

A new stygobiont melitid amphipod from the Nullarbor Plain

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Abstract – A new genus and species of melitid amphipod, *Nurina poulteri*, from the Nullarbor Plain, Western Australia, is described. The new taxon, from two caves in the Roe Plain region, is compared with melitids from elsewhere in Australia, and possible origins relevant to the recent geological history of the region are discussed.

INTRODUCTION

Stygobiont amphipods are being recorded in increasing numbers from widespread regions of Australia. The number of described troglobite or troglophile species is now near 50 (Bradbury and Williams, 1997a, b). The actual number of known species is, however, much greater as many are in the process of description or held in collections pending taxonomic treatment. The majority is associated with groundwaters in carbonate rocks which have been karstified. The Nullarbor Plain, approximately 200,000 km², located in central southern Australia around 30–32°S latitude between longitudes 124° and 132°E, is a region of Tertiary limestones, which arose from the sea in the Middle Miocene (15 MYA).

After final emergence from the sea the Nullarbor limestones underwent karstification, including the development of caves which intersect the regional groundwater table, although few of these underground lakes appear to contain aquatic macroinvertebrates. Richards (1971) recorded no aquatic fauna from a comprehensive survey of many caves, suggesting that low effective precipitation, general absence of permanent surface streams, and phreatic origin of the caves with no evidence of marine inundation, precluded colonisation either by marine or freshwater species. This is probably largely true, except in one region, the Roe Plains, an eroded area of coastal lowland in the central Nullarbor extending a distance of almost 300 km from Twilight Cove (~32°20'S, 126°E) to Wilson Bluff (~31°40'S, 129°E) and up to 40 km wide. This area of uplifted sea bed is low lying, compared with most of the Nullarbor, not exceeding a maximum altitude of 30 m above sea level at its northernmost margin, and adjacent the Southern Ocean in the Great Australian Bight along the southern edge. Although Richards (1971) found no evidence of marine invasion in Nullarbor caves,

there are indications of sea-levels as high as 30 m above the present level. Among Roe Plains caves, therefore, marine intrusive species, or relict marine species might well be expected, as has been found in other regions of similar geological history, such as North West Cape (Humphreys and Adams, 1991; Knott, 1983; Barnard and Williams, 1995; Bradbury and Williams, 1996, 1997b), the Ashburton River and lower Fortescue River areas in northern Western Australia (Bradbury, unpublished), and in the Flinders Ranges of South Australia (Barnard and Williams, 1995).

Knott (1983, 1985) reported on a 1982 collection from waters of Nurina Cave (one of the Roe Plains caves). He noted a number of amphipods thought to be of the genus *Melita* Leach. These specimens have not, however, been formally described. Several genera and species attributed to the Melitidae have already been recorded from other regions of Australia that have been subject to marine inundation (Bradbury, 1999); all are stygobionts. One of us (S.E.) accessed Nurina Cave (#N46) as well as the unnamed adjacent cave designated cave N1327, in December 1998, and was able to collect amphipod specimens from both sites. Three species of three amphipod families were represented in the collections. The most abundant, and the dominant species, which is described here, and the only taxon taken from Nurina Cave, is almost certainly that collected in 1982 and reported by Knott (1983); the other two taxa will be treated elsewhere, in conjunction with related collections.

METHODS OF DISSECTION AND DESCRIPTION

Methods of dissection, description and notation follow those of Bradbury and Williams (1996, 1997b).

The notation *M*, with an appended number, indicates the position of an object as a fraction of the distance from the base to the apex of an

appendage; **S** large spine; **s**, small spine. Abbreviations used in the figures are 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**, urosome; **1, 2, 3** ..7, first, second, third ..seventh article, segment, somite or epimeron (as appropriate).

Mandibular palp setae are described using the notation of Karaman (1969) and Barnard and Barnard (1983).

SYSTEMATICS

Family Melitidae Bousfield, 1973

Nurina gen. nov.

Type Species

Nurina poulteri sp. nov.

Diagnosis

Pleonite six dorsolaterally naked, pleonite 5 with robust dorsolateral seta; rostrum obsolescent; lateral cephalic lobes strongly projecting, large, plate like, with distinct ventral notch formed by the blunt extension of the anteroventral margin. Eyes absent. First antenna longer than the second, ratio of peduncular articles 1:1.3:0.5. Accessory flagellum four articulate, the fourth article tiny. Second antenna long, flagellum much shorter than peduncle, calceoli absent. Upper lip asymmetrical, ovate and apically piliose. Mandible: palp three articulate, article one short, naked; third article with CDE setae; accessory blades numerous, with interraker plumose setae and brushy basal setae onto the molar. Lower lip: bearing broad inner lobes. Maxillae: moderately setose medially, ovato-triangular, facially setose (pubescent), with medial and apical plumose setae; outer plate with nine denticulate robust setae, palps asymmetric the left with thin apical and subapical setae, the right with apical broad spines fused to the article as well as apical and subapical setae. Inner plate of second maxilla without plumose medial setae, but some naked paired medial setae extending to the apex, some facial. Both plates of second maxilla with naked apical and subapical setae of medium to moderate length and both with few marginal setules (pubescence). Maxilliped: inner plate long, extending to M0.7 of outer plate, with a medial submarginal disto-facial row of plumose setae extending more facial apically, blunt, naked

tooth like robust setae subterminally and an apical row of plumose setae; outer plate large, with long, curved, robust apical plumose setae continuous with a distal row of submarginal to apical, short to long naked tooth setae, and medial to sub marginal to facial paired rows of long naked setae; medial margin straight, without marginal robust setae, the distomedial corner quadrate; palp article two short, article three elongate, with no lateral setae; article three moderately to densely setose medially, with a row of long setae at the base of the dactyl distolaterally and facially; apex produced slightly, bearing marginal setules, dactyl unguiform, multispinous, without facial setules (not pubescent), bearing a long naked nail with basal setae. Coxae: one to four normal, longer than broad, lacking posterior robust setae; coxae one to three subquadrate, not apically expanded; coxa four moderately excavate posteriorly; coxa five shorter than four; female coxa six anterior lobe ventrally extended, coxa seven small, unlobed anteriorly. Gnathopods: diverse, gnathopod one much smaller than gnathopod two, dactyl of gnathopod one without recumbent inner tooth spine, both dactyls with distinct nail. First gnathopod small, merus lacking hyaline lobe, without rastellate seta, carpus longer than propodus, not lobate, palm of propodus transverse, short, deeply notched in males, distal row of long robust setae borne on palmar submargin each with a small subapical trigger; gnathopod two enlarged, 1.5–2.x gnathopod one, carpus short, triangular and lobate, dactyl enlarged and ovate, palm strongly oblique, setose, defining corner absent, but indicated by limit of robust setae; dactyl shorter than extent of robust setae. Pereopods: three and four shorter than pereopods five to seven, posterior setae on article six of pereopods three and four evenly spaced, weak; pereopods five to seven moderately long, six longest, the others subequal in length, the basis (article 2) moderately expanded, ovato-rectangular, posteriorly extended and slightly lobate; dactyls of pereopods lacking accessory spinules other than the usual single posterior and anterior setules. Coxae two to six each bearing a single flask shaped gill, that of coxa six sub equal in size to the gill of coxa five. Without sternal gills. Oostegites: present on coxae two to five of mature females; narrow, marginally poorly setose. Epimera: posteroventral corner of epimera one to three acuminate, but without spine or seta, posterior margins straight to slightly convex, with moderate numbers of setae; epimera two and three with facial robust setae near the ventral margin. Pleopods: peduncles with few setae, rami extending equally, basomedial setae of inner rami bifid; retinaculæ two per pleopod, plus two accessory retinaculæ. Uropods: apico-lateral corner of peduncles of uropods one and two with one and two robust setae; lateral- and medial- dorsal margins of peduncle of first uropod spinose, of

second naked; first uropod with basofacial robust seta; rami of uropod one subequal, the lateral ramus of uropod two shorter than the medial; rami of both uropods with two robust seta rows; third uropod strongly extended, peduncle of moderate length, outer ramus large of one article only, inner ramus short and scale-like; lateral and medial setae of outer ramus dense; peduncle with apical, medial and distal robust setae. Urosome: ventrodorsal robust seta on urosomite one at base of uropod one absent. Telson: shorter than broad, cleft 95%, laterally convex, medially sinuous, bearing long, medial, lateral and sub-apical robust setae, with one or two apical or sub-apical penicillate setae and paired lateral penicillate setules.

Relationships

The family Melitidae is characterised (Barnard and Barnard, 1983) by: the lower lips usually bearing inner lobes weak to fleshy; maxillae fully to not setose medially; the first gnathopod and also the female second gnathopod "melitid" in form; with a distinct palm; the male second gnathopod enlarged, the palm without robust setae or scattered robust setae; the third uropod is parviramous; the telson cleft; coxal gill seven absent; the first antenna accessory flagellum is of two or more articles; peraeopods 3–4 are ordinary, 5–7 basis variably enlarged, the dactyls simple; pleonites and urosomites only occasionally dentate; the oostegites narrow. *Nurina* bears these characteristics. *Nurina* is similar to *Melita* in that the peduncle of the third uropod is not elongate, inner lobes are present on the lower lip, the telson tapers distally, uropod three extends beyond uropod one in the whole specimen, anterior coxae are significantly longer than posterior coxae, the maxillae are weakly setose medially, the second gnathopod not bilaterally diverse, nor chelate, and the mandibular palp three articulate. However, *Nurina* differs from *Melita* in that: the eyes are lost; the second peduncular article of the first antenna is relatively longer, the third shorter; the primary flagellum of the first antenna is relatively much shorter – 2x vs 5x the length of the peduncle; the accessory flagellum is of four articles, rather than 2+; the third article of the mandibular palp bears C as well as D and E setae; the inner lobes of the lower lip are broad, but thin and poorly developed rather than well developed and fleshy; the inner plate of the first maxilliped is triangular rather than 'falcatotriangular' being straight not curved, and the outer plate bears nine robust denticulate setae as opposed to 7+; the dactyl of the maxillipedal palp is barely curved, not unguiform.

Nurina differs from *Psammogammarus* Karaman in that the third uropod is distinctly parviramous and the anterior coxae are distinctly longer than posterior coxae; from *Galapsiellus* J. L. Barnard and *Anchialella* J. L. Barnard in that the peduncle of the

third uropod is not elongate, the second gnathopod strong and the carpus not elongate; from *Psammoniphargus* in that the lower lip bears inner lobes and the mandibular palp is not reduced to a single article; from *Nainaloo* Karaman and Barnard and *Rotomelita* J. L. Barnard in that the telson is not rectangular, but tapering and without excavate apices; from *Melitoides* Gurjanova in that the third uropod exceeds the length of the first in the undissected specimen; from *Victoriopisa* Karaman and Barnard and *Eriopisa* Stebbing in that anterior coxae are significantly longer than posterior and that the third uropod is without a second article on the outer ramus; from *Maleriopa* Barnard and Karaman and *Paraniphargus* Tattersall in that maxillae bear medial setae; from *Dulichella* Stout in that the male second gnathopods are not asymmetrical, the body is smooth, without transdorsal serrations, and the inner plate of the first maxilla bears many setae and is not sickle like; from *Tegano* Karaman and Barnard in that the mandibular palp is not reduced to two articles.

Species Composition

Nurina contains only *N. poulteri* sp. nov.

Etymology

Named for the type location, Nurina Cave, Western Australia. The gender is feminine.

Nurina poulteri sp. nov.

Figures 1–5

Type Locality

Underground water, Nurina Cave, Roe Plains, Western Australia, Australia, 127°01'E, 32°01'S.

Material Examined

Holotype

♂, 'a' 9 mm (WAM C 24436), Nurina Cave N46, Roe Plains, Western Australia, Australia, 127°01'E, 32°01'S, 31 December 1998, S. Eberhard.

Allotype

♀, 'b' 7.5 mm (WAM C 24437), same data as holotype.

Paratypes

1 ♂, 8.9 mm (WAM C 24438) and 15 other specimens, same data as holotype.

Other Material

Australia: Western Australia: 2 ♀, cave N1327, Roe Plains, 127°01'E, 31°57'S, 10 April, 1997, N. Poulter and D. Hall (WAM BES 4648, BES 4651); 8 ♀, same data except 31 December 1998, S. Eberhard (WAM).

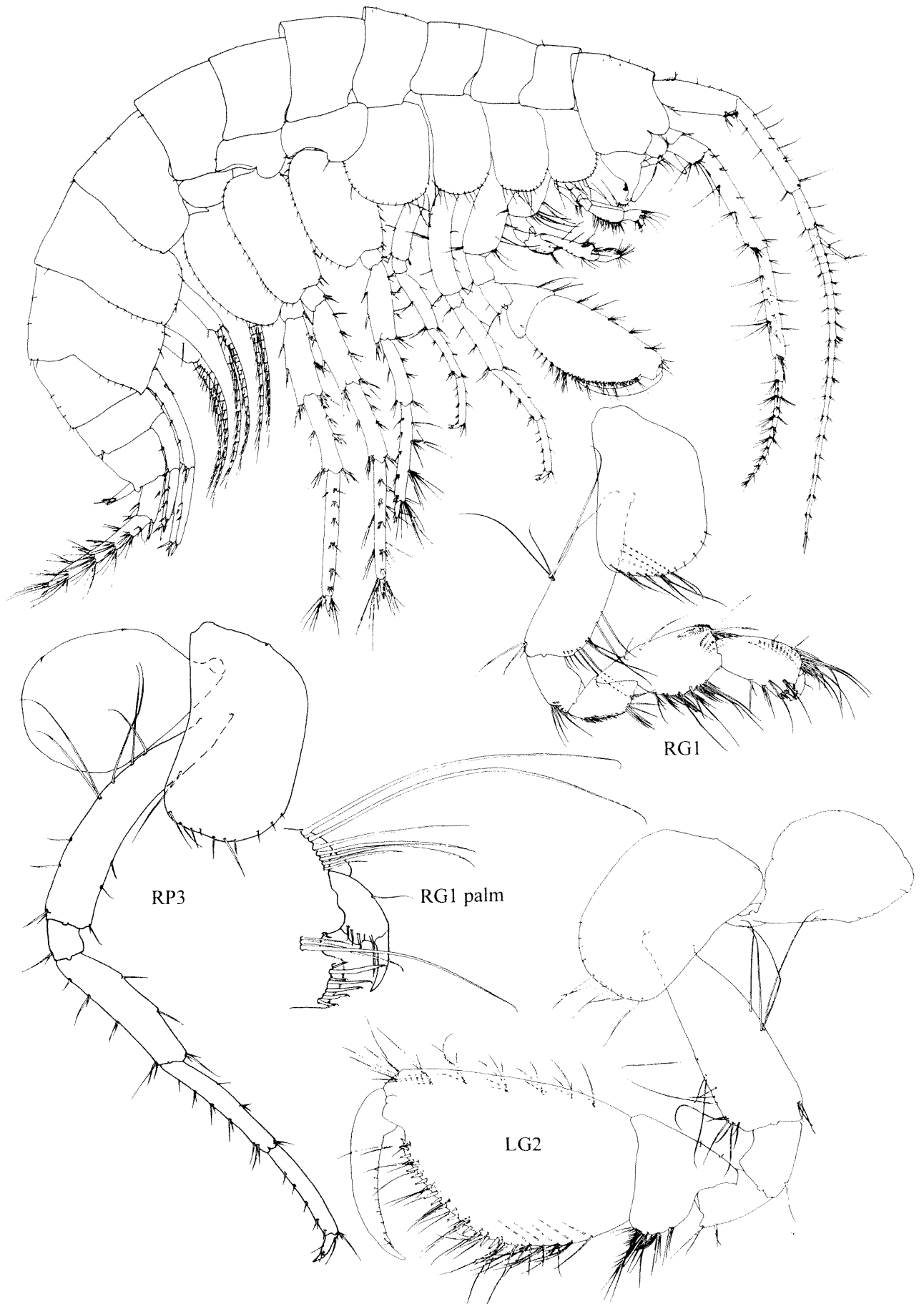


Figure 1 *Nurina poulteri* male 8.9 mm: whole; holotype, male 'a': right gnathopod 1 and palm, left gnathopod 2, right pereopod 3.

Diagnosis

As for the genus.

Description of holotype (male 'a')

Body (Figure 1): Length 9 mm. Urosome with few, scattered weak setules, urosomite five with one distolateral robust seta. *Head*: rostrum obsolescent, eyes absent. *First antenna* (Figure 1): Length 0.6 x body, 1.4 x second antenna; flagellum longer than peduncle, of twenty articles, the ultimate article tiny; peduncle article one 0.7 x the second which is longest, the third shortest, ratio of articles 1: 1.3: 0.5, article one with few setae, bearing a ventrodiscal group of simple and penicillate setae and one robust seta; sparse short and long setae present on articles two and three; calceoli and aesthetascs absent; accessory flagellum four articulate, the ultimate article tiny, extending to M0.3 of the fifth article of the primary flagellum; primary flagellum sparsely setulate, articles 3–4 short. *Second antenna* (Figure 1): length 0.4x body, peduncle much longer than flagellum, articles four and five equally long, sparsely setulate, other articles with few setae, length ratio of articles 1:3.3:3.1; flagellum short, eight articulate, moderately setose, lacking calceoli. *Upper lip*: asymmetrical, offset to the right, ovate, apically piliose. *Lower lip* (Figure 2): bilobed, the inner lobes broad, weak, extending to M0.7 of the outer lobes; outer lobes with strong denticulate distal setae, medial and distomedial pilia. *Left mandible* (Figure 2): palp three articulate, ratio of articles 1:3.5:3, the first article short and naked, the second linear, longer than article one with few medial and no lateral setae; article three sublinear, lacking A or B setae, with 1C, 3D, 4E setae; incisor bearing five teeth, lacinia mobilis four, accessory setal row of eight rakers and four interrakers; molar with distal plumose seta and peripheral posterior pubescence. *Right mandible* (Figure 2): palp similar, article two bearing few setae, article three with 1C, 3D, 4E setae, mandible with five teeth, lacinia mobilis bifid and strongly denticulate. *First maxilla* (Figure 2): left and right sides asymmetrical; inner plate ovatotriangular bearing eight left and seven right plumose distomedial and apical setae covered in short setules (pubescence); outer plate bearing nine denticulate terminal robust setae on both sides, facially setulate (pubescent); left palp, second article with a sub apical row of eight slender setae and six apical slender to strong naked setae; right palp article two with a sub apical row of seven naked and one distally plumose setae, two mediobasal naked setae and three broad tooth spines fused to the apex. *Second maxilla* (Figure 2): apicolateral margin of both plates setulate (pubescent), terminating in long naked, curved setae in apical and sub apical rows; medial setae of inner plate not plumose although some terminally rastellate. *Maxilliped* (Figure 2): peduncle bearing few setae;

inner plate subrectangular, facially and distolaterally setulate (pubescent); the outer plate bearing a medial submarginal row of fourteen naked tooth setae continuous with a medial subapical row of four tooth setae, all increasing in length distally forming a submedial pallisade row of teeth, distomedial to apicofacial paired rows of naked setae, an apicolateral to apical row of four long plumose setae, apicofacially and apicolaterally pubescent; the inner plate with a medio- to apicofacial row of eleven plumose setae, seven apicolateral plumose setae and three sub apical strong naked tooth spines; medial margin straight, naked, the apicomedial corner subquadrate; palp article three with a medial to distolateral row of long setae, and a row of long setae basal to the dactyl, the apex marginally setulate with a group of slender setae facial at the hinge of the dactyl, the dactyl itself bearing three accessory posterior setules and two setules basal to the nail. *First gnathopod* (Figure 1): small; coxal plate subrectangular, apically rounded with an apicomarginal row of eight long, slender setae and five anteroventral short slender setae; merus posteriorly bulbous and setate with a distal row of long, strong setae; carpus subtriangular, short about 0.5x propodus, not lobate, bearing post-transverse rows of strong rastellate and a few elongate simple slender setae; propodus trapezoidal, apically expanded, longer than wide with few anterior, posterior and facial setal rows, seven clusters of elongate facial setae at the dactyl base; palmar corner subquadrate, the palm short, marginally finely denticulate, strongly notched, with a sub palmar row of seven strong setae between the corner and notch, the palmar angle transverse to slightly oblique; the dactyl short, with three medial setae and a long slender seta basal to the nail, reaching almost to the palmar corner. *Second gnathopod* (Figure 1): much larger than the first; coxal plate subrectangular, broadly rounded apically with four short anteroventral and seven longer apical setae; merus postdistally extended, subquadrate; carpus subtriangular, moderately lobate, bearing transverse posterior rows of long setae; propodus much enlarged, three times the first gnathopod, ovate, longer than wide – 1.5x – with seven transverse dorsal (anterior) rows and six ventral (posterior) rows of setae; palm strongly oblique, rounded without a clearly defined palmar corner, the palm delineated by a marginal row of robust trigger setae and long slender simple setae; the dactyl short of the palmar corner bearing a row of small hooked setae sub marginal to the proximal edge, a small recumbent inner tooth spine and single seta basal to the nail. *Pereopods* (Figures 1, 3): pereopods three and four equal in length, longer than the gnathopods; coxa three subrectangular, apically rounded, broader than long, with only a

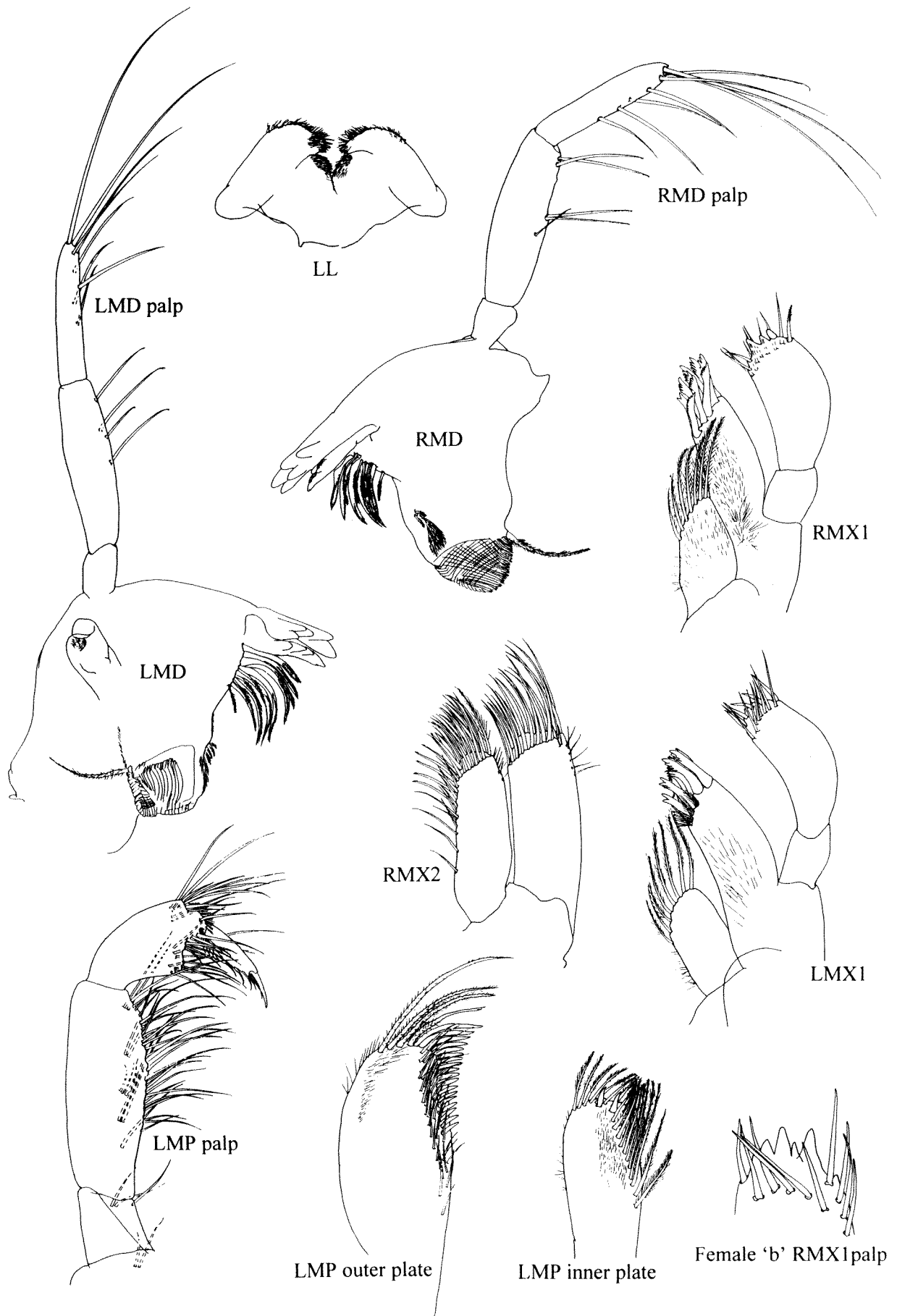


Figure 2 *Nurina poulteri* holotype, male 'a': mouthparts (all illustrations except where indicated); allotype, female 'b': apex of right first maxilla palp.

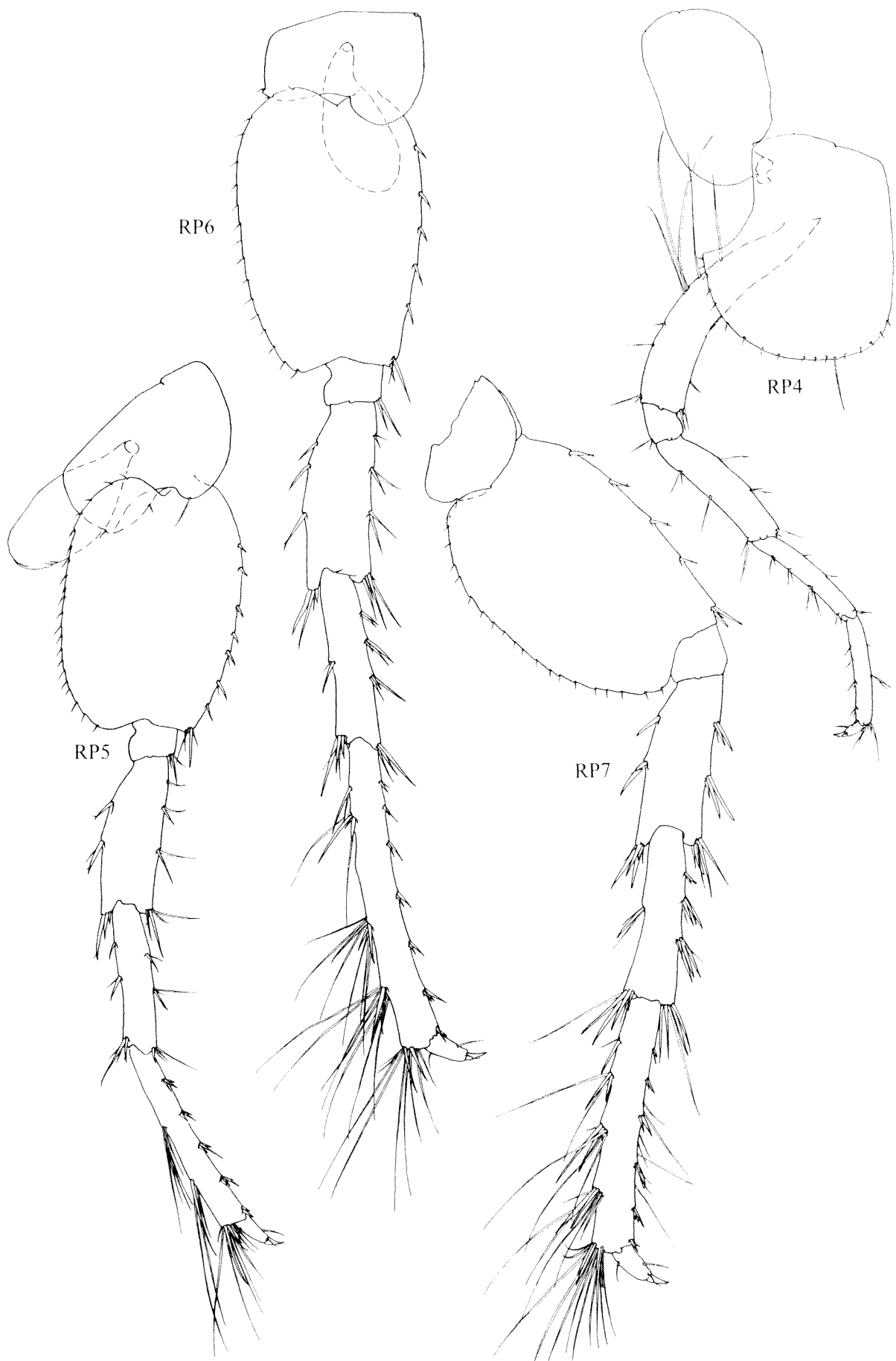


Figure 3 *Nurina poulteri* holotype, male 'a': pereopods 4-7.

few marginal setae ventrally; coxa four ovato-rectangular, moderately excavate posteriorly, with small marginal ventral setae; coxae five and six bilobed; coxa five with a single slender seta ventral on the anterior lobe and small ventral and postventral setules; coxa six with two very small posterior setules; coxa seven lacking an anterior lobe, bearing one small posterior setule. Pereopods three and four second article bearing long, straight, distally curved posterior setae, articles three and four with few short to medium length setae, articles five and six with mixed slender and robust setae. Pereopods five to seven; basis moderately expanded, with small posteroventral lobes, short to medium length anterior robust setae and short, weak posterior setae; merus to propodus well armed with long robust and slender setae, extremely long posteriorly on the carpus of each, dactyls without accessory setae except the normal single posterior and outer penicillate setules. *Gills* (Figure 5): coxae two to six bearing flask shaped gills, decreasing in size posteriorly, although gill six not significantly smaller than gill five. *Pleopods* (Figure 4): peduncles each bearing two retinaculae and two accessory retinaculae distomedially, and few short setae, some plumose; rami subequal in length, basal articles each with several setae, the medial setae of medial rami diamond headed, all rami of fourteen articles, except the medial third being of twelve articles. *Epimera* (Figure 4): epimera one with one anterior and one mid submarginal robust seta, the postventral corner acuminate but not spinous, the posterior margin slightly convex, almost straight, with six small setules; epimeron two with two anteroventral submarginal robust setae, the postventral corner acuminate, not spinous, the posterior margin slightly sinuous with five small setae; epimeron three with three anteroventral facial robust setae, the postventral corner acuminate but not spinous, the posterior margin slightly sinuous with six small setae. *Pleon* (Figure 4): pleonites one to three and urosomite one bearing few weak dorsal and dorsolateral setae; urosomite two with a single postlateral robust seta, urosomite three naked. *Uropods* (Figure 4). *First uropod*: longest; peduncle length 1.3x the length of the inner ramus, bearing a robust seta basofacially, a dorsolateral row of three robust setae and two apicodorsal robust setae, and a dorsomedial row of two robust setae and one apicomедial robust seta; rami subequal in length, the inner ramus being slightly longer, the outer ramus bearing two lateral and two medial robust setae, the inner ramus with one lateral and three medial robust setae, and each with five apical robust setae. *Second uropod*: smaller than the first, 0.6x the length; the peduncle length equal to the inner ramus, slightly longer than the outer (1.1x), peduncle bearing single apicolateral and apicomедial robust setae; outer ramus with two

dorsolateral and one dorsomedial robust setae and five apical robust setae, the inner ramus with two dorsolateral, two dorsomedial and five apical robust setae. *Third uropod*: strongly extended, length 0.8x uropod one; peduncle short, less than 0.5x the length of the outer ramus, with five apicolateral robust setae and one apicomедial robust seta basal to the inner ramus; inner ramus small, scale like, 0.4x peduncle length, bearing a single distal robust seta; outer ramus elongate, one articulate, linear, sub rectangular with a width to length ratio of 0.2, bearing five lateral and five medial transverse ranks of mixed long robust setae and very long slender simple setae, an apical cluster of six short robust setae and twelve very long slender simple setae. *Telson* (Figure 4): length less than width, shorter than urosomite three (0.75x), cleft 95% of length, lobes sub triangular, lateral margin almost straight, medially concave, narrowing distally to a mid distal peak bearing three small apical acuminations, lateral and medial robust setae dorsally at M0.8, and two sub apical robust setae medial to the apex, paired penicillate setules sub lateral at M0.85 and a single sub apical penicillate setule as well as one or two marginal naked setae, otherwise without dorsofacial setation.

Description of allotype (female 'b')

Similar to the holotype, except in the following: *Body*: Length 7.5 mm. *Mandibles*: palps three articulate, ratio of article lengths R – 20:54:45, L – 20:58:45, setae of article three of both 1C, 2D, 4E. *Maxillae*: inner plate of first maxilla bearing L 8, R8 plumose medial and apicomедial setae; palps asymmetric, left palp second article terminating in long strong setae, similar to the holotype, the right palp terminating in strong setae and broad fused tooth spines, differing from the holotype in number of denticulations (Figure 2). *First gnathopod* (Figure 5): first gnathopod small, smaller than gnathopod two, similar to the male holotype except that the palm lacks a notch. *Second gnathopod* (Figure 5): much larger than gnathopod one; propodus large, ovato-rectangular; palm without a clearly defined corner, indicated by the extent of robust trigger bearing setae; dactyl slightly shorter than the palm, bearing two facial setules a small recumbent inner tooth spine at the base of the nail and a row of submarginal hooked setae; coxae (Figure 5) two to five each bearing, in addition to a flask shaped gill, narrow, moderately setose oostegite, the anterior lobe of coxa six extended ventrally into an elongate curved plate. *Uropods*. *First uropod*: peduncle bearing a robust ventrofacial seta, a dorsolateral row of three robust setae and two apicolateral setae, and a medial row of two dorsolateral robust setae and one apicomедial robust seta; outer ramus bearing two dorsolateral, two dorsomedial and five apical robust setae; inner ramus one dorsolateral,

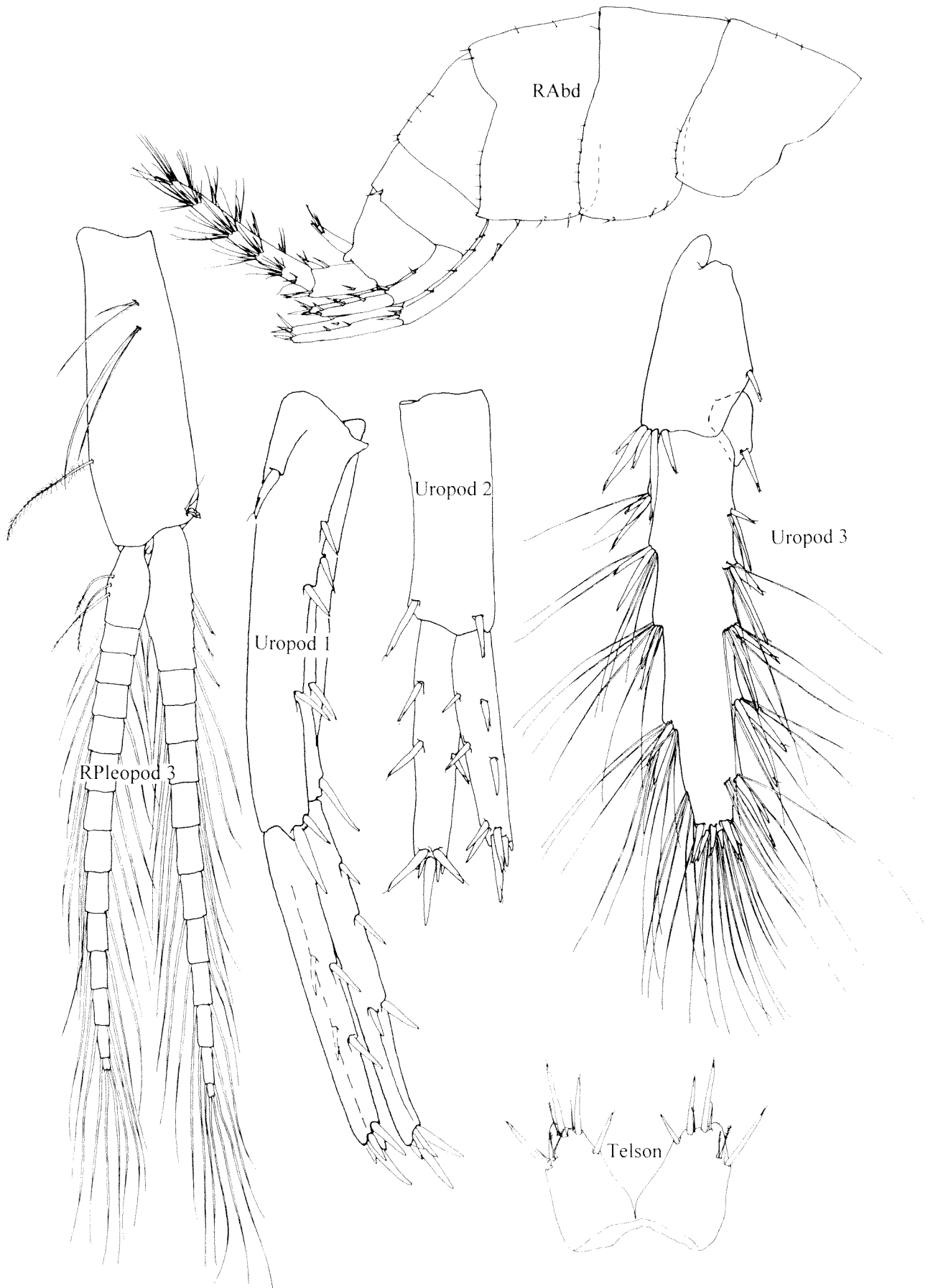


Figure 4 *Nurina poulteri* holotype, male 'a': abdomen, third pleopod, uropods 1-3, telson.

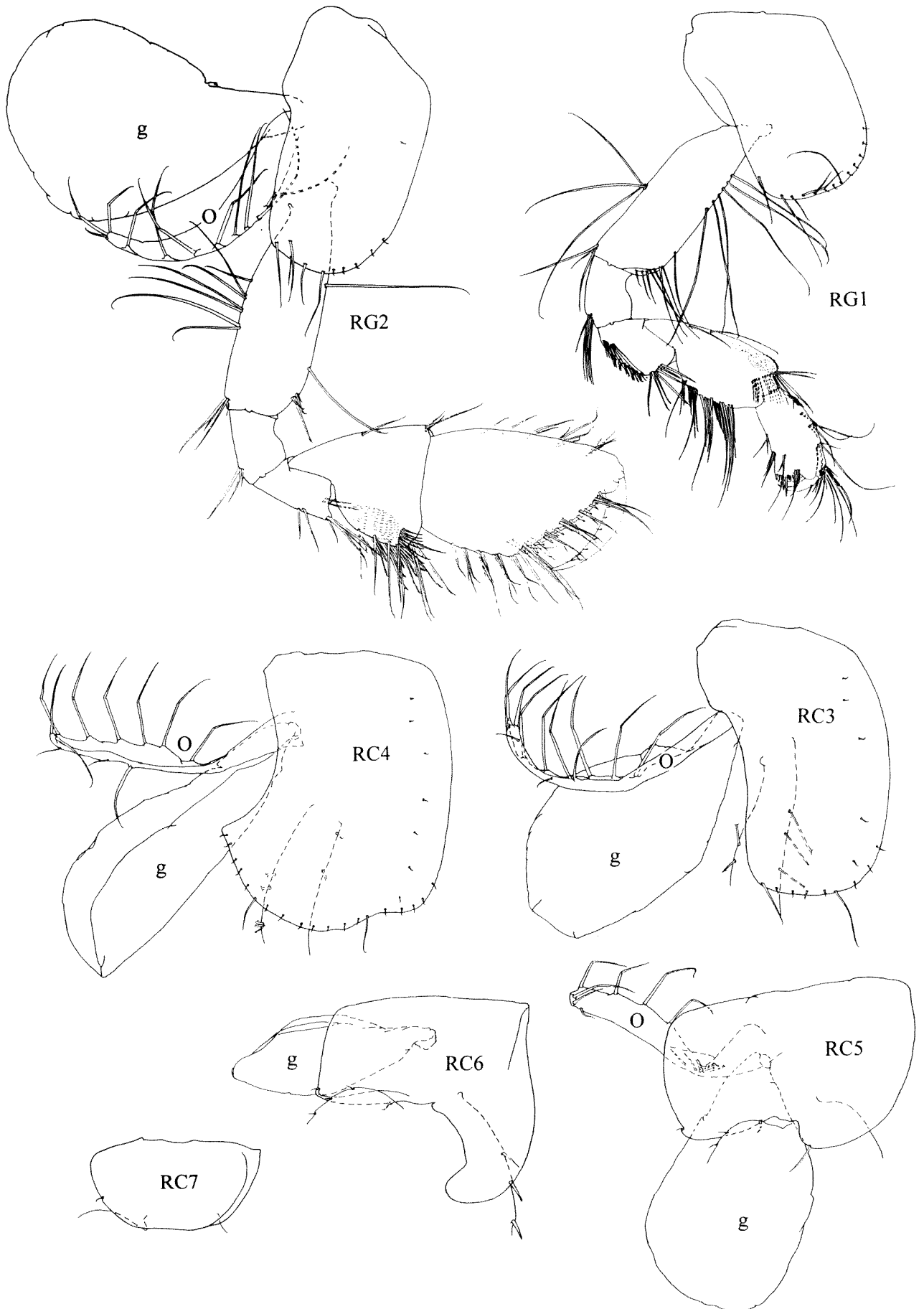


Figure 5 *Nurina poulteri* allotype, female 'b': gnathopods 1-2, coxae 3-7 indicating coxal gills and oostegites.

two dorsomedial and five apical robust setae. *Third uropod*: very similar to the male holotype; inner ramus bearing a second small apical seta; outer ramus of one article, bearing five translateral clusters of robust and slender setae both laterally and medially, and six robust and six very long slender apical setae.

Description of male 8.9 mm

Similar to the holotype, except in the following: *First antenna*: primary flagellum of twenty four articles (apex lost), the first elongate, 2x article two, the accessory flagellum of four articles, extending to M0.7 of article four of the primary flagellum. *First gnathopod*: with a deep palmar notch. *Second gnathopod*: very much larger than the first, propodus enlarged – 3.5x the first. *Uropods*. *First uropod*: peduncle with four dorsolateral, two apicolateral, two dorsomedial and one apicomedial robust setae; inner ramus bearing one dorsolateral, three dorsomedial and five apical robust setae; outer ramus bearing two dorsolateral, three dorsomedial, and five apical robust setae. *Second uropod*: peduncle bearing only a single apicolateral robust seta; inner ramus with three dorsolateral, two dorsomedial and five apical robust setae; outer ramus with one dorsolateral, three dorsomedial and five apical robust setae. *Third uropod*: peduncle bearing small basal and lateral facial setae, two apicolateral and two apicomedial robust setae; inner ramus small, scale like, bearing two apical robust setae; outer ramus one articulate, with six transverse medial and lateral clusters of robust and very long slender setae, the apex with five robust and twelve very long slender setae. *Telson*: the right lobe bearing an additional, fifth, lateral robust seta, the left lobe without this addition.

Distribution

Nurina Cave N46 and cave N1327, Roe Plains Western Australia.

Etymology

Named for Mr Norm Poulter who was involved in the collection of specimens from both Nurina Cave and cave N1327, and without whose participation this new species would not have been described.

Discussion

Three caves are known on the Roe Plains, although only two of these – Nurina Cave (N46) and cave N1327 – intersect the regional water-table. Nurina Cave is located approximately 14 km south of the Hampton Scarp, old eroded sea-cliffs marking the northern extent of the Roe Plains, and approximately 30 km north of the present coastline. The elevation of the entrance is 24.8 m +/- 1.5 m

above mean sea-level (Wigley and Hill, 1967). Several water quality measurements have been made in the cave: the salinity and chemical composition of the water is essentially the same as sea water, except that it is enriched with calcium (Gillieson and Spate, 1992; James *et al.*, 1991; Lowry, 1970). Entrance to the cave is via open vertical passages. *N. poulteri* is abundant in the pool immediately below the entrance and, although present elsewhere in the extensive cave system, is far less abundant (Eberhard, 1999).

Cave N1327 lies approximately 6 km north-west of Nurina Cave. Groundwater pools are relatively shallow – less than 2 m – including some with a silty substrate. The physicochemistry of the water is unknown. The entrance to this cave is quite restricted and the potential for external food supply thus reduced. In this cave *N. poulteri* (as well as other aquatic invertebrates) is closely associated with intrusive tree roots (mallee – *Eucalyptus* spp.) which penetrate to a depth of approximately 25 m to reach the water-table (Eberhard, 1999). These roots appear cropped, similar to root mats at Yanchep Caves, Western Australia which are heavily grazed by a diverse community of aquatic invertebrates (Jasinska *et al.*, 1996).

The Nullarbor region was inundated by the sea following subsidence during the early Cretaceous, the first limestones forming about 45MYA in the Middle Eocene (Lowry, 1970), with at least two periods of recession during the Oligocene and Early Miocene, followed by uplift during the Middle Miocene about 15MYA (Lowry and Jennings, 1974). Since that time, the Nullarbor Plain has not been subject to marine transgression until the Late Pliocene-Early Pleistocene when sea-level reached about 30 m above its present level. This transgression eroded the Roe Plains, and the Hampton Range scarp to the north is the old sea cliff of Late Pliocene age. The history of marine transgressions and recessions suggests that *Nurina poulteri* is a species derived from the stranding of a marine progenitor following one of these episodes. Other elements of the Nullarbor cave fauna, however, suggest a relict terrestrial/freshwater origin postdating the Late Pliocene-early Pleistocene emergence of the Roe Plains either by underground dispersal from the plateau or by vicariant extinction of surface dwelling ancestors (Gray, 1973 a, b). Nevertheless, *Nurina* bears many similarities to marine *Melita* and is considered to be of marine rather than freshwater origin. Similar marine-derived taxa have been described from North West Cape, Western Australia and the Flinders Ranges, South Australia (Humphreys and Adams, 1991; Knott, 1993; Barnard and Williams, 1995; Bradbury and Williams, 1997a, b).

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