

## Algal-tube Dwelling Amphipods in the Genus *Cerapus* from Australia and Papua New Guinea (Crustacea: Amphipoda: Ischyroceridae)

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**ABSTRACT.** Three new species of ischyrocerid amphipods in the genus *Cerapus* (*C. bundegi*, *C. murrayae*, and *C. volucola*) are described from Australia and Papua New Guinea. Although these species have all of the morphological characteristics of *Cerapus*, they differ from other species in the genus in the construction of their tubes which are wrapped and parchment-like and sometimes elaborately covered with pieces of cut algae and seagrasses.

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Within Australia about 20 species (described and undescribed) occur in the *Cerapus* clade of Lowry & Berents, 1996 (*Bathypoma*, *Cerapus*, *Notopoma*, *Paracerapus* and *Runanga*). These species can be grouped by the type of tube they build. The most common tube type is made of minute sand grains and detritus held together with amphipod silk, known as detrital-tubes. The ends may be straight or fluted. In other species the females attach coarse sand grains to one end of the tube to form a holdfast that is buried in the substrate, known as anchor-tubes. The species described here make their tubes by wrapping algae into tubes, that may be simple or elaborately decorated with pieces of algae or seagrasses and these are known as algal-tubes. These species live on algae and the tubes are assumed to form an effective camouflage. Although the tubes are bizarre compared with those of other species of *Cerapus*, the morphology of the species in this group is similar to the type species *C. tubularis* Say, 1817 (Lowry & Berents, 1989), which build their tubes of minute sand grains. In this paper we describe three new species (*C. bundegi*, *C. murrayae*, and *C. volucola*) that build algal-tubes.

J.L. Barnard (1973) placed *Erichthonius* and related genera and *Cerapus* and related genera in the Ischyroceridae, but not *Siphonoeetes* and related genera, which he placed in the Corophiidae. Bousfield (1979; 1982) and Just (1983) maintained the classification of J.L. Barnard (1973). Lowry & Berents (1996) were able to demonstrate the monophyly of the combined *Erichthonius*, *Cerapus* and *Siphonoeetes* clades, but they were not able to link the group with a known family level taxon. Myers & Lowry (2003), in their revision of the corophiidean amphipods, confirmed that the siphonoeetin clade (including the above three clades) is a sister taxon to the ischyrocerin clade which makes up the subfamily Ischyrocerinae.

Diagnosis are generated with the aid of Intkey (Dallwitz *et al.*, 1993 onwards; Dallwitz *et al.*, 1998). Characters in bold face distinguish each taxon in at least two respects from every other taxon in the genus *Cerapus*. Material used in this study is lodged in the Australian Museum, Sydney (AM). The following abbreviations are used on the plates: *A*, antenna; *D*, dactylus; *G*, gnathopod; *P*, pereopod; *PL*, pleopod; *UR*, urosome.

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**Superfamily Photoidea Boeck, 1871**

(Myers &amp; Lowry, 2003)

**Family Ischyroceridae Stebbing, 1899****Subfamily Ischyrocerinae Stebbing, 1899**

(Myers &amp; Lowry, 2003)

**Tribe Siphonocetini Just, 1983**

(Myers &amp; Lowry, 2003)

***Cerapus bundegi* n.sp.**

Figs. 1–2

**Type material.** HOLOTYPE, ♂, 4.77 mm, AM P62291; PARATYPE, ♀, 3.85 mm, AM P62385; 41 PARATYPES, AM P62381; PARATYPE, ♂, 3.54 mm, AM P62383; PARATYPE, ♂, 2.74 mm, AM P62384; north of jetty, Cottesloe Beach, Perth, Western Australia, Australia, 31°59'S 115°45'E, just outside limestone reef, sand with scattered seagrass, 4 m, J. Just, 3 April 1984, AU 28. 21 PARATYPES, AM P62382, off end of South Mole, Arthur Head, Fremantle, Western Australia, Australia, 32°3'S 115°44'E, brown & red algae, 6 m, R.T. Springthorpe, 25 December 1983, WA 274.

**Additional material.** 2 specimens, AM P62292, *Sargassum* sp. and sand, 2.3 m; 6 specimens, AM P62332, broad-leaf *Sargassum* sp., sand & algal bottom, 2.8 m; 3 juveniles, AM P62334, fine *Dictyota* sp. and sand, 2.6 m; 2 specimens, AM P62338, broad-leaf *Sargassum* sp. and sand, 2.9 m; 1 ♂, AM P62339, fine *Sargassum* sp. and sand, 2.9 m; 1 ♂, AM P62340, *Padina* sp., *Lobophora* sp. and sand, 2.7 m; 1 ♀, AM P62341, fine *Dictyota* sp. and sand, 2.3 m; 3 juveniles, AM P62387, *Padina* sp. and sand, 2.3 m; 1 ♂, AM P62392, *Dictyotales* and sand, 2.8 m; 4 specimens, AM P62395, *Sargassum* sp. and sand, 2.7 m; 3 specimens, AM P62397, *Dictyotales* and sand, 2.8 m; 2 specimens, AM P62404, *Sargassum* sp. and sand, 2.9 m, west side of Malus Island, Dampier Archipelago, Western Australia, Australia, 26°30.61'S 116°38.92'E, R.A. Peart, 27 September 1999, WA 661. 1 ♂, AM P62388, south side of Kendrew Island, Dampier Archipelago, Western Australia, Australia, 20°20.63'S 116°31.99'E, *Sargassum* sp. and sand, 3.8 m, R.A. Peart, 30 August 1999, WA 694. 4 specimens, AM P62389, mixed brown algae, 17 m, M. Hewitt; 3 juveniles, AM P62391, *Dictyopteris* sp., 17 m, P. Morrison, Nelson Rocks, Dampier Archipelago, Western Australia, Australia, 20°26.51'S 116°40.23'E, 7 September 1999, WA 715. 4 ♂, AM P62386, *Dictyopteris* sp., intertidal zone, 0.5 m; 1 ♀, AM P62394, *Padina* sp., intertidal, 0.5 m, Tish Point, Rosemary Island, Dampier Archipelago, Western Australia, Australia, 20°29.67'S 116°35.89'E, R.A. Peart, 30 August 1999, WA 685. 11 specimens, AM P62335, beach at north end of Bundegi Reef, Exmouth Gulf, Western Australia, Australia, 21°49'S 114°11'E, rocky rubble, coralline algae with green epiphyte, 2 m, H.E. Stoddart, 4 January 1984. Many specimens, AM P62336, seagrass with bases and sand, 2 m; 12 specimens, AM P62398, mixed algae, 2 m, J.K. Lowry; many specimens, AM P62393, south Ned's Camp, Cape Range National Park, Western Australia, Australia, 22°00'S 113°55'E, seagrass, 2 m, R.T. Springthorpe, 31 December 1983. many specimens, AM P62337, Ned's Camp, Cape Range National Park, Western Australia, Australia, 21°59'S 113°55'E, green algae, 1.5 m, R.T. Springthorpe, 2 January 1984, WA 380. 6 specimens, AM P62290, 4 m, R.T. Springthorpe; 3 specimens, AM P62333, mixed coralline algae, 4 m, J.K. Lowry, Red Bluff, Kalbarri, Western Australia, Australia, 27°42'S 114°9'E, 10 January 1984. 4 specimens, AM P62286, 16 specimens, AM P62285, reef close to shore, Champion Bay, Geraldton, Western Australia, Australia, 28°45.88'S 114°36.83'E, *Ecklonia radiata* on shallow rocky reef at low tide, 0.5 m, R.A. Peart, 28 November 2000. 4 specimens, AM P62396, Seven Mile Beach, Western Australia, Australia, 29°11'S 114°53'E, *Amphibolis* sp. (seagrass), 1 m, G.J. Edgar, 6 June 1987. 2 specimens, AM P62402, 10 specimens, AM P62406, 5 specimens, AM P62403, 2 ♀, AM P62405, Cottesloe Beach, Perth, Western Australia, Australia, 31°59'S 115°45'E, sand patch on limestone reef with algae & seagrass (*Amphibolis* sp.), 2 m, J. Just, 2–3 March 1984. 1 ♂, AM P62390, reef west of groynes, 2 km south of Cape Peron, Western Australia, Australia, 32°16'S 115°41'E, *Caulerpa* sp. in deep channels in limestone reef, 6 m, J.K. Lowry, 26 December 1983, WA 302. 1 ♀, AM P62399, sponges, 6 m, R.T. Springthorpe; 5 specimens, AM P62400, *Caulerpa* sp., 6 m, J.K. Lowry; 2 juveniles, AM P62401, orange gorgonacean, 6 m, R.T. Springthorpe, end of South Mole, Arthur Head, Fremantle, Western Australia, Australia, 32°3'S 115°44'E, 25 December 1983, WA 286.

**Diagnosis.** Head, rostrum long, apically acute; anteroventral corner subquadrate. **Antenna 1 peduncular article 1 longer than article 3, swollen along posterior margin. Pereonite 2 with sternal keel.** Pereopod 5 merus posterior lobe with 4 plumose setae.

**Description.** Based on holotype male, 4.77 mm. **Head,** rostrum long, apically acute, length 0.4× head; lateral cephalic lobe with ventral corner rounded, subocular margin weakly recessed, anteroventral corner subquadrate, ventral margin horizontal, posterior margin vertical. **Antenna 1** long, length 0.5× body length; peduncular article 1 longer than (1.2×) peduncular article 3, not produced anterodistally and anteromedially, swollen along posterior margin, posterodistal corner not produced; flagellum 6-articulate; article 1 short. **Antenna 2** length 0.9× antenna 1; flagellum 5-articulate; article 1 short. **Epistome and upper lip** fused, straight. **Mandible** with palp article 2 long and slender, length 3.1× breadth, 1.2× article 3; palp article 3 slender, blade-like, long, 3.3× breadth.

**Pereon.** **Pereonite 1** without lateral keel; without sternal keel. **Pereonite 2** with sternal keel. **Pereonite 3** without sternal keel. **Pereonite 5** length 2.1× depth.

**Gnathopod 1** coxa not fused to pereonite 1, length 1.4× depth, without anteroventral lobe; basis length 1.6× depth; carpus, length 1.2× depth with setose posterior lobe, broad; palm extremely acute, with barbed robust setae. **Gnathopod 2** carpocheate; coxa not fused to pereonite 2, length 1.7× depth, without anteroventral lobe or cusp; basis short, broad, length 1.3× breadth; carpus long, broad, length 1.2× breadth; palm shallowly excavate, anterodistal tooth small, located near articulation with propodus, posterodistal tooth well defined, medium, length 1.2× width; propodus broad, slightly curved, length 3.2× width, without proximal tooth on posterior margin, posterodistal corner smooth, without tooth; dactylus, length 0.7× propodus. Male gnathopod 2 changes significantly through growth stages. Figure 1 illustrates these changes for specimens ranging in size from 2.74 to 4.77 mm.

**Pereopod 3** coxa not fused to pereonite 3, length 2.2× depth, without anteroventral lobe; basis, length 1.7× breadth, evenly rounded, with simple setae along anterior margin, without denticles along anterior margin; ischium long, length 1.6× breadth; merus short, length 0.8× breadth, without ridges. **Pereopod 4** coxa not fused to pereonite 4, length 2× depth, without anteroventral lobe; basis length 1.3× breadth, with simple setal group midway along anterior margin; ischium long, length 2× breadth; merus short, length 1× breadth. **Pereopod 5** coxa length 1.3× depth, without patches of small setae, without setae along ventral margin; merus with anterior lobe not extending beyond anterior margin of carpus, posterior lobe with 4 plumose setae; propodus with 1 seta along posterior margin; dactylus short, uncinuate with one accessory hook. **Pereopod 6** coxa without setal fringe ventrally, without patch of small setae near anterior margin; basis without patch of small setae near anterior margin; merus, length 1.2× breadth; dactylus short, uncinuate, with two accessory hooks. **Pereopod 7** coxa without posterodorsal lobe, without patch of small setae; merus, length 1.7× breadth; dactylus, short, uncinuate, with two accessory hooks.

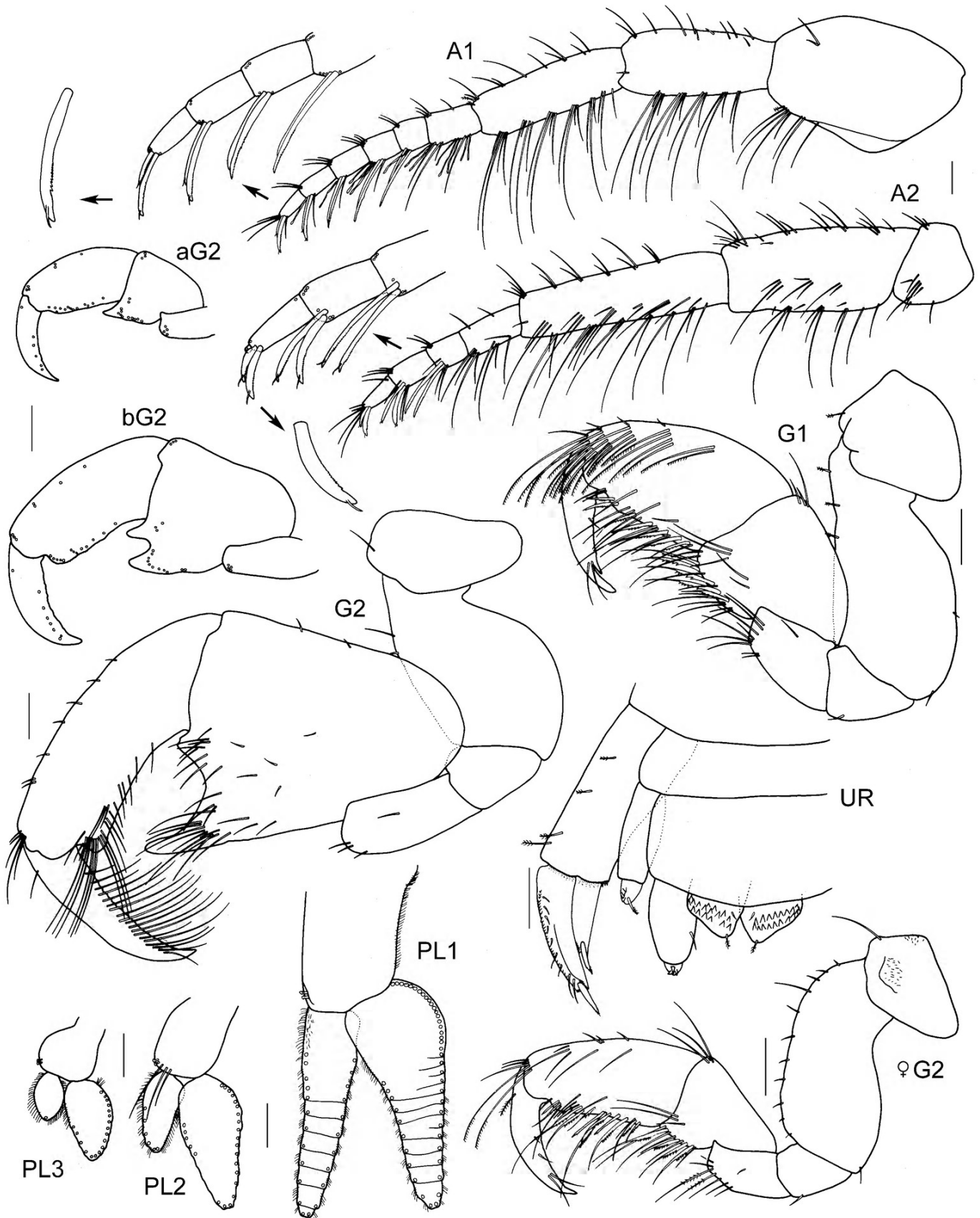


Fig. 1. *Cerapus bundegi* n.sp., holotype male, 4.77 mm (P62291), paratype female, 3.85 mm (P62385), paratype male "a", 2.74 mm (P62384), paratype male "b", 3.54 mm (P62383). South Mole, Arthur Head, Fremantle, Western Australia. Scales represent 0.1 mm.

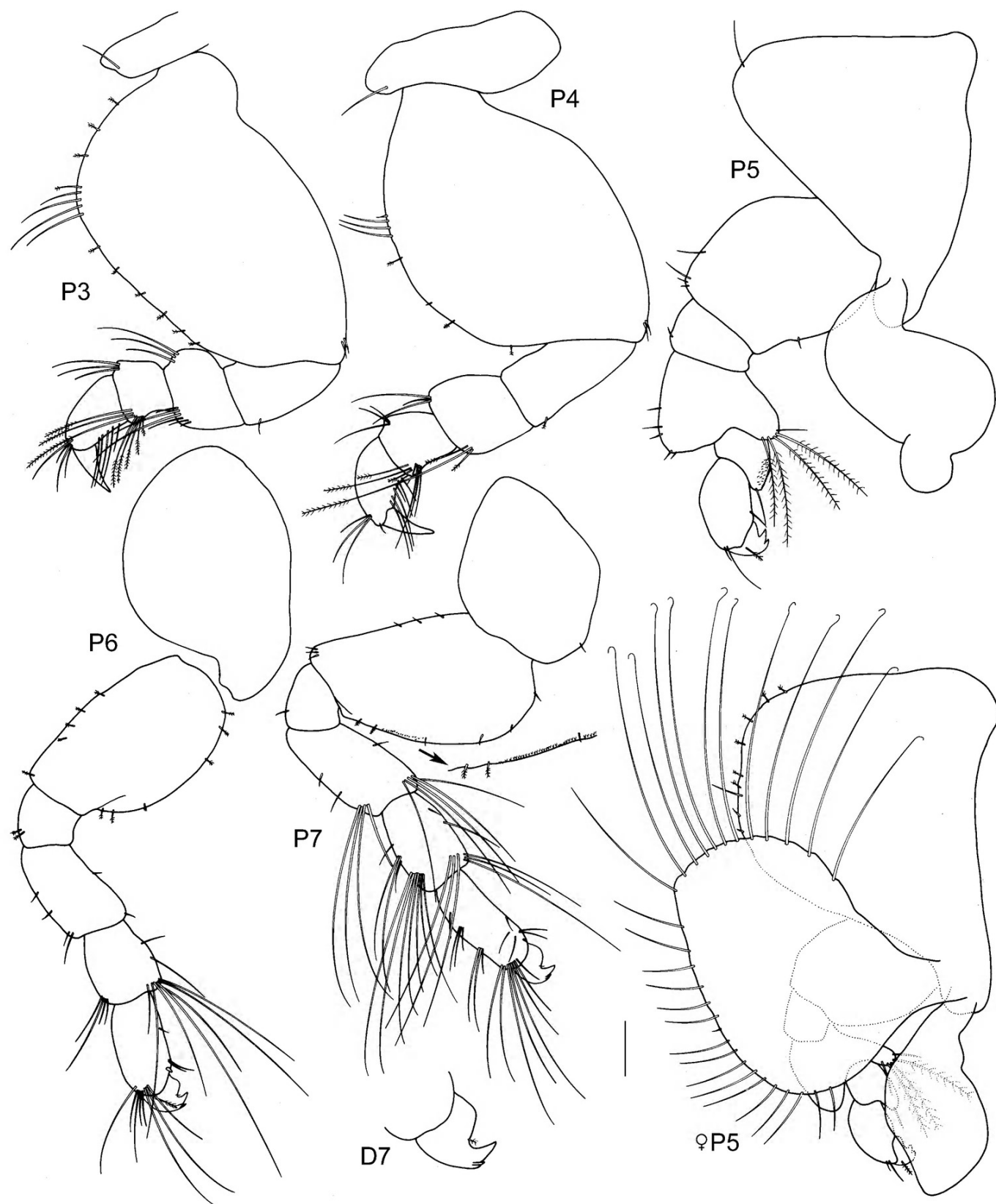


Fig. 2. *Cerapus bundegi* n.sp., holotype male, 4.77 mm (P62291), paratype female, 3.85 mm (P62385). South Mole, Arthur Head, Fremantle, Western Australia. Scales represent 0.1 mm.

**Pleon.** *Pleopods 1 to 3* decreasing in size. *Pleopod 1* inner ramus 8-articulate; outer ramus 8-articulate, article 1 evenly swollen. *Pleopod 2* biramous; inner ramus reduced, 1-articulate; outer ramus, broad, 1-articulate. *Pleopod 3* present; inner ramus present, reduced; 1-articulate. *Uropod 1* biramous, peduncle with distoventral corona of cuticular teeth, length

1.4× outer ramus; rami with distoventral corona of cuticular teeth; outer ramus with lateral row of denticles, without medial setae, with 9 lateral setae, with large apical robust seta without smaller slender setae; inner ramus, length 0.5× outer ramus, without medial or lateral setae, with large apical robust seta without smaller slender setae. *Uropod 2* uniramous, length of



peduncle  $2.4\times$  breadth,  $3.8\times$  ramus; ramus small, with 4 denticles and 1 apical seta. *Uropod 3* uniramous, peduncle length  $1.5\times$  breadth; ramus with 3 curved hooks. *Telson* length  $0.5\times$  breadth, moderately cleft,  $0.6\times$  length, each lobe with 17–18 anteriorly directed hooks, in 2 rows.

**Female** (sexually dimorphic characters). Based on paratype female, 3.85 mm (P62385). *Antenna 1* flagellum 4-articulate. *Pereonite 2* without sternal keel. *Pereonite 5* length  $1.5\times$  depth. *Gnathopod 1* coxa length  $1.7\times$  depth; basis length  $2.3\times$  depth; carpus, length  $1.1\times$  depth with setose posterior lobe. *Gnathopod 2* subchelate; coxa length  $1.9\times$  depth; basis slender, length  $1.8\times$  breadth; carpus short, compressed, length  $1.3\times$  breadth. *Pereopod 5* coxa length  $1.5\times$  depth, with setae along ventral margin. *Oostegites* from gnathopod 2 to pereopod 5.

**Etymology.** The species is named after Bundegi Reef, in the northern part of its range.

**Tube.** Wrapped, parchment-like; seagrass and algae “wrapped” to form a tube.

**Habitat.** Littoral, 0.5 to 6 m depth.

**Life-style.** Epifaunal sediment, algal or seagrass dwellers.

**Remarks.** *Cerapus bundegi* is a common, widespread species along the western Australian coast. The tubes of *C. bundegi* and *C. volucola* are almost identical, but morphologically the species differ in many ways. The most obvious differences are the shape of male gnathopod 2, and the number of dorsal recurved hooks on the telson (17–18 in *C. bundegi* and 14–15 in *C. volucola*).

**Distribution.** *Western Australia:* Malus Island, Kendrew Island, Nelson Rocks, Tish Point, Rosemary Island, all in the Dampier Archipelago; Bundegi Reef, Exmouth Gulf, Ned’s Camp, Cape Range National Park; Red Bluff, Kalbarri; Champion Bay, Geraldton; Seven Mile Beach; Cottesloe Beach, Perth; Cape Peron; South Mole, Arthur Head, Fremantle (20°S to 32°S).

### *Cerapus murrayae* n.sp.

Figs. 3–6

**Type material.** HOLOTYPE, ♂, 7.04 mm, AM P31037; PARATYPE, ♀, 4.64 mm, AM P51220; PARATYPE, ♂, 4.32 mm, AM P51218; PARATYPE, ♂, 3.04 mm, AM P51219; PARATYPE, ♂, 6.08 mm, AM P61568; PARATYPE, ♂, 8.9 mm, AM P62508; 36 PARATYPES, AM P61567; near bridge, Queenscliff Lagoon, Queenscliff, New South Wales, Australia, 33°47.1'S 151°16.8'E, washed in at high tide on drift algae *Lobophora variegatus* or *Zonaria*, intertidal, A. Murray, 26 October 1980. PARATYPE, ♂, 5.08 mm, AM P61569, Balmoral Beach, New South Wales, Australia, 32°49.6'S 151°15.2'E, C. Short, 3 m, sand, 7 September 1978. PARATYPE, ♂, AM P61570, 150 m N of Horseshoe Bay, Trial Bay, New South Wales, Australia, 30°53'S 153°03'E, sediment and detritus from around reef edge, hand dredge, 7 m, R.T. Springthorpe, 15 June 1986. PARATYPE, ♂, AM P61571, Split Solitary Island, New South Wales, Australia, 30°14.61'S 153°10.73'E, *Zonaria* sp., soft corals, bryozoans and sponges, 18 m, P.B. Berents, J.K. Lowry and R. Peart, 12 February 2000.

**Diagnosis.** Head, rostrum short, apically acute; anteroventral corner subquadrate. Antenna 1 peduncular article 1 longer than article 3, slightly swollen along posterior margin. Pereonite 2 without sternal keel. **Pereopod 5 merus posterior lobe with 7 plumose setae.**

**Description.** Based on holotype male, 7.04 mm (P31037). **Head,** rostrum short, apically acute, length  $0.2\times$  head; lateral cephalic lobe with ventral corner rounded, subocular margin

deeply recessed, anteroventral corner subquadrate, ventral margin horizontal, posterior margin vertical. *Antenna 1* long, length  $0.5\times$  body length; peduncular article 1 longer than ( $1.2\times$ ) peduncular article 3, not produced anterodistally and anteromedially, slightly swollen along posterior margin, posterodistal corner not produced; flagellum 6-articulate; article 1 short. *Antenna 2* subequal in length to antenna 1; flagellum 6-articulate; article 1 long. *Epistome and upper lip* fused, straight. *Mandible* with palp article 2 long and slender, length  $3.4\times$  breadth,  $1.4\times$  article 3; palp article 3 slender, blade-like, long,  $3.1\times$  breadth.

**Pereon.** *Pereonite 1* with lateral keel; without sternal keel. *Pereonite 2* without sternal keel. *Pereonite 3* without sternal keel. *Pereonite 5* length  $2\times$  depth.

*Gnathopod 1* coxa not fused to pereonite 1, length  $1.4\times$  depth, without anteroventral lobe; basis length  $1.8\times$  depth; carpus length  $1.3\times$  depth with setose posterior lobe, broad; palm extremely acute, with simple robust setae. *Gnathopod 2* carpochele; coxa not fused to pereonite 2, length  $1.6\times$  depth, without anteroventral lobe or cusp; basis short, broad, length  $1.3\times$  breadth; carpus long, broad, length  $1.2\times$  breadth; palm shallowly excavate, anterodistal tooth small, located near articulation with propodus, posterodistal tooth well defined, medium in size, length  $1.4\times$  width; propodus very broad, slightly curved, length  $2.2\times$  width, without tooth on posterior margin, posterodistal corner smooth, without tooth; dactylus, length  $0.7\times$  propodus.

*Pereopod 3* coxa fused to pereonite 3, with broad anteroventral lobe; basis, length  $1.7\times$  breadth, evenly rounded, with simple setae along anterior margin, without denticles along anterior margin; ischium long, length  $2.8\times$  breadth; merus short, length  $1\times$  breadth, without ridges. *Pereopod 4* coxa fused to pereonite 4, with anterior lobe; basis length  $1.3\times$  breadth, with simple setal group midway along anterior margin; ischium long, length  $2.1\times$  breadth; merus short, subequal in length 1 to breadth. *Pereopod 5* coxa length  $1.2\times$  depth, without patches of small setae, with setae along ventral margin; merus with anterior lobe extending beyond anterior margin of carpus, posterior lobe with 7 plumose setae; propodus with 3 setae along posterior margin; dactylus short, uncinete with one accessory hook. *Pereopod 6* coxa without setal fringe ventrally, without patch of small setae near anterior margin; basis without patch of small setae near anterior margin; merus, length  $2\times$  breadth; dactylus short, uncinete, with two accessory hooks. *Pereopod 7* coxa without posterodorsal lobe, without patch of small setae; merus, length  $1.6\times$  breadth; dactylus, short, uncinete, with two accessory hooks.

**Pleon.** *Pleopods 1 to 3* decreasing in size. *Pleopod 1* inner ramus 9-articulate; outer ramus 3-articulate, article 1 with medial lobe. *Pleopod 2* biramous; inner ramus reduced, 1-articulate; outer ramus, broad, 1-articulate. *Pleopod 3* present; inner ramus present, reduced; 1-articulate; outer ramus broad, 1-articulate. *Uropod 1* biramous, peduncle with distoventral corona of cuticular teeth, length  $1.5\times$  outer ramus; rami with distoventral corona of cuticular teeth; outer ramus with lateral row of denticles, without medial setae, and with 5 lateral setae, with large apical robust seta without smaller slender setae; inner ramus, length  $0.7\times$  outer ramus, without medial or lateral setae, with large apical robust seta without smaller slender setae. *Uropod 2* uniramous, length of peduncle  $2.8\times$  breadth,  $5.8\times$  ramus; ramus small, with 4 denticles and 1 apical seta. *Uropod 3* uniramous, peduncle



Fig. 3. *Cerapus murrayae* n.sp., Queenscliff Lagoon, New South Wales: (A), adult male; (B), tube with male protruding.

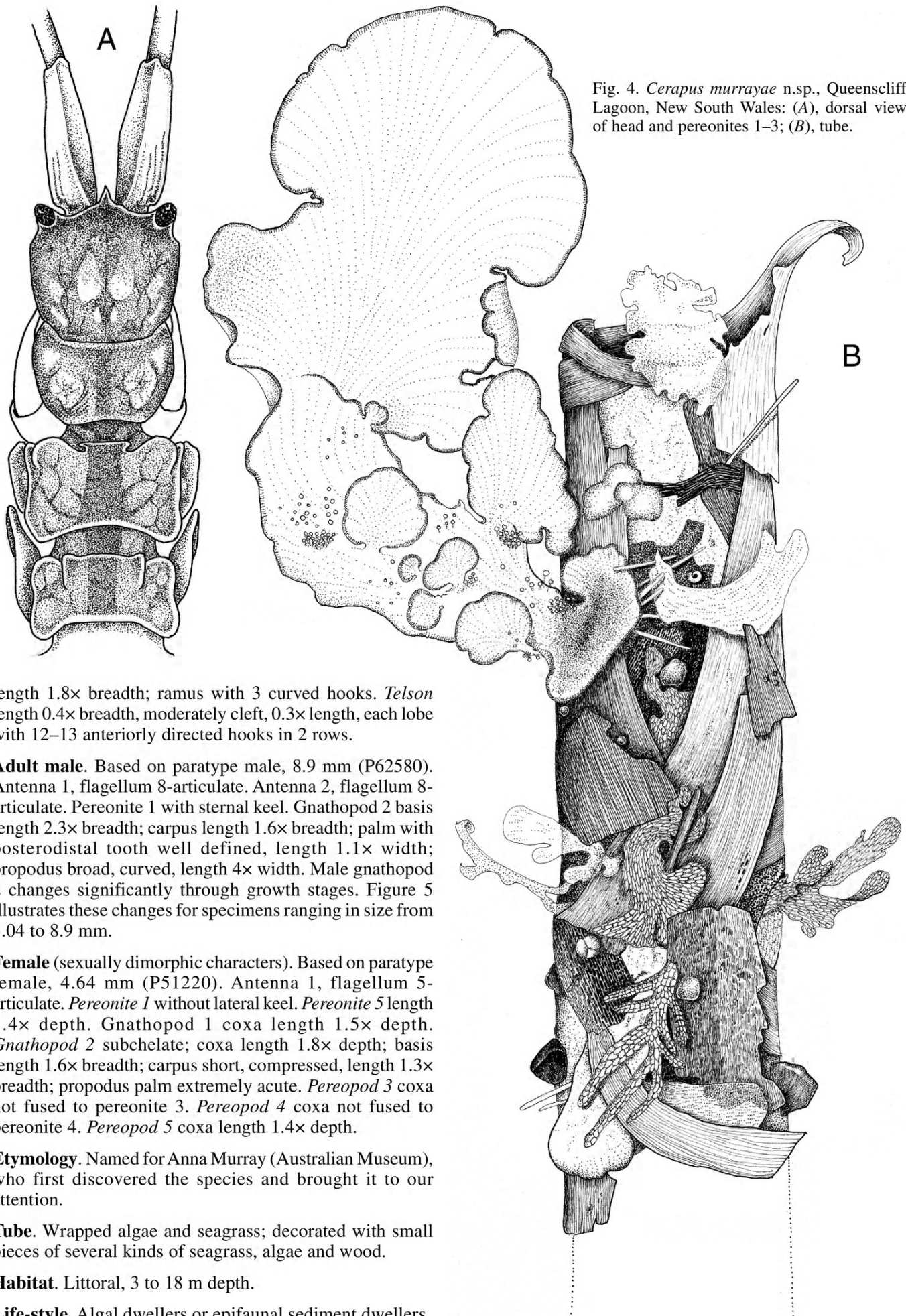


Fig. 4. *Cerapus murrayae* n.sp., Queenscliff Lagoon, New South Wales: (A), dorsal view of head and pereonites 1–3; (B), tube.

length  $1.8 \times$  breadth; ramus with 3 curved hooks. *Telson* length  $0.4 \times$  breadth, moderately cleft,  $0.3 \times$  length, each lobe with 12–13 anteriorly directed hooks in 2 rows.

**Adult male.** Based on paratype male, 8.9 mm (P62580). Antenna 1, flagellum 8-articulate. Antenna 2, flagellum 8-articulate. Pereonite 1 with sternal keel. Gnathopod 2 basis length  $2.3 \times$  breadth; carpus length  $1.6 \times$  breadth; palm with posterodistal tooth well defined, length  $1.1 \times$  width; propodus broad, curved, length  $4 \times$  width. Male gnathopod 2 changes significantly through growth stages. Figure 5 illustrates these changes for specimens ranging in size from 3.04 to 8.9 mm.

**Female** (sexually dimorphic characters). Based on paratype female, 4.64 mm (P51220). Antenna 1, flagellum 5-articulate. *Pereonite 1* without lateral keel. *Pereonite 5* length  $1.4 \times$  depth. Gnathopod 1 coxa length  $1.5 \times$  depth. *Gnathopod 2* subchelate; coxa length  $1.8 \times$  depth; basis length  $1.6 \times$  breadth; carpus short, compressed, length  $1.3 \times$  breadth; propodus palm extremely acute. *Pereopod 3* coxa not fused to pereonite 3. *Pereopod 4* coxa not fused to pereonite 4. *Pereopod 5* coxa length  $1.4 \times$  depth.

**Etymology.** Named for Anna Murray (Australian Museum), who first discovered the species and brought it to our attention.

**Tube.** Wrapped algae and seagrass; decorated with small pieces of several kinds of seagrass, algae and wood.

**Habitat.** Littoral, 3 to 18 m depth.

**Life-style.** Algal dwellers or epifaunal sediment dwellers.



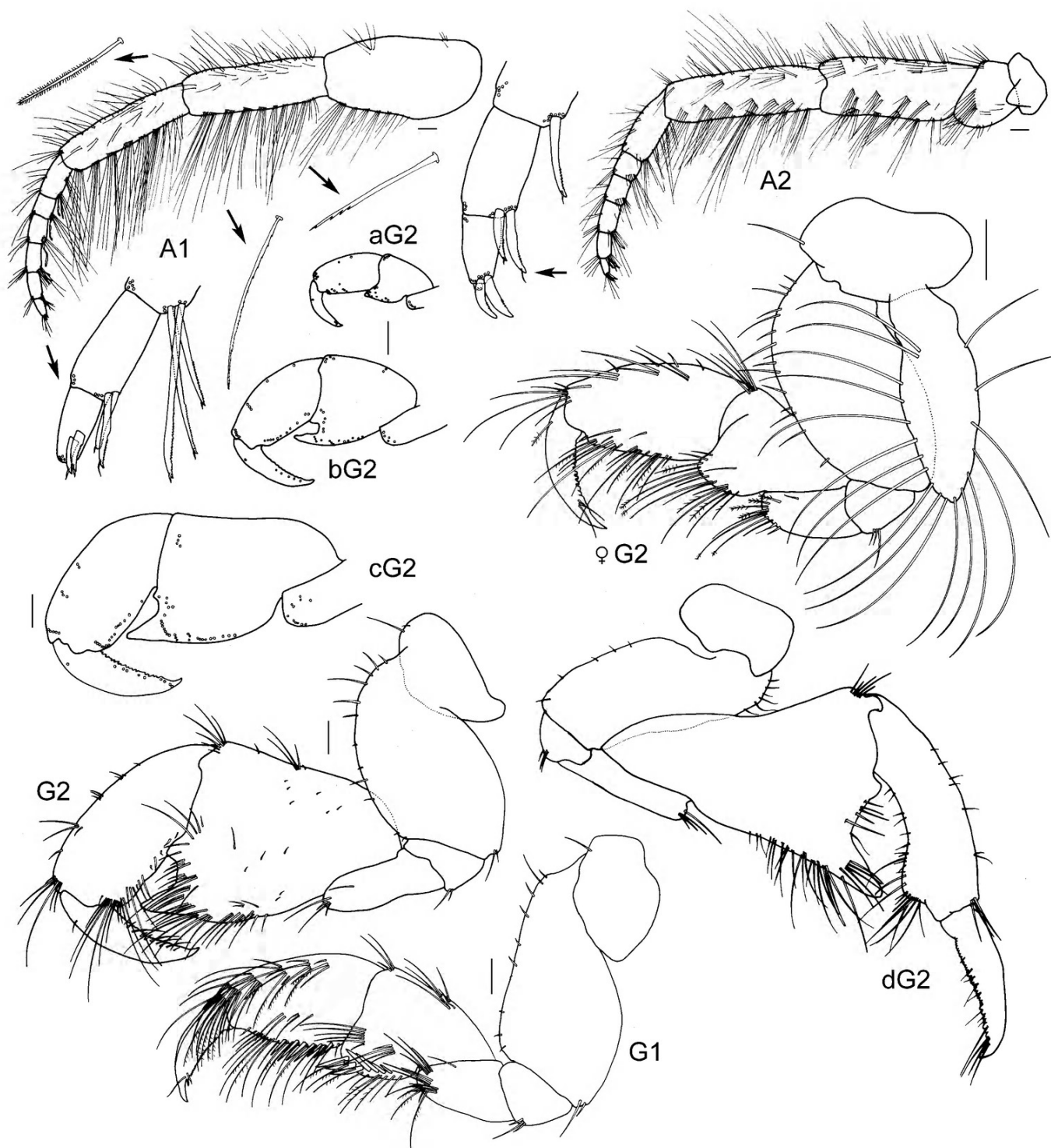


Fig. 5. *Cerapus murrayae* n.sp., holotype male, 7.04 mm (P31037), paratype female, 4.64 mm (P51220), paratype male "a", 3.04 mm (P51219), paratype male "b", 4.32 mm (P51218), paratype male "c", 6.08 mm (P61568) and paratype male "d", 8.9 mm (P62508), Queenscliff Lagoon, New South Wales. Scales for MD represent 0.05 mm; remainder represent 0.1 mm.

**Remarks.** *Cerapus murrayae* is currently known only from the New South Wales central coast, the most restricted distribution of the three known species that make parchment-like tubes. These spectacular tubes, decorated with pieces of algae, distinguish *C. murrayae* from *C. bundegi* and *C. volucola*. Morphologically *C. murrayae* can be distinguished from both *C. bundegi* and *C. volucola* by the shape of the male gnathopod 2 and the number of dorsal recurved hooks on the telson (17–18 in *C. bundegi* and 14–15 in *C. volucola*) is different.

**Distribution.** *New South Wales*: Horseshoe Bay, Trial Bay;

Split Solitary Island; Queenscliff Lagoon, Queenscliff; Balmoral Beach, Middle Harbour.

#### *Cerapus volucola* n.sp.

Figs. 7–9

**Type material.** HOLOTYPE, ♂, 3.20 mm, AM P62408; 12 PARATYPES, AM P62407; PARATYPE, ♂, 2.84 mm, AM P62409; PARATYPE, ♀, 3.92 mm, AM P62410; False Orford Ness, northeast of Cape York, Queensland, Australia, 11°23'S 142°52'E, rock, brown algae and sand, 4 m, D. Blake, 18 February 1979.



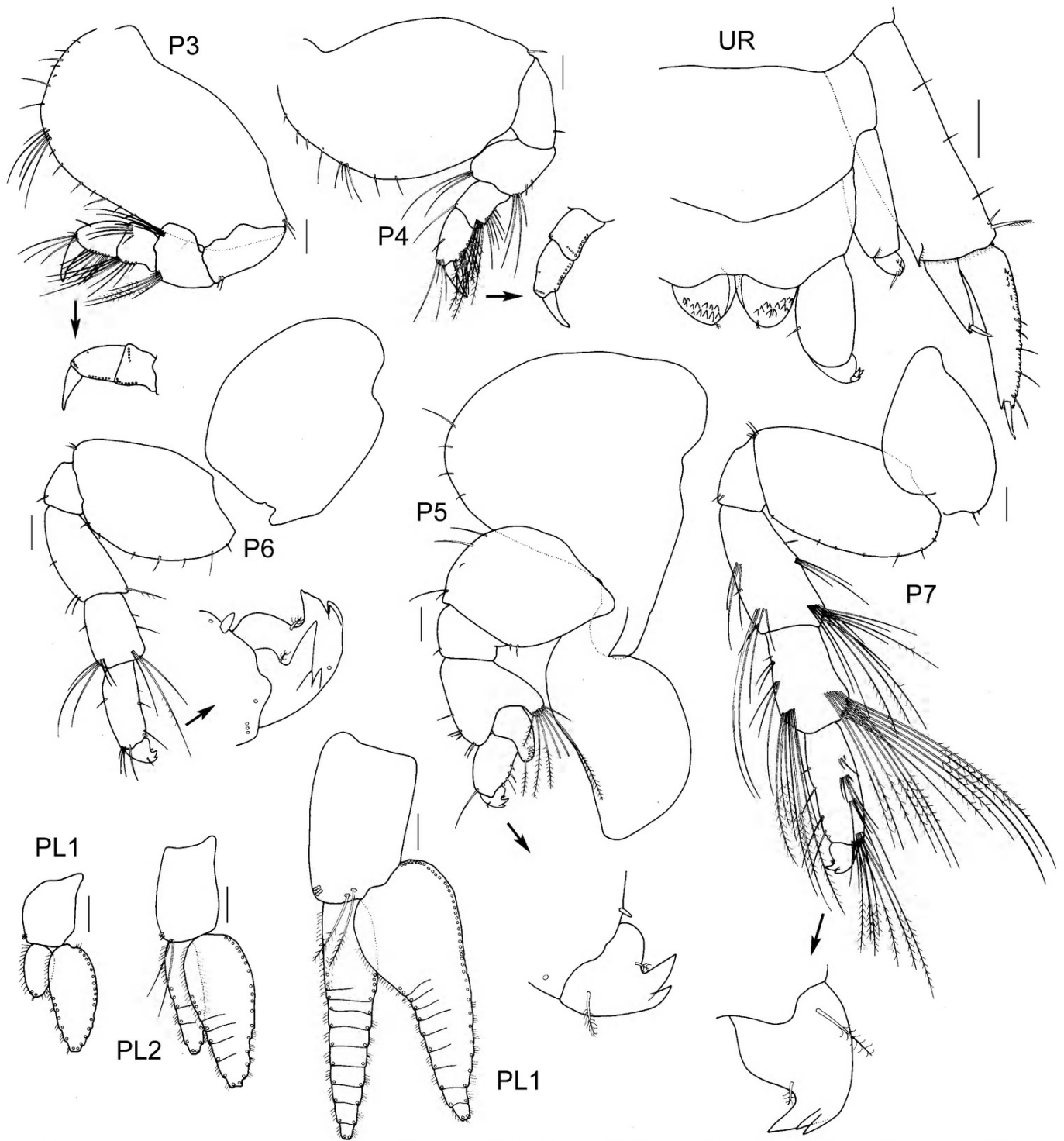


Fig. 6. *Cerapus murrayae* n.sp., holotype male, 7.04 mm (P31037), Queenscliff Lagoon, New South Wales. Scales represent 0.1 mm.

**Additional material.** 1 ♂, AM P62419; 2 specimens, AM P62413, Padoz Natun reef, Madang Lagoon, Papua New Guinea, 5°09.60'S 145°48.77'E, *Halimeda* & epiphytic algae on rubble consolidated by sponges, 8 m, D. Gochfeld, 15 December 1993; 1 ♀, AM P62414, Padoz Natun reef, Madang Lagoon, Papua New Guinea, 5°09.60'S 145°48.77'E, *Halimeda* & epiphytic algae on rubble consolidated by sponges, 8 m, D. Gochfeld, 2 January 1994. 3 specimens, AM P62411, half way between Lizard Island and Carter Reef, Queensland, Australia, 14°37'S 145°33'E, 38 m, J. Leis, 26 November 1981. 5 specimens, AM P62417, Magnetic Island, Queensland, Australia, 19°8'S 146°50'E, among *Sargassum*, 3 m, G. Edgar 13 August 1981. 1 ovigerous female, AM P62415, north Wistari Reef, Capricorn Group, Great Barrier Reef, Queensland, Australia, 23°29'S 151°53'E, coral sand, 24 m, D. Fisk, 11 November 1978; 1 ♀, AM P62416, northwest Wistari Reef, Great Barrier Reef, Queensland, Australia, 23°29'S 151°53'E, sand, 24 m, D. Fisk, 16 December 1978. 1 ♀, AM P62418, Middle Reef, North Stradbroke Island, Queensland, Australia, 27°24.4'S 153°32'E, *Zonaria*, 20 m, K.B. Attwood and E.L.A. Ho, 4 June 1993.

**Diagnosis.** Head, rostrum long, apically acute; antero-ventral corner rounded. Antenna 1 peduncular article 1 longer than article 3, swollen along posterior margin. Pereonite 2 without sternal keel. Pereopod 5 merus posterior lobe with 2 plumose setae.

**Description.** Based on holotype male, 3.20 mm (P62408) and paratype female, 3.92 mm (P62410). With chocolate-coloured stripe around margin of head and dorsal surface of peduncle of antenna 1. **Head**, rostrum long, apically acute, length 0.3× head; lateral cephalic lobe with ventral corner rounded, subocular margin weakly recessed, anteroventral corner rounded, ventral margin horizontal, posterior margin vertical. Antenna 1 long, length 0.5× body

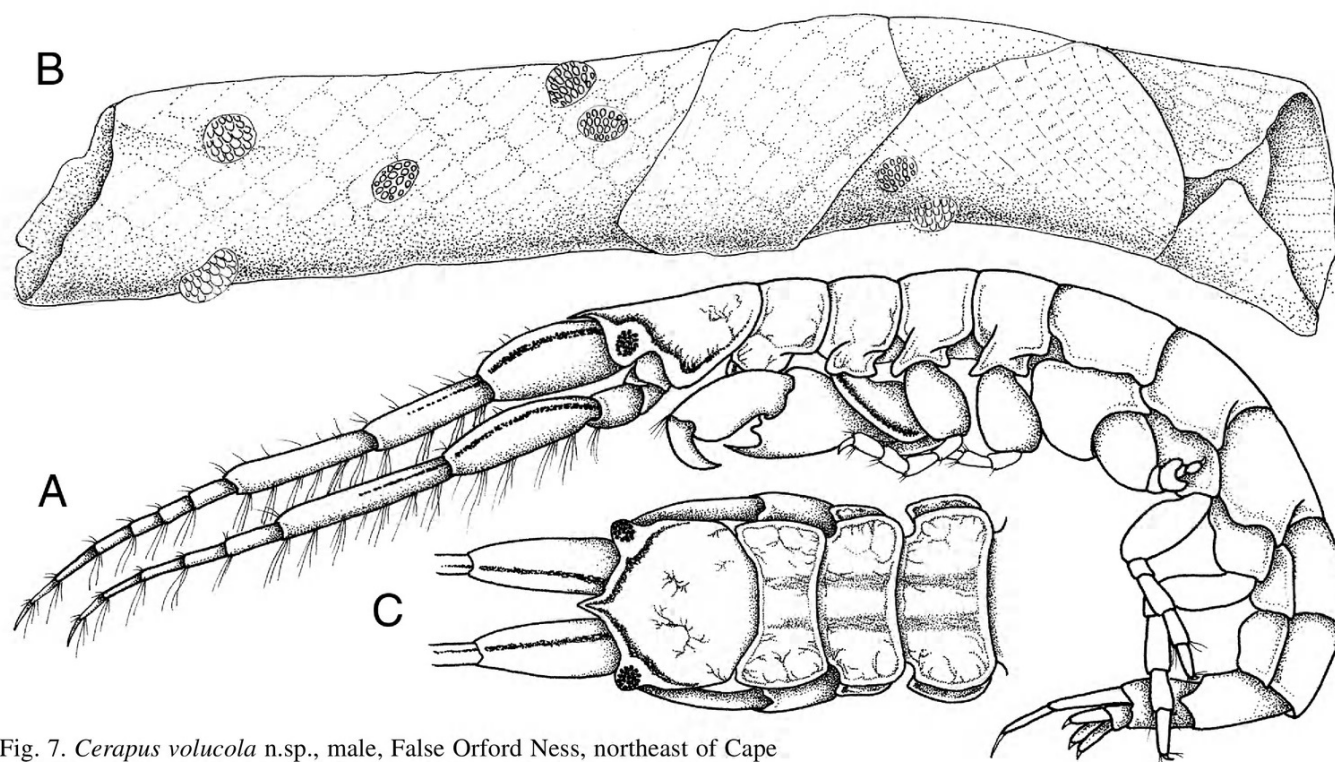


Fig. 7. *Cerapus volucola* n.sp., male, False Orford Ness, northeast of Cape York, Queensland: (A), whole animal; (B), tube; (C), dorsal view of head.

length; peduncular article 1 longer than ( $1.2\times$ ) peduncular article 3, not produced anterodistally and anteromedially, swollen along posterior margin, posterodistal corner not produced; flagellum 6-articulate; article 1 short. *Antenna* 2 length  $1\times$  antenna 1; flagellum 6-articulate; article 1 short. *Epistome and upper lip* fused, straight. *Mandible* with palp article 2 long and slender, length  $2.7\times$  breadth,  $1.1\times$  article 3; palp article 3 slender, blade-like, long,  $3.5\times$  breadth.

**Pereon.** *Pereonites* 1 to 3 without lateral or sternal keels. *Pereonite* 5 length  $1.6\times$  depth.

*Gnathopod* 1 coxa fused to pereonite 1, without anteroventral lobe; basis length  $1.75\times$  depth; carpus, length  $1.25\times$  depth with setose posterior lobe, broad; palm extremely acute, with barbed robust setae. *Gnathopod* 2 carpocheate; coxa fused to pereonite 2, without anteroventral lobe or cusp; basis short, broad, length  $1.35\times$  breadth; carpus long, broad, length  $1.1\times$  breadth; palm deeply excavate, anterodistal tooth large, located distal to articulation with propodus, posterodistal tooth well defined, medium, length  $1.3\times$  width; propodus very broad, slightly curved, length  $2.5\times$  width, without tooth on posterior margin, posterodistal corner smooth, without tooth; dactylus, length  $0.7\times$  propodus.

*Pereopod* 3 coxa fused to pereonite 3, with narrow anteroventral lobe; basis, length  $1.5\times$  breadth, evenly rounded, with plumose setal group and simple setae along anterior margin, without denticles along anterior margin; ischium long, length  $1.6\times$  breadth; merus short, length  $1\times$  breadth, without ridges. *Pereopod* 4 coxa fused to pereonite, with anterior lobe; basis length  $1.3\times$  breadth, with plumose setal group midway along anterior margin; ischium long, length  $1.8\times$  breadth; merus short, length  $1\times$  breadth. *Pereopod* 5 coxa length  $1.3\times$  depth, without patches of small setae, without setae along ventral margin; merus with anterior lobe extending beyond anterior margin of carpus, posterior lobe with 2 plumose setae; propodus with 1 seta

along posterior margin; dactylus short, uncinete with one accessory hook. *Pereopod* 6 coxa without setal fringe ventrally, without patch of small setae near anterior margin; basis without patch of small setae near anterior margin; merus, length  $1.6\times$  breadth; dactylus short, uncinete, with two accessory hooks. *Pereopod* 7 coxa without posterodorsal lobe, without patch of small setae; merus, length  $2.2\times$  breadth; dactylus, short, uncinete, with two accessory hooks.

**Pleon.** *Pleopods* 1 to 3 decreasing in size. *Pleopod* 1 inner ramus 7-articulate; outer ramus 5-articulate, article 1 evenly swollen. *Pleopod* 2 biramous; inner ramus reduced, 1-articulate; outer ramus, broad, 2-articulate. *Pleopod* 3 present; inner ramus present, reduced, 1-articulate. *Uropod* 1 biramous, peduncle with distoventral corona of cuticular teeth, length  $1.3\times$  outer ramus; rami with distoventral corona of cuticular teeth; outer ramus with lateral row of denticles, without medial setae, with 5 lateral setae, with large apical robust seta without smaller slender setae; inner ramus, length  $0.6\times$  outer ramus, without medial or lateral setae, with large apical robust seta without smaller slender setae. *Uropod* 2 uniramous, length of peduncle  $2.5\times$  breadth,  $4.6\times$  ramus; ramus small, with 4 denticles and 1 apical seta. *Uropod* 3 uniramous, peduncle length  $1.5\times$  breadth; ramus with 3 curved hooks. *Telson* length  $0.4\times$  breadth, moderately cleft,  $0.6\times$  length, each lobe with 14–15 anteriorly directed hooks in 2 rows.

**Female** (sexually dimorphic characters). Based on paratype female, 3.92 mm (P62410). *Gnathopod* 1 coxa not fused to pereonite 1, length  $1.5\times$  depth; basis length  $2.3\times$  depth; carpus, length  $1.1\times$  depth with setose posterior lobe, narrow. *Gnathopod* 2 subchelate; basis length  $1.6\times$  breadth; carpus length  $1.3\times$  breadth; propodus palm extremely acute; dactylus length  $0.8\times$  propodus. *Oostegites* from gnathopod 2 to pereopod 5.

**Etymology.** The species name is derived from the Latin words *volumen* for scroll and *cola* for inhabit.

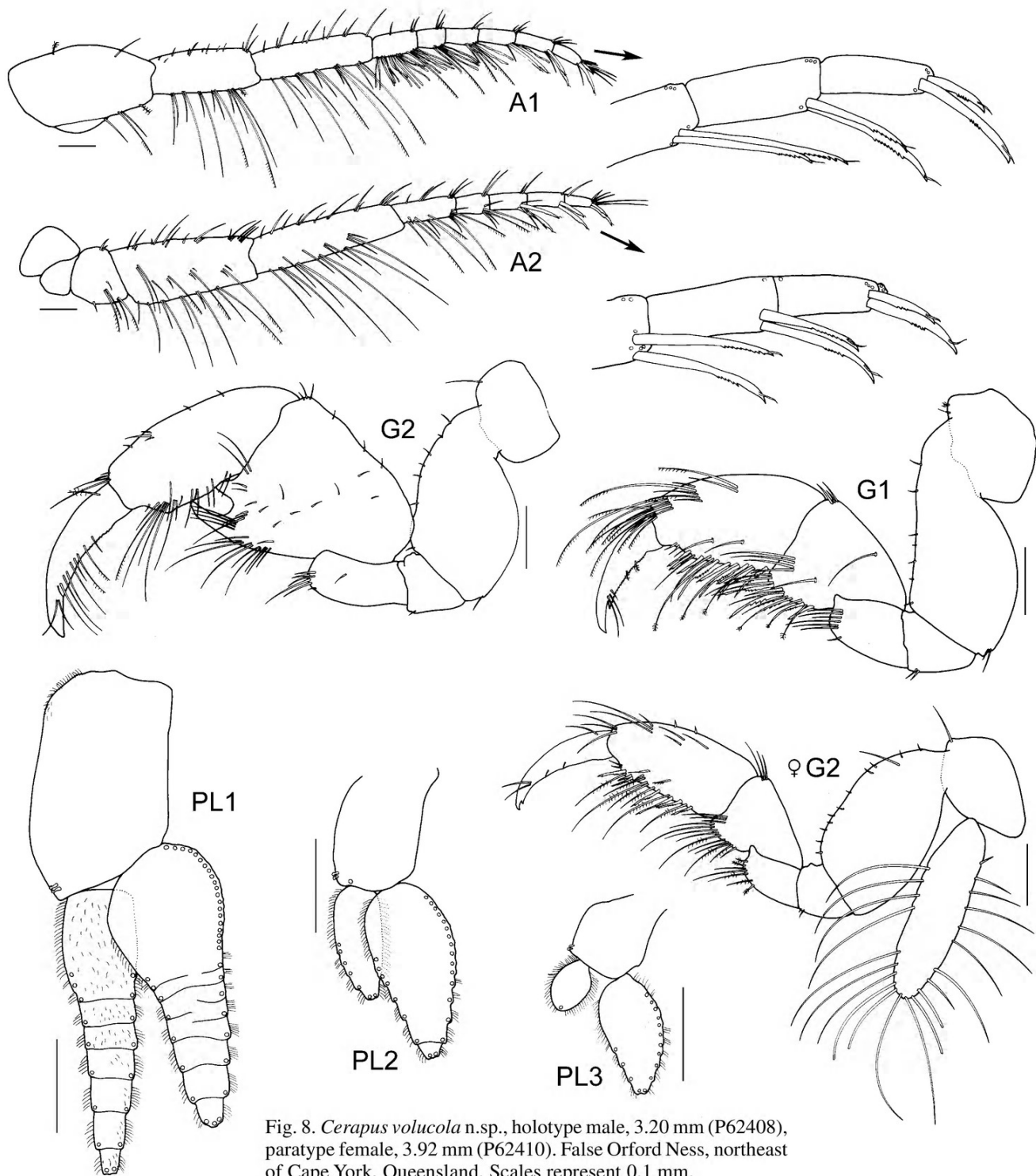


Fig. 8. *Cerapus volucola* n.sp., holotype male, 3.20 mm (P62408), paratype female, 3.92 mm (P62410). False Orford Ness, northeast of Cape York, Queensland. Scales represent 0.1 mm.

**Tube.** Wrapped, parchment-like; seagrass and algae “wrapped” to form a tube.

**Habitat.** Littoral, 3 to 38 m depth.

**Life-style.** Algal or seagrass dwellers.

**Remarks.** *Cerapus volucola* is a widespread species known from Madang Lagoon in northern Papua New Guinea, all along the Great Barrier Reef in northeastern Australia, to North Stradbroke Island in southern Queensland. The tubes of *C. bundegi* and *C. volucola* are almost identical, but morphologically the species differ in many ways. The most obvious differences are the shape of male gnathopod 2, and the number of dorsal recurved hooks on the telson (17–18 in *C. bundegi* and 14–15 in *C. volucola*).

**Distribution.** *Papua New Guinea*: Padoz Natun reef, Madang Lagoon. *Australia, Queensland*: False Orford Ness, northeast of Cape York; Lizard Island and Carter Reef; Magnetic Island; Wistari Reef, Capricorn Group; Middle Reef, North Stradbroke Island (5°S to 27°S).

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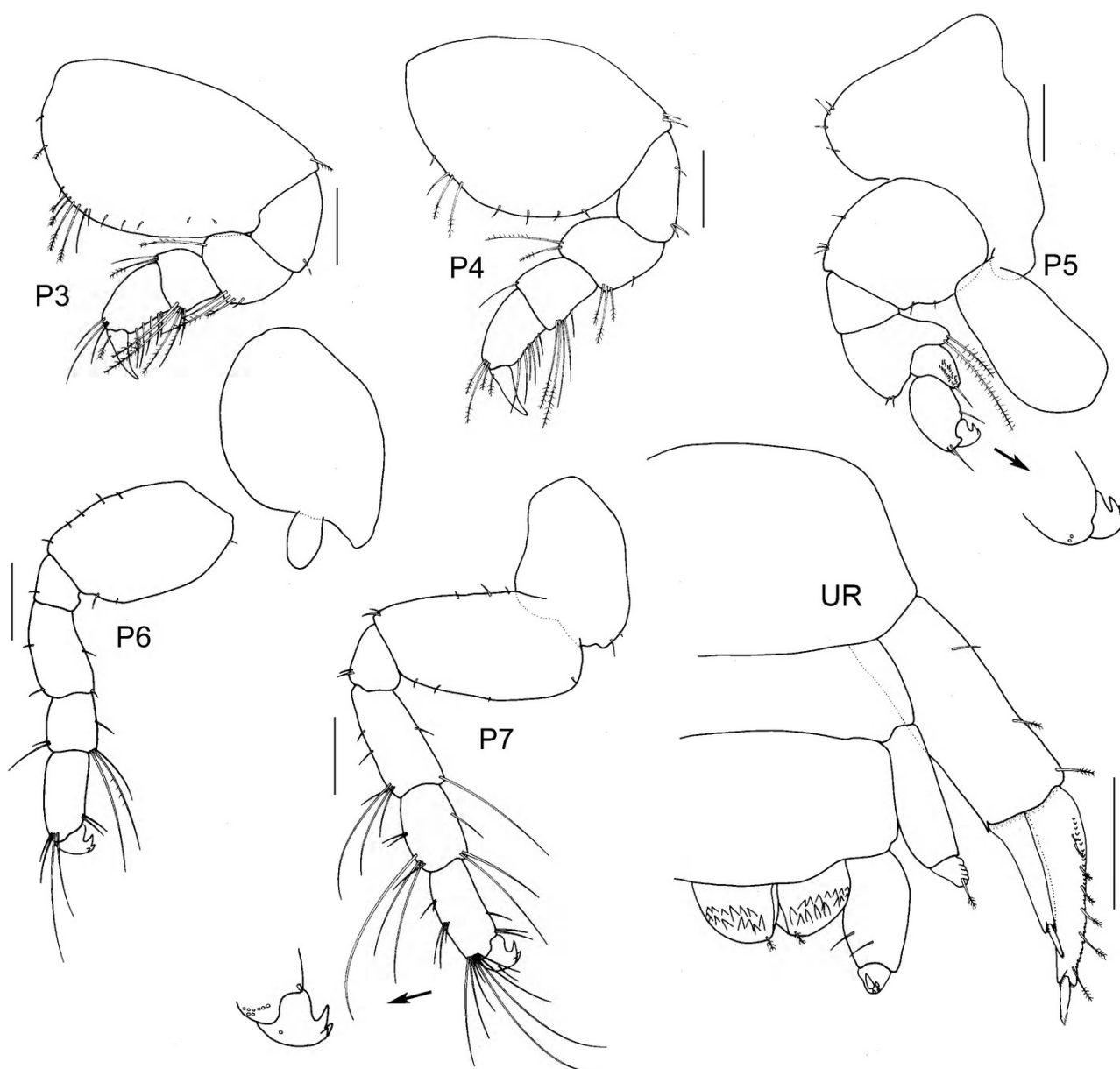


Fig. 9. *Cerapus volucola* n.sp., holotype male, 3.20 mm (P62408). False Orford Ness, northeast of Cape York, Queensland. Scales represent 0.1 mm.

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