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New species of Annelida of the Australian Indian Ocean Territory (Christmas Island and Cocos (Keeling) Islands) seamounts

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Abstract. Research voyages aboard the Australian RV, *Investigator*, in 2021 (IN2021_V08) and 2022 (IN2022_V04) sampled benthic communities from seamounts off Christmas Island and the Cocos (Keeling) Islands, collectively known as the Australian Indian Ocean Territories (IOT). Annelid specimens collected during these voyages were deposited at the Australian Museum, and 13 species from the families Aphroditidae and Serpulidae have previously been described. In this study, we describe seven new species: two in Onuphidae (*Anchinothria pettiboneae* sp. nov. and *Nothria multisetosa* sp. nov.), three in Polynoidae (*Admetella longilamella* sp. nov., *Gorgoniapolynoe unidentata* sp. nov., and *Harmothoe robinwilsoni* sp. nov.), and a new genus, *Terebellosuctoria*, with two new species (*Terebellosuctoria jimii* sp. nov. and *T. keelingensis* sp. nov.) in Terebellidae. A specimen of *Nothria* (AM W.54655), represented by a single individual, likely constitutes a new species but is not formally described here. The geographic ranges of the onuphids *Nothria orensanzi*, *N. simplex*, and *Hyalinoecia robusta*, as well as of the polynoid *Anotochaetonoe michelbhaudii*, are extended. Additionally, two polynoid specimens are identified as belonging to undescribed species within a potential new genus, which will be addressed in future work. All species descriptions are supported by DNA sequence data, and their phylogenetic positions within their respective families are assessed.

Keywords: Annelida; Polychaeta; biodiversity; species discovery; deep-sea; 18S; 28S; COI; 16S
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Introduction

Annelids occur in all marine environments, and they are typically a dominant macrofaunal (>300 µm) taxon in terms of abundance and species diversity in deep-sea soft sediments (Herring, 2010; Rex & Etter, 2010). They display a diverse range of life history strategies and feeding modes (Jumars *et al*., 2015) and play important roles in processing and burying organic matter, recycling nutrients and bioturbation of seafloor sediments (Hutchings, 1998).

Australian deep-sea polychaete biodiversity is severely underestimated as, prior to 2017, out of over 2,000 annelid species known from Australia (Atlas of Living Australia, 2026), only 15 species from seven families had been described from below 1000 m (Gunton *et al*., 2021, table 1). As of May 2025, the Australian Faunal Directory (Australian Government, 2026) listed a total of 1,491 species of polychaetes in Australian waters. A new era of Australian deep-sea exploration began in 2015 with the commission of the Australian RV '*Investigator*': as of May 2025, 56 new polychaete species have been described from 117 voyages onboard RV '*Investigator*' (Hutchings *et al*., 2025a). Most recently Murray *et al*. (2025) revised abyssal and bathyal polynoids from southern and eastern Australia, describing nine new species.

Systematic studies of benthic fauna in the deep sea off Australia's west coast (Indian Ocean) did not exist prior to 2020. Earlier reports of polychaetes have been limited to material collected by expeditions of broader geographical scope that included a few deep stations off Western Australia (e.g., McIntosh, 1922: *Fauveliopsis challengeriae*). Limited number of samples from below 1,000 m were taken on the lower shelf and upper bathyal depths of the western and southwestern continental margin of Australia from the FRV *Southern Surveyor*, in 2005 and 2007 (Poore *et al*., 2015), including *Laonice pectinata* Greaves *et al*., 2011 from 1,440 m.

The 'Investigating the IOT' voyages in 2021 and 2022 (O'Hara, 2024) were the first expeditions dedicated to exploration of deep-sea seamount fauna of the Indian Ocean off the Australian west coast. The voyages recovered a total of 419 polychaete specimens, and a preliminary illustrated summary of annelid taxa (Kupriyanova *et al*., 2024) reports 58 morphospecies from 29 families. Of these, four new species of the family Aphroditidae and nine species of the family Serpulidae have been described (Flaxman & Kupriyanova, 2024; Kupriyanova & Flaxman, 2024). The aim of this study was to describe new species of the annelid families Onuphidae, Polynoidae, and Terebellidae collected during the IOT expeditions.

Material and methods

Sample collection

Samples were mostly collected during the "Investigating the IOT" campaign (voyages IN2021_V04 and IN2022_V08) to the seamounts of Christmas Island and Cocos (Keeling) Islands—Australia's Indian Ocean Territories (IOT) during 2021–2022. Some additional samples collected during the RV '*Investigator*' voyage IN2022_V09 to the Gascoyne and Carnarvon Marine Parks and adjacent areas off Western Australia in 2022 were also included in this study (see Keesing *et al*., 2025 for details). The specimens collected during IN2022_V09 have been deposited to the Western Australian Museum (WAM, V. registration numbers). The station details for specimens examined for this study are available in Supplementary Table S1 and are described in O'Hara (2024). Three sampling gears—the 4 m beam trawl, Gandalf net, and Sherman sled—yielded annelid specimens (see O'Hara, 2024 for details). Specimens collected were sorted on ice onboard and fixed directly in 95% ethanol or 5% formalin. Specimens were shipped to and deposited in the collections of (AM, W. registration numbers) and Museums Victoria (MV). Comparative samples from earlier Australian research voyages (IN2015_C01, IN2015_C02, IN2015_E02, IN2017_C02, RE2017_C01, and IN2017_V03, see Murray *et al*., 2025 for details), deposited in AM, were also examined (Supp. Tables S1–S2).

Morphological examination methods

At the AM, specimens were photographed using an Olympus SZX7 microscope fitted with a Michrome 20 Pro digital camera and using Capture 2.3 software (manual stacking); dissected parts were photographed using an Olympus BX53 compound microscope fitted with an Olympus DP74 digital camera and using CellSens Standard software. Some terebellids were examined under a Nikon SMZ25 stereomicroscope, a Nikon Eclipse E400 compound microscope, and photographed with a Nikon DS-Ri 2 digital camera at Macquarie University, Sydney. To enhance contrast of external morphological structures, selected specimens were stained with methylene blue. Selected specimens were dehydrated in ethanol, critical-point dried, coated with 20 nm of gold, and examined under the Scanning Electron Microscope (SEM) JEOL JSM–6480 at Macquarie University, Sydney. Maps of sampling locations were produced using the Free and Open Source QGIS 3.42.2.

DNA extraction, amplification, and sequencing

Molecular work was carried out at the AM with some terebellid sequences produced at CNR, Arcachon, France and some onuphid sequences produced at University Museum of Bergen, Norway. At the AM, DNA was extracted from tissue samples using the Bioline Isolate II Genomic DNA extraction kit following the standard procedure of the manual. One fragment each of *CO*, *16S, 18S* and *28S* were amplified. The amplifications used the following primer pairs: polyLCO/polyCHO for *COI* (Carr *et al*., 2011), 16SarL/16SbrH for *16S* (from Palumbi *et al*., 1996, F modified), TimA/1100R2 for *18S* (Nóren and Jordelius, 1999) and Po28F1/ Po28R4 for *28S* (Struck *et al*., 2006).

PCR (Polymerase Chain Reactions) were performed in volumes of 25 µl, containing 3 ng DNA, 1X Qiagen CoralLoad PCR Buffer, 2.5 mM $MgCl_2$, 0.25 mM dNTP, 0.5 mM of each primer, 0.5 µg/µl of BSA, and 0.2 µl of Bioline MyTaq DNA polymerase. For *CO1*, amplification consisted of an initial denaturation step at 94°C for 4 min, followed by 35 cycles of denaturation at 94°C for 30 s, annealing at 52° for 30 s, followed by extension at 72°C for 1 min. The final extension was set to 72°C for 5 min. For *16S*, initial denaturation was at 94°C for 10 min, denaturation (40 cycles) at 94°C for 30 s, annealing at 59° for 30 s and extension at 72°C for 1 min with final extension at 72°C for 10 min. For *18S*, initial denaturation was at 94°C for 3.5 min, denaturation (40 cycles) at 94°C for 30 s, annealing at 50° for 30 s and extension at 72°C for 1 min with final extension at 72°C for 7 min. For *28S*, initial denaturation was at 94°C for 4 min, denaturation (35 cycles) at 94°C for 30 s, annealing at 48° for 30 s and extension at 72°C for 1 min with final extension at 72°C for 4 min. PCR products were purified and sequenced by the Macrogen sequencing facility (Seoul, South Korea). Chromatograms were manually corrected for misreads and forward and reverse strands were merged into one sequence file using CodonCode Aligner v. 9.0.1 (CodonCode Corporation, Dedham, MA).

At Arcachon, DNA was extracted with Maxwell (Promega) an automated DNA/RNA isolation, with Maxwell® RSC Blood DNA kit, following protocol supplied by the manufacturers. Approximately 400 bp of *16S* rDNA gene was amplified, using primers 16Sannf (Sjölin *et al*., 2005) and 16SbrH (Palumbi, 1996). Approximately 600 bp of *COI* gene was amplified using primers LCO1490 and HCO2198 (Folmer *et al*., 1994).

PCR were performed with GoTaq® G2 Flexi DNA Polymerase Kit (Promega) in volumes of 20 µl containing: 4 µL of 5X Green GoTaq® Flexi Reaction Buffer (final concentration of 1X), 1.2 µL of MgCl2 (25 Mm) solution, 0.4 µL of PCR nucleotide mix (final concentration of 0.2 mM each dNTP), 0.2 µl of each primer (final concentration of 1 µM), 0.1 µl of Taq DNA Polymerase (5U/µl), 1 µl of template DNA and 12.9 µL of nuclease-free water. For *16S,* amplification consisted of an initial denaturation step at 94°C for 10 min, followed by 40 cycles of denaturation at 94°C for 40 s, annealing at 59°C for 30 s, followed by extension at 72°C for 1 min. The final extension was set to 72°C for 10 min. For *COI,* amplification consisted of an initial denaturation step at 94°C for 10 min, followed by 5 cycles of denaturation at 94°C for 40 s, annealing at 44°C for 40 s, and extension at 72°C for 1 min; followed by another 35 cycles of denaturation at 94°C for 40 s, annealing at 51°C for 40 s, and extension at 72°C for 1 min. The final extension was set to 72°C for 5 min. PCR success was verified by electrophoresis in a 1% agarose gel stained with ethidium bromide. Amplified products were sent for Sanger sequencing to Macrogen Europe B.V. to complete double strand sequencing, using the same set of primers as used for PCR. Overlapping sequence (forward and reverse) fragments were merged into consensus sequences, using Geneious Prime 2023.0.1.

At the University Museum of Bergen, DNA was extracted using QuickExtract™ DNA Extraction Solution (Epicentre). A small piece of tissue, usually three or four segments, was placed into 100 µl QuickExtract™ solution, and incubated at 65 °C for 45 min followed by 2 min at 95 °C in a dry block thermostat. The same sets of primers and PCR protocols were used as at AM. The total volume of each PCR reaction was 25 µl containing: 17.35 µl of nuclease-free water, 2.5 µl of Buffer (10X), 2 µl of nucleotide mix (2.5 mM each dNTP), 1 µl of each primer (10 µM), 0.15 µl of TaKaRa Taq DNA polymerase (Clontech, concentration of 5 U/µl), 1 µl of template DNA. Amplified PCR products were analysed by electrophoresis on a 1% agarose gel stained with GelRed Nucleic Acid Stain and then sent to Macrogen Inc. facilities (Amsterdam, the Netherlands) for purification and bidirectional sequencing. Chromatograms of forward and reverse strands were merged into one sequence file using GeneStudio Pro 2.2. Sequences generated for this study were deposited in GenBank and the Barcode of Life Data Systems (BOLD) (Supp. Tables S2–S4).

Phylogenetic analyses

An independent analysis was run for each of three families (Onuphidae, Polynoidae, Terebellidae). The combined dataset of Onuphidae included 92 sequences of *COI*, 105 sequences of *16S* and 80 sequences of *28S* obtained either in this study or from GenBank, including the representatives of all genera from the subfamily Hyalinoeciinae and three species from the subfamily Onuphinae as the outgroups (Supp. Table S2). Alignments were performed in MAFFT (Katoh *et al*., 2002) with default settings. The dataset was split into five partitions (each codon position in *COI*; *16S* and *28S*). The BI analysis was performed in MrBayes v. 3.2.6 (Ronquist & Huelsenbeck, 2003) and included two runs of 10^7 generations, with four chains each and a sampling frequency of one tree per 1,000 generations. Other parameters were set to default. After checking for convergence (ESS>200) with Tracer (Rambaut *et al*., 2018), a consensus tree was then calculated after discarding the first 25% trees as burn-in. According to the MrBayes manual (5.3.4), a priori model testing was not performed, and the GTR+G+I model was applied to the BI analysis. Nodal support was assessed by values of Bayesian posterior probabilities (BPP). Pairwise genetic distances were calculated for mtDNA markers sequences using the Kimura two-parameter model (K2P, Kimura, 1980) as implemented in MEGA7 with the option ‘pair-wise deletion of gaps’.

The combined dataset of Polynoidae included 46 sequences of *COI*, 50 sequences of *16S*, 48 sequences of *18S* and 45 sequences of *28S* obtained either in this study or from GenBank (Supp. Table S3). Polynoidae sequence alignments were generated using MUSCLE in MEGA7 (Kumar *et al*., 2016). Phylogenetic trees were generated using Maximum Likelihood (ML) performed using IQ-TREE v. 2.1.1 (Minh *et al*., 2020), including the implemented model-finder function (Kalyaanamoorthy *et al*., 2017) and ultrafast bootstrapping (BS, 1000 replicates) (Hoang *et al*., 2018). The following models have been chosen: TIM3+F+I+R2, F81+F+I, TIM2+F+G4 (*COI* 1-3 codons); GTR+F+I+G4 (*16S*); HKY+F+G4 (*18S*); TIM+F+I+R2 (*28S*). Sequences of *Laetmonice murrayae* Flaxman & Kupriyanova, 2024 were used as outgroup for the analyses.

The combined dataset of Terebellidae included 38 *COI* sequences, 39 *16S* sequences, 24 *18S* sequences and 23 *28S* sequences obtained either in this study or from GenBank (Supp. Table S4). Alignments of *16S*, *18S* and *28S* were generated in Geneious Prime 2023.0.1 using MAAFT (Katoh *et al*., 2002) with default settings, while *COI* sequences were aligned with MUSCLE (Edgar, 2004). Maximum likelihood analyses were performed in IQ-TREE 2.2.0 (Trifinopoulos *et al*., 2016), under the best-fitting models (automatically chosen by IQ-TREE) GTR+F+I+G4 for *16S* and *COI*, and TNe + G4 for *18S* and *28S*. Node support was assessed with 1000 ultrafast bootstrap replicates (UFBoot; Minh *et al*., 2013). Pairwise Kimura 2-parameter (K2P) genetic distances were calculated in MEGA v7.0.26. Sequences of *Arenicola marina* (Linnaeus, 1758) were used as outgroup for concatenated and *COI* analyses.

Results

Molecular results

Within the family Onuphidae, the subfamily Hyalinoeciinae, the genera *Hyalinoecia* and *Anchinothria,* were recovered as monophyletic with full node support (posterior probability, BPP 1.00), while *Nothria* was paraphyletic (Fig. 1). All but one *Nothria* species formed a highly supported clade (BPP.1.00) and one of the newly discovered species in the present study, *Nothria multisetosa* sp. nov., was sister to *Leptoecia midatlantica* (BPP 0.96). Ten species and one previously reported species complex were recovered within the main *Nothria* clade with newly obtained sequences clustering within previously described from the deep Australian waters, *Nothria orensanzi* and *Nothria simplex*. A single specimen AM W.54655 formed an independent lineage, sister to another Australian species, *Nothria minima* (BPP 0.99). Mean between species K2P distances in the analysed *Nothria* species ranged from 16.2 to 29.1% in *COI*. Mean within species distances were 0–2.2%, except for *N. orensanzi* with 5.4% mean within species distance.

Five previously known species were recovered within *Hyalinoecia* with a single specimen collected from IOT clustering within *Hyalinoecia robusta*, a species known to have a nearly cosmopolitan distribution. Mean between species K2P distances in the analysed *Hyalinoecia* species ranged from 11.2 to 20.7% in *COI*. Mean within species distances were 0–0.3%, except for *H. robusta* with 3.7% mean within species distance.

Five tentative species were recovered within *Anchinothria* including the new species, *Anchinothria pettiboneae* sp. nov., with specimens collected from IOT and the Great Australian Bight (GAB), sister (BPP 0.96) to the clade combining previously reported *A.* cf. *pycnobranchiata* and *A. cirrobranchiata*, and two singletons, *Anchinothria* sp. 49016 and *Anchinothria* sp. 56845, requiring further study. Mean between species K2P distances in the analysed *Anchinothria* species ranged from 16.1 to 24.8% in *COI*. Mean within species distances were 0.2–2.3%.

Results of concatenated analysis of Polynoidae (Fig. 2) recovered the subfamilies Polynoinae, Admetellinae, and Lepidastheniinae as monophyletic with full node support (BS 100). The two sequences of specimens reported here as Polynoidae gen. sp. 1 (intraspecific *16S* genetic distance 0%) formed a well-supported clade (BS 97) and were recovered as sister to *Ceuthonoe nezhai* with full support. This clade was recovered as sister to the ((Polynoinae+Admetellinae)+Lepidastheniinae) clade.

Within Admetellinae, *Admetella longilamella* sp. nov. was sister to *A. undulata* (BS 99), whereas *Admetella* sp. AM W.54477 did not group with this taxon but formed sister to *Admetella* sp. 2. of Wu *et al*. (2024). Within Lepidastheniinae, the sequence of *Anotochaetonoe michaelbhaudi* formed a fully supported clade with *A. rubermaculata (*Interspecific distance 24.4%). Within Polynoinae, the genus *Gorgoniapolynoe* formed a well-supported monophyletic clade (BS 99) with fully supported *Gorgoniapolynoe unidentata* sp. nov. clade (intraspecific *COI* distance 0.4%) nested inside, being sister to *G. caeciliae*. *Harmothoe* was recovered as polyphyletic and *Harmothoe robinwilsoni* sp. nov. was recovered as sister to a large clade that included monophyletic *Gorgoniapolynoe* and nominal representatives of *Antipathipolyeunoa*, *Eunoe*, *Harmothoe*, *Neopolynoe*, and *Polyeunoa*.

Results of both *COI* and the concatenated analyses of Terebellidae (Fig. 3) recovered a fully supported clade composed of *Lanice spongicola* + *T. keelingensis* sp. nov. as sister to *T. jimii* sp. nov. This clade is interpreted here as *Terebellosuctoria* n. gen. Based on *COI* sequences, the interspecific *COI* genetic distances (K2P distances) between *T. jimii* sp. nov. and *T. spongicola* was 10%, that between *T. jimii* sp. nov. and *T. keelingensis* sp. nov. was 14.8% and that between *T. spongicola* and *T. keelingensis* sp. nov. was 14.5%. The intraspecific distances within specimens of *T. jimii* sp. nov. was 0.7% and 0.3% for *T. keelingensis* sp. nov. The clade *Terebellosuctoria* n. gen. was recovered as sister clade to the unresolved *Loimia*-*Lanice* group, with a mean K2P distance of 25.4% with *Lanice* species, and 26.1% with *Loimia* ones.

Taxonomy

Phylum Annelida Lamarck, 1802

Class Polychaeta Grube, 1850

Order Eunicida Dales, 1963

Family Onuphidae Kinberg, 1865

Onuphidae consists of the subfamilies Onuphinae comprising 17 genera and Hyalinoeciinae Paxton, 1986 comprising five genera. Most onuphids are tubicolous; Onuphinae are well represented in intertidal to shelf depths, Hyalinoeciinae are often found in deeper environments, making the onuphids the fourth most diverse polychaete family in the deep sea (Paterson *et al*., 2009). In Australian waters there are 77 species reported from 14 genera (Australian Government, 2026).

Remarks. Morphological characters were described using terminology by Paxton (1986), Budaeva and Paxton (2013), and Paxton *et al*. (2023).

Subfamily Hyalinoeciinae Paxton, 1986

Type genus: *Hyalinoecia* Malmgren, 1866

Anchinothria Paxton, 1986

Type species. *Diopatra pourtalesii* Ehlers, 1879.

Diagnosis. Derived from Budaeva and Paxton (2013). Body short, up to 100 segments. Median antenna longer and thicker than lateral antennae. Ceratophores short, consisting of 2–5 rings. Nuchal grooves straight. Anterior 2–3 pairs of parapodia enlarged, directed anteroventrally with bi- to trilobed prechaetal lobes. Uni- or bidentate simple or pseudocompound falcigers on first 2–4 pairs of anterior parapodia, in one species on first seven pairs of parapodia. Subacicular hooks in median position, from chaetigers 4–16. Pectinate chaetae wide with rolled margins, so-called ‘scoop-shaped’. Branchiae present or absent, single to up to 10 filaments. Tubes dorsoventrally flattened with parchment-like inner layer covered with mud and often incrusted with scattered large elongated foraminiferans, glass sponge spicules or echinoid spines attached along longitudinal margins of tubes.

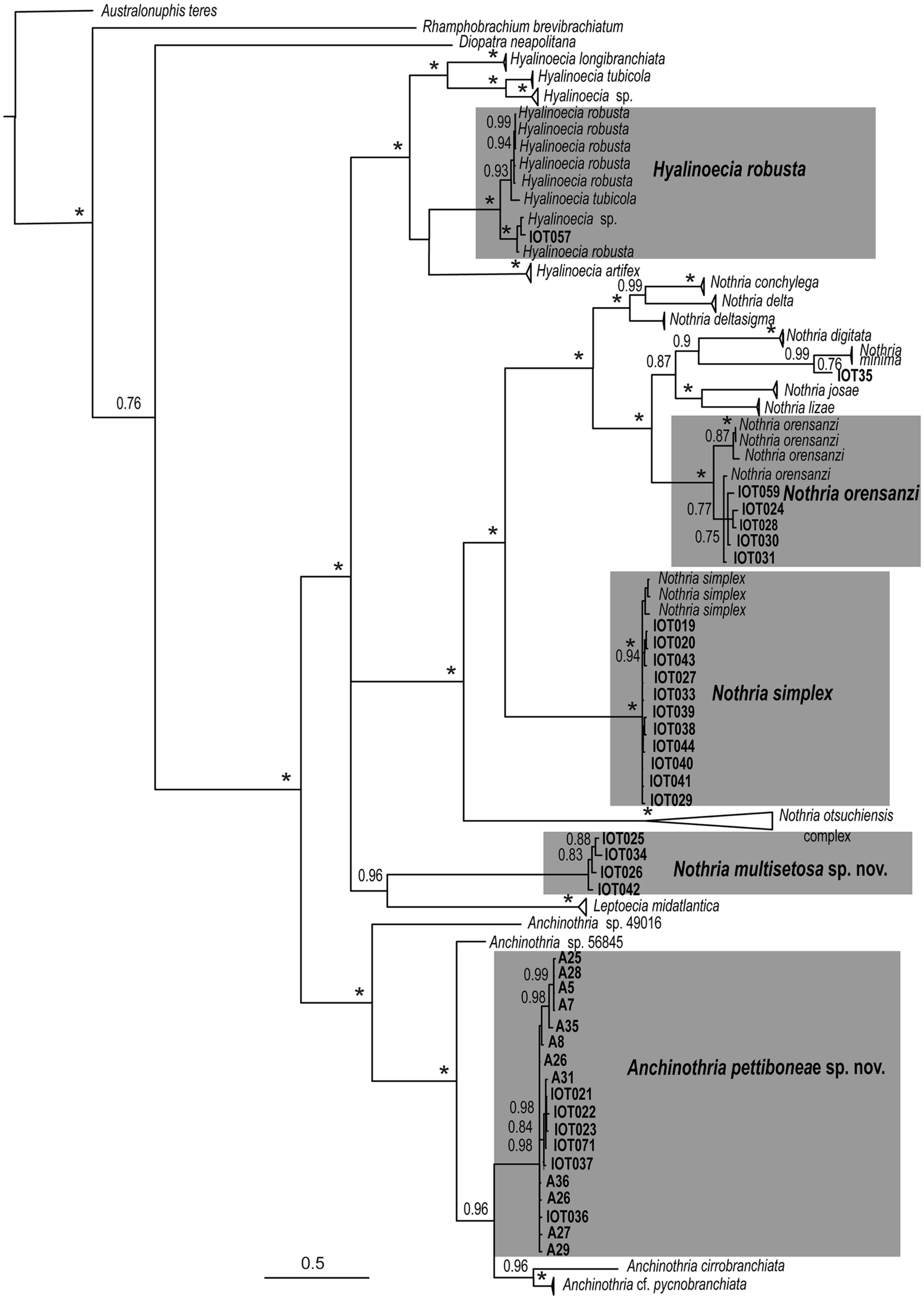

Figure 1. Phylogenetic tree of Onuphidae resulting from Bayesian analysis of concatenated *COI*/*16S*/*28S* sequences. Bold font indicates sequences generated in this study. Asterisks indicate posterior probabilities (pp) of 1.0.

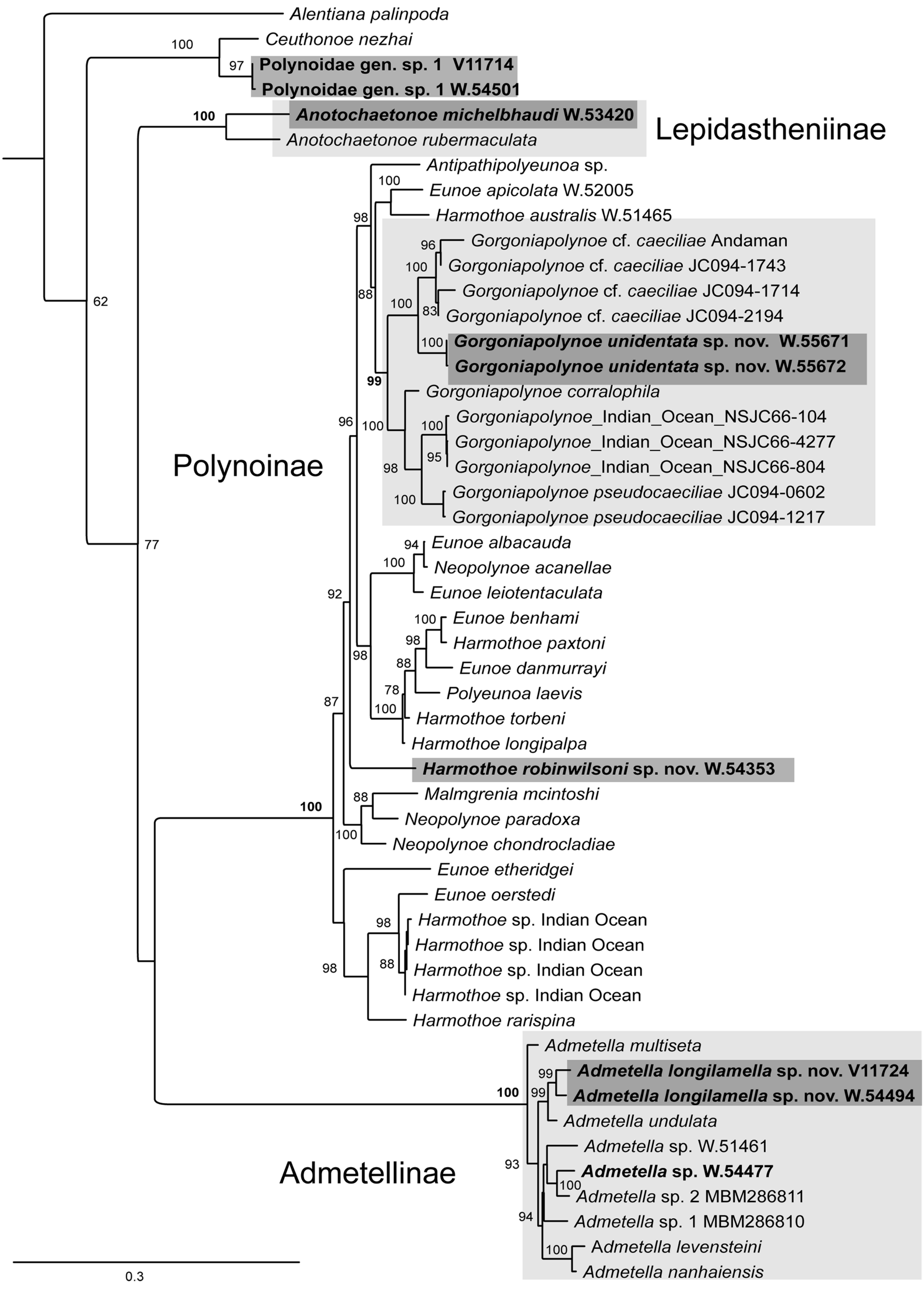

Figure 2. Maximum likelihood tree of Polynoidae using concatenated *COI*/*16S*/*18S*/*28S* sequences. Outgroup (*Laetmonice murrayae*) is not shown. ML analysis bootstrap support values < 80% not shown. Sequences in bold were generated in this study.

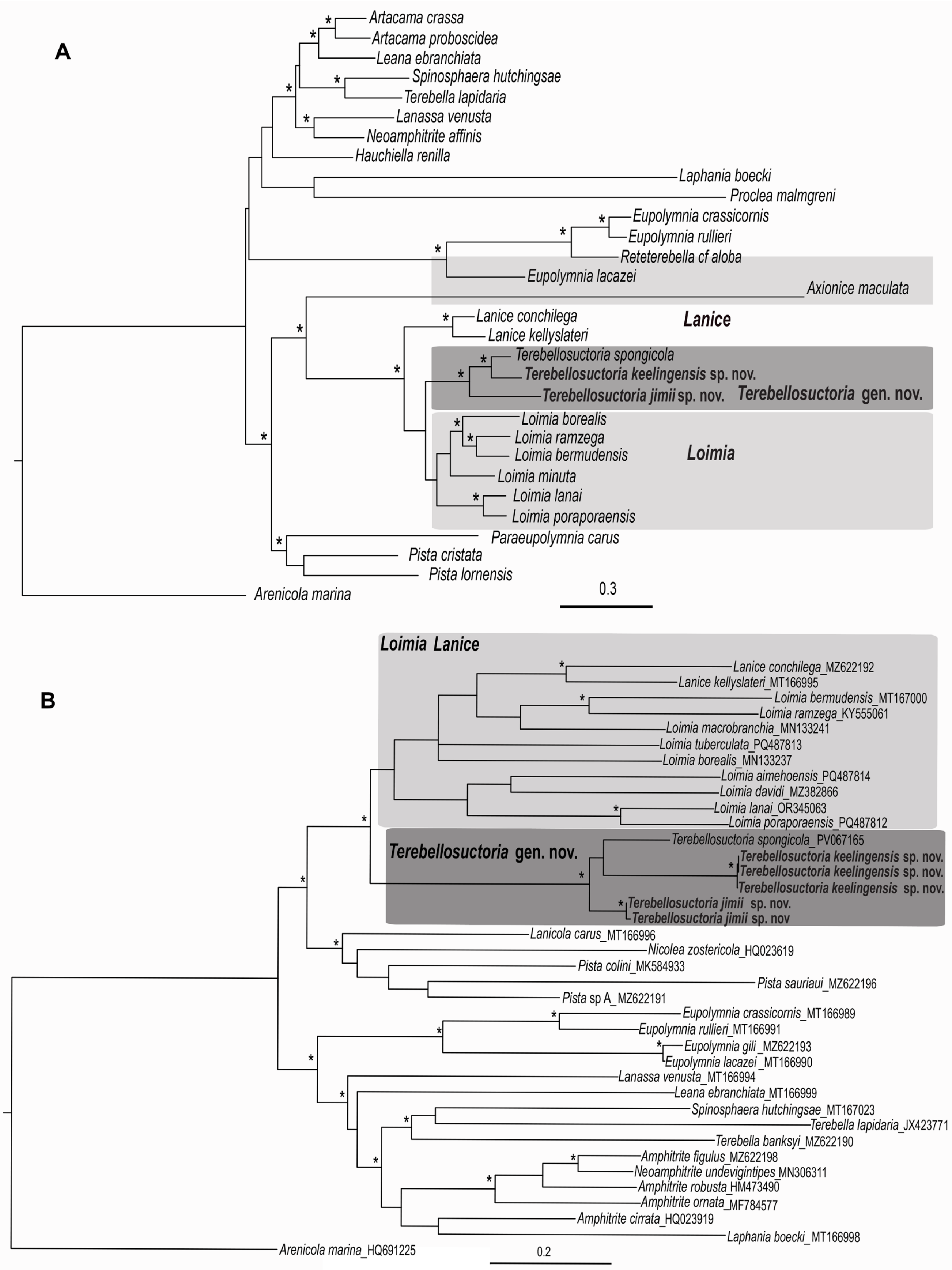

Figure 3. *(A)* Maximum likelihood tree of Terebellidae using concatenated *COI*/*16S*/*18S*/*28S* sequences. Asterisks indicate ML analysis bootstrap support values >85%. *(B)* Maximum likelihood tree using *COI* sequences. Asterisks indicate bootstrap support values >80%. Sequences in bold were generated in this study.

Anchinothria pettiboneae
Budaeva & Paxton sp. nov.

urn:lsid:zoobank.org:act:961E9CB8-0FEB-4FEF-BE11-1041AF38D959

Figs 4–6, 7A, Tables S1–S2

Type material examined. Holotype AM W.54596, IN2022_V08_157 (DNA voucher IOT21), South-west of Cocos (Keeling) Islands; 20.10.2022; 13.24389° S, 96.0814° E; 1,023 m. **Paratypes** AM W.56744, IN2015_C02_134 (DNA voucher A25, on SEM stub).

Other material examined. AM W.56848, IN2022_V08_157 (DNA voucher IOT22); AM W.56849, IN2022_V08_157 (DNA voucher IOT23); AM W.54636, IN2022_V08_124 (DNA voucher IOT36); AM W.54630, IN2022_V08_116 (DNA voucher IOT37); AM W.49019, IN2015_C02_131 (DNA voucher A6); AM W.49021, IN2015_C02_134 (DNA voucher A8); AM W.49013, IN2015_C01_96 (DNA voucher A7); AM W.49020, IN2015_C02_134 (DNA voucher A5); AM W.54435, IN2022_V08_113 (DNA voucher A30); AM W.56844, IN2022_V08_113 (DNA voucher A31); AM W.54432, IN2022_V08_113 (DNA voucher IOT71); AM W.49036, IN2015_C01_108 (DNA voucher A35); AM W.56840, IN2015_C01_108 (DNA voucher A36); AM W.49039, IN2015_C02_134 (DNA voucher A26); AM W.56841, IN2015_C02_134 (DNA voucher A27); AM W.56842, IN2015_C02_134 (DNA voucher A28); AM W.56843, IN2015_C02_134 (DNA voucher A29).

Questionable records: AM W.54014, IN2017_C02_207_130 (2); AM W.54015, RE2017_C01_OR26A_056 (1); AM W.54011, RE2017_C01_OR26A_149 (1).

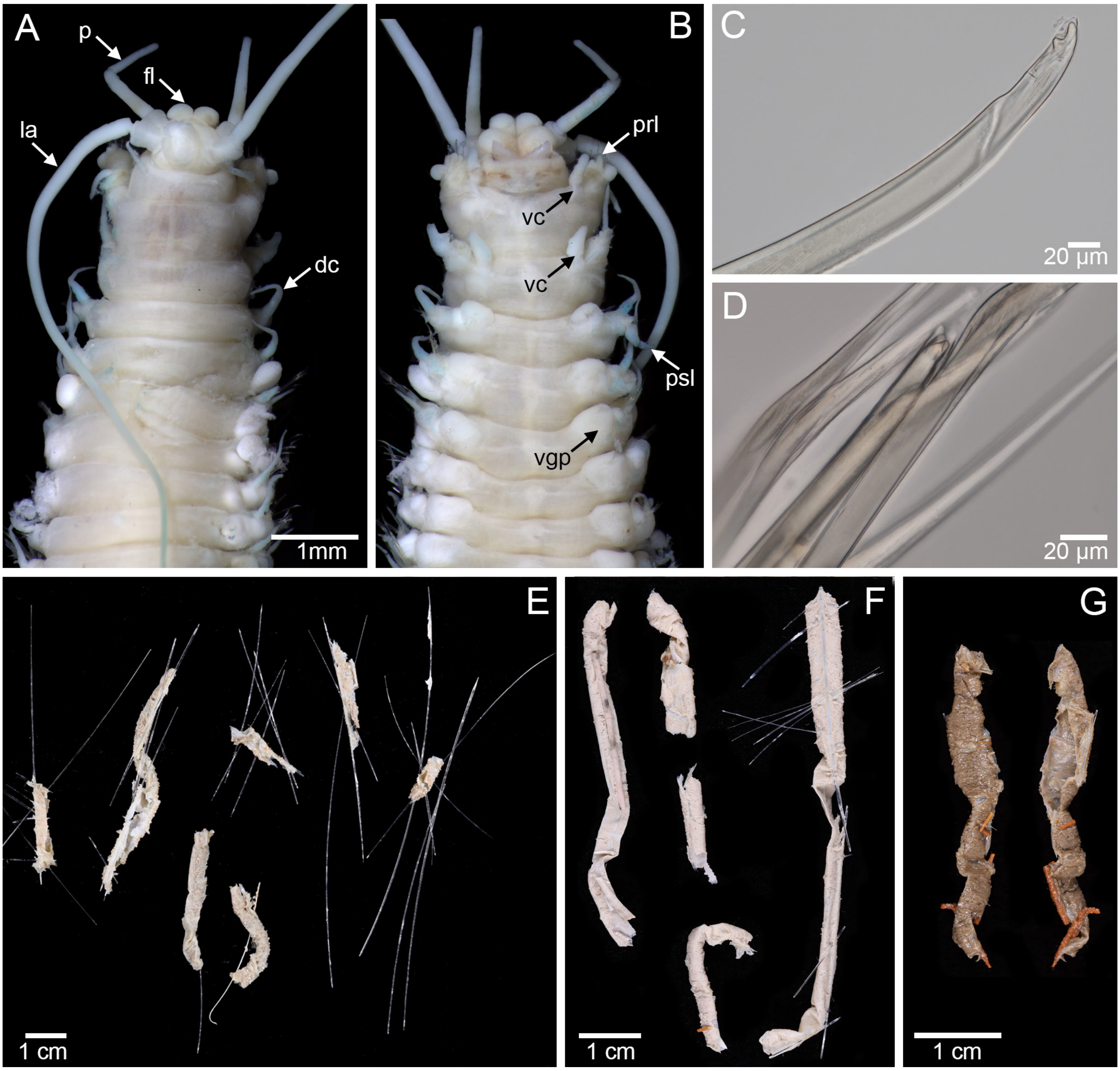

Figure 4. *Anchinothria pettiboneae* sp. nov., holotype AM W.54596 (*A, B, E*), AM W.49039 (*F*), AM W.54636 (*C, D*); *Anchinothria* cf. *pycnobranchiata* AM W.49909 (*G*). (*A*) anterior part, dorsal view; (*B*) same, ventral view; (*C*) pseudocompound hooded hook from chaetiger 1; (*D*) subacicular hook from chaetiger 5; (*E–G*) tube fragments. Abbreviations: *dc,* dorsal cirrus; *fl,* frontal lips; *la,* lateral antenna; *p,* palp; *prl,* prechaetal lobe; *psl,* postchaetal lobe; *vc,* ventral cirrus; *vgp,* ventral glandular pad. *(E–G)* Photo credit: Lisa Hodgson.

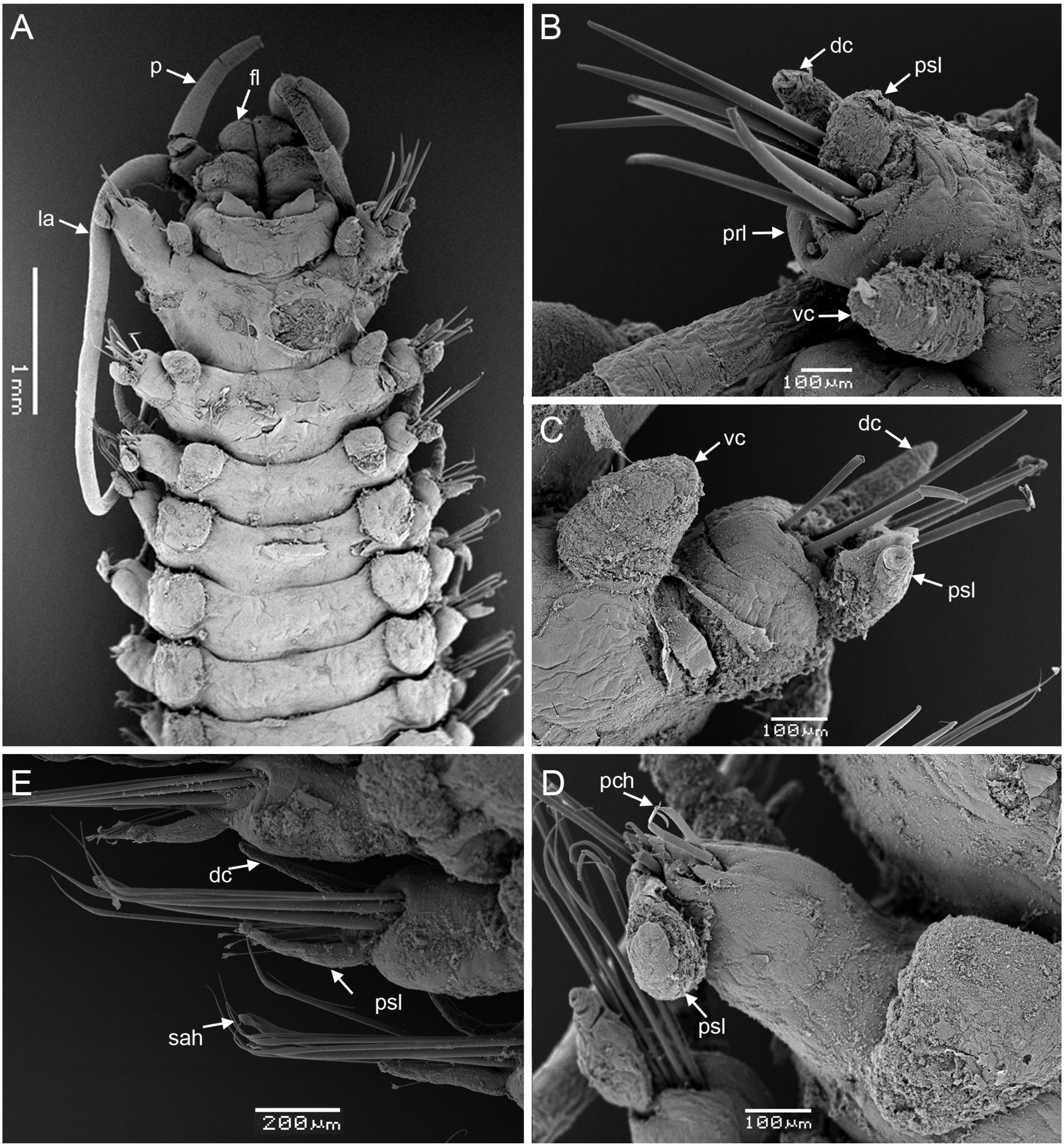

Figure 5. *Anchinothria pettiboneae* sp. nov., SEM micrograph of paratype AM W.56744. (*A*) anterior part, ventral view; (*B*) parapodium 1, ventral view; (*C*) parapodium 2, ventral view; (*D*) parapodium 3, ventral view; (*E*) parapodia from mid body region, ventral view. Abbreviations: *dc,* dorsal cirrus; *fl,* frontal lips; *la,* lateral antenna; *p,* palp; *pch*, pseudocompound hook; *prl,* prechaetal lobe; *psl,* postchaetal lobe; *sah,* subacicular hook*; vc,* ventral cirrus; *vgp,* ventral glandular pad.

Comparative material. *Anchinothria* cf. *pycnobranchiata* AM W.49908, IN2017_V03_056 (DNA voucher A10); AM W.49909, IN2017_V03_115 (DNA voucher A11); AM W.54013, IN2017_V03_122 (DNA voucher 32); W.49910, IN2017_V03_069 (DNA voucher A33).

Anchinothria sp. AM W.56845, IN2017_V03_069 (DNA voucher A34).

Anchinothria sp. AM W.49016, IN2015_C01_124 (DNA voucher A9).

Diagnosis. Eyes absent; branchiae single, from chaetiger 23–24; first pair of parapodia slightly enlarged with two very low prechaetal lobes; second and third pairs of parapodia equal in size with subsequent parapodia; first chaetiger with simple tapering chaetae, often broken off; first three chaetigers with anterior pseudocompound bidentate hooded hooks; limbate chaetae from chaetiger 2; pectinate chaetae scoop-shaped with up to 30 denticles, from chaetiger 3; subacicular hooks from chaetiger 4–5.

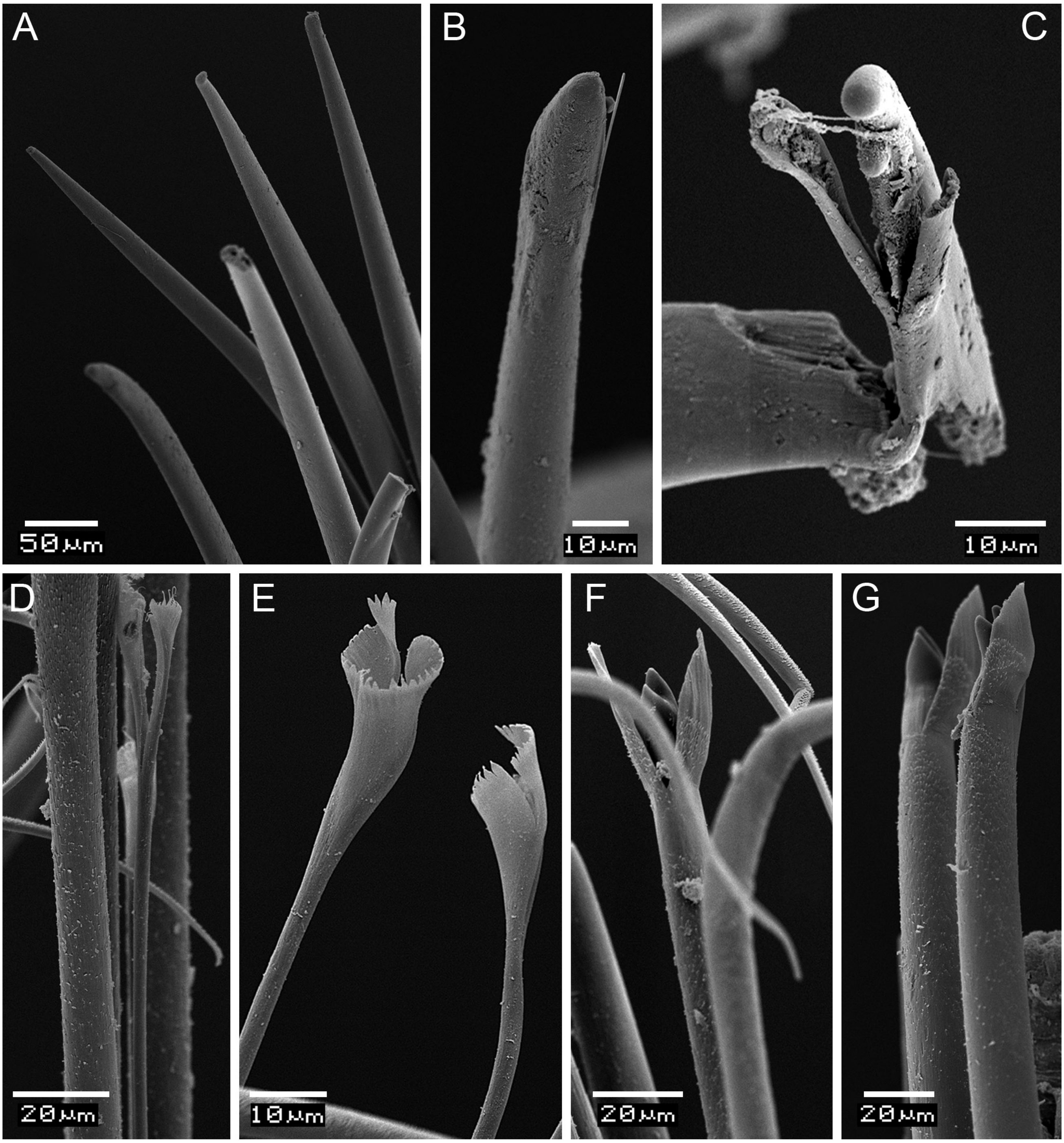

Figure 6. *Anchinothria pettiboneae* sp. nov., SEM micrograph of paratype AM W.56744. (*A*) pseudocompound hooks and simple tapering chaetae from parapodium 1; (*B*) pseudocompound hook from parapodium 1; (*C*) bidentate pseudocompound hook from parapodium 2; (*D*) pectinate chaetae from parapodium 3; (*E*) pectinate chaetae from midbody region; (*F*) single subacicular hook from parapodium 7; (*G*) paired subacicular hooks from midbody region.

Description. All examined specimens lacking posterior ends, most in very poor condition lacking most of body appendages and chaetae. Holotype incomplete, 10.5 mm long, 2.7 mm wide (at 10th chaetiger, excluding parapodia), of 16 chaetigers; other specimens up to 3.5 mm wide of 20–42 chaetigers (Fig. 4A–B). Alcohol-stored specimens overall cream coloured without distinct pattern. Prostomium anteriorly rounded with globular frontal lips inserted anteroventrally close together. Palpo- and antennophores with three indistinct rings. Median antenna broken off in holotype, reaching to chaetiger 9–11 in other specimens. Lateral antennae to chaetiger 11(7–10), palps to chaetiger 1. Nuchal groves straight, widely separated. Eyes absent. Peristomium short, peristomial cirri inserted subdistally (Figs 4A–B, 5A).

First chaetiger greatly enlarged, two times longer than peristomium. Anterior three pairs of parapodia modified; first pair slightly enlarged, directed forward, with two short, rounded ridge-like prechaetal lobes, thick and conical postchaetal lobes, digitiform dorsal and subulate to conical

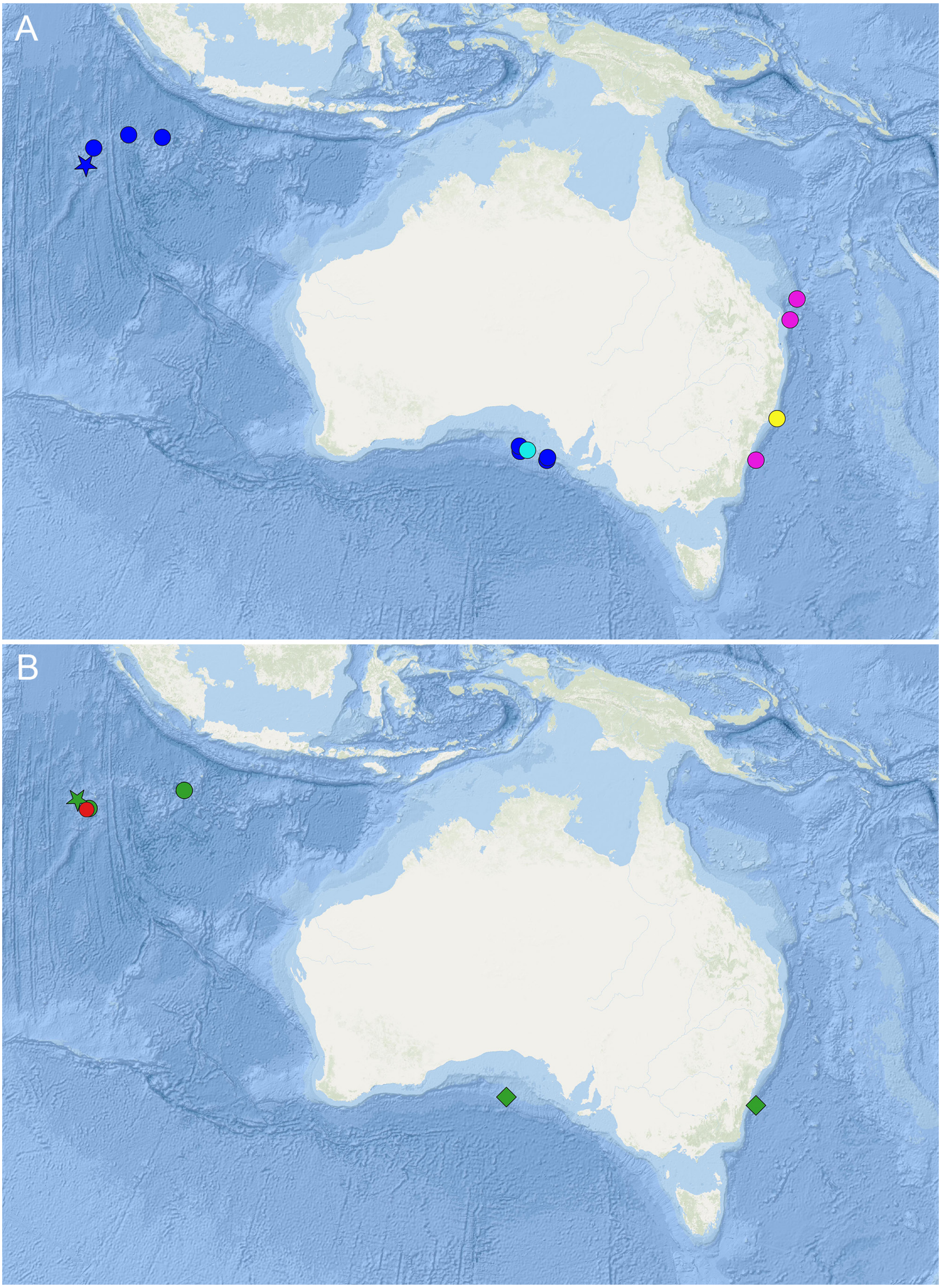

Figure 7. *(A) Anchinothria pettiboneae* sp. nov. (navy), *A*. cf. *pycnobranchiata* (pink), *Anchinothria* sp. 56845 (yellow), *Anchinothria* sp. 49016 (light blue); *(B) Nothria multisetosa* sp. nov. (green), *Nothria* sp. 54655 (red). Stars – type localities, circles – specimens with DNA data, rhombuses – specimens with morphology only.

ventral cirri (Fig. 5B). Second pair of parapodia similar in size with posterior parapodia bearing short, rounded prechaetal lobes, subulate dorsal cirri, postchaetal lobes and conical ventral cirri (Fig. 5C). Third pair of parapodia with very short rounded prechaetal lobes, bearing subulate dorsal cirri, postchaetal lobes and slightly conical ventral cirri transitioning into glandular pads (Fig. 5D). Prechaetal lobes becoming invisible after chaetiger 3; postchaetal lobes continue posteriorly, unclear to which segment due to poor condition of specimens. Ventral cirri conical to subulate on first two chaetigers, slightly conical on chaetiger 3, transforming into flat, round glandular pads from chaetiger 4. Branchiae not observed in holotype due to lack of posterior segments, from chaetiger 23–24 in other examined material, single and short.

In holotype, first pair of parapodia with three pseudocompound bidentate hooded hooks on each side. Second pair of parapodia with most chaetae broken, presumably hooks and limbate chaetae. Third pair of parapodia with limbate and pectinate chaetae, with wide bases of broken hooks. In paratype AM W.56744, studied under SEM, left first parapodium with three hooks with broken tips and three simple tapering chaetae (Figs 5B, 6A–B). Second pair of parapodia with three pseudocompound bidentate hooded hooks, three simple tapering chaetae and limbate chaetae (Figs 5C, 6C). Third pair of parapodia with two–three broken hooded hooks, limbate and pectinate chaetae (Figs 5D, 6D). In AM W.54636, pseudocompound hooded hooks from chaetiger 1 bidentate with short distal appendage and short paired hoods (Fig. 4C). Most of other examined specimens with hooks broken or present on one side only. Pectinate chaetae elongated, scoop-shaped with lateral margins rolled inward, with 20–30 denticles (Fig. 6E). Subacicular hooks from chaetiger 6 in holotype, possible earlier since very delicate and difficult to see without destroying specimen. In paratype AM W.56744 studied under SEM from chaetiger 7 (Fig. 6F–G). In AM W.54636, single bidentate subacicular hook from chaetiger 5, paired in subsequent segments (Fig. 4D). In other studied specimens, subacicular hooks from chaetiger 4–5 to 11 (possibly broken off earlier).

Tubes long, parchment-like, covered with thin layer of mud with numerous long objects (glass sponge spicules, sea urchin spines, pteropod shells) attached longitudinally (Fig. 4E–F).

Jaw apparatus and pygidium not observed.

Remarks. *Anchinothia pettiboneae* sp. nov. resembles *A. pycnobranchiata* (McIntosh, 1885), described from deep-sea localities off Chile, and later reported widely in Sub Antarctic region (Orensanz, 1990) in having simple branchiae starting from chaetiger 23–24 and subacicular hooks appearing early in anterior region, around chaetiger 4–5. The two species appear to have different tube ornamentation with light-coloured tubes with extremely long spicules of glass sponges and few pteropod shells attached in *A. pettinoneae* sp. nov. (Fig. 4E–F) and darker tubes with short agglutinated foraminiferan shells attached in *A.* cf. *pycnobranchiata* (Fig. 4G), reported in this study but also by Orensanz (1990).

In the paratype AM W.56744 with most anterior chaetae intact, an unusual type of chaetae was reported on the first pair of parapodia under SEM. In addition to three pseudocompound hooks, three simple sharply tapering chaetae were present on the left side. Since anterior chaetae were lost in most of the examined specimens (at least to some degree), it is difficult to assess whether these simple tapering chaetae represent a unique diagnostic character of *A. pettiboneae* sp. nov. or an unusual chaetal development in a single specimen.

Genetic distances between *A. pettiboneae* sp. nov. and *A.* cf. *pycnobranchiata* were 16.1% in *COI* and 29.5% in *16S*. Two more specimens with very divergent sequences were reported in the present study from Australian deep waters (AM W.49016 from GAB, 1003 m; and AM W.56845 from off New South Wales, 1006 m) demonstrating unreported diversity of *Anchinothria* in deep Australian waters.

Etymology. This species is named in honour of Marian Pettibone, the polychaete researcher whose early work on onuphids added to our understanding of the taxonomy of the genus which later was described as *Anchinothria*.

Distribution and bathymetry. Australian Indian Ocean Territories, off Cocos and Christmas Islands; Great Australian Bight; 965–1,991 m (Fig. 7A).

Hyalinoecia Malmgren, 1867

Type species: *Nereis tubicola* Müller, 1776.

Diagnosis. Emended from Paxton (1986). Body moderately long, up to 150 segments. Median antenna longer and thicker than lateral antennae. Ceratophores short, consisting of 2–5 rings. Nuchal grooves straight. Anterior 2–3 pairs of parapodia enlarged, directed anteroventrally with large auricular prechaetal lobes. Uni- or bidentate simple or pseudocompound hooks on first 2–3 pairs of anterior parapodia. Subacicular hooks in median position from chaetigers 15–30. Pectinate chaetae flat. Branchiae present or absent, always single filaments. Tubes longer than inhabitants, round in transverse section, translucent quill-like, with internal valves; without external covering of foreign particles.

Hyalinoecia robusta Southward, 1977

Figs 8–9, Tables S1–S2

Hyalinoecia robusta Southward, 1977: 175–180, pl. 1, figs a–j; pl. 2, figs a–b.

Hyalinoecia robusta.— Rosenfeldt, 1982: 47–48.— Hartmann-Schröder, 1982: 12.— Kirkegaard, 1988: 34.— Kirkegaard, 1995: 41, fig. 23.— Kirkegaard, 2001: 394.— Arias and Paxton, 2022: 3–7, figs 2–9.— Budaeva *et al*., 2024: 5–8, figs 3–5.

Hyalinoecia tubicola var. *longibranchiata* McIntosh,1885: 337–338 (in part).

Material examined. AM W.53503, IN2021_V04_013 (DNA voucher IOT57).

Remarks. This single specimen agrees well in morphological and molecular characteristics of *H. robusta* recently re-described by Arias and Paxton (2022) and Budaeva *et al.* (2024). The species was originally described from the Bay of Biscay at depths of 1,800 m (Southward, 1977) and was subsequently reported from the eastern and the western Atlantic and from the Indian Ocean. Here we present the

Figure 8. *Hyalinoecia robusta* AM W.53503. (*A*) tube, lateral view; (*B*) anterior part of live specimen projecting from partly dissected tube. Photo credit: Jeremy Horowitz and Claire Rowe.

first images of a live specimen photographed on board RV, *Investigator,* depicting uniform light brownish colour (Fig. 8).

The K2P distances in *COI* between the examined specimen and the records listed in Budaeva *et al.* (2024) ranged between 1.2 and 7.8%; and in *16S* between 0.02 and 1.0%. Details of three markers are available in Supplementary Table S2.

The specimen represents the eastern-most known record with associated molecular data in the very large geographical range of *H. robusta* spanning across the Atlantic to the Indian Ocean. Budaeva *et al.* (2024) questioned the records from the slope depths of Indonesia due to a lack of molecular data and detailed morphological description in Kirkegaard (1995). The newly obtained specimen from the eastern Indian Ocean makes these records more reliable and supports extension of the geographical range of *H. robusta* even further, from West Atlantic to Indonesia.

Distribution. East Atlantic from the Bay of Biscay to Angola, 440–2,300 m, mostly below 1,000 m; West Atlantic, off Massachusetts, 1,480 m; Indian Ocean, western India, off Goa, 1,000 m; Australian Indian Ocean Territories, Christmas Island, off McPherson Point, 1,363–1,501 m; possibly Indonesia, 1,160–2000 m (Kirkegaard, 1995) (Fig. 9).

Nothria Malmgren, 1867

Type species: *Onuphis conchylega* Sars, 1835

Diagnosis. Emended from Budaeva and Paxton (2013). Body short, up to 100 segments. Median antenna longer and thicker than lateral antennae. Ceratophores short, consisting of 2–5 rings. Nuchal grooves straight. Anterior 2–3 pairs of parapodia enlarged, directed anteroventrally with large auricular prechaetal lobes. Uni-, bi- or tridentate simple or pseudocompound falcigers on first 2–3 pairs of anterior parapodia. Subacicular hooks in median position from chaetigers 7–15. Pectinate chaetae wide with rolled margins, so-called ‘scoop-shaped’, in some species flat. Branchiae present or absent, single to up to five filaments. Tubes dorsoventrally flattened with thin inner parchment-like layer covered with large shell fragments, small stones and foraminiferans.

Nothria multisetosa

Budaeva & Paxton sp. nov.

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Figs 10–12, 7B, Tables S1–S2

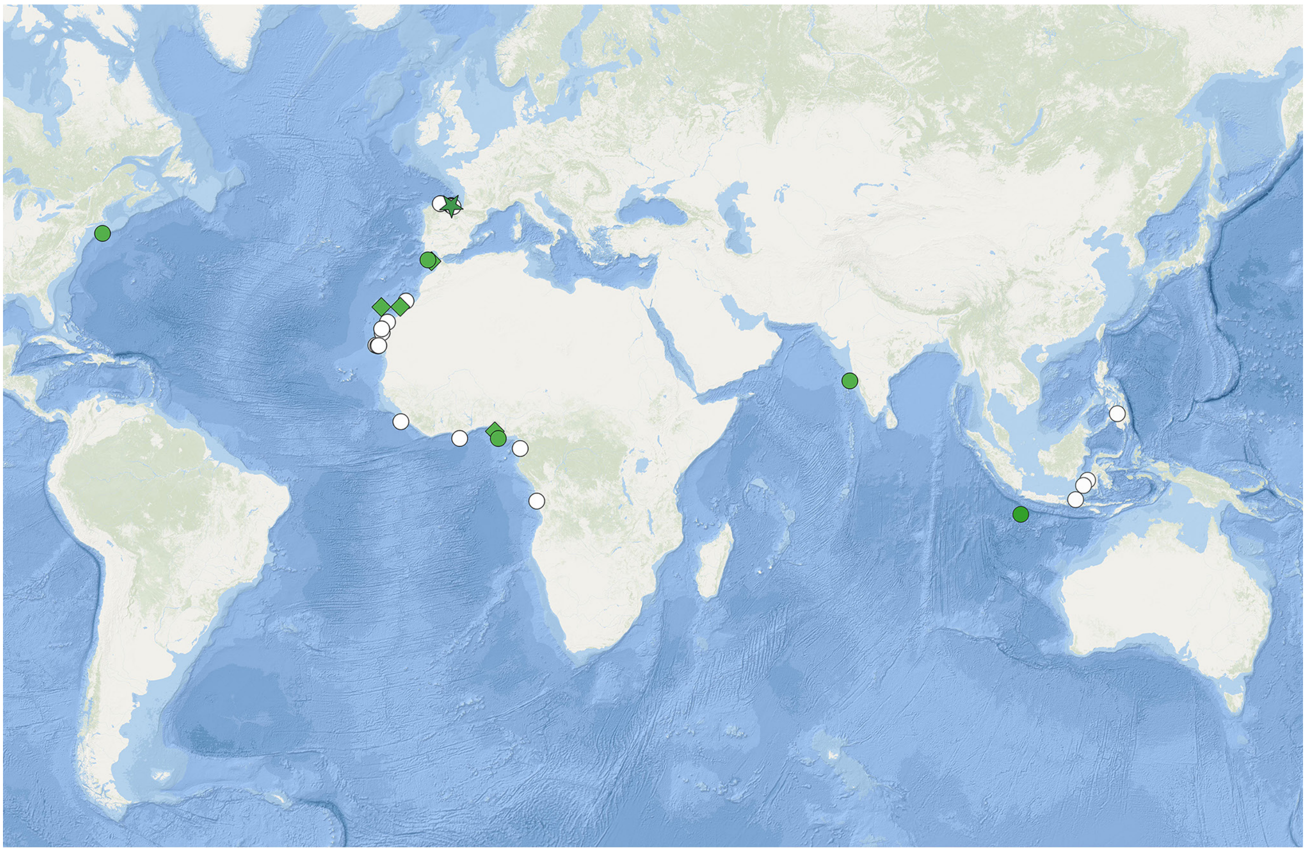

Figure 9. *Hyalinoecia robusta*. Star – type locality, filled circles – specimens with DNA data, rhombuses – specimens with morphology only, white circles – records from literature.

Nothria cf. *paxtonae* Imajima, 1999. — Paxton *et al*., 2023: 241, fig. 25, tabs 2, S1.

Type material examined. Holotype AM W.56864, IN2022_V08_147 (DNA voucher IOT34); West of Cocos (Keeling) Islands; 03.12.2024; 12.3878° S, 95.3944° E; 2,617–2,721 m. **Paratypes**. AM W.56863, IN2022_V08_181 (DNA voucher IOT25); AM W.56745, IN2022_V08_181 (DNA voucher IOT26, on SEM stub); AM W.54589, IN2022_V08_105 (DNA voucher IOT42, on SEM stub).

Other material examined. AM W.54664, IN2022_V08_147 (tubes and 3 damaged fragments); AM W.53844, IN2017_V03_56 (3); AM W.53843, IN2017_C01_207 (1).

Diagnosis. Eyes absent; branchiae absent; first pair of parapodia greatly enlarged; second pair of parapodia small, equal in size with subsequent parapodia; parapodia 1 with slender, pseudocompound, bidentate hooded hooks; parapodia 2 with slender, pseudocompound, bi- to tridentate hooded hooks; pectinate chaetae flat, from chaetiger 2; limbate chaetae up to 13 per parapodium, from chaetiger 2; subacicular hooks from chaetiger 9.

Description. All examined specimens lacking posterior ends. Holotype incomplete, 5 mm long, 1.2 mm wide (at 10th chaetiger, excluding parapodia), of 12 chaetigers (Fig. 10A–B). Paratypes 4.3–5.3 mm long, 1.3 mm wide, 9–13 chaetigers. Alcohol-stored specimens overall cream coloured with diffused pigmentation on front of prostomium, bases of lateral antennostyles and bases of first pair of parapodia. Prostomium anteriorly rounded with ovoid frontal lips inserted anteroventrally. Palpo- and antennophores with two indistinct rings. Median antennostyles broken in all specimens, lateral antennostyles present in holotype, thin and long, not measured due to extreme fragility of specimen. Nuchal groves straight widely separated. Eyes absent. Peristomium short, peristomial cirri inserted distally (Figs 10A–C, 11A).

Chaetiger 1 greatly enlarged, two (2.5) times longer than peristomium. Anterior three pairs of parapodia modified, first pair of parapodia greatly enlarged, directed forward, extending slightly beyond anterior margin of prostomium, with large auricular prechaetal lobes, subulate postchaetal lobes, dorsal and ventral cirri (Fig. 11B). Second pair of parapodia significantly smaller than first pair, similar in size with subsequent parapodia; with short tongue-like prechaetal lobes, subulate postchaetal lobes and dorsal cirri, and conical, wide at bases distally tapering ventral cirri (Fig. 11C–D). Third pair of parapodia of same size as subsequent, with reduced prechaetal lobes, subulate postchaetal lobes and dorsal cirri, and ovoid ventral cirri transformed into glandular pads (Fig. 11E). Branchiae absent.

Chaetal composition reported based on paratypes. First pair of parapodia with three (two) slender very long and slightly pseudocompound bidentate hooded hooks and one (two) shorter slender pseudocompound bidentate hooded hook (Fig. 12A). Second pair of parapodia with three slender strongly pseudocompound bi- to tridentate hooded hooks (Fig. 12B–C), two–four pectinate chaetae and one–two limbate chaetae. Third pair of parapodia with two–four pectinate chaetae and 9–12 limbate chaetae. Number of limbate chaetae in subsequent parapodia varying from

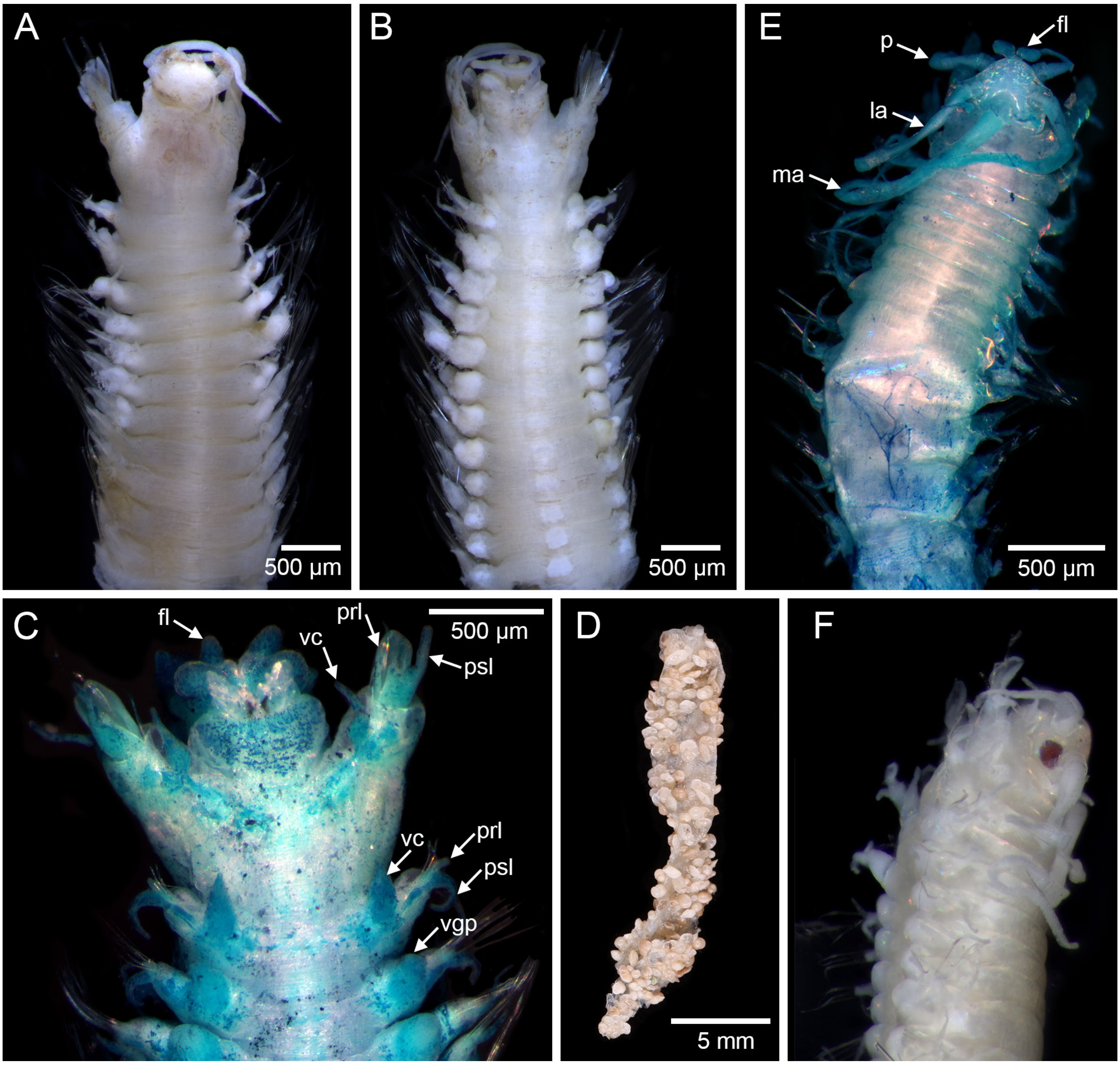

Figure 10. *Nothria multisetosa* sp. nov., holotype AM W.54664 (*A–B*), paratype AM W.56745 (*C*), paratype AM W.54589 (*D*); *Nothria* sp. AM W.54655 (*E, F*). (*A*) anterior part dorsal view; (*B*) same ventral view; (*C*) prostomium and anterior segments, ventral view; (*D*) tube; (*E*) anterior part dorsal view; (*E*) same, lateral view. Abbreviations: *fl,* frontal lips; *la,* lateral antenna; *ma,* median antenna*; p,* palp; *prl,* prechaetal lobe; *psl,* postchaetal lobe; *vc,* ventral cirrus; *vgp,* ventral glandular pad. (*E, C*) specimens stained with methylene blue.

nine to 13. Subacicular hooks from chaetiger 9, single per parapodium till end of fragment (Fig. 12G). Pectinate chaetae flat, with 12–15 denticles (Fig. 12D –F).

Pygidium and jaw apparatus not observed. Tubes flattened, covered with thin transparent lining, covered by shells of foraminiferans (Fig. 10D).

Remarks. *Nothria* cf. *paxtonae* was reported by Paxton *et al*. (2023) from two deep-sea localities in GAB and south-eastern Australia based on four incomplete formalin-preserved specimens. We re-examined this material and suggested that these specimens belong to *N. multisetosa* sp. nov. based on the presence of very enlarged first pair of parapodia and remarkably very small second pair of parapodia, lack of hooded hooks on chaetiger 3, flat shape pectinate chaetae, and numerous limbate chaetae in middle and posterior body segments. All examined specimens also shared a unique shape of ventral cirri on the second pair of parapodia, being widely conical and tapering.

Nothria multisetosa sp. nov. is most similar to *Nothria abyssia* Kucheruk, 1978 and *N. paxtonae* Imajima, 1999*,* small-sized species lacking branchiae, having pseudocompound hooks on the first two pairs of parapodia only, and having flat pectinate chaetae. The original description of *N. abyssia* shows gradual decrease in size from the first to the third pair of the anterior modified parapodia, which was also observed by Budaeva and Paxton (2013) in non-type material. In contrast, *N. multisetosa* sp. nov. and *N. paxtonae* both having a very small second pair of parapodia. Nevertheless, *Nothria multisetosa* sp. nov. can further be distinguished from *N. paxtonae* by the lack of eyes (two pairs of eyes present in *N. paxtonae*) and early start of pectinate chaetae: from chaetiger 2 in the former *vs*. chaetiger 9 in the latter. Moreover, indistinctly tridentate pseudocompound

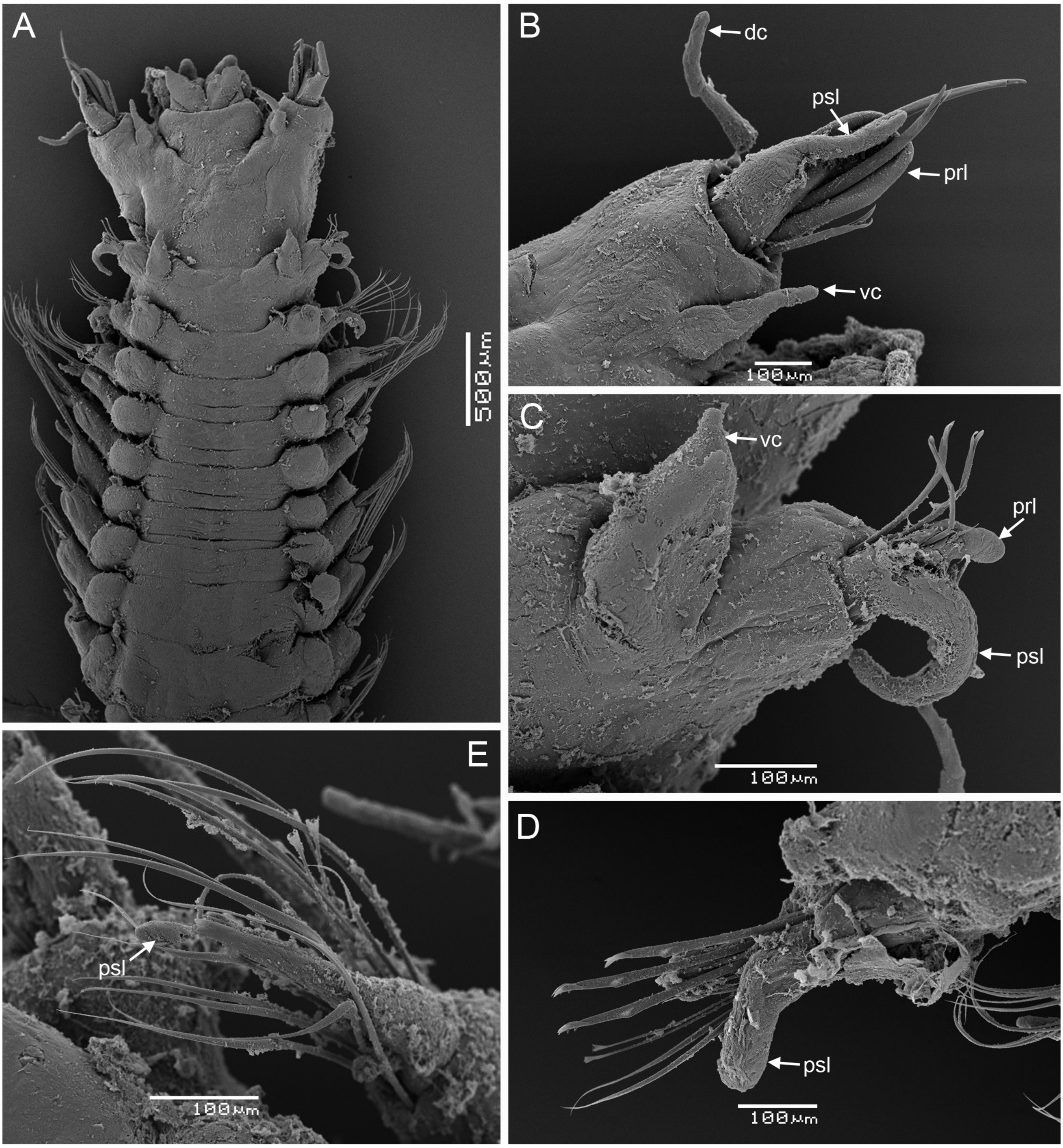

Figure 11. *Nothria multisetosa* sp. nov., SEM micrograph of paratypes AM W.56745 (*A–C*) and AM W.54589 (*D, E*). (*A*) anterior part, ventral vier; (*B*) parapodium 1, ventral view; (*C*) parapodium 2, ventral view; (*D*) same, posteroventral view; (*E*) parapodium 3, ventral view. Abbreviations: *dc,* dorsal cirrus; *prl,* prechaetal lobe; *psl,* postchaetal lobe; *vc,* ventral cirrus.

hooded hooks were reported in *N. multisetosa* sp. nov., which were not previously found in both sibling species.

Etymology. The species name, *multisetosa*, refers to the unusual high number of limbate chaetae present in all parapodia of the species.

Distribution. Australian Indian Ocean Territories, off Cocos and Christmas Islands; 2,298–2,923 m. Great Australian Bight, off Jervis Marine Park, New South Wales; 1,772–2,650 m (Fig. 7B).

Nothria orensanzi Paxton, Budaeva & Gunton, 2023

Fig. 13A, Tables S1–S2

Nothria orensanzi Paxton, Budaeva & Gunton, 2023: 237–240, figs 21–23.
Nothria sp. nov. 1.—Gunton *et al*., 2021: 75, fig. 16C–D.
?*Nothria* sp., near *solenotecton* Chamberlin, 1919.—Orensanz, 1990: 130, pl. 42, figs g–i.

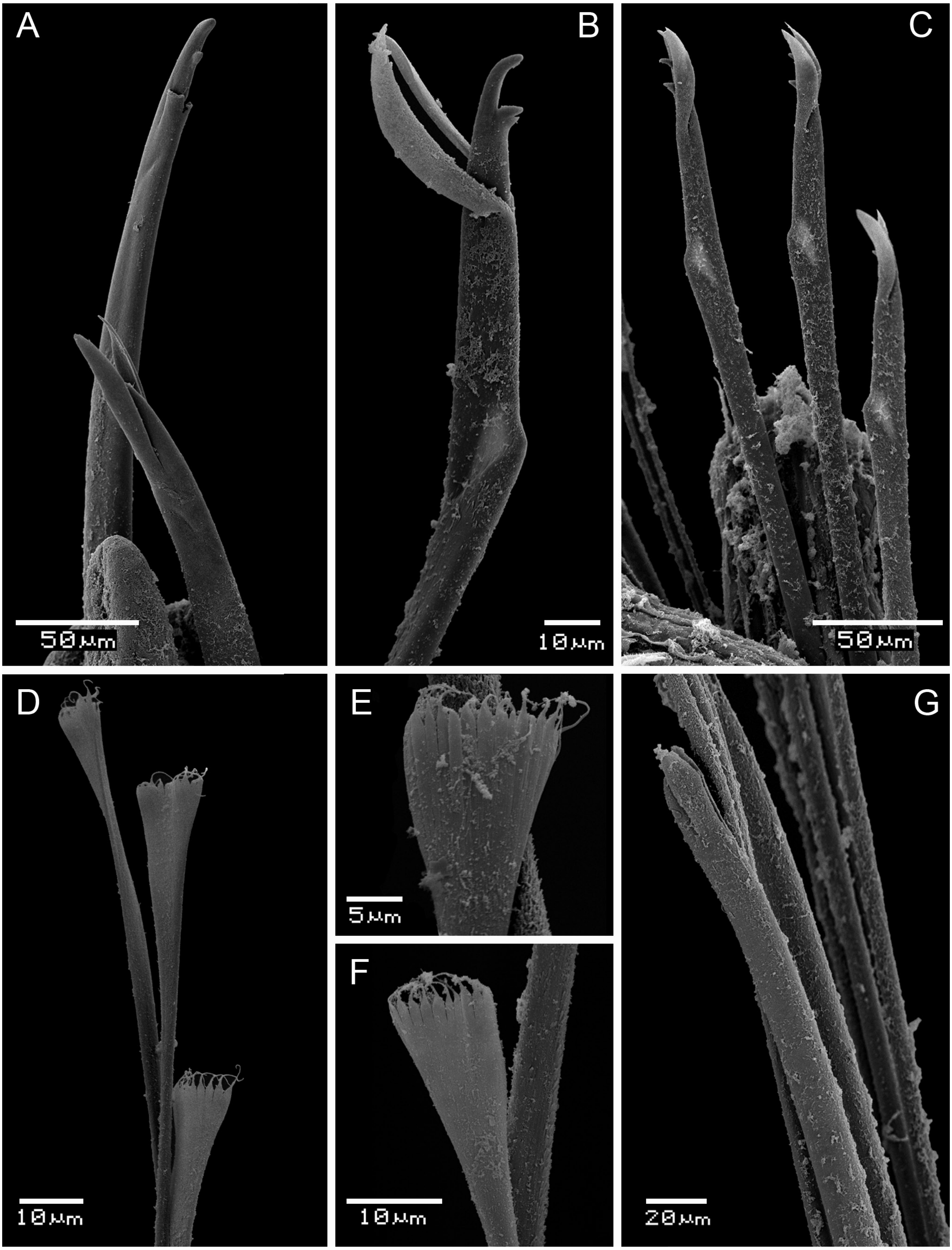

Figure 12. *Nothria multisetosa* sp. nov., SEM micrograph of paratype AM W.56745 (*A, G*) and AM W.54589 (*B–F*). (*A*) bidentate pseudocompound hook from chaetiger 1; (*B*) tridentate pseudocompound hook from chaetiger 2; (*C*) bidentate pseudocompound hooks from chaetiger 2; (*D–F*) pectinate chaetae; (*G*) subcircular hook from chaetiger 9.

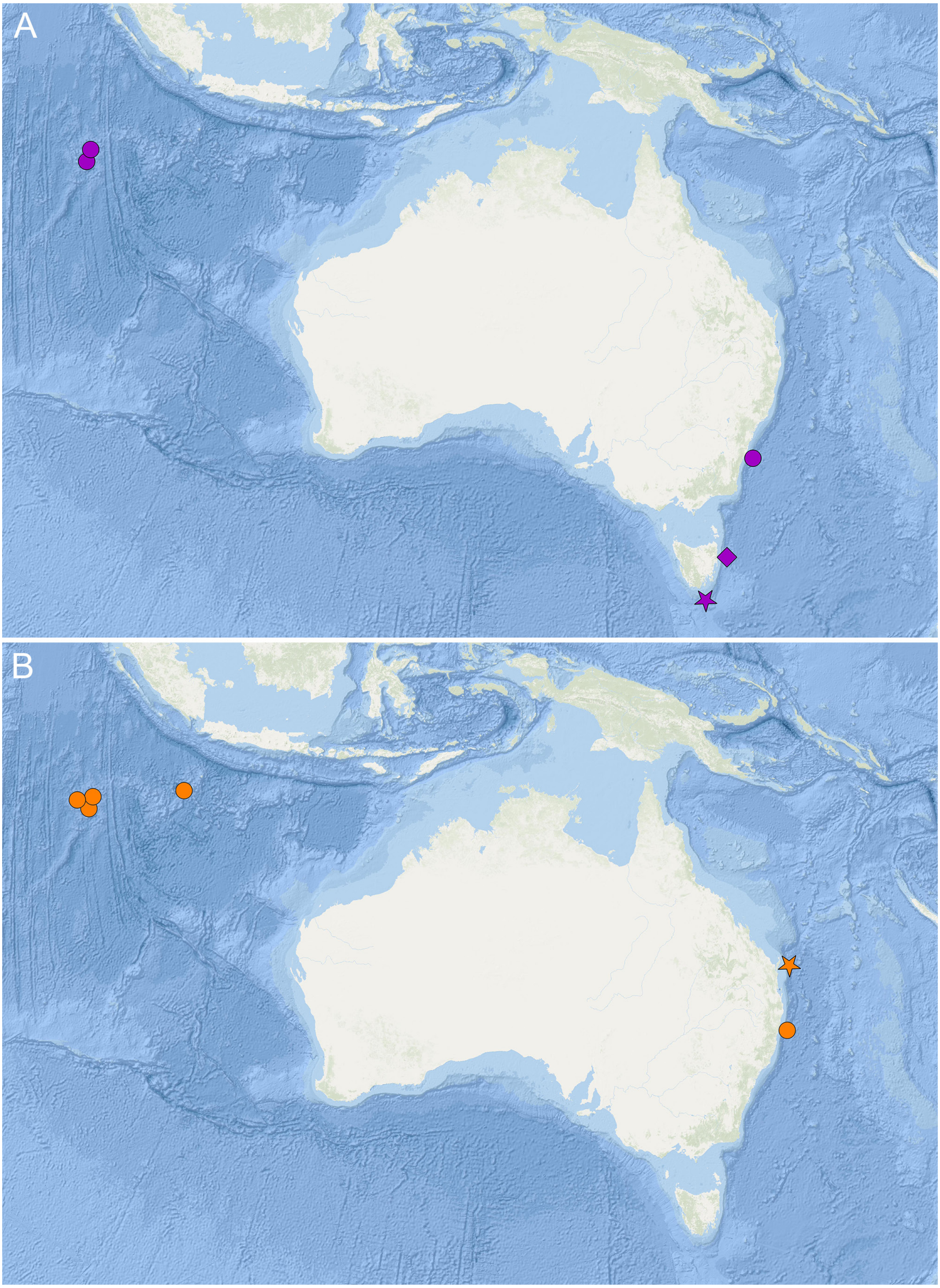

Figure 13. *(A) Nothria orensanzi*. *(B) Nothria simplex*. Stars – type localities, circles – specimens with DNA data, rhombuses – specimens with morphology only.

Type material examined. Holotype AM W.49031, IN2015_E02_22; Tasmania, Huon Marine Park; 11.05.2015; 44.33° S, 147.36° E; 2,010 m. **Paratypes** (5): AM W.49028, IN2015_E02_21 (1); AM W.49033, IN2015_E02_21 (1); AM W.53851, IN2015_E02_22 (3).

Other material examined. AM W.54618, IN2022_V08_181 (DNA voucher IOT24); AM W.56850, IN2022_V08_181 (DNA voucher IOT28); AM W.56851, IN2022_V08_145 (DNA voucher IOT30); AM W.56852, IN2022_V08_145 (DNA voucher IOT31); AM W.56853, IN2022_V08_145 (DNA voucher IOT32); AM W.54835, IN2022_V08_145 (3 specimens, DNA tissue IOT59 taken from one of them); AM W.54620 IN2022_V08_145 (2).

Remarks. The examined specimens agreed well with the original description by Paxton *et al*. (2023) in lacking eyes and branchiae and having first three anterior chaetigers with slender bidentate simple and pseudocompound hooks; pectinate and limbate chaetae from chaetiger 2 and subacicular hooks from chaetiger 11–13.

Paxton *et al*. (2023) reported genetic variation within *N. orensanzi* with two species being delimited in *COI* and *16S* datasets by the Poisson Tree Processes (PTP) species delimitation analysis. Quite high levels of intraspecific variation in K2P distances in *COI* (0–8.7%) and in *16S* (0–2.7%) were reported in this study. However, in the absence of clear morphological differences between the most divergent specimens, we assign all the examined material to a single species.

Distribution and bathymetry. Australian Indian Ocean Territories, off Cocos (Keeling) and Christmas Islands; off southern Tasmania, Freycinet and Huon Marine Parks, and New South Wales, Jervis Marine Park; 2,010–3,078 m (Fig. 13A).

Nothria simplex Paxton, Budaeva & Gunton, 2023

Fig. 13B

Nothria simplex Paxton, Budaeva & Gunton, 2023: 241–243, figs 26–27.

Type material examined. Holotype. AM W.49938, IN2017_V03_86; Queensland, off Fraser Island; 11.06.2017; 25.33–25.35°S, 154.07–154.08°E; 2,350–2,342 m. **Paratypes** (2). AM W.51645, IN2017_V03_86 (1); AM W.51646, IN2017_V03_115 (1).

Other material examined. AM W.56854, IN2022_V08_147 (DNA voucher IOT19); AM W.56855, IN2022_V08_147 (DNA voucher IOT20); AM W.56856, IN2022_V08_181 (DNA voucher IOT27); AM W.54649, IN2022_V08_147 (DNA voucher IOT33); AM W.56857, IN2022_V08_105 (DNA voucher IOT38); AM W.56858, IN2022_V08_105 (DNA voucher IOT39); AM W.56859, IN2022_V08_105 (DNA voucher IOT40); AM W.56860, IN2022_V08_105 (DNA voucher IOT41); AM W.56861, IN2022_V08_105 (DNA voucher IOT43); AM W.56862, IN2022_V08_105 (DNA voucher IOT44); AM W.54619, IN2022_V08_147 (1 plus two fragments).

Remarks. Examined specimens were all anterior fragments consisting of 11–17 chaetigers. Their morphology generally agreed very well with the original description (based on three specimens) in having pseudocompound hooks present on the first two chaetigers with limbate and pectinate chaetae starting from chaetiger 3. Branchial start varied form chaetiger 9 to 10, while it was recorded on chaetiger 10 only in the original description. Subacicular hooks started on chaetiger 11–13, recorded on chaetiger 13–15 in the type material.

Distribution and bathymetry. Australian Indian Ocean Territories, off Cocos (Keeling) and Christmas Islands; Eastern Australia, off Central Eastern Marine Park and off Fraser Island; 2342–3078 m (Fig 13B).

Nothria sp. 54655

Figs 14–15, Fig 7B, Tables S1–S2

Material examined. AM W.54655, IN2022_V08_179 (DNA voucher IOT35, on SEM stub).

Description. A single specimen, currently mounted on SEM stub, anterior fragment of 17 chaetigers, 3.5 mm long, 0.8 mm wide (at 10th chaetiger, excluding parapodia) (Figs 10E–F, 14A). Alcohol stored specimen overall cream coloured with no pigmented pattern. Prostomium anteriorly subtriangular with two ovate frontal lips close together. Palpo- and antennophores with 2–3 short rings. Two pairs of eyes with one pair of small eyespots dorsally at bases of palps and one pair of very large conspicuous eyes laterally (Fig. 10F).

First chaetiger enlarged, 1.5 times longer than chaetiger 2. Anterior three pairs of parapodia modified; first pair enlarged, directed forward, reaching the anterior margin of frontal lips, with large auricular prechaetal lobes, subulate postchaetal lobes and digitate dorsal and subulate ventral cirri (Fig. 14B). Second pair of parapodia smaller in size, directed slightly more laterally with smaller auricular prechaetal lobe (Fig. 14C). Third pair of parapodia slightly larger than subsequent unmodified parapodia, tongue-like prechaetal lobes, subulate postchaetal lobes ovate and transitioning to glandular pads ventral cirri (Fig. 14D). From chaetiger 4 onwards parapodia becoming uniform, directed laterally with prechaetal and postchaetal lobes gradually decreasing in size visible until chaetiger 9 and 10 respectively. Dorsal cirri remaining digitate throughout fragment gradually decreasing in length. Ventral cirri replaced by oval glandular pads from chaetiger 4. Single short branchiae present from chaetiger 11 (Fig. 14F).

First pair of parapodia with two large and stout and one–two slender pseudocompound bidentate hooded hooks (Fig. 15A). Second pair of parapodia with three slender bidentate pseudocompound hooded hooks (Fig. 15B) and five–six pectinate chaetae (some broken). Third pair of parapodia with three very slender pseudocompound bidentate hooded hooks (Fig. 15C), four–five pectinate chaetae and two limbate chaetae. All hooded hooks with wide space between distal and proximal teeth. Pectinate chaetae elongated, scoop-shaped with lateral margins rolled inward, with up to 12–15 denticles, throughout all segments, up to four per parapodium (Fig. 15D–E). Limbate chaetae continue till end of fragment, three–four per parapodium. Subacicular hooks

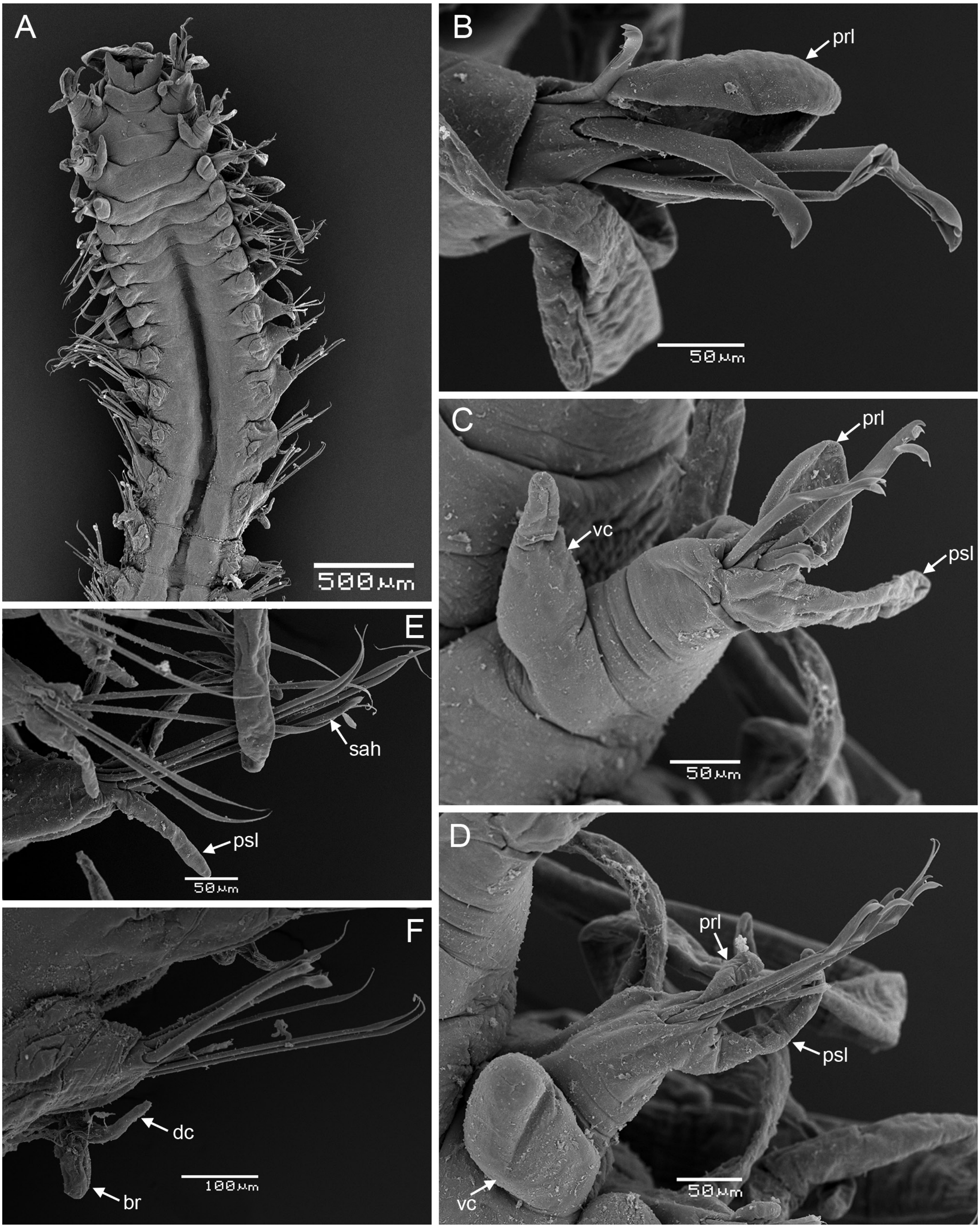

Figure 14. *Nothria* sp. 54655, SEM micrograph of AM W.54655. (*A*) anterior part, ventral view; (*B*) parapodium 1, ventral view; (*C*) parapodium 2, ventral view; (*D*) parapodium 3, ventral view; (*E*) parapodium 8 with single subacicular hook; parapodium 13 with simple branchia and paired subacicular hooks. Abbreviations: *br*, branchia; *dc,* dorsal cirrus; *prl,* prechaetal lobe; *psl,* postchaetal lobe; *sah,* subacicular hook; *vc,* ventral cirrus.

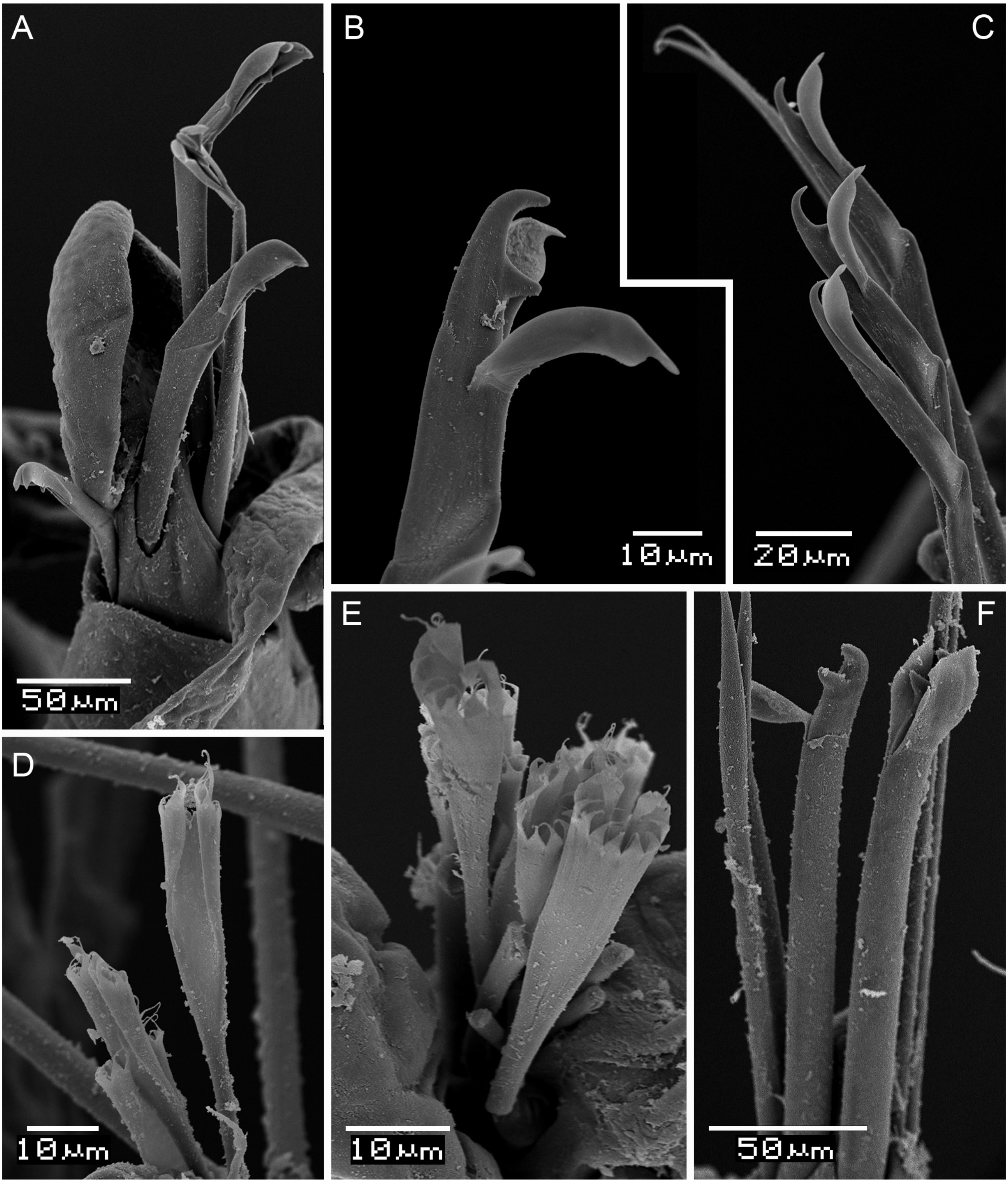

Figure 15. *Nothria* sp. 54655, SEM micrograph of AM W.54655. (*A*) bidentate pseudocompound hooks from chaetiger 1; (*B*) bidentate pseudocompound hook from chaetiger 2; (*C*) bidentate pseudocompound hooks from chaetiger 3; (*D*) pectinate chaetae from chaetiger 5; (*E*) same, from chaetiger 3; (*F*) subacicular hooks from chaetiger 12.

from chaetiger 8, first single, double in subsequent parapodia (Figs 14E, 15F).

Pygidium, jaw apparatus, and tube not observed.

Remarks. Of all deep-sea *Nothria* species reported from Australian waters, this species is most similar to *Nothria josae* Paxton *et al*., 2023 in having subtriangular prostomium, large posterior eyes, short branchiae from chaetiger 11, and 3 first chaetigers with bidentate hooks. Besides clear genetic differences (K2P distance in *16S* 11.2%), these two species can be distinguished by the absence of simple anterior hooded hooks and the presence of pectinate chaetae on chaetiger 2 in the new species compared to *N. josae*. The single studied specimen most probably represents a species new to science, but it is not formally named here due to lack of material for assessment of intraspecific variation which is essential in *Nothria* species descriptions.

Distribution and bathymetry. Known from the single locality, Australian Indian Ocean Territories, Muirfield Seamount, 111–121 m (Fig. 7B).

Order Phyllodocida Dales, 1962

Suborder Aphroditiformia Levinsen, 1883

Family Polynoidae Kinberg, 1856

Polynoidae are widely distributed, occurring in all depths from intertidal waters to hadal trenches (Paterson *et al*., 2009). There are currently ~ 900 accepted species in 172 genera (Read & Fauchald, 2026), some of which are restricted to the deep sea, especially species in the subfamily Macellicephalinae (Bonifácio & Menot, 2018). Polynoids are one of the dominant epifaunal annelid families in abyssal (> 2,000 m) depths (Paterson *et al*., 2009), but their diversity in Australian waters is poorly known. Gunton *et al*. (2021) reported 11 genera and 15 species collected during RV '*Investigator'* 2017 'Sampling the Abyss' voyage, of which nine species were named and described in Murray *et al*. (2025).

Remarks. Morphological characters were described using the terminology by Murray *et al*. (2025).

Subfamily Admetellinae Uschakov, 1977

Admetella McIntosh, 1885

Admetella McIntosh, 1885: 124–125.

Type species: *Admetella longipedata* (McIntosh, 1885).

Diagnosis. Emended from Wu *et al*. (2024). Body 49–82 segments. Cephalic peaks absent. Paired auxiliary appendages present at bases of lateral antennae ceratophores or arising from either side of base of median antenna ceratophore: either short and subtriangular, or long, digitiform, or structures basally wide and flattened and tapering to elongate tips. Tentacular sheaths absent. Elytra 19–31 pairs; on segments 2, 4, 5 7, 9, 11, 13, 15, 17, 19, 21, 23, then on every third segment after segment 23. Notopodia with elongate acicular lobe, shorter than neuropodia. Neurochaetae and notochaetae long, flattened, transparent, with faint spinous rows. Neurochaetae tips simple; bidentate neurochaetae absent. Nephridial papillae on ventral bases of parapodia starting from segments 3–11, small, tapered, or ovate.

Remarks. The diagnosis above is based on Pettibone (1967) and recently revised by Wu *et al*. (2024) who also included nephridial papillae in the diagnostic criteria. The diagnosis was further emended here to include the origin of auxiliary appendages from the sides of the median antennal ceratophore and either connecting the bases of the median antennal ceratophore to the lateral antennal ceratophores, or unattached to the prostomium proper.

Admetella and *Bathyadmetella* Pettibone, 1967 are the only genera in Admetellinae. These are the only genera with auxiliary appendages at the base of the lateral antennae ceratophores; in *Admetella* they can be either short, triangular and scale-like or long, digitiform structures, whereas in *Bathyadmetella* (not seen in this study) the auxiliary appendages are present both at the base of the lateral antennae ceratophores as well as in the form of long tentacular sheaths. Seven nominal species of *Admetella* are currently recognised; they are rarely collected but occur widely in the Indian, Pacific and Atlantic Oceans at depths of 400–6,000 m (Read & Fauchald, 2026).

Admetella longilamella Murray, Criscione & Kupriyanova sp. nov.

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Figs 16, 17A, Tables S1, S3

Admetella sp.—Kupriyanova *et al*., 2024: 28.

Material examined. Holotype WAM V11722, Western Australia, Gascoyne Marine Park, IN2022_V09_25, 20°47'29.1660"S, 111°43'55.6752"E, 3.12 2022, 1,470 m. Paratypes all from the same voyage: WAM V13827, IN2022_V09_25 (1); WAM V11715, IN2022_V09_12 (1); WAM V11716, IN2022_V09_14 (1); WAM V11721, IN2022_V09_24 (1); WAM V11724, IN2022_V09_24 (1, DNA voucher WAM006); WAM V11725, IN2022_V09_25 (1); WAM V11727, IN2022_V09_27 (2); WAM V11734, IN2022_V09_13 (1); WAM V11741, IN2022_V09_37 (1). Non-type material: Indian Ocean Territories, Cocos (Keeling) Islands, AM W.54494, IN2022_V08_191 (1, DNA voucher IOT073); AM W.54480, IN2022_V08_157 (1); AM W.54493, IN2022_V08_157 (1); AM W.54498, IN2022_V08_157 (1).

Additional material examined: AM W.54477, IN2022_V08_120 (1, DNA voucher IOT060), Indian Ocean Territories, Cocos (Keeling) Islands, Rudist Seamount.

Diagnosis. *Admetella longilamella* sp. nov. is distinguished from all other *Admetella* species by a combination of characters: the absence of aciculae in tentacular segment, the presence of notochaetae from segment 5, the form and start of the nephridial papillae from segment 5, the elongate form of the auxiliary appendages and their origin, arising from the base of the lateral antennae ceratophores.

Description: Holotype body large, ~85 mm long, 20 mm wide (excluding chaetae), with 66 segments. Anterior end folded over dorsally, posterior end damaged. Prostomium with cephalic peaks absent. Eyes absent or without pigment. Palps long, smooth, tapering. Median antenna ceratophore large, projecting dorsally from prostomium; style long smooth with pigmented subdistal inflation (Fig. 16B). Lateral antennae ceratophores continuous with anterolateral margins of prostomium; styles missing from holotype; some paratypes with styles long, cirriform, with pigmented subdistal inflation. Paired auxiliary appendages present, arising from base of median antennal ceratophore, as flattened processes, wide for half-length and tapering to elongate tips (tips often torn off) (Fig. 16B–C). Facial

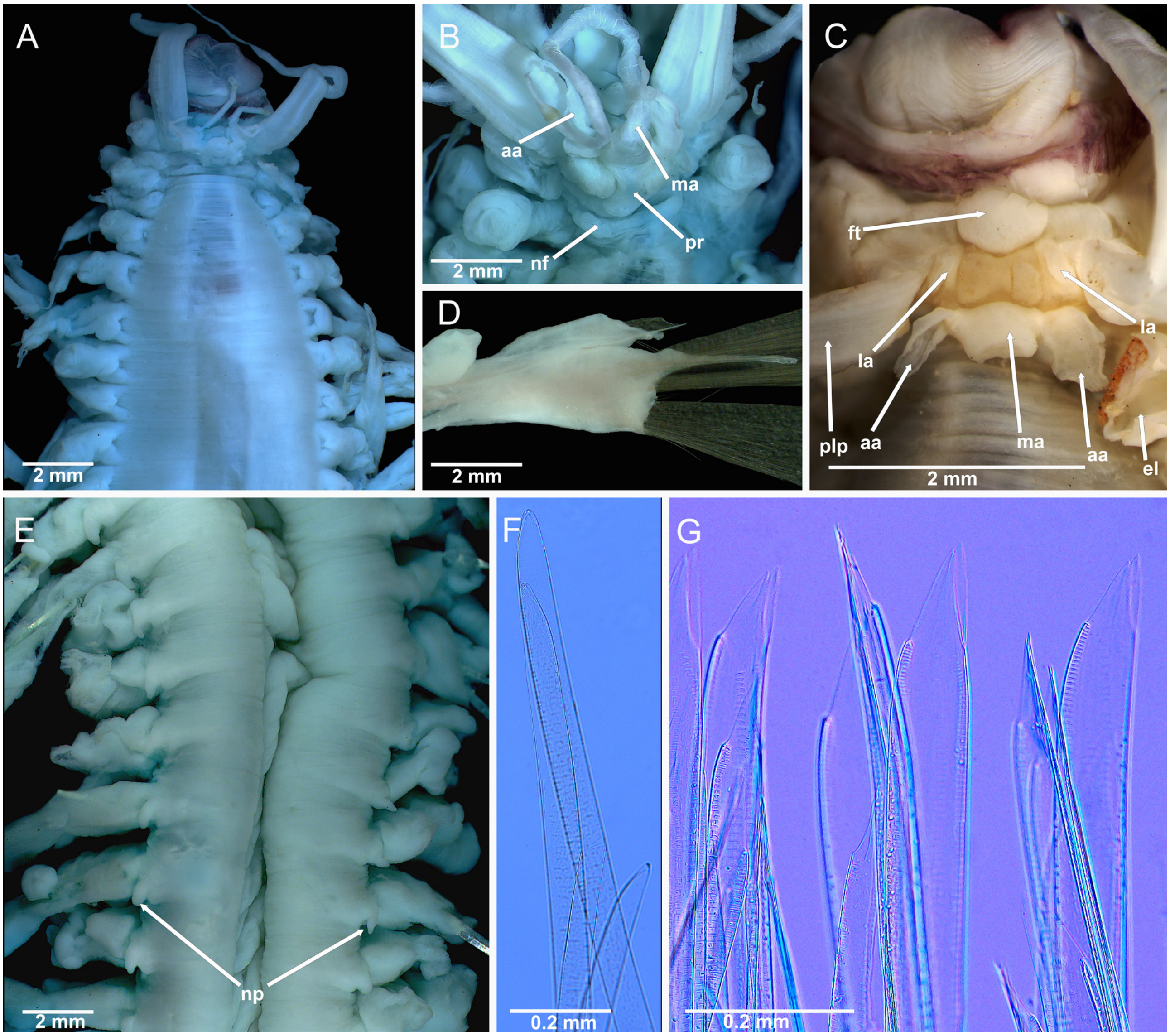

Figure 16. *Admetella longilamella* sp. nov., light photograph of WAM V11741. *(A)* anterior body, ventral view. WAM V13827: *(B)* dorsal view of prostomium. WAM V11724: *(C)* position of (damaged) auxiliary appendages on prostomium. WAM V13827: *(D)* parapodium 20. WAM V11741: *(E)* posterior ventral nephridial papillae. WAM V13827: *(F)* notochaetae from posterior parapodia. WAM V13827: *(G)* neurochaetae. Abbreviations: *aa*, auxiliary appendage; *el*, elytron; *ft*, facial tubercle; *la*, lateral antenna base; *ma*, median antenna; *nf*, nuchal fold; *np*, nephridial papilla; *plp*, palp; *pr*, prostomium.

tubercle present, bulbous (Fig. 16C). Tentaculophores achaetous, with small digitiform acicular lobe present medioventrally on dorsal tentaculophore (aciculum small, thin); tentacular styles long, with subdistal inflation and filiform tips. Nuchal fold present on dorsum of segment 2 (Fig. 16B). Dorsal cirri with elongate styles, non-papillate, subdistally inflated, tips filiform.

Dorsal tubercles present as longitudinal raised glandular ridges on cirrigerous segments (Fig. 16A). Nephridial papillae starting from segment 5 continuing to posterior end, short, blunt-tipped (Fig. 16E).

Elytra all missing on holotype; elytrophores 26 pairs, on segments 2, 4, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 26, 29, 32, 35, 38, 41, 44, 47, 50, 53, 56, 59, 62, 65 (i.e., every third segment after segment 23).

Segment 2 with small acicular lobe between large elytrophores and large ventral cirrophore. Rudimentary notopodia on segments 3 and 4 as acicular lobes, achaetous. Notochaetae start from segment 5. Neuropodial acicular lobe and neurochaetae start from segment three. Parapodia becoming as long as width of body; notopodia shorter than neuropodia, both with elongate acicular lobes (Fig. 16D). Notochaetae flattened laterally with faint striations (spinous rows) along margins, tips short, blunt and undivided (Fig. 16F). Neurochaetae numerous, flattened, transparent with faint striations (spinous rows) down both margins, tips short, triangular, often split laterally, appearing flattened and divided into two short triangular flaps (Fig. 16G).

Variation. Paratypes and additional material range in size from 44–137 mm in length with 21–28 pairs of elytra (elytrophores) and also exhibit variability in the attachment of the antennal scales – some are not attached to the prostomium at all, but only to the sides of the base of median antenna ceratophore, and this condition does not appear to be correlated with prostomial damage. Elytra are missing from all specimens.

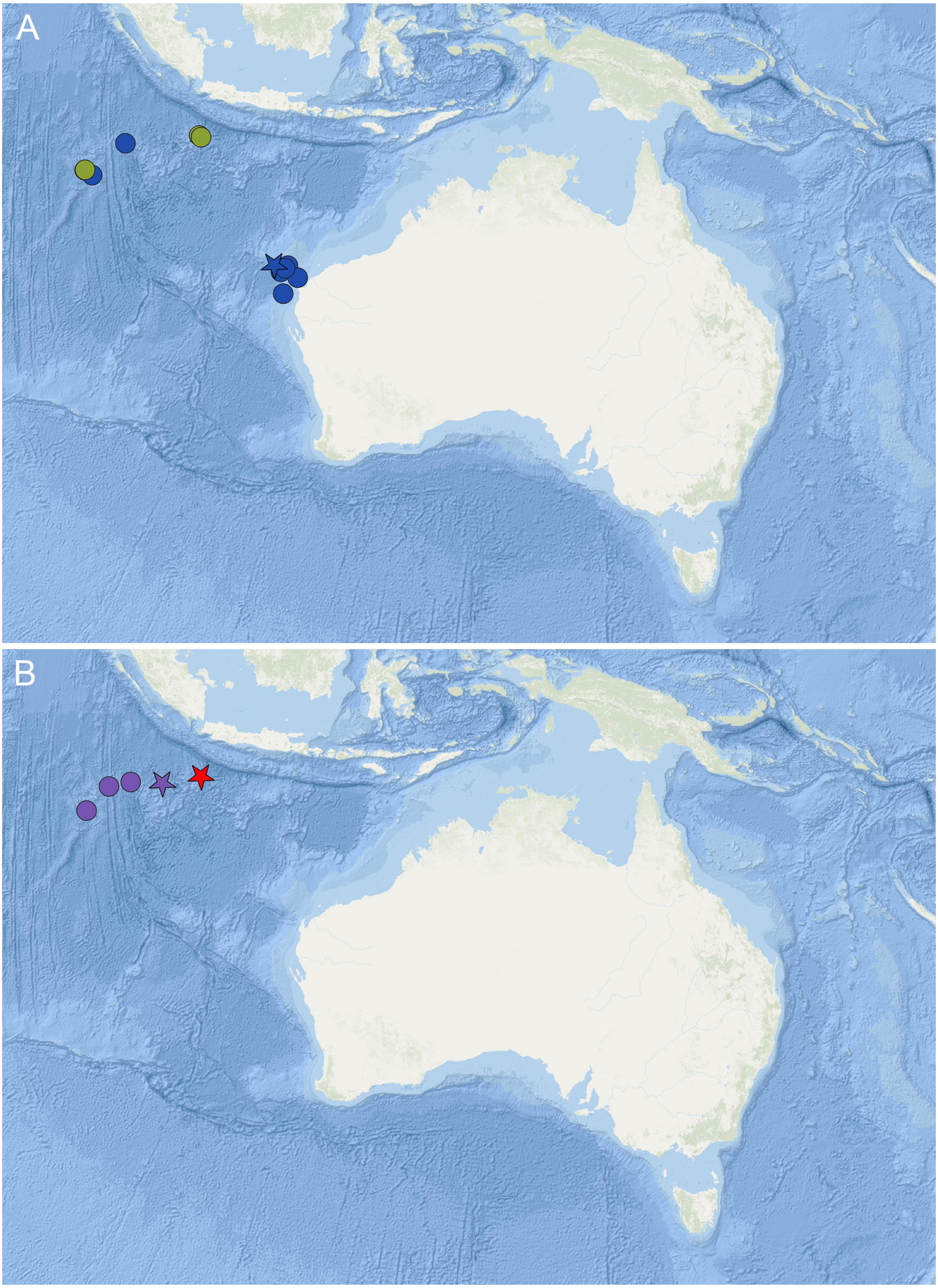

Figure 17. *(A) Admetella longilamella* sp. nov. (navy), *Anotochaetonoe michelbhaudii* (green). *(B) Gorgoniapolynoe unidentata* sp. nov. (red), *Harmothoe robinwilsoni* sp. nov. (purple). Stars – type localities, circles – specimens with DNA data.

Distribution and bathymetry. Indian Ocean, Cocos (Keeling) Islands and Gascoyne Marine Park; 1,000–3,839 m.

Etymology. The species is named for the elongate flattened auxiliary appendages ("long lamellae") arising from the base of the median antenna ceratophore.

Remarks. These specimens belong to subfamily Admetellinae, due to the terminal position of the lateral antennae on the prostomium and the dorsal displacement of the median antenna. They most closely resemble species of the genus *Admetella*, due to the presence of auxiliary appendages – a diagnostic character of *Admetella* – but which arise from the base of the median antenna (*sensu Admetella longipedata* McIntosh, 1885), rather than from the bases of the lateral antennae, and are elongate as opposed to "short, scale-like" (*Admetella hastigerens* Chamberlin, 1919 and *A. longipedata sensu* Pettibone, 1967).

Our specimens differ from *Bathyadmetella*, the only other genus of Admetellinae, due to the absence of long tentacular sheaths which *Bathyadmetella* possesses, as well as possessing notochaetae, which *Bathyadmetella* lacks.

There are currently seven nominal species of *Admetella*, but these damaged specimens do not correspond to any of these species, due to the elongate form of the auxiliary appendages arising from the median antenna, compared with the "short, scale-like" processes arising from the bases of lateral antennae of *A. longipedata* McIntosh, 1885 *sensu* Pettibone, 1967; *Admetella brevis* Levenstein, 1978; *Admetella multiseta* Wu *et al*., 2024; and *Admetella undulata* Wu *et al*., 2024; or short, subtriangular processes connecting the median and lateral antennae (*A. hastigerens* Chamberlin, 1919); or long, digitiform processes arising from the base of the lateral antennae ceratophores of *Admetella levensteini* Wu *et al*., 2024 and *Admetella nanhaiensis* Wu *et al*., 2024). Some of the specimens herein were reported by Kupriyanova *et al*. (2024). Other single specimens reported by Wu *et al*. (2024) from western Pacific Seamounts, as *Admetella* sp. 1 and sp. 2, appear to possess some similarities with our specimens, but differ due to the absence of aciculae in tentacular segment, and the start of notochaetae (segment 5, segment 7; cf. segment 5 in our specimens), the start of the nephridial papillae (segment 9, 11; cf. segment 5) and the origin of the auxiliary appendages arising from the base of the lateral antennae ceratophores (cf. the base of the median ceratophore) (Wu *et al*., 2024: 5, table 2).

The specimens most closely resemble *A. hastigerens* because of their larger size but differ from this species by the presence of elongate auxiliary appendages (compared with short subtriangular processes in *A. hastigerens*), the presence an acicular lobe in the tentacular segment, and the presence of notochaetae (both are absent in *A. hastigerens* according to Wu *et al*., 2024). They also differ from *A. longipedata* originally described from the Southern Ocean due to that species' absence of notochaetae, according to McIntosh (1885). This species also differs from that reported from off southeastern Australia by Murray *et al*. (2025: 197) as *Admetella* sp., in depths of 2,338–2,581 m (Fig. 2, AM W.51461) – but those specimens were damaged and only vestiges remain of the auxiliary appendages.

Most of the specimens from Cocos (Keeling) Islands in the Indian Ocean Territories, though somewhat damaged, exhibit the same form and location of auxiliary appendages as the ones from the Gascoyne Marine Park, and show little genetic difference (Fig. 2). However, another large but badly damaged specimen lacking all antennae, auxiliary appendages, chaetae and elytra (AM W.54477) appears to be more closely related to two damaged specimens collected from two tropical western Pacific seamounts and briefly described by Wu *et al*. (2024) as *Admetella* sp. 1 and sp. 2 (Fig. 2, as *Admetella* spp. MBM286810 and MBM286811).

Subfamily Lepidastheniinae

Pettibone, 1989

Anotochaetonoe Britayev & Martin, 2006

Anotochaetonoe Britayev & Martin, 2006: 4083

Type species: *Anotochaetonoe michelbhaudi* Britayev & Martin, 2006.

Diagnosis. Derived from Britayev and Martin (2006). Body 41–47 segments. Cephalic peaks absent. Eyes present. Anterior eyes located in front of widest part of prostomium; orientation lateral, dorsolateral to dorsal. Posterior eyes located at least one eye diameter in front of posterior margin; orientation dorsal. Median antenna ceratostyle elongate, evenly tapering, smooth. Lateral antennae prostomial location terminal, continuous with lateral margin of prostomium; ceratostyles elongate, evenly tapering, without papillae. Tentaculophores achaetous; tentacular cirri elongate, evenly tapering, without papillae.

Jaws comprising two dorsal and two ventral elements, all elements independent, fang-shaped. Pharynx barrel without distinct ornamentation, with 9 pairs of terminal papillae, terminal papillae all similar. Nuchal flap or fold on anterior margin of segment 2 absent. Elytra up to 20 pairs; on segments 2, 4, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 26, 29, 32, 34, 37, 40, 43, 46; large but leaving middle of dorsum uncovered (elytra partially covering dorsum on mid- and posterior segments). Elytra surface ornamented with microtubercles (few and sparse); elytra macrotubercles absent. Dorsal tubercles absent (or indistinct). Neuropodia margin with papillae along the ventral margin (between ventral cirrus and base of neuropodium). Aciculae of notopodia and neuropodia do not project clear of epidermis. Neuropodial prechaetal and postchaetal lobe subequal. Neuropodial prechaetal (acicular) lobe distal shape rounded. Neuropodial prechaetal supra-acicular process absent. Neuropodial postchaetal lobe distally entire. Notochaetae absent. Neurochaetae straight to falcate with rows of spines distally, and with simple unidentate tips and bidentate tips both present. Pygidium with terminal anus; pygidial appendages one pair of subulate or cirriform anal cirri.

Remarks. *Anotochaetonoe* is unique among polynoid genera in having up to 19–20 pairs of elytra, parapodial papillae and bidentate neurochaetae. *Anotochaetonoe* contains two species, *A. michelbhaudi* Britayev & Martin, 2006, a commensal in tubes of *Phyllochaetopterus* (Annelida: Chaetopteridae) and *A. rubermaculata* Murray *et al*., 2025 from Eastern Australian abyss.

Anotochaetonoe michelbhaudii Britayev & Martin, 2006

Figure 17A, Tables S1, S3

Anotochaetonoe michelbhaudii.—Kupriyanova *et al*., 2024: 30.

Material examined. AM W.53420, IN2021_V04_18 (1, DNA voucher IOT053), off Christmas Island NW; AM W.53397, IN2021_V04_5 (1), Christmas Island SE; AM W.54607, IN2022_V08_161 (1), Muirfield Seamount.

Description. Specimen AM W.53420 complete, with 57 segments, 25 mm long, 3.5 mm wide (excluding chaetae). Cephalic peaks absent. Lateral antennae arising terminally from prostomial lobes, set slightly ventral to median antenna ceratophore. Two pairs of small eyes. Facial tubercle present, small rounded to conical flap.

Nephridial papillae starting from segment 6, continuing to end of body. Orange-pigmented stripe ventrally at base of neuropodia. Neuropodia deeply incised dorsoventrally, prechaetal lobe subtriangular, longer than postchaetal rounded lobe.

Notochaetae absent, notopodia reduced to small acicular lobe on dorsal face of neuropodia.

Globular papillae present in single row on ventrum of neurochaetae, some ciliated, up to 12 papillae per row. Two kinds of neurochaetae present: superior ones with long length of rows of short spines, finer with filiform unidentate tips, blunt or knobbed; inferior ones with shorter section of rows of spines and with curved, bidentate tips, secondary tooth slender.

Ventral cirri short, tapering, not reaching end of neuropodia.

Elytra 22 pairs, present to posterior end of body, present on segments 2, 4, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 26, 29, 32, 35, 38, 41, 44, 47, 50, 53.

Elytra with brownish pigmentation in polygonal patches on anterior and medial areas of elytra; with a few micropapillae.

Remarks. These specimens agree with Britayev and Martin's (2006) description of the species from the East Atlantic off the coast of Congo. They were reported by Kupriyanova *et al*. (2024) and represent a new record of this species from the Indian Ocean and from depths >500 m. These are also the first molecular data for this species deposited in GenBank. The species differs from *Anotochaetonoe rubermaculata* Murray *et al*., 2025, which lacks knob-like tips on the superior neurochaetae, elytral micropapillae and ciliation of ventral parapodial papillae, as well as possess much smaller eyes than *A. michelbhaudii*. Molecular sequence data confirm their genetic difference (Fig. 2; genetic distance 24.4%).

Distribution and bathymetry. East Atlantic Ocean from Gulf of Cadiz to off Republic of Congo, 70–228 m; Indian Ocean, Australia, 442–997 m.

Gorgoniapolynoe Pettibone, 1991

Gorgoniapolynoe Pettibone 1991: 688.

Type species: *Gorgoniapolynoe bayeri* Pettibone, 1991

Diagnosis. Emended from Barnich *et al*. (2013). Body dorsoventrally flattened, with up to about 60 segments. Prostomium with or without cephalic peaks and three antennae; lateral antennae lateroventral to median antenna (i.e., ventral and removed from median antenna). Two pairs of eyes. Fifteen pairs of elytra on segments 2, 4, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 26, 29, and 32. Anterior one to three pairs of elytra modified, with translucent, chitinous central area; mid-dorsum uncovered by elytra, except in anterior segments. Parapodia with elongate acicular lobes with noto- and neuroacicula penetrating epidermis; tip of neuropodia extended to supra-acicular process. Notochaetae few, stout with blunt tips. Neurochaetae more numerous, of same width as notochaetae, with bidentate, notched or unidentate tips. Prominent glandular area on bases of ventral cirri beginning on segments 11–18.

Remarks. The generic diagnosis is herein emended to include the presence of solely unidentate neurochaetae.

Gorgoniapolynoe unidentata Murray, Criscione & Kupriyanova sp. nov.

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Figs 17B, 18, Tables S1, S3

?*Gorgoniapolynoe* sp.—Kupriyanova *et al*., 2024: 32.

Material examined. Holotype AM W.58081, IN2021_V04_9, Christmas Island, off McPherson Point, 7.07.2021, 10°26'11"S, 105°34'39"E, from antipatharian coral, 957–1,154 m. Paratypes AM W.53502 (9), AM W.53413 (3), AM W.53408 (16), AM W.53412 (3, incomplete), AM W.53409 (1), AM W.53410 (1), AM W.55671 (1, DNA voucher IOT005), AM W.55672 (1, DNA voucher IOT006). Holotype and paratypes all from the same station.

Diagnosis. *Gorgoniapolynoe unidentata* sp. nov. is distinguished from the other nine nominal *Gorgoniapolynoe* species by the absence of bidentate neurochaetae and presence of unidentate neurochaetae only, as well as the form of ornamentation on elytral surface.

Description. Holotype with 49 segments, 22 mm long, 3.5 mm wide incomplete (Fig. 18A). Prostomium wider than long (almost heart-shaped). Palps stout, short. Cephalic peaks absent. Anterior eyes on widest part of prostomium; two pairs large eyes. Lateral antennae short, arising near outer margin of prostomial lobes, somewhat ventral to prostomial lobes, widely separated from median antenna, styles smooth, as long as half width of prostomium. Median antenna much longer, styles non-papillate. Tentaculophores without chaetae (Fig. 18B). Nine pairs of pharyngeal papillae, two dorsal and two ventral jaws (from several paratypes AM W.53408).

Dorsal cirri smooth, longer than parapodia, tapering to filiform tips. Dorsal tubercles present on all cirrigerous segments, rounded to nodular (Fig. 18A–B).

Ventral cirri tapering, shorter than neuropodial lobe (except on segment 2), without papillae, arising mid-neuropodium. Nephridial papillae starting from segment 6, small, digitiform.

Elytra 15 pairs, most missing. Elytrophores present on 2,

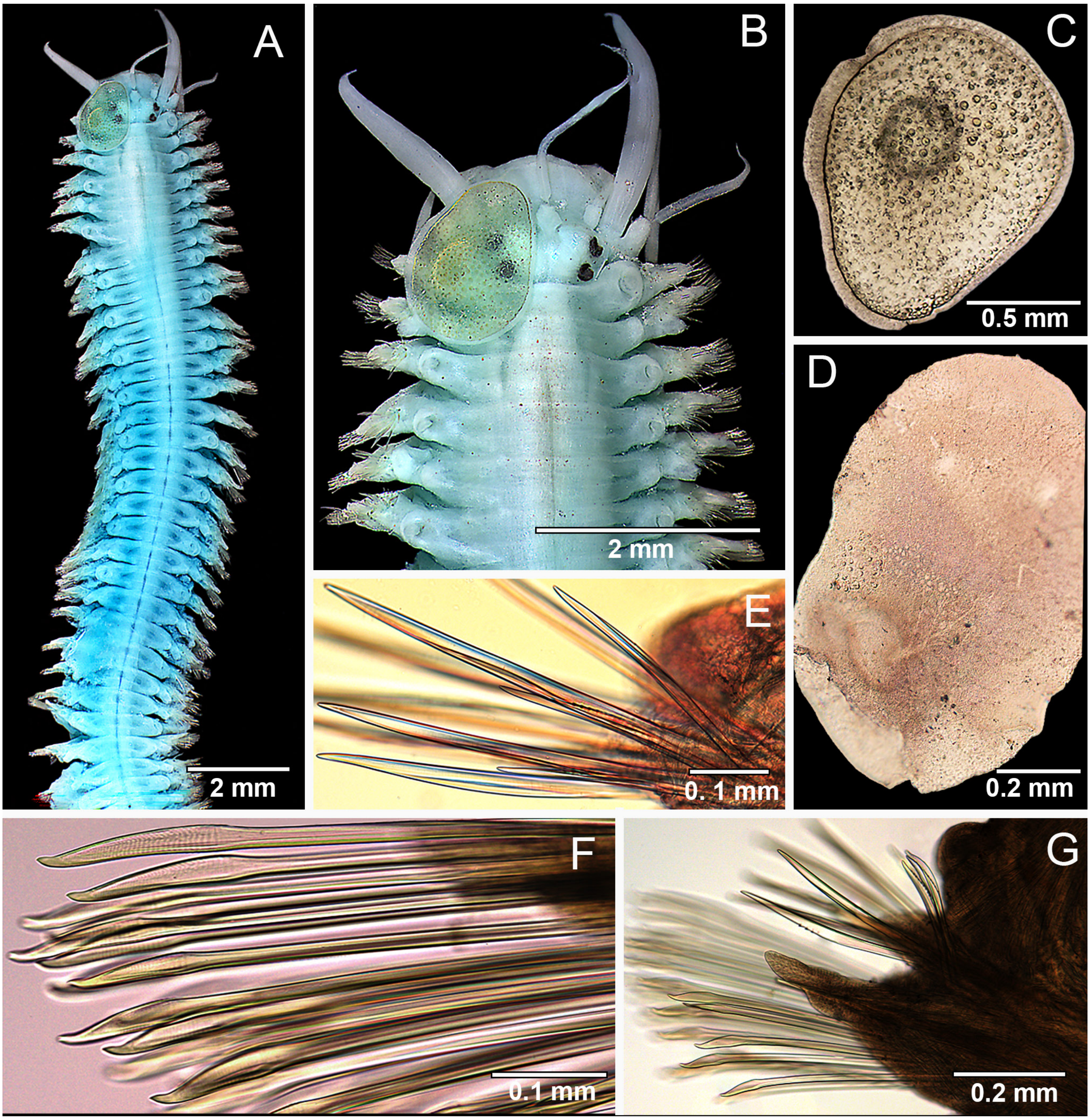

Figure 18. *Gorgoniapolynoe unidentata* sp. nov., light photographs of holotype AM W.58081: *(A)* anterior and middle body, dorsal view; *(B)* prostomium and anterior end. AM W.53408: *(C)* first elytron; *(D)* posterior elytron; *(E)* notochaetae; *(F)* neurochaetae; *(G)* parapodium from mid-body segment.

4, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 26, 29, 32. At least first and second pairs of elytra modified, sclerotised, covering dorsum, surface covered with robust microtubercles, round to cone-shaped, and with scattered short cylindrical micropapillae and thin, non-sclerotised borders; crescent-shaped chitinous area absent on the modified first and second elytra pairs (Fig. 18C). More posterior elytra thin, fragile, not covering dorsum, with patch of microtubercles near elytrophore scar, without papillae, but with faint pigment around elytral scar (Fig. 18D).

Parapodia biramous, notopodia slightly smaller than neuropodia; aciculae emergent. Neuropodial supra-acicular lobe present as an elongate flap; post-acicular lobe rounded (Fig. 18G).

Notochaetae 10–11 per notopodium, as thick as neurochaetae, acicular, of two kinds: most smooth, except for a few notochaetae on anterior face of notopodia having a few faint rows of short spines (Fig. 18E).

Neurochaetae with subdistal concave swelling (blades) with faint rows of spines, blades straight or slightly curved (in superior position) to strongly hooked (in middle and inferior position), with blunt unidentate tips (Fig. 18F); bidentate or notch-tipped chaetae absent.

Variation. Complete specimens with 40–68 segments; most specimens incomplete. A couple of specimens with more than 50 segments (from AM W.53408) have unsclerotised first and second elytra, but these have some microtubercles present in patches and may represent specimens that have undergone damage to the anterior end and are regrowing replacement elytra.

Remarks. These specimens closely resemble species of *Gorgoniapolynoe*, a genus of short-bodied gorgonian/stylasterid coral symbionts, however they lack the bidentate or notch-tipped neurochaetae typical of that genus (Pettibone, 1991; Barnich *et al*., 2013; Britayev *et al*., 2014; Serpetti *et al*., 2017; Maxwell *et al*., 2022). They also resemble the genus *Parahololepidella* Pettibone, 1969, species of which possess small elytra, similar neurochaetal forms and are also associated with antipatharian corals. However, the three nominal species of *Parahololepidella* possess a much greater number of segments and elytra and do not possess specialised sclerotised elytra (Gonzalez *et al*., 2023; Murray *et al*., 2025). There are also currently no specimens of species of *Parahololepidella* deposited in GenBank for comparison.

The specimens also resemble *Gorgoniapolynoe cairnsi* Pettibone, 1991 reported from off the Auckland Islands, Antarctica, in 370 m, but lack the bidentate neurochaetae of that species.

The specimens differ from *Gorgoniapolynoe pseudocaeciliae* Maxwell *et al*., 2022, which possesses a large crescent-shaped chitinous area on the first elytra, and cylindrical macropapillae on all elytra. They differ also from *G*. cf. *caeciliae* (*sensu* Maxwell *et al*., 2022) which has a large bean-shaped chitinous area that covers at least half of the first pairs of elytra and possesses barrel-shaped macropapillae on all elytra. Both of these species also possess bidentate or notched-tip neurochaetae, which our specimens lack. Molecular sequences reveal the affinity of our specimens with other *Gorgoniapolynoe* species but indicate that they belong to a different species (Fig. 2) and therefore the generic diagnosis is expanded to include species with only unidentate neurochaetae.

Etymology. The species is named for the unidentate neurochaetae.

Distribution and bathymetry. Indian Ocean, Australian Territories (Christmas Island); 957–1,154 m.

Harmothoe Kinberg, 1856

Type species: *Harmothoe spinosa* Kinberg, 1856 (type by subsequent designation).

Diagnosis. Emended from Murray *et al*. (2025). Body 35–48 segments. Cephalic peaks present. Eyes present or absent. Posterior eyes located near posterior margin of prostomium. Lateral antennae prostomial location ventral to and separate from prostomium; inserted ventrally, distinctly beneath level of median antenna. Jaws comprising two dorsal and two ventral elements, all elements independent, fang-shaped. Nephridial papillae distinct, at least on some median segments; first visible on segment 5, or 6. Elytra 15 pairs; on segments 2, 4, 5, then every second segment, distribution changing posteriorly; distribution on every third segment after segment 23. Last elytra on segment 32. Dorsal tubercles present on all cirrigerous segments. Aciculae of notopodia and neuropodia project clear of epidermis. Dorsal cirri styles elongate, evenly tapering, or subdistally inflated, or with sharply narrowed tips, without papillae, or papillated (in most species). Neuropodial prechaetal (acicular) lobe distal shape elongate, tapering. Neuropodial prechaetal supra-acicular process present or absent. Notochaetae distinctly thicker than neurochaetae (usually). Notochaetae dorsal orientation mainly held erect above body, or mainly or wholly dorso-lateral projections from notopodia. Longest notochaetae shorter than longest neurochaetae. Neurochaetae simple tips present or absent, neurochaetae with bidentate tips present.

Remarks. The diagnosis is herein emended to include eyes absent, and neuropodial supra-acicular process absent, so as to include the following new species. See Murray *et al*. (2025: 239–240) for further comments regarding *Eunoe-Harmothoe-Lagisca* taxonomy.

Harmothoe robinwilsoni Murray, Criscione & Kupriyanova sp. nov.

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Figs 17B, 19, Tables S1, S3

Harmothoe sp. 3.—Kupriyanova *et al*., 2024: 37.

Material examined. Holotype AM W.54353, IN2022_V08_113 (DNA voucher, IOT069), Lucia Seamount, 10°59'56"S, 102°22'56"E, 9.10.2022, 1.936–1,968 m. Paratypes AM W.54363, IN2022_V08_113 (1, incomplete); AM W.54359, IN2022_V08_122 (1); AM W.54361, IN2022_V08_115 (1, incomplete); non-type AM W.54354, IN2022_V08_113 (1).

Diagnosis. *Harmothoe robinwilsoni* sp. nov. can be distinguished from all 146 nominal species of *Harmothoe* by a combination of characters: the lack of supra-acicular neurochaetal lobes and lack of eye pigmentation. Also see Remarks.

Description. Holotype complete with 34 segments, ~18 mm long, 5 mm wide. Robust unpigmented body. Eyes without pigmented lenses (or eyes absent) but with distinct glandular bulges. Distinct cephalic peaks present, located near lateral margin of anterior prostomium (Fig. 19A). Palps short, appearing smooth. Lateral antennae located ventral to prostomium, ceratophore bases widely separated, styles short, length about ½ width of prostomium, basally inflated, with filamentous tapering tips, papillate. Median antenna ceratophore large, style long, tapering, papillate. Tentaculophores with acicular lobe and 1–3 chaetae, tentacular cirri styles tapering to filiform tips, papillate (Fig. 19A). Facial tubercle absent. Nuchal fold absent dorsally from segment 2. Dorsal tubercles present on all cirrigerous segments, bulbous. Ventral cirri on segment 2 longer than following cirri, papillate (small papillae); remaining ventral cirri short, arise from mid-neuropodia, smooth. Nephridial papillae starting from segment 5, continuing to end of body, digitiform. Dorsal cirri tapering to filiform tips, becoming longer more posteriorly, cirrophores cylindrical, styles with sparse fine small papillae (appear smooth under stereo microscope).

Elytra 15 pairs, on segments 2, 4, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 26, 29, 32. Elytra covering body completely. Elytra with few fine marginal and submarginal papillae and microtubercles covering entire surface, longer spines on

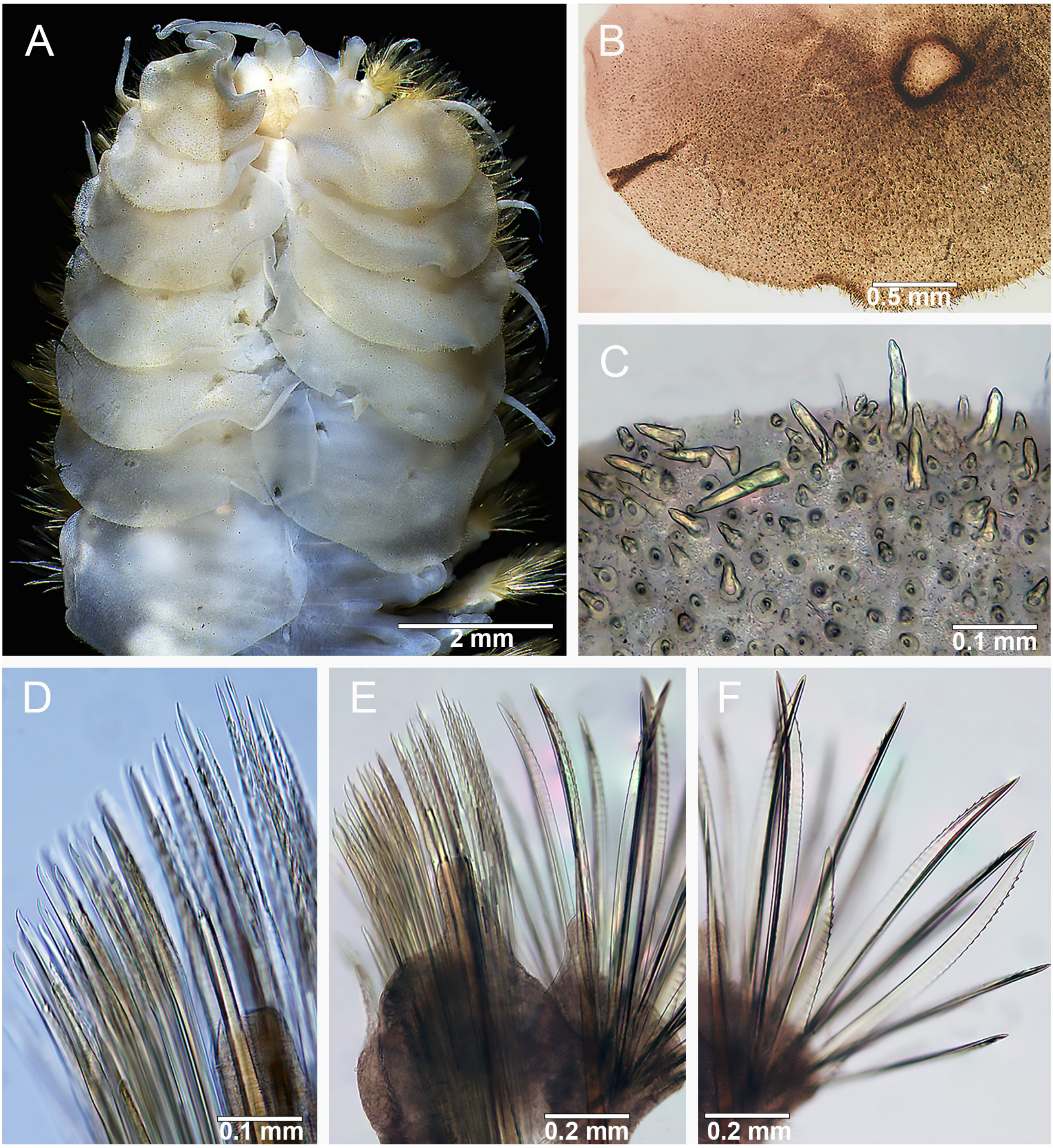

Figure 19. *Harmothoe robinwilsoni* sp. nov., light photographs of holotype AM W.54353: *(A)* anterior end, dorsal view. *(B)* elytron *(C)* tubercules and papillae on elytron; *(D)* neurochaetae; *(E)* middle segment parapodium; *(F)* notochaetae.

posterior and external areas, with some shorter spines and cone-shaped tubercles (Fig. 12B–C). Elytral mounds absent.

Notopodia slightly smaller than neuropodia; noto- and neuropodia with emergent aciculae. Neuropodial supra-acicular lobe absent (Fig. 19E). Neuropodial subacicular lobe rounded.

Notochaetae thicker than neurochaetae. Notochaetae numerous, with multiple transverse rows of short spines, tips long, pointed (Fig. 19F), becoming slenderer in inferior position. Neurochaetae numerous, of two types, both swollen subdistally, with transverse rows of spines, tips long, bare, bidentate, secondary tooth long, those in superior position more slender, with more rows of spines and secondary tooth long, fine (Fig. 19D).

Variation. Complete specimens range from 25–38 segments, most missing all elytra. Paratype AM W.54359 has 38 segments and an extended posterior section lacking elytrophores.

Remarks. These specimens belong to the genus *Harmothoe* as it is currently understood (see Murray *et al.*, 2025 for discussion of *Harmothoe* and related genera), due to their possession of cephalic peaks, lateral antennae inserted ventral to prostomium (bases not touching), presence of dorsal tubercles on all cirrigerous segments, noto- and neuropodia subequal in size and with elongate acicular lobes, notochaetae thicker than neurochaetae, all chaetae with transverse spinous rows, neurochaetae with solely bidentate tips, tentacular segment bearing chaetae, and elytra with ornamentation. However, they lack pigmented eye lenses and supra-acicular neuropodial lobes which most *Harmothoe* species possess. They do not accord exactly with any of the ~146 nominal species of *Harmothoe*.

Harmothoe sp. A, described by Averincev (1978) from 5,200 m in the Coral Sea, bears a strong resemblance to our specimens, by the absence of eyes and the presence of two similar types of bidentate neurochaetae. However, Averincev reports that "both dorsal and ventral parapodial lobes bear digitiform processes", perhaps indicating that a supra-acicular neuropodial lobe is present, whereas in our specimens it is absent. Other *Harmothoe* species obtained from the southwest Indian Ocean Ridge by Serpetti *et al.* (2016), which may compare with these specimens, appear to be genetically different from our specimens (Fig. 2).

These specimens also resemble *Gattyana australis* Averincev, 1978 described from depths of 1,100–1,200 m in the Southern Ocean between New Zealand and Campbell Island, but which differed from the generic diagnosis of *Gattyana* by possession of bidentate neurochaetae. That species should probably be referred to *Harmothoe sensu stricto*. Our specimens differ from the description of *G. australis* by the absence of pigmented eyes, and the neurochaetae of two kinds, both bidentate (whereas *G. australis* possesses unidentate and bidentate neurochaetae).

Etymology. This species is named in honour of Dr Robin Wilson, who has contributed greatly to our understanding of morphology and taxonomy of Polynoidae, and to the knowledge of Australian polychaetes in general.

Distribution and bathymetry. Australian Indian Ocean Territories, seamounts off Cocos (Keeling) Islands; 648–2,974 m.

Polynoidae gen. sp. 1

Figs 20, 21A, Tables S1, S3

Polynoinae gen. sp. 1.—Kupriyanova *et al.*, 2024:41.

Material examined. AM W.54501, IN2022_V08_155 (1, DNA voucher IOT068), Cocos (Keeling) Islands, Muirfield Seamount; WAM V11714, IN2022_V09_12 (1, DNA voucher WAM008), off Western Australia, Gascoyne Marine Park.

Description. Body robust, with 43–44 segments. Dark pigment present on prostomium, dorsum and ventrum; some dark pigment spots on parapodia (Fig. 20A–D). Prostomium wider than long. Cephalic peaks present, located towards anterolateral margin of prostomium. Palps without distinct papillae (smooth). Median antenna located dorsal to lateral antennae ceratophores. Median antenna ceratophore large, style missing on both specimens. Lateral antennae inserted sub-terminally/terminoventrally to median antenna (ventral to prostomial lobes), bases not touching, ceratophores formed by anterolateral continuations of prostomium. Tentaculophores with one to three chaetae, acicular lobe present. Tentacular styles missing. Two pairs of large eyes present, anterior and posterior pairs adjacent and almost touching; anterior pair placed at widest part of prostomium, oriented laterally. Facial tubercle present, large, bulbous, conical (Fig. 20B). Dorsal nuchal fold/flap absent from segment two. Pharynx everted, four jaws (dorsal and ventral pairs fused), 11 pairs of terminal pharyngeal papillae.

Dorsal tubercles present on cirrigerous segments, as rounded flaps with dark brown pigmentation (Fig. 20B, D). Dorsal cirri styles all missing. Ventral cirri located basally on neuropodia, with swollen bases, styles smooth and reaching to neuropodial lobe (Fig. 20G). Dorsally, two raised, transverse, ciliary bands per segment (Fig. 20D).

All elytra missing; 17 pairs of elytrophores present on 2, 4, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 26, 29, 32, 35, 36.

Notopodia and neuropodia with elongate acicular lobes, noto- shorter than neuropodia, aciculae not emergent. Neuropodial supra-acicular lobe absent (Fig. 20G).

Notochaetae thicker than neurochaetae. Notochaetae curved, with many transverse rows of spines, tips long, pointed; 10–25 per notopodial fascicle (Fig. 20E, G). Neurochaetae with slightly swollen shaft midway, transverse rows of spinules along one side of shaft and slightly curved, bare, unidentate tips (knife-like) (Fig. 20F). Bidentate chaetae absent.

Nephridial papillae (Fig. 20C) starting on segment 5.

Remarks. These two specimens do not fit into any of the known polymeric genera of Polynoinae. However, they do bear a slight resemblance to *Hololepidella* species, based on the re-diagnosis of the genus by Wehe (2006), due to the body length (up to 90 segments), numerous pairs (16–42) of elytra, neuropodia not deeply incised dorsally and ventrally, and with supra-acicular process of neuropodial lobe present or absent, as well the presence or absence of cephalic peaks and the presence or absence of chaetae on the tentaculophores. There are currently 12 nominal species of *Hololepidella* (see Read & Fauchald, 2026), and of these only *H. commensalis* Willey, 1905 and *H. ophiuricola* Gibbs, 1971 possess solely unidentate neurochaetae. However, neither species resembles these specimens, due to their lack of cephalic peaks, the small size and position of eyes, and the shape and ornamentation of the neurochaetae. All other nominal *Hololepidella* species possess bidentate neurochaetae. There are currently no molecular sequences of *Hololepidella* deposited in GenBank for comparison.

Molecular sequence data shows the specimens' affinity with the species of the monotypic genus *Ceuthonoe* (Fig. 2; *16S* genetic distance 4.6%), and that species bears some morphological similarity to these specimens. *Ceuthonoe nezhai* Wang *et al.*, 2021 described from western Pacific Ocean is, however, smaller, with a body of 32 segments and 14 pairs of elytra; prostomium with prominent cephalic peaks and facial tubercle; aciculae and chaetae on tentaculophores; biramous parapodia, each ramus with a long aciculum penetrating epidermis, without supra- or subacicular process; and noto- and neurochaetae with unidentate tips. *Ceuthonoe nezhai* is no longer considered as belonging to the subfamily Polynoinae and its placement is uncertain (Murray *et al.*, 2025: 258). Another species reported by Taboada *et al.* (2020) as Polynoidae sp. 2 ST 2019, described from the Gulf of Mexico, may also be considered as belonging to

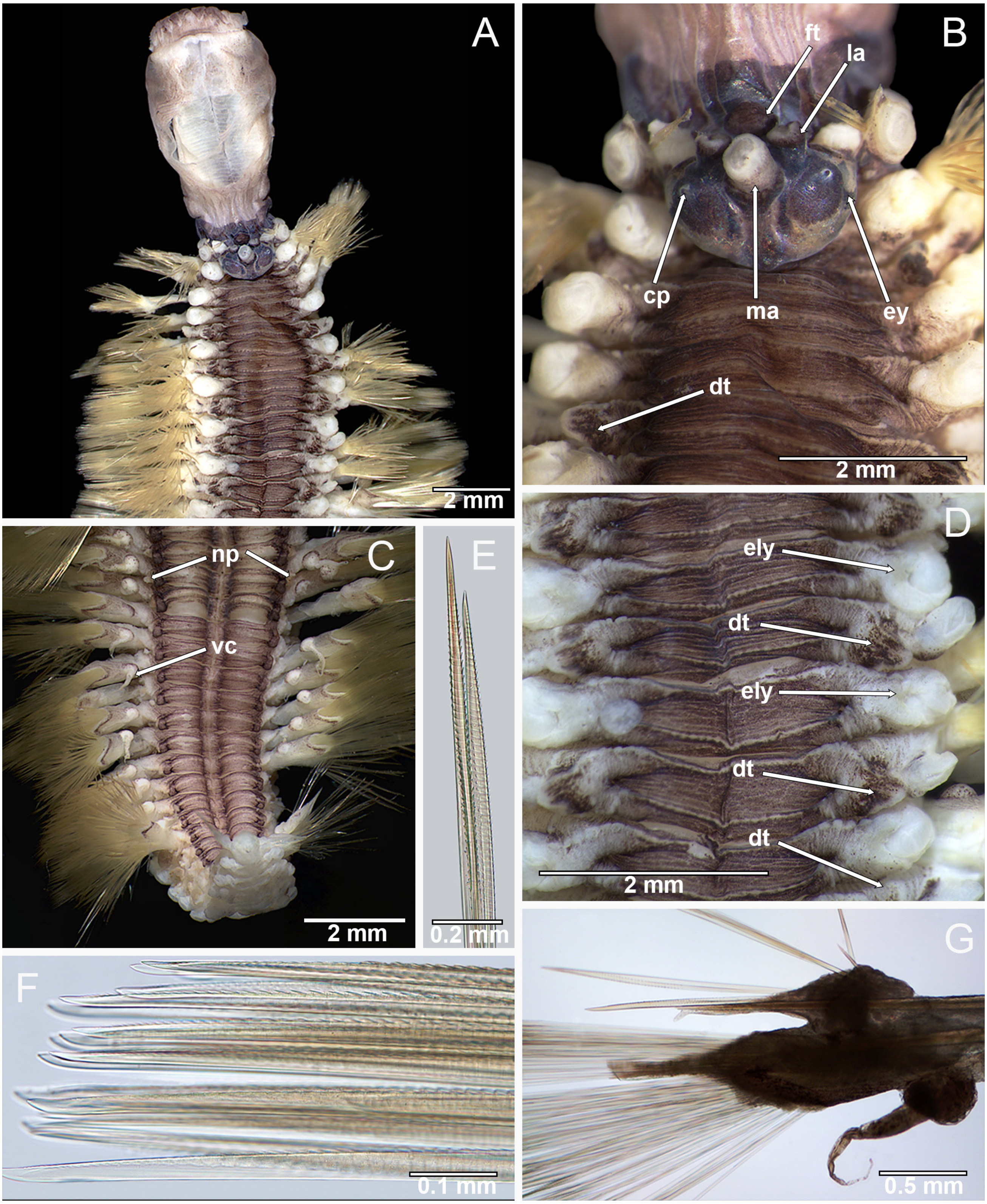

Figure 20. Polynoidae gen. sp. 1, light photographs of WAM V11714. *(A)* anterior end, dorsal view; *(B)* prostomium; *(C)* posterior end, ventral view; *(D)* dorsal tubercles; *(E)* notochaetae; *(F)* neurochaetae; *(G)* parapodium from middle segment. Abbreviations: *cp*, cephalic peak; *dt*, dorsal tubercle; *ely*, elytrophore; *ey*, eye: *ft*, facial tubercle; *la*, lateral antenna ceratophore; *ma*, median antenna ceratophore; *np,* nephridial papilla; *vc*, ventral cirrus.

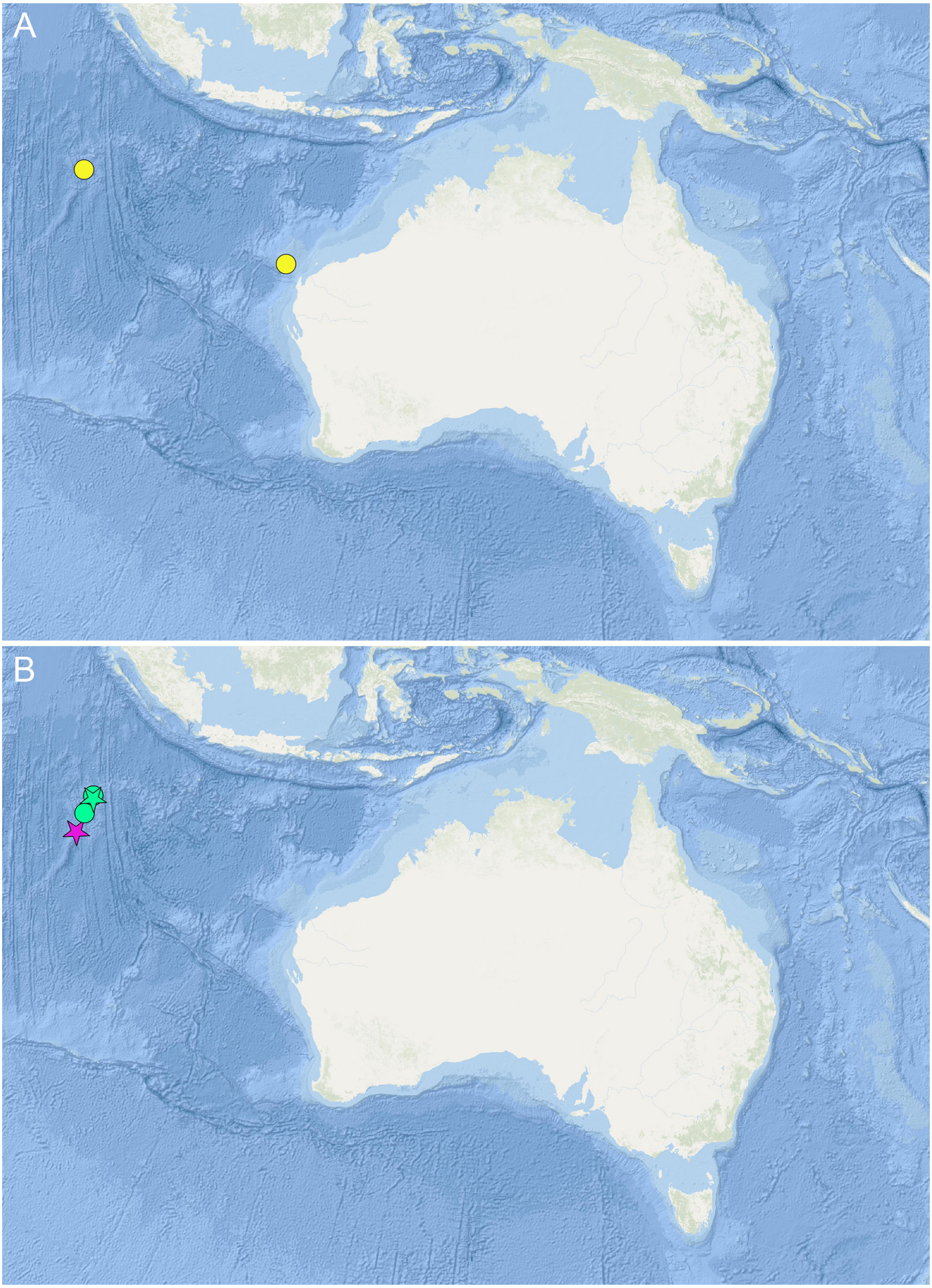

Figure 21. *(A)* Polynoidae gen. sp. 1. *(B) Terebellosuctoria jimii* sp. nov. (light green), *Terebellosuctoria keelingensis* sp. nov. (pink). Star – type locality, circles – specimens with DNA data.

the same clade as *C. nezhai* (see fig. 1, Wang *et al*., 2021) and which may also include this species described herein. Both *C. nezhai* and Polynoidae sp. 2 ST-2019 were collected in association with sponges (Wang *et al*., 2021). The clade remains as separate to the other polynoid subfamilies (fig. 1, Wang *et al*., 2021).

Because these specimens possess a combination of characters such as body length with fewer than 50 segments, 17 pairs of elytra, presence of cephalic peaks, the termino-ventral insertion of lateral antennae (ceratophores present), tentaculophores with chaetae, presence of a facial tubercle, absence of a nuchal fold on segment 2, neurochaetae with simple, unidentate, curved knife-like tips and transverse spinous rows, absence of bidentate, capillary or penicillate neurochaetae or notochaetae, notochaetae thicker than neurochaetae, elongate acicular lobes of both noto- and neuropodia, and the lack of a supracicular neuropodial process, these specimens do not fall within any of the currently accepted generic diagnoses. It is unfortunate that elytra were missing from both specimens, as they may represent a new genus and species. Until specimens complete with elytra are found, we are reluctant to erect a new genus and species.

Distribution and bathymetry. Australian Indian Ocean Territories, seamounts off Cocos (Keeling) Island and Gascoyne Marine Park; 1,080–1,595 m.

Order Terebellida Dales, 1962

Suborder Terebelliformia Levinsen, 1883

Family Terebellidae Johnston, 1846

There are currently 26 genera and 80 named species reported from Australian waters (Atlas of Living Australia, 2026). All Australian species have been described from shallow waters, except for *Pista torquata* Hutchings, 2007, with the type locality of the Tasman Sea at 610 m depth and reported from the GAB at 1,340–1,320 m. Gunton *et al*. (2021) reported three deep-sea genera from the eastern Australian abyss and a new abranchiate genus, but all in poor condition and none of which were found in the Indian Ocean. The majority of terebellids live in tubes in soft sediment, hereas only a few live in tubes attached to hard substrates.

Remarks. Morphological characters were described using terminology by Nogueira *et al*. (2010).

Subfamily Terebellinae Johnston, 1846

Terebellosuctoria Hutchings, Daffe & Lavesque gen. nov.

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Type species: *Terebellosuctoria jimii* Hutchings, Daffe & Lavesque sp. nov.

Diagnosis. Transverse prostomium attached to dorsal surface of upper lip, basal part as thick crest, eye spots present or absent. Buccal tentacles grooved cylindrical. Peristomium restricted to expanded lips, large upper lip, hood-like, wide button like mid-ventral lower lip. Segment 1 with large ventral lateral lobes connected mid-ventrally. Small triangular lateral lobes on segment 3 and sometimes on segment 2. Anterior ventral pads expanded to form a sucker-like structure with raised ventral margins on segments 3 to 8, followed by discrete non-raised ventral pads becoming progressively narrower and continuing as thin segmented groove to pygidium. Two to three pairs of branchiae with dichotomous branching with main stem ringed, unequal in size, on segments 2 to 4, largest on segment 2. Seventeen to 21 pairs of notopodia with narrow winged capillaries, tips with fine denticles, from segment 4. Neuropodia from segment 5, as low sessile glandular ridges in conjunction with notopodia with short-handled avicular uncini, initially arranged in single rows, from segment 11 to end of notopodia arranged in double intercalated rows, from termination of notopodia to pygidium in single rows. Posterior segments very compact. Pygidium rounded with glandular margins with or without papillae, anal cirri absent.

Etymology. The modified anterior ventral pads resemble a suction cup, hence "Terebellosuctoria", grammatical gender feminine, formed from Latin "Terebella", the stem genus of the family, combined with New Latin "suctorius" (suctorial), with linking "o" vowel for euphony and suffix "ia" matching related feminine terebellid genera.

Remarks. While some terebellid genera have a fixed number of notopodia, e.g., *Eupolymnia* Verrill, 1900*, Lanice* Malmgren, 1866, *Loimia* Malmgren, 1866*,* others e.g., *Amphitrite* O.F Müller, 1771*, Neoleprea* Hessle, 1917*, Nicolea* Malmgren, 1866 and *Terebella* Linnaeus, 1767, have a variable number. Similarly, while members of most genera have a fixed number of branchiae, there are some with a variable number, such as, for example, *Pista* Malmgren, 1866 and *Neoleprea*, which can have one, two or three pairs of branchiae. However, because none of these genera have the modification of the anterior ventral pads forming a sucker-like structures, we have erected a new genu**s** *Terebellosuctoria*. This new genus is closely related to *Loimia* and *Lanice* based on the results of molecular analyses here (Fig. 3).

Recently, Jimi *et al*. (2025) described *Lanice spongicola* from a deep-sea (843 m) locality off Minamidaito Island, Okinawa, Japan. The Japanese species not only shows a sucker-like structure similar to that found in our new species, but also the same types of uncini and notochaetae as well as a short lateral lobe on segment 2 and 3, although those on segment 2 are small and difficult to see on their illustrations. Jimi *et al*. (2025) provisionally assigned their species to the genus *Lanice*. However, bootstrap support in their analyses was very low, leaving the phylogenetic position of the species unresolved. The authors suggested that while it could be a highly derived member of *Lanice*, it may belong to a hitherto unrecognized lineage within the Terebellidae. Based both on molecular and morphological data here, we are transferring this species to *Terebellosuctoria* n. gen**.**, thus former *Lanice spongicola* becomes *Terebellosuctoria spongicola* (Jimi in Jimi, Manzano, Hookabe, Kise, Reimer, Woo, Fujiwara, 2025), new combination.

Terebellosuctoria jimii Hutchings, Daffe & Lavesque sp. nov.

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Figs 21B, 22–25, 26B, Tables 1, S1, S4

Euploymnia sp. 1.— Kupriyanova *et al*., 2024: 54, fig. 51.
Euploymnia sp. 2.—Kupriyanova *et al*., 2024: 55, fig. 52.
Terebella sp. 1.—Kupriyanova *et al*., 2024: 58, fig. 55.

Material examined. Holotype AM W.54638, IN2022_V08_138 (1 complete, DNA voucher IOT1), Cocos (Keeling) Islands, 6.10.2022, 12°02'49"S, 96°49'51"E, 674–648 m. **Paratypes** AM W.54833, IN2022_V08_138 (1, prepared for SEM); W.54628, IN2022_V08_126 (1 incomplete gravid female, DNA voucher IOT003); AM W.54667, IN2022_V08_161 (1 incomplete); AM W.54482, IN2022_V08_126 (1 incomplete, DNA voucher Pat32); AM W.54489, IN2022_V08_126 (1 incomplete, DNA voucher IOT72); AM W.54478, IN2022_V08_126 (7, including 5 complete); AM W.54515, IN2022_V08_126 (1 incomplete, DNA voucher Pat48); AM W.54479, IN2022_V08_126 (1 complete, parapodia prepared for SEM, ARC_W.54479).

Diagnosis. *Terebellosuctoria jimii* sp. nov. is characterised by having three pairs of branchiae, 17 pairs of notopodia, presence of eyespots, small triangular lateral lobes on segment 3 and pygidium with 8 large globular papillae (Table 1).

Description. Based on holotype, 15 mm long, 3.0 mm wide (Fig. 24A–D). Live material red in colour. Body of live animals reddish orange (Fig 22B). Preserved body colourless (Fig. 23A–D) except for pigmented anterior ventral pads, especially along lateral and ventral margins of segment 1, prostomium with two elongate brown patches of numerous eyespots. Numerous tentacles in live specimens (Fig. 22B). Few attached grooved cylindrical tentacles, but numerous scars. Transverse prostomium attached to dorsal surface of upper lip, basal part as thick crest. Upper lip large, rectangular, glandular with lateral margins surrounding mouth, base of upper lip grooved, margins. Peristomium restricted to lips. Segment 1 with rectangular glandular, ventro-lateral lobes, connected mid-ventrally by glandular shelf, margins of lobes with pale brown pigmentation, and continuing dorsally as narrow band.

Segment 3 with small discrete triangular lobe with a narrow connecting strip across the ventrum, lobes absent on segments 2 and 4 (Fig. 24C).

Anterior segments highly glandular ventrally, with discrete raised, tessellated and pigmented rectangular shields from segment 3 to 8, then rapidly reducing to a thin mid ventral stripe continuing to pygidium (Figs 23–24). Anterior ventral pads on segments 3 to 8 forming a pigmented sucker, brown at margins, paler in middle of pads, lateral margins strongly glandular, raised and convoluted, surface of pads strongly tessellated. Subsequent ventral pads becoming narrower without raised glandular margins and continuing to pygidium as a narrow ventral stripe (Fig. 24B).

Three pairs of unequal sized branchiae on segments 2–4, decreasing in size from first to third pairs, each with a long stalk and few dichotomous branches, third pair very small with only main stalk on one side and with only two very short branches on other side. First pair three times as long

Table 1. Distinguishing characters of species of *Terebellosuctoria* n. gen.

Species	Pairs of branchiae	Pairs of notopodia	Eyespots	Lateral lobes	Pygidium	Reference	Distribution
T. jimii sp. nov.	3, 1st much larger than others	17, tips finely denticulate	present	small triangular on segment 3	8 large globular papillae	this paper	Cocos (Keeling) Islands, 648-674 m
T. keelingensis sp. nov.	2 ,1st much larger than 2nd	22 (21–24), tips finely denticulate	absent	short elongate narrow on segment 3	10–20 short digitiform papillae	this paper	Cocos (Keeling) Islands, 648-674 m
T. spongicola	3, 1st pair largest	17, tips finely serrated	present	on segments 2 & 3 largest on 3	rounded, without papillae	Jimi *et al*., 2025	Okinawa, 843 m

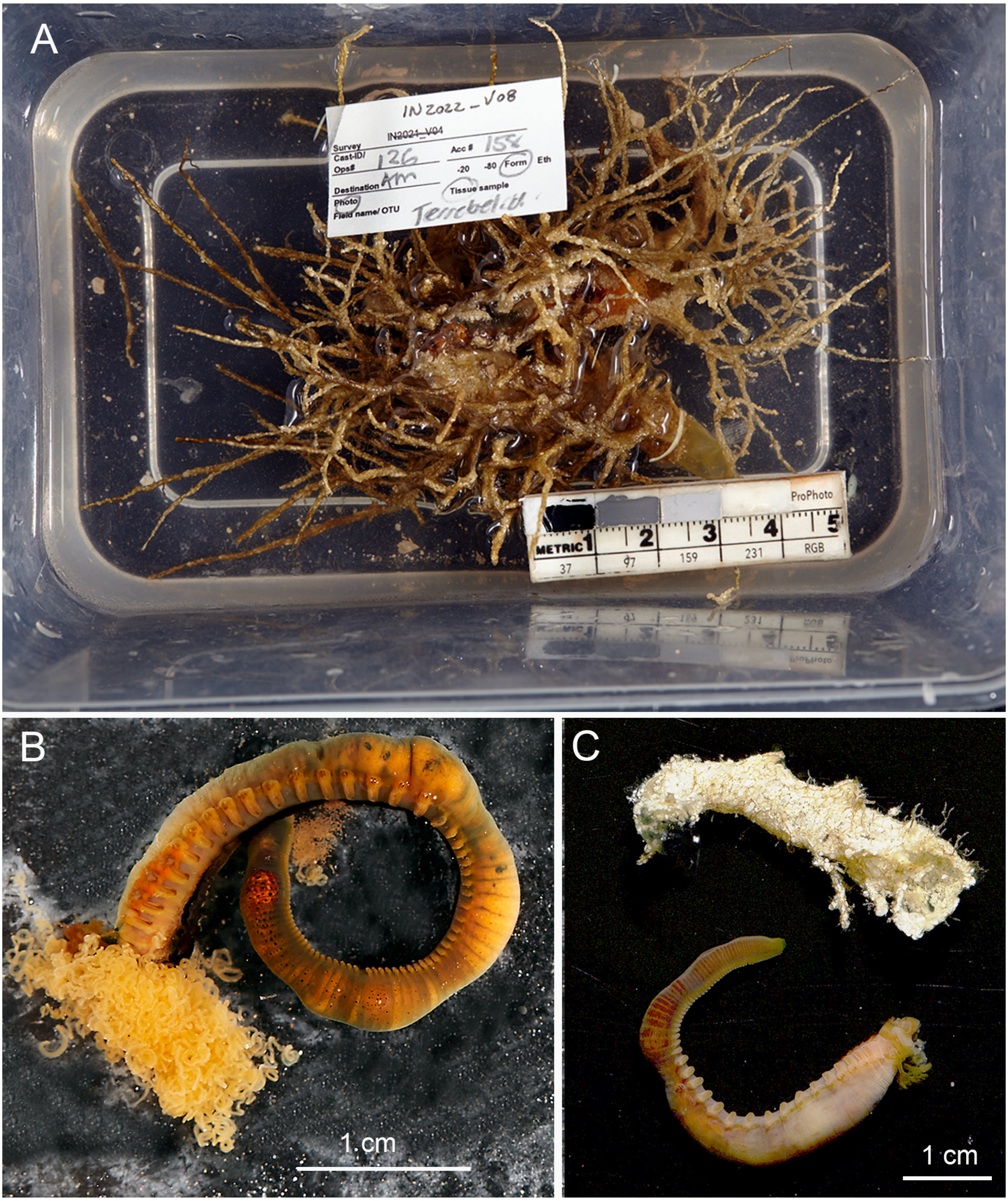

Figure 22. Light photographs of live Terebellidae taken on board. *(A, B) Terebellosuctoria jimii* sp. nov. AM W.54638. *(A)* live specimen in tube; *(B)* live specimen removed from the tube; *(C) Terebellosuctoria keelingensis* sp. nov., AM W.57962 live specimen with a tube piece.

as second pair (Figs 23D, 24C).

Seventeen pairs of notopodia from segment 4 with notochaetae arranged two tiers (Fig. 25C). Notochaetae narrow winged; under high magnification their surface finely ornamented with fine denticles along tips (Fig. 25D). Neuropodia from segment 5 as slightly raised glandular ridges in conjunction with notopodia (Figs 24C–D, 25A, D), from segment 20 onwards as conical to rectangular pinnules posteriorly (Fig. 24A–B). Neurochaetae short-handled avicular uncini, in completely intercalated double rows from segment 11 until termination of notopodia on segment 20, then in single rows to pygidium. Thoracic uncini as long as high, with triangular heel and sloping prow leading to pointed tip, dorsal button inserted at about halfway distance between

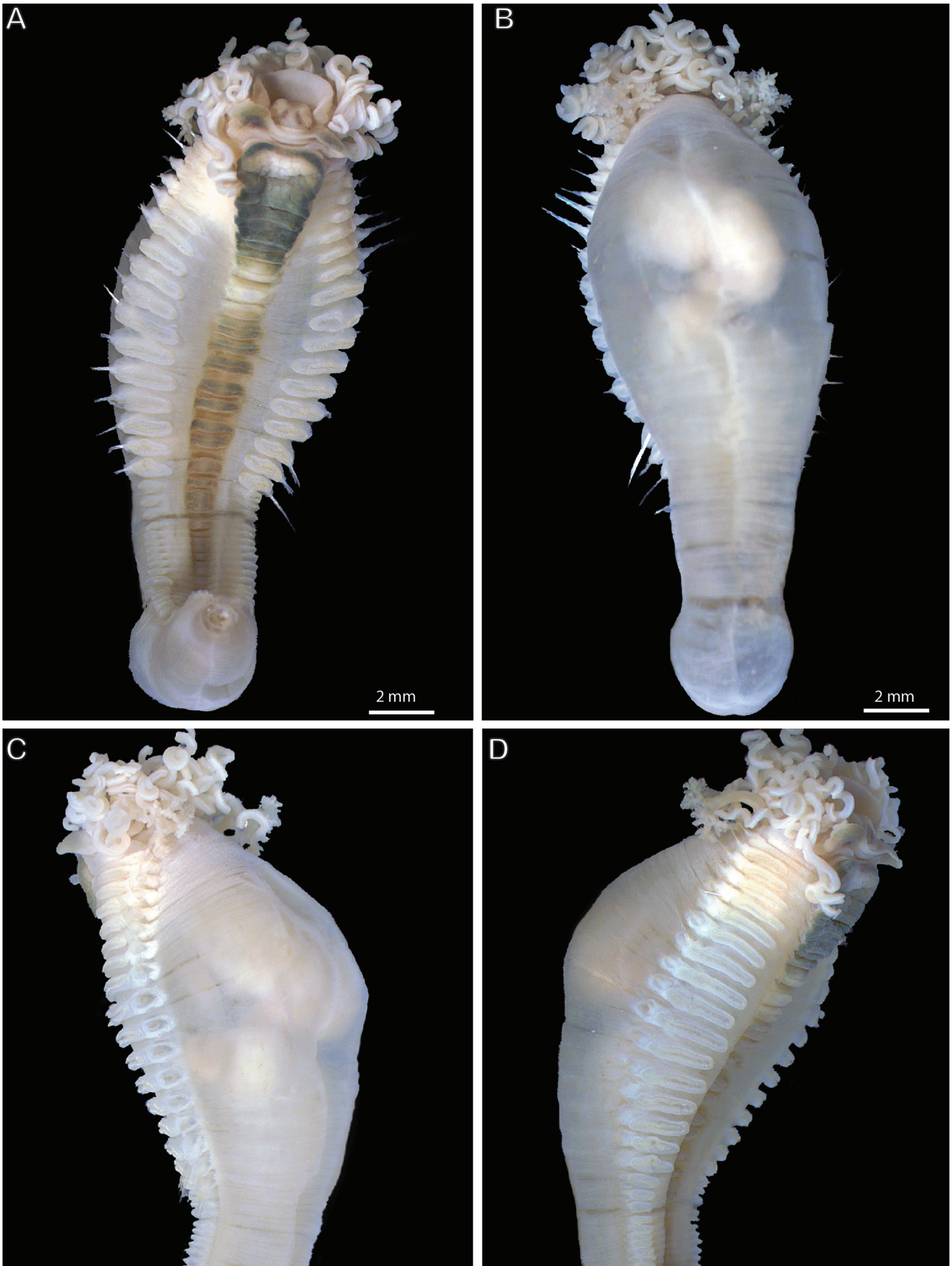

Figure 23. *Terebellosuctoria jimii* sp. nov., holotype AM W.54638, entire specimen removed from the tube. (*A*) ventral view; *(B)* dorsal view; *(C-D)*, lateral views.

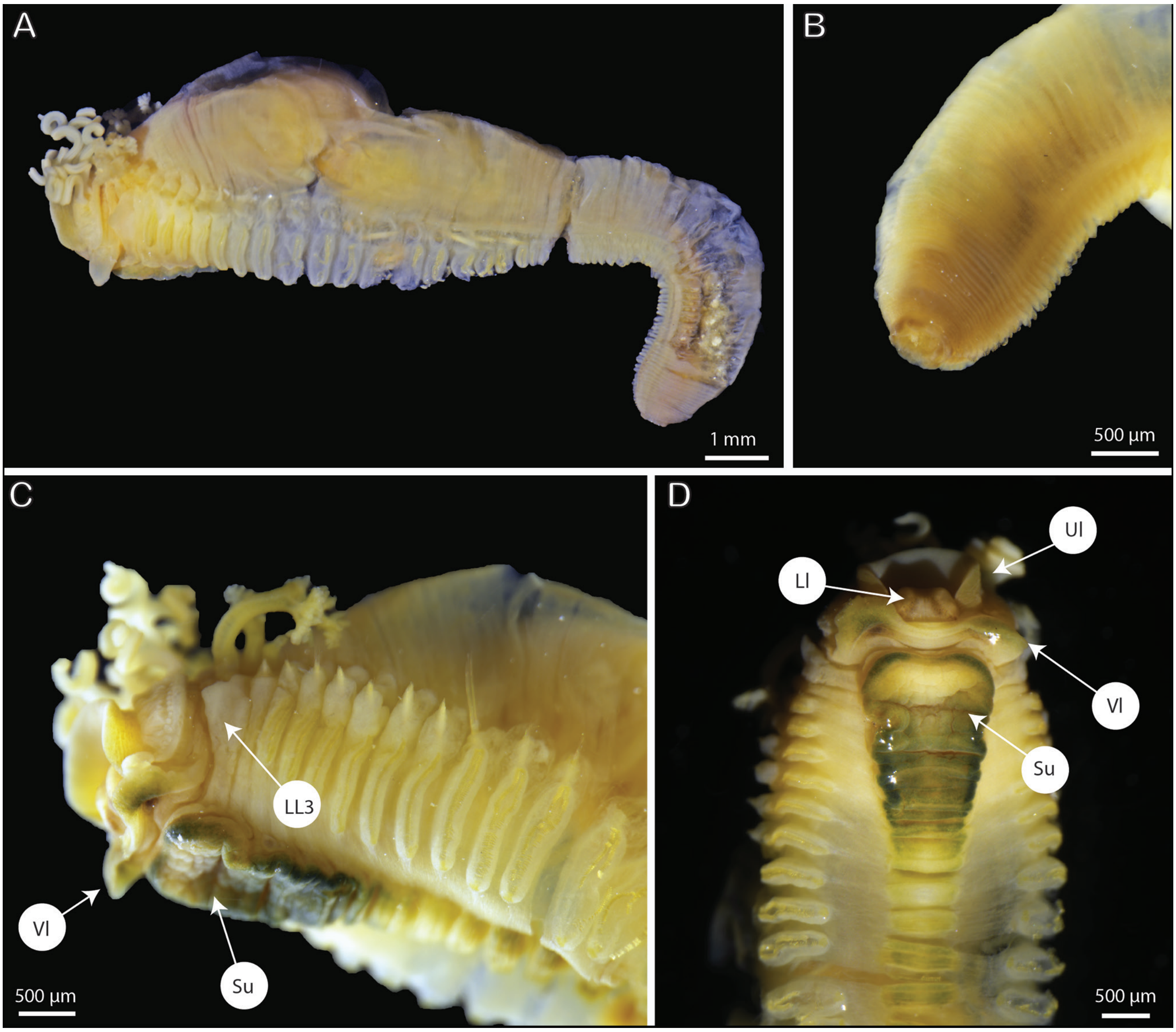

Figure 24. *Terebellosuctoria jimii* sp. nov., holotype AM W.54638. *(A)* entire specimen, lateral view; *(B)* posterior end, lateral view; *(C)* anterior end, lateral view; *(D)* anterior end, ventral view. Abbreviations: *Ll*, lower lip; *LL3*, lateral lobe from segment 3; *Su*, sucker-like structure; *Ul*, upper lip; *Vl*, ventral lobe.

base of main fang and tip of prow, base slightly curved. Dental formula: MF:1:1:1:∞ (Figs 25E, 26B) following terminology by Nogueira *et al*. (2010, fig. 37). Abdominal uncini similar to thoracic ones (Fig. 25F).

Pygidium rounded with eight large globular papillae (Fig. 24B).

Occurring in mass of tubes made of large transparent chitinous sheath covered with foraminifera and with multiple branching fine outgrowths also covered with attached foraminiferans. The tubes cemented together (Fig. 22A).

Variation. Paratypes range in size from 25 to 75 mm in length, 3 to 6 mm width, with 60–110 abdominal segments. Density of pigmentation varies on segment 1, with some lacking any pigmentation. The ventral suckers vary in terms of pigmentation, the degree of margin convolution, and the elevation of pads, but all specimens exhibit a discrete sucker distinct from subsequent ventral pads.

Remarks. *Terebellosuctoria jimii* sp. nov. differs from *T. keelingensis* sp. nov. in the number of pairs of notopodia, with 17 pairs in *T. jimii* sp. nov. and 21 in *T. keelingensis* sp. nov. The two species also differ in the number of pairs of branchiae, with three and two pairs respectively, although the structure of all branchiae is similar in both species as the first pair is much larger than the following ones. *Terebellosuctoria jimii* sp. nov. also differs from *T. keelingensis* sp. nov. by the presence of eyespots, which are absent in *T. keelingensis* sp. nov., and the presence of a pygidium with eight large globular papillae, instead of 10–20 short digitiform papillae as in *T. keelingensis* sp. nov.

Jimi *et al*. (2025) indicate that their *T. spongicola* has distally serrated tips of notochaetae, whereas *T. jimii* sp. nov. has fine denticles on tips of notochaetae. *Terebellosuctoria spongicola* Jimi *et al*., 2025, has lateral lobes on segments 2 and 3, notochaetae are distally serrated, pygidium without papillae, which clearly separates it from the two new species. The diagnostic characters are summarized in Table 1.

Some animals were clearly gravid females as orange eggs (around 100 µm in diameter) were found in the tubes. The body size range suggests that animals are iteroparous

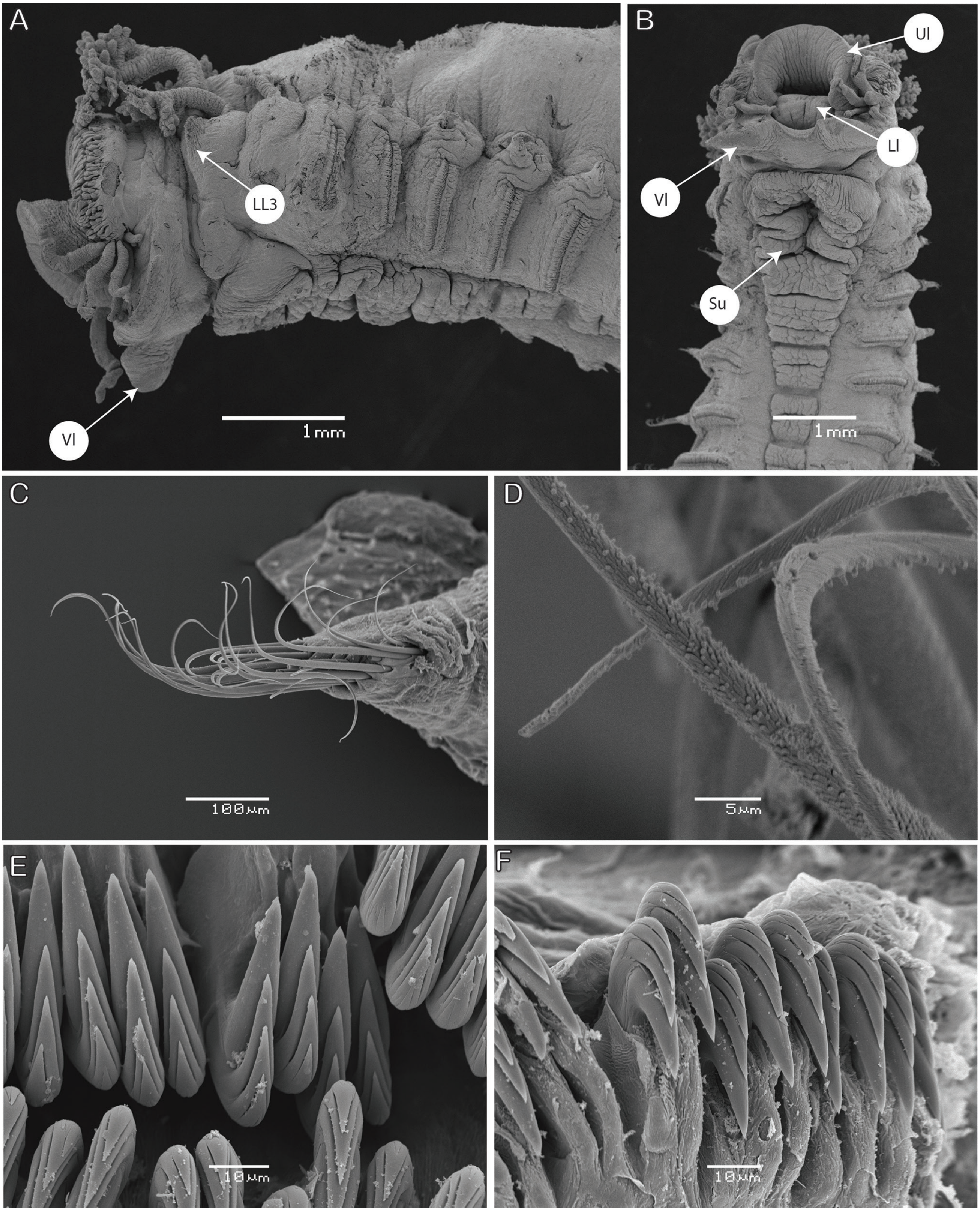

Figure 25. *Terebellosuctoria jimii* sp. nov., SEM micrograph of paratype AM W.54833. *(A)* anterior end, lateral view; *(B)* anterior end, ventral view; *(C)* notopodia, anterior part specimen; *(D)* notochaetae detail; *(E)* uncini, anterior chaetiger; *(F)* uncini, posterior chaetiger. Abbreviations: *Ll*, lower lip; *LL3*, lateral lobe from segment 3; *Su*, sucker-like structure; *Ul*, upper lip; *Vl*, ventral lobe.

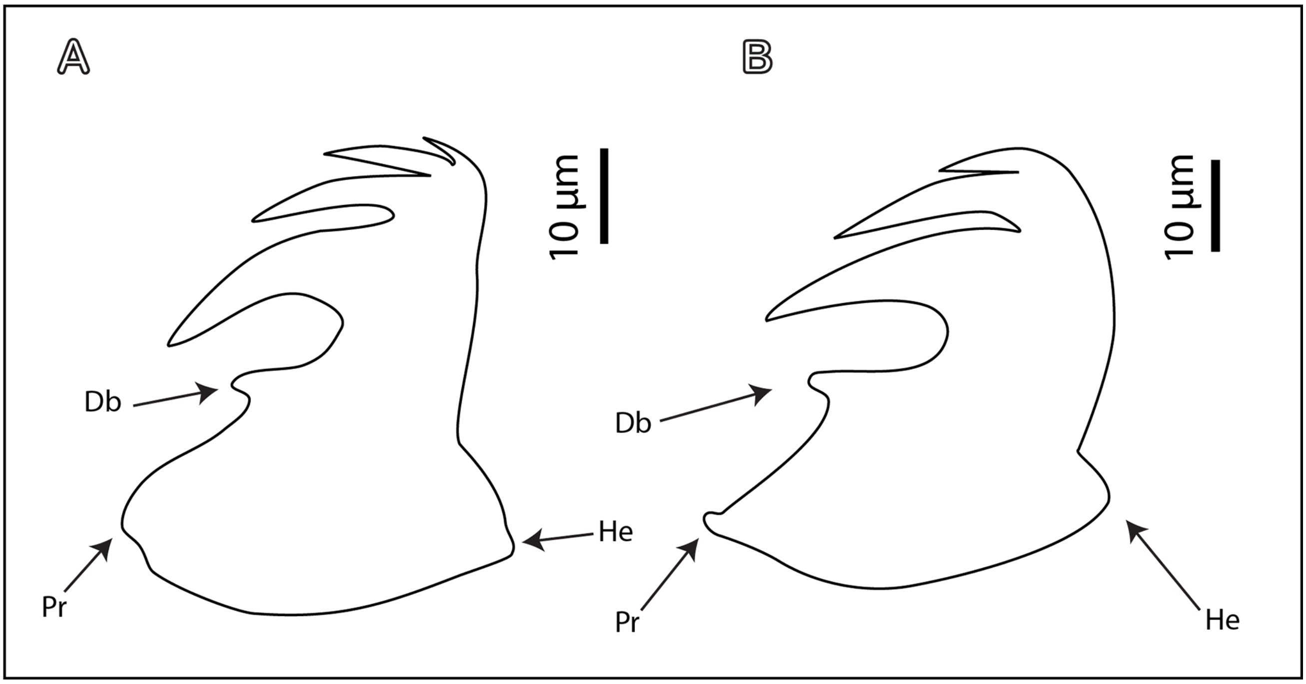

Figure 26. Line drawings of thoracic uncini. *(A) Terebellosuctoria keelingensis* sp. nov. *(B) Terebellosuctoria jimii* sp. nov. Abbreviations: *Db*, dorsal button; *H*e, heel; *Pr*, prow.

as all known terebellids (Rouse *et al*., 2022) and are likely continuous breeders.

Etymology. This species is dedicated to Dr Naoto Jimi (Nagoya University, Japan) for his impressive work on polychaete taxonomy. He was also the first to describe the presence of this ventral sucker in a terebellid.

Distribution and bathymetry. Known only from the type locality, seamounts off Cocos (Keeling) Islands; 648–674 m.

Terebellosuctoria keelingensis Hutchings, Daffe & Lavesque sp. nov.

urn:lsid:zoobank.org:act:31E0A1A7-A32F-414C-AFD4-3E4A36CC2383

Figs 21B, 22C, 26A, 27–30, Tables 1, S1, S4

Nicolea sp. 1.—Kupriyanova *et al*., 2024: 56, fig. 53.

Material examined. Holotype AM W.57962, IN2022_V08_193 (DNA voucher ARC W54629-1), Cocos (Keeling) Islands, 26.10.2022, 14°44'48"S, 95°25'2"E, 467–477 m. **Paratypes** AM W.57682, IN2022_V08_193 (1 incomplete, on SEM stub); AM W.54629, IN2022_V08_193 (5 incomplete); AM W.57965, IN2022_V08_193 (1, DNA voucher ARC W54629-2); AM W.57966, IN2022_V08_193 (1, DNA voucher ARC_ AM W54629-3). All paratypes from same station as holotype.

Diagnosis. *Terebellosuctori keelingensis* sp. nov. is characterised by having two pairs of branchiae and 22 pairs of notopodia, by short elongate lateral lobes on segment 3, by the absence of eyespots and by the presence of a pygidium with 10–20 short digitiform papillae (Table 1).

Description. Holotype complete, 15 mm in length, 3 mm maximum in width. Buccal tentacles missing but numerous scars present on thickened rim of peristomium (Fig. 27). Paratypes with some grooved cylindrical buccal tentacles (Fig. 27). Preserved holotype colourless except for a mid-narrow line of pigment on ventral lobes, and some brown pigmentation on anterior ventral pads, paratypes with varying amounts of pigmentation (Fig. 28D). Eyespots absent.

Peristomium restricted to lips, with large globular upper lip with smooth margins and not glandular, lower lip rectangular, swollen cushion-like, with smooth surface except for base with vertical striations (Fig. 28A–D). Segment 1 with large lateral lobes with corrugated margins connected by broad mid-ventral strip (Figs 27D, 29C).

Ventral pads 2–5 glandular, raised, with margins expanded and crenulated and wider than subsequent ones, and by chaetiger 7 forming a mid-ventral stripe (Fig. 27B) continuing to pygidium. Dorsum smooth (Figs 27A, 28A).

Segment 3 with short, elongate, narrow lateral lobe (Fig. 29B) with slight expansion towards dorsum. Conspicuous elongate nephridial papilla on segment 4 inserted ventrally to second pair of branchiae. Conspicuous globular genital papillae on segments 6–7 inserted dorsally to base of notopodia.

Two pairs of branchiae on segments 2–3, first pair with long, smooth main stalk with numerous short dichotomous branches, unequal in size (perhaps evidence of regeneration), second pair very small with short stalk and two branches (Figs 28A, C, 29A).

Notopodia from segment 4 and neuropodia from segment 5. Twenty-two pairs of notopodia, about 50 abdominal segments with only neuropodia, final segments very compact. Notopodia elongate with both lobes similar in length, those on segments 4 and 5 smaller than subsequent ones. Notopodia and neuropodia forming a single raised glandular structure (Fig. 28A). Notopodia with two rows of chaetae, narrow-winged, with ornamented surfaces and under high magnification margins of tips with fine denticulations (Fig. 30B). Neuropodia glandular and raised, avicular uncini arranged in single rows until segment 11, then in double rows until segment 24 (Fig. 30C), subsequently in single

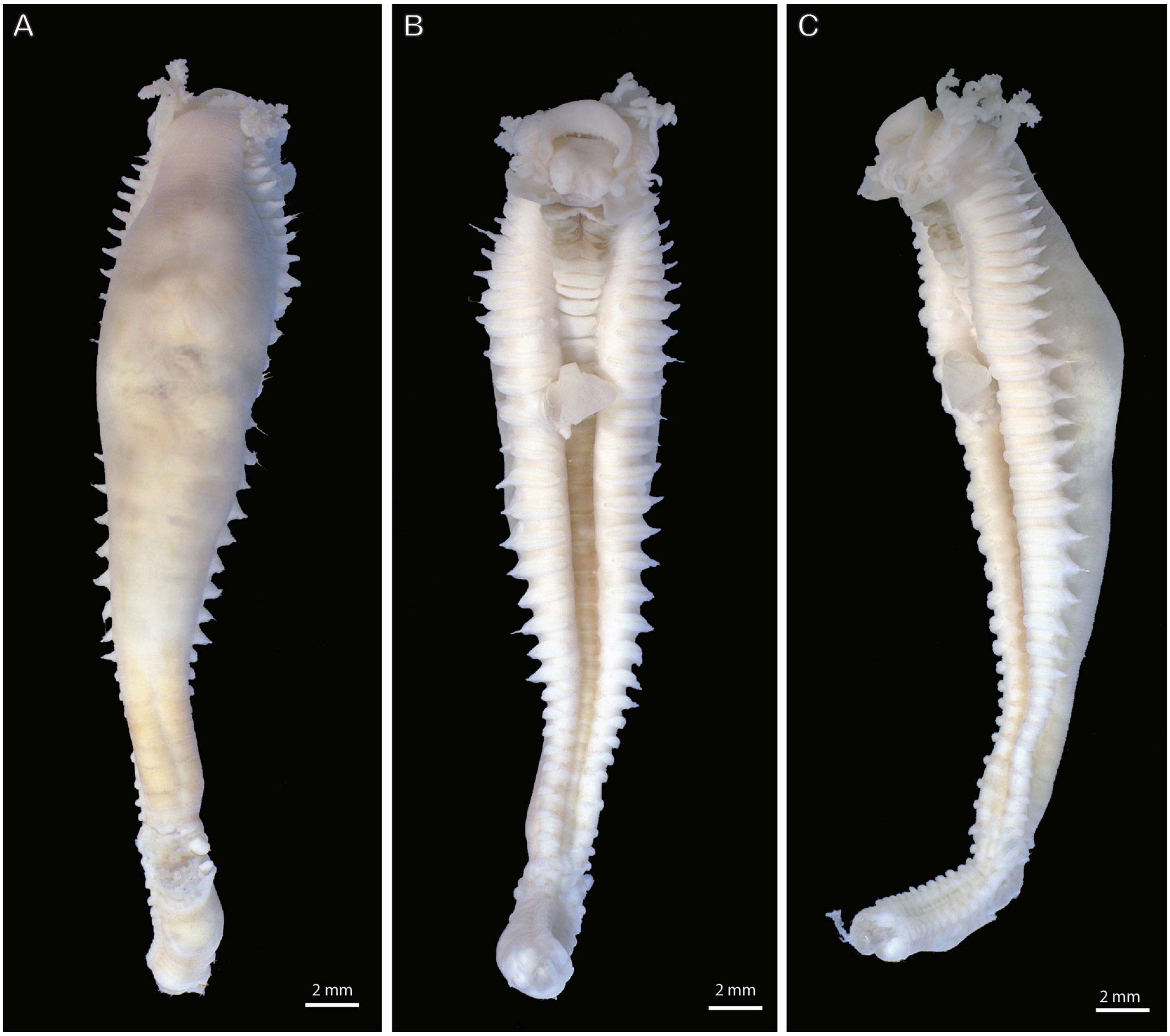

Figure 27. *Terebellosuctoria keelingensis* sp. nov., light photographs of holotype AM W.57962, entire specimen. *(A)* dorsal view; *(B)* lateral view; (*C*) ventral view.

rows to pygidium (Fig. 30D). Thoracic uncini with surface ornamentation and crest of uncinus with many small teeth (Figs 26A, 30A, C). Thoracic uncini as long as high, with triangular rounded heel and pointed prow, dorsal button inserted at about halfway distance between base of main fang and tip of prow, base slightly curved. Dental formula: MF:1:1:1:∞ (Fig. 26A). Abdominal neuropodia raised and becoming progressively shorter towards pygidium (Fig. 28A–C).

Pygidium with glandular margins with about 10–20 short digitiform-globular papillae (Fig. 28A–B). Occurring in simple chitinous tubes covered with foraminifera, not masses of tubes bearing numerous branching outgrowths (Fig. 22C).

Variation. Paratypes exhibit the following variation: second pair of branchiae can be very small, and some have conspicuous blood vessels in terminal branches, whereas others are colourless. Specimens vary in arrangement and intensity of pigmentation, ranging from some with extensive pigmentation on the anterior ventral pads (Fig. 28D) to others almost colourless (Fig. 28A). Number of pairs of notopodia vary from 21 to 22 pairs, one paratype has 24 pairs of notopodia on one side and 22 on other. Sizes of complete paratypes range from 22 to 25 mm in length and 3 to 4 mm in width.

Remarks. *Terebellosuctoria keelingensis* sp. nov. differs from *T. jimii* sp. nov. and *T. spongicola* by having two pairs of branchiae and 21 (22–24) pairs of notopodia, whereas *T. jimii* sp. nov. and *T. spongicola* have three pairs of branchiae and 17 pairs of notopodia. *Terebellosuctoria keelingensis* sp. nov. differs from these two species by the absence of eyespots. *Terebellosuctoria keelingensis* sp. nov. differs from *T. jimii* sp. nov. by the presence of 10–20 short papillae around the pygidium, rather than eight large globular papillae as in *T. jimii* sp. nov., whereas the papillae are absent in *T. spongicola.* Finally, *T. spongicola* has two pairs of lateral lobes on segments 2 and 3, whereas the two new species have only one pair of lobes on segment 3. The simple tubes of *T. keelingensis* sp. nov. are also very different from branched tubes of the other two species. Diagnostic characters are summarized in Table 1.

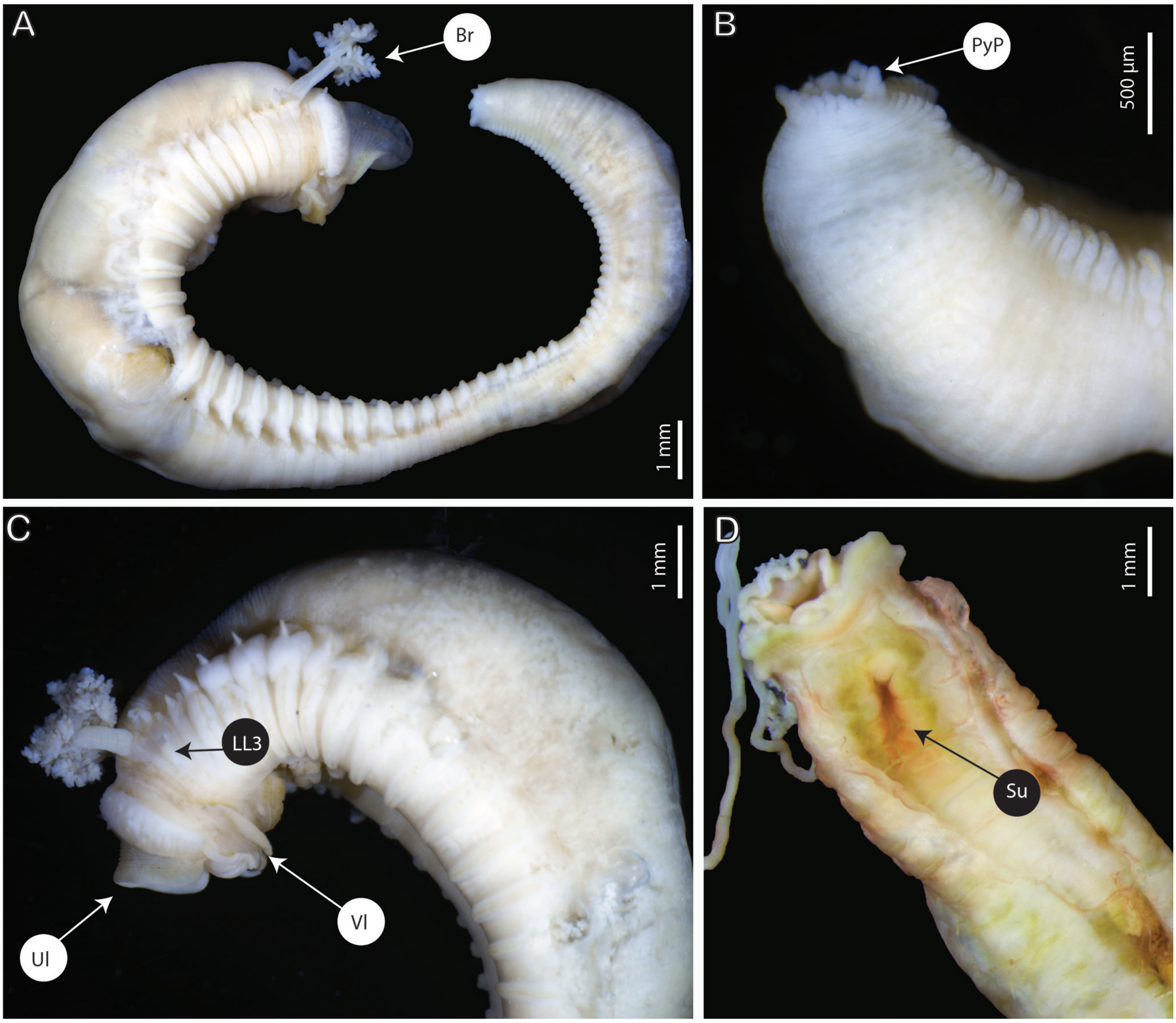

Figure 28. *Terebellosuctoria keelingensis* sp. nov., paratype AM W.57965 *(A-C)*, *(D)* paratype AM W.57966. *(A)* Entire specimen, lateral view; *(B)* Posterior end, lateral view; *(C)* Anterior end, lateral view; *(D)*. Anterior end, ventral view. Abbreviations: *Br*, branchiae; *LL3*, lateral lobe from segment 3; *PgP*, pygidial papillae; *Su*, structure-like structure; *Ul*, upper lip; *Vl*, ventral lobe.

Etymology. The species name refers to Cocos (Keeling) Islands, the type locality and geographical distribution of this species.

Distribution and bathymetry. Known only from the type locality, seamounts off Cocos (Keeling) Islands; 467–477 m.

Subfamily Thelepodinae Hessle, 1917

Thelepus Leuckart, 1849

Thelepus sp.

Material examined: AM W.53422 (1), Christmas Island, 10°32'59"S, 105°31'59"E, 1,388–1,533 m.

Remarks. A single damaged specimen belongs to the genus *Thelepus* as notopodia present from segment 3 and neuropodia from segment 5, with numerous simple branchial filaments. The specimen is too damaged to be described as only anterior segments present. This is the first record of the genus *Thelepus* from Australia's Exclusive Economic Zone.

Distribution and bathymetry. Known only from seamounts off Christmas Island; 1,388–1,533 m.

Discussion

This study examined polychaetes of the families Onuphidae, Polynoidae, and Terebellidae that were collected from depths ranging between 94 and 5,431 m during the RV, *Investigator,* voyages IN2021_V08 and IN2022_V04 to the seamounts of the Australian Indian Ocean Territories (IOT). These taxa were previously listed under open nomenclature in the illustrated catalogue of Kupriyanova *et al.* (2024). In the present work, we document 15 species from the IOT, comprising six onuphids, six polynoids, and three terebellids, of which seven are described as new species. Our results reveal a previously unrecognized level of biodiversity in the region and highlight the need for additional taxonomic

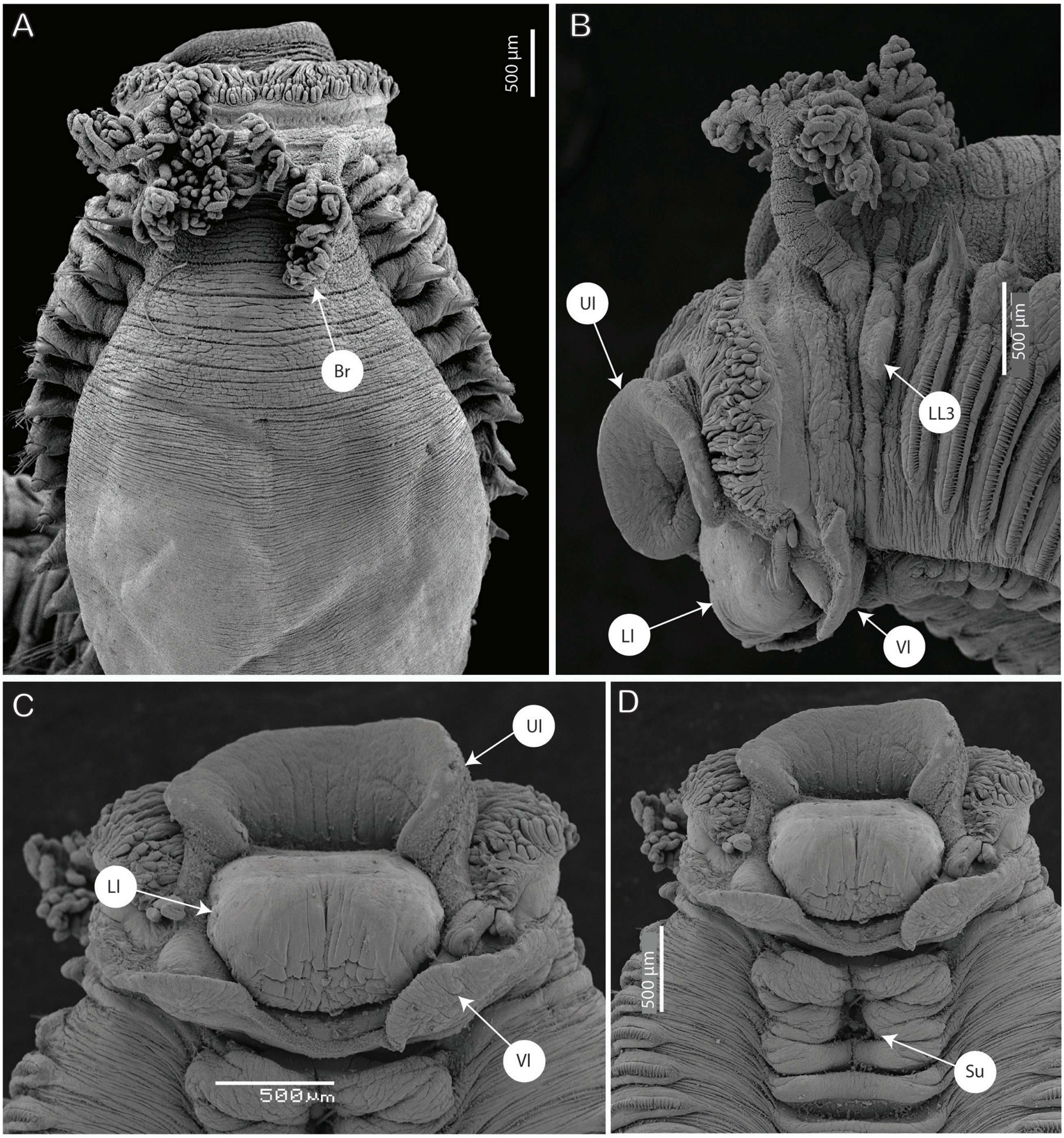

Figure 29. *Terebellosuctoria keelingensis* sp. nov., SEM micrograph of paratype AM W.57682. *(A)*. anterior end, dorsal view; *(B)* anterior end, lateral view; *(C, D)*. anterior end, ventral view. Abbreviations: *Br,* branchiae; *Ll,* lower lip; *Su*, structure-like structure; *Ul*, upper lip; *Vl*, ventral lobe.

investigations. Notably, DNA sequence data have been directly associated with the type specimens of all newly described species, providing reliable molecular reference material that will support future taxonomic identification and comparative studies.

The taxonomic composition of the polychaete samples collected during the voyages apparently reflects the sampling gear (trawls and sleds rather than grabs and cores) used in the surveys of the seamounts of the Australian Indian Ocean Territories. While larger-bodied representatives of predatory families (Aphroditidae) or of sedentary tubicolous families that attach to larger substrates (Serpulidae) were most numerous, infaunal species of annelids associated with soft sediments, such as terebellids and capitellids, were poorly represented.

Polynoidae is one of the families particularly well represented in both shallow-water and deep-sea environments (Murray *et al*., 2025). Unfortunately, many polynoid specimens examined here were significantly damaged during collection by trawls, losing elytra and chaetae as a result, which made identification difficult. Specimens that, upon initial examination (Kupriyanova *et al*., 2024), were suspected to belong to new species lacked morphologically important species- (or even genus-) level diagnostic features,

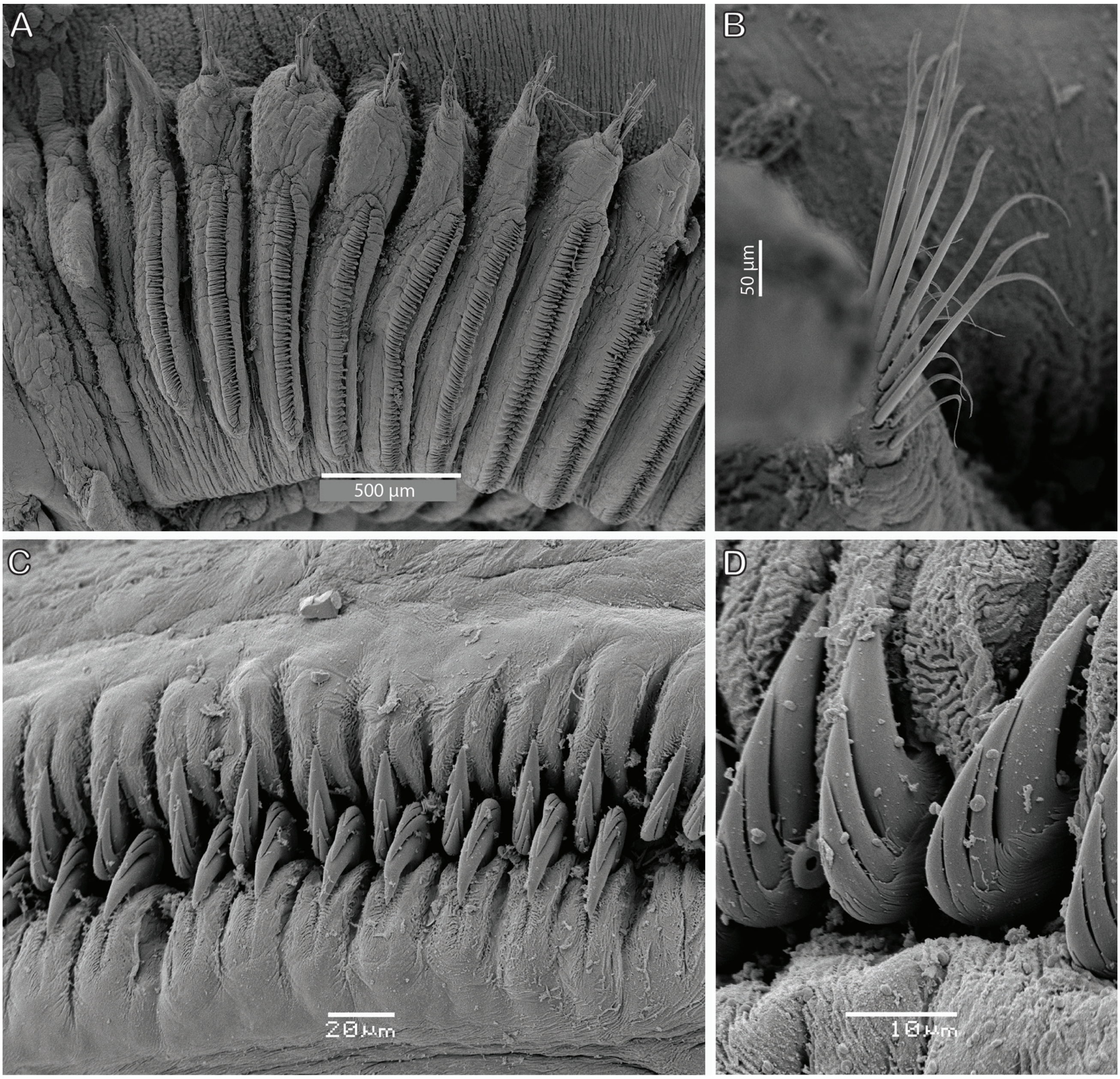

Figure 30. *Terebellosuctoria keelingensis* sp. nov., SEM micrograph of AM W.57682. *(A)* posterior thoracic parapodia; *(B)* notochaetae, anterior chaetiger; *(C)* uncini, anterior chaetiger; *(D)* uncini, posterior chaetiger.

which prevented adequate description. Further examination of specimens recently collected from the Gascoyne Marine Park and deposited in WAM will help elucidate species that are likely also present in the Indian Ocean Territories. In particular, specimens of the poorly known genus *Admetella* that lacked elytra and most chaetae, appear to belong to several species based on molecular data (Fig. 2); but further undamaged material and further genetic data are needed to confirm identifications.

Of particular interest to this study are two new species of spaghetti worms, *Terebellosuctoria jimii* sp. nov. and *T. keelingensis* sp. nov., which are assigned to the new genus *Terebellosuctoria* erected herein. Following the reclassification of *Lanice spongicola* Jimi *et al*., 2025, the genus *Terebellosuctoria* now comprises three species collected from bathyal environments in the Indian and Pacific Oceans. These species exhibit morphological similarities to members of the closely related genera *Loimia* and *Lanice*; however, they are united by a distinct synapomorphy: a modification of the ventral pad into a sucker-like structure. Jimi *et al*. (2025) suggested that this sucker functions in attachment to sponges, based on observations of *T. spongicola*. Although the precise nature of the association between the worm and its sponge host remains unclear, the authors considered the relationship to be symbiotic, given the observed host specificity and consistent spatial association. In contrast, the two new species collected during the IOT voyages were not associated with sponges or any other organisms. This suggests that the sucker-like structure may instead represent a more general adaptation among sediment-dependent taxa, such as terebellids, facilitating persistence in sediment-scarce environments, such as seamount slopes.

Because sampling remains limited, it is too early to draw firm conclusions about the biogeographic patterns of the newly described species. The discovery of new species on seamounts is not unexpected, as these habitats are separated by deep ocean basins and are often highly isolated. This isolation may be reinforced by ocean currents that retain larvae in the vicinity of seamounts (e.g., Mullineaux & Mills, 1997). Consequently, seamounts can promote the evolution of highly endemic species and unique ecosystems through long-term isolation (e.g., Shank, 2010). Conversely, they may also serve as stepping-stone habitats that facilitate dispersal across otherwise disconnected ocean regions (McClain, 2007). Furthermore, groups of seamounts may function either as isolated habitats or as dispersal corridors depending on the taxa involved (e.g., Miller & Gunasekera, 2017), meaning that both endemic and broadly distributed species may occur in these environments.

Our findings provide evidence for the presence of widely distributed species among the material collected during the IOT expeditions. For example, *Hyalinoecia robusta*, an onuphid considered to have an almost cosmopolitan distribution (Budaeva *et al.*, 2024), was identified in the IOT samples. Likewise, *Nothria orensanzi* and *N. simplex*, originally described from the abyssal regions off eastern Australia, were also recorded. In addition, *Anchinothria pettiboneae* sp. nov., described here, was detected in samples from the GAB, with its occurrence supported by DNA sequence data.

The vast proportion of the Australian Indian Ocean Territories was reserved in 2022 as the Christmas Island Marine Park and Cocos (Keeling) Islands Marine Park, with most offshore areas reserved as (IUCN II) National Park and the shallow areas around the island groups as a (IUCN IV) habitat zone. Baseline polychaete biodiversity surveys such as Kupriyanova *et al*. (2024) followed by integrative taxonomic studies (e.g., Flaxman & Kupriyanova, 2024; Kupriyanova & Flaxman, 2024, this study) are an essential first step to understanding and managing the global marine reserve system.

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Supplementary Information (SI)

Supplementary information for New species of Annelida of the Australian Indian Ocean Territory (Christmas Island and Cocos (Keeling) Islands) seamounts. See figshare files at: https://doi.org/10.6084/m9.figshare.32789943