

## *Linguimaera* Pirlot, 1936 (Crustacea, Amphipoda, Melitidae), a valid genus

TRAUDEL KRAPP-SCHICKEL

Forschungsinstitut und Museum A. Koenig, Adenauerallee 160, D-53113 Bonn, Germany (traudl.krapp@uni-bonn.de)

### Abstract

Krapp-Schickel, T. 2003. *Linguimaera* Pirlot, 1936 (Crustacea, Amphipoda, Melitidae), a valid genus. *Memoirs of Museum Victoria* 62(2): 257–283.

The genus *Maera* sensu lato is among the largest genera in the Melitidae, used as a catch-all for species lacking the defining characters of other genera. Recently, several authors have started splitting this species flock into better-defined genera and the present paper continues this task. It revives *Linguimaera* erected in 1936 by Pirlot, but soon after synonymised again with *Maera*. The most striking characters are a short third article of the mandibular palp, asymmetrical gnathopods in both sexes, epimeral plate 2 with a sinus, epimeral plate 3 serrate on its posterior margin and telsonic lobes asymmetrically incised. Eight species can be attributed to *Linguimaera*, of which seven are new: *L. pirloti* (type species), *L. bogombogo*, *L. caesaris*, *L. garitima*, *L. kellissa*, *L. leo*, *L. mannarensis* and *L. tias*.

### Key words

Taxonomy, Amphipoda, *Linguimaera*, Indo-Pacific

### Introduction

The suspicion that the amphipod family Melitidae may be paraphyletic is not new: Bousfield (1973) conceived it as comprising marine members of Barnard's Gammaridae (Barnard, 1969); neither he nor following researchers could find a single synapomorphy. Thus, genera are grouped on the basis of shared character states which may be homoplastic. Recent results of chromosome research confirmed big differences in chromosome numbers and karyotype-morphology between genera (Libertini and Krapp-Schickel, 2000).

Besides this, within *Maera* Leach, 1814 sensu lato, characters vary significantly. Barnard and Barnard (1983: 623) listed 59 species in their overview of the genus and diagnosed it: "Like *Elasmopus* but article 3 of mandibular palp not falciform. Like *Ceradocus* but inner plate of maxilla 2 lacking facial row of setae; maxillae generally poorly setose medially. Species of *Maera* probably polyphyletic, sources from *Ceradocus*, *Elasmopus*, *Mallacoota* etc." In recent years, several papers by me and others have started revision of this taxon by defining *Maera* sensu stricto (Krapp-Schickel, 2000; Krapp-Schickel and Jarrett, 2000), and by splitting off clades into new genera (*Quadrimaera* Ruffo and Krapp-Schickel, 2000, *Zygomaera* Krapp-Schickel, 2000 and *Othomaera* Krapp-Schickel, 2000). Here, the process continues and the present paper deals with the validation of *Linguimaera* Pirlot, 1936.

Walker (1904) described a new species of *Maera* found in Ceylon. He offered only small sketches and stressed eight differences from *Maera othonis* Milne Edwards, 1830; he named his species *Maera othonides*. The type material is no longer

extant and the description is too poor to give an exact idea about most of the crucial character states. Pirlot (1936) found amphipods during the *Siboga* expedition to Indonesia which he attributed to Walker's species. As he noticed an enlarged sagittal lobe of the labium, he erected a new genus *Linguimaera*, choosing not his material but "*Maera othonides* Walker 1904" as type species. Shortly after, Schellenberg (1938: 49) denied the taxonomic value of the shape of the upper lip at generic level (it occurs also in other species of *Maera* sensu lato), and synonymised *Linguimaera* with *Maera*.

Barnard (1972a: 224) suspected that there might be a group of species closely related to *M. othonides* Walker sensu Pirlot, but opined that the name *Linguimaera* Pirlot unfortunately was not available. In my opinion, Pirlot, who probably never saw Walker's type material of *M. othonides* (which I consider to be a species dubia), wrongly identified his Indonesian material as that species. In reality he based his description of *Linguimaera* on his Indonesian material which in the present paper is described as a new species, *L. pirloti*. According to ICZN (4th edition, 1999) Article 70.3.1, this may now be selected as the type species, replacing the dubious *Maera othonides* Walker chosen by Pirlot.

While studying the rich collections of Museum Victoria, Melbourne, it became obvious to me that *Maera othonides* Walker sensu Pirlot, 1936 shows a series of character states shared with *M. mannarensis* Sivaprakasam, 1968 and with other undescribed species. These peculiarities seem always to occur together, are probably not convergent but are synapomorphies of a clade of related species as Barnard had already surmised.

Abbreviations are as follows: AM, Australian Museum, Sydney; MCNCR, Museo Civico di Storia Naturale Verona; NMV, Museum Victoria, Melbourne; USNM, Natural History Museum, Smithsonian Institution, Washington; ZMA, Zoological Museum, Amsterdam.

Symbols used in the figures are as follows: Ep1–3, epimeral plates 1–3; Gn1, 2, gnathopods 1, 2 (l=large, s=small); Hd, head; LL, lower lip; Md, mandible; Mdp, mandibular palp; Mxp, maxilliped; Mx1, 2, maxilla 1, 2; ov., ovigerous; P3–7, pereopods 3–7; T, telson; U1–3, uropods 1–3; UL, upper lip; Us, urosome.

***Maera othonides* Walker, 1904 species dubia**

*Maera othonides* Walker, 1904: 273, fig. 29

**Remarks.** The original description of this species from Ceylon is slim. One is required to examine illustrations of *M. othonis* (Milne Edwards) from Europe to make assumptions on characters Walker did not describe other than by “similar to *M. othonis*.” He reported a length of 8 mm, article 3 mandibular palp “considerably shorter” than article 2, antenna 1 accessory flagellum with 3 articles, the third pleon segment with no teeth on its lower and 1–3 teeth on the posterior margin, third uropods truncate, telsonic lobes distally incised having one short robust seta sitting there, and a second notch on the inside of the lobe. This description would fit many species of the old *Maera* flock. Another species within this geographical distribution is *Linguimaera mannarensis* but we cannot check the suspicion that the two are the same.

Indian material cited under the same name by Chilton (1921: 535, fig. 5; no body length) could well be the same as that of K.H. Barnard (1935: 285, fig. 5; adults 11 mm) or of Nayar (1959: 26, pl. 8 figs 1–18; up to 12 mm) and is certainly not the species from Ceylon. In this, the antenna 1 accessory flagellum is up to 5 articles, the gnathopod 2 of the female has the palm slightly convex and of the male regularly excavated; the epimeral plate 3 is serrate on the posterior (and inferior) margins; uropod 3 and the posterior portion of the pleon are densely beset with delicate woolly setae; the telson is cleft halfway and its lobes distally pointed, with one long setule and two smaller ones, and no notch on inner margin. The characters of the mandibular palp (article 3 short, although much shorter still than in all *Linguimaera* species here described), the serrate posterior epimeral plate 3, and the lanceolate uropod 3 would match the definition of *Linguimaera*. But all three authors reported a “pubescent” pleon, densely setose uropod 3 and (only Nayar) pleon segments serrate along the posterodorsal margins of the segments. As already surmised by Krapp-Schickel (2000: 432), the citations of Chilton, K.H. Barnard and Nayar are synonyms of *Ceradomaera plumosa* Ledoyer, 1973 and not *Maera othonides* Walker. That species, according to Walker (1904) was “very common” in Sri Lanka. Nor is their material referable to Pirlot’s species, *Linguimaera pirloti* sp. nov. For the time being, *Maera othonides* Walker must remain species dubia.

**Distribution.** Sri Lanka.

***Linguimaera* Pirlot, 1936**

**Figure 1**

*Linguimaera* Pirlot, 1936: 309.— Schellenberg, 1938: 49 (synonymy of *Linguimaera* with *Maera*)

**Type species.** *Linguimaera pirloti* sp. nov. (= *Maera othonides* Walker sensu Pirlot, 1936), not *Maera othonides* Walker, 1904; herein selected, see ICZN (4th edition, 1999) Article 70.3.1

**Diagnosis.** Body smooth. Eyes reniform, more than twice as long as wide. Upper lip thickened, in side-view linguiform, lengthened, reaching between peduncles of antenna 2 (Fig. 1); mandibular palp article 1 rounded or subquadrate, distally not produced; article 3 considerably shorter than article 2, maxilla 1 inner plate with 3 robust setae, maxilla 2 not marginally setose. Antenna 1 longer than antenna 2; antenna 1 accessory flagellum of 2–6 articles; antenna 2 peduncle article 2 gland cone not longer than article 3; *Ceradocus*-like cephalic cheek having notch or slit. Coxa 1 anteriorly lengthened, pointed or rounded, posterodistal corner notched. Gnathopod 1 carpus *Ceradocus*-like swollen, with distoinferior margin usually lengthened to short, acute tooth, often hardly visible under dense robust setae; gnathopod 2 sexually dimorphic and asymmetrical in both sexes, palm ornate and excavate. Pereopod 3 equal to or longer than pereopod 4, merus often somewhat swollen; pereopods 5–7 slender, basis clearly longer than wide, often rectilinear with right-angled posterodistal corner, weakly to strongly serrated posteriorly; dactyli simple, with stiff robust seta on inner side functioning like a pincer. Pleon dorsally smooth. Epimeral plates 1, 2 posterodistal corner upwards curved, acute, followed by shallow sinus defined by another acute tooth; epimeral plate 3 posterior margin densely serrate, up to 9–11 teeth; uropod 3 rami much longer than peduncle, richly spinose, robust setae always much shorter than length of rami; telson deeply cleft, lobes characteristically asymmetrically incised, the outer end being longer; robust setae clearly shorter than telson length.

**Included species.** *Linguimaera bogombogo* sp. nov., *L. caesaris* sp. nov., *L. garitima* sp. nov., *L. kellissa* sp. nov., *L. leo* sp. nov., *L. mannarensis* Sivaprakasam, 1968, *L. pirloti* sp. nov., *L. tias* sp. nov.

**Discussion.** Lowry et al. (2001) redescribed *Megamoera mastersii* Haswell, 1879 from type material and figured round, not sexually dimorphic, eyes and symmetrical not sexually dimorphic gnathopods. They also redescribed *Moera hamigera* Haswell, 1879 on the basis of abundant recent collections. The latter is obviously a common species on Australian coasts which nevertheless totally seems to have escaped collecting in the last 130 years. It has different second epimeral plates, third uropods and telsonic lobes. Lowry et al. (2001) also redescribed *Megamoera boeckii* Haswell, 1879 with an emarginate telson shorter than broad. All these species do not seem to be closely related to the species flock presented here.

The genus *Anamaera* Thomas and Barnard, 1985 (from Florida, Thomas and Barnard, 1985) appears to be similar to *Linguimaera* also having asymmetrical gnathopod 2 and the same epimeral shape. But the mandibular palp article 3 is not shorter than article 2 and the eyes are rounded. *Maera williamsi* Bynum and Fox, 1977 was given erroneously as a synonym of *Anamaera hixoni* Thomas and Barnard, 1985 by Krapp-Schickel and Jarrett (2000) but has since been recognised as distinct. Another species remains to be described.

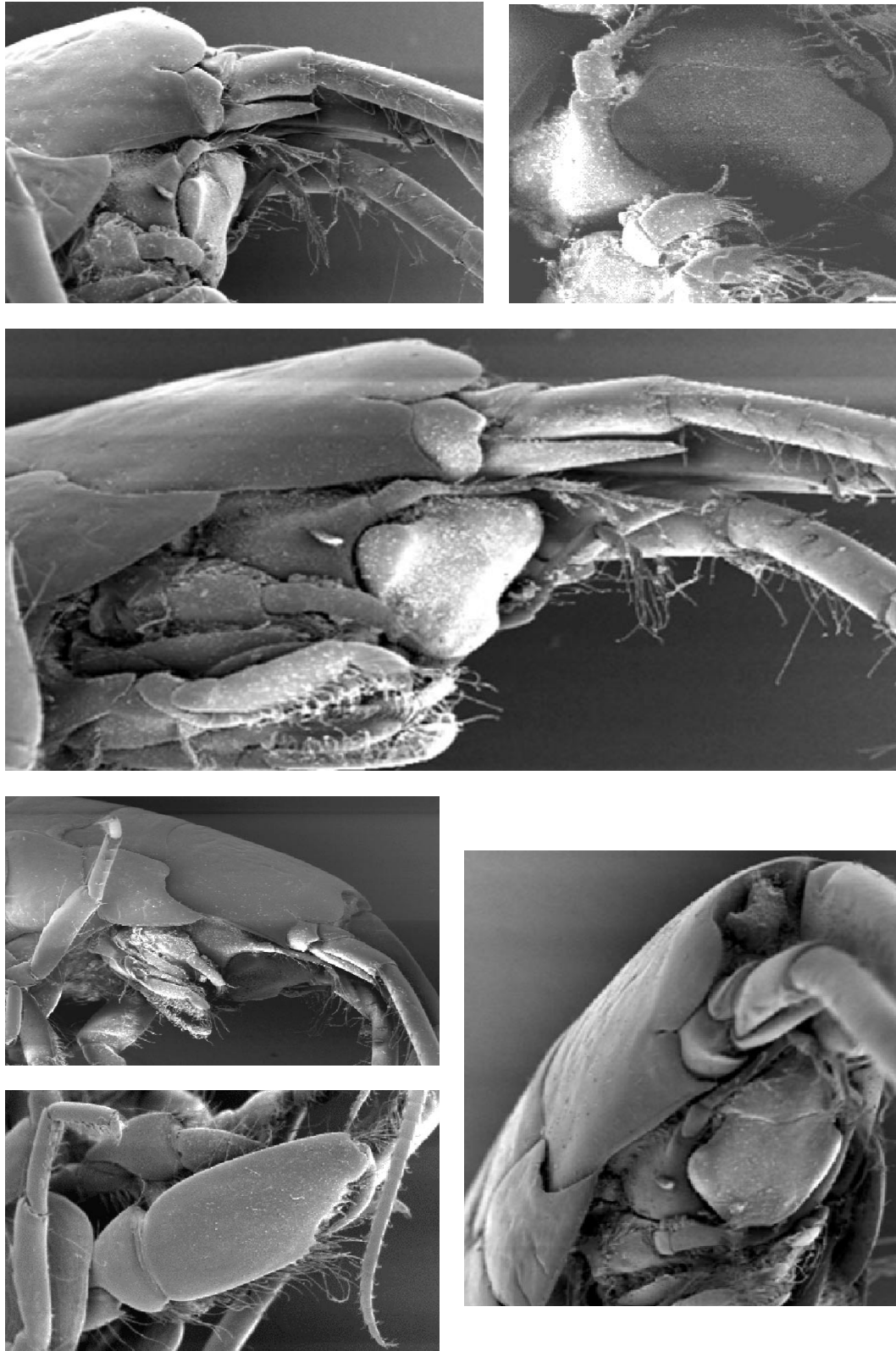


Figure 1: *Linguimaera* sp. male (Adelaide, South Australia) SEM pictures. Above: head with thickened upper lip laterally; mandible with palp, maxillae; left half of upper lip ventrally. Second line: head with antennae, upper lip, mandible with palp, maxillae and maxilliped ventrolaterally. Below: head with first coxae and mouthparts from lateral and ventral; gnathopod 2 male.

*Ceradomaera* Ledoyer, 1973 also has asymmetrical second gnathopods and differs mainly in the emarginate telson and dorsal teeth.

Serrations on epimeral plate 3, both below and above the posteroventral tooth, also occur in other species of *Maera* sensu lato (e.g. *Othomaera othonis* (Milne-Edwards, 1830), *Quadrimaera serrata* (Schellenberg, 1938), *Maera tepuni* Barnard, 1972), but extra teeth defining an excavation on epimeral plate 1 and (more clearly visible in) epimeral plate 2, appear to be confined in the Indo-Pacific to *Linguimaera*, and in the Atlantic to *Anamaera* and the *Maera williamsi*-clade.

Barnard (1972a) cited also *Maera othonopsis* Schellenberg, 1938 in connection with the present species flock. It was described with few figures on the basis of only two incomplete ovigerous females from the Gilbert Is (Tropical West-Pacific) as having subequal mandibular palp articles 2 and 3, quite different third uropods and telson (cf. *Quadrimaera* Ruffo and Krapp-Schickel, 2000 or *Mallacoota* Barnard, 1972), and was never found again. It certainly does not belong to *Linguimaera*.

The Indo-Pacific genus *Linguimaera* is well differentiated from other genera of this region (*Quadrimaera*, *Ceradocus* Costa, 1853, *Elasmopus* Costa, 1853, *Maeracoota* Myers, 1997, *Mallacoota*) by asymmetrical second gnathopods in both sexes, a sinus on the posterodistal corner of the first and second epimeral plates and a serrate posterior margin on the third epimeral plate. It shares the asymmetry of the gnathopods with the Atlantic *Anamaera* and the Indopacific *Zygomaera* Krapp-Schickel, 2000, but differs mainly by characters of the mandible (palp articles 2 and 3 subequal) and telson (in *Anamaera* lobes cuspidate, in *Zygomaera* lobes partly coalesced). The *Maera* sensu lato flock of Barnard and Barnard (1983), containing 59 species, is now mostly unravelled, but there are still a dozen species remaining in *Maera* sensu lato, thereby stressing that they do not belong to the well-defined *Maera* sensu stricto.

#### Key to genera similar to *Linguimaera*

1. Gnathopod 2 asymmetrical ..... 2
  - Gnathopod 2 symmetrical ..... 5
2. Telson fused halfway or more, distally only emarginate 3
  - Telson deeply cleft ..... 4
3. Metasome and urosome minutely toothed dorsally, beset with plumose setae; mandibular palp article 3 as short as article 1 ..... *Ceradomaera*
  - Metasome and urosome smooth; mandibular palp article 3 clearly longer than article 1 ..... *Zygomaera*
4. Eyes round, mandibular palp article 2 equal to article 3, distal robust setae of telson longer than telson length ... .. *Anamaera*
  - Eyes reniform, mandibular palp article 3 shorter than article 2, distal robust setae of telson shorter than telson length ..... *Linguimaera*
5. Dorsally carinate or toothed ..... 6
  - Dorsally smooth ..... 8
6. Gnathopod 2 palmar corner rectangular, urosomites 1, 2 with dorsal teeth ..... *Maeracoota*
  - Gnathopod 2 palmar corner absent or less than 90° ... 7

7. Epimeron 3 smooth or carinate, urosome carinate ..... *Mallacoota*
  - Epimeron 3 with serrations, urosome smooth ..... *Parelasomopus*
8. Mandibular palp article 3 falcate ..... *Elasmopus*
  - Mandibular palp article 3 linear ..... 9
9. Mandibular palp article 1 distally tooth-shaped, lengthened ..... 10
  - Mandibular palp article 1 rounded ..... 11
10. Gnathopod 2 dactylus outer margin densely setose; maxillae not fully setose ..... *Maera*
  - Gnathopod 2 dactylus outer margin with 1 seta; maxilla 1 inner plate fully setose, maxilla 2 with oblique facial row of setae ..... *Ceradocus*
11. Pereopod 5 basis not longer than coxa 5; uropod 3 very short, rami scarcely longer than peduncle ... *Lupimaera*
  - Pereopod 5 basis longer than coxa 5; uropod 3 rami clearly longer than peduncle ..... 12
12. Gnathopods 2 without palmar corner, dactyli smooth; uropod 3 lanceolate, medially widened, distally pointed . . . . . *Othomaera*
  - Gnathopod 2 distally widened, palmar corner well defined ..... 13
13. Palmar corner subrectangular, pereopod 5-7 dactylus simple, uropod 3 slightly unaequamous ... *Maeropsis*
  - Palmar corner rectangular, pereopods 5-7 with bifid dactylus, uropod 3 aequiramous ..... *Quadrimaera*

#### Key to species of *Linguimaera*

1. Telson distal robust setae longer than half telson length; gnathopod 2 male palm transverse ..... *L. garitima* (300 m depth, Australia)
  - Telson distal robust setae equal or shorter than half telson length; gnathopod 2 male palm oblique ..... 2
2. Uropod 3 ratio peduncle : rami greater or equal to 2.5 . 3
  - Uropod 3 ratio peduncle : rami less than 2.5 ..... 5
3. Longest distal robust seta on telson equal to half telson length; male gnathopod 2 palmar corner thumb-shaped . . . . . *L. leo* (shallow water, Australia)
  - Longest distal robust seta on telson shorter than half telson length; male gnathopod 2 without thumb ..... 4
4. Male gnathopod 2 palm J-shaped excavated, palmar corner sharp ..... *L. kellissa* (infralittoral, Australia)
  - Male gnathopod 2 palm oblique, neither excavated nor convex, without palmar corner ..... *L. pirloti* (infralittoral, Indonesia)
5. Male gnathopod 2 palm with deep U-shaped excavation, dactylus strongly inwards bent ..... *L. mannaensis* (no depth reported, India)
  - Male gnathopod 2 palm with excavation, not U-shaped 6
6. Male gnathopod 2 propodus palm with V-shaped incision near palmar corner; pereopods 5-7 very strong, posterodistal corner lengthened and broadened, pereopod 7 propodus widened . . *L. bogombogo* (littoral, Micronesia)
  - Male gnathopod 2 propodus palm with shallow semi-circular excavation; pereopods 5-7 slender ..... 7

7. Male gnathopod 1 propodus more than twice as long as wide; pereopod 7 basis posterior margin straight, posterodistal corner with right angle . . . . .  
 . . . . . *L. tias* (infralittoral, Australia and New Zealand)  
 — Male gnathopod 1 propodus twice as long as wide; pereopod 7 basis posterior margin and posterodistal corner rounded . . . . .  
 . . . . . *L. caesaris* (littoral, eastern Mediterranean, Red Sea)

*Linguimaera pirloti* sp. nov.

Figure 2

*Linguimaera othonides*.—Pirlot, 1936: 309–311, fig. 132.

*Material examined.* Holotype. Sulawesi, Sailus ketjil, Iles Paternoster, 27 m depth, corals and sand, 30, 31 Mar 1899 (*Siboga* Expedition stn 37), ZMA Amph. 204584 (1 male, 7.1 mm on 2 slides).

Paratypes. Détroit de Molo, 54–90 m, sand, 19 Apr 1899 (*Siboga* Expedition stn 51) ZMA Amph. 204585 (4 females, all on slides; 11 inadults in alcohol). 4°20'S, 122°58'E, sand and shells, 20 Sep 1899, 75–94 m (*Siboga* Expedition stn 204), ZMA Amph. 204586 (2 males, 1 adult female, partly on slides).

*Diagnosis.* Female gnathopod 1 propodus ratio of length : width = 3, in male = 2; palm not defined, posterior margin regular; palmar corner proximally followed by shallow excavation. Gnathopod 2 in both sexes similar in shape, but asymmetrical; in female palmar excavations deeper. Pereopod 7 basis ratio of length : width = 1.25. Telson with 2 or 3 distal robust setae, maximum lengths half length of telson.

*Description.* Adult male and female 6–7.1 mm.

Head: lateral cephalic sinus anteroventral corner blunt, nearly right-angled. Eyes with upper half narrower. Coxae 1–4 with small notch posterodistally.

Antenna 1 peduncle with 1 robust seta on article 1 distally; peduncle article 1 subequal article 2; article 3 about one third of article 1; accessory flagellum of 3–4 articles; antenna 2 slender, gland cone short, peduncle reaching end of antenna 1 peduncle; article 4 longer than article 5, flagellum as long as article 5, of about 12–14 articles.

Mandibular palp article 1 longer than wide; ratio of article 2 : article 1 = 3.6; article 2 : article 3 = 1.3; article 2 with 4 long setae but no groups of setae along margin; article 3 with 8 long setae. Mandibular incisor, lacinia mobilis and molar with medium sized blunt teeth. Molar medium Labium with rounded inner lobes, outer ones densely setose. Maxilla 1 unknown. Maxilla 2 outer plate wider than inner plate, outer plate 8 robust setae only distally, no setae marginally. Maxilliped unknown.

Gnathopod 1 weakly sexually dimorphic. Coxa 1 anteriorly acutely produced. Basis ratio length : width = 3, anterior margin with 3 long setae, posteriorly more and longer ones; merus posteroventrally with acute tooth; carpus with nearly parallel margins, length to width about 2.5, with stiff marginal and submarginal robust setae; propodus in female slim, narrower than carpus, ratio length : width = 2.5–3.0, in male wider, twice as long as wide, in both palm not defined.

Gnathopod 2 of *female* slightly asymmetrical in size, similar in shape. Coxa 2 longer than wide, basis with few short

setae on anterior margin, many very long ones on posterior margin; merus posterodistally with acute tooth; carpus posteroventral corner rounded; length ratio carpus : propodus = 0.8, about same width; propodus slender, ratio length : width = 2.5–3.0, palm concave, weakly defined by corner; 1 subdistal prominent robust seta on the inner surface next to the palmar corner, 2 smaller ones along the palm. Gnathopod 2 of *male* dimorphic both in size and shape: the smaller is as described for the female, the other has a longer, less excavated palm. Dactylus not much curved.

Pereopods spinose, propodus longer than merus, carpus shorter, length of basis : propodus = 1.3; basis posterior margin serrate, posterodistal corner somewhat lengthened. Dactyli forming a “chela” with their nail and the stiff, towards the dactylus bent robust seta on inner margin.

Epimeral plates 1, 2 posteroventral corners acute, followed by a shallow short sinus ending with a blunt tooth. Epimeral plate 3 with up to 9 small teeth on posterior margin, in adult males many irregular teeth, in juvenile specimens less; ventral margin smooth.

Uropod 2 the shortest, uropod 3 extending much more than uropod 1; uropod 1 peduncle longer than rami, 1 sub-basofacial strong curved robust seta in about one third of length on outer margin, 1 very long robust seta subdistally; inner ramus longer than outer one. Uropod 2 distally with 2 longer and some shorter robust setae. Uropod 3 ratio peduncle : rami less than 0.5, rami subequal, outer somewhat narrower than inner one; 1 article; both distally tapering, scarcely truncate, with 2–3 distal robust setae, marginal ones on outer ramus in 3–4 groups, on inner one many short single ones.

Telson, inner side shorter and outer corner acutely prominent; in the excavation 2–3 strong robust setae (0.2–0.5 of telson length).

*Etymology.* Dedicated to J.M. Pirlot.

*Distribution.* Sulawesi, Indonesia; coral rubble, shells, sand, 27–94 m.

*Remarks.* The “disproportionate” insertion between propodus and carpus, which Barnard (1972a: 126) stressed for this species flock, and which leads to a deeper “gap” dorsally in other species, is here very scarcely visible.

*Linguimaera bogombogo* sp. nov.

Figures 3–4

*Maera hamigera*.—Barnard, 1965: 507–510, fig. 16.

?*Maera* species A.—Barnard, 1970: 158, fig. 98, 99

(not *Maera hamigera* Haswell, 1879a: 333, pl. 21 fig. 1)

*Material examined.* Holotype. Eniwetok Atoll, Bogombogo Island, Micronesia, USNM 108926 (male, 4.3 mm).

Paratype. Eniwetok Atoll, Bogombogo Island, Micronesia, USNM 108926 (ovigerous female, 5.2 mm).

*Other material.* Eniwetok Atoll, Igurin I., lagoon side, alga *Bryopsis* sp., attached to rocks, 27 Sep 1956, USNM 108928 (male 5 mm, drawn by Barnard, 1965; 2 ovigerous females 5 mm, 4.3 mm, immature and juvenile, incomplete). Igurin I., lagoon side, preserved rocks, 27 Sep 1956, USNM 108949 (1 juvenile). Igurin I., lagoon side, sand washings from under rocks, 27 Sep 1956, USNM 108927 (1 male? 3.5 mm,

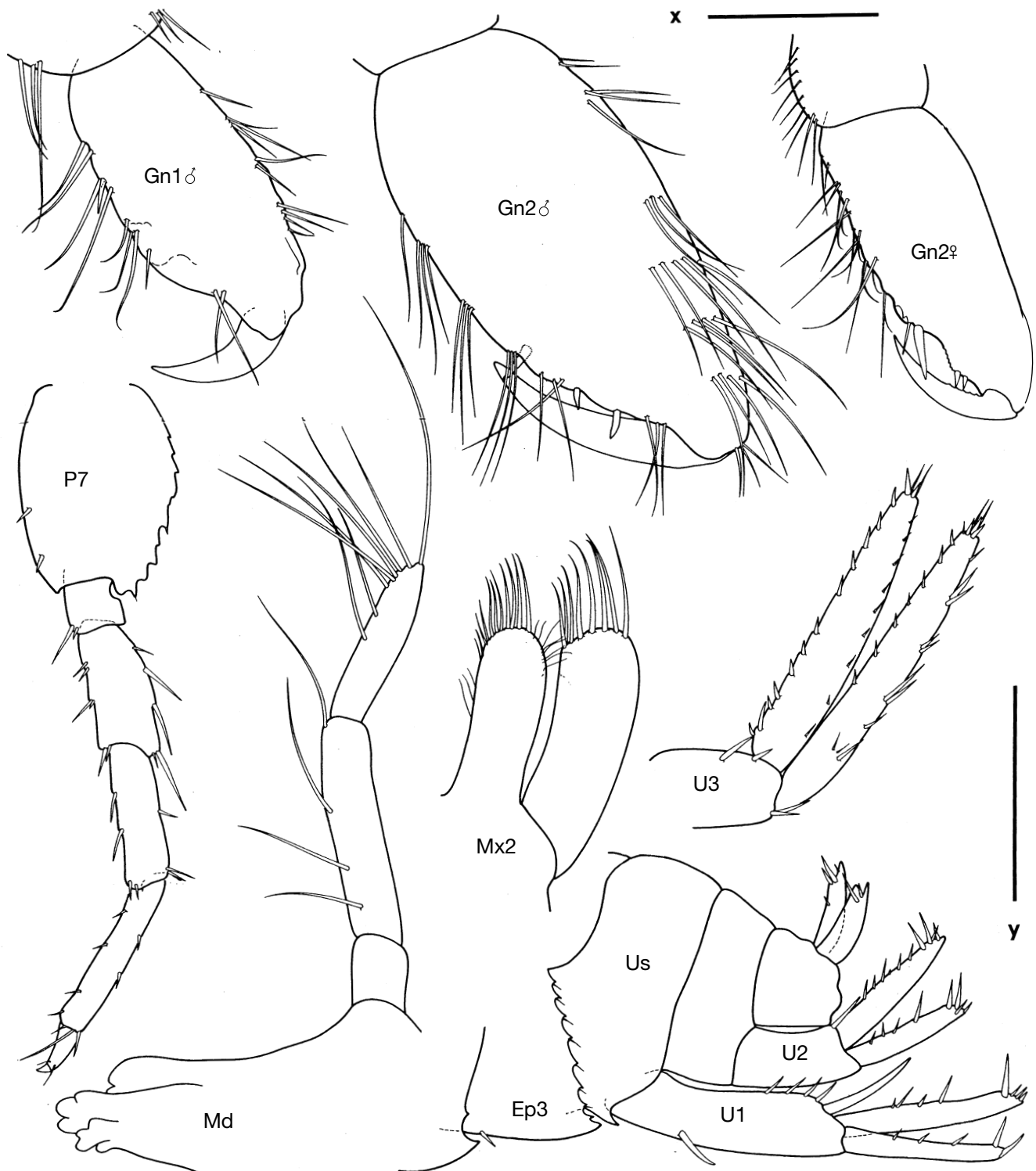


Figure 2. *Linguimaera pirloti* sp. nov., male, female (Sri Lanka). Gn2 female, Us, U3 in scale  $x = 0.5$  mm; Gn 1,2 male in scale  $x = 0.25$  mm; P7 in scale  $y = 1$  mm; Md, Mx2 in scale  $x = 0.2$  mm.

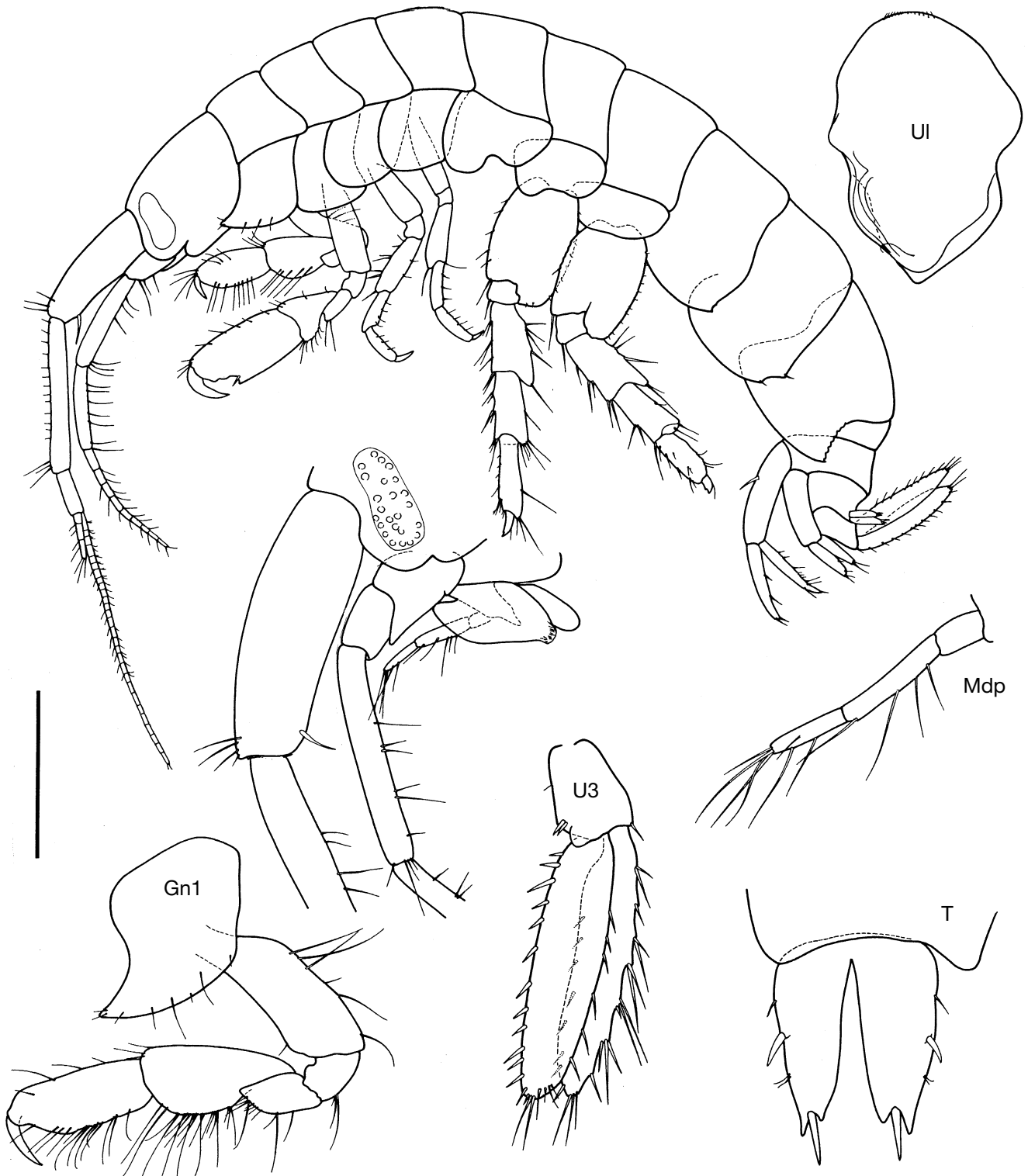


Figure 3. *Linguimaera bogombogo* sp. nov., male, female (Eniwetok Atoll, Bogombogo Island, Micronesia). Hd, Gn1, U3 in scale = 0,33 mm; Mdp, UL, T in scale = 0,175 mm.



Figure 4. *Linguimaera bogombogo* sp. nov., male, female (Eniwetok Atoll, Bogombogo Island, Micronesia). Gn2 female in scale = 0.25 mm; Gn2 male, Gn2' female in scale = 0.125 mm; P6, 7 in scale = 0.175.



1 specimen 3 mm, 3 juveniles). Boden I., ocean side, 12 Oct 1956, USNM 108929 (1 specimen 3.3 mm)..

**Diagnosis.** Gnathopod 1 propodus rectangular, twice as long as wide, palm oblique, straight. Gnathopod 2 male palm well defined as acute tooth, followed by V-shaped incision; palm with small shallow excavations. P7 rectangular, widened and posterodistally lengthened, ratio length : width = 1.5. Telson with 1 distal strong robust seta of about one third of telson length.

**Description.** Ovigerous female 5–5.5 mm, male 4–5 mm.

Head about same length as first 2 body segments. Lateral cephalic lobes rounded, with notch, anteroventral corner rounded. Eyes narrowed in middle.

Antenna 1 about 0.6 body length, peduncle = flagellum, peduncle article 1 shorter than article 2; flagellum of up to 25 articles, accessory flagellum of 3–4 articles; antenna 2 slender, gland cone reaching about half of peduncle article 3, article 4 longer than article 5, flagellum longer than peduncle article 5, of 8 articles.

Mandibular palp article 1 clearly longer than wide; ratio article 2 : article 3 = 1.4, article 2 with 4 long setae, article 3 distally 4 setae, laterally 2–3.

Gnathopod 1 not sexually dimorphic. Coxa 1 anterodistally lengthened and pointed. Basis ratio length : width = 3, posteriorly 5–6 long setae. Merus posterodistally rounded, characteristic pointed tooth lacking, ratio length : breadth less than 2; carpus triangular, ratio length : breadth = 2.3; propodus rectangular, less broad than carpus, ratio length : breadth = 2.3, palm defined, oblique.

Gnathopod 2 of *female* slightly dimorphic in size and shape. Coxa 2 quadrangular, basis with few long setae on posterior margin, merus posterodistally with tooth; carpus triangular, ratio length : breadth = 1.45, carpus : propodus = 0.55, both about same width; propodus slender, similar shape to male, but narrower; anterior and posterior margin parallel, palm defined by prominent tooth and beset with strong robust setae, anterior : posterior margin = 4:3. Smaller gnathopod 2 lacking prominent defining tooth, longer and narrower. Gnathopod 2 of *male* strongly dimorphic, carpus in larger gnathopod shorter, length subequal to width. Both propodi similar to female, but larger one more broadened and defining tooth as well as robust seta sitting next to it more developed.

Pereopods 3, 4 similar in shape and size. Pereopods 5–7 robust, basis rounded, very small serrations on posterior margins. Pereopod 6 the longest, in pereopod 7 the propodus shortened and thickened. Dactylus with uneven outer and inner margins, distally on inner one 1 stiff seta and one short and thin next to it.

Epimeral plate 3 with small dense serration.

Uropod 1 peduncle inferior margin on proximal third with 1 strong robust seta, subequal rami shorter than peduncle; uropod 2 subequal rami shorter than peduncle; uropod 3 rami subequal distally rounded, beset with many robust setae being maximally of a quarter of ramus length.

Telson longer than wide, lobes outer end longer than inner one; in excavation 1 strong robust seta inserted, about one third of telson length. Outer margin about halfway another, some-

what shorter robust seta, distally 1–2 fine setae, proximally a stiff robust seta.

**Etymology.** From the island where the type specimens were found (noun in apposition).

**Distribution.** Eniwetok Atoll (Micronesia); green algae (*Bryopsis*, *Caulerpa*, *Halimeda*) and surrounding sand of rocky intertidal; wash of old coral heads in about one-third metre of water, together with amphipods *Cymadusa filosa*, *Elasmopus pseudaffinis*, *Gammaropsis digitatus*, *G. pacificus*, *Lembos aequimanus*, *L. bryopsis*, *L. cf. intermedius*, *Quadrarmaera serrata*, *Mallacocta cf. insignis*, *Paragrubia vorax*.

**Discussion.** This species clearly belongs to this clade, having bean-shaped eyes, a (not very pronounced, but present) notched cephalic lobe, mandibular palp article 3 much shorter than article 2, coxa 1 anteriorly acutely lengthened, gnathopod 1 carpus thickened, gnathopod 2 asymmetrical, epimeral plates 1–3 with characteristic excavations or serrations, uropod 3 rami long and with many short robust setae, telsonic lobes distally incised.

#### *Linguimaera caesaris* sp. nov.

*Maera hamigera*. —Walker, 1909: 335, pl. 43, fig. 5.—Karaman and Ruffo, 1971: 152–158, figs 21–23.—Lyons and Myers, 1993: 587, fig. 10.

(not *Maera hamigera* Haswell 1879a: 333, pl. 21, fig. 1)

**Material examined.** Holotype. Cesarea, Mediterranean coast of Israel, MCNCR 425 (ovigerous female 8.5 mm).

Paratype. Same locality, MCNCR 1209–1212 (male 6 mm).

**Diagnosis.** Gnathopod 1 propodus rectangular, less broad than carpus, 3 times as long as large. Gnathopod 2 male, female propodus oval, palm one third of posterior margin, slightly excavated and defined by blunt to rectangular corner. Pereopod 7 basis oval, posterior margin with fine serration. Telson with 1 bigger and 2 tiny robust setae distally, maximum length about one third of telsonic length.

**Description.** Adult female 8.5 mm, male (immature?) 6 mm.

Head: lateral cephalic lobes rounded, anteroventral corner rounded. Eyes more than twice as long as large, upper part narrowed.

Antenna 1 peduncle scarcely longer than flagellum, peduncle article 1 shorter than article 2; flagellum of up to 28 articles, accessory flagellum of 5 articles; antenna 2 slender, gland cone short, article 4 longer than article 5, flagellum subequal to peduncle article 5, of 9 articles.

Mandibular palp article 1 longer than wide; article 2 : article 3 = 2, both with long setae, article 3 also distally.

Coxa 1 anterodistally a bit upturned, bluntly pointed, posterodistal corner with small notch. Basis ratio length : breadth = 3, posteriorly 5 long setae. Merus posterodistally rounded, (sharp tooth lacking here), less than twice as long as wide; carpus triangular, swollen; propodus rectangular, less broad than carpus, about 3 times as long as wide, palm defined, oblique.

Gnathopod 2 of *female* slightly dimorphic in size and shape. Coxa 2 rectangular, basis with 9 long setae on posterior margin,

merus posterodistally with sharp tooth; carpus triangular, ratio length : breadth = 1.5, carpus: propodus = 3:5, both about same width. Propodus slender, similar shape to male, but shorter; anterior : posterior margin = 5 : 3; palm defined by blunt corner beset with groups of robust setae, proximal part shallow excavate, in distal third defined by strong robust seta sitting elevated. The other gnathopod 2 lacks the palmar excavation as well as the defining robust seta near dactylus insertion and is narrower. Gnathopod 2 of *male* strongly dimorphic, carpus in larger gnathopod shorter, length subequal to width. Both propodi similar to female, but larger one broader, palmar defining tooth well developed, hump defining the palmar excavation more developed.

Pereopods 3, 4 very similar in shape and also size. Pereopods 5–7 robust, basis rectangular, small serrations on posterior margins; pereopod 5 small; pereopods 6, 7 subequal. Dactylus distally on inner margin with 2 stiff setae bent to tip of nail.

Epimeral plate 3 with serration of 4 or 5 teeth.

Uropod 1 peduncle inferior margin subproximally with 1 strong robust seta, subequal rami shorter than peduncle; uropod 2 with subequal rami as long as peduncle; uropod 3 peduncle less than half length of rami, rami subequal, beset with many short robust setae of maximally one seventh ramus length.

Telson longer or subequal to width, lobes outer end longer than inner one; in excavation 1 strong robust seta inserted with small additional ones, robust seta about one third of telson length. On outer margin of first and second third, another shorter robust seta.

*Etymology.* There are two reasons for the choice of this name: at first sight, because the Mediterranean material (see Karaman and Ruffo, 1971) comes from Cesarea (Israel), but more importantly it should remind of Sandro Ruffo, the grand old man and “emperor” (= caesar) of amphipodologists.

*Distribution.* Suez Channel (Walker, 1909); Mediterranean coast of Israel; Red Sea: Gulf of Aqaba (Karaman and Ruffo, 1971: 158; Lyons and Myers, 1993: 587–590); 4–5 m, coral rubble (Lyons and Myers, 1993).

*Discussion.* Figures and description of Ledoyer (1982: 523–527) match perfectly with the ones given by Karaman and Ruffo (1971), except the fact that the telson of the Madagascar material shows on the inner side of the lobes some short robust setae, which lack in the figures of Karaman and Ruffo (1971) and the ones by Lyons and Myers (1993).

### *Linguimaera garitima* sp. nov.

Figures 5–7

*Material examined.* Holotype. Australia. Tasmania, eastern Bass Strait, 82 km ENE of North Point, Flinders I. (39°27.7'S, 148°41.4'E), 293 m, coarse sand, naturalist's dredge, G.C.B. Poore on HMAS *Kimbla*, 28 Mar 1979 (stn BSS 36), NMV J52321 (1 male 7 mm).

Paratype. Collected with holotype, NMV J52322 (1 female 7 mm).

Other material. Collected with holotype, NMV J20371 (8 males, 16 females 17 juveniles).

*Diagnosis.* Similar to *L. leo* sp. nov. but: body smaller, articles narrower, coxa 1 anterodistally more lengthened and anteriorly

excavated, gnathopod 1, 2 propodus rectangularly narrow, setae long, gnathopod 2 male the smaller ones similar to gnathopod 2 female in totally lacking palmar tooth; pereopod 7 basis about twice as long as wide. Telson about as long as wide, distal strong robust seta between half and two thirds of telsonlength.

*Description.* Adult male, female 5.5–8 mm.

Head: lateral cephalic lobes rounded, anteroventral corner rectangular. Eyes more than twice as long as large, upper part narrowed.

Antenna 1 peduncle scarcely longer than flagellum, peduncle article 1 shorter than article 2; flagellum of up to 34 articles, accessory flagellum of 6 articles; antenna 2 gland cone short, article 4 longer than article 5, flagellum subequal to peduncle article 5, of 9 articles.

Mandibular palp article 1 longer than wide; article 2 : article 3 = 1.6, both with long setae, article 3 also distally.

Coxa 1 anterodistally acute and anteriorly excavated; gnathopod 1 propodus narrow, more than twice as long as wide.

Gnathopod 2 of *female* with narrow and long propodus lacking a defining tooth on the palmar corner, with palm oblique, crenulate. Gnathopod 2 of *male* propodus palm almost transverse, blunt robust defining tooth on (about rectangular) palmar corner; ratio of propodi gnathopod 1 : gnathopod 2 = 0.5.

Pereopods 3, 4 merus not widened; female pereopod basis narrower.

Uropod 1 peduncle as long as rami.. Uropod 3 rami with thinner robust setae.

Telsonic lobes with long robust seta which is clearly longer than half telsonlength.

*Etymology.* During my stay at Museum Victoria, Melbourne, Gary Poore and Tim O'Hara were extremely helpful on many occasions, and furthermore were strongly involved in the collection of the material. The specific epithet is a combination of their names and expresses my gratitude; used as an adjective.

*Distribution.* Bass Strait, coarse shell, 293 m.

*Discussion.* This clade seems strikingly conservative and though checking very thoroughly, there are not many easy characters separating this species from the much shallower *L. leo* (if not dealing with mature males), except: much greater depth, smaller body size, mandibular palp ratio article 2 to article 3 longer (1.65 vs 1.8 in *L. leo*), palmar corner of male gnathopod 2 with about right angle (vs oblique) and (most reliable character) a long robust seta on telsonic lobes (much shorter in *L. leo*).

### *Linguimaera kellissa* sp. nov.

Figures 8, 9

*Material examined.* Holotype. Australia. Victoria, eastern Bass Strait, 8 km S of South East Point, Wilsons Promontory (39°12.9'S, 146°27.3'E), 65 m, medium sand, R.S. Wilson on RV *Tangaroa*, 18 Nov 1981 (stn BSS 180), NMV J20370 (1 male 5 mm).

Paratype. Vic., eastern Bass Strait, 11.2 km E of eastern edge of Lake Tyers (37°51.41'S, 148°13.16'E), 32 m, sand-shell, Smith-McIntyre grab, Marine Science Laboratories, 25 Sep 1990 (stn MSL-EG 27), NMV J25482 (1 male 7 mm).

Other material. Vic., eastern Bass Strait, 8 km S of South East Point,

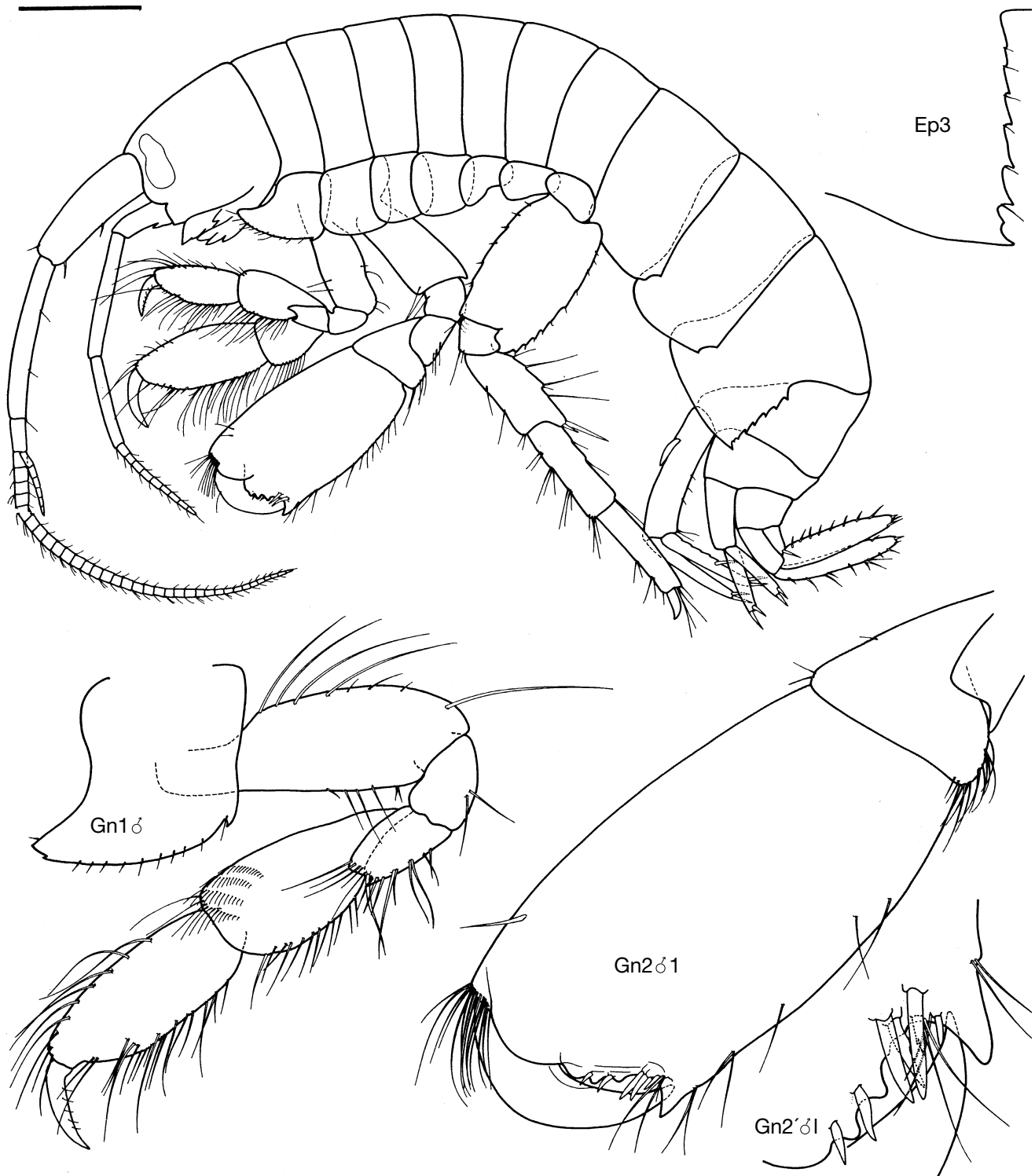


Figure 5. *Linguimaera garitima* sp. nov. (Tasmania). Habitus in scale = 1 mm; Gn1, Gn2 male large and Ep3 in scale = 0.4 mm; Gn2' male large in scale = 0.2 mm.

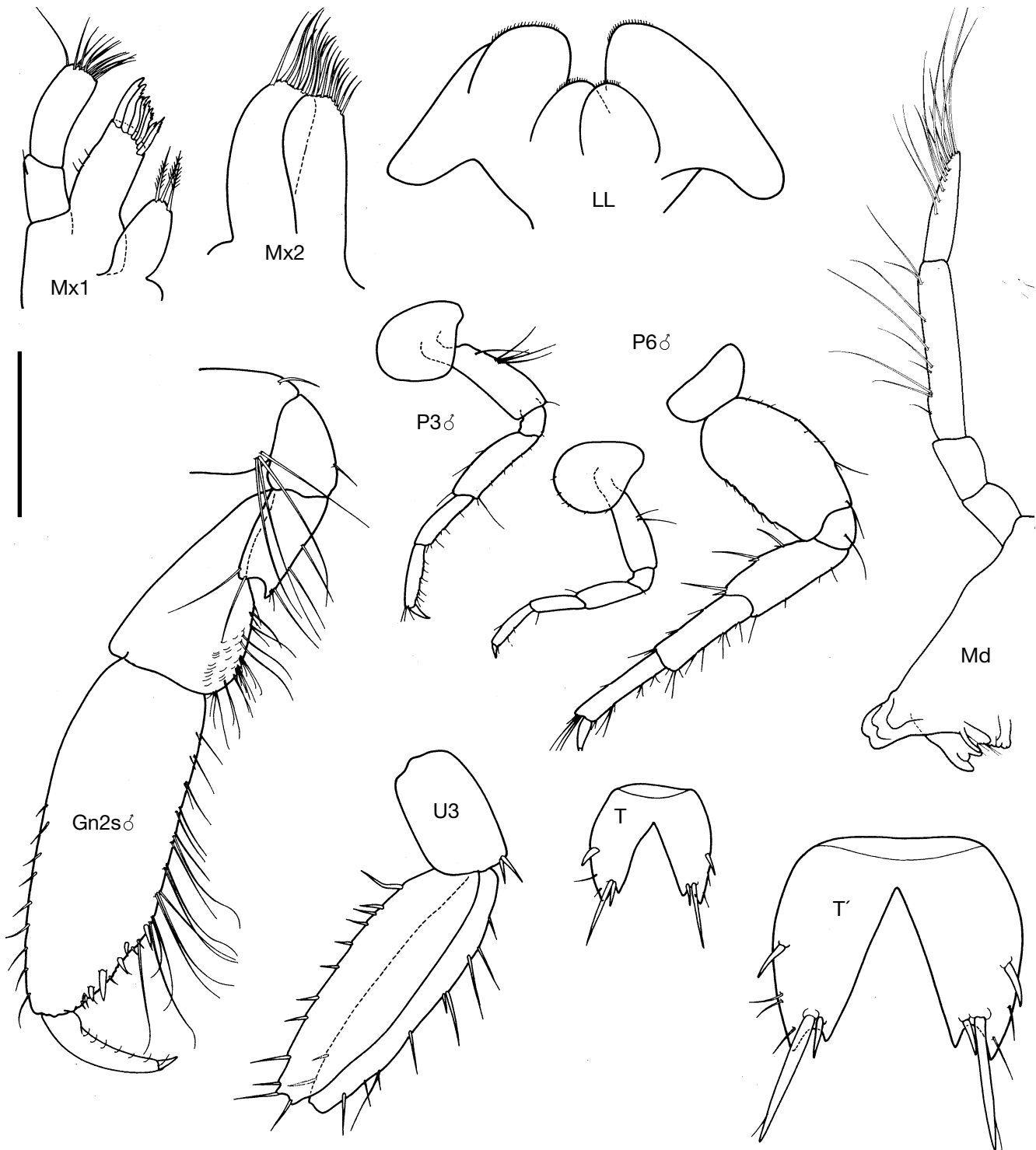


Figure 6. *Linguimaera garitima* sp. nov. (Tasmania). Mx1, 2; Md, LL, T' in scale = 0.25 mm; P3, 4, 6 in scale = 1.25 mm; Gn2 small male, U3, T in scale = 0.5 mm.

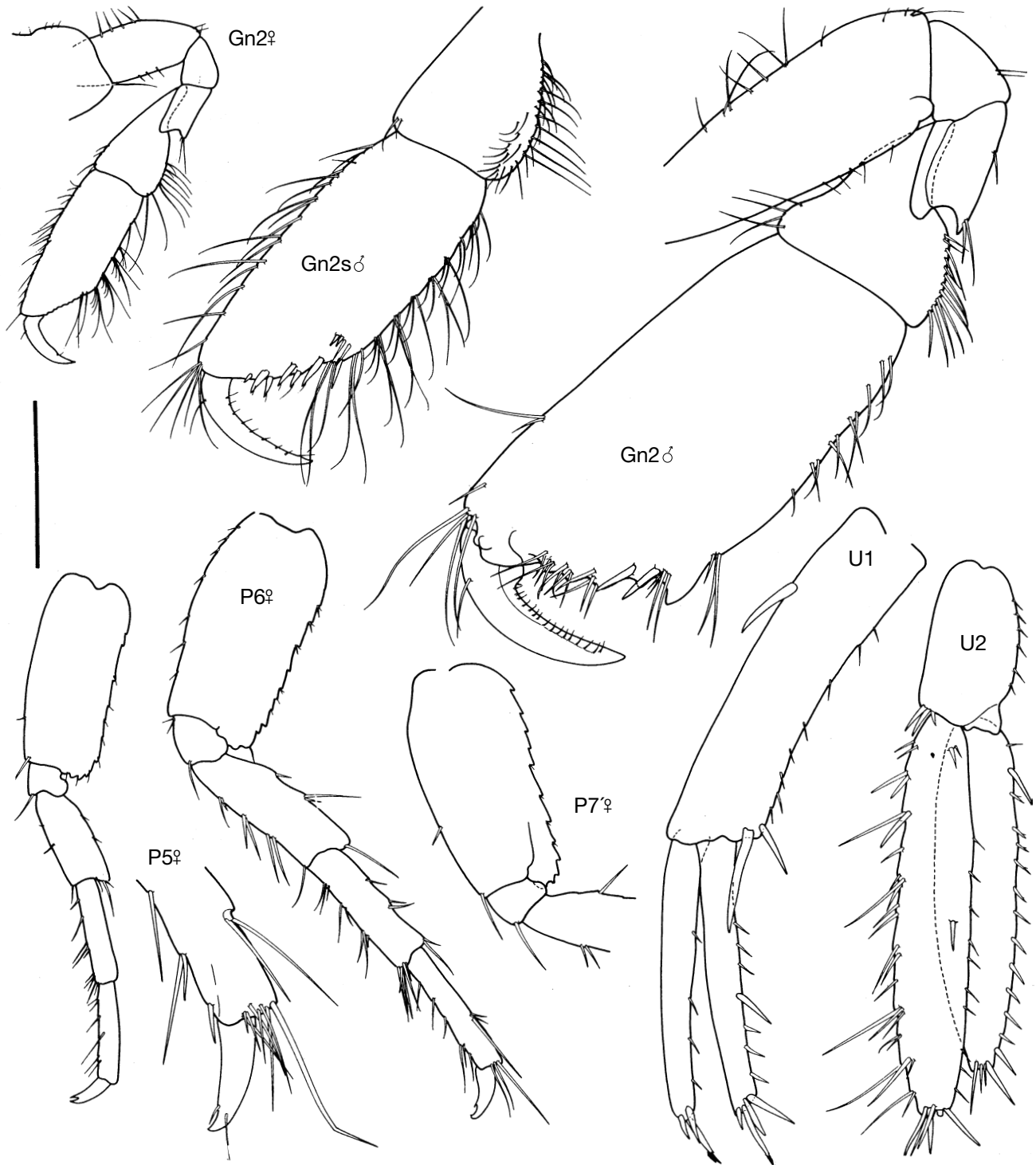


Figure 7. *Linguimaera garitima* sp. nov. (Tasmania). Gn2 male large, Gn2 male small; U1, U3 male, P7' female 8.5 mm in scale = 0.5 mm; Gn2 female, P5-7 female in scale = 1.25 mm.

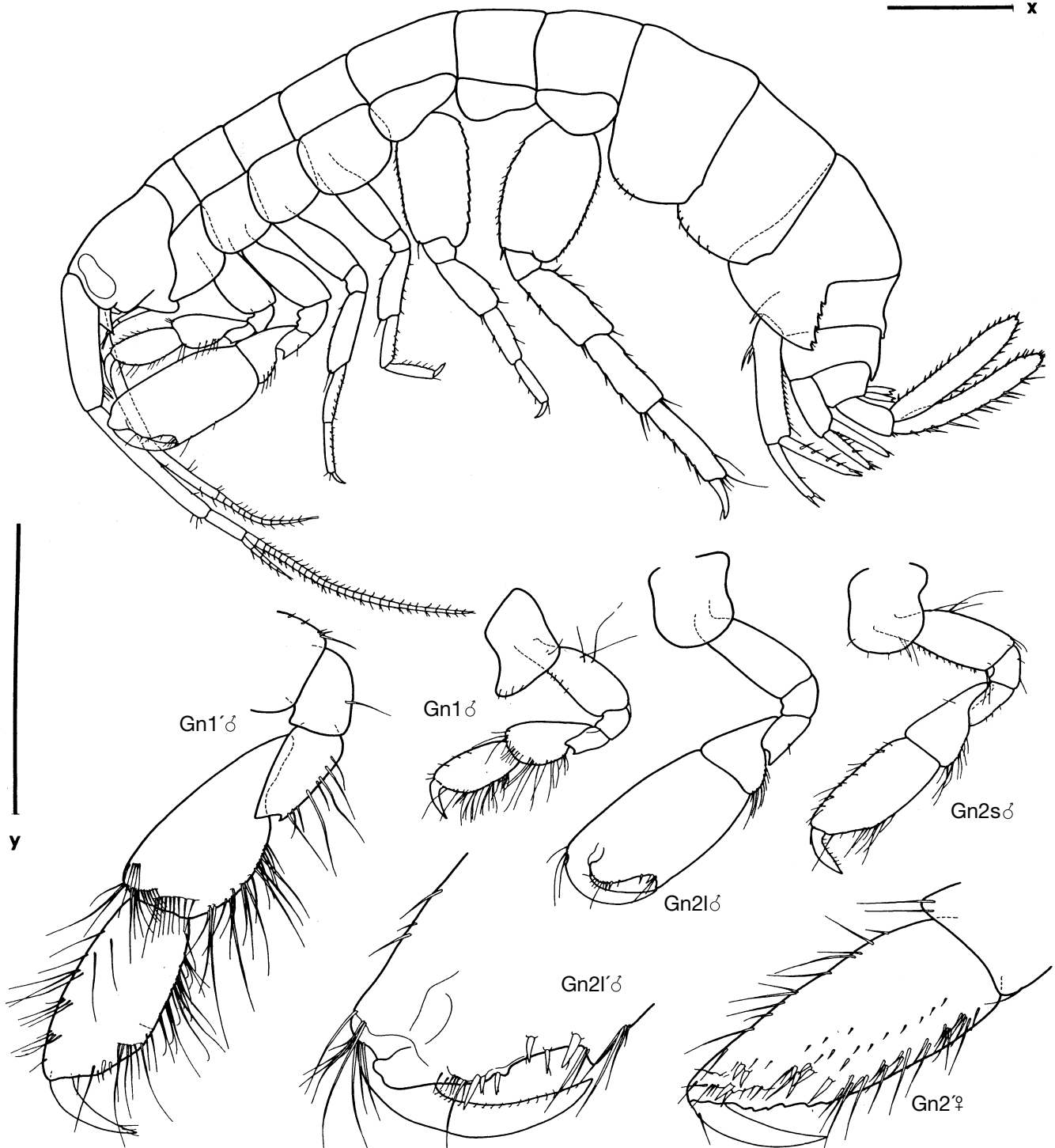


Figure 8. *Linguimaera kellissa* sp. nov. (eastern Bass Strait). Gn1 male, Gn2s male, Gn2 l male in scale x = 1 mm; Gn1' male, Gn2' female, Gn2 l' male in scale y = 1 mm.

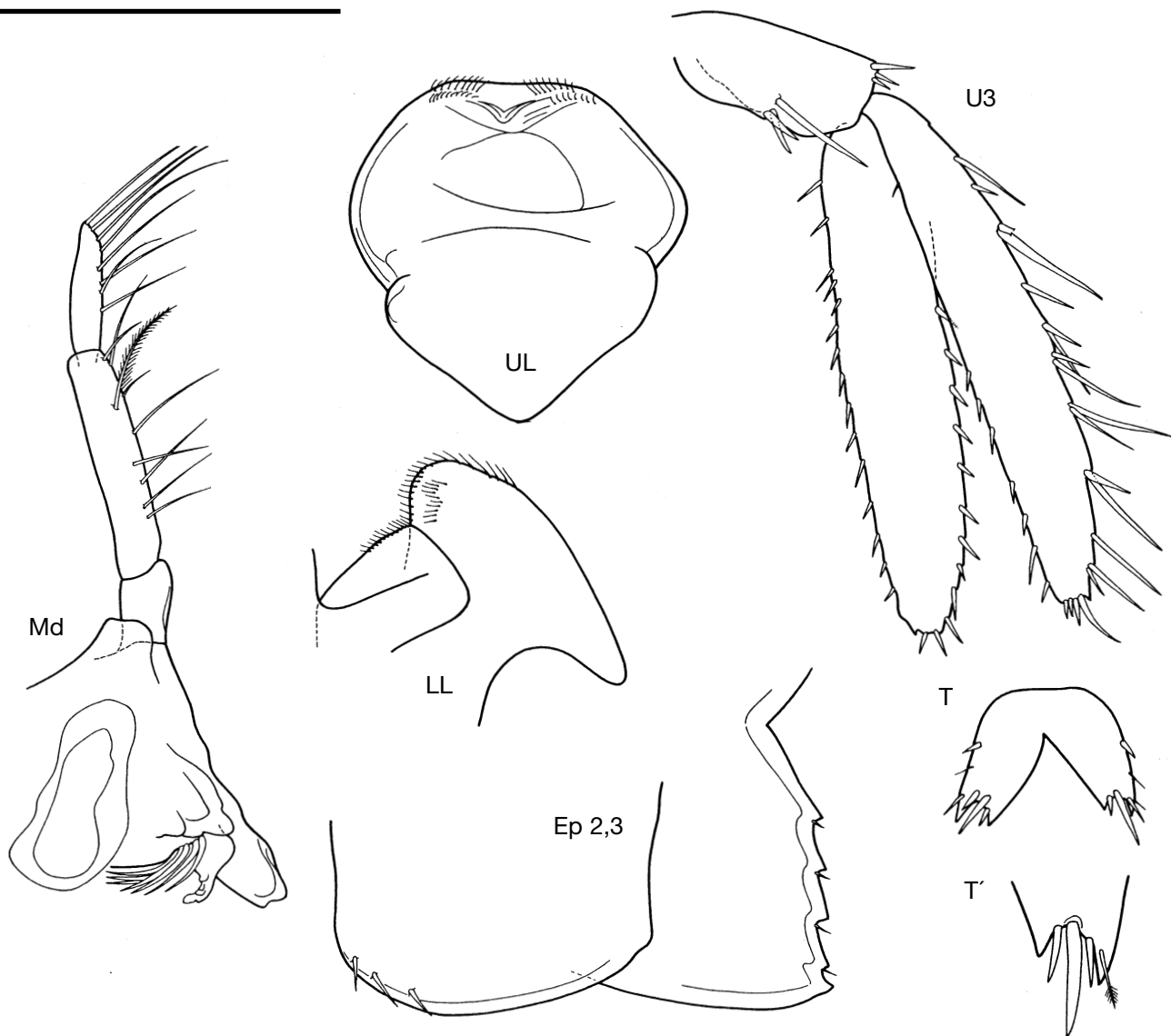


Figure 9. *Linguimaera kellissa* sp. nov. (eastern Bass Strait). UL; Md, LL, T' in scale = 0.5 mm; U3, Ep2, 3; T in scale = 1 mm.

Wilsons Promontory (39°12.9'S, 146°27.3'E), 65 m, NMV J52344 (5 males, 8 females, 2 juv.); NMV J52343 (1 male). 13.3 km E of eastern edge of Lake Tyers (37°51.74'S, 148°14.77'E), 37 m, NMV J25491 (1 female). 15.5 km SW of Pt Ricardo (37°53.14'S, 148°28.94'E), 45 m, NMV J25478 (4), NMV J25486 (1 male, 1 juv.), NMV J25485 (1 male, 1 female).

**Diagnosis.** Gnathopod 1 propodus and carpus relatively robust, propodus length in male twice of width; gnathopod 2 male palm distally next to palmar corner regularly J-shaped excavated, in female distally narrowing, with serrated palm. Pereopods 3–5 length subequal. Pereopod 7 basis ratio length : breadth = 1.5, posterior margin rounded. Uropod 3 very long, slim, rami about twice length of peduncle, always having a “knee” between peduncle and rami. Telson with short distal robust setae, distal one about one third to half of telson length.

**Description.** Adult male, female 7–9 mm.

Body slim, slender, fragile. Eyes reniform, medially narrowed, lower part longer and wider.

Antenna 1 half length of body, article 1 slightly shorter than article 2, accessory flagellum of 5 articles; antenna 2 gland cone long; peduncle reaches end of antenna peduncle article 2; flagellum of 11 articles.

Mandible incisor and lacinia mobilis with strong blunt teeth, accessory robust setae smooth; molar huge and oblong; palp article 2: article 1 = 3.75, article 2 : article 3 = 1.8, article 2 with 9 single long setae (some plumose) without groups.

Gnathopod 1 coxa 1 anteriorly lengthened, rounded, basis ratio length : breadth = 2.8; merus posterodistally acutely pointed; carpus rounded, ratio length : breadth = 2; propodus palm oblique, scarcely defined.

Gnathopod 2 of female propodus ratio length : breadth = 2.6, palm nearly straight, with many shallow excavations about one

third of total length, corner not defined. Gnathopod 2 of *male* propodus rectangular, about twice as long as wide, palm in the shape of a question mark or J, well defined by a prominent acute tooth, next to it palm distally smoothly excavated, no serrations, proximally ending in a rounded hump, beset with many short robust setae.

Pereopods basis in female slender, in male robust, in pereopod 7 basis ratio length : breadth = 1.5, posterior margin rounded, only very small serrations.

Epimeral plate 1 shorter than epimeral plate 2; epimeral plates 1, 2 posterodistal corner with scarcely visible very shallow excavation and second tooth. Epimeral plate 3 with few but strong teeth distally.

Uropod 3 very characteristic, always having a “knee” between peduncle and rami; peduncle ratio length : breadth = 2.2, outer ramus ratio length : breadth = 6.75, with many robust setae marginally and distally in 8–9 groups, apically long setae, that are easily lost.

Telson with 1 strong short robust seta distally, less than half telson length, accompanied by 1 other, of half length, on each side; 1 plumose seta on the outer margin distally, 2 robust setae and 1 seta marginally.

*Etymology.* Dedicated to Kelly Merrin and Melissa Storey with whom I shared the lab at Museum Victoria and who at any time were helpful and friendly “daughters” to their guest!

*Distribution.* Bass Strait, Australia, muddy, medium to coarse sand, sand-shell, 33–65 m.

### *Linguimaera leo* sp. nov.

Figures 10–12

*Maera mastersi*.—Barnard, 1972a: 226–227, fig. 132.

(not *Megamoera mastersii* Haswell, 1879b: 265, pl. 11 fig. 1)

*Material examined.* Holotype. Australia. Victoria, Port Phillip Bay, Prince George Light (38°6.3'S, 144°44.25'E), 9.6 m, silty sand with broken rock, SCUBA, Fisheries and Wildlife Dept and Museum, (stn PPS 10), NMV J35851 (1 male 12 mm).

Paratypes. Collected with holotype NMV J52309 (1 male, 2 juveniles, 11.8, 6–7 mm). Vic., Portland Bay, reef below lighthouse (38°22'S, 141°36.2'E), 3 m, sand and rubble, SCUBA airlift, R.S. Wilson, 26 Feb 1992 (stn CRUST 141); NMV J24121 (1 female, 15 mm). Western Port, off Crib Point (38°20.83'S, 145°13.49'E), 13 m, sandy gravel, Smith-McIntyre grab, A.J. Gilmour on FV *Melita*, 23 Mar 1965 (stn CPBS-N 32); NMV J48856 (more than 20 males, females).

Other material. Numerous specimens in 61 NMV collections from Vic. (Western Port, Port Phillip Bay, Cheviot Beach, Point Nepean, Bass Strait) and SA (Cape Northumberland, Wallaroo), 0–26 m, algal and sedimentary substrates. Port Phillip Bay (stn PPS 47 Area 40), USNM 275759 (1 male 12 mm, 1 female 10.5 mm, 2 male ?juvenile 10 mm); (stn PPS 83 Area 69), USNM 275759 (6 males 8–10.5 mm, 3 females, 7.5–8 mm).

*Diagnosis.* Gnathopod 1 propodus rectangular, ratio length : width = 2. Gnathopod 2 of male adult with prominent stout hump on palmar-corner, distally followed by a small incision; palm convex, with 3 incisions; dactylus near insertion not fitting totally to palm, leaving a hole-shaped gap. Pereopod 7

basis ratio length : width = 1.45. Telson with 1 long distal robust seta, between half and total telson length, and 3 short ones. (Pereopods 5–7 of ov. female strikingly twisted in articulation between merus and ischium.)

*Description.* Adult female 8–15 mm, male 7–12 mm.

Head nearly as long as first 2 segments, anteroventral corner acute. Eyes medially narrowed.

Antenna 1 about three fifths of body, peduncle article 1 subequal to article 2; flagellum of up to 30 articles, accessory flagellum of 3 or 4 articles; antenna 2 gland cone reaching half of article 3; flagellum of about 12 articles.

Mandible incisor, lacinia mobilis and molar medium; ratio palp article 2 : article 1 = 3; article 2: article 3 = 1.8; palp article 2 densely setose with 5–6 groups. Maxilla 1 inner plate narrower than outer plate, oval, with 3 plumose robust setae; outer plate 6 simple to pectinate robust setae, about twice as long as large, palp article 1 quadrangular, article 2 twice as long as large, 8 robust setae only apically. Maxilla 2 outer and inner plates equal, robust setae only distally, no fine hairs marginally. Maxilliped inner plate reaching one third of palp article 2, apically truncate with dense distal and a few lateral robust setae; outer plate large, oval, reaching two thirds of article 2 of palp, with curved robust setae, gradually increasing in length from inner to outer side; palp article 1 shorter than one third of article 2, article 3 half article 2, oval.

Gnathopod 1 not sexually dimorphic; coxa 1 anteriorly acutely lengthened; basis anterior margin with 4 or 5 medial robust setae, posteriorly longer robust setae; merus posteroventrally with short tooth; carpus regularly rounded on both margins, with stiff marginal and submarginal robust setae, about twice as long as wide; propodus rectangular, less broadened than carpus, ratio length : breadth = 2, palm oblique, well defined by blunt corner.

Gnathopod 2 of *female* strongly dimorphic in size, similar in shape; merus posterodistally with blunt tooth; carpus posteroventral corner with sharp tooth; carpus : propodus = 2:3, about same width; propodus rectangular, twice as long as wide, palm scarcely concave, scarcely defined by corner, no posterodistal “thumb”; 1 subdistal prominent robust seta on inner surface next to palmar corner, 6 smaller ones along palm. Gnathopod 2 of *male* strongly dimorphic in size and shape: the smaller is as described for smaller female gnathopod 2, the other has a palmar corner defined by a blunt and prominent “thumb”, distally followed by a short excavation, palm with rounded hump having 3 short excavations; dactylus strongly curved, leaving a hole-shaped gap near insertion.

Pereopods 3, 4 shape very similar, pereopod 3 reaching distally about half of gnathopod 2 propodus. Pereopods 5–7 similar, very spinose, on both margins serrate, propodus equal to merus, carpus shorter, basis : propodus = 1.7; pereopod 5 basis posterior margin straight to concave and weakly serrate, posterodistal corner broadened and lengthened; pereopod 6 subequal or somewhat longer pereopod 7, posteroventral corner lengthened.



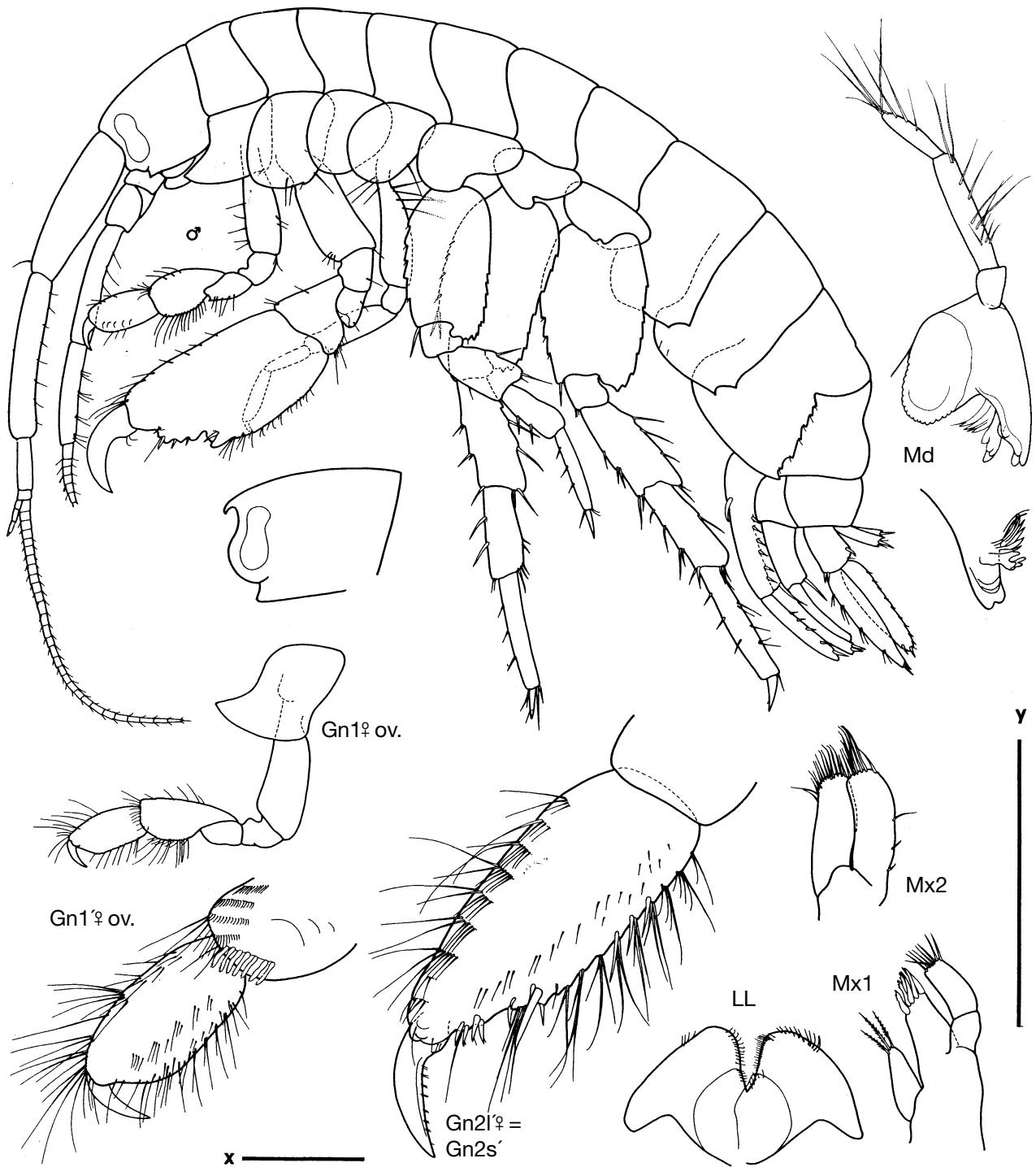


Figure 10. *Linguimaera leo* sp. nov., male, female (Victoria, Port Phillip Bay). Gn1 female in scale x = 1 mm, all other in scale y = 1 mm.

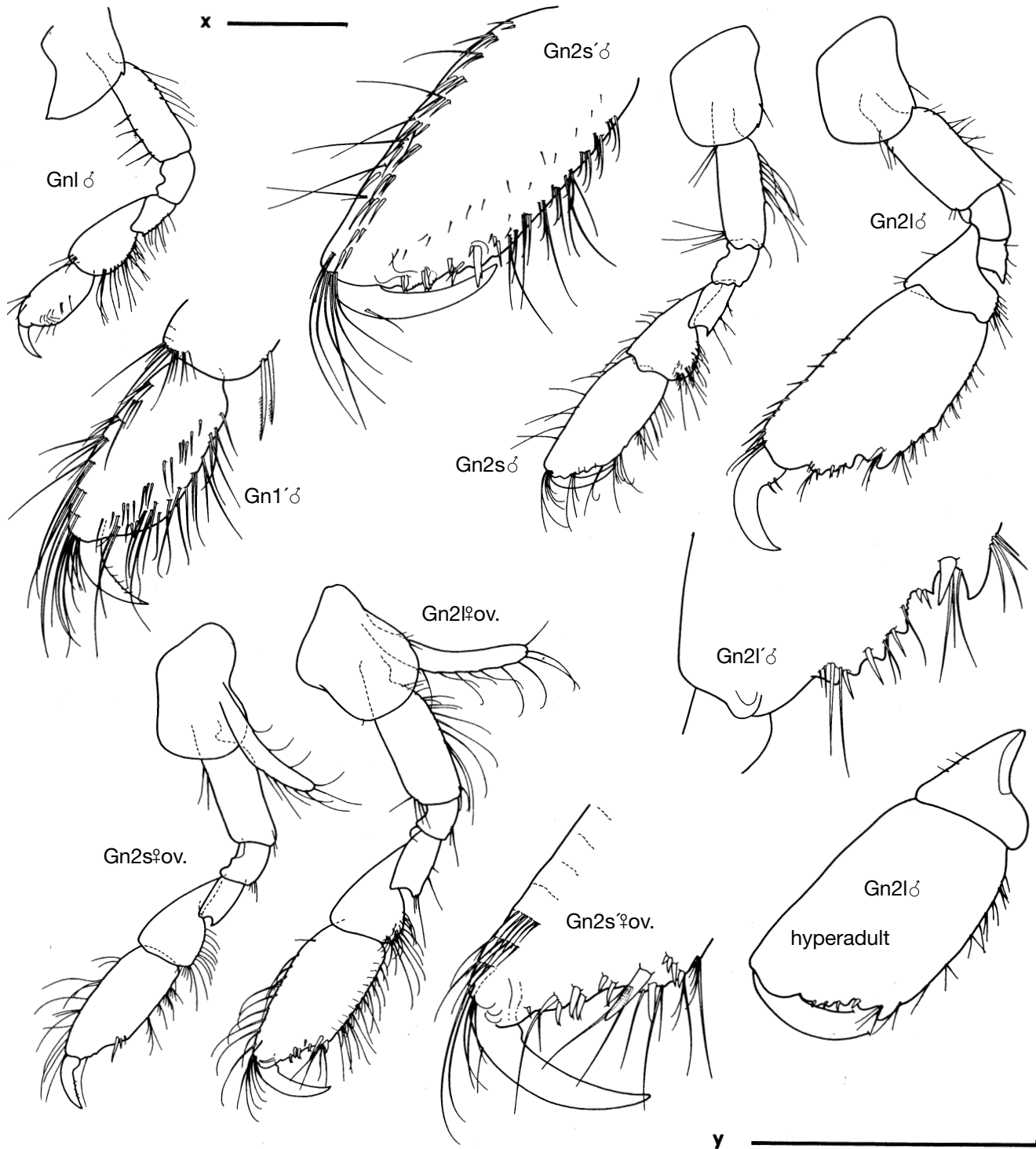


Figure 11. *Linguimaera leo* sp. nov., male, female (Victoria, Port Phillip Bay). Gn1 male, Gn2s male, Gn2 l large male, female, Gn2 male hyperadult, Gn2 small female in scale x = 1 mm; Gn1' male, Gn2' small male, Gn2' large, Gn2' small female in scale y = 1 mm.

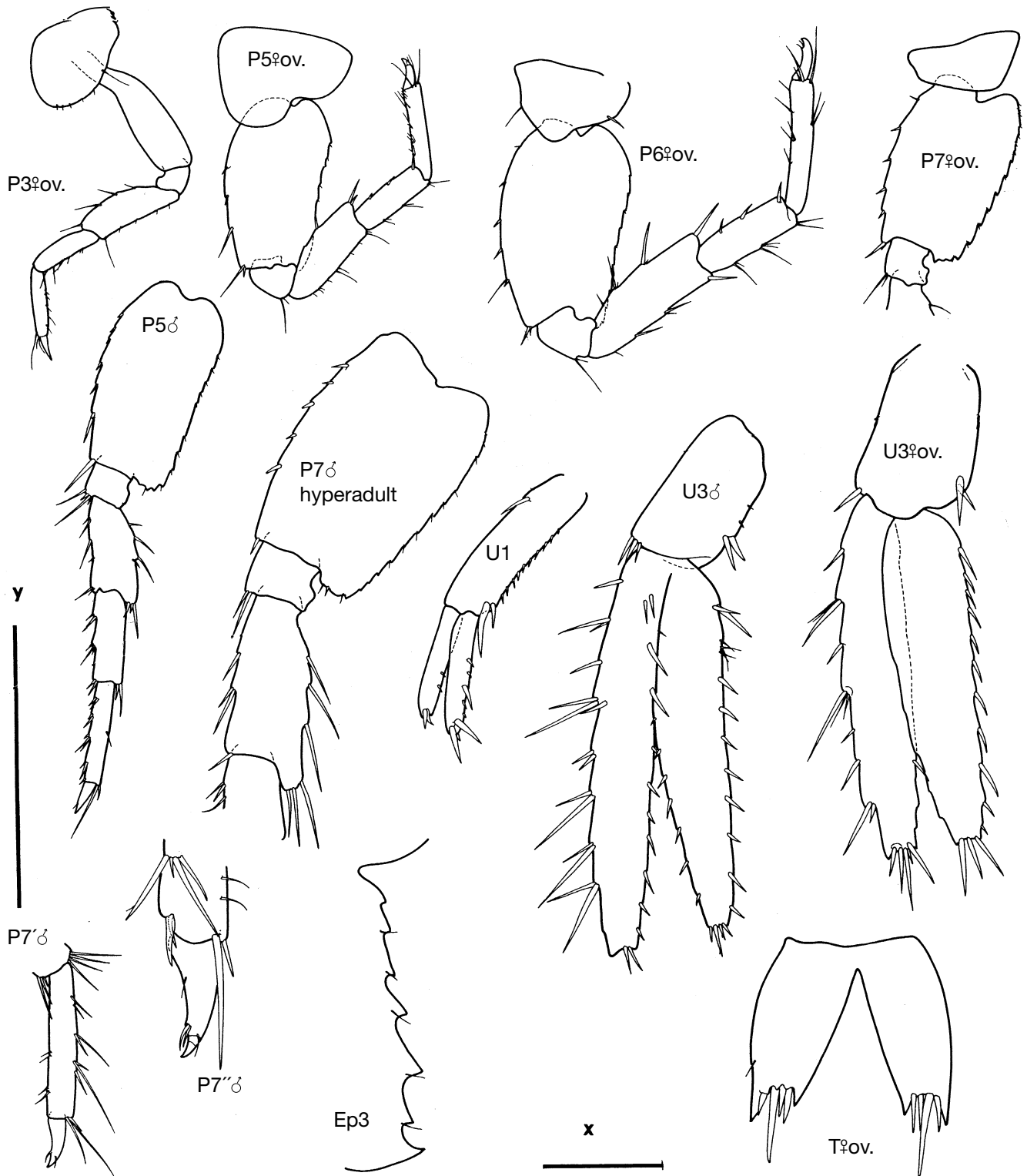


Figure 12. *Linguimaera leo* sp. nov., male, female (Victoria, Port Phillip Bay). P3–7 female, P7', P7 hyperadult male, U1 in scale x = 1 mm; Ep3, U3 male, female, P7'' male, T female in scale y = 1 mm.

Uropods 1, 2 ending at similar level; uropod 2 inner margin with 2 strong robust setae; uropod 3 peduncle half length of rami, outer ramus narrower than inner one; distally clearly truncate, with marginal robust setae on outer ramus in 7 or 8 groups.

Epimeral plate 3 serration with 7 or 8 teeth.

Telson quadrangular, 1 or 2 setae and no or 1 strong robust seta marginally; each lobe distally excavated as U-shape, with outer corner acutely prominent; in excavation 1 long robust seta (half or more telson-length) and 3 additional ones, not much surpassing length of the sinus.

*Etymology.* Dedicated to little Leo, the “most beautiful grandson in the world”! (noun in apposition).

*Distribution.* Victoria (Port Phillip Bay, Western Port, Portland Bay), South Australia (Walleroo), Western Australia (Bunbury, Favourite Is, Point Peron) (J.L. Barnard, 1972a); littoral, gravel pools, under rocks and holdfasts on reef, sand and rubble, sandy gravel; occurred in 56 samples with depth average of 12 m; most robust adults in intertidal.

*Remarks.* Already Barnard (1972a: 226) noticed the somewhat “disproportionate” insertion between propodus and carpus of gnathopod 1, which leads to a deeper “gap” dorsally.

*Discussion.* This species is found sometimes together with *L. tias* sp. nov. and has for more than a century been mixed up with other similar species. The above cited bibliography therefore contains only the proven citation by Barnard (1972a). There are several records of “*M. mastersi* (Haswell)”, mainly by Chevreux (1908: 481 – French Polynesia); Stebbing (1910: 457 – South Africa); Chilton (1916: 367 – New Zealand); Chilton (1925: 317 – Chatham Islands, New Zealand). But there is not enough information to make a conclusion.

#### *Linguimaera* aff. *leo*

*Material examined.* Numerous specimens in 18 NMV collections from eastern and central Bass Strait, 13–60 m depth, and Western Port, Victoria; sandy sediments.

*Remarks.* There are robust specimens of 10–15 mm in the first 10 metres of Port Phillip Bay, with oblique to nearly transverse gnathopod 2 palm in male, and robust ovigerous females with characteristically upwards twisted pereopods. Below 10 m down to about 45 m or even 60 m, in coarse sands or sandy shells of southern and eastern Bass Strait, there is a population of smaller and more delicate specimens, adult males with well developed penis papillae never reaching more than 8 mm, and ovigerous females of 6–7 mm. Their legs (especially gnathopod 1 male, pereopods 5–7 basis) are more slender, the setation on gnathopods 1, 2 basis or uropod 3 is richer and some distal robust setae are very long. But pereopods are mostly missing, robust setae are easily broken or setae lost, and there is no obvious and clearly reliable morphological difference to offer at the moment, to allow defining it as a separate species, and all differences found may also occur in less adult specimens of *Linguimaera leo*. But I mistrust that *Linguimaera leo* could have such a wide depth range, and also the ecology is quite different.

#### *Linguimaera mannarensis* (Sivaprakasam)

*Ceradocoides chiltoni*.—Sivaprakasam, 1968a: 109–111, fig. 11 (not *Ceradocoides chiltoni* Nicholls, 1938).

*Maera mannarensis* Sivaprakasam, 1968b: 274–278, figs 1–2.

*Maera mastersi*.—Sivaprakasam, 1970: 36, fig. 1 a–g.

(not *Megamoera mastersii* Haswell, 1879a: 265, pl. 11, fig. 1).

*Type locality.* Gulf of Mannar, India.

*Diagnosis.* Gnathopod 1 propodus medially widened, 2.4 times longer than wide, palm oblique, straight; gnathopod 2 male strongly asymmetrical, larger propodus pyriform, with rectangular hump near dactylus insertion and deep U-shaped incision, defined by a sharp tooth; carpus triangular, shorter than broad; pereopod 7 basis rounded, posterior margin serrated, propodus posterior margin with 3 groups of long robust setae and a fourth posterodistally; uropod 3 rami twice as long as peduncle, apically truncate, richly beset with robust setae. Telson with long apical robust seta, length twice the depth of incision of lobes and more than one third of telson length, with 2 strong robust setae mediolaterally.

*Description.* Adults 8–9 mm.

Lateral cephalic lobes rounded, with notch, anteroventral corner rounded. Eyes inferior part a bit widened, medially not narrowed.

Antenna 1 about 0.6 of body length; peduncle as long as flagellum, peduncle article 1 shorter than article 2; flagellum of 26–29 articles, accessory flagellum of 4–5 articles; antenna 2 slender, gland cone short, peduncle article 4 shorter than article 5, flagellum longer than article 5, of 11 articles.

Mandibular palp article 1 longer than wide; ratio article 2 : article 3 = 1.2 (thus article 3 relatively long compared to other species); both with long setae, especially many dense on article 3 distally.

Gnathopod 1 sexual dimorphism not found. Coxa 1 anterodistally a bit upturned, bluntly pointed; basis ratio length : breadth = 3, posteriorly 5 long setae and some shorter ones; merus posteroventrally rounded (sharp tooth lacking here), twice as long as wide; carpus triangular, swollen; propodus slender, less broad than carpus, 3 times as long as wide, palmar corner scarcely defined.

Gnathopod 2 male strongly dimorphic, carpus in larger gnathopod short, shorter than broad; palmar corner well developed, with upturned point, followed by U-shaped incision defined by a straight blunt distal elevation of palm; no especially prominent robust seta except some submarginal along palm; dactylus strongly curved, the bend being stronger than the outline of propodus, thus inwards folded.

Pereopods 3, 4 very similar in shape and also size; pereopods 5, 6 robust, basis rectangular, small serrations on posterior margins, posterodistal corner slightly lengthened and not widened; pereopod 7 basis much larger, posterior margin rounded, serrated; robust setae on posterodistal corner of carpus reaching or surpassing half length of propodus.

Epimeral plate 3 with serration of 3 or 4 teeth.

Uropod 1 peduncle inferior margin subproximally with 1 strong robust seta, rami shorter than peduncle, outer a bit shorter; uropod 2 outer ramus as long as peduncle, inner a bit

longer; uropod 3 much longer than uropods 1 and 2, rami subequal, truncate, beset with many short robust setae of maximally one fifth ramus length.

Telson longer than wide, lobes outer end longer than inner one; in excavation 1 strong robust seta inserted (one third of telson length) without small additional ones. Outer margin medially and on proximal third, 1 other, shorter robust seta.

*Distribution.* Gulf of Mannar, India; seaweeds.

*Discussion.* I have not seen this species, thus the description relies on Sivaprakasam's papers. According to them, this species differs from all other species by the the inwardly-bent dactylus and cup-shaped short carpus on the larger male gnathopod 2, the widened and serrate basis of pereopod 7 with long, rich setation on other articles and a relatively long mandibular palp article 3.

***Linguimaera tias* sp. nov.**

Figures 13–15

*Maera mastersi.*—Barnard, 1972b: 108–10, figs 55–56.—Sheard, 1936: 177–178 fig. 3.—Sheard, 1937: 24.

*Maera mastersii.*—Hale, 1929: 215, fig. 213.—Chilton, 1916: 367.—Chilton, 1925: 317.—Hurley, 1954: 603.—Lowry and Fenwick, 1983: 236.

?*Moera mastersi.*—Chilton, 1911: 564.—Chilton, 1921: 72–73.

(not *Megamoera mastersii* Haswell, 1879b: 265, pl. 1 fig. 1).

*Material examined.* Holotype. New Zealand, Otago Harbour, Shelly Beach, gravel pools, USNM 149478 (male 11.2 mm).

Paratype. Locality like above, USNM 149478 (ovigerous female 9.9 mm).

Other material. Numerous specimens in 39 NMV collections from Vic. (Western Port, Port Phillip Bay, Portland Bay), SA (Cape Northumberland), and eastern and central Bass Strait, 0–40 m depth, sedimentary and algal substrates.

*Diagnosis.* Gnathopod 1 propodus ratio length : breadth = 2.1–2.7, changing with age. Gnathopod 2 male, female propodus palm excavated, palmar corner in male without “thumb”-shaped prolongation; gnathopod 2 female similar in shape and not much different in size, slender. Pereopod 7 basis ratio length : breadth = 1.75. Telson with apical robust setae between half and total telson length.

*Description.* Adult male 10–17 mm, female 10–13 mm.

Eyes reniform, medially narrowed.

Antenna 1 0.8 of body length, peduncle article 1 shorter than article 2; flagellum of up to 46 articles, accessory flagellum of 6–7 articles. Antenna 2 gland cone nearly reaching end of article 3; peduncle reaches half of antenna 1 peduncle article 2; flagellum of 16–17 articles.

Mandible incisor and lacinia mobilis with strong blunt teeth, accessory robust setae serrate; molar huge and oblong; palp article 2: article 1 = 2.25, article 2 : article 3 = 1.3, article 2 with 12–13 long setae in 4–5 groups; maxilla 1 inner plate width subequal to outer plate; outer plate with 7–8 simple to pectinate robust setae; maxilla 2 setae only distal, but many fine hairs also marginally.

Gnathopod 1 weakly sexually dimorphic. Coxa 1 anteriorly bluntly lengthened; basis ratio length : breadth = 2.5; merus

posteroventally bluntly lengthened; carpus regularly rounded on posterior margin, length about twice to 2.3 width; propodus palm oblique, scarcely defined.

Gnathopod 2 weakly sexually dimorphic, different in size, not in shape, subchelate.

*Female* slightly dimorphic in size, similar in shape. Coxa 2 quadrangular, merus posterodistally with sharp tooth; propodus palm concave with blunt hump medially, defined by a posterodistal tooth, a straight part distally and shallow excavation proximally; 1 subdistal prominent robust seta on inner surface next to palmar corner, 6 smaller ones along the palm. *Male* dimorphic in size and shape, but in hyperadults both gnathopods again similar in size and shape; when dimorphic, one is as described for female, the other has a stronger defined palmar corner, distally followed by deeper semicircular excavation, while straight distal half of female has 1 or more blunt humps medially; dactylus stout, curved.

Pereopod 3 not much shorter than gnathopod 2 in male; pereopods 3, 4 basis and merus strong, other articles slim. Pereopods 5, 6 basis : propodus = 1.5; pereopod 7 male ratio length : width = 1.7.

Uropod 3 marginal setae on outer ramus in 4 or 5 groups.

Telson distomarginally with 2 small additional setae, no robust seta; in the excavation of lobes, 1 robust seta of about half telson length and another of one third telson length.

*Etymology.* Dedicated to our newest family member and son-in-law Matthias, shortened to Tias (noun in apposition).

*Discussion.* This species is very similar to *Linguimaera mannaensis* (Sivaprakasam, 1968). Differences are: eyes oval, width medially narrowing (vs width not narrowing); lateral cephalic lobe anterodistal corner pointed and curved (vs very little developed, rounded); mandibular palp article 3 distally oblique (vs regularly rounded); gnathopod 1 propodus twice as long as wide (vs longer and narrower); gnathopod 2 carpus longer than wide (vs wider than long); pereopod 7 basis posterior margin only very weakly rounded (vs evenly excavate); telson subquadrate (vs longer than wide); marginally on first third no robust seta (vs. one stout robust seta).

*Remarks.* Thomson (1882: 235, fig. 4a) illustrated a New Zealand amphipod as *Moera quadrimana* with characters similar to the present species, although his fig. 4b probably deals with the true *Quadrimaera quadrimana* (Dana).

*Distribution.* New Zealand: Otago Harbour, Shelly Beach (Barnard, 1972b). Australia: Victoria: Port Phillip Bay, Western Port, Portland Bay, Cape Northumberland, Bass Strait. South Australia: Sellicks Beach (Sheard, 1936). Gravel pools, sand, silty clay; 3.5–40 m depth.

***Linguimaera* sp.**

Figure 16

*Material examined.* South-western Bass Strait (39°32.8'S, 144°16'E), 18 m, 1 Nov 1980, fine sand, epibenthic sled, G.C.B. Poore on FV *Sarda* (stn BSS 107), NMV J 2505 (2 males 10 mm).

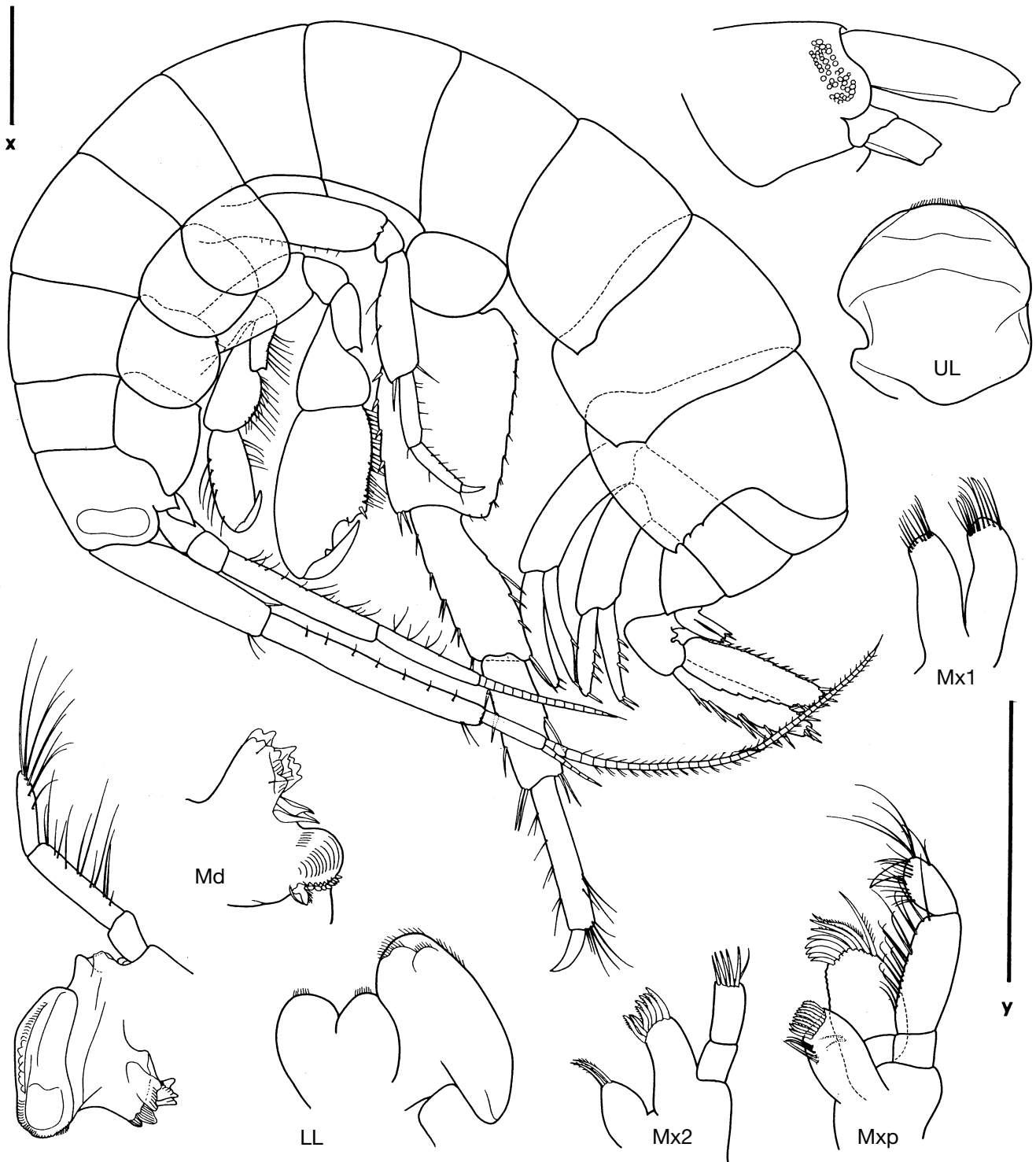


Figure 13. *Linguimaera tias* sp. nov., male (Victoria, Port Phillip Bay). Hd scale  $x = 1$  mm; mouthparts UL; Mx1, 2; Md; Mxp; LL in scale  $y = 1$  mm.

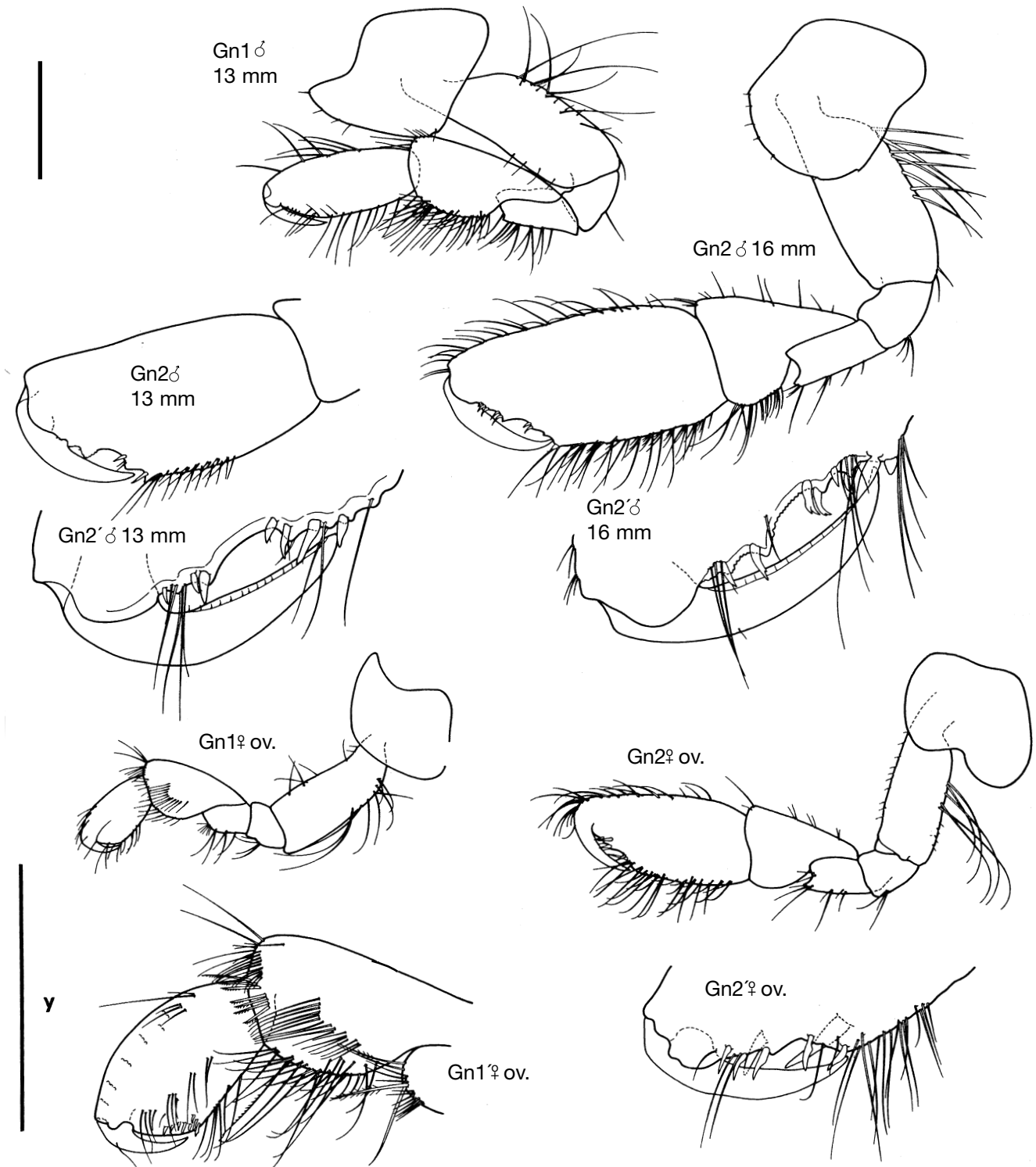


Figure 14. *Linguimaera tias* sp. nov., male, female (Victoria, Port Phillip Bay). Gn1, 2 male 13 mm, Gn2 male 16 mm, Gn1, 2 female in scale x = 1 mm; Gn2' male 13 mm, Gn2' male 16 mm, Gn1' female, Gn2' female in scale y = 1 mm.

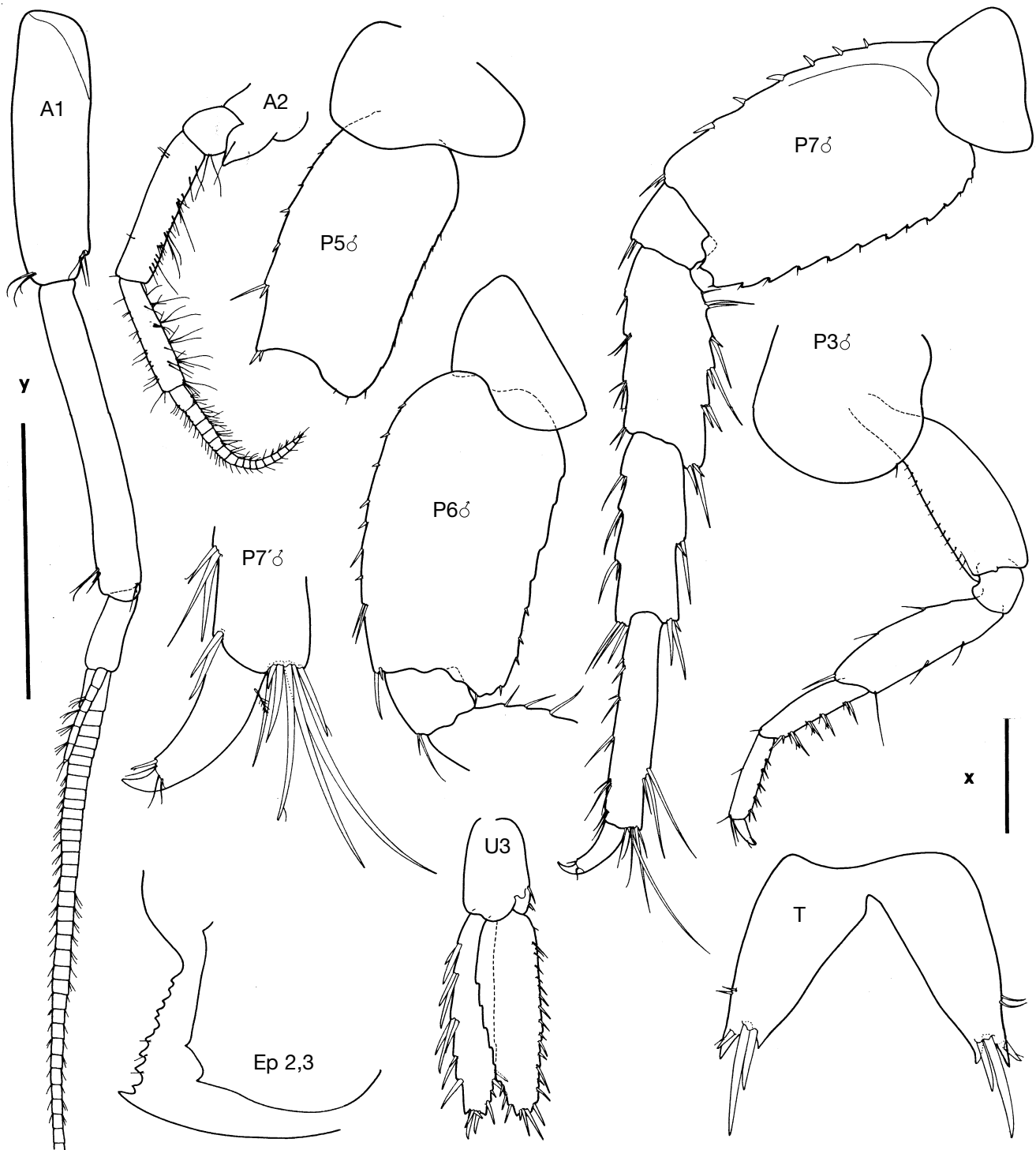


Figure 15. *Linguimaera tias* sp. nov., male, female (Victoria, Port Phillip Bay). P7' male, T in scale y = 1 mm; all other in scale x = 1 mm.



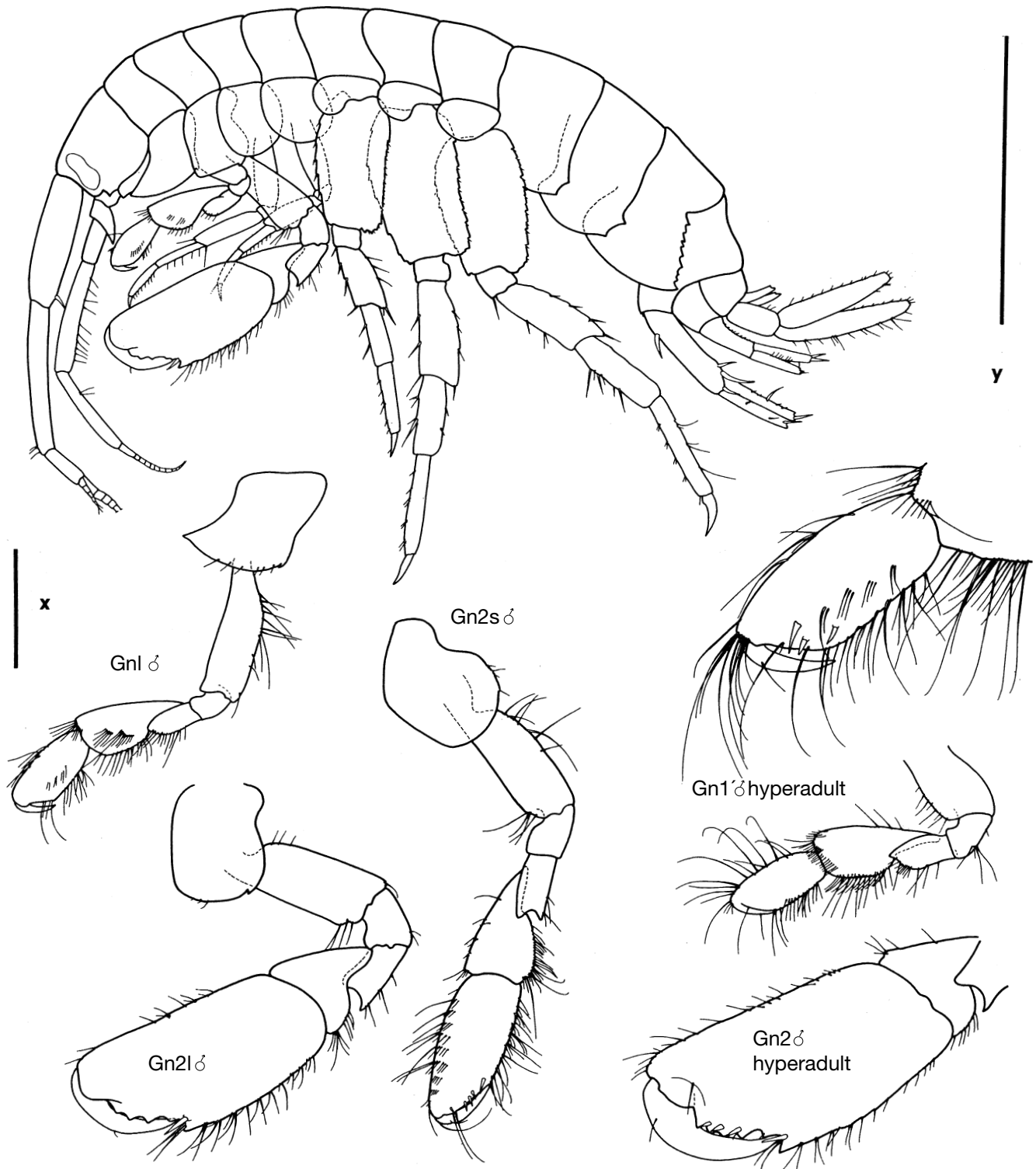


Figure 16. *Linguimaera* sp. (south-western Bass Strait). Gn1, 2 small male, Gn2 large male, Gn1, 2 hyperadult male in scale x = 1 mm; Gn1' male hyperadult in scale y = 1 mm.

**Diagnosis.** Length 10 mm. Coxa 1 anteriorly acutely produced. Gnathopod 1 propodus slender, carpus much longer than propodus, widened. Gnathopod 2 male palm slightly excavated and crenulated. Pereopods 5, 6 basis rectangular, pereopod 7 posterodistal corner rounded, lengthened. Uropod 3 long, slim. Telson with short distal robust setae that are scarcely exceeding tip; 4 robust setae along inner margin of telsonic lobes.

**Distribution.** Bass strait.

**Remarks.** This material is very similar to *L. leo* sp. nov. and *L. tias* sp. nov. but the robust setae on the inner margin of telsonic lobes (naked in all other species) seem to be a good character to distinguish this species within the group. Not a large animal, in many respects these specimens seem more slender than *L. leo*: antenna 2 peduncle article 4, gnathopod 1 propodus and carpus, and gnathopod 2 dactylus, propodus are all narrower than in *L. leo*. *Linguimaera* sp. shares the narrow articles of appendages with *L. tias*, and also the rich setation on the posterior margin of the basis of gnathopods and the relatively long accessory flagellum, but again the spination of the telson is much different. Most probably these species have different ecological niches. The present material is too poor for defining a new species.

#### ***Megamoera thomsoni* Miers, species dubia**

*Megamoera thomsoni* Miers, 1884: 318, pl. 34, fig. B.

**Remarks.** Miers' description of his Australian *Megamoera thomsoni* could apply to a species of *Linguimaera* (especially the slim gnathopod 1, propodus without palmar corner, carpus very long would fit *L. pirloti*). But coxa 1 is definitely rounded anteriorly in Miers' species (vs very acute), the serrated excavation on gnathopod 2 palm could fit some of the described species, while the telson is figured very differently as densely beset with robust setae on the inner margin of the lobes, and apically without any incision. Thus, as the type material is apparently lost and the description short, *Megamoera thomsoni* Miers seems to be related to *Linguimaera* and may be even to *L. pirloti*, *kellissa*, young *L. leo* or the unnamed species, but should be considered as species dubia.

#### ***Maera aequimana* Ledoyer, 1979, species dubia**

*Maera aequimana* Ledoyer, 1979: 77–78, fig. 43.

**Remarks.** The figures of Ledoyer (1979) match well with species of *Linguimaera*. However, it is stressed that the second male gnathopods are not asymmetrical (therefore the name – it may be an immature specimen?) and we don't know the shape of the third uropods. In the slide of the holotype the telson is broken in pieces, so it is not clear how far it is cleft, while the remaining material in alcohol (1 male, 1 female, 1 immature) is not available. For the time being this species must remain dubious.

#### **Conclusions**

The genus *Linguimaera* has an Indo-Pacific distribution. It shows close relationship to *Zygomaera*, but the latter has an uncleft and more or less emarginate telson, while that of

*Linguimaera* has a constant and quite characteristic structure in being deeply cleft with the tips of the lobes asymmetrically incised. The two genera share many other characters, such as the produced anterodistal corner of coxa 1, the thickened carpus of gnathopod 1, dimorphic gnathopods 2 in males (at least known in two species of *Zygomaera*), a shallow excavation on the posterodistal corner of epimeral plates 1 and 2, a serrate posterior margin of epimeral plate 3, and uropod 3 with a short peduncle and long rami with many short robust setae that are never longer than the rami. The differences with *Zygomaera* seem mainly to reside in the shape of the eyes (in *Zygomaera* rounded, often scarcely visible) and of the telson, but also in the always truncated tip of uropod 3 rami, which show in some species a minute second article. The last article of the mandibular palp is in *Zygomaera* (where known) only a little shorter or subequal to the second article (always clearly shorter in *Linguimaera*) and the falcate intramarginal robust seta distally on the peduncle uropod 1 is in *Zygomaera* strikingly strong and even on a special peduncle (vs less striking). While members of *Zygomaera* are not all described and known with all their crucial character states (and it might be that the emarginate telson is homoplastic), members of the new genus *Linguimaera* seem to form a natural group.

#### **Acknowledgements**

I am grateful to my friends Wim Vader, Joergen Berge (Tromsø, Norway) and Sandro Minelli (Padova, Italy), the latter also member of the committee of ICZN (International Commission for Zoological Nomenclature), for helping me out in nomenclatory questions. Many thanks to Gary Poore and his helpful crew for offering me a desk, equipment and time for discussions at their museum in Melbourne, and to John Moverley who for the second time took me into his house and family. Jim Lowry (Australian Museum, Sydney) most kindly sent me the draft of his Australian melitid paper before finishing my manuscript. I am obliged to the Deutsche Forschungsgemeinschaft who provided partial support for travel expenses for my last two stays in Australia. Dirk Platvoet (Museum Amsterdam, Netherlands) kindly provided the SEM pictures. Like always, Wim Vader revised the manuscript and replied with patience to my reference-queries. Careful critical reading of the submitted manuscript was finally done by Jim Lowry, Alan Myers and last but not least Gary Poore.

#### **References**

- Barnard, J.L. 1965. Marine Amphipoda of atolls in Micronesia. *Proceedings of the United States National Museum Washington* 117: 459–552.
- Barnard, J.L. 1969. The families and genera of marine Gammaridean Amphipoda. *United States National Museum Bulletin* 271: 1–535.
- Barnard, J.L. 1970. Sublittoral Gammaridea (Amphipoda) of the Hawaiian Islands. *Smithsonian Contributions to Zoology* 32: 1–286.
- Barnard, J.L. 1972a. Gammaridean Amphipoda of Australia, Part I. *Smithsonian Contributions to Zoology* 103: 1–333.
- Barnard, J.L. 1972b. The marine fauna of New Zealand: algae-living littoral Gammaridea (Crustacea Amphipoda). *Memoirs of the New Zealand Oceanographic Institute* 62: 7–216.

- Barnard J.L., and Barnard, C.M. 1983. *Freshwater Amphipods of the World. I. Evolutionary patterns. II. Handbook and bibliography.* Hayfield Associates: Mt Vernon. xix + 830 pp.
- Barnard, K.H. 1935. Report on some Amphipoda, Isopoda and Tanaidacea in the collections of the Indian Museum. *Records of the Indian Museum* 37/3: 279–319.
- Bousfield, E.L. 1973. *Shallow-water gammaridean Amphipoda of New England.* Cornell University Press: Ithaca and London. 312 pp.
- Chevreaux, E. 1908. Amphipodes recueillis dans les possessions françaises de l'Océanie par M. le Dr. Seurat, directeur du laboratoire de recherches biologiques de Rikitea (îles Gambier). *Memoirs de la Société Zoologique* 20: 470–527.
- Chilton, C. 1911. Crustacea.– Scientific results of the New Zealand Government trawling expedition, 1907. *Records of the Canterbury Museum* 1: 285–312.
- Chilton, C. 1916. Some Australian and New Zealand Gammaridae. *Transactions and Proceedings of the New Zealand Institute* 48: 359–370.
- Chilton, C. 1921. Fauna of the Chilka Lake – Amphipoda. *Memoirs of the Indian Museum* 5: 519–558.
- Chilton, C. 1925. Some Amphipoda and Isopoda from the Chatham Islands. *Records of the Canterbury Museum* 2: 317–320.
- Hale, H.M. 1929. *The crustaceans of South Australia. Part 2.* South Australian Government Printer: Adelaide. 202–380 pp.
- Haswell, W.A. 1879a. On some additional new genera and species of amphipodous crustaceans. *Proceedings of the Linnean Society of New South Wales* 4: 319–50.
- Haswell, W. A. 1879b. On Australian Amphipoda. *Proceedings of the Linnean Society of New South Wales* 4: 245–279.
- Hurley, D.E. 1954. Studies on the New Zealand amphipodan fauna No. 4: The family Gammaridae, including a revision of the freshwater genus *Phreatogammarus* Stebbing. *Transaction of the Royal Society of New Zealand* 81: 601–618.
- Karaman, G.S., and Ruffo, S. 1971. Contributo alla conoscenza delle specie mediterranee del genere *Maera*. *Memorie del Museo Civico di Storia Naturale, Verona* 19: 113–176.
- Krapp-Schickel, T. 2000. Pitfall genus *Maera* (Crustacea, Amphipoda, Melitidae). *Polskie Archiwum Hydrobiologii* 47: 413–440.
- Krapp-Schickel, T., and Jarrett, N.E. 2000. The amphipod family Melitidae on the Pacific Coast of North America: Part II. The *Maera* – *Ceradocus* – complex. *Amphipacifica* 2/4: 23–61.
- Leach, W.E. 1814. Crustaceology. *The Edinburgh Encyclopaedia* 7: 402–403, Appendix 429–434.
- Ledoyer, M. 1979. Les Gammariens de la pente externe du Grand Récif de Tulear (Madagascar) (Crustacea, Amphipoda). *Memorie del Museo Civico di Storia Naturale Verona* 2/1–150
- Ledoyer, M. 1982. Crustacés amphipodes gammariens. Familles des Acanthonotozomatidae à Gammaridae. *Faune de Madagascar* 59: 1–598.
- Libertini, A. and Krapp-Schickel, T. 2000. Chromosome number and conventional karyotype in eight marine amphipod species. *Polskie Archiwum Hydrobiologii* 47: 465–471.
- Lowry, J.K., Berents, P. and Springthorpe, R. 2001. Australian Amphipoda: Melitidae. Version 1: 18 January 2001. <http://crustacea.net>.
- Lowry, J.K., and Fenwick, G.D. 1983. The shallow-water gammaridean Amphipoda of the subantarctic islands of New Zealand and Australia: Melitidae, Hadziidae. *Journal of the Royal Society of New Zealand* 13: 201–260.
- Lyons, J., and Myers, A.A. 1993. Amphipoda Gammaridea from coral rubble in the Gulf of Aqaba, Red Sea: families Megaluroipidae, Melitidae, Phliantidae, Phoxocephalidae and Urothoidae. *Journal of Natural History* 27: 575–598.
- Miers, E.J. 1884. Collections from Melanesia. Crustacea. *Report on the Zoological Collections made in the Indo-Pacific Ocean during the Voyage of H.M.S. "Alert" 1881–82* : 178–322, 513–575.
- Nayar, K.N. 1959. On the Amphipoda of the Madras Coast. *Bulletin of the Madras Government Museum, Natural History Section* 6: 1–59.
- Pirlot, J.M. 1936. Les amphipodes de l'Expedition du Siboga. 2. Les amphipodes gammarides II., 3. Les amphipodes littoraux. III (1). *Siboga Expeditie* 33e: 237–328.
- Schellenberg, A. 1938. Litorale Amphipoden des Tropischen Pazifiks. *Kunglia Svenska Vetenskapsakademiens Handlingar* 3, 16/6: 1–105.
- Sheard, K. 1936. Amphipods from a South Australian reef – part 2. *Transactions of the Royal Society of South Australia* 60: 173–179.
- Sheard, K. 1937. A catalogue of Australian Gammaridea. *Transactions of the Royal Society of South Australia* 61: 17–29.
- Sivaprakasam, T.E. 1968a. Amphipoda from the east coast of India part 1. Gammaridea. *Journal of the Marine biological Association of India* 8: 82–122.
- Sivaprakasam, T.E. 1968b. A new species and a new record of Amphipoda (Crustacea) from the Gulf of Mannar. *Journal of the Marine Biological Association of India* 10: 274–282.
- Sivaprakasam, T.E. 1970. Amphipods of the genera *Maera* Leach and *Elasmopus* Costa from the east coast of India. *Journal of the Marine Biological Association of India* 10: 34–51.
- Stebbing, T.R.R. 1910. General catalogue of South African Crustacea. *Annals of the South African Museum* 6/5: 281–593.
- Thomas, J.D., and Barnard, J.L. 1985. Two new species of two new gammaridean genera (Crustacea: Amphipoda) from the Florida Keys. *Proceedings of the Biological Society of Washington* 98: 191–203.
- Thomson, G.M. 1882: On New Zealand Crustacea. Additions to the crustacean fauna of New Zealand. *Transaction of the New Zealand Institute* 14: 230–238.
- Walker, A.O. 1904. Report on the Amphipoda collected by Prof. Herdman at Ceylon 1902. *Report to the Government of Ceylon on the Pearl Oyster Fisheries of the Gulf of Manaar, Supplementary Report* 17: 229–300.
- Walker, A.O. 1909. Amphipoda Gammaridea from the Indian Ocean, British East Africa and the Red Sea. *Transactions of the Linnean Society of London, series 2, Zoology* 12: 323–344.

