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Lysianassidae*

J.K. LOWRY & H.E. STODDART
Crustacea Section, Australian Museum, 6 College Street, Sydney, New South Wales, 2010, Australia.
(jim.lowry@austmus.gov.au; helen.stoddart@austmus.gov.au)

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Abstract

Seven genera and eleven species of lysianassid amphipods are recorded from the Great Barrier Reef, Queensland, Australia. Six species are new to science. Six of the eleven species are considered to be scavengers. The Great Barrier Reef lysianassid fauna is more similar to that of the tropical Indo-West Pacific than to that of temperate Australia.

Key words: Crustacea, Amphipoda, Lysianassidae, Lysianassinae, Tryphosinae, Great Barrier Reef, Australia, taxonomy, new species, *Azotostoma fusta*, *Paralysianopsis padoz*, *Pseudambasia acuticaudata*, *Riwo mizeui*, *Shoemakerella barnardi*, *Tryphosella bet*, *Tryphosella cameloides*, *Tryphosella charlotteae*, *Tryphosella flynnana*, *Tryphosella seasana*, *Waldeckia enoei*

Introduction

In this paper we report seven genera and eleven species (including six new species) from the Great Barrier Reef. These are among the first tropical lysianassids reported from Australia.

The lysianassids from the Great Barrier Reef show more similarity to other tropical Indo-West Pacific lysianassid faunas than to the southern Australian fauna (eg. *Azotostoma fusta* J.L. Barnard, 1965 from the Caroline Islands and Madagascar; *Waldeckia enoei* Stephensen, 1931 from Indonesia; *Pseudambasia acuticaudata* (Ledoyer, 1984) from New Caledonia; *Riwo mizeui* Lowry & Stoddart, 1995 and *Paralysianopsis padoz* Lowry & Stoddart, 1995 from Madang Lagoon, Papua New Guinea). The presence of the genus *Shoemakerella* Pirlot, 1936 in north-eastern Australia (previously known from the western Atlantic Ocean) indicates an older, less well understood, connection (Myers 1991).

Shoemakerella was previously known only from the tropical western Atlantic Ocean, living on the Caribbean plate, which was once part of the Pacific Ocean (Malfait & Dinkelman 1972). There are a number of examples of this type of distribution. One of the best documented examples is the cirolanid isopod genus *Bathynomus* A. Milne Edwards, 1879 (see Lowry & Dempsey 2006) which is known only from the Indo-West Pacific and the tropical western Atlantic. At species level *Eurythenes thurstoni* Stoddart & Lowry, 2004, is known only from the western South Pacific and the tropical western North Atlantic (Stoddart & Lowry 2004).

Six of the eleven lysianassids in this study (*Paralysianopsis padoz*, *Riwo mizeui*, *Tryphosella bet* **sp. nov.**, *T. cameloides* **sp. nov.**, *T. flynnana* **sp. nov.** and *T. seasana* **sp. nov.**) were taken in baited traps and are considered to be scavengers. Two other species (*Tryphosella charlotteae* **sp. nov.** and *Waldeckia enoei* belong to genera that contain scavengers). Although Keable (1995) found that cirolanid isopods dominated the scavenging guild at Lizard Island, lysianassoid amphipods were abundant and regularly obtained in his traps. Lowry & Smith (2003) reported similar results in their study of scavenging crustaceans along the Great Barrier Reef (GBR).

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Materials and methods

The subfamily classification follows Lowry & Stoddart (1997).The descriptions were generated from a DELTA database (Dallwitz 2005) to lysianassid and uristid species. Material for this study was collected with baited traps, with epibenthic sled, with Smith-McIntyre grab or by hand on scuba and is lodged in the Australian Museum, Sydney (AM), and the Museum and Art Gallery of the Northern Territory, Darwin (NTM). A set of colour plates, a list of standard abbreviations and detailed station data is available in Lowry & Myers (2009). A CD (*Benthic Amphipoda (Crustacea: Peracarida) of the Great Barrier Reef: Interactive Keys* is available with the book or the keys can be accessed at the crustacea.net website.

Lysianassidae Dana, 1849

Lysianassinae Dana, 1849 (Hurley, 1963)

Azotostoma J.L. Barnard, 1965

Azotostoma fusta J.L. Barnard, 1965
(Figs 1, 2, Pl. 4B)

Azotostoma fusta J.L. Barnard 1965: 485, figs 1, 2. —? Ledoyer 1986: 732, fig. 281. —Barnard & Karaman 1991: 469.

Material examined. 2 unsexed, AM P68893 (EM 8.1c); 3 unsexed, AM P68891 and 1 female, 2.5 mm, AM P68919 (JDT/LIZ 15); 1 unsexed, AM P68886 (JML 16-10-7); 1 unsexed, AM P68887, (JML 20-10-1); 1 unsexed, AM P68888 (JML 20-10-2); 2 unsexed, AM P68889 and 1 female, 2.4 mm, AM P68918 (JML 81-26-11-4); 1 unsexed, AM P68890 (JML 83-4-3-11); 1 female, AM P68894 (NCL 112); 5 unsexed, AM P68895 (NCL 155); 1 unsexed, AM P68892 (QLD 95); 1 unsexed, AM P70557 (QLD 1618); 1 unsexed (SEL/LZI-1-3).

Type locality. Ifaluk Atoll, Caroline Islands, Micronesia, western North Pacific Ocean (~7°15'N 144°27'E).

Description. Based on female, 2.4 mm, AM P68918 and female, 2.5 mm, AM P68919.

Head and body without scattered setae. *Body* not expanded to form a lateral bulge, without dorsal carina. *Head* lateral cephalic lobes a semidome, with apically rounded margins; eyes round. *Antenna 1* subequal to antenna 2; flagellum article 1 slightly longer than article 2; without callynophore, robust setae absent from proximal articles; calceoli absent; accessory flagellum with 2 articles. *Antenna 2* less than 40% of body length; peduncle without brush setae, peduncular article 3 elongate, at least 2.5 x as long as broad; calceoli absent. *Mouthparts* forming a conical bundle. *Epistome*/*upper lip* fused, broadly rounded. *Mandible* molar absent; palp attached extremely proximally, article 3 without A3–setae. *Maxilla 1* inner plate with many fine apical setae; outer plate with setal-teeth in 6/5 arrangement; setal-tooth 7, left and right symmetrical, slightly cuspidate distally; palp distal margin with weak serrations. *Maxilliped* inner plates well developed, as long as outer plates; outer plates with 2 short slender apical robust setae; palp 4–articulate, article 4 large, article 2 projecting medially, article 3 inserted midway along anterior margin of article 2.

Pereon. *Gnathopod 1* simple, extremely attenuated; coxa large, about as long as coxa 2, subrectangular with slightly concave anterior margin; basis without setae along anterior margin; ischium short; carpus short (length 1.5 x breadth), distinctly shorter than propodus, without posterior lobe; propodus longer than broad, margins tapering; dactylus inner margin minutely serrated. *Gnathopod 2* subchelate; carpus longer than propodus; palm transverse; dactylus minute. *Pereopod 3* propodus with blunt, locking robust seta at posterodistal corner. *Pereopod 4* coxa with well developed posteroventral lobe; propodus with blunt, locking robust seta at posterodistal corner. *Pereopod 5* coxa equilobate; basis distinctly broader than long.

Pleon. *Epimeron 1* anterodistal corner broadly rounded. *Epimeron 3* posterior margin smooth, posterodistal corner produced, forming a small spine. *Urosomite 1* without dorsal depression, dorsally

straight. *Urosomites 2 and 3* fused. *Uropod 1* rami subequal. *Uropod 2* rami subequal, inner ramus without marginal constriction. *Uropod 3* without plumose setae on rami; outer ramus 1–articulate. *Telson* slightly longer than broad, entire, without dorsal robust setae.

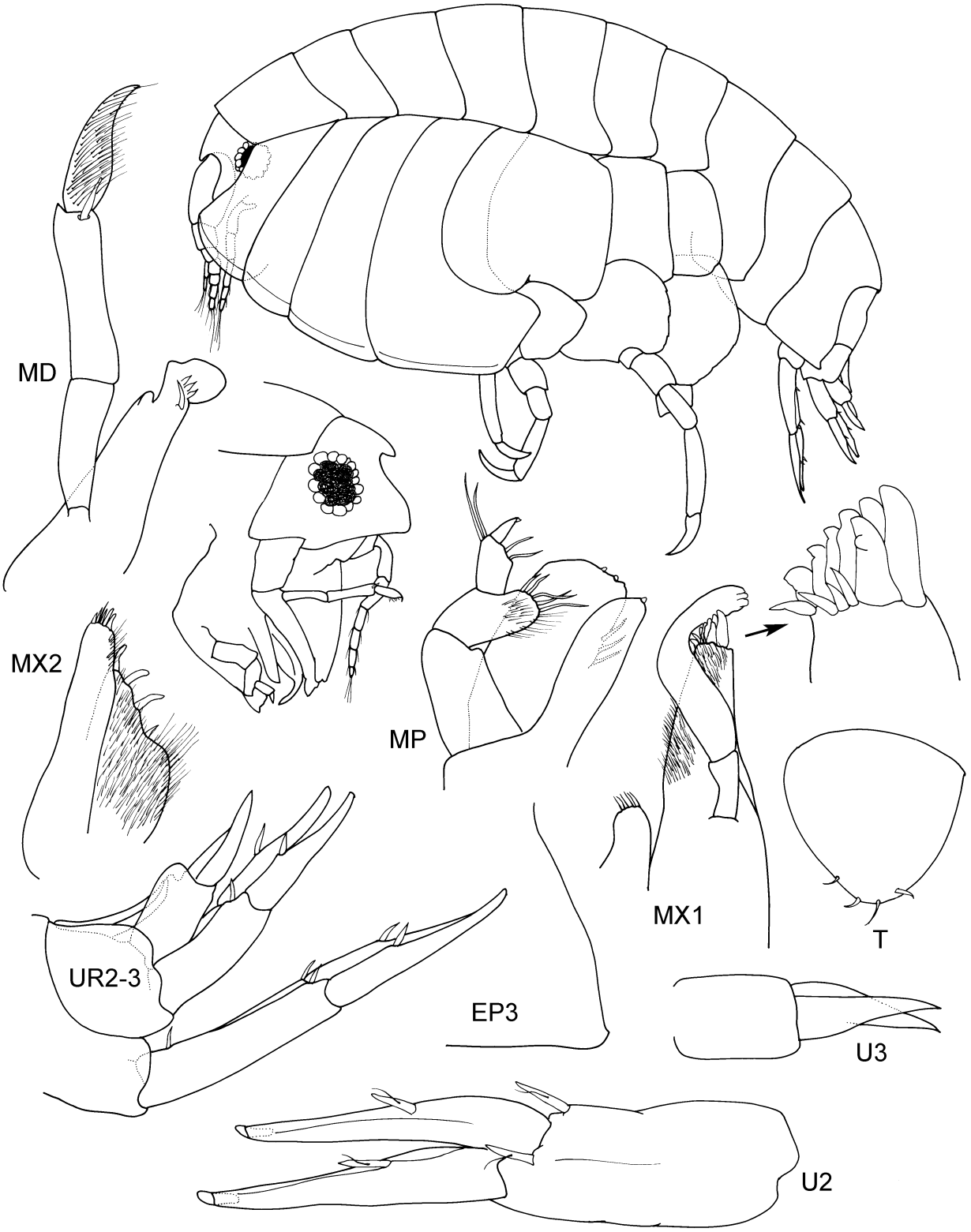

FIGURE 1. *Azotostoma fusta* J.L. Barnard, 1965, female, 2.5 mm, AM P68919, Lizard Head, Lizard Island, Great Barrier Reef ; U3 and T: female, 2.4 mm, AM P68918, between Lizard and Carter Reefs, Lizard Island, Great Barrier Reef.

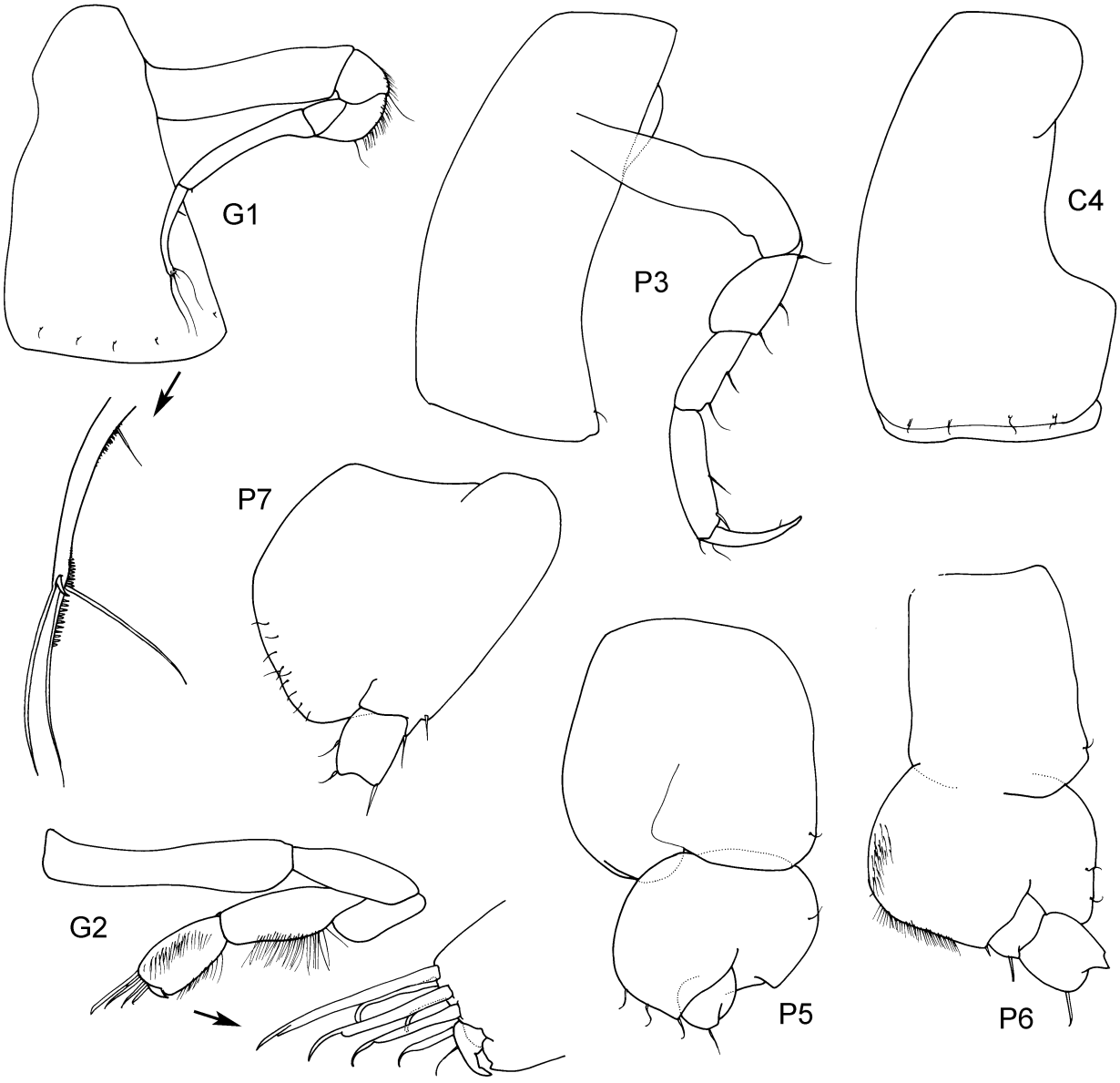

FIGURE 2. *Azotostoma fusta* J.L. Barnard, 1965, female, 2.4 mm, AM P68918, between Lizard and Carter Reefs, Lizard Island, Great Barrier Reef; G1 and G2 enlargements: female, 2.5 mm, AM P68919, Lizard Head, Lizard Island, Great Barrier Reef.

Habitat. Algae, coral rubble, fine sands and plankton at night, intertidal to 12 m depth.

Remarks. *Azotostoma fusta* is an unusual lysianassine with very specialized mouthparts. It can be separated from all other lysianassids on the reef by its conical mouthpart bundle and by its attenuated, simple first gnathopods. Another species, *A. bunakenensis* Ortiz & Lalana, 1997, has been reported from eastern Indonesia. They differ in: the dactylus of the first gnathopods, which is minutely serrated in *A. fusta* and smooth in *A. bunakenensis*; the telson, which is about as long as broad in *A. fusta* and longer than broad in *A. bunakenensis*; the inner plate of the second maxilla, which is greatly expanded in *A. fusta* and apparently subequal to the outer plate in *A. bunakenensis*; and the first maxilla outer plate, which has eleven setal-teeth in *A. fusta* and reportedly seven in *A. bunakenensis*.

Ledoyer's (1986) record of *A. fusta* from Madagascar might represent a separate species, based on the shape of the lateral cephalic lobe and the shape of pereopod 7 basis.

Distribution. *Australia*. Queensland: Lizard Island; Carter Reef; Dingo Beach near Bowen (current study). Tasman Sea: Middleton Reef (current study). ?*Madagascar.* Nosy-Be (Ledoyer 1986). *Micronesia*. Ifaluk Atoll, Caroline Islands (J.L. Barnard 1965). *New Caledonia*. Îlot des Goelands and Grand Récif Abore; Grand Récif Mbere (current study).

Pseudambasia Stephensen, 1927

Pseudambasia acuticaudata (Ledoyer, 1984)

(Figs 3, 4, Pl. 4C)

Parambasia acuticaudata Ledoyer, 1984: 84, fig. 41. —Barnard & Karaman, 1991: 514. —Lowry & Stoddart, 1994: 182.
Pseudambasia acuticaudata. —Lowry & Stoddart, 1995: 113, figs 8, 9.

Material examined. 1 unsexed, AM P68838 (FNQ 79-26); 7 unsexed, AM P68850 (JDT/LIZ 15); 1 male, AM P68860 (JML 20-10-2); 7 unsexed, AM P68859, 1 female, ovigerous (3 eggs), 2.5 mm, AM P68938 and 1 male, AM P68939, (JML 81/26-11-4); 1 unsexed, AM P68812 (NCL 110) ; 1 unsexed, AM P68813 (NCL 156); 2 unsexed, AM P68831 (NT 3); 1 unsexed, AM P68832 (NT 24); 2 unsexed, AM P68833 (NT 25); 1 unsexed, AM P68834 (NT 26); 6 unsexed, AM P68835(NT 55); 1 unsexed, AM P68836 (NT 66); 1 unsexed, AM P68837 (NT 76); 5 unsexed, NTM (PD 1); 2 unsexed, NTM (PD 2); 6 unsexed, NTM (PD 3); 3 unsexed, NTM (PD 4); 4 unsexed, NTM (PD 5); 4 unsexed, NTM (PD 6); 3 unsexed, NTM (PD 7); 13 unsexed, NTM (PD 8); 1 unsexed, NTM (PD 9); 16 unsexed, NTM (PD 10); 7 unsexed, NTM (PD 11); 1 female, AM P68846 (QLD 25); 1 ovigerous female, AM P68847 (QLD 35); 1 male, AM P68845 (QLD 48); 1 unsexed, AM P68841 (QLD 87); 1 unsexed, AM P68842 (QLD 88); 1 unsexed, AM P68843 (QLD 90); 1 unsexed, AM P68844 (QLD 91); 2 unsexed, AM P68839 (QLD 94); 2 unsexed, AM P68840 (QLD 95); 1 unsexed, AM P68848 (QLD 103); 1 unsexed, AM P71932 (QLD 1350); 1 unsexed, AM P71933 (QLD 1364); 1 unsexed, AM P70676 and 2 unsexed, AM P70687 (QLD 1641); 1 unsexed, AM P70694 (QLD 1636); 2 unsexed, AM P70713 (QLD 1636); 6 unsexed, AM P71180 (QLD 1730); 2 unsexed, AM P71158 (QLD 1732); 1 unsexed, AM P71094 (QLD 1733); 2 unsexed, AM P71166 (QLD 1751); 3 unsexed, AM P71292 (QLD 1763); 3 unsexed, AM P71470 (QLD 1792); 1 unsexed, AM P71361 (QLD 1800); 2 unsexed, AM P71460 (QLD 1803); 2 unsexed, AM P71401 (QLD 1806); 1 unsexed, AM P71414 (QLD 1815); 1 unsexed, AM P75694 (QLD 1863); 1 unsexed; AM P75695 (QLD 1873); 1 unsexed, AM P78687 (QLD 1889); 8 unsexed, AM P75693 (QLD 1979); 5 unsexed, AM P75691 (QLD 1983); 1 unsexed, AM P75692 (QLD 1988).

Type locality. Îlot Maître, Southwestern Lagoon, New Caledonia, western South Pacific Ocean (~22°16’S 166°26’E).

Description. Based on female, 2.5 mm, AM P68938 and male, P68939.

Head and body. *Body* without dorsal carina. *Head* lateral cephalic lobes rounded, with apically rounded margins; eyes round. *Antenna 1* subequal to antenna 2; flagellum article 1 slightly longer than article 2; without callynophore, robust setae absent from proximal articles; calceoli absent; accessory flagellum with 2 articles. *Antenna 2* less than 40% of body length; peduncular article 3 elongate, at least three times as long as broad; calceoli absent. *Mouthparts* forming a subquadrate bundle. *Mandible* molar absent; palp attached extremely proximally, article 3 without A3–setae. *Maxilla 1* outer plate with setal-teeth in 6/5 arrangement; setal-tooth 7, left and right symmetrical, cuspidate distally along inner margin; palp distal margin with serrations. *Maxilliped* inner plates well developed, greater than half the length of outer plate; outer plates without apical robust setae; palp 4–articulate, article 4 well developed.

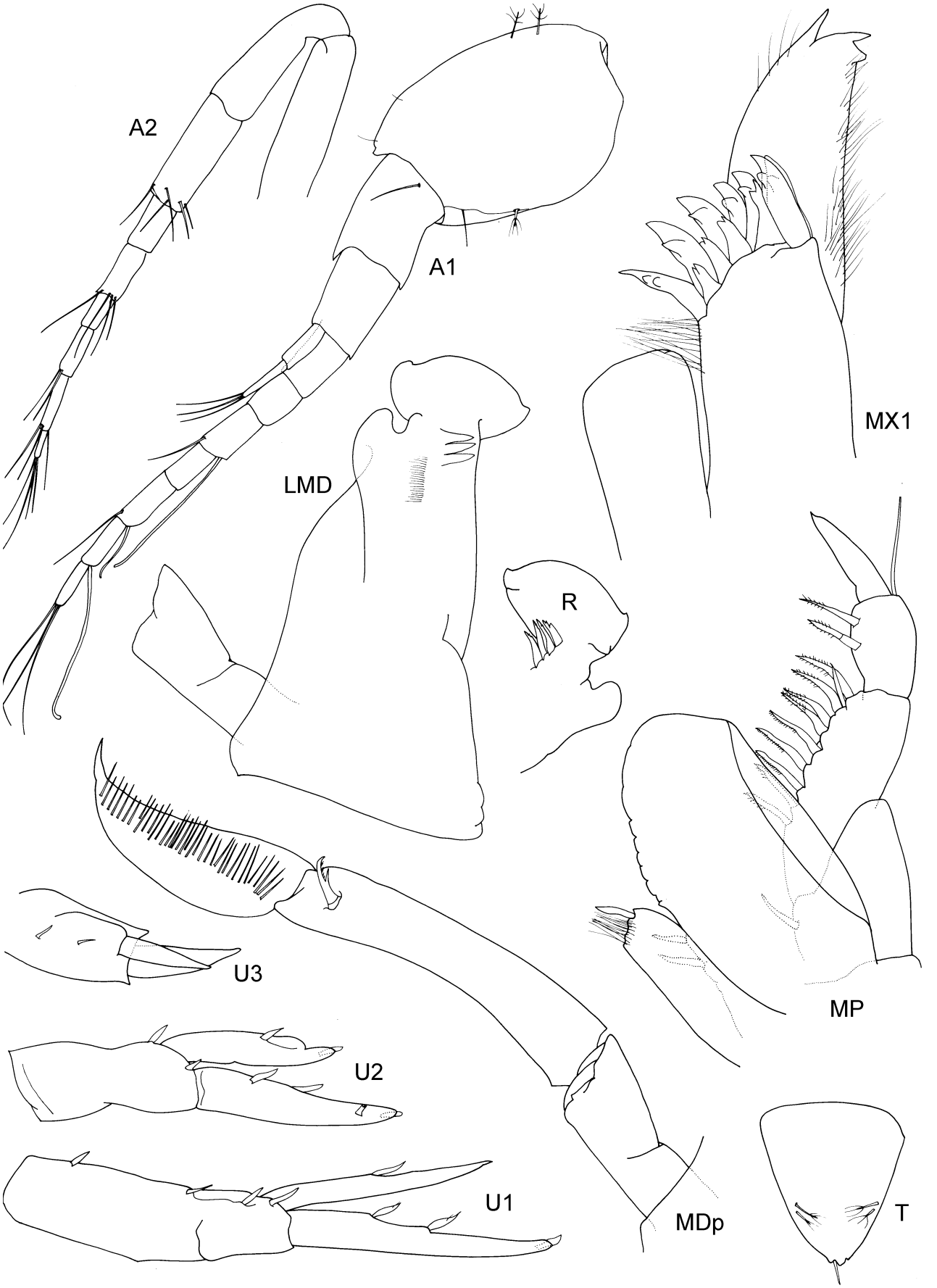

FIGURE 3. *Pseudambasia acuticaudata* Ledoyer, 1984, female, 2.5 mm, AM P68938, Raine Island, Great Barrier Reef.

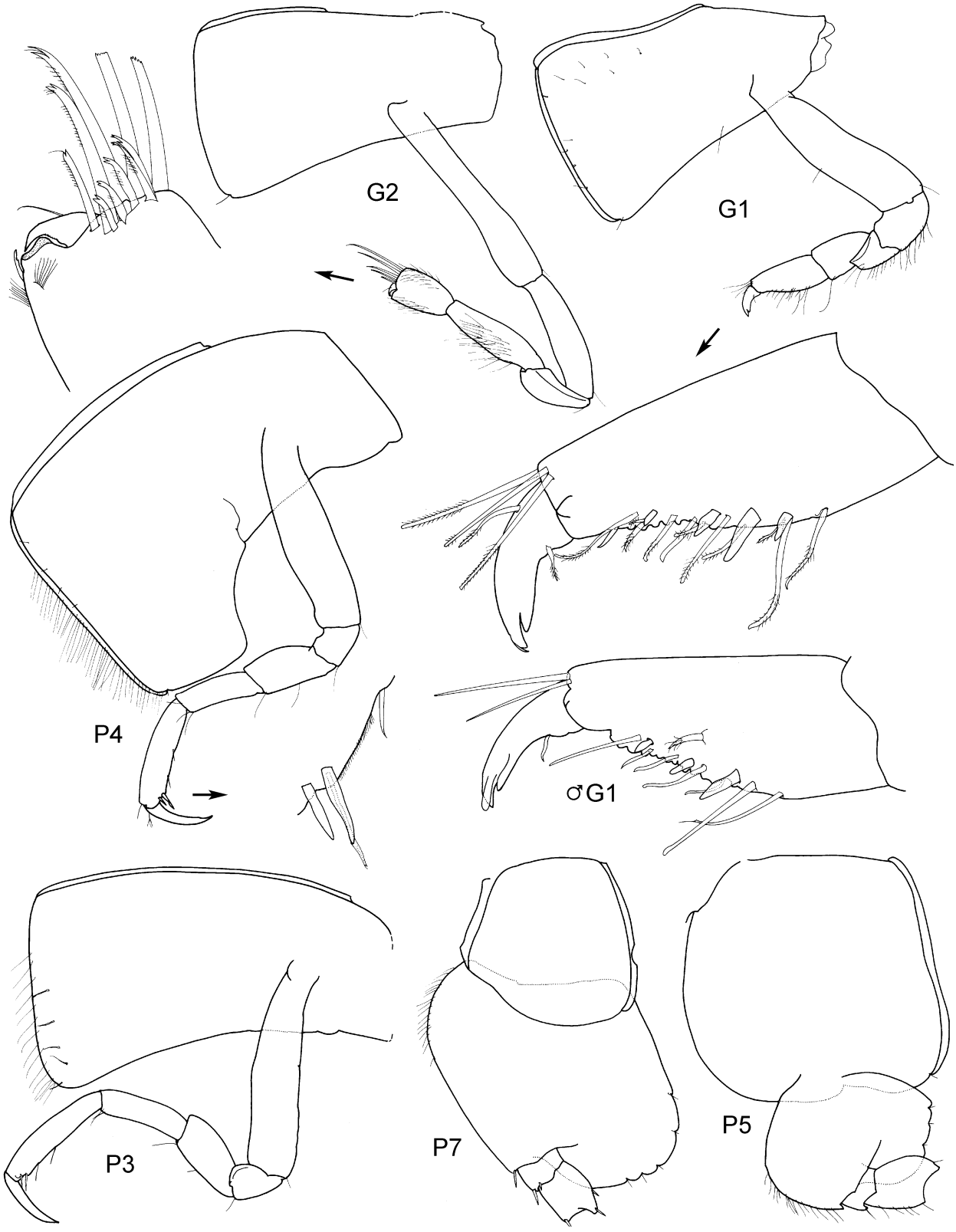

FIGURE 4. *Pseudambasia acuticaudata* Ledoyer, 1984, female, 2.5 mm, AM P68938, Raine Island, Great Barrier Reef.

Pereon. *Gnathopod 1* weakly subchelate; coxa large, about as long as coxa 2, subrectangular with slightly concave anterior margin; basis sparsely setose along anterior margin; ischium short; carpus short (length 1.7 x breadth), subequal in length to propodus, without posterior lobe; propodus longer than broad, margins

tapering, palm extremely acute, slightly excavate; dactylus inner margin not serrated. *Gnathopod 2* subchelate; carpus twice as long as propodus; palm transverse; dactylus minute. *Pereopod 4* coxa with well developed posteroventral lobe. *Pereopod 5* coxa equilobate; basis about as long as broad.

Pleon. *Epimeron 3* posterior margin smooth, posterodistal corner narrowly rounded. *Uropod 1* rami subequal. *Uropod 2* rami distinctly unequal, inner ramus with marginal constrictions. *Uropod 3* peduncle with dorsolateral flange; rami distinctly unequal, without plumose setae on rami; outer ramus 1–articulate. *Telson* slightly longer than broad, entire, without dorsal robust setae, with 2 long, apical slender setae.

Habitat. Coral rubble, coarse sand, sand and silt, seagrasses and algae such as *Padina* and *Halimeda* in 0 to 32 m depth.

Remarks. Lowry & Stoddart (1994, 1995) discussed morphological differences between populations of *P. acuticaudata* from northern Papua New Guinea, New Caledonia (type locality) and the Austral Isles in French Polynesia. We can find no differences between the population living on the Great Barrier Reef and the one from the Southwest Lagoon in New Caledonia.

Pseudambasia acuticaudata and *Shoemakerella barnardi* are the only lysianassid species on the GBR with a constricted inner ramus on uropod 2. *Pseudambasia acuticaudata* differs from *S. barnardi* and indeed all GBR species in the combination of a weakly subchelate first gnathopod and an elongate third article on the peduncle of antenna 2.

Distribution. *Australia*. Queensland: Goodes Island, Torres Strait; Raine Island; Nimrod Passage, Wreck Bay; Ferguson Reef; No. 8 Sand Cay; No. 5 Sandbank Reef; Lizard Island; Myrmidon Reef; Rib Reef; John Brewer Reef; Lodestone Reef; Pandora Reef; Dingo Beach, Bowen; One Tree Island (all current study). Northern Territory: New Year Island; McCluer Island; Oxley Island (current study). *New Caledonia*. Southwest Lagoon (Ledoyer 1984). *Papua New Guinea*. Madang Lagoon (Lowry & Stoddart 1995). *French Polynesia*. Austral Isles: Rurutu (Lowry & Stoddart 1994).

Riwo Lowry & Stoddart, 1995

Riwo mizeui Lowry & Stoddart, 1995
(Figs 5, 6)

Riwo mizeui Lowry & Stoddart, 1995: 127, figs 17–19.

Material examined. Female, 3.6 mm, AM P69376; male, 2.8 mm, AM P69377; 36 unsexed, AM P69378; (QLD 727). 1 unsexed, AM P69379 (QLD 683).

Type locality. Wongad Natun reef, Madang Lagoon, Papua New Guinea, western South Pacific Ocean (5°08.31'S 145°49.36'E), 4 m depth.

Description. Based on female, 3.6 mm, AM P69376.

Head and body. *Body* without dorsal carina. *Head* lateral cephalic lobes subtriangular, with apically rounded margins; eyes oval. *Antenna 1* subequal to antenna 2; flagellum article 1 slightly longer than article 2, with weak 1-field callynophore, robust setae absent from proximal articles; calceoli absent; accessory flagellum with 4 articles. *Antenna 2* less than 40% of body length; peduncular article 3 long; calceoli absent. *Mouthparts* forming a subquadrate bundle. *Epistome*/*upper lip* separate, epistome less produced than upper lip, straight; upper lip produced, rounded apically. *Mandible* molar a small, smooth flap with finely setose margins; palp attached proximally, article 3 without A3–setae. *Maxilla 1* outer plate with 10 setal-teeth in reduced 6/5 arrangement; setal-tooth 7, left and right symmetrical, cuspidate distally; palp distal margin with apical robust setae and serrations. *Maxilliped* inner plates poorly developed, not reaching half the length of the outer plate; outer plates without apical robust setae; palp 4–articulate, article 4 well developed.

Pereon. *Gnathopod 1* simple; coxa large, about as long as coxa 2, subrectangular with straight anterior margin; basis without setae along anterior margin; ischium short; carpus short (length 1.9 x breadth), subequal

in length to propodus, without posterior lobe; propodus longer than broad, margins tapering; dactylus inner margin not serrated. *Gnathopod 2* chelate; carpus longer than (2.4 x) propodus; palm slightly obtuse; dactylus minute. *Pereopod 4* coxa with well developed posteroventral lobe. *Pereopod 5* coxa anterior lobe slightly deeper than posterior lobe; basis about as long as broad.

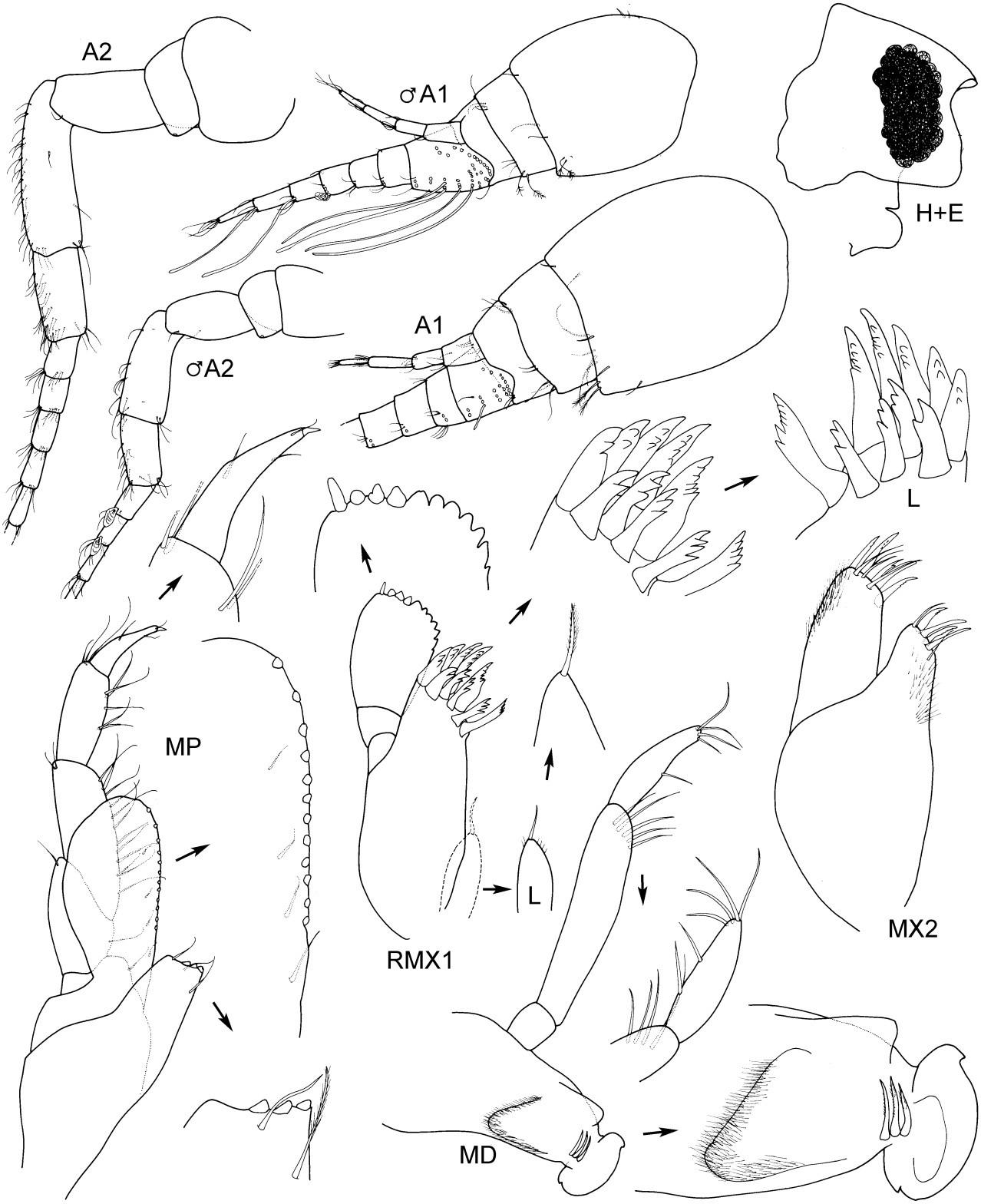

FIGURE 5. *Riwo mizeui* Lowry & Stoddart, 1995, female, 3.6 mm, AM P69376, and male, 2.8 mm, AM P69377, Ashmore Reef, Great Barrier Reef.

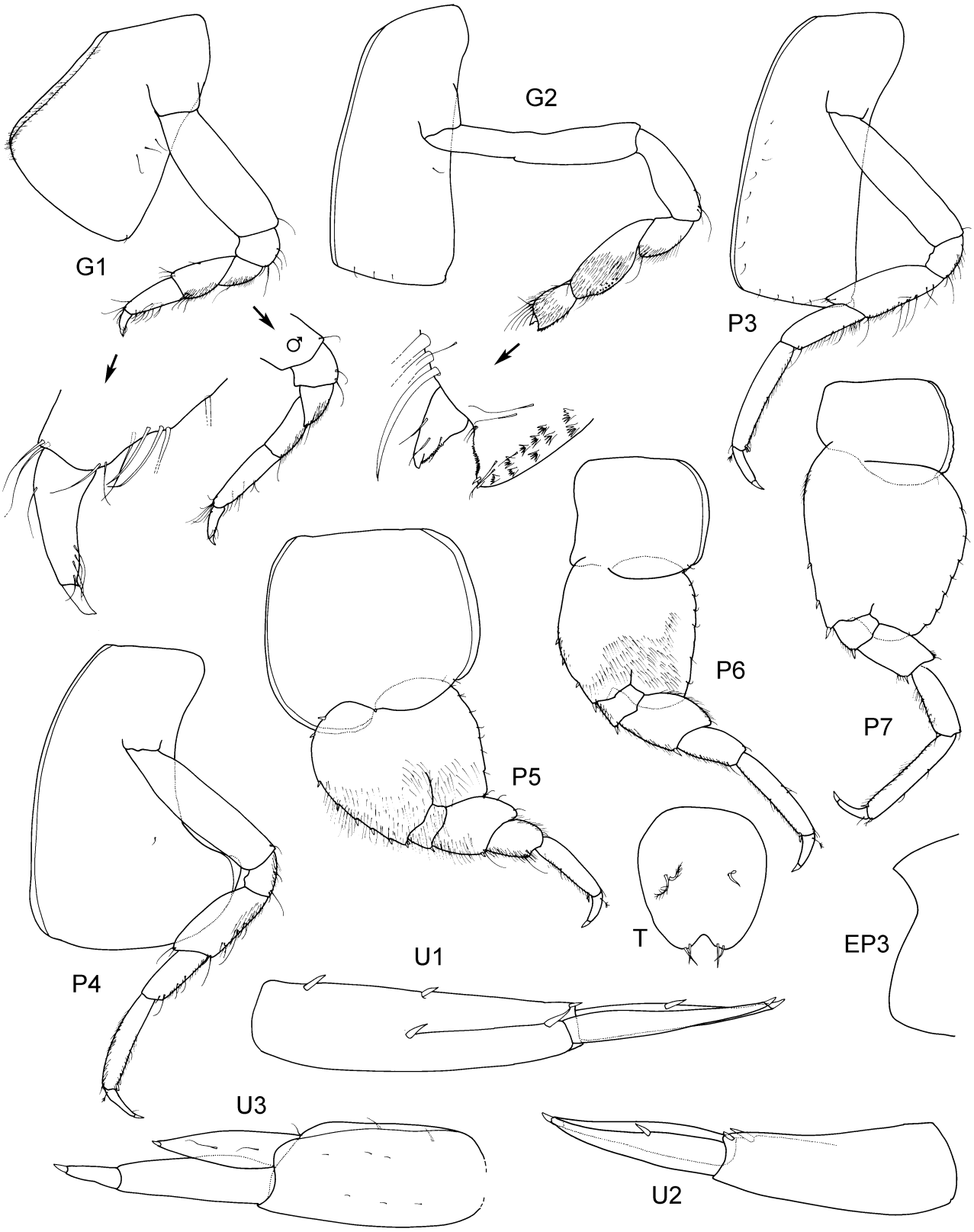

FIGURE 6. *Riwo mizeui* Lowry & Stoddart, 1995, female, 3.6 mm, AM P69376 and male, 2.8 mm, AM P69377, Ashmore Reef, Great Barrier Reef.

Pleon. *Epimeron 3* posterior margin smooth, posterodistal corner narrowly rounded. *Urosomite 1* without anterodorsal notch, slightly rounded dorsally, without boss. *Uropod 1* rami subequal. *Uropod 2* rami subequal,

inner ramus without marginal constriction. *Uropod 3* rami distinctly unequal, without plumose setae; outer ramus 2–articulate, article 2 short; inner ramus not reaching end of article 1 of outer ramus. *Telson* subequal in length and breadth, notched, without dorsal robust setae.

Male (sexually dimorphic characters) based on male, 2.8 mm, AM P69377. Antenna 1 with weak 2-field callynophore; calceoli present. Antenna 2 calceoli present.

Habitat. Scavenger living among soft and hard corals in 3 to 50 m depth.

Remarks. According to Lowry & Stoddart (1995) *Riwo mizeui* is a scavenger which occurs on living coral bottoms. It is the only lysianassid known from the Great Barrier Reef which has both a simple first gnathopod and distinctly unequal rami on uropod 3. *Pseudambasia acuticaudata* also has unequal rami on uropod 3, but the first gnathopod is weakly subchelate. *Riwo mizeui* differs from *Shoemakerella barnardi*, which also has a simple gnathopod 1, in the size of the eyes which cover most of the head (smaller in *S. barnardi*), the presence of robust setae on the distal margin of maxilla 1 palp (serrate in *S. barnardi*) and epimeron 3 which is narrowly rounded (broadly rounded in *S. barnardi*).

Living specimens *R. mizeui* have a black-speckled chromatophore pattern on the body (body white in *S. barnardi*).

Distribution. *Australia*. Queensland: Ashmore Reef (current study), inside Outer Barrier (current study). *Papua New Guinea*. Madang Lagoon (Lowry & Stoddart 1995).

Shoemakerella Pirlot, 1936

Remarks. *Shoemakerella* Pirlot, 1936: 264, was previously known only from the western North Atlantic Ocean, with a possible occurrence in the eastern North Pacific Ocean represented by Hurley's (1963) record of *Shoemakerella cubensis* (as *Lysianopsis*) from the Gulf of California. The present record is the first from the Indo-West Pacific Ocean. *Shoemakerella* is very similar to *Arugella* Pirlot, 1936: 259, a genus known from eastern Indonesia. Both genera have only slight sexual dimorphism, a molar reduced to a setose flap, no apical robust setae on the maxilla 1 palp, simple first gnathopods, a constricted inner ramus on uropod 2 and short third uropods with a flanged peduncle. However in *Shoemakerella* the mandibular molar has a medial row of small robust setae (absent in *Arugella*); the first article of the mandibular palp is long (short in *Arugella*); and STB - STD of the maxilla 1 outer plate inner row setal-teeth are stout (slender in *Arugella*).

Shoemakerella barnardi sp. nov.
(Figs 7, 8, Pl. 4D)

Type material. Holotype, female, 6.6 mm, AM P71008, Mermaid Cove, Lizard Island, Queensland, Australia (14°38.84'S 145°27.24'E), rubble, bommies and sand patches, 4 m, K. Klebba, L. Hughes & C. Rakocinski, 27 February 2005 (QLD 1709). Paratypes: 1 unsexed, AM P70181, between South and Bird Islands, Lizard Island, Queensland, Australia (14°40'S 145°28'E), rubble with sparse filamentous and abundant encrusting red algae, 8–9 m, B. Kensley, 9 January 1982 (BK 111); 3 unsexed, AM P70182, foot of drop-off, off Coconut Beach, Lizard Island, Queensland, Australia (14°40'S 145°28'E), coarse rubble with *Lithothamnion* and low algal turf, 17 m, B. Kensley, 19 January 1982 (BK 129); 2 unsexed, AM P70173, reefs at western end of lagoon, Lizard Island, Queensland, Australia (14°40'S 145°28'E), mixed algae, 0–3 m, J.K. Lowry, C. Short, P.C. Terrill, 5 October 1978 (QLD 11); 1 unsexed, AM P70174, off southern Point of Mermaid Cove, Lizard Island, Queensland, Australia (14°39'S 145°27'E), filamentous algae, stone washings and scrapings from crevices, C. Short & P.C. Terrill, 8 October 1978 (QLD 25); 1 unsexed, AM P70175, off North Point, Lizard Island, Queensland, Australia (14°39'S 145°27'E), red algae and coral rubble from subtidal caves, 6.1 m, J.K. Lowry, 14 October 1978 (QLD 49); 7 unsexed, AM P70176 and 1 female, AM P78944, off North Point, Lizard Island, Queensland, Australia (14°40'S 145°28'E), mixed algae, 6.1 m, J.K. Lowry, 14 October 1978

(QLD 50); 1 unsexed, AM P70177, off North Point, Lizard Island, Queensland, Australia (14°40'S 145°28'E), *Halimeda*, 6.1 m, J.K. Lowry, 14 October 1978 (QLD 52); 1 unsexed, AM P70178, 1.6 km south-west of Eagle Island, near Lizard Island, Queensland, Australia (14°38'S 145°22'E), sediment from coral fans, rubble and dead coral, 7.6 m, 17 October 1978 (QLD 59); 1 unsexed, AM P70179 and 1 ovigerous female, AM P70180, 1.6 km south-west of Eagle Island, near Lizard Island, Queensland, Australia (14°38'S 145°22'E), sponges with some algae and coral rubble, 4 m, J.K. Lowry, 17 October 1978 (QLD 61); 1 unsexed, AM P70183, Clam Gardens, Watsons Bay, Lizard Island, Queensland, Australia (14°39'53"S 145°27'00"E), encrusted calcareous algae on coral, 5.1 m, R.A. Peart, K. Dempsey & M.J. Huggett, 15 November 1999 (QLD 1347); 1 unsexed, AM P70654, Loomis Beach moorings, Lizard Island, Queensland, Australia (14°41'01"S 145°26'52"E), rock at base of mooring on sandy bottom, 3 m, J. Just, 24 February 2005 (QLD 1641); 2 unsexed, AM P70789, Loomis Beach moorings, Lizard Island, Queensland, Australia (14°41'01"S 145°26'52"E), rock at base of mooring on sandy bottom, 3 m, J. Just, 24 February 2005 (QLD 1649); 2 unsexed, AM P778945, Mermaid Cove, Lizard Island, Queensland, Australia (14°38.84'S 145°27.24'E), rubble, bommies and sand patches, 4 m, K. Klebba, L. Hughes & C. Rakocinski, 27 February 2005 (QLD 1709); 1 unsexed, AM P71225 (QLD 1770).

Additional material. 10 unsexed, AM P70277 (EM 1b); 9 unsexed, AM P70278 (EM 7b); 30 unsexed, AM P70279 (EM 8.1a); 16 unsexed, AM P70280 (EM 8.1c); 3 unsexed, AM P70281 (EM 8.1d); 1 unsexed, AM P70282 (EM 8.1e); 12 unsexed, AM P70283 (EM 8.1f); 44 unsexed, AM P70284 (EM 21i); 2 unsexed, AM P70285 (EM 30a); 1 ovigerous female and 1 juvenile, AM P70307 (PNG 14); 2 unsexed, AM P30980 (QLD 93); 2 unsexed, P.75696 (QLD 1863); 2 unsexed, AM P75697 (QLD 1920).

Type locality. Mermaid Cove, Lizard Island, Queensland, Australia (14°38'50"S 145°27'14"E), 4 m depth.

Etymology. Named for Jerry Barnard who succeeded Clarence Shoemaker as the amphipod specialist at the National Museum of Natural History, Smithsonian Institution. Amphipods were studied continuously at this institution for 78 years (1914-1992). During this time one of the great world collections of amphipod specimens and literature was amassed and the understanding of amphipod systematics was greatly advanced.

Description. Based on holotype female, 6.6 mm, AM P71008; paratype female, 5.5 mm, AM P78944 and paratype female, AM P70180.

Head and body. *Head and body* with scattered setae; body without dorsal carina. *Head* lateral cephalic lobes rounded, with apically rounded margins. *Antenna 1* subequal to antenna 2; peduncular article 1 without anterodistal lobe; article 2 long, about 0.5 x article 1; article 3 long, about 0.3 x article 1; accessory flagellum with 4 articles; flagellum without callynophore, robust setae absent from proximal articles, calceoli absent. *Antenna 2* less than 40% of body length; peduncle without brush setae; calceoli absent. *Mouthparts* forming a subquadrate bundle. *Epistome/upper lip* separate, epistome produced beyond upper lip, concave, not strongly projecting; upper lip produced, rounded apically. *Mandible* molar a small, smooth flap with finely setose margins; palp attached midway, article 3 without A3–setae. *Maxilla 1* outer plate with setal-teeth in 6/5 arrangement; setal-tooth 7, left and right symmetrical, cuspidate medially; setal-teeth B to D short, apically bifurcate; palp distal margin with serrations. *Maxilla 2* inner plate about 2 x width of outer plate. *Maxilliped* inner plates well developed, greater than half the length of outer plate; outer plates without apical robust setae; palp 4–articulate, article 4 well developed.

Pereon. *Gnathopod 1* simple; coxa large, about as long as coxa 2, subrectangular with slightly concave anterior margin and broadly rounded anteroventral corner; basis sparsely setose along anterior margin; ischium short; carpus short, subequal in length to propodus, without posterior lobe; propodus longer than broad, margins tapering, with denticulate patch along posterior margin, with 6 robust setae along posterior margin; dactylus inner margin not serrated. *Gnathopod 2* chelate; carpus longer than propodus; palm obtuse, concave; dactylus minute. *Pereopod 4* coxa with well developed posteroventral lobe. *Pereopod 5* coxa equilobate; basis distinctly broader than long. *Pereopod 7* basis posterior margin concave.

Pleon. *Epimeron 3* posterior margin smooth, posterodistal corner broadly rounded. *Urosomite 1* without dorsal depression, dorsally straight. *Uropod 1* rami subequal. *Uropod 2* rami subequal, inner ramus with

strong constriction. *Uropod 3* stout; peduncle with dorsolateral flange; rami subequal, without plumose setae; outer ramus 1–articulate. *Telson* distinctly longer than broad, entire, without dorsal robust setae, with 2 apical slender setae.

Habitat. Living among rubble, sand patches and calcareous algae, 0 to 33 m depth.

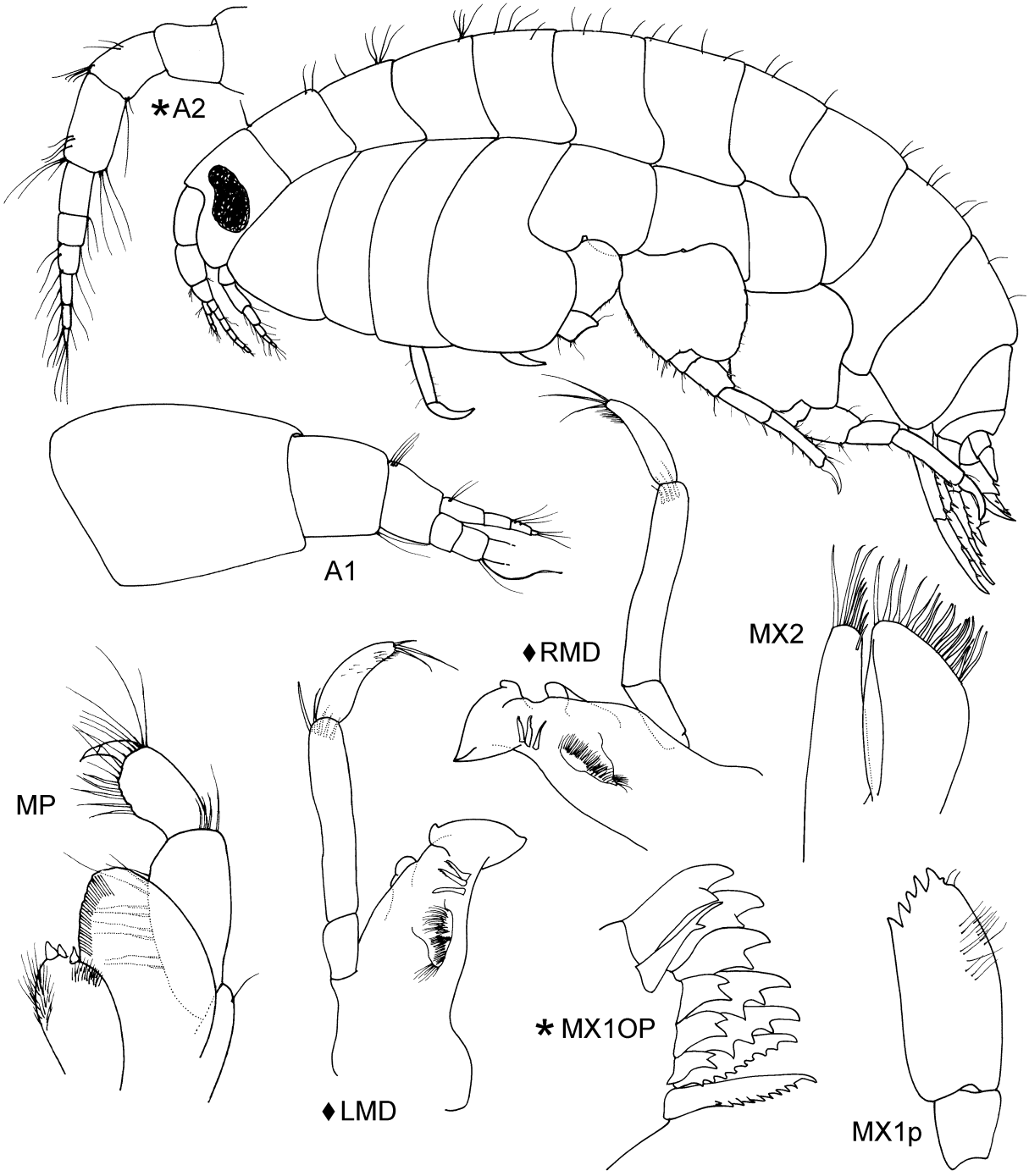

FIGURE 7. *Shoemakerella barnardi* **sp. nov.**, holotype, female, 6.6 mm, AM P71008, Mermaid Cove, Lizard Island, Great Barrier Reef; *paratype female, AM P70180, south-west of Eagle Island, Great Barrier Reef;♦ paratype female, 5.5 mm, AM P78944, North Point, Lizard Island, Great Barrier Reef.

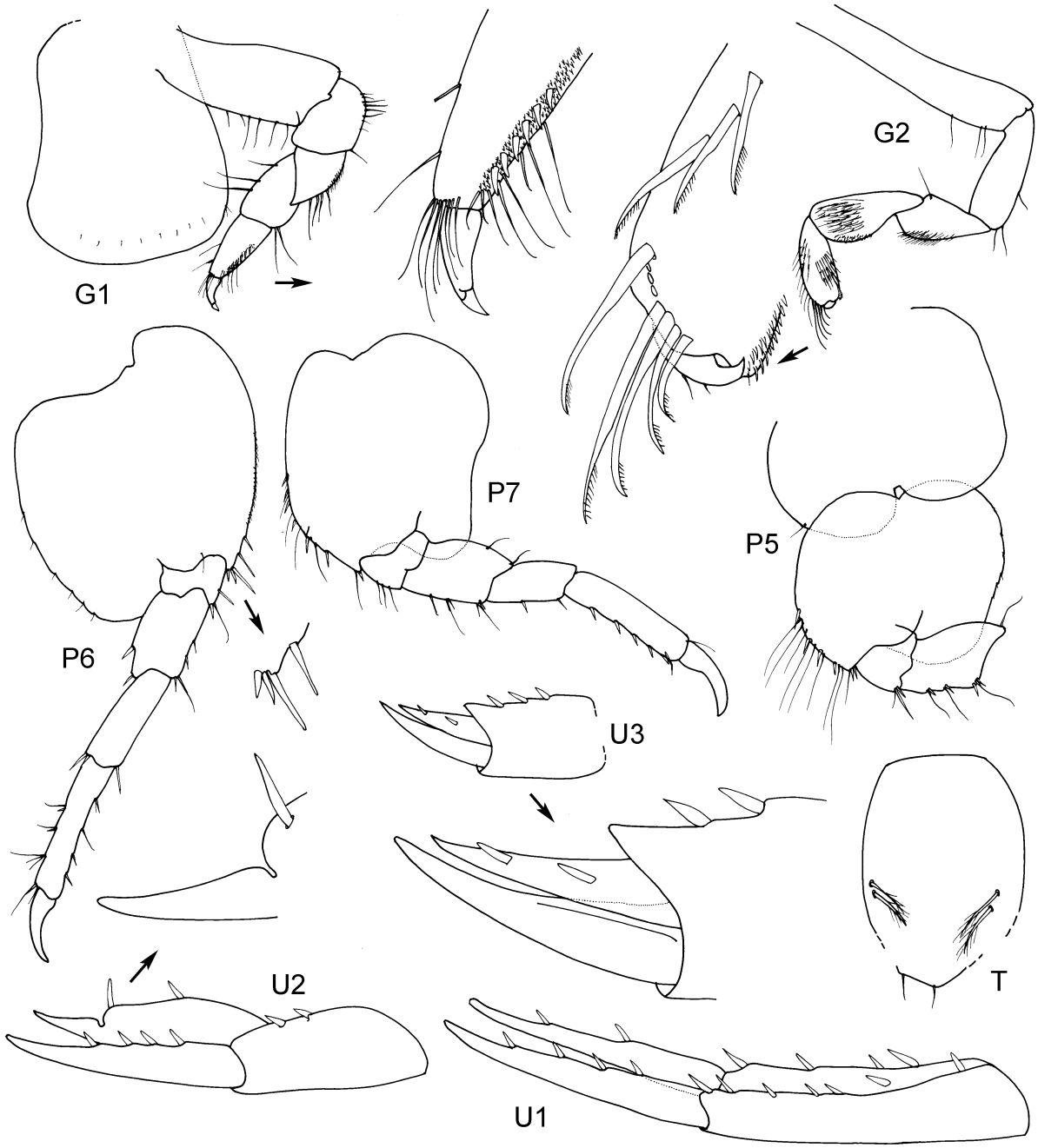

FIGURE 8. *Shoemakerella barnardi* **sp. nov.**, holotype, female, 6.6 mm, AM P71008, Mermaid Cove, Lizard Island, Great Barrier Reef.

Remarks. The only other species in the genus, *Shoemakerella cubensis* (Stebbing, 1897) and *S. lowryi* Gable & Lazo-Wasem, 1990, are both known only from the western North Atlantic Ocean. Considering the great distances separating these species from *S. barnardi*, they are remarkably similar. Lowry & Stoddart (1997) concluded that the only obvious character separating *S. cubensis* and *S. lowryi* was the relative length to breadth of pereopod 7 propodus (5.4 times as long as broad in *S. cubensis*; about 9.5 times in *S. lowryi*). In *S. barnardi* the ratio is only about 4.5 times. *Shoemakerella barnardi* differs from both *S. cubensis* and *S. lowryi* in having a distinct concavity on the posterior margin of the basis of pereopod 7.

Shoemakerella barnardi is distinguished from other lysianassid amphipods on the GBR by the scattered setae on the body in combination with the simple first gnathopods.

Distribution. *Australia*. Queensland: Lizard Island (current study); Heron Island (current study). Elizabeth and Middleton Reefs (current study). *Papua New Guinea*. Manunouha Island (current study).

Waldeckia Chevreux, 1906

Waldeckia enoei Stephensen, 1931
(Figs 9, 10)

Waldeckia enoei Stephensen, 1931: 3, figs 1–3. —J.L. Barnard 1958: 102.
Waldeckia kroyeri enoei. —Pirlot, 1936: 268, fig. 105B. —Barnard & Karaman 1991: 542.

Material examined. 4 unsexed, AM P77899 (JML 7-10-2); 2 unsexed, AM P77898 and 1 immature female, 4.0 mm, AM P78704 (JML 7-10-3); 2 unsexed, AM P77897 (JML 83/7-3-11); 1 unsexed, AM P77900 (QLD 92); 1 unsexed, AM P71054 (QLD 1718).

Type locality. Pulau Enu (as Poeloe Enoe), Aru Islands, Indonesia (~7°05'S 134°30'E).

Description. Based on immature female, 4.0 mm, AM P78704.

Head and body. *Body* without dorsal carina. *Head* lateral cephalic lobes rounded, with apically rounded margins; eyes reniform. *Antenna 1* slightly shorter than antenna 2; flagellum with weak 1-field callynophore, robust setae absent from proximal articles; calceoli absent; accessory flagellum with 5 articles. *Antenna 2* less than 40% of body length; peduncle without brush setae, peduncular article 3 elongate, calceoli absent. *Mouthparts* forming a subquadrate bundle. *Epistome*/*upper lip* fused, broadly rounded. *Mandible* molar setose with vestigial triturating surface; palp attached extremely proximally, article 3 without A3-setae. *Maxilla 1* outer plate with setal-teeth in 6/5 arrangement; setal-tooth 7, left and right symmetrical, cuspidate along most of straight inner margin; palp distal margin with apical robust setae. *Maxilliped* inner plates well developed, greater than half the length of outer plate; outer plates without apical robust setae; palp 4–articulate, article 4 well developed.

Pereon. *Gnathopod 1* minutely parachelate; coxa large, about as long as coxa 2, subrectangular with concave anterior margin; basis slender, moderately setose along anterior margin, bottle-shaped setae present; ischium short; carpus short, subequal in length to propodus, without posterior lobe; propodus margins tapering, palm obtuse, entire, straight; dactylus inner margin not serrated. *Gnathopod 2* subchelate; carpus longer than propodus; palm large, transverse, concave; dactylus well developed. *Pereopod 4* coxa with well developed posteroventral lobe. *Pereopod 5* coxa slightly lobate posteriorly; basis about as long as broad. *Pereopod 7* basis posterodistally produced less than halfway along merus.

Pleon. *Epimeron 3* posterior margin smooth, posterodistal corner subquadrate. *Urosomite 1* dorsally straight. *Uropod 1* rami subequal. *Uropod 2* rami subequal, inner ramus without marginal constriction. *Uropod 3* rami distinctly unequal, with plumose setae on each ramus; outer ramus 2–articulate, article 2 short, inner ramus not reaching end of article 1 of outer ramus. *Telson* distinctly longer than broad, deeply cleft, without dorsal robust setae, with 1 apical robust seta on each lobe.

Habitat. Sediment (mud, maerl, sand, shelly sand, coral debris, broken shell, stones), 13 to 34 m depth.

Remarks. *Waldeckia enoei* is the only lysianassid on the GBR with parachelate first gnathopods. The anterior margins of the basis of the first gnathopods have unique bottle-shaped setae which separates *W. enoei* from all other *Waldeckia* species and from all other species on the GBR.

Distribution. *Australia*. Queensland: Lizard Island (current study). *Indonesia*: Aru Islands (Stephensen 1931; Pirlot 1936); Misool Island, Ceram Sea (Pirlot 1936). *Timor*. North-east coast (Pirlot 1936).

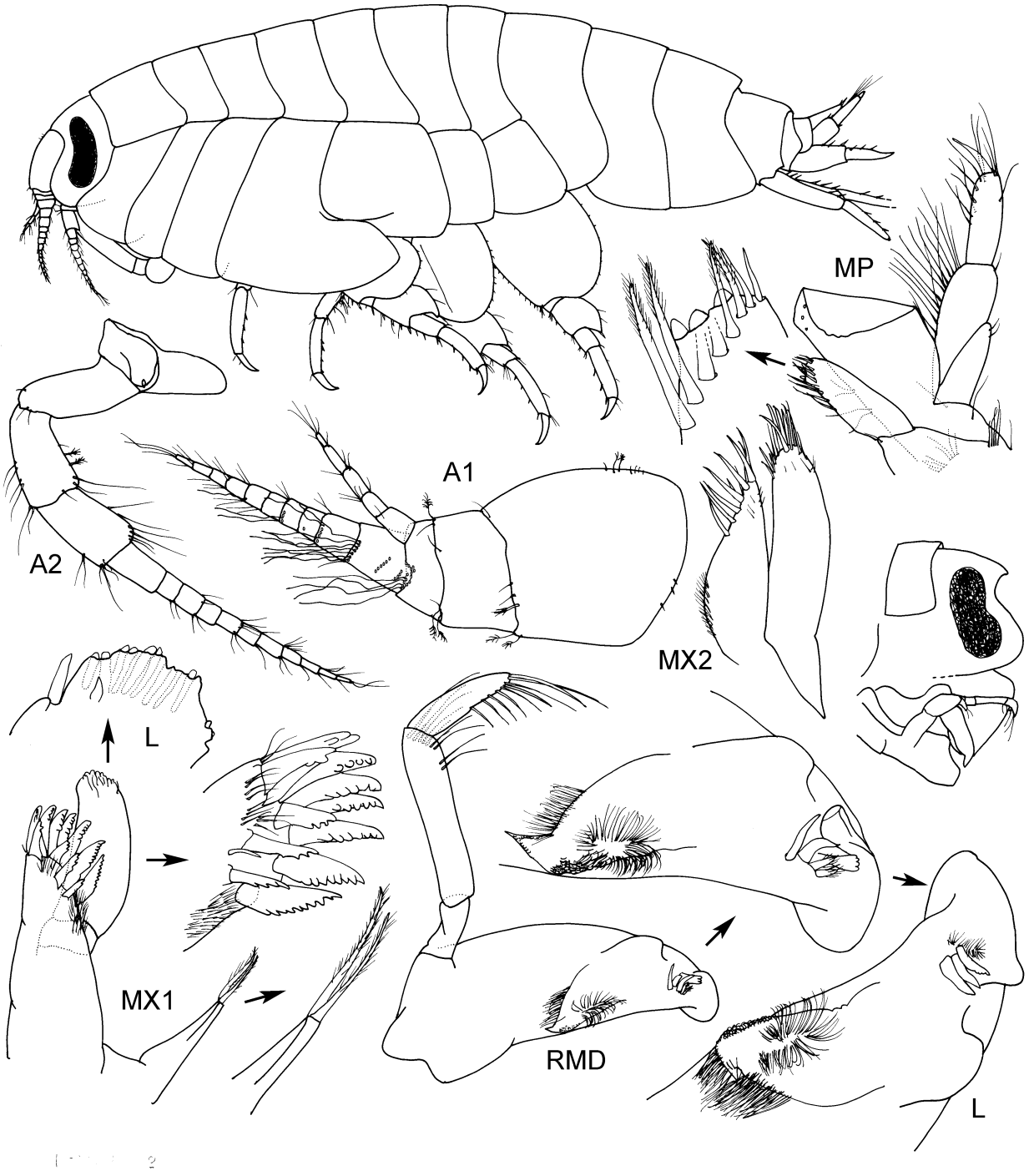

FIGURE 9. *Waldeckia enoei* Stephensen, 1931, female, 4.0 mm, AM P78704, Osprey Island, near Lizard Island, Great Barrier Reef.

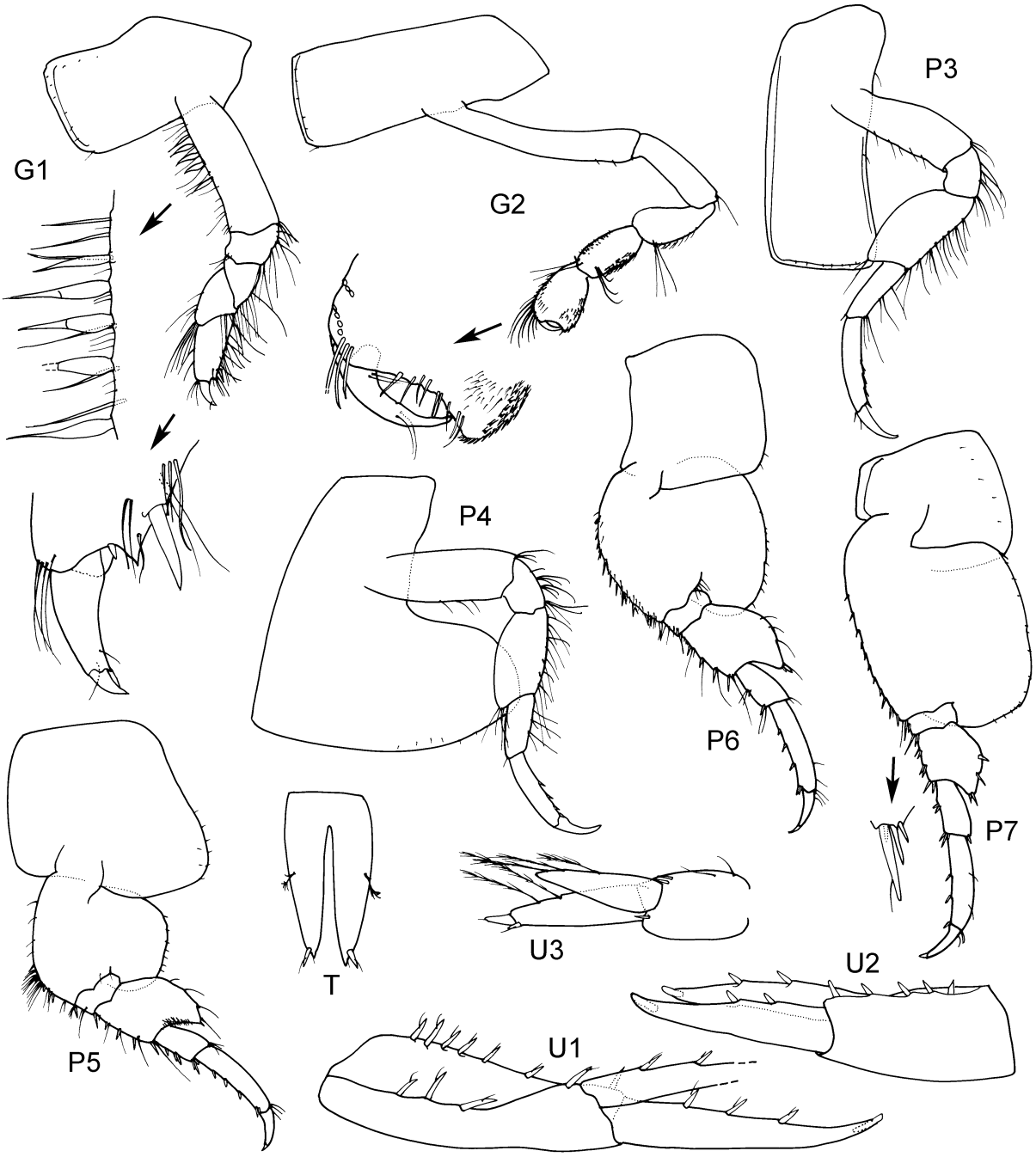

FIGURE 10. *Waldeckia enoei* Stephensen, 1931, female, 4.0 mm, AM P78704, Osprey Island, near Lizard Island, Great Barrier Reef.

Tryphosinae Lowry & Stoddart, 1997

***Paralysianopsis* Schellenberg, 1931**

***Paralysianopsis padoz* Lowry & Stoddart, 1995**
(Figs 11, 12)

Paralysianopsis padoz Lowry & Stoddart, 1995: 106, figs 3, 4.

Material examined. 1 male, 2.0 mm, AM P69600 (QLD 687); 2 unsexed, AM P69601 (QLD 690); 1 unsexed, AM P69602 (QLD 698); 1 female, 3.8 mm, AM P69603 and 14 unsexed, AM P69604 (QLD 699); 3 unsexed, AM P69605 (QLD 700); 4 unsexed, AM P69606 (QLD 747); 14 unsexed, AM P69607 (QLD 748).

Type locality. Padoz Tinan Reef, Madang Lagoon, Papua New Guinea (5º09.53'S 145º48.88'E), 2 m depth.

Description. Based on female, 3.8 mm, AM P69603.

Head and body. *Body* without dorsal carina. *Head* lateral cephalic lobes subtriangular, with apically subacute margins; eyes ovate. *Antenna 1* subequal to antenna 2; flagellum with weak 1-field callynophore, robust setae absent from proximal articles; calceoli absent; accessory flagellum with 5 articles, setose medially. *Antenna 2* less than 40% of body length; peduncle with strong brush setae; calceoli absent. *Mouthparts* forming a subquadrate bundle. *Epistome*/*upper lip* separate, epistome less produced than upper lip, narrowly rounded; upper lip produced, rounded apically. *Mandible* molar with reduced column and convex fully triturating surface; palp attached midway, article 3 without A3-setae. *Maxilla 1* outer plate with setal-teeth in 6/5 arrangement; setal-tooth 7, left and right symmetrical, cuspidate distally; palp distal margin with apical robust setae. *Maxilliped* inner plates well developed, greater than half the length of outer plate; outer plates without apical robust setae; palp 4–articulate, article 4 well developed.

Pereon. *Gnathopod 1* weakly subchelate; coxa large, about as long as coxa 2, subrectangular with straight anterior margin; basis expanded distally, sparsely setose along anterior margin; ischium short; carpus short (length 1.6 x breadth), subequal in length to propodus, without posterior lobe; propodus longer than broad, margins tapering, palm acute, entire, straight; posterodistal corner with robust seta; dactylus inner margin with large subapical spine. *Gnathopod 2* chelate; carpus longer than propodus; palm slightly obtuse; dactylus minute. *Pereopod 4* coxa with well developed posteroventral lobe. *Pereopod 5* coxa anterior lobe slightly deeper than posterior lobe; basis about as long as broad, with well developed, rounded posteroventral lobe.

Pleon. *Epimeron 3* posterodistal corner rounded. *Urosomite 1* dorsally straight. *Uropod 1* rami subequal. *Uropod 2* rami subequal, inner ramus without marginal constriction. *Uropod 3* rami subequal, without plumose setae; outer ramus 2–articulate, article 2 long (more than half length of article 1), inner ramus extending beyond article 1 of outer ramus. *Telson* longer than broad, entire, with dorsal robust setae.

Male (sexually dimorphic characters). Based on male, 2.0 mm, AM P69600 (QLD 687). Antenna 1 flagellum with weak 2-field callynophore (stronger than female); accessory flagellum moderately setose medially.

Habitat. Scavenger living in rubble at 2 to 30 m depth.

Remarks. The morphology of the *Paralysianopsis padoz* population from Ashmore Reef, Queensland is extremely similar to that of the population from Madang Lagoon, Papua New Guinea. The only discernible differences are the lateral cephalic lobes which are subtriangular in shape in the Ashmore Reef population (a semidome in the Madang population) and the accessory flagellum which is much more setose in the Ashmore Reef population.

Paralysianopsis padoz can be distinguished from other lysianassids on the Great Barrier Reef by the weakly subchelate gnathopod 1 and broadly rounded posteroventral corner on epimeron 3.

Distribution. *Australia*. Queensland: Ashmore Reef (current study). *Papua New Guinea*. Madang Lagoon (Lowry & Stoddart 1995).

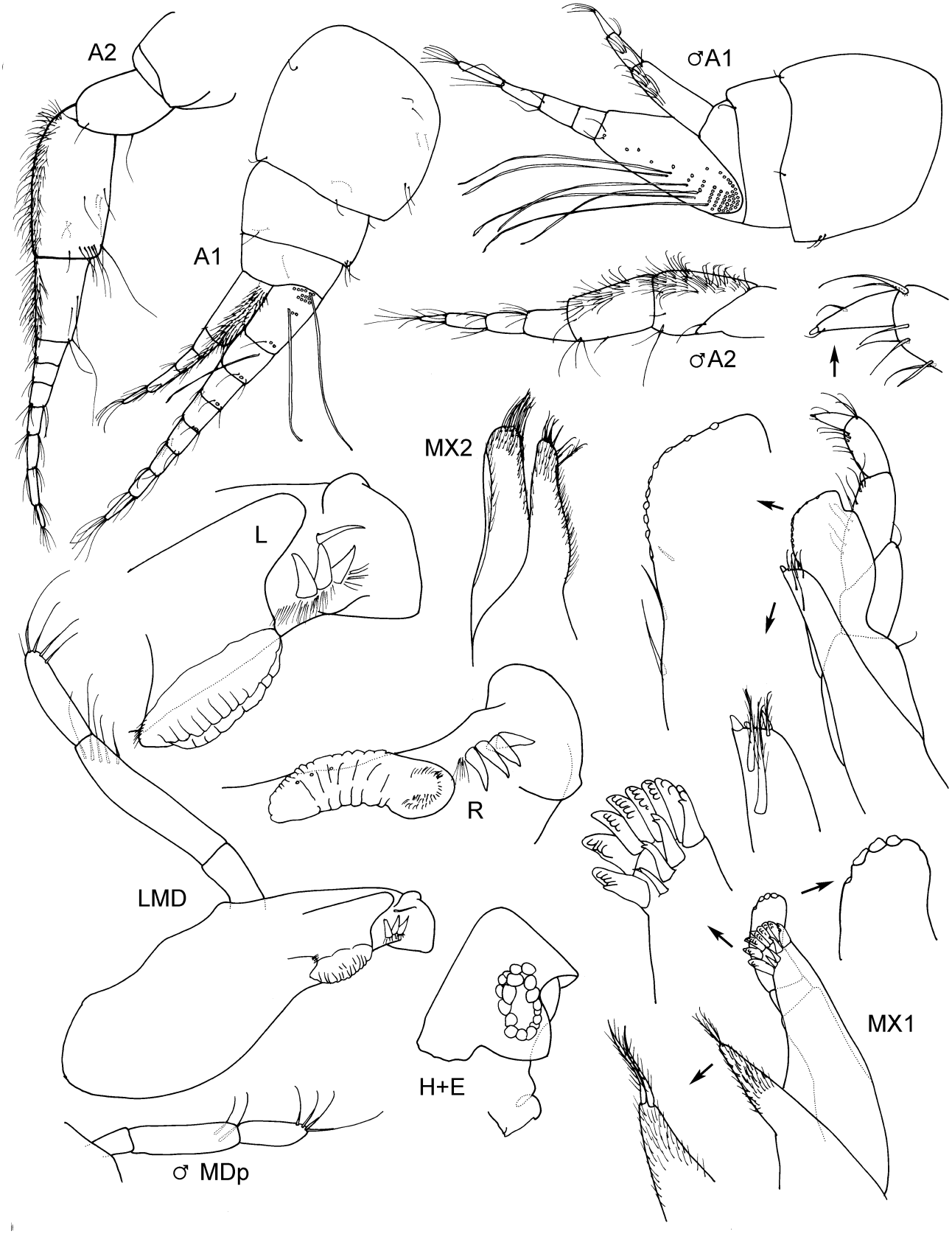

FIGURE 11. *Paralysianopsis padoz* Lowry & Stoddart, 1995, female, 3.8 mm, AM P69603; male, 2.0 mm, AM P69600; Ashmore Reef, Great Barrier Reef.

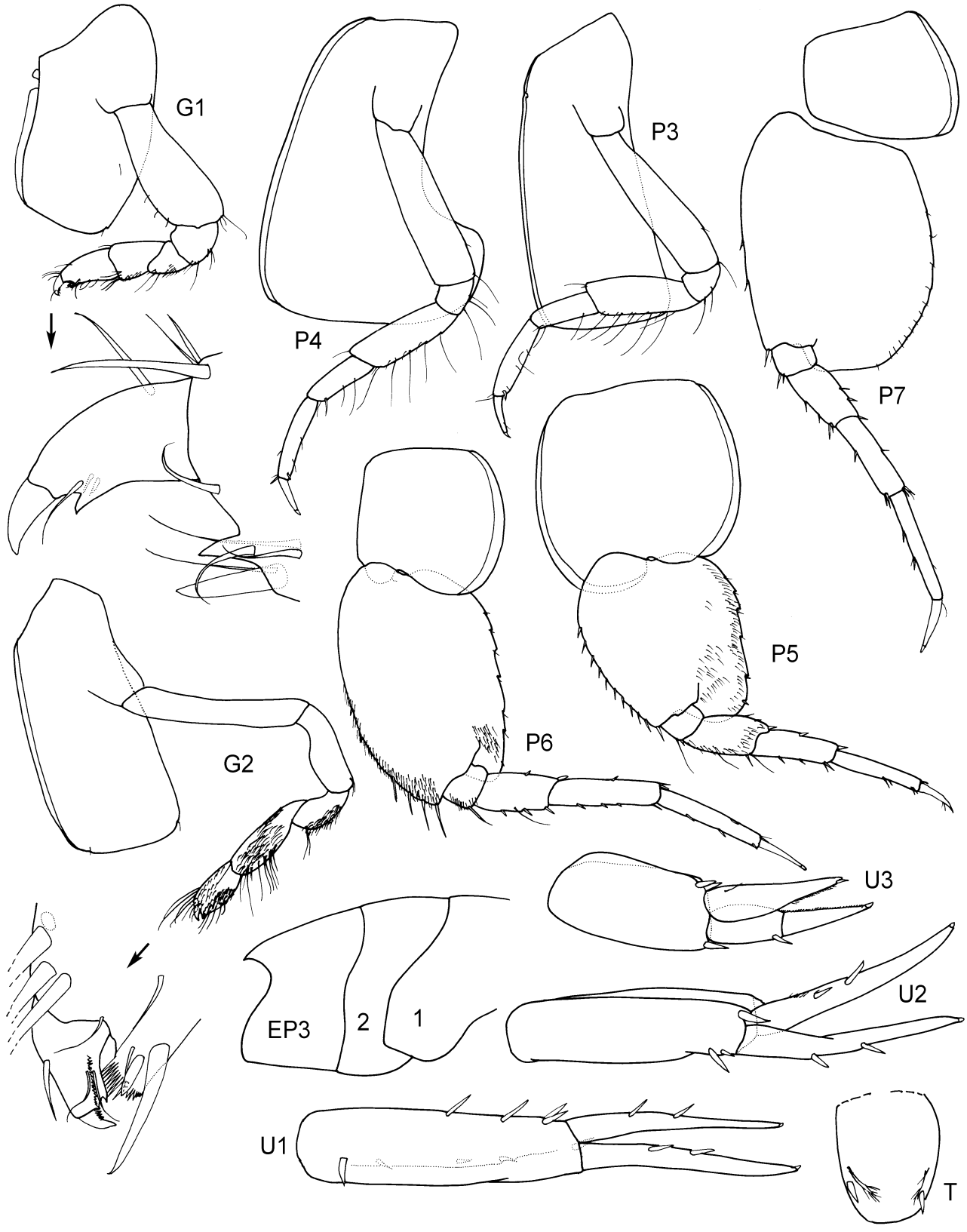

FIGURE 12. *Paralysianopsis padoz* Lowry & Stoddart, 1995, female, 3.8 mm, AM P69603, Ashmore Reef, Great Barrier Reef.

***Tryphosella* Bonnier, 1893**

Remarks. There is considerable variation within the genus *Tryphosella* as defined by Lowry & Stoddart (1995). One of the main defining characters of *Tryphosella* is the morphology of gnathopod 1 in which the coxa is reduced (slightly shorter than coxa 2) and tapering and the ischium is short, as evidenced in the type species *T. sarsi* Bonnier, 1893. Within the genus, especially in Australasian species, there is a tendency towards shortening the coxa to a point where it becomes about as long as broad and the ischium becomes at least twice as long as broad, as evidenced in the new species *T. seasana*. Given the two extremes there appears to be a case for establishing a second genus, but both characters are gradational so that in the case of *T. flynnana* and *T. seasana*, which are very similar, *T. flynnana* would remain in *Tryphosella* and *T. seasana* would move to a new genus.

Another set of defining characters is the prominent ridge on the coxae of pereopods 4 and 5 and an apparent 'photophore' on the basis of pereopod 5. Several species (*T. charlotteae* **sp. nov.**, *T. miersi* (Stebbing, 1888), *T. mucronata* (Pirlot, 1936)) known from Australia and New Guinea share these apomorphic characters. In other respects they cannot be separated from the genus *Tryphosella* and appear to form a species complex within it. At this stage we prefer to maintain all species in *Tryphosella*.

***Tryphosella bet* sp. nov.**
(Figs 13, 14)

Tryphosella sp. 2. —Keable, 1995: 42.

Type material. Holotype, female, ovigerous (6 eggs), 4.5 mm, AM P69568, Bet Reef, Torres Strait, Queensland, Australia (10°10.54'S 142°56.01'E), grey clay mud with shell grit, two baited traps set overnight, 20 m, S. Keable, 30 January 1993 (QLD 784). Paratypes: 1 male, 3.8 mm, AM P69569; 1 ovigerous female, 4.0 mm, AM P69570; 38 unsexed, AM P69571, same station data as holotype.

Additional material examined. 1 female, AM P69576, 1 male, AM P69577, 30 unsexed, AM P69578 (NT 169); 2 unsexed, AM P69579 (QLD 116); 1 ovigerous female, AM P69580 (QLD 303); 1 immature specimen, AM P69581 (QLD 304); 1 female, 1 immature specimen, AM P69582 (QLD 331); 1 ovigerous female, AM P69583 (QLD 459); 1 female, AM P69584 and 1 ovigerous female, 2 juveniles, AM P69585 (QLD 547); 2 ovigerous females, 2 juveniles, AM P69586 (QLD 548); 6 unsexed, AM P69593 (QLD 631); 1 unsexed, AM P69592 (QLD 670); 18 unsexed, AM P69591 (QLD 673); 96 unsexed, AM P52081 (QLD 915); 16 unsexed, AM P52077 (QLD 1073); 17 unsexed, AM P52078 (QLD 1075); 36 unsexed, AM P52079 (QLD 1091); 60 unsexed, AM P52080 (QLD 1093).

Type locality. Bet Reef, Torres Strait, Queensland, Australia (10°10.54'S 142°56.01'E), 20 m depth.

Etymology. Named for Bet Reef, the type locality.

Description. Based on holotype female, 4.5 mm, AM P69568 and ovigerous female, 4.0 mm, AM P69570.

Head and body. *Body* without dorsal carina. *Head* lateral cephalic lobes rounded, with apically rounded margins. *Antenna 1* shorter than antenna 2; flagellum with strong 2-field callynophore, robust setae present on proximal articles; calceoli absent; accessory flagellum with 4 articles. *Antenna 2* less than 40% of body length; peduncular articles 3 to 5 not enlarged, without brush setae; calceoli absent. *Mouthparts* forming a subquadrate bundle. *Epistome* produced slightly beyond upper lip, broadly rounded. *Mandible* molar with asymmetrically reduced column, proximally setose, distally triturating; palp attached midway, article 3 with proximal A3-seta. *Maxilla 1* outer plate with setal-teeth in 6/5 arrangement; setal-tooth 7, left and right symmetrical, cuspidate along most of sinsusoidal inner margin; palp distal margin with apical robust setae. *Maxilliped* inner plates well developed, greater than half the length of outer plate; outer plate with 2 long, slender apical robust setae; palp 4–articulate, article 4 well developed.

Pereon. *Gnathopod 1* subchelate; coxa slightly reduced, slightly shorter than coxa 2, tapering distally; basis sparsely setose along anterior margin; ischium long (length 2.2 x breadth); carpus long (length 2.5 x breadth), subequal in length to propodus, without posterior lobe; propodus longer than broad, margins subparallel, palm acute; dactylus inner face serrated. *Gnathopod 2* subchelate; carpus 2.2 x length of propodus; palm slightly obtuse; dactylus minute. *Pereopod 4* coxa with well developed posteroventral lobe. *Pereopod 5* coxa equilobate; basis about as long as broad, posterior margin not strongly serrated, with well developed wedge-shaped posteroventral lobe. *Pereopod 7* basis posterior margin slightly serrated.

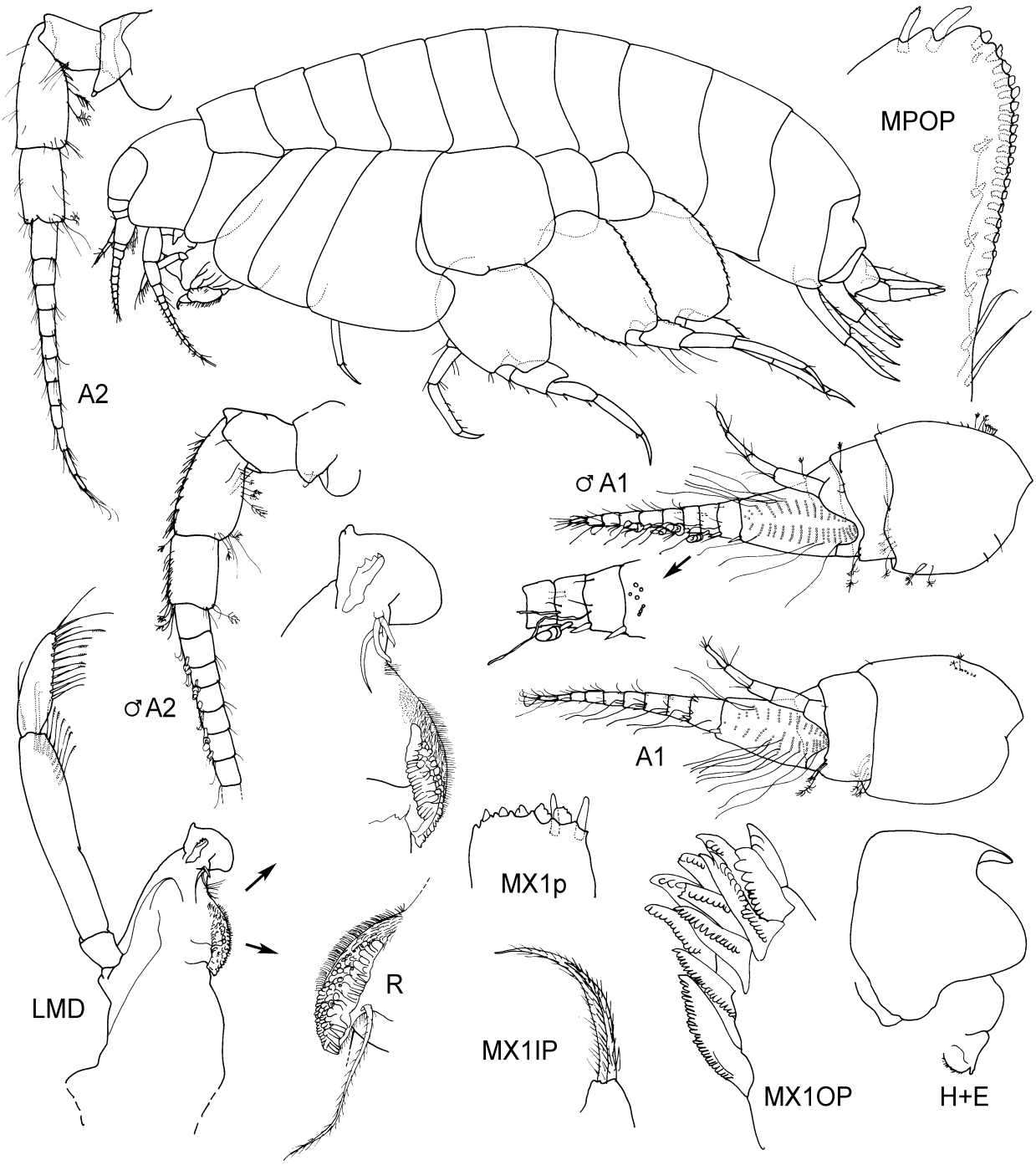

FIGURE 13. *Tryphosella bet* **sp. nov.**, holotype female, 4.5 mm, AM P69568; habitus: paratype female, 4.0 mm, AM P69570; paratype male, 3.8 mm, AM P69569; Bet Reef, Torres Strait.

Pleon. *Epimeron 3* posterior margin smooth, posterodistal corner acute. *Urosomite 1* with anterodorsal notch and slightly rounded boss. *Uropod 1* rami subequal. *Uropod 2* rami subequal, inner ramus without marginal constriction. *Uropod 3* rami subequal, with sparse plumose setae; outer ramus 2-articulate, article 2 long (about 0.5 x article 1); inner ramus extending beyond article 1 of outer ramus. *Telson* distinctly longer than broad, deeply cleft, with dorsal robust setae, with 1 apical robust seta on each lobe.

Male (sexually dimorphic characters). Based on paratype male, 3.8 mm, AM P69569. *Antenna 1* flagellum with stronger 2-field callynophore; calceoli present. *Antenna 2* peduncular articles 4 and 5 with brush setae; calceoli present. *Uropod 3* with more plumose setae and dense fine setae on each ramus.

Habitat. Scavenger living on mud and shell grit or sand and rubble bottoms from 19 to 25 m depth.

Remarks. *Tryphosella bet* differs from *T. cameloides, T. charlotteae, T. flynnana* and *T. seasana* in having robust setae present on the proximal articles of antenna 1 flagellum. *Tryphosella bet* is very similar to *T. wongada* Lowry & Stoddart, 1995 but differs from that species in having 2 (rather than 1) long apical robust setae on the outer plate of the maxilliped.

Distribution. *Australia*. Queensland: Bet Reef, Torres Strait (current study); Lizard Island (current study). Northern Territory: West Point, Darwin (current study).

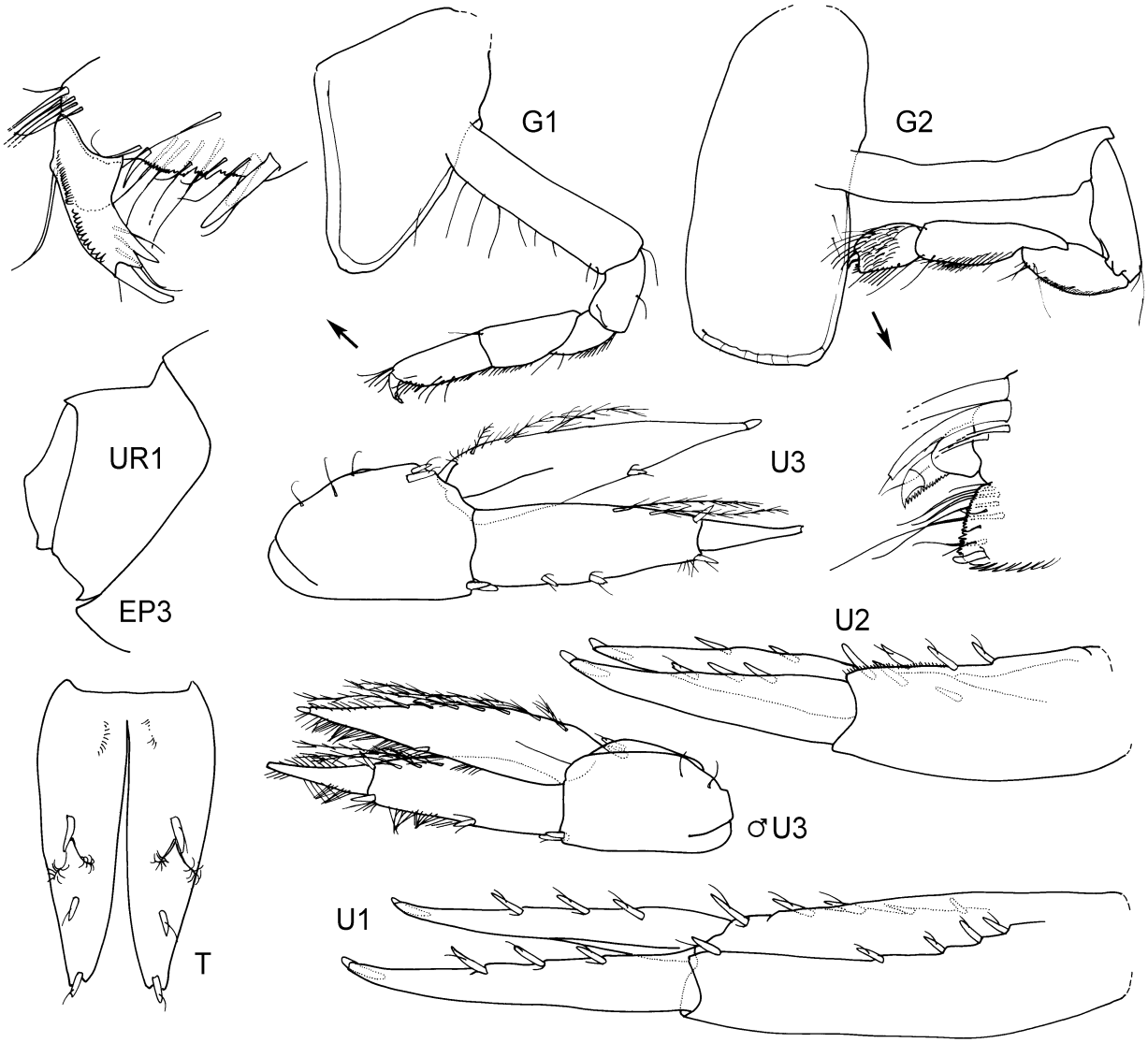

FIGURE 14. *Tryphosella bet* **sp. nov.**, holotype female, 4.5 mm, AM P69568; paratype male, 3.8 mm, AM P69569; Bet Reef, Torres Strait.

***Tryphosella cameloides* sp. nov.**
(Figs 15, 16)

Tryphosella sp. 1. —Keable, 1995: 42.

Type material. Holotype, female, ovigerous (3 eggs), 3.5 mm, AM P69362, Blue Lagoon between South and Palfrey Islands, Lizard Island, Queensland, Australia (14°40'S 145°28'E), very exposed, bare consolidated reef flat with boulders 30–40 cm in diameter, very few branching hard corals, occasional patch of soft corals, mainly *Sarcophyton*, baited trap, 0.5 m, S.J. Keable & D.J. Townsend, 25-26 June 1989 (QLD 429). Paratypes: 1 male, 3.0 mm, AM P69363; 1 male, 2.8 mm, AM P69364; 35 unsexed, AM P69365, same station data as holotype.

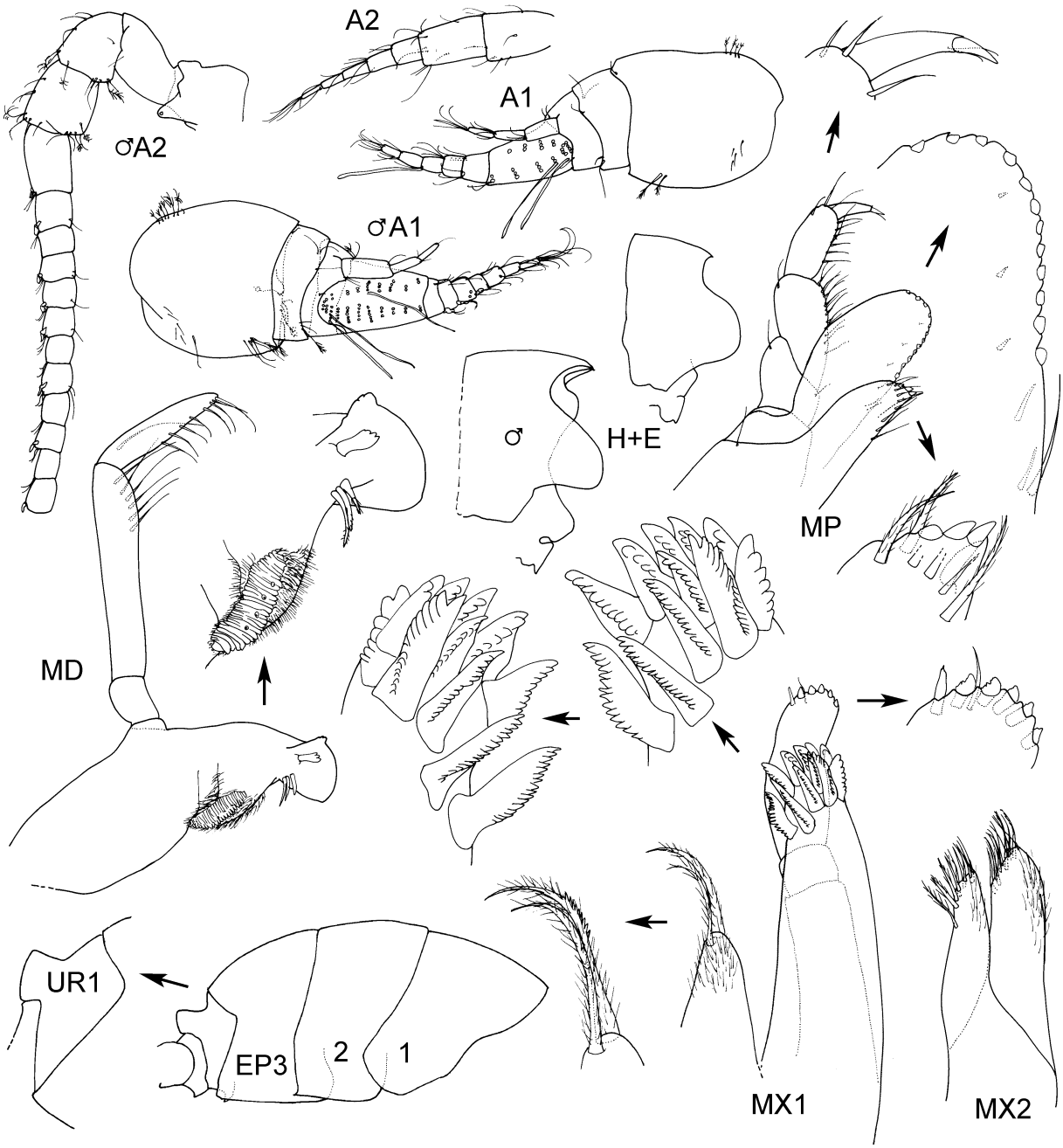

FIGURE 15. *Tryphosella cameloides* **sp. nov.**, holotype female, 3.5 mm, AM P69362; paratype male, 3.0 mm, AM P69363; Blue Lagoon, Lizard Island, Great Barrier Reef.

Additional material examined. 1 unsexed, AM P69371 (BK 126); 1 unsexed, AM P69372 (BK 131); 1 unsexed, AM P69368 (JDT/LIZ 15); 1 unsexed, AM P69370 (JDT/LIZ 17); 1 unsexed, AM P69369 (JDT/LIZ 19); 1 unsexed, AM P69373 (JDT/OPH 1); 1 unsexed, AM P69352 (QLD 291); 1 unsexed, AM P69353 (QLD 311); 1 unsexed, AM P69354 (QLD 323); 1 unsexed, AM P69355 (QLD 325); 2 unsexed, AM P69356 (QLD 372); 8 unsexed, AM P69357 (QLD 374); 1 unsexed, AM P69358 (QLD 379); 1 unsexed, AM P69359 (QLD 396); 7 unsexed, AM P69360 (QLD 401); 1 unsexed, AM P69361 (QLD 427); 3 unsexed, AM P69366 (QLD 481); 1 unsexed, AM P69367 (QLD 575); 5 unsexed, P69351 (QLD 631); 3 unsexed, AM P69350 (QLD 673); 1 unsexed, AM P69349 (QLD 746); 4 unsexed, AM P69346 (QLD 763); 1 unsexed, AM P69347 (QLD 764); 1 unsexed, AM P69348 (QLD 767); 1 unsexed, P71934 (QLD 1364); 1 unsexed, P70775 (QLD 1653); 2 unsexed, (SEL/LZI-1-2); 3 unsexed (SEL/LZI-2-1); 1 unsexed (SEL/LZI-2-7).

Type locality. Blue Lagoon between South and Palfrey Islands, Lizard Island, Queensland, Australia (14°40'S 145°28'E), 0.5 m depth.

Etymology. The name *cameloides* indicates the close similarity to *Tryphosella camela* (Stebbing, 1910).

Description. Based on holotype female, 3.5 mm, AM P69362.

Head and body. *Body* without dorsal carina. *Head* lateral cephalic lobes rounded, with apically rounded margins. *Antenna 1* subequal to antenna 2; with weak 2-field callynophore, robust setae absent from proximal articles; calceoli absent; accessory flagellum with 3 articles. *Antenna 2* less than 40% of body length; peduncular articles 3 to 5 not enlarged, without brush setae; calceoli absent. *Mouthparts* forming a subquadrate bundle. *Epistome* produced beyond upper lip, narrowly rounded. *Mandible* molar with asymmetrically reduced column, proximally setose, distally triturating; palp attached midway, article 3 with proximal A3-seta. *Maxilla 1* outer plate with setal-teeth in 6/5 arrangement; setal-tooth 7, left and right symmetrical, cuspidate along most of sinsusoidal inner margin; palp distal margin with apical robust setae. *Maxilliped* inner plates well developed, about half the length of outer plate; outer plate with 3 short, slender apical robust setae; palp 4–articulate, article 4 well developed.

Pereon. *Gnathopod 1* subchelate; coxa slightly reduced, slightly shorter than coxa 2, tapering distally; basis sparsely setose along anterior margin; ischium short (length 1.7 x breadth); carpus long (length 2.3 x breadth), subequal in length to propodus, without posterior lobe; propodus longer than broad, margins subparallel, palm slightly acute; dactylus inner face serrated. *Gnathopod 2* chelate; carpus 1.5 x length of propodus; palm slightly obtuse; dactylus minute. *Pereopod 4* coxa with well developed posteroventral lobe. *Pereopod 5* coxa equilobate; basis about as long as broad, posterior margin not strongly serrated. *Pereopod 7* basis posterior margin slightly serrated.

Pleon. *Epimeron 3* posterior margin smooth, posterodistal corner subquadrate. *Urosomite 1* with deep notch and subtriangular, subacute boss. *Uropod 1* rami subequal. *Uropod 2* rami subequal, inner ramus without marginal constriction. *Uropod 3* rami distinctly unequal, without plumose setae; outer ramus 2-articulate, article 2 long (about 0.5 x article 1); inner ramus not extending beyond article 1 of outer ramus. *Telson* distinctly longer than broad, deeply cleft, with dorsal robust setae, with 1 apical robust seta on each lobe.

Male (sexually dimorphic characters). Based on paratype male, 3 mm, AM P69363. *Head* lateral cephalic lobes semidome, with apically truncated margins. *Antenna 1* flagellum with strong 2-field callynophore; calceoli present. *Antenna 2* about half body length; calceoli present. *Epistome* produced beyond upper lip (more so than in female). *Uropod 3* with a few plumose setae on each ramus.

Habitat. Scavenger living on sand patches among corals on reef top and in coral rubble on reef slopes from the intertidal to 30 m depth.

Remarks. *Tryphosella cameloides* is most similar to *T. camela* (Stebbing, 1910). *Tryphosella camela* has not been redescribed, but we have examined new material. In *T. cameloides* the gnathopod 2 palm is slightly obtuse (transverse in *T. camela*). Both species have a distinctive subtriangular, subacute boss on urosomite 1. In *T. cameloides* the boss is laterally very thin whereas in *T. camela* it is more robust and is preceded by a very deep incision. The two species also differ slightly in the shape of the basis of pereopods 5 to 7.

Distribution. *Australia*. Queensland: Lizard Island; Eagle Island; Orpheus Island; Boot Reef; Great Detached Reef; Ashmore Reef (all current study).

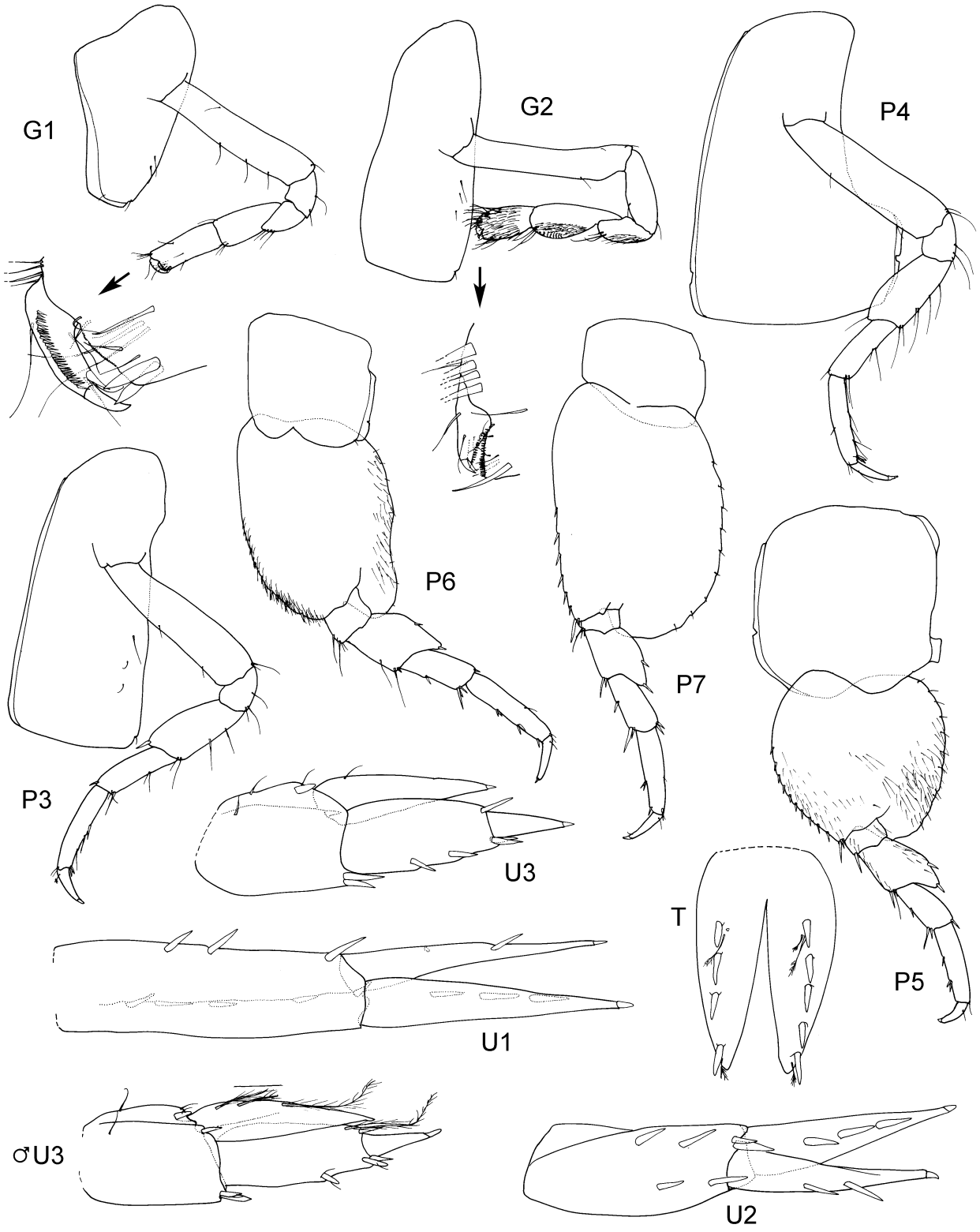

FIGURE 16. *Tryphosella cameloides* **sp. nov.**, holotype female, 3.5 mm, AM P69362; paratype male, 3.0 mm, AM P69363; Blue Lagoon, Lizard Island, Great Barrier Reef.

***Tryphosella charlotteae* sp. nov.**
(Figs 17, 18)

Type material. Holotype, female, ovigerous (at least 8 eggs), 12 mm, AM P69114, 100 metres north-east of sand spit, One Tree Island, Queensland, Australia (23°30'S 152°05'E), 1 m, large corer in coarse sand, C. Short & J. Young, 20 October 1979 (QLD 101). Paratype: male, 10mm, AM P69115, same station data as holotype. Paratypes: 1 ovigerous female, 1 immature specimen, AM P69111, Reef 'C', One Tree Island lagoon, Queensland, Australia (23°30'S 152°05'E), 5.5 m, light trap over sand, 2005 hours, P.S. McWilliam, 27 November 1977 (QLD 98). Paratypes: 1 ovigerous female, 1 adult male, 2 immature specimens, AM P69112, One Tree Island lagoon, Queensland, Australia (23°30'S 152°05'E), light trap 2 metres away from reef, 2207 hours, P.S. McWilliam, 14 November 1976, OT 208 (QLD 99). Paratypes: 1 male, 3 immature specimens, AM P69113, One Tree Island lagoon, Queensland, Australia (23°30'S 152°05'E), light trap, P.S. McWilliam, November 1975 or 1977 (QLD 100).

Additional material examined. 1 male, AM P69116 (QLD 102); 1 unsexed, AM P71853 (Kimbla 2); 1 male, AM P69117 (Kimbla Q 11).

Type locality. 100 metres north-east of sand spit, One Tree Island, Queensland, Australia (23°30'S 152°05'E).

Etymology. Named for Charlotte Watson, one of the collectors of the type material.

Description. Based on holotype, female, 12 mm, AM P69114 and paratype male, 10 mm, AM P69115.

Head and body. *Body* without dorsal carina. *Head* lateral cephalic lobes subtriangular, with apically rounded margins; eyes large, reniform, with ventral concave lens. *Antenna 1* shorter than antenna 2; flagellum with strong 2-field callynophore, robust setae absent from proximal articles; calceoli present; accessory flagellum with 4 articles. *Antenna 2* approximately half body length; peduncular articles 4 and 5 not enlarged, brush setae present; calceoli present. *Mouthparts* forming a subquadrate bundle. *Epistome* less produced than upper lip, straight. *Mandible* molar with asymmetrically reduced column, proximally setose, distally triturating; palp attached midway, article 3 with proximal A3-seta. *Maxilla 1* outer plate with setal-teeth in 6/5 arrangement; setal-tooth 7, left and right symmetrical, cuspidate along most of straight inner margin; palp distal margin with apical robust setae. *Maxilliped* outer plate with 2 short apical robust setae; palp 4–articulate, article 4 well developed.

Pereon. *Gnathopod 1* subchelate; coxa slightly reduced, slightly shorter than coxa 2, slightly tapering and broadly rounded distally; basis moderately setose along anterior margin; ischium long (length 2.2 x breadth); carpus long (length 2.1 x breadth), subequal in length to propodus, without posterior lobe; propodus longer than broad, margins subparallel, palm acute. *Gnathopod 2* chelate; carpus longer than propodus; palm obtuse; dactylus minute. *Pereopod 4* coxa with distinct lateral ridge, with well developed posteroventral lobe. *Pereopod 5* coxa with distinct lateral ridge, equilobate; basis about as long as broad, with "photophore". *Pereopod 7* basis posterior margin slightly serrated.

Pleon. *Epimeron 3* posterior margin smooth, posterodistal corner rounded. *Urosomite 1* with anterodorsal notch and slightly rounded boss. *Uropod 1* rami subequal. *Uropod 2* rami subequal, inner ramus without marginal constriction. *Uropod 3* with plumose setae on each ramus; outer ramus 2-articulate, article 2 short (about 0.1 x article 1); inner ramus not extending beyond article 1 of outer ramus. *Telson* longer than broad, deeply cleft, with dorsal robust setae, with 1or 2 apical robust setae on each lobe.

Habitat. Sandy bottoms from 1 to 82 m depth.

Remarks. *Tryphosella charlotteae* is very similar to *T. mucronata* (Pirlot, 1936) from Waigeo Island in West New Guinea. Both species have a well developed "photophore" on the basis of pereopod 5. The strongest differences between these species are the shape of the posteroventral lobe of pereopod 4 coxa which is more rounded in *P. mucronata* and has a strong lateral ridge in *T. charlotteae*; and the pereopod 7 basis which tapers less and is almost straight posteroventrally in *T. mucronata*. Stebbing (1888) described *T. miersi* (as *Hippomedon miersi*) from east of Moncoeur Island in Bass Strait. He did not illustrate a "photophore" on the basis of pereopod 5, but it may have been missed in his single preserved specimen. *Tryphosella miersi* differs from *T. charlotteae* in not having any ridging on the coxae of pereopods 4 or 5.

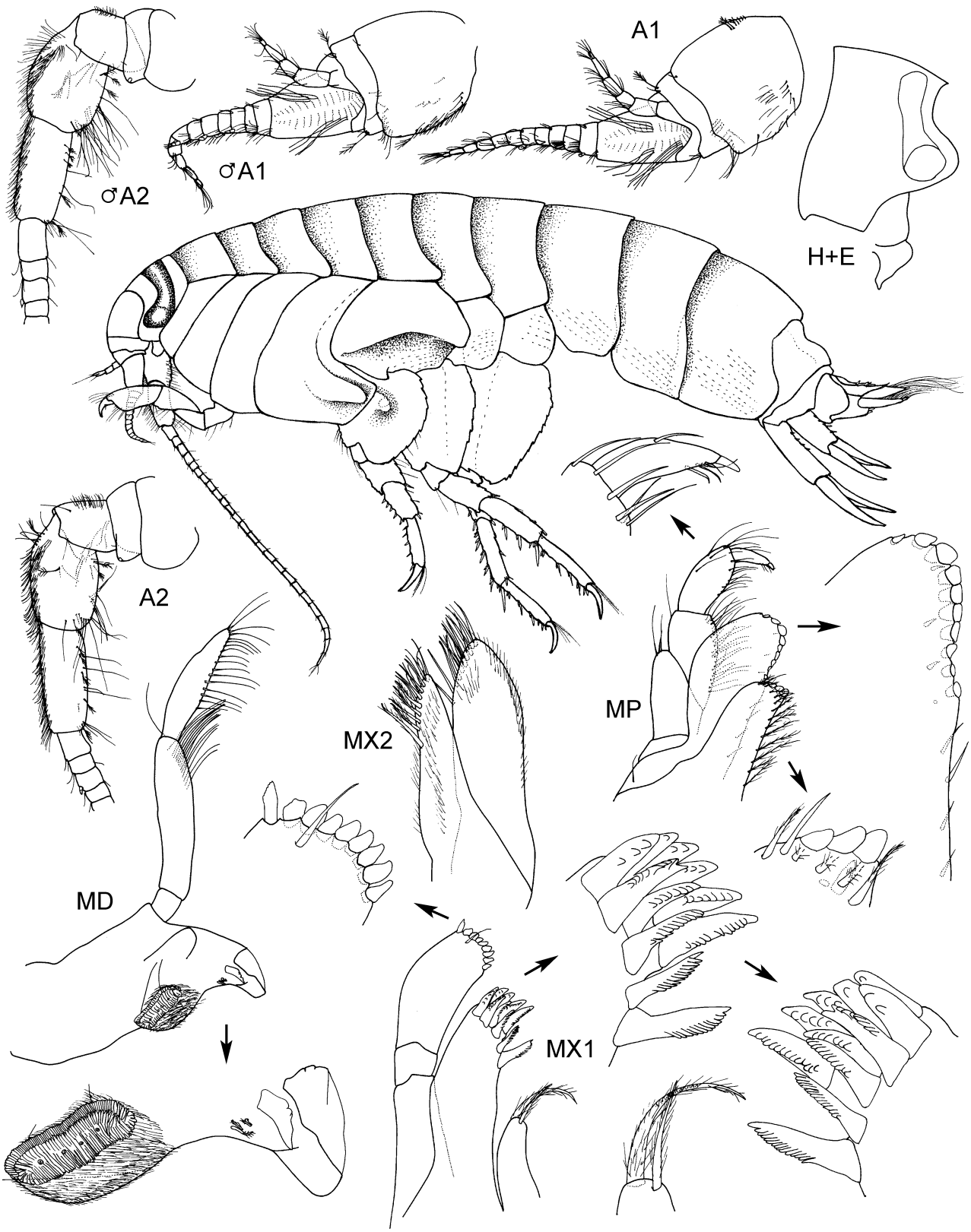

FIGURE 17. *Tryphosella charlotteae* **sp. nov.**, holotype female, 12 mm, AM P69114; habitus and male parts, paratype male, 10 mm, AM P69115; One Tree Island, Great Barrier Reef.

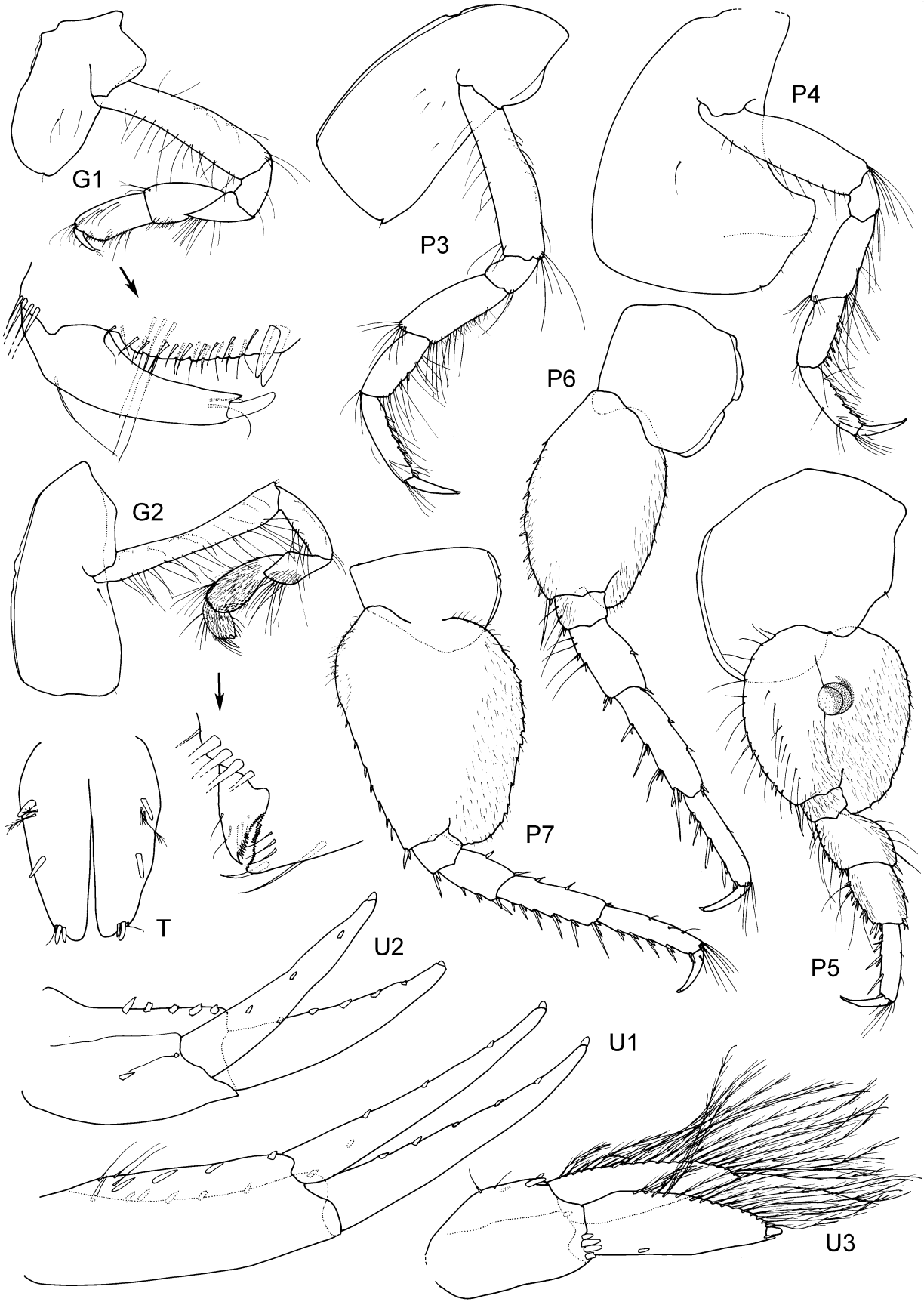

FIGURE 18. *Tryphosella charlotteae* **sp. nov.**, holotype, female, 12 mm, AM P69114, One Tree Island, Great Barrier Reef.

Distribution. *Australia*. Queensland: Lizard Island; One Tree Island; Fraser Island; Moreton Bay (all current study).

***Tryphosella flynnana* sp. nov.**
(Figs 19, 20)

Type material. Holotype, female, ovigerous (2 eggs), 5.0 mm, AM P69587, east of Flynn Reef, Queensland, Australia (16°41.61'S 146°17.94'E), baited trap, 50 m, 25.9 °C, J.K. Lowry & K. Dempsey on RV *Sunbird*, 18–19 May 1994 (QLD 1032). Paratypes: ovigerous female, 4.5 mm, AM P69588; male, 4.2 mm, AM P69589; 903 unsexed, AM P52150; same station data as holotype.

Additional material examined. 2 unsexed, AM P69590 (PNG 51); 47 unsexed, AM P49506 (QLD 916); 16 unsexed, AM P50366 (QLD 918); 93 unsexed, AM P50198 (QLD 919); 382 unsexed, AM P50249 (QLD 933); 105 unsexed, AM P50208 (QLD 935); 38 unsexed, AM P50374 (QLD 937); 22 unsexed, AM P50375 (QLD 938); 78 unsexed, AM P57615 (QLD 1034); 312 unsexed, AM P50341 (QLD 1052); 377 unsexed, AM P52250 (QLD 1054); 129 unsexed, AM P50346 (QLD 1055); 53 unsexed, AM P50350 (QLD 1057).

Type locality. East of Flynn Reef, Great Barrier Reef, Queensland, Australia (16°41.61'S 146°17.94'E), 50 m depth.

Etymology. Named for Flynn Reef, near the type locality.

Description. Based on holotype female, 5.0 mm, AM P69587 and paratype female, 4.5 mm, AM P69588.

Head and body. *Body* without dorsal carina. *Head* lateral cephalic lobes semidome, with apically rounded margins. *Antenna 1* subequal in length to antenna 2; flagellum with strong 2-field callynophore, robust setae absent from proximal articles; calceoli absent; accessory flagellum with 4 articles. *Antenna 2* less than 40% of body length; peduncular articles 3 to 5 not enlarged, without brush setae; calceoli present. *Mouthparts* forming a subquadrate bundle. *Epistome* produced beyond upper lip, broadly rounded. *Mandible* molar with asymmetrically reduced column, proximally setose, distally triturating; palp attached midway, article 3 with proximal A3-seta. *Maxilla 1* outer plate with setal-teeth in 6/5 arrangement; setal-tooth 7, left and right symmetrical, cuspidate along all of sinsusoidal inner margin; palp distal margin with apical robust setae. *Maxilliped* inner plates well developed, about half the length of outer plate; outer plate with 2 long, slender apical robust setae; palp 4–articulate, article 4 well developed.

Pereon. *Gnathopod 1* subchelate; coxa reduced, significantly shorter than coxa 2, tapering distally; basis sparsely setose along anterior margin; ischium long length (2.3 x breadth); carpus long (length 2.5 x breadth), longer than (1.2 x) propodus, without posterior lobe; propodus longer than broad, margins subparallel, palm acute; dactylus inner face serrated. *Gnathopod 2* chelate; carpus much longer than (2.3 x) propodus; palm slightly obtuse; dactylus minute. *Pereopod 4* coxa with well developed posteroventral lobe. *Pereopod 5* coxa equilobate; basis about as long as broad, posterior margin not strongly serrated, with well developed rounded posteroventral lobe. *Pereopod 7* basis posterodistally produced less than halfway along merus, posterior margin slightly serrated.

Pleon. *Epimeron 3* posterior margin smooth, posterodistal corner acute. *Urosomite 1* with anterodorsal notch and slightly rounded boss. *Uropod 1* rami subequal. *Uropod 2* rami subequal, inner ramus without marginal constriction. *Uropod 3* without plumose setae on rami; outer ramus 2-articulate, article 2 long (about 0.5 x article 1); inner ramus extending beyond article 1 of outer ramus. *Telson* longer than broad, deeply cleft, with dorsal robust setae, with 1 apical robust seta on each lobe.

Male (sexually dimorphic characters). Based on paratype male AM P69589. *Antenna 1* flagellum with stronger 2-field callynophore; calceoli present. *Antenna 2* about half length of body; peduncular articles 4 and 5 with brush setae; calceoli present. *Epistome* more produced and broadly rounded. *Uropod 3* with plumose setae on both rami.

Habitat. Soft bottoms in 10 to 100 m depth.

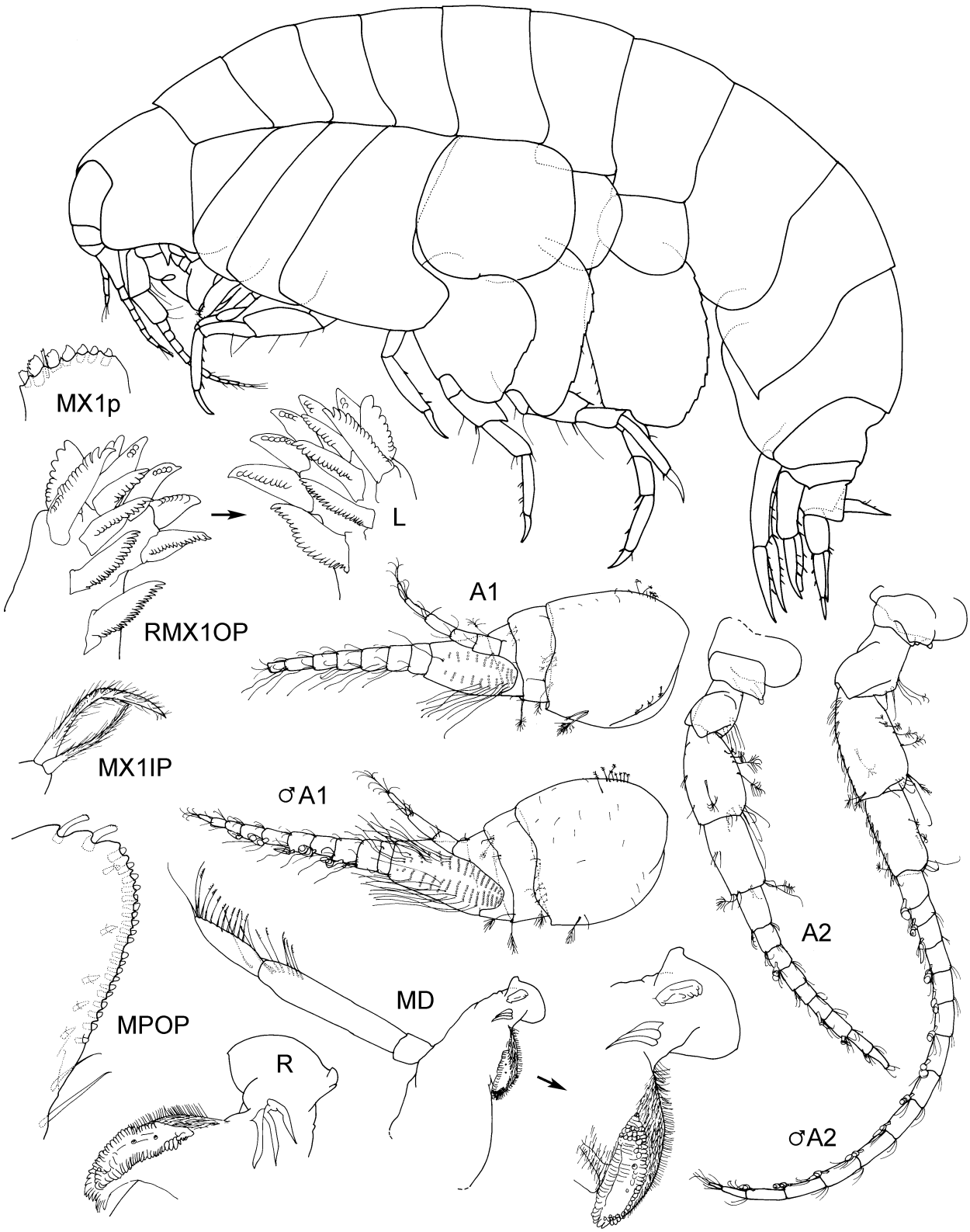

FIGURE 19. *Tryphosella flynnana* **sp. nov.**, holotype female, 5.0 mm, AM P69587; habitus: paratype female, 4.5 mm, AM P69588; paratype male, 4.2 mm, AM P69589; east of Flynn Reef, Great Barrier Reef.

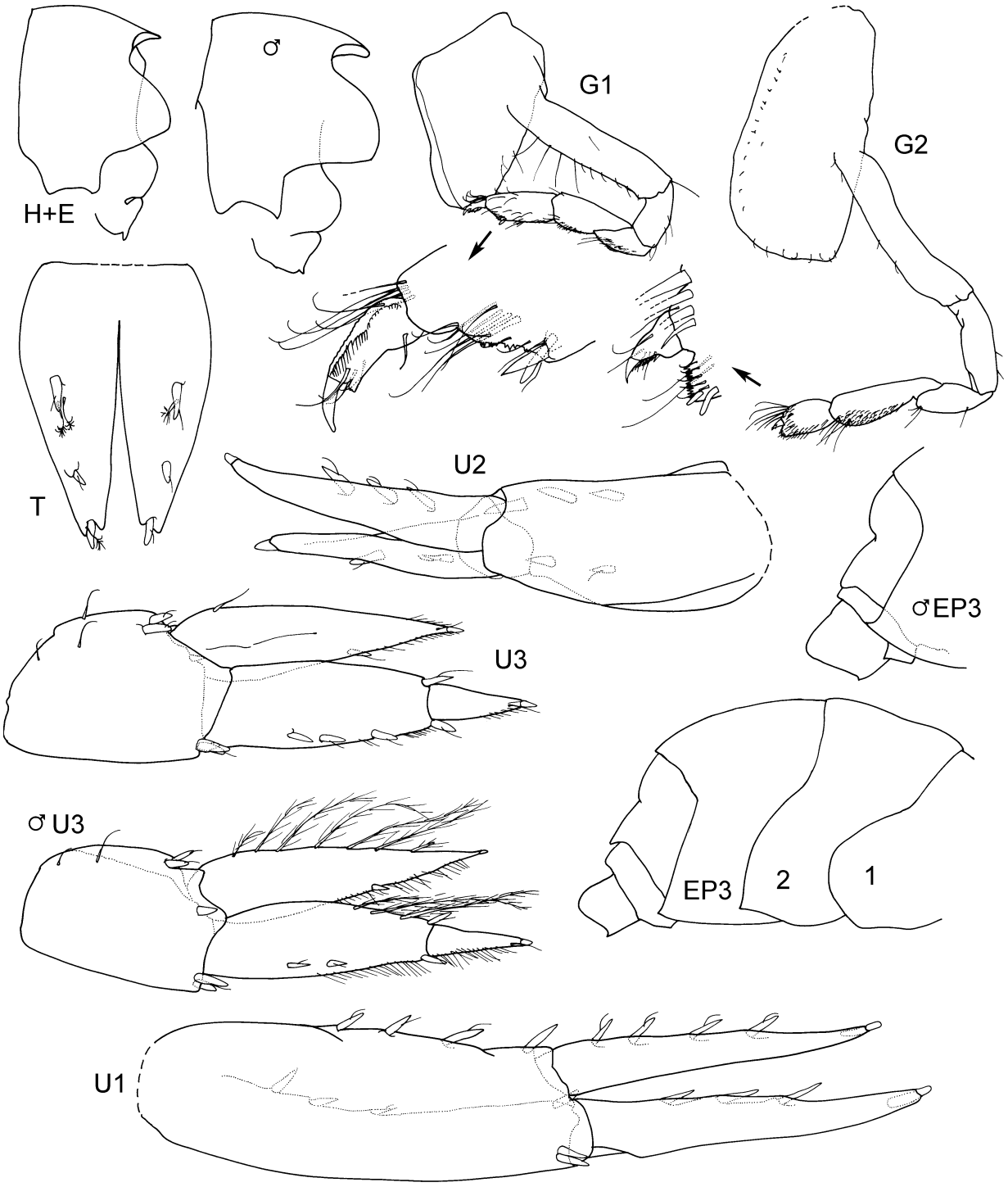

FIGURE 20. *Tryphosella flynnana* **sp. nov.**, holotype, female, 5.0 mm, AM P69587; paratype male, 4.2 mm, AM P69589; east of Flynn Reef, Great Barrier Reef.

Remarks. *Tryphosella flynnana* is very similar to *T. wongada* Lowry & Stoddart, 1995, from Madang Lagoon in northern Papua New Guinea. However in *T. flynnana* antenna 1 is shorter than antenna 2 (subequal in *T. wongada*); *T. flynnana* has no robust setae on the proximal articles of antenna 1 (present in *T. wongada*); *T. flynnana* has 2 apical robust setae on the outer plate of the maxilliped (1 robust seta in *T. wongada*). The two species appear to live in different habitats: *T. flynnana* on the continental shelf down to about 100 m and *T. wongada* in a lagoon system in less than 20 m depth.

Tryphosella flynnana is also similar to *T. astrolabensis* Lowry & Stoddart, 1995 from Astrolabe Bay in northern Papua New Guinea. However *T. astrolabensis* has more rounded lateral cephalic lobes than does *T. flynnana*, antenna 1 is subequal to antenna 2 in males and the posterodistal corner of epimeron 3 is produced into a small spine. *Tryphosella flynnana* lives on the inner continental shelf between 50 and 100 m depth, but *T. astrolabensis* has a wider depth range living on the continental shelf and slope from 90 to at least 500 m depth.

Distribution. *Australia*. Queensland: east of Flynn Reef (current study). *Papua New Guinea*. Bootless Bay (current study).

***Tryphosella seasana* sp. nov.**
(Figs 21, 22)

Type material. Holotype, female, ovigerous (3 eggs), 5.0 mm, AM P77905, east of Fitzroy Reef , Queensland, Australia (23°32'53"S 152°16'44"E), baited trap 3, 100 m, J.K. Lowry & K. Dempsey, MV *Reefknot*, 2-3 June 1994 (QLD 1078). Paratypes: male, 4.6 mm, AM P77906; male, 4.0 mm, AM P77907; female, 4.5 mm, AM P77908; 8 unsexed, AM P77909; 110 unsexed, AM P52156; same data as holotype. Paratypes: 32 unsexed, AM P52155, east of Fitzroy Reef, Queensland, Australia (23°32'53"S 152°16'44"E), baited trap 1, 100 m, J.K. Lowry & K. Dempsey, MV *Reefknot*, 2-3 June 1994 (QLD 1076). Paratypes: 45 unsexed, AM P52157, east of Fitzroy Reef, Queensland, Australia (23°32'53"S 152°16'44"E), baited trap 3, 100 m, J.K. Lowry & K. Dempsey, MV *Reefknot*, 3-4 June 1994 (QLD 1096).

Additional material examined. 3 unsexed, AM P52654 (QLD 951); 23 unsexed, AM P52151 (QLD 952); 45 unsexed, AM P52152 and AM P52656 (QLD 953); 162 unsexed, AM P52153 and AM P52654 (QLD 954); 454 unsexed, AM P52154 (QLD 955/SEAS); 1 male and 1 female, AM P48022 (QLD 1198); 1 unsexed, AM P48029 (QLD 1199).

Type locality. East of Fitzroy Reef, Queensland, Australia (23°32'53"S 152°16'44"E), 100 m depth.

Etymology. Named for the SEAS (Scavengers of Eastern Australian Seas) project.

Description. Based on holotype female, 5.0 mm, AM P77905 and paratype female, 4.5 mm, AM P77908.

Head and body. *Body* without dorsal carina. *Head* lateral cephalic lobes rounded, with apically rounded margins. *Antenna 1* slightly shorter than antenna 2; flagellum with strong 2-field callynophore, robust setae absent from proximal articles; calceoli absent; accessory flagellum with 4 articles. *Antenna 2* less than 40% of body length; peduncular articles 3 to 5 not enlarged, without brush setae; calceoli absent. *Mouthparts* forming a subquadrate bundle. *Epistome* slightly produced beyond upper lip, broadly rounded. *Mandible* molar with asymmetrically reduced column, proximally setose, distally triturating; palp attached midway, article 3 with proximal A3-seta. *Maxilla 1* outer plate with setal-teeth in 6/5 arrangement; setal-tooth 7, left and right symmetrical, cuspidate along most of sinsusoidal inner margin; palp distal margin with apical robust setae. *Maxilliped* inner plates well developed, about half the length of outer plate; outer plate with 2 long, slender apical robust setae; palp 4–articulate, article 4 well developed.

Pereon. *Gnathopod 1* subchelate; coxa reduced, significantly shorter than coxa 2, tapering distally; basis sparsely setose along anterior margin; ischium long (length 3.1 x breadth); carpus long (length 3.1 x breadth), subequal in length to propodus, without posterior lobe; propodus longer than broad, margins subparallel, palm acute; dactylus inner face serrated. *Gnathopod 2* subchelate; carpus 2.3 x length of propodus; palm transverse; dactylus minute. *Pereopod 4* coxa with well developed posteroventral lobe. *Pereopod 5* coxa equilobate; basis about as long as broad, posterior margin slightly serrated, with well developed wedge-shaped posteroventral lobe. *Pereopod 7* basis posterior margin slightly serrated.

Pleon. *Epimeron 3* posterior margin smooth, posterodistal corner acute. *Urosomite 1* with anterodorsal notch and slightly rounded boss. *Uropod 1* rami subequal. *Uropod 2* rami subequal, inner ramus without marginal constriction. *Uropod 3* with 1 plumose seta on inner ramus; rami subequal; outer ramus 2-articulate, article 2 long (about 0.5 x article 1); inner ramus extending beyond article 1 of outer ramus. *Telson* distinctly longer than broad, deeply cleft, with dorsal robust setae, with 1 apical robust seta on each lobe.

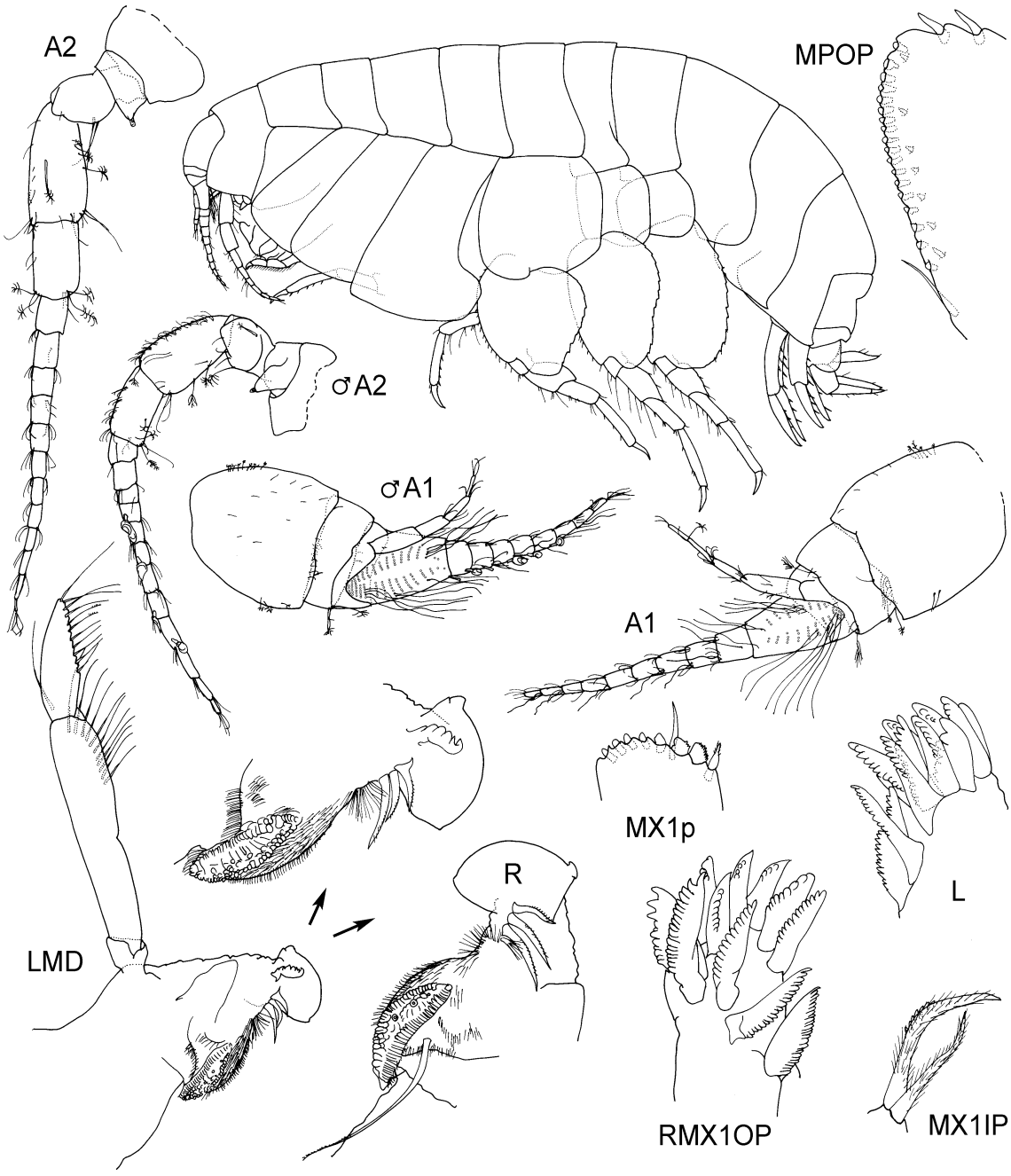

FIGURE 21. *Tryphosella seasana* **sp. nov.**, holotype female, 5.0 mm, AM P77905; habitus: paratype female, 4.5 mm, AM P77908; paratype male, 4.6 mm, AM P77906; east of Fitzroy Reef, Great Barrier Reef.

Male (sexually dimorphic characters). Based on paratype male, 4.6 mm, AM 77906. *Antenna 1* flagellum with stronger 2-field callynophore; calceoli present. *Antenna 2* about half body length; peduncular articles 4 and 5 with brush setae; calceoli present. *Urosomite 1* anterodorsal notch slightly deeper. *Uropod 3* with plumose setae on both rami.

Habitat. Scavenger on soft bottoms, 58 to 200 m depth.

Remarks. *Tryphosella seasana* and *T. flynnana* both live along the east coast of Australia in the same general habitat, but *T. flynnana* lives farther north and although they overlap in depth, *T. flynnana* is more common in shallower water. The main differences between these species are the shape of the gnathopod 1

coxa (short and tapering in *T. flynnana*, very short and almost subquadrate in *T. seasana*) and the shape of gnathopod 2 palm (slightly obtuse in *T. flynnana*, transverse in *T. seasana*). The very short, almost subquadrate coxa 1 separates *T. seasana* from all other GBR lysianassids.

Distribution. *Australia*. Queensland: east of Fitzroy Reef; east of Mooloolaba (current study).

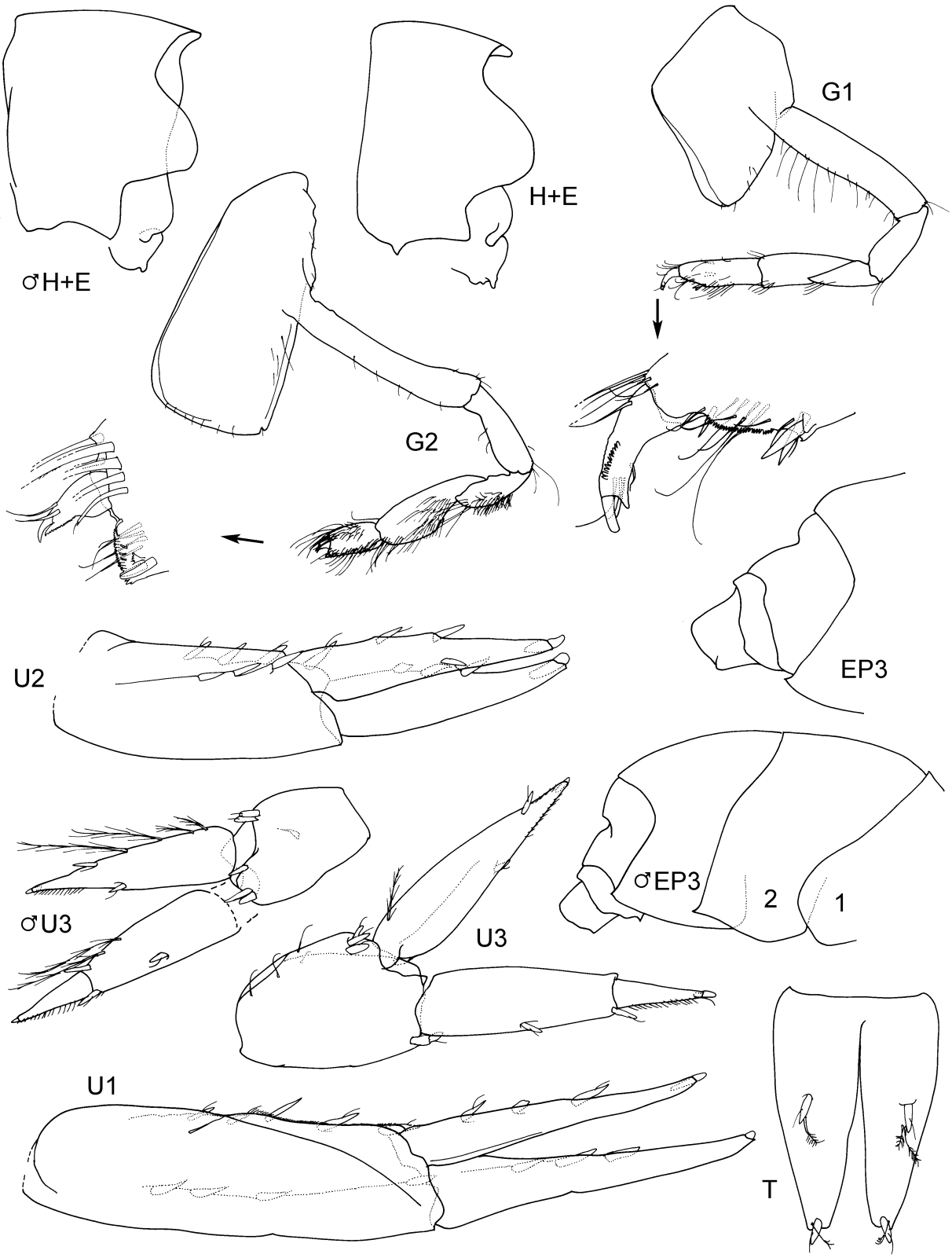

FIGURE 22. *Tryphosella seasana* **sp. nov.**, holotype, female, 5.0 mm, AM P77905; paratype male, 4.6 mm, AM P77906; east of Fitzroy Reef, Great Barrier Reef.

References

Barnard, J.L. (1958) Index to the families, genera, and species of the gammaridean Amphipoda (Crustacea). *Allan Hancock Foundation Publications, Occasional Paper*, 19, 1–145.

Barnard, J.L. (1965) Marine Amphipoda of atolls in Micronesia. *Proceedings of the United States National Museum*, 117, 459–551.

Barnard, J.L. (1969) The families and genera of marine gammaridean Amphipoda. *Bulletin of the United States National Museum*, 271, 1–535.

Barnard, J.L. & Karaman, G.S. (1991) The families and genera of marine gammaridean Amphipoda (except marine gammaroids). *Records of the Australian Museum, Supplement*, 13(1 & 2), 1–866.

Bonnier, J. (1893) Les amphipodes du Boulonnais (1). *Bulletin Scientifique de la France et de la Belgique*, 24, 161–207, pls 5–8.

Chevreux, E. (1906) Diagnoses d'amphipodes nouveaux provenant de l'expédition antarctique du *Français*. I. Lysianassidae. *Bulletin de la Société Zoologique de France*, 30, 159–165.

Dana, J.D. (1849) Synopsis of the genera of Gammaracea. *American Journal of Science and Arts, Series 2*, 8, 135–140.

Dallwitz, M. J. (2005) Overview of the DELTA System. http://delta–intkey.com/www/overview.htm. (8/9/2007).

Gable, M.F. & Lazo-Wasem, E.A. (1990) Lysianassidae (Amphipoda: Lysianassoidea) of Bermuda. *Journal of Crustacean Biology*, 10(4), 721–734.

Hurley, D.E. (1963) Amphipoda of the family Lysianassidae from the west coast of North and Central America. *Allan Hancock Foundation Publications, Occasional Paper*, 25, 1–160.

Keable, S.J. (1995) Structure of the marine invertebrate scavenging guild of a tropical reef ecosystem: field studies at Lizard Island, Queensland, Australia. *Journal of Natural History* 29(1), 27–45.

Ledoyer, M. (1984) Les gammariens (Crustacea, Amphipoda) des herbiers de phanérogames marines de Nouvelle Calédonie (région de Nouméa). *Mémoires du Muséum National d'Histoire Naturelle, Series A, Zoology*, 129, 1–113.

Ledoyer, M. (1986) Crustacés Amphipodes Gammariens. Familles des Haustoriidae à Vitjazianidae. *Faune de Madagascar*, 59(2), 599–1112.

Lowry, J.K. & Dempsey, K. (2006) The giant deep-sea scavenger *Bathynomus* (Crustacea: Isopoda: Cirolanidae) in the Indo-West Pacific. *Memoires du Museum National d'Histoire Naturelle*, 193, 163–192.

Lowry, J.K. & Myers, A.A. (2009) Foreword. *In*: Lowry, J.K. & Myers, A.A. (Eds), Benthic Amphipoda of the Great Barrier Reef, Australia. *Zootaxa*, 2260, 17–108.

Lowry, J. K. & Smith, S.D.A. (2003) *Invertebrate scavenging guilds along the continental shelf and slope of eastern Australia – general description*. Australian Museum, 59 pp.

Lowry, J.K. & Stoddart, H.E. (1994) Crustacea Amphipoda: Lysianassoids from the tropical western South Pacific Ocean. *in* A. Crosnier (ed.) Résultats des Campagnes MUSORSTOM, Volume 12. *Mémoires du Muséum National d'Histoire Naturelle*, Series A, Zoology, 161, 127–223.

Lowry, J.K. & Stoddart, H.E. (1995) The Amphipoda (Crustacea) of Madang Lagoon: Lysianassidae, Opisidae, Uristidae, Wandinidae and Stegocephalidae. *Records of the Australian Museum, Supplement*, 22, 97–174.

Lowry, J.K. & Stoddart, H.E. (1997) Amphipoda Crustacea IV. Families Aristiidae, Cyphocarididae, Endevouridae, Lysianassidae, Scopelocheiridae, Uristidae. *Memoirs of the Hourglass Cruises*, 10, 1–148.

Malfait, B. T. & Dinkelman, M.G. (1972) Circum-Caribbean Tectonic and Igneous Activity and the Evolution of the Caribbean Plate. *GSA Bulletin*, 83(2), 251–271.

Milne Edwards, A. (1879) Sur un isopode gigantesque des grandes profondeurs de la mer. *Comptes rendus hebdomadaires des Seances de I'Academie des Sciences*, 88, 21 –23.

Myers, A.A. (1991) How did Hawaii accumulate its biota? A test from the Amphipoda. *Research Letters in Evolution and Biogeography* 1, 24–29.

Ortiz, M. & Lalana, R. (1997) Amphipoda. *in* M. Gutu (ed.) *Results of the Zoological Expedition Organized by "Grigore Antipa" Museum in the Indonesian Archipelago (1991). 1. Peracarida (Crustacea). Travaux du Muséum National d'Histoire Naturelle "Grigore Antipa"*, 38, 29–113.

Pirlot, J.M. (1936) Les amphipodes de l'expédition du Siboga. Deuxiéme partie: Les amphipodes gammarides, II. - Les amphipodes de la mer profonde. 3: Addendum et partie générale. III. - Les amphipodes littoraux. 1: Lysianassidae, Ampeliscidae, Leucothoidae, Stenothoidae, Phliantidae, Colomastigidae, Ochlesidae, Liljeborgiidae, Oedicerotidae, Synopiidae, Eusiridae, Gammaridae. *Siboga-Expeditie, Monographie*, 33e, 237–328.

Schellenberg, A. (1931) Gammariden und Caprelliden des Magellangebietes, Sudgeorgiens und der Westantarktis. *Further Zoological Results of the Swedish Antarctic Expedition 1901-1903*, 2(6), 1–290, pl. 1.

Stebbing, T.R.R. (1888) Report on the Amphipoda collected by H.M.S. Challenger during the years 1873-1876. *Report on the Scientific Results of the Voyage of H.M.S. Challenger during the years 1873-76, Zoology* 29, 1–1737, pls 1–210.

Stebbing, T.R.R. (1906) Amphipoda. I. Gammaridea. *Das Tierreich*, 21, 1–806.

Stebbing, T.R.R. (1910) Scientific results of the trawling expedition of H.M.C.S. "Thetis". Crustacea. Part V. Amphipoda. *Australian Museum Memoir*, 4, 565–658, pls 47–60.
Stephensen, K. (1927) Papers from Dr. Th. Mortensen's Pacific Expedition 1914-16. XL. Crustacea from the Auckland and Campbell Islands. *Videnskabelige Meddelelser fra Dansk Naturhistorisk Forening i Kjöbenhavn*, 83, 289–390.
Stephensen, K. (1931) Amphipoda. *Mémoires du Musée Royal d'Histoire Naturelle de Belgique, (Hors Serie)*, 3(4), 1–14.
Stoddart, H.E. & Lowry, J.K. (2004) The deep-sea lysianassoid genus *Eurythenes* (Crustacea, Amphipoda, Eurytheneidae n. fam.). *Zoosystema*, 26(3), 425–468.