Reeling them in: Taxonomy of polychaetes used as bait by anglers in the Western Cape Province, South Africa

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Background. Common names are frequently used inconsistently for polychaete species used as bait in the peer-reviewed literature, field guides and legislative material. The taxonomy of many polychaete species based on morphology only also ignores cryptic divergences not yet detected. Such inconsistencies hamper effective management of polychaete species, especially as fishing for recreation and subsistence is increasing. This study investigates the scale of the problem by studying the use and names of bait polychaetes in the Western Cape Province of South Africa.

Methods. Fifteen recreational and 6 subsistence fishers at 12 popular fishing sites in the Western Cape Province donated 194 worms which they identified by common name. Worms were assigned scientific names according to a standard identification key for polychaetes from South Africa, and mitochondrial cytochrome oxidase I (COI) amplified and sequenced.

Results. This study identified 11 nominal species known by 10 common names, in families Siphonosomatidae, Arenicolidae, Sabellaridae, Lumbrineridae, Eunicidae, Onuphidae and Nereididae used. Cryptic diversity was investigated through employing mitochondrial COI sequences and these data will facilitate future identifications among widely distributed species. Several species (*Siphonosoma dayi*, *Abarenicola gilchristi*, *Scoletoma* cf. *tetraura*, *Marphysa corallina*, *Lysidice natalensis*, *Heptaceras quinquedens*, *Perinereis latipalpa*) are reported as bait for the first time, and while the names blood- and moonshineworms were consistently applied to members of Arenicolidae and Onpuhidae, respectively, coralworm was applied to members of Sabellaridae and Nereididae. Analysis of COI sequences supported morphological investigations that revealed the presence of two taxonomic units each for specimens identified as *Gunnarea gaimardi* and *Scoletoma* cf. *tetraua* according to identification keys. Similarly, sequences for *S.* cf. *tetraura* and *Lysidice natalensis* generated in this study do not match those from specimens in China and India, respectively. Further research is required to resolve the species complexes detected and also to refine the use of names by fishermen over a wider geographic range.

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Abstract

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Keywords: COI mtDNA, pseudocryptic species, taxonomy, bloodworm, coralworm, moonshineworm, musselworm, puddingworm, wonderworm

Introduction

In South Africa, shore-based marine fishing is an important recreational activity and part of the livelihood for many subsistence fisherman and has shown a steady increase over the last decades (McGrath et al., 1997; Sowman et al., 2014; Saayman et al., 2017). In South Africa, there is a close link between shore fishing and bait collecting (MacKenzie, 2005), so an increase in fishing intensity will certainly correlate with an increase in harvesting of natural stocks of bait species (Nel & Branch, 2014 cf. Hodgson, Allanson & Cretchley, 2000; Napier, Turpie & Clark, 2009; Simon et al., 2019a). However, in a recent assessment of the impacts of recreational and subsistence fishing in marine ecosystems in South Africa, impacts of bait collecting received just a passing mention (Majiedt et al., 2019). This supports Watson et al. (2017) who suggested that despite their wide use, polychaete worms (and many other bait species) are universally a poorly managed resource.

Knowing which species are being utilised is an important step towards improving management of a resource as many bait species, including those that may be morphologically very similar, may have different life history traits and habitat requirements (Hutchings & Lavesque, 2021), which may influence the vulnerability of species to exploitation. The Marine Recreational Activity Information Brochure issued by the Department of Agriculture, Forestry and Fisheries (now the Department of Environment, Forestry and Fisheries; DAFF 2017) identifies bait worms generically as seaworms, polychaetes and flatworms, and by various common names. The only taxa identified by genus are *Arenicola* Lamarck, 1801, *Nereis* Linnaeus, 1758, *Pseudonereis* Kinberg, 1865 and *Gunnarea* Johannson, 1927. As no images are included in the brochure, it is unclear what the worms listed by common name are. However, the popular *Two Oceans: A guide to the Marine Life of southern Africa* (Branch et al., 2016) provides images and common and scientific names for some baitworms; bloodworm (*Arenicola loveni* Kinberg, 1866), musselworm (*Pseudonereis podocirra* Schmarda, 1861 as *P. variegata* Grube, 1857), wonderworm (*Eunice aphroditois* Pallas, 1788), Cape reef worm (*Gunnarea gaimardi* Quatrefages, 1848, previously known as *G. capensis* Schmarda, 1861), and the estuarine

wonderworm (*Marphysa haemasoma* Quatrefages, 1866 previously known as *M. elityeni* Lewis and Karageorgopolous, 2008). The species names for bloodworm, musselworm and Cape reef worm (also known as coralworm in Branch et al., 2016) correspond with those provided in the Government Gazette No. 39790 (Marine Living Resources Act 2014, available at www.gpwonline.co.za). The latter source, however, uses different names for *E. aphroditois* (Bobbit or errant worm), *Arabella iricolor* Montagu, 1804 (moonshineworm) and *M. haemasoma* (wonderworms and also known as *M. sanguinea* Montagu, 1813). The situation is further complicated by reports of bait worms in other sources; for example, *Diopatra* Audouin & Milne-Edwards, 1833 species have been called case worm (Day, 1974), moonshineworm (Napier, Turpie & Clark, 2009; van Rensburg, Matthee & Simon, 2020), estuarine wonderworm (Smith & Smith, 2012; Allanson et al., 2016) and coralworm (Fielding, 2007, Fielding personal communication), while *E. aphroditois* has also been called coralworm (Wooldridge & Coetzee, 1998). Thus, management of utilised worms may be hampered by confusion around the identities of the species that are harvested, and a lack of consensus in the names among fishermen, scientists and managers.

The confusion around the use of common names is further complicated by recent polychaete taxonomic research which emphasised how poor our understanding of the biodiversity of South African polychaetes, including some used as bait, is. For example, *P. podocirra* and *M. haemasoma* were removed from synonymy with globally widespread *P. variegata* and *M. sanguinea*, respectively, so both are in fact indigenous to South Africa (Lewis & Karageorgopoulos, 2008; Kara, Macdonald & Simon, 2018; 2020, see also Hutchings & Lavesque, 2021). By contrast, the *Diopatra* species used as bait in two estuaries on the south and south east coasts of the country (van der Westhuizen & Marais, 1977; Fielding, 2007; Napier, Turpie & Clark, 2009; Simon et al., 2019a), was only recently identified as *D. aciculata* Knox & Cameron, 1971 (van Rensburg, Matthee & Simon, 2020). This species was originally described in Australia (Knox & Cameron, 1971) and is probably alien in South Africa (Elgetany et al., 2020; van Rensburg, Matthee & Simon, 2020). At least two other bait species, *A. iricolor* and *E. aphroditois*, are also apparently globally widespread with type localities geographically

distant from South Africa (see Day, 1967), and may therefore either be misidentified indigenous, or unacknowledged alien species. Some species that are harvested (e.g., *P. podocirra, E. aphroditois*, *A. iricolor, G. gaimardi*) are also very widespread within South Africa (Day, 1967; Branch et al., 2016), spanning multiple known barriers to gene flow for species with planktonic larvae. In such species, it is likely that complexes of morphologically similar but genetically distinct lineages (i.e., cryptic or pseudocryptic species, respectively), each with discrete distributions, exist (for example see species previously identified as *Pseudopolydora antennata* Claparède, 1869 from temperate and subtropical regions of the country (Simon, Sato-Okoshi & Abe, 2019b)).

This study builds on taxonomic information gathered to date, and explores the use of common names and the nomenclature of polychaete worms used as bait in the Western Cape Province where fishing is particularly popular (Madjiet et al., 2019), and where harvesting of polychaete worms is high (Turpie et al., 2003). Furthermore, the province spans two vicariant barriers to gene flow at Cape Point and Cape Agulhas (Teske et al., 2011, Fig. 1), and this may also split polychaete species into different taxonomic units. The specific aims of the study are to: 1) identify and provide updated descriptions of the polychaete species collected as bait by recreational and subsistence fishermen in the Western Cape Province of South Africa; 2) collate the common names used by the fishermen towards developing consensus for improved management; and 3) generate mtCOI sequences to explore the existence of species complexes locally and globally and facilitate identifications.

Methodology

Sample sites and collection

Sampling was conducted at 12 popular beach and estuarine fishing locations in the Western Cape Province, South Africa (Fig. 1), from June 2016 to May 2017. Collectively, these sites included sandy (Saldanha Bay, Muizenberg, Strand, Betty's Bay, Pearly Beach, Struisbaai, Witsand, Knysna) and or rocky (Velddrif, Melkbosstrand, Kommetjie, Betty's Bay, Hermanus, Witsand) habitats, which would influence the presence and absence of species collected. Most

137 worms were donated by bait collectors who all gave their prior consent to participate in the
138 project. Involvement by most recreational fishermen was confirmed prior to sampling via
139 fishing mailing lists or word of mouth. Some additional recreational and all subsistence
140 fishermen were approached on site. After the aims of the study were described to participants
141 and verbal consent received (ethical clearance number: SU-HSD-001609 from Stellenbosch
142 University), worms were collected according to the permitted methods (DAFF 2017), under
143 permit RES2017-27 issued to CAS by the Department of Environment, Forestry and Fisheries.
144 Additional samples of bloodworm were collected by the authors using the same techniques
145 (see Simon et al., 2020). The common names used by the bait collectors were noted for all
146 worms. All sampling was conducted during low tide. In some instances, fishermen were only
147 willing to donate a small piece of the worm that was sufficient for genetic analysis.
148
149 Specimen identification and processing
150 Samples were relaxed in an isotonic solution of 7% $MgCl_2$ in tap water, measured and
151 photographed. A section of each specimen was placed in 96% ethanol for molecular analysis.
152 The rest of the specimen was fixed in 4% formalin in seawater for at least 2 days, washed in
153 distilled water and stored in 70% ethanol. Samples were examined on Leica DM1000 light and
154 MZ75 dissecting microscopes, and photographed with a Leica EC3 camera attachment, or on
155 Leica DM750 light and M80 dissecting microscopes and photographed with an Olympus Targus
156 TG5 attached to the microscope eyepieces. Where necessary, images were stacked in Helicon
157 Focus Version 7.6.4 and processed in Photoshop Version C6. Specimens were identified using
158 Day (1967), and where necessary, more recent literature appropriate to individual taxa. All
159 specimens were deposited at IZIKO South African Museum (Table 1).
160
161 DNA extraction, amplification and sequencing
162 A Zymo Quick DNA™ MiniPrep Plus kit (Zymo-Spin™) was used to extract DNA according to the
163 manufacturer's protocol. Extracted DNA was amplified with the Polymerase Chain Reaction
164 (PCR) using the universal cytochrome oxidase subunit 1 (COI) primer pair: LCO1490 and
165 HCO2198 (Folmer et al., 1994) for all species. The following PCR thermal conditions were used:

94°C for 3 minutes; 34 cycles with 94°C for 45 seconds, 42°C for 1 minute and 72°C for 1 minute and a final extension at 72°C for 7 minutes (Bleidorn et al., 2005). PCR products were visualised on a 1% agarose gel using 3 µl of PCR product and 5 µl of Quick-Load Purple 100bp DNA ladder (New England BioLabs Inc.). PCR amplicons were sequenced at the Central Analytical Facility at Stellenbosch University using Sanger sequencing. All newly generated sequences were uploaded on GenBank (Table 1).

Molecular analysis

Sequences were edited and aligned using ClustalW with default parameters in MEGA X (https://www.megasoftware.net, Kumar et al., 2018). Neighbour joining trees were constructed in the same program, per family. Nodal support was obtained using 10 000 bootstrap replicates using the maximum composite likelihood method, with uniform rates and pairwise deletion.

Results

Worms were donated by 15 recreational and six subsistence fishers, with two additional fishers who were not categorised (Table 1). In total, these fishers donated 194 specimens belonging to seven families and 11 nominal species (Table 1). Together, these species were referred to by 10 common names (Table 1). Sequences were not generated for *Heptaceras quinquedens* and *Perinereis latipala,* with the remaining nine species representing 11 genetically distinct species (Table 1).

Taxonomic account

Sipuncula

Family: Siphonosomatidae Kawauchi, Sharma & Giribet, 2012

Genus: *Siphonosoma* Spengel, 1912

Species: *Siphonosoma dayi* Stephen, 1942

Figs. 2 – 3

195

196 *Siphonosoma dayi* Stephen, 1942: 246 – 247, Pl. XI, Figs 1, 2; Day, 1974, 49

197

198 *Material examined*: Knysna: 34°03'56.0"S 23°02'57.4"E, 2 specimens, MB-A090313 and MB-
199 A090318, 27 January 2017. A. N. du Toit, mid-intertidal sandflats in estuary.

200

201 *Description (based on Stephen (1942) and new material)*: New specimens: trunk length 198 and
202 230 mm, introvert of former 17 mm. In life body light to dark pink (Fig. 2 A), colour retained
203 after fixation, internally pearlescent pink (Fig. 2 E – H). Skin covered with oval shaped papillae in
204 longitudinal rows, following contours of circular muscle, appear white after fixation. Introvert
205 has terminal mouth ringed with short tentacles (Fig. 2B). On introvert papillae chitinised,
206 tubular, scale-like and with dark edges arranged in rows on each of the circular muscle bands
207 (Fig. 2B – D); larger and more numerous in anterior (Fig. 2C) than posterior (Fig. 2D).
208 Longitudinal muscle-layer divided into 21 or 22 bands (Fig. 2 E, G, black arrows), anastomosing
209 in anterior to form single sheet in region of introvert (Fig. 2E, black arrowhead). Four retractor
210 muscles; dorsal pair attached to body wall anteriorly, ventral pair attached more posteriorly
211 (Fig. 2E, G, H white arrowheads). Two branches of spindle muscle inserts close to dorsal
212 retractor muscles (Fig. 2H, black arrowhead). One pair of nephridia (Fig. 2, F).

213

214 *Remarks*: New specimens match the original description by Stephen (1942). Although only two
215 specimens were collected and sequenced, *S. dayi* (Fig. 3) forms a well-supported clade which is
216 independent from other known species within the genus.

217

218 *Common name*: Sandworm
219 *Collection method*: Hand digging and pumping.
220 *Known distribution*: South Africa: Knysna (Western Cape Province)
221 *Ecology*: In sand in low to mid intertidal in estuary.

222

223 Subclass: Sedentaria Lamarck, 1818

Family: Arenicolidae Johnston, 1835

Genus *Arenicola* Lamarck, 1801

Species: *Arenicola loveni* Kinberg, 1866

Figs. 4-6

Arenicola loveni Kinberg, 1866: 355; Ashworth 1911, 2 – 17, Fig. 1 – 3; Day 1967, 610, Fig. 29.1 f – k; Day 1974, 62, Fig. 54; Branch et al. 2016, 72, Fig. 27.9

Material examined: Betty's Bay: 34°22'39.6"S 18°51'21.6"E, 3 specimens, MB-A090220 – MB-A090222, 10 February 2017, mid-intertidal, sandy beach, A. du Toit. Knysna: 34°03'28.6"S 23°02'30.9"E, 3 specimens, MB-A090231 – MB-A090233, 27 January 2017, 34°03'54.3"S 23°03'03.7"E, 2 specimens MB-A090234 – MB-A090235, 28 January 2017, 2 specimens, 34°03'54.3"S 23°03'03.7"E, 29 January 2017, MB-A090236 – MB-A090237, mid-intertidal sandy beach A. du Toit. Muizenberg, 34°06'18.7"S 18°28'47.4"E, 1 specimen, MB-A090230, 13 March 2017, A. du Toit, 34°06'27.6"S 18°28'22.3"E, 1 specimen, MB-A090227, 2 specimens, 34°06'18.7"S 18°28'47.4"E, MB-A090228 – MB-A090229, 25 February 2017, 34°06'27.6"S 18°28'22.3"E, 1 specimen, MB-A090374, 25 February 2017, A. du Toit and C. Naidoo; low intertidal in surf zone, sandy beach. Pearly Beach: 34°39'33"S 19°29'27.43.6"E, 3 specimens MB-A090246 – MB-A090248, 12 February 2017, A. du Toit and H. van Rensburg, low-intertidal, sandy beach. Saldanha Bay: 33°00'26.9"S 17°56'46.3"E, 7 specimens, MB-A090257 – MB-A090263, 27 May 2017; 32°59'49.3"S 17°57'58.3"E, 3 specimens, MB-A090264 – MB-A090266, 27 May 2017, 33°00'26.9"S 17°56'46.3"E, 1 specimen, MB-A090375, 27 May 2017, C. Naidoo, low intertidal, sandy beach. Struisbaai: 34°47'41.1"S 20°02'57.6"E, 1 specimen, MB-A090238, 12 February 2017; 3 specimens, MB-A090239 – MB-A090241, 10 April 2017, 4 specimens, MB-A090242 – MB-A090245, C. Naidoo, A. du Toit and H. van Rensburg, mid to low intertidal, sandy beach. Witsand: 34°23'59.9"S 20°49'47.5"E, 7 specimens, MB-A090250 – MB-A090256, C. Naidoo, low intertidal, sandy beach.

Description (based on Day (1967) and new material): Live specimens up to 580 mm, including tail. Fixed specimens up to 296 mm long (excluding achaetous tail), 19.2 mm wide at chaetiger 1. In life, body colour variable; pink to brown, dark brown to black; usually darker in anterior, becoming lighter from branchial region posteriorly (Fig. 4 A, B, D), colour retained when fixed. Epidermis tessellated to chaetiger 5 or 6, papillated from chaetae 6 or 7 onward, including achaetous tail. Chaetigerous annuli prominent, number of annuli between first 4 chaetigers 2-3-4, thereafter 4 (Fig. 4D).

Anterior region consists of trilobed, non-retractable prostomium with nuchal groove on each side (Fig. 4E). One achaetous segment with 2 annuli (Fig. 4C). Proboscis eversible; covered in papillae, no pigment (Fig. 4C, E – H). Papillae on proximal section large and triangular (Fig. 4C, E, F, H). Papillae in median section more densely packed, small and nipple-shaped, becoming larger and more conical distally (Fig. 4C, F, G). One pair of long septal pouches that reach back to at least third diaphragm (Fig. 5A, B). One pair of conical oesophageal caecae (Fig. 5A). Thorax with 19 chaetigers. Notopodia rounded triangles, retractable lobes in oval torus (Fig. 5E). Notochaetae capillaries in two rows, anterior row shorter than posterior; with lateral toothed-crests and spinulose lamina (Fig. 6A). Neuropodia oval bearing single row of unidentate hooks (Fig. 6B), sometimes with faint denticle. Neuropodia long, approach midline of venter in branchiate region. Branchiae on chaetigers 7 – 19 (13 pairs), highly vascularised, highly branched, tree-shaped (Fig. 5F). On chaetiger 7 branchiae vestigial; 2 – 10 short gill stems, palmar membrane sometimes inconspicuous (Fig. 5E). Up to 22 main gill stems on branchiae on chaetigers 8 to 18, usually fewer on chaetiger 19. Palmar membrane fuse lower third of gill stems (Fig. 5F), sometimes appear papillate (Fig. 5G). Five pairs of nephridia on chaetigers 5 – 9; nephridiopores hooded, partially hooded (Fig. 5C, D) or unhooded, posterior to dorsal end of neuropodium. Tail achaetous, papillate, anus terminal.

Remarks: Specimens examined here conform to descriptions by Ashworth (1911) and Wells (1962) which included type material, but maximum size is larger. However, oval depressions seen by Ashworth (1911) ventral to some notopodia not observed. The colour variants of *A. loveni* from all sites form a well-supported clade (Fig. 7) which is exemplified by the fact that

those illustrated in Fig. 4 A, B and D are represented by an identical sequence (MK 922158). The structure seen here was previously reported in Simon et al. (2020).

Common name: Bloodworm

Collection method: By pump or digging with hand or trowel and hooking out with a wire. In Muizenburg collected from within surfzone.

Known distribution: South Africa: Saldanha Bay (Western Cape Province) to Durban (Kwa-Zulu Natal) (Day 1967).

Ecology: In sand in low to mid intertidal on sheltered sandy shores and estuaries.

Genus *Abarenicola* Wells, 1959

Species: *Abarenicola gilchristi* Wells, 1963

Figs 6, 8

Abarenicola gilchristi Wells, 1963: 147 – 149, Fig. 6c, pl 2 & 5; Day 1967: 611 – 612, Fig. 29.2

Arenicola assimilis var. *affinis* Ashworth 1911: 18, Figs 4 & 5 (in part); Day 1955: 427

Material examined: Betty's Bay: 34°22'S 18°51'E, 4 specimens (incomplete) (MB-A090223 – MB-A090226), 3 June 2016, mid-intertidal, sand, E. Newman. Pearly Beach: 34°39'48.4"S 19°29'17.2"E, 1 specimen (MB-A090249), 10 April 2017, low-intertidal, sand, A. du Toit and C. Naidoo.

Description (based on Day (1967) and new material): Up to 89 mm long (excluding achaetous tail), 11 mm wide at chaetiger 1. In life, body orange-pink (Fig. 8A), light to dark pink when fixed. Epidermis tessellated to chaetiger 4 or middle of chaetiger 5, papillated thereafter. Chaetigerous annuli of first 3 chaetigers prominent, number of annuli between first 4 chaetigers 2-2 (3 in one specimen)-4, thereafter 4 (Fig. 8B). Anterior region consists of trilobed, non-retractable prostomium and 1 achaetous segment (Fig. 8B, D). Nuchal groove on each side (Fig. 8D). Proboscis eversible; covered in papillae, no pigment (Fig. 8C). Papillae on proximal section

sparsely distributed, prominent, irregular in size, rounded (Fig. 8H). Papillae in median section densely packed, small, rounded, skin folded (Fig. 8G). Papillae of distal section densely packed, conical (Fig. 8F). Oesophageal caecae with one elongate and 11 to 20 (15 in fresh material) smaller caecae on either side of mid-line (Fig. 8E). Elongate 2 to more than 3 times length of short caecae.

Thorax with 19 chaetigers. Notopodia rounded triangles, retractable lobes in oval torus. Notochaetae spinulose capillaries (Fig. 6C) in single row. Neuropodia oval bearing single row of unidentate, finely serrated, hooks (Fig. 6D). Neuropodia short, do not approach midline of venter. Branchiae on chaetigers 8 – 19 (12 pairs) (Fig. 8A). Branchiae highly vascularised, large, up to 19 main gill stems; highly branched with lateral branches and gill filaments off each stem (Fig. 8I). Palmar membrane fuse lower third to half of gill stems (Fig. 8I). Five pairs of nephridia on chaetigers 5 – 9; nephridiopores unhooded, hooded, and partially hooded (Fig. 8 J – L), posterior to dorsal end of neuropodium. Tail achaetous, papillate, anus terminal.

Remarks: Specimens examined here conform to description by Wells (1963) and Day (1967), but are smaller. *Abarenicola gilchristi* formed part of a distinct lineage in a well-supported clade (Fig. 7) also comprising *Abarenicola brevior* and *A. wellsi*.

Common name: Bloodworm, bakkiewurm

Collection method: By hand or digging with trowel.

Known distribution: South Africa: Lambert's Bay to Walker Bay. Presence in Pearly Beach extends known distribution (Day, 1967) eastwards by only a few kilometers. Namibia: Luderitz. Report in Tamil Nadu, India (Thilagavathi et al., 2013) must be treated with caution.

Ecology: In sand in mid to low intertidal on sheltered shores

Order: Sabellida Levinsen, 1883

Family: Sabellariidae Johnston, 1865

Genus: *Gunnarea* Johannson, 1927

Species: *Gunnarea gaimardi* (Quatrefages, 1848)

Figures 9, 10

Pallasia gaimardi Quatrefages, 1848

Hermella capensis Schmarda, 1861: 23, pl. 23. Fig 171.

Sabellaria capensis McIntosh, 1885: 418, pl. 25A figs. 24-25, pl. 26A figs. 11-12.

Gunnarea capensis Day, 1967, fig. 33.2.d-i (NOT Schmarda, 1861).

Gunnarea gaimardi Branch et al., 2016, 73, Fig. 28.3

Material examined: Velddrif: 32°46'08.8"S 18°08'44.2"E, 10 specimens (incomplete), MB-A090356 – MB-A090358, MB-A090360, MB-A090364, MB-A090367 – MB-A090371, 26 May 2017, sand reefs in the mid-intertidal rock pools, A. N. du Toit. Bettys Bay: 34°22'39.6"S 18°51'21.6"E, 5 specimens (incomplete), MB-A090336, MB-A090337, MB-A090339 – MB-A090441), 3 June 2016, reefs in the lower intertidal zone, E. Newman. Hermanus: 34°24'41.1"S 19°16'44.8"E, 8 specimens (incomplete), MB-A090341 – MB-A090348), 11 February 2017, low to mid intertidal, A. N. du Toit and H. van Rensburg. Witsand: 34°23'31.9"S 20°51'50.1"E, 2 specimens (incomplete), MB-A090293, MB-A090294, 30 April 2017, low to mid intertidal, A. N. du Toit.

Description (based on Quatrefages (1848), Kirtley (1994) and new material): Body reaching a maximum of 43 mm; body colour opaque white (Fig. 9A-B) and cream with irregular dark brown spots (Fig. 10A-B). Opercular crown almost entire with mid-ventral shallow indentation (Fig. 10B). Paleae golden, arranged in two concentric rows (Figs 9B, 10B). Outer paleae geniculate, obtuse in shape with a single tooth on the antero-lateral margin (Fig. 9C, 10G, 2-3), 37 – 48 palaea. Inner paleae geniculate with elongate, wedge-shaped blades with sharp tips (Fig. 9C, 10G, 1), 25 – 46 paleae, arranged toward the midline of the crown with no overlap in paleae (Fig. 9B), whereas paleae overlap and completely conceal the fleshy disk (Fig. 10B). Anterior margin of crown with 49 – 73 conical papillae. Pair of ciliated palps in front of the

mouth (Figs 9D, 10E). Buccal lips present, with upper, lower and lateral lips (Figs 9D, 10E). Tentacular filaments compound and branched. Thorax consists of two modified chaetigers that lack notochaetae (Figs 9A, 10A). U-shaped building organ as part of the first modified chaetiger of the thorax (Figs 9D, 10E). Neurochaetae consists of capillaries with denticulate blade margins (Fig. 10C). Branchiae present in pairs on the dorsum. Ventral cirri small and conical with tapering ends. Parathorax consist of three chaetigers. Noto- and neurochaetae consist of alternating lanceolate chaetae and capillaries with denticulate blade margins (Fig. 10D, H, I). Uncini (notochaetae) (Fig. 10F) and reduced neuropodial lobes of abdominal chaetigers surrounded by tori. Ventral cirri conical with tapering ends, becoming digitiform with rounded ends, spanning the neuropodial lobe.

Remarks: Specimens all conform to the general description of *G. gaimardi* according to Day (1967) and Kirtley (1994). Nonetheless, specimens from Witsand showed distinct differences. Firstly, specimens from Velddrif, Betty's Bay and Hermanus (western group) have a deep groove on the opercular crown separating the peduncles (Fig. 9B), whereas in specimens from Witsand, the crown is entire (Fig. 10B). Secondly, specimens from the western group (reaching up to a maximum of 110 mm) were longer than specimens from Witsand (43 mm). Interestingly, the inner palaea arrangement observed for specimens from the western group had a similar orientation as specimens from Witsand. The only difference in arrangement was that the inner palaea did not overlap (Fig. 9B), whereas in Witsand specimens they seemed to do so (Fig. 10B). As such, the characters observed for specimens from the western group closely resemble specimens as described by Kirtley (1994), suggesting that the western group is most likely *Gunnarea gaimardi sensu stricto* while specimens from Witsand represent a new undescribed species of the genus. The morphological differences are supported by the molecular analysis which recovered two well supported clades (Fig. 11) and a genetic distance of 6% (±0.02), thus confirming their separation as two independent species. The first clade, designated *G. gaimardi*, included specimens from Velddrif, Betty's Bay and Hermanus (western group) and the second, designated *Gunnarea* sp. 1, included only the specimens from Witsand (Fig. 11). Morphological differences together with the genetic separation of the clades indicate the

presence of two species in what has, till now, been considered a monospecific genus (Capa, Hutchings & Peart 2012). Additional specimens, especially from more easterly locations, need to be examined to understand distributions of both species.

Common name: Coralworm, Cape reef worm, polwurm.

Collection method: Breaking of pieces of reef by hand or narrow blade to remove worms from tubes.

Known distribution: South Africa: the nominal species has been reported from KwaZulu-Natal on the east coast to the west coast of the Western Cape Province; Namibia: Walvis Bay to Luderitz (Day, 1967).

Ecology: Species form extensive reefs by building sandy tubes on rocks in the low to mid intertidal of exposed shores.

Order: Eunicida

Family: Lumbrineridae Schmarda, 1861

Genus: *Scoletoma* Blainville, 1828

Species: *Scoletoma* cf. *tetraura* (Schmarda, 1861)

Figures 12, 13

Notocirrus tetraurus Schmarda, 1861: 117, 6 figures

Lumbrinereis tetraurus Day, 1953: 435

Lumbrineris tetraura Day, 1967: 437, 439, Fig. 17.16 u-w, Branch et al., 2016: 70, Fig. 26.10

Material examined: Hermanus, Kammabaai: 34°24'41.1"S 19°16'44.8"E, 6 specimens (incomplete), MB-A090349 – MB-A090354, 11 February 2017, from rock pools in low to mid intertidal, A. N. du Toit and H van Rensburg. Betty's Bay: 34°22'S 18°51'E, 1 specimen (incomplete), MB-A090332, 3 June 2016, sandy sediment, E. Newman.

426 *Description (based on Day (1967) and new material)*: up to more than 300mm. Prostomium
427 conical, peristomium with two rings, second slightly shorter than first (Figs 12G, 13G). No eyes.
428 Prechaetal lobe or parapodia short and rounded throughout, postchaetal lobe longer and
429 triangular to digitiform, longer towards posterior, but shape the same (Figs 12A-C, 13A-C).
430 Winged capillary chaetae from chaetiger 1 to approximately chaetiger 56 to 70. Long-headed
431 simple hooded hooks from approximately chaetiger 4, shortening posteriorly (Figs 12D, E, 13D,
432 E), after chaetiger ~30 to ~35, head becomes even shorter with flared hood (Figs 12F, 13F),
433 appearing white (Fig. 13C). Aciculae yellow. Dental formula (variation): MI = 1 +1, MII = 5 (6) +
434 5, MIII = 2 (1) + 1 (2), MIV = 1 + 1, MV free, lateral to MIV and MIII.
435
436 *Remarks*: All seven specimens conform to the general description of *S. tetraura* according to
437 Day (1967). However, there were key morphological differences between the specimen from
438 Betty's Bay and those from Hermanus. In *S.* cf. *tetraura* from Betty's Bay, the body is more
439 robust, but with nearly twice as many chaetigers per 1mm than *S.* cf. *tetraura* from Hermanus.
440 In addition, in the latter species the long-headed simple hooded hooks are shorter, and post-
441 chaetal lobes are comparatively longer, especially in the posterior. Finally, specimens of the two
442 species were collected from different habitats (see below). Further research is needed to
443 determine which refers to the species recorded previously by Day (1967).
444
445 The morphological separation is supported by molecular analyses (Fig. 14) that retrieved two
446 well-supported operational taxonomic units, *Scoletoma* cf. *tetraura* sp. 1 (from Betty's Bay) and
447 *S* cf. *tetraura* sp. 2 (from Hermanus). The two *S.* cf. *tetraura* species from South Africa form part
448 of a weakly supported clade together with *Scoletoma fragilis* (O.F. Müller, 1776), *Lumbrineris*
449 *aberrans* Day, 1963, *Lumbrineris erecta* Moore, 1904, *Lumbrineris japonica* Marenzeller, 1879,
450 *Lumbrineris perkinsi* Carrera-Parra, 2001 which is separate from *S. tetraura* from China. The
451 separation of *S*. cf. *tetraura* from South Africa and *S. tetraura* from China in two different clades
452 with high support suggests that they are independent species. However, without sequences
453 from the species' type locality in Chile, it is impossible to determine whether the specimens
454 found in China and South Africa all represent new species or whether one of them is an alien.

Additionally, *S. tetraura* and *S. fragilis* were previously considered members of *Lumbrineris*, so the other *Lumbrineris* species in the clade should be revised to determine whether they are also in the genus *Scoletoma*, or whether this genus is paraphyletic.

Common name: Puddingworm

Collection method: Samples from Hermanus collected among broken pieces of *Gunnarea* tubes. Sample from Betty's Bay collected with a small trowel from sediment.

Known distribution: South Africa: Namibia to KwaZulu-Natal. Globally: Chile, Northwestern Atlantic Ocean, Caribbean Sea, Gulf of Mexico, Eastern Mediterranean Sea, Ireland.

Ecology: Burrows into sand in rock pools and among *Gunnarea* tubes.

Family: Eunicidae Berthold, 1827

Genus: *Marphysa* Quatrefages, 1866

Species: *Marphysa corallina* (Kinberg, 1865) (Figs. 1 and 2)

Figure 15

Nauphanta corallina Kinberg, 1865: 564.

Marphysa capensis Fauvel 1950; NOT *M. capensis* (Schmarda, 1861)

Marphysa coralline Day 1967: 400, Fig. 17.7 f – j; Branch et al. 2016 70, Fig 26.7

Material examined: Witsand: 34°23'31.9"S 20°51'50.1"E, 5 specimens, (incomplete) MB-A090276 – MB-A090280, 30 April 2017, from under rocks in rock pools in mid-intertidal, A. N. du Toit.

Description (Based on description by Day (1967) and new material): Body length up to 120mm. In life, body colour medium brown in anterior becoming light brown in posterior. Prostomium bilobed, lobes frontally rounded; sulcus deep. Prostomial appendages semi-circular with white tapering tips (Fig. 15A); pair of palps; pair of lateral antennae and one median antenna, 1.5

484 times length of prostomium (Fig. 15A). Black reniform eye spots below pair of lateral antennae
485 (Fig. 15A). Four pairs of maxillary plates and one maxilla; MF: 1+1, 3+3, 5+0, 4+6, 1+1. Branchiae
486 pectinate, present from 41st chaetiger as a single filament, reaching up to five to seven
487 filaments in posterior chaetigers (Fig. 15B). Acicula blunt with dark brown ends and black shafts
488 (Fig. 15C), present throughout; subacicular hooks present throughout with bidentate tips and
489 guards (Fig. 15C). Two types of capillaries present in supracicular fascicle; limbate and winged
490 (Fig. 15D, E). Pectinate chaetae present in supracicular fascicle; isodont broad blades and fine
491 teeth (Fig. 15D). Compound falcigers, bidentate tips, short blades with guards, present in
492 subacicular fascicle (Fig. 15D).
493
494 *Remarks*: All sequences from Witsand clustered with *M. corallina* from KwaZulu-Natal
495 (KT823410) (Kara, 2015), with high bootstrap support, indicating that it is a single species (Fig.
496 16). However, since the type locality of *M. corallina* is in Hawaii and the species has a global
497 disjunct distribution, it is possible that the specimens collected here are really an indigenous
498 species. Further investigation is required to confirm the taxonomic status of *M. corallina* in
499 South Africa.
500
501 *Common name*: Wonderworm
502 *Collection method*: By hand from sediment under rocks.
503 *Known distribution*: South Africa: Mabibi in northern KwaZulu-Natal to Mgazana in the Eastern
504 Cape Province, Witsand in Western Cape Province. Global distribution: Mozambique, New
505 Zealand, Red Sea, Australia, Marshall Islands, Lakshadweep Island and Juluit Atoll (Day, 1967;
506 Read & Fauchald, 2021).
507 *Ecology:* Occupies burrows in sediment under rocks in the mid-intertidal zone.
508
509 Species: *Marphysa haemasoma* Quatrefages, 1865 (Figs. 1 and 2)
510 Figure 17
511
512 *Marphysa sanguinea* Day 1967: 396, fig. 17.5 u – y (NOT Montagu, 1815)

513 *Marphysa elityeni* Lewis and Karageorgopoulos, 2008; Branch et al. 2016, 69, Fig. 2.5
514 *Marphysa haemasoma* Kara et al. 2020: 16 – 21, figs 4B, 6 – 7
515
516 *Material examined:* Knysna: 34°02'17.5"S 23°02'23.4"E, 2 specimens (incomplete), MB-
517 A090326, MB-A090328), 29 January 2017, A. N. du Toit. Betty's Bay: 34°22'S 18°51'E, 5
518 specimens (incomplete), MB-A090331, MB-A090333 – MB-A090335, MB-A090338), 3 June
519 2016, digging with a trowel in mid-intertidal rock pools, E. Newman. Strand: 34°07'03.2"S
520 18°49'29.4"E, 2 specimens, MB-A090271, MB-A090315), 13 January 2017, digging with trowel
521 in gravel under rocks in the mid-intertidal, A. N. du Toit. Soetwater: 34°09'33.0"S 18°19'40.7"E,
522 5 specimens (incomplete specimens), MB-A090272 – MB-A090275, MB-A090317, 10 March
523 2017, under rocks in mid-intertidal rock pools, A. N. du Toit. Melkbosstrand: 33°43'40.3"S
524 18°26'17.6"E, 4 specimens (incomplete), MB-A090267 – MB-A090270), 26 February 2017,
525 under rocks in mid-intertidal rocky reef, A. N. du Toit and C. Naidoo.
526
527 *Description*: Body length up to 470mm. In life body colour variable: dark brown/red anterior
528 with white spots for ~ 7 chaetigers (Fig. 17A), becoming medium brown in middle and darker
529 towards the posterior. Specimens from Knysna and Betty's Bay with blue tinge in anterior for ~
530 6 chaetigers (Fig. 17B), becoming light brown in middle to posterior. Body iridescent in all
531 specimens. Prostomium bilobed, lobes frontally rounded, sulcus deep (Fig. 17A, B). Prostomial
532 appendages in semi-circle with a brown band just before the tapering ends; pair of palps, pair
533 of lateral antennae and one medium antenna (Fig. 17A, B). Pair of eyes under the lateral
534 antennae. Four pairs of maxillary plates and a maxilla; MF: 1+1, 3/4+4, 5+0, 3+5, 1+1. Branchiae
535 pectinate, present from chaetiger 26 onwards as one or two filaments, reaching a maximum of
536 8 filaments in middle (Fig. 17C), reducing to a single filament in middle to posterior, absent in
537 posterior end near pygidium. Acicula black and unidentate (Fig. 17C), present throughout;
538 subacicular hooks light brown and unidentate; present in posterior chaetigers. Simple
539 capillaries (Fig. 17D) and pectinate chaetae present in supracicular fascicle. Two types of
540 pectinate chaetae; isodonts with fine teeth in anterior segments and anodonts with medium

and coarse teeth (Fig. 17F) in middle to posterior chaetigers. Compound spinigers with short and long blades present in subacicular fascicle throughout (Fig. 17E).

Remarks: Specimens collected here conformed to the description by Kara et al. (2020), except for those collected from Knysna and Betty's Bay which have a blue anterior (~6 chaetigers), becoming light brown in the middle to posterior end. Phylogenetic analysis recovered a single well-supported clade that comprised all specimens from Knysna, Betty's Bay, Strand, Soetwater and Melkbosstrand, indicating that the colour morphs are a single species (Fig. 17).

The use of two species of *Marphysa* in the Western Cape Province supports recent research showing that multiple species of this genus, especially members of the *M. sanguinea* complex, are used as bait, even within regions (see review by Hutchings & Lavesque, 2021). Although the current study showed that different colour morphs represent a single species, further research is needed to determine whether individuals occupying different habitats, as described by Day (1967) and Lewis & Karageorgopoulos (2008), are also a single species.

Common name: Wonderworm, bloukoppies. Listed as estuarine wonderworm in Branch et al. (2016).

Collection method: By hand from sediment under boulders in boulder fields.

Known distribution: South Africa: Langebaan Lagoon on the west coast to Port Elizabeth on the south coast (Day, 1967; Kara et al., 2020).

Ecology: Occupies burrows in sediment typically grey/black medium to coarse grains and rich in sulphur. In Knysna, specimens were found in sandier sediments.

Genus *Lysidice* Lamarck, 1818

Species: *Lysidice natalensis* Kinberg, 1865

Figure 18

Lysidice natalensis Kinberg, 1865: 566, Day, 1951: 40, Day, 1953: 435, Day, 1960: p336, Day, 1967: 401, Fig. 17.7 k-r, Branch et al., 2016: 70, Fig. 26.9

Lysidice atra Schmarda, 1861

Lysidice capensis Grube, 1868, Day, 1934: 53

Material examined: Witsand: 34°23'31.9"S 20°51'50.1"E, 11 specimens (2 complete), MB-A090281 – MB-A090289, MB-A090291, MB-A090292, 30 April 2017, from under rocks, in rock pools in mid-intertidal zone, A. du Toit.

Description (Description based on Day (1967) and new material): Complete specimens 62 and 63 mm long for 126 and 156 chaetigers, 5.8 and 2.4 mm wide at chaetiger 10. Colour brown with white spots, brown pigment extending into proximal part of prostomium, margin white (Fig. 18A). Prostomium bilobed, antennae tapered, shorter than prostomium, proximal part brown, tips white (Fig. 18A). Mandibles heavy; MI = 1 + 1; MII = 3 + 3; MIII 2-3 + 0, MIV = 2-3 +4-7. MV = 1 + 1. Parapodia with slender dorsal cirri (Fig. 18B), becoming shorter and thinner from chaetiger 22 to 38 onwards (Fig. 18E, H). Ventral cirrus triangular, getting shorter posteriorly, nipple-shaped in posteriormost chaetigers (Fig. 18B, E, H). Post-chaetal lobe truncate, getting shorter posteriorly, inconspicuous in posteriormost chaetigers (Fig. 18B, E, H). Superior chaetae limbate capillaries and comb chaetae of two sizes (Fig. 18F). Inferior compound chaetae with short blades, bidentate, teeth usually of similar sizes (Fig. 18C, D), but proximal tooth may be thicker and or longer. Acicula black with blunt tips (Fig. 18B, E, H); bidentate acicula hook with small hood from chaetiger 25 – 28 onwards (Fig. E, H), teeth may be worn, giving blunt appearance (Fig. 18G).

Remarks: Original description (Kinberg, 1865) is poor. Specimens collected here generally match descriptions by Day (1943, 1951, 1967), although posterior ventral cirrus more prominent than described by Day (1967). The description of *L. natalensis* from Pakistan (Mustaquim, 2000) is not very detailed, and the only differences from samples examined here are differently-shaped post-chaetal lobes. All specimens from Witsand form a well-supported clade that is not

598 reciprocally monophyletic with *L. natalensis* from India (Fig. 17; Sigamani et al., 2020). Identity
599 of the species in Pakistan is also doubtful.
600
601 *Common name*: Musselworm. Listed as three-antennaed worm in Branch et al. (2016).
602 *Collection method*: By hand.
603 *Known distribution*: South Africa: From Namibia to northern KwaZulu-Natal (Day 1967).
604 *Ecology*: Habitat variable; in the current study specimens were collected from under rocks in
605 rock pools, Day (1934) reported them from muddy sand.
606
607 Family: Onuphidae Kinberg, 1865
608 Genus *Heptaceras*
609 Species: *Heptaceras quinquedens* (Day, 1951)
610 Figure 19
611 *Onuphis quinquedens* Day, 1951: 40—42, fig. 6 a—h; Day, 1967: 422, fig. 17.13 a—e; Fauchald,
612 1982: 100, fig. 28 b
613 *Heptaceras quinquedens* Paxton, 1986
614
615 *Material examined*: Pearly Beach: 34°40'00.5"S 19°29'42.7"E, 5 specimens (incomplete), MB-
616 A090432—MB-A090436, 23 January 2017, H. van Rensburg & A. du Toit. Strand beach:
617 34°06'37.6"S 18°49'14.6"E, 1 specimen (incomplete), MB-A090442, 13 January 2017, H. van
618 Rensburg & A. du Toit. Struisbaai Main Beach: 34°47'32.3"S 20°02'54.8"E, 15 specimens
619 (incomplete), MB-A090421—MB-A090431, MB-A090437—MB-A090440, 27 January 2017, H.
620 van Rensburg, A. du Toit & C. Naidoo.
621
622 *Description (based on Day (1967), Fauchald (1982) and new material)*: Large species reaching
623 350mm in length and 6mm width at 10th chaetiger. Anterior section rounded, becoming dorso-
624 ventrally flattened and ventrally convex from chaetiger 3—6 onward (Fig. 19 D). In life,
625 prostomium and peristomium white (Fig. 19 B), rest of body pale, white-brown ventrally and
626 more reddish-brown dorsally (Fig. 19 E), becoming paler towards median and posterior

sections, dorsum covered with small red-brown spots, more prominent towards anterior (Fig. 19 B). Irregularly spaced red-brown or black dots on ceratophoral rings with a single white patch within the final elongated distal ring (Fig. 19 B). All colouring disappear after preservation (Fig. 19 A, C, D). Iridescent shine observed over entire body in live and preserved specimens (Fig. 19 A—D).

Prostomium with frontal extension forming palpohores for frontal palps (Fig. 19 C). Lateral antennae reaching chaetiger 4—7 on posterior part of prostomium, shorter median antenna reaching chaetiger 2—4 placed anterior to lateral antennae. Proximal ceratophoral rings wide, covering most of prostomium (Fig. 19 A). Ceratophores with 15—30 rings on median antennae and 20—48 rings on lateral antennae, each terminating in an elongated distal ring. Ceratophores at least as long as styles but up to twice the length of styles which taper distally (Fig. 19 B, D).

Peristomium as long as, or longer than, prostomium with deep mid-dorsal notch on the dorsal margin, flanking an elevated prostomial ridge (Fig. 19 A). Peristomial cirri as long as peristomium, slender and tapering, situated distally on peristomium on either side of the mid-dorsal notch, curving laterally (Fig. 19 A, B).

Parapodia mounted marginally, anterior three pairs projecting anteriorly, slightly elongated (Fig. 19 B, D) and modified with four or five hooded bi- or tridentate pseudo-compound falcigers (Fig. 19 G), remaining parapodia directed dorsally.

Dorsal cirri simple tapering filament anteriorly with small basal process towards posterior (Fig. 19 H), shorter than branchiae (Fig. 19 D, F). Ventral cirri subulate on anterior five chaetigers changing to pad-like globular form (Fig. 19 D).

Pectinate chaetae from chaetiger 6—8 with 22—28 teeth (Fig. 19 J). Superior limbate chaete from chaetiger 1. Branchiae start as simple tapered filaments on chaetiger 1 (Fig. 19 D), become pectinate on chaetiger 8—10 with maximum of 7—12 filaments per branchia (Fig. 19 F), continuing throughout rest of body (Fig. 19 E). Hooded bidentate acicular chaetae appear from 10th chaetiger to the end of the body (Fig. 19 I).

Remarks: The specimens examined here match earlier descriptions (Day, 1951; Day, 1967; Fauchald, 1982), but this is the first observation of tridentate falcigers in the modified parapodia, although tridentate falcigers are known to occur within the genus (Paxton, 1986). The third tooth is small (Fig. 19G) and not always present so can easily be overlooked. According to Fauchald (1982) the median antenna is longer than the posterior lateral ones in the holotype (reaching chaetiger three vs. two) but in all of the material examined here, the posterior lateral antennae were longer than the median antenna, conforming to the description by Paxton (1986). The iridescent shine seen on the body of *H. quinquedens* is similar to that of *Diopatra aciculata* (van Rensburg, Matthee & Simon, 2020) and may be why fishermen commonly refer to both species as moonshineworms.

Common name: moonshineworm

Collection method: "prawn pumps" during low tide.

Known distribution: South Africa: Western Cape Province to KwaZulu-Natal; report in India (Sigamani et al., 2020) needs to be confirmed.

Ecology: They build temporary tubes in the intertidal of sandy beaches, but do not build conspicuous chimneys.

Order: Phyllodocida

Family: Nereididae Blainville, 1818

Genus: *Perinereis* Kinberg, 1865

Species: *Perinereis latipalpa* (Schmarda, 1861)

Figure 20

Nereis (Nereis) latipalpa Schmarda, 1861: 104-105, fig. A, B, K, a, b, pl. 31. 244.

Neanthes latipalpa – Kinberg 1865: 171. von Marenzeller, 1888: 6-7, fig. 2 **n. syn.**

Neanthes latipalpa typica – Willey, 1904: 260-261, pl. 13, fig. 9, pl. 14, figs 1, 2, 2a, b. **n. syn.**

683 *Perinereis nuntia vallata* – Day, 1967: 334, fig. 14.12 p-s; Branch et al. 2016 67, fig 25.4 (NOT
684 Grube & Kroyer *in* Grube 1858).
685 *Perinereis namibia* Wilson & Glasby, 1993: 265-266, fig. 10a-k. **n. syn.**
686 *Perinereis latipalpa* – Villalobose-Guerrero, 2019: 474-483, figs. 3-7.
687
688 *Material examined:* Kommetjie: 34°08'34.5"S 18°19'20.4"E, 3 specimens (complete), MB-
689 A090297 – MB-A090299), 10 March 2017, from under rocks in the mid-intertidal zone, A. N. du
690 Toit.
691
692 *Description:* Body up to 170 mm. Colour dark green in anterior region, light brown in the
693 middle, to a pale yellow in the posterior. Red blotchy pigment in the middle of each segment,
694 prominent from chaetiger 7- 10 (Fig. 20A). Rectangular palpophores with rounded palpostyles.
695 Four pairs of tentacular cirri each on lateral sides of prostomium (Fig. 20A, C). Two antennae on
696 prostomium, slender with tapering ends (Fig. 20C). Two pairs of black eyes in a trapezoidal
697 arrangement. Maxillary ring mix of conical and p-bar paragnaths (Fig. 20B), AI: 1-2, AII (L+R):
698 4+6 – 9+10, AIII: 11-17 in an oval patch, AIV (L+R): 8+16 – 33+32, oral ring mix of conical and p-
699 bar paragnaths (Fig. 20 C-D), AV: 1, AVI (L+R): 8+9 – 10+12, AVII-AVIII: 34 – 58 p-bars in two
700 irregular rows. Dorsal and ventral cirri present throughout. Notochaetae: homogomph
701 spinigers with serrated blades, first 3 teeth at the base of the blade are larger, becoming
702 smaller and uniform till the tip (Fig. 20E, hoS). Neurochaetae: heterogomph spingiers with
703 serrated blades, uniform teeth (Fig. 20E, heS) and heterogomph falcigers with medium sized
704 blades, finely serrated (Fig. 20F).
705
706 *Remarks:* Specimens collected in this study conformed to the recent description in Villalobose-
707 Guerrero (2019). However, variation in body size and paragnath arrangement was noted; total
708 length of paratype, 127mm and paragnath arrangement, maxillary ring, AI: 1, AII: 4-5, AIII9, AIV:
709 18-23, oral ring, AV: 1, AVI: 9-11, AVII-AVIII: 53.
710
711 *Common name:* Coralworm.

712 *Collection method:* From under rocks in the mid-intertidal zone.
713 *Type locality:* Table Bay, Cape of Good Hope, South Africa.
714 *Known distribution:* South Africa: Hondeklip Bay on the west coast to Port St Johns on the east
715 coast; Namibia: extending north to Luderitz Bay; Mozambique (Day, 1967). However, records in
716 Namibia and Mozambique have not been confirmed and require further investigation.
717
718 Genus: *Pseudonereis* Kinberg, 1865
719 Species: *Pseudonereis podocirra* (Schmarda, 1861)
720 Figure 21
721
722 *Mastigonereis podocirra* Schmarda, 1861: 108, fig. 217.
723 *Nereis (Nereilepas) stimpsonis* Grube, 1866: 176.
724 *Pseudonereis variegata* Day, 1967: 331, fig. 14.12 a-f (NOT Grube, 1857); Branch et al., 2016:
725 66, Fig. 25.1
726 *Pseudonereis podocirra* Kara, Macdonald & Simon, 2018: 1286 – 1291, Figs 2 – 4
727
728 *Material examined:* Velddrif: 34°08'34.5"S 18°19'20.4"E, 9 specimens (incomplete), MB-
729 A090355, MB-A090359, MB-A090361 – MB-A090363, MB-A090365, MB-A090366, MB-
730 A090372, MB-A090373), 26 May 2017, from rock pools in the mid-intertidal, A. N. du Toit.
731 Betty's Bay: 34°22'39.6"S 18°51'21.6"E, 3 specimens (incomplete), MB-A090302, MB-A090304,
732 MB-A090305, 10 February 2017, from under mussel beds in the mid-intertidal mussel belt, A. N.
733 du Toit. Hermanus: 34°24'41.1"S 19°16'44.8"E, 6 specimens (incomplete), MB-A090306 – MB-
734 A090310, MB-A090443, 11 February 2017, from under mussels in the mid-intertidal mussel
735 belt, A.N. du Toit, H. van Rensburg
736
737 *Description*: Body length up to more than 140 mm. Colour variable: greenish-brown, greyish-
738 brown and medium brown (Fig. 21A) with white pigmented spots around 4 eyes on
739 prostomium. Black pigmented spots along midpoint of segment boundaries from chaetiger 13
740 (Fig. 21B). Pair of frontal antennae, palps and four pairs of tentacular cirri (Fig. 21A). A mix of

paragnaths; conical, shield-shaped and p-bars; arranged in distinct areas on pharynx. Area I: one conical, II: 15-17 conical in a wedge shape, III: 22 conical in three rows, IV: 27-32 conical and p-bars in a closely spaced arc shape, V: one conical, VI large shield-shaped bars and VII-VIII: 40 conical and p-bars alternating in 2-4 rows (Fig. 21C, D). Notopodial ligule enlarged and elongated from chaetiger 13 to posterior (Fig. 21E). Dorsal and ventral cirri present (Fig. 21E). Homogomph spinigers with finely serrated blades (Fig. 21G) and heterogomph falcigers (Fig. 21F) with concaved and finely serrated blades.

Remarks: Specimens collected in the study conformed to the description in Kara, Macdonald & Simon (2018), except for body length which was larger, measuring up to a maximum of 140mm. Molecular analyses (Fig. 22) recovered a single monophyletic group with strong maximum likelihood support, indicating a single panmictic population, further supporting Kara, Macdonald & Simon (2018). Synonymy of *P. podocirra* with *P. variegata* was recently reversed (Kara, Macdonald & Simon 2018), but it is not known whether *P. variegata* in KwaZulu-Natal in South Africa, Namibia and Mozambique, as reported by Day (1967), are a single species.

Common name: Musselworm

Collection method: Breaking off mussels by hand from the mussel bed, or by pouring household bleach over the bed (ADT; pers. obs.). Collection of nereidid species is no longer permitted (DEFF 2017).

Known distribution: Lamberts Bay to Kidds Beach in South Africa (Kara, Macdonald & Simon, 2018), possibly extending up the east coast to KwaZulu-Natal and Mozambique and up the west coast to Namibia (Day, 1967).

Ecology: In low intertidal among mussel beds and abandoned *Gunnarea* tubes and barnacle shells.

767 **Discussion**

768 This study found that more polychaete taxa are utilised in South Africa as bait than what has
769 previously been reported. In addition to the widely reported and investigated bait species
770 (*Arenicola loveni*, *Gunnarea gaimardi*, *Marphysa haemasoma* and *Pseudonereis podocirra*; e.g.,
771 van Herwerden, 1989; Lewis 2005; Sowman, 2006; Lewis & Karageorgopoulos, 2008; Branch et
772 al., 2016), several taxa were recorded for the first time (*Abarenicola gilchristi, Heptaceras*
773 *quinquedens, Marphysa corallina, Lysidice natalenis, Perinereis latipalpa, Scoletoma* cf.
774 *tetraura*). This is also the first published report of *Siphonosoma dayi* being used, even though
775 there have been anecdotal reports of fishermen in Knysna collecting sandworm there. By
776 contrast, *Arabella iricolor* and *Eunice aphroditois* which are listed as bait in legislation and field
777 guides (Marine Living Resources Act, 2014; Branch et al., 2016), were not collected in this study,
778 suggesting that even more species are actually used in the province. Furthermore, it is not
779 possible to determine whether species that were collected at single sites (*L. natalensis* and *P.*
780 *latipalpa*) are targeted more widely, or were misidentified since both were called by names
781 more widely used for other species.
782
783 Including *Diopatra aciculata* collected in Knysna in a parallel study (van Rensburg, Matthee &
784 Simon, 2020), 14 species were identified in the Western Cape Province by ten common names,
785 excluding Afrikaans translations. For species collected multiple times and from different
786 locations, individual common names were sometimes applied to more than one species.
787 Species of the same family or genus were often known by a single common name; for example,
788 arenicolids (bloodworm), onuphids (moonshineworms), *Scoletoma* species (puddingworms) and
789 *Marphysa* species (wonderworm). For the arenicolids and onuphids this is true even when the
790 species show clear morphological or environmental differences which may have been noted by
791 fishermen, as evidenced by fishermen in Pearly Beach who distinguished between bloodworm
792 (*A. Loveni*) and the bakkiewurm (*A. gilchristi*). This was the first time that a second arenicolid is
793 reported as bait, even though DAFF (2017) acknowledges that more than one species may be
794 used when they specify that bloodworm are “All species of the genus *Arenicola*” (this is
795 inaccurate as only one species of *Arenicola* has been recorded locally). Individual species were

sometimes called by multiple common names that were not translations of the same thing; for example, *M. haemasoma* (wonderworm, bloodworm or bloukoppie [this is Afrikaans for 'blue head', referring to the blue anterior of worms from Knysna and Betty's Bay]), *G. gaimardi* (coralworm, polwurm ['pol' is Afrikaans for a tuft, tussock or clump of grass, and may here refer to the clumps of tubes formed by the worms]) and *P. podocirra* (musselworm, coralworm), while *D. aciculata* is also called the pypiewurm (this is Afrikaans for 'pipe worm', undoubtedly alluding to the chimneys that extend from the mouths of the tubes) by bait collectors in Port Elizabeth (van Rensburg, Pers. Obs.). It is also apparent that individual common names were sometimes applied to species from different families, such as coralworm (*G. gaimardi, P. latiplapa¸ P. podocirra*) and musselworm (*P. podocirra, L. natalensis*).

For the most part, subsistence and recreational fishermen used the same names (e.g., for arenicolids, sabellarids, onuphids and *Marphysa* species). Variations in use of names, such as bloodworm for *M. haemasoma* in Melkbosstrand may suggest unfamiliarity with bait worms among some subsistence fishers, while coralworm for nereidids at Kommetjie and Velddrif may suggest differences in the use of names depending on geographic region and or type of fisherman. Interestingly, none of the fisherman used the names from Branch et al. (2016) for *M. haemasoma* (estuarine wonderworm which distinguishes it from *E. aphroditois,* the wonderworm), *G. gaimardi* (Cape reef-worm), *L. natalensis* (three-antennaed worm) or *S.* cf. *tetraura* (false earthworm). Finally, several common names that appear in DAFF (2017), such as rock, shingle, or pot worms, were not used for any of the species collected in this study. The results of this study confirm that common names are sometimes applied in an unsystematic manner, but may also suggest that not all species utilised were collected in this study and or that the application of common names have changed.

The genetic data confirmed the presence of complexes of morphologically similar species within South Africa and globally. Day (1967) reported *Gunnarea gaimardi* and *S. tetraura* from Namibia to northern KwaZulu-Natal. Given that this range spans the cold Namaqua, warm Agulhas and subtropical Natal ecoregions (Sink et al., 2018) and barriers to gene flow at Cape

Point, Cape Agulhas, Algoa Bay and Wild Coast (Teske et al., 2011), it is not surprising that these nominal species each included two genetically distinct species with geographic and habitat separation, respectively. This may also apply to *L. natalensis* that has a similar distribution (Day, 1967; Branch et al., 2016). Even though all specimens identified here as *G. gaimardi* (including *Gunnarea* sp) and the *Scoletoma* cf. *tetraura* species from Hermanus and Betty's Bay matched the descriptions of the nominal species provided in Day (1967), the two genetic groups identified in each could be easily distinguished after close morphological examination. This supports Hutchings & Kupriyanova (2018) who suggested that many descriptions contained in Day (1967), especially of species described before the 1900s such as the two species under discussion, are too generic to enable accurate identification. Similarly, sequences of *L. natalensis* and *S.* cf. *tetraura* generated in this study do not match those generated for conspecific specimens collected in India and China, respectively (Zhou et al., 2010; Sigamani et al., 2020; Unpublished data: Chen et al., 2017; Yao et al., 2017; Xing & Zang 2020), indicating the presence of complexes of species that may be morphologically similar but genetically distinct, from different locations around the world. Sigamani et al. (2020) used Day (1967) to identify their samples which also included *H. quinquedens*, originally described from South Africa; unfortunately we were unable to amplify sequences for the samples that we gathered to test whether the specimens from the two countries are the same species. However, our results again support Hutchings & Kupriyanova (2018) who warned that using Day (1967) to identify polychaetes outside of southern Africa may erroneously inflate the distribution ranges of polychaete species.

This study was limited by several constraints. Firstly, the geographical coverage was restricted relative to the total coastline of the province; the fishing sites were selected according to where participants could be recruited in advance (because bait collecting is time consuming and needs to coincide with low tides which further limited sampling opportunities, we contacted a core of the participants via fishing mailing lists to ensure success in collection) while we also avoided sites that were potentially unsafe, such as Strandfontein and Monwabisi beaches along the northern shores of False Bay. Because of this sampling strategy, there was a bias towards recreational fishermen because subsistence fishermen could not be contacted in advance.

Instead, subsistence fishermen were approached on an *ad hoc* basis if they were active at the preselected sampling sites. Additionally, many subsistence fishermen were unwilling to donate bait to the project because bait collecting is so time consuming. As a consequence, our understanding of the use of common names may still be incomplete if fishermen from different fishing sectors and who speak different languages (e.g., English, Afrikaans, isiXhosa) use different names.

In conclusion, the current study has confirmed that more polychaete species are currently used as bait than previously reported. Furthermore, the inconsistent application of common names across taxa and among users, including for the more popular and widespread species, may hamper effective management. The detection of pseudocryptic species complexes among some bait species may have further implications for the management of these taxa as individual species should form separate management units, especially if they are spatially separated. Finally, diversity of polychaetes in general, and bait species in particular, has been underestimated in South Africa, and the global distribution of some has been overestimated. Further research is required to clarify the taxonomy of the members of the pseudocryptic species complexes, and the use of polychaetes and common names across a wider geographic range, including by subsistence fishers.

Acknowledgements

The authors thank Amy Williams for assisting with processing samples, Breyten van der Merwe, Celeste du Toit and the many fishermen who were so generous with their time and expertise.

Additional information and declarations

Author contributions

CAS: Conceived and funded project, processed samples and wrote the manuscript

JK: Processed and analysed samples and contributed to writing the manuscript

HvR: Collected and processed samples and contributed to writing the manuscript

AdT and CN: Collected and processed samples

CAM: Co-supervised student authors, and participated in analysis of samples and editing final document.

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Table 1(on next page)

Museum and GenBank accession numbers with location and collector details

Table 1: Museum and GenBank accession numbers with location and collector details. GenBank accession numbers may be repeated when haplotypes are shared among different individuals. Samples were received from contributing fishermen and processed by Alheit du Toit (AdT), Caveshlin Naidoo (CN), Carol Simon (CS), and Hendré van Rensburg (HvR). NS - no sequences. # Sequences were previously published in Simon et al. (2020).

Table 1: Museum and GenBank accession numbers with location and collector details. GenBank accession numbers may be repeated when haplotypes are shared among different individuals. Samples were received from contributing fishermen and processed by Alheit du Toit (AdT), Caveshlin Naidoo (CN), Carol Simon (CS), and Hendré van Rensburg (HvR). NS - no sequences. # Sequences were previously published in Simon et al. (2020).

Species name	Common name according to fisherman[$]	Location	Fisherman's name	Type of Bait Collector	Collector and sample processor	GenBank Accession Number (COI) (Number of individuals)	Museum Accession Number (number of individuals)
Siphonosoma dayi	Sand worm	Knysna Estuary	Gerrie Barnard	Recreational	AdT	MW598440	MB-A090313
	Sand worm	Knysna Estuary	Gerrie Barnard	Recreational	AdT	MW598441	MB-A090318
Abarenicola gilchristi	Bloodworm	Betty's Bay	Ethan Newman	recreational	Ethan Newman	NS	MB-A090223 - MB-A090226 (4)
	Bakkiewurm	Pearly Beach	Frans	Recreational	CN & AdT	MW595992	MB-A090249
	Bakkiewurm	Pearly Beach	Frans	Recreational	CN & AdT	MW595993	DNA only
	Bakkiewurm	Pearly Beach	Frans	Recreational	CN & AdT	MW595994	DNA only
	Bakkiewurm	Pearly Beach	Frans	Recreational	CN & AdT	MW595995	DNA only
Arenicola loveni[#]	Bloodworm	Betty's Bay	Morne & Victor	Recreational	AdT	MK922184	MB-A090220
	Bloodworm	Betty's Bay	Morne & Victor	Recreational	AdT	MK922185	MB-A090221
	Bloodworm	Betty's Bay	Morne & Victor	Recreational	AdT	MK922163	MB-A090222
	Blood worm	Knysna Estuary	Gerrie Barnard	Recreational	AdT	MK922157	MB-A090231
	Blood worm	Knysna Estuary	Gerrie Barnard	Recreational	AdT	MK922158	MB-A090232
	Blood worm	Knysna Estuary	Gerrie Barnard	Recreational	AdT	MK922159	MB-A090233
	Blood worm	Knysna Estuary	Dewald Kamp	Recreational	AdT	MK922160	MB-A090234
	Blood worm	Knysna Estuary	Dewald Kamp	Recreational	AdT	MK922161	MB-A090235
	Blood worm	Knysna Estuary	Albert Kapp	Recreational	AdT	MK922158	MB-A090236
	Blood worm	Knysna Estuary	Albert Kapp	Recreational	AdT	MK922158	MB-A090237
	Bloodworm	Muizenberg	Anonymous	recreational	AdT & CN	MK922158	MB-A090227
	Bloodworm	Muizenberg	Anonymous	recreational	AdT & CN	MK922164	MB-A090228
	Bloodworm	Muizenberg	Anonymous	recreational	AdT & CN	MK922158	MB-A090229
	Bloodworm	Muizenberg	Anonymous	recreational	AdT	NS	MB-A090230
	Bloodworm	Muizenberg	Anonymous	recreational	AdT & CN	NS	MB-A090374
	Bloodworm	Pearly Beach	Ferdi Joubert	Recreational	AdT & HvR	MK922163	MB-A090246

	Bloodworm	Pearly Beach	Ferdi Joubert	Recreational	AdT & HvR	MK922163	MB-A090247
	Bloodworm	Pearly Beach	Ferdi Joubert	Recreational	AdT & HvR	MK922183	MB-A090248
	Bloodworm	Saldanha Bay	Anonymous	Unspecified	CN	MK922165	MB-A090257
	Bloodworm	Saldanha Bay	Anonymous	Unspecified	CN	MK922166	MB-A090258
	Bloodworm	Saldanha Bay	Anonymous	Unspecified	CN	MK922167	MB-A090259
	Bloodworm	Saldanha Bay	Anonymous	Unspecified	CN	MK922168	MB-A090260
	Bloodworm	Saldanha Bay	Anonymous	Unspecified	CN	MK922169	MB-A090261
	Bloodworm	Saldanha Bay	Anonymous	Unspecified	CN	MK922170	MB-A090262
	Bloodworm	Saldanha Bay	Anonymous	Unspecified	CN	MK922171	MB-A090263
	Bloodworm	Saldanha Bay	Anonymous	Unspecified	CN	MK922166	MB-A090264
	Bloodworm	Saldanha Bay	Anonymous	Unspecified	CN	MK922172	MB-A090265
	Bloodworm	Saldanha Bay	Anonymous	Unspecified	CN	MK922171	MB-A090266
	Bloodworm	Saldanha Bay	Anonymous	Unspecified	CN	NS	MB-A090375
	Bloodworm	Struisbaai	Gert Kotze	Recreational	AdT & HvR	MK922163	MB-A090238
	Bloodworm	Struisbaai	Gert Kotze	Recreational	CN & AdT	MK922173	MB-A090239
	Bloodworm	Struisbaai	Gert Kotze	Recreational	CN & AdT	MK922174	MB-A090240
	Bloodworm	Struisbaai	Gert Kotze	Recreational	CN & AdT	MK922158	MB-A090241
	Bloodworm	Struisbaai	Gert Kotze	Recreational	CN	MK922163	MB-A090242
	Bloodworm	Struisbaai	Gert Kotze	Recreational	CN	MK922175	MB-A090243
	Bloodworm	Struisbaai	Gert Kotze	Recreational	CN	MK922176	MB-A090244
	Bloodworm	Struisbaai	Gert Kotze	Recreational	CN	MK922158	MB-A090245
	Bloodworm	Witsand	Paul	Recreational	CN	MK922158	MB-A090250
	Bloodworm	Witsand	Paul	Recreational	CN	MK922158	MB-A090251
	Bloodworm	Witsand	Paul	Recreational	CN	MK922178	MB-A090252
	Bloodworm	Witsand	Paul	Recreational	CN	MK922179	MB-A090253
	Bloodworm	Witsand	Paul	Recreational	CN	MK922158	MB-A090254
	Bloodworm	Witsand	Paul	Recreational	CN	MK922158	MB-A090255
	Bloodworm	Witsand	Paul	Recreational	CN	MK922157	MB-A090256
Gunnarea gaimardi	Coral worm	Betty's Bay	Morne & Victor	Recreational	AdT	MN045177	DNA only
	Coral worm	Betty's Bay	Morne & Victor	Recreational	AdT	MN045178	DNA only
	Coral worm	Betty's Bay	Morne & Victor	Recreational	AdT	MN045179	DNA only
	Coral worm	Betty's Bay	Ethan Newman	recreational	CS	MN045177	MB-A090336

	Coral worm	Betty's Bay	Ethan Newman	recreational	CS	MN045177	MB-A090337
	Coral worm	Betty's Bay	Ethan Newman	recreational	CS	MN045177	MB-A090339
	Coral worm	Betty's Bay	Ethan Newman	recreational	CS	MN045181	MB-A090340
	Coral worm	Betty's Bay	Ethan Newman	recreational	CS	MN045180	MB-A090441
	Polwurm	Hermanus	Hein Engelbrecht	Recreational	AdT & HvR	MN045177	MB-A090341
	Polwurm	Hermanus	Hein Engelbrecht	Recreational	AdT & HvR	MN045177	MB-A090342
	Polwurm	Hermanus	Hein Engelbrecht	Recreational	AdT & HvR	NS	MB-A090343
	Polwurm	Hermanus	Hein Engelbrecht	Recreational	AdT & HvR	MN045177	MB-A090344
	Polwurm	Hermanus	Hein Engelbrecht	Recreational	AdT & HvR	MN045177	MB-A090345
	Polwurm	Hermanus	Hein Engelbrecht	Recreational	AdT & HvR	MN045182	MB-A090346
	Polwurm	Hermanus	Hein Engelbrecht	Recreational	AdT & HvR	MN045177	MB-A090347
	Polwurm	Hermanus	Hein Engelbrecht	Recreational	AdT & HvR	MN045177	MB-A090348
	Coral worm	Velddrif	Anonymous	Subsistence	AdT	MN045177	MB-A090356
	Coral worm	Velddrif	Anonymous	Subsistence	AdT	MN045177	MB-A090357
	Coral worm	Velddrif	Anonymous	Subsistence	AdT	MN045177	MB-A090358
	Coral worm	Velddrif	Anonymous	Subsistence	AdT	MN045179	MB-A090360
	Coral worm	Velddrif	Anonymous	Subsistence	AdT	MN045177	MB-A090364
	Coral worm	Velddrif	Anonymous	Subsistence	AdT	MN045177	MB-A090367
	Coral worm	Velddrif	Anonymous	Subsistence	AdT	MN045177	MB-A090368
	Coral worm	Velddrif	Anonymous	Subsistence	AdT	MN045177	MB-A090369
	Coral worm	Velddrif	Anonymous	Subsistence	AdT	MN045177	MB-A090370
	Coral worm	Velddrif	Anonymous	Subsistence	AdT	MN045177	MB-A090371
Gunnarea sp.1	Coral worm	Witsand	Paul	Recreational	AdT	MN045184	MB-A090293
	Coral worm	Witsand	Paul	Recreational	AdT	MN045183	MB-A090294
Scoletoma cf. *tetraura sp. 1 (* Betty's Bay)	Pudding worm	Betty's Bay	Ethan Newman	recreational	Carol Simon	MN419154	MB-A090332
Scoletoma cf. *tetraura sp. 2 (* Hermanus)	Pudding worm	Hermanus	Hein Engelbrecht	Recreational	AdT & HvR	NS	MB-A090349
	Pudding worm	Hermanus	Hein Engelbrecht	Recreational	AdT & HvR	MN419157	MB-A090350
	Pudding worm	Hermanus	Hein Engelbrecht	Recreational	AdT & HvR	NS	MB-A090351
	Pudding worm	Hermanus	Hein Engelbrecht	Recreational	AdT & HvR	NS	MB-A090352
	Pudding worm	Hermanus	Hein Engelbrecht	Recreational	AdT & HvR	MN419156	MB-A090353

	Pudding worm	Hermanus	Hein Engelbrecht	Recreational	AdT & HvR	MN419155	MB-A090354
Marphysa corallina	Wonderworm	Witsand	Paul	Recreational	AdT	MN067881	MB-A090276
	Wonderworm	Witsand	Paul	Recreational	AdT	MN067881	MB-A090277
	Wonderworm	Witsand	Paul	Recreational	AdT	MN067881	MB-A090278
	Wonderworm	Witsand	Paul	Recreational	AdT	MN067882	MB-A090279
	Wonderworm	Witsand	Paul	Recreational	AdT	MN067881	MB-A090280
Marphysa haemasoma	Wonderworm	Betty's Bay	Ethan Newman	recreational	Carol Simon	NS	MB-A090331
	Wonderworm	Betty's Bay	Ethan Newman	recreational	Carol Simon	MN067877	MB-A090333
	Wonderworm	Betty's Bay	Ethan Newman	recreational	Carol Simon	NS	MB-A090334
	Wonderworm	Betty's Bay	Ethan Newman	recreational	Carol Simon	MN067877	MB-A090335
	Wonderworm	Betty's Bay	Ethan Newman	recreational	Carol Simon	MN067877	MB-A090338
	Wonderworm	Knysna Estuary	Anonymous	recreational	AdT	MN067879 (3)	DNA only
	Wonderworm	Knysna Estuary	Anonymous	recreational	AdT	MN067878 (2)	DNA only
	Bloukoppie	Knysna Estuary	Anonymous	Subsistence	AdT	MN067878	MB-A090326
	Bloukoppie	Knysna Estuary	Anonymous	Subsistence	AdT	MN067878	MB-A090328
	Bloodworm	Melkbos Strand	Lucas	Subsistence	AdT & CN	MN067877 (2)	DNA only
	Bloodworm	Melkbos Strand	Lucas	Subsistence	AdT & CN	MN067877	MB-A090267
	Bloodworm	Melkbos Strand	Lucas	Subsistence	AdT & CN	MN067877	MB-A090268
	Bloodworm	Melkbos Strand	Lucas	Subsistence	AdT & CN	MN067877	MB-A090269
	Bloodworm	Melkbos Strand	Lucas	Subsistence	AdT & CN	MN067877	MB-A090270
	Wonderworm	Kommetjie	Altus	Subsistence	AdT	MN067877	DNA only
	Wonderworm	Kommetjie	Altus	Subsistence	AdT	NS	MB-A090272
	Wonderworm	Kommetjie	Altus	Subsistence	AdT	MN067877	MB-A090273
	Wonderworm	Kommetjie	Altus	Subsistence	AdT	MN067877	MB-A090274
	Wonderworm	Kommetjie	Altus	Subsistence	AdT	MN067877	MB-A090275
	Wonderworm	Kommetjie	Altus	Subsistence	AdT	MN067877	MB-A090317
	Wonderworm	Strand	Marnus	Subsistence	AdT & HvR	MN067880	DNA only
	Wonderworm	Strand	Marnus	Subsistence	AdT & HvR	MN067880	MB-A090271
	Wonderworm	Strand	Marnus	Subsistence	AdT & HvR	MN067880	MB-A090315
Lysidice natalensis	Musselworm	Witsand	Paul	Recreational	AdT	MN419162	MB-A090281
	Musselworm	Witsand	Paul	Recreational	AdT	MN419168	MB-A090282
	Musselworm	Witsand	Paul	Recreational	AdT	MN419165	MB-A090283

	Musselworm	Witsand	Paul	Recreational	AdT	MN419164	MB-A090284
	Musselworm	Witsand	Paul	Recreational	AdT	MN419165	MB-A090285
	Musselworm	Witsand	Paul	Recreational	AdT	MN419160	MB-A090286
	Musselworm	Witsand	Paul	Recreational	AdT	MN419161	MB-A090287
	Musselworm	Witsand	Paul	Recreational	AdT	MN419158	MB-A090288
	Musselworm	Witsand	Paul	Recreational	AdT	MN419159	MB-A090289
	Musselworm	Witsand	Paul	Recreational	AdT	MN419167	MB-A090291
	Musselworm	Witsand	Paul	Recreational	AdT	MN419163	MB-A090292
Heptaceras quinuedens	Moonshine worm	Pearly Beach	Ferdi Joubert	Recreational	AdT & HvR	NS	MB-A090432
	Moonshine worm	Pearly Beach	Ferdi Joubert	Recreational	AdT & HvR	NS	MB-A090433
	Moonshine worm	Pearly Beach	Ferdi Joubert	Recreational	AdT & HvR	NS	MB-A090434
	Moonshine worm	Pearly Beach	Ferdi Joubert	Recreational	AdT & HvR	NS	MB-A090435
	Moonshine worm	Pearly Beach	Ferdi Joubert	Recreational	AdT & HvR	NS	MB-A090436
	Moonshine worm	Strand	Charlie Friess	Recreational	AdT & HvR	NS	MB-A090442
	Moonshine worm	Struisbaai	Gert Kotze	Recreational	AdT & HvR	NS	MB-A090421
	Moonshine worm	Struisbaai	Gert Kotze	Recreational	AdT & HvR	NS	MB-A090422
	Moonshine worm	Struisbaai	Gert Kotze	Recreational	AdT & HvR	NS	MB-A090423
	Moonshine worm	Struisbaai	Gert Kotze	Recreational	AdT & HvR	NS	MB-A090424
	Moonshine worm	Struisbaai	Gert Kotze	Recreational	AdT & HvR	NS	MB-A090425
	Moonshine worm	Struisbaai	Gert Kotze	Recreational	AdT & HvR	NS	MB-A090426
	Moonshine worm	Struisbaai	Gert Kotze	Recreational	AdT & HvR	NS	MB-A090427
	Moonshine worm	Struisbaai	Gert Kotze	Recreational	AdT & HvR	NS	MB-A090428
	Moonshine worm	Struisbaai	Gert Kotze	Recreational	AdT & HvR	NS	MB-A090429
	Moonshine worm	Struisbaai	Gert Kotze	Recreational	AdT & HvR	NS	MB-A090430
	Moonshine worm	Struisbaai	Gert Kotze	Recreational	AdT & HvR	NS	MB-A090431
	Moonshine worm	Struisbaai	Gert Kotze	Recreational	AdT & CN	NS	MB-A090437
	Moonshine worm	Struisbaai	Gert Kotze	Recreational	AdT & CN	NS	MB-A090438
	Moonshine worm	Struisbaai	Gert Kotze	Recreational	AdT & CN	NS	MB-A090439
	Moonshine worm	Struisbaai	Gert Kotze	Recreational	AdT & CN	NS	MB-A090440
Perinereis latipalpa	Coral worm	Kommetjie	Mario	Subsistence	AdT	NS	MB-A090297
	Coral worm	Kommetjie	Mario	Subsistence	AdT	NS	MB-A090298
	Coral worm	Kommetjie	Mario	Subsistence	AdT	NS	MB-A090299

Pseudonereis podocirra	Musselworm	Betty's Bay	Morne & Victor	Recreational	AdT	MN067871	MB-A090302
	Musselworm	Betty's Bay	Morne & Victor	Recreational	AdT	MN067870	MB-A090304
	Musselworm	Betty's Bay	Morne & Victor	Recreational	AdT	MN067871	MB-A090305
	Musselworm	Hermanus	Hein Engelbrecht	Recreational	AdT & HvR	MN067872	MB-A090306
	Musselworm	Hermanus	Hein Engelbrecht	Recreational	AdT & HvR	MN067873	MB-A090307
	Musselworm	Hermanus	Hein Engelbrecht	Recreational	AdT & HvR	MN067871	MB-A090308
	Musselworm	Hermanus	Hein Engelbrecht	Recreational	AdT & HvR	MN067871	MB-A090309
	Musselworm	Hermanus	Hein Engelbrecht	Recreational	AdT & HvR	MN067872	MB-A090310
	Musselworm	Hermanus	Hein Engelbrecht	Recreational	AdT & HvR	MN067871	MB-A090443
	Coral worm	Velddrif	Anonymous	Subsistence	AdT	MN067874	MB-A090355
	Coral worm	Velddrif	Anonymous	Subsistence	AdT	MN067871	MB-A090359
	Coral worm	Velddrif	Anonymous	Subsistence	AdT	MN067871	MB-A090361
	Coral worm	Velddrif	Anonymous	Subsistence	AdT	MN067874	MB-A090362
	Coral worm	Velddrif	Anonymous	Subsistence	AdT	MN067874	MB-A090363
	Coral worm	Velddrif	Anonymous	Subsistence	AdT	MN067874	MB-A090365
	Coral worm	Velddrif	Anonymous	Subsistence	AdT	MN067872	MB-A090366
	Coral worm	Velddrif	Anonymous	Subsistence	AdT	MN067875	MB-A090372
	Coral worm	Velddrif	Anonymous	Subsistence	AdT	MN067876	MB-A090373

$ The English names are listed, although fishermen frequently use Afrikaans translations: bloodworm (bloedwurm), Coral worm (koraalwurm), mussel worm (mosselwurm), moonshine worm (maanskynwurm), pudding worm (poedingwurm), wonderworm (wonderwurm). English names were never used for polwurm or bakkiewurm.

Figure 1

Map of South Africa and the Western Cape province with sample sites.

Figure 1. Sample sites in the Western Cape Province, South Africa: Velddrif, Saldanha Bay, Melkbosstrand, Soetwater (Kommetjie), Muizenberg, Strand, Betty's Bay, Hermanus, Pearly Beach, Struisbaai, Witsand, Knysna, with the two main barriers to gene flow in the Western Cape Province, and three main ecoregions along the South African coast.

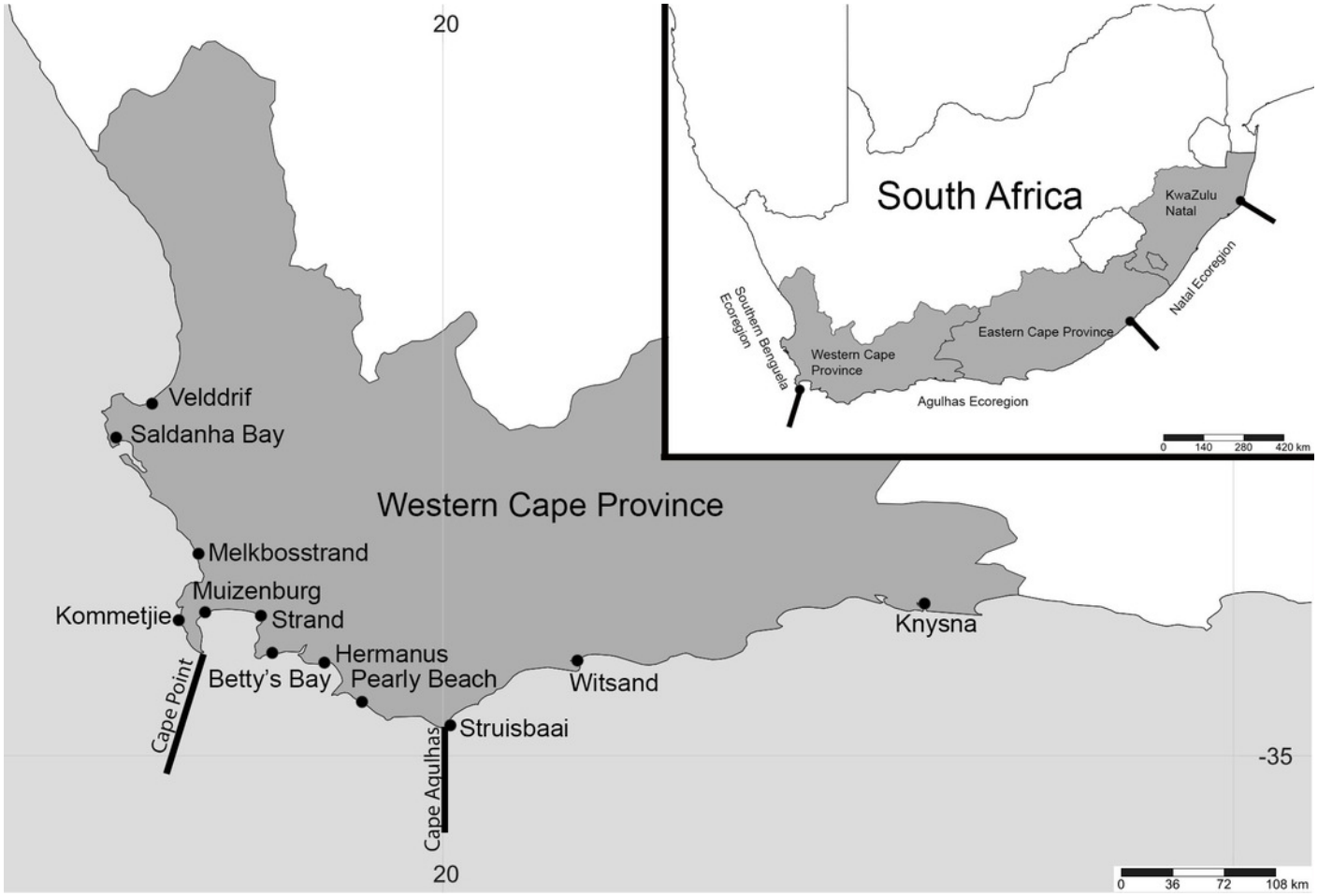

Figure 2

Morphology of *Siphonosoma dayi*

Figure 2. *Siphonosoma dayi* A) Live specimen, B) Everted introvert with tentacles, C) Scales on anterior of introvert, D) scales on posterior of introvert, E) Anterior, internal structure showing insertions of introvert muscles (white arrowheads), bands of longitudinal muscles (black arrows), anastomosed sheet of muscle in anterior (black arrowhead) and rectum (*), F) Pair of nephridia (N) and broken rectum (*) with insertion of anus (white arrowhead), G) Magnification of digestive system showing insertions of introvert muscles (arrowheads) and bands of longitudinal muscle (black arrow), H) Close-up of insertion of dorsal introvert muscle (white arrowhead) and spindle muscle (black arrowhead). Scale Bars: A = 10 mm; B, H = 2.5 mm; C = 0.5mm, D = 1 mm; E, F, G = 5 mm; A, E – H = MB A090313; B – D = MB A090318

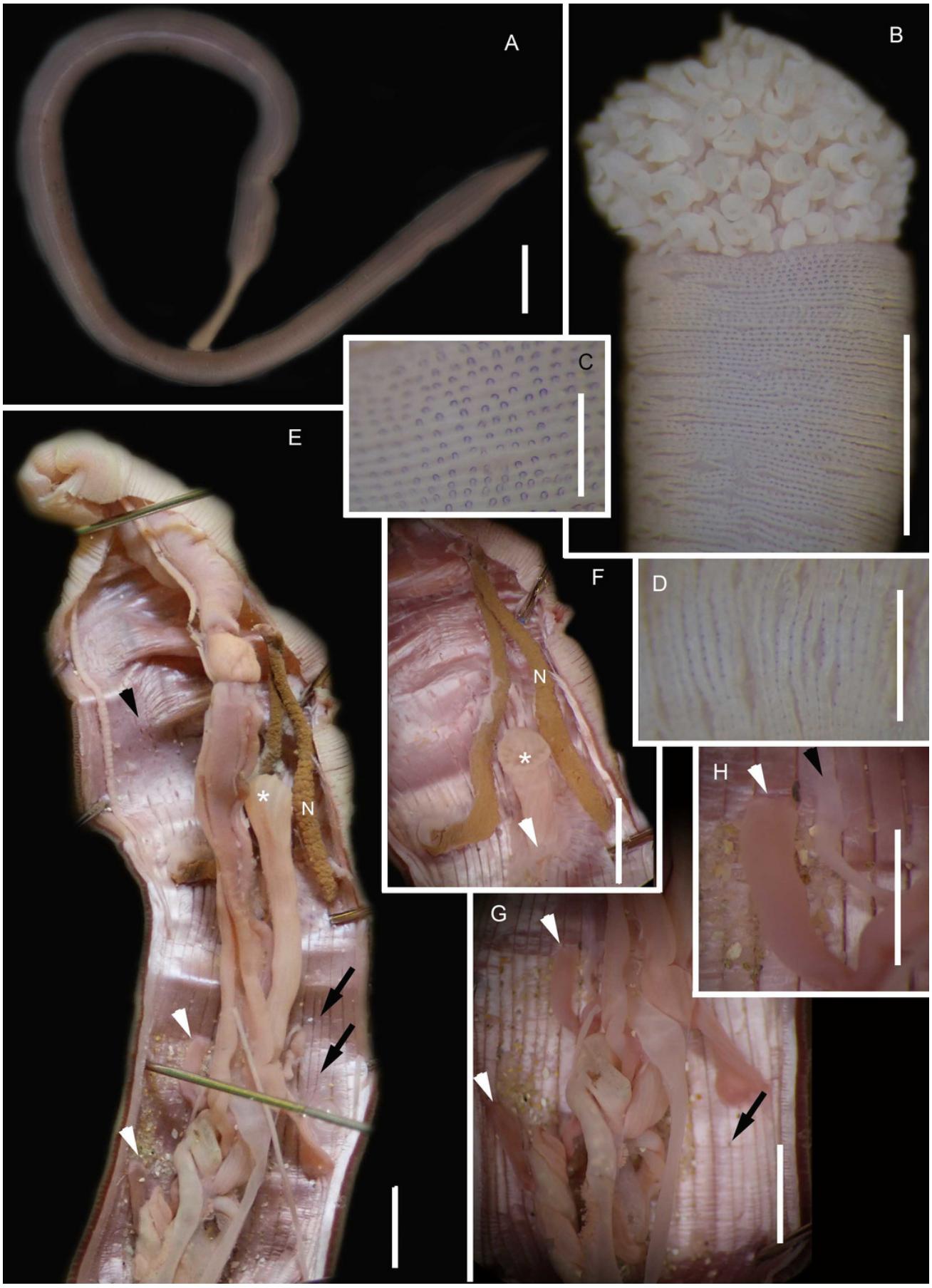
A
B
C
D
E
F
G
H
N
*
N
*

Figure 3

Neihbour Joining tree of *Siphonosoma* species

Figure 3. Neighbour Joining tree using mitochondrial sequences of various *Siphonosoma* species, including *S. dayi* from Knysna. * Indicates bootstrap support greater than 80%. Sequences obtained in this study are highlighted in grey. *Urechis caupo* was used as the outgroup. Scale bar represents number of substitutions per site.

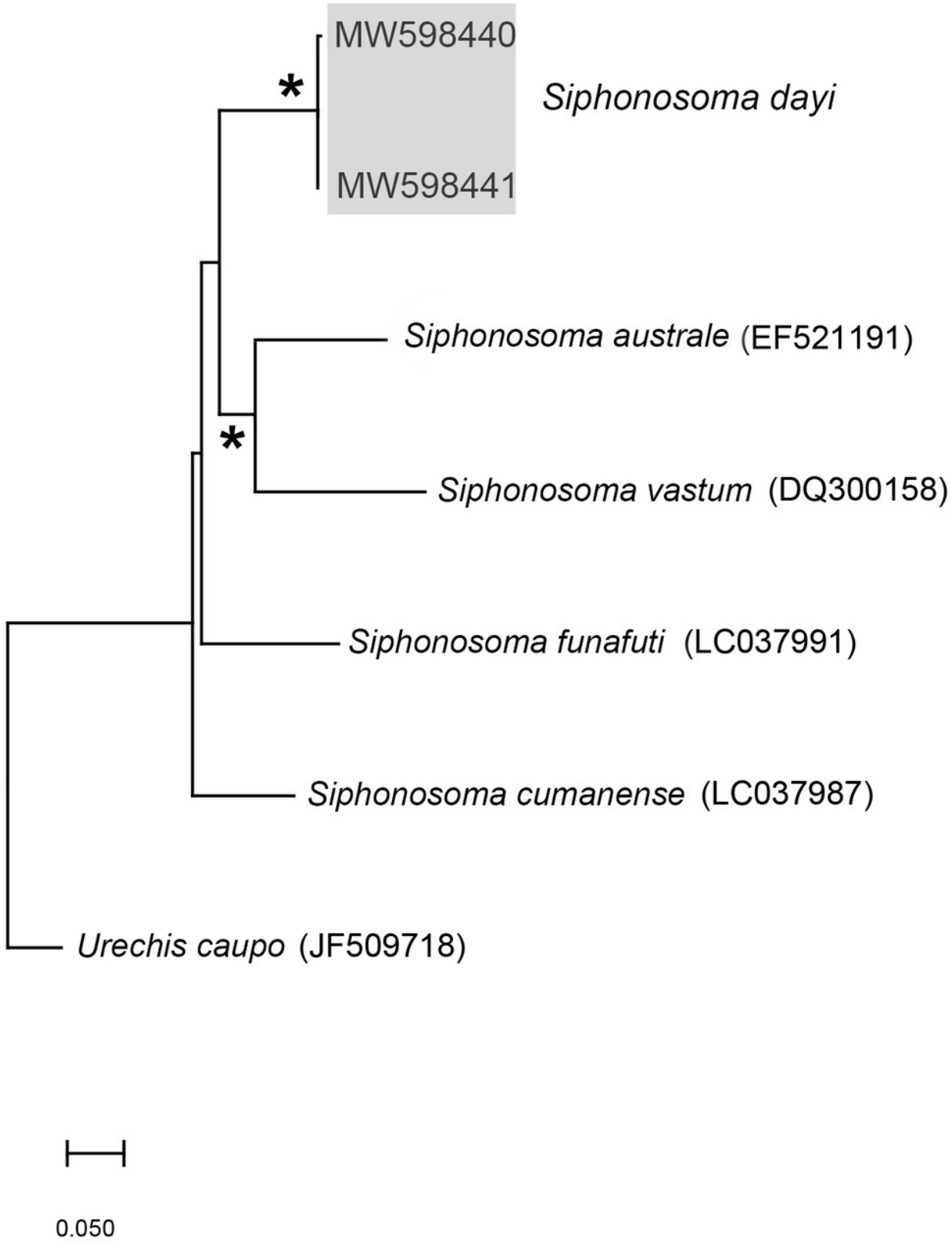
MW598440
MW598441
Siphonosoma dayi
Siphonosoma australe (EF521191)
Siphonosoma vastum (DQ300158)
Siphonosoma funafuti (LC037991)
Siphonosoma cumanense (LC037987)
Urechis caupo (JF509718)
0.050

Figure 4

External morphology of *Arenicola loveni*

Figure 4. *Arenicola loveni.* A) Almost uniformly dark specimen from Muizenberg, B) Dark specimen with distinctly lighter tail from Struisbaai, C) Close-up of proboscis of specimen in (B) showing annuli (white arrowheads), D) Light brown specimen with distinctly lighter branchial and tail region from Muizenberg, showing annuli in anterior chaetigers (white arrowheads), E) Prostomium and partially everted proboscis, F) Proboscis showing papillae in different regions, G) Papillae of distal part of proboscis, H) Papillae of proximal part of proboscis. Scale bars: A, B, D = 2 cm, C, E, F = 5 mm, G, H = 2.5 mm. A = MB-A090229, B = MB-A090241, D = MB-A090227, E – H: MB-A090259

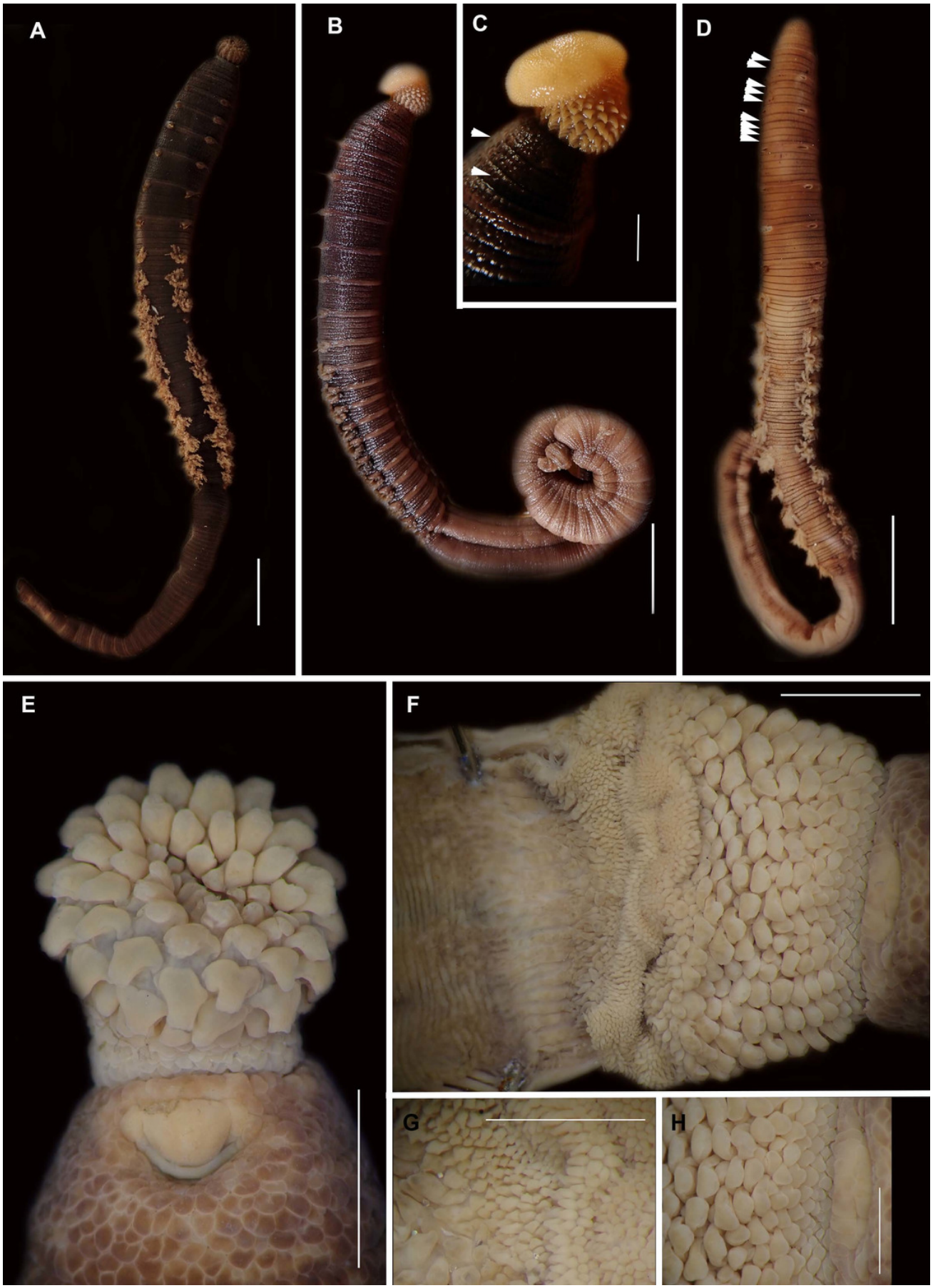
A
B
C
D
E
F
G
H

Figure 5

Morphology of *Arenicola loveni*

Figure 5. *Arenicola loveni.* A) Dorsal view of digestive system with septal pouches (arrowhead) and single pair of oesophageal caecae (arrow), B) Close up of anterior digestive system (ventral view) and septal pouches (arrowhead) and partially everted proboscis, C) Hooded nephridiopore, D) Partially hooded nephridiopore, E) Chaetiger 7 with vestigial branchia (arrowhead), F) Fully formed branchiae on chaetiger 14, G) Close up of palmar membrane showing papillated surface. Scale bars: A, B, = 10 mm, C, G = 1.5mm, D – F = 2.5mm, A: MB-A090252, B, D: MB-A090250, C, E – G: MB-A090259.

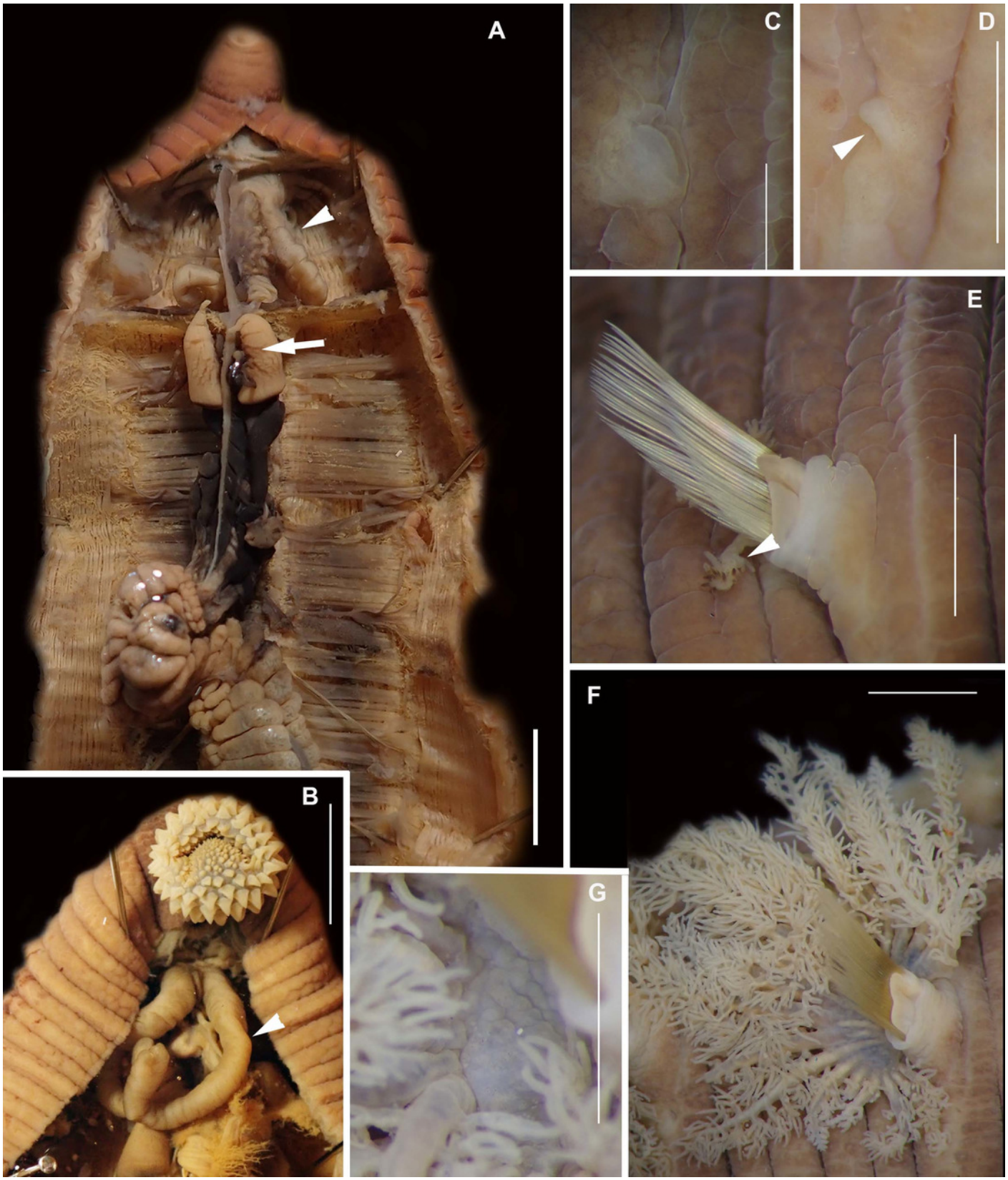
A
B
C
D
E
F
G

Figure 6

Arenicolid chatae

Figure 6. Arenicolid chaetae. A) Notochaetae and B) Neuropodial hooks of *Arenicola loveni*, C) Notochaetae and D) Neuropodial hooks of *Abarenicola gilchristi.* Scale Bars: A – D = 0.1mm. A, B = MB-A090261, C, D = MB-A090225

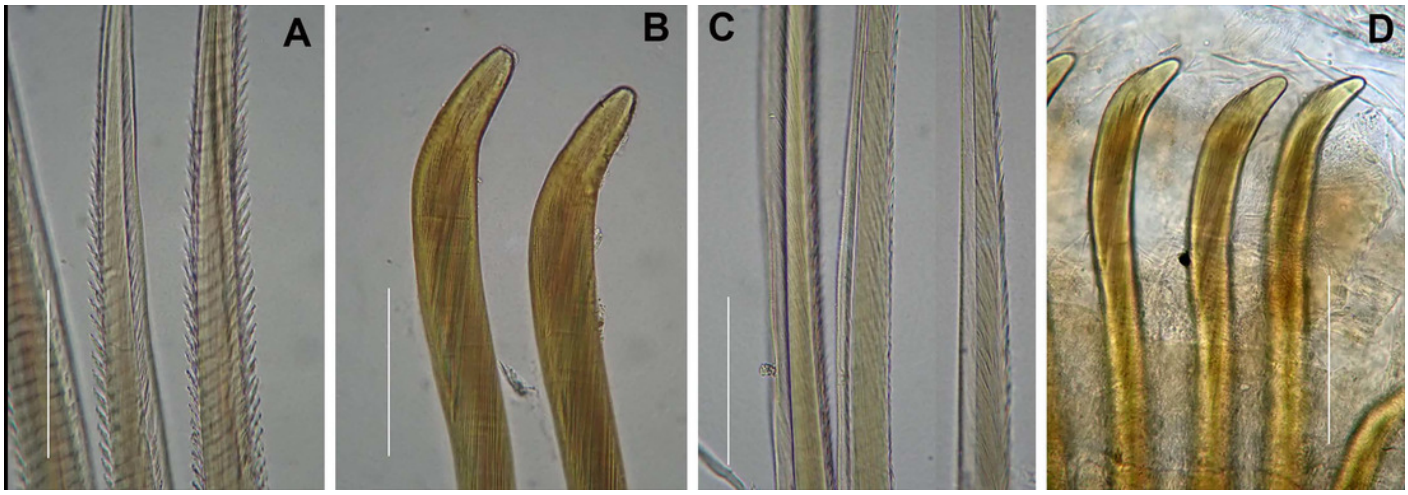

Figure 7

Neighbour joining tree of Arenicolidae

Figure 7. Neighbour Joining tree using mitochondrial sequences belonging to various *Arenicola* and *Abarenicola* species, including *A. loveni* and *A. gichristi* from South Africa. * Indicates bootstrap support greater than 80%. Areas highlighted in grey represent sequences generated in this study. *Maldanidae* sp. was used to root the tree. Scale bar represents substitutions per site.

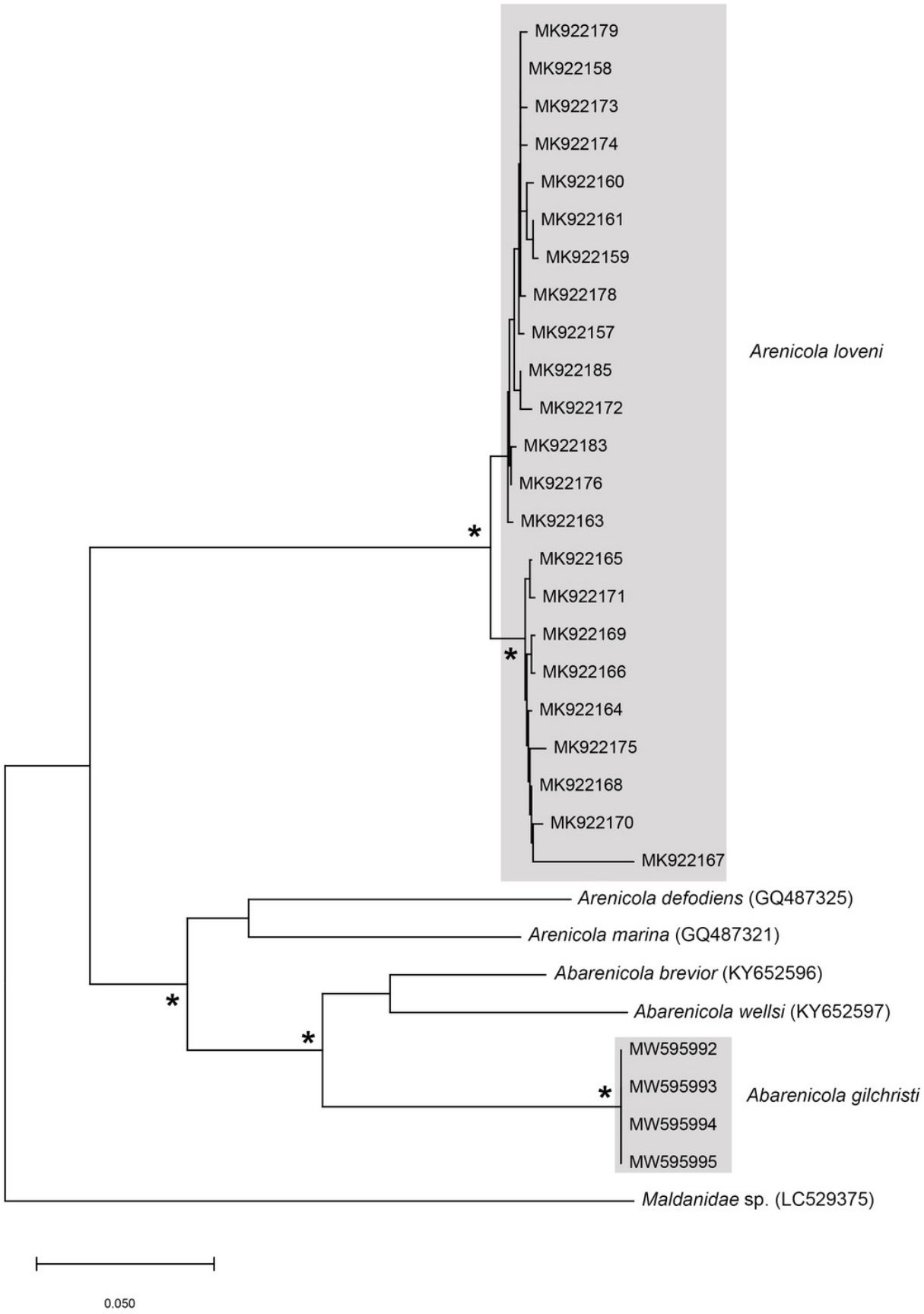
MK922179
MK922158
MK922173
MK922174
MK922160
MK922161
MK922159
MK922178
MK922157
MK922185
MK922172
MK922183
MK922176
MK922163
MK922165
MK922171
MK922169
MK922166
MK922164
MK922175
MK922168
MK922170
MK922167
Arenicola loveni
Arenicola defodiens (GQ487325)
Arenicola marina (GQ487321)
Abarenicola brevior (KY652596)
Abarenicola wellsi (KY652597)
MW595992
MW595993
MW595994
MW595995
Abarenicola gilchristi
Maldanidae sp. (LC529375)
0.050

Figure 8

Morphology of *Abarenicola gilchristi*

Figure 8. *Abarenicola gilchristi.* A) Live specimen, B) Dorso-lateral view of head, showing annulations on chaetigers 1 to 2 (arrowheads), C) Proboscis showing papillations in different regions, D) Dorsal view of head showing prostomium and partially everted proboscis, E) Digestive caecae; one large pair and multiple smaller pairs, F) Papillae of distal part of proboscis, G) Papillae of median part of proboscis, H) Papillae of proximal part of proboscis, I) Branchia on chaetiger 9, J) Unhooded nephridiopore, K) Hooded nephridiopore, L) Partially hooded nephridiopore. Scale bars: B, C, D, E = 5mm; I = 2mm, F – H = 2mm, J – L = 0.5mm; A, J: MB-A090223, B, I, K, L = MB-A090224; C – H = MB-A090226.

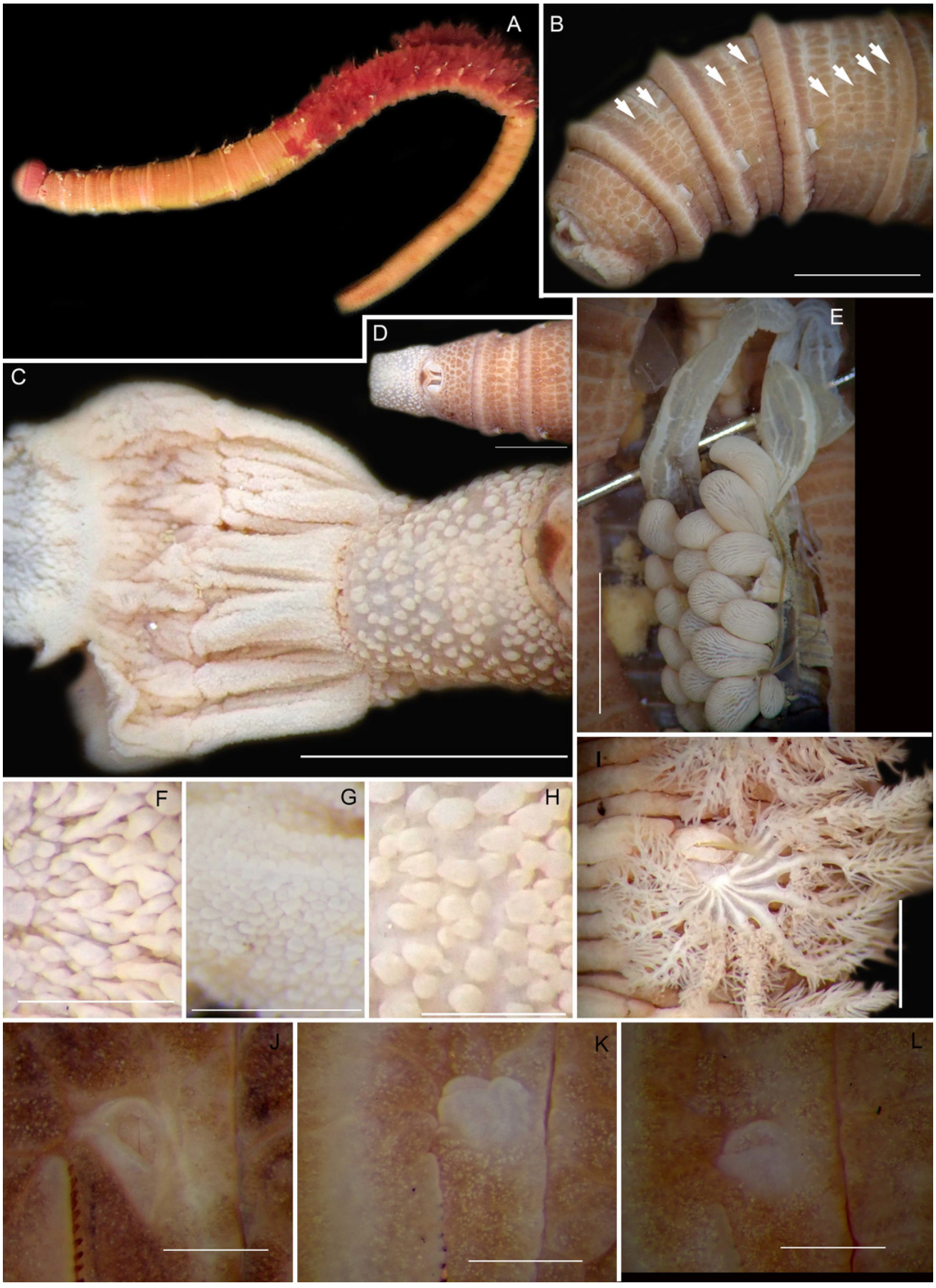
A
B
C
D
E
F
G
H
I
J
K
L

Figure 9

Morphology of *Gunnarea gaimardi*

Figure 9. *Gunnarea gaimardi*. A) Live specimen from Betty's Bay, B) Crown showing the inner palace (ip), outer palae (op), C) Palaea, 1: inner geniculate palae, 2 & 3: outer geniculate palae with tooth, D) Anterior region showing palps (p), median ridge (mr), tentacular filaments (tf), buccal lips (bl) and U-shaped building organ (UO). Scale bars: A = 5 mm, B, D = 2mm, C = 0.5mm. B, C, D = MB-A090342.

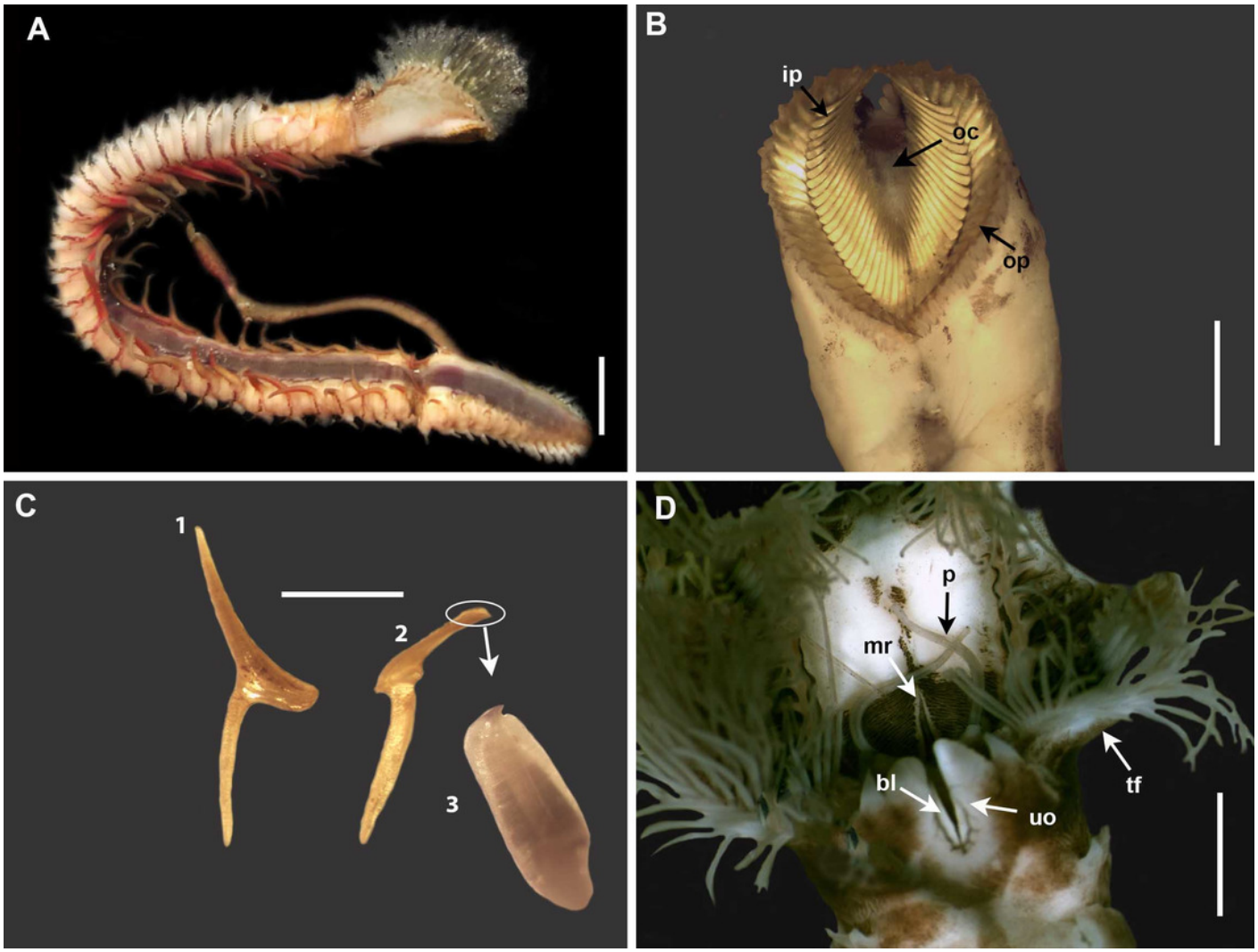

Figure 10

Morphology of *Gunnarea* species

Figure 10. *Gunnarea* species collected from Witsand. A) Live specimen, B) Crown showing the inner palae (ip) and outer palae (op), C) Neurochaetae of first thoracic chaetiger, D) Abdominal neurochaetae, E) Anterior region showing palps (p), Buccal lip (upper and lateral sides) and tentacular filaments (tf) , F) Posterior uncinus, G) Palaea 1- inner geniculate palae, 22 & 3 - outer geniculate palae with tooth, H) Lanceolate notochaetae, I) Neurochaetae. Scale bars: A=, B & E = 1mm, C, D, F, G = 0.5mm, H-I = 0.2mm. A, C, F = MB-A090293, B, E = MB-A090294.

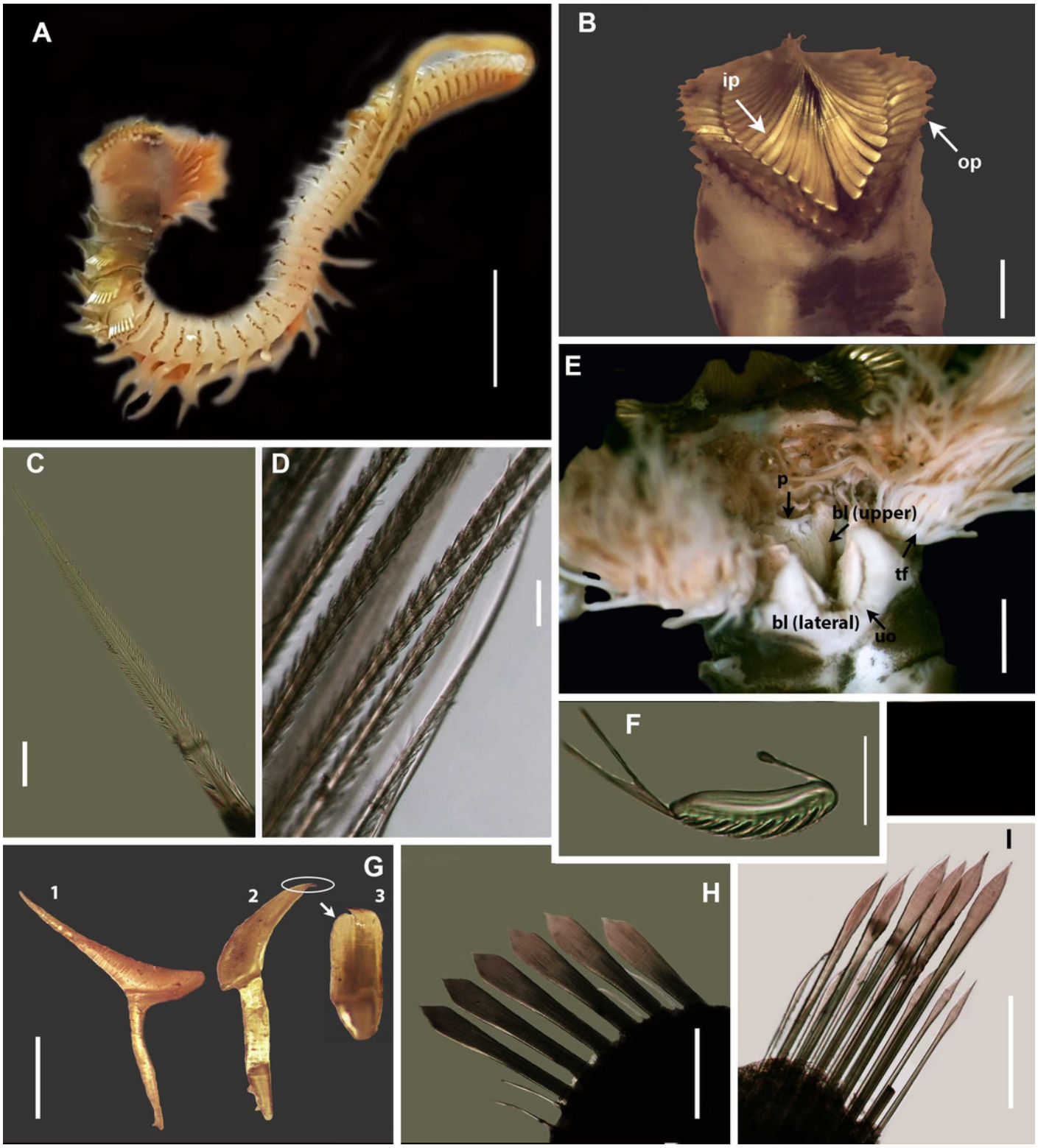
A
B
ip
op
E
p
bl (upper)
tf
bl (lateral)
uo
C
D
F
G
1
2
3
H
I

Figure 11

Neighbour joining tree of *Gunnarea*

Figure 11. Neighbour Joining tree of mitochondrial sequences of various species from family Sabellariidae including *Gunnarea capensis*. * Indicates bootstrap support greater than 80%. Areas in grey represent sequences generated in this study. *Spirobranchus sinuspersicus* was used to root the tree. Scale bar represents substitutions per site.

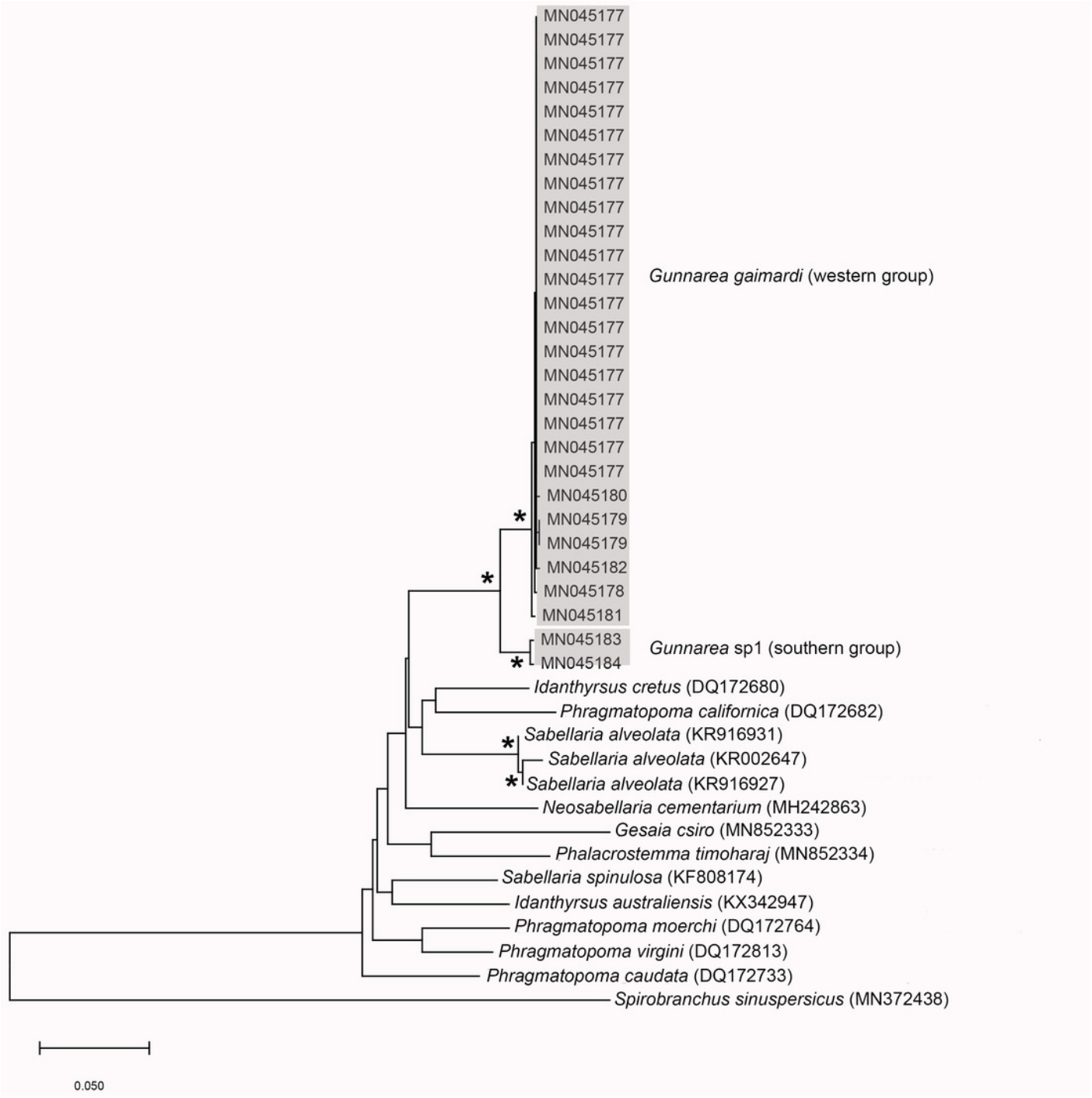
MN045177
MN045177
MN045177
MN045177
MN045177
MN045177
MN045177
MN045177
MN045177
MN045177
MN045177
MN045177
Gunnarea gaimardi (western group)
MN045177
MN045177
MN045177
MN045177
MN045177
MN045177
MN045177
MN045177
MN045180
MN045179
MN045179
MN045182
MN045178
MN045181
MN045183
MN045184
Gunnarea sp1 (southern group)
Idanthyrsus cretus (DQ172680)
Phragmatopoma californica (DQ172682)
Sabellaria alveolata (KR916931)
Sabellaria alveolata (KR002647)
Sabellaria alveolata (KR916927)
Neosabellaria cementarium (MH242863)
Gesaia csiro (MN852333)
Phalacrostemma timoharaj (MN852334)
Sabellaria spinulosa (KF808174)
Idanthyrsus australiensis (KX342947)
Phragmatopoma moerchi (DQ172764)
Phragmatopoma virgini (DQ172813)
Phragmatopoma caudata (DQ172733)
Spirobranchus sinuspersicus (MN372438)
0.050

Figure 12

Morphology of *Scoletoma* cf. *tetraura* from Betty's Bay

Figure 12. *Scoletoma* cf. *tetraura* Betty’s Bay. A) Chaetiger 5 showing pre- and post chaetal lobes, B) Chaetiger 31 showing pre- and post chaetal lobes, C) Posterior chaetiger showing pre- and post chaetal lobes, D) Long-headed hooded hooks on chaetiger 5, E) Long-headed hooded hook on chaetiger 31, F) Short-headed hook with flared hood from posterior chaetiger, G) Dorsal anterior. Scale bars: A, B = 1mm, C = 0.5mm, D – F = 0.2mm, G = 5mm. A – G = MB-A090332

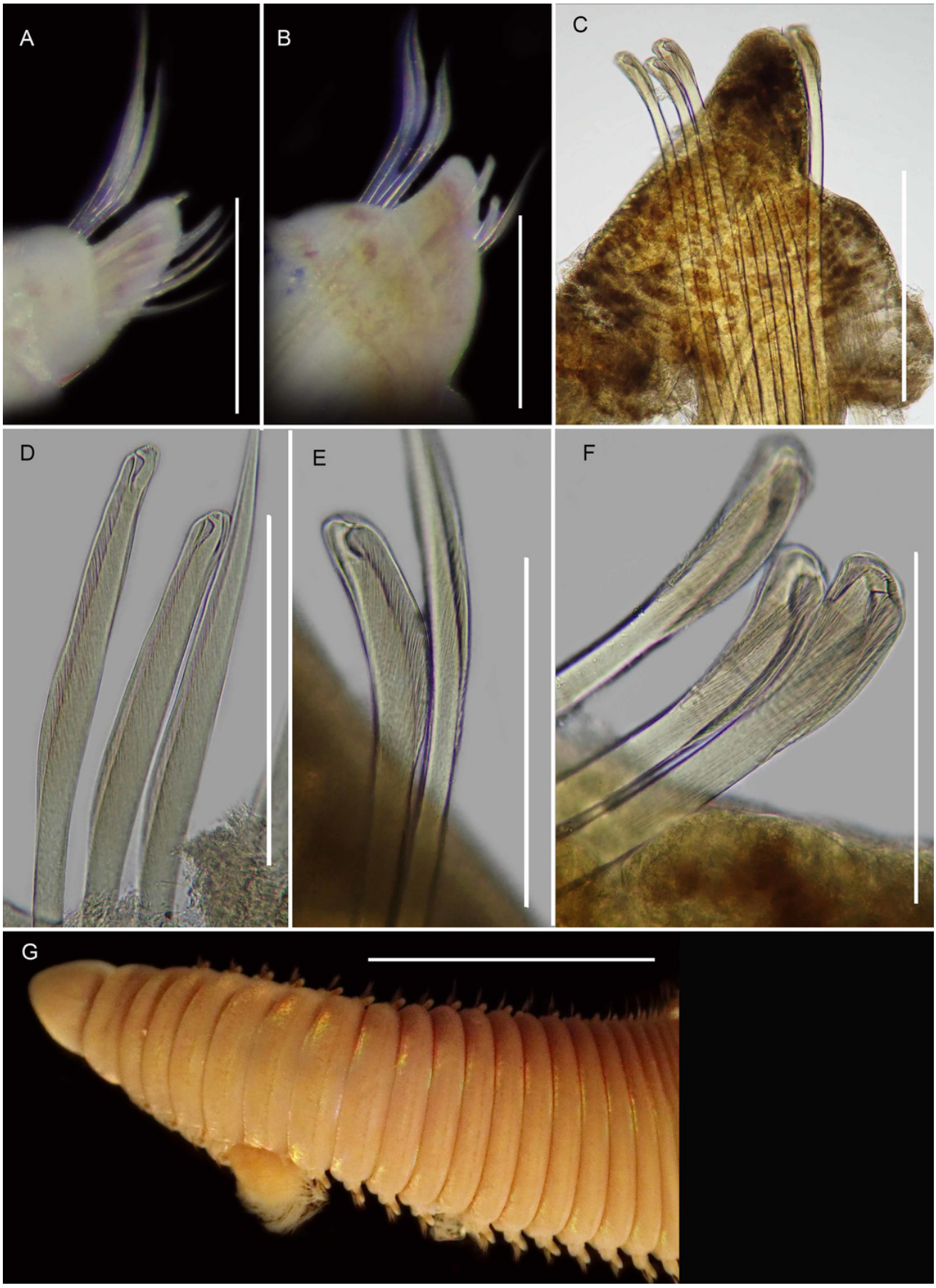
A
B
C
D
E
F
G

Figure 13

Morphology of *Scoletoma* cf. *tetraura* from Hermanus

Figure 13. *Scoletoma* cf*. tetraura* Hermanus. A) Chaetiger 3 showing pre- and post chaetal lobes, B) Chaetiger 30 showing pre- and post chaetal lobes, C) Posterior chaetiger showing pre- and post chaetal lobes, D) Long-headed hooded hooks on chaetiger 5, E) Long-headed hooded hook on chaetiger 31, F) Short-headed hook with flared hood from posterior chaetiger, G) Dorsal anterior. Scale bars: A – C = 0.5mm, D – F = 0.2mm, G = 5mm. A – G = MB-A090353

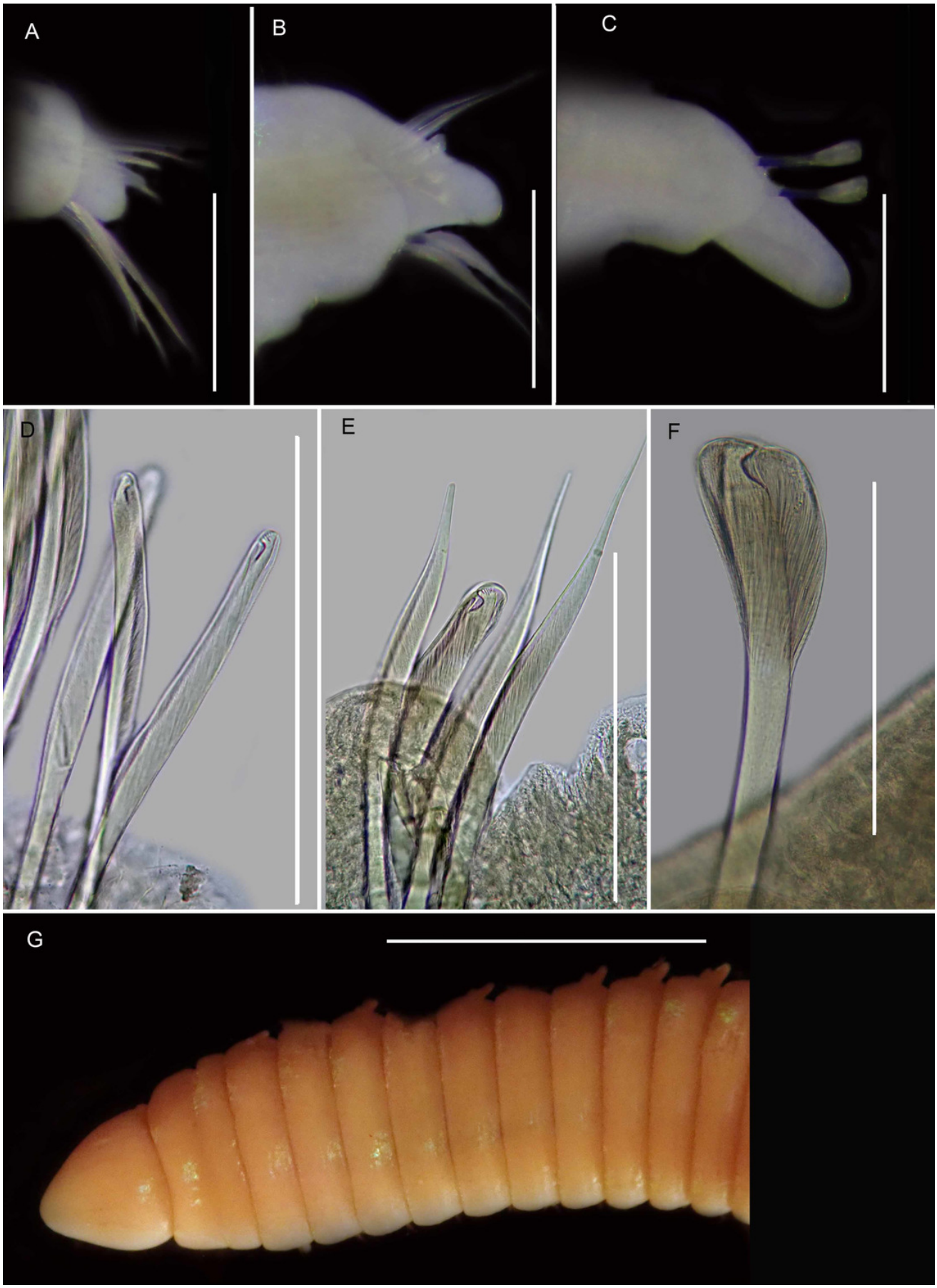
A
B
C
D
E
F
G

Figure 14

Neighbour joining tree of Lumbrineridae

Figure 14. Neighbour joining tree of mitochondrial sequences of various species in Lumbrineridae, including *Scoletoma tetraura*. * Indicates bootstrap support greater than 80%. Areas highlighted in grey represent sequences generated in this study; *Scoletoma* cf. *tetraura* sp1 and sp2. Area outlined in grey represent *S. tetraura* from China. *Arabella iricolor* and *A. semimaculata* were used as outgroups. Scale bar indicates substitutions per site.

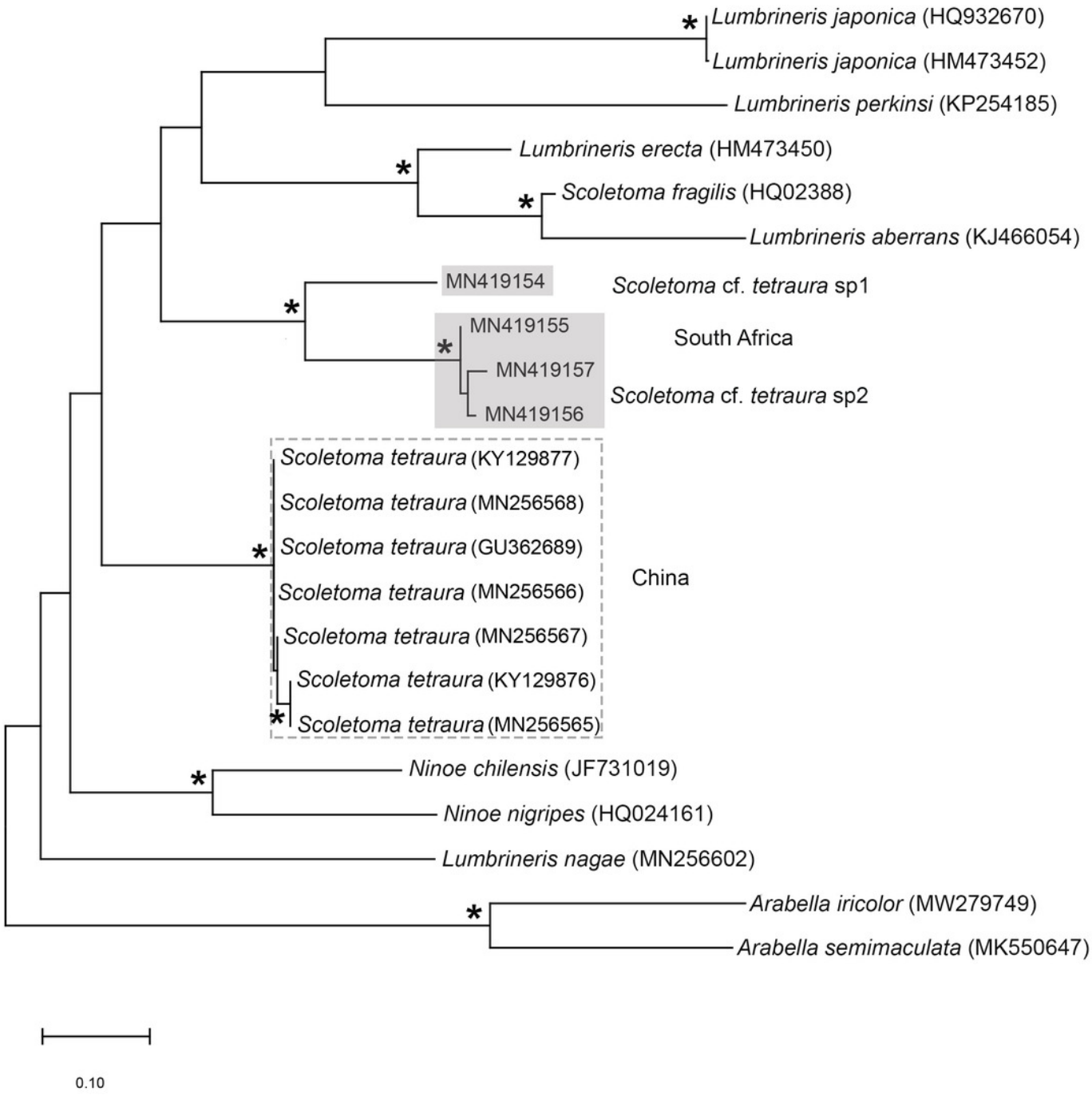
Lumbrineris japonica (HQ932670)
Lumbrineris japonica (HM473452)
Lumbrineris perkinsi (KP254185)
Lumbrineris erecta (HM473450)
Scoletoma fragilis (HQ02388)
Lumbrineris aberrans (KJ466054)
MN419154
Scoletoma cf. tetraura sp1
MN419155
South Africa
MN419157
Scoletoma cf. tetraura sp2
MN419156
Scoletoma tetraura (KY129877)
Scoletoma tetraura (MN256568)
Scoletoma tetraura (GU362689)
Scoletoma tetraura (MN256566)
Scoletoma tetraura (MN256567)
Scoletoma tetraura (KY129876)
Scoletoma tetraura (MN256565)
China
Ninoe chilensis (JF731019)
Ninoe nigripes (HQ024161)
Lumbrineris nagae (MN256602)
Arabella iricolor (MW279749)
Arabella semimaculata (MK550647)
0.10

Figure 15

Morphology of *Marphysa corallina*

Figure 15. *Marphysa corallina* A. Dorsal anterior, fixed specimen, B) Posterior chaetiger with branchia, C) Bidentate acicula chaetae with guard (on left) and unidentate/blunt aciculae (on right), D) Compound falcigers, comb and capillary chaetae, E) Limbate (lc) and winged (wc) capillaries. Scale bars: A= 5mm, B = 0.5mm, C = 0.2mm, D = 50um, E = 0.2mm. A = MB-A090277.

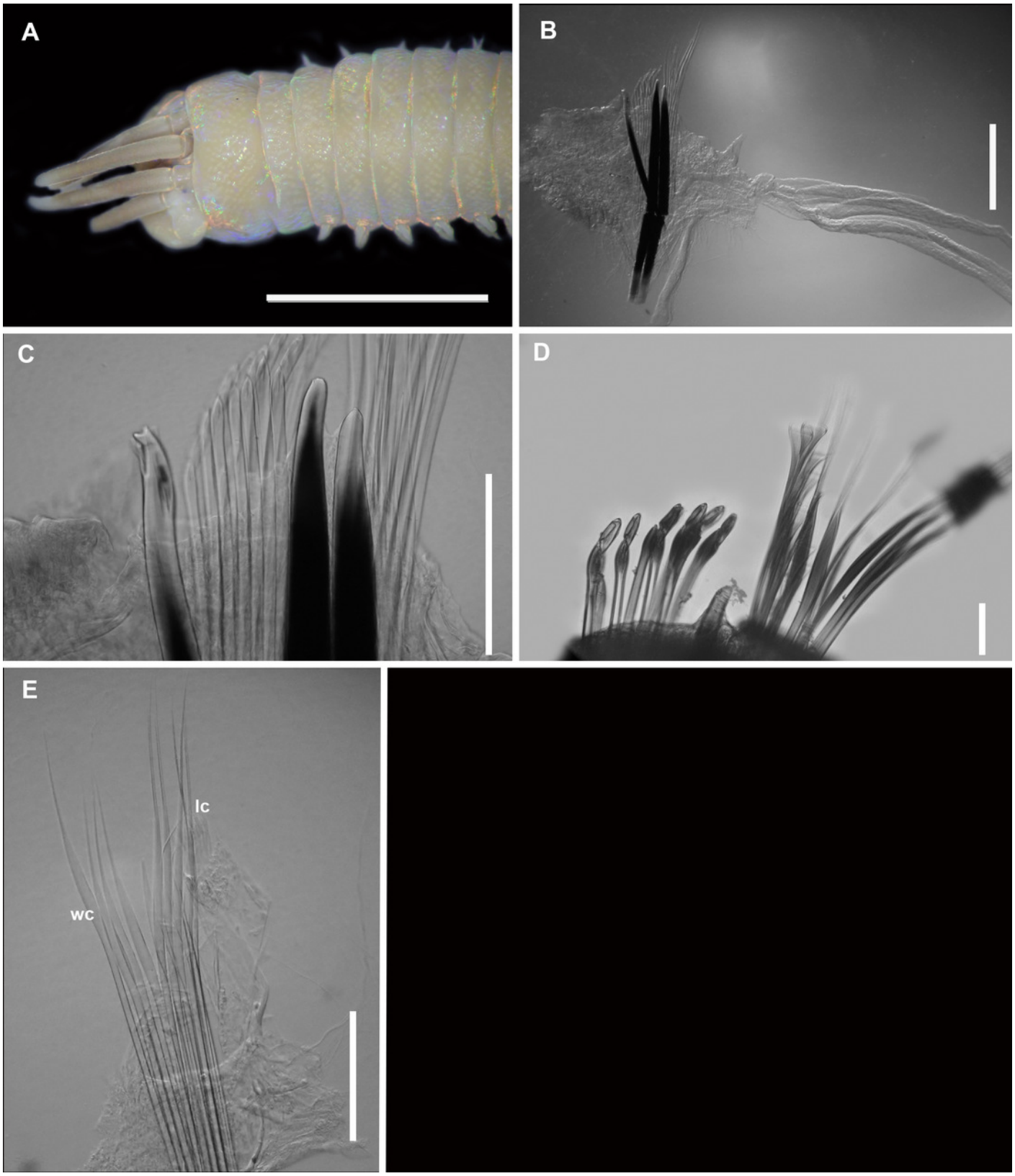
A
B
C
D
E
lc
wc

Figure 16

Neighbour Joining tree of Eunicidae

Figure 16. Neighbour Joining tree of various species belonging to family Eunicidae, including *Marphya* and *Lysidice* from South Africa. * Indicates bootstrap support greater than 80%. Grey highlighted areas indicate sequences generated in this study. Red branch represents a questionable sequence labelled as *Lysidice natalensis* from India. *Palola viridis, Eunice rubra* and *Hyalinocea* sp. were used as outgroups. Scale bar represented substitutions per site.

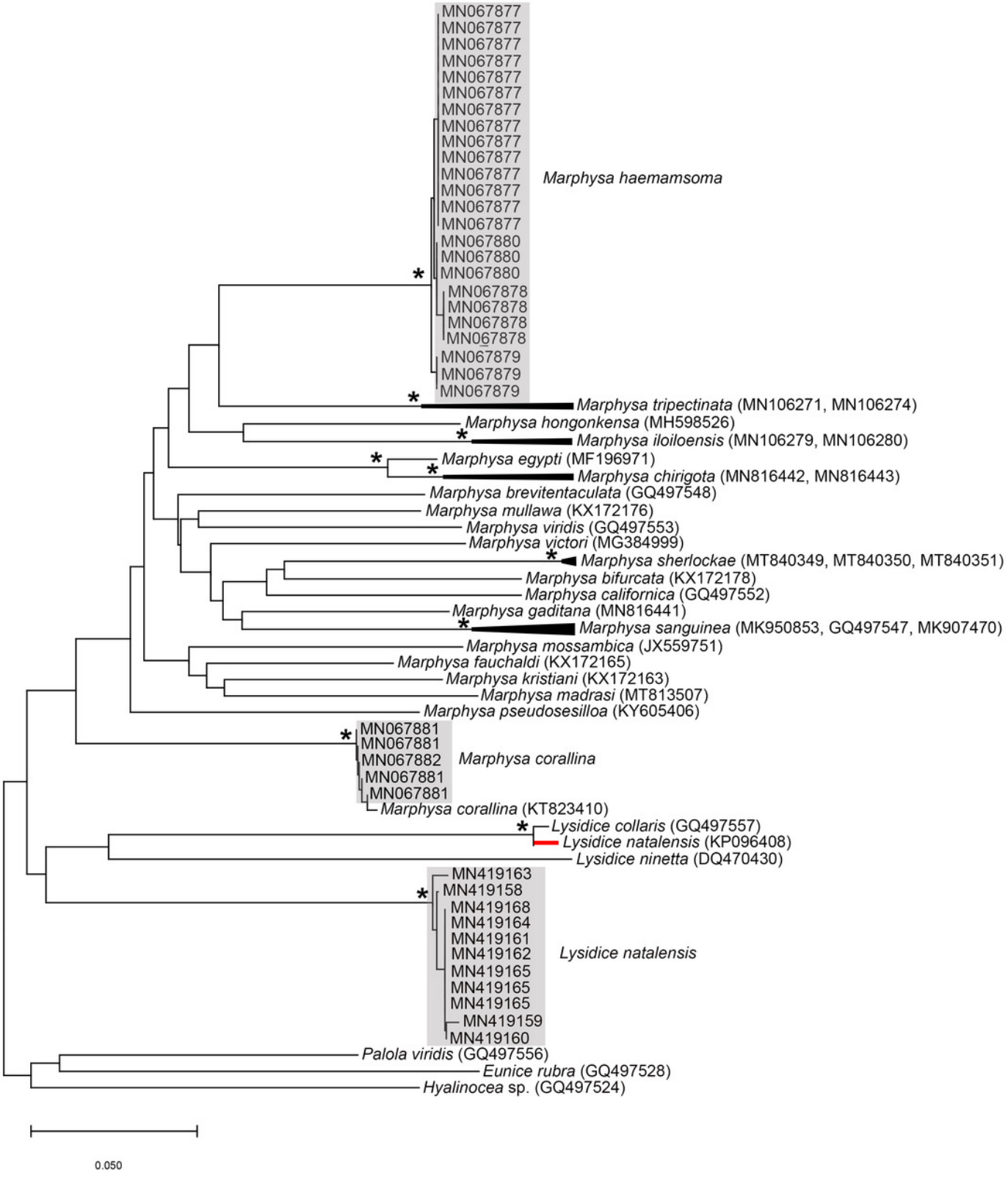
MN067877
MN067877
MN067877
MN067877
MN067877
MN067877
MN067877
MN067877
MN067877
MN067877
MN067877
MN067877
MN067877
MN067880
MN067880
MN067880
MN067878
MN067878
MN067878
MN067878
MN067879
MN067879
MN067879
Marphysa haemamsoma
Marphysa tripectinata (MN106271, MN106274)
Marphysa hongonkensa (MH598526)
Marphysa iloiloensis (MN106279, MN106280)
Marphysa egypti (MF196971)
Marphysa chirigota (MN816442, MN816443)
Marphysa brevitentaculata (GQ497548)
Marphysa mullawa (KX172176)
Marphysa viridis (GQ497553)
Marphysa victori (MG384999)
Marphysa sherlockae (MT840349, MT840350, MT840351)
Marphysa bifurcata (KX172178)
Marphysa californica (GQ497552)
Marphysa gaditana (MN816441)
Marphysa sanguinea (MK950853, GQ497547, MK907470)
Marphysa mossambica (JX559751)
Marphysa fauchaldi (KX172165)
Marphysa kristiani (KX172163)
Marphysa madrasi (MT813507)
Marphysa pseudosesilloa (KY605406)
MN067881
MN067881
MN067882
MN067881
MN067881
Marphysa corallina
Marphysa corallina (KT823410)
Lysidice collaris (GQ497557)
Lysidice natalensis (KP096408)
Lysidice ninetta (DQ470430)
MN419163
MN419158
MN419168
MN419164
MN419161
MN419162
MN419165
MN419165
MN419165
MN419159
MN419160
Lysidice natalensis
Palola viridis (GQ497556)
Eunice rubra (GQ497528)
Hyalinocea sp. (GQ497524)
0.050

Figure 17

Morphology of *Marphysa haemasoma*

Figure 17. *Marphysa haemasoma.* A) Dorsal anterior, live specimen B) Head of live specimen showing palps with blueish tinge and antennae, C) Middle chaetiger with branchia, D) Simple capillary chaetae, E) Compound spiniger, F) Pectinate chaetae (pc): Anodont. Scale bars: A= 5mm, B = 0.5mm, C = 0.2mm, D – E = 0.1mm. B=MB-A090326

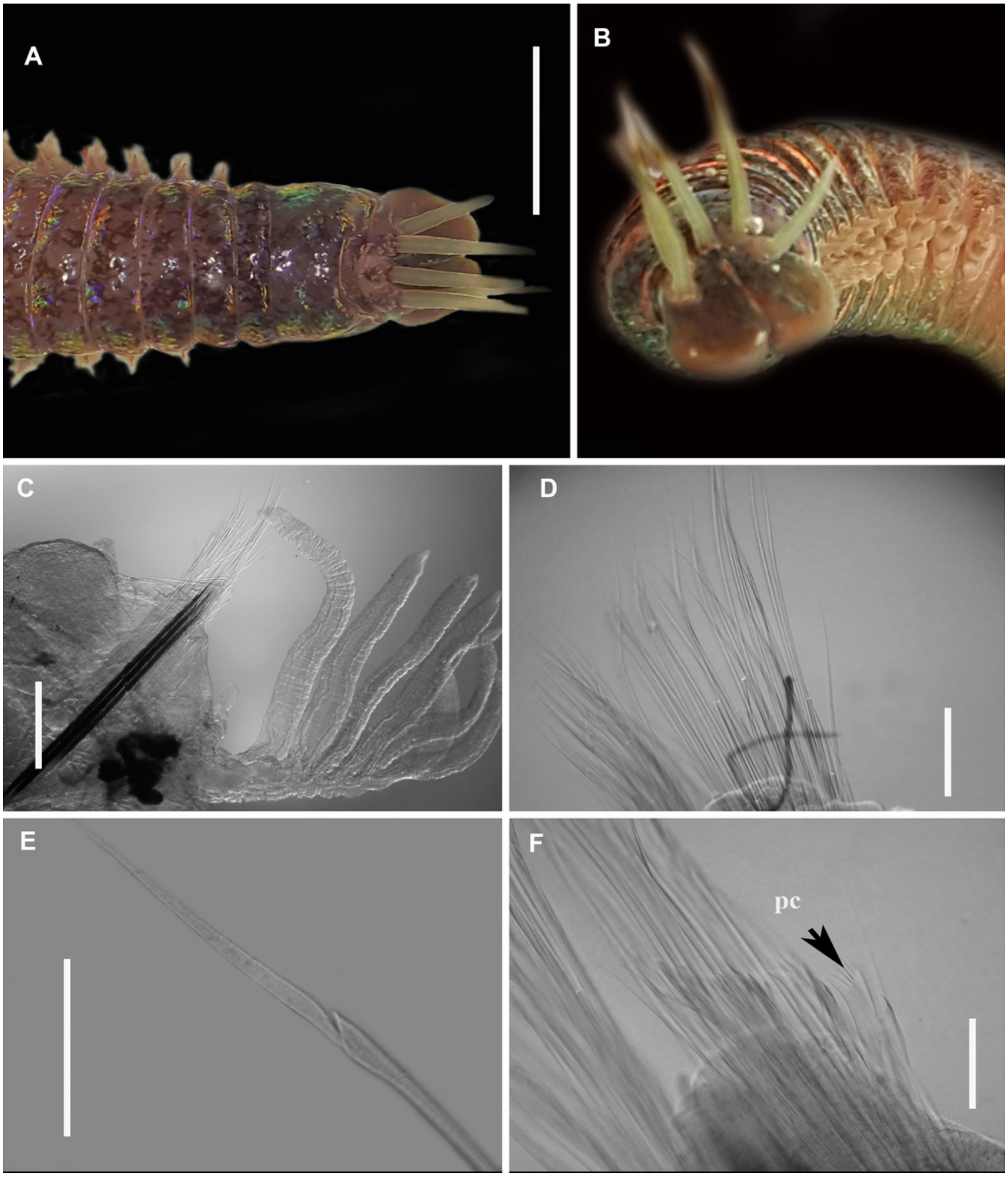
A
B
C
D
E
F
pc

Figure 18

Morphology of *Lysidice natalensis*.

Figure 18. *Lysidice natalensis*. A) Dorsal of head, preserved specimen, B) Chaetiger 5, C) Compound falciger of chaetiger 5, D) Compound falciger of chaetiger 28, E) Chaetiger 28, F) Limbate and comb (white arrowheads) chaetae of chaetiger 28, G) acicula hook of chaetiger 28, H) Posterior chaetiger. Scale bars: B, E, H = 0.5mm, C, D, F, G = 0.05mm. A – H = MB-A090291.

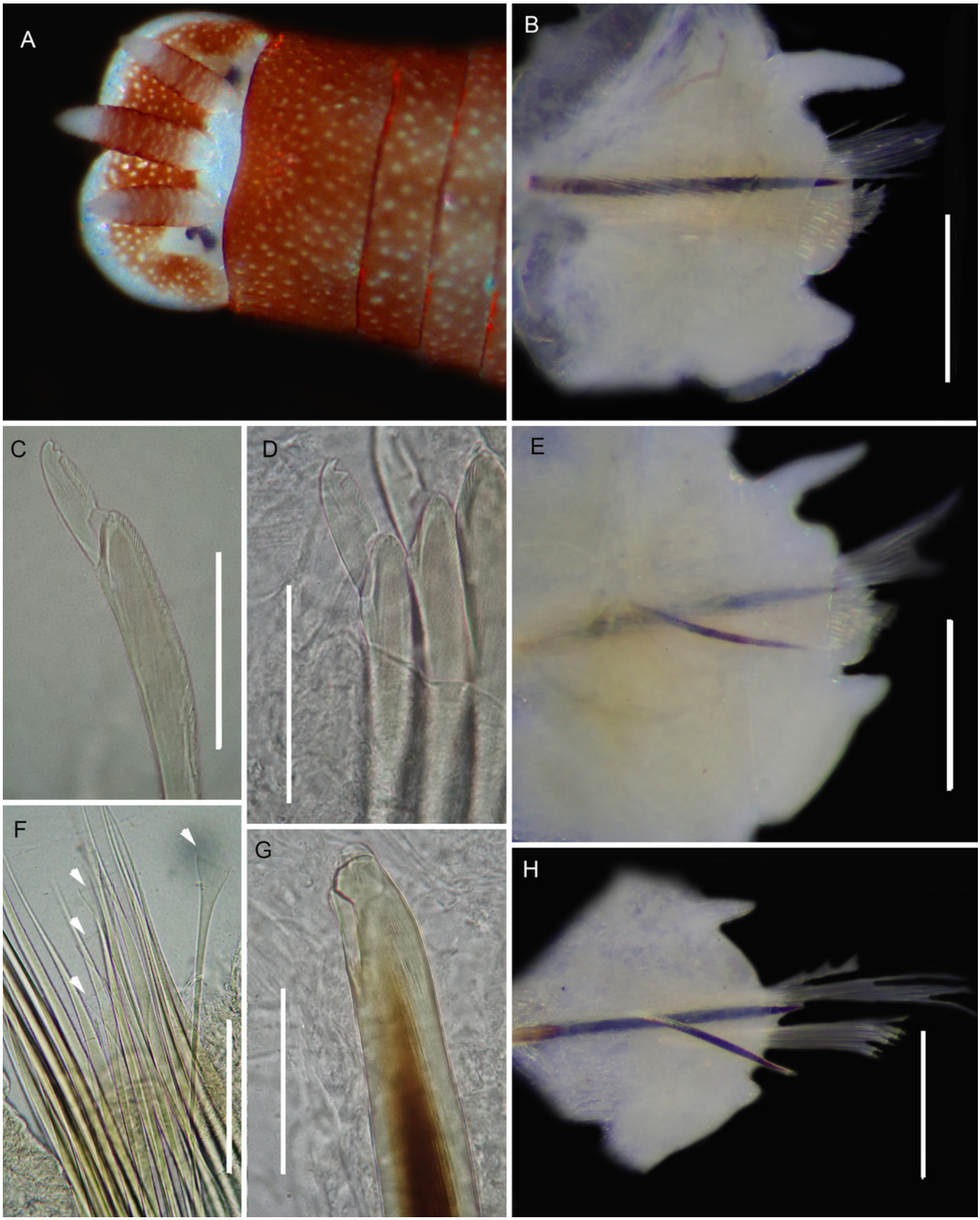
A
B
C
D
E
F
G
H

Figure 19

Morphology of *Heptaceras quinquedens*

Figure 19. *Heptaceras quinquedens*, A) Dorsal anterior of preserved specimen showing peristomial notch flanking prostomial ridge, laterally curving peristomial cirri and iridescent shine that remains after preservation, B) Dorsal anterior of live specimen, insert shows freckled spots on anterior dorsum, C) Ventral anterior of preserved specimen, D) Lateral anterior view of preserved specimen showing cylindrical shape of modified parapodia and progression of ventral cirri from subulate to globular form, E) Dorsal view of live specimen from chaetiger 11 – 92 showing fading of colouration from anterior to middle of body, F) Lateral view of live mid-section, G) Bidentate and tridentate falcigers, with minor third tooth encircled, H) Dorsal cirri from chaetiger 82 with small basal process encircled, I) Bidentate acicular chaetae, J) Pectinate chaetae. DC = Dorsal cirri, BR = Branchiae, VCS = Ventral cirri subulate form, VCG = Ventral cirri globular form. Scale bars: A = 1mm; B, C, D, F = 5mm; E = 10mm; G, I = 0.1mm; J = 5µm. A, D, H = MB-A090434; B, E, F = MB-A090442; C, G, J = MB-A090424.

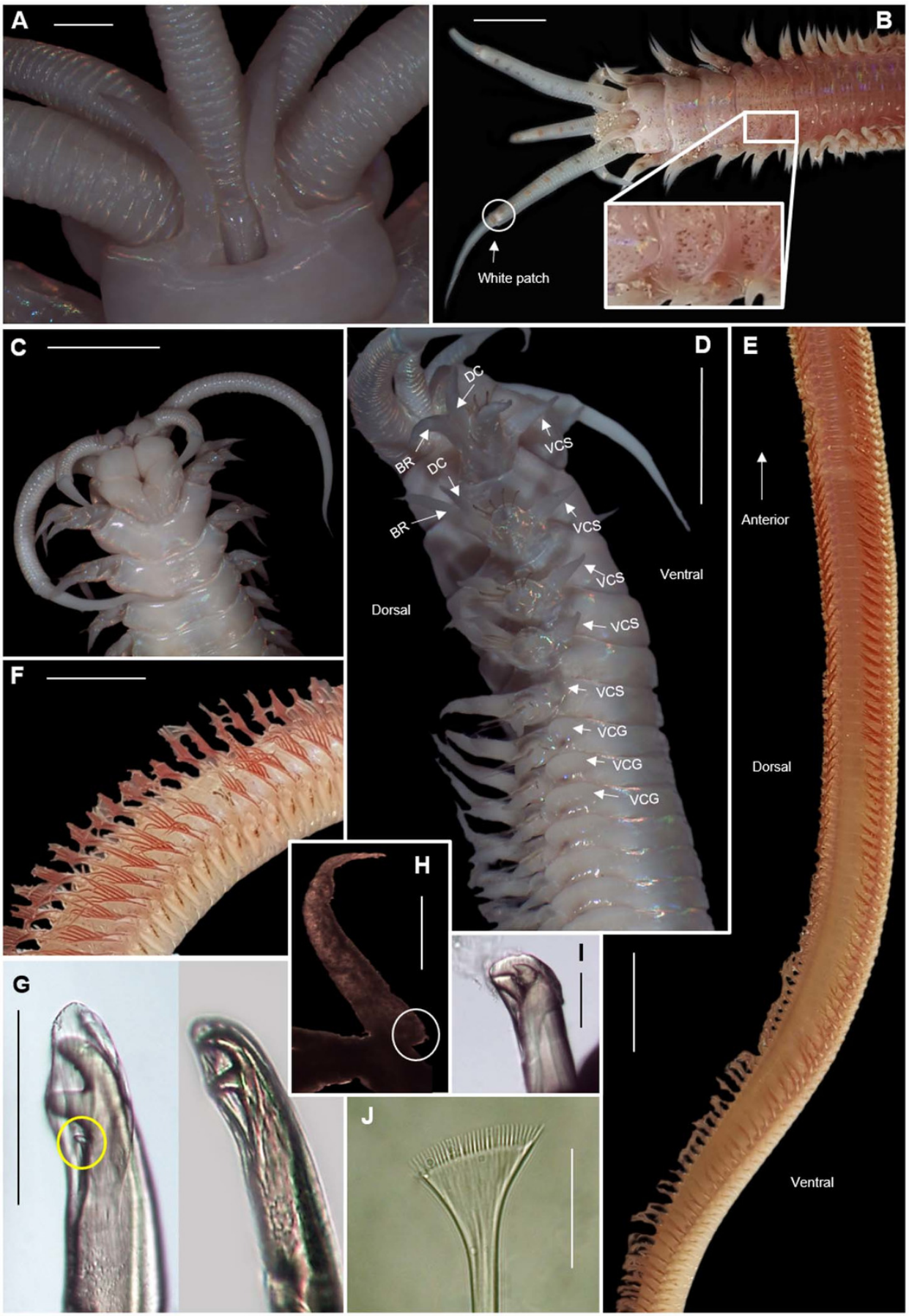
A
B
White patch
C
D
DC
BR
DC
BR
VCS
VCS
VCS
VCS
VCS
VCG
VCG
VCG
Ventral
Dorsal
E
Anterior
Dorsal
Ventral
F
H
I
G
J

Figure 20

Morphology of *Platynereis latipalpa*

Figure 20. *Perineseis latipalpa*, A) Anterior region (dorsal), B) Areas 1, 2, 3, 4 on pharynx (antero-ventral), C) Areas V and VI on pharynx (dorsal), D) Areas VII-VIII on pharynx (ventral), E) Heterogomph spinigers (heS) and homogomph spinigers (hoS) with enlarged teeth at base, F) Heterogomph falcigers with finely serrated blade. Scale bars: A, B, D = 2mm, C = 5mm, E – F = 0.1 mm.

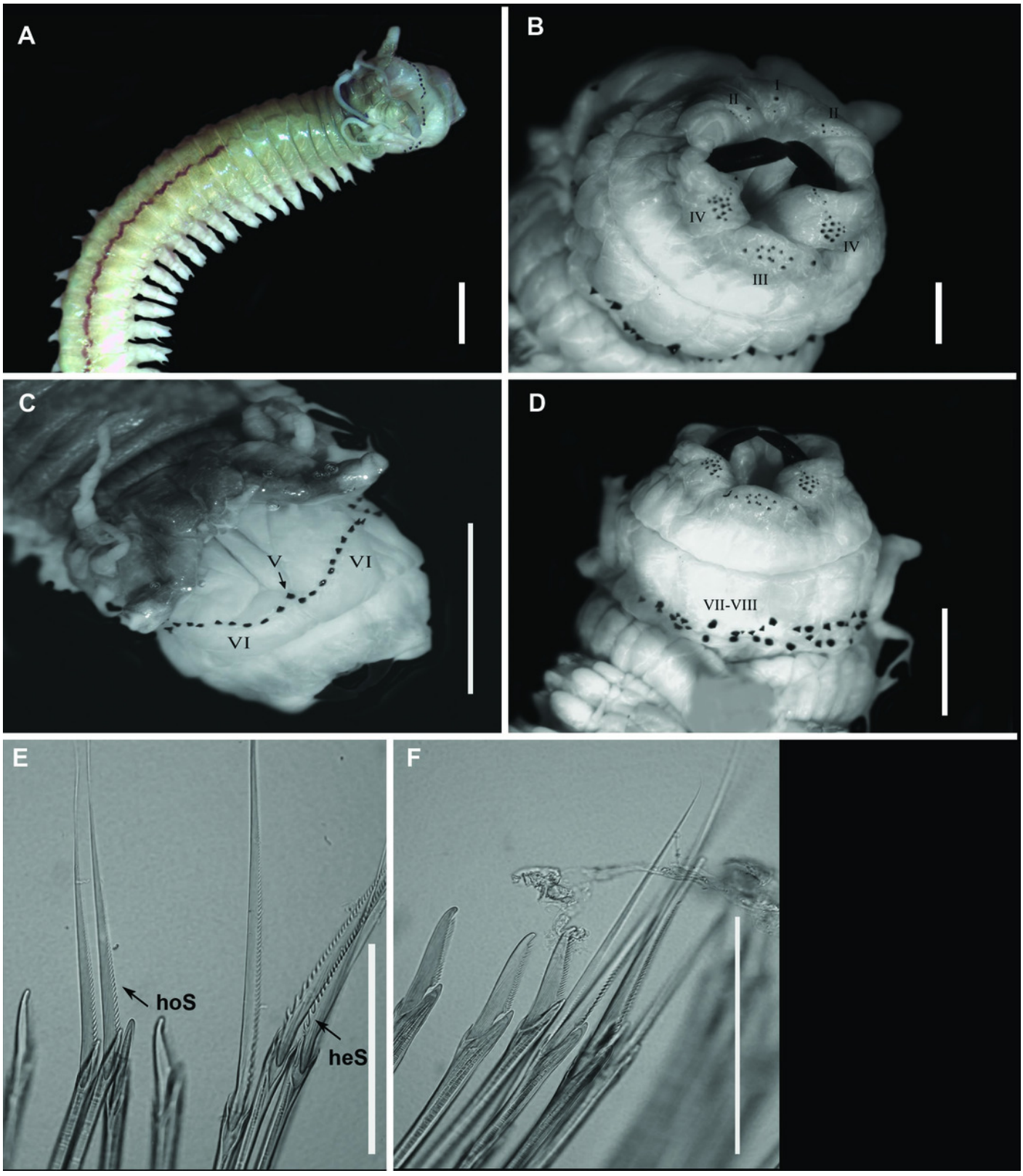
A
B
I
II
II
IV
IV
III
C
V
VI
VI
D
VII-VIII
E
hoS
heS
F

Figure 21

Morphology of *Pseudonereis podocirra*

Figure 21. *Pseudonereis podocirra.* A) Anterior view (dorsal), B) Posterior view, (dorsal? Ventral?) C & D) Paragnaths on pharynx, E) 30th parapodium, dorsal, F) Compound falciger with serrated blade, G) Compound spiniger with serrated blade. Scale bars: A, B: 2mm, C – E: 1mm, F – G: 0.1mm

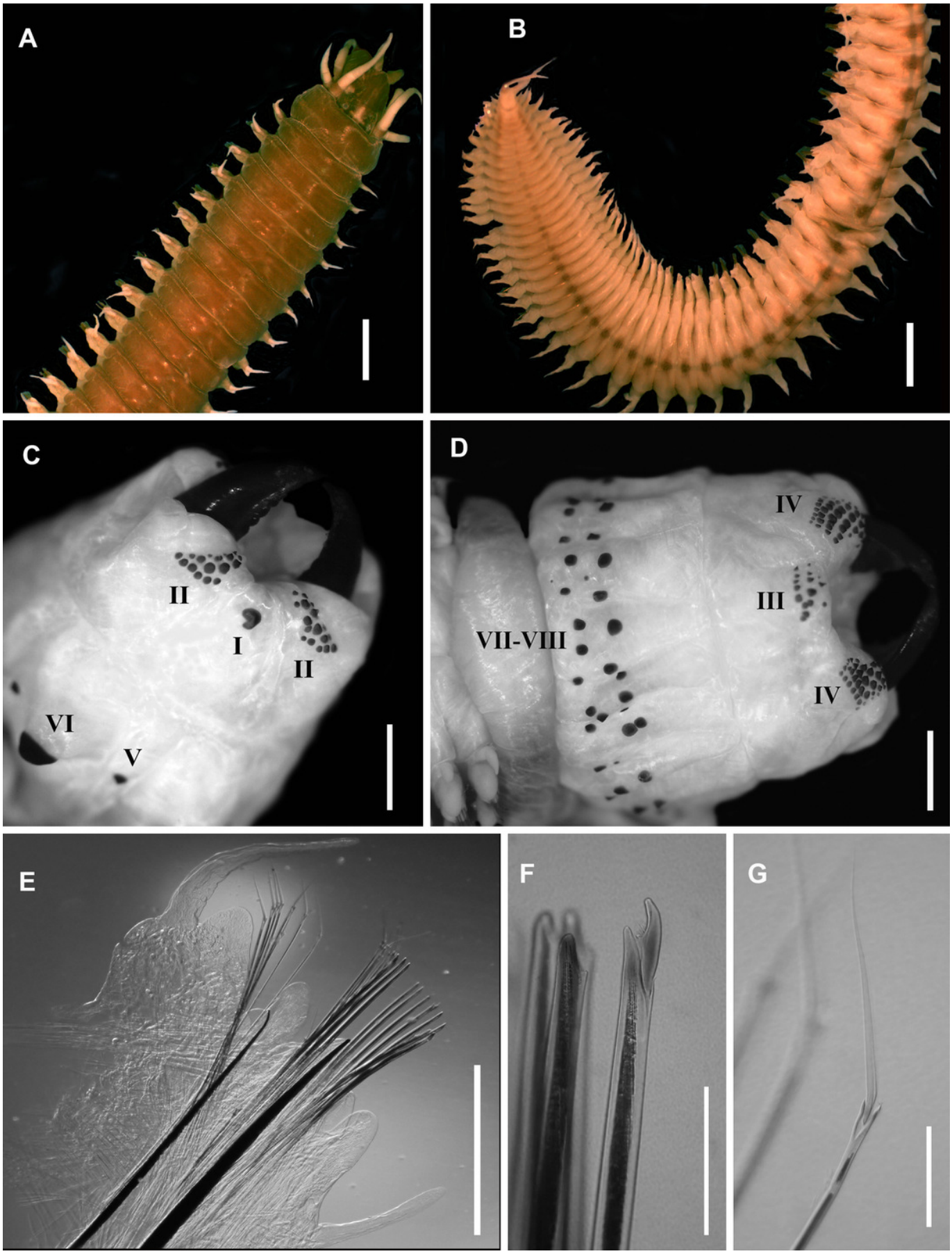
A
B
C
II
I
II
VI
V
D
IV
III
VII-VIII
IV
E
F
G

Figure 22

Neigbour joining tree of *Pseudonereis*

Figure 22. Neighbour Joining tree of various species belonging to *Pseudonereis.* * Indicates bootstrap support greater than 80%. Area highlighted in grey indicates sequences generated in the present study. *Perinereis aibuhitensis* was used as an outgroup. Scale bar represents substitutions per site.