the Marine Fauna of New Zealand

Primnoid octocorals (Anthozoa, Alcyonacea) — Part 3. *Thouarella*, and additional records of other primnoid species

Stephen Cairns

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Cover image
A community of lemon-yellow, orange-brown, and beige colour morphs of the bottle brush form of the primnoid octocoral, *Thouarella* (*T.*) *variabilis* (var. typical) Wright & Studer, 1889, on Seamount 7 (Australian EEZ), Macquarie Ridge, at 862 m (NIWA Stn TAN0803/78, 53.72° S, 159.13° E, 860 m, 11 April 2008). The small, white, stick-shaped objects are most likely carnivorous sponges (Family Cladorhizidae Dendy, 1922). Identity of primnoid confirmed tentatively by the author. Image captured by NIWA's DTIS (Deep Towed Image System) onboard RV *Tangaroa*, courtesy of the NIWA Seamounts Programme led by Drs Ashley Rowden and Malcolm Clark and CSIRO's Division of Marine and Atmospheric Research project "Biodiversity Voyages of Discovery" funded by the CSIRO Wealth from Oceans Flagship.

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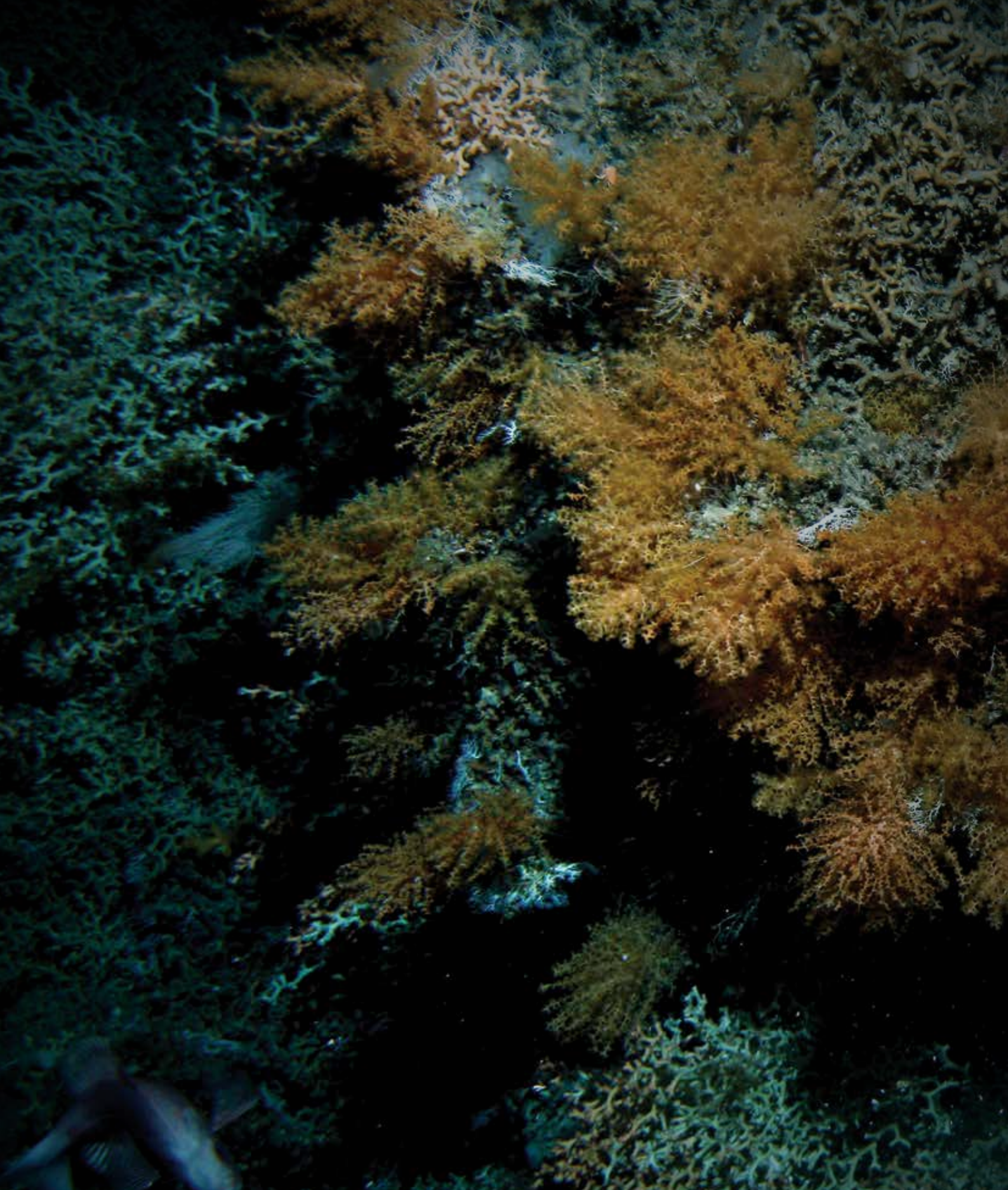

A community of the primnoid octocoral, *Thouarella* (*T.*) *variabilis* (var. typical) Wright & Studer, 1889, attached to live and dead matrix of the reef-forming, branching stony coral, *Solenosmilia variabilis* Duncan, 1873, on Gothic Seamount, Graveyard Knolls, Northwest Chatham Rise, at 1070 m (TAN1503/26, 42.73° S, 179.90° W, 1070 m, 31 March 2015). The fish to the left is an orange roughy, *Hoplostethus atlanticus* Collett, 1889. Identity of primnoid confirmed tentatively by the author. Image captured by NIWA's DTIS (Deep Towed Image System) onboard RV *Tangaroa*, courtesy of the NIWA Vulnerable Deepsea Communities Programme led by Drs Ashley Rowden and Malcolm Clark.

PREFACE

Primnoid octocorals (Anthozoa, Alcyonacea) — Part 3. *Thouarella*, and additional records of other primnoid species

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Abstract

The Primnoidae of New Zealand are reviewed from new and existing collections held within the National Institute of Water & Atmospheric Research Invertebrate Collection, Wellington, New Zealand; over 400 specimens from 222 stations were examined. This work constitutes the third and final part of a multipart series on the primnoid octocorals (phylum Cnidaria Hatschek, 1888; class Anthozoa Ehrenberg, 1834; order Alcyonacea Lamouroux, 1812; suborder Calcaxonia Grasshoff, 1999; family Primnoidae Milne Edwards, 1857) for the region. The focus of this memoir is the genus *Thouarella* Gray, 1870, including six species of that genus, and transfers one species, *T. moseleyi*, to the genus *Metafannyella* Cairns & Bayer, 2009. Two additional primnoid species are also reported as new records for the New Zealand region: *Metafannyella rigida* sp. nov., and *Dasystenella austasensis* (Zapata-Guardiola & López-González, 2010a). This brings the total number of primnoid species known from primarily within the New Zealand Exclusive Economic Zone to 67, including 63 named and four unnamed species, the most species-rich family among the New Zealand Octocorallia. Furthermore, additional records of 27 previously reported primnoid species are listed.

Keywords

Thouarella, Metafannyella, Dasystenella, Primnoidae, New Zealand, Auckland Island, Antipodes Islands, Bounty Islands, Three Kings Islands, Norfolk Ridge, North Island, South Island, Macquarie Ridge, Macauley Island (Kermadec Islands), Chatham Rise, Kermadec Ridge, Lord Howe Rise, Louisville Ridge, Tasmania, Three Kings Ridge, Norfolk Ridge, Campbell Plateau, Bounty Plateau, Raukumara Plain, New Zealand Exclusive Economic Zone, Australian Exclusive Economic Zone, Hjort Seamount, Colville Ridge, Bollons Seamount

Introduction

The Primnoidae (phylum Cnidaria Hatschek, 1888; class Anthozoa Ehrenberg, 1834; order Alcyonacea Lamouroux, 1812; suborder Calcaxonia Grasshoff, 1999; family Primnoidae Milne Edwards, 1857) is one of the most diverse and species-rich families within the Octocorallia (Cairns 2012, 2016b), consisting of 43 genera, five subgenera and about 283 species (Cairns & Wirshing 2018). The species of only one of these 43 genera, *Thouarella* Gray, 1870, is the focus of this study, although several other species and additional New Zealand records are included herein—these were missed previously in Cairns (2012, 2016b). *Thouarella* has been intensely studied over the last century, its species being allocated to several subgenera and species groups (see synonymy below) 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 of 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 by 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 or in pairs and whorls. The nominate subgenus consists of 28 species: the subgenus *Euthouarella* Gray, 1870 consists of eight species.

Before this series was initiated, a list of the octocorals occurring in New Zealand waters was published by Cairns *et al.* (2009), which listed only 10 named primnoid species but suggested another 30 unidentified species. Cairns (2012) covered four primnoid genera, including *Narella* Gray, 1870 and *Calyptrophora* Gray, 1866, and this study increased the number of named primnoid species to 26. Cairns (2016b) included most of the other primnoid genera and resulted in 56 named species plus six unnamed species, or a total of 62 species. This concluding work increases the number of known species to 63 plus an additional four unnamed species, or a total of 67 primnoid species. This represents about 23% of all known primnoid species, a disproportionately high percentage for a relatively small geographic region. The high number of species might be explained by the large number of seamounts and ridges occurring at 200–2000 m depth within the New Zealand region, topographical features which provide the preferred hard bottom substrate type for primnoid octocorals.

The 67 species makes Primnoidae the most species-rich family of Octocorallia in this region, and the second most species-rich family of Cnidaria in New Zealand waters, second only to the hydroid family Sertulariidae (Cairns *et al.* 2009)

Ecology

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A summary of ecological information on members of the octocoral family Primnoidae is presented in Cairns (2016b). Here, we provide additional and updated material specific to the genera *Thouarella*, *Metafannyella*, and *Dasystenella*.

Along with other hard corals, all species of *Thouarella*, *Metafannyella*, and *Dasystenella* are protected under the New Zealand Department of Conservation Wildlife Act 2010 (amendment of Schedule 7A of the Wildlife Act 1953). These primnoids have a bottlebrush, bushy, sea fan, or uniplanar form; while they are morphologically small, they are a group still susceptible to impacts from bottom trawling and bottom long-lining. For example, *Thouarella* records dominated long-line coral by-catch in New Zealand's Ross Sea toothfish fishery in a study by Tracey *et al.* (2010), and all three genera described here have been, and continue to be, recorded as by-catch on observed commercial fishing trips and during fisheries research trawl surveys (Macpherson *et al.* 2017, 2018; Mills *et al.* 2018; Tracey *et al.* 2017). Due to their upright position on the seafloor, these species would also be vulnerable to any mineral exploration or mining activities, e.g., from elevated levels of sediment and smothering, within the areas that they are found.

An understanding of this group's preferred environment is improving our knowledge of the ecological importance of the coral fauna to New Zealand, in terms of abundance, habitat, and ecology. Towed video and camera stills data, as seen along known transect lines obtained at sea, has enabled a significant amount of *in situ* data collection for coral taxa and the preferred bottom substrate in which they are found (see Seafloor images, Figs 1–10).

Within the region these three genera have a varied distribution. None of the six species of *Thouarella* are endemic, but rather are widespread throughout the Subantarctic and Antarctic regions; *Thouarella* (*E.*) *hilgendorfi* (Studer, 1878) appears to be almost cosmopolitan, occurring as well in tropical latitudes. Both species of *Metafannyella* are located on the

Chatham Rise: new species *M. rigida* being endemic to that region, and *M. moseleyi* (Wright & Studer, 1889) **comb. nov.** also found north to Indonesia. *Dasystenella austasensis*, like *Thouarella*, is circum-Antarctic in distribution. Within New Zealand waters species of *Thouarella* occur at 380–2010 m, *Metafannyella* at 39–1097 m, and *Dasystenella* occur at 720–1476 m.

Locality records of these and other octocorals continue to provide an understanding of the region's biodiversity, and spatial distribution data for various octocorals are being used for predicted distributions from habitat suitability modelling studies, both inside the New Zealand Exclusive Economic Zone (EEZ) as well as more widely, e.g., in the South Pacific Regional Fisheries Management Organisation (SPRFMO) area, (Anderson *et al.* 2016, Rowden *et al.* 2017, Georgian *et al.* 2019).

Invertebrate associates, particularly marine polychaetes, are often found commensally with these corals and some form tubes along the main branches of the coral colony. Six species included in this report (*Thouarella variabilis* Wright & Studer, 1889, *T. brevispinosa* Wright & Studer, 1889, *T. diadema* Cairns, 2006, *T.* (*E.*) *hilgendorfi*, *Metafannyella moseleyi*, *M. rigida* **sp. nov.**) consistently live with commensal polynoid polychaetes. Based on the specimens available, this commensal relationship seems to be an obligate one. Although the polynoids could not be identified to species level in the specimens examined, they were determined to be in the sub-family Polynoinae (Brett Gonzalez, Smithsonian Institution, pers. comm.). Other associates found on *Thouarella* colonies are ophiuroids and small white anemones.

Biological data are lacking, but several of the corals listed herein are gonochoric brooders. Dispersal strategies for two of these genera in New Zealand waters are described in Dueñas *et al.* (2016), who investigated phylogeographical patterns in the South Pacific and Southern Ocean of both *Tokoprymno* Bayer, 1996 and *Thouarella*. The Antarctic Circumpolar Current was seen to be a semi-permeable barrier to gene flow between northern and southern populations, with some gene flow occurring between regional populations. Significant genetic structure among four regional populations was apparent. Additionally, the authors provided evidence that the populations from each of their four sampling regions could be different species.

Methods and materials

Sample collection. All primnoid octocorals accessioned into the National Institute of Water & Atmospheric Research Invertebrate Collection (NIC), Wellington, New Zealand, since Cairns (2016b), were examined, as well as others that had been overlooked, adding 27 additional records of primnoid species. This study is based on over 400 specimens from 222 stations.

The majority of specimens were collected over a period of 19 years onboard the NIWA research vessels RV *Tangaroa* (1972–1984), RV *Tangaroa* (1991, still in service) and RV *Kaharoa*; numerical voyage identifier and associated stations are cited as NIWA Stn TAN(voyage number)/(Stn number) and NIWA Stn KAH(voyage number)/(Stn number), respectively. The voyages include those described as: Lee Edge (1959); Chatham Rise (1961); Benthos South (1962); Microseism Taranui (1963); Campbell Plateau (1965); Ngatoro Taranui (1966); Hikurangi Benthos (1967); Phosphorite (1968); North West Slope Benthos (1968); Chatham Benthos (1969); Challenger Centenary Cruise (1974); Chatham Island Phosphorite (1975); Norfolk Ridge II (1977); Chatham Coral (1978); Campbell Plateau III (1978); Bounty Benthos (1979); Canyon Coral (1979); Glauconite I (1979); Southern Benthomass (1981); Hikurangi Margin (1981); Northland SCUBA (1981); Norfolk Basin Geology (1983); Kermadec Coral (1982); Tasman Basin (1982); Norfolk Basin Geology (1983); Hikurangi Geomechanics (1987); Manganese Crusts (1988); Bay of Plenty Geology (1989); Telecom and Turnagain (1990); RV *Tangaroa* Seamounts of the Chatham Rise (1996, 2001, 2009); Kermadec Ridge Volcanics (2002); NORFANZ (2003); Bay of Plenty and Hikurangi Plateau Seamounts (2004); Graveyard Seamounts (2006); RENEWZ I-NEW ZEEPS - Exploration of Chemosynthetic Habitats of the New Zealand Region (2006); Oceans Survey 20/20 Chatham Rise (2007); Macquarie Ridge (2008); Oceans Survey 20/20 Bay of Islands (2009); KARMA 2 (2010); Vulnerable Deep Sea Communities I Hikurangi Margin (2010); Biogenic Habitats on the Continental Shelf (2011); Fisheries Oceanography II Chatham Rise (2011); Vulnerable Deep Sea Communities II Bay of Plenty (2012); NIRVANA (2012); Oceans Survey 20/20 Reinga Basin (2013); Vulnerable Marine Ecosystems: Louisville Ridge (2014); Kermadec-Rangitāhua (TAN612); RV *Tangaroa* Fisheries Research Trawl surveys (1995–2018); RV *Sonne* Chatham Rise voyage SO-17 (1981); and PoriBacNewZ voyage SO-254 (2017); Ministries of Fisheries New Zealand Scientific Observers Bycatch Programme; the Nova Expedition (1964); RV *Kaharoa* (KAH) Aotea Seamounts voyages (1999, 2002).

Material also included specimens from one station from the USNS *Eltanin*, and one from the USFC *Albatross*, both deposited at the National

Museum of Natural History (NMNH), Smithsonian Institution, Washington, D.C. Type specimens of most of the previously described species were examined. A confirmed depth range is presented for each species, defined as the deepest shallow to the shallowest deep component of all trawls considered for a species.

Sample preparation. Each species was examined and described from the macroscopic to microscopic level in a consistent order. The gross morphology of the colony, shape and colour, and aspects of the axis are reported first, followed by characteristics of the polyps (shape, size, arrangement of polyps, number of polyps per whorl, whorls per cm, and whorl diameter). All sclerite types were examined by Scanning Electron Microscopy (SEM), i.e., the body wall sclerites, operculars, coenenchymals, and pinnular (if present). Both outer and inner sides of these sclerites are described, as well as the number of body wall scales per row, including the sclerite formula. The sclerite formula is the range of number of sclerites in the abaxial: outer lateral: inner lateral: adaxial rows, respectively. Stereo pairs of the polyps are often provided to better visualise the three-dimensional relationships of the sclerite types and to show their proportional size. The SEM images were taken using a Zeiss EVO MA15 scanning electron microscope (after Cairns 2016b).

Registration of type and general material. Primary and secondary type materials of new species, and additional material, are accessioned within the NIC at NIWA, formerly the New Zealand Oceanographic Institute (NZOI), using the prefix **NIWA**. Several specimens collected from inside the Australian EEZ by NIWA have been donated to the Tasmanian Museum and Art Gallery (TMAG) and accessioned into their biodiversity collections (prefix **TMAG**). Voucher specimens and SEM stubs of most species belong to a series established by the author, and are deposited at the NMNH, Washington D.C. These stubs may be prefaced by the acronym, USNM, still used for cataloging purposes. Additional registration prefixes used in the text include: **MA** - for specimens from the TAN1612 Kermadec-Rangitāhua expedition accessioned into the collections of the Auckland War Memorial Museum (AIM), Auckland; **NHMUK** - for specimens accessioned into the collections of the Natural History Museum, Cromwell Rd, London SW7 5BD (formerly British Museum of Natural History, BMNH, BM (NH), NHM, BM); **USNM** - for specimens accessioned into the collections of the National Museum of Natural History (NMNH), Smithsonian Institution, Washington D.C.; **ZMB** - for specimens accessioned into the collections of the Museum für Naturkunde, Invalidenstrasse 43, 10115 Berlin, Germany; **MNHWU** (formerly MZW) - for specimens accessioned into the collections of the Museum of Natural History, Wrocław University, ul. Sienkiewicza 21, 50–335 Wrocław, Poland (formerly the Zoological Museum in part). Registration numbers are cited in the text.

ZooBank registration. This published work and the nomenclatural acts that it contains (i.e. creation of new species and new combinations) have been registered in ZooBank (http://www.zoobank.org/), the official registry of Zoological Nomenclature. The ZooBank Life Science Identifier for this publication is urn:lsid:zoobank.org:pub:19436036-5B5B-4B78-8706-9CCFEA9BE44E.

New scientific names and other comments are registered in ZooBank, and the registration details are included as part of the descriptions under the subheading 'ZooBank registration'.

Area of study. The main area of study is the New Zealand EEZ, including the Subantarctic region of New Zealand (Bollons Seamount, Bounty Plateau, Campbell Plateau, Pukaki Rise, and Macquarie Ridge) ridges to the north and east of New Zealand (West Norfolk and Norfolk Ridge, Three Kings Ridge, Reinga Ridge, South Maria Ridge, Colville Ridge, Kermadec Ridge, Louisville Ridge, and Cavalli Seamount region), Northland, Bay of Plenty to East Cape, Chatham Rise, and Challenger Plateau. A few specimens were collected from outside the New Zealand EEZ. Twenty-one specimens were collected from International Waters surrounding New Zealand including collections from the Tasman Sea (1977, 1998), West Norfolk Ridge (2003, 2006, 2009), Lord Howe Rise (2009, 2010), Challenger Plateau (1998–2000), Louisville Ridge (2014), Three Kings Rise (2017), Bollons Seamount (2003), and Macquarie Ridge (2008). Thirteen specimens were collected from the Australian EEZ including eight from around Macquarie Island on the Macquarie Ridge Surveys (2008, 1965), and others from early collections along Norfolk Ridge near Norfolk Island (1977), off Tasmania (1997) and the southern tip of the Campbell Plateau (1978).

Seafloor images of living primnoid octocoral species. Today, most NIWA voyages and international voyages with ROV capability, provide seafloor images of living organisms and their habitat. NIWA's Deep Towed Imaging System (DTIS) provides increasingly detailed images for the accurate identification of primnoids *in situ*; these images provide essential information for our understanding of the morphology and ecology of these octocorals. Seafloor images of

living specimens provided by NIWA are provided as an image library at the back of this volume (Seafloor images, Figs 1–10).

Terminology

The most comprehensive illustrated glossary of octocoral morphology is that of Bayer, Grasshoff & Verseveldt (1983), which was based on Bayer (1956). Morphological terms used in this paper were previously defined by Cairns (2016b) and are provided again, below, for ease of reference.

abaxial - a row or two contiguous longitudinal rows of body wall sclerites that occur on the outside (facing away from the branch) of the polyp

adaxial - a row or two contiguous longitudinal rows of body wall sclerites that occur on the inside (facing toward the branch) of the polyp

alternate pinnate - a feather-like branching pattern in which the branchlets alternate with one another as they arise from a stem

ascus scale - a body wall scale having a warty basal region that supports a cup-like concavity open to the outer surface

axis - the inner supporting structure, in primnoids being strongly calcified and consisting of undulating concentric layers; often golden in colour

biserial alternate - the placement of polyps on a branch in an alternating fashion on either side of the branch

body wall scale - the longitudinal rows (2–8) of scales that cover the polyp surface

bottlebrush branching - branching in which numerous crowded, short branchlets arise all around the main stem, resembling a bottlebrush

branchlet – small branches that diverge from a single or several larger-diameter branches

buccal scale - the distalmost pair of body wall scales of certain primnoid genera, such as *Narella* or *Paracalyptrophora*

coenenchymal scale - scales that cover the branch surfaces

dichotomous branching - branched colonies in which the branching pattern is a repeated bifurcation

flabellate – colonies that have a uniplanar shape

flagelliform - colonies that are unbranched, i.e., whip-like

inner lateral (IL) - two non-contiguous longitudinal rows of body wall sclerites that occur on the lateral edges of a polyp between the adaxial and outer lateral rows

keel - a longitudinal medial ridge on the inner face of opercular and some marginal scales

lateral branching - colonies in which the branching originates irregularly, neither pinnate nor dichotomous

marginal scale - the distalmost body wall scales that cover a polyp; those closest to the operculum

outer lateral (OL) - two non-contiguous longitudinal rows of body wall sclerites that occur on the lateral edges of a polyp between the abaxial and inner lateral rows

operculum - eight triangular scales that form a dome that covers the withdrawn tentacles in many primnoid genera

opposite pinnate branching - a feather-like branching pattern in which the branchlets occur opposite one another from a stem

polyp - an individual of the octocorallian colony

scale - a thin, flat or nearly flat sclerite; the predominant form of sclerite in the Primnoidae

sclerite - a calcareous (calcitic), usually microscopic, skeletal support element in the mesoglea of the colony, occurring in many different shapes and sizes; often used to distinguish species and genera

sclerite formula - the number range of body wall sclerites in the abaxial, outer lateral, inner lateral and adaxial rows, respectively

submarginal scale - the tier of body wall scales just proximal to the marginal scales

uniplanar colony - a colony having its branches arranged in a plane

whorl - three or more polyps forming a circle at the same level of a branch

Abbreviations

AIM	Auckland War Memorial Museum, The Auckland Domain, Parnell, Auckland 1010
L:W	Ratio of length to the width of a scale
MNHWU	Museum of Natural History, Wrocław University, Poland
NIC	NIWA Invertebrate Collection, NIWA, Wellington, New Zealand
NIWA	National Institute of Water & Atmospheric Research, 301 Evans Bay Parade, Kilbirnie, Wellington 6021
NMNH	National Museum of Natural History, Smithsonian Institution, Washington, DC (formerly United States National Museum, or USNM)
SEM	Scanning electron microscopy, often prefaces a stub number
TMAG	Tasmanian Museum and Art Gallery, Dunn Place, Hobart TAS 7000, Australia
USFC	United States Fish Commission

USNM United States National Museum, Smithsonian Institution, Washington, D.C., (now known as the NMNH), this acronym is still used for cataloguing purposes

ZMB Zoologisches Museum, Berlin

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First and foremost, I thank Di Tracey (NIWA), who encouraged and facilitated my study of New Zealand octocorals over the last decade. Without her help and vision, I could not have completed these works. She also wrote most of the ecology section of this paper. I am also indebted to the indefatigable Diana Mac Pherson (NIWA), who helped find and catalogue the octocoral specimens. Carina Sim-Smith (NIWA) generously made the distributional maps, and Robert Ford constructed the Photoshop figures as well as taking the colony images. I acknowledge four anonymous reviewers for their comments on this work, and the work of meticulous editors Michelle Kelly and Sadie Mills of NIWA, all of whom made this a more complete, accurate, and attractive work. Publication of this NIWA Biodiversity Memoir was funded by NIWA under Coasts and Oceans Research programme 2 Marine Biological Resources: Discovery and Definition of the Marine Biota of New Zealand (2015/2016 to 2020/2021 SCI) and NIWA Comms. I also thank Fisheries New Zealand Observers and NIWA fisheries research trawl and biodiversity survey scientists for their on-going sample collection; Geoff Read (NIWA) for comments on Polynoinae associates, and Rob Stewart for helping to select *in situ* camera images from the region.

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South Pacific Vulnerable Marine Ecosystems Project (TAN1402) funded by MBIE; Nascent Inter-Ridge Volcanic and Neotectonic Activity (NIRVANA, TAN1213) voyage, funded by FNZ, in collaboration with Auckland University, GNS Science, and the University of New Hampshire.

Deck photo of a primnoid octocoral thought to be *Metafannyella moseleyi* (Wright & Studer, 1889), from Diamond Head Seamount – Peak A in the Andes Seamount region east of the Chatham Islands, collected between 724 – 838 m (TAN1503/121, 44.142° S, 174.713° W, 724 – 838 m, 11 April 2015). Identity of primnoid confirmed tentatively by the author. Image by Rob Stewart, NIWA, onboard RV *Tangaroa*, courtesy of the NIWA Vulnerable Deepsea Communities Programme led by Drs Ashley Rowden and Malcolm Clark.

TAXONOMY & SYSTEMATICS

Checklist of species known from the New Zealand EEZ

This list incorporates all species known to occur within the New Zealand EEZ, as described in Cairns (2012, 2016b), and as updated here.

- * Species described or redescribed in this work.
- ** Species treated in Cairns (2016b) with additional information added in this work.
- † Species described in Cairns (2012) or listed in the checklist; these are not considered further in this work.
- ‡ Species described in Cairns (2016b) or listed in the checklist; these are not considered further in this work.
- § Species names are informal and operational, as there is currently not enough material to describe them formally

Notes

[1]*Metafannyella moseleyi* (Wright & Studer, 1889) **comb. nov.** is cited in the Cairns (2016b) New Zealand checklist as *Thouarella moseleyi* Wright & Studer, 1889. Species of *Thouarella* were not treated in Cairns (2016b) because they were the subject of the present work. The species was first mentioned in the checklist of species in Cairns (2012).

[2]*Mirostenella articulata* Bayer, 1988 (NIWA 54369, TAN905/121) is cited in the Cairns (2016b) checklist of species known from the New Zealand EEZ, as *Mirostenella* cf. *articulata* Bayer, 1988 (NIWA 54369). A subsequent examination by the author confirmed the identity of the species (hence removal of 'cf.' from the species name), but there is still not enough material to describe it properly.

[3]*Callogorgia* cf. *granulosa* (Kinoshita, 1907) (NIWA 11091) **sp. nov.** is cited in the Cairns (2016b) New Zealand checklist as *Fanellia* sp. nov. cf. *granulosa* (NIWA 11091), and in the checklist notes as *Fanellia* sp. nov. cf. *granulosa* (Kinoshita, 1907) from NIWA Stn Z8882 (NIWA 11091 and USNM 1278944). Cairns (2016b) considered the specimen to be distinct from *F. granulosa* (Kinoshita, 1907) and was not formally described because there was not enough material available for a proper description. *Callogorgia* cf. *granulosa* (Kinoshita, 1907) (NIWA 11091) **sp. nov.** remains an operational name until new material is available for study, and thus, has not been registered in ZooBank.

[4]*Callogorgia tuberculata* (Versluys, 1906) is cited in the Cairns (2016b) New Zealand checklist as *Fanellia tuberculata* (Versluys, 1906). All species in the genus *Fanellia* were transferred in synonymy to *Callogorgia* by Cairns & Wirshing (2018).

[5]*Perissogorgia* **sp. nov.** (NIWA 47808) was first cited in the Cairns (2016b) New Zealand checklist; it is an undescribed species known only from a single specimen (NIWA 47808 and USNM 1278871) from NZOI Stn G8. Cairns (2016b) considered the specimen to be distinctive in being unbranched, having 12 polyps per whorl, and having 6–8 unpaired abaxial sclerites. It was not described in Cairns (2016b) because there was not enough material available for a proper description. *Perissogorgia* **sp. nov.** (NIWA 47808) remains an operational name until new material is available for study, and thus, has not been registered in ZooBank.

Phylum CNIDARIA Hatschek, 1888
Class ANTHOZOA Ehrenberg, 1834
Order ALCYONACEA Lamouroux, 1812
Suborder CALCAXONIA Grasshoff, 1999
Family PRIMNOIDAE Milne Edwards, 1857
Genus ***Primnoella*** Gray, 1858
Primnoella australasiae (Gray, 1850) ‡
Primnoella distans Studer, 1878 **
Primnoella insularis Cairns, 2016b **
Primnoella sp. (NIWA 77617) ‡ §
Genus ***Convexella*** Bayer, 1996
Convexella krampi (Madsen, 1956) ‡
Genus ***Ophidiogorgia*** Bayer, 1980
Ophidiogorgia cf. *kuekenthali* (Gravier, 1913) (NIWA 77618) ‡ §

Genus ***Callozostron*** Wright, 1885
Callozostron acanthodes Bayer, 1996 **
Callozostron carlottae sensu Bayer, 1996 **
Callozostron mirabile Wright, 1885 ‡
Callozostron pinnatum Cairns, 2016b ‡
*Genus **Thouarella*** Gray, 1870
Subgenus ***Thouarella*** Gray, 1870
Thouarella (*Thouarella*) *brevispinosa* Wright & Studer, 1889 *
Thouarella (*Thouarella*) *crenelata* Kükenthal, 1907 *
Thouarella (*Thouarella*) *diadema* Cairns, 2006 *
Thouarella (*Thouarella*) *koellikeri* Wright & Studer, 1889 *
Thouarella (*Thouarella*) *variabilis* (var. typical) Wright & Studer, 1889 *
Thouarella (*Thouarella*) *variabilis* (var. *gracilis*) Wright & Studer, 1889 *
Subgenus ***Euthouarella*** Kükenthal, 1915
Thouarella (*Euthouarella*) *hilgendorfi* (Studer, 1878) *
Genus ***Loboprimnoa*** Cairns, 2016b
Loboprimnoa exotica Cairns, 2016b **
Genus ***Metafannyella*** Cairns & Bayer, 2009
Metafannyella chathamensis Cairns, 2016b **
Metafannyella eos (Bayer, 1998) **
Metafannyella moseleyi (Wright & Studer, 1889) **comb. nov.** [1] ‡ *
Metafannyella polita Cairns, 2016b **
Metafannyella rigida **sp. nov.** *
Metafannyella ventilabrum (Studer, 1878) ‡
Genus ***Mirostenella*** Bayer, 1988
Mirostenella articulata Bayer, 1988 (NIWA 54369) [2] ‡
Genus ***Plumarella*** Gray, 1870
Subgenus ***Dicholaphis*** Kinoshita, 1907
Plumarella (*Dicholaphis*) *cordilla* Cairns, 2016b ‡
Subgenus ***Faxiella*** Zapata-Guardiola & López-González, 2012
Plumarella (*Faxiella*) *delicatula* (Thomson & Rennet, 1931) ‡
Genus ***Helicoprimnoa*** Cairns, 2012
Helicoprimnoa fasciola Cairns, 2012 † ‡
*Genus **Callogorgia*** Gray, 1858
Callogorgia dichotoma Cairns, 2016b **
Callogorgia formosa (Kükenthal, 1907) ‡
Callogorgia gilberti (Nutting, 1908) **
Callogorgia histoclados (Cairns, 2016b) ‡ **
Callogorgia korema (Bayer & Stefani, 1989) **
Callogorgia modesta (Studer, 1878) ‡
Callogorgia sertosa (Wright & Studer, 1889) **
Callogorgia cf. *granulosa* (Kinoshita, 1907) (NIWA 11091) **sp. nov.** [3] §
Callogorgia tessellata Cairns, 2016b ‡
Callogorgia tuberculata (Versluys, 1906) [4] **
*Genus **Primnoa*** Lamouroux, 1812
Primnoa notialis Cairns & Bayer, 2005 ‡
Genus ***Narella*** Gray, 1870
Narella clavata (Versluys, 1906) † **
Narella dampieri Cairns, 2012 † ‡
Narella hypsocalyx Cairns, 2012 † **
Narella mesolepis Cairns, 2012 † ‡
Narella mosaica Cairns, 2012 † ‡

Genus ***Narella*** Gray, 1870 (*continued*)
Narella parva (Versluys, 1906) † ‡
Narella studeri (Versluys, 1906) † **
Narella vulgaris Cairns, 2012 † **
Genus ***Narelloides*** Cairns, 2012
Narelloides crinitus Cairns, 2012 † **
Narelloides traceyae Cairns, 2016b ‡**
Genus *Metanarella* Cairns, 2012
Metanarella nannolepis Cairns, 2012 † ‡
Genus ***Paracalyptrophora*** Kinoshita, 1908
Paracalyptrophora hawaiiensis Cairns, 2009 **
Paracalyptrophora mariae (Versluys, 1906) ‡
Genus ***Calyptrophora*** Gray, 1866
Calyptrophora clinata Cairns, 2007 ‡
Calyptrophora cristata Cairns, 2012 † **
Calyptrophora cucullata Cairns, 2012 † ‡
Calyptrophora diaphana Cairns, 2012 † **
Calyptrophora inornata Cairns, 2012 † **
Calyptrophora niwa Cairns, 2012 † **
Calyptrophora wyvillei Wright & Studer, 1889 † ‡
Genus ***Tokoprymno*** Bayer, 1996
Tokoprymno maia Bayer, 1996 ‡
Genus ***Parastenella*** Versluys, 1906
Parastenella pacifica Cairns, 2007 ‡
Parastenella spinosa (Wright & Studer, 1889) **
Genus ***Candidella*** Bayer, 1954
Candidella helminthophora (Nutting, 1908) **
Genus ***Pachyprimnoa*** Cairns, 2016b
Pachyprimnoa asakoae Cairns, 2016b ‡
Genus ***Perissogorgia*** Bayer & Stefani, 1989
Perissogorgia colossus Bayer & Stefani, 1989 ‡
Perissogorgia rigida Cairns, 2016b ‡
Perissogorgia **sp. nov.** (NIWA 47808) [5] ‡ §
Perissogorgia vitrea Bayer & Stefani, 1989 ‡
Genus ***Dasystenella*** Versluys, 1906
Dasystenella austasensis (Zapata-Guardiola & López-González, 2010a) *

Systematics

Order of taxa follows Cairns & Bayer (2009).

Phylum **Cnidaria** Hatschek, 1888
Class **Anthozoa** Ehrenberg, 1834
Order **Alcyonacea** Lamouroux, 1812
Suborder **Calcaxonia** Grasshoff, 1999
Family **Primnoidae** Milne Edwards, 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). —Taylor & Rogers 2015: 197.
Rhopalonema Roule, 1908: 2–3.
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 (*Epithourella*) 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. Colonies bottlebrush, uniplanar pinnate, or dichotomous in branching. Polyps isolated (occurring on all sides on the stem and branchlets in a random fashion, i.e., subgenus *Thouarella*) or arranged in pairs or whorls (subgenus *Euthouarella*). Each polyp covered by 6 or 8 longitudinal rows of body wall scales, the scales on 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 a 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 (from Cairns 2011).

Remarks. Most of the 36 species currently attributed to this genus (Table 1) occur deeper than 200 m, although one species, *T. hicksoni* Thomson, 1911, occurs as shallow as 11 m, and another, *T. vityaz*, holds the depth record for a octocoral at 6400 m (Cairns 2016a, Williams 2020). For more general comments, see the Introduction.

Key to the species of *Thouarella* in the New Zealand region

1a Polyps arranged in pairs or whorls of three ..... *T. hilgendorfi* (Studer, 1878)
1b Polyps arranged randomly on branchlets 2

2a Five or less body wall scales in abaxial rows. 3
2b Six or more body wall scales in abaxial rows 4

3a Two crowns of opercular scales; inner surface of marginal scale spine covered with multiple low serrate ridges ..... *T. diadema* Cairns, 2006
3b One crown of opercular scales; inner surface of marginal scale spines covered with a single prominent keel..... ..... *T. variabilis* Wright & Studer, 1889

4a Polyps distally flared ..... *T. brevispinosa* Wright & Studer, 1889
4b Polyps clavate 5

5a Outer surface of body wall scales coarsely granular and ridged; operculum of moderate height; coenenchymal scales 0.15–0.4 mm in greater diameter. ..... *T. koellikeri* Wright & Studer, 1889
5b Outer surface of body wall scales relatively smooth, with low granules and no ridges; operculum quite low; coenenchymal scales 0.2–0.5 mm in greater diameter ..... *T. crenelata* Kükenthal, 1907

Table 1. List of global *Thouarella* species, 11–6400 m. Species in the New Zealand EEZ bolded.

Taxon	Distribution and depth
Subgenus *Thouarella* (*Thouarella*)	
T. antarctica (Valenciennes, 1846)	SE South America, Crozet, 118–1005 m
***T. variabilis* Wright & Studer, 1889 var. typical**	Circum-Antarctic, 115–2100 m
T. variabilis* Wright & Studer, 1889 var. *gracilis	Heard Island, 278 m
***T. brevispinosa* Wright & Studer, 1889**	PEI, Argentina, 550–566 m
T. affinis Wright & Studer, 1889	mid-South Atlantic, 9–800 m
T. striata Kükenthal., 1907	Patagonia, Bouvet, 110–800 m
***T. crenelata* Kükenthal, 1907**	Circum-Subantarctic, 75–686 m
T. clavata Kükenthal, 1908	South Africa, 500 m
T. pendulina (Roule, 1908)	Circum-Antarctic, 32–655 m
T. chilensis Kükenthal, 1908	Patagonia, Chile, South Indian Ocean, 84–960 m
T. hicksoni Thomson, 1911	South Africa, 11–860 m
T. viridis Zapata-Guardiola & López-González, 2009	Patagonia, South Georgia, 106–825 m
T. minuta Zapata-Guardiola & López-González, 2009	Circum-Antarctic., 226–610 m
T. parachilensis Taylor & Cairns, 2013	South Georgia, Antarctic, 90–480 m
T. dispersa (Kükenthal, 1912)	Antarctica, 2450 m
T. grandiflora (Kükenthal, 1912)	Antarctica, 385 m
***T. diadema* Cairns, 2006**	Brazil, Patagonia, 278–3693 m
T. undulata Zapata-Guardiola & López-González, 2010b	South Georgia, 306–434 m
T. brucei Thomson & Ritchie, 1906	mid-SW Atlantic, Chile, 100–686 m
T. cristata Cairns, 2011	Aleutians, 94–768 m
***T. koellikeri* Wright & Studer, 1889**	Chile, Argentina, Antarctic Peninsula, 91–1920 m
T. andeep Zapata-Guardiola & López-González, 2010b	Antarctic, Patagonia, 312–714 m
T. trilineata Cairns, 2011	Aleutians, 97–1267 m
T. bipinnata Cairns, 2006	NW Atlantic, 507–1000 m
T. regularis (Wright & Studer, 1889)	Subantarctic, 137–658 m
T. porcupinensis Altuna & López-González, 2019	NE Atlantic, 365 m
T. islai Núñez -Flores, Gomez-Uchida & López-González, 2020	Weddell Sea, 261–600 m
T. weddellensis Núñez-Flores, Gomez-Uchida & López-González, 2020	Weddell Sea, 295–1097 m
T. polarsterni Núñez-Flores, Gomez-Uchida & López-González, 2020	Weddell Sea, 261–314 m
Subgenus *Thouarella* (*Euthouarella*)	
***T. hilgendorfi* (Studer, 1878)**	Cosmopolitan, 164–1760 m
T. laxa Versluys, 1906	Africa to Philippines, 400–1644 m
T. taylorae Cairns, 2018	Emperor Seamount, 280–372 m
T. vitjaz Zapata-Guardiola & López-González, 2012	North Pacific, Hawaii, 3200–6400 m
T. parva Kinoshita, 1908	Japan, depth unknown
T. biserialis (Nutting, 1908)	Hawai'i, 73–426 m
T. coronata Kinoshita, 1908	Japan, 146 m
T. debilis Cairns & Häaussermann, 2021	Chile, 24 m

Subgenus ***Thouarella* (*Thouarella*) Gray, 1870**

Thouarella Gray, 1870: 45.—Cairns 2006: 175–176; 2011: 4–5.—Taylor *et al*. 2013: 20–21 (species group 1).—Taylor & Rogers 2015: 197.

Thouarella (*Parathouarella*) Kükenthal, 1915: 150.

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

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

Diagnosis. *Thouarella* in which the polyps are arranged randomly on the stem and branchlets.

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

Thouarella (*T.*) *variabilis* Wright & Studer, 1889

Figs 1A–B, 3, 4; Seafloor images Figs 1–8.

Thouarella variabilis var. *a* (typical) Wright & Studer, 1889: 68–69, pl. 21, fig. 1.

Thouarella variabilis var. *c* (*gracilis*) Wright & Studer, 1889: 70.

Thouarella variabilis, Menneking 1905: 260–262, pl. 9, figs. 9–10, 21–22.—Brito, Tyler & Clarke 1997: 63–69 (reproductive biology).—Taylor *et al.* 2013: 19, 26–30, figs. 6–7 (complete synonymy).

Thouarella (*Parathouarella*) *variabilis*, Kükenthal 1919: 428, fig. 202.

Thouarella (*Thouarella*) *variabilis typical*, Cairns 2006: 177 (listed).—Cairns & Bayer, 2009: 27 (listed).

Thouarella (*Thouarella*) *variabilis* var. *gracilis*, Cairns 2006: 177 (listed).

Thouarella (*Thouarella*) *variabilis*, Cairns & Wirshing 2018: fig. 1 (cladogram).

Material examined. Variety typical (Seafloor images Figs 1–6, 8)—*Bollons Seamount*: NIWA 9610, NIWA Stn TAN0006/D1, 49.774° S, 176.679° W, 1000–1089 m, 23 May 2000, and 1 colony, USNM 1575146.

Macquarie Ridge: NIWA 42611, SOP Stn TRIP2571/147, 50.1° S, 163.8° E, 934–1012 m, 18 Mar 2008.

Seamount 8 (Australian EEZ), *Macquarie Ridge*: TMAG K5415, NIWA Stn TAN0803/89, 55.381° S, 158.427° E, 504–637 m, 15 Apr 2008, 1 specimen, SEM stubs 2545–2548.

Seamount 9 Hjort (Australian EEZ), *Macquarie Ridge*: USNM 98024, USNS *Eltanin* Stn 1423, 56.35° S, 158.467° E, 1574–1693 m, 12 Feb 1965.

Variety *gracilis* (Seafloor images Fig. 7)—*Three Kings Ridge*: NIWA 9775, NZOI Stn U582, 31.862° S, 172.433° E, 790 m, 05 Feb 1988.

Northland: NIWA 9735, NZOI Stn J971, Off Poor Knights Islands, 35.422° S, 174.982° E, 246 m, 22 Jun 1981.

Off Hawke's Bay: NIWA 9715, NZOI Stn R439, 39.447° S, 178.333° E, 1000 m, 16 Jun 1990; NIWA 9748, NZOI Stn R435, 39.430° S, 178.422° E, 985–1190 m, 15 Jun 1990.

Hikurangi Margin: NIWA 9676, NIWA Stn Z10820, 41.591° S, 175.773° E, 1400 m, 26 May 2001, and 1 colony, USNM 1575149; NIWA 63905, NIWA Stn TAN1004/100, 42.139° S, 174.546° E, 1375–1480 m, 24 Apr 2010; NIWA 64015, NIWA Stn TAN1004/114, 42.099° S, 174.578° E, 940–889 m, 26 Apr 2010.

Chatham Rise: NIWA 28816, NIWA Stn TAN0705/291, 42.947° S, 174.476° E, 950–971 m, 28 Apr 2007; NIWA 25343, NIWA Stn TAN0604/21, Zombie Hill, 42.766° S, 179.926° W, 906–1061 m, 29 May 2006; NIWA 25425, NIWA Stn TAN0604/105, Gothic Hill, 42.727° S, 179.898° W, 992–1120 m, 04 Jun 2006; NIWA 53324, NIWA Stn TAN0905/60, Shipley Seamounts, 42.810° S, 179.516° W, 1251–1290 m, 20 Jun 2009; NIWA 9635, NIWA Stn Z9436, 44.230° S, 178.441° E, 1090 m, 29 Sep 1998; NIWA 9777, NZOI Stn C618, 43.867° S, 175.333° W, 623 m, 30 Apr 1961; NIWA 9751, NIWA Stn Z9446, 44.702° S, 177.299° W, 1100 m, 11 Oct 1998.

Southland: NIWA 87073, SOP Stn TRIP3750/90, 46.8° S, 169.9° E, 442–617 m, 02 Jun 2013.

Campbell Plateau: NIWA 9674, NIWA Stn Z9595, Otara Hill, 48.017° S, 166.1° E, 940–1180 m, 27 Nov 1998; NIWA 9687, NZOI Stn B172, 48.308° S, 168.533° E, 732 m, 08 Oct 1959; NIWA 9714, NIWA Stn Z9597, 48.034° S, 166.101° E, 937 m, 28 Nov 1998; NIWA 9716, NIWA Stn Z9596, Otara Hill, 48.017° S, 166.083° E, 980 m, 27 Nov 1998; NIWA 9717, 9718, NIWA Stn Z9583, 48.034° S, 166.100° E, 935 m, 25 Nov 1998; NIWA 9725, NIWA Stn Z9587, 48.002° S, 166.085° E, 943 m, 27 Nov 1998; NIWA 25515, NIWA Stn TAN0414/66, 48.857° S, 166.534° E, 389–443 m, 16 Dec 2004; NIWA 25518, NIWA Stn TAN0414/67, 48.938° S, 166.587° E, 467–503 m, 16 Dec 2004; NIWA 80646, NIWA Stn TAN1117/97, 48.952° S, 166.735° E, 395 m, 19 Dec 2011; NIWA 98603, NIWA Stn TAN1412/85, 48.947° S, 166.725° E, 394 m, 19 Dec 2014; NIWA 104273, NIWA Stn TAN0219/75, 48.863° S, 166.552° E, 380–434 m, 10 Dec 2002.

Pukaki Saddle: NIWA 114354, NIWA Stn TAN0307/31, 49.326° S, 176.552° E, 1522–1552 m, 21 Apr 2003.

Bounty Plateau: NIWA 11309, 125209, NZOI Stn T25, 48.152° S, 179.34° W, 693 m, 12 Mar 1981; NIWA 14645, NZOI Stn I684, 48.333° S, 179.483° W, 705 m, 15 Mar 1979; NIWA 143997, NZOI Stn I685, 48.325° S, 179.492° W, 722 m, 16 Mar 1979.

Macquarie Ridge: NIWA 11323, NIWA Stn Z9592, 48.551° S, 164.951° E, 940–1180 m, 30 Nov 1998; NIWA 42610, SOP Stn TRIP2571/187, 50.3° S, 163.4° E, 957–967 m, 24 Mar 2008; NIWA 9677, NIWA Stn TAN0306/6, Christabel Seamount, 50.943° S, 164.610° E, 1140–1105 m, 14 Apr 2003.

Seamount 9 Hjort (Australian EEZ), *Macquarie Ridge*: TMAG K5419, NIWA Stn TAN0803/102, 56.242° S, 158.462° E, 790–1025 m, 16 Apr 2008, and 1 colony, USNM 1575153.

Bollons Seamount: NIWA 14678, NIWA Stn TAN0006/D1, 49.774° S, 176.679° W, 1000–1089 m, 23 May 2000.

Bollons Seamount (International Waters): NIWA 9669, NIWA Stn TAN0307/83, 49.768° S, 175.242° W, 1278–1261 m, 02 May 2003; NIWA 9671, NIWA Stn TAN0307/81, 49.799° S, 175.306° W, 1180–881 m, 02 May 2003.

Sister I Seamount, *off Tasmania (Australian EEZ)*: TMAG K5414, CSIRO Stn SS0197/15, 44.270° S, 147.290° E, 1100–1122 m, 23 Jan 1997.

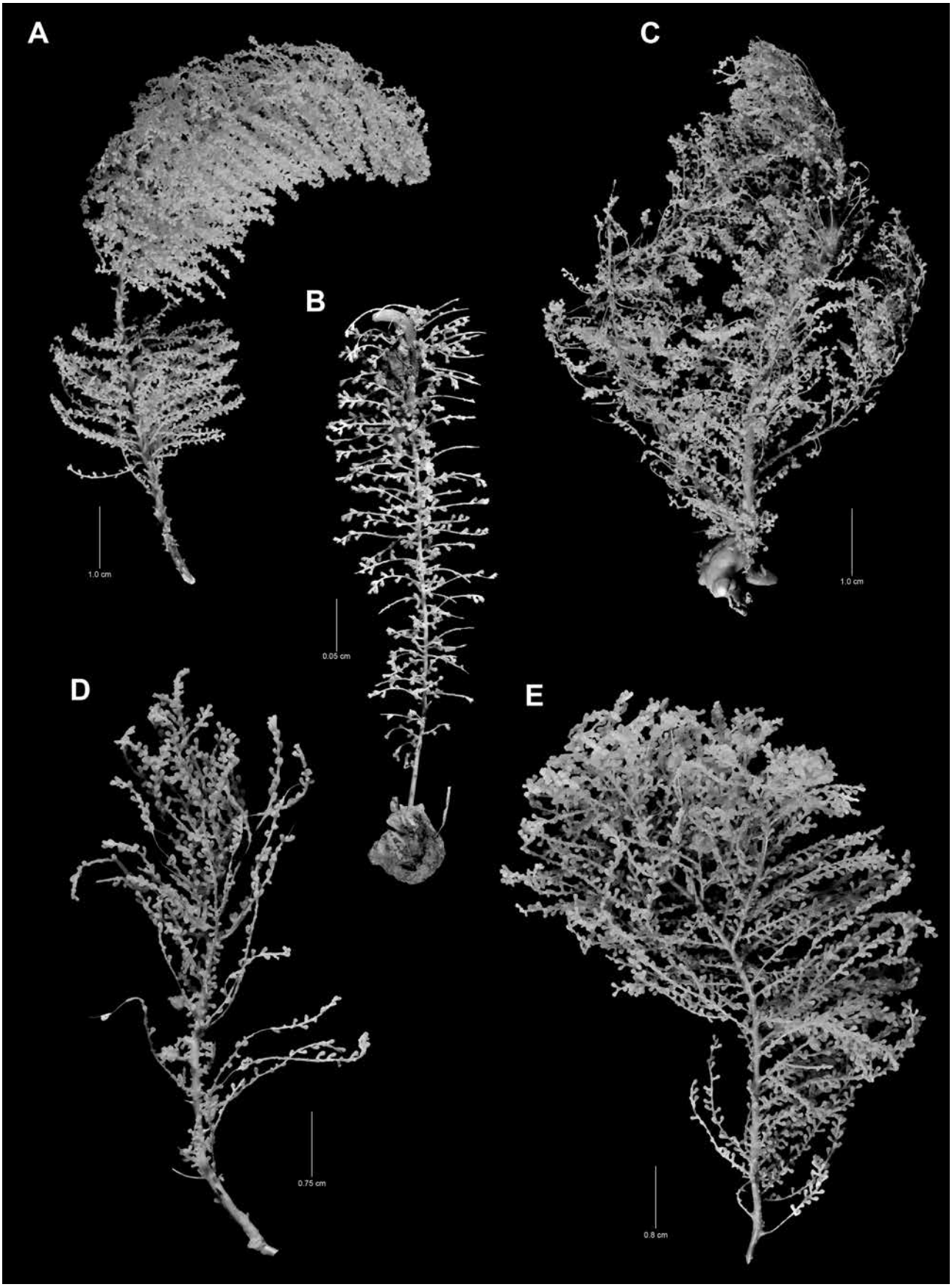

Figure 1. Colony morphology: **A.** *T. variabilis* (var. typical) Wright & Studer, 1889, TMAG K5415; **B.** *T. variabilis* (var. *gracilis*) Wright & Studer, 1889, NIWA 9676; **C.** *T. brevispinosa* Wright & Studer, 1889, TMAG K5411; **D.** *T. crenelata* Kükenthal, 1907, TMAG K5418; **E.** *T. koellikeri* Wright & Studer, 1889, NIWA 41003.

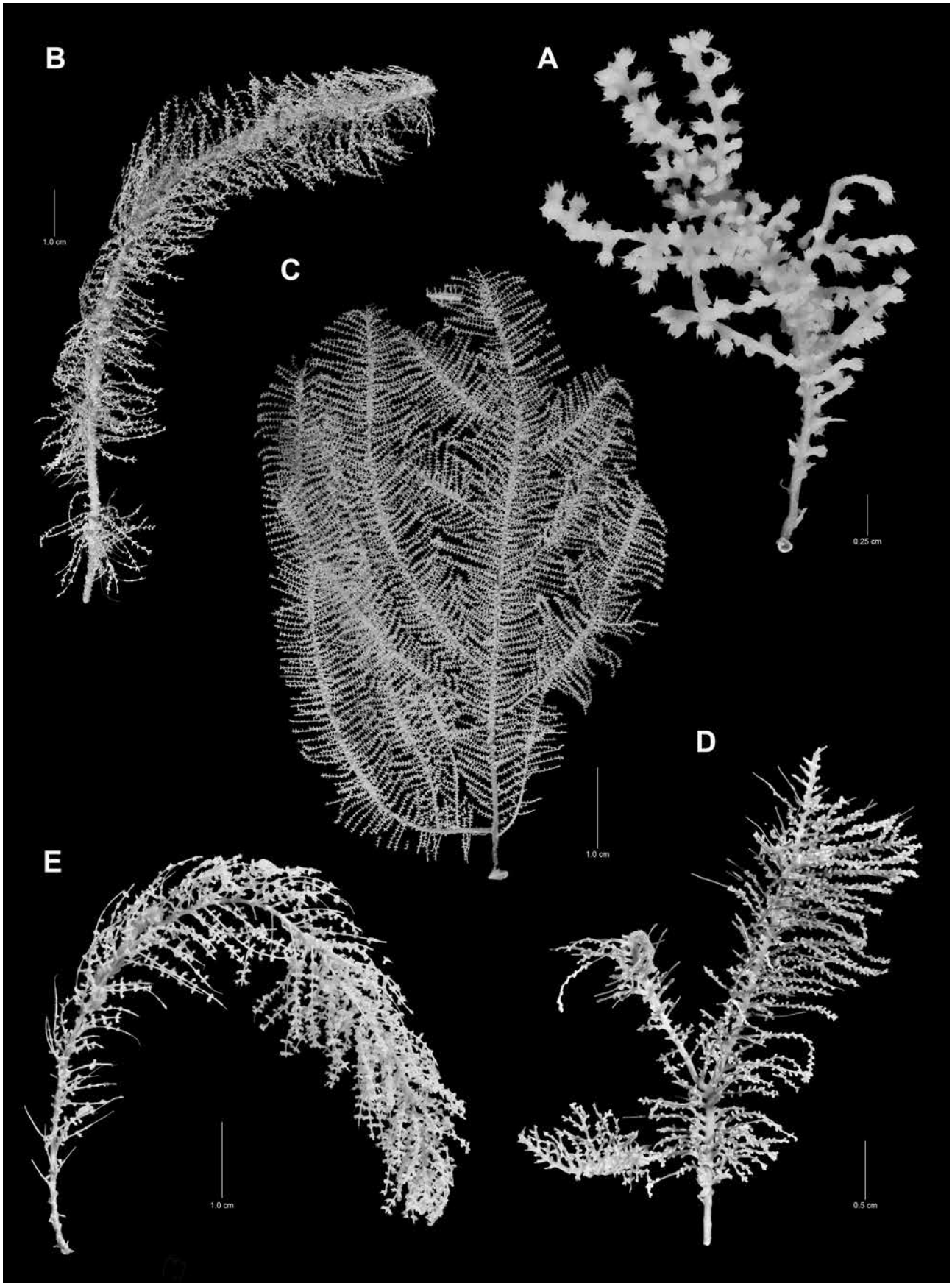

Figure 2. Colony morphology: **A.** *T. diadema* Cairns, 2006, NIWA 128286; **B.** *T. hilgendorfi* (Studer, 1878), NIWA 9618; **C.** *Metafannyella moseleyi* (Wright & Studer, 1889), NIWA 55479; **D.** *Metafannyella rigida* **sp. nov.**, holotype; **E.** *Dasystenella austasensis* (Zapata-Guardiola & López-González, 2010a), NIWA 9710.

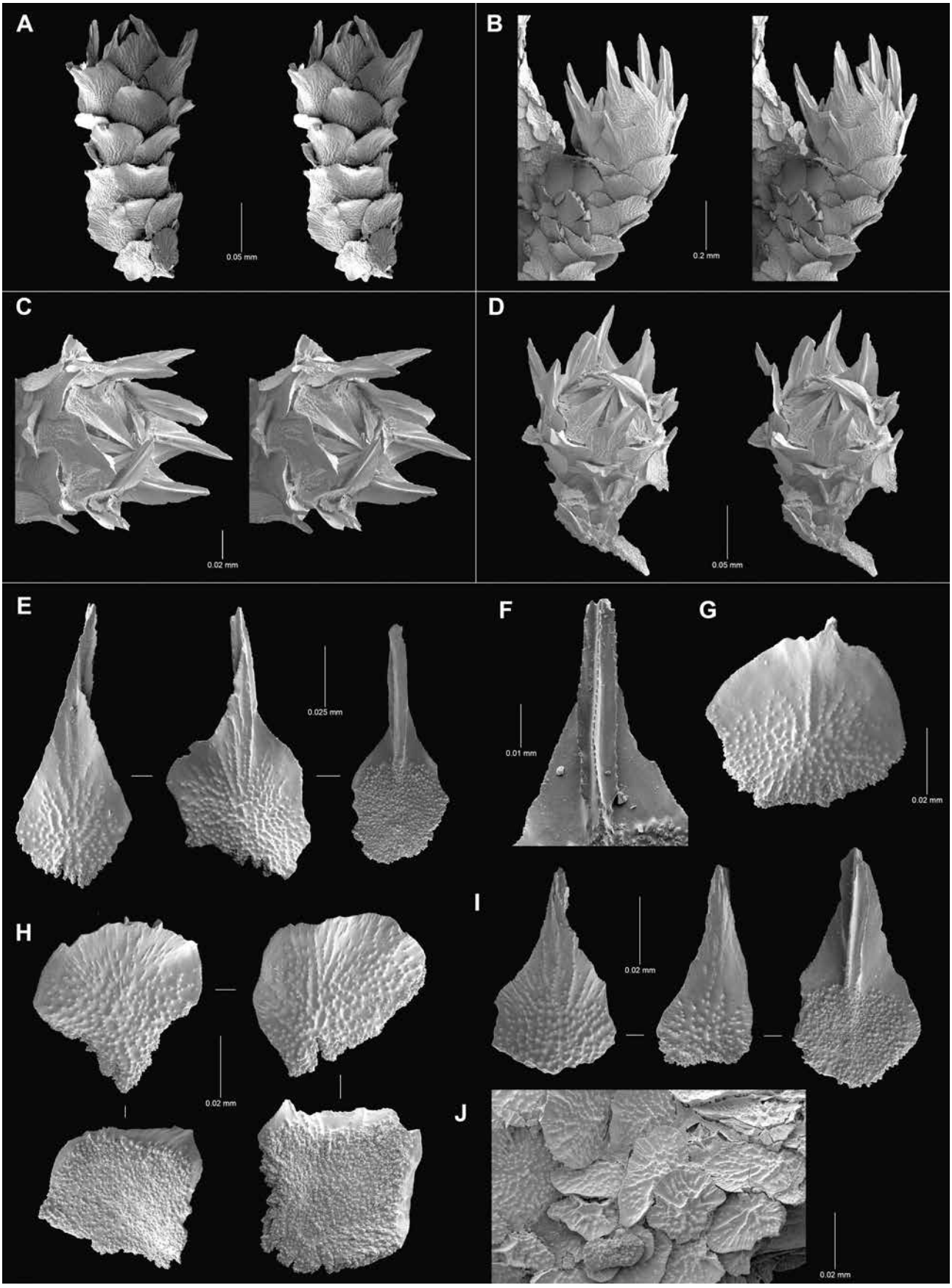

Figure 3. *Thouarella (T.) variabilis* (var. typical) Wright & Studer, 1889, TMAG K5415: **A**–**B.** Stereo views of abaxial and lateral side of a polyp, respectively; **C.** Stereo view of opercular region; **D.** Stereo view of adaxial side of a polyp; **E.** Marginal scales; **F.** Distal keel of a marginal scale; **G.** Submarginal scale; **H.** Body wall scales; **I.** Opercular scales; **J.** Coenenchymal scale, *in situ*.

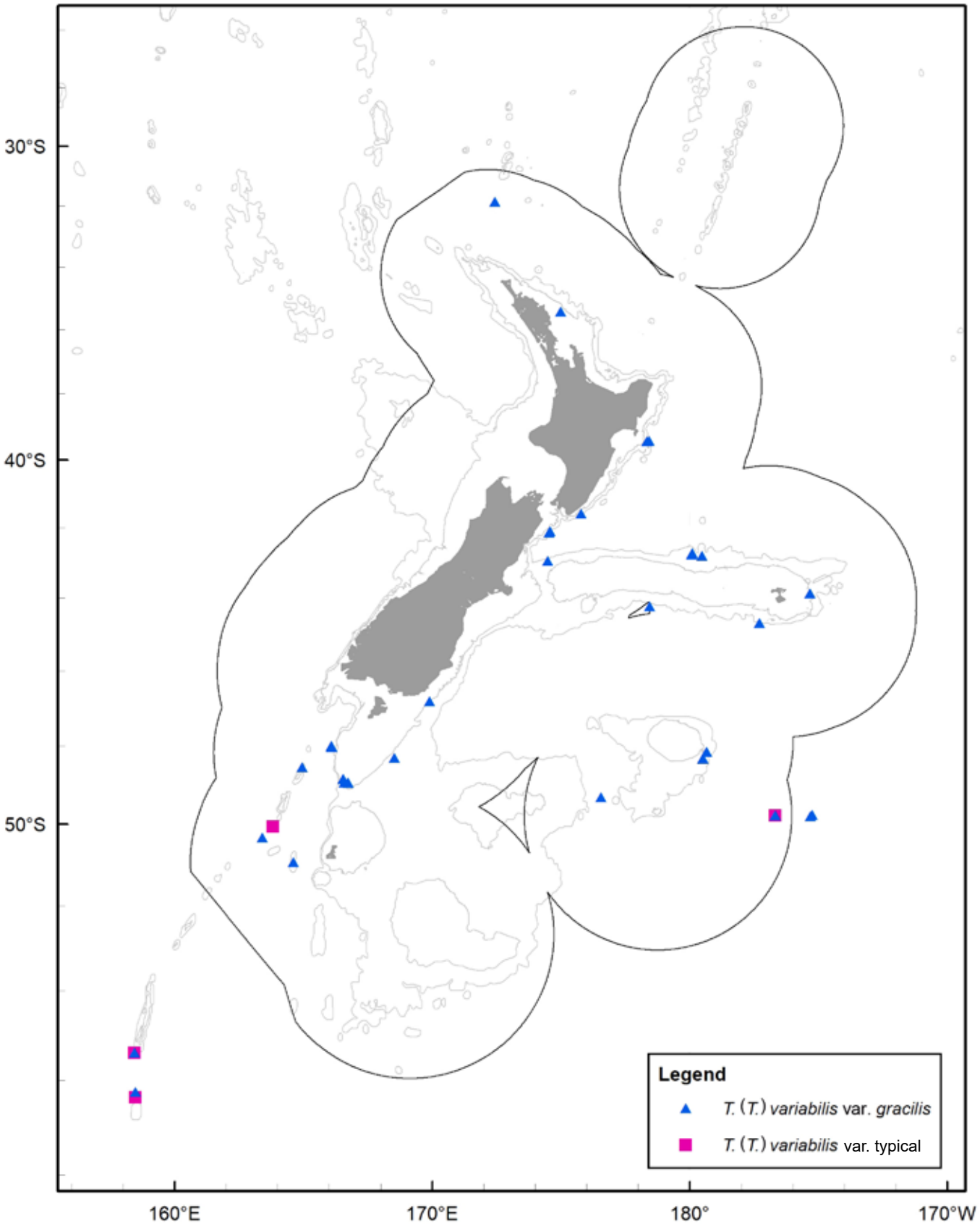

Figure 4. Distribution of *Thouarella (T.) variabilis* (var. typical) Wright & Studer, 1889 and *T. (T.) variabilis* (var. *gracilis*) Wright & Studer, 1889.

Types & locality. Variety typical: Syntypes—NHMUK1889.5.27.56, *Challenger* Stn 145, 46.717° S, 38.075°E (southeast of Prince Edward Island), 256 m.

Variety *gracilis*: Holotype—NHMUK1889.5.27.55, *Challenger* Stn 150, 52.067° S, 71.367° E (off Heard Island), 273 m.

Distribution. Circum-Antarctic and Subantarctic regions, 115–2010 m (Taylor *et al.* 2013). This is one of the few species of *Thouarella* previously reported from the New Zealand region, by Taylor *et al.* (2013), from off the Antipodes Islands, at its depth maximum. In the New Zealand region, the typical variety is known

from the southern plateau of New Zealand, including the Macquarie Ridge from The Snares to Macquarie Island, off Antipodes Island, and Bollons Seamount (Fig. 4), 637–2010 m (the deepest record of any *Thouarella* species). The *gracilis* variety is much more commonly collected, and is known from: Macquarie Island and Ridge, the entire eastern coasts of North and South Islands, Three Kings Ridge, Chatham Rise, Bounty Plateau, Bollons Seamount, and off Tasmania (Fig. 4), 246–1522 m.

Description (typical variety). The colony consists of a main branch (stem) up to 35 cm in height, which is often simple, but occasionally bifurcates into three or more distal branches (Fig. 1A). Branchlets are numerous, projecting from the main branches in close proximity and in all directions, forming a true bottlebrush configuration; branchlets are not aligned on the branch or occur in a spiral fashion, as implied by Wright & Studer (1889). The branchlets are 35–40 mm in length and often simple, although some bifurcate once or twice fairly close to their origin. The axis is circular in cross-section, brown-yellow, and fairly flexible. In large colonies it is common for several large commensal polynoid polychaetes to form tubes along the main branches. Polyps are cylindrical to slightly flared in shape, 1.7–2.1 mm in length (including the spinose marginal scales), and occur in random orientation on the branchlets as well as the main branches; 8–16, often 12, polyps occur per cm branchlet length, which is one of the several variable characters about this species.

The body wall scales are arranged in eight longitudinal rows, the number of scales in each row decreasing in number (but not in size) from ab- to adaxial polyp side (Figs 3A–B); the body wall sclerite formula is: 4–5: 3–4: 2–3: 1–3. The marginals (Figs 3E–F) are by far the largest scales, up to 1.1 mm in length, the distal 40–50% of each marginal scale consisting of a narrow spine. The inner surface of the marginal spine bears a prominent ridge (a keel) from which two lateral ridges protrude, all three ridges being finely serrate (Fig. 3F). The eight submarginal scales (Fig. 3G) are 0.5–0.6 mm in width, often having a short distal spine or tooth. All other body wall scales (Fig. 3H) are roughly square, 0.40–0.50 mm in height, and have a ridged inner distal margin. The eight opercular scales (Figs 3C–D, I) are similar in shape to the marginals but smaller, measuring only 0.40–0.65 mm in length. Both operculars and marginals bear low ridges and radiating lines of granules on their outer surface.

The coenenchymal scales (Fig. 3J) are variable in size and shape, ranging from 0.25–0.75 mm in greater diameter and are irregular in shape. These scales are imbricate and have a slightly concave outer surface, which is usually irregularly ridged, and bears smaller ridges and granules that radiate from the centre of the scale.

Comparisons. *Thouarella variabilis* is similar to *T. diadema* Cairns, 2006, a species described from off Brazil at 1000 m, both species having four or five abaxial body wall scales and similarly long marginal scales, but the inner surface of the marginal spines of *T. diadema* bears multiple short ridges, not one prominent keel, and its polyps are taller. Essentially the same can be said of *T. andeep* Zapata-Guardiola & López-González, 2010b, known only from Atka Bay, Antarctica at 602 m. Taylor *et al.* (2013) compare *T. variabilis* to several other species.

Remarks. Although the original description (Wright & Studer 1889) of *T. variabilis* (typical variety) and the redescription of Taylor *et al.* (2013) state that the main stem is simple (unbranched), Taylor *et al.* (2013: fig. 6a) and Wright & Studer (1898), as variety *gracilis*, both illustrate sparsely branching colonies. Likewise, both of these works state that the branchlets of the typical variety are 50–150 mm long, but measurements taken from their figures and the syntypes indicate a branchlet length of less than 40 mm.

Wright & Studer (1889) described an additional two varieties of the species *variabilis*, one of which they called *gracilis* from off Heard Island (Fig. 1B). I concur with the varietal designation of this form as suggested by Taylor *et al.* (2013). It differs primarily in having a more branched colony, smaller polyps (usually only 1.2–1.6 mm in length) and shorter branchlets (only 10–15 mm in length). Although Wright & Studer (1889) state that the polyp length is 2.0 mm, observation of a syntype indicates polyps as short as 1.4 mm. The specimen referred to by Taylor *et al.* (2013) as USNM 1130283 from Antarctica belongs to this variety. In the New Zealand region this variety is much more commonly collected than the typical variety.

A third variety of *T. variabilis* was described by Wright & Studer (1889), called *brevispinosa*, but is considered by Taylor *et al.* (2013) to be a separate species (see below).

Thouarella (*T.*) *brevispinosa* Wright & Studer, 1889

Figs 1C, 5, 6

Thouarella variabilis var. *b*, *brevispinosa* Wright & Studer, 1889: 69.—Molander 1929: 74–75.—Taylor & Rogers 2015: 193 (listed).

Thouarella (*Thouarella*) *variabilis* var. *brevispinosa*, Cairns 2006: 177 (listed).—Cairns & Bayer 2009: 27 (listed).

Thouarella brevispinosa, Taylor *et al.* 2013: 19, 30–33, figs. 8–9 (Group 1).

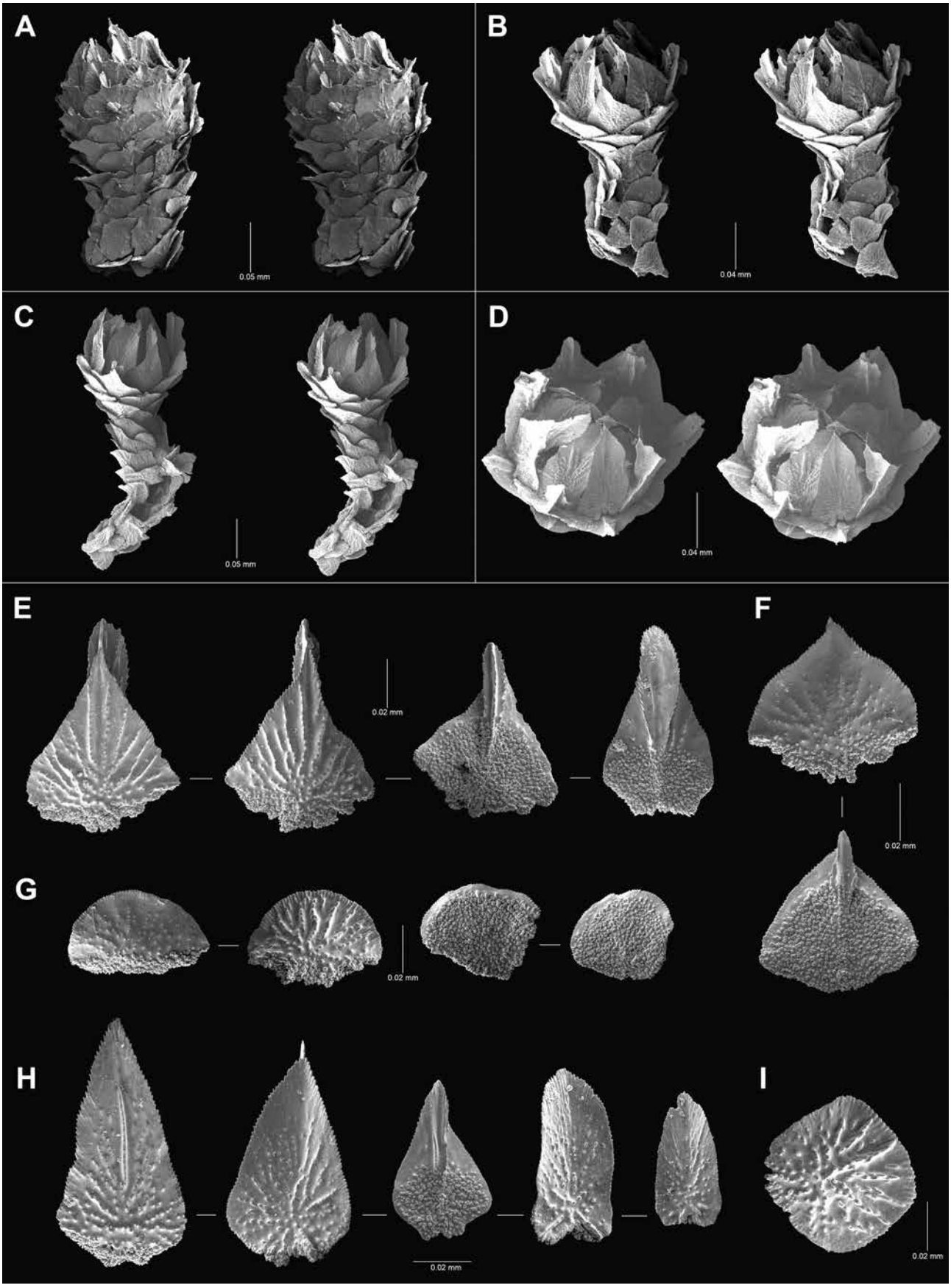

Figure 5. *Thouarella (T.) brevispinosa* Wright & Studer, 1889, TMAG K5411: **A.** Stereo view of abaxial side of a polyp; **B**–**C.** Stereo adaxial views of a polyp; **D.** Stereo opercular view of a polyp; **E.** Marginal scales; **F.** Submarginal scales; **G.** Body wall scales; **H.** Opercular scales; **I.** Coenenchymal scale.

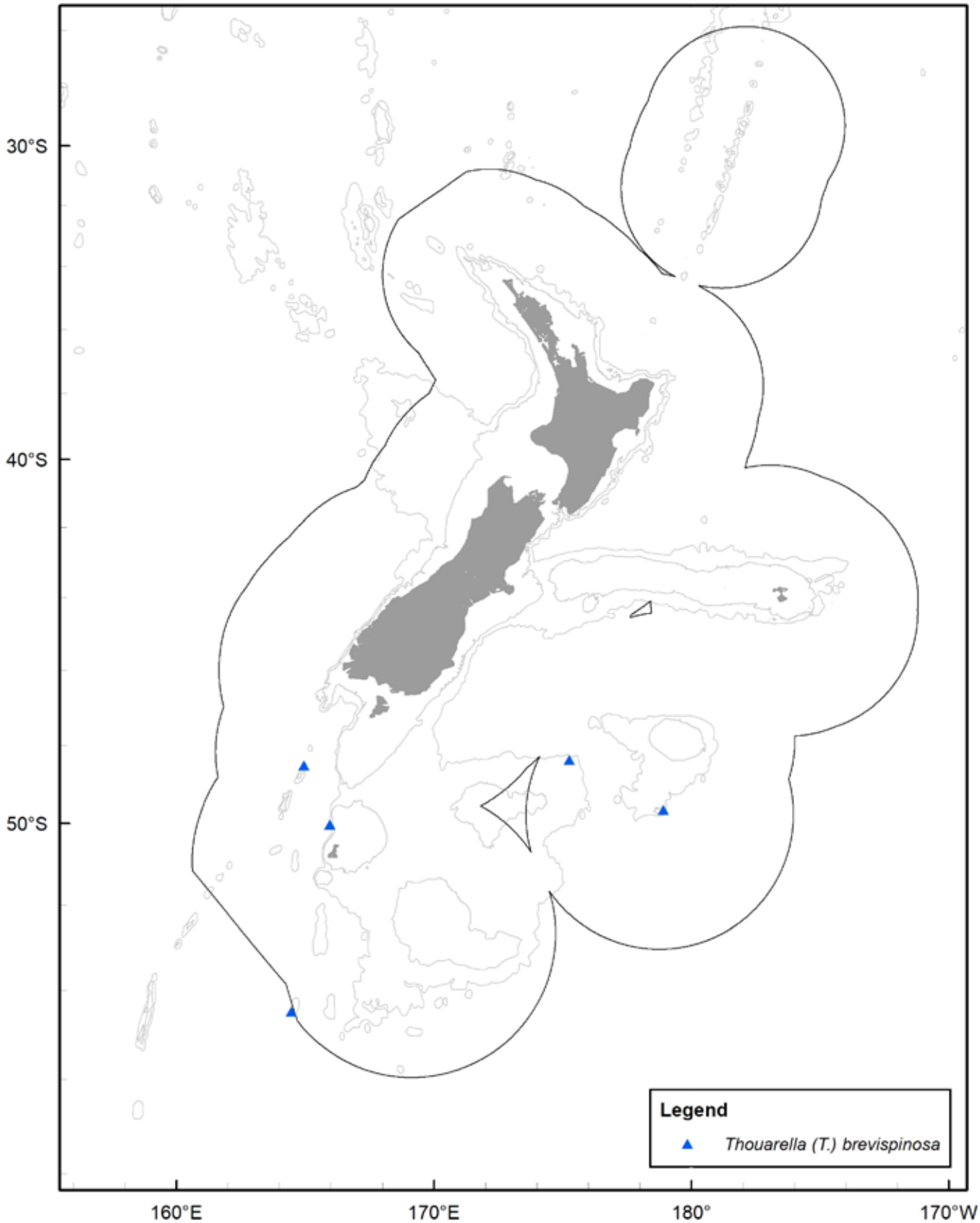

Figure 6. Distribution of *Thouarella (T.) brevispinosa* Wright & Studer, 1889.

Material examined. *Macquarie Ridge*: NIWA 39605, 39621, NIWA Stn TAN0803/19, Seamount 1 Spastic Spider, 48.532° S, 164.948° E, 1060–1112 m, 30 Mar 2008.

Campbell Plateau: NIWA 9609, 9611, NIWA Stn Z9581, 50.035° S, 165.95° E, 850 m, 04 Dec 1998; NIWA 114363, NIWA Stn TAN0307/46, off Antipodes Island, 49.665° S, 178.907° E, 524–504 m, 23 Apr 2003; NIWA 66110, SOP Stn TRIP2718/245, 48.4° S, 175.3° E, 948–1026 m, 10 Dec 2008.

Campbell Plateau (Australian EEZ): TMAG K5411, NZOI Stn S101, 54.483° S, 164.467° E, 1363 m, 03 Dec 1978, and 1 colony and SEM stubs USNM 2549–2551, USNM 1575146.

Type & locality. Holotype—NHMUK1889.5.27.54, *Challenger* Stn 145A: 46.683° S, 38.167° E (off Prince Edward Island), 566 m.

Distribution. In the New Zealand region: Campbell Plateau, including off Antipodes Island (Fig. 6), 504–1363 m; elsewhere, Prince Edward Island, Seymour Island (Antarctica) (Molander 1929), Falkland Islands (Molander 1929), and off Argentina, 150–566 m.

Description. The colony consists of a main stem up to 30 cm in length that may remain simple of bifurcate into several smaller stems in a planar fashion (Fig. 1C). Branchlets project from the stems in all directions, forming a loose bottlebrush shape. The branchlets are all about 25–30 mm in length and rarely bifurcate. The axis is circular in cross-section, yellow-bronze in colour, and fairly flexible. Commensal polynoid polychaetes are common on large colonies, as are white ophiuroids and small (4 mm in diameter) white anemones, the latter attached to the main stems. Polyps are distally flared, 1.9–2.7 mm in length, and placed in a random orientation of the stems and branchlets; 13–15 polyps occur per cm branchlet length.

The body wall scales are arranged in eight longitudinal rows, the number of scales in each row decreasing in number and size from ab- to adaxial polyp side (Figs 5B–C), the body wall sclerite formula being: 6–8: 5–6: 4–6: 3–4. The marginal scales (Fig. 5E) are 0.7–0.9 mm in length, the distal portion extending as a narrow spine, the proximal portion quite wide. The distal inner half of the marginal scale bears a prominent keel, usually with two lateral ridges, all three ridges finely serrate. The submarginal scales (Fig. 5F) also have a broad base, are 0.45–0.6 mm in width, and have a short distal spine and keeled inner surface. The remaining body wall scales (Fig. 5G) are 0.35–0.45 mm in height, somewhat crescent-shaped and have rounded, finely serrate distal edges. The opercular scales (Fig. 5H) are lanceolate in shape but smaller than the marginals. The abaxial operculars are about 0.75–0.8 mm in length with a pointed tip, the adaxial operculars are much smaller (0.40–0.45 mm) with a blunt tip. All polyp scales bear small granules arranged in a radiating pattern on their outer surfaces.

The coenenchymal scales (Fig. 5I) are round to irregular in shape, flat, and measure 0.20–0.35 mm in diameter/width. Like the polyp scales, they bear small granules on their outer surface, which are arranged in a radiating pattern.

Comparisons. *Thouarella brevispinosa* was considered so similar to *T. variabilis* (typical variety), as well as having been collected at essentially the same locality, that it was originally considered to be only a variety of the latter, differentiated by having larger polyps. Taylor *et al.* (2013) raised it to species level based on its larger polyps, slightly higher number of body wall scales (which probably accounted for the longer polyps), and sparser branching. To this I would add that *T. brevispinosa* has shorter branchlets than *T. variabilis* (typical variety), a less well-defined bottlebrush shape, and smaller coenenchymal scales.

Remarks. Taylor *et al.* (2013) state that the size of the coenenchymal scales is 0.1–0.2 mm in width, but their illustrations of the holotype, as well as the New Zealand specimens, show the coenenchymal scales to be larger, *i.e.*, 0.30–0.35 mm in diameter.

Thouarella (*T.*) *crenelata* Kükenthal, 1907

Figs 1D, 7, 8

Thouarella crenelata Kükenthal, 1907: 205; 1912: 302.—Taylor *et al.* 2013: 19, 48–52, figs. 18–19.

Thouarella (*Epithouarella*) *crenelata*, Kükenthal 1915: 151; 1919: 436–438, pl. 43, fig. 70; 1924: 300–301.—Cairns 2006: 177 (listed).—Cairns & Bayer 2009: 28, 35 (listed), fig. 7i–m.

Thouarella (*Thouarella*) *crenelata*, Cairns & Wirshing 2018: fig. 1.

Material examined. *Seamount 8 (Australian EEZ)*, *Macquarie Ridge*: TMAG K5416, NIWA Stn TAN0803/89, 55.381° S, 158.427° E, 504–637 m, 15 Apr 2008;

Seamount 9 Hjort (Australian EEZ), *Macquarie Ridge*: TMAG K5418, NIWA Stn TAN0803/98, 56.246° S, 158.506° E, 676–750 m, 16 Apr 2008, and 1 colony and SEM stubs USNM 2552–2555, USNM 1575151.

Seamount 7 (Australian EEZ), *Macquarie Ridge*: TMAG K5420, NIWA Stn TAN0803/79, 53.715° S, 159.131° E, 770–810 m, 12 Apr 2008, SEM stubs USNM 2556–2558.

Macquarie Ridge (*International Waters)*: NIWA 41125, NIWA Stn TAN0803/118, Seamount 10, 59.048° S, 158.901° E, 1400–1615 m, 19 Apr 2008.

Type & locality. The holotype is deposited at the ZMB, and fragments of the holotype are also at the MNHWU, Deutsche Tiefsee-Exp. Stn 131, Bouvet Island, 457 m.

Distribution. In the New Zealand region, Macquarie Ridge region (Fig. 8), 637–1400 m; elsewhere, circum-Subantarctic regions (mainly off South America), and Antarctic (Bouvet Island, northern Antarctic Peninsula), 75–686 m.

Description. The colony consists of a simple main stem and sometimes several secondary stems (Fig. 1D); colonies are known up to 35 cm in height. Most branchlets originate from the stem in a plane (lateral branchlets), in an irregular, alternate pinnate

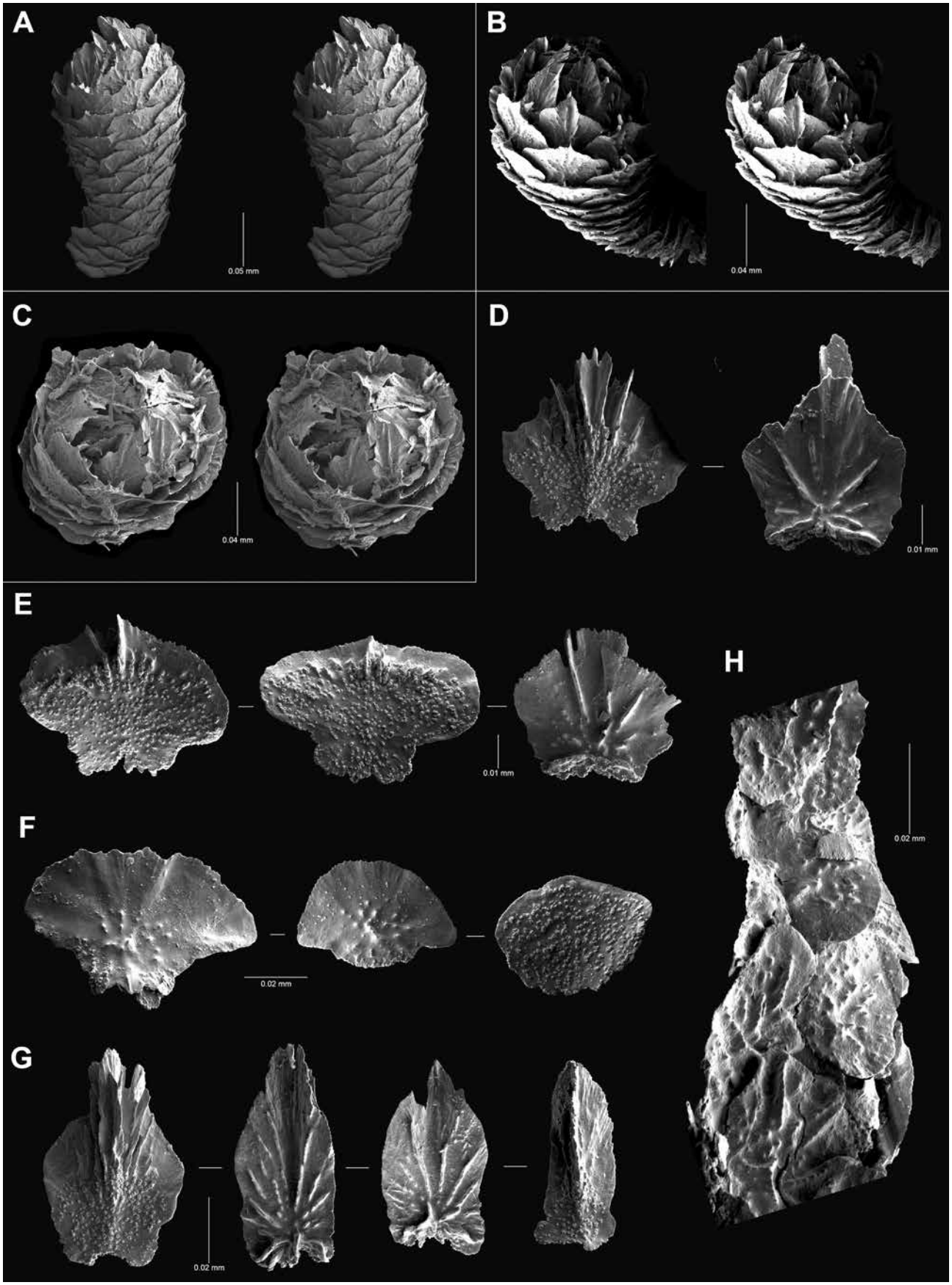

Figure 7. *Thouarella (T.) crenelata* Kükenthal, 1907, TMAG K5418: **A.** Stereo view of abaxial side of a polyp; **B–C.** Stereo opercular views of a polyp; **D.** Marginal scales; **E.** Submarginal scales; **F.** Body wall scales; **G.** Opercular scales; **H.** Coenenchymal scales, *in situ*.

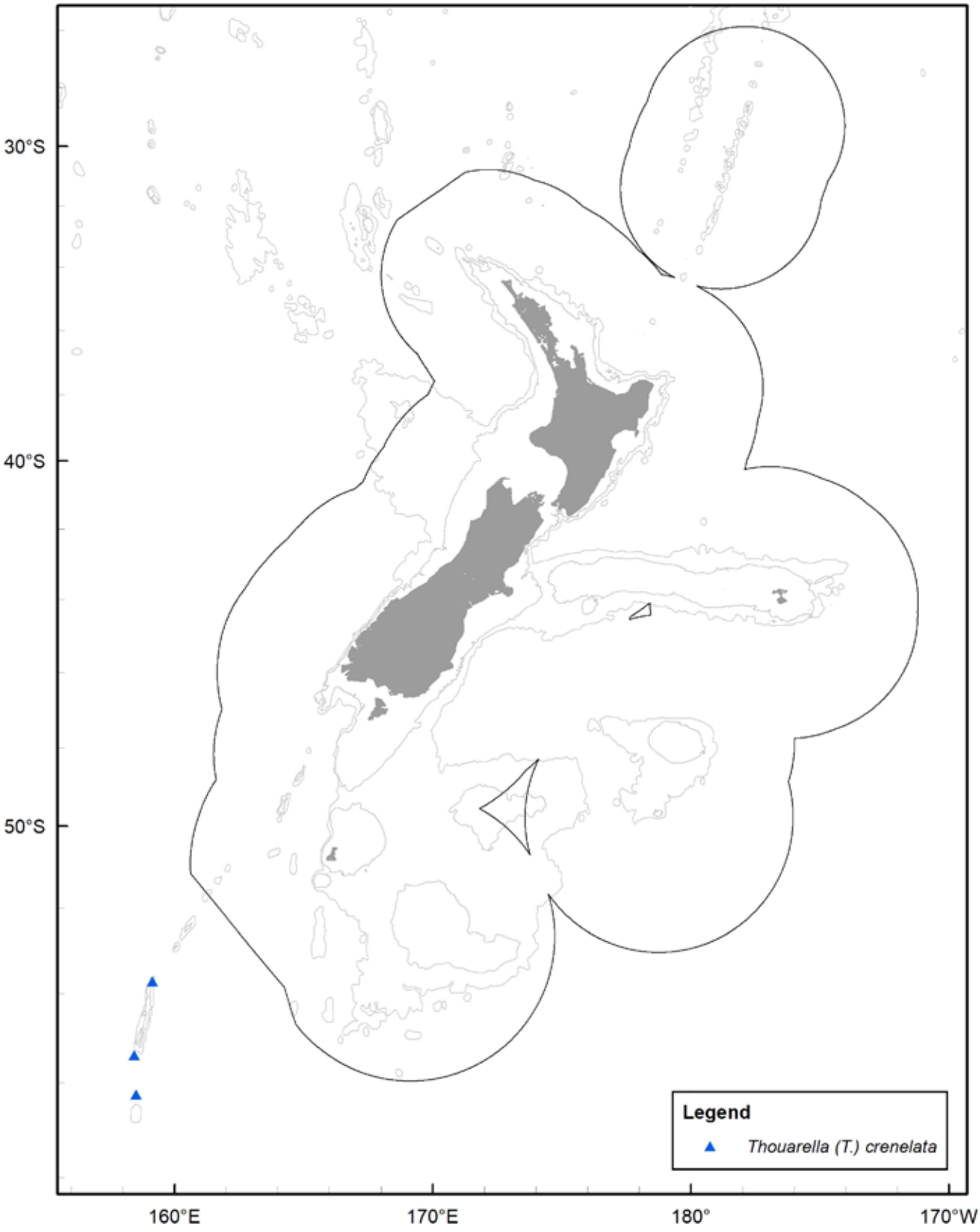

Figure 8. Distribution of *Thouarella (T.) crenelata* Kükenthal, 1907.

arrangement; however, some branchlets also diverge from the anterior and posterior faces. The lateral branchlets curve toward each other, forming an incomplete cylinder, which results in a bushy (not bottlebrush) shape. The branchlets are up to 40 mm in length and are rarely branched. The axis is circular to slightly flattened in cross-section, fairly flexible, and pale yellow in colour, as are the polyps; no polychaete commensalism was noted. Polyps are cylindrical but clavate at their tip, measuring 2.3–2.8 mm in length. Like the branchlets they occur on, the polyps are often arranged in an alternating manner in a plane on

opposite sides of a branchlet, (5–10 polyps per cm), but toward the branchlet tip they occur on all sides and are thus more numerous (e.g., 8–19 per cm).

The body wall scales are arranged in eight longitudinal rows, the number of scales in each row decreasing only slightly in number from ab- to adaxial polyp side (Figs 7A–B); the body wall sclerite formula is: 10–12: 9–11: 6–7: 4–7. The marginal scales (Fig. 7D) are squat (H:W usually less than 1), 0.45–0.55 mm in height, and have only a short apical tooth or sometimes a triangular point. Their distal inner surfaces bear four to six prominent finely serrate keels. The submarginals (Fig. 7E) are similar in shape, slightly smaller (0.40–0.50 mm in height) and have a slightly shorter distal projection and less well-developed inner distal keel. The remaining body wall scales (Fig. 7F) are semi-circular in shape, have a curved distal margin, and are 0.35–0.45 mm in height. The opercular scales (Fig. 7G) are elongate (0.55–0.70 mm in length, H:W 1.7–2.1), each bearing a single, or multiple keels, on their distal inner surface. The operculum is low but clearly visible from a lateral view. All body wall scales have slightly serrate distal edges, and all body wall scales, as well as the opercularis, have outer faces that are relatively smooth, bearing only sparse granules and low radiating ridges.

The coenenchymal scales (Fig. 7H) are thin, elliptical (greater axis 0.2–0.5 mm), imbricate, and somewhat concave above. Like the body wall scales, they also bear sparse low granules.

Comparisons. As implied in both their (Taylor *et al*. 2013) dichotomous and tabular keys, *T. crenelata* is most similar to *T. parachilensis* Taylor *et al*., 2013, a species known from off southern South America and the Antarctic Peninsula at 90–480 m. *T. parachilensis*, however, has more bulbous polyps and far more polyps per cm on distal branchlets, reaching up to 48 per cm.

As Zapata-Guardiola & López-González (2009) and Taylor *et al*. (2013) remark, *T. crenelata* is also quite similar to *T. viridis* Zapata-Guardiola & López-González, 2009, a species known from Patagonia to South Georgia from 106–825 m, but the latter differs in having a taller operculum and fewer abaxial body wall scales.

Comparisons to *T. koellikeri* are made in the account of that species below.

Remarks. Although reported from slightly south of the New Zealand EEZ, this species is included herein based on the strong possibility that it may also occur on the Macquarie Ridge and Campbell Plateau.

This species was once placed in the subgenus *Epithouarella* because its marginal scales were relatively short (not spinose), but this subgenus was collapsed into the nominate subgenus by Cairns & Wirshing (2018) based on molecular sequencing results.

Taylor *et al*. (2013) give a dimension of 0.15 mm for the coenenchymal scales; however their figured scale (Fig. 19p) measures 0.39 mm, and the New Zealand coenenchymal scales are also consistently larger than 0.15 mm.

Thouarella (*T.*) *koellikeri* Wright and Studer, 1889

Figs 1E, 9, 10

Thouarella köllikeri Wright & Studer, 1889: 65–65, pl. 11, fig. 5.
Thouarella (*Parathouarella*) *köllikeri*, Kükenthal 1919: 435.
Thouarella (*Thouarella*) *koellikeri*, Cairns 2006: 177 (listed).—Cairns & Bayer 2009: 27 (listed).—Ofwegen *et al*. 2009: 206, 8 figs.
Thouarella koellikeri, Pérez & Zamponi 2004: 7, fig. 3A.—Taylor *et al*. 2013: 19, 37–41, figs. 12–13 (key to species).

Material examined. *Seamount 9 Hjort (Australian EEZ)*, *Macquarie Ridge*: NIWA 41003, NIWA Stn TAN0803/102, 56.242° S, 158.462° E, 790–1025 m, 16 Apr 2008, SEM stubs USNM 2559–2561, 2655–2657.

Sister I Seamount, *off Tasmania (Australian EEZ)*: TMAG K5413, CSIRO Stn SS0197/15, 44.27° S, 147.29° E, 1100–1122 m, 23 Jan 1997.

Type & locality. Holotype—NHMUK1889.5.27.41, several polyps of the holotype are also at the NMNH (USNM 1002247), *Challenger* Stn 308, 50.142° S, 74.683° W (off Chile), 320 m.

Distribution. In the New Zealand region, Macquarie Ridge (Fig. 10), 790–1025 m; elsewhere, off southern Chile, Argentina, Antarctic Peninsula, Tasmania (herein), 15–1920 m.

Description. Material from New Zealand consists of one unbranched stem up to 25 cm in length, but colonies reported elsewhere indicate sparse branching does occur. The branchlets diverge at all angles from the main stem but are often absent or shorter on one side, resulting in a loose bottlebrush shape (Fig. 1E). Branchlets bifurcate only near their origin and are up to 45 mm in length. The axis is circular to slightly flattened in cross-section, fairly flexible, and pale yellow in colour, as are the polyps; no polychaete commensalism was noted. Polyps are cylindrical but clavate at their tips, measuring 1.9–2.3 mm in length, although polyps of previously reported specimens range from 1.6–2.5 m in length. The polyps are arranged on all sides of the branchlets, eight to ten occurring per cm length.

The body wall scales are arranged in eight longitudinal rows, the number of scales in each row decreasing only slightly in number from ab- to adaxial polyp side (Figs 9A–B); the body wall sclerite formula is: 9–10: 8–9: 7–8: 5–6. The marginals (Fig.

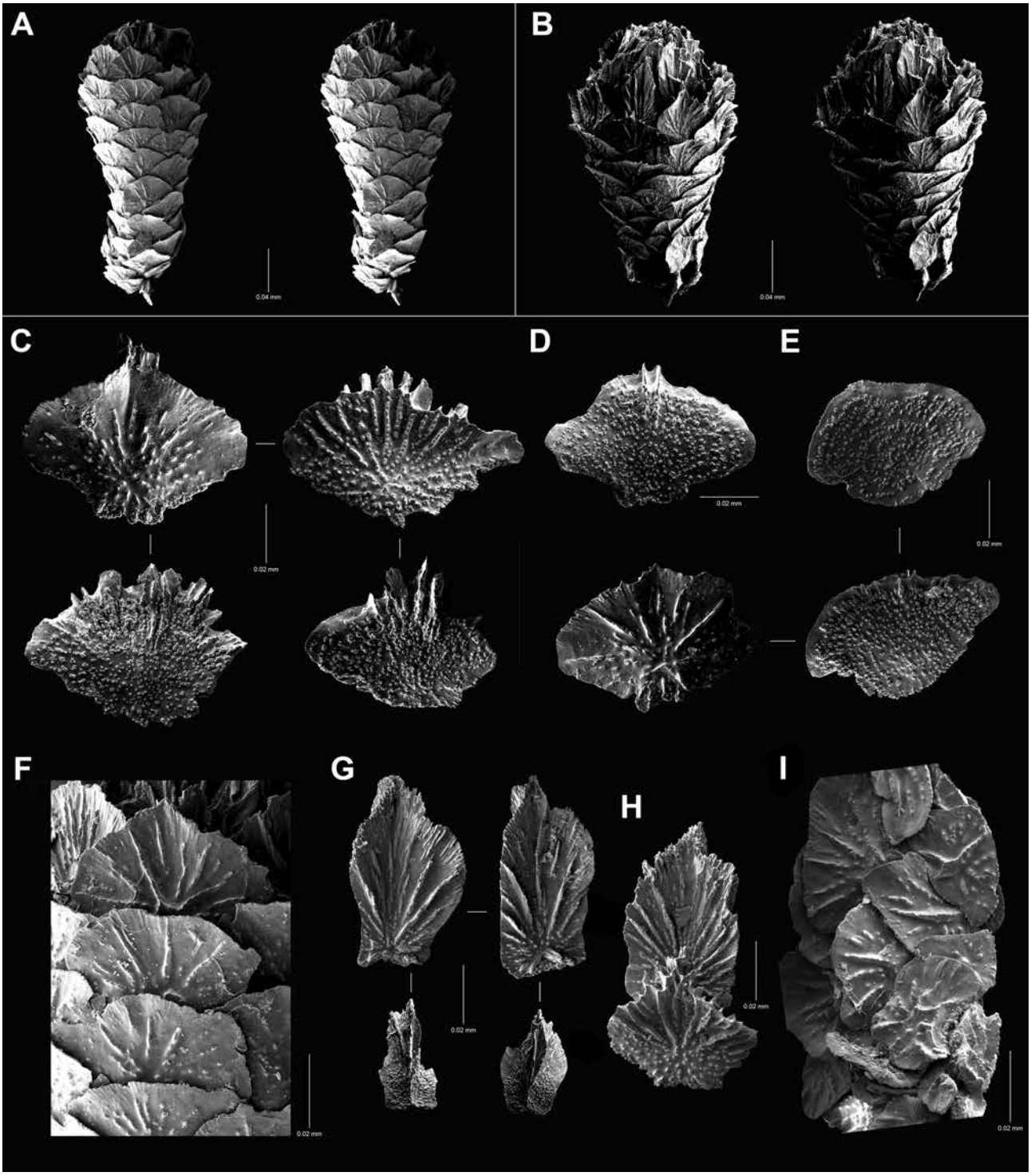

Figure 9. *Thouarella* (*T.*) *koellikeri* Wright & Studer, 1889, NZOI 41003: **A**–**B.** Stereo views of ab- and adaxial (respectively) sides of a polyp; **C.** Marginal scales; **D.** Submarginal scales; **E.** Body wall scales; **F.** Row of body wall scales; **G.** Opercular scales; **H.** Opercular and marginal scales, *in situ*; **I.** Coenenchymal scales, *in situ*.

9C) are squat (H:W = 0.85–1.0), and 0.25–0.35 mm in height, having only a short apical tooth or coming to a triangular point. Their distal inner marginal surfaces bear four to six prominent finely serrate keels, and their outer surface is covered with prominent granules and ridges that radiate from a common point near the base of each scale. The submarginals (Fig. 9D) are similar in shape but slightly smaller (0.25–0.30 mm in height), also with a broadly pointed distal edge and fewer inner distal keels. The remaining body wall scales (Figs 9E–F) are semi-circular, elliptical or pentagonal in shape, much broader than tall (H:W = 0.6–0.7), and 0.2–0.3 mm in height. The opercular scales (Figs 9G–H) are elongate (L:W = 1.5–2.7) and pointed, up to 0.50 mm in length; they bear multiple keels on their inner surface and prominent ridges on their concave

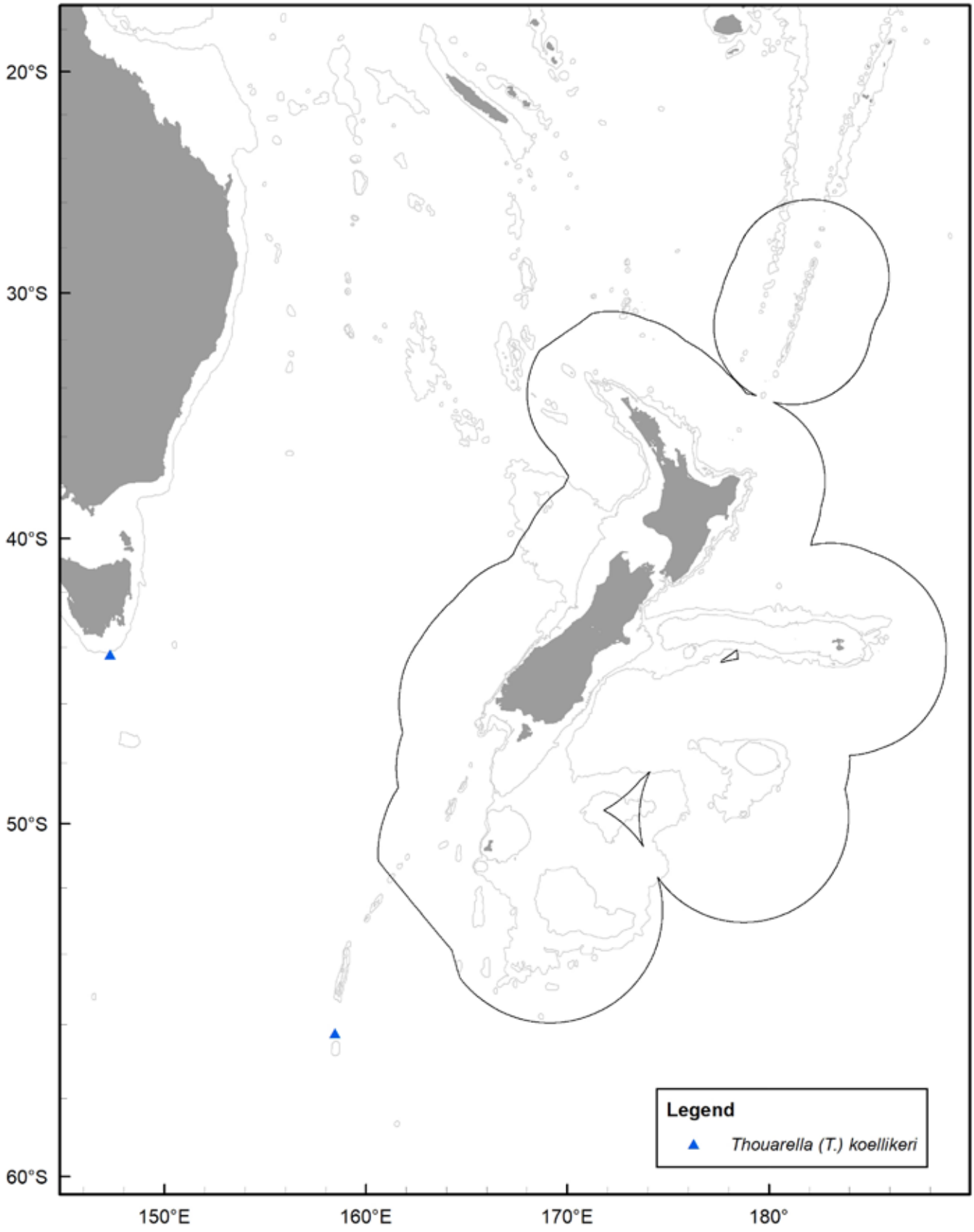

Figure 10. Distribution of *Thouarella* (*T.*) *koellikeri* Wright & Studer, 1889.

outer surface. The operculum is of moderate height.

The coenenchymal scales (Fig. 9I) are elliptical in shape, 0.15–0.40 mm in greater axis, and bear radiating ridges on their outer surface.

Comparisons. *Thouarella koellikeri* is extremely similar to *T. crenelata*, differing from that species in only several quantitative features: 1) it has a slightly longer operculum; 2) the outer surface of its body wall

scales are prominently granular and ridged; 3) it has slightly shorter polyps and correspondingly smaller body wall scales; 4) it has smaller coenenchymal scales. The collection of additional specimens and/or molecular sequencing may prove these two species to be synonymous or sister species, but until then the distinction made by Taylor *et al.* (2013) is followed.

Remarks. Ofwegen *et al.* (2009) mistakenly reported 147 m as the minimum depth for their Chilean record, whereas it should have been 14.7 m.

Thouarella (*T.*) *diadema* Cairns, 2006

Figs 2A, 11, 12

Thouarella (*Thouarella*) *diadema* Cairns, 2006: 177 –184, figs. 1G, 10–11.—Cairns & Wirshing 2018: 18, fig. 1.

?*Thouarella* (*Thouarella*) *bayeri* Zapata-Guardiola & López-González, 2010b: 133–135, figs. 2A, 3–4.

Thouarella (*Thouarella*) *sardana* Zapata-Guardiola & López-González, 2010b: 136–139, figs. 2C–D, 5–7.

Plumarella diadema, Cairns 2011: 8 (listed).—Taylor *et al.* 2013: 92. —Arantes & Loiola, 2014: 109–110, figs. 7–8.

Material examined. Holotype—USNM 1078187, wet sample from RV *Calypso* Stn 1776, off Sao Sebastião, Brazil, 24.907° S, 44.433° W, 1000 m.

Other material. *Bollons Seamount*: NIWA 9647, NIWA Stn TAN0307/82, 49.819° S, 175.256° W, 1218–1210 m, 02 May 2003, and 1 branch fragment, USNM 1575148.

Bounty Plateau: NIWA 128286, NZOI Stn T25, 48.152° S, 179.34° W, 693 m, 12 Mar 1981, SEM stubs USNM 2559–2561.

Distribution. In the New Zealand region, Bounty Plateau and Bollons Seamount (Fig. 12), 693–1210 m; elsewhere, off Brazil, Argentina to South Georgia, 278–3693 m.

Description. The colonies are small (rarely over 5 cm in height) and somewhat bushy (Fig. 2A), composed of a main stem and branchlets that originate primarily in a plane from opposite sides of the main stem, but then curve toward the anterior face to form a porous tube to house a commensal polynoid polychaete. The branchlets are about 15 mm in length and often bifurcate. The axis is circular to slightly flattened in cross-section, yellow, and fairly flexible; the polyps are white. Polyps are distally flared, their distal marginal spines projecting outward. Polyps are 2.5–3.0 mm in height (including marginal spines), occur in random orientation on the branchlets, and stand perpendicular to the branchlet; 7–10 polyps occur per cm branchlet length.

The body wall scales are arranged in eight longitudinal rows, the number of scales in each row decreasing only slightly in number and size from ab- to adaxial polyp side (Fig. 11B); the body wall sclerite formula is: 3–5: 3–4: 2–3: 4–5 (although the proximal adaxial body wall scales are quite small). The marginal scales (Figs 11D–E) are quite large, up to 1.5 mm in length, including a long slender distal spine that constitutes up to 60% of the scale length. The base of the marginal scale is quite broad, extending as two lateral wings, producing a rather low H:W ratio of 1.4–1.6. Their outer surface is intricately granulated in radiating rows from a common basal origin; their inner surface is tuberculate basally but bears numerous (up to seven) finely serrate ridges that extend to the spine tip. The spine is round in cross-section. The remaining body wall scales (Fig. 11F) are elliptical to fan-shaped and 0.5–0.8 mm in height, with a sparsely granular outer surface and a tuberculate inner surface that is devoid of ridges or keels. There are two crowns of opercular scales. The outer, larger crown (Figs 11C, G) consists of eight slender (L:W = 2.2–2.4) lanceolate scales 1.1–1.4 mm in length, having ridges on their outer surface and often multiple ridges on their inner distal surface, although occasionally this region is smooth. The inner crown (accessory operculars) consists of a crown of eight much smaller (0.2–0.5 mm in length) scales with an L:W of 1.6–2.0 (Fig. 11H); their outer surface is smooth as is the distal inner surface.

The coenenchymal scales (Fig. 11I) are variable in shape, ranging from 0.12 to 0.60 mm in length, the larger scales forming a transition between the lower polyp and the branch coenenchyme. They are thin and imbricate in arrangement, with radiating granules on their outer surface.

Comparisons. *T. diadema* is quite similar to *T. undulata* Zapata-Guardiola & López-González, 2010b, but that species has only eight opercular scales in two quartets (completely lacking accessory opercular scales).

Remarks. The discovery that the type and other specimens of *T. diadema* have small accessory opercular scales, not reported in the original description, reinforces the probability that the New Zealand specimens are *T. diadema*. The New Zealand specimens differ slightly from those found off South America, but only enough to be considered as a different form rather than a different species. The New Zealand specimens differ in having smaller colonies, having shorter marginal spines, and sometimes having a ridged inner opercular face, although this is not consistent. Also, the New Zealand specimens have a commensal relationship with a polynoid, but this may be a regional difference.

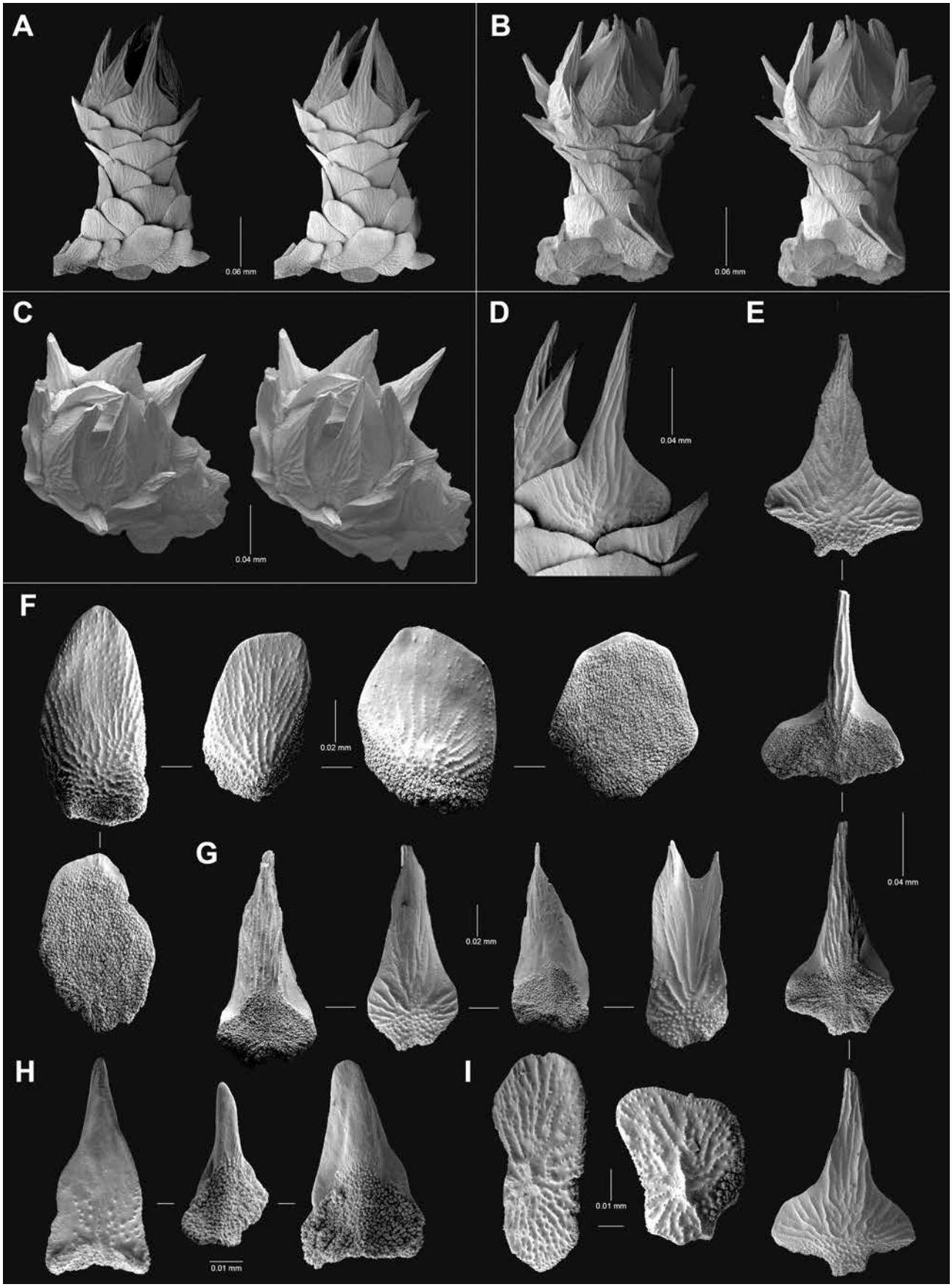

Figure 11. *Thouarella* (*T.*) *diadema* Cairns, 2006, NIWA 128286. **A–C.** Stereo views of abaxial, adaxial, and opercular aspects (respectively) of a polyp; **D.** Marginal scale, *in situ*; **E.** Marginal scales; **F.** Body wall scales; **G.** Opercular scales; **H.** Secondary opercular scales; **I.** Coenenchymal scales.

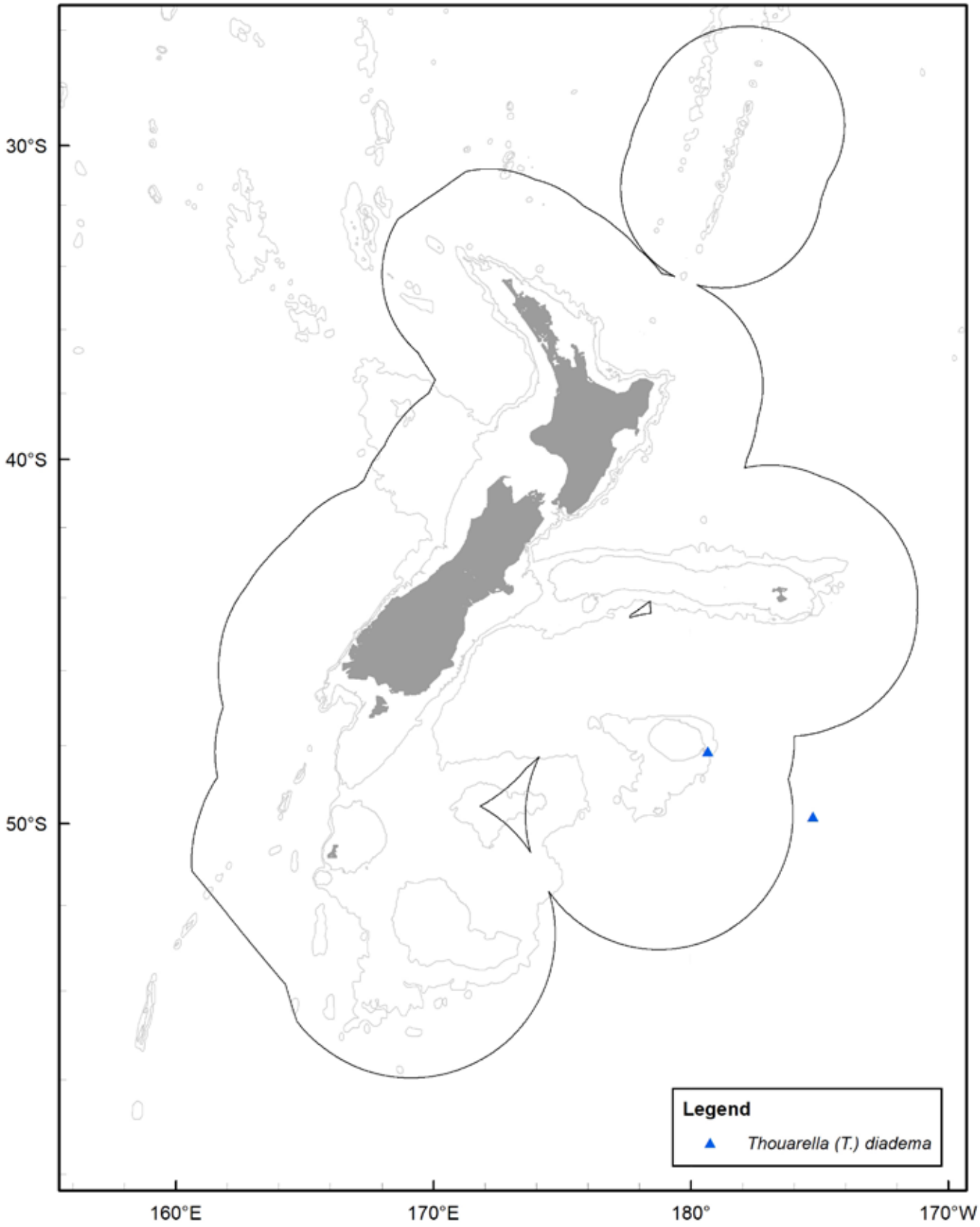

Figure 12. Distribution of *Thouarella* (*T.*) *diadema* Cairns, 2006.

Subgenus *Thouarella* (*Euthouarella*) Kükenthal, 1915

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

Type species. *Plumarella hilgendorfi* Studer, 1878, by subsequent designation (Bayer 1956).

Diagnosis. *Thouarella* in which the polyps are arranged in pairs or whorls on branchlets.

Distribution. Cosmopolitan, except for Subantarctic regions, 24–6400 m.

Thouarella (*Euthouarella*) *hilgendorfi* (Studer, 1878)

Figs 2B, 13, 14; Seafloor image Fig. 10.

Plumarella hilgendorfi Studer, 1878: 648–649, pl. 2, figs. 15a–e.

Thouarella hilgendorfi, Wright & Studer 1889: pl. 21, fig. 4.—Cairns 2006: 188.—Taylor *et al*. 2013: 18 (two figures), 76–77 (synonymy).

Thouarella typica Kinoshita, 1907: 230.

Thouarella hilgendorfi forma *plumatilis* Aurivillius, 1931: 252–256, pl. 5, fig. 9.

Thouarella (*Euthouarella*) *hilgendorfi*, Kükenthal 1915: 150.—Cairns 2006: 177; 2010: 417–422, figs. 1D, 4–5 (complete synonymy).

Thouarella (*Euthouarella*) *grasshoffi* Cairns, 2006: 184–188, figs. 1A, 12, 13.

Thouarella grasshoffi, Taylor *et al*. 2013: 91–92.

Material examined. *Colville Ridge*: NIWA 86236, NIWA Stn TAN1213/22, Colville Volcano, 30.083° S, 179.822° E, 483–530 m, 18 Oct 2012.

Kermadec Ridge: NIWA 9619, NIWA Stn Z9039, 34.282° S, 179.67° E, 609–875 m, 02 Apr 1998; MA46417, NIWA Stn TAN1612/125, near L'Esperance Rock, 31.4° S, 178.672° W, 840–900 m, 03 Nov 2016.

West Norfolk Ridge: NIWA 9622, NIWA Stn Z11101, 34.5° S, 168.733° E, 874–1030 m, 21 Jul 2002.

West Norfolk Ridge (International Waters): NIWA 66284, SOP Stn TRIP2886/13, 33.7° S, 167.7° E, 907–926 m, 23 Jun 2009.

Lord Howe Rise (International Waters): NIWA 65953, SOP Stn TRIP3177/65, 35.4° S, 165.3° E, 932–959 m, 08 Sep 2010; NIWA 66283, SOP Stn TRIP2894/130, 35.4° S, 165.3° E, 906–975 m, 25 Jul 2009.

Challenger Plateau (International Waters): NIWA 9621, NIWA Stn Z9400, 37.301° S, 167.367° E, 755 m, 30 Sep 1998; NIWA 9712, NIWA Stn Z9905, 37.313° S, 167.34° E, 839–929 m, 08 Jun 1999; NIWA 9741, NIWA Stn Z10240, 37.345° S, 168.035° E, 760 m, 20 Jun 1999; NIWA 9763, NIWA Stn Z10164, 37.203° S, 167.352° E, 800–800 m, 16 Jun 2000; NIWA 9772, NIWA Stn Z10165, 37.227° S, 167.342° E, 1061–1102 m, 15 Jun 2000.

Raukumara Plain: NIWA 9618, NIWA Stn Z9219, 37.068° S, 176.701° E, 1011 m, 06 Aug 1998, SEM stubs USNM 2558–2560, 2667–2669.

Louisville Ridge (International Waters): NIWA 94340, NIWA Stn TAN1402/91, 39.164° S, 167.35° W, 910–934 m, 20 Feb 2014, and 1 colony, USNM 1575155.

Chatham Rise: NIWA 69576, SOP Stn TRIP3235/20, 43.2° S, 179.4° E, 444–455 m, 04 Dec 2010.

Types & locality. Holotype, Zoologisches Museum, Berlin, Cni 2070, Tokyo Bay, Japan, 548 m.

Distribution. In the New Zealand region, southern Colville Ridge, Kermadec Ridge, Three Kings Ridge, southern Norfolk Ridge, Raukumara Plain, Chatham Rise (Fig. 14), 455–1061 m; elsewhere, common throughout Indo-West Pacific, including Hawaiian Islands, 174–750 m (Cairns 2010), North Atlantic, 720–1760 m (Cairns 2006).

Diagnosis. Colonies large (up to 48 cm in height), and sparsely to irregularly dichotomously branched (Fig. 2B). Branchlets simple and about 20–35 mm long, forming a true bottlebrush shape; commensal polynoid polychaete usually present. Polyps usually paired (Fig. 13A), occasionally in whorls of three, 1–1.4 mm in length, and slightly flared; six or seven pairs or whorls of polyps occur per cm branchlet length. Body wall scales (Fig. 13B) arranged in eight longitudinal rows according to sclerite formula: 6–7: 5–6: 3–4: 2–3; proximal adaxial scales are lacking. Marginal scales (Figs 13C–D) up to 0.8 mm in length, the distal half an elongate spine that bears a prominent multi-ridged keel on its inner surface, and the basal half quite broad (up to 0.5 mm in width). Submarginal scales (Fig. 13E) often apically pointed (but not spinose), up to 0.6 mm in length, with a broad base, but a lower L:W than marginals. Remaining body wall scales (Fig. 13F) elliptical in shape, 0.45–0.55 mm in length, having a finely serrate rounded distal margin. Opercular scales alternate in size, the four larger outer quartet of operculars (Fig. 13G) variable in length but ranging from 0.4–0.7 mm in length; the four smaller of the inner quartet (Fig. 13H) only 0.25–0.30 mm in length; distal inner faces of operculars smooth (not ridged). Their bases are slender, and thus their L:W is much higher than those of the marginals and submarginals. Coenenchymal scales (Figs 13I–J) are similar to body wall scales in shape but slightly smaller, the greater axis of their ellipses ranging from 0.18–0.38 mm. All body wall and coenenchymal scales have a sparsely granular outer surface, with series of low ridges radiating from a central region, otherwise smooth on their outer edges.

Comparisons. Among the eight species in the subgenus, only one other species has a bottlebrush arrangement of its branchlets: *T. grasshoffi* Cairns,

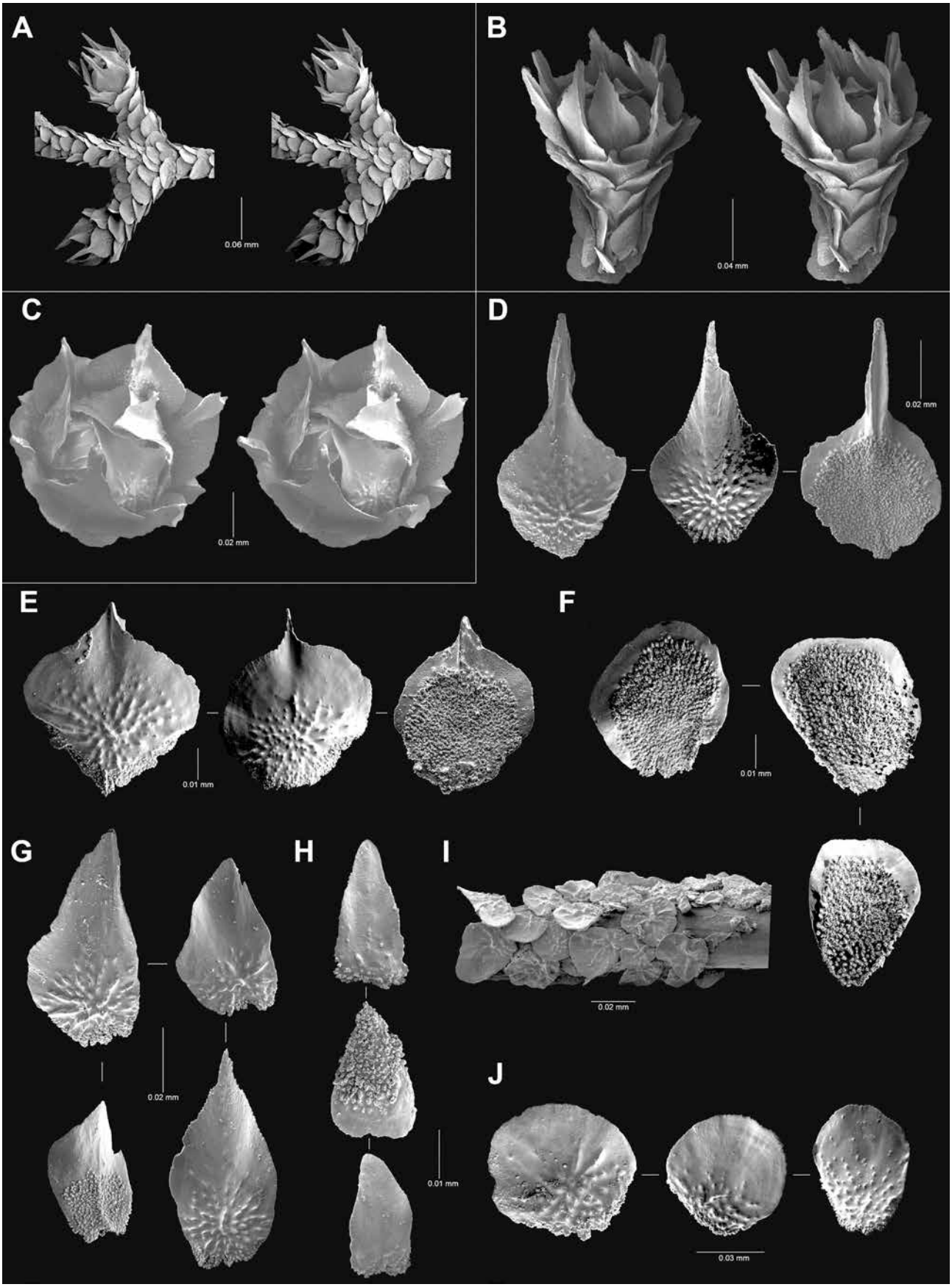

Figure 13. *Thouarella* (*E.*) *hilgendorfi* (Studer, 1878), NIWA 9618. **A.** Stereo view of a pair of polyps; **B.** Stereo view of adaxial side of polyp; **C.** Stereo opercular view of a polyp; **D.** Marginal scales; **E.** Submarginal scales; **F.** Body wall scales; **G.** Larger opercular scales; **H.** Smaller opercular scales; **I.** Coenenchymal scales, *in situ*; **J.** Coenenchymal scales.

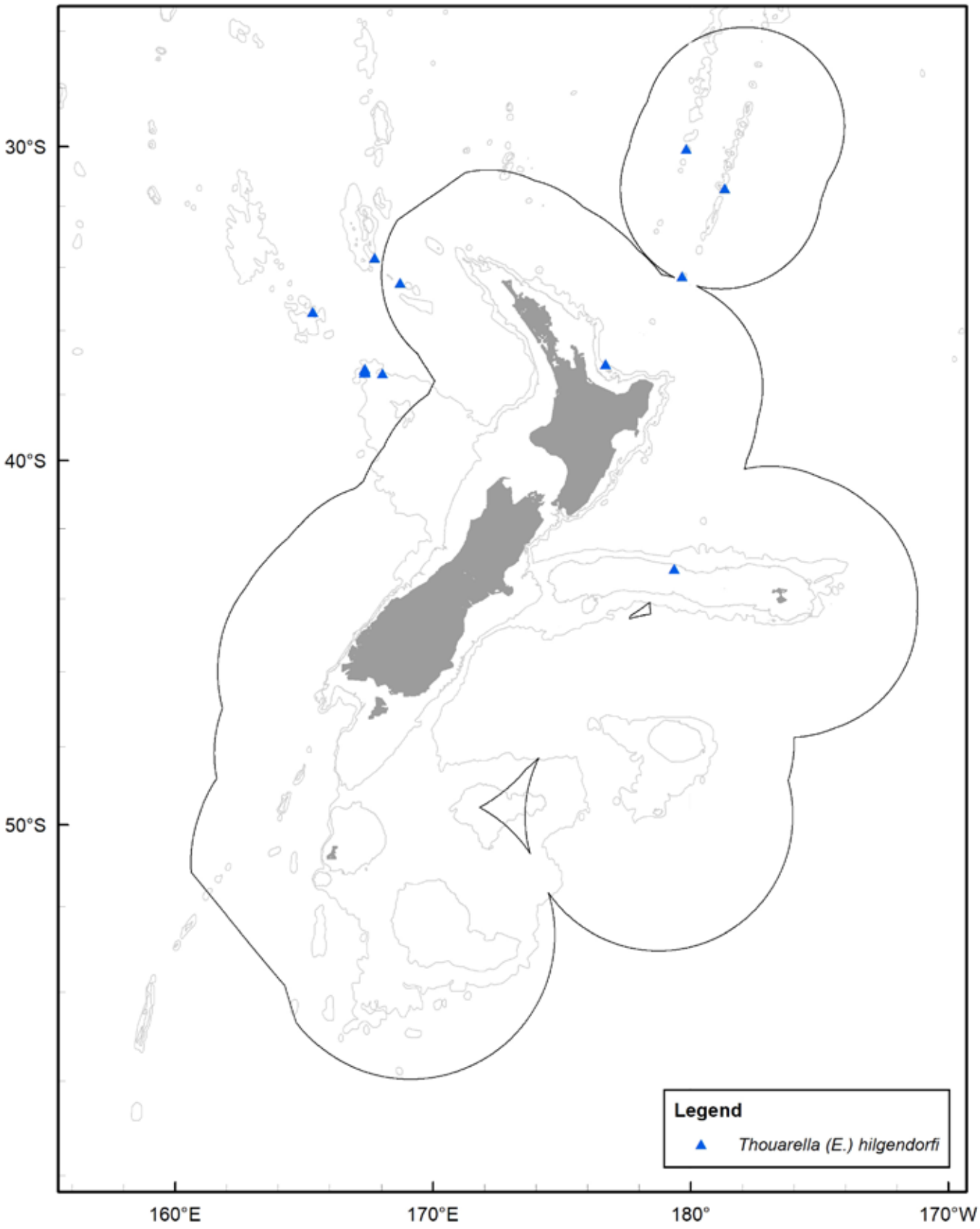

Figure 14. Distribution of *Thouarella* (*E.*) *hilgendorfi* (Studer, 1878).

2006, a species known from the North Atlantic from 720–1760 m. Although Cairns (2006) distinguished *T. hilgendorfi* from *T. grasshoffi* in the original description of the latter and again in Cairns (2010: 422), a re-analysis of the specimens from both oceans shows very few, if any, differences between the two species. The characters regarding a slight difference in colony shape and polyp size cited by Cairns (2006) are not now considered as differentiating characters, and the differences in number of polyps per whorl, opercular

ridging, and submarginal scales mentioned by Cairns (2010) appear to be inconsequential. I thus suggest the synonymy of *T. grasshoffi* with *T. hilgendorfi*.

Remarks. This common species has been adequately described and illustrated by Cairns (2010) and thus only a brief diagnosis is provided above. New information provided from the New Zealand specimens show that the species often lives with a commensal polynoid polychaete, and that the coenenchymal scales are polarised in position, in that their imbricate positioning allows for the free end to be directed distally (Fig. 13A).

Genus *Metafannyella* Cairns & Bayer, 2009

Metafannyella Cairns & Bayer, 2009: 35.

Type species. *Fannyella lepidota* Bayer, 1998, by original designation.

Diagnosis (adapted from Cairns 2016b). Colonies usually uniplanar, dichotomously branching, some species having branchlets arranged in a lyrate or bottlebrush configuration. Polyps arranged in whorls or in random order. Polyps protected by eight longitudinal rows of body walls scales. Outer face of body wall scales smooth or covered with low, smooth granular ridges; a curved, transverse thickened ridge separates the distal exposed portion of body wall scale from that which is covered by the more proximal scale (i.e., a weakly modified ascus scale). Inner faces of opercular scales keeled. Coenenchymal scales usually in two layers: an outer layer of large flat, discoidal imbricate scales or thick tessellated scales, and a lower layer of smaller discoidal scales.

Distribution. Off Antarctic Peninsula, Scotia Sea, Ross Sea, Weddell Sea, Auckland Rise, Macquarie Ridge, Chatham Rise, New Zealand, southern Norfolk Ridge, 39–1280 m.

Metafannyella moseleyi (Wright & Studer, 1889) comb. nov.

Figs 2C, 15, 16

Thouarella moseleyi Wright & Studer, 1889: 61–62, pl. 14, figs. 1, 1a, pl. 21, fig. 2.—Versluys 1906: 29–30, text figs. 26–27, pl. 1, fig. 6.—Taylor *et al*. 2013: 18, 19, 77–81, figs. 30–31.

Thouarella cf. moseleyi, Cairns *et al*. 2009: 93 (listed).

Thouarella (*Euthouarella*) *moseleyi*, Kükenthal 1915: 150; 1919: 417–418.—Cairns & Bayer 2009 (listed).

Material examined. *Maluku Islands*, *Indonesia*: USNM 57540, USFC *Albatross* 5617, Pulau Ternate, 0.825° N, 127.425° E, 240 m, 27 Nov 1909.

Norfolk Island (Australian EEZ): TMAG K5412, NZOI Stn P35, 28.965° S, 167.758° E, 392 m, 28 Jan 1977.

West Norfolk Ridge (International Waters): NIWA 104848, NIWA Stn TAN0308/97, 33.771° S, 167.325° E, 273–260 m, 28 May 2003.

Cavalli Seamount: NIWA 9652, 9694, NIWA Stn KAH204/40 (Z11063), 34.164° S, 173.964° E, 820–805 m, 18 Apr 2002; NIWA 9689, NIWA Stn KAH0204/32 (Z11059), 34.162° S, 173.962° E, 810–780 m, 17 Apr 2002, SEM stubs 2575–2578.

Northland: NIWA 56208, NIWA Stn TAN0906/135, 34.452° S, 173.22° E, 157–159 m, 13 Jul 2009; NIWA 56020, NIWA Stn TAN0906/130, Great Exhibition Bay, 34.556° S, 173.16° E, 107–105 m, 12 Jul 2009; NIWA 55940, 55941, NIWA Stn TAN0906/126, Great Exhibition Bay, 34.556° S, 173.156° E, 105–106 m, 12 Jul 2009; NIWA 55981, 55982, NIWA Stn TAN0906/129, Great Exhibition Bay, 34.571° S, 173.204° E, 115–115 m, 12 Jul 2009; NIWA 56247, NIWA Stn TAN0906/140, Great Exhibition Bay, 34.571° S, 173.209° E, 117–120 m, 13 Jul 2009; NIWA 55479, NIWA Stn TAN0906/83, 34.849° S, 173.901° E, 136–138 m, 09 Jul 2009, SEM stubs 2570–2572, 2652; NIWA 57416, NIWA Stn TAN0906/236, 34.85° S, 173.905° E, 134–132 m, 19 Jul 2009, and 1 colony, USNM 1575154; NIWA 57179, NIWA Stn TAN0906/205, 34.855° S, 173.609° E, 100–100 m, 17 Jul 2009; NIWA 128290, NZOI Stn Z9880, Off Ninety Mile Beach, 35.008° S, 172.53° E, 167 m, 30 Oct 1999.

Bay of Plenty: NIWA 9681, NIWA Stn KAH0001/63, 36.234° S, 176.202° E, 340–340 m, 17 Feb 2000; NIWA 9680, NIWA Stn Z8919, 36.5° S, 176.515° E, 956 m, 25 Jun 1995; NIWA 9679, NIWA Stn Z9219, 37.068° S, 176.701° E, 1011 m, 06 Aug 1998; NIWA 83354, NIWA Stn TAN1206/166, Matatara Knoll, 37.184° S, 176.984° E, 928–928 m, 30 Apr 2012.

Ranfurly Bank: NIWA 75599, NIWA Stn TAN1108/253, 37.469° S, 178.863° E, 117–106 m, 01 Jun 2011.

Ritchie Banks: NIWA 9721, 9771, NIWA Stn KAH9907/40 (Z10170), 39.471° S, 178.413° E, 865–865 m, 03 Jun 1999; NIWA 9720, NIWA Stn KAH9907/38 (Z10168), 39.476° S, 178.422° E, 874 m, 03 Jun 1999; NIWA 26911, NIWA Stn TAN0616/18, 39.541° S, 178.332° E, 775–810 m, 05 Nov 2006; NIWA 91293, NIWA Stn TAN1003/45, 39.784° S, 178.364° E, 830 m, 24 Mar 2010; NIWA 76760, NIWA Stn TAN1003/40, 39.963° S, 178.28° E, 1288 m, 23 Mar 2010; NIWA 76766, NIWA Stn TAN1003/22, 40.019° S, 178.067° E, 820 m, 21 Mar 2010; NIWA 26876, NIWA Stn TAN0616/10, 40.04° S, 178.143° E, 760–700 m, 04 Nov

2006; NIWA 76767, NIWA Stn TAN1003/24, 40.091° S, 178.189° E, 744 m, 22 Mar 2010.

Hikurangi Margin: NIWA 76704, NIWA Stn TAN1003/169, 40.635° S, 177.075° E, 875 m, 07 Apr 2010.

Chatham Rise: NIWA 9653, NIWA Stn TAN0104/396 (Z10740), Pyre Seamount, 42.717° S, 179.909° W, 1040 m, 21 Apr 2001; NIWA 47784, SOP Stn TRIP2253/23, 42.7° S, 177.7° W, 1166–1092 m, 30 May 2006.

Type & locality. Holotype—NHMUK1889.5.27.39, *Challenger* Stn 171, 28.55° S, 177.833° W (not E as indicated in Taylor *et al*. 2013), north of Raoul Island, Kermadec Islands, 1288 m.

Distribution. In the New Zealand region, southern Norfolk Ridge, Kermadec Islands, southern Three Kings Ridge, North Cape, Bay of Plenty, off eastern North Island (Fig. 16), 106–1097 m, although most records shallower than 400 m; elsewhere, Moluccas, Indonesia, 240 m (reported herein).

Description. The colony is flabellate, large colonies (up to 25 cm in height) having several main branches from which branchlets diverge in an alternate pinnate fashion (best seen on distal branches), but because some of the branchlets curve toward the anterior face to form a conduit for a polynoid polychaete, the lower branches appear somewhat bushy, or as a weak bottlebrush shape (Fig. 2C). The branchlets are 13–25 mm in length, and unbranched. They support, at a regular spacing, pairs (Fig. 15A) and occasionally whorls of three polyps, at a frequency of seven to nine pairs of whorls per cm. The polyps are white, stand perpendicular to the branchlet, are slightly flared, and are usually 1.0–1.5 mm in height.

The body wall scales are arranged in eight longitudinal rows (Fig. 15B), the number of scales in each row decreasing only slightly in number and size from ab- to adaxial polyp side; the body wall sclerite formula is: 5–6: 4–5: 4–5: 3–4. The eight marginal scales (Figs 15C, E) are somewhat elliptical in shape, although some have a pointed distal edge, and are usually broader than tall (width 0.3–0.35 mm, with a L:W = 0.8–0.95). Each marginal scale flanks its corresponding opercular scale as well as half of the perimeter of the two adjacent opercular scales to each side, forming an inner and outer crown of four scales, and thus overlapping one another (Fig. 15C). Their inner distal surface is covered with three to nine parallel ridges, which produce a coarsely serrate distal margin. The remaining body wall scales (Figs 15D, F) are somewhat smaller (0.25–0.30 mm wide, L:W = 0.65–0.85), each having a curved, finely serrate distal edge; its distal outer surface is smooth and its proximal surface sparsely granular, the granules radiating from near the thickened base of the scale. These scales have been classified as ascus scales by Bayer (1998), but Cairns & Wirshing (2018) have re-classified them as non-homologous "weak ascus" scales because there is no transverse ridge that separates the smooth distal from the proximal granular outer surface (Fig. 15D). The opercular scales are lanceolate in shape, 0.21–0.41 mm in length, having a L:W of 2.0–2.4. They vary greatly in size and shape (Figs 15G–H), some having one, two or no lateral wings. Their inner surface bears a prominent multi-ridged keel.

The coenenchymal scales (Fig. 15I) are elliptical to irregular in shape and up to 0.35 mm in greater length. They also bear sparse, low granules.

Comparisons. Among the ten species of *Metafannyella* (see Cairns 2016b: Table 2 for a comparison to the New Zealand species), *M. moseleyi* is closest to *M. chathamensis* Cairns, 2016b, both species having a primarily irregular dichotomous branching structure followed by alternate pinnate branchlets (quasi-bottlebrush), the latter topology to accommodate a commensal polychaete. *Metafannyella moseleyi* differs primarily in having polyps that are paired or in whorls of three, whereas those of *M. chathamensis* are randomly arranged, especially at the branchlet tips. *Metafannyella chathamensis* also has a tendency to have many brooding polyps, which *M. moseleyi* does not. Bathymetrically they are also similar, but geographically *M. chathamensis* occurs slightly more southerly, especially on the Chatham Rise, whereas *M. moseleyi* is more northerly, perhaps suggesting a subspecies distinction.

Remarks. *Metafannyella moseleyi* was placed in the genus *Thouarella* probably because of its bottlebrush colony shape; however, several other primnoid genera [*i.e*., *Dasystenella*, *Metafannyella* (in part), *Digitigorgia* Zapata-Guardiola & López-González, 2010, *Scyphogorgia* Cairns & Bayer, 2009, *Scopaegorgia* Zapata-Guardiola & López-González, 2010b (in part)] are known to have a bottlebrush shape. *Metafannyella moseleyi* differs from *Thouarella* in having marginal scales with independent, parallel, multiply ridged marginal scales (not medially keeled in the sense of *Thouarella*) and weakly developed ascus body wall scales.

The key to the *Thouarella* species (Taylor *et al.* 2013: 18, couplet 5b) incorrectly states that *T. moseleyi* has opposite pinnate branching of the branchlets, as their description, as well as the original description, report alternate pinnate branching.

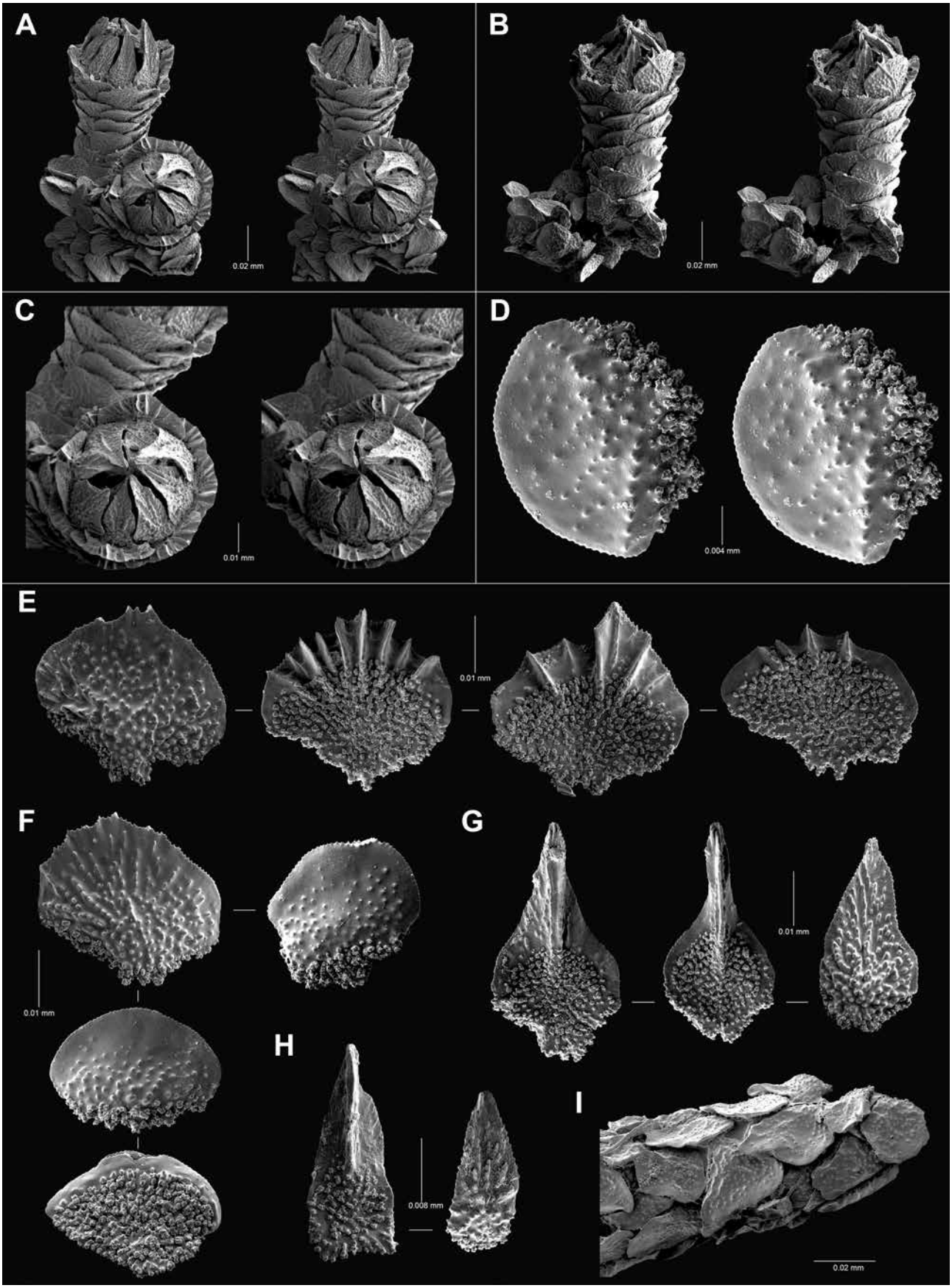

Figure 15. *Metafannyella moseleyi* (Wright & Studer, 1889) **comb. nov.**, NIWA 55479. **A.** Stereo view of two polyps; **B**–**C.** Stereo views of lateral and opercular aspects of polyp, respectively; **D.** Stereo view of a pseudo-ascus body wall scale; **E.** Marginal scales; **F.** Body wall scales; **G.** Larger opercular scales; **H.** Smaller opercular scales; **I.** Coenenchymal scales, *in situ*.

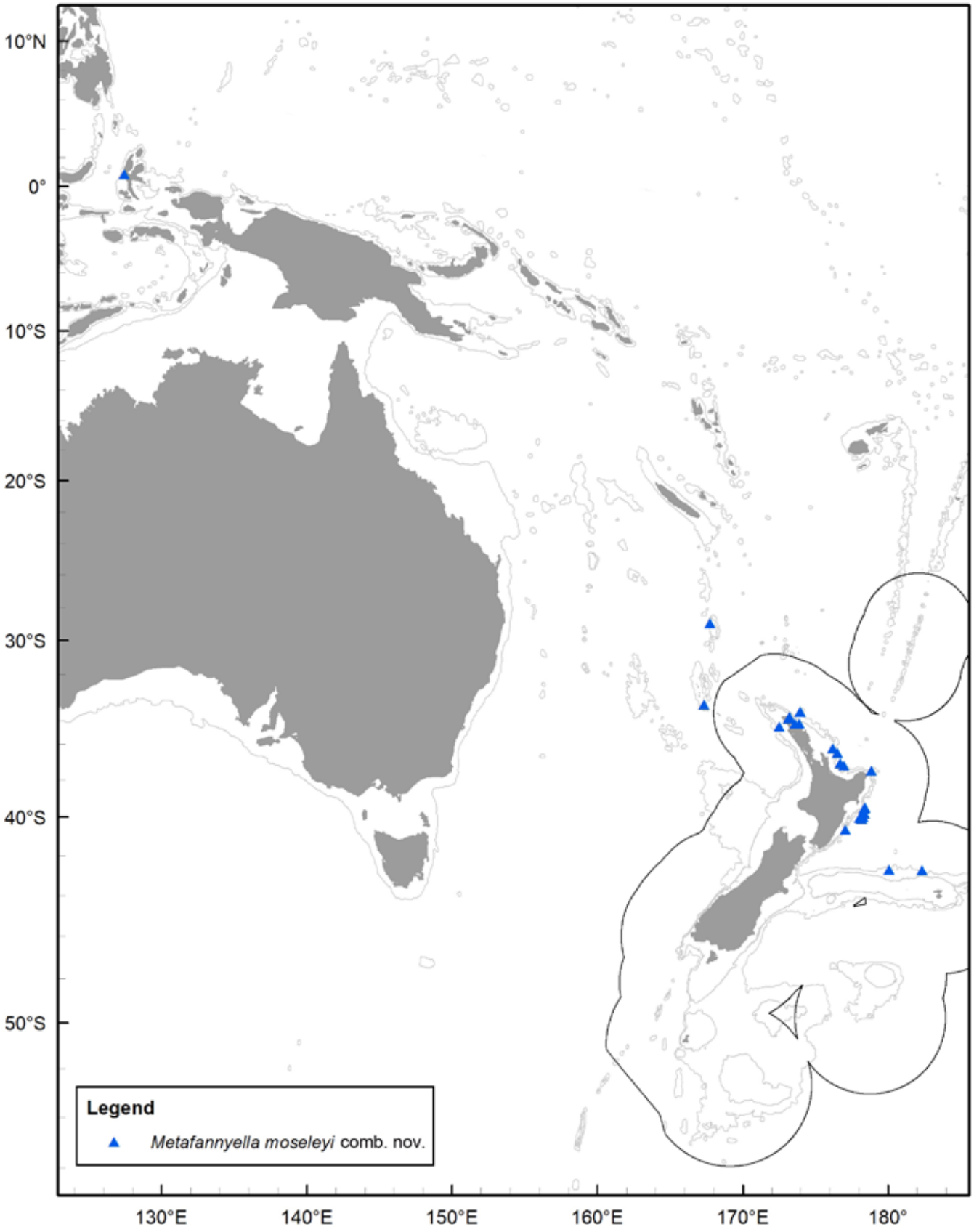

Figure 16. Distribution of *Metafannyella moseleyi* (Wright & Studer, 1889) **comb. nov.**

Metafannyella moseleyi (Wright & Studer, 1889) **comb. nov.** is cited in the Cairns (2016b) New Zealand checklist as *Thouarella moseleyi* Wright & Studer, 1889. Species of *Thouarella* were not treated in Cairns (2016b) because they were the subject of the present work. The species was first mentioned in the checklist of species in Cairns (2012).

Metafannyella rigida sp. nov.

Figs 2D, 17, 18

Material examined. **Holotype** NIWA 9643, NIWA Stn KAH0108/22 (Z10967), Mernoo Bank, Chatham Rise, 43.200° S, 175.712° E, 399 m, 04 Sep 2001, colony and SEM stubs 2579–2582, 2666. **Paratypes** *Chatham Rise*: NIWA 142888, NIWA Stn KAH0108/22 (Z10967), Mernoo Bank, 43.200° S, 175.712° E, 399 m, 04 Sep 2001, 2 colonies; NIWA 14646, NZOI Stn Q20, 44.160° S, 179.237° W, 320 m, 17 Mar 1978, 1 colony.

Type locality. Chatham Rise, 399 m.

Distribution. Known only from the Chatham Rise (Fig. 18), 320–399 m.

Description. Colonies are small, the holotype only 10 cm in height, the main stems sparsely and irregularly branching in one plane (Fig. 2D). Branchlets diverge from the main stems in an alternate pinnate manner but curve toward the anterior face to form a porous tube for a commensal polynoid polychaete, and thus appearing somewhat bushy or bottlebrush in shape. The axis of the main branches are strongly flattened in cross-section and yellow in colour, whereas the branchlets are 20–25 mm in length, circular in cross-section, often subdivided, and have a brown axis. Both stems and branchlets are quite rigid, with little flexibility. The polyps are white, 0.9–1.2 mm in height, and occur randomly on the branchlets (not in pairs or whorls), about 22–24 occurring per cm branchlet length.

The body wall scales are arranged in eight longitudinal rows, the number of scales in each row decreasing from ab- to adaxial polyp side, the proximal-most abaxial scales being the largest (Figs 17B–C); the body wall sclerite formula is: 5–6: 4–5: 3–4: 2–3. The marginal scales (Figs 17D–E) are arranged in two quartets, an inner and outer, and are wider than tall, measuring 0.30–0.32 mm in width. They may have a slightly pointed or straight distal margin, whereas their inner distal margin may be smooth of bear several parallel ridges, as do many *Metafannyella* species. The remaining body wall scales (Fig. 17F) are similarly shaped but smaller, 0.23–0.29 mm in width, and do not bear inner ridges. The outer face of all body wall scales is smooth distally and its proximal surface sparsely granular, the granules radiating from near the thickened base of the scale (weak ascus scales); their distal edges are finely serrate. The opercular scales (Fig. 17G) are lanceolate and appear to alternate in shape and size. The four larger operculars are 0.48–0.55 mm in length, with a L:W of 1.6–2.0, each bearing two lateral wings. The four smaller operculars are 0.37–.45 mm in length and do not have lateral wings, thus resulting in a higher L:W of 2.0–2.7. The larger operculars (Fig. 17G) are aligned with the outer marginal quartet, the smaller operculars are aligned with the inner marginal quartet. The inner faces of the operculars are prominently keeled.

The coenenchymal scales (Fig. 17H) are round to slightly elliptical, thin, and somewhat concave, with a greater diameter ranging from 0.09–0.35 mm. Their outer surface is smooth to sparsely granular.

Comparisons. Among the other nine species in the genus *Metafannyella*, *M. rigida* is most similar to *M. chathamensis*, both species having an irregular dichotomous branching of their stems followed by alternate pinnate branching of their branchlets, as well as similarly shaped body wall scales, and randomly arranged polyps. They are also sympatric both geographically and bathymetrically. Nonetheless, *M. rigida* differs in having very rigid branches and branchlets, subdivided (not simple) branchlets with a brown axis, fewer polyps per cm branchlet length, and slightly fewer body wall scales per row.

Etymology. Named *rigida* in allusion to the inflexibility of its colony (from the Latin *rigidus*, meaning inflexible, stiff).

ZooBank registration. *Metafannyella rigida* **sp. nov.** is registered in ZooBank under urn:lsid:zoobank.org:act:F5CDABF4-768A-4FF0-AEC4-E22A13E2D0AB

Genus ***Dasystenella*** **Versluys, 1906**

Stenella (Dasystenella) Versluys, 1906: 39, 48.
Dasystenella Bayer, 1981: 934, 937, 946.—Bayer & Stefani, 1989: 454.—Cairns, 2006: 188-189.

Type species. *Stenella acanthina* Wright & Studer, 1889, by monotypy.

Diagnosis (adapted from Cairns 2009). Branches of colony arranged in a bottlebrush. Polyps arranged in whorls of up to five, the polyps inclined upward. Operculum well developed; opercular scales keeled. Five marginal scales present on each polyp, each bearing an apical spine. Polyps covered with five longitudinal rows of body wall scales: one abaxial, two lateral, and two adaxial. Coenenchymal scales elliptical, arranged on one layer.

Distribution. Off Argentina, Scotia Ridge to South Shetland Islands, abyssal plain west of Tierra del Fuego, New Zealand, 300–5087 m.

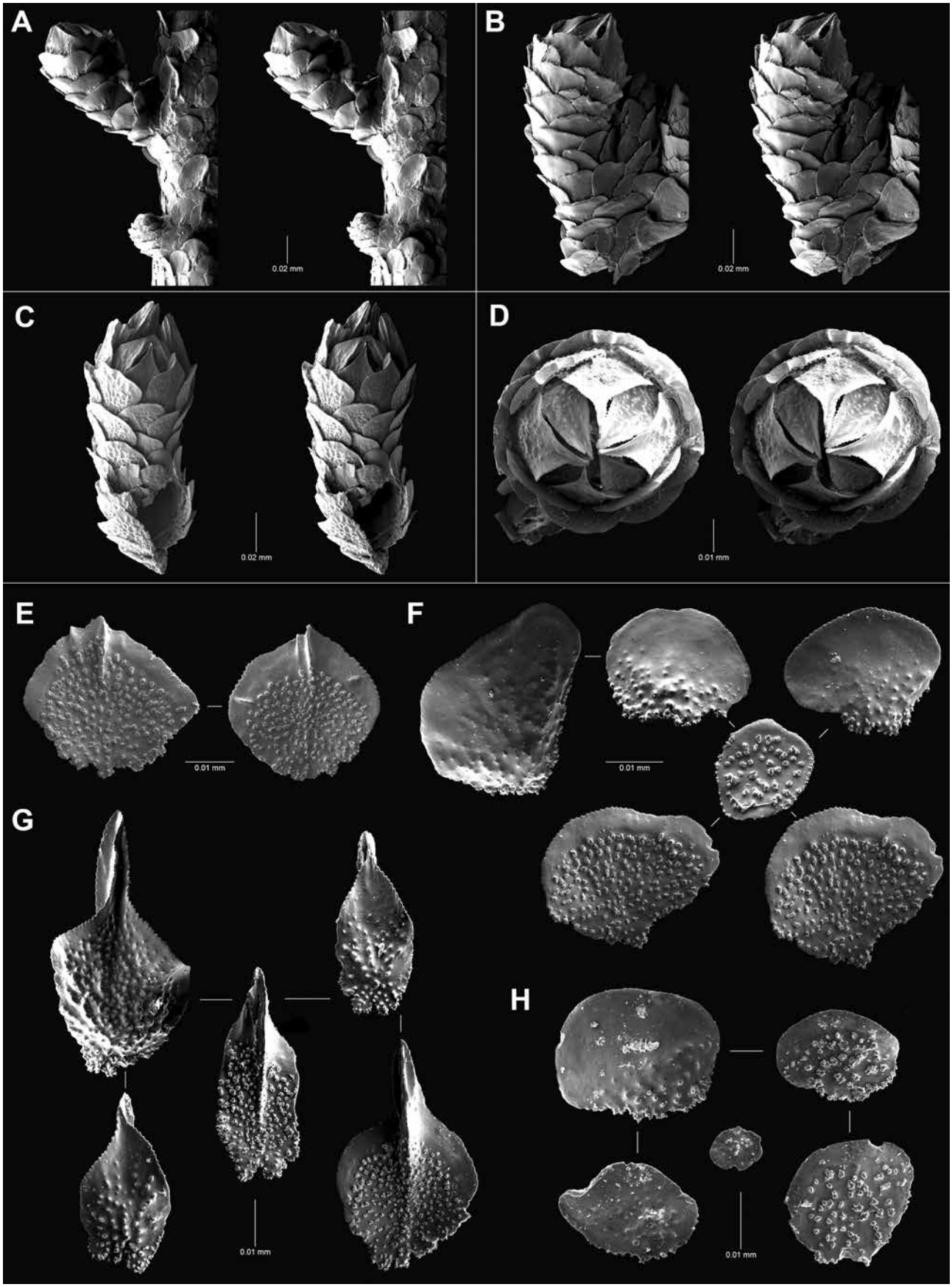

Figure 17. *Metafannyella rigida* **sp. nov.**, holotype, NIWA 9643. **A**–**B.** Stereo views of lateral side of polyps; **C.** Stereo view of adaxial side of polyp; **D.** Stereo opercular view of a polyp; **E.** Marginal scales; **F.** Body wall scales; **G.** Opercular scales; **H.** Coenenchymal scales.

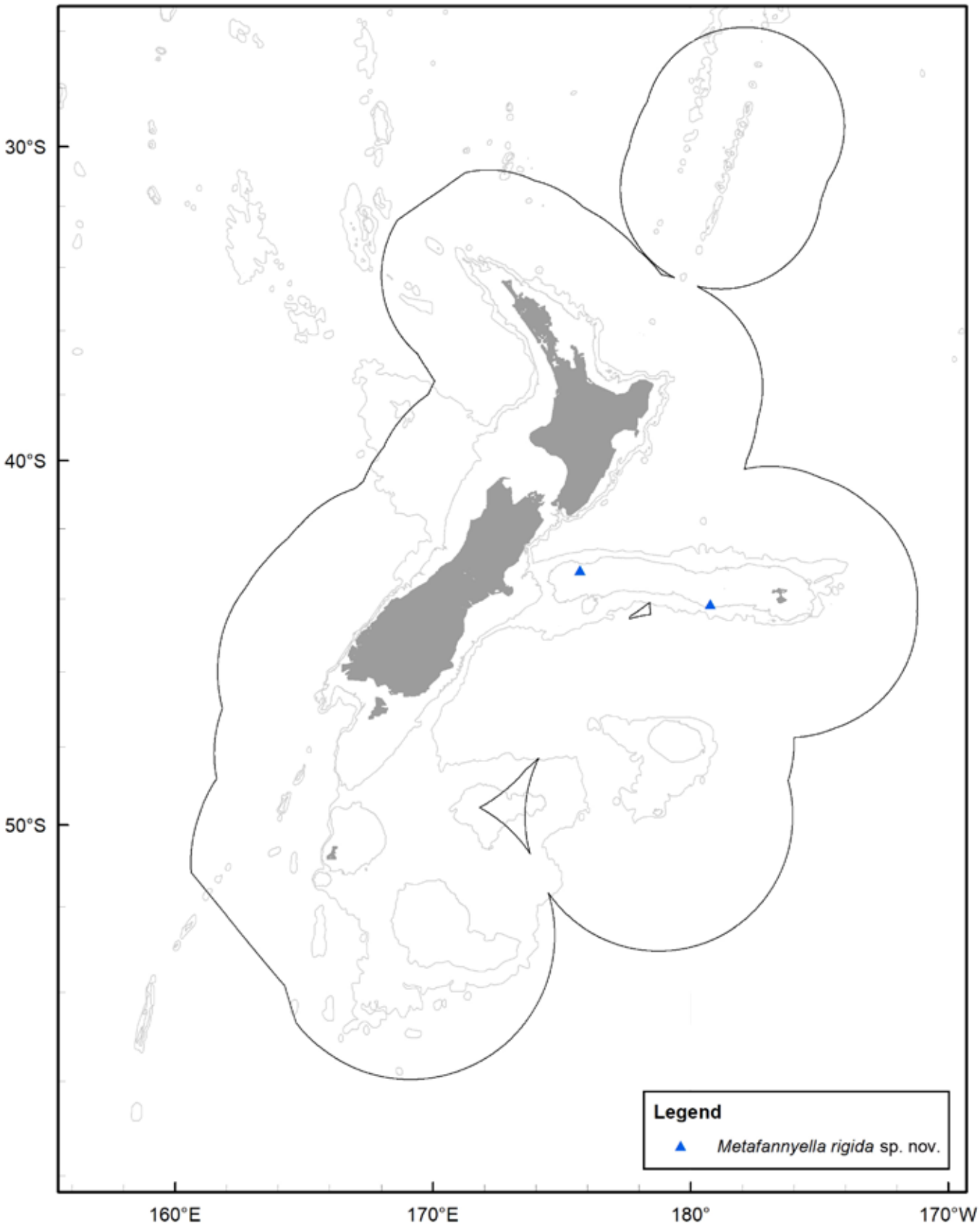

Figure 18. Distribution of *Metafannyella rigida* **sp. nov.**

Dasystenella austasensis (Zapata-Guardiola & López-González, 2010a)

Figs 2E, 19, 20

Tauroprimnoa austasensis Zapata-Guardiola & López-González, 2010a: 314–317, figs. 2a–b, 3–6.

Dasystenella austasensis, Taylor & Rogers 2015: 197 (fig. 1), 200.

Material examined. **Paratype**—USNM 1128573, Austasen, eastern Weddell Sea, Antarctica, 72.857° S, 19.644° W, 596–597 m, 31 Dec 2003.

Other material. *Southern Chatham Rise*: NIWA 28746, NIWA Stn TAN0705/101, 44.649° S, 178.457°

W, 1230–1241 m, 10 Apr 2007; NIWA 9620, NIWA Stn S135, 44.633° S, 174.81° E, 897–720 m, 24 Oct 1979; NIWA 11322, NIWA Stn AEX0101/25 (Z10945), 44.578° S, 177.235° W, 826 m, 22 Oct 2001; NIWA 9615, 9616, NIWA Stn Z9453, 44.576° S, 177.832° W, 978 m, 09 Oct 1998; NIWA 28737, NIWA Stn TAN0705/94, 44.567° S, 178.49° W, 1110–1119 m, 10 Apr 2007; NIWA 127411, NIWA Stn TAN0705/99, 44.561° S, 178.476° W, 1076–1103 m, 10 Apr 2007; NIWA 9632, NIWA Stn Z9419, 44.481° S, 178.516° W, 940–956 m, 25 Oct 1998; NIWA 9750, NIWA Stn Z9469, 44.385° S, 178.157° W, 805 m, 07 Oct 1998; NIWA 9634, NIWA Stn Z9468, 44.207° S, 179.059° E, 959 m, 02 Oct 1998; NIWA 113999, NIWA Stn TAN9511/18, 44.665° S, 174.893° E, 818–800 m, 08 Oct 1995.

Bounty Plateau: NIWA 9710, NZOI Stn I685, 48.325° S, 179.492° W, 722 m, 16 Mar 1979, and 1 colony and SEM stubs 2667–2670, USNM 1575150; NIWA 114356, NIWA Stn TAN0307/59, 49.311° S, 179.798° E, 1506–1476 m, 29 Apr 2003; NIWA 9743, NZOI Stn I694, 49.5° S, 178.75° E, 1004 m, 18 Mar 1979.

Pukaki Rise: NIWA 65928, SOP Stn TRIP2718/31, 49.8° S, 175.9° E, 855–1032 m, 14 Nov 2008.

Type locality. 72.857° S, 19.644° W (Austasen, eastern Weddell Sea, Antarctica), 596–598 m.

Distribution. In New Zealand region, Chatham Rise, Bounty Plateau, eastern Pukaki Rise (Fig. 20), 720–1476 m; elsewhere, Weddell Sea, 596–598 m.

Diagnosis. Main stem unbranched; branchlets up to 30 mm in length diverge from all sides of stem resulting in a bottlebrush shape (Fig. 2E). Polyps arranged in whorls of three or four, individual polyps up to 2.5 mm in height (exclusive of marginal spines). Marginal scales in two shapes and sizes. Two massive outer lateral marginals (Figs 19B–D) are up to 2.3 mm in length, having a massive trapezoidal base and an elongate distal spine forming 2/3 length of scale; L:W up to 3.5. The distal spine bears numerous longitudinal finely serrate ridges (Fig. 19E). Two adaxial marginals (Figs 19B–C) are rectangular in shape (not spinose), and about 0.4 mm in width. There are five rows of body wall scales: the single abaxial row (Fig. 19A) of three or four massive scales, two rows of two or three inner lateral and adaxial scales (Fig. 19B). Abaxial scales up to 0.9 mm in width, and usually broader than tall. Opercular scales (Figs 19C, G) occur in three size classes: scales of the smallest (0.6–0.7 mm in length, L:W = about 2.3) pair are lanceolate and aligned with the two large outer lateral marginal scales; scales of a slightly larger pair (up to 0.8 mm in length, with a similar L:W ratio) are in the adaxial position; and scales of the final two pairs (up to 1.3 mm in length, with a broad base and distal spine, L:W = 1.4–1.5) are in the abaxial and inner lateral positions. Coenenchymal scales (Fig. 19H) elliptical in shape, 0.45–0.60 mm in greater axis, concave above, thin, and finely granular.

Comparisons. The only other species in the genus, *D. acanthina* (Wright & Studer, 1889), known from Subantarctic South America (300–5087 m), is similar but differs in having an additional elongate abaxial marginal scale, well-developed spinose adaxial marginals, and more body wall scales per row. For comparison, that species is described and illustrated by Cairns (2006).

Remarks. This species was adequately described and illustrated by Zapata-Guardiola & López-González (2010a) and thus only a brief diagnosis is provided above. This is the only record of the species subsequent to its description from the type locality. Taylor & Rogers (2015) transferred the species to the genus *Dasystenella* based on molecular evidence as well as the observation that the other species in the genus, *D. acanthina*, occasionally had four marginal scales, the character that Zapata-Guardiola & López-González use to distinguish their new genus.

Additional records of 27 New Zealand primnoids previously reported in Cairns (2012, 2016b)

Order of taxa follows Cairns & Bayer (2009). Synonymies are restricted. Refer to Cairns (2016b) for full synonymies.

Primnoella distans Studer, 1878

Primnoella distans Studer, 1878: 644, pl. 1, figs 9A–C; —Cairns 2016b: 21; figs 1B, 4, 5; table 1 (p. 16).

Material examined. *Colville Ridge*: NIWA 92271, NZOI Stn P943A, 28.113° S, 179.518° W, 938 m, 31 May 1980.

Remarks. This record is consistent with those previously reported from New Zealand (Cairns 2012), but slightly extends its known distribution westward to the southern Colville Ridge.

Primnoella insularis Cairns, 2016b

Primnoella insularis Cairns, 2016b: 23; figs 1C, 6, 7; table 1 (p. 16).

Material examined. *Tasman Sea (International Waters)*: NIWA 24666, NZOI Stn P239, Gascoyne Tablemount, 36.692° S, 156.192° E, 140 m, 20 Oct 1977.

Bounty Plateau: NIWA 114384, NIWA Stn TAN0307/56, 49.488° S, 179.969° E, 2376–2385 m,

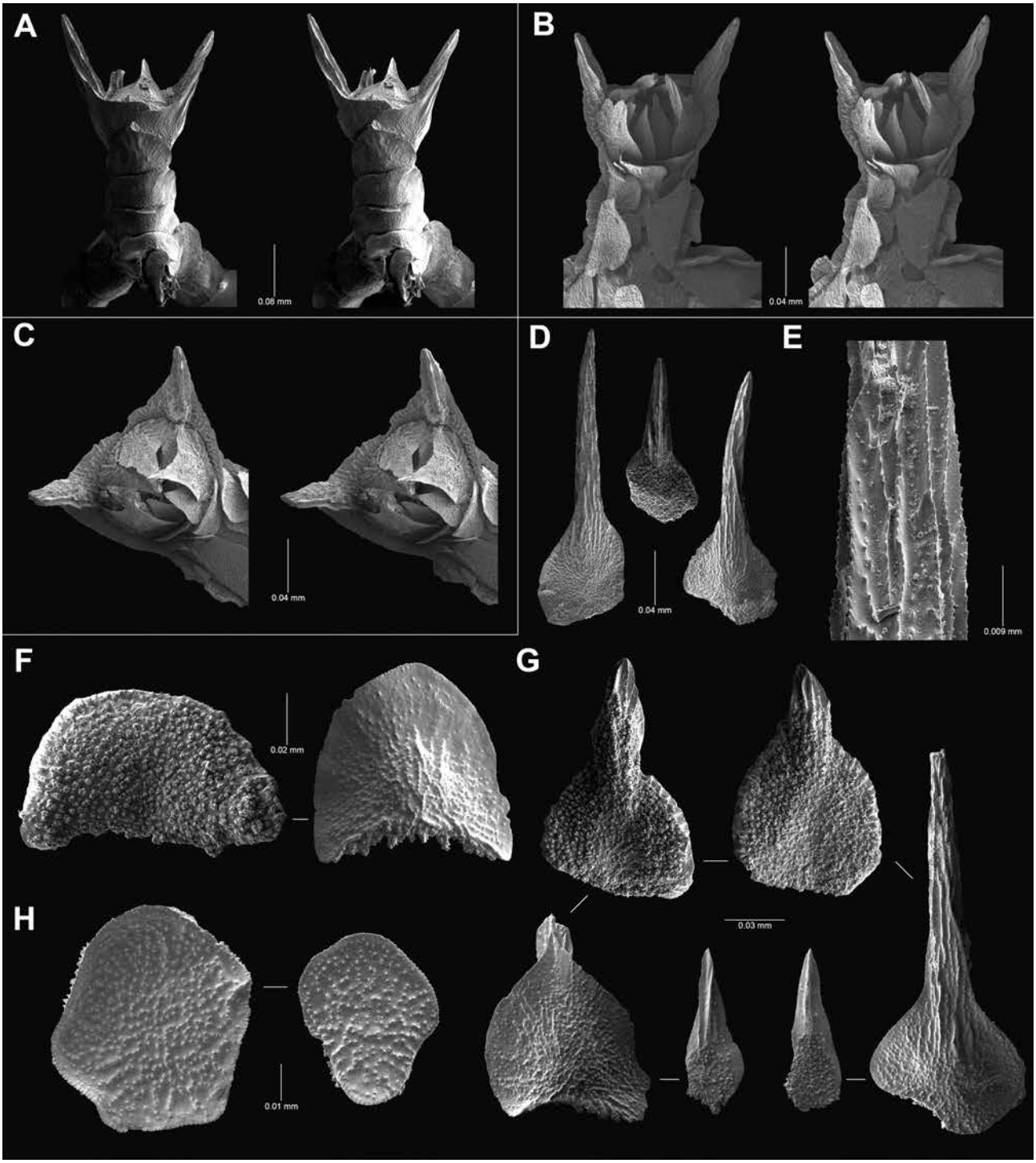

Figure 19. *Dasystenella austasensis* (Zapata-Guardiola & López-González, 2010a), NIWA 9710: **A–C.** Abaxial, adaxial, and opercular stereo views (respectively) of a polyp; **D.** Marginal scales; **E.** Spination on spine of marginal scale; **F.** Body wall scales; **G.** Opercular scales; **H.** Coenenchymal scales.

29 Apr 2003; NIWA 114379, NIWA Stn TAN0307/55, 49.669° S, 179.925° E, 2648–2650 m, 28 Apr 2003.

Remarks. These records extend the known geographic distribution of the species to the Bounty Plateau (off Antipodes Island) and south of Dampier Ridge, and extend the known bathymetric range downward from 823 to 2648 m.

Callozostron acanthodes Bayer, 1996

Callozostron acanthodes Bayer, 1996: 161–165, figs 7 (bottom), 15–17; —Cairns 2016b: 28; figs 1D (p. 17), 8, 9.

Material examined. *Chatham Rise*: NIWA 11312, NIWA Stn TAN9713/28, 45.038° S, 179.8° E, 1000–1020 m, 02 Dec 1997.

Bounty Plateau: NIWA 11088, NZOI Stn I666, 47.792° S, 178.992° W, 1165 m, 13 Mar 1979.

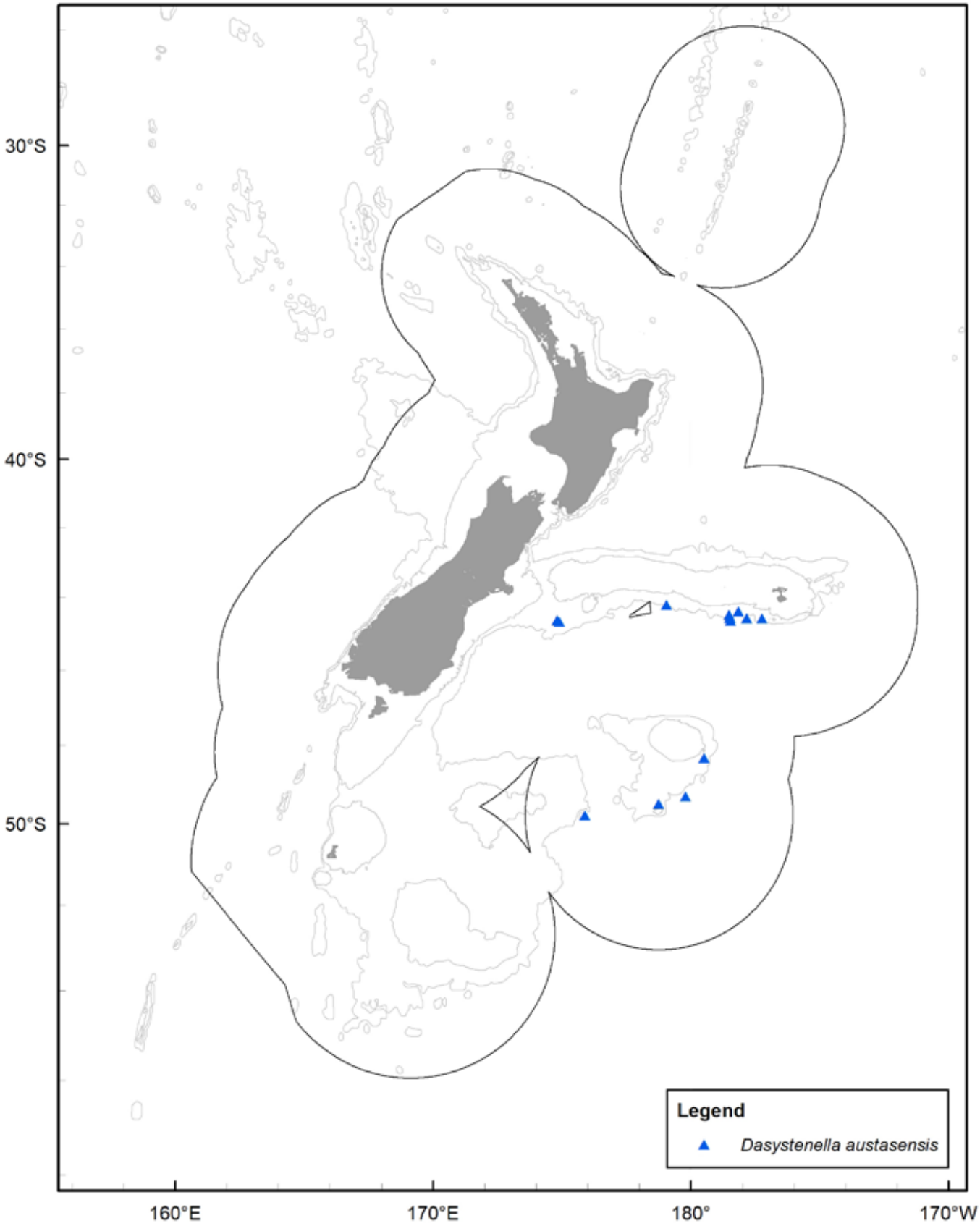

Figure 20. Distribution of *Dasystenella austasensis* (Zapata-Guardiola & López-González, 2010a).

Remarks. These records are consistent with those previously reported from New Zealand (Cairns 2016b), but slightly extend the known geographic distribution to the Chatham Rise.

Callozostron carlottae sensu Bayer, 1996

Callozostron carlottae, Bayer 1996: 159–161, figs. 7 (top), 8–10.
Not *Callozostron carlottae* Kükenthal, 1909: 49.

Material examined. *Campbell Plateau*: NIWA 127359,

NIWA Stn Z9775, 54.062° S, 171.662° E, 1315 m, 14 May 1999.

Remarks. Previously known only from off South Orkney Islands at 2355–2897 m, this taxon is now known from the southern Campbell Rise at 1823–1826 m.

Loboprimnoa exotica Cairns, 2016b

Loboprimnoa exotica Cairns, 2016b: 36; figs 1G, 14, 15.

Material examined. *Kermadec Ridge*: NIWA 64539, NIWA Stn TAN1007/55, Rumble II West Seamount, 35.343° S, 178.531° E, 1313–1363 m, 02 Jun 2010.

Remarks. This is only the second record of this species, and was collected virtually at the type locality, only 24 m shallower than the type.

Metafannyella chathamensis Cairns, 2016b

Pterostenella sp. Cairns et al., 2009: 93.
Metafannyella chathamensis Cairns, 2016b: 49; figs 16C (p. 40), 23, 24; table 2 (p. 39).

Material examined. *Northland*: NIWA 73261, NIWA Stn TAN1105/43, Middlesex Bank, 33.988° S, 171.751° E, 170–174 m, 28 Mar 2011; NIWA 57072, NIWA Stn TAN0906/178, North Cape, 34.41° S, 173.161° E, 203–169 m, 15 Jul 2009; NIWA 72979, NIWA Stn TAN1105/9, North Cape, 34.269° S, 173.025° E, 168–174 m, 26 Mar 2011; NIWA 54415, NIWA Stn TAN0906/2, 35.552° S, 174.56° E, 60–61 m, 04 Jul 2009.

Colville Knolls: NIWA 9688, NIWA Stn Z9157, 36.536° S, 176.511° E, 899 m, 19 Jun 1998; NIWA 9682, NIWA Stn Z9840, 36.505° S, 176.508° E, 990 m, 05 Jun 1999; NIWA 9766, NIWA Stn KAH0001/66, 36.216333° S, 176.212° E, 343–336 m, 18 Feb 2000.

West Coast North Island: NIWA 127406, NZOI Stn B675, 36.667° S, 173.833° E, 384 m, 26 Oct 1962.

Bay of Plenty: NIWA 11337, NZOI Stn E720, 37.55° S, 178.583° E, 256 m, 24 Mar 1967; NIWA 15529, NIWA Stn TAN0413/138, 37.316° S, 177.0748291016° E, 495–466 m, 14 Nov 2004; NIWA 9732, NZOI Stn E640, 37.253° S, 176.853° E, 123 m, 11 Oct 1966; NIWA 14725, NZOI Stn X138, 37.25° S, 176.841° E, 335 m, 27 Nov 1989.

Ritchie Banks: NIWA 14723, NZOI Stn R440, 39.438° S, 178.345° E, 970 m, 16 Jun 1990; NIWA 14693, NZOI Stn R435, 39.43° S, 178.422° E, 985–1190 m, 15 Jun 1990; NIWA 9726, 14656, 14657, NZOI Stn T109, 39.763° S, 178.235° E, 288 m, 24 Apr 1981.

Hawke Bay: NIWA 14647, NZOI Stn Q941, 39.865° S, 177.42° E, 413 m, 15 Sep 1987.

Hikurangi Margin: NIWA 104322, NIWA Stn KAH9907/1, 40.022° S, 178.069° E, 797–804 m, 01 Jun 1999; NIWA 63010, NIWA Stn TAN1004/2, 41.671° S, 175.625° E, 640–635 m, 15 Apr 2010; NIWA 26892, NIWA Stn TAN0616/67, 41.295° S, 176.556° E, 731–750 m, 10 Nov 2006; NIWA 26899, NIWA Stn TAN0616/70, 41.289° S, 176.587° E, 731–720 m, 10 Nov 2006; NIWA 26845, NIWA Stn TAN0616/12, 40.04° S, 178.145° E, 749–787 m, 04 Nov 2006.

Cook Strait: NIWA 63861, 63873, NIWA Stn TAN1004/91, 41.895° S, 174.633° E, 740–620 m, 24 Apr 2010; NIWA 64124, NIWA Stn TAN1004/120, 41.985° S, 174.699° E, 730–685 m, 26 Apr 2010; NIWA 64018, NIWA Stn TAN1004/114, 42.099° S, 174.578° E, 940–889 m, 26 Apr 2010; NIWA 9747, NZOI Stn E756, 42.03° S, 174.442° E, 885 m, 30 Mar 1967.

Chatham Rise: NIWA 9623, 9684, NIWA Stn Z9244, 43.067° S, 176.918° E, 368–351 m, 24 Nov 1997; NIWA 9626, NIWA Stn Z10929, 43.121° S, 175.819° E, 467 m, 04 Sep 2001; NIWA 9627, 9628, 9641, NIWA Stn Z10972, 43.121° S, 175.819° E, 467 m, 04 Sep 2001; NIWA 9629, NIWA Stn Z10920, 44.735° S, 176.814° W, 753 m, 01 Nov 2001; NIWA 9630, NIWA Stn Z10931, 43.137° S, 175.837° E, 441 m, 30 Oct 2001; NIWA 9631, NZOI Stn I721, 44.123° S, 175.77° E, 540 m, 26 Mar 1979; NIWA 9637, NIWA Stn Z9428, 44.43° S, 178.522° W, 868 m, 25 Oct 1998; NIWA 9640, NIWA Stn Z9419, 44.481° S, 178.516° W, 940–956 m, 25 Oct 1998; NIWA 9642, NIWA Stn Z10967, 43.2° S, 175.712° E, 399 m, 04 Sep 2001; NIWA 9644, NIWA Stn Z10969, 43.69° S, 179.437° E, 463 m, 11 Jan 2001; NIWA 9675, NIWA Stn Z9437, 44.43° S, 178.616° W, 843 m, 26 Oct 1998; NIWA 9711, NZOI Stn A910, 43.067° S, 178.65° W, 549 m, 13 Sep 1963; NIWA 9733, NZOI Stn G259A, 43.55° S, 179.367° E, 410 m, 23 Jan 1968; NIWA 9744, NZOI Stn E79, 43.083° S, 178° E, 371 m, 24 Mar 1964; NIWA 9755, NZOI Stn Q342, 44.168° S, 175.822° E, 365 m, 14 Nov 1979; NIWA 9756, NZOI Stn E79, 43.083° S, 178° E, 371 m, 24 Mar 1964; NIWA 9757, 9767, NZOI Stn D899, 44.383° S, 176.817° W, 370 m, 29 Mar 1969; NIWA 9758, NZOI Stn Q4C, 43.685° S, 179.942° E, 385 m, 12 Mar 1978; NIWA 9764, NIWA Stn Z9439, 44.584° S, 177.456° W, 850 m, 12 Oct 1998; NIWA 9765, NZOI Stn S194, 43.157° S, 173.792° E, 1190 m, 01 Nov 1979; NIWA 11348, NZOI Stn S192, 43.25° S, 173.8283° E, 130 m, 31 Oct 1979; NIWA 11758, NIWA Stn TAN9511/44, 44.21° S, 178.861° E, 1004–1007 m, 12 Oct 1995; NIWA 14671, NZOI Stn G294, 43.567° S, 179.333° W, 417 m, 25 Jan 1968; NIWA 14704, NZOI Stn H923, 43.483° S, 179.537° E, 395 m, 13 Aug 1975; NIWA 25428, NIWA Stn TAN0604/110, Main Knoll, 43.531° S, 179.629° E, 378–390 m, 07 Jun 2006; NIWA 25504, NIWA Stn TAN0301/9, 43.064° S, 177.463° E, 320–325 m, 30 Dec 2003; NIWA 25508, NIWA

Stn TAN0401/67, 43.93° S, 178.766° E, 613–610 m, 12 Jan 2004; NIWA 28734, NIWA Stn TAN0705/92, 44.374° S, 178.492° W, 804–821 m, 10 Apr 2007; NIWA 28770, NIWA Stn TAN0705/181, 44.068° S, 178.549° W, 451–452 m, 18 Apr 2007; NIWA 42554, SOP Stn TRIP2101/128, 42.7° S, 177.4° W, 1107–1123 m, 14 Jun 2005; NIWA 42623, SOP Stn TRIP2551/68, 44.2° S, 174.4° W, 1202–1302 m, 17 Dec 2007; NIWA 53638, NIWA Stn TAN0905/98, Diamondhead Seamount 44.147° S, 174.698° W, 720–780 m, 26 Jun 2009; NIWA 53733, NIWA Stn TAN0905/101, Dickies Seamount, 44.127° S, 174.57° W, 645–779 m, 26 Jun 2009; NIWA 53759, NIWA Stn TAN0905/103, Iceberg Seamount, 44.158° S, 174.555° W, 520–650 m, 26 Jun 2009; NIWA 54038, NIWA Stn TAN0905/112, Diamondhead Peak A Seamount 44.143° S, 174.725° W, 760–821 m, 27 Jun 2009; NIWA 66288, SOP Stn TRIP3004/80, 44.6° S, 177.4° W, 891 m, 01 Dec 2009; NIWA 66290, SOP Stn TRIP3004/35, 44.5° S, 177.9° W, 911 m, 24 Nov 2009; NIWA 70523, NIWA Stn TAN1101/98, 43.813° S, 178.459° E, 450–490 m, 22 Jan 2011; NIWA 78591, NIWA Stn TAN1116/63, 44.103° S, 178.674° E, 880–875 m, 10 Nov 2011; NIWA 91991, NIWA Stn TAN1401/5, 42.881° S, 176.366° E, 524 m, 03 Jan 2014; NIWA 113820, FV *Amital Explorer* Stn AEX1601/OP14, 42.798° S, 177.83° W, 806–915 m, 21 Jun 2016; NIWA 127465, NZOI Stn Z3924B, 43.567° S, 179.65° E, 388 m, 20 May 1981.

Remarks. This species was the most frequently collected primnoid species in the New Zealand region. Although many records are reported herein, the previously known range remains Chatham Rise to the Bay of Plenty and off Northland, and the bathymetric range expands only slightly from 302–1067 m to 123–1190 m.

Cairns *et al*. (2009) incorrectly reported this species as *Pterostenella* sp. in their checklist of New Zealand living Cnidaria.

Metafannyella eos (Bayer, 1998)

Fannyella eos Bayer, 1998: 165, 176–177, figs 20A, 21, 22.
Metafannyella eos, Cairns & Bayer 2009: 28.
Callogorgia cf. *ventilabrum* Cairns *et al*., 2009: 93.

Material examined. *Three Kings*: NIWA 104334, NZOI Stn E848, 33.983° S, 171.667° E, 250 m, 17 Mar 1968.

Remarks. This single record extends the known range of the species from Macquarie Ridge to off Three Kings Island.

Cairns *et al*. (2009) incorrectly reported this species as *Callogorgia* cf. *ventilabrum* in their checklist of New Zealand living Cnidaria.

Metafannyella polita Cairns, 2016b

Metafannyella polita Cairns, 2016b: 43; figs 16D (p. 40), 19, 20; table 2 (p. 39).

Material examined. *Three Kings*: NIWA 24623, NZOI Stn E323, 34° S, 172.25° E, 165 m, 11 Apr 1965.

Remarks. This record is consistent with the two previously reported locations from New Zealand (Cairns 2016b).

Callogorgia dichotoma Cairns, 2016b

Callogorgia dichotoma Cairns, 2016b: 59; figs 16G (p. 40), 29, 30; table 3 (p. 59).

Material examined. *Norfolk Ridge (Australian EEZ)*: TMAG K5421, NZOI Stn P46, 28.705° S, 167.945° E, 475 m, 30 Jan 1977.

Remarks. This is the second record of the species, extending its known distribution to just off Norfolk Island, and extends the bathymetric range shallower from 933 to 475 m.

Callogorgia gilberti (Nutting, 1908)

Caligorgia gilberti Nutting, 1908: 574, pl. 43, fig. 4; pl. 47, fig. 6; — Cairns 2016b: 65; fig. 31B (p. 62), 34, 35; table 3 (p. 59).

Material examined. *Kermadec Ridge*: NIWA 118651, MA46416, NIWA Stn TAN1612/71, Macauley Island, Kermadec Islands, 30.284° S, 178.197° W, 1431–1426 m, 29 Oct 2016.

Remarks. This record extends the known New Zealand distribution to the Kermadec Islands (Macauley I.) and extends the known bathymetric distribution downward from 1145 to 1426 m.

Callogorgia histoclados (Cairns, 2016b)

Fanellia histoclados Cairns, 2016b: 79; figs 31G (p. 62), 44, 45; table 4 (p. 73).

Material examined. *Kermadec Ridge*: MA46418, NIWA Stn TAN1612/134, 32.434° S, 179.156° W, 185–158 m, 04 Nov 2016.

Northland: NIWA 14727, NZOI Stn S562, 35.82° S, 172.9° E, 600–505 m, 05 Aug 1983.

Bay of Plenty: NIWA 9734, NZOI Stn F797, 37.428° S, 177.183° E, 348 m, 07 Sep 1966.

Remarks. These records are consistent with those previously reported from New Zealand (Cairns 2016b), but extend the known bathymetric range downward from 341 m to 505 m.

All species in the genus *Fanellia* were transferred in synonymy to *Callogorgia* by Cairns & Wirshing (2018).

Callogorgia korema (Bayer & Stefani, 1989)

Fanellia korema Bayer & Stefani, 1989: 472, pl. 35–36, pl. 41, fig. E–J; —Cairns, 2016b: 74; figs 31F (p. 62), 42, 43; table 4 (p. 73).

Material examined. *Kermadec Ridge*: NIWA 127410, NZOI Stn T235, off Macauley Island, Kermadec Islands, 30.322° S, 178.35° W, 510 m, 23 Mar 1982.

Remarks. This record extends the previously known New Zealand distribution (Cairns 2016b) from Wanganella Bank to the Kermadec Islands (Macauley Island), and the known bathymetric distribution downward from 425 m to 510 m.

All species in the genus *Fanellia* were transferred to *Callogorgia* by Cairns & Wirshing (2018).

Callogorgia sertosa (Wright & Studer, 1889)

Caligorgia sertosa Wright & Studer, 1889: 77–78, pl. 14, figs 2a, pl. 21, fig. 9.
Callogorgia sertosa, Cairns 2016b: 68; figs 31C (p. 62), 36, 37; table 3 (p. 59).

Material examined. *Colville Ridge*: NIWA 126057, RV *Sonne* Stn SO254/14ROV04, Colville Volcano, 30.09° S, 179.813° E, 471 m, 02 Feb 2017.

Kermadec Ridge: NIWA 126096, RV *Sonne* Stn SO254/25ROV07, W of Macauley Island, Kermadec Islands, 30.232° S, 178.462° W, 349 m, 05 Feb 2017.

Remarks. These records are consistent with those previously reported from New Zealand (Cairns 2016b), but extend the known bathymetric range downward from 398 m to 471 m.

Callogorgia tuberculata (Versluys, 1906)

Caligorgia tuberculata Versluys, 1906: 80, text fig. 95–96.
Fanellia tuberculata, Cairns 2016b: 73; figs 31 (p. 62), 40, 41; table 4.

Material examined. *SE of Three Kings Ridge (International Waters)*: NIWA 126018, RV *Sonne* Stn SO254/08ROV02, Seamount No. 114, 31.299° S, 175.201° E, 1143.7 m, 31 Jan 2017.

Remarks. This record extends the previously known New Zealand distribution (Cairns 2016b) to east of Three Kings Ridge, and the known bathymetric distribution downward from 525 m to 1144 m.

Callogorgia tuberculata (Versluys, 1906) is cited in the Cairns (2016b) New Zealand checklist as *Fanellia tuberculata* (Versluys, 1906). All species in the genus *Fanellia* were transferred in synonymy to *Callogorgia* by Cairns & Wirshing (2018).

Narella clavata (Versluys, 1906)

Narella clavata (Versluys, 1906): 98-101, pl. 10, fig. 26. —Cairns, 2012: 28; figs. 5, 8D, 20-21, table 1 (p.18).

Material examined. *Kermadec Ridge*: NIWA 118908, MA46422, NIWA Stn TAN1612/90, Macauley Island, Kermadec Islands, 30.223° S, 178.354° W, 195–287 m, 30 Oct 2016.

Remarks. This record is consistent with those previously reported from New Zealand by Cairns (2012).

Narella hypsocalyx Cairns, 2012

Narella hypsocalyx Cairns, 2012:17; figs. 1, 8B, 8J, 12-1; table 1 (page 18); —Cairns 2016b: 119.

Material examined. *West Norfolk Ridge (International Waters)*: NIWA 47733, SOP Stn TRIP2232/2, 33.7° S, 167.8° E, 646–909 m, 06 Mar 2006.

Reinga Ridge: NIWA 126392, NZOI Stn E855, 33.167° S, 169.933° E, 742–716 m, 17 Mar 1968.

Chatham Rise: NIWA 126870, NIWA Stn TAN1801/25, 42.454° S, 178.003° W, 865–893 m, 11 Jan 2018.

Remarks. These records are consistent with those previously reported from New Zealand by Cairns (2012, 2016b).

Narella studeri (Versluys, 1906)

Stachyodes regularis Wright & Studer, 1889: 55 (junior homonym).
Stachyodes studeri Versluys, 1906: 94
Narella studeri, Cairns, 2012: 32, figs. 6, 8I, 24-25; table 1 (page 18). Cairns 2016b: 119.

Material examined. *Colville Ridge*: NIWA 125638, NIWA Stn TAN1611/DR–5, 31.822° S, 179.417° E, 1209–1135 m, 13 Oct 2016.

Kermadec Ridge: NIWA 118655, MA46420, NIWA Stn TAN1612/71, Macauley Island, Kermadec Islands, 30.284° S, 178.197° W, 1431–1426 m, 29 Oct 2016.

Remarks. These records are consistent with those previously reported from New Zealand (Cairns 2012, 2016b).

Narella vulgaris Cairns, 2012

Narella vulgaris Cairns, 2012:21; figs. 2, 8A, 14-15; table 1 (page 18).

Material examined. *Colville Ridge*: NIWA 125380, NIWA Stn TAN1611/DR–7, 31.89° S, 179.321° E, 1130–1320 m, 13 Oct 2016.

Remarks. This record is consistent with those previously reported from New Zealand (Cairns 2012).

Narelloides crinitus Cairns, 2012

Narelloides crinitus Cairns, 2012: 36; figs. 7, 8H, 26-27; table 2 (page 37).

Material examined. *South Maria Ridge*: NIWA 119335, NIWA Stn TAN1312/D6–d80, 33.832° S, 171.552° E, 970–450 m, 15 Nov 2013.

Remarks. This record is consistent with those previously reported from New Zealand (Cairns 2012), but extends the known bathymetric range downward from 224 to at least 450 m.

Narelloides traceyae Cairns, 2016b

Narelloides traceyae Cairns, 2016b: 88; figs 46B (p. 83), 50, 51.

Material examined. *Pukaki Saddle*: NIWA 127413, NZOI Stn F127, 49.367° S, 176.267° E, 1280 m, 28 Jan 1965.

Remarks. This record is consistent with those previously reported from New Zealand (Cairns 2016b) but adds another record to the Bounty Plateau west of Antipodes Island.

Paracalyptrophora hawaiiensis Cairns, 2009

Paracalyptrophora hawaiiensis Cairns, 2009: 416, figs 1J, 4–5.
Paracalyptrophora hawaiiensis, Cairns 2016b: 94; figs 46D (p. 83), 54, 55 (nom. correct).

Material examined. *Kermadec Ridge*: MA46419, NIWA Stn TAN1612/134, Star of Bengal Bank, 32.434° S, 179.156° W, 185–158 m, 04 Nov 2016.

Remarks. This record extends the previously known New Zealand distribution (Cairns 2016b) to the southern Kermadec Ridge, and the known bathymetric distribution upward from 320 m to 185 m.

Calyptrophora cristata Cairns, 2012

Calyptrophora cristata Cairns, 2012: 49; figs. 7, 9E, 34-35; table 3 (page 43).

Material examined. *Kermadec Ridge*: NIWA 99673, NZOI Stn K795, 33.043° S, 179.577° W, 350 m, 18 Jul 1974.

Remarks. This is the second record of this species, extending its known distribution to the same latitude but on the southern Kermadec Ridge, and extending its known bathymetric range shallower from 850 to 350 m.

Calyptrophora diaphana Cairns, 2012

Calyptrophora diaphana Cairns, 2012: 56; figs. 3, 9A, 40-41, table 3 (page 43).

Material examined. *SE of Three Kings Ridge (International Waters)*: NIWA 126021, RV *Sonne* Stn SO254/08ROV02, Seamount No. 114, 31.297° S, 175.201° E, 1160 m, 31 Jan 2017.

Remarks. This record is consistent with those previously reported from New Zealand (Cairns 2012), but extends the known bathymetric range downward from 990 to 1160 m.

Calyptrophora inornata Cairns, 2012

Calyptrophora inornata Cairns, 2012: 46; figs. 1, 9B, 32-33; table 3 (page 43).

Material examined. *Colville Ridge*: NIWA 86275, NIWA Stn TAN1213/24, 30.128° S, 179.795° E, 650–536 m, 18 Oct 2012; NIWA 126055, RV *Sonne* Stn SO254/14ROV04, Colville Volcano, 30.09° S, 179.813° E, 471 m, 02 Feb 2017.

Remarks. These records are consistent with those previously reported from New Zealand (Cairns 2012), but slightly extend the known geographic distribution to the southern Colville Ridge, and extend its known bathymetric range upward from 885 to 471 m.

Calyptrophora niwa Cairns, 2012

Calyptrophora niwa Cairns, 2012: 51; figs. 5, 9G, 36-37; table 3 (page 43).

Material examined. *East Cape*: NIWA 126330, RV *Sonne* Stn SO254/84ROV18, Seamount No. 1247, 37.916° S, 179.215° E, 1440 m, 23 Feb 2017.

Remarks. This record is consistent with those previously reported from New Zealand (Cairns 2012), but extends the known bathymetric range downward from 1411 to 1440 m.

Parastenella spinosa Wright & Studer, 1889

Stenella spinosa Wright & Studer, 1889: 58, pl. 13, figs 1–2, pl. 20, fig. 9.

Parastenella spinosa, Cairns & Bayer, 2009: fig. 16C; Cairns 2016b: 96; figs 46E (p. 83), 56, 57.

Material examined. *Louisville Ridge (International Waters)*: NIWA 94226, NIWA Stn TAN1402/57, Censeam Guyot, 36.908° S, 169.846° W, 1013–1010 m, 15 Feb 2014.

South Tasman Rise (International Waters): NIWA 9691, NIWA Stn Z9265, 47.135° S, 148.717° E, 1046 m, 01 Sep 1998; NIWA 9692, NIWA Stn Z9234, 47.467° S, 148.901° E, 1024 m, 08 Aug 1998; NIWA 9695, NIWA Stn Z9362, 47.652° S, 147.451° E, 965 m, 10 Sep 1998.

Macquarie Ridge: NIWA 106592, SOP Stn TRIP4837/31, 51.6° S, 161.4° E, 1062–1132 m, 29 Jan 2017.

Seamount 9 Hjort (Australian EEZ) Macquarie Ridge: TMAG K5417, NIWA Stn TAN0803/98, 56.246° S, 158.506° E, 676–750 m, 16 Apr 2008.

Remarks. These records extend the known geographic range of this species to the Tasman Plateau and the Louisville Ridge. It is otherwise a widespread species in the Subantarctic regions (Cairns 2016b).

Candidella helminthophora (Nutting, 1908)

Stenella helminthophora Nutting, 1908: 575–576, pl. 44, figs 6–9, pl. 47, fig. 5.

Candidella helminthophora, Cairns 2016b: 102; figs 46G (p. 83), 60–62.

Material examined. *Kermadec Ridge*: NIWA 127408, NIWA Stn X655, Rumble II Seamount, 35.353° S, 178.536° E, 1357–1423 m, 11 Feb 1996.

Colville Ridge: NIWA 125640, NIWA Stn TAN1611/DR–5, 31.822° S, 179.417° E, 1209–1135 m, 13 Oct 2016.

Remarks. These records are entirely consistent with those previously reported from New Zealand by Cairns (2016b).

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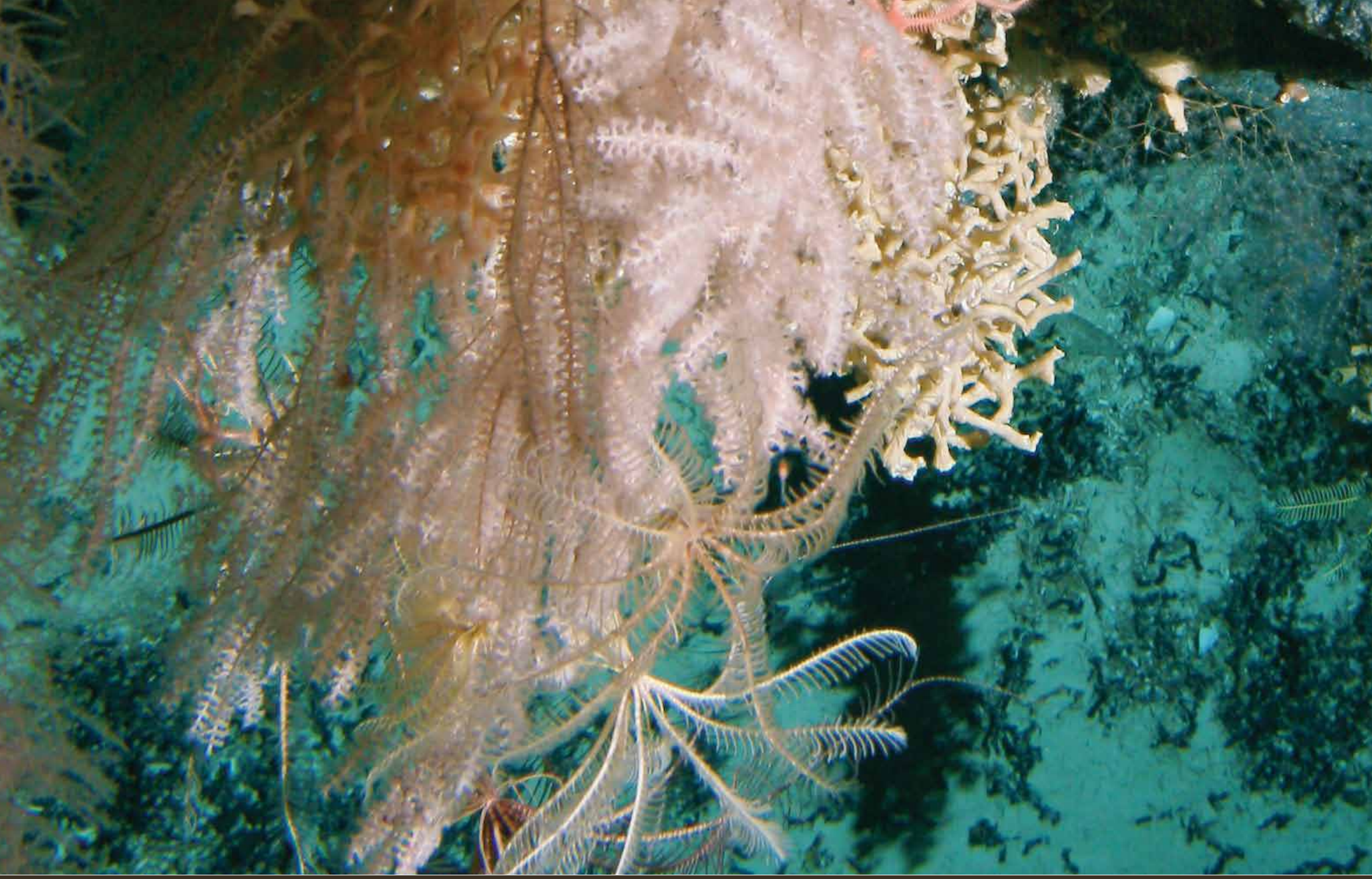
The beige, feathery primnoid octocoral *Thouarella* (*Euthouarella*) *hilgendorfi* (Studer, 1878), is highlighted in the lower centre of the image, attached to bedrock on Forde Guyot, Louisville Seamount Chain (International Waters), at 1177 m (TAN1402/6, 35.35° S, 170.37° W, 1177 m, 08 February 2014). Small crinoids are attached to both the branches of *T.* (*E.*) *hilgendorfi* and the gorgonian in the foreground. Colonies of the stony branching coral, *Solenosmilia variabilis* Duncan, 1873, can be seen in the background. Identity of primnoid confirmed tentatively by the author. Image captured by NIWA's DTIS (Deep Towed Image System) onboard RV *Tangaroa*, courtesy of the NIWA South Pacific Vulnerable Marine Ecosystems Project led by Drs Ashley Rowden and Malcolm Clark.



SEAFLOOR IMAGES

Seafloor images of living primnoid octocorals

With ongoing use of NIWA's DTIS (Deep Towed Imaging System) onboard RV *Tangaroa*, and other seafloor imaging tools such as Remotely Operated Vehicles (ROV) and submersibles operated off visiting international vessels, there is a critical need to provide accurate identifications from images only.

While we may be able to improve our accuracy by examining specimens taken from the same stations, an element of doubt remains as to the identity of invertebrate species using images only, especially if they do not have any obvious diagnostic morphological characters that facilitate determination at the species level. The identifications provided here are the most accurate possible, based upon our understanding of the species featured in this study. Unless otherwise indicated, all images are provided courtesy of NIWA.

1

Thouarella (*T.*) *variabilis* (var. typical) Wright & Studer, 1889 — most likely

DTIS image showing a community of the primnoid octocoral *Thouarella* (*T.*) *variabilis* (orange-brown bottle-brush form) attached to live and dead matrix of the reef-forming stony coral, *Solenosmilia variabilis* Duncan, 1873, on Ghoul Seamount, Graveyard Knolls, Northwest Chatham Rise, at 950 m. The large sponge is probably the delicate euplectellid glass sponge, *Atlantisella lorraineae* Reiswig & Kelly, 2017, illustrated on the Chatham Rise in Reiswig & Kelly (2018). The fish nestled between the small coral colonies near the sponge is the Mahia rattail, *Coelorinchus matamua* (McCann & McKnight, 1980).

TAN1503/62, Ghoul seamount, Graveyard Knolls, Northwest Chatham Rise, 42.80° S, 179.99° E, 950 m, 04 Apr 2015

2

Thouarella (*T.*) *variabilis* (var. typical) Wright & Studer, 1889 — confirmed

DTIS image showing a community of different colour morphs of the primnoid octocoral, *Thouarella* (*T.*) *variabilis* (var. typical), predominantly orange-brown, but also lemon yellow and beige bottle brush forms, on Seamount 7 (Australian EEZ), Macquarie Ridge, at 862 m. The small living cream sticks are probably carnivorous sponges (Family Cladorhizidae Dendy, 1922), the orange sea star is the trojan star, *Hippasteria phrygiana* (Parelius, 1768), and some small stylasterid hydrocorals are visible in the foreground.

TAN0803/78, Seamount 7 (Australian EEZ), Macquarie Ridge, 53.72° S, 159.13° E, 862 m, 11 Apr 2008

confirmed

Thouarella (*T.*) *variabilis* (var. typical) Wright & Studer, 1889

Thouarella (*T.*) *variabilis* (var. typical), predominantly lemon yellow, beige, and orange-brown bottle brush forms, on Seamount 7 (Australian EEZ), Macquarie Ridge at 862 m. Dead stony coral rubble (*Madrepora oculata* Linnaeus, 1758) covers the substrate, the small live cream sticks are probably carnivorous sponges (Family Cladorhizidae Dendy, 1922). A small king crab is visible to the left of the image.

TAN0803/78, Seamount 7 (Australian EEZ), Macquarie Ridge, 53.72° S, 159.13° E, 846 m, 11 Apr 2008

Thouarella (*T.*) *variabilis* (var. typical) Wright & Studer, 1889

DTIS image showing a group of the primnoid octocoral, *Thouarella* (*T.*) *variabilis* (var. typical), amongst stony coral rubble, on Seamount 1, Macquarie Ridge, at 1076 m. A few white stylasterid hydrocorals and sponges are present, the ear-shaped sponge most likely a specimen of the unidentified hexasterophoran glass sponge, *Chonelasma* sp. recorded in Reiswig & Kelly (2011) as being present on Macquarie Ridge.

TAN0803/20, Seamount 1, Macquarie Ridge, 48.55° S, 164.94° E, 1076 m, 30 Mar 2008

5

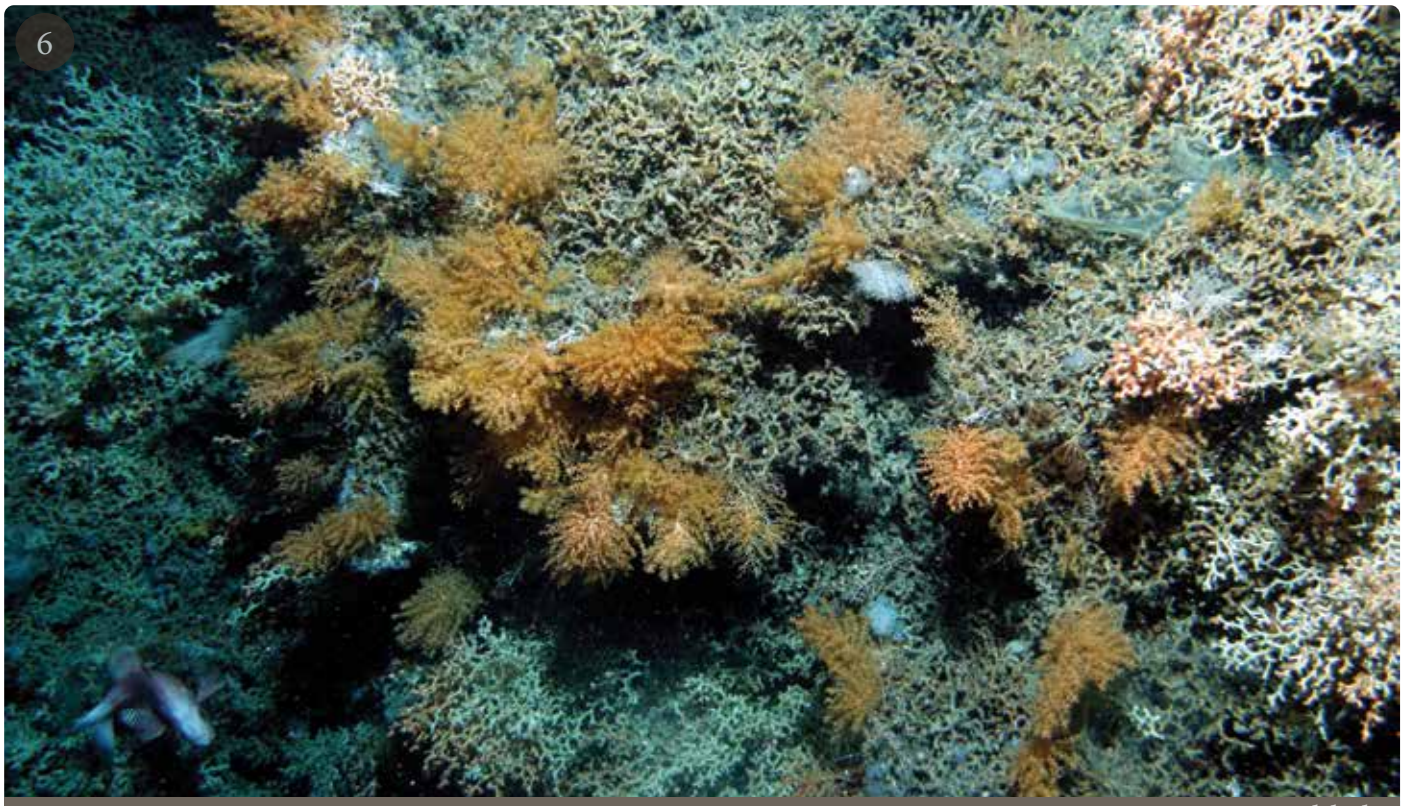
Thouarella (*T.*) *variabilis* (var. typical) Wright & Studer, 1889

most likely

DTIS image showing a community of different colour morphs of the primnoid octocoral, *Thouarella* (*T.*) *variabilis* (var. typical), predominantly the lemon-yellow, orange-brown and beige bottle brush forms, on Seamount 7 (Australian EEZ), Macquarie Ridge, at 862 m. The small "sticks" are probably carnivorous sponges (Family Cladorhizidae Dendy, 1922).

TAN0803/78, Seamount 7 (Australian EEZ), Macquarie Ridge, 53.72° S, 159.13° E, 860 m, 11 Apr 2008

6

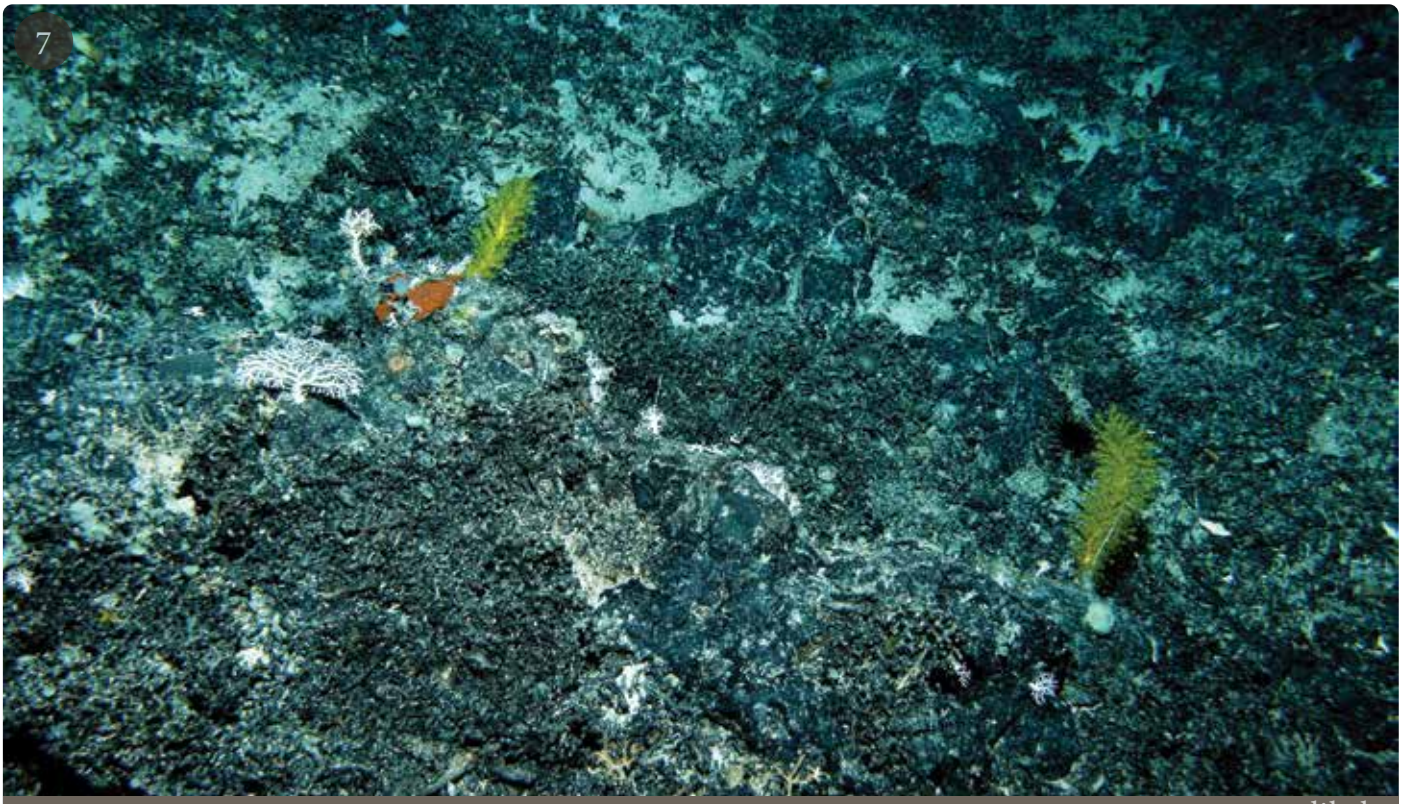


Thouarella (*T.*) *variabilis* (var. typical) Wright & Studer, 1889

most likely

DTIS image showing a community of the primnoid octocoral, *Thouarella* (*T.*) *variabilis*, (var. typical), attached to live and dead matrix of the reef-forming, branching stony coral, *Solenosmilia variabilis* Duncan, 1873, on Gothic Seamount, Graveyard Knolls, Northwest Chatham Rise, at 1070 m. The fish to the left is an orange roughy, *Hoplostethus atlanticus* Collett, 1889.

TAN1503/26, Gothic seamount, Graveyard Knolls, Northwest Chatham Rise, 42.73° S, 179.90° W, 1070 m, 31 Mar 2015



most likely

Thouarella (*T.*) *variabilis* (var. typical) Wright & Studer, 1889

DTIS image showing two lemon-yellow primnoid octocorals attached to bedrock on Seamount 3, Macquarie Ridge, at 1572 m, surrounded by several white stylasterid hydrocorals.

TAN0803/34, Seamount 3, Macquarie Ridge, 50.09° S, 163.50° E, 1572 m, 1 Apr 2008

Thouarella (*T.*) *variabilis* (var. typical) Wright & Studer, 1889

DTIS image showing different colour morphs of the primnoid octocoral, *Thouarella* (*T.*) *variabilis* (var. typical), amongst stony coral rubble, on Seamount 9 (Australian EEZ), Macquarie Ridge, at 1424 m. The irregular, vase-shaped sponges are *Regadrella australis* Reiswig & Kelly, 2018, endemic to Seamounts 7 and 9 (Australian EEZ) of South Macquarie Ridge (Reiswig & Kelly 2018).

TAN0803/101, Seamount 9 (Australian EEZ), Macquarie Ridge, 56.26° S, 158.46° E, 1424 m, 16 Apr 2008

9

Tokoprymno sp. indet. most likely

DTIS image showing a community of the primnoid octocoral genus *Tokoprymno* Bayer, 1996, distributed amongst white stylasterid hydrocorals on bedrock on Zombie Seamount, Graveyard Knolls, Northwest Chatham Rise, at 1096 m. The fish in the foreground is an orange roughy, *Hoplostethus atlanticus* Collett, 1889, with the shell of a dead *Fusitriton magellanicus* (Röding, 1798) inhabited by a hermit crab to the right.

TAN1503/8, Zombie seamount, Graveyard Knolls, Northwest Chatham Rise, 42.77° S, 179.93° W, 1096 m, 29 Mar 2015

10

Thouarella (*Euthouarella*) *hilgendorfi* (Studer, 1878) confirmed

DTIS image showing the beige, feathery primnoid octocoral, *Thouarella* (*Euthouarella*) *hilgendorfi* (Studer, 1878), illuminated in the lower centre of the image attached to bedrock on Forde Guyot, Louisville Seamount Chain, at 1177 m. Small crinoids are attached to both the branches of *T.* (*E.*) *hilgendorfi* and the gorgonian in the foreground. Colonies of the stony branching coral, *Solenosmilia variabilis* Duncan, 1873, can be seen in the background.

TAN1402/6, Forde Guyot, Louisville Seamount Chain (International Waters), 35.35° S, 170.37° W, 1177 m, 08 Dec 2014

Taxonomic index

Principal taxonomic account is in bold font; species illustrations in bold italic.
A checklist of New Zealand species is given on pages 14–16.

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