NIWA
Taihoro Nukurangi

the Marine Fauna of New Zealand

Primnoid octocorals (Anthozoa, Alcyonacea)—
Part 2. *Primnoella, Callozostron, Metafannyella, Callogorgia, Fanellia* and other genera

Stephen D. Cairns

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Biodiversity Memoir
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Cataloguing in Publication

CAIRNS, S.D.
The Marine Fauna of New Zealand. Primnoid octocorals (Anthozoa, Alcyonacea) — Part 2. *Primnoella, Callozostron, Metafannyella, Callogorgia, Fanellia* and other genera / by Stephen D. Cairns—Wellington: NIWA (National Institute of Water and Atmospheric Research), 2016.

Soft cover ISBN 978–0–473–36056–6
Hard cover ISBN 978–0–473–36057–3
Electronic ISBN 978–0–473–36058–0

Series and Managing Editor Michelle Kelly, NIWA
Technical Editor Sadie Mills, NIWA
Copy edited, typeset and indexed by Geoff Gregory, Word Therapy, Paraparaumu
Series Design by TCMedia Ltd
Printed and bound by Graphic Press & Packaging Ltd, Levin

Accepted by Michelle Kelly 02 February 2016, published June 2016

Cover image
A cluster of the shallow water primnoid octocoral *Perissogorgia vitrea* Bayer & Stefani, 1989 interspersed amongst the orange, siliceous golfball sponge *Tethya fastigata* Bergquist & Kelly-Borges, 1991, and unidentified tree-like octocorals on the edge of the ridge. Two-spot demoiselles, *Chromis dispilus* Griffin, 1923, swim overhead. Image taken at 45 m near Imagination Point, southern end of Poor Knights Islands, New Zealand. Image by Crispin Middleton, NIWA

ISSN 1174-0043; 129 (print edition)
ISSN 2463-638X; 129 (electronic)

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A dense community of the bright orange sea fan *Primnoa notialis* Cairns & Bayer, 2005, surrounding the trumpet hexactinellid *Hyalascus* sp. on Seamount 9, Macquarie Ridge, south west New Zealand (Australian EEZ) (NIWA Stn TAN0803/099, 56.265° S, 158.496° E, 635–777 m). Image captured by NIWA's DTIS (Deep Towed Imaging System) onboard RV *Tangaroa*, courtesy of the NIWA Deepsea Communities Programme led by Drs Ashley Rowden and Malcolm Clark.

PREFACE

The Marine Fauna of New Zealand. Primnoid octocorals (Anthozoa, Alcyonacea) — Part 2. *Primnoella, Callozostron, Metafannyella, Callogorgia, Fanellia* and other genera

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Abstract

The Primnoidae Milne Edwards, 1857 of New Zealand are reviewed from new and existing collections within the NIWA Invertebrate Collection at Wellington (NIC), with specimens from 218 stations examined, constituting Part 2 of a multipart series on the primnoids of New Zealand. Prior to this work, as summarised in Part 1 (Cairns 2012), 26 primnoid species had been reported from the New Zealand Exclusive Economic Zone (EEZ). Herein, 32 more species are treated, including 11 new species (*Primnoella insularis* **sp. nov.**, *Loboprimnoa exotica* **gen. et sp. nov.**, *Metafannyella polita* **sp. nov.**, *M. chathamensis* **sp. nov.**, *Plumarella cordilla* **sp. nov.**, *Callogorgia dichotoma* **sp. nov.**, *C. tessellata* **sp. nov.**, *Fanellia histoclados* **sp. nov.**, *Narelloides traceyae* **sp. nov.**, *Pachyprimnoa asakoae* **gen. et sp. nov.**, *Perissogorgia rigida* **sp. nov.**) and 14 new records for the New Zealand EEZ. Also reported but not described are seven species represented as juveniles, singletons, or poorly preserved specimens. Finally, at least four species remain to be described in the genera *Thouarella* Gray, 1870 and *Tokoprymno* Bayer, 1996. Thus, 62 species from 23 genera are known from the New Zealand region, constituting 21.8% of the known species diversity of the family and 52% of the generic diversity – a disproportionately high number of species from a region the size of the New Zealand EEZ. In addition, two new genera are described (*Loboprimnoa* **gen. nov.**, *Pachyprimnoa* **gen. nov.**), and one new combination is suggested: *Metafannyella ventilabrum* (Studer, 1878) **comb. nov.** Tabular and dichotomous keys are provided for the New Zealand species of *Primnoella* Gray, 1858, *Callozostron* Wright, 1885, *Metafannyella* Cairns & Bayer, 2009, *Callogorgia* Gray, 1858 and *Fanellia* Gray, 1870.

Keywords

Candidella, Loboprimnoa, Narelloides, Pachyprimnoa, Paracalyptrophora, Parastenella, Perissogorgia, Plumarella, Primnoa, taxonomic revision, new genera, new species, Auckland Island, Antipodes Islands, Bounty Islands, Three Kings Islands, Norfolk Island, North Island, South Island, Macquarie Island, McCauley Island, Chatham Rise, Dampier Ridge, Kermadec Ridge, Lord Howe Rise, Louisville Ridge, Norfolk Ridge, Three Kings Ridge, Macquarie Ridge, Challenger Plateau, Campbell Plateau, Bounty Plateau, Raukumara Plain, Wanganella Bank, Rumble II West Seamount, Clark Seamount, New Zealand EEZ, Australian EEZ.

Introduction

The family Primnoidae is among the most diverse and species-rich within the Octocorallia. Since the generic revision of Cairns & Bayer (2009) and including this paper, 43 new species, eight new genera, and two new subgenera have been added to this family (and one genus synonymised), much due to species discovered in the New Zealand Exclusive Economic Zone (EEZ). Including the taxa described herein, there are now 277 species and 44 genera known in the family (Taylor & Rogers 2015). The history of the species discovery of the New Zealand primnoids is summarised in the Introduction of Part I of this series (Cairns 2012).

A preliminary list of primnoid species known from New Zealand was published in Cairns *et al*. (2009), that checklist primarily the effort of co-author Juan Sánchez. The list included 40 species, only four of which were identified to the species level. An earlier list (Sánchez & Rowden 2006) included 27 primnoid species, all identified only to genus level. Cairns (2012: Part 1 of current series) expanded the number of 10 previously identified species by adding 13 new species and three new records, resulting in a known fauna of 26 species. In this paper, 11 new species and 14 new records are added, as well as one overlooked species, *Callogorgia modesta* (Studer, 1878), bringing the total to 52 species. Another six species are recognised but not reported herein except in the Checklist of Species (denoted by a single asterisk *). The genera *Tokoprymno* Bayer, 1996 and *Thouarella* Gray, 1870 are also not included in this report except in the Checklist of Species (denoted by a single asterisk *), pending work by other authors. Assuming one species of *Tokoprymno* and at least four more species of *Thouarella*, this brings the total New Zealand primnoid fauna to 62 species (62/284, 21.8% of all primnoids), 52 of which are known to the species level, and 23 genera (23/44 = 52% of the known genera). Primnoids are characteristic of deep-water environments, some occurring as deep as 6400 m (Cairns 2016); only one of the 62 New Zealand primnoids is known from shallow water: *Primnoella australasiae* (Gray, 1850). For the size of its EEZ, New Zealand has a disproportionately high number of primnoid species, a fact first noted by Sánchez & Rowden (2006).

Ecology

The primnoid octocorals are an important and abundant group globally whose history, classification, and form are well described in Cairns & Bayer (2009). Members of the Primnoidae are important habitat formers (Buhl-Mortensen & Mortensen 2005), providing refuge and shelter for fishes and other invertebrates (Husebø *et al*. 2002; Purser *et al*. 2013). Due to their size and their tree-like or fan-like shapes (Cairns 2012), they are susceptible to bottom trawling and other human activities in the deep sea such as mineral exploration (Clark & Rowden 2009; Tracey *et al*. 2014). Collection of specimens for taxonomic identification, by government observers as part of commercial fisheries by-catch or from research trawl and biodiversity surveys, has enabled descriptions to species level for many of the deep-sea corals found in New Zealand waters (Cairns 2012; Opresko *et al*. 2014), and have provided an understanding of impacts from fishing effort. Identification data has also enabled spatial distribution mapping, both known as well as predicted, using models for the various species, genera, and morphological forms (Tracey *et al*. 2011a, b; Baird *et al*. 2013; Anderson *et al*. 2014, 2015).

Within the New Zealand region the primnoid fauna is diverse and widespread (Cairns *et al*. 2009; Cairns 2012; Anderson *et al*. 2014, 2015). Along with other hard corals (Scleractinia, Stylasteridae), certain alcyonaceans including Primnoidae, are protected under the New Zealand Department of Conservation Wildlife Act 2010 (amendment of Schedule 7A of the Wildlife Act 1953). In addition, several deep-sea corals are listed as nationally vulnerable, naturally uncommon, or data deficient in the New Zealand region, and several have a threatened conservation status category (Freeman *et al*. 2013).

It is difficult to draw conclusions about the general biology, growth rates, age, reproduction, colonisation and dispersal strategies of New Zealand Primnoidae from overseas studies because biological data are poor globally. However, studies on species of *Primnoa* indicate considerable longevity (Andrews *et al*. 2002; Risk *et al*. 2002; Mortensen & Buhl-Mortensen 2004), and it can be assumed that the New Zealand taxa would also be long-lived and follow the general reproductive and dispersal trends known for the group. Some

primnoids are gonochoric brooders, possibly with an asynchronous reproductive cycle. We also know that brittle star colonies and polychaetes are found in commensal relationships with some primnoid genera.

Water chemistry and carbonate mineralogy of corals have a strong influence on the distribution of these organisms. Thresher *et al.* (2015) showed that Primnoidae in the South Pacific region may be bimineralic with different carbonate levels and solubility. Some Primnoidae have predominantly high magnesium (Mg) calcite (HMC) and others are predominantly aragonitic. Aragonite is 50% more soluble than low Mg calcite (LMC), while HMC has equal or greater solubility than aragonite. The mineralogy of *Primnoa notialis* Cairns & Bayer, 2005, redescribed within, has been studied in detail in New Zealand; it too is a bimineralic species but with a skeleton made up of a number of different layers of both aragonite and Mg calcite (Bostock *et al.* 2015).

While it is apparent that deep-sea coral distribution is dependent on hydrographic conditions and linked to the geomorphology of the seabed, combined with environmental parameters such as temperature, salinity, ocean chemistry and nutrient supply (Anderson *et al.* 2015), information on preferred habitat to species level is variable and poor for many coral groups including the primnoids. In some instances, however, data on the proportion of a particular species associated with seamount or slope habitats is available (Clark & Rowden 2009), along with accompanying data on the oceanographic environment within which they thrive.

The recent use of towed video and camera systems at sea has enabled a significant amount of *in situ* data collection for coral taxa and their related sediment type as seen along known transect lines (e.g. *see* Compton *et al.* 2012). This information is improving our knowledge of the ecological importance of the coral fauna to New Zealand in terms of abundance, habitat, and ecology. While these biological and ecological observations are numerous in some areas, specific data to species level does not often exist due to the difficulty in identifying various fauna *in situ*.

Methods and materials

Sample collection. This study was based on specimens from 218 stations, most (207) of which were collected by the National Institute of Water & Atmospheric Research (NIWA). The majority of specimens were collected over a period of 42 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. These include the RV *Tangaroa* (1972–1984) Challenger Centenary cruise (1974), Norfolk Basin geology (1983), Kermadec Coral (1982), Tasman Basin (1982), the RV *Tangaroa* Seamounts of the Chatham Rise (1996, 2001, 2009), Kermadec Ridge Volcanics (2002), Norfolk Ridge – Lord Howe Rise (NORFANZ, 2003), Bay of Plenty and Hikurangi Plateau Seamounts (2004), Graveyard Seamounts (2006), Kermadec Arc (KARMA, 2010), Ministries of Fisheries Scientific Observers Bycatch Programme (TRIP, 1998–2009), the *Nova* expedition (1964), and the RV *Kaharoa* (KAH) Aotea Seamount voyage (2002). Also included is material from six stations from the USNS *Eltanin*, deposited at the NMNH. Type specimens of most of the previously described species were examined. Station data, including latitude, longitude, depth, and collection date are included in Appendix 1. 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 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. 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.

Registration of type and general material. Primary and secondary type materials of new species, and additional material, are accessioned within the NIWA Invertebrate Collection (NIC) at NIWA, 301 Evans Bay Parade, Hataitai, Wellington 6021, formerly

the New Zealand Oceanographic Institute (NZOI), using the prefix **NIWA**. Holotype specimens and a share of the paratype 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 Scanning Electron Microscopy (SEM) stubs of most species are also deposited at the NMNH, Washington DC. Most of the SEM stub numbers listed in the section Material Examined belong to the series established by the author; if prefaced with a B, they belong to the Bayer series. Additional registration prefixes used in the text include: **MNHN** – for specimens accessioned into the collections of the Muséum National d'Histoire Naturelle, 57 Rue Cuvier, 75005 Paris, France; **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, 10th St. & Constitution Ave. NW, Washington, DC 20560, United States of America; **ZMA** – for specimens accessioned into the collections of the Zoölogich Museum, University of Amsterdam, Postbus 9517, 2300 RA, Leiden, Netherlands, since 2010 merged with the collections of National Museum for Natural History Naturalis and the Dutch National Herbaria to form Naturalis Biodiversity Center in Leiden; **ZMB** – for specimens accessioned into the collections of the Museum für Naturkunde, Invalidenstrasse 43, 10115 Berlin, Germany; **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.

Area of study. The main area of study is the New Zealand EEZ, including the Kermadec Ridge and Cavalli Seamount region, Chatham Rise, Challenger Plateau, Bounty and Campbell Plateaus and south to Macquarie Ridge; however, a few specimens have been collected from outside of the New Zealand Exclusive Economic Zone (EEZ). Fortyone specimens were collected from International Waters surrounding New Zealand including Louisville Ridge (2014), Wanganella Bank, and early collections from Norfolk Ridge (1977), the edge of the Challenger Plateau (1964), and off Noumea, southern New Caledonia (1966). Twenty seven specimens were collected from the Australian EEZ including twelve from Macquarie Ridge Surveys (2008, 1963), twelve from early collections along Norfolk Ridge near Norfolk Island (1975, 1977) and two specimens from an early Lord Howe survey (1978).

Terminology

The most comprehensive illustrated glossary of octocoral morphology is that of Bayer *et al.* (1983), which was based on Bayer (1956). Morphological terms used in this paper are defined below.

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

basal scale – the most proximal scales in certain primnoid genera, often articulating with the coenenchyme

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

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

cowl – a short hood produced by the slight overlap of the distal part of the marginal scales over the base of the opercular scales

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

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

flutes – marginal scales of the genus *Parastenella* are elongate and highly concave, the concavities referred to as flutes

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

infrabasal scale – one or more pairs of slender, crescent-shaped scales that lie between the basal and coenenchymal scales of certain primnoid genera (i.e. *Calyptrophora*) serving to help anchor the polyp to the coenenchymal scales

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

lyrate branching – planar colonies in which the secondary branches are upright and approximately parallel with each other

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

medial scale – one or more pairs of body wall scales lying between the basal and buccal scales of some primnoid genera

monopodial branching – the main axis of the colony maintains a single line of growth but gives rise to lateral branches

nematocyst pad – a high concentration of contiguous nematocysts found on the inner face of the fluted marginal scales of *Parastenella*

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 covering the withdrawn tentacles in the Primnoidae

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

pinnular rodlet – a very small rod found in the pinnular region of the tentacle

polyp – an individual of the octocorallian colony

rod – straight or slightly curved monaxial sclerite that is blunt at both ends

rosette – the eight fluted marginal scales of *Parastenella* form a characteristic flower-like arrangement, called a rosette; not to be confused with a sclerite type of the same name

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

spheroid – a small spheroidal sclerite, often covered with tiny granules, i.e. multituberculate

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

tubercle – a small discrete patch of granules that usually occurs on the inner surface of sclerites where they come into contact with other sclerites

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

IL	Inner lateral (position of body wall scale)
L:W	Ratio of the length to width of a scale
OL	Outer lateral (position of body wall scale)
MNHN	Muséum National d'Histoire Naturelle, 57 Rue Cuvier, 75005 Paris, France
NIWA	National Institute of Water & Atmospheric Research, 301 Evans Bay Parade, Hataitai, Wellington 6021
NIC	NIWA Invertebrate Collection, NIWA, Wellington, New Zealand
NHM	Natural History Museum, Cromwell Rd, London SW7 5BD, United Kingdom
NMNH	National Museum of Natural History, Smithsonian Institution, 10th St. & Constitution Ave. NW, Washington, DC 20560, United States of America
SMF	Forschungsinstitut und Naturmuseum Senckenberg, Senckenberganlage 25, 60325 Frankfurt am Main, Germany

Acknowledgements

I would like to thank Di Tracey (NIWA) for her tireless efforts to document the deep-sea coral fauna of New Zealand, and for her encouragement to attempt this project. I am indebted to Kareen Schnabel, Kate Neill, and Sadie Mills for their assistance with the collections and database of the NIWA Invertebrate Collection. Also, as stated in Part 1, I am grateful for the many collecting expeditions that have originated from NIWA over the last 32 years, which have made the deep-water EEZ of New Zealand one of the best collected and known in the world.

Specimens were collected on the following research projects: "Seamounts: their importance to fisheries and marine ecosystems", undertaken by NIWA and funded by the former New Zealand Foundation for Research, Science and Technology (FRST, projects: C01X0028, C01X0224) with additional funding from the former Ministry of Fisheries (projects: ZBD2000/04, ZBD2001/10); Ocean Survey 20/20 "Bay of Islands Coastal Biodiversity, Sediment and Seabed Habitat Project", funded and owned by Land Information New Zealand (LINZ); Kermadec Arc Minerals (KARMA) voyage, funded by FRST, in collaboration with Auckland University, New Zealand Institute of Geological and Nuclear Sciences (GNS), and Woods Hole Oceanographic Institute (WHOI); Ocean Survey 20/20 "Mapping the Mineral Resources of the Kermadec Arc" Project, funded by LINZ, GNS, NIWA, and WHOI (project C01X0906); "Biogenic Habitats on the Continental Shelf" project (voyages TAN1105 & TAN1108), funded by New Zealand Ministry for Primary Industries (MPI, Fisheries) (project: ZBD200801), FRST (CCM: C01X0907), NIWA Capability Fund (CF111358) and Oceans Survey 20/20 R/V *Tangaroa* days funded by LINZ; Voyage TAN1116, project "Food-web dynamics of New Zealand marine ecosystems" funded by the New Zealand Government under "Coasts & Oceans" core funding from the Ministry of Business, Innovation and Employment (MBIE); voyage TAN1206, 'Impact of resource use on vulnerable deep-sea communities' project (C01X0906), funded by the FRST; South Pacific Vulnerable Marine Ecosystems Project (C01X1229) funded by MBIE; Oceans Survey 20/20 Reinga (TAN1312) voyage, funded by LINZ and New Zealand Petroleum & Minerals; Orange Roughy trawl survey (TAN1003; project code ORH2007-01) funded by the MPI; CSIRO's Division of Marine and Atmospheric Research project "Biodiversity Voyages of Discovery" funded by the CSIRO Wealth from Oceans Flagship; Scientific Observer Programme funded by MPI.

I am thankful to Tim Coffer (NMNH) for his artistic Photoshop construction of the SEM figures, and to Robert Ford for the photography and Photoshop construction of the colony images. I also thank Erika MacKay (NIWA) for compiling the distributional maps. Twenty-two of the SEM images were reproduced from the Bayer archive of approximately 50,000 SEM negatives. 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 SCI).

Field of the unbranched spiralling *Primnoella insularis* sp. nov., surrounding the glove hexactinellid *Aphrocallistes beatrix beatrix* Gray, 1858, on Diamond Head, Andes Knolls, southeast Chatham Rise, New Zealand (NIWA Stn TAN1503/081, 44.136° S, 174.720° W, 610–818 m). Image captured by NIWA's DTIS (Deep Towed Imaging System) onboard RV *Tangaroa*, courtesy of the NIWA Deepsea Communities Programme led by Drs Ashley Rowden and Malcolm Clark.

TAXONOMY & SYSTEMATICS

Checklist of species known from the New Zealand EEZ

Phylum CNIDARIA Hatschek
Class ANTHOZOA Ehrenberg
Order ALCYONACEA Lamouroux
Suborder CALCAXONIA Grasshoff
Family PRIMNOIDAE Milne Edwards, 1857
Genus ***Primnoella*** Gray, 1858
Primnoella australasiae (Gray, 1850)
Primnoella distans Studer, 1878
Primnoella insularis **sp. nov.**
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 mirabile Wright, 1885
Callozostron pinnatum **sp. nov.**
Genus ***Thouarella*** Gray, 1870 **
Thouarella moseleyi Wright & Studer, 1889 **
Thouarella spp (3) **
Genus ***Loboprimnoa*** **gen. nov.**
Loboprimnoa exotica **gen. et sp. nov.**
Genus ***Metafannyella*** Cairns & Bayer, 2009
Metafannyella ventilabrum (Studer, 1878) **comb. nov.**
Metafannyella polita **sp. nov.**
Metafannyella eos (Bayer, 1998) (= *Callogorgia* cf. *ventilabrum sensu* Cairns *et al*. 2009)
Metafannyella chathamensis **sp. nov.** (= *Pterostenella* sp. *sensu* Cairns *et al*. 2009)
Genus ***Mirostenella*** Bayer, 1988 *
Mirostenella cf. *articulata* Bayer, 1988 (NIWA 54369) *
Genus ***Plumarella*** Gray, 1870
Plumarella (*Dicholaphis*) *cordilla* **sp. nov.**
Plumarella (*Faxiella*) *delicatula* (Thomson & Rennet, 1931)
Genus ***Helicoprimnoa*** Cairns, 2012 §
Helicoprimnoa fasciola Cairns, 2012 §
Genus ***Callogorgia*** Gray, 1858
Callogorgia dichotoma **sp. nov.**
Callogorgia formosa (Kükenthal, 1907)
Callogorgia gilberti (Nutting, 1908)
Callogorgia sertosa (Wright & Studer, 1889)
Callogorgia tessellata **sp. nov.**
Callogorgia modesta (Studer, 1878) *
Genus ***Fanellia*** Gray, 1870
Fanellia tuberculata (Versluys, 1906)
Fanellia korema Bayer & Stefani, 1989
Fanellia histoclados **sp. nov.**
Fanellia **sp. nov.** cf. *granulosa* (NIWA 11091) *
Genus ***Primnoa*** Lamouroux, 1812
Primnoa notialis Cairns & Bayer, 2005
Genus ***Narella*** Gray, 1870 §
Narella mesolepis Cairns, 2012 §
Narella hypsocalyx Cairns, 2012 §
Narella vulgaris Cairns, 2012 §
Narella mosaica Cairns, 2012 §
Narella dampieri Cairns, 2012 §
Narella clavata (Versluys, 1906) §
Narella parva (Versluys, 1906) §
Narella studeri (Versluys, 1906) §
Genus ***Narelloides*** Cairns, 2012 §
Narelloides crinitus Cairns, 2012 §
Narelloides traceyae **sp. nov.**
Genus ***Metanarella*** Cairns, 2012 §
Metanarella nannolepis Cairns, 2012 §
Genus ***Paracalyptrophora*** Kinoshita, 1908
Paracalyptrophora mariae (Versluys, 1906)
Paracalyptrophora hawaiiensis Cairns, 2009, **nom. correct.**
Genus ***Calyptrophora*** Gray, 1866 §
Calyptrophora cucullata Cairns, 2012 §
Calyptrophora inornata Cairns, 2012 §
Calyptrophora cristata Cairns, 2012 §
Calyptrophora niwa Cairns, 2012 §
Calyptrophora clinata Cairns, 2007 §
Calyptrophora diaphana Cairns, 2012 §
Calyptrophora wyvillei Wright & Studer, 1889 §
Genus ***Tokoprymno*** Bayer, 1996 **
Tokoprymno maia Bayer, 1996 **
Genus ***Parastenella*** Versluys, 1906
Parastenella spinosa Wright & Studer, 1889
Parastenella pacifica Cairns, 2007
Genus ***Candidella*** Bayer, 1954
Candidella helminthophora (Nutting, 1908)
Genus ***Pachyprimnoa*** **gen. nov.**
Pachyprimnoa asakoae **gen. et sp. nov.**
Genus ***Perissogorgia*** Bayer & Stefani, 1989
Perissogorgia vitrea Bayer & Stefani, 1989
Perissogorgia rigida **sp. nov.**
Perissogorgia colossus Bayer & Stefani, 1989
Perissogorgia **sp. nov.** (NIWA 47808) *

Notes

Six primnoid species are not included in this revision because they were represented by a singleton, were often poorly preserved, or the locality data was flawed. These are noted with a single asterisk (*), and are included here for the purpose of complete documentation at NIC and future study if more material is collected. These include:

(1) an undescribed species of *Perissogorgia* Bayer & Stefani, 1989, known only from one specimen from NZOI Stn G8 (NIWA 47808 and USNM 1278871). The specimen is distinctive in being unbranched, having 12 polyps per whorl, and having 6–8 unpaired abaxial sclerites.

(2) an unidentified species of *Ophidiogorgia* cf. *kuekenthali* (Gravier, 1913) known from one specimen from NZOI Stn K811 (NIWA 77618 and USNM 1278165). The specimen agrees with the generic description of the genus in having its abaxial polyp side covered with numerous small warty plates. It has polyps 1.9 mm in length and 9–10 polyps per whorl, and is thus most similar to *O. kuekenthali*, known only from the Antacrtic, but the condition of the single specimen is not adequate for definitive identification.

(3) a single specimen of *Primnoella* sp. from NZOI Stn K801 (NIWA 77617 and USNM 1278170), with polyps 2.3 mm in length and 18–19 polyps per whorl, with a whorl diameter of 4.5 mm, distinguishing it from the other three species reported herein, but having only one specimen it is not described as new.

(4) a juvenile *Mirostenella* cf. *articulata* Bayer, 1988 from NIWA Stn TAN0905/121 (NIWA 54369) with delicate dichotomous branching, polyps arranged in pairs and whorls of 3, 8 rows of 4–5 polyps each, and non-keeled opercular scales. It is probably *M. articulata* but the juvenile nature of the specimen does not allow definitive identification.

(5) *Convexella krampi* (Madsen, 1956), known from only one record from the Kermadec Trench at 5850 m. *Convexella krampi* is known only from the holotype, and thus nothing can be added to the fine description of Madsen (1956).

(6) an undescribed species, *Fanellia* **sp. nov.** cf. *granulosa* (Kinoshita, 1907) from NIWA Stn Z8882 (NIWA 11091 and USNM 1278944), with alternate pinnate branching, paired polyps each 1.7 mm in length, 5 whorls per cm, and 7–8 scales per abaxial row, slightly higher than that of *F. granulosa*. Although most similar to *F. granulosa*, various meristic counts vary slightly from that species, and thus it is considered distinct, but not enough material is available for a proper description.

Species from two other genera, *Thouarella* Gray, 1870 and *Tokoprymno* Bayer, 1996, are not treated here because others are currently working on those taxa. These are noted with double asterisks (**). *Thouarella moseleyi* Wright & Studer, 1889 and three *Thouarella* spp. were first mentioned in the checklist of species in Cairns (2009), and *Tokoprymno maia* Bayer, 1996 was first identified in the NIWA collections by Juan Sánchez.

Species listed with the symbol § were treated in Part I of this series (Cairns 2012) and are not considered further in this work.

Systematics

Order of taxa follows Cairns & Bayer (2009).

Phylum **Cnidaria** Hatschek

Class **Anthozoa** Ehrenberg

Order **Alcyonacea** Lamouroux

Suborder **Calcaxonia** Grasshoff

Family **Primnoidae** Milne Edwards

Genus ***Primnoella*** Gray, 1858

Primnoella Gray, 1858: 286.
Primnoella, Bayer 1996: 165–167; Cairns 2006: 162–163; Cairns & Bayer 2009: 25, Fig. 4Q–Z (more complete synonymy).
Callirrhabdos Philippi, 1894: 211.

Type species. *Primnoa australasiae* Gray, 1850, by monotypy.

Diagnosis. Colonies usually flagelliform. Polyps arranged in whorls of up to 20, each polyp strongly flattened in cross-section, facing upward, and closely appressed to branch. Polyps covered with eight longitudinal rows of body wall scales, only the two abaxial rows and abaxial edge of the outer laterals visible in abaxial view; many fewer scales present in inner lateral and adaxial rows, leaving adaxial side of polyp largely unprotected (naked). Marginal scales completely cover the small operculum; distal inner face of opercular smooth. Outer surface of opercular, body wall, and coenenchymal scales smooth. Coenenchymals little differentiated from the body wall scales, but usually thicker and elliptical, and have a lower layer of multituberculate spheroids.

Remarks. Including the new species described herein, there are 11 species known in the genus. The modern distinction between *Primnoella* v. *Convexella* was made by Bayer (1996). Taylor & Rogers (2015) imply that *Primnoella* is a polyphyletic genus. Table 1 compares the three New Zealand species in this genus.

Distribution. Western Atlantic, southwestern South America, southeastern Australia, New Zealand, Tasmania, 8–2217 m.

Primnoella australasiae (Gray, 1850)

Fig. 1A, 2, 3; Table 1

Primnoa australasiae Gray, 1850: 146, Pl. 2, Fig. 8–9.
Primnoella australasiae, Gray 1858: 286; Verrill 1876: 76–77; Wright & Studer 1889: 88, Pl. 18, Fig. 1, 1a, Pl. 21, Fig. 15; Versluys 1906: 52–54, Text Fig. 55–59; Thomson & Mackinnon 1911: 688, Pl. 61, Fig. 1; Kükenthal 1919: 401–402, Pl. 41, Fig. 62–63; Kükenthal 1924: 286; Benham 1927: 67, 68 (listed); Bayer 1996: 167–171, Fig. 18–19; Cairns & Bayer 2009: 26, Fig. 4Q–Z; Cairns *et al*. 2009: 93 (listed).

Material examined. USNM 4504 (reported by Verrill 1876 and Bayer 1996, the latter incorrectly as USNM 4505) and SEM stubs 2234–2236; SEM stub B505: Bluff Harbour, New Zealand, 30 colonies, collected as "sea weed" by E. Kershner, Jan 1875; USNM 58926 (topotypic, and also reported by Bayer 1996): D'Entrecasteaux Channel, Tasmania.

Types & locality. Syntypes – NHMUK1850.1.21.1, 6, 10 and NHMUK1983.3.2.13–14; NMNH SEM stubs B1936–1939. Gray (1850) stated that the type locality

Table 1. Comparison of New Zealand species of *Primnoella* Gray, 1858.

	P. australasiae	***P. distans***	***P. insularis***
Flexibility of axis	stiff	flexible (coiled)	stiff (coiled)
Maximum axis diameter	2.5 mm	0.4 mm	2.5 mm
Maximum colony length	1.5 m	32 cm	60 cm
Maximum colony colour	yellow or grey	rose-red	white
Whorls/cm	6.0–6.5	2.5–3.0	5.0–5.5
Space between whorls	close, 0–0.2 mm	2.3–2.8 mm	close, 0.–0.2 mm
Whorl diameter	2.0 mm	1 mm	1.4–1.7 mm
Polyps/whorl	11–15	3–5	5–8 (10)
Body wall sclerite formula	12–14:9–11:2–4:0–2	6–7:3–5:2:2	8–10:6–8:3–4:2–3
Distribution and depth range	Southeastern Australia, Tasmania, southern NZ, 13–273 m	Southeastern Australia, New Zealand, 796–2217 m	Insular New Zealand, 66–823 m

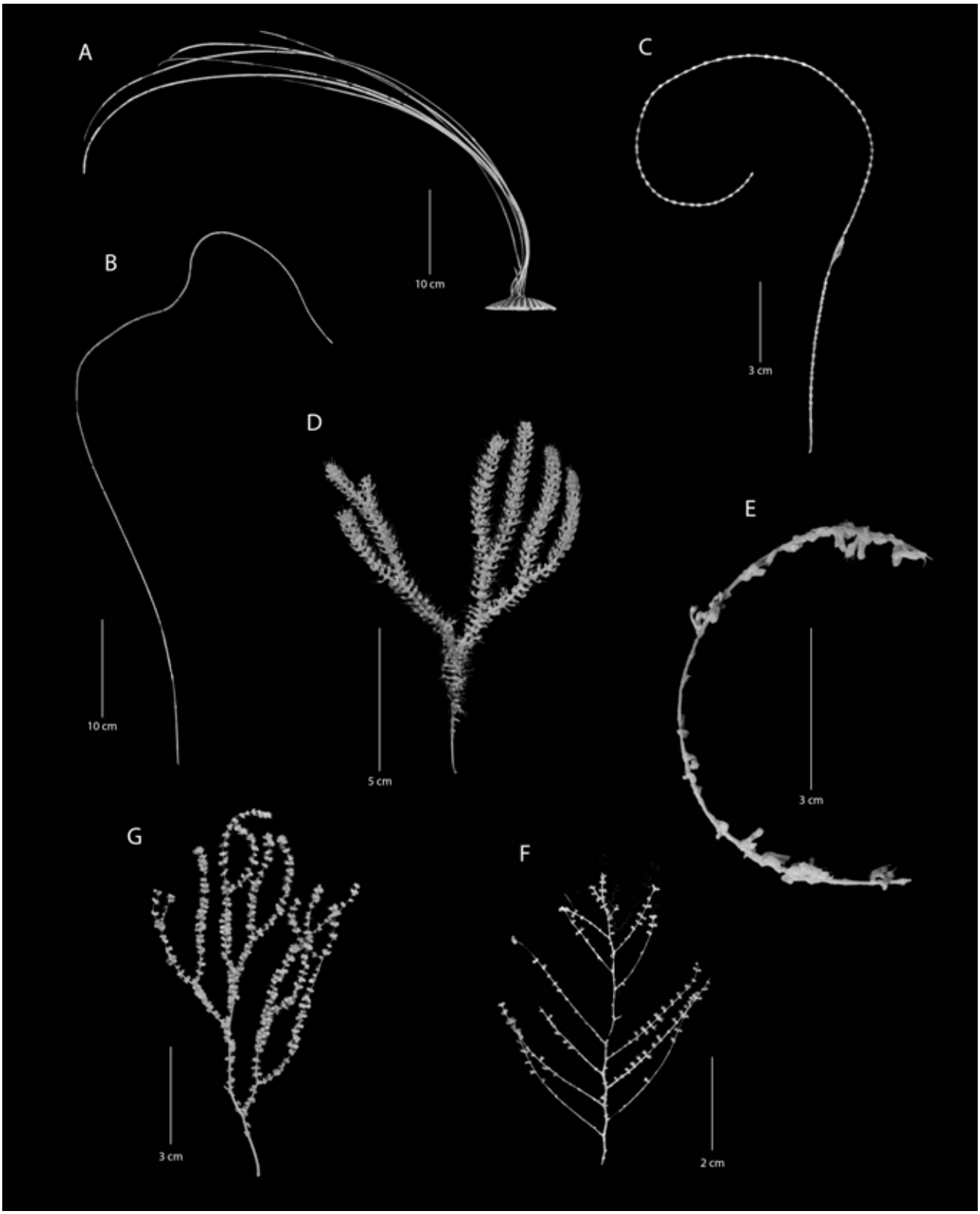

Figure 1. Specimen morphology: **A.** *Primnoella australasiae* (Gray, 1850), USNM 4504; **B.** *Primnoella distans* Studer, 1878, NIWA 11242; **C.** *Primnoella insularis* **sp. nov.**, holotype; **D.** *Callozostron acanthodes* Bayer, 1996, NIWA 76759; **E.** *Callozostron mirabile* Wright, 1885, NIWA 77603; **F.** *Callozostron pinnatum* **sp. nov.**, holotype; **G.** *Loboprimnoa exotica* **gen. et sp. nov.**, holotype.

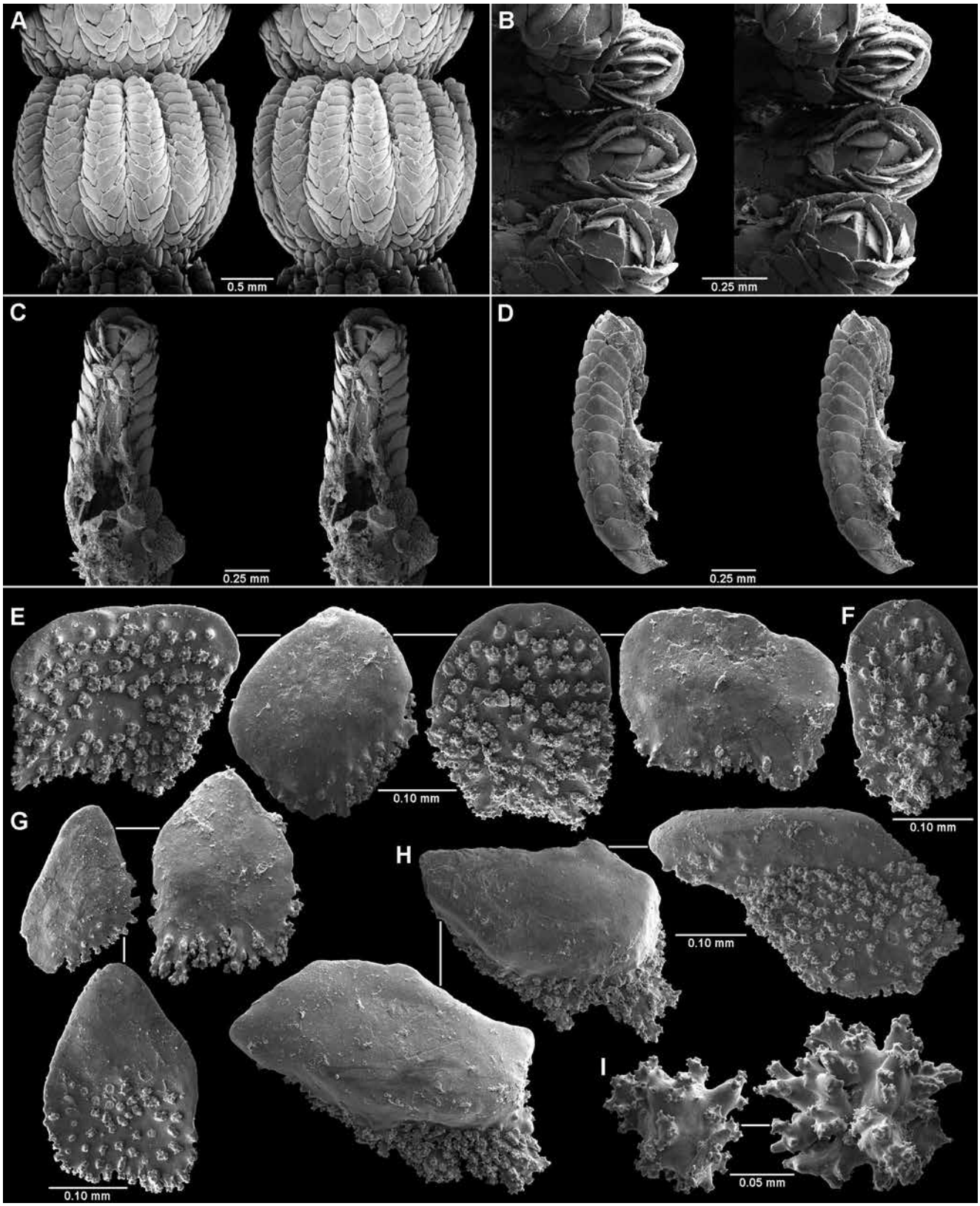

Figure 2. *Primnoella australasiae* (Gray, 1850) from USNM 4504: **A.** stereo view of a polyp whorl; **B.** stereo view of apical ends of three polyps; **C.** stereo view of largely adaxial side of polyp; **D.** stereo view of lateral polyp showing outer lateral row of scales; **E.** abaxial and OL body wall scales; **F.** IL body wall scale; **G**. opercular scales; **H**. coenenchymal scales; **I.** coenenchymal multituberculate spheroids.

was "…from a depth of some fathoms in D'Entrecasteaux Channel, between the mainland of Tasmania and Bruce's Island". The specimen was collected with algae and thus must have been relatively shallow. According to Dr P. Alderslade (pers. comm.) 'Bruce Island' is probably an incorrect transcription for 'Bruny Island', which forms the eastern side of D'Entrecasteaux Channel.

Distribution. Southeastern New South Wales; Victoria, Australia (see Encyclopedia of Life, eol.org); southeastern Tasmania; Bluff Harbour, South Island, New Zealand (Fig. 3), 13–273 m.

Description. The colonies are flagelliform (unbranched), and straight to slightly curved but never coiled, as many as seven attached to a single bivalve shell (Fig. 1A). The stem may be up to 2.5 mm in diameter and produces a rather stiff tension. The largest specimen reported (Wright & Studer 1889), measures 1.5 m in height; the tallest New Zealand specimen is 0.9 m. The polyps are arranged in closely spaced whorls (0.2 mm apart, 6–6.5 whorls per cm branch length) of 11–15 (Fig. 2A); the whorl diameter is about 2 mm. The polyps are compressed-cylindrical, characteristic of the genus, and 1.6–2.0 mm in length. The basal region of the stem is devoid of polyps and often encrusted with zoanthids, sponges, barnacles, and/or other octocorals. According to Verrill (1876) the colour of the colony is yellowish, grey, ash and/or white.

The body wall scales are arranged in six to eight rows according to the formula: 12–14: 9–11: 2–4: 0–2, most of the adaxial polyp face being naked (Fig. 2C). The abaxial and outer lateral scales are square to rectangular in shape with a straight distal edge (Fig. 2E), 0.27–0.30 mm in width. The inner lateral scales (Fig. 2F) are much smaller and elongate, only 0.12–0.13 mm in width. Adaxials, if present at all, are small (0.07 mm in diameter) and circular (see Versluys 1906: fig. 56). The opercular scales are completely covered by the marginals and thus difficult to see and only slightly smaller than the marginals (0.15–0.32 mm in length, L:W = 1.4) but have a triangular shape with a blunt apex (Fig. 2B, G). Their inner distal face is smooth (non-keeled, ridged or tuberculate), and their proximal face is tuberculate, whereas most of the inner face of the body wall scales is tuberculate. It is difficult to account for all eight opercular scales even aided with SEM.

The lower body wall scales transition into the coenenchymal plates, the latter differentiated by having a rounded (not straight) distal margin, being elliptical in shape, and in being somewhat narrower (0.13–0.31 mm wide) and thicker (Fig. 2H). Below this layer is a layer of large (measuring 0.12–0.20 mm in diameter) multituberculate spheroids (Fig. 2I), which, according to Versluys (1906: fig. 60), are linearly arranged along the longitudinal stem canals. The outer surface of the body wall, opercular, and coenenchymal scales is perfectly smooth, and sometimes glistens if dry and viewed under reflected light.

Comparisons. *Primnoella australasiae* is the longest of any of the *Primnoella* species. Compared to the other two New Zealand species (Table 1), it has the most number of polyps per whorl and most body wall scales per row of the three species. It is also by far the shallowest of the species.

Remarks. The species has been commonly reported from southeastern Australia and Tasmania (see Encyclopedia of Life, eol.org), only one record originating from New Zealand (Verrill 1876) from Bluff Harbour (southern South Island). It seems odd that such a large, shallow-water species has not been reported subsequently from New Zealand. The best description of the species is that of Versluys (1906), based on specimens collected by the HMS *Challenger* off Australia. All 62 New Zealand primnoids occur in relative deep water, except for *P. australasiae*. Grange & Brook (2010) report 12 shallow-water octocoral species from New Zealand but do not mention *P. australasiae*.

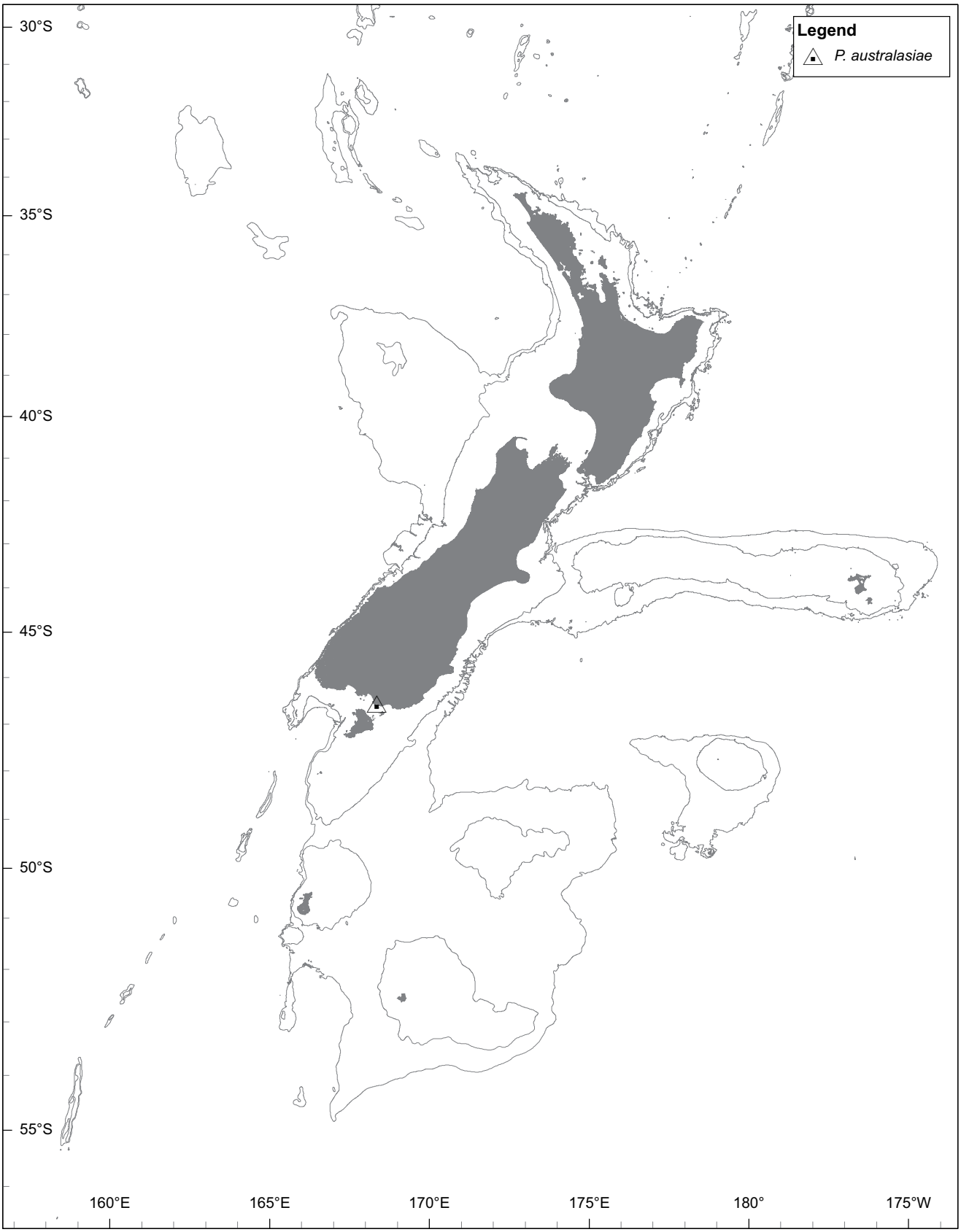

Figure 3. Distribution of *Primnoella australasiae* (Gray, 1850).

Primnoella distans Studer, 1878

Fig. 1B (p. 17), 4, 5; Table 1 (p. 16)

Primnoella distans Studer, 1878: 644, Pl. 1, Fig. 9A–C.

Primnoella distans, not Wright & Studer 1889: 85 (= *P. polita*); Versluys 1906: 52; ?Thomson & Mackinnon 1911: 689; Kükenthal 1919: 393–394; Kükenthal 1924: 283–284; Bayer, 1996: 179.

Material examined. *Kermadec Ridge*: NIWA 9698, 11242, NIWA Stn KAH0204/44, 34.266° S, 174.103° E, 850–840 m, 18 Apr 2002, 3 colonies; NIWA 11237, NIWA Stn TAN0205/12, 34.091° S, 179.556° E, 1930–1705 m, 13 Apr 2002, 4 colonies; NIWA 11239, NIWA Stn TAN0205/82, 32° S, 179° W, 2312–1958 m, 25 Apr 2002, 2 colonies (USNM 1278162, SEM stubs 2232–2233, 2247, 1 colony); NIWA 11243, NIWA Stn TAN0205/11, 34.029° S, 179.614° E, 2217–2217 m, 13 Apr 2002, 1 colony; NIWA 47807, NIWA Stn TAN0205/21, 33.701° S, 179.855° E, 1627–1330 m, 14 Apr 2002, 1 colony; NIWA 97491, NZOI Stn U572, 33.612° S, 170.033° E, 1679 m, 03 Feb 1988, 3 colonies (USNM 1278163, 1 colony).

Chatham Rise: NIWA 9701, NIWA Stn TAN0104/195, 42.784° S, 179.996° E, 973–880 m, 18 Apr 2001, 1 branch; NIWA 25347, NIWA Stn TAN0604/31, 42.789° S, 179.999° E, 1020–1054 m, 30 May 2006, 1 branch; NIWA 25359, NIWA Stn TAN0604/105, 42.727° S, 179.898° W, 992–1120 m, 04 Jun 2006, 2 colonies; NIWA 25365, NIWA Stn TAN0604/114, 42.717° S, 179.907° W, 1060–1140 m, 07 Jun 2006, 1 colony; NIWA 53267, NIWA Stn TAN0905/46, 42.675° S, 179.957° W, 1020–1120 m, 18 Jun 2009, 2 colonies; NIWA 54326, NIWA Stn TAN0905/120, 44.028° S, 174.591° W, 796–882 m, 28 Jun 2009, 1 colony.

Type & locality. Continental slope off Capricorn Channel, Queensland, Australia (22.350° S, 154.128° E), 1005 m (Holotype, *Gazelle* Collection, ZMB).

Distribution. Southern Kermadec Ridge, northern North Island, Chatham Rise (Fig. 5), 796–2217 m; elsewhere, found off southeastern Queensland, 1005 m.

Description. The colonies are flagelliform (Fig. 1B), longer colonies slightly coiled, and attached by a small holdfast up to 6 mm in diameter. The stem is quite slender (0.1–0.4 mm in diameter), "thread-like" according to Studer (1878), and thus gives little support to the colony, which is quite flexible. The longest colony (NIWA 11242) is 32 cm in length. Polyps are usually missing from the basal 3–5 cm of the colony, but are otherwise arranged in whorls of three to five, the polyps directed upward and closely adhering to the branch (Fig. 4A); the whorl diameter is about 1 mm. Whorls are well spaced, 2.5–3 whorls occurring per cm branch length, with an intervening space of 2.3–2.8 mm between whorls. The polyps are compressed-cylindrical in shape, up to 1.9 mm in length, and 0.5–0.6 mm in diameter. According to Studer (1878) the colonies are rose-red.

The body wall scales are arranged in eight rows according to the sclerite formula: 6–7: 3–5: 2: 2, the proximal adaxial side of the polyp being naked (Fig. 4B). The abaxial and outer lateral scales (Fig. 4C) are square to rectangular in shape with a straight distal edge, 0.35–0.45 mm in width. The inner lateral scales are much smaller and elongate, about 0.2 mm in length and 0.1 mm in width. The smaller adaxial scales are circular, about 0.1 mm in diameter. The opercular scales (Fig. 4D) are variable in size and shape, the adaxial operculars being small (0.35 mm in length) and pointed, whereas the laterals and abaxial operculars are larger (up to 0.48 mm in length) and blunt, somewhat tongue-shaped. L:W ratios range from 2.0–4.3. The distal inner surface of the operculars is smooth, the proximal surface tuberculate.

The proximal body wall scales gradually transition into the coenenchymal plates (Fig. 4E), the latter differentiated by having a rounded (not straight) distal margin, being elliptical in shape, and in being somewhat narrower (0.21–0.38 mm wide) and thicker (Fig. 4F). Below this layer is a layer of large (measuring 0.125–0.195 mm in diameter) multituberculate spheroids (Fig. 4G). The outer surface of the body wall, opercular, and coenenchymal scales is perfectly smooth, and sometimes glistens if dry and viewed under reflected light.

Comparisons. *Primnoella distans* is the smallest and most flexible of the New Zealand *Primnoella* (Table 1). It also has the least number of polyps/whorl (because they are so well separated), the smallest whorl diameter, and the deepest range of those species.

Remarks. The identification as *P. distans* of two specimens reported by Thomson & Mackinnon (1911: 689), collected on the HMCS *Thetis* in 1898 from 71–95 m near Sydney Harbour, are doubted based on their very shallow depth of capture, lesser number of abaxial

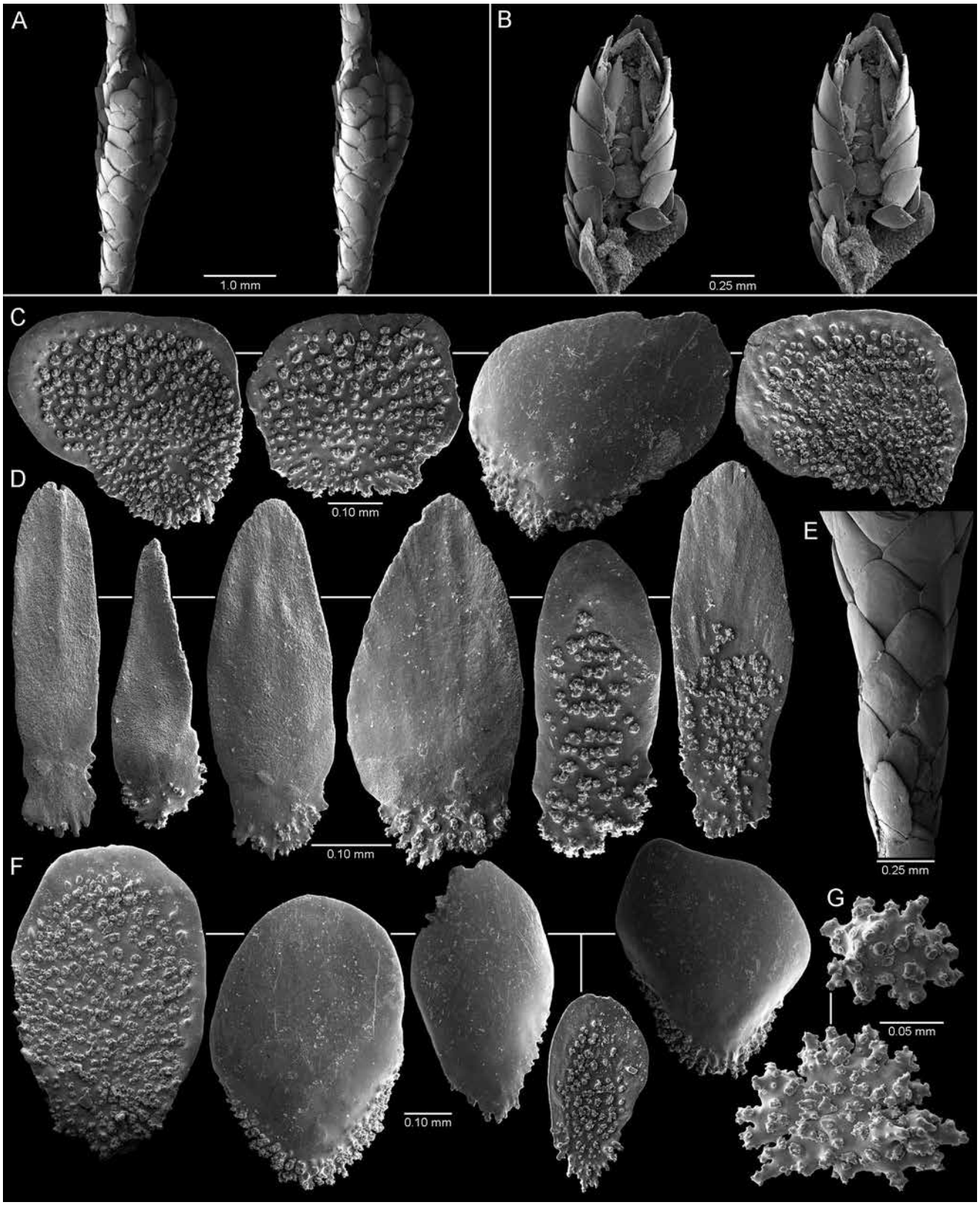

Figure 4. *Primnoella distans* Studer, 1878 from NIWA 11239: A. stereo view of a polyp whorl; **B.** stereo view of adaxial side of a polyp; **C.** body wall scales; **D.** opercular scales; **E.** coenenchymal scales *in situ*; **F.** individual coenenchymal scales; **G.** coenenchymal multituberculate spheroids.

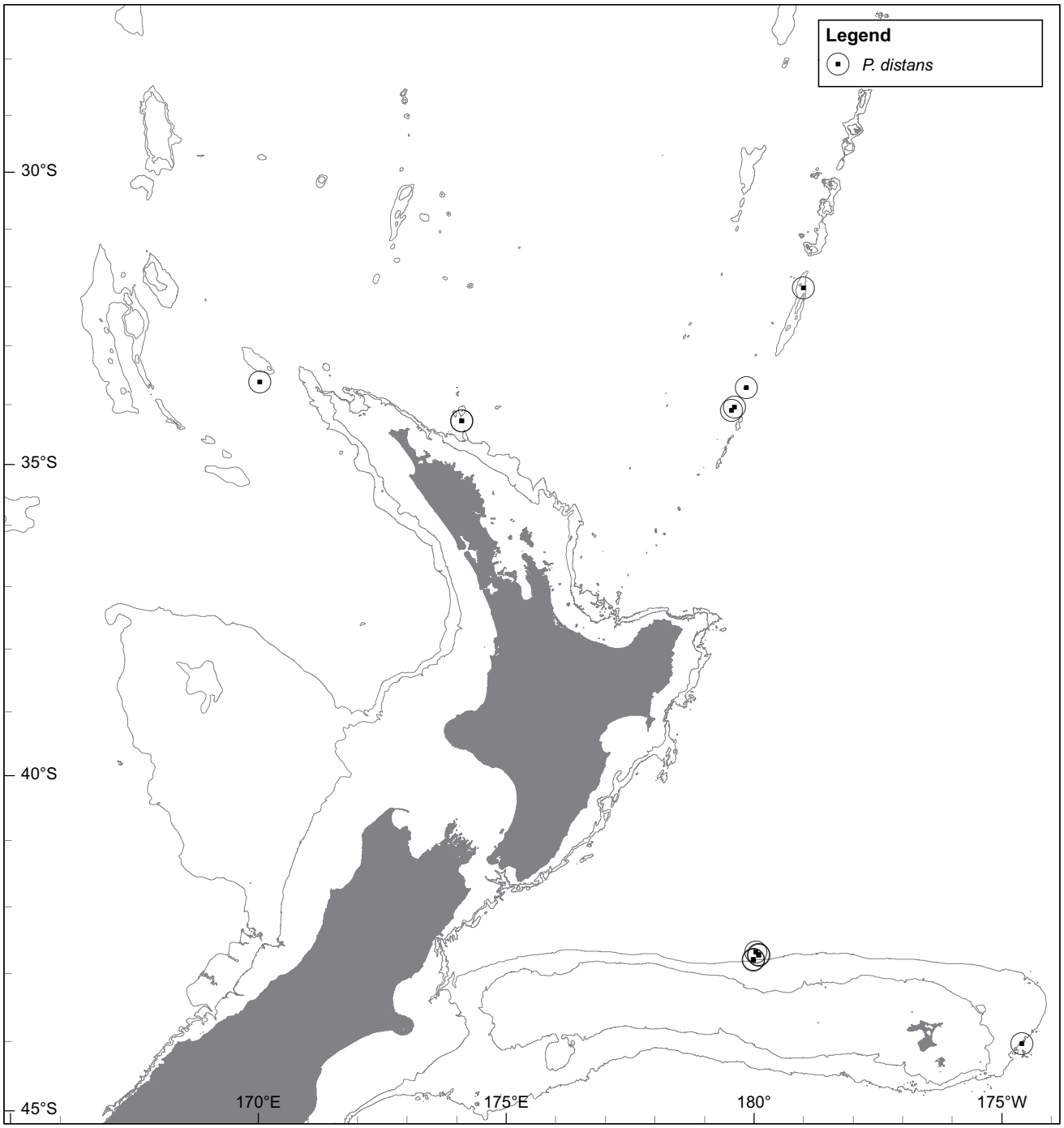

Figure 5. Distribution of *Primnoella distans* Studer, 1878.

scales per row, and the presence of "peculiar stolon-like basal attachments," which are not seen in typical *P. distans*. This then is considered to be the first report of the species subsequent to its original description and a new record for the New Zealand EEZ.

Primnoella insularis sp. nov.

Fig. 1C (p. 17), 6, 7; Table 1 (p. 16)

Material examined. Holotype NIWA 54069, NIWA Stn TAN0905/113, 44.15° S, 174.757° W, Diamond-head Seamount, Chatham Rise, New Zealand, 519–609 m, 27 Jun 2009, 1 colony (USNM 1278164, SEM stubs 2227–2229, 1 fragment). **Paratypes** TMAG K4376, NZOI Stn Q45, 33.178° S, 156.175° E, Lord Howe Rise,

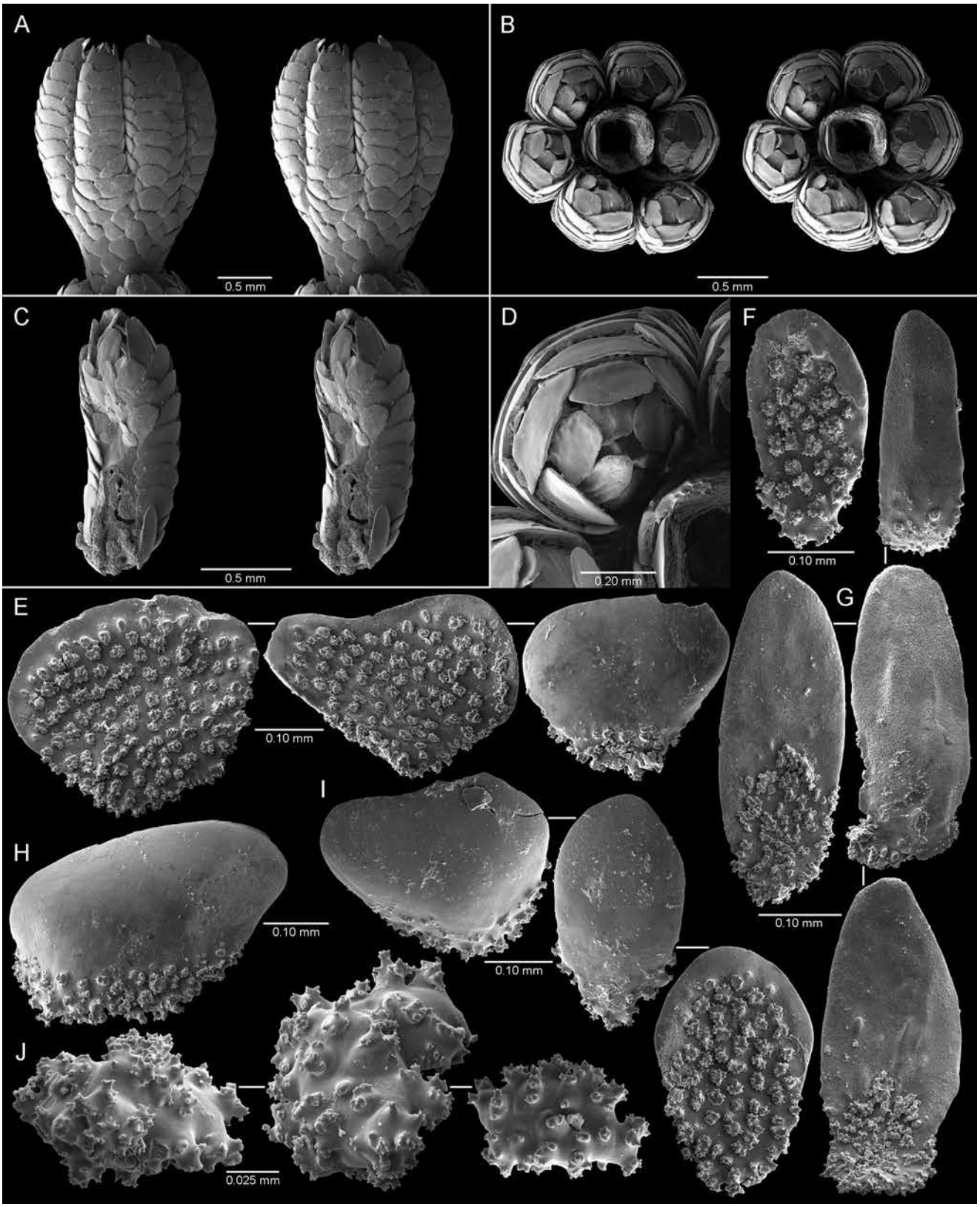

Figure 6. *Primnoella insularis* **sp. nov.**, holotype: **A.** stereo view of a polyp whorl; **B.** stereo view of apical polyp whorl showing operculars; **C.** stereo view of obliquely oriented polyp showing IL and adaxial scales; **D.** opercular region of polyp; **E.** abaxial and OL body wall scales; **F.** IL body wall scale; **G.** opercular scales; **H.** scale transitional between body wall and coenenchyme; **I.** coenenchymal scales; **J.** coenenchymal multituberculate spheroids.

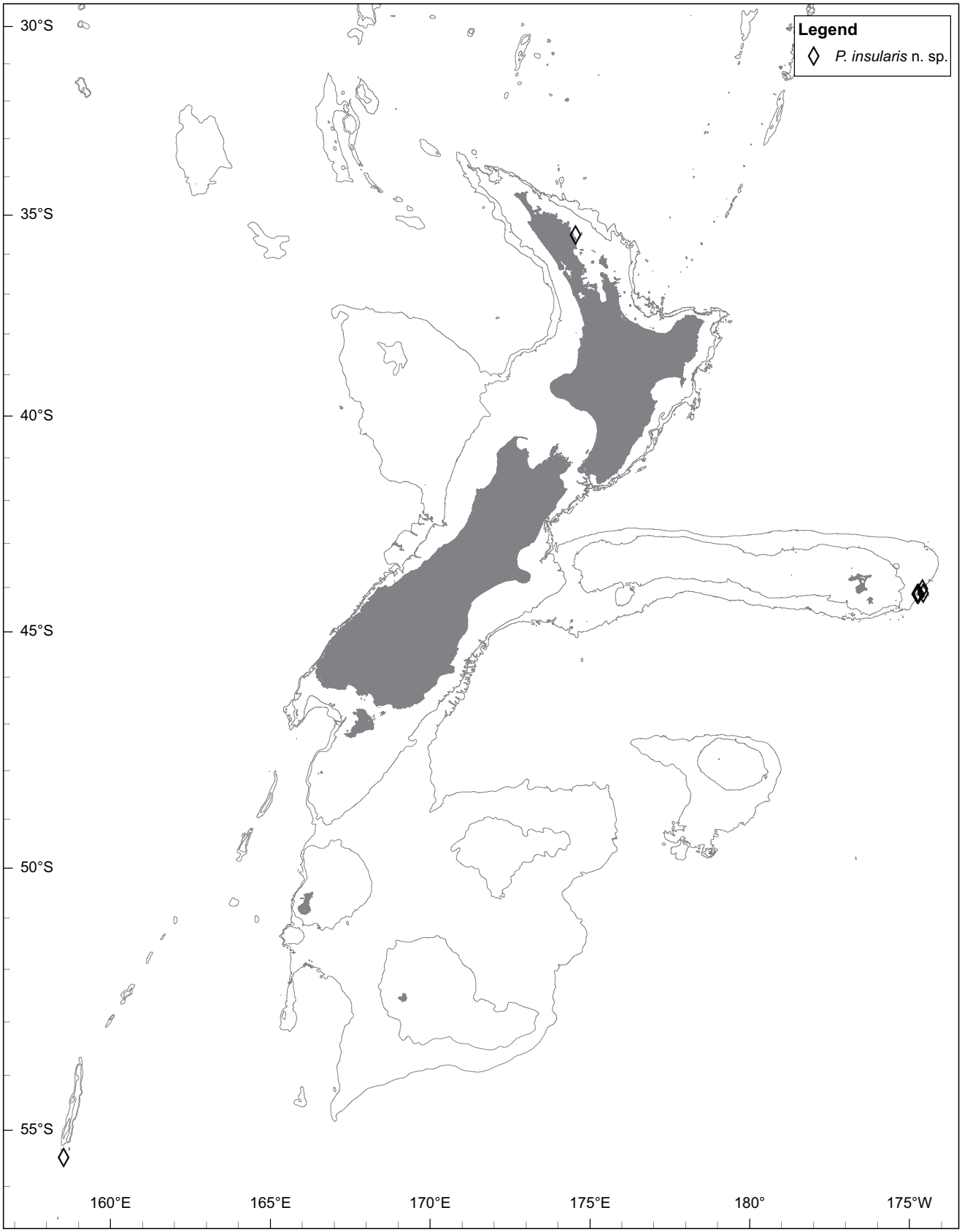

Figure 7. Distribution of *Primnoella insularis* **sp. nov.**

Australian EEZ, 153 m, 23 May 1978, 1 colony; TMAG K4377, NZOI Stn D6, 55.483° S, 158.525° E, Macquarie Ridge, Australian EEZ, 415 m, 25 May 2000, 5 colonies; NIWA 53548, NIWA Stn TAN0905/95, 44.136° S, 174.721° W, Diamond Head Seamount, Chatham Rise, New Zealand, 613–735 m, 25 Jun 2009, 1 colony; NIWA 53662, NIWA Stn TAN0905/99, 44.14° S, 174.72° W, Diamond Head Seamount, Chatham Rise, New Zealand, 641–758 m, 26 Jun 2009, 13 colonies; NIWA 53941, NIWA Stn TAN0905/110, 44.127° S, 174.57° W, Dickies Seamount, Chatham Rise, New Zealand, 650–800 m, 27 Jun 2009, 1 colony; NIWA 54015, NIWA Stn TAN0905/112, 44.143° S, 174.725° W, Diamond Head Seamount, Chatham Rise, New Zealand, 760–821 m, 27 Jun 2009, 2 colonies; NIWA 54342, NIWA Stn TAN0905/121, 44.028° S, 174.591° W, Aloha Seamount, Chatham Rise, New Zealand, 801–823 m, 28 Jun 2009, 4 colonies; NIWA 54538, NIWA Stn TAN0906/3, 35.5° S, 174.542° E, Bay of Islands, North Island, New Zealand, 66–64 m, 04 Jul 2009, 1 colony; NIWA 99701, NIWA Stn TAN0905/113, 44.15° S, 174.757° W, Diamond Head Seamount, Chatham Rise, New Zealand, 519–609 m, 27 Jun 2009, 14 colonies (USNM 1278611, 3 colonies).

Type locality. East of Pitt Island, Chatham Islands, 519–609 m.

Distribution. Off Macquarie Island, eastern Chatham Rise east of Pitt Island, northern North Island, Dampier Ridge (Fig. 7), 66–823 m, although most records deeper than 600 m.

Description. The colonies are flagelliform, longer colonies slightly coiled (Fig. 1C), and attached by a small hemispherical calcified holdfast. The stem is slender and smooth, up to 2.5 mm in diameter in large specimens (NIWA 54015), and thus more stiff and supportive than that of *P. distans*. One of the longest colonies (the holotype, Fig. 1C) is 60 cm in length and 1.7 mm in basal stem diameter. Polyps are arranged in upwardly directed whorls of five to eight, larger-diameter basal stems having as many as ten polyps per whorl (Fig. 6A, B). Whorls are very closely spaced, 5.0–5.5 whorls occurring per cm branch length, with a very short space between whorls consisting of only 0–0.2 mm; the whorl diameter is 1.4–1.7 mm. The polyps are compressed-cylindrical in shape, up to 2.0 mm in length, and about 0.6 mm in diameter.

The body wall scales are arranged in eight rows according to the sclerite formula: 8–10; 6–8: 3–4: 2–3, the proximal adaxial side of the polyp being naked (Fig. 6C). The abaxial and outer lateral body wall scales (Fig. 6E) are square to rectangular in shape with a straight distal edge, 0.30–0.42 mm in width. The inner lateral scales are narrower (0.16–0.18 mm width) and elliptical in shape (Fig. 6F). The tiny (0.09–0.10 mm in diameter) adaxial body wall scales are circular. The marginal scales, which are sometimes reduced in size, fold over and largely obscure the opercular scales (Fig. 6D), the operculars (Fig. 6G) being tongue-shaped and ranging from 0.28 mm (i.e. the adaxial operculars) to 0.39 mm in length (the abaxials). L:W ratios range from 2.1–2.9. The distal inner surface of the operculars is smooth, whereas the proximal inner surface is tuberculate.

As with *P. distans*, the proximal body wall scales gradually transition into the coenenchymals (Fig. 6H), the latter being elliptical in shape, only about 0.19–0.35 mm in width, and thicker (Fig. 6I). Multituberculate spheroids (Fig. 6J) measuring 0.65–0.120 mm in diameter occur below the coenenchymal plates. The outer surface of the body wall, opercular, and coenenchymal scales is smooth, and sometimes glistens.

Comparisons. *Primnoella insularis* **sp. nov.** is somewhat intermediate in characteristics between the other two New Zealand *Primnoella* (Table 1), but is distinctive in having a stiff but coiled axis, 8–10 scales in its abaxial body wall row, and 5–8 polyps per whorl.

Etymology. Named *insularis* because most specimens were collected near islands or on seamounts (*insularis*, Latin for 'of islands').

Genus ***Callozostron*** Wright, 1885

Callozostron Wright, 1885: 690–691.

Callozostron, Wright & Studer 1889: 48; Bayer 1996: 151–152; Cairns & Bayer 2009: 32–33 (complete synonymy and discussion).

Type species. *Callozostron mirabile* Wright, 1885, by monotypy.

Diagnosis. Colonies unbranched (flagelliform), sparsely dichotomously branched, or pinnately branched. Polyps cylindrical and stand perpendicular to branch, arranged in whorls of 3–14, the bases of adjacent polyps sometimes fused. Polyps covered by eight longitudinal rows of body wall scales, which completely cover the polyp body. At least 4, and in

some species up to 24 (the three distal transverse rows of body wall scales), marginal/submarginal scales bear an elongate apical spine; marginals do not fold over operculum. Opercular scales blunt or have elongate apical spines. Coenenchymal scales similar to those of body wall, but smaller, and arranged in one thin layer, but basal region of at least one species covered with a thick layer of tuberculate spheroids. All scales thin, with a smooth outer face and tuberculate inner face.

Remarks. Bayer (1996) described and keyed the four species of *Callozostron*, but there are some discrepancies between his descriptions and his key. For instance, he clearly stated in his account of *C. carlottae* Kükenthal, 1909, that its polyps have only two transverse rows (i.e. 16 scales) of marginal/ submarginal scales that have elongate apical spines. But in his key to the species, and all of the figures of that species, he indicates that there are three transverse rows of sclerites (i.e. 24 scales) that bear elongate an apical spine. This is an important distinction between the species in this genus. *Callozostron carlottae*, as described and illustrated by Kükenthal (1909, 1912), in fact has only two transverse rows of marginal scales that have an apical spine, and polyps about 1.5 mm in height (spines included). The polyps of Bayer's (1996) *C. carlottae* are up to 2.7 mm in height. Bayer explained this size discrepancy as possibly due to mis-measurement by Kükenthal, although as he stated, Kükenthal did not provide scale bars for his figures, but he did state the length of the polyps. The two differences between Bayer's *C. carlottae* and the type of *C. carlottae* suggest that Bayer's specimen may have been a different species (see key below), but until more specimens are collected and studied in this poorly-known group, his species is not renamed herein.

The species identified as *Callozostron* sp. by Cairns *et al.* (2009: 93) from New Zealand was not definitively located in the NIWA collections.

Distribution. Antarctic, Subantarctic (Scotia Sea, South Sandwich Islands, South Orkney Islands, South Georgia), Antipodes Islands, off North Island of New Zealand, Clarion-Clipperton Fracture Zone, 744–4235 m.

Key to the species of *Callozostron*

1 Colonies branched (dichotomously or pinnately) **2**

Colonies unbranched (flagelliform) **4**

2 Branching dichotomous; only four or five marginal scales on each polyp bear an elongate apical spine; polyps up to 3.5 mm in length ..... ***C. acanthodes* Bayer, 1996**

Branching pinnate; 8–24 marginal/submarginal scales on each polyp bear an elongate apical spine; polyps less than 1.3 mm in length **3**

3 Branching opposite pinnate; eight spinose marginals; 2–3 polyps/whorl ..... ***C. bayeri* Cairns, 2016**

Alternate pinnate branching; 24 spinose marginal/submarginals; 3–4 polyps/ whorl ..... ***C. pinnatum* sp. nov.**

4 Only 4–6 marginal scales on each polyp bear elongate apical spines, some marginals up to 4.5 mm in length; polyps up to 7 mm in length ..... ***C. mirabile* Wright, 1885**

16 or 24 marginal/ submarginal scales on each polyp (distal 2–3 transverse rows) bear an elongate apical spine, but marginals never more than 2 mm in length; polyps less than 2 mm in length **5**

5 16 marginal/submarginal scales on each polyp (distal two transverse rows) bear an elongate apical spine; marginal spines smooth and round in cross-section **6**

24 marginal/submarginal scales on each polyp (distal three transverse rows) bear an elongate apical spine; marginal spines slightly ridged and flat in cross-section ..... ***C. carlottae sensu* Bayer, 1996**

6 Polyps 1.2 mm tall including spines; marginal scales less than 0.8 mm in length ..... ***C. carlottae* Kükenthal, 1909**

Polyps 3.0 mm tall including spines; marginal scales up to 1.9 mm in length ..... ***C. diplodiadema* Bayer, 1996**

Callozostron acanthodes Bayer, 1996

Fig. 1D (p. 17), 8, 9

Callozostron acanthodes Bayer, 1996: 161–165, Fig. 7 (bottom), 15–17; Cairns & Bayer 2009: 27 (listed); Cairns *et al.* 2009: 93 (listed); Taylor & Rogers 2015: Fig. 1.

Material examined. Holotype—USNM 94575, Stn *Eltanin* 1712, 38.400° S, 178.883° E, off East Cape, North Island, New Zealand, 1354–1995 m, 28 May 1966, (NMNH SEM stubs B1594–1595, 1603, 1607, and 1618).

Other material. *Bay of Plenty*: NIWA 14432, NZOI Stn Z10169, 39.491° S, 178.418° E, 1000–1000 m, 03 Jun 1999, 24 colonies and/or branches.

Campbell Plateau: NIWA 11125, NZOI Stn F123, 47.633° S, 178.95° W, 1280 m, 27 Jan 1965, 8 colonies, and numerous calyces (USNM 1278166, colony fragment).

Chatham Rise: NIWA 76759, NIWA Stn TAN1003/24, 40.091° S, 178.189° E, 744 m, 22 Mar 2010, 2 colonies (USNM 1278167, branchlets and 1 branch, NMNH SEM stubs 2115–2118).

Type locality. Off East Cape, North Island, New Zealand.

Distribution. Off Bounty Islands, off East Cape and Hawkes Bay, northeastern North Island, New Zealand (Fig. 9), 744–1995 m.

Description. Colonies are uniplanar, and sparsely and dichotomously branched (Fig. 1D), the largest colony examined (NIWA 11125) 23 cm in height and 4.2 mm in basal branch diameter. The holdfast is a modest encrustation, the basal branch rising 4–6 cm before its first bifurcation. The branch axis is light brown to light orange. In many, but not all, colonies, a symbiotic polynoid polychaete lives along the branch axis, causing the flanking polyps to curve in a semi-circular fashion, forming an elongate porous tube for the worm. Otherwise, polyps stand perpendicular to the branch, but with their distal region often curved slightly upward. The polyps are cylindrical, their basal diameter (0.8 mm) usually only slightly wider than their distal (0.7 mm), but again widening slightly at the operculum. The polyps are up to 3.5 mm in height and arranged in whorls of three to six, five being the most common number (Fig. 8A, C). Often the bases of pairs of polys are fused. There are about four whorls per cm, and the whorl diameter is up to 10 mm, including the elongate marginal spines.

The body wall scales are arranged in eight longitudinal rows of 7–10 scales per row, the rows completely encircling the body wall, the scales of any two adjacent rows significantly overlapping their lateral edges. Toward the base of each polyp, the scale alignment becomes poorly defined, the scales grading imperceptibly in size and shape with those of the coenenchyme. The body wall scales are roughly rectangular (broader than tall) in shape, up to 0.6 mm in width, and usually have a finely serrate distal margin (Fig. 8D). Their outer surface is smooth and their inner face is tuberculate. Several (usually five of the eight) marginal body wall scales are modified by having an extremely long apical spine, these scales being up to 4.8 mm in height (Fig. 8A–C, E–F). The smooth apical spine may be up to eight times the length of the basal part of the scale, the basal section being up to 0.7 mm in width and somewhat trapezoidal in shape (Fig. 8F). The basal diameter of the spine is 0.14–0.16 mm. The spine on some of the marginals is considerably shorter or not present at all. The eight operculars are somewhat similar in shape to the spinose marginals, but are much shorter (Fig. 8G) (less than 1 mm in length), the distal spine constituting only half of the length of the scale, and the basal section is rectangular; the basal diameter of the spinose part is only 0.04–0.06 mm in diameter. In the closed condition the opercular spines overlap one another (Fig. 8B). Like the body wall and coenenchymal scales, their outer surface is smooth, their inner tuberculate. The coenenchymal scales are oval to irregular in shape, rarely more than 0.30 mm in width (Fig. 8H).

Comparisons. *Callozostron acanthodes* is the only dichotomously branched species, and one of only two species to have less than eight spinose marginal scales (see key to species above).

Remarks. Although originally well described and illustrated, the species was previously known from only one specimen. This account adds two additional localities and broadens the depth range of the species, as well as adding information on the polychaete symbiosis and larger colony and polyp sizes.

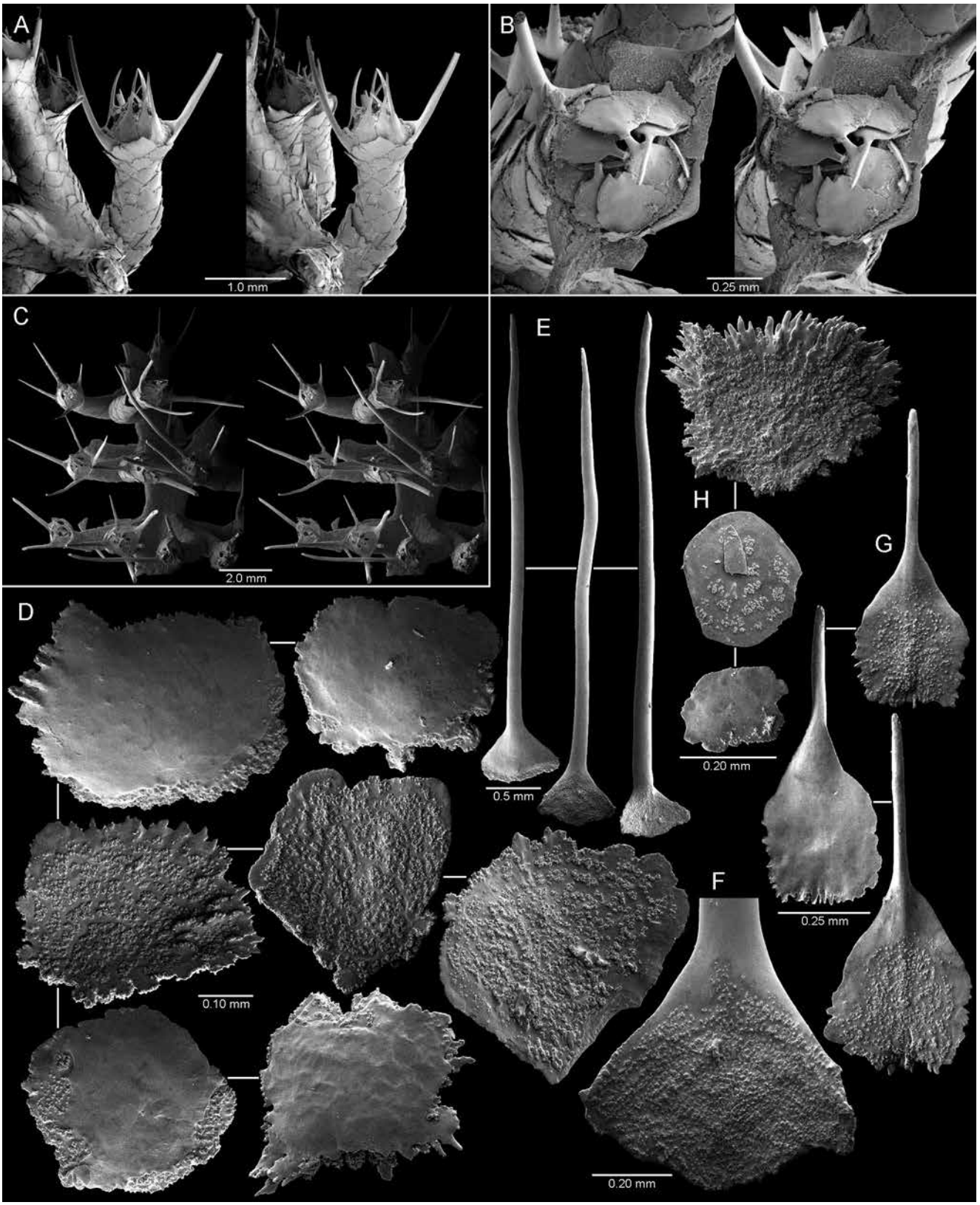

Figure 8. *Callozostron acanthodes* Bayer, 1996 (A–B, holotype; C–H, NIWA 76759): **A–C.** stereo views of polyps showing elongate marginal spines; **D.** body wall scales; **E.** spinose marginal scales; **F.** inner base of a marginal scale; **G.** opercular scales; **H.** coenenchymal scales.

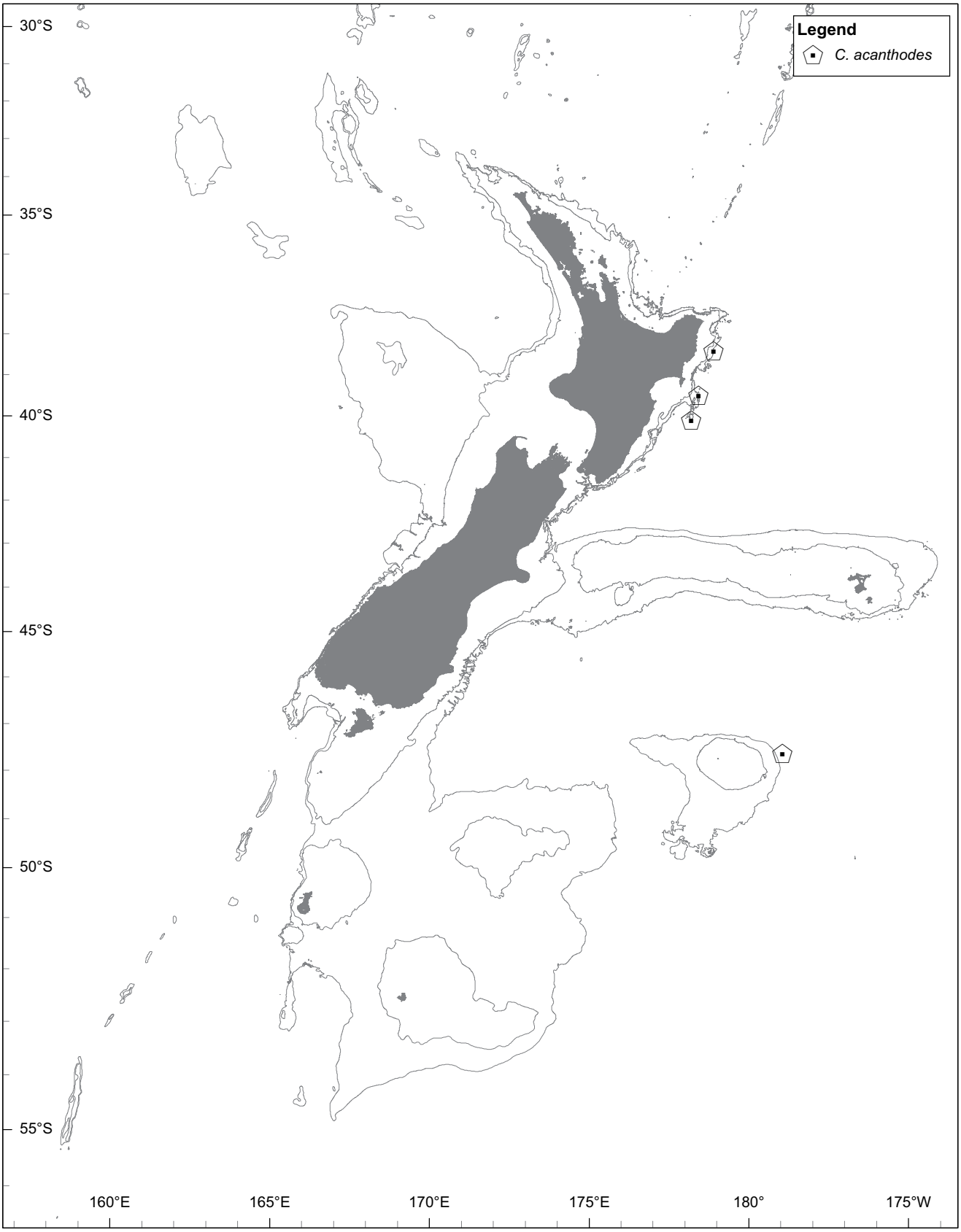

Figure 9. Distribution of *Callozostron acanthodes* Bayer, 1996.

Callozostron mirabile Wright, 1885

Fig. 1E (p. 17), 10, 11

Callozostron mirabile Wright, 1885: 691, Fig. 234, 235.

Callozostron mirabile, Bayer 1996: 152–159, Fig. 1 (left), 2–6 (complete synonymy); Cairns & Bayer 2009: 27, Fig. 5 O–X; Cairns *et al*. 2009: 93 (listed).

Callozostron mirabilis Wright & Studer, 1889: 48, 280, Pl. 10, Fig. 1–6, Pl. 20, Fig. 1.

Callozostron horridum Kükenthal, 1909: 49; Kükenthal 1912: 331, Text Fig. 38–42, Pl. 22, Fig. 12–13.

Material examined. *Campbell Plateau*: NIWA 77603, NZOI Stn F127, 49.367° S, 176.267° E, 1280 m, 28 Jan 1965, 1 colony (NMNH SEM stubs 2119–2120); NMNH SEM stubs of holotype B58–60.

Type&locality. Holotype – NHMUK1989.05.27-33, *Challenger* Stn 153 (65.700° S, 79.817° E), off Leopold and Astrid Coast of Princess Elizabeth Land, Antarctica (Indian Ocean sector), 3068 m.

Distribution. Widespread in Southern Ocean, including: near continental Antarctica (Princess Elizabeth Land and Balleny Islands), the Scotia Sea, South Sandwich Islands, and the Antipodes Islands (Fig. 1), 1280–3819 m.

Description. Colonies are flagelliform (unbranched, Fig. 1E), and up to 28 cm in length (the holotype). The polyps stand perpendicular to the stem and are cylindrical, up to 7 mm in length (including marginal spines) and about 1.0–1.5 mm in diameter. The polyps are arranged in whorls of 3–12, the lesser number toward the branch tip. Polyps are numerous and the whorls closely spaced, producing a somewhat disorganised concentration of polyps. The whorl diameter may be up to 20 mm, including the marginal spines.

The body wall scales are arranged in eight longitudinal rows of 7–10 scales per row, and like *C. acanthodes*, the lateral edges of the body wall scales overlap (Fig. 10D); also the row structure becomes disorganised toward the base of a polyp, where the scales subtly grade in size into the coenenchymal scales. The body wall scales are slightly convex (fitting the curvature of the polyp), quite thin, and rectangular to somewhat triangular in shape (Fig. 10E), the triangular scales occurring near the polyp margin. Body wall scales range from 0.50–1.0 mm in width and often have a serrate distal edge. Several (usually 4–6) marginal scales are modified by having an extremely long apical spine (Fig. 10A–C, F–G), these scales being up to 4.5 mm in height, the smooth spine being up to 6–7 times the length of the basal portion, the triangular basal portion being about 0.6 mm in width. The non-spinose marginals are triangular in shape. The opercular scales (Fig. 10H) are somewhat tongue-shaped, with a blunt (non-spinose) tip, 1.0–1.25 in length, and have a basal width of 0.52–0.88 mm. Usually one or two operculars per polyp have a broad base, the other seven or eight having a relatively slender base. The opercular outer surface is highly concave. The body wall, marginal, opercular, and coenenchymal scales all have a smooth outer surface and tuberculate inner surface. The coenenchymal scales (Fig. 10I) are indistinguishable from the proximal body wall scales, except that they are more irregular in shape and somewhat smaller, 0.40–0.50 mm in diameter.

Comparisons. *Callozostron mirabile* is very similar to *C. acanthodes* in many sclerite characteristics, but differs most significantly in having a flagelliform colony, non-spinose opercular scales, and having many more polyps per whorl (see key to species above).

Remarks. The species was well described by Wright & Studer (1889) and Kükenthal (1912, as *C. horridum*), and well illustrated by Bayer (1996); however, the latter did not formally re-describe the species. The one poorly preserved specimen reported herein does little more than re-confirm the occurrence of this species west of the Antipodes Islands, but does report a specimen from off New Zealand, and establishes a shallower depth range for the species.

Callozostron pinnatum sp. nov.

Fig. 1F (p. 17), 12, 13

Material examined. Holotype NIWA 82682, NIWA Stn TAN1206/77, 36.811° S, 177.465° E, Whakatane Seamount, Raukumara Plain, off Bay of Plenty, North Island, New Zealand, 878–911 m, 22 Apr 2012 (USNM 1278169, several calyces, and NMNH SEM stubs 2144–2148). **Paratype** NIWA 82842, NIWA Stn TAN1206/90, 36.79° S, 177.454° E, Whakatane Seamount, Raukumara Plain, off Bay of Plenty, North Island, New Zealand, 1160–1155 m, 23 Apr 2012, 1 colony, (USNM 1278168, 1 branch).

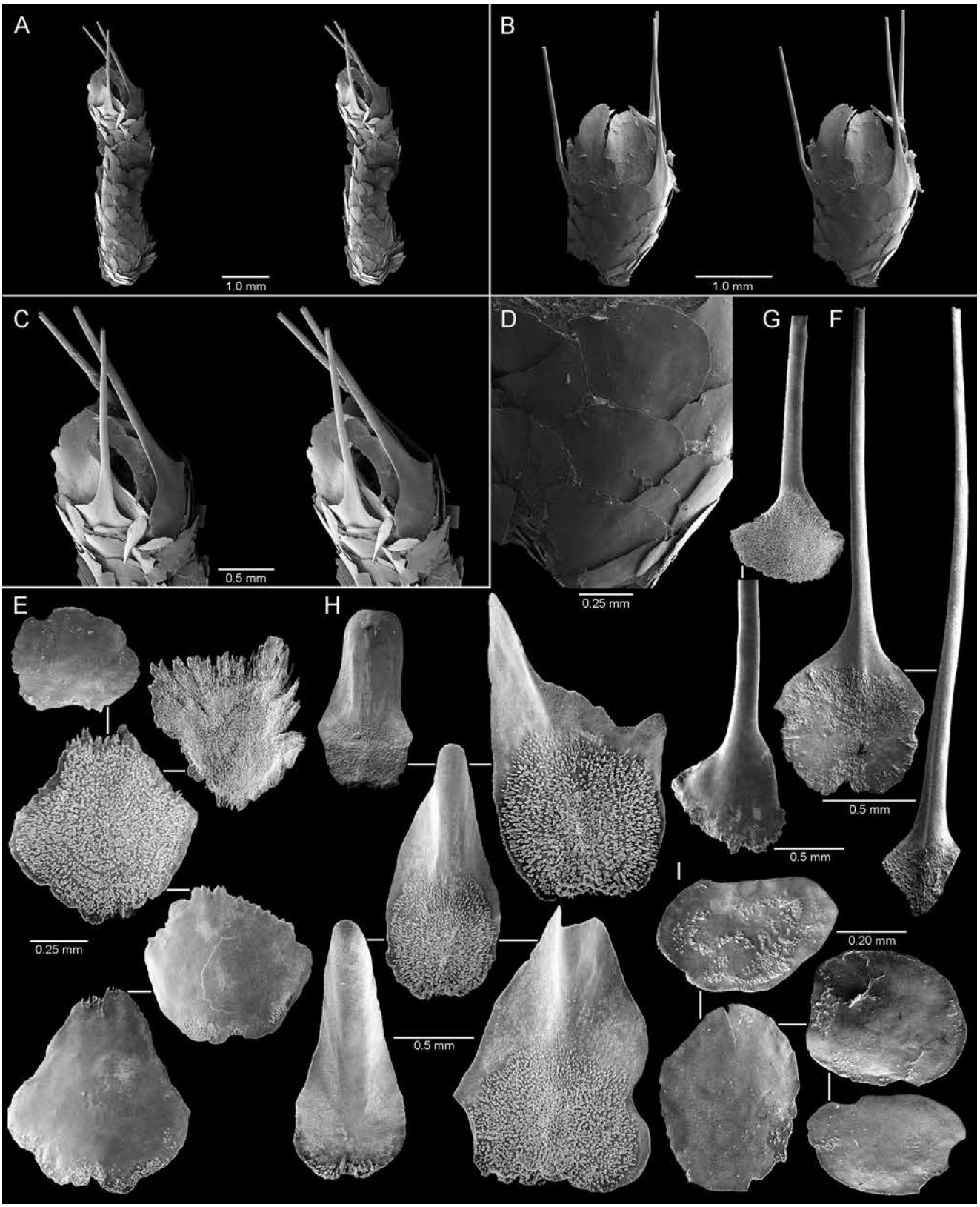

Figure 10. *Callozostron mirabile* Wright, 1885 (A–F, H–I, NIWA 77603; G, holotype): **A–C.** stereo views of polyps showing elongate marginal spines; **D.** body wall scales *in situ*; **E.** body wall scales; **F.** marginal scales; **G.** basal region of marginal scales; **H.** opercular scales; **I.** coenenchymal scales.

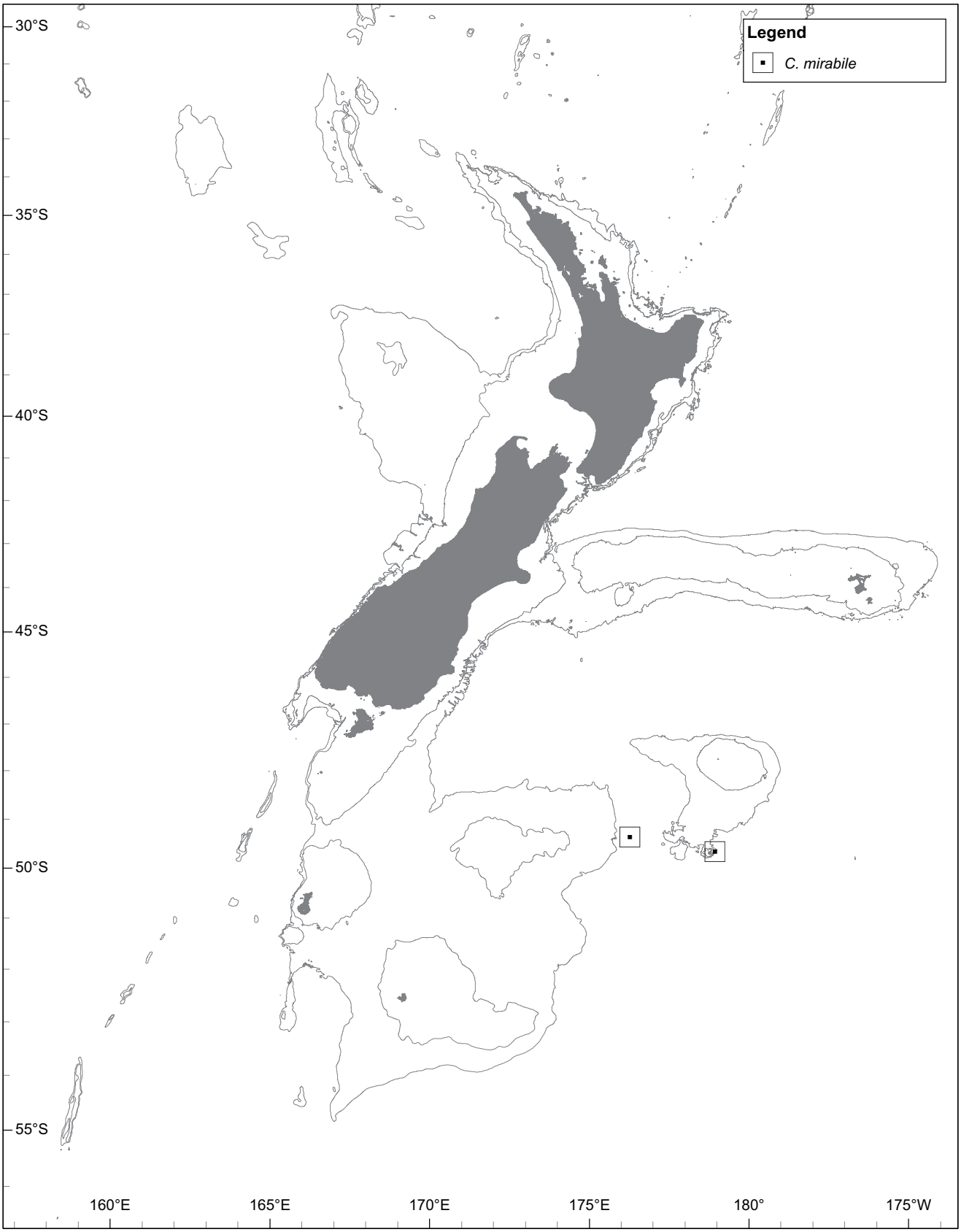

Figure 11. Distribution of *Callozostron mirabile* Wright, 1885.

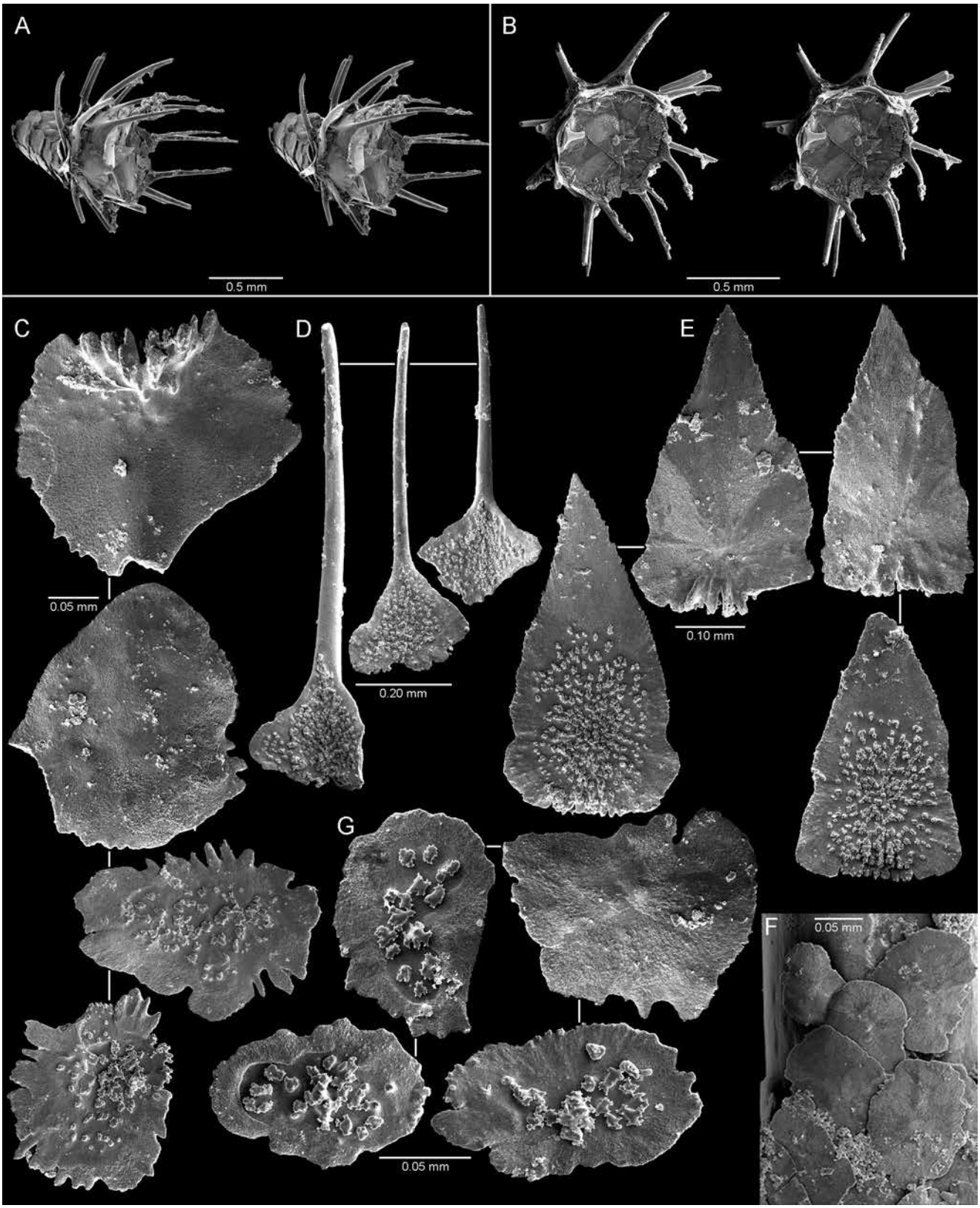

Figure 12. *Callozostron pinnatum* **sp. nov.**, holotype: **A–B.** stereo views of a polyp showing three rings of spinose marginal scales; **C.** body wall scales; **D.** marginal scales; **E.** opercular scales; **F.** coenenchymal scales *in situ*; **G.** coenenchymal scales.

Type locality. Whakatane Seamount, off Bay of Plenty.

Distribution. Known only from Whakatane Seamount, off Bay of Plenty (Fig. 13), 878–1160 m.

Description. The holotype (Fig. 1F), now in two pieces, was a pinnately branched fragment 7 cm in length having 13 side branchlets originating in alternate fashion on opposite sides of the branch. The branchlets are up to 30 mm in length; the diameter of the basal branch is 0.41 mm. The axis is pale yellow. The polyps stand perpendicular to the branchlets but with their distal regions curved upward. The polyps are cylindrical, about 0.3 mm in diameter, but broaden to an opercular diameter of about 0.6 mm; the height of the polyps is only about 1.1 mm. The polyps are arranged in well-defined, well-spaced whorls of three or four, three being the most common number. There are about five whorls per cm, and the whorl diameter is about 2.6 mm.

The body wall scales are arranged in eight longitudinal rows of 7–9 scales each. The body wall scales, exclusive of the three distalmost marginal rings, are circular, oval, or somewhat irregular in shape, 0.20–0.28 mm in width, thin, and often have prominent lacerations on their distal margin (Fig. 12C). The uppermost three rings of body wall scales (the marginals, submarginals, and the ring proximal to the submarginals), a total of 24 scales, bear an elongate, slender spine, these scales being up to 1.0 mm in length, the spine composing about 75% of that length (Fig. 12A–B, D). The anchoring base of these modified scales is triangular to rhomboidal in shape, and 0.25–0.31 mm in width. The eight opercular scales are similar in shape and size, resembling an isosceles triangle that has an apical angle of about 35° (Fig. 12E). When contracted, the operculum is flat and the opercular scales overlap one another (Fig. 12A, B). The coenenchymal scales (Fig. 12F–G) are similar to the body wall scales, oval to irregular in outline, and somewhat smaller: 0.09–0.19 mm in width. As in other members of the genus, the outer surface of the body wall, marginal, opercular and coenenchymal scales are smooth, whereas the inner surface is tuberculate.

Comparisons. *Callozostron pinnatum* **sp. nov.** is the only species in the genus to have alternate pinnate branching. It is similar to *C. carlottae sensu* Bayer, 1996 in having 24 spinose marginal/submarginal body wall scales, but differs in having pinnate branching and much smaller polyps (see key to species above).

Etymology. Named *pinnatum* (from Latin *pinnatus*, meaning feathered or pinnate), for the distinctive pinnate growth form of the species.

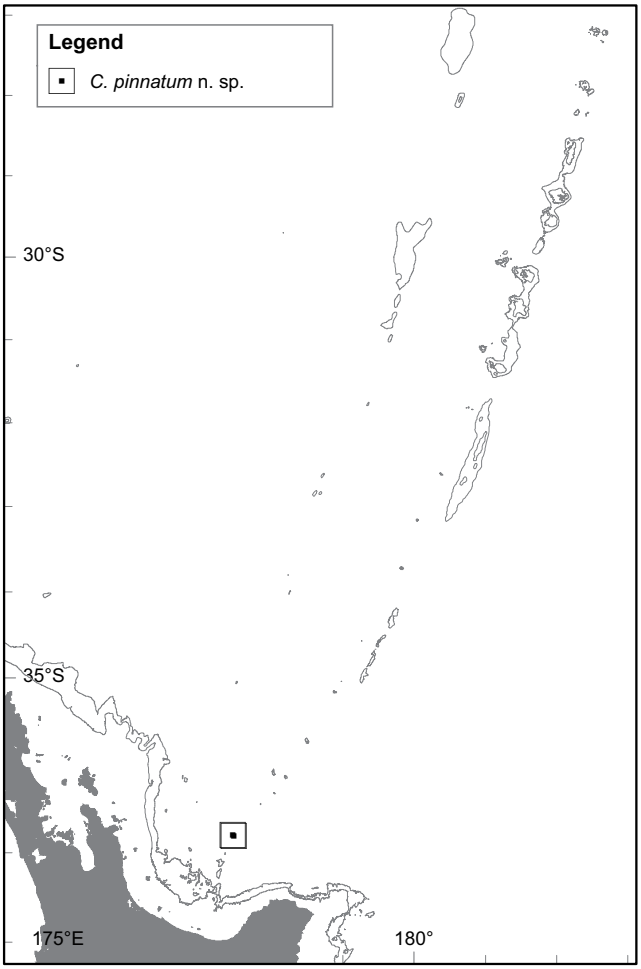

Figure 13. Distribution of *Callozostron pinnatum* **sp. nov.**

Genus ***Loboprimnoa* gen. nov.**

Type species. *Loboprimnoa exotica* **gen. et sp. nov.** here designated.

Diagnosis. Colonies dichotomously and laterally branched. Polyps pod-shaped, arranged in whorls of three or four. Opercular scales relatively huge, apically spinose in young polyps, wider and non-spinose in mature polyps. Operculars bear interlocking lateral spines at base. Marginal scales bear an elongate apical spine that does not enfold the operculum, and also have smaller overlapping lateral basal spines. Polyp body quite small and sac-like, covered with unorganised, transversely arranged, flattened rods. Coenenchymal scales lacking. Scales with smooth outer surface and tuberculate inner surface.

Remarks. *Loboprimnoa* **gen. nov.** is unique among the primnoids in that it does not have longitudinally arranged rows of body wall scales or any coenenchymal scales at all. Its small sac-like body region is also unique. Because it has transversely arranged flattened rods covering its short polyp wall, not longitudinal rows of scales, the genus key of Cairns & Bayer (2009) cannot be applied. It does, however, have many similarities to *Callozostron*, especially the morphology of its opercular and marginal scales. Nonetheless, it differs from this genus in having a small sac-like polyp body covered by transversely arranged flattened rods, lateral basal projections on its opercular and marginal scales, and in lacking coenenchymal scales.

Distribution. Off northeastern North Island, New Zealand, 1387–1420 m.

Etymology. Named *Loboprimnoa* (Greek *lobos*, meaning small capsule, pod + *primnoa*, a common suffix within the family), an allusion to the swollen, pod-shaped opercular region of the polyps. Gender: feminine.

***Loboprimnoa exotica* gen. et sp. nov.**

Fig. 1G (p. 17), 14, 15

Material examined. Holotype NIWA 72423, NIWA Stn TAN1104/40, 35.357° S, 178.516° E, Rumble II West Seamount, Raukumara Plain, off Bay of Plenty, North Island, New Zealand, 1387–1420 m, 08 Mar 2011, 1 colony (USNM 1278358 , 1 branch fragment, and NMNH SEM stubs 2110–2114).

Type locality. Rumble II West Seamount, Raukumara Plain, off Bay of Plenty.

Distribution. Known only from the type locality.

Description. The holotype (Fig. 1G) is uniplanar, 12 cm in height and 6.5 cm in width, with a basal stem diameter of 1.0 mm. Branching is lateral and dichotomous. The axis is greenish-gold and smooth, easily seen through the tissue as there are no coenenchymal scales. The polyps stand perpendicular to the branches, and are arranged in whorls (Fig. 14A, B) of three or four; four or five whorls occur every cm of branch length. The polyps show a progression in size and shape from juvenile to mature, a juvenile polyp of 1.3 mm height being conical in shape, the more mature polyps being up to 2.0 mm in height and pod-shaped (Fig. 14A–C), seemingly inflated, being broadest in diameter at mid-level.

The polyp is unique among the primnoids in that it is composed primarily of the eight large opercular scales, eight basally small marginal scales, and a small (0.3 mm in diameter) fleshy basal sac that must contain the rest of the polyp. This basal sac (Fig. 14F) is not covered by longitudinal rows of scales, but rather a disorganised layer of transversely arranged, flattened rods (like fingerbiscuits *sensu* Bayer *et al.* 1983). The rods are 0.27–0.34 mm in length, elongate (L:W = 5–7), have blunt tips, and are smooth on both faces (Fig. 14G). The eight opercular scales are similar in shape and size within a polyp (Fig. 14E, I), but transform in shape and size from small to large polyps. Operculars in juvenile polyps are about 1.1–1.3 mm in length and are slender (L:W = 5.5–6.0), having an apical spine composing about half its length. As the polyp increases in size, the operculars grow slightly in length (up to 1.55 mm), and considerably widen (L:W = 2.8), losing their apical spine altogether, but occasionally sporting two or three distal points (Fig. 14I). The operculars are longitudinally concave on their outer surface (Fig. 14E), but often have a narrow medial ridge on the distal half of this concavity. The proximal edge of the opercular scale is straight and projects as much as 0.27 mm on either side of the scale, often two or three smaller projections occurring just above the basal one; these projections serve to interlock with the projections of adjacent opercular scales (Fig. 14D, F). Just beneath the opercular bases are the square to trapezoidal bases of the eight marginal scales, each of

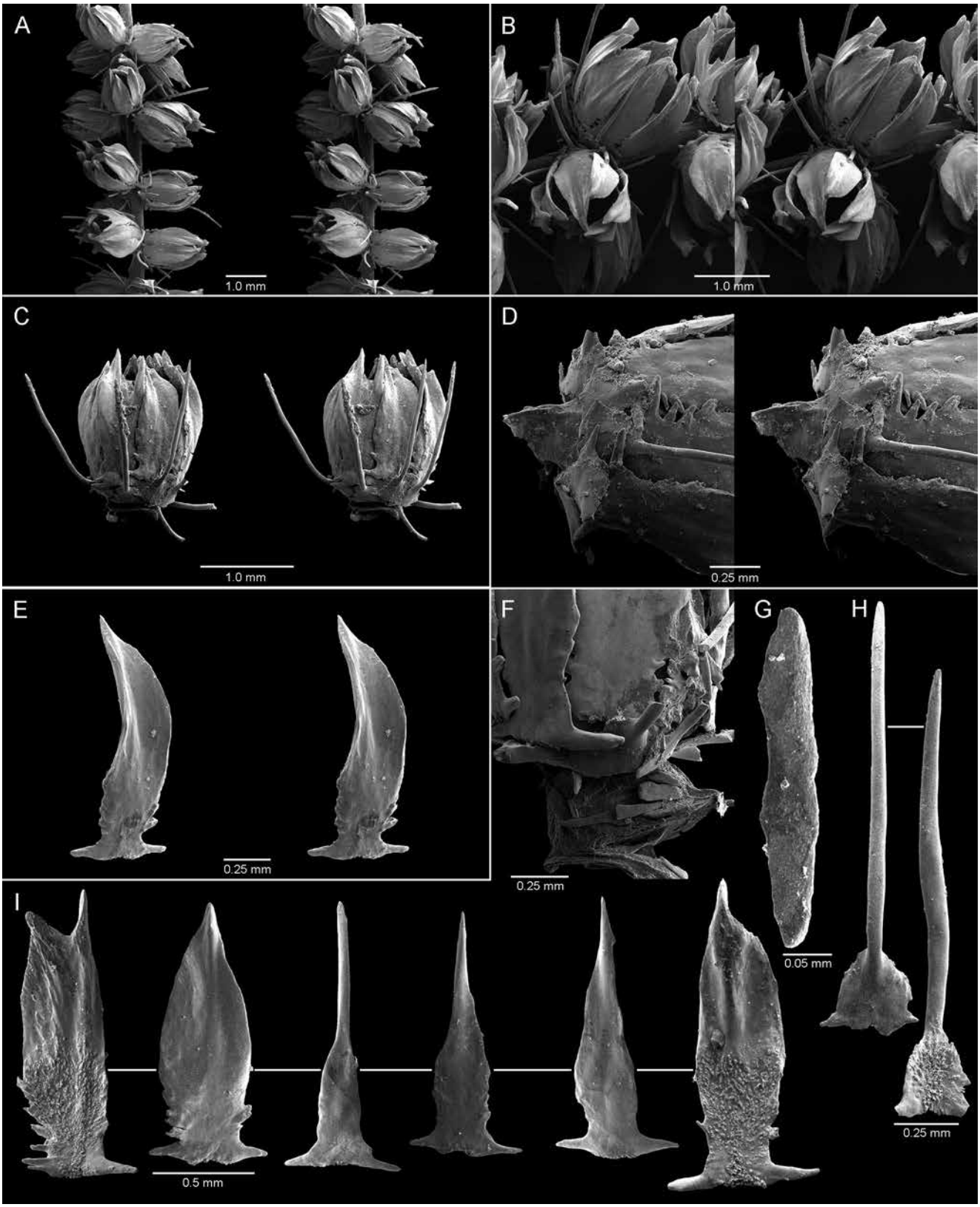

Figure 14. *Loboprimnoa exotica* **gen. et sp. nov.**, holotype: **A–B.** stereo views of polyp whorls; **C.** stereo view of lateral side of polyp; **D.** stereo view of basal part of polyp showing articulation of marginal scales; **E.** stereo view of outer surface of an opercular scale; **F.** lateral view of polyp showing transverse body wall scales *in situ*; **G.** a body wall scale; **H.** marginal scales; **I.** opercular scales.

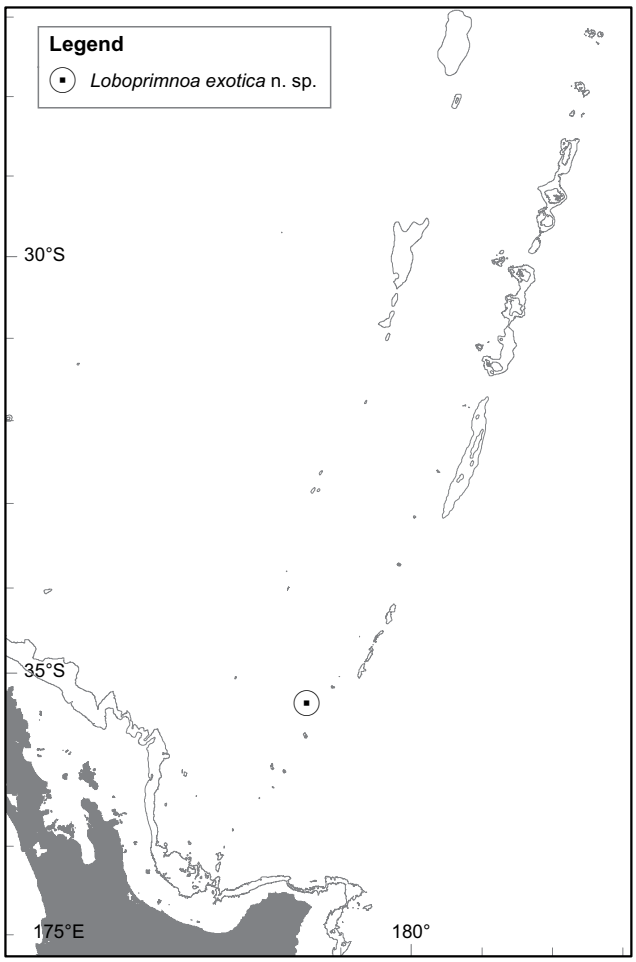

Figure 15. Distribution of *Loboprimnoa exotica* **gen. et sp. nov.**

which is about 0.3 mm in width (Fig. 14D, F, H). As with the opercularis, each basal scale has two lateral projections that interlock/overlap with projections of adjacent marginal bases. From each marginal base rises an elongate (up to 1.4 mm), slender (0.7–0.9 mm in diameter), smooth spine, approximately five times the length of the basal section (Fig. 14H), the eight marginal spines forming a kind of crown (Fig. 14C) surrounding, but not enfolding, the operculum, their tips terminating at about the same level as the opercular scales. No coenenchymal scales were observed. The opercular and marginal scales have a smooth outer surface and a tuberculate inner surface.

Etymology. Named *exotica* (from Greek *exotikos*, meaning alien, exotic, having the charm or fascination of the unfamiliar), an allusion to its unusual polyp morphology, as though it were from another planet.

Genus ***Metafannyella*** Cairns & Bayer, 2009

Metafannyella Cairns & Bayer, 2009: 35, Fig. 7N–U.

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

Diagnosis. Colonies uniplanar, dichotomously branching, some species having branchlets arranged in a lyrate or bottlebrush configuration. Polyps arranged in whorls or in no order, usually facing upward; brooding polyps common. Polyp protected by eight longitudinal rows of body wall scales, decreasing in width and number per row from ab- to adaxial polyp face; polyp usually completely covered by scales, but adaxially may be naked proximally; distal edge on body wall scales rounded and slightly serrate due to low parallel ridges on distal inner surface. Outer face of body wall scales smooth or covered with low smooth granules and ridges; a curved, transverse thickened ridge separates the distal exposed portion of the 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 prominently keeled. Marginal scales project beyond the operculum bases for a variable height. 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. Small tuberculate spheroids usually line the internal longitudinal canals.

Remarks. Including the two new species described herein and the new combination of *M. ventilabrum*, there are eight species (see Cairns & Bayer 2009, Taylor & Rogers 2015) known in this southern temperate to Antarctic genus. A key to the species in the genus and related genera was given by Bayer (1998) and a table comparing the four New Zealand species is given herein (Table 2). Bayer noted the resemblance of *Metafannyella* (his *Fannyella*) to *Callogorgia*, and compared and contrasted the two genera. He concluded that *Metafannyella* differed from *Callogorgia* in having a circumoperculum that folds over the operculum, having complete sclerite coverage of the adaxial side of the polyp, and having poorly developed ascus-like body wall scales. However, when the species included in *Metafannyella* are analysed it is noted that the circumoperculum is often poorly developed, and that in at least two species (*M. mawsoni* and *M. ventilabrum*) the adaxial polyp side is partially

naked. The term circumoperculum is an ambiguous one, as this feature continuously grades from small to large, and is often affected by preservation history. Herein the term is avoided in preference to simply describing the distance the marginal scales project beyond the opercular bases. In the course of this study it was noted that the opercular scales of all species of *Metafannyella* had a single medial keel, whereas those of *Callogorgia* bear multiple spinose ridges. Thus the only reliable differentiating characters that distinguish *Metafannyella* are its poorly developed ascus-like scales and its keeled opercular scales, the two genera otherwise being quite similar. The only region in which the two genera overlap is in the New Zealand region.

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

Metafannyella ventilabrum (Studer, 1878) **comb. nov.**

Fig. 16A, 17, 18; Table 2

Calligorgia ventilabrum Studer, 1878: 647–648, Pl. 2, Fig. 12A–D.
Caligorgia ventilabrum, Wright & Studer 1889: 78; Versluys 1906: 74–76, Text Fig. 83–84 (redescription of holotype); ?Nutting 1912: 61; Kükenthal 1919: 377; Kükenthal 1924: 275.
Callogorgia ventilabrum, Bayer 1982: 122 (key); Cairns & Bayer 2009: 29 (listed).
Fannyella, Alderslade 2006: 21.
Not *Callogorgia* cf. *ventilabrum*, Cairns *et al*. 2009: 93 (=*M. eos*).

Material examined. *Norfolk Ridge*: USNM 1287738, TAN0308/132 (NORFANZ), 33.54° S, 170.21° E, 514–540 m, 01/06/2003, 1 fragment; USNM 1287737, TAN0308/136 (NORFANZ), 33.39° S, 170.21° E, 469–490, 01/06/2003, 1 fragment.

Three Kings Islands: NIWA 11252 and 11276, NZOI Stn Z9752, 34.172° S, 172.197° E, 190 m, 02 Apr 1999, 4 colonies; NIWA 11253, NZOI Stn Z9741, 34.17° S, 172.21° E, 200 m, 16 Apr 1999, 2 colonies (NMNH SEM stub 1732); NIWA 14758, NZOI Stn E845, 34.125° S, 172.017° E, 277 m, 16 Mar 1968, 1 colony; NIWA 73567, NIWA Stn TAN1105/70, 34.133° S, 172.197° E, 125–129 m, 30 Mar 2011, 1 colony; NIWA 99996, NZOI Stn E323, 34° S, 172.25° E, 165 m, 11 Apr 1965, 1 colony.

North Cape: NIWA 9867, NZOI Stn E876, 34.65° S, 172.233° E, 216 m, 21 Mar 1968, 1 branch; NIWA 9883, NZOI Stn Z9742, 34.414° S, 173.133° E, 133 m, 19 Apr 1999, 1 colony; NIWA 11254, NZOI Stn C758, 34.667° S, 172.242° E, 199–199 m, 17 Feb 1962, 1 colony (USNM 1278171, 1 branch, NMNH SEM stubs 1733–1735); NIWA 11257, NZOI Stn J954, 34.633° S, 172.225° E, 204–192 m, 18 Jun 1981, fragments; NIWA 11259, NZOI Stn Z9877, 35.082° S, 172.681° E, 161 m, 30 Oct 1999, 1 colony (NMNH SEM stubs 2158–2160); NIWA 11260, NZOI Stn Z9883, 34.603° S, 172.74° E, 39 m, 31 Oct 1999, 1 colony; NIWA 72981, NIWA Stn TAN1105/9, 34.269° S, 173.025° E, 168–174 m, 26 Mar 2011, 5 colonies.

Table 2. Comparison of New Zealand species of *Metafannyella* Cairns & Bayer, 2009.

	M. ventilabrum	*M. polita*	*M. eos*	*M. chathamensis*
Colony shape	lyrate to dichotomous	dichotomous	dichotomous	bottle-brush
Polychaete commensal	absent	absent	absent	present
Polyp shape	cylindrical	cylindrical	clavate	cylindrical
Polyp length	0.9–1.2 mm	1.1–1.2 mm	up to 2.2 mm	1.2–1.3 mm
Polyps/whorl	4–6	4–5	4–7	no whorls
Whorls/cm	8–10	7–9	5–6	no whorls
Sclerite formula adaxial coverage	8–9:7–8:1–3:1	9–10:5–8:3–4:2	11–15:6–8:4–6:2–3	5–8:5–8:4–6:2–3
	naked	naked	covered	covered
Outer body wall scales	smooth low granules	smooth	smooth low granules	smooth low granules
Coenenchymal scale shape	elongate	elliptical	polygonal	circular
Coenenchymal scale arrangement	imbricate	imbricate	tessellate	imbricate
Tuberculate spheroids	absent	absent	present	absent
Distribution and depth range	northern North Island	northern North Island	ridges south of South Island	Chatham Rise and North Island
	39–540 m	150–167 m	333–1027 m	302–1067 m

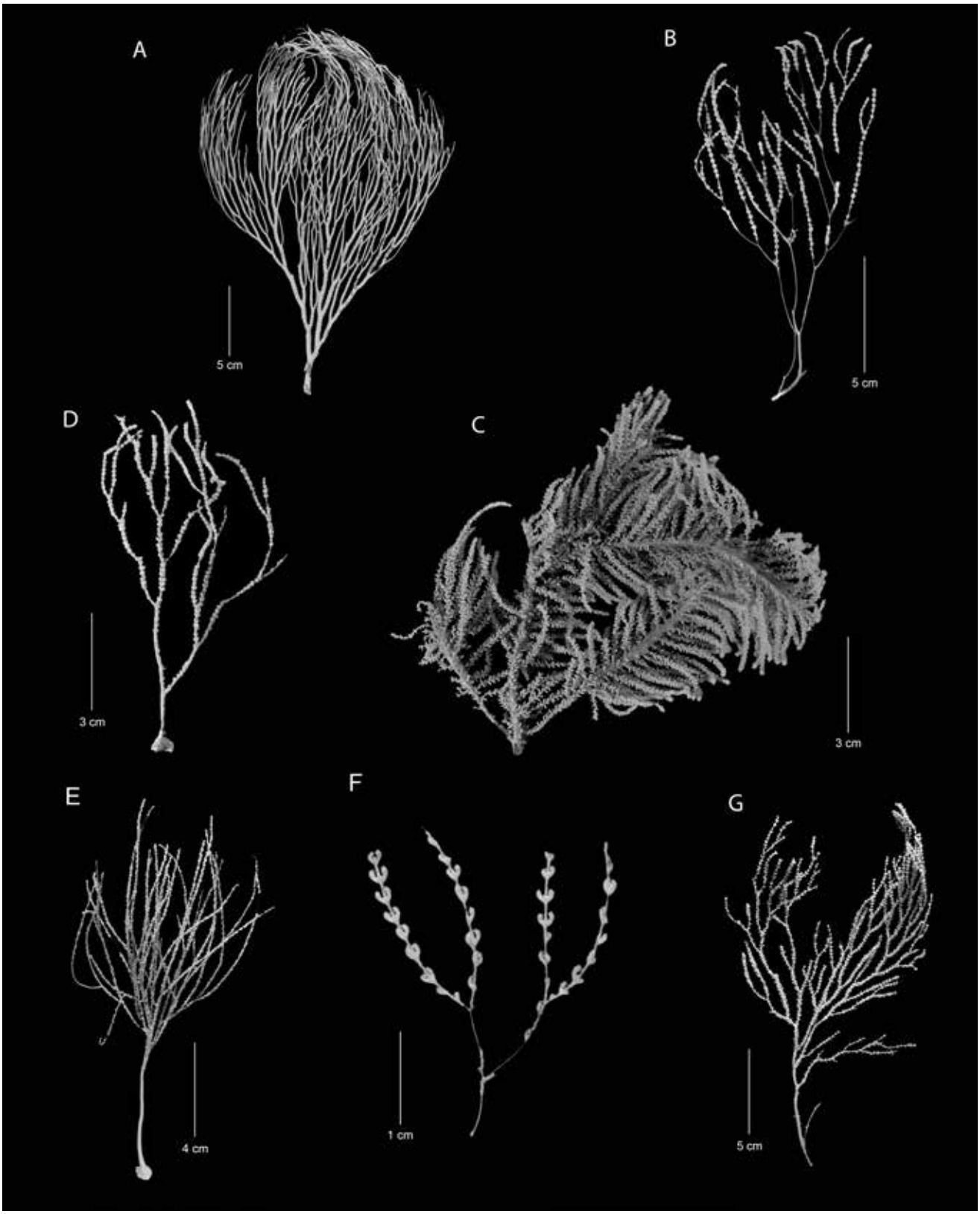

Figure 16. Specimen morphology: **A.** *Metafannyella ventilabrum* (Studer, 1878) **comb. nov.** from NIWA 11253; **B.** *Metafannyella eos* (Bayer, 1998), NIWA 42561; **C.** *Metafannyella chathamensis* **sp. nov.**, holotype; **D.** *Metafannyella polita* **sp. nov.**, holotype; **E.** *Plumarella* (*Dicholaphis*) *cordilla* **sp. nov.**, holotype; **F.** *Plumarella* (*Faxiella*) *delicatula* (Thomson & Rennet, 1931), NIWA 72100; **G.** *Callogorgia dichotoma* **sp. nov.**, holotype.

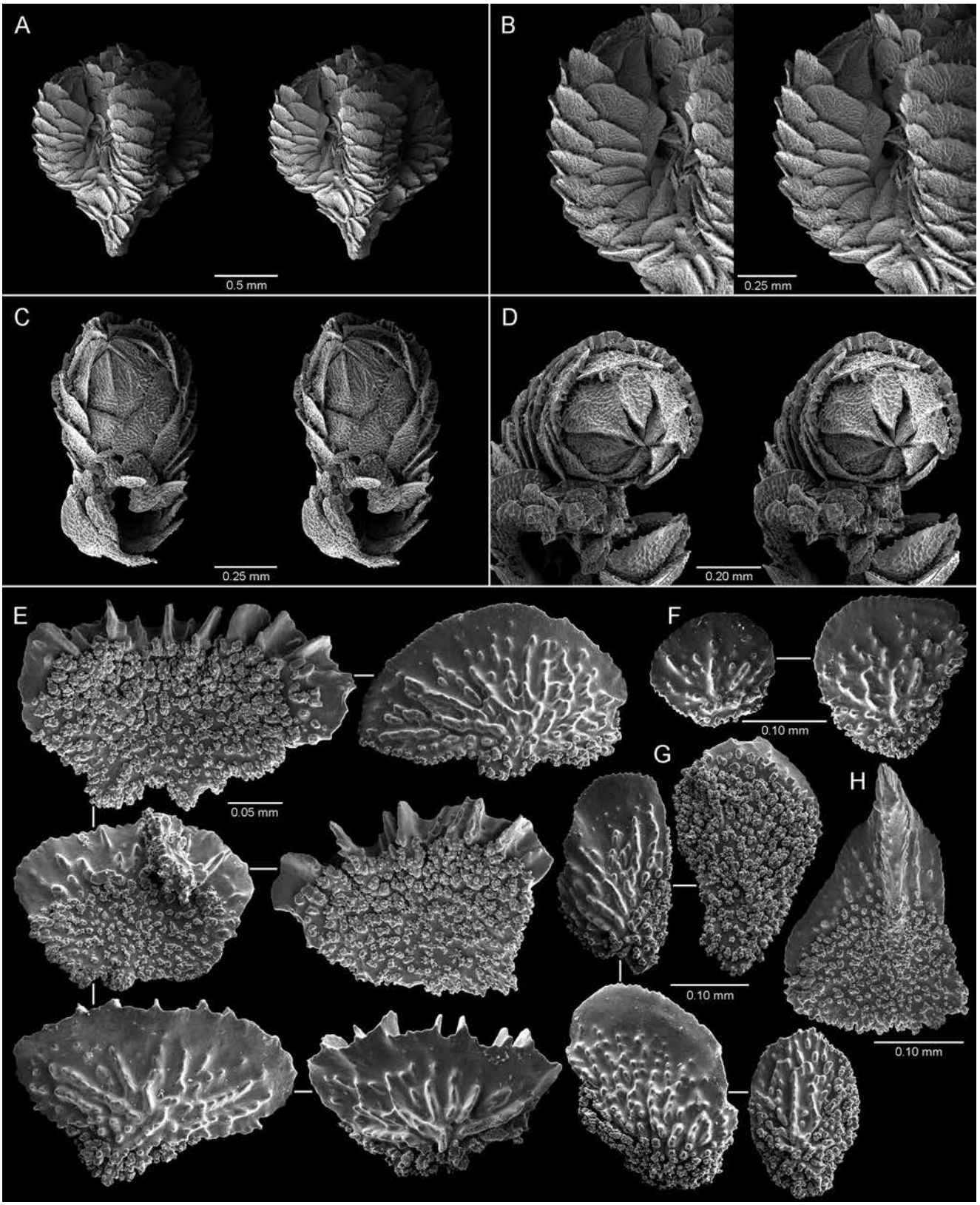

Figure 17. *Metafannyella ventilabrum* (Studer, 1878) **comb. nov.** (A–D, G, NIWA 11254; E–F, NIWA 11253): **A.** stereo view of a polyp whorl; **B.** stereo view of OL polyp edge; **C.** stereo view of adaxial side of a polyp; **D.** stereo view of opercular region; **E.** abaxial and OL body wall scales; **F.** adaxial body wall scales; **G.** coenenchymal scales; **H.** inner face of opercular scale showing keel.

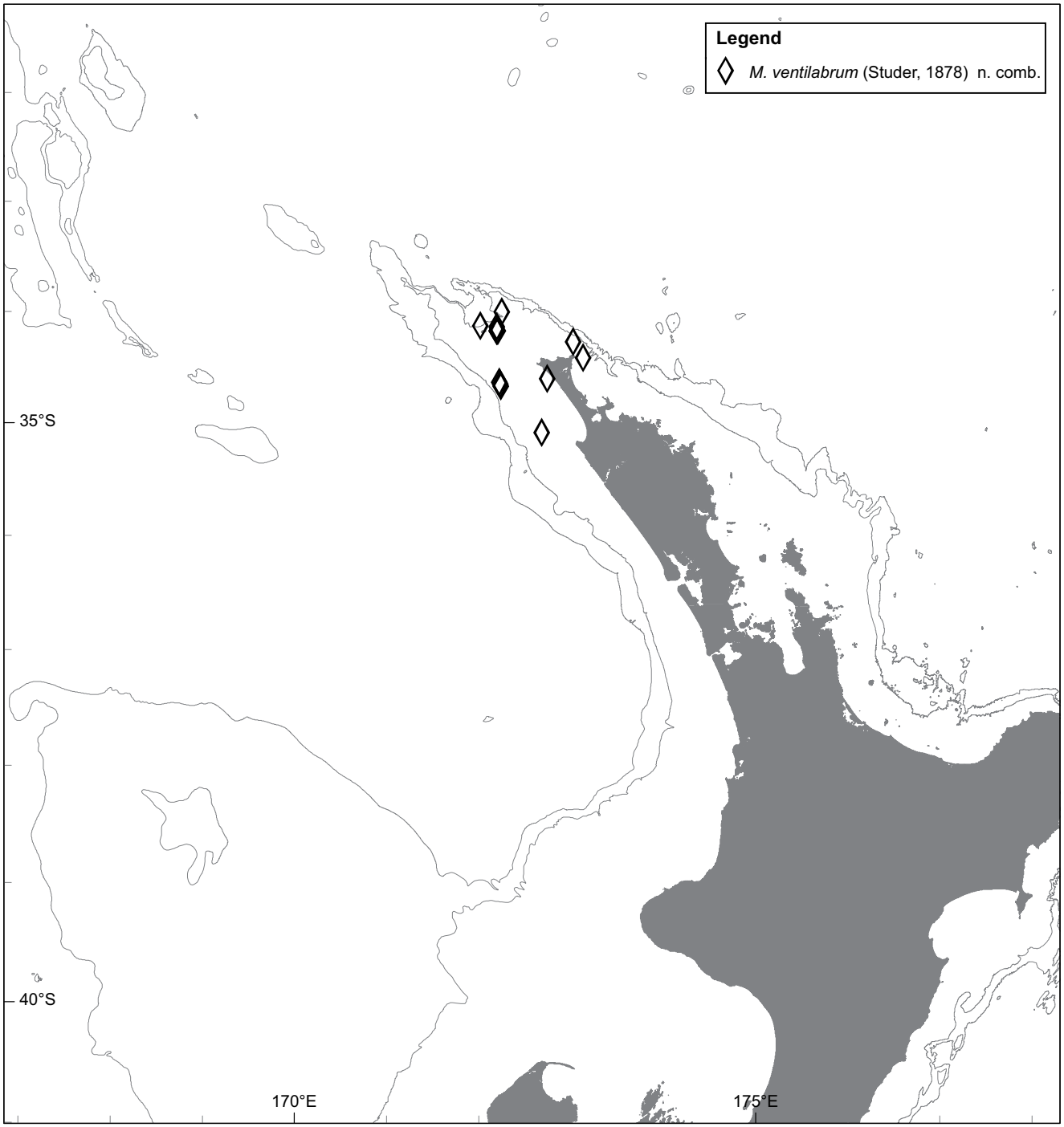

Figure 18. Distribution of *Metafannyella ventilabrum* (Studer, 1878) **comb. nov.**

Type & locality. Holotype—ZMB 1760, *Gazelle* Stn, 34.165° S, 172.597° E, off Three Kings Islands, New Zealand, 165 m (see Versluys 1906).

Distribution. Norfolk Ridge, Off Three Kings Island and North Cape (Fig. 18), 39–540 m.

Description. Colonies are uniplanar, initially lyrate in branching, followed by equal dichotomous branching (Fig. 16A), the end branches 4–10 cm long. The holotype (largest known specimen) is 35 cm in height. The basal branch diameter of large colonies attains 5 mm. The polyps are vasiform, expanding slightly at the anterior end, and are 0.9–1.2 mm in length and about 0.5 mm in distal diameter; brooding polyps are 2–3 times the normal width. Polyps are

arranged in whorls of four to six (Fig. 17A), depending on the branch diameter; eight to ten whorls occur per cm branch length. The diameter of a distal whorl is 1.2–1.5 mm.

There are eight longitudinal rows of body wall scales becoming fewer in number per row from ab- to adaxial polyp side, and smaller in width from distal to proximal position of the polyp. The body wall sclerite formula is 8–9: 7–8: 1–3: 1. Most body wall scales are fan-shaped, curve to fit the contour of the polyp, and are slightly reflected upward distally (Fig. 17A, B, E). The abaxial and outer lateral scales (Fig. 17B, E) are 0.27–0.34 mm wide, the inner laterals slightly smaller. Each of the paired adaxial marginals (Fig. 17F) is about 0.23 mm wide, below which are several smaller (0.12–0.16 mm in diameter) elliptical scales that occur in a random fashion, but do not cover the entire adaxial face, thus revealing a partially naked face (Fig. 17C). The outer surface of the body wall scales is covered with low smooth granules that appear to radiate from a transverse thickness near the proximal part of the scale. The inner face of the scales is tuberculate except for the distal edge, which is free of tubercles, somewhat translucent, and bears several parallel longitudinally arranged ridges that give the scale a finely serrate outer edge. The eight marginals project enough to cover the lower third of the operculum in a rudimentary cowl (Fig. 17B–D). The distal inner face of the opercularis are strongly keeled (Fig. 17H). The imbricate coenenchymal scales (Fig. 17G) are elliptical in shape, their greater axis (up to 0.41 mm) aligned with the branch, their lesser axis 0.14–0.21 mm in length.

Comparisons. *Metafannyella ventilabrum* differs from the other New Zealand congenerics (Table 2) by having an initially lyrate growth form that subsequently becomes dichotomous, and by elongate coenenchymal scales. It is compared to *M. polita* **sp. nov.** in the account of that species.

Remarks. Despite the lengthy synonymy, the species was previously known only from the holotype, all the other accounts being derivative or incorrect (Cairns 2009, Nutting 1912).

Metafannyella polita sp. nov.

Fig. 16D (p. 40), 19, 20; Table 2 (p. 39)

Material examined. Holotype NIWA 99702, NZOI Stn P7, 32.683° S, 167.477° E, Wanganella Bank, off northwestern North Island, International Waters, 150 m, 25 Jan 1977, 1 colony (USNM 1278356, 1 branchlet, NMNH SEM stubs 2177–2179). **Paratype** NIWA 99703, NZOI Stn Z9890, 35.008° S, 172.53° E, off North Cape, North Island, New Zealand, 167 m, 30 Oct 1999, 1 colony (USNM 1278357, 1 branch).

Type locality. Wanganella Bank, off northwestern North Island.

Distribution. Wanganella Bank and off North Cape, North Island (Fig. 20), 150–167 m.

Description. The holotype (Fig. 16D) is a complete, flabellate, dichotomously branched colony 11 cm tall, having a basal branch diameter of 1.0 mm. The terminal branches are relatively short, 1.5–2.5 mm long. The axis is golden yellow. The polyps are cylindrical, expanding slightly apically, and 1.1–1.2 mm in length. Brooding polyps are common, those having a distinct basal swelling in the lower half of the polyp. The polyps are arranged in whorls of four or five, there being seven to nine whorls per cm branch length. There is no polychaete commensalism.

There are eight longitudinal rows of body wall scales, the marginals of each row being 0.28–0.34 mm in width, their distal edges covering only the basal portion of the opercular scales; the more proximal body wall scales, especially those of the inner lateral and adaxial rows, are much smaller (Fig. 19C). The body wall sclerite formula is 9–10: 5–8: 3–4: 2. The body wall scales (Fig. 19A, B, E) are slightly curved to fit the contour of the polyp and have an arched, finely serrate distal margin. The outer surface of the body wall scales is covered with low smooth granules basally, but the distal portion of the scale, which is exposed, is smooth, as though polished. It may appear to be granular, but that is due to seeing the tubercles on the inner surface of the translucent scale. The inner face of the body wall scales is tuberculate except for the distal margin, which is non-tuberculate, but usually covered with longitudinally arranged parallel ridges. The opercular scales (Fig. 19F–G) are 0.33–0.38 mm

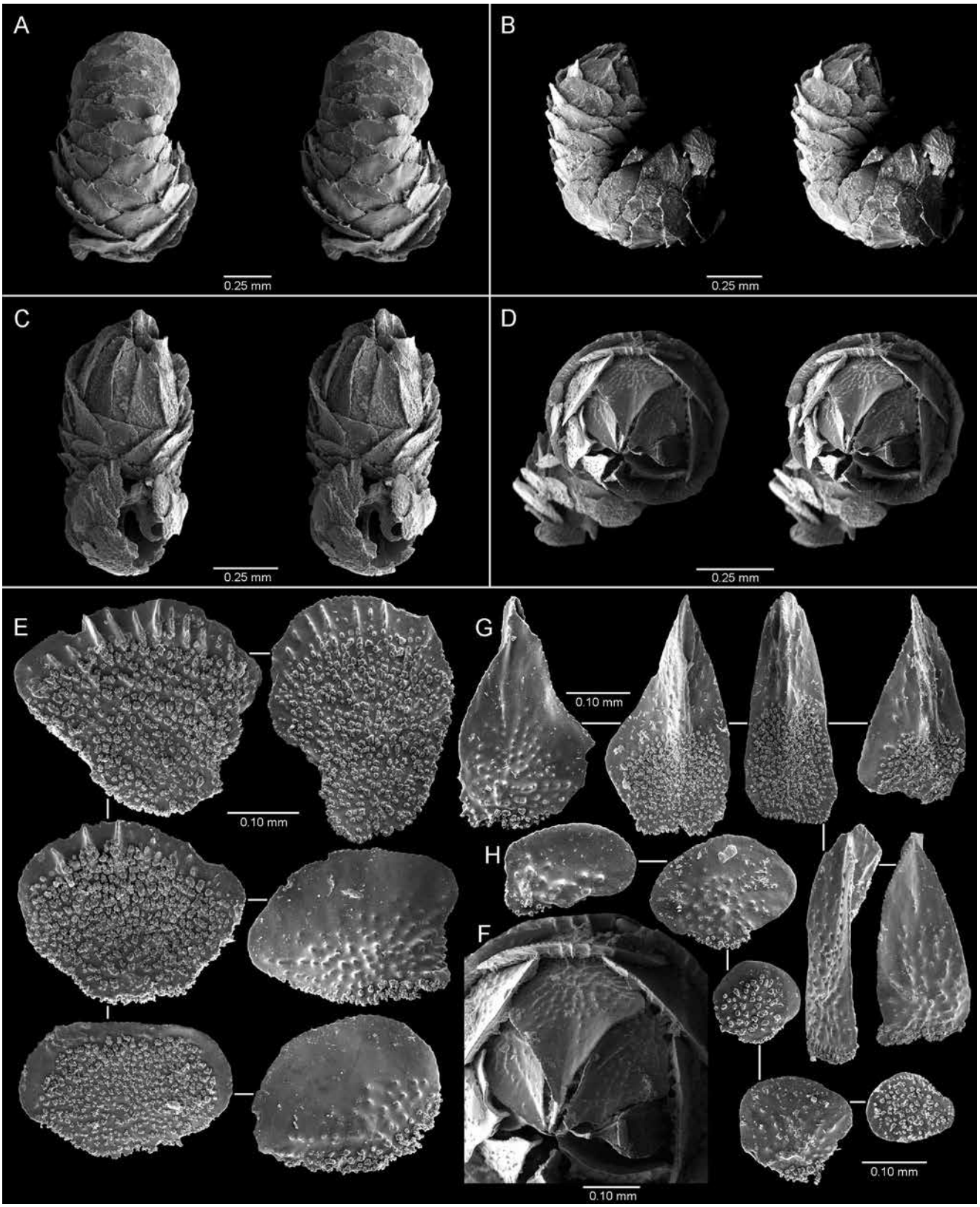

Figure 19. *Metafannyella polita* **sp. nov.**, holotype: **A–D.** stereo views of abaxial, lateral, adaxial, and opercular sides of a polyp, respectively; **E.** abaxial and OL body wall scales; **F.** detail of opercular region of a polyp; **G.** opercular scales; **H.** coenenchymal scales.

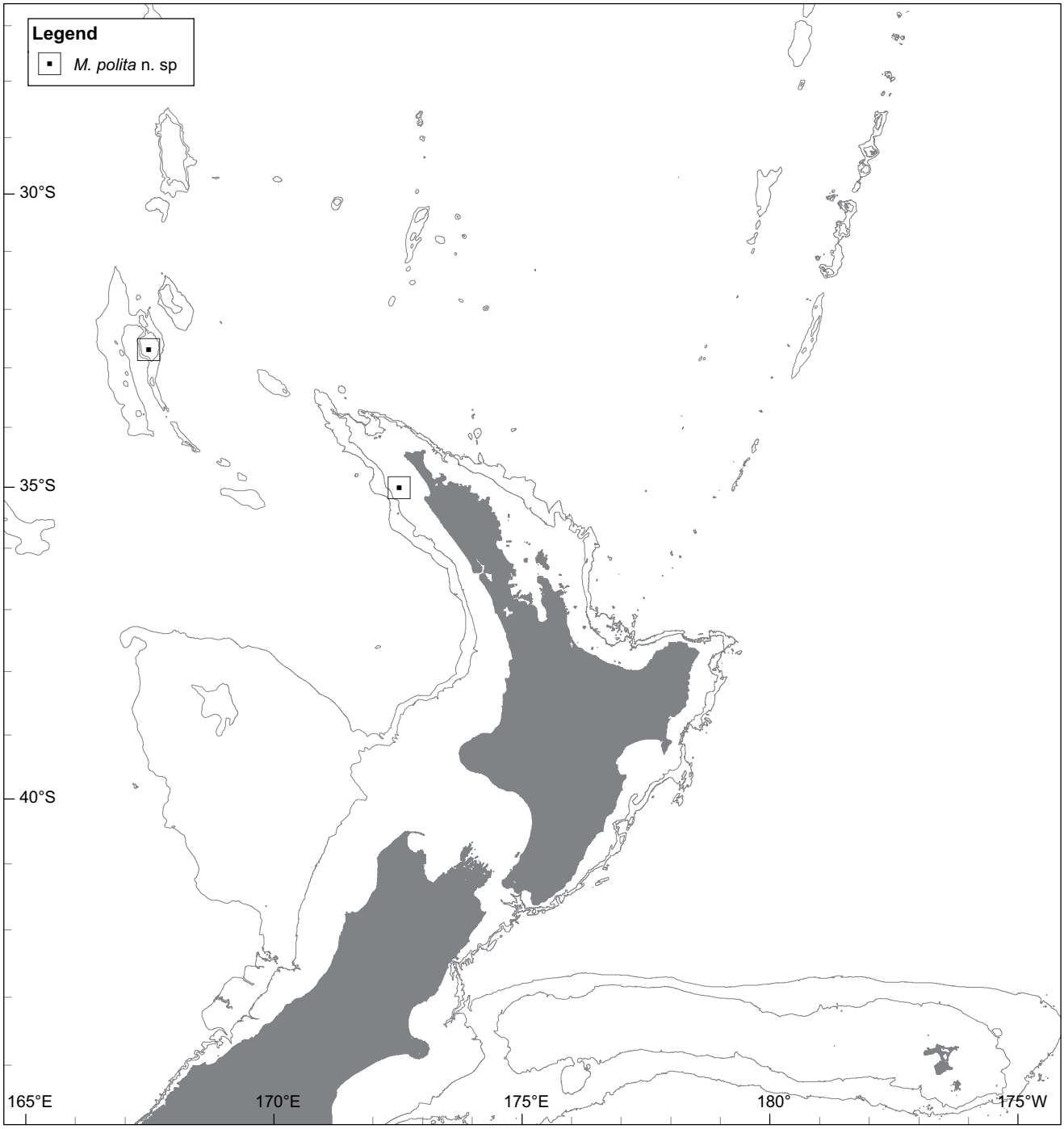

Figure 20. Distribution of *Metafannyella polita* **sp. nov.**

in length, the single abaxial opercular having two symmetrical basal lobes (L:W = 1.5), the single adaxial opercular also symmetrical but without lobes (L:W = 2.5). The other six lateral operculars are asymmetrical, each having a lateral basal lobe on its adaxial side, and an L:W of 1.5–2.5. Their distal outer surface is covered with radiating rows of smooth granules, whereas the distal outer surface is smooth. The proximal inner surface is tuberculate, the distal inner surface bearing a prominent medial keel. The coenenchymal scales (Fig. 19H) are small (0.10–0.24 mm in diameter), circular, imbricate, flat scales. Tuberculate spheroids are not present.

Comparisons. *Metafannyella polita* **sp. nov.** is most similar to *M. ventilabrum* in most characteristics (Table 2) and even in distribution but differs in its colonial growth form and the polished outer surface of its body wall scales.

Etymology. Named *polita* (from Latin *politum*, meaning smooth or polished) in allusion to the smooth distal outer surface of the body wall scales.

Metafannyella eos (Bayer, 1998)

Fig. 16B (p. 40), 21, 22; Table 2 (p. 39)

Fannyella eos Bayer, 1998: 165, 176–177, Fig. 20A, 21, 22; Cairns *et al.* 2009: 93 (listed).

Callogorgia cf. *ventilabrum*, Cairns *et al.* 2009: 93 (in part).

Metafannyella eos, Cairns & Bayer 2009: 28 (listed).

Material examined. Holotype—USNM 82074, *Eltanin* Stn 1411, 51.000° S, 162.017° E, Northern Macquarie Ridge, 333–371 m, 08 Feb 1965. Paratypes—USNM 82975, SMF 6987, same location as holotype.

Other material. *Macquarie Ridge*: NIWA 11272, NZOI Stn D22, 50.633° S, 163.95° E, 755 m, 26 Apr 1963, 1 colony; NIWA 11261 and 11266, NZOI Stn D39, 50.967° S, 165.75° E, 549 m, 07 May 1963, 2 colonies; NIWA 14669, NZOI Stn D149, 49.175° S, 166.85° E, 454 m, 14 Jan 1964, 1 colony; NIWA 42561, SOP Stn TRIP2571/190, 49.9° S, 163.8° E, 780–927 m, 25 Mar 2008, 1 colony (USNM 1278354, 2 branchlets, NMNH SEM stubs 1736–1739, 2175–2176); NIWA 42622, SOP Stn TRIP2571/146, 50° S, 163.8° E, 890–1027 m, 18 Mar 2008, 1 colony.

Type locality. Northern Macquarie Ridge, 333–371 m.

Distribution. Northern Macquarie Ridge, off Auckland Island and Auckland Rise (Fig. 22), 333–1027 m.

Description. Colonies are uniplanar (flabellate) and dichotomously branched, the terminal branches up to 5 cm in length (Fig. 16B). The largest specimen examined (NIWA 11266) is 27 cm in height and 12 cm in width, having a basal branch diameter of 4.4 mm. The branch axis is a dull green-bronze and smooth. The polyps are distinctly clavate (Fig. 21A), up to 2.2 mm in length and about 0.9 mm in distal diameter. The polyps are arranged in whorls of 4–7 (Fig. 21A), and 5–6 whorls occur per cm branch length. Brooding polyps were never observed.

There are eight longitudinal rows of body wall scales, becoming fewer in number per row and narrower from the ab- to the adaxial side, the body wall sclerite formula being 11–15: 6–8: 4–6: 2–3; however the more proximal adaxial side also has smaller, randomly arranged sclerites (Fig. 21D). There is no differentiation among the marginal scales, the distal edges of which cover only the basal part of the opercular scales. The abaxial and outer lateral body wall scales (Fig. 21E) are fan-shaped or asymmetric fan-shaped, and are about 0.3–0.5 mm in width. The inner laterals are somewhat smaller (0.26–0.28 mm wide), the adaxials even smaller (about 0.17 mm wide), and the randomly arranged proximal sclerites are small flat scales 0.10–0.12 mm in diameter that continue to cover the adaxial polyp body, such that the polyp is not naked on its adaxial side. The outer surface of the body wall scales is covered with smooth, low granules and ridges that appear to radiate from a transverse thickness near the proximal part of the scale. The inner face of the scales is tuberculate except for the distal edge which is free of tubercles, and somewhat translucent, bearing 10–15 parallel longitudinally arranged ridges that give the scale a coarsely serrate outer edge. The opercular scales (Fig. 21F) are long and slender, 0.55–0.66 mm in length, and have an L:W of 2.8–3.6. Their outer surface is covered with longitudinal rows and low ridges of smooth granules; their inner proximal surface is covered with tubercles, but their inner distal surface bears a prominent medial keel. The coenenchymal scales (Fig. 21G, H) are small polygonal bodies often twice as deep as wide, arranged in a closely-fit tessellated (mosaic) fashion, the scales up to about 0.2 mm wide. Below the outer layer of coenenchymal scales are smaller, flat, usually elliptical coenenchymals 0.11–0.17 mm in width (Fig. 21H). The longitudinal canals are surrounded with multituberculate spheroids (Fig. 21I) 0.05–0.10 mm in diameter.

Comparisons. *Metafannyella eos* is unique among the species in the genus in having distinctive clavate polyps, tuberculate spheroids, and tessellate coenenchymal scales (see Table 2, and key in Bayer 1998). It is also the southernmost species in the New Zealand region.

Remarks. This is the first subsequent report of this species since its original description, which was based on specimens from one station. Beyond the geographic and bathymetric range extensions supported by these specimens reported herein, little more can be added to the original description except for an illustration of the adaxial side of the polyp and a larger size for the colony.

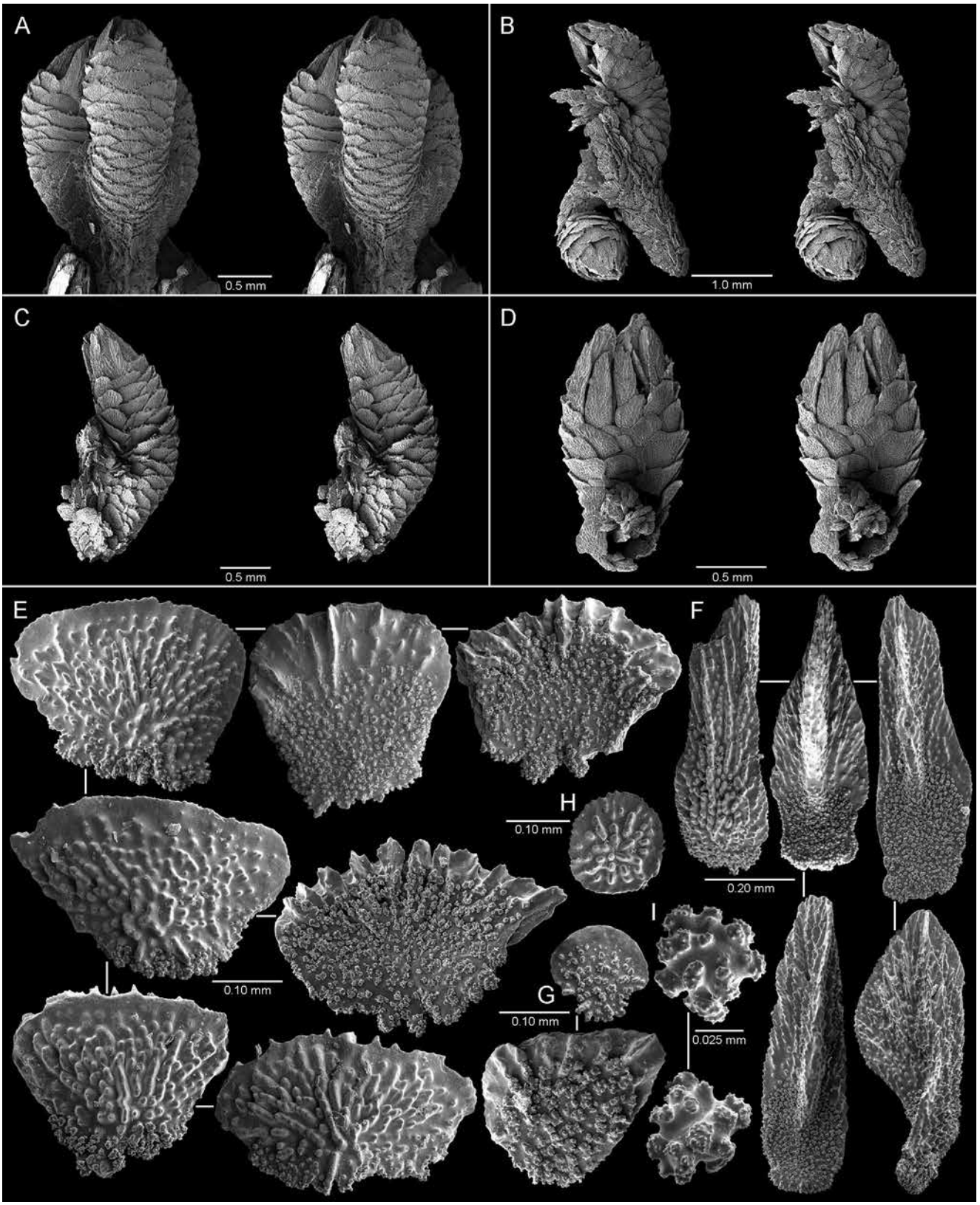

Figure 21. *Metafannyella eos* (Bayer, 1998) from NIWA 42561: **A–B.** stereo views of polyp whorls; **C.** stereo view of lateral edge of polyp; **D.** stereo view of adaxial polyp side; **E.** abaxial and OL body wall scales; **F.** opercular scales; **G.** inner surface of coenenchymal scales; **H.** outer surface of a coenenchymal scale; **I.** multituberculate spheroids.

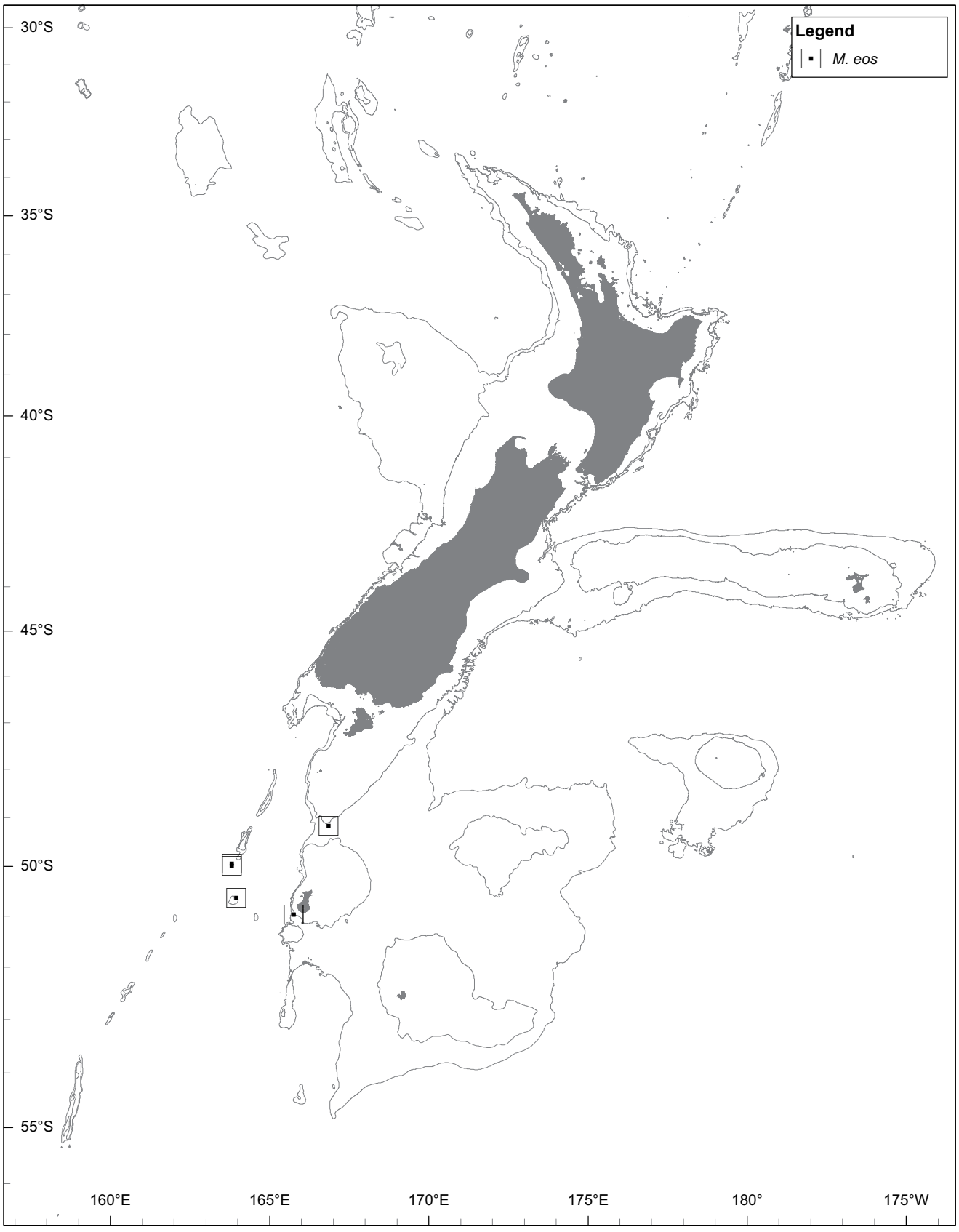

Figure 22. Distribution of *Metafannyella eos* (Bayer, 1998).

Metafannyella chathamensis sp. nov.

Fig. 16C (p. 40), 23, 24; Table 2 (p. 39)

Pterostenella sp., Cairns *et al.* 2009: 93 (listed).

Material examined. Holotype NIWA 9696, NZOI Stn C617, 43.973° S, 175.382° W, east of Chatham Island, Chatham Rise, 302 m, 30 Apr 1961, 1 colony (USNM 1278355, several branchlets, NMNH SEM stubs 2161–2163, 2180). **Paratypes** USNM 98022, *Eltanin* Stn 1403, 41.689° S, 175.483° E, 946–951 m, 31 Jan 1965, 24 colonies; NIWA 69513, SOP Stn TRIP3219/45, 37.4° S, 176.4° E, Bay of Plenty, North Island, New Zealand, 370 m, 02 Nov 2010, 1 colony; NIWA 66287, SOP Stn TRIP3004/43, 44.7° S, 177° W, Chatham Rise, New Zealand, 947–1067 m, 25 Nov 2009, 1 colony; NIWA 66289, SOP Stn TRIP3004/33, 44.5° S, 178.6° W, Chatham Rise, New Zealand, 710 m, 24 Nov 2009, 1 colony; NIWA 78547, NIWA Stn TAN1116/62, 44.078° S, 178.226° E, Chatham Rise, New Zealand, 949–951 m, 10 Nov 2011, 1 colony; NIWA 79242, NIWA Stn TAN1116/128, 43.389° S, 178.997° E, Chatham Rise, New Zealand, 395–401 m, 18 Nov 2011, 1 colony.

Type locality. East of Chatham Island, Chatham Rise.

Distribution. Eastern Chatham Rise, Bay of Plenty, North Island (Fig. 24), 302–1067 m.

Description. The holotype (Fig. 16C) is irregular in branching, part of a colony having five main branches arranged in a plane from which numerous short (5–30 mm in length) branchlets diverge in the plane of the colony, as well as at irregular angles from the anterior face of the colony, producing a bushy, modified bottlebrush arrangement of branchlets. The holotype is 13 cm tall with a basal branch diameter of 3.1 mm, but the largest specimen (NIWA 69513) is 34 cm in height. The posterior face of the colony is bare or is modified into a polynoid polychaete tube by the curvature of short branchlets into a framework of a tube, which is subsequently filled in by coenenchymal scales to form a continuous canopied tube, much as in *Fanellia histoclados*. The polyps have a slender mid-region and somewhat clavate tip, 1.2–1.3 mm in height, and about 0.45 mm in distal diameter. They are densely arranged (28–30 polyps per mm) in random order (Fig. 23A–B) on the branchlets and main branches (not in pairs or whorls), and their distal portions are usually directed anteriorly. Brooding polyps, with enlarged basal regions, are quite common.

There are eight longitudinal rows of body wall scales, becoming fewer in number per row and narrower from the ab- to the adaxial side (Fig. 23B–D), the body wall sclerite formula being 5–8: 5–8: 4–6: 2–3, the adaxial polyp face being fully covered (Fig. 23D). Most of the body wall scales are oval to semi-circular, curved to fit the contour of the polyp, and have a curved, finely serrate (Fig. 23E) distal margin. The abaxial and outer lateral body wall scales are 0.29–0.34 mm in width; the inner laterals are about 0.28 mm in width; and the adaxials are 0.22–0.23 mm wide. The outer surface of the body wall scales is covered with smooth, low granules that appear to radiate from a transverse thickness near the proximal part of the scale, although the outer distal margins are relatively smooth. The inner face of the scales is tuberculate except for the distal edge, which is free of tubercles, somewhat translucent, and, in the case of the marginals, bears 10–15 parallel, longitudinally arranged ridges; scale with a finely serrate distal edge. The submarginal body wall scales do not have these distal ridges. The distal margins of the marginal scales cover only the base of the opercular scales. The highly spinose opercular scales (Fig. 23F) are 0.40–0.56 mm in length; the abaxial operculars have a wide basal section (L:W = 1.9), whereas the adaxials are shorter and narrower (L:W = 3.1). Their outer surface is covered with four or five rows of granules or small spines that appear to radiate from a basal position on the scale. Their proximal inner surface is covered with tubercles, and the distal portion bears a prominent medial keel. The edges of the opercular scales and keel are finely serrate. The coenenchymal scales (Fig. 23G) are small (0.13–0.16 mm in diameter), circular, imbricate, flat scales. Tuberculate spheroids are not present.

Comparisons. *Metafannyella chathamensis* **sp. nov.** is distinctive among the species within its genus by having a bottlebrush arrangement of branchlets, which accommodates a commensal polychaete worm (Table 2). It is also unique in having unordered polyps (not arranged in whorls), as well as being the only species of this genus to occur on the Chatham Rise. Its bottlebrush branching is similar to many species of *Thouarella*, but it differs from that genus in having non-keeled marginal scales.

Etymology. Named *chathamensis* after the type locality of the species.

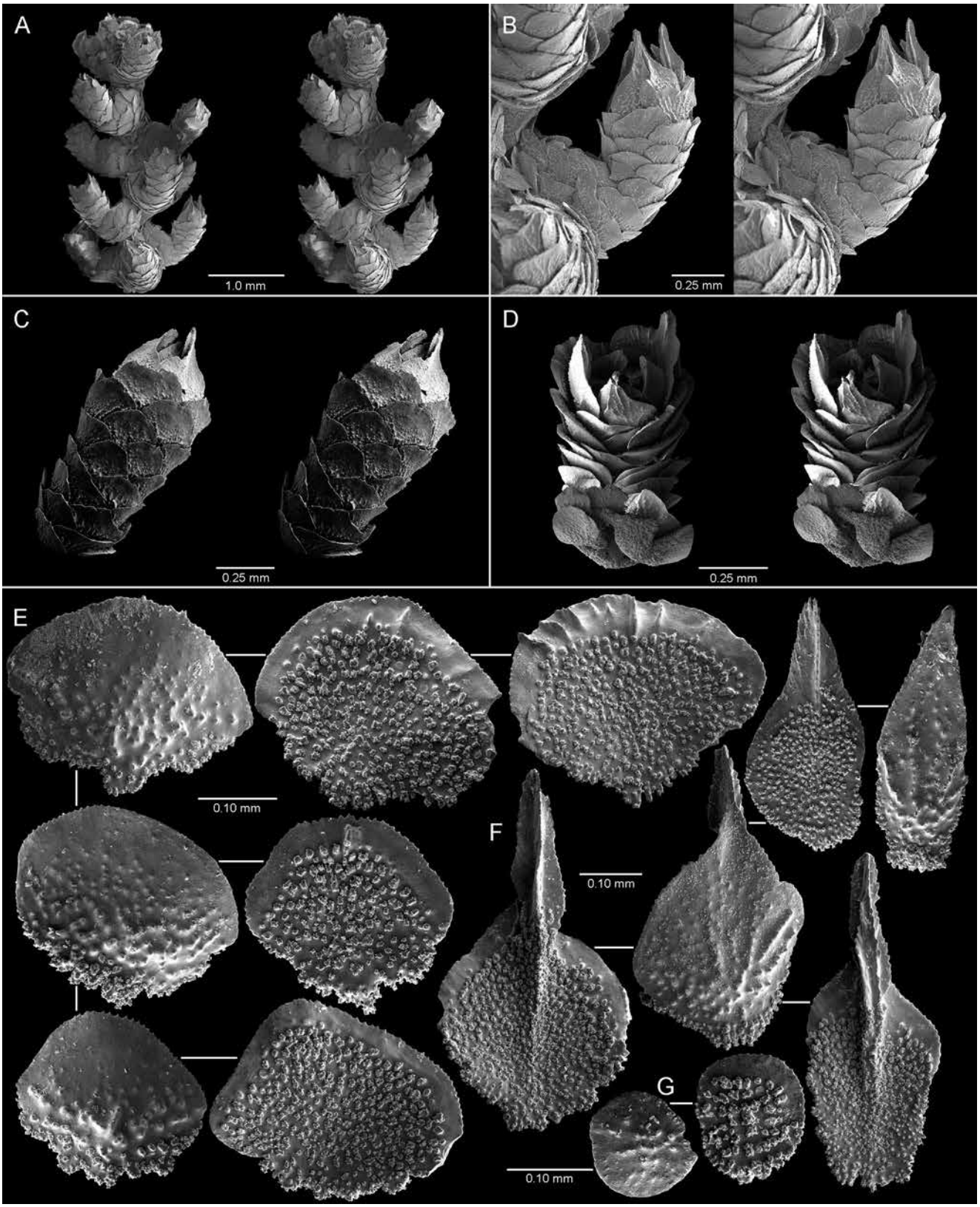

Figure 23. *Metafannyella chathamensis* **sp. nov.**, holotype: **A.** stereo view of a branch segment; **B–D.** stereo views of lateral, abaxial, and adaxial sides of a polyp, respectively; **E.** body wall scales; **F.** opercular scales; **G.** coenenchymal scales.

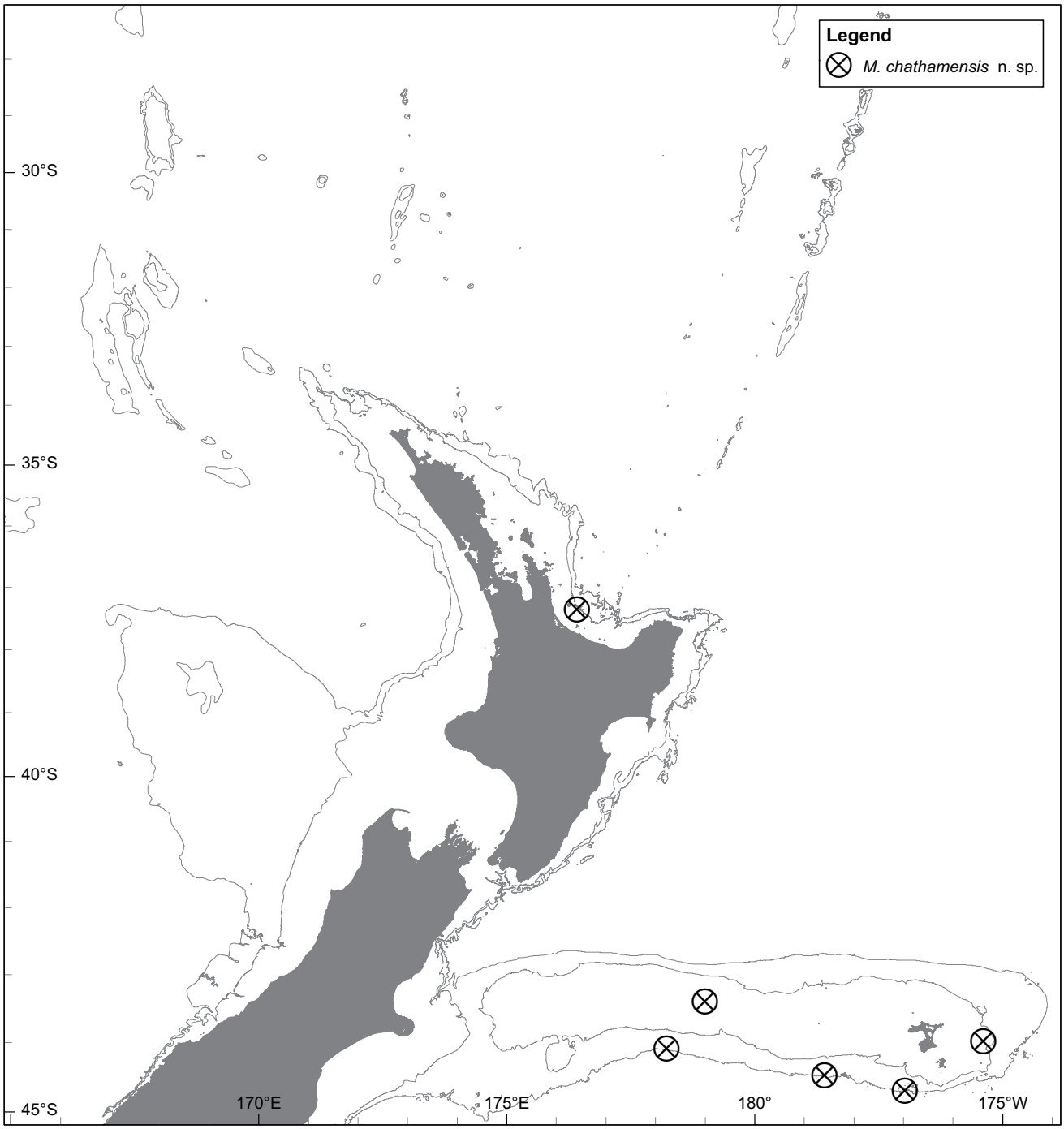

Figure 24. Distribution of *Metafannyella chathamensis* **sp. nov.**

Genus ***Plumarella*** Gray, 1870

Plumarella Gray, 1870: 36.

Plumarella, Wright & Studer 1889: xlix, 73–74; Kükenthal 1919: 340–343; Bayer 1961: 293; Cairns & Bayer 2004b: 448–449; Cairns & Bayer 2009: 39–40, Fig. 12K–S (more complete synonymy); Zapata-Guardiola & López-González 2012: 232–233; Zapata-Guardiola *et al.* 2012: 372.

Type species. *Gorgonia penna* Lamarck, 1815.

Diagnosis. Colonies usually uniplanar and alternately pinnately branched, but may also be bushy, dichotomous, and bottlebrush in branching. Polyps arranged in alternate biserial fashion (nominate subgenus), in random order (subgenus *Dicholaphis*), paired (subgenus *Faxiella*), or in whorls (subgenus *Verticillata*). Polyps covered by eight rows of body wall

scales, the scales of the adaxial rows sometimes reduced in number and size. Distal edges of marginal scales do not cover opercular bases. Their distal margins may be straight, spinose, of finely serrate; marginals lack inner keel. Opercular scales not keeled, except in subgenus *Faxiella*.

Remarks. Including the two new species described herein, there are 39 species in the genus (see Cairns & Bayer 2009, Cairns 2011, Taylor & Rogers 2015), most of which (26 species) are in the nominate subgenus. Three species of *Plumarella* were listed by Cairns *et al*. (2009) in the checklist of New Zealand living Cnidaria, reported as *P*. cf. *aurea*, *P*. cf. *longispina*, and *Plumarella* sp. No specimens identified as such were found in the NIWA collections and thus they are only mentioned here. It is unlikely that the two named species would occur in this geographic region. *Plumarella*, currently consisting of four subgenera, is a diverse genus, sometimes with overlapping characters with other genera such as *Callogorgia*; for instance, *Plumarella* (*Faxiella*) *delicatula* has keeled opercular scales; and *Plumarella* (*Verticillata*) species has polyps arranged in whorls. Clearly more specimens need to be examined and molecular analyses done. Preliminary molecular analyses of a limited number of *Plumarella* and *Callogorgia* species (Taylor & Rogers 2015; Cairns & Wirshing in prep.) do distinguish the genera based on mitochondrial and nuclear genes.

Distribution. Western Pacific, Aleutian Islands, Ecuador, Patagonia, Macquarie Island, New Zealand, northwestern Atlantic (Watling *et al*. 2011: Fig. 2.21), 10–3182 m.

Subgenus ***Plumarella*** (***Dicholaphis***) Kinoshita, 1907

Type species. *Dicholaphis delicata* Kinoshita, 1907.

Diagnosis. *Plumarella* in which the polyps occur on all sides of the branches.

Remarks. The eight previously known species in this subgenus were discussed and keyed by Cairns (2011). The discovery of a species from the New Zealand region significantly extends the range of this subgenus.

Distribution. Aleutian Islands, Japan, New Zealand, 40–2514 m.

Plumarella (***Dicholaphis***) ***cordilla*** **sp. nov.**

Fig. 16E (p. 40), 25, 26

Material examined. Holotype NIWA 11057, NZOI Stn P5, 32.607° S, 167.51° E, Wanganella Bank, Norfolk Ridge, International Waters, 126 m, 25 Jan 1977 (USNM 1278360, 1 branchlet, NMNH SEM stubs 1748–1750, 2181–2182). **Paratypes** NIWA 11058, and 11067, NZOI Stn G1, 32.583° S, 167.383° E, off Noumea, New Caledonia, International Waters, 138 m, 14 Sep 1966, 7 colonies; NIWA 11059, NZOI Stn P2, 32.594° S, 167.529° E, Wanganella Bank, 122 m, 24 Jan 1977, 28 colonies; NIWA 11065, NZOI Stn P1, 32.591° S, 167.533° E, Wanganella Bank, 122 m, 24 Jan 1977, 15 colonies; NIWA 11068, NZOI Stn E864, 32.6° S, 167.6° E, Wanganella Bank, 130 m, 19 Mar 1968, 4 colonies (USNM 1278362, 1 colony); NIWA 11069, NZOI Stn P6, 32.613° S, 167.51° E, Wanganella Bank, 127 m, 25 Jan 1977, 5 colonies; NIWA 11073, NZOI Stn P7, 32.683° S, 167.477° E, Wanganella Bank, 150 m, 25 Jan 1977, 1 colony; NIWA 99997, NZOI Stn P5, 32.607° S, 167.51° E, Wanganella Bank, 126 m, 25 Jan 1977, 17 colonies; NIWA 99704, NZOI Stn E323, 34° S, 172.25° E, Three Kings Islands, New Zealand, 165 m, 11 Apr 1965, 1 colony; NIWA 99705, NZOI Stn F923, 34.125° S, 172.778° E, off North Cape, New Zealand, 143 m, 13 Oct 1968, 1 colony; NIWA 54691, NIWA Stn TAN0906/21, 35.486° S, 174.501° E, Bay of Islands, North Island, New Zealand, 63–59 m, 05 Jul 2009, 5 colonies (USNM 1278361, 1 colony); NIWA 54745, NIWA Stn TAN0906/24, 35.515° S, 174.641° E, Bay of Islands, 105–107 m, 05 Jul 2009, 1 colony; NIWA 55582, NIWA Stn TAN0906/90, 34.956° S, 173.873° E, Bay of Islands, 56–55 m, 09 Jul 2009, 2 colonies; NIWA 57139, NIWA Stn TAN0906/181, 34.44° S, 173.13° E, Bay of Islands, 115–110 m, 15 Jul 2009, 1 colony; NIWA 93648, NIWA Stn TAN0906/109, 34.716° S, 173.556° E, Bay of Islands, 172–170 m, 10 Jul 2009, 1 branch; NIWA 93678, NIWA Stn TAN0906/81, 34.879° S, 173.917° E, Bay of Islands, 115–112 m, 08 Jul 2009, 1 colony; NIWA 99706, NZOI Stn J966, 34.865° S, 173.862° E, off Whangaroa, 120 m, 20 June 1981, 1 colony.

Type locality. Wanganella Bank.

Distribution. Wanganella Bank (southern Norfolk Ridge), off northern North Island, New Zealand (Fig. 26), 56–170 m.

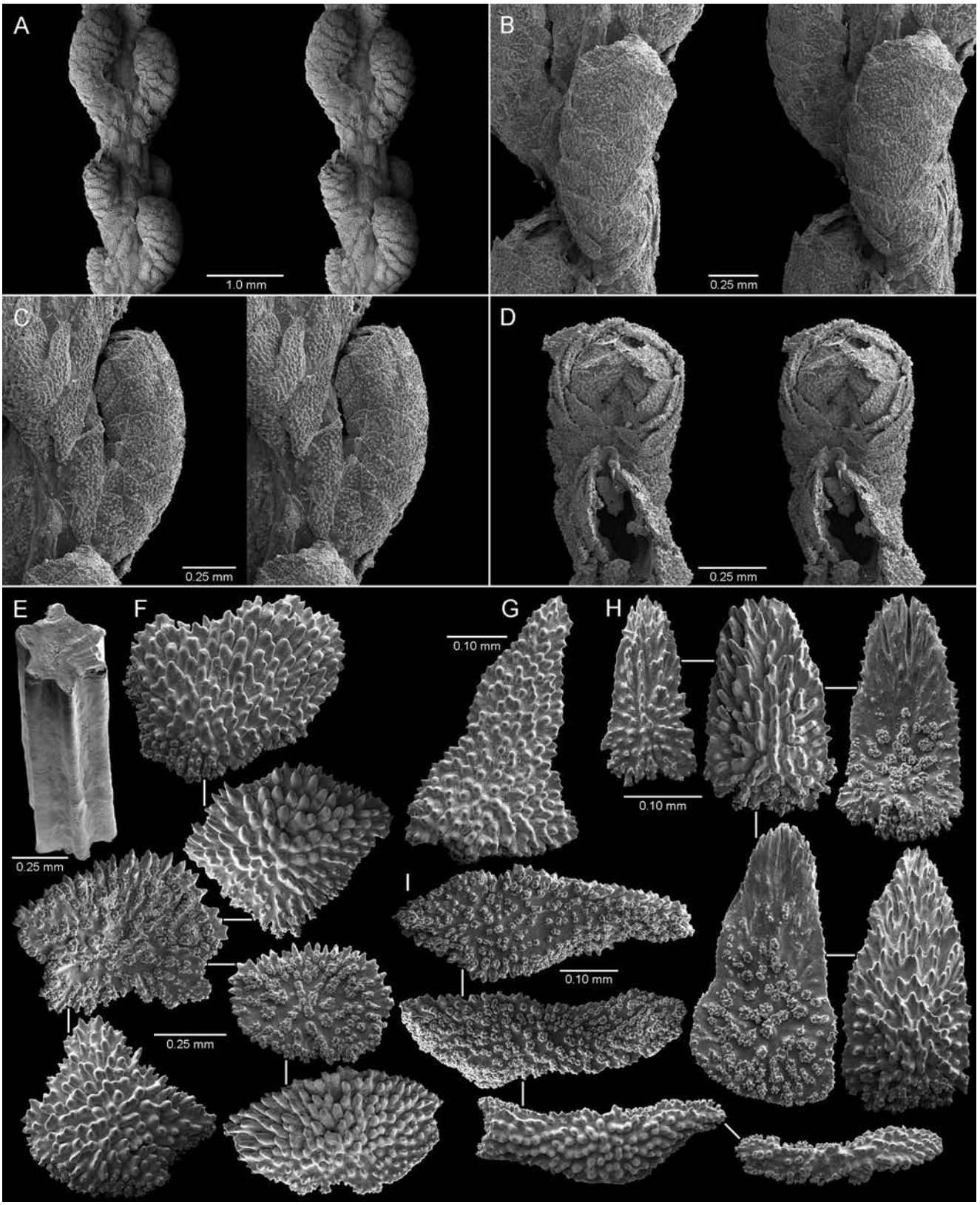

Figure 25. *Plumarella* (*Dicholaphis*) *cordilla* **sp. nov.**, holotype: **A–B.** stereo views of irregular arrangements of polyps on branchlets; **C–D.** stereo views of lateral and adaxial sides of a polyp, respectively; **E.** segment of ridged axis; **F.** body wall scales; **G.** body wall scale adjacent to coenenchyme; **H.** opercular scales; **I.** coenenchymal scales.

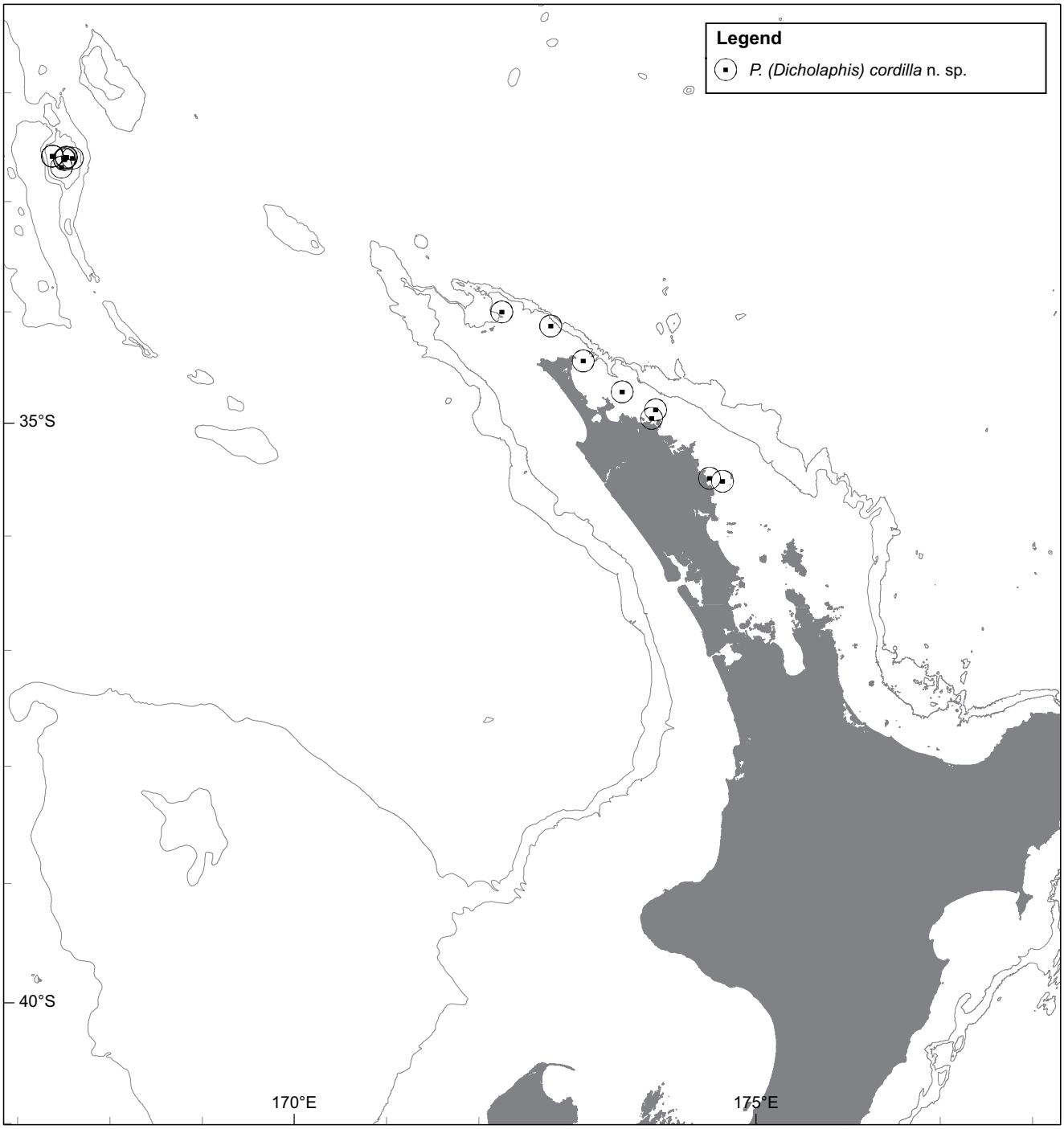

Figure 26. Distribution of *Plumarella* (*Dicholaphis*) *cordilla* **sp. nov.**

Description. The lower region of the colonies has an irregularly pinnate branching mode (Fig. 16E), sometimes the branchlets asymmetrically originating from one side of a main branch (candelabra-type), but in other cases being symmetrical. Branchlets are subsequently dichotomously branched, but often remain unbranched and reach up to16 cm in length. Some colonies are uniplanar but most are somewhat bushy. The basal 4–5 cm of the holotype is a monopodial stem, above which branching occurs. The intact colony is 16 cm tall, with a basal branch diameter of 2.2 mm, but colonies may be up to 21 cm in height (NZOI Stn P6). The colonies are quite flexible and the branches are relatively slender, the distinctive internal axis bearing six to nine longitudinal ridges (Fig. 25E), the ridges each about 0.1 mm in height; the colour of the axis is a light translucent brown. The polyps are cylindrical, upturned, and 0.9–1.4 mm in length. They

occur on all sides of branches and branchlets in no order (Fig. 25A, B), although sometimes they appear to be arranged in pairs; 10–30 polyps occur per cm of branch, depending on the position within the colony. Polyps are white. Occasionally brooding polyps are present, these being up to three times the diameter of a normal polyp.

There are eight longitudinal rows of body wall scales, becoming fewer and less wide from the ab- to adaxial side (Fig. 25D) of the polyp; the body wall sclerite formula is: 9–10: 6–8: 2–4: 1–2. The body wall scales (Fig. 25F) are rectangular and have a straight but serrate distal margin, ranging from 0.23–0.36 mm in width. The basalmost body wall scales are somewhat triangular and curved (Fig. 25G), forming a transition between the rectangular body wall scales and the irregularly shaped coenenchymals. The outer surface of the body wall scales is completely covered with prominent blunt spines, whereas the inner surface is covered with tubercles and does not bear ridges or keels. The opercular scales (Fig. 25H) range from 0.26–0.34 mm in length, decreasing in length from the ab- to abaxial side of the polyp, but maintaining an L:W of 1.7-2.0. The opercular are slightly curved to form a conical operculum. Their outer surface, like the body wall scales, is covered with tall blunt spines that are often arranged on radiating ridges; the proximal inner surface is tuberculate, whereas the distal inner surface is relatively smooth to striate. The coenenchymal scales (Fig. 25I) are oval to irregular in shape, up to 0.43 mm in length, and like the other scales, bear prominent blunt spines on their outer surface.

Comparisons. Among the eight species in the subgenus *Plumarella* (*Dicholaphis*), *P. cordilla* **sp. nov.** keys closest to *P. profunda* Cairns, 2011 (Aleutian Islands, 2514 m), both species having pinnate branching and rectangular marginal body wall scales. Aside from the geographic and bathymetric differences, *P. cordilla* **sp. nov.** differs from that species in having a spiny body wall, opercular and coenenchymal scales, more scales per body wall row, and in having shorter opercular scales.

Etymology. Named *cordilla* (Latin for small cord, as might be used in a musical instrument), an allusion to the tough, flexible, wire-like axis of the species.

Subgenus ***Plumarella*** (***Faxiella***) Zapata-Guardiola & López-González, 2012

Type species. *Amphilaphis abietina* Studer, 1894.

Diagnosis. *Plumarella* in which the polyps occur in pairs, and inner face of opercular is keeled.

Remarks. This subgenus is distinguished from the three others in the genus by having paired polyps. Only two species are attributed to this subgenus, the type species from off Ecuador and the other described herein. The holotype of *P. abietina* was recently redescribed by Zapata and López-González (2012).

Distribution. Macquarie Island (Australian EEZ); Bay of Plenty, New Zealand; off Ecuador, 520–3182 m.

Plumarella (***Faxiella***) ***delicatula*** (Thomson & Rennet, 1931)

Fig. 16F (p. 40), 27, 28

Dicholaphis delicatula Thomson & Rennet, 1931: 30, Pl. 9, Fig. 8–9, Pl. 12, Fig. 4.
Mirostenella delicatula, Cairns & Bayer 2009: 28, 38–39 (listed).
Plumarella (*Faxiella*) *delicatula*, Zapata-Guardiola, López-González & Gili 2012: 233–236, Fig. 6–7.

Material examined. *Bay of Plenty*: NIWA 72100, NIWA Stn TAN1104/10, 36.475° S, 177.865° E, 1168–1198 m, Clark Seamount, 03 Mar 2011, 2 colonies (USNM 1278363, 1 branch fragment, NMNH SEM stubs 2142–2143, 2186).

Chatham Rise: NIWA 53764, NIWA Stn TAN0905/103, 44.158° S, 174.555° W, Iceberg Seamount, 520–650 m, 26 Jun 2009, 2 colonies.

Type & locality. Holotype—AM G13266, 54.600° S, 158.800° E, off Macquarie Island, Australian EEZ, 2743 m.

Distribution. Macquarie Island, east of Pitt Island, and Bay of Plenty, North Island (Fig. 28), 520–2743 m.

Description. The two specimens from NIWA 72100 may be parts of the same colony, and are similar in size, fragility, and branching to the holotype: one colony is 30 mm in height, with four terminal branches (Fig. 16F), the other 55 mm in width, with seven terminal branches. The holotype is 40 mm in height, with nine terminal branches. In general, the colony is extremely delicate (as the name implies), uniplanar, and has a slender basal branch diameter of about 0.2 mm. The

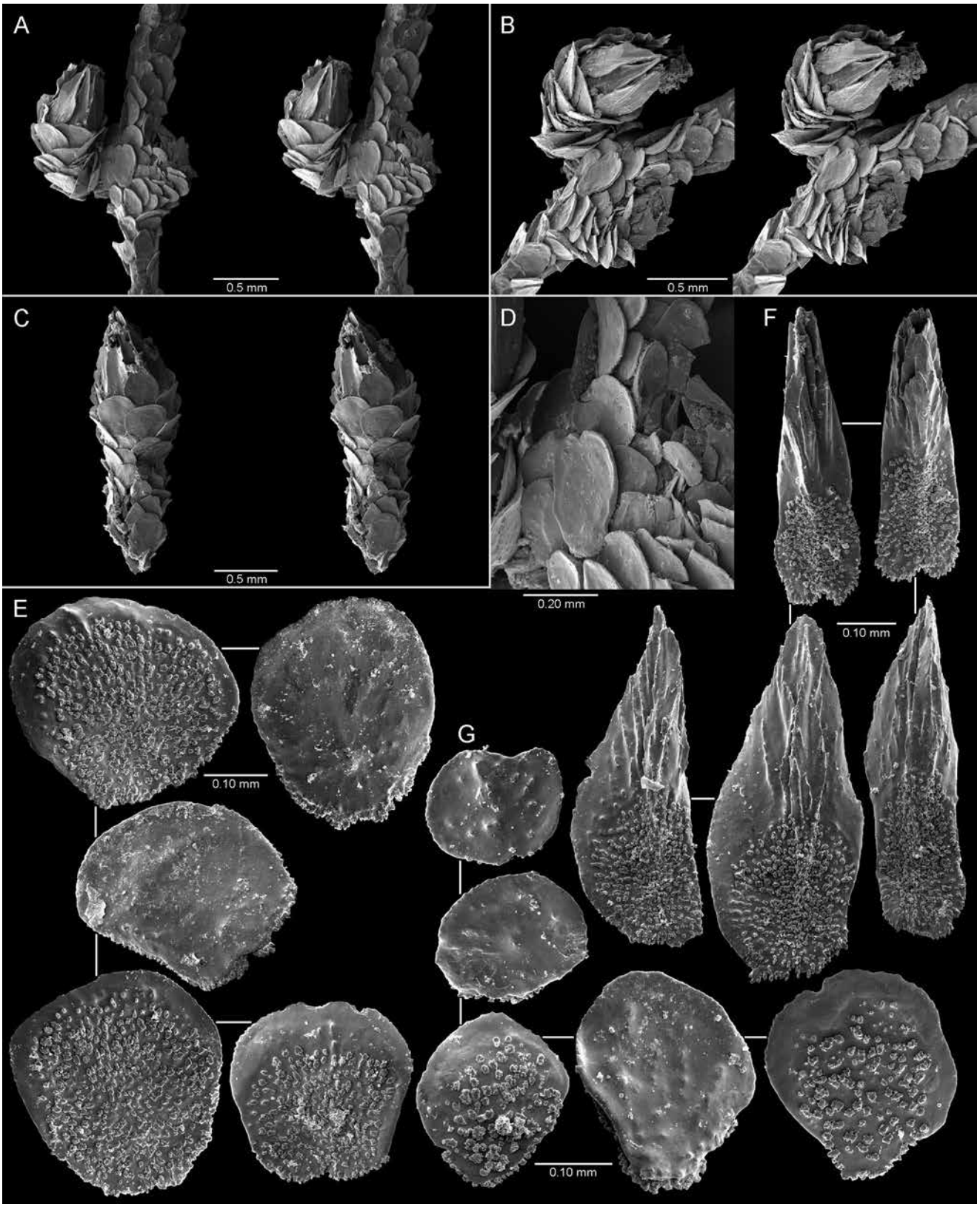

Figure 27. *Plumarella* (*Faxiella*) *delicatula* (Thomson & Rennet, 1931) from NIWA 72100: **A–B.** stereo views of paired polyps; **C.** stereo view of abaxial side of polyp; **D.** coenenchymal scales *in situ*; **E.** body wall scales; **F.** opercular scales; **G.** individual coenenchymal scales.

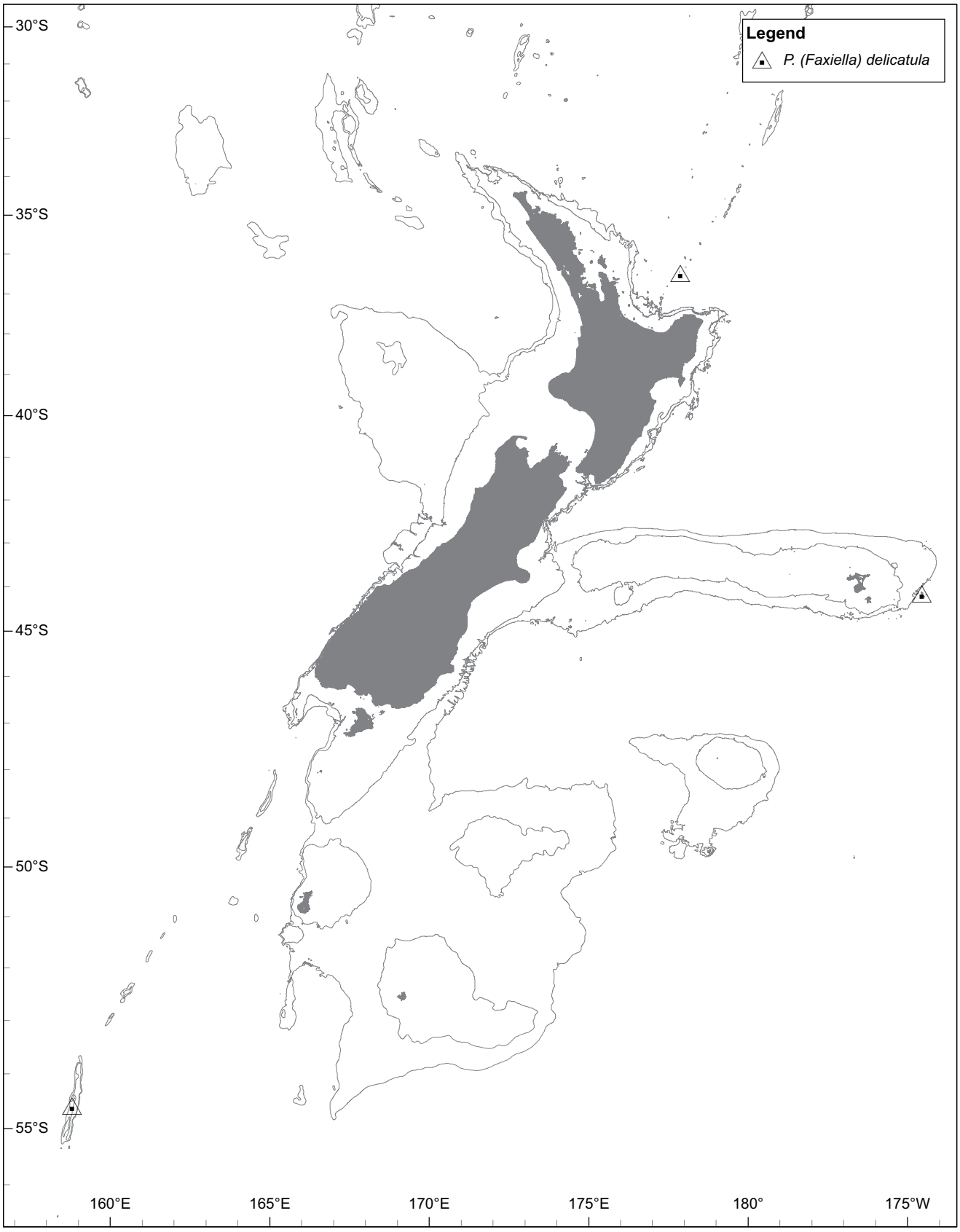

Figure 28. Distribution of *Plumarella* (*Faxiella*) *delicatula* (Thomson & Rennet, 1931).

axis is pale yellow. The polyps are paired (Fig. 27A, B), approximately four pairs occurring every cm of branch length. The polyps are curved upward, 1.2–1.5 mm in length, and slightly flared distally (Fig. 27C). The colonies from NIWA 53764 differ from the above mentioned and the type in having alternating polyps as well as paired polyps and a colony that is loosely pinnate.

There are eight longitudinal rows of body wall scales, becoming only slightly fewer in number per row and narrower from the ab- to the adaxial side, the adaxial side of the polyp being fully covered with scales. The body wall sclerite formula is: 4–7: 3–4:3–4: 3–4. All body wall scales (Fig. 27E), including the marginals, are flat to slightly concave, with a rounded distal edge, the marginal scales being 0.31–0.36 mm in width, the more proximal body wall scales 0.16–0.30 mm in width. The outer surface of the body wall scales is essentially flat and smooth; the inner surface is covered with low tubercles, except for the distal margin (40–50 μm in width), which is flat. The opercular scales (Fig. 27B, F) are triangular to lanceolate, long and slender (L:W = 2.3–3.2), 0.4–0.6 mm in length. They have a longitudinally concave, smooth outer surface; a tuberculate inner proximal surface; and a multiple-keeled inner distal surface. The coenenchymal scales (Fig. 27D, G) are virtually indistinguishable from the body wall scales, elliptical to round in shape, having a slightly concave smooth outer face, and a tuberculate inner surface. They are slightly smaller than the body wall scales, averaging about 0.22 mm in width, and are arranged in a linearly imbricate fashion.

Comparisons. *Plumarella delicatula* differs from the type species, *P. abietina* (Studer, 1894) in having smaller polyps and thus smaller scales, more polyp pairs per cm branch (four v. two for *P. abietina*), having dichotomous branching (that of *P. abietina* is loosely pinnate), and having a smooth outer surface of the operculars and body wall scales, those of *P. abietina* being prominently ridged with serrate edges.

Remarks. These are the first subsequently reported specimens of this species since its original description, and they agree in most characteristics with the original description and the redescription of Zapata-Guardiola *et al.* (2012). The multiple-keeled opercular scales of *P.* (*Faxiella*) blurs its distinction from the genus *Plumarella*.

This species should not be confused with the similarly spelled *Plumarella* (*Dicholaphis*) *delicata* (Kinoshita, 1907) from Japan.

Genus ***Callogorgia*** Gray, 1858

Callogorgia Gray, 1858: 286.

Callogorgia, Bayer 1982: 119–123 (key to Indo-Pacific species); Bayer 1998: 162–163; Cairns & Bayer 2002: 841–845 (key to western Atlantic species); Cairns & Bayer 2009: 40, Fig. 1A–D (more complete synonymy).

Calligorgia Gray, 1870: 35 (unjustified emendation).

Caligorgia Wright & Studer, 1889: 75–77 (unjustified emendation).

Type species. *Gorgonia verticillata* Pallas, 1766, by monotypy.

Diagnosis. Colonies uniplanar, pinnately (alternate or opposite) or dichotomously branched. Polyps cylindrical, often clavate, arranged in whorls of up to 12, all polyps facing upward. Polyps covered with eight longitudinal rows of body wall scales, the number of scales in each row decreasing from ab- to adaxial polyp side, the adaxial side largely unprotected (naked). Distal edges of marginal scales do not project beyond the opercular bases. Body wall scales granular, smooth, or covered with tall ridges. Inner side of opercular scales convex, covered with a multiple serrate keel. Coenenchymal scales imbricate or tessellate.

Remarks. Including the two new species described herein, there are currently 26 species known in the genus (Cairns & Bayer 2009, Taylor & Rogers 2015), six of which occur in the New Zealand region (Table 3). Bayer (1982) provided a useful key to the Indo-Pacific species of the genus, which constitute the majority of the species; only five other species are known from the Atlantic Ocean. Regarding his key, however, one must keep in mind that two species in this key have been transferred to other genera (*C. ventilabrum* and *C. laevis*), and two more must be added (*C. gilberti* and *C. dubia* (Thomson & Henderson, 1906)), as well as the two new species described herein. The primary characters used by Bayer (1982) and Kükenthal (1919, 1924) before him were: gross morphology of the colony, number of body wall sclerites in the various longitudinal rows, and size of the polyps.

Callogorgia (Table 3) has morphological similarities to *Metafannyella* (Table 2, p. 39) *Plumarella,* and *Fanellia* (Table 4, p. 73) as discussed in the accounts of those three genera.

Distribution. Indo-Pacific, North Atlantic, 37–2472 m (see Watling *et al.* 2011: Fig. 2.18).

Callogorgia dichotoma sp. nov.

Fig. 16G (p. 40), 29, 30; Table 3

Material examined. Holotype NIWA 15493, NIWA Stn SMT0001/15, 36.169° S, 176.739° E, Raukumara Plain, off the Bay of Plenty, North Island, New Zealand, 933–940 m, 17 Jun 2000, 1 colony (USNM 1278364, numerous dried calyces, NMNH SEM stubs 2137–2139, 2187–2188, 2196).

Type locality. Raukumara Plain, off the Bay of Plenty.

Distribution. Known only from type locality (Fig. 30).

Description. The holotype (Fig. 16G) is a uniplanar colony 26 cm tall, with a basal branch diameter of 1.65 mm. Branching is dichotomous, the terminal branchlets rarely more than 3 cm in length. The polyps are arranged in pairs (Fig. 29A, B) (on opposite sides of a branchlet) or whorls of three, rarely four, four to six whorls occurring per cm branch length. The polyps are 1.8–2.2 mm in length, expand slightly distally (Fig. 29C), and are directed upward along the branch. Brooding polyps, twice the width of a normal polyp, are common. The polyps and coenenchyme are white.

There are eight longitudinal rows of body wall scales, decreasing in number from ab- to adaxial polyp side, the body wall sclerite formula being: 5–6: 5–6: 2–3: 1+. Below the adaxial marginals there are some smaller, irregularly arranged elliptical scales, but the adaxial polyp side is short and, for the most part, uncovered (Fig. 29C). Most of the body wall scales are semi-circular to fan-shaped (Fig. 29E), with a serrate distal edge, the serrations sometimes corresponding to low, closely spaced, radiating ridges on the outer surface; the inner surface is tuberculate. Many, but not all, of the body wall scales have a projecting medial apex, most commonly seen on the marginal scales. The distal margins of the eight marginal scales (Fig. 29F) cover only a small basal part of the operculum and does not fold over it (Fig. 29F). The opercular scales (Fig. 29G) range in length from 0.45–0.85 mm, decreasing in length from the ab- to adaxial side, altogether forming a tall conical operculum that constitutes a significant fraction of the polyp length; their L:W ranges from

Table 3. Comparison of New Zealand species of *Callogorgia* Gray, 1858.

	C. dichotoma	*C. formosa*	*C. gilberti*	*C. sertosa*	*C. tessellata*
Branching mode	dichotomous	opposite-pinnate	alternate-pinnate	alternate-pinnate	alternate-pinnate
Length of terminal branchlets	less than 3 cm	to 15 cm		to 5 cm	to 9 cm
Polyps/whorl	2–3	3–5	4–5	3–4	4–5
Whorls/cm	4–6/cm	4/cm	4/cm	4–4.5/cm	6–7/cm
Polyp length	1.8–2.2 mm	1.4–1.6 mm	1.5–1.8 mm	1.4–1.8 mm	1.0–1.2 mm
Body wall sclerite formula	5–6:5–6:2–3:1+	8–10:7–9:2–5:1–3	11–13:3–7:2–4:1–2	7–9:5–7:2:1–2	9–11:6–8:2:1
Body wall sclerite shape	fan-shaped	rectangular	fan-shaped	rectangular	rectangular
Body wall sclerite outer sculpture	low radiating serrate ridges	serrate distally, smooth outer surface	highly ridged	pitted	smooth with low granules
Opercular tip	blunt	blunt	pointed	blunt, rod-like	pointed
Coenenchymal scale arrangement	imbricate	imbricate	imbricate	tessellate	tessellate
Coenenchymal scale thickness and shape	thin, rectangular	thick, elongate	thick, elongate	thick, rectangular	thick, irregular
Coenenchymal scale surface sculpture	ridged, central boss	granular	granular, occasionally ridged	pitted	smooth (low granules)
Other unique characters	operculars sometimes bifid; marginals sometimes pointed	operculars covered with coarse blunt spines		operculum tall	
Distribution and depth range	North Island 933–940 m	southern Norfolk Ridge and North I. 313–341 m	Lord Howe Rise and North I. 766–1145 m	Kermadec Islands 398 m	Three Kings and North I. 340–540 m

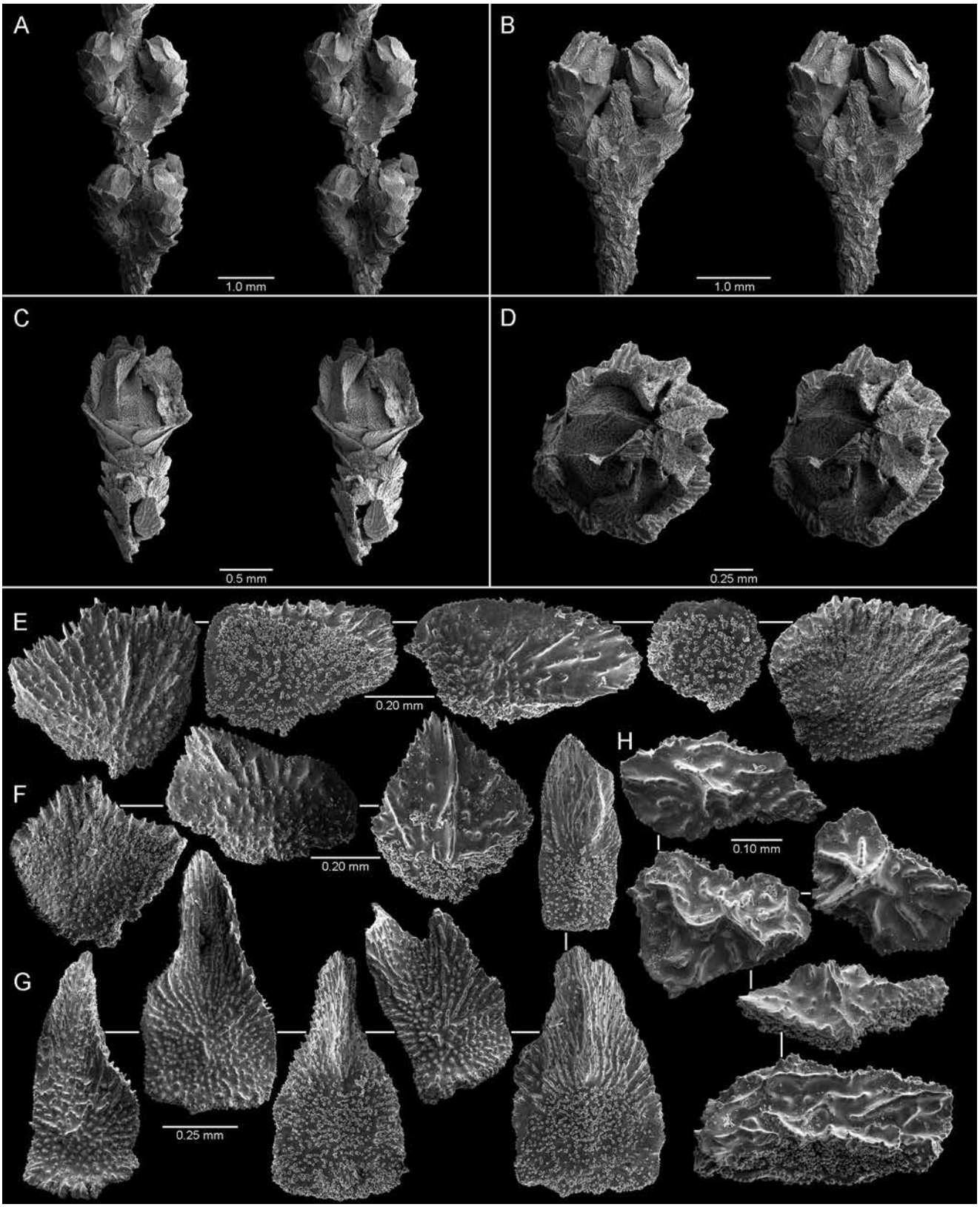

Figure 29. *Callogorgia dichotoma* **sp. nov.** from NIWA 15493: **A–B.** stereo views of polyp whorls; **C–D.** stereo views of adaxial and opercular sides of a polyp, respectively; **E.** body wall scales; **F.** marginal scales; **G.** opercular scales; **H.** coenenchymal scales.

1.9–2.2. Their outer surface is deeply longitudinally concave and covered with numerous closely-spaced, fine ridges, like the body wall scales. The proximal half of their inner surface is tuberculate, whereas the distal inner surface is covered with finely serrate keel; the tip is blunt. Occasionally the opercular scales are bifid. The coenenchymal scales are elliptical to irregular in shape, imbricate in arrangement, and 0.11–0.45 mm in width/diameter, their outer surface bearing complex ridges and often a central boss (Fig. 29H), producing a rather rough micro-texture.

Comparisons. According to Bayer's (1982) key to the Pacific *Callogorgia*, there are another seven species with dichotomous branching, but *C. dichotoma* **sp. nov.** can be distinguished by its having a high number of outer lateral row scales and a relatively low number (5–6 v. 8–13) of abaxial row scales (Table 3). Without explanation, Bayer did not include the dichotomously branching *C. modesta* (Studer, 1878) in his key, the type of which was collected close to the type locality of *C. dichotoma* **sp. nov.** on the Raukumara Plain off the Bay of Plenty, New Zealand (35.350º S, 175.667º E, 1092 m), but that species differs by having six polyps per whorl, nine whorls per cm, and only two scales in each outer lateral body wall scale row.

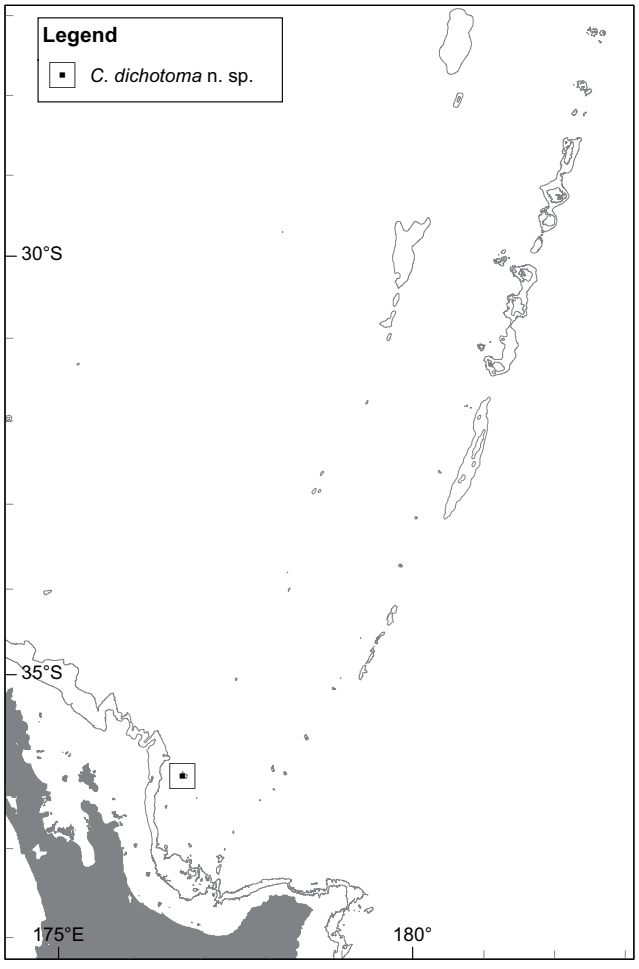

Figure 30. Distribution of *Callogorgia dichotoma* **sp. nov.**

Etymology. Named *dichotoma* in reference to its branching mode, although that is not a unique character in the genus (see Bayer 1982 for a key to the dichotomous species).

Callogorgia formosa (Kükenthal, 1907)

Fig. 31A, 32, 33; Table 3 (p. 59)

Caligorgia formosa Kükenthal, 1907: 208–209.
Caligorgia formosa, Kükenthal 1919: 366–369, Text Fig. 155–159, Pl. 30, Fig. 1, Pl. 40, Fig. 47.
Primnoella indica Kükenthal, 1907: 210.
Callogorgia formosa: Bayer, 1982: 130–134, Fig. 9–10; Cairns 2010: 427–429, Fig. 1E, 12A (more complete synonymy).

Material examined. *West Norfolk Ridge*: NIWA 11144, NZOI Stn Z10988, 33.8° S, 167.2° E, International Waters 313 m, 25 Jan 2002, branches (NMNH SEM stubs 1729–1731, 2191–2192).

Bay of Plenty: NIWA 99707, NZOI Stn J676, 37.375° S, 177.195° E, 341 m, 08 Sep 1974, 1 colony.

Type & locality. Syntype—MZW 25**,** southwest of Nicobar Islands, Indian Ocean, 362 m, collected on the *Valdivia* (no collection details given).

Distribution. Wanganella Bank and Bay of Plenty, North Island, New Zealand (Fig. 33), 313–341 m; elsewhere, Great Nicobar Islands, Hawai'ian Islands, 296–750 m.

Description. The colony is uniplanar, up to 1 m in height as reported by Bayer (1982), but the specimens reported herein are fragmentary, the largest only 22 cm in length, but having a basal branch diameter of 5.6 mm, implying a much larger colony size. Colonies consist of one straight main branch from which pairs of undivided branchlets diverge from opposite sides of the branch (opposite pinnate, Fig. 31A), the undivided branchlets being up to 15 cm in length. The axis is stiff and pale yellow in colour. Polyps are arranged in whorls of three to five; approximately four whorls

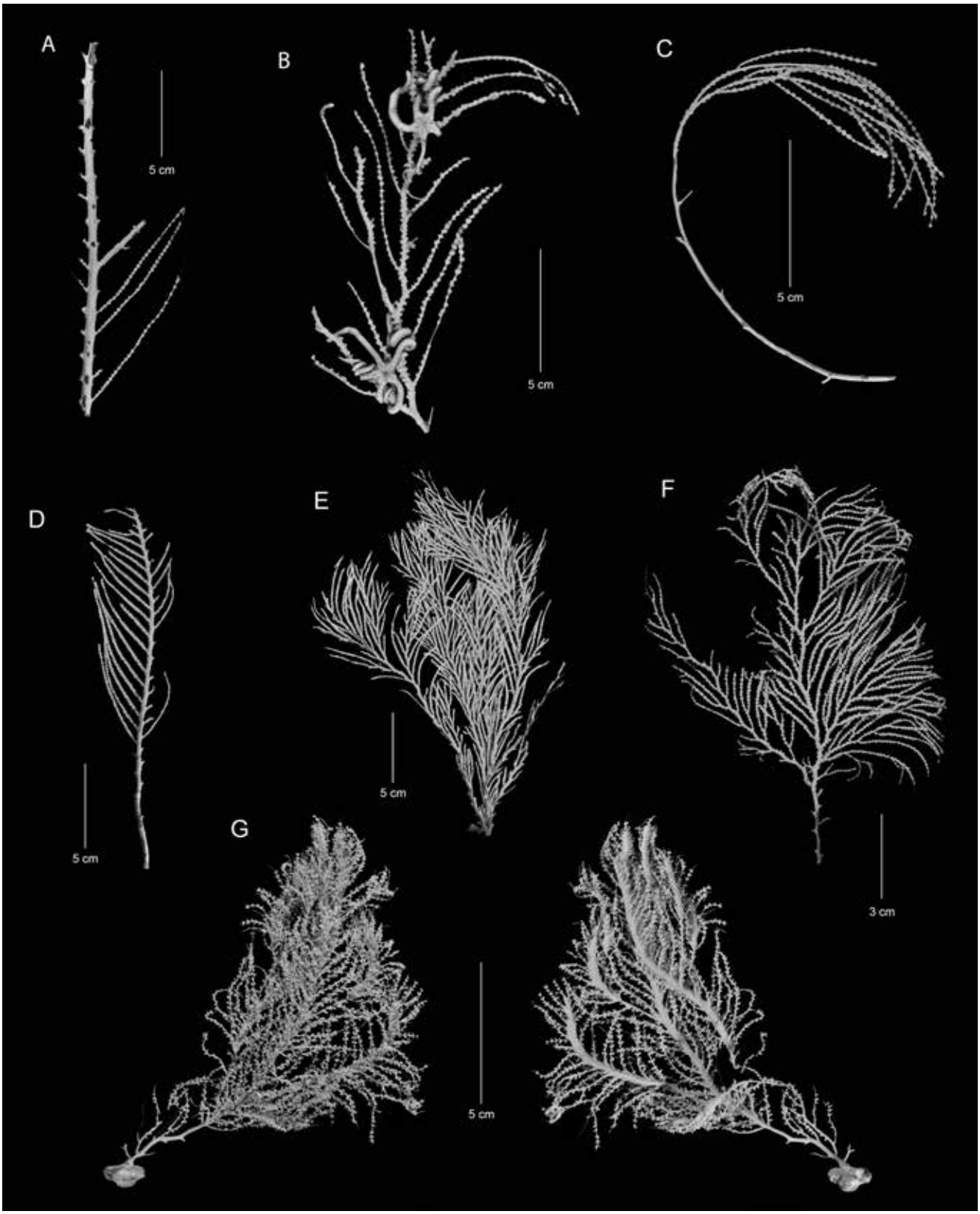

Figure 31. Specimen morphology: **A.** *Callogorgia formosa* (Kükenthal, 1907), NIWA 11144; **B.** *Callogorgia gilberti* (Nutting, 1908), NIWA 76752; **C.** *Callogorgia sertosa* (Wright & Studer, 1889), NIWA 9878; **D.** *Callogorgia tessellata* **sp. nov.**, holotype; **E.** *Fanellia tuberculata* (Versluys, 1906), NIWA 11249; **F.** *Fanellia korema* Bayer & Stefani, 1989, NIWA 11251; **G.** *Fanellia histoclados* **sp. nov.**, holotype, upper and lower sides of same specimen, the latter showing worm tubes.

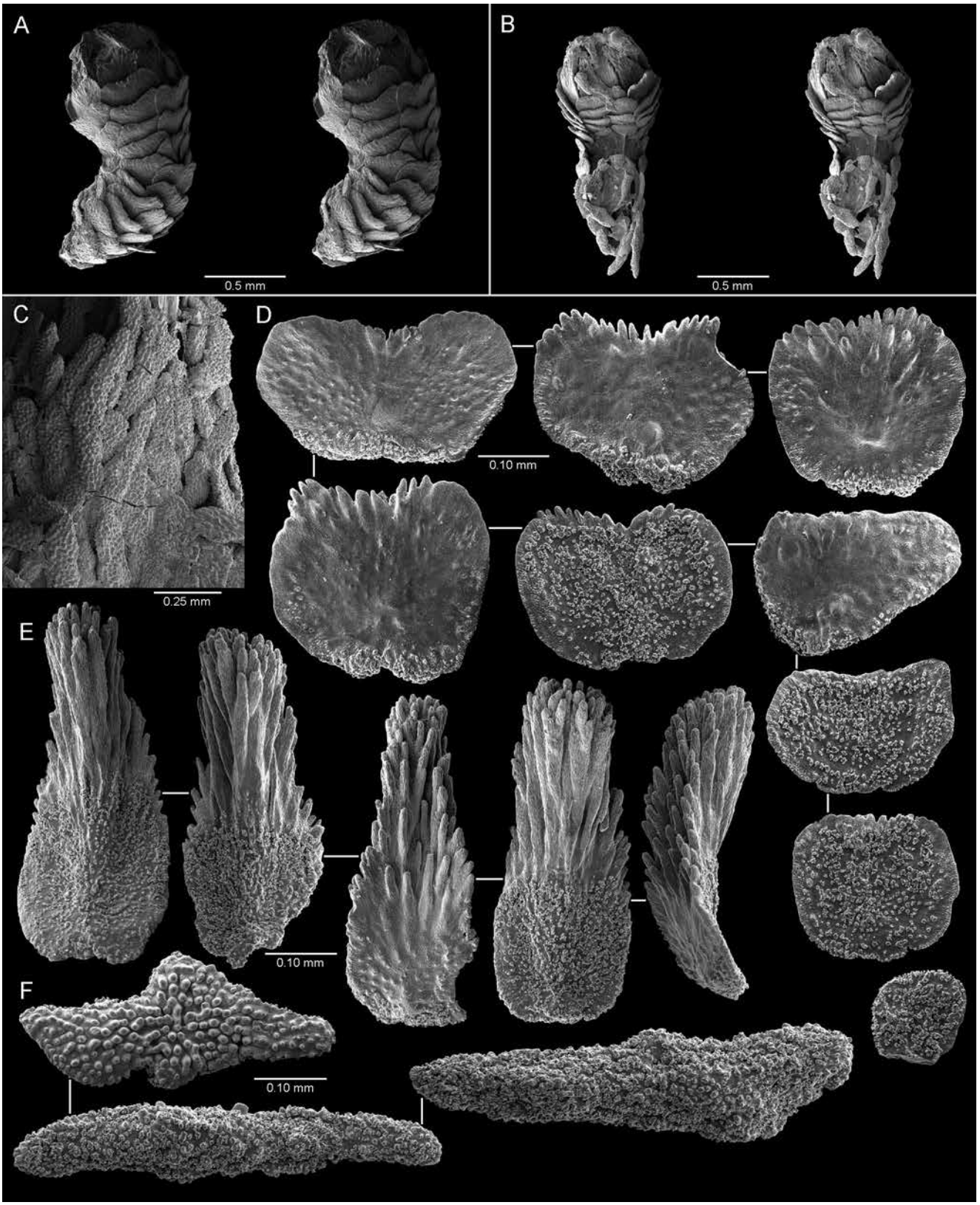

Figure 32. *Callogorgia formosa* (Kükenthal, 1907) from NIWA 11144: **A–B.** stereo views of OL and adaxial edges of a polyp, respectively; **C.** elongate coenenchymal scales *in situ*; **D.** body wall scales; **E.** opercular scales; **F.** coenenchymal scales.

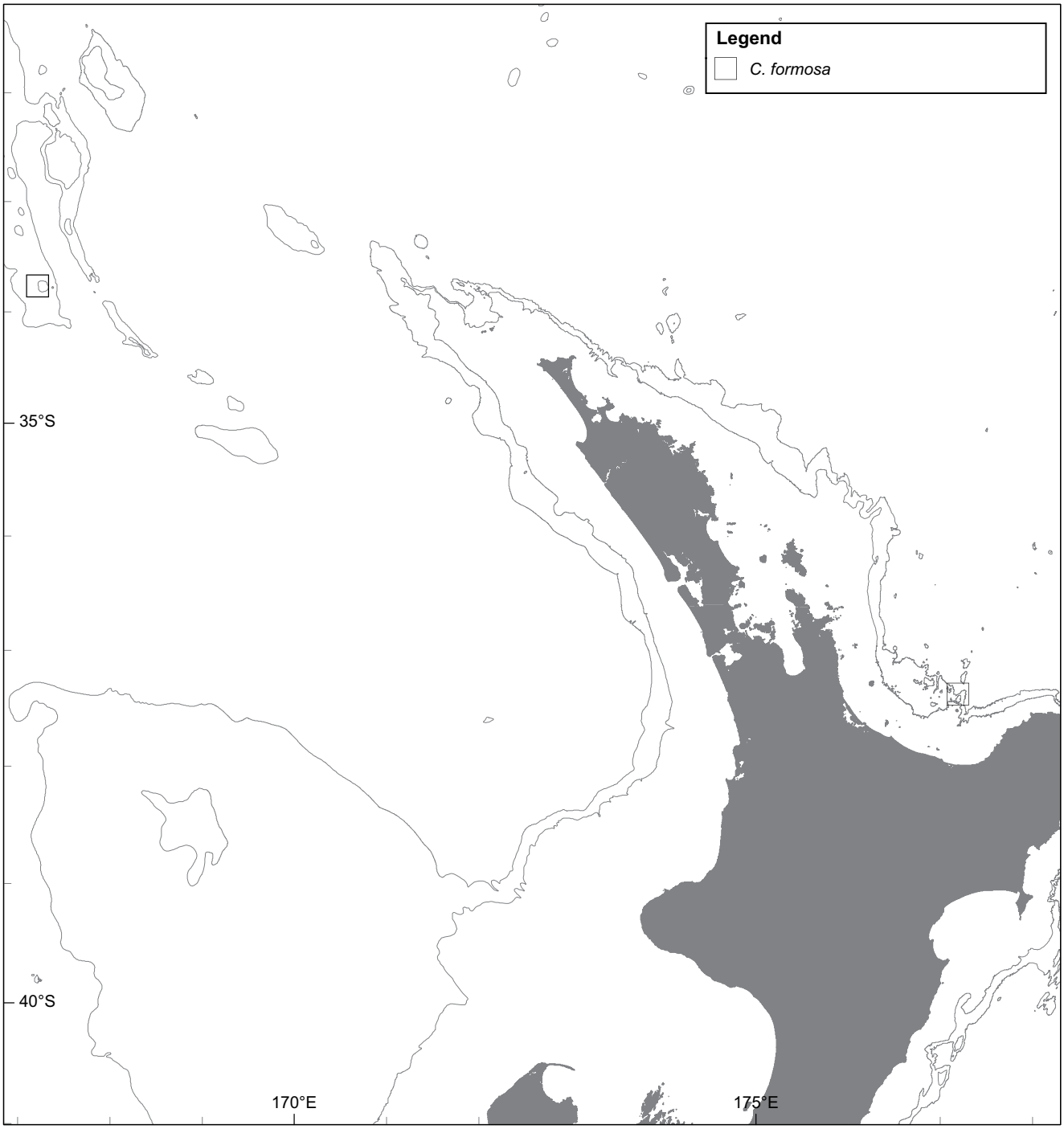

Figure 33. Distribution of *Callogorgia formosa* (Kükenthal, 1907).

occur per cm branch length. The polyps are slightly clavate, curved upward, and are 1.4–1.6 mm in length.

There are eight longitudinal rows of body wall scales, decreasing in number from ab- to adaxial polyp side (Fig. 32A), the body wall sclerite formula being: 8–10: 7–9: 2–5: 1–3, the proximal adaxial side of the polyp being unprotected (Fig. 32B). The body wall scales are rectangular to trapezoidal in shape (Fig. 32D), usually with a coarsely dentate distal edge and a slightly papillate outer surface; the inner surface is tuberculate. Body wall scales range from 0.23–0.36 mm in width. The distal edges of the eight marginal scales cover only the bases of the opercular scales. The opercular scales (Fig. 32E) range in length from 0.40–0.55 mm, decreasing in length only slightly from the ab- to adaxial side; their L:W ranges from 1.8–2.0. These scales are unique in that both the outer and distal inner surfaces are covered with coarse blunt spines, producing a thick, blunt apex. The proximal inner face of the operculars is tuberculate. The coenenchymal

scales (Fig. 32C, F) are elongate (L:W = 4–8) plate-like, up to 1.0 mm in length, longitudinally arranged along the branch axis in an imbricate fashion. Their outer surface is granular, their inner surface tuberculate.

Comparisons. This is the only species among the 26 described to have opposite pinnate branching, and also has a unique spination on its opercular scales (Table 3).

Remarks. This is a new record for this species for the New Zealand EEZ, although it appears to be a widespread species, its range extending from the central Indian Ocean to Hawai'i.

Callogorgia gilberti (Nutting, 1908)

Fig. 31B (p. 62), 34, 35; Table 3 (p. 59)

Caligorgia gilberti Nutting, 1908: 574, Pl. 43, Fig. 4, Pl. 47, Fig. 6.
Caligorgia gilberti, Kükenthal 1919: 383–384.
Callogorgia gilberti: Grigg & Bayer 1976: 170; Cairns 2010: 429–433, Fig. 1A, 10–11; Quattrini *et al.* 2013: 8, 12.

Material examined. Holotype—*Albatross* Stn 4130, 21.971° N, 159.349° W, east of Kaua'i, Hawai'ian Islands, 517–565 m. Paratypes deposited at the NMNH (see Cairns 2010).

Lord Howe Rise (International Waters): NIWA 65520, SOP Stn TRIP2894/93, 35.9° S, 165.6° E, 766–1025 m, 15 Jul 2009, 1 colony (USNM 1278366, 1 branch).

Bay of Plenty: NIWA 11086, NZOI Stn Z10900, 36.509° S, 176.516° E, 908 m, 17 Jun 2000, 1 fragment (USNM 1278365, 1 branch fragment, NMNH SEM stubs 1725–1728, 2193–2195); NIWA 27983, NZOI Stn Z10897, 36.509° S, 176.516° E, 908 m, 17 Jun 2000, fragment.

Hikurangi Margin: NIWA 76705, NIWA Stn TAN1003/169, 40.635° S, 177.075° E, 875 m, 07 Apr 2010, 1 branch; NIWA 76752, NIWA Stn TAN1003/88, 41.241° S, 176.458° E, 1145 m, 29 Mar 2010, 1 colony.

Type locality. East of Kaua'i, Hawai'ian Islands, 517–565 m.

Distribution. Raukamura Plain, Hikurangi Margin off southeastern North Island, southern Lord Howe Rise (Fig. 35), 766–1145 m; elsewhere, Hawai'ian Islands and Cross Seamount, 326–965 m (Cairns 2010).

Description. The colony is uniplanar and up to 60 cm in height (Cairns 2010); however, the largest New Zealand specimen (NIWA 11086) is only 29 cm in height with a basal branch diameter 2.2 mm in greater diameter, the axis being rectangular in cross section. Branching is regularly alternate-pinnate, with some of the branchlets forming pinnate branchlets as well (Fig. 31B). The polyps are arranged in whorls (Fig. 34A) of four or five; about four whorls occur per cm branch length. The polyps are clavate, curved upward (Fig. 34A, C), and 1.5–1.8 mm in length.

There are eight longitudinal rows of body wall scales, decreasing in number from ab- to adaxial polyp side (Fig. 34A, B, D), the body wall sclerite formula being: 11–13: 3–7: 2–4: 1–2, the proximal adaxial side of the polyp being short and essentially unprotected (Fig. 34D). The body wall scales (Fig. 34E) are fan-shaped to trapezoidal in shape, the proximal abaxial scales being quite wide (up to 0.6 mm) and wrapping around much of the polyp, occupying the space normal protected by the outer laterals. The distal abaxials, on the other hand, are somewhat narrower than their flanking OL scales, but the boundary of the distalmost three to five rings of abaxial and outer lateral body wall scales is indistinct due to the tall longitudinal ridges on the outer surface (Fig. 34A). These scales are covered with 10–15 tall (up to 40 μm), longitudinally radiating, thin ridges that project beyond the scale edge, forming a deeply serrate distal margin. This ridging becomes progressively less prominent proximally on the polyp, but these scales still have a serrate distal edge. The inner surface of the body wall scales is tuberculate. The eight marginal scales form a cowl-like structure (Fig. 34C), which covers the basal third of the operculum. The opercular scales (Fig. 34F) range in length from 0.42–0.51 mm, decreasing in length only slightly from the ab- to adaxial side; their L:W ranges from 1.6–2.6. The outer surface of the operculars is ornamented with prominent spinose ridges; the proximal inner surface is tuberculate, whereas the distal inner surface is covered by a multiple serrate keel somewhat like those on the outer surface. The coenenchymal scales (Fig. 34G) are elongate (L:W = 5–8) and up to 0.9 mm in length, longitudinally arranged along the branch axis in an imbricate fashion. Their outer surface is granular and sometimes bears a low medial ridge; their inner surface is tuberculate.

Comparisons. *Callogorgia gilberti* belongs to a subset of seven of the 26 valid species in the genus, which is characterised by having highly ridged

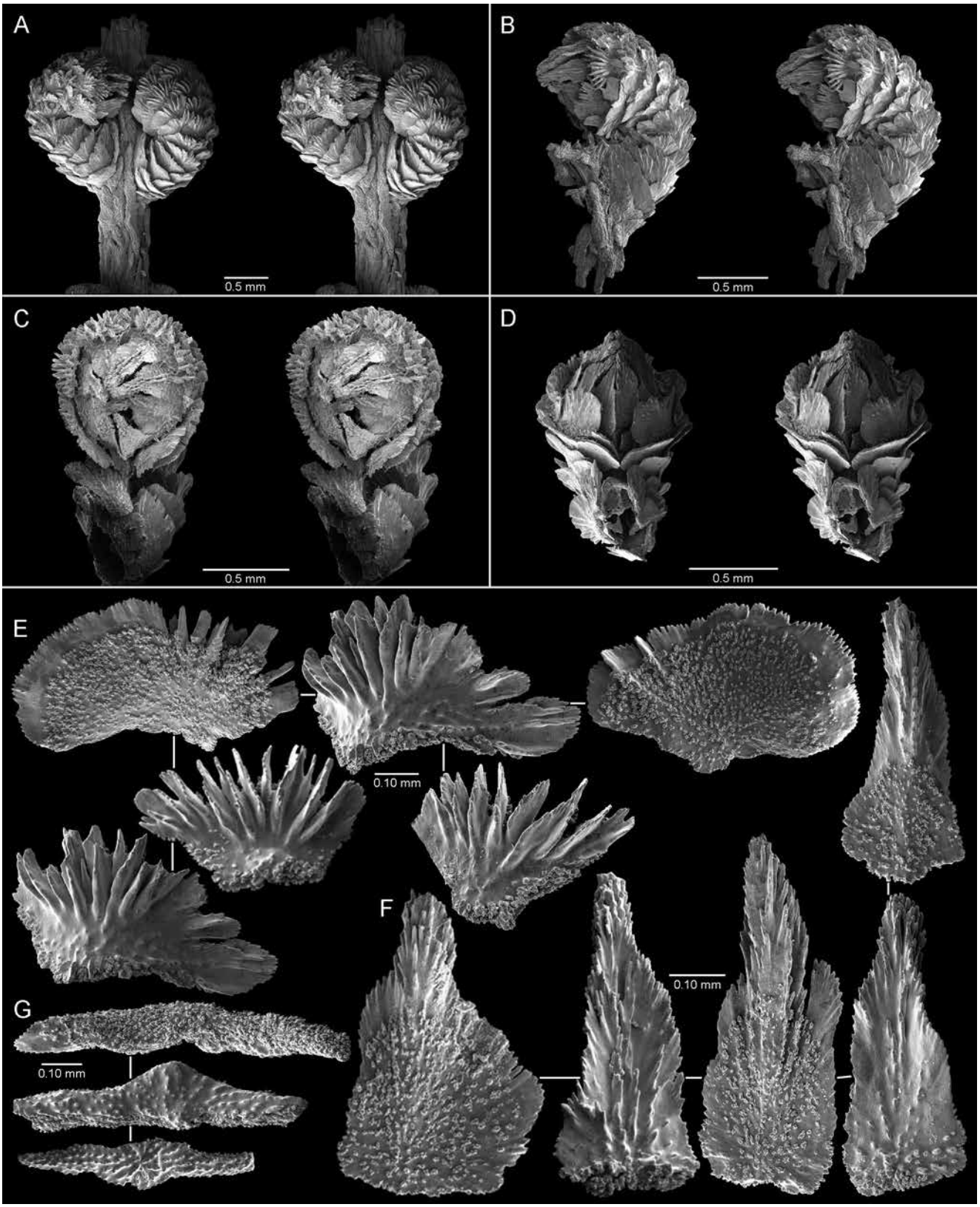

Figure 34. *Callogorgia gilberti* (Nutting, 1908) from NIWA 11086: **A.** stereo view of a polyp whorl; **B–D.** stereo views of lateral, opercular and adaxial sides of a polyp, respectively; **E.** body wall scales; **F.** opercular scales; **G.** coenenchymal scales.

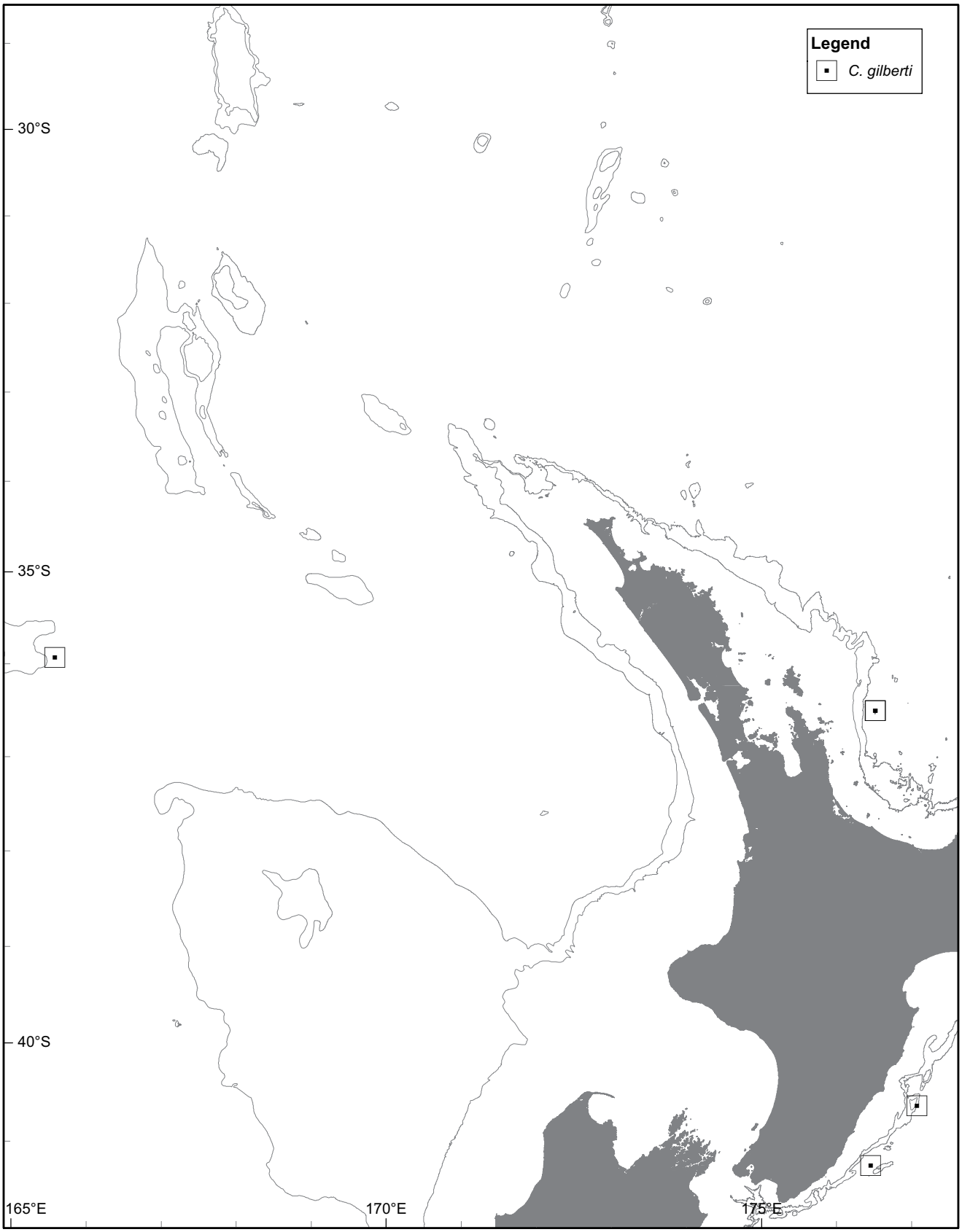

Figure 35. Distribution of *Callogorgia gilberti* (Nutting, 1908).

(cristate) abaxial and outer lateral body wall scales, the boundaries between the abaxial and outer lateral scales being obscured by these tall ridges. The seven species are: *C. verticillata* (Pallas, 1766), *C. flabellum* (Ehrenberg, 1834), *C. weltneri* (Versluys, 1906) (= *C. cristata* Aurivillius, 1931), *C. robusta* (Versluys, 1906), *C. ramosa* (Kűkenthal & Gorzawsky, 1907), *C. gilberti* (Nutting, 1908), and *C. americana* Bayer & Cairns, 2003 and of which only *C. gilberti* is known to occur in the New Zealand region (Table 3).

Remarks. This is a new record of this species from the New Zealand EEZ. The New Zealand specimens differ from those reported from Hawai'i (Bayer 1982, Cairns 2010) by having slightly larger polyps and thus fewer whorls per cm (4 per cm v. 4.5–6 per cm).

Cairns (2010) synonymised the western Atlantic *C. americana* Cairns & Bayer, 2002 with *C. gilberti* based on their similar morphology, but Quattrini *et al.* (2013) considered these two taxa to be discrete based on slight morphological differences and their allopatric distribution. However, their molecular analyses (based on two mitochondrial and one nuclear gene) produced a relatively small p-distance of 0.38–0.41, traditionally considered to be below the threshold that discriminates among octocoral species (i.e. 0.5) suggested by McFadden *et al.* (2010). Nonetheless, Quattrini's distinction is followed herein.

Callogorgia sertosa (Wright & Studer, 1889)

Fig. 31C (p. 62), 36, 37; Table 3 (p. 59)

Caligorgia sertosa Wright & Studer, 1889: 77–78, Pl. 14, Fig. 2a, Pl. 21, Fig. 9.

Caligorgia sertosa, Versluys 1906: 58–60, Text Fig. 65–67 (redescription of holotype); Not Nutting 1909: 715 (= *C. kinoshitae*); Kükenthal 1919: 369; Kükenthal 1924: 269.

Callogorgia sertosa: Bayer 1982: 122 (key); Not Alderslade 2006: 20 (= *C. tessellata*); Cairns & Bayer 2009: 29 (listed).

Material examined. NIWA 9878, NZOI Stn K840, 30.293° S, 178.422° W, off Macauley Island, Kermadec Islands, 398 m, 28 Jul 1974, 1 broken colony (USNM 1278367, branch fragments, NMNH SEM stubs 2131–2133).

Type & locality. Holotype—NHMUK1889.5.27–61, *Challenger* Stn 192, 5.820° S, 132.238° E, off Kei Islands, Banda Sea, 256 m.

Distribution. Northeast of McCauley Island, Kermadecs (Fig. 37), 398 m; elsewhere, Banda Sea, 256 m.

Description. The colony is uniplanar, 24 cm tall (much taller than wide, Fig. 31C), with a basal branch diameter of 1.3 mm, about the same size as the holotype. Branching is alternate-pinnate, the branchlets undivided and up to 5 cm in length. The polyps are arranged in whorls of three or four (Fig. 36A, B), sometimes one side of a branchlet devoid of polyps; approximately 4–4.5 whorls occur per cm branch length. The polyps are slightly clavate, curve upward, and are 1.4–1.8 mm in length. The axis is pale yellow.

There are eight longitudinal rows of body wall scales, decreasing in number from ab- to adaxial polyp side, the body wall sclerite formula being: 7–9: 5–7: 2: 1–2, the proximal adaxial side of the polyp being unprotected (Fig. 36D). The proximal abaxial body wall scales transition into the coenenchymal scales in a seamless manner (Fig. 36E). The body wall scales (Fig. 36F) are square to rectangular in shape: the abaxial and OL scales are about 0.45 mm in width, the IL scales about 0.41 mm in width, and scales of the single pair of adaxials only about 0.22 mm wide. The inner face of the body wall scales is tuberculate, the distal edge smooth, and the outer face distinctively pitted (Fig. 36F, G), each shallow pit 32–34 μm in diameter and contiguous with adjacent pits. The perimeter of each pit bears 12–14 small (about 3 μm diameter) spines (Fig. 36G). The opercular scales range in length from 0.72–0.44 mm, decreasing in size from the ab- to adaxial side; their L:W ranges from 1.7 (abaxials) to 3.4 (adaxials). The outer surface of the operculars is ornamented with low ridges that radiate from a nucleus near the base of the scale (Fig. 36H). Their lateral edges are finely serrate and the tip is rod-like (about 65 μm in diameter), and blunt (Fig. 36J). The proximal inner surface is tuberculate, and the distal inner surface is covered with seven to nine serrate ridges constituting a keel, half of which reach the tip of the opercular scale (Fig. 36J). Cigar-shaped tentacular/pinnular rods (Fig. 36I) are present that are about 40 μm in length and have an L:W of about 3.4. The coenenchymal scales (Fig. 36K) are thick (up to 65 μm), up to 1.1 mm in length, and arranged in a mosaic pattern (edges abutted, tessellate). To achieve

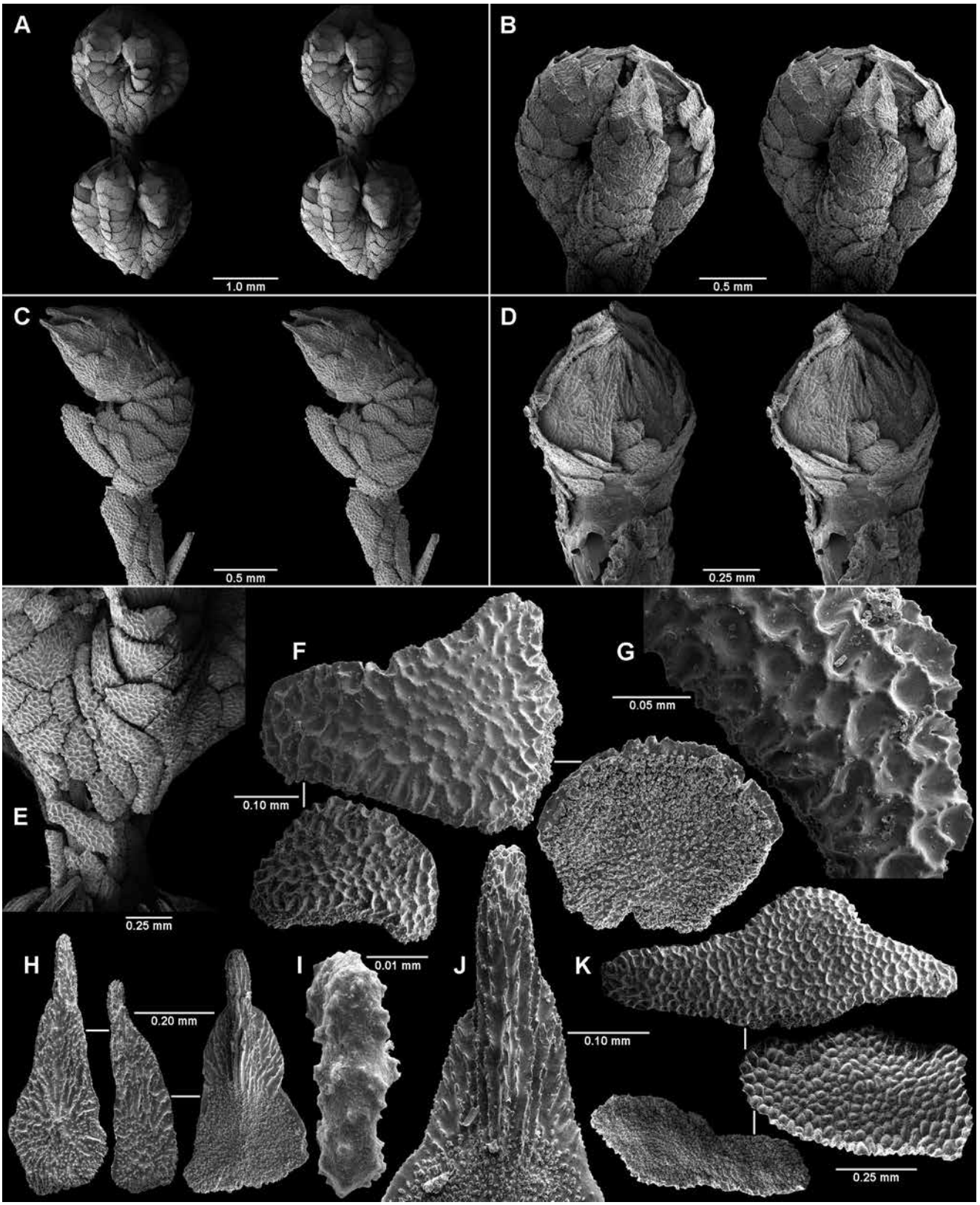

Figure 36. *Callogorgia sertosa* (Wright & Studer, 1889) from NIWA 9878: **A.** stereo view of two polyp whorls; **B.** stereo view of a terminal polyp whorl; **C–D.** stereo views of lateral and opercular aspects; **E.** basal section of several polyps; **F.** body wall scales; **G.** pitted nature of outer body wall scale; **H.** opercular scales; **I.** pinnular rodlet; **J.** detail of distal inner side of opercular scale; **K.** pitted coenenchymal scales.

the mosaic pattern the scales are of varying shapes and sizes; elongate coenenchymals have an L:W up to 3.2, but some may be more rectangular with an L:W of only 2.5. Like the body wall scales, the outer surface of the coenenchymals is pitted, the inner surface tuberculate.

Comparisons. *Callogorgia sertosa* is distinguished from other New Zealand *Callogorgia* by having an exteriorly pitted body wall, coenenchymal scales and blunt rod-like opercular scales (Table 3 herein, and Bayer, 1982: key).

Remarks. The single specimen reported herein keys to *C. sertosa* in the key published by Bayer (1982), and is consistent with the descriptions and figures of the holotype given by Wright & Studer (1889) and Versluys (1906). It constitutes the first valid record of the species since its original description and is a new record for the New Zealand EEZ. The unique sculpturing of the body wall and coenenchymal scales was not noted by Wright & Studer (1889), but is well described and illustrated by Versluys (1906).

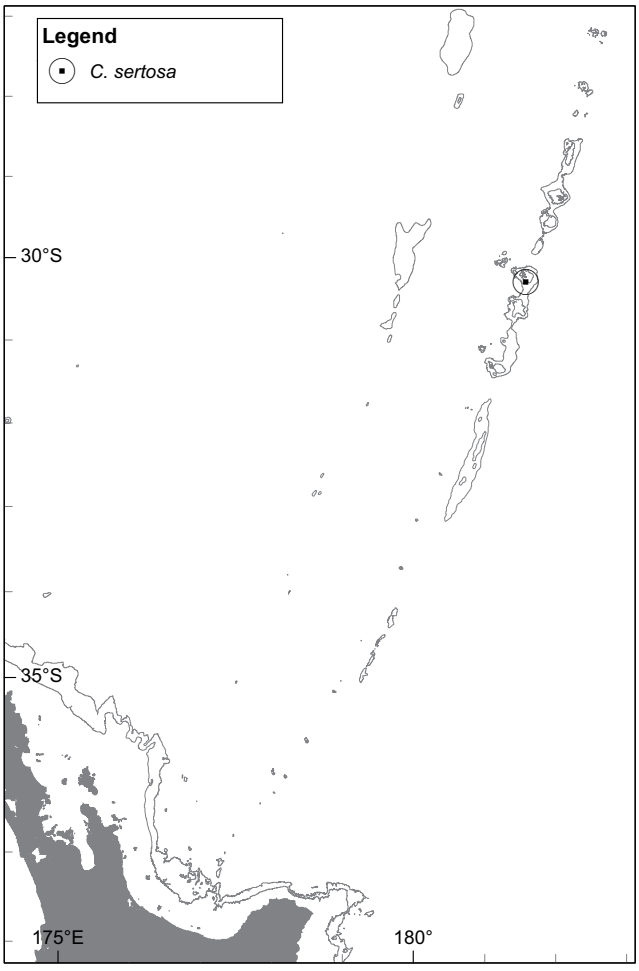

Figure 37. Distribution of *Callogorgia sertosa* (Wright & Studer, 1889).

Callogorgia tessellata sp. nov.

Fig. 31D (p. 62), 38, 39; Table 3 (p. 59)

Callogorgia sertosa, Alderslade 2006: 20.

Material examined. Holotype NIWA 11087, NZOI Stn X121, 37.412° S, 177.195° E, Bay of Plenty, North Island, New Zealand, 340 m, 23 Nov 1989 (NMNH SEM stubs 2134–2136). **Paratypes** NIWA 99708, NZOI Stn X121, same data as holotype, 4 colonies (USNM 1278369, 1 colony); USNM 1287735, TAN0308/132 (NORFANZ), 33.54° S, 170.21° E, NW of Three Kings Islands, 514–540, 01/06/2003, 1 fragment; USNM 1287736, TAN0308/136 (NORFANZ), 33.39°, 170.21° E, NW of Three Kings Islands, 469–490, 01/06/2003, 1 fragment; NIWA 11090, NZOI Stn J683, 37.345° S, 177.113° E, 388 m, 08 Sep 1974, 1 broken colony (USNM 1278368, branchlet);.

Type locality. Bay of Plenty.

Distribution. Bay of Plenty and northwest of Three Kings Islands (Fig. 39), 340–540 m.

Description. The colonies are uniplanar and taller than wide, the largest specimen (the holotype, Fig. 31D) measuring 27 cm in height, with a basal branch diameter of 3.3 mm, but a broken basal branch from a paratype (NIWA 11090) measures 5.6 mm in diameter, implying a much larger colony height. The branching is alternate-pinnate, the undivided branchlets up to 9 cm in length. The polyps are arranged in whorls of four or five, approximately six to seven whorls occur per cm branch length. The small polyps are clavate, curve upward, and are 1.0–1.2 mm in length. The axis is pale yellow and finely ridged longitudinally.

There are eight longitudinal rows of body wall scales, decreasing in number from ab- to adaxial polyp side, the body wall sclerite formula being: 9–11: 6–8: 2: 1, the short proximal adaxial side of the polyp being unprotected (Fig. 38D). The body wall scales are rectangular to fan-shaped (Fig. 38F), the abaxial

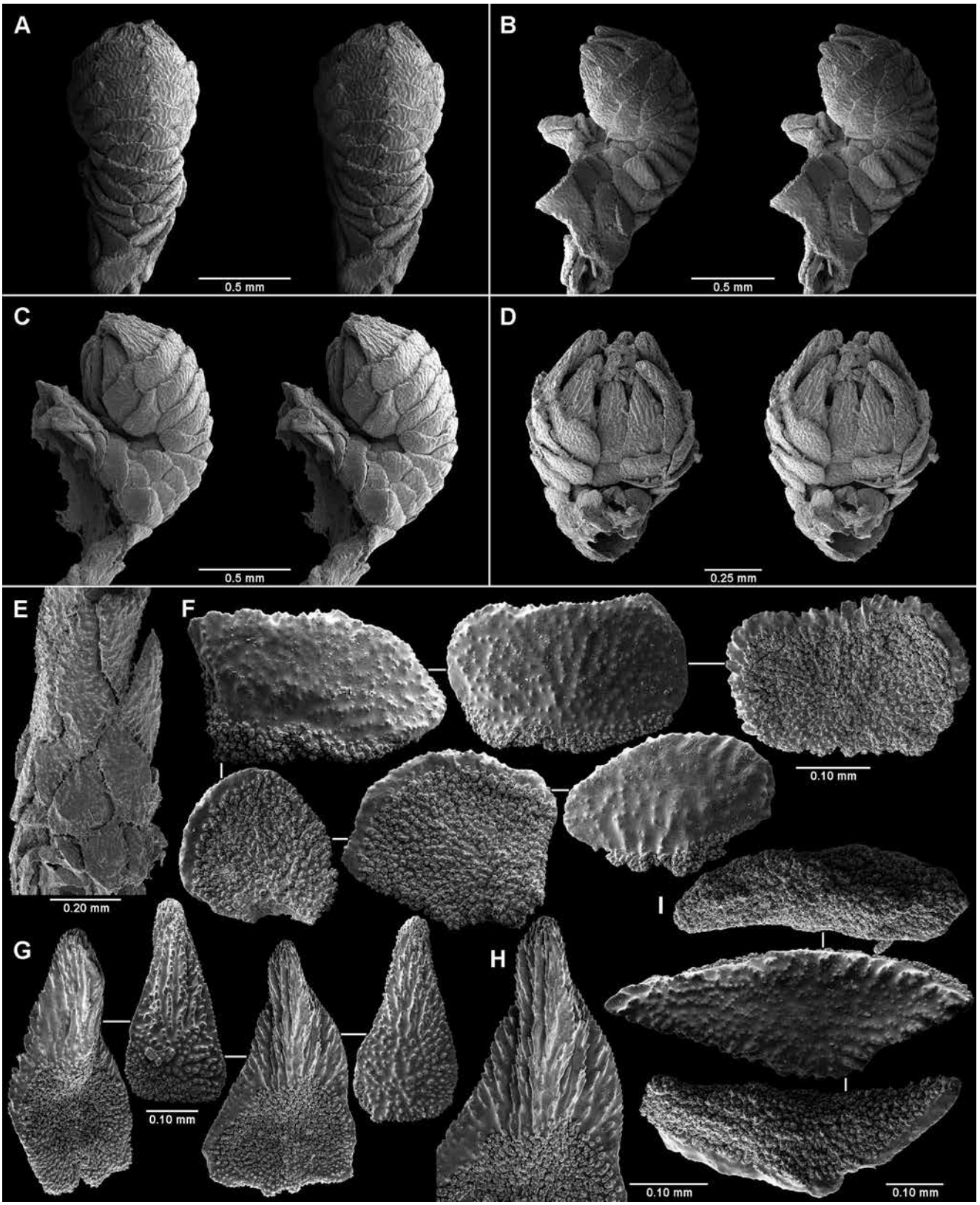

Figure 38. *Callogorgia tessellata* **sp. nov.**, holotype: **A.** stereo view of abaxial side of a polyp; **B–C.** stereo views of lateral side of polyps; **D.** stereo view of adaxial side of polyp; **E.** coenenchymal scales *in situ*; **F.** body wall scales; **G.** opercular scales; **H.** detail of distal inner side of opercular scale; **I.** coenenchymal scales.

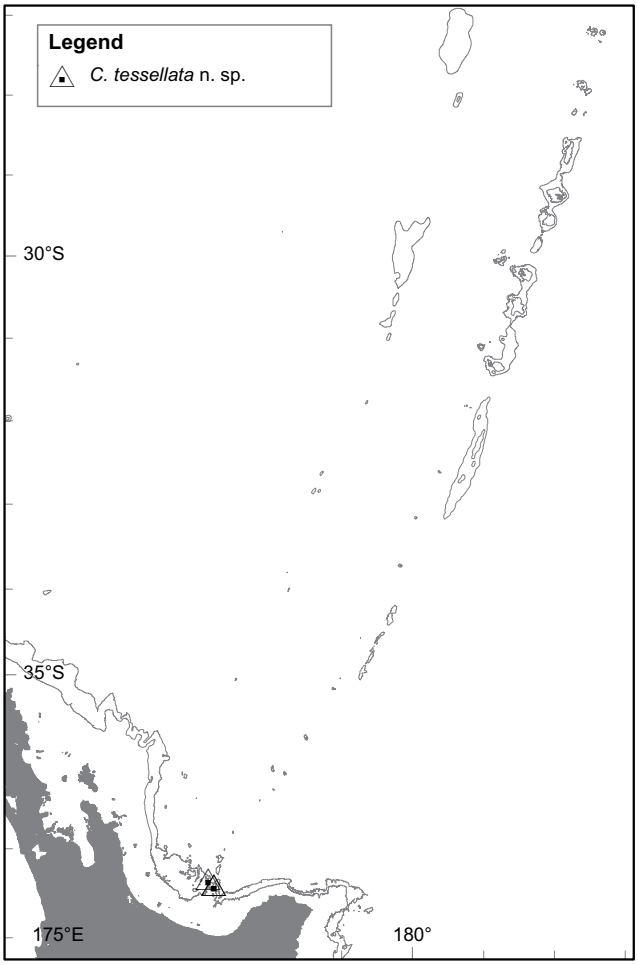

Figure 39. Distribution of *Callogorgia tessellata* **sp. nov.**

and OL scales 0.31–0.38 mm in width, except for the basalmost abaxial scales, which are wider (up to 0.55 mm) and shorter, providing a transition to the coenenchymal scales. The IL scales, although few, are among the widest of the body wall scales, about 0.40 mm in width. The single adaxial pair (Fig. 38D) are 0.21–0.23 mm in width and elliptical in shape. The distal edges of the eight marginal body wall scales cover only the basal opercular region. The outer surface of the body wall scales is relatively smooth, covered with rows of low rounded granules; the inner surface is tuberculate; the distal edge is smooth. The opercular scales range in length from 0.31–0.49 mm, decreasing in size from the ab- to adaxial side; their L:W ranges from 1.5 (abaxials) to 2.0 (adaxials). The outer surface of the operculars is ornamented with low, parallel, serrate ridges as well as granules (Fig. 38G). Their lateral edges are finely serrate and their tip is blunt but not rod-like. The proximal inner opercular surface is tuberculate, and the distal inner surface is covered with six to eight serrate ridges, the central-most of these ridges occurring on a medial crest or keel (Fig. 38H). The coenenchymal scales (Fig. 38I) are thick (up to 70 μm), up to 0.65 mm in length, and arranged in a mosaic, or tessellate (edges abutted), pattern. They are trapezoidal to rectangular and sometimes quite irregular in shape; their outer surface is smooth and covered with low rounded granules like that of the body wall scales, and the inner surface is tuberculate; their edges are granular, producing a puckered appearance. Cigar-shaped tentacular rods are present that are about 25–20 μm in length and have an L:W of about 3.

Comparisons. In the key to the Indo-Pacific *Callogorgia* species (Bayer 1982), *C. tessellata* **sp. nov.** comes closest to *C. sertosa*, but can be distinguished from that species (Table 3) by its smaller polyps, more numerous body wall scales, and smoother body wall and coenenchymal scales.

Etymology. Named *tessellata* (from Latin *tessellatus*, meaning mosaic), in reference to the tessellate arrangement of the thick coenenchymal scales.

Genus ***Fanellia*** Gray, 1870

Fanellia Gray, 1870: 46.

Fanellia, Bayer 1982: 134–135 (key to species); Bayer & Stefani 1989: 470–471 (key to species); Cairns & Bayer 2009: 40–41, Fig. 12E–M; Cairns 2010: 433; Cairns 2011: 16–17.

Type species. *Primnoa compressa* Verrill, 1865, by monotypy.

Diagnosis. Colonies uniplanar, branches arranged in an alternate-pinnate (sympodial or pseudomonopodial) or dichotomous manner. Polyps cylindrical, often clavate, arranged in pairs or whorls of up to 16, all polyps facing upward, and often appressed to branchlet. Polyps covered with 4–8 longitudinal rows of body wall scales, the number of scales in each row decreasing from ab- to adaxial polyp side, the adaxial side largely unprotected. Distal edges of

marginal scales do not fold over opercular scales. Outer surface of body wall and coenenchymal scales covered with closely spaced, complex, granular tubercles, sometimes fusing into low, flat-topped radial ridges; tubercles separated by deep narrow valleys. Inner distal surface of opercular scales convex, covered with a keel composed of multiple serrate ridges. Coenenchymal scales or plates thick, and imbricate or tessellate.

Remarks. Including the new species described herein, there are nine species known in this genus, a key to most of these species provided by Bayer & Stefani (1989) and a tabular comparison of the three New Zealand species as Table 4, herein. *Fanellia* is very similar to *Callogorgia*, their similarity discussed extensively by Bayer (1982), but the primary difference being the distinctive tuberculate texture of the body wall and coenenchymal scales of *Fanellia*. This differentiation may have to be revisited, since the first molecular analysis involving these two genera (Quattrini *et al.* 2013: Fig. S1, 3) using sequences derived from both mitochondrial and nuclear genes, found an unidentified species of *Fanellia* to nest within the *Callogorgia* clade. This interpretation was reinforced by the phylogenetic analysis of Taylor & Rogers (2015).

Distribution. Western and central Pacific from New Zealand to Alaska, 82–1341 m.

Fanellia tuberculata (Versluys, 1906)

Fig. 31E (p. 62), 40, 41; Table 4

Caligorgia tuberculata Versluys, 1906: 80–81, Text Fig. 95–96.

Caligorgia aspera Kinoshita, 1908: 39, Pl. 2, Fig. 15–16, Pl. 6, Fig. 47.

Caligorgia pseudoflabellum Bayer, 1949: 207, Pl. 4, Fig. 2, Text Fig. 2A–C.

Fanellia tuberculata, Bayer 1982: 144–154, Fig. 18–26 (key to species); Bayer & Stefani 1989: 471 (key to species); Cairns 2010: 433–434, Table 3 (more complete synonymy); Taylor & Rogers 2015: Fig. 1.

Material examined. *Challenger Plateau (International Waters)*: NIWA 11094, NZOI Stn D242, 38° S, 169.05° E, 337 m, 02 Oct 1964, 2 branches;

Kermadec Ridge: NIWA 11278, NZOI Stn K8263, 28.8° S, 177.8° W, 142 m, 25 Jul 1974, 21 colonies; NIWA 11249, NZOI Stn Z9043, 32.175° S, 179.082° W, 224 m, 05 Apr 1998, 3 colonies (NMNH SEM stubs 2197–2199); NIWA 11089, NZOI Stn Z9044, 32.195° S, 179.092° W, 122–307 m, 16 Sep 1998, 1 colony (USNM 1278374, 1 branch, NMNH SEM stubs 1744–1746).

Bay of Plenty: NIWA 15488, NIWA Stn TAN0413/174, 37.335° S, 177.076° E, 502–430 m, 16 Nov 2004, 3 colonies; NIWA 16242, NIWA Stn TAN0413/175, 37.324° S, 177.121° E, 534–424 m, 16 Nov 2004, 1 branch; NIWA 99709, NZOI Stn J676, 37.375° S, 177.195° E, 341 m, 08 Sep 1974, 2 colonies.

Type & locality. Holotype—ZMA Coel. 2286, *Siboga* Stn 95, 5.717° N, 119.667° E, Sulu Sea, 522 m.

Distribution. Challenger Plateau, Bay of Plenty, Kermadec Ridge (Fig. 41), 122–534 m; elsewhere, Hawai'ian Islands, Sulu Sea, Bikini, Japan, 128–522 m.

Table 4. Comparison of New Zealand species of *Fanellia* Gray, 1870.

	F. tuberculata	***F. korema***	***F. histoclados***
Branching	alternate-pinnate, followed by dichotomous	alternate-pinnate, followed by dichotomous	alternate-pinnate, bushy
Polychaete commensal	absent	absent	present
Polyps/whorl	2–3	2–1	1–2
Polyp length	0.9–1.3 mm	0.8–1.0 mm	1.1–1.2 mm
Body wall scale formula	4–8:1–2:01:1	3–6:1–2:0:1	6–8:3–8:2–3:3–4
Distal edge of marginal scales	straight	pointed	pointed
Opercular tip	single (blunt)	single (pointed)	1–3 (pointed or blunt)
Outer surface of coenenchymal scales	tuberculate (flat-topped)	0–2 bosses or cylindrical projections per scale	tuberculate (flat-topped)
Distribution and depth range	Challenger Plateau, Kermadec Ridge and North I. 122–534 m	southern Norfolk Ridge 150 m	Kermadec Ridge and North I. 122–341 m

Description. The colony is uniplanar and alternate-pinnate (sympodial) in branching, the branchlets subsequently dichotomously branching such that distal branchlets are rarely more than 4 cm in length (Fig. 31E) (i.e. quasi-dichotomous *sensu* Bayer 1982, or pseudomonopodial *sensu* Alderslade 2006). The largest colony from the New Zealand region (NIWA 11278) measures 42 cm in height, with a basal branch diameter of 5.5 mm. Polyps are arranged most commonly in pairs (Fig. 40A), more rarely in whorls of three, giving the branchlet a flattened aspect, six to eight whorls occurring along a cm length of branchlet; polyps are often absent from the distal cm of the branchlets. The polyps are slightly flared, 0.9–1.3 mm in length, and strongly appressed to the branch surface (Fig. 40C), such that the branch is slightly indented to accommodate the adaxial side of the polyp. The axis is a brownish-yellow colour.

There are six longitudinal rows of body wall scales, decreasing in number from ab- to adaxial polyp side, the body wall sclerite formula being: 4–8: 1–2: 0–1: 1, the short adaxial side of the polyp being unprotected (Fig. 40D). The body wall scales are rectangular, somewhat curved to fit around the polyp, and have a straight distal edge (Fig. 40B, E). The abaxial marginals are narrow, crowded by the wide adjacent OL marginal (Fig. 40C), whereas the proximal abaxial body wall scales are much wider than others, taking the place of the absent OL and IL scales at this level of the polyp, these wide abaxials being up to 0.55 mm in width. The adaxial marginal scales are 0.13–0.15 mm in width and because they are not followed by additional scales, do not qualify as rows. The outer surface of the body wall scales is covered with elaborate, closely spaced tubercles, each up to about 25–50 μm in diameter and separated by deep valleys about 5 μm in width; around the upper circumference of each tubercle are 7–14 small (about 4 μm in diameter) granules. The inner face of the body wall scales is also tuberculate, but the tubercles are much smaller than those on the outer surface. The opercular scales (Fig. 40F) range in length from 0.30–0.55 mm, decreasing in size from the ab- to adaxial side; their L:W ranges from 1.6 (abaxials) to 2.2 (adaxials). The outer surface of the operculars tend to be ornamented with low, tuberculate ridges that radiate from a proximal central point; the proximal two-thirds of the inner surface is tuberculate, whereas the distal third is covered by a multiply serrate keel. Their lateral edges are finely serrate and the single opercular tip is blunt. The coenenchymal plates (Fig. 40G) are thick, up to 0.52 mm in length, and arranged in a mosaic, or tessellate (edges abutted), pattern. They are trapezoidal to rectangular, and sometimes quite irregular in shape, their edges difficult to distinguish; their outer surface is level and covered with the same kind of complex tubercles that cover the body wall scales, and their inner surface is tuberculate.

Comparisons. This species was exhaustively illustrated by Bayer (1982), making it unnecessary for Cairns (2010) to illustrate his Hawai'ian specimens. It is included in Bayer & Stefani's (1989) key to the species. *Fanellia tuberculata* is distinctive in having straight-edged marginal scales, blunt single-tipped opercular scales, and relatively short terminal branches (Table 4).

Remarks. This constitutes the first record of this species for the New Zealand EEZ.

Fanellia korema Bayer & Stefani, 1989

Fig. 31F (p. 62), 42, 43; Table 4 (p. 73)

Fanellia korema Bayer & Stefani, 1989: 472–473, Pl. 35–36, Pl. 41, Fig. E–J.

Fanellia korema, Taylor & Rogers, 2015: Fig. 1.

Material examined. Holotype—MNHN Oct.S.1987.21, *Vauban* Stn DC03 (HGP 17), 22.233° S, 167.233° E, Pointe Sud du Grand Récif, New Caledonia, 425 m. Paratype—USNM 79969 and SEM stub B732 (data as for holotype).

Wanganella Bank (International Waters): NIWA 9877 and 11251, NZOI Stn P7, 32.683° S, 167.477° E, 150 m, 25 Jan 1977, 2 colonies (USNM 1278375 and 12783761, 1 branch, NMNH SEM stubs 2200–2201).

Type locality. Pointe Sud du Grand Récif, New Caledonia, 425 m.

Distribution. Wanganella Bank (southern Norfolk Ridge) (Fig. 43), 150 m; elsewhere, New Caledonia, 425 m.

Description. The New Zealand colonies are uniplanar and primarily alternate-pinnate (sympodial or pseudomonopodial) in branching (Fig. 31F), although the terminal branchlets, which never exceed 4 cm in length, are secondarily dichotomously branched. The largest colony is 15 cm in height and 11 cm in width, with a basal branch diameter of 1.4 mm. The axis is golden. Polyps are arranged in pairs (Fig. 42A) or whorls of three, six to nine whorls occurring

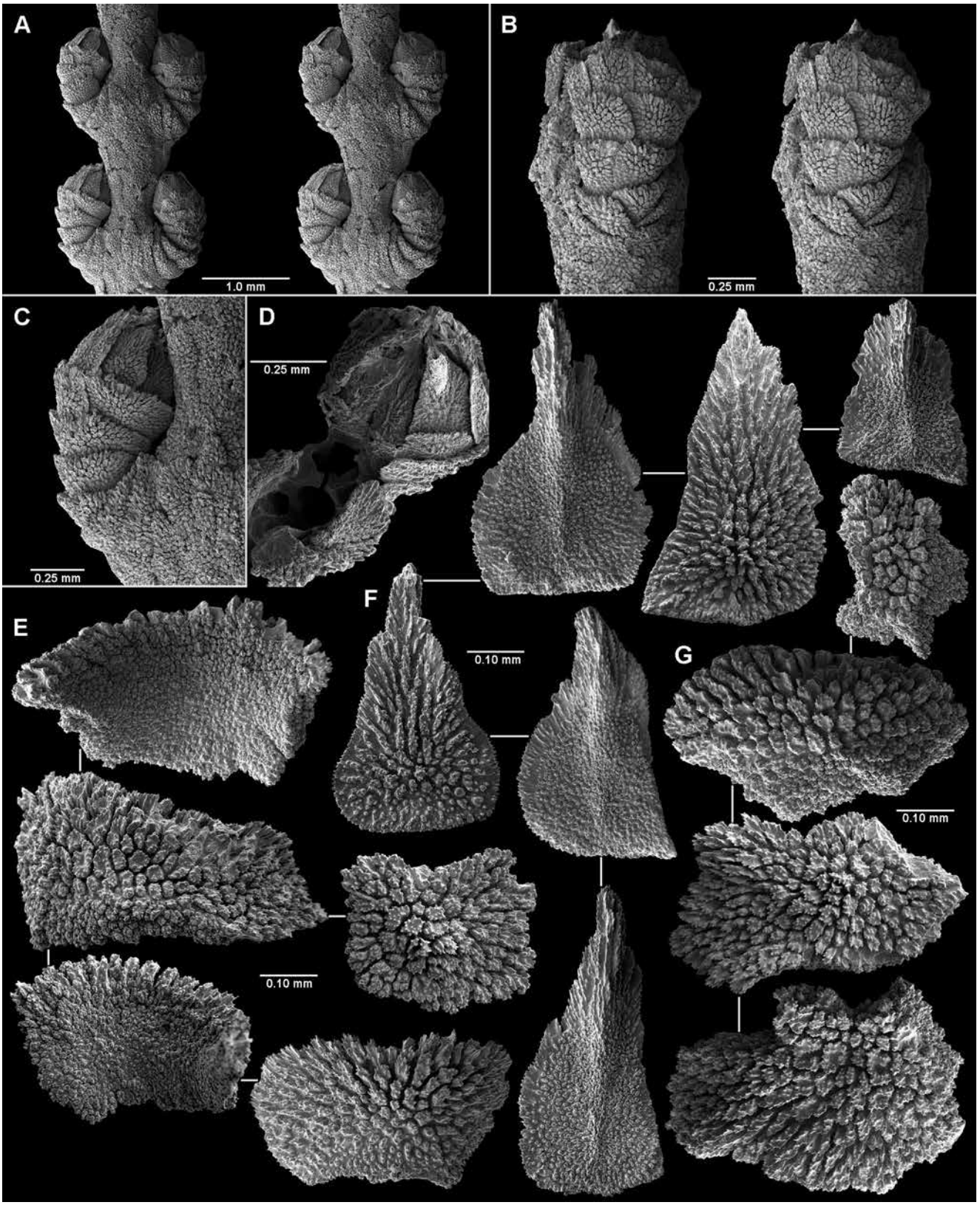

Figure 40. *Fanellia tuberculata* (Versluys, 1906) (A, E, NIWA 11089; B–D, F–G, NIWA 11249): **A.** stereo view of two pairs of polyps; **B.** stereo view of abaxial side of a polyp; **C–D.** lateral and adaxial views of a polyp, respectively; **E.** body wall scales; **F.** opercular scales; **G.** coenenchymal plates.

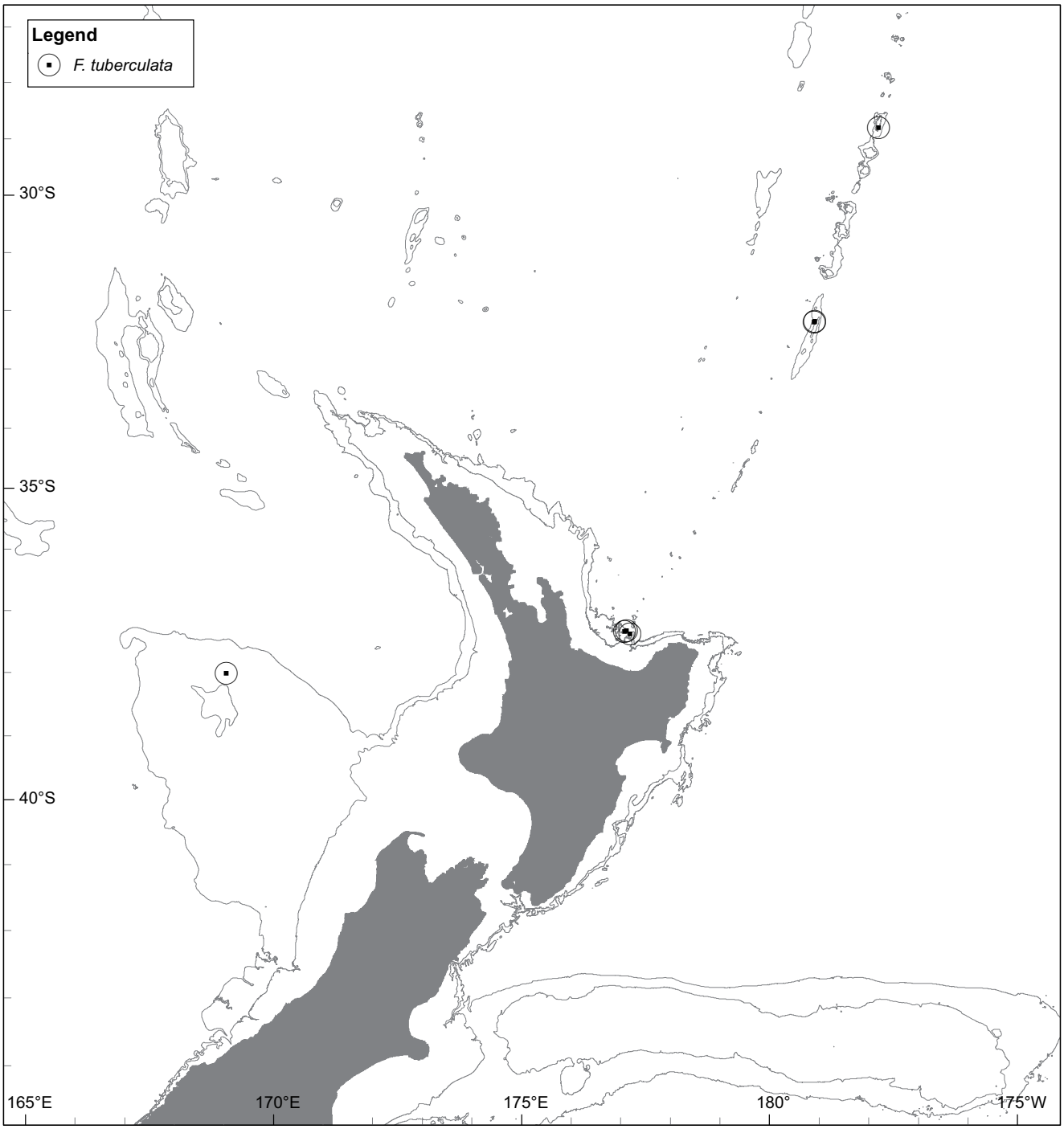

Figure 41. Distribution of *Fanellia tuberculata* (Versluys, 1906).

per cm branchlet length. The polyps are slightly flared distally, somewhat adnate to the branchlets, 0.8–1.0 mm in length, and directed upward (Fig. 42B).

There are only four longitudinal rows of body wall scales, decreasing in number from ab- to adaxial polyp side, the body wall sclerite formula being: 3–6: 1–2: 0: 1, the short adaxial side of the polyp being unprotected (Fig. 42C). There are no IL body wall scales, and the most proximal abaxial body wall scales are quite wide, covering the space normally occupied by the lateral scales. There are only six marginal scales, four large ones and two small adaxial ones. The body wall scales (Fig. 42E) are thick and strongly curved since they take the place of not only the abaxial but both lateral positions of the body wall scales; they are rectangular to fan-shaped, all being about 0.3 mm in width, except for the basal-most abaxial scales, which are up to 0.58 mm wide, and the adaxial scales, which are only 0.06 mm wide. The distal outer surface of the body wall scales are covered with tall complex tubercles

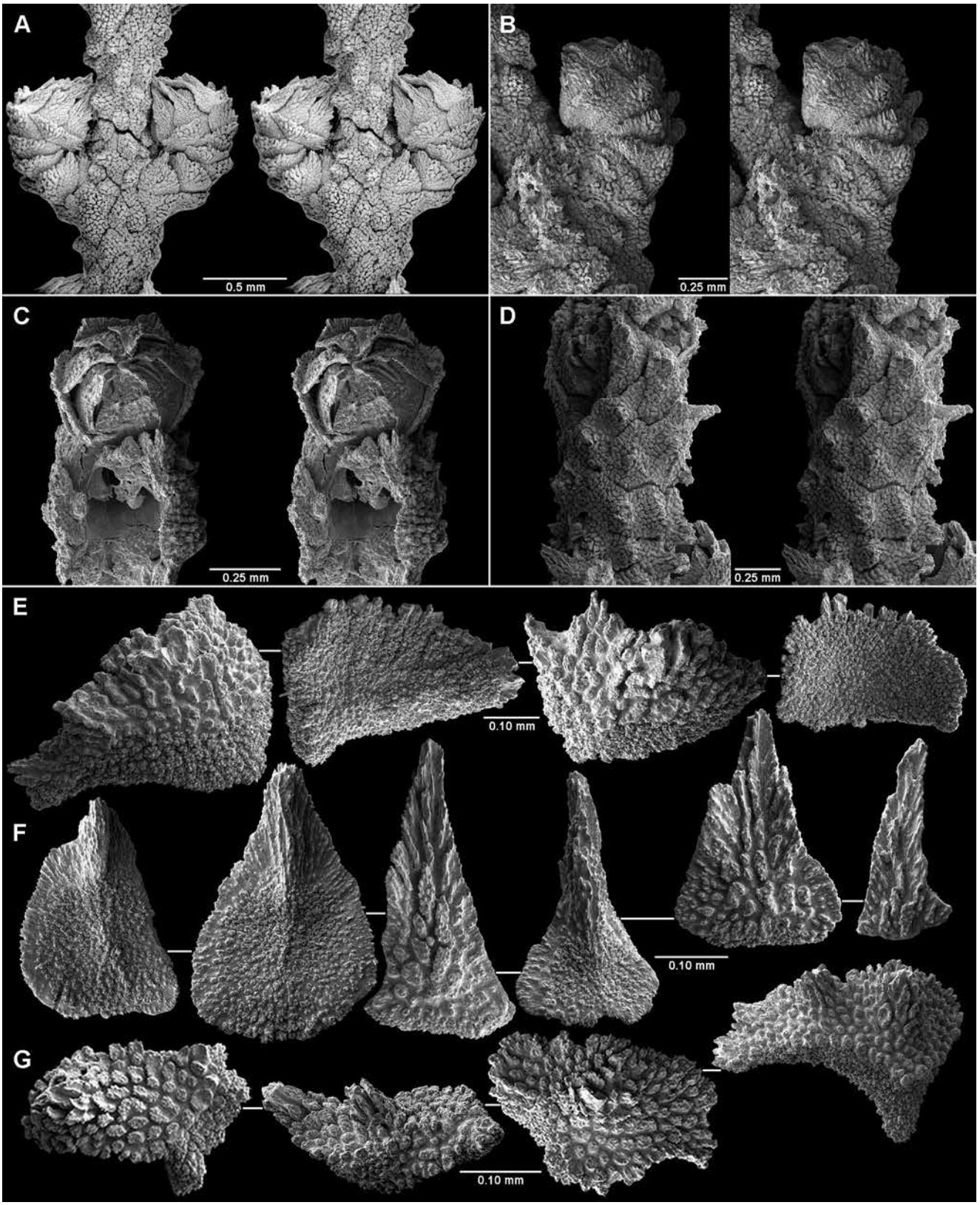

Figure 42. *Fanellia korema* Bayer & Stefani, 1989 (A, paratype, USNM 79969; B–C, F, NIWA 11251; D–E, G, NIWA 9877): **A.** stereo view of a polyp pair; **B–C.** stereo views of lateral and adaxial sides of a polyp, respectively; **D.** stereo view of coenenchymal scales showing central bosses; **E.** body wall scales; **F.** opercular scales; **G.** coenenchymal scales.

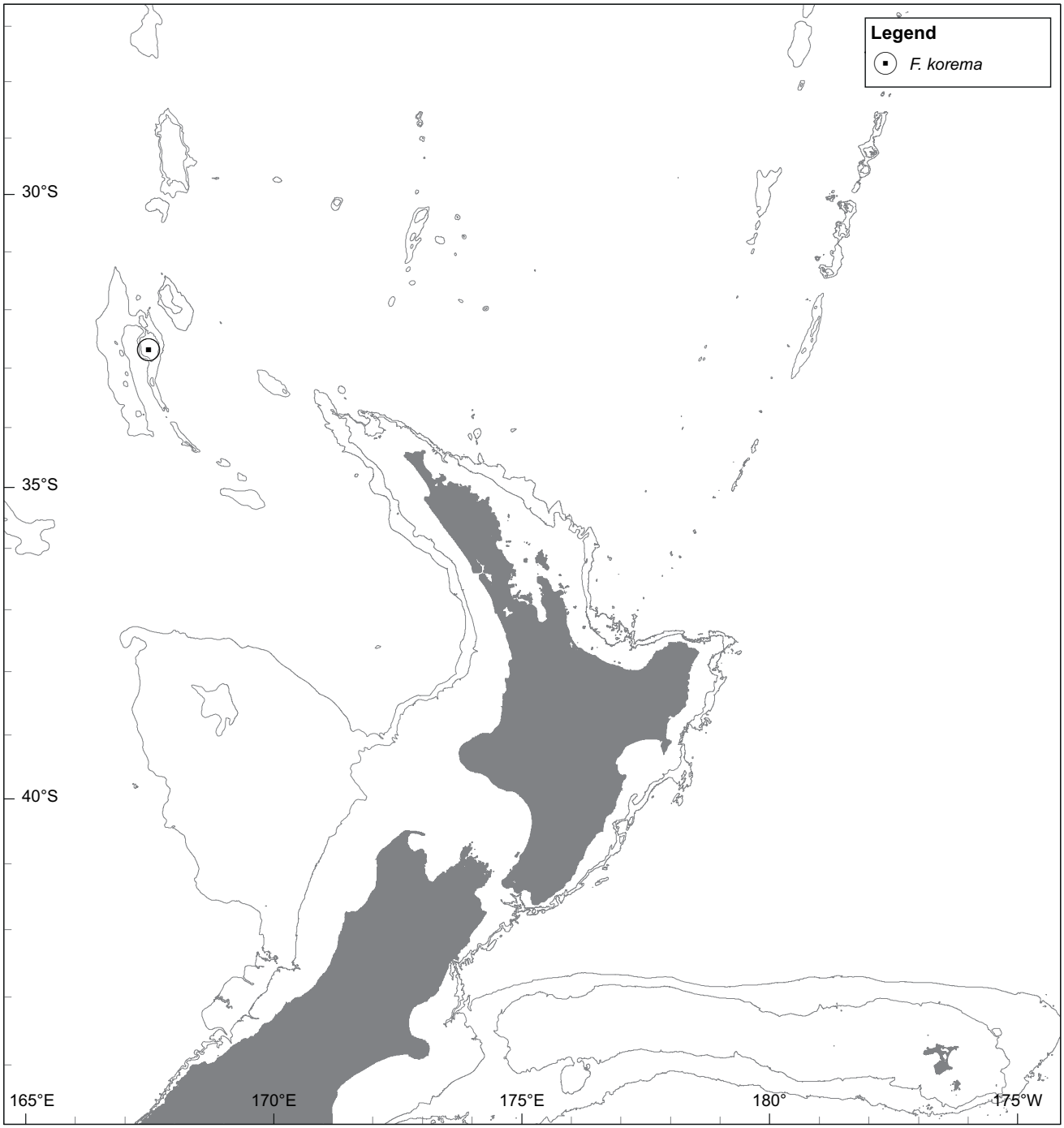

Figure 43. Distribution of *Fanellia korema* Bayer & Stefani, 1989.

characteristic of the genus, the tubercles up to 40 µm in diameter. The marginal scales are further modified by having a thicker medial crest, which often projects as a low triangle covering the proximal portion of the opercular scales. The inner surface of the body wall scales is covered with smaller tubercles. The opercular scales (Fig. 42F) range in length from 0.22–0.42 mm, decreasing in size from the ab- to adaxial side; their L:W ranges from 1.8 (abaxials) to 2.2 (adaxials). The outer surface of the operculars is ornamented with low, tuberculate ridges that radiate from a proximal central point; the proximal two-thirds of the inner surface are tuberculate, whereas the distal third is covered by a multiply serrate keel. All operculars have one pointed tip and finely serrate lateral edges. The coenenchymal scales (Fig. 42G) are thick (up to 70 µm thick), 0.16–0.71 mm in length, and arranged in a mosaic, or tessellate (edges abutted), pattern, with deep narrow valleys between them. They are rectangular or quite irregular in shape, each scale usually having one or two centrally placed bosses, these bosses sometime forming prominent (up to 0.17 mm in height) cylindrical (0.1 mm in diameter) projections (Fig. 42D); otherwise the scales are flat. Their outer and inner surfaces are

otherwise tuberculate similar to that of the body wall scales.

Comparisons. *Fanellia korema* is distinctive in lacking IL scales and in having one or two prominent cylindrical protuberances on each coenenchymal scale (Table 4).

Remarks. This is the first report of this species subsequent to its original description and is a new record for the New Zealand EEZ. It differs from the New Caledonian holotype primarily in its branching style, the holotype having a primarily dichotomous branching, whereas the New Zealand specimens are primarily pinnate, followed by sympodial.

Fanellia histoclados sp. nov.

Fig. 31G (p. 62), 44, 45; Table 4 (p. 73)

Material examined. Holotype NIWA 11274, NZOI Stn J676, 37.375° S, 177.195° E, Bay of Plenty, North Island, New Zealand, 341 m, 08 Sep 1974 (NMNH SEM stubs 1740–1743, 2183–2185). **Paratypes** NIWA 99710, NZOI Stn J676, same data as holotype, 4 colonies (USNM 1278377, 2 colonies); NIWA 11250, NZOI Stn Z9044, 32.2° S, 179.1° W, Kermadec Ridge, 122–307 m, 16 Sep 1998, 2 colonies; NIWA 99711, NZOI Stn K8263, 28.8° S, 177.8° W, Kermadec Ridge, 142 m, 25 Jul 1974, 5 colonies; NIWA 99712, NZOI Stn X121, 37.412° S, 177.195° E, Bay of Plenty, 340 m, 23 Nov 1989, 2 branches.

Type locality. Bay of Plenty.

Distribution. Kermadec Ridge, Bay of Plenty (Fig. 45), 122–341 m.

Description. Colonies are primarily uniplanar with alternate-pinnate branching (Fig. 31G), but the commensal polynoid polychaete tube modifies the main branches such that the branchlets are curved into the anterior face of the colony, producing a slightly bushy colony. The holotype (Fig. 31G) is 15 cm in height with a basal branch diameter of 1.6 mm; the largest specimen (NIWA 11250) is 35 cm tall with a basal branch diameter of 7.8 mm. A polychaete tube approximately 2 mm in diameter is invariably present along the anterior side of the main branches of the colonies of this species. The tube walls are completely covered with a thin, sclerite-containing (scales 0.20–0.25 mm in diameter) membrane, that covers the space between adjacent branchlets, producing a web-like, non-porous covering for the worm (Fig. 44D, G). Polyps usually occur in pairs (Fig. 44A), but sometimes occur singly, six to seven pairs of polyps occurring per cm branchlet length. The polyps are slightly flared (Fig. 44B), white, and 1.1–1.2 mm in length; the distal cm of each branchlet is devoid of polyps. The axis is yellow-brown in colour.

There are eight longitudinal rows of body wall scales, decreasing in number from ab- to adaxial polyp side, the body wall sclerite formula being: 6–8: 3–8: 2–3: 3–4; the short, curved adaxial side of the polyp is fully covered with scales (Fig. 44C). The body wall scales (Fig. 44E) are square to rectangular in shape, the marginals, submarginals, and sometimes the third tier of body wall scales having a medial distal spine (Fig. 44B); however, spines do not occur on any adaxial body wall scales. The outer face of the body wall scales is covered with tall, flat-topped granular tubercles (Fig. 44F) (up to 30 μm in diameter) or more narrow (3–5 μm) ridges that are separated by deep valleys, the microarchitecture that is characteristic of the genus. Often the tubercles are fused into linear ridges at the distal margin of the scales. The inner faces are covered with smaller tubercles, except for the spines, which are covered with thick longitudinal ridges. The opercular scales (Fig. 44H) range in length from 0.34–0.44 mm, decreasing in size from the ab- to adaxial side; their L:W ranges from 1.23 (abaxials) to 1.75 (adaxials). The outer surface of the operculars is ornamented with low, broad (30 μm), granular ridges that appear to be formed from fused tubercles, which radiate from a proximal central point; the proximal two-thirds of the inner surface is covered with small tubercles, whereas the distal third is covered by a multiply serrate keel. The operculars may have one to three tips or even have a blunt end; their lateral edges are finely serrate (Fig. 44I). The coenenchymal scales (Fig. 44J) are thick, tessellate, flat, and irregular in shape, up to 0.50 mm in longer axis. Their outer surface is tuberculate and ridged as described for the body wall scales.

Comparisons. *Fanellia histoclados* **sp. nov.** is distinctive in having a bushy colony and the invariable presence of a commensal polychaete worm (Table 4).

Etymology. Named *histoclados* (from the Greek *histos*, meaning web + *klados*, meaning branch), an allusion to the webbed branches formed to accommodate the commensal polychaete. Treated as a noun.

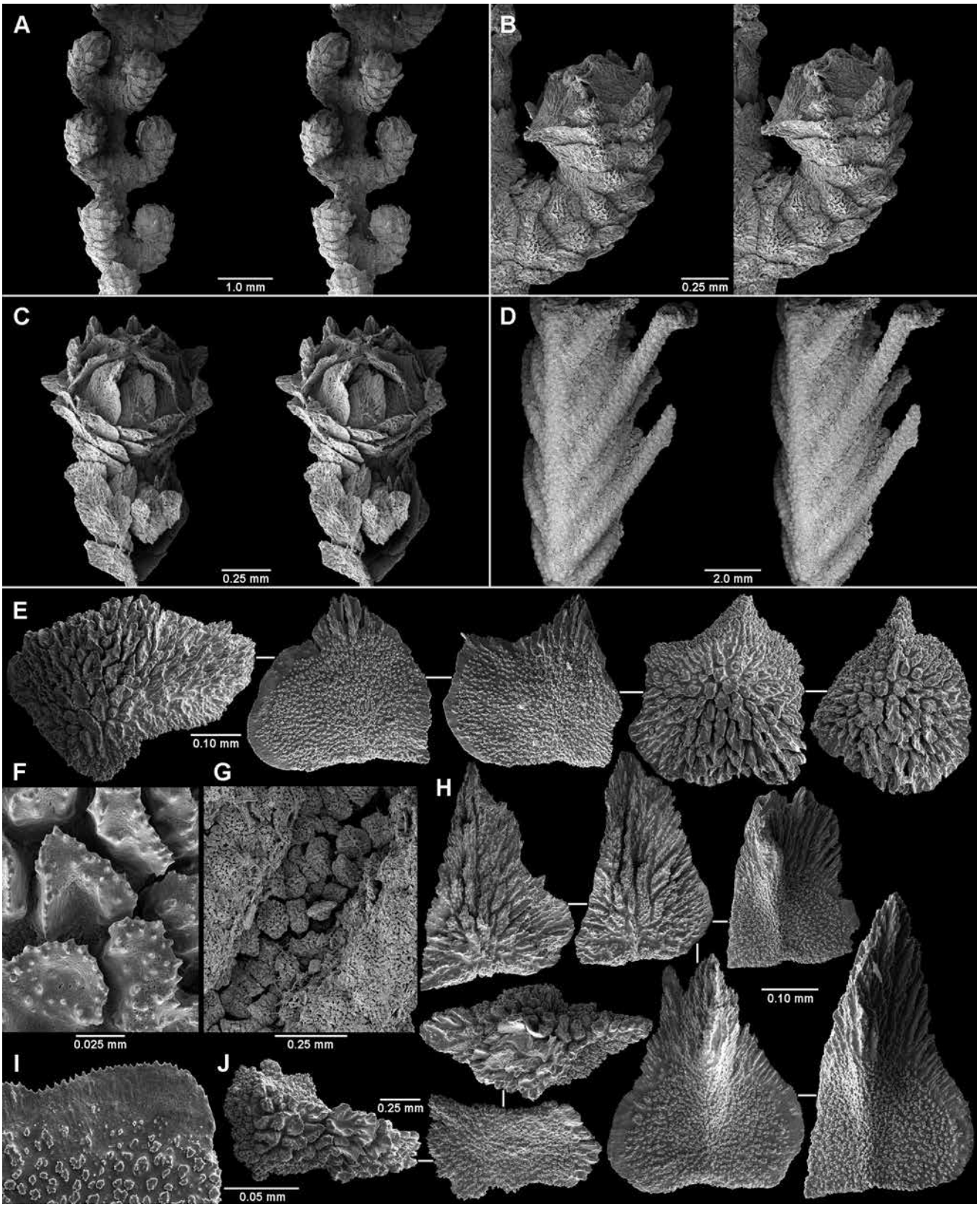

Figure 44. *Fanellia histoclados* **sp. nov.**, holotype: **A.** stereo view of paired polyps; **B–C.** stereo views of lateral and adaxial polyp side, respectively; **D.** stereo view of worm-induced web between adjacent branchlets; **E.** body wall scales; **F.** detail of body wall tubercle; **G.** coenenchymal scales forming web; **H.** opercular scales; **I.** finely serrate edge of a opercular scale; **J.** coenenchymal scales.

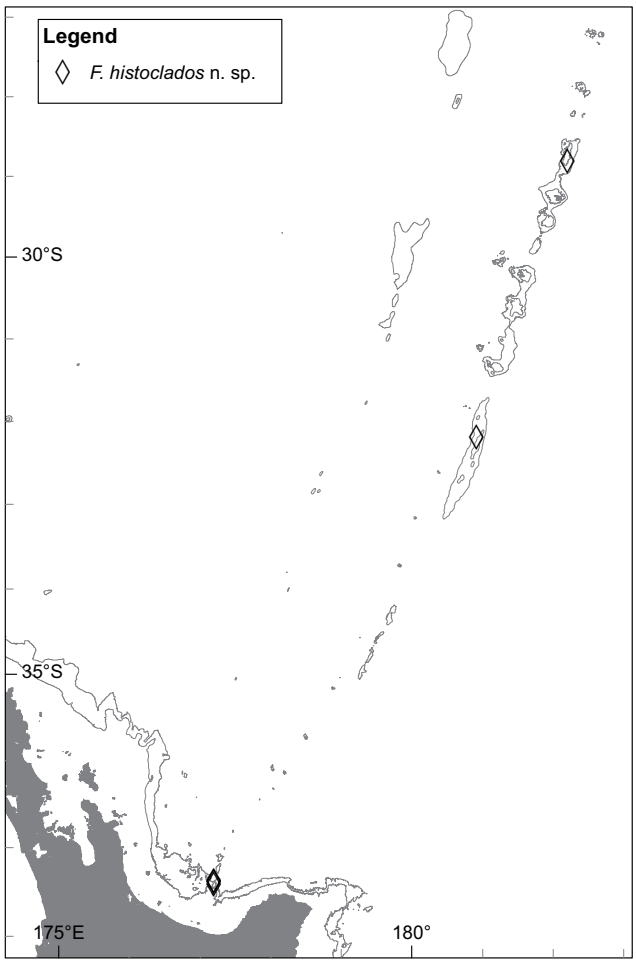

Figure 45. Distribution of *Fanellia histoclados* **sp. nov.**

Genus ***Primnoa*** Lamouroux, 1812

Primnoa Lamouroux, 1812: 188.

Primnoa, Cairns & Bayer 2005: 226–228; Cairns & Bayer 2009: 41–42, Fig. 13 H–P (more complete synonymy); Cairns 2011: 19.

Type species. *Gorgonia lepadifera* Linnaeus, 1767 (=*Gorgonia resedaeformis* Gunnerus, 1763), by monotypy.

Diagnosis. Colonies dichotomously and irregularly branched, flabellate to slightly bushy, up to 2 m in height. Polyps closely spaced and randomly arranged, facing downward. Polyps fleshy, protected by a prominent cowl of 9–10 marginal scales, several tiers of medial scales, usually a pair of basal scales, and two short rows of peri-adaxial and adaxial scales, most of the adaxial and lateral polyp faces being naked. Opercular scales blunt, their inner surface bearing a low keel. Pinnular rodlets cigar-shaped and common. Coenenchymal scales elongate, thick, irregular in shape, and granular.

Remarks. The genus, consisting of four species, was revised by Cairns & Bayer (2005).

Distribution. North Atlantic, North Pacific, subantarctic South Pacific, and New Zealand (Watling *et al.* 2011: Fig. 2.22), 8–1463 m.

Primnoa notialis Cairns & Bayer, 2005

Frontispiece; Fig. 46A, 47–49

Primnoa notialis Cairns & Bayer, 2005: 228, 246–252, Fig. 1F–G, 11–13.

Not *Primnoa* sp. Grange & Brook 2010: 149–150 with colour figure; Cairns *et al.* 2009: 93 (listed).

Material examined. Holotype—USNM 87621, *Eltanin* Stn 1346, 54.817° S, 129.800° W, Subantarctic seamount on Heezen Fracture Zone of Eltanin Fracture Zone System, 549 m. Paratypes—USNM 58169–58172, *Eltanin* Stn 1343; USNM 98264, *Eltanin* Stn 1345; USNM 87624, 87625, 87627, 87622, *Eltanin* Stn 1346.

Other material. *Chatham Rise*: NIWA 11292, NZOI Stn Z10759, 44.675° S, 175.822° E, 621 m, 16 Dec 2000, 1 colony; NIWA 11301 and 27987, NZOI Stn Z9865, 44.685° S, 175.808° W, 844 m, 19 Oct 1999, 2 colonies (NMNH SEM stubs 2244–2246); NIWA 42525, SOP Stn TRIP2551/162, 44.2° S, 174.5° W, 601–1824 m, 28 Dec 2007, 1 colony; NIWA 42548 and 49227, SOP Stn TRIP2714/80, 44.5° S, 178.6° W, 785–880 m, 12 Nov 2008, 2 colonies; NIWA 42613, SOP Stn TRIP2617/120, 44.5° S, 175.8° E, 600 m, 16 May 2008, 1 colony; NIWA 42615, SOP Stn TRIP2551/59, 44.5° S, 174.8° W, 1304–1457 m, 15 Dec 2007, 1 colony; NIWA 42626, SOP Stn TRIP2551/50, 44.5° S, 174.8° W, 1288–1203 m, 14 Dec 2007, 1 colony; NIWA 42628, SOP Stn TRIP2608/18, 44.5° S, 174.8° W, 1300–1460 m, 16 Apr 2008, 1 colony; NIWA 44610, SOP Stn TRIP2520/160, 44.1° S, 174.5° W, 770–1000 m, 29 Nov 2007, 1 colony; NIWA 47774, SOP Stn TRIP2714/157, 44.5° S, 178.6° W, 702–904 m, 26 Nov 2008, 1 colony; NIWA 49226, SOP Stn TRIP2361/109, 44.5° S, 174.8° W, 1293–1463 m, 05 Feb 2007, 1 colony; NIWA 49229, SOP Stn TRIP2551/49, 44.5° S, 174.8° W, 1289–1297 m, 14 Dec 2007, 1 colony; NIWA 49230, SOP Stn TRIP2551/55,

44.5° S, 174.8° W, 1283–1393 m, 15 Dec 2007, 1 colony (NMNH SEM stubs 2239–2241); NIWA 53325, NIWA Stn TAN0905/60, 42.81° S, 179.516° W, 1251–1290 m, 20 Jun 2009, 1 colony; NIWA 61920, SOP Stn TRIP3065/214, 45° S, 175.5° E, 1070–1100 m, 09 Mar 2010, 1 colony; NIWA 61935, SOP Stn TRIP3065/211, 44.5° S, 178.7° W, 661–904 m, 08 Mar 2010, 1 colony; NIWA 65525, SOP Stn TRIP3028/236, 44.4° S, 179.3° W, 963–1100 m, 21 Jan 2010, 1 colony; NIWA 65526, SOP Stn TRIP3004/33, 44.5° S, 178.6° W, 710 m, 24 Nov 2009, 1 colony; NIWA 65528, SOP Stn TRIP3028/136, 44.5° S, 178.6° W, 735 m, 10 Jan 2010, 1 colony; NIWA 65529, SOP Stn TRIP3028/127, 44.5° S, 178.7° W, 690–925 m, 09 Jan 2010, 1 colony; NIWA 65530, SOP Stn TRIP3028/131, 44.5° S, 178.6° W, –944 m, 10 Jan 2010, 1 colony; NIWA 65537, SOP Stn TRIP2807/243, 44.2° S, 174.6° W, 620–1052 m, 10 Mar 2009, 1 colony; NIWA 65538, SOP Stn TRIP2807/253, 44.5° S, 174.8° W, 1310–1447 m, 11 Mar 2009, 1 colony; NIWA 65543, SOP Stn TRIP2807/252, 44.5° S, 174.8° W, 1308 m, 11 Mar 2009, 1 colony (USNM 1278543, 1 branch, NMNH SEM stubs 2237–2238, 2242–2243); NIWA 65545, SOP Stn TRIP2807/241, 44.5° S, 174.8° W, 1270 m, 09 Mar 2009, 1 colony; NIWA 65553 and 66308, SOP Stn TRIP2955/111, 44.5° S, 178.6° W, 730–936 m, 19 Oct 2009, 2 colonies; NIWA 65992, SOP Stn TRIP3223/27, 44.9° S, 175.5° E, 974–1160 m, 07 Nov 2010, 1 colony.

Bounty Plateau: NIWA 42487, SOP Stn TRIP2653/71, 47.3° S, 178.2° E, 889–1019 m, 22 Jul 2008, 1 colony; NIWA 42519, SOP Stn TRIP2468/11, 47.3° S, 178.8° E, 753–860 m, 20 Jul 2007, 1 colony; NIWA 42531, SOP Stn TRIP2635/144, 47.3° S, 178.2° E, 887–905 m, 02 Jul 2008, 1 colony; NIWA 42630, SOP Stn TRIP2494/19, 47.5° S, 177° E, 745–790 m, 03 Sep 2007, 1 colony; NIWA 44168, SOP Stn TRIP2416/54, 47.5° S, 177° E, 720–741 m, 28 Apr 2007, 1 colony; NIWA 44615, SOP Stn TRIP2506/142, 47.4° S, 178.3° E, 860–913 m, 19 Oct 2007, 1 colony; NIWA 45896, SOP Stn TRIP2468/43, 47.2° S, 177.6° E, 1065–1164 m, 28 Jul 2007, 3 colonies; NIWA 46484, SOP Stn TRIP2494/14, 47.5° S, 177.8° E, 867–915 m, 02 Sep 2007, 1 colony; NIWA 65521, SOP Stn TRIP2921/24, 47.9° S, 178.4° E, 505 m, 07 Aug 2009, 1 colony; NIWA 65522, SOP Stn TRIP2920/47, 47.3° S, 178.7° E, 86–980 m, 21 Sep 2009, 1 colony; NIWA 65524, SOP Stn TRIP2920/44, 47.3° S, 178.8° E, 770–870 m, 21 Sep 2009, 1 colony; NIWA 66126, SOP Stn TRIP2718/255, 47.6° S, 177.9° E, 595–874 m, 12 Dec 2008, 1 colony; NIWA 66127, SOP Stn TRIP2718/141, 47.3° S, 177.5° E, 829–1038 m, 28 Nov 2008, 1 colony; NIWA 66128, SOP Stn TRIP2718/126, 47.4° S, 178.1° E, 904–910 m, 25 Nov 2008, 1 colony; NIWA 66497, SOP Stn TRIP2718/108, 47.6° S, 177.9° E, 848–918 m, 24 Nov 2008, 1 colony; NIWA 75813, SOP Stn TRIP3406/61, 47.5° S, 177.8° E, 878–976 m, 15 Nov 2011, 1 colony.

Bounty Trough: NIWA 11289, NZOI Stn Z11100, 46.145° S, 171.405° E, 1041–1103 m, 09 May 2002, 1 colony; NIWA 42629, SOP Stn TRIP2320/48, 46° S, 171.4° E, 1223–1250 m, 25 Oct 2006, 1 colony; NIWA 44612, SOP Stn TRIP2506/45, 47.3° S, 172.4° E, 1110–1270 m, 03 Oct 2007, 1 colony (USNM 1278511, 1 colony); NIWA 44613, SOP Stn TRIP2506/105, 47.2° S, 172.4° E, 1110–1122 m, 13 Oct 2007, 1 colony; NIWA 44620, SOP Stn TRIP2506/81, 46.9° S, 171.9° E, 1106–1357 m, 09 Oct 2007, 1 colony; NIWA 66125, SOP Stn TRIP2718/299, 47.2° S, 172.4° E, 780–1237 m, 19 Dec 2008, 1 colony.

Campbell Plateau: NIWA 11293 and 91299, NZOI Stn Z9601, 48.002° S, 166.085° E, 940 m, 27 Nov 1998, 2 colonies; NIWA 28421, NIWA Stn TAN0307/81, 49.799° S, 175.306° W, International Waters, 1180–881 m, 02 May 2003, 1 colony (USNM 1278441, 1 colony); NIWA 27989, NZOI Stn Z10173, 49.774° S, 176.679° W, 1000–1089 m, 23 May 2000, 1 colony; NIWA 42632 and 42633, SOP Stn TRIP2614/98, 49.9° S, 175.3° E, 800–820 m, 25 Apr 2008, 2 colonies; NIWA 42636, SOP Stn TRIP2571/220, 49.9° S, 175.3° E, 781–859 m, 30 Mar 2008, 1 colony; NIWA 44611, SOP Stn TRIP2506/108, 48.3° S, 174.8° E, 985–1143 m, 14 Oct 2007, 1 colony; NIWA 61980, SOP Stn TRIP3077/127, 48.8° S, 175.4° E, 769–767 m, 31 Mar 2010, 1 colony; NIWA 65554, SOP Stn TRIP2920/66, 48.8° S, 175.4° E, 685–746 m, 24 Sep 2009, 1 colony; NIWA 66500, SOP Stn TRIP3112/23, 48.6° S, 175.4° E, 867–865 m, 20 Apr 2010, 1 colony; NIWA 69883, NZOI Stn Z9775, 54.062° S, 171.662° E, 1315 m, 14 May 1999, 1 colony; NIWA 91205, NZOI Stn Z10922, 51.478° S, 174.06° E, 671 m, 25 Nov 2001, 1 colony (USNM 1278379, 1 colony).

Solander Trough: NIWA 11291 and 27986, NZOI Stn Z9592, 48.551° S, 164.951° E, 940–1180 m, 30 Nov 1998, 1 colony; NIWA 11294, NZOI Stn Z9590, 49.118° S, 164.3° E, 948 m, 01 Dec 1998, 1 colony; NIWA

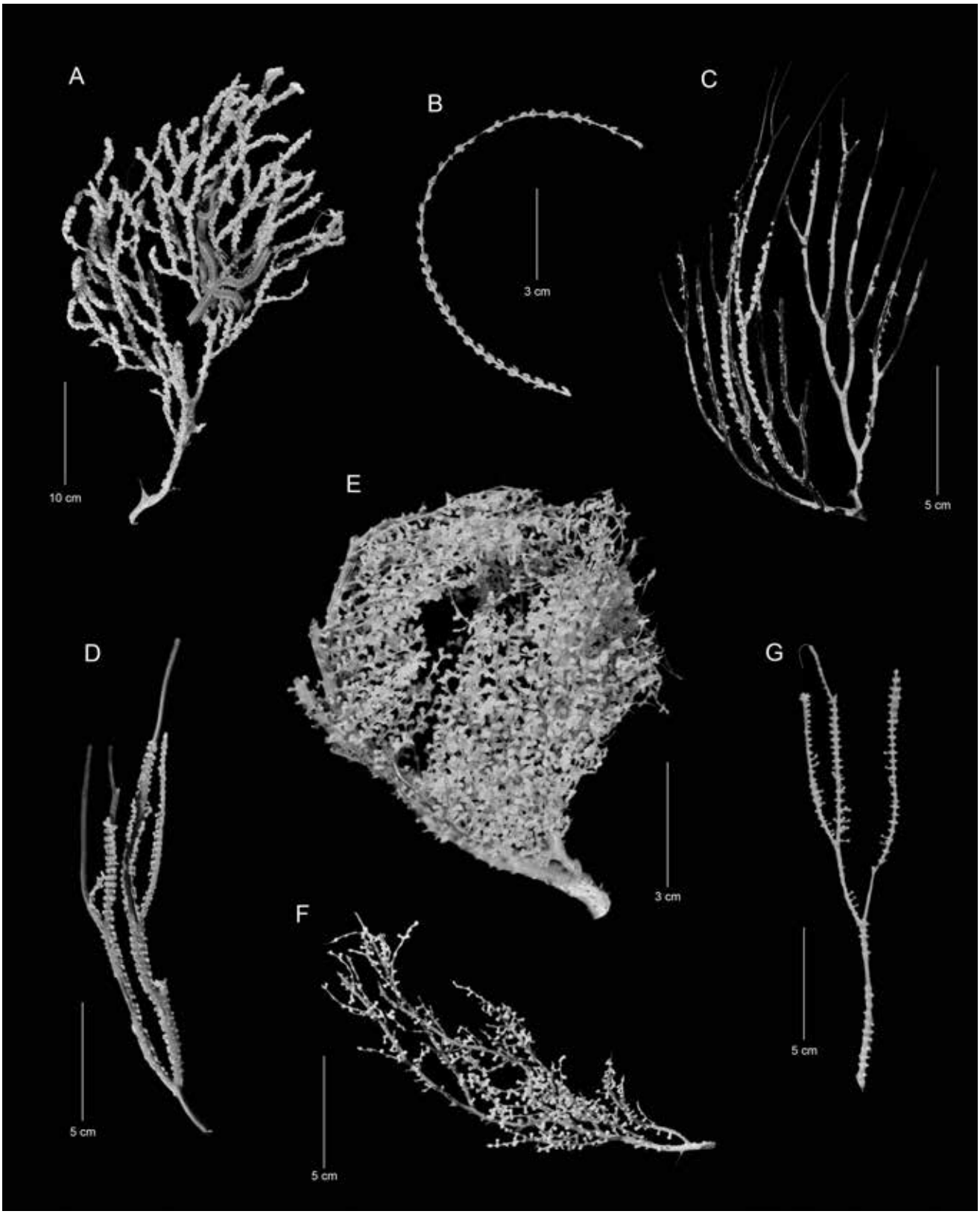

Figure 46. Specimen morphology: **A.** *Primnoa notialis* Cairns & Bayer, 2005, NIWA 47774; **B.** *Narelloides traceyae* **sp. nov.**, holotype; **C.** *Paracalyptrophora mariae* (Versluys, 1906), NIWA 72192; **D.** *Paracalyptrophora hawaiiensis* Cairns, 2009, **nom. correct.**, NIWA 66298; **E.** *Parastenella spinosa* Wright & Studer, 1889, USNM 83619; **F.** *Parastenella pacifica* Cairns, 2007, NIWA 94401; **G.** *Candidella helminthophora* (Nutting, 1908), NIWA 11127.

11295, NZOI Stn Z9352, 50.068° S, 165.884° E, 993 m, 20 Sep 1998, 1 colony; NIWA 11296, 11299, 41743, and 91268, NZOI Stn Z9585, 48.558° S, 164.957° E, 1061 m, 29 Nov 1998, 4 colonies (USNM 1278381, 1 colony); NIWA 27985, NZOI Stn Z9605, 48.55° S, 164.901° E, 1046 m, 29 Nov 1998, 1 colony (USNM 1278544, 1 colony); NIWA 41744, NZOI Stn Z9586, 48.551° S, 164.951° E, 1067 m, 13 Dec 1998, 1 colony; NIWA 42618, SOP Stn TRIP2571/193, 50.1° S, 165.9° E, 1004–1192 m, 25 Mar 2008, 1 colony; NIWA 42634, SOP Stn TRIP2571/190, 49.9° S, 163.8° E, 780–927 m, 25 Mar 2008, 1 colony.

Macquarie Ridge (Australian EEZ): TMAG K4378, NIWA Stn TAN0803/89, 55.381° S, 158.427° E, 504–637 m, 15 Apr 2008, 1 colony (USNM 1278382, 1 colony); TMAG K4386, NIWA Stn TAN0803/98, 56.246° S, 158.506° E, 676–750 m, 16 Apr 2008, 2 colonies (USNM 1278545 and 1278378, 2 colonies); TMAG K4387, NIWA Stn TAN0803/102, 56.242° S, 158.462° E, 790–1025 m, 16 Apr 2008, 2 colonies.

Type locality. Subantarctic seamount on Heezen Fracture Zone of Eltanin Fracture Zone System.

Distribution. Off southwestern New Zealand, including the Chatham Rise, Campbell Plateau, Macquarie Ridge, Bounty Plateau (Fig. 49), and the Heezen Fracture Zone (type locality), 501–1463 m.

Description. Specimens are irregularly branched, forming planar to slightly bushy colonies up to 40 cm in height (NIWA 4774, Fig. 46A), but judging from calcified basal branch diameters of up to 28 mm in diameter, much larger colonies certainly exist. Branches are thick, up to 1 cm in sub-terminal diameter, and fleshy; the axis is smooth, woody, and golden-yellow, greenish or gray in colour. A cross section of a branch reveals 10–12 large (0.35 mm in diameter) gastrodermal canals surrounding the axis, separated from one another by only a thin walls (Fig. 47B). Polyps are closely spaced, crowded on the branches, but occur in no order. Most polyps point downward (a very small percentage face upward), and thus the distal branch tip is a small mound (Fig. 47A) about 2.5 mm in diameter covered with coenenchymal scales and flanked by the basal scales of the distal most polyps. The polyps are strongly flared distally (Fig. 47C), the flare produced by a circular cowl (Fig. 47E) constructed of five of the nine marginal scales. Polyps are 4.5–6.0 mm in length and up to 4 mm in distal diameter. Colonies are grey to white.

The body wall scales are somewhat variable in number and position. There are usually nine marginal (buccal) scales (Fig. 47E), consisting of: three large (up to 2.2 mm in length and 1.6 mm in width), thin, rectangular scales that surround the abaxial and lateral sides of the polyp; a pair of slightly smaller marginals in the inner lateral position; a pair of smaller peri-adaxial scales about 0.7 mm in width; and finally a pair of small (0.5 mm in width) truly adaxial scales, which are usually hidden behind the peri-adaxials and thus do not contribute to the cowl (Fig. 47F). The five larger marginals (Fig. 48A) form a prominent cowl encircling the operculum. Proximal to the abaxial marginal scales are one or two tiers of two or three scales each of medial scales that cover the abaxial side of the polyp, occasionally with smaller stellate-shaped (Fig. 48B) supernumerary scales that fill the spaces between the medials. The abaxial medials are 0.7–0.1.5 mm in width. The pair of basal scales are usually slightly larger than the medials (1.4–1.6 mm in width) but are not as large as the marginals, and have rounded distal edges, or in some cases, bear a dorsolateral spur up to 0.4 mm in length (Fig. 48D). Their medial lateral edges are digitate, reinforcing their connection to the adjacent basal. The lateral sides of the polyp are devoid of sclerites, but there may be one more set of scales posterior to the peri-adaxial and adaxial marginals, resulting in the adaxial side of the polyp being naked (Fig. 48F). Thus the sclerite formula for this species is: 3–4: 0: 1–2: 1–2. The opercular scales (Fig. 49C) are quite elongate (up to 2.1 mm, L:W = 2.4–3.3), and slightly bent to form a canopied operculum; they usually have a blunt to rounded tip (Fig. 49D), a digitate base, and a low-keeled inner face. The opercular and body wall scales bear a fine granulation on their outer surface. Rotund pinnular rodlets (Fig. 49F) are common, measuring up to 0.19 mm in length and having an L:W = 3.3–3.6.

The coenenchymals (Fig. 48E) are quite variable in size (0.4–1.6 mm in length), but are usually elongate and irregular in shape. They are thicker than the body wall scales and longitudinally arranged along the branch axis. They bear a coarse granulation.

Comparisons. Despite two keys to the species of *Primnoa*, both dichotomous and tabular (Cairns & Bayer 2005), the differences among the species are

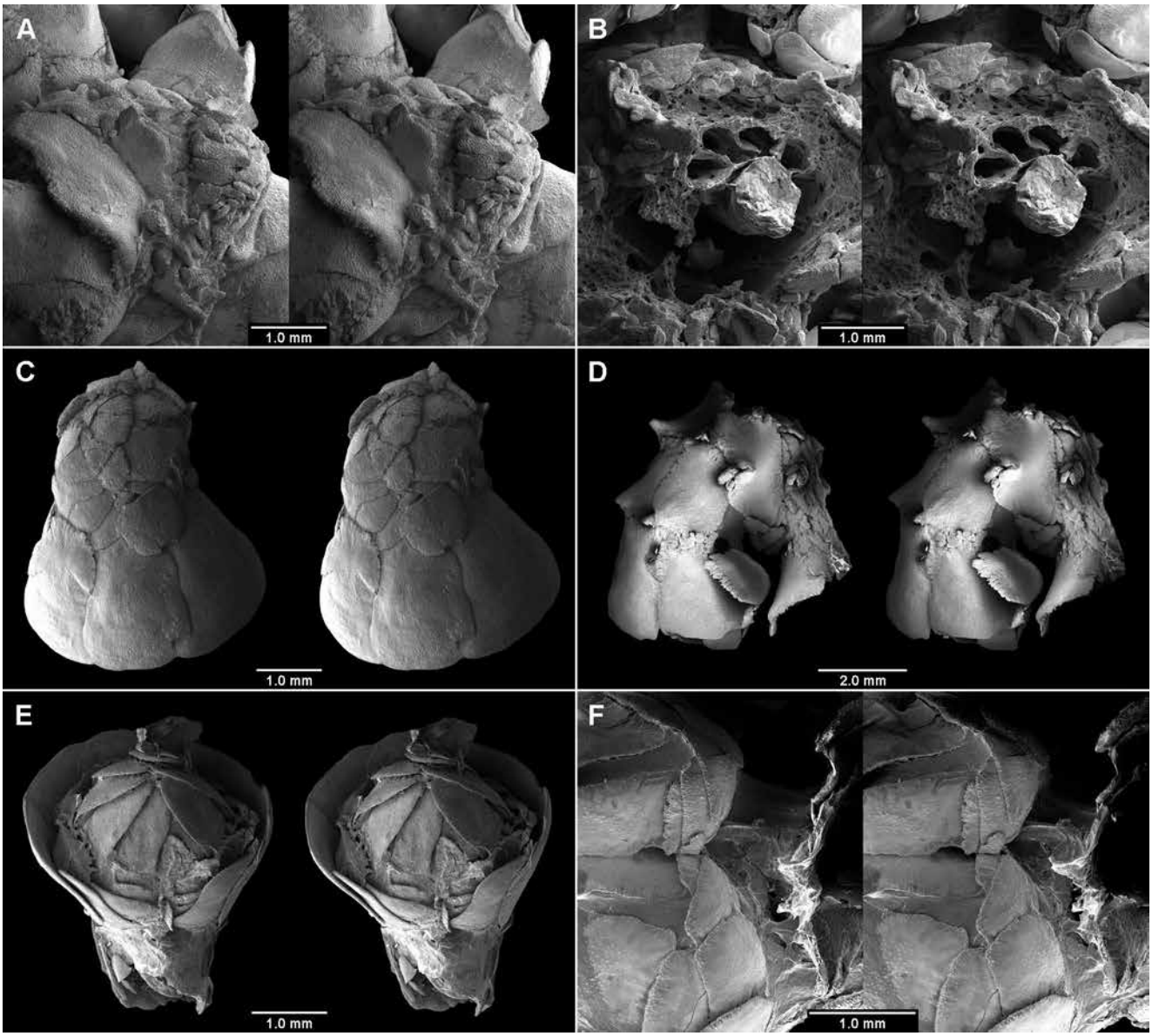

Figure 47. *Primnoa notialis* Cairns & Bayer, 2005 (A–B, E–F, NIWA 49230; C, NIWA 65543; D, NIWA 11291): **A.** stereo view of branch tip; **B.** stereo view of branch axis surrounded by solenial canals; **C.** stereo view of abaxial side of a polyp; **D.** stereo view of polyps showing prominent distal spines on basal scales; **E.** stereo opercular view showing adaxial side and opercular cowl; **F.** stereo view of adaxial polyp (orientated transversely).

subtle, especially among the *P. pacifica* Cairns & Bayer 2005, *P. resedaeformis*, and *P. notialis* species complex, and become even more so when numerous specimens are examined and intraspecific variation is better understood. Ultimately these three taxa may be found to be subspecies or variants of the same worldwide species. At this point, however, the North Atlantic *P. resedaeformis* appears to differ from *P. notialis* in having discretely paired medial scales and no supernumerary medial scales, and a tendency to have ten marginal scales (six larger and two pairs of smaller adaxial). The North Pacific *P. pacifica* has nine marginal scales, like *P. notialis*, but differs in having massive basal scales that bear prominent sharp, dorsolateral spines up to 1.5 mm in length; about 25% (19/78 lots reported herein) of the specimens of New Zealand *P. notialis* have a dorsolateral spur on their basal scales but no larger than 0.4 mm in length, the remaining specimens having a rounded distal edge. This variation can be found in polyps from the same colony. Furthermore, the basal scales of *P. notialis* are not as massive as those of *P. pacifica*. Also, the medial scales of *P. pacifica* are usually slender and extend to the lateral faces of the polyp, whereas those of

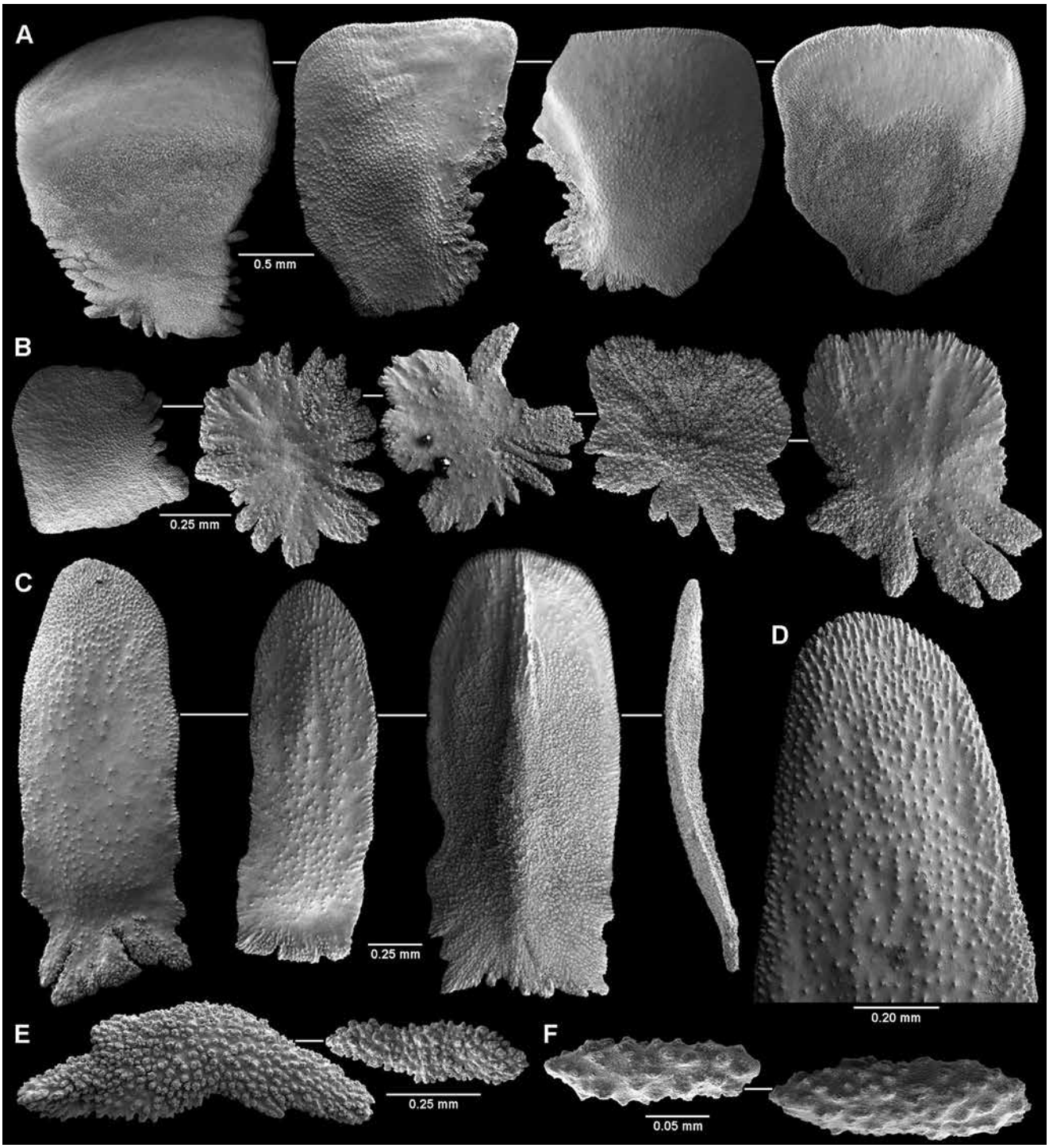

Figure 48. *Primnoa notialis* Cairns & Bayer, 2005 from NIWA 65543: **A.** large marginal scales; **B.** body wall and supernumerary scales; **C.** opercular scales; **D.** distal region of outer opercular scale; **E.** coenenchymal scales; **F.** pinnular rodlets.

P. notialis are rectangular to trapezoidal, do not occur on the lateral faces, and are often accompanied by supernumerary stellate scales. Finally, the pinnular rodlets of *P. pacifica* appear to be twice the length as those of *P. notialis*.

Remarks. This is the most commonly collected primnoid in the New Zealand region, 78 records reported herein, but nonetheless constitutes a new record for the New Zealand EEZ. Because of its size and relative abundance, it may serve as a refuge for deep-sea fish and other invertebrates.

The report of *Primnoa* sp. by Grange & Brook (2010) from the North Cape at about 30 m is unsubstantiated and doubtful due to its shallow depth. This may form the basis for the false report of *Primnoeides* by Doak (1971) and perpetuated by Cairns *et al.* (2009)

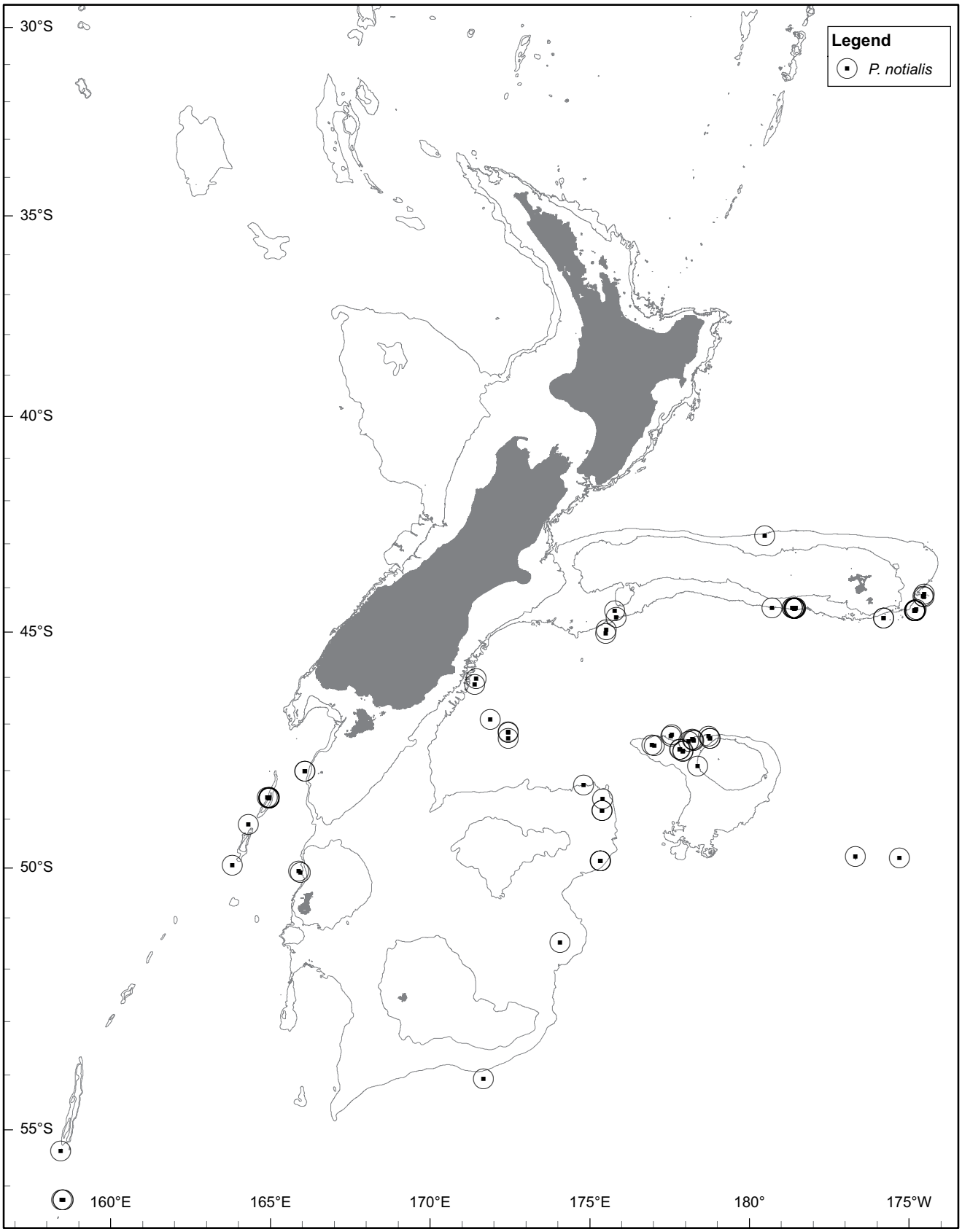

Figure 49. Distribution of *Primnoa notialis* Cairns & Bayer, 2005.

Genus ***Narelloides*** Cairns, 2012

Type species. *Narelloides crinitus* Cairns, 2012.

Diagnosis. Colonies flagelliform. Polyps arranged in upward-facing whorls. Polyps consist of a single or paired infrabasal scales, 1–3 pairs of basal scales, 3–5 abaxial body wall scales, and one pair of inner lateral, outer lateral and/or adaxial marginals, resulting in only six marginal scales; adaxial side of polyp bare. Opercular scales keeled. Outer faces of all scales smooth. Coenenchymal scales elliptical and flat.

Remarks. Including the new species described below, there are only two species in the genus, both known only from the New Zealand EEZ. It is compared to other similar primnoid genera having multiple pairs of abaxial body wall scales by Cairns (2012, Table 2).

Distribution. Three Kings Islands and Bounty Platform, New Zealand, 157–1280 m.

Narelloides traceyae sp. nov.

Fig. 46B (p. 83), 50, 51

Material examined. Holotype NIWA 99713, NZOI Stn F123, 47.633° S, 178.95° W, Bounty Plateau, east of Bounty Island, 1280 m, 27 Jan 1965, 1 colony (USNM 1278547, dried calyces and NMNH SEM stubs 2248–2252). **Paratype** NIWA 99714, NZOI Stn I666, 47.792° S, 178.992° W, Bounty Plateau, 1165 m, 13 Mar 1979, 4 colonies (USNM 1278548, 1 colony).

Type locality. Bounty Plateau, east of Bounty Island.

Distribution. Bounty Plateau (Fig. 51), 1165–1280 m.

Description. The colony is unbranched (flagelliform), up to 18 cm in length and 1.1 mm in basal branch diameter (NZOI Stn I666), although the holotype (Fig. 46B) is much shorter (10 cm), chosen for its better preservation of the polyps. The axis is bronze in colour. Polyps face upward and are arranged in whorls of four or five, about two whorls occurring per cm branch length; the horizontal length of a polyp is 3.4–3.8 mm.

Each polyp is composed of a pair of infrabasals, two or three pairs of basals, three abaxial pairs (including the marginals), one pair of outer and inner lateral each, and no adaxials (Fig. 50B, C). Thus the sclerite formula is: 5–6+: 1: 1: 0, the plus indicating the infrabasal pair. The infrabasals are quite wide (up to 1.7 mm), almost encircling the base of the polyp but do not meet on the adaxial side (Fig. 50 C, D); they are only about 0.4 mm tall. Above the infrabasals are two or three pairs of curved basals (Fig. 50E), each slightly wider than the lower, ranging from 0.7–1.5 mm in width but consistently about 0.5–0.6 mm in height. The uppermost and thus largest basals have a small (up to 0.15 mm in height) flat lobe on their anterolateral margin. The first pair of medial scales (Fig. 50F), those that articulate with the uppermost basal, is the largest (scale length 1.3–1.5 mm) and forms a right angle with the basal scale. The other two pairs of abaxial scales (Fig. 50G) are shorter but equally wide, e.g. 0.8–1.0 mm. A pair of OL (Fig. 50B) and IL scales occur in the marginal position, these only slightly smaller than the abaxial marginal scales. The adaxial side of the polyp is largely naked (Fig. 50C). The outer faces of the body wall scales are smooth, the inner faces bear a uniform fine granulation. The operculum is quite prominent, composed of scales roughly the same length (i.e. 1–7–1.9 mm) although the adaxials are significantly shorter (i.e. 1.3 mm). The abaxial operculars are quite broad, having an L:W of about 1.7, but they scales become progressively narrower toward the adaxial side (Fig. 50C, H), resulting in the adaxial operculars having a L:W of 3.7. The upper face of the operculars is smooth to slightly spiny apically and somewhat creased centrally; their inner face is covered with fine granules.

The coenenchymal scales (Fig. 50I) are elliptical to irregular in shape, 0.23–0.60 mm in greater diameter, and have a perfectly flat outer surface. They are arranged in an imbricate manner often seemingly on edge (Fig. 50J).

Comparisons. Although clearly belonging to the same genus, *N. traceyae* **sp. nov.** differs from *N. crinitus* in having larger polyps and thus fewer per cm branch length, fewer polyps per whorl, paired infrabasals (not unique), marginals with rounded apical edges (not pointed), and in having much larger opercular scales. *N. traceyae* **sp. nov.** also occurs at a greater depth and much farther to the south than *N. crinitus*.

Etymology. Named in honour of Dianne M. Tracey (NIWA), who has assiduously promoted the study of the deep water fauna of the New Zealand region.

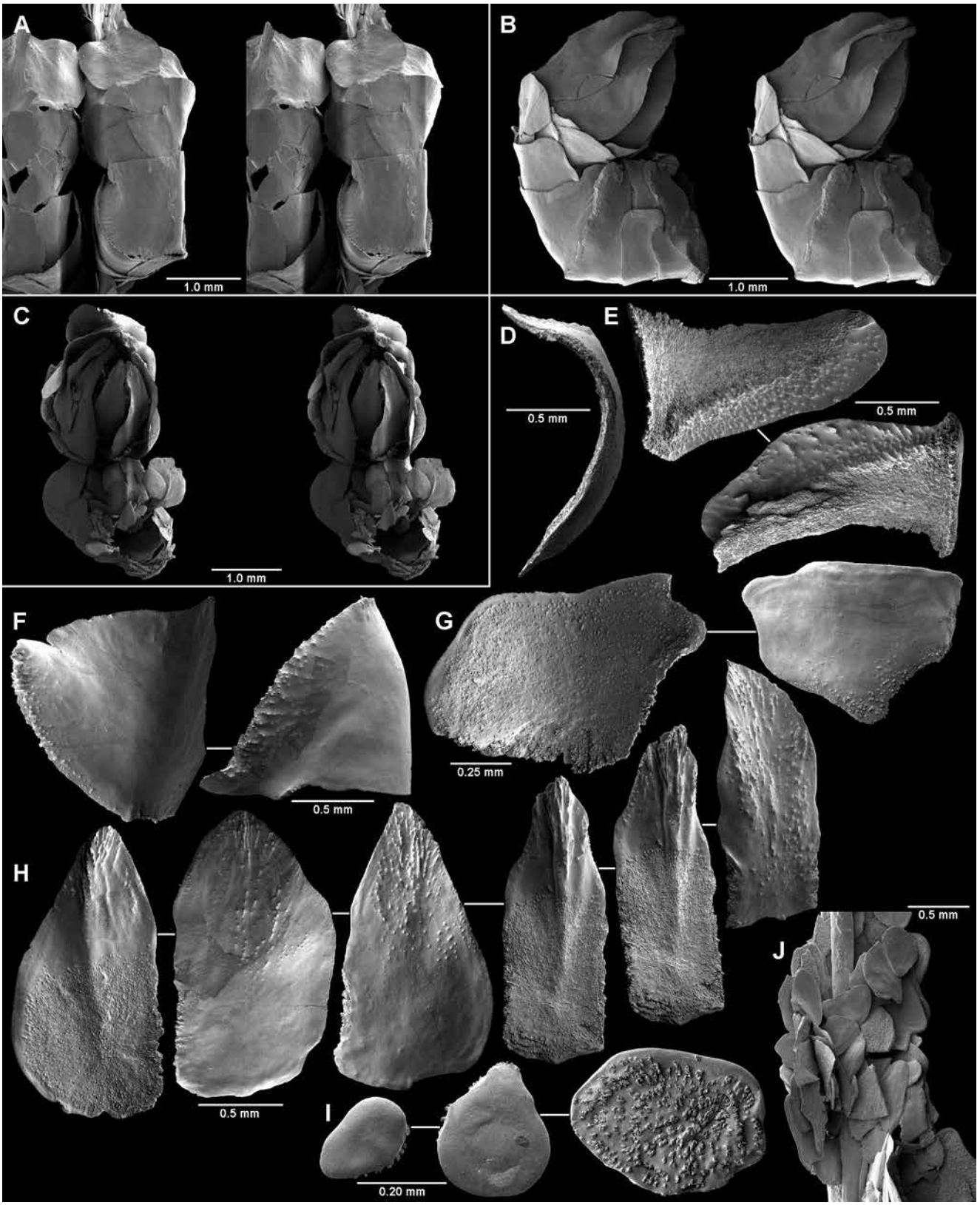

Figure 50. *Narelloides traceyae* **sp. nov.**, holotype: **A–C.** stereo views of abaxial, lateral, and adaxial side of a polyp, respectively; **D.** edge view of an infrabasal scales; **E.** basal scales; **F.** first pair of medial body wall scales; **G.** second pair of body wall scales; **H.** opercular scales; **I.** coenenchymal scales; **J.** coenenchymal scales *in situ*.

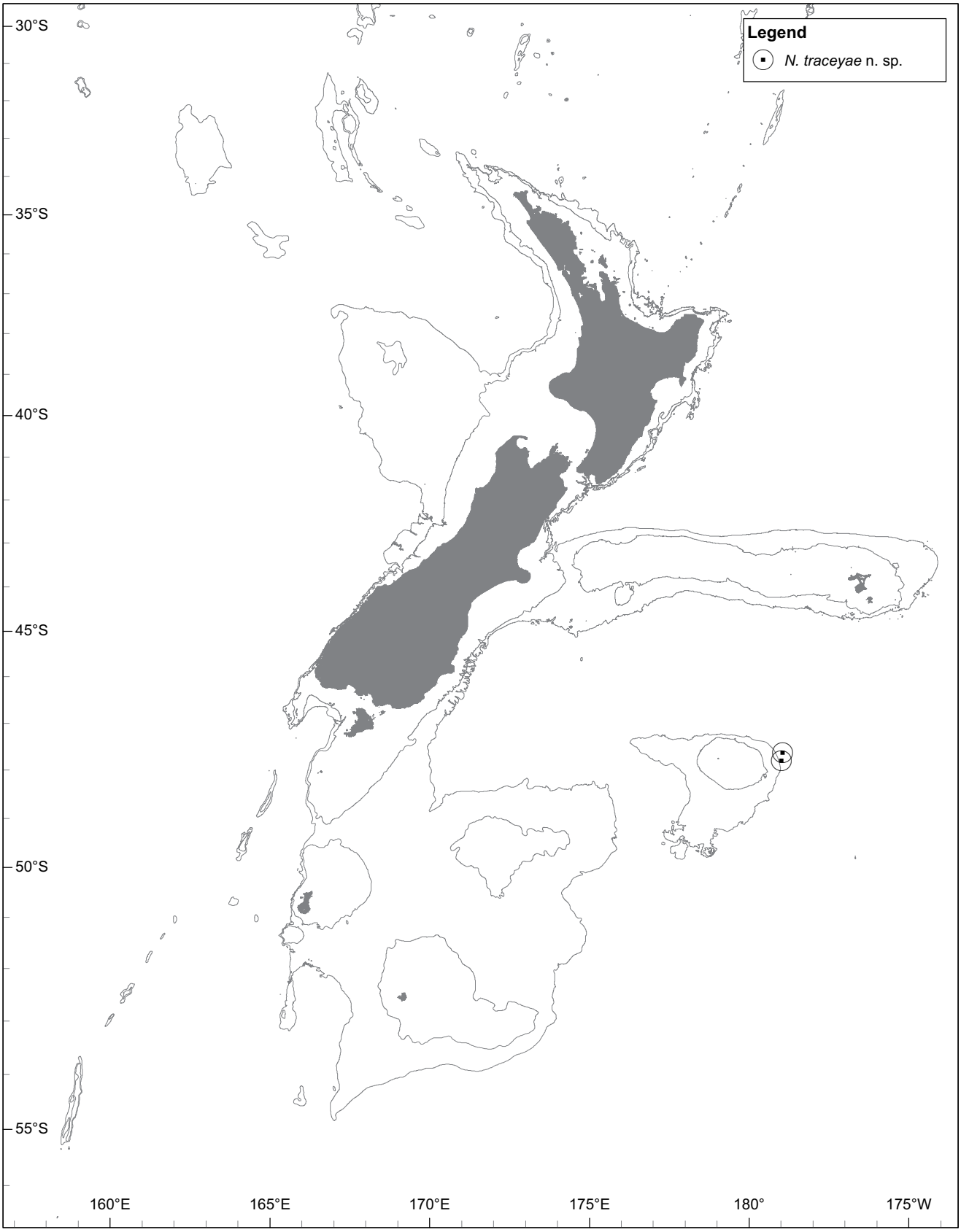

Figure 51. Distribution of *Narelloides traceyae* **sp. nov.**

Genus ***Paracalyptrophora*** Kinoshita, 1908

Calyptrophora (*Paracalyptrophora*) Kinoshita, 1908: 58.
Paracalyptrophora: Bayer, 1981: 937, 946; Cairns & Bayer 2004a: 115 (more complete synonymy); Cairns & Bayer 2009: 44.

Type species. *Calyptrophora kerberti* Versluys, 1906, by subsequent designation (Cairns & Bayer 2004a).

Diagnosis. Colonies uniplanar or biplanar, usually dichotomously branched (sometimes lyrate). Polyps arranged in whorls, the polyps directed downward. Body wall of polyps covered by two pairs of scales (basals and buccals) that encircle the polyp but which are not fused to one another; one or two pairs of crescent-shaped infrabasals help to secure basal scales to branch. Some species have one pair of small adaxial buccal scales. Inner surface of opercular scales keeled. Coenenchymal scales irregular in shape, often granular or ridged.

Remarks. There are eight species in the genus (see Cairns & Bayer 2004a, 2009 and Cairns 2009). A key to and discussion of most of the species are provided by Cairns & Bayer (2004a).

Distribution. Southwestern Pacific, Japan, Hawai'i, North Atlantic, 150–1480 m.

Paracalyptrophora mariae (Versluys, 1906)

Fig. 46C (p. 83), 52, 53

Calyptrophora mariae Versluys, 1906: 107–109, Pl. 9, Fig. 25, Text Fig. 140–145.
Paracalyptrophora mariae, Cairns & Bayer 2004a: 132–135, Fig. 1H, 10A–C (complete synonymy).

Material examined. *Bay of Plenty*: NIWA 72192, NIWA Stn TAN1104/17, 36.448° S, 177.844° E, Clark Seamount, 990–1105 m, 04 Mar 2011, 1 colony (USNM 1278551, branches).

Challenger Plateau (International Waters): NIWA 65987, SOP Stn TRIP3239/10, 37.8° S, 168.1° E, 629–687 m, 26 Nov 2010, 2 branch fragments (NMNH SEM stubs 2127–2130).

Type & locality. Holotype—ZMA Coel. 7414, Stn *Siboga* 297, 10.650° S, 123.000° E, Roti Strait, between Timor and Roti, 520 m.

Distribution. Northwestern Challenger Plateau, Bay of Plenty (Clark Seamount) (Fig. 53), 629–1105 m; elsewhere, Timor Sea, New Caledonia, 418–520 m.

Description. Colonies are equally and sparsely dichotomously branched (Fig. 46C), and biflabellate in growth form, although the two branch fragments reported herein are too small to see the biflabellate nature. The largest New Zealand colony (NIWA 72192) is a biflabellate colony 16 cm tall. The axis is stiff and dark bronze in colour. Polyps occur in whorls of four to seven and face downward, four or five whorls occurring per cm branch length. The polyps are 2.2–2.3 mm in length, including the infrabasals.

The two basal scales stand at a 45° angle to the branch and reach up to 1.4 mm in height, the distal 0.75–0.9 mm consisting of a tall, pointed, flattened spine on the dorsolateral margin (Fig. 52A, D); the spine bears longitudinally arranged, serrate ridges on its inner (Fig. 52E) and outer surfaces. A short articular ridge occurs at the base of the inner face of the spine (Fig. 52F). The large (up to 1.4 mm in length) abaxial buccal scales (Fig. 52A, G–H) have a deeply serrate to dentate distal margin, each projection corresponding to a low, spinose ridge covering the distal third of the scale. Otherwise, the dorsolateral edges of the basal and buccal scales are rounded (not ridged or turning at a right angle); the outer faces of both types of body wall scales are hispid, covered with numerous sharp spines; also both types of scales are open in position in that they do not fuse or touch on their adaxial side. A pair of small (0.3 mm in diameter) adaxial marginal (buccal) scales (Fig. 52B) are tucked beneath the proximal part of the adaxial operculars. The basal scales are held in position by two pairs of crescent-shaped infrabasals (Fig. 52I), the more distal pair up to 0.35 mm in height, the lower pair smaller (about 0.15 mm in height).

The operculum is prominent (Fig. 52 A–C), consisting of triangular scales (L:W = 1.8–2.7) ranging from 0.8–1.1 mm in length (Fig. 52J), decreasing in size from the ab- to adaxial side of the polyp but increasing in L:W in the same direction; the lateral operculars are asymmetric in shape, having a basolateral lobe on their adaxial side. Near the base of the outer surface of the operculars, rows of granules and spines radiate towards the edges of the scale, those oriented distally forming low ridges. The proximal half of the inner face of the operculars is finely tuberculate, but the distal half bears a prominent medial keel and sometimes lateral ridges. The basals, buccals, and opercular scales all have finely serrate edges.

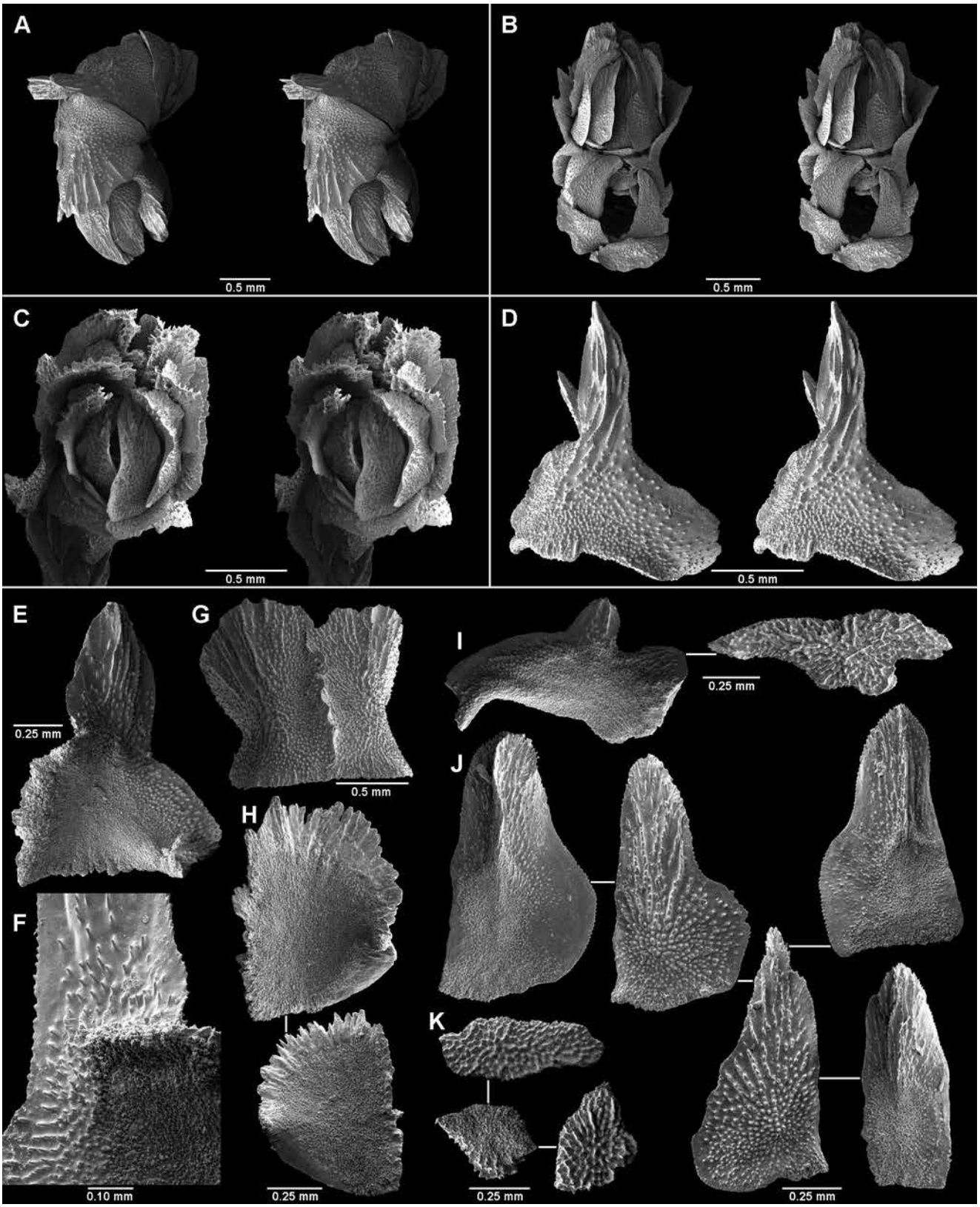

Figure 52. *Paracalyptrophora mariae* (Versluys, 1906) from NIWA 65987: **A–B.** stereo lateral and adaxial views of a polyp, respectively; **C.** stereo view of opercular scales; **D.** stereo lateral view of a basal scale; **E.** basal scale; **F.** articular ridge of basal scale; **G.** two buccal scales still attached; **H.** buccal scales; **I.** infrabasal scales; **J.** opercular scales; **K.** coenenchymal scales.

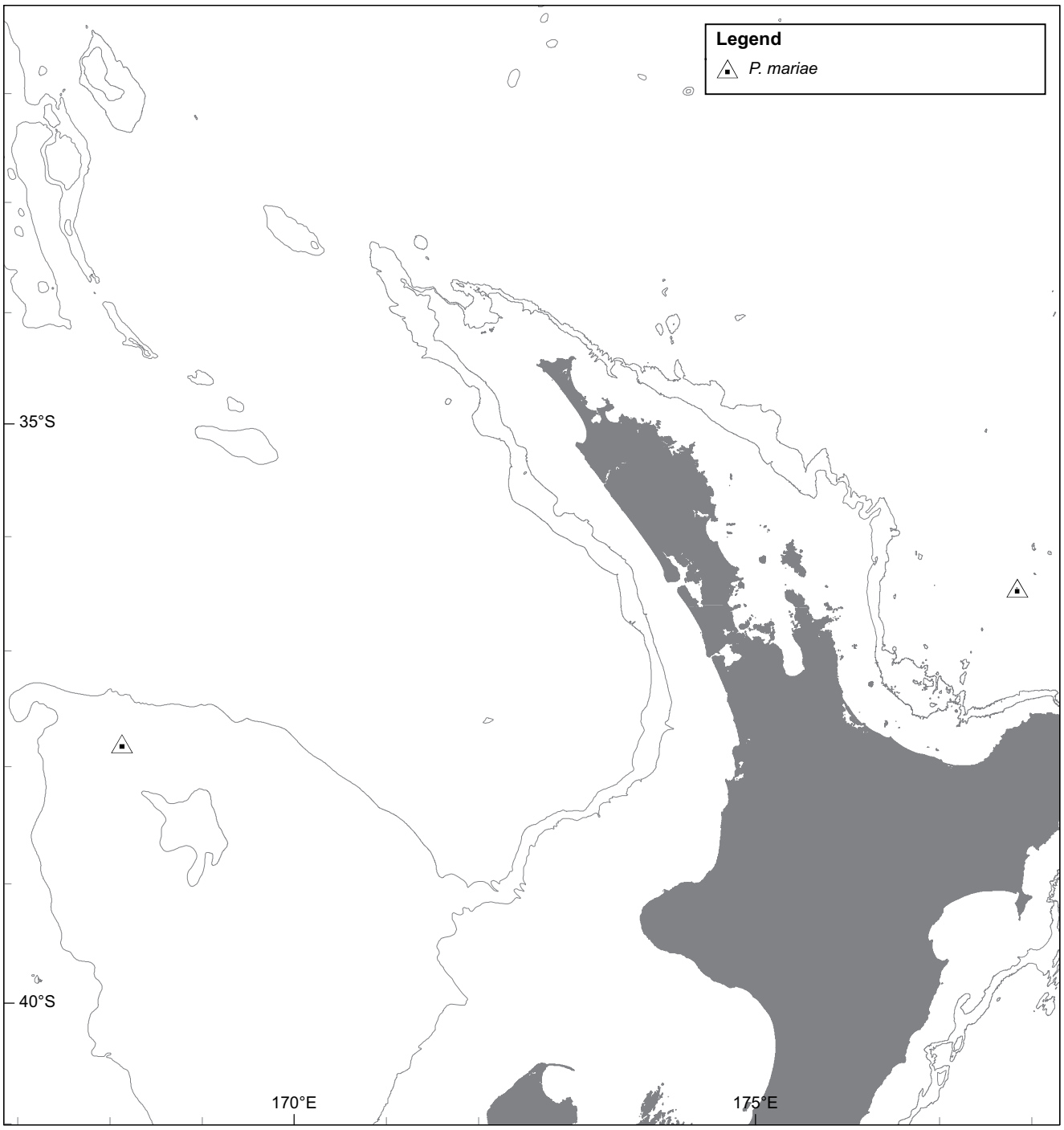

Figure 53. Distribution of *Paracalyptrophora mariae* (Versluys, 1906).

The coenenchymal scales (Fig. 52K) are elongate (0.25–0.65 mm in length), often elliptical, or irregular in shape, slightly imbricate, and flat, but are covered with spines and short ridges, much like that of the body wall scales.

Comparisons. As noted by Cairns (2009), *P. mariae* is very similar to *P. echinata* Cairns, 2009 (the latter known only from the Hawai'ian Islands, 708–1475 m), *P. mariae* differing in having a biplanar colony (not uniplanar) and granular (not hispid) outer surface of the body wall scales. The *P. mariae* reported herein have hispid body wall scales, but not enough material is present to determine their colony growth form. Thus, the hispid nature of the body wall scales is now considered to be a variable character. Nonetheless, *P. mariae* can still be distinguished from *P. echinata* by having a pair of adaxial buccal scales and a dentate and ridged distal edge of the marginal scales, whereas that of *P. echinata* is smooth (finely serrate) and not ridged.

Remarks. Although represented by only two small branch fragments, these specimens constitute the third report of this species, a new record for the New Zealand EEZ, and fills a distribution void between Indonesia and New Caledonia. It also allows the observation that the species has two pairs of infrabasal scales and one pair of adaxial buccals. The New Zealand specimens are more similar in size to the holotype than to the smaller-polyped specimen reported from New Caledonia by Cairns & Bayer (2004a).

Paracalyptrophora hawaiiensis Cairns, 2009, **nom. correct.**

Fig. 46D (p. 83), 54, 55

Paracalyptrophora hawaiinensis Cairns, 2009: 416–420, Fig. 1J, 4–5.

Material examined. Holotype—USNM 1071425, *Pisces* Stn 5–591, 18.710° N, 158.255° W, near Cross Seamount, Hawai'i, 367 m.

Lord Howe Rise (International Waters): NIWA 66298, SOP Stn TRIP2894/80, 35.3° S, 165.2° E, 915–921 m, 12 Jul 2009, several branches (USNM 1278552, 1 branch, NMNH SEM stubs 2121–2126); NIWA 66299, SOP Stn TRIP2914/40, 35.4° S, 165.3° E, 920–928 m, 22 Jul 2009, large denuded branches; NIWA 66300, SOP Stn TRIP2914/16, 35.4° S, 165.3° E, 904 m, 15 Jul 2009, large denuded branches.

Type locality. Near Cross Seamount, Hawai'i, 367 m.

Distribution. Southern Lord Howe Rise (west of northern North Island) (Fig. 55), 904–928 m; elsewhere, Hawai'ian Islands, Cross Seamount, 320–970 m.

Diagnosis. Colonies are uniplanar, equally and dichotomously branched (Fig. 46D). Branch fragments are up to 27 cm in height and 21 mm in basal branch diameter (NIWA 66300); axis rigid and black. Polyps in whorls of six to eight (Fig. 54A), each 1.6–2.1 mm in length. Basal scales (Fig. 54E) up to 0.9 mm in height, including a short (0–0.10 mm tall), sometimes inconspicuous, wide, blunt distal lobe; basals bear several low ridges on dorsolateral edge of outer surface. Abaxial buccal scales (Fig. 54F) up to 1.25 mm in length, having a rounded dorsolateral region and a smooth (not dentate of spinose), finely serrate distal edge. One to two pairs of smaller (0.45 mm in greater diameter), elliptical adaxial buccals also present (Fig. 54G). One pair of crescent-shaped infrabasals (Fig. 54H), up to 0.35 mm in height, present. Outer surface of body wall scales covered with small spines. Opercular scales (Fig. 54I) range from 0.55–0.90 mm in length, decreasing in size from ab- to adaxial side of polyp. Surface ornamentation as described for *P. mariae*. Coenenchymal scales (Fig. 54J–K) irregular in shape, flat to slightly concave outer surface, and up to 0.7 mm in length; coenenchymals covered with low granules that appear to radiate from central point.

Comparisons. *Paracalyptrophora hawaiiensis* differs from *P. mariae* in having a uniplanar colony (not biflabellate), basal scales with much smaller basal spines, a smooth (not serrate) distal edge of the buccal scales, and smaller polyps.

Remarks. Only a diagnosis is provided herein, as this species was fully described recently in the original description. This constitutes a new record of this species for the New Zealand EEZ.

Genus ***Parastenella*** Versluys, 1906

Stenella: Wright & Studer, 1889: 56 (in part); Kükenthal 1919: 443–445 (in part).
Stenella (*Parastenella*) Versluys, 1906: 39, 45.
Candidella (*Parastenella*), Bayer 1956: Fig. F222.
Parastenella, Bayer 1961: 295; 1981: 936; Cairns 2007a: 245–247; Cairns 2007b: 518 (tabular key to species); Cairns & Bayer 2009: 45–46, Fig. 16A–G; Cairns 2010: 434 (dichotomous key to species).

Type species. *Stenella doederleini* Wright & Studer, 1889, by subsequent designation (Bayer 1956).

Diagnosis. Colonies uniplanar to slightly bushy; branching dichotomous. Polyps stand perpendicular to branch, arranged independently or in pairs or whorls of up to 4. Eight marginal scales present, offset in position with opercular scales; marginal and sometimes submarginal scales fluted; nematocyst pad on distal inner face of each marginal. Body wall scales arranged in 4–8 longitudinal rows. Operculum well developed, inner surface keeled. Coenenchymal scales flat or highly concave, sometimes ridged. Pinnular rodlets sometimes present.

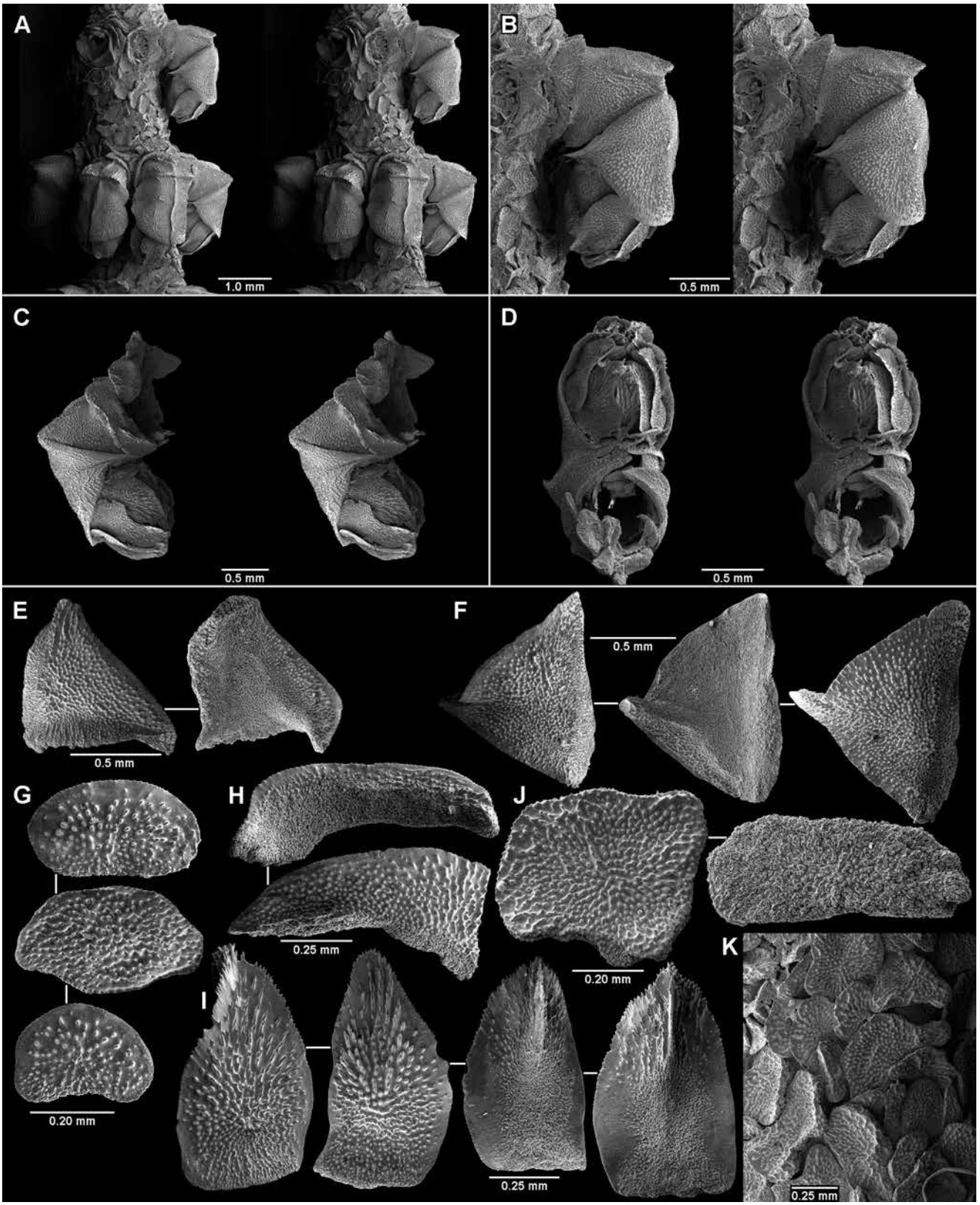

Figure 54. *Paracalyptrophora hawaiiensis* Cairns, 2009 from NIWA 66298: **A.** stereo view of two polyp whorls; **B–C.** stereo lateral views of polyps; **D.** stereo view of adaxial side of a polyp; **E.** basal scales; **F.** buccal scales; **G.** adaxial buccal (marginal) scales; **H.** infrabasal scales; **I.** opercular scales; **J.** coenenchymal scales; **K.** coenenchymal scales *in situ*.

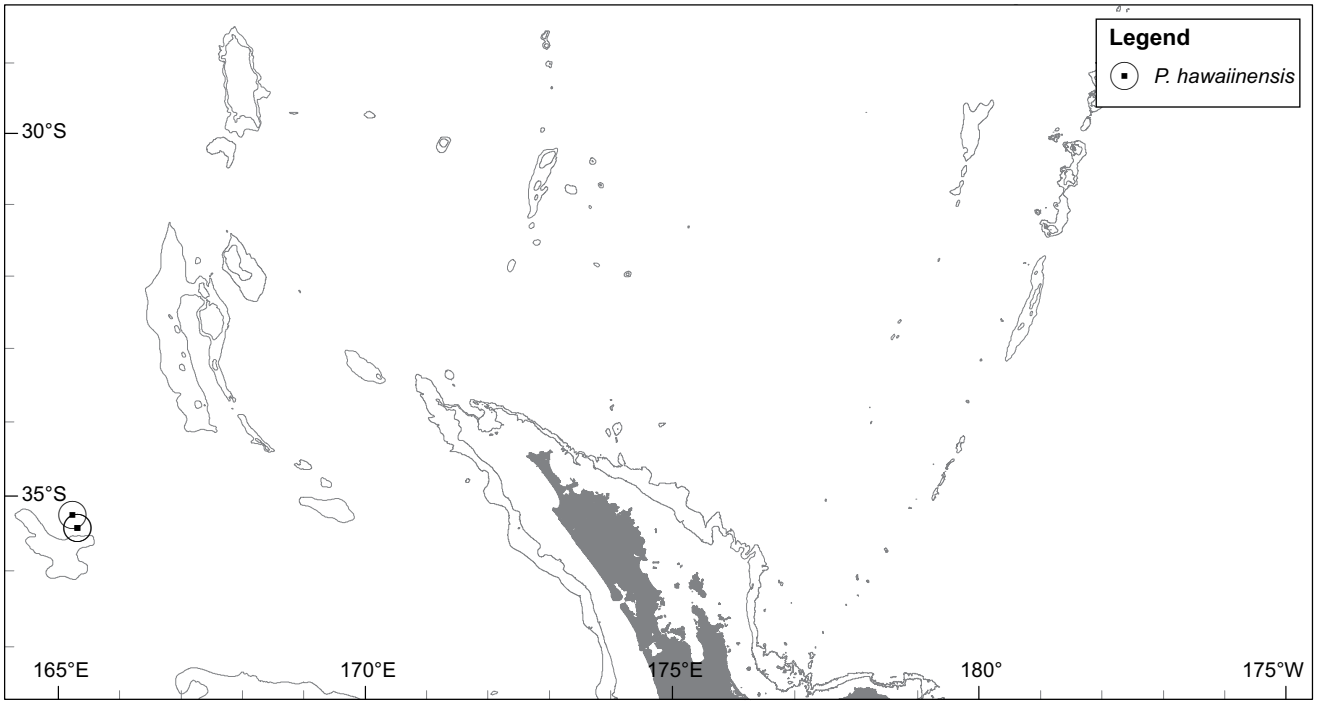

Figure 55. Distribution of *Paracalyptrophora hawaiiensis* Cairns, 2009.

Remarks. Seven species are currently known in this genus, the species keyed and discussed in Cairns (2007b, 2010) and Cairns & Bayer (2009).

Distribution. Northern, central, and southern Pacific, Subantarctic region, Antarctic, northwest Atlantic (see Watling *et al*. 2011: Fig. 2.17), 400–3423 m.

Parastenella spinosa Wright & Studer, 1889

Fig. 46E (p. 83), 56, 57

Stenella spinosa Wright & Studer, 1889: 58–59, Pl. 13, Fig. 1–2, Pl. 20, Fig. 9; Versluys 1906: 47; Kükenthal 1919: 446; Kükenthal 1924: 304, Fig. 166.

Parastenella spinosa, Cairns & Bayer 2009: Fig. 16c; Cairns 2007b: Table 2 (tabular key); Cairns 2010: 435 (dichotomous key); Taylor & Rogers 2015: 197.

Material examined. Syntypes—NHMUK1889.5.27.2, 3, 35, 36, 38, *Challenger* Stn 145a, 46.683° S, 38.167° E, off Prince Edward Island, southern Indian Ocean, 567 m.

Other material. *Bounty Plateau*: NIWA 46372, SOP Stn TRIP2494/14, 47.5° S, 177.8° E, 867–915 m, 02 Sep 2007, 1 colony; NIWA 61969, SOP Stn TRIP3077/188, 47.5° S, 177.8° E, 862–992 m, 08 Apr 2010, 1 branch (USNM 1278359, branchlets); NIWA 66104, SOP Stn TRIP2718/115, 47.6° S, 177.9° E, 858–957 m, 24 Nov 2008, 1 branch; NIWA 66143, SOP Stn TRIP2718/109, 47.6° S, 177.9° E, 855–987 m, 24 Nov 2008, 1 branch; NIWA 67867, SOP Stn TRIP2416/54, 47.5° S, 177° E, 720–741 m, 28 Apr 2007, 1 branch.

Macquarie Ridge (Australian EEZ): USNM 98870, *Eltanin* Stn 1414, 52.33° S, 160.62° E, 659–798 m, 09/02/1965, 1 colony; USNM 98023, *Eltanin* Stn 1415, 53.76° S, 159.2° E, 750–996 m, 09/02/1965, 1 colony; USNM 83619 and 98039, *Eltanin* Stn 1416, 53.75° S, 159.08° E, 787–842 m, 09/02/1965, 2 colonies, SEM stubs 2220–2222, 2230–2231, Bayer series 1567; USNM 98040 and 98041, *Eltanin* Stn 1419, 54.53° S, 159.03° E, 494–714 m, 10/02/1965, 2 colonies; USNM 77382, 83618 and 98042, *Eltanin* Stn 1422, 56.33° S, 158.48° E, 833–892 m, 10/02/1965, 3 colonies; TMAG K4379, NIWA Stn TAN0803/77, 53.738° S, 159.114° E, 1014–925 m, 11 Apr 2008, 1 branch; TMAG K4380, NIWA Stn TAN0803/82, 53.729° S, 159.163° E, 1087–1160 m, 12 Apr 2008, 1 branch; TMAG K4381, NIWA Stn TAN0803/102, 56.242° S, 158.462° E, Hjort Seamount, 790–1025 m, 16 Apr 2008, 1 branch; TMAG K4382, NIWA Stn TAN0803/98, 56.246° S, 158.506° E, Hjort Seamount, 676–750 m, 16 Apr 2008, 1 branch.

Subantarctic (International Waters): NIWA 65552, SOP Stn TRIP2938/6, 53.5° S, 140° E, 1274–998 m, 25 Sep 2009, 1 branch.

Type locality. Off Prince Edward Island, southern Indian Ocean.

Distribution. Macquarie Ridge, Hjort Seamount, Bounty Plateau (Fig. 24), 676–1160 m; seamount on

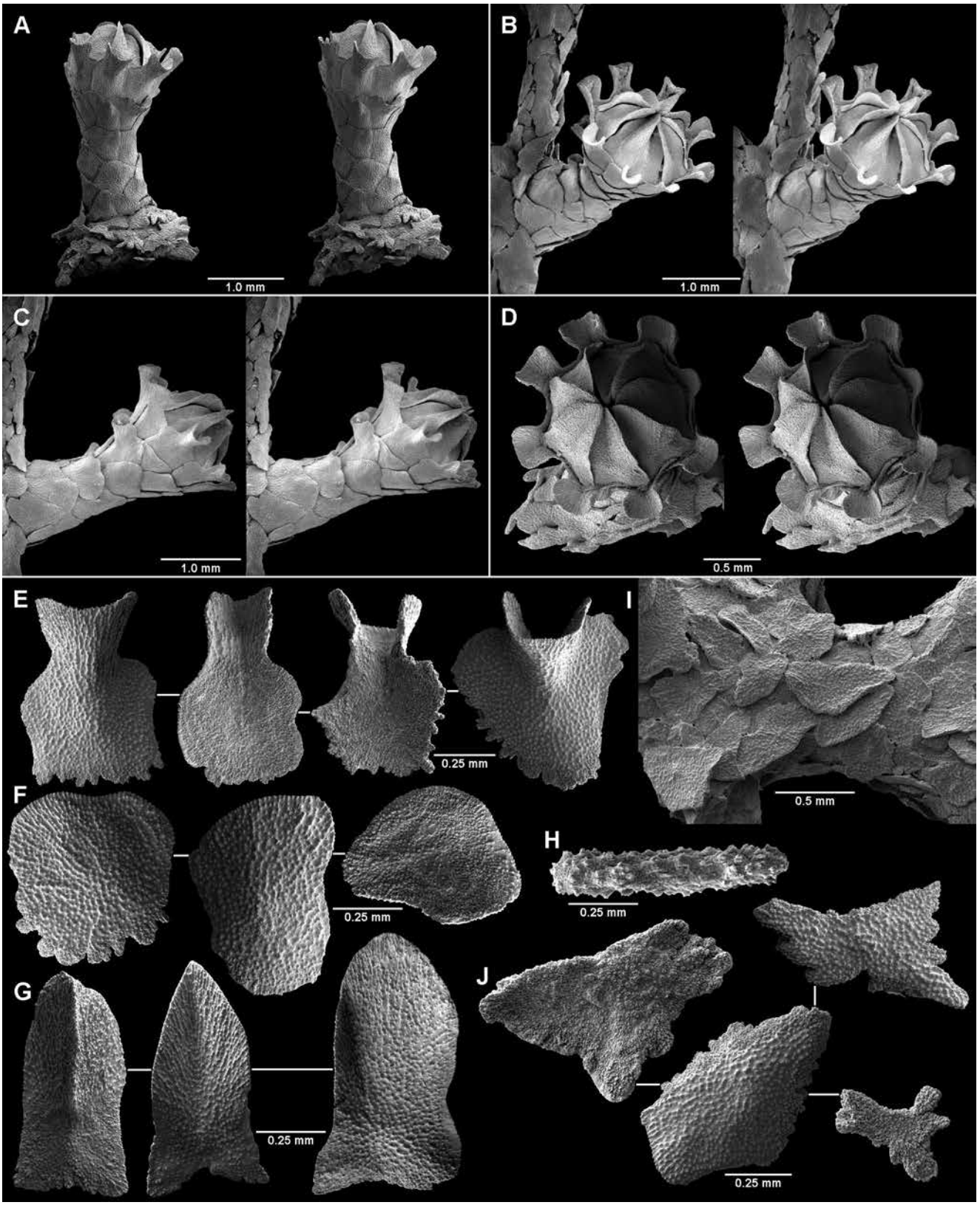

Figure 56. *Parastenella spinosa* Wright & Studer, 1889 from USNM 83619: **A.** stereo view of abaxial side of polyp; **B, D.** stereo views of operculum and symmetrical rosette of marginal scales; **C.** stereo view of lateral side of a polyp; **E.** fluted marginal scales; **F.** body wall scales; **G.** opercular scales; **H.** pinnular rodlet; **I.** coenenchymal scales *in situ*; **J.** coenenchymal scales.

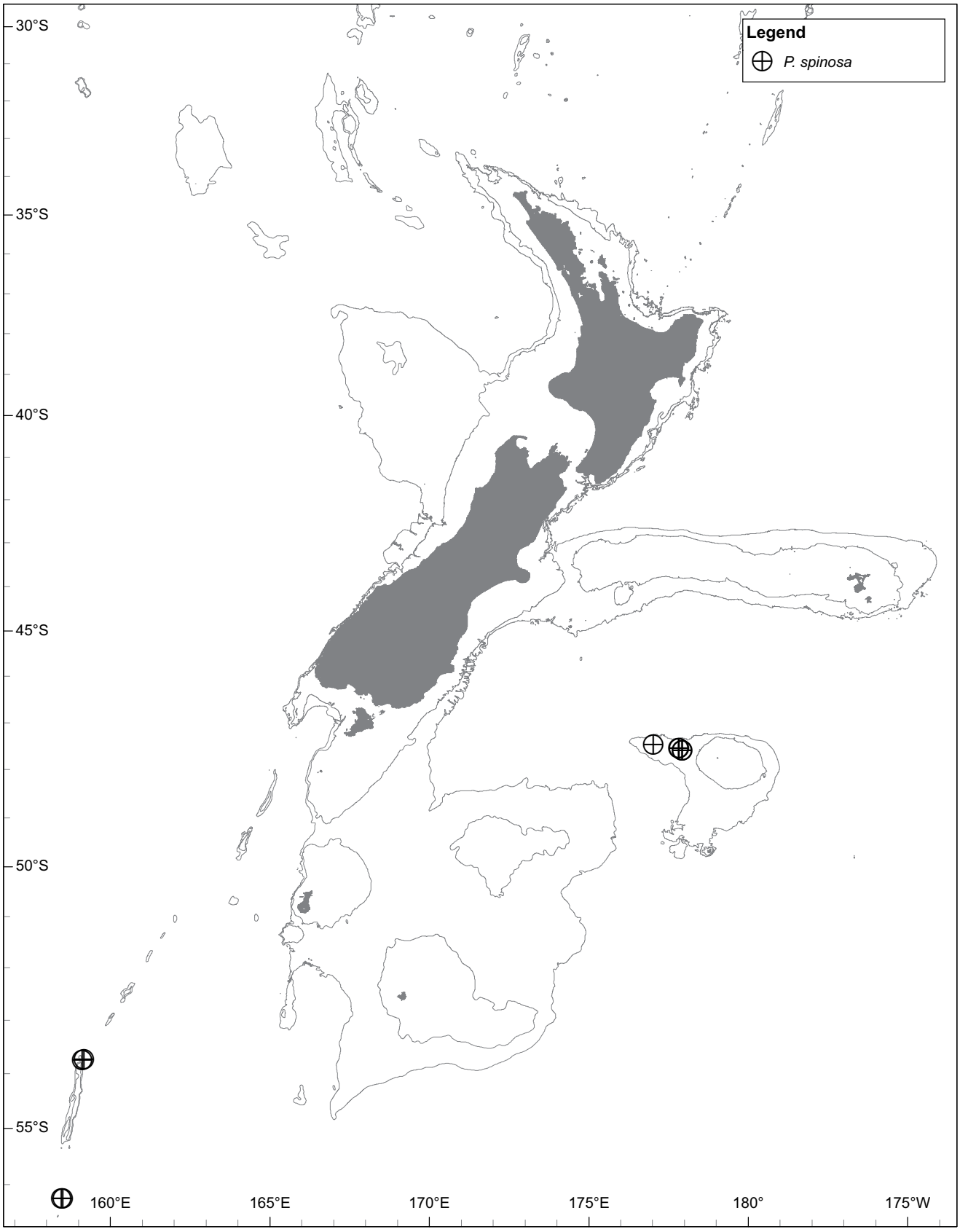

Figure 57. Distribution of *Parastenella spinosa* Wright & Studer, 1889.

subantarctic Albatross Cordillera, 1274 m; off Prince Edward Island, 567 m; Ross Sea, Antarctica, 445–448 m.

Description. The colonies are primarily uniplanar but also somewhat bushy (Fig. 47E), with many branchlets diverging from the plane of the flabellum; branching is quite irregular. The largest colony (USNM 83619) is 16 cm in height, with a basal branch diameter of 8.9 mm. The polyps are white, overlaying a dark golden to bronze coloured axis; the axis is stiff (rigid), large colonies having heavily calcified basal branches. Polyps are arranged in random order or sometimes in pairs, stand perpendicular to the branches (Fig. 57A) up to 3.5 mm in height, and are 2.0–2.5 mm in flared distal diameter.

Each polyp is covered with eight fluted marginal scales and three to five horizontal tiers of four to six body wall scales Fig. 57A–C); distinct longitudinal rows of body wall scales are not present. The fluted marginals form a symmetrical rosette (Fig. 57B, D), each marginal up to 0.8 mm in length and 0.6 mm in width, its distal flute composing one third to half the length and about half the width of the marginal scale (Fig. 57E). The flutes have parallel edges that are sometimes even curved inward, forming a deep, relatively narrow, and sometimes almost tubular structure. As is characteristic for the genus, a nematocyst pad occurs on the inner distal face of each marginal scale (Fig. 57B). On one side of the polyp, usually the abaxial and/or lateral sides, the submarginal scale also bears a lesser developed flute (Fig. 57 A, C), and the scale on the third tier may have an even smaller flute. The non-fluted marginal body wall scales (Fig. 57F) are large (up to 0.8 mm in width) and have an arched distal margin. The opercular scales (Fig. 57 G) are relatively the same size and shape, ranging from 0.8–0.9 mm in height and 1.7–2.2 in L:W. They have a highly concave outer surface, the concavity corresponding to a prominent medial keel on its inner surface. The pinnular rodlets (Fig. 57H) are cylindrical (cigar-shaped), up to 86 μm in length and about 17 μm in diameter (L:W=5.0–5.1). The coenenchymal scales (Fig. 57J) are arranged in a single thin layer. Individual coenenchymal scales are irregular in shape (sometimes digitiform or elongate), thin, flat, imbricate (Fig. 57I), and up to 1 mm in length. The outer surfaces of the body wall scales, operculars, and coenenchymal scales are covered with a uniform, low granulation.

Comparisons. *Parastenella spinosa* is compared to the other New Zealand congeneric, *P. pacifica*, in the account of that species, and is compared to all other congenerics through tabular and dichotomous keys by Cairns (2007b, 2010). It might be noted that in those two publications, Cairns incorrectly attributed the authorship of this species to Studer (1894).

Remarks. Despite the list of references given above, these are the first subsequent records of this species since its original description and thus a new record for the New Zealand EEZ. It appears to have a circum-Subantarctic to Antarctic distribution, with its depth range in the bathyal region.

Parastenella pacifica Cairns, 2007

Fig. 46F (p. 83), 58, 59

Parastenella pacifica Cairns, 2007b: 526–527, Table 2, Fig. 1C, 8–9.
Parastenella pacifica, Cairns 2010: 435 (including key to species).

Material examined. Holotype—USNM 1071799, 45.417° N, 125.183° W, west of Cape Meares, Oregon, USA, 1498–1527 m.

Other material. *Chatham Rise*: NIWA 25375 and 25329, NIWA Stn TAN0604/133, 41.801° S, 179.494° W, Shipley Seamount, 1240–1275 m, 09 Jun 2006, 2 colonies (USNM 1278857, 1 colony); NIWA 49791, NIWA Stn TAN0905/60, 42.81° S, 179.516° W, Shipley Seamount, 1251–1290 m, 20 Jun 2009, branches.

Louisville Ridge (International Waters): NIWA 94090 and 94096, NIWA Stn TAN1402/15, 35.337° S, 170.443° W, Forde Seamount, 1075–1100 m, 09 Feb 2014, 2 branches; NIWA 94155, NIWA Stn TAN1402/31, 35.317° S, 170.452° W, Forde Seamount, 1205–1600 m, 11 Feb 2014, branches; NIWA 94231, NIWA Stn TAN1402/57, 36.908° S, 169.846° W, Censeam Guyot, 1013–1010 m, 15 Feb 2014, branches; NIWA 94266, NIWA Stn TAN1402/59, 36.924° S, 169.836° W, Censeam Guyot, 1147–1400 m, 15 Feb 2014, 1 colony; NIWA 94299, NIWA Stn TAN1402/66, 37.707° S, 169.015° W, Anvil Seamount, 1244–1370 m, 16 Feb 2014, 1 colony; NIWA 94342, NIWA Stn TAN1402/91, 39.164° S, 167.35° W, 910–934 m, 20 Feb 2014, branches (USNM 1278858, branches); NIWA 94401, NIWA Stn TAN1402/97, 39.196° S, 167.59° W, 1082–1090 m, 21 Feb 2014, 2 colonies; NIWA 94495, NIWA Stn TAN1402/134, 40.639° S, 165.553° W, Ghost Seamount, 1370–1448 m, 26 Feb 2014, branches.

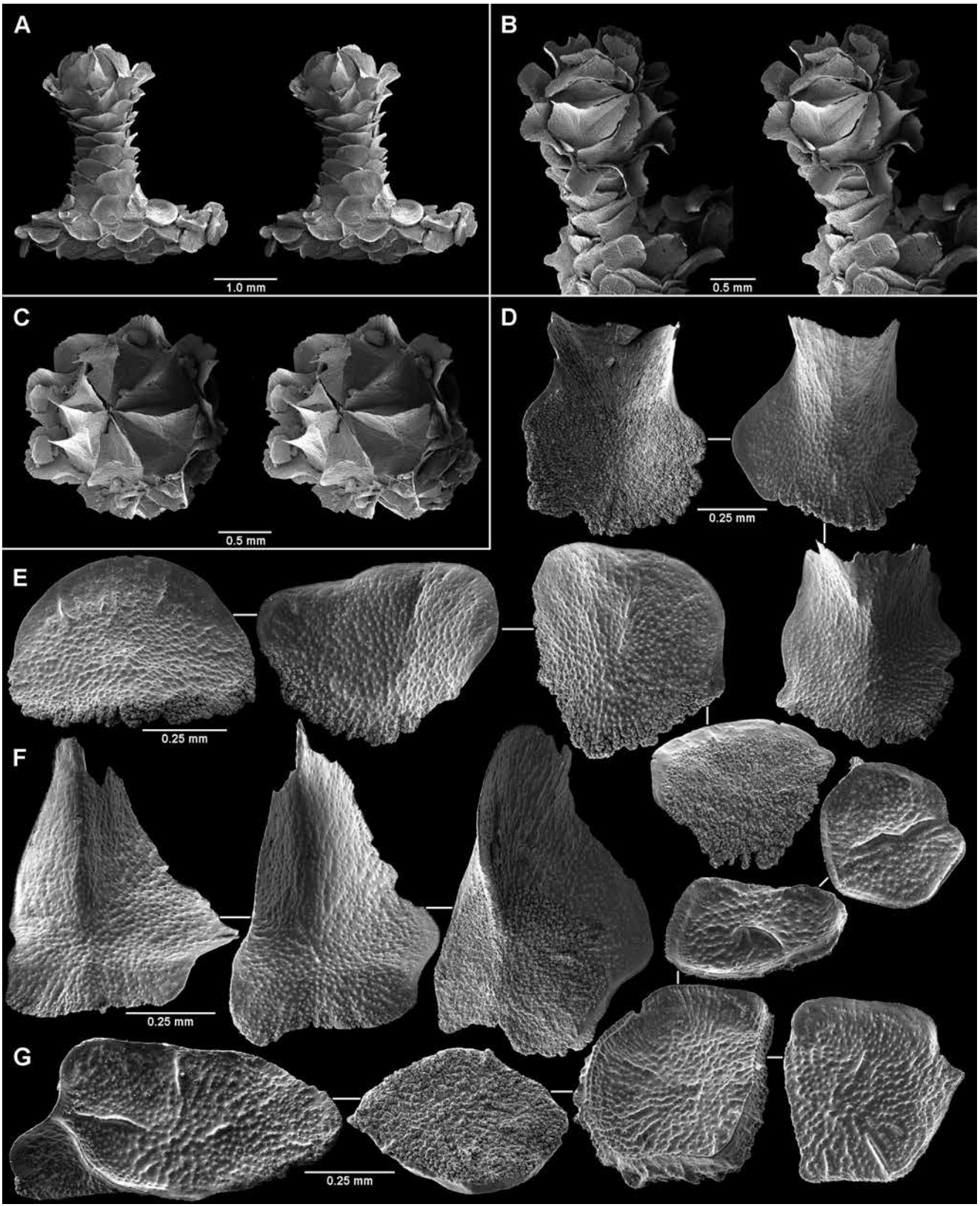

Figure 58. *Parastenella pacifica* Cairns, 2007 from NIWA 94401: **A.** stereo view a polyp and coenenchymal scales; **B–C.** stereo views of operculum and symmetrical rosette of marginal scales, the latter showing nematocyst pads; **D.** fluted marginal scales; **E.** body wall scales; **F.** opercular scales; **G.** ridged coenenchymal scales.

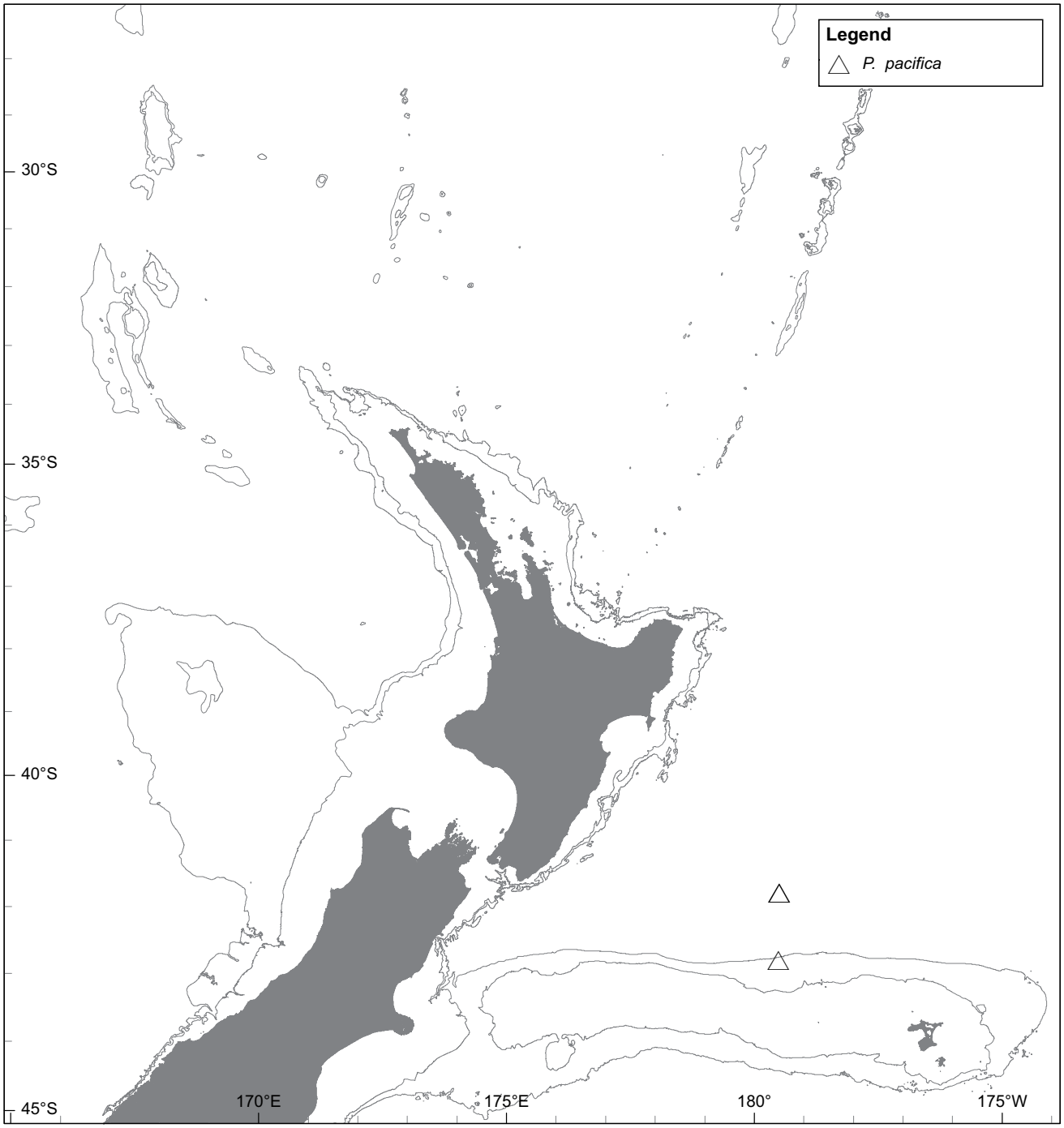

Figure 59. Distribution of *Parastenella pacifica* Cairns, 2007.

Type locality. West of Cape Meares, Oregon.

Distribution. Southern Louisville Ridge, Chatham Rise (Fig. 59), 910–1448 m; elsewhere, off Oregon and British Columbia, 1527–1986 m.

Description. Colonies are primarily uniplanar but somewhat bushy (Fig. 46F) due to their irregular branching; the largest New Zealand specimen (NIWA 94401) measures 15 cm in height and has a basal branch diameter of 2.3 mm. The polyps are white, overlaying a dark bronze-coloured axis, which is rather stiff. The polyps are arranged primarily in random order, but may also occur in pairs, and stand perpendicular to the branch (Fig. 58A) up to 3.7 mm in height and 1.9 mm in flared distal diameter.

Each polyp is covered by eight fluted marginal scales and eight longitudinal rows of body scales (Fig. 58A–C), the rows consisting of five to seven scales (including the marginal). The fluted marginals (Fig.

58D) form a symmetrical rosette (Fig. 58B, C), each marginal up to 0.75 mm in length and 0.7 mm in basal width, its distal flute composing about one-third the length and 60–85% of the width of the marginal scale. The flutes are thus wide and relatively shallow. The distal inner edge of the marginal flutes is covered with small, longitudinally arranged spines, which corresponds to where the nematocyst pad (Fig. 58C) islocated. Submarginal fluted scales do not occur. The non-marginal body wall scales (Fig. 58E) are 0.6–0.8 mm in width and have a strongly arched distal edge. The opercular scales (Fig. 58F) range from 0.8–0.9 mm in length and 1.1–1.6 in L:W; the lateral operculars are asymmetric, having a lateral lobe near their base. They have a highly concave outer surface, corresponding to a prominent longitudinal keel on their inner surface. No pinnular rodlets were noted. The coenenchymal scales (Fig. 58G) are arranged in a single layer, individual scales usually elliptical or irregularly elongate in shape, invariably with upturned outer edges, and range from 0.5–0.8 mm in greater length. The outer surface of the body wall, coenenchymal, and opercular scales is covered with a low granulation. Occasionally short low ridges are present on the distal edges of the body wall scales and are irregularly or radially placed on the coenenchymals.

Comparisons. *Parastenella pacifica* is easily distinguished from *P. spinosa* by having concave coenenchymal scales, broad and shallow marginal flutes, and in lacking flutes on its submarginal body wall scales. It also differs in having asymmetric opercular scales and more rows of body wall scales, as well as being found consistently north of *P. spinosa*. It is compared to the other species in the genus by dichotomous and tabular keys by Cairns (2010) and Cairns (2007b), respectively.

Remarks. The New Zealand specimens were carefully compared to the type material from much farther north off Oregon and Canada. They differ only in having a less well-developed ridging of the coenenchymal scales (which may be due to environment or simple intraspecific variation) and in lacking pinnular rodlets, the significance of which is unknown. This constitutes a new record of this species for the New Zealand EEZ.

Genus ***Candidella*** Bayer, 1954

Stenella Gray, 1870: 48 (junior homonym of *Stenella* Gray, 1866, a cetacean).

Candidella Bayer, 1954: 296 (*nomen novum*).

Candidella, Cairns & Bayer 2004b: 476–477; Cairns 2009: 440; Cairns & Bayer 2009: 46, Fig. 16H–N (synonymy and discussion); Cairns 2012: 37 (Table 2).

Type species. *Primnoa imbricata* Johnson, 1862, by monotypy.

Diagnosis. Colonies uniplanar, with dichotomous branching or flagelliform (unbranched). Polyps arranged in whorls, the polyps usually standing perpendicular to branch. Each polyp with four large marginal scales, forming a cowl around operculum. Body wall scales much smaller, occurring in 2–4 submarginal tiers; one pair of rectangular basal scales anchors polyp to branch. Opercular scales have a prominent inner keel. Coenenchymal scales occur in a single thin layer, composed of small elliptical scales often with a concave outer surface.

Remarks. Four species are known in this genus. The genus and most of the species have been discussed and figured by Cairns (2009) and Cairns & Bayer (2009).

Distribution. Amphi-Atlantic, Fiji, Hawai'ian Islands, New Zealand (see Watling *et al*. 2011: Fig. 2.20), 378–2165 m.

Candidella helminthophora (Nutting, 1908)

Fig. 46G (p. 83), 60–62

Stenella helminthophora Nutting, 1908: 575–576, Pl. 44, Fig. 6–9, Pl. 47, Fig. 5.

Candidella helminthophora, Grigg & Bayer 1976: 171; Cairns 2009: 440–443, Fig. 1A, H, 19–20 (complete synonymy).

Material examined. Holotype—USNM 23385, *Albatross* Stn 3973, 23.786° N, 166.415° W, off French Frigate Shoals, Hawai'ian Islands, 722–726 m (see Cairns 2009).

Off North Cape: NIWA 19329, NZOI Stn Z11062, 34.159° S, 173.963° E, 800 m, 18 Apr 2002, 1 branch.

Kermadec Ridge: NIWA 11071 and 12468, NZOI Stn Z665, 35.336° S, 178.539° E, Rumble II West Seamount, 1312–1260 m, 12 Feb 1996, 3 colonies, (USNM 1278860, branches, NMNH SEM stubs 2214–2218); NIWA 11194, NZOI Stn Z10800, 35.732° S, 178.522° E, 1200 m, 23 May 2001, 1 branch; NIWA

13234, NZOI Stn X655, 35.353° S, 178.536° E, Rumble II West Seamount, 1357–1423 m, 11 Feb 1996, branches; NIWA 64357, NIWA Stn TAN1007/12, 34.623° S, 178.389° E, Gill Seamount, 1700–1540 m, 24 May 2010, branches; NIWA 64548, NIWA Stn TAN1007/56, 35.36° S, 178.509° E, Rumble II West Seamount, 1270–1267 m, 02 Jun 2010, branches; NIWA 64754, NIWA Stn TAN1007/103, 35.359° S, 178.511° E, Rumble II West Seamount, 1287–1378 m, 06 Jun 2010, 1 branch; NIWA 64813, NIWA Stn TAN1007/106, 35.353° S, 178.511° E, Rumble II West Seamount, 1382–1416 m, 06 Jun 2010, branches; NIWA 64962 and 77182, NIWA Stn TAN1007/118, 35.364° S, 178.525° E, Rumble II West Seamount, 1280–1380 m, 08 Jun 2010, branches; NIWA 72363, NIWA Stn TAN1104/33, 35.36° S, 178.506° E, Rumble II West Seamount, 1290–1395 m, 07 Mar 2011, 2 colonies; NIWA 72489, NIWA Stn TAN1104/54, 35.353° S, 178.536° E, Rumble II West Seamount, 1379–1440 m, 10 Mar 2011, branches; NIWA 72533 and 72537, NIWA Stn TAN1104/58, 35.361° S, 178.512° E, 1380–1416 m, 11 Mar 2011, 2 colonies; NIWA 72568, NIWA Stn TAN1104/59, 35.36° S, 178.511° E, 1270–1410 m, 11 Mar 2011, branches; NIWA 72924, NIWA Stn TAN1104/124, 35.857° S, 178.448° E, 1237–1460 m, 19 Mar 2011, branches.

Bay of Plenty: NIWA 11118, NZOI Stn Z9225, 37.118° S, 177.284° E, 690–800 m, 15 Aug 1998, 1 colony (USNM 1278859, branchlets, NMNH SEM stubs 1719–1724); NIWA 11122, NZOI Stn Z9227, 37.118° S, 177.287° E, 617–654 m, 16 Aug 1998, 1 colony; NIWA 11127, NZOI Stn Z10061, 37.047° S, 176.497° E, 949–949 m, 27 Mar 2000, 1 colony; NIWA 15487, NIWA Stn TAN0413/24, 36.958° S, 177.371° E, 1286–1208 m, 09 Nov 2004, 4 colonies; NIWA 15617, NIWA Stn TAN0413/35, 36.959° S, 177.332° E, 1396–1462 m, 09 Nov 2004, 1 branch; NIWA 15618, NIWA Stn TAN0413/26, 36.945° S, 177.389° E, 1608–1495 m, 09 Nov 2004, 1 branch; NIWA 15638, NIWA Stn TAN0413/63, 37.224° S, 177.234° E, 693–698 m, 11 Nov 2004, 3 colonies; NIWA 91270, NZOI Stn Z9230, 36.885° S, 177.367° E, 787 m, 15 Aug 1998, 1 large branch.

Type locality. Off French Frigate Shoals, Hawai'ian Islands, 722–726 m (see Cairns 2009).

Distribution. Southern Kermadec Ridge, Raukumara Plain, and off North Cape (Fig. 62), 617–1700 m; elsewhere, Hawai'ian Islands, 417–1801 m.

Description. Colonies are uniplanar, and equally dichotomously branched, the axils between the branches small, only 20–30° (Fig. 46G). The largest New Zealand specimen (NIWA 11122) is 23 cm in height and 9.1 mm in basal branch diameter.The basal stem of large colonies is firmly calcified, otherwise the axis is pale yellow. Polyps occur in whorls of two to four and usually stand perpendicular to the branch, but in some colonies are curved slightly upward or slightly downward. The polyps are up to 3.8 mm in height and strongly flared due to the cowl formed by the four marginal scales.

The marginals always number four, the abaxial marginals being slightly wider than the adaxial; the abaxials (Fig. 60A, 61A) 1.0–1.5 mm in width and encircling about 110° of the polyp perimeter; the adaxials (Fig. 60B, 61C) 0.7–0.9 mm in width, each encircling about 70° of the circumference. The distal margin of the marginals has a straight distal edge, other times somewhat wavy or lobate (Fig. 61A). There are always four smaller submarginal body wall scales (Fig. 60A), often the abaxial being larger (wider and deeper) than the adaxials (Fig. 60C). In general, there are one to two more tiers of paired body wall scales although their number and consistency are variable, the adaxial scales always being somewhat smaller, which facilitates a slight bending of the polyp. The lateral edges of the basals, which are aligned with the branch axis, meet and overlap abaxially but are slightly parted adaxially. The large paired basal scales (Fig. 61B) are rectangular in shape, up to 1.4 mm in height, and 0.8 mm in width. They are highly curved such that they almost encircle the base of the polyp, and are firmly anchored to the branch coenenchyma, such that when polyps are detached from the branch the basal scales invariably remain attached to the branch. However, in branch sections hosting a commensal polynoid polychaete *Gorgoniapolynoe muzikae* Pettibone, 1991, the two basals from adjacent polyps that flank the worm are greatly enlarged (Fig. 60D, E) up to 3.5 mm in width, curving away from the polyp to form a continuous canopy for the polychaete. The outer surface of the body wall scales bears low granules. The opercular scales (Fig. 61D) are relatively similar in size, ranging from 0.9–1.15 mm in length and having an L:W of 1.4–1.9. Their inner faces are strongly keeled and finely and densely granulated, whereas the outer faces have coarse granules like the body wall scales.

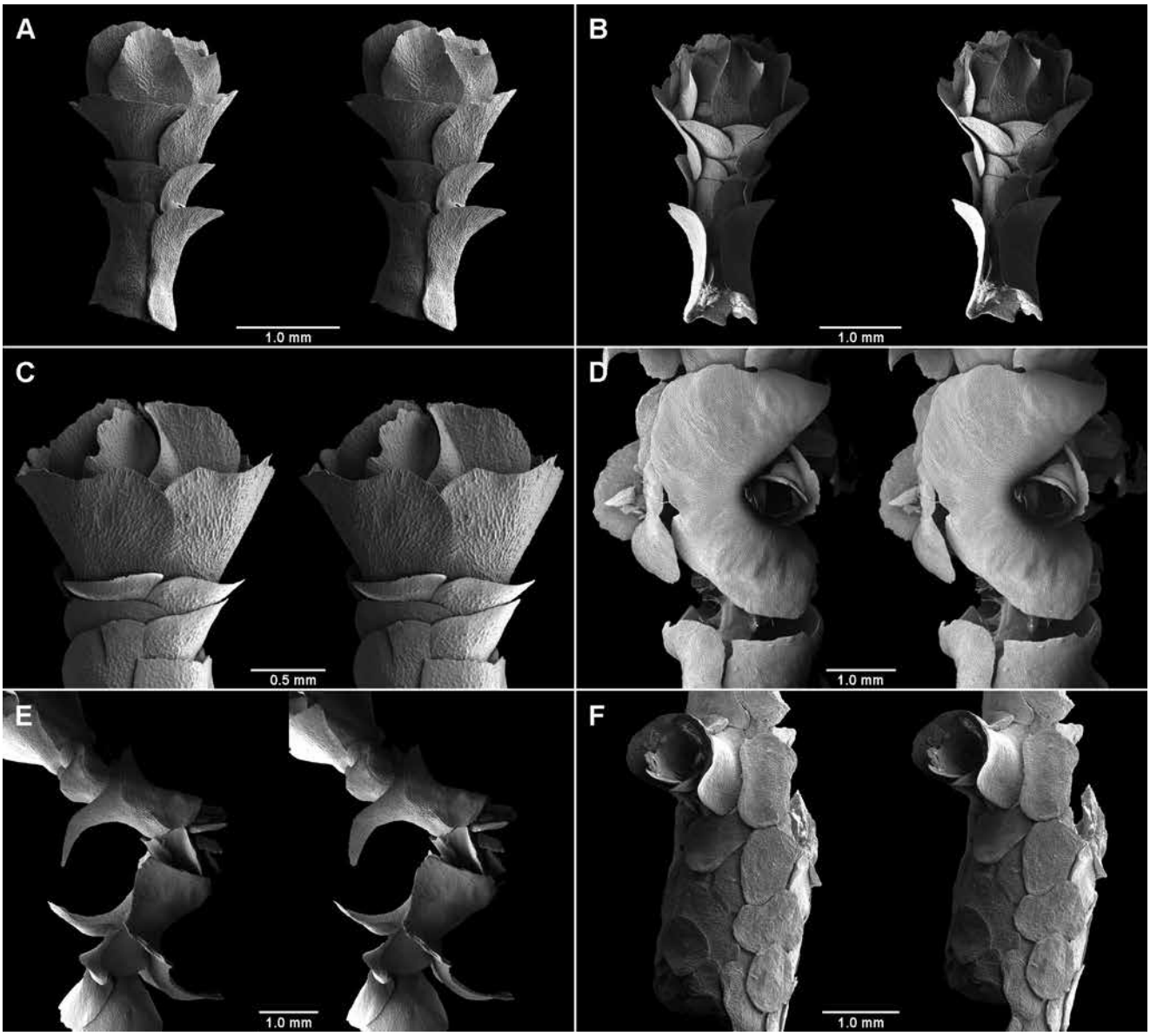

Figure 60. *Candidella helminthophora* (Nutting, 1908) (A–B, D–F, NIWA 12468; C, NIWA 11127): **A–B.** stereo views of ab- and adaxial side of a polyp; **C.** stereo view of distal adaxial side of a polyp; **D.** stereo view of enlarged basal scales forming worm tube; **E.** stereo view of cross section of worm tube composed of enlarged basal scales; **F.** stereo view of coenenchymal scales and a pair of basal scales, *in situ*.

The opercular scales are usually asymmetric in shape and sometimes bifid. The coenenchymal scales (Fig. 60F) have a flat to slightly concave outer surface and are elliptical to irregular in shape, rarely more than 0.5 mm in length.

Comparisons. See Cairns (2009).

Remarks. This is the first report of this species other than from the Hawai'ian Islands and thus is a new record for the New Zealand EEZ. It appears to be identical to the Hawai'ian populations and occurs at a similar depth range.

Genus ***Pachyprimnoa*** **gen. nov.**

Type species. *Pachyprimnoa asakoae* **gen. et sp. nov.**, here designated.

Diagnosis. Colonies uniplanar, dichotomously branching. Polyps arranged in pairs or whorls of up to 4, polyps standing perpendicular to branch. Each polyp protected by four massive pointed marginal and four smaller, non-spinose submarginal scales, and one or two transverse rows of smaller scales proximal to those. Opercular scales arranged in two quartets,

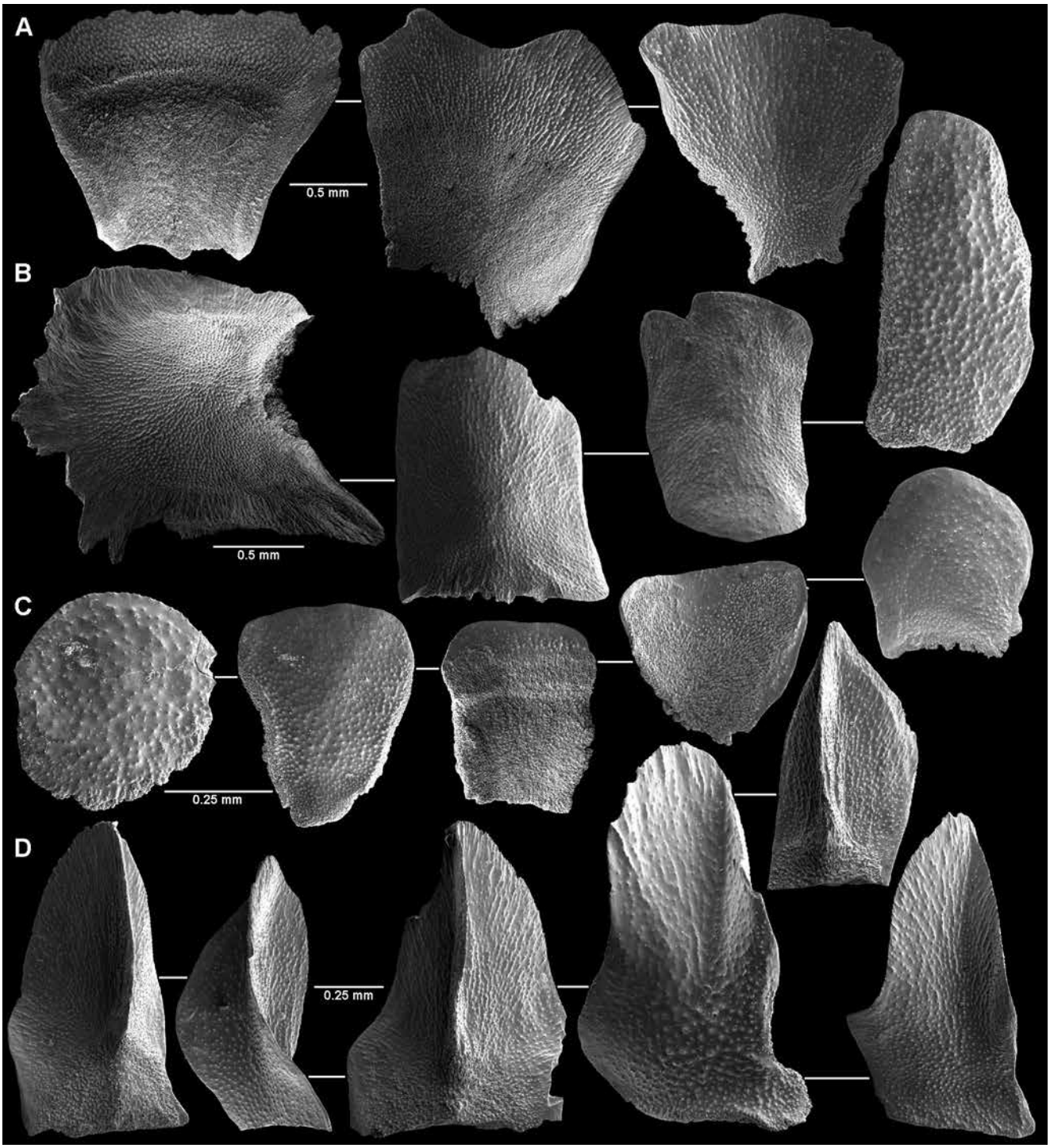

Figure 61. *Candidella helminthophora* (Nutting, 1908) from NIWA 11118 and 12468: **A.** abaxial marginal scales; **B.** basal scales; **C.** adaxial body wall scales; **D.** opercular scales.

those composing the smaller crown aligned with the marginals and mostly hidden by the operculars of the larger crown; operculars not keeled. Large paired infrabasal scales absent.

Remarks. This genus, which has four spinose marginal scales, keys closest to *Candidella* in the genus key of Cairns & Bayer (2009). But, it differs from *Candidella* in having: two crowns (each of four scales) of opercular scales of different size and shape, massive spinose marginal scales; non-keeled opercular scales; the absence of a marginal cowl; and the absence of a pair of large infrabasal scales.

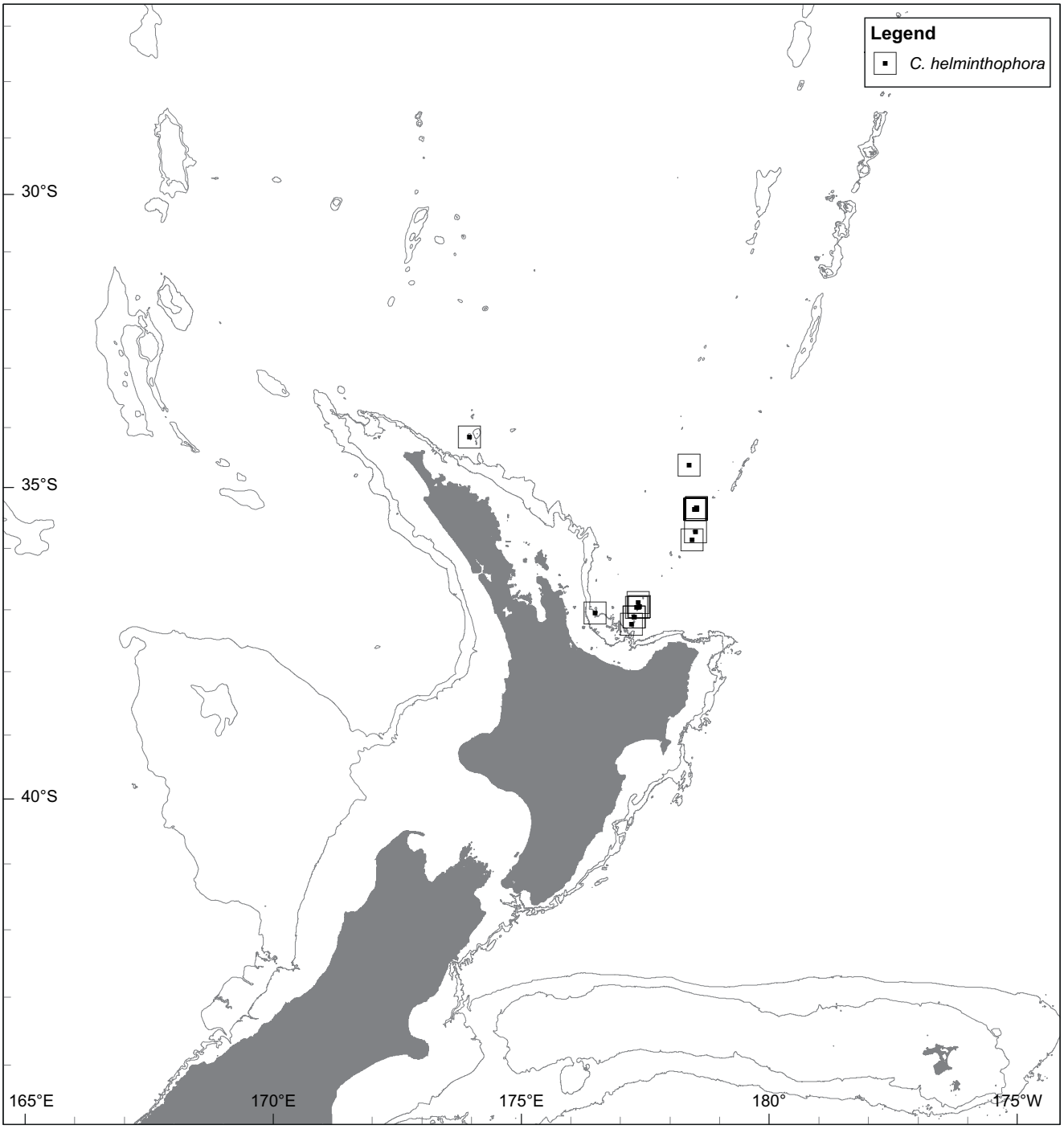

Figure 62. Distribution of *Candidella helminthophora* (Nutting, 1908).

Distribution. Three Kings Ridge, Wanganella Bank, 312–530 m.

Etymology. A combination of *pachys* (Greek for thick) and *primnoa* (a common primnoid suffix), in allusion to the four massive marginal scales.

Pachyprimnoa asakoae gen. et sp. nov.

Fig. 63A–B, 64, 65

Material examined. Holotype NIWA 11132, NZOI Stn S572, 30.758° S, 172.795° E, Three Kings Ridge, 530–403 m, 15 Aug 1983 (USNM 1278861, calyces, NMNH SEM stubs 2202–2204, 2211–2213. **Paratypes** USNM 1278952, S572, same as holotype data, 1 colony; NIWA 88630, SOP Stn TRIP3933/21, 33.4° S, 167.6° E, Wanganella Bank, International Waters,

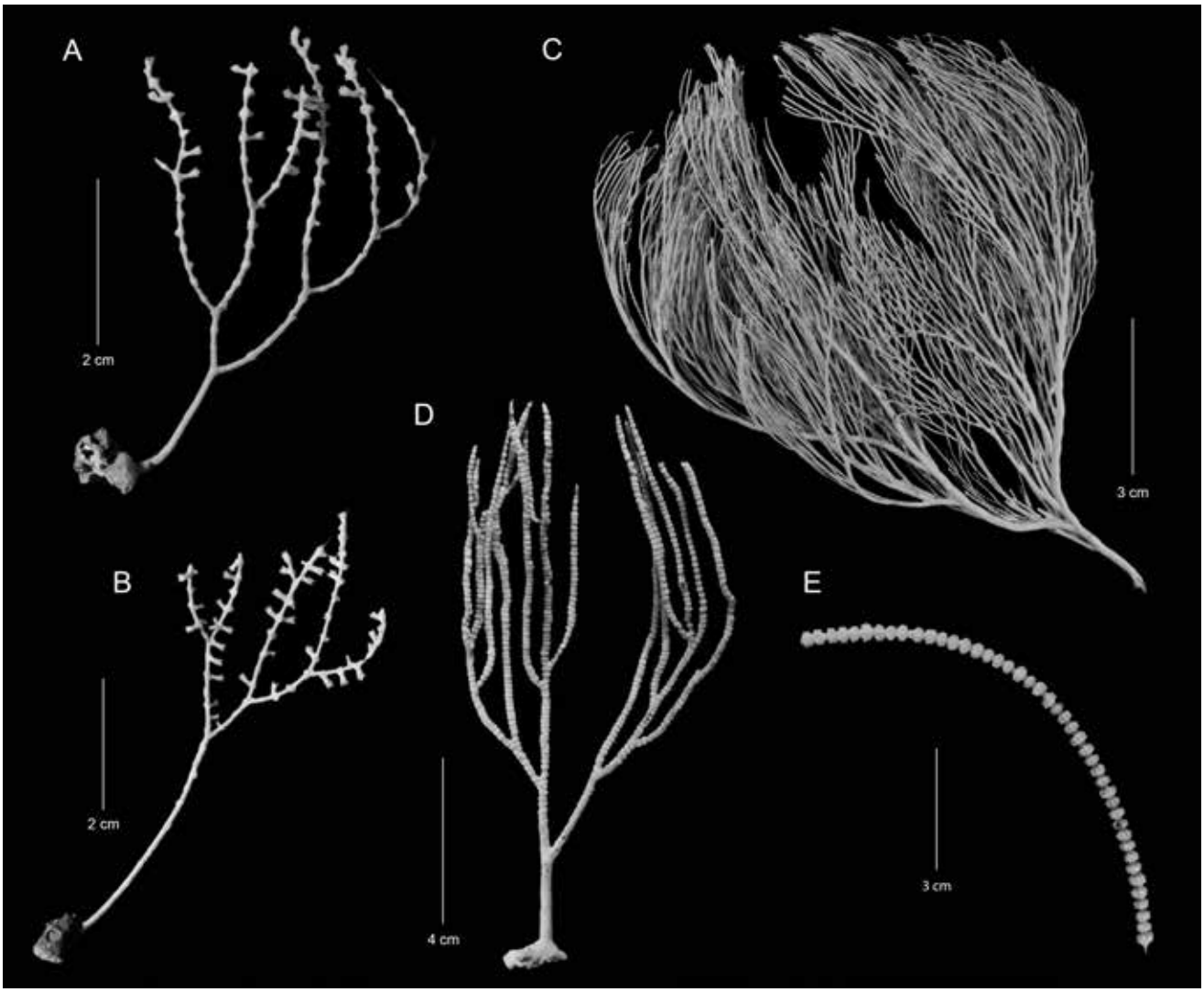

Figure 63. Specimen morphology: **A.** *Pachyprimnoa asakoae* **gen. et sp. nov.**, holotype; **B.** *P. asakoae* **gen. et sp. nov.**, paratype, USNM 1278953; **C.** *Perissogorgia vitrea* Bayer & Stefani, 1989, NIWA 73071; **D.** *Perissogorgia rigida* **sp. nov.**, holotype; **E.** *Perissogorgia colossus* Bayer & Stefani, 1989, NIWA 91106.

312–383 m, 11 Nov 2013, 1 colony (USNM 1278862, 1 branch).

Type locality. Three Kings Ridge.

Distribution. Same as that of genus (Fig. 65).

Description. The colony is uniplanar, with equal dichotomous branching (Fig. 63A, B), the holotype (Fig. 63A) a complete colony measuring 6 cm in height and 1.05 mm in basal branch diameter; the larger paratype (NIWA 88630) measures 15 cm in height. Branching begins from a basal main branch 1.5–3.5 cm in height. Polyps are arranged in pairs or whorls of up to four (Fig. 64A), the polyps standing perpendicular to the branch up to 2.5 mm in height. There are about four whorls per cm branch length.

Each polyp is covered distally by four massive, spinose marginal scales (Fig. 64A–C, G) up to 1.3 mm in height, 0.9 mm in basal width (L:W 1.2–1.3), and up to 0.23 mm in thickness. These scales bear a thick cylindrical apical spine, which has multiple serrate ridges on its inner face; the outer face bears linear rows of small granules. Slightly proximal to these marginals is a tier of four flat, broad (up to 0.75 mm in width), non-spinose submarginal scales (Fig. 64B, C) that alternate in position with the marginals. Proximal to the submarginals are one to two tiers of smaller body wall scales (Fig. 64E, H). At the base of the polyp is a ring of smaller scales that serve as anchoring scales, or infrabasals (Fig. 64A). The outer distal edges of the body wall scales are gently arched and finely ridged; their outer surface bears a low granulation; their inner surface is uniformly tuberculate. The eight opercular scales are arranged in two quartets of four. The upper (visible) quartet (Fig. 64D) consists of four flat lanceolate scales (Fig. 64I) up to 1.0 mm in length and

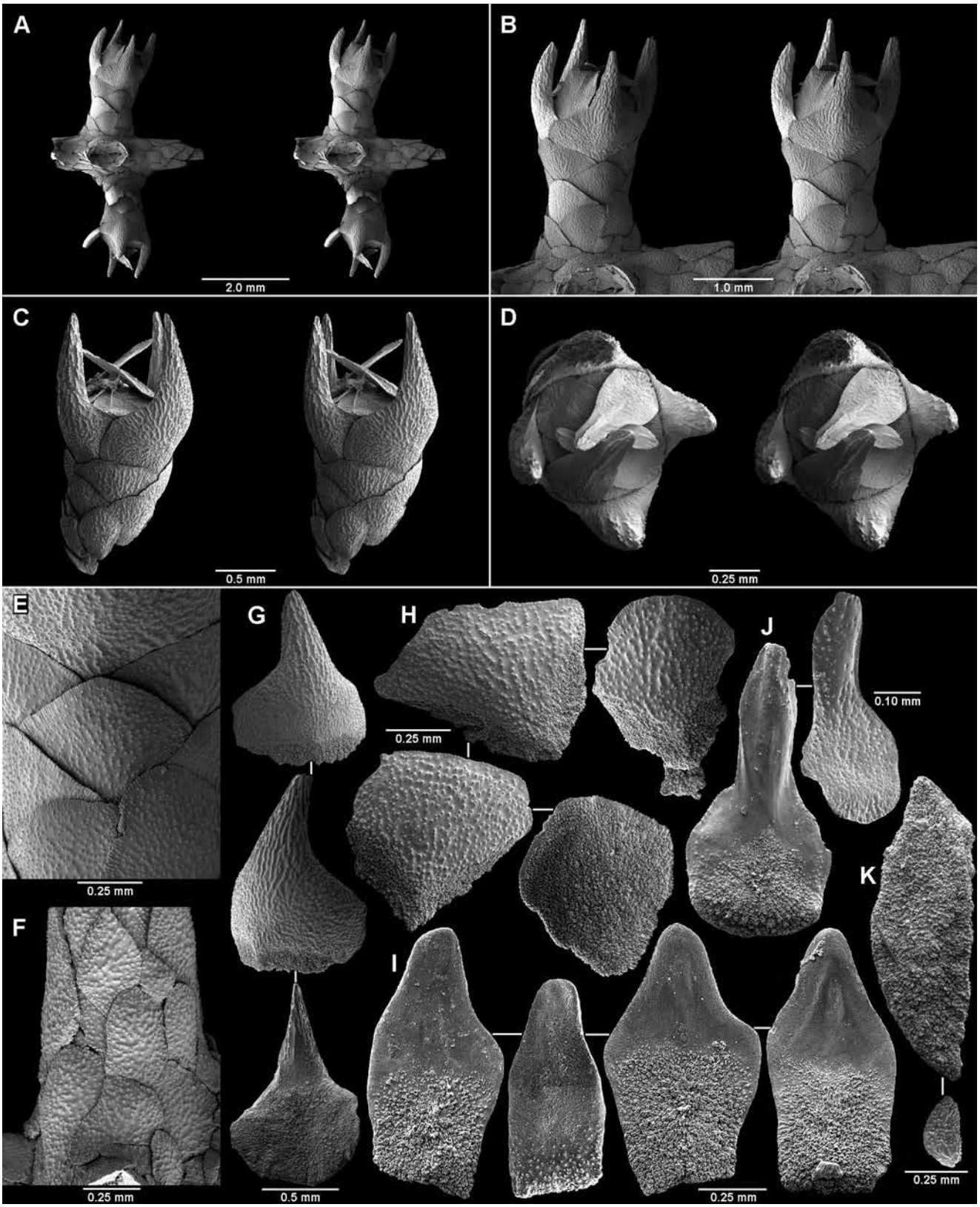

Figure 64. *Pachyprimnoa asakoae* **gen. et sp. nov.**, holotype: **A.** stereo view of a whorl of three polyps; **B–C.** lateral stereo view of polyps showing massive marginal scales; **D.** stereo view of operculum surrounded by the four marginal scales; **E.** marginal scales *in situ*; **F.** coenenchymal scales *in situ*; **G.** massive marginal scales; **H.** body wall scales; **I.** upper opercular scales; **J.** lower opercular scales; **K.** coenenchymal scales.

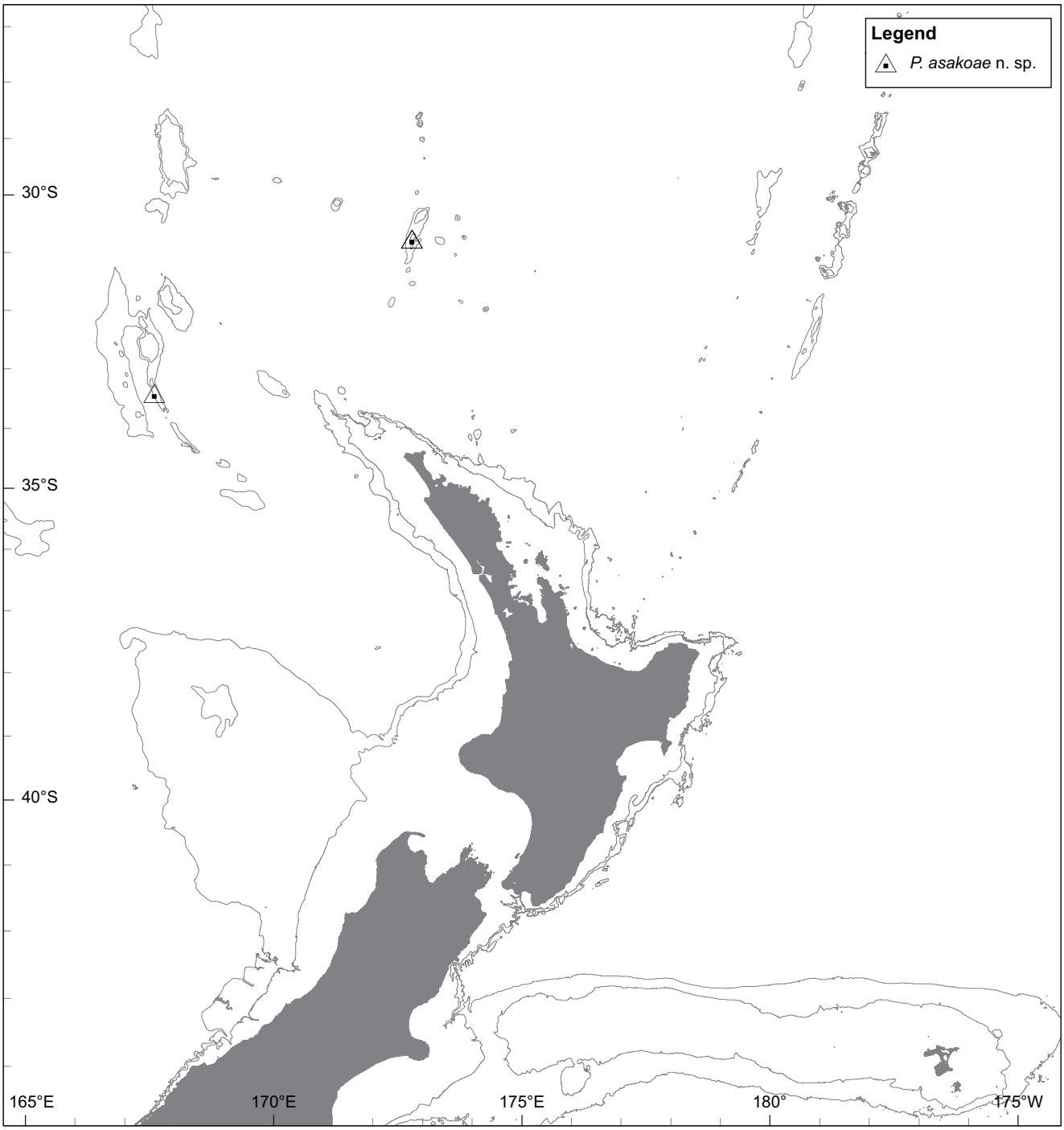

Figure 65. Distribution of *Pachyprimnoa asakoae* **gen. et sp. nov.**

0.4–0.5 mm in basal diameter (L:W = 2.0–2.1); they are aligned with the overlapping edges of adjacent marginal scales, and their distal tips overlap one another. The lower crown, which is almost completely covered by the upper crown, consists of smaller (up to 0.55 mm in length and about 0.25 mm in basal width) triangular scales (Fig. 64J); they are aligned with the four large marginal scales. The distal inner face of all operculars is flat and smooth; their outer face is concave and faintly granular. The thick coenenchymals (Fig. 64K) are flat and irregularly shaped scales ranging from 0.17 to 1.2 mm in length. They are arranged in a mosaic pattern (Fig. 64F) and bear low granules.

Remarks. The paratype differs in having much less thickened marginal scales, almost of normal thickness.

Etymology. Named in honor of Asako Matsumoto, who first recognised the affinity of this genus to *Candidella*.

Genus ***Perissogorgia*** Bayer & Stefani, 1989

Perissogorgia Bayer & Stefani, 1989: 459–461 (key to species).
Perissogorgia, Cairns & Bayer 2009: 47.

Type species. *Perissogorgia viridis* Bayer & Stefani, 1989, by original designation.

Diagnosis. Colonies unbranched or dichotomously or laterally branched. Polyps arranged in whorls, directed upward, closely appressed to branch surface. Body wall of polyp protected by a single abaxial row of large, crescentric scales, usually a few OL scales, rarely any IL scales, and sometimes a pair of adaxial scales (adaxial side usually naked or strongly appressed to branch). Opercular scales strongly keeled. Coenenchymal scales imbricate or mosaic, often with concave outer faces; a lower layer of tuberculate spheroids may be present.

Remarks. Including the new species described herein there are eight species known in the genus, all previously known only from the New Caledonian region.

Distribution. Norfolk Island to North Cape, New Zealand, including Wanganella Bank, 50–1110 m; elsewhere, New Caledonia, Loyalty Islands, 55–750 m.

Perissogorgia vitrea Bayer & Stefani, 1989

Fig. 63C (p. 107), 66, 67

Perissogorgia vitrea Bayer & Stefani, 1989: 466–468, Pl. 21–28.
Perissogorgia vitrea, Taylor & Rogers 2015: Fig. 1.

Material examined. Majority of paratypes deposited at the NMNH (Bayer & Stefani 1989).

Norfolk Ridge (Australian EEZ): TMAG K4388, NZOI Stn P39, 29.173° S, 167.862° E, 77 m, 29 Jan 1977, 3 colonies; TMAG K4389, NZOI Stn P26, 29.915° S, 167.747° E, 130–301 m, 27 Jan 1977, 5 colonies; TMAG K4390, NZOI Stn I89, 29.422° S, 168.003° E, 65 m, 23 Jul 1975, 1 colony; TMAG K4391, NZOI Stn I84, 29.13° S, 168.165° E, 65 m, 22 Jul 1975, 24 colonies (NMNH SEM stubs 2149–2152, 2157); TMAG K4392, NZOI Stn P40, 29.17° S, 167.833° E, 394–472 m, 21 Jan 1977, 4 colonies; TMAG K4393, NZOI Stn P37, 29.172° S, 168.043° E, 62 m, 29 Jan 1977, 1 colony (USNM 1278865, 2 colonies).

Off Noumea (International Waters): NIWA 99716, NZOI Stn G1, 32.583° S, 167.383° E, 138 m, 14 Sep 1966, 1 colony.

Wanganella Bank (International Waters): NIWA 99717, NZOI Stn P5, 32.607° S, 167.51° E, 126 m, 25 Jan 1977, 1 colony.

Three Kings Islands: NIWA 99715, NZOI Stn E323, 34° S, 172.25° E, 165 m, 11 Apr 1965, 1 colony.

Cape Reinga: NIWA 73373, NIWA Stn TAN1105/60, 34.43° S, 172.354° E, 83–86 m, 30 Mar 2011, 2 colonies.

North Cape: NIWA 9863, NZOI Stn Z9744, 34.363° S, 172.972° E, 100 m, 18 Apr 1999, 4 colonies; NIWA 9864, NZOI Stn F923, 34.125° S, 172.778° E, 143 m, 13 Oct 1968, 1 colony; NIWA 9865, NZOI Stn Z9498, 34.977° S, 172.533° E, 164–168 m, 17 Jan 1996, 1 colony; NIWA 9868, NZOI Stn Z9713, 34.375° S, 172.929° E, 65 m, 29 Jan 1999, 5 colonies; NIWA 9870 and 11279, NZOI Stn Z9681, 34.315° S, 172.818° E, 63 m, 26 Jan 1999, 7 colonies; NIWA 11077, NZOI Stn J953, 34.66° S, 172.218° E, 270 m, 18 Jun 1981, 1 colony (USNM 1278864, 1 colony); NIWA 55434, NIWA Stn TAN0906/81, 34.879° S, 173.917° E, 115–112 m, 08 Jul 2009, 1 colony; NIWA 55657, NIWA Stn TAN0906/96, 34.913° S, 173.832° E, 52–54 m, 09 Jul 2009, 1 colony; NIWA 55942, NIWA Stn TAN0906/126, 34.556° S, 173.156° E, 105–106 m, 12 Jul 2009, 1 colony, (NMNH SEM stubs 2166–2167); NIWA 56093, NIWA Stn TAN0906/132, 34.557° S, 173.285° E, 139–141 m, 13 Jul 2009, 1 colony; NIWA 56602, NIWA Stn TAN0906/159, 34.388° S, 173.041° E, 59–59 m, 14 Jul 2009, 4 colonies; NIWA 56821 and 56823, NIWA Stn TAN0906/164, 34.402° S, 173.138° E, 145–149 m, 14 Jul 2009, 7 colonies; NIWA 56911 and 56965, NIWA Stn TAN0906/170, 34.378° S, 173.027° E, 65–64 m, 15 Jul 2009, 3 colonies; NIWA 57074, NIWA Stn TAN0906/178, 34.41° S, 173.161° E, 203–169 m, 15 Jul 2009, 1 colony; NIWA 57198, NIWA Stn TAN0906/205, 34.855° S, 173.609° E, 100–100 m, 17 Jul 2009, 1 colony; NIWA 57283, NIWA Stn TAN0906/225, 34.853° S, 173.609° E, 100–103 m, 18 Jul 2009, 1 colony; NIWA 57403, NIWA Stn TAN0906/235, 34.876° S, 173.916° E, 117–114 m, 19 Jul 2009, 1 colony; NIWA 57456, NIWA Stn TAN0906/236, 34.85° S, 173.905° E, 134–132 m, 19 Jul 2009, 1 colony; NIWA 73071, NIWA Stn TAN1105/27, 34.272° S, 172.787° E, 66–67 m, 27 Mar 2011, 2 colonies; NIWA 77615, NZOI Stn Z9890, 35.008° S, 172.53° E, 167 m, 30 Oct 1999, 1 colony.

Poor Knights Islands: NIWA 9882, NZOI Stn I15, 35.409° S, 174.467° E, 50 m, 04 May 1975, 4 colonies;

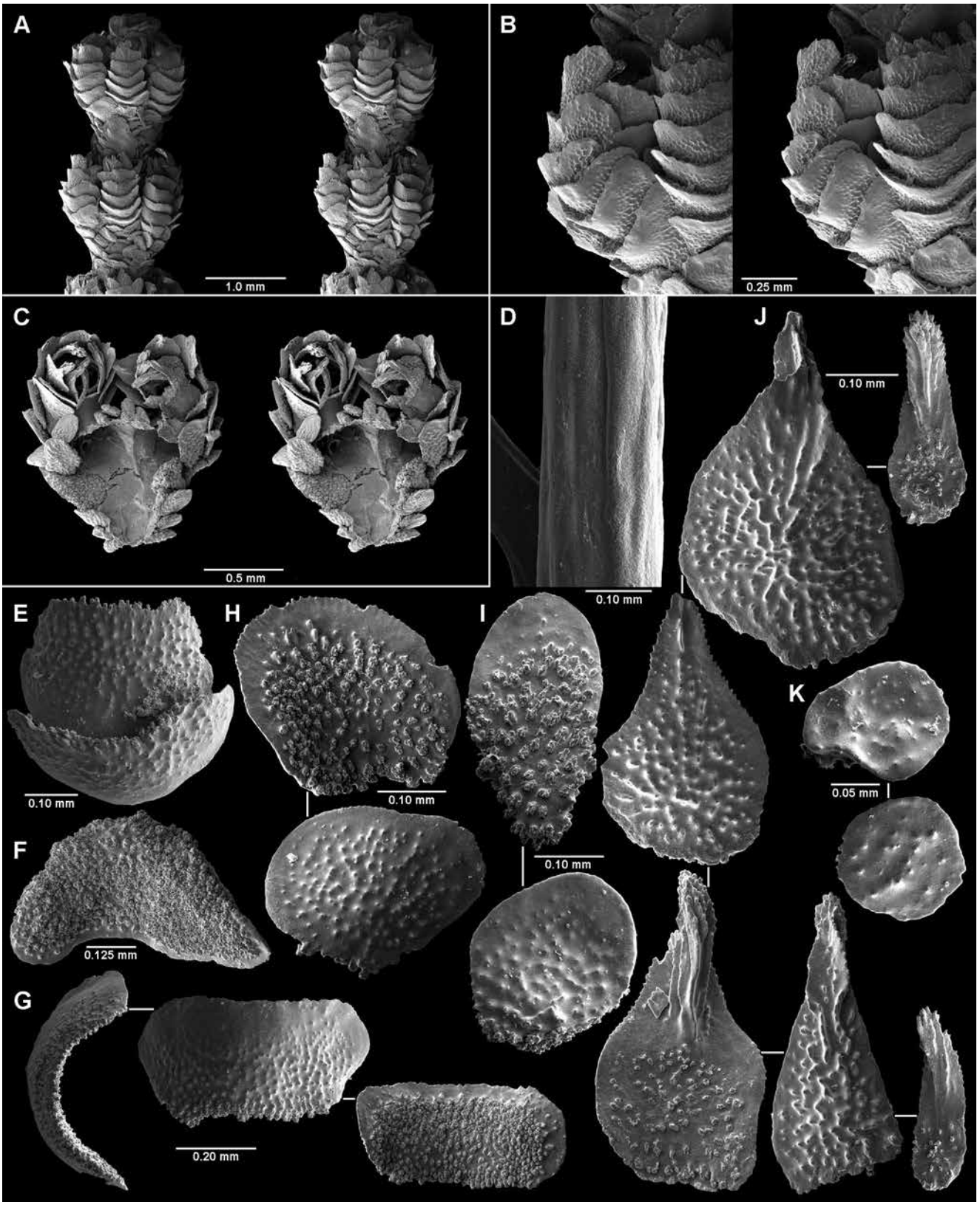

Figure 66. *Perissogorgia vitrea* Bayer & Stefani, 1989 from NIWA 11280: **A.** stereo view of two polyp whorls; **B–C.** oblique and adaxial stereo views of polyps; **D.** smooth axis; **E.** basal and next-lowest body wall scale; **F.** inner face of curved basal body wall scale; **G.** body wall scales; **H.** lateral body wall scales; **I.** adaxial body wall scales; **J.** opercular scales; **K.** coenenchymal scales.

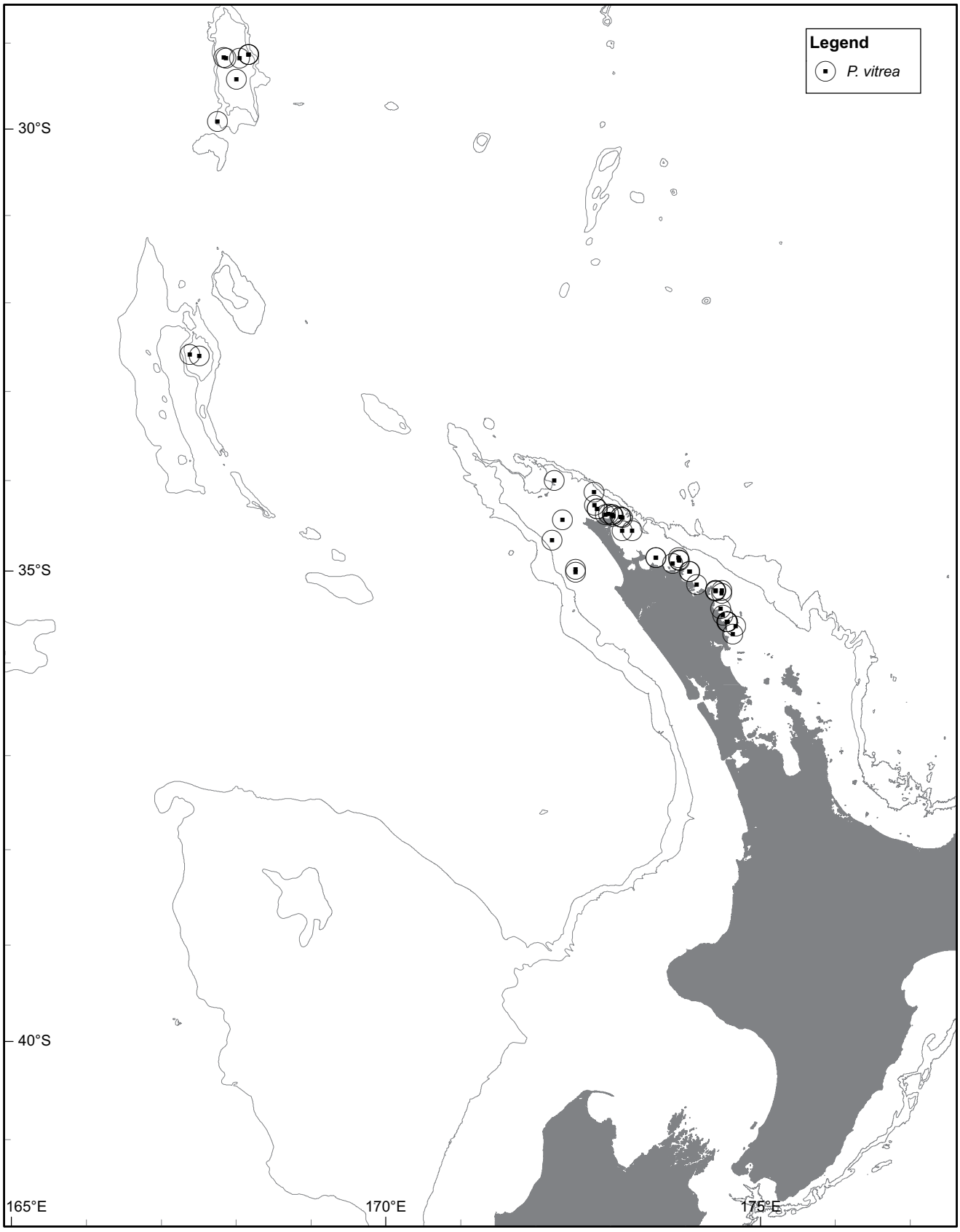

Figure 67. Distribution of *Perissogorgia vitrea* Bayer & Stefani, 1989.

NIWA 11085, NZOI Stn I14, 35.598° S, 174.667° E, 104 m, 04 May 1975, 2 colonies; NIWA 11066, NZOI Stn Z10160, 35.685° S, 174.634° E, 80 m, 13 Dec 1999, 9 colonies.

Bay of Islands: NIWA 54829 and 54861, NIWA Stn TAN0906/30, 35.211° S, 174.405° E, 101–104 m, 06 Jul 2009, 5 colonies; NIWA 54386 and 54417, NIWA Stn TAN0906/2, 35.552° S, 174.56° E, 60–61 m, 04 Jul 2009, 30 colonies (USNM 1278866, 1 colony); NIWA 54705, NIWA Stn TAN0906/21, 35.486° S, 174.501° E, 63–59 m, 05 Jul 2009, 10 colonies; NIWA 54761 and 54762, NIWA Stn TAN0906/25, 35.553° S, 174.553° E, 57–57 m, 05 Jul 2009, 16 colonies; NIWA 54889, NIWA Stn TAN0906/33, 35.208° S, 174.486° E, 142–135 m, 06 Jul 2009, 3 colonies; NIWA 54933, NIWA Stn TAN0906/36, 35.242° S, 174.483° E, 128–133 m, 06 Jul 2009, 1 colony (USNM 1278863, 1 colony); NIWA 54973, NIWA Stn TAN0906/38, 35.216° S, 174.403° E, 99–105 m, 06 Jul 2009, 1 colony; NIWA 55162, NIWA Stn TAN0906/57, 35.146° S, 174.152° E, 55–55 m, 07 Jul 2009, 1 colony; NIWA 55233, NIWA Stn TAN0906/65, 35.004° S, 174.056° E, 105–108 m, 08 Jul 2009, 1 colony; NIWA 55323, NIWA Stn TAN0906/68, 35.005° S, 174.06° E, 110–108 m, 08 Jul 2009, 1 colony.

Type & locality. Holotype—MNHN Oct.A.1987.12, *Vauban* Stn 150 (HGP-68), 22.502° S, 166.840° E, off southern New Caledonia, 62–68 m.

Distribution. Off Norfolk Island and southern Norfolk Ridge, off North Cape of North Island (Fig. 67), 42–472 m; Loyalty Islands, New Caledonia, 68–520 m.

Description. Colonies are uniplanar and abundantly branched (Fig. 63C) in an equal dichotomous manner, the branching axils being relatively small, and the distal branches rarely more than 3 cm in length. The largest colony (NIWA 9870) is 35 cm in height, with a basal branch diameter of 7.7 mm. The axis is brown to black and ridged; however, near the slender branch tips the axis is smooth; overall the colonies are relatively flexible. The basal 2–3 cm of larger colonies are covered with white granular sclerites, unlike those of the other branch surfaces. Polyps occur in whorls of five or six (Fig. 66A), more in larger-diameter branches, the polyps 1.1–1.3 mm in length and pointing upward, lying close to the branch surface (Fig. 66B). There are usually six to seven whorls per cm branch length.

Each polyp is covered by a single (unpaired) row of five to seven abaxial scales (Fig. 66B), 0–3 pairs of OL scales, and usually one small pair of adaxial scales (Fig. 66C, I); there are no IL scales. The sclerite formula is thus: 5–7 (unpaired): 0–3: 0: 1. The abaxial scales (Fig. 66E–G) are robust (thick) and highly curved, covering roughly half the circumference of the polyp, and rectangular in shape. They increase in size from distal to proximal position, the distalmost abaxials being about 0.32–0.36 mm in width, the proximal ones up to 0.66 mm in width. The narrower distal abaxials are augmented in width by one to three pairs of outer lateral scales of almost the same width (Fig. 66H). The adaxial side of the polyp is not covered with scales (Fig. 66C). The somewhat translucent (vitreous in aspect) outer surface of the body wall scales grades from smooth to slightly granular proximally, whereas the inner surface is almost entirely tuberculate. The opercular scales (Fig. 66J) are triangular but with a somewhat rod-shaped or cylindrical distal end. Operculars decrease in size from ab- to adaxial side of the polyp, ranging from 0.24–0.50 mm in length and having a L:W ratio of 1.6–2.7. The outer surface of the operculars is covered with low granules that seem to radiate from a central point and occasionally fuse into short ridges. The proximal inner surface is tuberculate, whereas the distal inner surface bears a multi-ridged, serrate keel. The coenenchymals (Fig. 66K) are elliptical, imbricate scales 0.13–0.40 mm in greater diameter, granular to smooth above and tuberculate below.

Comparisons. *Perissogorgia vitrea* is one of three species in the genus to have a dichotomously branching colony. It is most similar to *P. rigida*, and is compared to that species below. It is distinguished from *P. monile* Bayer & Stefani, 1989 by having a higher number of thinner (translucent) and smoother body wall scales; thin, imbricating, concave coenenchymal scales (v. thick, mosaic, flat scales); and in lacking tentacular sclerites. These differences are discussed and distinguished by key in Bayer & Stefani (1989).

Remarks. This fairly commonly collected species represents the first records subsequent to its original description and thus a new record for the New Zealand EEZ. A small (0.23 mm in diameter) sinistrally-coiling gastropod protoconch was found in the gastrovascular cavity of one of the polyps. Evidence of diet in deep-water octocorals is rarely recorded but discussed by Watling *et al.* (2011).

Perissogorgia rigida sp. nov.

Fig. 63D (p. 107), 68, 69

Material examined. Holotype TMAG K4383, NZOI Stn P18, 29.577° S, 168.05° E, just south of Norfolk Island, Australian EEZ, 90–86 m, 26 Jan 1971, 1 colony (USNM 1278867, branchlet, NMNH SEM stubs 2153–2156). **Paratypes** TMAG K4384, NZOI Stn P49, 28.722° S, 167.893° E, off Norfolk Island, Australian EEZ, 110 m, 30 Jan 1977, 1 colony; TMAG K4385, NZOI Stn P22, 29.515° S, 167.98° E, off Norfolk Island, Australian EEZ, 56 m, 26 Jan 1977, 1 colony; NIWA 9880, NZOI Stn P19, 29.56° S, 168.027° E, off Norfolk Island, Australian EEZ, 81 m, 25 Jan 1977, 1 colony, (USNM 1278868, 1 colony).

Type locality. Just south of Norfolk Island.

Distribution. Known only from off Norfolk Island (Fig. 69), 56–110 m.

Description. Colonies are uniplanar and sparsely branched in a lateral manner, the distal branches often 5–9 cm in length. The largest colony (the holotype, Fig. 63D) is 13 cm in height and 3.1 mm in basal branch diameter. The axis is dark brown and highly ridged (seven to nine ridges on distal branches), even at the branch tips (Fig. 68B, C); overall the colony is stiff and not very flexible. Polyps occur in whorls of eight to nine (Fig. 68A) near branch tips and even more on larger-diameter branches; the whorls are closely spaced, usually eight whorls occurring per cm branch length. The polyps are 1.1–1.2 mm in length, directed upward, and lie very close to the branch, almost adnate in position; toward the branch tip they attenuate in size.

Each polyp is covered by a single (unpaired) row of about six abaxial scales, two pairs of OL scales, no IL scales, and an unknown number of adaxials (unknown because of the difficulty of observing the adaxial side of an adnate polyp). The sclerite formula is thus: 6 (unpaired): 2: 0: ?. The size and shape of the abaxial body wall scales (Fig. 68D) are similar to those described for *P. vitrea*, and as with *P. vitrea*, the outer surface is smooth to low granular but is not translucent. The opercular scales (Fig. 68E) are also similar to those of *P. vitrea*, ranging from 0.28–0.41 mm in length, with an L:W of 1.7–2.4, but lacking rod-shaped distal tips; small keels are present on the distal inner surface. The coenenchymal scales (Fig. 68F) are elliptical to rectangular in shape, with a highly concave outer face, ranging in length from 0.17–0.39 mm. Beneath the layer of imbricate coenenchymals are multiple layers of smaller (0.10–0.28 mm in diameter) multi-tuberculate spheroids (Fig. 68G).

Comparisons. *Perissogorgia rigida* **sp. nov.** is most similar to *P. viridis*, but can be distinguished by having more polyps per whorl, smaller colonies with longer end branches, highly ridged and stiffer axes, adnate polyps, and coenenchymal tuberculate spheroids.

Etymology. Named *rigida* (from Latin *rigidus*, meaning stiff or inflexible), in reference to the stiffness of the colonies.

Perissogorgia colossus Bayer & Stefani, 1989

Fig. 63E (p. 107), 70, 71

Perissogorgia colossus Bayer & Stefani, 1989: 461, 464–465, Pl. 15–17, Text Fig. 1D.

Perissogorgia colossus, Alderslade 2006: 21.

Material examined. *Reinga Basin (International Waters)*: NIWA 91106, NIWA Stn TAN1312/d38, 33.308° S, 166.684° E, 1110–1020 m, 09 Nov 2013, 3 branches (may be one broken colony) (USNM 1278870, dried calyces, NMNH SEM stubs 2168–2174); NIWA 11225, NZOI Stn Z10989, 33.887° S, 167.938° E, 1082–1082 m, 22 Jan 2002, 1 colony.

Norfolk Ridge (Australian EEZ): USNM 1287734, NIWA Stn TAN0308/29 (NORFANZ), 28.85° S, 167.71° E, 690–812 m, 15/05/2003, 1 colony.

Type & locality. Holotype—MNHN. Oct.1987.6; *Coriolis* Stn CP22 (Chalcal 2), 24.672° S, 168.645° E, Antigonia Seamount, Northern Norfolk Ridge, 750 m (USNM 79973, fragment of type, NMNH SEM stubs B1260, 1264–1269).

Distribution. Wanganella Bank, off Norfolk Island, southern Norfolk Ridge (Fig. 71), 690–1110 m; northern Norfolk Ridge (near New Caledonia), 750 m.

Description. Colonies are unbranched (flagelliform), the largest colony (the holotype, Fig. 63E) 19 cm in length; the largest New Zealand specimen (NIWA 91106) is 13 cm in length and 1.05 mm in axis diameter, but undoubtedly part of a longer colony. The axis is pale yellow in colour and relatively stiff. Polyps occur in closely spaced (3–3.5 whorls per cm) whorls of seven or eight (Fig. 70A, C), the polyps directed upward, each measuring 3.5–3.8 mm in length. The whorl diameter is 4.7–4.9 mm.

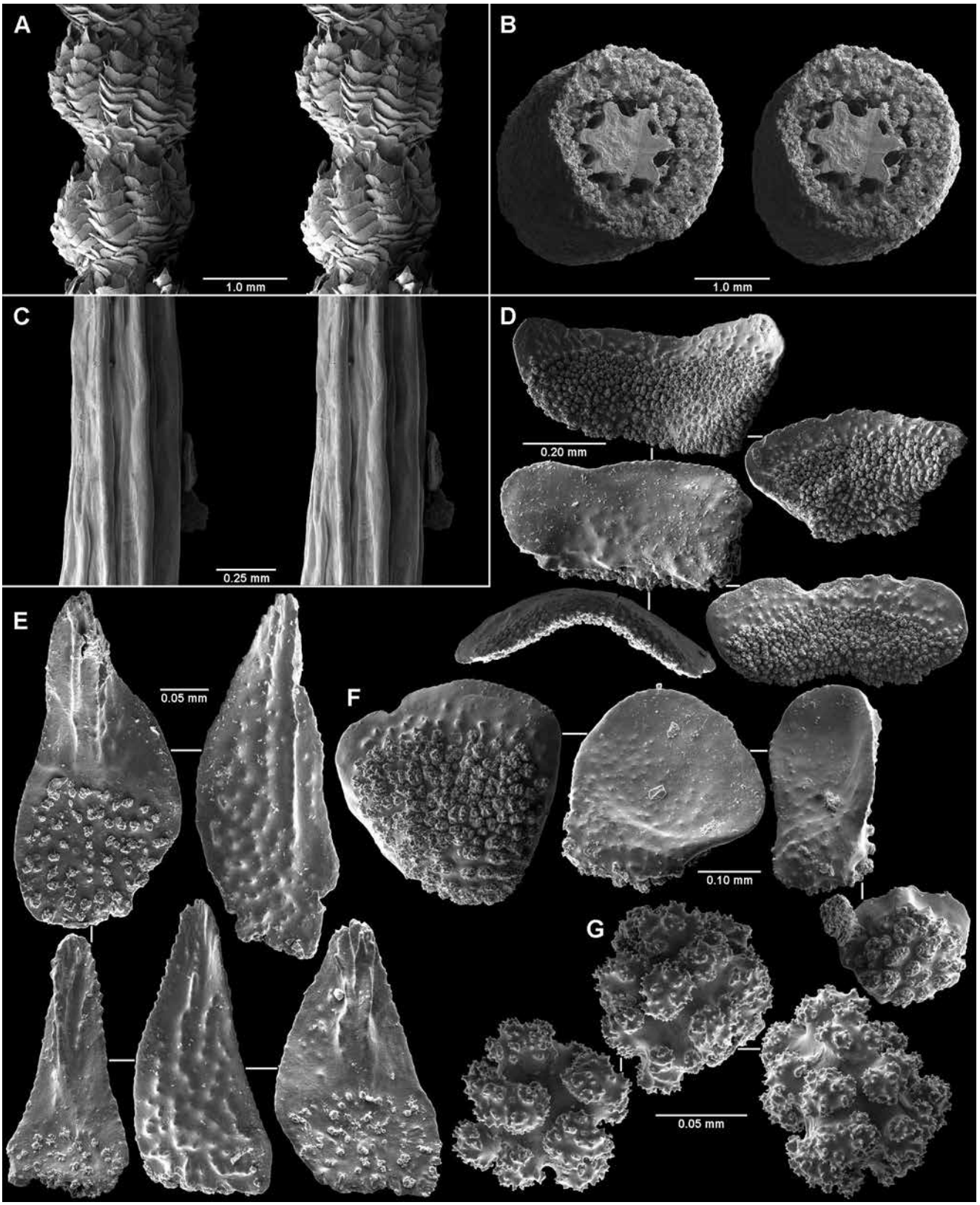

Figure 68. *Perissogorgia rigida* **sp. nov.** (A, C–F, holotype; B, G, paratype, NIWA 55942): **A.** stereo view of two polyp whorls; **B.** stereo view of branch cross section showing ridged axis and surrounding spheroids; **C.** stereo view of axis; **D.** body wall scales; **E.** opercular scales; **F.** coenenchymal scales; **G.** multituberculate spheroids.

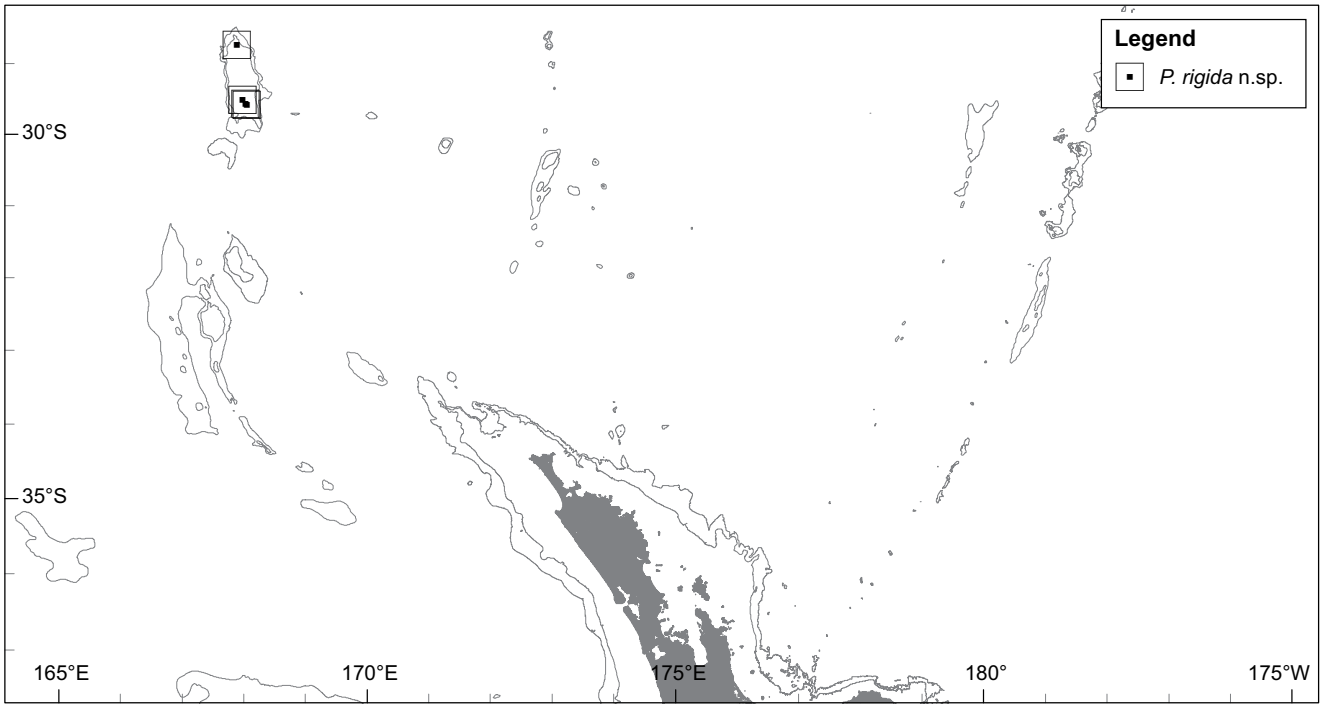

Figure 69. Distribution of *Perissogorgia rigida* **sp. nov.**

Each polyp is covered by a single row of three large abaxial scales (Fig. 70D), two pairs of smaller OL marginal scales (Fig. 70B, E), and two pairs of even smaller adaxial scales (Fig. 70F), the IL scales being absent; the sclerite formula is thus: 3 (unpaired): 2 (disjunct): 0: 2. The abaxial marginal scale (Fig. 70D, upper left) is quite large and slightly curved, up to 1.9 mm in length and 1.8 mm in width, its translucent distal edges forming a cowl (Fig. 70C) surrounding the relatively small operculum. The medial scale is similar in shape and only slightly smaller; the basal scale (Fig. 70D, right upper and lower) is often the largest and most curved of the abaxial scales, up to 2.0 mm in width and usually having a bilobate distal edge. The OL marginal scales are small squares 0.35–0.45 mm in width (Fig. 70B, E), whereas the OL basals (which are not contiguous with the marginal outer laterals), are larger (up to 0.8 mm in length), rectangular, and have a smooth (not denticulate) distal edge. Two small (0.22–0.30 mm in diameter) pairs of adaxial marginal scales (Fig. 70F) are present, but the adaxial side of the polyp is largely naked. All body scales are covered with low spines, arranged in radiating rows. The opercular scales (Fig. 70G) vary greatly in size and shape, the abaxial operculars up to 1.2 mm in length, with a broad distal edge and a low L:W, e.g. 1.25. The adaxial operculars are only about 0.5–0.6 mm in length, pointed, and have an L:W of about 3.2. All operculars bear a prominent keel on their inner surface, which is often arranged in an oblique manner, their outer surface is concave and covered with spines arranged in radiating rows from a proximal nucleus (Fig. 70I). The coenenchymal sclerites (Fig. 70H) include elongate sail scales up to 1.5 mm in length with ridges up to 0.35 mm in height. Other coenenchymals are elongate (0.3–0.75 mm in length) and have a flat, granular outer surface.

Comparisons. Except for an undescribed, unbranched species from NZOI Stn G8 (NIWA 47808), mentioned in the Material and Methods, *Perissogorgia colossus* is the only species in the genus from New Zealand to have a flagelliform colony. Three other species have unbranched colonies, and are discussed and keyed by Bayer & Stefani (1989).

Remarks. This is the second report of this species subsequent to its original description. The NORFANZ record is herein confirmed and documented.

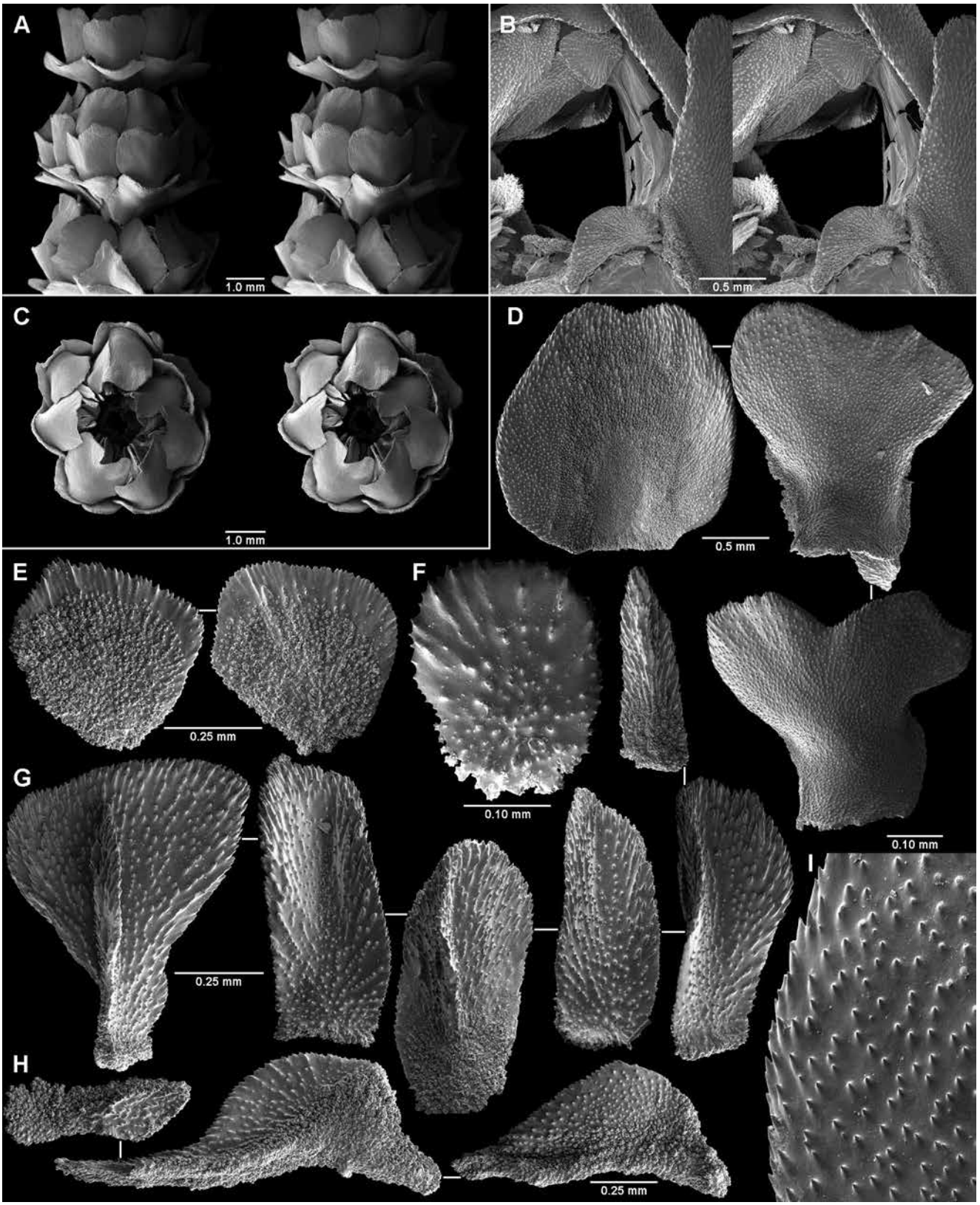

Figure 70. *Perissogorgia colossus* Bayer & Stefani, 1989 from NIWA 91106: **A.** stereo view of three polyp pairs; **B.** stereo view of lateral portion of a polyp showing the two disjunct outer lateral marginal scales; **C.** stereo view of an apical polyp whorl; **D.** abaxial body wall scales; **E.** outer lateral marginal scales; **F.** adaxial marginal scale; **G.** opercular scales; **H.** ridged coenenchymal scales; **I.** spines on opercular scale.

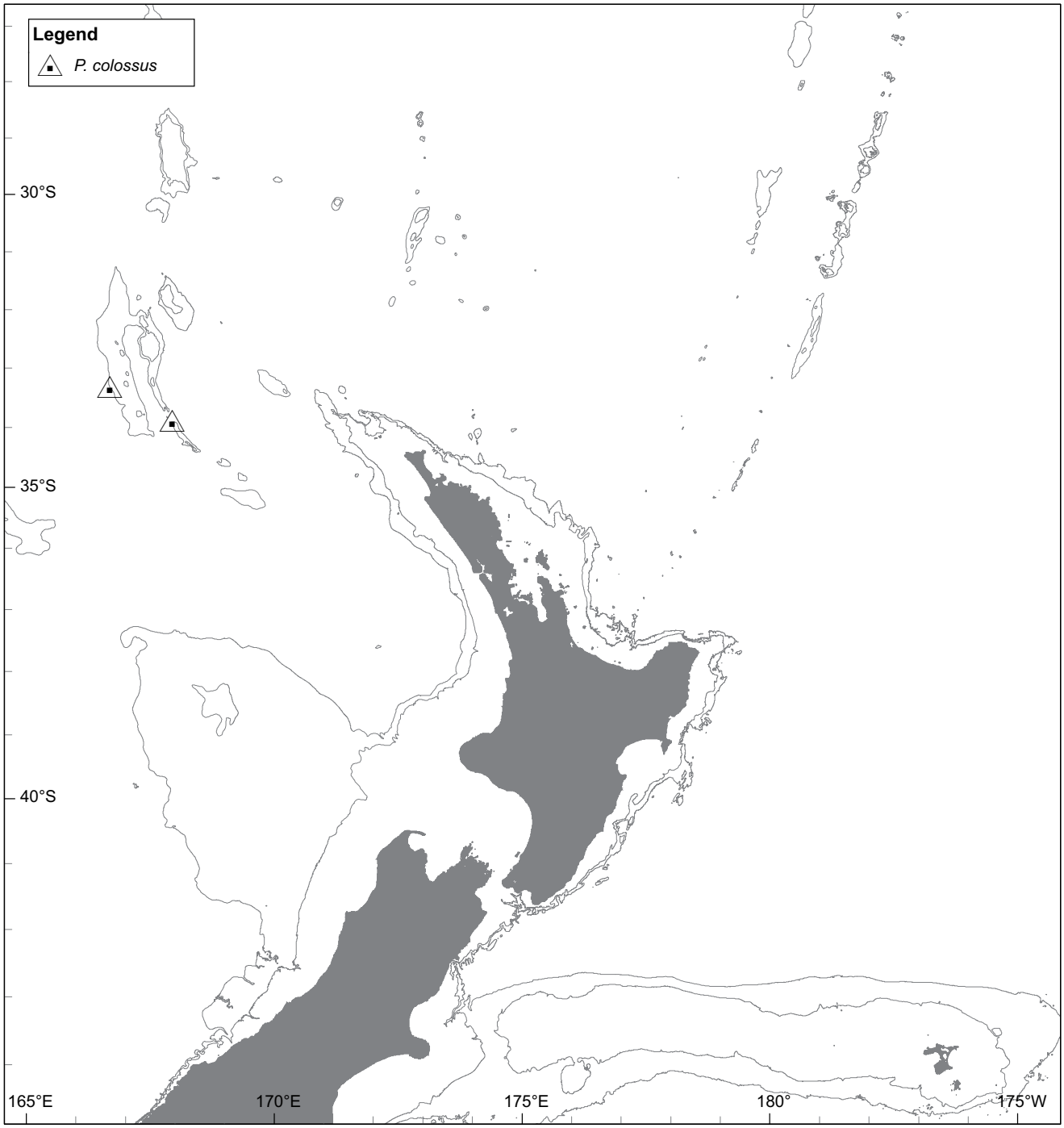

Figure 71. Distribution of *Perissogorgia colossus* Bayer & Stefani, 1989.

Additional records of species reported in Cairns (2012)

***Narella mesolepis* Cairns, 2012**

Material examined. *Lord Howe Rise (International Waters)*: USNM 1287690, NIWA Stn TAN0308/46 (NORFANZ), 27.64° S, 163.71° E, 1635–1749 m, 19/05/2003, 1 colony (= *Narella* sp. (in part) *sensu* Alderslade, 2006: 21).

Bounty Plateau: NIWA 99718, NZOI Stn I666, 47.792° S, 178.992° W, 1165 m, 13 Mar 1979, 1 colony.

Remarks. Extends distribution to Bounty Plateau and Lord Howe Rise, and to a depth of 1749 m.

***Narella hypsocalyx* Cairns, 2012**

Material examined. *Louisville Ridge*: NIWA 94345, NIWA Stn TAN1402/91, 39.164° S, 167.35° W, 910–934 m, 20 Feb 2014, branches.

***Narella parva* (Versluys, 1906)**

Material examined. *Lord Howe Rise (Australian EEZ)*: NIWA 11105, NZOI Stn Q68, 29.233° S, 159° E, 1045 m, 01 Jun 1978, branches.

Remarks. Extends distribution to southern Lord Howe Rise (off Middleton Reef).

***Narella studeri* (Versluys, 1906)**

Material examined. *Kermadec Ridge*: NIWA 11182, NIWA Stn TAN0205/45, 31.084° S, 179.026° W, Volcano K, 941–1112 m, 19 Apr 2002, 1 branch.

Norfolk Ridge: USNM 1287729, TAN0308/133 (NORFANZ), 33.4° S, 170.22° E, 465–490 m, 01 Jun 2003, 1 colony (= *Narella* sp. (in part) *sensu* Alderslade, 2006: 21).

***Metanarella nannolepis* Cairns, 2012**

Material examined. *Off Noumea (International Waters)*: NIWA 99721, NZOI Stn G1, 32.583° S, 167.383° E, 138 m, 14 Sep 1966, 1 branch.

Wanganella Bank (International Waters): NIWA 11079, NZOI Stn P7, 32.683° S, 167.477° E, 150 m, 25 Jan 1977, 1 colony.

***Calyptrophora inornata* Cairns, 2012**

Material examined. *Norfolk Ridge*: NIWA 69575, SOP Stn TRIP3252/23, 33.7° S, 167.8° E, 648–880 m, 03 Jan 2011, 1 large colony.

Cavalli Seamounts: NIWA 11288, NIWA Stn KAH0204/30, 34.146° S, 173.963° E, 825–800 m, 17 Apr 2002, 1 colony; NIWA 11137 and 11159, NZOI Stn Z11058, 34.147° S, 173.963° E, 825–800 m, 17 Apr 2002, 2 large colonies.

Bay of Plenty: NIWA 11161, NZOI Stn Z8882, 37.017° S, 176.718° E, Waioeka Knoll, 976 m, 01 Aug 1997, 1 branch; NIWA 11300, NZOI Stn Z9225, 37.118° S, 177.284° E, 690–800 m, 15 Aug 1998, large branches; NIWA 99719, NZOI Stn Z9230, 36.885° S, 177.367° E, 787 m, 15 Aug 1998, 1 large branch.

Hikurangi Margin: NIWA 26862, NIWA Stn TAN0616/30, 39.545° S, 178.331° E, 790–815 m, 06 Nov 2006, 1 colony;

Remarks. Slightly extends known bathymetric range to 648–976 m.

***Calyptrophora clinata* Cairns, 2007**

Material examined. *Cavalli Seamounts*: NIWA 11281, NZOI Stn Z11046, 34.119° S, 174.152° E, Aotea Seamount, 800–670 m, 14 Apr 2002, 1 branch; NIWA 11284, NIWA Stn KAH0204/40, 34.164° S, 173.964° E, 820–805 m, 18 Apr 2002, 1 branch.

Kermadec Ridge: NIWA 14766, NIWA Stn TAN0205/73, 30.032° S, 178.801° W, 872–1086 m, 23 Apr 2002, 2 branches.

Remarks. Slightly extends known bathymetric range to 800–1086 m.

***Calyptrophora diaphana* Cairns, 2012**

Material examined. *Colville Ridge*: NIWA 11285, NIWA Stn TAN0205/73, 30.032° S, 178.801° W, 872–1086 m, 23 Apr 2002, 3 branches.

Kermadec Ridge: NIWA 11282, NIWA Stn TAN0205/2, 34.579° S, 179.27° E, Volcano B, 1124–1113 m, 12 Apr 2002, 1 branch; NIWA 99720, NZOI Stn Z9225, 37.118° S, 177.284° E, 690–800 m, 15 Aug 1998, 1 branch.

Remarks. Extends distribution to southern Colville and Kermadec Ridges, and bathymetric range to 1113 m.

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APPENDIX 1. List of stations

NZ, New Zealand Exclusive Economic Zone; AUS, Australian Exclusive Economic Zone; INTW, International Waters; NZOI, New Zealand Oceanographic Institute; Eltanin Stn XXXX, USNS *Eltanin*; KAHXXXX/XX, NIWA Stn KAH(voyage number)/(Stn number), RV *Kaharoa*; TANXXXX/XX, NIWA Stn TAN(voyage number)/(Stn number) RV *Tangaroa;* SMTXXXX/XX, Fisheries research trawl survey Stn SMT(voyage number)/(Stn number) FV *Seamount Enterprise*; TRIPXXXX/XXX, MPI Stn TRIP(trip number)/(Stn number) various fishing industry vessels; ZXXXXX, NZOI & NIWA "Z stations" collected on various vessels; *Plumarella* (*D.*) = *Plumarella* (*Dicholaphis*); *Plumarella* (*F.*) = *Plumarella* (*Faxiella*).

Station	Species	EEZ	Catalogue number	Latitude	Longitude	Depth (m)	Date
NZOI C617	*Metafannyella chathamensis*	NZ	NIWA 9696	43.97° S	175.38° W	302	30/04/1961
NZOI C758	*Metafannyella ventilabrum*	NZ	NIWA 11254	34.67° S	172.24° E	199	17/02/1962
NZOI D149	*Metafannyella eos*	NZ	NIWA 14669	49.17° S	166.85° E	454	14/01/1964
NZOI D22	*Metafannyella eos*	NZ	NIWA 11272	50.63° S	163.95° E	755	26/04/1963
NZOI D242	*Fanellia tuberculata*	INTW	NIWA 11094	38° S	169.05° E	337	02/10/1964
NZOI D39A	*Metafannyella eos*	NZ	NIWA 11261	50.97° S	165.75° E	549	07/05/1963
NZOI D39A	*Metafannyella eos*	NZ	NIWA 11266	50.97° S	165.75° E	549	07/05/1963
NZOI D6	*Primnoella insularis*	AUS	TMAG K4377	55.48° S	158.53° E	415	25/05/2000
NZOI E323	*Metafannyella ventilabrum*	NZ	NIWA 99996	34° S	172.25° E	165	11/04/1965
NZOI E323	*Perissogorgia vitrea*	NZ	NIWA 99715	34° S	172.25° E	165	11/04/1965
NZOI E323	*Plumarella* (*D.*) *cordilla*	NZ	NIWA 99704	34° S	172.25° E	165	11/04/1965
NZOI E845	*Metafannyella ventilabrum*	NZ	NIWA 14758	34.13° S	172.02° E	277	16/03/1968
NZOI E864	*Plumarella* (*D.*) *cordilla*	INTW	NIWA 11068	32.6° S	167.6° E	130	19/03/1968
NZOI E876	*Metafannyella ventilabrum*	NZ	NIWA 9867	34.65° S	172.23° E	216	21/03/1968
Eltanin Stn 1403	*Metafannyella chathamensis*	NZ	USNM 98022	41.69° S	175.48° E	946–951	31/01/1965
Eltanin Stn 1411	*Metafannyella eos*	NZ	USNM 82074	51° S	162.02° E	333–371	08/02/1965
Eltanin Stn 1414	*Parastenella spinosa*	AUS	USNM 98870	52.33° S	160.62° E	659–798	09/02/1965
Eltanin Stn 1415	*Parastenella spinosa*	AUS	USNM 98023	53.76° S	159.2° E	750–996	09/02/1965
Eltanin Stn 1416	*Parastenella spinosa*	AUS	USNM 83619	53.75° S	159.08° E	787–842	09/02/1965
Eltanin Stn 1419	*Parastenella spinosa*	AUS	USNM 98040	54.53° S	159.03° E	494–714	10/02/1965
Eltanin Stn 1422	*Parastenella spinosa*	AUS	USNM 77382	56.33° S	158.48° E	833–892	10/02/1965
Eltanin Stn 1712	*Callozostron acanthodes*	NZ	USNM 94575	38.4° S	178.88° E	1354–1995	28/05/1966
Eltanin Stn 1852	*Callozostron mirabile*	NZ	USNM 77402	49.4° S	178.93° E	952–1336	03/01/1967
NZOI F123	*Callozostron acanthodes*	NZ	NIWA 11125	47.63° S	178.95° W	1280	27/01/1965
NZOI F123	*Narelloides traceyae*	NZ	NIWA 99713	47.63° S	178.95° W	1280	27/01/1965
NZOI F127	*Callozostron mirabile*	NZ	NIWA 77603	49.37° S	176.27° E	1280	28/01/1965
NZOI F923	*Perissogorgia vitrea*	NZ	NIWA 9864	34.13° S	172.78° E	143	13/10/1968
NZOI F923	*Plumarella* (*D.*) *cordilla*	NZ	NIWA 99705	34.13° S	172.78° E	143	13/10/1968
NZOI G1	*Perissogorgia vitrea*	INTW	NIWA 99716	32.58° S	167.38° E	138	14/09/1966
NZOI G1	*Plumarella* (*D.*) *cordilla*	INTW	NIWA 11058	32.58° S	167.38° E	138	14/09/1966
NZOI G1	*Plumarella* (*D.*) *cordilla*	INTW	NIWA 11067	32.58° S	167.38° E	138	14/09/1966
NZOI I14	*Perissogorgia vitrea*	NZ	NIWA 11085	35.6° S	174.67° E	104	04/05/1975
NZOI I15	*Perissogorgia vitrea*	NZ	NIWA 9882	35.41° S	174.47° E	50	04/05/1975
NZOI I666	*Narelloides traceyae*	NZ	NIWA 99714	47.79° S	178.99° W	1165	13/03/1979
NZOI I84	*Perissogorgia vitrea*	AUS	TMAG K4391	29.13° S	168.16° E	65	22/07/1975
NZOI I89	*Perissogorgia vitrea*	AUS	TMAG K4390	29.42° S	168° E	65	23/07/1975
NZOI J676	*Callogorgia formosa*	NZ	NIWA 99707	37.38° S	177.2° E	341	08/09/1974
NZOI J676	*Fanellia histoclados*	NZ	NIWA 11274	37.38° S	177.2° E	341	08/09/1974
NZOI J676	*Fanellia histoclados*	NZ	NIWA 99710	37.38° S	177.2° E	341	08/09/1974
NZOI J676	*Fanellia tuberculata*	NZ	NIWA 99709	37.38° S	177.2° E	341	08/09/1974
NZOI J683	*Callogorgia tessellata*	NZ	NIWA 11090	37.35° S	177.11° E	388	08/09/1974
NZOI J953	*Perissogorgia vitrea*	NZ	NIWA 11077	34.66° S	172.22° E	270	18/06/1981
NZOI J954	*Metafannyella ventilabrum*	NZ	NIWA 11257	34.63° S	172.23° E	192–204	18/06/1981

Station	Species	EEZ	Catalogue number	Latitude	Longitude	Depth (m)	Date
NZOI J966	*Plumarella* (*D.*) *cordilla*	NZ	NIWA 99706	34.87° S	173.86° E	120 m	20/06/1981
NZOI K8263	*Fanellia histoclados*	NZ	NIWA 99711	28.8° S	177.8° W	142	25/07/1974
NZOI K8263	*Fanellia tuberculata*	NZ	NIWA 11278	28.8° S	177.8° W	142	25/07/1974
NZOI K840	*Callogorgia sertosa*	NZ	NIWA 9878	30.29° S	178.42° W	398	28/07/1974
KAH0204/44	*Primnoella distans*	NZ	NIWA 9698	34.27° S	174.1° E	840–850	18/04/2002
KAH0204/44	*Primnoella distans*	NZ	NIWA 11242	34.27° S	174.1° E	840–850	18/04/2002
Bluff Harbour	*Primnoella australasiae*	NZ	USNM 4504	46.57° S	168.34° E	?	01/1875
NZOI P1	*Plumarella* (*D.*) *cordilla*		NIWA 11065	32.59° S	167.53° E	122	24/01/1977
NZOI P18	*Perissogorgia rigida*	AUS	TMAG K4383	29.58° S	168.05° E	86–90	26/01/1971
NZOI P19	*Perissogorgia rigida*	AUS	NIWA 9880	29.56° S	168.03° E	81	25/01/1977
NZOI P2	*Plumarella* (*D.*) *cordilla*	INTW	NIWA 11059	32.59° S	167.53° E	122	24/01/1977
NZOI P22	*Perissogorgia rigida*	AUS	TMAG K4385	29.51° S	167.98° E	56	26/01/1977
NZOI P26	*Perissogorgia vitrea*	AUS	TMAG K4389	29.92° S	167.75° E	130–301	27/01/1977
NZOI P37	*Perissogorgia vitrea*	AUS	TMAG K4393	29.17° S	168.04° E	62	29/01/1977
NZOI P39	*Perissogorgia vitrea*	AUS	TMAG K4388	29.17° S	167.86° E	77	29/01/1977
NZOI P40	*Perissogorgia vitrea*	AUS	TMAG K4392	29.17° S	167.83° E	394–472	21/01/1977
NZOI P49	*Perissogorgia rigida*	AUS	TMAG K4384	28.72° S	167.89° E	110	30/01/1977
NZOI P5	*Perissogorgia vitrea*	INTW	NIWA 99717	32.61° S	167.51° E	126	25/01/1977
NZOI P5	*Plumarella* (*D.*) *cordilla*	INTW	NIWA 11057	32.61° S	167.51° E	126	25/01/1977
NZOI P5	*Plumarella* (*D.*) *cordilla*	INTW	NIWA 99997	32.61° S	167.51° E	126	25/01/1977
NZOI P6	*Plumarella* (*D.*) *cordilla*	INTW	NIWA 11069	32.61° S	167.51° E	127	25/01/1977
NZOI P7	*Fanellia korema*	INTW	NIWA 9877	32.68° S	167.48° E	150	25/01/1977
NZOI P7	*Fanellia korema*	INTW	NIWA 11251	32.68° S	167.48° E	150	25/01/1977
NZOI P7	*Metafannyella polita*	INTW	NIWA 99702	32.68° S	167.48° E	150	25/01/1977
NZOI P7	*Plumarella* (*D.*) *cordilla*	INTW	NIWA 11073	32.68° S	167.48° E	150	25/01/1977
NZOI Q45	*Primnoella insularis*	AUS	TMAG K4376	33.18° S	156.18° E	153	23/05/1978
NZOI S572	*Pachyprimnoa asakoae*	NZ	NIWA 11132	30.76° S	172.8° E	403–530	15/08/1983
NZOI S572	*Pachyprimnoa asakoae*	NZ	NIWA 99812	30.76° S	172.8° E	403–530	15/08/1983
SMT0001/15	*Callogorgia dichotoma*	NZ	NIWA 15493	36.17° S	176.74° E	933–940	17/06/2000
TAN0104/195	*Primnoella distans*	NZ	NIWA 9701	42.78° S	180° E	880–973	18/04/2001
TAN0205/11	*Primnoella distans*	NZ	NIWA 11243	34.03° S	179.61° E	2217	13/04/2002
TAN0205/12	*Primnoella distans*	NZ	NIWA 11237	34.09° S	179.56° E	1705–1930	13/04/2002
TAN0205/21	*Primnoella distans*	NZ	NIWA 47807	33.7° S	179.85° E	1330–1627	14/04/2002
TAN0205/82	*Primnoella distans*	NZ	NIWA 11239	32° S	179° W	1958–2312	25/04/2002
TAN0307/81	*Primnoa notialis*	INTW	NIWA 28421	49.8° S	175.31° W	881–1180	02/05/2003
TAN0308/29	*Perissogorgia colossus*	AUS	USNM 1287734	28.85° S	167.71° E	690–812	15/05/2003
TAN0308/46	*Narella mesolepis*	INTW	USNM 1287690	27.64° S	163.71° E	1635–1749	19/05/2003
TAN0308/132	*Metafannyella ventilabrum*	NZ	USNM 1287738	33.54° S	170.21° E	514–540	01/06/2003
TAN0308/132	*Callogorgia tessellata*	NZ	USNM 1287735	33.54° S	170.21° E	514–540	01/06/2003
TAN0308/133	*Narella studeri*	NZ	USNM 1287729	33.4° S	170.22° E	465–490	01/06/2003
TAN0308/136	*Metafannyella ventilabrum*	NZ	USNM 1287737	33.39° S	170.21° E	469–490	01/06/2003
TAN0308/136	*Callogorgia tessellata*	NZ	USNM 1287736	33.39° S	170.21° E	469–490	01/06/2003
TAN0413/174	*Fanellia tuberculata*	NZ	NIWA 15488	37.33° S	177.08° E	430–502	16/11/2004
TAN0413/175	*Fanellia tuberculata*	NZ	NIWA 16242	37.32° S	177.12° E	424–534	16/11/2004
TAN0413/24	*Candidella helminthophora*	NZ	NIWA 15487	36.96° S	177.37° E	120–1286	09/11/2004
TAN0413/26	*Candidella helminthophora*	NZ	NIWA 15618	36.94° S	177.39° E	1495–1608	09/11/2004
TAN0413/35	*Candidella helminthophora*	NZ	NIWA 15617	36.96° S	177.33° E	1396–1462	09/11/2004
TAN0413/63	*Candidella helminthophora*	NZ	NIWA 15638	37.22° S	177.23° E	693–698	11/11/2004
TAN0604/105	*Primnoella distans*	NZ	NIWA 25359	42.73° S	179.9° W	992–1120	04/06/2006
TAN0604/114	*Primnoella distans*	NZ	NIWA 25365	42.72° S	179.91° W	1060–1140	07/06/2006

Station	Species	EEZ	Catalogue number	Latitude	Longitude	Depth (m)	Date
TAN0604/133	*Parastenella pacifica*	NZ	NIWA 25375	41.8° S	179.49° W	1240–1275	09/06/2006
TAN0604/133	*Parastenella pacifica*	NZ	NIWA 25329	41.8° S	179.49° W	1240–1275	09/06/2006
TAN0604/31	*Primnoella distans*	NZ	NIWA 25347	42.79° S	180° E	1020–1054	30/05/2006
TAN0803/102	*Parastenella spinosa*	AUS	TMAG K4381	56.24° S	158.46° E	790–1025	16/04/2008
TAN0803/102	*Primnoa notialis*	AUS	TMAG K4387	56.24° S	158.46° E	790–1025	16/04/2008
TAN0803/77	*Parastenella spinosa*	AUS	TMAG K4379	53.74° S	159.11° E	925–1014	11/04/2008
TAN0803/82	*Parastenella spinosa*	AUS	TMAG K4380	53.73° S	159.16° E	1060–1187	12/04/2008
TAN0803/89	*Primnoa notialis*	AUS	TMAG K4378	55.38° S	158.43° E	504–637	15/04/2008
TAN0803/98	*Parastenella spinosa*	AUS	TMAG K4382	56.25° S	158.51° E	676–750	16/04/2008
TAN0803/98	*Primnoa notialis*	AUS	TMAG K4386	56.25° S	158.51° E	676–750	16/04/2008
TAN0905/103	*Plumarella delicatula*	NZ	NIWA 53764	44.16° S	174.56° W	520–650	26/06/2009
TAN0905/110	*Primnoella insularis*	NZ	NIWA 53941	44.13° S	174.57° W	650–800	27/06/2009
TAN0905/112	*Primnoella insularis*	NZ	NIWA 54015	44.14° S	174.72° W	760–821	27/06/2009
TAN0905/113	*Primnoella insularis*	NZ	NIWA 54069	44.15° S	174.76° W	519–609	27/06/2009
TAN0905/113	*Primnoella insularis*	NZ	NIWA 99701	44.15° S	174.76° W	519–609	27/06/2009
TAN0905/120	*Primnoella distans*	NZ	NIWA 54326	44.03° S	174.59° W	796–882	28/06/2009
TAN0905/121	*Primnoella insularis*	NZ	NIWA 54342	44.03° S	174.59° W	801–823	28/06/2009
TAN0905/46	*Primnoella distans*	NZ	NIWA 53267	42.67° S	179.96° W	1020–1120	18/06/2009
TAN0905/60	*Parastenella pacifica*	NZ	NIWA 49791	42.81° S	179.52° W	1251–1290	20/06/2009
TAN0905/60	*Primnoa notialis*	NZ	NIWA 53325	42.81° S	179.52° W	1251–1290	20/06/2009
TAN0905/95	*Primnoella insularis*	NZ	NIWA 53548	44.14° S	174.72° W	613–735	25/06/2009
TAN0905/99	*Primnoella insularis*	NZ	NIWA 53662	44.14° S	174.72° W	641–758	26/06/2009
TAN0906/109	*Plumarella* (*D.*) *cordilla*	NZ	NIWA 93648	34.72° S	173.56° E	17172	10/07/2009
TAN0906/126	*Perissogorgia vitrea*	NZ	NIWA 55942	34.56° S	173.16° E	105–106	12/07/2009
TAN0906/132	*Perissogorgia vitrea*	NZ	NIWA 56093	34.56° S	173.29° E	139–141	13/07/2009
TAN0906/159	*Perissogorgia vitrea*	NZ	NIWA 56602	34.39° S	173.04° E	59	14/07/2009
TAN0906/164	*Perissogorgia vitrea*	NZ	NIWA 56823,	34.4° S	173.14° E	145–149	14/07/2009
TAN0906/164	*Perissogorgia vitrea*	NZ	NIWA 56821	34.4° S	173.14° E	145–149	14/07/2009
TAN0906/170	*Perissogorgia vitrea*	NZ	NIWA 56911	34.38° S	173.03° E	64–65	15/07/2009
TAN0906/170	*Perissogorgia vitrea*	NZ	NIWA 56965	34.38° S	173.03° E	64–65	15/07/2009
TAN0906/178	*Perissogorgia vitrea*	NZ	NIWA 57074	34.41° S	173.16° E	169–203	15/07/2009
TAN0906/181	*Plumarella* (*D.*) *cordilla*	NZ	NIWA 57139	34.44° S	173.13° E	110–115	15/07/2009
TAN0906/2	*Perissogorgia vitrea*	NZ	NIWA 54386	35.55° S	174.56° E	60–61	4/07/2009
TAN0906/2	*Perissogorgia vitrea*	NZ	NIWA 54417	35.55° S	174.56° E	60–61	4/07/2009
TAN0906/205	*Perissogorgia vitrea*	NZ	NIWA 57198	34.85° S	173.61° E	100	17/07/2009
TAN0906/21	*Perissogorgia vitrea*	NZ	NIWA 54705	35.49° S	174.5° E	59–63	05/07/2009
TAN0906/21	*Plumarella* (*D.*) *cordilla*	NZ	NIWA 54691	35.49° S	174.5° E	59–63	05/07/2009
TAN0906/225	*Perissogorgia vitrea*	NZ	NIWA 57283	34.85° S	173.61° E	100–103	18/07/2009
TAN0906/235	*Perissogorgia vitrea*	NZ	NIWA 57403	34.88° S	173.92° E	114–117	19/07/2009
TAN0906/236	*Perissogorgia vitrea*	NZ	NIWA 57456	34.85° S	173.91° E	132–134	19/07/2009
TAN0906/24	*Plumarella* (*D.*) *cordilla*	NZ	NIWA 54745	35.51° S	174.64° E	105–107	05/07/2009
TAN0906/25	*Perissogorgia vitrea*	NZ	NIWA 54761	35.55° S	174.55° E	57	05/07/2009
TAN0906/25	*Perissogorgia vitrea*	NZ	NIWA 54762	35.55° S	174.55° E	57	05/07/2009
TAN0906/3	*Primnoella insularis*	NZ	NIWA 54538	35.5° S	174.54° E	64–66	04/07/2009
TAN0906/30	*Perissogorgia vitrea*	NZ	NIWA 54829	35.21° S	174.41° E	101–104	06/07/2009
TAN0906/30	*Perissogorgia vitrea*	NZ	NIWA 54861	35.21° S	174.41° E	101–104	06/07/2009
TAN0906/33	*Perissogorgia vitrea*	NZ	NIWA 54889	35.21° S	174.49° E	135–142	06/07/2009
TAN0906/36	*Perissogorgia vitrea*	NZ	NIWA 54933	35.24° S	174.48° E	128–133	06/07/2009
TAN0906/38	*Perissogorgia vitrea*	NZ	NIWA 54973	35.22° S	174.4° E	99–105	06/07/2009
TAN0906/57	*Perissogorgia vitrea*	NZ	NIWA 55162	35.15° S	174.15° E	55	07/07/2009

Station	Species	EEZ	Catalogue number	Latitude	Longitude	Depth (m)	Date
TAN0906/65	*Perissogorgia vitrea*	NZ	NIWA 55233	35° S	174.06° E	105–108	08/07/2009
TAN0906/68	*Perissogorgia vitrea*	NZ	NIWA 55323	35° S	174.06° E	108–110	08/07/2009
TAN0906/81	*Perissogorgia vitrea*	NZ	NIWA 55434	34.88° S	173.92° E	112–115	08/07/2009
TAN0906/81	*Plumarella* (*D.*) *cordilla*	NZ	NIWA 93678	34.88° S	173.92° E	112–115	08/07/2009
TAN0906/90	*Plumarella* (*D.*) *cordilla*	NZ	NIWA 55582	34.96° S	173.87° E	55–56	09/07/2009
TAN0906/96	*Perissogorgia vitrea*	NZ	NIWA 55657	34.91° S	173.83° E	52–54	09/07/2009
TAN1003/169	*Callogorgia gilberti*	NZ	NIWA 76705	40.63° S	177.07° E	875	07/04/2010
TAN1003/24	*Callozostron acanthodes*	NZ	NIWA 76759	40.09° S	178.19° E	744	22/03/2010
TAN1003/88	*Callogorgia gilberti*	NZ	NIWA 76752	41.24° S	176.46° E	1145	29/03/2010
TAN1007/103	*Candidella helminthophora*	NZ	NIWA 64754	35.36° S	178.51° E	1287–1378	06/06/2010
TAN1007/106	*Candidella helminthophora*	NZ	NIWA 64813	35.35° S	178.51° E	1382–1416	06/06/2010
TAN1007/118	*Candidella helminthophora*	NZ	NIWA 64962	35.36° S	178.53° E	1280–1380	08/06/2010
TAN1007/118	*Candidella helminthophora*	NZ	NIWA 77182	35.36° S	178.53° E	1280–1380	08/06/2010
TAN1007/12	*Candidella helminthophora*	NZ	NIWA 64357	34.62° S	178.39° E	1540–1700	24/05/2010
TAN1007/56	*Candidella helminthophora*	NZ	NIWA 64548	35.36° S	178.51° E	1267–1270	02/06/2010
TAN1104/10	*Plumarella* (*F.*) *delicatula*	NZ	NIWA 72100	36.48° S	177.86° E	1168–1198	03/03/2011
TAN1104/124	*Candidella helminthophora*	NZ	NIWA 72924	35.86° S	178.45° E	1237–1460	19/03/2011
TAN1104/17	*Paracalyptrophora mariae*	NZ	NIWA 72192	36.45° S	177.84° E	990–1105	04/03/2011
TAN1104/33	*Candidella helminthophora*	NZ	NIWA 72363	35.36° S	178.51° E	1290–1395	07/03/2011
TAN1104/40	*Loboprimnoa exotica*	NZ	NIWA 72423	35.36° S	178.52° E	1387–1420	08/03/2011
TAN1104/54	*Candidella helminthophora*	NZ	NIWA 72489	35.35° S	178.54° E	1379–1440	10/03/2011
TAN1104/58	*Candidella helminthophora*	NZ	NIWA 72533	35.36° S	178.51° E	1380–1416	11/03/2011
TAN1104/58	*Candidella helminthophora*	NZ	NIWA 72537	35.36° S	178.51° E	1380–1416	11/03/2011
TAN1104/59	*Candidella helminthophora*	NZ	NIWA 72568	35.36° S	178.51° E	1270–1410	11/03/2011
TAN1105/27	*Perissogorgia vitrea*	NZ	NIWA 73071	34.27° S	172.79° E	66–67	27/03/2011
TAN1105/60	*Perissogorgia vitrea*	NZ	NIWA 73373	34.43° S	172.35° E	83–86	30/03/2011
TAN1105/70	*Metafannyella ventilabrum*	NZ	NIWA 73567	34.13° S	172.2° E	125–129	30/03/2011
TAN1105/9	*Metafannyella ventilabrum*	NZ	NIWA 72981	34.27° S	173.02° E	168–174	26/03/2011
TAN1116/128	*Metafannyella chathamensis*	NZ	NIWA 79242	43.39° S	179° E	395–401	18/11/2011
TAN1116/62	*Metafannyella chathamensis*	NZ	NIWA 78547	44.08° S	178.23° E	949–951	10/11/2011
TAN1206/77	*Callozostron pinnatum*	NZ	NIWA 82682	36.81° S	177.47° E	878–911	22/04/2012
TAN1206/90	*Callozostron pinnatum*	NZ	NIWA 82842	36.79° S	177.45° E	1155–1160	23/04/2012
TAN1312/d38	*Perissogorgia colossus*	INTW	NIWA 91106	33.31° S	166.68° E	1020–1110	09/11/2013
TAN1402/134	*Parastenella pacifica*	INTW	NIWA 94495	40.64° S	165.55° W	1370–1448	26/02/2014
TAN1402/15	*Parastenella pacifica*	INTW	NIWA 94090	35.34° S	170.44° W	1075–1100	09/02/2014
TAN1402/15	*Parastenella pacifica*	INTW	NIWA 94096	35.34° S	170.44° W	1075–1100	09/02/2014
TAN1402/31	*Parastenella pacifica*	INTW	NIWA 94155	35.32° S	170.45° W	1205–1600	11/02/2014
TAN1402/57	*Parastenella pacifica*	INTW	NIWA 94231	36.91° S	169.85° W	1010–1013	15/02/2014
TAN1402/59	*Parastenella pacifica*	INTW	NIWA 94266	36.92° S	169.84° W	1147–1400	15/02/2014
TAN1402/66	*Parastenella pacifica*	INTW	NIWA 94299	37.71° S	169.02° W	1244–1370	16/02/2014
TAN1402/91	*Parastenella pacifica*	INTW	NIWA 94342	39.16° S	167.35° W	910–934	20/02/2014
TAN1402/97	*Parastenella pacifica*	INTW	NIWA 94401	39.2° S	167.59° W	1082–1090	21/02/2014
TRIP2320/48	*Primnoa notialis*	NZ	NIWA 42629	46.0° S	171.4° E	1223–1250	25/10/2006
TRIP2361/109	*Primnoa notialis*	NZ	NIWA 49226	44.5° S	174.8° W	1293–1463	05/02/2007
TRIP2416/54	*Parastenella spinosa*	NZ	NIWA 67867	47.5° S	177.0° E	720–741	28/04/2007
TRIP2416/54	*Primnoa notialis*	NZ	NIWA 44168	47.5° S	177.0° E	720–741	28/04/2007
TRIP2468/11	*Primnoa notialis*	NZ	NIWA 42519	47.3° S	178.8° E	753–860	20/07/2007
TRIP2468/43	*Primnoa notialis*	NZ	NIWA 45896	47.2° S	177.6° E	1064–1165	28/07/2007
TRIP2494/14	*Parastenella spinosa*	NZ	NIWA 46372	47.6° S	177.8° E	867–915	02/09/2007
TRIP2494/14	*Primnoa notialis*	NZ	NIWA 46484	47.6° S	177.8° E	867–915	02/09/2007

Station	Species	EEZ	Catalogue number	Latitude	Longitude	Depth (m)	Date
TRIP2494/19	*Primnoa notialis*	NZ	NIWA 42630	47.5° S	177.0° E	745–790	03/09/2007
TRIP2506/105	*Primnoa notialis*	NZ	NIWA 44613	47.2° S	172.4° E	1110–1122	13/10/2007
TRIP2506/108	*Primnoa notialis*	NZ	NIWA 44611	48.3° S	174.8° E	985–1143	14/10/2007
TRIP2506/142	*Primnoa notialis*	NZ	NIWA 44615	47.4° S	178.3° E	860–913	19/10/2007
TRIP2506/45	*Primnoa notialis*	NZ	NIWA 44612	47.3° S	172.4° E	1110–1270	03/10/2007
TRIP2506/81	*Primnoa notialis*	NZ	NIWA 44620	46.9° S	171.9° E	1106–1357	09/10/2007
TRIP2520/160	*Primnoa notialis*	NZ	NIWA 44610	44.1° S	174.5° W	770–1000	29/11/2007
TRIP2551/162	*Primnoa notialis*	NZ	NIWA 42525	44.2° S	174.6° W	601–1824	28/12/2007
TRIP2551/49	*Primnoa notialis*	NZ	NIWA 49229	44.5° S	174.8° W	1289–1297	14/12/2007
TRIP2551/50	*Primnoa notialis*	NZ	NIWA 42626	44.5° S	174.8° W	1203–1288	14/12/2007
TRIP2551/55	*Primnoa notialis*	NZ	NIWA 49230	44.5° S	174.8° W	1283–1393	15/12/2007
TRIP2551/59	*Primnoa notialis*	NZ	NIWA 42615	44.5° S	174.8° W	1304–1457	15/12/2007
TRIP2571/146	*Metafannyella eos*	NZ	NIWA 42622	50.0° S	163.8° E	890–1027	18/03/2008
TRIP2571/190	*Metafannyella eos*	NZ	NIWA 42561	49.9° S	163.8° E	780–927	25/03/2008
TRIP2571/190	*Primnoa notialis*	NZ	NIWA 42634	49.9° S	163.8° E	780–927	25/03/2008
TRIP2571/193	*Primnoa notialis*	NZ	NIWA 42618	50.1° S	165.9° E	1004–1192	25/03/2008
TRIP2571/220	*Primnoa notialis*	NZ	NIWA 42636	49.9° S	175.3° E	781–859	30/03/2008
TRIP2608/18	*Primnoa notialis*	NZ	NIWA 42628	44.5° S	174.8° W	1300–1460	16/04/2008
TRIP2614/98	*Primnoa notialis*	NZ	NIWA 42632	49.9° S	175.3° E	800–820	25/04/2008
TRIP2614/98	*Primnoa notialis*	NZ	NIWA 42633	49.9° S	175.3° E	800–820	25/04/2008
TRIP2617/120	*Primnoa notialis*	NZ	NIWA 42613	44.5° S	175.8° E	600	16/05/2008
TRIP2635/144	*Primnoa notialis*	NZ	NIWA 42531	47.4° S	178.2° E	887–905	02/07/2008
TRIP2653/71	*Primnoa notialis*	NZ	NIWA 42487	47.3° S	178.2° E	889–1019	22/07/2008
TRIP2714/157	*Primnoa notialis*	NZ	NIWA 47774	44.5° S	178.6° W	702–904	26/11/2008
TRIP2714/80	*Primnoa notialis*	NZ	NIWA 42548	44.5° S	178.6° W	785–880	12/11/2008
TRIP2714/80	*Primnoa notialis*	NZ	NIWA 49227	44.5° S	178.6° W	785–880	12/11/2008
TRIP2718/108	*Primnoa notialis*	NZ	NIWA 66497	47.6° S	177.9° E	848–918	24/11/2008
TRIP2718/109	*Parastenella spinosa*	NZ	NIWA 66143	47.6° S	177.9° E	855–987	24/11/2008
TRIP2718/115	*Parastenella spinosa*	NZ	NIWA 66104	47.6° S	177.9° E	858–957	24/11/2008
TRIP2718/126	*Primnoa notialis*	NZ	NIWA 66128	47.4° S	178.1° E	904–910	25/11/2008
TRIP2718/141	*Primnoa notialis*	NZ	NIWA 66127	47.3° S	177.6° E	829–1038	28/11/2008
TRIP2718/255	*Primnoa notialis*	NZ	NIWA 66126	47.6° S	177.9° E	595–874	12/12/2008
TRIP2718/299	*Primnoa notialis*	NZ	NIWA 66125	47.2° S	172.4° E	780–1237	19/12/2008
TRIP2807/241	*Primnoa notialis*	NZ	NIWA 65545	44.5° S	174.8° W	1270	09/03/2009
TRIP2807/243	*Primnoa notialis*	NZ	NIWA 65537	44.2° S	174.6° W	620–1052	10/03/2009
TRIP2807/252	*Primnoa notialis*	NZ	NIWA 65543	44.5° S	174.8° W	1308	11/03/2009
TRIP2807/253	*Primnoa notialis*	NZ	NIWA 65538	44.5° S	174.8° W	1310–1447	11/03/2009
TRIP2894/80	*Paracalyptrophora hawaiinensis*	INTW	NIWA 66298	35.3° S	165.2° E	915–921	12/07/2009
TRIP2894/93	*Callogorgia gilberti*	INTW	NIWA 65520	35.9° S	165.6° E	766–1025	15/07/2009
TRIP2914/16	*Paracalyptrophora hawaiinensis*	INTW	NIWA 66300	35.4° S	165.3° E	904	15/07/2009
TRIP2914/40	*Paracalyptrophora hawaiinensis*	INTW	NIWA 66299	35.4° S	165.3° E	920–928	22/07/2009
TRIP2920/44	*Primnoa notialis*	NZ	NIWA 65524	47.3° S	178.8° E	770–870	21/09/2009
TRIP2920/47	*Primnoa notialis*	NZ	NIWA 65522	47.3° S	178.7° E	86–980	21/09/2009
TRIP2920/66	*Primnoa notialis*	NZ	NIWA 65554	48.8° S	175.4° E	685–746	24/09/2009
TRIP2921/24	*Primnoa notialis*	NZ	NIWA 65521	47.9° S	178.4° E	505	07/08/2009
TRIP2938/6	*Parastenella spinosa*	INTW	NIWA 65552	53.5° S	140.0° E	998–1274	25/09/2009
TRIP2955/111	*Primnoa notialis*	NZ	NIWA 65553	44.5° S	178.6° W	730–936	19/10/2009
TRIP2955/111	*Primnoa notialis*	NZ	NIWA 66308	44.5° S	178.6° W	730–936	19/10/2009
TRIP3004/33	*Metafannyella chathamensis*	NZ	NIWA 66289	44.5° S	178.6° W	710	24/11/2009
TRIP3004/33	*Primnoa notialis*	NZ	NIWA 65526	44.5° S	178.6° W	710	24/11/2009

Station	Species	EEZ	Catalogue number	Latitude	Longitude	Depth (m)	Date
TRIP3004/43	*Metafannyella chathamensis*	NZ	NIWA 66287	44.7° S	177.0° W	947–1067	25/11/2009
TRIP3028/127	*Primnoa notialis*	NZ	NIWA 65529	44.5° S	178.7° W	690–925	09/01/2010
TRIP3028/131	*Primnoa notialis*	NZ	NIWA 65530	44.5° S	178.6° W	944	10/01/2010
TRIP3028/136	*Primnoa notialis*	NZ	NIWA 65528	44.5° S	178.6° W	735	10/01/2010
TRIP3028/236	*Primnoa notialis*	NZ	NIWA 65525	44.5° S	179.3° W	963–1100	21/01/2010
TRIP3065/211	*Primnoa notialis*	NZ	NIWA 61935	44.5° S	178.7° W	661–904	08/03/2010
TRIP3065/214	*Primnoa notialis*	NZ	NIWA 61920	45.0° S	175.5 ° E	1070–1100	09/03/2010
TRIP3077/127	*Primnoa notialis*	NZ	NIWA 61980	48.8° S	175.4° E	767–769	31/03/2010
TRIP3077/188	*Parastenella spinosa*	NZ	NIWA 61969	47.5° S	177.8° E	862–992	08/04/2010
TRIP3112/23	*Primnoa notialis*	NZ	NIWA 66500	48.6° S	175.4° E	865–867	20/04/2010
TRIP3219/45	*Metafannyella chathamensis*	NZ	NIWA 69513	37.4° S	176.4° E	370	02/11/2010
TRIP3223/27	*Primnoa notialis*	NZ	NIWA 65992	45.0° S	175.5° E	974–1160	07/11/2010
TRIP3239/10	*Paracalyptrophora mariae*	INTW	NIWA 65987	37.8° S	168.1° E	629–687	26/11/2010
TRIP3406/61	*Primnoa notialis*	NZ	NIWA 75813	47.5° S	177.8° E	878–976	15/11/2011
TRIP3933/21	*Pachyprimnoa asakoae*	INTW	NIWA 88630	33.4° S	167.6° E	312–383	11/11/2013
Three Kings Is.	*Metafannyella ventilabrum*	NZ	ZMB 1760	34.17° S	172.6° E	165	1877
Macquarie Island	*Plumarella* (*F.*) *delicatula*	AUS	AM G13266	54.6° S	158.8° E	2743	19/11/1914
NZOI U572	*Primnoella distans*	NZ	NIWA 97491	33.61° S	170.03° E	1679	03/02/1988
NZOI X121	*Callogorgia tessellata*	NZ	NIWA 99708	37.41° S	177.2° E	340	23/11/1989
NZOI X121	*Callogorgia tessellata*	NZ	NIWA 11087	37.41° S	177.2° E	340	23/11/1989
NZOI X121	*Fanellia histoclados*	NZ	NIWA 99712	37.41° S	177.2° E	340	23/11/1989
NZOI X665	*Candidella helminthophora*	NZ	NIWA 11071	35.34° S	178.54° E	1260–1312	12/02/1996
NZOI X665	*Candidella helminthophora*	NZ	NIWA 12468	35.34° S	178.54° E	1260–1312	12/02/1996
NZOI X665	*Candidella helminthophora*	NZ	NIWA 13234	35.34° S	178.54° E	1260–1312	12/02/1996
Z10061	*Candidella helminthophora*	NZ	NIWA 11127	37.05° S	176.5° E	949	27/03/2000
Z10160	*Perissogorgia vitrea*	NZ	NIWA 11066	35.68° S	174.63° E	80	13/12/1999
Z10169	*Callozostron acanthodes*	NZ	NIWA 14432	39.49° S	178.42° E	1000	03/06/1999
Z10173	*Primnoa notialis*	NZ	NIWA 27989	49.77° S	176.68° W	1000–1089	23/05/2000
Z10759	*Primnoa notialis*	NZ	NIWA 11292	44.68° S	175.82° E	621	16/12/2000
Z10800	*Candidella helminthophora*	NZ	NIWA 11194	35.73° S	178.52° E	1200	23/05/2001
Z10897	*Callogorgia gilberti*	NZ	NIWA 27983	36.51° S	176.52° E	908	17/06/2000
Z10900	*Callogorgia gilberti*	NZ	NIWA 11086	36.51° S	176.52° E	908	17/06/2000
Z10922	*Primnoa notialis*	NZ	NIWA 91205	51.48° S	174.06° E	671	25/11/2001
Z10988	*Callogorgia formosa*	INTW	NIWA 11144	33.77° S	167.22° E	313	25/01/2002
Z10989	*Perissogorgia colossus*	INTW	NIWA 11225	33.89° S	167.94° E	1082	22/01/2002
Z11062	*Candidella helminthophora*	NZ	NIWA 19329	34.16° S	173.96° E	800	18/04/2002
Z11100	*Primnoa notialis*	NZ	NIWA 11289	46.15° S	171.4° E	1041–1103	09/05/2002
Z9043	*Fanellia tuberculata*	NZ	NIWA 11249	32.18° S	179.08° W	224	05/04/1998
Z9044	*Fanellia histoclados*	NZ	NIWA 11250	32.2° S	179.09° W	122–307	16/09/1998
Z9044	*Fanellia tuberculata*	NZ	NIWA 11089	32.2° S	179.09° W	122–307	16/09/1998
Z9225	*Candidella helminthophora*	NZ	NIWA 11118	37.12° S	177.28° E	690–800	15/08/1998
Z9227	*Candidella helminthophora*	NZ	NIWA 11122	37.12° S	177.29° E	617–654	16/08/1998
Z9230	*Candidella helminthophora*	NZ	NIWA 91270	36.88° S	177.37° E	787	15/08/1998
Z9352	*Primnoa notialis*	NZ	NIWA 11295	50.07° S	165.88° E	993	20/09/1998
Z9498	*Perissogorgia vitrea*	NZ	NIWA 9865	34.98° S	172.53° E	164–168	17/01/1996
Z9585	*Primnoa notialis*	NZ	NIWA 11296	48.56° S	164.96° E	1061	29/11/1998
Z9585	*Primnoa notialis*	NZ	NIWA 11299	48.56° S	164.96° E	1061	29/11/1998
Z9585	*Primnoa notialis*	NZ	NIWA 41743	48.56° S	164.96° E	1061	29/11/1998
Z9585	*Primnoa notialis*	NZ	NIWA 91268	48.56° S	164.96° E	1061	29/11/1998
Z9586	*Primnoa notialis*	NZ	NIWA 41744	48.55° S	164.95° E	1067	13/12/1998

Station	Species	EEZ	Catalogue number	Latitude	Longitude	Depth (m)	Date
Z9590	*Primnoa notialis*	NZ	NIWA 11294	49.12° S	164.3° E	948	01/12/1998
Z9592	*Primnoa notialis*	NZ	NIWA 11291	48.55° S	164.95° E	940–1180	30/11/1998
Z9592	*Primnoa notialis*	NZ	NIWA 27986	48.55° S	164.95° E	940–1180	30/11/1998
Z9601	*Primnoa notialis*	NZ	NIWA 11293	48° S	166.08° E	940	27/11/1998
Z9601	*Primnoa notialis*	NZ	NIWA 91299	48° S	166.08° E	940	27/11/1998
Z9605	*Primnoa notialis*	NZ	NIWA 27985	48.55° S	164.9° E	1046	29/11/1998
Z9681	*Perissogorgia vitrea*	NZ	NIWA 9870	34.32° S	172.82° E	63	26/01/1999
Z9681	*Perissogorgia vitrea*	NZ	NIWA 11279	34.32° S	172.82° E	63	26/01/1999
Z9713	*Perissogorgia vitrea*	NZ	NIWA 9868	34.38° S	172.93° E	65	29/01/1999
Z9741	*Metafannyella ventilabrum*	NZ	NIWA 11253	34.17° S	172.21° E	200	16/04/1999
Z9742	*Metafannyella ventilabrum*	NZ	NIWA 9883	34.41° S	173.13° E	133	19/04/1999
Z9744	*Perissogorgia vitrea*	NZ	NIWA 9863	34.36° S	172.97° E	100	18/04/1999
Z9752	*Metafannyella ventilabrum*	NZ	NIWA 11252	34.17° S	172.2° E	190	02/04/1999
Z9752	*Metafannyella ventilabrum*	NZ	NIWA 11276	34.17° S	172.2° E	190	02/04/1999
Z9775	*Primnoa notialis*	NZ	NIWA 69883	54.06° S	171.66° E	1315	14/05/1999
Z9865	*Primnoa notialis*	NZ	NIWA 11301	44.69° S	175.81° W	844	19/10/1999
Z9865	*Primnoa notialis*	NZ	NIWA 27987	44.69° S	175.81° W	844	19/10/1999
Z9877	*Metafannyella ventilabrum*	NZ	NIWA 11259	35.08° S	172.68° E	161	30/10/1999
Z9883	*Metafannyella ventilabrum*	NZ	NIWA 11260	34.6° S	172.74° E	39	31/10/1999
Z9890	*Metafannyella polita*	NZ	NIWA 99703	35.01° S	172.53° E	167	30/10/1999
Z9890	*Perissogorgia vitrea*	NZ	NIWA 77615	35.01° S	172.53° E	167	30/10/1999

Taxonomic index

Principal taxonomic account is in bold font; species illustrations in bold italic.

NIWA Biodiversity Memoir 129
ISSN 1174-0043; 129 (print)
ISSN 2463-638X; 129 (online)
Soft cover ISBN 978-0-473-36056-6
Hard cover ISBN 978-0-473-36057-3
Electronic ISBN 978-0-473-36058-0