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Eleven New Species and a New Genus of Diastylidae (Crustacea: Cumacea) from Australia and One New Species from Canada

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ABSTRACT. The shallow water cumacean fauna of Australia is relatively well known, particularly from the southern coasts. However, recent investigations in the collections of the Australian Museum and Museum Victoria have yielded 12 new species and one new genus of diastylid cumaceans, most from continental shelf and slope depths of Australia; one new species in Museum Victoria is from Canadian waters. The new genus *Austroleptostylis* is described, and the species *Leptostylis recalvastra* Hale, 1945 is transferred to it, creating the new combination *Austroleptostylis recalvastra* (Hale, 1945). The new species *Anchistylis halei* n. sp., *Diastylis kapalae* n. sp., *Diastylopsis incompta* n. sp. (from Canada), *Diastylopsis senta* n. sp., *Diastylopsis trisetosa* n. sp., *Dimorphostylis nordaustriana* n. sp., *Dimorphostylis roccatagliatai* n. sp., *Dimorphostylis triplicata* n. sp., *Makrokyllindrus eirmoacanthus* n. sp., *Paradiastylis berentsae* n. sp., *P. botanybayensis* n. sp., and *P. occidentaustralis* n. sp. are described. *Diastylopsis diaphanes* Zimmer, 1913 is transferred to *Litogynodiastylis* Gerken, 2001, creating the new combination *Litogynodiastylis diaphanes* (Zimmer, 1913), and *D. bosphorica* Băcescu, 1982 is transferred to *Diastylodes* Sars, 1900, creating the new combination *Diastylodes bosphorica* (Băcescu, 1982). The adult male and ovigerous female of *Austroleptostylis recalvastra* n. comb. are described. Keys to all Australian diastylid species are provided, as are global keys to all species of *Diastylopsis* and *Paradiastylis*.

KEYWORDS. Cumacea; Diastylidae; Australia; Canada; *Anchistylis*; *Austroleptostylis*; *Diastylis*; *Diastylodes*; *Diastylopsis*; *Dimorphostylis*; *Leptostylis*; *Litogynodiastylis*; *Makrokyllindrus*; *Paradiastylis*.

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Cumaceans are small crustaceans that live on the seafloor, common in muddy and sandy environments. There are currently eight recognized families of Cumacea, seven of which are recorded from Australian waters. Herbert Hale described many species in an important series of works from 1928–1951. Since 1951, there has been significant work on the Australian Bodotriidae (Tafe & Greenwood, 1996), Gynodiastylidae (Gerken, 2001), Lampropidae

(Gerken, in prep.), Pseudocumatidae (Akiyama & Gerken, 2011), Ceratocumatidae (Petrescu, 2004), and Nannastacidae (Petrescu, 2006), but no work on the Diastylidae. As part of a Geddes Collections Fellowship and a Museum Victoria Fellowship, the collections of the Australian Museum and Museum Victoria were investigated for novel taxa in the cumacean family Diastylidae.

In the first half of the twentieth century, 16 species in four genera (*Anchistylis* Hale, 1945; *Dimorphostylis* Zimmer, 1921; *Leptostylis* Sars, 1869; *Paradiastylis* Calman, 1904) of diastylid cumaceans were described from Australian waters (Calman, 1905; Foxon, 1932; Hale, 1928, 1936, 1945, 1951), with eight of the 16 species in the genus *Dimorphostylis*. The current work includes new species of *Anchistylis*, *Dimorphostylis* and *Paradiastylis*, as well as new species of *Diastylis* Say, 1818, *Diastylopsis* Smith, 1880, *Makrokylindrus* Stebbing, 1912, and the new genus *Austroleptostylis*, bringing the total of diastylid genera recorded from Australian waters to eight, and the number of species to 27.

The Diastylidae currently consists of approximately 325 species in 23 genera, with 32% of the species placed in *Diastylis*. In most areas of the world, *Diastylis* is the most frequently encountered diastylid genus, particularly in temperate to cold waters. The Australian diastylid fauna is somewhat unusual in that there were no species of *Diastylis* known prior to this work, and only one *Diastylis* species was encountered during this work. While some of the samples were from warm areas, such as northern and western Australia, many of the samples were from temperate waters of the southern shelf and slope, where *Diastylis* might be expected. The Australian fauna is similar to the north-western Pacific coasts of Japan and Korea in being rich in diversity in the genus *Dimorphostylis*.

Materials and methods

Samples were sorted from within the collections of the Australian Museum (AM) and Museum Victoria (NMV). Samples were collected by various means including scuba, dredge and sled, and preservation was either in formalin with subsequent transfer into ethanol, or directly in ethanol. Where the preservation is known, it is listed in the museum records. Registration numbers starting with *P* indicate material is deposited at the Australian Museum, numbers starting with *J* indicate material is deposited at Museum Victoria.

Specimens were temporarily mounted in a mixture of 95% glycerin/5% EtOH, and illustrated using *camera lucida* on a dissecting microscope and a compound microscope. Some specimens were temporarily stained using a dilute solution of Chlorazole Black dissolved in ethanol. Body length is measured from the tip of the pseudorostral lobes to the posterior border of pleonite 6. The term preparatory female indicates a female with small external brood plates, ready to moult into a female with large brood plates and a brood. A subadult female is one that does not have small external brood plates. Because there are cumaceans with life histories that include multiple broods where the females moult between large and small brood plates multiple times (Akiyama & Yamamoto, 2004; Bishop, 1982), preparatory female and subadult female are therefore not synonymous. Setal terminology largely follows Watling (1989). Illustrations were prepared in Adobe Illustrator using a Wacom Intuos 3 tablet according to the procedures described in Coleman (2003, 2009).

Systematics

Diastylidae Bate, 1856

Key to the genera of Diastylidae known from Australian waters

- | | | |
|---|---|----------------------------------|
| 1 | Telson longer than uropod peduncles | 2 |
| — | Telson distinctly shorter than uropod peduncles | 3 |
| 2 | Carapace rounded, pereonites 3–4 not directed posteriorly | <i>Makrokylindrus</i> |
| — | Carapace elongate, pereonites 3–4 directed posteriorly | <i>Diastylopsis</i> |
| 3 | Female without exopod on maxilliped 3 | <i>Paradiastylis</i> |
| — | Female with exopod on maxilliped 3 | 4 |
| 4 | Female with rudimentary exopods on pereopods 3–4 | 5 |
| — | Females without rudimentary exopods on pereopods 3–4 | 7 |
| 5 | Male with modified pleopods with single ramus; carapace with distinct curved dorsolateral ridge | <i>Anchistylis</i> |
| — | Male pleopods with rami; carapace without dorsolateral ridge | 6 |
| 6 | Male with 2 pairs of pleopods | <i>Leptostylis</i> |
| — | Male with 1 pair of pleopods | <i>Austroleptostylis</i> n. gen. |
| 7 | Male with expanded bases of pereopods and exopods | <i>Dimorphostylis</i> |
| — | Male without greatly expanded bases of pereopods and exopods | <i>Diastylis</i> |

Anchistylis Hale, 1945

Type species. *Anchistylis waitei* (Hale, 1928)

Diagnosis. *Female.* Carapace not elongate, with at least 1 oblique lateral ridge curving down towards antennal notch. Pleon slender and short. Maxilliped 3 with exopod. Rudimentary exopods present on pereopods 3–4. Telson without setae. *Male.* Carapace similar to female. Bases of pereopods 3–5 broad, bases of exopods broadened. Telson with pair of very long terminal setae. With 2 pairs of uniramous or aramous pleopods with specialized setae.

Remarks. The uniramous or aramous pleopods with specialized setae are characteristic for the genus. However,

without males, females may be difficult to place in *Anchistylis* with certainty except by identification to species. Due to the small body size and reduced size of the pleon, when adult or nearly adult males are not present, the genus may be confused with *Litogynodiastylis*, and can be distinguished by the presence of an exopod on maxilliped 3 in the female (the exopod is absent in all female Gynodiastylidae). The minimal dimorphism between the males and females is like that found in the Gyndiastylidae, and close inspection of the pleon may be necessary to determine if pleopods are present in subadult male.

Australian species. *Anchistylis halei* n. sp.; *A. longipes* Hale, 1945; *A. similis* Hale, 1945; *A. waitei* (Hale, 1928).

Key to the Australian species of *Anchistylis*

- | | | |
|---|--|------------------------|
| 1 | Carapace with curving dorsolateral ridge and parallel ridge anteriorly | <i>A. halei</i> n. sp. |
| — | Carapace with curving dorsolateral ridge, without parallel ridge | 2 |
| 2 | Uropod endopod article 2 longer than article 3 | <i>A. waitei</i> |
| — | Uropod endopod article 2 equal or shorter than article 3 | 3 |
| 3 | Pereopod 1 basis equal to all other articles together | <i>A. similis</i> |
| — | Pereopod 1 basis shorter than all other articles together | <i>A. longipes</i> |

Anchistylis halei n. sp.

Figs 1–4

Type material. Holotype ovigerous female, AM P85793; paratype ovigerous female, dissected, AM P85794; paratype adult male, dissected, AM P85795; 35°04'S 150°41'12"E, 12 m, P. A. Hutchings, 1989–1990.

Other material examined. 1 male, AM P85796; AM P85797, 4 females, 6 males, 2 juveniles; 1 female, AM P85798; 1 male, AM P85799; 1 male, AM P85800; 4 males, AM P85801; 35°04'S 150°41'12"E, 12 m, P. A. Hutchings, 1989–1990. 1 individual, AM P53667, 33°58'16"S 151°09'55"E, 3 m, State Pollution Control Commission, 1976.

Diagnosis. *Female and subadult male.* Carapace with two lateral ridges curving towards antennal notch, ending on anterior margin of carapace. Uropod endopod article 1 longer than articles 2 and 3 together. *Adult male.* Carapace as in female. Pleopods aramous.

Description

Ovigerous female. Holotype ovigerous female, AM P85793, 2.0 mm; paratype ovigerous female, AM P85794, 2.7 mm. —Carapace lateral ridge curving from ventral part of antennal notch dorsally and turning anteriorly on dorsal part of carapace, with second shorter ridge anterior of longer ridge, starting above antennal notch; pseudorostral lobes 0.4 × carapace length; eye lobe broad, 0.07 carapace length, with lenses; carapace subequal to length of pereonites (Fig. 1A–C). —Paratype ovigerous female, AM P85794, 2.7 mm. —Antennule peduncle article 1 longest, unarmed; article 2 with 2 setae; article 3 with 2 setae; main flagellum of 3 articles, with several simple setae and 2 aesthetascs; accessory flagellum of 1 article, less than 0.5 length of main flagellum article 1, with 3 simple setae (Fig. 1D). —Antenna of 4 articles, each article with single pappose seta (Fig. 1D).

—Mandible navicular, with 8–9 microserrate setae medially, lacinia mobilis with 2 cusps (Fig. 1E). —Maxillule with 2 endites; outer endite with 3 rows of stout simple setae; inner endite with 2 simple, 1 tricuspid and 1 microserrate setae; palp broken (Fig. 1F). —Maxilla with 3 endites; broad endite distal margin lined with slender setae, medial margin with row of simple setae and 2 pappose setae; medial narrow endite with 4 microserrate setae terminally; distal narrow endite with 4 microserrate setae terminally; both narrow endites extending past margin of broad endite (Fig. 1G). —Maxilliped 1 basis produced as medial lobe with row of pappose setae and 2 hook setae; ischium absent; merus with 2 pappose setae; carpus 1.5 × merus length, with 2 pappose setae, 7 beak-like, and field of simple setae medially; propodus 0.8 × carpus length, with 4 pappose setae medially and plumose seta laterally; dactylus 0.9 × propodus length, with 3 simple and 1 pappose setae terminally (Fig. 1H). —Maxilliped 2 basis longer than all other articles together, with 4 simple and 4 pappose setae; ischium absent; merus 0.2 × basis length, with pappose seta; carpus 2.1 × merus length, with 6 simple setae; propodus 0.7 × carpus length, with 8 simple and 1 plumose setae; dactylus 0.6 × propodus length, with 3 simple setae terminally (Fig. 1I). —Maxilliped 3 basis 1.8 × all other articles together, with 11 pappose setae medially, distal margin produced to midpoint of merus, with 6 plumose setae; ischium 0.09 × basis length, unarmed; merus 1.6 × ischium length, with 2 pappose setae medially, plumose seta laterally; carpus 1.0 × merus length, with 2 sparsely plumose setae medially, plumose seta laterally; propodus 0.8 × carpus length, with 2 sparsely plumose setae medially, 2 plumose setae laterally; dactylus 1.0 × propodus length, with 5 simple setae terminally; exopod 0.6 × basis length, basal article unarmed, flagellum with plumo-annulate setae (Fig. 2A). —Left (normal) pereopod 1 basis 0.8 × length of all other articles together, with 9 pappose, 1 plumose and 1 stout simple setae; ischium 0.1 × basis length, with plumose seta; merus 1.1 ischium length, with 1 pappose and 1 simple setae; carpus 2.8 × merus

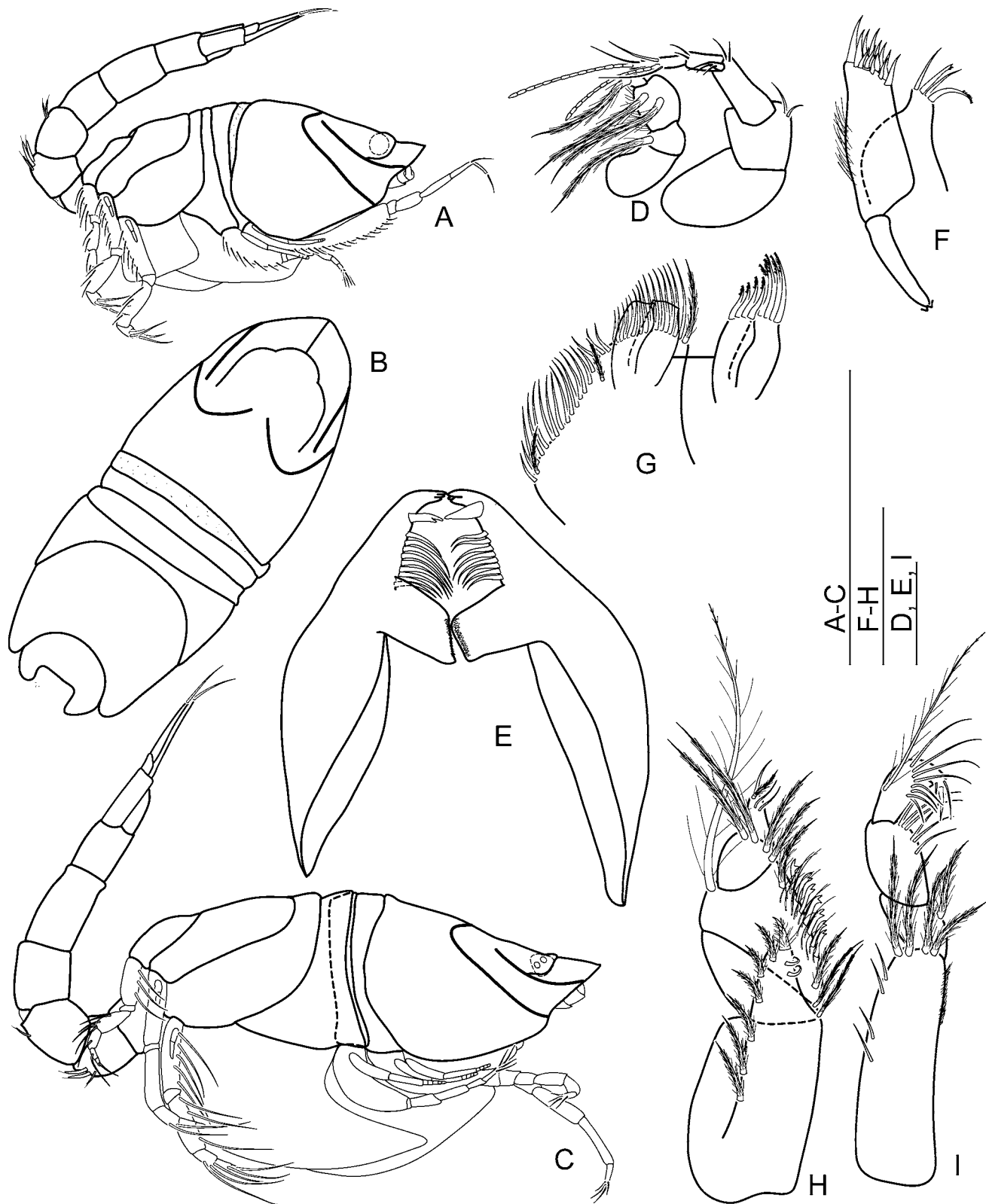


Figure 1. *Anchistylis halei* n. sp. female. Holotype ovigerous female, 2.0 mm, AM P85793: (A), lateral view. Paratype ovigerous female, 2.7 mm, AM P85794: (B), dorsal view; (C), lateral view; (D), antennule and antenna; (E), mandibles; (F), maxillule; (G), maxilla; (H), maxilliped 1; (I), maxilliped 2. Scale bars A–C = 1.0 mm, D–I = 0.1 mm.

length, with 2 simple setae; propodus $1.0 \times$ carpus length, with simple seta; dactylus $0.7 \times$ propodus length, with 8 simple setae distally; exopod $0.8 \times$ basis length, basal article with 3 pappose setae, flagellum with plumo-annulate setae (Fig. 2B). —Right (aberrant) pereopod 1 basis $1.4 \times$ length of all other articles together, with 9 pappose, 1 plumose

and 1 stout simple setae; ischium $0.07 \times$ basis length, with plumose seta; merus $1.5 \times$ ischium length, unarmed; carpus $2.5 \times$ merus length, unarmed; propodus $0.7 \times$ carpus length, unarmed; dactylus $0.9 \times$ propodus length, with 4 simple setae distally; exopod $0.8 \times$ basis length, basal article with 2 pappose setae, flagellum with plumo-annulate setae (Fig.

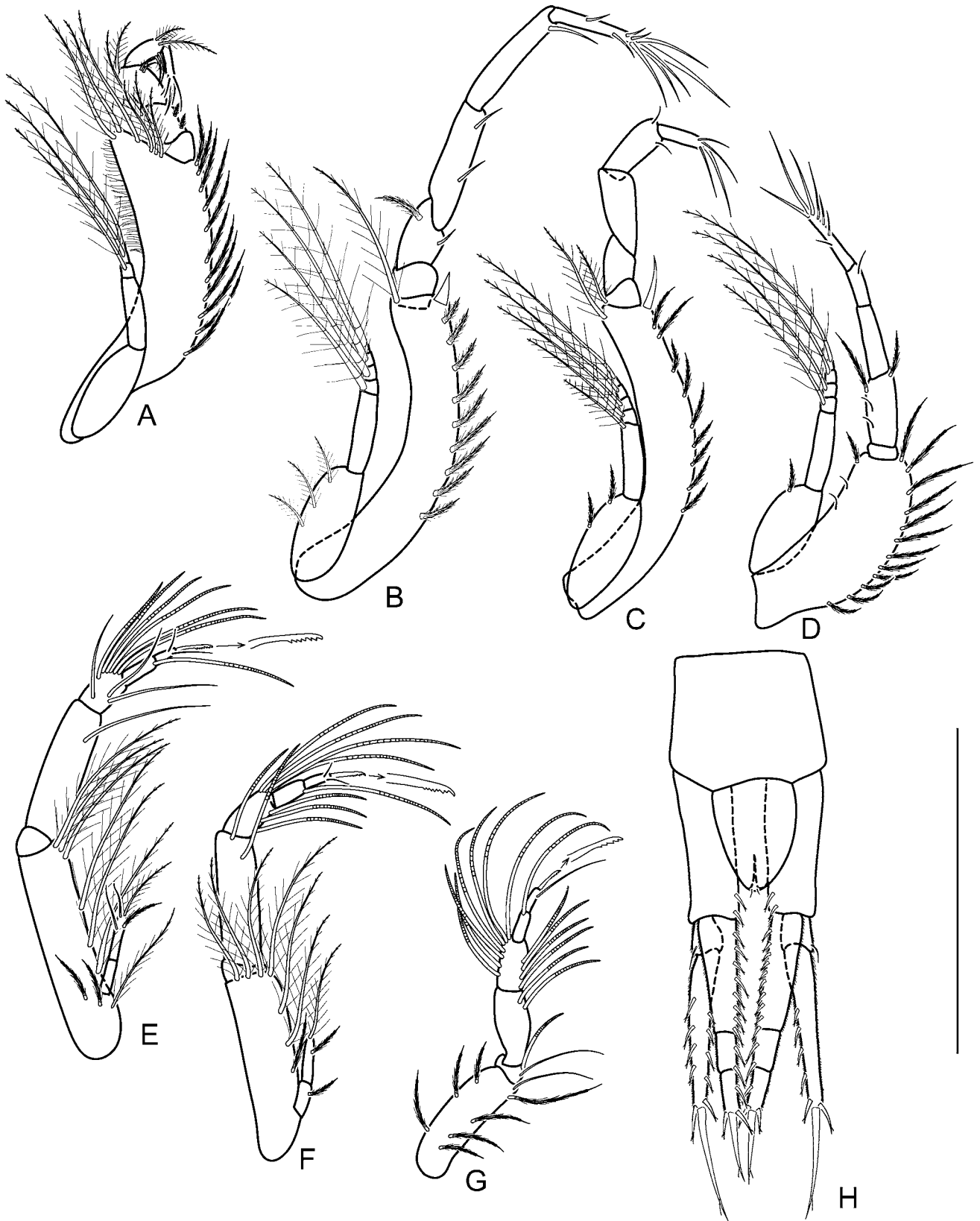


Figure 2. *Anchistylis halei* n. sp. female. Paratype ovigerous female, 2.7 mm, AM P85794: (A), maxilliped 3; (B), left pereopod 1; (C), right pereopod 1; (D), pereopod 2; (E), pereopod 3; (F), pereopod 4; (G), pereopod 5; (H), pleonite 6, telson and uropods. Scale bar = 0.5 mm.

2C). —Pereopod 2 basis $0.7 \times$ length of all other articles together, with 2 simple and 13 pappose setae; ischium $0.08 \times$ basis length, unarmed; merus $4.3 \times$ ischium length, with 2 simple and 2 pappose setae; carpus $1.1 \times$ merus length, unarmed; propodus $0.6 \times$ carpus length, with simple seta;

dactylus $1.6 \times$ propodus length, with 4 simple setae and 3 simple setae terminally; exopod $1.2 \times$ basis length, basal article with pappose seta, flagellum with plumo-annulate setae (Fig. 2D). —Pereopod 3 basis $0.8 \times$ length of all other articles together, with 2 pappose and 7 plumose setae;

ischium $0.1 \times$ basis length, unarmed; merus $5.0 \times$ ischium length, with simple seta; carpus $0.3 \times$ merus length, with 3 simple and 6 annulate setae; propodus $0.9 \times$ carpus length, with annulate seta; dactylus $0.6 \times$ propodus length, with 1 simple seta and serrate seta terminally; exopod rudimentary, $0.4 \times$ basis length, of 2 articles with 2 simple, 1 pappose and 1 plumose setae (Fig. 2E). —Pereopod 4 basis $0.7 \times$ length of all other articles together, with 5 plumose and 1 pappose setae; ischium $0.06 \times$ basis length, unarmed; merus $12.5 \times$ ischium length, with 2 annulate setae; carpus $0.4 \times$ merus length, with 7 annulate setae; propodus $0.6 \times$ carpus length, with annulate seta; dactylus $0.8 \times$ propodus length, with 2 simple setae and serrate seta terminally; exopod rudimentary, $0.4 \times$ basis length, of 2 articles with 2 pappose and 1 plumose setae (Fig. 2F). —Pereopod 5 basis $0.7 \times$ length of all other articles together, with 1 simple and 7 pappose setae; ischium $0.08 \times$ basis length, with 1 simple and 1 annulate setae; merus $7 \times$ ischium length, with 2 annulate setae; carpus $0.6 \times$ merus length, with 11 annulate setae; propodus $0.6 \times$ carpus length, with annulate seta; dactylus $1.0 \times$ propodus length, with 1 simple seta and serrate seta terminally (Fig. 2G). —Telson $0.8 \times$ length of pleonite 6, with 1 pair of tiny hair-like setae laterally, no terminal setae (Fig. 2H). —Uropod peduncles $1.0 \times$ pleonite 6 length, $1.2 \times$ telson length, with 2 setae with single subterminal setule medially. Uropod endopod of 3 articles, $1.4\text{--}1.5 \times$ peduncle length, margins lined with fine hair-like setae; article 1 longer than articles 2 and 3 together, with 8–9 setae with single subterminal setule medially; article 2 shortest, with 2 setae with single subterminal setule medially; article 3 with 2 setae with single subterminal setule medially, 1 laterally, terminal seta longer than article 3, with single subterminal setule. Uropod exopod of 2 articles, subequal to length of endopod, margins lined with fine hair-like setae; article 1 $0.2 \times$ length of article 2, with simple seta; article 2 with 6–10 setae with single subterminal setule marginally, terminal seta longer than endopod terminal seta, with single subterminal setule (Fig. 2H).

Adult male. Paratype adult male, AM P85795, 3.5 mm. —Carapace lateral ridge curving from ventral part of antennal notch dorsally and turning anteriorly on dorsal part of carapace, with second shorter ridge anterior of longer ridge, starting above antennal notch; eye lobe with lenses; carapace $1.8 \times$ length of pereonites together (Fig. 3A). —Antennule peduncle article 1 longer than articles 2 and 3 together, with 2 simple setae; article 2 $0.5 \times$ length of article 1, unarmed; article 3 $0.7 \times$ length of article 2, with short simple setae distally; main flagellum of 6 articles, with many short simple setae, 2 aesthetascs terminally; accessory flagellum of 3 articles, $0.7 \times$ length of main flagellum, with simple setae terminally (Fig. 3B). —Antenna extending past telson; peduncle of 5 articles; article 3 with pappose seta, article 5 with ranks of setae on anterior face, ranks do not circle article; flagellum with long articles, each with several small simple setae (Fig. 3C). —Maxilliped 3 basis $2.0 \times$ length of all other articles together, with 3 simple and 10 plumose setae medially, distal corner produced to midpoint of merus, with 5 plumose setae; ischium $0.07 \times$ basis length, unarmed; merus $1.7 \times$ ischium length, with 3 pappose and 1 plumose setae; carpus $1.0 \times$ merus length, with 6 pappose and 1 plumose setae; propodus $0.6 \times$ carpus length, with 2 pappose setae; dactylus $1.7 \times$ propodus length, with 4 simple setae terminally; exopod $0.8 \times$ basis length, basal article unarmed,

flagellum with plumo-annulate setae (Fig. 3D). —Pereopod 1 basis $1.0 \times$ length of all other articles together, with 9 pappose, 1 plumose and 1 stout simple setae; ischium $0.06 \times$ basis length, unarmed; merus $2.2 \times$ ischium length, with 1 plumose and 1 pappose setae; carpus $2.1 \times$ merus length, with 2 simple setae; propodus $1.1 \times$ carpus length, with 3 simple setae; dactylus $0.8 \times$ propodus length, with 4 simple setae and 3 simple setae terminally; exopod $0.7 \times$ basis length, basal article width $1.7 \times$ width of basis, with 3 pappose setae, flagellum with plumo-annulate setae (Fig. 4A). —Pereopod 2 basis $1.0 \times$ length of all other articles together, with 10 pappose setae; ischium $0.04 \times$ basis length, unarmed; merus $6.0 \times$ ischium length, with 1 simple and 1 pappose setae; carpus $1.1 \times$ merus length, with 4 simple setae; propodus $0.5 \times$ carpus length, with 4 simple setae; dactylus $1.6 \times$ propodus length, with 6 simple setae and 3 simple setae terminally; exopod $1.0 \times$ basis length, basal article width $1.7 \times$ width of basis, with 3 pappose setae, flagellum with plumo-annulate setae (Fig. 3E). —Pereopod 3 basis $0.95 \times$ length of all other articles together, with 7 pappose setae; ischium $0.07 \times$ basis length, with 3 annulate setae; merus $9.0 \times$ ischium length, with 3 annulate setae; carpus $0.3 \times$ merus length, with 5 annulate setae; propodus $0.8 \times$ carpus length, with annulate seta; dactylus $0.7 \times$ propodus length, with 2 simple setae and serrate seta terminally; exopod $1.2 \times$ basis length, basal article width $1.3 \times$ width of basis, with 2 pappose setae, flagellum with plumo-annulate setae (Fig. 4B). —Pereopod 4 basis $0.8 \times$ length of all other articles together, with 3 pappose, 2 plumose and 1 annulate setae; ischium $0.08 \times$ basis length, with 2 annulate setae; merus $7.3 \times$ ischium length, with 3 annulate and 1 plumose setae; carpus $0.4 \times$ merus length, with 8 annulate setae; propodus $0.6 \times$ carpus length, with annulate seta; dactylus $1.2 \times$ propodus length, with 2 simple setae and serrate seta terminally; exopod $1.4 \times$ basis length, basal article width $1.3 \times$ width of basis, with 4 plumose setae, flagellum with plumo-annulate setae (Fig. 4C). —Pereopod 5 basis $0.6 \times$ length of all other articles together, with 4 pappose setae; ischium $0.2 \times$ basis length, with annulate seta; merus $2.8 \times$ ischium length, with 3 annulate setae; carpus $0.8 \times$ merus length, with 8 annulate and 1 pappose setae; propodus $0.7 \times$ carpus length, with annulate seta; dactylus $0.7 \times$ propodus length, with simple seta and serrate seta terminally (Fig. 4D). —Pleopod 1 without rami, with 2 stout, curved hook setae (Fig. 4E). —Pleopod 2 without rami, with excavation and small seta indicating division between peduncle and ramus, but without articulation, with 1 pappose, 1 curved hook, and 1 complex bicuspid seta terminally (Fig. 4F). —Telson $1.1 \times$ length of pleonite 6, without lateral setae, 2 long slender terminal setae (Figs 4G–H). —Uropod peduncles $1.5 \times$ pleonite 6 length, $1.5 \times$ telson length, medial margin lined with fine hair-like setae, with 4 setae with single subterminal setule distally. Uropod endopod of 3 articles, $1.6 \times$ peduncle length, medial margins lined with fine hair-like setae; article 1 longer than articles 2 and 3 together, with 8–10 setae with single subterminal setule medially; article 2 with 3 setae with single subterminal setule medially; article 3 $1.0 \times$ article 2 length, with 4–5 setae with single subterminal setule medially, 1 laterally, terminal seta shorter than article 3, simple with single subterminal setule. Uropod exopod $0.9 \times$ length of endopod; article 1 $0.3 \times$ article 2 length, with 0–1 simple seta; article 2 with 4 setae on each margin, terminal seta long with single subterminal setule (Fig. 4G).

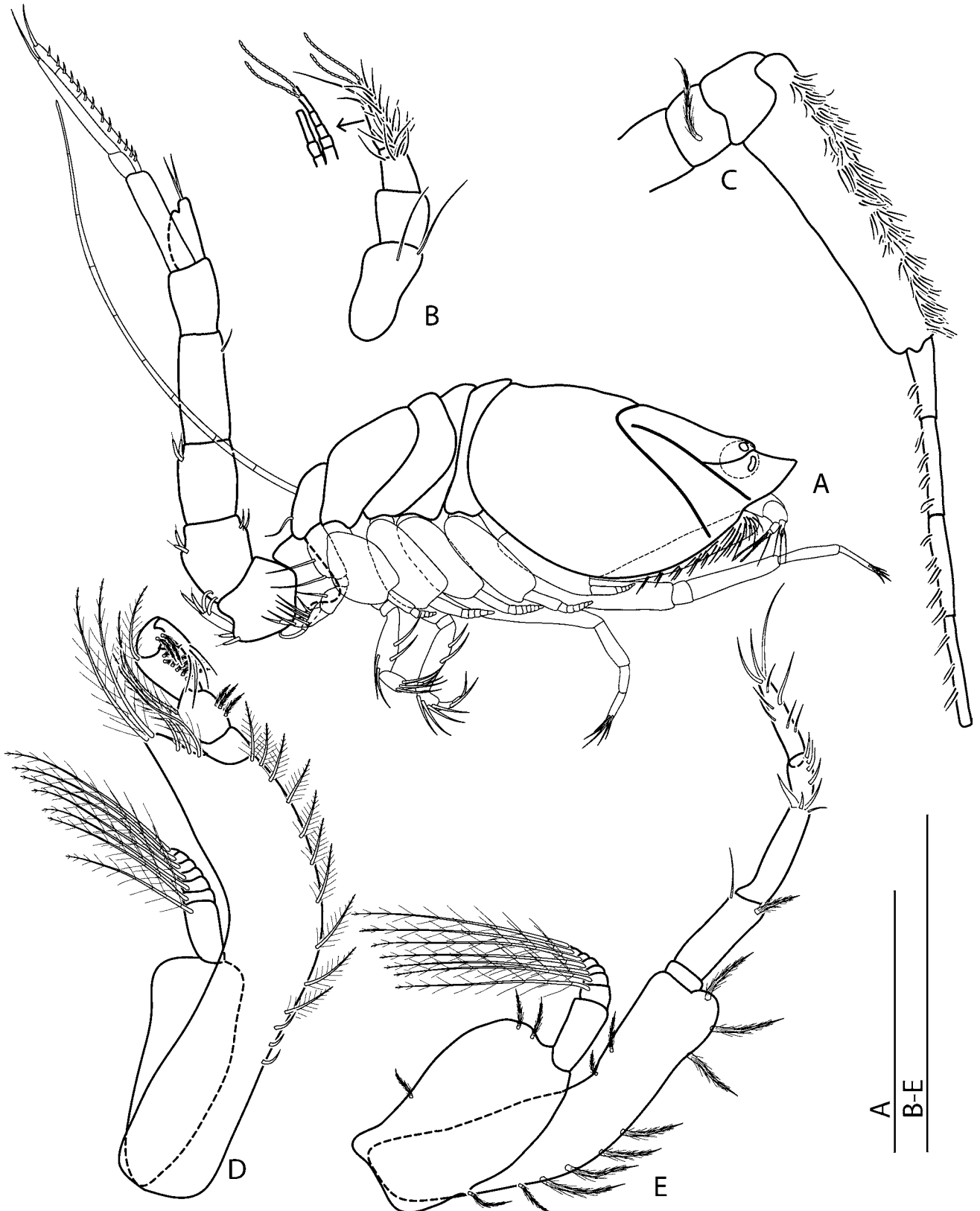


Figure 3. *Anchistylis halei* n. sp. male. Paratype adult male, 3.5 mm, AM P85795: (A), lateral view; (B), antennule; (C), antenna; (D), maxilliped 3; (E), pereopod 2. Scale bars A = 1.0 mm, B–E = 0.5 mm.

Etymology. The species is named *halei* in honor of the extensive work by Herbert Hale on the Australian cumacean fauna.

Remarks. The new species has a unique carapace within the Australian *Anchistylis*. The other three Australian species

of *Anchistylis* have a single lateral ridge curving towards the antennal notch and a depression at the antennal border bounded by a small ridge. In comparison, the new species has two parallel lateral ridges curving toward the antennal border and meeting the anterior margin of the carapace, and no small ridge or depression at the antennal border. The new species

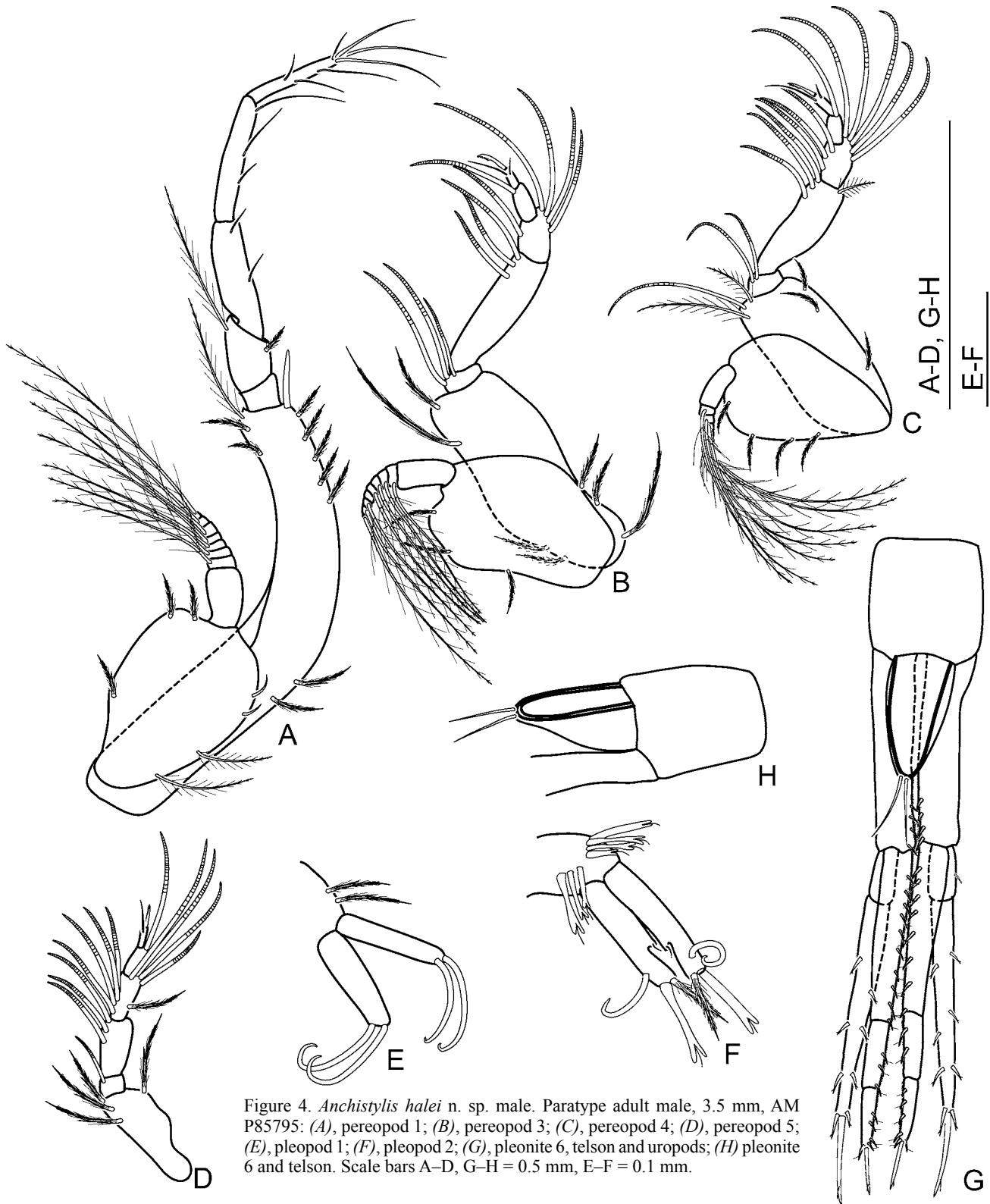


Figure 4. *Anchistylis halei* n. sp. male. Paratype adult male, 3.5 mm, AM P85795: (A), pereopod 1; (B), pereopod 3; (C), pereopod 4; (D), pereopod 5; (E), pleopod 1; (F), pleopod 2; (G), pleonite 6, telson and uropods; (H) pleonite 6 and telson. Scale bars A–D, G–H = 0.5 mm, E–F = 0.1 mm.

also agrees with the observation of Roccatagliata (1997) that Australian *Anchistylis* have two strong hook-like setae on pleopod 1, while the South American *Anchistylis* have one hook-like seta on pleopod 1. The new species is also unique within the genus in that the pleopods are reduced to being entirely without rami. There is an excavation on the side of pleopod 2 that indicates the site of the articulation between the peduncle and ramus, but there is no articulation present.

The paratype ovigerous female that was dissected had a variation in morphology between the right and left first pereopod. The left pereopod 1 is similar in proportions,

length and setation to both the holotype and the paratype adult male, strongly suggesting that this is the normal morphology. The right pereopod 1 has the basis the same length with similar setation to the left pereopod 1, but the remaining articles in the appendage are shortened and have reduced setation relative to the left pereopod 1, suggesting that this morphology is aberrant. Since the difference between the two pereopods is distal of the basis, it is possible that the appendage was broken off at the basis-ischium articulation and the distal articles represent regeneration.

Austroleptostylis n. gen.

Type species. *Austroleptostylis recalvastra* (Hale, 1945)

Diagnosis. *Female and subadult male.* Carapace without spines, anterior margin strongly serrate. Telson with 1 pair lateral setae, 1 pair stout terminal setae. *Adult male.* Carapace boxy in shape. Pleon with several stout setae on pleonite 2. Antennule greatly expanded, with large brush of setae. Antennae short, not extending past posterior border of pleonite 5. Single pleopod with extremely stout peduncle, tiny rami with few long plumose setae.

Etymology. The new genus name is formed from the combination of *Austro* from the Latin *austral* for southern,

and *Leptostylis*, referring to the fact that the genus is only known from the southern hemisphere.

Remarks. With adult males in hand, it is clear that the species Hale described as *Leptostylis recalvastra* has only one pair of pleopods in the adult male. As Hale did not have any adult males in the material he examined, it is not surprising that he placed the species in *Leptostylis*. The only species of *Leptostylis* known from Australian waters, *L. vercoi*, is readily distinguishable from *Austroleptostylis* by the male bearing two pairs of pleopods and by the presence of spines on the carapace, which are absent in *A. recalvastra*.

Australian species. *Austroleptostylis recalvastra* (Hale, 1945).

Key to the Australian species of *Austroleptostylis* and *Leptostylis*

- 1 Carapace covered in small spines *Leptostylis vercoi*
 — Carapace smooth, anterior margin toothed *Austroleptostylis recalvastra* n. gen.

Austroleptostylis recalvastra (Hale, 1945)

Figs 5–9

Type material. South Australian Museum, C2762–2763, ovigerous female and subadult male, 4–5 miles off Eden, New South Wales, 60–70 m.

Other material examined. Ovigerous female, dissected, NMV J46861; ovigerous female, NMV J46862; adult male, NMV J46863; adult male, dissected, NMV J46864; 8 ovigerous females, 25 subadult females, 27 adult males, 11 subadult males, NMV J45976; 39°44'48"S 148°40'36"E, 124 m, R. S. Wilson, 14 Nov. 1981.

Diagnosis. *Female and subadult male.* Carapace without spines or carinae, toothed on anterior margin; eye lobe without lenses. Telson, shorter than pleonite 6, less than half length of uropod peduncle, terminal setae stout and long. *Adult male.* Carapace boxy, covered in small pits, folded ventrally, anterior margin and anterior margin of ventral fold crenulate. Telson shorter than pleonite 6, less than half length of uropod peduncle, terminal setae stout and long.

Description

Ovigerous female. Ovigerous female, 4.9 mm, NMV J46861; ovigerous female, 4.2 mm, NMV J46862. Carapace toothed on anterior margin, antennal notch absent; pseudorostral lobes $0.4 \times$ carapace length; eye lobe $0.04 \times$ carapace length, without lenses; carapace $2.4 \times$ length of pereonites together (Figs 5A–B). —Antennule peduncle article 1 longest, with 1 simple and 1 plumose setae, fine hair-like setae on distal margin; article 2 $0.7 \times$ article 1 length, with 2 simple and 1 pedunculate setae; article 3 $1.3 \times$ article 2 length, with 5 simple and 1 plumose setae; main flagellum of 2 articles, with 3 simple setae and 2 aesthetascs; accessory flagellum of 2 articles, $0.8 \times$ length of main flagellum article 1, with 3 simple setae (Fig.

5C). —Mandible navicular, with 11–12 microserrate setae medially, lacinia mobilis with 2 cusps (Fig. 5D). —Maxillule with 2 endites; outer endite with 2 rows of stout simple setae; inner endite with 3 simple and 1 tridentate setae; palp with 2 microserrate setae (Fig. 5E). —Maxilla with 3 endites; broad endite distal margin with plumose seta, row of simple setae and 2 plumose setae, medial margin with row of pedunculate setae, with 2 plumose setae; medial narrow endite with 4 microserrate setae terminally; distal narrow endite with 5 microserrate setae terminally; both narrow endites extending past distal margin of broad endite (Figs 5F–G). —Maxilliped 1 basis produced as medial lobe with 1 simple, 6 pappose, 2 hook and 1 very stout setae; ischium absent; merus with plumose seta; carpus $2.3 \times$ merus length, with 5 beak, many simple and 1 pappose setae medially, 2 plumose setae laterally; propodus $0.6 \times$ carpus length, with 3 plumose setae distally, medial margin with fine hair-like setae; dactylus $0.7 \times$ propodus length, with 1 simple and 1 dentate setae (Fig. 5H). —Maxilliped 2 basis $0.8 \times$ length of all other articles together, with 4 plumose setae distally; ischium $0.06 \times$ basis length, unarmed; merus $5.3 \times$ ischium length, with plumose seta; carpus $1.3 \times$ merus length, with 5 plumose setae; propodus $0.8 \times$ carpus length, with 4 plumose setae medially, 2 plumose setae laterally; dactylus $0.5 \times$ propodus length, with 3 simple setae terminally (Fig. 5I). —Maxilliped 3 basis $1.5 \times$ length of all other articles together, with 7 pappose setae medially, 2 plumose setae laterally, distal corner not produced; ischium $0.08 \times$ basis length, with pappose seta; merus $1.5 \times$ ischium length, with 1 pappose and 1 plumose setae; carpus $1.7 \times$ merus length, with 3 pappose setae; propodus $1.0 \times$ carpus length, with 4 simple and 2 plumose setae; dactylus $0.6 \times$ propodus length, with 4 simple setae terminally; exopod $0.7 \times$ basis length, basal article unarmed, flagellum with plumoannulate setae (Fig. 6A). —Pereopod 1 basis $0.5 \times$ length of all other articles together, with 22 simple and 7 plumose setae; ischium $0.09 \times$ basis length, unarmed; merus $1.7 \times$ ischium length, with 2 simple setae; carpus $3.9 \times$ merus length, with 5 simple setae; propodus $1.3 \times$ carpus length,

with 10 simple setae; dactylus $0.3 \times$ propodus length, with 8 simple setae and 2 simple setae terminally; exopod basis $0.8 \times$ length, basal article with simple seta, flagellum with plumo-annulate setae (Fig. 6B). —Pereopod 2 basis $0.5 \times$ length of all other articles together, with 8 simple setae; ischium $0.08 \times$ basis length, with simple seta; merus $3.3 \times$ ischium length, with 4 simple setae; carpus $2.5 \times$ merus length, with 15 simple setae; propodus $0.4 \times$ carpus length, with 3 simple setae; dactylus $3.0 \times$ propodus length, with 14 simple setae and simple seta terminally; exopod $1.7 \times$ basis length, basal article with 4 simple setae, flagellum with plumo-annulate setae (Fig. 6C). —Pereopod 3 basis $1.8 \times$ length of all other articles together, with 10 simple setae; ischium $0.06 \times$ basis length, with 2 simple setae; merus $2.7 \times$ ischium length, with simple seta; carpus $1.5 \times$ merus length, with 3 simple and 2 annulate setae; propodus $0.3 \times$ carpus length, with annulate seta; dactylus $1.0 \times$ propodus length, with 2 simple setae and simple seta terminally; exopod rudimentary, $0.1 \times$ basis length, of 2 articles with 2 simple setae (Fig. 6D). —Pereopod 4 basis $1.3 \times$ length of all other articles together, with 13 simple setae; ischium $0.08 \times$ basis length, unarmed; merus $2.7 \times$ ischium length, with simple seta; carpus $1.5 \times$ merus length, with 3 simple and 2 annulate setae; propodus $0.3 \times$ carpus length, with annulate seta; dactylus $1.3 \times$ propodus length, with 2 simple setae and simple seta terminally; exopod rudimentary, $0.1 \times$ basis length, of 2 articles with 2 simple setae (Fig. 6E). —Pereopod 5 basis $1.1 \times$ length of all other articles together, with 6 simple setae; ischium $0.07 \times$ basis length, with simple seta; merus $3.5 \times$ ischium length, with simple seta; carpus $1.6 \times$ merus length, with 2 simple and 2 annulate setae; propodus $0.3 \times$ carpus length, with annulate seta; dactylus $1.0 \times$ propodus length, with 2 simple setae and simple seta terminally (Fig. 6F). —Telson $0.8 \times$ length of pleonite 6, with 1 pair lateral setae with single subterminal setule, 2 stout simple terminal setae, $0.4 \times$ telson length (Fig. 6G). —Uropod peduncles $2.0 \times$ pleonite 6 length, $2.7 \times$ telson length, with 11–12 setae with single subterminal setule medially. Uropod endopod of 3 articles, $0.7 \times$ peduncle length; article 1 with 2 setae with single subterminal setule medially; article 2 $0.8 \times$ article 1 length, with 1 simple seta laterally, 1 seta with single subterminal setule medially; article 3 $0.8 \times$ article 2 length, with 3–4 simple and 0–1 pedunculate setae and 2 simple with single subterminal setule terminally. Uropod exopod of 2 articles, $0.8 \times$ length of endopod; article 1 $0.3 \times$ article 2 length, unarmed; article 2 with 3 simple and 1 simple with single subterminal setule setae, and simple terminal seta (Fig. 6G).

Adult male. Adult male, 4.5 mm, NMV J46863; 4.6 mm, NMV J46864. Carapace boxy, covered in small pits, anterior margin strongly crenulate, carapace folded ventrally, anterior margin of ventral fold crenulate; pseudorostral lobes $0.4 \times$ carapace length; eye lobe $0.05 \times$ carapace length, without lenses; carapace 3.7 – $3.9 \times$ length of pereonites together. Pleonite 2 with several stout setae ventrally (Figs 7A–D). —Antennule peduncle article 1 longest, with simple seta; article 2 $0.4 \times$ article 1 length, unarmed; article 3 wider than long, $1.7 \times$ article 2 length, with multitude of setae terminally; main flagellum of 4 articles, with 3 simple and 2 aesthetasc setae terminally; accessory flagellum of 3 articles, article broadened distally,

extending past distal border of main flagellum article 3, article 2 with 5 simple setae distally, article 3 with simple seta terminally (Figs 7E–F). —Antenna extending no farther than posterior border of pereonite 5; peduncle of 5 articles; article 5 with few ranks of setae distally, incompletely circling article; flagellum with 22 articles, each with several simple setae (Fig. 7G). —Mandible navicular, with 8–9 microserrate setae medially, lacinia mobilis with 3 cusps (Fig. 8A). —Maxillule with 2 endites; outer endite with two rows of stout simple setae; inner endite with 2 simple, 2 microserrate and 1 tricuspid setae; palp with 2 microserrate setae (Fig. 8B). —Maxilla with 3 endites; broad endite distal margin with row of simple setae, 1 pappose seta, medial margin with row of pedunculate setae, 2 pappose setae; medial narrow endite with 4 microserrate setae terminally; lateral narrow endite with 4 microserrate setae terminally; both narrow endites extending past distal margin of broad endite (Fig. 8C). —Maxilliped 1 basis produced as lobe medially, with 5 pappose, 2 hook and 1 very stout pappose setae; ischium absent; merus with plumose seta laterally; carpus $2.1 \times$ merus length, with 5 hook setae, field of simple and 1 pappose setae medially, plumose seta laterally; propodus $0.6 \times$ carpus length, with 3 plumose and 1 dentate setae; dactylus $0.3 \times$ propodus length, with 2 simple setae terminally (Fig. 8D). —Maxilliped 2 basis $0.9 \times$ length of all other articles together, with 2 simple and 2 plumose setae distally; ischium $0.06 \times$ basis length, unarmed; merus $4.0 \times$ ischium length, with 2 plumose setae medially, plumose seta laterally; carpus $1.7 \times$ merus length, with 5 plumose setae medially, 2 plumose setae laterally; propodus $0.8 \times$ carpus length, with 4 simple and 1 plumose setae medially, 1 simple and 1 plumose setae laterally; dactylus $0.4 \times$ propodus length, with 3 simple setae terminally (Fig. 8E). —Maxilliped 3 basis $1.3 \times$ length of all other articles together, with pappose setae medially, medial margin produced as teeth distally, distal corner with 3 plumose setae; ischium $0.07 \times$ basis length, with pappose seta; merus $1.5 \times$ ischium length, with pappose seta medially, plumose seta laterally; carpus $2.3 \times$ merus length, with 2 pappose setae medially, simple seta laterally; propodus $0.9 \times$ carpus length, with 5 plumose setae medially, simple seta laterally; dactylus $0.8 \times$ propodus length, with simple setae terminally; exopod $1.0 \times$ basis length, basal article with pappose seta, flagellum with plumo-annulate setae (Fig. 8F). —Pereopod 1 broken. —Pereopod 2 basis $0.5 \times$ length of all other articles together, with 3 simple and 2 plumose setae; ischium $0.06 \times$ basis length, unarmed; merus $3.7 \times$ ischium length, with 4 simple setae; carpus $3.5 \times$ merus length, with 13 simple setae; propodus $0.3 \times$ carpus length, with 2 simple setae; dactylus $2.1 \times$ propodus length, with 14 simple setae, simple seta terminally; exopod $1.4 \times$ basis length, basal article with 2 pappose setae, flagellum with plumo-annulate setae (Fig. 8G). —Pereopod 3 basis $1.5 \times$ length of all other articles together, broad, with 11 simple setae, margin serrate; ischium $0.7 \times$ basis length, with 3 simple setae; merus $2.2 \times$ ischium length, with 3 simple setae; carpus $1.7 \times$ merus length, with 3 simple and 2 annulate setae; propodus $0.2 \times$ carpus length, with annulate seta; dactylus $1.3 \times$ propodus length, with 2 simple setae and simple seta terminally; exopod $1.03 \times$ basis length, basal article with plumose setae, flagellum with plumo-annulate setae (Fig. 9A). —Pereopod 4 basis $1.2 \times$ length of all other articles

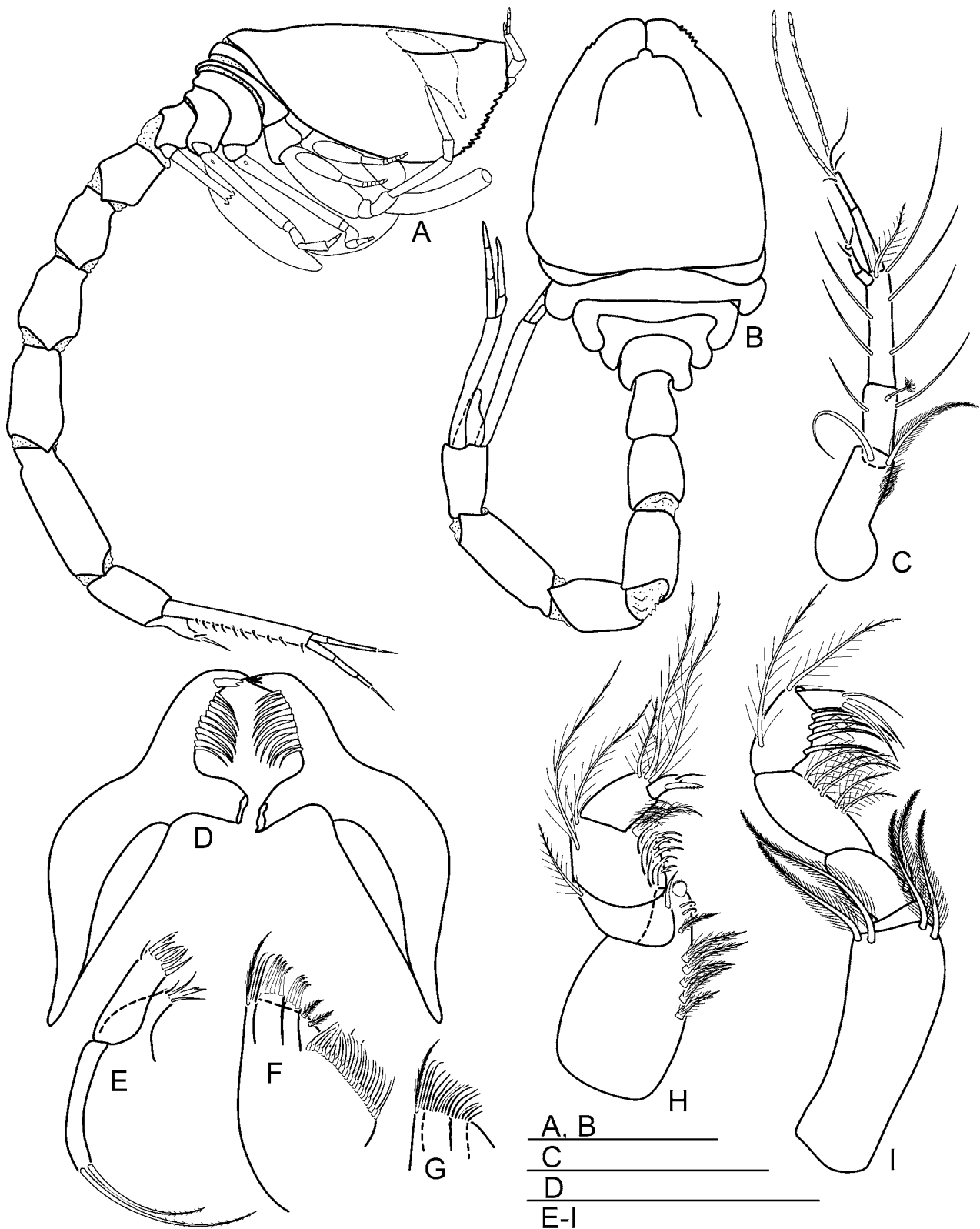


Figure 5. *Austroleptostylis recalvastra* (Hale, 1945) n. gen., n. comb., female, 4.9 mm, NMV J46861: (A), lateral view; (C), antennule; (D), mandibles; (E), maxillule; (F), maxilla; (G), maxilla narrow endites; (H), maxilliped 1; (I), maxilliped 2. Female, 4.5 mm, NMV J46862: (B), dorsal view. Scale bars A,B = 1.0 mm, C–I = 0.5 mm.

together, with 10 simple setae, margin serrate; ischium $0.1 \times$ basis length, with 2 simple setae; merus $2.0 \times$ ischium length, with 3 simple setae; carpus $1.6 \times$ merus length, with 4 simple and 2 annulate setae; propodus $0.4 \times$ carpus

length, with annulate seta; dactylus $0.8 \times$ propodus length, with 2 simple setae and simple seta terminally; exopod $1.2 \times$ basis length, basal article unarmed, flagellum with plumo-annulate setae (Fig. 9B). —Pereopod 5 basis $1.0 \times$ length of

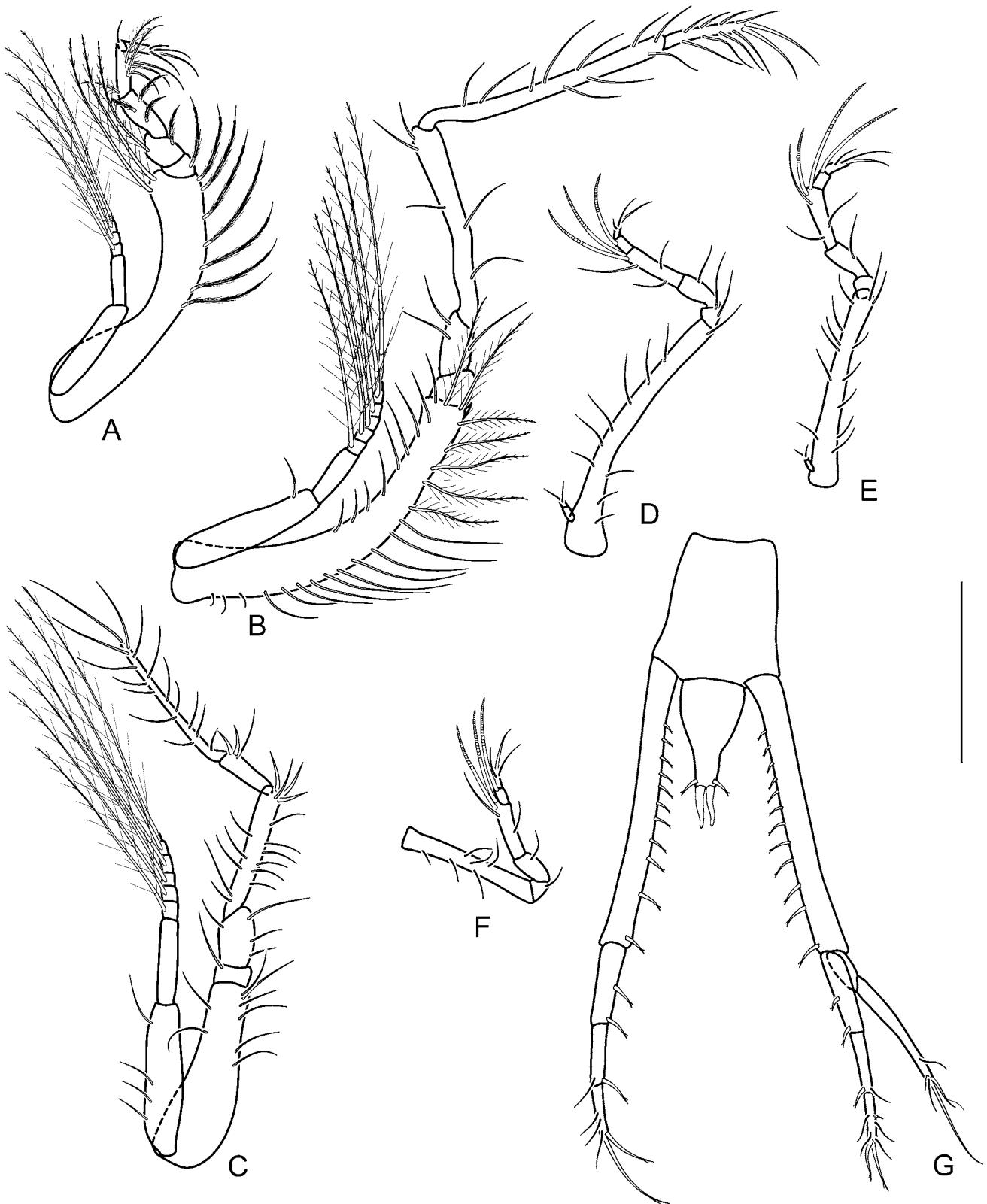


Figure 6. *Austroleptostylis recalvastra* (Hale, 1945) n. gen., n. comb., female, 4.9 mm, NMV J46861: (A), maxilliped 3; (B), pereopod 1; (C), pereopod 2; (D), pereopod 3; (E), pereopod 4; (F), pereopod 5; (G), pleonite 6, telson and uropods. Scale bar = 0.5 mm.

all other articles together, with 6 simple setae; ischium $0.1 \times$ basis length, unarmed; merus $2.0 \times$ ischium length, with simple seta; carpus $2.0 \times$ merus length, with 4 simple and 2 annulate setae; propodus $0.3 \times$ carpus length, with annulate seta; dactylus $1.2 \times$ propodus length, with 2 simple setae

and simple seta terminally (Fig. 9C). —Pleopod 1 peduncle wide, rami tiny, endopod uniarticulate, with plumose seta, exopod bi-articulate, with 3 plumose setae (Fig. 9D). —Telson $1.2 \times$ length of pleonite 6, with 1 pair simple lateral setae with single subterminal setule, two stout simple

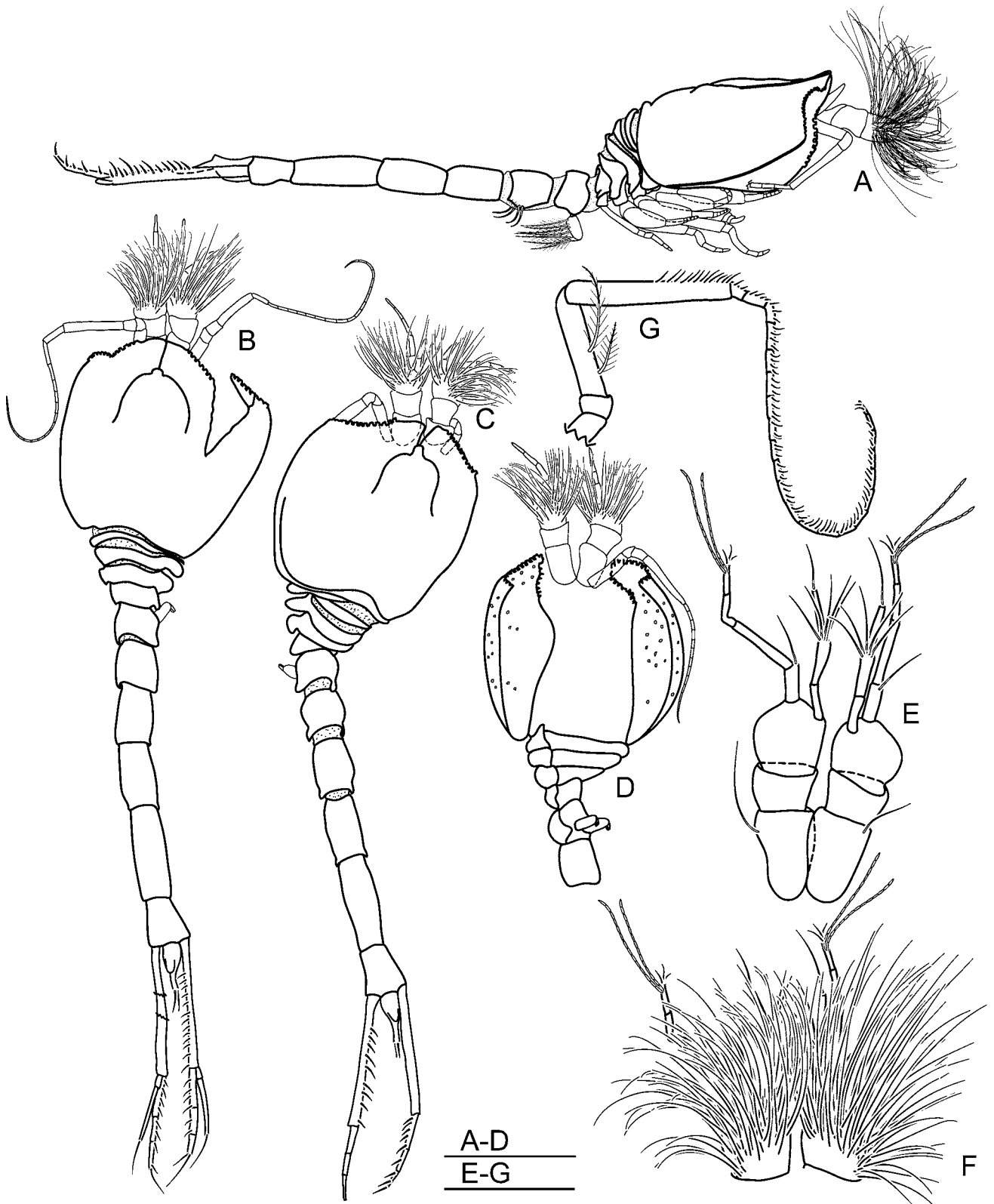


Figure 7. *Austroleptostylis recalvastra* (Hale, 1945) n. gen., n. comb., male, 4.5 mm, NMV J46863: (A), lateral view; (C), dorsal view; (D), ventral view. Male, 4.6 mm, NMV J46864: (B), dorsal view; (E), antennules without setae; (F), antennules with setae; (G), antenna. Scale bars A–D = 1.0 mm, E–G = 0.5 mm.

terminal setae, $0.4 \times$ telson length (Fig. 9E). —Uropod peduncles $3.0 \times$ pleonite 6 length, $2.6 \times$ telson length, with 15 or 19 simple setae with single subterminal setule medially. Uropod endopod of 3 articles, $0.7 \times$ peduncle length; article 1 longest, with 3 or 5 simple setae with single

subterminal setule medially, 1 simple and 1 pedunculate setae laterally; article 2 $0.6 \times$ article 1 length, with 2 simple setae with single subterminal setule medially, 2–3 simple setae laterally; article 3 $1.2 \times$ article 2 length, with simple seta with single subterminal setule medially, 0–2 simple

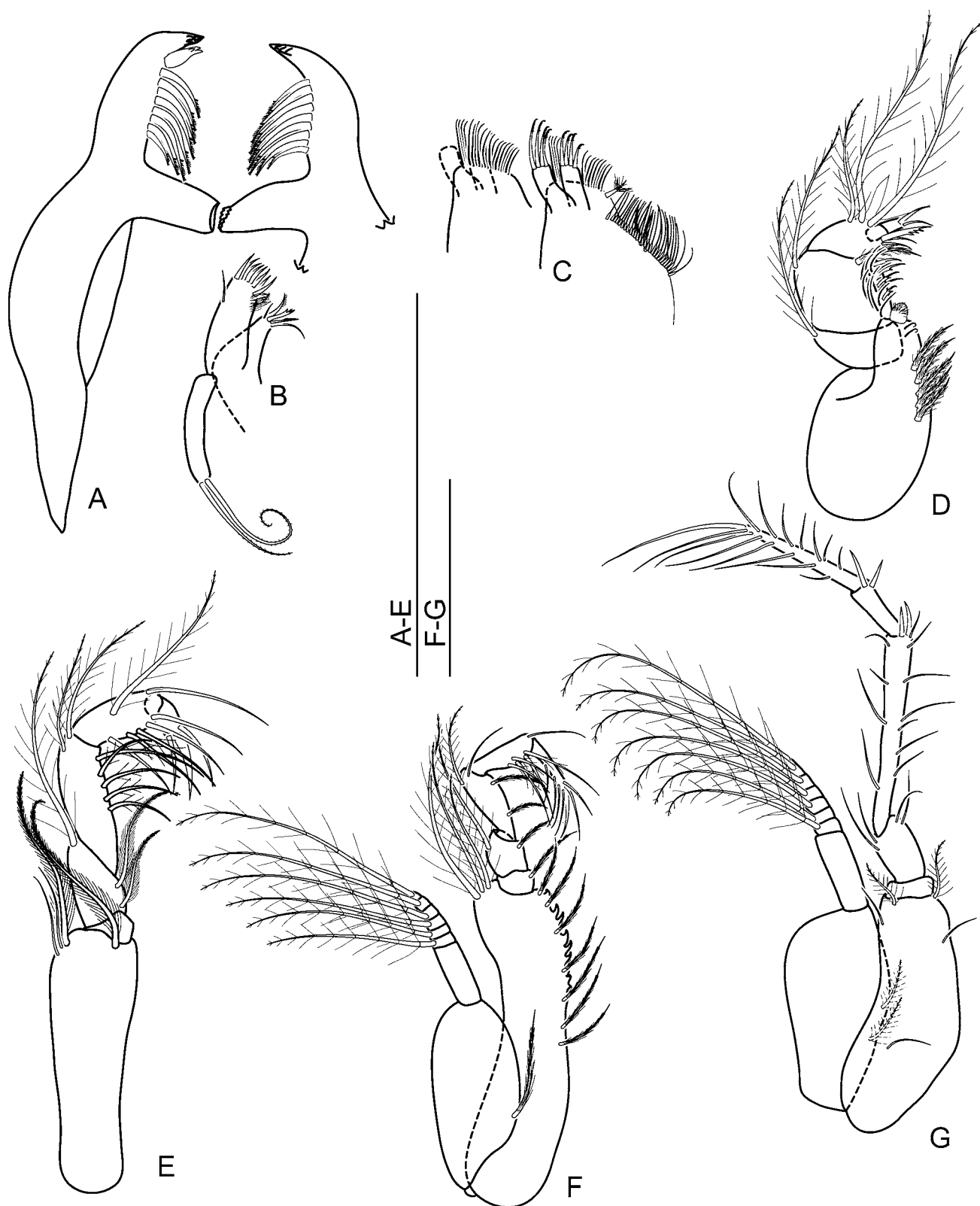


Figure 8. *Austroleptostylis recalvastra* (Hale, 1945) n. gen., n. comb., male, 4.6 mm, NMV J46864: (A), mandibles; (B), maxillule; (C), maxilla; (D), maxilliped 1; (E), maxilliped 2; (F), maxilliped 3; (G), pereopod 2. Scale bars = 0.5 mm.

setae laterally, terminal seta simple with single subterminal setule. Uropod exopod $0.8 \times$ length of endopod; article 1 unarmed, $0.2 \times$ article 2 length; article 2 with 2 simple and 1 simple with single subterminal setule setae, terminal seta simple with single subterminal setule (Fig. 9E).

Remarks. The species placed in the new genus, *Austroleptostylis recalvastra* (Hale, 1945), is easily distinguishable from the only species of *Leptostylis* known from Australia, *Leptostylis vercoi*, because *L. vercoi* has the carapace covered in spines, and in *A. recalvastra* the carapace has

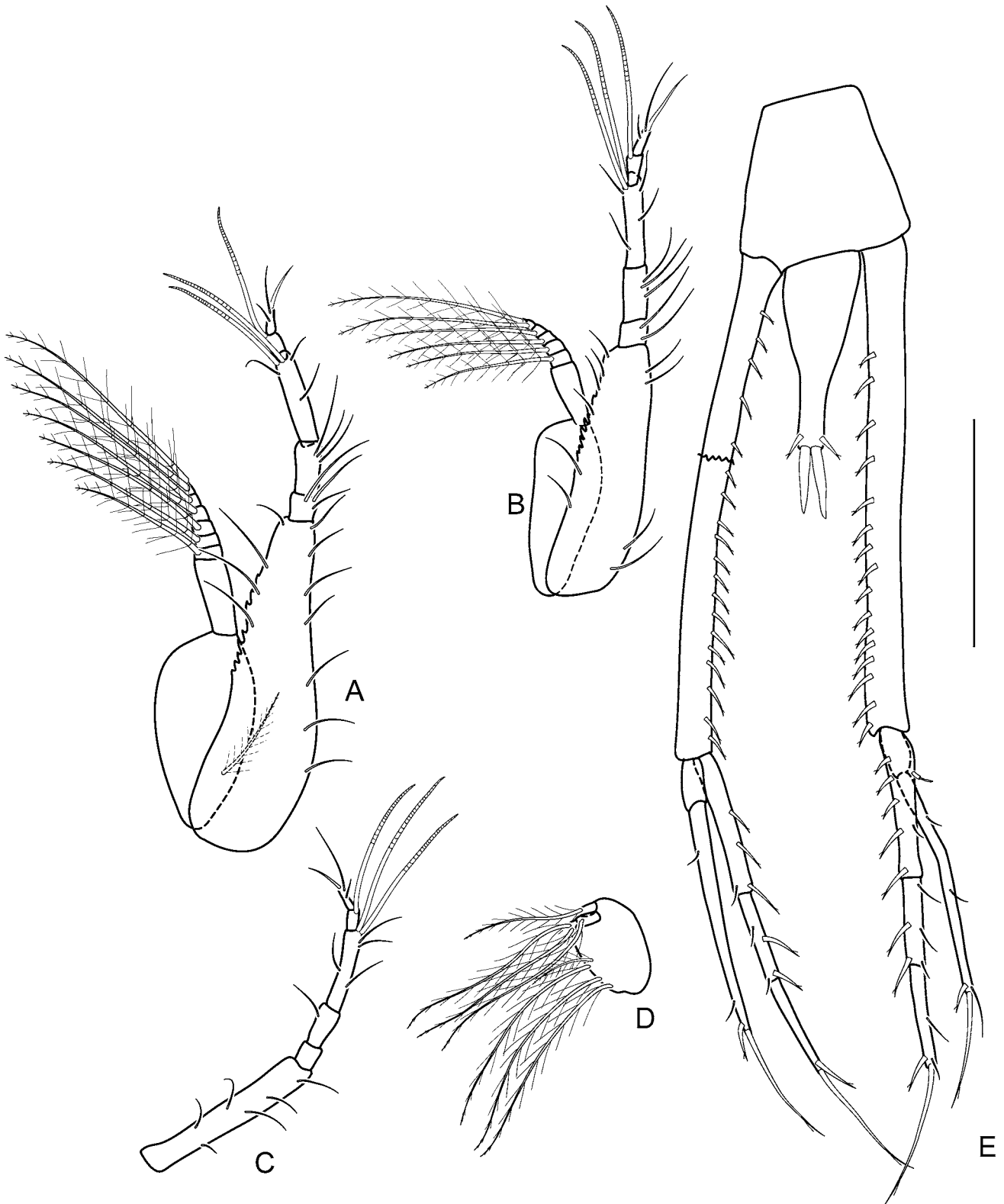


Figure 9. *Austroleptostylis recalvastra* (Hale, 1945) n. gen., n. comb., male, 4.6 mm, NMV J46864: (A), pereopod 3; (B), pereopod 4; (C), pereopod 5; (D), pleopod; (E), pleonite 6, telson and uropods. Scale bar = 0.5 mm.

no spines. Hale did not have any adult male material when originally describing the species, and the stout setae present on pleonite 2 in the adult male could be mistaken in the subadult male for a developing pleopod. In addition, the one pair of pleopods present in this species is unusual in that the

peduncle is quite large and the rami are minute in the adult male, thus the rami are probably nearly impossible to see in the subadult male, making the males appear more juvenile than they are, based on the apparent pleopod development.

Diastylis Say, 1818

Type species. *Diastylis rathkii* (Krøyer, 1841) by designation.

Diagnosis. *Female and subadult male.* Carapace with pseudorostrum not greatly elongate. Pereopods 3–4 with or without rudimentary exopods. Telson twice length of pleonite 6, with post-anal portion, with at least 3 pairs of lateral setae. *Adult male.* Antennule not greatly expanded, may have brush of setae on peduncle article 3. Antennae extending to end of pleon. Pereopod and exopod bases may be weakly expanded. With 2 pairs of pleopods.

Remarks. There is currently only one species described from Australian waters that fits within the genus *Diastylis*.

As noted in the introduction, the Australian diastylid fauna is unusual in that it is not dominated by *Diastylis* species. Within the Australian fauna, the genus that is most likely to be confused with *Diastylis* is *Makrokyllindrus*. The telson in the only species of *Makrokyllindrus* currently known from Australian waters is distinctly longer than the uropod peduncles, while the only species of *Diastylis* from this region has the telson shorter than the uropod peduncles. The difference in telson length relative to uropod peduncle length is not characteristic for the genera, but it serves to easily distinguish between the two Australian species.

Australian species. *Diastylis kapalae* n. sp.

Key to the Australian species of *Diastylis* and *Makrokyllindrus*

- 1 Telson longer than uropod peduncles, without lateral setae; carapace with two pairs large spines anteriorly, small spines arranged in multiple short rows *Makrokyllindrus eirmoacanthus* n. sp.
- Telson shorter than uropod peduncles, at least 4 pairs of lateral setae; carapace with many spines, all subequal in size, with two distinct strongly serrate lateral ridges *Diastylis kapalae* n. sp.

Diastylis kapalae n. sp.

Figs 10–11

Type material. Holotype subadult female, AM P85772; paratype subadult male, dissected, AM P85773; 33°40'–33°43'S 152°04'–152°06'E, 1108–1115 m, FRV “Kapala”, 19 Dec. 1985. Paratype subadult male, AM P85774, 33°37'–33°39'S 152°02'–152°04'E, 896–923 m, FRV “Kapala”, 10 Dec. 1980.

Other material examined. None.

Diagnosis. *Female and subadult male.* Carapace covered with small spines, two parallel lateral ridges sweeping anteriorly, lined with spines. Pereonites and pleonites with small spines. Telson pre-anal portion lateral margin strongly toothed, lateral setae closely spaced posteriorly, same length as terminal setae. *Adult male.* Unknown.

Description

Subadult female. Holotype subadult female, AM P85772, 11.5 mm. —Carapace covered with small spines, with two parallel ridges sweeping from mid dorsal anteriorly, lined with spines, branchial regions slightly inflated, with depression dorsally between inflations; pseudorostral lobes 0.5 × carapace length; eye lobe 0.02 × carapace length, without lenses; carapace 1.9 × length of pereonites together. Pereonites and pleonites with spines (Fig. 10A).

Subadult male. Paratype subadult male, dissected, AM P85773, 10.5 mm; paratype subadult male, AM P85774, 10.6 mm. —Carapace ornamentation as in holotype female; pseudorostral lobes 0.5 × carapace length; eye lobe 0.04 carapace length, without lenses; carapace 1.8 × length of pereonites together. Pereonites and pleonites covered with spines (Figs 10B–C). —Antennule peduncle article 1 longest, with 1 simple and 1 pappose setae, margin with fine hair-like setae, corner produced as tooth; article

2 0.4 × article 1 length, with 4 plumose setae, produced as small tooth distally; article 3 1.9 × article 2 length, with 1 simple and 1 plumose setae; main flagellum of 5 articles, terminal article 0.7 × length of subterminal article, subterminal article with 2 aesthetascs, terminal article with 2 simple setae; accessory flagellum of 4 articles, 0.5 × main flagellum length, with 4 simple setae (Fig. 10D). —Mandible navicular, with 12–13 microserrate setae medially, lacinia mobilis with 3 cusps (Fig. 10E). —Maxillule with 2 endites; outer endite with double row of stout setae; inner endite with 2 simple, 2 microserrate and 1 tricuspid setae; palp with 2 stout setae (Fig. 10F). —Maxilla with 3 endites; broad endite distal margin with row of simple setae, pappose seta, medial margin with row of pedunculate setae and 2 pappose setae; medial narrow endite with 3 simple setae terminally; distal narrow endite with 4 simple setae terminally; both narrow endites extending past distal margin of broad endite (Fig. 10G). —Maxilliped 1 basis produced as lobe with 7 simple, 2 hook, 1 plumose and 1 very stout microserrate setae; ischium absent; merus unarmed; carpus 1.7 × merus length, with 4 beak and field of simple setae medially, with 2 plumose setae laterally; propodus 0.6 × carpus length, with 2 plumose and 2 dentate setae; dactylus 0.8 × propodus length, with 3 simple setae terminally (Fig. 10H). —Maxilliped 2 basis 1.3 × length of all other articles together, with 1 simple and 4 plumose setae distally; ischium 0.04 × basis length, unarmed; merus 4.0 × ischium length, with 2 plumose setae; carpus 2.0 × merus length, with 4 plumose and 3 pappose setae medially, 2 plumose setae laterally; propodus 0.7 × carpus length, with 6 plumose setae medially, plumose seta laterally; dactylus 0.5 × propodus length, with 7 simple setae terminally (Fig. 10I). —Maxilliped 3 basis 2.2 × length of all other articles together, with 13 pappose setae medially, 4 plumose setae at distal corner, medial margin produced as strong teeth, increasing in size distally; ischium 0.06 × basis length, with pappose seta; merus 1.2 × ischium length, with pappose seta medially, plumose seta laterally, medial margin and

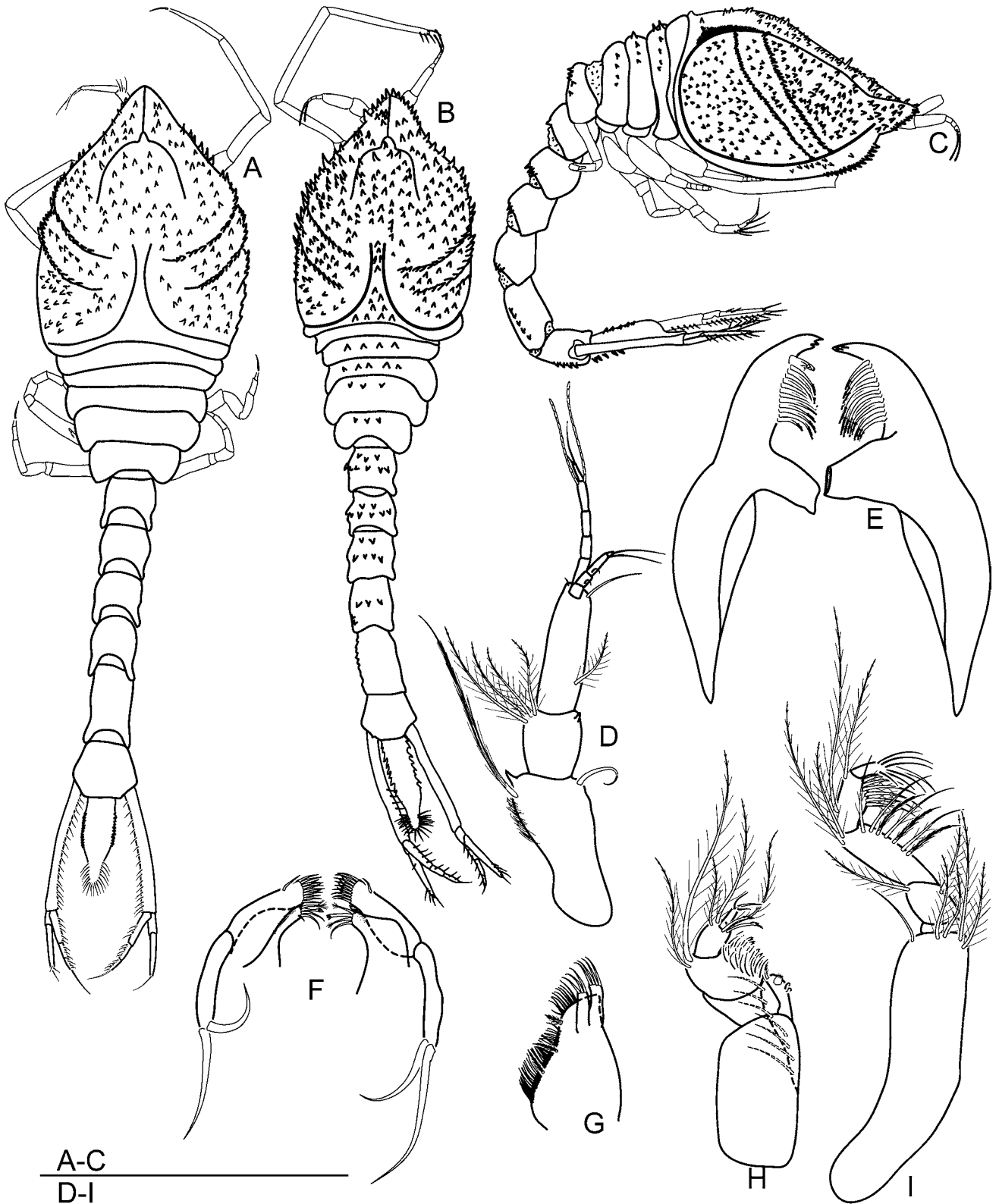


Figure 10. *Diastylis kapalae* n. sp. female, male. Holotype female, 11.5 mm, AM P85772: (A), dorsal view. Paratype subadult female, 10.5 mm, AM P85773: (B), dorsal view; (D), antennule; (E), mandibles; (F), maxillules; (G), maxilla; (H), maxilliped 1; (I), maxilliped 2. Paratype subadult male, 10.6 mm, AM P85774: (C), side view. Scale bars A–C = 5.0 mm, D–I = 0.5 mm.

lateral margin each produced as single large tooth; carpus $1.0 \times$ merus length, with 2 pappose setae medially, 2 plumose setae laterally, medial margin produced as 2 large teeth; propodus $1.8 \times$ carpus length, with 4 plumose setae medially, plumose seta laterally; dactylus $0.7 \times$ propodus

length, with 5 simple setae terminally; exopod $0.7 \times$ basis length, basal article unarmed, flagellum with plumo-annulate setae (Fig. 11A). —Pereopod 1 basis $0.5 \times$ length of all other articles together, with 28 plumose setae, medial margin produced as strong teeth, largest at distal corner;

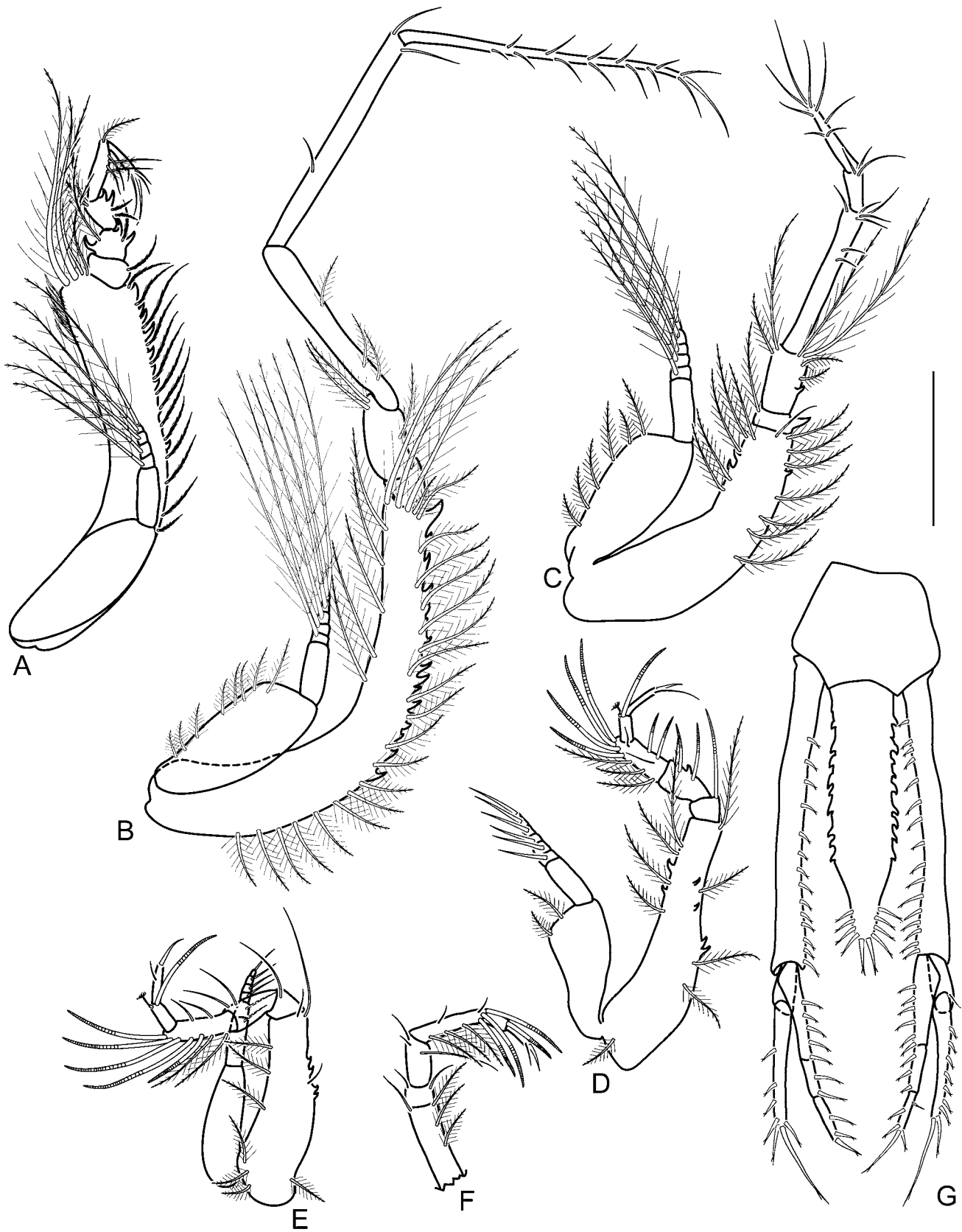


Figure 11. *Diastylis kapalae* n. sp. female. Paratype subadult female, 10.5 mm, AM P85773: (A), maxilliped 3; (B), pereopod 1; (C), pereopod 2; (D), pereopod 3; (E), pereopod 4; (F), pereopod 5; (G), pleonite 6, telson and uropods. Scale bar = 1.0 mm.

ischium $0.1 \times$ basis length, unarmed; merus $1.9 \times$ ischium length, with 3 plumose setae; carpus $2.7 \times$ merus length, with 3 plumose setae; propodus $1.2 \times$ carpus length, with 3 simple setae; dactylus $1.2 \times$ propodus length, with 13

simple setae and simple seta terminally; exopod $0.7 \times$ basis length, basal article with 8 plumose setae, flagellum with plumo-annulate setae (Fig. 11B). —Pereopod 2 basis $0.8 \times$ length of all other articles together, with 1 simple and 12

plumose setae, margins produced as few teeth; ischium $0.07 \times$ basis length, with plumose seta, margin produced as large tooth; merus $3.3 \times$ ischium length, with 6 plumose setae; carpus $2.5 \times$ merus length, with 7 simple setae; propodus $0.3 \times$ carpus length, with 3 simple setae; dactylus $1.8 \times$ propodus length, with 3 simple setae and 5 simple setae terminally; exopod $1.0 \times$ basis length, basal article with 6 plumose setae, flagellum with plumo-annulate setae (Fig. 11C). —Pereopod 3 basis $1.5 \times$ length of all other articles together, with 9 plumose setae, produced as scattered teeth; ischium $0.08 \times$ basis length, with annulate seta; merus $2.3 \times$ ischium length, with 2 annulate setae, produced as tooth; carpus $1.1 \times$ merus length, with 1 simple, 3 plumose and 6 annulate setae; propodus $0.5 \times$ carpus length, with 1 annulate and 1 pedunculate setae; dactylus $1.6 \times$ propodus length, with 2 simple setae terminally; exopod $0.9 \times$ basis length, basal article with 2 plumose setae, flagellum with short simple setae (Fig. 11D). —Pereopod 4 basis $0.9 \times$ length of all other articles together, with 3 simple and 7 plumose setae, margin produced as few teeth; ischium $0.1 \times$ basis length, with simple seta; merus $2.5 \times$ ischium length, with 2 simple setae; carpus $1.3 \times$ merus length, with 2 simple, 2 plumose and 5 annulate setae; propodus $0.5 \times$ carpus length, with annulate and pedunculate setae; dactylus $1.5 \times$ propodus length, with simple seta and simple seta terminally; exopod $1.2 \times$ basis length, basal article unarmed, flagellum with short simple setae (Fig. 11E). —Pereopod 5 basis with 1 simple and 3 plumose setae; ischium with 2 simple setae; merus $2.5 \times$ ischium length, with 3 simple setae; carpus $1.4 \times$ merus length, with 2 simple, 3 plumose and 2 annulate setae; propodus $0.4 \times$ carpus length, with annulate seta; dactylus $1.2 \times$ propodus length, with 2 simple setae terminally (Fig. 11F). —Telson $2.3 \times$ length of pleonite 6, with 4 pairs of lateral simple setae with single subterminal setule, two terminal setae with single subterminal setule, margin of pre-anal portion strongly toothed (Fig. 11G). —Uropod peduncles $2.5\text{--}2.7 \times$ pleonite 6 length, $1.1\text{--}1.2 \times$ telson length, with 14 or 16 simple setae with single subterminal setule medially. Uropod endopod of 3 articles, $0.6\text{--}0.7 \times$ peduncle length; article 1 longest, with 5 simple setae with single subterminal setule medially; article 2 $0.4\text{--}0.6 \times$ article 1 length, with 2–3 simple setae with single subterminal setule medially; article 3 subequal to article 2, with 2 simple setae with single subterminal setule medially, 0–1 pedunculate and 0–1 simple setae with single subterminal setule laterally, terminal seta simple with single subterminal setule. Uropod exopod $0.9 \times$ length of endopod; article 1 $0.3 \times$ article 2 length, with 0–1 simple seta; article 2 with 5 or 8 simple setae with single subterminal setule laterally, 0–1 simple seta with single subterminal setule medially, terminal seta simple with single subterminal setule (Fig. 11G).

Etymology. The new species is named *kapalae* for the research vessel that collected the specimens, the FRV Kapalae.

Remarks. The telson of this species is unique in the Australian diastylid fauna, in being relatively large, with strong teeth on the margins of the pre-anal portion, with 4 pairs of lateral setae closely clustered together and the terminal setae similar in size to the lateral setae on the post-anal portion of the telson. The carapace ornamentation is also unique within the Australian diastylid fauna. This is a large species, as the only specimens observed were more than 10 mm and subadult.

Diastylopsis Smith, 1880

Type species. *Diastylopsis dawsoni* Smith, 1880

Diagnosis. *Female and subadult male.* Carapace elongate. Pereonites 2 and 3 separated ventrally. Pereonites 3–4 may be fused dorsally, free ventrally. Pereopods 3–4 with or without rudimentary exopods in the female. Telson with post-anal portion, with or without lateral setae, 2 or rarely 3 terminal setae. *Adult male.* Antennae extending to end of pleon. With 2 pairs of pleopods.

Remarks. There are no previous records of the genus from Australian waters. There are two problematic species currently ascribed to *Diastylopsis*, *D. diaphanes* Zimmer, 1913 and *D. bosphorica* Băcescu, 1982. It is clear from the published descriptions and figs. that *D. diaphanes* properly belongs in *Litogynodiastylis* Gerken, 2001, as the Zimmer (1913) figs. clearly show a male without pleopods, and the first pereopod without a brush of long setae on the propodus. Thus, *D. diaphanes* Zimmer, 1913 is formally transferred to *Litogynodiastylis* as the new combination *Litogynodiastylis diaphanes* (Zimmer, 1913). The description and figs. of *D. bosphorica* clearly show a truncate mandible, and there is no reason to suspect that this is an error, thus *D. bosphorica* properly belongs in *Diastylodes*. Therefore, *D. bosphorica* Băcescu, 1982 is formally transferred to *Diastylodes* as the new combination *Diastylodes bosphorica* (Băcescu, 1982).

The placement of the new species *Diastylopsis senta* and *D. trisetosa* in *Diastylopsis* could be disputed, with an alternate placement within *Makrokyllindrus*, based on telson proportions. *Makrokyllindrus* and *Diastylis* seem to constitute a continuous series in the proportions of the pre- and post-anal portions of the telson, as discussed in Day, 1980, with *Diastylis* generally having the pre-anal portion shorter than the post-anal portion, and *Makrokyllindrus* having a tubular telson with the pre-anal portion longer than the post-anal portion. However, there are species ascribed to each genus that merge this boundary, so that the current generic definitions are insufficient to clearly discriminate two discrete groups. This problem will only be resolved with a phylogenetic study of the Diastylidae.

My placement of *Diastylopsis trisetosa* in *Diastylopsis* rather than *Makrokyllindrus* rests in part on the elongate carapace ornamented with concentric semi-vertical ridges, which is shared with the majority of species currently accepted as *Diastylopsis*, and unusual within *Makrokyllindrus*. In *Makrokyllindrus* the carapace is very commonly globular, and distinctly not elongate. My placement of *D. senta* in *Diastylopsis* rather than *Makrokyllindrus* also relies on the elongate carapace. In addition, while pereopods 3–5 of *D. trisetosa* and *D. senta* may not be extremely stout, they are distinctly not slender. The new Australian species that I have placed in *Makrokyllindrus* (*M. eirmoacanthus*) more clearly fits with the other known species of *Makrokyllindrus* in that it has the expected globular carapace.

All species. *Diastylopsis annulata* (Zimmer, 1902); *D. crassior* Calman, 1911; *D. dawsoni* Smith, 1880; *D. elongata* Calman, 1911; *D. goeki* Roccatagliata & Heard, 1992; *D. incompta* n. sp.; *D. senta* n. sp.; *D. tenuis* Zimmer, 1936; *D. thileni* (Zimmer, 1902); *D. trisetosa* n. sp.

Global key to all species of *Diastylopsis*

- 1 Carapace smooth, unornamented except for ridge on pseudo-rostral lobe 2
 — Carapace with multiple ridges, sculpturing or spines 4
- 2 Telson longer than uropod peduncles *D. incompta* n. sp.
 — Telson shorter than uropod peduncles 3
- 3 Uropod endopod shorter than exopod *D. crassior*
 — Uropod endopod longer than exopod *D. elongata*
- 4 Carapace without ridges, anterior half with spines, increasing in length anteriorly *D. senta* n. sp.
 — Carapace with ridges, with or without spines 5
- 5 Telson longer or equal to uropod peduncles 6
 — Telson shorter than uropod peduncles 9
- 6 Carapace with ridges on anterior 1/3 only, posterior 2/3 smooth *D. thileni*
 — Carapace with ridges and rugosities throughout 7
- 7 Telson with 3 terminal setae *D. trisetosa* n. sp.
 — Telson with 2 terminal setae 8
- 8 Telson post-anal portion longer or equal to pre-anal portion, carapace sculpturing weaker *D. goeki*
 — Telson post-anal portion shorter than pre-anal portion, carapace strongly sculptured *D. annulata*
- 9 Telson more than half length of uropod peduncles *D. tenuis*
 — Telson less than half length of uropod peduncles *D. dawsoni*

Diastylopsis incompta n. sp.

Figs 12–13

Type material. Holotype subadult male, dissected, NMV J62370, Conception Bay, 1 mile S of Clapper, Newfoundland, Canada, 47°29'N 52°58'W, 16 May 1978.

Other material examined. None.

Diagnosis. *Female and subadult male.* Carapace with weakly serrate ridge on frontal lobe, anterior half of ventral margin weakly serrate, antennal notch present. Pereonite 5 produced acutely posteriorly. Telson longer than uropod peduncles, with at least 10 pairs lateral setae. *Adult male.* With 2 pairs of pleopods. Otherwise unknown.

Description

Juvenile male. Holotype juvenile male, NMV J62370, 11.7 mm. —Carapace longer than deep, with weakly serrate ridge on frontal lobe, ending posterior of eye lobe, antennal notch present, anterior half of ventral margin serrate to within antennal notch; pseudorostral lobes $0.4 \times$ carapace length; eye lobe $0.04 \times$ carapace length, without lenses; carapace $1.7 \times$ length of pereonites together. Pereonite 5 strongly produced posteriorly (Fig. 12A). —Antennule peduncle article 1 $1.3 \times$ articles 2 and 3 together, with

simple seta, produced as 2 teeth on distal margin; article $2.0.3 \times$ article 1 length, with 4 simple setae; article 3 $1.3 \times$ article 2 length, with 2 simple and 3 pedunculate setae; main flagellum of 4 articles, with 2 aesthetascs and 4 simple setae; accessory flagellum of 2 articles, with 2 simple and 1 pedunculate setae (Fig. 12B). —Maxilla with 3 endites; broad endite distal corner with pappose seta, distal margin lined with simple setae with pappose seta at medial corner, medial margin lined with plumose setae and 2 pappose setae; medial narrow endite with 4 microserrate setae terminally; distal narrow endite with 5 microserrate setae terminally; both narrow endites extending past distal margin of broad endite (Fig. 12C). —Maxilliped 1 basis produced as lobe, with 2 simple, 2 hook, 7 pappose and 1 very stout microserrate setae; ischium absent; merus with 2 simple setae laterally; carpus $1.8 \times$ merus length, with 7 beak, 2 pappose and many simple setae medially, 4 simple and 1 plumose setae laterally; propodus $0.6 \times$ carpus length, with 2 simple and 2 plumose setae; dactylus $0.6 \times$ propodus length, with 2 simple setae terminally (Fig. 12D). —Maxilliped 2 basis $1.3 \times$ length of all other articles together, with 4 simple and 3 plumose setae; ischium $0.03 \times$ basis length, unarmed; merus $4.5 \times$ ischium length, with 2 plumose setae; carpus $2.4 \times$ merus length, with 12 plumose setae medially, plumose seta laterally; propodus $0.5 \times$ carpus length, with 10 plumose setae medially, plumose seta laterally; dactylus $0.4 \times$ propodus length, with 4 simple setae terminally (Fig.

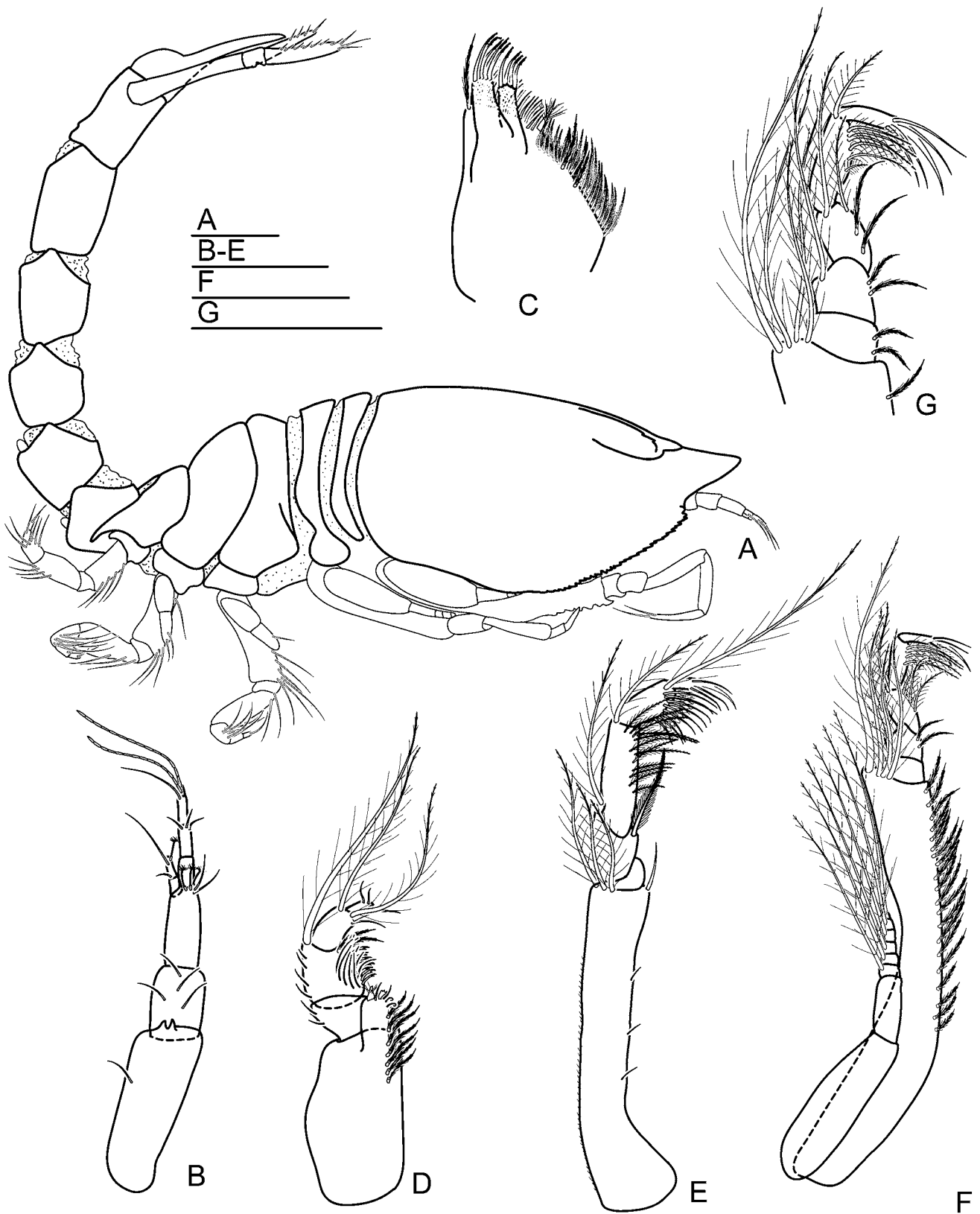


Figure 12. *Diastylopsis incompta* n. sp. male. Holotype subadult male, 11.7 mm, NMV J62370: (A), side view; (B), antennule; (C), maxilla; (D), maxilliped 1; (E), maxilliped 2; (F), maxilliped 3; (G), maxilliped 3. Scale bars A, F = 1.0 mm, B–E, G = 0.5 mm.

12E). —Maxilliped 3 basis $2.3 \times$ length of all other articles together, with 20 pappose setae medially, 4 plumose setae at distal corner; ischium $0.06 \times$ basis length, with 2 pappose setae; merus $1.2 \times$ ischium length, with 2 pappose setae medially, plumose seta laterally; carpus $1.0 \times$ merus length,

with 1 plumose and 2 pappose setae medially, plumose seta laterally; propodus $1.9 \times$ carpus length, with 6 plumose setae medially, plumose seta laterally; dactylus $0.6 \times$ propodus length, with 5 simple setae terminally; exopod $0.7 \times$ basis length, basal article unarmed, flagellum with

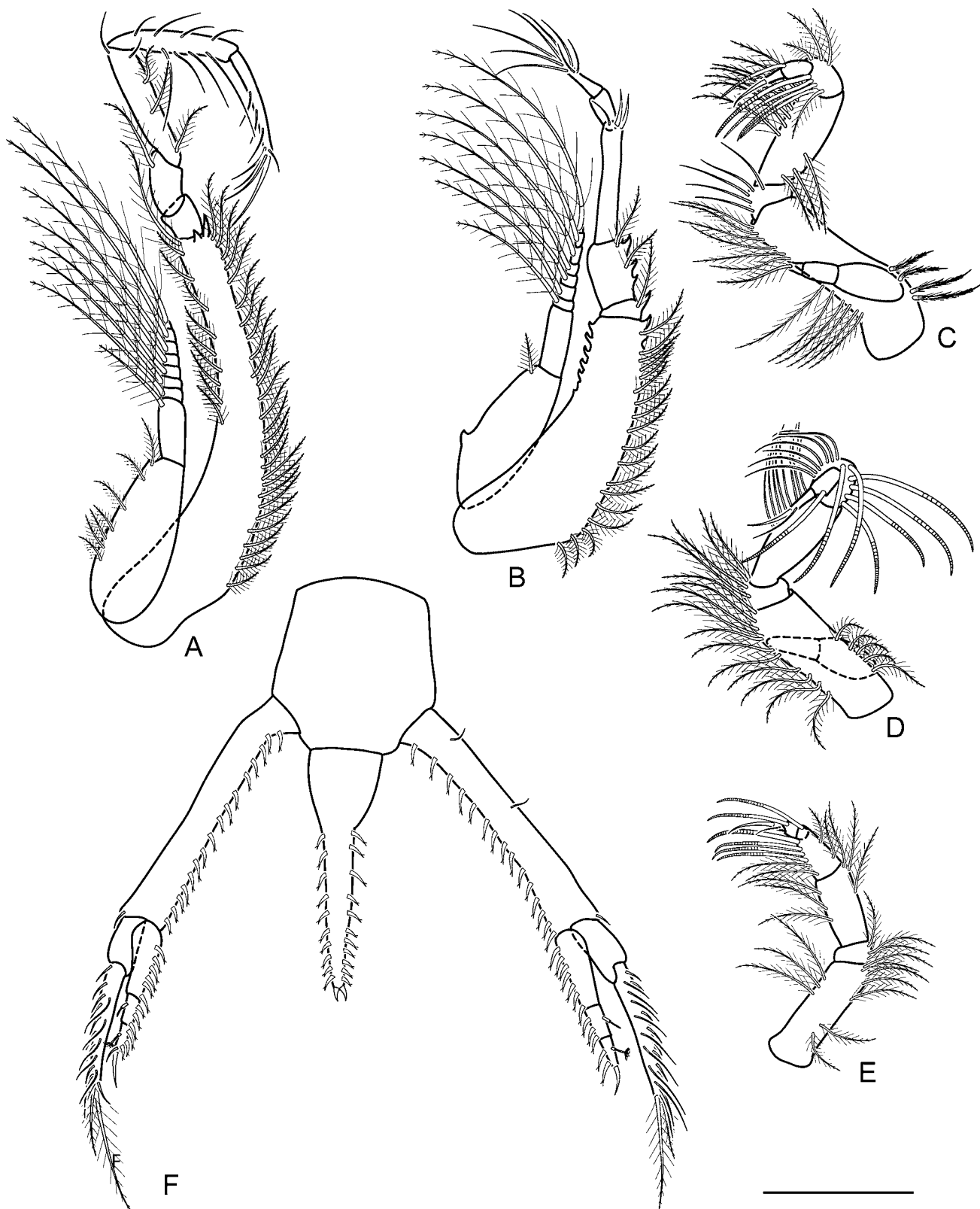


Figure 13. *Diastylopsis incompta* n. sp. male. Holotype subadult male, 11.7 mm, NMV J62370: (A), pereopod 1; (B), pereopod 2; (C), pereopod 3; (D), pereopod 4; (E), pereopod 5; (F), pleonite 6, telson and uropods. Scale bar = 1.0 mm.

plumo-annulate setae (Figs 12F–G). —Pereopod 1 basis $1.0 \times$ length of all other articles together, with plumose setae on margins, distal margin produced as 2 strong teeth; ischium $0.07 \times$ basis length, unarmed; merus $1.7 \times$ ischium length, with plumose seta; carpus $2.5 \times$ merus length, with 2

simple and 3 plumose setae; propodus $1.0 \times$ carpus length, with 8 simple setae; dactylus $0.8 \times$ propodus length, with 3 simple setae and 5 simple setae terminally; exopod $0.8 \times$ basis length, basal article with 7 plumose setae, flagellum with plumo-annulate setae (Fig. 13A). —Pereopod 2 basis

1.0 × length of all other articles together, with plumose setae, margin produced as strong teeth, corner produced as strong tooth; ischium 0.05 × basis length, with plumose seta, margin produced as strong tooth; merus 4.3 × ischium length, with 2 plumose setae, margin produced as 3 teeth; carpus 1.9 × merus length, with 3 simple setae; propodus 0.2 × carpus length, unarmed; dactylus 1.7 × propodus length, with 8 simple setae terminally; exopod 1.1 × basis length, basal article with plumose seta, produced as tooth proximally, flagellum with plumo-annulate setae (Fig. 13B). —Pereopod 3 basis 1.1 × length of all other articles together, with plumose setae; ischium 0.1 × basis length, with 5 simple setae; merus 5.0 × ischium length, with 7 plumose setae; carpus 0.4 × merus length, with 4 plumose and 4 annulate setae; propodus 0.8 × carpus length, with annulate seta; dactylus 0.7 × propodus length, with simple seta terminally; exopod 0.6 × basis length, of 2 articles, with plumose seta (Fig. 13C). —Pereopod 4 basis 0.7 × length of all other articles together, with plumose setae; ischium 0.1 × basis length, with plumose setae; merus 5.5 × ischium length, with simple setae; carpus 0.4 × merus length, with 7 simple and 6 annulate setae; propodus 0.6 × carpus length, with annulate seta; dactylus 0.7 × propodus length, with 2 simple setae terminally; exopod 0.7 basis length, of 2 articles, without setae (Fig. 13D). —Pereopod 5 basis 0.7 × length of all other articles together, with plumose setae; ischium 0.1 × basis length, with plumose setae; merus 5.0 × ischium length, with plumose setae; carpus 0.7 × merus length, with 4 plumose and 5 annulate setae; propodus 0.3 × carpus length, with annulate seta; dactylus 0.7 × propodus length, with 2 simple setae terminally (Fig. 13E). —Pleopods present on pleonites 1–2, small buds (Fig. 12A). —Telson 1.4 × length of pleonite 6, with 10–11 simple lateral setae with single subterminal setule, 2 terminal simple setae (Fig. 13F). —Uropod peduncles 1.5 × pleonite 6 length, 1.1 × telson length; medial margin with 15–16 simple setae with single subterminal setule, lateral margin with 1 or 3 simple setae. Uropod endopod of 3 articles, 0.5 × peduncle length; article 1 longer than articles 2 and 3 together, with 6–7 simple setae with single subterminal setule medially; article 2 0.4 × article 1 length, with 3 simple setae with single subterminal setule medially, pedunculate seta laterally; article 3 1.0 × article 2 length, with 2–3 simple setae with single subterminal setule medially, 1 pedunculate and 0–1 simple setae laterally, terminal seta simple. Uropod exopod 1.4 × length of endopod; article 1 0.3 × article 3 length, unarmed; article 2 with many simple and 2 plumose setae, terminal seta plumose (Fig. 13F).

Etymology. The species is named *incompta* from the Latin *incomptus* meaning unadorned, in reference to the carapace being smooth except for the ridge on the pseudorostral lobes. Within the genus, all other species have much more ornamentation on the carapace.

Remarks. The sole specimen of this species, despite being 11.7 mm long, is clearly a male several moults from becoming an adult, based on the minimal development of the pleopods and the exopods on pereopods 3–4. The adults of this species are expected to be quite a bit larger than this specimen, perhaps as much as 20 mm. It is possible that this species may not belong in *Diastylopsis*; however, without the adults in hand, *Diastylopsis* is the only plausible generic placement at this time.

Diastylopsis senta n. sp.

Figs 14–15

Type material. Holotype ovigerous female, NMV J62368; paratype subadult male, dissected, NMV J46865; 38°24'30"S 148°42'06"E, 1200 m, R. S. Wilson, 15 Nov. 1981.

Other material examined. 1 manca, NMV J46866, 38°24'30"S 148°42'06"E, 1200 m, R. S. Wilson, 15 Nov. 1981.

Diagnosis. *Female and subadult male.* Carapace with spines anteriorly, increasing in size and density anteriorly, where spines absent carapace is reticulated. Pereonites 3–4 fused dorsally, free ventrally. Pereopods 3–4 without rudimentary exopods in female. Telson with short post-anal portion, without lateral setae. *Adult male.* Unknown.

Description

Ovigerous female. Holotype ovigerous female, NMV J62368, 9.1 mm. —Carapace anterior half covered in spines, increasing in length anteriorly, antennal notch oblique; pseudorostral lobes 0.4 × carapace length; eye lobe 0.03 × carapace length; carapace 1.8 × length of pereonites together (Fig. 14A).

Subadult male. Paratype subadult male, NMV J46865, 6.8 mm estimated. —Carapace as in female (Fig. 14B). —Antennule peduncle article 1 longest, with 4 simple and 2 pappose setae; article 2 0.9 × article 1 length, with 8 simple and 1 pappose setae; article 3 0.7 × article 2 length, with 8 simple and 3 pedunculate setae; main flagellum of 4 articles, article 2 longest, with 2 aesthetascs and 1 simple and 2 pedunculate setae; accessory flagellum of 3 articles, with 3 simple and 1 pedunculate setae (Fig. 14C). —Antenna of 5 articles, peduncle articles 1–4 with pappose and simple setae, article 5 and flagellum without setae, flagellum not divided, subadult male (Fig. 14D). —Mandible navicular, with 18 microserrate setae medially (Fig. 14E). —Maxillule with 2 endites; outer endite with double row of simple setae; inner endite with 3 simple, 1 microserrate and 1 tricuspid setae; palp with 2 microserrate setae (Fig. 14F). —Maxilla with 3 endites; broad endite distal margin with pappose and simple setae, medial margin with row of pedunculate setae and pappose seta; medial narrow endite with 4 microserrate setae terminally; distal narrow endite with 5 microserrate setae terminally; both narrow endites extending past distal margin of broad endite (Fig. 14G). —Maxilliped 1 basis produced as lobe with 4 pappose, 2 hook, 1 simple and 1 very stout microserrate setae; ischium absent; merus with plumose seta laterally; carpus 2.4 × merus length, with 6 beak setae and many simple setae medially, plumose seta laterally; propodus 0.8 × carpus length, with 3 plumose and 2 dentate setae; dactylus 0.3 × propodus length, with 2 simple setae (Fig. 14H). —Maxilliped 2 basis with 2 simple and 4 plumose setae; ischium 0.02 × basis length, unarmed; merus 10 × ischium length, with plumose seta; carpus 1.6 × merus length, with 3 pappose setae medially, 2 plumose setae laterally; propodus 0.8 × carpus length, with 6 plumose setae medially; dactylus broken off (Fig. 14I). —Maxilliped 3 basis 1.8 × length of all other articles together, with 6 pappose setae medially, distal corner produced past distal border of ischium, with 5 plumose

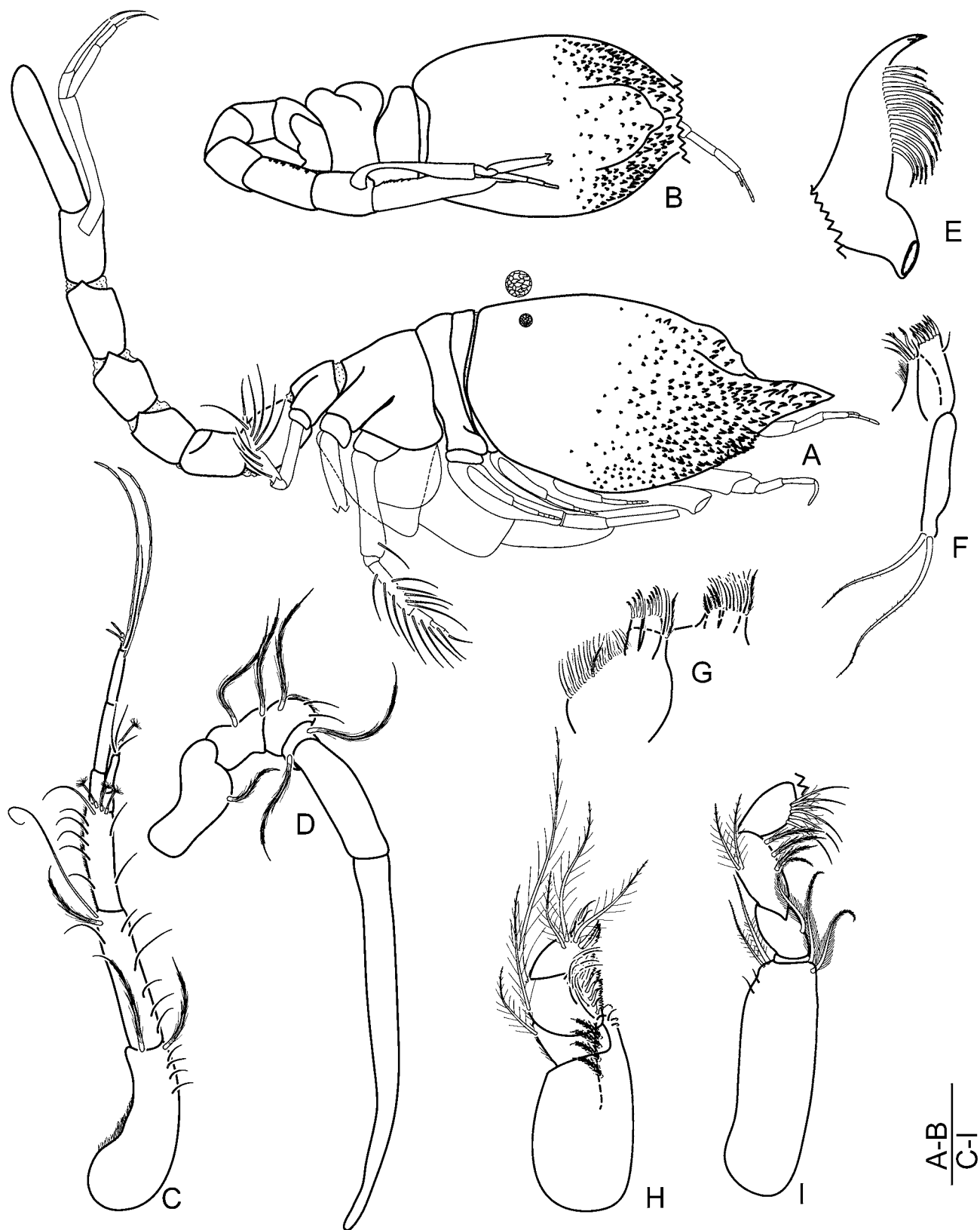


Figure 14. *Diastylopsis senta* n. sp. female. Holotype ovigerous female, 9.1 mm, NMV J62368: (A), side view. Paratype subadult male, 6.8 mm estimated, NMV J46865: (B), dorsal view; (C), antennule; (D), antenna; (E), mandible; (F), maxillule; (G), maxilla; (H), maxilliped 1; (I), maxilliped 2. Scale bars A–B = 1.0 mm, C–I = 0.5 mm.

setae; ischium $0.06 \times$ basis length, with pappose seta, produced as tooth medially; merus $1.5 \times$ ischium length, medial margin produced as tooth, with pappose seta, with plumose seta laterally; carpus $1.7 \times$ merus length, with 5

plumose setae medially; propodus $1.0 \times$ carpus length, with 4 plumose setae medially; dactylus $0.9 \times$ propodus length, with 4 simple setae terminally; exopod $0.7 \times$ basis length, basal article with unarmed, flagellum with plumo-annulate

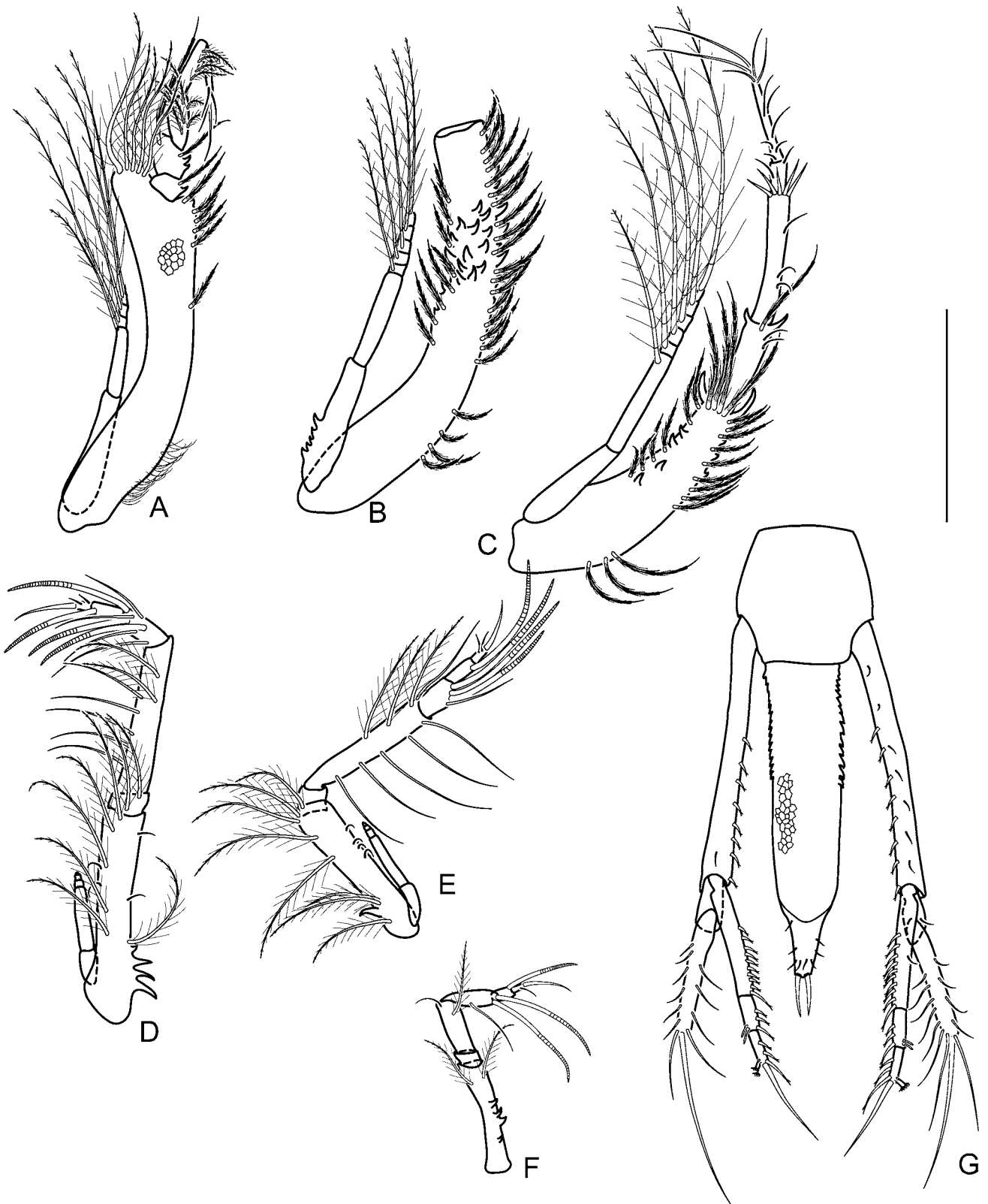


Figure 15. *Diastylopsis senta* n. sp. female. Paratype subadult male, 6.8 mm estimated, NMV J46865: (A), maxilliped 3; (B), pereopod 1; (C), pereopod 2; (D), pereopod 3, (E), pereopod 4; (F), pereopod 5; (G), pleonite 6, telson and uropods. Scale bar = 1.0 mm.

setae (Fig. 15A). —Pereopod 1 basis with pappose setae, produced as strong teeth; exopod $0.7 \times$ basis length, basal article produced as teeth, flagellum with plumo-annulate setae (Fig. 15B). —Pereopod 2 basis $0.7 \times$ length of all

other articles together, with pappose setae, produced as teeth, with 2 large teeth distally; ischium absent; merus with 2 simple and 1 pappose setae, produced as 2 teeth distally; carpus $1.4 \times$ merus length, with 3 simple setae proximally,

distal margin with 5 stout simple setae; propodus $0.2 \times$ carpus length, with 2 simple setae; dactylus $3.2 \times$ propodus length, with 6 simple setae and 5 simple setae terminally; exopod $1.2 \times$ basis length, flagellum with plumo-annulate setae (Fig. 15C). —Pereopod 3 basis $0.8 \times$ length of all other articles together, with simple and plumose setae, produced as 3 large teeth proximally; ischium $0.1 \times$ basis length, with 2 plumose setae; merus $7.5 \times$ ischium length, with 5 simple and 2 plumose setae; carpus $0.3 \times$ merus length, with 4 simple and 3 annulate setae; propodus $0.9 \times$ carpus length, with annulate seta; dactylus $0.4 \times$ propodus length, with 2 simple setae and simple seta terminally; exopod $0.6 \times$ basis length, without setae (Fig. 15D). —Pereopod 4 basis $0.8 \times$ length of all other articles together, with plumose setae, produced as single large tooth proximally; ischium $0.06 \times$ basis length, unarmed; merus $13 \times$ ischium length, with 6 simple and 3 plumose setae; carpus $0.3 \times$ merus length, with 1 simple and 3 annulate setae; propodus $0.8 \times$ carpus length, with annulate seta; dactylus $0.5 \times$ propodus length, with 2 simple setae and simple seta terminally; exopod $0.7 \times$ basis length, without setae (Fig. 15E). —Pereopod 5 basis $0.8 \times$ length of all other articles together, with 2 plumose setae, produced as several teeth; ischium $0.1 \times$ basis length, unarmed; merus $3.3 \times$ ischium length, with 1 simple and 1 plumose setae; carpus $0.8 \times$ merus length, with 1 simple and 2 annulate setae; propodus $0.5 \times$ carpus length, with annulate seta; dactylus $0.5 \times$ propodus length, with simple seta and simple seta terminally (Fig. 15F). —Telson $2.3 \times$ length pleonite 6, without lateral setae, with few small simple setae on dorsal surface, 2 simple terminal setae (Fig. 15G). —Uropod peduncles $1.9 \times$ pleonite 6 length, $0.8 \times$ telson length, with 8 simple setae with single subterminal setule medially, with 1 or several small simple setae on dorsal surface. Uropod endopod of 3 articles, $0.8 \times$ peduncle length; article 1 $1.7 \times$ articles 2 and 3 together, with 10 simple setae with single subterminal setule medially; article 2 $0.3 \times$ article 1 length, with 3 simple setae with single subterminal setule medially, 2 pedunculate setae laterally; article 3 $1.0 \times$ article 2 length, with 3 simple setae with single subterminal setule medially, with 2 pedunculate setae laterally, terminal seta simple. Uropod exopod of 2 articles, $0.8 \times$ length of endopod; article 1 $0.5 \times$ article 2 length, unarmed; article 2 with many simple setae, terminal seta simple (Fig. 15G).

Etymology. The species is named *sentata* from the Latin *sentus*, meaning thorny and rough, in reference to the multitude of spines present on the carapace, producing a rough appearance.

Remarks. Within the Australian *Diastylopsis* fauna, the carapace architecture is unique, with the spines increasing in size and density anteriorly.

Diastylopsis trisetosa n. sp.

Figs 16–19

Type material. Holotype preparatory female, NMV J62361; paratype preparatory female, NMV J46867; paratype ovigerous female, dissected, NMV J46868; $66^{\circ}03'00''\text{S}$ – $66^{\circ}02'54''\text{S}$ $49^{\circ}50'00''\text{E}$ – $49^{\circ}47'54''\text{E}$, 690–911 m, M. D. Norman, 29–30 Nov. 1985.

Other material examined. 1 ovigerous female, 21 preparatory females, 3 subadult females, 9 subadult males, 5 mancae, NMV J46869, $66^{\circ}03'00''\text{S}$ – $66^{\circ}02'54''\text{S}$ $49^{\circ}50'00''\text{E}$ – $49^{\circ}47'54''\text{E}$, 690–911 m, M. D. Norman, 29–30 Nov. 1985.

Diagnosis. *Female and subadult male.* Carapace with 2 oblique serrate parallel ridges, strongly serrate short ridges anterior of the oblique ridges, carapace covered in small ridges posterior of the oblique ridges, producing a rugose appearance, dorsal margin strongly serrate. Pereonites 3–4 not fused. Pereopods 3–4 with rudimentary exopods in female. Telson 3–4 pairs of lateral setae and with 3 terminal setae. *Adult male.* Unknown.

Description

Ovigerous and preparatory female. Holotype preparatory female, NMV J62361, 9.7 mm; paratype preparatory female, NMV J46867, 10.0 mm; paratype ovigerous female, NMV J46868, 9.9 mm. —Carapace with 2 strongly serrate parallel ridges curving from mid-dorsum anteroventrally, not reaching anterior margin, posterior to ridges carapace covered in small ridges, creating strongly rugose appearance, anterior of ridges with groups of strong teeth on frontal lobe and pseudorostral lobes; pseudorostral lobes $0.4 \times$ carapace length; eye lobe $0.06 \times$ carapace length, without lenses; carapace $1.9 \times$ length of pereonites together. Pereonite 3 expanded anteriorly laterally, overriding pereonite 2 laterally (Figs 16A–C).

Paratype preparatory female NMV J46867. —Pereopod 1 basis $0.6 \times$ length of all other articles together, with plumose setae, produced as strong teeth; ischium $0.2 \times$ basis length, unarmed; merus $0.9 \times$ ischium length, with 2 simple setae, produced as 2 teeth distally; carpus $2.4 \times$ merus length, with 1 simple and 1 plumose setae; propodus $1.3 \times$ carpus length, with 3 simple setae; dactylus $1.0 \times$ propodus length, with simple setae; exopod $0.7 \times$ basis length, basal article with plumose seta, flagellum with plumo-annulate setae (Fig. 17A). —Pereopod 2 basis $0.8 \times$ length of all other articles together, with plumose setae; ischium $0.06 \times$ basis length, unarmed; merus $5.0 \times$ ischium length, with 2 plumose setae; carpus $1.5 \times$ merus length, with 3 stout simple setae distally; propodus $0.3 \times$ carpus length, with simple seta; dactylus $1.7 \times$ propodus length, with 4 simple setae and 5 simple setae terminally; exopod $1.1 \times$ basis length, basal article with 4 plumose setae, flagellum with plumo-annulate setae (Fig. 17B). —Telson $1.7 \times$ length of pleonite 6, with 3–4 simple setae with single subterminal setule laterally, 3 simple terminal setae; pre-anal portion margins produced as teeth (Fig. 17C). —Uropod peduncles $1.4 \times$ pleonite 6 length, $0.8 \times$ telson length, with 11–12 simple setae medially. Uropod endopod of 3 articles, $0.6 \times$ peduncle length; article 1 longest, with 4 simple setae medially; article 2 $0.6 \times$ article 1 length, with 4 simple setae medially; article 3 $0.8 \times$ article 2 length, with 2

simple setae medially, terminal seta broken. Uropod exopod of 2 articles, $0.9 \times$ length of endopod; article 1 $0.3 \times$ article 2 length, unarmed; article 2 with 3 simple setae, terminal seta broken (Fig. 17C).

Paratype ovigerous female, NMV J46868. —Antennule peduncle article 1 $1.8 \times$ articles 2 and 3 together, with 1 simple

and 1 pappose setae, distal margin serrate; article 2 $0.3 \times$ article 1 length, with few simple setae; article 3 $1.0 \times$ article 2 length, with 1 simple and 2 pedunculate setae; main flagellum of 3 articles? broken; accessory flagellum of 3 articles, shorter than article 1 of main flagellum, with simple seta (Fig. 18A). —Antenna of 4 articles, each article with plumose seta, shorter than antennule peduncle article 1 (Fig. 18A). —Mandible navicular, with 15 microserrate setae medially, lacinia mobilis with 3 cusps (Fig. 18B). —Maxillule with 2 endites; outer endite with double row of stout simple setae; inner endite with 3 microserrate and 1 quadricuspid setae; palp with 2 microserrate setae (Fig. 18C). —Maxilla with 3 endites; broad endite distal margin lined with simple setae laterally and pappose setae medially, medial margin lined with pedunculate setae, with 2 pappose setae, medial face with rows of fine hair-like setae; medial narrow endite with 3 microserrate and 1 simple setae terminally; distal narrow endite with 3 microserrate and 3 simple setae terminally; both narrow endites extending past distal margin of broad endite (Figs 18D–E). —Maxilliped 1 basis produced as lobe with 3 simple, 7 pappose and 1 stout

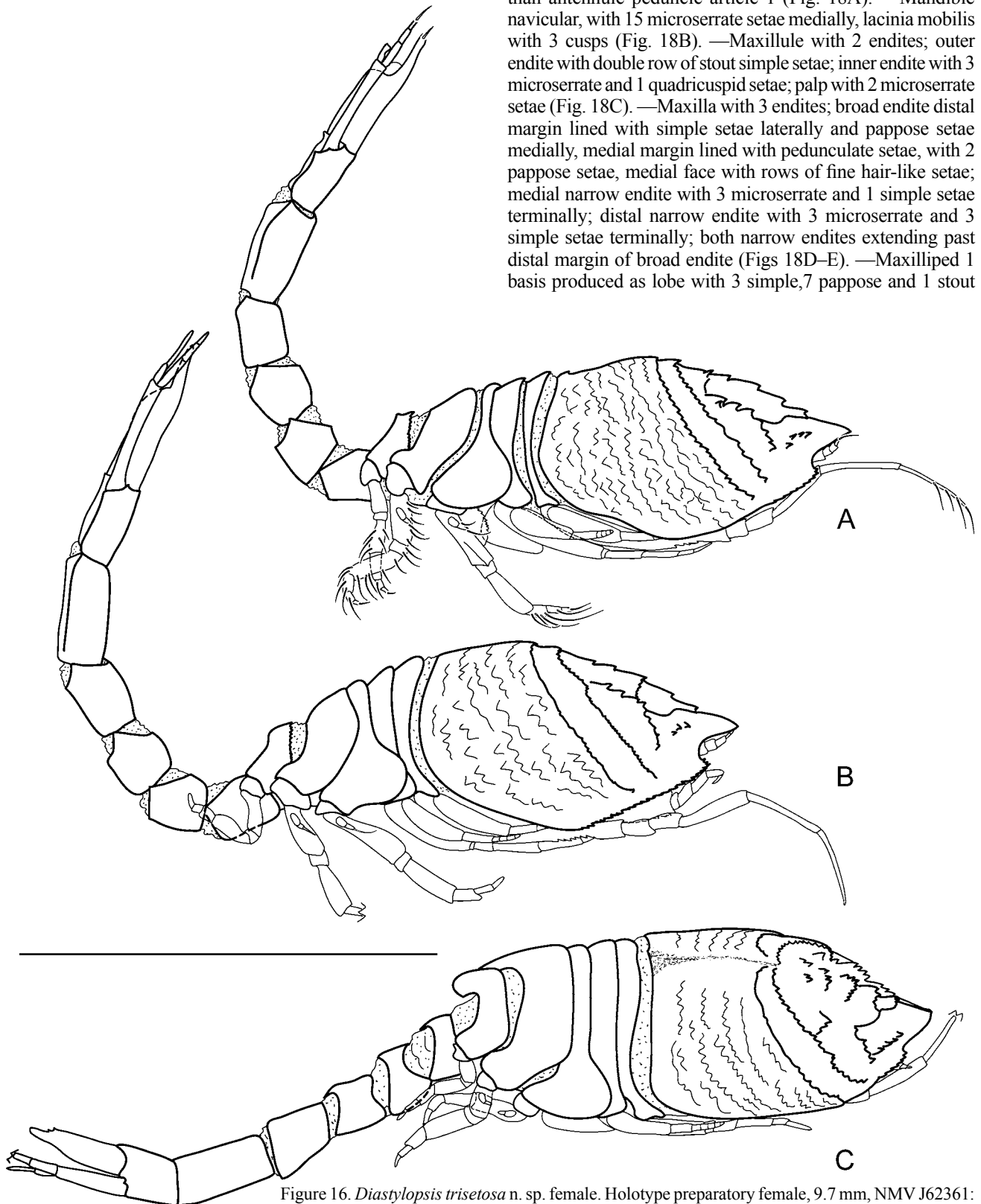


Figure 16. *Diastylopsis trisetosa* n. sp. female. Holotype preparatory female, 9.7 mm, NMV J62361: (A), side view. Paratype preparatory female, 10.0 mm, NMV J46867: (B), side view. Paratype ovigerous female, 9.9 mm, NMV J46868: (C), side/dorsal view. Scale bar = 5.0 mm.

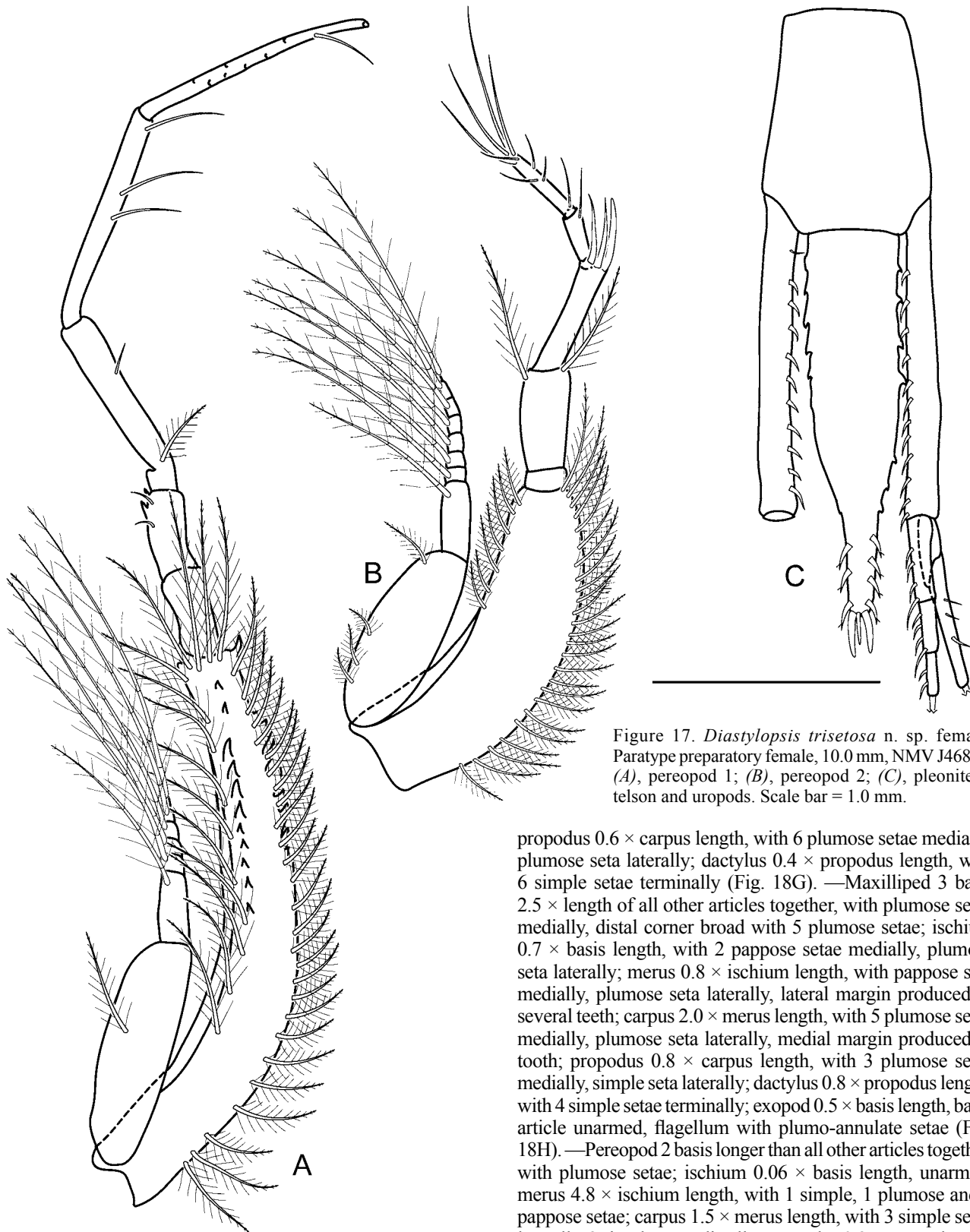


Figure 17. *Diastylopsis trisetosa* n. sp. female. Paratype preparatory female, 10.0 mm, NMV J46867: (A), pereopod 1; (B), pereopod 2; (C), pleonite 6, telson and uropods. Scale bar = 1.0 mm.

bicuspid setae; ischium absent; merus with plumose seta laterally; carpus $1.2 \times$ merus length, with 5 beak setae and many simple setae medially, plumose seta laterally; propodus $1.0 \times$ carpus length, with 5 plumose setae; dactylus $0.3 \times$ propodus length, with 2 simple setae (Fig. 18F). —Maxilliped 2 basis $1.4 \times$ length of all other articles together, with 3 simple and 8 plumose setae; ischium $0.03 \times$ basis length, unarmed; merus $4.0 \times$ ischium length, with 2 plumose setae; carpus $3.1 \times$ merus length, with 6 plumose setae medially, plumose seta laterally;

propodus $0.6 \times$ carpus length, with 6 plumose setae medially, plumose seta laterally; dactylus $0.4 \times$ propodus length, with 6 simple setae terminally (Fig. 18G). —Maxilliped 3 basis $2.5 \times$ length of all other articles together, with plumose setae medially, distal corner broad with 5 plumose setae; ischium $0.7 \times$ basis length, with 2 pappose setae medially, plumose seta laterally; merus $0.8 \times$ ischium length, with pappose seta medially, plumose seta laterally, lateral margin produced as several teeth; carpus $2.0 \times$ merus length, with 5 plumose setae medially, plumose seta laterally, medial margin produced as tooth; propodus $0.8 \times$ carpus length, with 3 plumose setae medially, simple seta laterally; dactylus $0.8 \times$ propodus length, with 4 simple setae terminally; exopod $0.5 \times$ basis length, basal article unarmed, flagellum with plumo-annulate setae (Fig. 18H). —Pereopod 2 basis longer than all other articles together, with plumose setae; ischium $0.06 \times$ basis length, unarmed; merus $4.8 \times$ ischium length, with 1 simple, 1 plumose and 1 pappose setae; carpus $1.5 \times$ merus length, with 3 simple setae laterally, 3 simple setae distally; propodus $0.3 \times$ carpus length, with 2 simple setae; dactylus with simple setae, broken; exopod $1.1 \times$ basis length, basal article with 3 plumose setae, flagellum with plumo-annulate setae (Fig. 19A). —Pereopod 3 basis $0.6 \times$ length of all other articles together, with plumose setae; ischium $0.1 \times$ basis length, with annulate setae; merus $6.4 \times$ ischium length, with plumose and annulate setae; carpus $0.4 \times$ merus length, with annulate seta; propodus $0.8 \times$ carpus length, with annulate seta; dactylus $0.8 \times$ propodus length, with simple seta terminally; exopod rudimentary, $0.4 \times$ basis length, of 2 articles



Figure 18. *Diastylopsis trisetosa* n. sp. female. Paratype ovigerous female, 9.9 mm, NMV J46868: (A), antennules and antennae; (B), mandibles; (C), maxillule; (D), maxilla; (E), maxilla narrow endites; (F), maxilliped 1; (G), maxilliped 2; (H), maxilliped 3. Scale bars A–D, F–G = 0.5 mm, E = 0.25 mm, H = 1.0 mm.

with plumose setae (Fig. 19B). —Pereopod 4 basis $0.6 \times$ length of all other articles together, with plumose setae; ischium $0.1 \times$ basis length, with plumose setae; merus $6.2 \times$ ischium length, with plumose and annulate setae; carpus $0.4 \times$ merus length, with annulate setae; propodus $0.8 \times$ carpus length, with 1

simple and 1 annulate setae; dactylus $0.8 \times$ propodus length, with simple seta terminally; exopod rudimentary, $0.4 \times$ basis length, of 2 articles with plumose setae (Fig. 19C). —Pereopod 5 basis $0.4 \times$ length of all other articles together, with plumose setae; ischium $0.2 \times$ basis length, with plumose setae; merus 4.5

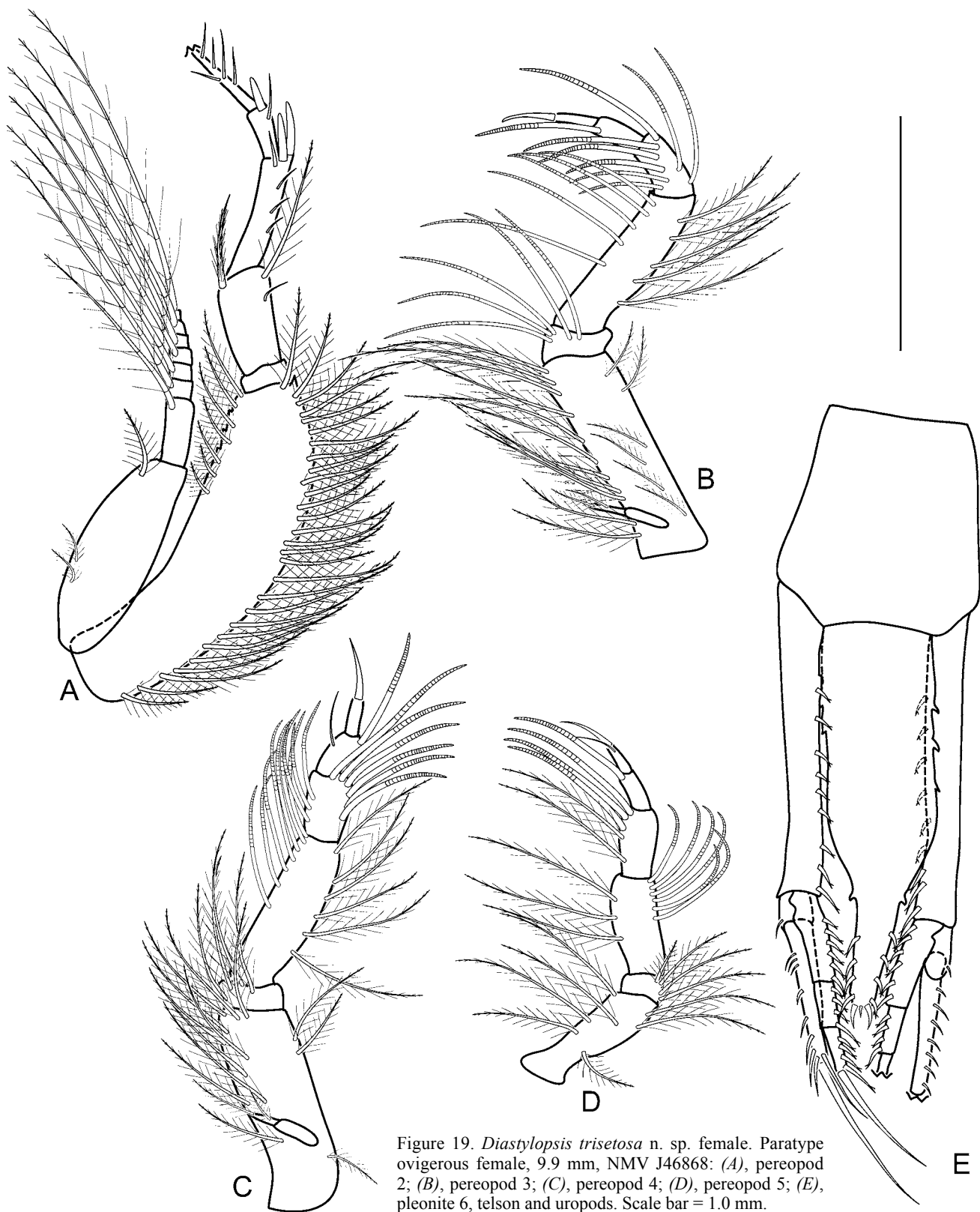


Figure 19. *Diastylopsis trisetosa* n. sp. female. Paratype ovigerous female, 9.9 mm, NMV J46868: (A), pereopod 2; (B), pereopod 3; (C), pereopod 4; (D), pereopod 5; (E), pleonite 6, telson and uropods. Scale bar = 1.0 mm.

\times ischium length, with plumose and annulate setae; carpus $0.7 \times$ merus length, with 2 plumose and 3 annulate setae; propodus $0.6 \times$ carpus length, with annulate seta; dactylus $0.8 \times$ propodus length, with simple seta and simple seta terminally (Fig. 19D). —Telson $1.9 \times$ length of pleonite 6, with 4 pairs of simple setae with single subterminal setule laterally, 3 simple terminal setae, central terminal seta small; pre-anal margins produced as teeth

(Fig. 19E). —Uropod peduncles $1.4 \times$ pleonite 6 length, $0.8 \times$ telson length, with 9 simple setae with single subterminal setule medially. Uropod endopod of 3 articles, $0.6 \times$ peduncle length; article 1 $1.0 \times$ articles 2 and 3 together, with 6 simple setae with single subterminal setule medially; article 2 $0.5 \times$ article 1 length, with 4 simple setae with single subterminal setule medially; article 3 $1.0 \times$ article 2 length, with 4 simple

setae with single subterminal setule medially, terminal seta simple. Uropod exopod of 2 articles, $0.9 \times$ length of endopod; article 1 $0.2 \times$ article 2 length, with simple seta; article 2 with 8 simple setae laterally, simple seta medially, terminal seta simple (Fig. 19E).

Etymology. The species is named *trisetosa* in reference to the three terminal setae present on the telson, a unique characteristic within the genus.

Remarks. Without males, it is impossible to be certain that this species does not belong in the family Lampropidae. However, the antennules and antennae are short in the female, which is characteristic of the Diastylidae, rather than long as is characteristic of the Lampropidae. The structure and ornamentation of the carapace are typical for *Diastylopsis* and would be unique within the Lampropidae. In the Lampropidae the telson is typically not divided between pre-anal and post-anal, with a narrowing at the anus, while this is quite common in the Diastylidae and is apparent in this species. In the diastylid genus *Dimorphostylis*, the adult males of several species have three terminal setae on the telson, while the females and subadult males have two terminal setae. This is the first record of a diastylid species in which the females have three terminal setae on the telson.

Dimorphostylis Zimmer, 1921

Type species. *Dimorphostylis asiatica* Zimmer, 1921.

Diagnosis. *Female and subadult male.* Maxilliped 3 with exopod. Pereopods 3–4 without exopods. *Adult male.* With greatly expanded bases on pereopods 2–4 and exopods.

Remarks. The only consistent characteristics differentiating between *Dimorphostylis* and *Paradiastylis* are the presence of an exopod on maxilliped 3 and the lack of rudimentary exopods on pereopods 3–4 in *Dimorphostylis* females and the lack of the exopod on maxilliped 3 and the presence of rudimentary exopods on pereopods 3–4 in *Paradiastylis* females. The males of both genera have expanded bases on pereopods 2–4 and the exopods on those pereopods, thus it is impossible to determine the generic placement of the males without the conspecific female.

Australian species. *Dimorphostylis australis* Foxon, 1932; *D. colefaxi* Hale, 1945; *D. cottoni* Hale, 1936; *D. inauspicata* Hale, 1945; *D. nordaustriana* n. sp.; *D. roccatagliatai* n. sp.; *D. subaculeata* Hale, 1945; *D. tasmanica* Hale, 1945; *D. tribulis* Hale, 1945; *D. triplicata* n. sp.; *D. vieta* (Hale, 1936).

Key to the Australian species of *Dimorphostylis*

- | | | |
|---|--|-----------------------------|
| 1 | Telson at least $1.5 \times$ length of pleonite 6 | 2 |
| — | Telson less than $1.5 \times$ length of pleonite 6 | 3 |
| 2 | Pereopod 1 propodus subequal to basis; adult male pereopod 2 basal expansion reaching only to mid-carpus | <i>D. australis</i> |
| — | Pereopod 1 propodus distinctly shorter than basis; adult male pereopod 2 basal expansion reaching to at least mid-propodus | <i>D. triplicata</i> n. sp. |
| 3 | Carapace covered in small spines, no ridges | <i>D. subaculeata</i> |
| — | Carapace not covered in spines, spines if present only on anterior part of carapace | 4 |
| 4 | Lateral margin of telson with distinct tooth | 5 |
| — | Lateral margin of telson entire | 6 |
| 5 | Carapace with distinct lateral ridges; uropod endopod article 2 shorter than article 3 | <i>D. inauspicata</i> |
| — | Carapace without distinct lateral ridges; uropod endopod article 2 longer than article 3 | <i>D. tasmanica</i> |
| 6 | Uropod endopod article 1 distinctly longer than articles 2 and 3 together | 7 |
| — | Uropod endopod article 1 not distinctly longer than articles 2 and 3 together | 9 |
| 7 | Carapace with folds but no distinct ridges; pereopod 1 short, propodus shorter than carpus | <i>D. colefaxi</i> |
| — | Carapace with distinct ridges, may be serrate; pereopod 1 long, propodus longer than carpus | 8 |
| 8 | Carapace with at least 4 lateral ridges on each side | <i>D. cottoni</i> |
| — | Carapace with no more than 3 lateral ridges on each side | <i>D. tribulis</i> |
| 9 | Uropod endopod article 1 not much longer than article 2 | <i>D. vieta</i> |
| — | Uropod endopod article 1 distinctly longer than article 2 | 10 |

- 10 Carapace with 1 distinct lateral ridge, indistinct ridge or fold posterior of distinct ridge; pereopod 1 propodus subequal to basis *D. nordaustriana* n. sp.
- Carapace with at least 2 distinct lateral ridges; pereopod 1 propodus distinctly shorter than basis *D. roccatagliatai* n. sp.

Dimorphostylis nordaustriana n. sp.

Figs 20–23

Type material. Holotype preparatory female, AM P85775; paratype ovigerous female, dissected, AM P85776; paratype adult male, dissected, AM P85777; paratypes 1 adult male, 1 subadult male, AM P85778; 10°54'S 133°02'E, 6 m, J. K. Lowry, 13 Oct. 1982.

Other material examined. AM P84313, 11°34'16"S 129°50'14"E, 49 m, Geoscience Australia, 28 Aug. 2009. AM P84761, 22°06'12"S 113°52'06"E, 38.7 m, Geoscience Australia, 16 Aug. 2008. 11 adult males, 4 subadult males, 6 ovigerous females, 4 subadult females AM P85779; 2 ovigerous females, 4 subadult females, 15 subadult males, 8 juveniles, 16 mancae AM P85780; 10°54'S 133°02'E, 6 m, J. K. Lowry, 13 Oct. 1982. 1 adult male, 1 subadult male, 2 ovigerous females, 4 subadult females, AM P85781, 10°54'S 133°02'E, 10 m, J. K. Lowry and G. C. B. Poore, 14 Oct. 1982. 8 adult males, 3 subadult males, 2 mancae AM P85782; 2 ovigerous females, 1 subadult female, AM P85783; 11°00'S 132°49'E, 5 m, J. K. Lowry, 20 Oct. 1982. 4 individuals, AM P85784, 20°29'46"S 116°47'29"E, 10 m, P.A Hutchings and L. Avery, 4 Aug. 2000.

Diagnosis. *Female and subadult male.* Carapace with oblique lateral ridge, strongly serrate, continuing onto pseudorostral lobe, with narrow depression parallel to lateral portion of ridge. Telson shorter than pleonite 6, with distinct post-anal portion, without lateral setae. *Adult male.* Carapace without ridges. Pereonite 5–pleonite 4 with ventrolateral stout setae to entrain antennal flagellum. Antennule with brush of setae on peduncle article 3. Antennae extending past posterior border of telson. Pleopods small. Telson with distinct post-anal portion, 2 pairs of lateral setae, 2 terminal setae.

Description

Ovigerous and preparatory females. Holotype preparatory female, AM P85775, 3.2 mm; paratype ovigerous female, AM P85776, 2.9 mm. —Carapace with dentate ridge starting near posterior border, sweeping dorsally to a point, then sweeping ventrally onto pseudorostral lobe, not meeting anterior margin, with narrow depression parallel to longer part of ridge, antennal notch oblique, anteroventral corner of carapace with several teeth; pseudorostral lobes 0.5 × carapace length, with 2–3 separated teeth on dorsal midline, 2 teeth at tip of pseudorostral lobe; eye lobe 0.1 × carapace length, at least twice as broad as long, with lenses, distinct tooth at dorsal midline; carapace 2.3 × length of pereonites together (Figs 20A–C).

Paratype ovigerous female, AM P85776, 2.9 mm. —Antennule peduncle article 1 1.0 × articles 2 and 3 together, with 2 plumose setae and margin lined with fine hair-like setae; article 2 0.4 × article 1 length, with plumose seta; article 3 1.8 × article 2 length, with 2 simple and 1 pedunculate setae; main flagellum of 3 articles, with 2 aesthetascs and simple seta; accessory flagellum of 1 article, 0.5 × length of

main flagellum, with 3 simple setae (Fig. 20D). —Antenna of 2 subequal articles; article 1 with pappose seta; article 2 with 3 pappose setae (Fig. 20E). —Mandible navicular, with 9–10 microserrate setae medially, lacinia mobilis with 3 cusps (Fig. 20F). —Maxillule with 2 endites; outer endite with double row of stout simple setae, margins lined with fine hair-like setae, with pappose seta; inner endite with 3 simple, 1 microserrate and 1 tricuspid setae, margins lined with fine hair-like setae; palp with 2 simple setae (Fig. 20G). —Maxilla with 3 endites; broad endite distal margin lined with simple setae and 4 pappose setae, medial margin with row of pedunculate setae and 2 pappose setae; medial narrow endite with 4 microserrate setae terminally; distal narrow endite with 5 microserrate setae terminally; both narrow endites relatively broad, barely reaching past distal margin of broad endite (Fig. 20H). —Maxilliped 1 basis produced as lobe with 3 simple, 6 pappose, 2 hook and 1 very stout simple setae; ischium absent; merus unarmed; carpus 2.2 × merus length, with field of simple setae and 6 beak setae medially, plumose seta laterally; propodus 0.5 × carpus length, with 2 pappose, 2 comb-like, and 3 plumose setae; dactylus 0.5 × propodus length, with 3 simple setae terminally (Fig. 20I). —Maxilliped 2 basis 0.4 × length of all other articles together, with 4 plumose setae distally; ischium 0.08 × basis length, unarmed; merus 8.0 × ischium length, with plumose seta laterally; carpus 1.6 × merus length, with 5 pappose setae medially, plumose seta laterally; propodus 0.8 × carpus length, with 3 pappose and 3 plumo-dentate setae medially, plumose seta laterally; dactylus 0.5 × propodus length, with 4 simple setae (Fig. 20J). —Maxilliped 3 basis 1.2 × length of all other articles together, with 8 pappose setae medially, distomedial corner produced as tooth, distolateral corner expanded, with 5 plumose setae, width of article double distally; ischium 0.1 × basis length, produced as 2 teeth medially; merus 0.8 × ischium length, with 2 pappose setae medially, plumose seta laterally; carpus 2.0 × merus length, with 4 plumose setae medially, plumose seta laterally; propodus 0.8 × carpus length, with 3 plumose setae medially, plumose seta laterally; dactylus 1.0 × propodus length, with 2 simple and 1 pappose setae, 2 simple setae terminally; exopod 0.6 × basis length, basal article unarmed, flagellum with plumo-annulate setae (Fig. 21A). —Pereopod 1 basis 0.5 × length of all other articles together, with 7 plumose setae; ischium 0.05 × basis length, with plumose seta; merus 4.3 × ischium length, with 1 simple and 2 plumose setae; carpus 3.0 × merus length, unarmed; propodus 1.4 × carpus length, with 6 simple setae; dactylus 0.3 × propodus length, with 4 simple and 6 simple setae terminally; exopod 0.7 × basis length, basal article unarmed, flagellum with plumo-annulate setae (Fig. 21B). —Pereopod 2 basis expanded, 0.8 × length of all other articles together, with 1 simple and 4 plumose setae; ischium 0.03 × basis length, unarmed; merus 9.0 × ischium length, with plumose seta; carpus 1.7 × merus length, with 2 simple setae; propodus 0.5 × carpus length, with plumose seta; dactylus 1.9 × propodus length, with 3 simple setae and 4 simple setae terminally; exopod 1.3 × basis length, basal article with simple seta, flagellum with plumo-annulate setae (Fig. 21C). —Pereopod 3 basis 1.0 ×

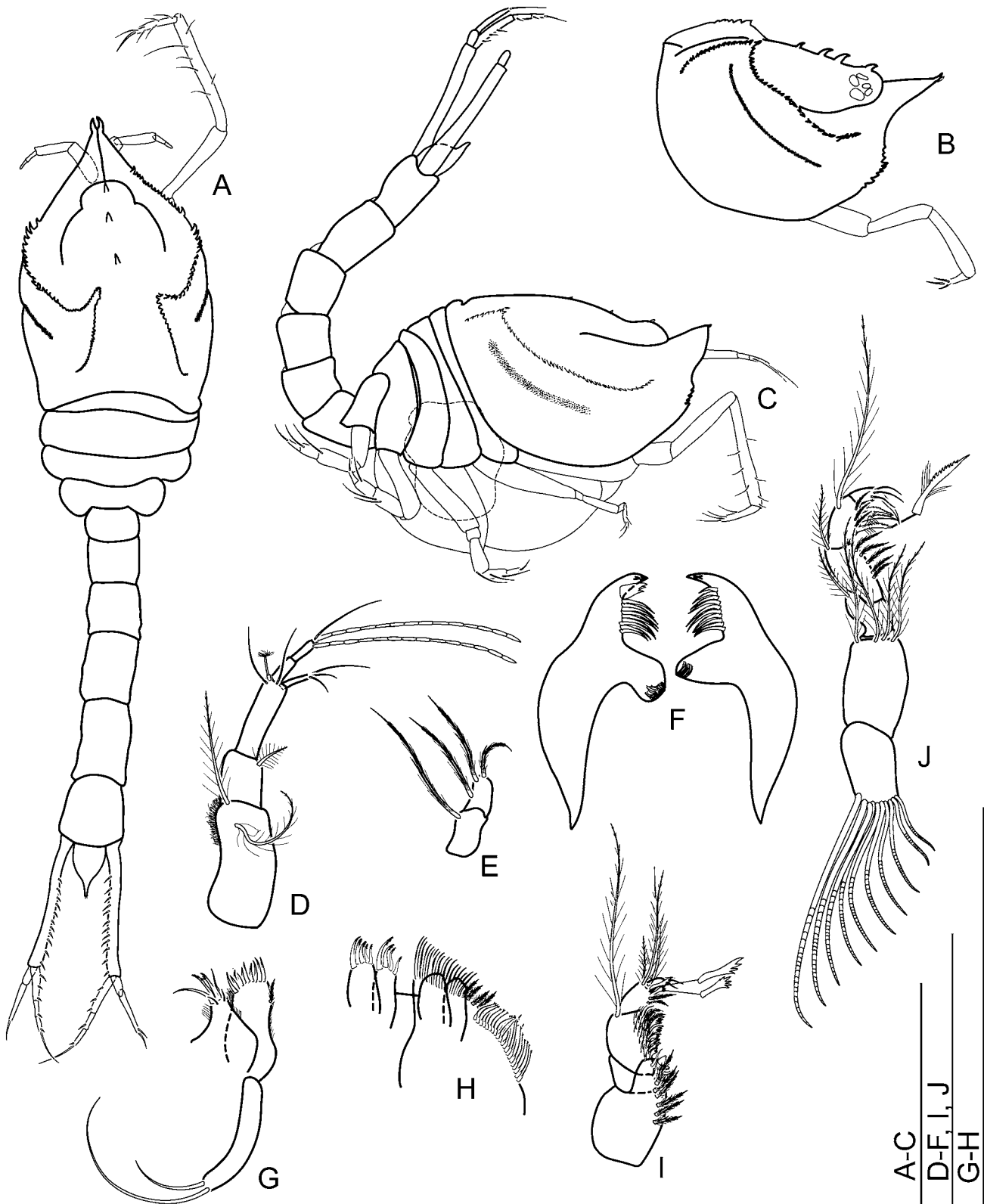


Figure 20. *Dimorphostylis nordaustriana* n. sp. female. Holotype preparatory female, 3.2 mm, AM P85775: (A), dorsal view; (B), side view carapace. Paratype ovigerous female, 2.9 mm, AM P85776: (C), side view; (D), antennule; (E), antenna; (F), mandibles; (G), maxillule; (H), maxilla; (I), maxilliped 1; (J), maxilliped 2. Scale bars A–C = 1.0 mm, D–J = 0.5 mm.

length of all other articles together, with simple seta; ischium $0.08 \times$ basis length, with simple seta; merus $5.7 \times$ ischium length, with 5 simple and 2 annulate setae; carpus $0.5 \times$ merus length, with 4 simple and 2 annulate setae; propodus $0.9 \times$ carpus length, with annulate seta; dactylus $0.7 \times$ propodus

length, with 1 simple seta and simple seta terminally (Fig. 21D). —Pereopod 4 basis $0.9 \times$ length of all other articles together, with 5 simple and 2 pedunculate setae; ischium $0.1 \times$ basis length, with 2 simple setae; merus $2.8 \times$ ischium length, with 3 simple setae; carpus $0.6 \times$ merus length, with

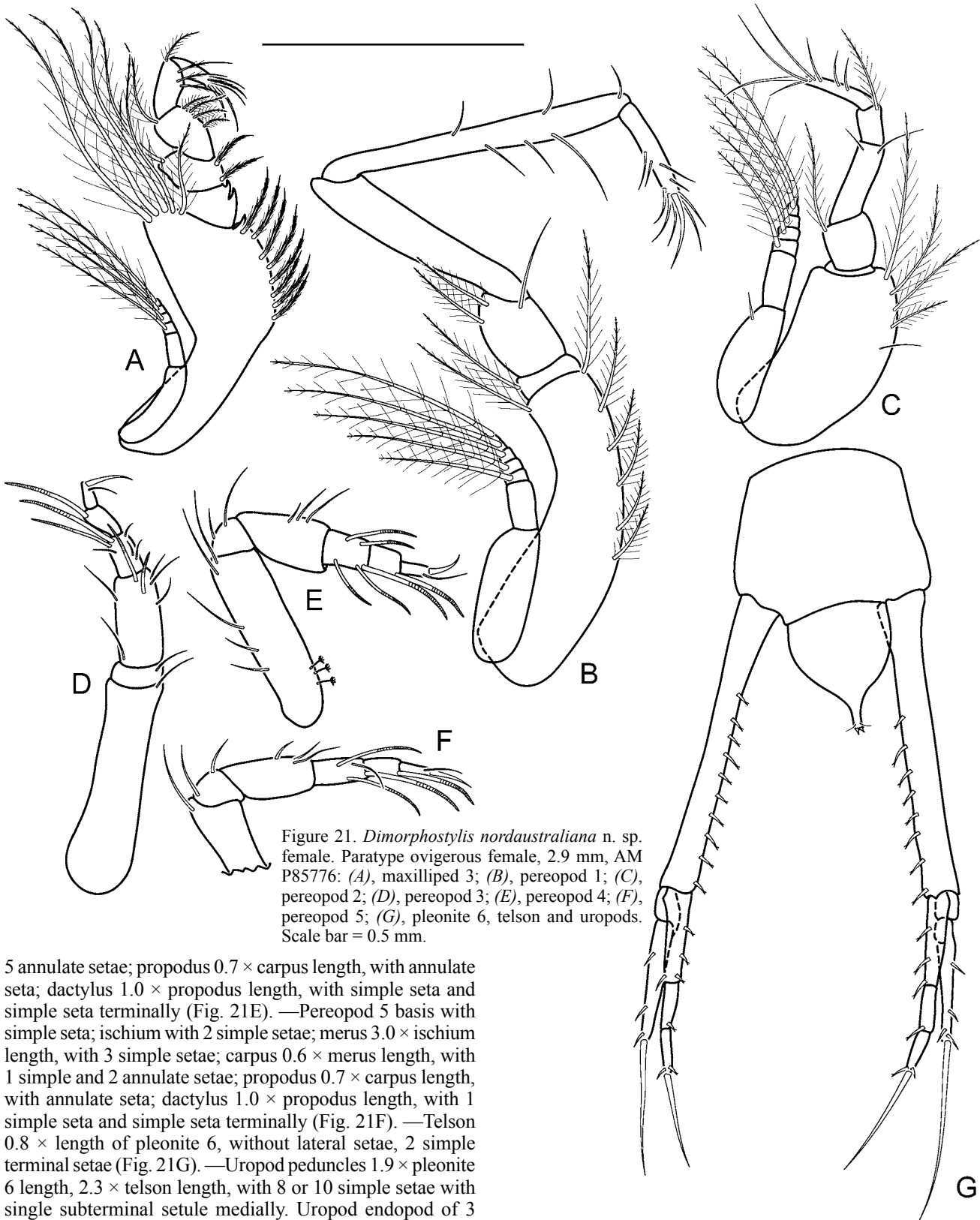


Figure 21. *Dimorphostylis nordaustrialiana* n. sp. female. Paratype ovigerous female, 2.9 mm, AM P85776: (A), maxilliped 3; (B), pereopod 1; (C), pereopod 2; (D), pereopod 3; (E), pereopod 4; (F), pereopod 5; (G), pleonite 6, telson and uropods. Scale bar = 0.5 mm.

5 annulate setae; propodus $0.7 \times$ carpus length, with annulate seta; dactylus $1.0 \times$ propodus length, with simple seta and simple seta terminally (Fig. 21E). —Pereopod 5 basis with simple seta; ischium with 2 simple setae; merus $3.0 \times$ ischium length, with 3 simple setae; carpus $0.6 \times$ merus length, with 1 simple and 2 annulate setae; propodus $0.7 \times$ carpus length, with annulate seta; dactylus $1.0 \times$ propodus length, with 1 simple seta and simple seta terminally (Fig. 21F). —Telson $0.8 \times$ length of pleonite 6, without lateral setae, 2 simple terminal setae (Fig. 21G). —Uropod peduncles $1.9 \times$ pleonite 6 length, $2.3 \times$ telson length, with 8 or 10 simple setae with single subterminal setule medially. Uropod endopod of 3 articles, $0.6 \times$ peduncle length; article 1 $1.0 \times$ articles 2 and 3 together, with 3 simple setae with single subterminal setule medially; article 2 $0.5 \times$ article 1 length, with simple seta with single subterminal setule medially; article 3 $1.1 \times$ article 2 length, with simple seta with single subterminal setule medially, simple seta laterally, terminal seta simple.

Adult male. Paratype adult male, AM P85777, 3.6 mm. —Carapace unornamented; pseudorostral lobes $0.5 \times$ carapace

length; eye lobe $0.1 \times$ carapace length, twice as broad as long, with 4 lenses; carapace $2.3 \times$ length of pereonites together. Pereonite 5 with 2 stout simple setae on posterior border. Pleonites 1–5 with stout, curved setae facing each other. Stout setae on pereonite 5 and pleonites are to entrain antennal flagellum against the body (Figs 22A–C). —Antennule peduncle article 1 $1.1 \times$ length of articles 2 and 3 together, with 1 pappose and 1 simple setae, margin with fine hair-like

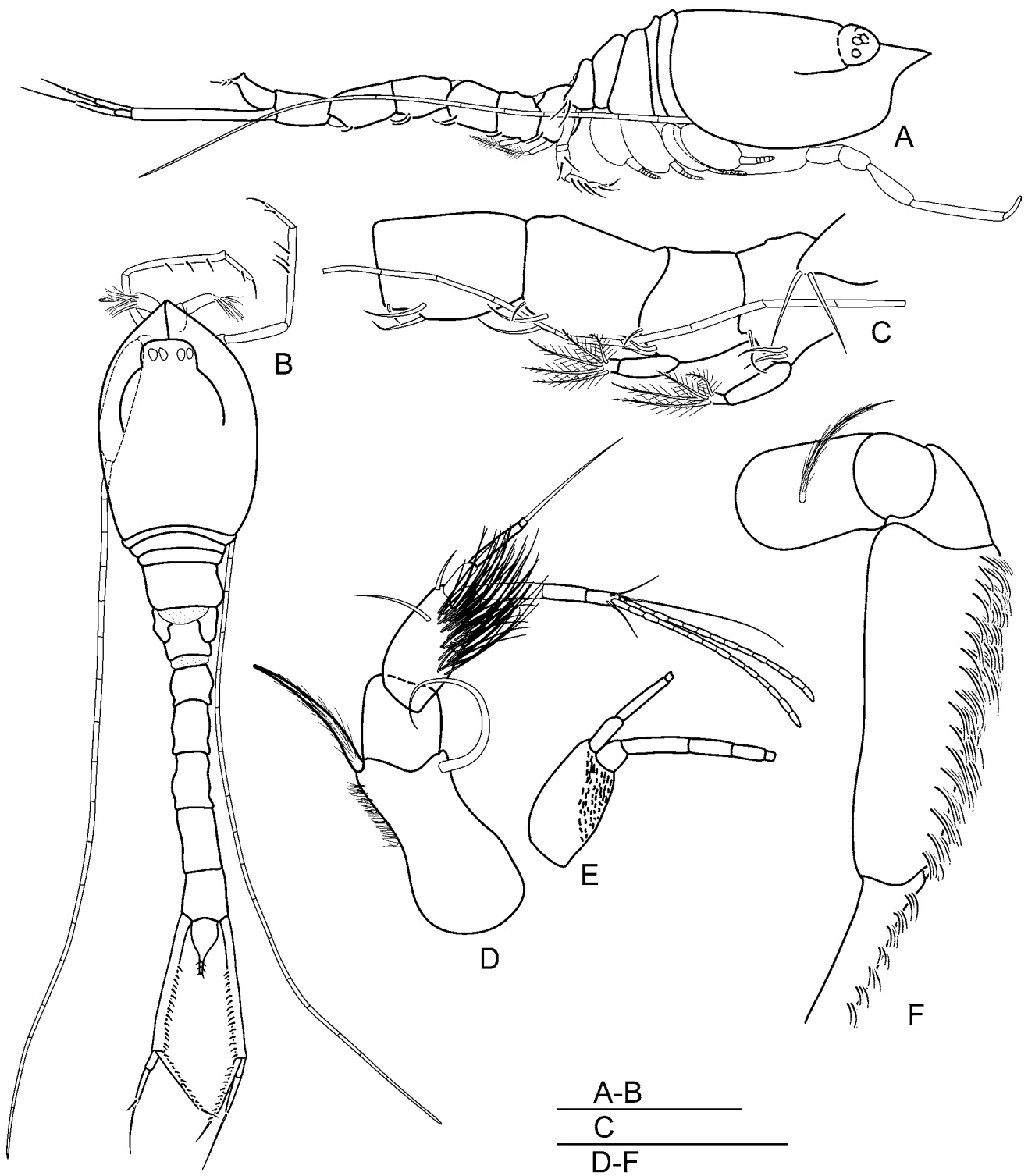


Figure 22. *Dimorphostylis nordaustraliana* n. sp. male. Paratype adult male, 3.6 mm, AM P85777: (A), side view; (B), dorsal view; (C), pleonites 1–4; (D), antennule; (E), antennule without setae on article 3; (F), antenna. Scale bars A–B = 1.0 mm, C–F = 0.1 mm.

setae; article 2 $0.3 \times$ article 1 length, unarmed; article 3 $2.0 \times$ article 2 length, with 2 simple setae and brush of simple setae on margin; main flagellum of 5 articles, with 2 aesthetascs and 3 simple setae; accessory flagellum of 3 articles, $0.6 \times$ main flagellum length, with simple seta terminally (Figs 22D–E). —Antenna extending past uropod rami; peduncle of 4 articles, article 1 with pappose seta; article 4 with ranks of setae, incompletely circling article; flagellum with long articles (Figs 22B, F). —Maxilliped 3 basis $1.1 \times$ length of

all other articles together, with 1 simple and 6 pappose setae medially, lateral corner with 5 plumose setae; ischium $0.1 \times$ basis length, with pappose seta; merus $2.3 \times$ ischium length, with pappose seta medially, plumose seta laterally; carpus $0.6 \times$ merus length, with 3 pappose setae medially, plumose seta laterally; propodus $1.1 \times$ carpus length, with 2 pappose setae medially, plumose seta laterally; dactylus $0.5 \times$ propodus length, with 6 simple setae terminally; exopod $0.8 \times$ basis length, basal article with plumose seta, flagellum with plumo-

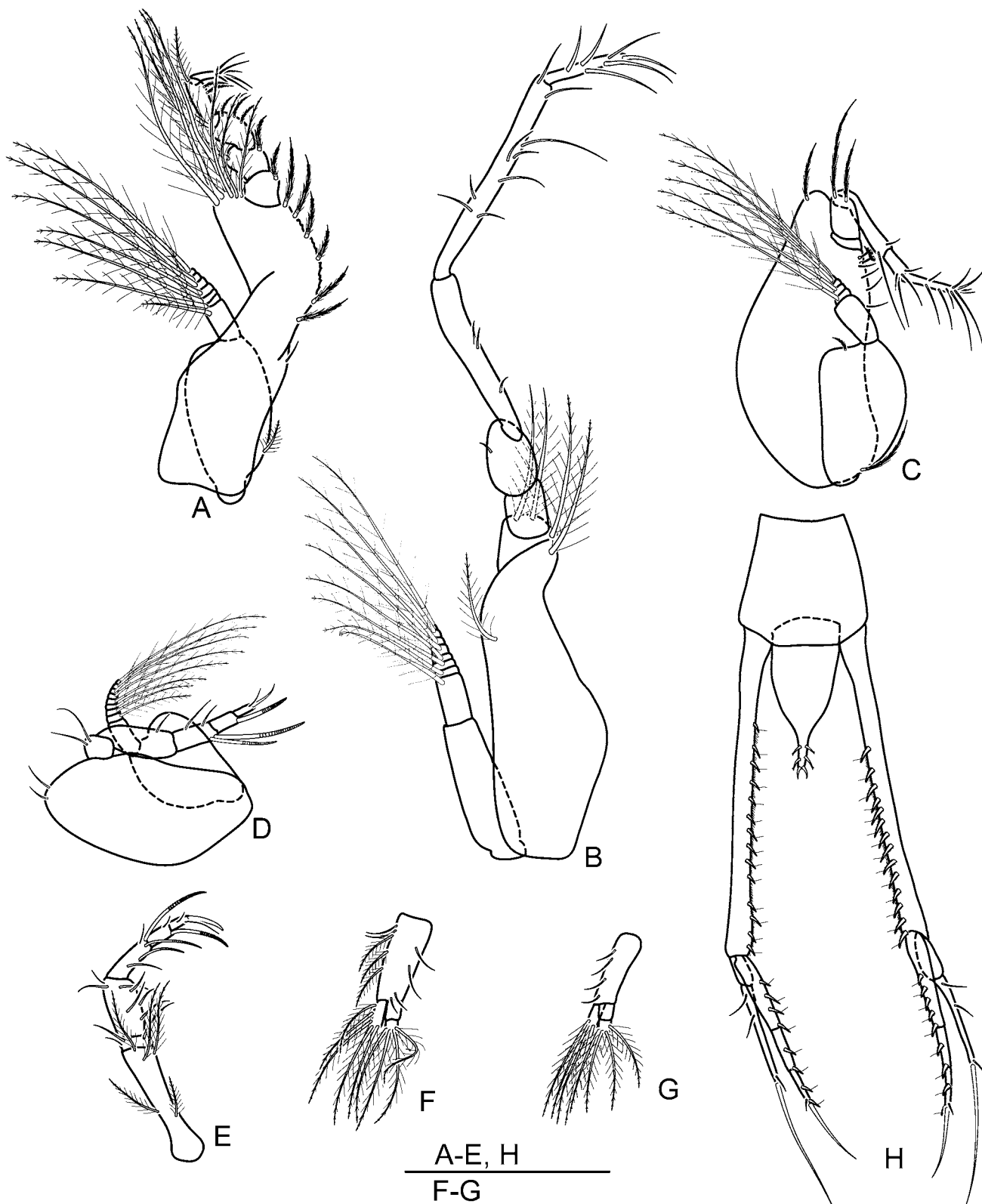


Figure 23. *Dimorphostylis nordaustrialiana* n. sp. male. Paratype adult male, 3.6 mm, AMP85777: (A), maxilliped 3; (B), pereopod 1; (C), pereopod 3; (D), pereopod 4; (E), pereopod 5; (F), pleopod 1; (G), pleopod 2; (H), pleonite 6, telson and uropods. Scale bar = 0.5 mm.

annulate setae (Fig. 23A). —Pereopod 1 basis $0.6 \times$ length of all other articles together, with 5 plumose setae; ischium $0.1 \times$ basis length, unarmed; merus $1.4 \times$ ischium length, with simple seta; carpus $3.0 \times$ merus length, with 3 simple setae; propodus $1.3 \times$ carpus length, with 9 simple setae; dactylus $0.3 \times$ propodus length, with 3 simple setae and 3 simple setae

terminally; exopod $0.8 \times$ basis length, not broadened, basal article unarmed, flagellum with plumo-annulate setae (Fig. 23B). —Pereopod 2 basis $1.2 \times$ length of all other articles together, with 4 simple, 1 pappose and 2 pedunculate setae; ischium $0.04 \times$ basis length, unarmed; merus $4.0 \times$ ischium length, with pappose seta; carpus $2.0 \times$ merus length, with

2 simple and 1 pappose setae; propodus $0.3 \times$ carpus length, with 4 simple setae; dactylus $1.8 \times$ propodus length, with 3 simple setae and 7 simple setae terminally; exopod $0.8 \times$ basis length, basal article with 2 pappose setae, flagellum with plumo-annulate setae (Fig. 23C). —Pereopod 3 basis $0.9 \times$ length of all other articles together, broadened, with 2 simple setae; ischium $0.1 \times$ basis length, with 2 simple setae; merus $3.5 \times$ ischium length, with simple seta; carpus $0.6 \times$ merus length, with 2 simple and 2 annulate setae; propodus $0.6 \times$ carpus length, with annulate seta; dactylus $0.8 \times$ propodus length, with simple seta and simple seta terminally; exopod $1.0 \times$ basis length, basal article broad, unarmed, flagellum with plumo-annulate setae (Fig. 23D). —Pereopod 4 not illustrated. —Pereopod 5 basis $0.8 \times$ length of all other articles together, with 5 plumose setae; ischium $0.08 \times$ basis length, with 2 simple setae; merus $5.5 \times$ ischium length, with 7 simple setae; carpus $0.8 \times$ merus length, with 2 simple and 3 annulate setae; propodus $0.6 \times$ carpus length, with 1 simple and 1 annulate seta; dactylus $0.8 \times$ propodus length, with 2 simple setae and simple seta terminally (Fig. 23E). —Pleopod 1 peduncle with 6 simple and 3 plumose setae; endopod uniarticulate, without process, with 4 plumose setae; exopod biarticulate, with 5 plumose setae (Fig. 23F). —Pleopod 2 peduncle with 4 simple setae; endopod uniarticulate, with 4 plumose setae; exopod biarticulate, with 3 plumose setae (Fig. 23G). —Telson $1.0 \times$ length of pleonite 6, with 2 pairs lateral simple setae with single subterminal setule, 2 simple terminal setae (Fig. 23H). —Uropod peduncles $2.5 \times$ pleonite 6 length, $2.5 \times$ telson length, medial margin lined with fine hair-like setae and with 14 microserrate setae with single subterminal setule. Uropod endopod of 3 articles, $0.5 \times$ peduncle length; article 1 longer than articles 2 and 3 together, with 4–5 microserrate setae with single subterminal setule medially; article 2 $0.4\text{--}0.5 \times$ article 1 length, with 2 microserrate setae with single subterminal setule medially; article 3 $1.0 \times$ article 2 length, with 2 microserrate setae with single subterminal setule medially, simple seta laterally, terminal seta simple. Uropod exopod $0.8 \times$ length of endopod; article 1 $0.3 \times$ article 2 length; article 2 with 3 simple setae, simple terminal seta longer than exopod (Fig. 23H).

Etymology. The species is named *nordaustraliana* because the specimens were collected in the Northern Territory of Australia.

Remarks. The new species *Dimorphostylis roccatagliatai* is quite similar to the new species *D. nordaustraliana*. In the females, the carapace and antenna are different, and in both males and females the proportions of the pereopods are different. The females of both species share a similarly shaped dentate ridge in the same position on the carapace; however, in *D. roccatagliatai* there are a strong and a weak ridge ventral and parallel to the anterior part of the dentate ridge, while in *D. nordaustraliana* there is only a narrow depression parallel to dentate ridge. The female antenna in *D. nordaustraliana* is bi-articulate with pappose setae, while in *D. roccatagliatai* the antenna is tri-articulate, with a mix of simple and plumose setae. The propodus of pereopod 1 is no more than $1.2 \times$ as long as the merus in both sexes in *D. roccatagliatai*, while it is at least $1.3 \times$ or more as long as the merus in both sexes in *D. nordaustraliana*. In females of *D. nordaustraliana* the bases of maxilliped 3 and pereopod 2 are much wider than in females of *D. roccatagliatai*.

Dimorphostylis roccatagliatai n. sp.

Figs 24–27

Type material. Holotype ovigerous female, NMV J62369; paratype ovigerous female, dissected, NMV J46870; paratype preparatory female, dissected, NMV J46871; paratype adult male, dissected, NMV J46872; $11^{\circ}06'00''\text{S}$ $133^{\circ}00'00''\text{E}$, 8 m, G. C. B. Poore, 17 Oct. 1982.

Other material examined. 1 ovigerous female, 4 preparatory females, 1 adult male, 4 subadult males, 1 juvenile, 1 manca, NMV J46873; $11^{\circ}06'00''\text{S}$ $133^{\circ}00'00''\text{E}$, 8 m, G. C. B. Poore, 17 Oct. 1982.

Diagnosis. *Female and subadult male.* Carapace with 2 strong and 1 weak parallel oblique lateral ridges. Telson shorter than pleonite 6, with distinct post-anal portion, without lateral setae, with 2 terminal setae. *Adult male.* Carapace without ridges. Pleonites 3–4 with stout setae ventrolaterally to entrain antennal flagellum. Antennule with brush of setae on peduncle article 3. Antennae extending past posterior border of telson. Telson with distinct post-anal portion, with 1 pair lateral setae, 2 terminal setae.

Description

Ovigerous female. Holotype ovigerous female, NMV J62369, 2.6 mm; paratype ovigerous female, NMV J46870, 3.2 mm; paratype preparatory female, NMV J46871, 2.4 mm. —Carapace with dorsal ridge, origin near posterior margin, curving dorsal and forward to a point after $\frac{1}{3}$ of carapace length, then sweeping ventrally toward antennal notch, not meeting anterior margin of carapace, with strong ridge and inconspicuous weak ridge ventral and parallel to anterior part of dorsal ridge, dorsal fold of frontal lobe with irregular teeth, antennal notch oblique, with teeth; pseudorostral lobes $0.5 \times$ carapace length; eye lobe $0.1\text{--}0.2 \times$ carapace length, broader than long, with lenses; carapace $2\text{--}3 \times$ length of pereonites together (Figs 24A–C).

Paratype ovigerous female, NMV J46870, 3.2 mm. —Antennule peduncle article 1 $0.9 \times$ articles 2 and 3 together, with 1 pappose and 1 simple setae, margin with fine hair-like setae; article 2 $0.4 \times$ article 1 length with 2 simple, 2 pappose and 1 pedunculate setae; article 3 $1.6 \times$ article 2 length, with 3 simple and 1 pedunculate setae; main flagellum of 3 articles, with 2 aesthetascs; accessory flagellum of 2 articles, $0.5 \times$ main flagellum length, with 2 simple and 2 pedunculate setae (Fig. 24D). —Antenna of 3 articles; article 1 with simple seta; article 2 with plumose seta; article 3 with 2 simple and 1 plumose setae (Fig. 24E). —Mandible navicular, with 8 or 11 microserrate setae medially, large lacinia mobilis with 3 cusps (Fig. 24F). —Maxillule with 2 endites; outer endite with double row of stout simple setae, margin with simple seta and lined with fine hair-like setae; inner endite with 3 simple, 1 microserrate and 1 tricuspid setae; palp with 2 microserrate setae (Fig. 24G). —Maxilla with 3 endites; broad endite distal margin with row of simple setae, 3 microserrate and 1 pappose setae, medial margin with row of pedunculate setae; medial narrow endite with 4 microserrate setae terminally; distal narrow endite with 5 microserrate setae terminally; both narrow endites extending to distal corner of broad endite (Fig. 24H). —Maxilliped 1 basis expanded as lobe with 6 simple, 5 pappose and 1 microserrate setae, with pappose setae on main article; ischium absent;

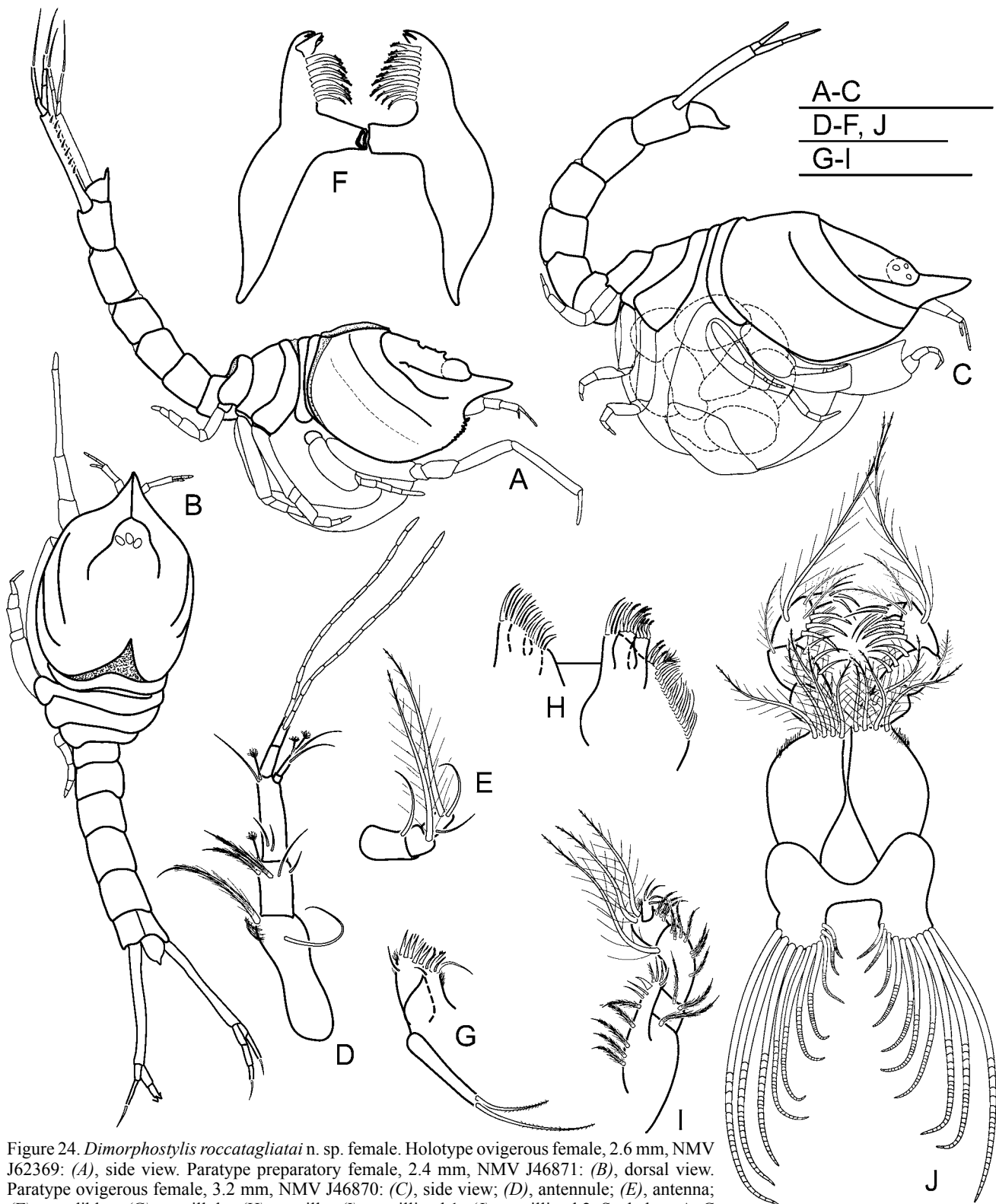


Figure 24. *Dimorphostylis roccatagliatai* n. sp. female. Holotype ovigerous female, 2.6 mm, NMV J62369: (A), side view. Paratype preparatory female, 2.4 mm, NMV J46871: (B), dorsal view. Paratype ovigerous female, 3.2 mm, NMV J46870: (C), side view; (D), antennule; (E), antenna; (F), mandibles; (G), maxillule; (H), maxilla; (I), maxilliped 1; (J), maxilliped 2. Scale bars A–C = 1.0 mm, D–J = 0.5 mm.

merus with 2 pappose setae; carpus $3.0 \times$ merus length, with 7 pappose and 1 plumose setae; propodus $0.5 \times$ carpus length, with 3 pappose and 2 plumose setae; dactylus $0.7 \times$ propodus length, with 4 simple setae terminally (Fig. 24I). —Maxilliped 2 basis $0.8 \times$ length of all other articles together, with 4 plumose setae distally; ischium $0.04 \times$ basis length, unarmed; merus $7.0 \times$ ischium length, with plumose seta; carpus $1.3 \times$ merus length, with 3 plumose setae medially

and plumose seta laterally; propodus $0.8 \times$ carpus length, with 3 plumo-dentate and 2 plumose setae medially, plumose seta laterally; dactylus $0.5 \times$ propodus length, with 4 simple setae terminally (Fig. 24J). —Maxilliped 3 basis $1.3 \times$ length of all other articles together, with 8 pappose setae medially, lateral margin lined with fine hair-like setae distally, distal corner weakly produced, with 4 plumose setae; ischium $0.1 \times$ basis length, with pappose seta medially and plumose

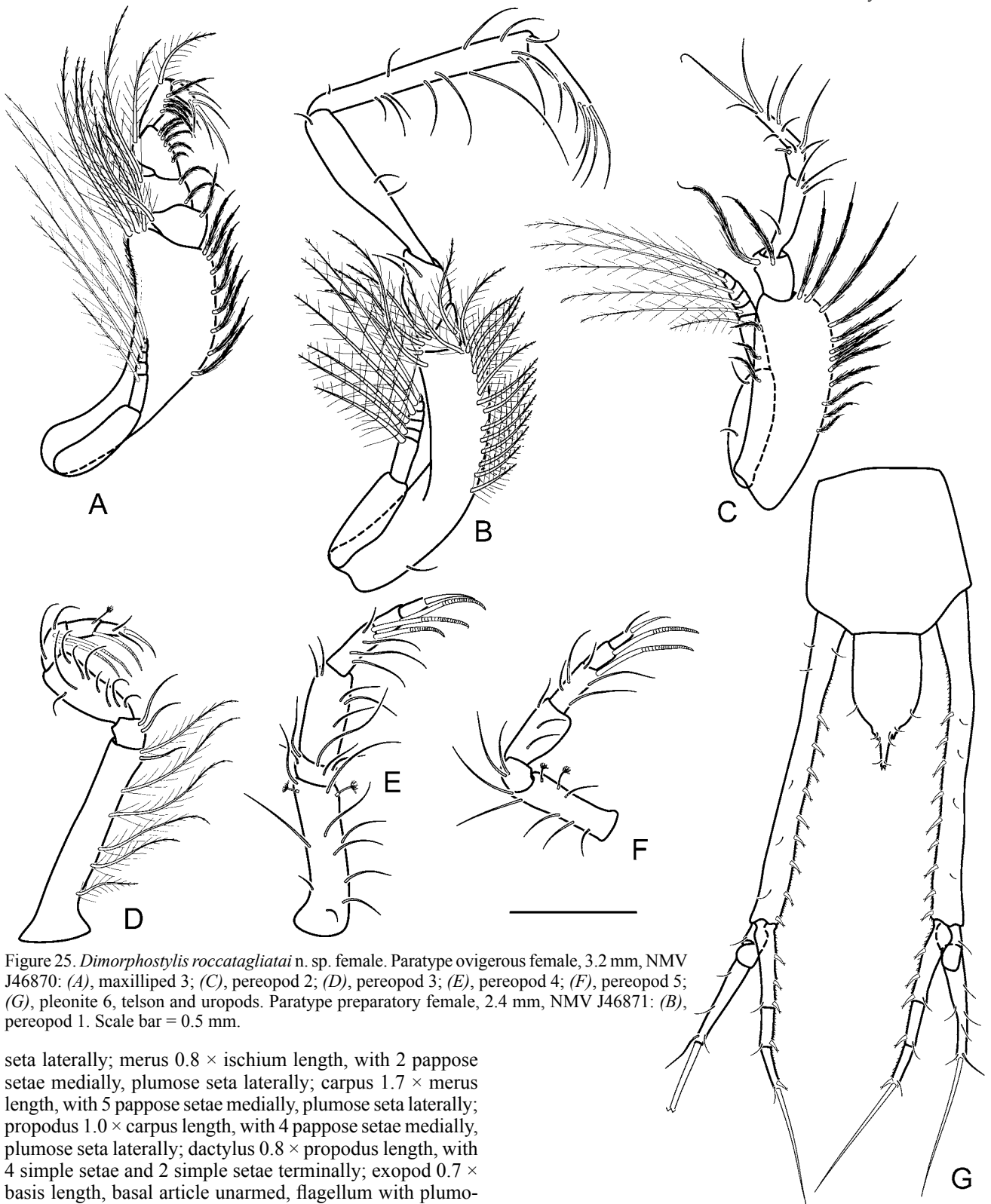


Figure 25. *Dimorphostylis roccatagliatai* n. sp. female. Paratype ovigerous female, 3.2 mm, NMV J46870: (A), maxilliped 3; (C), pereopod 2; (D), pereopod 3; (E), pereopod 4; (F), pereopod 5; (G), pleonite 6, telson and uropods. Paratype preparatory female, 2.4 mm, NMV J46871: (B), pereopod 1. Scale bar = 0.5 mm.

seta laterally; merus $0.8 \times$ ischium length, with 2 pappose setae medially, plumose seta laterally; carpus $1.7 \times$ merus length, with 5 pappose setae medially, plumose seta laterally; propodus $1.0 \times$ carpus length, with 4 pappose setae medially, plumose seta laterally; dactylus $0.8 \times$ propodus length, with 4 simple setae and 2 simple setae terminally; exopod $0.7 \times$ basis length, basal article unarmed, flagellum with plumo-annulate setae (Fig. 25A).

Paratype preparatory female, NMV J46871, 2.4 mm. — Pereopod 1 basis $0.5 \times$ length of all other articles together, with 1 simple and many plumose setae; ischium $0.1 \times$ basis length, with 3 plumose setae; merus $2.8 \times$ ischium length, with 2 simple setae; carpus $2.8 \times$ merus length, with 3 simple setae; propodus $1.2 \times$ carpus length, with 13 simple setae; dactylus $0.4 \times$ propodus length, with 3 simple setae and 3 simple setae terminally; exopod $0.7 \times$ basis length, basal article unarmed, flagellum with plumo-annulate setae (Fig. 25B).

Paratype ovigerous female, NMV J46870, 3.2 mm. — Pereopod 2 basis $1.0 \times$ length of all other articles together, with 15 pappose setae; ischium not visible; merus with 2 pappose setae; carpus $1.9 \times$ merus length, with 4 simple setae; propodus $0.4 \times$ carpus length, with 3 simple and 1 pedunculate setae; dactylus $1.7 \times$ propodus length, with 4 simple setae and 3 simple setae terminally; exopod $1.1 \times$ basis length, basal article with 2 simple setae, flagellum with plumo-annulate setae (Fig. 25C). — Pereopod 3 basis $1.1 \times$ length of all other articles together, with 1 simple and

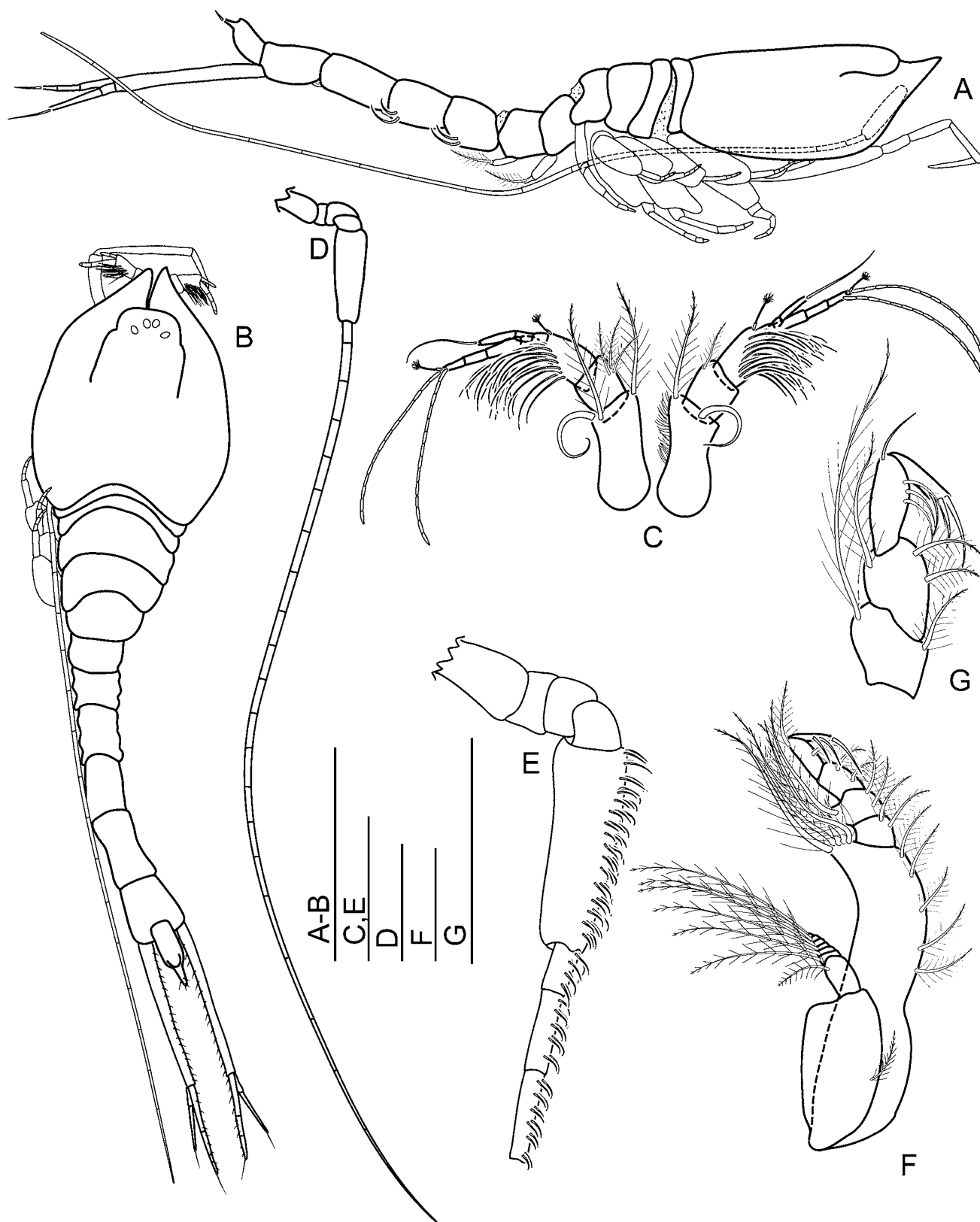


Figure 26. *Dimorphostylis roccatagliatai* n. sp. male. Paratype adult male, 3.2 mm, NMV J46872: (A), side view; (B), dorsal view; (C), antennules; (D), antenna; (E), antenna; (F), maxilliped 3; (G), maxilliped 3. Scale bars A–B = 1.0 mm, C–G = 0.5 mm.

6 plumose setae; ischium $0.1 \times$ basis length, with 2 simple setae; merus $3.0 \times$ ischium length, with 9 simple setae; carpus $0.4 \times$ merus length, with 2 simple and 2 annulate setae; propodus $0.6 \times$ carpus length, with 1 annulate and 1 pedunculate setae; dactylus $1.0 \times$ propodus length, with

2 simple setae and simple seta terminally (Fig. 25D). — Pereopod 4 basis $0.7 \times$ length of all other articles together, with 10 simple and 2 pedunculate setae; ischium $0.1 \times$ basis length, with 5 simple setae; merus $5.0 \times$ ischium length, with 5 simple setae; carpus $0.6 \times$ merus length, with 4 simple

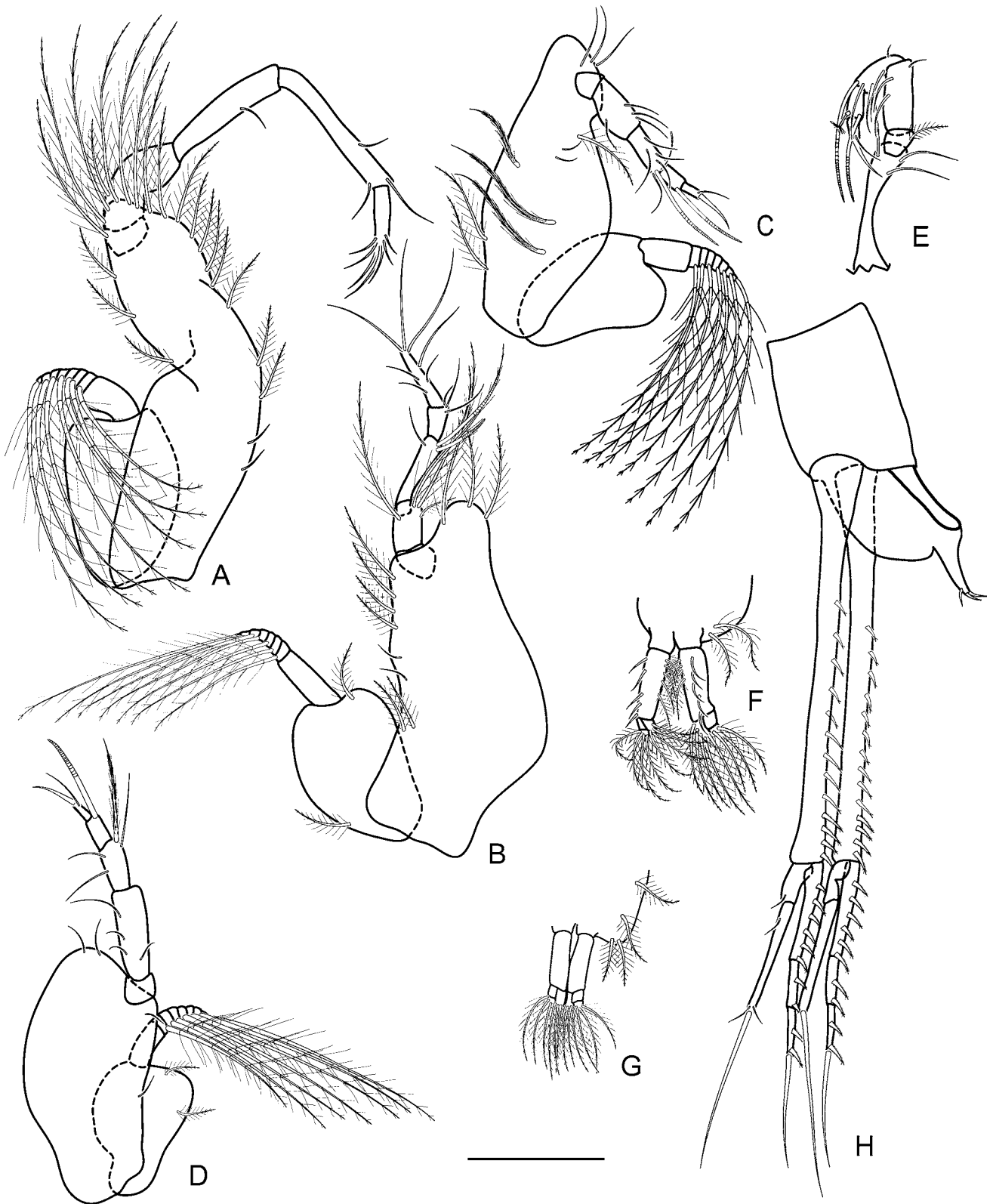


Figure 27. *Dimorphostylis roccatagliata* n. sp. male. Paratype adult male, 3.2 mm, NMV J46872: (A), pereopod 1; (B), pereopod 2; (C), pereopod 3; (D), pereopod 4; (E), pereopod 5; (F), pleopods 1; (G), pleopods 2; (H), pleonite 6, telson and uropods. Scale bar = 0.5 mm.

and 2 annulate setae; propodus $0.5 \times$ carpus length, with annulate seta; dactylus $1.0 \times$ propodus length, with simple seta terminally (Fig. 25E). —Pereopod 5 basis $0.5 \times$ length of all other articles together, with 6 simple and 2 pedunculate setae; ischium $0.3 \times$ basis length, with 2 simple setae; merus $2.2 \times$ ischium length, with 3 simple setae; carpus $0.8 \times$ merus

length, with 5 simple and 1 annulate setae; propodus $0.5 \times$ carpus length, with annulate seta; dactylus $0.8 \times$ propodus length, with 1 simple seta and simple seta terminally (Fig. 25F). —Telson $0.9 \times$ length of pleonite 6, with no lateral setae, 2 tiny terminal setae (Fig. 25G). —Uropod peduncles $1.9 \times$ pleonite 6 length, $2.3 \times$ telson length, medial margin

lined with fine hair-like setae, with scattered small simple setae, with 9 simple setae with single subterminal setule medially. Uropod endopod of 3 articles, medial margin lined with fine hair-like setae, $0.6 \times$ peduncle length; article 1 subequal to articles 2 and 3 together, with 3 simple setae with single subterminal setule medially, simple seta laterally; article 2 $0.5 \times$ article 1 length, with simple seta with single subterminal setule medially, with simple seta laterally; article 3 $1.0 \times$ article 2 length, with simple seta with single subterminal setule medially, simple seta laterally, simple terminal seta long. Uropod exopod of 2 articles, $0.9 \times$ length of endopod; article 1 $0.5 \times$ article 2 length, with simple seta; article 2 with 4 or 6 simple setae, simple terminal seta as long as exopod (Fig. 25G).

Adult male. Paratype adult male, NMV J46872, 3.2 mm. — Carapace unornamented; pseudorostral lobes $0.4 \times$ carapace length; eye lobe $0.1 \times$ carapace length, more than twice as broad as long, with lenses; carapace $2.3 \times$ length of pereonites together (Figs 26A–B). —Antennule peduncle article 1 $0.9 \times$ length of articles 2 and 3 together, with 1 simple and 1–2 plumose setae, medial margin lined with fine hair-like setae; article 2 $0.6 \times$ article 1 length, with 1 or 3 plumose setae; article 3 $0.8 \times$ article 2 length, with group of simple setae on lateral face, pedunculate seta on distomedial corner; main flagellum of 5 articles, with 2 aesthetascs and pedunculate seta; accessory flagellum of 3 articles, $0.6 \times$ main flagellum length, with simple seta (Fig. 26C). —Antenna extending at least to tips of uropod rami; peduncle of 5 articles; article 5 with ranks of short setae, incompletely circling article; flagellum with long articles, each with several short setae (Figs 26D–E). —Maxilliped 3 basis $1.7 \times$ length of all other articles together, with 5 plumose setae medially, lateral corner expanded, with 5 plumose setae; ischium $0.1 \times$ basis length, with 2 plumose setae medially; merus $1.0 \times$ ischium length, with plumose seta medially, plumose seta laterally; carpus $1.3 \times$ merus length, with 2 plumose setae medially, plumose seta laterally; propodus $1.2 \times$ carpus length, with 3 plumose setae medially, simple seta laterally; dactylus $0.7 \times$ propodus length, with 3 simple setae terminally; exopod $0.8 \times$ basis length, basal article with plumose seta, flagellum with plumo-annulate setae (Figs 26F–G). —Pereopod 1 basis $0.9 \times$ length of all other articles together, expanded distally to midpoint of merus, with 2 simple and many plumose setae; ischium $0.05 \times$ basis length, unarmed; merus $3.0 \times$ ischium length, unarmed; carpus $2.1 \times$ merus length, with simple seta; propodus $1.2 \times$ carpus length, with 3 simple setae; dactylus $0.4 \times$ propodus length, with 7 simple setae terminally; exopod $0.7 \times$ basis length, basal article unarmed, flagellum with plumo-annulate setae (Fig. 27A). —Pereopod 2 basis $1.2 \times$ length of all other articles together, expanded distally to distal border of merus, with 2 simple and 9 plumose setae; ischium $0.1 \times$ basis length, unarmed; merus $1.7 \times$ ischium length, with 4 plumose setae; carpus $1.9 \times$ merus length, with 1 simple and 2 annulate setae; propodus $0.3 \times$ carpus length, with 3 simple setae; dactylus $2.6 \times$ propodus length, with 4 simple setae and 3 simple setae terminally; exopod $0.9 \times$ basis length, basal article with 2 plumose setae, flagellum with plumo-annulate setae (Fig. 27B). —Pereopod 3 basis $1.5 \times$ length of all other articles together, expanded distally to midpoint of merus, with 3 simple, 2 plumose and 3 pappose setae; ischium $0.1 \times$ basis length, unarmed; merus $2.2 \times$ ischium length, with 4 simple setae; carpus $0.8 \times$ merus

length, with 6 simple and 1 annulate setae; propodus $0.6 \times$ carpus length, with annulate seta; dactylus $0.8 \times$ propodus length, with simple seta and simple seta terminally; exopod $0.9 \times$ basis length, basal article unarmed, flagellum with plumo-annulate setae (Fig. 27C). —Pereopod 4 basis $1.0 \times$ length of all other articles together, expanded distally to midpoint of merus, with 3 simple setae; ischium $0.1 \times$ basis length, unarmed; merus $4.5 \times$ ischium length, with 4 simple setae; carpus $0.6 \times$ merus length, with 3 simple and 1 pappose setae; propodus $0.5 \times$ carpus length, with annulate seta; dactylus $0.8 \times$ propodus length, with simple seta and simple seta terminally; exopod $1.1 \times$ basis length, basal article with 2 plumose setae, flagellum with plumo-annulate setae (Fig. 27D). —Pereopod 5 basis narrow, with 3 simple setae; ischium with plumose seta; merus $2.2 \times$ ischium length, with 3 simple setae; carpus $0.6 \times$ merus length, with 2 simple and 1 annulate setae; propodus $0.8 \times$ carpus length, with 1 pedunculate and 1 annulate setae; dactylus $0.7 \times$ propodus length, with simple seta and simple seta terminally (Fig. 27E). —Pleopod 1 peduncle with 6 simple and 5 plumose setae; endopod uniarticulate, without process, with 4 plumose setae; exopod biarticulate, with 4 plumose setae (Fig. 27F). —Pleopod 2 peduncle unarmed; endopod uniarticulate, without process, with 3 plumose setae; exopod biarticulate, with 4 plumose setae (Fig. 27G). —Telson $0.8 \times$ length of pleonite 6, with 1 pair simple lateral setae, 2 simple terminal setae (Fig. 27H). —Uropod peduncles $2.4 \times$ pleonite 6 length, $2.9 \times$ telson length, with 9–10 simple setae with single subterminal setule and 4 microserrate setae with single subterminal setule medially. Uropod endopod of 3 articles, $0.5 \times$ peduncle length; article 1 $1.1 \times$ length of articles 2 and 3 together, with 6 microserrate setae with single subterminal setule medially; article 2 $0.5 \times$ article 1 length, with 2 microserrate setae with single subterminal setule medially; article 3 $1.0 \times$ article 2 length, with 2 microserrate setae with single subterminal setule medially, terminal seta simple. Uropod exopod $0.8 \times$ length of endopod; article 1 $0.3 \times$ article 2 length, with simple seta; article 2 3 simple setae, simple terminal seta as long as exopod (Fig. 27H).

Etymology. The species is named *roccatagliatai* in honor of Daniel Roccatagliata, for all his work on the order Cumacea.

Remarks. The most similar species is the new species *Dimorphostylis nordaustriana*, which presents an overall similar appearance in the females and males, as well as being a similar size. However, there are differences between *D. nordaustriana* and *D. roccatagliatai* in female carapace morphology and antenna and in both sexes in the proportions of pereopod 1. In females of *D. roccatagliatai* there are 2 prominent and 1 faint parallel ridges laterally on the carapace, while females of *D. nordaustriana* only have one ridge and parallel narrow depression. In both sexes of *D. roccatagliatai* the propodus of pereopod 1 is no more than $1.2 \times$ the merus length, while in *D. nordaustriana* the propodus of pereopod is at least $1.3 \times$ the merus length. In addition, in females of *D. nordaustriana* the bases of maxilliped 3 and pereopod 2 are much wider than in *D. roccatagliatai*. The males of *D. nordaustriana* have a slender exopod on pereopod 1 and the pereopods are generally less setose, while in *D. roccatagliatai* the exopod on pereopod 1 is very broad, and the pereopods are generally more setose.

Dimorphostylis triplicata n. sp.

Figs 28–29

Type material. Holotype adult male, NMV J46874; paratype adult male, dissected, NMV J46875; paratypes 1 subadult male, 1 manca NMV J46876; 11°06'00"S 133°00'00"E, 8 m, G. C. B. Poore, 17 Oct. 1982.

Other material examined. None.

Diagnosis. *Female and subadult male.* Female unknown. Carapace with 3 parallel oblique ridges, connected dorsally by short curved ridges, and terminally by short vertical ridges, serrate ridges on pseudorostral lobe. *Adult male.* Carapace with 3 parallel oblique lateral ridges, not connected anteriorly, not reaching anterior margin of carapace. Antennule with brush of setae covering at least half of surface of peduncle article 3. Antennae extending to posterior border of telson. Telson much longer than pleonite 6, no post-anal portion present, without stout lateral setae, with 2 tiny terminal setae.

Description

Subadult male. Paratype subadult male, NMV J46876, 2.9 mm. —Carapace with 3 parallel ridges originating posterior dorsally, sweeping anterior and ventral to anterior $\frac{1}{3}$ of carapace, connected by short vertical ridge terminating in tooth at corner of vertical ridge and dorsal most ridge, serrate ridge continuing anterior from tooth on pseudorostral lobe, terminating near eye lobe, dorsal fold of frontal lobe with scattered teeth, scattered long setae on carapace, antennal notch not deep; pseudorostral lobes $0.3 \times$ carapace length; eye lobe $0.06 \times$ carapace length, with dorsal tooth and lenses; carapace $3.9 \times$ length of pereonites together (Fig. 28C).

Adult male. Holotype adult male, NMV J46874, 3.4 mm; paratype adult male, NMV J46875, 3.4 mm. —Carapace longer and less deep than subadult male, with 3 parallel ridges originating posterior dorsally, sweeping anterior and ventral, without vertical ridge connecting parallel ridges; pseudorostral lobes $0.4\text{--}0.5 \times$ carapace length; eye lobe $0.1 \times$ carapace length, with lenses; carapace $2.8 \times$ length of pereonites together (Figs 28A–B). —Paratype adult male, NMV J46875, 3.4 mm. —Antennule peduncle article 1 $1.0 \times$ length of articles 2 and 3 together, with simple seta, margin lined with fine hair-like setae; article 2 $0.4 \times$ article 1 length, with 4 pappose setae, margins lined with simple setae; article 3 $1.4 \times$ article 2 length, with thick brush of simple setae on lateral face, with pedunculate seta; main flagellum of 5 articles, with 1 aesthetasc and 2 simple setae; accessory flagellum of 3 articles, $0.6 \times$ main flagellum length, with 2 simple setae terminally (Figs 28D–E). —Antenna extending to end of uropod peduncles; article 5 with ranks of short setae incompletely circling article, and pappose seta; flagellum with long articles, each with several groups of short setae (Fig. 28F). —Mandible navicular, with 11 microserrate setae medially (Fig. 29A). —Maxillule with 2 endites; outer endite with double row of stout simple setae; inner endite broken off; palp with 2 microserrate setae (Fig. 29B). —Maxilla with 3 endites; broad endite distal margin with pappose seta, row of simple setae and 4 pappose setae, medial margin

lined with row of pedunculate setae and 2 pappose setae; medial narrow endite with 4 microserrate setae terminally; distal narrow endite with 5 microserrate setae terminally; inner endite not extending past distal corner of broad endite, outer narrow endite extending to distal corner of broad endite (Fig. 29C). —Maxilliped 1 basis produced as lobe with 2 simple, 7 pappose, 2 hook and 1 stout beak-like setae; ischium absent; merus distal margin lined with fine hair-like setae; carpus $1.5 \times$ merus length, with 4 beak setae and simple setae medially, lateral margin lined with fine hair-like setae, with plumose seta; propodus $0.8 \times$ carpus length, with 4 plumose, 1 pappose and 2 serrate setae; dactylus $0.4 \times$ propodus length, with 4 simple setae terminally (Fig. 29D). —Maxilliped 2 basis $1.0 \times$ length of all other articles together, with 2 simple and 3 plumose setae distally; ischium $0.03 \times$ basis length, unarmed; merus $6.0 \times$ ischium length, with 1 plumose and 1 pappose setae; carpus $2.2 \times$ merus length, with 5 plumose setae medially, plumose seta laterally; propodus $1.0 \times$ carpus length, with 3 serrate and 4 plumose setae medially, plumose seta laterally; dactylus $0.3 \times$ propodus length, with 2 simple setae terminally (Fig. 29E). —Maxilliped 3 basis $1.9 \times$ length of all other articles together, with 7 plumose and 1 pappose setae medially, distal corner broad, with 5 plumose setae; ischium $0.05 \times$ basis length, with pappose seta; merus $2.0 \times$ ischium length, with 3 pappose setae medially; carpus $1.3 \times$ merus length, with 2 simple setae medially; propodus $1.1 \times$ carpus length, with 4 simple setae medially, plumose seta laterally; dactylus $0.6 \times$ propodus length, with 5 simple setae terminally; exopod $0.7 \times$ basis length, basal article unarmed, flagellum with plumo-annulate setae (Fig. 29F). —Pereopod 1 basis $0.6 \times$ length of all other articles together, with 4 plumose setae distally; ischium $0.1 \times$ basis length, unarmed; merus $1.7 \times$ ischium length, with simple seta; carpus $3.3 \times$ merus length, with simple seta; propodus $1.4 \times$ carpus length, with 21 simple setae; dactylus $0.3 \times$ propodus length, with 2 simple setae and 6 simple setae terminally; exopod $0.7 \times$ basis length, basal article with 2 simple setae, flagellum with plumo-annulate setae (Fig. 29G). —Pereopod 2 basis $1.1 \times$ length of all other articles together, expanded distally to midpoint of carpus, with 14 plumose setae; ischium $0.1 \times$ basis length, unarmed; merus $2.8 \times$ ischium length, with 3 simple setae; carpus $1.0 \times$ merus length, with 5 simple setae; propodus $0.5 \times$ carpus length, with simple seta; dactylus $1.8 \times$ propodus length, with 5 simple setae terminally; exopod $1.0 \times$ basis length, basal article unarmed, flagellum with plumo-annulate setae (Fig. 29H). —Pereopod 3 basis $1.3 \times$ length of all other articles together, expanded distally past ischium, with 1 simple and 9 plumose setae; ischium $0.07 \times$ basis length, unarmed; merus $4.0 \times$ ischium length, with simple seta; carpus $0.8 \times$ merus length, with 3 simple and 1 annulate setae; propodus $0.6 \times$ carpus length, with 1 pedunculate and 1 annulate setae; dactylus $0.6 \times$ propodus length, with 3 simple setae terminally; exopod $1.0 \times$ basis length, basal article unarmed, flagellum with plumo-annulate setae (Fig. 29I). —Pereopod 4 basis $1.0 \times$ length of all other articles together, expanded distally past ischium, with 6 plumose setae; ischium $0.1 \times$ basis length, with 2 simple setae; merus $4.0 \times$ ischium length, with 6 simple setae; carpus $0.8 \times$ merus length, with 4 simple and 1 annulate setae; propodus $0.4 \times$ carpus length, with annulate seta; dactylus $1.0 \times$ propodus length, with 2 simple setae terminally; exopod

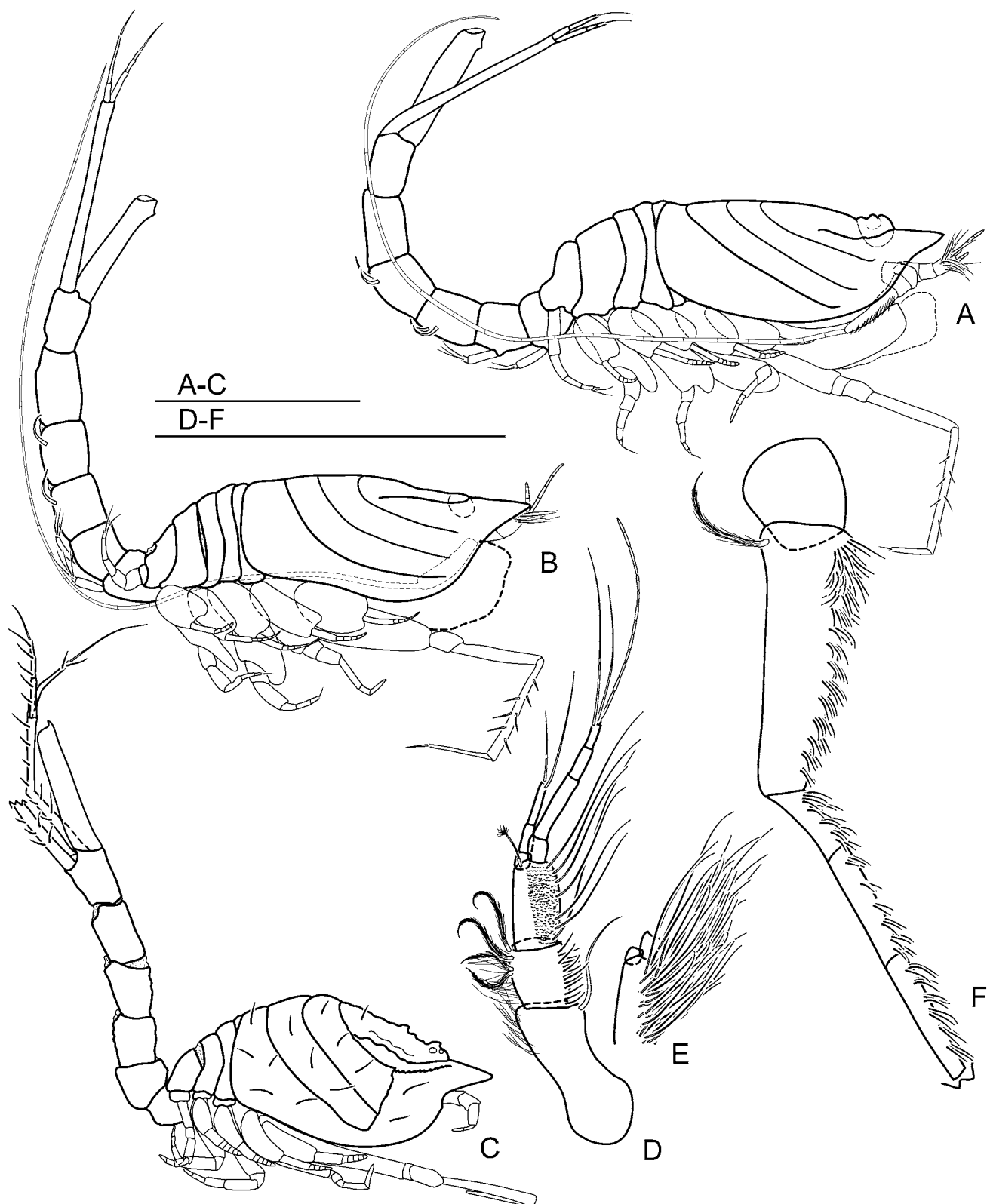


Figure 28. *Dimorphostylis triplicata* n. sp. male. Holotype adult male, 3.4 mm, NMV J46874: (A), side view. Paratype adult male, 3.4 mm, NMV J46875: (B), side view; (D), antennule without setal brush; (E), antennule article 3 with setal brush; (F), antenna. Paratype subadult male, 2.9 mm, NMV J46876: (C), side view. Scale bars A–C = 1.0 mm, D–F = 0.5 mm.

1.1 × basis length, basal article unarmed, flagellum with plumo-annulate setae (Fig. 29J). —Pereopod 5 basis 0.7 × length of all other articles together, with 4 simple setae; ischium 0.2 × basis length, with 2 simple setae; merus 3.0 × ischium length, with 3 simple setae; carpus 0.9 ×

merus length, with 6 simple setae; propodus 0.6 × carpus length, with 1 pedunculate and 1 annulate setae; dactylus 0.8 × propodus length, with 3 simple setae terminally (Fig. 29K). —Pleopod 1 peduncle with 4 simple and 4 plumose setae; endopod uniaarticulate, with 3 plumose setae; exopod

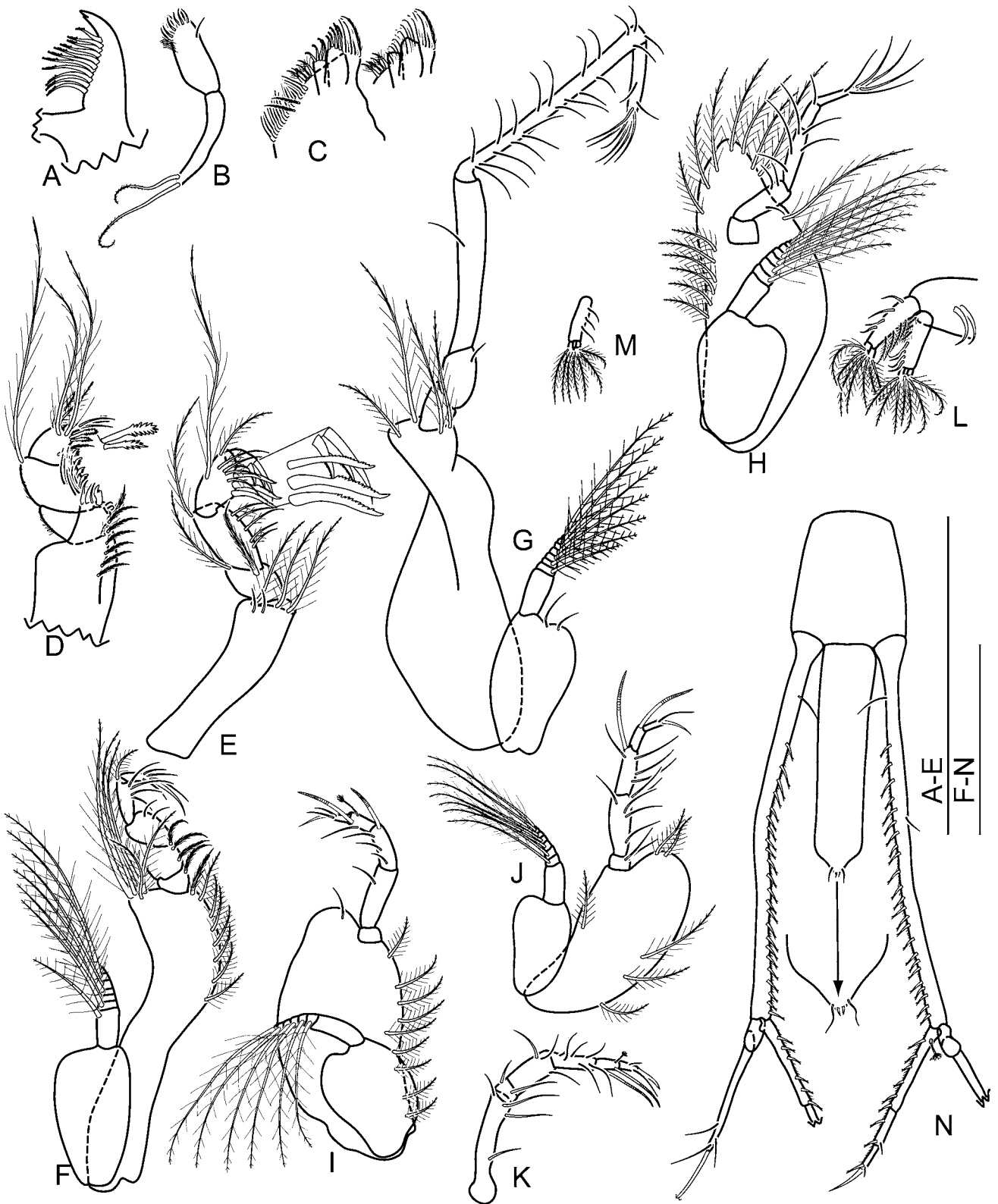


Figure 29. *Dimorphostylis triplicata* n. sp. male. Paratype adult male, 3.4 mm, NMV J46875: (A), mandible; (B), maxillule; (C), maxilla; (D), maxilliped 1; (E), maxilliped 2; (F), maxilliped 3; (G), pereopod 1; (H), pereopod 2; (I), pereopod 3; (J), pereopod 4; (K), pereopod 5; (L), pleopods 1; (M), pleopods 2; (N), pleonite 6, telson and uropods. Scale bars = 0.5 mm.

biarticulate with 4 plumose setae (Fig. 29L). —Pleopod 2 peduncle with 4 simple setae; endopod uniarticulate, with 3 plumose setae; exopod biarticulate with 3 plumose setae (Fig. 29M). —Telson 1.7 × length of pleonite 6, without lateral stout setae, 2 tiny terminal setae (Fig. 29N). —

Uropod peduncles 2.9 × pleonite 6 length, 1.7 × telson length, with 1 simple and 23–24 simple setae with single subterminal setule medially, medial margin lined with fine hair-like setae. Uropod endopod of 3 articles, 0.4 × peduncle length; article 1 1.2 × length of articles 2 and 3

together, with 6 simple setae with single subterminal setule medially, medial margin lined with fine hair-like setae, pedunculate seta laterally; article 2 $0.5 \times$ article 1 length, with 2 simple setae with single subterminal setule medially, medial margin lined with fine hair-like setae, simple seta laterally; article 3 $0.7 \times$ article 2 length, with simple seta with single subterminal setule medially, medial margin lined with fine hair-like setae, simple seta laterally, terminal seta simple. Uropod exopod $0.8 \times$ length of endopod; article 1 $0.3 \times$ article 2 length, unarmed; article 2 with 3 simple setae, terminal seta broken (Fig. 29N).

Etymology. The species is named *triplicata* for the three lateral ridges or *plica* present on the carapace.

Remarks. The female of *Dimorphostylis triplicata* is not currently known, thus it is possible that the species should be placed in *Paradiastylis*. Differentiation between *Paradiastylis* and *Dimorphostylis* is impossible without the females, as the only consistent differences are the lack of an exopod on maxilliped 3 and the presence of rudimentary exopods on pereopods 3–4 in the *Paradiastylis* female, while the females of *Dimorphostylis* have an exopod on maxilliped 3 and no exopods on pereopods 3–4.

The subadult male *Dimorphostylis triplicata* is similar in carapace ornamentation and the long telson to the female of the new species *Paradiastylis occidentaustralis*. However, the species can be differentiated by the proportions of pereopod 1. In *P. occidentaustralis* the propodus of pereopod 1 is distinctly longer than the basis, while in *D. triplicata* the propodus of pereopod 1 is distinctly shorter than the basis. As the adult male of *P. occidentaustralis* is not currently known, it may be confused with the male of *D. triplicata*. The carapace architecture of the female of *D. triplicata* is expected to be similar to the subadult male.

The adult male of the new species is similar to the adult male illustrated by Hale (1945) for *Dimorphostylis australis*; however, the proportions of the articles of pereopod 1 vary, with a relatively longer carpus and dactylus in *D. australis*, and a relatively shorter carpus and dactylus in *D. triplicata*. The carapace of the subadult male, collected at the same time and place as the adult male, is quite different from that illustrated by Foxon (1932) for the female of *D. australis*. Despite the poor quality of the Foxon illustrations, it is clear that in his female specimen the three ridges on the carapace continued forward to the anterior margin of the carapace, there is no indication of a vertical ridge, and there are four tubercles shown dorsally. In contrast, the subadult male of the new species has three lateral ridges that meet a vertical ridge well posterior of the anterior margin. As subadult male and female cumaceans typically have very similar carapace morphology, it is expected that the female of this species will resemble the subadult male, and thus be quite different from the female of *D. australis*.

Makrokylindrus Stebbing, 1912

Type species. *Makrokylindrus fragilis* Stebbing, 1912.

Diagnosis. Telson longer than uropod peduncles, without lateral setation, without distinct post-anal portion.

Remarks. This species is included in a short key with the new species of *Diastylis*. As noted by Day (1980), the genera *Diastylis* and *Makrokylindrus* may be difficult to impossible to differentiate, as the generic diagnoses rely on telson pre and post-anal proportions and setation.

Australian species. *Makrokylindrus eirmoacanthus* n. sp.

Makrokylindrus eirmoacanthus n. sp.

Figs 30–31

Type material. Holotype subadult female, AM P85802; paratype subadult female, dissected, AM P85803; paratypes, 1 ovigerous female, 5 subadult females, AM P85804; $33^{\circ}40' - 33^{\circ}43'S$ $152^{\circ}04' - 152^{\circ}06'E$, 1108–1115 m, FRV “Kapala”, 19 Dec. 1985. Paratype subadult female, dissected, AM P85806, $33^{\circ}35' - 33^{\circ}37'S$ $152^{\circ}05'E$, 1144 m, FRV “Kapala”, 10 Dec. 1980.

Other material examined. 2 individuals, AM P85805, $33^{\circ}29'S$ $152^{\circ}06'E$, 523 m, FRV “Kapala”, 11 Feb. 1986. 1 female, AM P85807, $33^{\circ}26'S$ $152^{\circ}11'E$, 869 m, FRV “Kapala”, 6 Dec. 1979. 1 ovigerous female, 3 subadult females, AM P85808, $33^{\circ}31' - 33^{\circ}33'S$ $152^{\circ}07' - 152^{\circ}08'E$, 914 m, R. Springthorpe, 10 Dec. 1980.

Diagnosis. *Female and subadult male.* Carapace produced as 2 pairs of large horns, one pair on the pseudorostral lobes, one pair ventrolaterally, with many short serrate ridges, ventral margin strongly serrate, with serrate ridges on pseudorostrum, pseudorostrum ending in pair of large teeth. Pereonites 3–5 and pleonites 1–3 with pair of large dorsal spines. Uropod endopod of 2 articles. *Adult male.* Unknown.

Description

Subadult female. Holotype subadult female, AM P85802, 7.5 mm; paratype subadult female, AM P85803, 7.1 mm; paratype subadult female, AM P85806, 7.3 mm. —Carapace bulbous, branchial regions expanded, with many lines of small spines, with 2 pairs of large spines, one on pseudorostral lobes, one at ventrolateral corner; pseudorostral lobes $0.4 \times$ carapace length, with row of small spines terminating in long spine, with pair of medium spines terminally; eye lobe $0.04 \times$ carapace length, without lenses; carapace $2.0 - 2.4 \times$ length of pereonites together. Pereonites 1–2 with 1–2 rows of small spines; pereonites 3–5 with pair of large spines dorsally. Pleonites 1–3 with pair of large spines dorsally; pleonites 4–6 with scattered small spines, pleonite 5 longest (Figs 30A–C). —Paratype subadult female, AM P85803, 7.1 mm. —Antennule peduncle article 1 $0.9 \times$ length of articles 2 and 3 together, with 2 plumose setae; article 2 $0.6 \times$ article 1 length, with simple seta; article 3 $0.8 \times$ article 2 length, with 3 simple setae; main flagellum of 4 articles, with 1 aesthetasc and 2 simple setae; accessory flagellum of 2 articles, $0.2 \times$ main flagellum length, shorter than main flagellum article 1, with 3 simple setae (Fig. 30D). —Antenna of 2 articles; article 1 long, with pappose

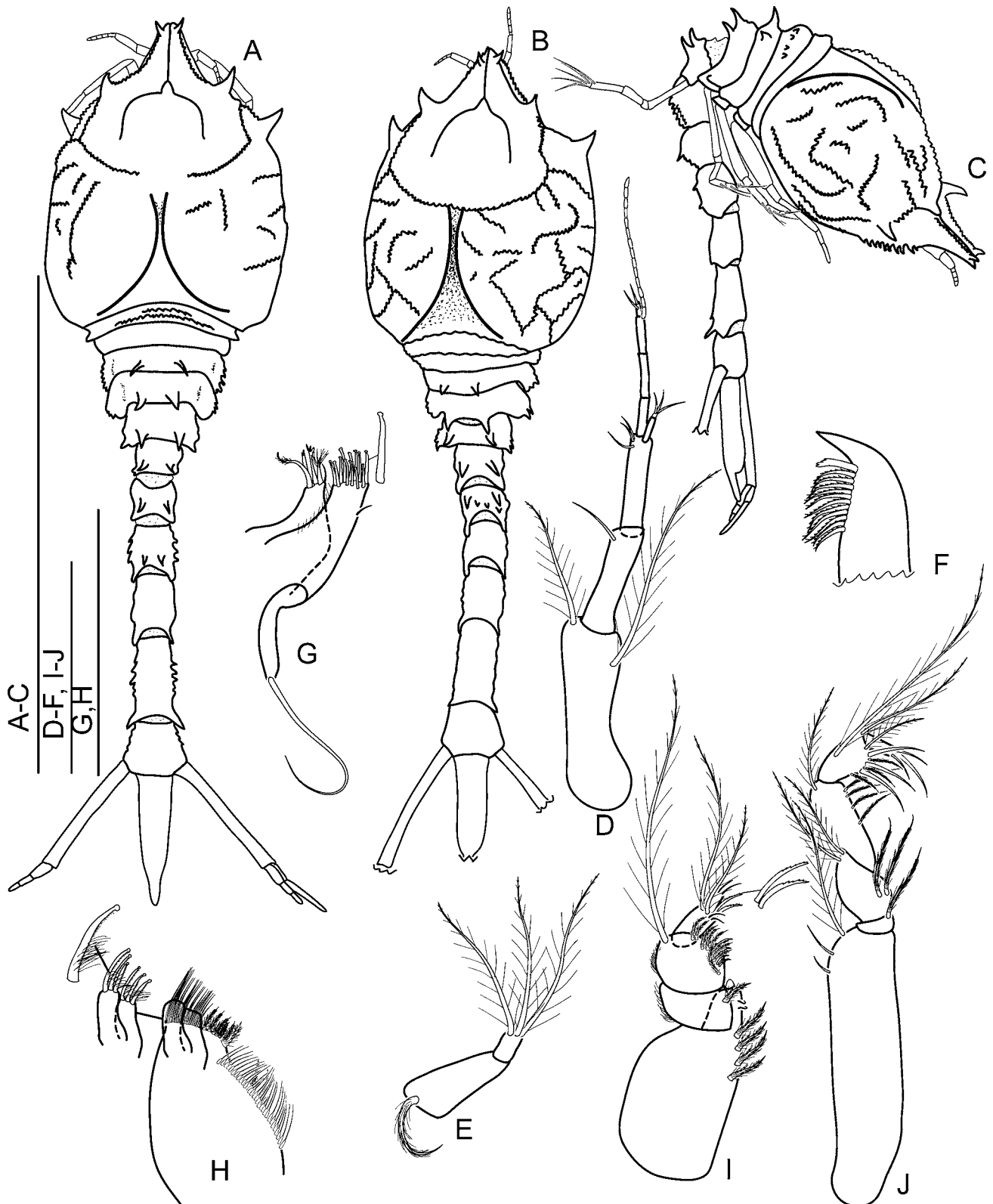


Figure 30. *Makrokyllindrus eirmoacanthus* n. sp. female. Holotype subadult female, 7.5 mm, AM P85802: (A), dorsal view. Paratype subadult female, 7.1 mm, AM P85803: (B), dorsal view; (D), antennule; (E), antenna; (F), mandible; (G), maxillule; (H), maxilla; (I), maxilliped 1; (J), maxilliped 2. Paratype subadult female, 7.3 mm, AM P85806: (C), dorsal/side view. Scale bars A–C = 5.0 mm, D–J = 0.5 mm.

seta; article 2 with 3 plumose setae (Fig. 30E). —Mandible with 11 microserrate setae medially, lacinia mobilis with 3 cusps (Fig. 30F). —Maxillule with 2 endites; outer endite with double row of setae bulbous terminally; inner endite with 1 simple, 2 microserrate and 2 tricuspoid setae; palp with

single seta (Fig. 30G). —Maxilla with 3 endites; broad endite distal margin with row of simple setae and pappose setae, medial margin with row of pedunculate setae and pappose seta; medial narrow endite with 3 setae with long setules proximally, short setules distally, bulbous terminally; distal

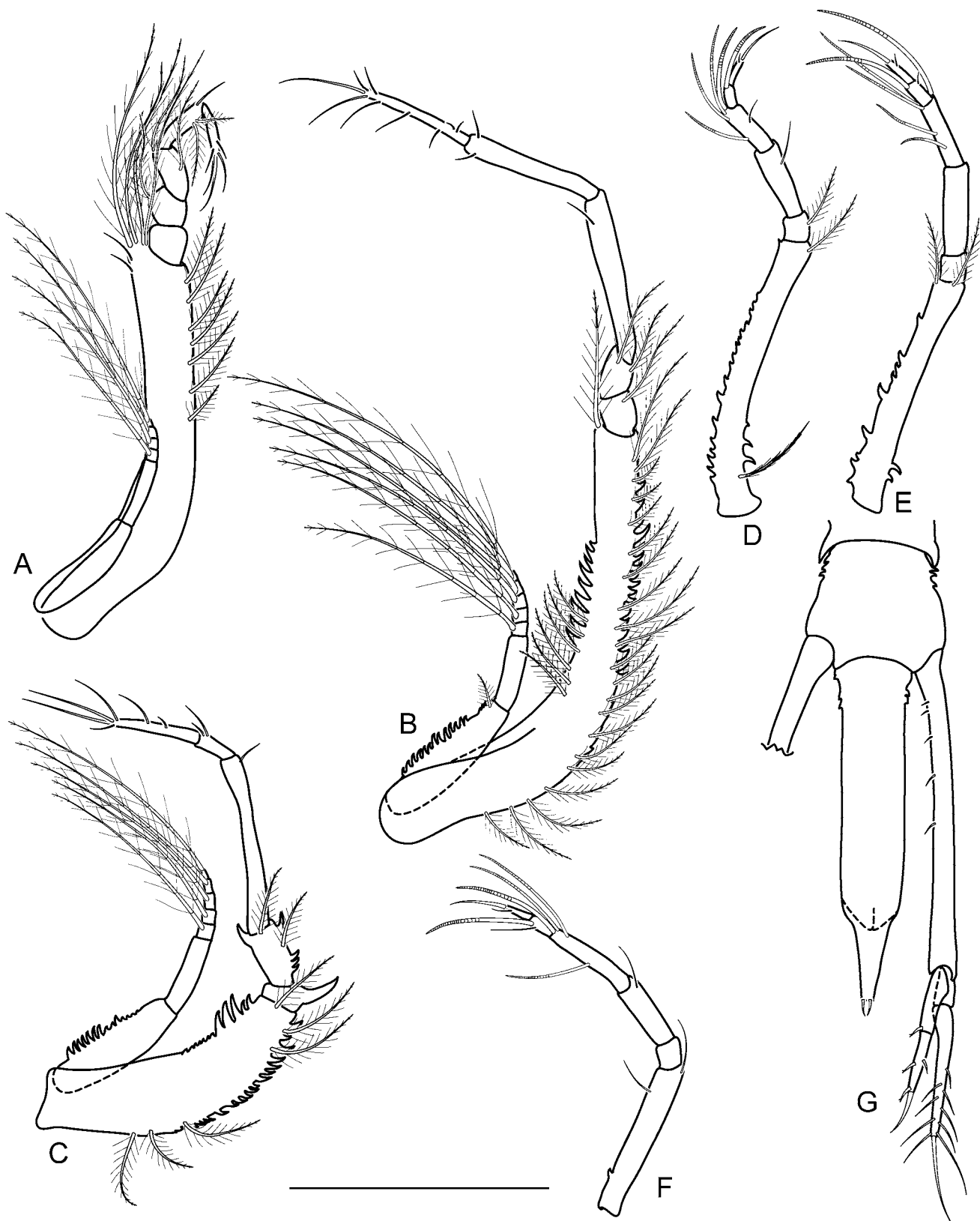


Figure 31. *Makrokyllindrus eirmoacanthus* n. sp. female. Paratype subadult female, 7.1 mm, AM P85803: (A), maxilliped 3; (B), pereopod 1; (C), pereopod 2; (D), pereopod 3; (E), pereopod 4; (F), pereopod 5. Paratype subadult female, 7.3 mm, AM P85806: (G), pleonite 6, telson and uropod. Scale bar = 1.0 mm.

narrow endite with 3 setae with long setules proximally, short setules distally, bulbous terminally; both narrow endites extending past distal margin of broad endite (Fig. 30H). —Maxilliped 1 basis produced as lobe, with 5 pappose, 2

hook and 1 very stout simple setae; ischium absent; merus lateral margin lined with fine hair-like setae; carpus 1.8 × merus length, with 4 beak and 7 pappose setae medially, lateral margin lined with fine hair-like setae, with plumose

seta; propodus $0.5 \times$ carpus length, with 2 simple, 2 dentate and 2 plumose setae; dactylus $0.6 \times$ propodus length, with 2 simple setae (Fig. 30I). —Maxilliped 2 basis $1.2 \times$ length of all other articles together, with 2 simple and 1 plumose setae distally; ischium $0.04 \times$ basis length, with pappose seta; merus $5.0 \times$ ischium length, with 2 pappose setae medially, 2 plumose setae laterally; carpus $1.6 \times$ merus length, with 4 pappose setae medially, plumose seta laterally; propodus $0.6 \times$ carpus length, with 3 simple and 3 pappose setae medially, 2 plumose setae laterally; dactylus $0.6 \times$ propodus length, with 3 simple setae terminally (Fig. 30J). —Maxilliped 3 slender, basis $1.8 \times$ length of all other articles together, with 7 plumose setae medially, distal corner with 2 simple and 4 plumose setae; ischium $0.09 \times$ basis length, unarmed; merus $0.8 \times$ ischium length, with plumose seta laterally; carpus $1.8 \times$ merus length, with plumose seta medially, plumose seta laterally; propodus $1.0 \times$ carpus length, with 2 plumose setae medially, simple seta laterally; dactylus $0.9 \times$ propodus length, with 5 simple setae terminally; exopod $0.6 \times$ basis length, basal article unarmed, flagellum with plumo-annulate setae (Fig. 31A). —Pereopod 1 basis $0.9 \times$ length of all other articles together, with many plumose setae, lateral margins produced as strong teeth; ischium $0.08 \times$ basis length, with plumose seta; merus $0.8 \times$ ischium length, with 2 plumose setae; carpus $5.8 \times$ merus length, with simple seta; propodus $0.8 \times$ carpus length, with 2 simple setae; dactylus $0.8 \times$ propodus length, with 5 simple setae and 3 simple setae terminally; exopod $0.6 \times$ basis length, basal article with plumose seta, margin produced as many strong teeth, flagellum with plumo-annulate setae (Fig. 31B). —Pereopod 2 basis $0.7 \times$ length of all other articles together, with 6 plumose setae, lateral margins produced as teeth, increasing in size distally; ischium $0.07 \times$ basis length, produced as single large tooth; merus $3.3 \times$ ischium length, with 2 plumose setae, margins produced as teeth, increasing in size distally; carpus $3.0 \times$ merus length, with simple seta; propodus $0.2 \times$ carpus length, with 2 simple setae; dactylus $2.5 \times$ propodus length, with 4 simple setae and 2 simple setae terminally; exopod $1.1 \times$ basis length, basal article produced as many teeth, decreasing in size distally, flagellum with plumo-annulate setae (Fig. 31C). —Pereopod 3 basis $1.5 \times$ length of all other articles together, with 1 plumose and 1 pappose setae, lateral margins produced as teeth, decreasing in size distally; ischium $0.1 \times$ basis length, with plumose seta; merus $2.4 \times$ ischium length, with simple seta; carpus $0.8 \times$ merus length, with 1 simple and 4 annulate setae; propodus $0.3 \times$ carpus length, with annulate seta; dactylus $1.3 \times$ propodus length, with simple seta and simple seta terminally (Fig. 31D). —Pereopod 4 basis $1.0 \times$ length of all other articles together, with 2 plumose setae, lateral margins

produced as scattered teeth, decreasing in size distally; ischium $0.1 \times$ basis length, unarmed; merus $3.8 \times$ ischium length, unarmed; carpus $0.8 \times$ merus length, with 5 annulate setae; propodus $0.3 \times$ carpus length, with 1 simple and 1 annulate setae; dactylus $1.3 \times$ propodus length, with simple seta and simple seta terminally (Fig. 31E). —Pereopod 5 basis $0.7 \times$ length of all other articles together, with 2 simple setae, margin produced as tooth; ischium $0.1 \times$ basis length, unarmed; merus $2.8 \times$ ischium length, with simple seta; carpus $1.5 \times$ merus length, with 4 annulate setae; propodus $0.3 \times$ carpus length, with 1 simple and 1 annulate setae; dactylus $1.0 \times$ propodus length, with simple seta and simple seta terminally (Fig. 31F). —Paratype subadult female, AM P85806, 7.3 mm. —Telson $3.0 \times$ length of pleonite 6, without lateral setae, 2 simple terminal setae (Fig. 31G). —Uropod peduncles $2.7 \times$ pleonite 6 length, $0.9 \times$ telson length, with 5 small simple setae proximally. Uropod endopod of 2 articles, $0.4 \times$ peduncle length; article 1 with simple seta with single subterminal setule medially; article 2 $0.9 \times$ article 1 length, with 2 simple setae with single subterminal setule medially, with simple seta laterally, terminal seta simple. Uropod exopod of 2 articles, $1.3 \times$ length of endopod; article 1 $0.3 \times$ article 2 length; article 2 with 9 simple setae laterally, terminal seta simple (Fig. 31G).

Etymology. The species is named *eirmoacanthus* from the Greek *eirmos* meaning in a line in combination with *acanthus* meaning spines. The name refers to the multiple lines of spines present on the carapace.

Remarks. This is the only species in the genus currently known from Australian waters. The carapace ornamentation is unique within the Australian diastylid fauna.

Paradiastylis Calman, 1904

Type species. *Paradiastylis brachyura* Calman, 1904.

Diagnosis. *Female.* Without exopod on maxilliped 3. *Adult male.* Bases of pereopods 1–4 greatly expanded, bases of exopods on pereopods 1–4 expanded.

Remarks. *Paradiastylis* and *Dimorphostylis* can only be reliably separated by the maxilliped 3 exopod, absent in *Paradiastylis* females and present in *Dimorphostylis* females. If females are not present, it may not be possible to differentiate between the two genera.

Australian species. *Paradiastylis berentsae* n. sp.; *P. botanybayensis* n. sp.; *P. longipes* Calman, 1905; *P. mollis* Hale, 1945; *P. occidentaustralis* n. sp.; *P. whiteleyi* Hale, 1951.

Key to all species of *Paradiastylis*

- | | | |
|---|---|------------------------------------|
| 1 | Telson longer than uropod peduncles | <i>P. capillata</i> |
| — | Telson shorter than uropod peduncles | 2 |
| 2 | Telson more than $\frac{1}{2}$ peduncle length | 3 |
| — | Telson less than $\frac{1}{2}$ peduncle length | 5 |
| 3 | Carapace with ridges | <i>P. occidentaustralis</i> n. sp. |
| — | Carapace without ridges, covered in fine spines | 4 |

4	Telson with distinct post-anal region	<i>P. bathyalis</i>
—	Telson tubular, without distinct post-anal region	<i>P. botanybayensis</i> n. sp.
5	Carapace with ridges	7
—	Carapace without ridges	6
6	Carapace with small spines, may be difficult to see	<i>P. berentsae</i> n. sp.
—	Carapace smooth, without spines	<i>P. whitleyi</i>
7	Carapace with 1 lateral ridge	<i>P. culicoides</i>
—	Carapace with more than 1 lateral ridge	8
8	Carapace with 4 lateral ridges	<i>P. brachyuran</i>
—	Carapace with 3 lateral ridges	9
9	Uropod peduncle much longer than pleonite 6 and telson together	10
—	Uropod peduncle shorter than pleonite 6 and telson together	<i>P. mollis</i>
10	Pereopod 2 carpus shorter than propodus and dactylus together	<i>P. longipes</i>
—	Pereopod 2 carpus as long or longer than propodus and dactylus together	<i>P. belone</i>

Paradiastylis berentsae n. sp.

Figs 32–33

Type material. Holotype ovigerous female, AM P53670; paratype ovigerous female, dissected, AM P85809; 33°58'39"S 151°12'22"E, 7.5 m, State Pollution Control Commission, 8 Dec. 1976. Paratypes 5 individuals, P63682, 33°59'24"S 151°12'48"E, 20 m, State Pollution Control Commission, 7 Feb. 1977.

Other material examined. 1 individual, P41995; 2 individuals, P41996; 33°58'17"S 151°11'58"E, 7 m, Australian Museum, 7 Apr. 1992. 1 female, AM P53668, 33°57'12"S 151°10'E, 3 m, State Pollution Control Commission, 3 Dec. 1976. 2 individuals, AM P53669, 33°58'38"S 151°12'28"E, 7.5 m, State Pollution Control Commission, 13 Dec. 1976. 2 individuals, AM P53672, 33°58'52"S 151°12'23"E, 7.6 m, State Pollution Control Commission, 13 Dec. 1976. 1 individual, AM P53673, 33°58'47"S 151°12'16"E, 8 m, State Pollution Control Commission, 13 Dec. 1976. 1 individual, AM P53674, 33°59'24"S 151°12'48"E, 21 m, State Pollution Control Commission, 24 Jan. 1977. 5 individuals, AM P53675, 34°00'S 151°14'E, 21 m, 24 Jan. 1977. 2 individuals, AM P53676; 1 individual, AM P53677; 34°00'S 151°14'E, 11–13 m, 27 Jan. 1977. 1 individual, AM P53678, 33°59'18"S 151°12'38"E, 19.2 m, State Pollution Control Commission, 2 Feb. 1977. 2 individuals, AM P53679, 33°59'59"S 151°12'01"E, 4.5 m, State Pollution Control Commission, 2 Feb. 1977. 1 individual, AM P53680, 33°59'35"S 151°12'56"E, 20 m, State Pollution Control Commission, 4 Feb. 1977. 2 females, AM P53683, 34°00'S 151°12'E, 13 m, State Pollution Control Commission, 10 Mar. 1977. 2 ovigerous females, 1 subadult female, AM P53684, 33°59'24"S 151°12'48"E, 13 m, State Pollution Control Commission, 10 Mar. 1977. 2 ovigerous females, 3 subadult females, 1 juvenile, P42012, 33°58'45"S 151°11'02"E, 7 m, Australian Museum, 28 July 1992. 1 individual, AM P53687, 33°34'S 151°16'E, 10 m, A. R. Jones and A. Murray, 18 Sept. 1980. 1 individual, AM P53688, 33°35'S 151°17'E, 4 m, A. R. Jones and A. Murray, 21 Aug. 1984. 1 individual, AM

P85810, 33°58'39"S 151°12'22"E, 7.5 m, State Pollution Control Commission, 8 Dec. 1976. 1 individual, AM P85811, 27°13'20"S 160°43'25"E, 1989 m, J. K. Lowry, 7 May 1989. 1 female, AM P85812, 33°34'30"S 151°16'30"E, 4 m, A. R. Jones and A. Murray, 27 May 1983. 1 female, AM P85813, 33°33'S 150°14'E, 4 m, A. R. Jones, C. J. Watson-Russell, F. Byers, 1 Aug. 1979. 1 individual, AM P85814, 33°33'S 151°14'E, 4 m, A. R. Jones, C. J. Watson-Russell, F. Byers, 18 Dec. 1979. 1 individual, AM P85815, 33°33'S 151°14'E, 4 m, A. R. Jones, C. J. Watson-Russell, F. Byers, 21 Aug. 1980. 1 individual, AM P85816, 33°35'S 151°17'E, 4 m, A. R. Jones and A. Murray, 9 Nov. 1982. 1 female, AM P85817, 33°35'S 151°17'E, 4 m, A. R. Jones and A. Murray, 21 Aug. 1984. 1 female, AM P85818, 33°35'S 151°17'E, 4 m, A. R. Jones and C. J. Watson-Russell, 5 Feb. 1977. 1 female, AM P85819, 33°35'S 151°17'E, 4 m, A. R. Jones and C. J. Watson-Russell, 5 Feb. 1979. 1 female, AM P85820, 33°35'S 151°17'E, 4 m, A. R. Jones and C. J. Watson-Russell, 13 Nov. 1979. 1 individual, AM P85821, 33°35'S 151°17'E, 4 m, A. R. Jones and A. Murray, 9 Feb. 1984. 1 individual, AM P85822, 33°35'S 151°17'E, 12 m, A. R. Jones and A. Murray, 22 Nov. 1976. 1 female, AM P85823, 33°34'S 151°16'E, 10 m, A. R. Jones and A. Murray, 20 Aug. 1980. 1 female, AM P85824, 33°34'S 151°13'30"E, 5 m, A. R. Jones and A. Murray, 7 Aug. 1981. 1 individual, AM P85825, 33°33'30"S 151°14'30"E, 5 m, A. R. Jones and A. Murray, 9 Nov. 1982.

Diagnosis. *Female and subadult male.* Carapace with few scattered spines, without ridges. Telson shorter than pleonite 6. Uropod endopod article 1 longer than articles 2 and 3 together. *Adult male.* Unknown.

Description

Ovigerous female. Holotype ovigerous female, AM P53670, 3.2 mm; paratype ovigerous female, AM P85809. —Carapace with few scattered spines, branchial regions expanded; pseudorostral lobes 0.5 × carapace length, acute; eye lobe 0.08 × carapace length, broader than long, with lenses; carapace 2.5 × length of pereonites together (Figs 32A–B). —Paratype ovigerous female, AM P85809.

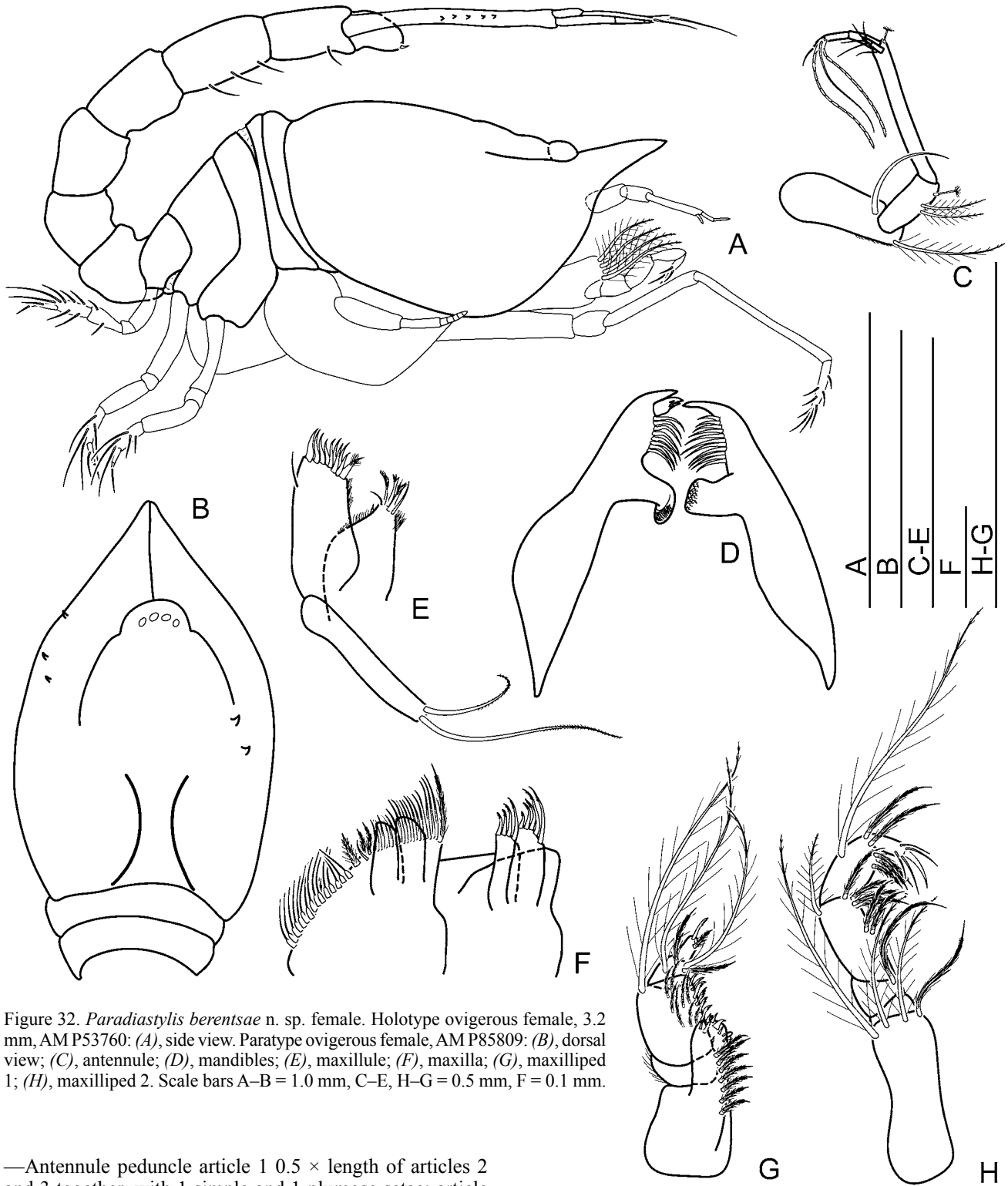


Figure 32. *Paradiastylis berentsae* n. sp. female. Holotype ovigerous female, 3.2 mm, AMP53760: (A), side view. Paratype ovigerous female, AMP85809: (B), dorsal view; (C), antennule; (D), mandibles; (E), maxillule; (F), maxilla; (G), maxilliped 1; (H), maxilliped 2. Scale bars A–B = 1.0 mm, C–E, H–G = 0.5 mm, F = 0.1 mm.

—Antennule peduncle article 1 $0.5 \times$ length of articles 2 and 3 together, with 1 simple and 1 plumose setae; article 2 $0.6 \times$ article 1 length, with 2 plumose and 1 pedunculate setae; article 3 longest, $2.2 \times$ article 2 length, with 1 simple and 1 pedunculate setae; main flagellum of 3 articles, with 2 aesthetascs and 2 simple setae; accessory flagellum of 2 articles, $0.3 \times$ main flagellum length, with 4 simple setae terminally (Fig. 32C). —Mandible navicular, with 8 or 11 micro serrate setae medially, lacinia mobilis with 3 cusps (Fig. 32D). —Maxillule with 2 endites; outer endite with double row of simple setae, 1 pappose and 1 slender simple setae; inner endite with 2 simple, 2 pappose and 1 tricuspid setae; palp with 2 micro serrate setae (Fig. 32E). —Maxilla

with 3 endites; broad endite distal margin lined with simple setae and 3 pappose setae, medial margin with row of pedunculate setae; medial narrow endite with 4 micro serrate setae terminally; distal narrow endite with 5 micro serrate setae terminally; both narrow endites extending past distal margin of broad endite (Fig. 32F). —Maxilliped 1 basis produced as lobe with 4 simple, 2 hook, 7 pappose and 1 stout simple setae; ischium absent; merus with lateral margin lined with fine hair-like setae; carpus $4.5 \times$ merus length, with 4 beak, 8 pappose and 2 simple setae medially, plumose seta

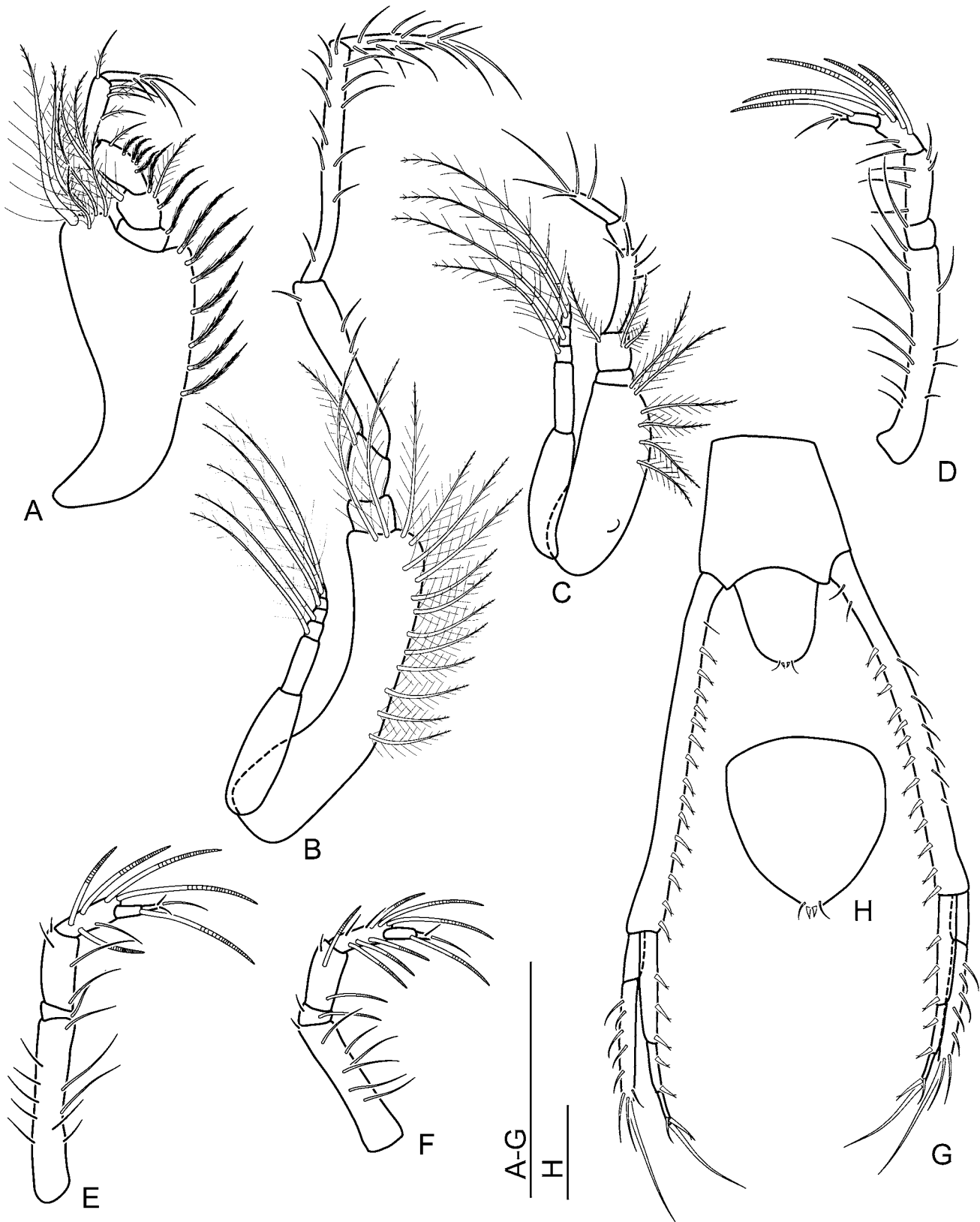


Figure 33. *Paradiastylis berentsae* n. sp. female. Paratype ovigerous female, AM P85809: (A), maxilliped 3; (B), pereopod 1; (C), pereopod 2; (D), pereopod 3; (E), pereopod 4; (F), pereopod 5; (G), pleonite 6, telson and uropods; (H), telson. Scale bars A–G = 0.5 mm, H = 0.1 mm.

laterally; propodus $0.3 \times$ carpus length, with 2 pappose and 2 plumose setae; dactylus $1.2 \times$ propodus length, with 1 dentate and 1 pappose setae (Fig. 32G). —Maxilliped 2 basis $0.7 \times$ length of all other articles together, with 3 plumose and 1

pappose setae distally; ischium $0.1 \times$ basis length, unarmed; merus 1.7 ischium length, with pappose seta; carpus $3.6 \times$ merus length, with 6 pappose setae medially and plumose seta laterally; propodus $0.7 \times$ carpus length, with 5 pappose

setae medially and plumose seta; dactylus $0.6 \times$ propodus length, with 4 simple setae (Fig. 32H). —Maxilliped 3 basis $1.2 \times$ length of all other articles together, with 7 pappose setae medially, broadened and expanded at distolateral corner to mid-merus, with 5 plumose setae; ischium $0.07 \times$ basis length, with pappose seta; merus $2.0 \times$ ischium length, with 1 plumose and 2 pappose setae medially, plumose seta laterally; carpus $1.8 \times$ merus length, with 1 plumose and 4 pappose setae medially, plumose seta laterally; propodus $1.1 \times$ carpus length, with 3 plumose setae medially, plumose seta laterally; dactylus $0.4 \times$ propodus length, with 3 simple setae and 2 simple setae terminally (Fig. 33A). —Pereopod 1 basis $0.6 \times$ length of all other articles together, with 14 plumose setae; ischium $0.05 \times$ basis length, unarmed; merus $2.7 \times$ ischium length, with plumose seta; carpus $3.8 \times$ merus length, with 3 simple setae; propodus $1.3 \times$ carpus length, with 11 simple setae; dactylus $0.4 \times$ propodus length, with 13 simple setae and simple seta terminally; exopod $0.8 \times$ basis length, basal article unarmed, flagellum with plumo-annulate setae (Fig. 33B). —Pereopod 2 basis $0.9 \times$ length of all other articles together, with 6 plumose setae; ischium $0.06 \times$ basis length, unarmed; $3.0 \times$ ischium length, with 3 plumose setae; carpus $2.3 \times$ merus length, with 5 simple setae; propodus $0.4 \times$ carpus length, with simple seta; dactylus $1.8 \times$ propodus length, with 3 simple setae and 2 simple setae terminally; exopod $1.3 \times$ basis length, basal article unarmed, flagellum with plumo-annulate setae (Fig. 33C). —Pereopod 3 basis $1.0 \times$ length of all other articles together, with 12 simple setae; ischium $0.1 \times$ basis length, with simple seta; merus $3.0 \times$ ischium length, with 5 simple setae; carpus $0.7 \times$ merus length, with 2 simple and 4 annulate setae; propodus $0.6 \times$ carpus length, with annulate seta; dactylus $0.4 \times$ propodus length, with simple seta and simple seta terminally (Fig. 33D). —Pereopod 4 basis $1.1 \times$ length of all other articles together, with 10 simple setae; ischium $0.03 \times$ basis length, with simple seta; merus $12.0 \times$ ischium length, with 4 simple setae; carpus $0.8 \times$ merus length, with 1 simple and 5 annulate setae; propodus $0.6 \times$ carpus length, with annulate seta; dactylus $0.6 \times$ propodus length, with simple seta and simple seta terminally (Fig. 33E). —Pereopod 5 basis $0.8 \times$ length of all other articles together, with 6 simple setae; ischium $0.08 \times$ basis length, with annulate seta; merus $3.7 \times$ ischium length, with 1 simple and 2 annulate setae; carpus $0.8 \times$ merus length, with 2 simple and 6 annulate setae; propodus $0.7 \times$ carpus length, with annulate seta; dactylus $0.3 \times$ propodus length, with simple seta and simple seta terminally (Fig. 33F). —Telson $0.7 \times$ length of pleonite 6, without stout lateral setae, 2 small simple terminal setae (Figs 33G–H). —Uropod peduncles $2.8 \times$ pleonite 6 length, $3.9 \times$ telson length, with 1 or several simple setae, 13 or 15 simple setae with single subterminal setule medially. Uropod endopod of 3 articles, $0.5 \times$ peduncle length; article 1 $1.4 \times$ length of articles 2 and 3 together, with 3 simple setae with single subterminal setule medially; article 2 $0.4 \times$ article 1 length, with 2 simple setae with single subterminal setule medially; article 3 $0.8 \times$ article 2 length, with 1 simple seta with single subterminal setule medially, simple seta laterally, terminal seta simple. Uropod exopod of 2 articles, $0.8 \times$ length of endopod; article 1 $0.4 \times$ article 2 length; article 2 with 7–8 simple setae, terminal seta simple, about as long as article 1 (Fig. 33G).

Etymology. The species is named *berentsae* for Penny Berents of the Australian Museum.

Remarks. The most similar species to *Paradiastylis berentsae* are *P. botanybayensis* n. sp. and *P. whiteleyi*. *Paradiastylis botanybayensis* can be distinguished by the carapace covered in small spines and the telson longer than pleonite 6, while in *P. berentsae* the carapace has a few scattered spines and the telson is distinctly shorter than pleonite 6. *Paradiastylis whiteleyi* is similar in the uropod endopod proportions, with article 1 being longer than articles 2 and 3 together; however, the telson has a distinct post-anal portion with stout lateral setae, and the species is only known from Western Australia. In comparison, *P. berentsae* has no post-anal portion or stout lateral setae on the telson, and is only known from New South Wales.

Paradiastylis botanybayensis n. sp.

Figs 34–37

Type material. Holotype ovigerous female, AM P53685, 34°00'S 151°12'E, 13 m, State Pollution Control Commission, 10 Mar. 1977. Paratype subadult female, dissected, AM P53681, 33°59'22"S 151°12'45"E, 19.2 m, State Pollution Control Commission, 4 Feb. 1977. Paratype adult male, dissected, AM P53671, 33°58'44"S 151°12'30"E, 7.5 m, State Pollution Control Commission, 13 Dec. 1976. Paratype 1 female, AM P85785, 33°58'39"S 151°12'22"E, 7.5, State Pollution Control Commission, 8 Dec. 1976. Paratypes 2 specimens, P42011, 33°58'45"S 151°11'02"E, 7 m, Australian Museum, 28 July 1992.

Other material examined. None.

Diagnosis. *Female and subadult male.* Carapace covered in small spines, without ridges. Telson longer than pleonite 6, but less than $1.5 \times$ pleonite 6, terminal setae tiny. Uropod endopod article 1 longer than articles 2 and 3 together. *Adult male.* Carapace without spines, without ridges. Antennule with brush of setae on peduncle article 3. Antennae extending to posterior border of telson. Telson longer than pleonite 6, terminal setae long.

Description

Ovigerous female. Holotype ovigerous female, AM P53685, 3.2 mm; paratype ovigerous female, AM P53681, 3.5 mm. —Carapace covered in small spines, may be difficult to see in poorly preserved or poorly calcified specimens; pseudorostral lobes $0.5 \times$ carapace length, acute; eye lobe $0.07 \times$ carapace length, broader than long, with lenses; carapace $3.0 \times$ length of pereonites together (Figs 34A–B). —Paratype ovigerous female, AM P53681, 3.5 mm. —Antennule peduncle article 1 $0.5 \times$ length of articles 2 and 3 together, with 1 simple and 1 pappose setae, margin thickly lined with fine hair-like setae; article 2 $0.8 \times$ article 1 length, with 4 simple and 2 pappose setae; article 3 $1.9 \times$ article 2 length, slender, with 1 simple and 2 pedunculate setae; main flagellum of 3 articles, with 2 aesthetascs and simple seta; accessory flagellum of 1 article, $0.4 \times$ main flagellum length, shorter than main flagellum article 1, with 4 simple setae (Fig. 34C). —Antenna of 4 articles, each with 1 plumose or pappose seta (Fig. 34D). —Mandible navicular, with 13 microserrate setae medially (Fig. 34E). —Maxillule with 2 endites; outer endite with row of stout simple setae, medial margin lined with fine hair-like setae; inner endite with 3 simple and 1 tricuspid setae, medial margin with fine hair-like setae; palp with 2 microserrate

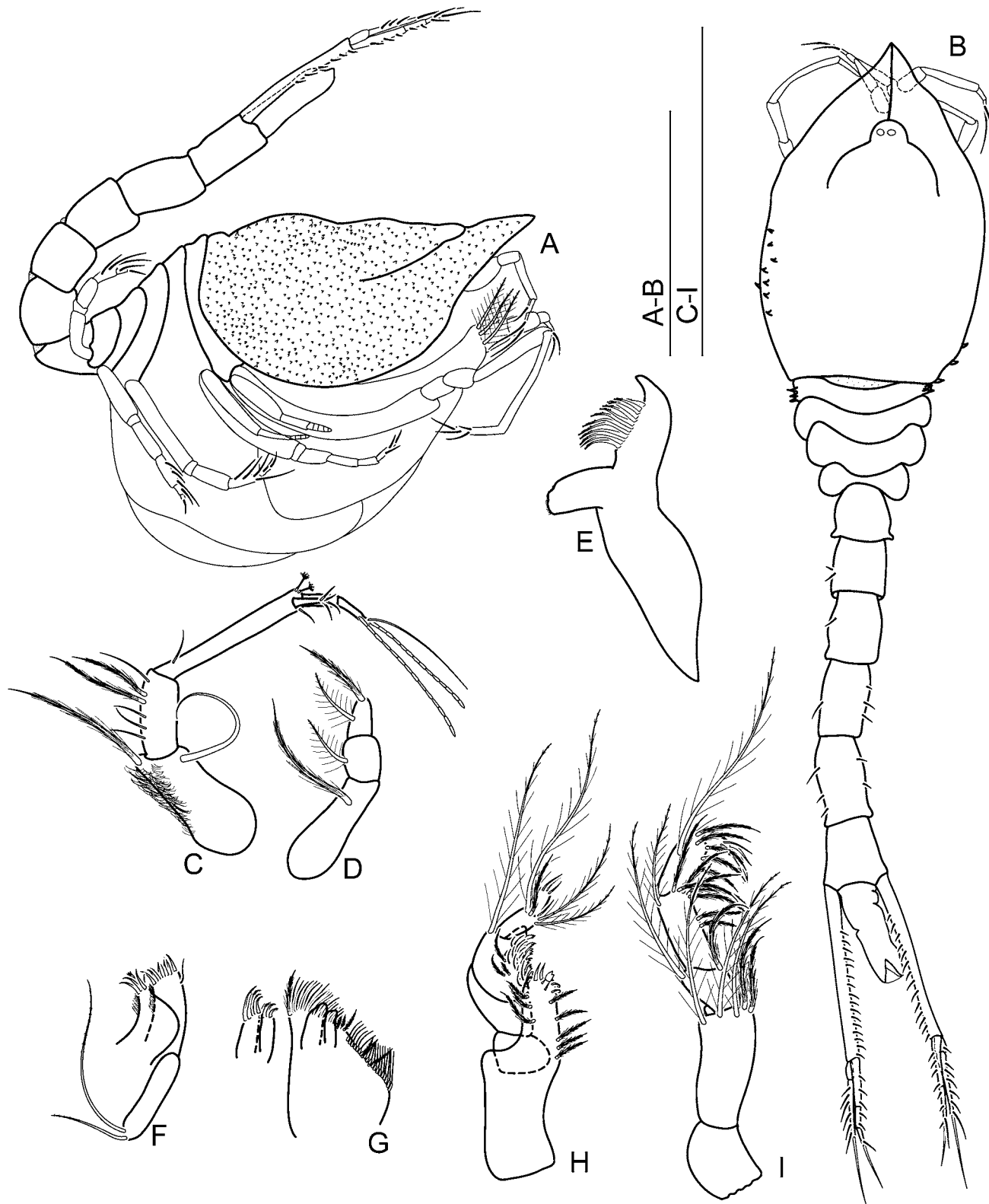


Figure 34. *Paradiastylis botanybayensis* n. sp. female. Holotype ovigerous female, 3.2 mm, AM P53865: (A), side view. Paratype ovigerous female, 3.5 mm, AM P53681: (B), dorsal view; (C), antennule; (D), antenna; (E), mandible; (F), maxillule; (G), maxilla; (H), maxilliped 1; (I), maxilliped 2. Scale bars A–B = 1.0 mm, C–I = 0.5 mm.

setae (Fig. 34F). —Maxilla with 3 endites; broad endite distal margin with pappose seta at corner, row of simple and pappose setae, medial margin with row of pedunculate setae and 2 pappose setae; medial narrow endite with 3 micro serrate setae terminally; distal narrow endite with 4 micro serrate setae terminally; both narrow endites extending barely past distal margin (Fig. 34G). —Maxilliped 1 basis produced as

lobe with 4 simple, 8 pappose, 2 hook and 1 stout bicuspid setae; ischium present, unarmed; merus unarmed; carpus $1.7 \times$ merus length, with 3 pappose, many simple and 5 beak setae on medial face, plumose seta laterally; propodus $0.6 \times$ carpus length, with 1 simple, 3 plumose and 1 pappose setae; dactylus $0.9 \times$ propodus length, with 3 simple setae (Fig. 34H). —Maxilliped 2 basis $0.6 \times$ length of all other articles

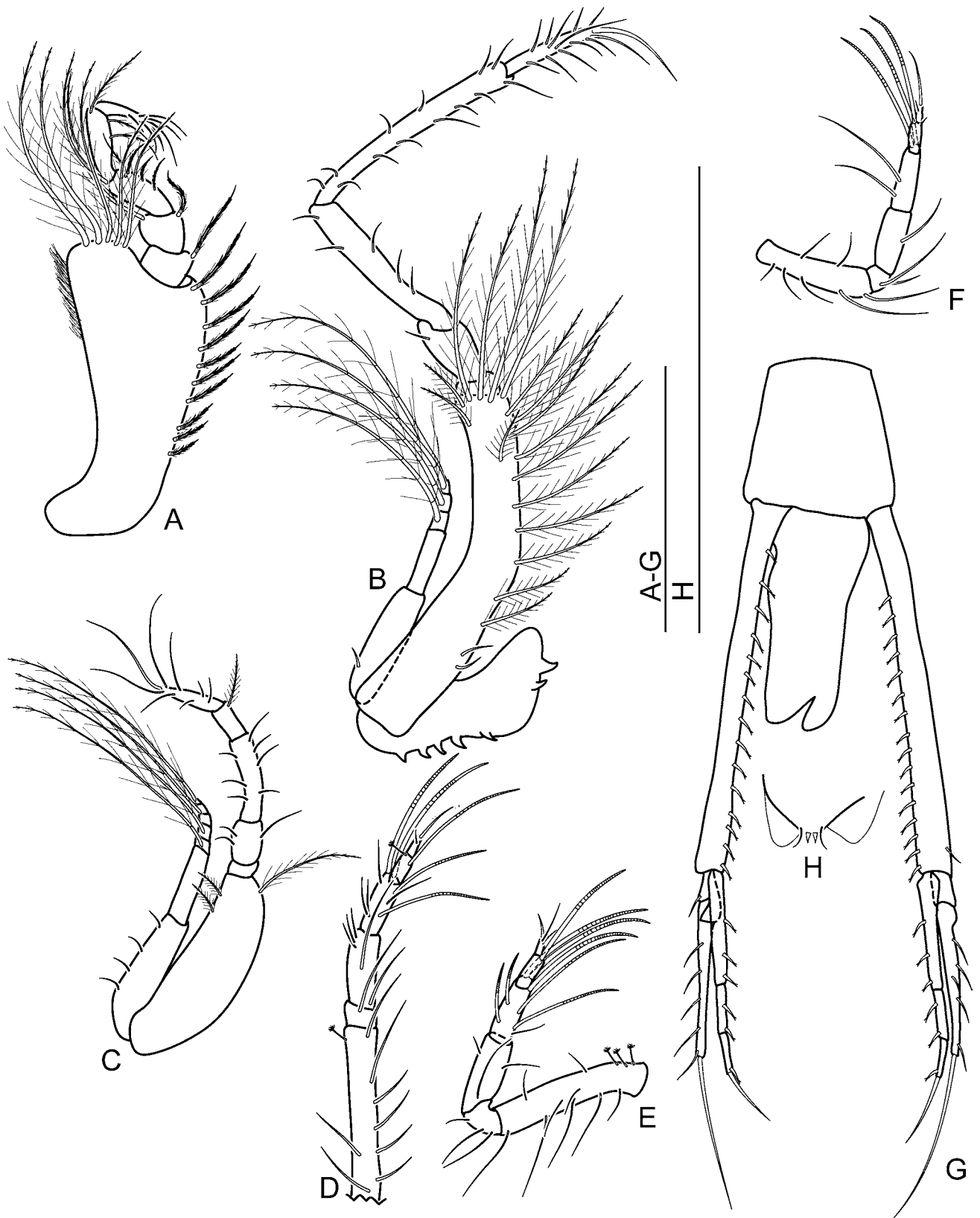


Figure 35. *Paradiastylis botanybayensis* n. sp. female. Paratype ovigerous female, 3.5 mm, AM P53681: (A), maxilliped 3; (B), pereopod 1; (C), pereopod 2; (D), pereopod 3; (E), pereopod 4; (F), pereopod 5; (G), pleonite 6, telson and uropods; (H), telson. Scale bars = 0.5 mm.

together, with 3 plumose and 2 pappose setae distally; ischium $0.04 \times$ basis length, unarmed; merus 8.0 ischium length, with pappose seta medially, plumose seta laterally; carpus $2.0 \times$ merus length, with 7 pappose setae medially, plumose seta laterally; propodus $0.7 \times$ carpus length, with 5 pappose and 1

plumose setae; dactylus $0.5 \times$ propodus length, with 3 simple setae (Fig. 34I). —Maxilliped 3 basis $1.2 \times$ length of all other articles together, broad, with 10 pappose setae medially, distal corner expanded, with 5 plumose setae; ischium $0.1 \times$ basis length, with pappose seta; merus $1.0 \times$ ischium length, with

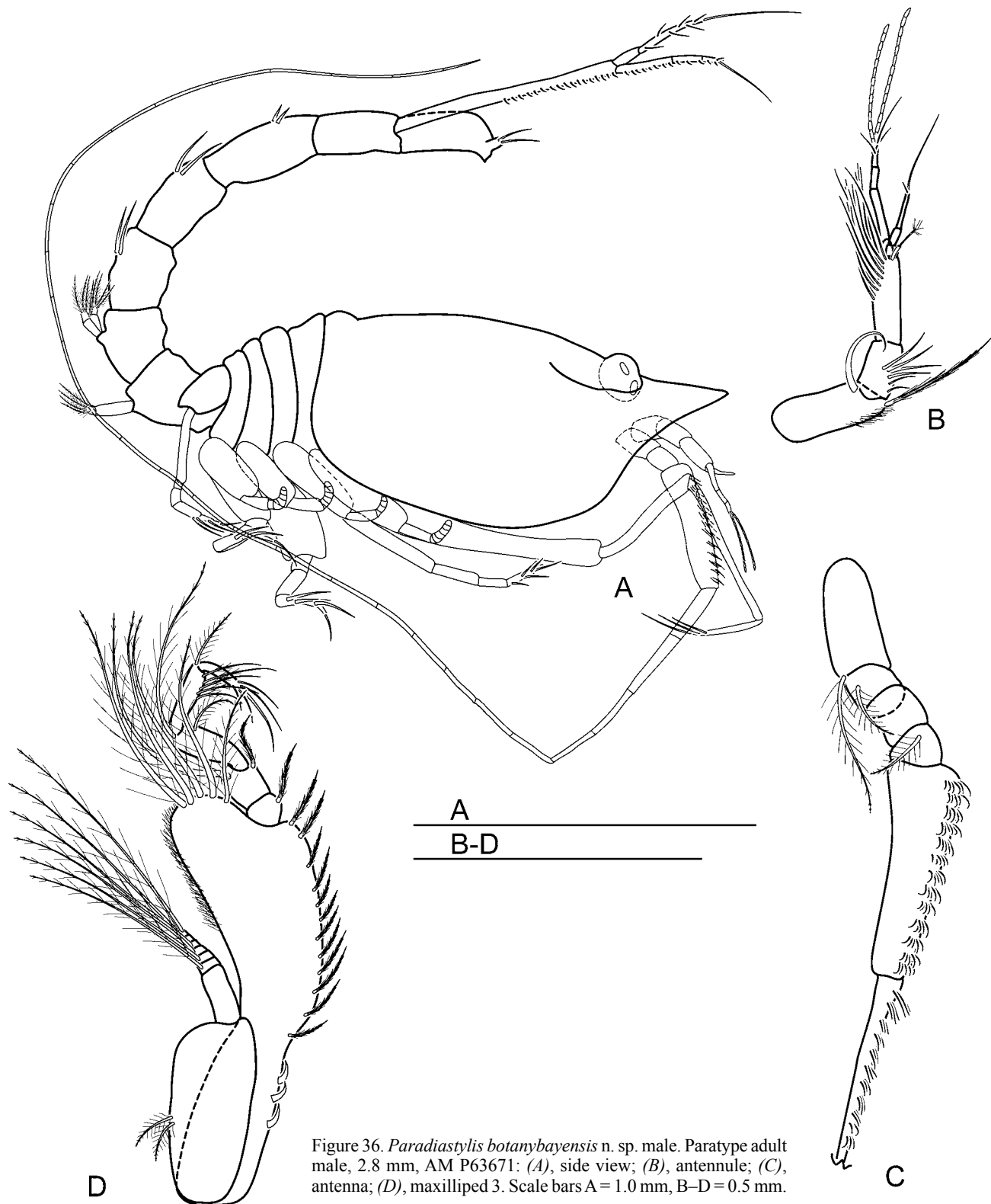


Figure 36. *Paradiastylis botanybayensis* n. sp. male. Paratype adult male, 2.8 mm, AM P63671: (A), side view; (B), antennule; (C), antenna; (D), maxilliped 3. Scale bars A = 1.0 mm, B–D = 0.5 mm.

pappose seta medially, plumose seta laterally; carpus $2.0 \times$ merus length, with 4 pappose setae medially, plumose seta laterally; propodus $1.1 \times$ carpus length, with 2 plumose setae medially, plumose seta laterally; dactylus $0.6 \times$ propodus length, with 5 simple setae terminally (Fig. 35A). —Pereopod 1 basis $0.6 \times$ length of all other articles together, with 2 simple and 17 plumose setae; ischium $0.03 \times$ basis length, unarmed; merus $5.0 \times$ ischium length, with simple seta; carpus $3.0 \times$ merus length, with 5 simple setae; propodus $1.3 \times$ carpus

length, with 13 simple setae; dactylus $0.4 \times$ propodus length, with 12 simple setae and simple seta terminally; exopod $0.7 \times$ basis length, basal article with simple seta, flagellum with plumo-annulate setae (Fig. 35B). —Pereopod 2 basis $0.8 \times$ length of all other articles together, with 3 plumose setae; ischium $0.06 \times$ basis length, unarmed; merus $3.5 \times$ ischium length, with 3 simple setae; carpus $2.1 \times$ merus length, with 7 simple setae; propodus $0.4 \times$ carpus length, with plumose seta; dactylus $1.8 \times$ propodus length, with 6 simple setae and

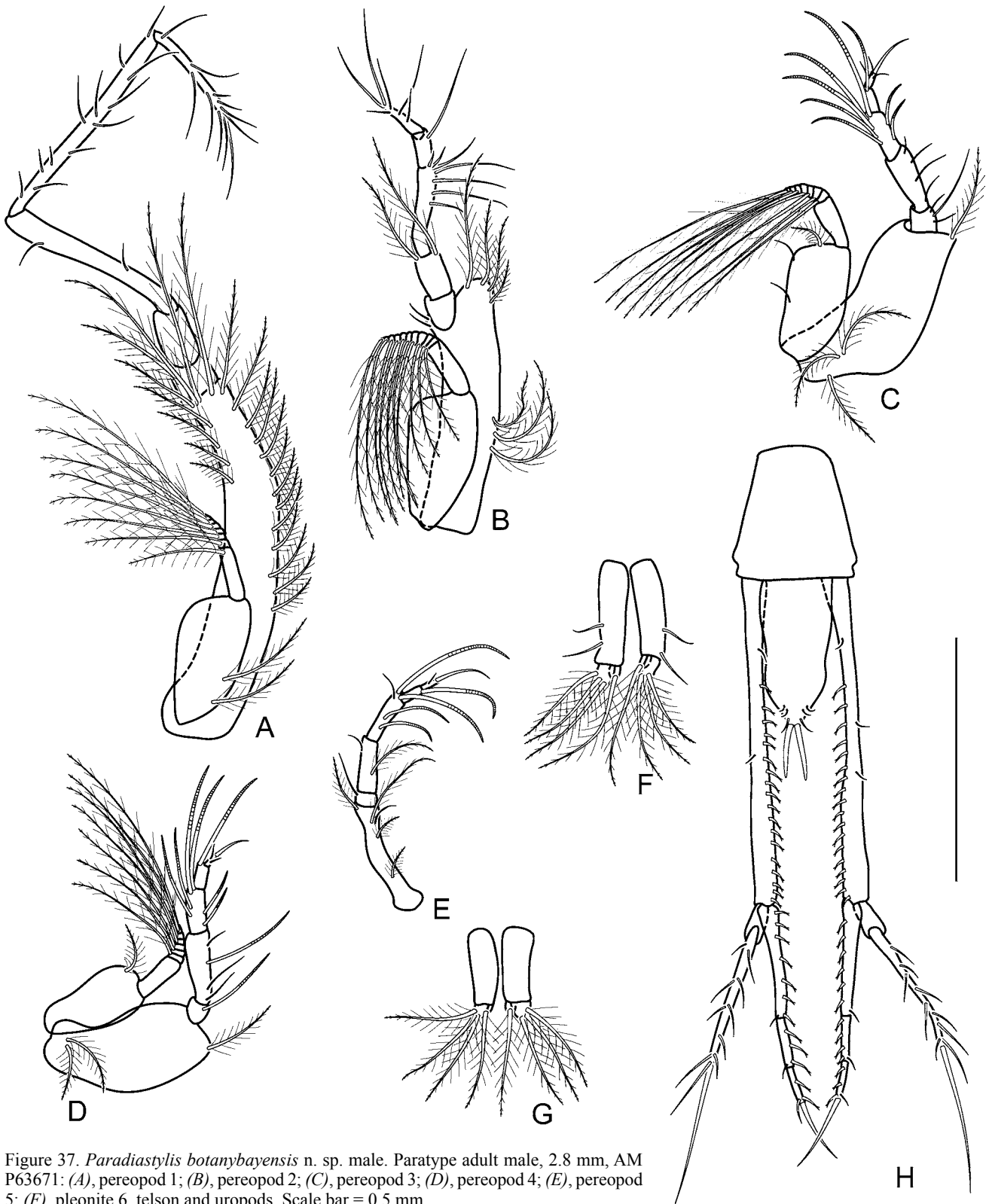


Figure 37. *Paradiastylis botanybayensis* n. sp. male. Paratype adult male, 2.8 mm, AM P63671: (A), pereopod 1; (B), pereopod 2; (C), pereopod 3; (D), pereopod 4; (E), pereopod 5; (F), pleonite 6, telson and uropods. Scale bar = 0.5 mm.

2 simple setae terminally; exopod $1.2 \times$ basis length, basal article with 4 simple setae, flagellum with plumo-annulate setae (Fig. 35C). —Pereopod 3 basis with 8 simple and 1 pedunculate setae; ischium with 2 simple setae; merus $4.0 \times$ ischium length, with 4 simple setae; carpus $0.8 \times$ merus length, with 4 simple and 4 annulate setae; propodus $0.5 \times$ carpus length, with 1 annulate and 1 pedunculate setae; dactylus $0.6 \times$ propodus length, with 1 simple and simple

seta terminally (Fig. 35D). —Pereopod 4 basis $0.7 \times$ length of all other articles together, with 9 simple and 3 pedunculate setae; ischium $0.2 \times$ basis length, with 3 simple setae; merus $2.2 \times$ ischium length, with 3 simple setae; carpus $0.9 \times$ merus length, with 1 simple and 7 annulate setae; propodus $0.6 \times$ carpus length, with annulate seta; dactylus $0.5 \times$ propodus length, with 2 simple setae and simple seta terminally (Fig. 35E). —Pereopod 5 basis $0.6 \times$ length of all other articles

together, with 7 simple setae; ischium $0.2 \times$ basis length, with 2 simple setae; merus $3.3 \times$ ischium length, with simple seta; carpus $1.0 \times$ merus length, with 2 simple and 2 annulate setae; propodus $0.5 \times$ carpus length, with annulate seta; dactylus $0.6 \times$ propodus length, with simple seta and simple seta terminally (Fig. 35F). —Telson $1.4 \times$ length of pleonite 6, without stout lateral setae, 2 small simple terminal setae (Figs 35G–H). —Uropod peduncles $2.4 \times$ pleonite 6 length, $1.7 \times$ telson length, with 15–16 simple setae with single subterminal setule medially, 0–1 simple setae laterally. Uropod endopod of 3 articles, $0.5 \times$ peduncle length; article 1 $1.3 \times$ articles 2 and 3 together, with 3 simple setae with single subterminal setule medially; article 2 $0.4 \times$ article 1 length, with 2 simple setae with single subterminal setule medially; article 3 $0.8 \times$ article 2 length, with simple seta with single subterminal setule medially, terminal seta simple. Uropod exopod of 2 articles, $0.9 \times$ length of endopod; article 1 $0.2 \times$ article 2 length, with 0–1 simple setae; article 2 with 5 simple setae laterally, terminal seta simple, longer than endopod terminal seta (Fig. 35G).

Adult male. Paratype adult male, AM P53671, 2.8 mm. —Carapace unornamented; pseudorostral lobes $0.4 \times$ carapace length, acute; eye lobe $0.1 \times$ carapace length, with lenses; carapace $3.9 \times$ length of pereonites together (Fig. 36A). —Antennule peduncle article 1 $0.7 \times$ length of articles 2 and 3 together, with 1 simple and 1 plumose setae, margin thickly lined with fine hair-like setae; article 2 $0.6 \times$ article 1 length, with 6 simple setae; article 3 $1.5 \times$ article 2 length, with cluster of simple setae, 1 pedunculate seta; main flagellum of 4 articles, with 2 aesthetascs and 3 simple setae; accessory flagellum of 3 articles, $0.6 \times$ main flagellum length, with 2 simple setae (Fig. 36B). —Antenna extending to posterior border of telson; peduncle of 5 articles, articles 1, 2, and 4 each with plumose seta; article 5 with ranks of short setae, incompletely circling article; flagellum with long articles, each with several simple setae (Figs 36A, C). —Maxilliped 3 basis $1.5 \times$ length of all other articles together, broad, with 3 simple and 12 pappose setae medially, expanded distally with 5 plumose setae, lateral margin lined with fine hair-like setae; ischium $0.07 \times$ basis length, with pappose seta; merus $1.2 \times$ ischium length, with pappose seta medially, plumose seta laterally; carpus $2.3 \times$ merus length, with plumose seta medially, plumose seta laterally; propodus $0.9 \times$ carpus length, with 5 plumose setae medially, plumose seta laterally; dactylus $0.8 \times$ propodus length, with 5 simple setae terminally; exopod $0.7 \times$ basis length, basal article with 2 plumose setae, flagellum with plumo-annulate setae (Fig. 36D). —Pereopod 1 basis $0.6 \times$ length of all other articles together, with 21 plumose setae; ischium $0.09 \times$ basis length, with plumose seta; merus $1.8 \times$ ischium length, unarmed; carpus $3.4 \times$ merus length, with 2 simple setae; propodus $1.2 \times$ carpus length, with 12 simple setae; dactylus $0.4 \times$ propodus length, with 9 simple setae, simple seta terminally; exopod $0.6 \times$ basis length, basal article with 2 plumose setae, flagellum with plumo-annulate setae (Fig. 37A). —Pereopod 2 basis $0.8 \times$ length of all other articles together, with 2 simple and 7 plumose setae, expanded distally to mid-merus; ischium $0.2 \times$ basis length, unarmed; merus $1.1 \times$ ischium length, with 2 plumose setae; carpus $2.3 \times$ merus length, with 7 simple setae; propodus $0.3 \times$ carpus length, with simple seta; dactylus $1.5 \times$ propodus length, with 4 simple setae and 2 simple setae terminally; exopod $1.1 \times$

basis length, basal article unarmed, flagellum with plumo-annulate setae (Fig. 37B). —Pereopod 3 basis $1.1 \times$ length of all other articles together, with 4 plumose setae; ischium $0.1 \times$ basis length, with 3 simple setae; merus $3.0 \times$ ischium length, with 4 simple setae; carpus $0.8 \times$ merus length, with 7 annulate setae; propodus $0.5 \times$ carpus length, with annulate seta; dactylus $0.6 \times$ propodus length, with 3 simple setae, simple seta terminally; exopod $1.1 \times$ basis length, basal article with 2 simple and 1 plumose setae, flagellum with plumo-annulate setae (Fig. 37C). —Pereopod 4 basis $0.9 \times$ length of all other articles together, with 3 plumose setae; ischium $0.1 \times$ basis length, with annulate seta; merus $3.5 \times$ ischium length, with 3 simple and 1 annulate setae; carpus $0.6 \times$ merus length, with 6 annulate setae; propodus $0.6 \times$ carpus length, with annulate seta; dactylus $0.6 \times$ propodus length, with 2 simple setae, simple seta terminally; exopod $1.2 \times$ basis length, basal article with plumose seta, flagellum with plumo-annulate setae (Fig. 37D). —Pereopod 5 basis $0.8 \times$ length of all other articles together, with 1 simple and 4 plumose setae; ischium $0.1 \times$ basis length, with simple seta; merus $3.3 \times$ ischium length, with 1 simple and 1 plumose setae; carpus $1.0 \times$ merus length, with 1 simple and 4 annulate setae; propodus $0.4 \times$ carpus length, with annulate seta; dactylus $0.8 \times$ propodus length, with simple seta and simple seta terminally (Fig. 37E). —Telson $1.1 \times$ length of pleonite 6, without stout lateral setae, with few slender simple setae, 2 long simple terminal setae (Fig. 37F). —Uropod peduncles $2.5 \times$ pleonite 6 length, $2.2 \times$ telson length, with 1 simple and 18 simple setae with single subterminal setule medially, 1–2 simple setae laterally. Uropod endopod of 3 articles, $0.6 \times$ peduncle length; article 1 $1.4 \times$ length of articles 2 and 3 together, with 6–7 simple setae with single subterminal setule medially, simple seta laterally; article 2 $0.4 \times$ article 1 length, with 3–4 simple setae with single subterminal setule medially, simple seta laterally; article 3 $0.8 \times$ article 2 length, with 2–3 simple setae with single subterminal setule medially, simple seta laterally, terminal seta simple. Uropod exopod $0.9 \times$ length of endopod; article 1 $0.2 \times$ article 2 length; article 2 with 9–10 simple setae, terminal seta simple, longer than endopod terminal seta (Fig. 37F).

Etymology. The species is named *botanybayensis* for the place the specimens were collected, Botany Bay, Australia.

Remarks. The new species *Paradiastylis botanybayensis* is most similar to the new species *P. berentsae*. These two species can be differentiated by the carapace ornamentation and telson. In *P. botanybayensis* the carapace is covered in small spines in the female, and in *P. berentsae* the carapace has at most a few scattered spines. It may be difficult to see the carapace spines in *P. botanybayensis* if the specimen is soft or poorly calcified, in this situation staining with chlorazole black may be useful. In *P. berentsae* the telson is distinctly shorter than pleonite 6, while in *P. botanybayensis* the telson is distinctly longer than pleonite 6. The male of *P. berentsae* is currently unknown, so it is impossible to distinguish between the males of both species.

Other than the carapace ornamentation and telson length, the females of both species are very similar in size, appendages and overall appearance. Hale (1945) points out in his discussion of *Dimorphostylis* that it appears that the relative length of the post-anal portion of the telson is not particularly useful in diastylid species discrimination in Australian waters; however, the difference in this case is

the entire telson length, which has not been suggested to be problematic for species discrimination. The difference in this case is consistent in all specimens encountered of both species, with no specimens that were difficult to ascribe to one species or the other on the basis of telson size.

The other species from Australian waters that might be confused with *P. botanybayensis* is *P. whitleyi*, as the uropod endopod proportions are similar in that article 1 is distinctly longer than articles 2 and 3 together. However, *P. whitleyi* has a distinct post-anal portion to the telson, and stout lateral setae on the telson in the adult male, while the adult male of *P. botanybayensis* has no post-anal portion on the telson, and no stout lateral setae.

Paradiastylis occidensaustralis n. sp.

Figs 38–39

Type material. Holotype ovigerous female, AM P85786; paratype preparatory female, dissected, AM P85787; 16°29'05"S 123°00'35"E, 12 m, J. K. Lowry, K. B. Attwood, 26 May 2010.

Other material examined. 4 individuals, AM P85788, 25°10'S 113°39'E, 0.5 m, H. E. Stoddart, 6 Jan. 1984. 3 individuals, AM P85789, 19°59'12"S 117°48'36"E, 41 m, CSIRO, 26 Jun. 1983. 3 individuals, AM P85790, 19°58'00"–19°57'42"S 117°49'36"–117°49'54"E, 42 m, CSIRO, 26 Jun. 1983. 1 individual, AM P85791, 19°56'42"S 117°53'48"E, 42–43 m, CSIRO, 26 Aug. 1983. 1 individual, AM P85792, 19°56'42"–19°56'24"S 117°53'48"–117°53'00"E, 41 m, CSIRO, 26 Oct. 1983.

Diagnosis. *Female and subadult male.* Carapace with 3 parallel oblique lateral serrate ridges, connected dorsally with short curved ridges, and connected anteriorly with a short vertical ridge ending in a strong spine, with several strong spines on the dorsal margin. Telson more than 1.5 × the length of pleonite 6, without distinct post-anal portion, without lateral setae, with pair of tiny terminal setae. Uropod endopod article 1 longer than articles 2 and 3 together. *Adult male.* Unknown.

Description

Ovigerous and preparatory females. Holotype ovigerous female, AM P85786, 3.9 mm; paratype preparatory female, AM P85787, 3.8 mm. —Carapace with 3 parallel serrate oblique lateral ridges, connected at the dorsal origin by short ridges, and connected at the anterior terminus with short vertical ridges, with strong tooth at anterior corner of dorsal most parallel ridge, with few strong teeth on dorsal margin, with scattered setae; pseudorostral lobes 0.4 × carapace length; eye lobe 0.1 × carapace length, with dorsal tooth, with lenses; carapace 2.1 × length of pereonites together; antennal notch excavated, ventral corner produced as sharp tooth. Pereonites 3–4 fused dorsally, free ventrally. Pleonite 6 with long setae (Figs 38A–C). —Paratype preparatory female, AM P85787, 3.8 mm —Antennule peduncle article 1 0.8 × length of articles 2 and 3 together, with 1 simple and 1 plumose setae; article 2 0.5 × article 1 length, with 13 simple setae; article 3 1.8 × article 2 length, with 5 simple, 2 plumose and 1 pedunculate setae; main flagellum of 3 articles, with 2 long aesthetascs and no setae; accessory flagellum of 2 articles, 0.4 × main flagellum length, with 5 simple and 1

pedunculate setae (Fig. 38D). —Mandible navicular, with 12 microserrate setae medially, lacinia mobilis with 2 cusps (Fig. 38E). —Maxillule with 2 endites; outer endite with double row of stout setae; inner endite with 2 simple, 1 microserrate and 1 tricuspid setae; palp with 2 microserrate setae (Fig. 38F). —Maxilla with 3 endites; broad endite distal with 1 pappose seta, row of simple setae and pappose setae, medial margin with row pedunculate setae; medial narrow endite with 4 microserrate setae terminally; distal narrow endite with 4 microserrate setae terminally; both narrow endites extending only to length of distal corner (Fig. 38G). —Maxilliped 1 basis produced as lobe with 5 simple, 2 hook and 6 pappose setae; ischium absent; merus with pappose seta; carpus 0.9 × merus length, with simple and beak setae medially, plumose seta laterally; propodus 0.6 × carpus length, with 5 plumose and 2 microserrate setae; dactylus 0.8 × propodus length, with 3 simple setae (Fig. 38H). —Maxilliped 2 basis 0.8 × length of all other articles together, with 2 plumose setae distally; ischium 0.1 × basis length, unarmed; merus 2.0 × ischium length, with plumose seta medially, plumose seta laterally; carpus 1.6 × merus length, with 4 plumose setae medially, 2 plumose setae laterally; propodus 0.9 × carpus length, with 6 simple and 2 plumose setae; dactylus 0.4 × propodus length, with 4 simple setae (Fig. 38I). —Maxilliped 3 basis 1.2 × length of all other articles together, with 6 pappose setae medially, expanded distally, with 4 plumose setae; ischium 0.1 × basis length, with pappose seta; merus 0.9 × ischium length, with 2 plumose setae medially, plumose seta laterally; carpus 1.5 × merus length, with plumose seta medially, plumose seta laterally; propodus 1.0 × carpus length, with 4 plumose setae medially, plumose seta laterally; dactylus 0.8 × propodus length, with 5 simple setae terminally (Fig. 39A). —Pereopod 1 basis 0.4 × length of all other articles together, with 3 simple and 16 plumose setae, medial margin produced as teeth; ischium 0.1 × basis length, unarmed; merus 1.8 × ischium length, unarmed; carpus 3.8 × merus length, with 7 simple setae; propodus 1.4 × carpus length, with 21 simple setae; dactylus 0.3 × propodus length, with 8 simple setae and 2 simple setae terminally; exopod 0.7 × basis length, basal article unarmed, flagellum with plumo-annulate setae (Fig. 39B). —Pereopod 2 basis 0.8 × length of all other articles together, with 10 plumose setae, medial margin produced as teeth distally; ischium 0.03 × basis length, unarmed; merus 9.0 × ischium length, with 3 simple setae; carpus 2.1 × merus length, with 5 simple setae; propodus 0.3 × carpus length, with 3 simple setae; dactylus 2.0 × propodus length, with 6 simple and simple seta terminally; exopod 1.2 × basis length, basal article with 3 plumose setae, flagellum with plumo-annulate setae (Fig. 39C). —Pereopod 3 basis 1.0 × length of all other articles together, with 13 simple setae; ischium 0.1 × basis length, with 2 simple setae; merus 4.0 × ischium length, with 3 simple setae; carpus 0.5 × merus length, with 4 simple and 1 annulate setae; propodus 0.8 × carpus length, with annulate seta; dactylus 1.0 × propodus length, with 2 setae terminally (Fig. 39D). —Pereopod 4 basis 0.7 × length of all other articles together, with 5 simple setae; ischium 0.1 × basis length, with 2 simple setae; merus 4.5 × ischium length, with 2 simple setae; carpus 0.6 × merus length, with 4 simple and 1 annulate setae; propodus 0.5 × carpus length, with annulate seta; dactylus 0.8 × propodus length, with 2 setae terminally (Fig. 39E). —Pereopod 5 basis 0.7 × length of all other articles together, with 3 simple setae; ischium 0.1 × basis length, with 2 simple setae; merus 4.3 × ischium

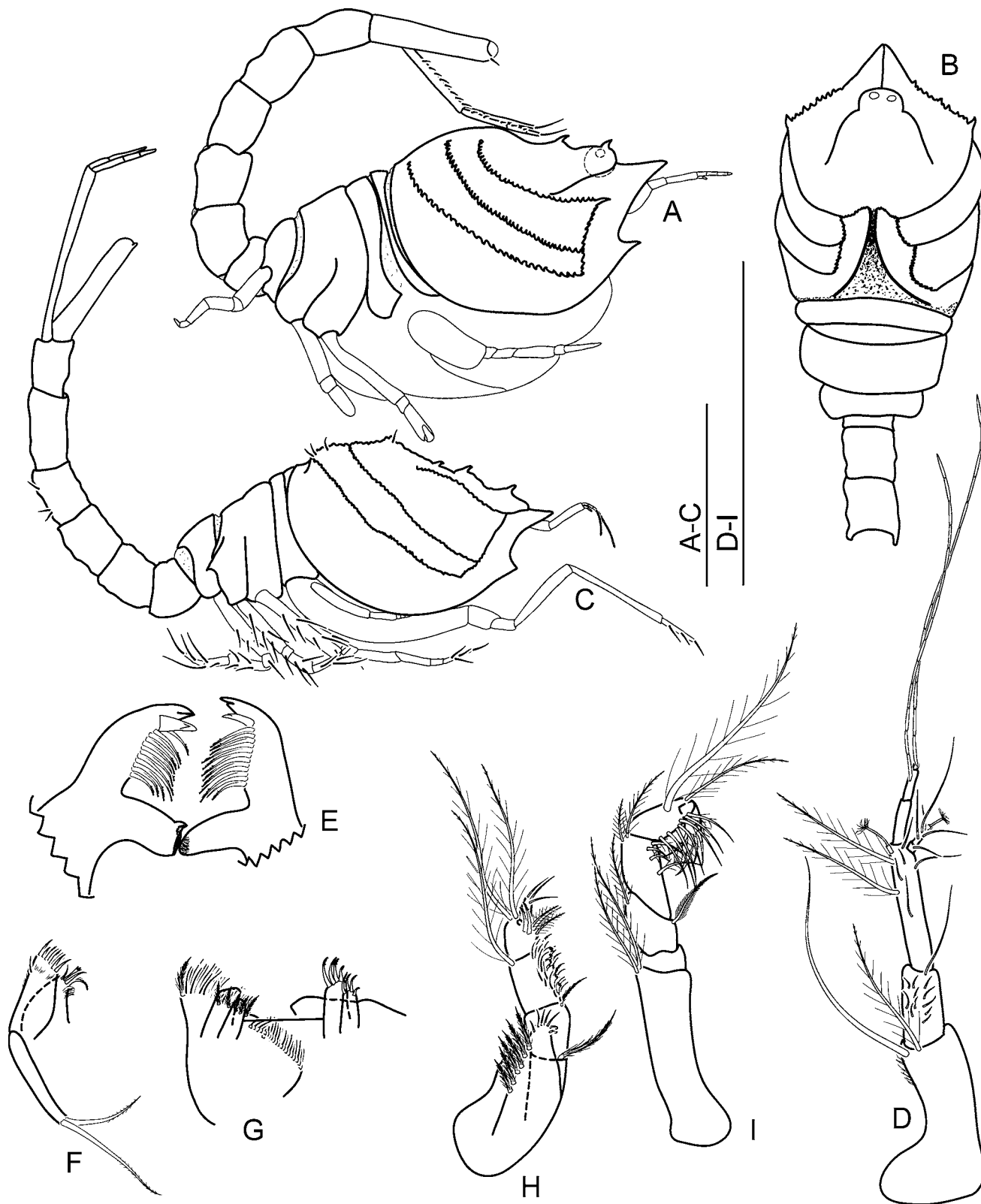


Figure 38. *Paradiastylis occidentaustralis* n. sp. female. Holotype ovigerous female, 3.9 mm, AM P85786: (A), side view. Paratype preparatory female, 3.8 mm, AM P85787: (B), dorsal view; (C), side view; (D), antennule; (E), mandibles; (F), maxillule; (G), maxilla; (H), maxilliped 1; (I), maxilliped 2. Scale bars A–C = 1.0 mm, D–I = 0.5 mm.

length, with 2 simple setae; carpus $0.9 \times$ merus length, with 5 simple and 1 annulate setae; propodus $0.5 \times$ carpus length, with 1 simple and 1 annulate setae; dactylus $0.8 \times$ propodus length, with 2 setae terminally (Fig. 39F). —Telson $1.9 \times$ length of pleonite 6, with no stout lateral setae, 2 tiny blunt

terminal setae (Figs 39G–H). —Uropod peduncles $2.8 \times$ pleonite 6 length, $1.5 \times$ telson length, with 1 simple and 8 simple setae with single subterminal setule medially, 14 simple seta laterally. Uropod endopod of 3 articles, $0.4 \times$ peduncle length; article 1 $1.3 \times$ length of articles 2 and 3

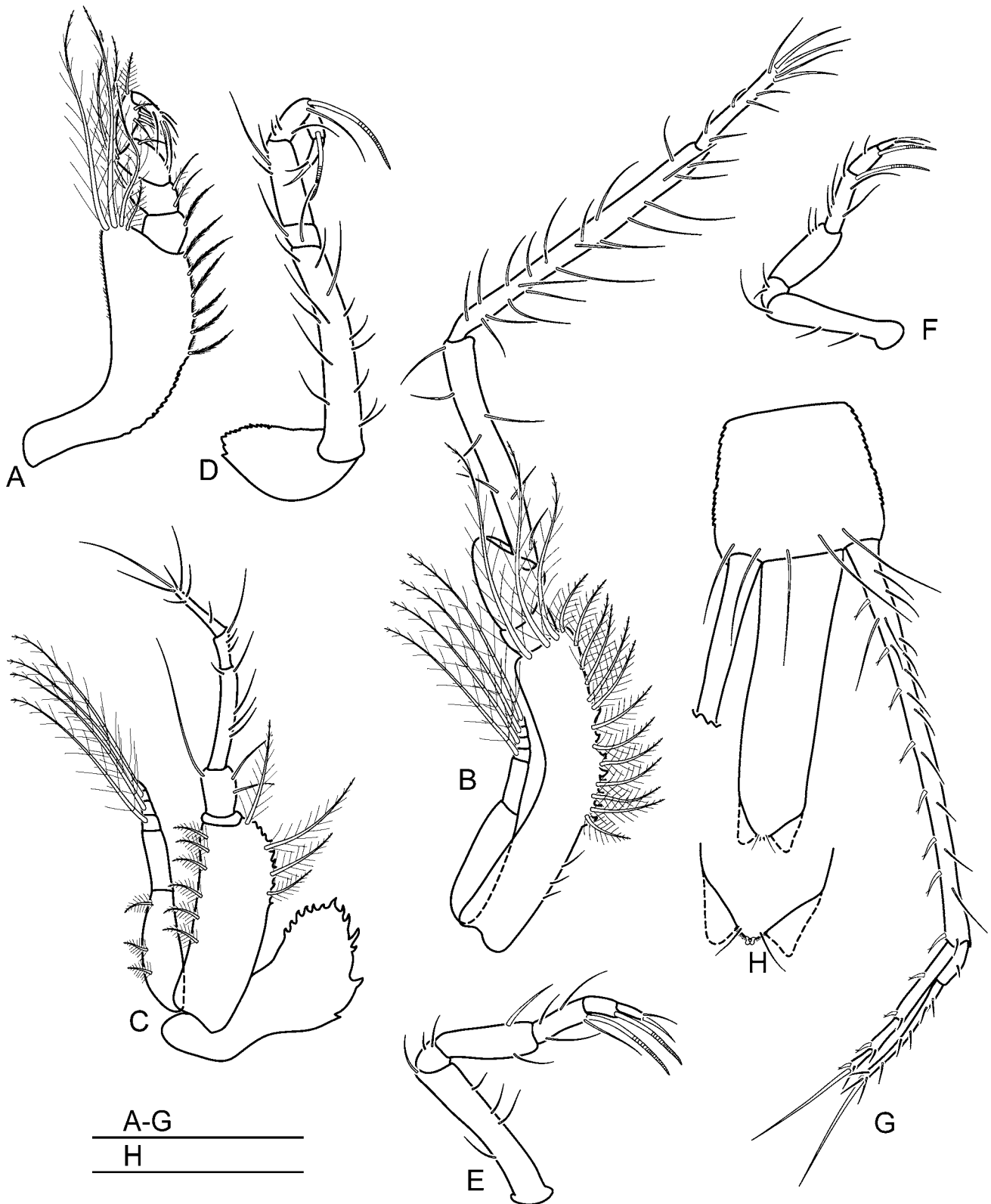


Figure 39. *Paradiastylis occidentaustralis* n. sp. female. Paratype preparatory female, 3.8 mm, AM P85787: (A), maxilliped 3; (B), pereopod 1; (C), pereopod 2; (D), pereopod 3; (E), pereopod 4; (F), pereopod 5; (G), pleonite 6, telson and uropods; (H), telson. Scale bars A–G = 0.5 mm, H = 0.25 mm.

together, with 2 simple setae with single subterminal setule medially, simple seta laterally; article 2 $0.5 \times$ article 1 length, with simple seta with single subterminal setule medially, simple seta laterally; article 3 $0.6 \times$ article 2 length, with simple seta with single subterminal setule medially, simple

seta laterally, terminal seta simple. Uropod exopod of 2 articles, $1.1 \times$ length of endopod; article 1 $0.3 \times$ article 2 length, with simple seta; article 2 with 8 simple setae, terminal seta simple, equal in length with uropod endopod terminal seta (Fig. 39G).

Etymology. The species is named *occidensaustralis* meaning western Australia, the place of collection.

Remarks. The carapace of the new species is similar to many species of *Dimorphostylis*; however, the female specimens do not have an exopod on maxilliped 3, requiring that this species be placed in *Paradiastylis*, and also differentiating them easily from the *Dimorphostylis* females. The most similar species are *D. australis* and *D. triplicata*, both of which have 3 parallel oblique ridges on the carapace and a long, tubular telson. However, in *D. australis* the female has an exopod on maxilliped 3, and the oblique ridges are not connected by short vertical ridges anteriorly. In *P. occidensaustralis* the female has no exopod on maxilliped 3, and the oblique ridges are connected anteriorly by short vertical ridges. The carapace of the subadult male of *D. triplicata* is very similar to the carapace of *P. occidensaustralis*, but can be differentiated by the proportions of pereopod 1. In *D. triplicata* the propodus of pereopod 1 is distinctly shorter than the basis, while in *P. occidensaustralis* the propodus of pereopod 1 is subequal to the basis.

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