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New species of *Pygolabis* Wilson, 2003 (Isopoda, Tainisopidae, Crustacea) from Western Australia

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Abstract

Four new isopod species of the hypogean genus *Pygolabis* (family Tainisopidae) are described from the Pilbara and Gascoyne regions of Western Australia. The species appear to be restricted to small areas in the ground waters below single or neighbouring creek beds. These species are similar in overall morphology, and are primarily identified using features of the pleotelson, uropods and the shape of the appendix masculina on the male pleopod 2.

Key words: Tainisopidae, *Pygolabis*, Western Australia, hypogean, taxonomy, narrow range endemics

Introduction

The isopod family Tainisopidae was established with the description of an unusual hypogean species *Pygolabis humphreysi* Wilson, 2003. *Pygolabis* species have tong-like uropods (giving them a rather earwig-like appearance), unlike *Tainisopus* Wilson and Ponder, 1992, which has flattened uropods typical of other isopods. Here, we extend the knowledge on this family by describing four new species of *Pygolabis* from the Pilbara and Gascoyne regions in Western Australia.

All species of *Pygolabis* have distributions restricted to ground waters of one or several creek drainages in the Fortescue, Ashburton or Lyons River catchments (Fig. 1). In a few localities, specimens have been collected that were similar to the species described below, but differed in a few features—these are indicated in Figure 1 by "?". These species are difficult to separate, and fully adult males should be examined to confirm an identification.

Despite similar morphologies among the *Pygolabis* species, preliminary genetic sequences using the cytochrome oxidase subunit I gene (Cara Francis, personal

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communication) have shown that they are distinct genetically, with divergences between *P. humphreysi* and two geographically adjacent species (*P. paraburdoo* sp. nov. and *P. weeliwolli* sp. nov.) exceeding 16%. This level of genetic divergence between morphologically similar isopod species has also been observed in the Kakadu *Eophreatoicus* species complex (Phreatoicidea; G. Wilson & C. Humphrey, personal observation).

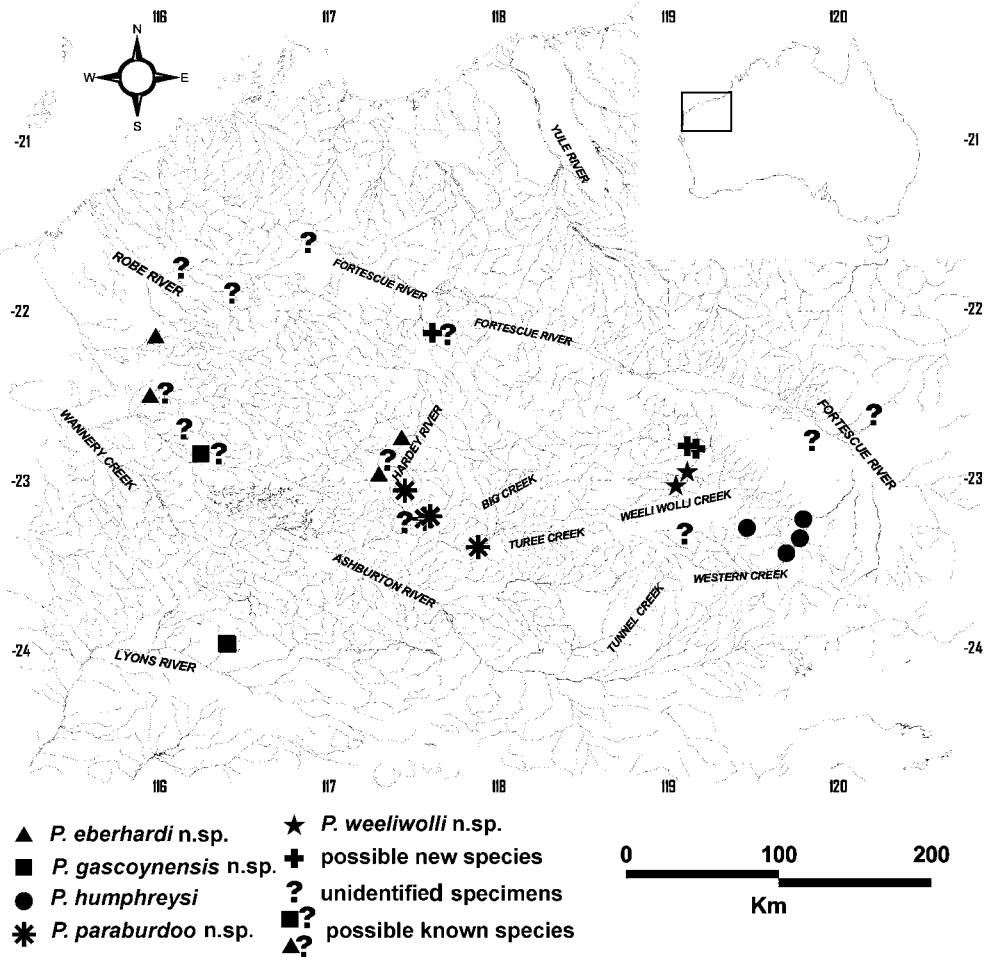

FIGURE 1. Distribution of *Pygolabis* species in the Pilbara and Gascoyne Regions of Western Australia (box in upper right inset shows approximate position within the continent).

Methods

Descriptions were generated using the taxonomic database system DELTA (Dallwitz 1980; Dallwitz *et al*. 2000), and diagnoses were constructed from the output of the DELTA program INTKEY. The descriptions use the terminology and style of Wilson (2003) and

Wilson & Ponder (1992), with the exception that, at the request of the associate editor, Roman numerals are not used for pereopods as in previous papers. Imaging methods are those of Wilson (2003). Where measurements or ratios are expressed as ranges of several specimens, the holotype value is either the larger value and indicated as simply "(holotype)"or as stated in the brackets. In the following species descriptions, *Pygolabis eberhardi* sp. nov. is described in full, but subsequent species descriptions contain only those characters that were found to differ from that species. The mouthparts of *P. humphreysi* and *P. eberhardi* sp. nov. were compared but because no significant differences were found, these were not described in the other species because the morphology was regarded as consistent in all species.

The type localities and localities, including those of specimens that could not be accurately identified, are shown in Figure 1 to indicate the known distribution of *Pygolabis*. To avoid overlapping points for a single species, only endpoints of their known range within a creek drainage are shown on the map.

Deposition of specimens is indicated follows: **WAM**, Western Australian Museum, Perth; **AM**, Australian Museum, Sydney.

Figures use descriptive abbreviations, as follows: **A1,** antennula; **A2,** antenna; **HD,** cephalon or head; **MXP,** maxilliped; **P1–P7,** pereopod 1–pereopod 7; **PN1–PN7**, pereonite 1–pereonite 7; **PE,** penes; **PLN,** pleotelson or pleon; **PLN1, –**pleonite 1; **PLP1–PLP5**, pleopod 1–pleopod 5; **APM,** appendix masculina, distal part of endopod of male pleopod 2; **UR,** uropod; **EN,** endopod; **EX,** exopod; **V,** ventral view; **D,** dorsal view; **L,** lateral view.

Systematics

Family Tainisopidae Wilson, 2003

Pygolabis Wilson, 2003

Pygolabis Wilson, 2003: 7.

Type species. *Pygolabis humphreysi* Wilson, 2003; by original designation.

Remarks. The species described below conform to the original diagnosis and description of the genus (Wilson, 2003), so we do not revise the family or the generic diagnoses. Wilson (2003) indicated that the group is clearly a member of the higher isopods, informally referred to as "Flabellifera *sensu lato*," the classification of which was substantially reorganised by Brandt & Poore (2003). Although Brandt & Poore (2003) introduced a subordinal name for the Tainisopidae, their analysis had no well–defined basal structure for the higher isopods, and did not establish a sister group relationship

between the Tainisopidae and any other clade. The overall classification introduced by Brandt & Poore (2003) disagrees with other recent phylogenetic studies and classifications (e.g., Tabacaru & Danielopol 1999; Martin & Davis 2001; Dreyer & Wägele 2002). Recent genetic analyses (C. Francis, personal communication), although only using similarity procedure, found a species of *Pygolabis* and an idoteid isopod to have similar sequences. The relationships of the higher isopods apparently require further research, so the subordinal status of the Tainisopidae within the isopods should be left open until a better corroborated analysis of the higher isopods is available.

The sexually dimorphic pleopod 1 endopod is an additional character of generic importance. In males of *Pygolabis*, this limb is twisted, usually around the elongated penes that extend through it, and has several long denticulate setae on the distal margin (PLP1 in Figs. 7, 9, 11, 13). In females, pleopod 1 is flattened with a few short plumose setae on the distal margin.

The Tainisopidae show two distinctly different morphologies for the pleotelson and the position of the anus (Wilson & Ponder 1992: fig. 3A; Wilson 2003: fig. 6F). Because the section of the pleotelson anterior to the insertion of the uropods is elongate in *Pygolabis*, the anus is separated from the pleopodal region by a small ridge and faces posteroventrally. In *Tainisopus* species, where the anterior part of the pleotelson is short relative to the posterior part, the anus is covered by the pleopods, faces ventrally and is not marked by an anterior ridge.

Key to the species of Tainisopidae

This key is provisional because additional species have been discovered that belong to this genus (locations shown in Fig. 1; C. Francis personal communication). The two species of *Tainisopus* Wilson & Ponder, 1992 are included to allow identification for all described members of this family. *Pygolabis* species are conservative in their overall morphology, as indicated by Figures 2–13. Species identification must, therefore, involve fine details, particularly on the pleotelson, uropods and the appendix masculina of the male pleopod 2. Other characters, such as counts of setae on various limbs or relative lengths of limbs, may be useful when detailed morphometric patterns from specimens comprising a large series of each species are known. The variable pleotelson in *P. humphreysi* presents difficulties in an identification key; we have attempted, therefore, to choose additional features that, although microscopic, will facilitate reliable identification of adults of the various species. Figure 2 explains some of the morphological characters used in this key.

1. Pleotelson anterolateral margins (anterior to uropods) short, uropods inserting anteriorly, posterolateral margin (posterior to uropods) broadly rounded; uropodal rami both distally rounded, endopod straight-sided (not curved) ..... 5 (*Tainisopus*)
– Pleotelson anterolateral margins enlarged, uropods inserting near midpoint of lateral margins, posterolateral margins sinuate, apex projecting; uropodal exopod flattened

and distally rounded, endopod curving medially and distally pointed, forming robust claw ..... 2 (*Pygolabis*)

2. Pleotelson apex posterior margin indentation present; uropod protopod with fewer than 15 (approximately 9–12) small tooth–like setae along medial margin, endopod length never exceeding 1.5 exopod length 3
– Pleotelson apex posterior margin indentation absent; uropod protopod with more than 15 (approximately 18–20) small tooth-like setae along medial margin, endopod length typically exceeding 1.5 exopod length (*P. humphreysi* with exceptions)..... 4
3. Pleotelson lateral inflection points of posterior margin closer to uropod insertions than to apex; pereonites 5–7 length medially decreasing posteriorly; male pleopod 2 appendix masculina with broad (width greater than proximal groove width) distal cup ..... ***Pygolabis gascoyne* sp. nov.**
– Pleotelson lateral inflection points of posterior margin midway between uropod insertions and apex; pereonites 5–7 length medially subequal; male pleopod 2 appendix masculina with narrow (width subequal to proximal groove width) distal cup, teeth on lateral margin separated by at least tooth width for more than half of lateral margin length, proximal teeth distinctly longer than lateral teeth in middle of ridge ..... ***Pygolabis weeliwolli* sp. nov.**
– Pleotelson lateral inflection points of posterior margin closer to apex than to uropod insertions; pereonites 5–7 length medially subequal; male pleopod 2 appendix masculina with broad (width greater than proximal groove width) distal cup, teeth on lateral margin separated by at least tooth width or separated by less than tooth width for more than half of lateral margin length ..... ***Pygolabis paraburdoo* sp. nov.**
4. Pleotelson distance between uropod insertions and apex more than half length of pleotelson; pleopod 2 male appendix masculina lateral margin projecting and somewhat quadrate, teeth distinctly projecting from lateral margin, proximal teeth distinctly longer than lateral teeth ..... ***Pygolabis eberhardi* sp. nov.**
– Pleotelson distance between uropod insertions and apex subequal to half length of pleotelson; pleopod 2 male appendix masculina lateral margin forming smoothly rounded arc, teeth barely projecting from lateral margin, proximal teeth subequal to lateral teeth ..... ***Pygolabis humphreysi***
5. Pleotelson apex in dorsal view broadly rounded; pereopod 1 merus with robust bidenticulate sensillate setae; pleopod 2 female endopod setae absent ..... ***Tainisopus fontinalis***
– Pleotelson apex in dorsal view obtusely pointed; pereopod 1 merus lacking robust bidenticulate sensillate setae; pleopod 2 female endopod setae present ..... ***Tainisopus napierensis***

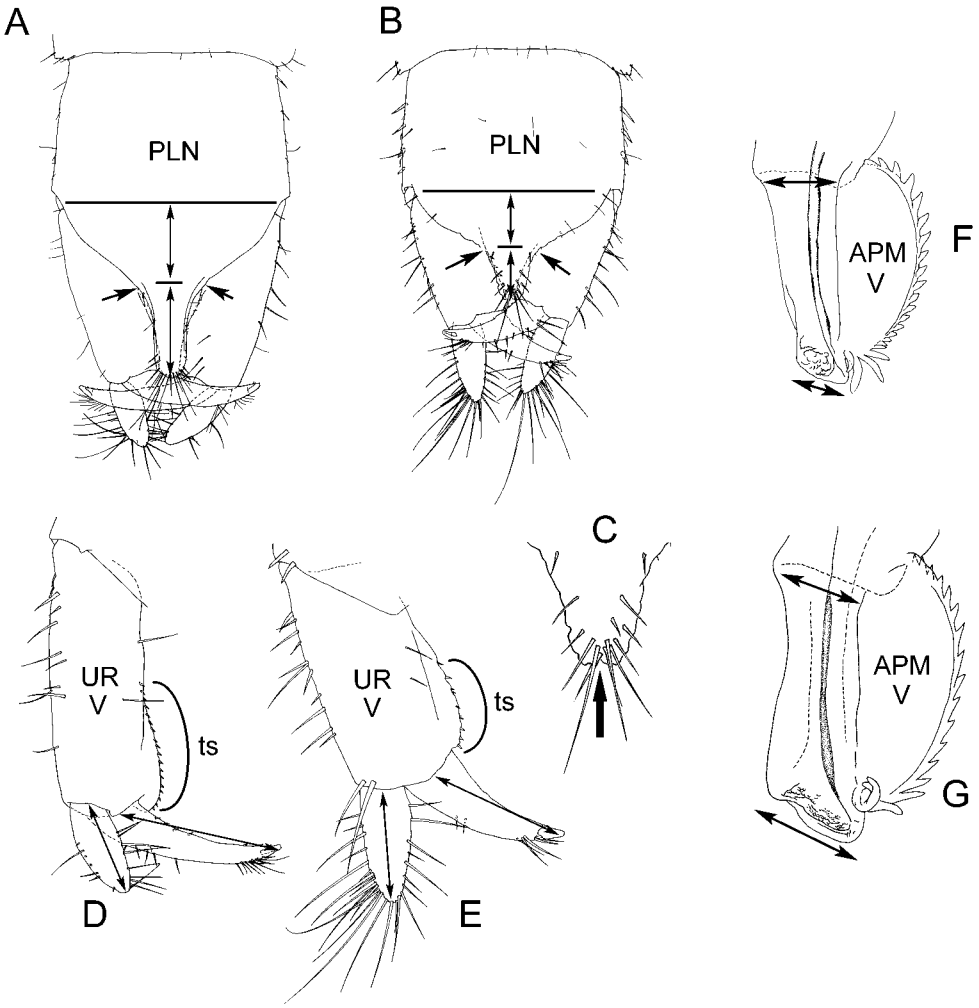

FIGURE 2. Selected morphological features used in the key and in the descriptions. A–B, pleotelson lateral inflection points of posterior margin indicated by single arrows: A, closer to uropod insertions that to apex; B, midway between uropod insertions and apex. C, distal tip of the pleotelson showing indentation. D–E, uropods showing comparative lengths of exopod and endopod, and position of small tooth-like setae (curved line marked with "ts"): D, endopod length exceeding 1.5 exopod length, with more than 15 small tooth-like setae; E, endopod length less than 1.5 exopod length, with less than 15 small tooth-like setae. F–G, male pleopod 2 appendix masculina distal cup size (see also Fig. 4): F, distal cup narrow, width subequal or narrower than proximal groove width; G, distal cup broad, width greater than proximal groove width. Images (not to same scale) from *Pygolabis eberhardi* sp. nov. (A, D), *P. weeliwolli* sp. nov. (B, C, E, F) and *P. gascoyne* sp. nov. (G)

Pygolabis humphreysi Wilson (Figs 3, 4A–B)

Pygolabis humphreysi Wilson, 2003: 245, figs 1–7.

Material examined. Western Australia: Pilbara Region: Newman Borefield: male, bore W157, 23°13.0'S 119°54.0'E, fld. no. BES 3534, 11 xi 1998 (S. Eberhard) (WAM C34940); male (illustrated), body length 8.9 mm, bore W78, 23°19.75'S 119°51.25'E, fld. no. BES 4833 haul net, 23 vii 1997 (W.F. Humphreys, S.M. Eberhard) (WAM C34941); male, bore W23-4 south west of ore body 23 Fortescue River catchment, 23°19.03'S 119°51.02'E, fld. no. PSS002, 10 iv 2003 (J.S. Cocking, S.A. Halse) (AM P70401); 2 females, male, body length 8.8mm, bore W260 at Production Bore K31 Fortescue River catchment, 23°17.51'S 119°52.2'E, fld. no. PSS003, 13 x 2004 (H.J. Barron, J.S. Cocking) (AM P70402); 2 males, 1 female, bore W28 Great Northern Highway near Newman Airport, 23°24.20'S 119°47.76'E, depth to water 5 m, depth to bottom 8 m, fld. no. PSS005, 10 iv 2003 (J.S. Cocking, A.E. MacIntosh) (AM P70403, slide STY 002).

Diagnosis. *Pleotelson.* Distance between uropod insertions and apex subequal to half length of pleotelson, lateral inflection points of posterior margin midway between uropod insertions and apex (or closer to apex than to uropod insertions); apex posterior margin indentation absent. *Pleopod 2 male endopod appendix masculina*. Teeth on lateral margin barely projecting from lateral margin, separated by less than tooth width for more than half of lateral margin length, proximal teeth subequal to lateral teeth in middle of ridge, lateral margin forming smoothly rounded arc; distal tip with broad (width greater than proximal groove width) cup, medial distal margin rounded. *Uropods*. Protopod extending beyond pleotelson apex.

Remarks. Wilson (2003) mentioned that this species showed variation in the form of the pleotelson apical projection, with the projection length apparently correlated with body length–larger specimens had larger projections. In Figure 3, we show a specimen with the short pleotelson projection. We have observed no consistent features that would suggest that this species might contain two distinct taxa.

Distribution. Newman Borefield and surroundings, 23°17–24'S 119°48–53'E, Pilbara Region, Western Australia.

Pygolabis eberhardi sp. nov. (Figs 4C–F, 5–7)

Etymology. This species is named in honour of Dr Stefan Eberhard (Department of Conservation and Land Management), who has actively explored subterranean aquatic habitats in many places around Australia. The last syllable of the species name is similar to the name of the type locality, Hardey River.

Type material. Western Australia: Pilbara Region: Holotype male "specimen 7", body length 13.3 mm, Hardey River Borefield: 22°55.59'S 117°23.06'E, fld. no. PSS173

26 vii 2003 (M.D. Scanlon, J.S. Cocking) (WAM C34942). Paratypes: 31 specimens, same data as holotype (AM P70404); 6 males (2 WAM C34943, 4 AM P70405), 3 females (2 WAM C34944, 1 AM P70406), same data as holotype; 118 specimens, same data as holotype except 21 xi 2003 (M.D. Scanlon, J.S. Cocking, H.J. Barron) (AM P70407); male "specimen 1", manca "specimen 3", 22°43'S 117°31'E, fld. no. BES 4850, 1993 (W.F. Humphreys, S.M. Eberhard) (WAM C34945); male "specimen 2", body length 11.4 mm, mouthparts, pereopods and pleopods dissected for examination and illustration or SEM, same data as WAM C34945 (AM P70408); male, body length 11.1 mm, 22°43'S 117°31'E, fld no. BES 4858 1993 (W.F. Humphreys, S.M. Eberhard) (WAM C34946); male, body length 12.4 mm, 22°55.59'S 117°23.01'E, depth to water 3 m, depth to bottom 17 m, fld. no. PSS174 26 vii 2003 (M.D. Scanlon, J.S. Cocking) (AM P70409, slide STY001); 1 male, 1 female (WAM C34947), 2 males (AM P70410), bore NWSLK220B Ashburton River catchment, 22°55.59'S 117°23.06'E, fld. no. PSS174, 21 xi 2003.

Other material. 4 males, 5 females, bore NWSLK58 House Creek, Ashburton River catchment, 22°27.88'S 116°02.18'E, fld. no. PSS172, 21 v 2004 (M.D. Scanlon, J.S. Cocking) (AM P70411); male, female, bore RED002 Red Hill Well Ashburton River catchment, 22°07.19'S 116°03.89'E, fld. no. PSS358, 11 viii 2004 (M.D. Scanlon, H.J. Barron) (AM P70412).

Diagnosis. *Pleotelson.* Distance between uropod insertions and apex more than half length of pleotelson; lateral inflection points of posterior margin closer to uropod insertions than to apex; distance from lateral inflection points of posterior margin to apex greater than from uropod insertions to inflection points; apex rounded, posterior margin indentation absent. *Pleopod 2 male endopod appendix masculina.* Teeth on lateral margin separated by less than tooth width for more than half of lateral margin length, proximal teeth distinctly longer than lateral teeth in middle of ridge; lateral margin distinctly and broadly projecting — somewhat quadrate with conspicuous rounded proximal angle; distal tip with broad cup; medial distal margin rounded. *Uropods.* Protopod extending subequal to pleotelson apex.

Description. *Body.* Medial length 6.08–7.45 width at pereonite 3 (holotype).

Head. Length 0.6–0.78 width (holotype 0.60), 1.03–1.3 pereonite 1 medial length (holotype 1.03); dorsal surface covered with scattered fine setae; antennal notch present; clypeus rounded, proximal width 0.59 head width, extending between antennal insertions, mandibular articular fossa narrower than clypeal height; labrum distally rounded, without setae, symmetrical.

Pereonites. Total medial length 0.5–0.58 body length (holotype 0.50); medially 2–6 subequal and longest, 7 slightly shorter; dorsal surfaces with scattered fine setae, with 1–2 thin transverse cuticular ridges.

Pleonites. Articulation flexible (able to move in vertical and transverse axis); with scattered sparse fine setae; total medial length 0.25–0.28 body length (holotype); 1–4 lengths subequal and shorter than pereonite 7, pleonite 5 length subequal to pereonite 7; respective medial lengths: body length — 0.05, 0.05, 0.05, 0.05, 0.06–0.07 (holotype).

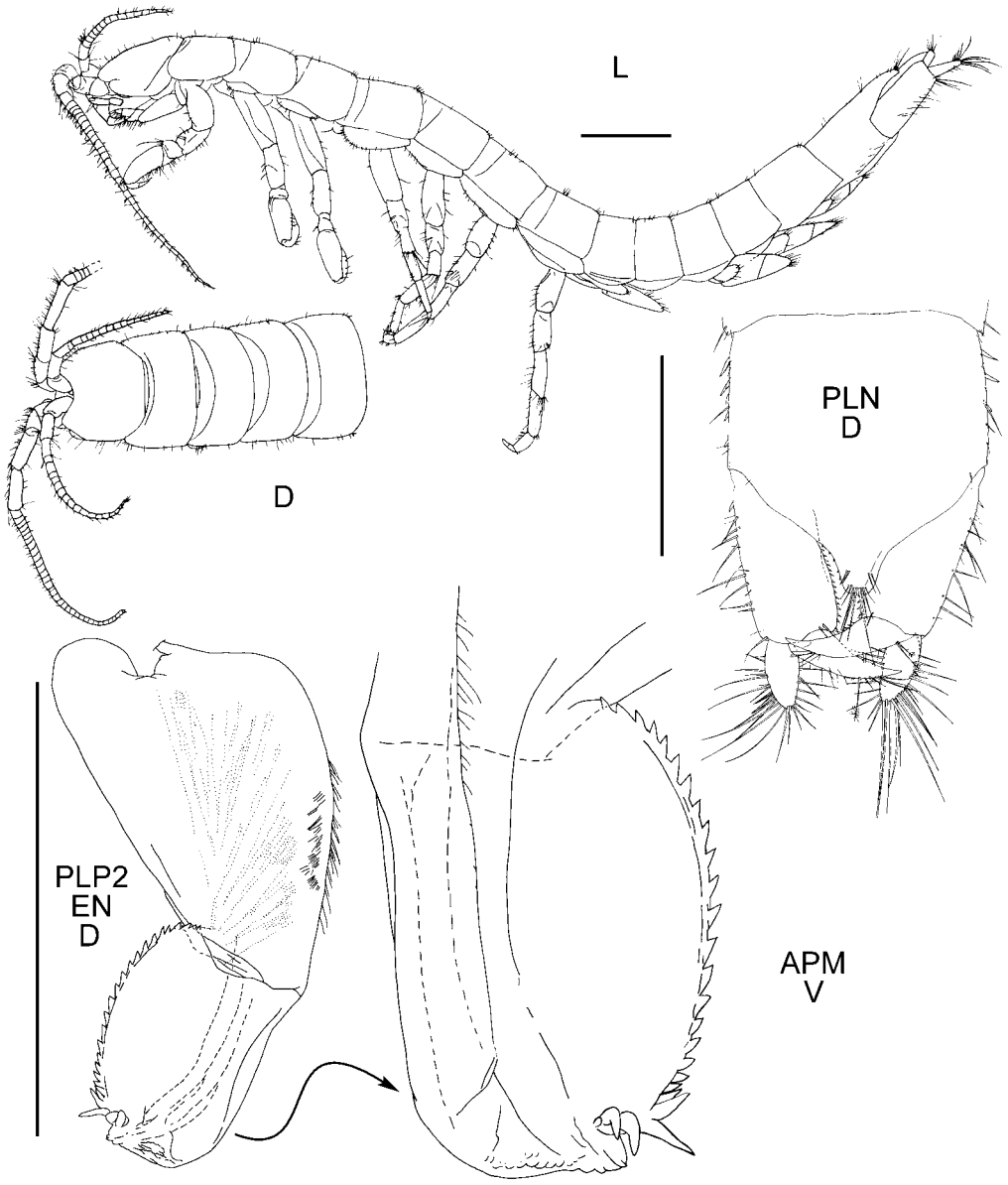

FIGURE 3. *Pygolabis humphreysi* Wilson, 2003. Male (WAM C34941). Scale bar 1 mm. Pleopod 2 endopod scale bar 0.5mm.

Pleotelson. Medial length 1.36–1.37 width (holotype), 0.45–0.58 pleon length (holotype); distance between uropod insertions and apex 0.56 total medial length of pleotelson; lateral inflection points of posterior margin occurring at 0.44 of distance between the uropod insertions and apex; distance from lateral inflection points of posterior margin to apex 1.3 distance from uropod insertions to lateral inflection points of posterior

margin; dorsal surface with scattered simple setae; robust sensillate setae absent, posterolateral margins with 14–20 small non-sensillate simple setae.

Penes. Cross section oval, with elongate thin-walled and tapering extension.

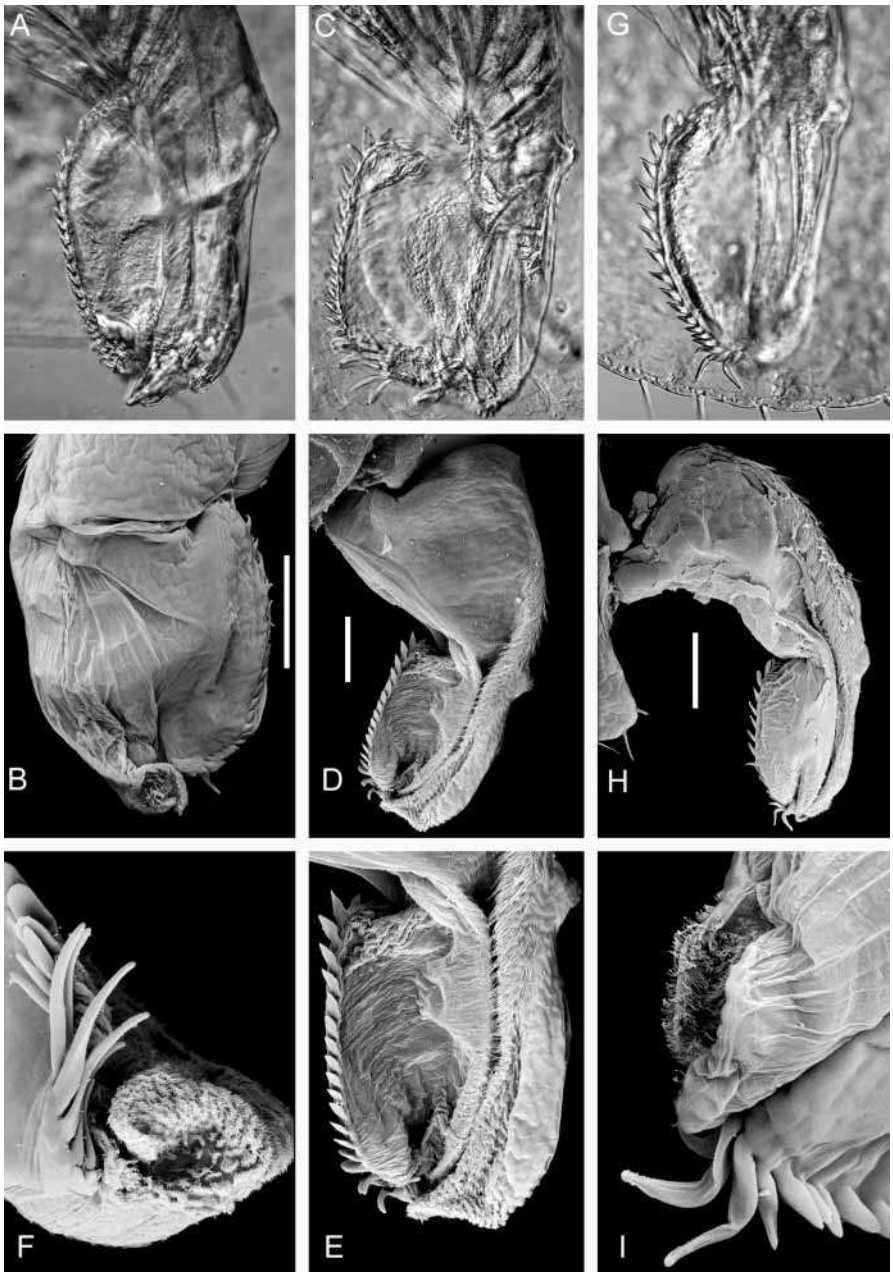

FIGURE 4. Comparison of the appendix masculina (male pleopod 2 endopod, right side) of three species of *Pygolabis*: *P. humphreysi* (AM P64993) A–B; *P. eberhardi* sp. nov. (AM P70408) C–F; *P. weeliwolli* sp. nov. (AM P70413) G–I. Light micrographs of parts (A,C,G) prior to SEM imaging (B, D–F,H–I). All are in ventral view, except B and I–dorsal view, and F–posterodistal view. Scale bar 100 microns.

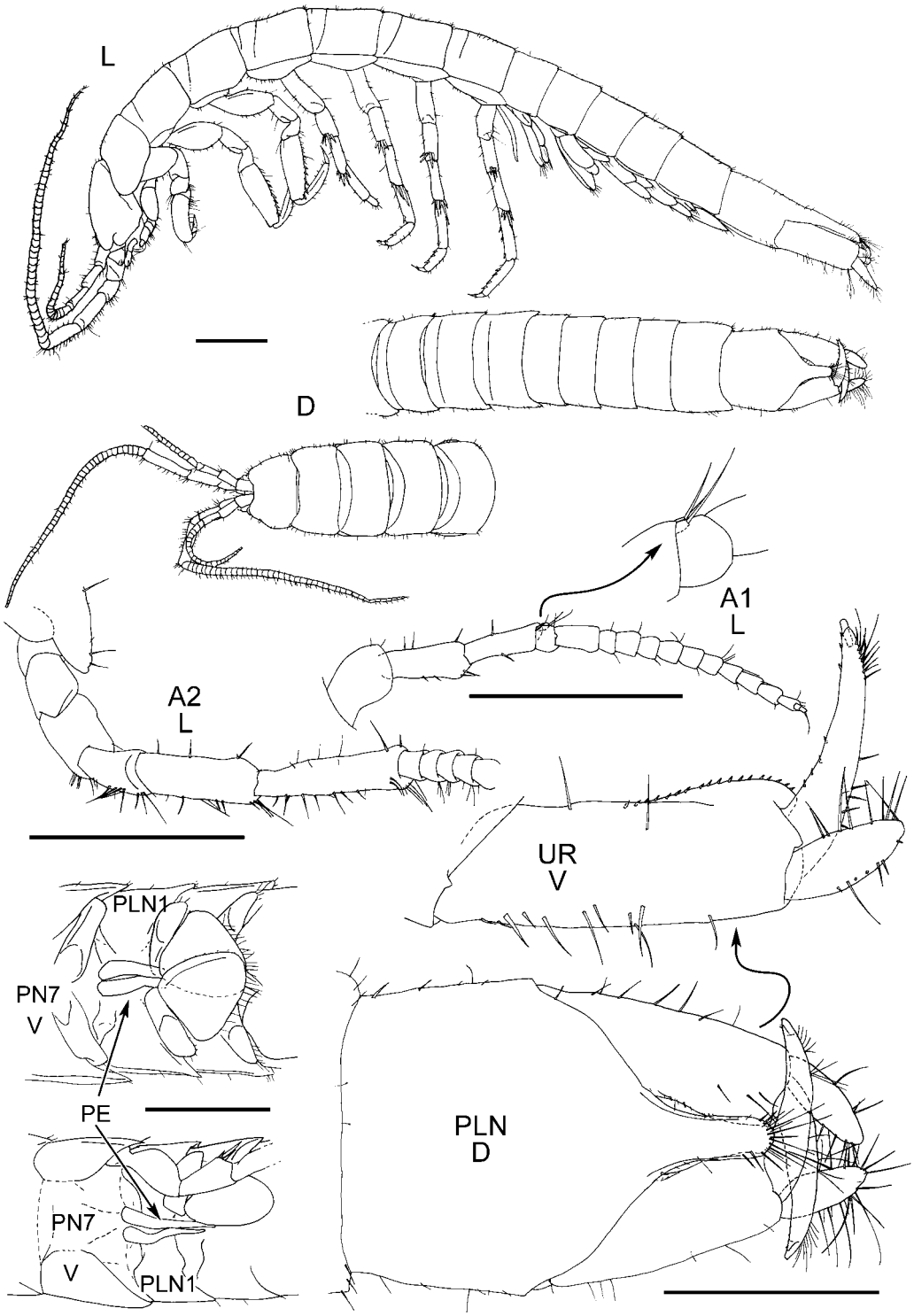

FIGURE 5. *P. eberhardi* sp. nov. Holotype male (WAM C34942), except sternites PN7–PLN1 male (AM P70408), with and without pleopod 1. Scale bar 1 mm.

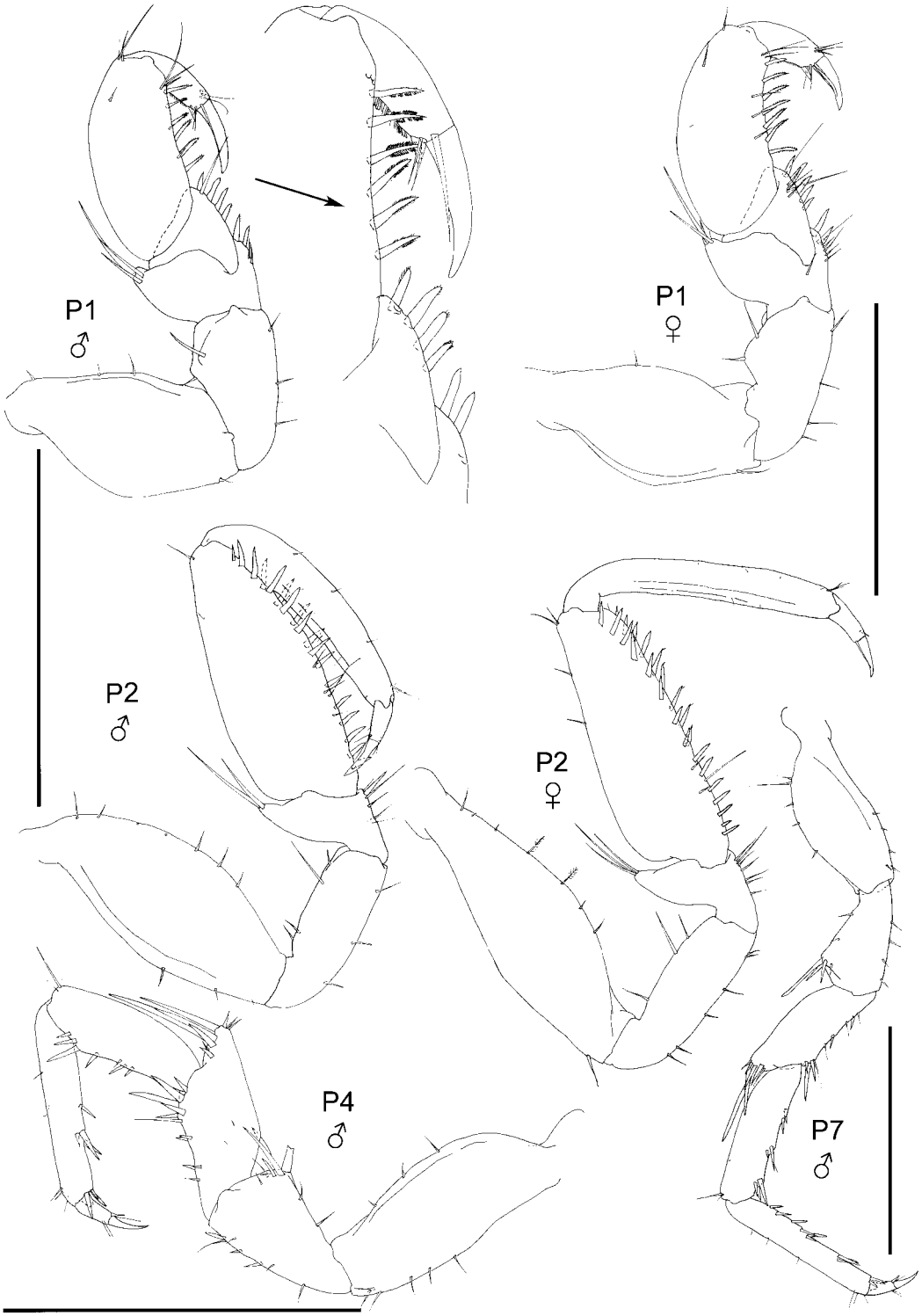

FIGURE 6. *P. eberhardi* sp. nov. pereopods. Male (AM P70408); female (WAM C34944). Scale bar 1 mm.

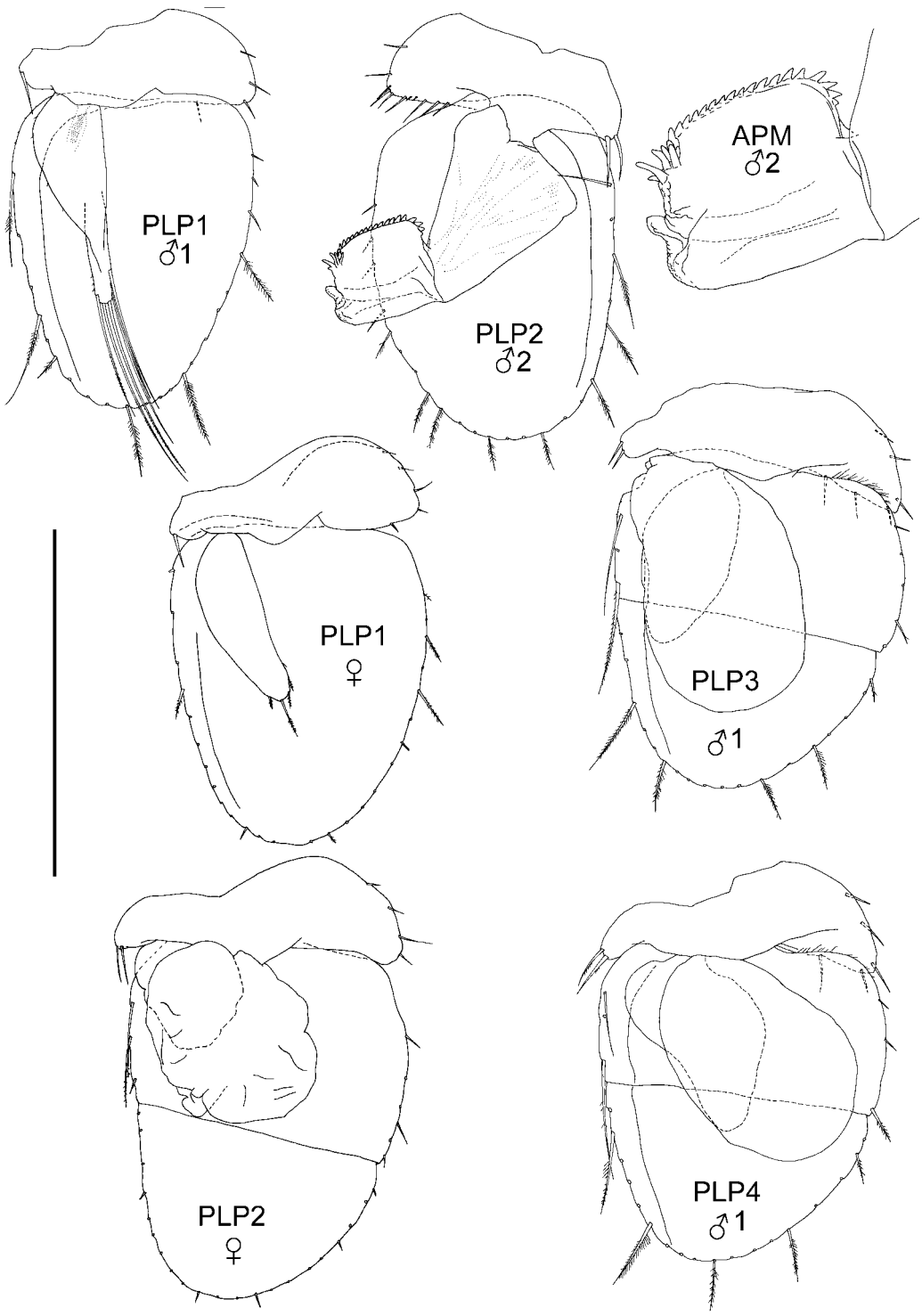

FIGURE 7. *P. eberhardi* sp. nov. Pleopods in dorsal view. Male 1 (AM P70408); male 2 (WAM C34942); female (WAM C34944). Scale bar 1 mm.

Antennula. Length 0.18–0.22 body length (holotype 0.18); with 17–20 articles (holotype 17); article 1 with few simple setae; articles 1–3 subequal; article 3 without penicillate setae; secondary flagellum rudimentary (minute setose article on article 3 anteromedial distal margin), with several simple setae, penicillate setae absent.

Antenna. 0.48–0.54 body length (holotype 0.48); with 40–42 articles (holotype). Protopod articles 1–3 increasing in length distally, with few simple setae; proximal article 4 subequal to protopod article 3, proximal articles 5–6 longer, increasing in length distally. Flagellum length 0.68 antenna total length.

Mandible. Articular axis approximately at right angles to gnathal edge; left lacinia mobilis large, flattened and toothed, distinctly separated from spine row; right lacinia mobilis indistinctly separated from remainder of spine row; right lacinia mobilis bifurcate with two dentate plates (smaller plate on anterior surface of larger plate); spine row on ridge between incisor and molar, with remaining spines other than lacinia mobilis not bifurcate. Palp length 0.96 mandible length; article 1 with 1 distal simple setae; article 2 with 2 longitudinal rows of setae (1 row setulate and 1 row simple); article 3 weakly curved, with 8–12 setae, setae finely setulate, coarsely spinulate setae absent.

Maxillula. Medial lobe with 4 pappose setae. Lateral lobe with 11 distal robust setae, including 6 denticulate; ventral face setae absent.

Maxilla. Outer lateral lobe with 6 comb setae. Medial lobe medial margin slightly concave distally; extent of setae confined to distal half of medial margin past insertion of lateral lobes.

Maxilliped. Epipod length 1.07 width; distal margin narrowly rounded. Palp basal width 0.21 length. Endite with 5 coupling hooks on right side (3 large, 2 small).

Pereopods. Coxae 2–3 lateral sutures well indented; coxae 4–7 medial shape triangular, with broad medial extension toward midline. Pereopods 1–7 respective lengths: body length — 0.19, 0.27, 0.25, 0.22, 0.23, 0.23, 0.24. Pereopod 1 with robust toothed sensillate setae on ventral margins of propodus and carpus, robust smooth sensillate setae on ventral margins of carpus (P2–3) and merus (P1–3), 4–7 with few sensillate setae. Pereopod 1 propodus and carpus with robust bidenticulate sensillate setae, respectively 6, 4. Pereopods 2–3 carpus with 18–23 (male 18, female 23), 13 robust sensillate setae respectively, robust sensillate setae smooth, lateral row with 7–15 robust setae (7 in male, 15 in female).

Pleopods. When lying flat on ventral surface of pleon, weakly enclosed laterally by respective pleonite pleurae; 2–4 overlapped by preceding pleopod by about half length. Protopods lateral margin bearing elongate sensillate setae; medial margin curved serrate robust setae present. Exopods with fewer than 26 marginal plumose setae. Pleopod 1 endopod sexually dimorphic (twisted and with several long denticulate apical setae in males, thin and flattened with several short plumose apical setae in females); length in female 0.53 exopod length; with only 2–3 small distal plumose setae (female), or with several long minutely denticulate setae (male). Pleopod 2 male endopod appendix

masculina length 0.82 distance from base of appendix masculina to distal margin of exopod, lateral margin with 22–25 teeth (paratype with 22 in light microscope picture and 24 in SEM, 25 in line drawing of holotype), including 6–8 distal elongate spine-like teeth (most distal spines smaller than others, holotype 8); distal segment length 1.12–1.53 width (1.12 line drawing holotype, 1.27 light microscope, 1.53 SEM); distal tip cup without teeth on distal lateral margin. Pleopod 2 female endopod setae absent. Pleopods 3–5 endopod setae absent.

Uropods. Length 0.12–0.18 body length (holotype 0.12), 0.46–0.7 pleon length (holotype 0.46). Protopod length between insertion and distal margin 1–1.04 length between insertion and pleotelson apex (holotype); with 18 small tooth-like setae along medial margin; ventrolateral margin long thin laterally projecting setae present (abundant). Endopod length 0.65–0.72 protopod length (holotype 0.65), 1.53–1.67 exopod length (holotype); medial margin without penicillate setae, with 7 small tooth-like setae (mostly placed proximally). Exopod length 0.39–0.47 protopod length (holotype 0.39).

Remarks. The elongate pleotelson (extending subequal to the distal margin of the uropod protopod) with rounded apex that lacks an indentation, combined with the appendix masculina (which has a broadly projecting quadrate lateral margin, with closely spaced teeth that are longer in the proximal portion of the margin relative to those in the middle of the margin) are characters that diagnose this species. Two samples, (AM P70411 and AM P70412), were collected at a relatively large distance from the type locality (150–163 km). Despite matching the description of this species closely, particularly in the diagnostic features of the distinctive appendix masculina, they are excluded from the type series to allow a precise designation of the type locality.

Distribution. Hardey Borefield 22°43.00–55.59'S 117°23.06–31.00'E and two localities to the north west, 22°07.19–27.88'S 116°02.18–03.89'E, Pilbara Region, Western Australia.

Pygolabis weeliwolli sp. nov. (Figs 8–9)

Etymology. The name of this species is drawn from its type locality, and is treated as a masculine noun in apposition.

Type material. Western Australia: Pilbara region, Weeli Wolli area: Holotype male "specimen 5", body length 9.28 mm, Bore BH32s, 22°55'S 119°11'E, fld. no. BES 5489, 16 xi 1998 (S.M. Eberhard) (WAM C34948 [specimen 5]). Paratypes: 3 males, female, same data as holotype (WAM C34949); 2 males, female, same data as holotype except fld. no. BES 6446, 16 xi 1998 (S. Eberhard) (WAM C34950); male, body length 8.3 mm, pereopods pleopods dissected for examination and illustration or SEM, spring, 22°55'S 119°11'E, fld. no. BES 3589 Bou–Roche pump, 16 xi 1998 (S.M. Eberhard) (AM P70413); 4 males, bore BH17S, 22°55.12'S 119°12.03'E, depth to water 3 m depth to

bottom 11 m, fld. no. PSS007, 5 x 2002 (M.D. Scanlon, J.S. Cocking) (AM P70414, slide STY003).

Other material. 4 males, 3 females, bore WB3, Road to Area C, Fortescue River catchment, 23°0.15'S 119°07.93'E, fld. no. PSS152, 17 xi 2003 (M.D. Scanlon, J.S. Cocking) (AM P70415).

Diagnosis. *Pleotelson.* Distance between uropod insertions and apex less than half length of pleotelson; lateral inflection points of posterior margin midway between uropod insertions and apex; distance from lateral inflection points of posterior margin to apex less than from uropod insertions to inflection points; apex truncate, posterior margin indentation present. *Pleopod 2 male endopod appendix masculina.* Teeth on lateral margin separated by at least tooth width for more than half of lateral margin length, proximal teeth distinctly longer than lateral teeth in middle of ridge; lateral margin not distinctly projecting — forming smoothly rounded arc; distal tip with narrow cup; medial distal margin angular. *Uropods.* Protopod extending beyond pleotelson apex.

Description. *Head*. Length 0.71–0.8 width (holotype 0.71), 1.14–1.29 pereonite 1 medial length (holotype); clypeus proximal width 0.5 head width.

Pereonites. Total medial length 0.46–0.5 body length (holotype); medially 2–7 subequal.

Pleonites. 1–4 lengths subequal and shorter than pereonites 1–7, pleonite 5 length subequal to pereonites 1–7; respective medial lengths: body length — 0.05, 0.05, 0.05, 0.05, 0.08.

Pleotelson. Medial length 1.11–1.14 width (holotype), 0.49–0.56 pleon length (holotype); distance between uropod insertions and apex 0.43 total medial length of pleotelson; lateral inflection points of posterior margin occurring at 0.55 of distance between the uropod insertions and apex; distance from lateral inflection points of posterior margin to apex 0.81 distance from uropod insertions to lateral inflection points of posterior margin; posterolateral margins with 14 small non-sensillate simple setae (approximately).

Antennula. Length 0.25–0.28 body length (holotype 0.25); with 20–23 articles (holotype 20); articles 1–3 subequal.

Antenna. 0.47–0.54 body length (holotype 0.50); with 32–41 articles (holotype). Flagellum length 0.66 antenna total length.

Pereopods. Pereopods 1–7 respective lengths: body length — 0.17, 0.27, 0.25, 0.21, 0.22, 0.23, 0.23. Pereopod 1 propodus, carpus and merus with robust bidenticulate sensillate setae, respectively 7, 1, 1. Pereopods 2–3 carpus with 17, 15 robust sensillate setae respectively, lateral row with 11 robust setae.

Pleopods. Pleopod 2 male endopod appendix masculina length 0.91 distance from base of appendix masculina to distal margin of exopod; lateral margin with 17–23 teeth (17 in SEM, 19 in photograph from light microscope, 23 in holotype line drawing), including 2–4 distal elongate spine-like teeth (holotype 4); distal segment length 1.35–1.79 width (holotype line drawing 1.35, 1.58 light microscope, 1.79 SEM).

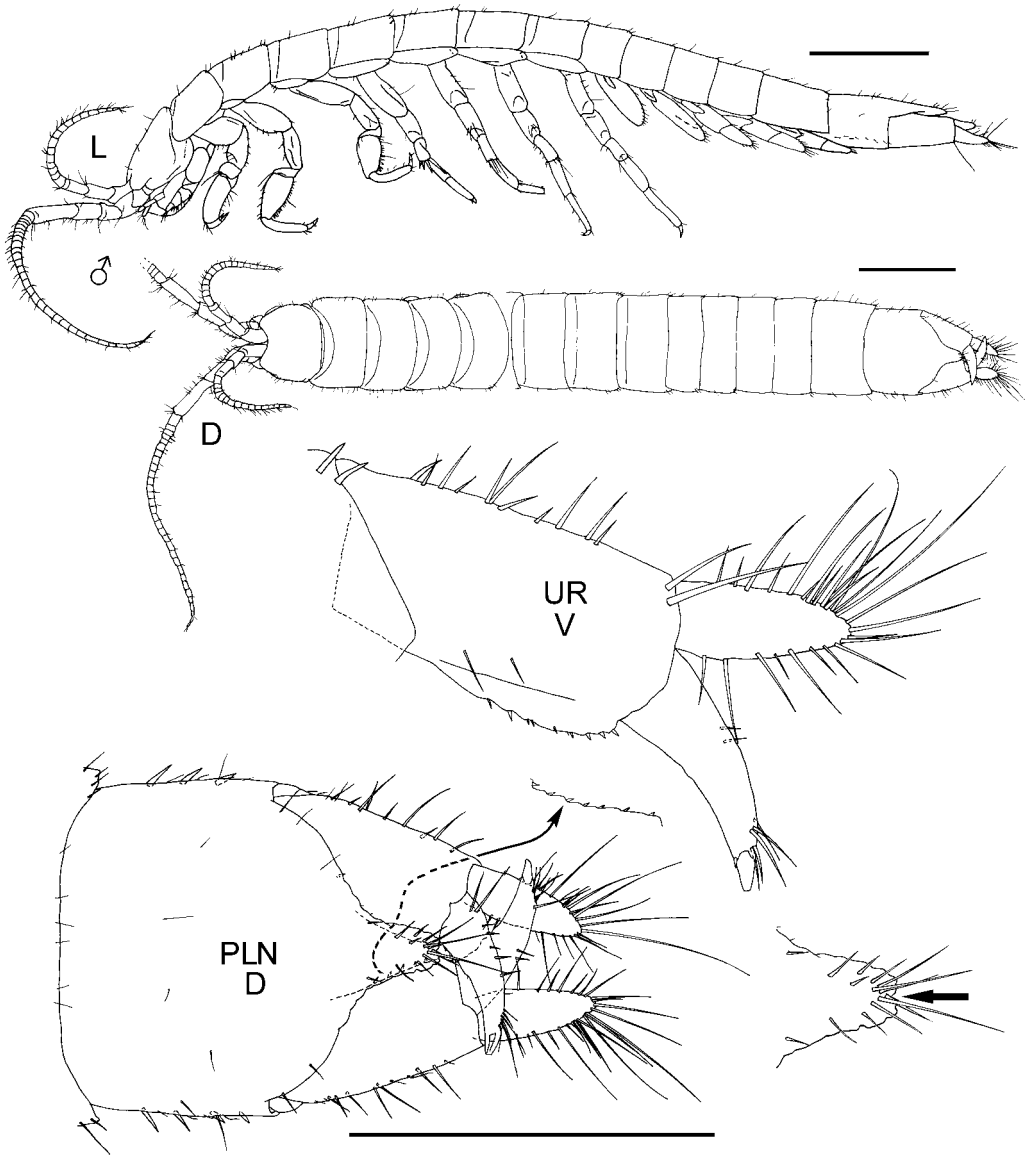

FIGURE 8. *P. weeliwolli* sp. nov. Holotype male (WAM C34948). Dorsal view shown in two sections owing to curvature of body. Arrow indicating ventral side of the pleotelson terminal margin. Bold arrow showing indentation on tip of pleotelson. Scale bar 1 mm.

Uropods. Length 0.11–0.17 body length (holotype 0.11), 0.4–0.63 pleon length (holotype 0.40). Protopod length between insertion and distal margin 1.13–1.16 length between insertion and pleotelson apex (holotype); with 9 small tooth-like setae along medial margin. Endopod length 0.71–0.73 protopod length (holotype), 1.29–1.42 exopod length (holotype); medial margin without penicillate setae, with 4 small tooth-like setae (mostly placed proximally). Exopod length 0.51–0.55 protopod length (holotype 0.51).

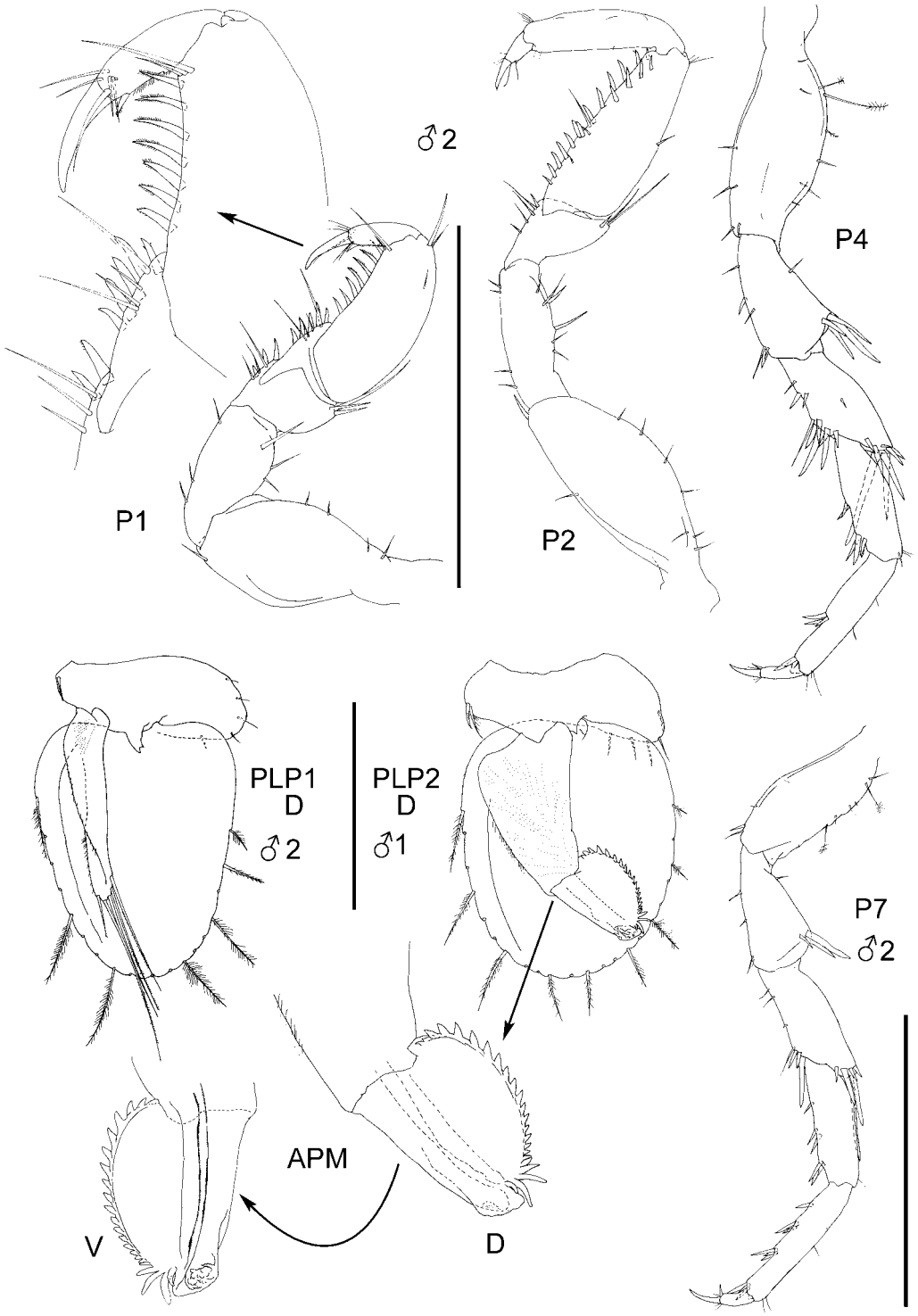

FIGURE 9. *P. weeliwolli* sp. nov. Holotype male (WAM C34948); paratype male 2 (AM P70413). Scale bar: pereopods, 1 mm; pleopods 0.5 mm.

Remarks. The short pleotelson with a truncate indented apex, combined with the appendix masculina (which has a smoothly rounded lateral margin, with widely spaced teeth that are longer in the proximal portion of the margin relative to those in the middle of the margin, and a narrow distal cup with an angular medial distal margin) are characters that diagnose this species. The specimens from one site to the south west of the immediate vicinity of the type locality (AM P70415) have a pleotelson apex with the indentation weakly developed or absent. They are, therefore, excluded from the type series, but otherwise conform to the species description.

Distribution. Weeli Wolli area 22°55.00–55.12'S 119°11.00–12.03'E, and one locality to the south west 23°0.15'S 119°07.93'E, Pilbara Region, Western Australia.

Pygolabis paraburdoo sp. nov. (Figs 10–11)

Etymology. The name of this species is drawn from its type locality Paraburdoo, and is treated as a masculine noun in apposition.

Type material. Western Australia: Pilbara Region, Parburdoo Town Bore Field: Holotype male, body length 12.9 mm, bore PTO3-A, 23°11.28'S 117°40.64'E, fld. no. PSS111, 22 xi 2003 (M.D. Scanlon, J.S. Cocking), depth to water 6 m, depth to bottom 51 m (WAM C34951, slide STY 005). Paratypes: male, body length 8.0 mm, pereopods and pleopods dissected for examination and illustration or SEM, ground water monitoring bore near Paraburdoo, 23°11.16'S 117°41.31'E, fld. no. HI-148 16 vii 2000 (S. Anstee) (AM P70416); 2 males, female, near Paraburdoo, 23°11.2'S 117°41.3'E, fld. no. HI-649 (S. Anstee) (AM P70417); 1 male, 1 female (WAM C34952), 1 male, 1 female (AM P70418), bore PTO3-A Ashburton River catchment, 23°11.29'S 117°40.64'E, fld. no. PSS111, 9 iv 2003 (S.A. Halse, A.E MacIntosh); male, bore PFO9-4 Turee Creek Bore Field Ashburton River catchment, 23°22.11'S 117°57.59'E, fld. no. PSS058 8 iv 2003 (M.D Scanlon, S.A Halse) (AM P70419); male, body length 9.1 mm, bore PSPRSLK20 Rocklea Station Ashburton River catchment, 23°01.53'S 117°32.41'E, fld. no. PSS177, 26 vii 2003 (M.D Scanlon, J.S. Cocking) (AM P70420).

Diagnosis. *Pleotelson.* Distance between uropod insertions and apex subequal to half length of pleotelson; lateral inflection points of posterior margin closer to apex than to uropod insertions; distance from lateral inflection points of posterior margin to apex less than from uropod insertions to inflection points; apex truncate, posterior margin indentation present. *Pleopod 2 male endopod appendix masculina.* Teeth on lateral margin separated by at least tooth width for more than half of lateral margin length, proximal teeth subequal to lateral teeth in middle of ridge; lateral margin not distinctly projecting — forming smoothly rounded arc; distal tip with broad cup; medial distal margin rounded. *Uropods.* Protopod extending subequal to pleotelson apex or extending beyond pleotelson apex.

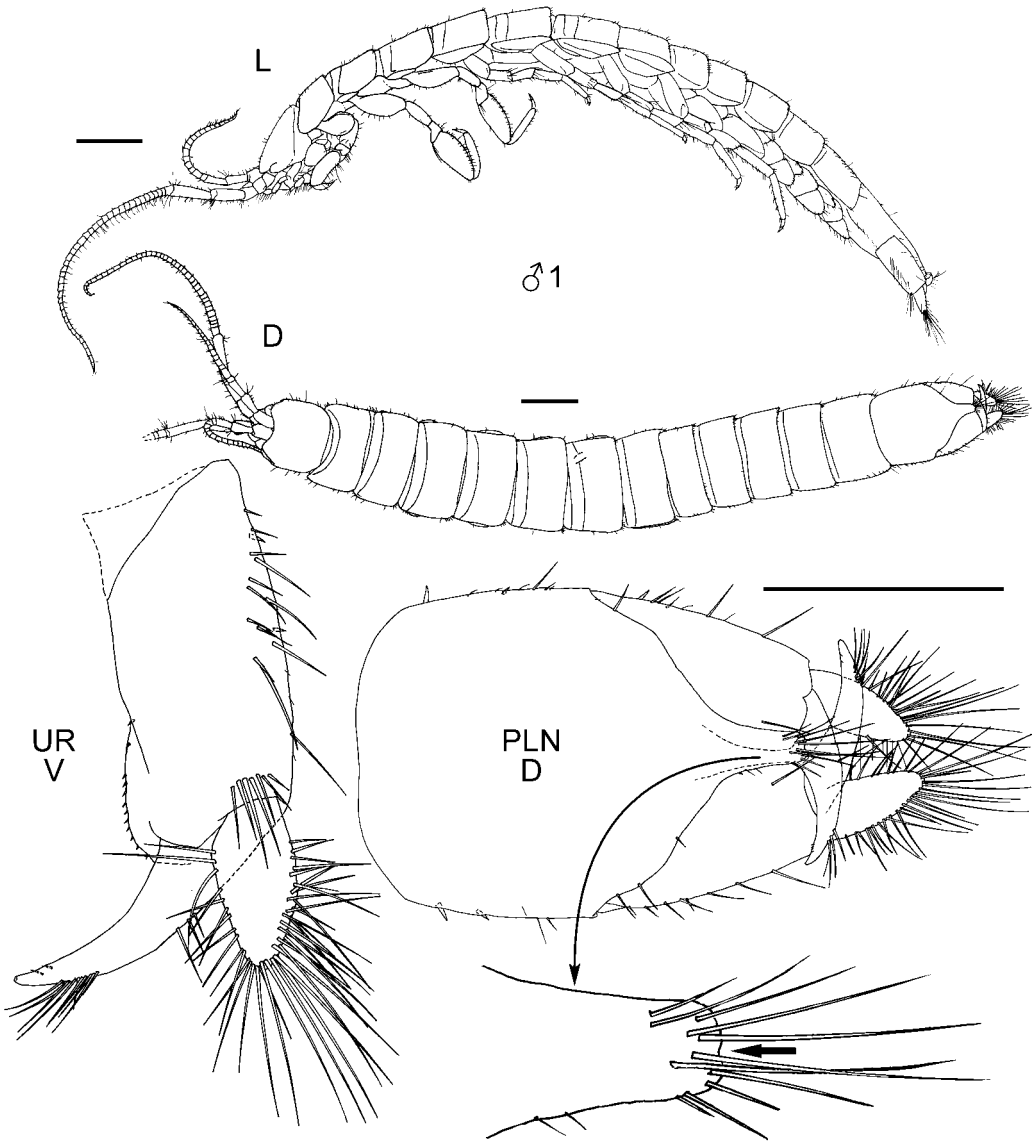

FIGURE 10. *P. paraburdoo* sp. nov. Holotype male, (WAM C34951). Bold arrow showing indentation on tip of pleotelson. Scale bar 1 mm.

Description. *Head*. Length 0.63–0.76 width (holotype), 1.43–1.52 pereonite 1 medial length (holotype); clypeus proximal width 0.66 head width.

Pereonites. Total medial length 0.43–0.47 body length (holotype); medially 3–4 subequal and longest, 2 and 5–7 subequal.

Pleonites. 1–4 subequal to each other and pereonite 1, pleonite 5 length subequal to pereonites 2 and 5–7; respective medial lengths: body length — 0.05, 0.05, 0.05, 0.05, 0.07.

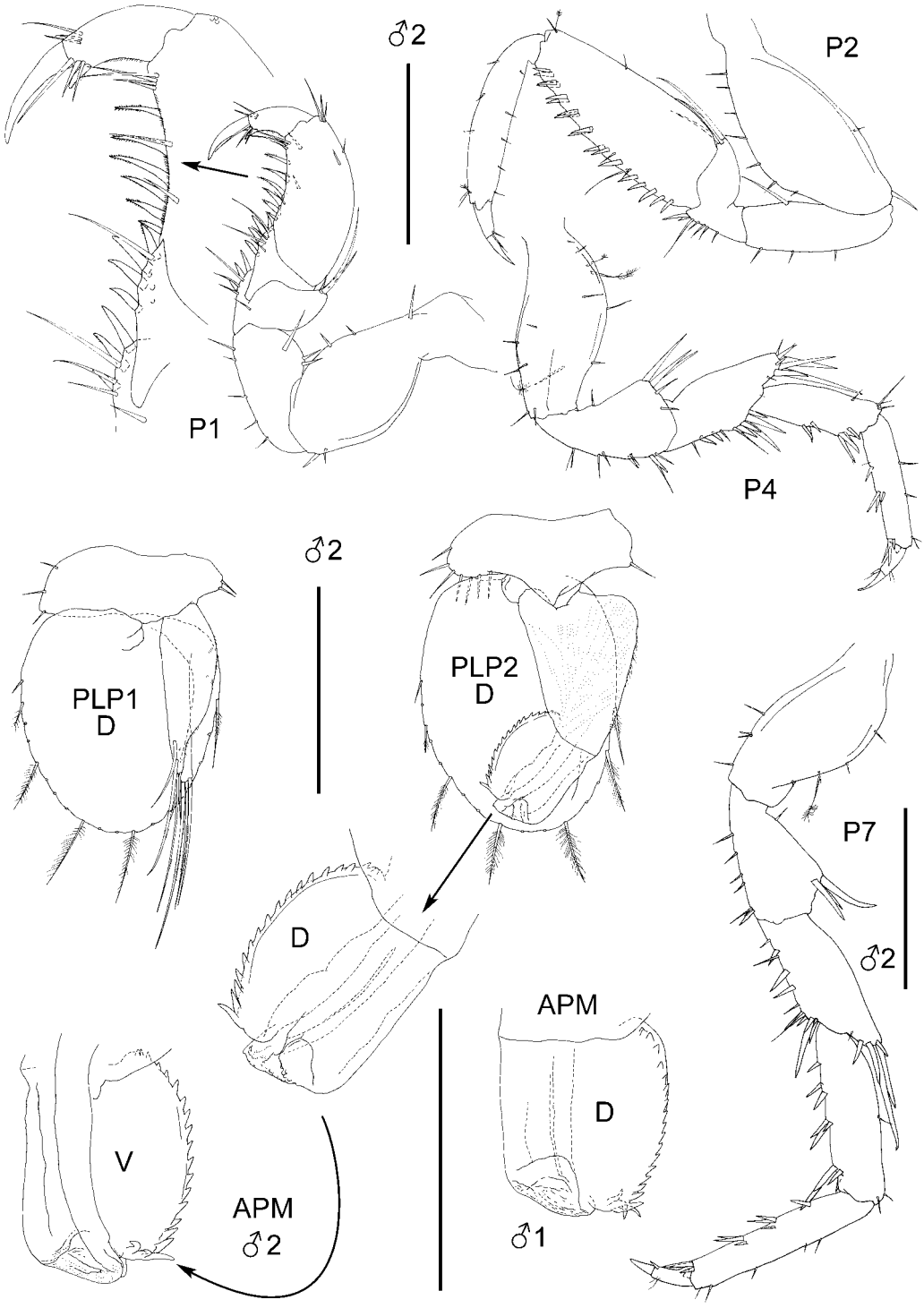

FIGURE 11. *P. paraburdoo* sp. nov. Paratype male 2 (AM P70416); holotype male (WAM C34951). Scale bar 0.5 mm.

Pleotelson. Medial length 1.14–1.37 width (holotype), 0.49–0.5 pleon length (holotype 0.49); distance between uropod insertions and apex 0.48 total medial length of pleotelson; lateral inflection points of posterior margin occurring at 0.52 of distance between the uropod insertions and apex; distance from lateral inflection points of posterior margin to apex 0.94 distance from uropod insertions to lateral inflection points of posterior margin; posterolateral margins with 20 small non-sensillate simple setae (approximately).

Antennula. Length 0.22–0.26 body length (holotype 0.22); with 18–22 articles (differs from side to side 18–20 in paratype, holotype 22); article 2 subequal to article 1, article 3 shorter than article 1.

Antenna. 0.43–0.53 body length (holotype 0.43); with 38–41 articles (holotype). Flagellum length 0.64–0.67 antenna total length (holotype 0.64).

Pereopods. Pereopods 1–7 respective lengths: body length — 0.16, 0.29, 0.26, 0.19, 0.23, 0.26, 0.28. Pereopod 1 propodus, carpus and merus with robust bidenticulate sensillate setae, respectively 6, 1–4 (1 strongly and 3 weakly bidenticulate). Pereopods 2–3 carpus with 18, 19 robust sensillate setae respectively, lateral row with 12 robust setae.

Pleopods. Pleopod 2 male endopod appendix masculina length 0.96 distance from base of appendix masculina to distal margin of exopod; lateral margin with 20–21 (holotype) teeth, including 3–5 distal elongate spine-like teeth (holotype 4); distal segment length 1.02–1.29 width (holotype 1.02).

Uropods. Length 0.1–0.14 body length (holotype 0.10), 0.33–0.5 pleon length (holotype 0.33). Protopod length between insertion and distal margin 1.01–1.17 length between insertion and pleotelson apex (holotype 1.01); with 12 small tooth-like setae along medial margin. Endopod length 0.57–0.76 protopod length (holotype), 1.31–1.4 exopod length (holotype); medial margin without penicillate setae, without small tooth-like setae. Exopod length 0.43–0.54 protopod length (holotype).

Remarks. *Pygolabis paraburdoo* is most similar to *P. humphreysi* and *P. gascoyne*. It differs from *P. humphreysi* in having a truncate indented pleotelson apex (compared to rounded and entire) and an appendix masculina with teeth on the distal lateral margin distinctly separated for more than half of the distance in which they occur (compared to not distinctly separated). *Pygolabis paraburdoo* differs from *P. gascoyne* in having the appendix masculina with teeth on the distal lateral margin distinctly separated for more than half of the distance in which they occur (compared to not distinctly separated) and the medial distal margin rounded (compared to angular).

Distribution. Paraburdoo Town Borefield 23°01.53–22.11'S 117°32.41–57.59'E, Pilbara Region, Western Australia.

Pygolabis gascoyne sp. nov. (Figs 12–13)

Etymology. The name of this species, treated as a noun in apposition, is drawn from the Gascoyne region of Western Australia, where Wanna Station is located.

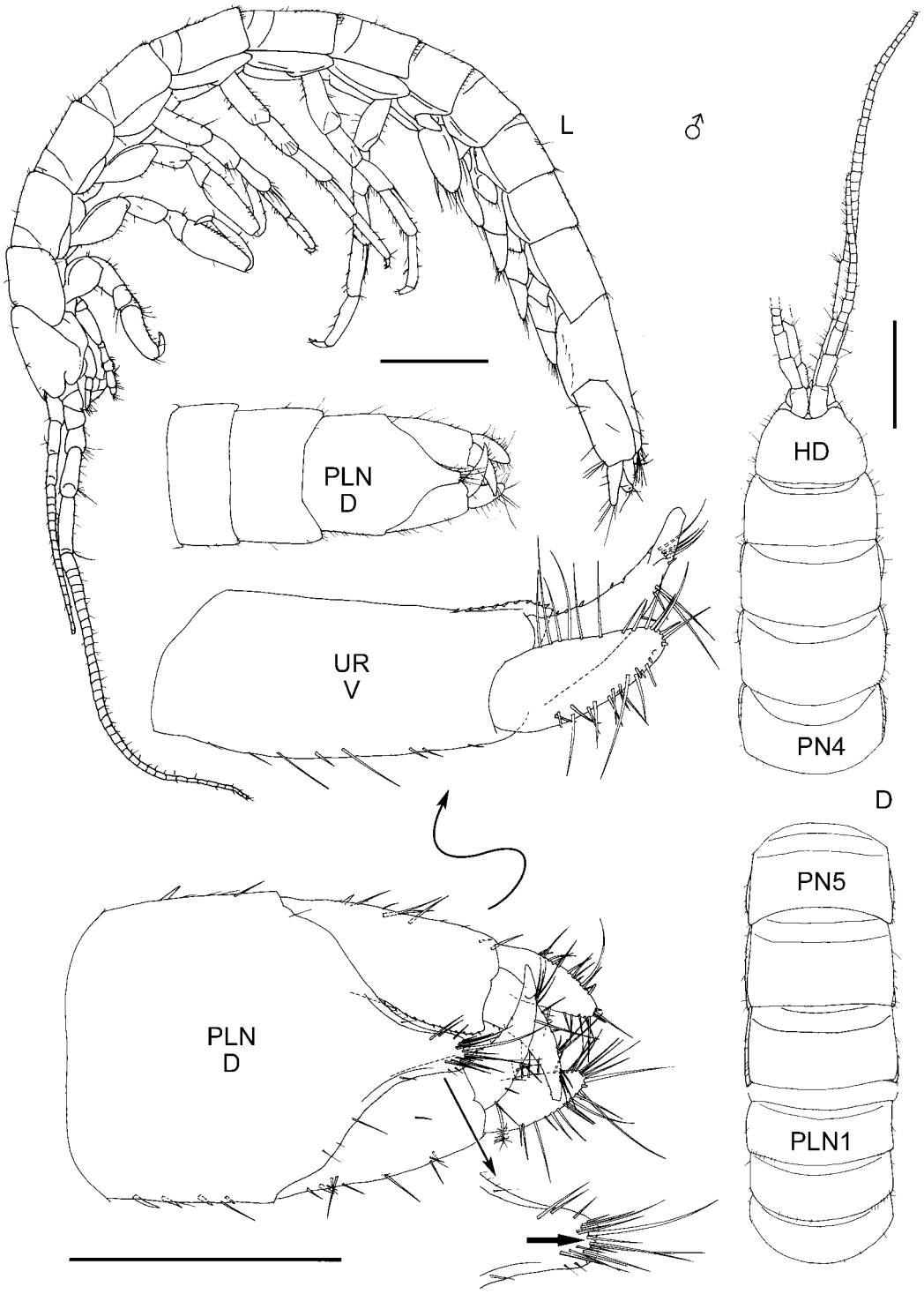

FIGURE 12. *P. gascoyne* sp. nov. Holotype male (WAM C34953). Bold arrow showing indentation on tip of pleotelson. Scale bar 1 mm.

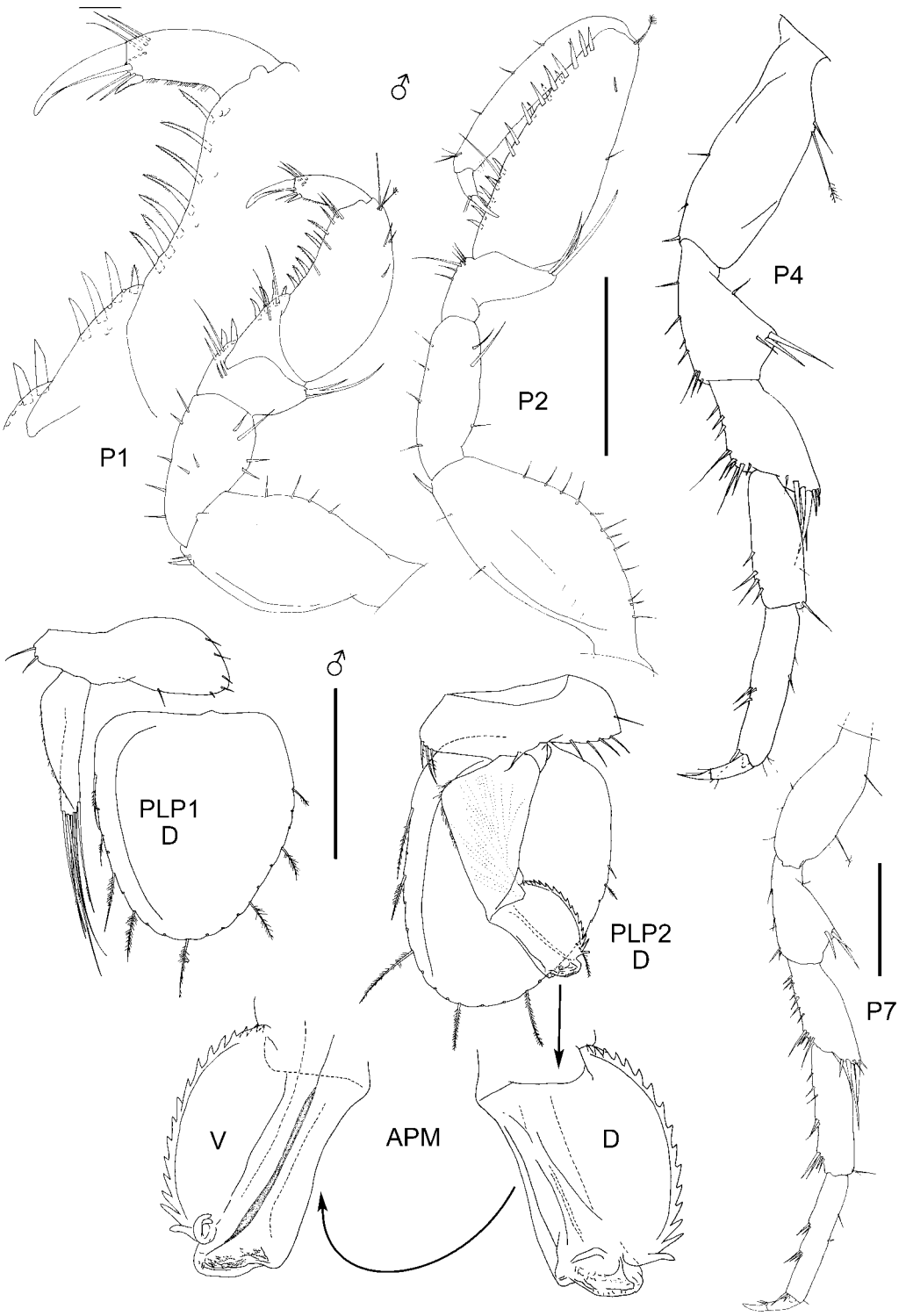

FIGURE 13. *P. gascoyne* sp. nov. Holotype male (WAM C34953). Scale bar 0.5 mm.

Type material. Western Australia: **Gascoyne region:** Holotype male, body length 10 mm, Wanna Station, bore at StoneTank Well, 23°56.3'S 116°29.5'E, fld. no. BES 8835, 14 iv 2003 (W.F. Humphreys, R. Leijs) preserved in 100% ethanol (WAM C34953). Paratypes: female, body length 9.8 mm, same data as holotype except fld. no. BES 8836 preserved in 75% "special meths" (AM P70421).

Diagnosis. *Pleotelson.* Distance between uropod insertions and apex subequal to half length of pleotelson; lateral inflection points of posterior margin closer to uropod insertions than to apex; distance from lateral inflection points of posterior margin to apex greater than from uropod insertions to inflection points; apex truncate, posterior margin indentation present. *Pleopod 2 male endopod appendix masculina.* Teeth on lateral margin separated by less than tooth width for more than half of lateral margin length, proximal teeth subequal to lateral teeth in middle of ridge; lateral margin not distinctly projecting — forming smoothly rounded arc; distal tip with broad cup; medial distal margin angular. *Uropods.* Protopod extending beyond pleotelson apex.

Description. *Head*. Length 0.59 width, 1.15 pereonite 1 medial length; clypeus proximal width 0.48 head width.

Pereonites. Total medial length 0.52 body length; medially 3–5 subequal and longest, 2 and 6 shorter and subequal, 7 shorter than 6.

Pleonites. 1–4 lengths subequal and shorter than pereonite 7, pleonite 5 length subequal to pereonite 7; respective medial lengths: body length — 0.05, 0.05, 0.06, 0.05, 0.07.

Pleotelson. Medial length 1.29 width, 0.55 pleon length; distance between uropod insertions and apex 0.48 total medial length of pleotelson; lateral inflection points of posterior margin occurring at 0.44 of distance between the uropod insertions and apex; distance from lateral inflection points of posterior margin to apex 1.26 distance from uropod insertions to lateral inflection points of posterior margin; posterolateral margins with 28 small non-sensillate simple setae (approximately).

Antennula. Length 0.23 body length; with 20 articles; article 2 subequal to article 1, article 3 shorter than article 1.

Antenna. 0.44 body length; with 32–38 articles (32 right side, 38 left side). Flagellum length 0.76 antenna total length.

Pereopods. Pereopods 1–7 respective lengths: body length — 0.14, 0.24, 0.23, 0.19, 0.21, 0.22, 0.24. Pereopod 1 propodus and carpus with robust bidenticulate sensillate setae, respectively 7, 1. Pereopods 2–3 carpus with 18, 19 robust sensillate setae respectively, lateral row with 9 robust setae.

Pleopods. Pleopod 2 male endopod appendix masculina length 0.91 distance from base of appendix masculina to distal margin of exopod; lateral margin with 18 teeth, including 4 distal elongate spine-like teeth; distal segment length 1.29 width.

Uropods. Length 0.13 body length, 0.44 pleon length. Protopod length between insertion and distal margin 1.11 length between insertion and pleotelson apex; with 12

small tooth-like setae along medial margin. Endopod length 0.58 protopod length, 1.16 exopod length; medial margin with proximal and distal penicillate setae, with 7 small tooth-like setae (placed proximally and distally). Exopod length 0.5 protopod length.

Remarks. *Pygolabis gascoyne* is most similar to *P. humphreysi* and *P. paraburdoo*. It differs from *P. humphreysi* in having a truncate indented pleotelson apex (compared to rounded and entire) and an appendix masculina with the distal medial margin angular (compared to rounded). *Pygolabis gascoyne* differs from *P. paraburdoo* in having the appendix masculina with teeth on the distal lateral margin not distinctly separated (compared to distinctly separated for more than half of the distance in which they occur) and the medial distal margin angular (compared to rounded).

Distribution. Stone Tank Well, Wanna Station, Gascoyne Region, 23°56.3'S 116°29.5'E, Western Australia.

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