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

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Background. Common names are frequently used inconsistently for marine annelid species used as bait in the peer-reviewed literature, field guides and legislative material. The taxonomy of many such species based on morphology only also ignores cryptic divergences not yet detected. Such inconsistencies hamper effective management of marine annelids, 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 marine annelids in the Western Cape Province of South Africa. **Methods.** Fifteen recreational and six 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 the families Siphonosomatidae, Arenicolidae, Sabellaridae, Lumbrineridae, Eunicidae, Onuphidae and Nereididae. 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* species, *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 Onuphidae, 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 initially identified as *Gunnarea gaimardi* and *Scoletoma tetraura* according to identification keys. Similarly, sequences for *Scoletoma* species 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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2   Province, South Africa

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17   **Abstract**

18   **Background.** Common names are frequently used inconsistently for marine annelid species

19   used as bait in the peer-reviewed literature, field guides and legislative material. The taxonomy

20   of many such species based on morphology only also ignores cryptic divergences not yet

21   detected. Such inconsistencies hamper effective management of marine annelids, especially as

22   fishing for recreation and subsistence is increasing. This study investigates the scale of the

23   problem by studying the use and names of bait marine annelids in the Western Cape Province

24   of South Africa.

25   **Methods.** Fifteen recreational and six subsistence fishers at 12 popular fishing sites in the

26   Western Cape Province donated 194 worms which they identified by common name. Worms

27   were assigned scientific names according to a standard identification key for polychaetes from

28   South Africa, and mitochondrial cytochrome oxidase I (COI) amplified and sequenced.

29   **Results.** This study identified 11 nominal species known by 10 common names, in the families

30   Siphonosomatidae, Arenicolidae, Sabellaridae, Lumbrineridae, Eunicidae, Onuphidae and

31   Nereididae. Cryptic diversity was investigated through employing mitochondrial COI sequences

32   and these data will facilitate future identifications among widely distributed species. Several

33   species (*Siphonosoma dayi*, *Abarenicola gilchristi*, *Scoletoma* species, *Marphysa corallina*,

34   *Lysidice natalensis*, *Heptaceras quinquedens*, *Perinereis latipalpa*) are reported as bait for the

35   first time, and while the names blood- and moonshineworms were consistently applied to

36   members of Arenicolidae and Onuphidae, respectively, coralworm was applied to members of

37   Sabellaridae and Nereididae. Analysis of COI sequences supported morphological investigations

38   that revealed the presence of two taxonomic units each for specimens initially identified as

39   *Gunnarea gaimardi* and *Scoletoma tetraura* according to identification keys. Similarly,

40   sequences for *Scoletoma* species and *Lysidice natalensis* generated in this study do not match

41   those from specimens in China and India, respectively. Further research is required to resolve

42   the species complexes detected and also to refine the use of names by fishermen over a wider

43   geographic range.

45 **Keywords: COI mtDNA, common name, pseudocryptic species, taxonomy, bloodworm,**

46 **coralworm, moonshineworm, musselworm, polychaetes, puddingworm, wonderworm**

48   **Introduction**

50   In South Africa, shore-based marine fishing is an important recreational activity and part of the

51   livelihood for many subsistence fishermen and has shown a steady increase over the last

52   decades (McGrath et al., 1997; Sowman et al., 2014; Saayman et al., 2017).There is a close link

53   between shore fishing and bait collecting (MacKenzie, 2005), so an increase in fishing intensity

54   will certainly correlate with an increase in harvesting of natural stocks of bait species (Nel &

55   Branch, 2014 cf. Hodgson, Allanson & Cretchley, 2000; Napier, Turpie & Clark, 2009; Simon et

56   al., 2019a). However, in a recent assessment of the impacts of recreational and subsistence

57   fishing in marine ecosystems in South Africa, impacts of bait collecting received just a passing

58   mention (Majiedt et al., 2019). This supports Watson et al. (2017) who suggested that despite

59   their wide use, marine annelids (i.e., polychaete worms) and probably many other bait species

60   are universally a poorly managed resource.

62   A wide variety of marine invertebrates are used as bait by South African fishermen (MacKenzie

63   2005; Branch et al., 2016; DAFF, 2017). However, live marine annelids (indigenous or imported)

64   are not sold in bait shops and are instead collected by subsistence and recreational fishermen

65   who should possess appropriate permits (DAFF, 2017). Collection is controlled by taxon-specific

66   daily limits (DAFF, 2017), but these restrictions have remained almost unchanged for decades

67   (cf. Gaigher, 1979; van Herwerden et al., 1989 and DAFF, 2017). Furthermore, although nearly

68   2.5 million worms are harvested annually (Turpie, Heydenrych & Lamberth, 2003), biological

69   information to inform management strategies is limited (Gaigher, 1979; van Herwerden, 1989;

70   Lewis, 2005; Simon et al. 2020) while restrictions on collection also do not accommodate the

71   different bait collecting habits by recreational and subsistence fishermen (Simon et al. 2019a).

72   Knowing which species are being utilised is an important step towards improving management

73   of a resource as many bait species, including those that may be morphologically very similar,

74   may have different life history traits and habitat requirements (Hutchings & Lavesque, 2021),

75   which may influence the vulnerability of species to exploitation. The Marine Recreational

76   Activity Information Brochure issued by the Department of Agriculture, Forestry and Fisheries

77 in South Africa (now the Department of Forestry, Fisheries and Environment; DAFF 2017)

78 identifies bait worms generically as seaworms, polychaetes and flatworms, and by various

79 common names. The only taxa identified by genus are *Arenicola* Lamarck, 1801, *Nereis*

80 Linnaeus, 1758, *Pseudonereis* Kinberg, 1865b and *Gunnarea* Johannson, 1927. As no images are

81 included in the brochure, it is unclear what the worms listed by common name are. However,

82 the popular *Two Oceans: A guide to the Marine Life of southern Africa* (Branch et al., 2016)

83 provides images and common and scientific names for some baitworms: bloodworm (*Arenicola*

84 *loveni* Kinberg, 1866), musselworm (*Pseudonereis podocirra* (Schmarda, 1861) as *P. variegata*

85 (Grube & Kröyer, 1858)), wonderworm (*Eunice aphroditois* (Pallas, 1788)), Cape reef worm

86 (*Gunnarea gaimardi (*Quatrefages, 1848), as *G. capensis* (Schmarda, 1861) in earlier editions),

87 and the estuarine wonderworm (*Marphysa haemasoma* Quatrefages, 1866 as *M. elityeni* Lewis

88 & Karageorgopolous, 2008, see Kara et al. 2020). The species names for bloodworm,

89 musselworm and Cape reef worm (also known as coralworm in Branch et al., 2016) correspond

90 with those provided in the Government Gazette No. 39790 (Marine Living Resources Act 2014).

91 The latter source, however, uses different names for *E. aphroditois* (Bobbit or errant worm),

92 *Arabella iricolor (*Montagu, 1804) (moonshineworm) and *M. haemasoma* (wonderworms and

93 listed as *M. sanguinea (*Montagu, 1813)). The situation is further complicated by reports of bait

94 worms in other sources; for example, *Diopatra* Audouin & Milne-Edwards, 1833 species have

95 been called case worm (Day, 1974), moonshineworm (Napier, Turpie & Clark, 2009; van

96 Rensburg, Matthee & Simon, 2020), estuarine wonderworm (Smith & Smith, 2012; Allanson et

97 al., 2016) and coralworm (Fielding, 2007, Fielding personal communication), while *E.*

98 *aphroditois* has also been called coralworm (Wooldridge & Coetzee, 1998). Thus, management

99 of utilised worms may be hampered by confusion around the identities of the species that are

100 harvested, and a lack of consensus in the names used among fishermen, scientists and

101 managers active in South Africa.

102

103 The confusion around the use of common names is further complicated by recent taxonomic

104 research which emphasised how poor our understanding of the biodiversity of South African

105 marine annelids, including some used as bait, is. For example, *P. podocirra* and *M. haemasoma*

106   were removed from synonymy with apparently globally widespread *P. variegata* and *M.*

107   *sanguinea*, respectively, so both are in fact indigenous to South Africa (Lewis &

108   Karageorgopoulos, 2008; Kara, Macdonald & Simon, 2018; 2020). By contrast, the *Diopatra*

109   species used as bait in two estuaries on the south and southeast coasts of the country (van der

110   Westhuizen & Marais, 1977; Fielding, 2007; Napier, Turpie & Clark, 2009; Simon et al., 2019a),

111   was only recently identified as *D. aciculata* Knox & Cameron, 1971 (van Rensburg, Matthee &

112   Simon, 2020). This species was originally described in Australia (Knox & Cameron, 1971) and is

113   probably alien in South Africa (Elgetany et al., 2020; van Rensburg, Matthee & Simon, 2020). At

114   least two other bait species, *A. iricolor* and *E. aphroditois*, are also apparently globally

115   widespread with type localities geographically distant from South Africa (see Day, 1967), and

116   may therefore either be misidentified indigenous, or unacknowledged alien species. Some

117   species that are harvested (e.g., *P. podocirra, E. aphroditois, A. iricolor, G. gaimardi*) are also

118   widespread within South Africa (Day, 1967; Branch et al., 2016). The ranges of these species,

119   which have planktonic larvae, span multiple known phylogeographic barriers to gene flow in

120   the region. It is thus likely that complexes of genetically distinct but morphologically identical or

121   similar lineages exist (i.e., cryptic or pseudocryptic species, respectively), each with discrete

122   distributions. This was shown for species previously identified as *Pseudopolydora antennata*

123   Claparède, 1869 from temperate and subtropical regions of the country (Simon, Sato-Okoshi &

124   Abe, 2019b), emphasising the need for thorough taxonomic studies of seemingly widespread

125   species.

126

127   This study builds on taxonomic information gathered to date, and explores the use of common

128   names and the nomenclature of marine annelid worms used as bait in the Western Cape

129   Province where fishing is particularly popular (Madjiet et al., 2019), and where harvesting of

130   worms is high (Turpie, Heydenrych & Lamberth, 2003). Furthermore, the province spans two

131   vicariant barriers to gene flow at Cape Point and Cape Agulhas (Teske et al., 2011, Fig. 1), and

132   this may also split species into different taxonomic units. The specific aims of the study are to:

133   1) identify and provide updated descriptions of the annelid species collected as bait by

134   recreational and subsistence fishermen in the Western Cape Province of South Africa; 2) collate

135   the common names used by the fishermen towards developing consensus for improved

136   management; and 3) generate mtCOI sequences to explore the existence of species complexes

137   locally and globally and facilitate identifications.

138

139   **Methodology**

140   Sample sites and collection

141   Sampling was conducted at 12 popular beach and estuarine fishing locations in the Western

142   Cape Province, South Africa (Fig. 1), from June 2016 to May 2017. Collectively, these sites

143   included sandy (Saldanha Bay, Muizenberg, Strand, Betty's Bay, Pearly Beach, Struisbaai,

144   Witsand, Knysna) and or rocky (Velddrif, Melkbosstrand, Kommetjie, Betty's Bay, Hermanus,

145   Witsand) habitats, which would influence the presence and absence of species collected. Most

146   worms were donated by bait collectors who all gave their prior consent to participate in the

147   project. Involvement by most recreational fishermen was confirmed prior to sampling via

148   fishing mailing lists or word of mouth. Some additional recreational and all subsistence

149   fishermen were approached on site. After the aims of the study were described to participants

150   and verbal consent received (ethical clearance number: SU-HSD-001609 from Stellenbosch

151   University), worms were collected according to the permitted methods (DAFF 2017), under

152   permit RES2017-27 issued to CAS by the Department of Forestry, Fisheries and Environment.

153   Additional samples of arenicolids (bloodworm) were collected by the authors using the same

154   techniques (see Simon et al., 2020). The common names used by the bait collectors were noted

155   for all worms. All sampling was conducted during low tide, with specific collection methods for

156   the different taxa included in the systematic accounts below. In some instances, fishermen

157   were only willing to donate a small piece of the worm that was sufficient for genetic analysis.

158

159   Specimen identification and processing

160   Samples were relaxed in an isotonic solution of 7% $MgCl_2$ in tap water, measured and

161   photographed. A section of each specimen from the mid-body or posterior was placed in 96%

162   ethanol for molecular analysis. The rest of the specimen was fixed in 4% formalin in seawater

163   for at least 2 days, washed in distilled water and stored in 70% ethanol. Samples were

164 examined on Leica DM1000 light and MZ75 dissecting microscopes, and photographed with a

165 Leica EC3 camera attachment, or on Leica DM750 light and M80 dissecting microscopes and

166 photographed with an Olympus Targus TG5 attached to the microscope eyepieces. Where

167 necessary, images were stacked in Helicon Focus Version 7.6.4 and processed in Photoshop

168 Version C6. Specimens were identified using Day (1967; 1974), and where necessary, more

169 recent literature appropriate to individual taxa. All specimens were deposited at IZIKO South

170 African Museum (Table 1).

171

172 DNA extraction, amplification and sequencing

173 Approximately 25 mg of tissue was used either from mid-section or posterior end to extract

174 DNA using the Zymo Quick DNA™ MiniPrep Plus kit (Zymo-Spin™) according to manufacturer's

175 protocol. The universal primer pair: LCO1490 and HCO2198 (Folmer et al., 1994) was used to

176 amplify a fragment of the cytochrome oxidase subunit 1 gene for all species. The following PCR

177 thermal conditions were used: 94°C for 3 minutes; 34 cycles with 94°C for 45 seconds, 42°C for

178 1 minute and 72°C for 1 minute and a final extension at 72°C for 7 minutes (Bleidorn et al.,

179 2005). The amplified PCR products were visualised on a 1% agarose gel using 3 µl of PCR

180 product and 5 µl of Quick-Load Purple 100bp DNA ladder (New England BioLabs Inc.), following

181 Simon et al. (2020). All PCR products were sequenced using Sanger sequencing at the Central

182 Analytical Facility at Stellenbosch University. All newly generated sequences were uploaded on

183 GenBank (Table 1).

184

185 Molecular analysis

186 Sequences were edited in BioEdit Version 7.2.6 (Hall, 1999) and aligned using ClustalW with

187 default parameters in MEGA X (Kumar et al., 2018). Neighbour joining trees were constructed in

188 the same program, per family. Nodal support was obtained using 10 000 bootstrap replicates

189 using the maximum composite likelihood method, with uniform rates and pairwise deletion.

190

191 **Results**

192

193   Worms were donated by 15 recreational and six subsistence fishers, with two additional fishers

194   who were not categorised (Table 1). In total, these fishers donated 194 specimens belonging to

195   seven families and 11 nominal species: *Siphonosoma dayi* Stephen, 1942, *Abarenicola gilchristi*

196   Wells, 1963, *Arenicola loveni*, *Gunnarea gaimardi*, *Scoletoma* cf. *tetraura*, *Marphysa* cf.

197   *corallina*, *M. haemasoma*, *Lysidice natalensis* Kinberg, 1865, *Heptaceras quinquedens* (Day,

198   1951), *Perinereis latipalpa* (Schmarda, 1861) and *Pseudonereis podocirra* (Table 1). Together,

199   these species were referred to by 10 common names (Table 1). Sequences could not be

200   generated for *Heptaceras quinquedens* and *Perinereis latipala* even after multiple attempts,

201   with the remaining nine species representing 11 genetically distinct species, including two

202   species each of *Gunnarea* and *Scoletoma* (Table 1).

203

204   Taxonomic account

205   Order: Sipuncula Stephen, 1964

206   Family: Siphonosomatidae Kawauchi, Sharma & Giribet, 2012

207   Genus: *Siphonosoma* Spengel, 1912

208   Species: *Siphonosoma dayi* Stephen, 1942

209   Figs 2 & 3

210

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

212   Common name: Sandworm.

213

214   *Material examined*: Knysna: 34°03'56.0"S 23°02'57.4"E, 2 specimens, MB-A090313 and MB-

215   A090318, 27 January 2017, coll. A. N. du Toit, mid-intertidal sandflats in estuary.

216

217   *Description*: Trunk length 198 and 230 mm, introvert of former 17 mm. In life body light to dark

218   pink, colour retained after fixation (Fig. 2A), internally pearlescent pink (Fig. 2E – H). Skin

219   covered with oval shaped papillae in longitudinal rows, following contours of circular muscle,

220   appear white after fixation. Introvert has terminal mouth ringed with short tentacles (Fig. 2B);

221   papillae chitinised, tubular, scale-like and with dark edges arranged in rows on circular muscle

222   bands (Fig. 2B – D); larger and more numerous in anterior end (Fig. 2C) than posterior (Fig. 2D).

223   Longitudinal muscle-layer divided into 21 or 22 bands (Fig. 2E, G, black arrows), anastomosing

224   anteriorly to form single sheet in region of introvert (Fig. 2E, black arrowhead). Four retractor

225   muscles; dorsal pair attached to body wall anteriorly, ventral pair attached more posteriorly

226   (Fig. 2E, G, H white arrowheads). Two branches of spindle muscle insert close to dorsal

227   retractor muscles (Fig. 2H, black arrowhead). One pair of nephridia (Fig. 2E, F).

228

229   *Remarks*: New specimens match the original description by Stephen (1942). Although only two

230   specimens were collected and sequenced, *S. dayi* (Fig. 3) forms a well-supported clade which is

231   independent from other known species within the genus.

232

233   *Collection method*: Hand digging and pumping.

234   *Type locality*: Knysna, Western Cape Province, South Africa.

235   *Known distribution in South Africa*: Knysna (Day, 1974).

236   *Ecology*: In sand in low to mid intertidal in estuary.

237

238   Subclass: Sedentaria Lamarck, 1818

239   Infraclass: Scolecida Rouse & Fauchald, 1997

240   Family: Arenicolidae Johnston, 1835

241   Genus: *Arenicola* Lamarck, 1801

242   Species: *Arenicola loveni* Kinberg, 1866

243   Figs 4 – 6A & B

244

245   *Arenicola loveni* Kinberg, 1866: 355; Ashworth 1911: 2 – 17, Figs 1 – 3; Wells 1962: 348, Pl. 2 &

246   4; Day 1967: 610, Fig. 29.1 f – k; Day 1974: 62, Fig. 54; Branch et al. 2016: 72, Fig. 27.9

247   Common name: Bloodworm.

248

249   *Material examined*: Betty's Bay: 34°22'39.6"S 18°51'21.6"E, 3 specimens, MB-A090220 – MB-

250   A090222, 10 February 2017, mid-intertidal, sandy beach, coll. A. du Toit. Knysna: 34°03'28.6"S

251 23°02'30.9"E, 3 specimens, MB-A090231 – MB-A090233, 27 January 2017, 34°03'54.3"S

252 23°03'03.7"E, 2 specimens MB-A090234 – MB-A090235, 28 January 2017, 2 specimens,

253 34°03'54.3"S 23°03'03.7"E, 29 January 2017, MB-A090236 – MB-A090237, mid-intertidal sandy

254 beach, coll. A. du Toit. Muizenberg, 34°06'18.7"S 18°28'47.4"E, 1 specimen, MB-A090230, 13

255 March 2017, coll. A. du Toit, 34°06'27.6"S 18°28'22.3"E, 1 specimen, MB-A090227, 2 specimens,

256 34°06'18.7"S 18°28'47.4"E, MB-A090228 – MB-A090229, 25 February 2017, 34°06'27.6"S

257 18°28'22.3"E, 1 specimen, MB-A090374, 25 February 2017, coll. A. du Toit and C. Naidoo; low

258 intertidal in surf zone, sandy beach. Pearly Beach: 34°39'33"S 19°29'27.43.6"E, 3 specimens

259 MB-A090246 – MB-A090248, 12 February 2017, coll. A. du Toit and H. van Rensburg, low-

260 intertidal, sandy beach. Saldanha Bay: 33°00'26.9"S 17°56'46.3"E, 7 specimens, MB-A090257 –

261 MB-A090263, 27 May 2017; 32°59'49.3"S 17°57'58.3"E, 3 specimens, MB-A090264 – MB-

262 A090266, 27 May 2017, 33°00'26.9"S 17°56'46.3"E, 1 specimen, MB-A090375, 27 May 2017,

263 coll. C. Naidoo, low intertidal, sandy beach. Struisbaai: 34°47'41.1"S 20°02'57.6"E, 1 specimen,

264 MB-A090238, 12 February 2017; 3 specimens, MB-A090239 – MB-A090241, 10 April 2017, 4

265 specimens, MB-A090242 – MB-A090245, coll. C. Naidoo, A. du Toit and H. van Rensburg, mid to

266 low intertidal, sandy beach. Witsand: 34°23'59.9"S 20°49'47.5"E, 7 specimens, MB-A090250 –

267 MB-A090256, coll. C. Naidoo, low intertidal, sandy beach.

268

269 *Description*: Live specimens up to 580 mm, including tail. Fixed specimens up to 296 mm long

270 (excluding achaetous tail), 19.2 mm wide at chaetiger 1. In life, body colour variable; pink to

271 brown, dark brown to black; usually darker in anterior, becoming lighter from branchial region

272 posteriorly (Fig. 4A, B, D), colour retained when fixed. Epidermis tessellated to chaetiger 5 or 6,

273 papillated from chaetae 6 or 7 onward, including achaetous tail. Chaetigerous annuli

274 prominent, number of annuli between first 4 chaetigers 2-3-4, thereafter 4 (Fig. 4D).

275 Anterior region consists of trilobed, non-retractable prostomium with nuchal groove on each

276 side (Fig. 4E, arrows). One achaetous segment with 2 annuli (Fig. 4C). Proboscis eversible;

277 covered with papillae, no pigment (Fig. 4C, E – H). Papillae on proximal section large and

278 triangular (Fig. 4C, E, F, H). Papillae in median section more densely packed, small and nipple-

279 shaped, becoming larger and more conical distally (Fig. 4C, F, G). One pair of long septal

280 pouches that reach back to at least third diaphragm (Fig. 5A, B). One pair of conical

281 oesophageal caecae (Fig. 5A). Thorax with 19 chaetigers. Notopodia rounded triangles,

282 retractable lobes in oval torus (Fig. 5E). Notochaetae capillaries in two rows, anterior row

283 shorter than posterior; with lateral toothed-crests and spinulose lamina (Fig. 6A). Neuropodia

284 oval bearing single row of unidentate hooks (Fig. 6B), sometimes with faint denticle.

285 Neuropodia long, approach midline of venter in branchiate region. Branchiae on chaetigers 7 –

286 19 (13 pairs), highly vascularised, highly branched, arborescent (tree-shaped) (Fig. 5F). On

287 chaetiger 7 branchiae vestigial; 2 – 10 short gill stems, palmar membrane sometimes

288 inconspicuous (Fig. 5E). Up to 22 main gill stems on branchiae on chaetigers 8 to 18, usually

289 fewer on chaetiger 19. Palmar membrane fuse lower third of gill stems (Fig. 5F), sometimes

290 papillated (Fig. 5G). Five pairs of nephridia on chaetigers 5 – 9; nephridiopores hooded, partially

291 hooded (Fig. 5C, D) or unhooded, posterior to dorsal end of neuropodium. Tail achaetous,

292 papillated, anus terminal.

293

294 *Remarks*: Specimens examined here conform to descriptions by Ashworth (1911) and Wells

295 (1962) which included type material, but maximum size is larger. However, oval depressions

296 seen by Ashworth (1911) ventral to some notopodia were not observed. The colour variants of

297 *A. loveni* from all sites form a well-supported clade (Fig. 7) which is exemplified by the fact that

298 those illustrated in Fig. 4A, B and D are represented by an identical sequence (MK 922158). This

299 clade includes two subclades, representing specimens collected on the west and south coasts,

300 respectively. The structure seen here was previously reported in Simon et al. (2020), where

301 nuclear data confirmed that these west and south coast clades represent a single species. The

302 separation between these clades is demarcated by Cape Point, a location known to present a

303 barrier to gene flow (Teske et al. 2011; Simon et al. 2020).

304

305 *Type locality*: Durban, KwaZulu-Natal, South Africa.

306 *Collection method*: By pump or digging with hand or trowel and hooking out with a wire. In

307 Muizenburg collected from within surfzone.

308   *Known distribution in South Africa*: Saldanha Bay (Western Cape Province) to Durban (Kwa-Zulu

309   Natal) (Day 1967).

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

311

312   Genus: *Abarenicola* Wells, 1959

313   Species: *Abarenicola gilchristi* Wells, 1963

314   Figs 6C & D & 8

315

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

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

318   Common name: Bloodworm, bakkiewurm.

319

320   *Material examined*: Betty's Bay: 34°22'S 18°51'E, 4 specimens (incomplete) (MB-A090223 – MB-

321   A090226), 3 June 2016, mid-intertidal, sand, coll. E. Newman. Pearly Beach: 34°39'48.4"S

322   19°29'17.2"E, 1 specimen (MB-A090249), 10 April 2017, low-intertidal, sand, coll. A. du Toit and

323   C. Naidoo.

324

325   *Description*: Up to 89 mm long (excluding achaetous tail), 11 mm wide at chaetiger 1. In life,

326   body orange-pink (Fig. 8A), light to dark pink when fixed (Fig. 8B). Epidermis tessellated to

327   chaetiger 4 or middle of chaetiger 5, papillated thereafter. Chaetigerous annuli of first three

328   chaetigers prominent, number of annuli between first four chaetigers 2-2 (3 in one specimen)-

329   4, thereafter 4 (Fig. 8B). Anterior region consists of trilobed, non-retractable prostomium and

330   one achaetous segment (Fig. 8B, D). Nuchal groove on each side (Fig. 8D). Proboscis eversible;

331   covered in papillae, no pigment (Fig. 8C). Papillae on proximal section sparsely distributed,

332   prominent, irregular in size, rounded (Fig. 8H). Papillae in median section densely packed, small,

333   rounded, skin folded (Fig. 8G). Papillae of distal section densely packed, conical (Fig. 8F).

334   Oesophageal caecae with one elongate and 11 to 20 smaller caecae on either side of mid-line

335   (Fig. 8E), elongate double to more than triple length of short caecae.

336 Thorax with 19 chaetigers. Notopodia rounded triangles, retractable lobes in oval torus.

337 Notochaetae spinulose capillaries (Fig. 6C) in single row. Neuropodia oval bearing single row of

338 unidentate, finely serrated, hooks (Fig. 6D). Neuropodia short, do not approach midline of

339 venter. Branchiae on chaetigers 8 – 19 (12 pairs) (Fig. 8A). Branchiae highly vascularised, large,

340 up to 19 main gill stems; highly branched, arborescent (tree-shaped), with lateral branches and

341 gill filaments off each stem (Fig. 8I). Palmar membrane fuse lower third to half of gill stems (Fig.

342 8I). Five pairs of nephridia on chaetigers 5 – 9; nephridiopores unhooded, hooded, and partially

343 hooded (Fig. 8J – L), posterior to dorsal end of neuropodium. Tail achaetous, papillate, anus

344 terminal.

345

346 *Remarks*: Specimens examined here conform to description by Wells (1963) and Day (1967), but

347 are smaller. *Abarenicola gilchristi* formed part of a distinct lineage in a well-supported clade

348 (Fig. 7) also comprising *Abarenicola brevior* (Wells, 1963) and *A. wellsi* Darbyshire, 2017.

349

350 *Collection method*: By hand or digging with trowel.

351 *Type locality*: Buffelsbaai, Cape Peninsula, Eastern Cape province, South Africa.

352 *Known distribution in South Africa*: Lambert's Bay to Walker Bay. Presence in Pearly Beach.

353 extends known distribution (Day, 1967) eastwards by only a few kilometres. Namibia: Luderitz.

354 Report in Tamil Nadu, India (Thilagavathi et al., 2013) must be treated with caution.

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

356

357 Order: Sabellida Levinsen, 1883

358 Family: Sabellariidae Johnston, 1865

359 Genus: *Gunnarea* Johannson, 1927

360 Species: *Gunnarea gaimardi* (Quatrefages, 1848)

361 Fig. 9

362

363 *?Pallasia gaimardi* Quatrefages, 1848a: 24, 1866: 322, Pl. 13. Figs 17 & 18

364 *?Hermella capensis* Schmarda, 1861: 23, Pl. 23. Fig. 171. *?Sabellaria capensis* McIntosh 1885:

365 418, Pl. 25A Figs 24 & 25, Pl. 26A Figs 11 712

366 *Gunnarea capensis* Day 1967: Fig. 33.2.d-i (NOT Schmarda, 1861), *in partum*

367 *Gunnarea gaimardi* Kirtley 1994: Fig. 3.1.2.a – e, *in partum*

368 *Gunnarea gaimardi* Branch et al. 2016: 73, Fig. 28.3

369 Common name: Coralworm, Cape reef worm, polwurm.

370

371 *Material examined:* Velddrif: 32°46'08.8"S 18°08'44.2"E, 10 specimens (incomplete), MB-

372 A090356 – MB-A090358, MB-A090360, MB-A090364, MB-A090367 – MB-A090371, 26 May

373 2017, sand reefs in the mid-intertidal rock pools, coll. A. N. du Toit. Bettys Bay: 34°22'39.6"S

374 18°51'21.6"E, 5 specimens (incomplete), MB-A090336, MB-A090337, MB-A090339 – MB-

375 A090441), 3 June 2016, reefs in the lower intertidal zone, coll. E. Newman. Hermanus:

376 34°24'41.1"S 19°16'44.8"E, 8 specimens (incomplete), MB-A090341 – MB-A090348), 11

377 February 2017, low to mid intertidal, coll. A. N. du Toit and H. van Rensburg.

378

379 *Description:* Body a maximum of 110 mm in length; body colour opaque white and cream with

380 irregular dark brown spots when fixed (Fig. 9A – C). Opercular crown and opercular stalk

381 completely fused (Fig. 9B). Two rows of golden outer and inner paleae, arranged in two

382 concentric rows (Fig. 9B). Approximately 44 – 48 outer paleae and 35 – 46 inner paleae. Outer

383 paleae geniculate, obtuse in shape with a single weak tooth on the antero-lateral margin (Fig.

384 9D1, 3). Inner paleae geniculate with elongate, wedge-shaped peaks with sharp tips (Fig. 9D2),

385 arranged toward the midline of the crown with no overlap in paleae (Fig. 9B – C). Anterior

386 margin of crown with 49 – 73 conical papillae (Fig. 9B). Pair of ciliated palps in front of the

387 mouth (Fig. 9E). Buccal lips present, with upper, lower and lateral lips (Fig. 9E). Tentacular

388 filaments compound and branched (Fig. 9C). U-shaped building organ on the thorax (Fig. 9E);

389 neurochaetae consists of capillaries with bipinnate blade margins (Fig. 9F); Parathorax consist

390 of three chaetigers; notochaetae lanceolate interspersed with capillaries (Fig. 9H);

391 neurochaetae alternating lanceolate chaetae of two lengths (Fig. 9G); neurochaetae thinner

392 than notochaetae. Abdomen with pairs of branchiae on each segment; neuropodial lobes

393   reduced on abdominal chaetigers , surrounded by tori; uncini with five teeth (Fig. 9J);

394   neurochaetae verticillate chaetae (Fig. 9I); ventral cirri conical with tapering ends, becoming

395   digitiform with rounded ends, spanning the neuropodial lobe.

396

397   *Remarks:* Specimens collected from all western sites (Veldrif, Betty's Bay and Hermanus)

398   conformed to the general descriptions according to Day (1967) and Kirtley (1994). Nonetheless,

399   differences in the morphology of the outer paleae were observed. Day (1967) described two

400   incurving teeth present on the outer paleae, but this differs from what was observed in

401   specimens collected in the present study: one tooth on the antero-lateral margin of the outer

402   paleae. Additionally, Day (1967), described the inner paleae as completely concealing the

403   "fleshy disk" or opercular disk, however, this was not observed for our specimens, instead the

404   opercular disk was visible in the mid-section where paleae did not overlap, which was similar to

405   Kirtley (1994). Nonetheless, all other characters observed for our specimens were similar to

406   specimens as described by Kirtley (1994) and Day (1967), suggesting that they most likely

407   represent *Gunnarea gaimardi* sensu stricto. Molecular analyses (Fig. 10) will be discussed under

408   *Gunnarea* sp. 1.

409

410   *Collection method:* Breaking off pieces of reef by hand or narrow blade to remove worms from

411   tubes.

412   *Type locality*: Cape of Good Hope, Western Cape Province, South Africa.

413   *Known distribution in* South Africa: the nominal species has been reported from KwaZulu-Natal

414   on the east coast to the west coast of the Western Cape Province; Namibia: Walvis Bay to

415   Luderitz (Day, 1967), but this needs to be revised.

416   *Ecology:* Species form extensive reefs by building sandy tubes on rocks in the low to mid

417   intertidal of exposed shores.

418

419   Species: *Gunnarea* sp. 1

420   Fig. 11

421

422   Material examined: Witsand: 34°23'31.9"S 20°51'50.1"E, 2 specimens (incomplete), MB-

423   A090293, MB-A090294, 30 April 2017, low to mid intertidal, coll. A. N. du Toit.

424

425   *Description*: Body maximum of 43 mm (MB-A090293) in length (MB-A090294 = 34 mm), when

426   fixed body colour opaque white with black pigmentation throughout (Fig. 11A, B). Opercular

427   crown and opercular stalk completely fused (Fig. 11B). Two rows of golden inner and outer

428   paleae (Fig. 11B). Approximately 34 – 38 inner paleae and 42 – 43 outer paleae. Outer paleae

429   geniculate with a single tooth on the antero-dorsal margin (Fig. 11G2, 3), inner paleae

430   geniculate with elongate, wedge-shaped peaks with a sharp tip (Fig. 11G1), and orientated

431   toward the midline, with both rows overlapping and concealing the opercular disk (Fig. 11B).

432   Anterior margin of opercular crown with 50 conical papillae (Fig. 11B). Pair of ciliated palps in

433   front of mouth (Fig. 11E). Buccal lips present with upper, lower and lateral lips (Fig. 11E).

434   Tentacular filaments compound and branched (Fig. 11E). U-shaped building organ as part of

435   thorax (Fig. 11E); neurochaetae capillaries with bipinnate blade margins (Fig. 11C). Parathorax

436   of three chaetigers; notochaetae alternating lanceolate and capillary chaetae (Fig. 11H),

437   neurochaetae lanceolate chaetae of two lengths (Fig. 11I), neurochaetae thinner than

438   notochaetae. Abdomen with a pair of branchiae on each segment; reduced neuropodial lobes

439   surrounded by tori, uncini with seven teeth (Fig. 11F); neurochaetae verticillate (Fig. 11D).

440   Ventral cirri conical with tapering ends, becoming digitiform with rounded ends spanning the

441   neuriopodial lobes.

442

443   *Remarks:* Specimens collected from Witsand (southern site) conformed to the general

444   description by Day (1967), including having paleae that completely conceal the "fleshy disk" or

445   opercular disk. Specimens from the southern site generally resemble *Gunnarea gaimardi* (from

446   western sites) in having a single tooth on the antero-lateral margin of the outer paleae.

447   Nonetheless several differences were observed. Firstly, western site specimens were longer

448   (max. of 110 mm), whereas southern specimens were a maximum of 43 mm. The most distinct

449   feature between these two morpho-groups was the shape, orientation and arrangement of

450   paleae on the opercular crown. The peaks of the outer and inner paleae are longer in

451   specimens from the southern site compared to that observed in specimens from the western

452   sites; the angle of inclination between the handle and peaks of the inner paleae is larger in

453   western specimens than southern specimens; the outer paleae blades are wider and shorter in

454   specimens from southern sites compared to the longer, thinner blades observed in western

455   specimens. The inner paleae in western specimens do not overlap at the midpoint of the

456   opercular disk, thereby exposing the disk, whereas in southern specimens the paleae overlap,

457   completely concealing the disk. Additionally, the abdominal uncini of western specimens have

458   five teeth, which is two less than that observed for southern specimens. Lastly, western

459   specimens have more opercular papillae than southern specimens when comparing similar

460   sized animals; 73, length 45 mm and 50, length 43 mm, respectively. These differences noted

461   between specimens collected from the southern site and *G. gaimardi* from western sites

462   indicate that they are indeed separate species and that specimens from the southern site

463   (Witsand) most likely represents a new undescribed species of the genus. These morphological

464   differences are supported by the molecular analysis which recovered two well supported clades

465   (Fig. 10) and a genetic distance of 6% (±0.02), thus confirming their separation as independent

466   species. The first clade, designated *G. gaimardi*, included specimens from Velddrif, Betty's Bay

467   and Hermanus (western group) and the second, designated *Gunnarea* sp. 1, included only the

468   specimens from Witsand (Fig. 10). Morphological differences together with the genetic

469   separation of the clades indicate the presence of two species in what has, till now, been

470   considered a monospecific genus (Capa, Hutchings & Peart 2012). Preliminary observations of

471   *Gunnarea* sp. from Port Shepstone in KwaZulu-Natal suggest that they conform to the

472   description of *Gunnarea* sp. 1 and studies are underway to confirm this.

473

474   *Collection method:* Breaking off pieces of reef by hand or narrow blade to remove worms from

475   tubes.

476   *Known distribution in South Africa*: Witsand, Western Cape Province, South Africa.

477   *Ecology:* Species form extensive reefs by building sandy tubes on rocks in the low to mid

478   intertidal of exposed shores.

479

480   Order: Eunicida Dales, 1962

481   Family: Lumbrineridae Schmarda, 1861

482   Genus: *Scoletoma* Blainville, 1828

483   Species: *Scoletoma* sp. 1

484   Fig. 12

485

486   ?*Lumbrinereis tetraurus* Day 1953: 435

487   ?*Lumbrineris tetraura* Day 1967: 437, 439, Fig. 17.16 U – W, Branch et al. 2016: 70, Fig. 26.10

488   Common name: Puddingworm.

489

490   *Material examined:* Betty's Bay: 34°22'S 18°51'E, 1 specimen (incomplete), MB-A090332, 3 June

491   2016, sandy sediment, coll. E. Newman.

492

493   *Description*: more than 145 mm; L10 = 8.1 mm, W10 = 3.4 mm (Fig. 12A). Prostomium conical,

494   peristomium with two rings, second slightly shorter than first (Fig. 12A). No eyes. Prechaetal

495   lobes truncate throughout, postchaetal lobe longer and bluntly triangular, becoming longer

496   towards posterior end (Fig. 12C – E). Winged capillary chaetae from chaetiger 1 to

497   approximately chaetiger 57. Long-headed simple multidentate hooded hooks (about 0.2 mm

498   long) from approximately chaetiger 4, shortening posteriorly (Fig. 12F, G), after about chaetiger

499   35, head becomes even shorter with flared hood (Fig. 12H), appearing white. Aciculae yellow.

500   Dental formula: MI = 1 +1, MII = 5 + 5, MIII = 2 + 2, MIV = 1 + 1 (Fig. 12B), MV free, lateral to

501   MIV and MIII.

502

503   *Remarks:* The specimen conforms to the general description *of S. tetraura* according to

504   Schmarda (1861) and Day (1967), and no characters could be identified to distinguish the

505   specimen collected here from the description of specimens from Chile. However, the specimen

506   differs morphologically and genetically from others collected in this study that also conform to

507   the description of *S. tetraura* by Day (1967), and genetically from specimens identified as *S.*

508   *tetraura* in China (Fig. 13; discussed under *Scoletoma* sp. 2 below). The species is therefore

509   identified here as *Scoletoma* sp. 1.

510

511   *Collection method*: Collected with a small trowel from sediment.

512   *Apparent distribution in South Africa*: Known only from a single site. It closely resembles

513   *Scoletoma tetraura* which has been reported from Namibia to KwaZulu-Natal.

514   *Ecology:* Burrows into sand in rock pools.

515

516   Species: *Scoletoma* sp. 2

517   Fig. 14

518

519   ?*Lumbrinereis tetraurus* Day 1953: 435

520   ?*Lumbrineris tetraura* Day 1967: 437, 439, Fig. 17.16 u – w, Branch et al. 2016: 70, Fig. 26.10

521   Common name: Puddingworm.

522

523   *Material examined:* Hermanus, Kammabaai: 34°24'41.1"S 19°16'44.8"E, 6 specimens

524   (incomplete), MB-A090349 – MB-A090354, 11 February 2017, from rock pools in low to mid

525   intertidal, coll. A. N. du Toit and H van Rensburg.

526

527   *Description*: up to more than 300 mm; L10 = 6.8 to 9.8 mm, W10 = 1.9 to 3.4 mm. Prostomium

528   conical, peristomium with two rings, second slightly shorter than first (Fig. 14A). No eyes.

529   Prechaetal lobes truncate, short and rounded throughout, postchaetal lobe longer and bluntly

530   triangular in anterior chaetigers, becoming digitiform and longer towards posterior end (Fig.

531   14C – E). Winged capillary chaetae from chaetiger 1 to approximately chaetiger 56 to 70. Long-

532   headed simple multidentate hooded hooks (about 0.15mm long) from approximately chaetiger

533   4, shortening posteriorly (Fig. 14F, G), after about chaetiger 25, but usually after about

534   chaetiger 30 to 35, head becomes even shorter with flared hood (Fig. 14H), appearing white

535   (Fig. 14E). Aciculae yellow. Dental formula (variation): MI = 1 +1, MII = 5 (6) + 5, MIII = 2 (1) + 1

536   (2), MIV = 1 + 1 (Fig. 14B), MV free, lateral to MIV and MIII.

537

538 *Remarks*: All six specimens conform to the general description of *S. tetraura* according to

539 Schmarda (1861) and Day (1967), and no characters could be identified to distinguish the

540 specimens collected here from the description of specimens from Chile. However, this species

541 differs from the specimen from Betty's Bay. In *Scoletoma* sp. 2 from Hermanus, the long-

542 headed simple hooded hooks are about 25% shorter than those of *Scoletoma* sp. 1 from Betty's

543 Bay, and post-chaetal lobes are about 30% longer in the posterior. Furthermore, the segments

544 of *Scoletoma* sp. 2 appear to be longer than those of *Scoletoma* sp. 1; in specimens that are

545 similarly wide, specimens of the former are 1.5 to 1.8 mm longer for the first 10 chaetigers than

546 in the latter. Finally, specimens of the two species were collected from different habitats.

547 Further research is needed to determine which, if any, refers to the species recorded previously

548 by Day (1967) as *S. tetraura*.

549

550 The morphological separation is supported by molecular analyses (Fig. 13) that retrieved two

551 well-supported operational taxonomic units, *Scoletoma* sp. 1 (from Betty's Bay) and *Scoletoma*

552 sp. 2 (from Hermanus). The two *Scoletoma* species from South Africa form part of a weakly

553 supported clade together with *Scoletoma fragilis* (O.F. Müller, 1776), *Lumbrineris aberrans* Day,

554 1963, *Lumbrineris erecta* Moore, 1904, *Lumbrineris japonica* Marenzeller, 1879, and

555 *Lumbrineris perkinsi* Carrera-Parra, 2001 which is separate from *S. tetraura* from China. The

556 separation of *Scoletoma* spp 1 and 2 from South Africa and *S. tetraura* from China in two

557 different clades with high support suggests that they are independent species. However,

558 without sequences from the species' type locality in Chile, it is impossible to determine

559 whether the specimens found in China and South Africa all represent new species or whether

560 one of them is an alien. Specimens from the extended global distribution *of S. tetraura* need to

561 be examined, as there are likely more species within this complex. Additionally, *S. tetraura* and

562 *S. fragilis* were previously considered members of *Lumbrineris*, so the other *Lumbrineris* species

563 in the clade should be revised to determine whether they are also in the genus *Scoletoma*, or

564 whether this genus is paraphyletic.

565

566   *Collection method*: Samples from Hermanus collected among broken pieces of *Gunnarea* tubes.

567   *Apparent distribution in South Africa*: Known only from a single site. It closely resembles

568   *Scoletoma tetraura,* which has been reported from Namibia to KwaZulu-Natal.

569   *Ecology:* Burrows into sand among *Gunnarea* tubes.

570

571   Family: Eunicidae Berthold, 1827

572   Genus: *Marphysa* Quatrefages, 1866

573   Species: *Marphysa* cf*. corallina*

574   Fig. 15

575

576   *Marphysa corallina* Day 1967: 400, Fig. 17.7 F – J; Branch et al. 2016: 70, Fig 26.7

577   Common name: Wonderworm.

578

579   *Material examined:* Witsand: 34°23'31.9"S 20°51'50.1"E, 5 specimens, (incomplete) MB-

580   A090276 – MB-A090280, 30 April 2017, under rocks in rock pools in mid-intertidal, coll. A. N. du

581   Toit.

582

583   *Description*: Body length more than 120 mm; L10 = 8 – 11 mm, W10 = 0.4 – 0.5 mm. In live

584   specimens, body colour medium to dark brown in anterior becoming light brown in posterior;

585   iridescent throughout (Fig. 15A). Prostomium bilobed, lobes frontally rounded; sulcus deep.

586   Prostomial appendages semi-circular with white tapering tips (Fig. 15A); pair of palps extend to

587   second peristomial ring; pair of lateral antennae reaching second segment and one median

588   antenna extending to third segment (Fig. 15A). Black reniform eye spots below pair of lateral

589   antennae (Fig. 15A, black arrows). Four pairs of maxillary plates and one maxilla; MI = 1 + 1, MII

590   = 3 + 3, MIII = 5 + 0, MIV = 4 + 6, MV = 1 + 1 (Fig. 15F). Branchiae pectinate, from chaetiger 35 –

591   47 onwards present as a single filament, reaching up to five to seven filaments in middle

592   chaetigers (Fig. 15B). Dorsal cirri digitform in anterior, middle and posterior chaetigers. Ventral

593   cirri conical in anterior chaetigers and reduces to an oval swelling with a rounded tip in

594   posterior chaetigers. Aciculae blunt with dark brown tips and ends and black shafts (Fig. 15B, E);

595 3 per fascicle in anterior segments, reducing to 2 and then 1 in middle segments; subacicular

596 hooks, light brown tips with black shafts, present from 40th chaetiger with bidentate tips and

597 guards (Fig. 15B, E). Limbate capillaries present in supracicular fascicle throughout (Fig. 15D, E).

598 Pectinate chaetae present in supracicular fascicle; isodont broad blades and fine teeth (Fig.

599 15E). Compound falcigers, bidentate tips, short blades with guards, present in subacicular

600 fascicle (Fig. 15C).

601

602 *Remarks*: Specimens collected in this study conform to the general description according to Day

603 (1967). Unfortunately, the original description of *M. corallina* (Kinberg, 1865a) was poor, with

604 no illustrations against which to compare the specimens collected in this study. However, since

605 the type locality of *M. corallina* is in Hawaii and the species has a global disjunct distribution, it

606 is probable that the specimens collected here are really an incorrectly identified indigenous

607 species. We therefore take the more conservative route and refer to the species collected in

608 South Africa as *M.* cf. *corallina.* All specimens collected during this study were incomplete,

609 missing their posterior ends, so characters such as anodont chaetae, the number of branchial

610 filaments and the number of aciculae in the posterior regions were not documented and thus

611 could not be commented on.

612

613 All sequences generated clustered with *M. corallina* from KwaZulu-Natal (KT823410) (Kara,

614 2015), with high bootstrap support, indicating that it is a single species (Fig. 16). Further

615 investigation is underway to confirm the taxonomic status of *M. corallina* in South Africa.

616

617 *Collection method*: By hand from sediment under rocks.

618 *Known distribution in South Africa*: Mabibi in northern KwaZulu-Natal to Mgazana in the Eastern

619 Cape Province, Witsand in Western Cape Province (Day, 1967; current study).

620 *Apparent distribution globally*: Mozambique, New Zealand, Red Sea, Australia, Marshall Islands,

621 Lakshadweep Island and Juluit Atoll (Day, 1967; Read & Fauchald, 2021).

622 *Ecology:* Occupies burrows in sediment under rocks in the mid-intertidal zone.

623

624   Species: *Marphysa haemasoma* Quatrefages, 1866

625   Fig. 17

626

627   *Marphysa haemasoma* Quatrefages, 1866: 334 – 334, Figs. 4B, 6 & 7; Grube 1870: 299

628   *Marphysa sanguinea* Day 1967: 396, fig. 17.5 U – Y (NOT Montagu, 1815)

629   *Marphysa elityeni* Lewis & Karageorgopoulos 2008: 280 – 281, Figs. 1 &2; Branch et al. 2016:

630   69, Fig. 2.5

631   *Marphysa haemasoma* Kara et al. 2020: 16 – 21, Figs 4B, 6 & 7

632   Common name: Wonderworm, bloukoppies. Listed as estuarine wonderworm in Branch et al.

633   (2016).

634

635   *Material examined:* Knysna: 34°02'17.5"S 23°02'23.4"E, 2 specimens (incomplete), MB-

636   A090326, MB-A090328), 29 January 2017, coll. A. N. du Toit. Betty's Bay: 34°22'S 18°51'E, 5

637   specimens (incomplete), MB-A090331, MB-A090333 – MB-A090335, MB-A090338), 3 June

638   2016, digging with a trowel in mid-intertidal rock pools, coll. E. Newman. Strand: 34°07'03.2"S

639   18°49'29.4"E, 2 specimens, MB-A090271, MB-A090315), 13 January 2017, digging with trowel

640   in gravel under rocks in the mid-intertidal, coll. A. N. du Toit. Soetwater: 34°09'33.0"S

641   18°19'40.7"E, 5 specimens (incomplete specimens), MB-A090272 – MB-A090275, MB-A090317,

642   10 March 2017, under rocks in mid-intertidal rock pools, coll. A. N. du Toit. Melkbosstrand:

643   33°43'40.3"S 18°26'17.6"E, 4 specimens (incomplete), MB-A090267 – MB-A090270), 26

644   February 2017, under rocks in mid-intertidal rocky reef, coll. A. N. du Toit and C. Naidoo.

645

646   *Description*: Body length more than 470mm. In life body colour variable: dark brown/red

647   anterior with white iridescent spots for about 7 chaetigers (Fig. 17A), becoming medium brown

648   in middle and darker towards the posterior. Specimens from Knysna and Betty's Bay with blue

649   colouration in anterior for about 6 chaetigers (Fig. 17B, white arrow), becoming light brown in

650   middle to posterior. Body iridescent in all specimens. Prostomium bilobed, lobes frontally

651   rounded, sulcus deep (Fig. 17A, B). Prostomial appendages in semi-circle with a brown band just

652   before the tapering ends in live specimens; pair of palps reaching first peristomial ring, pair of

653   lateral antennae extending to second segment and one median antenna reaching first chaetiger

654   (Fig. 17A, B). Pair of eyes under the lateral antennae. Four pairs of maxillary plates and a maxilla

655   (variation); MI = 1 + 1, MII = 3 (4) + 4, MIII = 5 + 0, MIV = 3 + 5, MV = 1 + 1 (Fig. 17C). Branchiae

656   pectinate, present from chaetiger 26 onwards as two filaments, reaching a maximum of 8

657   filaments in middle, reducing to a single filament in middle to posterior, absent in posterior end

658   near pygidium. Acicula black (Fig. 17E) throughout, five per fascicle in anterior chaetigers,

659   reducing to three in posterior; subacicular hooks not observed. Simple capillaries and pectinate

660   chaetae present in supracicular fascicle. Four types of pectinate chaetae; isodonts with fine

661   teeth and symmetrical blades (Fig. 17F) in anterior segments and anodonts with medium and

662   coarse teeth (Fig. 17D, G) in middle to posterior chaetigers. Compound spinigers with short and

663   long blades present in subacicular fascicle throughout.

664

665   *Remarks*: Specimens collected here conformed to the description by Kara et al. (2020), except

666   for those collected from Knysna and Betty's Bay which have a blue anterior (approximately first

667   six chaetigers), becoming light brown in the middle to posterior end. Phylogenetic analysis

668   recovered a single well-supported clade that comprised all specimens from Knysna, Betty's Bay,

669   Strand, Kommetjie (Soetwater) and Melkbosstrand, indicating that the colour morphs are a

670   single species (Fig. 16). Lewis & Karageorgopolous (2008) observed colour variation in

671   specimens which included iridescent blues and greens for the reproductive segments along the

672   length of the body, from chaetigers 70 – 80. This does not conform to the colour morphs found

673   in the specimens in the present study in which the colour was observed in the anterior regions.

674   Nonetheless, the colour on the remaining parts of the body, "medium brown in the middle and

675   darker toward the posterior", conform to that reported by Lewis & Karageorgopolous (2008).

676

677   The use of two species of *Marphysa* in the Western Cape Province supports recent research

678   showing that globally, multiple species of this genus, especially members of the *M. sanguinea*

679   complex, are used as bait, even within regions (see review by Hutchings & Lavesque, 2021).

680   Although the current study showed that different colour morphs represent a single species,

681   further research is needed to determine whether individuals occupying different habitats, as

682   described by Day (1967) and Lewis & Karageorgopoulos (2008), are also a single species.

683

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

685   *Type locality*: Cape of Good Hope, Western Cape, South Africa.

686   *Known distribution in South Africa*: Langebaan Lagoon on the west coast to Port Elizabeth on

687   the south coast (Day, 1967; Kara et al., 2020).

688   *Ecology:* Occupies burrows in sediment typically grey/black medium to coarse grains and rich in

689   sulphur. In Knysna, specimens were found in sandier sediments.

690

691   Genus: *Lysidice* Lamarck, 1818

692   Species: *Lysidice natalensis* Kinberg, 1865

693   Fig. 18

694

695   *Lysidice natalensis* Kinberg, 1865: 566; Hartman 1948: 84, 85, Pl. XI Figs 1 – 2; Day 1951: 40; Day

696   1953: 435; Day 1960: p336; Day 1967: 401, Fig. 17.7 K – R; Branch et al. 2016: 70, Fig. 26.9

697   *Lysidice atra* Schmarda, 1861

698   *Lysidice capensis* Grube, 1868: 12, Fig. 4; Day 1934: 53

699   Common name: Musselworm. Listed as three-antennaed worm in Branch et al. (2016).

700

701   *Material examined*: Witsand: 34°23'31.9"S 20°51'50.1"E, 11 specimens (2 complete), MB-

702   A090281 – MB-A090289, MB-A090291, MB-A090292, 30 April 2017, from under rocks, in rock

703   pools in mid-intertidal zone, coll. A. du Toit.

704

705   *Description*: Complete specimens 62 and 63 mm long for 126 and 156 chaetigers. L10 5.28 – 9.8

706   mm, W10 1.84 – 4.5 mm. Colour reddish-brown with white spots, both extending into middle of

707   prostomium and antennae, margin of prostomium and tips and base of antennae white (Fig.

708   18A). Prostomium bilobed, antennae tapered, lateral antennae shorter than prostomium,

709   median antenna slightly longer, proximal part brown, tips white (Fig. 18A). Mandibles thick; MI

710   1 + 1; MII 3 + 3; MIII 2-3 + 0; MIV 2-3 +4-7; MV 1 + 1. Parapodia with slender dorsal cirri (Fig.

711   18B), becoming shorter and thinner from chaetiger 22 to 38 onwards (Fig. 18E, H). Ventral

712   cirrus bluntly triangular (Fig. 18B), getting shorter posteriorly (Fig. 18E), nipple-shaped in

713   posteriormost chaetigers (Fig. 18H). Post-chaetal lobe truncate (Fig. 18B), getting shorter

714   posteriorly (Fig. 18E), inconspicuous in posteriormost chaetigers (Fig. 18H). Superior chaetae

715   limbate capillaries and comb chaetae of two sizes (Fig. 18F). Inferior compound chaetae with

716   short blades, bidentate, teeth usually of similar sizes (Fig. 18C, D), but proximal tooth may be

717   thicker and or longer. Acicula black with blunt tips, one in anterior chaetigers, two in middle

718   and posterior (Fig. 18B, E, H); bidentate acicula hook with small hood from chaetiger 25 – 28

719   onwards (Fig. 18E, H), teeth may be worn, giving unidentate appearance (Fig. 18G).

720

721   *Remarks*: Original description by Kinberg (1865a) is poor, but this material is later described by

722   Hartman (1948). Specimens collected here generally match this latter description, and those by

723   Day (1951, 1953, 1967), although the posterior ventral cirrus is more prominent than described

724   by Day (1967). The wide distribution within South Africa is suggestive of multiple species and

725   may be further reflected by the two species that Day (1967) synonymised with *L. natalensis*

726   without explanation. It is therefore possible that *L. capensis* and *L. atra*, both originally

727   described from the temperate Western Cape Province in Kalk Bay and the Cape of Good Hope,

728   respectively, are not *L. natalensis* which was first described from Durban in the subtropical

729   KwaZulu-Natal. Additionally, Day (1967) provides no explanation for why *L. atra*, which was

730   described four years before *L. natalensis* and therefore claims priority, was synonymised with

731   the latter. More specimens from throughout the distribution range and any available type

732   material need to be examined to resolve the taxonomy of this species. The description of *L.*

733   *natalensis* from Pakistan by Mustaquim (2000) is not very detailed, and the only differences

734   from samples examined here are differently shaped post-chaetal lobes. All specimens from

735   Witsand form a well-supported clade that is not reciprocally monophyletic with *L. natalensis*

736   from India (Fig. 16; Sigamani et al., 2020). Identity of the species in Pakistan is also doubtful.

737

738   *Collection method*: By hand.

739   *Type locality*: Durban, KwaZulu-Natal, South Africa.

740   *Known distribution in* South Africa: From Namibia to northern KwaZulu-Natal (Day 1967).

741   *Ecology*: Habitat variable; in the current study specimens were collected from under rocks in

742   rock pools, Day (1934) reported them from muddy sand.

743

744   Family: Onuphidae Kinberg, 1865

745   Genus: *Heptaceras* Ehlers, 1868

746   Species: *Heptaceras quinquedens* (Day, 1951)

747   Fig. 19

748

749   *Onuphis quinquedens* Day, 1951: 40 – 42, Fig. 6A – H; Day 1967: 422, Fig. 17.13A – E; Fauchald

750   1982: 100, Fig. 28B

751   *Heptaceras quinquedens* Paxton 1986: 58 – 60, Fig. 36I, J

752   Common name: moonshineworm.

753

754   *Material examined*: Pearly Beach: 34°40'00.5"S 19°29'42.7"E, 5 specimens (incomplete), MB-

755   A090432 – MB-A090436, 23 January 2017, coll. H. van Rensburg & A. du Toit. Strand beach:

756   34°06'37.6"S 18°49'14.6"E, 1 specimen (incomplete), MB-A090442, 13 January 2017, coll. H.

757   van Rensburg and A. du Toit. Struisbaai Main Beach: 34°47'32.3"S 20°02'54.8"E, 15 specimens

758   (incomplete), MB-A090421 – MB-A090431, MB-A090437 – MB-A090440, 27 January 2017, coll.

759   H. van Rensburg, A. du Toit and C. Naidoo.

760

761   *Description*: Large species reaching 350mm in length and 6mm width at 10th chaetiger. Anterior

762   section rounded, becoming dorso-ventrally flattened and ventrally convex from chaetiger 3 – 6

763   onward (Fig. 19D). In life, prostomium and peristomium white (Fig. 19B), rest of body pale,

764   white-brown ventrally and more reddish-brown dorsally (Fig. 19E), becoming paler towards

765   median and posterior sections, dorsum covered with small red-brown spots, more prominent

766   towards anterior (Fig. 19B). Irregularly spaced red-brown or black dots on ceratophoral rings

767   with a single white patch within final elongated distal ring (Fig. 19B). All colouring disappears

768 after preservation (Fig. 19A, C, D). Iridescent shine observed over entire body in live and

769 preserved specimens (Fig. 19A – D).

770 Prostomium with frontal extension forming palpohores for frontal palps (Fig. 19C). Lateral

771 antennae reaching chaetiger 4 – 7 on posterior part of prostomium, shorter median antenna

772 reaching chaetiger 2 – 4 placed anterior to lateral antennae. Proximal ceratophoral rings wide,

773 covering most of prostomium (Fig. 19A). Ceratophores with 15 – 30 rings on median antennae

774 and 20 – 48 rings on lateral antennae, each terminating in an elongated distal ring.

775 Ceratophores at least as long as styles but up to twice the length of styles which taper distally

776 (Fig. 19B, D). Peristomium as long as, or longer than, prostomium with deep mid-dorsal notch

777 on the dorsal margin, flanking an elevated prostomial ridge (Fig. 19A). Peristomial cirri as long

778 as peristomium, slender and tapering, situated distally on peristomium on either side of the

779 mid-dorsal notch, curving laterally (Fig. 19A, B).

780 Parapodia mounted marginally, anterior three pairs projecting anteriorly, slightly elongated

781 (Fig. 19B, D) and modified with four or five hooded bi- or tridentate pseudo-compound falcigers

782 (Fig. 19G), remaining parapodia directed dorsally. Dorsal cirri simple tapering filament

783 anteriorly with small basal process towards posterior end (Fig. 19H), shorter than branchiae

784 (Fig. 19D, F). Ventral cirri subulate on anterior five chaetigers changing to pad-like globular form

785 (Fig. 19D). Pectinate chaetae from chaetiger 6 – 8 with 22 – 28 teeth (Fig. 19J). Superior limbate

786 chaetae from chaetiger 1. Branchiae start as simple tapered filaments on chaetiger 1 (Fig. 19D),

787 become pectinate on chaetiger 8 – 10 with maximum of 7 – 12 filaments per branchia (Fig. 19F),

788 continuing throughout rest of body (Fig. 19E). Hooded bidentate acicular chaetae appear from

789 10th chaetiger to the end of the body (Fig. 19I).

790

791 *Remarks*: The specimens examined here match earlier descriptions (Day, 1951; Day, 1967;

792 Fauchald, 1982), but this is the first observation of tridentate falcigers in the modified

793 parapodia, although tridentate falcigers are known to occur within the genus (Paxton, 1986).

794 The third tooth is small (Fig. 19G) and not always present so can easily be overlooked.

795 According to Fauchald (1982) the median antenna is longer than the posterior lateral ones in

796 the holotype (reaching chaetiger three vs. two) but in all of the material examined here, the

797   posterior lateral antennae were longer than the median antenna, conforming to the description

798   by Paxton (1986). The iridescent shine seen on the body of *H. quinquedens* is similar to that of

799   *Diopatra aciculata* (van Rensburg, Matthee & Simon, 2020) and may be why fishermen

800   commonly refer to both species as moonshineworms.

801

802   *Collection method:* "prawn pumps" during low tide.

803   *Type locality:* Umpangazi, KwaZulu-Natal, South Africa.

804   *Known distribution in South Africa:* Western Cape Province to KwaZulu-Natal (Day, 1967).

805   *Apparent distribution globally:* report in India (Sigamani et al., 2020) needs to be confirmed.

806   *Ecology:* They build temporary tubes in the intertidal of sandy beaches, but do not build

807   conspicuous chimneys.

808

809   Order: Phyllodocida Dales, 1962

810   Family: Nereididae Blainville, 1818

811   Genus: *Perinereis* Kinberg, 1865b

812   Species: *Perinereis latipalpa* (Schmarda, 1861)

813   Fig. 20

814

815   *Nereis (Nereis) latipalpa* Schmarda, 1861: 104 – 105, txt-fig. A, B, Ka & b, Pl. 31,244

816   *Neanthes latipalpa* Kinberg, 1865b: 171; von Marenzeller 1888: 6 – 7, Fig. 2

817   *Neanthes latipalpa typica* Willey, 1904: 260 – 261, Pl. 13, Fig. 9, Pl. 14, Fig. 1 – 2, 2a & b

818   *Perinereis nuntia vallata* Day 1967: 334, Fig. 14.12 P – S; Branch et al. 2016: 67, Fig. 25.4 (NOT

819   Grube & Kroyer *in* Grube 1858).

820   *Perinereis namibia* Wilson & Glasby, 1993: 265 – 266, Fig. 10A – K.

821   *Perinereis latipalpa* Villalobos-Guerrero 2019: 474 – 483, Figs 3 – 7.

822   Common name: Coralworm.

823

824   *Material examined:* Kommetjie: 34°08'34.5"S 18°19'20.4"E, 3 specimens (complete), MB-

825   A090297 – MB-A090299), 10 March 2017, under rocks in the mid-intertidal zone, coll. A. N. du

826   Toit.

827

828   *Description:* Body up to 170 mm. Live specimens, body colour dark green in anterior region,

829   light brown in the middle, to a pale yellow in the posterior. Red blotchy pigment in the middle

830   of each segment, prominent from chaetiger 7 – 10 onwards (Fig. 20A, B, black arrows).

831   Rectangular palpophores with rounded palpostyles. Two antennae, slender with tapering ends

832   (Fig. 20A, D). Two pairs of black eyes in a trapezoidal arrangement (Fig. 20A). Maxillary ring with

833   conical paragnaths (Fig. 20C), Area I = 1 – 2, Area II (variation) = 4(9) + 6(10), Area III = 11 – 17 in

834   an oval patch, Area IV = 8(33) + 16(32), spoon shaped patch. Oral ring with conical paragnaths

835   (Fig. 20D, E), Area V = 1, Area VI = 8(10) + 9(12) in a long arc, Area VII – VIII = 34 – 58 cones in

836   two irregular rows. Dorsal and ventral cirri present throughout. Notochaetae, homogomph

837   spinigers with serrated blades, first 3 teeth at the base of the blade larger, becoming smaller

838   and uniform till the tip (Fig. 20F, hoS). Neurochaetae, homogomph, heterogomph spingiers with

839   serrated blades, uniform teeth (Fig. 20E, heS) and heterogomph falcigers with medium sized

840   blades, finely serrated (Fig. 20G).

841

842   *Remarks:* Specimens collected in this study conformed to the recent redescription in Villalobos-

843   Guerrero (2019). However, variation in body size and paragnath arrangement was noted; total

844   length of paratype is 127 mm and paragnath arrangement, Area III = 9, Area IV = 18-23, Area VII

845   – VIII = 53.

846

847   *Collection method:* From under rocks in the mid-intertidal zone.

848   *Type locality:* Table Bay, Cape of Good Hope, South Africa.

849   *Known distribution in* South Africa: Hondeklip Bay on the west coast to Port St Johns on the east

850   coast; Namibia: extending north to Luderitz Bay; Mozambique (Day, 1967). However, records in

851   Mozambique have not been confirmed and require further investigation.

852

853   Genus: *Pseudonereis* Kinberg, 1865b

854   Species: *Pseudonereis podocirra* (Schmarda, 1861)

855   Fig. 21

856

857   *Mastigonereis podocirra* Schmarda, 1861: 108, Fig. 217.

858   *Nereis (Nereilepas) stimpsonis* Grube, 1866: 176.

859   *Pseudonereis variegata* Day 1967: 331, Fig. 14.12A – F (NOT Grube & Kröyer, 1858); Branch et

860   al., 2016: 66, Fig. 25.1

861   *Pseudonereis podocirra* Kara, Macdonald & Simon 2018: 1286 – 1291, Figs 2 – 4

862   Common name: Musselworm.

863

864   *Material examined:* Velddrif: 34°08'34.5"S 18°19'20.4"E, 9 specimens (incomplete), MB-

865   A090355, MB-A090359, MB-A090361 – MB-A090363, MB-A090365, MB-A090366, MB-

866   A090372, MB-A090373), 26 May 2017, from rock pools in the mid-intertidal, coll. A. N. du Toit.

867   Betty's Bay: 34°22'39.6"S 18°51'21.6"E, 3 specimens (incomplete), MB-A090302, MB-A090304,

868   MB-A090305, 10 February 2017, from under mussel beds in the mid-intertidal mussel belt, coll.

869   A. N. du Toit. Hermanus: 34°24'41.1"S 19°16'44.8"E, 6 specimens (incomplete), MB-A090306 –

870   MB-A090310, MB-A090443, 11 February 2017, from under mussels in the mid-intertidal mussel

871   belt, coll. A.N. du Toit and H. van Rensburg.

872

873   *Description*: Body length up to more than 140 mm. Colour variable: greenish-brown, greyish-

874   brown and medium brown (Fig. 21A, B) with white pigmented spots around 4 eyes on

875   prostomium. Black pigmented spots along midpoint of segment boundaries from chaetiger 13

876   (Fig. 21B). A mix of different types of paragnaths; conical, shield-shaped and p-bars; arranged in

877   distinct areas on pharynx. Area I = 1 conical, Area II = 15 – 17 conical in a wedge shape, Area III

878   = 22 conical in three-four rows, Area IV = 27 – 32 conical and p-bars in a closely spaced arc

879   shape, Area V = 1 conical, Area VI = large shield-shaped bars and Area VII – VIII = 40 conical and

880   p-bars alternating in 2 – 4 rows (Fig. 21C). Oral ring (Fig. 21C), AVI-V-AVI pattern, υ-shaped:

881   ridges of AVI sub-medially separated producing parallel furrows. Notopodial ligule enlarged and

882   elongated from chaetiger 13 to posterior (Fig. 21F). Dorsal and ventral cirri present (Fig. 21F).

883   Homogomph spinigers with finely serrated blades (Fig. 21E) and heterogomph falcigers (Fig.

884   21D) with concaved and finely serrated blades.

885

886   *Remarks*: Specimens collected in the study conformed to the redescription in Kara, Macdonald

887   & Simon (2018), except for body length which was larger, measuring up to a maximum of 140

888   mm. Molecular analyses (Fig. 22) recovered a single monophyletic group with strong maximum

889   likelihood support, indicating a single genetically similar population, further supporting Kara,

890   Macdonald & Simon (2018). Synonymy of *P. podocirra* with *P. variegata* was recently reversed

891   (Kara, Macdonald & Simon 2018), but it is not known whether *P. variegata* in KwaZulu-Natal in

892   South Africa, Namibia and Mozambique, as reported by Day (1967), are a single species.

893

894   *Collection method*: Breaking off mussels by hand from the mussel bed, or by pouring household

895   bleach over the bed (ADT; pers. obs.). Collection of nereidid species is no longer permitted

896   (DAFF 2017).

897   *Type locality*: Cape of Good Hope, Western Cape, South Africa.

898   *Known distribution in South Africa*: Lamberts Bay to Kidds Beach (Kara, Macdonald & Simon,

899   2018), possibly extending up the east coast to KwaZulu-Natal and Mozambique and up the west

900   coast to Namibia (Day, 1967).

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

902   shells.

903

904   **Discussion**

905   This study found that more marine annelid taxa are utilised in South Africa as bait than what

906   has previously been reported. In addition to the widely reported and investigated bait species

907   (*Arenicola loveni*, *Gunnarea gaimardi*, *Marphysa haemasoma* and *Pseudonereis podocirra*; e.g.,

908   van Herwerden, 1989; Lewis 2005; Sowman, 2006; Lewis & Karageorgopoulos, 2008; Branch et

909   al., 2016), several taxa were recorded for the first time (*Abarenicola gilchristi*, *Gunnarea* sp. 1,

910   *Heptaceras quinquedens, Lysidice natalensis, Marphysa* cf. *corallina, Perinereis latipalpa*,

911   *Scoletoma* spp 1 and 2). This is also the first published report of *Siphonosoma dayi* being used,

912   even though there have been anecdotal reports of fishermen collecting sandworm in Knysna

913   since at least 2009 (M.K.S. Smith, South African national Parks, Knysna, pers. comm.). By

914   contrast, *Arabella iricolor* and *Eunice aphroditois* (or species matching their general

915   descriptions), which are listed as bait in legislation and field guides (Marine Living Resources

916   Act, 2014; Branch et al., 2016), were not collected in this study. This suggests that more species

917   are used in the province than collected by us, possibly because these species did not occur at

918   the sites sampled, and or that identifications of these species being used were incorrect. For

919   example, one of the authors never found *E. aphroditois* in the Western Cape Province even

920   after extensive sampling in apparently appropriate substrate, although she did find *Eunice*

921   species in the subtidal in KwaZulu-Natal on the east coast (JK, personal observations).

922   Furthermore, *A. iricolor* is superficially similar to lumbrinerid species, and it is possible that both

923   taxa are collected, or that these species were confused in the records for bait collecting.

924   Finally, it is not possible to determine whether species that were collected at single sites (*L.*

925   *natalensis* and *P. latipalpa*) are targeted more widely, or were misidentified since both were

926   called by names more widely used for other species.

927

928   Including *Diopatra aciculata* collected in Knysna in a parallel study (van Rensburg, Matthee &

929   Simon, 2020), 14 species were identified in the Western Cape Province by ten common names,

930   excluding Afrikaans translations. For species collected multiple times and from different

931   locations, individual common names were sometimes applied to more than one species.

932   Species of the same family or genus were often known by a single common name; for example,

933   arenicolids (*Arenicola loveni* and *A. gilchristi*) are bloodworm, onuphids (*D. aciculata* and *H.*

934   *quinquedens*) are moonshineworms, *Scoletoma* species are puddingworms and *Marphysa*

935   species are wonderworms. For the arenicolids and onuphids this is true even when the species

936   show clear morphological or environmental differences which may have been noted by

937   fishermen, as evidenced by fishermen in Pearly Beach who distinguished between bloodworm

938   (*A. loveni*) and the bakkiewurm (*A. gilchristi*). This was the first time that a second arenicolid is

939   reported as bait, even though DAFF (2017) acknowledges that more than one species may be

940   used when they specify that bloodworm are "All species of the genus *Arenicola*", although this

941   is inaccurate as only one species of *Arenicola* has been recorded locally. Individual species were

942   sometimes called by multiple common names that were not translations of the same thing. For

943   example, *M. haemasoma* was identified as wonderworm, bloodworm or bloukoppie (this is

944   Afrikaans for 'blue head', referring to the blue anterior of worms from Knysna and Betty's Bay);

945   *G. gaimardi* was identified as coralworm and polwurm ('pol' is Afrikaans for a tuft, tussock or

946   clump of grass, and may here refer to the clumps of tubes formed by the worms); *P. podocirra*

947   was identified as musselworm and coralworm, while *D. aciculata* was also called the

948   pypiewurm (this is Afrikaans for 'pipe worm', undoubtedly alluding to the chimneys that extend

949   from the mouths of the tubes) by bait collectors in Port Elizabeth (van Rensburg, Pers. Obs.). It

950   is also apparent that individual common names were sometimes applied to species from

951   different families, such as coralworm (*G. gaimardi, P. latiplapa¸ P. podocirra*) and musselworm

952   (*P. podocirra, L. natalensis*).

953

954   For the most part, subsistence and recreational fishermen used the same names (e.g., for

955   arenicolids, sabellarids, onuphids and *Marphysa* species). Variations in use of names may

956   suggest unfamiliarity with bait worms among some subsistence fishermen, such as bloodworm

957   for *M. haemasoma* in Melkbosstrand, or differences in the use of names depending on

958   geographic region and or type of fishermen, such as coralworm for nereidids at Kommetjie and

959   Velddrif. Interestingly, none of the fishermen used the names from Branch et al. (2016) for *M.*

960   *haemasoma* (estuarine wonderworm which distinguishes it from *E. aphroditois,* the

961   wonderworm), *G. gaimardi* (Cape reef-worm), *L. natalensis* (three-antennaed worm) or

962   *Scoletoma* species (*S. tetraura* false earthworm). Finally, several common names that appear in

963   DAFF (2017), such as rock, shingle, or pot worms, were not used for any of the species collected

964   in this study. The results of this study confirm that common names are sometimes applied in an

965   inconsistent manner by managers and bait collectors. These differences may be maintained

966   through the transfer of knowledge, across generations of bait collectors, of the identification of

967   worms by morphology and ecological patterns. However, it is possible that the application of

968   common names has changed (e.g., the name moonshineworm applied to onuphids and not *A.*

969   *iricola* (Marine Living Resources Act, 2014)).

970

971   The genetic data confirmed the presence of complexes of morphologically similar species within

972   South Africa and globally. Day (1967) reported *Gunnarea gaimardi* and *S. tetraura* from

973   Namibia to northern KwaZulu-Natal. Given that this range spans the cold Namaqua, warm

974   Agulhas, and subtropical Natal ecoregions (Sink et al., 2018) and barriers to gene flow at Cape

975   Point, Cape Agulhas, Algoa Bay and Wild Coast (Teske et al., 2011), it is not surprising that these

976   nominal species each included two genetically distinct species with geographic and habitat

977   separation, respectively. This may also apply to *L. natalensis* that has a similar distribution (Day,

978   1967; Branch et al., 2016). Even though all specimens identified here as *Gunnarea* (including

979   *Gunnarea* sp. and *G. gaimardi*) and the *Scoletoma* species from Hermanus and Betty's Bay

980   matched the descriptions of the nominal species provided in Day (1967; *G. gaimardi* and *S.*

981   *tetraura,* respectively), the two genetic groups identified in each could be easily distinguished

982   after thorough morphological examination. This supports Hutchings & Kupriyanova (2018) who

983   suggested that many descriptions contained in Day (1967), especially of species described

984   before the 1900s such as the two species under discussion, are too generic to enable accurate

985   identification. Similarly, sequences of *L. natalensis* and *Scoletoma* species 1 and 2 generated in

986   this study do not match those generated for *L. natalensis* and *S. tetraura* collected in India and

987   China, respectively (Zhou et al., 2010; Sigamani et al., 2020; Unpublished data: Chen et al.,

988   2017; Yao et al., 2017; Xing & Zang 2020), indicating the presence of complexes of species that

989   may be morphologically similar but genetically distinct, from different locations around the

990   world. Sigamani et al. (2020) used Day (1967) to identify their samples which also included *H.*

991   *quinquedens*, originally described from South Africa; unfortunately, we were unable to obtain

992   sequences for the samples that we gathered to test whether the specimens from the two

993   countries are conspecific. However, our results again support Hutchings & Kupriyanova (2018)

994   who warned that using Day (1967) to identify polychaetes outside of southern Africa may

995   erroneously inflate the distribution ranges of polychaete species.

996

997   Resolving the identities of marine annelids used as bait has several important management

998   implications. This is exemplified by the recent discovery that moonshineworm collected in

999   Swartkops and Knysna estuaries is *D. aciculata*, a species originally described in Australia and is

1000 probably an alien in South Africa (Elgetany et al., 2020; Van Rensburg et al., 2020). Thus, the

1001 focus of management of this species must change from conserving populations to preventing

1002 further population growth and spread (Van Rensburg, 2019; Van Rensburg et al. 2020). This

1003 could be done by permitting increased removal by bait collectors, but preliminary investigations

1004 suggest that this is unfeasible (van Rensburg, 2019) and that alternative management strategies

1005 need to be explored. Knowing the identity of the worms used may also have important

1006 implications for the movement of bait species between sites where worms are collected and

1007 where fish are caught, since unused bait that can regenerate is frequently discarded in the

1008 latter (M.K.S. Smith, South African National Parks, Knysna). This is especially important if the

1009 species is alien (as *D. aciculata*), or if species thought to be locally widespread are multiple

1010 species with restricted distributions (as may be the case for *Gunnarea*, *Scoletoma* and *Lysidice*

1011 species).

1012

1013 The disjunction between the common names used by collectors and managers is especially

1014 problematic when considering the worms that should not be collected. The most recent

1015 brochure issued by DAFF (2017) states that Cape reef worm (specified as *Gunnarea*), cannot be

1016 collected, but that coralworm can. Since collectors contributing to this study all called *Gunnarea*

1017 coralworm, and because it is unlikely that many would know the genus name, bait collectors

1018 could collect this species not knowing that they are breaking the law (or use it as a defence if

1019 they do). The prohibition on collection of *Gunnarea* and musselworms (identified as *Nereis* and

1020 *Pseudonereis* by DAFF (2017)) is related to the structural damage caused to reefs and mussel

1021 beds during collection (van Herwerden, 1989), although this is not clearly articulated in the

1022 information brochure. It may therefore be more effective to specify the prohibition of taxa

1023 based on the habitats that they occupy, and not just name.

1024

1025 This study was limited by several constraints. Firstly, the geographical coverage was restricted

1026 relative to the total coastline of the province; the fishing sites were selected according to where

1027 participants could be recruited in advance (because bait collecting is time consuming and needs

1028 to coincide with low tides which further limited sampling opportunities, we contacted a core of

1029 the participants via fishing mailing lists to ensure success in collection) while we also avoided

1030 sites that were potentially unsafe, such as Strandfontein and Monwabisi beaches along the

1031 northern shores of False Bay. Because of this sampling strategy, there was a bias towards

1032 recreational fishermen because subsistence fishermen could not be contacted in advance.

1033 Instead, subsistence fishermen were approached on an *ad hoc* basis if they were active at the

1034 preselected sampling sites. Additionally, many subsistence fishermen were unwilling to donate

1035 bait to the project because bait collecting is so time consuming. We were also reluctant to offer

1036 compensation to fishermen because the sale of worms is prohibited by law (Marine Living

1037 Resources Act, 2014). Consequently, our understanding of the use of common names is still

1038 incomplete because species reportedly used as bait, but not found, could not be addressed in

1039 this study. This is further exacerbated when fishermen from different fishing sectors and who

1040 speak different languages (e.g., English, Afrikaans, isiXhosa) use different names.

1041

1042 In conclusion, the current study has confirmed that more polychaete species are currently used

1043 as bait than previously reported. Furthermore, the inconsistent application of common names

1044 across taxa and among users, including for the more popular and widespread species, may

1045 hamper effective management. The detection of pseudocryptic species complexes among some

1046 bait species may have further implications for the management of these taxa as individual

1047 species should form separate management units, especially if they are spatially separated.

1048 Finally, diversity of marine annelids in general, and bait species in particular, has been

1049 underestimated in South Africa, and the global distribution of some has been overestimated.

1050 Research to clarify the taxonomy of the members of the pseudocryptic species complexes

1051 identified here, i.e., *Scoletoma* species 1 and 2 and *Gunnarea* sp. 1, and the use of polychaetes

1052 and common names across a wider geographic range is ongoing.

1053

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1059 **Additional information and declarations**

1060 **Author contributions**

1061 CAS: Conceived and funded project, processed samples and wrote the manuscript

1062 JK: Processed and analysed samples and contributed to writing the manuscript

1063 HvR: Collected and processed samples and contributed to writing the manuscript

1064 AdT and CN: Collected and processed samples

1065 CAM: Co-supervised student authors, and participated in analysis of samples and editing final

1066 document.

1067

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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: Baitworm species from Western Cape, South Africa, found in this study, including common names, locations, 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), Ethan Newman (EN) 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	EN & CS	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, MB-A090237
	Bloodworm	Muizenberg	Anonymous	Recreational	AdT & CN	MK922158	MB-A090227, MB-A090229
	Bloodworm	Muizenberg	Anonymous	Recreational	AdT & CN	MK922164	MB-A090228
	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, 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, MB-A090264
	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, MB-A090266
	Bloodworm	Saldanha Bay	Anonymous	Unspecified	CN	MK922172	MB-A090265
	Bloodworm	Saldanha Bay	Anonymous	Unspecified	CN	NS	MB-A090375
	Bloodworm	Struisbaai	Gert Kotze	Recreational	CN, AdT & HvR	MK922163	MB-A090238, MB-A090242
	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	MK922175	MB-A090243
	Bloodworm	Struisbaai	Gert Kotze	Recreational	CN	MK922176	MB-A090244
	Bloodworm	Struisbaai	Gert Kotze	Recreational	CN	MK922158	MB-A090245, MB-A090250, MB-A090251, MB-A090254, MB-A090255
	Bloodworm	Witsand	Paul	Recreational	CN	MK922178	MB-A090252
	Bloodworm	Witsand	Paul	Recreational	CN	MK922179	MB-A090253
	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, MB-A090337, 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, MB-A090342, MB-A090344, MB-A090345, MB-A090347, MB-A090348
	Polwurm	Hermanus	Hein Engelbrecht	Recreational	AdT & HvR	NS	MB-A090343
	Polwurm	Hermanus	Hein Engelbrecht	Recreational	AdT & HvR	MN045182	MB-A090346
	Coral worm	Velddrif	Anonymous	Subsistence	AdT	MN045177	MB-A090356 - MB-A090358, MB-A090364, MB-A090367 - MB-A090371 (9)
	Coral worm	Velddrif	Anonymous	Subsistence	AdT	MN045179	MB-A090360
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	CS	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 - MB-A090278, MB-A090280 (4)
	Wonderworm	Witsand	Paul	Recreational	AdT	MN067882	MB-A090279
Marphysa haemasoma	Wonderworm	Betty's Bay	Ethan Newman	Recreational	CS	NS	MB-A090331
	Wonderworm	Betty's Bay	Ethan Newman	Recreational	CS	MN067877	MB-A090333, MB-A090335, MB-A090338 (3)

	Wonderworm	Betty's Bay	Ethan Newman	Recreational	CS	NS	MB-A090334
	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, MB-A090328 (2)
	Bloodworm	Melkbos Strand	Lucas	Subsistence	AdT & CN	MN067877 (2)	DNA only
	Bloodworm	Melkbos Strand	Lucas	Subsistence	AdT & CN	MN067877	MB-A090267 - MB-A090270 (4)
	Wonderworm	Soetwater Kommetjie	Altus	Subsistence	AdT	MN067877	DNA only
	Wonderworm	Soetwater Kommetjie	Altus	Subsistence	AdT	NS	MB-A090272
	Wonderworm	Soetwater Kommetjie	Altus	Subsistence	AdT	MN067877	MB-A090273 - MB-A090275, MB-A090317 (4)
	Wonderworm	Strand	Marnus	Subsistence	AdT & HvR	MN067880	DNA only
	Wonderworm	Strand	Marnus	Subsistence	AdT & HvR	MN067880	MB-A090271, MB-A090315 (2)
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, MB-A090285 (2)
	Musselworm	Witsand	Paul	Recreational	AdT	MN419164	MB-A090284
	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	Moonshineworm	Pearly Beach	Ferdi Joubert Hermann Schuch & Charlie Friess	Recreational	AdT & HvR	NS	MB-A090432 - MB-A090436 (5)
	Moonshineworm	Strand		Recreational	AdT & HvR	NS	MB-A090442

	Moonshineworm	Struisbaai	Gert Kotze	Recreational	CN, AdT & HvR	NS	MB-A090421 - MB-A090431, MB-A090437 - MB-A090440 (15)
Perinereis latipalpa	Coral worm	Kommetjie	Mario	Subsistence	AdT	NS	MB-A090297 - MB-A090299 (3)
Pseudonereis podocirra	Musselworm	Betty's Bay	Morne & Victor	Recreational	AdT	MN067871	MB-A090302, MB-A090305 (2)
	Musselworm	Betty's Bay	Morne & Victor	Recreational	AdT	MN067870	MB-A090304
	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, MB-A090309, MB-A090443
	Musselworm	Hermanus	Hein Engelbrecht	Recreational	AdT & HvR	MN067872	MB-A090310
	Coral worm	Velddrif	Anonymous	Subsistence	AdT	MN067874	MB-A090355, MB-A090362, MB-A090363, MB-A090365 (4)
	Coral worm	Velddrif	Anonymous	Subsistence	AdT	MN067871	MB-A090359, MB-A090361 (2)
	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, Kommetjie (Soetwater), 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. (Map created in http://www.simplemappr.net/ and edited in Photoshop Version C6.)
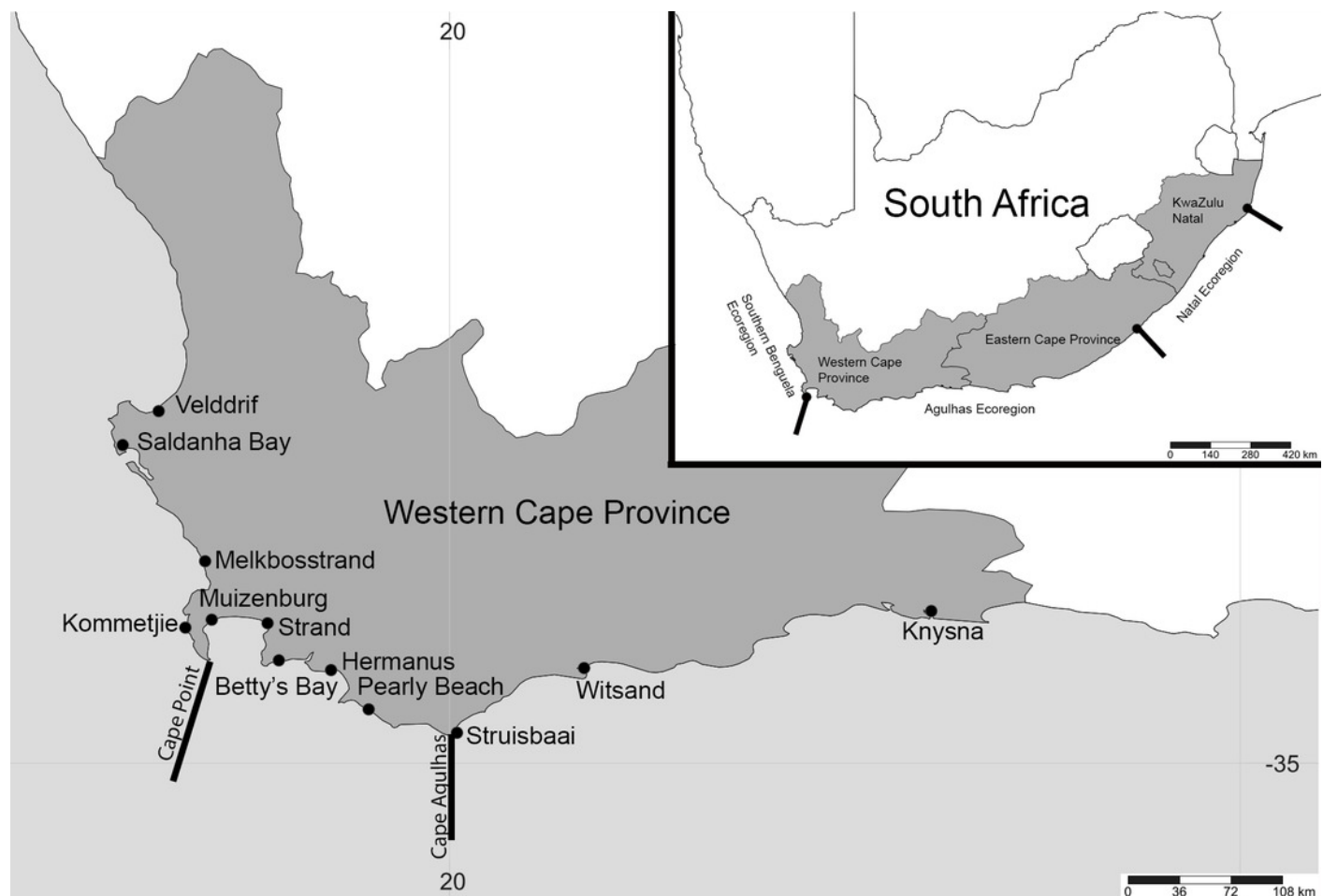
Figure 2

Morphology of *Siphonosoma dayi*

Figure 2. *Siphonosoma dayi* Stephen, 1942. A) Fixed specimen, in two pieces, 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; AB – D = MB A090318; E – H = MB A090313
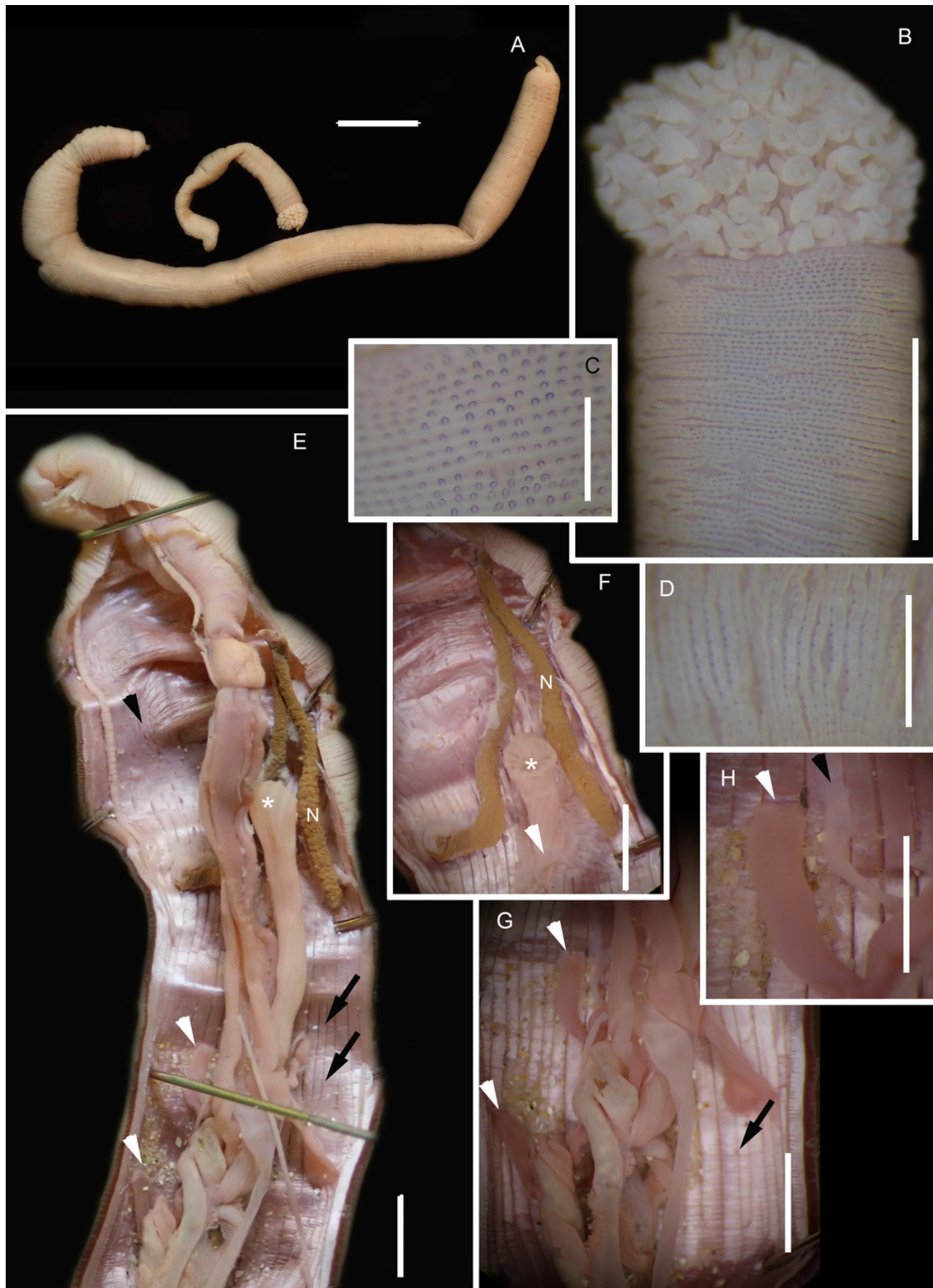
Figure 3

Neighbour Joining tree of *Siphonosoma* species

Figure 3. Neighbour Joining tree using mitochondrial sequences of various *Siphonosoma* Spengel, 1912 species, including *S. dayi* Stephen, 1942 from Knysna. * Indicates bootstrap support greater than or equal to 80%. Sequences obtained in this study are highlighted in grey. *Urechis caupo* Fisher & MacGinite, 1928 was used as the outgroup. Scale bar represents number of substitutions per site.
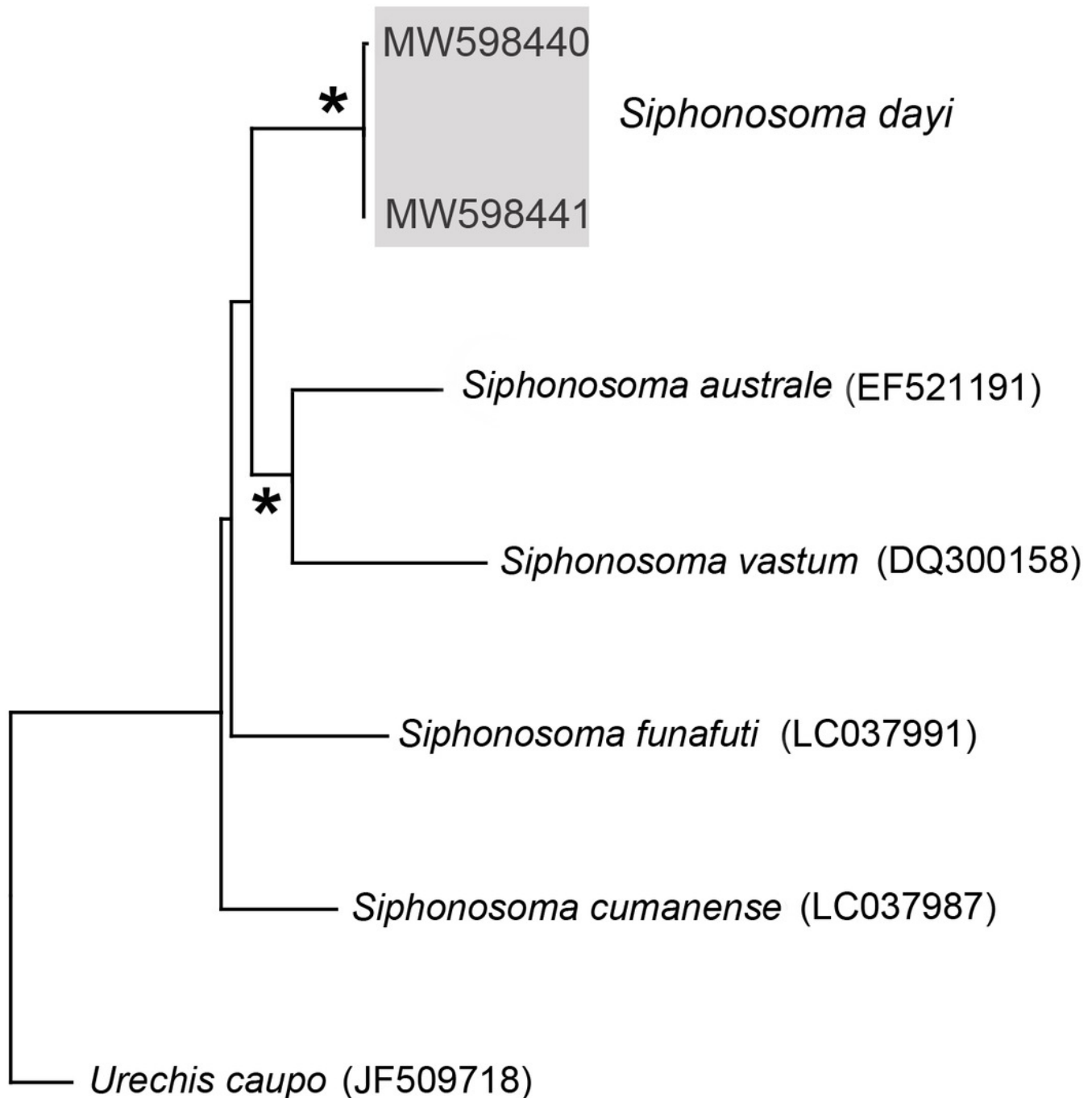
Figure 4

External morphology of *Arenicola loveni*

Figure 4. *Arenicola loveni* Kinberg, 1866. A) Almost uniformly dark specimen from Muizenberg, dorsal view, B) Dark specimen with distinctly lighter tail from Struisbaai, lateral view, 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), dorsal view, E) Prostomium and partially everted proboscis, dorsal view, arrows show nuchal grooves, F) Proboscis showing papillae in different regions, dorsal view, G) Papillae of distal part of proboscis, dorsal view, H) Papillae of proximal part of proboscis, dorsal view. 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
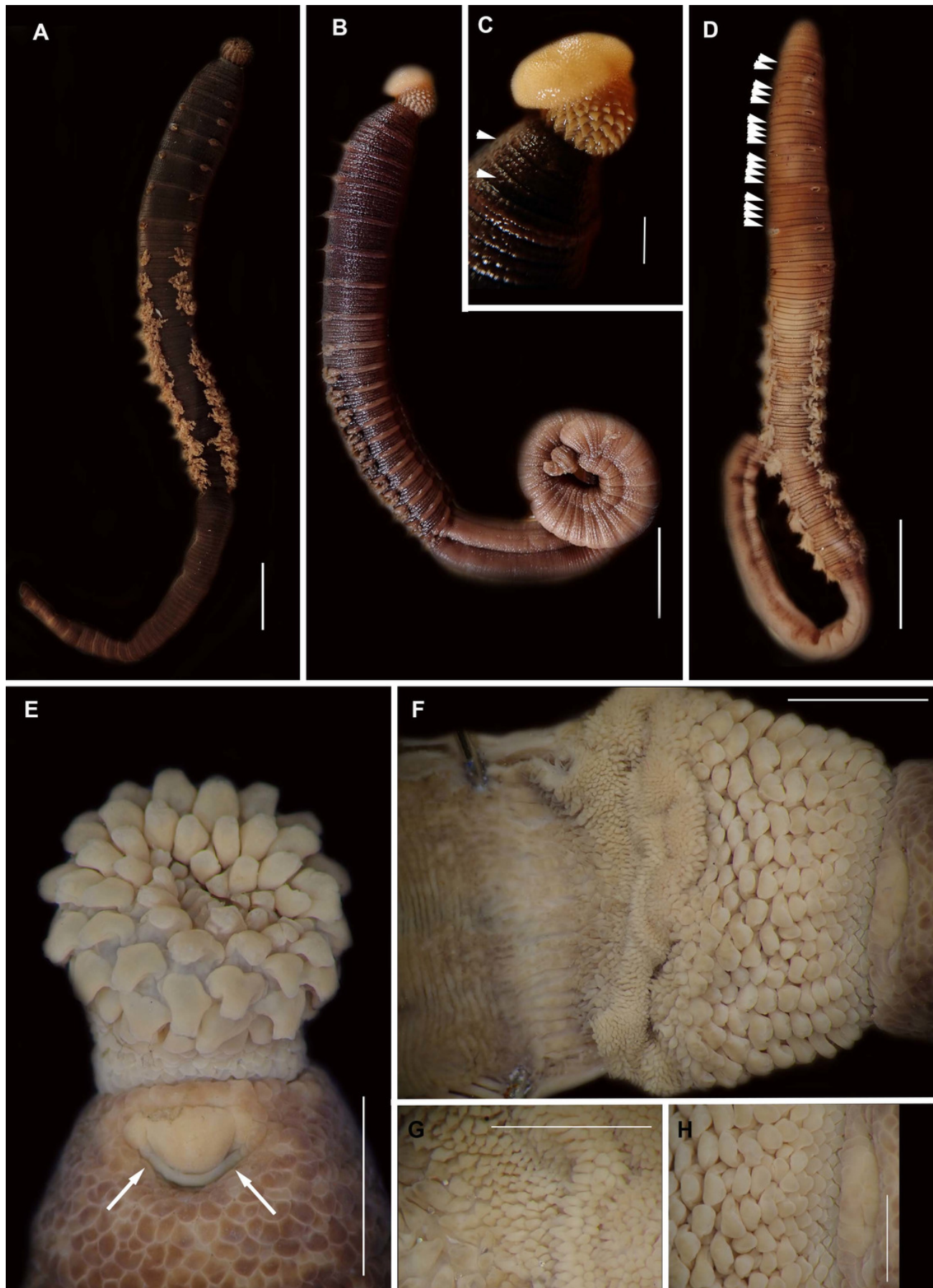
Figure 5

Morphology of *Arenicola loveni*

Figure 5. *Arenicola loveni* Kinberg, 1866*.* 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.
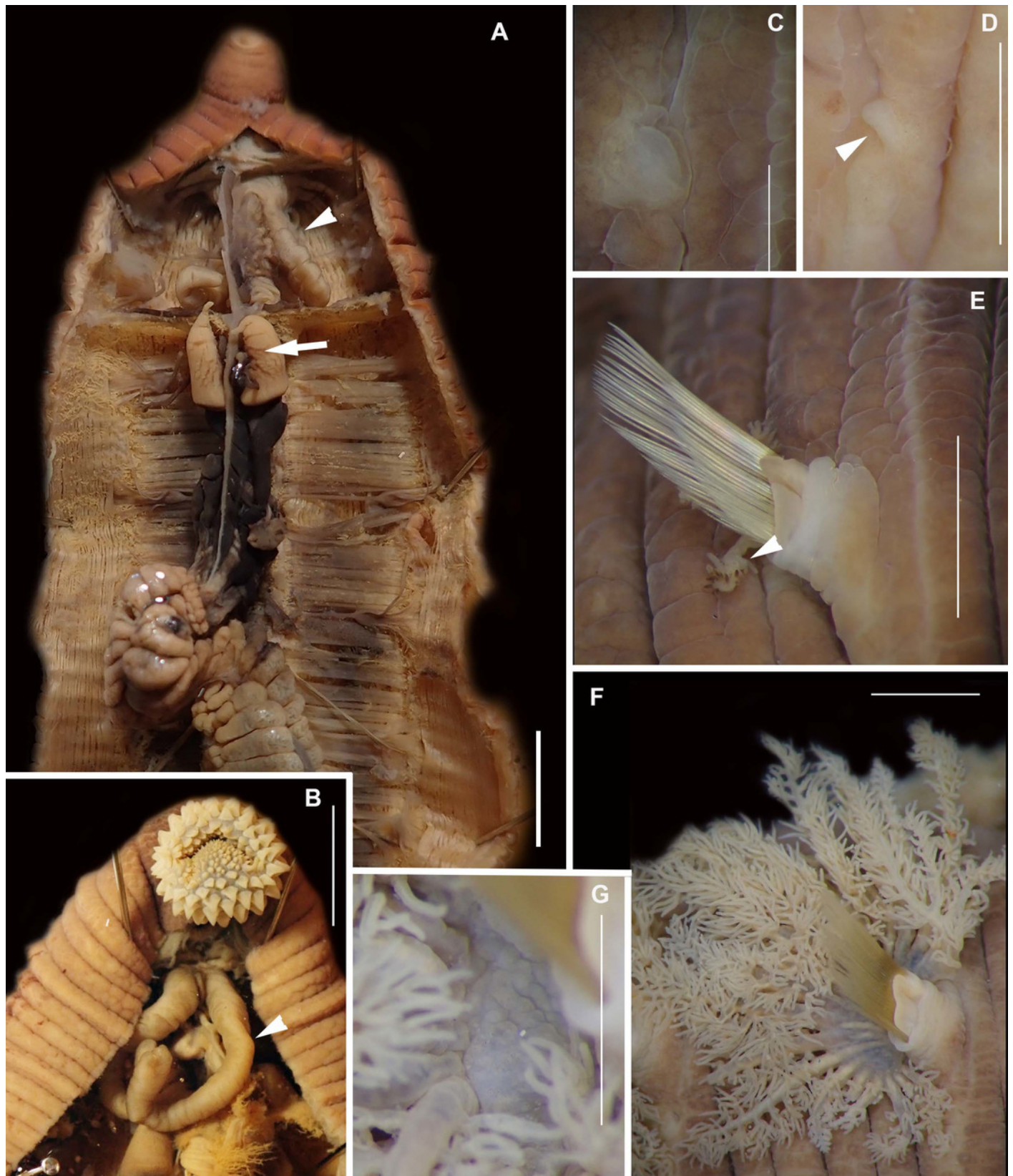
Figure 6

Arenicolid chatae

Figure 6. Arenicolid chaetae. A) Notochaetae and B) Neuropodial hooks of *Arenicola loveni* Kinberg, 1866, C) Notochaetae and D) Neuropodial hooks of *Abarenicola gilchristi* Wells, 1963. Scale Bars: A – D = 0.1mm. A, B = MB-A090261, C, D = MB-A090225
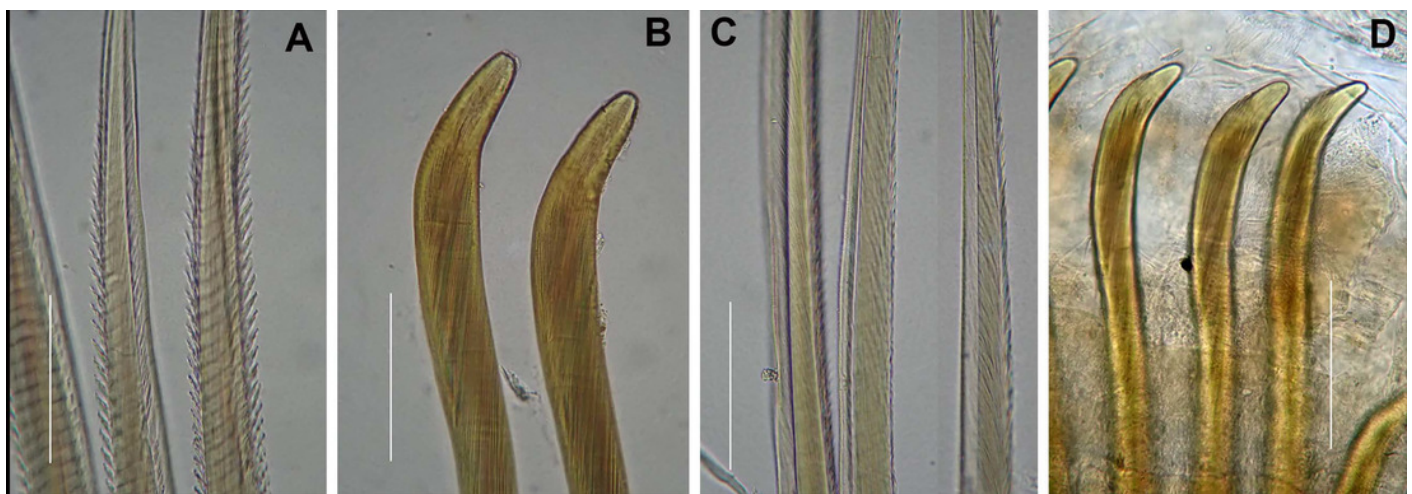
Figure 7

Neighbour joining tree of Arenicolidae

Figure 7. Neighbour Joining tree using mitochondrial sequences belonging to various *Arenicola Lamarck, 1801* and *Abarenicola Wells, 1959* species, including *A. loveni* Kinberg, 1866 and *A. gilchristi* Wells, 1963 from South Africa. * Indicates bootstrap support greater than or equal to 80%. Areas highlighted in grey represent sequences generated in this study. *Maldanidae* sp. was used as outgroup. 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* Wells, 1963 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, arrows show nuchal grooves, 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: A = 2 mm, 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.
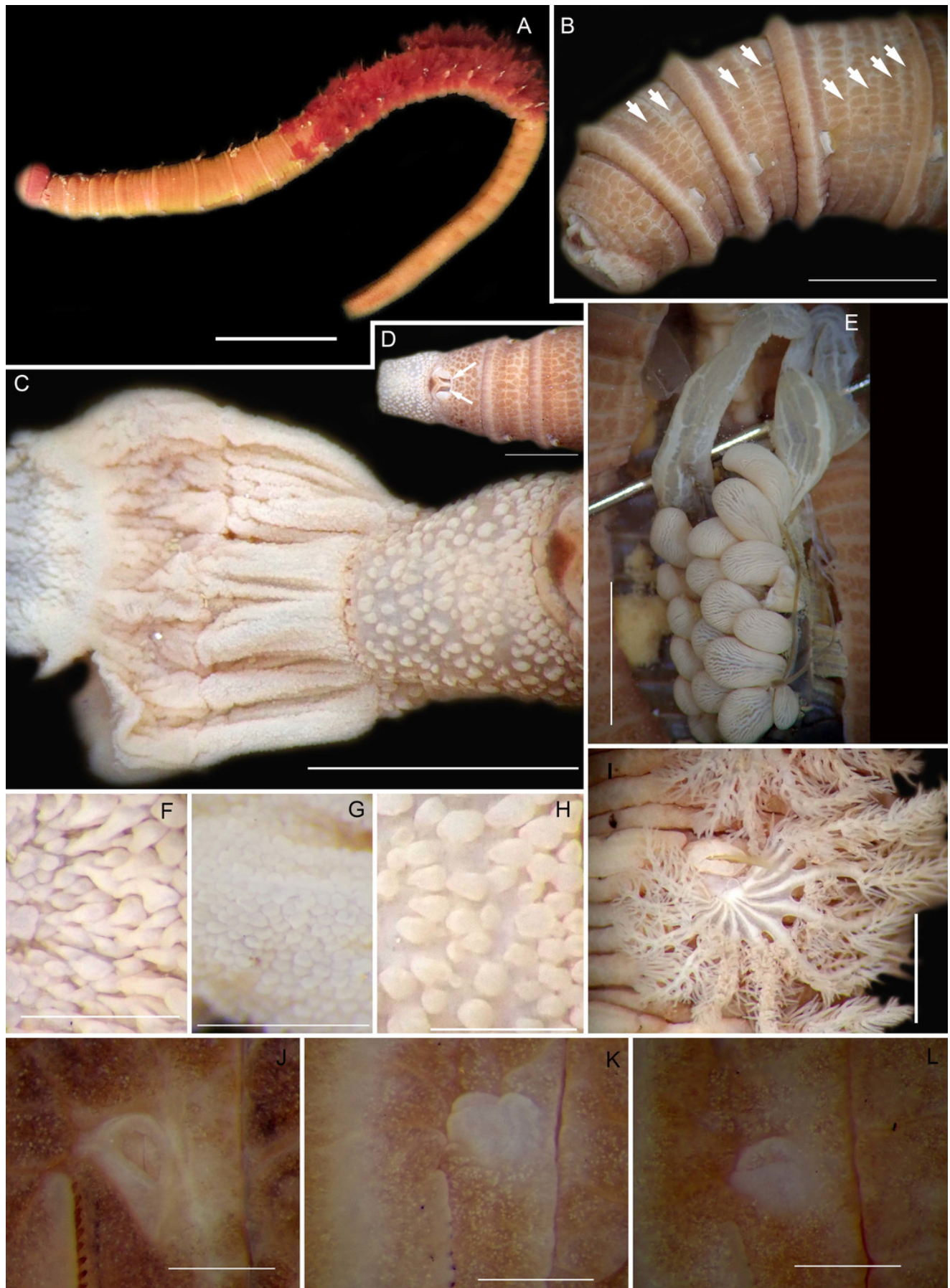
Figure 9

Morphology of *Gunnarea gaimardi*

Figure 9. *Gunnarea gaimardi* (Quatrefages, 1848). A) Live specimen from Betty's Bay, B) Dorsal view of crown showing the inner paleae (ip), outer paleae (op), opercular disk (od), papillae (cp), C) Right side view of crown showing the tentacular filaments (tf), D) Palee, 1 &3: outer geniculate paleae with tooth, 2: inner geniculate paleae, E) Ventral view of anterior region showing palps (p), median ridge (mr), and U-shaped building organ (bo), F) Bipinnate capillaries, neurochaetae, G) Lanceolate chaetae of two lengths, neurochaetae, H) Lanceolate and capillaries, notochaetae, I) Verticillate chaetae, neurochaetae, J) Uncini. Scale bars: A & C = 5 mm, B & E = 2mm, D = 0.5mm, F, I, J = 50µm, G & H = 0.2 mm. B, F - J = MB-A090337, c = MB-A090343, d = MB=A090371.
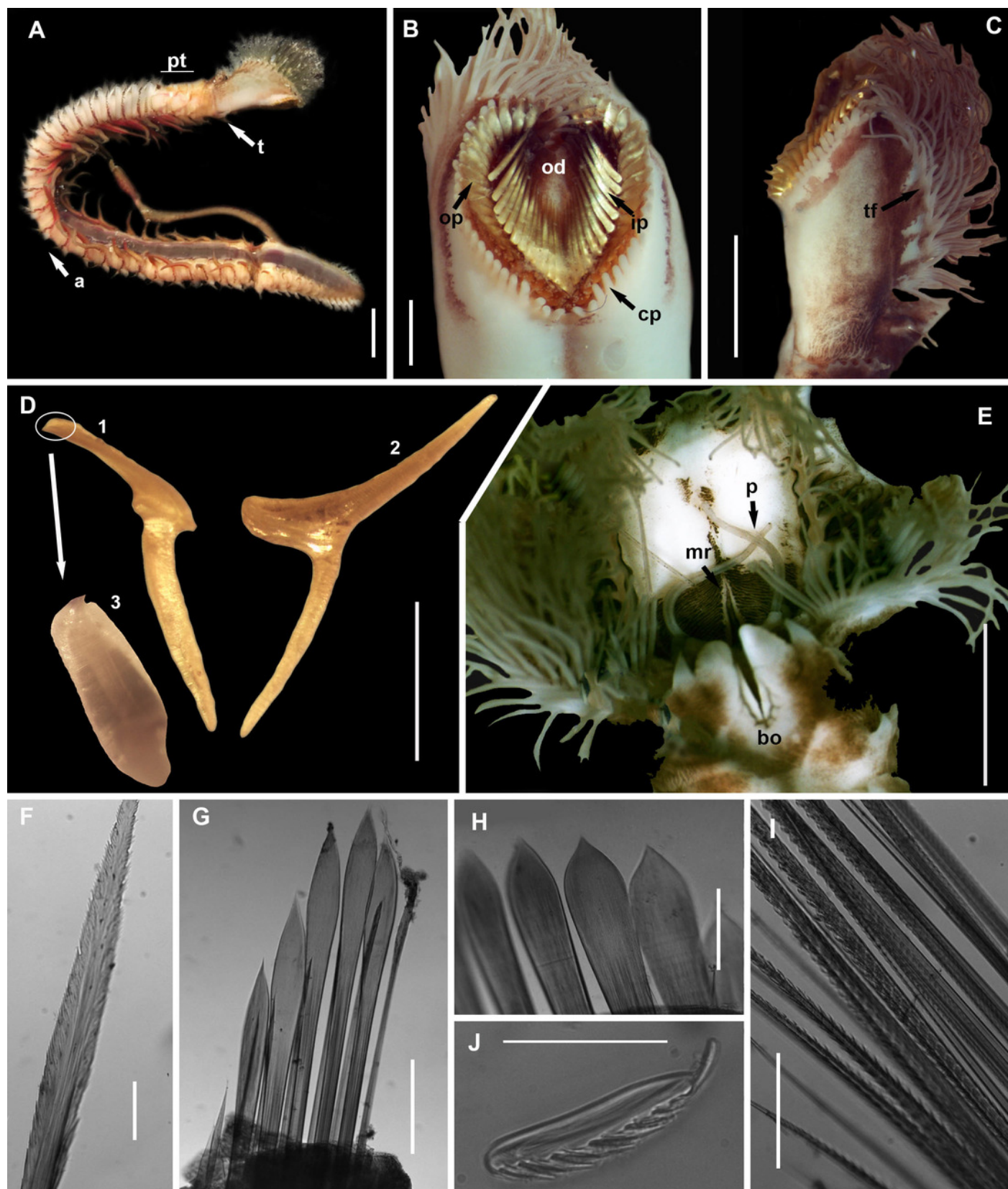
Figure 10

Neighbour joining tree of *Gunnarea*

Figure 11. Neighbour Joining tree of mitochondrial sequences of various species from family Sabellariidae Johnston, 1865 including *Gunnarea capensis* (Schmarda, 1861). * Indicates bootstrap support greater than 80%. Areas in grey represent sequences generated in this study. *Spirobranchus sinuspersicus* Pazoki, Rahimian, Struck, Katouzian & Kupriyanova, 2020 was used to root the tree. Scale bar represents substitutions per site.

MN045177
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MN045177
MN045177
MN045177

Gunnarea gaimardi (western group)

MN045180
MN045179
MN045179
MN045182
MN045178
MN045181

*

*

MN045183   *Gunnarea* sp1 (southern group)
MN045184
*

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 11

Morphology of *Gunnarea* species

Figure 10. *Gunnarea* Johannson, 1927 species collected from Witsand. A) Live specimen, B) Crown showing the inner paleae (ip) and outer paleae (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 paleae, 2 & 3 - outer geniculate paleae with tooth, H) Lanceolate notochaetae, I) Neurochaetae. Scale bars: A= 5mm, B & E = 1mm, C, D, F, G = 0.5mm, H-I = 0.2mm. A, C, F - I = MB-A090293, B, E = MB-A090294
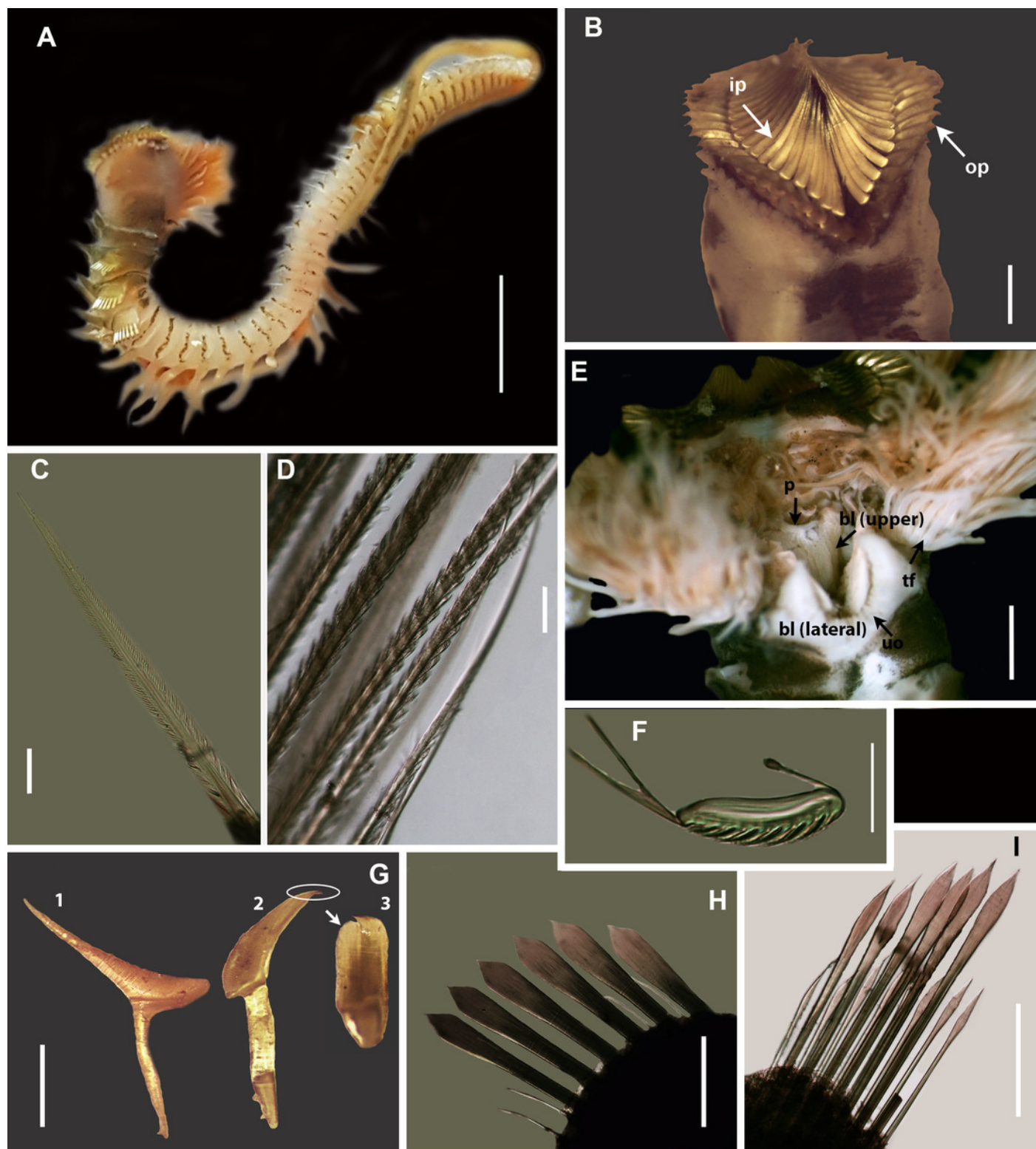
Figure 12

Morphology of *Scoletoma* species from Betty's Bay

Figure 12. *Scoletoma* species 1 from Betty's Bay. A) Dorsal anterior, B) MIII and MIV of jaws, ventral view, C) Chaetiger 5 showing pre-chaetal (Prcl) and post chaetal (Pcl) lobes, anterior view, D) Chaetiger 31 showing prechaetal and post chaetal lobes, anterior view, E) Posterior chaetiger showing prechaetal and post chaetal lobes, anterior view, F) Long-headed multidentate hooded hooks on chaetiger 5, G) Long-headed multidentate hooded hook on chaetiger 31, H) Short-headed multidentate hook with flared hood from posterior chaetiger. Scale bars: A = 5mm, B – E = 0.5mm, F – H = 0.2mm. A – H = MB-A090332
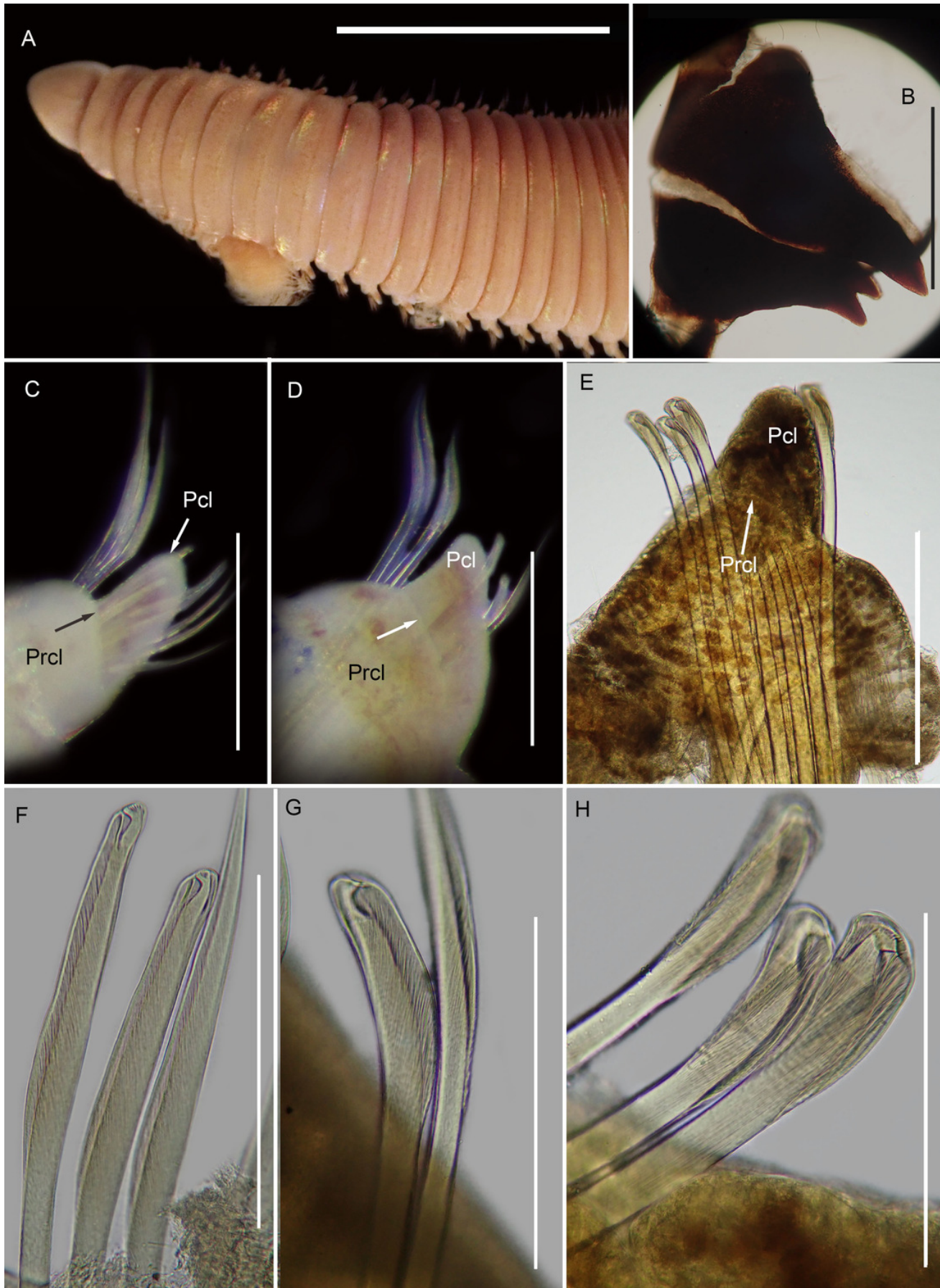
Figure 13

Neighbour joining tree of Lumbrineridae

Figure 14. Neighbour joining tree of mitochondrial sequences of various species in Lumbrineridae, including *Scoletoma tetraura* (Schmarda, 1861) from China. * Indicates bootstrap support greater than 80%. Areas highlighted in grey represent sequences generated in this study; *Scoletoma* species sp. 1 and sp. 2. Area outlined with grey dashed line represents *S. tetraura* from China. *Arabella iricolor* (Montagu, 1804) and *A. semimaculata* (Moore, 1911) were used as outgroups. Scale bar indicates substitutions per site.
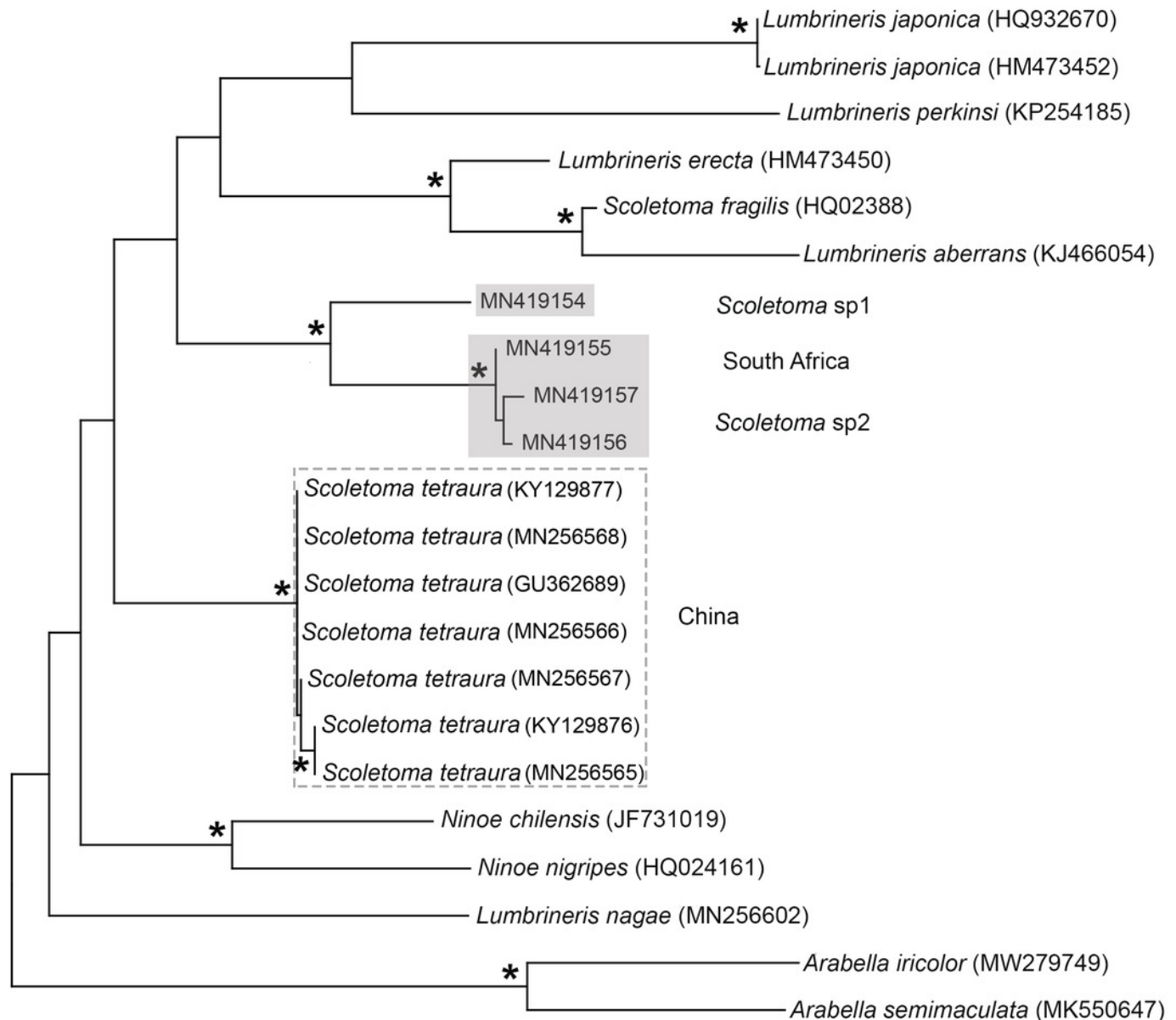
Figure 14

Morphology of *Scoletoma* species from Hermanus

Figure 13. *Scoletoma* species 2 from Hermanus. A) Dorsal anterior, B) MIII and MIV of jaws, ventral view, C) Chaetiger 3 showing pre-chaetal (Prcl) and post chaetal (Pcl) lobes anterior view, D) Chaetiger 30 showing pre- and post chaetal lobes, anterior view, E) Posterior chaetiger showing pre- and post chaetal lobes, anterior view, F) Long-headed multidentate hooded hooks on chaetiger 5, G) Long-headed multidentate hooded hook on chaetiger 31, H) Short-headed multidentate hook with flared hood from posterior chaetiger. Scale bars: A = 5mm, B – E = 0.5mm, F – H = 0.2mm. A – H = MB-A090353
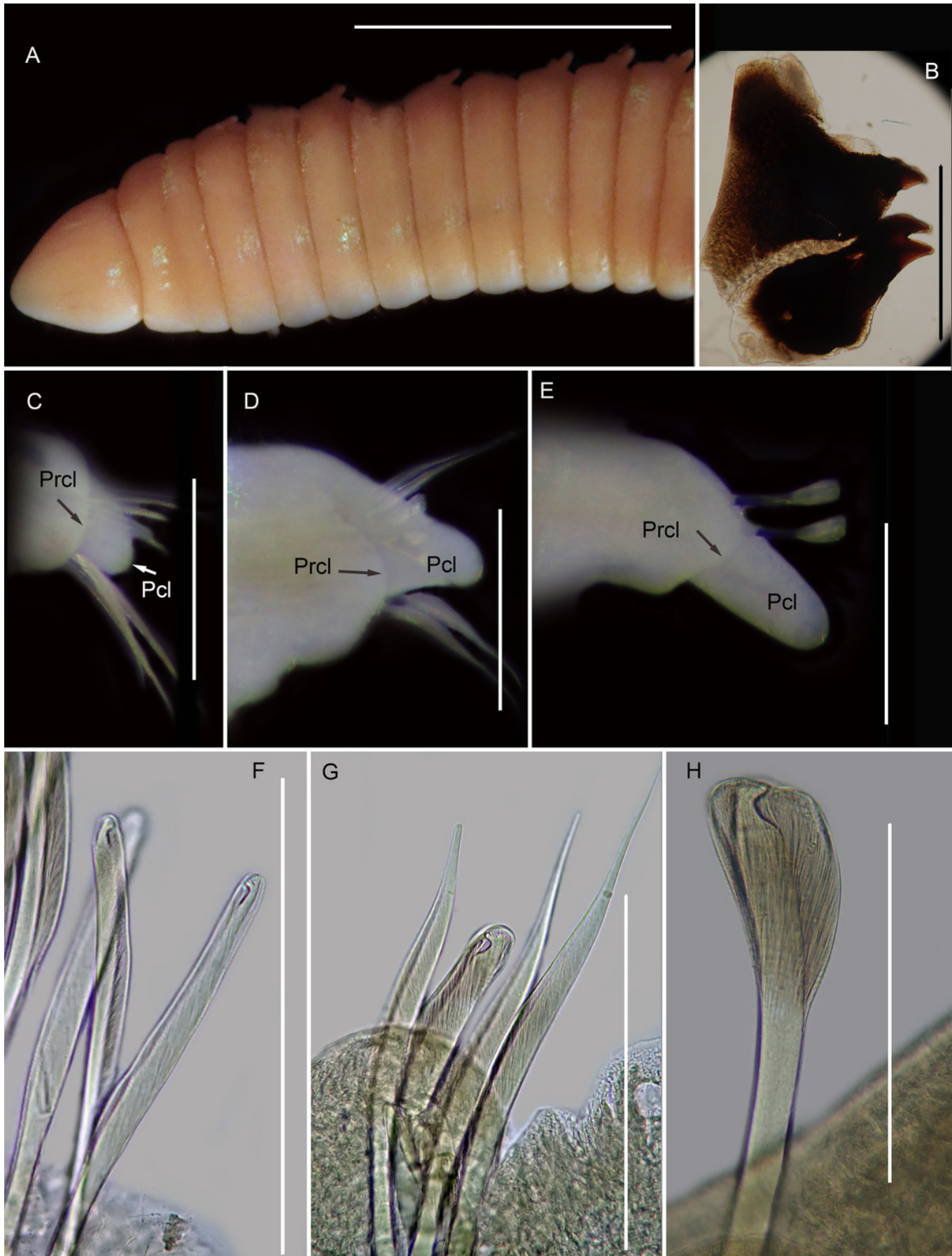
Figure 15

Morphology of *Marphysa corallina*

Figure 15. *Marphysa cf corallina* A) Anterior region (dorsal), live specimen, B) Posterior
chaetiger with branchiae, C) Compound bidentate falcigers with guards , D) Limbate
capillaries, E) Chaetae, acicula and subacicular hooks, F) Dorsal view of Maxillary apparatus
Scale bars: A = 5mm, B = 0.5mm, C & D = 50μm, E = 0.2mm, F = 2mm. A, C & D = MB-
A090276, E & F = MB-A090280. Figure 16. Neighbour Joining tree of various species
belonging to family Eunicidae Berthold, 1827, including *Marphysa* Quatrefages, 1866 and
Lysidice Lamarck, 1818 from South Africa. * Indicates bootstrap support greater than or
equal to 80%. Grey highlighted areas indicate sequences generated in this study. Red branch
represents a questionable sequence labelled as *Lysidice natalensis Kinberg, 1865* from India.
Palola viridis Gray in Stail, 1847*, Leodice rubra* Grube, 1856 and *Hyalinocea* sp. were used as
outgroups. Scale bar represented substitutions per site.
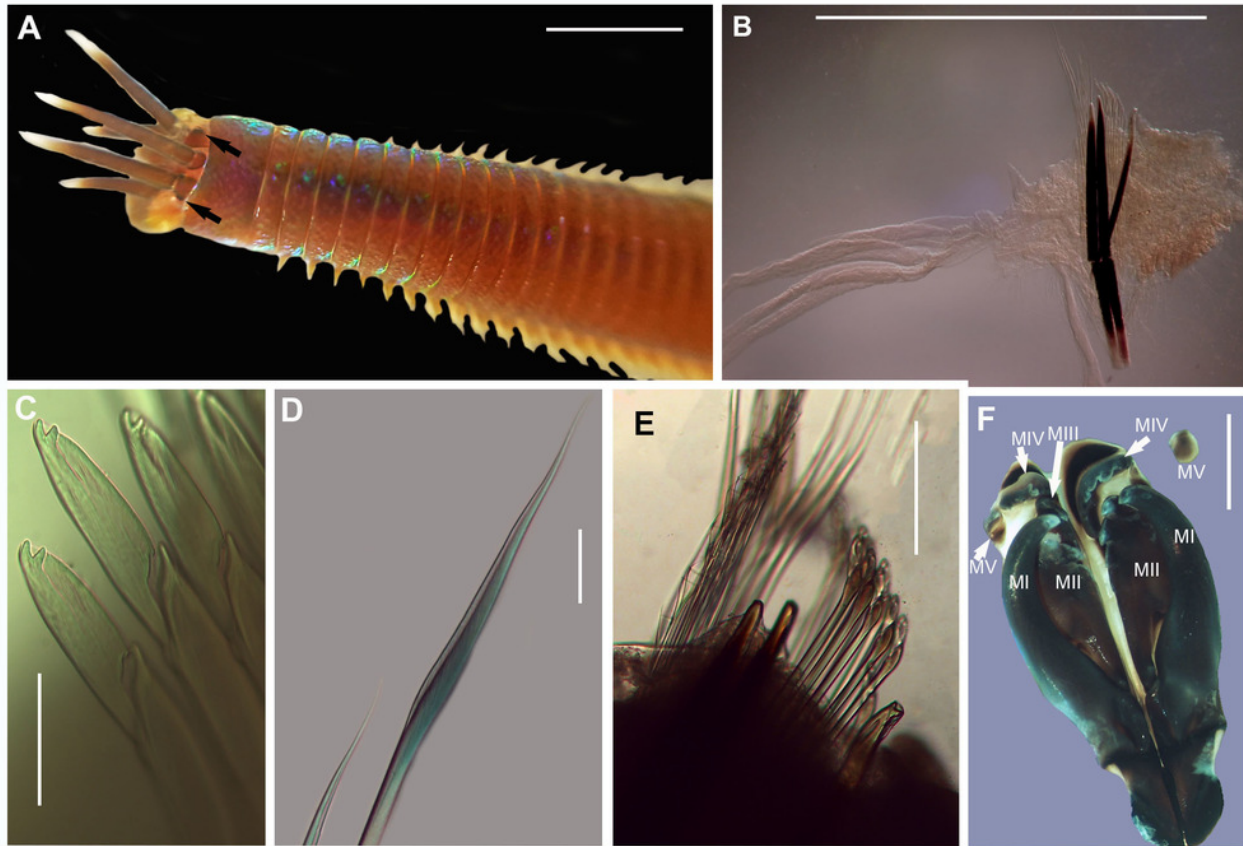
Figure 16

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.
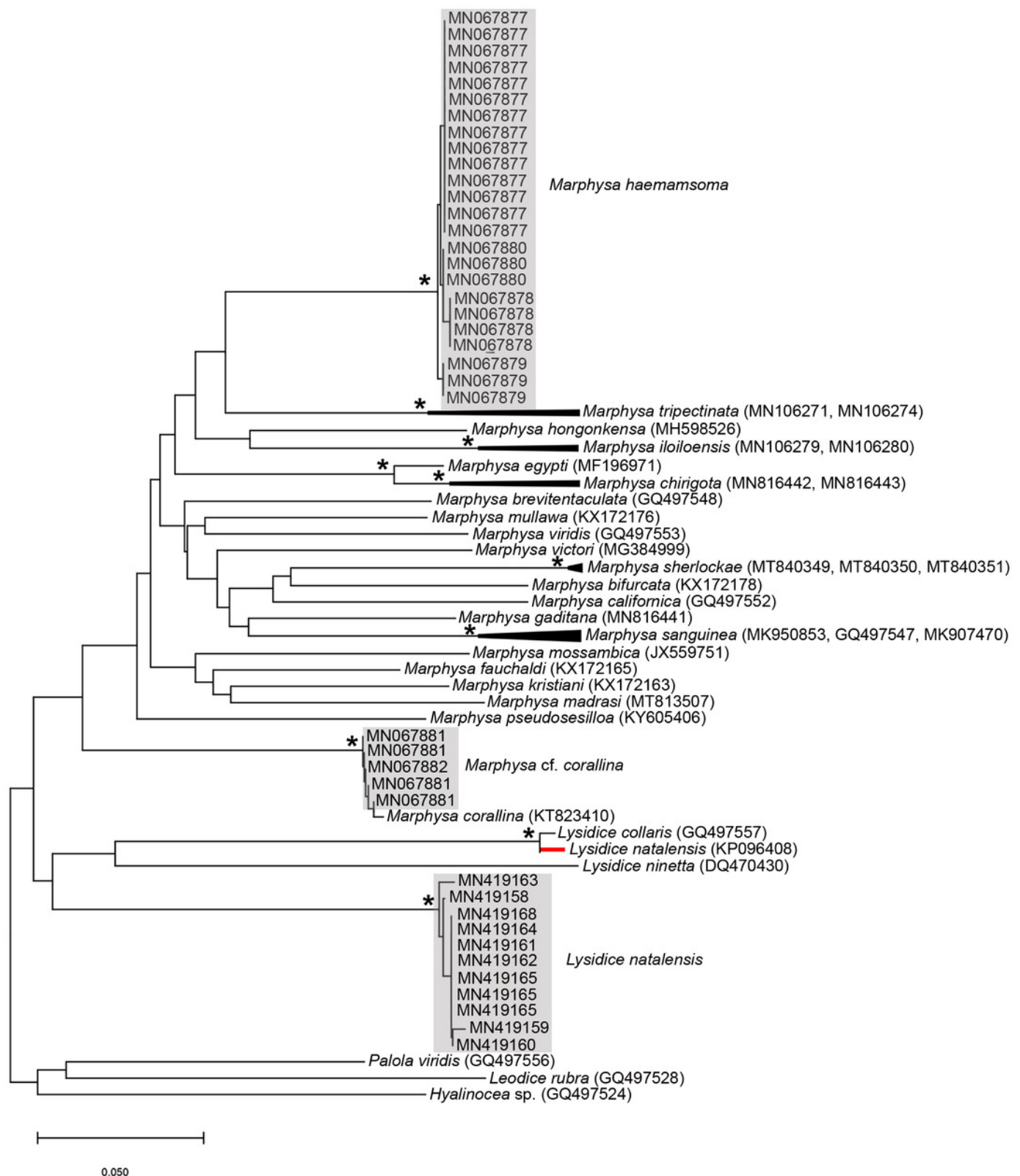
Figure 17

Morphology of *Marphysa haemasoma*

Figure 17. *Marphysa haemasoma* Quatrefages, 1866. A) Dorsal anterior, live specimen B) Dorsal anterior of live specimen, arrow showing blue colouration C) Dorsal view of maxillary apparatus, D) Pectinate anodont chaetae E) Middle chaetiger with branchia, F) Pectinate isodont chaetae, G) Pectinate anodont chaetae. Scale bars: A & B= 5mm, C = 2mm, D, F & G =50μm, E = 0.25mm. A = MB-A090326, B = MB-A090328, C = MB-A090274, D, F - G = MB-A090273.
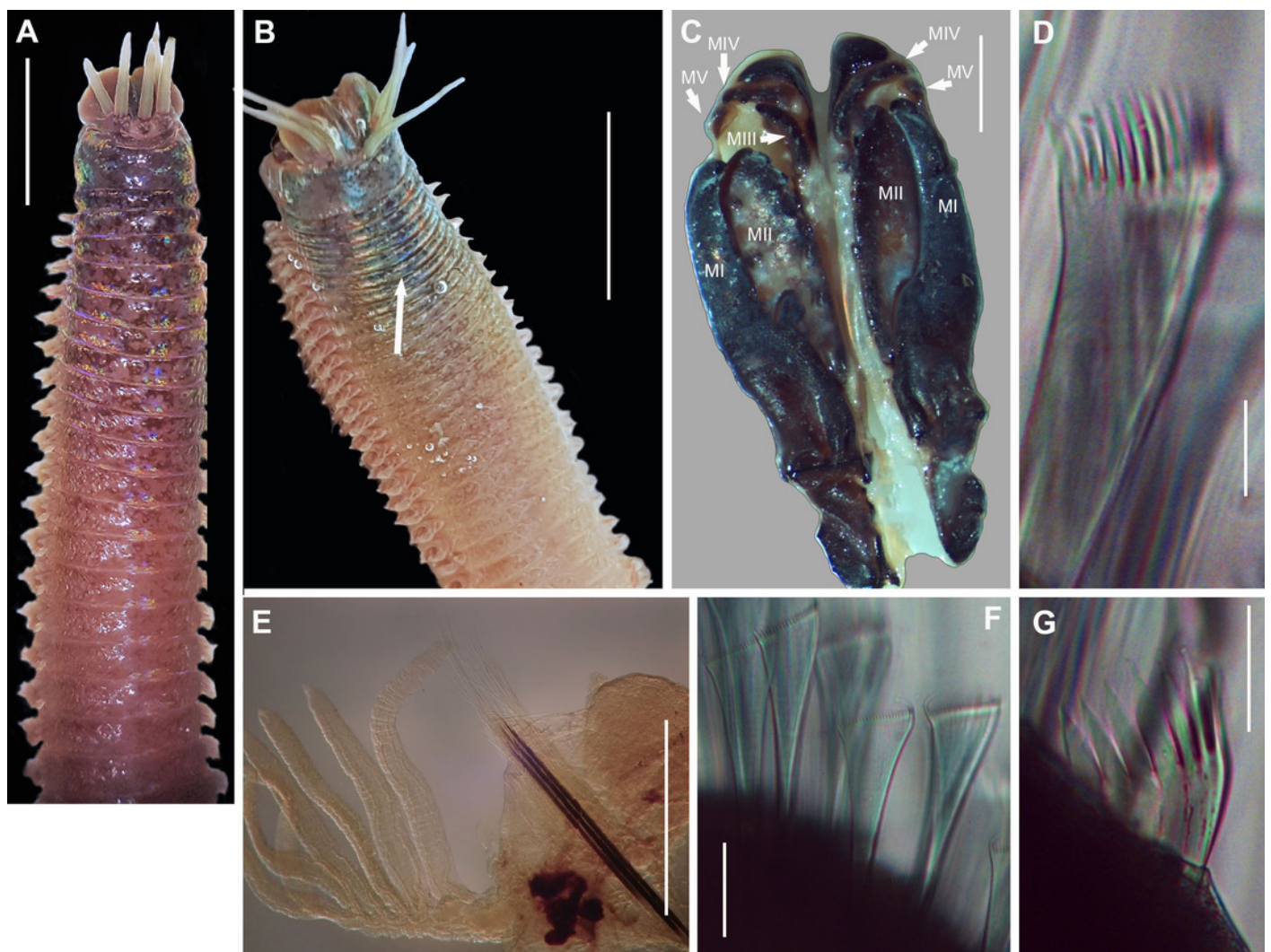
Figure 18

Morphology of *Lysidice natalensis*.

Figure 18. *Lysidice natalensis* Kinberg, 1865. A) Dorsal of head, live specimen, B) Chaetiger 5, anterior view, C) Compound falciger of chaetiger 5, D) Compound falciger of chaetiger 28, E) Chaetiger 28, anterior view F) Limbate and comb (white arrowheads) chaetae of chaetiger 28, G) Acicula hook of chaetiger 28, H) Posterior chaetiger. Scale bars: A = 1mm, B, E, H = 0.5mm, C, D, F, G = 0.05mm. A – H = MB-A090291.
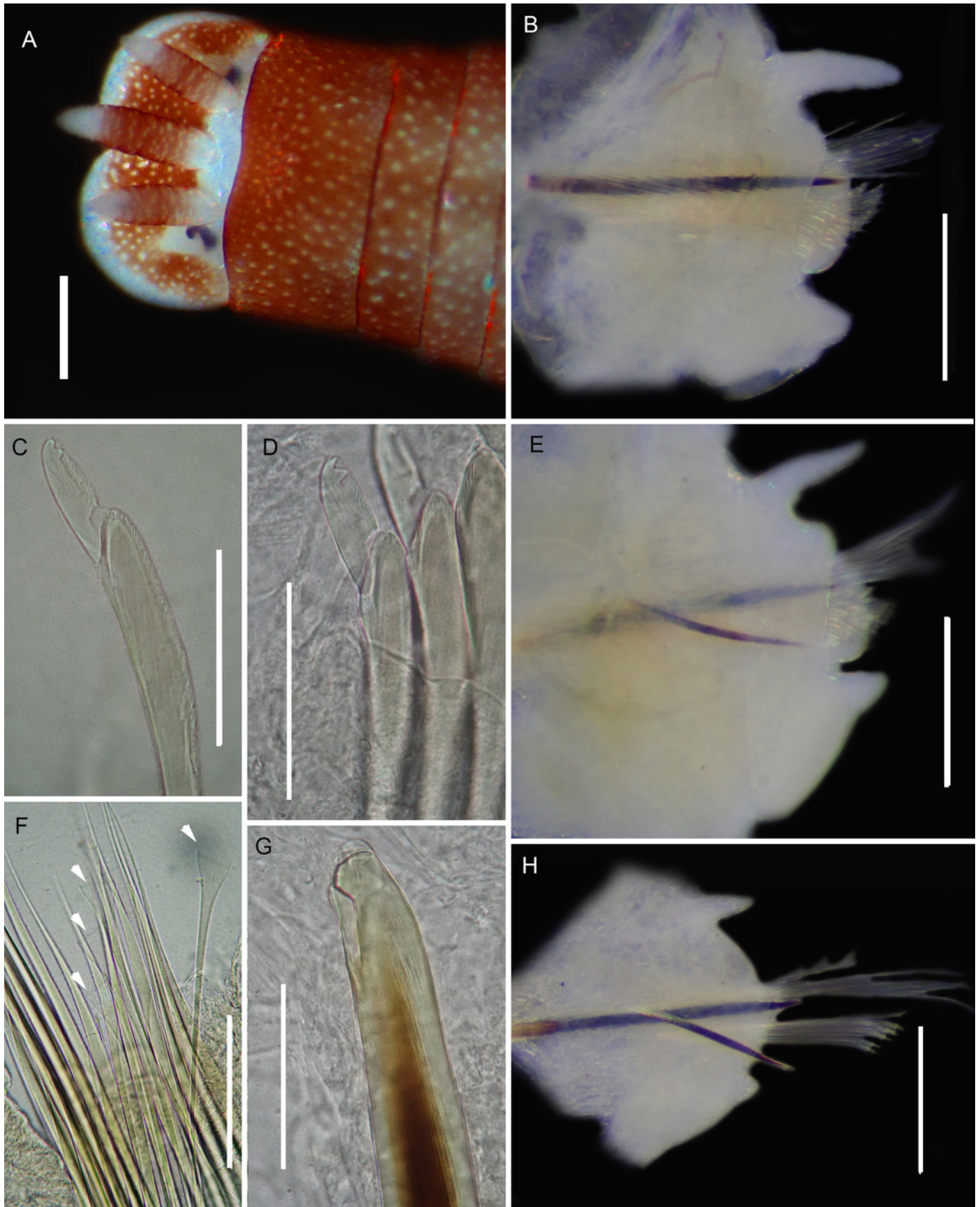
Figure 19

Morphology of *Heptaceras quinquedens*

Figure 19. *Heptaceras quinquedens* (Day, 1951). 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, C5 = Chaetiger five. 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.
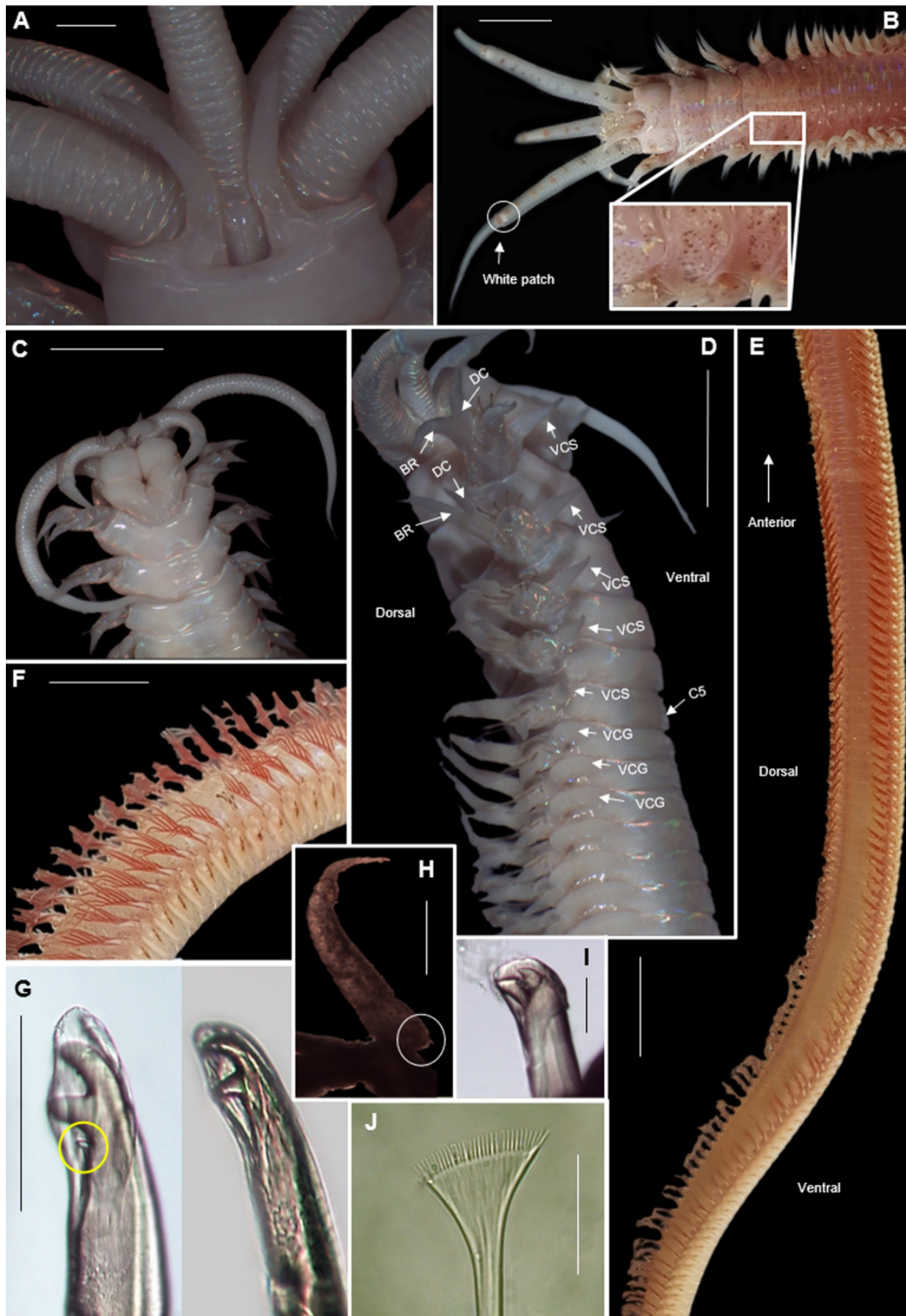
Figure 20

Morphology of *Platynereis latipalpa*

Figure 20. *Perineseis latipalpa* (Schmarda, 1861). A) Anterior region (dorsal), B) Middle region showing red colouration on segments (dorsal), C) Everted pharynx showing Areas 1, 2, 3, 4 (antero-ventral), D) Everted pharynx showing Areas V and VI (dorsal), E) Everted pharynx showing Areas VII-VIII (ventro-lateral), F) Heterogomph spinigers (heS) and homogomph spinigers (hoS) with enlarged teeth at base, G) Heterogomph falcigers with finely serrated blade. Scale bars: A & B, D = 5mm, C & E = 2mm, F - G = 0.1 mm.
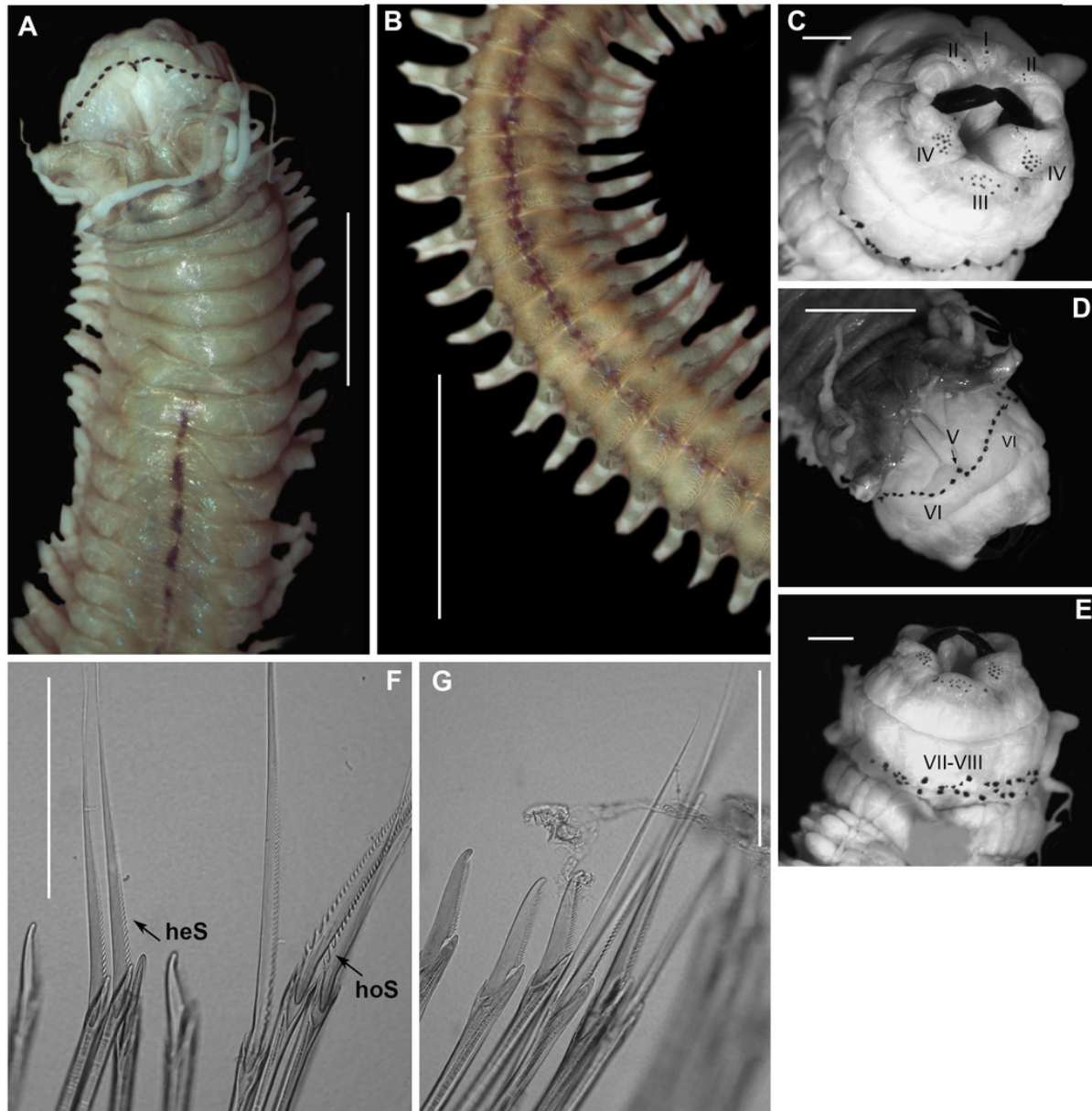
Figure 21

Morphology of *Pseudonereis podocirra*

Figure 21. *Pseudonereis podocirra* (Schmarda, 1861). A) Anterior region (dorsal), B) Posterior region, (dorsal), C) Paragnaths on pharynx, Areas I - VIII, D) Compound falciger with serrated blade, E) Compound spiniger with serrated blade, F) 30th chaetiger (dorsal). Scale bars: A - C = 2mm, D & E = 0.1mm, F = 1mm.

Figure 22

Neigbour joining tree of *Pseudonereis*
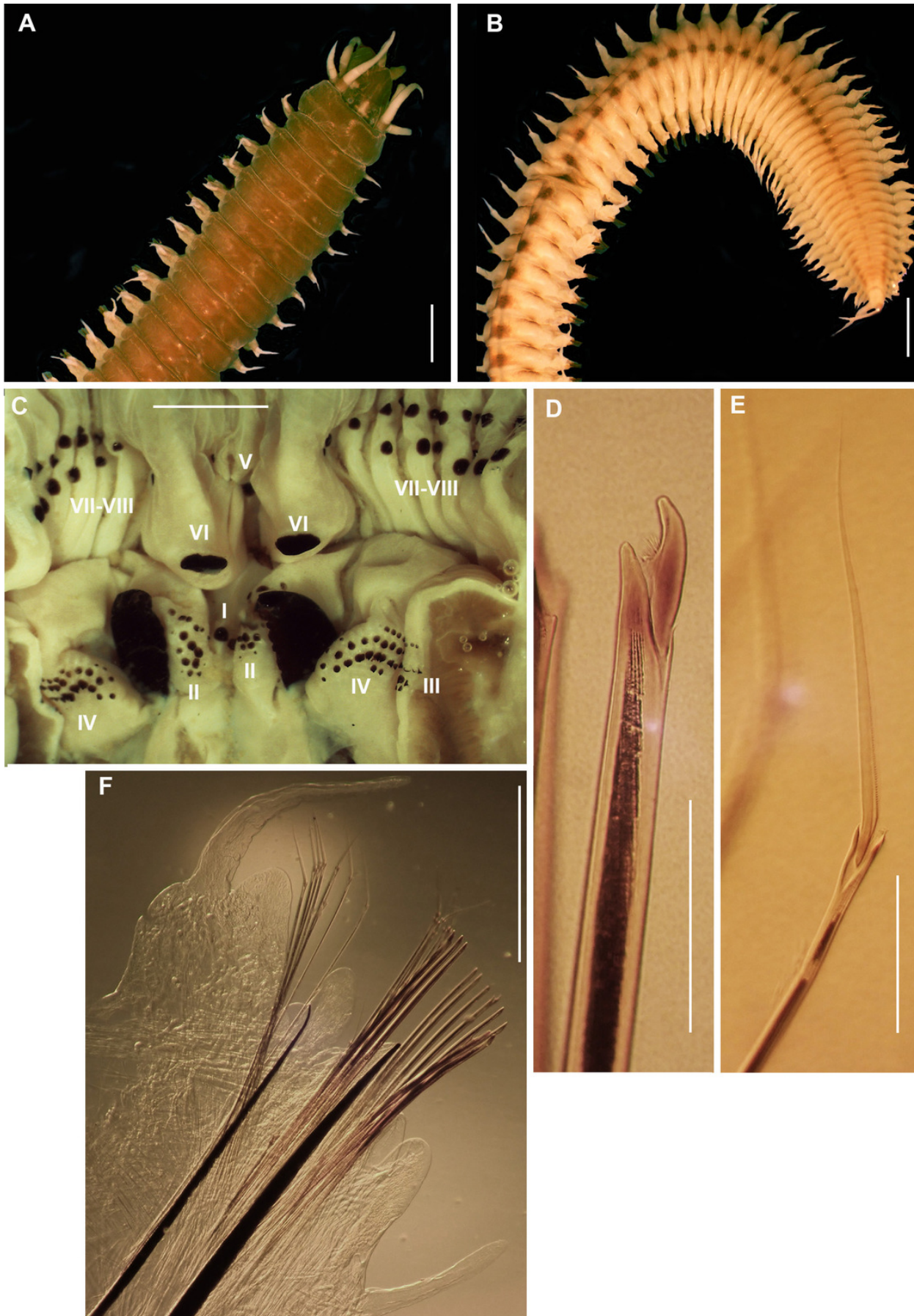
Figure 22. Neighbour Joining tree of various species belonging to *Pseudonereis* Kinberg, 1865b. * Indicates bootstrap support greater than or equal to 80%. Area highlighted in grey indicates sequences generated in the present study. *Perinereis aibuhitensis* (Grube, 1878) was used as an outgroup. Scale bar represents substitutions per site.