Zootaxa 3380: 1–33 (2012)
www.mapress.com/zootaxa/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

New and little-known gnathiid isopod crustaceans (Cymothoida) from the northern Great Barrier Reef and the Coral Sea

JÖRUNDUR SVAVARSSON[1] & NIEL L. BRUCE[2]

[1]*Institute of Biology, University of Iceland, Aragata 9, 101 Reykjavík, Iceland and University of Iceland's Research Centre at Suðurnes, 245 Sandgerði, Iceland. E-mail: jorundur@hi.is*

[2]*Museum of Tropical Queensland and School of Marine and Tropical Biology, James Cook University; Queensland Museum, 70–102 Flinders Street, Townsville, Queensland 4810, Australia; Senior Research Fellow, Department of Zoology, University of Johannesburg, South Africa. E-mail: niel.bruce@qm.qld.gov.au*

Table of contents

Abstract

Ten species of Gnathiidae (Crustacea, Isopoda, Cymothoida) including six new species, are reported from Lizard Island and nearby reefs, northern Great Barrier Reef and reefs of the Coral Sea (Chesterfield Reefs, Mellish Reef and Marion Reef): *Gnathia wistari* **sp. nov**. (Lizard Island region and Capricorn Group, southern Great Barrier Reef), *Gnathia coralmaris* **sp. nov**. (Mellish Reef), *Gnathia varanus* **sp. nov**. (Lizard Island group), *Gnathia marionis* **sp. nov**. (Marion Reef), *Gnathia hamletgast* **sp. nov**. (Chesterfield Reefs) and *Elaphognathia australis* **sp. nov**. (Chesterfield Reefs). New localities are reported for four other species: *Gnathia aureamaculosa* Ferreira and Smit, 2009 and *Gnathia masca* Farquharson and Smit, 2012 from Lizard Island and nearby reefs; *Gnathia falcipenis* Holdich and Harrison, 1980 and *Gnathia variobranchia* Holdich and Harrison, 1980 from Lizard Island, Wistari Reef, Heron Island and Chesterfields Reefs.

Key words: Coral reefs, Great Barrier Reef, Coral Sea, Isopoda, Gnathiidae, taxonomy

Accepted by K. Meland: 15 May 2012; published: 5 Jul. 2012

Introduction

Gnathiid isopods (Cymothoida) are small (3–10 mm) but distinctive animals, the males being characterized by large and conspicuous mandibles on the head. In contrast the female and larval morphology differs considerably from that of males (Holdich & Harrison 1980; Cohen & Poore 1994; Smit & Davies 2004; Wilson *et al*. 2011), at the juvenile stages the mouthparts being adapted to feeding on fish blood (e.g. Monod 1926; Smit & Davies 2004). The non-feeding adults are cryptic in behaviour, living in benthic cavities such as in coral rubble, while the larvae start each moulting stage by entering the water column to feed externally on fishes. After feeding, the larvae return to the cavities guarded by the male and remain remaining there until the next departure to the water column or when they moult into adult males or females (Monod 1926; Smit & Davies 2004). An extensive review of the family has been given by Smit and Davies (2004).

Gnathiid isopods are mostly shallow-water organisms, the majority of species living at depths of less than 100 metres; only 20 species have been recorded from depths greater than 1,000 metres. Gnathiids have been frequently reported from coral reefs (e.g. Holdich & Harrison 1980; Kensley 1988; Müller 1989a, b; Coetzee *et al*. 2008, Coetzee *et al*. 2009; Ferreira *et al*. 2009; Kensley *et al*. 2009; Farquharson *et al*. 2012). There is a growing body of information on the biology, ecology and 'parasitology' of these animals on the Great Barrier Reef (GBR) (e.g. Nagel & Grutter 2007; Grutter *et al*. 2008; Grutter 2008).

Taxonomic knowledge of Australian gnathiid isopods rests principally with two significant contributions, those of Cohen and Poore (1994) dealing primarily with shelf and slope species from southeastern Australia, and the earlier review of Holdich and Harrison (1980) based primarily on material from the Queensland coast and Great Barrier Reef. More recently a series of single-species descriptions has been published on Queensland isopods, based on larvae that were taken from known fish hosts and reared to adult stages, providing the first reliable link between the immature stages and adults (Coetzee, *et al*. 2008; Coetzee, *et al*. 2009; Ferreira *et al*. 2009; Ferreira *et al*. 2010; Farquharson *et al*. 2012). Of these species, three were not collected during the first two CReefs expeditions to Lizard Island (2008–2009), suggesting that while the host identity for the juveniles is known the adult habitat is not known, and these species may have an off-reef habitat.

Material and methods

Sampling. Shallow coral-reef habitats can be broadly divided into two convenient categories: inter-tidal reef flat and sub-tidal reef. Samples were taken by snorkelling or SCUBA diving to a depth of 30 metres. The technique is to place samples of the dead coral substrate (including fossil or compacted reef, eroded and dead coral heads; compacted coral rubble is particularly productive) into a 20-litre plastic bucket; that is taken back to the laboratory, and there moderately broken up, the water laced with a few drops of concentrated formaldehyde and left to stand for 5–30 minutes. Small samples (5 litre or less) were collected in 250 μm or 350 μm mesh bags, and processed into a bucket the same way. Ideally the sample is then elutriated under a sea-water hose with the washings passed through a soft fine-mesh net and either sorted immediately under a microscope or fixed in ethanol for later sorting.

Depth range records are given for all species where data are available. Maximum depths are restricted to less than the maximum permitted diving depth (30 m), and do not necessarily indicate maximum depth of occurrence.

The term 'small rubble' refers to coral rubble about fist-size or smaller, but larger than gravel.

Descriptions. Descriptions were prepared using the program DELTA (Dallwitz *et al*. 1997; see also Coleman *et al*. 2010). All descriptions are based on the adult males. More than one species of *Gnathia* may be present in coral reef samples and equally multiple species of females and pranizas may be present without any male. Furthermore Nagel *et al*. (2008), using molecular data, showed that yet further, possible cryptic, species occur in the Lizard Island region. At present it is not possible to confidently associate females or pranizas to the male of one particular species. Therefore for all of the new species only the male has been described.

Morphology of head and mandibles. Monod (1926: fig. 115, p. 270) presented a schema for the terms used in describing the structures of the head and mandible, a system that has since been followed, largely unchanged, (e.g. Holdich & Harrison 1980; Cohen & Poore 1994: fig. 1). Some of these structures and terms are difficult to interpret, and two in particular require redefinition due the morphology of some of the species here described.

The mandibular incisor cannot be homologised with the incisor of other isopods, and appears to be the point of junction between the mandibular carina and remaining anterior portion of the cusp. The incisor is routinely described as present or absent, and may or may not have a cusp.

The anterior margin of the head has a superior frontolateral process, inferior frontolateral process and a mediofrontal process, each variously present or absent. In both Monod (1926) and Cohen and Poore (1994) the inferior frontolateral process is clearly shown to be inferior (= ventral) to both the superior frontolateral process and the mediofrontal process. In *Gnathia varanus* **sp. nov**. there are two superior frontolateral processes and no inferior frontolateral process, as both processes are clearly dorsal to the mediofrontal process. Descriptions refer to the lateral of these processes when the processes are paired.

Material is deposited at the Museum of Tropical Queensland, Townsville (MTQ) and at the Icelandic Museum of Natural History (IMNH).

Classification follows Brandt and Poore (2003); setal terminology is based on Watling (1989); morphological terminology follows Cohen and Poore (1994) and limb orientation follows Bruce (2009) and Keable (2006).

Taxonomy

Cymothoida Wägele, 1989

Gnathiidae Leach, 1814

Genus *Elaphognathia* Monod, 1926

Type species. *Anceus ferox* Haswell, 1885; subsequent designation by Cohen and Poore (1994).

Remarks. The most recent diagnosis to the genus is that of Cohen and Poore (1994). There are 13 species of *Elaphognathia*, six of which occur in Australia (Cohen & Poore 1994; present work), with four species being recorded from tropical and subtropical habitats.

Elaphognathia australis sp. nov.

(Figs 1–3)

Material examined. ***Holotype***. ♂, 1.3 mm, Long Island, Chesterfield reefs, 19.8833°S, 158.31667°E, 4 May 1979, reef flat, exposed, 1 m, coll. N. L. Bruce (MTQ W10736).

Paratype. ♂, 1.4 mm, cay, 6 km north of Long Island, Chesterfield reefs, *c*. 19.8833°S, 158.31667°19'E, 10 May 1979, lagoon, 300 m from reef crest, 1 m, in dead coral, coll. N. L. Bruce (MTQ W10728, + 9 microslides).

Description. *Body* 2.2 times as long as greatest width, widest at pereonite 3; dorsal surfaces smooth, without setae. *Cephalosome* semi-pentagonal, 0.6 as long as wide, lateral margins narrowing posteriorly; dorsal surface smooth; dorsal sulcus wide, shallow, short; translucent region absent; paraocular ornamentation absent, posteromedian tubercle present. *Frontolateral processes* present. *Frontal margin* concave, median point with process. *External scissura* absent. *Mediofrontal process* present, strong, acute, without ventral notch, without fine setae. *Supraocular lobe* pronounced, wide; accessory supraocular lobe not pronounced. *Superior frontolateral process* present, weak, rounded, with 1 long simple seta. *Inferior frontolateral process* absent. *Mesioventral margin* straight. *Eyes* present, round, 0.3 as long as cephalosome length, bulbous, standing out from head surface, ommatidia arranged in rows, eye colour faded, not known.

Pereon lateral margins subparallel, without setae; anteriorly smooth. *Pereonite 1* fused dorsally with cephalosome; *areae laterales* absent on pereonite 5; *pereonite 6* without lobi laterales; lobuii absent. *Pleotelson* 0.9 times as long as anterior width, lateral margins smooth, anterolateral margins weakly concave, posterolateral margin distally concave; mid-dorsal surface with 2 sub-median setae (set posteriorly), anterolateral margin without submarginal setae, posterolateral margin with 1 submarginal seta, apex with 2 setae.

Antennule peduncle article 3 1.8 times as long as article 2, 1.9 times as long as wide; flagellum 1.4 as long as article 3, with 4 articles. *Antenna* peduncle article 4 1.8 times as long as wide, 1.8 times as long as article 3, with 2 penicillate setae, and 3 simple setae; article 5 1.5 times as long as article 4, 2.7 times as long as wide, inferior margin with 8 simple setae; flagellum 1.0 as long as article 5, with 7 articles.

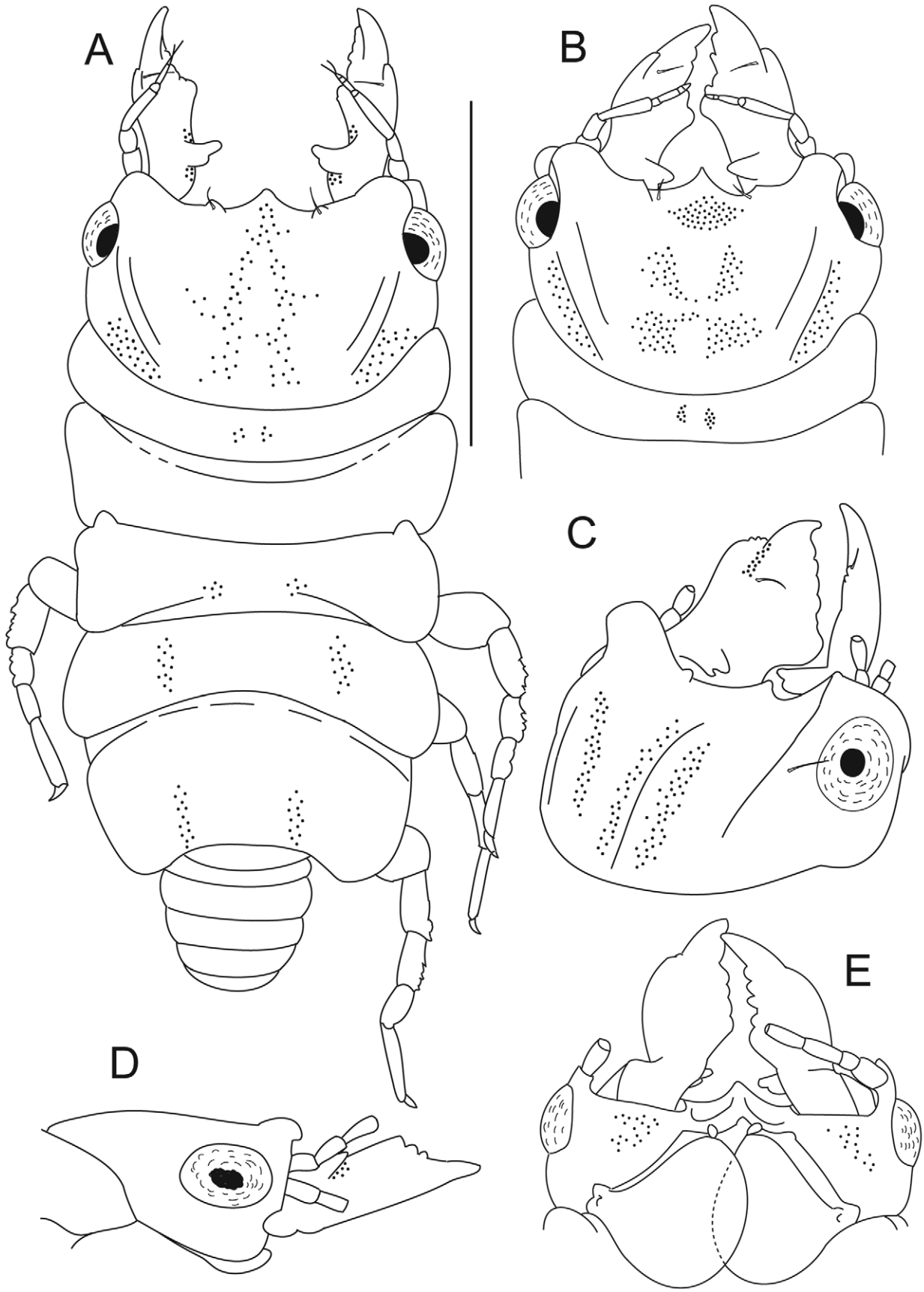

FIGURE 1. *Elaphognathia australis* **sp. nov**. A, ♂, holotype, 1.3 mm (MTQ W10736), B–E, ♂ paratype, 1.4 mm (MTQ W10728). B, cephalosome, dorsal view. C, cephalosome, dorso-lateral view. D, cephalosome, lateral view. E, cephalosome, ventral view. Scale = 0.5 mm.

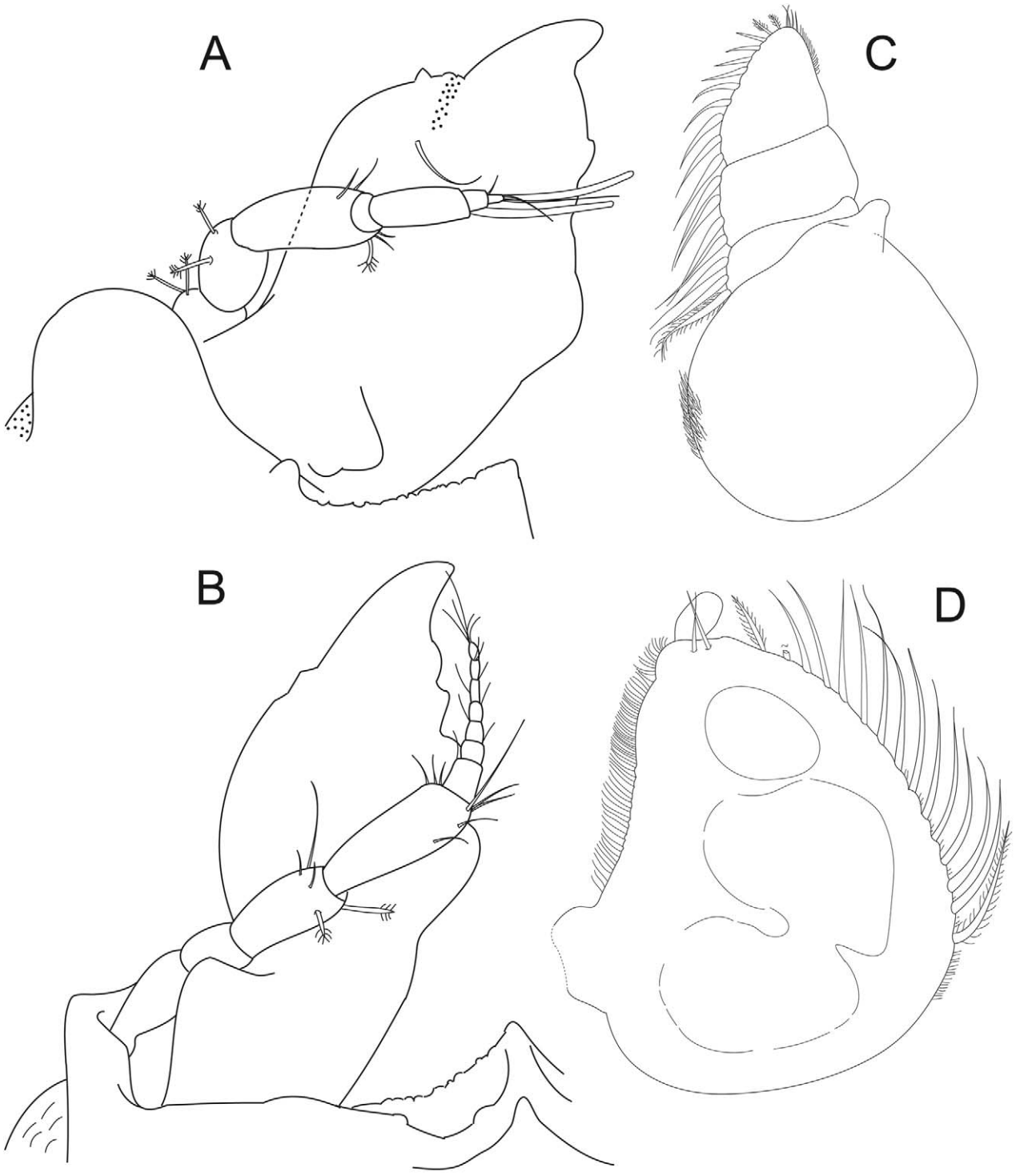

FIGURE 2. *Elaphognathia australis* **sp. nov**., ♂, paratype, 1.4 mm (MTQ W10728). A, mandible, dorsal view, and antennule. B, mandible, ventral view, and antenna. C, maxilliped. D, pylopod.

*Mandibl*e 0.5 as long as width of cephalosome, mandible rectangular, weakly curved, distally; mandible apex 10% total length; mandibular seta present. *Carina* present, smooth, along entire length. *Incisor* elevated, standing clear of surface, distal denticulation present. *Blade* present, dentate, with distinct angle, straight, along proximal 55% of margin. *Pseudoblade* absent; *internal lobe* present, bifid, large, smooth; dorsal lobe absent; basal neck short; erisma absent; lamina dentata absent.

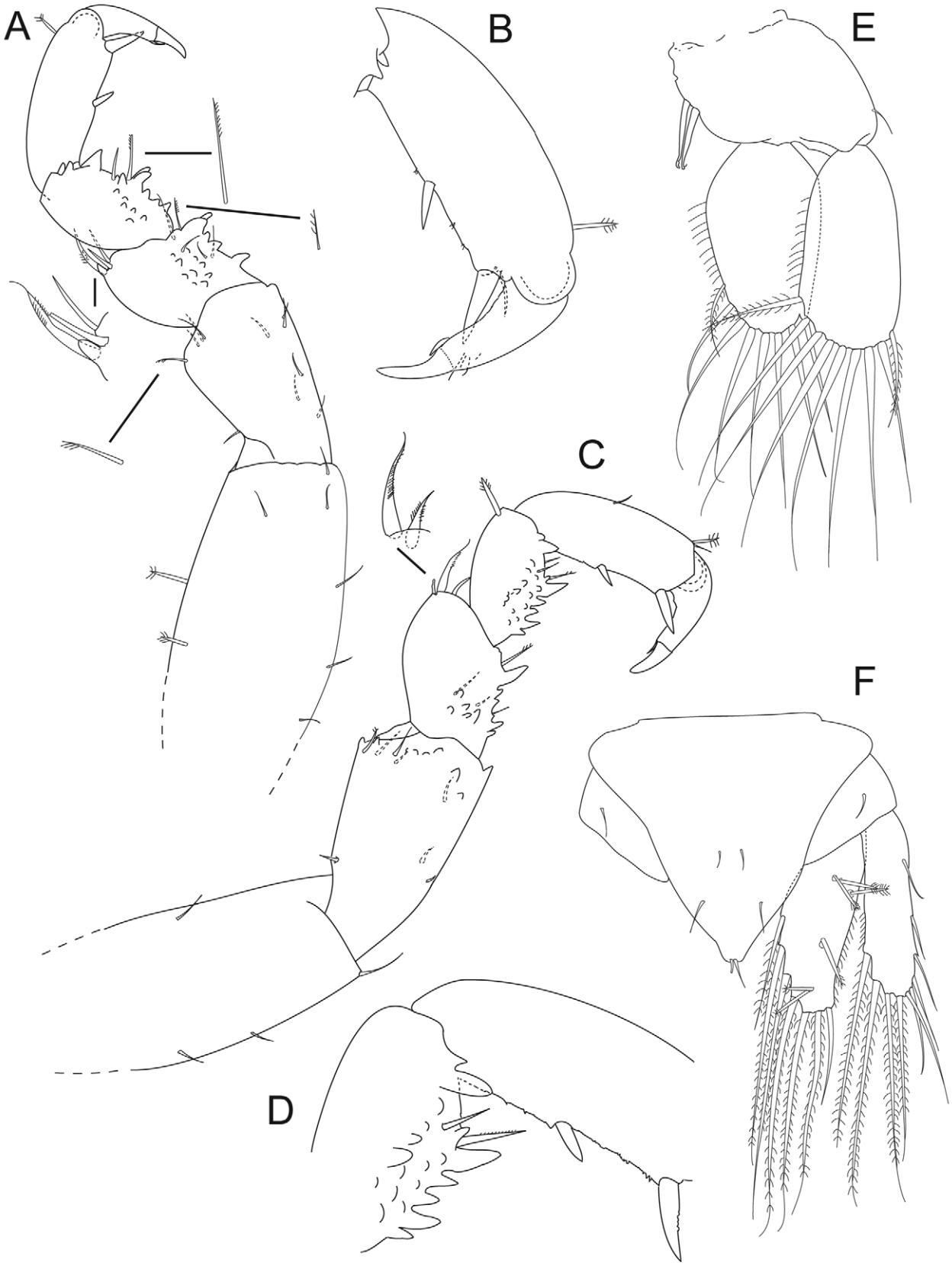

FIGURE 3. *Elaphognathia australis* **sp. nov**., ♂, paratype, 1.4 mm (MTQ W10728). A, pereopod 2. B, propodus and dactylus of pereopod 2. C, pereopod 6. D, carpus and propodus of pereopod 6. E, pleopod 2. F, pleotelson and uropod.

Maxilliped 4-articled (articles 4 and 5 fused). *Maxilliped* article 1 lateral margin with distolateral mass of scale-setae; article 2 lateral margin with 3 plumose setae (PMS); article 3 lateral margin with 4 plumose setae; article 4 lateral margin with 11 plumose setae; endite extending to distal margin of article 2; without coupling setae. *Pylopod* article 1 1.3 as long as wide, without distolateral lobe; posterior and lateral margins forming rounded curve; lateral margin with 15 large PMS; mesial margin with continuous scale-setae, distal margin with 2 long simple setae; article 2 2.7 as long as wide; article 3 absent.

Pereopods 2–6 with long simple setae; propodus distal robust seta (RS) twice length of proximal RS; lateral and inferior margins with prominent tubercles, pereopod 2 with tubercles on merus and carpus. *Pereopod 2 basis* 2.4 times as long as greatest width, superior margin without long setae (and 2 penicillate setae), inferior margin with 6 setae (short); *ischium* 0.5 times as long as basis, 1.6 as long as wide, superior margin with 4 setae (short), inferior margin with 6 setae (short); *merus* 0.5 as long as ischium, 0.8 as long as wide, superior margin with 3 long setae (1 biserrate, 1 fine setulose), inferior margin with 4 long setae (1 fine setulose seta); *carpus* 0.6 as long as ischium, 2.1 as long as wide, superior margin without long setae, inferior margin with 2 setae (1 fine setulose seta); *propodus* 0.9 times as long as ischium, 2.6 times as long as wide, superior margin with 1 long seta (penicillate), inferior margin without short setae, without long simple setae, and with 2 RS; *dactylus* 0.7 as long as propodus. *Pereopods 3 and 4* similar to pereopod 2. *Pereopod 5* similar to pereopod 6. *Pereopod 6* with tubercles on ischium to carpus, *basis* superior margin with 1 long seta, and no penicillate setae, inferior margin with 2 long setae; *ischium* 1.7 as long as greatest width, superior margin with 3 long setae, inferior margin with 2 long setae; *merus* 0.6 as long as ischium, 1.3 times as long as wide, superior margin with 3 long setae (2 biserrate), inferior margin 1 long seta (fine setulose seta), without dense patch of scale-setae; *carpus* 0.5 as long as ischium, 1.6 times as long as wide, superior margin with 1 long seta (penicillate), inferior margin with 3 long setae (and 1 fine setulose seta); *propodus* 0.8 as long as ischium, 2.8 times as long as wide, superior margin with 3 long setae, inferior margin without long setae, and 2 RS; dactylus 0.8 as long as propodus. *Penes* opening flush with surface of sternite 7.

Pleopod 2 exopod 2.1 as long as wide, 9 PMS; *endopod* 1.6 as long as wide, endopod with 8 PMS. Pleopod 2 *appendix masculina* absent.

Uropod rami extending beyond pleotelson, apices broadly rounded. *Peduncle* with 1 dorsal seta. *Endopod* 2.5 as long as greatest width, dorsally with 6 sensory setae; lateral margin sinuate, lateral margin with 1 simple seta; mesial margin weakly convex, with 6 long plumose setae. *Exopod* extending to end of endopod, 3.6 times as long as greatest width; lateral margin weakly convex, with 6 simple setae; proximomesial margin sinuate, proximally concave, mesiodistal margin with 4 long PMS.

Remarks. *Elaphognathia australis* **sp. nov**. is most similar to *Elaphognathia forceps* (Holdich & Harrison, 1980), but differs in the shape of the excavation of the frontal margin. In *E. forceps* the excavation is narrow and deep, while in *E. australis* the excavation is wide, with a wide rostrum-like medial frontal process.

Etymology. Alludes to the Southern Hemisphere locality of collection.

Distribution. Long Island, Chesterfield reefs, Coral Sea.

Genus *Gnathia* Leach, 1814

Type species. *Gnathia termitoides* Leach, 1814; see Cohen and Poore (1994).

Remarks. *Gnathia* is a large genus, numbering 111 species, and ubiquitous and common in coral-reef habitats. The most recent generic revision is that of Cohen and Poore (1994).

Gnathia aureamaculosa Ferreira and Smit, 2009

Gnathia aureamaculosa Ferreira and Smit, 2009 in Ferreira *et al*. 2009: 1067, figs 1A–H, 2A–C, 3, 6A, B, 7A. —Wilson *et al*. 2011: 511, figs 1–5, 6F–G.

Material examined. 4 ♂ (reared), Lizard Island, Queensland, Australia, 14.681856°S, 145.464922°E, A. Grutter stn m, 1 June 1998, symbiotic with the fish species *Hemigymnus melapterus* (3 ♂ MTQ W24856, 1 ♂ IMNH 2726). 1 ♂, Lizard Island, off North Point, 'Washing Machine', 14.65067°S, 145.4601°E, 17 April 2008, dead coral, 6–8 m, CReefs stn CGLI038, coll. S. Smith (MTQ W14119).

Remarks. The four reared specimens examined here were reared from larvae collected from the thick-lipped wrasse [*Hemigymnus melapterus* (Bloch, 1791; Labridae) by Grutter *et al*. (2000)]. These specimens, and the single specimens collected at Lizard Island in 2008 all agree well with the description. The paucity of specimens in the CReefs material suggests that the precise habitat of this species has not yet been located.

Distribution. Known only from Lizard Island, Great Barrier Reef.

***Gnathia coralmaris* sp. nov.**
(Figs 4–7)

Material examined. ***Holotype***. ♂, 1.9 mm, Mellish Reef, Australian Coral Sea, 17.406667°S, 155.858333°E, 1 May 1979, lagoon, 6 m, coll. N. L. Bruce (MTQ W30559).

Paratype. ♂, 2.3 mm, dissected, same data as holotype (MTQ W10729, + 9 microslides).

Description. *Body* 2.8 times as long as greatest width, widest at pereonite 4; dorsal surfaces polished, sparsely setose. *Cephalosome* quadrate, 0.8 as long as wide, lateral margins convex; dorsal surface with sparse granules; dorsal sulcus wide, shallow, extended; translucent region present; elliptical; paraocular ornamentation strongly developed, posteromedian tubercle present. *Frontolateral processes* present. *Frontal margin* produced, triangular, median point excavate. *External scissura* present, wide, deep. *Mediofrontal process* present, weak, rounded, with ventral notches, without fine setae. *Supraocular lobe* pronounced, wide; accessory supraocular lobe not pronounced. *Superior frontolateral process* present, single, strong, unequally apically bifid, with 3 long simple setae. *Inferior frontolateral process* absent. *Eyes* present, elongate, 0.3 as long as cephalosome length, contiguous with head surface, ommatidia arranged in rows, eye colour yellow.

Pereon lateral margins subparallel, with few setae; anteriorly smooth and with sparse fine granules. *Pereonite 1* not fused dorsally with cephalosome; dorsolateral margins fully obscured by cephalosome; *pereonite 2* wider than pereonite 1; *areae laterales* absent on pereonite 5; *pereonite 6* without lobi laterales; lobuii well-developed, globular. *Pleotelson* 0.9 times as long as anterior width, lateral margins serrate (at mid-margin), anterolateral margins concave, posterolateral margin weakly concave; mid-dorsal surface with 2 sub-median setae (small), anterolateral margin with 1 submarginal seta (small), posterolateral margin with 2 submarginal setae (prominent), apex with 2 setae.

Antennule peduncle article 3 1.9 times as long as article 2, 4.1 times as long as wide; flagellum 0.9 as long as article 3, with 5 articles. *Antenna* peduncle article 4 2.9 times as long as wide, 2.2 times as long as article 3, without penicillate setae, and with 4 simple setae; article 5 1.2 times as long as article 4, 3.7 times as long as wide, inferior margin with 2 penicillate setae, with 12 simple setae; flagellum 0.9 as long as article 5, with 6 articles.

*Mandibl*e 0.5 as long as width of cephalosome, mandible triangular, weakly curved, evenly; mandible apex 20% total length; mandibular seta present. *Carina* present, smooth, along entire length. *Incisor* dentate, distal denticulation present. *Blade* present, smooth, strongly convex, proximally convex, along proximal 50% of margin. *Pseudoblade* absent; *internal lobe* absent; dorsal lobe absent; basal neck short; erisma present; lamina dentata absent.

Maxilliped 5-articled. *Maxilliped* article 1 lateral margin with continuous marginal scale-setae; article 2 lateral margin with 4 plumose setae; article 3 lateral margin with 7 plumose setae; article 4 lateral margin with 5 plumose setae; article 5 with 7 plumose setae; endite extending to distal margin of article 2; without coupling setae. *Pylopod* article 1 1.8 as long as wide, with distolateral lobe; posterior and lateral margins forming rounded curve; lateral margin with 25 large PMS; mesial margin with continuous scale-setae, distal margin with 4 long simple setae; article 2 1.2 as long as wide; article 3 minute, with 2 setae.

Pereopods 2–6 without long plumose setae; propodus distal RS slightly longer than proximal RS; lateral and inferior margins with weak tubercles, pereopod 2 with tubercles on basis to ischium. *Pereopod 2 basis* 2.2 times as long as greatest width, superior margin 6 long setae, inferior margin 4 setae; *ischium* 0.6 times as long as basis, 2.1 as long as wide, superior margin with 4 setae, inferior margin with 6 setae; *merus* 0.5 as long as ischium, 1.5 as long as wide, superior margin with 3 long setae, inferior margin with 6 long setae; *carpus* 0.6 as long as ischium, 1.8 as long as wide, superior margin with 1 long seta, inferior margin with 4 setae (1 biserrate); *propodus* 0.9 times as long as ischium, 3.2 times as long as wide, superior margin 3 long setae, inferior margin with 3 short setae, without long simple setae (1 penicillate seta), and 2 RS; *dactylus* 0.6 as long as propodus. *Pereopods 3 and 4* similar to

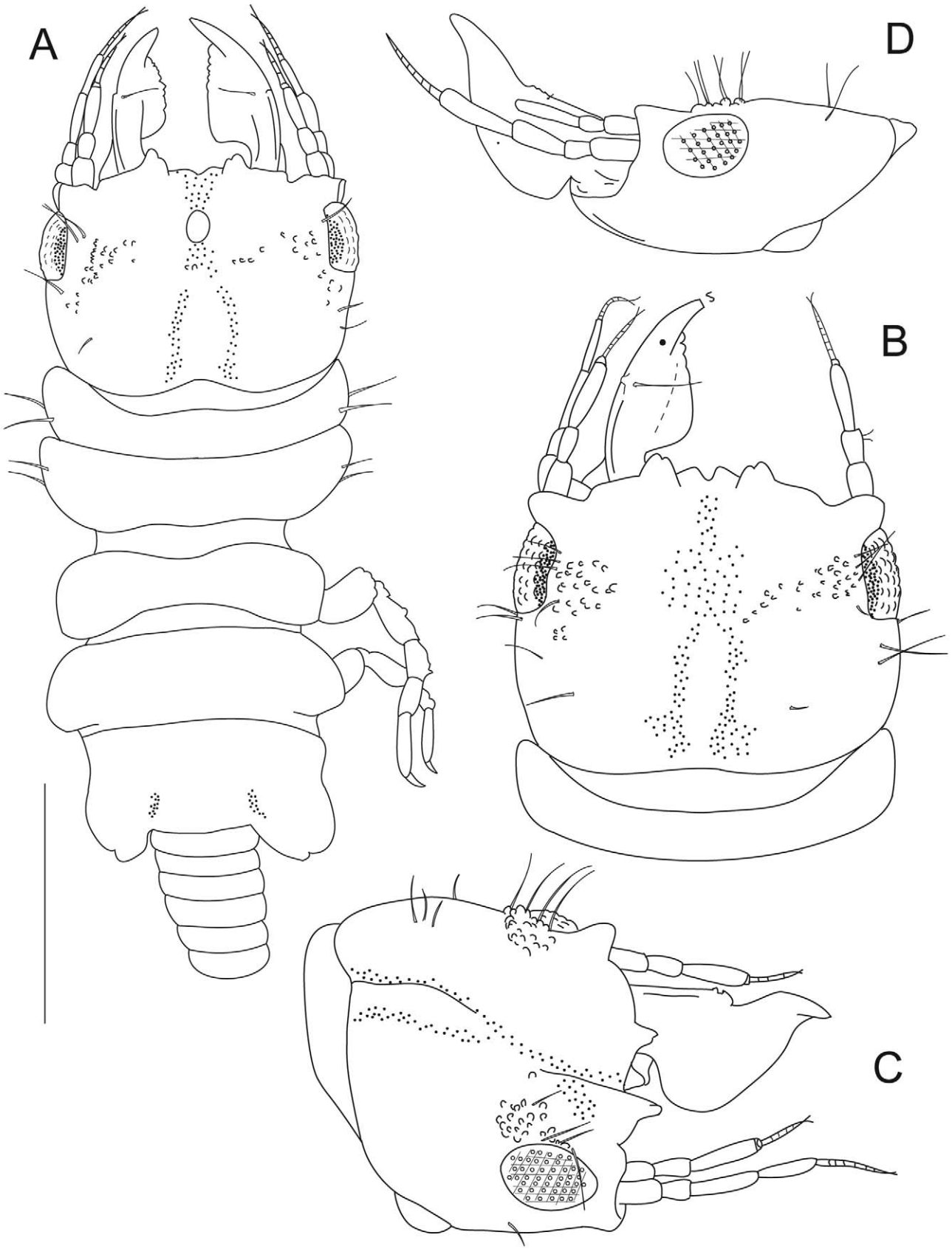

FIGURE 4. *Gnathia coralmaris* **sp. nov**. A, habitus, ♂, holotype, 1.9 mm (MTQ W30559), B–D, ♂ paratype, 2.3 mm (MTQ W10729). B, cephalosome, dorsal view. C, cephalosome, dorso-lateral view. D, cephalosome, lateral view. Scale = 0.5 mm.

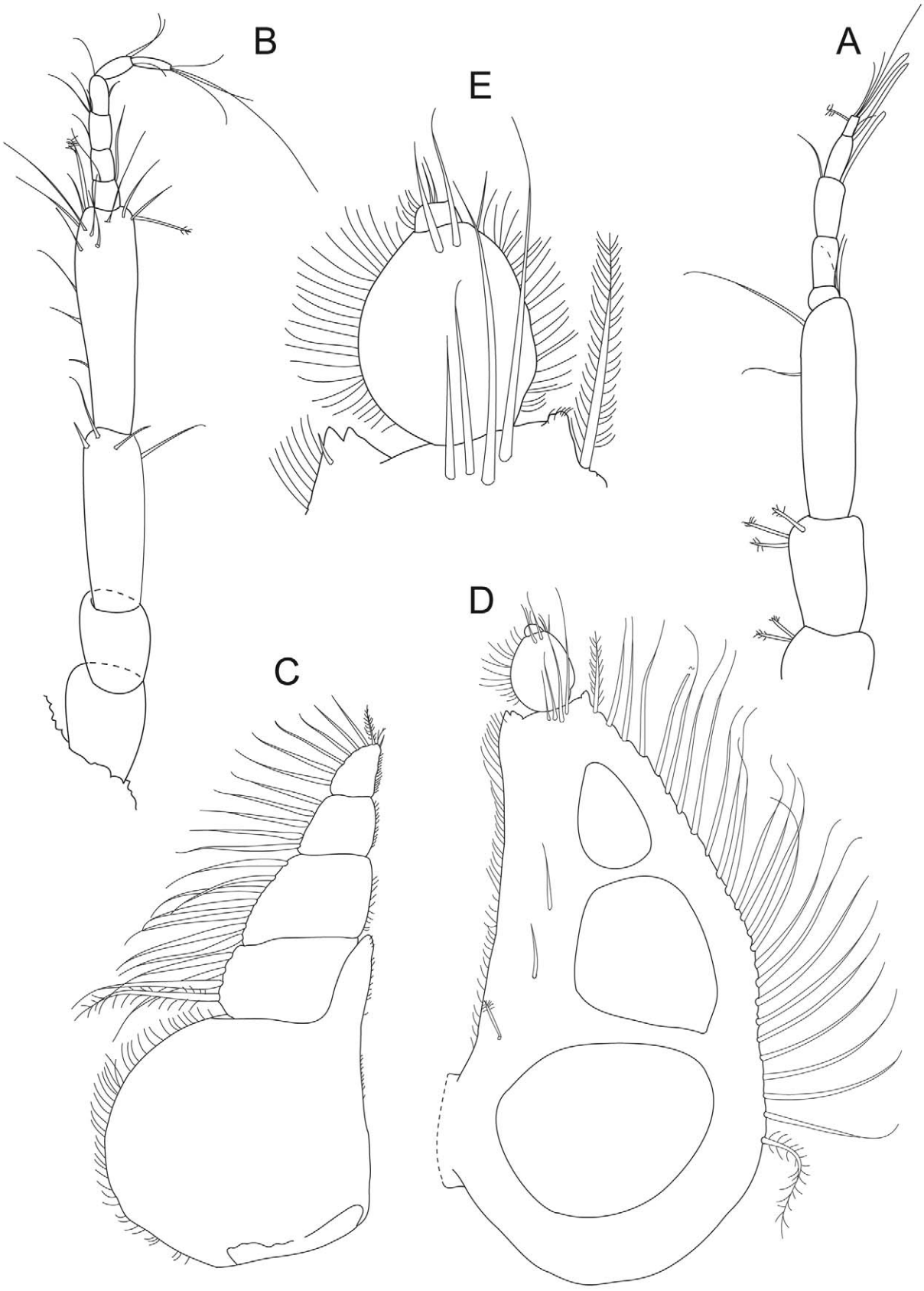

FIGURE 5. *Gnathia coralmaris* **sp. nov.**, ♂, paratype, 2.3 mm (MTQ W10729). A, antennule. B, antenna. C, maxilliped. D, pylopod. E, second and third article of pylopod.

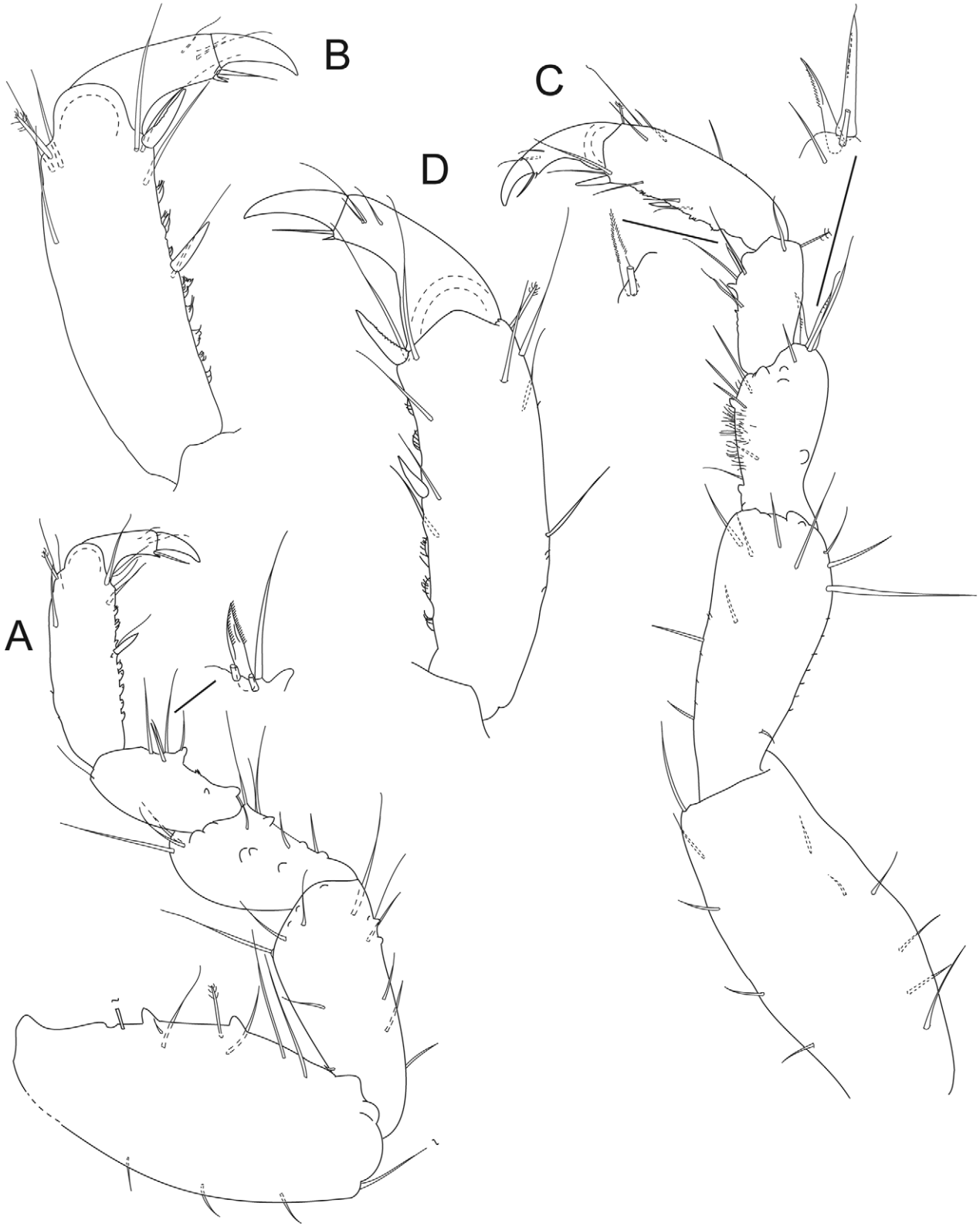

FIGURE 6. *Gnathia coralmaris* **sp. nov.**, ♂, paratype, 2.3 mm (MTQ W10729). A, pereopod 2. B, propodus and dactylus of pereopod 2. C, pereopod 6. D, propodus and dactylus of pereopod 6.

pereopod 2. *Pereopod 5* similar to pereopod 6. *Pereopod 6 basis* 2.1 times as long as greatest width, superior margin with 6 long setae, and no penicillate setae, inferior margin with 5 long setae; *ischium* 0.8 as long as basis, 2.3 as long as greatest width, superior margin with 5 long setae, inferior margin with 5 long setae; *merus* 0.6 as long as

ischium, 1.6 times as long as wide, superior margin with 2 long setae (and 2 biserrate setae), inferior margin 5 long setae, with dense patch of scale-setae; *carpus* 0.5 as long as ischium, 1.9 times as long as wide, superior margin without long setae (1 penicillate seta), inferior margin with 4 long setae; *propodus* 0.7 as long as ischium, 2.8 times as long as wide, superior margin with 4 long setae (and 1 penicillate seta), inferior margin with 5 long setae, and 2 RS; dactylus 0.7 as long as propodus. *Penes* opening flush with surface of sternite 7.

Pleopod 2 exopod 1.9 as long as wide, 9 PMS; *endopod* 1.9 as long as wide, endopod with 7 PMS. Pleopod 2 *appendix masculina* present, with parallel margins, 0.5 times as long as endopod, distally bluntly rounded.

Uropod rami extending beyond pleotelson, apices broadly rounded. *Peduncle* with 1 dorsal seta. *Endopod* 2.3 as long as greatest width, dorsally with 6 sensory setae; lateral margin distally concave, lateral margin with 3 simple setae; mesial margin strongly convex, with 7 long plumose setae. *Exopod* not extending to end of endopod, 3.8 times as long as greatest width; lateral margin weakly convex, with 7 simple setae; proximomesial margin straight, distally convex, mesiodistal margin with 4 long PMS.

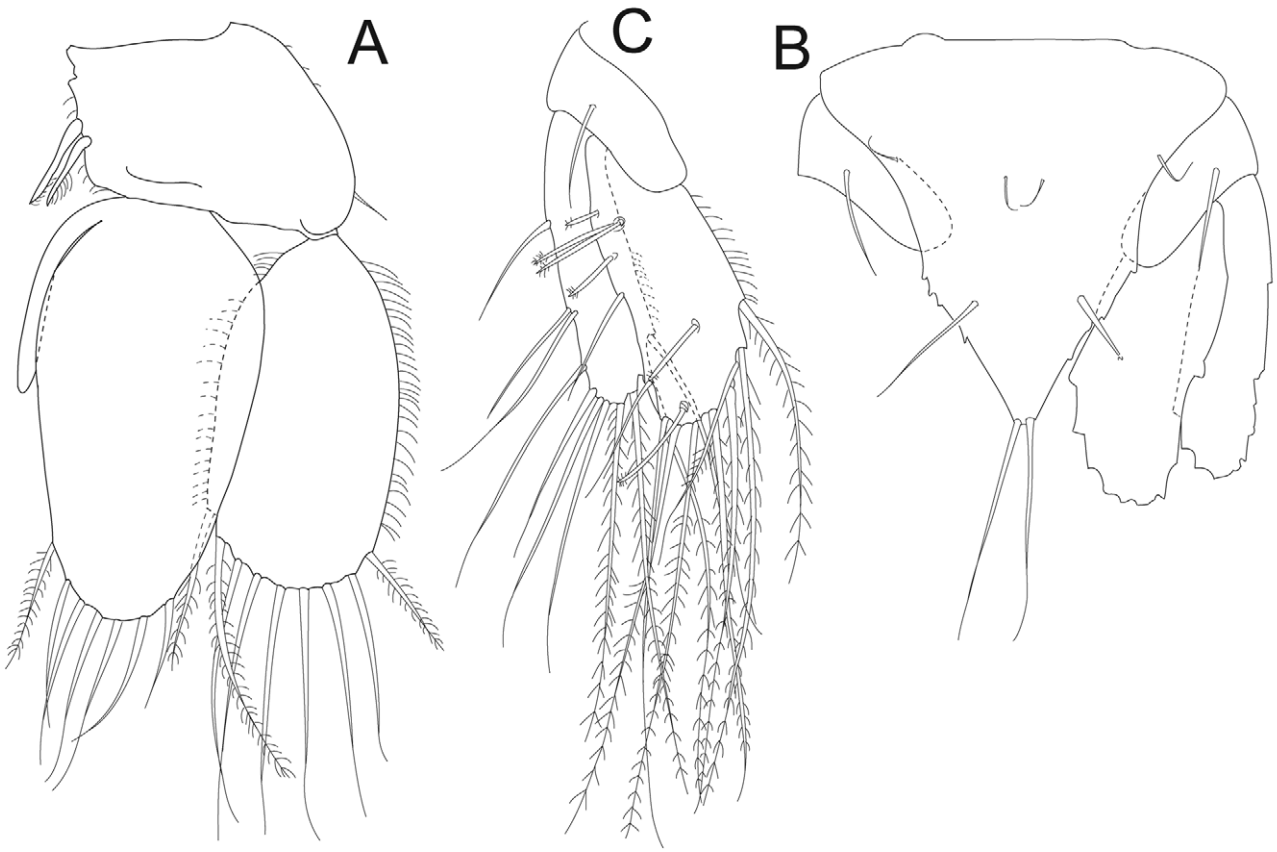

FIGURE 7. *Gnathia coralmaris* **sp. nov.**, ♂, paratype, 2.3 mm (MTQ W10729). A, pleopod 2. B, pleotelson and outline of uropod. C, uropod.

Remarks. *Gnathia coralmaris* **sp. nov**. is distinguished from all Australian species by the shape of the frontal margin and the frontal processes. *Gnathia coralmaris* **sp. nov**. is most similar to *Gnathia phallonajopsis* Monod, 1925 from the Mediterranean and *Gnathia perimulica* Monod, 1926 from the Gulf of Thailand. *Gnathia coralmaris* differs from *G. perimulica* in having smooth frontal margin (crenulated mid-part and crenulated laterofrontal process in *G. perimulica*), and from *G. phallonajopsis* by lacking internal lobe (lobe present in *G. phallonajopsis*) on the mandible.

Etymology. The epithet combines the Latin words *corallium* and *maris*.

Distribution. Mellish Reef, Australian Coral Sea Territory.

Gnathia falcipenis Holdich and Harrison, 1980

Gnathia falcipenis Holdich and Harrison, 1980: 223, figs 3a–h, 3j, 3k. —Poore and Lew Ton, 2002: 189.

Material examined. Lizard Island Group: 2 ♂, patch reef off Palfrey Is, 14.68345°S, 145.44147°E, 16 April 2008, fist-sized rubble on flat bottom between bommies, 2–3 m, CReefs stn CGLI 034B, coll. N. L. Bruce (MTQ W14120). 1 ♂, lagoon entrance in from Seabird Islet, 14.68900°S, 145.46710°E, patch reef, 19 April 2008, medium small rubble, 1–3 m, CReefs stn CGLI 041B, coll. N. L. Bruce (MTQ W14121).

Outer barrier reefs: 1 ♂, 1 ♀, Day Reef, 14.48356°S, 145.5459°E, 13 February 2009, outer reef, flat rubble in gully, 10 m, CReefs stn LIZ09 04A, coll. N.L. Bruce & M. Błażewicz-Paszkowycz (MTQ W31379).

Remarks. The species was only found at shallow waters, 1–10 metres, in coral rubble. Holdich and Harrison (1980) reported the species from Chinaman's Head, Lizard Island at depths of 3.7 m and from a semi-permanent log on the mid-shore at Magnetic Island off Townsville.

Distribution. Lizard Island and surrounding region and Magnetic Island; at depths of 1 to 10 metres on inner, mid-shelf and outer reefs.

Gnathia hamletgast sp. nov.
(Figs 8–9)

Material examined. ***Holotype.*** ♂, 2.6 mm, Bennett Island, Chesterfield reefs, northern reef, 8 May 1979, coral rock, lagoon, coll. N. L. Bruce (MTQ W10740).

Description. *Body* 3.2 times as long as greatest width, widest at pereonite 3; dorsal surfaces polished, sparsely setose. *Cephalosome* quadrate, 0.8 as long as wide, lateral margins convex; dorsal surface with sparse granules; dorsal sulcus narrow, shallow, extended; translucent region absent; paraocular ornamentation strongly developed, posteromedian tubercle present. *Frontolateral processes* present. *Frontal margin* convex, median point with process. *External scissura* present, narrow, deep. *Mediofrontal process* present, strong, spatuloid, bifid, without ventral notch, without fine setae. *Supraocular lobe* pronounced, wide; accessory supraocular lobe not pronounced. *Superior frontolateral process* present, strong, unequally apically bifid, with 2 long simple setae. *Inferior frontolateral process* present, apically unequally bifid, without setae. *Mesioventral margin* straight. *Eyes* present, elongate, 0.3 as long as cephalosome length, contiguous with head surface, ommatidia arranged in rows, eye colour dark brown. *Pereon* lateral margins subparallel, with few setae; anteriorly smooth. *Pereonite 1* not fused dorsally with cephalosome; dorsolateral margins fully obscured by cephalosome; *pereonite 2* wider than pereonite 1; *areae laterales* absent on pereonite 5; *pereonite 6* without lobi laterales; lobuii well-developed, globular.

*Mandibl*e 0.6 as long as width of cephalosome, mandible triangular, weakly curved, evenly; mandible apex 20% total length; mandibular seta present. *Carina* present, smooth, along entire length. *Incisor* knob-like, distal denticulation absent. *Blade* present, dentate, with distinct angle, convex, along proximal 50% of margin. *Pseudoblade* absent; *internal lobe* present, rounded, large, smooth; dorsal lobe absent; basal neck short; erisma absent; lamina dentata absent.

Pereopods 2–6 without long plumose setae; propodus distal RS 1.5 length of proximal RS; lateral and inferior margins with weak tubercles, pereopod 2 with tubercles on merus and carpus and basis. *Pereopod 2 basis* 2.3 times as long as greatest width, superior margin 12 long setae, inferior margin 7 setae; *ischium* 0.8 times as long as basis, 2.4 as long as wide, superior margin with 7 setae, inferior margin with 9 setae; *merus* 0.4 as long as ischium, 1.2 as long as wide, superior margin with 4 long setae, inferior margin with 7 long setae; *carpus* 0.5 as long as ischium, 1.9 as long as wide, superior margin with 2 long setae, inferior margin with 7 setae (1 biserrate); *propodus* 0.8 times as long as ischium, 2.8 times as long as wide, superior margin 4 long setae (1 penicillate), inferior margin with 6 short setae, 1 long simple seta, and 2 RS; *dactylus* 0.6 as long as propodus. *Pereopods 3 and 4* similar to pereopod 2. *Pereopod 5* similar to pereopod 6. *Pereopod 6* with tubercles on carpus, *basis* 2.6 times as long as greatest width, superior margin with 11 long setae, and 1 penicillate seta, inferior margin with 3 long setae; *ischium* 0.8 as long as basis, 2.6 as long as greatest width, superior margin with 9 long setae (5 short, 3 long and 1 short acute RS), inferior margin with 9 long setae (4 short submarginal, 5 long marginal); *merus* 0.5 as long as ischium, 1.5 times as long as wide, superior margin with 5 long setae, inferior margin 6 long setae, with dense patch of

scale-setae; *carpus* 0.5 as long as ischium, 2.3 times as long as wide, superior margin with 2 long setae (and 1 penicillate seta), inferior margin with 4 long setae; *propodus* 0.8 as long as ischium, 3.8 times as long as wide, superior margin with 6 long setae (and 1 penicillate seta), inferior margin with 7 long setae, and 2 RS; dactylus 0.5 as long as propodus. *Penes* medially united, penial process 7.4 times as long as basal width.

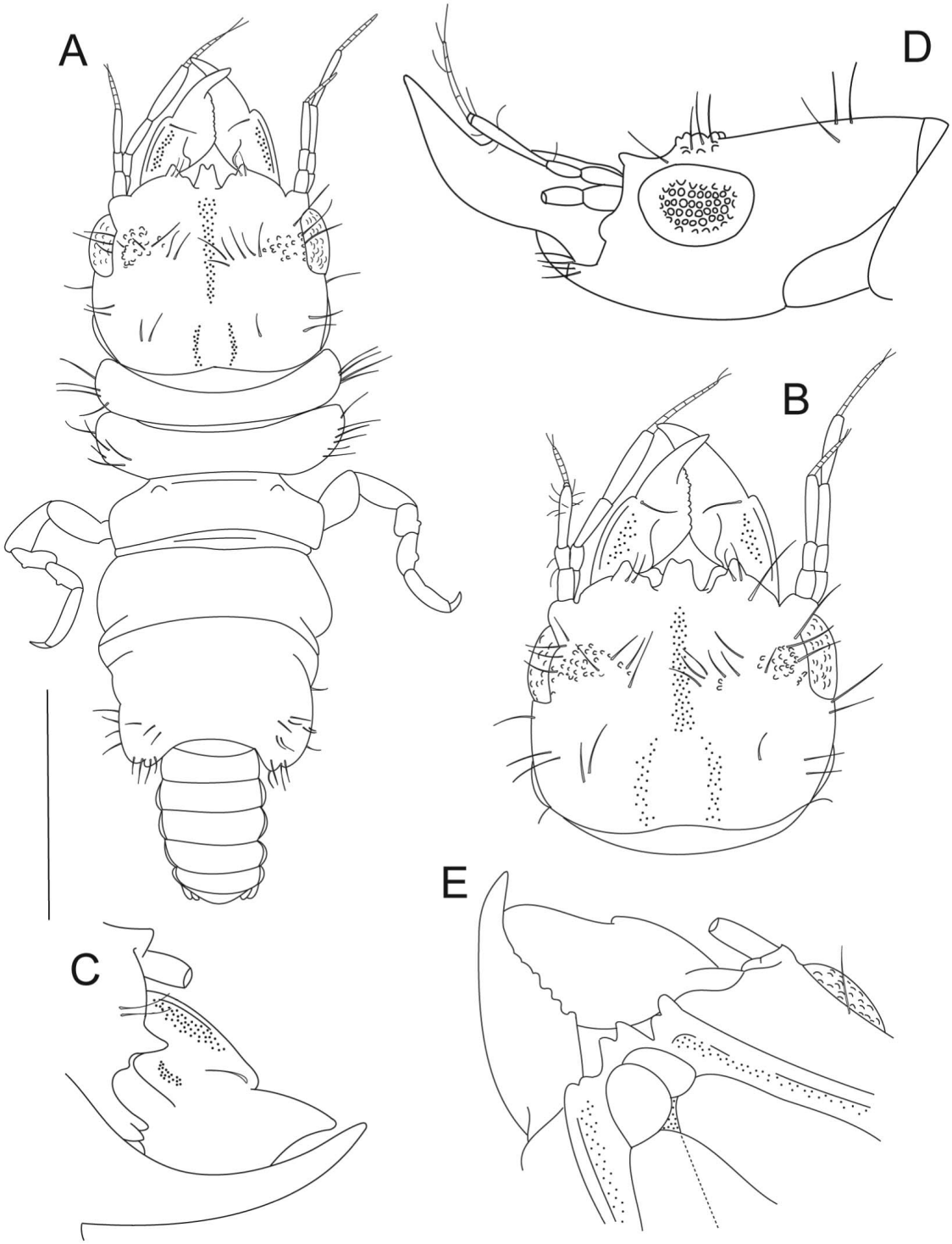

FIGURE 8. *Gnathia hamletgast* **sp. nov**. ♂, holotype, 2.6 mm (MTQ W10740). A, habitus, B, cephalosome, dorsal view. C, anterior end of cephalosome, dorso-lateral view. D, cephalosome, lateral view. E, anterior end of cephalosome, ventral view. Scale = 1.0 mm.

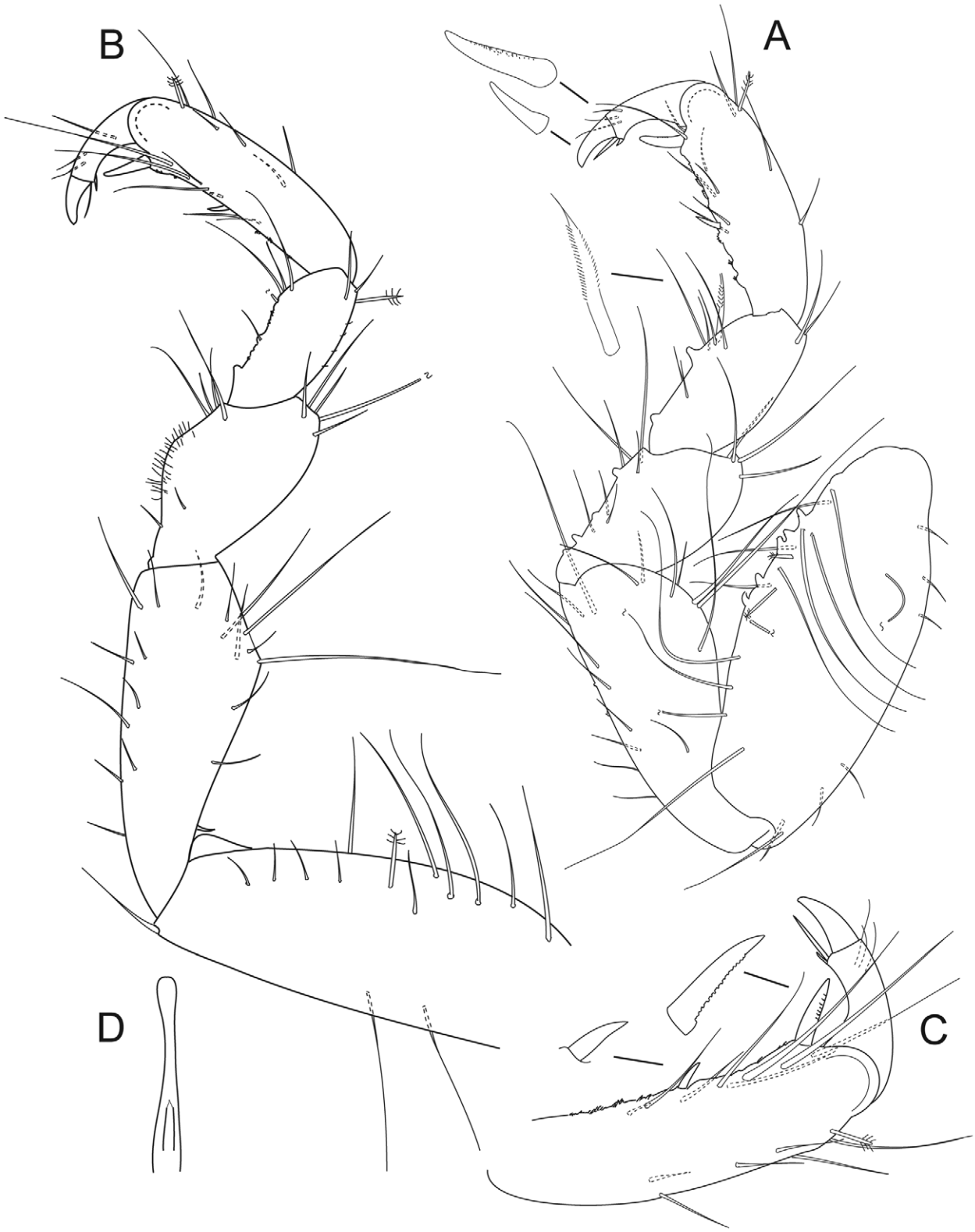

FIGURE 9. *Gnathia hamletgast* **sp. nov**., ♂, holotype, 2.6 mm (MTQ W10740). A, pereopod 2. B, pereopod 6. C, propodus and dactylus of pereopod 6. D, penis.

Remarks. The somewhat long, spatuloid mediofrontal process readily distinguishes *Gnathia hamletgast* **sp. nov**. from all Australian gnathiids. *Gnathia calamitosa* Monod, 1926 from southeastern Australia shows some resemblance, but mediofrontal process of that species is not strongly bifid. Furthermore the superior frontolateral

process is unequally apically bifid in *G. hamletgast*, while being simple and rounded in *G. calamitosa*. The species shows also some resemblance to *G. regalis* Monod, 1926 from New Zealand in the shape of the mediofrontal process. The mandibles, however, differ in the absence of a medial lobe in *G. regalis*, but being present in *Gnathia hamletgast*.

An abbreviated description is given here as dissection was minimal in order to preserve the integrity of the holotype.

Etymology. Bennett Island is named after Captain J.B. Bennett of the schooner *Prince of Denmark*, a whaler wrecked on the Chesterfield Reefs on 19 March 1863. The crew used the remains of the whaler to build a new boat, the *Hamlet´s Ghost*, to successfully escape and rescue from the island; noun in apposition.

Distribution. Bennett Island, Chesterfield reefs, Coral Sea.

***Gnathia marionis* sp. nov.**
(Figs 10–13)

Material examined. ***Holotype***. ♂, 2.8 mm, Marion Reefs, off Brodie Cay, 19.2833°S, 152.21667°E, 13 May 1979, lagoon pinnacle, 10 m, coll. N. L. Bruce (MTQ W30561).

Paratypes. 2 ♂, 3.0 mm, 2.5 mm, same location as of holotype (MTQ W30562, W30563). Male dissected, micoslides (MTQ W10733).

Description. *Body* 2.8 times as long as greatest width, widest at pereonite 3 and pereonite 5; dorsal surfaces smooth, sparsely setose. *Cephalosome* quadrate, 0.9 as long as wide, lateral margins sub-parallel; dorsal surface with sparse granules; dorsal sulcus narrow, shallow, short; translucent region present; elliptical; paraocular ornamentation strongly developed, posteromedian tubercle present. *Frontolateral processes* present. *Frontal margin* produced, truncate, median point with process. *External scissura* present, narrow, shallow. *Mediofrontal process* present on wide, even frontal margin; small, pointed, without ventral notch, with fine setae. *Supraocular lobe* not pronounced, long; accessory supraocular lobe not pronounced. *Superior frontolateral process* present, single, strong, conical, without long simple setae. *Inferior frontolateral process* absent. *Mesioventral margin* straight. *Eyes* present, elongate, 0.3 as long as cephalosome length, contiguous with head surface, ommatidia arranged in rows, eye colour yellow (probably faded).

Pereon lateral margins subparallel, with few setae; anteriorly smooth. *Pereonite 1* not fused dorsally with cephalosome; dorsolateral margins fully obscured by cephalosome; *pereonite 2* wider than pereonite 1; *areae laterales* present on pereonite 5; *pereonite 6* without lobi laterales; lobuii weak, globular. *Pleotelson* 0.9 times as long as anterior width, lateral margins smooth, anterolateral margins weakly concave, posterolateral margin distally concave; mid-dorsal surface with 2 sub-median setae (short), anterolateral margin with 1 submarginal seta (short), posterolateral margin with 1 submarginal seta (prominent), apex with 2 setae.

Antennule peduncle article 2 0.7 times as long as article 1, article 3 2.3 times as long as article 2, 5.1 times as long as wide; flagellum 1 as long as article 3, with 5 articles. *Antenna* peduncle article 4 3 times as long as wide, 2.2 times as long as article 3, with 2 penicillate setae, and 12 simple setae (marginal and submarginal); article 5 1.1 times as long as article 4, 3.6 times as long as wide, inferior margin with 4 penicillate setae, and 16 simple setae (marginal and submarginal); flagellum 1.4 as long as article 5, with 7 articles.

Mandible 0.6 as long as width of cephalosome, mandible triangular, weakly curved, distally; mandible apex 20% total length; mandibular seta present. *Carina* present, finely dentate, along entire length. *Incisor* knob-like and elevated, standing clear of surface, distal denticulation absent. *Blade* present, dentate, strongly convex, midventrally convex, along proximal 50% of margin. *Pseudoblade* absent; *internal lobe* present, quadrate, large, smooth; dorsal lobe absent; basal neck short; erisma present; lamina dentata absent.

Maxilliped 5-articled. *Maxilliped* article 1 lateral margin with continuous marginal scale-setae; article 2 lateral margin with 3 plumose setae; article 3 lateral margin with 6 plumose setae; article 4 lateral margin with 5 plumose setae; article 5 with 7 plumose setae; endite extending to distal margin of article 2; without coupling setae. *Pylopod* article 1 1.8 as long as wide, with distolateral lobe; posterior and lateral margins forming rounded curve; lateral margin with 30 large PMS; mesial margin with continuous scale-setae, distal margin with 7 long simple setae; article 2 1.1 as long as wide; article 3 minute, with 7 setae.

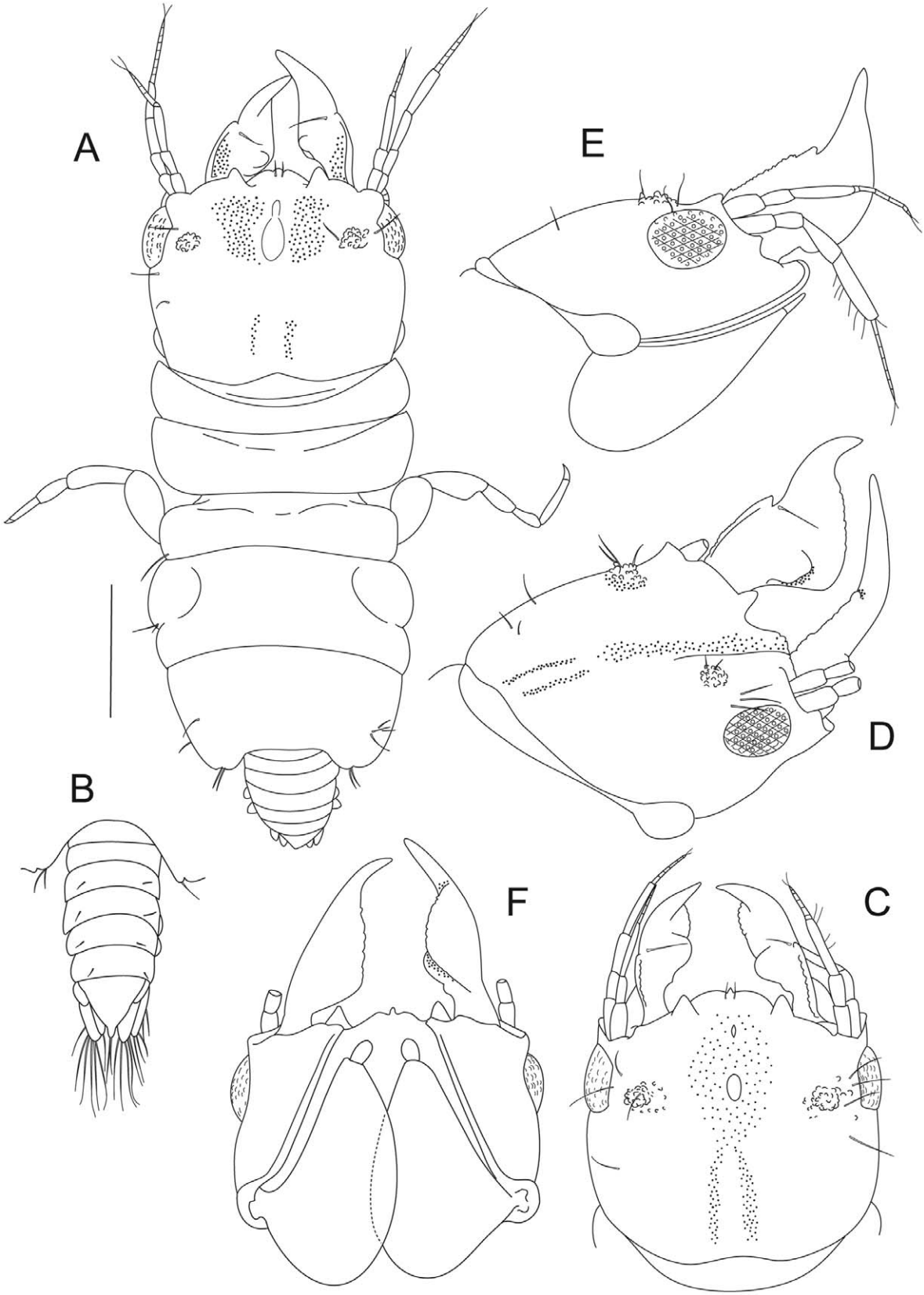

FIGURE 10. *Gnathia marionis* **sp. nov.**, A–B, ♂, holotype, 2.8 mm (MTQ W30561), C–F, ♂ paratype, 3.0 mm (MTQ W10733). A, habitus. B, pleonites and pleotelson. C, cephalosome, dorsal view. D, cephalosome, dorso-lateral view. E, cephalosome, lateral view. F, cephalosome, ventral view. Scale = 0.5 mm.

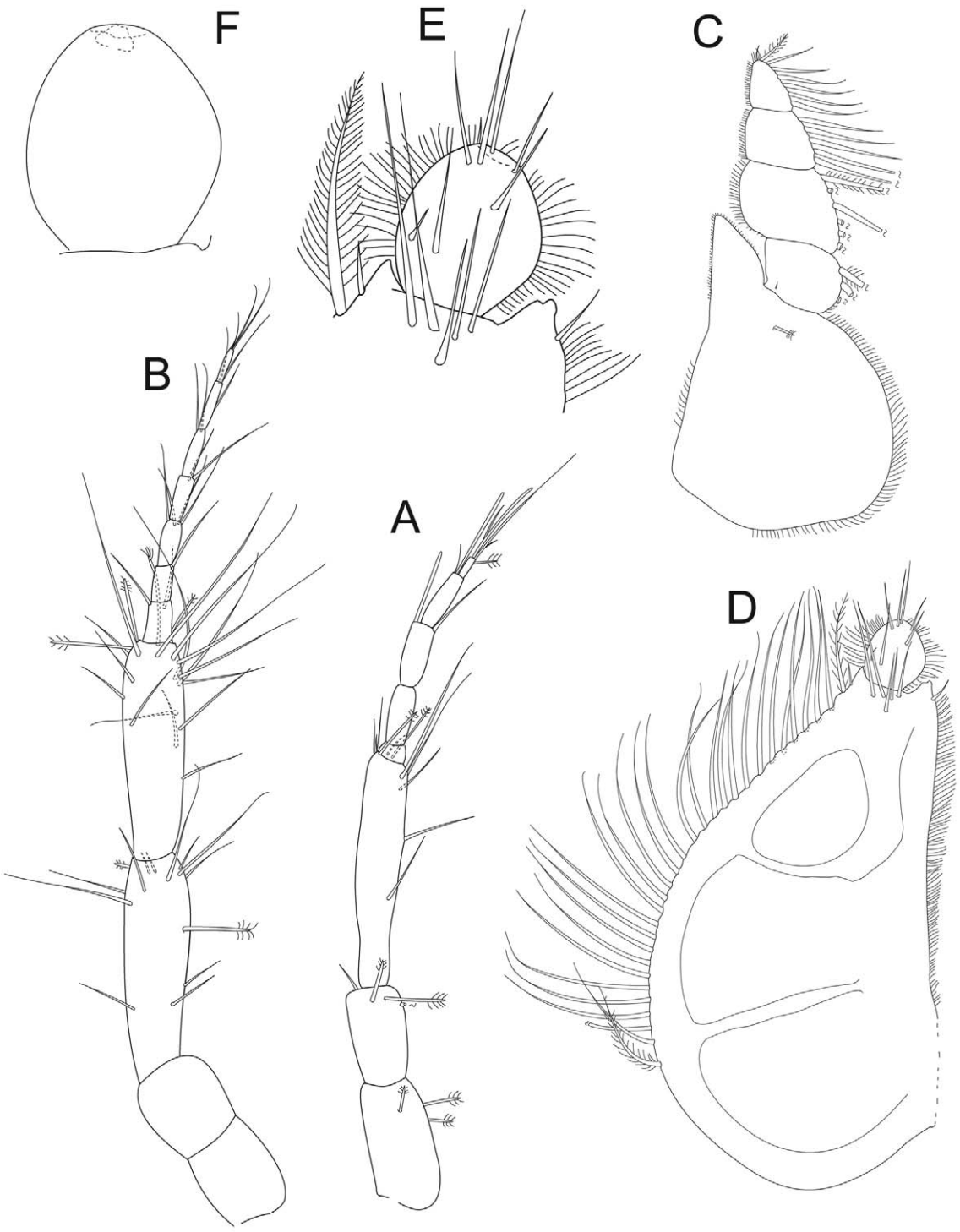

FIGURE 11. *Gnathia marionis* **sp. nov.**, ♂, paratype, 3.0 mm (MTQ W10733). A, antennule. B, antenna. C, maxilliped. D, pylopod. E, second and third article of pylopod. F, outline of second and third article of pylopod.

Pereopods 2–6 without long plumose setae; propodus distal RS as long as proximal RS; lateral and inferior margins with prominent tubercles, pereopod 2 with tubercles on merus and carpus and basis. *Pereopod 2 basis* 2.3 times as long as greatest width, superior margin 5 long setae (and 2 penicillate setae), inferior margin 6 setae (long); *ischium* 0.6 times as long as basis, 2.1 as long as wide, superior margin with 5 setae, inferior margin with 7 setae; *merus* 0.5 as long as ischium, 1.4 as long as wide, superior margin with 4 long setae, inferior margin with 7 long setae; *carpus* 0.6 as long as ischium, 1.9 as long as wide, superior margin with 1 long setae, inferior margin

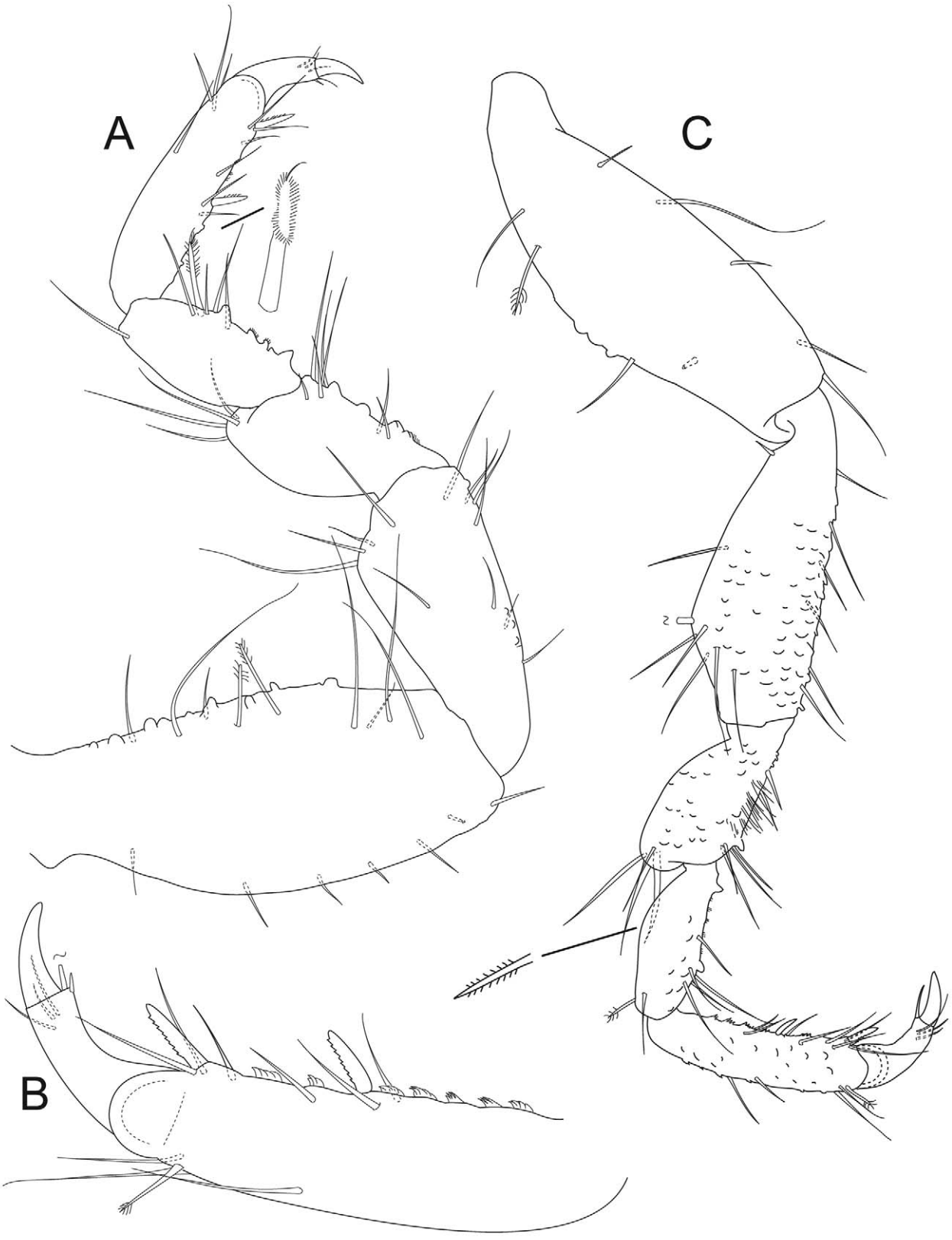

FIGURE 12. *Gnathia marionis* **sp. nov.**, ♂, paratype, 3.0 mm (MTQ W10733). A, pereopod 2. B, propodus and dactylus of pereopod 2. C, pereopod 6.

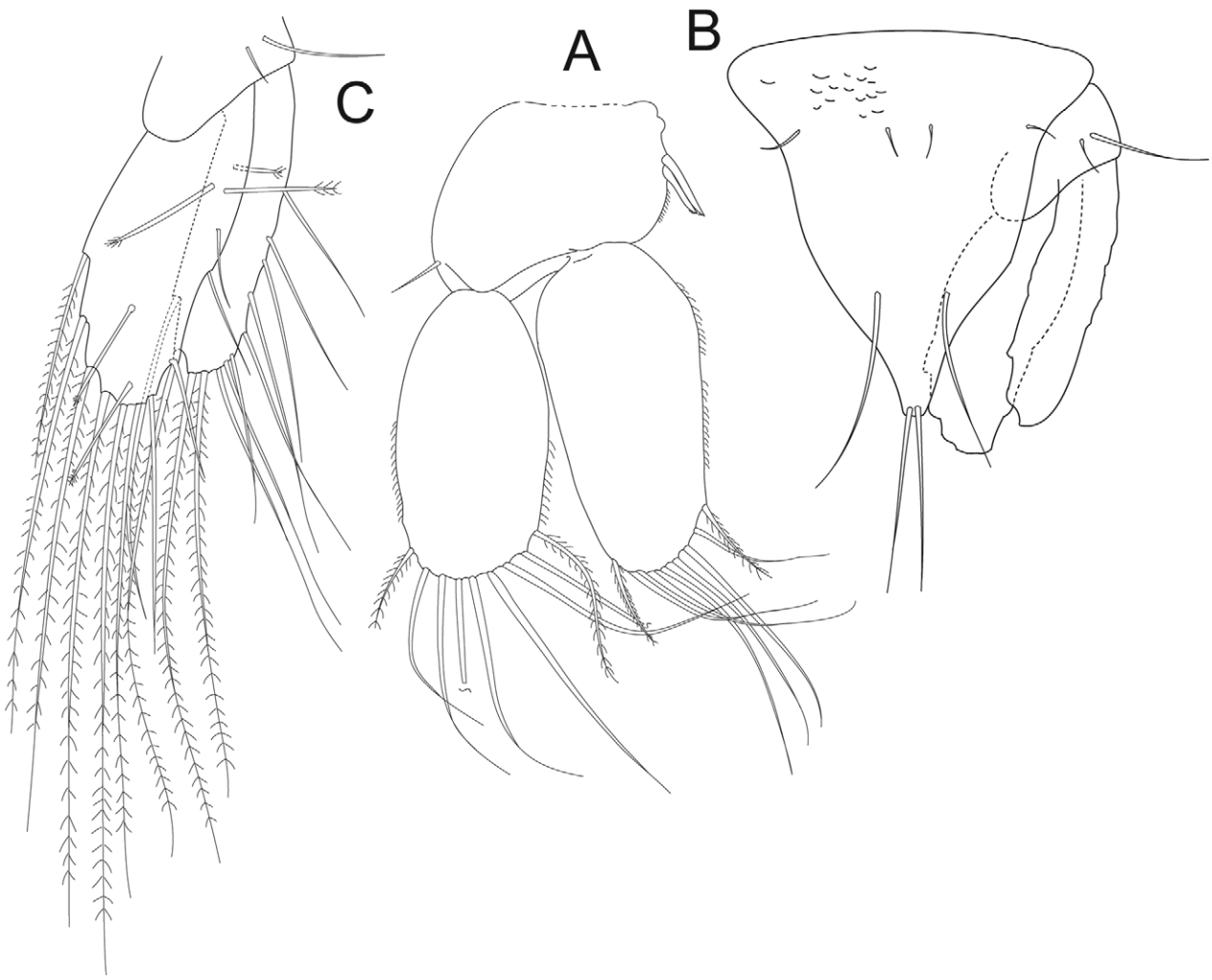

FIGURE 13. *Gnathia marionis* **sp. nov**., ♂, paratype, 3.0 mm (MTQ W10733). A, pleopod 2. B, pleotelson and outline of uropod. C, uropod.

with 5 setae (4 simple, 1 biserrate RS); *propodus* 0.9 times as long as ischium, 4.1 times as long as wide, superior margin 4 long setae (1 penicillate), inferior margin with 6 short setae, without long simple setae, and 2 RS; *dactylus* 0.5 as long as propodus. *Pereopods 3 and 4* similar to pereopod 2. *Pereopod 5* similar to pereopod 6. *Basis* 2.8 times as long as greatest width, superior margin with 2 long setae, and 1 penicillate seta, inferior margin with 5 long setae; *ischium* 0.8 as long as basis, 2.6 as long as greatest width, superior margin with 7 long setae, inferior margin with 6 long setae; *merus* 0.5 as long as ischium, 1.7 times as long as wide, superior margin with 4 long setae (1 biserrate), inferior margin 6 long setae, with dense patch of scale-setae; *carpus* 0.5 as long as ischium, 2.6 times as long as wide, superior margin with 2 long setae (1 penicillate), inferior margin with 5 long setae; *propodus* 0.7 as long as ischium, 4.2 times as long as wide, superior margin with 4 long setae, inferior margin with 8 long setae, and 2 RS; dactylus 0.6 as long as propodus. *Penes* medially united and flat lobes, penial.

Pleopod 2 exopod 1.9 as long as wide, 9 PMS; *endopod* 2.1 as long as wide, endopod with 8 PMS. Pleopod 2 *appendix masculina* absent.

Uropod rami extending beyond pleotelson, apices broadly rounded. *Peduncle* with 2 dorsal setae. *Endopod* 2.3 as long as greatest width, dorsally with 4 sensory setae; lateral margin proximally convex and distally concave, lateral margin with 4 simple setae; mesial margin weakly convex, with 6 long plumose setae. *Exopod* not extending to end of endopod, 3.8 times as long as greatest width; lateral margin weakly convex, with 8 simple setae; proximomesial margin straight, distally convex, mesiodistal margin with 4 long PMS.

Remarks. *Gnathia marionis* **sp. nov**. shows some resemblance to *G. cornuta* Holdich and Harrison, 1980 in the shape of the mandible (long blade), but is distinguished from the latter and all other Australian gnathiids in having a small mediofrontal process on a wide, even frontal margin.

Etymology. The epithet is taken from the type locality.
Distribution. Marion Reef, Australian Coral Sea Territory.

Gnathia masca Farquharson and Smit, 2012

Gnathia masca Farquharson and Smit, 2012 in Farquharson *et al*. 2012: 23, figs 1A–G, 2A–C, 3A–E, 6A, B, 10A.

Material examined. Lizard Island: 2 ♂, 2 ♀, North Point, 14.64567°S, 145.45325°E, 14 April 2008, 10–14 m, loose coral rubble, CReefs stn CGLI 025B, coll. M. Błażewicz-Paszkowycz (MTQ W14123). 1 ♂, 2 ♀, off Mermaid Cove, North Point, 'Washing Machine', 14.64064°S, 145.45365°E, 18 April 2008, 15 m, CReefs stn CGLI 039, coll. M. Błażewicz-Paszkowycz (MTQ W14123). 3 ♂, 3 ♀, McGillivray's Reef, 14.38567°S, 145.46710°E, 18 April 2008, smooth rubble, 18 m, CReefs stn CGLI 040A, coll. M. Schlacher & T. Hendricks (MTQ W14130). 6 ♂, 2 ♀, patch reef in lagoon entrance in from Seabird Islet, 14.68900°S, 145.46710°E, 19 April 2008, small rubble, dead coral, 15 m, CReefs stn CGLI 041E, coll. N.L. Bruce & M. Błażewicz-Paszkowycz (3 ♂ MTQ W14125; 3 ♂ IMNH 2727).

Outer barrier reefs: 3 ♂, Day Reef, 14.50525°S, 145.5612°E, 22 February 2009, outer reef front, coral rubble, 27–29 m, CReefs stn LIZ09 17A, coll. S. Smith & J. Caley (MTQ W31100). 1 ♂, Yonge Reef, 14.57972°S, 145.61010°E, 20 April 2008, pass, 17–15 m, dead *Acropora* head, 17 m, CReefs stn CGLI 046A, coll. M. Błażewicz-Paszkowycz (MTQ W14126). 8 ♂, Yonge Reef, 14.57972°S, 145.61010°E, 20 April 2008, pass, 17–15 m, silty dead coral, CReefs stn CGLI 046B, coll. M. Błażewicz-Paszkowycz (MTQ W14127). 3 ♂, 1 ♀, Yonge Reef, 14.57972°S, 145.61010°E, 20 April 2008, passage, 17–15 m, rubble, 15 m, CReefs stn CGLI 046C, coll. M. Błażewicz-Paszkowycz (MTQ W14128). 3 ♂, 1 ♀, Yonge Reef, 14.60694°S, 145.62310°E, 20 April 2008, back reef, rubble, 10 m, CReefs stn CGLI 047C, coll. M. Błażewicz-Paszkowycz (MTQ W14129).

Remarks. This species is common around Lizard Island and adjacent outer reefs; found mainly in coral rubble at depths between 10 and 29 metres.

Distribution. Lizard Island region.

Gnathia varanus sp. nov.
(Figs 14–17)

Material examined. ***Holotype***. ♂, 4.0 mm, Lizard Island, North Queensland, lagoon entrance in from Seabird Islet, 14.68900°S, 145.46710°E, patch reef, 19 April 2008, small rubble, dead coral, 15 m, CReefs stn CGLI 041E, coll. N.L. Bruce & M. Błażewicz-Paszkowycz (MTQ W14160).

Paratypes. 6 ♂ (dissected paratype, MTQ W14161; 2 ♂ IMNH 2724; 3 ♂ MTQ W14162, same locality as holotype).

Description. *Body* 3.1 times as long as greatest width, widest at pereonite 2 and pereonite 3; dorsal surfaces sparsely punctate, sparsely setose. *Cephalosome* quadrate, 0.8 as long as wide, lateral margins narrowing posteriorly; dorsal surface with numerous granules; dorsal sulcus wide, shallow, extended; translucent region absent; paraocular ornamentation strongly developed, posteromedian tubercle present. *Frontolateral processes* present. *Frontal margin* straight, median point with process. *External scissura* present, wide, shallow. *Mediofrontal process* present, strong, acute, without ventral notch, without fine setae. *Supraocular lobe* pronounced, wide; accessory supraocular lobe not pronounced. *Superior frontolateral process* present, paired, strong, conical, with 2 long simple setae. *Inferior frontolateral process* absent. *Mesioventral margin* straight. *Eyes* present, elongate, 0.3 as long as cephalosome length, contiguous with head surface, ommatidia arranged in rows, eye colour faded, not known.
Pereon lateral margins narrowing posteriorly, with few setae; anteriorly with numerous fine granules. *Pereonite 1* not fused dorsally with cephalosome; dorsolateral margins fully obscured by cephalosome; *pereonite 2* wider than pereonite 1; *areae laterales* present on pereonite 5; *pereonite 6* without lobi laterales; lobuii well-developed, globular. *Pleotelson* 1.3 times as long as anterior width, lateral margins finely serrate, anterolateral margins distally weakly concave, posterolateral margin straight; mid-dorsal surface with 2 sub-median setae, anterolateral margin with 1 submarginal seta, posterolateral margin with 1 submarginal seta, apex with 2 setae.

Antennule peduncle article 2 1.0 times as long as article 1, article 3 1.8 times as long as article 2, 4.7 times as long as wide; flagellum 1.3 as long as article 3, with 5 articles. *Antenna* peduncle article 4 2.6 times as long as wide, 1.9 times as long as article 3, with 1 penicillate seta, and 13 simple setae (marginal and submarginal); article 5 1.2 times as long as article 4, 3.6 times as long as wide, inferior margin with 1 penicillate seta, with 35 simple setae (dense setal field on dorsal and ventral surfaces); flagellum 1.6 as long as article 5, with 7 articles.
Mandible 0.6 as long as width of cephalosome, mandible triangular, strongly curved, distally; mandible apex 30% total length; mandibular seta present. *Carina* present, smooth, along entire length. *Incisor* elevated, standing clear of surface, distal denticulation absent. *Blade* present, dentate, strongly convex, proximally convex, along proximal 50% of margin. *Pseudoblade* absent; *internal lobe* present, quadrate, small, smooth; dorsal lobe absent; basal neck short; erisma present; lamina dentata absent.

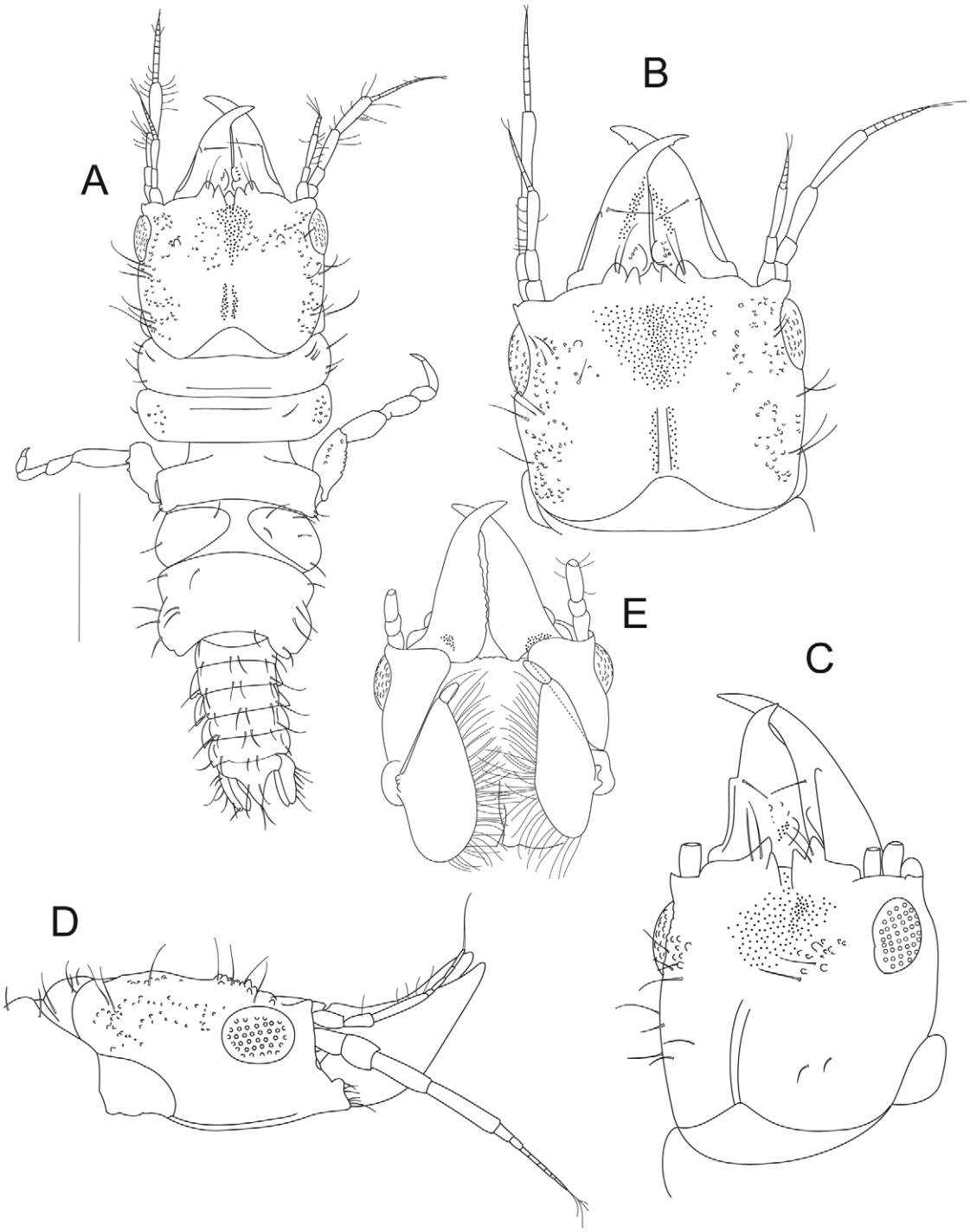

FIGURE 14. *Gnathia varanus* **sp. nov**. A, habitus, ♂, holotype, 4.0 mm (MTQ W14160), B–E, ♂ paratype, 3.8 mm (MTQ W14161). B, cephalosome, dorsal view. C, cephalosome, dorso-lateral view. D, cephalosome, lateral view. E, cephalosome, ventral view. Scale = 1.0 mm.

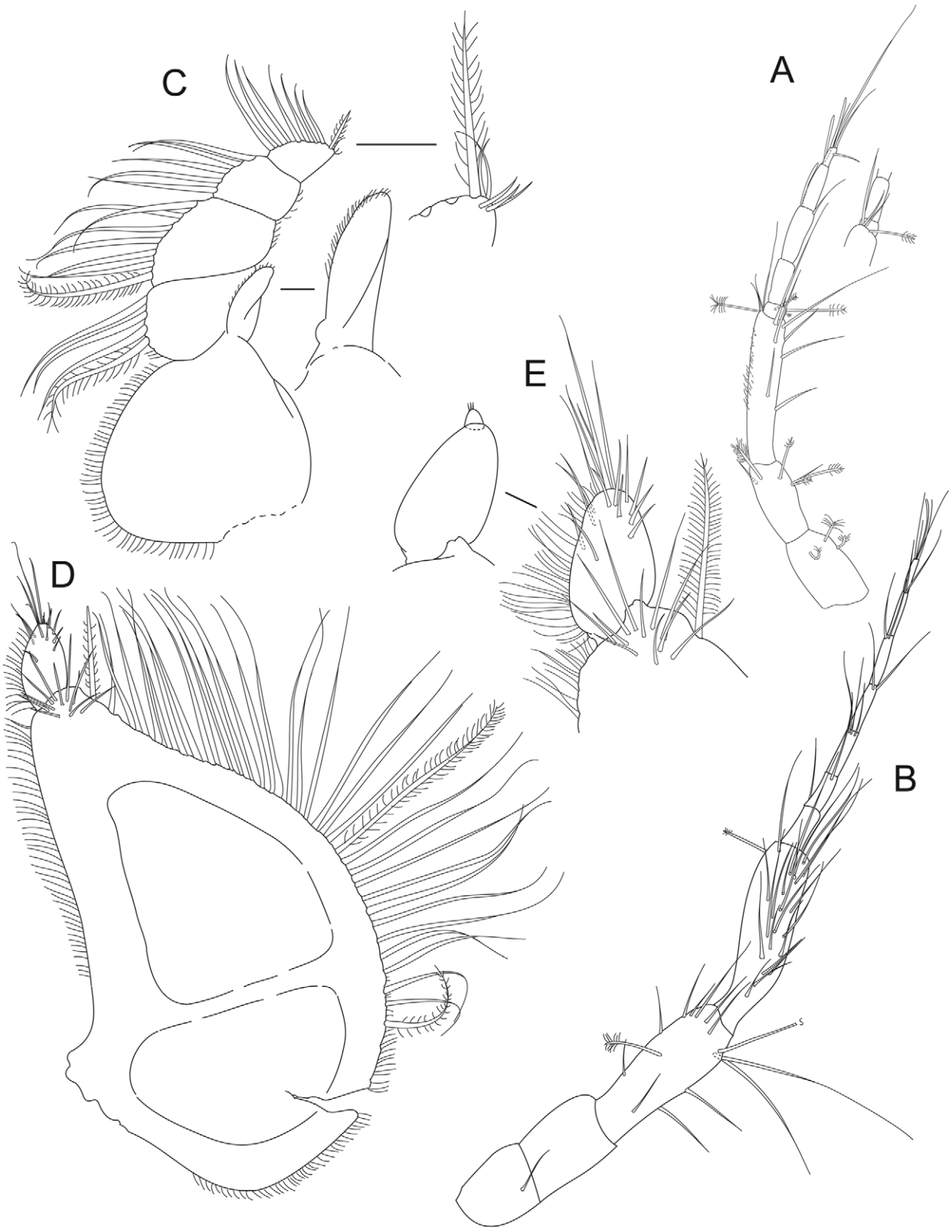

FIGURE 15. *Gnathia varanus* **sp. nov.**, ♂, paratype, 3.8 mm (MTQ W14161). A, antennule. B, antenna. C, maxilliped. D, pylopod. E, second and third article of pylopod and outline of the same articles.

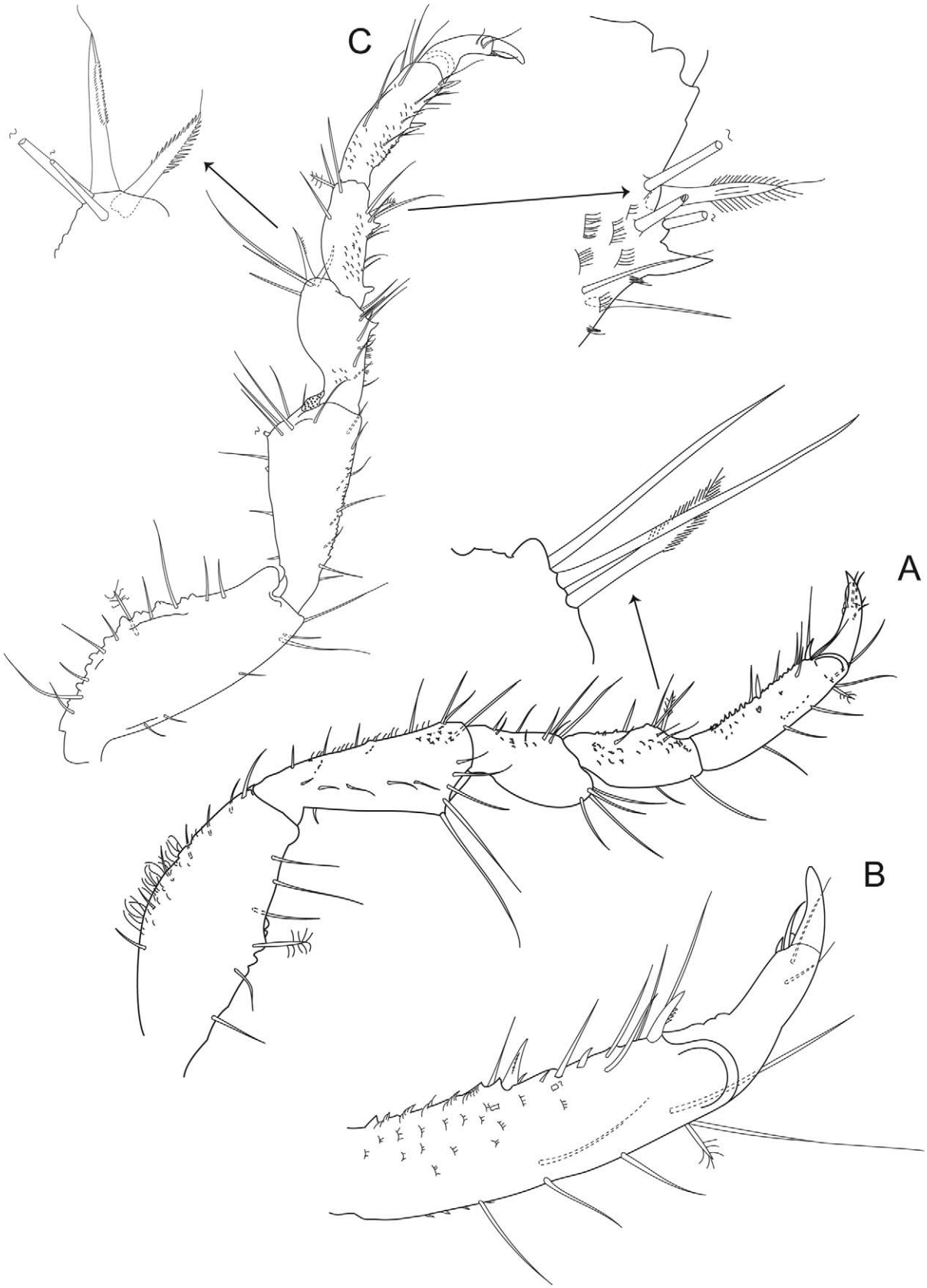

FIGURE 16. *Gnathia varanus* **sp. nov.**, ♂, paratype, 3.8 mm (MTQ W14161). A, pereopod 2. B, propodus and dactylus of pereopod 2. C, pereopod 6.

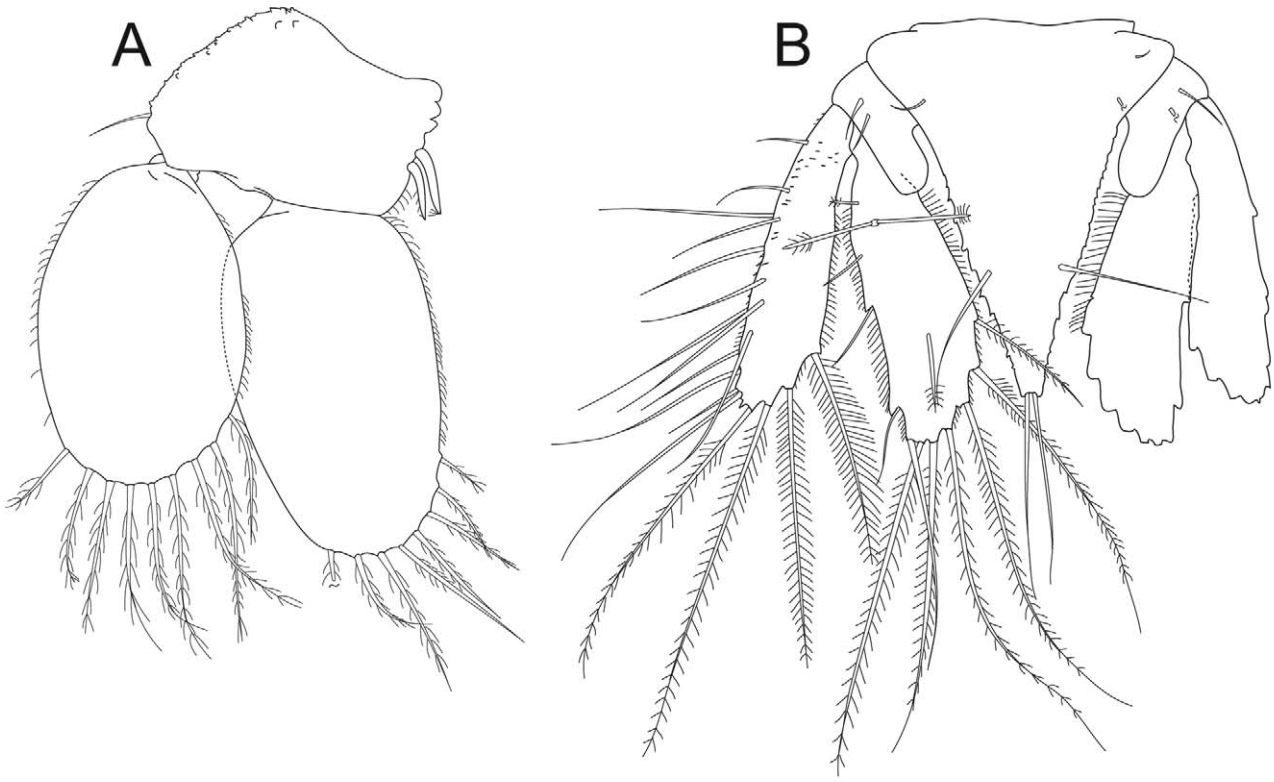

FIGURE 17. *Gnathia varanus* **sp. nov.**, ♂, paratype, 3.8 mm (MTQ W14161). A, pleopod 2. B, pleotelson and uropods.

Maxilliped 5-articled. *Maxilliped* article 1 lateral margin with continuous marginal scale-setae; article 2 lateral margin with 4 plumose setae; article 3 lateral margin with 7 plumose setae; article 4 lateral margin with 5 plumose setae; article 5 with 8 plumose setae; endite extending to distal margin of article 2; without coupling setae. *Pylopod* article 1 1.8 as long as wide, without distolateral lobe; posterior and lateral margins forming rounded curve; lateral margin with 34 large PMS; mesial margin with continuous scale-setae, distal margin with 12 long simple setae; article 2 1.64 as long as wide; article 3 minute.

Pereopods 2–6 without long plumose setae; propodus distal RS as long as proximal RS; lateral and inferior margins with weak tubercles, pereopod 2 with tubercles on basis. *Pereopod 2 basis* 2.3 times as long as greatest width, superior margin 5 long setae (and 1 penicillate seta), inferior margin 7 setae; *ischium* 0.8 times as long as basis, 2.5 as long as wide, superior margin with 10 setae, inferior margin with 9 setae; *merus* 0.5 as long as ischium, 1.5 as long as wide, superior margin with 4 long setae, inferior margin with 8 long setae; *carpus* 0.6 as long as ischium, 2.1 as long as wide, superior margin with 2 long setae, inferior margin with 6 setae (1 biserrate); *propodus* 0.8 times as long as ischium, 3.9 times as long as wide, superior margin 6 long setae, inferior margin with 6 short setae (1 penicillate seta), 6 long simple setae, and 2 RS; *dactylus* 0.6 as long as propodus. *Pereopods 3 and 4* similar to pereopod 2. *Pereopod 5* similar to pereopod 6. *Pereopod 6* with tubercles on merus and carpus and with tubercles on superior margin of basis, *basis* 2.2 times as long as greatest width, superior margin with 9 long setae, and 1 penicillate seta, inferior margin with 7 long setae; *ischium* 0.8 as long as basis, 2.4 as long as greatest width, superior margin with 9 long setae, inferior margin with 9 long setae; *merus* 0.6 as long as ischium, 1.4 times as long as wide, superior margin with 3 long setae, inferior margin 9 long setae, without dense patch of scale-setae; *carpus* 0.6 as long as ischium, 2.5 times as long as wide, superior margin with 3 long setae, inferior margin with 6 long setae; *propodus* 0.7 as long as ischium, 3.7 times as long as wide, superior margin with 5 long setae, inferior margin with 6 long setae, and 2 RS; dactylus 0.6 as long as propodus. *Penes* opening flush with surface of sternite 7.

Pleopod 2 exopod 1.5 as long as wide, 9 PMS; *endopod* 1.7 as long as wide, endopod with 8 PMS. Pleopod 2 *appendix masculina* absent.

Uropod rami extending beyond pleotelson, apices narrowly rounded. *Peduncle* with 2 dorsal setae. *Endopod* 2.8 as long as greatest width, dorsally with 3 sensory setae; lateral margin proximally convex, lateral margin with 4

simple setae; mesial margin weakly convex, with 6 long plumose setae. *Exopod* not extending to end of endopod, 4.1 times as long as greatest width; lateral margin weakly convex, with 13 simple setae; proximomesial margin straight, mesiodistal margin with 4 long PMS.

Remarks. *Gnathia varanus* **sp. nov**. is distinguished from all other Australian gnathiids by the large mediofrontal and paired superior frontolateral processes, the latter being located close to the mesial line of the cephalosome. Several gnathiid species have strong superior frontolateral processes close to the medial line (e.g. *Gnathia venusta* Monod, 1925; *Gnathia illepida* Monod, 1923), but these species have different configuration of the frontolateral processes.

Etymology. The species name is the generic name for the large Sand Goanna, *Varanus gouldii* (Gray, 1838), for which the island was given its English name (noun in apposition).

Distribution. Known only from Lizard Island, northern Great Barrier Reef.

Gnathia variobranchia Holdich and Harrison, 1980

Gnathia variobranchia Holdich and Harrison 1980: 231, figs 7a–h.– Poore and Lew Ton, 2002: 190.

Material examined. 1 ♂, Lizard Island, North Point, 14.64553°S, 145.45335°E, 12 April 2008, small rubble in hollow on crest, 1.0 m, CReefs stn CGLI 020B, coll. N.L. Bruce (MTQ W14122). 1 ♂, Lizard Island, stn 7, 1980 (MTQ W10737). 1 ♂, Long Island, Chesterfields reefs, 19.8833°S, 158.3167°E, 5 May 1979, seaward reef face, dead coral, 12 m, coll. N.L. Bruce (MTQ W10734). 1 ♂, Wistari Reef, from dead coral, 3 December 1979, 21 m, coll. N.L. Bruce (MTQ W10711). 1 ♂ (damaged), Wistari reef, southwest corner, 11 m, 4 December 1979, coll. N.L. Bruce (MTQ W10712). 1 ♂ (poor condition), Heron Island, "Canyons", reef slope, 1 December 1979, coral rock, 7 m, coll. N.L. Bruce (MTQ W10713).

Remarks. The present specimens agree well with the description of *Gnathia variobranchia* Holdich and Harrison, 1980 in body shape and the general appearance of the head. The rami of the pleopods vary considerably in their lengths as shown for *G. variobranchia*. The appendages were, however, sparsely illustrated by Holdich and Harrison (1980).

Distribution. Occurs the length of the Great Barrier Reef from Lizard Island in the north to Heron Island and Wistari Reef, Capricorn Group in the south; here reported from Chesterfield Reefs, Coral Sea; at depths of 1 to 21 metres.

Gnathia wistari sp. nov.

(Figs 18–21)

Material examined. ***Holotype***. ♂, 3.7 mm, off northern Wistari Reef, Qld, 7 November 1978, 22 m, sediment, coll. D. Fisk (QM W24256).

Paratypes. 2 ♂, same data as holotype (MTQ W10676 [dissected, 12 microslides], ♂ at IMNH 2725). 1 ♂, Wistari reef, 3 December 1979, 21 m, from dead coral, coll. N.L. Bruce (MTQ W10675). *Lizard Island Series*: 2 ♂, McGillivray's Reef, 14.38567°S, 145.46710°E, 18 April 2008, 18 m, dead coral, CReefs stn CGLI 040B, M. Schlacher & T. Hendricks (MTQ W14159). 2 ♂, Yonge Reef, 14.57972°S, 145.61010°E, 20 April 2008, passage, 17–15 m, rubble, CReefs stn CGLI 046C, coll. M. Błażewicz-Paszkowycz (MTQ W14158). 2 ♂, Day Reef, 14.48356°S, 145.5459°E, 13 February 2009, outer reef, flat rubble in gully, 10 m, CReefs stn LIZ09 04A, coll. M. Błażewicz-Paszkowycz (MTQ W30461). 1 ♂, Day Reef, 14.48539°S, 145.5464°E, 19 February 2009, outer reef front, coarse sand and fine rubble, 19 m, CReefs stn LIZ09 12C, coll. N. Bruce & M. Błażewicz-Paszkowycz (MTQ W31068). 1 ♂, Day Reef, 14.48539°S, 145.5464°E, 19 February 2009, outer reef front, coral rubble in gully, 17 m, CReefs stn LIZ09 12F, coll. N. Bruce & M. Błażewicz-Paszkowycz (MTQ W31053). 14 ♂, Hicks Reef, 14.44803°S, 145.4992°E, 21 February 2009, outer reef front, small coral heads and rubble, 15 m, CReefs stn LIZ09 16C, coll. N. Bruce & M. Błażewicz-Paszkowycz (MTQ W30462). 8 ♂, Day Reef, 14.50525°S, 145.5612°E, 22 February 2009, outer reef front, coral rubble, 27–29 m, CReefs stn LIZ09 17A, coll. S. Smith & J. Caley (IMNH 2794).

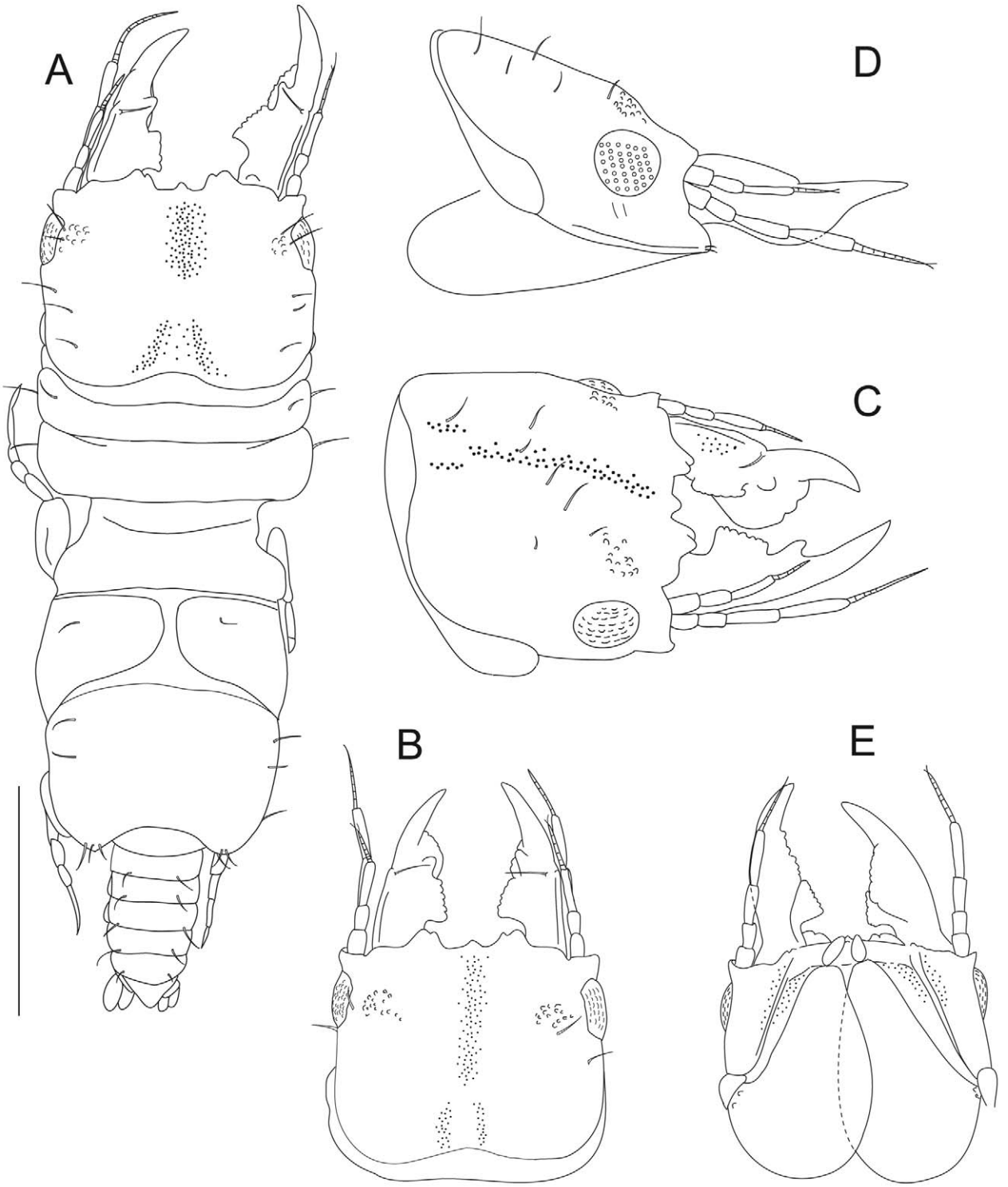

FIGURE 18. *Gnathia wistari* **sp. nov**. A, habitus, ♂, holotype, 3.7 mm (QM W24256), B–E, ♂, paratype, 3.3 mm (MTQ W10676). B, cephalosome, dorsal view. C, cephalosome, dorso-lateral view. D, cephalosome, lateral view. E, cephalosome, ventral view. Scale = 1.0 mm.

Other non-type material. 1 ♂, Lizard Island, stn 7, 1980, coll. N.L. Bruce (MTQ W10737), 2 ♂, Lizard Island, stn 31, 1980, coll. N.L. Bruce (MTQ W10738).

Description. *Body* 3.1 times as long as greatest width, widest at pereonite 2 and pereonite 3; dorsal surfaces smooth, sparsely setose. *Cephalosome* quadrate, 0.8 as long as wide, lateral margins parallel; dorsal surface smooth

and with sparse granules; dorsal sulcus wide, shallow, extended; translucent region absent; paraocular ornamentation weakly developed, posteromedian tubercle present. *Frontolateral processes* present. *Frontal margin* straight, median point with process. *External scissura* present, narrow, shallow. *Mediofrontal process* present, weak, rounded, without ventral notch, without fine setae. *Supraocular lobe* pronounced, wide; accessory supraocular lobe not pronounced. *Superior frontolateral process* present, strong, unequally apically bifid, without long simple setae. *Inferior frontolateral process* absent. *Mesioventral margin* straight. *Eyes* present, round, 0.3 as long as cephalosome length, contiguous with head surface, ommatidia arranged in rows, eye colour faded yellow.

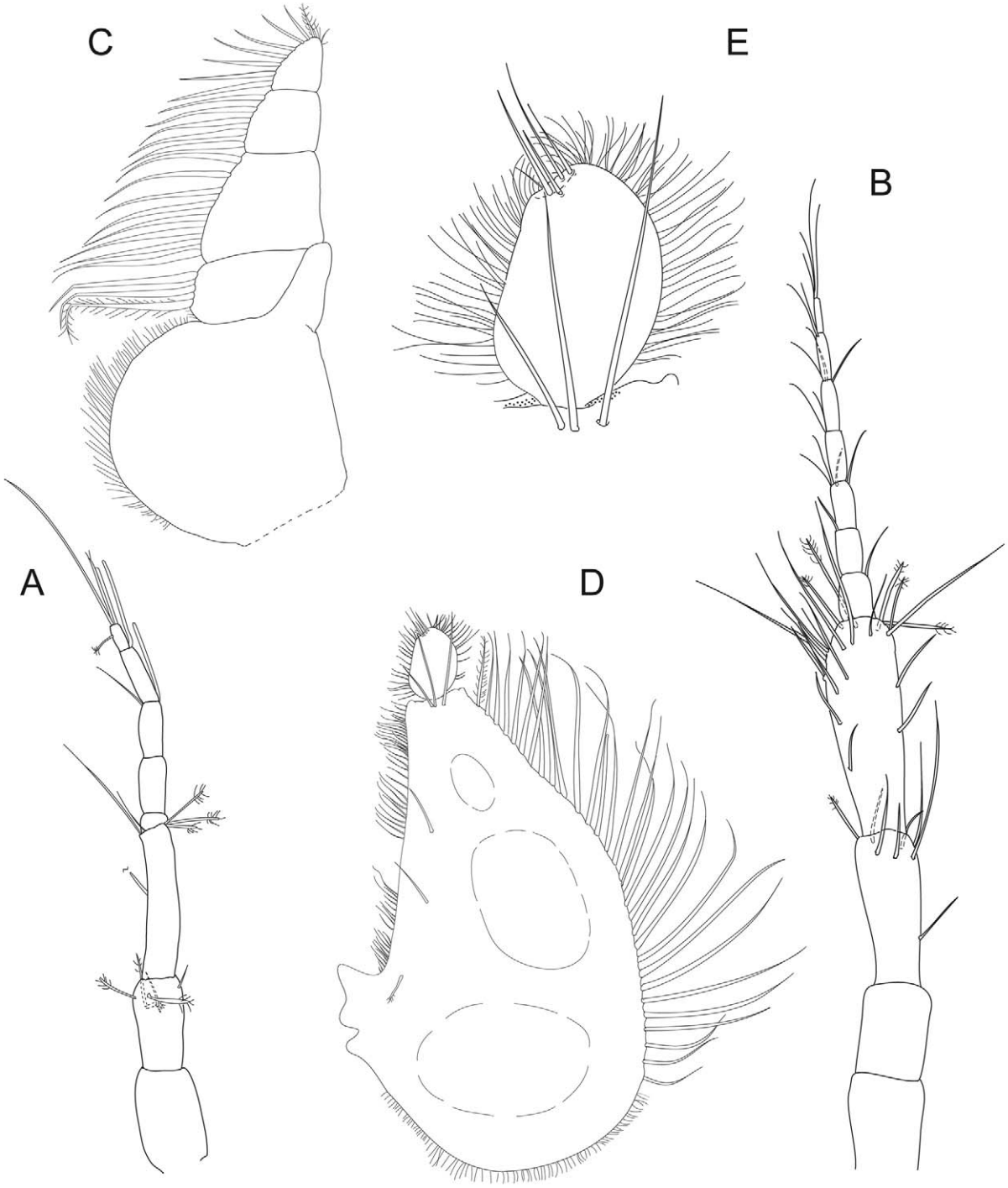

FIGURE 19. *Gnathia wistari* **sp. nov**, ♂, paratype, 3.3 mm (MTQ W10676). A, antennule. B, antenna. C, maxilliped. D, pylopod. E, second article of pylopod.

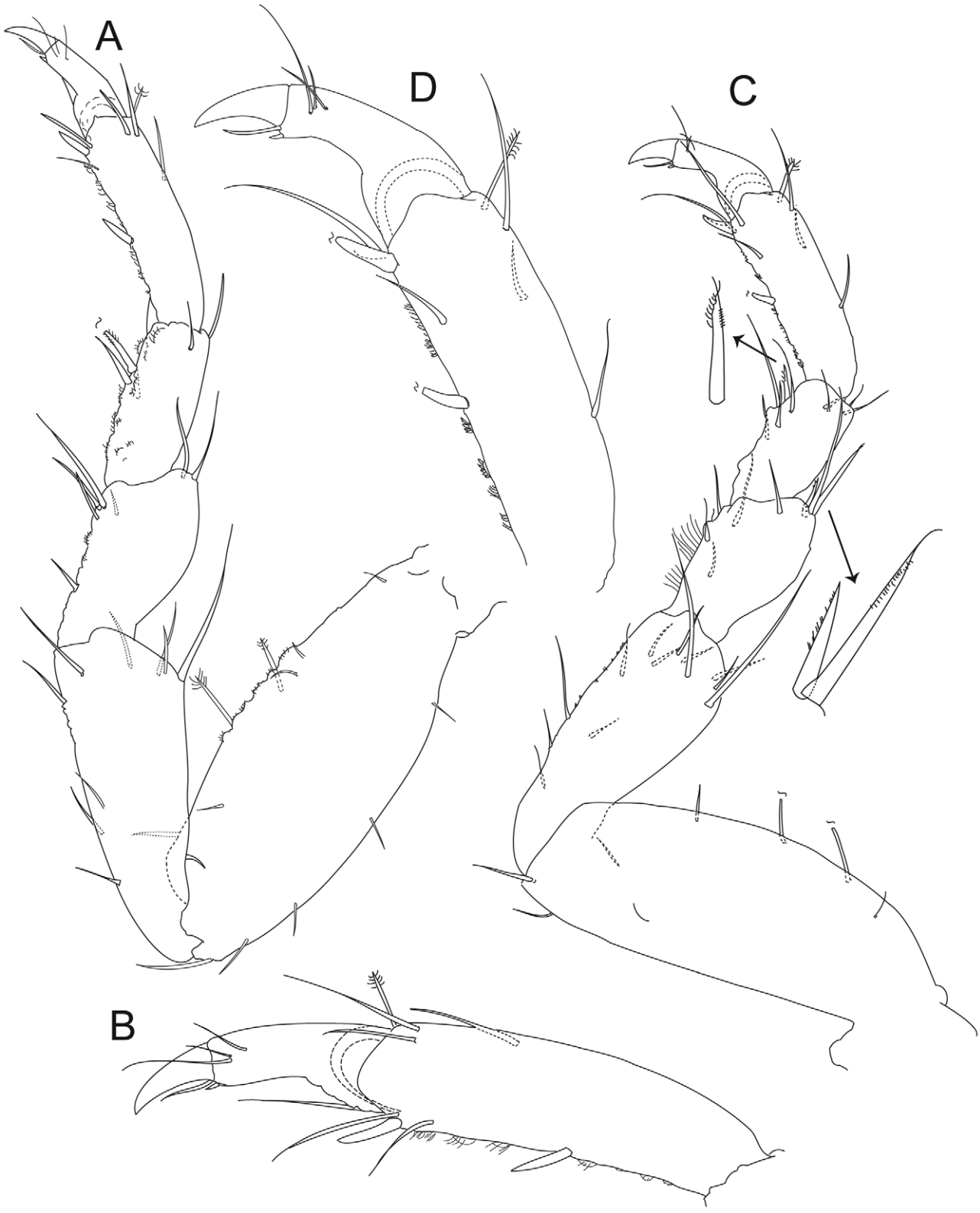

FIGURE 20. *Gnathia wistari* **sp. nov**, ♂, paratype, 3.3 mm (MTQ W10676). A, pereopod 2. B, propodus and dactylus of pereopod 2. C, pereopod 6. D, propodus and dactylus of pereopod 6.

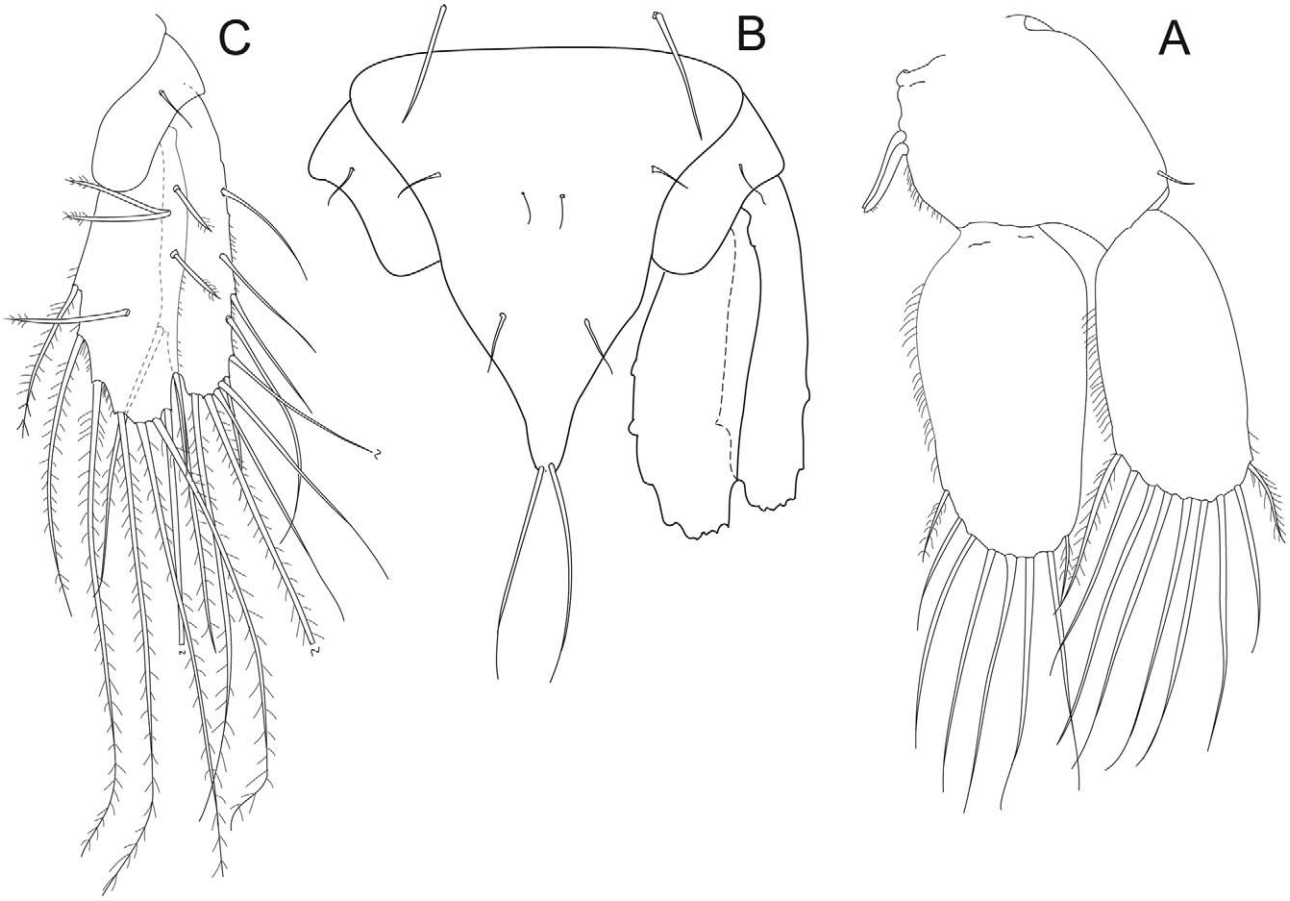

FIGURE 21. *Gnathia wistari* **sp. nov**, ♂, paratype, 3.3 mm (MTQ W10676). A, pleopod 2. B, pleotelson and outline of uropod. C, uropod.

Pereon lateral margins narrowing posteriorly, with few setae; anteriorly smooth. *Pereonite 1* not fused dorsally with cephalosome; dorsolateral margins not obscured by cephalosome; *pereonite 2* as wide as pereonite 1; *areae laterales* present on pereonite 5; *pereonite 6* without lobi laterales; lobuii absent. *Pleotelson* 1.1 times as long as anterior width, lateral margins smooth, anterolateral margins weakly concave, posterolateral margin distally concave; mid-dorsal surface with 1 sub-median seta, anterolateral margin with 1 submarginal seta, posterolateral margin with 1 submarginal seta, apex with 2 setae.

Antennule peduncle article 2 1 times as long as article 1, article 3 1.7 times as long as article 2, 4.8 times as long as wide; flagellum 1.4 as long as article 3, with 5 articles. *Antenna* peduncle article 4 2.4 times as long as wide, 1.6 times as long as article 3, with 1 penicillate seta, and 8 simple setae; article 5 1.4 times as long as article 4, 2.9 times as long as wide, inferior margin with 5 penicillate setae, with 15 simple setae; flagellum 1.5 as long as article 5, with 7 articles.

*Mandibl*e 0.6 as long as width of cephalosome, mandible triangular, weakly curved, distally; mandible apex 25% total length; mandibular seta present. *Carina* present, smooth, along entire length. *Incisor* knob-like, distal denticulation absent. *Blade* present, dentate, strongly convex, midventrally convex, along proximal 40% of margin. *Pseudoblade* absent; *internal lobe* present, bifid, large, crenulate; dorsal lobe absent; basal neck short; erisma absent; lamina dentata absent.

Maxilliped 5-articled. *Maxilliped* article 1 lateral margin with continuous marginal scale-setae; article 2 lateral margin with 3 plumose setae; article 3 lateral margin with 8 plumose setae; article 4 lateral margin with 5 plumose setae; article 5 with 8 plumose setae; endite extending to distal margin of article 2; without coupling setae. *Pylopod* article 1 1.7 as long as wide, without distolateral lobe; posterior and lateral margins forming rounded curve; lateral margin with 30 large PMS; mesial margin with continuous scale-setae, distal margin with 3 long simple setae; article 2 1.6 as long as wide; article 3 absent, without setae.

Pereopods 2–6 without long plumose setae; propodus distal RS slightly longer than proximal RS; lateral and inferior margins with weak tubercles, pereopod 2 with tubercles on merus and carpus. *Pereopod 2 basis* 2.4 times as long as greatest width, superior margin 5 long setae, inferior margin 5 setae; *ischium* 0.7 times as long as basis, 2.3 as long as wide, superior margin with 4 setae, inferior margin with 5 setae; *merus* 0.6 as long as ischium, 1.6 as long as wide, superior margin with 2 long setae, inferior margin with 5 long setae; *carpus* 0.6 as long as ischium, 2.3 as long as wide, superior margin with 2 long setae, inferior margin with 3 setae (1 biserrate); *propodus* 0.5 times as long as ischium, 3.8 times as long as wide, superior margin 3 long setae (and one penicillate), inferior margin with 1 short seta, 2 long simple setae, and 2 RS; *dactylus* 0.7 as long as propodus. *Pereopods 3 and 4* similar to pereopod 2. *Pereopod 5* similar to pereopod 6. *Pereopod 6* with tubercles on superior margin of basis, *basis* 2.5 times as long as greatest width, superior margin with 6 long setae, and no penicillate setae, inferior margin with 3 long setae; *ischium* 0.7 as long as basis, 2.3 as long as greatest width, superior margin with 5 long setae, inferior margin with 8 long setae; *merus* 0.6 as long as ischium, 1.5 times as long as wide, superior margin with 4 long setae (2 biserrate), inferior margin 4 long setae, with dense patch of scale-setae; *carpus* 0.5 as long as ischium, 1.9 times as long as wide, superior margin with 4 long setae, inferior margin with 6 long setae (1 biserrate); *propodus* 0.8 as long as ischium, 3.2 times as long as wide, superior margin with 4 long setae (1 penicillate), inferior margin with 3 long setae, and 2 RS; dactylus 0.7 as long as propodus. *Penes* opening flush with surface of sternite 7.

Pleopod 2 exopod 2.1 as long as wide, 9 PMS; *endopod* 1.9 as long as wide, endopod with 8 PMS. Pleopod 2 *appendix masculina* absent.

Uropod rami extending beyond pleotelson, apices broadly rounded. *Peduncle* with 1 dorsal seta. *Endopod* 2.5 as long as greatest width, dorsally with 5 sensory setae; lateral margin weakly sinuate, lateral margin with 2 simple setae; mesial margin strongly convex, with 6 long plumose setae. *Exopod* not extending to end of endopod, 3.8 times as long as greatest width; lateral margin weakly convex, with 7 simple setae (and 1 submarginal seta); proximomesial margin straight, distally convex, mesiodistal margin with 4 long PMS.

Remarks. *Gnathia wistari* **sp. nov**. is similar to *Gnathia aureamaculosa* Ferreira and Smit, 2009 in having large mesial lobes on the mandible. These two species can, however readily be distinguished by the shape of the mandible, which is rectangular in *G. aureamaculosa* and triangular–oval in *Gnathia wistari*, and by the shape of the superior frontolateral processes, being apically bifid in *G. wistari*, but conical in *G. aureamaculosa*.

Etymology. Named for the type locality; noun in apposition.

Distribution. *Gnathia wistari* **sp. nov**. is known from both the northern and southern Great Barrier Reef; recent collections from the northern Great Barrier Reef indicate that it occurs most commonly on the outer reefs rather than mid-shelf and continental island reefs; at depths of 8–29 metres.

Discussion

Gnathiid isopods are diverse on the Great Barrier Reef, although there has been no previous attempt to assess the overall diversity of any one coral reef or coral-reef region. Furthermore, previous collecting methods have often been limited to intertidal or small samples, with a correspondingly lower capture level than in the more substantial samples taken during the CReefs program. Species totals for coral-reef Gnathiidae are generally low, one to three species, reflecting the lack of appropriate sampling rather than actual diversity. For example the much larger area of the Caribbean has 14 recorded species (e.g. Müller 1988a, b; Kensley & Schotte 1989) and the Western Indian Ocean has 10 species from coral-reef habitats (e.g. Müller 1989a; Kensley *et al*. 2009), with a maximum local diversity of three species in the large Seychelles region. In large part one would expect that with thorough sampling the number of species would significantly increase.

Prior to this study seven species of Gnathiidae had been recorded from the Lizard Island region, the highest diversity for any coral-reef locality. This report increased the diversity to 11 species in two genera, the greatest known diversity for a single area, not including a further few undescribed species that lacked adequate material for description. The diversity may still be higher. Molecular analysis of the genetic diversity of larval gnathiids (Nagel *et al*. 2008) revealed potentially 13 species from the Lizard Island and Heron Island, suggesting that there are still several species yet to be described. CReefs data from Heron Island, southern Great Barrier Reef and Ningaloo Reef in Western Australia indicate that these southerly reefs have a lower species diversity than Lizard Island.

Acknowledgments

Material from Lizard Island was collected under the auspices of the CReefs project organized by the Australian Institute of Marine Science (AIMS). The CReefs Australia Project is generously sponsored by BHP Billiton in partnership with The Great Barrier Reef Foundation, the Australian Institute of Marine Science and the Alfred P. Sloan Foundation; CReefs is a field program of the Census of Marine Life. This study was supported by the University of Iceland Research Fund. JS thanks the staff of the Museum of Tropical Queensland for their hospitality during his stays in Townsville. We thank Julian Caley and Shawn Smith (AIMS) for their excellent organization and field support; NLB thanks Magdalena M. Błażewicz-Paszkowycz for her excellent team spirit while collecting at Lizard Island. Denise Seabright (MTQ) is thanked for her work in providing final art. We wish to thank Gary C.B. Poore and Nico J. Smit for their constructive comments on the paper.

References

Brandt, A. & Poore, G.C.B. (2003) Higher classification of the flabelliferan and related Isopoda based on a reappraisal of relationships. *Invertebrate Systematics*, 17(6), 893–923.

Bruce, N.L. (2009) The marine fauna of New Zealand: Isopoda, Aegidae (Crustacea). *NIWA Biodiversity Memoir*, 122, 1–252.

Coetzee, M.L., Smit, N.J., Grutter, A.S. & Davies, A.J. (2008) A new gnathiid (Crustacea, Isopoda) parasitizing two species of requiem sharks from Lizard Island, Great Barrier Reef, Australia. *Journal of Parasitology Research*, 94(3), 608–615.

Coetzee, M.L., Smit, N.J., Grutter, A.S. & Davies, A.J. (2009) *Gnathia trimaculata* n. sp. (Crustacea: Isopoda: Gnathiidae), an ectoparasite found parasitising requiem sharks from Lizard Island, Great Barrier Reef, Australia. *Systematic Parasitology*, 72(2), 97–112.

Cohen, B.F. & Poore, G.C.B. (1994) Phylogeny and biogeography of the Gnathiidae (Crustacea: Isopoda) with descriptions of new genera and species, most from south-eastern Australia. *Memoirs of the Museum of Victoria*, 54, 271–397.

Coleman, C.O., Lowry, J.K. & Macfarlane, T. (2010) DELTA for beginners. An introduction into the taxonomy software package DELTA. *ZooKeys*, 45, 1–75.

Dallwitz, M.J., Paine, T.A. & Zurcher, E.J. (1997) *User's guide to the DELTA system. A general system for processing taxonomic descriptions*. CSIRO Division of Entomology, Canberra, 1–160 pp.

Farquharson, C., Smit, N.J., Grutter, A.S. & Davies, A.J. (2012) *Gnathia masca* sp. nov. (Crustacea, Isopoda, Gnathiidae) from Lizard Island, Great Barrier Reef, Australia. *Zootaxa*, 3233, 22–36.

Ferreira, M.L., Smit, N.J., Grutter, A.S. & Davies, A.J. (2009) A new species of gnathiid (Crustacea: Isopoda) parasitizing teleosts from Lizard Island, Great Barrier Reef, Australia. *Journal of Parasitology*, 95(5), 1066–1075.

Ferreira, M., Smit, N.J. & Davies, A.J. 2010. *Gnathia grutterae* sp. nov. (Crustacea, Isopoda, Gnathiidae) parasitising representatives of the Balistidae, Labridae and Tetraodontidae from Lizard Island, Great Barrier Reef, Australia. *Zootaxa*, 2718, 39–50.

Grutter, A.S., Morgan, J.A.T. & Adlard, R.D. (2000) Characterising parasitie [sic] gnathiid isopod species and matching life stages with ribosomal DNA ITS2 sequences. *Marine Biology*, 136, 201–205.

Grutter, A.S., Pickering, J., McCallum, H. & McCormick, M.I. (2008) Impact of micropredatory gnathiid isopods on young coral reef fishes. *Coral Reefs* 27(3), 655–661.

Grutter, A.S. (2008) Interactions between gnathiid isopods, cleaner fish, and other fish at Lizard Island, Great Barrier Reef. *Journal of Fish Biology* 73, 2094–2109.

Holdich, D.M. & Harrison, K. (1980) The crustacean isopod genus *Gnathia* Leach from Queensland waters with description of nine new species. *Australian Journal of Marine and Freshwater Research*, 31, 215–240.

Keable, S.J. (2006) Taxonomic revision of *Natatolana* (Crustacea: Isopoda: Cirolanidae). *Records of the Australian Museum*, 58(2), 133–244.

Kensley, B. (1988) Preliminary observation on the isopod crustacean fauna of Aldabra Atoll. *Bulletin of the Biological Society of Washington*, 8, 40–44.

Kensley, B. & Schotte, M. (1989) *Guide to the Marine Isopod Crustaceans of the Caribbean*. Smithsonian Institution Press, Washington, D.C. & London, 1–308 pp.

Kensley, B., Schotte, M. & Poore, G.C.B. (2009) Gnathiid isopods (Crustacea: Isopoda: Gnathiidae), mostly new, from the Indian Ocean. *Proceedings of the Biological Society of Washington*, 122(2), 32–51.

Monod, T. (1926) Les Gnathiidæ. Essai monographique (Morphologie, Biologie, Systématique). *Mémoirs de la Société de Sciences Naturelles du Maroc*, 13, 1–668.

Müller, H.-G. (1988a) The genus *Gnathia* Leach (Isopoda) from the Santa Marta area, northern Colombia, with a review of Gnathiidea from the Caribbean Sea and Gulf of Mexico. *Bijdragen tot de Dierkunde*, 58(1), 88–104.

Müller, H.-G. (1988b) Redescription of *Gnathia johanna* Monod, 1926 (Isopoda) from St. John, Virgin Islands. *Bulletin Zoölogisch Museum Universiteit van Amsterdam*, 11(15), 129–135.

Müller, H.-G. (1989a) *Gnathia wolffi* n. sp., a coral-reef inhabiting isopod from Kenya, with a key to the *Gnathia ferox* complex

(Cymothoidea: Gnathiidae). *Bonner Zoologische Beiträge*, 40, 63–67.
Müller, H.-G. (1989b) Two new species of *Gnathia* Leach from coral reefs at Mooréa, Society Islands, with redescription of *Gnathia margaritarum* Monod, 1926 from Panama Pacific (Isopoda: Cymothoidea: Gnathiidae). *Bulletin Zoölogisch Museum, Universiteit van Amsterdam*, 12(3), 65–78.
Nagel, L., Montgomerie, R. & Lougheed, S.C. (2008) Evolutionary divergence in common marine ectoparasites *Gnathia* spp. (Isopoda: Gnathiidae) on the Great Barrier Reef: phylogeography, morphology, and behaviour. *Biological Journal of the Linnean Society*, 94, 569–587.
Nagel, L. & Grutter, A.S. (2007) Host preference and specialization in *Gnathia* sp., a common parasitic isopod of coral reef fishes. *Journal of Fish Biology*, 70, 497–508.
Poore, G.C.B. & Lew Ton, H. (2002) Gnathiidae Leach, 1814. *In:* Poore, G.C.B. (Ed.) *Crustacea: Malacostraca: Syncarida and Peracarida: Isopoda, Tanaidacea, Mictacea, Thermosbaenacea, Spelaeogriphacea*. Zoological Catalogue of Australia. CSIRO Publishing, Melbourne, 19.2A, 184–191.
Smit, N.J. & Davies, A.J. (2004) The curious life-style of the parasitic stages of gnathiid isopods. *Advances in Parasitology*, 58, 289–391.
Watling, L. (1989) A classification concept for crustacean setae based on the homology concept. In: Felgenhauer, B.E., Watling, L. & Thistle, A.B. (Eds.) *Functional morphology of feeding and grooming in Crustacea*. A.A. Balkema, Rotterdam, 6, 15–26.
Wilson, G.D.F., Sims, C.A. & Grutter, A.S. (2011) Toward a taxonomy of the Gnathiidae (Isopoda) using juveniles: the external anatomy of *Gnathia aureamaculosa* zuphea stages using scanning electron microscopy. *Journal of Crustacean Biology*, 31, 509–522.