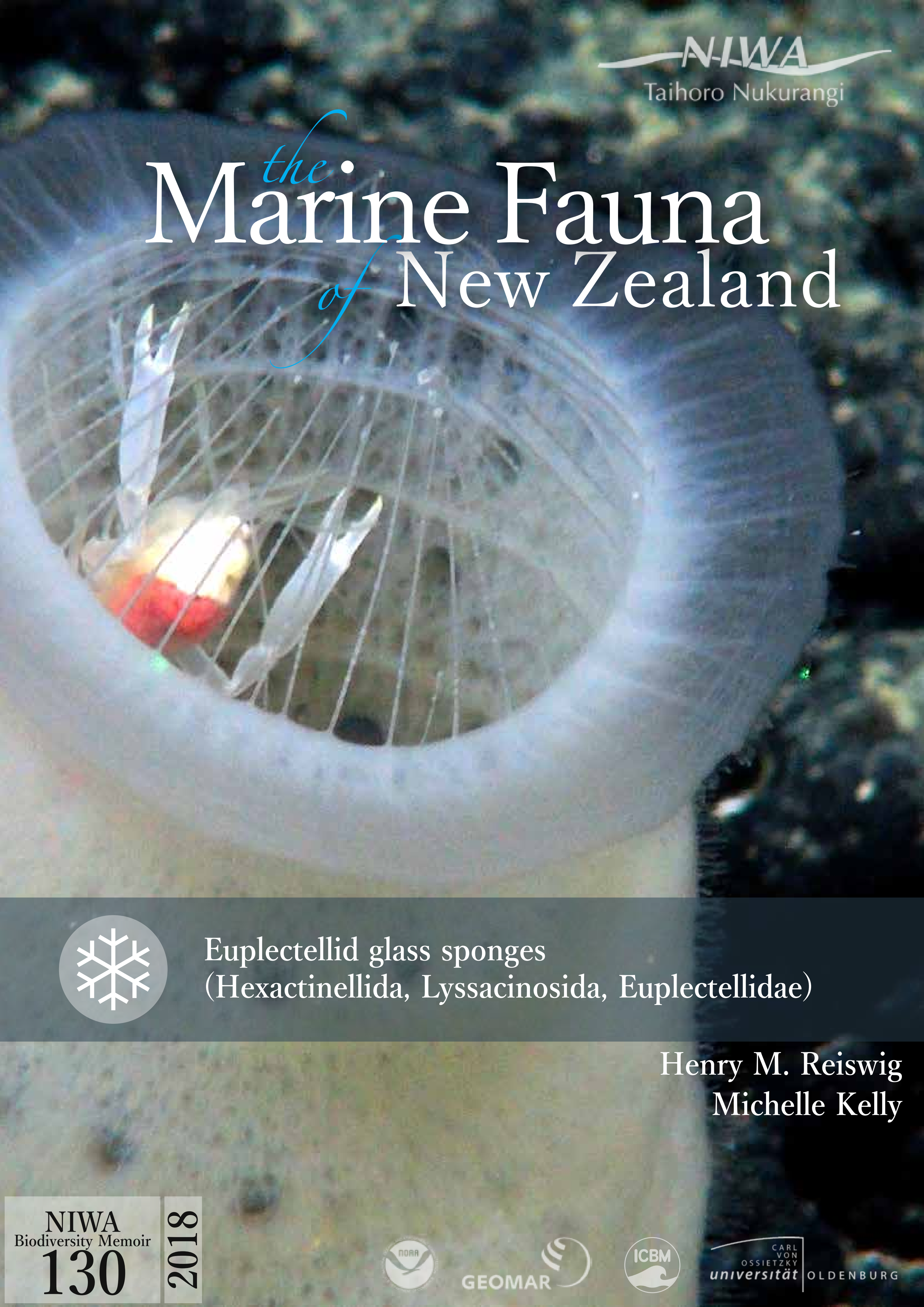

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Euplectellid glass sponges (Hexactinellida, Lyssacinosida, Euplectellidae)

Henry M. Reiswig
Michelle Kelly

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Biodiversity Memoir
130
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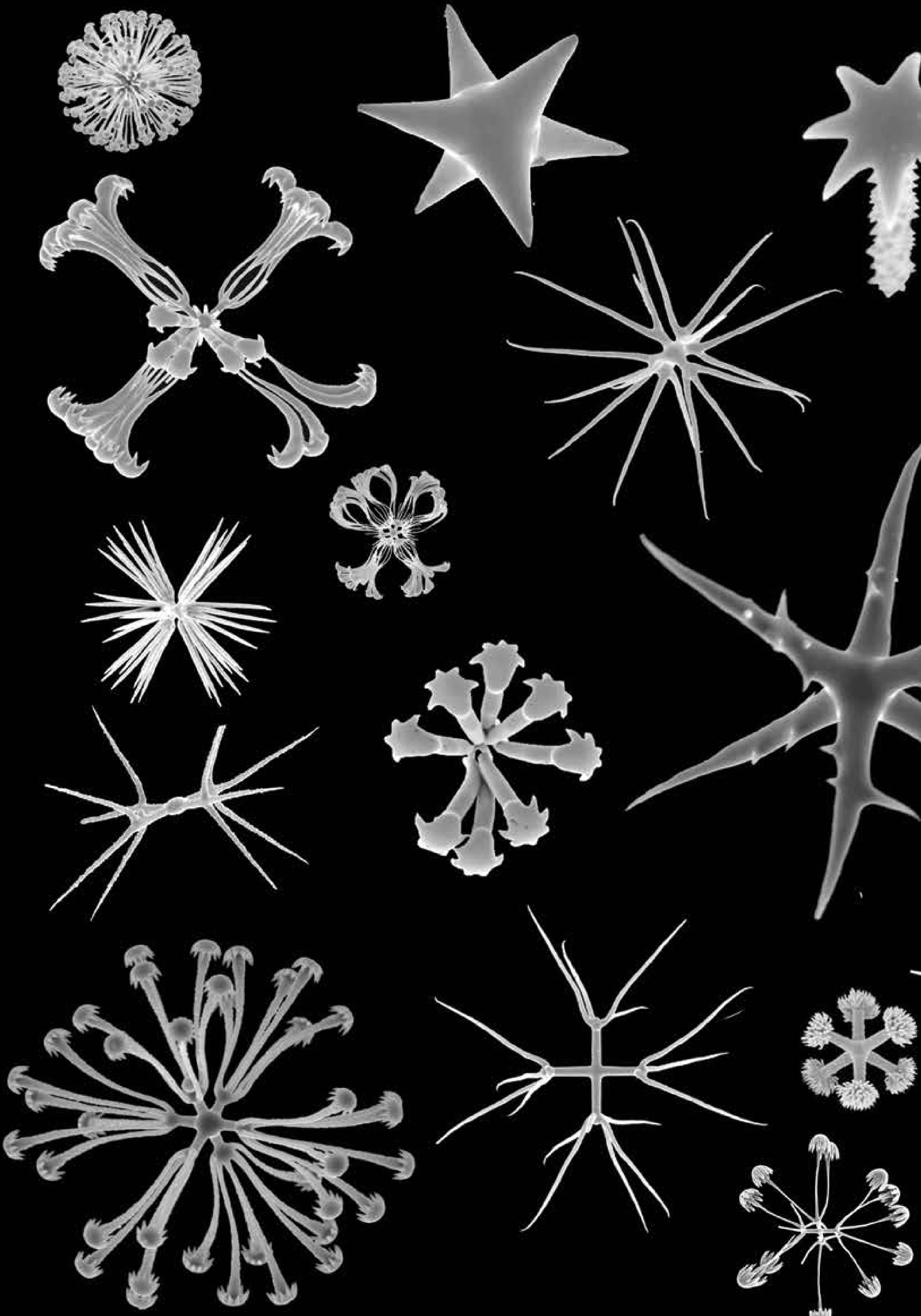

The Marine Fauna of New Zealand

Euplectellid glass sponges

Cover image

Close-up of the apex of new species, *Regadrella hispida* **sp. nov.** with a delicate corona of marginal spicules projecting in a thin frilly cuff on the upper body wall, eyelash-like hexactine parietal prostalia projecting from the rim, and hispid body wall. A venus shrimp, *Spongicoloides* sp., one of a pair that live commensally in each sponge, is visible just inside the cavity. NIWA 126123 was collected and photographed onboard ROV *Kiel 6000*, during the GEOMAR RV *Sonne* expedition SO254, on the southern Kermadec Ridge (RV *Sonne* Stn SO254/33ROV08_BIOBOX23, 35.380° S, 178.980° E, 1184 m). Copyright: ROV *Kiel 6000* Team/ GEOMAR, Helmholtz Centre for Ocean Research Kiel, Germany.

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Cataloguing in Publication

REISWIG, H.M.; KELLY, M.
The Marine Fauna of New Zealand. Euplectellid glass sponges (Hexactinellida, Lyssacinosida, Euplectellidae) / by Henry M. Reiswig & Michelle Kelly—Wellington: NIWA (National Institute of Water and Atmospheric Research), 2018 (NIWA Biodiversity Memoir, ISSN 1174-0043; 130)

Soft cover	ISBN 978-0-473-39713-5
Hard cover	ISBN 978-0-473-39714-2
Electronic	ISBN 978-0-473-39715-9

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 and initial layout by TCMedia Ltd
Printed and bound by Graphic Press & Packaging Ltd, Levin

Accepted for publication by Sadie Mills, 21 March 2018, published 1 July 2018

Special thanks to our international contributors

ISSN 1174-0043; 130 (print edition)

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PREFACE

TAXONOMY & SYSTEMATICS

Twin, basally conjoined *Regadrella okinoseana* Ijima, 1896, are very uncommon; they usually occur as single tubes. The image shows the truncate tops covered by rounded sieve-plates and body walls that bears pits, each of which has a parietal osculum in the central depression. The image was captured by DTIS (Deep Towed Imaging System) onboard RV *Tangaroa* (NIWA Stn TAN1402/147, Valerie Seamount, Louisville Seamount Chain (International waters), 41.370° S, 164.424° E, 1312–1544 m), courtesy of the NIWA South Pacific Vulnerable Marine Ecosystems Project.

PREFACE

The Marine Fauna of New Zealand. Euplectellid glass sponges (Hexactinellida, Lyssacinosida, Euplectellidae)

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Abstract

Family Euplectellidae Gray, 1867 (Hexactinellida, Lyssacinosida) of the New Zealand Exclusive Economic Zone (EEZ) is reviewed, inventoried from existing and new collections, and revised where necessary. Collections within the NIWA Invertebrate Collection (NIC), the Museum of New Zealand Te Papa Tongarewa (NMNZ), and specimens from the NORFANZ mid-Tasman Sea survey, housed at the Queensland Museum (QM), have yielded well over 250 catalogued specimens, some of which are from the Australian EEZ and International waters.

Prior to this work, our knowledge of euplectellid glass sponges in New Zealand waters was limited to three species, *Regadrella okinoseana* Ijima, 1896, *Walteria leuckarti* Ijima, 1896 and *W. flemmingi* Schulze, 1885, and eight undescribed species listed in Kelly *et al.* (2009). In 2017, a new species of *Atlantisella*, *A. lorraineae* Reiswig & Kelly, 2017, was described from Tangaroa Seamount on the Kermadec Ridge. This list of four known species has now been expanded to a total of 26 species, including an additional four species known from other locations and 18 new species. These 26 species represent each of the three subfamilies, Euplectellinae Gray, 1867, Corbitellinae Gray, 1872, and Bolosominae Tabachnick, 2002, and span 14 genera, three of which are new to science (*Plumicoma* **gen. nov.**, *Amphoreus* **gen. nov.**, *Trychella* **gen. nov.**).

Four additional species, previously unknown in the New Zealand region, are redescribed: *Euplectella imperialis* Ijima, 1894; *E. plumosum* Tabachnick & Lévi, 2004; *Bolosoma charcoti* Tabachnick & Lévi, 2004; *B. biocalum* Tabachnick & Lévi, 2004. Three species from the Norfolk Ridge south of New Caledonia have been included as they are considered highly likely to be present in the New Zealand region, but have, thus far, not been collected: *Placopegma plumicomum* Tabachnick & Lévi, 2004; *Bolosoma meridionale* Tabachnick & Lévi, 2004, and *Hyalostylus monomicrosclerus* Tabachnick & Lévi, 2004.

Numerous records from the Australian EEZ occur in this work: *Euplectella imperialis* from Lord Howe Plateau and the Great Australian Bight and *Walteria flemmingi* from the latter locality; *E. plumosum* from Lord Howe Rise and *Regadrella okinoseana* from Lord Howe Rise, Norfolk Basin and Seamount 7, South Macquarie Ridge. New species, *Regadrella australis* **sp. nov.**, is described from the Australian EEZ surrounding Macquarie Island, and other locations in the New Zealand EEZ. Records from International waters surrounding New Zealand include *Euplectella imperialis* from Lord Howe Plateau and *R. okinoseana* from Wanganella Bank and Louisville Seamount Chain.

Non-technical summary

Glass sponges in the Family Euplectellidae (basket glass sponges) found in the New Zealand Exclusive Economic Zone (EEZ) are reviewed and revised by studying existing and new collections within the NIWA Invertebrate Collection (NIC), Museum of New Zealand Te Papa Tongarewa (NMNZ) and specimens from the NORFANZ mid-Tasman Sea survey, housed at the Queensland Museum in Brisbane. Studying these collections has yielded well over 250 catalogued specimens, some of which are from the Australian EEZ and International waters.

Prior to this work, we only knew of three basket glass sponges in New Zealand waters: *Regadrella okinoseana*, *Walteria leuckarti* and *W. flemmingi*. In 2017, a new species, *Atlantisella lorraineae*, was described from Tangaroa Seamount on the Kermadec Ridge. This list of four known species has now been expanded to a total of 26 species, including an additional four species known from other locations and 18 new species. These 26 species are representative of the entire family Euplectellidae and span 14 genera, three of which are new to science (*Plumicoma*, *Amphoreus*, *Trychella*).

Four species previously unknown in the New Zealand region are redescribed: *Euplectella imperialis*; *E. plumosum*; *Bolosoma charcoti* and *B. biocalum*. Three species from the New Caledonia EEZ have been included as they are considered highly likely to be present in the New Zealand region, but have, thus far, not been collected: *Placopegma plumicomum*; *Bolosoma meridionale*; *Hyalostylus monomicrosclerus*.

Records from the Australian EEZ are included in this work: *Euplectella imperialis*, *E. plumosum*, *Regadrella okinoseana* and *Walteria flemmingi* are recorded from Lord Howe Plateau, Lord Howe Rise and Norfolk Basin in the north, Great Australian Bight, South Australia, and South Macquarie Ridge to the south of New Zealand. The type locality of the new species *Regadrella australis* **sp. nov**. is Macquarie Ridge, in the Australian EEZ surrounding Macquarie Island; it is also recorded from the surrounding New Zealand EEZ. Records from International waters surrounding New Zealand include *Euplectella imperialis* from Lord Howe Plateau and *R. okinoseana* from Wanganella Bank and Louisville Seamount Chain.

Keywords

Porifera, Hexactinellida, Lyssacinosida, Euplectellidae, Euplectellinae, Bolosominae, Corbitellinae, *Amphidiscella*, *Amphoreus* **gen. nov.**, *Atlantisella*, *Bolosoma*, *Corbitella*, *Dictyaulus*, *Euplectella*, *Holascus*, *Hyalostylus*, *Malacosaccus*, *Regadrella*, *Saccocalyx*, *Trychella* **gen. nov.**, *Walteria*, *Placopegma*, *Plumicoma* **gen. nov.**, systematics, glass sponge, taxonomy, new species, Great Australian Bight, Lord Howe Plateau, Lord Howe Rise, Louisville Seamount Chain, Norfolk Basin, Norfolk Ridge, South Macquarie Ridge, South Tasman Rise, Wanganella Bank, New Zealand EEZ, Australian EEZ, International waters

Introduction

Prior to this work, our knowledge of the glass sponge family Euplectellidae Gray, 1867, in New Zealand waters, was limited to three certain species, *Regadrella okinoseana* Ijima, 1896, *Walteria flemmingi* Schulze, 1885 and *W. leuckarti* Ijima, 1896, the former two species listed in Dawson (1993), a literature review of the sponge fauna of New Zealand. In a more recent inventory of New Zealand biodiversity, Kelly *et al.* (2009) listed the former three species as well as *Malacosaccus erectus* Lévi, 1964, from the Tasman Sea, which was also listed by Dawson (1993). This species has not been recovered in any of the collections examined here, but a new species of *Malacosaccus* is described: *M. microglobus* **sp. nov.** (=*Malacosaccus* sp. Reiswig MS in Kelly *et al.* 2009).

Kelly *et al.* (2009) listed a further three known species: *Holascus* cf. *obesus* Schulze, 1904, *Trachycaulus* cf. *gurlitti* Schulze, 1886, and *Symplectella rowi* Dendy, 1924. *Holascus* cf. *obesus*, first described from the Weddell Sea, Antarctica, and *Trachycaulus* cf. *gurlitti*, known only from the mid-South Pacific Ocean, were both attributed to the New Zealand region by HMR, in his first, unpublished, preliminary, survey of the New Zealand fauna in 1998. Neither of these species were recovered in this work, but two new species of *Holascus* are described here: *H. tasmanensis* **sp. nov.** and *H. pannosus* **sp. nov.** *Symplectella rowi* Dendy, 1924, is now considered to be within the lyssacinosidan family Rossellidae (Dohrmann 2016).

Kelly *et al.* (2009) also listed six manuscript names: *Euplectella* sp. Reiswig MS (=*Euplectella semisimplex* **sp. nov.**); *Malacosaccus* sp. Reiswig MS (=*M. microglobus* **sp. nov.**); *Regadrella* sp. 2 Reiswig MS (= *R. australis* **sp. nov.**), *Regadrella* sp. 3 Reiswig MS (= *R. hispida* **sp. nov.**), *Regadrella* sp. 4 Reiswig MS (= *R. pedunculata* **sp. nov.**); Gen. nov. et n. sp. Reiswig MS (=*Plumicoma solida* **gen. et sp. nov.**). In 2017, a new species of *Atlantisella*, *A. lorraineae* Reiswig & Kelly, was described from Tangaroa Seamount on the Kermadec Ridge, only the second species of the genus, previously known only from the type species, *A. incognita* Tabachnick, 2002, from the North Central Atlantic.

The historical list of three known species has now been expanded to 26 species in total for the Euplectellidae, 18 of which are new to science. These represent 14 genera, three of which are also new to science (*Plumicoma* **gen. nov.**, *Amphoreus* **gen. nov.**, *Trychella* **gen. nov.**). The three species, previously known from New Zealand waters, are well represented in the newly surveyed material.

With the exception of the known New Zealand endemic *Atlantisella lorraineae*, four additional species were previously unknown in the New Zealand region: *Euplectella imperialis* Ijima, 1894 (Type locality: Sagami Bay, Japan); *E. plumosum* Tabachnick & Lévi, 2004 (Type locality: Loyalty Basin and Norfolk Ridge, New Caledonia); *Bolosoma charcoti* Tabachnick & Lévi, 2004 (Type Locality: Norfolk Ridge south of New Caledonia); *B. biocalum* Tabachnick & Lévi, 2004 (Type Locality: Norfolk Ridge south of New Caledonia). These are reported and described, extending their distribution ranges.

Descriptions of three other species in three genera, from the Norfolk Ridge south of New Caledonia, have been included as they are considered highly likely to be present in the New Zealand region, but have, thus far, not been collected: *Placopegma plumicomum* Tabachnick & Lévi, 2004; *Bolosoma meridionale* Tabachnick & Lévi, 2004, and *Hyalostylus monomicrosclerus* Tabachnick & Lévi, 2004.

Numerous records from the Australian EEZ occur in this work: *Euplectella imperialis* was recorded from Lord Howe Plateau and the Great Australian Bight; *Walteria flemmingi* also from the latter locality; *E. plumosum* was recorded from Lord Howe Rise and *Regadrella okinoseana* from Lord Howe Rise, Norfolk Basin and Seamount 7, South Macquarie Ridge. The type locality of *R. australis* **sp. nov.** is within the Australian EEZ surrounding Macquarie Island, on Macquarie Ridge, and has been included here as the species is also found in the New Zealand EEZ. This work also includes several species records from International waters surrounding New Zealand: *Euplectella imperialis* was recorded from Lord Howe Plateau, and *R. okinoseana* was recorded from Wanganella Bank off Northland's west coast and the Louisville Seamount Chain.

A considerable amount of indeterminate material was recorded from the South Tasman Rise, Macquarie Ridge and the Southern Ocean. These washed-out specimens, whose skeletons are incompatible with any known species in New Zealand waters, indicate that there are a few species yet to be collected in condition needed for full species level determination and description.

The New Zealand Euplectellidae is described and reviewed here in the light of recent work in other locations (Tabachnick & Lévi 2004; Reiswig 2014; Reiswig & Kelly 2017) and new molecular systematics arrangements for the group (Dohrmann *et al.* 2017).

Methods and materials

Sample collection. Most of the sponges were collected by rock dredge, epibenthic sled or trawl from New Zealand waters by the National Institute of Water and Atmospheric Research (NIWA) research vessels *Tangaroa*, between 1996 and 2014, and *Kaharoa*, between 1995 and 2002. The RV *Tangaroa* stations are cited under the sections entitled 'Material examined' in each description, as NIWA Stn TANXXXX/XX, and the RV *Kaharoa* stations as NIWA Stn KAHXXXX/XX. A few sponges were collected by other New Zealand fisheries, research and commercial vessels, RV *Acheron*, FV *Cordella*, FRV *James Cook*, FV *Otago Buccaneer*, RV *Rapuhia*, FV *Seamount Enterprise*, MV *Taranui*, MV *Tangaroa*, and some very old, historically important specimens reviewed were originally collected by the HMS *Challenger*, SS *Valdivia*, and HMS *Sealark*.

Two recent expeditions that utilised ROV technology to collect and photograph specimens provided critical specimens and images for this study. Specimens and seafloor images and videos were collected as part of Project *PoribacNewZ* of the Institute for Chemistry and Biology of the Marine Environment (ICBM), Carl von Ossietzky University of Oldenburg, on the new German RV *Sonne* (voyage SO254), using the GEOMAR Helmholtz Centre for Ocean Research Kiel ROV *Kiel 6000*. Over 30 specimens and numerous underwater images and videos were provided for our study (Schupp *et al.* 2017). Relevant collection sites are included in Figure 1.

The recent NOAA Mountains Under the Sea expedition (EX1705) to Te Kawhiti a Maui Potiki deep ridge (Cook Islands EEZ), amongst other locations, provided images of two euplectellid species, *Walteria* **sp. indet.** and *Saccocalyx tetractinus* **sp. nov.**, of interest to discussions in this study. The images were taken by scientists onboard NOAA ROV *Deep Discoverer 2* operating from RV *Okeanos Explorer*, at depths greater than 2000 m. All NIWA stations except the NOAA Cook Islands EEZ sites are illustrated in Fig. 1. Specimens were either frozen immediately upon collection or preserved and stored for the long term in 70% ethanol, or are now dry.

Sample preparation. Specimens were first triaged to determine if proper spicules were present: if dry, by simply viewing directly under a dissecting microscope, or, if wet,

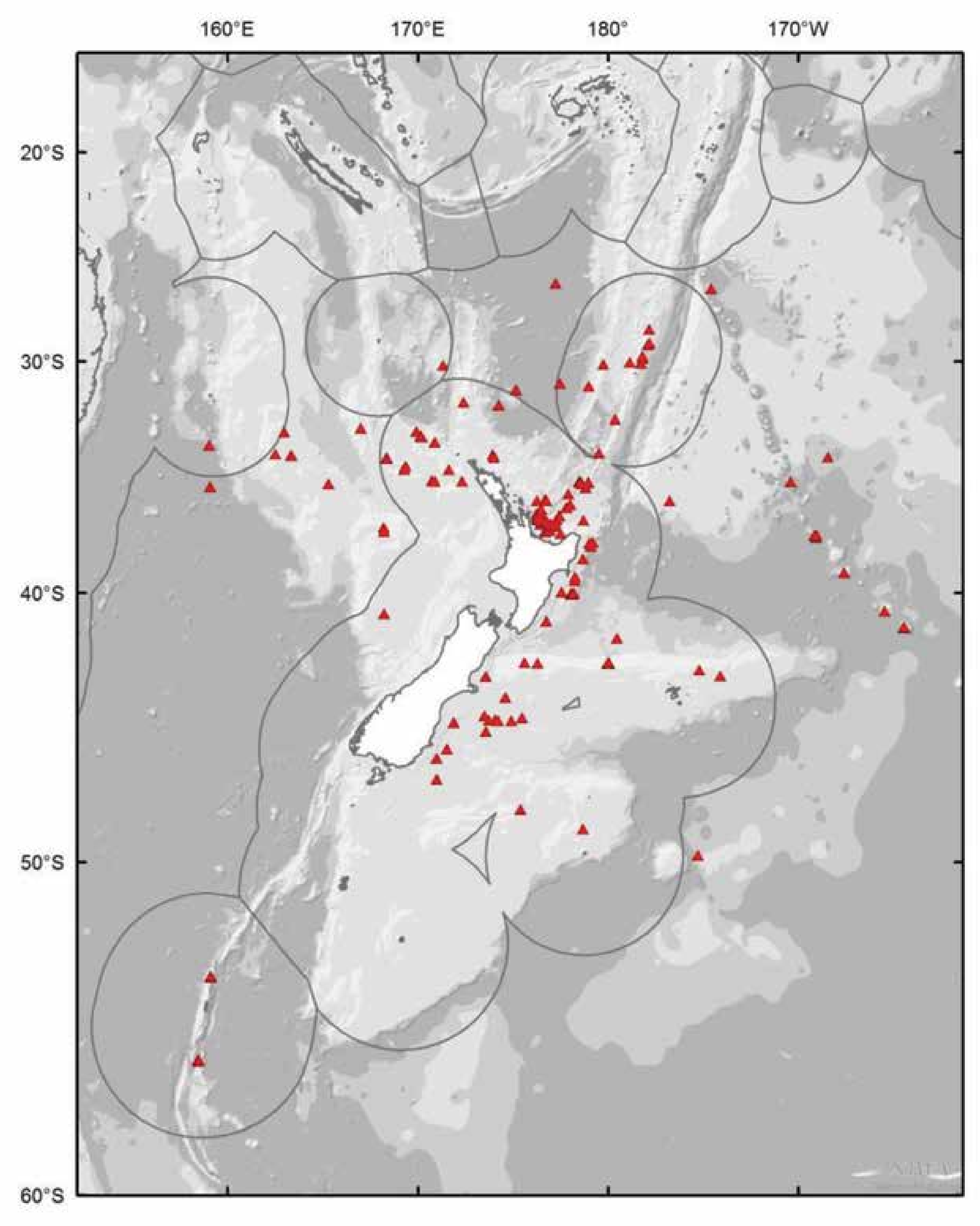


Figure 1. Study area showing collection stations for euplectellid glass sponge species in New Zealand EEZ, Australian EEZ (surrounding Macquarie Island on Macquarie Ridge), and in International waters.

by making temporary digestions of small pieces of the body wall in commercial sodium hypochlorite bleach. These preliminary examinations usually provided information on structure of lyssacine frameworks, required for most long-dead, washed-out specimens. Where spicules were present, small tufts were picked by forceps or scraped by scalpel from dermal and atrial surfaces, dehydrated, cleared and mounted in Canada balsam on microscope slides to identify surface spicule types. Where specimens had thin walls, and were in good condition, wall sections about 0.5 mm^2 were excised, dehydrated, cleared, and whole mounted in balsam on microscope slides.

Preparations of cleaned spicules and/or lyssacine frameworks were made by taking one or two 0.5–1.0 ml subsamples from a specimen, soaking them in water to remove ethanol, then digesting them in test tubes in hot (95°C) nitric acid to dissolve organic contents from spicules and frameworks. After cooling and diluting in a small petri dish, large and medium-size spicules were picked from the suspension by forceps or pipette under a dissecting microscope, repeatedly rinsed in distilled water, and transferred directly to clean 9 mm square cover glasses to which they quickly adhered by drying, or to cover glasses coated with a hot glue which is tacky at 42°C. The cover glasses were then attached to scanning electron microscopy (SEM) stubs by epoxy and prepared for SEM. Clean lyssacine frameworks were picked from the spicule suspension, rinsed several times in tap water, dried, mounted on SEM stubs with epoxy or double-sided tape, and prepared for SEM.

The clean spicules remaining in the diluted nitric acid suspension were further processed for both light microscopy (LM) and SEM. About 50 dermal and atrial spicules (pentactins or hexactins) were transferred by pipette to a petri dish of water; two of the four tangential rays were broken off with fine forceps and the remaining 3- or 4-rayed spicules were pipetted onto microscope slides and spread out with forceps and needle. After drying, Canada balsam and cover glasses were added. These slides, with consistently orientated dermal and atrial spicules, provided easy measurement of tangential and proximal rays. A small aliquot of the remaining spicule suspension was passed through a 13 mm diameter, 0.2 µm pore-size polycarbonate membrane filter. After drying the filter, which contained both megascleres and microscleres, it was mounted on an SEM stub using double-sided tape. The remainder of the spicule suspension was processed for LM; it was passed through three or four 25 mm diameter, 0.22 µm pore-size nitrocellulose Millipore© filters. The three or four filter preps made from each suspension were rinsed with tap water while in the filter holder and transferred to microscope slides to dry; the last filter intentionally was given a heavy spicule load that, before drying, was mostly transferred, often as a pad of wet spicules, by forceps from the filter to several drops of water on a clean microscope slide and spread with a fine needle. After drying, each filter and spicule spread was cleared with xylene; the filters trimmed with scissors to remove the excess unused periphery, and mounted in Canada balsam under cover glass. Occasionally, but not routinely throughout this process, when spicules in suspension accumulated fine clay particles, adhering in clumps, the suspensions were further diluted with water and treated with an ultrasonic cleaner in their normal solutions (cleaning agents were not used).

The dry SEM preparations, consisting of cleaned spicules on cover glasses or filters, cleaned frameworks on epoxy or tape, were sputter-coated with gold-paladium and imaged with a Hitachi S-3500 SEM at the Biology Department, University of Victoria.

Spicule and framework dimensions. Measurements of spicules were made using a computer-digitiser joined to either compound or dissecting LM by drawing tube (camera lucida) and Sigma-Scan® software. Framework elements were either measured directly by LM as above, or indirectly by using the image-analysis software SigmaScan Pro® on the SEM images. Dimensions are expressed as micrometres (µm); where expressed as millimetres (mm), this is stated accordingly. Dimensions are given in a table associated with the 'Description' section for each species. Dimensions are cited as mean (mean) and standard deviation (s. d.), range, and the number of measurements made. Where a spicule form being considered within a table of dimensions is not present in the specimen, this is indicated by 'n. a.'

Registration of type and general material. Primary and secondary type materials of new species, and additional material, are deposited in the NIWA Invertebrate Collection (NIC) at the National Institute of Water and Atmospheric Research (NIWA; formerly New Zealand Oceanographic Institute, NZOI), Greta Point, Wellington, using the prefix NIWA—, and the Museum of New Zealand Te Papa Tongarewa (formerly National Museum of New Zealand, NMNZ), using the prefix NMNZ PO.—. Nine specimens, including *Regadrella okinoseana*, and the holotype and paratypes of *R. australis* **sp. nov.**, were recorded from the Australian EEZ around Macquarie Island, on Macquarie Ridge, to the southwest of New Zealand. These specimens have been donated to the Queensland Museum and accessioned into their biodiversity collections (prefix QM G—) except for one paratype and one non-type specimen of *R. australis*, which have been retained as vouchers at NIC. One specimen of *R. okinoseana* from northeast of Norfolk Basin and two specimens of *Euplectella imperialis* Ijima, 1894 from Lord Howe Plateau were collected by the NZOI in the Australian EEZ in 1983 and 1971, respectively. These sponges have also been donated to the Queensland Museum and accessioned into their biodiversity collections. Sixteen specimens were collected on the joint New Zealand-Australian NORFANZ voyage of May 2003 (Clark *et al.* 2003, Williams *et al.* 2006); these were accessioned on the voyage by the Queensland Museum using the prefix QM G—. The following agreement was made regarding sharing of this material, some of which was collected from Australian EEZ locations (Lord Howe Rise, North Norfolk Ridge, West Norfolk Ridge), New Zealand EEZ locations (West Norfolk Ridge, South Norfolk Ridge), and in International waters on the West Norfolk Ridge (Fig. 1). Any QM G-registered specimens from within the New Zealand EEZ are to be re-registered with a NIWA registration number and housed at NIC. A voucher of the main NIWA-registered specimen will be retained where practical (without destroying the specimen) with the original QM G accession number and sent back to the QM. Any QM G-registered samples from within the Australian EEZ or from within International waters are to retain the QM G accession number and this is to be cited in this work with the specimen held at the QM. A voucher of the main QM G specimen will be retained where practical (without destroying the specimen), re-registered with a NIWA number and retained in New Zealand. Registration numbers are cited in the text. Synonomies of taxa are not exhaustive but are restricted to the major works dealing with those names.

Area of study. The main area covered extends from 26° to below 56° S and 158° E to 170° W, covering seamount regions in the Lord Howe Rise (Australian EEZ and International waters) and Louisville Seamount Chain (International waters). Collection localities in the New Zealand EEZ include the Kermadec Ridge and Cavalli Seamount region, Chatham Rise, Challenger Plateau, and south to the Macquarie Ridge, including the Australian EEZ surrounding Macquarie Island (Fig. 1). The furthest south a euplectellid was recorded was 65.6° S in the Southern Ocean. Locations of specimens are shown on individual maps included in the detailed treatments of each species. Depths range from 335 to 4744 m.

While most sponges were collected by NIWA (and formerly the New Zealand Oceanographic Institute), several specimens were also collected on New Zealand fishing vessels, and on joint New Zealand-Australian collaborations. These included: the NORFANZ voyage of May 2003, which covered 14 seamount and slope sites in the general region of the Norfolk Ridge and Lord Howe Rise (Clark *et al.* 2003, Williams *et al.* 2006); and the MacRidge 2 voyage (TAN0803) of 2008, which represented a collaboration between NIWA and the Institute of Geological and Nuclear Sciences (GNS Science) in New Zealand, and Commonwealth Scientific and Industrial Research Organisation (CSIRO) Division of Marine and Atmospheric Research, the Antarctic Climate and Ecosystems Cooperative Research Centre (ACECRC), and the Research School of Earth Sciences, Australian National University (ANU) in Australia. All specimens collected from Australian EEZ and International waters are listed as such in the sections entitled 'Material examined' within each species description. Unless otherwise stated as such, all specimens are from the New Zealand EEZ.

Seafloor images of living euplectellid sponges. Today, most NIWA voyages, and international voyages with ROV capability, provide seafloor images of living organisms and their habitat. NIWA's Deep Towed Imaging System (DTIS) provides increasingly detailed images for the accurate identification of sponges *in situ*; these images provide essential information for our understanding of the morphology and ecology of these sponges. Seafloor images of living euplectellid sponges, provided by NIWA, GEOMAR and NOAA are provided as an image library at the back of this volume.

Terminology

Specialist terminology for hexactinellid sponges follows Boury-Esnault & Rützler (1997) and Tabachnick & Reiswig (2002), and is included here for convenience. Some terms have been modified.

amphidisc – (*birotulate* or *discodiactin* of Tabachnick & Lévi, 2004; *codondiactin* of Dohrmann *et al.* 2017), diactine spicule with umbels (often equal shape and size) at opposite ends; spicules related to amphidiscs, but with more than two rays, have other names

anchor – basalia (spicules) with teeth or serrated disc or reduced rays on the outer end

anchorate – end of spicule with two or more claw-like or grapnel-like spines, often in a whorl

aspidoplumicome – (discoplumicome of Dohrmann *et al.* 2017), plumicome in which the secondary rays emante from the edge of a shield-like disc in a single whorl

atrial cavity – (atrium, gastral cavity, paragaster, vestibule) large internal cavity of funnel, cup or tube-form sponges; usually but not always exhalant

atrialia – (gastralia) spicules associated with the atrial surface

atrium – see *atrial cavity*

basal disc – see *basidictyonal plate*

basal plate – see *basidictyonal plate*

basalia – spicules protruding from lower sponge surface serving for attachment, often with the appearance of a beard

basidictyonal plate – (basal disc, basal plate) siliceous framework formed by the first (basal) layer of hexactine spicules, irregular spicule elements and synapticula, which serves as attachment to hard substrate

basiphytous(e) – (basiphytes) method of attachment to hard substratum by basidictyonal plate

calycocom(e) – hexasterous spicule with secondary rays emanating from a solid calyx (capitulum); used in the description of stellate discohexasters of *Rossella* and related genera; also, known in some Euplectellidae

calycoid(al) – type of branching when the secondary rays begin from calyx-like outer ends of primary rays

calyx – cup

choanosomal skeleton – denotes the loose or fused megascleres lying between the dermalia and atrialia (see also *ectosomal skeleton*)

choanosomal – (parenchymal) location of objects (spicules, skeleton) between dermal and atrial surfaces

codon- – condition of spicule ray tip: umbel with very long parallel teeth; thimblate

codonhexaster – a hexaster with umbel-shaped ray tips (see codon-)

corona – crown

cuff – a parietal ledge; external continuous collar-like ledge around the main osculum margin, e.g. in Euplectellidae; marginal cuff

-come – suffix relating to secondary rays of a microsclere now used in names of distinct forms, e.g. graphiocome = graphiohexaster, floricome, pappocome, discocome = discohexaster; origin confused: Latin, comes = satellite; Greek kohn = hair

comitalia – accessory spicules physically associated with principalia

drepanocome – oxyhexaster with sickle-shaped, hook-like, or s-shaped secondary rays thickest in the outer third of ray, rays longer and thicker than those of sigmatocome

dermalia – spicules of any size category associated with the dermal (external) surface; autodermalia (see also *hypodermalia*)

diactin – (diactine spicule; diactin; diact; oxydiact; rhabdodiactin) two-rayed spicule with rays aligned on the same (single) axis; both rays often with similar endings

dianchor – distinctive to *Holascus*

disc(o) – (umbel) disc-like; adjective describing disc-like or toothed-disc terminus of a spicule ray or tine (see also *discoidal*)

discaster – like a discohexaster but with primary rays subsumed into the expanded siliceous centre

discoctaster – microsclere with primary rays rearranged by fusion to form eight compound primary rays situated at the corners of a cube; these rays branch to form secondary rays ending in small discs; see *disc*- and *octaster*

discodiatin – see *amphidisc*

discohexactin – (discohexact) six-rayed spicule with discoidal ends

discohexaster – hexaster with secondary rays ending as small discs

discoidal – disc-like termination of primary or secondary ray, usually with serrated or toothed margin

discostauractin – (tetradisc, discotetractin) a four-rayed spicule with disc-like ends

discoparatetractin – four-rayed triaxon spicule in which two of the rays are in one axis and the other two rays are perpendicular to them, one ray developed in the second and third axes, with disc-like ends

discotauactin – three-rayed diaxon spicule with rays situated in a single plane, with disc-like ends

discopentactin – five-rayed triaxon spicule with perpendicular rays, with disc-like ends

distal – for spicule parts placed distant from the spicule centre (axial cross), or attachment to sponge, term used to differentiate a specific spicule ray from other rays within the same spicule; the distal ray is that ray which is directed away from the choanosome centre; in atrialia it projects to the atrium

ectosomal skeleton – (ectosomal spicules) specifically denotes the loose spicules associated with the surface (dermal and atrial) as distinct from the choanosomal skeleton (see *choanosomal skeleton*)

euplectelloid – tubular body with an apical sieve-plate

fibula – sigma-like diactin with curved rays and central inflation; derived from microhexactins; in some *Holascus* and *Euplectella*

floricoidal – condition in a microsclere where the sigmoid terminal rays of each tuft are arranged like the petals of a lily flower

floricome – hexaster with sigmoid (s-shaped) secondary rays that end in an asymmetrical plate provided with marginal teeth or rays

graphiocome – (graphiocom, graphicome, graphi(o)hexaster) hexaster with numerous long, thin secondary rays arrayed in parallel tufts, each tuft emanating from a disc-like capitulum of a primary ray

helicographiocome – graphiocome with numerous long, thin secondary rays or raphides, which are sinuous, and in end view form a helical coil, not a spiral, as earlier thought

hemi- – (hemy-) prefix for hexasterous spicules with irregular number of secondary rays, often with one or more primary rays carrying a single secondary ray

hemidiscohexaster – see *hemi*- and *discohexaster*

hemihexaster – (roller star) see *hemi*- and *hexaster*

hemionychohexasters – see *hemi*- and *onychexaster*

hemioxyhexaster – see *hemi*- and *oxyhexaster*

hemioxystauraster – see *hemi*- and *stauraster*

hexactin(e) – (hexact, hex-) six-rayed triaxon spicule with rays of equal length and form perpendicular to one another; noun as hexactin (a hexactin) and adjective as hexactine (an hexactine spicule)

hexaster – hexactine spicule with six distally branching primary rays

holactin(e) – sexradiate, triaxon (see holo–)

hol(o) – indicates absence of secondary rays, sometimes called spines (holoxyhexaster, holactin)

hypodermalia – (dermalia) large pentactine spicules whose tangential rays are paratangentially situated immediately beneath the dermal surface, each with proximal ray directed inside body; support overlaying layer of dermal spicules; centre and tangential rays may be pushed up over the dermal surface but still called hypodermalia to reflect position of origin

lateralia – (pleuralia) prostalia that protrude from the lateral wall of the sponge

lateral (parietal) osculum – (oscula; gap) single or numerous holes located on the lateral wall of the dermal surface, usually penetrating the entire wall thickness

lateral diverticula osculum – (oscula; gap) single or numerous holes located on a pocket extending from the lateral wall of the dermal surface, usually penetrating the entire wall thickness

lopho- – prefix for spicules with a tuft of thin secondary rays (Greek: lophos = tuft or comb)

lophophytous(e) – (lophophytes) method of attachment where sponges are anchored in soft or to hard substratum by means of protruding spicules (basalia) with the body suspended above or partially embedded in substrate

lophodiscohexaster – see *lopho-* and *discohexaster*

lophohexaster – (pappocome) see *lopho-* and *hexaster*

microhexactin(e) – small hexactin with rays <150 µm long; see *hexactin*

microsphere – small globular microsclere that may have a lumpy or smooth surface

micro- – small

microxyhexactin(e) – see *micro-* and *hexactin*

monactin(e) – single-rayed monaxon spicule, e.g. most basalia

onyc(h)hexaster – hexaster with onychoidal secondary ray termini (claws); often misnamed as discohexaster.

onych(o)- – prefix referring to onychoidal or claw-bearing ray termination

onychohexactin – see *onycho-* and *hexactin*

onychexaster – astrose microsclere with onychoidal secondary ray termini (claws); sometimes imprecisely referred to as discaster

onychaster – see also *onychexaster*

onychohexaster – see also *onychexaster*

onychoid(al) – refers to the distal terminus of a spicule ray which bears one or several claws, spines, or teeth, often arranged in a grapnel-like manner, emanating from the original ray without swelling; commonly confused with discoidal terminations

oxy- – prefix for spicules with acutely pointed tips

oxydiaster – diaster with acute ray tips

oxyhexactin – hexactin with acute ray tips

oxyhexaster – hexaster with acute ray tips

oxyoid(al) – term referring to the distal terminus of a spicule ray which tapers slowly to a slender and sharp (acute) point

oxypentaster – pentaster with acute tips

oxystauraster – stauraster with acute tips

pappocome – (trichaster, lophohexaster) Greek: pappus = old man, beard; ambiguous term inconsistently applied to a variety of hexasters with numerous divergent rays

paratetractin – four-rayed triaxon spicule in which two of the rays are in one axis and the other two rays are perpendicular to them, one ray developed in the second and third axes

parenchymal(ia) – location in middle layer of body wall, between dermal and atrial layers; spicules located in this region; see *choanosomal*

parietal oscula – lateral oscula

pedunculate – with a stem (peduncle)

pentactin(e) – (pentact; pent-) five-rayed triaxon spicule with perpendicular rays

pentaster – see *pentactine* (pent-) and *aster*

pileate – ray tip capped with a marginally serrate hemispherical disc

pinular(us) – ray of a spicule having a spined, pine-tree like form (i.e. pinular diactin or pinular pentactin, *pinuli*

plumicome – hexaster with s-shaped feather-like secondary rays of unequal length arranged in several concentric circles from a flattened or swollen primary ray termination

primary rosette – the central part, or primary rays, of a hexaster with branching rays

principalia – large spicules located in the choanosomal region that form the primary component of skeletal support

prostalia – (prostal) spicules which protrude from the body surface, including the base (basalia), margins of oscules (marginalia), and lateral surfaces (lateralia/pleuralia)

raphides – (rhaphides) small thin spicules or parts of spicules; they are commonly secondary rays broken from the graphiocomes

sieve-plate – perforated skeletal lattice that covers the main or terminal osculum in Hexasterophora (e.g. *Euplectella*); or atrialia and hypoatrialia separated from the choanosome by developed subatrial cavities and canals in Amphidiscophora

sigmatocomes – (lophocome, tylfloricome, sigmatocom) hexaster with sigmoidal or s-shaped secondary rays usually arranged in a single circle on each primary ray

sigmoid(al) – shape of a spicule ray, s-form

spirodiscohexasters – discohexaster with each tuft of secondary rays spirally twisted

staur(o)- – spicule shape as four rays in a cross (two developed axes in one plane)

stauractin(e) – (stauract) cross-like spicule which consists of four rays perpendicular to one another

stauraster – see *staur-* and *aster*

strobiloid(al) – type of outer end of primary ray which terminates in a pinecone-shaped end, a strobila

strobiloplumicomes – see *strobiloidal* and *plumocome*

sword hexactin – hexactin with enlarged distal ray, tangential and proximal rays or ends shorter, tapering like a sword

synapticulum(ula) – (synapticular junctions) bridges between spicules or rays composed of siliceous cement; may be short and simple or extended, filament-like, branching and anastomosing structures forming silica networks; synapticula never have axial filaments

tangential – (paratangential) planes parallel to body surfaces, dermal or atrial; spicule rays situated in those planes

tauactins – three-rayed diaxon spicule with rays situated in a single plane; T-shaped

tetractin(e) – (tetract; quadriradiate) four-rayed spicule, either stauractin (two axes with both rays) or paratetractin (three axes, with 2, 1, 1 rays each)

tine – branches emanating from a scopule head; prongs

triactin(e) – spicules with three rays in two axes (diaxon; rays lie in one plane)

tyl(o)hexaster – see *tyloid* and *hexaster*

tyloid(al) – (tylo) outer ends of spicule rays which are spherical

typha-like – see typhoidal

typhoid(al) – type of spicule tip with abrupt elongate cylindrical inflation (rod) in the ray axis; so far only used for hexaster of *Hyalostylus dives*

umbel – (disc) disc or rotule with teeth at end of shaft; umbellate

undefended – (with respect to a rigid body stalk) once built, the structure is undefended by living tissue and may be encrusted by other organisms; it may be modified except at the (living) apex.

Abbreviations

BMNH	British Museum of Natural History, BMNH, BM (NH), NHM, London
DTIS	Deep Towed Imaging System (NIWA)
EEZ	Exclusive Economic Zone
GEOMAR	Research Centre for Marine Geosciences, Helmholtz Centre for Ocean Research Kiel, Germany
HURL	Hawaii Undersea Research Laboratory, University of Hawai'i
ICBM	Institute for Chemistry and Biology of the Marine Environment, Carl von Ossietzky University of Oldenburg
IRD	Institut de Recherche pour le Développement, Noumea, New Caledonia
LM	Light microscopy
MCZ	Museum of Comparative Zoology, Harvard University, United States of America
MNHN	Muséum National d'Histoire Naturelle, Paris, France
NHM	Natural History Museum, London, United Kingdom
NHMUK	Accessioning number for Natural History Museum (formerly British Museum of Natural History, BMNH, BM (NH), NHM, London)
NIC	NIWA Invertebrate Collection, NIWA, Wellington, New Zealand
NIWA	National Institute of Water and Atmospheric Research, Wellington, New Zealand
NMNZ	Museum of New Zealand Te Papa Tongarewa, Wellington, New Zealand (formerly National Museum of New Zealand)
NOAA	National Oceanic and Atmospheric Administration, U. S. Department of Commerce
NZOI	New Zealand Oceanographic Institute (now NIWA)
QM	Queensland Museum, South Brisbane, Australia
SEM	Scanning electron microscopy
SOP	Scientific Observer Programme
s. d.	Standard deviation

Acknowledgements

Specimens were supplied by the NIWA Invertebrate Collection (NIC), and we are particularly grateful to Sadie Mills and Diana Macpherson for their diligent assistance with loans. We also acknowledge the work of Emma Sherlock at NHM in unearthing the history of the two fragments of *Saccocalyx pedunculatus* specimens. We thank Nicola Rush of NIWA for preparation of materials for examination and Carina Sim-Smith for compilation of Fig. 1. We thank Rob Stewart, Alan Hart and Peter Marriott, NIWA, for their onboard specimen photography of sponge specimens and provision of DTIS images, and Blayne Herr of TCMedia for the design and compilation of the seafloor images of living euplectellid sponges. We are also grateful to John Rosser MA LTCL, Mark Riley and Cedric Littlewood, for their assistance with suggestions for new species names and for advising on the correct form of the new taxon names. We gratefully acknowledge Brent Gowen, University of Victoria, Philip Lambert, Kelly Sendall, Heidi Gartner and Moretta Frederick, Royal British Columbia Museum, for technical assistance. We thank Dr Bruce Marshall, Museum of New Zealand Te Papa Tongarewa, Wellington, for the loan of specimens from their collections. Dr Martin Dohrmann, Ludwig-Maximilians-University, Munich, and Dr Dorte Janussen, Senckenberg Gesellschaft für Naturforschung, Frankfurt, provided comprehensive reviews of this work, for which we are very grateful.

Specimens were collected on the following research projects: Many specimens were collected on NORFANZ voyage, TAN0306, a survey of the mid-Tasman Sea on RV *Tangaroa* during May and June 2003, funded by Australia's National Oceans Office (NOO), CSIRO Marine and Atmospheric Research (CMAR), NIWA, and New Zealand's Ministry of Fisheries (MFish) (Project ZBD2002–16). We are grateful to the Queensland Museum, particularly to Dr John N. A. Hooper, for the collection, accession, and provision of specimens for identification and inclusion in this Memoir. We also thank Dorte Janussen, Senckenberg Museum, for her interim care of the Queensland Museum collections.

Several specimens representing new species were collected from within Australian EEZ waters around Macquarie Island on the TAN0803 voyage of RV *Tangaroa*. These specimens have been donated to the Queensland Museum and accessioned into their biodiversity collection, and we thank Dr John Hooper and Dr Merrick Ekins for facilitating this. The MacRidge 2 voyage (TAN0803) represented collaboration between New Zealand and Australian scientists from NIWA and GNS Science in New Zealand, and CSIRO Division of Marine and Atmospheric Research, the Antarctic Climate and Ecosystems Cooperative Research Centre, and the Research School of Earth Sciences, Australian National University in Australia. The biological component of the voyage was conducted under the NIWA project entitled, "Seamounts: their importance to fisheries and marine ecosystems" funded by the New Zealand Foundation for Research, Science and Technology (FRST), and CSIRO's Division of Marine and Atmospheric Research project entitled, "Biodiversity Voyages of Discovery" funded by the CSIRO Wealth from Oceans Flagship.

Several specimens from other New Zealand seamounts were collected under the NIWA project entitled, "Seamounts: their importance to fisheries and marine ecosystems", funded by FRST with additional funding from MFish (e.g., voyages KAH9907, KAH0204, TAN0104, TAN0107, TAN0205, TAN0307, TAN0413, TAN0604, TAN0905), and later, along with specimens from plateaus, canyons and trenches, under the project entitled, "Impact of resource use on vulnerable deep-sea communities" (CO1X0906), funded by FRST (voyage TAN1206). Additional specimens were collected on NIWA biodiversity or collaborative voyages such as: TAN1007 – Kermadec Arc Minerals (KARMA) voyage (Contract CO1X0808), funded by the Ministry of Business, Innovation & Employment (MBIE), in collaboration with Auckland University, GNS Science (New Zealand), and Woods Hole Oceanographic Institute (USA). TAN1104 – Ocean Survey 20/20 Mapping the Mineral Resources of the Kermadec Arc Project, funded by Land Information New Zealand, GNS Science, and NIWA; TAN1402 – South Pacific Vulnerable Marine Ecosystems Project (C01X1229) funded by MBIE; TAN1213 – Nascent Inter-Ridge Volcanic And Neotectonic Activity (NIRVANA) voyage, funded by MPI, in collaboration with Auckland University, GNS Science, and the University of New Hampshire (USA), and additional MBIE funding; TAN1116 – Food-web dynamics of New Zealand marine ecosystems project supported by the New Zealand government under "Coasts & Oceans" core funding from MBIE.

Several specimens were collected as bycatch species from fisheries on NIWA research fisheries trawl surveys (e.g., TAN9506, TAN0408, TAN1003, SMT9501) funded by MFish and later MPI, and specimens from stations beginning with TRIPXXXX, were collected by observers on New Zealand fishing vessels under the Scientific Observer Programme (SOP), funded by MPI.

Over 30 specimens and numerous underwater images and videos were provided for our study by ICBM University of Oldenburg (Project *PoribacNewZ*). Collections were made onboard the new German RV *Sonne* (voyage SO254), using the GEOMAR Helmholtz Centre for Ocean Research Kiel ROV *Kiel 6000*, with participation and funding from GEOMAR, DSMZ, LMU, NIOZ, NIWA, and ETH-Zurich. Funding for voyage SO254, Project *PoribacNewZ*, grant number 03G0254A by the Federal Ministry of Education and Research (BMBF) is gratefully acknowledged. NIWA voyage participation was funded through MBIE SSIF 'Enhancing Collections' project. We are most grateful to Prof. Peter Schupp, ICBM, University of Oldenburg, Germany, for his persistence in obtaining funding for this voyage and supporting our participation on this voyage.

Some of the seafloor images were captured by NOAA ROV *Deep Discoverer 2* onboard RV *Okeanos Explorer*, courtesy of NOAA's Office of Ocean Exploration and Research/Mountains in the Deep Programme (EX1705).

A seafloor image of one specimen included in the section, "Seafloor images of living euplectellid sponges", were collected during the joint Japan-New Zealand leg of the Quelle 2013 Expedition (YK13-11), funded by JAMSTEC and supported by the NIWA project entitled, "Impacts of resource use on vulnerable deep-sea communities" (MBIE contract CO1X0906), and NIWA's Coasts and Oceans Centre (Project COPR1406).

This work was made possible by financial support from the University of Victoria and the Royal British Columbia Museum to HMR. This research was funded by NIWA under Coasts and Oceans Research Programme 2 Marine Biological Resources: Discovery and definition of the marine biota of New Zealand (2014/2015 to 2017/2018 SCIs).

Close-up of the convoluted body section of a new species of *Saccocalyx, S. tetractinus* **sp. nov.**, showing the single and divided pocket-like outgrowths of the body wall and the delicate atrial margin. NIWA 126029 was collected and photographed onboard ROV *Kiel 6000*, during the GEOMAR RV *Sonne* expedition SO254, in the abyssal basin between Three Kings and Colville Ridges (RV *Sonne* Stn SO254/10ROV03_BIOBOX3, 30.991° S, 177.500° E, 4160 m). Copyright: ROV *Kiel 6000* Team/ GEOMAR, Helmholtz Centre for Ocean Research Kiel, Germany.

TAXONOMY & SYSTEMATICS

Checklist of species known from the New Zealand EEZ

Three species from the Norfolk Ridge south of New Caledonia have been included as they are considered highly likely to be present in the New Zealand region, but have, thus far, not been collected: *Placopegma plumicomum* Tabachnick & Lévi, 2004; *Bolosoma meridionale* Tabachnick & Lévi, 2004, and *Hyalostylus monomicrosclerus* Tabachnick & Lévi, 2004. These are denoted with a single asterisk (*).

Phylum PORIFERA Grant, 1836
Class HEXACTINELLIDA Schmidt, 1870
Subclass HEXASTEROPHORA Schulze, 1886
Order LYSSACINOSIDA Zittel, 1877
Family EUPLECTELLIDAE Gray, 1867
Subfamily EUPLECTELLINAE Gray, 1867

- Genus ***Euplectella*** Owen, 1841
    - *Euplectella imperialis* Ijima, 1894
    - *Euplectella plumosum* Tabachnick & Lévi, 2004
    - *Euplectella semisimplex* **sp. nov.**
    - *Euplectella* **sp. indet.**
- Genus ***Holascus*** Schulze, 1886
    - *Holascus tasmanensis* **sp. nov.**
    - *Holascus pannosus* **sp. nov.**
- Genus ***Malacosaccus*** Schulze, 1886
    - *Malacosaccus microglobus* **sp. nov.**
- Genus ***Placopegma*** Schulze, 1896*
    - *Placopegma plumicomum* Tabachnick & Lévi, 2004*

Subfamily CORBITELLINAE Gray, 1872

- Genus ***Atlantisella*** Tabachnick, 2002
    - *Atlantisella lorraineae* Reiswig & Kelly, 2017
- Genus ***Corbitella*** Gray, 1867
    - *Corbitella plagiariorum* **sp. nov.**
    - *Corbitella inopiosa* **sp. nov.**
- Genus ***Dictyaulus*** Schulze, 1896
    - *Dictyaulus hydrangeaformis* **sp. nov.**
    - *Dictyaulus crinolinum* **sp. nov.**
    - *Dictyaulus orientalis* **sp. nov.**
- Genus ***Regadrella*** Schmidt, 1880
    - *Regadrella okinoseana* Ijima, 1896
    - *Regadrella australis* **sp. nov.**
    - *Regadrella hispida* **sp. nov.**
    - *Regadrella pedunculata* **sp. nov.**
    - *Regadrella* **sp. indet.**
- Genus ***Walteria*** Schulze, 1886
    - *Walteria flemmingi* Schulze, 1885
    - *Walteria leuckarti* Ijima, 1896
    - *Walteria* **sp. indet.**
- Genus ***Plumicoma*** **gen. nov.**
    - *Plumicoma solida* **gen. et sp. nov.**

Subfamily CORBITELLINAE **incertae sedis**

Subfamily BOLOSOMINAE Tabachnick, 2002

- Genus ***Bolosoma*** Ijima, 1904
    - *Bolosoma charcoti* Tabachnick & Lévi, 2004
    - *Bolosoma biocalum* Tabachnick & Lévi, 2004
    - *Bolosoma meridionale* Tabachnick & Lévi, 2004*
- Genus ***Saccocalyx*** Schulze, 1896
    - *Saccocalyx tetractinus* **sp. nov.**
- Genus ***Hyalostylus*** Schulze, 1886*
    - *Hyalostylus monomicrosclerus* Tabachnick & Lévi, 2004*
- Genus ***Amphidiscella*** Tabachnick & Lévi, 1997
    - *Amphidiscella abyssalis* **sp. nov.**
    - *Amphidiscella sonnae* **sp. nov.**
- Genus ***Amphoreus*** **gen. nov.**
    - *Amphoreus schuppi* **gen. et sp. nov.**
- Genus ***Trychella*** **gen. nov.**
    - *Trychella kermadecensis* **gen. et sp. nov.**

Family EUPLECTELLIDAE **subfam., gen. et sp. indet.**

Systematics

Phylum **Porifera** Grant, 1836

Class **Hexactinellida** Schmidt, 1870

Subclass **Hexasterophora** Schulze, 1886

Order **Lyssacinosida** Zittel, 1877

Lyssakina Zittel, 1877 (emended).
Euplectellaria Schrammen, 1903.
Lyssacina Ijima, 1903.
Lyssacinaria Schrammen, 1924.
Lyssacinosa Ijima, 1927.
Lyssacinosida Zittel, 1877.

Diagnosis. Hexasterophora in which choanosomal megascleres remain as separate skeletal components, or, where fusion occurs it is by deposition of silica at contact points or as synapticula between diactine, tauactine, stauractine, or hexactine megascleres, or by tip-to-ray fusion of hexactine choanosomalia forming longitudinal strands of single continually extended rays with uniaxial connecting beams. Body form is typically a single ovoid, cup or tube bearing a single terminal osculum and deep atrial cavity, but might also be as branching fan or tubes, or tongue-like plate. Attachment to the substrate is either direct or by short peduncle or long stalk and is usually basiphytous with a thin basidictyonal plate of fused hexactins; lophophytous or rhizophytous attachment also occurs. Thin-walled forms may have a sieve plate over terminal osculum and a regular series of small parietal oscula; thicker-wall forms may occasionally bifurcate or grow one or more lateral diverticula, each with terminal osculum. Branching in stalks of cupshaped members is poorly documented as a growth form and may result from secondary settlement. Choanosomal megascleres may be mainly diactins, or unfused or fused hexactins, or a combination of stauractins, tauactins, diactins, rarely pentactins. Dermalia may be large pentactins or hexactins unsupported by hypodermalia, or small hexactins, pentactins, stauractins or diactins supported by large pentactine hypodermalia. Atrialia may be either hexactins and/or pentactins and/or stauractins; hypoatrial pentactins may be present. Sceptrules and uncinates absent. Lateral prostalia may be absent or special diactins or extended hypodermal pentactins or simply the extended distal rays of choanosomal hexactins or pentactins; basalia of lophophytous forms may be monactine, diactine or pentactine anchors. Microscleres include single types or combinations of stellate and spherical discohexasters of regular or hemi-form, discoctasters, discohexactins, floricomes, discoplumicomes, strobiloplumicomes, sigmatocomes, oxyhexasters of regular and hemi-form, graphiocomes, trichasters, oxyhexactins, onychoexasters, and onychohexactins (after Dohrmann *et al.* 2017, emended from Reiswig 2002).

Family **Euplectellidae** Gray, 1867

Euplectellidae Gray, 1867: 527.
Hertwigiidae Topsent, 1892: 25.
Alcyoncellidae de Laubenfels, 1936: 188.
Placopegmatidae de Laubenfels, 1936: 187 (part).

Diagnosis. Tubular, cup-shaped, fungus-like growth forms; lophophytous or basiphytous, sometimes pedunculate. Prostalia basalia, when present, are anchorate spicules, rarely diactins. Main osculum may be covered by a sieve-plate. Choanosomal spicules are stauractins, tauactins and diactins; hexactins and pentactins, when present among choanosomal spicules, are not numerous but are often the largest spicules constructing the base for the skeleton wall, their distal rays serving as prostalia lateralia. Dermalia are usually hexactins, in some genera pentactins, or both. Atrialia are pentactins or hexactins or both. Microscleres are various with amazing variability of the outer ends (Tabachnick 2002).

Remarks. Morphological and molecular data strongly support Euplectellidae as a monophyletic group (Dohrmann *et al.* 2017). The subfamilies used below are clearly not monophyletic groups as shown by Dohrmann *et al.* (2017) and therefore subfamilial classification of Euplectellidae is in urgent need of revision (or should be abolished altogether).

Subfamily **Euplectellinae** Gray, 1867

Euplectellinae Gray, 1867: 504; Schulze 1886: 37; Ijima 1903.
Holascinae Schulze, 1886: 39; Schulze 1887: 85; Schulze 1896: 44.

Diagnosis. Lophophytous Euplectellidae (Tabachnick 2002).

Remarks. The subfamily presently contains seven genera, six of which have anchorate basalia. One genus, *Chaunangium* Schulze, 1904, has poorly known basalia that are presumed to be diactins; its move to Euplectellinae by Tabachnick (2002) awaits collection and examination of new specimens to test this placement. Unfortunately no species of *Chaunangium* were found in the collections surveyed here.

Genus ***Euplectella*** Owen, 1841

Euplectella Owen, 1841: 3.
Conasterium Ehrenberg, 1861: 452.

Diagnosis. The body is tubular with numerous lateral oscula and with a colander-like sieve-plate. Lophophytous, attached to substratum with anchor-like basalia. Principal choanosomal spicules (large) are chiefly stauractins usually with hexactins or pentactins. The distal rays of these hexactins and pentactins are rough; the proximal rays in hexactins are always rudimentary. Additional choanosomal spicules are diactins, tauactins and rarely stauractins together with rare derivatives. The choanosomal spicules form longitudinal and circular skeleton beams. The sieve-plate contains hexactin derivatives that vary in different species. Basalia are anchor-like spicules with four or more teeth. Dermalia are hexactins. Atrialia are pentactins. Microscleres are floricomes and graphiocomes, sometimes hexasters and small sigmatocomes, rarely discohexasters, hemihexasters, hexactins and onychasters (Tabachnick 2002).

Type species. *Euplectella aspergillum* Owen, 1841 by monotypy.

Euplectella imperialis Ijima, 1894

Figs 2, 3; Seafloor Image Figs 29, 30; Table 1

Euplectella imperialis Ijima, 1894: 365; 1901: 58 + pls I–II; Schulze 1904: 131; Tabachnick *et al.* 2008: 66.
Euplectella regalis, Reiswig 1992, not Schulze 1900: 24.
Euplectella regalis, Kelly & Tracey 2011: 53.

Material examined. *Tasman Basin*: NIWA 71000, 71003, NZOI Stn P927, 40.835° S, 168.247° E, 1009 m, 08 Apr 1980.

Bay of Plenty: NIWA 76852, NZOI Stn Z9220, TRIP1124/59, 37.2° S, 176.5° E, 948 m, 06 Aug 1998; NMNZ PO.000514, NZOI Stn R122m, 37.537° S, 177.515° E, 660 m, 05 Jan 1979.

East of Gisborne: NMNZ PO.000708, FRV *James Cook* Stn J9/34/89, 38.593° S, 178.712° E, 911–862 m, 23 Sep 1989; NMNZ PO.000467, FRV *James Cook* Stn J09/17/89, 39.947° S, 177.572° E, 986 m, 15 Sep 1989.

Hikurangi Trough: NMNZ PO.000465, NIWA Stn TAN9393/149, 41.127° S, 176.782° E, 1335–1427 m, 02 Apr 1993.

Southeast of Banks Peninsula: NMNZ PO.000468, FRV *James Cook* Stn J10/37/84, 44.928° S, 174.092° E, 1097–1116 m, 15 Jun 1984; NMNZ PO.000464, FV *Cordella* Stn COR9004/009, 44.786° S, 173.513° E, 1030–1049 m, 01 Nov 1990.

Chatham Rise: NIWA 27813, NIWA Stn TAN0408/46, 43.683° S, 174.155° E, 1074–1072 m, 23 Jul 2004; NIWA 27814, NIWA Stn TAN0408/48, 43.625° S, 174.273° E, 896 m, 23 Jul 2004; NIWA 27811, NIWA Stn TAN0408/61, 44.080° S, 174.630° E, 1093–1085 m, 25 Jul 2004; NIWA 27812, NIWA Stn TAN0408/51, 43.960° S, 174.358° W, 1125–1124 m, 23 Jul 2004; NIWA 52197, NIWA Stn TAN0509/74, 42.758° S, 175.636° E, 889–885 m, 04 Jul 2005; NIWA 76856, NZOI Stn X503, 43.268° S, 174.071° W, 1050 m, 08 Jul 1994; NIWA 52198, NIWA Stn TAN0408/10, 42.777° S, 176.316° E, 1113–1116 m, 10 Jul 2004; NIWA 53121, NIWA Stn TAN0905/40, 42.780° S, 179.903° W, 921–1024 m, 17 Jun 2009; NMNZ PO.000516, FV *Otago Buccaneer* Stn B01/83/84, 43.037° S, 175.165° W, 870 m, 20 Jul 1984; NMNZ PO.000470, FRV *James Cook* Stn J15/05/90, 44.844° S, 175.491° E, 1044–1050 m, 20 Sep 1990.

Off Dunedin: NIWA 76951, NZOI Stn G699, 46.337° S, 171.000° E, 1116 m, 22 Jan 1970; NIWA 88418, NZOI Stn E399, 46.000° S, 171.550° E, 1222 m, 06 Oct 1965; NIWA 71008, NZOI Stn S153, 45.352° S, 173.597° E, 1386 m, 07 Oct 1979; NIWA 70999, NZOI Stn Z9822, 44.961° S, 174.944° E, 949 m, 02 Dec 1997; NIWA 78456, NIWA Stn TAN1116/57, 44.954° S, 174.248° E, 967–968 m, 09 Nov 2011.

Campbell Plateau: NIWA 76955, NZOI Stn G889, 48.182° S, 175.430° E, 780 m, 04 Dec 1970.

Bounty Plateau: NIWA 70952, 76853, 76858, NZOI Stn I689, 48.858° S, 178.692° E, 808 m, 17 Mar 1979.

Lord Howe Plateau (*International waters*): QM G316694, NIWA Stn TAN0308/92, 34.217° S, 163.360° E, 1082 m, 27 May 2003; QM G316695, QM G316996, NIWA Stn TAN0308/90, 34.203° S, 163.356° E, 1090 m, 26 May 2003; NIWA 70942, NZOI Stn G824, 33.173° S, 162.987° E, 811 m, 05 Feb 1971; NIWA 71004, NZOI Stn Z11013, TRIP1613/29, 37.3° S, 168.2° E. 1074 m, 22 Feb 2002.

Lord Howe Plateau (*Australian EEZ*): QM G316696, NIWA Stn TAN0308/73, 32.423° S, 161.794° E, 1132–1197 m, 24 May 2003; QM G335890, NZOI Stn G818, 33.000° S, 162.808° E, 791 m, 04 Feb 1971; QM G335889, NZOI Stn G820, 33.150° S, 162.600° E. 793 m, 15 Feb 1971.

Great Australian Bight (*Australian EEZ*): SAM S693, S694, 33.447° S, 128.683° E, 956–973 m, 28 Jul 1988; SAM S723, 35.233° S, 133.767° E, depth not recorded, 07 Nov 1989; SAM S725, 35.950° S, 131.400° E, 920–990 m, 01 Dec 1989; SAM S726, 33.750° S, 126.967° E, 937–1100 m, 06 Dec 1989; SAM S727, 34.100° S, 131.333° E, 1124–1131 m, 15 Dec 1989; SAM S728, 34.083° S, 131.350° E, 1107–1157 m, 18 Dec 1989.

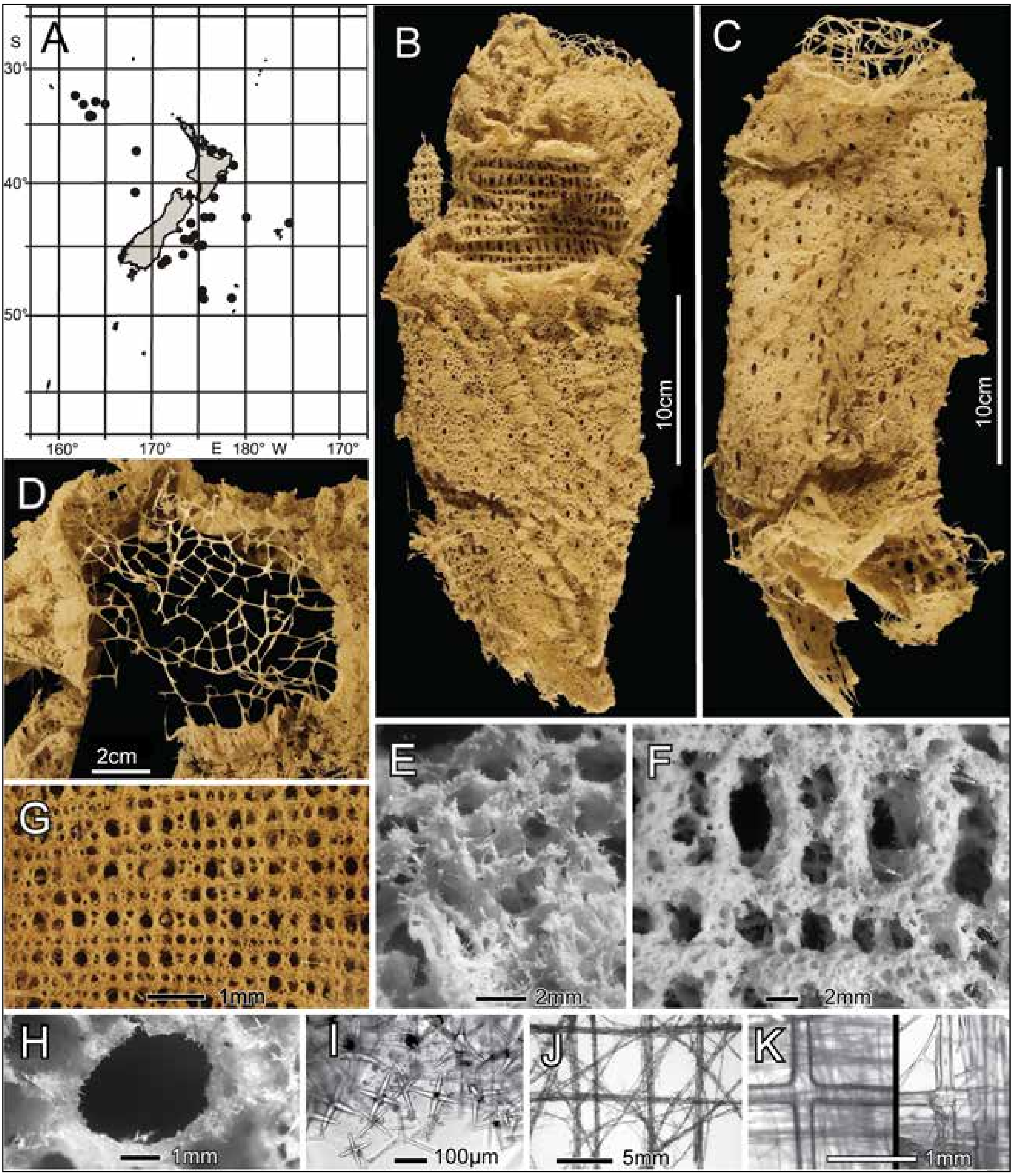


Figure 2. *Euplectella imperialis* Ijima, 1894, distribution, morphology and skeleton: **A.** distribution in New Zealand, Australian EEZ and International waters; **B.** reference specimen, QM G316694, with wall opened to show atrial surface; **C.** smaller specimen, QM G316695, with less developed parietal ridges; **D.** sieve-plate of specimen in B; **E.** dermal surface of specimen in B; **F.** atrial surface of specimen in B; **G.** atrial surface of NIWA 27811; **H.** parietal osculum before clearing and mounting; **I.** edge of parietal osculum showing prostalia marginalia; **J.** cleaned main wall of specimen in B showing rectangular meshes; **K.** primary stauractins in upper unfused framework (left) and in lower fused framework (right) of reference specimen QM G316694.

Sagami Bay (Japanese EEZ): MCZ IZ 46774, 366–1098 m, collector and date unrecorded.

Other locations (images only). NIWA Stn TAN1303/16, Great South Basin, Dunedin, 47.103° S, 171.019° E, 1234–1227 m, 24 Mar 2013 (Seafloor Image Fig. 30); NIWA Stn TAN0705/164, Chatham Rise, 42.849° S, 176.958° W, 846 m, 17 Apr 2007 (Seafloor Image Fig. 29).

Comparative material. *Euplectella regalis*, Holotype—NHMUK 1907.08.1.10, ZMB 3616, 5453, H.M.S *Investigator*, Stn 222, Andaman Is, Eastern Indian Ocean, 13.450° N, 93.242° E, 741 m, 21 Dec 1896; *Euplectella*

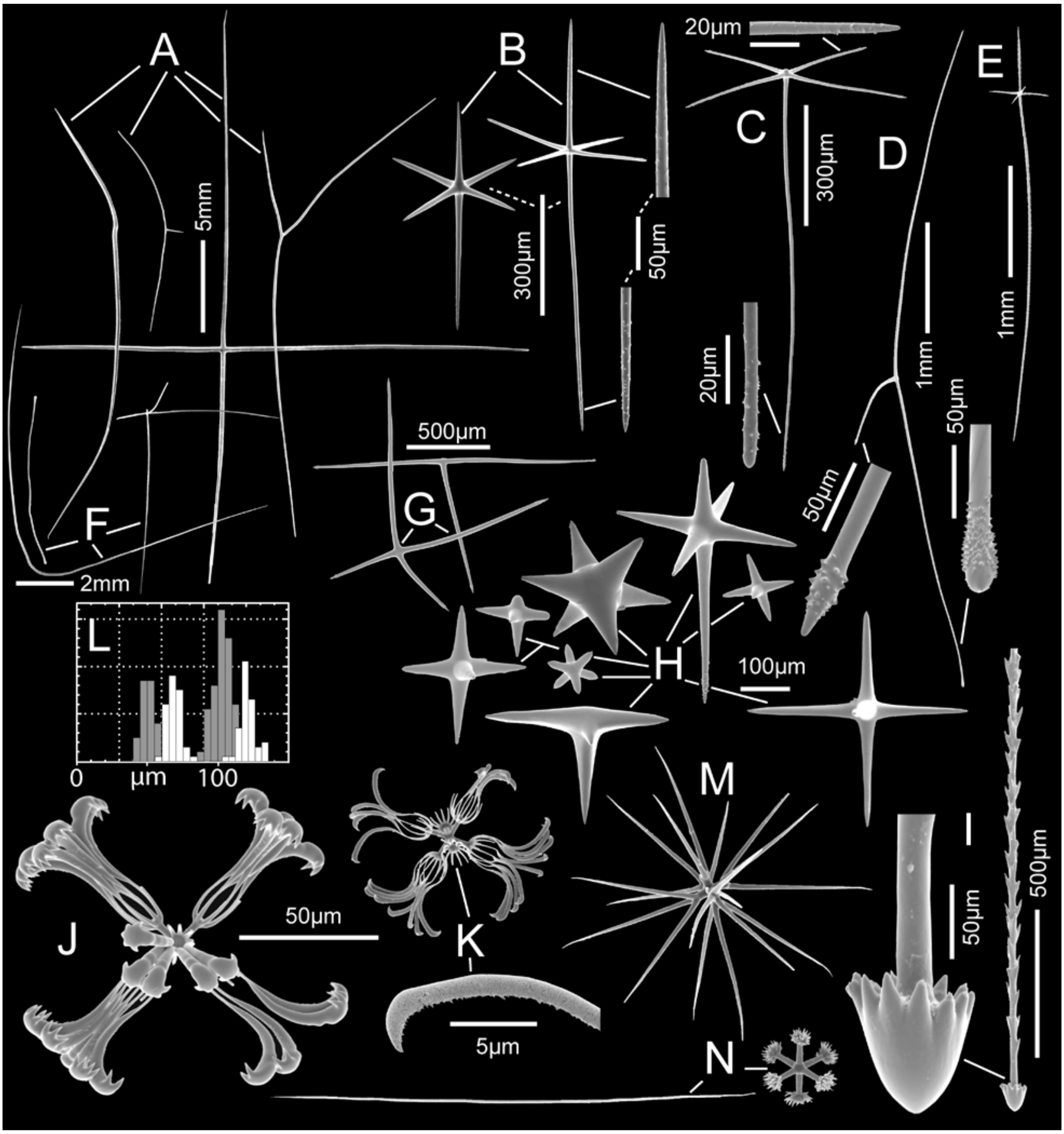


Figure 3. *Euplectella imperialis* Ijima, 1894, spicules: **A.** primary wall spicules; **B.** two dermalia with enlarged distal and proximal ray ends; **C.** atrialium with enlarged ray ends; **D.** comital triactin with enlarged ray ends; **E.** large prostal hexactin from parietal ridge edge; **F.** cuff and sieve spicules including the cuff basal hexactin (right), the bent diactins of cuff base and sieve beams (far left) and a diactin from sieve beam (left); **G.** medium-size "filler" spicules from body wall; **H.** oscularia; **I.** basal anchor with enlargement of the umbel; **J.** floricome 1; **K.** floricome 2 with enlarged secondary ray end; **L.** frequency plot of bimodal floricome diameters, reference New Zealand specimen in white, Japan MCZ IZ 46774 in gray; **M.** oxyhexaster; **N.** graphicome centrum and loose secondary ray (raphide). All spicules from the reference specimen except I, from NIWA 53121.

aspergillum, NHMUK 1887.10.20.12, H.M.S. *Challenger* Stn 209, Zebe, Philippines, 10.233° N, 123.900° E, 174 m, 22 Jan 1875.

Type & locality. Ijima did not designate a type specimen. The University Museum, University of Tokyo, holds around 32 *E. imperialis* catalogued lots, but none contain any note as to type status; Sagami Bay, Japan, from muddy bottom with volcanic detritus, 366–549 m.

Distribution. Tasman Basin, Bay of Plenty, Hikurangi Trough, Chatham Rise, Subantarctic New Zealand (Fig. 2A); Lord Howe Plateau (Australian EEZ and International waters); Great Australian Bight; Sagami and Suruga Bays, Japan; the East China Sea.

Habitat. Attached to soft substratum by root spicules. Depth range within New Zealand waters, 889–1197 m; worldwide 741–1197 m.

Table 1. Spicule dimensions (µm) of *Euplectella imperialis* Ijima, 1894, from QM G316694. Basalia taken from NIWA 53121 (*).

Parameter	mean	s. d.	range	no.
Primary stauractin				
longitudinal ray length (mm)	18.7	2.4	14.8–23.7	25
transverse ray length (mm)	11.1	1.3	8.2–13.3	16
ray width	239	47	120–337	30
Primary triactin				
longest ray length (mm)	9.4	3.0	4.1–15.9	22
transverse ray length (mm)	3.9	3.3	0.4–11.4	22
ray with	115	39	75–216	22
Primary diactin				
length (mm)	18.3	6.0	10.4–24.8	5
ray width	144	70	86–257	5
Dermalia, sword hexactin				
distal ray length	221	38	132–284	50
distal ray width	7.4	2.3	4.1–16.1	50
tangential ray length	192	32	120–289	50
tangential ray width	7.0	1.8	4.2–13.0	50
proximal ray length	540	265	150–1503	50
proximal ray width	7.5	3.2	4.1–25.0	50
Atrialia, pentactin				
tangential ray length	295	62	170–609	50
tangential ray width	13.8	3.4	7.0–22.6	50
proximal ray length	631	212	146–999	50
proximal ray width	15.3	3.7	7.4–28.5	50
Comital triactins and tetractins				
ray length (mm)	5.7	2.2	2.6–10.0	25
ray width	29.7	5.9	18.8–45.5	50
Dermal ridge prostal hexactin				
distal ray length	515	155	226–1003	48
distal ray width	23.1	6.5	10.2–37.2	25
tangential ray length	332	127	102–519	12
tangential ray width	20.1	5.8	9.8–31.9	17
proximal ray length	1757	674	703–3123	12
proximal ray width	22.6	6.9	10.8–34.1	23
Cuff prostal hexactin				
distal ray length	893	534	204–3113	29
distal ray width	31.9	17.8	5.4–87.6	45
tangential ray length	320	35	135–1058	35
tangential ray width	27.8	17.5	6.3–101.0	45
proximal ray length (mm)	2.9	1.5	1.1–6.4	29
proximal ray width	30.7	18.9	6.1–97.8	44

Parameter	mean	s. d.	range	no.
Cuff primary triactin				
long ray length (mm)	3.7	1.7	0.6–5.9	9
ray width	85.3	8.9	71.5–98.0	9
Cuff planar hexactin				
long ray length (mm)	4.5	3.4	032–13.4	69
ray width	66.5	19.5	22.9–116.8	69
Cuff basal hexactin				
body wall ray length (mm)	7.7	0.7	5.6–8.9	20
tangential ray length (mm)	4.0	1.7	2.0–6.2	10
cuff ray length (mm)	4.3	1.20	2.2–5.6	15
distal short ray length	367	330	119–1342	20
proximal short ray length	155	48	60–263	18
ray width	62.3	17.3	33.2–91.8	20
Cuff basal bent diactin				
length (mm)	12.2	4.6	6.1–18.9	19
width	99.0	37.3	40.0–175.9	19
Small choanosomal fillers				
ray length	822	268	401–1593	50
ray width	31.6	9.2	16.0–52.3	50
Prostalia marginalia				
ray length	136.5	44.7	42.9–234.6	50
*Basalia				
umbel width	89.3	n. a.	84.2–99.1	5
umbel height	108.9	n. a.	92.4–118.2	5
axial cross height	272	n. a.	272–273	3
Floricome 1				
diameter	121.2	5.8	107.9–135.0	50
primary ray length	9.2	0.8	7.6–10.7	50
secondary ray length	51.6	2.7	45.3–59.3	50
Floricome 2				
diameter	68.4	5.2	57.2–81.6	50
primary ray length	7.6	0.9	5.5–9.5	50
secondary ray length	27.0	2.4	23.2–32.1	50
Oxyhexaster				
diameter	108.6	9.3	88.1–130.8	50
primary ray length	5.1	0.8	3.4–6.7	50
secondary ray length	49.2	4.3	40.5–58.5	50
Graphiocome centre				
diameter	24.8	2.4	18.3–29.0	50
secondary ray length	153.2	10.8	121.9–178.8	50

Description. Body form is a slightly flattened cylinder, anchored in mud by rooting spicules extending in tufts from the bottom (Figs 2B–C; Seafloor Image Figs 29, 30); apically terminated by a transverse sieve-plate (Fig. 2D). The body wall is up to 5 mm thick, fluffy, with 3.6 mm diameter parietal oscula (2.5–4.4 mm, n = 40), widely spaced and distributed regularly on the outer lateral surfaces in transverse rows which are obliquely offset to form longitudinal spirals (Seafloor Image Fig. 30). The outer (dermal) surface, between parietal ridges, is liberally pocked by obscured inhalant canals, 1.4 mm in diameter (0.6–2.0 mm, n = 47) (Figs 2E–G). Spicule fusion is extensive in the lower body but absent from the upper body and sieve-plate.

Dimensions of the New Zealand specimens range from a small wall fragment 35 x 20 mm, to the nearly whole, mature reference specimen QM G316694 (Fig. 2B), 416 x 138 mm (flattened); the lower end and its root tufts are missing. Specimen QM G316695 (Fig. 2C) is similar but smaller, 243 x 74 mm. The well-developed cuff and diagonal parietal ridges are continuous and up to 1.5 cm wide.

Texture is soft and fragile where spicule fusion has not occurred (top walls and sieve-plate); where spicule fusion is present, the sponge is firm and crunchy.

Surface of upper and lateral wall is dominated in mature specimens by a well-developed cuff and continuous diagonal parietal ridges up to 1.5 cm wide. The body wall is up to 5 mm thick, fluffy, with parietal oscula, 3.6 (2.5–4.4) mm, n = 40, diameter, widely spaced and distributed regularly on the outer lateral surfaces in transverse rows which are obliquely offset to form longitudinally-oblique spirals. The outer (dermal) surface between parietal ridges bears large numbers of obscured inhalant canals, 1.4 (0.6–2.0) mm, n = 47, in diameter (Fig. 2E). Atrial surface (Figs 2F–G) is richly perforated by parietal oscula and exhalent canal apertures distributed in a pattern reminiscent of texture of coarse burlap cloth; main apertures are 2.0 (1.0–3.6) mm, n = 115, in diameter but smaller holes are present down to sizes dependent upon hydration state of the individual specimen.

Colour light beige wet or dry.

Skeleton. Choanosomal skeleton consists of a primary rectangular lattice of large stauractins surrounded by very long and thin triactins and unequal stauractins; spaces between the main fascicles are filled by a mixture of short-rayed triactins, stauractins, paratetractins, pentactins and hexactins. Basally in older specimens the primary and comital spicules undergo joining by deposition of secondary silica (= fusion) forming a rigid framework (Figs 2J–K). Such fusion is extensive in basal parts to scant or no fusion in upper parts.

Ectosomal skeleton of the wall is mainly composed of sword hexactins on the dermal surface and pentactins on the atrial surface. The sieve-plate, present in eight of the 13 specimens, has cylindrical beams covered by a layer of stout hexactins and pentactins over an axial skeleton of large diactins and triactins. Basalia consist of diactine anchors which originate in bundles along the wall primary spicules in the lower third of the body; they project basally as several discrete tufts before coalescing near the basal end of the body into a single thick bundle which extends an undetermined distance into the sediment.

Spicules. Megascleres (Figs 2, 3; Table 1) are highly diverse; we recognise 15 types and could easily add many more types specialised by location. Primary spicules of the wall (spicules several mm in length and over 100 µm in diameter) are mainly large stauractins (50%), triactins (37%) and irregular diactins (13%) (Figs 2K, 3A). The large stauractins differ in length of the smooth rectangular rays, the upper ray is longest and the lateral rays are shortest; the lower ray may be like either of those.

Dermalia are mostly medium-sized sword hexactins with the hilt extending outwards from the dermal surface (Fig. 3B) but about 5% of dermal spicule preparations were pentactins like the atrialia (Fig. 3C) but slightly smaller; the hexactine dermalia have small spines sparsely scattered over the distal ray and the outer half of the proximal ray; the pointed tangential rays either bear these small spines or are smooth.

Atrialia are pentactins with rough ray ends, slightly inflated and either pointed or rounded. Comitalia of the primary spicules are thin triactins (Fig. 3D), paratetractins and rarely diactins with long smooth rays with rough rounded or pointed ends.

Prostalia of parietal ridges are large sword hexactins (Fig. 3E) like dermalia but about three times larger; the distal ray is often slightly inflated and is either entirely bare or is ornamented with small conic spines.

Sieve-plate megascleres have not been exhaustively analysed; they consist of stout and thin superficial hexactins and pentactins (not figured) with ray lengths of 142–216 µm. The axial bundles of the beams carry both thin comital diactins around very large diactins, some bent at nearly 90° (Fig. 3F left).

The marginal cuff is structured very much like the parietal ridges with prostal sword hexactins at the free margin and large triactins providing internal support. The cuff deviates from the parietal ridges in having large planar hexactins with two reduced rays in the same axis supporting the middle of the cuff and large hexactins with two reduced rays in different axes (Fig. 3F right) providing basal support at the proximal cuff margin; the longest ray projects down into the body wall along the body primary stauractins; a second, long ray projects out into the cuff; two of the long rays in the same axis project laterally in the cuff basal margin. The cuff basal margin is also occupied by stout bent diactins, one ray always in the margin, the other ray projecting into the bordering sieve-plate, body wall or the cuff.

Throughout the body, the main choanosomal spaces are occupied by short-rayed triactins and stauractins (Fig. 3G) as filler spicules.

Prostalia marginalia (Figs 2I, 3H) are stout hexactins, pentactins, paratetractins and triactins with rudiments of missing rays variously developed. Similar spicules are found singly occurring throughout the body.

Basalia (Fig. 3I) have a narrow multidentate umbel at the lower end of a long shaft, barbed on the lower third. Umbel teeth numbered 6–11 in the four basalia where these were enumerable.

Microscleres (Fig. 3; Table 1) are two types of floricomes, oxyhexasters and graphiocomes. Floricomes 1 (Fig. 3J) are large and robust with each primary ray supporting 7–10 sigmoid terminal rays ending in an inflated head with 3–6 large marginal teeth; a small patch of denticles occurs inconsistently on the outer distal curve of the terminal rays but the surfaces are otherwise smooth. Floricomes 2 (Fig. 3K), often called 'sigmatocomes', are smaller and more delicate, each primary ray carrying 9–14 sigmoid terminal rays ending in a slightly expanded head bearing 1–3 small marginal teeth. The outer surface of every terminal ray is ornamented with a band of small blunt denticles extending 15–22 µm from the head to near the inflection point. Oxyhexasters (Fig. 3L) are entirely smooth and of moderate thickness. The short primary rays support 1–4 usually straight secondary rays (ca. 2% hemioxyhexasters) but not uncommonly the tips are slightly curved. Graphiocomes (Fig. 3M) have short primary rays, sparsely ornamented with low bumps, each supporting about 40 moderately long raphidial secondary rays.

Remarks. This very abundant euplectellid species was compared to data available on all known *Euplectella* species and assigned to *E. imperialis* on the basis of their having all of the spicules of that species and differing from other *Euplectella* in the selected following ways: *Euplectella aspera* Schulze, 1896 and *E. crassistellata* Schulze 1886, have principal hexactins in addition to the standard stauractins; *E. aspergillum* Owen, 1841, has smaller microscleres and no floricomes; *E. cucumer* Owen, 1857, has principal pentactins and hexactins; *E. curvistellata* Ijima, 1901, has prostalia marginalia as compass diactins; *E. gibbsa* Tabachnick & Collins, 2008, has some rare pentactins as principalia and larger oxyhexasters (mean diameter 153 vs 109 µm); *E. jovis* Schmidt, 1880, has unique fibulae; *E. marshalli* Ijima, 1895, has prostalia marginalia as mostly diactins, triactins and stauractins and smaller oxyhexasters (diameter 75–83 vs 88–131 µm); *E. nobilis* Schulze, 1904, has principal stauractins and pentactins and no prostalia marginalia; *E. nodosa* Schulze, 1886, has principal pentactins and hexactins; *E. oweni* Herklots & Marshall, 1868, has prostalia marginalia as compass diactins and smaller microscleres; *E. paratetractina* Tabachnick *et al.*, 2008, has (undefined) "large numbers" of paratetractine megascleres; *E. plumosum* Tabachnick & Lévi, 2004, has principal hexactins, stauractins and triactins; *E. simplex* Schulze, 1896, has no oxyhexasters; *E. suberea* Thomson, 1876, has principal pentactins; *E. timorensis* Ijima, 1927, has smaller oxyhexasters (diameter 60–80 vs 88–131 µm) and diactine comitalia.

No type specimen was selected for *E. imperialis* by Ijima; the original type series is probably mostly still residing in the Tokyo Museum (Ogawa *et al.* 2010) but several were certainly sold to western museums, including the British Museum (Natural History) and Museum of Comparative Zoology (MCZ), Cambridge, Massachussetts. Review of the MCZ specimen showed the "floricome 2" spicules, newly recognised by us here, to be common, but smaller than those of the New Zealand specimens; floricome size-freqency plots (Fig. 3L) are conspicuously bimodal for both. The smaller floricome size class is absent from *E. aspergillum aspergillum* Owen, 1841 and *E. aspergillum regalis* Schulze, 1900; their floricome size-frequency plots are unimodal. The South Australian specimens, SAM S693 and S694, previously identified as *E. regalis* are reassigned here to *E. imperialis* based on this additional information.

Tabachnick *et al.* (2008) recently subjectively synonymised *E. regalis* with *E. aspergillum* but retained both as distinct subspecies. The authors remarked that both Schulze (1900) and Ijima (1901) commented on the similarity between these two species, but Schulze (1900) made no such comment. Tabachnick *et al.* (2008) also provided a table of spicule data of the holotype of *E. regalis*, including measurements of dermalia and atrialia which had never been provided. Unfortunately, that data conflicts with our own measurements of the holotype; it is likely those authors made a conversion error and their comment that megascleres of *E. regalis* are smaller than those of *E. aspergillum* is invalid. The general defence for their main synonymisation action was the necessity of taxonomic recognition of two new subspecies of *E. aspergillum* distinguished by geography and minor morphological features. Tabachnick *et al.* remark in discussion that the sigmatocome (our floricome 2) of the *E. imperialis* SAM specimens (then identified as *E. regalis)* is probably a young stage of floricome and therefore they infer its insignificance. Here we show clearly that floricome 2 of *E. imperialis* is not an immature floricome; it differs from floricome 1 in the number of terminal rays, in total size and primary ray length, which cannot increase in spicule maturisation; it is a replicated mature spicule type as evidenced by its repeated occurrence. With recognition of the sigmatocome as a special floricome variant, with its slightly inflated head and variable marginal tooth number, we consider it to have taxonomic significance.

Key diagnostic characters

- Mature body form is typically euplectelloid with sieve-plate, parietal oscula and transverse rows of oscula which are obliquely offset to form longitudinal spirals.

- Primary spicules are mainly large stauractins
- Microscleres include oxyhexasters, floricomes 1 & 2 ("sigmatocomes") and graphiocomes

Euplectella plumosum Tabachnick & Lévi, 2004

Figs 4, 5; Table 2

Euplectella plumosum Tabachnick & Lévi, 2004: 18.

Material examined. *South Kermadec Ridge*: NIWA 52173, NIWA Stn TAN0205/12, 34.091° S, 179.556° E, 1930–1705 m, 13 Apr 2002.

Bay of Plenty: NIWA 82050, NIWA Stn TAN1206/10, 37.059° S, 176.816° E, 1231–1202 m, 15 Apr 2012; NIWA 83479, NIWA Stn TAN1206/179, Site SL3c, slope, 37.317° S, 178.030° E, 1186 m, 01 May 2012.

Eastern Bay of Plenty: NIWA 82552, NIWA Stn TAN1206/68, Site CA3c, runaway sea valley canyon, 37.365° S, 177.879° E, 1229 m, 21 Apr 2012.

Lord Howe Rise (Australian EEZ): QM G316697, NIWA Stn TAN0308/47, 28.498° S, 161.260° E, 1530 m, 20 May 2003; QM G316716, NIWA Stn TAN0308/71, 32.066° S, 159.88° E, 1920–1934 m, 24 May 2003.

Type & locality. Holotype—MNHN HCL 541, Loyalty Basin and Norfolk Ridge, New Caledonia, 1070–2697 m.

Distribution. Known from South Kermadec Ridge, Bay of Plenty and Lord Howe Rise near Norfolk Island (Australian EEZ) (Fig. 4A), and from four stations around New Caledonia, between 20.590–24.178° S and 166.400–167.561° E (Tabachnick & Lévi 2004).

Habitat. Rooted in soft substratum by anchoring spicules. Depth range within New Zealand region, 1202–1930 m, worldwide, 1070–2697 m.

Description. Morphology of the New Zealand and Australian specimens is that of a typical tubular euplectelloid but the majority are badly damaged (Figs 4B–C). The larger figured specimen (Fig. 4B) consists of three fragments (body, body/root, root) of 5–7 cm length each, probably from a single individual; a sieve-plate was not included. The smaller specimen (Fig. 4C) was a flattened body of 6 cm length, with partial extremely delicate sieve-plate and root. NIWA 82552 and 83479 have long, attenuated roots, that are about the same length as their tubular bodies. The delicate and fragile body wall bears projecting prostal rays of primary hexactins (Fig. 4B), giving the external body wall a very spiky texture; these rays are broken and flattened in this specimen (Fig. 4D). Parietal oscula, 0.87 mm diameter (0.4–1.6, n = 38) are scattered without pattern throughout the body wall. Specimens are light brown in colour.

Skeleton. Choanosomal skeleton is a primary lattice of large stauractins (Fig. 4E) and hexactins with short proximal ray; their abundance ratios are 86/28 and 57/50 in the large and small specimens. These primary spicules are bound together by diactins to pentactins with one axis far longer that the others. Counts of primary comitalia, (n = 86) in specimen in Fig. 4B, are 37% pentactins, 33% diactins, 21% triactins, the remainder as stauractins and paratetractins and (n = 61) in specimen in Fig. 4C are 48% triactins, 34% diactins, 11% paratetractins, the remainder scattered between stauractins and pentactins. The loose bundles of basalia originate in the choanosome in the body wall in close association with the primary spicule layers and their shafts provide a major support for the lower body wall. Fusion of the lower body wall spicules by synapticula was in progress in the larger specimen but no spicule fusion was detected in the smaller specimen. A dense population of short-rayed (500–1000 µm) megascleres as filler spicules, such as are present in *E. semisimplex* **sp. nov.** (below), are absent. Oxyhexaster microscleres occur dispersed throughout the choanosome.

Ectosomal skeleton is dominated externally by the radial prostal rays of the choanosomal primary hexactins. These rays are supported by a bundle of distinctive diactine comitalia where they pass through the ectosomal layer. The ectosomal layers are supported by poorly preserved reticulations of sword-shaped (hilt-out) dermal hexactins and atrial pentactins. The surface-related microscleres are floricomes and graphiocomes, but oxyhexasters occur everywhere. The sieve-plate of the small specimen (Fig. 4F) seems to be in an early development stage. The primary support is formed by the upper tangential rays of the primary body wall hexactins; the radial rays are present but if a cuff was present it is here disorganised. Other supporting spicules of the sieve beams are thick strongly bent diactins, small diactins, triactins and tetractins. No proper surface dermalia or atrialia appear associated with the sieve beams. Anchorate basalia arise as choanosomal spicules but end up projecting externally as partly ectosomal spicules at the lower end of the specimen.

Spicules. Megascleres (Fig. 5; Table 2) are generally much larger in the larger specimen for principalia and their choanosomal comitalia; these differences are accepted as being due to age and maturity differences of the specimens and are not considered important for species identification or differentiation. The most obvious, but not the most abundant, principalia are the large hexactins with long prostal ray; the prostal ray is usually smooth or sparsely spined, but rarely is it coarsely thorned (Fig. 5A

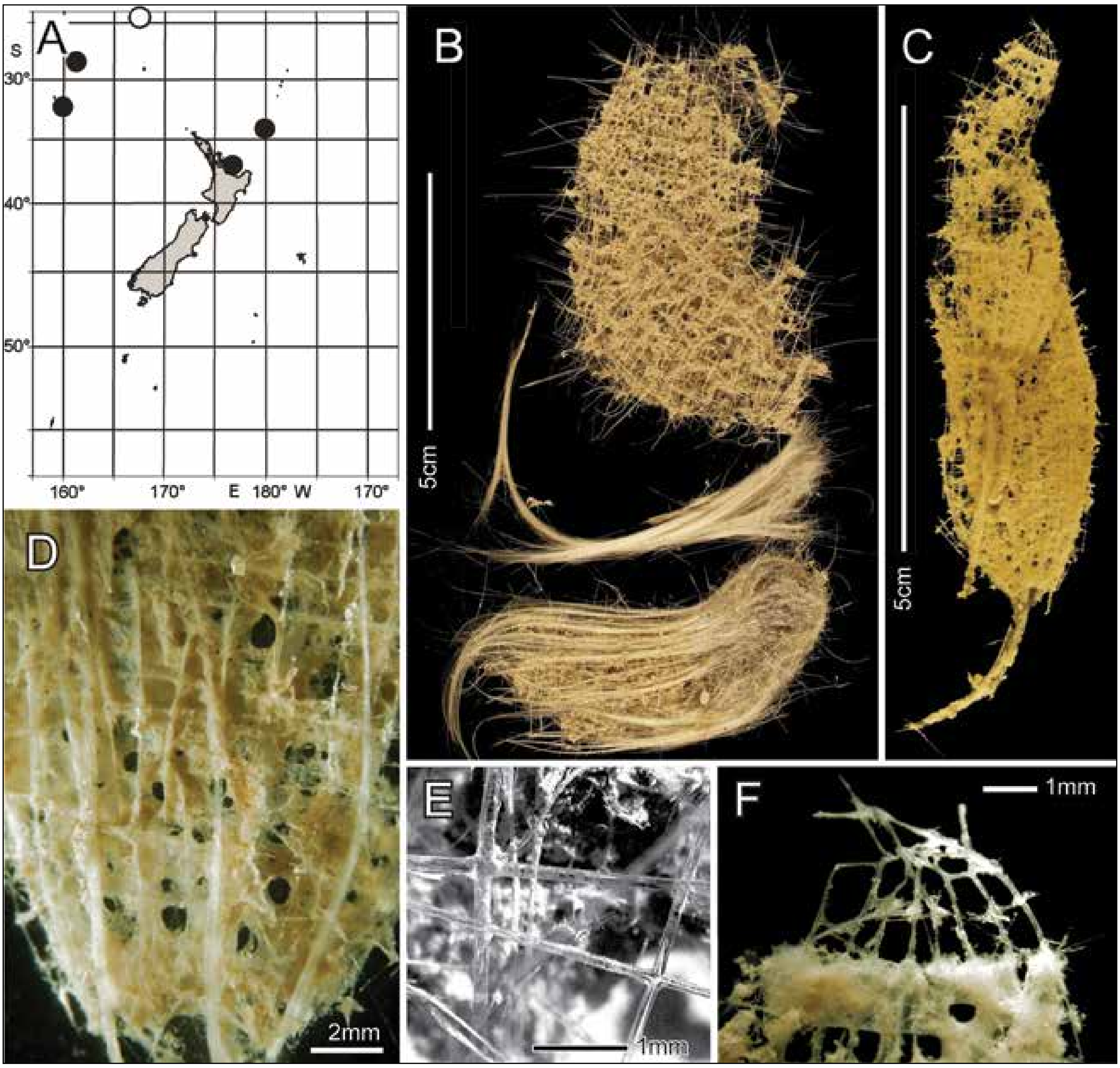


Figure 4. *Euplectella plumosum* Tabachnick & Lévi, 2004, distribution, morphology and skeleton: **A.** distribution in New Zealand waters and Australian EEZ. Open circle at the top of map is the collection site for one of the paratypes reported by Tabachnick and Lévi (2004); **B.** reference specimen NIWA 52173 in three pieces; **C.** NIWA 82050; **D.** lower part of specimen in C showing absence of prostal rays (broken over) and presence of scattered parietal oscula; **E.** centres of principal stauractins in NIWA 52173; **F.** arched sieve-plate of NIWA 82050.

left). The most abundant principalia are large stauractins (Fig. 5A upper) with longest rays longitudinal and shorter rays transverse; they are entirely smooth.

Dermalia are thin sword-shaped hexactins (Fig. 5B) with all rays being finely roughened and ray tips pointed. Atrialia are pentactins of similar size (Fig. 5C) but ray tips are rounded and slightly inflated. Comitalia of the principalia are diactins to pentactins (Fig. 5D), thin, smooth and several mm in length; their tips are rough, rounded and often slightly inflated. Comitalia of the prostal ray of the principal hexactins are distinctive short straight diactins with tapering rays and a more pronounced central swelling (Fig. 5E); their tips are rough and pointed. No prostalia marginalia are present.

Data on sieve-plate spicules are slight due to the small size of the structure in NIWA 82050 (Fig. 4C) and its absence in NIWA 52173 (Fig. 4B). The sieve beams contain three diactins (a thick curved to strongly-bent form, a long thin form, and a short thin form) and short thick triactins and stauractins (Fig. 5F). Prostalia basalia (anchors) are typical umbel-bearing diactins (Fig. 5G) with thorned lower shaft and smooth upper shaft; umbels have 3–9 teeth and the axial cross is located high up in the shaft.

Microscleres (Fig. 5; Table 2) of three types are present: floricomes, oxyhexasters and their variants, and graphiocomes; all three are common but no differential measure of abundance for all types was made. Floricomes

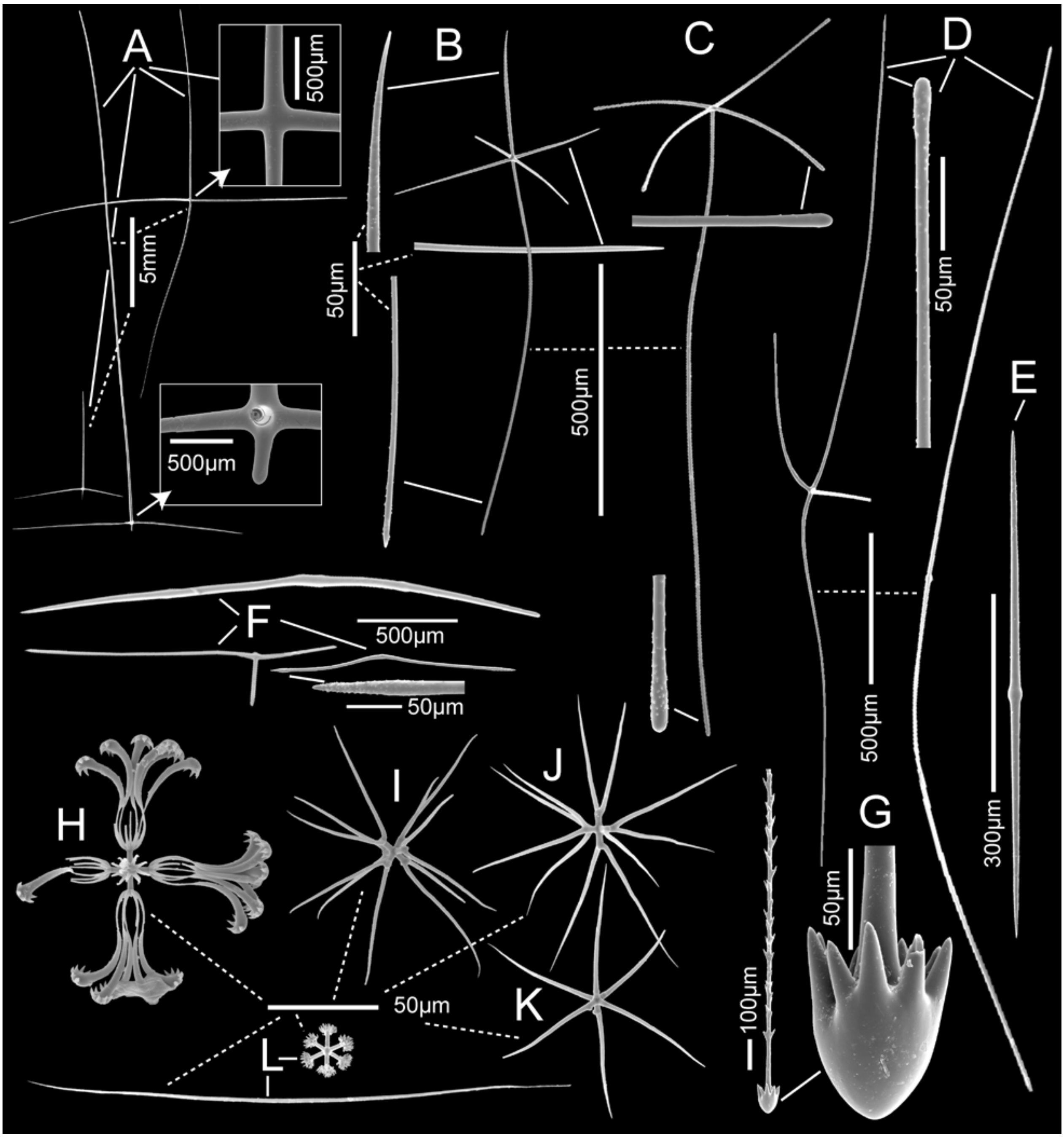


Figure 5. *Euplectella plumosum* Tabachnick & Lévi, 2004, spicules: **A.** principalia, a stauractin (above) and two hexactins (below); **B.** dermalium, sword hexactin, with magnified ray ends; **C.** pentactine atrialium with magnified ray ends; **D.** comital stauractin and diactin with a typical ray end magnified; **E.** small comital diactin of the prostal hexactine ray; **F.** two diactine and a triactine sieve-plate spicules; **G.** basal anchor with umbel magnified; **H.** floricome, damaged; **I.** oxyhexaster; **J.** hemioxyhexaster; **K.** oxyhexactin; **L.** graphiocome centrum and raphide (below). Sieve-plate spicules (F) from NIWA 82050; all others from NIWA 52173.

(Fig. 5H) are typical with each primary ray bearing 7–8 sigmoid terminals ending in an inflated head with 3–6 marginal teeth on one side. Oxyhexasters and their variants (Figs 5I–K) have short primary rays and 1–4 straight or slightly curved terminals. Within this group (oxy-tip) 86% are oxyhexasters, 10% are hemioxyhexasters, and 4% are oxyhexactins. Some certainly are pentactins and stauractins but the centra could not reliably be categorised for this. NIWA 82050 has distinctive hemioxyhexasters with all branching restricted to one axis and the intervening two axes bearing only simple, unbranched rays. Graphiocomes (Fig. 5L) are encountered only in pieces with each terminal ray bearing about 50 bases of the broken-off terminal rays. Total mean diameter of the reconstructed graphiocomes is 459 µm and 258 µm, for the larger and smaller New Zealand specimens, respectively.

Remarks. The combination of characters which exclude these New Zealand specimens from all known *Euplectella* species, except *E. plumosum*, are the presence of a cuff, prostal lateralia as primary hexactins, graphiocomes,

Table 2. Spicule dimensions (μm) of *Euplectella plumosum* Tabachnick & Lévi, 2004, from NIWA 52173 and NIWA 82050.

Parameter	**NIWA 52173**				**NIWA 82050**			
	mean	**s. d.**	**range**	**no.**	**mean**	**s. d.**	**range**	**no.**
Prostal & primary hexactin								
distal ray length (mm)	19.7	6.1	11.2–3	19	2.9	1.3	1.0–5	30
distal ray width	171	31	101–237	34	69	18	27–99	49
tangential ray length (mm)	7.0	1.8	3.3–10	34	2.7	1.1	0.2–5	59
tangential ray width	135	25	77–181	37	56	14	27–79	56
proximal ray length	482	81	250–709	33	244	115	97–562	46
proximal ray width	121	25	59–159	35	56	13	24–88	49
Primary stauractin								
longitudinal ray length (mm)	10.7	2.6	4.8–19.9	75	4.2	1.0	2.0–6.4	50
transverse ray length (mm)	8.6	2.3	2.5–14.4	61	3.1	0.6	1.5–4.1	24
ray width	136	27	64–182	86	67	13	33–94	79
Dermalia, hexactin								
distal ray length	239	34	157–296	24	204	26	160–288	50
distal ray width	5.9	1.2	4.5–9.8	26	5.9	1.9	3.7–15.2	50
tangential ray length	231	23	173–275	26	220	25	175–284	50
tangential ray width	6.0	1.0	4.6–8.9	25	5.9	1.7	3.6–12.7	50
proximal ray length	749	235	421–1307	18	930	343	410–1658	50
proximal ray width	5.6	1.5	3.5–9.6	27	5.8	1.7	3.7–11.7	50
Atrialia, pentactin								
tangential ray length	283	72	140–481	39	280	53	177–500	50
tangential ray width	6.9	1.6	4.5–10.0	47	8.3	1.7	4.2–13.9	50
proximal ray length	821	234	376–1331	26	797	241	185–1443	50
proximal ray width	7.4	2.0	4.0–12.0	41	8.5	1.7	4.2–14.1	50
Comital diactin to pentactin								
long axis length (mm)	13.2	3.2	10.2–19.5	7	3.6	1.1	2.3–5.6	9
ray width	13.6	5.3	5.2–27.9	50	8.1	2.1	3.7–11.3	15
Comitalia of prostalia								
length	639	n. a.	511–735	3	685	98	441–819	50
width	10.6	n. a.	6.6–13.9	3	13.5	3.2	5.1–19.0	50
Sieve thick diactin								
length (mm)	n. a.	n. a.	n. a.		1.8	0.9	0.8–3.9	9
width	n. a.	n. a.	n. a.		31.1	12.6	15.1–60.8	10
Sieve short diactin								
length	n. a.	n. a.	n. a.		814	172	483¬–1177	38
width	n. a.	n. a.	n. a.		13.6	2.9	7.1–19.3	50
Sieve long diactin								
length (mm)	n. a.	n. a.	n. a.		1.7	0.3	1.3–2.3	17
width	n. a.	n. a.	n. a.		10.6	3.2	4.7–18.4	24
Sieve short triactin/stauractin								
long ray length	n. a.	n. a.	n. a.		278	112	171–467	8
ray width	n. a.	n. a.	n. a.		12.9	3.2	7.5–17.0	9
Basalia, anchor								
umbel width	74.4	3.3	69.6–79.0	10	84.0	9.5	62.6–102.0	38
umbel height	96.5	2.6	91.8–101.1	10	96.6	7.7	70.2–111.0	38
axial cross height	223	30	175–257	5	203	38	125–310	38
smooth shaft width	n. a.	n. a.	n. a.		29.4	7.3	18.9–41.7	43
Floricome								
diameter	120.8	8.9	99.0–138.0	50	104.3	6.5	85.7–122.5	50
primary ray length	8.9	1.4	5.3–11.7	50	9.3	1.0	6.5–11.2	50
secondary ray length	52.2	3.7	43.9–58.8	50	44.0	2.9	35.2–52.4	50
Oxyhexaster								
diameter	122	13	87–151	50	95.8	8.9	77.5–118.0	50
primary ray length	6.3	1.0	3.8–8.4	50	8.0	2.2	4.9–20.4	50
secondary ray length	55.0	5.2	36.4–66.6	50	41.3	3.9	32.9–49.1	50
Oxyhexactin								
diameter	140	11	123–161	11	n. a.	n. a.	n. a.	
Graphiocome								
centrum diameter	21.8	2.1	17.1–26.8	50	20.7	2.3	15.1–25.2	50
secondary ray length	224	26	131–272	50	119	19	86–174	50

medium-size floricomes with 7–8 secondary rays per tuft, regular and hemi- oxyhexasters, and absence of prostalia marginalia and other microsclere categories. In the original description of *E. plumosum* by Tabachnick and Lévi, the stauractine principalia, which are very abundant in the New Zealand specimens, were almost entirely ignored with emphasis placed upon the hexactine prostal principalia. Their cursory mention of stauractin principalia is deceptive and suggests that their description was based on examination of small surface fragments rather than digests of large entire wall fragments.

Key diagnostic characters

- Body typically euplectelloid being tubular, thin-walled and penetrated by parietal oscula, and thin hair-like root
- Principalia include hexactins with long distal rays that serve as prostalia lateralia and give a spiky texture to the surface
- Microscleres are floricomes, oxyhexasters and graphiocomes

Euplectella semisimplex sp. nov.

Figs 6, 7, Table 3

Material examined. Holotype NIWA 82452, NIWA Stn TAN1206, Eastern Bay of Plenty, 37.504° S, 177.619° E, 696–689 m, 20 Apr 2012.

Type locality. Eastern Bay of Plenty (Fig. 6A).

Distribution. Known only from the type locality.

Habitat. Attached to soft substratum by root spicules; depth range 696–689 m.

Description. Morphology of the holotype (Fig. 6B) is a cylindrical euplectelloid, presumably anchored in soft sediment by rooting spicules extending as a single tuft from the bottom. Apically, it lacks a cuff, but is terminated by a transverse sieve plate remaining only as remnants in the collected specimen (Figs 6C–E). The thin body wall is smooth and even, without ridges or projections, but the dermal surface has been lightly and evenly abraded during collection. The framework consists of strictly longitudinal and transverse spicule bands (Figs 6B, D, F) without any obvious significant oblique elements. No spicule fusion is present. Dimensions of the holotype are 56 mm in body length, 22 mm in diameter and 1.23 (0.84–1.58) (n = 15) mm in wall thickness. Texture is soft but not fragile; surface of outer side is lightly and evenly abraded so dermal spicules occur only in patches and parietal oscula are thus difficult to distinguish from inhalant and exhalant channels (Fig. 6F). Those openings on the outer surface with intact margins are considered parietal oscula and are distributed in longitudinal and oblique rows. Semi-stout pentactin and hexactin spicules are common in the parietal oscula margins and are thus considered oscularia (Fig. 6C–D). Parietal oscula are 0.82 (0.12–2.43) (n = 38) mm in diameter. The inner surface is intact. Colour is white excepting the lower part of the root tuft which is gray.

Skeleton. Choanosomal skeleton consists of a rectangular framework composed of large primary stauractins surrounded by long and thin comitalia. Spaces between the main fascicles are filled by a mixture of short-rayed choanosomal spicules: diactins, tauactins, stauractins, paratetractins, pentactins and hexactins. Fusion of choanosomal spicules is not present.

Ectosomal skeleton of the wall is mainly composed of two forms of sword hexactins on the dermal surface and pentactins on the atrial surface. The sieve plate, present only as remnants, has cylindrical beams covered by a layer of stout hexactins and pentactins over an axial skeleton of large diactins and triactins. Sieve beams are 0.07–0.12–0.17 (n = 25) mm in diameter. Basalia consist of diactine anchors which emanate from all over the lower body in a single broad tuft.

Spicules. Megascleres (Figs 6, 7; Table 3) are primary stauractins, dermalia, atrialia, choanosomalia, comitalia, marginal spicules, sieve plate spicules, parietal oscularia and basal anchors. Primary stauractins (Fig. 7A) are smooth and perfectly rectangular with the two longest rays of one axis oriented longitudinally and the two shorter rays in the perpendicular axis oriented laterally and slightly bent back to conform with body curvature. Most are broken and intact tips were not found. Dermalia occur as two types, a thin regular sword hexactin (Fig. 7B) and a thicker sword hexactin with longer hilt (Fig. 7C). The regular dermalium has a thin, tapering distal ray ornamented with small spines scattered along its length; it ends in a pointed tip. The tangential and proximal rays are mainly smooth and sharp-tipped but the ends are sparsely spined on tangential rays and more extensively spined on the proximal ray. The thicker dermalium has a distal ray which is not tapered but slightly inflated and bears larger spines. The other rays are like those of the regular thin form. Atrialia (Fig. 7D) are regular pentactins with tangential rays of equal length. Their rays are like the corresponding ones of dermalia. Choanosomal megascleres (Fig. 7E) are mainly tauactins (34% of 140) and pentactins (26%) with fewer diactins (19%), hexactins (9%), stauractins (7%) and paratetractins (5%). Rays are smooth and ends are subterminally rough with smooth bluntly-pointed tips. Comitalia (Fig. 7F) are mainly tauactins (57% of

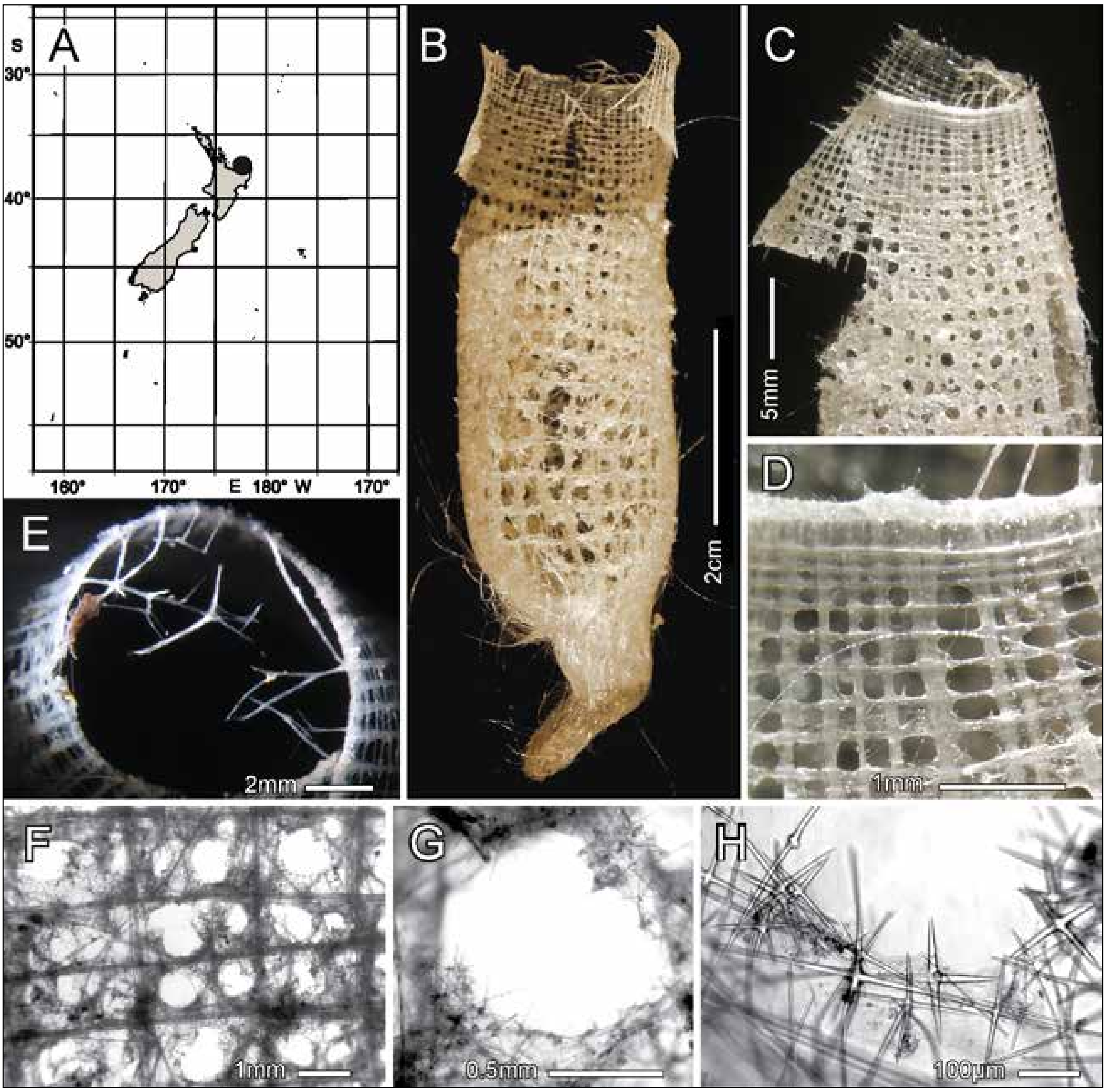


Figure 6. *Euplectella semisimplex* sp. nov., holotype NIWA 82452, distribution, morphology and skeleton: **A.** distribution in New Zealand waters; **B.** upper wall partially removed for sampling; **C.** lateral view of upper end showing residue of sieve plate; **D.** closer view of the margin and rectangular arrangement of main skeletal meshes; **E.** terminal view showing sieve plate residue; **F.** abraded dermal surface showing difficulty of distinguishing parietal oscula from exhalant channels; **G.** parietal osculum with margin mostly intact; **H.** oscularia in the parietal osculum margin.

149) with fewer stauractins (17%), paratetractins (17%) and pentactins (9%); there are no diactine or hexactine comitalia. They are like choanosomalia in smoothness and width but they are over 10× in length and have at least twice the number of subterminal spines as those. Marginal spicules (Fig. 7G) are mainly hexactins (55% 0f 159) and diactins (39%) with few tauactins (5%) and stauractins (1%); there are no marginal pentactins or paratetractins. The hexactins are large, robust spicules with one or two short rudimentary rays but all are broken in various ways. They approximate the shape of spicules that support the cuff in other euplectellids but the longest rays here up to 2 mm are consistent with a lack of cuff development in this species. The other marginal spicules are entirely similar to their choanosomal counterparts. Sieve spicules (Fig. 7H) are mostly diactins (89% of 150) with very few pentactins (6%), tauactins (3%) and stauractins (2%). Diactins include some very robust, strongly curved forms that form the axis of sieve beams but large numbers of thinner forms forming the surrounding sheath are more common. Parietal oscularia (Fig. 7I) are mainly stout pentactins (72% of 50) with some hexactins (18%) and stauractins (10%). Basal anchors (Fig. 7J) are diactins, as in other *Euplectella* spp., with the short ray bearing the multi-toothed anchor and the longer ray having proclined thorns along most of its length but ultimately being

Table 3. Spicule dimensions (µm) of *Euplectella semisimplex* **sp. nov.**, from holotype NIWA 82452.

Parameter	**mean**	**s. d.**	**range**	**no.**
Primary stauractin				
longitudinal ray length (mm)	8.0	1.7	5.0–10.5	14
transverse ray length (mm)	5.4	1.0	4.0–6.7	5
ray width	60.9	9.3	28.6–74.7	79
Regular sword dermalium				
distal ray length	256	82	120–525	32
distal ray width	9.4	2.3	5.7–15.8	50
tangential ray length	234	55	138–367	45
tangential ray width	9.1	2.1	6.2–15.1	50
proximal ray length	1036	263	493–1478	26
proximal ray width	9.2	2.4	5.9–16.3	50
Thick sword dermalium				
distal ray length	565	101	347–766	21
distal ray width	20.7	3.7	13.3–28.2	35
tangential ray length	285	70	182–486	29
tangential ray width	18.3	3.0	12.4–24.5	35
proximal ray length	1450	436	649–2004	13
proximal ray width	18.8	3.0	13.2–25.0	35
Atrialium				
tangential ray length	328	95	176–677	61
tangential ray width	10.0	2.5	5.7–17.9	61
proximal ray length	412	134	200–790	61
proximal ray width	10.5	2.6	5.9–16.5	61
Choanosomal diactin				
length	936	441	286–1676	27
width	10.3	3.8	5.6–24.4	27
Choanosomal tauactin				
paired ray length	673	285	264–1590	47
unpaired ray length	458	276	20–1266	47
ray width	14.3	3.6	7.9–23.0	47
Choanosomal stauractin				
long ray length	676	303	209–1116	10
short ray length	353	157	180–627	10
ray width	14.1	4.4	6.0–20.4	10
Choanosomal paratetractin				
paired ray length	880	321	427–1277	7
unpaired ray length	360	161	163–642	7
ray width	15.6	3.5	10.0–20.3	7
Choanosomal pentactin				
long tangential ray length	500	317	93.7–1190	36
short tangential ray length	300	126	77.9–605	36
proximal ray length	567	126	60–3377	36
ray width	13.7	4.3	6.3–23.2	36
Choanosomal hexactin				
long ray length	140	68	54–286	13
short ray length	79	39	19–150	13
ray width	7.8	3.0	3.8–14.2	13
Comitalium (mixed)				
length (mm)	9.71	1.59	5.6–12.2	23
comitalium ray width	15.0	4.5	6.3–25.4	70
Margin diactin				
length (mm)	1.1	0.5	0.4–2.2	36
width	7.8	2.8	2.4–18.7	62
Margin hexactin				
total length	799	489	314–2016	33
ray width	12.9	6.5	4.3–31.3	87
Sieve diactin				
length (mm)	1.80	1.06	0.4–8.1	111
width	12.9	7.3	2.8–36.1	134
Parietal oscularium				
ray length	112	25	60–212	50
ray width	13.2	3.3	8.1–21.8	50
Basal anchor				
umbel width	55.8	5.4	49.1–66.4	17
umbel height	61.2	3.5	55.4–69.1	17
axial cross height	227	38	152–312	17
Floricome				
diameter	99.9	5.5	82.0–112.6	100
primary ray length	8.7	0.9	6.5–11.0	100
secondary ray length	41.3	2.5	34.6–46.1	100
Graphiocome centrum				
diameter	21.5	2.1	13.4–26.3	59
secondary ray length	160	14	114–194	64

smooth in its upper portion. Tooth number of the anchor umbel varies from 6.8 (4–11) (n = 17).

Microscleres (Fig. 7; Table 3) are only floricomes and graphiocomes. Floricomes (Fig. 7K) are large and robust with each primary ray supporting 8.15 (6–9) (n = 33) sigmoid terminal rays ending in an inflated head with 4.84 (3–7) (n = 97) large marginal teeth; a small patch of short knobs (not longer than their diameter) occurs inconsistently on the outer distal curve of the terminal rays but the surfaces are otherwise smooth. There is no smaller class of floricome. Graphiocomes (Fig. 7L, M) have short primary rays, each ending distally in a flattened ovoid which carries the short basal stubs of 50–60 terminal rays (one counted as 57) on its outer surface. The primary rays are ornamented with a few small knobs (0–4 per ray) but are otherwise smooth. The terminal rays are thin and straight, sparsely covered by short reclined spines; the distal end is sharply pointed while the basal end bears three short rays around the facet where it was connected to the stub on the primary ray swelling. Both microsclere types are widely distributed through the body, including the margin, but both are absent from the sieve plate.

Etymology. Named for the partial similarity of the new species to *Euplectella simplex* Schulze, 1896, from the Andaman Sea; the microscleres of the latter are restricted to floricomes and graphiocomes as in the new species.

Remarks. We consider this rare New Zealand euplectellid to be old enough and large enough to have expressed all its spicules, and the complete lack of oxyhexasters is a major character. Among the 17

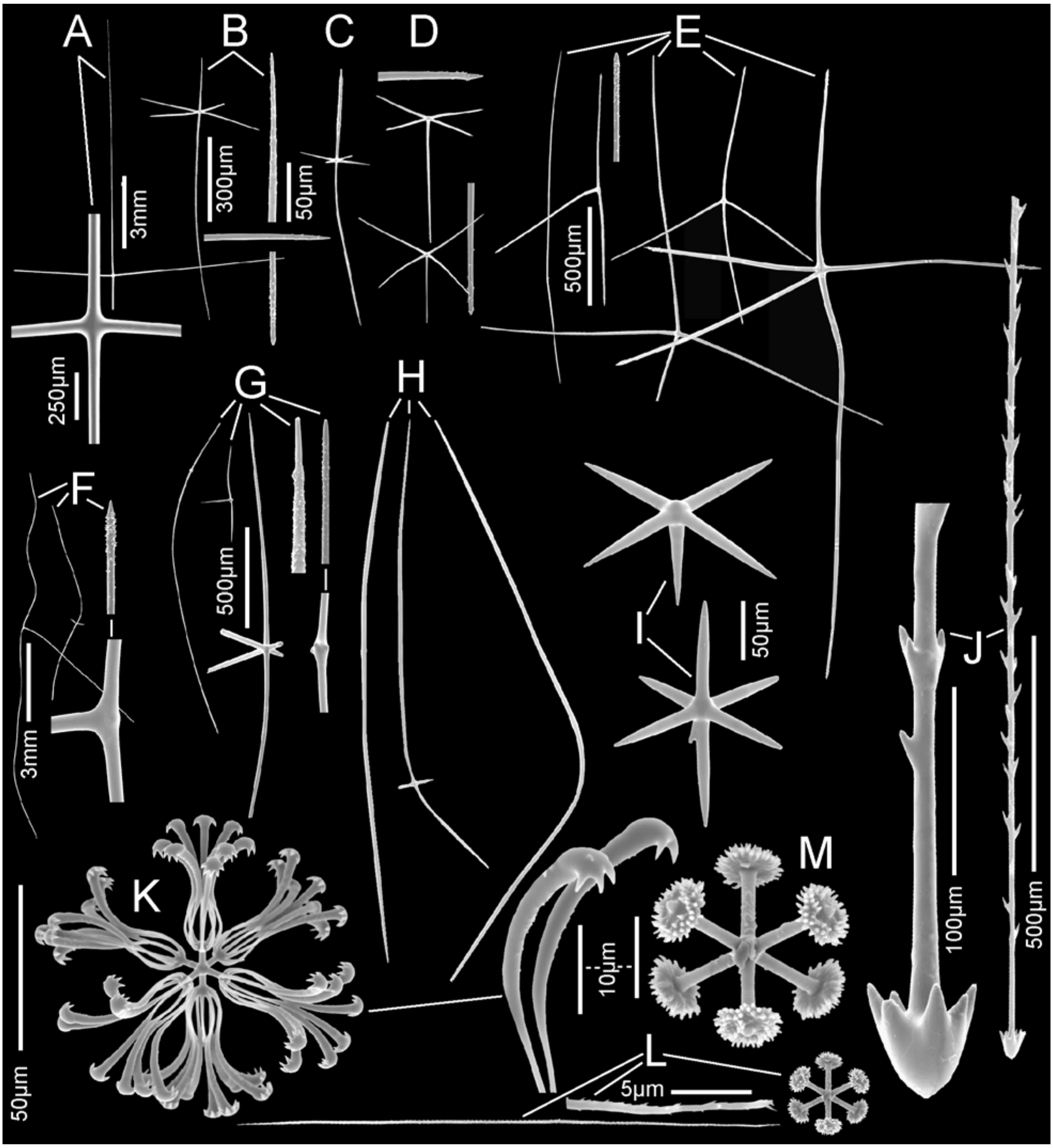


Figure 7. *Euplectella semisimplex* **sp. nov.**, holotype NIWA 82452 spicules: **A.** primary stauractin (broken) with enlargement of its centre; **B.** regular sword hexactin dermalium with enlarged ray ends; **C.** thick dermalium; **D.** two whole atrialia and enlarged ray ends; **E.** choanosomal diactin, tauactin, stauractin, paratetractin and large pentactin with enlarged ray end of tauactin; **F.** comital tauactin and tetractin with enlarged tauactin parts; **G.** margin diactin, tauactin, hexactin and enlarged diactin parts; **H.** sieve spicules: two whole diactins and tetractin; **I.** oscularia: pentactin and hexactin; **J.** basal anchors at different magnifications; **K.** floricome with two enlarged terminal rays; **L.** graphiocome centrum and terminal raphide (lower) at same scale of floricome with enlarged basal part of raphide; **M.** graphiocome central part enlarged to show detail. Scale of all magnified megasclere parts without a scale as in B; scale for whole megascleres in C and D as in B; scale of H as in G.

known and accepted species of the genus *Euplectella*, there are only two that have microscleres restricted to floricomes and graphiocomes: *E. simplex* Schulze, 1896 and *E. nodosa* Schulze, 1886. The New Zealand specimen cannot be assigned to the North Atlantic *E. nodosa* since that species has pentactin primaries and three tooth anchors while the primaries here are stauractins and the anchors are multi-tooth. In comparing the New Zealand specimen with *E. simplex* there are many similarities but also some major differences; we consider Schulze's report of anchorate pentactins as basalia in a single specimen of *E. simplex* to be very dubious and of no significance since this is unique among *Euplectella* and probably attributable to contamination of the root tuft with foreign spicules, a common phenomenon. More importantly *E. simplex* is reported to have comitalia mostly as diactins (vs none present here), sieve spicules as mostly tauactins (vs mostly diactins here with tauactins very rare), choanosomalia as mostly hexactins (vs hexactins rare here; most choanosomalia are tauactins and pentactins), one type of dermalium (vs two distinct dermalia here), floricomes with eight claws (vs 3–7 here), and other spicule dimensional differences. We thus conclude that the New Zealand specimen represents a new species, here designated as the holotype of *Euplectella semisimplex* **sp. nov.**

Key diagnostic characters

- Body is typically euplectelloid with parietal oscula and sieve plate
- Primary spicules are only large stauractins
- Microscleres include only one class each of floricome and graphiocome

Euplectella **sp. indet.**

Fig. 8

Material examined. *Mahia Peninsula, Hawke's Bay*: NIWA 88175, NZOI Stn E713, 25 km southeast of Table Cape, (Kahutara Point), 39.347° S, 178.283° E, 935 m, 22 Mar 1967.

North Cape: NIWA 71031, NZOI Stn E880, 35.333° S, 172.333° E, 1029 m, 22 Mar 1968.

Bay of Plenty: NIWA 52827, NZOI Stn Z9159, SMT9801/41, 36.169° S, 176.744° E, 967 m, 25 Jun 1998.

Off Dunedin, southeast coast of the South Island: NZMNZ PO.000491, FRV *James Cook* Stn J4/50/84, 44.950° S, 173.762° E, 1190–1200 m, 23 Feb 1984.

Lord Howe Rise (*International waters*): NIWA 70949, NZOI Stn Z11035, TRIP1630/23, 37.5° S, 168.2° E, 953 m, 24 Mar 2002.

Louisville Seamount Chain (International waters): NIWA 90190, JAMSTEC Submersible *Shinkai* Stn YK13-11/1372/4 onboard RV *Yokosuka*, 26.606° S, 174.566° W, 2199 m, 26 Oct 2013.

Distribution. Lord Howe Rise and Louisville Seamount Chain (International waters), North Cape, Bay of Plenty, Māhia Peninsula, Hawke's Bay, off Dunedin, southeast coast of the South Island (Fig. 8A).

Habitat. Presumably all are rooted in soft substrate; depth range within New Zealand area is 935–1200 m.

Description. Morphology of all six specimens (Figs 8B–E) are fragmentary, none including more than one-half a specimen; all include at least a fragment of a fused reticulate body wall within which primary stauractins can be identified. Rectangular meshes are delineated by major longitudinal and transverse beams with oblique beams crossing and subdividing the concerned rectangular mesh. Three of the specimens contain basalia but the umbellate tips are found in only two specimens. No indication of a sieve-plate is present. Specimens range in size from 2 to 8 cm in largest dimension. Texture is tough but slightly flexible. Colours vary from white to light brown.

Skeleton. Choanosomal skeleton is a rectangular lattice supported by stauractin principalia. Loose and fused megascleres are present in all but NIWA 88175 and consist mainly of triactins with some pentactins. None have prostalia marginalia or microscleres. Ectosomal skeleton is absent except for basalia in two specimens.

Spicules. Megascleres (Fig. 8) are stauractin principalia fused into the primary lattice and unmeasurable. The basal anchor measurements for NIWA 71031 are: umbel width, 78.1 & 71.7 µm; umbel height, 97.5 & 95.6 µm; axial cross height 385 & 518 µm. For NIWA 88175 they are: umbel width, 68.0 & 77.4 µm; umbel height, 124 & 112 µm; axial cross height, 306 & 308 µm. Means of the four anchors (Figs 8F, G) are: anchor width, 74 µm; anchor height, 107 µm; axial cross height, 380 µm.

Microscleres are absent in all specimens.

Remarks. These fragments belong to the genus *Euplectella* because of the general body form, and the rectangular lattice supported by stauractin principalia. They are thus, most likely to belong to the same species. Unfortunately, the specimens lack microscleres and other specific megasclere types, and cannot be assigned to either of the species described above or other known species. The basalia measurements favour *E. imperialis* in umbel height and *E. plumosum* in umbel width. Until further specimens with full spiculation are collected, we can go no further in describing this species.

Genus ***Holascus*** Schulze, 1886

Holascus Schulze, 1886: 39.

Holascella (in part – *H. euonyx* Lendenfeld, 1915: 44; *H. taraxacum* (Lendenfeld 1915: 29).

Diagnosis. Body is tubular with a sieve-plate in some species, lophophytous, with thin walls and a tuft of anchor-like basalia. Choanosomal spicules are hexactins, pentactins, stauractins, and tauactins that vary in number and combination in different species. Additional choanosomal spicules are short-rayed diactins and other short-rayed derivatives of hexactins. Dermalia and atrialia are usually pinular hexactins, atrialia rarely pentactins. Mi-

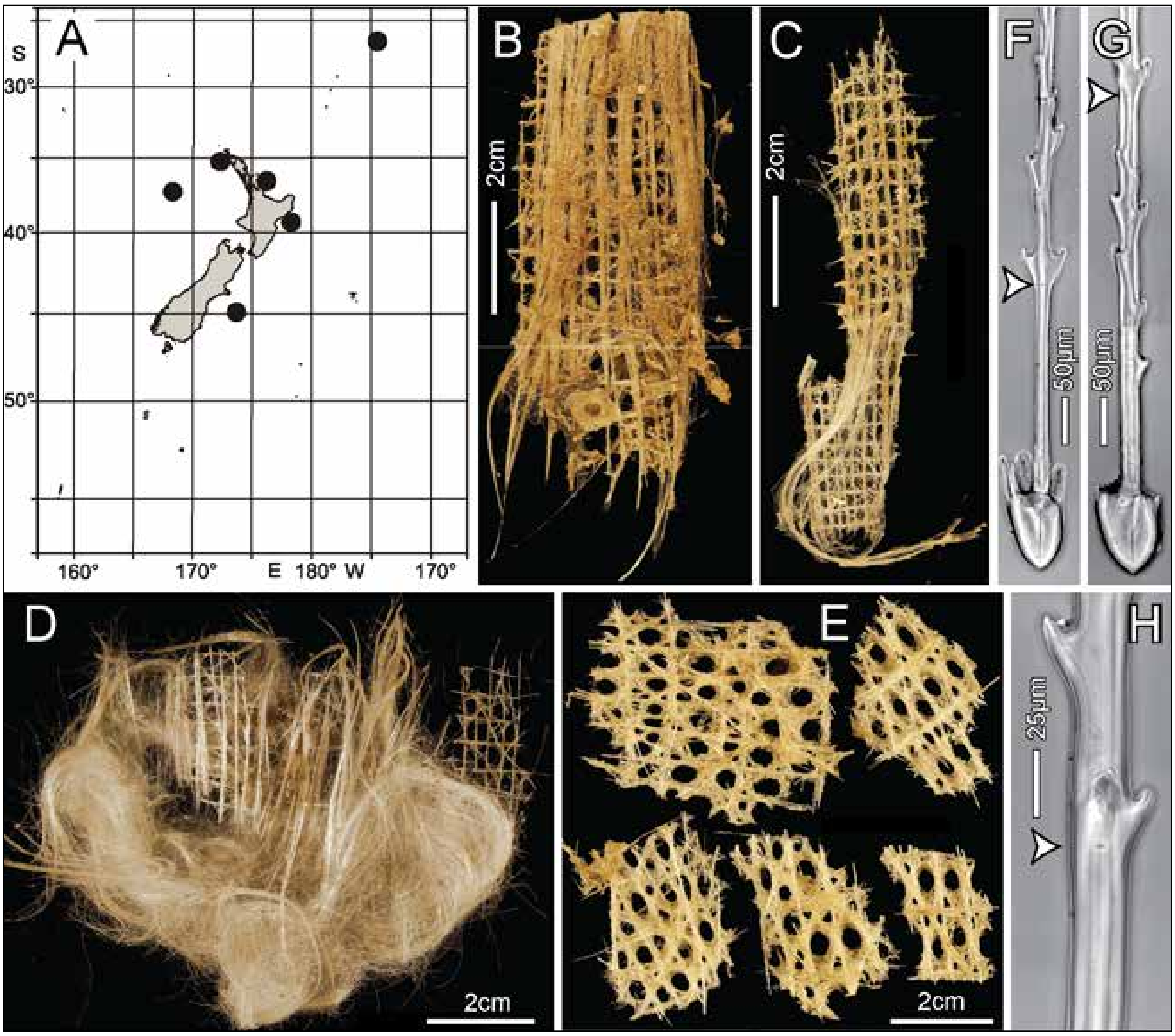


Figure 8. *Euplectella* **sp. indet.**, distribution, morphology and skeleton: **A.** distribution in New Zealand waters; **B.** NIWA 70949; **C.** NIWA 71031; **D.** NIWA 88175; **E.** NIWA 52827; **F.** lower end of one of two basalia from NIWA 88175 with four marginal teeth and axial cross indicated by arrowhead; **G.** lower end of one of two basalia from NIWA 71031 with indeterminate marginal teeth number but axial cross indicated by arrowhead; **H.** closer view of axial cross of G.

croscleres are various combinations of hexasters, hemihexasters, hexactins, triactins, diactins, discohexasters, hemidiscohexasters, discohexactins, onychohexasters, hemionychohexasters, onychohexactins, graphiocomes, drepanocomes, and tylohexasters (modified from Tabachnick 2002).

Type species. *Holascus stellatus* Schulze, 1886 (by original designation).

Holascus tasmanensis sp. nov.

Figs 9, 10; Table 4

Material examined. Holotype NIWA 104128, NZOI Stn U203, North Tasman Basin (International waters), 35.553° S, 159.097° E, 4744 m, 29 Sep 1982.

Type locality. North Tasman Basin (International waters).

Distribution. Known only from the type locality (Fig. 9A).

Habitat. Presumably rooting by a tuft of basal anchors in soft sediment; depth, 4744 m.

Description. Morphology of the holotype (Fig. 9B) is tubular without a sieve covering the terminal osculum. The lower body ends at a clear interface (Fig. 9C) from which the more transparent non-living root tuft continues. Dimensions of the total specimen are 127.2 mm in length comprised of a body 79.1 mm and root tuft 48.1 mm in length; maximum body width is 14.7 mm and wall thickness is 3.2 mm. The cylindrical atrium is 8.3 mm in diameter with a simple oscular edge. Texture is soft and felt-like to touch; easily deformable and fragile. Surface is macroscopically smooth but regularly lumpy under dissecting microscopy (Fig. 9D). Colour is light brown.

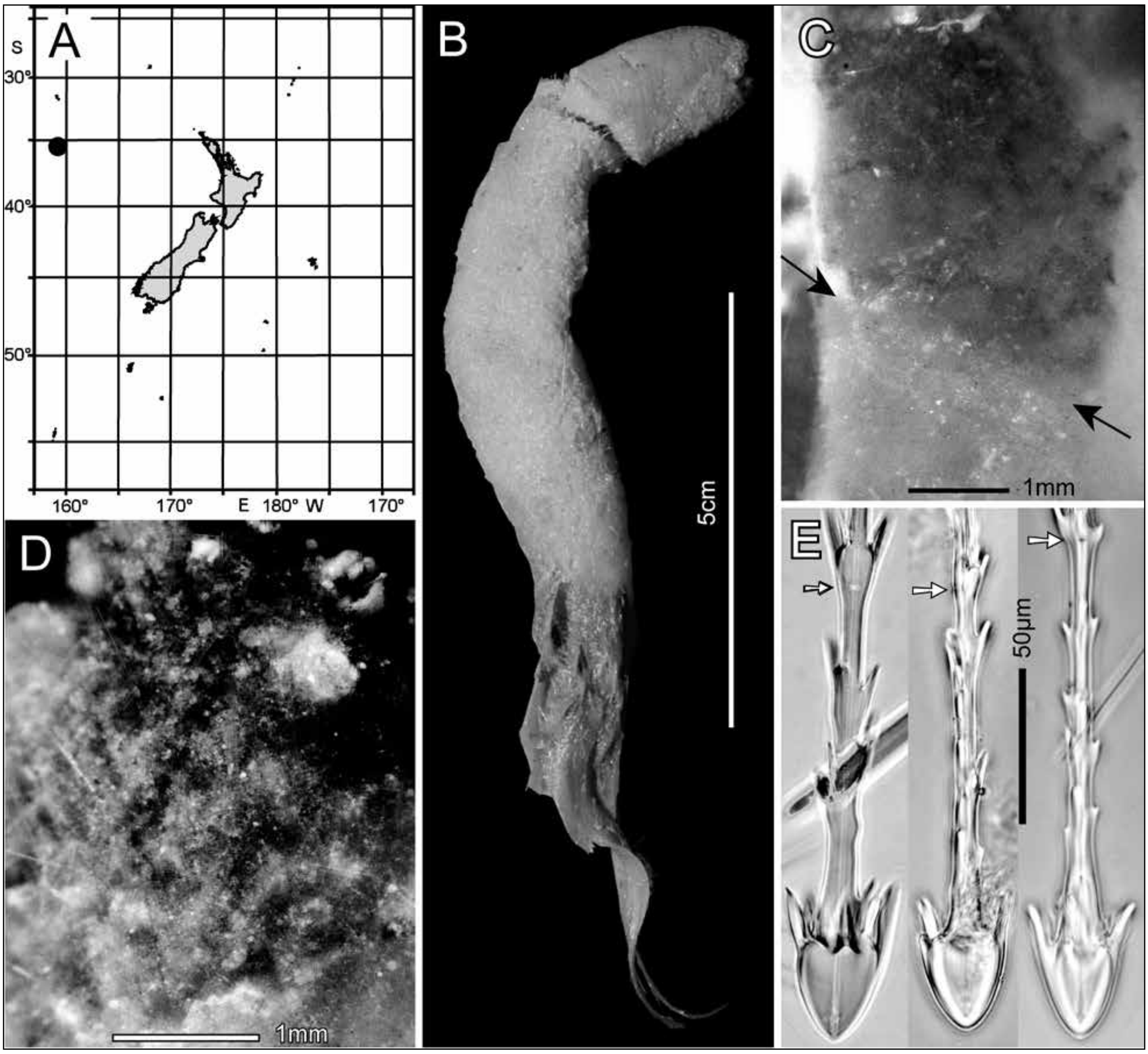


Figure 9. *Holascus tasmanensis* **sp. nov.**, holotype NIWA 104128, distribution and morphology: **A.** distribution in International waters; **B.** preserved holotype; **C.** bottom of body and beginning of the root tuft (discontinuity marked by arrows); **D.** lateral body wall surface showing roughness; **E.** lower ends of three basal anchors with axial cross positions indicated by white arrows.

Skeleton. Choanosomal skeleton is a reticulation of loose spicules, without discernable organisation; there is no evidence of spicule fusion. Principalia are large pentactins with short unpaired rays. Choanosomal megascleres with long or tangential rays of 1–2 mm length and 11–13 µm thickness are triactins, paratetractins and pentactins, less commonly stauractins and diactins. Smaller megascleres in the 150–750 µm size range acting as choanosomal space-filling spicules are simple curved diactins, unique diactins here termed as "dianchors" and regular hexactins are very abundant. Loose microscleres and the proximal parts of the basal anchors are choanosomal skeletal components.

Ectosomal skeleton consists of spicules associated with surface membranes or projecting for a significant distance from the living surface (e.g. basalia). These include surficial sword hexactins with outward projecting hilt as the dermalia and atrialia. Parts of the basal anchors extending from the body are the smooth upper shafts, the thorned lower shafts and umbel-bearing lower tips. Microscleres occur in all surface tissues as ectosomal elements.

Spicules. Megascleres (Figs 9, 10; Table 4) are principal pentactins, choanosomal diactins, triactins, stauractins, paratetractins, pentactins, small filler diactins, hexactins and dianchors, anchorate basalia. The principal pentactins (Fig. 10A) are large spicules with smooth cylindrical rays and rough rounded tips; one tangential ray is twice as long as the others while the proximal ray is less than half the length as the shortest tangential ray. The large choanosomal spicules (1–5 mm length) include uncommon diactins (Fig. 10B), common triactins

(Fig. 10C), uncommon stauractins (Fig. 10D), common paratetractins (not figured), and common pentactins (Fig. 10E). These all have smooth cylindrical rays with rough rounded tips. Occasionally the tips of any of these may be greatly inflated (Fig. 10F). The surficial sword hexactins (Fig. 10G) have a slight scaling on the distal ray but smooth cylindrical rays for the other five. All rays are more sharply pointed than the choanosomal spicules. Thin diactins (Fig. 10H) serve as filler spicules and are very abundant everywhere; they are often confused with the graphiocome secondary rays which with they share similarity of size. Thin, regular hexactins (Fig. 8I) are also extremely common filler spicules; their broken rays are also easily confused with graphiocome secondary rays.

Anchorate basalia (Fig. 10J) are common in every spicule preparation. These are diactins with the axial cross located in all but one spicule in the shaft above the small umbel (Fig. 9E). Diactins of moderate length with swollen ends emulating the umbels of basal anchors (Fig. 10K) are encountered throughout the choanosomal tissues as a third class of filler spicules. They lack the reclined shaft thorns of true basal anchors and instead have a sparsely spined shaft and a swelling at the medial axial cross location.

Microscleres (Fig. 10; Table 4) are oxyhexasters and graphiocomes, both extremely common. Oxyhexasters (Fig. 10L) are rather robust microscleres with a swollen centrum, thick primary rays and thinner secondary rays; all rays are smooth. Secondary rays number 3 (2–4) and 36% of all rays have curved tips; 75% of all oxyhexasters have at least one curved tip. Graphiocomes (Fig. 10M) are typical of the family with no special characters. Reconstruction using the mean of centrum measurements gives total diameters of these spicules as 595 (515–682) µm.

Other spicular elements are encountered in preparations that do not belong to any of the elements described above. They are mostly long spined axes (0.2–2+ mm) often with one tip intact; spicules with both ends have not been found. The most striking difference between these rather common components is the rampant ornamentation of spines all over the shaft, a feature rarely encountered in the more distinctive choanosomal spicules here and in other hexactinellids. From evidence repeatedly seen we strongly suspect these are dianchor spicules upon which special secondary silica deposition occurs. Deformations of dianchor spicules are seen but generally recognised as such. If such deposition continued, the original form of the spicule would be

Table 4. Spicule dimensions (µm) of *Holascus tasmanensis* **sp. nov.**, from holotype NIWA 104128

Parameter	mean	s. d.	range	no.
Primary pentactin				
longitudinal ray length (mm)	6.9	1.9	3.8–10.2	11
transverse ray length (mm)	3.8	0.7	3.1–5.3	9
proximal ray length	1.2	0.3	0.6–1.5	8
ray width	72	11	49–91	30
Choanosomal diactin				
length (mm)	1.7	1.7	0.5–5.9	14
width	11.8	4.2	5.8–21.1	16
Choanosomal triactin				
paired ray length (mm)	1.8	0.9	0.3–4.2	50
unpaired ray length (mm)	1.1	0.6	0.4–3.6	47
width	13.0	4.3	5.7–22.2	50
Choanosomal stauractin				
ray length (mm)	1.2	0.7	0.4–2.9	16
ray width	12.5	2.4	7.4–16.9	16
Choanosomal paratetractin				
paired ray length (mm)	1.7	0.9	0.4–3.5	50
unpaired ray length (mm)	1.1	0.7	0.3–4.0	50
ray width	13.6	3.2	5.8–20.1	50
Choanosomal pentactin				
paired ray length (mm)	1.1	0.7	0.2–3.9	50
unpaired ray length (mm)	0.7	0.4	0.2–2.2	44
ray width	13.9	2.8	8.6–20.0	50
Surface sword hexactin				
distal ray length	208	37	70–435	50
ray width	13.0	2.2	8.4–18.7	50
tangential ray length	213	41	147–353	50
ray width	12.5	1.9	8.1–17.8	50
proximal ray length	881	264	183–1393	50
ray width	12.8	1.8	9.3–17.6	50
Thin small diactin				
length	457	93	158–602	50
width	2.7	0.4	1.9–3.7	50
Choanosomal thin hexactin				
ray length	404	87	187–617	50
ray width	7.6	1.6	4.7–11.1	50
Basal anchor				
total length (mm)	2.4	2.6	0.4–13.5	22
umbel width	30.7	4.4	18.5–39.7	92
umbel height	42.2	5.1	29.0–51.9	92
axial cross height	153	32	89–300	87
number of umbel teeth	5.0	1.0	1–8	92
upper shaft width	13.3	4.0	4.6–22.9	50
Dianchorate diactin				
length	417	149	211–745	50
width	4.5	1.4	2.2–9.5	50
Oxyhexaster				
diameter	140	25	104–186	50
primary ray length	9.2	1.0	6.8–11.4	50
secondary ray length	61.5	12.4	44.3–85.8	50
Graphiocome centrum				
diameter	34.3	3.1	27.1–42.8	50
secondary ray length	281	17	240–323	50

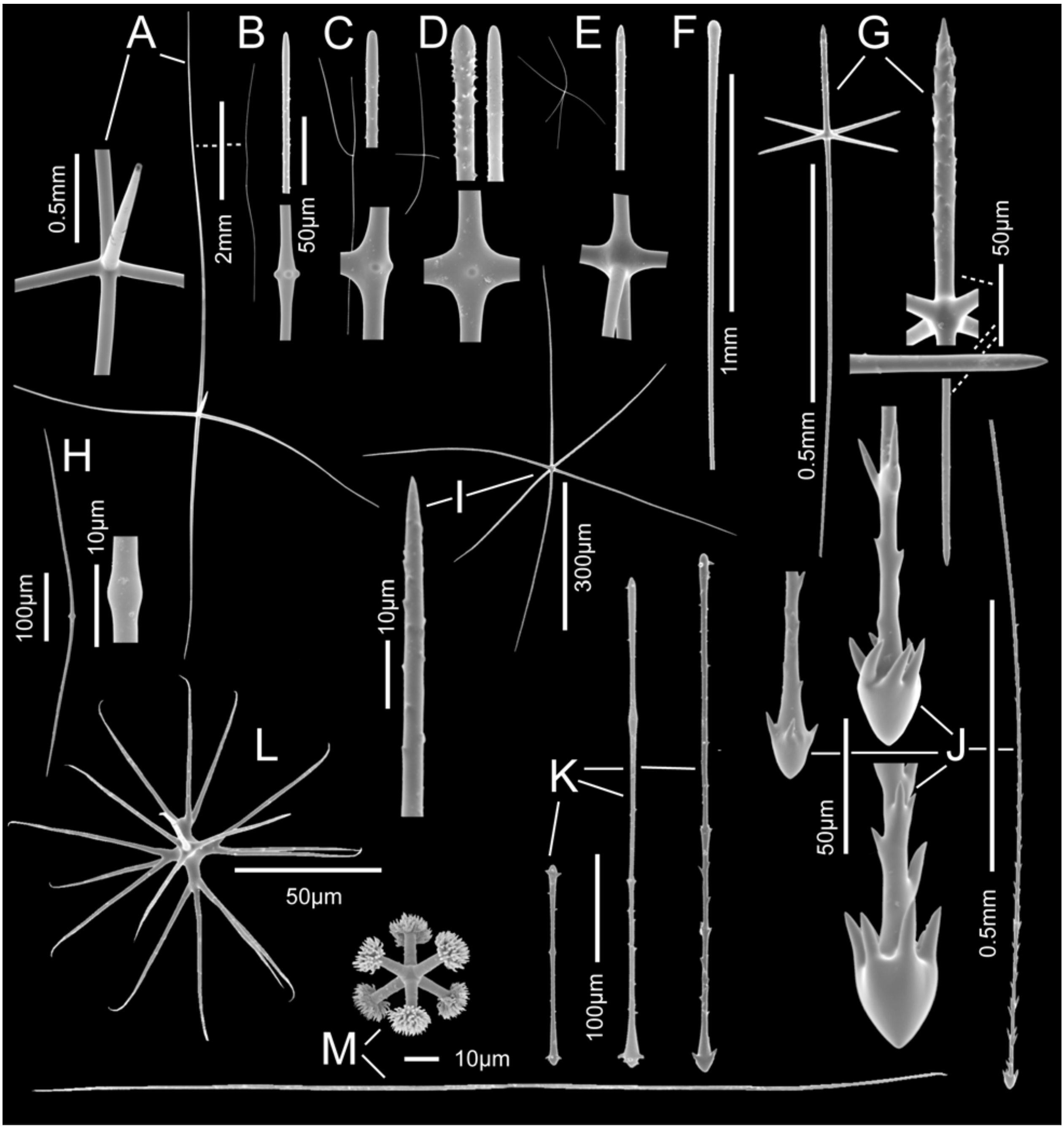


Figure 10. *Holascus tasmanensis* **sp. nov.**, holotype NIWA 104128, spicules: **A.** principal pentactin, whole and with centre magnified; **B.** choanosomal diactin, whole, centre and ray end magnified; **C.** choanosomal triactin, whole, centre and ray end magnified; **D.** choanosomal stauractin, whole, centre and two ray ends magnified; **E.** choanosomal pentactin, whole, centre and ray end magnified; **F.** inflated ray end which can occur on any of the large choanosomal megascleres; **G.** dermal sword hexactin, whole and distal, tangential and proximal rays or ends magnified; **H.** thin diactin filler spicule, whole, centre magnified; **I.** thin regular hexactin, whole, ray end magnified; **J.** lower ends of basalia showing variety of umbel forms; **K.** three dianchors in their more common forms without significant secondary silica deposition; **L.** oxyhexaster with most rays with curved tips; **M.** graphiocome, centrum and one secondary ray.

unrecognisable and the element would soon assume the form we encounter but have been unable to assign to a spicule type.

Etymology. The species name *tasmanensis* reflects the type locality, the North Tasman Basin.

Remarks. The new sponge described here is clearly a member of *Holascus* by its presence of hexactins as dermalia, direct protrusion of anchorate basalia from the lower body as a single tuft and lack of floricomes. Among the presently recognised 14 species of *Holascus*, only three species possess the microsclere combination of oxyhexasters and graphiocomes: *H. edwardsi* Lendenfeld, 1915, *H. obesus* Schulze, 1904, and *H. stellatus* Schulze, 1886. The new form can be excluded from all of these by possession of abundant thin curved diactins and dianchors, not mentioned in description of any of those species (exclusion by absence). The new form can be further distinguished from *H. edwardsi* and *H. obesus* by the much smaller principalia ray length (10 mm vs 70–190 mm and 30 mm, respecitively). Argument could be made for the unique nature of the New Zealand form because of distance; *H. edwardsi* is known from the eastern Pacific and *H. stellatus* is from the southwest Atlantic. One species, *H. obesus*, is from the neighbouring subantarctic area, but has thicker dermalia (24 vs 13 μm thick) and thin associated comitalia that are straight diactins (absent in the new form). Considering these differences, it is concluded here that the new form from the North Tasman Basin is a new species, here named *Holascus tasmanensis* **sp. nov.**

Key diagnostic characters

- Body as a tube without parietal oscula (wall perforations)
- Principalia are pentactins
- Microscleres are oxyhexasters and graphiocomes
- Dianchors are distinctive small megascleres

Holascus pannosus **sp. nov.**

Figs 11, 12; Table 5

Material examined. Holotype NIWA 104129, NZOI Stn U203, North Tasman Basin (International waters), 35.553° S, 159.097° E, 4744 m, 29 Sep 1982, 5 fragments.

Type locality. North Tasman Basin (International waters).

Distribution. Known only from the type locality (Fig. 11A).

Habitat. Presumably rooting by a tuft of basal anchors in soft sediment; depth, 4744 m.

Description. Morphology of the five fragments is amorphous, forming thick, fibrous masses, varying externally spiny to smooth. The original fragments were lost during conversion of the collections from NZOI to NIWA and only the subsamples (Figs 11B–D) remain, all probably part of one original specimen. The spiny surface on some specimens (Fig. 11E) is due to the presence of dermal sword hexactins. One of the subsampled fragments had a short but visibly obvious portion of a root tuft (Fig. 11C arrowhead). Dimensions of the original five

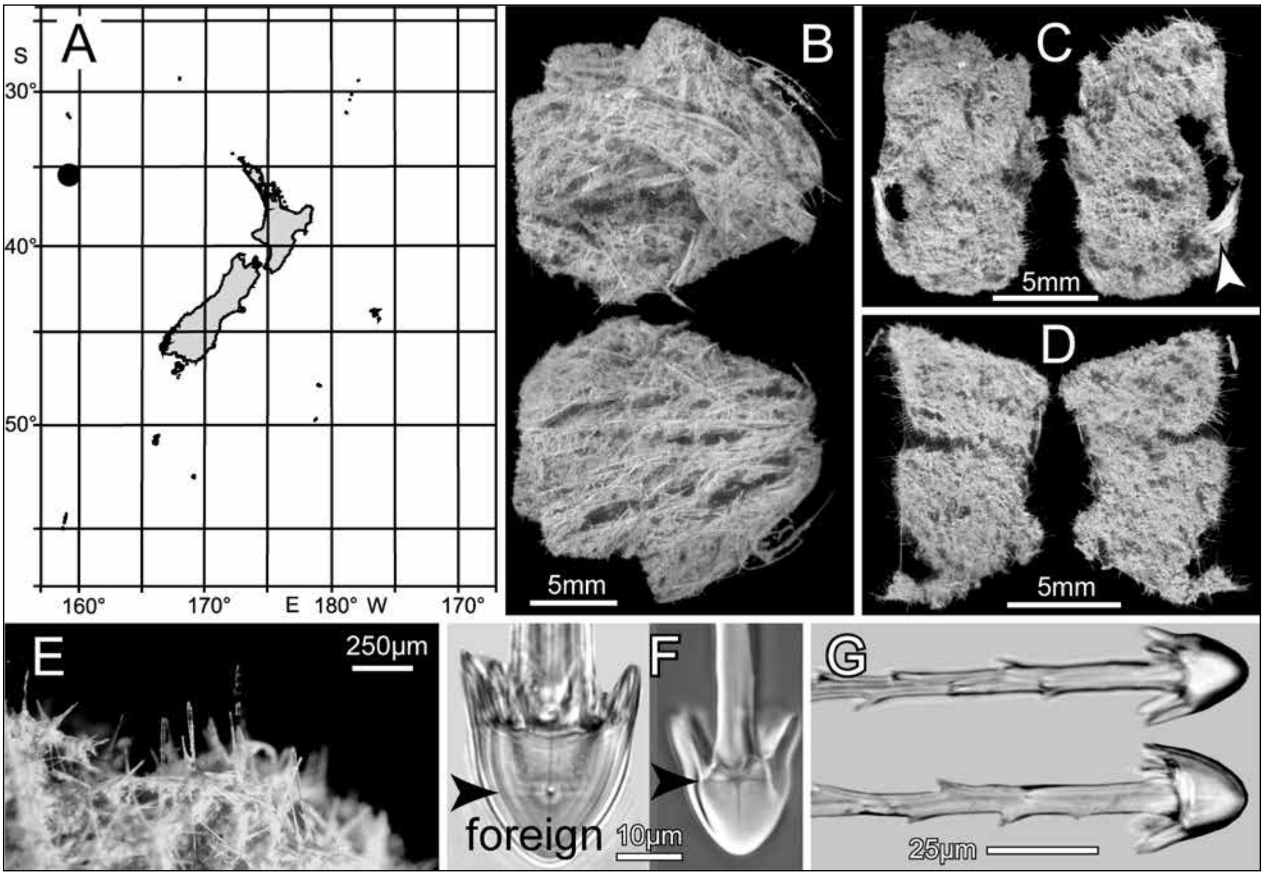


Figure 11. *Holascus pannosus* **sp. nov.**, holotype NIWA 104129, distribution, morphology and skeleton: **A.** distribution in International waters; **B–D.** three remaining fragments of the holotype NIWA 104129; **E.** surface of fragment in C showing dermalia distal projecting rays; **F.** two distinctly different umbel types from fragment in D, the left umbel is larger and has a low position (arrow) of the axial cross; the right umbel is proper to this species; **G.** two proper basalia lower ends showing shaft thorns.

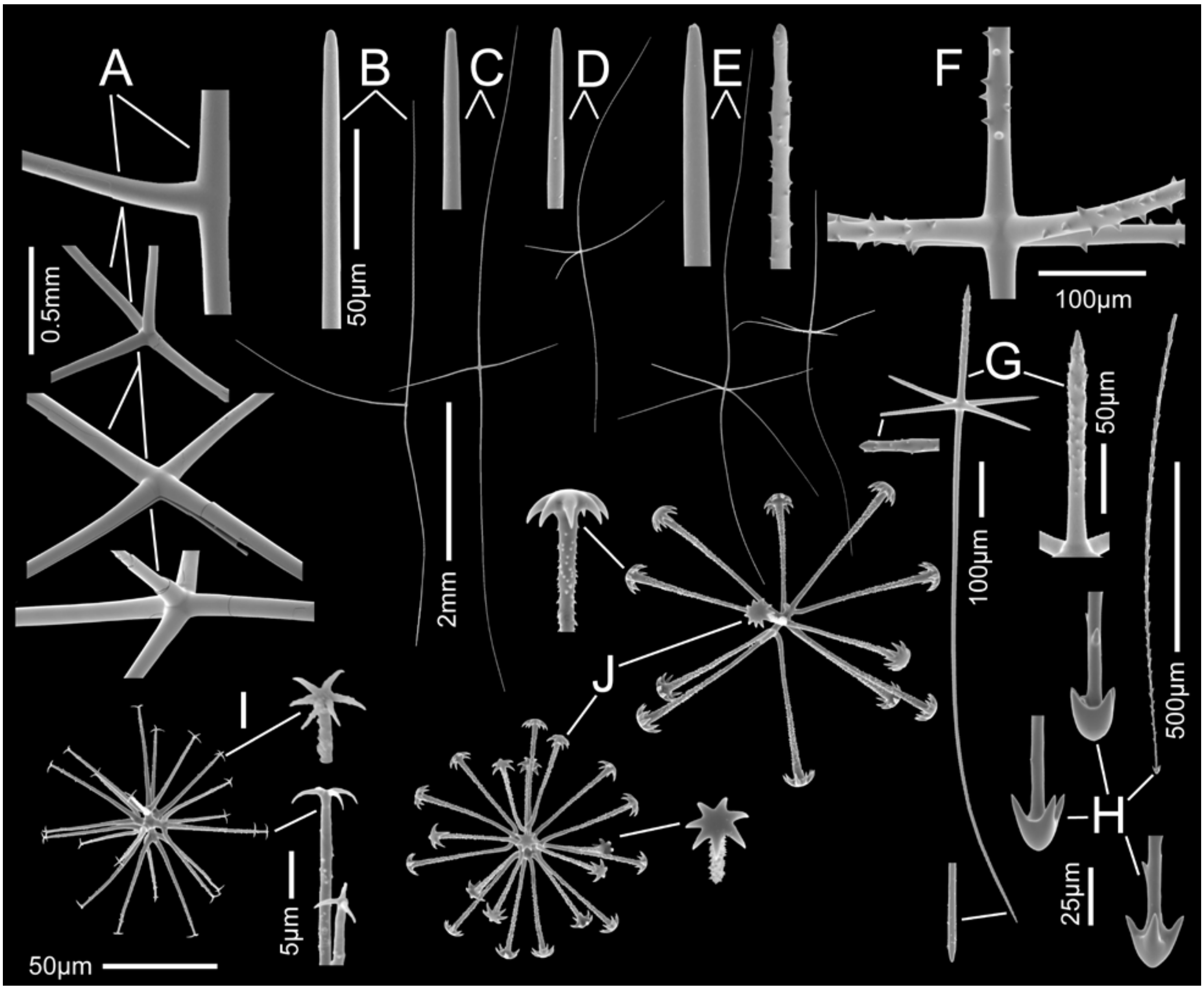


Figure 12. *Holascus pannosus* **sp. nov.**, holotype NIWA 104129, spicules: **A.** centres of principalia of different forms; **B.** choanosomal triactin, whole, ray end magnified; **C.** choanosomal stauractin, whole, ray end magnified; **D.** choanosomal pentactin, whole, ray end magnified; **E.** two choanosomal hexactins, whole, ray ends magnified; **F.** magnified view of the centre of the hexactin in E right, showing macrospination of the proximal rays; **G.** dermalium, whole and magnified distal ray and tips of tangential and proximal ray ends; **H.** basal anchors, distal parts with three umbels magnified; **I.** onychohexaster, whole, ray ends magnified; **J.** two different discohexaster forms, whole, ray ends magnified.

fragments varied from the largest, 47 x 24 x 11 mm to the smallest 20 x 8 x 5 mm; the existing subsamples are much smaller. Texture is soft and fragile. Colour light beige to grey in alcohol.

Skeleton. Ectosomal skeleton consists of spicules associated with surface membranes or projecting a significant distance from the living surface (e.g. basalia). These include surficial sword hexactins with outward projecting hilt as the dermalia and probably atrialia. Parts of the basal anchors extending from the body are the smooth upper shafts, the thorned lower shafts and umbel-bearing lower tips (Figs 11F, G); a few foreign basalia were found (Fig. 11F left), which were certainly not from *Holascus pannosus* **sp. nov.** Microscleres occur in all surface tissues as ectosomal elements.

Spicules. Megascleres (Figs 11, 12; Table 5) are various principalia recognised here as megascleres greater than 35 µm in thickness, normal choanosomal megascleres about 23 µm in thickness, dermal sword hexactins, and anchorate basalia. Large spicules considered principalia (Fig. 12A) are a mixture of triactins (6), paratetractins (2), stauractins (4), pentactins (8), and hexactins (1) of 21 encountered. Most rays are broken but when intact they are smooth and cylindrical with smooth rounded tips. Choanosomal megascleres are mainly hexactins (50%) and pentactins (30%), with fewer stauractins (4%), paratetractins (7%), triactins (5%), and rare diactins (<1%). These are mostly like the principalia (Fig. 12B–E) but thinner. In only the pentactins and hexactins, about half of them have macrospines on the proximal part of the spicules (Fig. 12F) and entire rays may rarely be spiny. Dermal sword hexactins (Fig. 12G) have short distal rays with moderately sized spines pointing outwards; distal inflation of the distal ray [(distal width – basal width) basal width^{-1}] is 49%. Ends of both tangential and proximal rays have a few small proclined spines. The anchorate basalia

Table 5. Spicule dimensions (µm) of *Holascus pannosus* **sp. nov.**, from holotype NIWA 104129.

Parameter	mean	s. d.	range	no.
Principalia				
longitudinal ray length (mm)	5.2	1.5	3.0–8.0	15
transverse ray length (mm)	1.9	0.9	1.1–3.7	17
radial unpaired length (mm)	0.6	0.4	0.3–1.6	9
ray width	80.8	28.3	35.6–139.8	21
Choanosomal triactin				
paired ray length (mm)	2.6	1.5	0.4–4.9	20
width	23.3	6.6	10.4–32.4	18
Choanosomal stauractin				
ray length (mm)	2.6	1.1	0.1–4.8	46
ray width	24.4	4.0	13.9–34.3	63
Choanosomal paratetractin				
paired ray length (mm)	3.5	0.9	0.7–4.2	25
ray width	23.3	4.8	10.0–35.3	43
Choanosomal pentactin				
paired ray length (mm)	2.5	1.0	0.7–4.3	54
unpaired ray length (mm)	1.2	0.4	0.2–2.0	42
ray width	22.4	4.7	11.6–34.7	73
Choanosomal hexactin				
ray length (mm)	1.3	0.7	0.3–3.3	63
ray width	21.5	4.0	8.7–30.8	61
Surface sword hexactin				
distal ray length	263	39	140–388	98
ray width (basal)	18.1	4.5	6.2–25.3	101
ray width (maximal)	26.9	6.0	13.0–37.8	100
tangential ray length	344	107	130–662	56
ray width	17.1	4.4	5.9–24.7	101
proximal ray length	822	211	202–1227	51
ray width	17.3	4.4	6.2–26.3	101
Basal anchor				
umbel width	23.1	2.7	19.0–26.0	5
umbel height	23.6	0.7	22.6–24.5	5
axial cross height	12.6	n. a.	12.0–13.0	2
number of umbel claws	4.6	0.9	4–6	5
Onychohexaster				
diameter	101.6	10.2	71.7–120.5	50
primary ray length	6.1	0.9	4.6–7.8	50
secondary ray length	45.0	5.2	31.6–56.0	50
Discohexaster				
diameter	92.4	15.2	67.1–142.7	50
primary ray length	6.0	0.8	4.3–8.2	50
secondary ray length	40.4	7.0	28.2–64.5	50

(Figs 11F, G; 12H) have a smooth proximal shaft, lower shaft thickly thorned, and terminal umbel with 4–6 claws or teeth. The axial cross is in the upper part of the umbel very close to the base of the claws.

Microscleres (Fig. 12; Table 5) are onychohexasters (88%), rare onychohexactins (<1%) and discohexasters (12%). Onychohexasters (Fig. 12I) are spherical, with each short smooth primary ray supporting 2–5 long rough terminal rays, each ending in a whorl of 2–6 claws curved back towards the spicule. Onychohexactins are similar but all primary rays bear a single terminal ray. Discohexasters and hemidiscohexasters (Fig. 12J) are spherical with each short primary ray supporting 1–5 long rough terminal rays, each ending in a disc with 5–10 marginal teeth.

Etymology. Named for the ragged surface and interior of the sponge specimens (*pannosus*, ragged; Latin).

Remarks. This form is clearly a member of Euplectellinae on the basis of its anchorate basalia. Its complement of microscleres as discohexasters, onychohexasters and rare onychohexactins (without floricomes), and great range of megascleres (hexactins, pentactins, stauractins, paratetractins, tauactins), places it as a member of the genus *Holascus*. Within the genus, the lack of oxyoidal microscleres seen here is shared with only one species, *H. fibulatus* Schulze, 1886. That species, however, has neither discohexasters nor onychohexasters, but instead has graphiocomes and distinctive fibulae. The form from the North Tasman Basin to the west of New Zealand, described above, thus represents the first known member of a new species designated here as *Holascus pannosus* **sp. nov.**

Key diagnostic characters

- Half of the choanosomal hexactins are centrally macrospined
- Umbels of anchors are smallest among known New Zealand forms and certainly amongst the smallest in the world
- Principalia are not restricted to a single spicule form but vary widely
- Microscleres are onychohexasters, discohexasters and rare onychohexactins

Genus *Malacosaccus* Schulze, 1886

Malacosaccus Schulze, 1886: 41.
Holascella (in part – *H. ancorata* Lendenfeld, 1915: 37).

Diagnosis. Body is tubular or saccular, lophophytous, pedunculate, with anchor-like basalia. Choanosomal spicules are chiefly hexactins, usually with pentactins, stauractins and tauactins. Choanosomal spicules of the peduncle are tauactins with rare stauractins, paratetractins and anchors. Dermalia and atrialia are usually pinular hexactins. Microscleres are hexasters, sometimes hemihexasters and hexactins, discohexasters, floricomes and sometimes onychasters (from Tabachnick 2002).

Type species. *Malacosaccus vastus* Schulze, 1886 (by original designation).

Malacosaccus microglobus sp. nov.

Figs 13, 14; Seafloor Image Figs 21–25; Table 6

Material examined. Holotype NIWA 76972, NZOI Stn U203, North Tasman Basin (International waters), 35.553° S, 159.097° E, 4744 m, 29 Sep 1982. **Paratype** NIWA 104130, NZOI Stn U203, North Tasman Basin (International waters), 35.553° S, 159.097° E, 4744 m, 29 Sep 1982.

Other locations (images only). *Reinga Basin*: NIWA Stn TAN1603/UWC02, 35.330° S, 170.904° E, 1999–1972 m, 21 Mar 2006 (Seafloor Image Fig. 22); NIWA Stn TAN1603/06, Reinga Basin, 35.307° S, 170.748° E, 1860 m, 21 Mar 2006 (Seafloor Image Figs 23, 24); NIWA Stn TAN1603/02, Reinga Basin, 35.330° S, 170.905° E, 2002 m, 21 Mar 2006 (Seafloor Image Fig. 25); NIWA Stn TAN0803/078, Seamount 7, Macquarie Ridge (Australian EEZ), 53.717° S, 159.125° E, 845 m, 11 Apr 2008 (Seafloor Image Fig. 21).

Type locality. North Tasman Basin (International waters) (Fig. 13A).

Distribution. Known only from the type locality.

Habitat. Rooted in soft sediment at 4744 m.

Description. Morphology as a tripartite sponge with a funnel or champagne flute-shaped body, born on a compact cylindrical stem with a basal root tuft, emanating from its lower end (Fig. 13B, C; Seafloor Image Figs 21–25). Some specimens have a basiphytous form of basal attachment to hard substrate, but this is atypical (Seafloor Image Figs 21, 24). Dimension of the holotype, without the root, is 205 mm long; the severely damaged body is 37 x 20 mm (Fig. 13D). The stem is 168 mm long, with thickness ranging from 6.2 mm at top, narrowing to 4.3 mm in the middle, expanding gradually toward the bottom to 9.1 mm and ending in a very dense tyle of 14.8 mm. Form and dimensions of the paratype (Fig. 13C) are similar, but this specimen, two other specimens and 11 fragments, were lost during the transfer of collections from NZOI to NIWA; fortunately, the entire holotype and a fragment of the paratype taken in 1995 survive.

Texture of the body is soft and fragile. Surfaces are generally smooth but felt-like due to their covering by closely packed dermalia. In the holotype, the projecting dermalia have been eroded from most of the outer body surface (Figs 13D, E), leaving the inhalant canals exposed, but the dermalia and the resulting felt-like surface are retained in some more protected areas just above the stalk (Fig. 13F). The atrial body surface is smooth with exhalent canals opening directly into the vestibule. The stalk is hollow (Fig. 13H) and densely covered with plush dermalia (Fig. 13I) where not worn off. Colour is light beige.

Skeleton. Choanosomal skeleton of the body is a loose mesh of large pentactine and hexactine megascleres. Fragments of much larger tauactins suggest that these are principalia in the body but are very rare. The stem has large numbers of tauactin principalia oriented longitudinally (Fig. 13J) within the very dense thicket of smaller tauactins; a few longitudinally extended pentactins and hexactins accompany the tauactins in the stem. Spicule fusion does not occur. The basal tyle of the stem lacks the hollow lumen and instead is filled with larger pentactin and hexactin megascleres, ends of tauactins, and new spicule types such as microspheres, micropentactins in huge abundance and basalia not yet projected into the root. Upper shafts of root basalia also project up into the lower stem tyle. Other loose choanosomal spicules include floricome microscleres in the body; oxyhexasters and onycho/discohexasters are present in the stem.

Ectosomal skeleton of body is a layer of sword-like dermalia externally and a layer of pentactin atrialia on the inner atrial surface. Microscleres are occasional occupants. The ectosomal layer of the stem consists of dermalia smaller than those of the body but atrialia are absent. The root is considered all ectosomal and consists exclusively of basal anchors, their umbels, lower thorned shafts and upper smooth shafts.

Spicules. Megascleres (Figs 13, 14; Table 6) are principal tauactins, large body choanosomal megascleres (rays over 1 mm in length; 71% pentactins, 28% hexactins, 1% paratetractins, rare stauractins, tauactins and diactins), body dermal sword hexactins, body pentactin atrialia (indistinguishable from choanosomal pentactins), large stem choanosomal megascleres (83% tauactins, 10% pentactins, 5% paratetractins, 3% diactins) and basal anchors of the stem-root.

The stem bottom, or stem tyle, also contains a considerable number of large megascleres that clearly have one ray in the stem tyle but the main spicule is projected out into the presumably non-living top of the root as a thicket supporting the basalia; a detailed analysis of the composition of these spicules has not been made. Smaller spiny pentactins, subhexactins and hexactins in the stem bottom swelling are considered here as microscleres. Principalia are tauactins (Fig. 14A) with unpaired rays curved tightly to lie parallel to one of the paired rays; these are most easily seen in and extracted whole from the stem, but fragments of them obtained from the body suggest they provide primary support there as well. Like all choanosomal megascleres here, they are smooth with rounded tips.

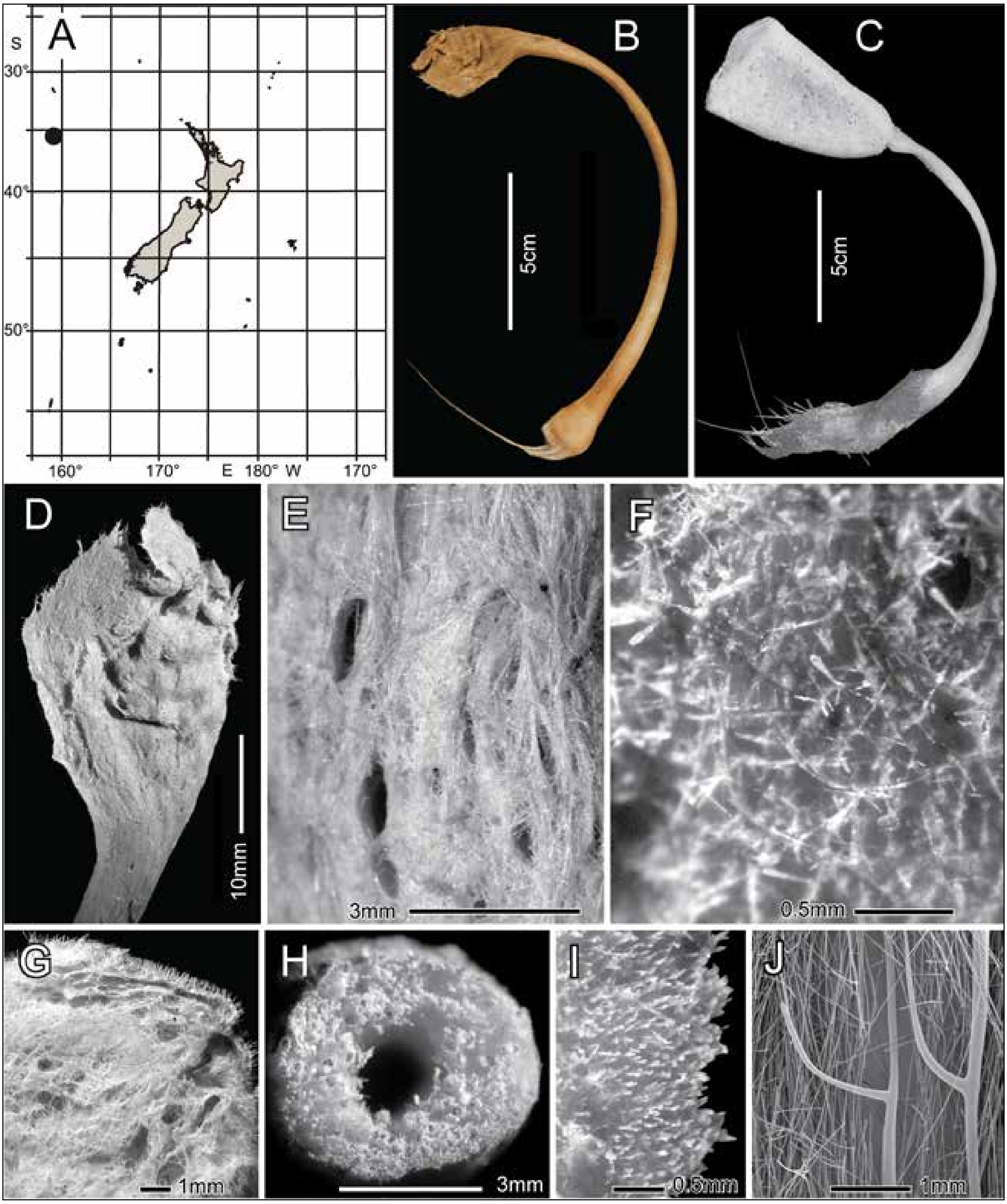


Figure 13. *Malacosaccus microglobus* **sp. nov.**, distribution, morphology and skeleton: **A.** distribution in International waters; **B.** holotype, NIWA 76972, with damaged top body, long stem and small part of basal root; **C.** paratype, NIWA 104130, remaining now only as a body wall fragment; **D.** worn body of the holotype; **E.** dermal outer surface of holotype where dermalia have been lost; **F.** lower holotype body where dermalia remain; **G.** atrial surface and body margin with dermalia projecting (top); **H.** section of the stem with wide canal lumen; **I.** dense cover of dermalia on outer stem surface; **J.** principal tauactins, centre magnified.

Large body choanosomal megascleres are dominated by pentactins that are the same as atrialia and given in the data table and figure as such along with data on hexactins and figure of hexactins and tauactins (Fig. 14B). Large choanosomal megascleres in the stem differ in composition being dominated by elongate tauactins (Fig. 14E) and paratetractins (Fig. 14F) instead of pentactins. Dermal sword hexactins of body (Fig. 14C) and stem (Fig. 14G) are similar in form but differ considerably in dimensions; body dermalia are generally much larger

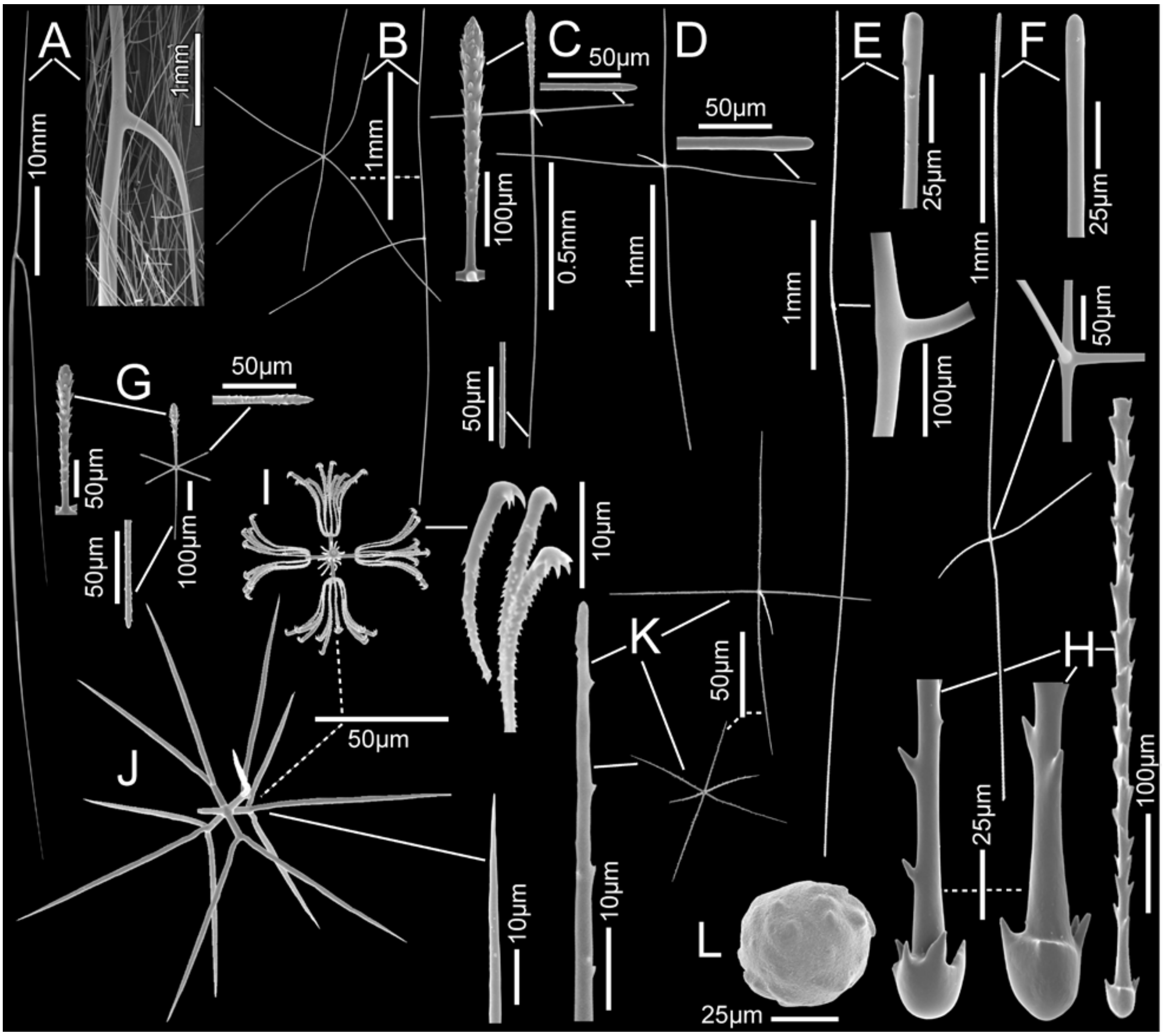


Figure 14. *Malacosaccus microglobus* **sp. nov.**, spicules: **A.** principal tauactin from stem with centre magnified; **B.** body choanosomal hexactine and tauactine megascleres; **C.** body hexactine dermalium with magnified distal ray and tips of other rays; **D.** body pentactine atrialium with ray tip magnified; **E.** stem choanosomal tauactin with ray tip magnified; **F.** stem choanosomal paratetractin with centre and ray tip magnified; **G.** stem hexactine dermalium with distal ray and other ray tips magnified; compare with C (same scale); **H.** three basal anchors; **I.** floricome with three secondary rays magnified; **J.** oxyhexaster and secondary ray tip magnified (one primary ray is broken on the spicule); **K.** spiny micro-pentactin and hexactin from the bottom of the stem with ray tip magnified; **L.** silica sphere from bottom of the stem. I–J from the paratype NIWA 104130; all others from holotype NIWA 76972.

and rays longer than those of the stem. Basal anchors are typical of other euplectelloid forms, with strongly thorned shaft, small number of teeth on the umbel: 3.9 (2–7), n = 22, and axial cross within the umbel.

Microscleres (Fig. 14; Table 6) are floricomes, oxyhexasters, spiny pentactins, subhexactins and hexactins and microspheres; other microscleres including onychohexasters similar in size and form to those of *Holascus pannosus* **sp. nov.**, and discohexasters, are considered foreign since they did not occur regularly in both holotype and paratype. Floricomes (Fig. 14I) are relatively small, with smooth, short primary rays supporting 8.2 (1–15), n = 12, secondary rays. The secondary rays bear dense recurved digitate-tipped spines on the outer (concave) surfaces and less dense similar spines on the inner (convex) surfaces; terminal teeth number 3.2 (1–6), n = 20. Oxyhexasters (Fig. 14J) and hemioxyhexasters have moderately long primary rays and generally one to three straight smooth terminal rays; the latter may be curved basally but are never sinuous. Commonly one of the terminal rays may reduce to a small thorn. Small entirely spined pentactins, subhexactins and hexactins (Fig. 14K) are found in very high density in the lower stem tyle. Silica microspheres (Fig. 14L), smooth or lumpy, 10–49 µm in diameter, occur commonly within the lower stem tyle.

Table 6. Spicule dimensions (µm) of *Malacosaccus microglobus* **sp. nov.**, from holotype NIWA 76972.

Parameter	**mean**	**s. d.**	**range**	**no.**
Principal tauactin				
ray length (mm)	36.3	11.4	20.4–53.6	10
ray width	152	63	59–281	14
Body choanosomal hexactin				
ray length	1027	317	468–1523	50
ray width	9.6	2.0	6.1–16.0	50
Body dermal sword hexactin				
distal ray length	306	42	181–383	67
basal ray width	10.3	2.3	6.4–17.7	67
maximum ray width	24.9	5.1	9.6–36.8	67
tangential ray length	285	74	113–438	41
proximal ray length	981	224	487–1421	23
Body atrial/choanosomal pentactin				
tangential ray length	1132	335	484–1629	50
proximal ray length	748	206	272–1276	50
ray width	9.3	2.3	5.1–14.5	50
Stem choanosomal tauactin				
axial ray length (mm)	4.7	1.4	0.8–7.8	32
ray width	21.6	5.9	9.6–35.8	50
Stem choanosomal paratetractin				
ray length (mm)	3.8	1.6	1.6–5.4	7
ray width	19.4	7.1	4.7–25.0	7
Stem choanosomal pentactin				
tangential ray length	971	383	382–1429	6
ray width	15.0	5.8	2.4–23.0	6
Stem dermal sword hexactin				
distal ray length	245	15	202–273	50
basal ray width	8.1	1.4	4.3–11.4	58
maximal ray width	18.9	3.2	11.6–26.7	58
tangential ray length	163	15	130–194	50
proximal ray length	261	39	160–351	50
Basal anchor				
umbel width	28.8	5.2	17.3–37.7	23
umbel length	32.6	5.7	16.2–41.4	23
axial cross height	12.0	1.2	9.9–14.9	23
Floricome				
diameter	69.9	5.3	55.3–85.9	71
primary ray length	7.6	0.9	5.9–10.3	71
secondary ray length	27.4	2.3	22.4–35.4	71
Oxyhexaster				
diameter	120.9	21.3	71.6–159.0	58
primary ray length	8.6	1.5	5.3–11.4	58
secondary ray length	52.6	10.0	30.2–69.7	58
Spined micropentactin				
ray length	116	43	56–235	50
ray width	2.7	0.6	1.7–4.6	50

Etymology. The species name reflects the possession of a new spicule type in this species, the microsphere (*microglobus*, small sphere; invented Greek and Latin noun).

Remarks. The two specimens with long stem (peduncle) supported by tauactins, anchorate basalia emanating from the lower stem and microscleres consisting of oxyhexasters, hemioxyhexasters and floricomes clearly belong to the genus *Malacosaccus*.

Among the eight recognised species of *Malacosaccus*, only one, *M. anchorata* (Lendenfeld 1915) has principalia like the new form as tauactins (with tetractins); all other species have principalia as stauractins, pentactins or hexactins exclusively or mainly. Where the new form has no proper discohexasters or onychohexasters, all eight species are described as having at least one category of these microscleres. When only floricomes are considered, here spiny and 55–86 µm diameter, those in all other *Malacosaccus* species except *M. anchorata* are described, calculated from author data or figured as being much larger: *M. coatsi* Topsent, 1910, 96–133 µm; *M. erectus* Lévi, 1964, 126 µm; *M. floricomatus* Topsent, 1901, 65–200 µm; *M. heteropinulum* Tabachnick, 1990, 82–152 µm; *M. pedunculatus* Topsent, 1910, 100–145 µm; *M. unguiculatus* Schulze, 1886, 136 µm; *M. vastus* Schulze, 1886, 97–140 µm.

Based on location (Tasman Sea) and body form (See Lévi 1964, pl. VIA), *M. erectus* would be the most suitable recipient of the new form, but according to its brief original description, it differs from the new form in having stauractins instead of tauactins as principalia, having discohexactins and discohexasters as microscleres (absent in the new form) and larger floricomes, calculated as 126 µm diameter vs 55–86 in the new form. Pending anticipated reexamination of the type specimen of *M. erectus*, the differences between all known species and the new form described here warrant its designation as a new species, here designated as *Malacosaccus microglobus* **sp. nov.**

Key diagnostic characters

- Body form is tripartite with a small cup-shaped body, a long hollow cylindrical stem and a short root tuft
- Tauactins are the principalia and the major choanosomal megascleres of the stem
- Dermalia have a greatly inflated distal ray ornamented by large spines or scales
- Microscleres are small oxypentactins, oxyhexactins, oxyhexasters; hemioxyhexasters and floricomes

Genus *Placopegma* Schulze, 1896

Placopegma Schulze, 1896: 63.
[*Placopegma*] Burton, 1959: 153; 179 (*lapsus*)

Diagnosis. Body oval with a circular, colander-like fold in the middle, directed downwards. Lophophytous with flat upper part, where a single terminal osculum, with sieve-plate or prostalia marginalia, are located. Basalia are four-toothed anchors and, probably, monaxone spicules with rounded outer ends, gathered in a compact tuft in the lower part. Choanosomal spicules and spicules of the sieve-plate are diactins, sometimes hexactins. Dermalia and atrialia are pentactins, rarely hexactins. Hexactins, like the dermal and atrial forms, are found among the sieve-plate spicules. Microscleres are discohexasters, sometimes in combination with plumicomes, hexasters, hexactins and discohexactines (emended from Tabachnick 2002).

Type species. *Placopegma solutum* Schulze, 1896 (by monotypy).

Placopegma plumicomum Tabachnick & Lévi, 2004

Placopegma plumicomum Tabachnick & Lévi, 2004: 16, figs 1D, 3A–Q.

Type & locality. Holotype—MNHN HCL591, BIOCAL, *Jean Charcot* Stn CP 61, New Caledonia, 24.195° S, 167.523° E, 1070 m.

Distribution. Norfolk Ridge, New Caledonia, 1070 m.

Diagnosis (translated from the original description). A single specimen was collected of conical shape, 22 mm long and 50 mm maximum diameter. It has no apical sieve plate. The oscule is 6 mm diameter. The walls are thick. There are two crowns of prostalia: the marginalia diactins form a crown in which the spicules are oriented towards the top and the other crown is located near the equator of the sponge. The latter crown is formed of anchoring spicules orientated towards the bottom. The sponge is significantly macerated. The choanosomal spicules are diactins measuring 1.9–3.0×0.005–0.019 mm with rudimentary medial actins and roughened, conical or obtuse extremities. The marginalia diactins are thicker and measure 3–25×0.038–0.167 mm; they are smooth or roughened. Prostalia basalia are spiny anchors with four short teeth. These spicules are a few mm long and 0.007–0.015 mm diameter; the distal teeth are 0.03 mm long. The dermal spicules are pentactins, rarely pentactins with a sixth rudimentary actin, hexactins and stauractins. The actins of these spicules are rough and their extremities are obtuse. The tangential actins of the dermal spicules measure 0.053–0.084 mm; the proximal actin 0.099–0.342 mm long; the diameter of the tangential and proximal actins is 0.008–0.023 mm. The atrial spicules are essentially pentactins. Their actins are rough, rarely smooth; the tangential actins of the atrial spicules are 0.122–0.295 mm; their distal actin is 0.213–0.448 mm long; the diameter of the tangential distal actins is 0.011–0.015 mm. There are two types of microscleres: discohexasters and plumicomes. The discohexasters are spherical and are 0.036–0.054 mm diameter; their primary rosette is 0.004–0.007 mm diameter. The plumicomes are 0.040–0.050 mm diameter and their primary rosette is 0.018–0.022 mm diameter. *Placopegma plumicomum* has thus far been recorded only from the Norfolk Ridge south of New Caledonia, at 1070 m.

Remarks (translated from the original description). This new species belongs to the genus *Placopegma*. The morphology of this sponge and the spicule composition of the skeleton are like those of the type genus, *P. solutum* Schulze, 1896, collected from the Indian Ocean, but it is a distinct species without a sieve plate. Another specimen that has been described from the north-eastern Pacific under the name of *Placopegma* sp. (Schulze 1899) probably belongs to a new species. *Placopegma plumicomum* is characterised by its shape and by the presence of plumicomes among its microscleres.

Further remarks. A diagnosis of this species has been included as it is considered highly likely to be present in the New Zealand region, but has, thus far, not been collected. Types have not been examined but refer to the original publication.

Subfamily **Corbitellinae** Gray, 1872

Corbitellidae Gray, 1872: 457.
Taegerinae Schulze, 1886: 41; Schulze 1887: 94; Schulze 1895: 49.
Corbitellinae Ijima, 1902: 30.
Euplectellinae, in part (*Regadrella* Schulze, 1886, 1887).

Diagnosis. Basiphytous Euplectellidae attached directly by their lower parts, without a well-recognisable peduncle (emended from Tabachnick 2002).

Remarks. Images of living, purported Corbitellinae (*Dictyaulus*, *Corbitella* or *Regadrella* spp.), are figured in Seafloor Image Figs 31–43.

Genus ***Atlantisella*** Tabachnick, 2002

Atlantisella Tabachnick, 2002: 1416–1418, fig. 18.

Diagnosis. Body is tubular, basiphytous. Choanosomal spicules are diactins, rarely triactins, stauractins and pentactins which are often fused by synapticula in the lower part of the sponge. Dermalia and atrialia are macrospined pentactins sometimes supplemented with hexactins. Microscleres are graphiocomes and staurasters, with or without calycocome-like oxyhexasters (after Reiswig & Kelly 2017).

Type species. *Atlantisella incognita* Tabachnick, 2002 (by original designation).

Atlantisella lorraineae Reiswig & Kelly, 2017

Seafloor Image Figs 70–84

Atlantisella lorraineae Reiswig & Kelly, 2017: 94; figs 1–4, table 1.

Type & locality. Holotype—NIWA 82163, NIWA Stn TAN1206/23, southwest flank of Tangaroa Seamount, southern Kermadec Ridge, 36.336° S; 178.018° E, 1490–1422 m, 17 Apr 2012.

Additional material examined. *Otago/Canterbury Slope* (collected by GEOMAR ROV *Kiel 6000*, onboard RV *Sonne*, ICBM expedition SO254): NIWA 126209, 126216, RV *Sonne* Stn SO254/76ROV13_BIOBOX4, 45.026° S, 171.903° E, 662 m, 19 Feb 2017; NIWA 126225, RV *Sonne* Stn SO254/76ROV13_BIOBOX19, 45.024° S, 171.905° E, 602 m, 19 Feb 2017.

Pegasus Canyon Slope, off Christchurch shelf (collected by GEOMAR ROV *Kiel 6000*, onboard RV *Sonne*, ICBM expedition SO254): NIWA 126249, RV *Sonne* Stn SO254/77ROV14_BIOBOX20, 43.288° S, 173.606° E, 668 m, 20 Feb 2017 (Seafloor Image Fig. 77).

Other locations (images only). *Graveyard Seamount Complex, Chatham Rise*: NIWA Stn TAN0905/23, Graveyard Seamount, 42.760° S, 179.987° W, 770–919 m, 15 Jun 2009 (Seafloor Image Figs 79, 81, 84); NIWA Stn TAN0905/54, Diabolical Seamount, 42.790° S, 179.982° W, 894–1058 m, 18 Jun 2009 (Seafloor Image Fig. 80); NIWA Stn TAN0604/067, Ghoul Seamount, 42.798° S, 179.988° E, 940 m, 1 Jun 2006 (Seafloor Image Fig. 74); NIWA Stn TAN0604/075, Ghoul Seamount, 42.761° S, 179.990° W, 757 m, 2 Jun 2006 (Seafloor Image Fig. 76).

Rumble II West Seamount, Kermadec Ridge: NIWA Stn TAN1007/33, 35.347° S, 178.544° E, 1181–1439 m, 30 May 2010 (Seafloor Image Fig. 78).

Macquarie Ridge: NIWA Stn TAN0803/020, Seamount 1, 48.553° S, 164.937° E, 1106 m, 30 Mar 2008 (Seafloor Image Fig. 70); NIWA Stn TAN0803/032, Seamount 3, 50.092° S, 163.461° E, 1091 m, 1 Apr 2008 (Seafloor Image Figs 71, 72); NIWA Stn TAN0803/049, Seamount 5, 51.070° S, 161.987° E, 319–471 m, 4 Apr 2008 (Seafloor Image Fig. 73); NIWA Stn TAN0803/018, Seamount 1, 48.531° S, 164.950° E, 1077 m, 30 Mar 2008 (Seafloor Image Fig. 75).

Macquarie Ridge (Australian EEZ): NIWA Stn TAN0803/068, Seamount 6, 52.379° S, 160.676° E, 452 m, 9 Apr 2008 (Seafloor Image Fig. 82); NIWA Stn TAN0803/078, Seamount 7, 53.717° S, 159.125° E, 845 m, 11 Apr 2008 (Seafloor Image Fig. 83).

Distribution. Southern Kermadec Ridge, Pegasus Canyon Slope and Otago/Canterbury Slope off Christchurch continental shelf, and Chatham Rise, New Zealand, 602–1439 m; extended in this work to Macquarie Ridge.

Diagnosis. Very thin-walled, single or double funnel or vase sponges, with extended foliose edges and a short hollow stem, occasionally conjoined, frequently solitary. Specimens range from about 10–20 mm tall, about 15–31 mm in diameter at the top, with walls that are about 0.3 to 0.7 mm thick (Seafloor Image Figs 70–81). Sponge is very soft and easily torn. Surface is smooth, ridged, without channelisation. Colour in life pale translucent tan to white. The choanosomal skeleton is a loose spicule network bounded externally and internally by ectosomal membranes supported by the tangential rays of large spined surficial pentactins. The proximal rays of pentactins of the two surfaces overlap in a network of moderate-size diactins. The ectosomal skeleton is a raised reticulation formed by the crossed rays of surficial spined pentactins. The rectangular dermal lattice mesh is about 150 (75–236) µm wide and the less regular atrial lattice is 163 (75–299) µm. No synapticula apparent. Megascleres are superficial pentactins, coarsely spined on the external surface, proximal ray always much longer than the tangential rays: 326 (163–764) µm long, indistinguishable as dermalia and atrialia. Choanosomal diactins are 2228 (1000–4720) µm long, divisible into two classes by thickness. Microscleres are oxystaurasters and hemioxystaurasters, 125 (100–150) µm diameter; calycocome-like oxyhexasters, 150 (122–179) µm diameter; graphiocomes, 451 (343–535) µm diameter (total graphiocome diameter estimated by adding the length of two raphides to the centrum diameter, composed of two primary rays and their terminal calices). *Atlantisella lorraineae* has thus far been recorded from hard lava and rock substrate on Southern Kermadec Ridge sites (1181–1439 m), on sand-overlaid bedrock with gorgonians and corals (Clark *et al.* 2009) on the Graveyard Hills, Chatham Rise sites (770–1058 m), and on bedrock outcrops with boulder and cobble fields on Canyon slope, off Christchurch continental shelf (668 m) (emended from Reiswig & Kelly 2017).

Remarks. *Atlantisella lorraineae* is only the second species of the genus, previously known only from the type species, *A. incognita* Tabachnick, 2002, from the North

Central Atlantic. The sponge is particularly beautiful, being a delicate, cup- to sheet-shaped sponge and is often mistaken for a demosponge due to the very fine weave and thin lamella. The species is relatively common on the Chatham Rise to the east of the South Island, on Macquarie Ridge to the south of New Zealand, and on the Southern Kermadec Ridge to the northeast of the North Island.

Genus *Corbitella* Gray, 1867

Corbitella Gray 1867: 530.
Taegeria Schulze, 1886: 41.
Eudictyon Marshall, 1875: 211.
Eudictyum Schulze, 1886: 43.

Diagnosis. The body is saccular with numerous lateral oscula and with colander-like sieve-plate or with radial elements of prostralia marginalia, basiphytous. Choanosomal spicules are predominantly diactins and some other hexactine derivatives such as stauractins, triactins. Dermalia are hexactins. Atrialia are pentactins, like those in choanosome. Microscleres are discohexactins, hemidiscohexasters amd discohexasters, smooth and spiny microhexactins, floricomes and graphicomes, sometimes discasters (from Tabachnick 2002).

Type species. *Alcyoncellum speciosum* Quoy & Gaimard, 1833 (by monotypy).

Corbitella plagiariorum sp. nov.

Figs 15, 16; Table 7

Material examined. Holotype NIWA 76484, NIWA Stn TAN1003/53, 45 km southeast of Cape Kidnappers, 39.493° S, 178.262° E, 752 m, 24 Mar 2010. **Paratypes** *Southeast of Cape Kidnappers*: NMNZ PO.000494/A, NMNZ PO.000494/B, FRV *James Cook* Stn J10/39/86, 40.017° S, 178.082° E, 840 m, 28 Aug 1986.

Comparative material. *Corbitella pulchra* (Schulze, 1887) (originally *Taegeria pulchra*), holotype, NHMUK 1887.10.20.028, HMS *Challenger*, Stn 174c, near Fiji Islands, 19.131° S, 178.326° E, 1116 m, 03 Aug 1874; *Corbitella speciosa* (Quoy & Gaimard, 1833) (originally *Alcyoncellum speciosum*), holotype and genotype, MNHN HX26, off the Mollucas, Indonesia, coordinates, date and depth unknown.

Type locality. Forty-five km southeast of Cape Kidnappers (Fig. 15A).

Distribution. Known from two locations southeast of Cape Kidnappers.

Habitat. Attached to hard substratum, 752–840 m.

Description. Morphology of the holotype (Fig. 15B) is a large cylindrical middle body fragment, dimensions 21.7 cm long and 10.0 cm in diameter with the puffy wall up to 4.5 mm thick. It lacks both the top and bottom. Parietal oscula, 3.4 (2.0–5.8) mm in diameter are distributed irregularly. The outer surface is obviously badly worn with choanosomal spicule bundles exposed (Fig. 15D) but the internal surface is intact (Fig. 15E) with slight circular ridges visible (Fig. 15B). The paratypes are of moderate size; specimen NMNZ PO.000494/A (Fig. 15C) is a nearly complete flattened cylinder 18.0 cm long by 7.5 cm in width (calculated diameter as 4.8 cm) with a corona and 5–8 mm wide cuff at the top (Fig. 15F) but without a base. Specimen NMNZ PO.000494/B is a flattened plate, 20.9 x 11.6 cm, from a mid body segment without top or base torn open. All specimens are light brown when dried or in ethanol; colour when live is unknown.

Skeleton. Choanosomal skeleton is a network of crossing longitudinal, transverse and oblique bundles of thin comital diactins enclosing large principal stauractins, diactins and few tauactins, paratetractins, pentactins and hexactins; the latter likely to have had one ray projecting from the worn dermal surface which served as prostalia. The main skeletal framework has a dominant rectangular aspect (Fig. 15G) with oblique elements almost as strong as the longitudinal and transverse bundles. Transverse (circular) bundles are always the most atrial, the longitudinal bundles always dermal to these; oblique bundles are situated both between the longitudinal and transverse bundles and more dermal to all other bundles. Component spicules are loose apically but gradually fused basally into a rigid scaffold. Loose choanosomal spicules rarely included in fusion are small diactins, tauactins, smaller stauractins, pentactins, hexactins and microscleres.

Ectosomal skeleton of the dermal surface is retained in patches of the worn surface. Dermalia are sword hexactins with short ray projecting; atrialia are regular pentactins. Large narrow hexactins with very short tangential rays probably served as prostalia on the margins of parietal ridges which were disrupted during collection. Microscleres are dispersed among the proximal rays of dermalia and atrialia.

Spicules. Megascleres (Figs 15, 16; Table 7) are principal stauractins, pentactins, hexactins, diactins, tauactins, paratetractins, smaller choanosomal diactins and tauactins, narrow prostal hexactins, dermal hexactins and atrial pentactins. Principalia are taken here as large spicules over 60 µm in width; they are very diverse in this species and all have sharp tips. Of the 350 spicules

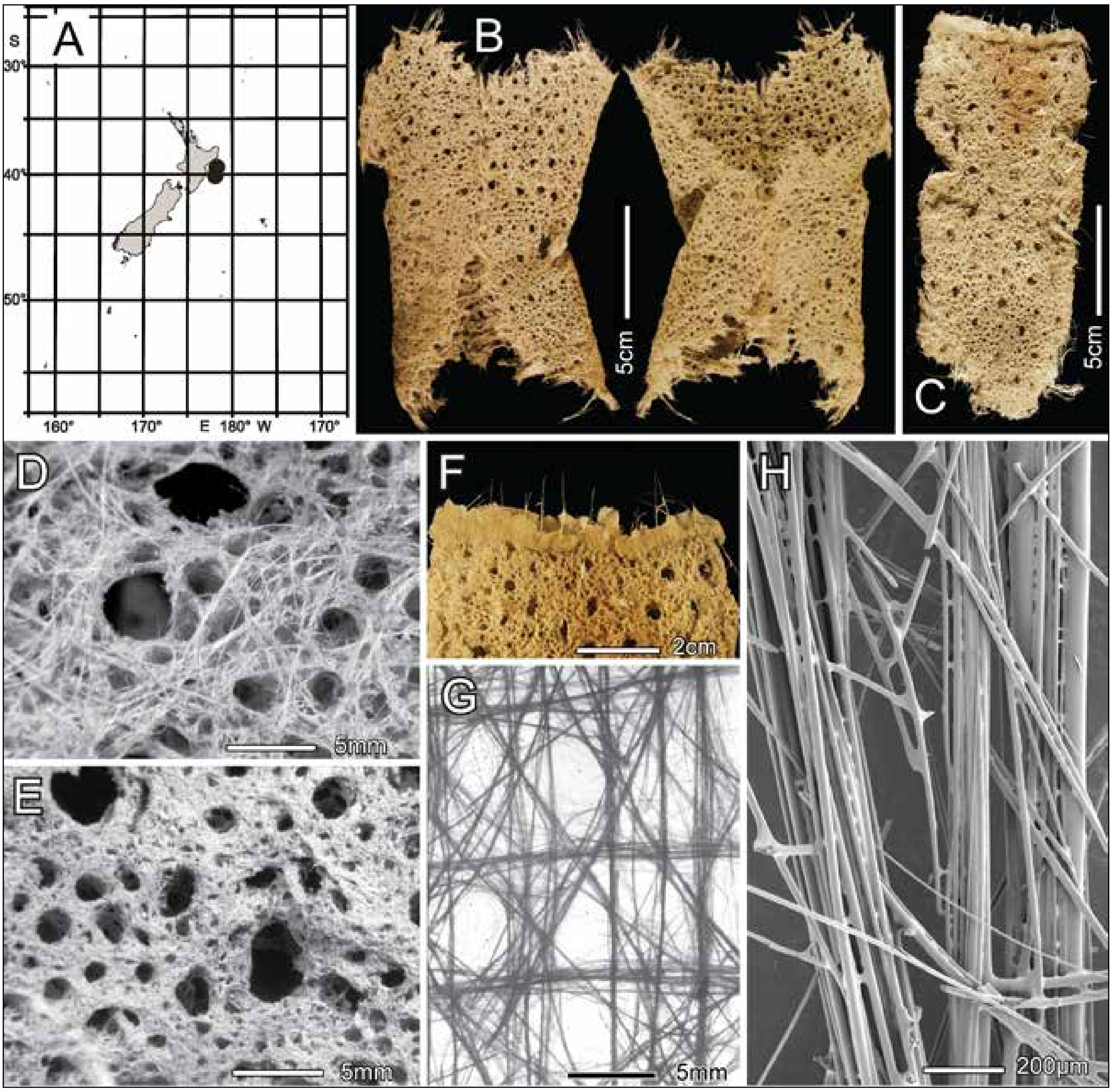


Figure 15. *Corbitella plagiariorum* **sp. nov.**, distribution, morphology and skeleton: **A.** distribution in New Zealand waters; **B.** holotype, NIWA 76484, views of both sides; **C.** paratype NMNZ PO.000494/A; **D.** dermal surface of holotype showing parietal oscula and exposed choanosomal spicules; **E.** atrial surface of holotype with variety of sizes of exhalent apertures and no evidence of abrasion; **F.** upper end of paratype with marginal cuff and rays of abraded corona; **G.** cleaned choanosomal framework of holotype with clear longitudinal and transverse spicule bands; **H.** framework of holotype with spot-fused comital and primary spicules and some synapticular bridge ladders.

enumerated, diactins were most numerous (57%), stauractins next (17%), then tauactins (14%), hexactins (7%), pentactins (4%), and paratetractins (2%).

Large stauractins (Fig. 16A) form the basis of the longitudinal and transverse bundles; their transverse rays are shorter and bent to conform to body curvature. All rays taper gradually to fine points. The relatively rare large pentactins (Fig. 16B) have their tangential rays bent back away from the short unpaired rays that clearly extend dermally but probably did not project beyond the body surface. Smaller primary hexactins (Fig. 16C) have the relatively short tangential rays and one ray ornamented with low conical spines, thereby interpreted as a projecting distal prostal ray.

Primary diactins (Fig. 16D) are most numerous and provide support for the oblique skeletal bundles. Primary tauactins and paratetractins (Figs 16 E, F) provide support for all bundles. All comital diactins and tauactins (not figured) form the most abundant components of all skeletal bundles; they have rough and rounded tips. Choanosomal diactins and tauactins (Figs 16G, H) as well as unfigured small rare stauractins, paratetractins, pentactins and hexactins are filler spicules, not involved in skeletal bundle formation but supporting choanosomal tissues. Their tips

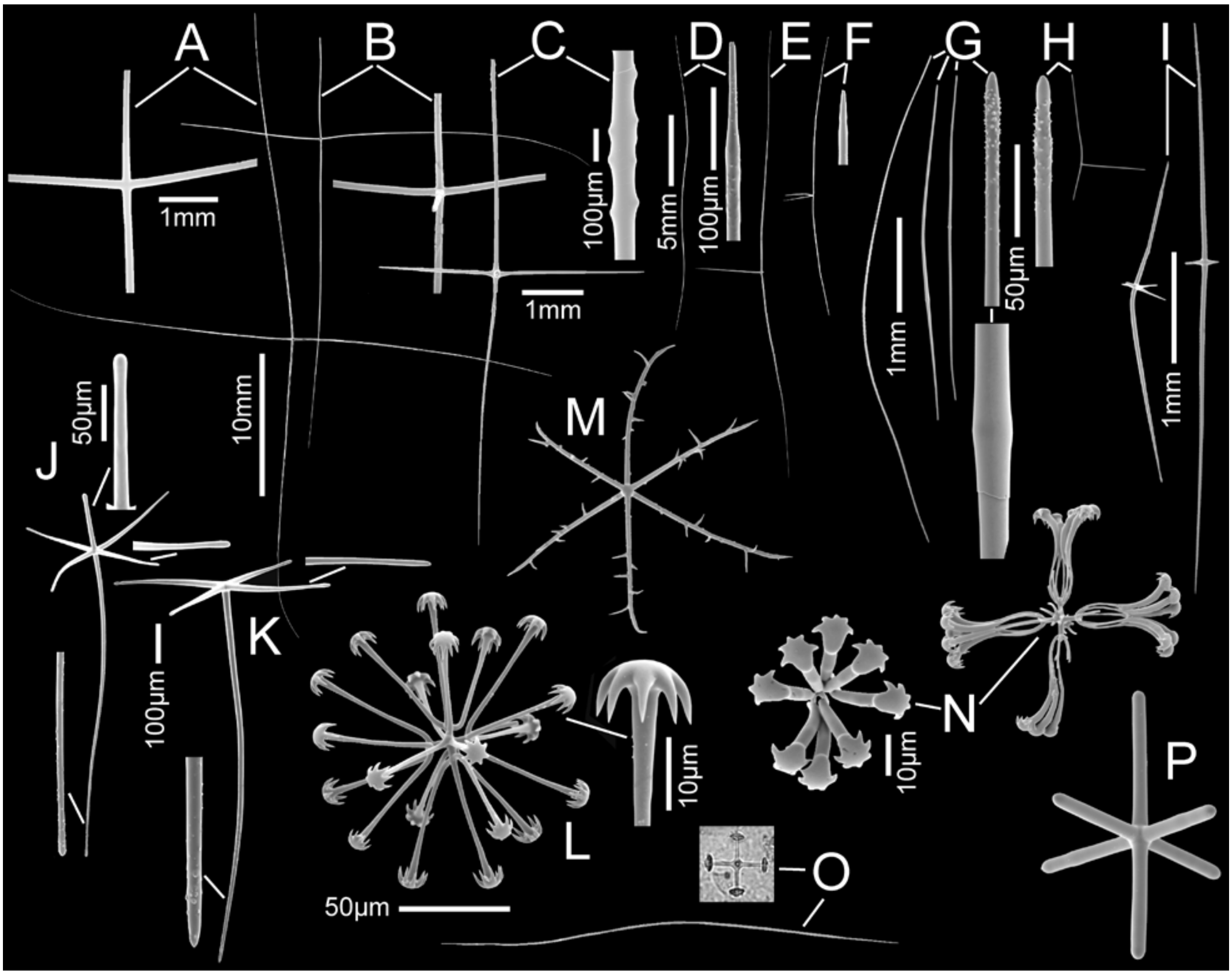


Figure 16. *Corbitella plagiariorum* **sp. nov.**, holotype NIWA 76484, spicules: **A.** primary stauractin, whole, centre magnified; **B.** primary pentactin, whole, centre magnified; **C.** primary hexactin, whole and prostal ray segment magnified; **D.** primary diactin, whole, tip magnified; **E.** primary tauactin; **F.** primary paratetractin, whole, ray tip magnified; **G.** choanosomal diactins, whole, tip and centre magnified; **H.** choanosomal filler tauactin, whole, ray tip magnified; **I.** two narrow prostal hexactins; **J.** sword dermalium, whole, ray tips magnified; **K.** atrialium, whole, ray tips magnified; **L.** spherical discohexaster, whole, terminal ray tip; **M.** spined oxyhexaster; **N.** floricome, partially broken with magnified terminal ray tuft; **O.** graphiocome centrum magnified (LM) and raphide; **P.** blunt-tip holactin. Scales same for A–C, D–F, G–H, J–K and whole microscleres L–P.

are similarly rough and rounded. Narrow prostal hexactins (Fig. 16I) are uncommon and usually encountered with the longer thicker ray broken at the tip and occasionally ornamented with low scales. They are interpreted to be the same spicule commonly seen in other euplectellids on parietal ridges which have been abraded from the dermal surface. Dermalia are sword-shaped hexactins (Fig. 16J) with all ray tips rounded and slightly inflated. Atrialia are pentactins (Fig. 16K) with rounded tangential ray tips and bluntly pointed (parabolic) proximal ray tips; the proximal ray is commonly bent. There are no prostalia marginalia.

Microscleres (Fig. 16; Table 7) are discohexasters (31%), oxyhexactins (25%), floricomes (15%), graphiocomes (3%) and blunt-tip holactins (25%). Discohexasters (Fig. 16L) are the most abundant microsclere (31%). Each short primary ray carries 4 (2–5) long secondary rays ending in a slightly anchorate disc with 5–9 recurved marginal teeth; the latter may undergo irregular branching in abnormal forms resulting in as many as 17 teeth. All parts are smooth. Oxyhexactins (Fig. 16M) are common and characteristically bear few long spines on each ray but they are occasionally very short; entirely smooth microxyhexactins are uncommon (not figured). Floricomes (Fig. 16N) are entirely smooth, common and of the standard form, but all are broken. Each short primary ray bears 7–10 terminal rays ending in a swollen asymmetric cap with 5(3–7) marginal teeth. Occasional abnormal forms have some short terminal rays ending in a smooth tyle. Graphiocomes (Fig. 16O) occur with centrum and terminal rays always separated; the centra are uncommon and were not encountered in SEM. The terminal rays are straight or slightly sigmoid and very sparsely spined. Blunt-tip holactins (Fig. 16P) are common and occur mainly as hexactins but also as pentactins,

Table 7. Spicule dimensions (µm) of *Corbitella plagiariorum* **sp. nov.**, from holotype NIWA 76484.

Parameter	mean	s. d.	range	no.
Primary stauractin				
longitudinal ray length (mm)	19.5	2.8	14.4–24.0	50
transverse ray length (mm)	15.9	2.6	8.1–20.9	50
ray width	129.3	16.1	81.8–160.7	50
Primary pentactin				
longest ray length (mm)	17.5	4.5	9.7–24.7	14
transverse ray length (mm)	13.8	5.0	5.2–21.5	11
unpaired ray length (mm)	1.13	0.55	0.52–1.86	7
ray width	108.2	20.8	61.5–130.5	14
Primary hexactin				
tangential ray length (mm)	2.56	1.33	0.24–4.60	12
tangential ray width	82.7	6.74	67.4–95.5	12
projecting ray length (mm)	2.08	n. a.	0.14–3.53	4
projecting ray width	100.1	n. a.	89.0–108.4	4
Primary diactin				
length (mm)	21.1	5.9	10.3–46.9	51
width	77.7	13.9	49.4–102.6	51
Primary tauactin				
paired ray length (mm)	11.7	4.0	5.9–19.8	49
unpaired ray length (mm)	3.3	2.0	0.2–8.0	49
ray width	79.9	23.4	41.9–129.8	50
Primary paratetractin				
longest ray length	13.1	2.9	10.5–18.3	6
shortest ray length	3.6	1.6	1.8–6.0	6
ray width	76.9	24.4	46.2–104.7	6
Comital diactins				
length (mm)	6.92	2.77	3.38–10.65	21
width	16.0	3.9	9.0–25.5	34
Comital tauactin				
paired ray length (mm)	4.08	1.54	1.52–6.08	18
unpaired ray length (mm)	1.29	0.64	0.50–3.00	18
ray width	17.7	3.2	11.6–25.0	49
Choanosomal diactin				
length (mm)	1.26	0.46	0.26–2.25	32
width	12.8	2.8	5.8–22.7	143
Choanosomal tauactin				
paired ray length (mm)	1.03	0.78	0.33–4.42	32
unpaired ray length (mm)	0.59	0.17	0.37–1.05	32
ray width	14.2	3.1	6.6–24.8	123
Narrow prostal hexactin				
distal ray length (mm)	2.84	0.70	1.85–3.98	6
tangential ray length (mm)	0.45	0.28	0.17–1.17	24
proximal ray length (mm)	2.26	0.69	0.91–3.26	22
ray width	49.4	12.7	29.3–87.3	75
Dermalia sword				
distal ray length	140	58	46–258	50
tangential ray length	228	71	91–520	50
proximal ray length	660	164	317–1070	50
ray width	13.2	3.6	6.7–23.6	50
Atrialia tangential				
ray length	250	52	118–371	50
proximal ray length	695	187	174–1350	50
ray width	13.3	3.2	7.1–23.2	100
Discohexaster				
diameter	117	10	94–140	50
primary ray length	7.3	1.1	5.1–9.4	50
secondary ray length	51.6	4.9	39.6–64.5	50
Oxyhexactin, spined				
diameter	165	17	124–204	50
Oxyhexactin, smooth				
diameter	111	13	86–130	22
Floricome				
diameter	112	6.1	93–124	50
primary ray length	8.9	0.9	6.5–11.1	50
secondary ray length	47.3	2.7	41.9–52.9	50
Graphiocome				
centrum diameter	27.0	2.2	23.4–31.3	30
secondary ray (raphide) length	192	13	166–218	50
Blunt-tip holactin				
diameter	161	53	95–331	50
ray width	9.4	2.4	4.5–14.6	50

stauractins and triactins; they are entirely smooth. This microsclere is so unusual among hexactinellids that it has, as yet, no special name.

Etymology. The species name refers to the type locality, Cape Kidnappers (*plagiariorum*, 'of the kidnappers'; Latin).

Remarks. Although these specimens lack evidence of basal attachment or anchor spicules, they are assigned to the subfamily Corbitellinae since their characters available agree with members of that group. Among the euplectelloid Corbitellinae they are excluded from the genera *Regadrella* and *Heterotella* Gray, 1867, by the presence of stauractine principalia, unknown in those genera. Presence of graphiocomes excludes them from *Dictyaulus* and *Pseudoplectella* Tabachnick, 1990. Their characters are compatible only with the genus *Corbitella*, and are here so assigned. Among the five-known species, only *C. pulchra* (Schulze, 1887), has a similar rectangular framework with stauractins as primary spicules. We confirm here that the completely fused framework of *C. speciosa* (Quoy & Gaimard, 1833), has no rectangular aspects and cannot be supported by primary stauractins but must have diactins as primary spicules. Re-examination of *C. pulchra* and *C. speciosa* holotypes also confirm that the small blunt-tip holactin microscleres occur in both species, mainly as unequal-rayed stauractins, suggesting this may be a common but previously overlooked feature of all *Corbitella* species. Our new form differs from the geographically nearby (Fiji) *C. pulchra* in several characters. The new form has no discohexactins while these are common in *C. pulchra*. The new form has smaller discohexasters with greater number of marginal teeth: here 117 (94–140) µm diameter with 8(5–9) teeth vs 167(152–189) µm diameter with 4–6 teeth. Otherwise the two are very similar and clearly closely related. The recently described *C. polyacantha* Qi Kou *et al.* (in press) has small choanosomal stauractins (ray lengths 121–677 µm vs 14.4–24.0 mm here), huge discoid microscleres, onychohexasters, oxyhexasters and anchorate discohexasters that are absent from the form described here. From these differences, we conclude that the new form is a new species, described here as *C. plagiariorum* **sp. nov.** We are sympathetic with Tabachnick's (2002) suggestion that *C. pulchra* and now this new form, with corona in place of a sieve-plate, be distinguished from other species of the genus by formation of a separate subgenus, *Taegeria*, but we also refrain from making such a formal proposal since there are still very few *Corbitella* specimens known in sufficient detail to warrant that action.

Key diagnostic characters

- Euplectelloid body form with coronal margin around the osculum
- Prostalia marginalia are absent
- Primary spicules are diverse but large stauractins form the basis of the main rectangular framework
- Microscleres include discohexasters, floricomes, thorned oxyhexactins, graphiocomes and blunt-tip holactins; discohexactins are absent

Corbitella inopiosa sp. nov.

Figs 17, 18; Table 8

Material examined. Holotype NIWA 52104, NIWA Stn TAN307/83, International waters 100 km east of Bollons Seamount, Subantarctic New Zealand, 49.768° S, 175.242° W, 1278–1261 m, 02 May 2003.

Comparative material. *Corbitella pulchra* (originally *Taegeria pulchra*), holotype, NHMUK 1887.10.20.028, HMS *Challenger*, Stn 174c, near Fiji Islands, 19.131° S, 178.326° E, 1116 m, 03 Aug 1874; *Corbitella speciosa* (originally *Alcyoncellum speciosum*), holotype and genotype, MNHN HX26, off the Moluccas, Indonesia, exact coordinates, date and depth unknown.

Type locality. International waters, 100 km east of Bollons Seamount, Subantarctic New Zealand (Fig. 17A).

Distribution. Known from only the type locality.

Habitat. Presumably attached to hard substratum at 1261–1278 m.

Description. Morphology is euplectelloid; the holotype consists of two moderate-size fragments, 93 x 106 mm and 89 x 100 mm, of the mid body wall of a presumably tubular body (Fig. 17B). Neither attachment base nor top of the specimen were collected. Wall thickness varies from 1 to 2 mm. Rectangular arrangement of the primary framework is obvious in both dermal and atrial sides. The dermal surface (Fig. 17C) is badly worn but longitudinal and transverse primary spicule bundles are easily recognisable. The atrial surface (Fig. 17D) is also badly worn and has very strong lateral (circular) bundles and thinner oblique bundles. Organisation of the primary frame is clearer with profusion of small spicule bundles in a wall fragment cleaned with bleach (Fig. 17E). Large primary stauractins are evident in closer view of the same preparation (Fig. 17F). Parietal oscula, 3.2 (1.8–5.5) mm in diameter, are irregularly distributed. Colour is light brown when dried.

Skeleton. Choanosomal skeleton is a network of crossing longitudinal, transverse and oblique bundles of thin comital diactins enclosing large principal stauractins, diactins and a few tauactins. The main skeletal framework has a dominant rectangular aspect (Fig. 17E) with small oblique elements. Transverse (circular) bundles are always the most atrial, the longitudinal bundles always dermal to these; oblique bundles are situated both between the longitudinal and transverse bundles and more dermal to all other bundles. Fusion of primaries and comitalia occur only basally in the holotype.

Loose choanosomal spicules include small diactins, large and small tauactins and stauractins and microscleres. Pentactins and hexactins are never encountered as choanosomal elements and prostalia marginalia are absent. Ectosomal skeleton of the dermal surface is retained in patches of the worn surface. Dermalia are sword hexactins with short ray projecting; atrialia are regular pentactins. Large narrow hexactins with very short tangential rays were certainly prostalia and may have been situated on parietal ridges which were disrupted during collection. Microscleres are dispersed among the proximal rays of dermalia and atrialia. Common occurrence of spicules from foreign sponges includes small stellate discohexasters, scopules, onychohexasters, and other forms.

Spicules. Megascleres (Figs 17, 18; Table 8) are principal stauractins, diactins, tauactins, smaller choanosomal diactins, tauactins and stauractins, narrow prostal hexactins, dermal hexactins and atrial pentactins. Principalia are taken here as large spicules over 60 µm in width; they are moderately diverse and all have sharp tips. Of the 200 principal spicules enumerated, irregular stauractins were most numerous (46%), regular stauractins next (36%), then diactins (9%) and tauactins (8%). The large regular stauractins (Fig. 18A) form the basis of the

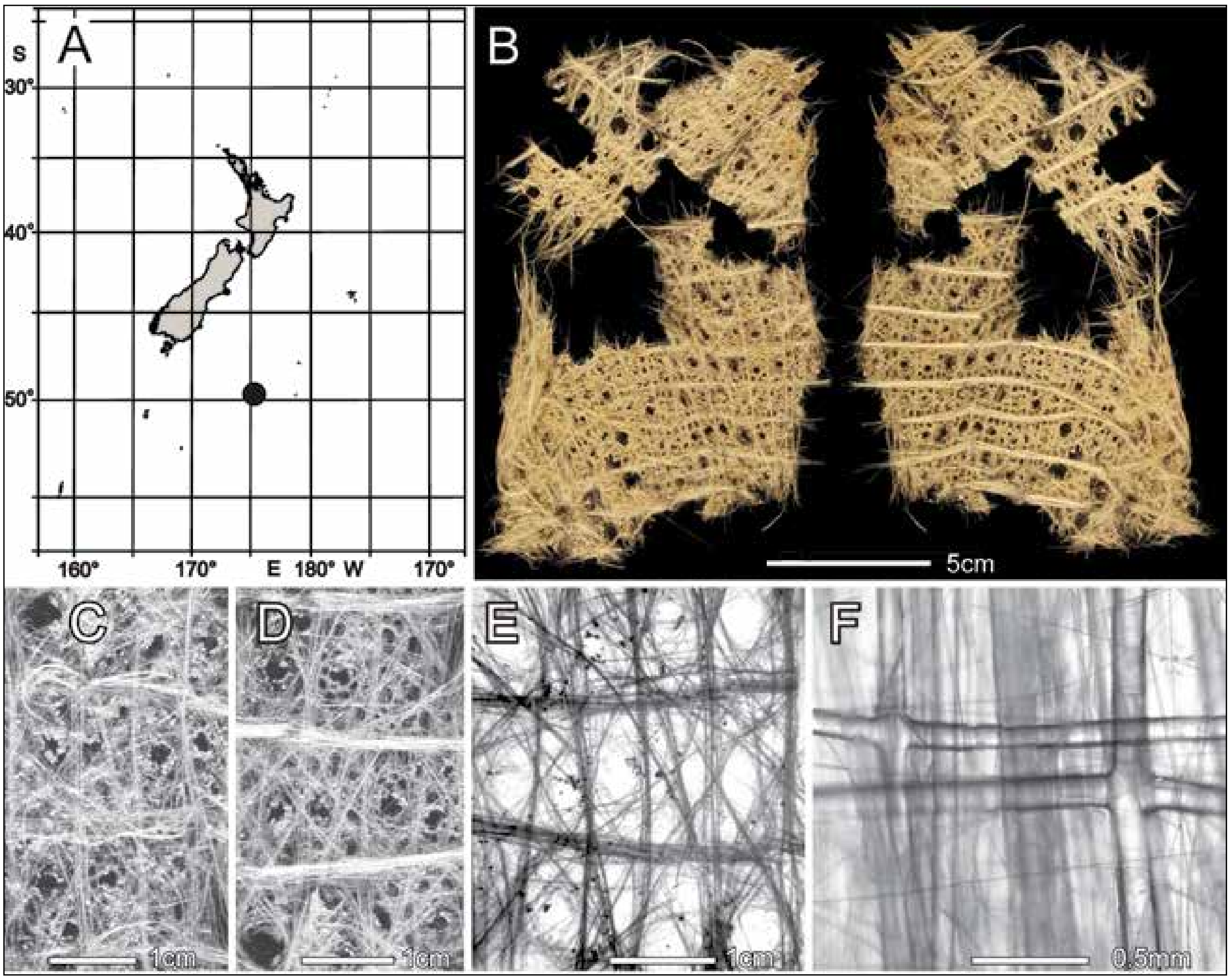


Figure 17. *Corbitella inopiosa* **sp. nov.**, holotype NIWA 52104, distribution, morphology and skeleton: **A.** distribution in International waters to the east of the Subantarctic New Zealand region; **B.** holotype, NIWA 52104, dermal side left, atrial side right; **C.** dermal surface showing parietal osculum damage resulting in exposed choanosomal spicules; **D.** atrial surface with main transverse spicule bundles; **E.** cleaned choanosomal framework with clear longitudinal and transverse spicule bundles; **F.** close view of bundle with two large primary stauractins.

longitudinal and transverse bundles; their transverse rays are shorter and bent to conform to body curvature. All rays taper gradually to fine points. Irregular stauractins (Fig. 18B) have their cross situated centrally or distally on one long ray; in either case, the rays are not perpendicular and one axis thus lies in either a longitudinal or transverse bundle while the other lies in an oblique bundle. Primary diactins (Fig. 18C) are regular without central swellings.

Comitalia (Fig. 18D) are mainly stauractins (89%), with small proportions as tauactins (9%) and diactins (3%). Narrow hexactins (Fig. 18E) have very short tangential rays and distal ray ornamented with short scale-like spines pointing distally. Accessory choanosomal diactins not associated with primary spicule bundles have rough rounded tips and inflated centres with two or four knobs. Accessory choanosomal stauractins and tauactins occur in two size classes; the larger are of a size like the diactins and could be grouped with them; the smaller, here classed as fillers (Fig. 18G), are 84% stauractins, 8% tauactins and 8% diactins. Dermalia are sword-like hexactins (Fig. 18H) with short unornamented distal ray and all rays ending in sharp tips. Atrialia (Fig. 18I) are regular pentactins with tangential ray tips inflated.

Microscleres (Figs 17, 18; Table 8) are discohexasters and discohexactins (2.5%), oxyhexactins (15.2%), floricomes (75%), and helicographiocomes (7.4%). Blunt-tip holactins are absent. Large disco-tipped microscleres are mainly hemidiscohexasters (61%, Fig. 18J), discohexactins (29%, Fig. 18K) and full discohexasters (10%). The hemi-forms have 9 (7–12) terminal rays while the full hexasters have 15 (12–18) terminal rays. All rays are entirely smooth and end in large discs with 6 (4–8) recurved marginal claws. Oxyhexactins occur in smooth and thorned forms (Fig. 18L); thorns are rarely large enough to be obvious in LM. Floricomes occur in three size forms generally easily distinguished in LM; their terminal rays are quite distinct (Fig. 18M). Floricome 1 (64% of floricomes, Fig. 18N) microscleres are large,

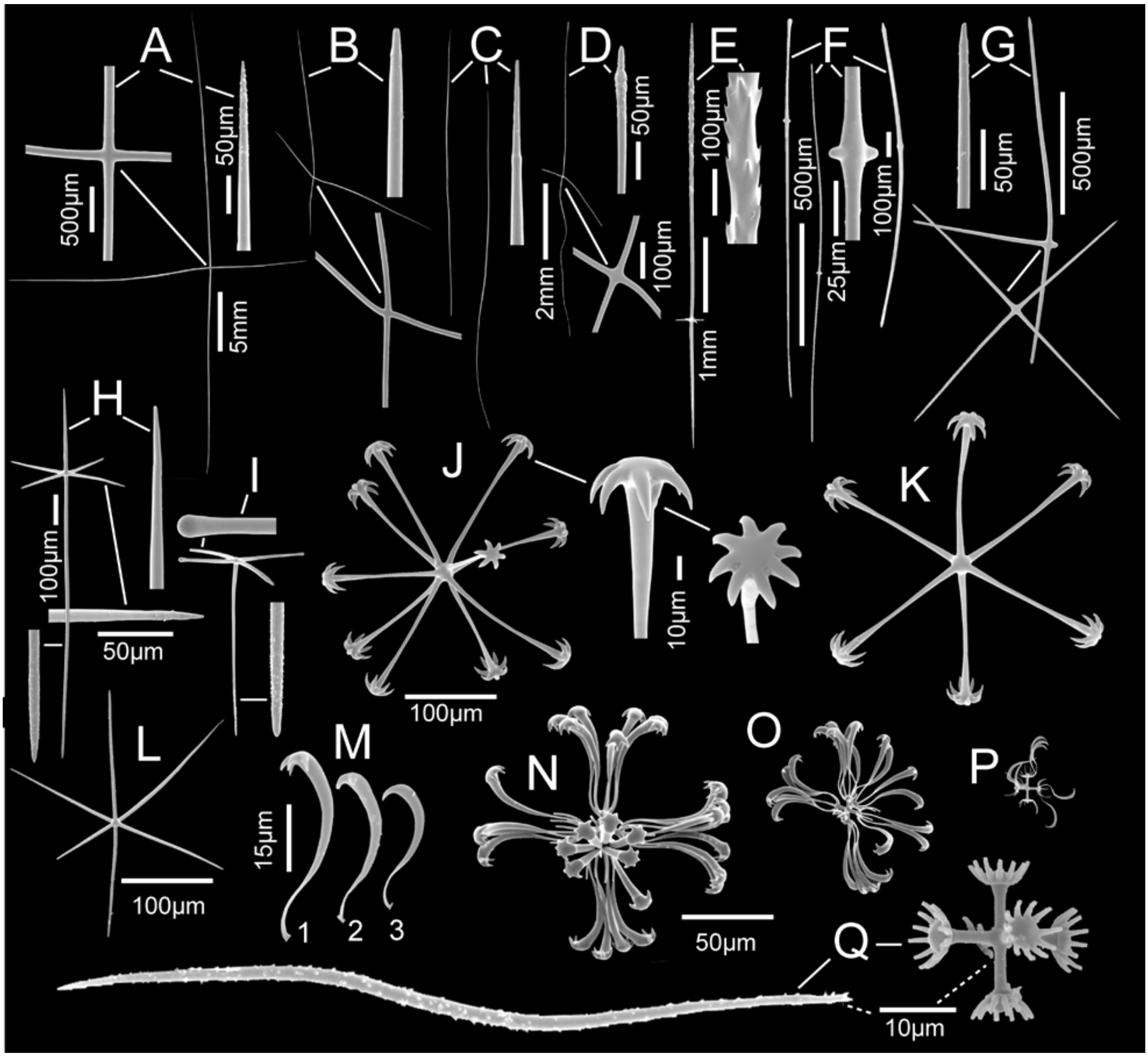


Figure 18. *Corbitella inopiosa* **sp. nov.**, holotype NIWA 52104, spicules: **A.** primary regular stauractin, whole, centre magnified; **B.** primary irregular stauractin, whole, centre magnified; **C.** primary diactin, two whole, tip magnified; **D.** comital stauractin, whole, centre and ray tip magnified; **E.** narrow prostal hexactin, whole, distal ray segment magnified; **F.** three whole choanosomal diactins, centre magnified; **G.** choanosomal filler tauactin and stauractin with ray tip magnified; **H.** dermalium, whole, distal, tangential and proximal ray tips magnified; **I.** atrialium, whole, tangential and proximal ray tips magnified; **J.** hemidiscohexaster, whole, ray tips magnified; **K.** discohexactin; **L.** oxyhexactin, appears smooth but has very small spines; **M.** terminal rays of three classes of floricomes; **N.** floricome 1; **O.** floricome 2; **P.** floricome 3; **Q.** helicographiocome centrum and terminal, helicoid ray. Scales same for A–C, H–I, whole spicules in J–L, and whole floricomes N–P.

~130 µm in diameter, with 4–6 marginal teeth on their end clubs. Floricome 2 (22% of floricomes, Fig. 18O) are ~83 µm in diameter with 2–4 marginal teeth. Floricome 3 (14.5% of floricomes, Fig. 18P) are very small, ~60 µm in diameter and have 1 or rarely 2 marginal claws; this spicule is often called a sigmatocome but the terminal ray head is swollen and canted as in other floricomes. All floricomes are entirely smooth. Helicographiocomes (Fig. 18Q) always occur as separated centra and terminal raphides; they are easily mistaken for centra of floricome 3 and require care to distinguish these. Centra are finely rough and the distal end of each primary ray is an inflated disc bearing a single marginal circle of 10–12 bases of the terminal rays; the central face of the disc is very unusual for graphiocomes in carrying no terminal ray bases and is smooth. Terminal raphides are entirely covered with small reclined spines and the ubiquitous sinuous profile of these suggests they are helices rather than spirals.

Etymology. The species name refers to the lack of choanosomal pentactins and hexactin megascleres, and blunt-tip holactin microscleres (*inopiosa*, 'in want'; Latin).

Remarks. This species is very like the previous *C. plagiariorum* **sp. nov.** and clearly is closely related. The same argument for assignment of this form to the

Table 8. Spicule dimensions (µm) of *Corbitella inopiosa* **sp. nov.**, from holotype NIWA 52104.

Parameter	mean	s. d.	range	no.
Primary stauractin, regular				
ray length (mm)	15.3	5.6	4.9–25.9	68
ray width	103	22	59–147	76
Primary stauractin, irregular				
ray length (mm)	8.2	6.3	0.2–29.2	104
ray width	71.6	21.4	22.6–137.1	54
Primary tauactins				
longest ray length (mm)	12.0	4.0	5.7–18.2	9
unpaired ray length (mm)	4.4	3.8	0.7–13.1	9
ray width	72.4	21.9	35.4–112.3	9
Primary diactin				
length (mm)	23.6	5.6	10.7–30.6	10
width	82.4	18.7	54.0–121.0	10
Comitalia, all				
total length (mm)	9.5	4.6	1.6–17.8	22
width	19.3	5.1	10.0–43.2	40
Narrow hexactine prostalia				
distal ray length (mm)	2.9	0.9	1.1–4.3	50
distal ray width	33.4	8.3	16.3–48.8	50
tangential ray length	238	53	127–356	50
tangential ray width	26.0	5.6	15.6–41.9	50
proximal ray length (mm)	1.4	0.4	0.6–2.0	50
Choanosomal diactin				
length (mm)	1.6	0.6	0.8–3.4	50
width	23.7	3.5	16.3–30.0	25
Choanosomal large stauractins				
longest ray length (mm)	1.1	0.7	0.4–4.3	50
ray width	20.9	4.6	10.6–31.0	33
Choanosomal filler stauractins				
longest ray length	608	158	379–4271	56
ray width	18.6	4.3	10.2–27.4	25
Dermalia sword				
distal ray length	241	40	149–338	50
tangential ray length	240	39	165–335	50
proximal ray length	616	163	302–1104	50
ray width	9.3	1.9	5.8–13.5	50
Atrialia				
tangential ray length	279	59	165–401	50
proximal ray length	671	222	287–1155	50
ray width	13.8	2.2	8.0–18.0	100
Discohexaster				
diameter	362	45	219–460	51
primary ray length	10.6	2.3	6.5–17.3	48
secondary ray length	166	21	104–203	44
disc diameter	37.7	4.6	25.1–47.0	51
Discohexactin				
diameter	398	40	298–464	23
disc diameter	41.1	4.5	27.5–47.4	23
Oxyhexactin, spined				
diameter	252	24	195–289	30
Oxyhexactin, smooth				
diameter	372	65	258–498	50
Floricome 1				
diameter	130	12	103–155	128
primary ray length	9.3	1.1	6.6–12.0	128
secondary ray length	56.0	5.1	44.8–67.2	128
Floricome 2				
diameter	83.4	8.9	69.3–97.8	51
primary ray length	7.4	0.8	6.0–9.6	51
secondary ray length	34.8	4.3	27.6–42.1	51
Floricome 3				
diameter	60.2	6.6	41.5–84.2	51
primary ray length	6.7	0.9	4.9–8.3	51
secondary ray length	24.1	3.3	18.4–37.7	51
Helicographiocome				
centrum diameter	17.1	n. a.	14.1–21.6	3
secondary ray (raphide) length	81.2	15.5	52.4–118.9	50

genus *Corbitella*, made above, also applies here. Within the genus it shares having primary stauractins only with *C. pulchra* and *C. plagiariorum* **sp. nov.** It differs from *C. plagiariorum* **sp. nov.** in lacking choanosomal pentactins and hexactin megascleres, in lacking blunt-tip holactin microscleres and in having discohexactins and three different forms of floricomes, while the latter has no discohexactins and a single class of floricome. The new form differs from *C. pulchra* by having stauractine comitalia vs diactins, three size classes of floricomes vs one class, no blunt-tip holactin microscleres vs their presence, and much larger disco-tip microscleres, mean diameters 362 and 398 µm vs 167 and 170 µm. It differs from *C. polyacantha* in having large primary stauractins (absent there) and in lacking onychohexasters and anchorate discohexasters (present there). These differences ensure that the Bollons Seamount specimen is distinct from all known species of *Corbitella* and we designate the new species as *C. inopiosa* **sp. nov.**

Key diagnostic characters

- Euplectelloid body form, with oscular margin still unknown
- Prostalia marginalia are absent
- Primary spicules are diverse but large stauractins are the basis of the rectangular framework
- Microscleres include discohexasters, discohexactins, three classes of floricomes, smooth and thorned oxyhexactins, and helicographiocomes but no blunt-tip holactins

Genus *Dictyaulus* Schulze, 1896

Dictyaulus Schulze, 1896: 36.

Diagnosis. Body is tubular, basiphytous with numerous lateral oscula and a sieve-plate constructed with radially directed prostalia marginalia or colander-like structure, developed from the former. Choanosomal spicules are chiefly stauractins, tauactins, and diactins are rare. The spicules of the sieve-plate are hexactins and their derivatives up to diactins. Large choanosomal hexactins with short spiny distal end are not obligate. Dermalia are hexactins and pentactins, toothed discohexasters or discasters, anchorate discohexasters, floricomes and sometimes drepanocomes and sigmatocomes (from Tabachnick 2002).

Remarks. Images of living, purported New Zealand and Cook Island region *Dictyaulus* spp., are figured in Seafloor Image Figs 39–41.

Type species. *Dictyaulus elegans* Schulze, 1896 (by monotypy).

***Dictyaulus hydrangeaformis* sp. nov.**

Figs 19–21; Table 9

Material examined. Holotype NIWA 71002, NZOI Stn Z8883, TRIP1024/45, Bay of Plenty, North Island, 37.4° S, 176.9° E, 752 m, 06 Aug 1997. **Paratypes** *South Norfolk Ridge (International waters)*: QM G316699, NIWA Stn TAN0308/142, 34.275° S, 168.401° E, 1246–1249 m, 02 Jun 2003.

Kermadec Ridge: NIWA 52148, NIWA Stn TAN0205/39, 32.607° S, 179.605° W, 1175 m, 17 Apr 2002.

Southern Kermadec Ridge (collected by GEOMAR ROV *Kiel 6000*, onboard RV *Sonne*, ICBM expedition SO254): NIWA 126124, RV *Sonne* Stn SO254/33ROV08_BIOBOX18, 35.380° S, 178.980° E, 1196 m, 07 Feb 2017.

Type locality. Bay of Plenty, North Island (Fig. 19A).

Distribution. Known from four locations off northern New Zealand.

Habitat. Attached to hard substratum, 752–1249 m.

Description. Morphology of the holotype (Fig. 19B) is a medium sized thin-walled plate from a cylindric euplectelloid sponge, 13.5 cm wide by 9.2 cm length and 1.7–3.6 mm in thickness. Surfaces of both sides are badly worn (Fig. 19G, H); very thick lateral (circular) spicule bundles of the atrial side are particularly obvious; neither the top nor the attachment bottom was collected. Parietal oscula 3.4 (2.0–5.8) mm in diameter are distributed irregularly. Paratypes are of moderate size; QM G316699 (Fig. 19C), the flattened conic top end of a specimen, is 18.9 cm long and 16.1 cm wide (lower diameter calculated as 10.2 cm) with a thickness of 0.8–1.4 mm from a large specimen. The sieve plate is partially intact (Fig 19F) but the cuff is severely abraded. The second paratype, NIWA 52148, is a flattened plate-like mid body fragment 11.1 cm long by 7.2 cm wide by 2.0–3.2 mm thick. Paratype NIWA 126124 (Fig. 19D) is 20.1 cm long and 7.2 cm in diameter at the upper end (excluding the lateral prostalia); it is the only specimen where the basal attachment disc is present. Lateral prostalia of this ROV-collected specimen are intact and surprisingly dense compared to the other specimens collected by fish trawl or epibenthic sled where the prostalia are mostly gone and retained only in small patches. The *in-situ* image taken of the specimen before collection (Fig. 19E) shows the uninjured marginal cuff and sieve plate with an unusual central aperture. Details of sieve plate structure are similar to that of paratype QM G316699 (Fig. 19C). All are light brown when dried or in ethanol; colour when live is light beige.

Skeleton. Choanosomal skeleton is a network of crossing longitudinal, transverse and oblique bundles of thin comital diactins enclosing large principal stauractins, diactins and fewer tauactins, paratetractins, pentactins and hexactins. The main skeletal framework has a dominant rectangular aspect with most obvious elements being the large transverse (circular) spicule bundles (Fig. 19H) spaced at ~ 14 mm. Transverse bundles are always the most atrial elements with longitudinal bundles always dermal to these; oblique bundles are situated both between the longitudinal and transverse bundles and more dermal to all other bundles. Component spicules are loose apically but gradually fused basally into a rigid scaffold (Fig. 19I). Loose choanosomal spicules rarely involved in fusion are small to medium sized diactins, tauactins, stauractins, pentactins, hexactins, and microscleres. At the margin of the sieve plate, cuff and body wall, large hexactins or pentactins join these elements with the longest ray extending into a sieve beam, two opposite rays extending in the marginal bundle and a shorter ray extending into the cuff; the other one or two rays are reduced to short rays or small knobs.

Ectosomal skeleton of the dermal surface of the holotype is retained in patches of the worn surface. Dermalia are sword hexactins with short ray (hilt) projecting; atrialia are regular pentactins. Short segments of thin parietal ridges remaining in depressions of the dermal surface are fringed by narrow large hexactin prostalia with very short tangential rays. Microscleres are dispersed among the proximal rays of dermalia and atrialia.

Cuff skeleton consists of primary stauractins located medially with two very long opposite rays oriented

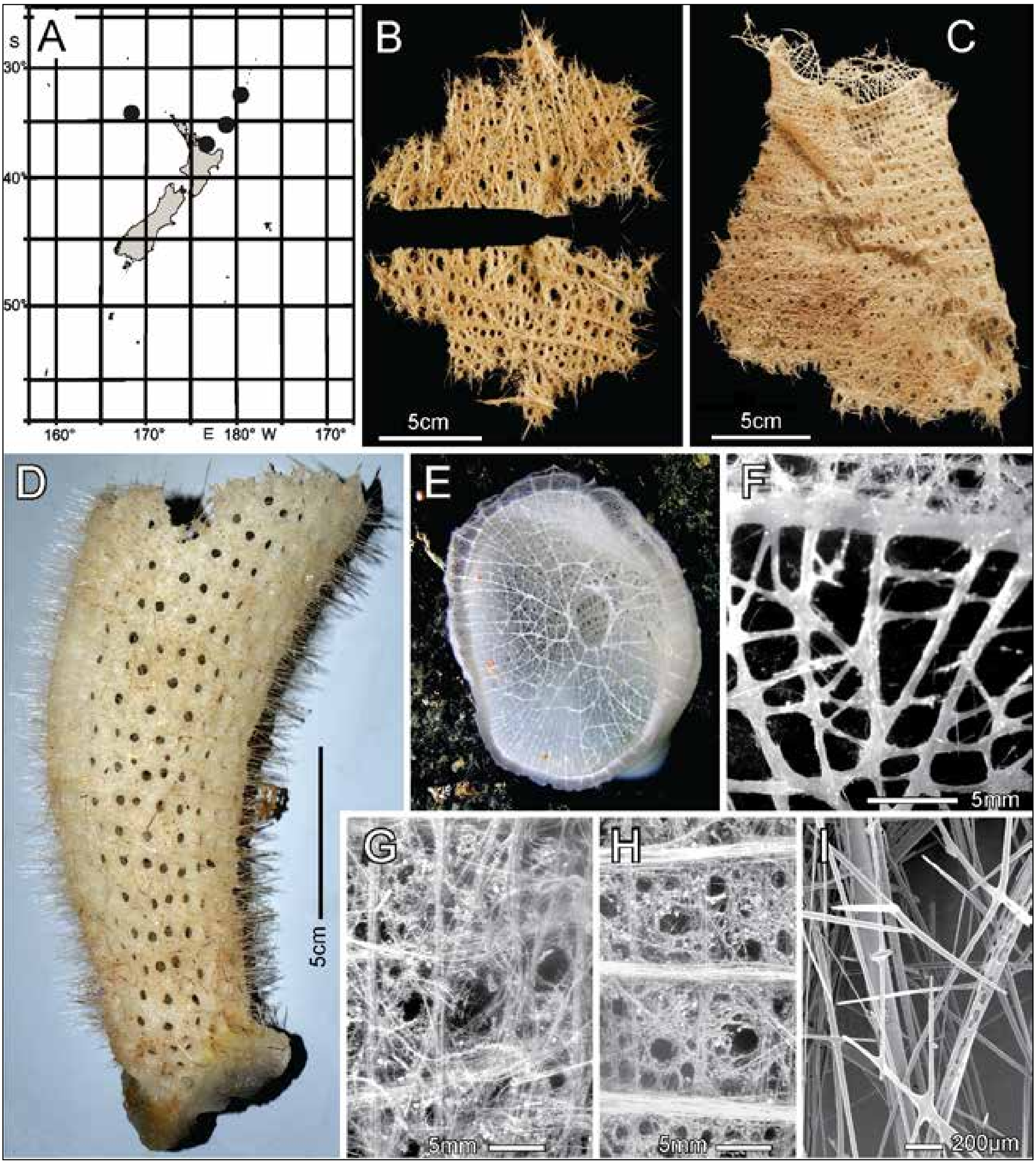


Figure 19. *Dictyaulus hydrangeaformis* **sp. nov.**, distribution, morphology and skeleton: **A.** distribution in New Zealand and International waters; **B.** part of holotype, NIWA 71002, dermal side above, atrial side below; **C.** paratype QM G316699; **D.** paratype NIWA 126124; **E.** upper end with sieve plate of paratype NIWA 126124, *in-situ* image; **F.** edge of sieve plate and damaged marginal cuff of paratype QM G316699; **G.** dermal surface of holotype showing parietal osculum and damage indicated by exposed choanosomal spicules; **H.** atrial surface of holotype with main transverse spicule bundles; **I.** cleaned choanosomal framework showing spicule fusion (SEM). Image in E captured by GEOMAR ROV *Kiel 6000* onboard RV *Sonne* (voyage SO254), courtesy of Project *PoriBacNewZ*, GEOMAR & ICBM.

laterally around the cuff and two shorter rays oriented radially. Large tauactins form overlapping laterally oriented bundles in the middle and outer cuff areas. The outer fringe consists of the diactins and typical narrow hexactins oriented radially. Upper and lower surface are lined by stocky hexactins, some of them similar to body dermalia.

Sieve plate skeleton consists of primary diactins and tauactins of irregular shape and length forming the axis of the beams. They are enclosed in bundles of long comital spicules and intermediate spicules that are not especially elongate. A layer of small short diactins encloses these and small stocky hexactins cover the outer surface.

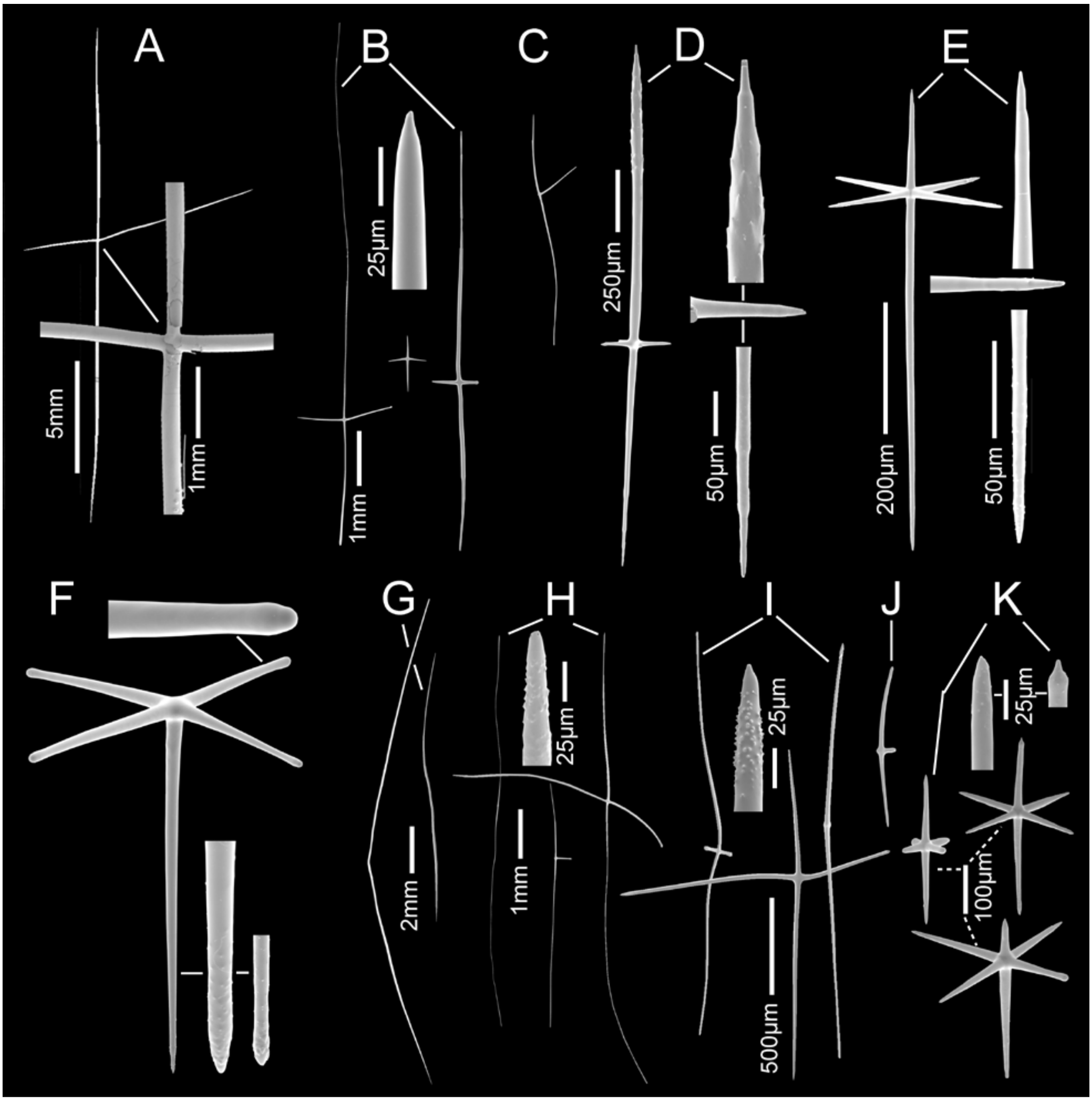


Figure 20. *Dictyaulus hydrangeaformis* **sp. nov.**, holotype NIWA 71002, body spicules A–F; paratype QM G316699, sieve-plate body spicules G–K: **A.** primary regular stauractin, whole, centre magnified; **B.** choanosomal stauractin, whole, ray tip magnified; **C.** choanosomal tauactin; **D.** narrow prostal hexactin with ray tips magnified; **E.** dermalium, whole, distal, tangential and proximal ray tips magnified; **F.** atrialium, whole with tangential and proximal ray tips magnified; **G.** two large primary diactins of the sieve plate; **H.** three comitalia of the sieve plate and tip magnified; **I.** three intermedial sieve plate spicules and tip magnified; **J.** small sieve plate triactin; **K.** various forms of surface hexactins of sieve-plate beams with ray tips magnified.

Spicules. Megascleres (Fig 20; Table 9) are primary stauractins (rarely diactins, tauactins, paratetractins, pentactins), smaller choanosomal stauractins, tauactins, narrow prostal hexactins, dermal hexactins and atrial pentactins. Primary spicules are taken here as large spicules over 60 µm in width; they are very diverse in this species and all have sharp tips. Of the 57 primary spicules enumerated, stauractins were dominant (93%), and all other types listed above occurred as single examples. The large stauractins (Fig. 20A) form the basis of the longitudinal and transverse bundles; their transverse rays are shorter and bent to conform to body curvature. All rays taper gradually to fine points. Choanosomal spicules are predominately stauractins (Fig. 20B) and tauactins (Fig. 20C); comitalia are included in the measurements of these categories. Their tips are either smoothly pointed or rough and rounded. Narrow prostal hexactins (Fig. 20D) are moderately common and usually encountered with the longer thicker ray broken at the tip and occasionally ornamented with low scales. They are the same spicule commonly seen in other euplectellids on parietal ridges and marginal cuffs. Dermalia are sword-shaped hexactins

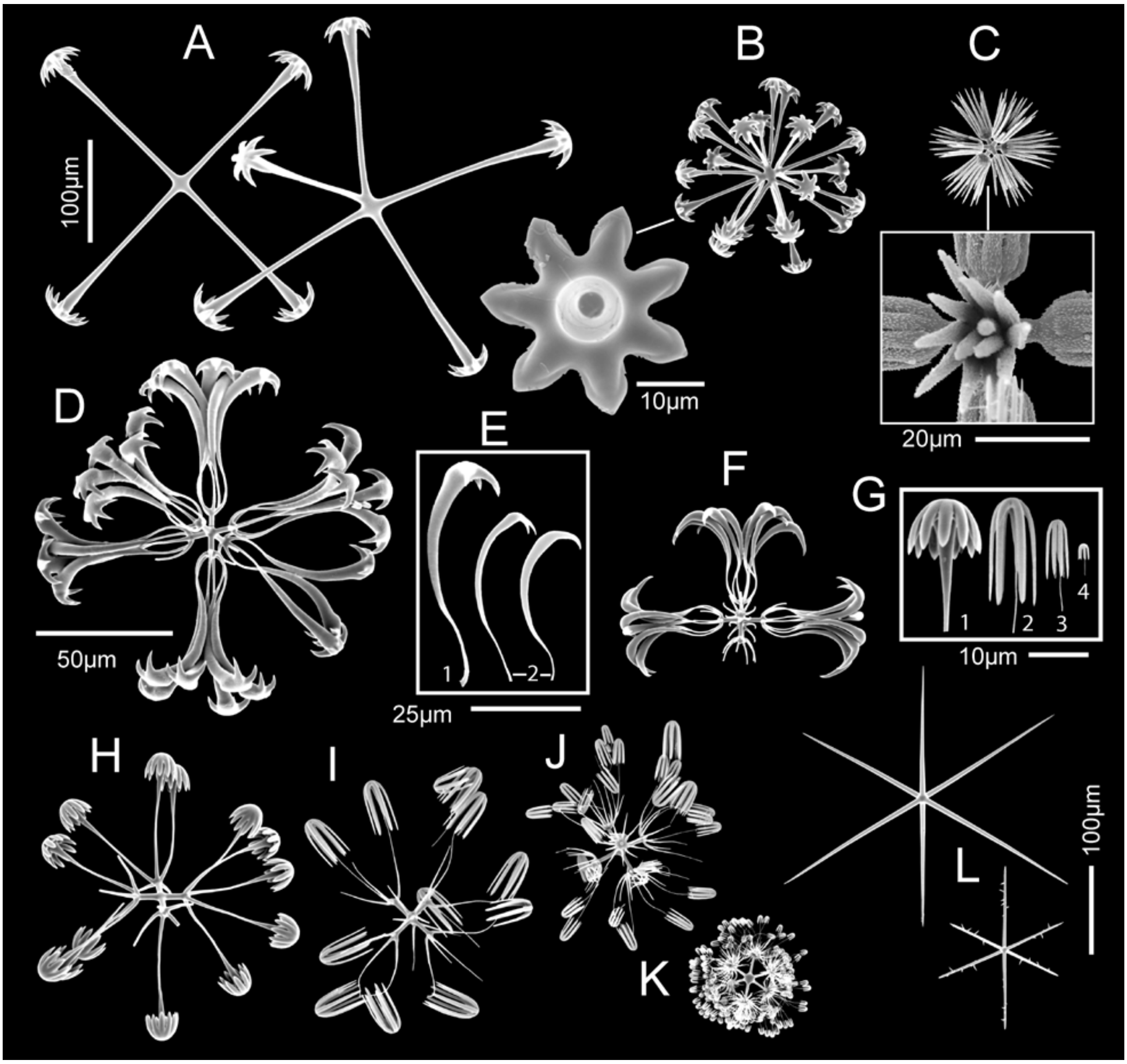


Figure 21. *Dictyaulus hydrangeaformis* **sp. nov.**, holotype NIWA 71002, microscleres: **A.** discostauractin (left) and hemidiscostauraster (right); **B.** discohexaster with end disc magnified; **C.** oxyhexaster, whole, centre of terminal ray tuft magnified; **D.** floricome 1; **E.** terminal rays of floricomes 1 & 2; **F.** floricome 2; **G.** terminal ends of secondary codonhexaster 1–4 rays; **H.** codonhexaster 1; **I.** codonhexaster 2; **J.** codonhexaster 3; **K.** codonhexaster 4; **L.** smooth and spined oxyhexactins. Scales same for whole spicules in A–C, D & F, H–K.

(Fig. 20E) with all ray tips sharply pointed. Atrialia are pentactins (Fig. 20F) with rounded and inflated tangential ray tips and bluntly or sharply pointed proximal ray tips. There are no prostalia marginalia.

Sieve-plate spicules were assessed in paratype QM G316699; the central part contains primary diactins, comitalia, intermedia, small subsurface diactins and surficial hexactins. Sieve primary diactins (Fig. 20G) and rare tauactins are usually bent and form the central axis of sieve beams. Sieve comitalia (Fig. 20H) are mainly stauractins (42%) with diactins (38%) and tauactins (20%) common; they enclose the primary spicules in a silk-like sheath. Intermedial spicules (Fig. 20I) are mainly diactins (90%) and few tauactins (8%) and stauractins (2%); they form the bulk of the sieve beam mass around the central bundle. Small diactins and tauactins (Fig. 20J) form a subsurface layer into which the surface hexactins are anchored. Surficial hexactins vary somewhat in shape, with stout bluntly-pointed rays or smoothly rounded abreviated rays. There is no apparent difference in spicule types on inner, outer, or lateral surfaces of the sieve beams. The margin where sieve and cuff connect with the main body clearly contains other special spicule types which were not analysed here due to damage during collection.

Microscleres (Fig. 21; Table 9) include discostauractins and variants with up to seven terminal rays (42%), discohexasters (35%), oxyhexasters (21%), two floricome forms (together 2%), four codonhexaster forms (abundance not assessed) and oxyhexactins (abundance not assessed). Discostauractins and their rare hemi-

Table 9. Spicule dimensions (µm) of *Dictyaulus hydrangeaformis* **sp. nov.**, from holotype NIWA 71002 and paratype QM G316699 (*).

Parameter	mean	s. d.	range	no.
Primary stauractin, regular				
ray length (mm)	17.7	8.2	6.1–38.3	31
ray width	166	45	99–290	31
Choanosomal stauractin				
long ray length (mm)	1.40	1.1	0.5–5.5	50
short ray length (mm)	0.5	0.2	0.1–1.0	50
ray width	38.7	10.3	18.7–61.2	50
Choanosomal tauactin				
longest ray length (mm)	2.0	1.7	0.6–6.5	36
unpaired ray length (mm)	0.5	0.3	0.1–1.4	36
ray width	33.4	7.8	22.1–60.2	36
Narrow prostal hexactin				
distal ray length (mm)	1.0	0.8	0.1–5.5	54
basal ray width	23.0	10.3	9.3–58.4	100
maximum ray width	24.8	10.5	9.9–60.5	92
tangential ray length	131	43	53–282	100
tangential ray width	18.7	7.4	7.6–45.9	100
proximal ray length (mm)	736	407	148–1936	95
prostal ray width	21.9	10.4	10.1–61.3	100
Dermalia, hexactin				
distal ray length	95	52	34–290	50
tangential ray length	126	61	44–291	50
proximal ray length	176	108	43–506	50
ray width	6.4	2.5	2.9–14.4	50
Atrialia				
tangential ray length	325	84	174–523	50
proximal ray length	554	150	211–843	50
ray width	20.1	4.4	9.7–29.2	50
*Sieve-plate large diactin				
length (mm)	10.0	3.4	4.1–20.6	50
width	118	28	66–194	50
*Sieve comitalia				
length (mm)	6.1	2.3	2.2–10.8	26
width	9.4	3.1	5.0–17.5	37
*Sieve intermedials				
length (mm)	1.5	0.4	1.0–2.5	50
width	25.1	6.1	14.1–45.2	50
*Sieve small diactin				
ray length	594	124	271–889	50
width	18.1	4.0	9.6–29.1	50
*Sieve surface hexactin				
ray length	192	41	125–296	50
ray width	17.5	5.3	7.1–28.1	50
Disco- and hemistauractin				
diameter	354	53	227–450	50
disc diameter	47.4	4.3	36.3–55.9	50
ray width	5.1	1.2	2.6–8.0	50
Discohexaster and stauraster				
diameter	215	20	185–265	50
primary ray length	10.2	2.0	6.5–13.9	50
secondary ray length	98.4	10.5	82.0–124.5	50
Oxyhexaster				
diameter	121.3	8.1	108.9–146.2	50
primary ray length	10.4	1.4	7.6–14.4	50
secondary ray length	50.3	2.9	45.0–58.5	50
Floricome 1				
diameter	124	10	105–138	32
primary ray length	8.8	1.1	7.3–12.2	32
secondary ray length	54.2	4.8	43.7–60.8	32
Floricome 2				
diameter	94	9	72–115	41
primary ray length	7.3	0.9	5.6–9.3	41
secondary ray length	39.5	4.5	30.3–49.3	41
Codonhexaster 1				
diameter	112	9	91–129	18
primary ray length	7.9	1.0	6.4–9.3	18
secondary ray length	48.6	4.5	37.2–56.6	18
Codonhexaster 2				
diameter	93.7	4.7	87.4–102.8	23
primary ray length	8.0	0.9	6.4–9.8	23
secondary ray length	38.5	2.8	31.9–44.7	23
Codonhexaster 3				
diameter	75.0	10.4	52.6–88.3	26
primary ray length	8.3	1.4	4.2–11.1	26
secondary ray length	30.2	4.6	21.5–36.5	26
Codonhexaster 4				
diameter	43.4	5.1	31.8–55.9	31
primary ray length	9.0	0.9	7.0–10.7	31
secondary ray length	13.7	3.1	7.5–22.4	31
Thorned oxyhexactin				
diameter	98.3	13.1	67.2–128.3	52
ray width	3.3	0.6	2.3–5.1	52

forms (Fig. 21A) are the largest and most abundant microsclere; they are entirely smooth and rays end in slightly anchorate discs. Smaller spherical discohexasters (Fig. 21B) and discostauraster variants are also entirely smooth; each primary ray supports 2–3 terminal rays and the end discs are like those of discostauractins in Fig. 21A. Stellate oxyhexasters (Fig. 21C) are shaped like calycocomes but the calyx is not extended here; they are entirely rough with 10–14 closely bunched terminal rays borne on each primary ray end as a single marginal whorl enclosing 1–4 central rays. When the calyx is particularly weak or undeveloped, the terminal rays are broken off and occur as loose spicules, particularly in atrial tissues.

Floricomes occur in two size/form categories, both being entirely smooth. The floricome 1 (Figs 21D, E) category is the larger, ~124 µm in diameter, and has 4–8 terminal rays on each primary ray and bears asymmetric terminal clubs with 2–5 long sharp marginal teeth. Floricome 2 (Figs 21E, F) is two-thirds the size of floricome 1, has more terminal rays, 9–13 per primary ray, and usually has only one marginal tooth, rarely two, on each terminal club. If these were imaged only with LM, they could be called sigmatocomes.

Codonhexasters are here divided into four types based on terminal ending size/form (Fig. 21G); all parts are smooth. Codonhexaster 1 (Fig. 21H), also occurring in stauraster and pentaster variations, has umbels that are smoothly hemispheric but much longer than the discs of discostauractins and discohexasters occurring here. They have 2–6 terminal rays per primary ray and carry a terminal umbel with 5–11 marginal teeth. The codonhexaster 2 (Fig. 21I) form occurs rarely also in stauraster form; the primary rays carry 3–7 terminal rays ending in a narrow thimblate umbel with 5–8 marginal teeth. Codonhexaster 3 (Fig. 21J) has only been found in the hexaster form; each primary ray carries 8–12 terminal rays originating in a single ring (whorl) and ending in deep umbels with 6–9 long teeth. Codonhexaster 4 (Fig. 21K) form is extremely abundant; each primary ray bears about 20 terminal rays usually originating in several whorls (strobilate) on the primary ray terminal swelling; the terminal umbels are very tiny with 8–9 teeth but could not be well imaged with the SEM available. Oxyhexactins (Fig. 21L) occur in smooth and thorned forms; only the thorned forms were measured.

Etymology. The species name refers to the *hydrangea*-like form of the codonhexaster 4 microsclere (Fig. 21K). *Hydrangea* is a genus of over 70 species of flowering plants native to southern and eastern Asia and the Americas (*hydrangeaformis*, *Hydrangea*-like'; an adjective agreeing with the Latin - from Greek - masculine genus name).

Remarks. The new specimens agree with the diagnosis of the genus *Dictyaulus* and are so assigned. Among the four known species, the New Zealand specimens are unique in having discostauractins and the calycocome-like oxyhexasters. While *Dictyaulus romani* Murillo *et al.* 2013 is described as having oxyhexasters as large "pappocomes", 258 (169–333) µm in diameter, which may indeed be graphiocomes, they are clearly distinct from the oxyhexasters in the New Zealand form. The new form differs from the closely-related *D. starmeri* Tabachnick & Lévi, 2004, in lacking discasters and drepanocomes present in the latter, and having abundant discostauractins and stellate oxyhexasters absent in the latter. These differences confirm that the New Zealand specimens represent a new species of the genus, here designated as *Dictyaulus hydrangeaformis* **sp. nov.**

Key diagnostic characters

- Euplectelloid body form with sieve-plate
- Prostalia marginalia are absent
- Primary spicules are diverse but large stauractins form the basis of the main rectangular framework
- Microscleres include discostauractins, discohexasters, two types of floricomes, four types of codonhexasters and smooth and thorned oxyhexactins

***Dictyaulus crinolinum* sp. nov.**

Figs 22–24; Table 10

Material examined. Holotype NIWA 76346, NZOI Stn Z7181, TRIP1124/38, Bay of Plenty, 37.0° S, 176.7° E, 972 m, 20 Jul 1998. **Paratypes** *Lord Howe Rise (International waters)*: NIWA 69562, SOP Stn TRIP3246/14, 34.1° S, 162.5° E, 565–787 m, 27 Dec 2010.

Bay of Plenty: NIWA 71005, 44796, NZOI Stn Z9174, 37.017° S, 176.717° E, 972 m, 05 Jul 1998.

Type locality. Bay of Plenty, North Island (Fig. 22A).

Distribution. Known from three locations off northern New Zealand, including Lord Howe Rise (International waters).

Habitat. Presumably attached to hard substratum between 565–972 m.

Description. Morphology is euplectelloid; the holotype (Fig. 22B) consists of an upper fragment of body wall, 6.6 cm tall x 13.0 cm wide with sieve-plate, torn from a large specimen of unknown size. Paratype 1 (NIWA 69562) consists of a much larger but still incomplete specimen 27.0 cm tall x 27.3 cm wide with sieve-plate; only a subsample (Fig. 22B) was available for study. Paratype 2 (NIWA 71005) is a body wall fragment 10.6 cm tall x 12 cm wide without sieve-plate. Paratype 3 (NIWA 44797) is a completely fused lower body cone 19.7 cm tall x 4.9 cm wide at the top with basal attachment disc. Wall thickness varies as 1.5–2.6 mm, 1.8–4.3 mm, 3.2–4.4 mm and 3.8 mm in holotype and paratypes, respectively. The rectangular arrangement of the primary framework is obvious in views of both dermal and atrial sides. The dermal surface of the holotype (Fig. 22D, E) is undamaged and bears a well-developed, frilly cuff, 6.5–9.5 mm wide. The atrial surface (Fig. 22F, G) is also well preserved; exhalent holes around the parietal oscula are larger and widely open on this surface (Fig. 22G). Marginal beams of the holotype sieve-plate are continuous with longitudinal spicule bundles of the body (Fig. 22H). Sieve meshes are polygonal with sides 3.8 (1.0–7.6) mm, n = 70, and beams are cylindrical in section with diameters (widths) of 0.7 (0.1–2.8) mm, n = 70. Parietal oscula, 2.3 (1.1–3.1) mm diameter, n = 44, are regularly distributed in horizontal and longitudinal rows. Parietal ridges are absent from all specimens examined but occur in the photograph of the lower part of the body of the larger paratype 1 not

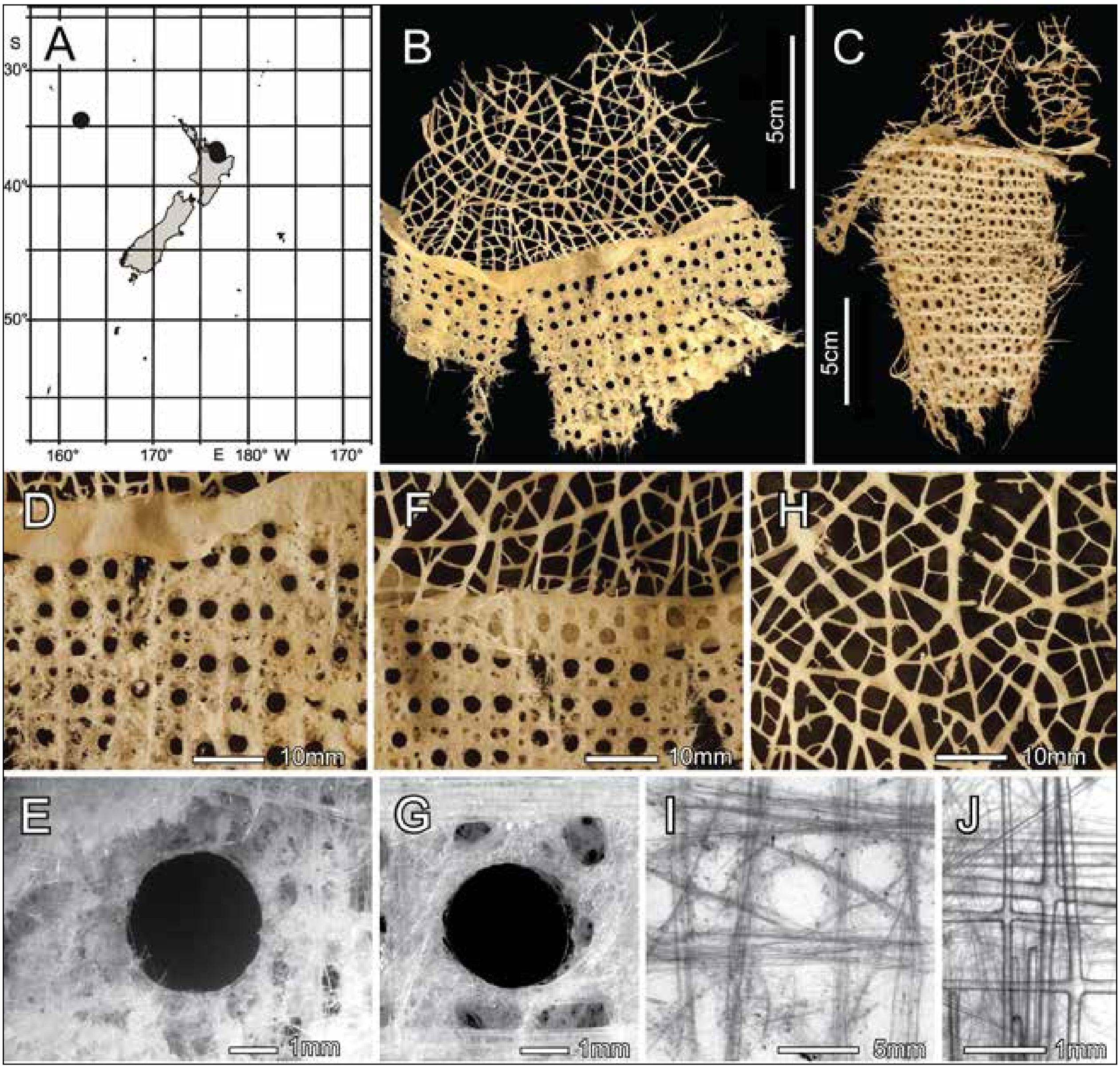


Figure 22. *Dictyaulus crinolinum* **sp. nov.**, distribution, morphology and skeleton: **A.** distribution in New Zealand and International waters; **B.** holotype, NIWA 76346; **C.** fragment of paratype NIWA 69562; **D.** dermal surface showing parietal osculum and cuff; **E.** dermal surface of parietal osculum; **F.** upper atrial surface showing longitudinal body spicule bundles aligned with sieve-plate beams; **G.** atrial surface around parietal osculum; **H.** outer surface of sieve-plate; **I.** main skeletal bundles of body wall after removal of surface and loose choanosomal spicules; **J.** closer view of primary stauractins in the same preparation. D–J from holotype.

available for processing. Colour is light brown when in alcohol and dried.

Skeleton. Choanosomal skeleton is a network of crossing longitudinal, transverse and oblique bundles of spicules (Fig. 22I). The thickest bundles are longitudinal and transverse; they have large regular stauractins as primary spicules (Fig. 22J) encased within a dense sheath of thin comitalia. It was not possible to determine the sequence of stacking of the differently oriented spicule bundles. Fusion of primaries and comitalia occur only basally in the holotype. Loose choanosomal spicules include small regular stauractins, tauactins, paratetractins, pentactins and microscleres; special prostalia marginalia are absent. The margin of the body wall, sieve-plate and cuff is supported by large hexactins with a long ray projecting into a sieve-plate beam, two opposite long rays extending in the marginal spicule bundle and short rays extending into the body and cuff; the remaining rays are reduced to short pins or knobs. Large tauactins add to support of the margin with the longest ray in the sieve-plate beam and two short rays curving into the marginal spicule bundle. Ectosomal skeleton of the dermal surface is largely intact. Dermalia are sword hexactins with the short ray projecting; atrialia are regular pentactins. Large narrow hexactins that serve as prostalia of parietal ridges were not found in any of the body samples. None of the specimens inspected had either parietal ridges or such prostalia suggesting linkage of the two structures.

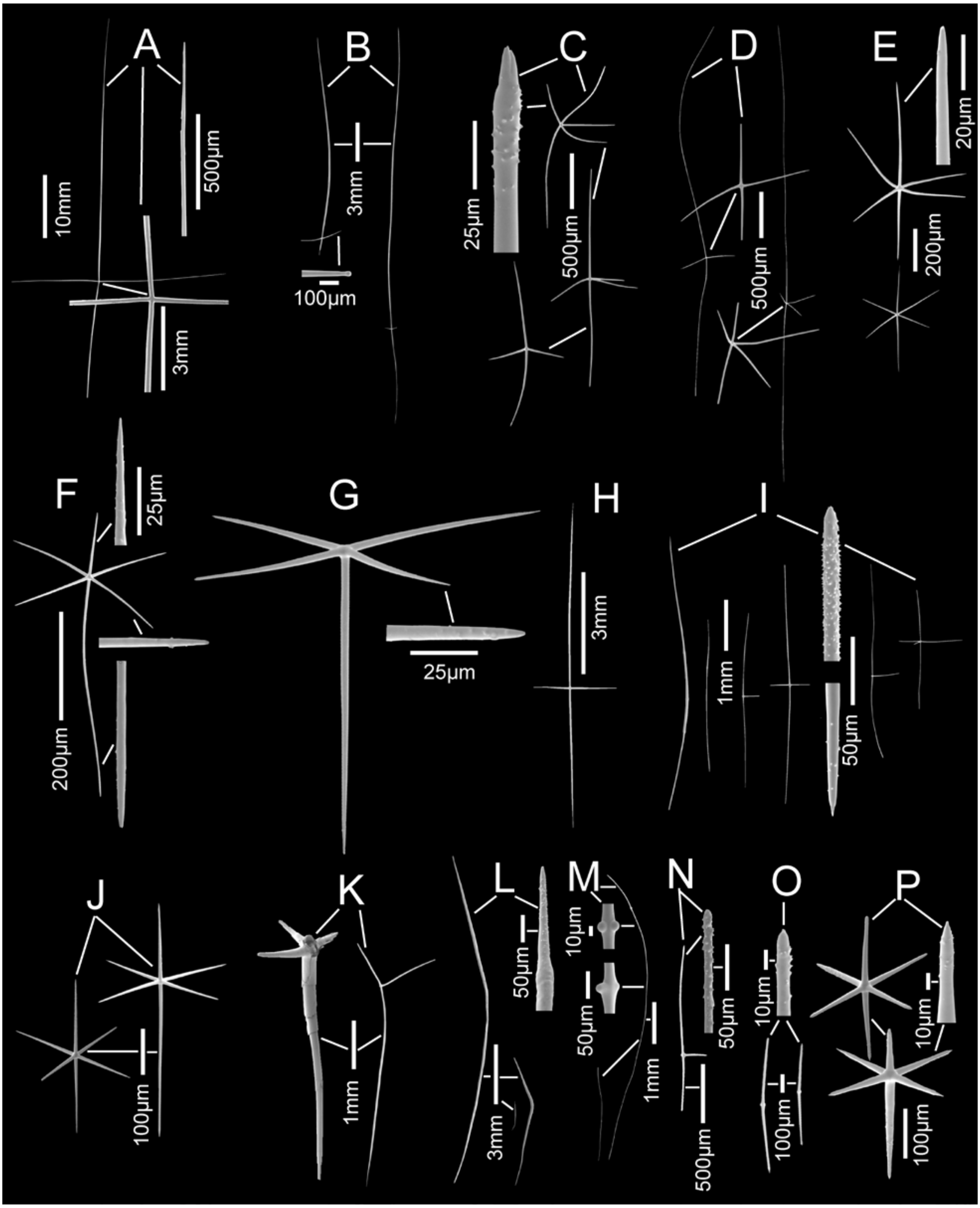


Figure 23. *Dictyaulus crinolinum* **sp. nov.**, paratype NIWA 69562 (A–C), holotype NIWA 76346 (D–P) body spicules: **A.** primary regular stauractin, whole, centre and ray tip magnified; **B.** primary irregular stauractins, one short ray tip magnified; **C.** choanosomal intermedial paratetractin and pentactins, ray tip magnified; **D.** comitalia, centres magnified; **E.** choanosomal smaller hexactins, ray tip magnified; **F.** dermalium, ray tips magnified; **G.** atrialium, whole and magnified tangential ray tip; **H.** primary stauractin; **I.** intermedial diactins, tauactin, stauractin, paratetractin and pentactin with ray tips magnified; **J.** surface hexactins; **K.** marginal broken hexactin and tauactin; **L.** primary diactins, tip magnified; **M.** comital diactins, centres magnified; **N.** intermedial tauactin, ray tip magnified; **O.** small subsurface diactins, tip magnified; **P.** two surface hexactins with ray tip magnified. A–G are body spicules, H–I cuff spicules from holotype, L–P sieve-plate spicules.

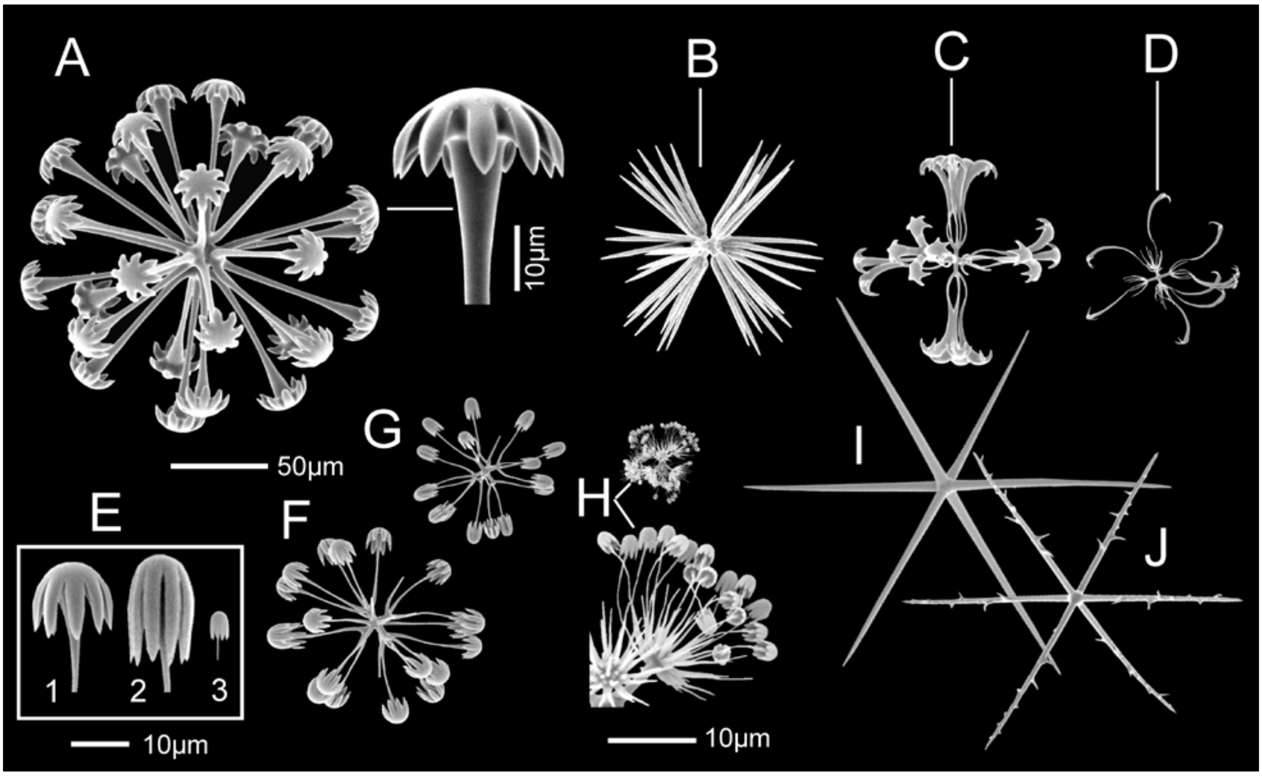


Figure 24. *Dictyaulus crinolinum* **sp. nov.**, holotype NIWA 76346, microscleres: **A.** spherical discohexaster whole, ray end magnified; **B.** stellate oxyhexaster; **C.** floricome 1; **D.** floricome 2; **E.** umbels of three codonhexaster classes; **F.** codonhexaster 1; **G.** codonhexaster 2; **H.** codonhexaster 3 whole, partial area of same magnified; **I.** smooth small oxyhexactin; **J.** thorned oxyhexactin. Scales same for all whole spicules.

Microscleres are dispersed among the proximal rays of dermalia and atrialia.

Cuff skeleton consists of major bundles of radial and transverse spicules; the radial bundles contain strong tauactins and long thin stauractins while the transverse bundles contain thick diactins and thin comital tauactins, stauractins, paratetracins. The outer fringe consists of diactin tips and broken narrow hexactins. Both surfaces are lined by small stocky hexactins. Sieve-plate skeleton beams have as axial spicules thick irregular diactins, often bent. They are encased in a layer of long thin comital diactins, tauactins and stauractins. A subsurface layer of small short diactins and intermediate tauactins and stauractins covers this and forms a support for the surface hexactins.

Spicules. Megascleres (Fig 23; Table 10) of the body are principal stauractins and very rare tauactins and pentactins, choanosomal stauractins, pentactins, paratetractins and tauactins, comitalia, dermal hexactins and atrial pentactins. Principalia are taken here as large spicules over 60 µm in width; they are overwhelmingly regular and irregular (cross not near middle of spicule) smooth stauractins with sharp tips. Of the 67 principal spicules enumerated, irregular stauractins were most numerous (51%), regular stauractins next (45%), and others (5%). The large regular stauractins (Fig. 23A) form the basis of the longitudinal and transverse spicule bundles; their transverse rays are shorter and bent to conform to body curvature. Irregular stauractins (Fig. 23B) have their cross situated distally on one long ray and very short transverse rays. Medium-size choanosomal spicules (200 enumerated) are stauractins (41%), pentactins (37%), paratetractins (14%), tauactins (6.5%), and rare hexactins and diactins (together 1.5%); they are smooth with rough bluntly pointed tips which may be slightly inflated (Fig. 23C). Comitalia (Fig. 23D) (132 enumerated) are mainly stauractins (51%), tauactins (20%), and diactins (20%) with few pentactins and paratetractins. Choanosomal regular hexactins (Fig. 23E) (not measured) are smaller than the medium-size choanosomal megascleres, larger than the smooth oxyhexactin microscleres but clearly not shaped like dermalia. Dermalia are sword-shaped hexactins (Fig. 23F) with short sharp unornamented distal ray and other rays ending in bluntly sharp tips. Atrialia (Fig. 23G) are regular smooth pentactins with bluntly pointed tips.

Cuff spicules include primary stauractins, large diactins, intermedial stauractins and tauactins, narrow prostal hexactins and surface hexactins. The primary stauractins (Fig. 23H) are entirely smooth with the longer rays lying in the transverse place along the cuff's circular axis and the short rays oriented radially, one inwards

Table 10. Spicule dimensions (µm) of *Dictyaulus crinolinum* **sp. nov.**, from holotype NIWA 76346 and paratype NIWA 69562 (*).

Parameter	mean	s. d.	range	no.
*Primary stauractin, regular				
long ray length (mm)	31.0	10.5	10.6–57.8	41
short ray length (mm)	12.4	4.6	3.3–21.8	25
ray width	141	41	71–210	30
*Primary stauractin, irregular				
long ray length (mm)	13.8	5.4	3.3–26.1	41
short ray length (mm)	3.0	2.7	0.5–11.0	27
ray width, basal	62.6	20.5	32.2–116.5	34
ray width, maximum	105.6	29.2	58.5–158.7	32
Choanosomal stauractin				
long ray length (mm)	1.7	1.0	0.3–4.1	50
short ray length (mm)	0.5	0.3	0.1–1.3	50
ray width	20.5	3.9	12.8–29.8	50
Choanosomal pentactin				
tangential ray length (mm)	0.8	0.5	0.4–3.9	53
proximal ray length (mm)	0.5	0.2	0.2–1.1	51
ray width	18.0	4.2	8.5–27.0	52
Choanosomal paratetractin				
longest ray length (mm)	0.9	0.8	0.4–5.5	50
ray width	19.0	4.0	9.9–31.4	50
Choanosomal tauactin				
longest ray length (mm)	1.6	1.3	0.4–5.8	50
unpaired ray length (mm)	0.8	0.7	0.2–4.9	50
ray width	21.2	4.4	11.8–31.5	50
*Comitalia				
long ray length (mm)	14.7	4.6	6.4–22.4	20
central ray width	25.3	5.5	17.2–40.0	20
distal ray width	10.3	2.4	7.5–15.6	20
Dermalia, sword hexactin				
distal ray length	187	33	98–253	50
tangential ray length	173	29	116–261	50
proximal ray length	442	137	173–831	50
ray width	8.2	2.0	4.8–11.8	50
Atrialia				
tangential ray length	275	45	187–363	50
proximal ray length	570	194	220–1130	50
ray width	13.9	2.6	9.4–20.6	50
Cuff primary stauractin				
long ray length (mm)	8.5	3.2	5.3–14.5	7
short ray length (mm)	1.8	1.3	0.8–4.5	7
width	70.0	20.9	45.9–109.6	7
Cuff intermedial diactin				
length (mm)	2.7	1.1	1.1–4.4	11
width	22.8	9.1	5.3–33.2	11
Cuff intermedial stauractin				
long ray length (mm)	1.4	0.6	0.3–3.7	50
short ray length (mm)	0.4	0.2	0.1–1.1	50
ray width	19.6	5.9	7.3–44.4	100
Cuff intermedial tauactin				
long ray length (mm)	1.5	0.8	04–3.6	19
unpaired ray length	0.4	0.3	0.0–1.0	19
ray width	20.9	6.4	7.1–33.4	19
Cuff narrow prostal hexactin				
distal ray length (mm)	1.2	0.1	1.0–1.3	9
tangential ray length	109	14	87–130	11
proximal ray length (mm)	1.3	0.3	0.8–1.7	9
ray width	16.9	3.0	12.0–21.6	13
Cuff surface hexactin				
ray length	174	58	88–448	50
ray width	8.7	3.0	3.6–19.6	50
Sieve primary diactin				
length (mm)	3.8	2.5	1.4–11.6	38
width	35.7	25.5	9.9–111.3	42
Sieve small diactin				
length	736	193	345–1241	107
width	15.1	3.7	4.7–25.5	50
Sieve surface hexactin ray				
length	172	36	108–304	50
width	12.0	2.9	6.1–20.3	50
Discohexaster				
diameter	198	28.3	112–236	51
primary ray length	10.3	2.1	6.5–15.1	51
secondary ray length	89.2	12.3	49.8–105.7	51
Oxyhexaster				
diameter	129	13	105–164	28
primary ray length	9.7	1.1	7.6–11.9	28
secondary ray length	54.8	5.3	46.0–71.5	28
Floricome 1				
diameter	107.8	5.3	94.4–119.3	66
primary ray length	7.0	0.9	4.6–8.9	66
secondary ray length	47.2	2.7	40.6–53.5	66
Floricome 2				
diameter	79.4	4.5	70.2–90.6	40
primary ray length	6.1	1.0	4.0–8.1	40
secondary ray length	34.1	2.1	30.0–39.3	40
Codonhexaster 1				
diameter	96.5	7.1	90.9–106.9	4
primary ray length	7.6	1.2	6.3–9.0	4
secondary ray length	41.9	3.7	37.4–46.5	4
Codonhexaster 2				
diameter	72.7	12.0	45.5–99.2	59
primary ray length	6.8	1.1	4.6–9.4	59
secondary ray length	29.6	5.2	17.0–42.6	59
Codonhexaster 3				
diameter	45.9	3.3	37.4–55.0	50
primary ray length	7.2	0.8	5.3–8.9	50
secondary ray length	16.1	1.4	12.9–19.5	50
Smooth oxyhexactin				
diameter	298	51	117–440	57
ray width	5.9	1.1	3.8–8.5	57
Thorned oxyhexactin				
diameter	197	24	129–259	50
ray width	3.7	0.6	2.7–5.0	50

and one outwards. Medium-size megascleres 1–4 mm in total length, considered intermedials (Fig. 23I), include diactins, stauractins, paratetractins, tauactins, and pentactins. They are mostly smooth but the ends may be rough. Narrow prostal hexactins (not figured) are mostly broken and few were thus available for measurement. Surface hexactins (Fig. 23J) have either equal ray lengths or one ray elongate.

Marginal spicules include broken large thick hexactins and thinner tauactins (Fig. 23K), both positioned with the long ray extending into a sieve beam. Sieve spicules include primary diactins, intermedial diactins and tauactins, small diactins and surface hexactins. The primary diactins (Fig. 23L) are curved or bent and are entirely smooth with sharp tips. Intermedial diactins (Fig. 23M), tauctins (Fig. 23N) and others are mostly smooth with rough ends. The small subsurface diactins (Fig. 23O) are gently curved with an inflated centre and rough tips. Surface hexactins (Fig. 23P) are stout and entirely smooth; tips are rounded or hastate with sharp points.

Microscleres (Fig. 24; Table 10) are discohexasters, oxyhexasters, two floricomes, three codonhexasters and smooth and thorned oxyhexactins; graphicomes may well be present but their parts were too rare to consider as a definite proper spicule category. Large discohexasters (Fig. 24A) are spherical and entirely smooth; each short primary ray supports 3–7 long terminal rays which end in discs with 7–11 strong marginal teeth. Stellate oxyhexasters (Fig. 24B) are entirely rough; each short primary ray supports 6–8 long straight bluntly-pointed terminal rays. They are mainly atrial in position. The floricome 1 (Fig. 24C) category is entirely smooth and has short primary rays, each bearing 3–7 long sigmoid terminal rays ending in asymmetrical clubs with 3–5 long marginal claws. Floricome 2 (Fig. 24D), also entirely smooth, is smaller; each short primary ray bears 5–7 sigmoid terminal rays ending in small asymmetrical clubs with 1–3 very long thin claws. Codonhexasters were divided into three types by scatter plot analysis of umbel dimensions measured in SEM (Fig. 24E); all are entirely smooth. Codonhexaster 1 (Fig. 24F) has hemispheric umbels; each short primary ray bears 4–7 long curved terminal rays ending in umbels with 8–11 strong claws. Codonhexaster 2 (Fig. 24G) has elongate umbels; each primary ray bears 6–12 terminal rays ending in umbels with 6–12 elongate teeth. Codonhexaster 3 (Fig. 24H) is very small with relatively long primary rays and bushy terminal ray tufts; each primary ray bears about 40 (one counted as 41) terminal rays ending in small elongate umbels with 9–12 elongate teeth. Terminal rays originate across the face of the inflation at the distal end of primary rays and can be interpreted a strobilate pattern. Small oxyhexactins with sharp tips occur as smooth (Fig. 24I) and thorned (Fig. 24J) forms. Many that appear smooth in LM prove to have very few small spines in SEM so the two types cannot be reliably enumerated with LM.

Etymology. The species name refers to the shape and structure of the sponge body which resembles a crinoline, a structured petticoat designed to hold out a woman's skirt, popular at various times since the mid-19th century (*crinolinum*; *crinus* (hair) + *linum* (thread or flax); Latin).

Remarks. This species is very like, and sympatric with, the previously described *Dictyaulus hydrangeaformis* **sp. nov.** Relative to the other known and accepted species of the genus, this species differs in having moderate-size oxyhexasters unknown in any of those species, but shared only with *D. hydrangeaformis* **sp. nov.** It differs dramatically from that species in the total absence here of the most abundant microslere there, the discostauractins. Besides this, the two species differ in having three classes of codonhexasters here vs. four classes in *D. hydrangeaformis* **sp. nov.**, absence of narrow prostal hexactins on the body here vs their presence there, having 6–8 terminal rays on oxyhexaster tufts here vs 10–14 rays there.

The closely related *D. starmeri* described by Tabachnick and Lévi (2004) looks similar in body form and spiculation when limits of resolution in LM and choice of spicule names is accounted for. Their 'discaster' is similar to our 'discohexaster' but theirs is still larger, 198–410 vs 112–236 µm diameter. Their 'sigmatocome' is superficially similar to our 'oxyhexaster' but their terminal rays are sigmoid and smooth while ours are straight and completely rough. Their 'drepanocome' corresponds well with our 'floricome 2' in shape and size. Major differences remain in that *D. starmeri* has narrow hexactins as prostalia but these are not absent in form described here and primary stauractin rays are much shorter there than those of our new form, 0.3–15 vs 10.6–57.8 mm. We consider these differences sufficient to conclude that the four specimens described here represent a new species, designated as *Dictyaulus crinolinum* **sp. nov.**

Key diagnostic characters

- Euplectelloid body form with oscular margin still unknown
- Prostalia marginalia are absent
- Primary spicules are diverse but large stauractins are the basis of the rectangular framework
- Microscleres include spherical discohexasters, stellate oxyhexasters, two classes of floricomes, three classes

of codonhexasters and smooth and thorned oxyhexactins; discostauractins are absent and graphiocomes are too rare to acknowledge as proper

Dictyaulus orientalis sp. nov.

Figs 25, 26; Table 11

Material examined. Holotype NIWA 52049, NIWA Stn TAN0412/198, 250 km east of Cape Kidnappers, North Island, New Zealand, 39.410° S, 179.866° E, 2348–2274 m, 20 Nov 2004.

Type locality. Two hundred and fifty km east of Cape Kidnappers (Fig. 25A).

Distribution. Known from only the type location.

Habitat. Presumably attached to hard substratum between 2348 and 2274 m.

Description. Morphology of the holotype is a euplectelloid barrel, with large apical sieve plate and parietal oscula, but the specimen was severely damaged during collection and packaging for transport (Fig. 25B). By reconstruction, the specimen is the upper body, about 101 mm tall and 76 mm in diameter; the lower body is absent. Wall thickness in the areas with dermal tissues still intact is 3.2 to 3.6 mm. The sieve plate (Fig 25C) has an array of radiating main beams that bifurcate radially, numbering 15 at the central pad where they join, and 32 at the margin; there is no clear indication as to whether the beams are continuous with the main longitudinal skeletal bands of the body. Holes of the sieve plate are triangular and quadrangular with rounded corners. Beam lengths circumscribing the sieve pores are 5.0 (1.9–10.3) (n = 62) mm for the long sides of pores and 3.0 (1.1–5.1) (n = 62) mm for the short sides. Sieve beam widths are 0.63 (0.26–1.17) (n = 65) mm. There is no cuff detectable at the margin (Fig. 25D). The dermal surface, like the sieve plate, is mostly abraded but tissue pads remain in places (Fig. 25E) suggesting the remains of low parietal ridges. Parietal oscula cannot be certainly distinguished from inhalant and exhalant canals due to abrasion of dermal tissues but the diameter of holes through the body wall are 2.8 (1.9–6.6) (n = 28) mm on the dermal surface and 3.4 (1.7–6.4) (n = 27) mm on the atrial surface. Body wall thickness measured where dermal tissues are intact is 3.2 to 3.6 mm. The skeletal framework of the body wall has a regular rectangular arrangement of the main spicule bundles, obvious in views of both dermal and atrial sides. The circular atrial bands (Fig. 25F) are spaced 10.6 (8.3–15.3) (n = 14) mm apart in mid body. Colour of the main body is dark brown while the sieve plate is light brown in alcohol.

Skeleton. Choanosomal skeleton is a network of thick longitudinal and transverse spicule bundles with thinner bundles oriented obliquely. Thick primary stauractins, tauactins and diactins located axially in the bundles are encased in a sheath of thin, mostly tauactin comitalia. Longitudinal bundles are located dermally, transverse (circular) bundles are located atrially but due to the poor condition of the specimen, it was not possible to determine the precise location of the oblique bundles. Fusion of primaries and comitalia occur in the basal third of the specimen by both silica deposition at points of spicule contact and synapticular bridging (Figs 25G, H). Loose choanosomal spicules are mostly robust tauactins, stauractins and diactins with a filler contingent of very common small oxyhexactins and rare tauactins and stauractins. Loose microscleres are mainly located between the choanosomal megascleres. Special oscularia are absent. The body margin is supported mainly by diactins with a few comitalia located between them. The main thick spicules of the sieve plate beams are diactins, often strongly curved, surrounded by a sheath of diactin, tauactin and stauractin comitalia.

Ectosomal skeleton consists mainly of sword hexactins on the dermal side and rare regular pentactins on the atrial side. Floricome microscleres are closely associated with dermalia and are considered to be ectosomal spicules. Small stout hexactins cover the surface of the margin and sieve plate beams.

Spicules. Megascleres (Fig. 26; Table 11) of the body are numerically dominated by tauactins in the larger classes. Primary spicules (principalia) (Figs 26A–C) are tauactins (43% of 90 counted), diactins (30%), and stauractins (26%) with only one hexactin. They are entirely smooth with rays averaging about 10 mm in length and 100 µm in width. The tauactins and stauractins are very variable in shape while diactins have no central swellings. Large choanosomal megascleres (Figs 26D–E) are mainly tauactins (57% of 507 counted), stauractins (27%) and diactins (11%) with a few pentactins, hexactins and paratetractins (5% total). Rays are mostly smooth but ends have a few small subterminal spines; rays are typically 700 x 15 µm. Diactins have well developed central swellings (Fig. 26E). Small choanosomal oxyhexactins (Fig. 26F) are abundant fillers (94%) between the larger megascleres, a roll including also a few small tauactins and stauractins. Rays are generally smooth and ends vary from rounded to bluntly pointed to very sharp and few have end spines. Ray sizes are typically 140 x 8 µm. Comitalia (Fig. 26G) are long, thin spicules in the form of tauactins (63% of 36 counted), stauractins (26%) and diactins (11%). They

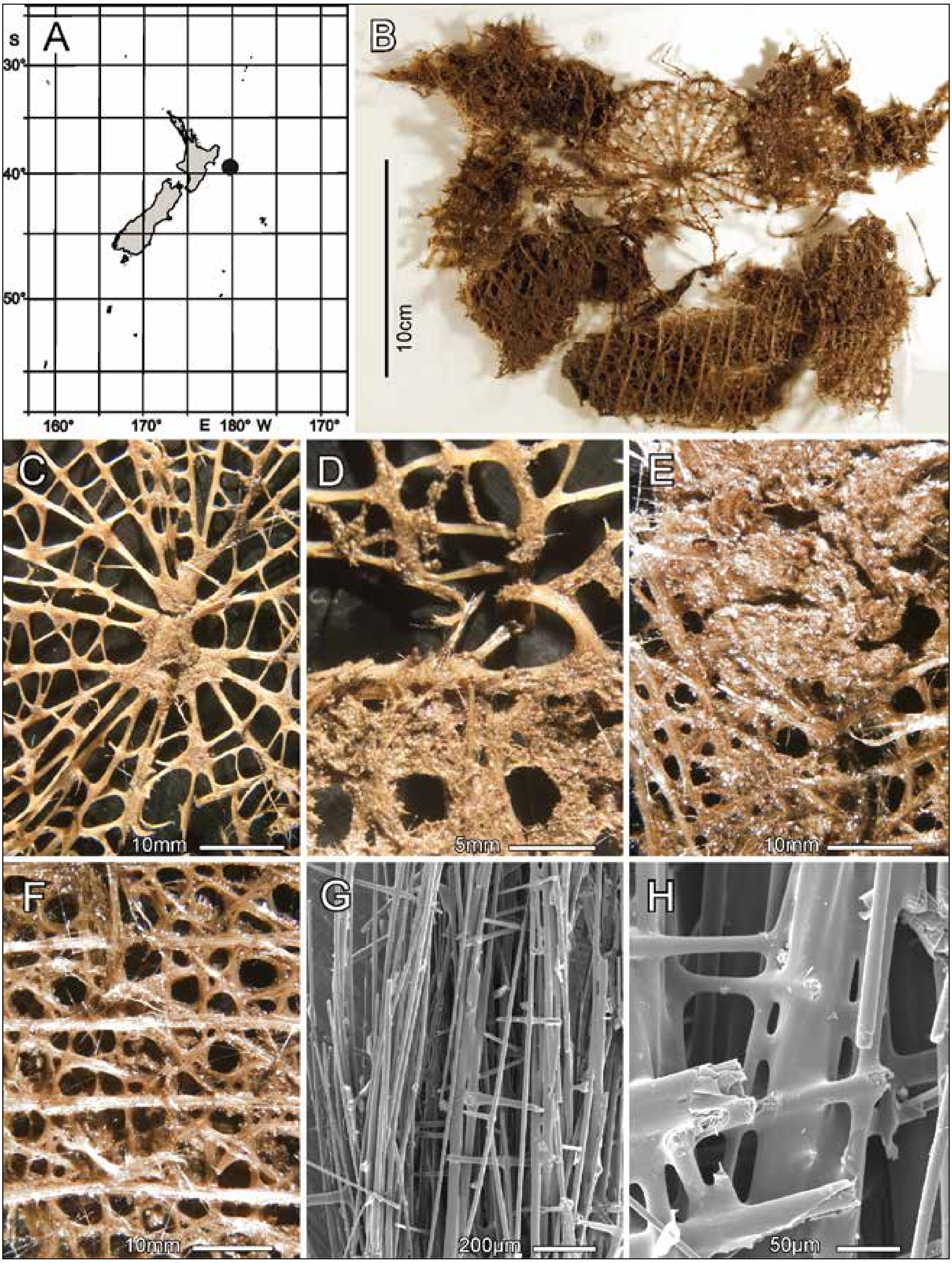


Figure 25. *Dictyaulus orientalis* **sp. nov.**, holotype NIWA 52049, distribution, morphology and skeleton: **A.** distribution in New Zealand waters; **B.** preserved holotype; **C.** sieve plate in closer view; **D.** margin between sieve plate (above) and body (below); **E.** dermal surface with low puffy parietal ridges; **F.** atrial surface with circular spicule bundles; **G.** fused patch of tauactin and stauractin comitalia; **H.** closer view of fused spicules showing contact fusions and synapticular bridges.

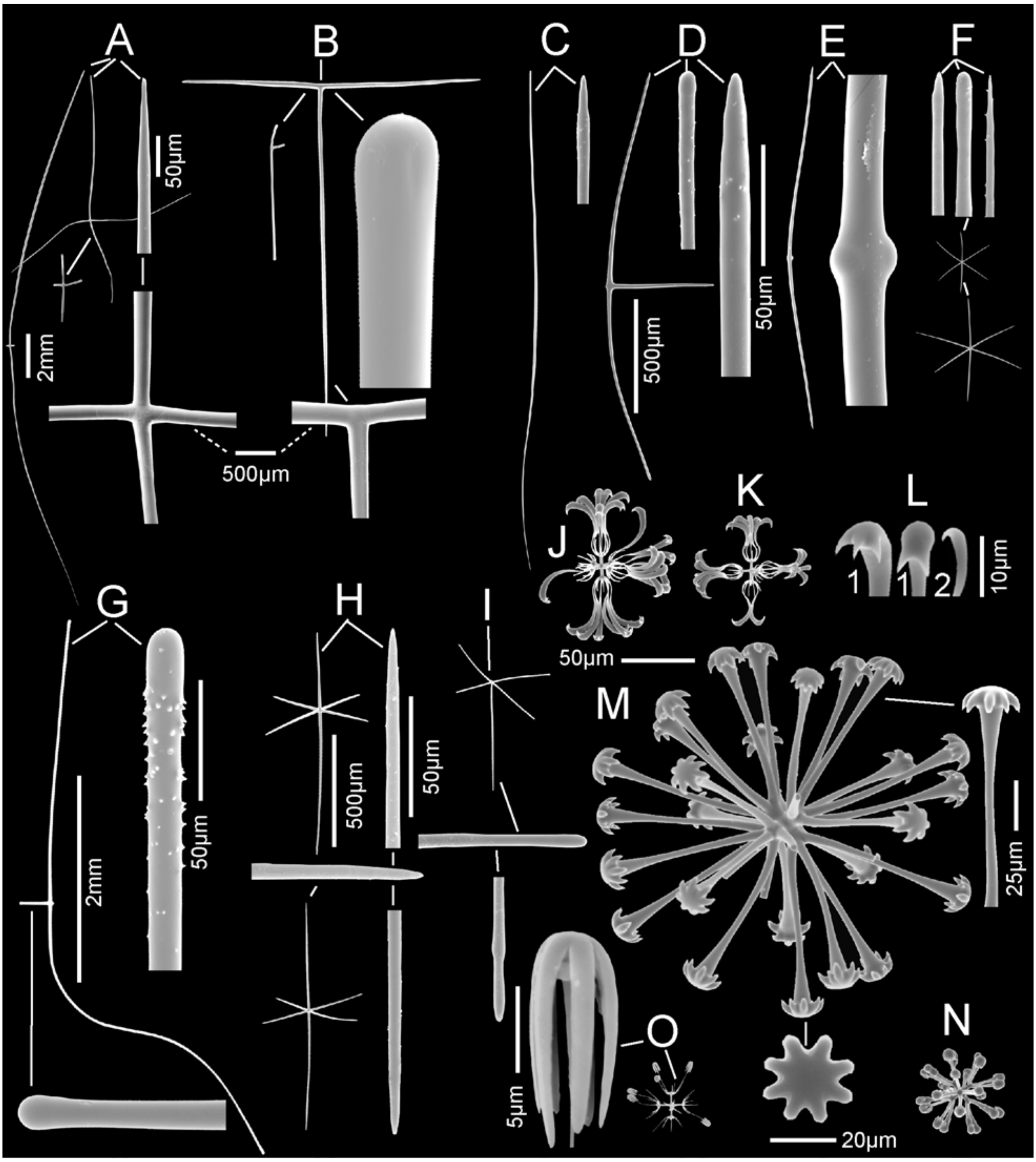


Figure 26. *Dictyaulus orientalis* **sp. nov.**, holotype NIWA 52049 spicules: **A.** primary stauractins, three whole and enlarged ray tip and centre; **B.** primary tauactins, two whole and enlarged ray tip and centre; **C.** primary diactin, whole and enlarged tip (scales in A apply to B and C); **D.** large choanosomal tauactin, one whole and two enlarged ray tips; **E.** large choanosomal diactin, one whole and enlarged centre; **F.** small choanosomal hexactins, two whole and three enlarged ray tips (scales in D apply to E and F); **G.** comitalia, one whole tauactin and enlarged main and unpaired ray tips; **H.** dermalia, two whole and enlarged distal, tangential and proximal ray tips; **I.** atrialium, one whole and enlarged ray tips (scales as in H); **J.** floricome 1; **K.** floricome 2; **L.** floricome 1 and 2 enlarged terminal ray tips as marked; **M.** discohexaster 1 whole, enlarged lateral view of terminal ray and end view of terminal disc; **N.** discohexaster 2; **O.** codonhexaster, whole (broken) and lateral view of terminal umbel (scale in J applies to all whole microscleres).

are smooth except for subterminal spines. Ray sizes are 4 mm x 20 µm so while they are relatively thin, they are unusually thicker than the large choanosomal megascleres and oxyhexactins. Dermalia (Fig. 26H) are mostly sword hexactins while a few have distal and proximal rays of nearly equal length. They are generally smooth except for a few small spines on the ends of all six rays. Atrialia (Fig. 26I) are regular pentactins, similar in characteristics to the dermalia; they are very rare. Sieve plate spicules (not figured) consist of large diactins as principalia surrounded

Table 11. Spicule dimensions (µm) of *Dictyaulus orientalis* **sp. nov.**, from holotype NIWA 52049.

Parameter	mean	s. d.	range	no.
Primary stauractin, regular				
long ray length (mm)	12.8	2.5	7.6–17.7	23
short ray length (mm)	7.5	3.8	1.7–16.5	22
ray width	99.1	51.6	35.6–222.9	91
Primary tauactin				
paired ray length (mm)	10.6	3.3	5.4–19.1	39
unpaired ray length (mm)	3.6	4.7	0.2–17.3	38
ray width	90.4	35.7	37.9–233.9	109
Primary diactin				
length (mm)	17.0	4.6	8.2–24.8	27
width	131.7	65.8	42.7–280.0	27
Primary hexactin				
ray length (mm)	4.6	3.7	0.8–9.7	4
ray width	305.2	44.8	250.7–350.4	4
Choanosomal tauactin				
total main axis length (mm)	1.4	0.3	0.7–2.4	71
unpaired ray length (mm)	0.4	0.2	0.6–1.1	71
ray width	14.7	2.6	7.6–19.7	71
Choanosomal small hexactin				
ray length	190.5	52.7	92.2–289.3	50
ray width	5.2	1.4	2.9–8.9	50
Comitalia				
total length (mm)	8.2	2.3	4.0–11.9	24
perpendicular ray length (mm)	0.4	0.2	0.1–1.2	20
ray width	19.5	6.2	7.2–35.8	32
Dermalia, hexactin				
distal ray length	247.6	87.0	132.8–572.6	35
tangential ray length	232.1	51.0	126.5–355.1	35
proximal ray length	512.2	220.3	185.4–1071.5	35
ray width	7.4	2.7	3.0–18.8	111
Atrialia				
tangential ray length	299.6	92.7	178.0–480.3	19
proximal ray length	430.1	220.8	215.3–849.9	9
ray width	7.8	2.8	2.9–13.8	32
Sieve plate large diactin				
length (mm)	14.7	3.5	9.1–19.3	23
width	105.4	43.8	43.8–234.8	43
Sieve comitalia				
length (mm)	6.8	2.0	3.6–19.3	37
width	19.9	6.1	9.5–34.1	61
Sieve small diactin				
length	844	175	515–1206	17
width	16.0	4.0	9.2–23.6	17
Sieve small hexactin				
ray length	209	46	127–340	50
ray width	20.7	5.0	11.4–35.4	50
Marginal large spicules*				
total length (mm)	11.1	4.0	2.3–23.0	40
perpendicular ray length (mm)	1.50	2.71	0.10–9.04	10
ray width	70.6	33.1	13.0–143.0	33
Floricome 1				
diameter	103.5	5.7	90.2–117.5	65
primary ray length	8.9	0.9	6.7–11.2	65
secondary ray length	42.8	2.9	35.7–49.2	65
Floricome 2				
diameter	61.9	5.9	53.3–83.4	44
primary ray length	7.4	0.8	5.7–9.0	44
secondary ray length	23.7	2.8	20.1–34.3	44
Discohexaster 1				
diameter	285	23	213–328	45
primary ray length	13.8	2.2	8.1–18.6	45
secondary ray length	130.4	11.3	97.9–152.1	45
Discohexaster 2				
diameter	140	39	62–164	6
primary ray length	10.1	2.3	7.7–13.2	6
secondary ray length	60.4	18.4	23.4–73.0	6
Codonhexaster				
diameter	74.0	9.0	54.0–94.2	65
primary ray length	8.5	1.2	5.6–12.1	59
umbel height	10.0	2.0	6.5–13.5	34
umbel width	5.0	0.6	4.1–6.7	39

* marginal large spicules are mostly diactins but also include tauactins and stauractins.

by a sheath of diactin comitalia and covered externally by a layer of stout oxyhexactins; the lack of tauactins in the sieve plate contrasts strikingly with body spiculation. Marginal spicules are a mixture of diactins, tauactins and stauractins, similar to those of the body.

Microscleres (Fig. 26M–O; Table 11) are two classes of floricomes, two classes of discohexasters and a single class of codonhexasters. Larger floricomes 1 (Fig. 26J) have on each short primary ray 7.7 (5–10) (n = 22) sigmoid terminal rays ending in swollen tips with 2.4 (2–3) (n = 36) short marginal claws (Fig. 26L); terminal rays with single claws probably are present but they were never imaged in an orientation to make this certain. Terminal rays are entirely smooth, lacking the rows of denticles on the outer distal part. Smaller floricome 2 (Fig. 26K) is typically 60% of the size of floricome 1 and was verified as a distinct category by size-frequency visualisation. Each short primary ray bears 9.8 (7–11) (n = 12) sigmoid terminal rays ending in an asymmetric swollen head bearing only one marginal claw (Fig. 26L). Terminal ray shafts are also smooth here. Large discohexasters 1 (Fig. 26M) have short but easily measurable smooth primary rays bearing 5.1 (4–7) (n = 18) long terminal rays ending in a disc with 7.2 (6–8) (n = 28) marginal teeth. Terminal rays are mostly smooth but a few very small spines occur irregularly on many. Small discohexasters 2 (Fig. 26N) are rare; they are typically half the size of discohexasters 1 and primary rays are relatively longer. Each smooth primary ray supports 4–5 terminal rays which end in discs with ~ 7 marginal teeth but the disc is often deformed so the number of teeth is indeterminate. Codonhexasters (Fig. 26O) are always broken. Each short smooth primary ray bears 3.9 (2–7) (n = 71) long smooth terminal rays each ending in an elongate umbel with 7.0 (5–9) (n = 33) teeth. Among 16 of the more intact centres, one was found to be a codonstauraster. Most microscleres are generally distributed but floricomes 2 and discohexasters 2 are mainly atrial.

Etymology. Named for the distribution of this species along the east coast of the North Island of New Zealand.

Remarks. This specimen is similar to, and sympatric with, the two, new species of *Dictyaulus* described above, but it differs from those and the four known and accepted species of the genus. *Dictyaulus elegans* Schulze, 1896, from the North-Central Indian Ocean, has both micro-codonhexasters (24–30 µm diameter) and drepanocomes, both of which are absent in this specimen. *Dictyaulus marecoi* Tabachnick and Collins, 2008, from the northern Mid-Atlantic Ridge, has no large discohexasters (only 34–78 vs 213–328 µm diameter here) and has drepanocomes, which are absent here. *Dictyaulus romani* Murillo *et al.*, 2013, from Northwest Atlantic, has large oxyhexasters ("pappocomes") and micro-codonhexasters (22–65 µm diameter), both of which are absent here. *Dictyaulus starmeri* Tabachnick and Lévi, 2004, from Wallis Island, Southwest Pacific, has two size classes of codonhexasters and drepanocomes (probably our floricomes 2) while the present specimen has only one class of codonhexaster. This specimen differs from the two new species, *D. hydrangeaformis* **sp. nov.** and *D. crinolinum* **sp. nov.** described above, in lacking the calycocome-like oxyhexaster present in both of those and in lacking the large discostauractins of the former and micro-codonhexaster of the latter. We consider these differences sufficient to conclude that this specimen represents a new species, designated as *Dictyaulus orientalis* **sp. nov.**

Key diagnostic characters

- Euplectelloid body form with oscular margin still largely unknown
- Special parietal oscularia spicules are absent
- Primary spicules are diverse but large stauractins are the basis of the rectangular framework
- Microscleres include two classes of floricomes, two classes of spherical discohexasters, and one class of codonhexaster

Genus ***Regadrella*** Schmidt, 1880

Regadrella Schmidt, 1880: 36.
Trichaptella Filhol, 1885: 287.

Diagnosis. Body is saccular with numerous lateral oscula and with colander-like sieve-plate or with radially directed beams of prostalia oscularia; basiphytous. Choanosomal spicules are predominantly diactins with additional hexactins and other hexactine derivatives. Prostalia lateralia, if present, are giant hexactins. Dermalia are hexactins. Atrialia are pentactins. Microscleres are floricomes, graphiocomes, onychohexasters, hemionychohexasters, hexasters or staurasters (modified from Tabachnick 2002).

Type species. *Regadrella phoenix* Schmidt, 1880 (by monotypy).

Regadrella okinoseana Ijima, 1896

Figs 27, 28; Seafloor Image Figs 44–55; Table 12

Regadrella okinoseana Ijima, 1896: 250; Ijima 1901: 223; Lévi & Lévi 1982: 292; Reiswig 1992: 33; Tabachnick *et al.* 2008: 60; Reiswig & Stone 2013: 25; Dawson 1993: 56.
Regadrella cylindrica Ijima, 1927: 250, 335.
Regadrella decora Schulze, 1900: 30.
Regadrella peru Tabachnick, 1990: 169.

Material examined. *Lord Howe Rise (Australian EEZ)*: QM G316744, NIWA Stn TAN0308/52, 33.750° S, 159.035° E, 999 m, 21 May 2003.

Wanganella Bank (International waters): NIWA 88626, SOP Stn TRIP3933/23, 33.0° S, 167.0° E, 677–546 m, 11 Nov 2013.

South Norfolk Ridge: NIWA 121285, NIWA Stn TAN0308/141, 34.285° S, 168.358° E, 788–800 m, 02 Jun 2003; NIWA 76854, NZOI Stn U570, 34.815° S, 169.293° E, 691 m, 03 Feb 1988; NIWA 121290, NZOI Stn E855, 33.167° S, 169.933° E, 742 m, 17 Mar 1968; NIWA 121286, NIWA Stn TAN0308/126, 33.390° S, 170.193° E, 490–526 m, 31 May 2003; NIWA 121287, NIWA Stn TAN0308/136, 33.393° S, 170.206° E, 469–490 m, 01 Jun 2003; NIWA 121288, NIWA Stn TAN0308/133, 33.396° S, 170.217° E, 465–490 m, 01 Jun 2003.

West Norfolk Ridge: NIWA 121289, NIWA Stn TAN0308/139, 34.342° S, 168.387° E, 382–390 m, 02 Jun 2003.

East Norfolk Basin: NIWA 71034, NZOI Stn E852, 33.633° S, 170.917° E, 1024 m, 17 Mar 1968.

Northeast of Norfolk Basin (Australian EEZ): QM G335897, NZOI Stn S568, 30.167° S, 171.337° E, 650–900 m, 13 Aug 1983.

Three Kings Ridge: NIWA 70939, NZOI Stn U582, 31.862° S, 172.433° E, 790 m, 05 Feb 1988; NIWA 76851, 70951, NZOI Stn Z9026, 31.980° S, 174.265° E, 700 m, date unknown; NIWA 70941, NZOI Stn U582, 31.862° S, 172.433° E, 790 m, 05 Feb 1988.

South Kermadec Ridge, Whakatane Seamount: NIWA 82950, NIWA Stn TAN1206/101, 36.790° S, 177.456° E, 1150–1210 m, 24 Apr 2010.

Kermadec Island: NIWA 76943, NZOI Stn T243, east of McCauley Island, 30.083° S, 178.250° W, 1035 m, 04 Mar 1982; NMNZ PO.000483, NZOI Stn 5/IV/1973, RV *Acheron,* 4 miles north-northeast of Herald Island, 29.233° S, 177.883° W, 650–670 m, 05 Apr 1973.

Colville Ridge, Scoria Cone: NIWA 86215, NIWA Stn TAN1213/21, 30.133° S, 179.769° E, 573–750 m, 18 Oct 2012.

North Cape region: NIWA 49086, SOP Stn TRIP2704/11, 34.8° S, 171.6° E, 868–991 m, 02 Oct 2008; NIWA 51789, NIWA Stn KAH0204/32, 34.162° S, 173.962° E, 780–810 m, 17 Apr 2002; NIWA 3641, NIWA Stn KAH0204/40, 34.164° S, 173.964° E, 805–820 m, 18 Apr 2002; NIWA 70947, NZOI Stn F868, 37.475° S, 176.717° E, 972 m, 05 Jul 1998; NIWA 71036, NZOI Stn U574, 33.327° S, 170.155° E, 570 m, 04 Feb 1988.

West Cavalli Seamount: NIWA 51812, NIWA Stn KAH0204/33, 34.143° S, 173.952° E, 870 m, 17 Apr 2002.

Bay of Plenty: NIWA 71007, NZOI Stn Z8882, TRIP1024/39, 37.0° S, 176.7° E, 976 m, 01 Aug 1997; NIWA 71040, NZOI Stn X138, 37.250° S, 176.841° E, 335 m, 07 Nov 1989; NIWA 71067, NIWA Stn Z9159, 36.169° S, 176.745° W, 967 m, 25 Jun 1998; NIWA 71106, NZOI Stn Z10062, TRIP1337/13, 37.1° S, 176.5° E, 694 m, 27 Mar 2000; NIWA 82832, NIWA Stn TAN1206/90, 36.789° S, 177.454° E, 1160–1155 m, 23 Apr 2012; NIWA 82960, NIWA Stn TAN1206/101, 36.790° S, 177.456° E, 1150–1210 m, 24 Apr 2012.

Southeast of Hawke's Bay: NMNZ PO.000515, FRV *James Cook* Stn J10/40/86, 40.025° S, 178.063° E, 935 m, 28 Aug 1986.

Hikurangi Margin: NIWA 76855, NIWA Stn TAN0107/236, 41.591° S, 175.773° E, 1400–1000 m, 26 May 2001.

Southeast of Cape Kidnappers, Hawke's Bay: NMNZ PO.002262 (2 specimens), FRV *James Cook* Stn J10/39/86, 40.017° S, 178.082° E, 840 m, 28 Aug 1986.

South Macquarie Ridge (Australian EEZ), Seamount 7: QM G335896, G335895, NIWA Stn TAN0803/84, 53.705° S, 159.115° E, 998–1100 m, 13 Apr 2008.

Other locations (images only). *Seamount 986, off Hawkes Bay shelf* (collected by GEOMAR ROV *Kiel 6000*, onboard RV *Sonne*, ICBM expedition SO254): NIWA 126166, RV *Sonne* Stn SO254/36ROV10_BIOBOX17, 39.988° S, 178.215° E, 774 m, 9 Feb 2017; NIWA 126296, RV *Sonne* Stn SO254/79ROV16_BIOBOX7, 40.048° S, 178.135° E, 896 m, 22 Feb 2017 (Seafloor Image Fig. 46); NIWA 126297, RV *Sonne* Stn SO254/79ROV16_BIOBOX9, 40.048° S, 178.137° E, 893 m, 22 Feb 2017 (Seafloor Image Fig. 47); NIWA 126298, RV *Sonne* Stn SO254/79ROV16_BIOBOX13, 40.049° S, 178.136° E, 890 m, 22 Feb 2017.

Southern Kermadec Ridge, Whakatane Seamount: NIWA Stn TAN1206/79, 36.811° S, 177.470° E, 1022–1013 m, 22 Apr 2012; NIWA Stn TAN1206/89, 36.792° S, 177.448° E, 1170–1186 m, 23 Apr 2012 (Seafloor Image Fig. 45).

Louisville Seamount Chain (International waters): NIWA Stn TAN1402/60, Anvil Seamount, 37.605° S, 169.021° W, 1191–1225 m, 15 Feb 2014; NIWA Stn TAN1402/63, Anvil Seamount, 37.712° S, 169.016° W, 1230–1418 m, 16 Feb 2014; NIWA Stn TAN1402/147, Valerie Guyot, 41.354° S, 164.417° W, 1312–1544 m, 01 Mar 2014 (Seafloor Image Fig. 49); NIWA Stn TAN1402/150, Valerie Guyot, 41.381° S, 164.424° W, 1135–1400 m, 01 Mar 2014 (Seafloor Image Fig. 50); NIWA Stn TAN1402/94, 39 South Seamount, 39.158° S, 167.549° W, 1064–1062 m, 21 Feb 2014.

Reinga Basin: NIWA Stn TAN1603/UWC06, 35.308° S, 170.748° E, 1860 m, 21 Mar 2006 (Seafloor Image Figs 44, 48).

Diabolical Seamount, Graveyard Seamount Complex, Chatham Rise: NIWA Stn TAN0905/52, 42.794° S, 179.987° W, 922–1052 m, 18 Jun 2009 (Seafloor Image Fig. 51).

Rumble II East Seamount, Kermadec Ridge: NIWA Stn TAN1007/61, 35.424° S, 178.647° E, 1061–1521 m, 02 Jun 2010.

Type & locality. Tokyo Museum has four specimens of *R. okinoseana* but none is labelled as the holotype. Ijima may not have designated a type specimen; there may never have been one selected as type and even if there was one, it may have been traded or bought so we may never know if there was one or if so, where it is now (Ogawa *et al.* 2010); Sagami Bay, Japan.

Distribution. Known worldwide in 12 locations in the Pacific and Indian Oceans from Alaska, Japan, Indonesia, southern tip of India, New Caledonia, New Zealand, northwest and South Australia and questionably off Chile at depths of 390–1386 m. Distribution around New Zealand is expanded here to 30 locations, mostly around the North Island but extending south to Macquarie Ridge at depths of 335–1210 m.

Habitat. Attached to hard substratum at depths of 335–1386 m.

Description. Morphology is a euplectelloid tube of variable shape, from conical to barrel-shaped (Fig. 27B); rare intact specimens have a truncate top covered by a sieve-plate and a narrow lower end with small basal disc attached to hard substratum (Fig. 27C; Seafloor Image Figs 44–51). A marginal cuff is present in half the specimens that have a sieve-plate. The lateral outer body wall bears pits about 1 cm apart, each of which has a parietal osculum at the central depression; parietal ledges vary from virtually invisible to extensive outgrowth of the dermal tissue between pits to 5 cm long bubble or nodule-shaped extensions. Body wall thickness varies from 2 to 25 mm. Reference specimen NIWA 86215 (Fig. 27C) is 30.5 cm long, 7.2 cm in maximum diameter, 6.3 cm in sieve-plate diameter, 4–6 mm in wall thickness and 2.5 cm in basal disc diameter. The dermal surface (Fig. 27F) has parietal oscula 1.9 (0.8–3.2) mm, n = 70, in diameter and nearest-neighbour spacing between them is 3.0 (0.4–9.0) mm, n = 70. Low abraded parietal ridges are oriented obliquely. The atrial surface (Fig. 27G) has thick bands of fused spicules running between parietal oscula and smaller exhalent openings. The sieve-plate (Fig. 27E) has mainly triangular but also polygonal and oval meshes; beam lengths of 5.2 (2.0–11.0) mm, n = 40, and beam widths of 0.9 (0.2–2.9) mm, n = 40. The marginal cuff, 300 µm in thickness and 4.8 mm in width, remains only in small patches (Fig. 27H). Sieve-plate and atrial body wall surface are completely fused in this specimen requiring a second reference specimen for examination of the free spicules of these areas. Second reference specimen, QM G335897 (Fig. 27D) is the upper part of what appears to be a young specimen torn off during collection; it is 11.2 cm long, 6.5 cm in greatest diameter and body wall thickness of 2 mm. Some fusion of the main central supporting spicules occurs in the lower 3 cm. Remnants of the marginal cuff and parietal ridges are barely detectable due to a combination of their early stage of development and physical erosion sustained during collection. Other specimens include either small fragments of body wall or old, nearly washed out basal parts. Colour is light brown in alcohol and dried.

Skeleton. Choanosomal skeleton providing the main support is a network of crossing longitudinal and curving oblique bundles of spicules with little evidence of fusion (Fig. 27I); there is no rectangular aspect to the support network. All the primary spicules are curved diactins surrounded by a dense sheath of thin diactin comitalia; there are no primary stauractins. Other loose choanosomal spicules include diactins of intermediate thickness, small oxyhexactins and microscleres. The choanosome of the atrial side is entirely fused in a layer 1–1.5 mm in thickness and is composed mainly of diactins, including primary, comital and choanosomal spicules (Fig. 27J); a few hexactins are included. Special oscularia are absent.

Ectosomal skeleton of the dermal surface has been severely abraded but spicules are retained. Dermalia are sword hexactins with the short ray projecting; atrialia are absent in the reference specimen due to fusion but in the second reference specimen are regular pentactins. Large narrow hexactins that serve as prostalia of parietal ridges are only found occasionally. Microscleres are dispersed among the proximal rays of dermalia and atrialia.

Cuff skeleton is mainly supported by curved diactins smaller than those of the main body oriented transversely. Even smaller diactins and thin comital diactins surround the main supporting spicules. The outer margin is composed of a palisade of large narrow (short tangential ray) hexactins oriented radially with one long ray projecting up to a millimeter from the cuff; these can be considered cuff prostalia. Surfaces are covered with small hexactins, some of which are identical to body dermalia. All microscleres of the body also occur in the cuff.

Sieve-plate skeleton of the reference specimen is entirely fused and unavailable for analysis. Beams of the secondary reference specimen are axially supported by large fusiform diactins surrounded by smaller diactins of varying thickness; there are no strongly bent diactins. Smaller hexactins of greatly varying form coat the surfaces, some of which are like body dermalia. Medium-size stauractins and a few triactins also occur. Microscleres are rare but present.

Spicules. Megascleres (Fig. 28; Table 12) of the body are principal diactins, choanosomal diactins, comital diactins, dermal hexactins and atrial pentactins. Principal diactins (Fig. 28A) are gently curved or sinuous, mainly smooth with sharp tips but subterminally roughened; they have no central swelling. Choanosomal diactins (Fig. 28B) are curved, have a central swelling and subterminally rough, rounded tips. Comital diactins (Fig. 28C) are very thin spicules, straight to sinuous in shape, with subterminally rough, parabolic tips. Dermalia are mostly sword-shaped hexactins with a short distal ray or hexactins with both rays in one axis elongated (Fig. 28D). The distal ray is smooth or ornamented with a few proclined spines and has a rounded tip; tips of tangential rays are typically smooth and sharp; tips of proximal rays are typically rough and sharp. Atrialia (Fig. 28E) are regular, smooth pentactins with tangential tips either rough or smooth, rounded or slightly inflated and proximal ray tips rough and rounded. Cuff diactins (Fig. 28F) are smooth,

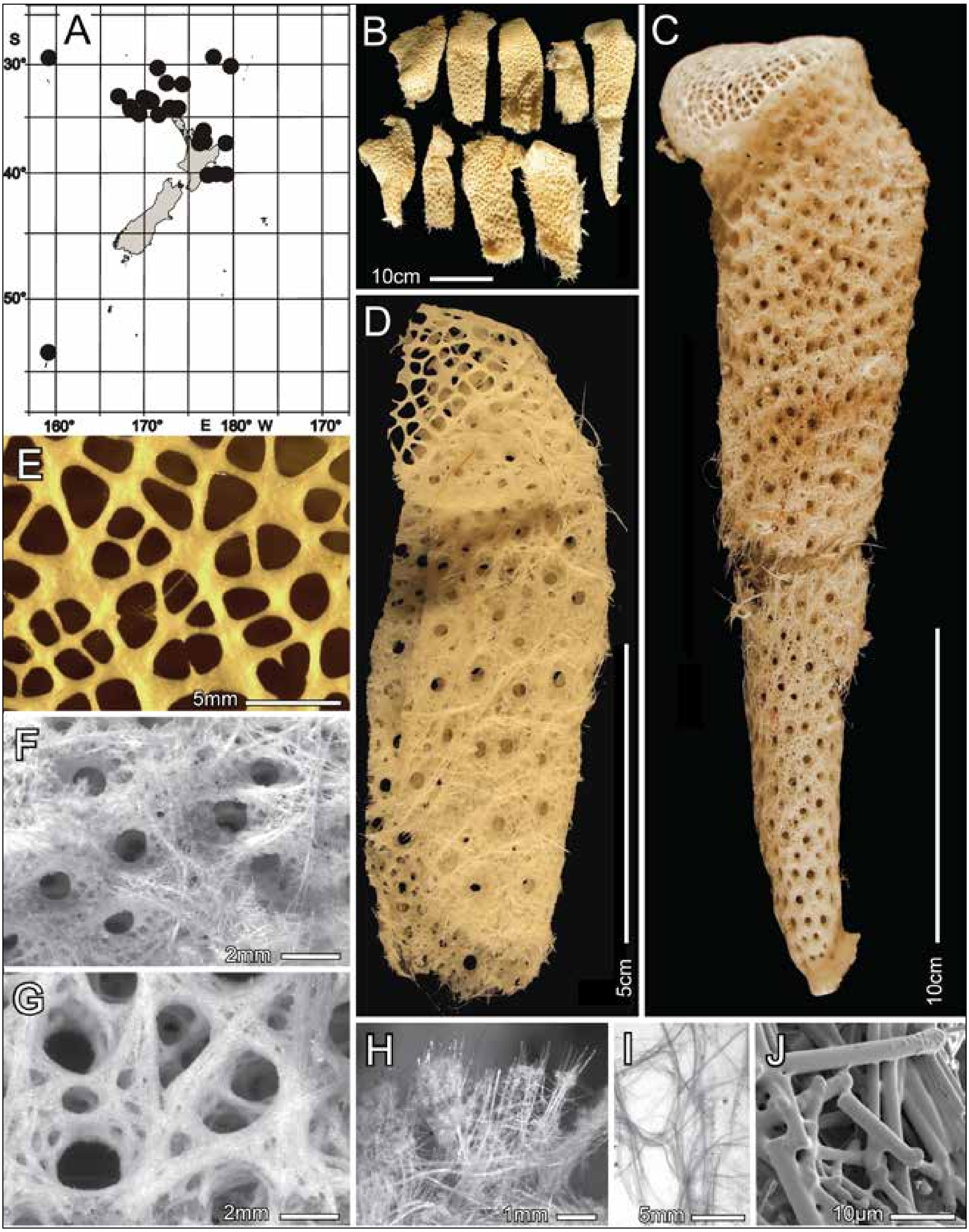


Figure 27. *Regadrella okinoseana* Ijima, 1896, distribution, morphology and skeleton: **A.** distribution in New Zealand and Australian EEZ and International waters; **B.** body shape and size of a single haul, NIWA 86215; **C.** reference specimen of NIWA 86215; **D.** one half of secondary reference specimen QM G335897; **E.** central sieve-plate; **F.** dermal surface with pits and parietal oscula; **G.** atrial surface with strong fused spicule bands and numerous small exhalent pores; **H.** residual cuff segment, body surface below; **I.** cleaned main spicule network in natural orientation; **J.** fusion of spicules on the atrial surface (SEM). Figures E–J from reference specimen NIWA 86215.

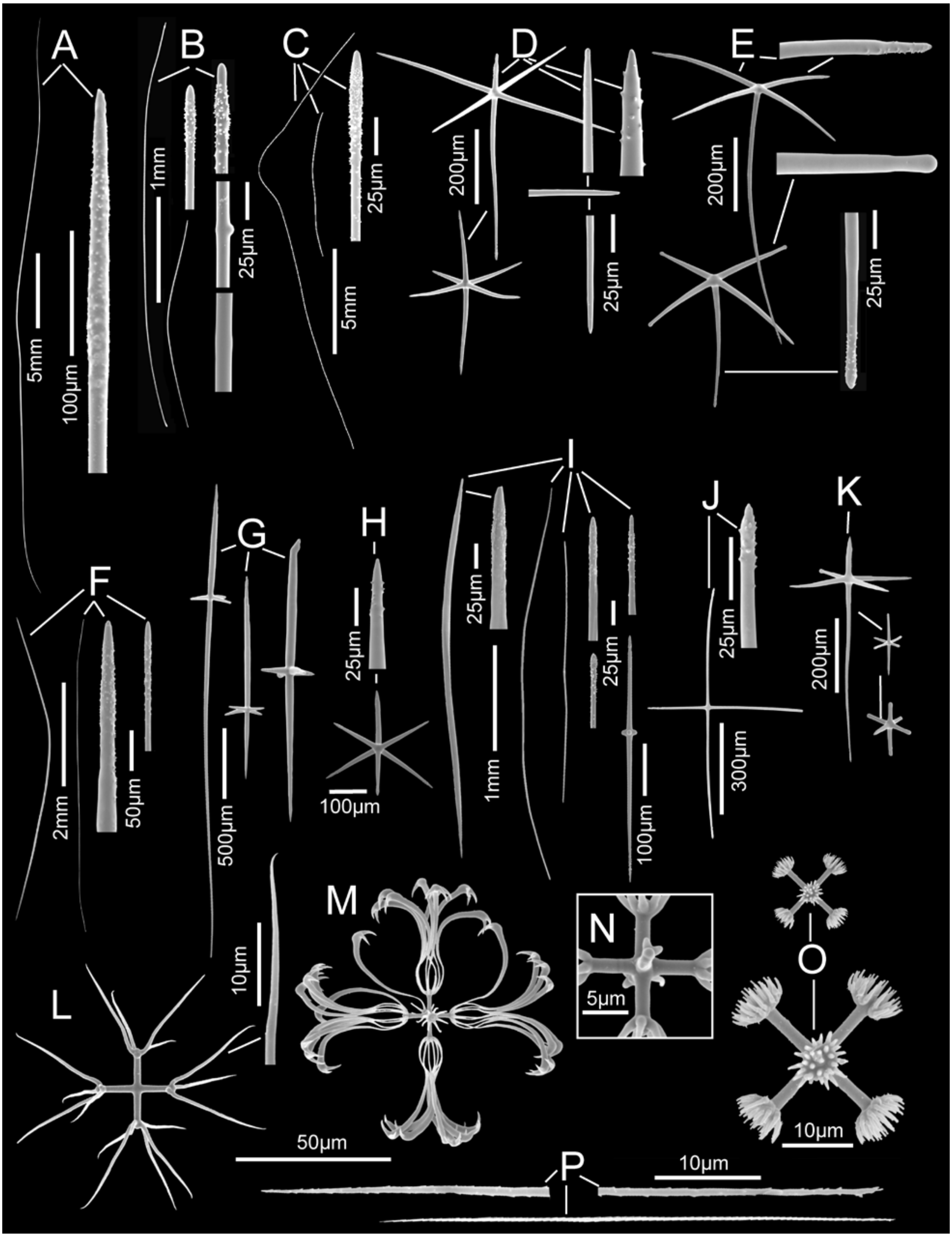


Figure 28. *Regadrella okinoseana* Ijima, 1896, spicules: **A.** primary diactin, whole, end magnified; **B.** two whole choanosomal diactins, two ends magnified; **C.** two whole comital diactins, end magnified; **D.** two whole dermalia, ray ends magnified; **E.** two whole atrialia, ray ends magnified; **F.** two whole diactins from the cuff, ends magnified; **G.** cuff large narrow hexactins from margin, projecting end up; **H.** cuff surface hexactin with ray end magnified; **I.** various sieve diactins, ends magnified; **J.** sieve stauractin, ray end magnified; **K.** sieve surface hexactins; **L.** oxystauraster, terminal ray magnified; **M.** floricome; **N.** centre of occasional floricome with short, rudimentary primary rays in and out of image; **O.** graphiocome, small image same scale as other microscleres, larger image magnified to show terminal bases; **P.** secondary ray of graphiocome, lower one in scale of other microscleres and the upper two as magnified ends. All spicules from reference specimen NIWA 86215 except E (atrialia) and I–K (sieve) from secondary reference specimen QM G335897.

Table 12. Spicule dimensions (µm) of _Regadrella okinoseana_ Ijima, 1896, from NIWA 86215 and QM G335897(*).

Parameter	mean	s. d.	range	no.
*Primary diactin				
length (mm)	20.1	5.8	9.6–38.8	85
width	69.6	14.3	39.6–100.5	86
Choanosomal diactin				
length (mm)	1.4	0.7	0.5–3.6	50
width	11.0	3.1	5.7–20.2	50
Comital diactin				
length (mm)	11.3	n. a.	5.2–22.6	3
broken spicule length (mm)	7.6	2.3	4.3–15.9	37
width	7.4	1.9	3.8–12.4	50
Dermalia, sword hexactin				
distal ray length	132	39	54.1–228	50
distal ray width	14.7	4.1	6.4–23.8	50
tangential ray length	210	47	121–326	50
tangential ray width	14.4	4.4	6.2–24.7	50
proximal ray length	306	66	176–482	50
proximal ray width	14.9	4.4	6.3–22.2	50
*Atrialia, pentactin				
*tangential ray length	291	99	173–676	50
*tangential ray width	15.7	1.9	11.7–21.1	50
*proximal ray length	488	164	161–748	50
*proximal ray width	16.0	2.1	11.8–20.9	50
Cuff diactin				
length (mm)	2.2	1.9	0.3–10.3	50
width	12.3	5.0	4.5–34.6	50
Cuff large narrow hexactin				
distal ray length	657	204	285–1113	50
distal ray width	31.3	7.8	17.7–49.0	50
tangential ray length	146	34	105–262	50
tangential ray width	26.2	6.4	15.5–40.0	50
proximal ray length	473	156	199–813	50
proximal ray width	29.1	7.3	17.5–43.8	50
Cuff surface hexactins				
distal ray length	162	45	93–371	50
tangential ray length	160	41	113–273	24
proximal ray length	297	67	178–442	24
ray width	9.7	2.2	5.1–15.6	50
*Sieve diactin				
length (mm)	1.5	1.2	0.2–5.6	50
width	16.9	8.6	7.5–51.0	50
*Sieve stauractin				
*long ray length	177	103	59–530	33
*short ray length	114	44	15–196	33
*ray width	9.4	2.7	4.2–15.5	33
*Sieve surface hexactin				
*distal ray length	100	41	37–203	43
*tangential ray length	114	44	34–254	48
*proximal ray length	237	147	61–675	41
*ray width	14.4	4.8	5.8–25.3	50
Oxystauraster				
diameter	82.0	7.0	65.5–97.7	50
primary ray length	10.5	1.2	7.8–13.1	50
secondary ray length	32.1	2.7	24.8–37.7	50
Floricome				
diameter	78.3	6.1	64.9–90.0	50
primary ray length	6.8	0.7	5.3–8.3	50
secondary ray length	32.6	3.0	25.9–38.7	50
Graphiocome centre				
diameter	25.1	2.1	20.6–29.5	50
raphide length	158	14	134–186	50

without central swelling, with ends subterminally rough but terminally smooth with rounded tips. Cuff narrow hexactins (Fig. 28G) are highly variable in shape, having short, rough, tangential rays and either the long or short ray of the main axis as the projecting ray. Similar spicules are occasionally found in dermal preparations and were likely from the parietal ridges which have been largely abraded. Cuff surface hexactins (Fig. 28H) have rays even in length or unequal and like sword-shaped dermalia; tips are rough and sharp. Sieve diactins (Fig. 28I) are also highly variable in length and width and obviously include several subtypes such as primary, medium-size and comital diactins; a central swelling occurs only in the thin diactins while all have ends with subterminal roughness. Sieve stauractins (Fig. 28J) have equal ray lengths in smaller ones but unequal lengths in larger ones; ray ends are rough with sharp tips. Sieve beam surfaces are coated with medium and small hexactins (Fig. 28K), some of which resemble body dermalia and the smaller ones have near equal ray lengths with smooth round tips.

Microscleres (Fig. 28; Table 12) are oxystaurasters, floricomes and graphiocomes. Oxystaurasters (Fig. 28L) are usually extremely abundant but southern specimens from Macquarie Ridge have few oxyoid microscleres and, of those, only 54% are oxystaurasters, 31% are oxypentasters and 15% are oxyhexasters. In oxystaurasters each primary ray supports 2 to 5 terminal rays that are straight or slightly inflected outwards and have sharp curved tips. Floricomes (Fig. 28M) are mostly regular but have one or two stunted primary rays; primary rays of regular forms have 6 to 10 sigmoid terminal rays ending in small heads with 1 to 3 claws. Most are otherwise entirely smooth but a few have small and inconsistently located denticles on the inner distal part of the terminal rays. Graphicomes (Fig. 28O) are common; primary rays have a few small spines and each bears a tuft of terminal ray bases on their end disc, one counted as 34 implying about 200 terminal rays on each spicule. Terminal rays (raphides) have three rootlet spines of unequal length at their base, and sparse, small reclined spines along the entire shaft. A few small, fine-spined microxyhexactins were found in all body spicule preparations but they were too rare to measure and image with SEM.

Remarks. This abundant New Zealand species agrees in almost every character with Ijima's (1896 and 1901) original descriptions of *Regadrella okinoseana* from Japan. The principalia are thinner in both northern (39–101 µm) and southern New Zealand populations (66–168 µm) vs "to 220 µm" in Japan specimens, but they agree with the specimen described from New Caledonia by Lévi & Lévi (1982). Floricomes are similar: 87–102 (southern New Zealand) vs 98–107 µm diameter (Japan) and both are larger than those from northern New Zealand (64–90 µm) and the Indian Ocean specimens described as *R. decora* = *R. okinoseana* by Schulze (1900) (72–80 µm).

With the addition of the two specimens from the Australian EEZ in southern New Zealand (Macquarie Ridge) the species has quite a disjunct distribution: the vast majority of specimens are distributed along the eastern and northern North Island and further north on the Norfolk and Three Kings ridges. The Macquarie Ridge specimens, QM G335896 and G335895, are somewhat unusual in that they have very few oxyoid microscleres but of those, most are oxystaurasters. Almost all other spicules are identical to those from northern specimens but for microscleres where measurements can be rather precise, those of the southern specimens are on average 20% larger, possibly due to the greater silica content of deeper, colder waters. We are confident, however, that the New Zealand specimens are part of the widespread *R. okinoseana* population and that the Macquarie Ridge specimens are also part of that population.

Key diagnostic characters

- Euplectelloid body form with sieve-plate, cuff and parietal ridges
- Distinctive special oscularia are absent or inconsistent
- Primary spicules are only large diactins
- Microscleres are numerically dominated by oxystaurasters but floricomes and graphiocomes are common

Regadrella australis sp. nov.

Figs 29, 30; Seafloor Image Figs 56–65; Table 13

Material examined. Holotype QM G335892, NIWA Stn TAN0803/102, Seamount 9, South Macquarie Ridge (Australian EEZ), 56.242° S, 158.462° E, 970–1025 m, 16 Apr 2008. **Paratypes** *South Macquarie Ridge (Australian EEZ)*: QM G335893, NIWA Stn TAN0803/84, Seamount 7, 53.705° S, 159.115° E, 998–1100 m, 13 Apr 2008; NIWA 40991, NIWA Stn TAN0803/102, Seamount 9, 56.242° S, 158.462° E, 970–1025 m, 16 Apr 2008; QM G335894, NIWA Stn TAN0803/103, 56.287° S, 158.451° E, 1170–1420 m, 16 Apr 2008.

Other material. *South Macquarie Ridge (Australian EEZ)*: NIWA 76976, 94681, NIWA Stn TAN0803/77, Seamount 7, 53.738° S, 159.114° E, 1014–925 m, 11 Apr 2008; QM G335891, NIWA Stn TAN0803/98, Seamount 9, 56.246° S, 158.506° E, 676–750 m, 16 Apr 2008.

Other locations (images only). *Macquarie Ridge (Australian EEZ)*: NIWA Stn TAN0803/078, Seamount 7, 53.717° S, 159.125° E, 845 m, 11 Apr 2008 (Seafloor Image Figs 56, 58, 60, 62); NIWA Stn TAN0803/101, Seamount 9, 56.259° S, 158.457° E, 799 m, 16 Apr 2008 (Seafloor Image Fig. 57); NIWA Stn TAN0803/092, Seamount 8, 55.402° S, 158.407° E, 558 m, 15 Apr 2008 (Seafloor Image Fig. 59); NIWA Stn TAN0803/099, Seamount 9, 56.265° S, 158.496° E, 635 m, 16 Apr 2008 (Seafloor Image Figs 61, 63, 65); NIWA Stn TAN0803/126, Seamount 11, 57.986° S, 160.489° E, 556 m, 20 Apr 2008 (Seafloor Image Fig. 64).

Type locality. Seamounts 7 and 9, South Macquarie Ridge, Australian EEZ.

Distribution. South Macquarie Ridge, Australian EEZ on southern New Zealand's Macquarie Ridge (Fig. 29A).

Habitat. Attached to hard substratum at depths of 675–1420 m.

Description. A barrel-shaped euplectelloid (Fig. 29B, C) with truncate top, with a slightly convex sieve-plate on only two of the six specimens; the basal attachment was not collected for any of them. The lateral outer body wall bears pits of varying depth about 7 mm apart, each of which has one, two or rarely three parietal oscula at the central depression; parietal ledges vary from nearly none (Fig. 29C) to extensive flap-like outgrowths of the dermal tissue to 21 mm long and 12 mm wide (Fig. 29B). Body wall thickness, excluding the long parietal flaps, varies from 4–10 mm. Sieve meshes (Fig. 29D) are highly variable in shape and size. The figured holotype (Fig. 29B) is a wall segment from a larger specimen 108 mm tall by 38 mm diameter which lacks the lower part. The paratype QM G335893 (Fig. 29C) is also the upper part of a specimen, 184 mm long by 55.6 mm diameter. Parietal oscula are 2.5 (0.2–3.7) mm, n = 64, in diameter in the mid and lower body but are smaller, 1.8 (0.1–2.3) mm, n = 34, in diameter and more closely spaced in the upper, youngest and thinnest body area. The atrial surface (Fig. 29F) has thick bundles of loose or fused spicules running between parietal oscula and smaller exhalent openings on the sides of the atrial depressions. The marginal cuff

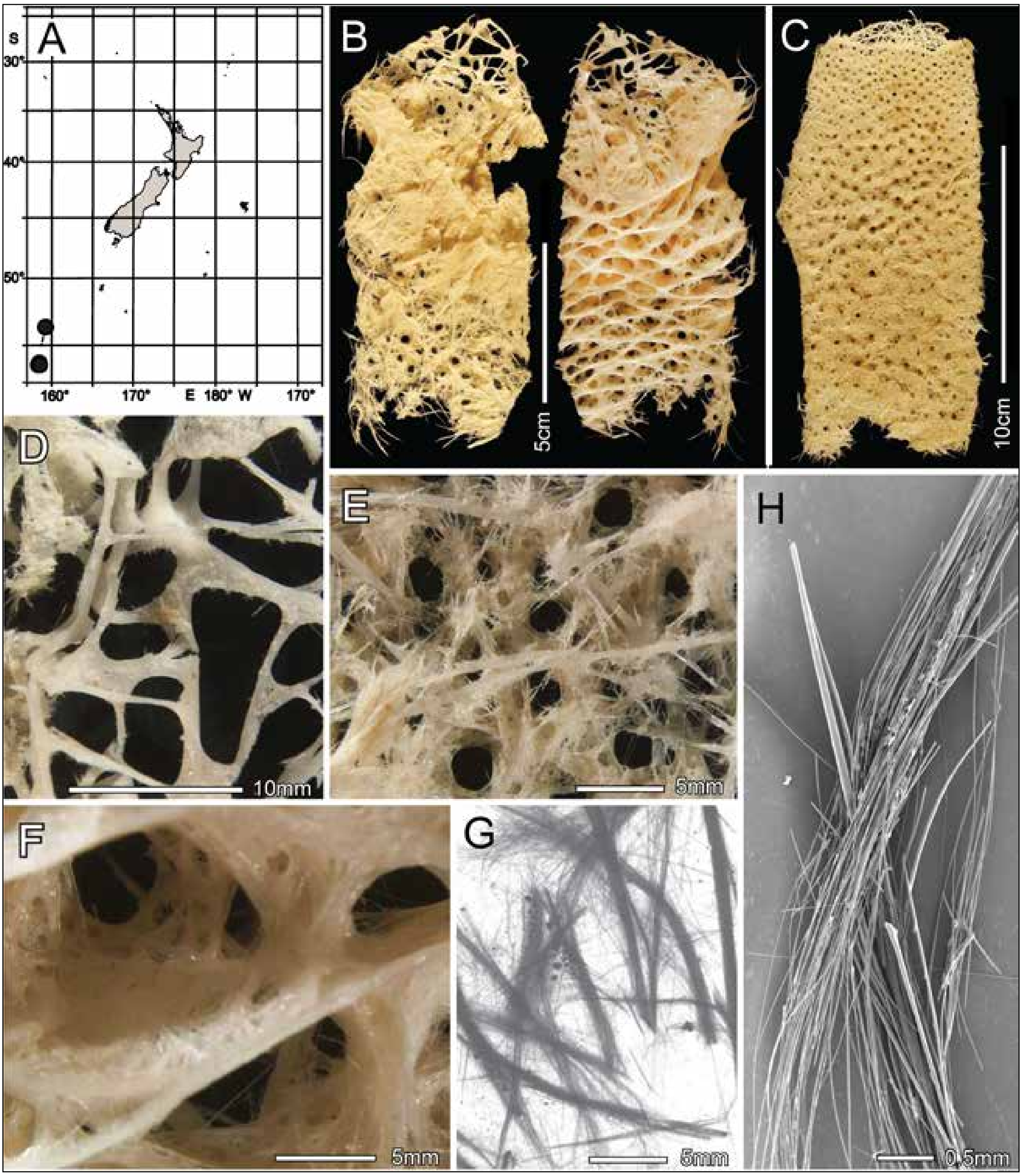


Figure 29. *Regadrella australis* **sp. nov.**, distribution, morphology and skeleton: **A.** distribution within the Australian EEZ on southern New Zealand's Macquarie Ridge; **B.** holotype QM G335892, dermal surface left, atrial surface right; **C.** paratype QM G335893, dermal surface; **D.** sieve-plate of holotype; **E.** close-up of damaged dermal surface of holotype; **F.** close-up of atrial surface of holotype; **G.** main spicule bundles of the holotype framework cleaned in bleach; **H.** one spicule bundle with a primary diactin extending from the bundle axis.

is mostly abraded but patches 3 mm wide remain on the holotype. Spicule fusion is patchy in the lower atrial body wall and sieve-plate. Other specimens are small fragments of body wall or subsamples from moderately large specimens. Colour is light brown in alcohol and dried.

Skeleton. The choanosomal skeleton is the main support and is a network of crossing longitudinal and curving oblique bundles of thin comital diactins surrounding one or two primary diactins. When the bundles are isolated in bleach preparations they largely separate (Fig. 29G), and no rectangular aspect is present in this network. When the bundles are teased, the axial principal diactins are exposed (Fig. 29H). Other loose choanosomal spicules include diactins of intermediate thickness, small oxyhexactins and microscleres. Special oscularia are absent. Ectosomal skeleton of the dermal surface includes sword-shaped hexactins as dermalia with the short ray projecting; some giant dermalia are present

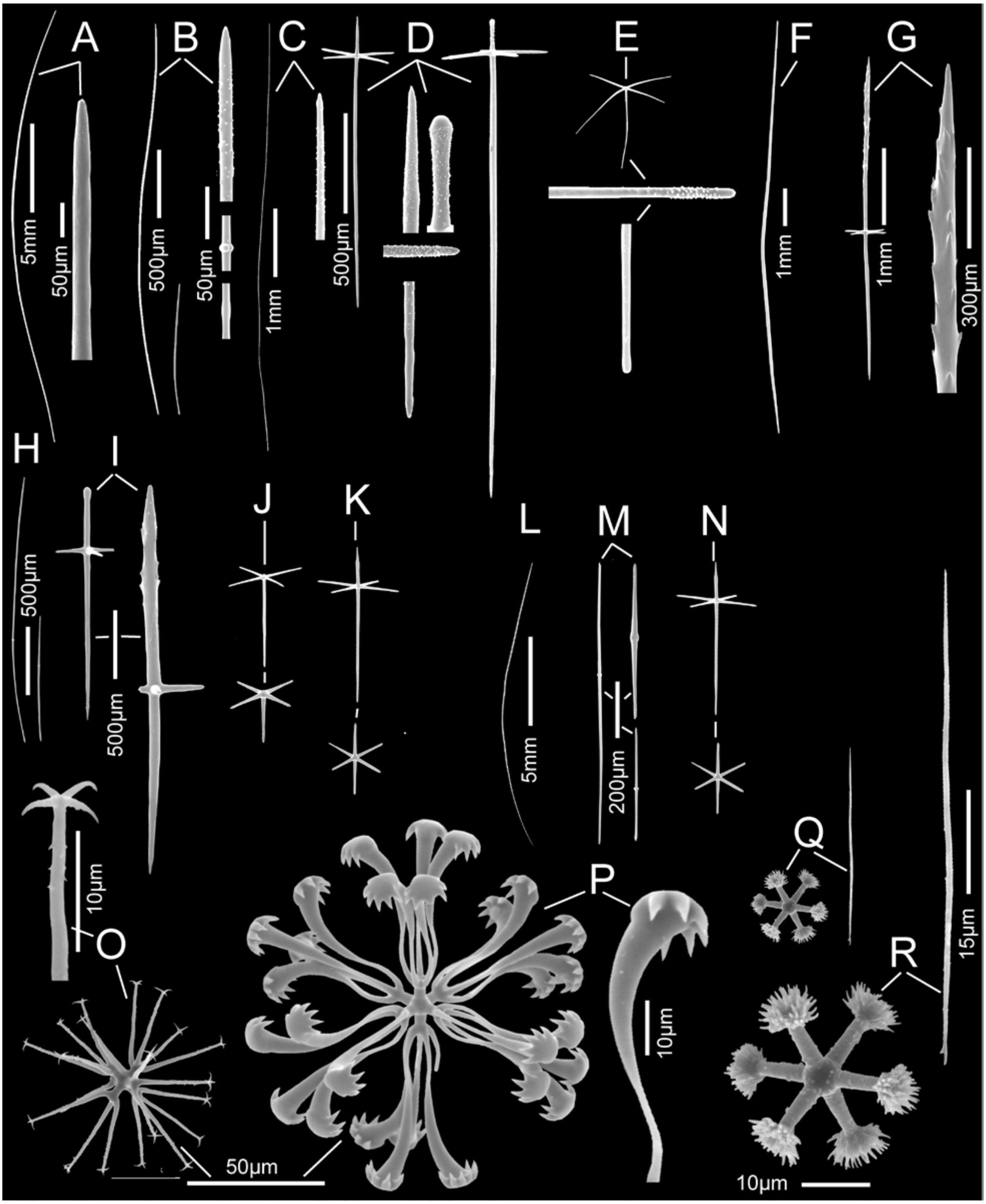


Figure 30. *Regadrella australis* **sp. nov.**, spicules; **A.** primary diactin, whole, end magnified; **B.** two whole choanosomal diactins, two centres, magnified end; **C.** whole comital diactin, magnified end; **D.** whole regular dermalium, four magnified ray ends and whole giant dermalium; **E.** whole atrialium, magnified ray ends; **F.** whole thick diactin from a parietal flap; **G.** whole prostal narrow hexactin, magnified distal end from a parietal flap; **H.** two whole diactins from the marginal cuff; **I.** two whole prostal narrow hexactins from marginal cuff; **J.** two whole surface pentactins from marginal cuff; **K.** two whole hexactins from marginal cuff; **L.** whole thick diactin from sieve-plate; **M.** three whole diactins from sieve-plate; **N.** two whole surface hexactins from sieve-plate; **O.** whole onychohexaster, terminal ray end magnified; **P.** whole floricome, terminal ray end magnified; **Q.** graphiocome centre and terminal ray at same magnification as other microscleres; **R.** graphiocome and terminal ray at higher magnification to show details. All spicules from the holotype, QM G335892. Scales for ray ends same as B, scales of all whole hexactins and pentactins the same as D.

Table 13. Spicule dimensions (µm) of *Regadrella australis* **sp. nov.**, from holotype QM G335892.

Parameter	mean	s. d.	range	no.
Primary diactin				
length (mm)	15.4	4.8	7.6–25.1	37
width	101.1	22.5	63.0–171.0	72
Choanosomal diactin				
length (mm)	1.5	0.9	0.4–4.1	50
width	17.1	9.7	8.2–49.1	50
Comital diactin				
length (mm)	7.7	2.6	2.7–12.0	26
width	10.7	2.9	7.5–19.9	26
Dermalia, sword hexactin				
distal ray length	170	26	104–221	50
distal ray width	12.7	3.8	7.6–21.4	50
tangential ray length	210	35	138–293	50
tangential ray width	12.1	3.4	5.7–20.1	50
proximal ray length	577	365	224–2912	50
proximal ray width	12.7	4.1	6.3–23.0	50
Atrialia, pentactin				
tangential ray length	383	79	238–487	11
tangential ray width	13.8	3.2	9.4–22.8	15
proximal ray length	208	n. a.	52.9–364	2
proximal ray width	11.9	n. a.	10.4–13.4	4
Parietal ridge diactin				
length (mm)	4.6	1.8	2.0–11.0	56
width	64.0	14.8	31.5–93.5	56
Parietal ridge narrow hexactin				
distal ray length (mm)	1.8	0.5	0.6–2.8	45
distal ray basal width	48.0	12.9	21.1–79.5	53
distal ray maximum width	102.2	31.2	26.8–160.5	47
tangential ray length	332	90	222–630	52
proximal ray length (mm)	1.5	0.4	0.9–2.5	40
Cuff diactin				
length (mm)	1.6	0.7	0.7–3.2	50
width	14.6	5.9	10.0–43.9	50
Cuff large narrow hexactin				
distal ray length	611	261	62–1429	59
distal ray basal width	55.3	19.6	21.6–115.5	73
distal ray maximum width	68.7	31.0	21.6–142.1	58
tangential ray length	259	53	136–395	77
proximal ray length (mm)	1.30	0.44	0.4–2.2	55
Cuff surface pentactin				
tangential ray length	192	32	132–237	9
tangential ray width	16.7	3.0	11.7–19.5	9
proximal ray length	491	155	330–741	7
proximal ray width	20.0	4.7	13.1–24.7	8
Cuff surface hexactin				
distal ray length	214	117	42–668	32
tangential ray length	205	34	128–268	40
proximal ray length	570	258	201–1513	36
ray width	18.9	7.2	8.8–38.2	50
Sieve thick diactin				
length (mm)	9.4	2.9	5.5–16.9	26
width	81.0	26.5	36.0–164.4	86
Sieve thin diactin				
length (mm)	3.6	2.8	0.5–12.6	38
width	12.8	2.3	8.3–18.5	50
Sieve surface hexactin				
distal ray length	274	119	115–507	19
tangential ray length	226	65	114–453	34
proximal ray length	397	240	107–1018	26
ray width	22.8	9.7	6.2–48.3	34
Onychohexaster				
diameter	79.1	6.1	62.1–89.6	50
primary ray length	6.8	1.1	3.8–8.8	50
secondary ray length	32.9	2.9	25.1–38.3	50
Floricome				
diameter	143	6.1	128–154	50
primary ray length	10.5	1.0	7.7–12.7	50
secondary ray length	61.6	3.1	53.7–67.7	50
Graphiocome				
centre diameter	24.8	2.0	20.9–30.0	50
raphide length	80.4	4.5	70.2–92.9	60

on the sides of parietal flaps and larger narrow hexactins project from the free edges of the parietal ridges (flaps) as prostalia. Atrialia are sparse pentactins and hexactins like dermalia. Microscleres include floricomes attached to the distal rays of dermalia and other microscleres dispersed among the proximal rays of dermalia and atrialia. Cuff skeleton is mainly supported by curved diactins smaller than those of the main body oriented transversely. Smaller diactins and thin comital diactins surround the main supporting spicules. The outer margin is composed of a palisade of narrow hexactins with short tangential rays oriented radially with one long ray projecting up to a millimeter from the cuff; these can be considered cuff prostalia. Surfaces are covered with small hexactins (80%), pentactins (15%) and triactins (5%). All microscleres of the body also occur in the cuff. Sieve-plate skeleton has primary curved diactins about half as long as the body principalia. Most diactins are medium length (average 3.6 mm) and surround the primary diactins as comitalia. Surface spicules are hexactins (77%), some sword-shaped, some very thickened, some with equal rays, pentactins (13%), and stauractins, paratetractins and triactins (together 6.5%). Large stauractins and triactins are not present. Microscleres are rare but present.

Spicules. Megascleres (Fig. 30; Table 13) of the body are principal diactins, choanosomal diactins, comital diactins, dermal hexactins and atrial pentactins. Principal diactins (Fig. 30A) are gently curved or sinuous, smooth with rounded tips; they have no central swelling. Choanosomal diactins (Fig. 30B) are curved, have a central swelling and subterminally rough parabolic tips. Comital diactins (Fig. 30C) are very thin spicules, straight to sinuous in shape with subterminally rough parabolic tips. Dermalia are mostly sword-shaped hexactins with a short distal ray and fewer giant thickened hexactins (Fig. 30D). The distal rays are smooth or ornamented with a few proclined spines and have sharp or clavate tips; ends of tangential and proximal rays are typically subterminally rough with parabolic tips. Atrialia are regular pentactins (Fig. 30E) and sword-shaped hexactins; ray ends are subterminally rough and rounded. Large diactins of the parietal flaps (Fig. 30F) are like body principalia in being entirely smooth without central swelling and having rounded tips. Narrow hexactins of the parietal flaps (Fig. 30G) have long distal rays ornamented with proclined spines and end in sharp tips; other rays are smooth with sharp tips. Cuff diactins (Fig. 30H) are like body choanosomal diactins with central swelling and subterminally rough tips. Cuff narrow hexactins (Fig. 30I) are highly variable in shape, having distal rays short or long, smooth and clavate or fusiform and procline-spined; tangential rays are short with rough and abruptly sharp or rounded tips; proximal rays are long, subterminally rough with sharp tips. Cuff surfaces are covered by a layer of mixed pentactins (Fig. 30J) and hexactins (Fig. 30K), and triactins with subterminally rough, abruptly pointed tips often with thickened rays. Sieve thick diactins (Fig. 30L) that occupy axial positions in the sieve beams are entirely like body principalia but about half as long, like those of atrial and dermal body surfaces. Sieve thin diactins (Fig. 30M) are identical to body choanosomal and comital diactins. Sieve surface hexactins (Fig. 30N), pentactins, stauractins, paratetractins and triactins are like those covering the cuff and their counterparts in body surfaces.

Microscleres (Fig. 30; Table 13) are onychohexasters, floricomes and graphiocomes. Onychohexasters (Fig. 30O) are the most abundant microsclere. The short primary rays are smooth, each supporting 2 to 5 terminal rays ornamented with few small reclined spines and ending in a tuft of 2 to 5 claws extending perpendicular and distally curving back toward the spicule centre. Floricomes (Fig. 30P) are strong and robust; each smooth primary ray supports 4–6 smooth terminal rays ending in clubs with 5–7 marginal teeth. Single denticles occur occasionally on the terminal rays but they are never organised in a pattern. Graphiocomes (Fig. 30R) are of the typical euplectelloid form; the centre and primary rays are ornamented with small hemispherical bumps in no discernable pattern; each primary ray ends in an inflation bearing the basal stubs of about 50 terminal rays. The graphiocomes were never found intact; the loose terminal rays are almost straight raphides with three spines on the basal end, a sharp outer tip and small reclined spines scattered sparsely all around the shaft.

Etymology. The species name refers to the Southern Ocean distribution of this species which seems to be confined to the Australian EEZ section of New Zealand's South Macquarie Ridge (*australis*, 'southern'; Latin).

Remarks. This southern species agrees with the diagnosis of *Regadrella*. Within the genus there are presently three species with onychohexasters, *R. delicata* Wilson, 1904, *R. komeyamai* Ijima, 1901, and *R. phoenix* Schmidt, 1880. The present form differs from *R. delicata* in having larger floricomes (143 vs 80 µm diameter), in having more terminal claws on the onychohexasters (mostly 3–4 vs 2 there), in having larger dermalia (distal ray 170 vs 80 µm length, prostal ray 577 vs 200 µm length), and in almost every other character. The new form differs from *R. komeyamai* in having a reticulate sieve vs only a corona in the new species and in having no proper body prostalia vs prostal hexactins projecting to 10 mm in the new species. The new form differs from *R. phoenix* in its possession of parietal ridges as flaps (parietal ridges are absent in *R. phoenix*), lacking large body prostal hexactins (present in the latter but incompatible with measurements of the narrow hexactins of the parietal ridges here), and having larger floricomes with almost no overlap in size (128–154 vs 54–130 µm diameter). Based upon these comparisons, we conclude that the southern New Zealand specimens represent a new species, here proposed as *Regadrella australis* **sp. nov.**

While the southern species, *R. australis* **sp. nov.**, differs from the more widely spread northern species, *R. okinoseanea*, on the principle basis of spiculation, DTIS images of euplectelloid sponges from Macquarie Ridge (Seafloor Image Figs 52–65) suggest that there may be a morphological basis for distinction as well. *Regadrella okinoseanea* is at the southern-most extent of its distribution on Macquarie Ridge and spicule differences were noted for these rare examples. However, the majority of specimens featured in DTIS images have a more barrel-shaped morphology, with a heavily puckered and ridged surface, the apex of which has heavily indented margins with a deeply ridged, concave sieve-plate. A few specimens have a leaner, tubular morphology, with a smoother surface (no parietal ridges), and a convex sieve plate, rather like that in Fig. 27C. On this basis, we conclude that these latter are possibly *Regadrella okinoseanea*.

Key diagnostic characters

- Euplectelloid body form with sieve-plate, cuff and parietal ridges
- Distinctive special oscularia are absent or inconsistent
- Primary spicules are only large diactins
- Microscleres are numerically dominated by onychohexasters but floricomes and graphiocomes are common

***Regadrella hispida* sp. nov.**

Figs 31, 32; Seafloor Image Figs 67–69; Table 14

Material examined. Holotype NIWA 52176, NIWA Stn TAN0205/47, South Colville Ridge, 31.137° S, 179.012° E, 841–776 m, 19 Apr 2002. **Paratype** NIWA 69460, NIWA Stn NZOI X693, North Raukumara Plain, 35.883° S, 177.925° E, 1664–1920 m, 14 Feb 1996.

Other locations (images only). *Southern Kermadec Ridge* (collected by GEOMAR ROV *Kiel 6000*, onboard RV *Sonne*, ICBM expedition SO254): NIWA 126122, RV *Sonne* Stn SO254/33ROV08_BIOBOX16, 35.382° S, 178.979° E, 1205 m, 07 Feb 2017 (Seafloor Image Fig. 68); NIWA 126123, RV *Sonne* Stn SO254/33ROV08_BIOBOX23, 35.380° S, 178.980° E, 1184 m, 07 Feb 2017; NIWA 126350, RV *Sonne* Stn SO254/85ROV19_BIOBOX6, 35.609° S, 178.854° E, 1164 m, 24 Feb 2017.

Seamount 986, off Hawkes Bay shelf (collected by GEOMAR ROV *Kiel 6000*, onboard RV *Sonne*, ICBM expedition SO254): NIWA 126162, RV *Sonne* Stn SO254/36ROV10_BIOBOX4, 39.990° S, 178.214° E, 793 m, 09 Feb 2017 (Seafloor Image Fig. 69); NIWA 126163, RV *Sonne* Stn SO254/36ROV10_BIOBOX7, 39.990° S, 178.214° E, 783 m, 09 Feb 2017; NIWA 126164, RV *Sonne* Stn SO254/36ROV10_BIOBOX19, 39.988° S, 178.215° E, 770 m, 09 Feb 2017; NIWA 126165, RV *Sonne* Stn SO254/36ROV10_BIOBOX3, 39.991° S, 178.215° E, 792 m, 09 Feb 2017 (Seafloor Image Fig. 67).

Louisville Seamount Chain (International waters), Ghost Seamount: NIWA Stn TAN1402/120, 40.727° S, 165.444° W, 886–1153 m, 25 Feb 2014.

Comparative material. *Regadrella phoenix*, cotypes, USNM 00976, USFCS *Blake*, Stn 281, Barbados, West Indies, 12.913° N, 59.608° W, 527 m, 06 Mar 1879, identified by O. Schmidt; *Regadrella phoenix*, MCZ 31599, USFCS *Blake*, Stn 190, Dominique, West Indies, 15.303° N, 61.442° W, 991 m, 29 Jan 1879.

Type locality. South Colville Ridge, New Zealand (Fig. 31A).

Distribution. Northern New Zealand waters: South Colville Ridge, North Raukumara Plain, Hawkes Bay, Southern Kermadec Ridge and Louisville Seamount Chain (International waters).

Habitat. Attached to hard substratum at depths of 770–1920 m.

Description. Morphology of the holotype is a barrel-shaped euplectelloid, 7.0 cm tall by 5.1 cm wide, with coarsely and regularly-spined external surface, without a sieve-plate but with a corona of very long marginal spicules projecting from a thin cuff on the upper body wall (Fig. 31B; Seafloor Image Fig. 68), resembling a set of long eyelashes or a Venus fly-trap. Images of specimens (Seafloor Image Figs 67, 69) reveal a long, slightly curved, tubular shape for most specimens. The attachment base is a basal disc as in other *Regadrella*. The dermal surface is somewhat obscured in the moderately handled holotype by having the 5–10 mm projecting lateral prostal hexactins pushed over or broken during packaging and now mostly lying prone on the sponge outer surface (Fig. 31C); closest neighbour spacing of lateral prostalia is 2.3 (0.6–4.7) mm, n = 70. Parietal ridges are poorly developed but the depressions around parietal oscula are clearly perceptible. Parietal oscula are flush with the atrial surface (Fig. 31D) which lacks ridges and any projecting spicules; parietal oscula are 1.6 (0.8–2.9) mm, n = 51, in diameter. Wall thickness, excluding prostalia, is 1.5–2.0 mm. Fusion of choanosomal spicules is widespread in the basal parts but spicules in the upper wall remain separate. The paratype is a small 4.2 by 1.6 cm fragment of body wall lacking corona and base. Colour is light brown in alcohol and dried.

Skeleton. The choanosomal skeleton provides the main support and is a network of crossing longitudinal and curving oblique diactin primaries and the overlapping basal portions of the primary hexactin prostalia. In the upper half of the body these remain as unfused, separate spicules (Fig. 31E) so prostalia can be easily pulled from the wall or pushed over; in the lower part the diactins and central part of prostalia are fused together forming a rigid structure (Fig. 31F). Comitalia are present but they do not form tight bundles and are rarely fused to primary spicules and each other. There is no rectangular aspect to the support network. Other loose choanosomal spicules include diactins of intermediate thickness and microscleres. Ectosomal skeleton of the dermal surface consists of the distal ray of the principal prostal hexactins, smaller typical sword-shaped hexactins (dermalia) with the short ray projecting, and microscleres. On the atrial surface are pentactin atrialia with long proximal rays projecting into the choanosome, and microscleres. The long narrow dermal hexactins that serve as prostalia of parietal ridges in other species are not present here. Cuff

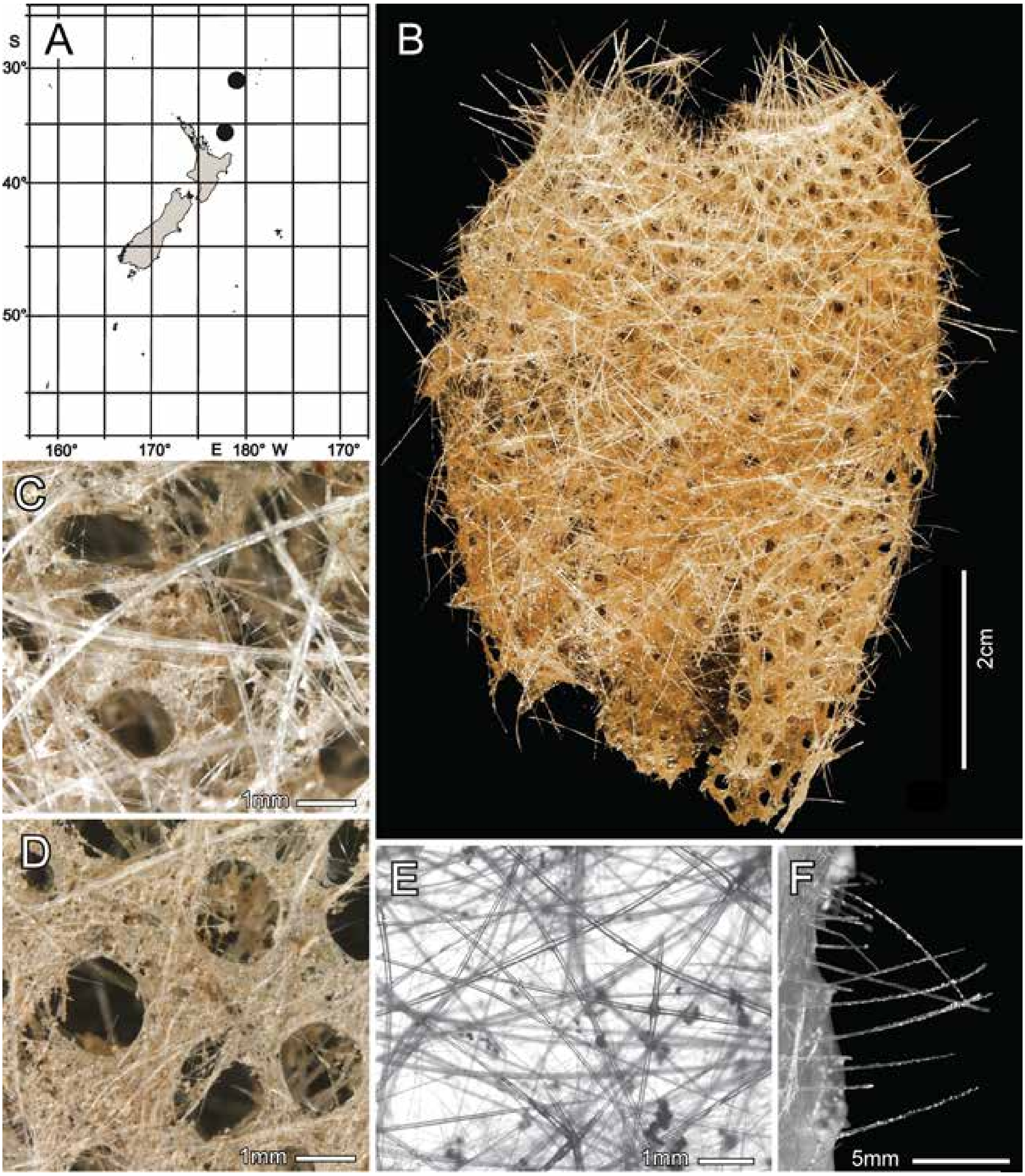


Figure 31. *Regadrella hispida* **sp. nov.**, distribution, morphology and skeleton: **A.** distribution in New Zealand waters; **B.** holotype, NIWA 52176, in dermal view, flattened with prominant lateral prostalia and closely placed marginal prostalia around the superior osculum; **C.** dermal surface closeup showing distal rays of lateral prostalia bent over to the surface plane and parietal oscula; **D.** atrial surface closeup showing parietal oscula and lack of perpendicular longitudinal and transverse spicule bundles; **E.** upper body framework digested with bleach yields single separate principalia; comital spicule bundles are present but removed during gentle rinsing; **F.** lower body framework a fused network of principal diactins and prostal hexactins; view shows distal rays of prostalia projecting from their fused-in basal parts.

skeleton was not analysed since a sample could not be isolated from the upper body wall and corona. Coronal skeleton consists mainly of large marginal prostalia (coronal hexactins) curving in from the upper margin to form a coarse-mesh cover over the main osculum. They have reduced inner and outer tangential rays; a few of these have the inner tangential ray undeveloped and are designated as pentactins. Transitional forms between parietal prostalia (one short ray as the proximal) and marginal prostalia (two short rays as the radial tangential rays) occur as hexactins with a short proximal ray and one very long tangential ray.

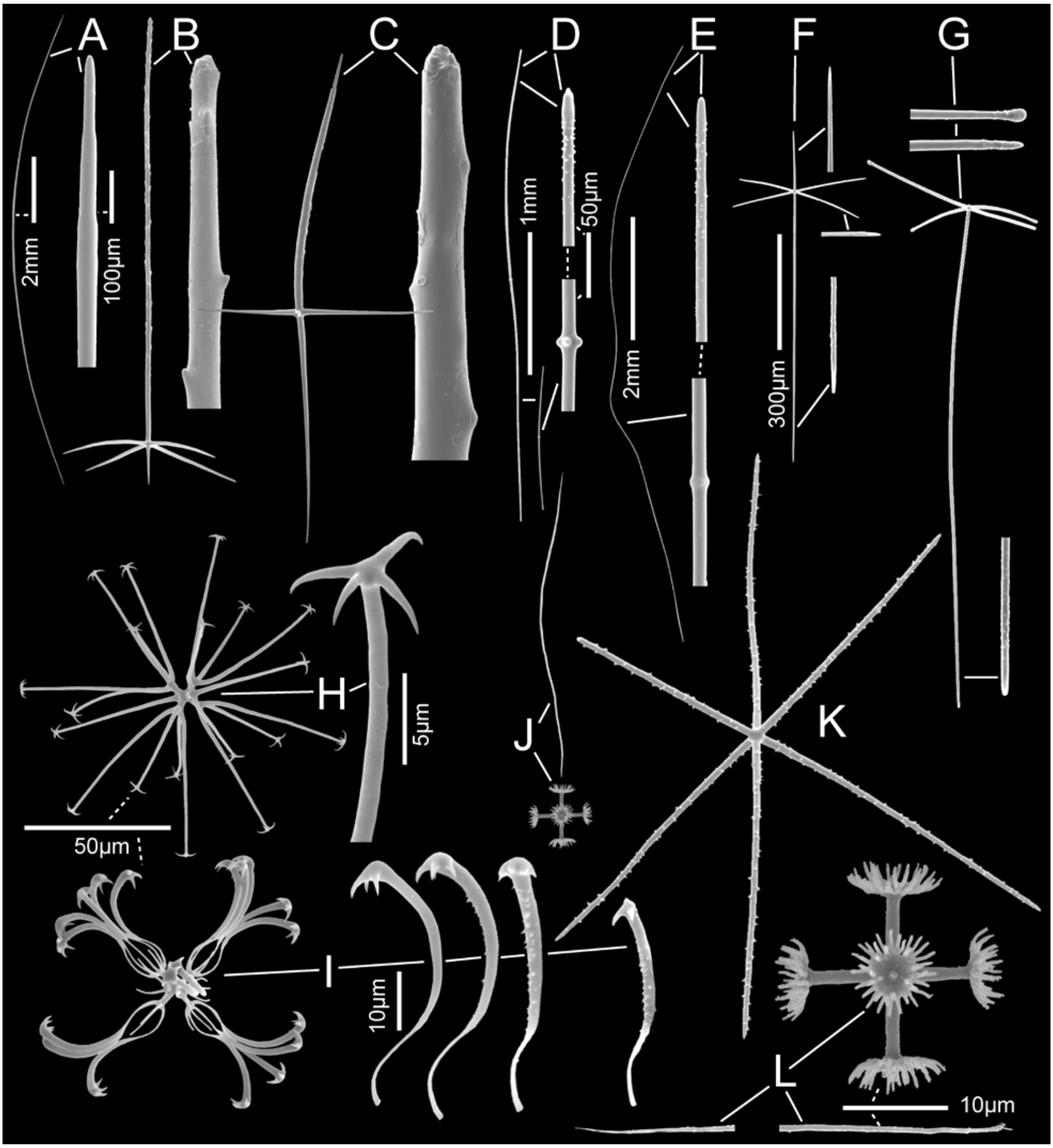


Figure 32. *Regadrella hispida* **sp. nov.**, holotype, NIWA 52176, spicules: **A.** primary diactin, whole, end magnified; **B.** primary prostal hexactin, whole, distal ray end magnified (broken tip); **C.** coronal marginal prostal hexactin, whole, end of distal ray magnified (broken tip); scales of whole spicules, ray ends are the same for A–C; **D.** two whole choanosomal diactins, end and centre magnified; **E.** whole curved comital diactin, end and centre magnified; **F.** whole dermalium, three ray ends magnified; **G.** whole atrialium, two ray ends magnified; all spicule parts in D–G are the same scale as D; whole spicules in F & G are the same scale; **H.** whole onychohexaster, terminal ray end magnified; **I.** whole floricome, various terminal rays magnified; **J.** graphiocome centre and terminal ray at same magnification of whole spicules H–K; **K.** rough (microspined) oxyhexactin; **L.** graphiocome centre and terminal ray ends magnified.

Spicules. Megascleres (Fig. 32; Table 14) of the body are principal diactins, choanosomal diactins, comital diactins, dermal hexactins and atrial pentactins. Principal diactins (Fig. 32A) are curved or rarely sinuous, without distinct central swelling, with rounded tips which are smooth or subterminally rough. Principal hexactins that also serve as lateral prostalia have a long, sparsely serrated distal ray (Fig. 32B) ending in a sharp point; the four tangential rays are moderately long, smooth and bend down away from the distal ray and end in a rounded tip with subterminal roughness; the proximal ray, the shortest, is straight and ends in a rounded club or sharp point. Choanosomal diactins (Fig. 32D) are slightly curved or sinuous, have a central swelling with four knobs and ends

Table 14. Spicule dimensions (µm) of *Regadrella hispida* **sp. nov.**, from holotype NIWA 52176.

Parameter	mean	s. d.	range	no.
Primary diactin				
length (mm)	11.5	4.03	4.8–21.1	77
width	77.1	16.4	44.1–113.7	77
Primary prostal hexactin				
distal ray length (mm)	6.6	3.1	2.0–12.3	36
distal ray basal width	100.9	25.5	35.8–160.4	118
tangential ray length (mm)	2.7	1.5	0.5–13.4	401
proximal ray length (mm)	0.9	0.3	0.3–1.8	108
Coronal hexactin/pentactin				
distal ray length (mm)	7.8	1.1	6.1–9.1	13
distal ray basal width	152.2	39.0	90.8–229.3	14
lateral tangential ray length (mm)	2.6	0.7	1.3–4.1	27
radial tangential ray length (mm)	0.6	0.3	0.3–1.2	19
proximal ray length (mm)	5.55	1.1	4.1–8.2	14
Choanosomal diactin				
length (mm)	2.3	1.5	0.4–7.2	100
width	8.8	2.5	5.4–17.4	54
Comital diactin				
length (mm)	7.8	1.7	5.1–10.9	23
width	7.6	1.1	4.8–9.4	31
Dermalia, sword hexactin				
distal ray length	111	18	79–160	53
distal ray width	3.7	0.6	2.3–5.8	50
tangential ray length	167	26	123–249	53
tangential ray width	3.7	0.8	2.6–5.8	50
proximal ray length	416	117	206–703	53
proximal ray width	3.7	0.7	2.3–6.3	50
Atrialia, pentactin				
tangential ray length	334	78	191–567	84
tangential ray width	7.8	1.6	4.0–11.0	63
proximal ray length	909	299	431–1717	50
proximal ray width	7.8	1.6	3.2–11.5	50
Onychohexaster				
diameter	102.3	6.9	85.2–120.6	50
primary ray length	6.4	0.7	4.9–8.4	50
secondary ray length	45.7	3.4	38.6–55.1	50
Floricome				
diameter	103.4	5.6	89.0–119.8	50
primary ray length	7.9	1.0	5.0–9.9	50
secondary ray length	44.0	2.8	36.3–51.4	50
Graphiocome				
centre diameter	18.1	1.8	12.7–21.3	50
raphide length	96.4	8.6	74.0–110.8	50
Rough oxyhexactin				
ray length	126	25	67–182	25
ray width	3.6	0.7	2.3–5.2	25

are subterminally rough with rounded or parabolic tips. Comital diactins (Fig. 32E) are very thin spicules, straight to sinuous in shape, with subterminally rough parabolic tips. Dermalia (Fig. 32F) are sword-shaped hexactins with the short distal ray sparsely and minutely spined; the other rays are mostly smooth with small spines proximal to the sharp tips. Atrialia (Fig. 32G) are regular smooth pentactins with tangential rays ending in either rough or smooth, rounded or inflated tips; proximal ray ends are subterminally rough with rounded tips.

Microscleres (Fig. 32; Table 14) are onychohexasters (39%), floricomes (24%), graphiocomes (37%) and rough oxyhexactins. Onychohexasters (Fig. 32H) are fairly smooth but a few small spines are scattered across the surface; each short primary ray bears 2–4 secondary rays ending in a tuft of 2–5, usually 4, 4–4.5 µm long claws extending perpendicular to the ray but distally curving back toward the spicule centre. They are more abundant in atrial tissues. Floricomes (Fig. 32I) are variable in shape of terminal rays; each short primary ray bears 5–8 sinuous terminal rays ending in a cap with 1–5 marginal claws or rarely short blunt knobs on the outer side. Spination along the inner curve of the secondary rays varies from none to extensive. Floricomes are relatively more abundant in dermal tissues. Graphiocome centres (Fig. 32J, L) have smooth principal rays; each discoid primary ray cap carries the bases of about 40 (figured one, counted 43) terminal rays in 2–3 marginal whorls but usually none inserting in the central area of the cap. This is variable as some graphiocomes have bases of terminal rays across the outer surface of the cap. Terminal rays, never found attached to their centres, are sharply pointed on the distal end and bear three short stumps on their basal ends; the entire surface is sparsely ornamented with short reclined spines. This spicule type is equally abundant in both dermal and atrial tissues. Rough (microspined) oxyhexactins (Fig. 32K) have entirely rough cylindrical rays nearly equal in length; ray ends taper abruptly to sharp pointed tips.

Etymology. The species name refers to the markedly hispid nature of this species due to the possession of extensive, obvious, hexactine parietal prostalia (*hispida*, 'hairy'; Latin).

Remarks. This species meets all criteria for inclusion in the genus *Regadrella*. Within *Regadrella*, three of the six accepted species have onychohexasters, *R. delicata*, *R. komeyamai* and *R. phoenix*. The new species can be excluded from *R. delicata* by its having lateral prostalia vs none, larger onychohexasters (diameter 85–121 µm vs 70 µm), typically four claws on ray tips of these vs two, larger floricomes (diameter 89–119 µm vs 80 µm) and larger marginal (coronal) prostalia with longest ray to 9 mm vs 4.8 mm. The new species can be excluded from *R. komeyamai* by having larger onychohexasters (diameter 85–121 µm vs 80–96 µm), smaller floricomes (diameter 89–119 µm vs 136–152 µm) with 1–5 vs 5–8 marginal teeth, and smaller marginal (coronal) prostalia with rays up to 9 x 0.21 mm vs 18 x 0.5 mm. It was not possible to exclude the new species from the most recent characterisation of *R. phoenix* provided by Tabachnick (2002) but we were doubtful that a West Indian species shared genetic continuity with the New Zealand species. In our review, we have found severe problems with Tabachnick's summary.

In his original description of *Regadrella phoenix*, Schmidt (1880) reported several specimens from Barbados and St. Croix, West Indies; he figured only two washed-out dead bases but had other material that was alive when collected. He designated no type specimen among those now divided between collections of MCZ and USNM as cotypes. Another very large specimen from the same cruise, MCZ 31599, identified by Schmidt as *R. phoenix*, has been re-examined and is a *Dictyaulus* sp. In his description of *R. phoenix*, Schmidt described no spicules other than to state they did not differ from those of *Euplectella aspergillum* Owen, 1841, which is clearly erroneous since it was known at the time that the primary spicules of *E. aspergillum* were stauractins, not diactins and its microscleres included oxyhexasters and not onychohexasters as in his new species. The first real description of *R. phoenix* spiculation was provided by Schulze (1887) from a specimen provided by Schmidt; he documented the form of spicules including figures of the floricomes and not-yet-named onychohexasters, but gave no size measurements. He erroneously stated that the primary spicules were oxypentactins probably by misinterpretation of marginal prostalia. The first full body figure was published by Agassiz (1888), without information on collection site or where it was maintained, showing clearly that the species had a palisade of marginalia but no lateral prostalia, also importantly never mentioned by Schmidt or Schulze. Topsent (1895, 1896) reported *R. phoenix* from the Central and East Atlantic (Bay of Biscay and Azores), earlier identified as *Rhabdodictyum delicatum,* and from the coast of Morocco earlier identified as *Tricaptella [=Thryhaptella] elegans* by Filhol (1885), based on the presence of floricomes, onychohexasters and absence of discohexasters. Other specimens were provisionally identified as *R. phoenix* from the Galapagos (Schulze 1899), Chile (Ijima 1901), Nicobar Islands (Schulze 1904), tip of South Africa (Kirkpatrick 1913), Spanish-Moroccan Gulf (Boury-Esnault *et al.* 1994) and nearby locations by other authors. These reports have been accepted by Tabachnick in his 2002 redescription of *R. phoenix* although he noted that some of them may not belong to that species. He nonetheless formed his redescription upon some unknown set of these and other specimens, but pointedly not on just the cotypes that were available to him. The spicule data and figures published in *System Porifera* (Tabachnick 2002) for *R. phoenix* are thus not appropriate for characterising that species. Our purpose here is not to properly redescribe the West Indian species, but to compare it to the New Zealand form. We thus measured most spicule types of the USNM 00976 cotype. Dimensions of many spicule types are similar in both specimens with broad overlap between the two but some clear differences occur. Distal rays of lateral prostalia of *R. phoenix* (only 4 found) are 1.3 (1.0–1.6) mm vs 6.6 (2.0–12.3) mm, n = 36, in the New Zealand species, with no overlap. Onychohexasters are, respectively, 69 (57–87) µm, n = 50, vs 102 (85–121) µm, n = 50, in diameter with little overlap and secondary rays are 30 (25–37) µm, n = 50, vs 44 (39–51) µm, n = 50, in length with no overlap. Floricomes are, respectively, 85 (68–99) µm, n = 50, vs 103 (89–120) µm, n = 50, in diameter with little overlap. These data and all indications that *R. phoenix* lacks visually detectable lateral prostalia, provide convincing evidence to us that these are different species. We designate the new New Zealand species as *Regadrella hispida* **sp. nov.**

Key diagnostic characters

- Euplectelloid body form without sieve-plate or parietal ridges but with corona, marginal cuff and extensive obvious hexactine parietal prostalia
- Hexactine parietal prostalia give the appearance of a set of long eyelashes or Venus fly-trap
- Distinctive special oscularia are absent
- Primary spicules are only large diactins
- Microscleres are nearly equally abundant onychohexasters, floricomes and graphiocomes

Regadrella pedunculata sp. nov.

Figs 33, 34; Seafloor Image Fig. 66; Table 15

Material examined. Holotype NIWA 71107, NZOI Stn Z9014, Western Bay of Plenty, 36.913° S, 176.340° E, 588 m, 23 Jan 1990. **Paratypes** *Northern Bay of Plenty*: NIWA 88173, NIWA Stn KAH9501/10, 36.160° S, 176.292° E, 560–527 m, 06 Jan 1995.

Western Bay of Plenty: NIWA 76345, NZOI Stn Z9228, TRIP1124/70, 36.7° S, 176.5° E, 820 m, 17 Aug 1998; NIWA 70950, NIWA Stn Z9020, 36.703° S, 176.265° E, 520 m, 24 Jan 1998; NIWA 70945, 76344, NIWA Stn Z9016, 36.802° S, 176.302° E, 522 m, 23 Jan 1998; NMNZ PO.000502, NZOI Stn R117, 20 km east of Alderman Island, 36.928° S, 176.323° E, 542–588 m, 24 Jan 1979.

Northwestern Bay of Plenty: NIWA 71133, NIWA Stn Z9023, 36.962° S, 176.322° E, 535 m, 25 Jan 1998.

Bay of Plenty: NIWA 82043, NIWA Stn TAN1206/7, 36.112° S, 176.734° E, 1012–1047 m, 15 Apr 2012; NMNZ PO.000513, New Zealand Marine Dept Prawn Survey Haul 12, 37.427° S, 176.921° E, 604–659 m, 29 Sep 1962.

Kermadec Ridge: NIWA 76947, NZOI Stn K805, near Raoul Island, 29.178° S, 177.790° W, 1142 m, 02 Jul 1974; NIWA 70948, NZOI Stn K831, 29.862° S, 178.182° W, 965 m, 07 Jul 1974.

Other locations (images only). *Seamount 986, off Hawkes Bay shelf* (collected by GEOMAR ROV *Kiel 6000*, onboard RV *Sonne*, ICBM expedition SO254): NIWA 126299, RV *Sonne* Stn SO254/79ROV16_BIOBOX3, 40.049° S, 178.135° E, 908 m, 22 Feb 2017 (Seafloor Image Fig. 66).

Type locality. Western Bay of Plenty, New Zealand (Fig. 33A).

Distribution. Bay of Plenty and Kermadec Ridge.

Habitat. Presumably rooted in soft sediment at depths of 520–1142 m.

Description. Morphology of the holotype is a barrel-shaped euplectelloid (Fig. 33B), flattened when measured, 15.4 cm tall by 5.1 cm wide, narrowed to 1.47 cm width at the upper end bearing a small sieve plate (Fig. 33C) and narrowed to only 3.3 mm width at the inferior, peduncular 'root' (Fig. 33D). The smooth outer surface is slightly abraded but parietal oscula are well preserved, irregularly distributed and 1.4 (1.1–2.0) mm, n = 127, in diameter. Wall thickness is 2.8 (2.3–3.6) mm, n = 16. The dermal surface bears many inhalant canal openings around the parietal oscula; it is fluffy in appearance with the dermal lattice and thin parietal ridges preserved in places (Fig. 33F). The atrial surface bears numerous uncovered exhalant canal openings and is comparatively flat, smooth and hard (Fig. 33G). The 15 paratype specimens include 10 nearly complete bodies, 10.0–15.4 cm in length, of which five have sieve plates and four have roots. The three remaining paratypes are body wall fragments, 2.7–6.9 cm in length, with neither sieve plates nor roots. Parietal ridges are poorly developed in most but one specimen, NIWA 71133 (Fig. 33E), which has these strongly formed in a lateral orientation. Fusion of choanosomal spicules is common in basal parts only. Colour is light brown to light orange in alcohol and dried. Note that the 'root' is clearly a distinct morphological feature that may, occasionally, be attached to small pebbles, as such functioning as a form of attachment as well as possibly rooting into soft sediment. All specimens with the bottom intact always have the peduncle. Living specimens show the barrel-shaped body and delicate, apical sieve-plate (Seafloor Image Fig. 66).

Skeleton. Choanosomal skeleton providing the main body support is a network of mostly longitudinal bundles of diactin primaries and their surrounding comitalia (Fig. 33H); fewer and smaller spicule bundles are oriented obliquely. There is no rectangular aspect or prostalia associated with this network. Other loose choanosomal spicules include diactins of intermediate thickness, a few large hexactins of irregular form, and microscleres. Ectosomal skeleton of the dermal surface consists of typical sword-shaped hexactins (dermalia) with the short ray projecting, and microscleres. The atrial surface is mostly covered by choanosomal diactins; very few pentactin atrialia and microscleres are in soft tissues around parietal oscula. Cuff skeleton of the residual portion consists of medium and small diactins, a few stauractins and large numbers of dermalia-like hexactins. No large prostalia were found. Sieve skeleton has large coronal (marginal) hexactins in the sieve margin extending with major rays down into the body wall and up into the basal sieve beams. Two to four large diactins lie along these as supporting comitalia. Other sieve beams have large axial diactins, both normal and shaped like body primary diactins, and thickened irregular forms; these are covered in layers of smaller diactins and superficially coated by dermalia-like hexactins. A few small rough monactins occur but their position is uncertain. Sieve meshes have the following dimensions: length 2.6 (1.1–4.7) mm, n = 23, width 1.6 (0.8–2.6) mm, n = 23, beam width 260 (131–584) µm, n = 44. The central part of the root is a fused extension of the choanosomal skeleton. A layer of diactins of moderate thickness from the outer body choanosome extends peripherally down around the fused centre (Fig. 33I) and continues beyond (Fig. 33J) for an unknown distance into the sediments as a body support. Most of the root diactins are joined by synapticula in the upper root area but remain as loose spicule parts in the lowermost region of the root.

Spicules. Megascleres (Fig. 34; Table 15) of the body are principal diactins, choanosomal diactins, comital diactins, large asymmetric hexactins, dermal sword hexactins and atrial pentactins. Principal diactins (Fig. 34A) are curved or bent, have no central swelling and tips which are rounded and smooth or subterminally rough. Choanosomal diactins (Fig. 34B) are slightly curved or sinuous, have a central swelling with four knobs and ends are subterminally rough with rounded or parabolic tips. Comital diactins (Fig. 34C) are very thin spicules, straight to sinuous in shape with subterminally four central

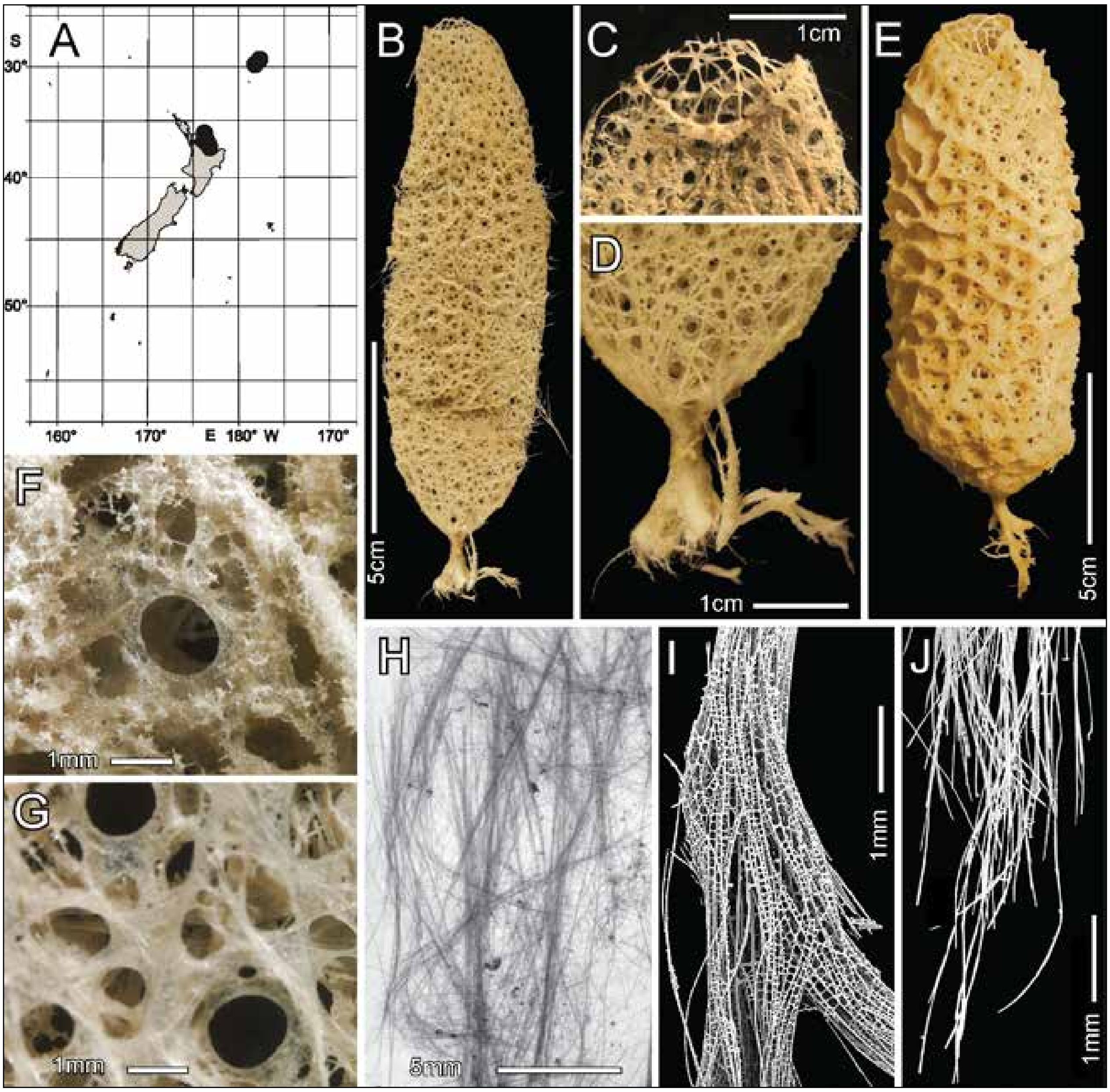
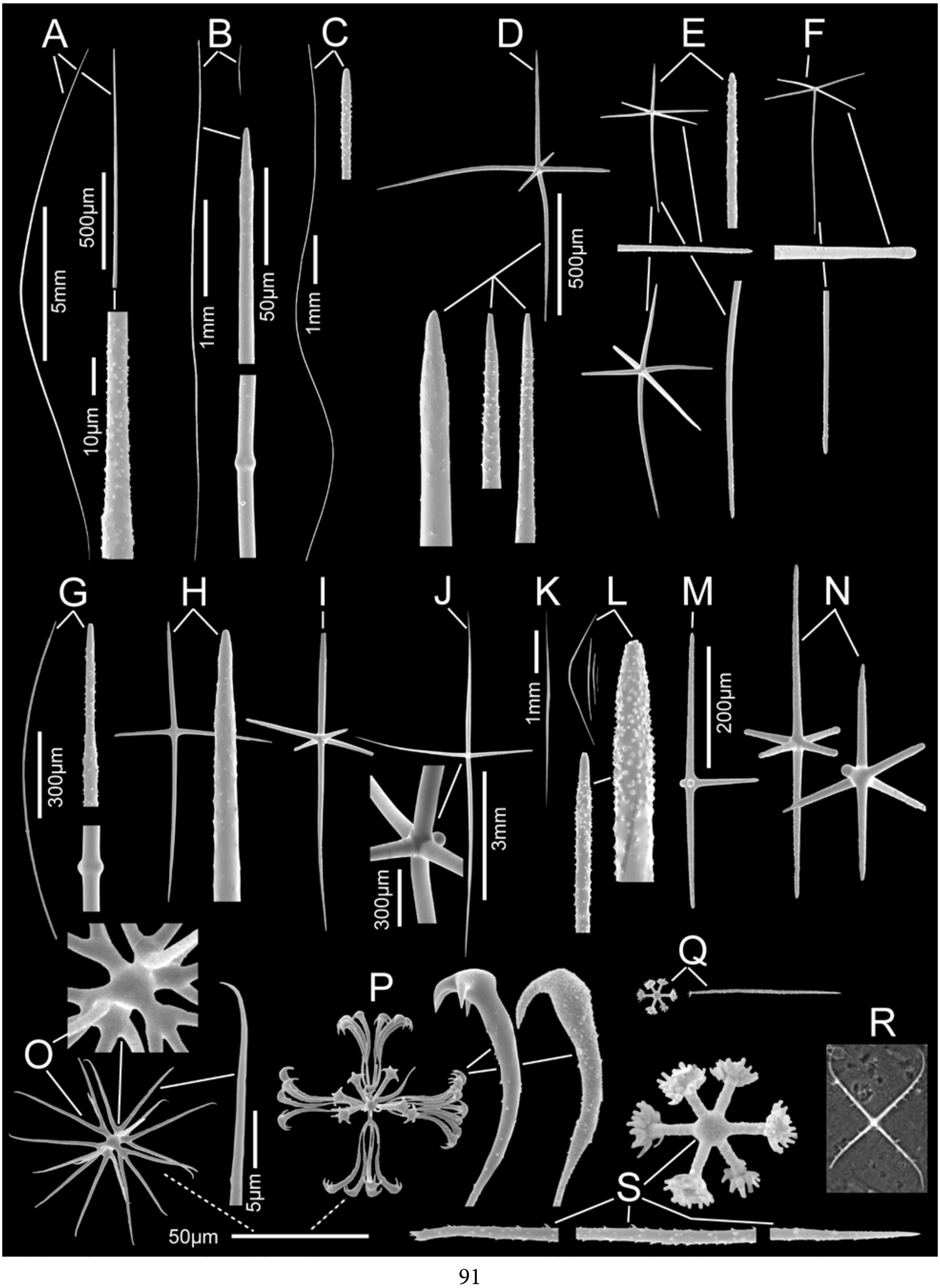


Figure 33. *Regadrella pedunculata* **sp. nov.**, distribution, morphology and skeleton: **A.** distribution in New Zealand waters; **B.** holotype NIWA 71107; **C.** closer view of upper end with sieve plate and remnants of cuff; **D.** magnified view of short peduncle and flaring root; **E.** paratype NIWA 71133; **F.** close-up of the dermal surface showing a parietal osculum surrounded by inhalant canals partially covered by remnants of the dermal lattice; **G.** atrial surface at the same magnification with two parietal oscula, exhalant canals not covered, and hard smooth surface; **H.** main body wall skeleton after bleach treatment showing longitudinal and transverse spicule bundles but no clear rectangular arrangement; **I.** peel from surface of lower peduncle at narrowest point, spicules connected by synapticula; **J.** lower end of the root tuft with spicules unfused.

Figure 34 (*opposite*). *Regadrella pedunculata* **sp. nov.**, holotype NIWA 71107, spicules: **A.** primary diactin, whole, magnified ray end, subterminal rough area magnified; **B.** choanosomal diactins, two whole, ray end and spicule centre magnified; **C.** comital diactin, whole and magnified ray end; **D.** large asymmetrical hexactin, whole and three ray ends; **E.** dermal sword hexactins, two whole with magnified distal, tangential and proximal ray ends; **F.** atrial pentactin, whole, tangential and proximal ray ends magnified; **G.** cuff main diactin, whole, ray end and spicule centre magnified; **H.** cuff stauractin, whole, ray end magnified; **I.** cuff surface hexactin; **J.** coronal (or marginal) hexactin from marginal sieve beam, whole, rotated centre magnified; **K.** supporting diactin (comitalium) of the coronal spicules, rays tapering smoothly from a thick centre to fine tips; **L.** diactins of sieve-plate beams, four whole, two ray ends magnified; **M.** tauactin of sieve-plate; **N.** hexactin and variant with reduced ray from surface cover of sieve-plate beams; **O.** oxyhexaster, whole, magnified spicule centre and terminal ray end; **P.** floricome, whole, two terminal ray ends magnified; **Q.** graphiocome centre and terminal ray; **R.** spined oxyhexactin; **S.** graphiocome magnified from Q. Scale in D applies to whole spicules in E–F, H–I, M–N; scale in B for spicule parts applies to same in C–H, L. Scale for whole microscleres in O applies also to P–R; scale of magnified parts of O applies to magnified parts in P and all of S.

swellings and rough parabolic tips. The few asymmetric large hexactins (Fig. 34D) are probably choanosomal spicules encountered only in dermal spicule preparations but their exact position is undetermined. The rays are unequal in length, have parabolic tips with subterminal roughness but are otherwise smooth. Dermalia (Fig. 34E) are sword-shaped hexactins with the short distal ray sparsely and minutely spined; the other rays are mostly smooth with small subterminal spines and pointed tips. These vary considerably in some having one or two long or stubby tangential rays or general thickening. Atrialia (Fig. 34F) are regular smooth pentactins with tangential rays ending in either rough or smooth, rounded or inflated tips; proximal rays are subterminally rough with rounded



tips. Cuff megascleres, in the remnants examined, consist of diactins, stauractins and hexactins. Cuff diactins (Fig. 34G) are like body choanosomal diactins in being mostly smooth and having central swellings and subterminal roughness. Cuff stauractins (Fig. 34H) are moderate in size, have rays of slightly unequal length with subterminal roughness and parabolic tips. Cuff hexactins (Fig. 34I) are like body dermalia but often have short and long tangential axes. Sieve megascleres consist of coronal hexactins, coronal supporting diactins, thick and thin diactins, triactins and hexactins. Sieve coronal hexactins (Fig. 34J) provide marginal support for the sieve plate; every marginal beam has one of these spicules joining the sieve plate to the main body. Each has two long rays, the distal one curving up into a marginal sieve beam and the proximal one extending straight down into the body wall; the four tangential rays differ drastically in size: two lateral rays are moderately long and project within the upper margin, one very short radial ray projects out into the cuff and one ray, usually a short nub but with an axial filament, projects inwards, opposite the cuff. Since one ray is relatively undeveloped, homologues of this in other euplectellids may have been called pentactins. Coronal support diactins (Fig. 34K) have a narrow diamond shape; both rays taper smoothly from the central thick area to the ray tips. Two to four of these spicules support each coronal spicule across the sieve-body boundary. Sieve diactins (Fig. 34L) occur in thick and normal forms. The thick forms are generally longer and extend across beam junctions. Normal diactins are like the choanosomal diactins. Sieve tauactins and hexactins (Fig. 34M, N) are surface spicules on sieve beams; both have one elongate axis.

Microscleres (Fig. 34; Table 15) are oxyhexasters (74%), hemioxyhexasters (3%), floricomes (14.5%), graphiocomes (6%) and spined oxyhexactins (2.5%). Oxyhexasters (Fig. 34O) have a spherical inflated centrum and short primary rays that each support 1–4 (usually 2–3) terminal rays with curved tips; these are generally entirely smooth but occasionally have a few very small spines. Floricomes (Fig. 34P) are the same size as oxyhexasters. Each of their short, smooth primary rays supports 4–9 (usually 6–8) s-shaped terminal rays, ending in an asymmetric cap with 1–7 (usually 3) marginal claws. The terminal rays may be smooth or rough and many also are ornamented with a few larger denticles distributed irregularly on the inner sides. Graphiocomes (Fig. 34Q, S) have very short, smooth primary rays each ending in a hemispherical cap bearing the bases of about 30 relatively short terminal rays densely covered with reclined spines.

Table 15. Spicule dimensions (µm) of *Regadrella pedunculata* **sp. nov.**, from holotype NIWA 71107.

Parameter	**mean**	**s. d.**	**range**	**no.**
Primary diactin				
length (mm)	15.2	3.9	7.1–26.9	56
width	57.5	8.9	41.6–75.7	54
Choanosomal diactin				
length (mm)	2.3	0.6	3.1–5.1	50
width	17.2	6.4	7.5–35.4	50
Comital diactin				
length (mm)	6.7	1.8	4.1–10.0	25
width	9.2	1.8	5.9–12.2	25
Dermalia, sword hexactin				
distal ray length	169	59	34–301	50
tangential ray length	238	124	116–652	50
tangential ray width	10.5	4.5	4.2–25.9	50
proximal ray length	368	117	191–709	50
Atrialia, pentactin				
tangential ray length	180	42	84–255	30
tangential ray width	5.2	1.0	3.3–7.3	31
proximal ray length	194	n. a.	142–246	2
proximal ray width	5.2	0.6	4.1–6.2	10
Cuff diactin				
length	665	294	414–2059	40
width	9.7	2.5	4.7–14.7	40
Coronal (marginal) hexactin				
distal ray length (mm)	2.06	n. a.	1.5–3.1	4
width	82.0	n. a.	65.5–102.1	4
body wall ray length (mm)	3.8	n. a.	2.6–4.8	4
lateral tangent ray length (mm)	1.7	n. a.	1.1–2.8	4
cuff (outer) ray length	426	n. a.	312–530	4
inner ray length	135	n. a.	109–149	4
Coronal support diactin				
length (mm)	3.9	0.6	3.1–5.1	12
width	60.1	14.2	36.7–84.8	12
Sieve thick diactin				
length (mm)	2.0	0.9	0.8–4.5	50
width	39.7	10.5	23.3–63.5	50
Sieve normal diactin				
length (mm)	1.1	0.6	0.3–2.5	50
width	14.1	3.7	6.7–21.2	50
Sieve surface hexactin				
long ray length	228	50	91–343	50
short ray length	78	29	32–144	50
ray width	14.7	3.3	4.6–23.0	50
Root diactin				
width	15.9	4.9	7.5–27.2	50
Oxy- and hemioxyhexaster				
diameter	71.0	7.3	55.6–90.1	50
primary ray length	5.0	0.8	2.8–7.5	50
secondary ray length	30.8	3.4	23.7–38.9	50
Floricome				
diameter	71.3	4.0	63.0–79.7	50
primary ray length	6.6	0.8	5.1–9.8	50
secondary ray length	29.3	1.8	24.4–32.5	50
Graphiocome				
centre diameter	14.0	1.1	12.0–16.9	50
raphide length	52.1	5.1	38.1–59.0	50
Spined oxyhexactin				
ray length	37.2	10.3	25.4–74.4	50
ray width	1.7	0.4	1.0–2.9	50

Spined oxyhexactins (Fig. 34R) were found in only two of 12 specimens examined, NIWA 71107 and NMNZ PO.000502. They are exceptionally small; rays of individual spicules are either all entirely straight or all curved to various degrees; the spines are robust, longer than ray diameters and proclined. None were encountered on SEM preparations. Unspined oxyhexactins also occur in small numbers; they are larger than the spined forms with ray length of 135 (107–161), n = 5.

Etymology. The species name refers to the form of the base of attachment of the sponge which is a peduncle rather than a tough circular attachment disc as found in many other species of *Regadrella* (*pedunculata*, 'stem'; Latin)

Remarks. The two specimens from Kermadec Ridge differ slightly from the North Island specimens in having slightly larger oxyhexasters (mean diameters 83 and 87 µm vs 68–80 µm; largest is 100 µm) and floricomes (mean diameters as 93 and 104 µm vs 71–89 µm, largest is 117 µm). They do not differ from the North Island specimens in other spicule sizes or characters and are all considered to be members of a single species population. This species agrees with the diagnosis of the genus *Regadrella*. Among the six presently recognised valid species, main microscleres are onychohexasters in three species, oxystaurasters in one species, oxyhexactins in one species and oxyhexasters in one species, *R. rhizophora* Tabachnick & Lévi, 2004. The description of *Regadrella rhizophora* differs from the new species in at least four characters. In *R. rhizophora* vs the new species, 1) principal diactins are 0.5–4 mm vs 7–27 mm (no overlap), 2) rare oxyhexactins with long 1–9 mm distal ray vs no such spicule, 3) no graphiocome vs abundant in every specimen, and 4) no spiny oxyhexactin vs moderately abundant but only in 2 of 12 specimens. Although *R. rhizophora* and the new species are very similar in morphology and close in geographical location, both being supported in soft sediments by roots, the differences in characters support a lack of genetic connection between their populations. We consider the form described above to be a new species, here named *Regadrella pedunculata* **sp. nov.**

Key diagnostic characters

- Euplectelloid body form with small sieve plate, parietal ridges, marginal cuff but no long lateral prostalia
- Short peduncle and root instead of attachment disc
- Primary spicules are only large diactins
- Microscleres are mostly oxyhexasters, floricomes and graphiocomes; spined oxyhexactins are less abundant and were found only in a few specimens

Regadrella sp. indet.

Material examined. *South Macquarie Ridge (Australian EEZ), Seamount 7*: NIWA 40565, NIWA Stn TAN0803/81, 53.731° S, 159.166° E, 1150–1270 m, 12 Apr 2008; NIWA 62091 (distribution record only), NIWA Stn TAN0803/84, 53.705° S, 159.115° E, 998–1100 m, 13 Apr 2008.

Graveyard Seamount Complex, Chatham Rise Ghoul Hill (distribution records only): NIWA 25288, 25291, 25294, NIWA Stn TAN0604/116, 42.797° S, 179.986° E, 950–1045 m, 07 Jun 2006; NIWA 25296, NIWA Stn TAN0604/117, 42.797° S, 179.985° E, 950–1025 m, 07 Jun 2006.

Distribution. South Macquarie Ridge, Australian EEZ on southern New Zealand's Macquarie Ridge; Graveyard Seamount Complex, Chatham Rise.

Habitat. Presumably attached to hard substrate at 998–1270 m.

Description. Morphology consists of a typical but grossly damaged cylindrical regadrellid upper body torn into two pieces, one with partial sieve plate, but without the base. The pieces are like both *Regadrella okinoseana* and *R. australis* **sp. nov.** which both occur in the area. The problem with identifying this specimen is that its proper microscleres cannot be confidently determined due to their extreme rarity and due to the relatively great contamination with obviously foreign microscleres. It could belong to either of the above species but it is not possible to establish species-level identity.

Genus *Walteria* Schulze, 1886

Walteria Schulze, 1886: 42.
Hyalodendron Moore, 1898: 430.

Diagnosis. Body is saccular or tubular, basiphytous. Walls are thin and rigid with numerous lateral oscula. Distal lateral processes are simple or dichotomously branching outgrowths of the lateral wall. Choanosomal spicules are monaxons, probably diactins, rarely triactins and other hexactin derivatives, fused by synapticulae. Prostalia lateralia are large hexactins or pentactins. Dermalia are hexactins. Atrialia are pentactins. Microscleres are spiny microhexactins, graphiocomes, spherical toothed or serrated discohexasters with numerous secondary rays, stellate discohexasters, floricomes and onychasters are sometimes absent (Tabachnick 2002).

Type species. *Walteria flemmingi* Schulze, 1885 (by monotypy).

Walteria flemmingi Schulze, 1885

Figs 35–37; Seafloor Image Figs 99–102; Table 16

Walteria flemmingi Schulze, 1885: 445, 1886: 42, 1887: 96, 1895: 35; Ijima 1901: 278; Chave & Malahoff 1998: 77; Tabachnick 2002: 1433; Tabachnick & Lévi 2004: 30; Dawson 1993: 56.

Material examined. Holotype—BMNH 1887.10.20.029, HMS *Challenger*, Stn 170A, Kermadec Ridge, 29.75° S, 178.183° W, 1152 m, 14 Jul 1874.

Other material. *Kermadec Ridge*: NIWA 71132, SOP Stn TRIP1674/33, 34.7° S, 169.4° E, 967–970 m, 19 Jul 2002.

Lord Howe Rise: QM G316686, NIWA Stn TAN0308/51, 29.228° S, 158.020° E, 810–1000, 21 May 2003.

Raukumara Plain, northeast of Bay of Plenty: NIWA 52829, NZOI Stn Z9805, 37.088° S, 177.263° E, 742 m, 16 Jun 1999; NIWA 71066, NZOI Stn X201, 37.135° S, 177° E, 1050 m, 06 Dec 1989.

Southern Three Kings Ridge: NIWA 51784, NIWA Stn KAH0204/44, South Cavalli Seamount, 34.300° S, 174.000° E, 850–840 m, 18 Apr 2002.

Western Three Kings Ridge: NIWA 55984, NZOI Stn Z9025, 31.980° S, 174.265° E, 1680–677 m, date not recorded.

Southern end of Norfolk Ridge: NIWA 76859, SOP Stn TRIP1674/23, 34.7° S, 169.4° E, 967–970 m, 19 Jul 2002.

Great Australian Bight (Australian EEZ): SAM S716, 35.100° S, 133.750° E, 916 m, Sep 1989; SAM S717, 34.250° S, 124.700° E, 920–1120 m, 08 Dec 1989; SAM S718, 35.067° S, 133.583° E, 900–960 m, 13 Apr 1989; SAM S719, 33.717° S, 129.317° E, 940–985 m, 18 Nov 1989; SAM S720, 33.583° S, 129.067° E, 860–931 m, 10 Dec 1989; SAM S721, 33.683° S, 129.283° E, 907–906 m, 10 Dec 1989; SAM S722, 33.067° S, 133.983° E, 625–890 m, 09 Nov 1989.

Hawai'i (US EEZ): BPBM C0862, HURL Dive P5-528, Cross Seamount, 18.751° N, 158.240° W, 975 m, 25 Oct 1993.

Other locations (images only). *Kermadec Ridge*: NIWA Stn TAN1206/24, Tangaroa Seamount, 36.329° S, 178.040° E, 964–788 m, 17 Apr 2012 (Seafloor Image Fig. 102); NIWA Stn TAN1206/93, Clark Seamount, 36.453° S, 177.844° E, 1025–1045 m, 23 Apr 2012 (Seafloor Image Fig. 100).

Macquarie Ridge (Australian EEZ): NIWA Stn TAN0803/101, Seamount 9, 56.259° S, 158.457° E, 799 m, 16 Apr 2008 (Seafloor Image Fig. 99).

Macquarie Ridge (International waters): NIWA Stn TAN0803/115, Seamount 10, 59.011° S, 158.880° E, 158 m, 19 Apr 2008 (Seafloor Image Fig. 101).

Type locality. Kermadec Ridge (Fig. 35A).

Distribution. Known from North Central Pacific Ocean off Hawai'i, through the southwest Pacific islands of New Caledonia and New Zealand extending south to Macquarie Ridge and west to South Australia (Fig. 35B).

Habitat. Attached to hard substratum at depths of 370–1680 m.

Description. Morphology is an open, reticulate, barrel-shaped sponge, up to 48.2 cm in height and 12.5 cm in diameter (Fig. 35C, D; Seafloor Image Figs 99–102) with a crudely hairy aspect due to the large number of lateral processes projecting 3.5 (1.8–6.0) cm, n = 31, from nodes of the lateral outer surface, usually lost in dredge and trawl-collected samples, with the distal body tapered to a very small terminal osculum (Fig. 35G) and proximal end tapered to a small attachment disc grappelled onto hard substratum and supported by lateral struts (Fig. 35J). There is no fleshy body wall, cuff or sieve plate; living tissue is distributed on a thin net-like skeletal lattice that has a strong rectangular component (Fig. 35D–F) with beam lengths (= mesh sides) of 5.5 (2.9–8.8) mm, n = 55; strong oblique components are also evident in the holotype (Fig. 35C). In the best-preserved specimens, tissues are puffy and form a band, 1–5 mm thick, around the strongly fused framework of almost all beams; tissues are usually thickest at skeletal nodes, but in all areas, they are arranged around small-gauge tubes 1.1 (0.6–1.7) mm, n = 56, in outer diameter and 0.3 (0.2–0.5) mm, n = 27, in internal diameter (Fig. 35H, I), which house the polyps of hydrozoan colonies, probably obligate commensals, whose connecting stolons branch throughout the sponge tissue. The internal water mass circumscribed by the reticulate sponge body, the spongocoel, is evidently widely connected to the external water mass through the large body meshes, but the sponge may exert a modifying influence on the qualities of internal water over time. Lateral processes like the beams of the body wall project externally perpendicular to the body surface from the nodes of the barrel; they are not well retained in most specimens probably because they are often torn off during collection. In areas close to the osculum (Fig. 35G) the main supporting spicules are not fused, allowing lateral and longitudinal expansion of the body wall during growth here; over most of the body, however, the skeletal framework is firmly fused (Fig. 35J–L), making it difficult but not impossible to obtain samples of primary spicules. Specimens range from small fragments of the body wall 4.3 x 4.2 cm to basal cups up to 11.8 cm tall x 5.0 cm upper diameter, to large nearly complete bodies up to 48.2 cm height x 12.5 cm diameter. Colour is light brown in alcohol and dried.

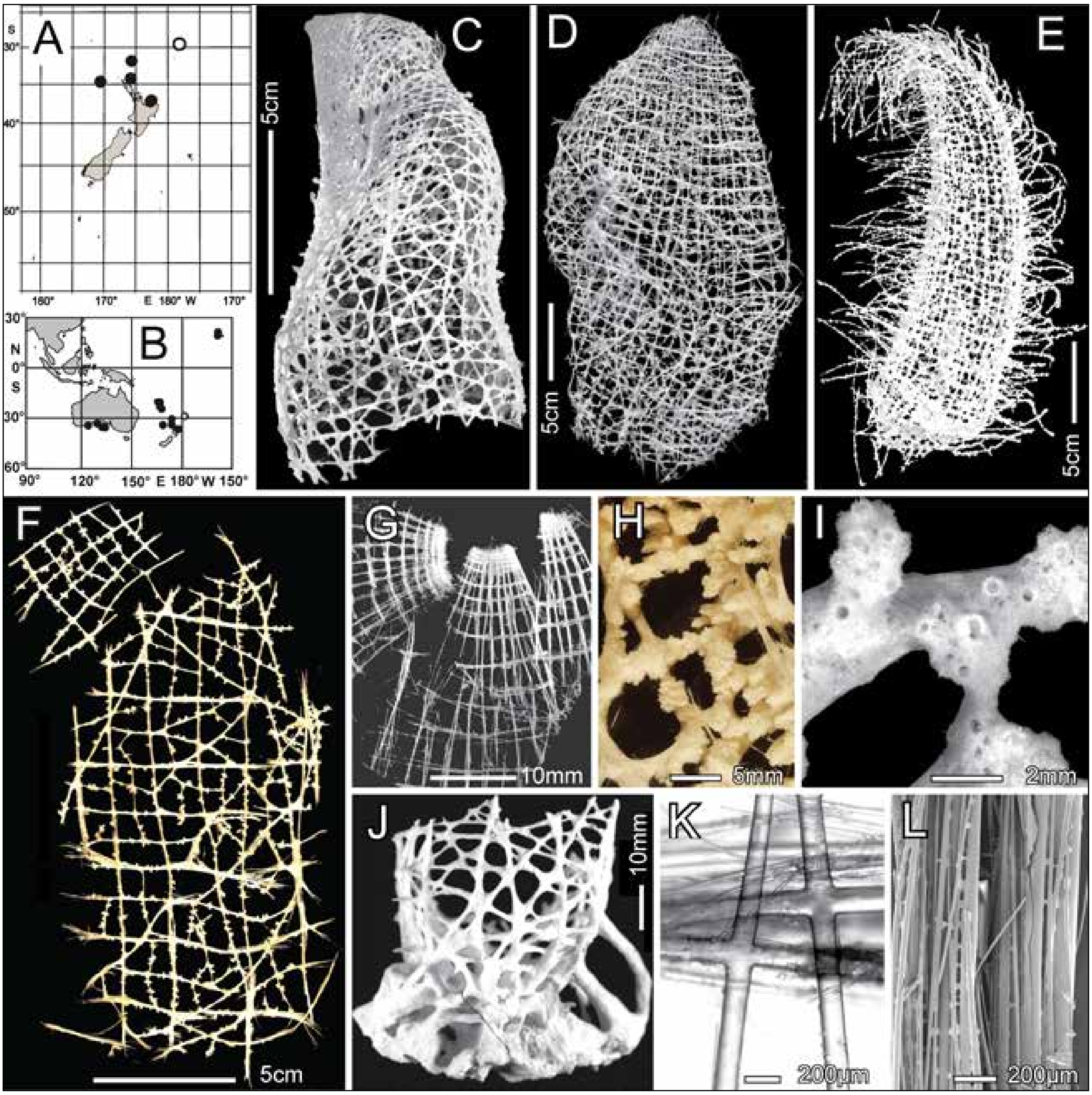


Figure 35. *Walteria flemmingi* Schulze 1885, distribution, morphology and skeleton: **A.** distribution in New Zealand waters, holotype location shown as open circle; **B.** known world distribution of *W. flemmingi*; **C.** holotype BMNH 1897.10.20.039; **D.** South Australian specimen SAM S-716; **E.** ROV-collected Hawai'ian specimen BPBM C-0862, with abundant lateral processes; **F.** NIWA 71066 from New Zealand, showing rectangular and oblique organisation of body wall; **G.** broken oscular margin and the bordering young body wall structure of SAM S-717; **H.** well-preserved fluffy tissues of NIWA 76859; **I.** beams of the body wall of SAM S-718 with tubules of sponge tissue that were formed around hydrozoan polyps; **J.** the basal cup skeleton of SAM S-722; **K.** centres of two primary stauractins from one body node of NIWA 51784; **L.** fused axial skeleton of a body beam of the holotype.

Skeleton. Choanosomal skeleton is difficult to distinguish from ectosomal elements since the body consists of a sieve-like network of thin strands. Over most of the body the central elements of the strands are primary stauractins and diactins, the latter graduated in thickness from about 6 to 200 µm in diameter. These are generally fused by synapticula into a rigid network. Smaller diactins, stauractins, triactins and microscleres are never fused with the larger spicules and remain as loose choanosomal spicules. Ectosomal skeleton of the dermal surface consists of a layer of sword-shaped hexactins as dermalia with short ray (hilt) projecting and forming a velvet-like plush across the outer surface of the main body strands and all surfaces of lateral processes. The inner surface of body strands is covered by a layer of pentactins with the long unpaired rays extending into the strands. Microscleres are dispersed among the proximal rays of dermalia and atrialia.

Spicules. Spicule data from a small fragment of the holotype are given because of its taxonomic importance,

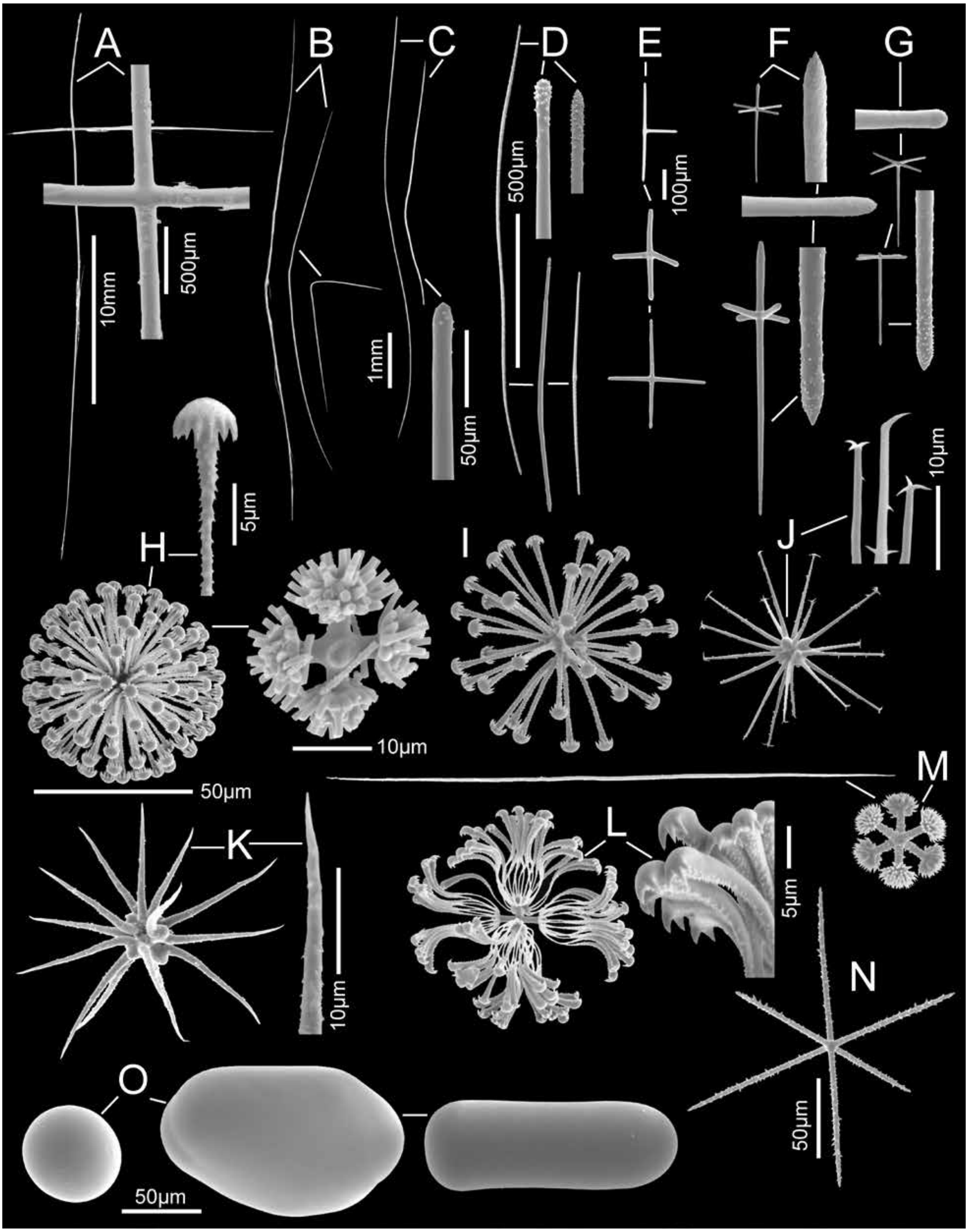


Figure 36. *Walteria flemmingi* Schulze, 1885, spicules: **A.** primary stauractin, whole, centre magnified; **B.** three primary diactins; **C.** two large choanosomal diactins, tip magnified; **D.** three small choanosomal diactins, two tips magnified; **E.** choanosomal tauactin and two stauractins; **F.** two whole dermal sword-like hexactins, ray ends magnified; **G.** two atrial pentactins, ray ends magnified; **H.** discohexaster 1 with terminal ray magnified and centrum with terminal rays removed; **I.** discohexaster 2; **J.** onychohexaster from New Zealand specimen with terminal ray tips magnified; **K.** oxyhexaster and magnified terminal ray tip from South Australian specimen; **L.** Floricome, terminal ray tuft magnified; **M.** graphiocome centrum and loose terminal ray; **N.** spined oxyhexactin; **O.** three pearls. C, D part, E, F part, G part, H, I, L, M, N, O from holotype BMNH 1897.10.20.039. A, B, D part, F part, G part, J from NIWA 71066. K from SAM S-717. All whole microscleres H–M at same scale.

but a more expansive data set is also given for a non-type specimen where damage to the specimen was not an issue.

Megascleres (Fig. 36; Table 16) of the body are stauractins and diactins as principalia, choanosomal diactins, stauractins and tauactins, hexactine dermalia and pentactine atrialia. Principal stauractins (Fig. 36A) with axes crossing perpendicularly, give the framework its overall rectangular arrangement of strands; their centres are easily dissected from most fused frameworks. Examination of 39 body nodes showed no stauractins in 27 (69%), one stauractin centre in 9 nodes (39%) and two stauractin centres in three nodes (8%). Principal diactins (Fig. 36B) are usually gently curved or bent in body strands, rarely sharply bent, about 90° at the bases of lateral processes, where one ray lies in a body strand and one ray projects out into the process. Choanosomal diactins (Fig. 36C, D) are gently curved, have a nearly undetectable central swelling and subterminally rough, rounded or blunt-pointed tips; they are here subjectively divided into large (> 4 mm) and small (< 4 mm) length categories. Choanosomal tauactins and stauractins (Fig. 36E) have rays similar in size and form; they are completely smooth with rounded tips. Dermalia are sword-shaped hexactins with a short distal ray (hilt) (Fig. 36F); all rays may be subterminally smooth or rough due to small spines but these are never large enough to show a directional tilt. Distal and proximal ray tips are usually blunt-pointed while tangential ray tips are rounded. Atrialia (Fig. 36G) are regular smooth pentactins with tangential ray tips either slightly rough or smooth, rounded or slightly inflated and proximal ray tips rougher, slightly inflated and bluntly pointed.

Microscleres (Fig. 36; Table 16) are discohexasters in two forms, onychohexasters and/or oxyhexasters, floricomes, graphiocomes, usually spined oxyhexactins, rarely smooth oxyhexactins and occasionally pearls. Discohexasters are spherical with very short, smooth primary rays and rough straight terminal rays; they occur in either the more common 'high-density' form with 25–45 terminal rays per primary ray (Fig. 36H) or uncommon 'low-density' form with 3–10 terminal rays on each primary ray (Fig. 36I); marginal teeth on terminal discs number 10–17. Onychohexasters and oxyhexasters (Fig. 36J) co-occur in four of the seven New Zealand specimens, although onychohexasters are by far the more common and are present in all specimens. Terminal branching and formation of claws defines onychohexasters and absence of such branching and claws and acute tips defines the oxyhexasters. In some individual spicules, both types of terminal rays are present and the spicule is assigned to the type with the most common tip. Both spicule types share a bulge of the distal primary rays extending beyond the origins of the terminal rays, and sparse spination of terminal rays.

The South Australian specimens, in contrast, all have large numbers of oxyhexasters while onychohexasters occur in 4 out of 7 specimens. The oxyhexaster there (Fig. 36K) is stouter and terminal tips are often straight or smoothly curved instead of sharply bent. Floricomes (Fig. 36L) are present in all specimens, but in variable abundance; terminal rays are quite abundant at 12–18 per primary ray and terminal claws are short and few at 2–6 but most commonly 2–3. A patch of fine spines runs

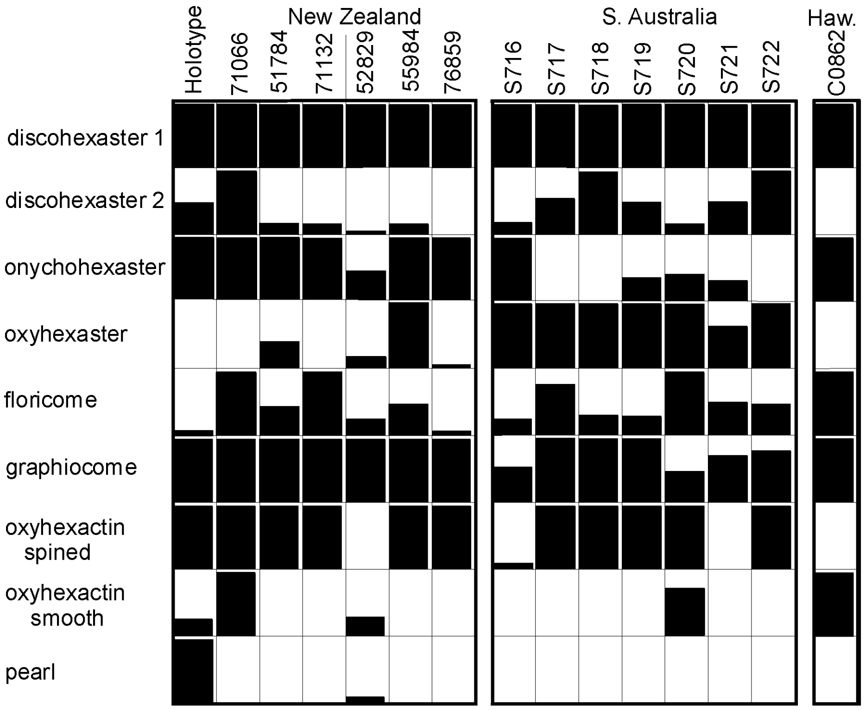


Figure 37. Relative abundance of microscleres in New Zealand and South Australian specimens of *Walteria flemmingi* Schulze, 1885. Microsclere abundance enumerated in samples of 15 surveyed specimens are represented by percentage occurrence (box fill) relative to the reference abundance of discohexaster 1, assumed to be at a consistent level in all specimens. Upper horizontal axis, NIWA and South Australian Museum registration numbers of compared specimens; HAW=Hawai'i.

Table 16. Spicule dimensions (µm) of *Walteria flemmingi* Schulze, 1885 from Kermadec Ridge (Holotype BMNH 1887.10.20.029) and Bay of Plenty, New Zealand (NIWA 71066).

Parameter	BMNH 1887.10.20.029				NIWA 71066			
	mean	s. d.	range	no.	mean	s. d.	range	no.
Primary stauractin								
ray length (mm)	n. a.	n. a.	n. a.	n. a.	10.4	4.6	5.3–26.8	22
ray width	78.5	n. a.	78.5	1	129	28	84–191	45
Primary diactin								
length (mm)	12.0	1.7	10.6–14.5	6	10.8	8.8	4.8–50.3	39
width	72.4	56	36.5–181.8	6	87.2	29.4	34.7–199.2	39
Large choanosomal diactin								
length (mm)	7.2	1.4	4.4–10.2	37	8.4	2.01	4.4–12.2	36
width	25.4	4.8	20.8–34.8	34	79.3	17.4	34.8–105.8	36
Small choanosomal diactin								
length	1293	967	460–4173	46	997	693	377–3935	113
width	16.4	3.0	6.3–20.6	69	12.3	5.8	3.9–30.7	113
Choanosomal stauractin								
long axis length	301	101	96–559	50	292	85	149–509	74
ray width	12.4	4.5	4.5–21.9	50	11.7	2.6	7.5–17.7	74
Choanosomal tauactin								
main axis length	260	70	143–358	8	447	119	305–884	26
unpaired ray length	97	47	31–164	8	188	84	98–410	26
ray width	11.3	5.5	4.7–19.0	8	12.7	2.4	9.1–17.9	26
Dermalia, sword hexactin								
distal ray length	147	52	54–272	57	160	81	55–348	25
distal ray basal width	20.0	5.9	7.1–33.0	57	14.5	4.2	8.0–22.5	25
distal ray maximum width	22.3	7.8	7.1–40.7	57	17.7	6.5	6.8–30.5	25
tangential ray length	119	20	78–156	57	122	24	58–177	25
tangential ray width	18.1	5.0	6.0–28.6	57	12.0	3.3	5.4–17.6	25
proximal ray length	443	147	196–817	57	514	209	196–859	25
proximal ray width	19.1	5.3	7.1–29.3	57	13.5	3.9	8.0–24.0	25
Atrialia, pentactin								
tangential ray length	152	39	77–284	50	128	24	65–169	25
tangential ray width	14.4	3.5	8.5–21.7	50	11.4	2.7	6.8–17.9	25
proximal ray length	225	138	43–631	50	292	138	113–677	25
proximal ray width	13.9	3.8	6.6–23.8	50	12.0	3.1	6.8–18.9	25
Discohexaster								
diameter	70.3	6.2	60.2–92.7	69	63.5	2.7	58.2–68.0	25
primary ray length	7.5	1.1	4.5–9.7	69	7.7	0.8	6.3–9.4	25
secondary ray length	27.7	3.5	20.9–39.2	69	23.9	1.0	22.3–26.3	25
Onychohexaster								
diameter	74.8	6.3	60.2–91.7	50	70.5	5.1	57.5–79.2	25
primary ray length	7.2	0.9	5.5–10.0	50	4.1	1.0	2.6–6.1	25
secondary ray length	31.5	3.1	24.0–38.1	50	31.5	2.4	25.5–34.9	25
Floricome								
diameter	71.0	n. a.	69.0–73.0	2	74.6	3.7	64.7–80.1	25
primary ray length	7.6	n. a.	7.3–7.9	2	6.0	3.7	4.7–7.3	25
secondary ray length	28.5	n. a.	28.5	2	31.6	1.8	27.8–34.4	25
Graphiocome								
diameter (calc.)	395	42	269–459	50	417	39	325–487	25
primary ray length	12.9	1.1	10.9–15.6	51	27.8	2.1	23.0–32.2	25
secondary ray length	184	21	122–216	50	195	19	149–229	25
Spined microxyhexactin								
diameter	149	43	46–224	52	184	30	142–247	25
ray width	2.8	0.8	1.5–5.2	52	3.3	0.7	2.2–4.6	25
Smooth microxyhexactin								
diameter	165	37	94–244	20	221	48	146–345	25
ray width	3.7	1.0	1.7–5.2	20	3.7	0.6	2.7–5.3	25
Pearls								
diameter	83	48	8.7–188	52	n. a.	n. a.	n. a.	n. a.

down the outer surface of the terminal rays from just below the marginal claws to the rays' narrowest points. Graphiocomes (Fig. 36M) are typical for Euplectellidae, having short primary rays ornamented with short smooth hemispheric knobs; each primary ray supports on its distal swelling about 40–50 bases of long, fine terminal rays (raphides). Spined oxyhexactins (Fig. 36N) occur in most specimens from New Zealand and South Australia, but smooth oxyhexactins occur rarely. Spherical and irregularly shaped pearls (Fig. 36O) occur in the holotype in considerable numbers but are found only in one other New Zealand specimen and there in very low numbers. Microsclere abundance (Fig. 37) indicates that *W. flemmingi* always has discohexasters 1, floricomes, graphiocomes, and either onychohexasters (in all New Zealand specimens) or oxyhexasters (in all South Australian specimens) or both; discohexasters 2, smooth or spined microxyhexactins, and pearls were not found in all specimens.

Remarks. Both earlier descriptions of this species by Schulze (1887) and Tabachnick (2002) give reasonable accounts of the general morphology and spiculation but both also contain errors of omission and commission. Neither of those descriptions included the existence of the primary stauractins or their importance in generating the rectangular lattice of wall strands apparently because neither author explored the fused wall frameworks in detail. Schulze did not recognise the lateral processes and onychohexaster microscleres. Tabachnick (2002) made two important statements that we have been unable to verify. He stated prostalia lateralia occur here up to 14 mm in length and that the spicules forming the basis of lateral processes are large hexactins and pentactins, presumably giving their measurements as distal rays to 70 mm length and tangential rays up to 23 mm long with rays 230–320 µm in width. He provides illustration of part of a prostalium lateralium from the holotype in his Fig. 28F. We found no substantiation of either such prostalia lateralia or basal supporting large hexactins or pentactins in processes in examination of 14 specimens; we conclude that Tabachnick erred in describing foreign spicules as proper to the species. They do not occur in *W. flemmingi*. Tabachnick also states that some of the spherical, disc-bearing microscleres are discasters, presumably because their primary rays are difficult to resolve in LM. We made extensive examination of these spicules with SEM and found no evidence of primary ray fusion. Disc-bearing microscleres of *W. flemmingi* are all discohexasters. Finally, both earlier descriptions include direct or indirect statements that stellate discohexasters occur here; the only stellate microscleres we encountered were floricomes and graphiocomes.

Specimens of *Walteria flemmingi* show a major difference between the South Australian specimens having oxyhexasters and the New Zealand and Hawai'ian specimens having onychohexasters. The degree of the difference is strong, but common occurrence of both spicule types in both populations suggest they share moderate genetic exchange and are parts of a single species population.

Key diagnostic characters

- Euplectellid pattern of spicules with dermal hexactins, atrial pentactins, floricomes and graphiocomes.
- Unique, net-like, barrel-shaped body with reticulate wall supporting external lateral processes.
- Primary spicules include large stauractins

Walteria leuckarti Ijima, 1896

Figs 38, 39; Seafloor Image Figs 103–111; Table 17

Walteria leuckarti Ijima, 1896: 251, 1901: 278, 1902: 119.
Hyalodendron navalium Moore, 1898: 430.
Walteria leuckarti longina Tabachnick, 1988: 53.

Material examined. *Lord Howe Rise (International waters)*: NIWA 66081, SOP Stn TRIP2894/116, 35.4° S, 165.3° E, 926–954 m, 21 Jul 2009.

Kermadec Ridge: NIWA 70756, NZOI Stn K806, north of Raoul Island, 28.512° S, 177.822° W, 1165 m, 03 Jul 1974; NIWA 52140, NIWA Stn TAN0205/72, west of Macauley Island, 30.0417° S, 178.842° W, 1161–960 m, 23 Apr 2002; NIWA 86322, NIWA Stn TAN1213/39, Havre Volcano, 31.104° S, 179.099° W, 1022–1034 m, 20 Oct 2012.

Cavalli Seamount, North of North Cape: NIWA 51811, 51839 (distribution record only), NIWA Stn KAH0204/7, 34.119° S, 174.152° E, 800–670 m, 14 Apr 2002.

East Cape, North Island: NIWA 70751, NZOI Stn Z9181, TRIP1124/138, 360 km east of East Cape, 37°0° S, 178.7° E, 972 m, 20 Jul 1998; NIWA 70753, NIWA Stn TAN9506/76, 50 km east of East Cape, 37.948° S, 179.047° E, 980–1300 m, 18 May 1995.

Rumble II West Chimney Field, 278 km northeast of Bay of Plenty: NIWA 72486 (reference specimen), NIWA Stn TAN1104/54, 35.353° S, 178.536° E, 1379–1440 m, 10 Mar 2011; NIWA 72393, NIWA Stn TAN1104/37, 35.350° S, 178.542° E, 1197–1297 m, 08 Mar 2011; NIWA 72479, NIWA Stn TAN1104/50, 35.349° S, 178.542° E, 1170–1295 m, 09 Mar 2011; NIWA 72597, NIWA Stn TAN1104/62, 35.353° S, 178.537° E, 1306–1220 m, 11 Mar 2011; NIWA 64533, NIWA Stn TAN1007/55, 35.343° S, 178.531° E, 1313–1363 m, 02 Jun 2010; NIWA 64495, NIWA Stn TAN1007/54, 35.354° S, 178.526° E, 1166–1209 m, 02 Jun 2010; NIWA 64887, NIWA Stn TAN1007/111, 35.355° S, 178.540° E, 1230–1380 m, 07 Jun 2010; NIWA 76342, NZOI Stn X653, 35.365° S, 178.547° E, 1339–1239 m, 11 Feb 1996.

Raukumara Plain, north of Bay of Plenty: NIWA 52050, NIWA Stn TAN0413/33, 36.949° S, 177.3448° E, 1105–1113 m, 09 Nov 2004; NIWA 62027, 76343, NZOI Stn Z9153, northwest edge, 36.535° S, 176.512° E, 923–1045 m, 16 Jun 1999.

Bay of Plenty: NIWA 70754, NZOI Stn Z9212, TRIP1124/50, 37.0° S, 176.7° E, 974 m, 23 Jul 1998; NIWA 70755, 70758, NZOI Stn Z8882, TRIP1024/39, 37.0° S, 176.7° E, 976 m, 01 Aug 1997; NIWA 70785, NZOI Stn Z9780, TRIP1242/18, 37.0° S, 176.7° E, 927 m, 25 Jun 1999; NIWA 70786, NIWA Stn SMT9501/20, western side of Bay of Plenty, 36.520° S, 176.496° E, 904–1086 m, 24 Jun 2011; NIWA 76341, NZOI Stn Z9808, 37.247° S, 177.225° E, 862 m, 16 Jun 1999; NIWA 83423, NIWA Stn TAN1206/171, 37.176° S, 176.975° E, 1178–1163 m, 30 Apr 2012; NIWA 52019, NIWA Stn TAN0413/54, 37.237° S, 177.277° E, 1126–1134 m, 11 Nov 2004; NIWA 70757, NZOI Stn Z9805, 37.088° S, 177.263° E, 742 m, 16 Jun 1999.

Sagami Sea, Japan (Japanese EEZ): BMNH 1898.12.19.002, no station or collection data provided, estimated location 35° N, 139.5° E, 274–549 m, collection date not recorded; MCZ PORa-9212, collected by A. Owston 5696 (purchased), no station and collection data provided, estimated location 35.138° N, 139.333° E, 549–1098 m, collection date not recorded.

South Fiji Basin (International waters): NIWA 71065, NIWA Stn TAN0411/25, 26.375° S, 177.267° E, 855 m, 06 Oct 2011.

Other locations (images only). *Seamount 114, East of Three Kings Ridge* (*International waters*) (collected by GEOMAR ROV *Kiel 6000*, onboard RV *Sonne*, ICBM expedition SO254): NIWA 126019, RV *Sonne* Stn SO254/08ROV02_BIOBOX3, 31.300° S, 175.196° E, 1359 m, 31 Jan 2017 (Seafloor Image Fig. 104); NIWA 126020, RV *Sonne* Stn SO254/08ROV02_BIOBOX11, 31.301° S, 175.197° E, 1281 m, 31 Jan 2017; NIWA 126023, RV *Sonne* Stn SO254/08ROV02_BIOBOX5, 31.298° S, 175.197° E, 1338 m, 31 Jan 2017 (Seafloor Image Fig. 108); NIWA 126324, RV *Sonne* Stn SO254/84ROV18_BIOBOX16, 37.912° S, 179.216° E, 1278 m, 23 Feb 2017 (Seafloor Image Fig. 109: *Walteria* cf. *leuckarti*); RV *Sonne* Stn SO254/08ROV02_BIOBOX5 onboard RV *Sonne*, 31.298° S, 175.197° E, 1338 m, 31 Jan 2017 (Seafloor Image Fig. 103).

Rumble II West Seamount, Kermadec Ridge: NIWA Stn TAN1007/39, 35.348° S, 178.544° E, 1157–1434 m, 31 May 2010 (Seafloor Image Fig. 114); NIWA Stn TAN1007/126, 35.349° S, 178.544° E, 1169–1455 m, 09 Jun 2010 (Seafloor Image Fig. 111); NIWA Stn TAN1007/35, 35.354° S, 178.527° E, 1170–1324 m, 31 May 2010 (Seafloor Image Figs 105–107).

Kermadec Ridge: NIWA Stn TAN1206/20, Tangaroa Seamount, 36.334° S, 178.022° E, 1156–1173 m, 16 Apr 2012 (Seafloor Image Fig. 110); NIWA Stn TAN1206/37, Clark Seamount, 36.458° S, 177.835° E, 1193–1186 m, 18 Apr 2012 (Seafloor Image Fig. 112); NIWA Stn TAN1206/79, Whakatane Seamount, 36.811° S, 177.470° E, 1022–1013 m, 22 Apr 2012 (Seafloor Image Fig. 113).

Louisville Seamount Chain (International waters), Canopus Seamount: JAMSTEC Submersible *Shinkai* Stn YK13-11/1372 onboard RV *Yokosuka*, 26.613° S, 174.570° W, 1648 m, 26 Oct 2013.

Type & locality. Sagami Bay, Japan, is the collection location of the original cotype series, a holotype was not designated. The Japan specimens listed above may have been part of the cotype series.

Distribution. Known previously from Sagami Bay, Japan, and Marianas Basin. Eighteen locations around New Zealand: North Island, Kermadec Ridge, Three Kings Ridge (International waters) and Lord Howe Rise (International waters), Louisville Seamount Chain (International waters) (Fig. 38A).

Habitat. Attached to hard substratum at depths of 855–1440 m.

Description. Morphology is a frond-like form arising from a basal disc with a thin tubular main stem up to a meter in length, supporting thin, solid lateral branches (processes) up to 200 mm in length that emanate perpendicularly all around the main stem (Fig. 38B–E; Seafloor Image Figs 103–111); oval lateral oscula about 5 mm long are distributed singly along the main stem at 1–5 cm intervals. Small tubercles and long lateral extensions of expanded sponge tissue, about 1.2–1.7 mm in diameter, occur singly or in clumps along the main stem surface, each tubercle/extension containing one or a few cavities housing the naked polyps of a commensal hydroid which branches through the entire sponge. In life, these polyps are very sticky and exude copious slime. Main stems and lateral extensions can also be occasionally dichotomously or trichotomously branched and lateral processes may branch into secondary and tertiary branches. The reference fragment specimen, NIWA 72486 (Fig. 38B), retains the best condition of main stem and lateral processes among the New Zealand specimens, but other specimens (Fig.

38C) show the basal disc and branching of the main stem. A lateral osculum, characteristic of the lateral processes and tubercles, is shown in Fig. 38D. A section of the main stem of the dry reference specimen (Fig. 38G) shows the location of the fused tubular framework and thickness of the choanosomal tissues of both inner and outer layers. The fused framework (Fig. 38H, I) is mainly composed of diactins, singly or in bundles, with common ladder-like synapticulae. The reference specimen is 12.7 cm in length, 5.1 cm in total breadth with stem diameter of 6–8 mm. A total of 36 fragments from New Zealand were inspected with a mean length of 9.2 (1.0–51.9) cm, mean stem diameter of 9.2 (5.2–18.4) mm, n = 93, mean oscular long diameter of 5.2 (1.3–9.4) mm, n = 125 and short diameter of 3.1 (0.9–6.5) mm, n = 121, and mean spacing between oscula of 17.5 (2.1–55.7) mm, n = 117. Colour is light brown in alcohol and dried. This sponge species is often mistaken as the primnoid octocoral, *Thouarella* sp., *in-situ*, because of the density of the laterial extensions.

Skeleton. Choanosomal skeleton consists of the nearly ubiquitous, tubular fused framework of diactins and the free spicules lying between dermal and atrial skeleton layers. The framework is composed mostly or entirely of diactins soldered together at points of contact or connected by synapticular bridges (Fig. 38H, I). Size data of primary spicules of the body wall framework, presumably thick diactins, are unavailable due to their fusion, but they remain mostly free in one specimen, NIWA 62027, where their data indicates they are distinctly larger than those of the lateral branches of the reference specimen. Other free megascleres of the choanosomal region include regular diactins, stauractins and tauactins. Also, all microsclere types can be found among the choanosomal megascleres as free spicules.

Ectosomal skeleton of the outer (dermal) surface of the body wall and all surfaces of lateral branches are covered by a layer of sword hexactins, shaft pointing outwards, with microscleres interspersed among them. The inner surface of the body wall is the only place an atrial lining occurs; atrialia are about equal numbers of pentactins and hexactins with exceedingly short, rudimentary distal rays. Microscleres rarely occur in preparations of this layer and are probably contaminants from other areas.

Spicules. Spicule data (Table 17) are mostly from the reference specimen, NIWA 72486, but primary body wall diactins are not measureable there due to fusion; they are only measurable in NIWA 62027.

Megascleres (Fig. 39; Table 17) of the body are principal diactins, choanosomal diactins, stauractins and tauactins, hexactine dermalia and pentactine atrialia. Principal diactins of the body wall and processes (Fig. 39A) are similar and slightly bent with smooth pointed ends; they differ in size with those from the body wall being three times as long and twice as thick as those from the processes. One apparently proper stauractin, with short lateral rays, was obtained from the unfused specimen; while of interest, because of the abundance of primary stauractins in *W. flemmingi*, they do not constitute an important component of spiculation of the body wall in *W. leuckarti*. Choanosomal diactins (Fig. 39B) vary widely in size; they are straight or slightly curved with rough parabolic tips. Dermalia (Fig. 39D) of the body wall and processes are similar sword hexactins in form but those of the processes have longer and thicker rays than those of the body wall; distal rays are mostly inflated lanceolate in form and covered in sharp proclined spines but clavate and thin uninflated forms are not rare. Tangential and proximal rays are smooth; the tangential ray ends often inflated and proximal rays usually rough. Atrialia (Fig. 39E) are only present within the main stem lumen; they consist almost equally of regular pentactins and hexactins with short, rounded and proper distal ray. Their tangential and proximal rays are like those of dermalia.

Microscleres (Fig. 39; Table 17) are discohexasters 1 (57%), discohexasters 2 (0.5%), onychohexasters and/or oxyhexasters (34%), graphiocomes (6%), floricomes (2%), spined oxyhexactins (<1%), and smooth oxyhexactins (<1%). Discohexasters are spherical with very short, smooth primary rays and rough, straight terminal rays; they occur in either the more common 'high-density' form 1, with 25–45 terminal rays per primary ray (Fig. 39F), or uncommon 'low-density' form 2, with 3–10 terminal rays on each primary ray (Fig. 39G); marginal teeth on terminal discs number 10–17 and these often appear fused to neighbouring discs (Fig. 39F inset) but this may also be due to a deposited contaminant. Onychohexasters and oxyhexasters (Fig. 39H) co-occur commonly in all ten examined specimens and onychoid and oxyoid ray tips often occur on the same spicule. Oxyoid tips are often sharply curved as hooks, perhaps interpretable as a single onychoid claw; distinct onychoid tips have 2–5 claws of similar size and shape. Graphiocomes (Fig. 39I) are typical for Euplectellidae with short, primary rays ornamented with short, smooth hemispheric knobs; each primary ray supports on its distal swelling about 40–50 bases of long fine terminal rays (raphides) bearing sparse recurved spines. Floricomes (Fig. 39J) are present in all eight specimens examined in detail for these, but they are always rare; one specimen had no intact floricomes but their presence was confirmed by occurrence of their

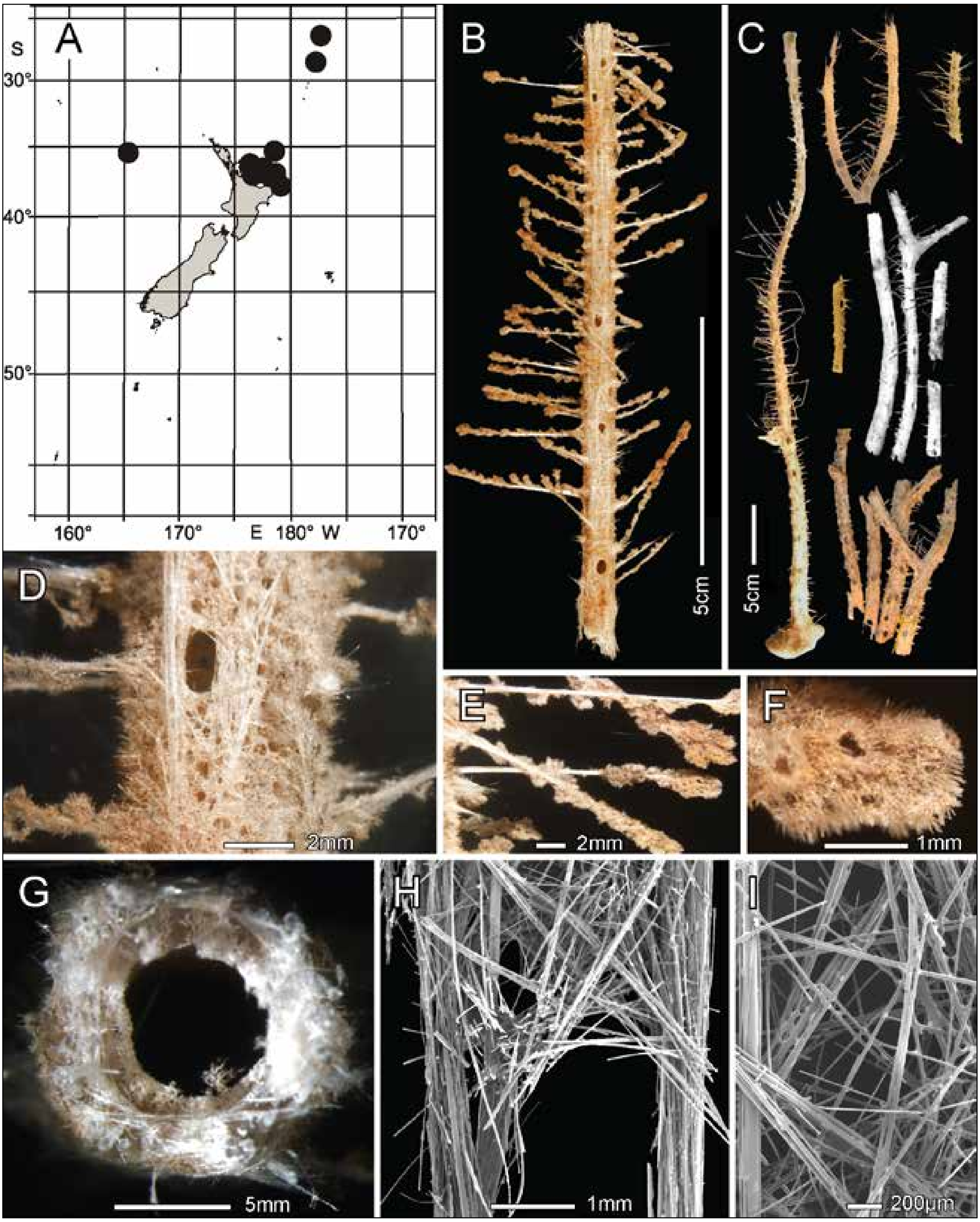
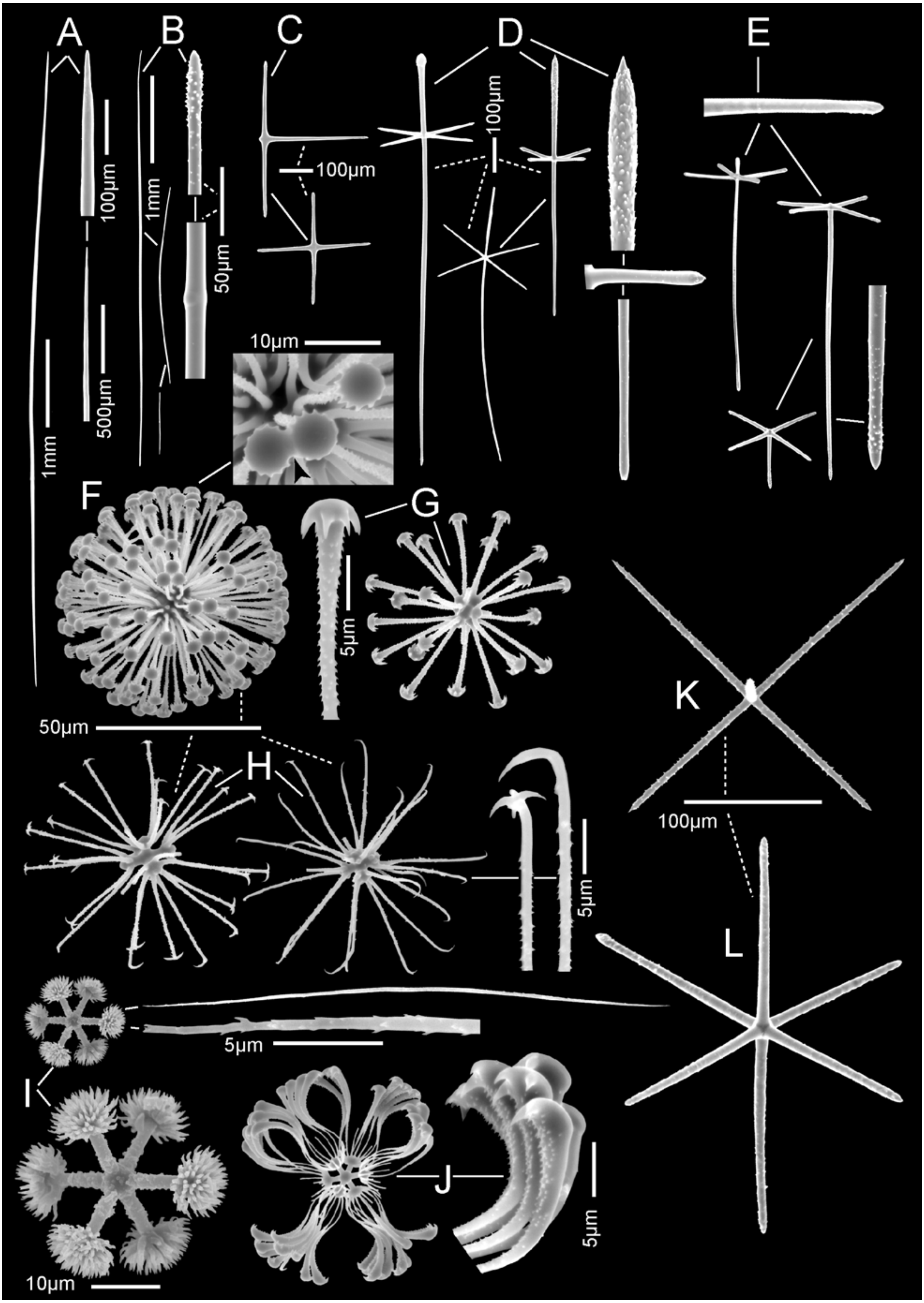


Figure 38. *Walteria leuckarti* Ijima, 1896, distribution, morphology and skeleton: **A.** distribution in New Zealand and International waters; **B.** dry New Zealand reference specimen, NIWA 72486; **C.** other New Zealand specimens, left NIWA 70758, upper NIWA 70755, upper right NIWA 70754, middle right NIWA 70786, lower right NIWA 66081, centre NIWA 70753; **D.** close-up view of main stem with osculum and lateral branches of specimen in B; **E.** lateral branches of specimen in B; **F.** dry sponge tissue tubercle with tubes that were occupied by commensal hydrozoan polyps; **G.** section of main stem of reference specimen; **H.** fused framework of the main stem; **I.** closer view of fused framework of the main tube.

Figure 39 (*opposite*). *Walteria leuckarti* Ijima, 1896, spicules: **A.** primary diactin of process with two magnified tips at different magnifications; **B.** three choanosomal diactins, spicule centre and tip magnified; **C.** choanosomal tauactin and stauractin, whole; **D.** three dermal sword hexactins, rays of the more common form magnified; **E.** three whole atrialia, ray tips magnified; **F.** discohexaster 1 with insert of terminal discs, possibly fused; **G.** discohexaster 2, distal end of



terminal ray magnified; **H.** onychohexaster (left) and oxyhexaster (right) with two of the common terminal ray ends; **I.** graphiocome with primary centre at scale of other whole microscleres (above) and magnified to show detail (below), and terminal ray at same scale (whole) and magnified basal part; **J.** floricome (whole) and magnified group of terminal ray ends; **K.** spined oxyhexactin; **L.** smooth-rough oxyhexactin (not spined). Scale of all magnified rays of megascleres same as those in B; scale of whole spicules in E same as D. All spicules from reference specimen NIWA 72486 except graphiocome centres from NIWA 70786.

Table 17. Spicule dimensions (µm) of *Walteria leuckarti* Ijima, 1896, from reference specimen NIWA 72486, or from NIWA 62027 (*).

Parameter	mean	s. d.	range	no.
*Wall primary diactin				
**length (mm)*	18.8	7.2	9.5–38.4	101
**width*	102.4	29.4	48.6–185.1	104
Process primary diactin				
length (mm)	6.9	2.1	2.5–10.8	46
width	55.1	18.4	25.6–96.8	54
Choanosomal diactin				
length (mm)	1.2	0.9	0.6–5.7	102
width	13.2	5.0	5.5–26.7	81
Choanosomal stauractin				
long ray length	233	55	151–385	35
short ray length	163	47	99–352	35
ray width	11.7	3.2	5.6–20.3	35
Choanosomal tauactin				
main ray length	264	90	132–434	22
unpaired ray length	165	140	27–734	23
main ray width	13.2	3.2	9.4–21.6	23
Dermalia, body wall sword hexactin				
distal ray length	181	105	56–815	50
distal ray basal width	9.5	2.6	4.1–16.1	50
distal ray maximum width	13.3	3.5	6.8–22.8	50
tangential ray length	124	24	74–182	50
tangential ray width	8.5	2.3	4.5–13.1	50
proximal ray length	360	106	192–633	50
proximal ray width	9.1	2.6	4.6–15.5	50
Dermalia, process sword hexactin				
distal ray length	217	39	150–277	25
distal ray basal width	13.3	2.6	7.3–20.3	25
distal ray maximum width	18.3	3.6	10.0–24.0	25
tangential ray length	110	21	77–152	25
tangential ray width	11.6	2.1	8.1–16.3	25
proximal ray length	425	137	155–669	25
proximal ray width	12.1	2.1	8.4–15.4	25
Atrialia, body, pentactin & hexactin				
hexactin distal ray length	34	10	21–66	50
pentactin tangential ray length	155	25	112–214	50
pentactin tangential ray width	13.1	2.7	8.1–22.3	50
pentactin proximal ray length	444	162	104–807	50
pentactin proximal ray width	14.7	3.0	6.0–20.2	50
Discohexaster 1, dense				
diameter	73.3	3.7	64.9–80.5	50
primary ray length	9.4	1.0	7.5–11.7	50
secondary ray length	27.8	1.9	24.0–32.4	50
Oxy/onychohexaster				
diameter	71.0	5.5	58.3–81.8	50
primary ray length	5.9	1.0	3.0–8.1	50
secondary ray length	30.0	2.9	24.5–39.2	50
Graphiocome				
centre diameter	25.9	2.8	14.3–30.8	47
raphide length	153	13	128–191	50
Floricome				
diameter	67.0	5.4	61.6–85.8	34
primary ray length	6.9	0.7	5.7–8.0	34
secondary ray length	26.8	2.4	24.3–34.4	34
Oxyhexactin, spined				
ray length	121	17	95–153	13
ray width	7.8	2.2	5.3–12.5	13
Oxyhexactin, smooth				
ray length	132	19	87–172	39
ray width	9.4	2.4	4.9–13.1	39

distinct terminal rays. Secondary rays number 14 (11–18) on each primary ray and the short terminal claws number 3 (1–5); a wide patch of short reclined digitate spines covers outer concave surface of terminal rays. Spined and smooth oxyhexactins (Fig. 39K, L) are similar in size and shape but fine spines cover the entire surface of the spined forms and the medial area of the smooth forms are completely smooth. Microscleres are entirely absent in tissues lining the inside (atrial) surface of the main stem.

Remarks. The New Zealand forms are virtually identical to those described from Sagami Bay, Japan, as *Walteria leuckarti* by Ijima (1901), the main difference being that floricomes could not be found, and were apparently absent in the Japan specimens. To confirm this, we inspected two Japanese specimens of *W. leuckarti*, one certainly from A. Owston's collection and both very likely to have originally been seen and identified by Ijima himself. After an exhaustive search, we confirm that no floricomes were found in those specimens, indicating but not confirming that no floricomes exist in them. Much later, Tabachnick (1988) described a single specimen from the Marianas Basin as being virtually identical to *W. leuckarti* but with floricomes (abundance not indicated) and designated it as a new subspecies, *W. leuckarti longina*. One of us (HMR) has co-authored the opinion (Lopes *et al.* 2011) that subspecies designations within the Hexactinellida should be avoided. To maintain consistency, our choices of taxonomic treatment of the New Zealand specimens are thus limited. We could assign them to *W. leuckarti longina* but thereby contradict our 2011 statement and belief that subspecies are not useful in hexactinellid taxonomy or we could assign them to *W. leuckarti* and synonymise Tabachnick's subspecies. We consider the latter action to be most consistent with present practice within hexactinellid taxonomy, and consistent with the fact that floricomes are rare and difficult to find in the New Zealand specimens. We therefore propose synonymisation of *W. leuckarti longina* with *W. leuckarti* Ijima and assign the New Zealand specimens to the same species.

Seafloor Image Figs 109–114 illustrate several specimens that differ considerably from the typical tubular form of *W. leuckarti* (Seafloor Image Figs 103–108); these may represent a new species from the Kermadec Ridge (NIWA Stn TAN1206/37, TAN1007/39, TAN1206/79, TAN1007/126). The morphological characteristics that differentiate these specimens from typical *W. leuckarti* include their opaque-white colouration, a divaricating, almost bracken-like form, but primarily, the uniform-length processes that emanate from the primary branches.

Key diagnostic characters

- Unique bottle-brush-like body with thin, tubular main stem bearing scattered small parietal oscula and thin solid lateral branches emanating from the stem wall
- Euplectellid pattern of spicules with dermal hexactins, atrial pentactins, graphiocomes and rare floricomes
- Primary spicules are diactins
- Often mistaken as the primnoid octocoral *Thouarella* sp., *in-situ*, because of the density of the lateral extensions

Walteria sp. indet.

Fig. 40; Seafloor Image Figs 115–118

Material examined. *Waioeka Knoll, Bay of Plenty*: NIWA 71039, NZOI Stn Z8882, TRIP1024/39, 37.0° S, 176.7° E, 976 m, 01 Aug 1997.

Other locations (image only). *Rumble II West Seamount, Kermadec Ridge*: NIWA Stn TAN1007/35, 35.353° S, 178.527° E, 1170–1324 m, 31 May 2010; NIWA Stn TAN1007/37, 35.356° S, 178.505° E, 1446–1610 m, 31 May 2010 (Seafloor Image Fig. 116).

Reinga Basin: NIWA Stn TAN1603/ UWC06, 35.308° S, 170.748° E, 1860 m, 21 Mar 2006 (Seafloor Image Fig. 117); NIWA Stn TAN1603UWC/06, 35.308° S, 170.746° E, 1860 m, 21 Mar 2006 (Seafloor Image Fig. 118).

Cook Islands, Te Kawhiti a Maui Potiki deep ridge: NOAA ROV *Deep Discoverer 2* Stn EX1705/Dive03, Te Kawhiti a Maui Potiki deep ridge, Cook Islands, 04.584° S, 162.399° W, 2210–2200 m, 2 May 2017 (Seafloor Image Fig. 115).

Distribution. Known from the Bay of Plenty, North Island, New Zealand (Fig. 40A).

Habitat. Holotype probably attached to hard substratum at a depth of 976 m.

Description. Morphology, a hollow cylinder with fenestrate wall, long dead and lacking free spicules, base and apex (Fig. 40B; Seafloor Image Figs 115–118). The rigid wall of fused spicules is permeated by oval openings, the larger of which are interpreted as lateral or parietal oscula (Fig. 40C). The framework is formed by fusion of diactins (Fig. 40D), either by secondary deposition at points of spicule contact or by synapticular bridges between spicules, the latter process resulting in ladder-like structures (Fig. 40E). The tube is 18.7 cm long with the largest diameter of 4.21 cm and a mean wall thickness of 1.9 (1.2–2.5) mm, n = 8. The larger wall holes, parietal oscula, have mean longitudinal dimensions of 9.0 (5.2–15.0) mm, n = 55; transverse dimensions 4.7 (3.2–6.3) mm, n = 40. Smaller holes of more irregular shape and unlikely to represent parietal oscula have a mean major diameter of 2.9 (1.2–5.0) mm, n = 23. Framework bands between adjacent oscula have a mean width of 2.4 (1.0–5.8) mm, n = 65. In overt aspect, the specimen has about 12 main swollen longitudinal bands within the framework but no obvious major transverse or circular components. There is no evidence of lateral processes on the severely eroded framework. Colour is a golden light brown.

Skeleton. Choanosomal skeleton consists of a framework of fused diactins. No loose spicules are retained. Ectosomal skeleton is entirely absent.

Spicules. Other than those fused to form the framework are entirely absent.

Remarks. The specimen is almost certainly a dead, eroded framework of an undescribed species of *Walteria.* The tubular body and parietal oscula are reminiscent of *W. leuckarti* but here the body is much larger in diameter, 42.1 vs 5.2–18.4 mm there, and the parietal oscula differ considerably in mean size, largest diameter here 9.0 mm vs 5.2 mm there, but there is some overlap. Spacing between parietal oscula is clearly different, being nearly adjacent here but with mean centre-to-centre distance of 17.5 mm there. The framework here is like that of *W. leuckarti* but the longitudinal beams are absent there.

Although a tubular *Walteria* of such a large calibre is so far absent from known species, we are aware of the existence of a similar, spicule-bearing specimen from Hawai'i, considered to be a new and, as yet, undescribed species, giving strong support for the probability that the framework described here is from a species of *Walteria.* We include a seafloor image of a sponge from International waters near the Cook Islands (NOAA ROV *Deep Discoverer 2* Stn EX1705/Dive03 onboard RV *Okeanos Explorer*, Te Kawhiti a Maui Potiki deep ridge, 04.584° S, 162.399° W, 2210–2200 m, 2 May 2017; Seafloor Image Fig. 115), that we think is the same new species. We also include an image of a similar, but uncollected sponge, from

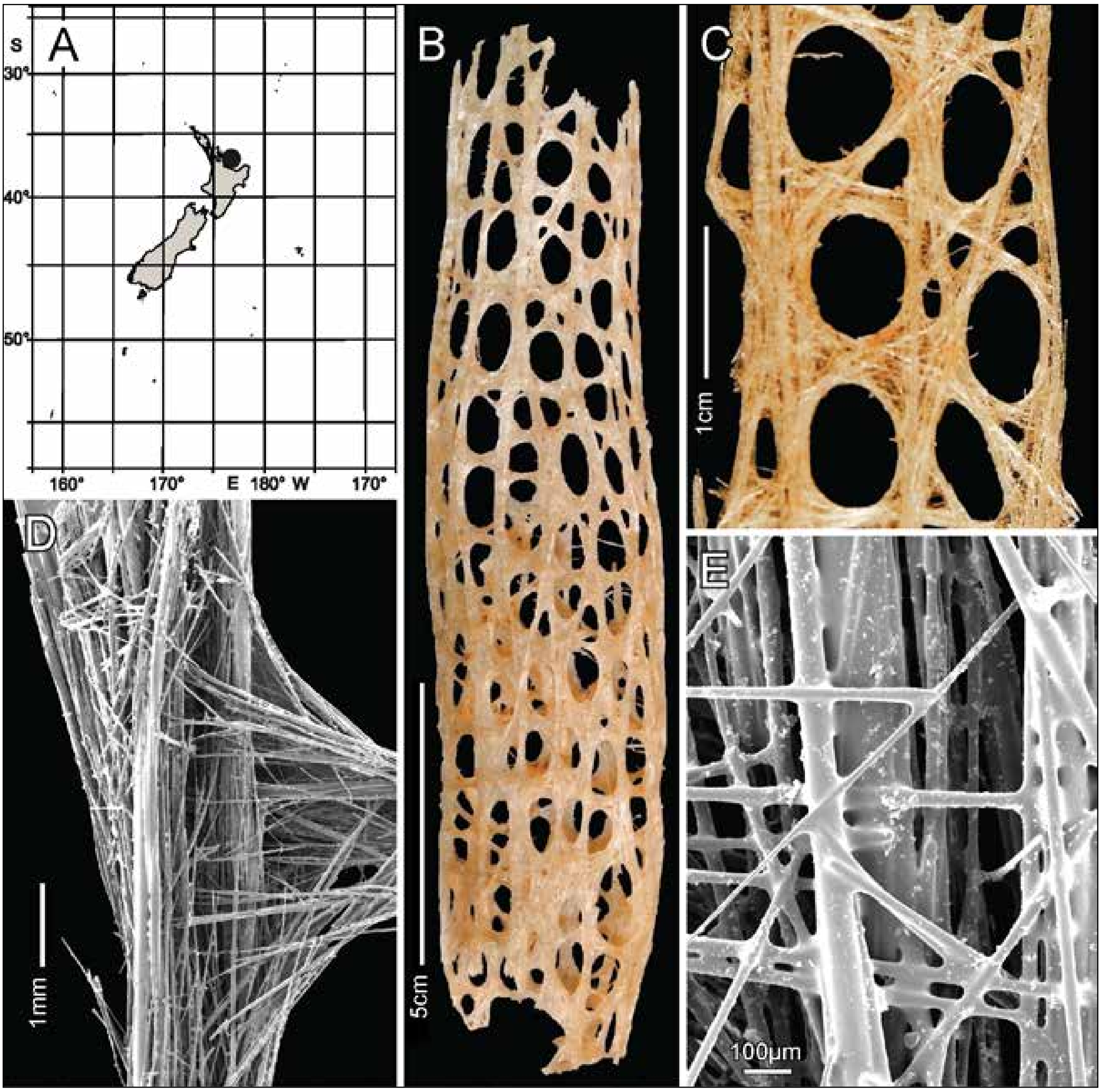


Figure 40. *Walteria* sp., distribution and skeleton: **A.** collection site; **B.** NIWA 71039; **C.** closer image of wall with parietal oscula and smaller holes; **D.** low magnification image of framework at intersection of two parietal oscula with a main longitudinal band; **E.** higher magnified image of framework structure.

Rumble II West Seamount, Kermadec Ridge (Seafloor Image Fig. 116), and Reinga Basin (Seafloor Image Figs 117, 118). However, because of the poor condition of the New Zealand specimen, we refrain from giving it a species name, and simply report it as *Walteria* sp., trusting that further benthic faunal collecting in the Bay of Plenty will some day provide a live specimen worthy of being compared to the Hawai'an and Cook Islands material, which will one day be examined and named.

Key diagnostic characters

- Tubular body, about 4 cm diameter, with closely spaced parietal oscula that have a mean diameter of 9 mm.
- Pointed tip of sponge evident in images of living specimens
- Lateral processes evident in images of living specimens

Genus *Plumicoma* gen. nov.

Diagnosis. Corbitellinae with globular body lacking sieve plate and parietal oscula. Microscleres are large discohexasters, floricomes, microcodonhexasters and two plumicomes, one with flattened terminal tips with asymmetric marginal claws and one with smoothly recurved oxyoid terminal tips.

Etymology. Named for the distinctive microscleres, plumicomes.

Remarks. The new specimen cannot be accommodated in any of the 11 genera presently recognised in the subfamily Corbitellinae. The thick non-euplectelloid body with sharp outer margin and aspidoplumicomes is shared with *Chaunangium* but the aspidoplumicomes are quite different in form and the new specimen lacks any evidence of basalia.

Type species. *Plumicoma solida* **gen. et sp. nov.**, this report.

***Plumicoma solida* gen. et sp. nov.**

Figs 41–42; Table 18

Material examined. Holotype NIWA 100512, NIWA Stn TAN0413/188, 113 km east of Table Cape, North Island, 39.019° S, 179.343° E, 2675–2446 m, 18 Nov 2004.

Type locality. Off Table Cape, North Island, New Zealand (Fig. 41A).

Distribution. Known from only the type location.

Habitat. Presumably attached to hard substratum between 2675 and 2446 m.

Description. Morphology of the holotype is a globular tun-shaped sponge (Fig. 41B) severely damaged during collection and packaging (Fig. 41C). It lacks the euplectelloid features of a spacious atrial cavity, a thin body wall, a sieve plate and parietal oscula but has at least two sharp-edged ridges (Fig. 41D) that may represent margins separating dermal and atrial areas but no differences were detected in spiculation of the two sides of the ridges. Some areas of the body outside the ridges (Fig. 41E) are puffy and externally lined by a palisade of large sword-shaped hexactins. Small holes 5–11 mm diameter with sharp margins are common on the body surface, penetrating up to 10 mm into the globular thick fleshy body; in one area within the largest ridge ring they are closely packed and may represent a crude sieve area. The specimen is 111 mm long and 69 mm in greatest width. An attachment structure is not identifiable anywhere on the outer surface. Colour when fresh was grey, when preserved in alcohol is light brown.

Skeleton. Choanosomal skeleton is a dense network of variously oriented thick bundles of large primary diactins and stauractins surrounded by thin diactin comitalia. Large and small hexactins fill spaces between the large bundles. Fusion of primaries and comitalia occur in small patches throughout the specimen (Fig. 41F, G) but are not integrated into a more extensive fused body framework.

Ectosomal skeleton consists mainly of sword hexactins retained in some patches of the dermal surface. Precise locations of the microscleres has not been possible to determine.

Spicules. Megascleres (Fig. 42; Table 18) of the body are numerically dominated by large choanosomal diactins. Primary spicules (pincipalia) are stauractins (15% of 48 counted) and diactins (85%). Primary stauractins (Fig. 42A) are narrow with long rays in one axis and short rays in the other; they are entirely smooth with fine open tips. Primary diactins (Fig. 42B) are curved and smooth with a slightly inflated centre; tips are either smooth and clavate or very lightly spined and parabolic. Choanosomal megascleres are dominated by large diactins, comital diactins and small equal-ray hexactins but include large hexactins, fewer large pentactins, rare large tauactins, large stauractins and large paratetractins. Large choanosomal diactins (Fig. 42C) are curved and smooth with centres with two, three, or four short knobs; tips are rough and rounded. Large choanosomal pentactins (Fig. 42D) have rays of unequal length; they are smooth with rough ends and rounded or parabolic tips. Large choanosomal hexactins (Fig. 42E) have smooth curved rays of unequal length; tips are like those of the pentactins. Small choanosomal hexactins (Fig. 42F) have straight rays completely but sparsely ornamented with short proclined spines; their tips are abruptly tapered to a rounded end. Small pinular hexactins (Fig. 42G) are uncommon; both rays of one axis differ from the other four rays, one being thicker and spinier, the other being thinner and shorter. These may be atrialia but their precise location remains unresolved. Dermalia (Fig. 42H) vary widely in size, up to 4 mm total length, and proportional lengths of distal and proximal rays. Most have sparse spines on the distal half of rays but some are entirely spined. The distal ray varies in shape from narrowly tapered to a sharp tip to distally lightly inflated to distally greatly inflated.

Microscleres (Fig. 42I–M; Table 18) consist of one class of large discohexaster, two classes of plumicomes, one class of codonhexaster and one class of floricome. Precise counts of abundances are not possible due to breakage of the delicate plumicomes but relative abundance is easily grasped; plumicomes are about equal and the most numerous, codonhexasters follow closely, discohexasters are a distant fourth and floricomes are rare. Discohexasters (Fig. 42I) are large spicules with each of the short smooth primary rays supporting 8.1 (5–12) (n = 22) smooth terminal rays ending in hemispheric discs, each with 9.8 (9–11) (n = 31) broad marginal teeth. Aspidoplumicome 1 (Fig. 42J) has smooth short primary rays, each ending distally in a small disc 10 (7–9–11.5) (n = 20) µm in diameter which bears a single marginal

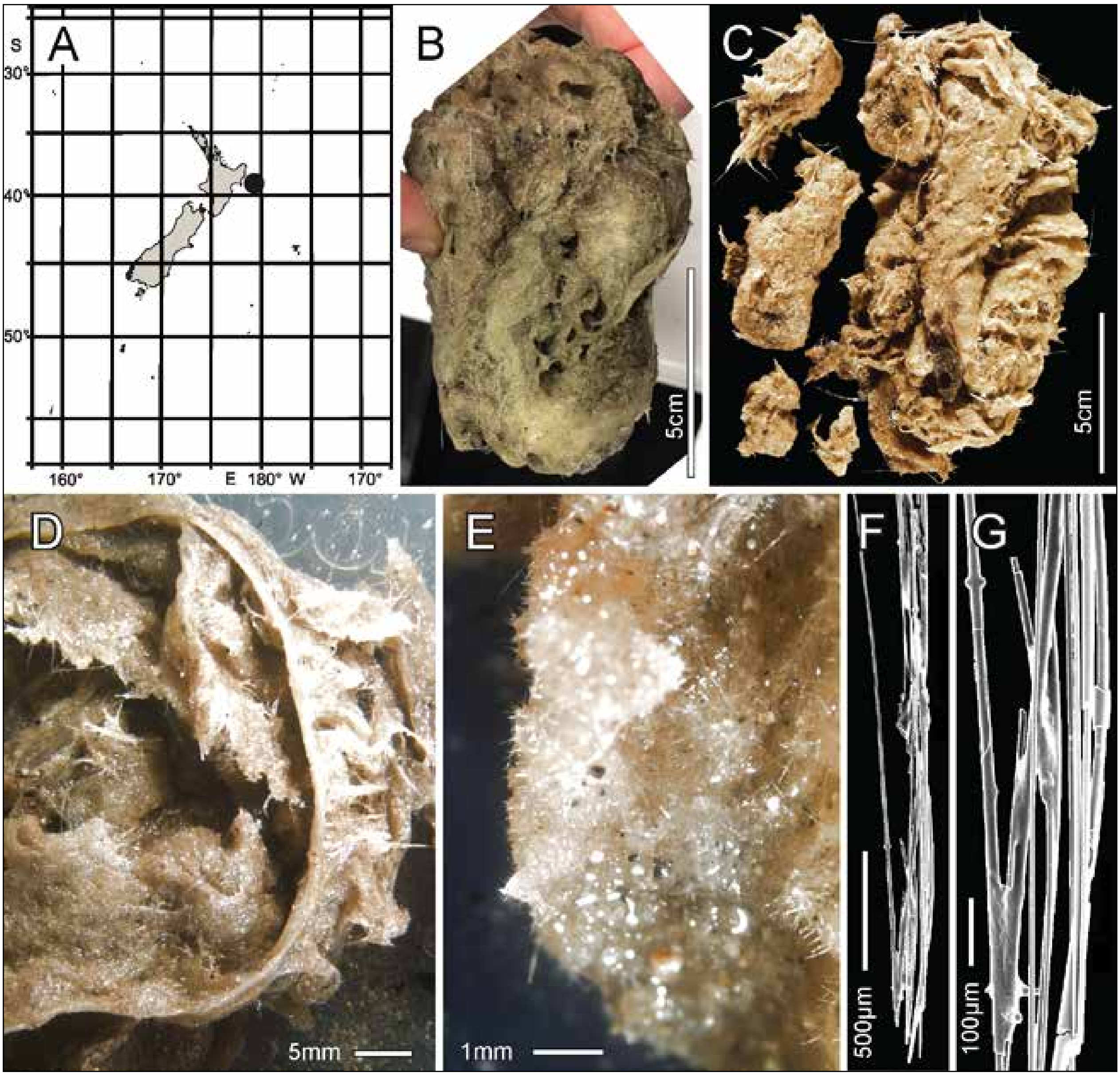


Figure 41. *Plumicoma solida* **gen. et sp. nov.**, distribution, morphology and skeleton: **A.** distribution in New Zealand waters; **B.** holotype NIWA 100512, deck photo; **C.** holotype when received in lab; **D.** margin ridge; **E.** puffy dermal surface with projecting patches of dermalia distal rays; **F.** fused bundle of choanosomal megascleres; **G.** closer view of the fused bundle with a clear diactin centre.

whorl, and occasionally a few on the disc face, of 23.4 (21–25) (n = 12) sigmoid terminal rays extending out in plumose fashion and ending at 4–5 levels from the disc. The terminal rays bear two fairly straight lines of denticles on the outer surfaces and end in an asymmetric hand-like plate bearing 4.3 (2–7) marginal claws on the outer edge like floricomes, the shorter rays bearing fewer claws and the longer ones bearing more claws. Aspidoplumicome 2 (Fig. 42K) is similar to aspidoplumicome 1 but the terminal rays, 70.6 (25.7–120.6) (n = 74) µm in length, are smoothly arched and recurved to sharp oxyoid tips like those of drepanocomes, lacking the abrupt change in angle at the tip seen in aspidoplumicome 1. Details of the primary discs are unavailable in the few SEM images of this spicule type but they are similar to aspidoplumicome 1 in LM. Microcodonhexasters (Fig. 42L) are tiny hexasters with umbellate tips (length > width) on terminal rays. Each terminal ray ends in a flattened ovoid with a central prominent cone; 44–45 smooth terminal rays originate from the narrow edges of the ovoid in 3–4 whorls. Umbels have 9.2 (7–11) (n = 37) long rounded teeth. Floricomes (Fig. 42M) are rare. The short smooth primary rays terminate in small cup-like capitula, each of which supports a single whorl of 9–10 sigmoid terminal rays of the same length arranged in a perianth. Terminal rays have no, or a very few, denticles on their outer shaft and end in inflated asymmetric heads with 9.7 (6–11) (n = 12) marginal claws directed to the outer side of the perianth.

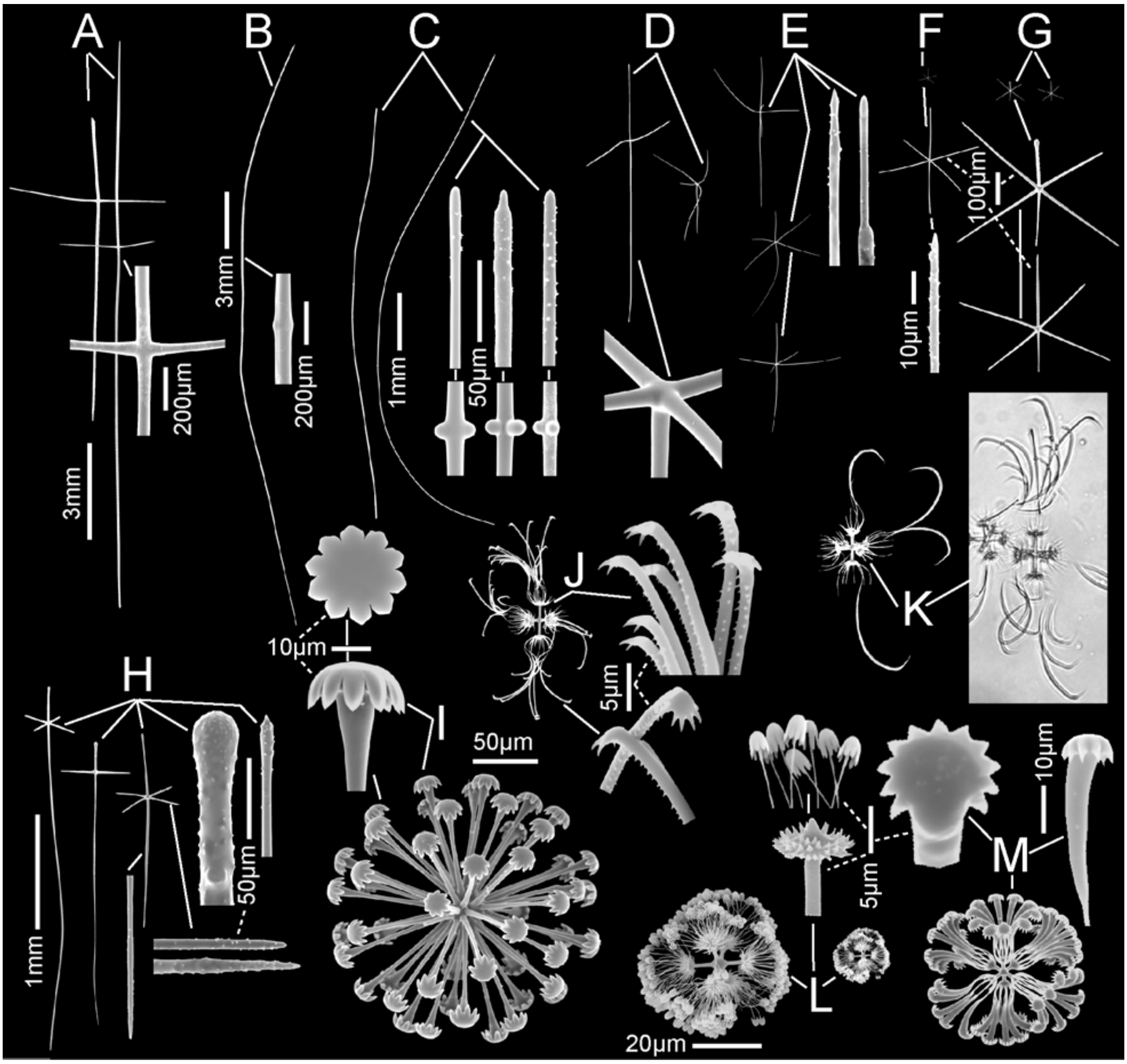


Figure 42. *Plumicoma solida* **gen. et sp. nov.**, holotype NIWA 100512 spicules: **A.** primary stauractins, two whole spicules and enlarged centre; **B.** primary diactin and enlarged centre; **C.** choanosomal diactins, two whole spicules plus enlarged tips and centres; **D.** choanosomal pentactins, two whole spicules plus enlarged centre; **E.** large choanosomal hexactins, three whole spicules plus enlarged ray ends (scales in C apply also to D & E); **F.** small choanosomal hexactin and enlarged ray tip; **G.** small pinular hexactins; **H.** dermalia, three whole spicules plus enlarged distal, tangential and proximal ray tips; **I.** discohexaster with enlarged terminal discs (50 µm scale applies to all whole microscleres except enlarged codonhexaster in L); **J.** aspidoplumicome 1 with enlarged terminal ray ends; **K.** aspidoplumicome 2, severely broken in SEM and more intact in LM; **L.** microcodonhexaster whole, enlarged whole (left) and enlarged primary ray end and terminal umbels; **M.** floricome with enlarged terminal ray and asymmetrical terminal ray end.

Etymology. The species name, *solida*, refers to the dense and solid body form of the specimen.

Remarks. This specimen is clearly a member of the family Euplectellidae by its sword-shaped dermalia and floricome microscleres, but it is not easily assigned to either of the three subfamilies with certainty since it lacks the diagnostic features of basal anchors, a stalk and an attachment surface. It is here assigned to the subfamily Corbitellinae on the basis of its microcodonhexasters which are almost identical to those of several species of *Dictyaulus*. In its set of characters, this species is incompatible with the diagnoses of all 11 genera of the subfamily, especially with respect to its two forms of aspidoplumicomes. Among Corbitellinae, only *Hertwigia falcifera* Schmidt, 1880, has aspidoplumicomes, and those of this new species are quite distinct from those in form. Indeed, the floricoid aspidoplumicome here is a rare form of plumicome known only in the bolosomid *Hyalostylus dives* Schulze, 1886, which differs in all other microscleres, body form and stalk. The new species is here designated as the holotype of a new genus and named *Plumicoma solida* **gen. et sp. nov.**

Table 18. Spicule dimensions (µm) of *Plumicoma solida* **gen. et sp. nov.**, from holotype NIWA 100512.

Parameter	mean	s. d.	range	no.
Primary stauractin				
longitudinal ray length (mm)	6.2	2.8	2.3–11.5	13
transverse ray length (mm)	1.3	1.0	0.1–2.8	14
ray width	62.6	21.2	21.0–98.2	20
Primary diactin				
length (mm)	11.4	5.6	4.7–31.3	41
width	52.7	18.3	20.7–93.8	41
Choanosomal diactin				
length (mm)	7.2	2.6	2.4–14.5	53
width	12.7	2.8	7.2–19.4	51
Comital diactin				
length (mm)	9.8	1.7	6.8–13.3	29
width	9.5	2.8	3.3–15.9	50
Choanosomal pentactin				
tangential ray length (mm)	1.5	0.9	0.7–3.2	15
proximal ray length (mm)	1.2	0.5	0.6–1.8	5
ray width	13.9	3.6	10.0–21.5	10
Choanosomal large hexactin				
long ray length	898	580	248–2190	51
short ray length	367	257	79–1523	51
ray width	12.0	2.2	6.7–16.0	62
Choanosomal small hexactin				
ray length	256	32	165–324	54
ray width	11.3	2.7	4.0–16.2	51
Small pinular hexactin				
distal ray length	191	68	38–314	15
tangential ray length	244	45	163–314	12
proximal ray length	256	82	88–375	13
ray width	12.2	2.6	7.7–17.7	15
Dermalia, sword hexactin				
distal ray length	282	190	32–1383	45
distal ray basal width	15.1	3.3	10.2–24.4	38
distal ray clavate tip width	22.3	8.2	12.5–36.8	8
tangential ray length	246	42	151–421	46
tangential ray width	14.0	3.2	8.5–23.2	42
proximal ray length	1228	776	366–2985	38
proximal ray width	15.1	3.2	10.6–25.1	38
Discohexaster				
diameter	267	30	189–312	50
primary ray length	12.2	2.4	5.7–17.1	50
secondary ray length	122.1	14.0	84.5–142.4	50
Aspidoplumicome 1				
diameter	161	23	113–274	72
primary ray length	13.7	1.4	9.7–17.4	72
secondary ray length	59.7	12.5	33.0–88.7	145
Aspidoplumicome 2				
diameter	185	38	122–273	37
primary ray length	13.4	1.4	10.3–16.5	37
secondary ray length	70.6	20.4	25.7–120.6	74
Microcodonhexaster				
diameter	50.4	5.0	40.9–64.5	50
primary ray length	10.4	1.3	8.0–12.9	50
secondary ray length	15.3	2.2	8.2–20.0	50
umbel length	3.0	0.3	2.3–3.5	67
umbel width	2.1	0.1	1.8–2.4	65
Floricome				
diameter	152	35	114–191	10
primary ray length	12.2	1.8	9.8–15.0	10
secondary ray length	57.8	17.6	43.5–97.5	10

Key diagnostic characters

- Globular tun-shaped body which is not euplectelloid, lacking parietal oscula and sieve plate
- Primary spicules are diactins and stauractins
- Dermalia are sword-like hexactins but atrialia remain uncertain
- Spicule fusion is present but only in small patches
- Microscleres are discohexactins, two aspidoplumicomes, microcodonhexasters and floricomes

Subfamily **Corbitellinae incertae sedis**

Material examined. *Kermadec Ridge*: NIWA 121751, NZOI Stn T243, 30.089° S, 178.250° W, 1035 m, 24 Mar 1982.

Norfolk Ridge: QM G316692, NIWA Stn TAN0308/102, 33.708° S, 167.451° E, 1451–1478 m, 28 May 2003; NIWA 44140, SOP Stn TRIP2419/4, 34.5° S, 168.7° E, 916–688 m, 01 May 2007; QM G316690, NIWA Stn TAN0308/132, 33.342° S, 170.233° E, 614–675 m, 01 Jun 2003; QM G316726, NIWA Stn TAN0308/9; 34.048° S, 171.136° E, 1145–1185 m, 12 May 2003.

Three Kings Ridge: NIWA 71037, NZOI Stn U582, 31.862° S, 172.433° E, 790 m, 05 Feb 1988.

North Cape: NIWA 121752, NIWA Stn KAH0204/38, 34.159° S, 173.963° E, 800–780 m, 18 Apr 2002; NIWA 51834 (distribution record only), NIWA Stn KAH0204/7, 34.119° S, 174.153° E, 800–670 m, 14 Apr 2002.

Ngatoro Ridge, Bay of Plenty: NIWA 69060, SOP Stn TRIP1124/69, 37.1° S, 177.2° E, 617–654 m, 16 Aug 1998.

Colville Channel: NIWA 71033, NZOI Stn I61, 36.375° S, 175.220° E, 514 m, 12 May 1975.

Raukumara Plain: NIWA 62052, NZOI Stn X689, 36.000° S, 177.947° E, 1880–1600 m, 14 Feb 1996.

West of Table Cape (Kahutara Point), Mahia Peninsula, Hawke's Bay: NMNZ PO.000529, NIWA Stn TAN9303/88, 39.789° S, 178.366° E, 800–1000 m, 27 Mar 1993; NMNZ POR477, FRV *James Cook* Stn J9/28/89, 39.763° S, 178.317° E, 850–870 m, 18 Sep 1989; NIWA 71038 (distribution record only), NZOI Stn R439, 39.447° S, 178.333° E, 1000 m, 16 Jun 1990.

Hikurangi Margin, Rock Garden: NIWA 52968, NIWA Stn TAN0616/7, 40.039° S, 178.144° E, 766–764 m, 04 Nov 2006.

Chatham Rise (distribution records only): NIWA 22964, NIWA Stn TAN0604/10, Zombie Hill, 42.765° S, 179.928° W, 1005–1082 m, 28 May 2006; NIWA 51934, NIWA Stn TAN0104/153, 42.733° S, 179.899° W, 1076–990 m, 18 Apr 2001; NIWA 51958, NIWA Stn TAN0104/387, 42.726° S, 179.899° W, 1100–1000 m, 20 Apr 2001.

Valerie Guyot, Louisville Seamount Chain (International waters): NIWA 94571, NIWA Stn TAN1402/138, 41.580° S, 164.255° W, 1223–1241 m, 28 Feb 2014.

South Macquarie Ridge (Australian EEZ): NIWA 40553 (distribution record only), NIWA Stn TAN0803/81, Seamount 7, 53.731° S, 159.166° E, 1150–1270 m, 12 Apr 2008; NIWA 40669, NIWA Stn TAN0803/88, Seamount 8, 55.381° S, 158.430° E, 501–775 m, 15 Apr 2008; NIWA 41008, NIWA Stn TAN0803/102, Seamount 9 Hjort, 56.242° S, 158.462° E, 790–1025 m, 16 Apr 2008.

Macquarie Ridge, Seamount 3, Clementsville: NIWA 52602, NIWA Stn TAN0803/33, 50.091° S, 163.482° E, 1077–1408 m, 01 Apr 2008; NIWA 52603, NIWA Stn TAN0803/31, 50.088° S, 163.492° E, 1163–1125 m, 01 Apr 2008.

Macquarie Ridge (International waters): NIWA 41081, NIWA Stn TAN0803/114, 59.065° S, 158.935° E, 1775–1973 m, 19 Apr 2008.

Southern Ocean (International waters): NIWA 67580, CCAMLR SOP Stn TRIP2730/11, 65.5° S, 177.7° W, 1698–1679 m, 09 Dec 2008.

South Tasman Rise (International waters): NIWA 71032, SOP Stn TRIP1153/71, 47.5° S, 148.9° E, 1022 m, 15 Sep 1998.

Distribution. From Kermadec Ridge, around North Island and Louisville Seamount Chain (International waters) to extreme south end of Macquarie Ridge (International waters).

Habitat. Presumably all attached to hard substrate at 514–1973 m.

Description. Morphology of 10 of the 12 specimens is that of a fused basal attachment cup with fenestrate marginal walls, common to most corbitellids. These are entirely washed out with no loose spicules remaining; they are thus unidentifiable to genus. Height ranges from 2.1–5.3–10.0 cm and diameter ranges from 1.6–3.3–5.5 cm. Some have been collected with spicule-bearing upper bodies but it cannot be concluded that the bases belong to those specimens.

One of the specimens, NIWA 121752, is a small attachment base on a dead auloplacoid framework with a basidicyonal mass intimately associated with a moderate number of loose spicules. Damage during collection makes it uncertain whether it is a juvenile stage or the remnants of an older specimen that has been torn from its attachment, in either case the loose basal spicules have not yet been fused into a solid structure. It contains loose diactins with slight central swellings, a variety of hexactin, pentactin and stauractin megascleres, a few large discasters and graphiocomes with stout spiral terminal rays. The spicule compliment that can be considered proper is insufficient to provide a full identification of the specimen. It could be a young/remnant of a *Corbitella*, e.g. *C. discasterosa* Tabachnick and Levi (2004) or a *Dictyocalyx*, e.g. *D. lifousantalis* Tabachnick and Levi (2004).

Specimen NIWA 41081, is a severely damaged fluffy body wall fragment of a euplectellid with slight megasclere fusion on one end, diactins as primary spicules and sword hexactins as probable surface spicules but no surfaces are preserved. There are no anchors and no pieces of anchor shafts. It has floricomes with single teeth and graphiocomes with kinked terminal rays but no other hexasters. The spicule complement is distinct and does not agree with that of any known species. Because the specimen is in such poor condition its identity cannot be further determined.

Subfamily **Bolosominae** *Tabachnick, 2002*

Taegerinae, in part

Diagnosis. Basiphytous Euplectellidae, the body of which is cup-shaped, spherical or fungiform, with a long, thin tubular peduncle, several times longer than the body (modified from Tabachnick 2002).

Remarks. The subfamily is not monophyletic (Dohrmann *et al.* 2017) and is likely to require revision in the near future. Images of living, purported Bolosominae, are figured in Seafloor Image Figs 8–20.

Genus ***Bolosoma*** **Ijima, 1904**

Placosoma Ijima, 1903: 2.
Bolosoma Ijima, 1904: 305; Schulze 1904: 173.

Diagnosis. Body is fungiform, pedunculate, basiphytous with a more-or-less everted atrial cavity. Choanosomal spicules predominantly diactins, rare spicules are hexactins and pentactins. The spicules of the peduncle are diactins fused into a rigid skeleton by synapticular junctions. Dermalia and atrialia are hexactins, rarely pentactins. Microscleres are anchorate and toothed discohexasters, discasters, hemidiscohexasters, discohexatins and derivatives of the latter to amphidiscs (after Tabachnick 2002).

Remarks. Assignment of authority of the replacement name *Bolosoma* to Schulze (1904) by Tabachnick (2002) is an error. Ijima (1904: 305), published 18 June 1904, supersedes that of the Schulze publication which is without specific date and thus is relegated to publication date as 31 Dec 1904. Images of living, purported Bolosominae and *Bolosoma* spp., are figured in Seafloor Image Figs 8–14.

Type species. *Placosoma paradictyum* Ijima, 1903 by monotypy.

Bolosoma charcoti Tabachnick & Lévi, 2004

Figs 43, 44; Table 19

Bolosoma charcoti Tabachnick & Lévi, 2004: 41, figs 16A, 18A–K.

Material examined. *Shipley Seamount, north of mid-Chatham Rise*: NIWA 25311, NIWA Stn TAN0604/133, 41.801°S, 179.494°W, 1240–1275 m, 09 Jun 2006.

Rumble II West Chimney Field, 278 km northeast of Bay of Plenty: NIWA 72598, NIWA Stn TAN1104/62, 35.353° S, 178.537° E, 1306–1220 m, 11 Mar 2011.

Type & locality. Holotype—MNHN HCL 502, Norfolk Ridge south of New Caledonia, 1300–1475 m.

Distribution. Known from only three locations, the type location to the south of New Caledonia and the new locations north of Chatham Rise (Fig. 43A) and the Bay of Plenty.

Habitat. Probably attached to hard substratum at a depth of 1240–1275 m.

Description. Morphology was grossly damaged during collection; what remains are two solid drumstick-shaped specimens consisting of dark, fragile, felt-like upper bodies, borne on bright, tough, firm stalks (Fig. 43B). Despite the degree of damage to both upper bodies and stalks, the diagnostic spicules are retained at almost all locations. The choanosome, often with its bundles of loose diactins, is exposed over most of the dark, upper parts (Fig. 43C); there is no indication of a surface lattice retained at any point of the specimens (Fig. 43D) but residual surface hexactins were found at all eight body locations sampled. The stalks consist of about 12 large bundles (Fig. 43E) of longitudinally-oriented diactins fused by synapticula forming ladder-like structures and by direct incorporation of closely lying spicules in a common silica cover (Figs 43F, G). The longitudinal orientation of the fused stalk diactins is closely maintained throughout the individual bundles (Fig. 43H) and the entire stalks; there are no elements with circular or radial orientation. Stalk diactin bundles are 2.2–3.7 mm wide. Macroscopic openings of the body are irregular, rare and not interpretable as normal body apertures (e.g. normal oscula, parietal oscula, etc.). The specimens are 13.8 and 24.6 cm long with the largest diameter of 3.5 cm; there is no identifiable wall for wall thickness measurement. Framework bands between adjacent oscula have a mean width of 2.4 (1.0–5.8) mm, n = 65. Colour of the dry specimens are dark brown on the upper (body) part and light brown on the smooth lower stalk.

Skeleton. Choanosomal skeleton consists of a confused tangle of loose megascleres spread onto the fused stalk diactin bundles. No fusion occurs in the choanosomal spicules except in the stalk bundles (Fig. 43F, G). Loose megascleres and microscleres are randomly strewn through the dark tissue of the upper body. Ectosomal skeleton is not preserved in any recognisable form at any surface location.

Spicules. Megascleres (Fig. 44; Table 19) include stalk diactins, choanosomal diactins, choanosomal hexactins to stauractins, and surficial hexactins; atrialia were not convincingly found. Loose stalk diactins (Fig. 44A) occur on stalk bundle surfaces and between bundles; they are straight to slightly curved with rough, bluntly-pointed or parabolic tips. Some of the diactins fused into the bundles may be longer but they were not measurable. Choanosomal diactins (Fig. 44B) occur as loose spicules, singly or in bundles, throughout the dark felt-like tissues of the upper body; they are like the stalk diactins but are shorter and much thinner. Choanosomal hexactins, pentactins and stauractins (Fig. 44C, D) occur sporadically at all sampled sites; their rays are approximately equal in length and tips are rough like those of diactins. Surficial hexactins (Fig. 44E) are almost certainly dermalia but occur in all locations without specific information on their original position. All ray ends are rough with distal rays ending in clavate tips, tangential rays in rounded tips, and proximal rays in parabolic tips.

Microscleres (Fig. 44; Table 19) are all discohexactins (Fig. 44F) ranging in form from pileate (smallest) to anchorate (largest); all rays are smooth and marginal teeth of terminal discs number 7 to 10 to 11. In the series of form from pileate to intermediate to anchorate, discohexactins vary directly in diameter (smallest as pileate, largest as anchorate), obviously in length of terminal umbel, but indirectly in width of ray shaft, the thinnest and most delicate being the larger anchorates. No hint of discohexasters was found in any preparation.

Remarks. The damaged specimens without lower attachment and only remnants of the upper body were not easily assigned to a family, but presence of narrow tapering stalks and only discohexactin microscleres proved their membership in *Bolosoma*. Within the genus their spiculation agreed with that of *B. charcoti*, known from only two specimens collected in nearby waters of New Caledonia, but atrialia could not be determined in the New Zealand specimens. We are confident in assigning the specimens as the third and fourth known members of *B. charcoti*.

Key diagnostic characters

- Soft upper body with loose spicules borne on narrow tapering stalk of fused diactins.
- Megascleres consist of diactins, stauractins, pentactins, hexactins and sword hexactins
- Microscleres consist of only discohexactins, with discs ranging from pileate to anchorate.

Bolosoma biocalum Tabachnick & Lévi, 2004

Fig. 45; Table 20

Bolosoma biocalum Tabachnick & Lévi, 2004: 39, figs 16B–C, 17A–E.

Material examined. *Louisville Seamount Chain (International waters)*: NIWA 94162, NIWA Stn TAN1402/21, Forde Guyot, 35.320° S, 170.450° W, 1205–1600 m, 11 Feb

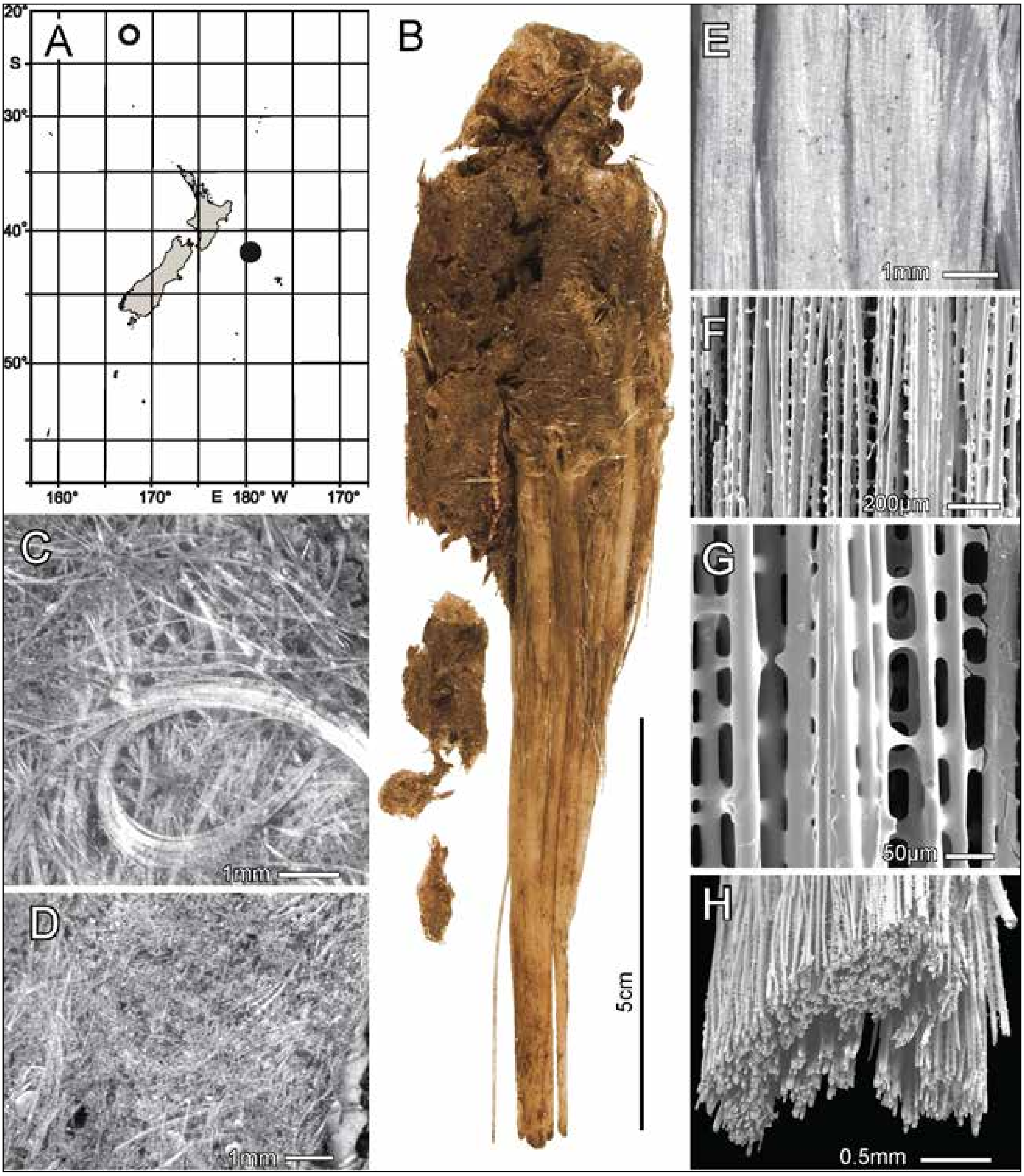


Figure 43. *Bolosoma charcoti* Tabachnick & Lévi, 2004, distribution, morphology and skeleton: **A.** distribution in New Zealand and New Caledonian waters, the type locality as unfilled circle, the new specimens as filled circles; **B.** NIWA 25311; **C–D.** close views of two locations on the damaged surface; **E.** close view of the upper stalk (LM); F. SEM view of same; **G.** closer view of longitudinally aligned diactins and their fusion by synapticulae; **H.** oblique SEM view of a transected diactin bundle of the stalk.

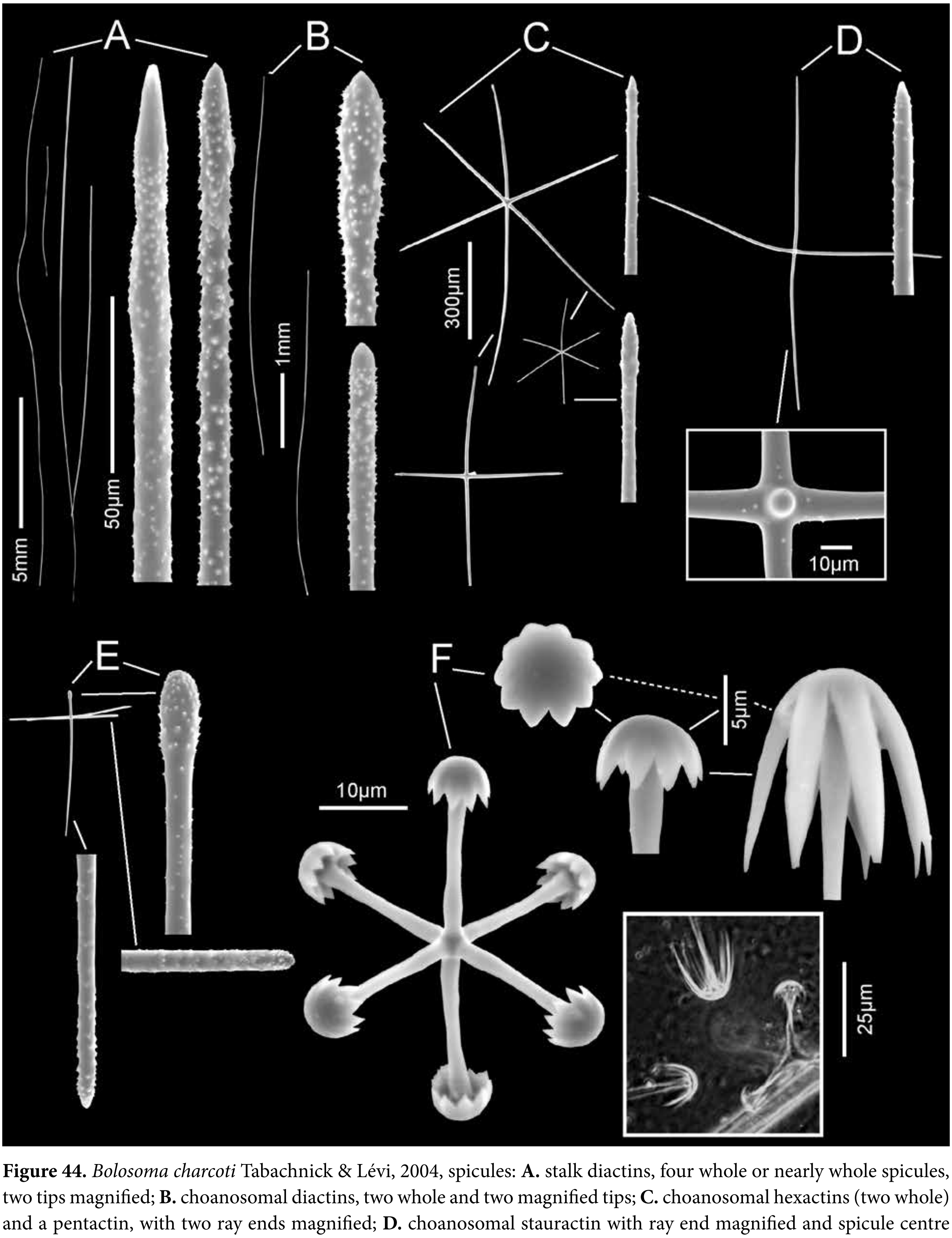


Figure 44. *Bolosoma charcoti* Tabachnick & Lévi, 2004, spicules: **A.** stalk diactins, four whole or nearly whole spicules, two tips magnified; **B.** choanosomal diactins, two whole and two magnified tips; **C.** choanosomal hexactins (two whole) and a pentactin, with two ray ends magnified; **D.** choanosomal stauractin with ray end magnified and spicule centre (insert); **E.** superficial hexactin, almost certainly a dermalium, three ray ends magnified; **F.** discohexactins, one whole and variety of pileate, intermediate and anchorate terminal ray tips, the range of which are shown in a phase contrast LM (insert). Scales the same as in A for all megasclere ray tips; scale for whole spicules in D & E the same as in C. All spicules from NIWA 25311.

Table 19. Spicule dimensions (µm) of *Bolosoma charcoti* Tabachnick & Lévi, 2004, from NIWA 25311.

Parameter	mean	s. d.	range	no.
Stalk diactins				
length (mm)	23.7	11.7	5.0–45.9	9
width	71.9	18.4	38.8–96.9	11
Choanosomal diactin				
length (mm)	2.1	0.6	0.8–3.7	50
width	9.2	2.1	5.5–14.2	50
Choanosomal hexactin to stauractin				
ray length	478	106	293–687	27
ray width	9.9	1.9	6.4–13.9	31
Surficial hexactin				
distal ray length	73.7	7.7	19.3–271.9	47
distal ray width	7.7	2.0	3.7–14.0	47
tangential ray length	241	94	142–652	108
tangential ray width	8.0	1.8	4.2–12.4	108
proximal ray length	366	118	137–647	36
proximal ray width	7.9	2.1	3.7–12.8	49
Pileate discohexactin				
diameter	45.6	7.5	25.4–63.4	84
umbel length	3.7	0.7	1.9–5.2	90
umbel width	7.4	1.0	4.3–9.9	90
ray width	1.6	0.3	0.9–2.3	90
Intermediate discohexactin				
diameter	69.2	11.4	47.0–104.5	31
umbel length	6.6	0.8	5.3–8.4	37
umbel width	9.9	1.0	8.3–12.4	37
ray width	1.1	0.3	0.3–2.1	37
Anchorate discohexactin				
diameter	102	22	41–134	28
umbel length	16.0	3.6	8.6–23.7	123
umbel width	14.8	2.2	11.1–20.1	123
ray width	0.8	0.2	0.3–1.6	121

2014; NIWA 94229, NIWA Stn TAN1402/57, CenSeam Guyot, 36.910° S, 169.850° W, 1013–1010 m, 15 Feb 2014.

Type & locality. Holotype—MNHN HCL500, BIOCAL *Jean Charcot* Stn CP 62, New Caledonia, 24.177° S, 167.811° E, 1395–1410 m, 1985. Paratype—MNHN HCL501, BIOCAL *Jean Charcot* Stn CP 57, New Caledonia, 23.721° S, 166.968° E, 1490–1620 m, 1985.

Distribution. Known previously only from the Norfolk Ridge south of New Caledonia, but recorded here from the Louisville Seamount Chain (International waters) (Fig. 45A).

Habitat. Probably attached to hard substratum at depths of 1010–1620 m.

Description. Morphology of both specimens was grossly damaged during collection. NIWA 94162 (Fig. 45B) is the torn upper body with three remnants of the stalk on the top, right and lower edge of the figure. No clear surface structure is evident and normal body form cannot be inferred from the specimen. NIWA 94229 (Fig. 45C) is a fragment of the cylindrical upper stalk of a much larger specimen whose body form also cannot be deduced. Both are soft and fibrous in texture but the latter is more resistant to deformation. Sizes of the specimens are, respectively, 18.2 mm in diameter by 56.1 mm in length and 8.8 mm in diameter by 20.5 mm in length. Colour of both is light brown or beige.

Skeleton. Choanosomal skeleton of NIWA 94162 consists of bundles of solitary diactins and overlapping hexactins forming a supporting network. Microscleres are strewn through the choanosome without detectable pattern. Pieces of large diactins loosely joined by synapticula are found throughout the specimen, no doubt due to displacement from the disrupted stalk. Fusion of diactins is not likely to occur in the normal body choanosome. The more intact fragments of the stalk consist of nearly parallel diactins loosely joined by synapticula (Fig. 45D, E). Both loose megascleres and microscleres are adherent, but not fused to the fused diactins. The entire specimen of NIWA 94229 is like the stalk fragments of NIWA 94162. Ectosomal skeleton is not preserved in any recognisable form at any surface location. Surfacial sword-shaped hexactins are scattered throughout both specimens.

Spicules. Spicules of both specimens are similar but only those of NIWA 94162 were measured (Table 20).

Megascleres (Fig. 45; Table 20) include stalk diactins, choanosomal diactins, choanosomal hexactins and surfacial hexactins; atrialia were not convincingly distinguished and the only pentactins found were deemed to be of foreign origin. Stalk diactins (Fig. 45D) are straight and smooth with rough, rounded and often inflated tips (Fig. 45F). Choanosomal diactins (Fig. 45G) occur singly or in bundles, throughout the dark felt-like tissues of the upper body; they are straight to curved, smooth, with centres bearing four bosses in thinner ones but filled out to nearly indetectable swellings in thicker ones. They have rough tips that are pointed in thinner forms but rounded in thicker forms. Choanosomal hexactins (Fig. 45H) are abundant; they are entirely sparsely spined, have rays of nearly equal length with either sharp-pointed or rounded tips. Surfacial sword-shaped hexactins (Fig. 45I) are almost certainly dermalia but occur in all locations without specific indication of their original position. They are also entirely sparsely spined and have ray tips like

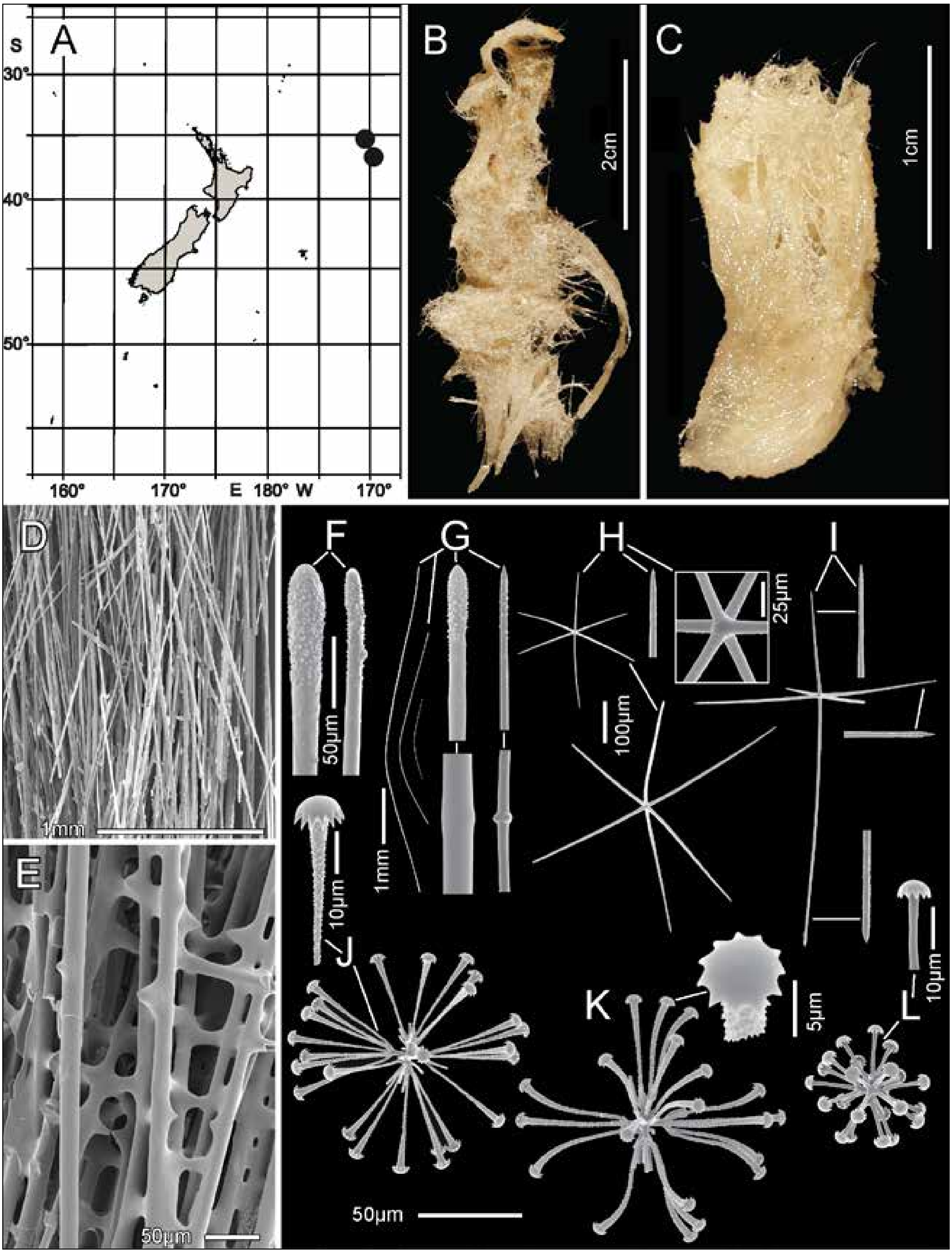


Figure 45. *Bolosoma biocalum* Tabachnick & Lévi, 2004, distribution, morphology, skeleton and spicules: **A.** distribution on the Louisville Seamount Chain (International waters); **B.** NIWA 94162; **C.** NIWA 94229; **D.** surface of stalk remnant (SEM); **E.** closer view of stalk diactins joined by ladder-like synapticula; **F.** tips of stalk diactins; **G.** choanosomal diactins, three whole and enlargements of two tips and centre swellings; **H.** choanosomal hexactins, two whole and enlargements of a ray tip and centre; **I.** surface hexactin, whole and enlargements of distal, tangential and proximal ray tips; **J.** large discohexaster, whole and terminal ray end; **K.** floricoid variant of the large discohexaster with enlarged terminal ray tip; **L.** small discohexaster, whole and enlarged terminal ray end. All megasclere tips and centres at scale in F; whole spicule in I at same scale as H; all whole microscleres at scale below J. All spicule images from NIWA 94162.

Table 20. Spicule dimensions (µm) of *Bolosoma biocalum* Tabachnick & Lévi, 2004, from NIWA 94162.

Parameter	mean	s. d.	range	no.
Choanosomal diactin				
length (mm)	2.8	2.0	0.9–9.3	50
width	13.3	4.9	5.7–26.8	50
Choanosomal hexactin				
ray length	291	78	139–449	50
ray width	7.9	2.0	4.7–12.1	50
Surfacial hexactin				
distal ray length	152	55	52–316	50
distal ray width	5.8	1.8	3.7–10.8	50
tangential ray length	199	64	103–358	50
tangential ray width	5.9	2.0	3.1–10.6	50
proximal ray length	368	98	198–606	50
proximal ray width	6.0	2.0	3.4–11.2	50
Large discohexaster				
diameter	121	7	104–135	76
primary ray length	8.5	1.1	5.8–10.7	76
secondary ray length	52.5	3.6	39.9–59.0	76
Small discohexaster				
diameter	60	4	54–73	35
primary ray length	5.2	1.2	2.9–8.1	35
secondary ray length	25.6	2.3	21.1–32.5	35

those of choanosomal hexactins. Distal rays are mostly tapered to sharp tips but a small proportion have slight inflation towards the distal end.

Microscleres are all discohexasters (Fig. 45; Table 20). Larger discohexasters (Fig. 45J) are spherical with short, smooth primary rays, each of which bears 4–9 rough straight terminal rays that end in hemispheric discs bearing 10–14 marginal teeth. A small proportion, about 5%, are stellate-floricoid in shape (Fig. 45K), with sigmoid terminal rays but with terminal discs identical to those of the spherical form. The smaller discohexasters (Fig. 45L) are also spherical, each short smooth primary ray bearing only 3–5 smooth terminal rays ending in hemispherical discs with 11–14 marginal teeth. The two discohexasters occur at a ratio of 15/1, the larger form being the more common. They differ in size, without overlap, number of terminal rays, and in form and ornamentation of their terminal rays, the larger being rough and swelling in diameter toward the disc while the smaller being smooth and nearly cylindrical throughout their length. There are no floricoid variants of the smaller discohexaster.

Remarks. The damaged specimens without lower attachment and only remnants of the upper body or stalk were not easily assigned to a family, but presence of a narrow stalk and only discohexaster microscleres proved their membership in *Bolosoma*. Within the genus their spiculation agreed with that of *B. biocalum* Tabachnick and Lévi 2004, known from only two specimens collected in nearby waters of New Caledonia. We are confident in assigning the specimens to *B. biocalum*, but some differences from the original description are noted here. The authors of the original description did not give clear size data for choanosomal diactins and made only oblique reference to presence of choanosomal hexactins without data. They described and figured only a single discohexaster with rough terminal rays and diameter ranging from 61–108 µm. Their lack of reporting two distinct discohexasters is probably due to the small numbers of their measurements or possibly due to the presence of only one category in the New Caledonia specimens.

We also note that the dimensions of the holotype and paratype given in the original description are probably incorrect, as per the image of the holotype (Fig. 16C in Tabachnick & Lévi 2004) and paratype (Fig. 16B in Tabachnick & Lévi 2004) of *B. biocalum*. If the length of the holotype peduncle is correct at 40 mm long, then the peduncle should taper from 4 mm thick to 2 mm thick at the base (not 1 mm thick as stated) and the body should be 35 mm high, 18 mm wide (not 45 × 24 mm as stated) and probably about the same thickness (not 2–3 mm as stated). If the length of the paratype peduncle is correct at 30 mm long, then the peduncle should taper from 3.5 mm thick to 2.6 mm thick at the base (not 0.5 mm thick as stated) and the body should be 66 mm high, 31 mm wide.

Key diagnostic characters

- Soft upper body with remnants of a thin stalk of diactins fused by synapticula
- Megascleres consist of diactins, equal-rayed hexactins and sword-like hexactins
- Microscleres consist of only discohexasters of two size classes

Bolosoma meridionale Tabachnick & Lévi, 2004

Bolosoma meridionale Tabachnick & Lévi, 2004: 44, figs 16G, 20A–Q.

Type & locality. Holotype—MNHN HCL507, HALIPRO 2, *Zoneco* Stn BT 024, New Caledonia, 25.007° S, 170.285° E, 995–1010 m, 1985.

Distribution. Loyalty Ridge, southeast of New Caledonia, between depths of 995–1010 m.

Diagnosis (translated from the original description). The sponge has a peduncle and a body in the shape of a funnel, 130 mm long and 120 mm maximum diameter. The body wall is 15–20 mm thick; the peduncle is 400 mm long and 20 mm diameter. The peduncle is fixed by a basal disk 50 mm diameter. The choanosomal spicules are diactins. The smooth diactins of the peduncle are cemented and 0.008–0.061 mm diameter. The diactins of the apical part are smooth with roughened obtuse extremities and rudiments of medial actins. The diactins measure 1.3–1.9 × 0.007–0.009 mm. The dermal and atrial hexactins have rough actins with rough extremities. The distal actins of the dermal hexactins are 0.053–0.114 mm long, tangential actins 0.099–0.205 mm long, proximal actins 0.296-0.486 mm. The proximal actins of the atrial spicules measure 0.046–0.106 mm, the tangential actins are 0.137–0.319 mm, the distal actin 0.068–0.433 mm. The actins of the dermal and atrial spicules are 0.010–0.017 mm diameter. The microscleres have toothed discs: discohexasters, hemidiscohexasters discohexactins, discostauractins discoparatetractins, discotauactins and discopentactins. Discodiactins ("amphidiscs") are absent. A few spicules may be found that have disc-less actins, with obtuse or onychoidal ends. The discohexasters and hemidiscohexasters are 0.047–0.079 mm diameter: the primary rosette is 0.007–0.009 mm diameter. The discohexactins and their derivatives are 0.050–0.072 mm diameter.

Remarks. A diagnosis of this species has been included as it is considered highly likely to be present in the New Zealand region, but has, thus far, not been collected. Types have not been examined but refer to the original publication.

The dimensions of the holotype given in the original description are probably incorrect, as per the image of the holotype (Fig. 16G in Tabachnick & Lévi 2004) of *B. meridionale*. If the length of the peduncle is correct at 400 mm long, then the thickness of the peduncle should be 40 mm, tapering to 20 mm thick. The basal disc of the peduncle should be 60 mm wide (not 50 mm as stated). The softer body of the sponge is 195 mm high (not 130 mm as stated), 120 mm maximum diameter as stated.

Genus ***Saccocalyx*** Schulze, 1896

Saccocalyx Schulze, 1896: 53; Tabachnick 2002: 1409.
Nubicaulus Reiswig, 1999: 503.

Diagnosis. Bolosominae with a cup-like body, large atrial cavity and thin walls. Basiphytous with long, tubular peduncle. Large specimens have lateral oscula on the digitate processes of the wall. Choanosomal spicules are diactins and hexactins. Spicules of the peduncle are long diactins fused by synapticula. Dermalia and atrialia are pinular hexactins. Microscleres are mainly spirodiscohexasters and plumicomes; drepanocomes, codonhexasters (anchorate discohexasters) and acanthose microxyhexactins may be present or absent (modified from Tabachnick 2002).

Remarks. The diagnosis of *Saccocalyx* is modified from that of Tabachnick (2002) due to addition of *S. microhexactin* by Gong *et al.* (2015) and *S. tetractinus* **sp. nov.** here.

Type species. *Saccocalyx pedunculatus* Schulze, 1896 by monotypy.

Saccocalyx tetractinus **sp. nov.**

Figs 46, 47; Seafloor Image Figs 85–97; Table 21

Material examined. Holotype NIWA 70933, NZOI Stn E745A, 88 km southeast of East Cape, North Island, 38.067° S, 179.108° E, 1441 m, 28 Mar 1967. **Paratype** NIWA 93419, NIWA Stn TAN1402/8, Forde Guyot, Louisville Seamount Chain (International waters), 35.350° S, 170.370° W, 1154–1270 m, 08 Feb 2014.

Comparative material examined. *Saccocalyx pedunculatus*, holotype, BMNH 08.9.24.17, central Bay of Bengal, Indian Ocean, RIMSS *Investigator,* Stn 118, 12.333° N, 85.133° E, 3300 m, 15 Dec 1890; BMNH 07.8.1.13, RIMSS *Investigator,* Stn 118 (same location and probably from same specimen).

Other locations (images only). *Seamount 114, East of Three Kings Ridge* (*International waters)* (collected by GEOMAR ROV *Kiel 6000*, onboard RV *Sonne*, ICBM expedition SO254): NIWA 126012, RV *Sonne* Stn SO254/08ROV02_BIOBOX4, 31.300° S, 175.196° E, 1347 m, 31 Jan 2017 (Seafloor Image Fig. 87).

Abyssal basin between Three Kings & Colville Ridges (collected by GEOMAR ROV *Kiel 6000*, onboard RV *Sonne*, ICBM expedition SO254): NIWA 126029, RV *Sonne* Stn SO254/10ROV03_BIOBOX3, 30.991° S, 177.500° E, 4160 m, 01 Feb 2017 (Seafloor Image Fig. 88).

Seamount 1247, off East Cape (collected by GEOMAR ROV *Kiel 6000*, onboard RV *Sonne*, ICBM expedition SO254): NIWA 126321, RV *Sonne* Stn SO254/84ROV18_BIOBOX11, 37.912° S, 179.215° E, 1352 m, 23 Feb 2017 (Seafloor Image Fig. 86); NIWA 126322, RV *Sonne* Stn SO254/84ROV18_BIOBOX3, 37.916° S, 179.215° E, 1457 m, 23 Feb 2017 (Seafloor Image Fig. 85); NIWA 126323, RV *Sonne* Stn SO254/84ROV18_BIOBOX3, 37.916° S, 179.215° E, 1457 m, 23 Feb 2017.

Rumble II East Seamount, Kermadec Ridge: NIWA Stn TAN1007/46, 35.426° S, 178.652° E, 1113–1377 m, 01 Jun 2010 (Seafloor Image Fig. 89).

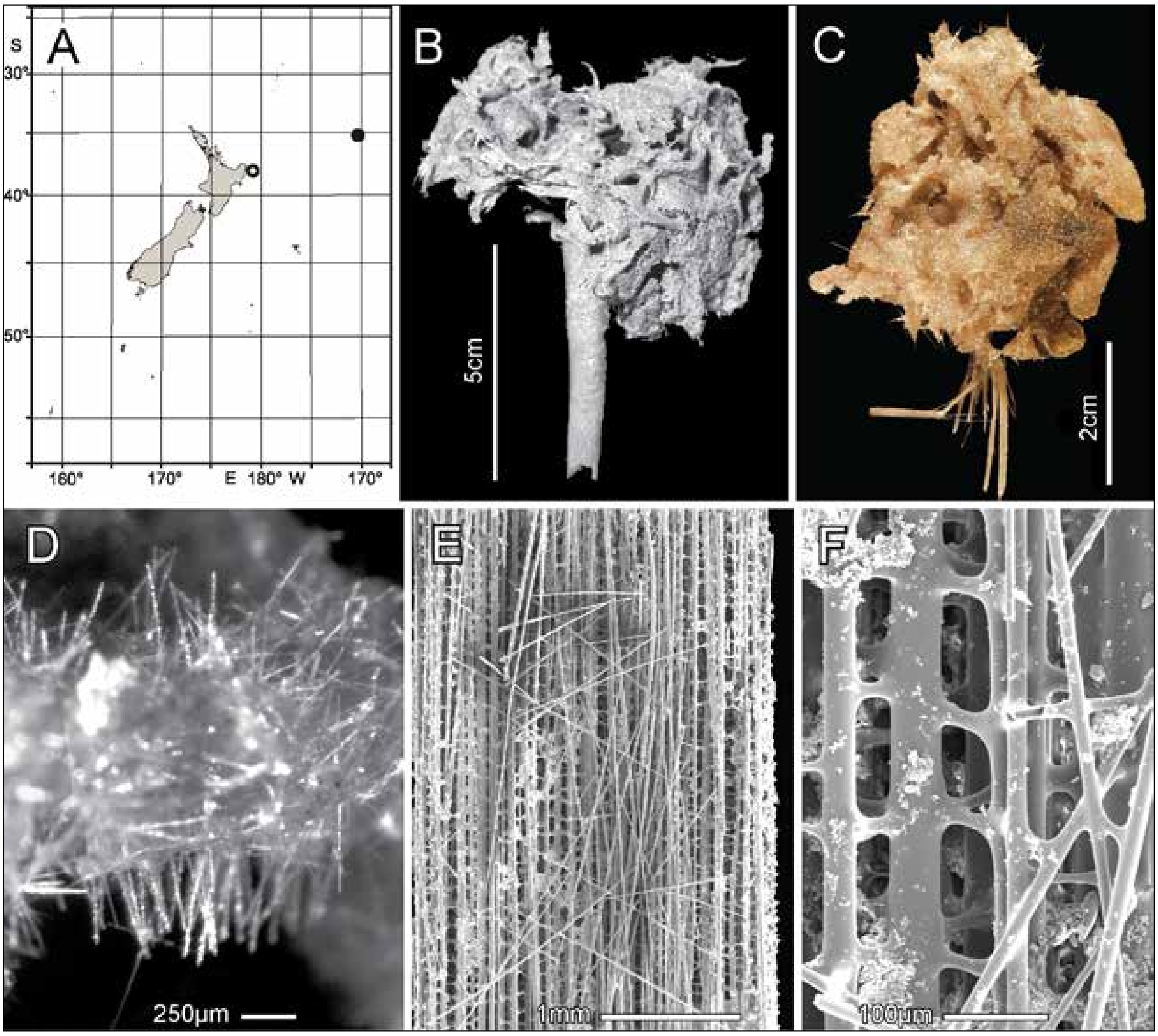


Figure 46. *Saccocalyx tetractinus* **sp. nov.**, distribution, morphology, skeleton: **A.** distribution in New Zealand and International waters, the type locality as unfilled circle, the new specimen as filled circle; **B.** holotype NIWA 70933; **C.** paratype NIWA 93419; **D.** close view of dermal and atrial pinules projecting from a wall section; **E.** surface of a sliver of the stalk showing inner diactins with few synapticula and oriented randomly; **F.** close-up view of stalk diactins connected by fairly long synapticula.

Rumble II West Seamount, Kermadec Ridge: NIWA Stn TAN1007/041, 35.350° S, 178.546° E, 1197 m, 31 May 2010 (Seafloor Image Fig. 90).

Louisville Seamount Chain (International waters): NIWA Stn TAN1402/6, Forde Guyot, 35.349° S, 170.374° W, 1145–1390 m, 08 Feb 2014 (Seafloor Image Figs 92–95); NIWA Stn TAN1402/68 (Seafloor Image Fig. 96); Anvil Seamount, 37.636° S, 169.129° W, 1162–1528 m, 16 Feb 2014; NIWA Stn TAN1402/150, Valerie Guyot, 41.381° S, 164.424° W, 1135–1400 m, 01 Mar 2014 (Seafloor Image Fig. 97).

Macquarie Ridge: NIWA Stn TAN0803/032, Seamount 3, 50.092° S, 163.461° E, 1091 m, 1 Apr 2008 (Seafloor Image Fig. 91).

Type locality. Eighty-eight km southeast of East Cape, North Island (Fig. 46A).

Distribution. Known from only two locations, just southeast of North Cape, North Island and far northeast of North Island, in International waters on the Louisville Seamount Chain (International waters) (Fig. 46A), and Macquarie Ridge to the south of New Zealand.

Habitat. Attached to hard substratum at a depth of 1083–1270 m.

Description. Morphology of both holotype and paratype (Fig. 46B, C) was heavily damaged during collection, obscuring the main osculum and lateral processes of the upper body. Only remnants of the stalk are present in both. The body surface of the holotype is rag-like but the paratype retains some regions with delicate structure including dermal pinules in a normal tight palisade (Fig. 46D). The remaining upper part of the stalk of the holotype is in fair shape, showing most surface

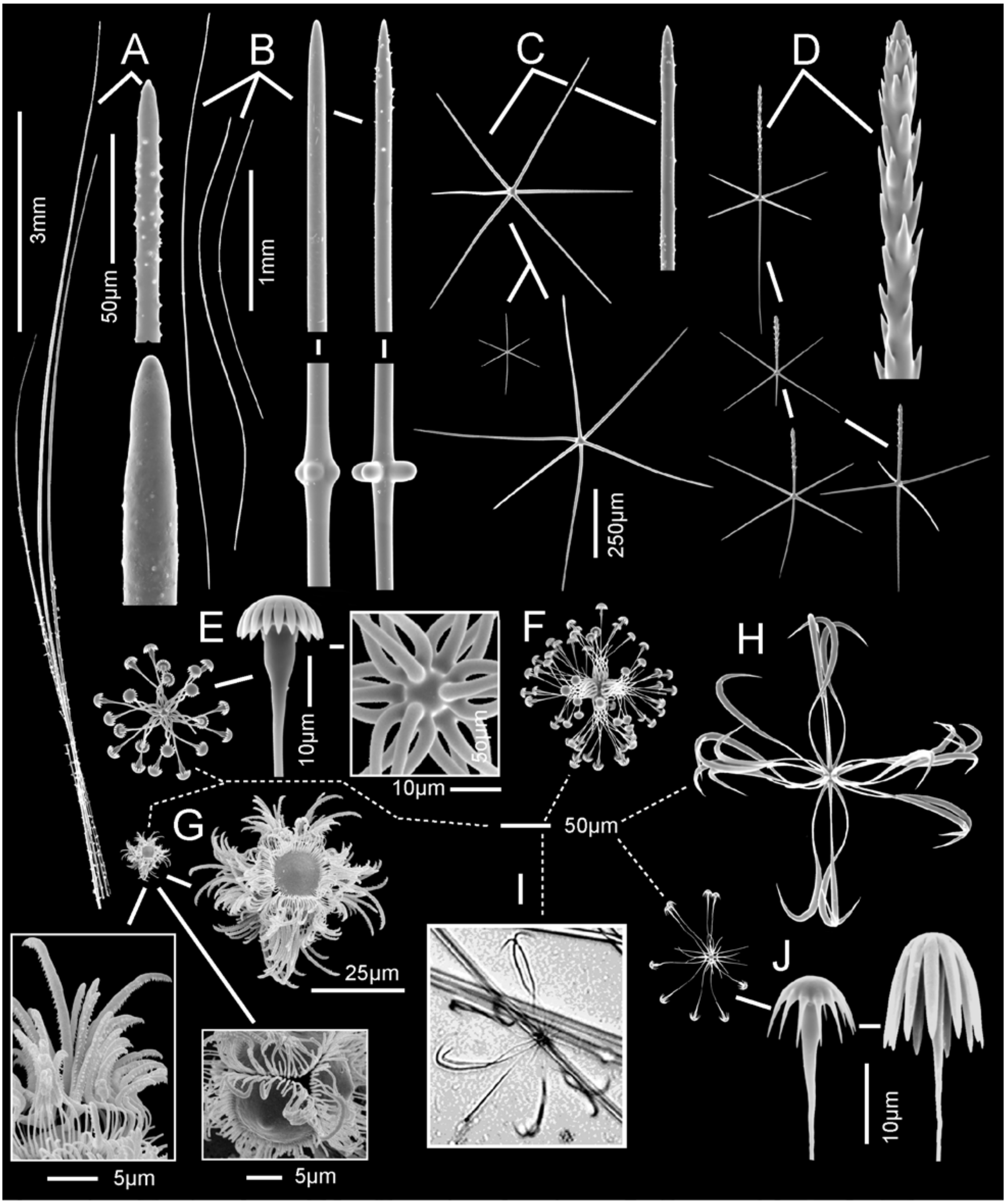


Figure 47. *Saccocalyx tetractinus* **sp. nov.**, spicules and a comparative spirodiscohexaster from holotype of *S. pedunculatus*: **A.** stalk diactins partially free of fusion with two enlarged tips; **B.** choanosomal diactins, two whole, two enlarged centres and tips; **C.** choanosomal hexactins, two whole large and one small, with an enlarged tip from a large example; **D.** surfacial pinular hexactins (dermalia or atrialia), four whole and enlarged pinular ray end; **E.** spirodiscohexaster whole and enlarged terminal ray and spicule centre; **F.** comparable spirodicohexaster from holotype of *S. pedunculatus*; **G.** aspidoplumicome, whole at scale of other microscleres and enlarged to show detail plus enlarged secondary ray tuft and primary disc margins, never fused; **H.** drepanocome 1; **I.** drepanocome 2 in LM since not encountered in SEM; **J.** codonhexaster, nearly whole and two magnified examples of the anchorate terminal discs. Scales for whole megascleres the same as in B; scales for all megasclere ray tips as in A. All except F from *S. tetractinus* holotype, NIWA 70933.

Table 21. Spicule dimensions (µm) of *Saccocalyx tetractinus* **sp. nov.**, holotype NIWA 70933 and *S. pedunculatus* Schulze, 1896, holotype BMNH 08.9.24.17. Some spicules are present but unmeasurable (*).

Parameter	*S. tetractinus* NIWA 70933				*S. pedunculatus* BMNH 08.9.24.17			
	mean	**s. d.**	**range**	**no.**	**mean**	**s. d.**	**range**	**no.**
Choanosomal diactin								
length (mm)	2.9	0.7	1.3–4.6	50	2.9	1.0	1.0–4.8	30
width	11.1	2.5	4.5–18.1	50	13.2	3.7	5.5–17.8	30
Choanosomal hexactin								
ray length	482	114	225–723	50	413	153	215–1114	61
ray width	13.1	2.5	7.4–18.1	50	10.0	2.4	5.3–17.8	51
Small hexactin								
ray length	60.3	8.6	44.9–68.6	6	168	27	102–198	41
ray width	5.7	0.7	4.7–6.6	6	4.4	0.8	2.8–5.8	41
Surface pinular hexactin								
pinule ray length (mm)	301	95	87–484	50	401	41	305–485	50
pinule basal width	9.9	2.9	6.0–18.2	50	9.6	2.2	6.2–16.7	40
pinule maximum width	12.1	2.9	7.2–21.9	50	24.3	3.3	16.7–29.7	40
tangential ray length	296	69	185–495	50	220	38	143–329	50
tangential ray width	10.0	2.4	5.0–16.1	50	8.5	1.4	6.0–11.6	40
proximal ray length	393	140	130–672	50	309	120	117–587	50
proximal ray width	9.4	2.3	4.8–16.9	50	9.3	2.0	6.4–13.8	40
Spirodiscohexaster								
diameter	154	8.5	136–168	50	157	11.1	132–177	27
proximal ray length	7.4	0.9	5.5–9.2	50	10.9	1.2	9.2–14.0	27
secondary ray length	70.7	3.6	59.5–78.0	50	63.8	16.4	9.4–80.3	27
Aspidoplumicome								
diameter	52.2	4.5	41.6–64.1	50	68.2	n. a.	65.2–71.8	3
primary ray length	8.2	0.8	6.5–11.3	50	10.6	n. a.	10.2–11.0	3
secondary ray length	18.5	2.1	13.9–23.4	50	24.0	n. a.	21.7–26.5	3
Drepanocome 1								
diameter	330	22	227–364	50	*			
primary ray length	8.8	1.3	6.1–11.5	50				
secondary ray length	156	11	130–173	50				
Drepanocome 2								
diameter	148	36	103–220	18	113	8.5	100–122	6
primary ray length	6.4	1.2	4.5–10.0	18	7.6	1.1	6.2–9.4	6
secondary ray length	69	19	44–113	18	49.3	4.9	42.7–55.2	6
Codonhexaster								
diameter	140	27	116–165	27				
primary ray length	6.3	0.7	5.0–7.9	27				
secondary ray length	64	7	53–77	27				

diactins firmly attached by synapticular bridges and oriented parallel to the stalk surface; some diactins in the stalk canal remain unattached or poorly so and are oriented oblique to the stalk surface (Fig. 46E). Synapticula are very abundant but they do not occlude the volume of space between adjacent spicules in these still young specimens (Fig. 46F). The holotype body is 7.4 cm in diameter and 5.9 cm in height; the hollow stalk fragment is 5.2 cm in length and varies in width from 9.1–6.5 mm, expanding as it approaches the body. The paratype body is 4.8 cm wide and 4.9 cm tall; the residual stalk fragment is 2.3 cm long but shattered. The upper bodies of both specimens are dark brown from mud filling; the stalk remnants are white. Living specimens reveal a beautiful pocketed, bubbled soft body atop a long slender, frequently, kinked, stem (Seafloor Image Figs 85–97).

Skeleton. Choanosomal skeleton consists of a confused tangle of loose megascleres spread without order onto the fused diactins of the stalk. No synapticular fusion was detected among choanosomal body spicules. Loose megascleres and microscleres are randomly strewn through the dark tissue of the upper body. Ectosomal skeleton is preserved only in the paratype in the palisade arrangement of dermalia in patches of surface.

Spicules. Megascleres (Figs 46, 47; Table 21) consist of stalk diactins, choanosomal diactins, choanosomal hexactins, and surfacial hexactins; atrialia could not be isolated. Detached stalk diactins (Fig. 47A) are partially free of synapticula and smooth with subterminal spines that are subsumed by silica deposition in thicker spicules; tips are bluntly rounded. Choanosomal diactins (Fig. 47B) are sinuous or curved, rarely straight, smooth with more pointed tips, with or without subterminal spines. Choanosomal hexactins (Fig. 47C) have rays of approximately equal length that are entirely but very sparsely covered by minute spines; tips are sharp-pointed with slightly denser but not abundant small spines. Small choanosomal hexactins with rays less than 200 µm in length are moderately common and reported here as a distinct spicule category because they could be considered microhexactins but they do not differ from the other choanosomal hexactins except in size. Dermalia and atrialia are thin, pinular hexactins (Fig. 47D), with the long pinulus bearing strong, sharp, obliquely-projecting scales but with the pinulus terminally inflated only slightly (mean maximal diameter only 12.3% greater than basal diameter); the pinulus tip is rather abruptly pointed. The other rays are like those of choanosomal hexactins with the tangential rays about the same length as the pinulus but the proximal ray about 30% longer.

Microscleres (Fig. 47; Table 21) are spirodiscohexasters, aspidoplumicomes, drepanocomes of two sizes and anchorate discohexasters (codonhexasters). Spirodiscohexasters (Fig. 47E) are spherical in shape with the distal end of each short primary ray, a small knob on the centrum, supporting four and only four terminal rays that spiral out one-half turn counterclockwise to end in a terminal disc with 14–19, n = 31, short marginal teeth. Aspidoplumicomes (Fig. 47G) are bushy spicules with compact centre and frilly sigmoid terminal rays. The short, stout primary rays spread at their distal ends into shield-like convex rounded-square discs, each of which bears a single whorl of 75–81 (4 counted) terminal rays curving out from the margins, then up and in, and finally ending in an outward curve. The terminal rays differ in length and degree of curvature resulting in five or more layers in a tuft; the details of their precise arrangement remain unknown. Each terminal ray bears two irregular rows of reclined digitate denticles on their outer faces and end in simple rounded hooks. Drepanocomes 1 (Fig. 47H) are large, smooth, simple spicules; each short primary ray bearing four, sharply sigmoid terminal rays, each with a sharp, scythe-like outward bend, in the most distal part. Final ray tips are extremely sharp. Drepanocomes 2 are like drepanocome 1 but are about one-half their size and thickness. Anchorate discohexasters or codonhexasters (Fig. 47J) are delicate smooth forms with short distal rays that each bear four extremely thin (0.4–0.5 µm) terminal rays ending in shallow to deep umbels with about 10 long marginal teeth. Immature umbels may be shallow (height/width = 0.64) but usually they are taller than wide (height/width > 1). No acanthose microhexactins were found after extensive search of the holotype but many 53–185 µm in diameter occur in the paratype.

Etymology. The species name, *tetractinus*, is chosen to reflect the presence here of four secondary rays on each primary ray of all spirodiscohexasters.

Remarks. The new species clearly meets all criteria for membership in the genus *Saccocalyx* but how does it differ from the three known species, type species *S. pedunculatus* Schulze, 1896 from the Bay of Bengal, *S. careyi* (Reiswig, 1999) from Northern California, and *S. microhexactin* Gong *et al.* 2015 from the South China Sea? The first problem is that Schulze (1896, 1902), in his description of the single type specimen of *S. pedunculatus* from the *Investigator* Expedition, saw and reported only two microscleres, the spirodiscohexasters and plumicomes. Thus, the other microscleres were unknown in the genus and Reiswig (1999) therefore erected the new genus and species, *Nubicaulus careyi*, with drepanocomes and codonhexasters to fill that gap. Soon after, Tabachnick (2002) re-examined and re-described the *Investigator* specimen of *S. pedunculatus* but at this point the second problem arose. Tabachnick wisely confined himself to the type specimen when describing megascleres but shifted in his treatment of microscleres to include numerous (~20?) other specimens from other collections. He considered all known specimens of *Saccocalyx* to belong to the single widespread polymorphic species *S. pedunculatus* with the result that at that point there was no firm knowledge about the categories, sizes and details of the microscleres of the type specimen of *S. pedunculatus.* All the non-type specimens he included in his material and all other specimens uncritically assigned to *S. pedunculatus* in other works should be regarded as "*Saccocalyx* sp." until their relationships to the other type specimens are individually clarified. We were thus unable to make a complete comparison between the new New Zealand material and the type specimen of *S. pedunculatus* at that time.

To alleviate this problem, we obtained small fragments of two subspecimens of the *S. pedunculatus* type specimen from the British Museum and carried out detailed spicule assessment (Table 21). Microscleres include two sizes of drepanocomes but the larger one was present only as unmeasurable fragments; we found no evidence of codonhexasters. Comparing the new species with *S.*

pedunculatus, the small hexactins differ in size with no overlap. Pinules in the new species are little thickened distally (12.1 vs 24.3 µm). Spirodiscohexasters of the new species all have four terminal rays on each primary ray (Fig. 46E) compared to *S. pedunculatus* with 12.3 (8–16), n = 20 (Fig. 46F). These differences indicate that there is presently is no genetic exchange between the populations of Bay of Bengal and New Zealand.

The new New Zealand species differs from *S. careyi* in having no abruptly terminated, 'clavate' dermalia (vs about 10% there), having four terminal rays on each spirodiscohexaster primary (vs 15–24 there), having a small class of drepanocomes (vs none there) and having codonhexasters (vs none there). These differences are considered adequate evidence to conclude the local populations have no genetic connectivity.

The New Zealand species differs from *S. microhexactin* in having the distal end of the pinular ray moderately swollen vs not swollen, having four terminal rays on each primary of spirodiscohexasters vs 8–12 there, having four terminal rays on each primary of drepanocomes 1 vs eight rays there and having codonhexasters vs none there. These differences are again adequate to show little or no genetic connection between these populations. The microacanthohexactins emphasized by Gong *et al.* (2015) as particularly significant in *S. microhexactin* seem less so because of their moderate numbers in the paratype of the New Zealand species.

We illustrate numerous specimens originally identified by us as *Saccocalyx pedunculatus* (Seafloor Image Figs 85–97). With resolution of the problems of specimen comparisons, we find that the New Zealand *Saccocalyx* specimens, now known as *S. tetractinus* **sp. nov.**, have unique spicule complement differing from all recognised species. Thus, all specimens from at least the surrounding 1500 km from the New Zealand coastline should now be referred to as *S. tetractinus* **sp. nov.** until they can be assessed for their spiculation. In 'Seafloor images of living euplectellid sponges', we include an image of an uncollected sponge from over 2000 m depth in International waters near the Cook Islands (NOAA ROV *Deep Discoverer 2* Stn EX1705/Dive03 onboard RV *Okeanos Explorer*, Te Kawhiti a Maui Potiki deep ridge, 04.584° S, 162.399° W, 2210–2200 m), considered at this stage to be *Saccocalyx pedunculatus* (Seafloor Image Fig. 98).

Key diagnostic characters

- Soft upper body with loose spicules borne on narrow stalk of fused diactins
- Megascleres consist of diactins and hexactins
- Microscleres consist of spirodiscohexasters, aspidoplumicomes, two sizes of drepanocomes and codonhexasters with microacanthohexactins only in the paratype
- All rayed microscleres have only four terminal rays on each primary ray

Genus ***Hyalostylus*** Schulze, 1886

Hyalostylus Schulze, 1886: 44.

Diagnosis. Body is pedunculate, basiphytous, with bell-like or discoidal upper part and usually, a vast atrial cavity. Choanosomal spicules are diactins. The spicules of the peduncle are diactins fused by synapticula. Dermalia and atrialia are hexactins and sometimes pentactins. Microscleres are combinations of sigmatocomes, spherical and stellate discohexasters with serrated, toothed and anchorate discs, hexasters with typha-like secondary rays and floricomes (emended from Tabachnick 2002).

Remarks. Images of living, purported New Zealand *Hyalostylus* spp., are figured in Seafloor Image Figs 26, 27.

Type species. *Hyalostylus dives* Schulze, 1886 (by monotypy).

Hyalostylus monomicrosclerus Tabachnick & Lévi, 2004

Hyalostylus monomicrosclerus Tabachnick & Lévi, 2004: 37, figs 13D–E, 15A–J.

Type & locality. Holotype—MNHN HCL570, BIOCAL *Jean Charcot* Stn CP 60, New Caledonia, 24.024° S, 167.141° E, 1480–1530 m, 1985. **Paratypes**—MNHN HCL571–582, BIOCAL *Jean Charcot* Stn CP 57, New Caledonia, 23 deg 43.721° S, 166.968° E, 1490–1620 m, 1985; MNHN HCL569, BIOCAL *Jean Charcot* Stn CP 26, New Caledonia, 22.661° S, 166.457° E, 1618–1740 m, 1985.

Distribution. Norfolk Ridge south of New Caledonia, between depths of 1480–1740 m.

Diagnosis (translated from the original description). The holotype and paratypes have the shape of a finely stalked mushroom, the peduncle of which ranges from 15–70 mm long, 1–1.5 mm diameter. The body is oval, flattened, 26–35 mm diameter, 12–15 mm thick. One of the paratypes forms an oval plate measuring 22–25 mm diameter and sits oblique to the summit of the peduncle. The choanosomal spicules are diactins of two types: the largest are smooth with roughened tapering or obtuse extremities, measuring 4–10 x 0.06–0.08 mm. Most of the choanosomal diactins measure 0.5–1 x 0.003–0.010 mm; they are rough or smooth near the centre and the extremities are tapered or obtuse and rough. The diactins of the peduncle are 0.010–0.091 mm diameter and are linked by synapticula. The dermal and atrial spicules are hexactins, pentactins and rarely stauractins, with roughened tapering or obtuse extremities. The distal actins of the dermal hexactins are 0.015–0.129 mm long, the tangential actins of the hexactins, pentactins and stauractins are 0.167–0.395 mm long, the proximal actins of hexactins and pentactins are 0.106–0.699 mm long. The proximal actins of the atrial hexactins are 0.053–0.122 mm long, tangential actins measure 0.091–0.350 mm; the distal actins of the hexactins and pentactins are 0.243–0.730 mm long. The actins of the dermal and atrial spicules are 0.011–0.022 mm thick. There is only one type of microsclere, the sigmatocome, measuring 0.032–0.050 mm diameter, with a primary rosette of 0.008–0.013 mm diameter.

Remarks (translated from the original description). This new species was classified in the genus *Hyalostylus* without consideration of the types of microsclere present. The two species of *Hyalostylus*, *H. dives* of the central Pacific (Schulze 1886, 1887) and *H. monomicrosclerus*, differ from the other genera of Euplectellidae with peduncles by the absence of plumicomes and amphidiscs. The two species differ in their shape, *H. dives* having a funnel-shaped peduncle and body, and by the microscleres, which are sigmatocomes, floricomes and various discohexasters, some with secondary typhoidal actins.

Further remarks. *Hyalostylus monomicrosclerus* has thus far been recorded only from the the Norfolk Ridge south of New Caledonia, between depths of 1480–1740 m. A diagnosis of this species has been included as it is considered highly likely to be present in the New Zealand region, but has, thus far, not been collected. Types have not been examined but refer to the original publication. The dimensions of the paratype given in the original description are probably incorrect, according to the images (Fig. 13D, E in Tabachnick & Lévi 2004) of *H. monomicrosclerus*. Only the paratype is figured: If the length of the paratype peduncle is correct at 70 mm, then the peduncle should taper from 2.5 mm thick to 1.3 mm thick at the base (not 1–1.5 mm thick as stated) and the ovoid body of the paratype should be 44 mm high (not 35 mm as stated) and 34 mm wide.

Genus *Amphidiscella* Tabachnick & Lévi, 1997

Amphidiscella Tabachnick & Lévi, 1997: 147.

Diagnosis. Body is cup-like, basiphytous, pedunculate. Choanosomal skeleton is chiefly of diactins. Dermalia and atrialia are hexactines. Microscleres are amphidiscs, staurodiscs, hexadiscs, hemidiscohexasters, discohexasters, floricomes and sometimes sigmatocomes (from Tabachnick 2002).

Remarks. Images of living, purported *Amphidiscella* spp., are figured in Seafloor Image Figs 17–20.

Type species. *Amphidiscella caledonica* Tabachnick & Lévi, 1997.

Amphidiscella abyssalis sp. nov.

Figs 48–49; Seafloor Image Figs 1–3; Table 22

Material examined. Holotype NIWA 126030, RV *Sonne* Stn SO254/10ROV03_BIOBOX11, abyssal basin between Three Kings & Colville Ridges, 30.991° S, 177.501° E, 4159 m, 01 Feb 2017 (Seafloor Image Fig. 1), collected by GEOMAR ROV *Kiel 6000*, onboard RV *Sonne*, ICBM expedition SO254. **Paratypes** *Abyssal basin between Three Kings & Colville Ridges* (collected by GEOMAR ROV *Kiel 6000*, onboard RV *Sonne*, ICBM expedition SO254): NIWA 126031, RV *Sonne* Stn SO254/10ROV03_BIOBOX3, 30.991° S, 177.500° E, 4160 m, 01 Feb 2017 (Seafloor Image Fig. 3); NIWA 126032, RV *Sonne* Stn SO254/10ROV03_BIOBOX4, 30.991° S, 177.500° E, 4160 m, 01 Feb 2017 (Seafloor Image Fig. 2); NIWA 126033, RV *Sonne* Stn SO254/10ROV03_BIOBOX1, 30.991° S, 177.500° E, 4162 m, 01 Feb 2017.

Type locality. Abyssal basin between Three Kings & Colville Ridges (Fig. 48A).

Distribution. Known only from the type location.

Habitat. Attached to hard substratum between 4159 and 4162 m.

Description. Morphology of the holotype is a tulip- or bonnet-shaped body on a moderately long thin stalk (Fig. 48B–F; (Seafloor Image Figs 1–3). The body is delicate and fragile, easily torn and broken during handling. The body consists of a lower spherical part with an undulating, almost ribbed surface, supporting a wider, flaring upper part bearing the oscular margin with a sharp outer margin. The atrium is either narrow and deep or shallow and bears one to four large uncovered openings of large exhalant canals. The external body surface is smooth to the eye but covered with small depressions visible under a dissecting microscope (Fig. 48G) with distal ends of dermalia protruding from the raised surface. The rigid stalk is

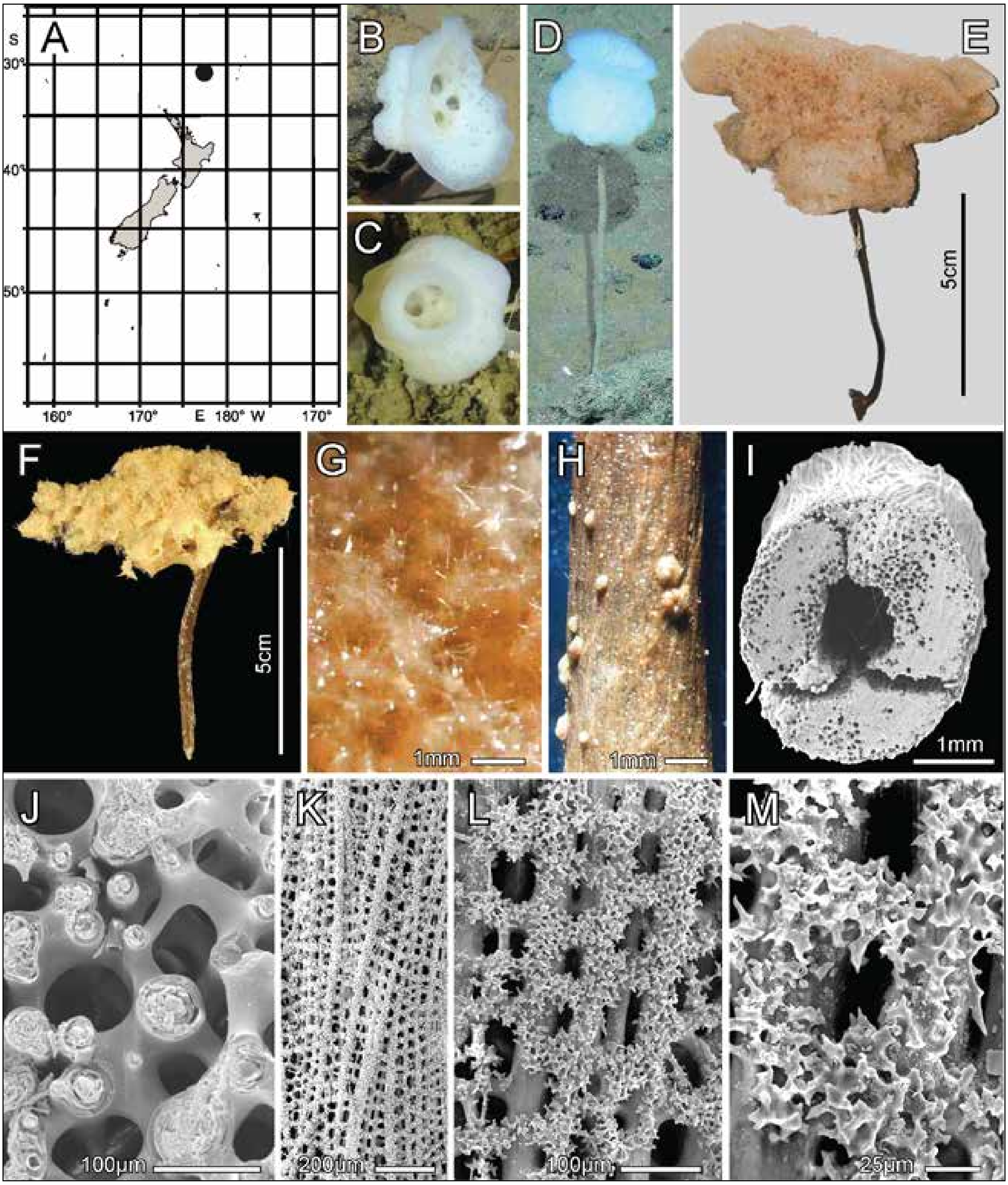


Figure 48. *Amphidiscella abyssalis* **sp. nov.**, distribution, morphology, skeleton: **A.** distribution in New Zealand waters; **B.** holotype NIWA 126030, *in-situ* image; **C.** paratype NIWA 126031, *in-situ* image; **D.** paratype NIWA 126032, *in-situ* image; **E.** holotype deck image; **F.** holotype lab image; **G.** dermal surface; **H.** stalk fragment with attached Foraminifera; **I.** sectioned hollow stalk; **J.** closer view of sectioned stalk showing tabular connections between diactins; **K.** surface of stalk at low resolution showing tabulae and surface ornamentation; **L.** close view of stalk surface ornamentation; **M.** closer view of stalk surface ornamentation. Figures B, E–M from holotype. Images in B–D captured by GEOMAR ROV *Kiel 6000* onboard RV *Sonne* (voyage SO254), courtesy of Project *PoriBacNewZ*, GEOMAR & ICBM.

clearly undefended (without living tissues), colonised by small foraminifera (Fig. 48H), and hollow (Fig. 48I). The holotype, in the deck photo, is 79 mm in greatest diameter, 48 mm in body height, 36 mm in diameter of the lower spherical part, 54 mm in stalk length and 3 mm in stalk diameter. Paratypes in order given above are 61, 30 and 37 mm in greatest diameter, 34, 20 and 18 mm in height, 21, 15 and [unmeasurable] mm in diameter of the lower spherical part, and 4, 3 and 3 mm in stalk diameter. Complete stalks were not collected for any of the paratypes so stalk lengths are not available. Colour *in-situ* appeared white; on deck and preserved they are beige.

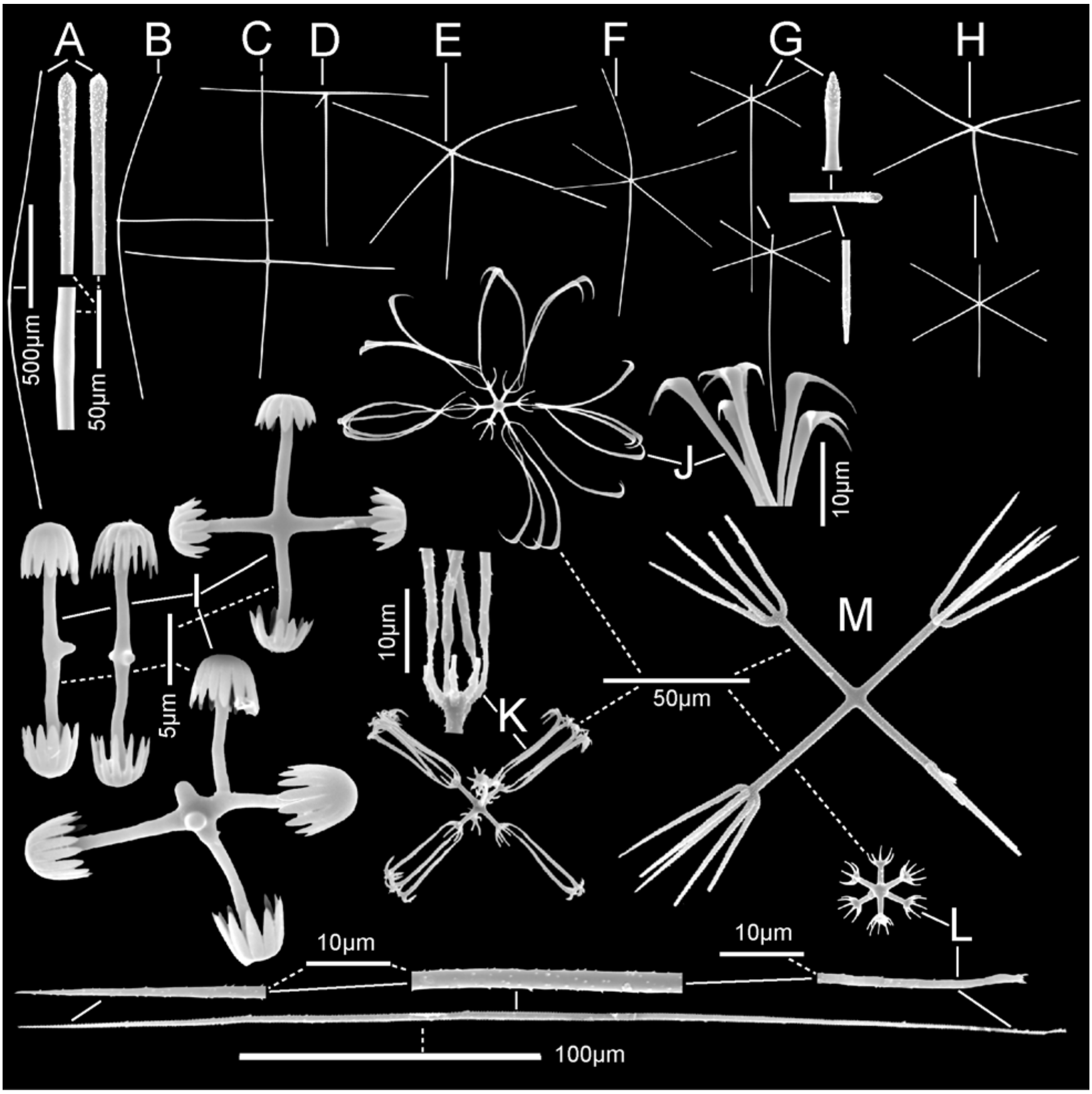


Figure 49. *Amphidiscella abyssalis* **sp. nov.**, NIWA 126030 spicules: **A.** choanosomal diactin, one whole and enlarged tips and centre; **B.** choanosomal tauactin; **C.** choanosomal stauractin; **D.** choanosomal paratetractin; **E.** choanosomal pentactin; **F.** choanosomal hexactin; **G.** two sword-like hexactine dermalia with enlarged ray ends; **H.** two types of atrialia, a pentactin and hexactin; **I.** amphidiscs and derived tetradisc and hemitriaster; **J.** atypical floricome with enlargement of secondary ray ends; **K.** stunted graphiocome, whole and enlarged attachment of secondary rays to primary ray end; **L.** graphiocome centrum, whole secondary ray and enlarged parts of secondary ray; **M.** oxystauraster. All whole megascleres and parts at same scales shown in A.

Skeleton. Choanosomal skeleton is a loose network of mostly single disoriented choanosomal diactins, fewer choanosomal hexactins and pentactins and very few choanosomal tauactins, stauractins and paratetractins. All choanosomal megascleres are about the same size but only 2 longer thicker (and broken) diactins 9 mm x 49 µm were found that appear to be proper since their terminations are similar to those of the other megascleres. Spicule fusion is restricted to the stalk and does not occur in the body. Thin comitalia are also not present.

Ectosomal skeleton consists of sword hexactins of the dermal surface, pentactins and hexactins on the atrial surface and microscleres associated with them.

Stalk skeleton is unusual in the diactins not being joined by simple synapticula and fusion at points of contact, but here being joined by secondary silica deposited as thick struts (Fig. 48J) forming porous tabulae at fairly regular intervals along the stalk (Fig. 48K). The outer stalk surface is also ornamented with an anaxial siliceous coating with sharp, spiny surfaces all along the outer diactins and tabulae (Fig. 48L, M); there is no trace of this coating internally within the stalk.

Spicules. Megascleres (Fig. 49; Table 22) of the body are numerically dominated by large choanosomal slightly curved diactins with slightly swollen rough ends and abruptly blunted tips (Fig. 49A). The central swelling is small but easily recognisable. The next most abundant megasclere types (~1/10th of diactins) are choanosomal pentactins and hexactins (Fig. 49E, F), with all rays about equal in length and slightly curved. Rays are smooth with rough ends exactly like those of the diactins. Rare megascleres (~1/100th of diactins) are tauactins, stauractins and paratetractins (Fig. 49B–D) with the same characteristics of the pentactins and hexactins. Dermalia are sword-shaped hexactins (Fig. 49G) with straight smooth rays; the short distal ray bears short proclined spines at the swollen end in place of the vertical spines on choanosomal megascleres. Tangential ray ends are like those of other megascleres but the proximal rays lack the preterminal swelling and appear more tapered to a bluntly rounded tip. Atrialia (Fig. 49H) consist of pentactins and hexactins in about the same proportions (48:44) with a very few paratetractins. They are like the other megascleres but the hexactins have the shorter distal ray without the subterminal swelling and spination of dermalia.

Microscleres (Fig. 49I–L; Table 22) are difficult to characterise because all specimens include a large variety of clearly foreign origin including parts of drepanocomes, spirodiscohexasters, aspidoplumicomes, regular discohexasters and spiral graphiocome terminal rays. Proper microscleres are determined by abundance, consistency of occurrence in all specimens, and absence of potential foreign source. Proper microscleres thus include the overwhelmingly abundant amphidiscs and their variants, an atypical floricome, a stunted graphiocome and a large graphiocome; an oxyhexaster/stauraster is included although it is not abundant and usually broken but a candidate foreign source is presently unknown. Amphidiscs, tetradiscs and derived hexasters (Fig. 49I) are minute but at least 100 times more abundant than any other microsclere type. Amphidiscs, the most numerous forms, are entirely smooth, have two terminal umbels and strongly developed central swellings. Far less common are the tetradiscs and hemihexaster varieties with number of umbels ranging from 3–7; the number of umbel teeth range is 12 (9–15), n = 21. Atypical floricomes (Fig. 49J) are like floricomes in having six tufts of sigmoid terminal rays with swollen ends and claws asymmetrically arranged on each terminal ray tip but differ in having no significant broadening (discoidal aspect) of the terminal tip swelling and having no ornamentation on the terminal ray shafts. They are entirely smooth with each primary ray bearing 5 (4–7), n = 43 terminal rays with ends vertically swollen and bearing 1–3 asymmetrically directed claws. Stunted graphiocomes (Fig. 49K) are uncommon but clearly derivations of graphiocomes in that the centrum is identical to those, have terminal rays with a swelling just above the narrow attachment to the primary ray and bear small recurved shaft spines similar to those on the graphiocome terminal rays. Here, however, the terminal rays are abbreviated and terminate in either 1–6 onychoid claws or simply a sharp hook. Graphiocomes (Fig. 49L)

Table 22. Spicule dimensions (µm) of *Amphidiscella abyssalis* **sp. nov.**, from holotype NIWA 126030.

Parameter	mean	s. d.	range	no.
Choanosomal diactin				
length (mm)	2.1	0.4	0.7–2.8	50
width	9.2	1.8	5.5–13.8	53
Choanosomal pentactin				
tangential ray length	581	112	415–940	31
proximal ray length	578	113	331–872	27
ray width	13.7	2.7	8.5–16.0	31
Choanosomal hexactin				
ray length	551	129	339–744	12
ray width	11.9	3.2	5.6–16.0	12
Dermal sword hexactin				
distal ray length	118	53	35–313	50
tangential ray length	426	71	302–599	50
proximal ray length	796	169	402–1086	49
ray width	11.0	2.9	5.8–18.8	51
Atrialia, pentactin				
tangential ray length	615	117	439–961	45
proximal ray length	585	134	205–870	43
ray width	13.7	2.5	7.3–18.8	46
Atrialia, hexactin				
distal ray length	102	50	51–305	36
tangential ray length	488	89	381–911	36
proximal ray length	631	255	103–1085	36
ray width	12.8	2.7	5.6–18.5	40
Amphidisc				
length	19.2	2.9	12.2–25.5	53
umbel height	3.6	0.9	1.5–6.4	53
umbel diameter	4.3	0.7	3.0–6.6	53
Tetradisc, hexadisc & hexaster				
diameter	24.2	5.9	17.8–56.7	53
umbel height	3.9	0.9	2.5–6.4	53
umbel diameter	5.1	0.9	3.3–8.4	53
Floricome				
diameter	102.7	16.1	61.3–137.4	51
primary ray length	9.1	1.2	6.5–11.7	51
secondary ray length	42.7	8.0	24.1–61.2	51
Stunted graphiocome				
centrum diameter	23.2	2.4	20.2–27.0	7
secondary ray length	36.9	11.3	25.7–61.1	7
Graphiocome				
centrum diameter	22.5	3.1	15.2–31.7	53
secondary ray (raphide) length	362.1	30.0	292.3–424.3	53
Oxyhexaster				
diameter	162	14	121–189	49

are abundant spicules, always broken apart, with short smooth primary rays, each bearing 7 (4–9), n = 15 very long and robust terminal rays, 3 (2.4–2.9) µm thick (n = 6), sparsely ornamented with small recurved spines and ending in a sharp oxyoid tip. Mean diameter of the intact spicules is calculated to be 747 µm. Occasionally terminal rays have a branched tip with one branch shaped as a recurved hook. Oxyhexasters and rare oxystaurasters (Fig. 49M) are entirely rough with straight terminal rays numbering 4–7 on each primary ray. These spicules are rare and invariably broken and would be considered likely to be foreign in origin, but there is so far, no known candidate in the area that could be the source of this spicule. They occur in all four specimens and are therefore considered to be proper.

Etymology. The species name, *abyssalis*, refers to the great depth from which this new species was collected: greater than 4000 m deep within the abyssal South Fiji Basin, between the Three Kings and Colville Ridges, north of New Zealand.

Remarks. The specimens described above clearly belong to the genus *Amphidiscella* by their possession of amphidiscs and floricome microscleres. They differ from the geographically closest species, *A. caledonica* Tabachnick & Lévi 1997, in the absence of graphiocomes and presence of normal floricomes there. The other Pacific species, *A. lecus* Reiswig, 2014, from off Washington, USA, has entirely different graphiocomes (called spiroxyhexasters) with thick spiraled raphides, true floricomes, and codonhexasters (none here). They share the same stalk structure and ornamentation with the specimens here. The North Atlantic species, *A. atlantica* Tabachnick & Collins, 2008, has no floricome (for which it probably should be moved to *Vityaziella* Tabachnick & Lévi, 1997). The last species, also North Atlantic but further north, *A. monai* Tabachnick & Lévi, 1997, has graphiocomes (called sigmatocomes) with sigmoid terminal rays (straight here), discohexasters with hemispherical discs (none here) and typical floricomes with spined terminal rays (smooth rays on floricomes here). These differences indicate that the New Zealand specimens represent a new species which is here designated *Amphidiscella abyssalis* **sp. nov.**

Key diagnostic characters

- Non-euplectelloid, soft, tulip-shaped body on a thin undefended stalk
- Choanosomal megascleres; mainly diactins, hexactins and pentactins, share a narrow size range of one to two mm total length
- Dermalia are sword-like hexactins; atrialia are equal numbers of pentactins and hexactins
- Spicule fusion is present only in the stalk
- Microscleres are amphidiscs and variants, atypical floricomes, large graphiocomes, stunted graphiocomes and oxyhexasters

Amphidiscella sonnae sp. nov.

Figs 50–51 Seafloor Image Fig. 4; Table 23

Material examined. Holotype NIWA 126034**,** RV *Sonne* Stn SO254/10ROV03_BIOBOX7, abyssal basin between Three Kings & Colville Ridges, 30.991° S, 177.501° E, 4159 m, 01 Feb 2017 (Seafloor Image Fig. 4), collected by GEOMAR ROV *Kiel 6000*, onboard RV *Sonne*, ICBM expedition SO254.

Type locality. Abyssal basin between Three King & Colville Ridges (Fig. 50A).

Distribution. Known from only the type location.

Habitat. Attached to hard substratum at 4159 m.

Description. Morphology of the holotype is a spherical body with a flattened top bearing a small terminal osculum and asymmetric gutter on one side, all borne on a moderately long thin stalk (Fig. 50B; Seafloor Image Fig. 4). The body is delicate and fragile, easily torn and broken during handling as evident in its condition available for study in the laboratory (Fig. 50C). The atrium, known only from the *in-situ* and other lab images, appears narrow and moderately deep, but is not determinable in the lab specimen. The external body surface is smooth to the eye but under dissecting microscope is covered with small low papillae bearing short projecting spicules (Fig. 50D). The rigid stalk is clearly undefended, colonised by small foraminiferans (Fig. 50E), and hollow (Fig. 50F). The holotype, in the *in-situ* photo, is 66 by 47 mm in greater and lesser diameters, with an osculum 0.7 x 1.2 cm in diameters. Total stalk length is unavailable but the incomplete fragment on the lab specimen was 72 mm long; it is slightly flattened with diameters of 1.1 x 1.4 mm and those of the central canal 245 x 292 µm. Colour *in-situ* appeared white; preserved in ethanol it is reddish yellow.

Skeleton. Choanosomal skeleton is a loose network of mostly single choanosomal megascleres interlaced in apparent confusion without detectable organisation. Thick sections show that surfaces of the sample have been severely disturbed. Dermal sword hexactins are rarely in place, often moved into the surface or lost and choanosomal hexactins and pentactins are exposed to form the hispid surface elements of Fig. 50D. Thin bands of overlapping choanosomal diactins, 4–10 spicules in width, are the

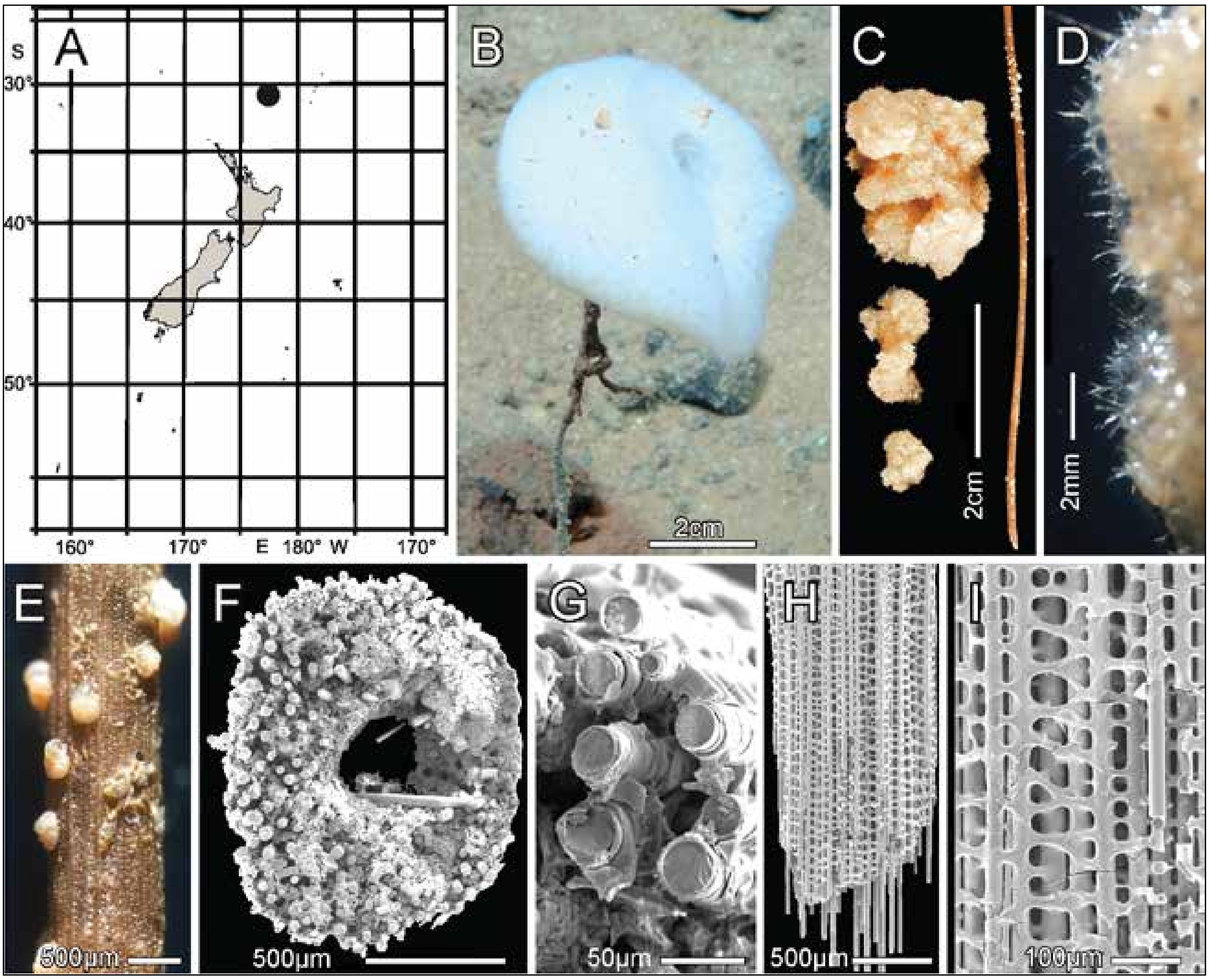


Figure 50. *Amphidiscella sonnae* **sp. nov.**, holotype NIWA 126034, distribution, morphology, and skeleton: **A.** distribution in New Zealand waters; **B.** *in-situ* image of the holotype, NIWA 126034; **C.** laboratory photo of the holotype as received for examination; **D.** surface of the laboratory specimen; **E.** stalk with attached foraminifera; **F.** sectioned hollow stalk; **G.** closer view of sectioned stalk showing diactins spaced some distance apart and siliceous bars connecting some of them; **H.** external surface of the acid-cleaned stalk showing strictly parallel orientation of diactins and silica bars joining them; **I.** closer view of stalk surface showing details of siliceous synapticula joining neighbouring diactins, their occasional branching, regularity of spacing of synapticula and absence of surface ornamentation. Image in B captured by GEOMAR ROV *Kiel 6000* onboard RV *Sonne* (voyage SO254), courtesy of Project *PoriBacNewZ*, GEOMAR & ICBM.

only structured components of the choanosome; they extend for several mm throughout the sections in random orientations. They appear to be the main components giving some support to the choanosome. Spicule fusion is restricted to the stalk and does not occur in the body.

Ectosomal skeleton consists of sword hexactins on the dermal surface and presumed pentactins on the atrial surface before their disturbance. Microscleres occur densely scattered throughout the choanosome and ectosome.

Stalk skeleton is unusual among stalked hexactinellids but characteristic of *Amphidiscella* in that the strictly parallel diactins are rarely ever in contact with each other but are spaced some distance apart (Fig. 50G) and neighbours are joined by a longitudinal series of simple or branched, flattened, transverse, anaxial synapticula. The flattened synapticula or plates are spaced at fairly regular intervals along every pair of neighbouring diactins (Fig. 50H, I) but there is no obvious continuity in placement of plates between other diactin pairs; thus, tabulae across the whole stalk wall are not formed. The outer stalk surface is not ornamented.

Spicules. Megascleres (Fig. 51; Table 23) cannot be certainly localised because of damage to the specimen by the time of study; dermal and atrial surfaces cannot be determined so spicule morphology provides the only clue to the role a given spicule type plays. Megascleres of the body are numerically dominated by choanosomal diactins (35% of 150 counted), with choanosomal hexactins (29%), pentactins (including both choanosomal and atrial, 27%) and dermal sword hexactins (9%); a very few tauactin and stauractin megascleres are present but not encountered

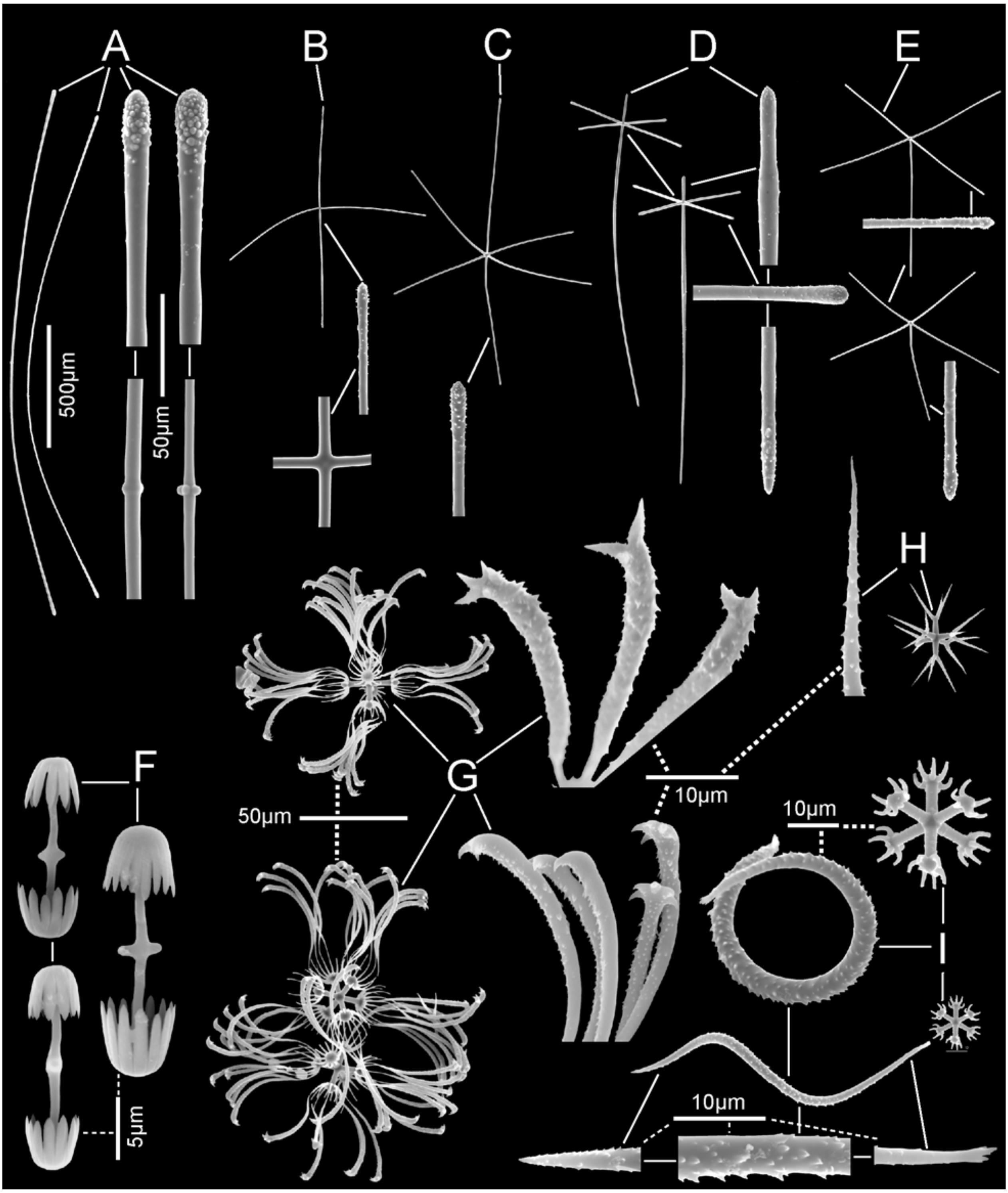


Figure 51. *Amphidiscella sonnae* **sp. nov.**, holotype spicules: **A.** choanosomal diactins; two whole and enlarged tips and centres (scales apply to all megascleres B–F); **B.** choanosomal stauractin with enlarged ray end and central segment; **C.** choanosomal hexactin with enlarged ray end; **D.** two whole dermal sword hexactins with enlarged ray ends; **E.** two whole presumptive atrial pentactins and their enlarged ray ends; **F.** three amphidiscs; **G.** three whole floricomes with enlargement of two sets of secondary rays: the less common form entirely covered with spines (top), and the more common form with denticles restricted to the outer side (scale applies to all whole microscleres or parts not connected to another scale bar); **H.** oxyhexaster and magnified secondary ray end; **I.** graphiocome; small centrum and helically curved (undulatory) terminal ray, enlarged centrum to show detail, terminal ray viewed from the attachment end (circular structure), and enlarged ends and middle of a terminal ray (bottom).

during the count. Choanosomal diactins are slightly curved, cylindrical, smooth spicules with swollen rough ends and abruptly blunted tips (Fig. 51A). Their central swelling is small but easily recognisable. Choanosomal stauractins (Fig. 51B) and triactins have all the features of diactins: smooth, cylindrical rays with swollen rough ends and abrupt tips. Choanosomal hexactins (Fig. 51C) have rays of nearly equal length which are also like the rays of diactins. Dermal sword hexactins (Fig. 51D) have short distal rays, longer tangential rays and very long proximal rays. The distal rays are slightly inflated and sometimes bear very small spines. Tangential rays always have rough inflated tips like other choanosomal spicules. Proximal rays have rough ends without inflation. Pentactins (Fig. 51E) include atrialia and almost certainly some choanosomal pentactins but there is no basis on which they can be differentiated. Both tangential and proximal rays have the usual rough inflated ends with blunt tips.

Microscleres (Fig. 51F–I; Table 23) consist of overwhelmingly abundant amphidiscs and their variants, floricomes, oxyhexasters and graphiocomes. Amphidiscs (Fig. 51F) have a central cross with two short undeveloped rays and two longer developed rays bearing terminal umbels with 11.4 (9–13, n = 13) teeth; umbels are about as wide as long, height/width is 2.0 (0.7–1.5, n = 51). Amphidisc variants are rare; of 584 scored, 99% are amphidiscs, 0.5% are tridiscs, 0.3% are tetradiscs while those bearing five or more umbels, including hexadiscs and hexasters with ray branching were seen outside of the counted population but occur as less than 0.1%. Floricomes (Fig. 51G) have short smooth primary rays, each of which bears a small discoid capitulum with a conical outer swelling. From the edges of capitulum discs emanate 14 (9–17, n = 32) sigmoid secondary rays with only slightly swollen heads and 3.2 (2–5, n = 63) short claws asymmetrically directed towards the outside of the tuft. Most secondary rays bear denticles scattered only on the outer surface and are smooth on the inner surface toward the centre of the tuft but some bear denticles on all surfaces. Oxyhexasters (Fig. 51H) are relatively small; their sparsely-spined primary rays have no capitulum but each directly bears 2.5 (2–8, n = 81) straight, tapered secondary rays which are densely covered with reclined spines. Graphiocomes (spiroxyhexasters; Fig. 51I) are encountered with secondary rays detached from the centrum; the compact centrum consists of six stout, sparsely-spined primary rays each of which bears a small conical capitulum with 6.8 (6–9), n = 18 short bases of the long secondary rays. Each short base has an articulation facet from which extends a single helically-twisted, stout secondary ray which is ornamented with dense reclined spines on its outer surface; the inner surface is smooth. In end view the secondary rays are curved dextrally or clockwise through an angle of ca 430° from base to tip. They bear a set of five small parallel spurs at the point of articulation with their base on the primary ray.

Table 23. Spicule dimensions (µm) of *Amphidiscella sonnae* **sp. nov.**, from holotype NIWA 126034.

Parameter	mean	s. d.	range	no.
Choanosomal diactin				
length (mm)	1.7	0.4	1.0–2.4	51
width	6.6	2.2	3.0–12.7	52
Choanosomal hexactin				
ray length	546	122	189–785	51
ray width	9.3	1.9	4.9–12.8	56
Dermal sword hexactin				
distal ray length	119	33	58–190	52
tangential ray length	295	63	138–435	54
proximal ray length	753	176	463–1472	50
ray width	13.4	2.8	8.4–18.8	53
Atrialia, pentactin*				
tangential ray length	530	97	340–749	53
proximal ray length	536	116	323–764	52
ray width	9.4	1.8	6.7–14.3	52
Amphidisc				
length	17.9	2.3	14.3–22.8	51
umbel height	4.9	0.8	3.4–6.8	51
umbel diameter	4.9	0.7	3.8–7.0	51
Tetradisc, hexadisc & hexaster				
diameter	22.1	3.8	15.3–36.5	41
umbel height	4.8	0.9	3.4–7.0	41
umbel diameter	5.7	0.8	4.0–7.4	41
Floricome				
diameter	106.0	8.1	88.8–123.1	50
primary ray length	10.6	1.0	8.3–12.6	50
secondary ray length	43.9	4.1	34.5–52.3	50
Oxyhexaster				
diameter	73.8	7.3	52.1–89.7	50
primary ray length	9.7	1.4	6.9–13.2	50
secondary ray length	28.0	3.1	18.5–35.2	50
Graphiocome centrum				
diameter	21.5	1.9	17.1–25.6	51
secondary ray (rhaphide) length	129.0	14.5	95.8–175.8	53
secondary ray (rhaphide) width	4.5	0.5	3.5–5.6	66

* Choanosomal pentactins cannot be distinguished from atrial pentactins.

Etymology. The species name, *sonnae*, refers to the RV *Sonne*, from which this new species, and several other new taxa were collected. The German research institutes GEOMAR Helmholtz Centre for Ocean Research Kiel, and Institute for Chemistry and Biology of the Marine Environment of the Carl von Ossietzky University of Oldenburg, provided over 30 specimens and underwater images for our study from their ROV *Kiel 6000* used during Project *PoriBacNewZ* on the RV *Sonne* cruise in New Zealand waters (Schupp *et al.* 2017).

Remarks. The specimen described above clearly belongs to the genus *Amphidiscella* by possession of amphidisc and floricome microscleres. It differs from the geographically closest species, *A. caledonica* Tabachnick & Lévi, 1997, in the absence of graphiocomes there. The other Pacific species, *A. lecus* Reiswig, 2014, from off Washington, USA, has similar graphiocomes (spiroxyhexasters) but also codonhexasters which are absent here. The North Atlantic species, *A. atlantica* Tabachnick & Collins, 2008, has no floricomes which are abundant here. The last species, also from the North Atlantic but further north, *A. monai* Tabachnick & Lévi, 1998, has discohexasters with hemispherical discs, which are absent here. Finally, it differs from *A. abyssalis* **sp. nov.**, described above, in having graphiocomes with straight secondary rays there (thick helical secondary rays here) and differently shaped floricomes. These differences indicate that the New Zealand specimen represents a new species which is here designated *Amphidiscella sonnae* **sp. nov.**

Key diagnostic characters

- A non-euplectelloid, soft, asymmetric spherical body, on a thin undefended stalk
- Choanosomal megascleres, mainly diactins, hexactins and pentactins, share a narrow size range of one to two mm total length
- Dermalia are sword-like hexactins; atrialia are presumably pentactins
- Spicule fusion is present only in the stalk
- Microscleres are amphidiscs and variants, floricomes, graphiocomes with thick helicoid secondary rays, and small oxyhexasters

Genus ***Amphoreus*** gen. nov.

Diagnosis. Bolosominae with a thick-walled, funnel-shaped body, borne on a short thick stalk attached to hard substratum. It lacks sieve plate and parietal oscula. Microscleres are two spherical discohexasters, a stellate-floricoid discohexaster and tentatively a small oxyhexaster and a large oxystauraster/hexaster.

Etymology. The new genus name, *Amphoreus* (Greek) reflects the amphora or jar-shape of the sponge, with restricted apex and a wider body, and the lack of a sieve plate over the opening.

Remarks. This new specimen cannot be accommodated in any of the eight genera presently recognised in the subfamily Bolosominae. The floricoid discohexasters are not uncommon microscleres of Hexactinellida but they are so far unknown among the Bolosominae.

Type species. *Amphoreus schuppi* **gen. et sp. nov.,** this report.

Amphoreus schuppi gen. et sp. nov.

Figs 52–53; Seafloor Image Fig. 5; Table 24

Material examined. Holotype NIWA 126035, RV *Sonne* Stn SO254/10ROV03_BIOBOX8, abyssal basin between Three Kings & Colville Ridges, 30.991° S, 177.501° E, 4159 m, 01 Feb 2017 (Seafloor Image Fig. 5), collected by GEOMAR ROV *Kiel 6000*, onboard RV *Sonne*, ICBM expedition SO254).

Type locality. Abyssal basin between Three Kings & Colville Ridges (Fig. 52A).

Distribution. Known from only the type location.

Habitat. Presumably attached to hard substratum at 4159 m.

Description. Morphology is a thick-walled, sack or vase-shaped body, the restricted apex of which has rounded margins, borne on a short stalk (Fig. 52B–D; Seafloor Image Fig. 5). The lower part of the stalk (Fig. 52E) is incomplete where it was torn during collection but it may have been attached to hard substratum on one side. The dermal surface of the body appears fairly smooth to the eye, but is somewhat irregular under dissecting microscope and lacks evidence of any prostalia (Fig. 52F). There is one large opening through the lower body wall on one side that appears proper but there are no parietal oscula or indications of a sieve plate. The atrial surface is also smooth with small openings of exhalant canals distributed uniformly. The specimen is 61.2 by 73.9 mm in diameter measured from the *in-situ* image; total height including the 7.7 mm dead stalk is 44.3 mm measured from the preserved specimen. The body wall hole is 6.3 x 11.5 mm and wall thickness is 3.2 (2.8–3.7), n = 4 mm. Atrial canal apertures are 0.8 (0.3–1.2), n = 23 mm in diameter. The specimen is white when alive, light brown when preserved.

Skeleton. Choanosomal skeleton is mainly supported by bundles of 6–12 choanosomal diactins located just below the atrial surface (Fig. 52G); thick sections show they are oriented mostly transversely but a few run longitudinally (Fig. 52H). The dermal side is supported by the proximal rays of the ectosomal dermalia and choanosomal hexactins. The middle wall is supported only by a loose network of single choanosomal diactins and hexactins. There is no fusion of megascleres in the body. Microscleres are generally dispersed throughout the choanosome.

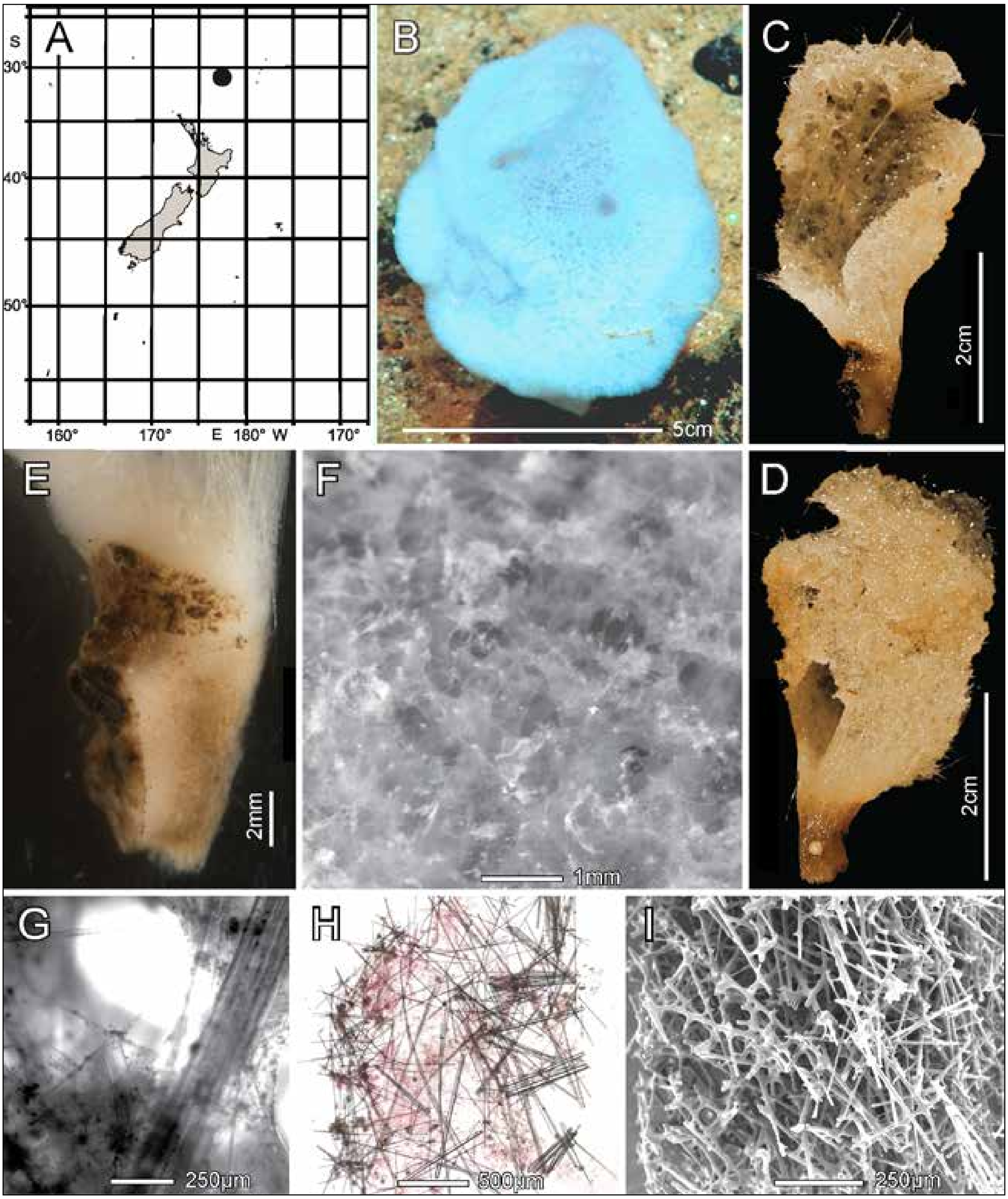


Figure 52. *Amphoreus schuppi* **gen. et sp. nov.**, holotype NIWA 126035, distribution, morphology, and skeleton: **A.** distribution in New Zealand waters; **B.** *in-situ* image of the holotype, NIWA 126035; **C., D.** laboratory photos of the preserved holotype as received for examination; **E.** magnified photo of the short stalk with a lateral attachment surface; **F.** dermal surface of the body; **G.** atrial surface with bundle of diactins and a hexactine atrialium; **H.** thick section of the body wall, dermal surface on the left side; **I.** cleaned fused framework of the stalk (SEM). Image in B captured by GEOMAR ROV *Kiel 6000* onboard RV *Sonne* (voyage SO254), courtesy of Project *PoriBacNewZ*, GEOMAR & ICBM.

Ectosomal skeleton consists mainly of sword hexactins and microscleres of the dermal surface. The atrial hexactins and microscleres form a thin ectosomal layer on the interior funnel surface which is usually lost in thick sections.

Stalk skeleton is a fused network of diactins that are oriented without consistency and joined mainly at points of contact (Fig. 52I).

Spicules. Like all specimens collected at SO254/10ROV03_BIOBOX8, this specimen is heavily contaminated with obviously foreign spicules: tyloscopules, uncinates, macrospined pentactins, amphidiscs,

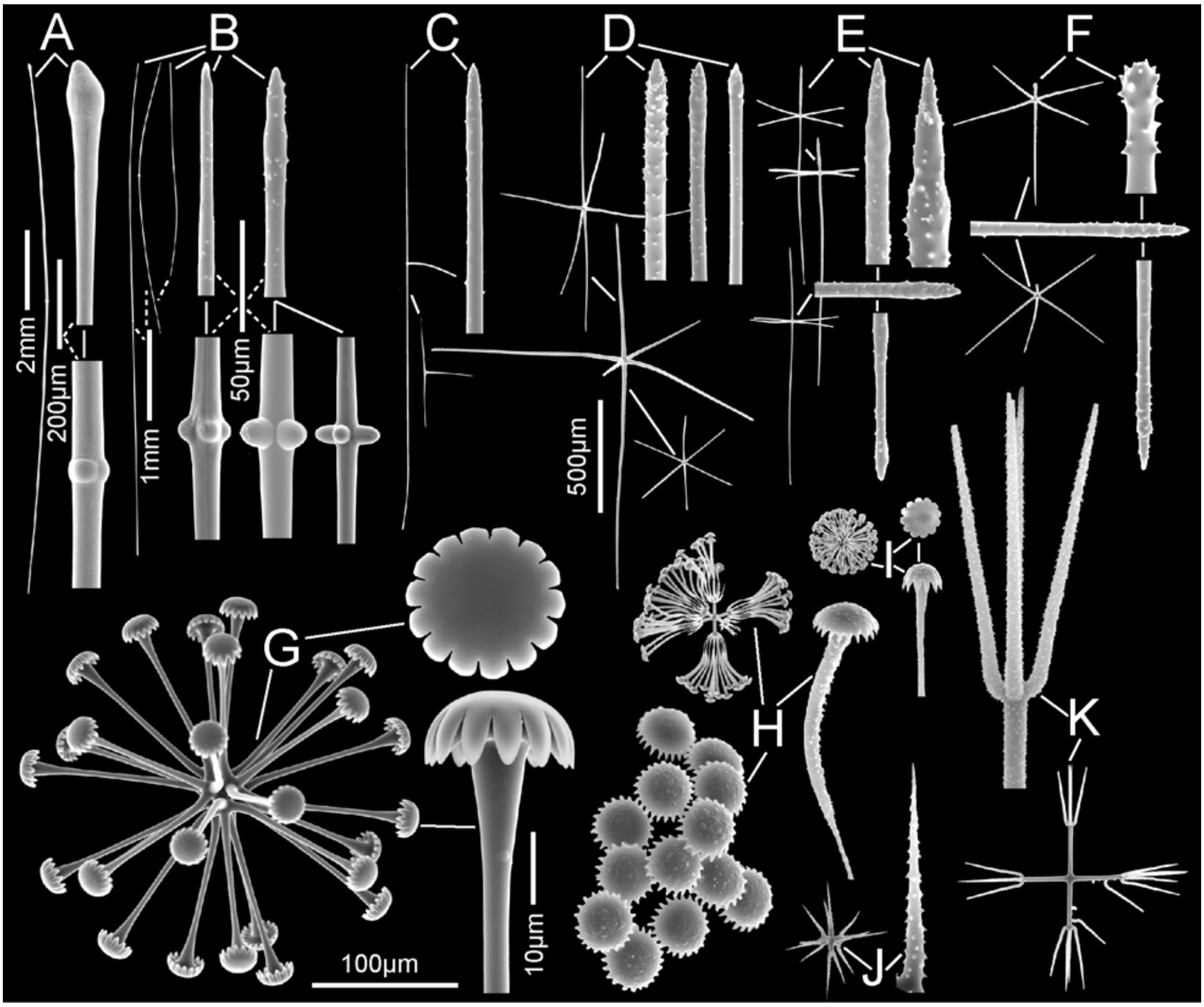


Figure 53. *Amphoreus schuppi* **gen. et sp. nov.**, holotype spicules: **A.** principal diactin and enlarged tip and centre; **B.** choanosomal diactins; three whole and enlarged tips and centres (scale of whole spicules applies also to C; scale of parts apply to C–F; **C.** choanosomal tauactins, two whole and enlarged ray end; **D.** three choanosomal hexactins and three enlarged ray ends (scale applies to E and F); **E.** three dermal sword hexactins with enlarged ray ends; **F.** two whole atrial hexactins and their enlarged ray ends; **G.** large spherical discohexaster with enlarged ray ends (scales apply to all microscleres); **H.** floricoid-stellate discohexaster with enlarged secondary rays; **I.** small spherical discohexaster with enlarged secondary ray; **J.** small oxyhexaster with enlarged secondary ray (may be foreign); **K.** large oxystauraster with enlarged tuft of secondary rays (may be foreign).

drepanocome parts, various graphiocome terminal rays and discohexasters. It has been difficult to distinguish which spicules are proper, and the two, rare, oxy-tipped microscleres described below may be foreign in origin.

Megascleres (Fig. 53; Table 24) of the body are numerically dominated by large choanosomal diactins (38% of 212 counted, excluding dermalia and atrialia). Primary spicules (pincipalia, 17%) are considered to be diactins over 23 µm in width as supported by frequency histograms of diactin length and width measurements. Other choanosomal megascleres are hexactins (33%), pentactins (8%), tauactins (4%) and rare stauractins (<1%). Primary diactins (Fig. 53A) are slightly-curved smooth spicules with prominent central swelling and ends either tapered to a blunt tip or inflated to a clavate tip. Choanosomal diactins (Fig. 53B) are nearly straight to curved spicules with very prominent central swellings, often with four short rays; they are mostly smooth but have sparse spines scattered over the distal quarters and have bluntly-pointed tips. Choanosomal tauactins (Fig. 53C), stauractins and pentactins are either entirely coarsely or sparsely spined with sharp ray tips. Choanosomal hexactins (Fig. 53D) usually have rays about the same length but occasionally one or two rays are two times or a quarter the length of the others. They are entirely sparsely spined and rays end in rather abruptly sharp or blunt tips. Sword-shaped hexactine dermalia (Fig. 53E) have straight rays that are entirely sparsely spined. Distal rays are the most variable in length and form, most often like the other rays but occasionally they are short and tips are

Table 24. Spicule dimensions (µm) of *Amphoreus schuppi* **gen. et sp. nov.**, from holotype NIWA 126035.

Parameter	mean	s. d.	range	no.
Primary diactin				
length (mm)	9.4	2.6	6.7–15.7	31
width	38.7	14.2	23.3–71.3	36
Choanosomal diactin				
length (mm)	4.0	1.4	1.2–6.3	47
width	12.4	3.5	4.0–22.1	81
Choanosomal tauactin				
paired ray length (mm)	1.6	1.0	0.6–2.9	6
unpaired ray length	290	231	32–550	8
ray width	15.3	3.5	9.2–19.9	7
Choanosomal pentactin				
tangential ray length (mm)	1.2	0.6	0.3–4.9	13
proximal ray length (mm)	0.7	0.4	0.3–1.5	9
ray width	15.8	5.0	8.1–28.4	18
Choanosomal hexactin				
ray length	511	254	209–1865	69
ray width	13.6	3.2	7.4–21.1	59
Dermalia, sword hexactin				
distal ray length	241	54	114–404	56
distal ray basal width	12.3	1.9	8.2–16.9	59
tangential ray length	305	51	211–515	59
tangential ray width	12.2	1.9	8.9–16.9	58
proximal ray length	757	126	535–1082	57
proximal ray width	12.1	2.3	8.6–17.2	58
Atrialia				
distal ray length	68.8	65.0	19.8–492	48
distal ray width	15.1	3.7	7.2–24.5	48
tangential ray length	462	121	199–786	52
tangential ray width	15.0	2.9	9.0–21.3	52
proximal ray length	413	129	203–675	34
proximal ray width	15.3	3.5	7.6–23.4	52
Discohexaster, large				
diameter	261	30	178–311	42
primary ray length	11.9	1.9	7.2–17.0	42
secondary ray length	119.2	14.5	81.2–142.0	42
Floricoid discohexaster				
diameter	124.2	6.0	112.5–139.4	55
primary ray length	15.4	1.5	12.3–18.8	55
secondary ray length	49.6	3.3	43.7–64.3	55
Discohexaster, small				
diameter	50.5	4.7	35.8–61.5	57
primary ray length	6.4	1.0	4.2–9.0	57
secondary ray length	20.1	2.2	13.1–24.9	57
Oxyhexaster, small				
diameter	75.3	10.3	54.5–96.1	35
primary ray length	9.9	2.1	6.8–16.4	35
secondary ray length	29.0	4.8	18.5–45.2	35
Oxystauraster/hexaster				
diameter	163	15	129–193	43
primary ray length	34.8	5.4	22.5–45.7	43
secondary ray length	47.1	5.2	36.7–61.0	43

inflated; they rarely are rougher than the other rays. Atrial hexactins (Fig. 53F) are entirely spined but more densely and coarsely than the other megascleres; the distal ray is generally abbreviated and has the largest spines.

Microscleres (Fig. 53G–K; Table 24) consist of five types, two of which are common, three are uncommon; in order of abundance, they are a small spherical discohexaster (68.9% of 320 counted), a floricoid stellate discohexaster (20.7%), a large oxystauraster/hexaster (3.7%), a large spherical discohexaster (3.6%) and a small oxyhexaster (3.0%). They are presented in the figure and table in sequence of their impact to the viewer. Large spherical discohexasters (Fig. 53G) have short primary rays, each of which supports 4.8 (4–5), n = 24 straight secondary rays ending in hemispherical discs 25.6 (23.4–27.7), n = 36 µm in diameter with 14.4 (12–15), n = 11 marginal teeth; the typical secondary ray tuft has one central ray surrounded by four evenly spaced marginal rays. Floricoid stellate discohexasters (Fig. 53H) have the overall shape of floricomes but the ends of secondary rays are clearly complete discs. Each of the primary rays ends in a small disc which carries 15.6 (13–19), n = 22 sigmoid secondary rays originating from the disc margin and two to four originating from the disc face; the secondary rays end in hemispherical discs 9 (8.3–9.8), n = 35 µm in diameter with 21.9 (18–24), n = 13 marginal teeth. Secondary rays are completely rough with longer spines on the concave outer surface. Small spherical discohexasters (Fig. 53I) have smooth primary rays ending in small discs which bear the origins of 14.1 (12–18), n = 8 secondary rays as a marginal whorl but also a secondary whorl and four or five origins located on the disc face. The straight secondary rays are lightly rough (without spines) and end in small hemispheric discs 5.3 (5.0–5.7), n = 40 µm in diameter with 11.7 (10–12), n = 18 marginal teeth. Small oxyhexasters (Fig. 53J, possibly foreign) have short, thick, sparsely-spined primary rays, each of which bears 2.7 (2–3), n = 36 stout straight secondary rays ending in sharp tips. Large oxystaurasters/hexasters (Fig. 53K, possibly foreign) occur mainly as staurasters (47%) and hexasters (37%) with few as pentasters (16%). Each rough primary ray bears 3.2 (2–5), n = 38 very finely rough secondary rays which end in sharp tips. Supplemental secondary rays originate from the sides of the primary rays below the normal branch point in 16% of these spicules.

Etymology. The species is named in honour of Professor Peter Schupp, Institute for Chemistry and Biology of the Marine Environment of the Carl von Ossietzky University of Oldenburg, Germany, for his vision and organisation of the Project *PoriBacNewZ*, bringing GEOMAR Helmholtz Centre for Ocean Research Kiel's ROV *Kiel 6000*, and RV *Sonne* to New Zealand waters.

Remarks. This specimen is clearly a member of the family Euplectellidae by virtue of its sword-shaped dermalia, but it is not a member of the subfamily Euplectellinae by absence of rooting basalia. It cannot convincingly be assigned to either of the other subfamilies Corbitellinae or Bolosominae by virtue of the shortness of its stalk. In assessment of spiculation, it shares its distinctive floricoid discohexaster (complete terminal discs and secondary rays of equal length) with only *Malacosaccus vastus* Schulze, 1896 (Euplectellinae) which is an untenable grouping for this form. In its other certainly proper microscleres it is consistent with placement in either Corbitellinae or Bolosominae. In its possession of atrial hexactins, however, it is similar to most Bolosominae (atrial hexactins) and unlike most Corbitellinae (atrial pentactins) and we use this character to tentatively assign this new form to Bolosominae. Within Bolosominae (and Corbitellinae as well) this form cannot be included in any presently known genus without seriously changing its diagnosis. We thus propose another new monospecific genus within Bolosominae to contain this form which is here named *Amphoreus schuppi* **gen. et sp. nov.**

Key diagnostic characters

- Sack or funnel-form body which is not euplectelloid, lacking parietal oscula and sieve plate
- Primary spicules are diactins
- Dermalia are sword-shaped hexactins while atrialia are hexactins with short distal rays and long tangential rays
- Spicule fusion is present only in the short stalk
- Microscleres which are certainly proper are all discohexasters, two sizes of spherical forms and a distinctive floricoid stellate form

Genus *Trychella* gen. nov.

Diagnosis: Bolosominae with large, soft, cowbell-shaped body, supported on, what appears to be a short, hard, 'peduncle', or narrow base of attachment. Main body megascleres are choanosomal diactins; other megascleres are sword-shaped dermal hexactins and choanosomal hexactins. Atrialia remain unknown. Microscleres are dominated by amphidiscs and their variants (tetradiscs, hexadiscs, hemidiscohexasters), large discasters, two sizes of discohexasters, graphiocomes with helicoid terminal rays (spiroxyhexasters) and microxydiactins.

Etymology. The genus name is derived from the Swiss German *trychel*, or the large bulbous cowbell of Switzerland, and refers to the shape of the sponge.

Remarks. The new specimen is clearly an amphidisc-bearing euplectellid but cannot be accommodated in any of the other three genera of amphidisc-bearing bolosomids, *Bolosoma, Vityaziella* or *Amphidiscella*. None of the known species of *Bolosoma* have graphiocomes and they are not a component of the genus diagnosis. Only one species, *B. musorstum* Tabachnick & Lévi, 2004 has amphidiscs but the abundance of amphidiscs has not been reported. Among the four species of *Amphidiscella*, *A. atlantica* Tabachnick & Collins, 2008 does not fit its present genus diagnosis; its microscleres are limited to amphidiscs and their variants, and graphiocomes, the same pattern of the only known species of *Vityaziella*, *V. renki*. We here propose that *A. atlantica* be moved to *Vityaziella* as *V. atlantica*. Including the two new species described above, the five species of *Amphidiscella* all have floricomes. The newly formed genus contains a single species that lacks floricomes but has a rich suite of other microscleres jncluding graphiocomes.

The question remains as to whether the holotype has a true peduncle, presently considered to be the key diagnostic character for Bolosominae; it was only possible to retrieve three small portions of the margin of the sponge, and the ROV video did not capture side views of the sponge. Video of the collection by the large ROV arm and clasper, revealed that the sponge was quite firmly attached to the substrate at the base; the sponge wobbled slightly around the base of attachment but was not displaced sideways as would be expected if it had a tubular peduncle. Furthermore, the shadow cast by the ROV lights indicated that the base of the sponge was fairly close to the substrate.

Type species: *Trychella kermadecensis* **gen. et sp. nov.,** this report.

Trychella kermadecensis gen. et sp. nov.

Figs 54–55; Seafloor Image Fig. 7; Table 25

Material examined. Holotype NIWA 126125, RV *Sonne* Stn SO254/33ROV08_BIOBOX15, Southern Kermadec Ridge, 35.382° S, 178.979° E, 1211 m, 07 Feb 2017 (Seafloor Image Fig. 7), collected by GEOMAR ROV *Kiel 6000*, onboard RV *Sonne*, ICBM expedition SO254.

Type locality. Southern Kermadec Ridge (Fig. 54A).

Distribution. Known from only the type location.

Habitat. Holotype attached to a near vertical ridge of basalt at 1211 m depth, but form of the attachment base remains unknown and unavailable.

Description. Morphology is a large, bulbous, cowbell-shaped body, with a moderately deep atrium and lumpy external surface at coarse scale, but smooth at a fine scale (Fig. 54B; Seafloor Image Fig. 7). Parietal oscula are

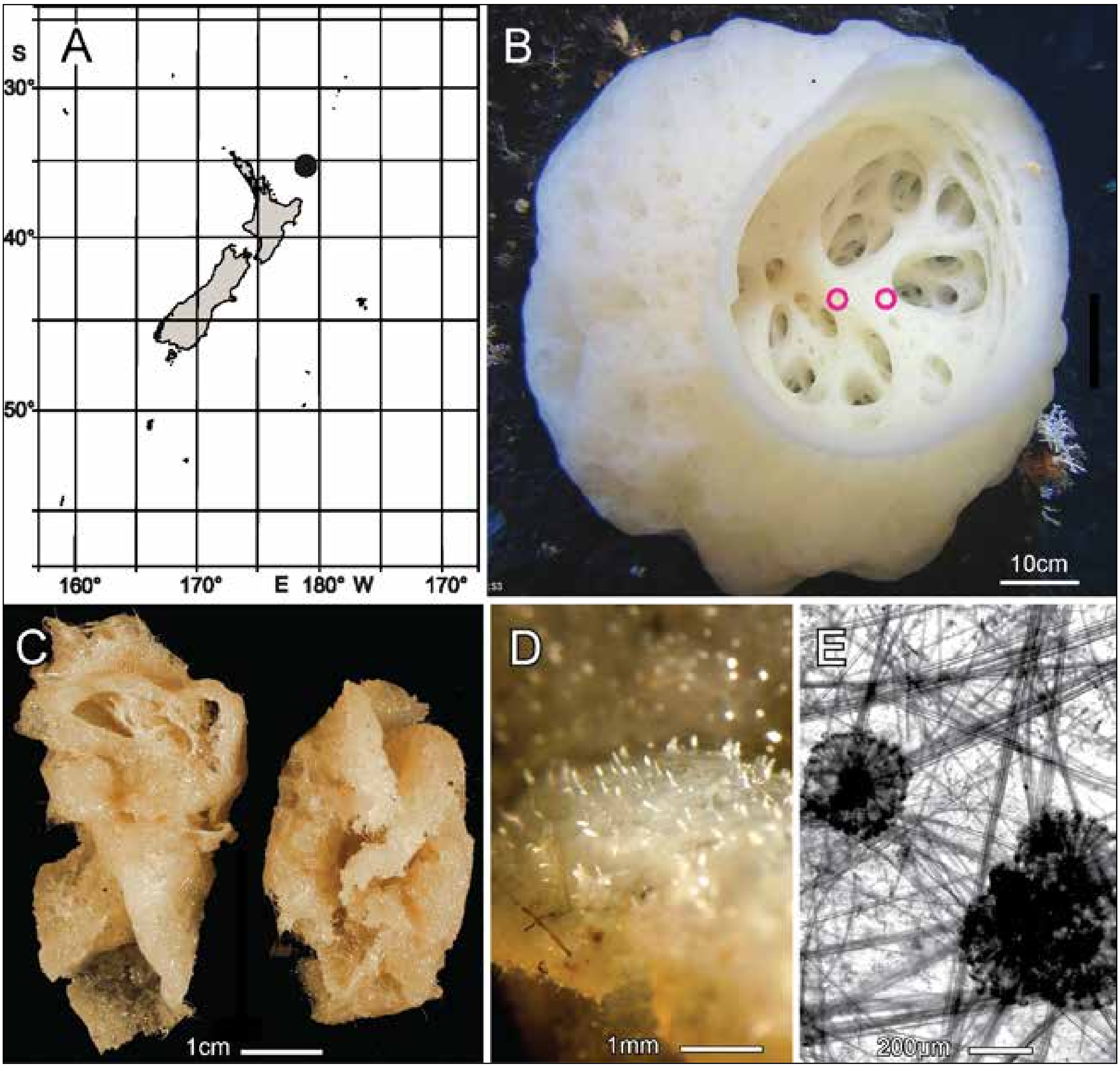


Figure 54. *Trychella kermadecensis* **gen. et sp. nov.**, holotype NIWA 126125, distribution, morphology, and skeleton: **A.** distribution in New Zealand waters; **B.** *in-situ* image of the holotype, NIWA 126125, with 6.24 cm-spaced laser spots outlined for scale; **C.** preserved portions of holotype margin, as received for examination; **D.** surface with projecting distal rays of sword-shaped dermalia; **E.** thick section of choanosome. Image in B captured by GEOMAR ROV *Kiel 6000* onboard RV *Sonne* (voyage SO254), courtesy of Project *PoriBacNewZ*, GEOMAR & ICBM.

absent. Attachment is by a short, hard, peduncle; a long thin stalk is not present. Samples were taken by ROV only of the upper body parts; these for examination consisted of two moderate sized fragments from the sponge margin (Fig. 54C). The body is delicate and fragile, easily torn during handling, but appeared relatively firm and bouncy *in-situ*. The oscular margin has a thin smooth extended rim without marginalia; the atrium bears very large open compound apertures of the exhalant system without a surface lattice cover. The smooth external body surface is covered with distal rays of sword-shaped dermalia protruding from the raised surface (Fig. 54D). The size of the holotype, as measured from laser spots, is 69.0 x 73.7 cm, osculum is 42.2 x 51.7 cm and exhalant opening series are 10, 4, 2 and 1 cm in diameter. The fragments recovered are 54 x 28 mm and 42 x 25 mm in length and width. Body wall thickness is probably the smaller of these, around 25–28 mm. Colour *in-situ* was white; on deck and preserved they are light beige.

Skeleton. Choanosomal skeleton is a loose network of mostly crossing bundles and single choanosomal diactins (Fig. 54E). Few choanosomal hexactins and microscleres are scattered throughout the diactin scaffold. No spicule fusion occurs in the body samples available for examination. Thin comitalia are not present.

Ectosomal skeleton consists of sword hexactins on all surfaces examined. Searches for distinctive atrial spicules on 13 locations were negative; all bore typical dermal hexactins. Three explanations for these results are: a) atrial surfaces were not included in the samples, or b)

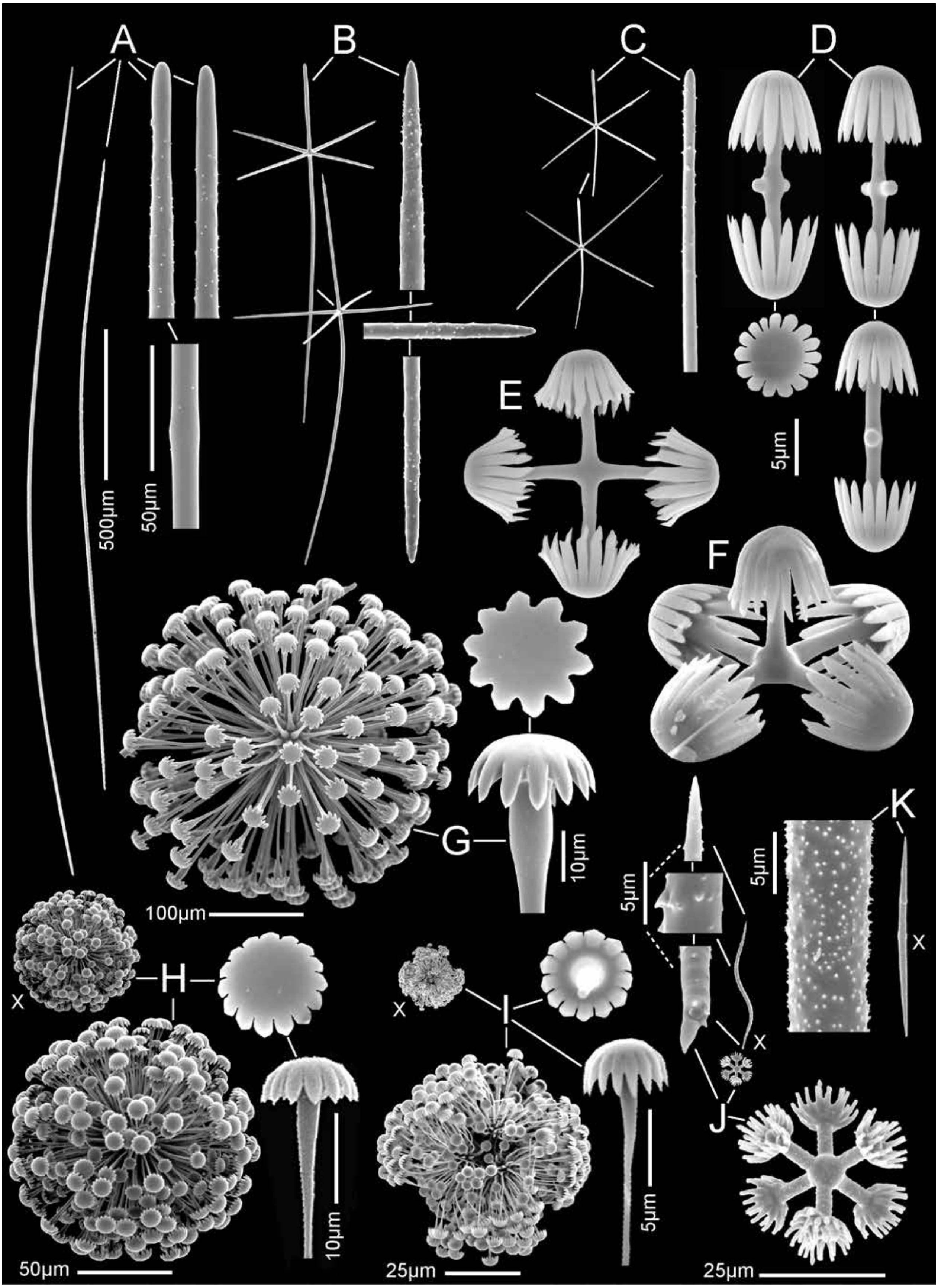


Figure 55. *Trychella kermadecensis* **gen. et sp. nov.**, holotype spicules: **A.** choanosomal diactins and enlarged centre and ends; **B.** two sword-shaped hexactine dermalia with enlarged ray ends; **C.** two choanosomal hexactins with enlarged ray end (all megascleres and parts at the same scales as A); **D.** three amphidiscs and umbel end view; **E.** tetradisc; **F.** pentadisc (D–F at same scale); **G.** discaster, whole and enlarged secondary ray ends; **H.** discohexaster 1, whole (x), enlarged whole and secondary ray ends; **I.** discohexaster 2, whole (x) enlarged whole and secondary ray ends; **J.** graphiocome centre and terminal ray (x), enlarged centre and three parts of terminal ray; base of terminal ray rotated to show attachment facet surrounded by five basal spines; **K.** microxydiactin, whole and enlarged segment. All whole microscleres indicated with 'x' are at the 100 µm scale of whole discaster in G.

atrial spicules are indistinguishable from dermal spicules, or 3) the atrial surfaces were overlooked in examinations; the first seems most likely. Microscleres are also associated with the ectosomal skeleton.

Spicules. Megascleres (Fig. 55A–C; Table 25) of the body are numerically dominated by slightly curved choanosomal diactins with smooth or sparsely rough ends and rounded tips (Fig. 55A). The central swelling is small and scarcely recognisable. The next most abundant megascleres are the sword-shaped hexactine dermalia (Fig. 55B), with fairly long distal rays; all rays are spined on the distal half and have parabolic tips. Some distal rays are swollen and clavate. Choanosomal hexactins (Fig. 55C) have all six rays nearly equal in length but one ray is usually distinctly thicker suggesting they may be the missing atrialia. Rays are otherwise like those of dermalia.

Microscleres (Fig. 55D–K; Table 25) include amphidiscs with variants up to hemihexasters, large discasters, two discohexasters, graphiocomes with helicoid terminal rays (spioxyhexasters) and microxydiactins. Amphidiscs (Fig. 55D), by far the most abundant microsclere, have two nearly equal umbels at ends of a shaft with two knobs at its centre. Umbels have 13–15 teeth. Variants of amphidiscs are tetradiscs (Fig. 55E) which have wider flaring umbels with tips of teeth turned inwards; their abundance is about 1/30 that of amphidiscs. Other amphidisc variants are pentadiscs (Fig. 55F), hexadiscs, and very rare forms with one or two rays branched. Discasters (Fig. 55G) have completely fused primary rays, verified by SEM of broken spicules and developing stages. The secondary rays are all about the same length and number about 200 in total on each spicule; terminal discs are pileate and have 10.7 (9–13), n = 59 robust marginal teeth. Discohexaster 1 (Fig. 55H) are about 35% of the size of discasters. Their primary rays end in large ovoids from each of which about 50 secondary rays of unequal length radiate, ending in pileate discs of unequal diameters. The outermost discs have 13.5 (11–16), n = 48 broad marginal teeth, but smaller discs ending below the spicule surface in 2–3 layers may have fewer teeth. Discohexasters 2 (Fig. 55I) are only about 18% of the size of discasters. In other than size, they are like discohexaster 1 with ovoid ends of primary rays, each bearing about 50 terminal rays of unequal length ending in discs of unequal diameter in 3–4 layers; the pileate discs of the outer layer are deeper and bear 16.2 (12–21), n = 22 long marginal teeth. Graphiocomes (spiroxyhexasters; Fig. 55J) have typical centra with solid hemispherical calyces at the distal ends of the smooth primary rays each bearing the bases of 24–25.6–27 helicoid secondary rays. The secondary rays, always found detached from the centrum, curve through about one cycle (360°), bear larger spines on the outer surface and end in sharp tips. Microxydiactins (Fig. 55K) are straight rods with slight central swelling, tapered rays and acute tips; the surface is entirely rough with small densely packed spines.

Table 25. Spicule dimensions (μm) of *Trychella kermadecensis* **gen. et sp. nov.**, from holotype NIWA 126125.

Parameter	mean	s. d.	range	no.
Choanosomal diactin				
length (mm)	1.828	0.443	1.117–2.798	53
width	11.5	2.3	3.8–17.4	52
Dermal sword hexactin				
distal ray length	362	82	151–546	53
tangential ray length	303	65	184–584	58
proximal ray length	899	114	538–1204	54
ray width	12.2	2.2	8.5–18.7	51
Choanosomal hexactin				
ray length	207	60	137–348	25
ray width	7.7	1.6	5.1–12.9	25
Amphidisc				
length	19.1	2.4	12.6–23.5	54
umbel height	5.5	0.9	3.4–7.4	54
umbel diameter	6.5	1.0	4.3–9.1	54
Tetradisc				
diameter	22.0	1.7	19.3–26.2	50
umbel height	5.3	0.9	3.2–8.1	50
umbel diameter	8.5	1.2	5.6–11.4	50
Discaster				
diameter	381	37	225–438	53
fused centre diameter	39.3	37.5	15.4–81.6	52
secondary ray length	153	15	94–178	53
terminal disc diameter	28.7	3.0	17.3–33.3	52
Discohexaster 1				
diameter	134	13	106–204	60
primary ray length	20.0	2.3	15.8–25.2	60
secondary ray length	47.7	5.5	35.9–77.2	61
terminal disc diameter	11.6	1.1	9.0–14.3	61
Discohexaster 2				
diameter	68.7	10.3	51.9–99.8	51
primary ray length	14.5	2.1	10.7–23.6	54
secondary ray length	20.2	4.1	14.1–32.6	51
terminal disc diameter	5.1	1.2	2.9–8.3	51
Graphiocome centrum				
diameter	27.7	2.9	20.4–33.9	51
helicoid secondary ray length	128	12	104–149	54
Microxydiactin				
length	166	20	80–234	51
width	6.1	1.1	2.9–9.7	51

Etymology. The species name, *kermadecensis*, is derived from the type locality, the Kermadec Ridge, to the northeast of New Zealand.

Remarks. Although there is no unequivocal certainty that the specimen described here has what could reasonably be called a stalk, it is clearly related to the stalked bolosomids bearing amphidisc microscleres. It is thus assigned to Bolosominae where its spiculation indicates that it represents a new genus. It lacks the floricomes present in all known species of *Amphidiscella* and has large discasters and microxydiactins that occur in neither of the three known amphidisc-bearing genera. At present it represents the only known species of a new genus and is here designated as *Trychella kermadecensis* **gen. et sp. nov.**

Key diagnostic characters

- A non-euplectelloid, large, soft, cowbell-shaped body, attachment by short peduncle
- Choanosomal megascleres are mainly diactins with some hexactins of equal ray length
- Dermalia are sword-like hexactins; atrialia are uncertain
- Spicule fusion is absent in the body
- Microscleres are amphidiscs and variants, discasters, discohexasters, graphiocomes and microxydiactins

Family **Euplectellidae subfam., gen. et sp. indet.**

Material examined. *Norfolk Ridge*: NIWA 66018, SOP Stn TRIP2886/13, 33.6° S, 167.7° E, 907–926 m, 23 Jun 2009.

Kermadec Ridge (distribution records only): NIWA 52146, 52179, NIWA Stn TAN0205/82, 32° S, 179° W, 1958–1680 m, 25 Apr 2002; NIWA 52175, NIWA Stn TAN0205/47, 31.137° S, 179.012° W, 841–776 m, 19 Apr 2002.

West Cavalli Seamount: NIWA 51808, 114912, NIWA Stn KAH0204/40, 34.164° S, 173.965° E, 820–805 m, 18 Apr 2002.

Bay of Plenty: NIWA 52022, NIWA Stn TAN0413/114, 37.550° S, 176.986° E, 172–352 m, 13 Nov 2004.

Bay of Plenty Seamounts: NIWA 51972 (distribution record only), NIWA Stn TAN0413/54, 37.237° S, 177.277° E, 1126–1134 m, 11 Nov 2004; NIWA 52037 (distribution record only), NIWA Stn TAN0413/24, 36.958° S, 177.371° E, 1286–1208 m, 09 Nov 2004; NIWA 69395, NIWA Stn KAH9907/37, 39.491° S, 178.418° E, 1000 m, 03 Jun 1999.

Seamount 986, off Hawkes Bay shelf (collected by GEOMAR ROV *Kiel 6000*, onboard RV *Sonne*, ICBM expedition SO254): NIWA 126168, RV *Sonne* Stn SO254/36ROV10_BIOBOX1, 39.990° S, 178.215° E, 802 m, 09 Feb 2017.

Chatham Rise: NIWA 53742, NIWA Stn TAN0905/102, 44.127° S, 174.570° W, 845–940 m, 26 Jun 2009; NIWA 51916, NZOI Stn Z10829, TAN0101/7, 43.261° S, 178.425° E, 374 m, 30 Dec 2000.

Southeast of Dunedin: NIWA 71131, NZOI Stn G699, 46.337° S, 171.000° E, 1116 m, 22 Jan 1970.

Bollons Seamount (distribution record only): NIWA 52105, NIWA Stn TAN0307/85, 49.547° S, 177.028° W, 2040–1906 m, 02 May 2003.

Seamount 7, South Macquarie Ridge (Australian EEZ): NIWA 121753, NIWA Stn TAN0803/84, 53.705° S, 159.115° E, 998–1100 m, 13 Apr 2008.

Southern Ocean (International waters, distribution record only): NIWA 67579, CCAMLR SOP TRIP2730/9, 65.6° S, 177.7° W, 1559–1680 m, 09 Dec 2008.

Distribution. Scattered around New Zealand from Norfolk Ridge to Chatham Rise to Macquarie Ridge and beyond in the Southern Ocean.

Habitat. Presumably either rooted in soft sediment or attached to hard substrate at 805–1116 m.

Description. Morphology of five of the six specimens is that of a washed-out fragment of a euplectellid body wall with completely fused spicules. Two have strongly rectangular arrangements of main components suggesting large stauractins are primary components but the other three have no rectangular elements. The sixth specimen, NIWA 114912, is a sieve plate, completely fused and with beautifully scalloped margins. None contain features that allow their assignment to one of the three subfamilies of Euplectellidae. Wall fragments range in size from 2.6 x 3.0 cm to 4.9 x 14.2 cm; the sieve plate is 3.0 x 4.0 cm.

Discussion

Identification of 26 species of Euplectellidae in the New Zealand area demonstrate the rich diversity of this group there. They are apportioned in the three subfamilies nearly equally. The large number of new species, 18 of the 26 (or 69% new) may seem surprising in view of the considerable taxonomic work done in the adjacent area around New Caledonia (Roux *et al.* 1991; Lévi & Lévi 1982; Tabachnick & Lévi 1997; 2000; 2004), but the New Zealand area is larger and contains greater variation in habitat types. Our expectations are that, despite this increase in the knowledge of the diversity of the family in this area, there still remain perhaps 20 or more euplectellid species to be discovered there.

The large NIWA collections, from which most species here were described, were made with dredge, trawl or epibenthic sled. Fragile specimens and parts of specimens were consequently mostly damaged to the point that external morphology often could not be reliably reconstructed and infiltration of foreign tissues made determination of autochthonous spiculation a major problem. However, today, most voyages onboard RV *Tangaroa* use NIWA's DTIS to provide seafloor images that provide essential information for our understanding of the morphology and ecology of these sponges. Other seafloor imaging and collection tools, such as ROV and submersibles, operated off visiting international vessels, have provided important seafloor images of living euplectellid sponges and allowed collection of relatively undamaged specimens. The 2017 ICBM voyage to New Zealand waters on the RV *Sonne* (voyage SO254), collected over 30 euplectellid specimens, amongst many other Hexactinellida and Demospongiae, each accompanied by numerous still *in-situ* images, videos, and deck images (Schupp *et al.* 2017), confirming the pivotal importance of this technology for our understanding of the living forms of these sponges. Of the 27 species covered in this study, 19 (70%) are new to science. New species were added to 12 genera. Three specimens were designated as holotypes of new genera and species, *Plumicoma solida*, *Amphoreus schuppi* and *Trychella kermadecensis* **gen. et spp. nov.**; six specimens were designated holotypes and paratypes of two new species of *Amphidiscella, A. sonnae* and *A. abyssalis* **spp. nov.**, and a paratype of the new species *Dictyaulus hydrangeaformis* **sp. nov.** Twenty-five specimens provided new locations for known species.

With increasing use of imagery rather than collection, there is an urgent need to provide accurate identifications from images, if specimens are not available. Collection of specimens by ROV have shown how valuable this method is in obtaining relatively undamaged specimens, a portion of which is suitable for molecular sequence processing. However, some problems remain. Imaging of the specimen is often restricted and does not always include side and top views, both of which are necessary to know how the specimen is attached and constructed. Spicule contamination was still high in the *Kiel 6000*-collected specimens and its solution remains a problem.

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Close-up of the delicate, swirling, foliose cups of the euplectellid species, *Atlantisella lorraineae* Reiswig & Kelly, 2017, showing the opening to the hollow peduncle and the thin, fine 'weave' of the body (lower to middle left of image). The cup-shaped glass sponge to the lower right is an unidentified species of *Rossella* sp., possibly *R. antarctica* Carter, 1872 (Hexactinellida, Lyssacinosida, Rossellidae). Images captured by DTIS onboard RV *Tangaroa* from NIWA Stn TAN0905/23, Graveyard Seamount, Chatham Rise, 770–919 m.

SEAFLOOR IMAGES

Seafloor images of living euplectellid sponges

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

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

1

confirmed

Amphidiscella abyssalis sp. nov.
(holotype NIWA 126030)

Characterised by the soft, bonnet-shaped body with a shallow atrium and a thin, undefended stalk (Text Fig. 48B)

RV *Sonne* Stn SO254/10ROV03_BIOBOX11, abyssal basin between Three Kings & Colville Ridges (collected and photographed by ROV *Kiel 6000*, GEOMAR expedition SO254, aboard RV *Sonne*), 30.991° S, 177.501° E, 4159 m, 01 Feb 2017, image courtesy of *PoriBacNewZ* project, GEOMAR & ICBM

2

confirmed

Amphidiscella abyssalis sp. nov.
(paratype NIWA 126032)

Characterised by the soft, tulip-shaped body with a deep, narrow, atrium and a thin, undefended stalk (Text Fig. 48D)

RV *Sonne* Stn SO254/10ROV03_BIOBOX4, abyssal basin between Three Kings & Colville Ridges (collected and photographed by ROV *Kiel 6000*, GEOMAR expedition SO254, aboard RV *Sonne*), 30.991° S, 177.500° E, 4160 m, 01 Feb 2017, image courtesy of *PoriBacNewZ* project, GEOMAR & ICBM

3

confirmed

Amphidiscella abyssalis sp. nov.
(paratype NIWA 126031)

Characterised by the soft, tulip-shaped body with a deep, narrow atrium and a thin, undefended stalk (Text Fig. 48C)

RV *Sonne* Stn SO254/10ROV03_BIOBOX3, abyssal basin between Three Kings & Colville Ridges (collected and photographed by ROV *Kiel 6000*, GEOMAR expedition SO254, aboard RV *Sonne*), 30.991° S, 177.500° E, 4160 m, 01 Feb 2017, image courtesy of *PoriBacNewZ* project, GEOMAR & ICBM

4

confirmed

Amphidiscella sonnae sp. nov.
(holotype NIWA 126034)

Characterised by the soft, spherical body, asymmetric osculum and gutter, and a thin, undefended stalk (Text Fig. 50B)

RV *Sonne* Stn SO254/10ROV03_BIOBOX7, abyssal basin between Three Kings & Colville Ridges (collected and photographed by ROV *Kiel 6000*, GEOMAR expedition SO254, aboard RV *Sonne*), 30.991° S, 177.501° E, 4159 m, 01 Feb 2017, image courtesy of *PoriBacNewZ* project, GEOMAR & ICBM

5

confirmed

Amphoreus schuppi gen. et sp. nov.
(holotype NIWA 126035)

Characterised by the sack or funnel-shaped body, lacking a sieve plate and (parietal) oscules in the wall (Text Fig. 52B)

RV *Sonne* Stn SO254/10ROV03_BIOBOX8, abyssal basin between Three Kings & Colville Ridges (collected and photographed by ROV *Kiel 6000*, GEOMAR expedition SO254, aboard RV *Sonne*), 30.991° S, 177.501° E, 4159 m, 01 Feb 2017, image courtesy of *PoriBacNewZ* project, GEOMAR & ICBM

6

unconfirmed

Subfamily Bolosominae

Note the amphora-shaped body, as in the new genus *Amphoreus*, with no wall (parietal) oscules or sieve-plate

NIWA Stn TAN1306/111, Chatham Rise, 43.544° S, 179.783° E, 390 m, 17 Jun 2013

7

confirmed

Trychella kermadecensis gen. et sp. nov.
(holotype NIWA 126125)

Characterised by the large size, the bulbous, cowbell-shaped body, with a deep atrium

RV *Sonne* Stn SO254/33ROV08_BIOBOX15, Southern Kermadec Ridge, (collected and photographed by ROV *Kiel 6000*, GEOMAR expedition SO254, aboard RV *Sonne*), 35.382°S, 178.979° E, 1211 m, 07 Feb 2017, image courtesy of *PoriBacNewZ* project, GEOMAR & ICBM

8

unconfirmed

Subfamily Bolosominae, possibly *Bolosoma* sp.

Characterised by the fungus-shaped, pedunculate morphology, basiphytous mode of attachment to hard substrate and everted atrial cavity

NIWA Stn TAN1402/128, Ghost Seamount, Louisville Ridge (International waters), 40.636° S, 165.561° W, 1332–1510 m, 25 Feb 2014

9

unconfirmed

Subfamily Bolosominae, possibly *Bolosoma* sp.

Characterised by the fungus-shaped, pedunculate morphology, basiphytous mode of attachment to hard substrate and everted atrial cavity

NIWA Stn TAN1402/128, Ghost Seamount, Louisville Ridge (International waters), 40.636° S, 165.561° W, 1332–1510 m, 25 Feb 2014

10

unconfirmed

Subfamily Bolosominae, possibly *Bolosoma* sp.

Characterised by the fungus-shaped, pedunculate morphology, basiphytous mode of attachment to hard substrate and everted atrial cavity

NIWA Stn TAN1402/79, 39 South Seamount, Louisville Ridge (International waters), 37.242° S, 169.267° W, 1084–1104 m, 18 Feb 2014

11

unconfirmed

Subfamily Bolosominae, possibly *Bolosoma* sp.

Characterised by the fungus-shaped, pedunculate morphology, basiphytous mode of attachment to hard substrate and everted atrial cavity

NIWA Stn TAN1402/60, Anvil Seamount, Louisville Ridge (International waters), 37.605° S, 169.021° W, 1191–1225 m, 15 Feb 2014

12

unconfirmed

Subfamily Bolosominae

Characterised by a soft, bulbous, bell-shaped body, as in the new genus *Trychella*, with a short stalk attached to hard substrate

NIWA Stn TAN1007/039, Rumble II West Seamount, Kermadec Ridge, 35.348° S, 178.544° E, 1157 m, 31 May 2010

unconfirmed

Subfamily Bolosominae

Characterised by a soft, bulbous, bell-shaped body, as in the new genus *Trychella*, most likely to have a short stalk

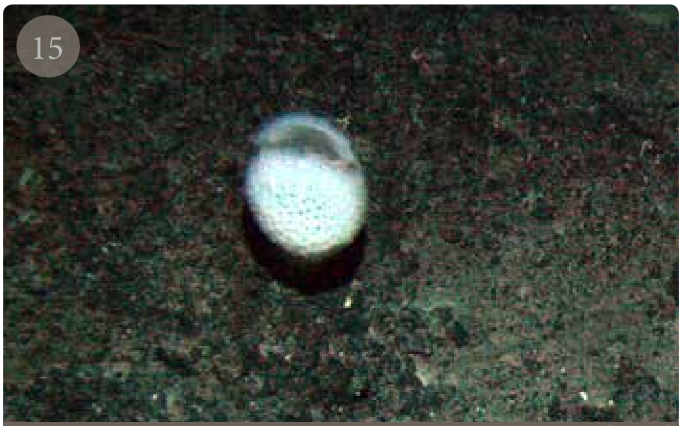
NIWA Stn TAN1007/040, Rumble II West Seamount, Kermadec Ridge, 35.349° S, 178.545° E, 1191 m, 31 May 2010

unconfirmed

Subfamily Bolosominae

Characterised by a soft, bulbous, bell-shaped body, as in the new genus *Trychella*, with a short stalk attached to hard substrate

NIWA Stn TAN1007/040, Rumble II West Seamount, Kermadec Ridge, 35.349° S, 178.545° E, 1191 m, 31 May 2010



unconfirmed

Subfamily Bolosominae or Corbitellinae

'Venus flower basket' form, spherical rather than tubular, with lateral (parietal) oscules visible in wall but no sieve-plate, possibly attached to hard substrate by a thin, short peduncle

NIWA Stn TAN1007/036, Rumble II West Seamount, Kermadec Ridge, 35.363° S, 178.538° E, 1175 m, 31 May 2010

unconfirmed

Subfamily Bolosominae or Corbitellinae

'Venus flower basket' form, spherical rather than tubular, with lateral (parietal) oscules visible in wall but no sieve-plate, attached to hard substrate by a thin, short peduncle

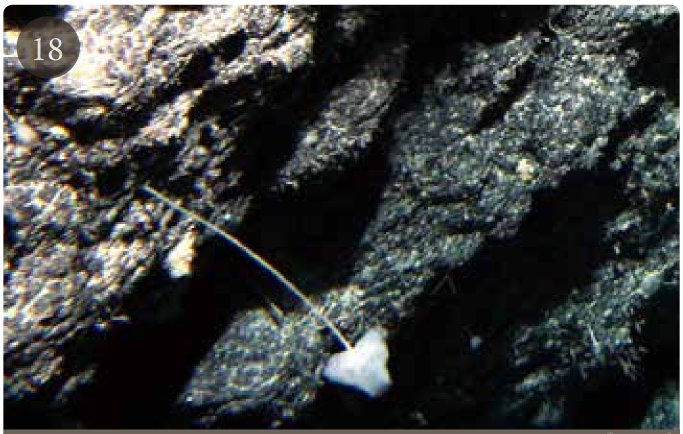
NIWA Stn TAN1007/65, Rumble II East Seamount, Kermadec Ridge, 35.424° S, 178.649° E, 1095 m, 3 Jun 2010

unconfirmed

Subfamily Bolosominae or *Amphidiscella* sp.

Characterised by a soft, conical body, with two specialised lateral (oscular?) surfaces and a thin hard peduncle

NIWA Stn TAN1007/048, Rumble II East Seamount, Kermadec Ridge, 35.422° S, 178.649° E, 1074 m, 1 Jun 2010

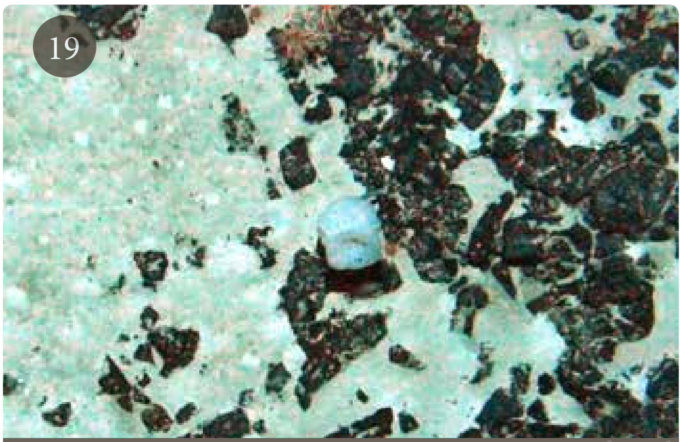


unconfirmed

Subfamily Bolosominae or *Amphidiscella* sp.

Characterised by a soft, conical body and a thin hard peduncle

NIWA Stn TAN0803/115, Seamount 10, Macquarie Ridge (International waters), 59.011° S, 158.880° E, 1589–1861 m, 19 Apr 2008

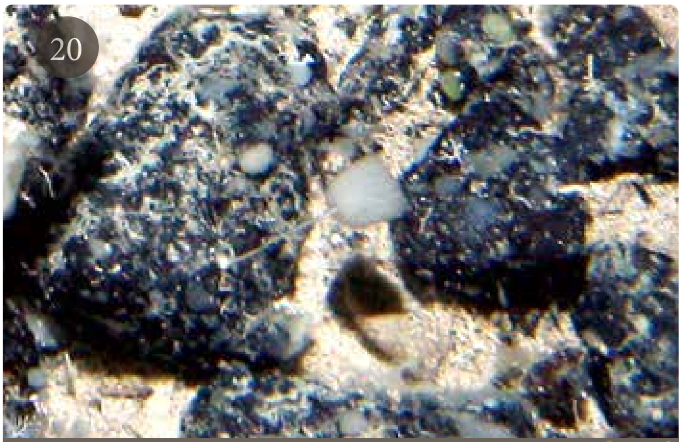

19

unconfirmed

Subfamily Bolosominae or *Amphidiscella* sp.

Characterised by a soft, cup-shaped body and thin hard peduncle

NIWA Stn TAN0803/032, Seamount 3, Macquarie Ridge, 50.092° S, 163.461° E, 1091 m, 1 Apr 2008

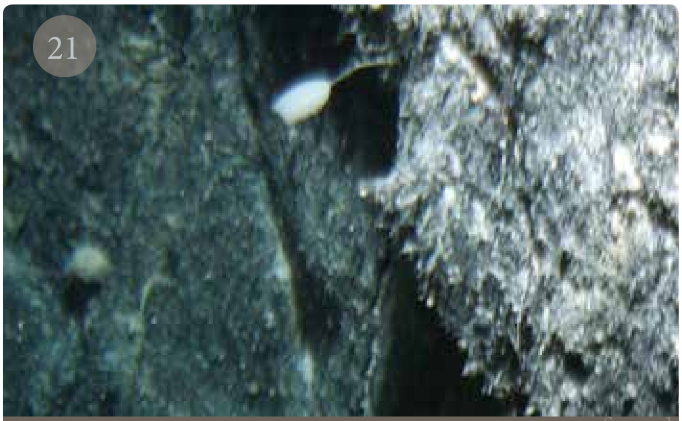

20

unconfirmed

Subfamily Bolosominae or *Amphidiscella* sp.

Characterised by a soft, cup-shaped body and thin hard peduncle

NIWA Stn TAN0803/101, Seamount 9, Macquarie Ridge (Australian EEZ), 56.259° S, 158.457° E, 799 m, 16 Apr 2008


21

unconfirmed

Subfamily Euplectellinae, possibly *Malacosaccus microglobus* sp. nov.

Characterised by a champagne flute-shaped body with a soft, flexible peduncle, attached to hard substrate in the uncommon basiphytous form

NIWA Stn TAN0803/078, Seamount 7, Macquarie Ridge (Australian EEZ), 53.717° S, 159.125° E, 845 m, 11 Apr 2008


22

unconfirmed

Subfamily Euplectellinae, possibly *Malacosaccus microglobus* sp. nov.

Characterised by a champagne flute-shaped body with a soft, flexible peduncle, attached into soft substrate in the typical (lophophytous) form

NIWA Stn TAN1603/UWC02, Reinga Basin, 35.330° S, 170.905° E, 2002 m, 21 Mar 2006

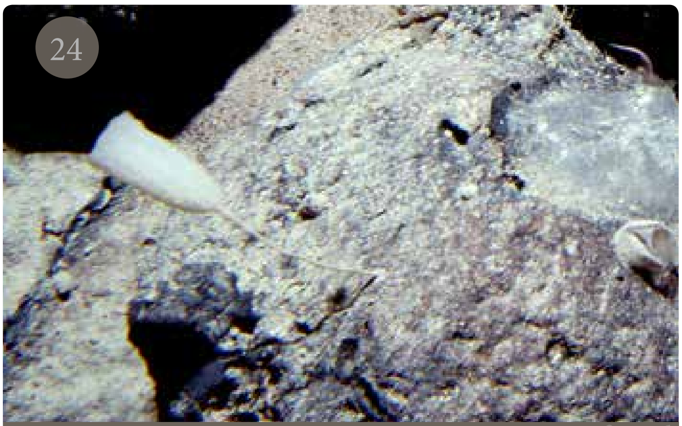

23

unconfirmed

Subfamily Euplectellinae, possibly *Malacosaccus microglobus* sp. nov.

Characterised by a champagne flute-shaped body with a soft, flexible peduncle, attached into soft substrate in the typical (lophophytous) form

NIWA Stn TAN1603/UWC06, Reinga Basin, 35.307° S, 170.751° E, 1860 m, 21 Mar 2006

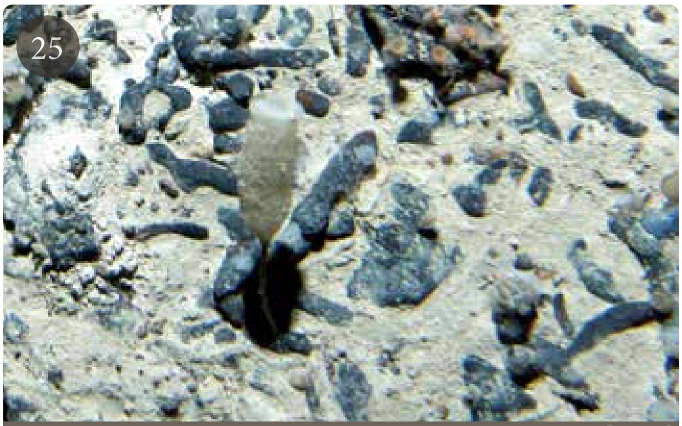

24

unconfirmed

Subfamily Euplectellinae, possibly *Malacosaccus microglobus* sp. nov.

Characterised by a champagne flute-shaped body with a soft, flexible peduncle, attached to hard substrate in the uncommon basiphytous form

NIWA Stn TAN1603/UWC06, Reinga Basin, 35.307° S, 170.748° E, 1860 m, 21 Mar 2006



25

unconfirmed

Subfamily Euplectellinae, possibly *Malacosaccus microglobus* sp. nov.

Characterised by a champagne flute-shaped body with a soft, flexible peduncle, attached into soft substrate in the typical (lophophytous) form

NIWA Stn TAN1603/UWC02, Reinga Basin, 35.330° S, 170.905° E, 2002 m, 21 Mar 2006

26

unconfirmed

Subfamily Bolosominae, possibly *Hyalostylus* sp.

Characterised by their shape which resembles a lollipop or mushroom

NIWA Stn TAN1206/87, Whakatane Seamount, Southern Kermadec Ridge, 36.803° S, 177.453° E, 1088–990

27

unconfirmed

Subfamily Bolosominae, possibly *Hyalostylus* sp.

Characterised by their shape, which resembles a lollipop or mushroom. Unlikely to be *Caulophacus* sp. (family Rossellidae), since the stalk appears undefended (without living tissue on it)

RV *Sonne* Stn SO254/10ROV03_BIOBOX3, abyssal basin between Three Kings & Colville Ridges (collected and photographed by ROV *Kiel 6000*, GEOMAR expedition SO254, aboard RV *Sonne*), 30.991° S, 177.500° E, 4160 m, 01 Feb 2017, image courtesy of *PoriBacNewZ* project, GEOMAR & ICBM

28

unconfirmed

Subfamily Euplectellinae or dictyonal species

Subfamily Euplectellinae (if attached within soft substrate beneath coral rubble), subfamily Corbitellinae (possibly *Regadrella okinoseana*), or an undetermined dictyonal species (subclass Hexastophora)

NIWA Stn TAN0604/074, Pyre Seamount, Graveyard Seamounts, 42.716° S, 179.905° W, 1070 m, 2 Jun 2006

29

most likely

Euplectella imperialis

'Venus flower basket,' tubular form, note typical diagonal, criss-cross parietal ridges, and attached basally in sediment by long anchoring spicules

NIWA Stn TAN0705/164, Chatham Rise, 42.849° S, 176.958° W, 846 m, 17 Apr 2007

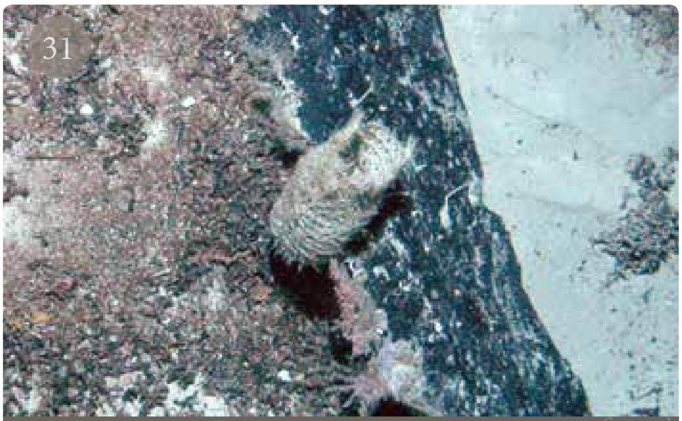
30

most likely

Euplectella imperialis

'Venus flower basket,' tubular form, note typical diagonal, criss-cross parietal ridges, oscules visible between ridges and attached basally in sediment by long anchoring spicules

NIWA Stn TAN1303/16, Great South Basin, Dunedin, 47.103° S, 171.019° E, 1234–1227 m, 24 Mar 2013



31

unconfirmed

Subfamily Corbitellinae or *Euplectella imperialis*

Subfamily Corbitellinae, such as *Corbitella* or *Dictyaulus* spp. (if attached to hard substrate) or *Euplectella imperialis* (if rooted in soft sediment under coral rubble). Note horizontal bands on inner surface. Specimen dead

NIWA Stn TAN1402/94, Anvil Seamount, Louisville Ridge (International waters), 39.145° S, 167.542° W, 1064 m, 21 Feb 2014

32

unconfirmed

Subfamily Corbitellinae

Smooth, even wall, with no ridges or projections. If attached by long spicules into soft sediment beneath rock, suggests new species *Euplectella semisimplex*, or if attached to hard substrate at base, suggests *Regadrella* sp.

NIWA Stn TAN1402/63, Anvil Seamount, Louisville Ridge (International waters), 37.700° S, 169.013° W, 1230 m, 16 Feb 2014

33

unconfirmed

Subfamily Corbitellinae

Smooth, even wall, with no ridges or projections. If attached by long spicules into soft sediment beneath rock, suggests new species *Euplectella semisimplex*, or if attached to hard substrate at base, suggests *Regadrella* sp.

NIWA Stn TAN1402/149, Valerie Guyot, Louisville Ridge (International waters), 41.398° S, 164.434° W, 1122 m, 1 Mar 2014

34

unconfirmed

Subfamily Corbitellinae

Smooth-sided tube and basiphytous attachment to hard substrate, suggests a species of *Dictyaulus*, *Corbitella* or *Regadrella*

NIWA Stn TAN1007/061, Rumble II East Seamount, Kermadec Ridge, 35.424° S, 178.647° E, 1061–1521 m, 02 Jun 2010

35

unconfirmed

Subfamily Corbitellinae

Smooth-sided tube and basiphytous attachment to hard substrate, suggests a species of *Dictyaulus*, *Corbitella* or *Regadrella*

NIWA Stn TAN1206/79, Whakatane Seamount, Bay of Plenty, 36.811° S, 177.470° E, 1022–1013 m, 22 April 2012

36

unconfirmed

Subfamily Corbitellinae

Smooth-sided tube and basiphytous attachment to hard substrate, suggests a species of *Dictyaulus*, *Corbitella* or *Regadrella*

NIWA Stn TAN1402/60, Anvil Seamount, Louisville Ridge (International waters), 37.605° S, 169.021° W, 1191–1225 m, 15 Feb 2014

37

unconfirmed

Subfamily Corbitellinae

Smooth-sided tube and basiphytous attachment to hard substrate, suggests a species of *Dictyaulus*, *Corbitella* or *Regadrella*

NIWA Stn TAN1206/79, Whakatane Seamount, Bay of Plenty, 36.811° S, 177.470° E, 1022–1013 m, 22 April 2012

38

unconfirmed

Subfamily Corbitellinae

Subfamily Corbitellinae, possibly *Regadrella okinoseana* or *Corbitella inopiosa* sp. nov., if attached basally to hard substrate; note relatively smooth surface

NIWA Stn TAN0803/101, Seamount 9, Macquarie Ridge (Australian EEZ), 56.259° S, 158.457° E, 799 m, 16 Apr 2008

39

unconfirmed

Subfamily Corbitellinae or *Dictyaulus* sp.

This 'Venus flower basket' sponge can be mistaken for the relatively common species, *Regadrella okinoseana*, but is characterised by a thin, translucent body wall, compared to the thicker, bumpier, more opaque body of many species of *Regadrella*. Dark spots on the surface of the sponges are the main gaps in the choanosomal tissue and are clearly in transverse rows, bordered by a series of transverse ridges, unlike the body form in *Regadrella*

NOAA ROV *Deep Discoverer 2* Stn EX1705/Dive03, Te Kawhiti a Maui Potiki deep ridge, Cook Islands, 04.584° S, 162.399° W, 2210–2200 m, 2 May 2017, image captured by NOAA ROV *Deep Discoverer 2* onboard RV *Okeanos Explorer*, courtesy of NOAA's Office of Ocean Exploration and Research/ Mountains in the Deep Programme (EX1705)

40

unconfirmed

Subfamily Corbitellinae or *Dictyaulus* sp.

This 'Venus flower basket' sponge can be mistaken for the relatively common species, *Regadrella okinoseana*, but is characterised by a thin, translucent body wall, compared to the thicker, bumpier, more opaque body of many species of *Regadrella*. Dark spots on the surface of the sponges are the main gaps in the choanosomal tissue and are clearly in transverse rows, bordered by a series of transverse ridges, unlike the body form in *Regadrella*

NIWA Stn TAN1007/34, Rumble II West Seamount, Kermadec Ridge, 35.356° S, 178.524° E, 1205–1353 m

41

unconfirmed

Subfamily Corbitellinae or *Dictyaulus* sp.

This 'Venus flower basket' sponge can be mistaken for the relatively common species, *Regadrella okinoseana*, but is characterised by a thin, translucent body wall, compared to the thicker, bumpier, more opaque body of many species of *Regadrella*. Dark spots on the surface of the sponges are the main gaps in the choanosomal tissue and are clearly in transverse rows, bordered by a series of transverse ridges, unlike the body form in *Regadrella*

NIWA Stn TAN1603/UWC06, Reinga Basin, 35.308° S, 170.746° E, 1854–1942 m, 21 Mar 2006

42

unconfirmed

Subfamily Corbitellinae

Characterised by basiphytous attachment to hard substrate, smooth surface as in species of *Dictyaulus*, *Corbitella* or *Regadrella*

NIWA Stn TAN1206/79, Whakatane Seamount, Bay of Plenty, 36.811° S, 177.470° E, 1022–1013 m, 22 April 2012

unconfirmed

Subfamily Corbitellinae

Characterised by basiphytous attachment to hard substrate, smooth surface as in species of *Dictyaulus*, *Corbitella* or *Regadrella*; specimen dead

NIWA Stn TAN1007/117, Rumble II West Seamount, Kermadec Ridge, 35.354° S, 178.526° E, 1189 m, 8 Jun 2010

most likely

Regadrella okinoseana

Characterised by a tube or vase-shaped body with ridges, a fine, regular sieve-plate and protruding margin

NIWA Stn TAN1603/UWC06, Reinga Basin, 35.308° S, 170.748° E, 1860 m, 21 Mar 2006

most likely

Regadrella okinoseana

Characterised by a tube or vase-shaped body with ridges, a fine, regular sieve-plate and protruding margin

NIWA Stn TAN1206/89, Whakatane Seamount, Bay of Plenty, 36.792° S, 177.448° E, 1170–1186 m, 23 April 2012

most likely

Regadrella okinoseana
(NIWA 126296)

Characterised by a tube or vase-shaped body with ridges and everted pockets, a fine, regular sieve-plate and protruding margin

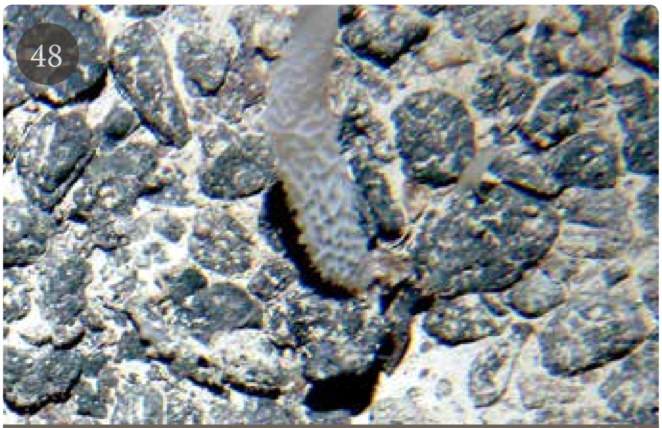
RV *Sonne* Stn SO254/79ROV16_BIOBOX7, Seamount 986, off Hawkes Bay shelf (collected and photographed by ROV *Kiel 6000*, GEOMAR expedition SO254, aboard RV *Sonne*), 40.048° S, 178.135° E, 896 m, 22 Feb 2017, image courtesy of *PoriBacNewZ* project, GEOMAR & ICBM

most likely

Regadrella okinoseana
(NIWA 126297)

Characterised by a tube or vase-shaped body with ridges and everted pockets, a fine, regular sieve-plate and protruding margin

RV *Sonne* Stn SO254/79ROV16_BIOBOX9, Seamount 986, off Hawkes Bay shelf (collected and photographed by ROV *Kiel 6000*, GEOMAR expedition SO254, aboard RV *Sonne*), 40.048° S, 178.137° E, 893 m, 22 Feb 2017, image courtesy of *PoriBacNewZ* project, GEOMAR & ICBM



most likely

Regadrella okinoseana

Characterised by a tube or vase-shaped body with ridges; attached to hard substrate

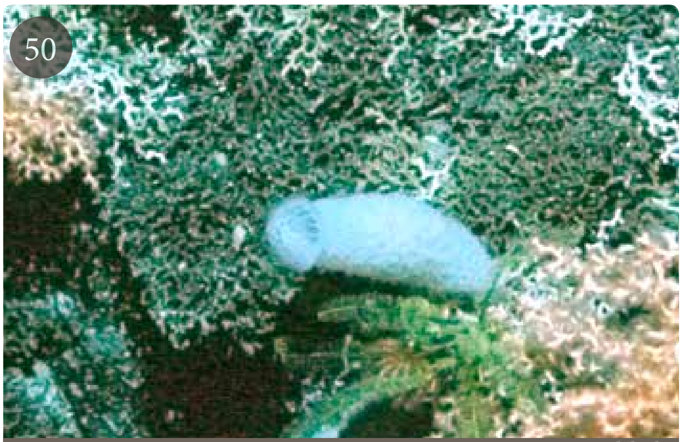
NIWA Stn TAN1603/UWC06, Reinga Basin, 35.307° S, 170.751° E, 1860 m, 21 Mar 2006

most likely

Regadrella okinoseana

Characterised by a tube-shaped body with ridges, a fine, regular sieve-plate and protruding margin. The double tube is very unusual (from Clark *et al.* 2015, Fig. 47C, 60)

NIWA Stn TAN1402/147, Valerie Guyot, Louisville Ridge (International waters), 41.370° S, 164.424° W, 1312–1544 m, 1 Mar 2014



most likely

Regadrella okinoseana

Characterised by a tube-shaped body with ridges, a fine, regular sieve-plate and protruding margin (from Clark *et al.* 2015, Fig. 47D)

NIWA Stn TAN1402/150, Valerie Guyot, Louisville Ridge (International waters), 41.394° S, 164.432° W, 1135–1400 m, 1 Mar 2014

most likely

Regadrella okinoseana

Characterised by a tube-shaped body with ridges

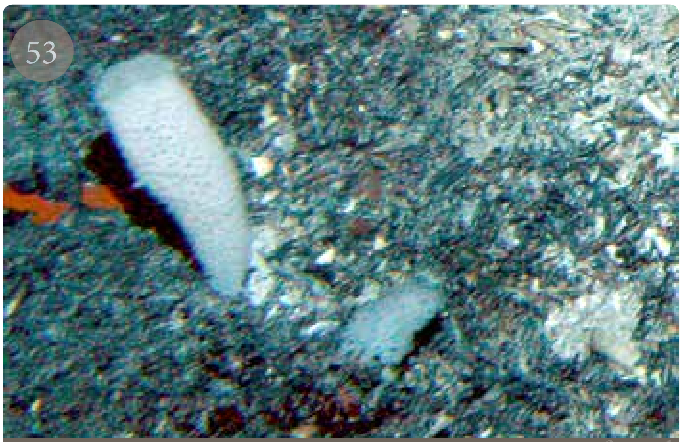
NIWA Stn TAN0905/52, Diabolical Seamount, Graveyard Seamount Complex, Chatham Rise, 42.794° S, 179.987° W, 922–1052 m, 18 Jun 2009

unconfirmed

Regadrella okinoseana or *R. australis* sp. nov.

The relatively smooth surface suggests *R. okinoseana*, but this species is uncommon at this lattitude

NIWA Stn TAN0803/078, Seamount 7, Macquarie Ridge (Australian EEZ), 53.717° S, 159.125° E, 845 m, 11 Apr 2008



unconfirmed

Regadrella okinoseana or *R. australis* sp. nov.

The relatively smooth surface suggests *R. okinoseana*, but this species is uncommon at this lattitude

NIWA Stn TAN0803/034, Seamount 3, Macquarie Ridge, 50.089° S, 163.499° E, 1198 m, 1 Apr 2008

unconfirmed

Regadrella okinoseana or *R. australis* sp. nov.

The relatively smooth surface suggests *R. okinoseana*, but this species is uncommon at this lattitude

NIWA Stn TAN0803/083, Seamount 7, Macquarie Ridge (Australian EEZ), 53.738° S, 159.142° E, 894 m, 12 Apr 2008


55

unconfirmed

Regadrella okinoseana or *R. australis* sp. nov.

The relatively smooth surface suggests *R. okinoseana*, but this species is uncommon at this lattitude

NIWA Stn TAN0803/078, Seamount 7, Macquarie Ridge (Australian EEZ), 53.717° S, 159.125° E, 845 m, 11 Apr 2008


56

most likely

Regadrella australis sp. nov.

Characterised by a barrel-shaped body, coarse surface and sieve-plate, and low marginal cuff

NIWA Stn TAN0803/078, Seamount 7, Macquarie Ridge (Australian EEZ), 53.717° S, 159.125° E, 845 m, 11 Apr 2008


57

most likely

Regadrella australis sp. nov.

Characterised by a barrel-shaped body, coarse surface and sieve-plate, and low marginal cuff

NIWA Stn TAN0803/101, Seamount 9, Macquarie Ridge (Australian EEZ), 56.259° S, 158.457° E, 799 m, 16 Apr 2008


58

most likely

Regadrella australis sp. nov.

Characterised by a barrel-shaped body, coarse surface and sieve-plate, and low marginal cuff

NIWA Stn TAN0803/078, Seamount 7, Macquarie Ridge (Australian EEZ), 53.717° S, 159.125° E, 845 m, 11 Apr 2008


59

most likely

Regadrella australis sp. nov.

Characterised by a barrel-shaped body, coarse surface and sieve-plate, and low marginal cuff

NIWA Stn TAN0803/092, Seamount 8, Macquarie Ridge (Australian EEZ), 55.402° S, 158.407° E, 558 m, 15 Apr 2008


60

most likely

Regadrella australis sp. nov.

Characterised by a barrel-shaped body, coarse surface and sieve-plate, and low marginal cuff

NIWA Stn TAN0803/078, Seamount 7, Macquarie Ridge (Australian EEZ), 53.717° S, 159.125° E, 845 m, 11 Apr 2008

61

most likely

Regadrella australis sp. nov.

Characterised by a barrel-shaped body, coarse surface and sieve-plate, and low marginal cuff

NIWA Stn TAN0803/099, Seamount 9, Macquarie Ridge (Australian EEZ), 56.265° S, 158.496° E, 635 m, 16 Apr 2008

62

most likely

Regadrella australis sp. nov.

Characterised by a barrel-shaped body, coarse surface and sieve-plate, and low marginal cuff

NIWA Stn TAN0803/078, Seamount 7, Macquarie Ridge (Australian EEZ), 53.717° S, 159.125° E, 845 m, 11 Apr 2008

63

most likely

Regadrella australis sp. nov.

Characterised by a vase-shaped body, coarse surface and sieve-plate, and low wavy marginal cuff

NIWA Stn TAN0803/099, Seamount 9, Macquarie Ridge (Australian EEZ), 56.265° S, 158.496° E, 635 m, 16 Apr 2008

64

most likely

Regadrella australis sp. nov.

Characterised by a barrel-shaped body, coarse surface and sieve-plate, and low wavy marginal cuff

NIWA Stn TAN0803/126, Seamount 11, Macquarie Ridge (Australian EEZ), 57.986° S, 160.489° E, 556 m, 20 Apr 2008

65

most likely

Regadrella australis sp. nov.

Characterised by a barrel-shaped body, coarse surface and sieve-plate, and low wavy marginal cuff

NIWA Stn TAN0803/099, Seamount 9, Macquarie Ridge (Australian EEZ), 56.265° S, 158.496° E, 635 m, 16 Apr 2008

66

unconfirmed

Regadrella pedunculata sp. nov.
(NIWA 126299)

Characterised by a barrel-shaped body, low to non-existent margin, and root-like basal attachment, seen in the collected specimen but not here

RV *Sonne* Stn SO254/79ROV16_BIOBOX3, Seamount No. 986, off Hawkes Bay shelf (collected and photographed by ROV *Kiel 6000*, GEOMAR expedition SO254, aboard RV *Sonne*), 40.049° S, 178.135° E, 907 m, 22 Feb 2017, image courtesy of *PoriBacNewZ* project, GEOMAR & ICBM

confirmed

Regadrella hispida sp. nov.
(NIWA 126165)

Characterised by tubular body, extremely spiny surface, large frilly margin and a crown of very long marginal spicules that resemble eyelashes covering the opening

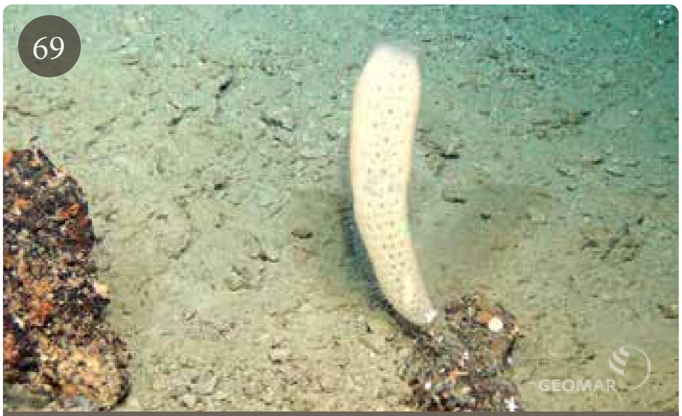
RV *Sonne* Stn SO254/36ROV10_BIOBOX3, Seamount 986, off Hawkes Bay shelf (collected and photographed by GEOMAR ROV *Kiel 6000*, onboard RV *Sonne*, ICBM expedition SO254), 39.991° S, 178.215° E, 792 m, 09 Feb 2017, image courtesy of *PoriBacNewZ* project, GEOMAR & ICBM

confirmed

Regadrella hispida sp. nov.

Apex showing large frilly margin and crown of very long marginal spicules that resemble eyelashes covering the opening

RV *Sonne* Stn SO254/36ROV10_BIOBOX4, Seamount 986, off Hawkes Bay shelf (collected and photographed by GEOMAR ROV *Kiel 6000*, onboard RV *Sonne*, ICBM expedition SO254), 39.990° S, 178.214° E, 793 m, 09 Feb 2017, image courtesy of *PoriBacNewZ* project, GEOMAR & ICBM

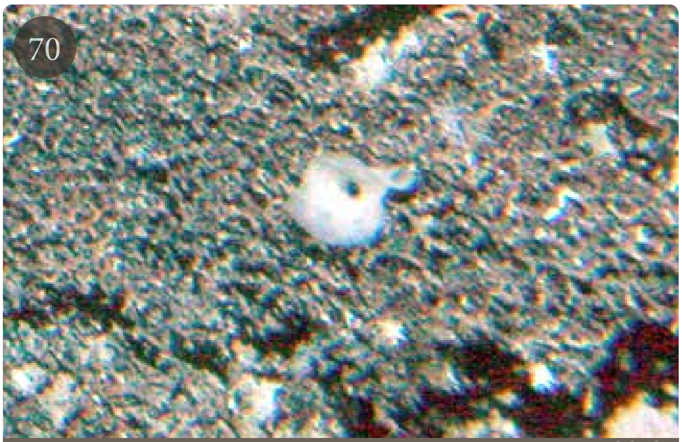


confirmed

Regadrella hispida sp. nov.
(NIWA 126162)

Characterised by tubular body, extremely spiny surface, large frilly margin and a crown of very long marginal spicules that resemble eyelashes covering the opening

RV *Sonne* Stn SO254/36ROV10_BIOBOX4, Seamount 986, off Hawkes Bay shelf (collected and photographed by GEOMAR ROV *Kiel 6000*, onboard RV *Sonne*, ICBM expedition SO254), 39.990° S, 178.214° E, 793 m, 09 Feb 2017, image courtesy of *PoriBacNewZ* project, GEOMAR & ICBM



most likely

Atlantisella lorraineae

Characterised by the thin, translucent vase-shaped body, with a hollow stalk-like base

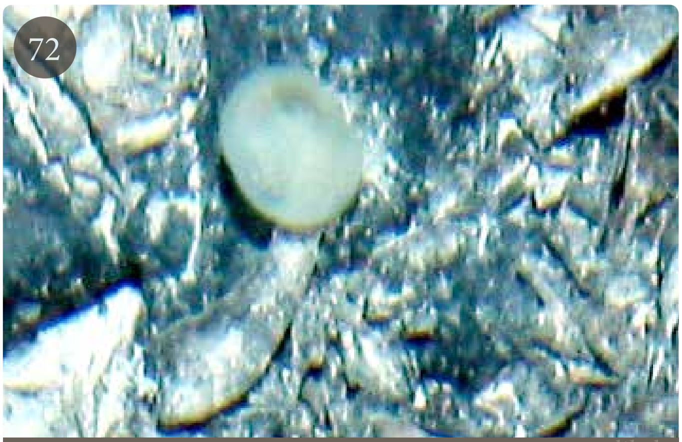
NIWA Stn TAN0803/020, Seamount 1, Macquarie Ridge, 48.553° S, 164.937° E, 1106 m, 30 Mar 2008

most likely

Atlantisella lorraineae

Characterised by the thin, translucent vase-shaped body

NIWA Stn TAN0803/032, Seamount 3, Macquarie Ridge, 50.092° S, 163.461° E, 1091 m, 1 Apr 2008



most likely

Atlantisella lorraineae

Characterised by the thin, translucent vase-shaped body

NIWA Stn TAN0803/032, Seamount 3, Macquarie Ridge, 50.092° S, 163.461° E, 1091 m, 1 Apr 2008

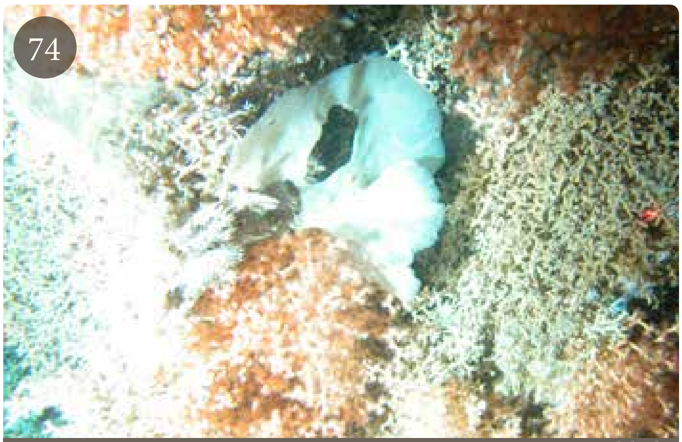
73

unconfirmed

Atlantisella lorraineae

Characterised by the thin, translucent vase-shaped body

NIWA Stn TAN0803/049, Seamount 5, Macquarie Ridge, 51.070° S, 161.987° E, 319–471 m, 4 Apr 2008



74

most likely

Atlantisella lorraineae

Large specimen characterised by a thin, translucent, fan-shaped body, with no discernible perforations, attached by multiple points to coral rubble

NIWA Stn TAN0604/067, Ghoul Seamount, Graveyard Seamounts Complex, Chatham Rise, 42.798° S, 179.988° E, 940 m, 1 Jun 2006

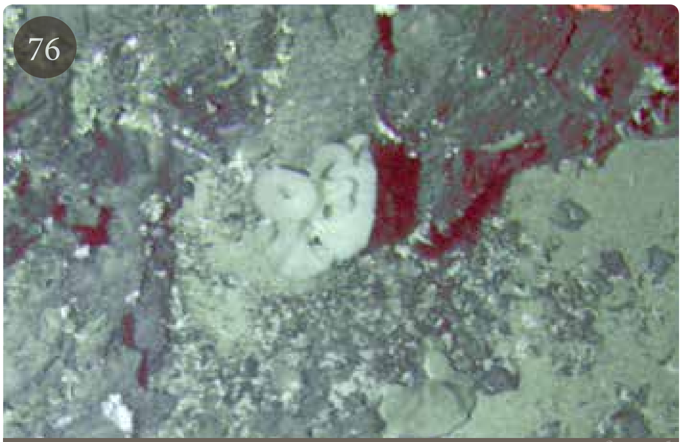
75

most likely

Atlantisella lorraineae

Large specimen characterised by a thin, translucent, fan-shaped body, with no discernible perforations, attached by multiple points to coral rubble

NIWA Stn TAN0803/018, Seamount 1, Macquarie Ridge, 48.531° S, 164.950° E, 1077 m, 30 Mar 2008



76

unconfirmed

Atlantisella lorraineae

Large specimen characterised by a thin, translucent, fan-shaped body, with no discernible perforations

NIWA Stn TAN0604/075, Graveyard Seamounts Complex, Chatham Rise, 42.761° S, 179.990° W, 757 m, 2 Jun 2006

77

confirmed

Atlantisella lorraineae

(NIWA 126249)

Characterised by a thin, translucent, tube to fan-shaped body, with no discernible perforations, attached by multiple points to coral rubble

RV *Sonne* Stn SO254/77ROV14_BIOBOX20, Canyon slope, off Christchurch continental shelf (collected and photographed by ROV *Kiel 6000*, GEOMAR expedition SO254, aboard RV *Sonne*), 43.288° S, 173.606° E, 668 m, 20 Feb 2017, image courtesy of *PoriBacNewZ* project, GEOMAR & ICBM

78

most likely

Atlantisella lorraineae

Large specimen characterised by a thin, translucent, fan-shaped body, with no discernible perforations, attached by multiple points to coral rubble (reproduced with permission from Reiswig & Kelly 2017, Fig. 2A)

NIWA Stn TAN1007/33, Rumble II West Seamount, Kermadec Ridge, 35.347° S, 178.544° E, 1181–1439 m, 30 May 2010

most likely

Atlantisella lorraineae

Characterised by the thin, translucent vase-shaped body, with a hollow stalk-like base (reproduced with permission from Reiswig & Kelly 2017, Fig. 2C)

NIWA Stn TAN0905/23, Graveyard Seamount, Graveyard Seamount Complex, Chatham Rise, 42.760° S, 179.987° W, 770–919 m, 15 Jun 2009

most likely

Atlantisella lorraineae

Large specimens characterised by the thin, translucent, fan-shaped body, with no discernible perforations, attached by multiple points to coral rubble (image from Clark *et al.* 2009, cover; reproduced with permission from Reiswig & Kelly 2017, Fig. 2B)

NIWA Stn TAN0905/54, Diabolical Seamount, Graveyard Seamount Complex, Chatham Rise, 42.790° S, 179.982° W, 894–1058 m, 18 Jun 2009

most likely

Atlantisella lorraineae

Characterised by a thin, translucent vase-shaped body, with a hollow stalk-like base, (from Clark *et al.* 2009, p. 40; reproduced with permission from Reiswig & Kelly 2017, Fig. 2D)

NIWA Stn TAN0905/23, Graveyard Seamount, Graveyard Seamount Complex, Chatham Rise, 42.760° S, 179.987° W, 770–919 m, 15 Jun 2009

unconfirmed

Atlantisella lorraineae or Family Rossellidae

Appears to be a little thick and opaque for *A. lorrainea;* may be family Rossellidae, such as genus *Hyalascus* sp.

NIWA Stn TAN0803/068, Seamount 6 Macquarie Ridge (Australian EEZ), 52.379° S, 160.676° E, 452 m, 9 Apr 2008

unconfirmed

Atlantisella lorraineae or Family Rossellidae

Appears to be a little thick and opaque for *A. lorrainea;* may be family Rossellidae, such as genus *Hyalascus* sp.

NIWA Stn TAN0803/078, Seamount 7, Macquarie Ridge (Australian EEZ), 53.717° S, 159.125° E, 845 m, 11 Apr 2008

unconfirmed

Atlantisella lorraineae or Family Rossellidae

Appears to be a little thick and opaque for *A. lorrainea;* may be family Rossellidae, such as genus *Hyalascus* sp. (reproduced with permission from Reiswig & Kelly 2017, Fig. 2E)

NIWA Stn TAN0905/23, Graveyard Seamount, Graveyard Seamount Complex, Chatham Rise, 42.760° S, 179.987° W, 770–919 m, 15 Jun 2009

85

confirmed

Saccocalyx tetractinus sp. nov.
(NIWA 126322)

Characterised by a cup-shaped body with bubbly processes (pockets and pouches) on top of a robust, tapering, hollow stem

RV *Sonne* Stn SO254/84ROV18_BIOBOX3, Seamount No. 1247, off East Cape (collected and photographed by ROV *Kiel 6000*, GEOMAR expedition SO254, aboard RV *Sonne*), 37.916° S, 179.215° E, 1456 m, 23 Feb 2017, image courtesy of *PoriBacNewZ* project, GEOMAR & ICBM

86

confirmed

Saccocalyx tetractinus sp. nov.
(NIWA 126321)

Characterised by a cup-shaped body with bubbly processes (pockets and pouches) on top of a robust, tapering, hollow stem

RV *Sonne* Stn SO254/84ROV18_BIOBOX11, Seamount No. 1247, off East Cape, (collected and photographed by ROV *Kiel 6000*, GEOMAR expedition SO254, aboard RV *Sonne*), 37.912° S, 179.215° E, 1352 m, 23 Feb 2017, image courtesy of *PoriBacNewZ* project, GEOMAR & ICBM

87

confirmed

Saccocalyx tetractinus sp. nov.
(NIWA 126012)

Characterised by a cup-shaped body with bubbly processes (pockets and pouches) on top of a robust, tapering, hollow stem

RV *Sonne* Stn SO254/08ROV02_BIOBOX4, Seamount 114, East of Three Kings Ridge (International waters) (collected and photographed by GEOMAR ROV *Kiel 6000*, onboard RV *Sonne*, ICBM expedition SO254), 31.300° S, 175.196° E, 1347 m, 31 Jan 2017, image courtesy of *PoriBacNewZ* project, GEOMAR & ICBM

88

confirmed

Saccocalyx tetractinus sp. nov.
(NIWA 126029)

Characterised by a cup-shaped body with bubbly processes (pockets and pouches) on top of a robust, tapering, hollow stem

RV *Sonne* Stn SO254/10ROV03_BIOBOX3, abyssal basin between Three Kings & Colville Ridges (collected and photographed by ROV *Kiel 6000*, GEOMAR expedition SO254, aboard RV *Sonne*), 30.991° S, 177.500° E, 4160 m, 01 Feb 2017, image courtesy of *PoriBacNewZ* project, GEOMAR & ICBM

89

most likely

Saccocalyx tetractinus sp. nov.

Characterised by a cup-shaped body with bubbly processes (pockets and pouches) on top of a robust, tapering, hollow stem

NIWA Stn TAN1007/46, Rumble II East Seamount, Kermadec Ridge, 35.426° S, 178.652° E, 1113–1377 m, 1 Jun 2010

90

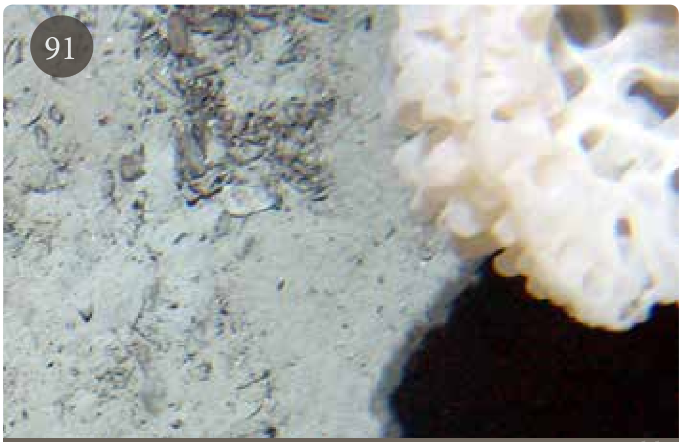
most likely

Saccocalyx tetractinus sp. nov.

Characterised by a cup-shaped body with bubbly processes (pockets and pouches) on top of a robust, tapering, hollow stem

NIWA Stn TAN1007/041, Rumble II West Seamount, Kermadec Ridge, 35.350° S, 178.546° E, 1197 m, 31 May 2010

91



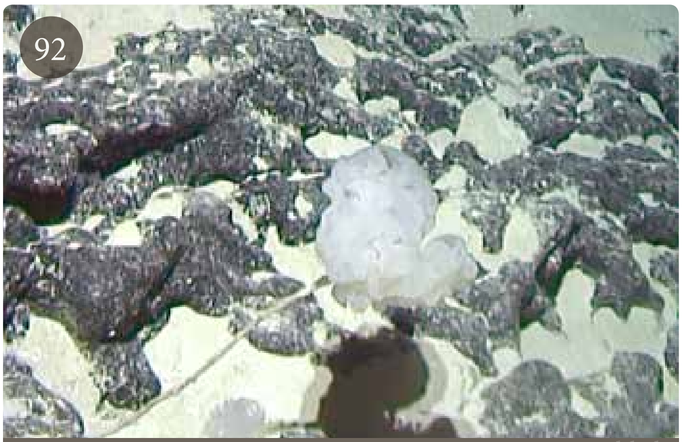
questionable

Saccocalyx tetractinus sp. nov.

Characterised by a cup-shaped body with bubbly processes (pockets and pouches) on top of a robust, tapering, hollow stem; first apparent record at this lattitude

NIWA Stn TAN0803/032, Seamount 3, Macquarie Ridge, 50.092° S, 163.461° E, 1091 m, 1 Apr 2008

92



most likely

Saccocalyx tetractinus sp. nov.

Characterised by a cup-shaped body with bubbly processes (pockets and pouches) on top of a robust, tapering, hollow stem

NIWA Stn TAN1402/6, Forde Guyot, Louisville Ridge (International waters), 35.358° S, 170.366° W, 1145–1390 m, 8 Feb 2014

93

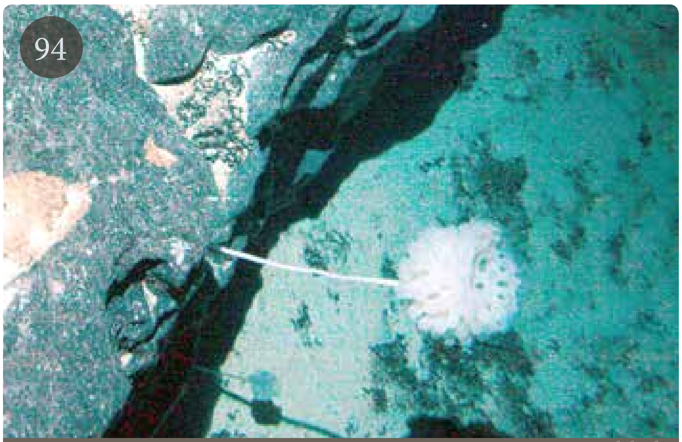
most likely

Saccocalyx tetractinus sp. nov.

Characterised by a cup-shaped body with bubbly processes (pockets and pouches) on top of a robust, tapering, hollow stem

NIWA Stn TAN1402/6, Forde Guyot, Louisville Ridge (International waters), 35.358° S, 170.366° W, 1145–1390 m, 8 Feb 2014

94



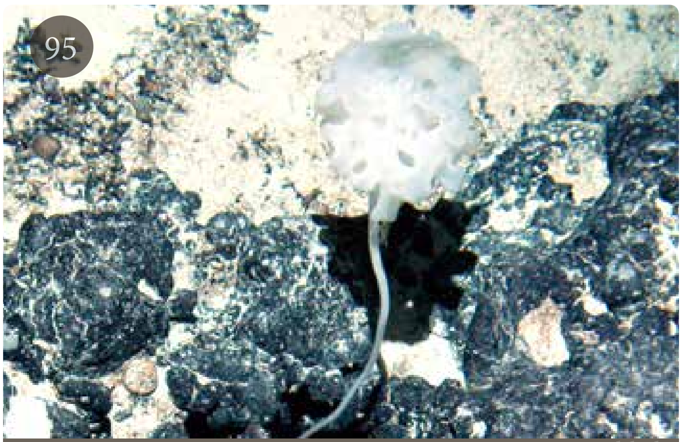
most likely

Saccocalyx tetractinus sp. nov.

Characterised by a bubbly cup-shaped body and thin tapering, hollow stem (Clark *et al.* 2015, Fig. 7A)

NIWA Stn TAN1402/6, Forde Guyot, Louisville Ridge (International waters), 35.349° S, 170.374° W, 1145–1390 m, 8 Feb 2014

95



most likely

Saccocalyx tetractinus sp. nov.

Characterised by a cup-shaped body with bubbly processes (pockets and pouches) on top of a robust, tapering, hollow stem

NIWA Stn TAN1402/6, Forde Guyot, Louisville Ridge (International waters), 35.358° S, 170.366° W, 1145–1390 m, 8 Feb 2014

96

most likely

Saccocalyx tetractinus sp. nov.

Characterised by a cup-shaped body with bubbly processes (pockets and pouches) on top of a robust, tapering, hollow stem

NIWA Stn TAN1402/68, Anvil Seamount, Louisville Ridge (International waters), 37.629° S, 169.123° W, 1162–1528 m, 16 Feb 2014

97

most likely

Saccocalyx tetractinus sp. nov.

Characterised by a cup-shaped body with bubbly processes (pockets and pouches) on top of a robust, tapering, hollow stem

NIWA Stn TAN1402/150, Valerie Guyot, Louisville Ridge (International waters), 41.381° S, 164.424° W, 1135–1400 m, 1 Mar 2014

98

most likely

Saccocalyx pedunculatus (Schulze 1895)

Characterised by a cup-shaped body with bubbly processes (pockets and pouches) on top of a robust, tapering, hollow stem. We consider this specimen, from Kawhiti a Maui Potiki deep ridge, north of the Cook Islands, to be the type species, *S. pedunculatus*, because it occurs beyond a radius of about 1500 km from New Zealand

NOAA ROV *Deep Discoverer 2* Stn EX1705/Dive03, Te Kawhiti a Maui Potiki deep ridge, Cook Islands, 04.584° S, 162.399° W, 2210–2200 m, 2 May 2017, image captured by NOAA ROV *Deep Discoverer 2* onboard RV *Okeanos Explorer*, courtesy of NOAA's Office of Ocean Exploration and Research/ Mountains in the Deep Programme (EX1705)

99

most likely

Walteria flemmingi

Characterised by a translucent, loose, net-like structure, expanding from a restricted attachment base, terminating in a restricted apex

NIWA Stn TAN0803/101, Seamount 9, Macquarie Ridge (Australian EEZ), 56.259° S, 158.457° E, 799 m, 16 Apr 2008

100

most likely

Walteria flemmingi

Characterised by a translucent, loose, net-like structure, expanding from a restricted attachment base, terminating in a restricted apex. This specimen is in good condition; you can see the conical tip and basidictyonal plate attaching it to rocky substrate. The small, scattered lateral processes are visible on the lower, shadowed side of the sponge. The pinkish orange colouration, on the upper right in the sponge, is most likely a shrimp-like crustacean

NIWA Stn TAN1206/93, Clark Seamount, Kermadec Ridge, 36.453° S, 177.844° E, 1025–1045 m, 23 Apr 2012

101

most likely

Walteria flemmingi

Characterised by a translucent, loose, net-like structure, expanding from a restricted attachment base, terminating in a restricted apex; lateral processes visible

NIWA Stn TAN0803/115, Seamount 10, Macquarie Ridge (International waters), 59.011° S, 158.880° E, 158 m, 19 Apr 2008

102

most likely

Walteria flemmingi

Characterised by a translucent, loose, net-like structure, expanding from a restricted attachment base, terminating in a restricted apex; specimen is dead, covered in silt and starting to disintegrate

NIWA Stn TAN1206/24, Tangaroa Seamount, Kermadec Ridge, 36.329° S, 178.040° E, 964–788 m, 17 Apr 2012

103

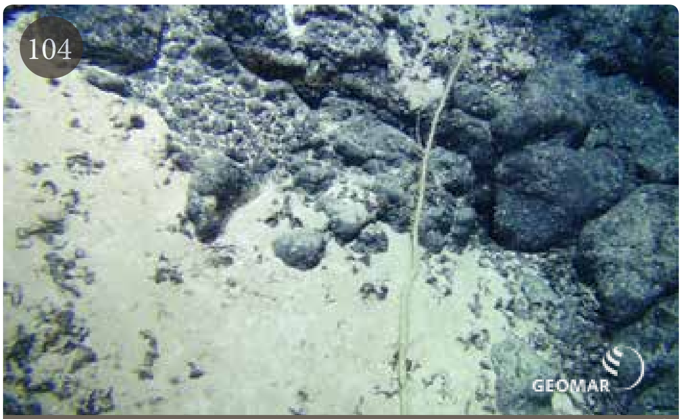
most likely

Walteria leuckarti

Characterised by the tubular, tree-like structure, with numerous 'window oscules' along the main tube, and extensive lateral branches and processes which are themselves dichotomous and multiple-branched

RV *Sonne* Stn SO254/08ROV02_BIOBOX5, Seamount 114, East of Three Kings Ridge (collected and photographed by ROV *Kiel 6000*, GEOMAR expedition SO254, aboard RV *Sonne*), 31.298° S, 175.197° E, 1338 m, 31 Jan 2017, image courtesy of *PoriBacNewZ* project, GEOMAR & ICBM

104



confirmed

Walteria leuckarti
(NIWA 126019)

Characterised by the tubular, tree-like structure

RV *Sonne* Stn SO254/08ROV02_BIOBOX3, Seamount 114, East of Three Kings Ridge (International waters) (collected and photographed by GEOMAR ROV *Kiel 6000*, onboard RV *Sonne*, ICBM expedition SO254), 31.300° S, 175.196° E, 1359 m, 31 Jan 2017, image courtesy of *PoriBacNewZ* project, GEOMAR & ICBM

105

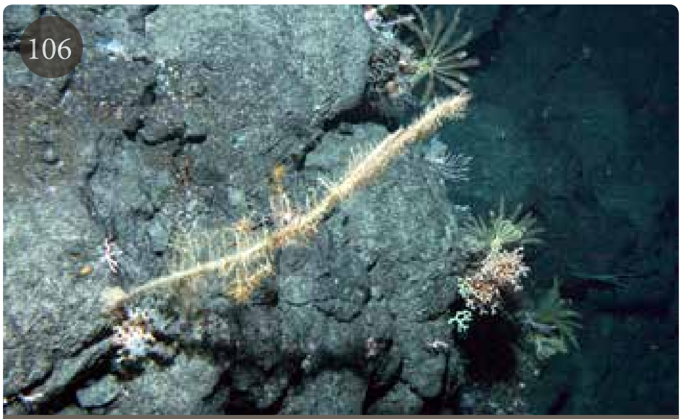
most likely

Walteria leuckarti

Characterised by the tubular, tree-like structure, with numerous 'window oscules' along the main tube

NIWA Stn TAN1007/35, Rumble II West Seamount, Kermadec Ridge, 35.354° S, 178.527° E, 1170–1324 m, 31 May 2010

106



most likely

Walteria leuckarti

Characterised by the tubular, tree-like structure, with numerous 'window oscules' along the main tube, and extensive lateral branches and processes which are themselves dichotomous and multiple-branched

NIWA Stn TAN1007/35, Rumble II West Seamount, Kermadec Ridge, 35.354° S, 178.527° E, 1170–1324 m, 31 May 2010

107

most likely

Walteria leuckarti

Characterised by the tubular, tree-like structure, with numerous 'window oscules' along the main tube, and extensive lateral branches and processes which are themselves dichotomous and multiple-branched

NIWA Stn TAN1007/35, Rumble II West Seamount, Kermadec Ridge, 35.354° S, 178.527° E, 1170–1324 m, 31 May 2010

108

confirmed

Walteria leuckarti
(NIWA 126023)

Characterised by the tubular, tree-like structure, with numerous 'window oscules' along the main tube, and extensive lateral branches and processes which are themselves dichotomous and multiple-branched

RV *Sonne* Stn SO254/08ROV02_BIOBOX5, Seamount 114, East of Three Kings Ridge (International waters) (collected and photographed by GEOMAR ROV *Kiel 6000*, onboard RV *Sonne*, ICBM expedition SO254), 31.298° S, 175.197° E, 1338 m, 31 Jan 2017, image courtesy of *PoriBacNewZ* project, GEOMAR & ICBM

109

unconfirmed

Walteria cf. *leuckarti*

(NIWA 126324)

This may be a new species of *Walteria*, characterised by the white opacity of the sponge, and uniform length and form of the lateral processes

RV *Sonne* Stn SO254/84ROV18_BIOBOX16, Seamount No. 1247, off East Cape (collected and photographed by ROV *Kiel 6000*, GEOMAR expedition SO254, aboard RV *Sonne*), 37.912° S, 179.216° E, 1277 m, 23 Feb 2017, image courtesy of *PoriBacNewZ* project, GEOMAR & ICBM

110

unconfirmed

Walteria cf. *leuckarti*

This may be a new species of *Walteria*, characterised by the white opacity of the sponge, and uniform length and form of the lateral processes

NIWA Stn TAN1206/20, Tangaroa Seamount, Kermadec Ridge, 36.334° S, 178.022° E, 1156–1173 m, 16 April 2012

111

unconfirmed

Walteria cf. *leuckarti*

This may be a new species of *Walteria*, characterised by the white opacity of the sponge, and uniform length and form of the lateral processes

NIWA Stn TAN1007/126, Rumble II West, Kermadec Ridge, 35.349° S, 178.544° E, 1169–1455 m, 09 Jun 2010

112

unconfirmed

Walteria cf. *leuckarti*

This may be a new species of *Walteria*, characterised by the divaricating form, reminiscent of bracken, the white opacity of the sponge, and uniform length and form of the lateral processes

NIWA Stn TAN1206/37, Clark Seamount, Kermadec Ridge, 36.458° S, 177.835° E, 1193–1186 m, 18 Apr 2012

113

unconfirmed

Walteria cf. *leuckarti*

This may be a new species of *Walteria*, characterised by the divaricating form, reminiscent of bracken, the white opacity of the sponge, and uniform length and form of the lateral processes

NIWA Stn TAN1206/79, Whakatane Seamount, Kermadec Ridge, 36.329° S, 178.040° E, 964–788 m, 17 Apr 2012

114

unconfirmed

Walteria cf. *leuckarti*

This may be a new species of *Walteria*, characterised by the divaricating form, reminiscent of bracken, the white opacity of the sponge, and uniform length and form of the lateral processes

NIWA Stn TAN1007/39, Rumble II West Seamount, Kermadec Ridge, 35.348° S, 178.544° E, 1157–1434 m, 31 May 2010

115

unconfirmed

Walteria sp. indet.

We think that this image is of *Walteria* sp. indet., recorded previously only from the Hawai'ian region, and now maybe near the Cook Islands. It is characterised by a thick, lattice-work, tubular body, with extensive side processes. The diagnostic morphological characters are the pointed apex and lattice-like body wall

NOAA ROV *Deep Discoverer 2* Stn EX1705/Dive03, Te Kawhiti a Maui Potiki deep ridge, Cook Islands, 04.584° S, 162.399° W, 2210–2200 m, 2 May 2017, image captured by NOAA ROV *Deep Discoverer 2* onboard RV *Okeanos Explorer*, courtesy of NOAA's Office of Ocean Exploration and Research/ Mountains in the Deep Programme (EX1705)

116

unconfirmed

Walteria sp. indet.

Characterised by a thick, lattice-work, tubular body, with extensive side processes and has been recorded previously only from the Hawai'ian region. The diagnostic morphological characters are the pointed apex and lattice-like body wall. We believe that this is a good New Zealand example of *Walteria* sp. indet., too thick to be *W. leuckarti*, and too thin to be *W. flemmingi*

NIWA Stn TAN1007/37, Rumble II West Seamount, Kermadec Ridge, 35.356° S, 178.505° E, 1446–1610 m, 31 May 2010

117

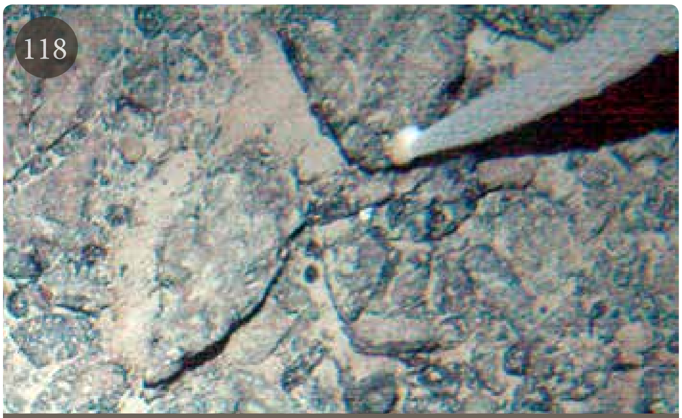
unconfirmed

Subfamily Corbitellinae, or *Walteria* sp. indet.

Base of a sponge resembling *Walteria* sp. indet.; note the thin tubular shape, unlike other Corbitellinae which tend to expand above the base. Specimen dead

NIWA Stn TAN1603/UWC06, Reinga Basin, 35.308° S, 170.748° E, 1860 m, 21 Mar 2006

118



unconfirmed

Subfamily Corbitellinae, or *Walteria* sp. indet.

Base of a sponge resembling *Walteria* sp. indet.; note the thin tubular shape, unlike other Corbitellinae which tend to expand above the base

NIWA Stn TAN1603/UWC 06, Reinga Basin, 35.308° S, 170.746° E, 1860 m, 21 Mar 2006

119

unconfirmed

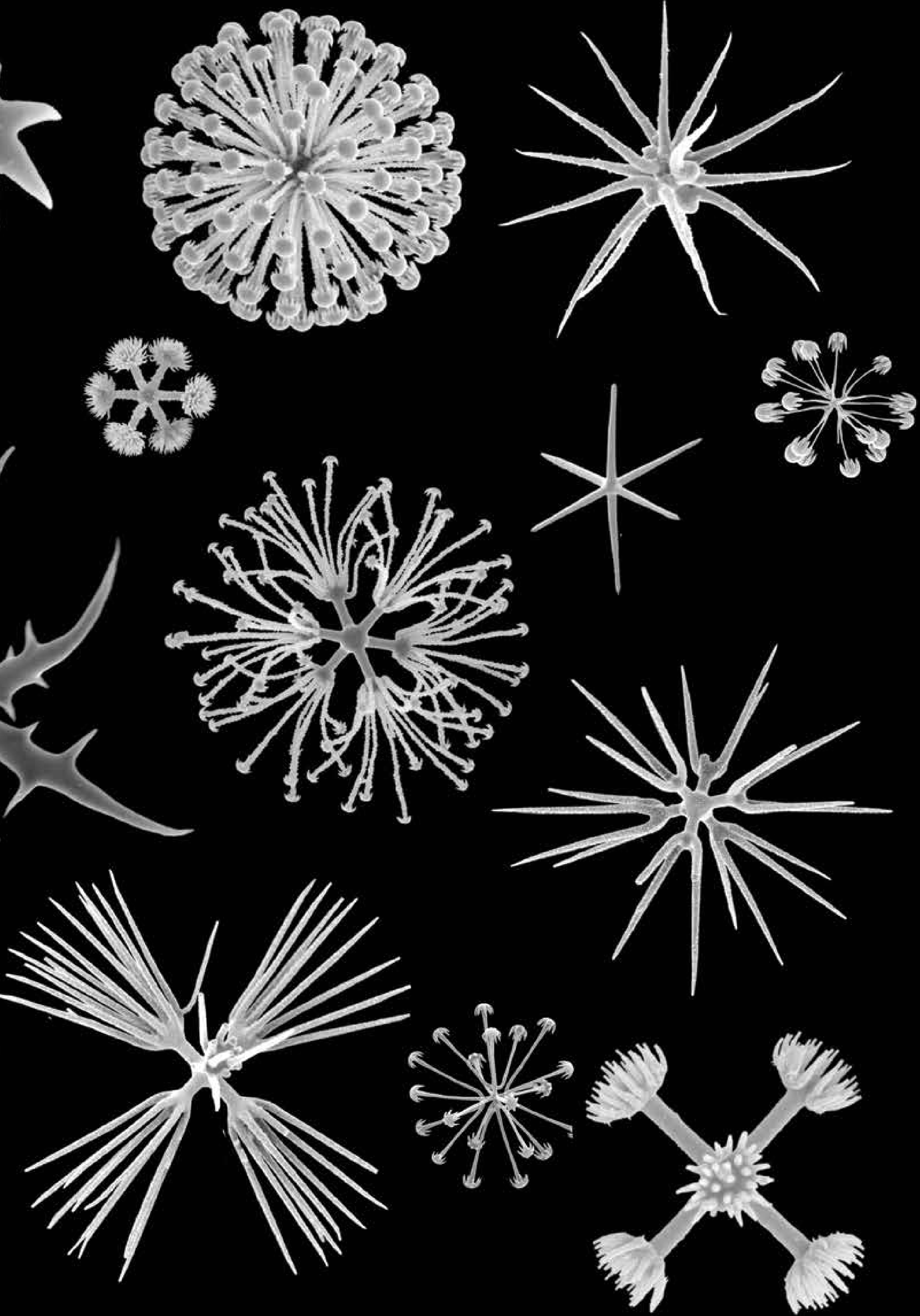
Subfamily Corbitellinae

Dead, broken, subfamily Corbitellinae, or vase-shaped *Walteria* sp. Sponge on right may be the dictyonal glass sponge *Euryplegma auriculare* Schulze, 1886

NIWA Stn TAN1206/24, Tangaroa Seamount, Kermadec Ridge, 36.329° S, 178.040° E, 964–788 m, 17 Apr 2012

Taxonomic index

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



NIWA Biodiversity Memoir 130
ISSN 1174-0043; 130 (print)
ISSN 2463-638X; 130 (online)

Soft cover ISBN 978-0-473-39713-5
Hard cover ISBN 978-0-473-39714-2
Electronic ISBN 978-0-473-39715-9