

The Taxonomy of Amphipoda (Crustacea) from Australian Fresh Waters: Part 2

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ABSTRACT. Taxonomic information on freshwater species from Western Australia, Queensland and South Australia is presented. The following new crangonyctoid taxa are established: *Austrogammarus telsosetosus*, *Toulrabia*, new genus, with *T. willsi*, *Uroctena whadjukia*, and *Chillagoe*, new genus, with *C. thea*; the following species is reviewed: *U. setosa*; the following new genera, apparently melitoid, are established: *Brachina*, new genus, with *B. invasa*, and *Nedsia*, new genus, with *N. douglasi*.

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This report is the second of a planned series documenting our investigations of the taxonomy of Australian freshwater Amphipoda. Our first report laid the foundation for our studies in that, for the most part, it redescribed all known Australian crangonyctoid taxa and discussed the higher taxonomic category into which we placed them. The present report is mostly concerned with the description of new crangonyctoid taxa (but also adds to our knowledge of one known crangonyctoid, *Uroctena setosa* Nicholls, and describes two new non-crangonyctoid taxa).

For the present, we regard the non-crangonyctoid taxa we describe as part of the melitoid (hadzioid) complex, that is, as taxa of essentially marine derivation. Whatever their derivation, their description clearly emphasises the points made in our first report concerning the rich diversity of Australian freshwater

amphipods. It also indicates the range of sources from which this diversity derives. Given the relative dearth of taxonomic studies on Australian freshwater amphipods to date, particularly with regard to subterranean taxa, the discovery of further non-crangonyctoid taxa would not be surprising. Even so, crangonyctoids remain the dominant type in Australian fresh waters, outside those found in lowlands where ceinids (*Austrochiltonia*) dominate.

A comprehensive discussion of the crangonyctoid concept was given in our first report. In that discussion, we were generally critical of the concept as a whole but chose to support it as a useful working hypothesis or “enabling mechanism” promoting our studies until the time when knowledge of Australian freshwater amphipods was further advanced. The present paper follows the same principles. Thus, for present purposes, crangonyctoid amphipods are considered to possess a

combination of at least the following characteristics: 1, calceoli (when present) are of linear form (not cup-shaped); 2, the accessory flagellum of antenna 1 is 2+ articulate; 3, the outer ramus of uropod 3 is usually 2-articulate, but if not the uropod is variramous or parviramous; 4, coxae 5–7 are smaller than coxa 4; 5, basofacial spines on the peduncle of uropod 1 are absent; 6, inner lobes of lower lip are indistinct; 7, the palp of maxilla 1 is 2-articulate; 8, setae other than E-setae are present on the mandibular palp; 9, gnathopod 1 is not dominant.

The present studies suggest no major comment on these criteria and until our studies on Tasmanian and Victorian crangonyctoids are complete, any reconsideration of the crangonyctoid concept is clearly premature.

The melitoid (hadzioid) complex is equally difficult to demarcate and it too needs reconsideration. For the present, however, we simply regard the melitoids as distinguishable from the crangonyctoids by, *inter alia*, their lack of linear calceoli, absence of sternal gills and the presence of a basofacial spine on the peduncle of the first uropod. The feature of melitoids that we regard as critical is the form of the first gnathopod, i.e. gnathopod small, hand almost rectangular with a short transverse palm having simple (non-symmetrically bifid) spines and with an elongate wrist.

Methods of Dissection and Description

Our methods of dissection and description are essentially those used before (Williams & Barnard, 1988). They need no repetition here. To expedite the use of the present work, however, it will be helpful to note the following abbreviations.

Setae in text formulae have the following abbreviations: E, large seta; e, small seta; S, large spine; s, small spine. Spines are considered to be inflexible setae.

A key to the abbreviations used in Figs 1–26 is as follows: A—antenna; Abd—abdomen; acc—accessory; C—coxa; d—dorsal; dact—dactylus; E—epimeron; fl—flake; flag—flagellum; g—gill; G—gnathopod; Hd—head; i—inner; juv—juvenile; l—left; lac—lacinia mobilis; LL—lower lip; MD—mandible; med—medial; mol—molar; MP—maxilliped; MX—maxilla; o—outer; O—oostegite; opp—opposite; p—palp; P—pereopod; PC—prebuccal complex; pl—plate; Pp—pleopod; r—right; sp—spine; sq—square view; sr—setae removed (sometimes marked by sockets); st—sternal gill; T—telson; U—uropod; UL—upper lip; UR—urosoma; 1, 2, 3... 7—first, second, third... seventh article, segment, somite or epimeron (as appropriate). These abbreviations are the same as those used previously by us.

Crangonyctoidea

Paramelitidae Bousfield

Austrogammarus Barnard & Karaman, 1984

Austrogammarus Barnard & Karaman, 1984: 60–61.

Type species. *Gammarus australis* Sayce, 1901, by original designation.

For the generic diagnoses, additional description, characters of interspecific value and sexual attributes see Williams & Barnard (1988: 16–17).

Relationships. *Austrogammarus* is regarded as the basic (most primitive) genus of Australian paramelitids.

Composition. This genus now includes seven species: *A. australis* (Sayce), *A. smithi* Williams & Barnard, *A. haasei* (Sayce), *A. saycei* Williams & Barnard, *A. spinatus* Williams & Barnard, *A. multispinatus* Williams & Barnard and *A. telsosetosus* n.sp. Keys to the first six of these species, based upon the most prominent specific differences, were given by Williams & Barnard (1988: 16–17). In these keys, *A. telsosetosus* keys to *A. multispinatus*. These two species differ only slightly from each other (see remarks under Relationships below).

Austrogammarus telsosetosus n.sp.

Figs 1–4

Etymology. Named for the basalwards extension of setae on the telson.

Type locality. Creek flowing into Lake Bonney, South Australia, beyond wood plant effluent outflow.

Material examined. HOLOTYPE (Australian Museum, P44058), female “q” 9.76 mm, in type series collected 21 November 1977, P. & D. Suter collectors, sample number 967 “1: 280, 000 329 390”. ALLOTYPE (Australian Museum, P44059) same sample, male “s” 7.42 mm. Other measured specimens, female “r” (P44060) 9.00 mm and male “t” (P44061) 7.70 mm. Five other specimens (P44062) in same sample. Tributary of Eight Mile Creek, South Australia, 22 November 1977, P. & D. Suter collectors, sample number 969 “1: 50, 000 824 900,” juvenile “w” (P44063) 4.95 mm, female “v” 10.70 mm and 5 other specimens. Cress Creek, at Port MacDonnell, South Australia, 22 November 1977, P. & D. Suter collectors, sample number 971, male “u” (P44064) 5.91 mm. Other material: Eight Mile Creek, South Australia, January 1980, Keith F. Walker collector, 9 specimens (P44065).

Diagnosis. Flagellum of antenna 2 poorly setose and bearing calceoli in male. Coxae 1–4 weakly to not setose ventrally, coxa 4 lacking ventral setae, only with posteroventral setae and several anteroventral setae, coxae 1–3 with several posterior spines. Coxa 4 with

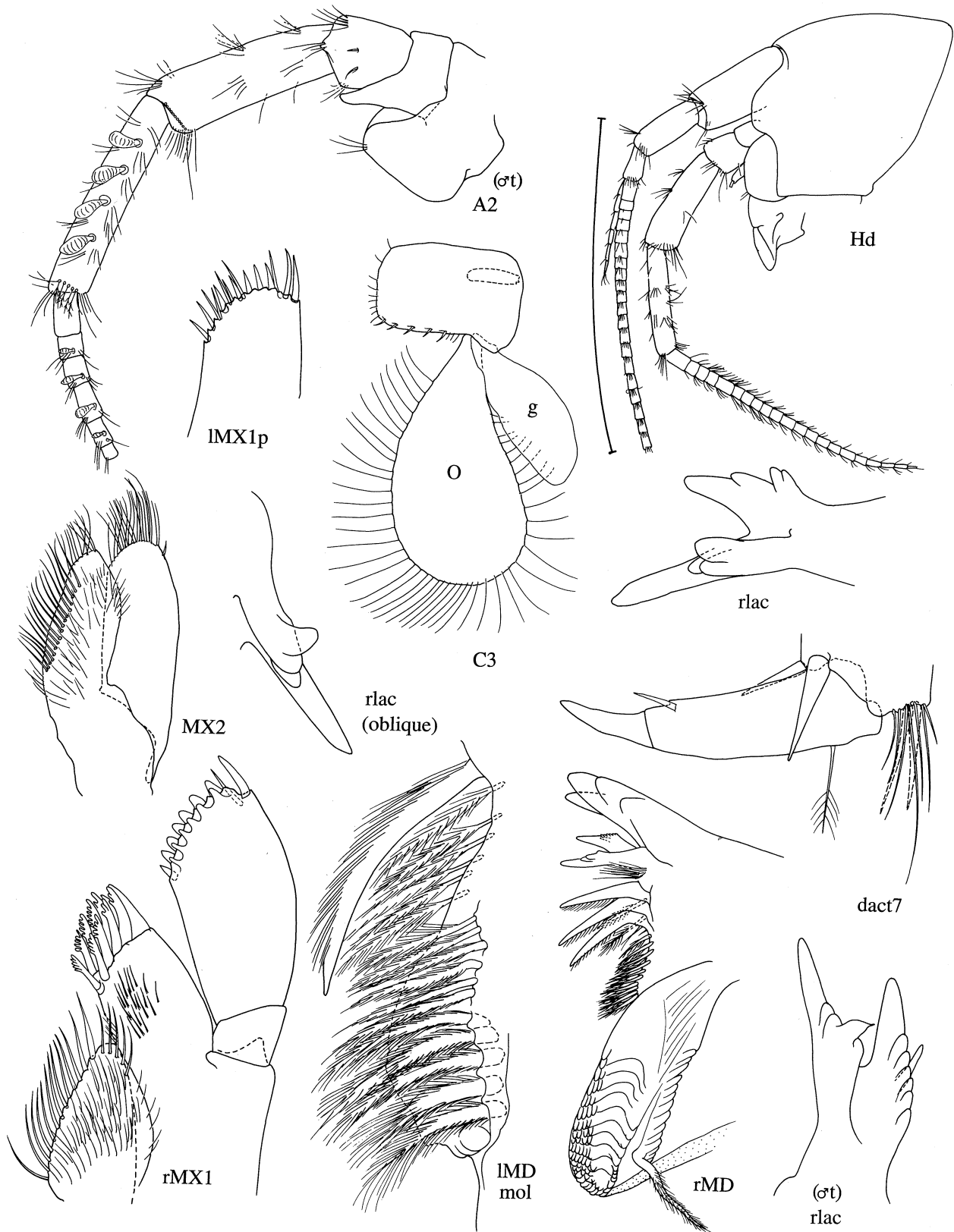


Fig. 1. *Austrogammarus telsosetosus* n.sp., holotype, female "q" 9.76 mm (all drawings except those indicated); male "t" 7.70 mm.

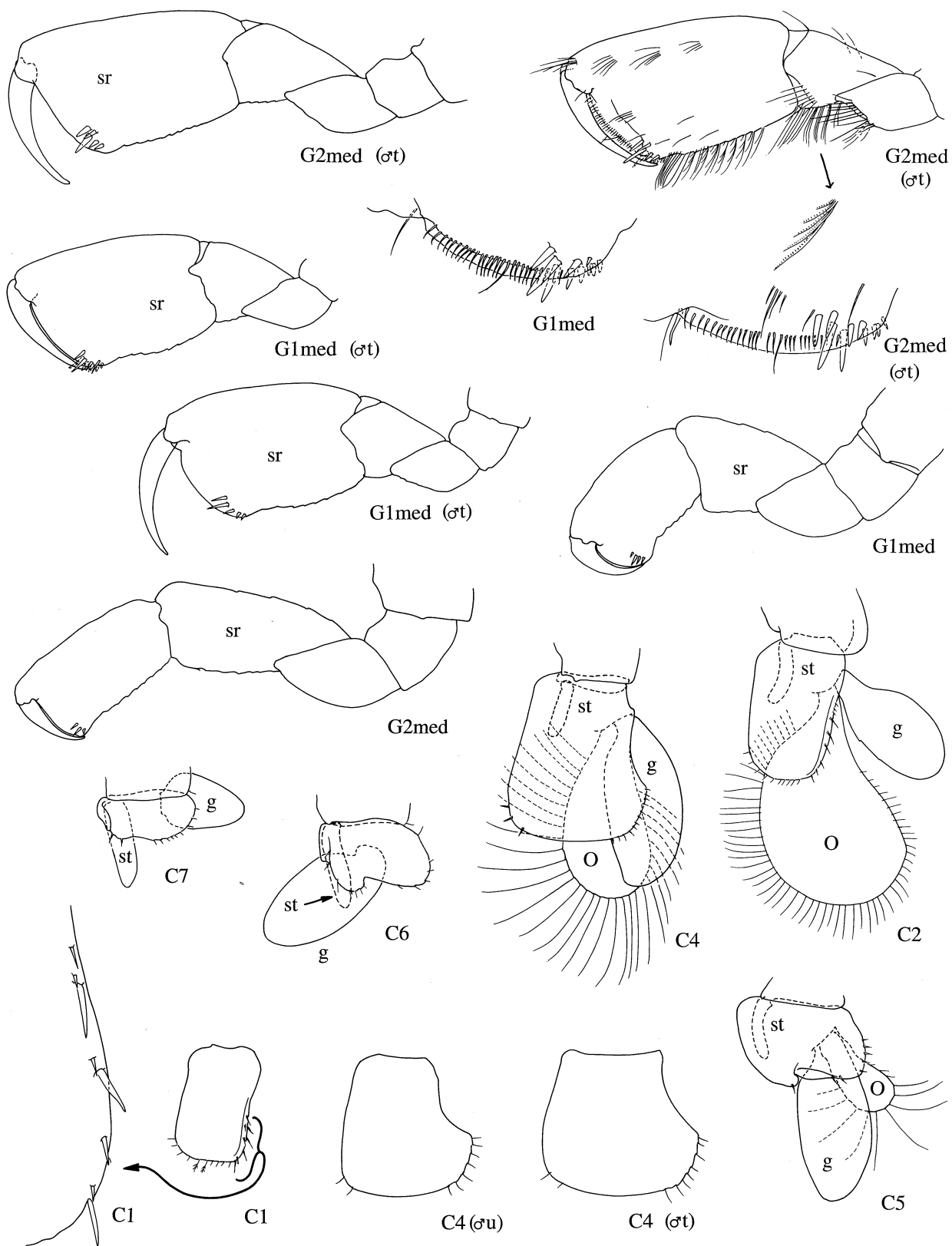


Fig. 2. *Austrogammarus telsosetosus* n.sp., holotype, female "q" 9.76 mm (all drawings except those indicated); male "v" 7.70 mm; male "u" 5.91 mm.

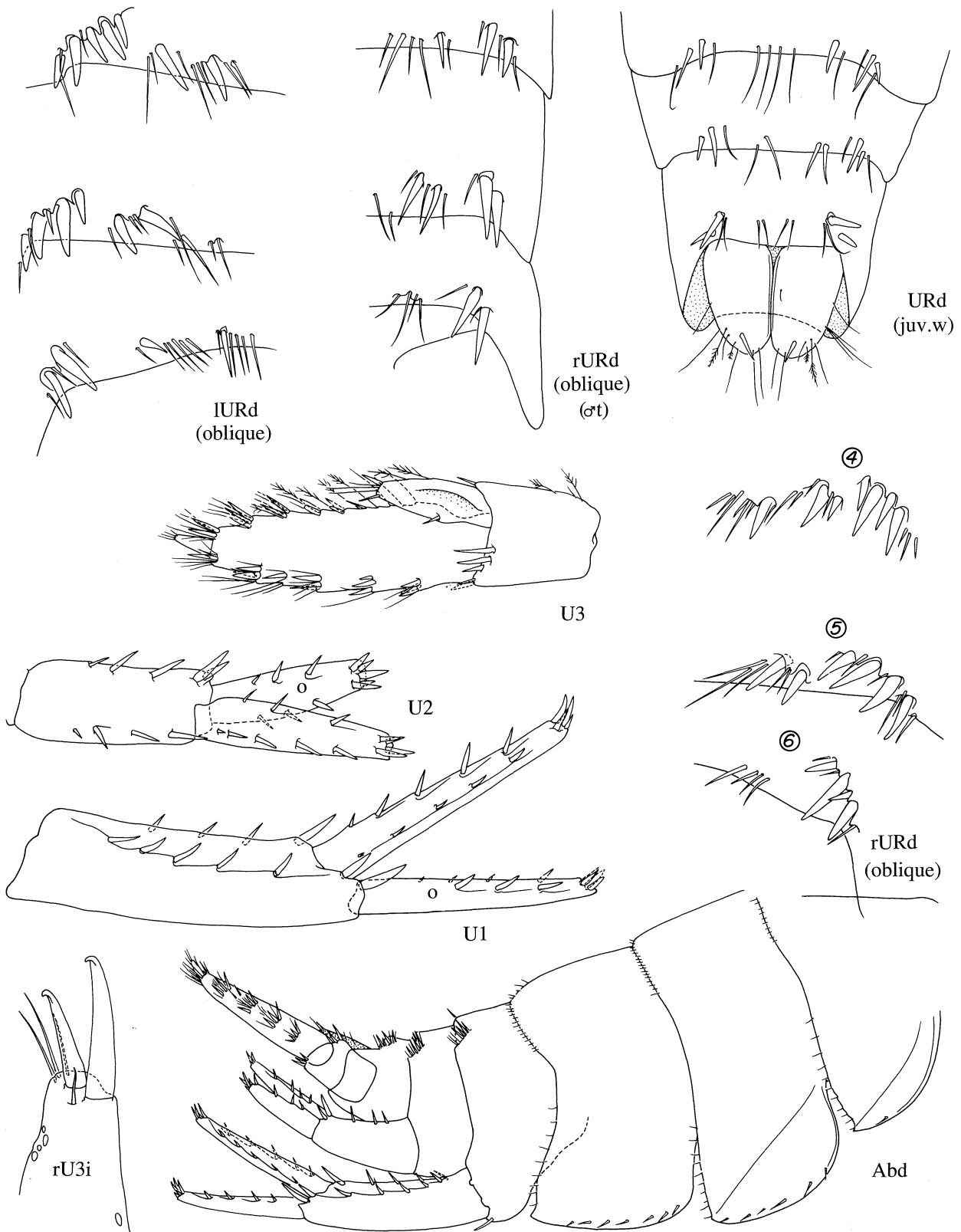


Fig. 3. *Austrogammarus telsosetosus* n.sp., holotype, female "q" 9.76 mm (all drawings except those indicated); male "t" 7.70 mm; juvenile "w" 4.95 mm.

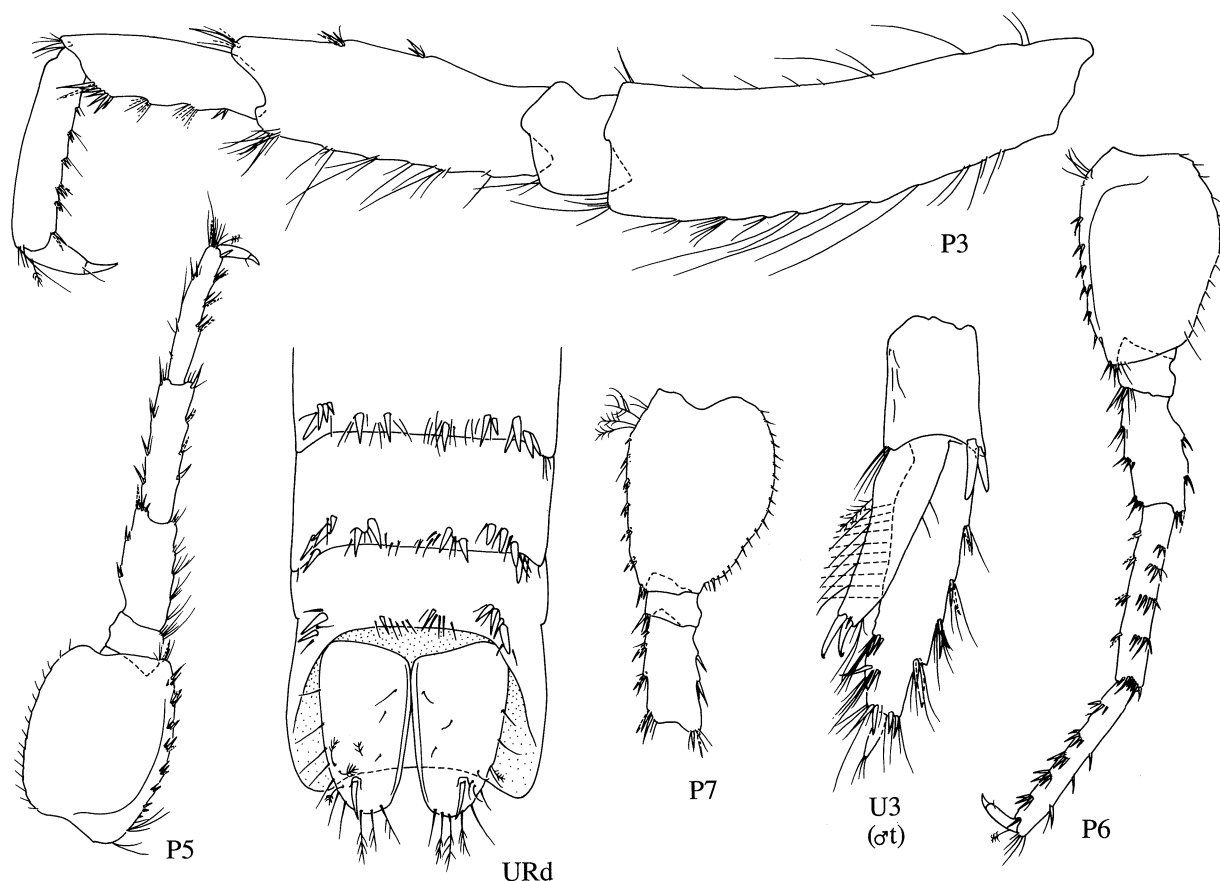


Fig. 4. *Austrogammarus telsosetosus* n.sp., holotype, female “q” 9.76 mm (all drawings except those indicated); male “t” 7.70 mm.

posteroventral lobe unusually weak. Gnathopods dimorphic between the sexes, palmar corners in male not bent outward, with 10 spines. Posterior spines on article 6 of pereopods 3–4 in single sets, without group of setae placed between spine sets 1 and 2, formula thus 2-2-3-2-2-1 (all spines) and 2-4-3-4-3; lateral spine formulae on article 5 of pereopods 3 and 4 = 3-1-2-1 and 4-4-4-1; article 2 of pereopods 5–7 with short setae; setae of articles 4–6 of pereopods 5–7 short and of low density; article 4 of only pereopod 7 short. Epimeron 1 without anteroventral setae. Urosomal setation dorsally short and stiff; pleonites 4–5 with 4+ dorsolateral spines on each side, with one or two additional dorsomedial sets of 1–2 spines, pleonite 6 with 2–4 spines on each side, formulae from medial to lateral on one side only, pleonite 4 = 1-2-4 or 1-1-5, pleonite 5 = 0-2-4, pleonite 6 = 0-2 or 0-4, often with incipiently thickened small spinules in middle of segment; none of uropods 1–2 with setae on peduncles and inner rami, apicolateral corner of peduncle on uropod 1 with 2 spines only, on uropod 2 with 2 spines only, medial spines on peduncle of uropod 1 (distal to proximal = 1-1-1-1), setae in same sets = 0, on uropod 2 = 1-1-1-1 and 0; uropod 3 strongly setose, inner ramus reaching to about M.33 in female and M.60 in male on outer ramus, with one subapical

spine in female only, apex with many setae and 2 long hooked spines in male placed towards medial side, with 2 widely separated spines in female, medial margin with setae in tandem, lateral margin with setae in male, with spine in female; article 1 on outer ramus with spine sets laterally and medially mixed with setae arranged in clusters, article 2 small, with short apical setae. Telson fully cleft, lobes separable, spinose and setose, setae extending more basalwards than in *A. multispinatus*.

Description of holotype (female “q”). *Body* (Figs 3, 4): pleon dorsally setose, setation dense and transverse on pleonites 1–3, setae very short and confined to margins of segments, pleonites 4–6 with spine-seta rows weakly ranked longitudinally but generally in transverse band; length, 9.76 mm.

Head (Fig. 1): eyes absent.

First antenna (Fig. 1): length 0.57 of body, 1.3 second antenna, flagellum much longer than peduncle, setae sparse; accessory flagellum 6–7 articulate, reaching past article 7 of primary flagellum. *Second antenna* (Fig. 1): length 0.40 body; peduncle as long as flagellum, articles 4 and 5 equal in length, articles 3, 4 and 5 with weak ventral setation; flagellum 21 articulate, setose ventrally, lacking calceoli.

Left mandible: setae of palp article 3 = 4, 2A, 3, 5B, many D, 2E; incisor 5-toothed, lacinia mobilis 4-toothed, 6 setose accessory blades; molar (Fig. 1) with short setose spines. *Right mandible* (Fig. 1): incisor 4-toothed; lacinia mobilis bifid, denticulate; accessory blades of 3 setose spines and vestigial fourth; molar with short plumose seta. *Left first maxilla* (Fig. 1): palp article 2 with 11 thin apical spines and 4 scarcely subterminal facial setae; inner plate with 13 widely spread medial setae. *Right first maxilla* (Fig. 1): palp article 2 with 8 thick apical spines articulated to segment and one articulate apicolateral spine. *Second maxilla* (Fig. 1): outer margin of outer plate with one short seta; inner margin of inner plate with strongly submarginal row of many setae.

First gnathopod (Fig. 2): coxal plate sparsely setose marginally, posterior margin with 4 (aberrantly 7) spines; carpus weakly elongate, unlobed; propodus rectangular, longer than wide, posterolateral angle ordinary, palm oblique, curved. *Second gnathopod* (Fig. 2): slightly longer and thinner than first gnathopod, carpus elongate; coxal plate with 6 posterior spines.

Pereopods (Figs 1, 2, 4): coxa 3 with 5 posterior spines, coxa 4 lacking setae below and lacking posterior spines, deeply emarginate, but posterior lobe not as long as in *A. multispinatus*; pereopods 3–4 not longer than gnathopod 2, pereopod 3 longer than 4, article 4 moderately setose posteriorly.

Epimera (Fig. 3): all epimera with small posteroventral tooth, each with short posterior setules, epimera 1, 2 and 3 with 1, 6 and 7 ventrofacial spines. Uropod lengths relative to uropod 1: uropod 2 = 0.60, 3 = 0.73. *Pleopods 1–3*: peduncular setae = successively: 9 apicolateral; 8 apicolateral, 6–4–2 lateral, 4 basomedial; 5 apicolateral, 4–6 basolateral, 4 basomedial; coupling hooks = 2, accessory spines = 2; articles of outer rami = 20–20–19, of inner rami = 17–17–16, setae of basal article for each ramus laterally to medially = 7–2–3–8, 5–3–2–7 and 4–1–1–7.

First uropod (Fig. 3): peduncle length $1.2 \times$ length of rami. *Second uropod* (Fig. 3): peduncle 1.2 inner rami. *Third uropod* (Fig. 3): peduncle length 0.37 outer ramus, about same length as urosomite 3; proximal article with 6 medial and 6 lateral transverse spine-setae; inner ramus length 0.33 of outer. *Telson* (Fig. 4): about as long as urosomite 3; fully cleft; apices strongly setose, dorsum of each lobe with one spine and numerous setae, several of these basal and basolateral setae extending to M.40.

Description of other material. Specimen “t” (Figs 1–4): male; length 7.70 mm; like female but article 5 of antenna 2 (Fig. 1) with 4 calceoli, basal articles past article 1 of flagellum each with calceolus (antennae of available males otherwise broken). Propodi of gnathopods (Fig. 2) expanded, carpi shortened, medial defining spines of palm 4, lateral 6. Coxa 4 (Fig. 2) more strongly produced but not as strongly as in *A. multispinatus*. Peduncle of uropod 3 (Fig. 4) with 3 apicolateral spines (only 2 showing in figure), with 6 ventral spines (not

shown); inner ramus reaching to M.60 on outer ramus, apex with 2 hooked spines, medial margin widely setose, article 1 of outer ramus with number of spine-setal ranks much reduced (but body length of male much shorter than in female), medial base more widely setose. Five lateral setae (or setal positions, one positions with 2 setae) on each side.

Specimen “r”: female; 9.00 mm; spines on article 5 on pereopod 3 = 5–1–1, on pereopod 4 = 5–1–2–1–0 (last position bearing seta only); total spines on left article 2 of pereopod 3 (proximal to distal) = 2–2–2–2–2, on right pereopod 3 = 1–2–2–1–2, on left pereopod 4 = 2–2–3–3–2.

Specimen “v”: female, 10.70 mm, spines on one side of pleonites 4–6 = 5–4–3.

Specimen “u”: male, 5.91 mm, coxa 4 illustrated for varietal shape.

Specimen “w”: juvenile, 4.95 mm, urosome (Fig. 3) spine counts on one side of urosomites 4–6 = 2–2–2 or 3–4–2 (variable).

Illustrations. The lower lip and maxilliped are like *A. australis* but the maxilliped is even more setose and spinose.

Relationship. Differing only slightly from *A. multispinatus* and perhaps a subspecies of it. The two taxa are separated by a distance of 800 km. *Austrogammarus telsosetosus* differs from *A. multispinatus* in the slightly larger count of dorsal spines on the pleonites in adults, the basalwards extension of setation on the telson and the slightly shorter lobe on coxa 4.

Distribution. South-eastern South Australia just west of border with Victoria, streams (blind, therefore possibly hypogean, living as epigeans only in vicinity of emergent springs).

Toulrabia n.gen.

Etymology. Named for the type locality.

Type species. *Toulrabia willsi* n.sp.

Diagnosis. Pleonites with several dorsal setae. Rostrum weak, lateral cephalic lobes strongly projecting and strong antennal sinus present. Eyes absent.

Antenna 1 elongate, longer than antenna 2, ratio of peduncular articles about 40:28:15, accessory flagellum 2-articulate. Antenna 2 very short, flagellum much shorter than peduncle, calceoli absent.

Ratio of mandibular palp articles about 6:20:15, article 2 poorly setose, article 3 weakly falcate, setae = CDE. Labium lacking inner lobes. Maxillae barely setose medially, inner plate of maxilla 1 subrectangular, with 2 apicomedial setae, outer plate with 9 spines, palps asymmetric, right one with thin apical spines, left one with thick apical cusps fused to segment. Inner plate of maxilla 2 lacking oblique row of setae on face, lacking medial setae.

Coxae 1–4 of medium length, longer than broad, coxae 1–4 lacking posterior spines, coxa 1 not expanded below, coxa 4 weakly excavate posteriorly, coxa 5 much shorter than 4. Gnathopods 1–2 small (in female, male unknown), carpi of medium length, nearly as long as propodi, weakly lobate, meri lacking hyaline lobe, palms weakly (1) to strongly (2) oblique, lacking rugosities, spines not symmetrically bifid, rather with small subapical trigger-like extensions; spines at corner of palm = 1 and 2; long thin setae along palm dense and simple.

Pereopods 5–7 moderately elongate, pereopod 6 longer than pereopod 7, article 2 moderately expanded, elongate-pyriform, posteroventrally lobate on pereopods 5–6, scarcely so on pereopod 7; dactyls of pereopods 3–4 with 1 accessory spinule, of pereopods 5–7 with 3–5 spinules on inner edge besides ordinary setule attached to side of unguiform base.

Coxae 2–6 each with gill, gill 6 not reduced. Thoracic segments 6–7 with anterolateral sternal gills of sausage form, two pairs on sternite 6, one pair on sternite 7; medial gill of each pair on sternite 6 longest, gills of sternite 7 very small. Coxae 2–5 with oostegite, small but broad on coxa 5, very large and broad on coxae 2–4, longer than broad on coxae 2–3, about square on coxa 4.

Uropod 3 poorly extended, peduncle short, outer ramus 1-articulate, slightly longer than peduncle, inner ramus short and scale-like, generally reaching to M.40 on article 1 of outer ramus. Telson shorter than broad, cleft about 60 percent, lobes tumid laterally, with apical spination and setation, no basolateral armaments except for pair of lateral penicillate setules about M.60 on each side.

Additional description. Upper lip uniform, rounded and symmetrical below. Accessory blades (rakers) on mandibles very few (3–4), on right side with interraker plumose seta between each main raker; on right mandible few additional penicillate setae beyond rakers and riding onto base of molar, on left mandible instead with large basal molarial ragged seta besides regular apical molarial seta. Both plates of maxilla 2 with apical setae of medium length; inner plates of maxillae 1–2 and medial and lateral margins of maxilla 2 poorly covered with pubescence. Maxillipedal inner plate very long, with distal row of several plumose setae and 3 blunt naked spines (in groups of 2 and 1), and medial row of plumose setae; outer plate large, with distal row of few plumose setae continuous with medial row of blunt naked tooth-spines; palp articles 2–3 weakly setose laterally, article 2 well setose medially, article 3 lacking organised comb row of spines near base of dactyl, apex barely produced, not rugose. Dactyls of gnathopods with small recumbent inner tooth-spine, with stiff spinules or setules at inner nail articulation line and with additional spinule on inner dactylar margin. Gnathopod 1 without one rastellate seta of article 4 enlarged and scythe-like. Pereopods 3–4 especially short and thin relative to pereopods 5–7. Posterior spine sets on article 6 of pereopods 3–4 evenly spaced. Pleopods similar,

peduncles moderately setose; outer rami extending subequally; basomedial setae on inner rami of pleopods not bifid; retinacula 2, accessory retinacula present. Posteroventral tooth of epimera 1–3 absent, posterior margins smooth and sparsely setulose; some epimera with facial spines near ventral margin. Apicolateral corner of peduncles on uropods 1–2 with 2 and 3 spines (thus with 1–2 ventrally displaced spines), dorsal margins spinose, medial margin of uropod 1 spinose; rami of uropod 1 extending equally, outer ramus of uropod 2 scarcely shortened; uropod 1 lacking basofacial armaments; only inner rami of uropod 2 with 2 spine rows. Medial setae of outer ramus on uropod 3 absent; usually with subdistal peduncular seta(e). Ventrodistal spine on urosomite 1 at base of uropod 1 moderately developed.

Sexual dimorphism. Only female known.

Relationship. This genus closely resembles *Hurleya* but differs in the following ways: (1) it bears C setae on the mandibular palp; (2) it has a short article 1 on the mandibular palp; (3) it has feeble gnathopods in the female; (4) it has four (versus two) sternal gills on pereonite 6; and (5) it lacks article 2 on the outer ramus of uropod 3.

Toulrabia willsi n.sp.

Figs 5–7

Etymology. Named for the explorer William John Wills, 1834–1861.

Type locality. Stream on Mount Toulrab, Stirling Ranges, Western Australia.

Material examined. HOLOTYPE (Western Australian Museum, WAM 15-19), female “a” 6.14 mm, in type series collected 22 December 1965 by D.H.D. Edward. Other material examined (PARATYPES), female “b” 5.64 mm. Six other female specimens in same sample.

Diagnosis. As in the genus.

Description of holotype (female “a”). *Body* (Fig. 5): urosome poorly armed dorsally; length, up to 6.14 mm.

Head (Fig. 5): rostrum obsolescent; eyes absent.

First antenna (Fig. 5): length 0.66 of body, 2.1 second antenna, flagellum longer than peduncle, peduncular article 1 longest, article 3 shortest, setae sparse, flagellum with 23 articles, no calceoli, no aesthetascs; accessory flagellum 2-articulate, articles of primary flagellum uniform, sparsely setulate. *Second antenna* (Fig. 5): length 0.33 body; peduncle longer than flagellum, article 4 longer than 5, articles 3, 4 and 5 with moderate ventral setation, article 3 without dorsomedial spines; flagellum 7-articulate, moderately setose ventrally, lacking calceoli.

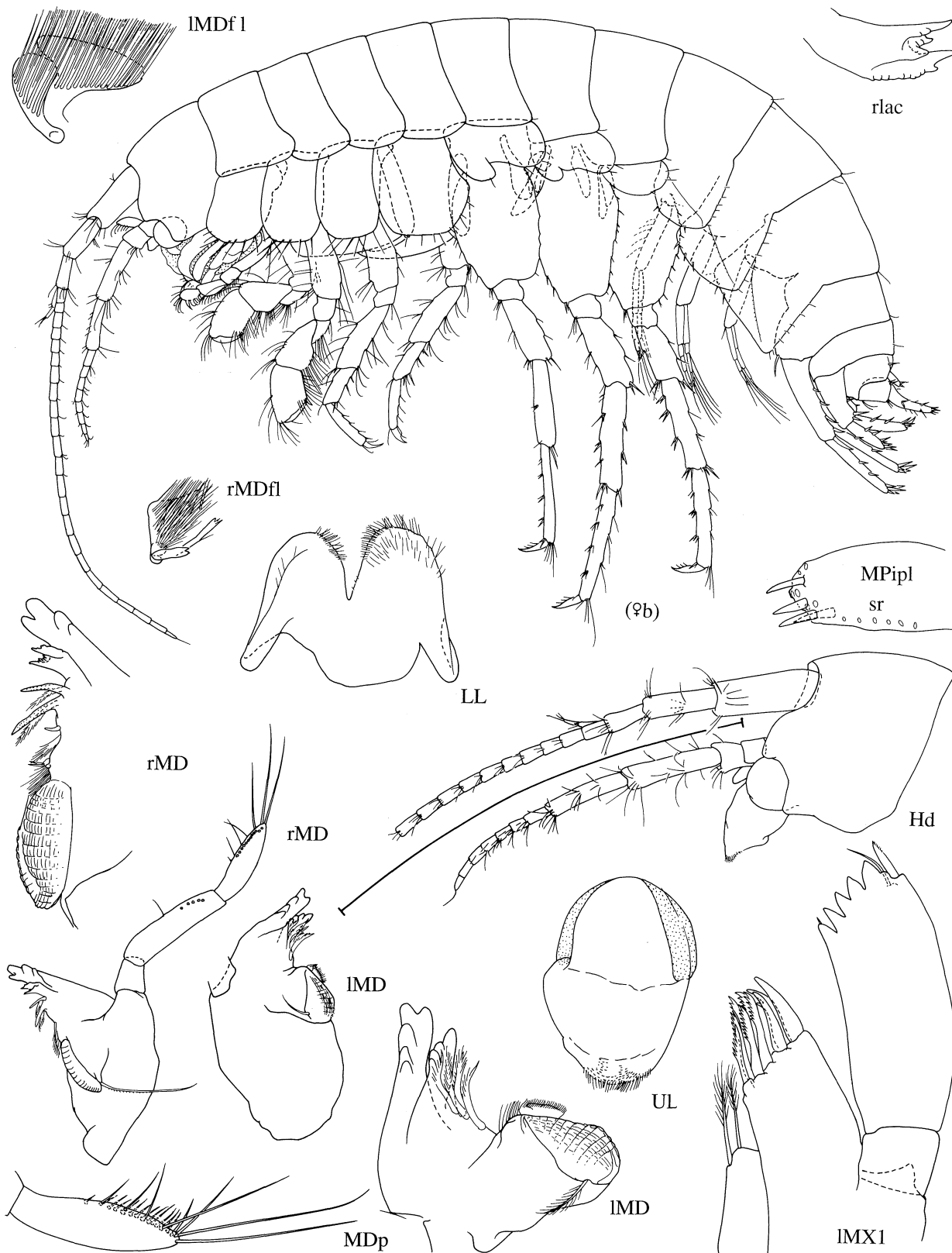


Fig. 5. *Toulrabria willsi* n.sp., holotype, female "a" 6.14 mm (all drawings except those indicated); female "b" 5.64 mm.

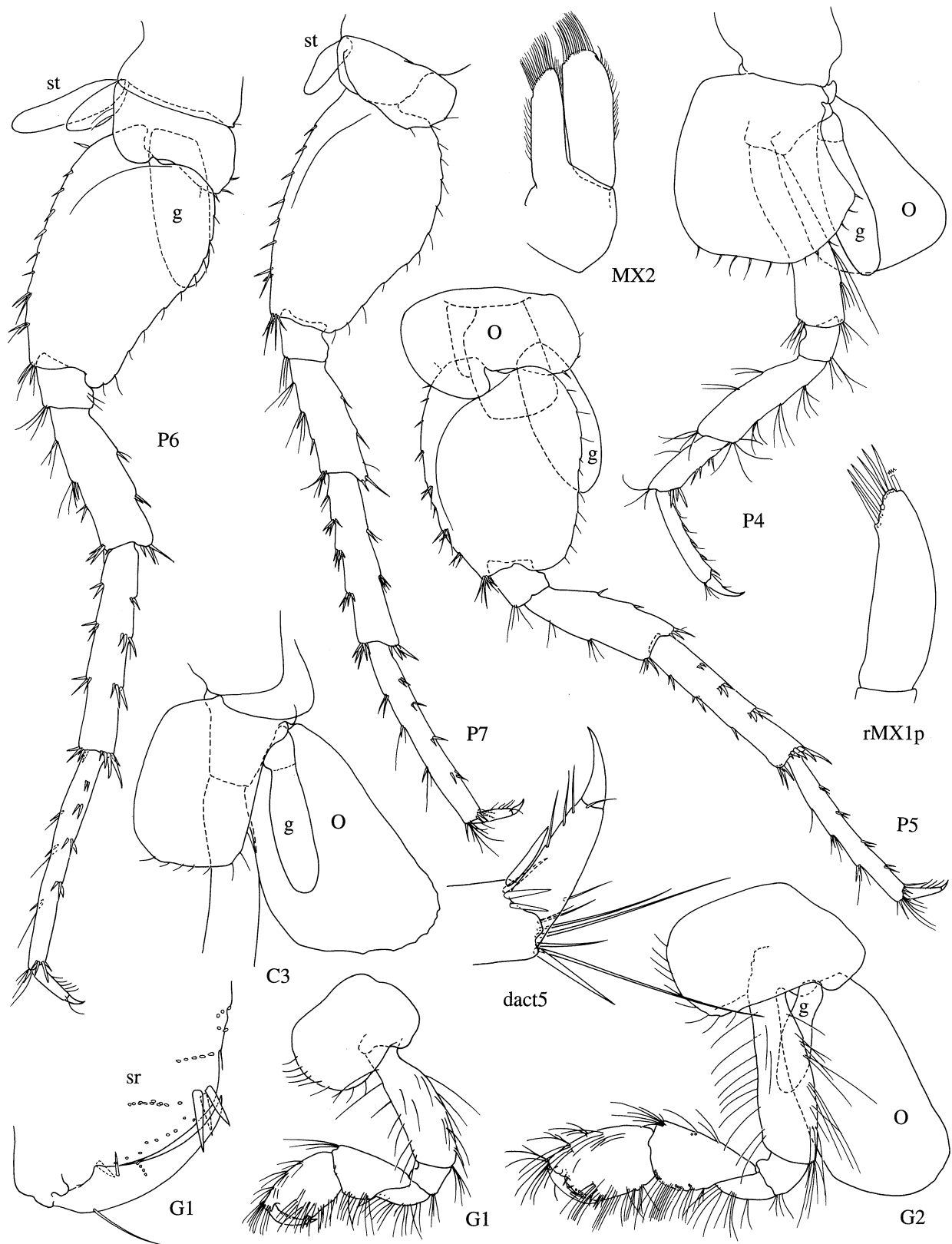


Fig. 6. *Toulrabia willsi* n.sp., holotype, female "a" 6.14 mm.

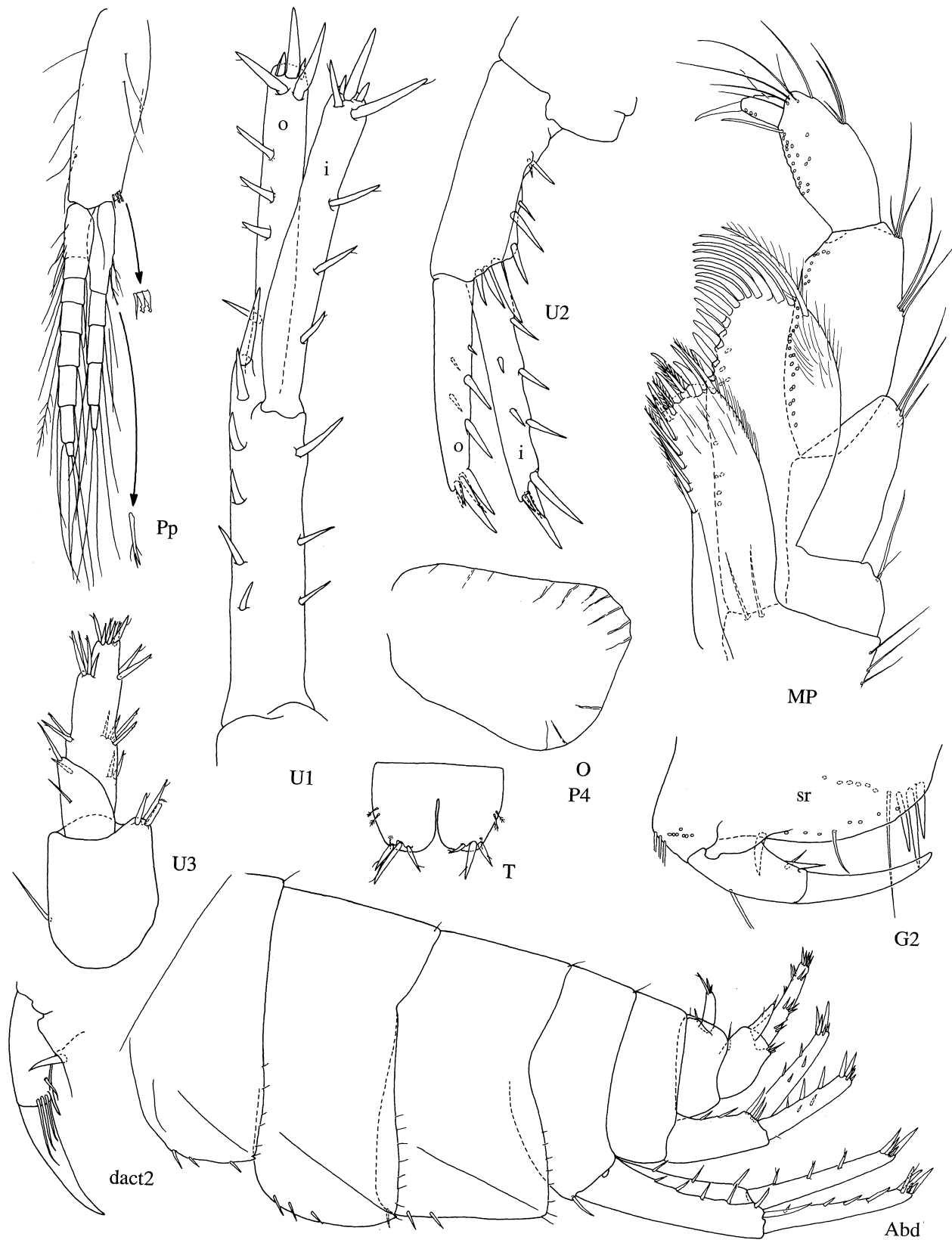


Fig. 7. *Toulrabia willsi* n.sp., holotype, female "a" 6.14 mm.

Upper lip (Fig. 5): apical margin evenly rounded but connection to epistome and epistome itself slightly asymmetrical. *Left mandible* (Fig. 5): palp article 3 shorter than 2, article 2 with 6 medial marginal setae, article 3 with 4C, 14D, 3E; incisor 5-toothed, lacinia mobilis 4-toothed, 4 setose accessory blades; molar bearing distal plumose seta, several penicillate hooked brushy basal setae, other pubescence, and pair of immensely setulate chisel spines. *Right mandible* (Fig. 5): incisor 4-toothed; lacinia mobilis bifid, very broad, each flake denticulate; accessory blades of 2 plumose spines. *Right first maxilla* (Fig. 6): palp article 2 with 7 thin apical spines, outer plate with 9 spines, most denticulate; inner plate with 2 apicomedial setae. *Left first maxilla* (Fig. 5): palp article 2 with 5 thick apical spines mostly fused to segment, one apicolateral thin spine and one subterminal apicolateral facial seta. *Second maxilla* (Fig. 6): outer plate outer apical margin with 1 small spinule, apicomedial margin of inner plate lacking setae. *Maxilliped* (Fig. 7): palp article 3 with ranks of thin setae on inner edge; inner plate (Fig. 5) with 1 ventrofacial spine.

First gnathopod (Fig. 6): coxal plate with short setae apically, without posteroventral spine; article 4 without posterior hump, carpus weakly lobate; propodus subrectangular, longer than wide, posterior edge widely setose, posterolateral angle rounded, with 1 medial and 2 lateral spines, no lateral spine elongate, palm slightly oblique, convex; dactylus reaching end of palm. *Second gnathopod* (Figs 6, 7): similar; palmar corner with 2 lateral and 1 medial spines, coxal plate similarly setose.

Pereopods (Figs 6, 7): coxa 3 with similar setae, coxa 4 emarginate, with similar setae; pereopods 3–4 slightly longer than gnathopod 2, pereopod 3 scarcely longer than 4, article 4 sparsely setose posteriorly, article 5 poorly spinose posteriorly, posterior spine formula = EE-EE-EEE, posterior margin of article 6 on pereopods 3–4 with spine formula of ES-ES-ES-ES-SS and EES-ES-ES-SS; pereopods 5–7 similar, each with 4 locking spines; coxae 5–7 bearing few setae on ventral margin of posterior lobes, article 2 weakly expanded and lobate posteroventrally, lobe obsolescent on pereopod 7, bearing thin medium to short posterior setae; dactyls of pereopods 3–7 with accessory spine formula of 1-1-3-5-4. Gills of coxae 2–6 sausage shaped, of pereopod 6 not reduced. Oostegites (Fig. 7) lacking setae except for tiny apicomarginal pits.

Sternal (gills) processes: segments 6–7 with sausage-shaped sternal gills in formula of (on one side) 2-1, gills attached to front of lateral edge of segment, pair of gills on sternite 6 arranged transversely, lateralmost gill shorter.

Epimera (Fig. 7): each epimeron posteroventrally quadrate, posterior margins scarcely convex, smooth and setulose, each epimeron with 3 ventral spines and lateral oblique ridge. *Pleon*: each dorsolateral posterior margin of pleonites 1–6 with following setal-spine formula (s=side, t=top): 1 = Es, 2 = Es, 3 = Es, 4 = Es, 5 = 0, 6 = EtSs; uropod 3 (Fig. 5) not extending beyond uropods 1 and 2 in entire animal, uropod lengths relative

to uropod 1: uropod 2 = 0.66, 3 = 0.50. *Pleopods* (for specimen "b"): retinacula 2 per pleopod, one accessory; peduncles each with 5+2, 6+2+2+2, and 4+2 setae, rami extending equally, outer with 8-7-6 articles, inner with 5-5-5 articles, setae on basal articles = 7-1-1-3, 5-1-1-2, 3-2-1-2, none bifid.

First uropod (Fig. 7): peduncle length 1.3 rami; outer margin with 1 apicodistal spine besides row of 5 dorsal spines, with 3 medial spines; rami of subequal length, both rami with 1 row of marginal spines. *Second uropod* (Fig. 7): peduncle about $1.0 \times$ length of inner ramus, with 3 apicodorsal spines, 2 dorsolateral spines, medial margin with 3 spines, basalmost small; outer ramus subequal to inner, both with 2 rows of marginal spines in formula of 3-2, apices of rami on uropods 1–2 with 5 spines. *Third uropod* (Fig. 7): peduncle length 0.80 outer ramus, longer than urosomite 3, with subdistal seta besides apical cluster of 3 spines; outer ramus proximal article with several irregular spine ranks, article 2 absent; inner ramus length 0.40 of outer, with 1 apical spine. *Telson* (Fig. 7): broader than long, shorter than urosomite 3; cleft 60 percent of its length; apices each with 3 spines in facial notches, 1 apicolateral setule, each lobe with pair of penicillate setules dorsolaterally at M.60.

Distribution. Western Australia, Stirling Ranges.

Uroctena Nicholls

Uroctena Nicholls, 1926: 106.

Type species. *Uroctena affinis* Nicholls, 1926, by original designation (not = *Neoniphargus westralis* Chilton, 1925).

For the generic diagnosis, additional description, characters of interspecific value, sexual attributes, and relationships, see Williams & Barnard (1988: 90–91).

Speciation. The new material at our disposal does not allow us to expand on our previous remarks concerning the extent and nature of speciation within the genus (Williams & Barnard, 1988: 90). Thus, we retain as valid the several species of *Uroctena* so far described despite the small differences between them. There is no doubt, however, that *Uroctena setosa* is very distinct from the group of *U. westralis* – *affinis* – *whadjukia* – *yellandi*.

Composition. With our description of a new species of *Uroctena*, the genus at present contains five species: *U. affinis* Nicholls, *U. westralis* (Chilton), *U. setosa* Nicholls, *U. yellandi* Nicholls and *U. whadjukia* n.sp. A new key to enable separation of these species is given below.

Key to the Species of *Uroctena*

1. Antennae 1–2 densely setose, setae long and drooping, telson cleft halfway, gnathopods of both sexes bearing long anterior setae on carpus and propodus, article 2 of male gnathopod 2 lacking stout spines *U. setosa*
- Antennae 1–2 poorly setose, setae short and stiff, telson cleft 75+ percent, gnathopods of both sexes lacking long anterior setae on carpus and propodus, article 2 of male gnathopod 2 with stout spines 2
2. Article 2 of male gnathopod 2 with stout anterior spines 3
- Article 2 of male gnathopod 2 with thin anterior spines or setae 4
3. Article 2 of male gnathopod 2 with 4 sets (3–4 each) of posterolateral spines *U. affinis*
- Article 2 of male gnathopod 2 with 2 sets (2 each) of posterolateral spines *U. whadjukia*
4. Article 2 of male gnathopod 2 with about 10–14 lateral spines, eyes absent (and young of *U. affinis*) *U. westralis*
- Article 2 of male gnathopod 2 with about 6–8 lateral spines, eyes well developed but white (and young of *U. affinis*) *U. yellandi*

Uroctena whadjukia n.sp.

Figs 8–13

Etymology. From the principal, original Aboriginal tribe of south-western Australia.

Type locality. Wungong System, Chandler Road, creek draining granite outcrop, stop 2.

Material examined. HOLOTYPE (Western Australian Museum, WAM 16-95), male “g” 7.1 mm, in type series collected 16.7.82 by C.M. Austin and B. Knott. ALLOTYPE (Western Australian Museum), female “h” 3.60 mm. Other material (PARATYPES) examined, juvenile “j” 1.17 mm, male “k” 7.19 mm. Ten other adults and ten other juveniles in same sample.

Diagnosis. Eyes not visible in preserved specimens. Setae of antennae 1–2 sparse and short; male antenna 2 weakly pediform, about 1.5 times as thick as antenna 1; propodus of male gnathopod 1 lacking stout posterior spines; article 2 of male gnathopod 2 with about 4 stout posterolateral facial spines in 2 sets and about 3–9 medium-stout anterior spines plus up to 8 setae in specimens with fewer than 5 spines; gnathopods of both sexes not setose as noted in description of *U. setosa*; telson cleft 70+ percent, each apex with 1 spine and 2–3 setae, each dorsum or lateral edge with 3 setae.

Description of holotype (male “g”). Body (Fig. 9): urosome moderately armed dorsally; length, 7.1 mm.

Head (Fig. 9): rostrum small; eyes in death absent.

First antenna (Figs 8, 9): length 0.6 of body, 1.45 second antenna, flagellum longer than peduncle, peduncular article 1 longest, article 3 shortest, setae sparse, medial face of article 1 with armament formula of SS-eSS-SS-e, flagellum with 24 articles, each article commencing at article 6 with tiny aesthetascs; accessory flagellum 5-articulate, reaching end of article 5 of primary flagellum, articles uniform, sparsely setulate.

Second antenna (Figs 8, 9): length 0.40 body; peduncle longer than flagellum, article 4 longer than 5, articles 3, 4 and 5 with moderate ventral setation, article 3 with 3 dorsomedial spines; flagellum 9-articulate, well setose ventrally, lacking calceoli.

Upper lip: apical margin evenly rounded but connection to epistome and epistome itself slightly asymmetrical. **Left mandible** (Figs 8, 11): palp article 3 shorter than 2, article 2 with 9 medial marginal setae, article 3 with 2A, 2B, 3C, 2 D, 6E; incisor 5-toothed, lacinia mobilis 4-toothed, 6 setose accessory blades; molar bearing plumose seta, several penicillate hooked brushy basal setae, other pubescence, and one chisel spine. **Right mandible** (Figs 8, 9): incisor 4-toothed; lacinia mobilis not bifid, very broad, partly divided into 2 flakes, denticulate; accessory blades of 2 plumose spines, setae of palp article 3 with 2A, 2B, 2C, 6D, 5E. **Left first maxilla** (Fig. 9): palp article 2 with 6 thin

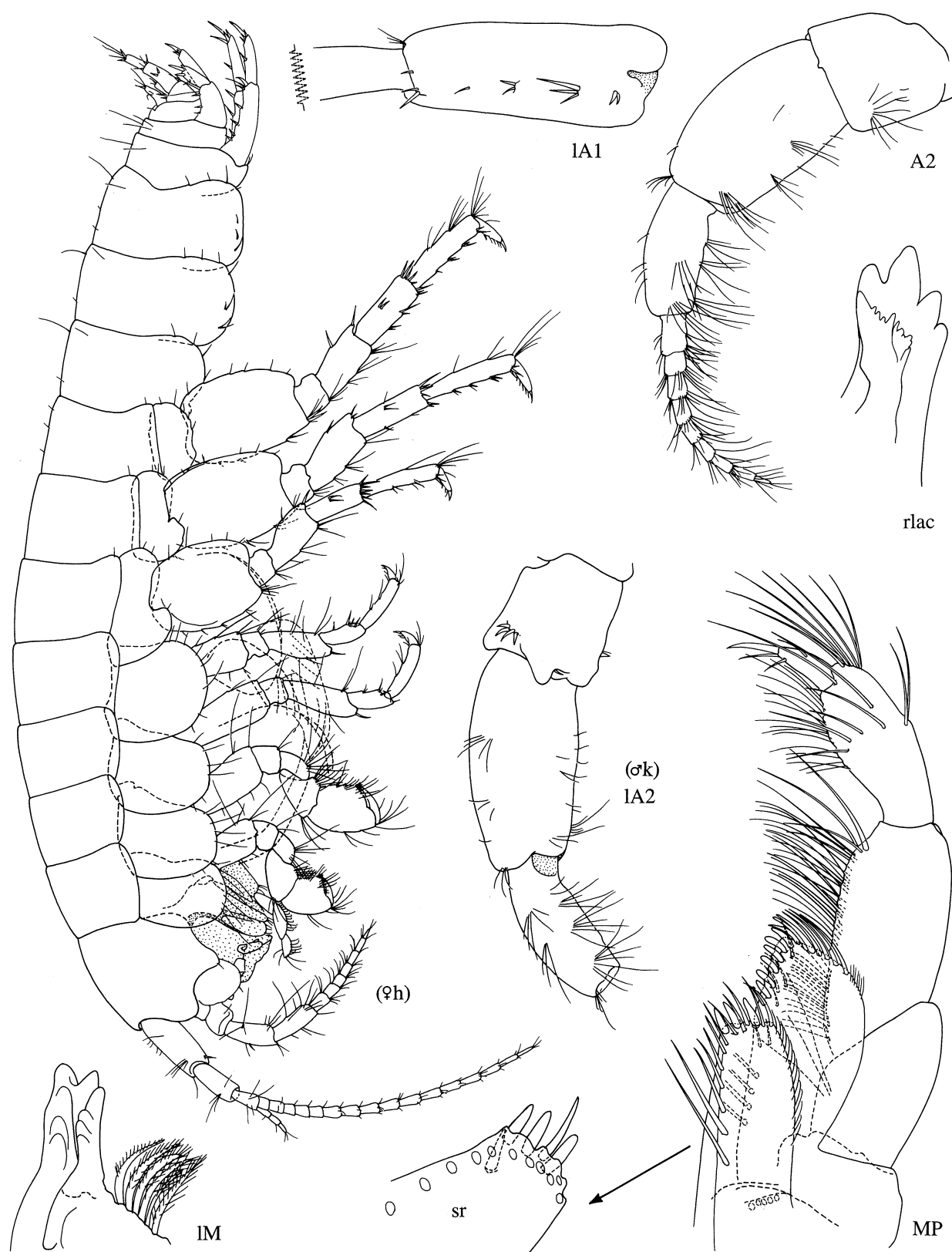


Fig. 8. *Uroctena whadjukia* n.sp., holotype, male "g" 7.09 mm (all drawings except those indicated); female "h" 3.60 mm; male "k" 7.19 mm.

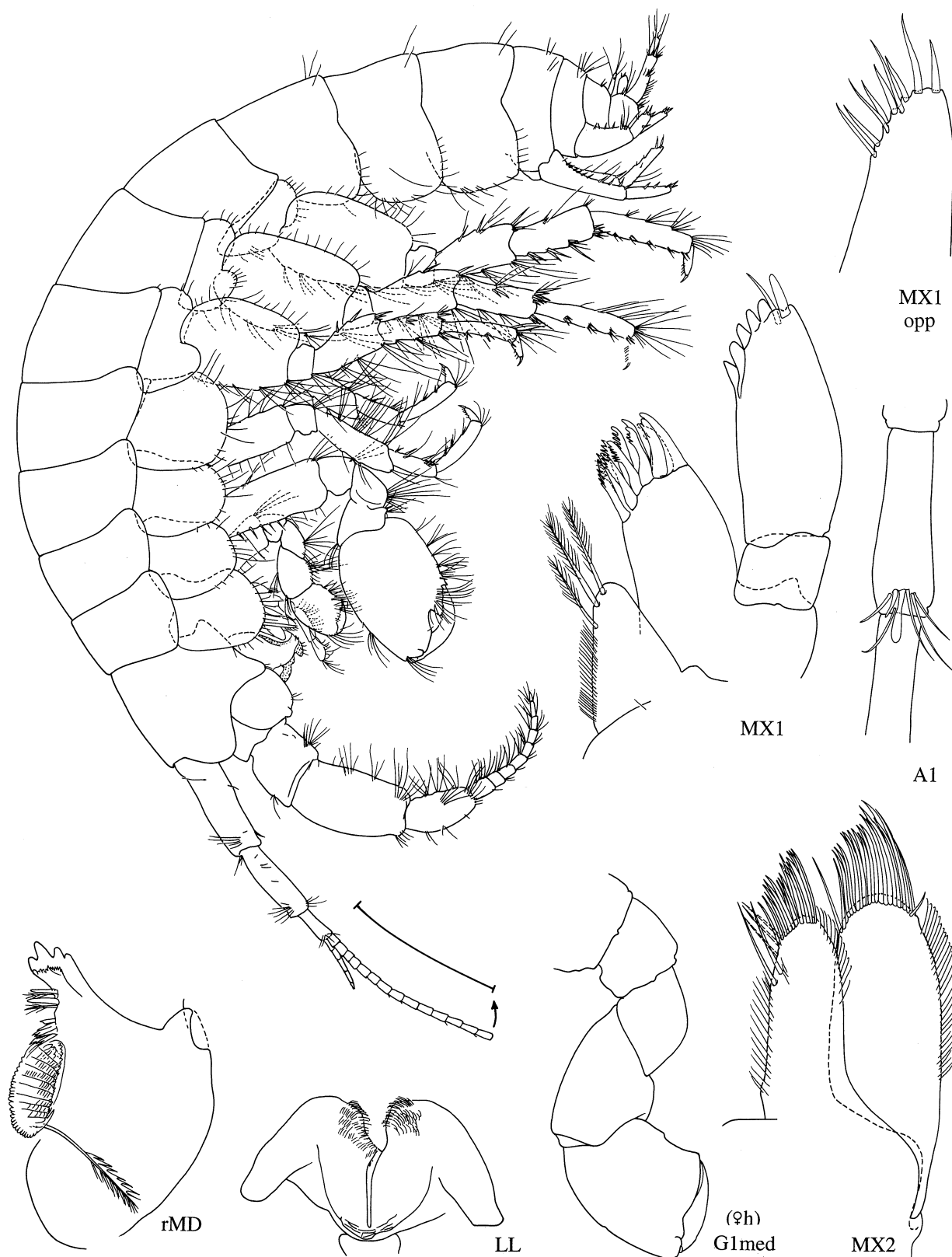


Fig. 9. *Uroctena whadjukia* n.sp., holotype, male "g" 7.09 mm (all drawings except those indicated); female "h" 3.60 mm.

apical spines and 3 barely subterminal facial setae, outer plate with 11 spines, most denticulate; inner plate with 3 apicomedial setae. *Right first maxilla* (Fig. 9): palp article 2 with 5 thick apical spines partly articulated to segment, one apicolateral thin seta. *Second maxilla* (Fig. 9): outer plate outer apical margin with 1 small spinule, apicomedial margin of inner plate with 2 weakly submarginal thick setae. *Maxilliped* (Fig. 8): palp article 3 with ranks of thin setae on inner edge, apical part with rank of 5 thicker setae, apex not strongly produced, not rugose; inner plate with 3 thick spines and several plumose setae apically, long medial row of plumose setae, and 1 ventrofacial spine.

First gnathopod (Figs 10, 11): coxal plate with long and short setae apically, with 1 posteroventral spine; article 4 without posterior hump; carpus well developed and longer than in *U. westralis*, narrow and not lobate; propodus subrectangular, longer than wide, posterolateral angle rounded, posterior edge with 3 acclivities and 3 sets of setae, with 1 medial and 3 lateral spines, no lateral spine elongate, palm slightly oblique, convex; dactylus reaching end of palm. *Second gnathopod* (Fig. 10): enlarged; article 2 with 3 medium anterior spines, posterolateral face with 4 spines in 2 sets, article 5 short and lobate, article 6 hugely ovato-rectangular, palm oblique, sculptured, palmar corner with 1 lateral and 1 medial spines, posterior margin near corner without spines; dactyl strongly curved, fitting palm; coxal plate well setose, with one posteroventral spine.

Pereopods (Figs 9–12): coxa 3 with long setae and one posteroventral spine, coxa 4 barely emarginate, with 4 anteroventral, 11 posterior setae and 2 posteroventral spines; pereopods 3–4 not longer than gnathopod 2, pereopod 3 scarcely longer than 4, article 4 well setose posteriorly, article 5 poorly setose posteriorly, posterior spine formula = eS-ESS-4S and EE-SS4S, posterior margin of article 6 on pereopods 3–4 with spine formula of ES-ES-ES-SS and ES-ES-ESS-SS; pereopods 5–7 similar, each with 3 locking spines and locking seta; coxae 5–7 bearing spines or setae on ventral margin of both lobes, article 2 expanded and lobate posteroventrally, bearing thin medium to long posterior setae; dactyls of pereopods 3–7 with spine formula of 4-4-4-6(6), pereopod 7 internal formula = 1-1-2-2, thus spines doubled only on pereopod 7. Gills of coxae 2–6 sausage shaped, of pereopod 6 not reduced.

Sternal (gills) processes (Fig. 12): segments 2–7 with sausage-shaped sternal gills in formula of 1-1-1-2-2-2, gills on segments 2–6 central, on segment 7 attached to front of lateral edge of segment.

Epimera (Figs 9, 13): each epimeron posteroventrally rounded, posterior margins convex, notched and setose, setae long, epimeron 1 with 1 ventral seta, epimera 2–3 with setal formula of 1-2-2-2 and 1-3-2-1-1. *Pleon* (Figs 9, 13): each dorsolateral posterior margin of pleonites 1–6 with following setal formula (s=side, t=top): 1 = st; 2 = st; 3 = st; 4 = 2s, t; 5 = 2s, 3t; 6 = 2t; uropod 3 strongly extending beyond uropods 1 and 2 in entire animal, uropod lengths relative to uropod 1: uropod 2 = 0.75, 3 = 0.80. *Pleopods* (Fig. 12):

retinacula 2 per pleopod, no accessories; peduncles each with 19–19–30 setae, rami extending equally, outer with 13–15, 11, 10 articles; inner with 10–11, 9, 9 articles; setae on basal articles = 4-1-1-3, 4-2-1-3, 2-11-2, none bifid, variable on pleopod 1 on right and left members (formula averaged).

First uropod (Fig. 13): peduncle length 1.5 rami; outer margin with 1 apicodistal spine besides row of 10 dorsal spines and one seta between spines 8 and 9, with 1 apical spine medially and row of 4 setae; rami of subequal length, both rami with 2 rows of marginal spines or setae in formula of SS-SS and E-SS, outer ramus with 4 apical and inner ramus with 5 apical spines. *Second uropod* (Fig. 13): peduncle about 1.5 length of inner ramus, with 5 dorsolateral spines, no apical, medial margin with 2 basal setae in tandem and one large curved apically barbed hook-spine; outer ramus shorter than inner, both with 2 rows of marginal spines in formula of S-S and S-eS, apices with 4 and 5 spines. *Third uropod* (Fig. 13): peduncle length 0.50 outer ramus, as long as length of urosomite 3, with several lateral ranks of subdistal setae besides apical cluster of 4 setae and 3 spines, apicomedial corner with spine and seta; outer ramus proximal article with outer (but turned ventrally) comb-row of 12 bifid setae, with transverse lateral spine-seta row on body (3S, 2E), medial margin of apex with 4 spines, lateral margin with 2 spines and 4 setae, apex of large article 2 with 4 apical spines and 3 setae; inner ramus length 0.37 of outer, with 2 apical spines. *Telson* (Fig. 13): broader than wide, shorter than urosomite 3; cleft 70 percent of its length; apices each with spine in lateral notch, 2–3 apical and 1 apicolateral setae, each lobe with 2 dorsomedial setae and each lobe with pair of penicillate setules dorsolaterally at M.55.

Description of allotype (female “h”). *Body* (Fig. 8): length, 3.60 mm. Like male but antennae shorter, antenna 2 short and slender, article 5 almost as long as 4; head sinus smaller; coxae slightly taller, coxal setae slightly sparser, bilobation of coxa 7 weaker; gnathopod 2 (Fig. 10) small, similar to but slightly larger than gnathopod 1 (Fig. 9), carpi of gnathopods 1–2 shorter than on male gnathopod 1, lobation distinct on female gnathopod 2, latter with only 1 medial spine, 1 lateral defining spine on palm; oostegites of coxae 2–3 (Fig. 10) large, ovate, of coxa 4 smaller, of coxa 5 very small. Sternal gill formula distinctive (Fig. 12), segments 2–4 each with pair of more or less central gills, segments 5–6 each with 2 pairs, each pair lateral, and segment 7 with 1 pair, each member attached laterally. Armaments of epimera (Fig. 13) short and several comprising spines, formula of epimera 1–3 = E--ES, EE--S, S, e; uropod 3 (Fig. 13) relatively smaller than in male, subdistal armaments sparser, ventrolateral comb of outer ramus absent, replaced by pair of spines in notch, but apex of article 2 better developed, with 7 spines and 3 setae; telson (Fig. 13) more embryonic in appearance, apical spine on each lobe more central, setae fewer but dorsomedial setal pair relatively more basal.

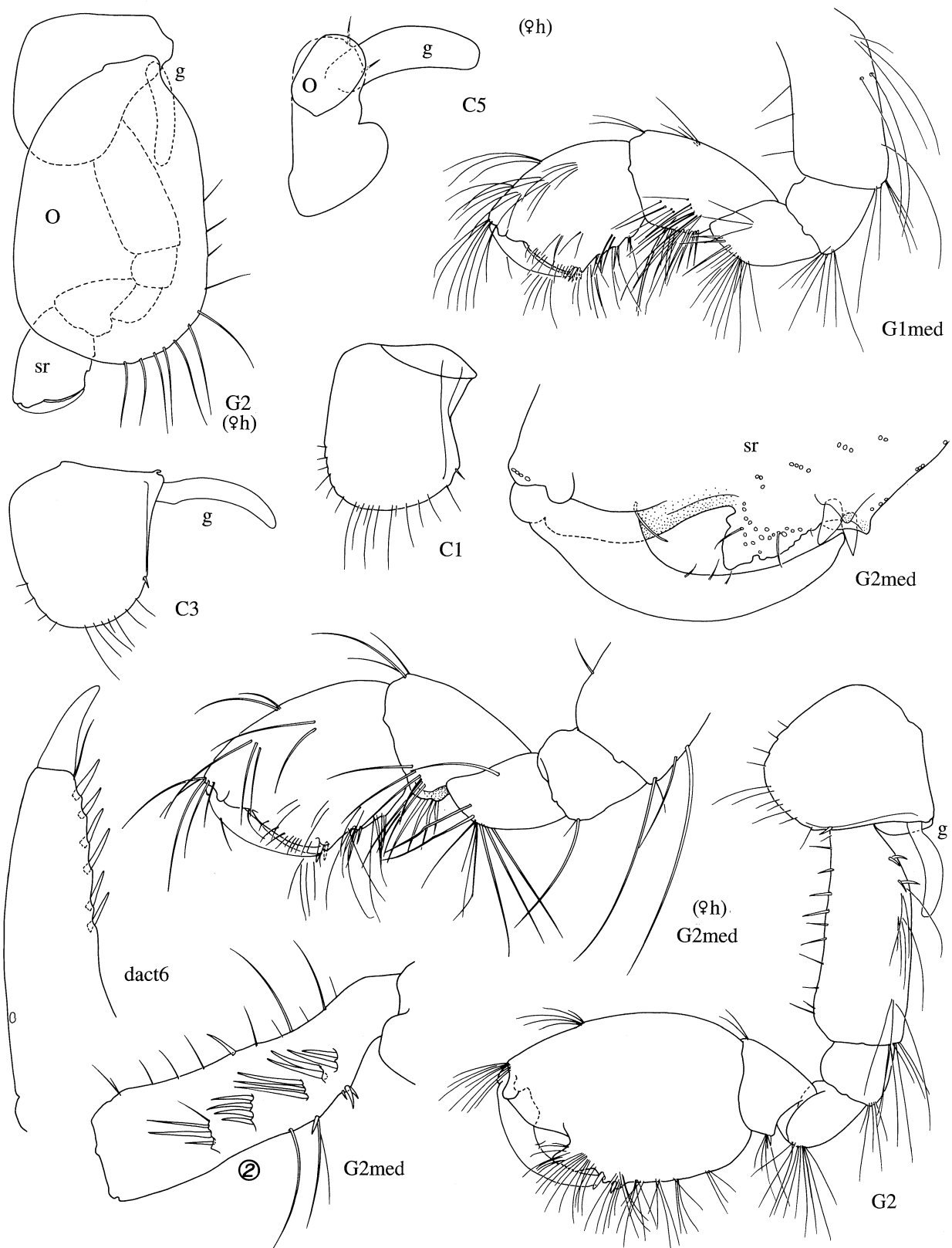


Fig. 10. *Uroctena whadjukia* n.sp., holotype, male "g" 7.09 mm (all drawings except those indicated); female "h" 3.60 mm.

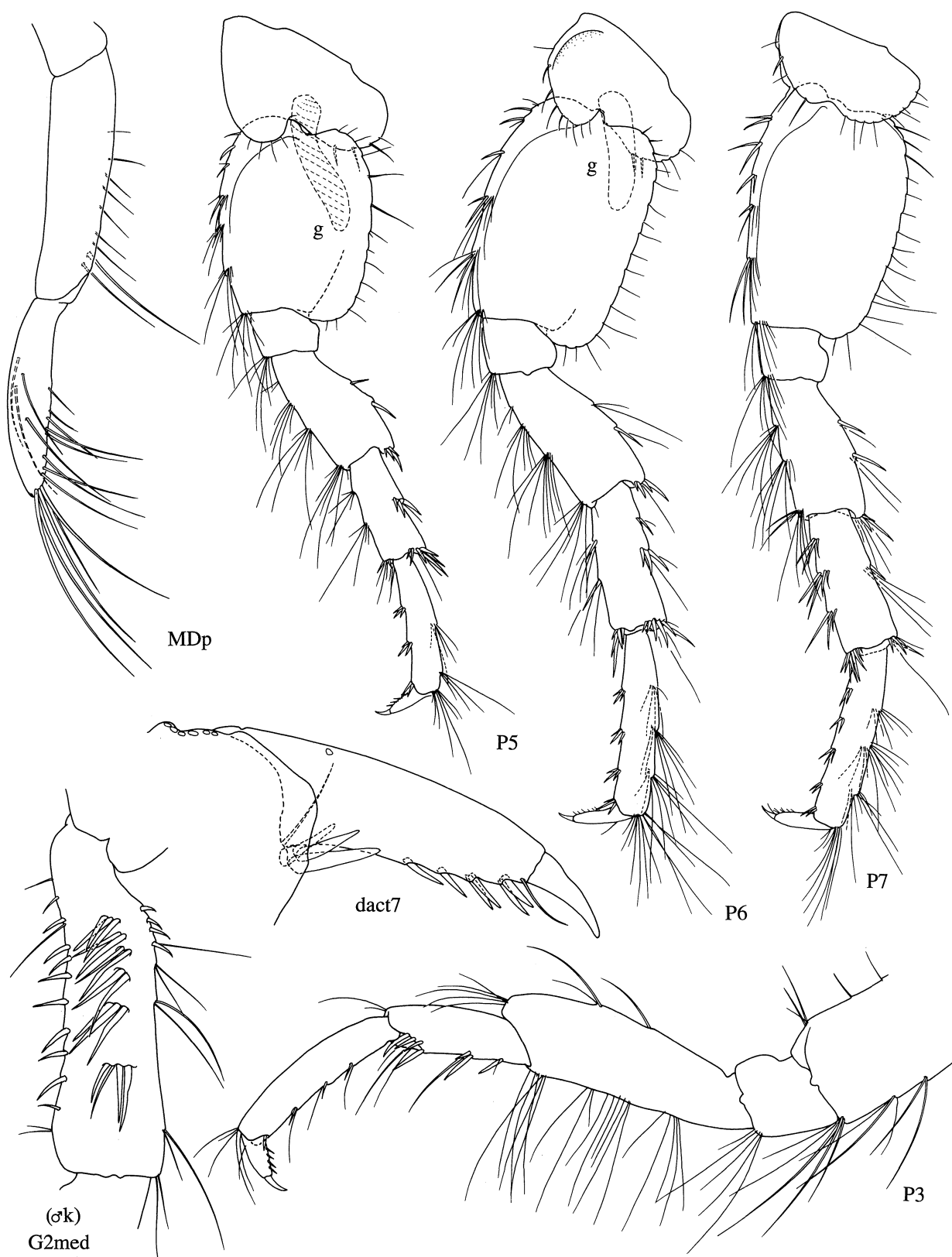


Fig. 11. *Uroctena whadjukia* n.sp., holotype, male "g" 7.09 mm (all drawings except those indicated); male "k" 7.19 mm.

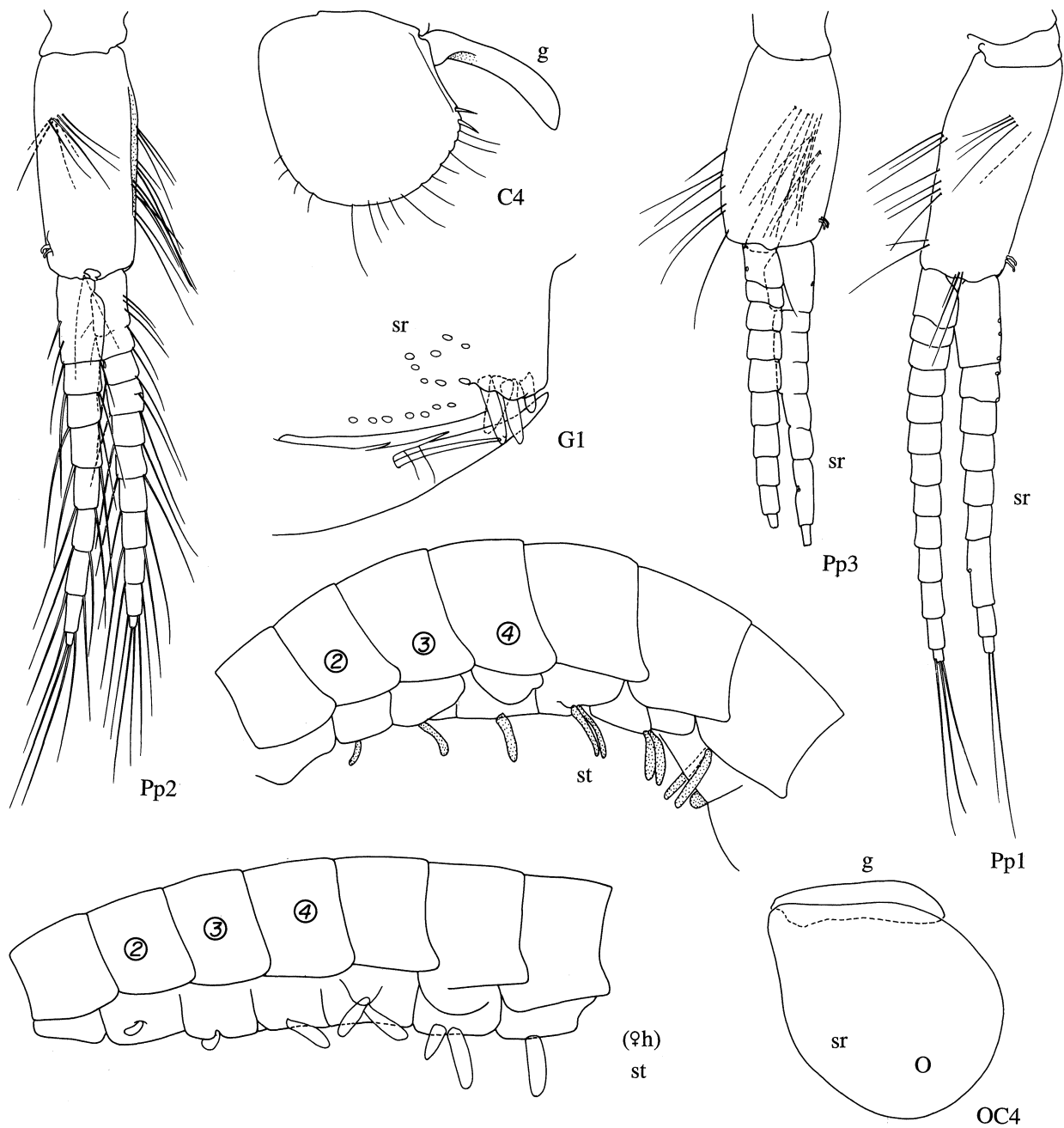


Fig. 12. *Uroctena whadjukia* n.sp., holotype, male "g" 7.09 mm (all drawings except those indicated); female "h" 3.60 mm.

Additional notes of minor items: mandibular palp article 2 with 4 setae, article 3 formula = 3A, 3B, 3D, 5E, left rakers 6; left maxilla 2 palp with 5 thin apical spines and 2 setae; armament formulae on article 5 of pereopods 3 and 4: SS-S-SS and SS-S-SSS, on article 6 = E-ES and ES-ES-SS, dactyls each with 2 spines; locking spines on pereopods 5-7 = 3S+E, dactylar spines = 2-2-4. Formulae on pleopods 1-3: articles of outer rami = 7-7-5, inner rami = 5-5-4, setae on each

peduncle = 5-3-5, setae on outer and inner basal articles of outer and inner rami of pleopods 1-3 = 3-1-1-3, 2-1-1-2, 1-1-1-2, outer rami shorter than inner. Posteroventral spines on urosomite 1 = 2; uropodal spine and setal formulae: uropod 1 peduncle dorsolateral = S-S-S-S-SES, medially = E--S, outer ramus of uropods 1-2 lateral and medial spines = 1-1 and 0-1, inner ramus = 0-1 and 0-0, apical spines of outer and inner rami of uropods 1-2 = 4-5 and 4-5.

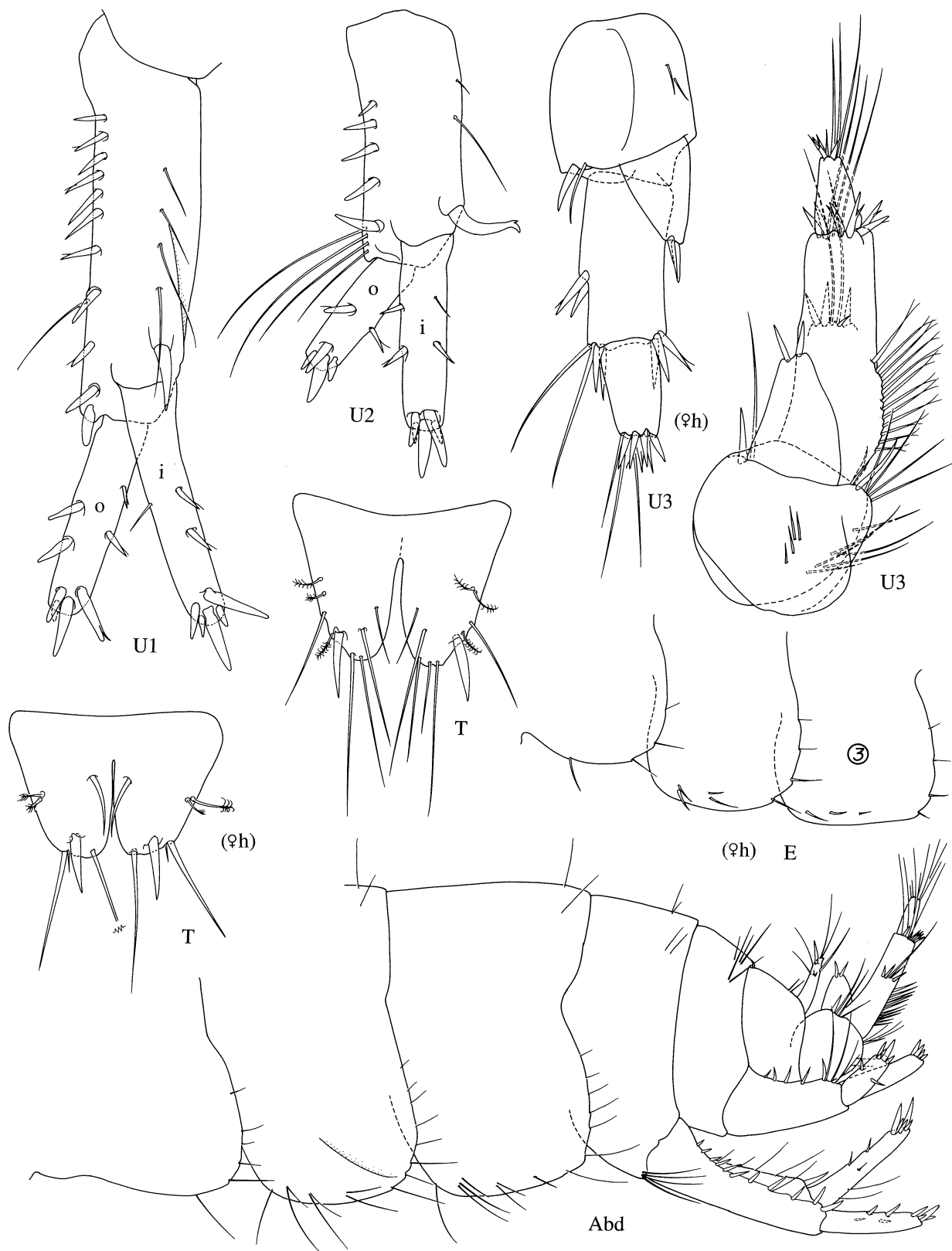


Fig. 13. *Uroctena whadjukia* n.sp., holotype, male "g" 7.09 mm (all drawings except those indicated); female "h" 3.60 mm.

Description of other material. Specimen “k” (Figs 8, 11): male, length 7.19 mm. Slightly more advanced than male “g”, pattern of spines on article 2 of gnathopod 2 slightly distinctive (see Fig. 11). Flagellum of antenna 1 with 21 articles, of antenna 2 with 10, calceoli absent. Pereopods 5–6 each with 4 locking spines and one seta, of pereopod 7 with 3 locking spines and one seta. Dorsolateral margin of peduncle on uropod 1 with 12 spines and 2 setae, of uropod 2 with 6 spines and 5 setae.

Specimen “j” is hatchling in brood pouch of female “h”. Generally appearance embryonic, body and appendages of swollen appearance, rostrum absent; accessory flagellum 2-articulate, large; flagellar articles of antenna 1 = 5, of antenna 2 = 4; setae of coxae 1–4 = 2-1-1-2; palmar defining spines of gnathopods 1–2 = 1 lateral seta, 1 medial seta and spine; spine formula on article 5 of pereopod 4 = 0-1-1, on article 6 = 0-2; locking spines on pereopods 3–7 = 2, on pereopod 5 but less so on pereopods 6–7 one spine about two-thirds as long as dactyl, all dactyls with 1 seta and one spine; setae on pleonites 1–4 = 2 on each side and 1 fully dorsal; on pleonite 5 = 1 lateral each side and 1 fully dorsal; absent on pleonite 6; all rami of pleopods 1–3 with 2 articles each; epimera 1–3 each with only 1 seta each at posteroventral corner; formulae on uropod 1 peduncle apicolateral = 1, uropod 2 = 1; rami of uropods 1–2 lacking marginal spines, all with 4 apical spines each; peduncle of uropod 3 lacking spines, inner ramus with 1 apical spine, article 1 of outer ramus with 1 apicomedial and 1 apicolateral spine, article 2 with 2 medium and 1 short apical setae; each lobe of telson with 1 apical spine, 1 apicolateral penicillate setule and 2 dorsolateral penicillate setules.

Relationship. This species differs from the type species of the genus, *U. affinis*, in the much smaller number of posterolateral spines on article 2 of male gnathopod 2; *U. affinis* bears four sets of three to four each, whereas this species has two sets of two each. In this species there are also no spines on gnathopod 2 propodus besides the defining spines, and the dactyl of gnathopod 1 reaches the apex of the palm. Note that many items of *U. affinis* are unknown such as setation sizes and patterns on pereopods, uropods, epimera, and medial antenna 1.

Distribution. Western Australia, Wungong System, creek.

Uroctena setosa Nicholls

Figs 14–17

Uroctena setosa Nicholls, 1926: 107–108, pl. 12, figs 1–6, pl. 13, figs 7–9.—Straskraba, 1964: 128–130, figs 4–5.—Williams & Barnard, 1988: 100–103, figs 58, 59.

As previously indicated (Williams & Barnard, 1988: 100), we do not accept Straskraba's (1964) amplified

description of this species; his amplification was not based on material from the type locality and he provided no evidence that the material he described did in fact agree with the material described by Nicholls (1926). Our own previous redescription was based on the text and drawings of Nicholls (1926) and we reserved judgement on whether material in the Western Australian Museum (WAM 478-86 [1 slide], 481–86 [3 slides], all in poor condition) represents type material. We still do. Our description, in the circumstances, was less than complete and contained many indications of where further information was required. We have now been able to procure additional material from the Western Australian Museum from the Nicholls collection. This is in good condition and we judge it to be conspecific with the taxon described by Nicholls (1926) as *U. setosa*. Its description enables us to clarify many points of uncertainty.

Material examined. WAM 93-74, “From either Kalamunda Mundaring Swan R or Moora Prof Nicholls coll, n”, 11 specimens, including male “c”, 7.59 mm (illustrated), female “d”, 5.50 mm (illustrated), male “e”, 3.91 mm and male “f”, 3.37 mm.

Description (male “c”). *Body:* urosome well armed dorsally; length, 7.59 mm.

Head (Fig. 14): rostrum obsolescent; eyes absent.

First antenna (Fig. 14): length 0.40 of body, 1.1 length of second antenna; peduncular article 1 longest, article 3 shortest, setae sparse; flagellum 1.4 as long as peduncle, poorly setose, primary flagellum with 18 articles, accessory flagellum 4-articulate, reaching to article 5 of main flagellum. *Second antenna* (Fig. 14): length 0.37 body, almost pediform; peduncle longer than flagellum, article 4 scarcely longer than 5, articles 3, 4 and 5 with dense ventral setation; flagellum 9-articulate, densely setose, lacking calceoli.

Left mandible (Figs 14, 17): palp article 3 shorter than 2, article 2 with 14 inner marginal setae, article 3 with 1A, 1B, 3D, 9E setae; incisor 4-toothed, lacinia mobilis 4-toothed, 3 or 4 (badly preserved) setose accessory blades and 3 interrakers; molar (Fig. 17) bearing short plumose seta, 2 large distal (towards incisor) hooked brushy comb setae and 3 proximal (away from incisor) detached flake-pods. *Right mandible* (Fig. 14): incisor 4-toothed; lacinia mobilis bifid, denticulate, one denticulation moderately extended; accessory blades of 1 (probably aberrant) plumose spine, setae of palp article 3 = 1A, 1B, 3D, 9E. *Left first maxilla:* palp article 2 with 6 thin apical and medial spines and 3 subterminal facial setae, outer plate with 11 spines, most denticulate; inner plate with [?] apical setae (maxillae 1–2 badly eroded or encrusted, unable to analyse fully or illustrate). *Right first maxilla:* palp article 2 with 5 thick apical spines mostly fused to segment, 1 apicolateral thin spine and 1 subterminal apicolateral facial seta. *Second maxilla:* outer plate apicolateral face with 1 thick spinule, apicomedial corner of inner plate with 2 weakly submarginal thick setae and no other marginal setae. *Maxilliped:* palp article 3 with ranks of thin setae

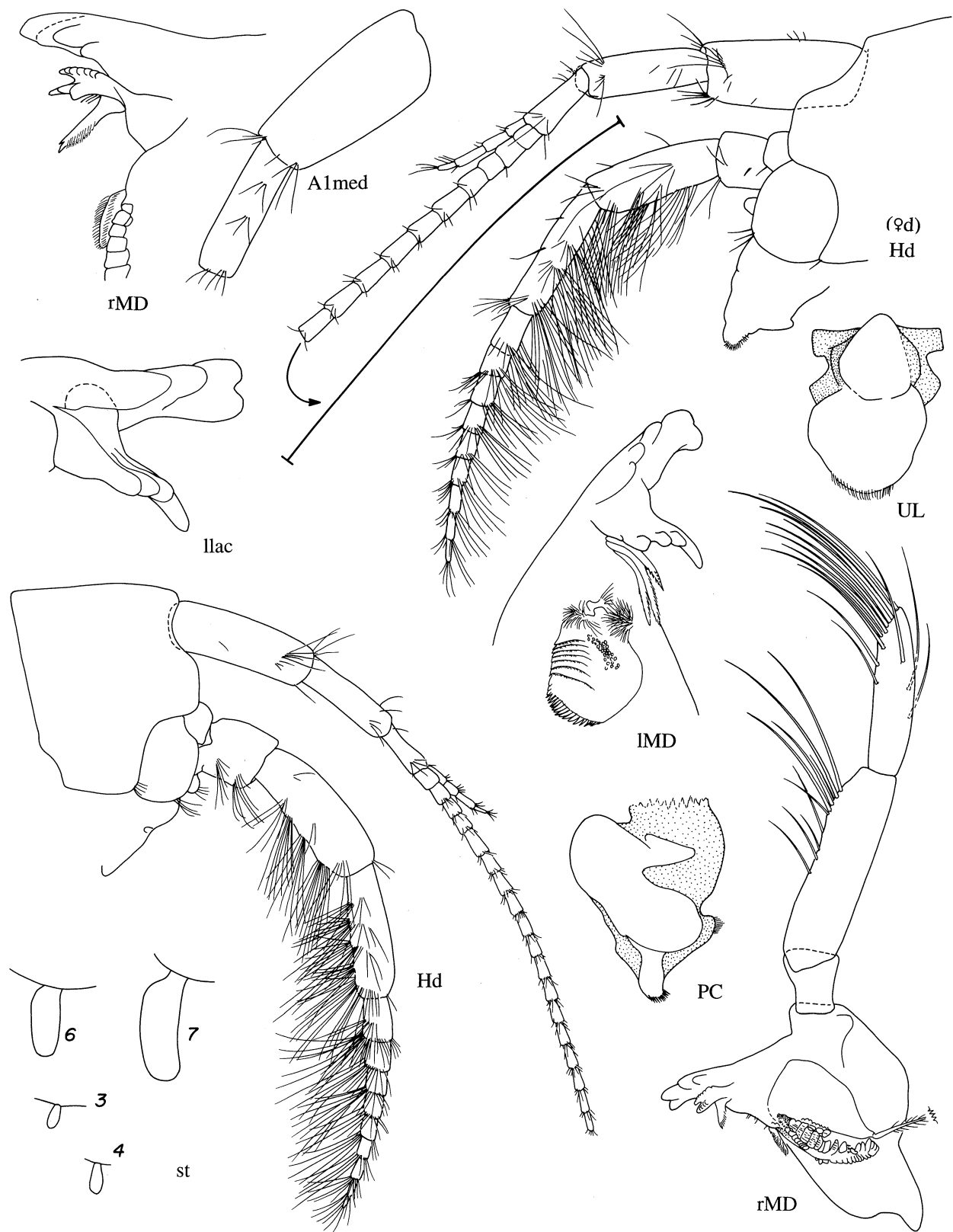


Fig. 14. *Uroctena setosa* Nicholls, male "c" 7.59 mm (all drawings except those indicated); female "d" 5.50 mm.

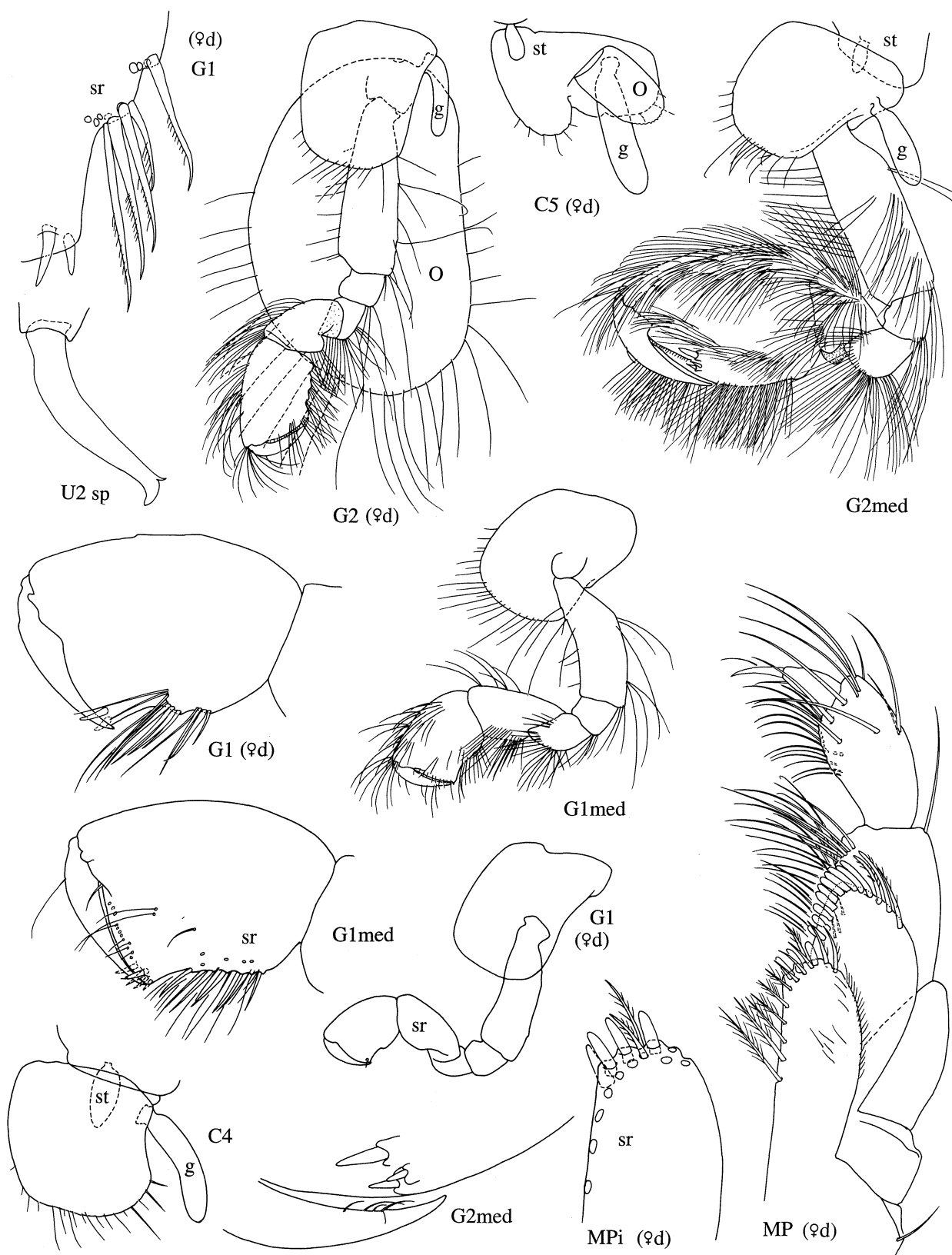


Fig. 15. *Uroctena setosa* Nicholls, male "c" 7.59 mm (all drawings except those indicated); female "d" 5.50 mm.

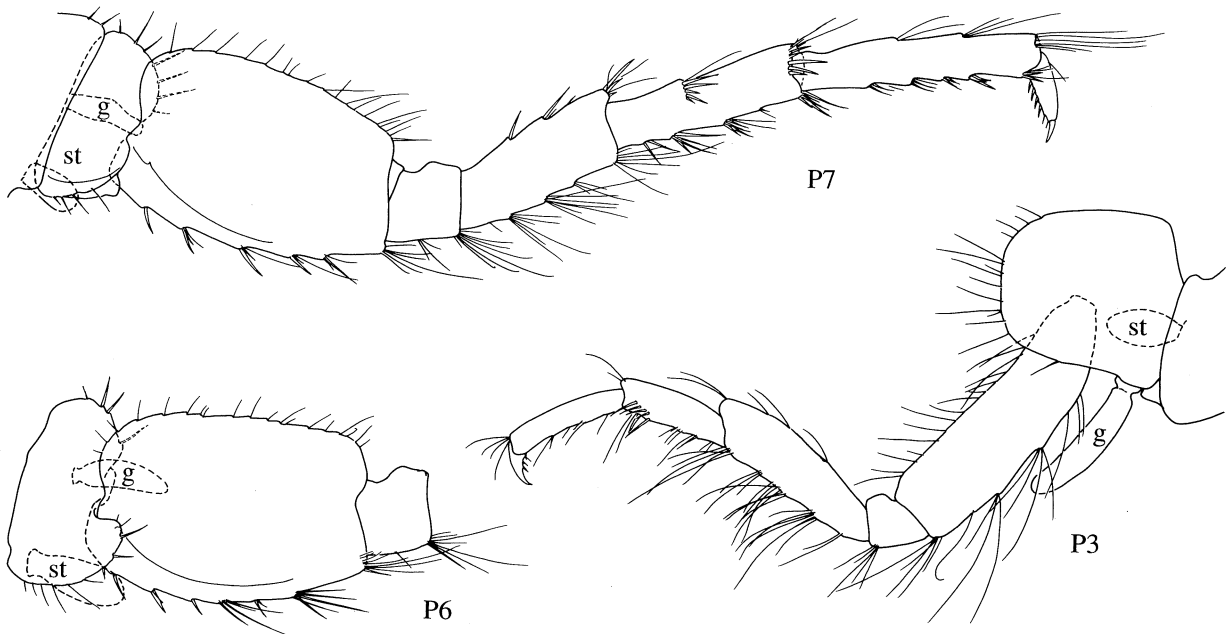


Fig. 16. *Uroctena setosa* Nicholls, male "c" 7.59 mm.

on inner edge, apical part with rank of thicker bifid setae, apex poorly produced and not rugose; inner plate with 3 thick spines and plumose setae apically, medial row of 6 plumose setae, and one ventrofacial spine.

First gnathopod (Fig. 15): coxal plate with many long setae ventrally; article 4 without posterior hump; carpus well developed, long and not lobate, with at least 3 rastellae; propodus ovatotrapezoidal, slightly longer than wide, posterior edge with 5–6 heavily setose acclivities, some of these setae approaching thickness of spines, posterolateral angle rounded, with 1 medial and 4 lateral spines, no lateral spines elongate, palm slightly oblique, scarcely convex; dactylus not exceeding end of palm. *Second gnathopod* (Fig. 15): much larger than first gnathopod; article 2 lacking large spines; carpus short, weakly lobate; propodus huge, ovate, posterior margin almost smooth, setose, palm very oblique, palmar corner with 2 medial spines; very long setae fully present on anterior margins of carpus and propodus and on posterior margins of merus and propodus; coxal plate setose.

Pereopods (Figs 16, 17): ventral margins of coxae rounded, with numerous long setae, coxa 4 slightly emarginate, with 4 anteroventral but no posterior setae; pereopods 3–4 longer than gnathopod 2, pereopod 3 longer than 4, article 4 moderately setose posteriorly, article 5 less strongly setose posteriorly, posterior margin of article 6 on pereopods 3–4 with spine-seta (total) formulae of 1-2-1-3-2 and 2-3-1-3-2; pereopods 5–7 similar, 6 slightly longest, coxae with spines on ventral margin of posterior lobe, article 2 expanded and weakly lobate posteroventrally on pereopods 5–6, bearing short to medium posterior setules. Coxal gills sausage-

shaped, of medium size, very slightly decreasing in size in following order: 5, 4, 3, 2, 6; seventh segment with pair of strap-shaped penial processes about size of sixth coxal gills.

Sternal processes (Fig. 14): six pairs of fleshy, sausage-shaped sternal gills present on segments 2–7, attached to front of lateral edge of each of segments 5–7, more closely to mid-transverse line and also more central on other segments.

Epimera (Fig. 17): each epimeron posteroventrally rounded, posterior margins serrate and setose, epimeron 1 with 3 ventral setae, formula of anterofacial spine-setae on epimera 2–3 = 2-2-1-2-1 and 1-2-1-2-1. *Pleon* (Fig. 17): dorsolateral posterior margin of pleonites 1–3 sparsely setose, pleonites 4–5 with several dorsal groups of dense setae, pleonite 6 with few dorsolateral setules on each side; uropod 3 extending beyond uropods 1 and 2 in entire animal, uropod lengths relative to uropod 1: uropod 2 = 0.67, 3 = 0.67. *Pleopods*: retinacula 2 per pleopod, no accessories; each peduncle well setose; rami of equal extension, articles of outer rami on pleopods 1–3 = 13-11-9, inner = 11-11-9; setae on basal articles, outer margin of outer ramus to inner margin of inner ramus on pleopods 1–3 = 3-2-1-2, 3-2-1-1, 2-1-2-1, no bifid or barbed setae.

First uropod (Fig. 17): peduncle length 1.4 rami; outer margin with 3 apicodistal spines and 3 setae besides row of 7 dorsal spines, with one apical spine medially and row of 4 widespread medial setae; rami of subequal length, both rami with 2 rows of marginal spines, ramus with 5 apical spines. *Second uropod* (Fig. 17): peduncle about 1.1 length of inner ramus, with 3

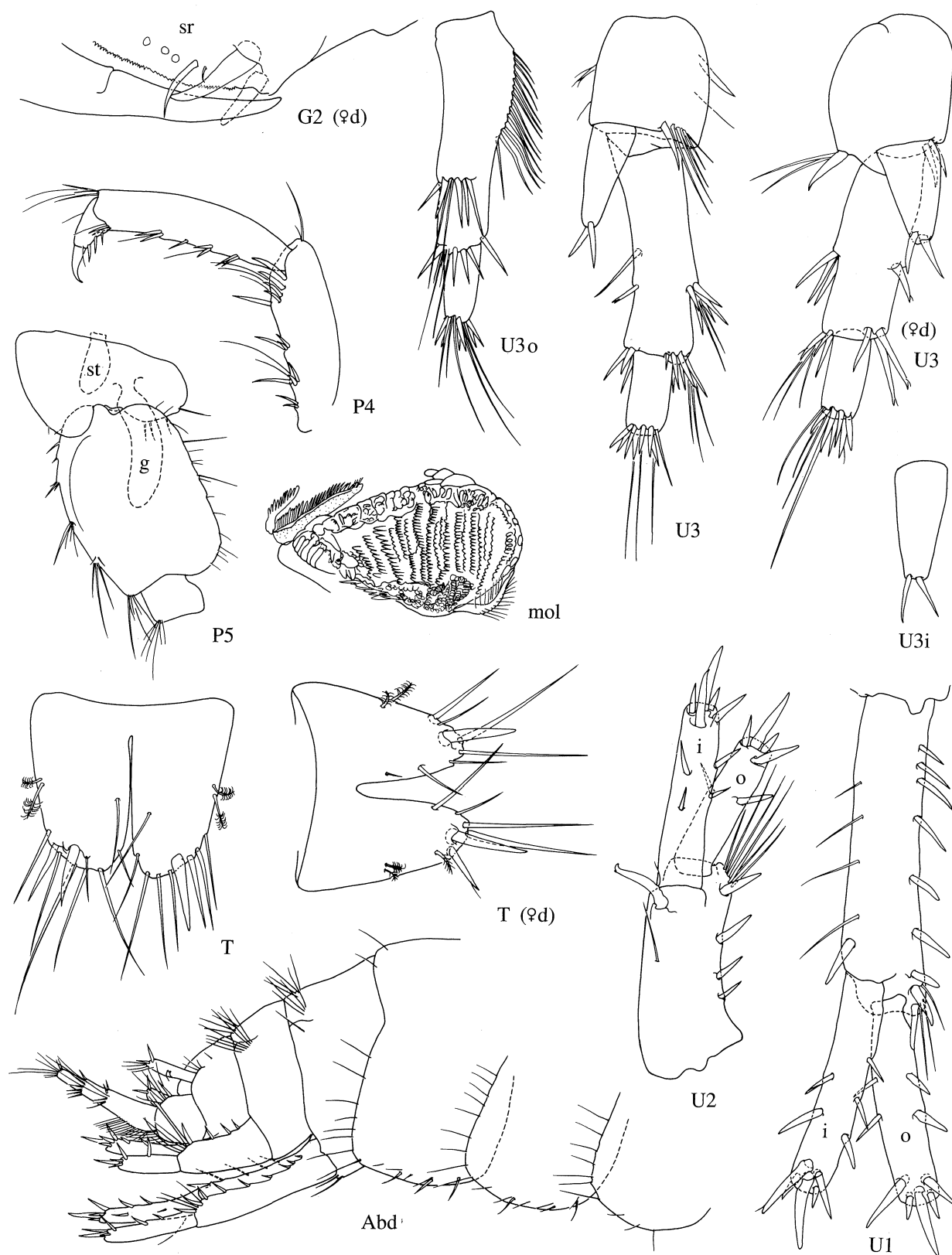


Fig. 17. *Uroctena setosa* Nicholls, male "c" 7.59 mm (all drawings except those indicated); female "d" 5.50 mm.

dorsolateral spines and 1 apical, with 6 apical setae, medial margin with hooked and barbed apical spine (Fig. 15) and one medial seta; outer ramus shorter than inner, both with 2 rows of marginal spines, apices with 5 and 4 spines. *Third uropod* (Fig. 17): peduncle length 0.44 outer ramus, almost as broad as long, shorter than urosomite 3, with 3 lateral long setae besides apicolateral spine and 5 setae; outer ramus proximal article with one lateral spine-setal cluster on body, ventrolateral margin with comb of about 14 short stiff bent setae on flange, distolateral margin with 6 spines and 3 long seta, apicomедial margin with 4 spines, medial margin with 2 spines, distal article large, with 7 apical spines and 4 long setae: inner ramus length 0.36 of outer, with 2 apical spines. *Telson* (Fig. 17): of ordinary length, shorter than urosomite 3; cleft 80 percent of its length; apices each with 1–2 spines and 7 setae; each lobe with 1–2 dorsal setae, and pair of penicillate setules dorsolaterally at M.50.

Description of female “d”. Up to 5.5 mm long. *Antenna* (Fig. 14). First antenna as long in relation to body as in male if not longer but second antenna 0.33 length of body. *Second antenna* (Fig. 14) more slender than in male and scarcely pediform, densely setose but less so than in male, article 4 of peduncle not longer than article 5, flagellum with 9 articles.

Mandibles. Right mandible with 2 rakers, interrakers 2; molarial seta elongate; incisor with 4 teeth; left mandible with 4 rakers, 4 interrakers, molar with 6 leaflobes, seta short, with 2 major hook-comb setae and one rudimentary; left palp setae, 1A, 1B, 2D, 7E.

Gnathopods and pereopods. First gnathopod (Fig. 15): smaller even than male gnathopod 1, propodus less expanded: 1 medial and 1 lateral spine at defining corner of palm. Second gnathopod (Fig. 15): somewhat larger than gnathopod 1, armament of defining corner of palm similar. Gnathopods 1–2 much more setose than in female of *U. westralis*, with especially long tufts of setae anteriorly on carpus and propodus and posteriorly on merus. Coxae 2–4 with huge oostegite (Fig. 15), that of coxa 5 very small. Coxal gills slightly smaller than in male. Sternal gill number 7, gills slightly larger than in male (relative to surrounding structures), gill 6 as large as in male, then sternal gills 5, 4, 3 and 2 progressively smaller until gill 2 less than half length of article 3 on gnathopod 2. Volume occupied by sternal gills in male filled with 9 hatched juveniles in female.

Illustrations. Maxillae 1–2 not illustrated; in poor condition. Lower lip as in other Australian crangonyctoids. Maxillipeds of specimen “c” also in poor shape, illustration thus made of specimen “d”.

Remarks. The male differs from the concept of this species proposed by Williams & Barnard (1988) based on the literature in the following ways: the urosome is densely armed dorsally, the posterior margins of the propodi on gnathopod 1 in both sexes have some setae sufficiently thickened to be denoted as spines, the telson

is cleft 80 percent (versus 50) and male uropod 3 has a rank of spines laterally beyond the basal comb of setae. The figure of male gnathopod 1 as copied from Nicholls in our figure 58 (Williams & Barnard, 1988) may actually be a female gnathopod 2, although the so-labelled female gnathopod 2 is not very different from that one we show herein; if the male gnathopod 1 is indeed as shown by Nicholls, then he probably had a far more mature male than ours.

Relationship. Differing from all other species of *Uroctena* in the lack of facial spines on article 2 of male gnathopod 2 and the much higher degree of setation on the gnathopods and antennae 1–2 of both sexes. Article 2 of male gnathopod 2 does possess many setae, but no stiff thick spines.

Distribution. Western Australia, reservoir at Katanning.

Chillagoe n.gen.

Etymology. Named for the type locality.

Type species. *Chillagoe thea* n.sp.

Diagnosis. Pleonites with few dorsal spines and setae. Rostrum obsolescent, lateral cephalic lobes strongly projecting and moderate antennal sinus present. Eyes absent.

Antenna 1 moderately elongate, longer than antenna 2, ratio of peduncular articles about 19:14:9, accessory flagellum 2-articulate. Flagellum of antenna 2 much shorter than peduncle, calceoli absent.

Ratio of mandibular palp articles about 9:12:8, article 2 moderately setose, article 3 ovate, setae = DE. Labium lacking inner lobes. Maxillae barely setose medially, inner plate of maxilla 1 tapering distally, with 2 apical setae, outer plate with 9 spines, palps asymmetric, one side with thin apical spines, other side with thick but articulate apical spines. Inner plate of maxilla 2 lacking oblique row of setae on face, with one apicomедial seta slightly submarginal.

Coxae 1–4 short, but slightly longer than broad, coxae 1–3 lacking row of posterior spines, coxa 1 not expanded below, coxa 4 scarcely lobate, coxa 5 shorter than 4. Gnathopods enlarged in female (male unknown), carpi short, lobate, fourth article lacking hyaline lobe, palms strongly oblique, lacking rugosities, spines not symmetrically bifid, rather with small subapical trigger-like extensions; spines at corner of palm 7+; small spinules along palm sparse and simple.

Pereopods 5–7 elongate, pereopod 6 longer than pereopod 7, article 2 moderately expanded, ovate and posteroventrally lobate: dactyls of pereopods 3–7 with 0–1 spinules on inner edge besides ordinary 1 setule.

Coxae 2–6 each with gill, gill 6 not reduced. Oostegites slender. Thoracic segments 2–6 each with mid-ventral pair of sternal gills of sausage form.

Uropod 3 well extended, peduncle short, outer ramus 2-articulate, article 2 tiny, inner ramus absent. Telson slightly elongate, cleft about 70 percent, lobes not tumid laterally, with one apical spine on each lobe, no lateral armaments except for pair of lateral penicillate setules about M.70 on each side.

Additional description. Upper lip uniform, rounded and symmetrical below. Accessory blades (rakers) on mandibles 4–6, usually with interraker plumose seta between each main raker; few additional penicillate setae beyond rakers and riding on to base of molar, with regular apical molarial seta. Both plates of maxilla 2 with long apical setae; inner plates of maxillae 1–2 and outer plate of maxilla 2 covered with pubescence. Maxillipedal inner plate long, with distal row of several plumose setae and 2 blunt naked spines, and medial row of 3 plumose setae; outer plate of medium size, without distal plumose setae, with medial row of blunt or pointed naked tooth-spines; palp articles 2–3 poorly setose or not laterally, article 2 moderately setose medially, article 3 lacking organised comb row of spines near base of dactyl, apex barely produced, not rugose.

Dactyls of gnathopods without small recumbent inner tooth-spine but with stiff setule(s) at inner nail articulation line. Gnathopod 1 without one rastellate seta of article 4 enlarged and scythe-like. Pereopods 3–4 proportional to pereopods 5–7. Posterior spine sets on article 6 of pereopods 3–4 evenly spaced (one aberration shown). Pleopods similar, peduncles not setose; outer rami slightly shortened in female; basomedial setae on inner rami of pleopods not bifid; retinacula 2, accessory retinacula absent.

Posteroventral tooth of epimera 1–3 absent but posterior margins sparsely setulose; some epimera with facial spines and setae near ventral margin. Apicolateral corner of peduncles on uropods 1–2 with 3–2 spines, dorsal margins spinose, medial margin of uropod 1 with only one apical spine; rami of uropod 1 extending subequally, outer ramus of uropod 2 shortened, margins spinose, uropod 1 bearing basofacial spine; only inner rami of uropods 1–2 with 2 spine rows. Medial setae of outer ramus on uropod 3 absent; with subdistal peduncular seta. Ventrodistal spine on urosomite 1 at base of uropod 1 moderately developed.

Sexual dimorphism. Unknown. Because female gnathopods enlarged, male gnathopods presumably also enlarged; setosity of male uropod 3 and subsidiary armaments and size of antennae unknown.

Relationship. This is the second Australian genus to lack an inner ramus on uropod 3. *Chillagoe* differs otherwise from *Giniphargus*, which also lacks this structure, in the enlarged gnathopods, 2-articulate (versus 4-articulate) accessory flagellum, strongly reduced article 2 on the outer ramus of uropod 3, much less vermiform body shape, unthickened antenna 2, presence of basofacial spine on uropod 1, and loss of medial setation on the maxillae.

Chillagoe closely resembles the pseudoniphargid group of east Asia. The uniramous uropod 3 is a strongly correlative feature but *Chillagoe* differs from pseudocrangonyctids in the well-developed mandibular molar, the nature of the outer rami of uropods 1–2, the slightly deeper telsonic cleft, and the fully developed 9 spines (versus 6–7) on the outer plate of maxilla 1. Owing to the great distance across tropical and marine frontiers between Japan and Australia, the pseudocrangonyctids and *Chillagoe* may be convergent derivatives from two different root stocks. The presence of sternal gills in the two groups suggests an origin from basic crangonyctoid root stocks. It may also have affinities with *Sternophysinx* from caves in South Africa (J.R. Holsinger, pers. comm.). For the present, the taxon is regarded as a somewhat aberrant paramelitid. In any event, the lack of rugosities on its gnathopods, *inter alia*, clearly exclude it from the Neoniphargidae, and the form of its sternal processes (gills), *inter alia*, from the Perthiidae, the only other recognised Australian families of crangonyctoids.

Chillagoe thea n.sp.

Figs 18–20

Etymology. Named for the type locality.

Type locality. Tea Tree Cave, from freshwater pool in cave, Chillagoe, Queensland.

Material examined. HOLOTYPE (Australian Museum, P44066), female “k” 5.81 mm, in type series collected 22 August 1973, A.V. Spain collector. Other material from type series (PARATYPES), female “l” (P44067) 4.98 mm, female “m” (P44068) 5.27 mm, female “n” (P44069, unmeasured), juvenile “o” (P44070) 3.80 mm and 23 other specimens (P44071, no males). Other material: same locality, 23 August 1973, A.V. Spain collector, 9 specimens (P44072).

Diagnosis. As in the genus.

Description of holotype (female “k”). *Body* (like *Protocrangonyx* in Williams & Barnard, 1988, fig. 63): pleon poorly armed dorsally, armament bilateral, total dorsal setae on pleonites 1–3 = 2–4–4, spinules on pleonites 4–6 = 2–2–0; length, 5.8 mm.

Head: rostrum obsolescent; eyes absent.

First antenna: length 0.53 of body, 1.6 second antenna, flagellum longer than peduncle, peduncular article 1 longest, article 3 shortest, setae sparse, distoventral corner of article 1 with strong spine, flagellum with 17 articles, lacking conspicuous aesthetascs, accessory flagellum 2-articulate, reaching middle of article 2 of primary flagellum, articles uniform after first 4, sparsely setulate. *Second antenna:* length 0.33 body; peduncle longer than flagellum, articles 4–5 of equal length, articles 3, 4 and 5 with poor to moderate ventral setation; flagellum 5-articulate, poorly setose ventrally, lacking calceoli.

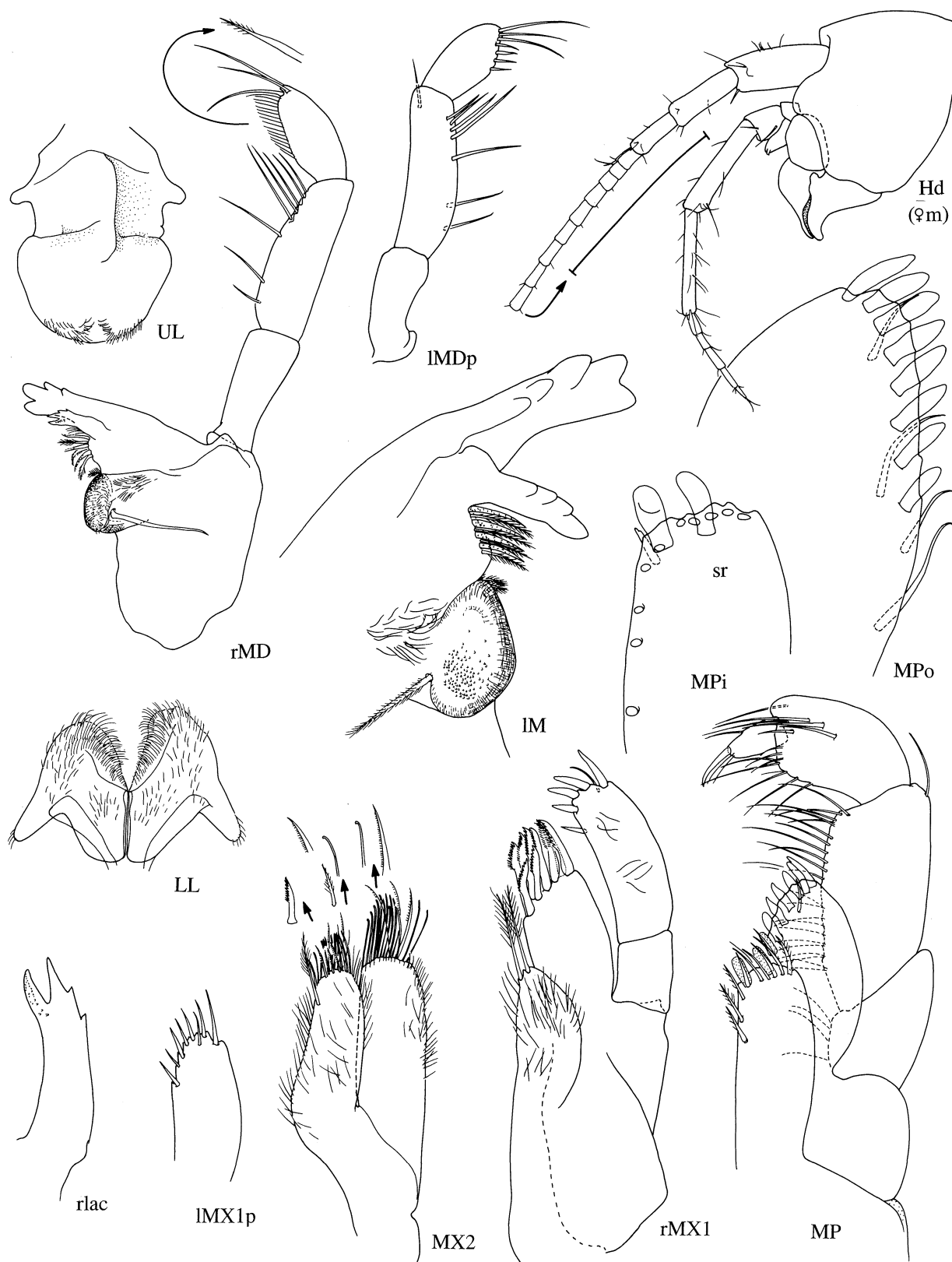


Fig. 18. *Chillagoe thea* n.sp., holotype, female "k" 5.81 mm (all drawings except those indicated); female "m" 5.27 mm.

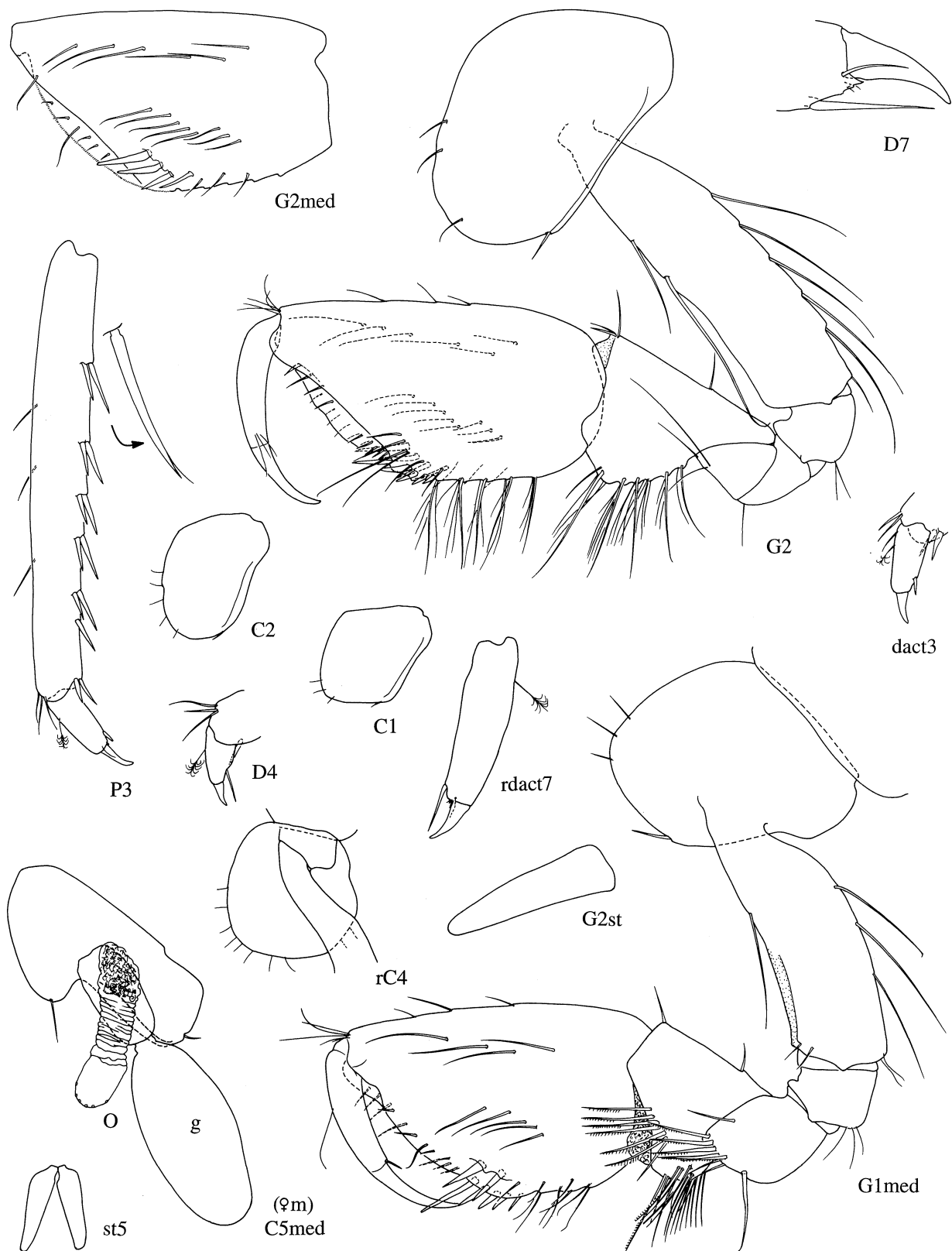


Fig. 19. *Chillagoe thea* n.sp., holotype, female "k" 5.81 mm (all drawings except those indicated); female "m" 5.27 mm.

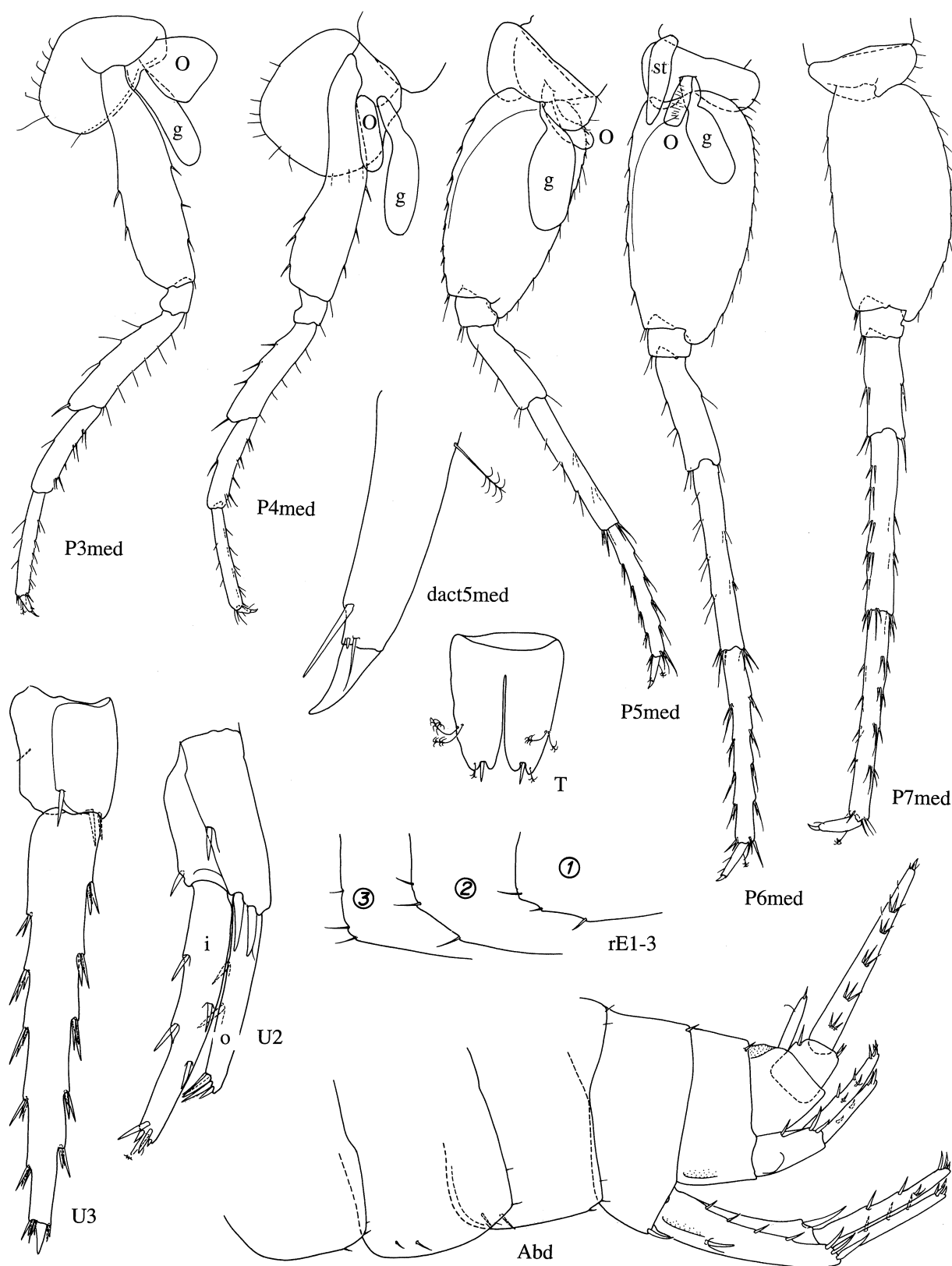


Fig. 20. *Chillagoe thea* n.sp., holotype, female "k" 5.81 mm.

Upper lip (Fig. 18): apical margin evenly rounded, connection to epistome and epistome itself symmetrical, epistome with anterior keel. *Lower lip* (Fig. 18): without inner lobes. *Left mandible* (Fig. 18): palp article 3 [aberrant], article 2 with 7 medial marginal setae; incisor 5-toothed; lacinia mobilis 4-toothed, 4 setose accessory blades; molar bearing plumose seta, several penicillate hooked brushy basal setae, other pubescence. *Right mandible* (Fig. 18): incisor 4-toothed; lacinia mobilis bifid, narrow, denticulate; accessory blades of 7 plumose spines, palp article 3 shorter than 2, setae = 15D, 3E. *Left first maxilla* (Fig. 18): palp article 2 with 7 thin apical spines and 1 barely subterminal facial seta, outer plate with 9 spines, most denticulate; inner plate with 2 apicomedial setae. *Right first maxilla* (Fig. 18): palp article 2 with 5 thick apical and medial spines fully articulated to segment, one thin seta apicolaterally. *Second maxilla* (Fig. 18): outer plate outer apical margin without spinule, apicomedial margin of inner plate with 1 weakly submarginal thick seta. *Maxilliped* (Fig. 18): palp article 3 with sparse ranks of thin setae on inner edge, no lateral setae, face with linear row of 3 setae, apex not strongly produced, not rugose; inner plate with 2 thick spines and several plumose setae apically, medial row of 3 plumose setae, and 1 ventrofacial spine; outer plate with 8 thick spines medially.

First gnathopod (Fig. 18): coxal plate with 3 short setules anteroapically, with 1 posteroventral setule; article 4 without posterior hump; carpus thick, short, lobate; propodus subrectangular, longer than wide, posterolateral angle rounded, posterior edge with 3 acclivities and 3 sets of setae, with 2 medial and 5 lateral spines, one lateral spine elongate, palm oblique, convex; dactylus reaching end of palm. *Second gnathopod* (Fig. 19): of similar size to gnathopod 1; article 5 short and lobate but longer than on gnathopod 1, article 6 more evenly rectangular, palm oblique, palmar corner with 5 lateral and 4 medial spines, posterior margin with 5 setose acclivities; dactyl strongly curved, fitting palm; setation of coxal plate like coxa 1.

Pereopods (Figs 19, 20): coxa 3 with 6 anterior setae and one posteroventral setule, coxa 4 barely emarginate, with 8 anteroventral and 3 posteroventral setae; pereopods 3–4 not longer than gnathopod 2, pereopod 3 scarcely longer than 4, article 4 weakly setose posteriorly, article 5 weakly spinosetose posteriorly, posterior spine formula = se-se-s-2se and se-se-s-2se, posterior margin of article 6 on left pereopod 3 with spine formula of 2-2-2-2-2-1-2, on right = 2-2-2-2-2-2, on pereopod 4 = 2s-2s-2se-2se-2s; pereopods 5–7 similar, each with 2 locking spines; coxae 5–7 bearing spines or setae on posteroventral margin of posterior lobes, article 2 expanded and lobate posteroventrally, thinner on pereopod 7, bearing thin short posterior setae; dactyls of pereopods 3–7 with one main spinule, one facial setule at nail margin plus tiny accessory setule rudiments. Gills (Fig. 20) of coxae 2–6 sausage shaped, of pereopod 6 not reduced. Oostegites slender but lacking setae, shrivelled basally and appearing short.

Sternal (gills) processes (Fig. 19): segments 2–6 with sausage-shaped sternal gills in central pairs.

Epimera (Fig. 20): each epimeron posteroventrally

subquadrate, posterior margins scarcely convex, with 1–2 posterior setules, epimeron 1 with 1 ventral setule, epimera 2–3 with facial spine formula of 2-2. *Pleon* (Fig. 20): each dorsolateral posterior margin of pleonites 1–3 with following setal formula, 1-2-2, pleonites 4–6 with dorsolateral spine formula of 1-1-0. Uropod 3 strongly extending beyond uropods 1 and 2 in entire animal, uropod lengths relative to uropod 1: uropod 2 = 0.50, 3 = 0.86. *Pleopods*: retinacula 2 per pleopod, no accessories; peduncles without setae, outer rami shorter than inner by length of 2 inner articles, outer with 10-10-9 articles, inner with 8-8-8 articles, setae on basal articles = 1-1-1-2 on all pleopods, none bifid.

First uropod (Fig. 20): peduncle length 1.2 rami; 1 large basofacial spine on outer face; outer margin with 3 apicodistal spines besides row of 4 dorsal spines, with 1 apical spine medially; rami of subequal length, only inner ramus with 2 rows of marginal spines in formula of 2-2, with outer ramus with 2 ventromedial spines, each ramus with 4 apical spines. *Second uropod* (Fig. 20): peduncle about 0.75 length of inner ramus, with 1 dorsolateral spine, 2 apicals, medial margin with one apical spine; outer ramus shorter than inner, with 2 dorsomedial spines, only inner ramus with 2 rows of marginal spines in formula of 2-2, apices each with 5 spines. *Third uropod* (Fig. 20): peduncle length 0.28 outer ramus, longer than urosomite 3, with one medial seta, one dorsolateral and 2 ventrolateral spines; outer ramus proximal article with 5 lateral and 5 medial ranks of 2–3 spines each, apicolateral corner with 2 spines, apicomedial corner with 5 spines; article 2 small. *Telson* (Fig. 20): 1.25 longer than wide, scarcely shorter than urosomite 3; cleft 70 percent of its length; apices each with spine in notch, 1 apical setule, and each lobe with pair of penicillate setules dorsolaterally at M.70.

Notes of minor items on holotype: left mandibular palp article 2 with 7 medial setae, one seta on apicodorsal corner unlike right palp, setae of article 3 = 4D, 3E.

Description of other material. Specimen “l”: female, length 4.98 mm. Left mandibular palp article 3 with setal formula of 14D, 4E (thus left palp on holotype is abnormal); left article 6 of pereopod 3 with posterior spine formula of 2-1-2-2-2-2-2; epimeron 1 lacking posterior setule, face of epimeron 2 with only 1 spine, epimeron 3 lacking direct posterior setule, one at corner present; inner ramus of uropod 1 with 3 marginal spines; lateral margin of ramus on uropod 3 with only 4 sets of spines.

Specimen “o”: juvenile, length 3.80 mm. Epimeron 1 lacking ventral spine, epimera 2–3 each with 1 facial spine, only one posteroventral spine; uropod 1 as in holotype, uropod 2 like holotype but outer ramus with only 1 marginal spine, inner ramus formula, lateral = 0-1, medial = 1-1; outer ramus of uropod 3 with only 4 lateral sets of spines.

Specimen “m” (Figs 18, 19): female, length 5.27 mm.

Distribution. Queensland, Chillagoe, Tea Tree Gully, from freshwater pool in cave.

"Melitoid" Genera

Brachina n.gen.

Etymology. Taken from one of the localities of the type species.

Type species. *Brachina invasa* n.sp.

Diagnosis. Body slender but not vermiform. Pleonites with sparse dorsal spines and setae. Rostrum obsolescent, lateral cephalic lobes weakly projecting and weak antennal sinus present. Eyes absent.

Antenna 1 elongate, longer than antenna 2, ratio of peduncular articles about 19:18:10, accessory flagellum 3 articulate. Flagellum of antenna 2 much shorter than peduncle, calceoli absent.

Mandibular palp only 2-articulate, ratio of articles about 8:21, article 2 sublinear, truncate, setae only. Labium lacking inner lobes. Maxilla 1 with apical setose setae on inner plate, outer plate with 7 (aberrantly 8) spines, palps symmetrical, with thin apical spines. Inner plate of maxilla 2 with medial margin sparsely setose halfway to base.

Coxae 1–4 of medium length, longer than broad, coxae 1–4 lacking posterior spines, coxa 1 not expanded below, coxa 4 well lobate, coxa 5 shorter than 4. Gnathopods diverse, gnathopod 1 small and of melitoid form (see Barnard & Barnard, 1983), carpus long, not lobate, fourth palm transverse, lacking rugosities, spines not symmetrically bifid, rather with small subapical trigger-like extensions; spines at corner of palm 7+; small spinules or setules along palm sparse and simple. Gnathopod 2 enlarged, carpus short, weakly lobate, propodus almond-shaped, palm very oblique, dactyl fitting palm, spines at corner 2, small spinules along palm not bifid, posterior margin of propodus with about 4 groups of thick setae each tapering rapidly and several strongly curved apically, setae however short relative to most extreme of hadzioid genera (see Barnard & Barnard, 1983).

Pereopods 5–7 elongate, pereopod 7 longer than pereopod 6, article 2 moderately expanded, ovate but only posteroventrally lobate (weakly) in pereopod 5; dactyls of pereopods 3–7 without spinules on inner edge besides ordinary articulation setules (3).

Coxae 2–6 each with large pedunculate gill, gill 6 not reduced. Oostegites slender. Sternal gills absent.

Uropod 3 well extended, parviramous, peduncle short, outer ramus 2-articulate, article 2 small, inner ramus short and scale-like. Telson shorter than broad, fully cleft, lobes tumid laterally, with 3 apical spines on each apically cuspidate lobe, with one basolateral spine at M.37, one medial spine at M.70, pair of lateral penicillate setules near lateral apex on each side.

Additional description. Upper lip uniform, rounded and symmetrical below. Accessory blades (rakers) on mandibles 3, without interraker setae; several additional comb setae on distal surface of molar, with regular apical molarial seta. Both plates of maxilla 2 with long

apical setae; inner plates of maxillae 1–2 and outer plate of maxilla 2 lacking pubescence. Maxillipedal inner plate long, with distal row of several plumose setae and 4 blunt or weakly bifid naked spines, and medial row of 4 plumose setae; outer plate of medium size, with distal plumose setae, without medial row of tooth-spines, medial margin simply carved into waves; palp articles 2–3 not setose laterally, article 2 moderately setose medially, article 3 lacking organised comb row of spines near base of dactyl, apex barely produced, not rugose.

Dactyls of gnathopods with stiff setule at inner nail articulation line. Gnathopod 1 without rastellate seta on article 4. Pereopods 3–4 proportional to pereopod 5. Posterior spine sets on article 6 of pereopods 3–4 evenly spaced. Pleopods similar, peduncles with 0–1 seta; outer rami slightly shortened; basomedial setae on inner rami of pleopods bifid but not barbed; retinacula 2, accessory retinacula absent.

Posteroventral tooth of epimera 1–3 tiny, only posterior margin of epimeron 3 sparsely setulose; some epimera with sparse facial spines near ventral margin. Apicolateral corner of peduncles on uropods 1–2 with 2–1 spines, dorsal margins spinose, medial margin of uropod 2 with only one apical spine; rami of uropod 1 extending subequally, outer ramus of uropod 2 scarcely shortened, margins spinose, uropod 1 bearing basofacial spine; only inner rami of uropods 1–2 with 2 spine rows. Medial setae of outer ramus on uropod 3 absent; without subdistal peduncular spine. Ventrodistal spine on urosomite 1 at base of uropod 1 absent.

Sexual dimorphism. No secondary differences.

Relationships. In the absence of calceoli and sternal gills and the apical position of the ordinary telsonic penicillate setules, we presume this genus has its closest relationship with melitoids. It keys out very close to the *Abhudomelita* – *Melita* complex, a pan-tropical marine supergenus, but differs from that taxon in the loss of one article on the mandibular palp, a scarce difference, but, more importantly, lacks inner lobes on the lower lip and therefore belongs with the hadziids (see Barnard & Barnard, 1983).

In the hadziid group, this genus appears to have its closest affinities to *Psammoniphargus*. The two genera have strong (perhaps convergent?) resemblances in the structure of the outer plate on the maxilliped and slightly less striking in the condition of the gnathopods, coxae, uropods and epimera. Our new genus differs significantly in the symmetry of the palps of maxilla 1 and subordinately in the slightly better developed mandibular palp.

We are inclined to believe that *Psammoniphargus* and *Brachina* are convergent Indo-Pacific genera descendant from the melitoid facies by loss of inner lobes on the lower lip. Except for this loss and the reduction of the mandibular palp these genera appear strongly melitoid.

The lack of calceoli and sternal gills and the presence of a basofacial spine on uropod 1 suggest a marine origin for the two derivatives.

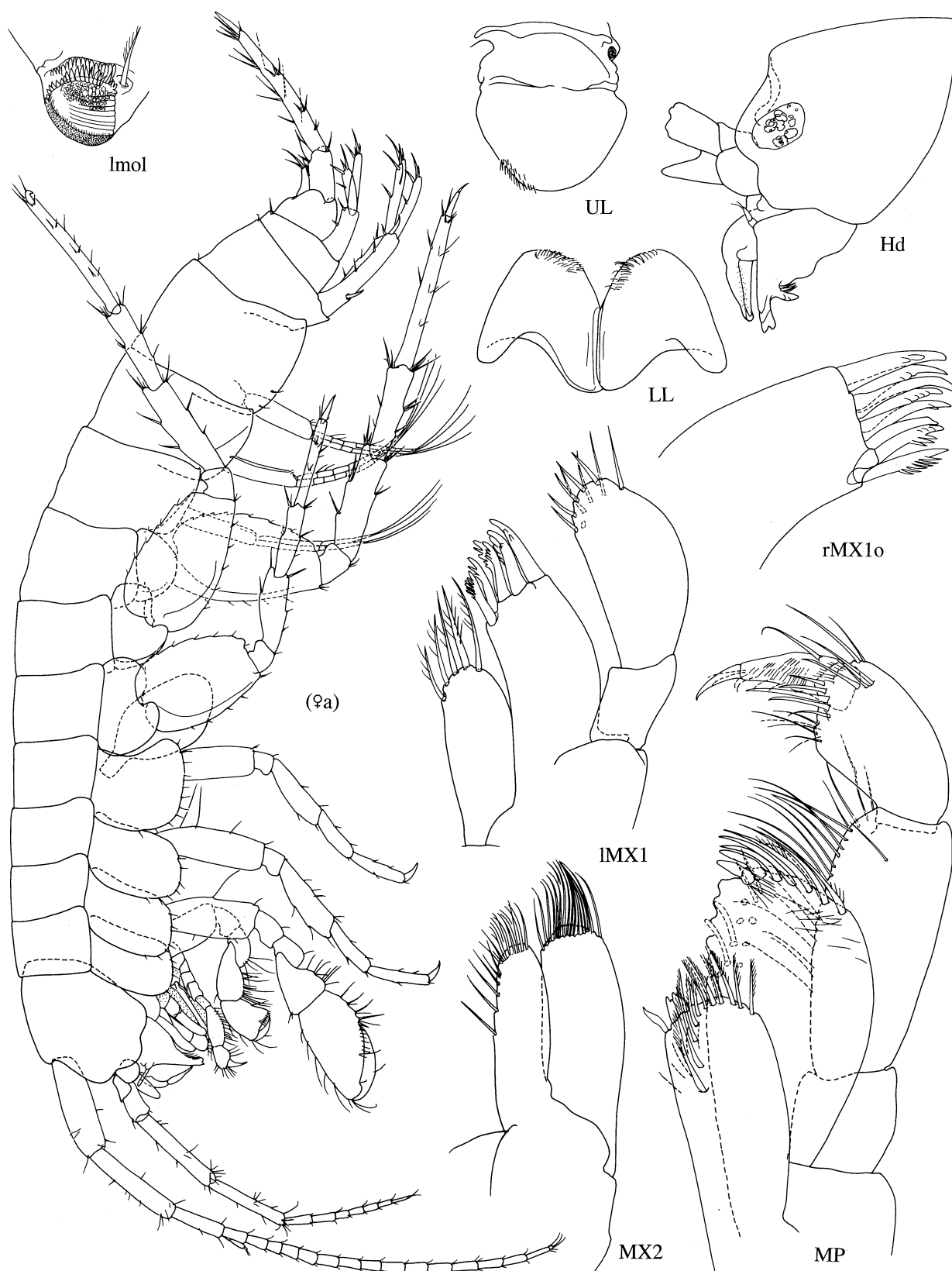


Fig. 21. *Brachina invasa* n.sp., holotype, female "y" 5.83 mm (all drawings except those indicated); female "a" 4.09 mm.

specimens. Brachina Creek, near Aroona turnoff, Flinders Ranges, South Australia, 3 March 1979, sample number 1073 (P44083), W.D. Williams collector, 7 specimens.

Diagnosis. As in the genus.

Description of holotype (female "y"). *Body:* pleon (Fig. 23) poorly armed dorsally, armament bilateral, total dorsal setae on pleonites 1–6 = 2-2-2-2-0-0, spinules on pleonites 4–6 = 0-2-0; length, 5.83 mm.

Head (Fig. 21): rostrum obsolescent; cephalic lobes weak, founded (illustrated) or weakly subangular, eyes in death absent.

First antenna: length 0.62 of body, 1.6 second antenna, flagellum longer than peduncle, peduncular articles 1–2 longest, article 3 shortest, setae sparse, distoventral corner of article 1 with strong spine, flagellum with 21 articles, lacking conspicuous aesthetascs; accessory flagellum 3-articulate, scarcely exceeding apex of article 1 of primary flagellum, articles uniform after first 4, sparsely setulate. *Second antenna:* length 0.4 body; peduncle longer than flagellum, article 4 slightly longer than 5, articles 3, 4 and 5 with poor ventral setation; flagellum 10-articulate, poorly setose ventrally, lacking calceoli.

Upper lip (Fig. 21): apical margin evenly rounded, connection to epistome and epistome itself symmetrical, epistome with anterior keel. *Lower lip* (Fig. 21): inner lobes absent. *Left mandible* (Figs 21–23): palp article 2 with 2 apical setae, article 3 absent; incisor 5+ toothed, lacinia mobilis 4-toothed, 3 setose accessory blades; molar bearing plumose seta, several combed or brushy basal setae, other pubescence. *Right mandible* (Fig. 22): incisor 5-toothed; lacinia mobilis bifid, narrow, denticulate; accessory blades of 3 plumose spines. *Left first maxilla* (Fig. 21): palp article 2 with 5 thin apical spines and 4 subterminal facial or apicolateral setae, outer plate with 7 spines, most denticulate; inner plate with 5 apical setae. *Right first maxilla* (Fig. 21): palp symmetrical with left first maxilla; outer plate with 8 (aberrant) spines. *Second maxilla* (Fig. 21): outer plate outer apical margin without spinule, apicomedial margin of inner plate with 6 marginal thick setae. *Maxilliped* (Figs 21, 22): palp article 3 lacking setae on inner edge, no lateral setae, face with linear row of 3 setae, apex not strongly produced, not rugose; inner plate (Fig. 22) with 4 thick spines and several plumose setae apically, medial row of 4 plumose setae, and 1 ventrofacial spine.

First gnathopod (Fig. 22): coxal plate with 9 short setules anteriorly and apically, no posteroventral setule; article 4 without posterior hump; carpus slightly elongate, not lobate; propodus subrectangular (trapezoidal), longer than wide, posterolateral angle rounded and weakly bulbous, posterior edge with 1 acclivity and 1 set of setae, with 2 medial and 3 lateral spines (in the way we interpret these spines compared to other species other species in our work), lateral spines slightly elongate, palm transverse, convex, minutely serrate; dactylus reaching end of palm. *Second gnathopod* (Fig. 22): much enlarged; article 5 short and weakly lobate,

article 6 almond-shaped, palm oblique, palmar corner with 1 lateral hadziid seta (see Barnard & Barnard, 1983) and 2 mediofacial spines, posterior margin with 3 setose acclivities, setae of hadziid or eriopisellid form; dactyl strongly curved, fitting palm; coxal plate with 10 setules.

Pereopods (Figs 22, 23): coxa 3 with 9 anteroapical setules, coxa 4 emarginate, with 10 anteroventral setules and 1 posteroventral setule; pereopods 3–4 longer than gnathopod 2, pereopod 3 longer than 4, articles 4–5 weakly setose posteriorly, posterior spine formula on article 6 = 2-2-2-2 and 2-2-2-2; pereopods 5–7 similar, but progressively longer, each with 2 locking spines; coxae 5–6 bearing setule on posteroventral margin of posterior lobes, on pereopod 5 article 2 weakly expanded and minutely lobate posteroventrally, no lobe on pereopods 6–7, bearing thin short posterior setae in serration notches; dactyls of pereopods 3–7 with one facial setule at nail margin plus 2 setules more marginally. Gills of coxae 2–6 paddle-shaped, weakly pediculate, of pereopod 6 reduced, about half as long and one quarter as voluminous as gill 4, gill sizes progressively small in order: 4, 3, 2, 5, 6. Oostegites slender but lacking setae.

Sternal (gills) processes: None.

Epimera (Fig. 23): each epimeron with small posteroventral tooth, posterior margins weakly convex, with 1-1-4 posterior setules, epimeron 1 naked below, epimera 2–3 with facial spine formula of 1-2. *Pleon* (Fig. 23): each dorsolateral posterior margin of pleonites 1–3 with following setal formula, 1-1-1, pleonites 4–6 with dorsolateral spine formula of 0-1-0. Uropod 3 strongly extending beyond uropods 1 and 2 in entire animal, uropod lengths relative to uropod 1: uropod 2 = 0.60, 3 = 1.3. *Pleopods:* retinacula 2 per pleopod, no accessories; peduncles of 1-3 with 1 lateral, 1 basal and no other setae, outer rami shorter than inner by length of 2 inner articles, outer with 9-9-9 articles, inner with 8-8-8 articles, setae on basal articles = 4-1-1-4, 3-1-1-3, 2-1-1-3, bifid basomedial setae on inner rami = 3-2-2 (of the total of 4-3--3 setae present on basal article).

First uropod (Fig. 23): peduncle length 1.4 rami; 1 large basofacial spine on outer face; outer margin with 2 apicodistal spines besides row of 3 dorsal spines, with 3 spines medially; rami of subequal length, only inner ramus with 2 rows of marginal spines in formula of 2-2, each ramus with 4 apical spines. *Second uropod* (Fig. 23): peduncle about 1.0 length of inner ramus, with 3 dorsolateral spines, medial margin with one apical spine; outer ramus shorter than inner, with 2 dorsal spines, only inner with 2 rows of marginal spines in formula of 1-2, apices with 3 and 4 spines each. *Third uropod* (Fig. 23): peduncle length 0.36 outer ramus, longer than urosomite 3, with one medial spine, one dorsolateral and 2 ventrolateral spines; outer ramus proximal article with 3 lateral and 3 medial ranks of 3–4 spines each, apicolateral corner with 3 spines, apicomedial corner with 3 spines; article 2 small. *Telson* (Fig. 23):

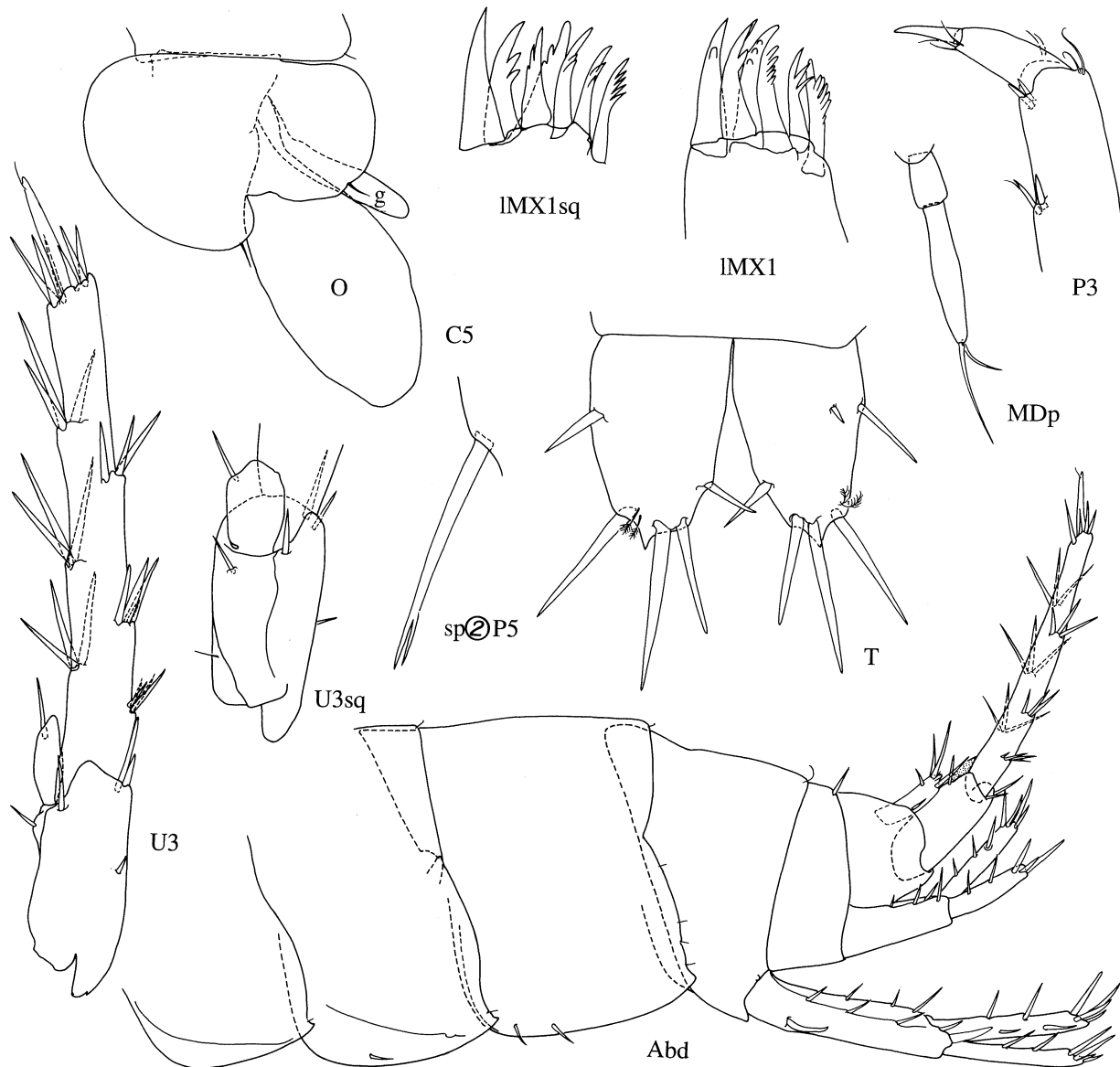


Fig. 23. *Brachina invasa* n.sp., holotype, female "y" 5.83 mm.

0.80 as long as wide, scarcely shorter than urosomite 3; cleft 100 percent of its length; apices each with spine in apicolateral notch, 2 apical spines on medial side of apical cusp, 1 apicomedial spine, 2 apicolateral penicillate setules, and each lobe with single member or pair of lateral (or partly dorsal) spines at M.37.

Description of allotype (male "z"). *Body*: length 4.55 mm. Like female but gnathopod 2 slightly and many other body parts less setose mainly owing to slightly smaller body size or lesser maturation. Gills 2 and 3 heavily infested with surficial protozoans.

Description of other material. Specimen "a" (Fig. 21): female, length 4.09 mm.

Specimen "x": female, length 4.36 mm. Left mandible

with 4 rakers. Outer plate of left and right maxillae 1 with 7 spines (thus holotype aberrant).

Specimen "b": juvenile, length 2.86 mm. All taxonomic characters identifiable; examples showing lesser development than adults as follows: primary flagellum of antenna 1 with 12 articles, of antenna 2 with 6 articles; tooth on palm of gnathopod 2 rudimentary, one medial defining spine only, defined laterally with one hadziid seta joined by 2 thin setules, posterior margin of propodus with 2 setal positions, anterior margin with 4 setal positions; posterior armament formula on article 6 of pereopod 3 = e-e-ss; article 1 of uropod 3 with 2 lateral and 3 medial spine sets; telson with only 3 apical spines on each lobe plus normal setules.

Illustrations. Left mandible of holotype with dotted seta

added in place where right seta present (Fig. 22); other specimens with this seta present on left mandible. Holotype selected because of completeness of all legs but bearing two aberrations: eight spines on outer plate of one maxilla 1 and lack of left molarial seta.

Distribution. South Australia, Flinders Ranges, in streams, springs.

Nedsia n.gen.

Etymology. Named for the type locality.

Type species. *Nedsia douglasi* n.sp.

Diagnosis. Only pleonite 6 with 2 dorsolateral spines. Rostrum obsolescent, lateral cephalic lobes strongly projecting, very broad, no antennal sinus present. Eyes absent.

Antenna 1 elongate, longer than antenna 2, ratio of peduncular articles about 45:35:8, accessory flagellum 2-articulate. Antenna 2 very short, flagellum much shorter than peduncle, calceoli absent.

Ratio of mandibular palp articles about 5:8, only 2-articulate, article 1 not setose, article 2 linear, subtruncate, setae = 2 or 3E. Labium with inner lobes. Maxillae well setose medially, inner plate of maxilla 1 ovate, with 6 medial setae, outer plate with 7 spines, palps symmetrical, with thin apical spines. Inner plate of maxilla 2 with row of medial setae barely extending onto face apically, lacking other, medial setae.

Coxae 1–7 short, broader than long, coxae 1–4 lacking posterior spines, coxa 1 not expanded below, coxa 4 not excavate posteriorly, coxa 5 as long as 4. Gnathopods 1–2 diverse (in female, male unknown), gnathopod 1 small, feeble, carpus longer than propodus, not lobate, merus lacking hyaline lobe, palm transverse, spines not symmetrically bifid, rather with small subapical trigger-like extensions; armament at corner of palm = lateral 3 long setae, medial 4 short spines; setae along palm sparse and simple. Gnathopod 2 weakly enlarged, carpus short and lobate, hand of medium enlargement and ovate, palm oblique, irregularly spinose and sparsely setose, defining one spine.

Pereopods 5–7 moderately elongate, pereopod 7 longer than pereopods 5–6, article 2 moderately expanded, ovato-rectangular, posteroventrally extended but not lobate; dactyls of pereopods 3–7 lacking accessory spinules.

Coxae 2–6 each with flask-shaped gill, gill 6 not reduced. Thoracic segments lacking sternal gills, coxae 2–5 each with thin, poorly setose oostegite.

Uropod 3 strongly extended, peduncle short, outer ramus 2-articulate and huge, inner ramus short and scale-like, reaching to M.24 on article 1 of outer ramus. Telson longer than broad, cleft 100 percent, lobes weakly convex laterally, with subapical setation, with lateral setal-spines and single lateral penicillate setules about M.60 on each side.

Additional description. Upper lip asymmetrical, weakly excavate below. Accessory blades (rakers) on mandibles very few (3–4), on right side with or without interraker plumose seta between each main raker; on both mandibles few additional serrations beyond rakers. Both plates of maxilla 2 with apical setae of medium length; inner plates of maxillae 1–2 and medial and lateral margins of maxilla 2 poorly covered with pubescence. Maxillipedal inner plate long, with distal row of several plumose setae and 2 blunt naked spines, and short medial row of plumose setae; outer plate large, with few distal plumose setae continuous with blunt naked tooth-spine, medial margin carved into sinuities, spineless, ventral margin with pairs of blunt setae; palp articles 2–3 weakly setose 2 laterally, article 2 moderately setose medially, article 3 with comb rows near base of dactyl, apex weakly produced, dactyl unguiform, with short nail. Dactyls of gnathopods lacking inner tooth-spine, lacking nail. Gnathopod 1 without rastellate seta of article 4. Pereopods 3–4 of proportions similar to pereopods 5–7. Posterior spine sets on article 6 of pereopods 3–4 unevenly spaced. Pleopods similar, peduncles with only 1 seta each; rami extending subequally; basomedial setae on inner rami of pleopods not bifid; retinacula 2, one accessory retinaculum present. Posteroventral tooth of epimera 1–3 absent, posterior margins smooth and barely setulose; some epimera with facial spines near ventral margin. Apicolateral corner of peduncles on uropods 1–2 with 1 and 2 spines (thus with 0–1 ventrally displaced spines), dorsal margins spinose, medial margin of uropod 1 with 2 apical spines; rami of uropod 1 extending subequally, outer ramus of uropod 2 shortened; uropod 1 with basofacial spine; all rami of uropods 1–2 with 2 spine rows, albeit weakly furnished. Medial setae of outer ramus on uropod 3 sparse; usually with subdistal peduncular seta(e) or spine(s). Ventrodistal spine on urosomite 1 at base of uropod 1 absent.

Sexual dimorphism. Only female known.

Aberrance. Left uropod 3 of holotype regenerating, lacking article 2. Most other specimens lacking uropod 3 and pereopods 5–7 through breakage during preservation.

Variables. Interraker setae on mandibles present or absent; setules similar to interrakers occasionally affixed beyond rakers.

Relationship. This genus is probably an invader from the sea rather than a member of the crangonyctoid facies because the apical article 2 on the accessory flagellum is shortened, a mediobasal spine is present on article 1 of antenna 1, the lower lip has inner lobes, the mandibular palp is reduced, the inner plate of the maxilliped has only two apical spines, the outer plate has its medial spines replaced by wavy cusps and the sternal gills are absent (but see *Antipodeus* in Williams & Barnard, 1988).

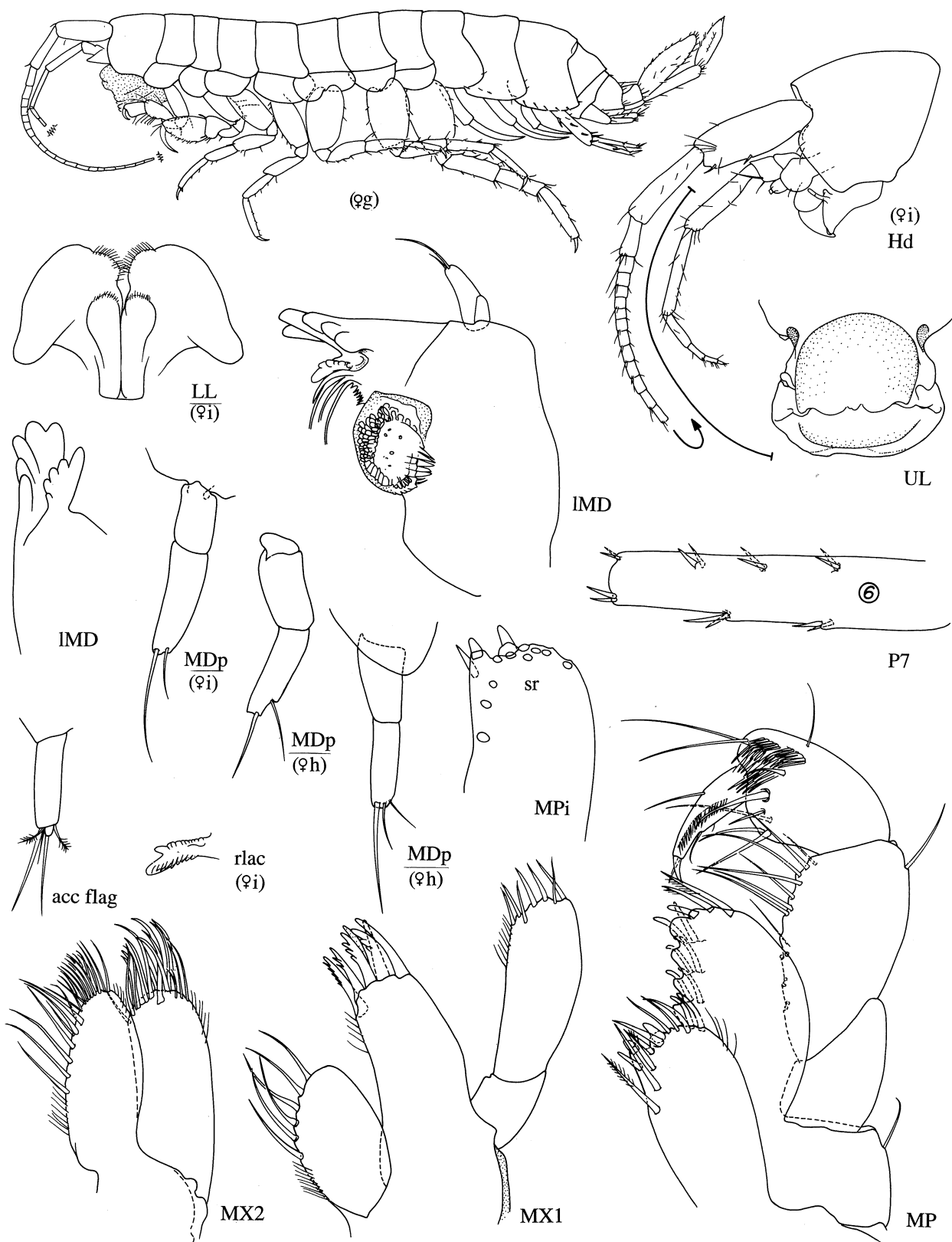


Fig. 24. *Nedsia douglasi* n.sp., holotype, female "g" 4.77 mm (all drawings except those indicated); female "h" 5.08 mm; female "i" 4.38 mm.

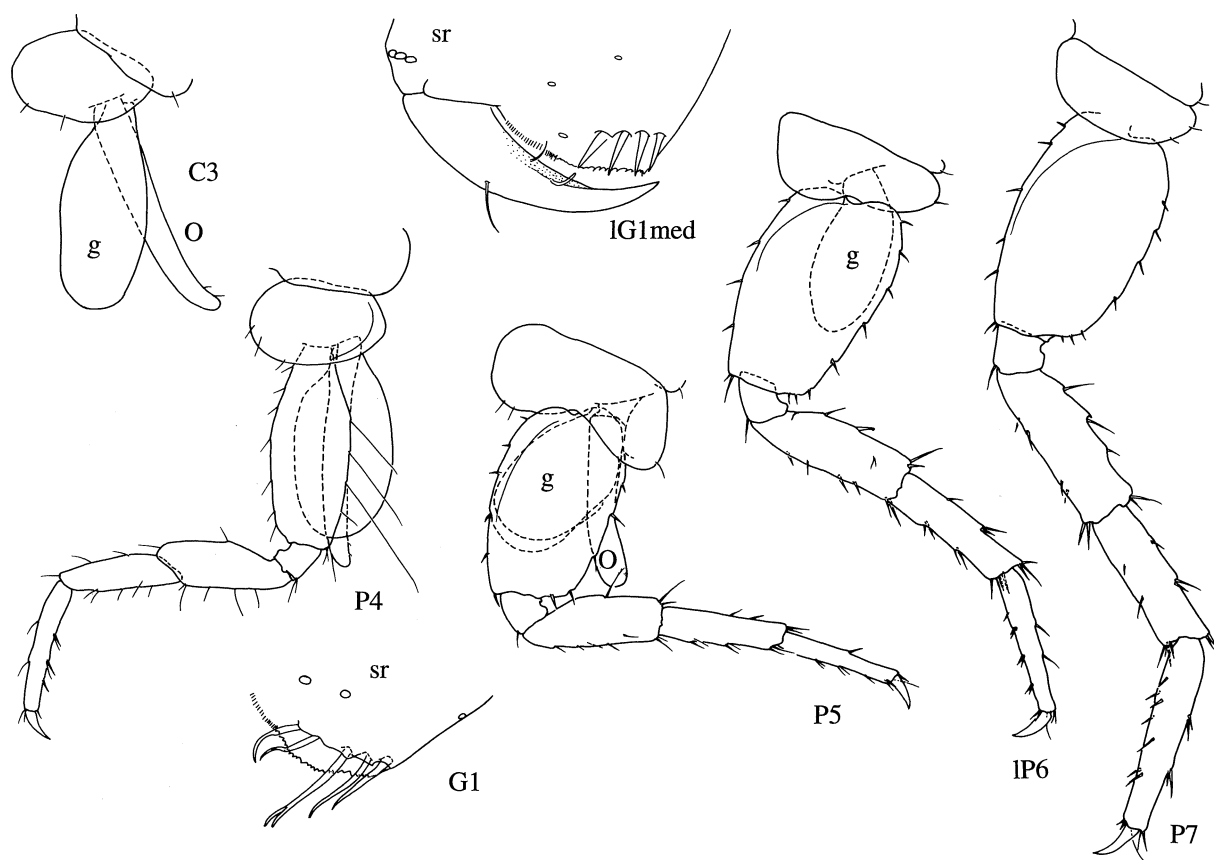


Fig. 25. *Nedsia douglasi* n.sp., holotype, female "g" 4.77 mm.

***Nedsia douglasi* n.sp.**

Figs 24–26

Etymology. Named for the collector of the material.

Type locality. Ned's Well, Yardie Creek, North West Cape, Western Australia.

Material examined. HOLOTYPE (Western Australian Museum, WAM 7-64), female "g" 4.77 mm, in the type series collected August 1963, A.M. Douglas collector. Other material from type series (PARATYPES), female "h" 5.08 mm, female "i" 4.38 mm and 26 other specimens (no males).

Diagnosis. As in the genus.

Description of holotype (female "g"). *Body* (Fig. 24): urosome poorly armed dorsally; length, 4.74 mm.

Head (Fig. 24): rostrum obsolescent; eyes absent.

First antenna (Fig. 24): length about 0.6 of body (broken), 2.4 second antenna, flagellum longer than peduncle, peduncular article 1 longest, article 3 shortest, setae sparse, flagellum with many articles, no calceoli, no aesthetascs; accessory flagellum 2-articulate, second article tiny, articles of primary flagellum uniform, sparsely setulate. *Second antenna* (Fig. 24): length 0.25

body; peduncle longer than flagellum, articles 4–5 equally long, articles 3, 4 and 5 with weak ventral setation, article 3 without dorsomedial spines; flagellum 4-articulate, lacking calceoli.

Upper lip (Fig. 24): apical margin excavate, connection to epistome and bulbous epistome itself slightly asymmetrical. *Left mandible* (Fig. 24): palp article 1 shorter than 2, article 2 with 2 apical setae; incisor 5-toothed, lacinia mobilis 5-toothed, 4 setose accessory blades; molar lacking distal plumose seta, no other pubescence. *Right mandible*: incisor 5-toothed; lacinia mobilis bifid, slender, each flake denticulate; accessory blades of 4 scarcely plumose spines. *Right and left first maxillae* (Fig. 24): palp article 2 with 7 thin apical and subapical spines, outer plate with 7 spines, most denticulate; inner plate with 6 medial setae. *Second maxilla* (Fig. 24): outer plate outer apical margin with pubescence, basomedial margin of inner plate with pubescence. *Maxilliped* (Fig. 24): palp article 3 with pair of thin setae on inner edge; inner plate with 1 ventrofacial spine.

First gnathopod (Figs 25, 26): coxal plate with short setae apically, without posteroventral spine; article 4 posteriorly bulbous; carpus not lobate; propodus trapezoidal, expanding apically, longer than wide, posterior edge almost naked, corner of palm almost square, with 3 lateral setae and 4 medial spines, palm

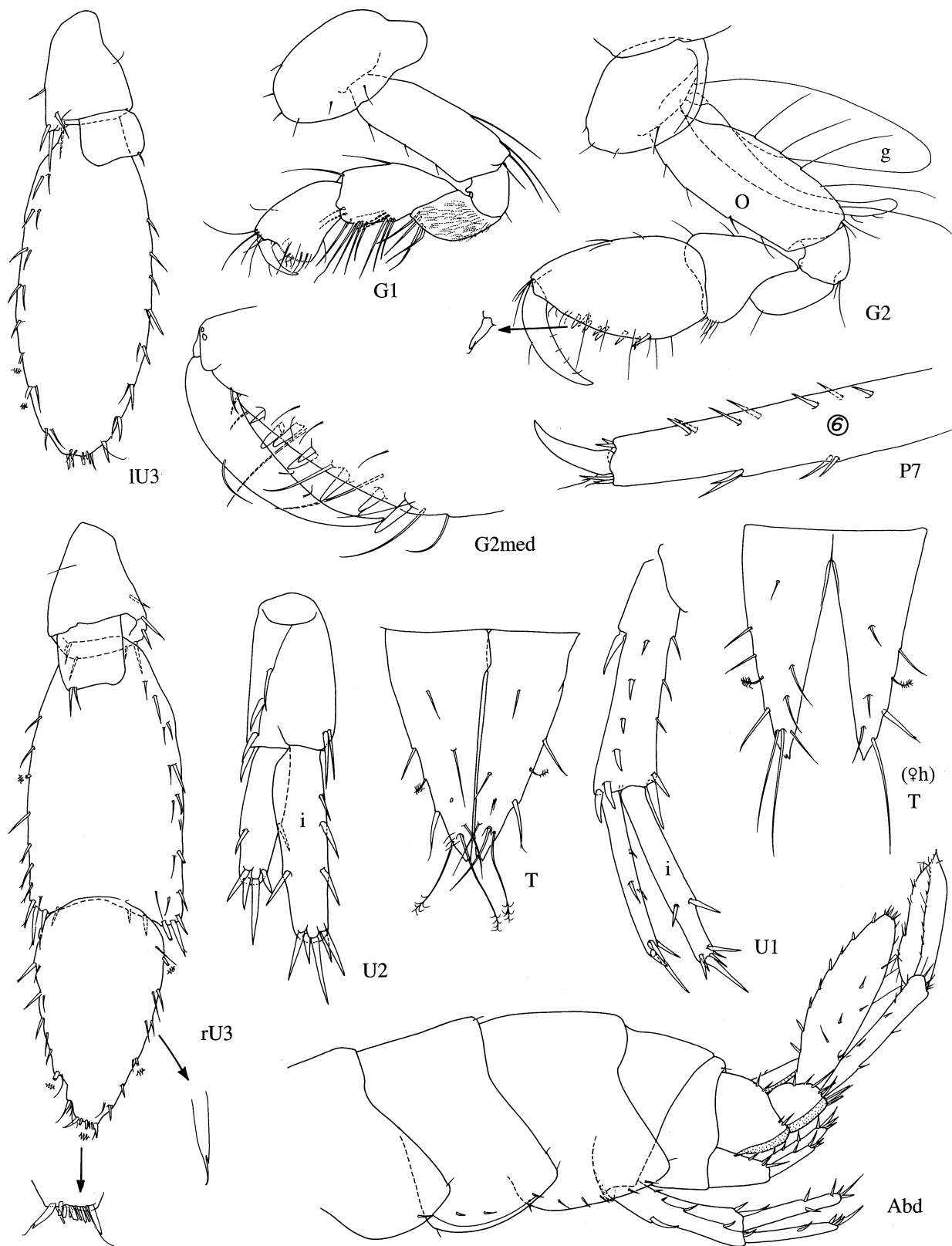


Fig. 26. *Nedsia douglasi* n.sp., holotype, female "g" 4.77 mm (all drawings except those indicated); female "h" 5.08 mm.

slightly convex; dactylus reaching end of palm. Palm of *second gnathopod* (Fig. 26): with 4 lateral and 4 medial spines, spine at palmar corner medial, coxal plate broader and poorly setose.

Pereopods (Figs 24–26): coxa 3 with similar setae, coxa 4 more irregular, with similar setae; pereopods 3–4 longer than gnathopod 2, pereopod 3 not longer than 4, articles 4–5 sparsely setose posteriorly, posterior margin of article 6 on pereopods 3–4 with armament formula of ES-ES-S-S, thus with only one locking spine; pereopods 5–7 similar but consecutively elongate, each with 2 locking spines; anterior spines on pereopod 7 article 6 displaced inward by keel-like expansion of segment; coxae 5–7 bearing few setae on ventral margin of posterior lobes, article 2 moderately expanded and not lobate but extended posteriorly, bearing thin short posterior setae; dactyls of pereopods 3–7 simple, naked except for outer basal penicillate setule. Gills of coxae 2–6 flask-shaped, of pereopod 6 not reduced. Oostegites strap-shaped, poorly setose.

Epimera (Fig. 26): each epimeron posteroventrally quadrate (softly), posterior margins scarcely convex, smooth and barely setulose, epimera 1–3 with 1–3–6 ventrofacial spines, lacking lateral oblique ridge. *Pleon* (Figs 24, 26): only pleonites 2 and 5 with dorsolateral posterior seta, pleonite 6 with 2 dorsolateral and 2 distoventral spinules; uropod 3 extending well beyond uropods 1 and 2 in entire animal, uropod lengths relative to uropod 1: uropod 2 = 0.5, 3 = 1.33. *Pleopods*: retinacula 2 per pleopod, one accessory: peduncles each with 1 apicolateral seta, rami extending subequally, outer with 10–9–8 articles, inner with 10–9–8 articles, setae on basal articles = 1–1–1–1 for all rami, none bifid.

First uropod (Fig. 26): peduncle length 1.3 rami, 1 basofacial spine, outer margin with 1 apicodistal spine besides row of 3 dorsal spines, with 2 apicomedial spines: rami of subequal length, both rami with 2 sparsely filled rows of marginal spines. *Second uropod* (Fig. 26): peduncle about 1.1 length of inner ramus, with 2 apicodorsal spines, 2 dorsolateral spines, medial margin with 2 apical spines: outer ramus shorter than inner, both with 2 rows of marginal spines in formula of 1–1 and 1–3, apices of rami on uropods 1–2 with 4–6 and 4–5 spines. *Third uropod* (Fig. 26): peduncle length 0.28 outer ramus, shorter than urosomite 3, with subdistal seta besides apicolateral cluster of 5 spines; outer ramus proximal article with several irregular spine-setal ranks, article 2 shorter but similarly armed; inner ramus length 0.12 of outer, with 2 apical spines, left uropod 3 regenerant. *Telson* (Fig. 26): 1.2 as long as wide, as long as urosomite 3; cleft 100 percent of its length; apices minutely notched, subapices each with 3 long setae, 3 other dorsal setae and 2 lateral setae on each lobe, each lobe with single penicillate setule dorsolaterally at M.60.

Description of other material. Specimen “h”: female, length 5.08 mm. Mandibular palps (Fig. 24) with 2–3 apical setae on article 2. Telson less setose apically than holotype.

Specimen “i”: female, length 4.38 mm. *Head*, right lacinia mobilis and mandibular palp illustrated (Fig. 24).

Distribution. Western Australia, North West Cape, in well.

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