

First record of *Pareiasmopus setiger* Chevreux, 1901 from Singapore, including synonymization of *Pareiasmopus siamensis* Wongkamhaeng, Coleman & Pholpunthin, 2013 with *Pareiasmopus setiger* (Crustacea, Amphipoda, Maeridae)

Azman Abdul Rahim¹, Ali Eimran Alip²

¹ Marine Ecosystem Research Centre (EKOMAR), Faculty of Science and Technology, Universiti Kebangsaan Malaysia
43600 Bangi, Selangor, Malaysia

² Tropical Marine Science Institute (TMSI), National University of Singapore, 14 Kent Ridge Road, 119227, Singapore

<http://zoobank.org/1786F9FE-98D8-40B8-9460-A6FB89EB2DC0>

Corresponding author: Azman Abdul Rahim (abarahim@gmail.com)

Abstract

Received 24 November 2014

Accepted 26 March 2015

Published 7 April 2015

Academic editor:

Matthias Glaubrecht

Key Words

Amphipoda

Maeridae

Singapore

Pareiasmopus setiger

Pareiasmopus siamensis

synonym

Pareiasmopus setiger has been widely described from tropical to subtropical regions from Philippine Islands, Sulu Sea, Indonesia, Australia, north Indian Ocean and the Seychelles by several authors. The present study provides detailed descriptions of *Pareiasmopus setiger* Chevreux, 1901 (Crustacea: Amphipoda) based on newly collected specimens from Pulau Hantu, Singapore. Morphological characters of the specimens closely resemble those of *Pareiasmopus setiger* and *Pareiasmopus siamensis* Wongkamhaeng, Coleman & Pholpunthin, 2013. The specimens of both the species were quite similar to the Singapore specimens, although the shapes of appendages vary with growth and locality; therefore, *P. siamensis* is synonymized with *P. setiger*. The following species characteristics for *P. setiger* are indicated: 1) antenna 1 peduncle with 2 setae; 2) male gnathopod 2 propodus palm transverse; 3) Pereopods 5 to 7 posterior margins with long slender setae; and 4) dorsal carina pattern for pereonite 7 and pleonites 1 to 3.

Introduction

Few works have been published on amphipods from Singapore and most are a century old. These works include Stebbing (1887), Mayer (1903) and Tattersall (1922). The genus *Pareiasmopus* Stebbing, 1888 belongs to the family Maeridae Krapp-Schickel, 2008, with species typically occurring in the Indo-West Pacific (Hughes 2009). To date only three species, *Pareiasmopus suluensis* (Dana, 1853), *P. setiger* Chevreux, 1901 and *P. dancaui* Ortiz & Lalana (1997) are recognized with certainty from the Southeast Asian waters. Australia and the adjacent waters have the largest number of recorded taxa within this genus with seven species altogether namely, *Pareiasmopus*

aumogo Hughes, 2011, *P. cymatilis* Lowry & Hughes, 2009, *P. echo* Barnard, 1972, *P. poorei* Hughes, 2009, *P. sowpigiensis* Lowry & Springthorpe, 2005, *P. suensis* (Haswell, 1879), and *P. ya* Barnard, 1972.

Materials and methods

This study was based on material collected in July 2013, from the shallow-water coral reef habitats of Pulau Hantu, Singapore (Fig. 1). Samples were collected using artificial substrates (mesh bath netting) that were laid amongst corals and were then carefully transferred into plastic containers. Material was fixed in 10% buffered formalin. In the labo-

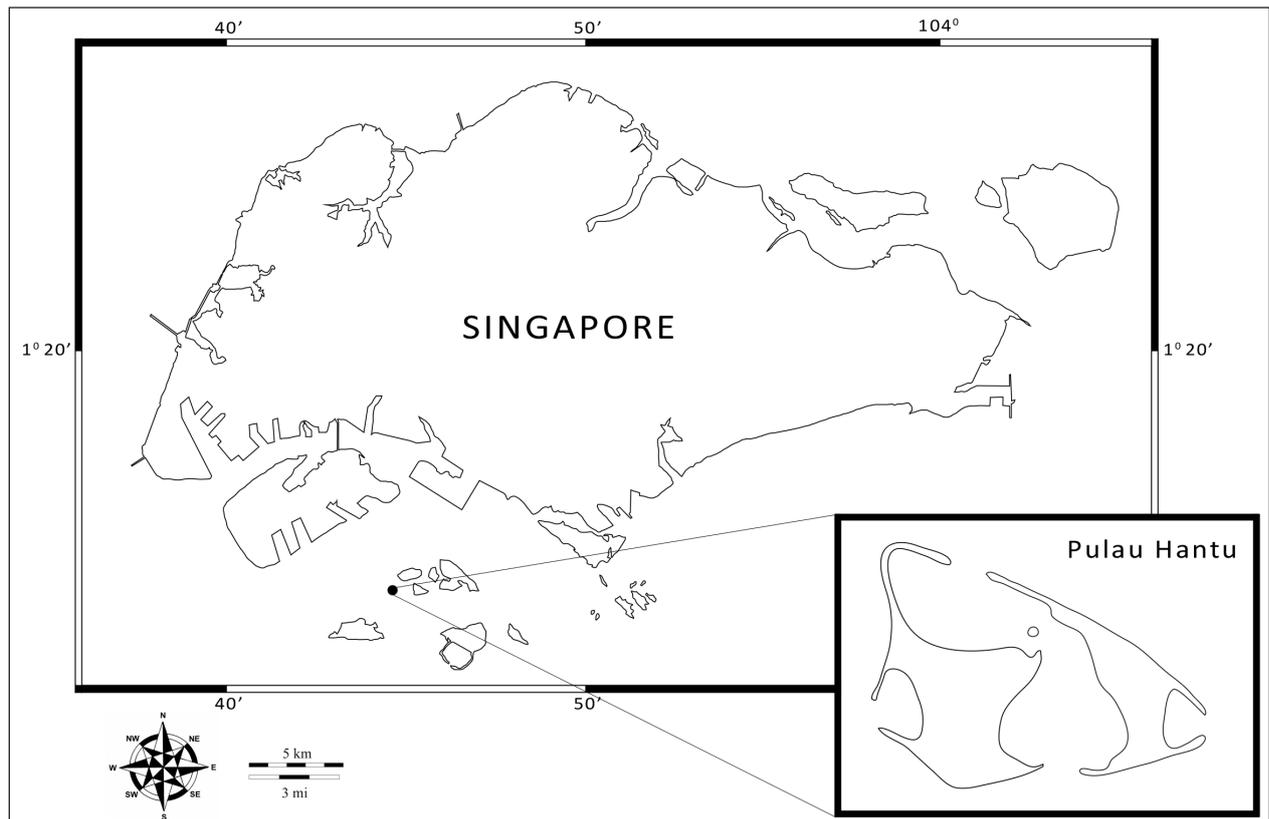


Figure 1. Pulau Hantu, Singapore.

ratory, amphipod specimens were sorted and preserved in 70% alcohol. The specimens were examined under a compound microscope and later selected for dissection. Specimens were introduced into increasing concentrations of glycerol before dissection was carried out in an excavated glass block with glycerol as a medium. Dissected parts were then permanently mounted in 100% glycerol. Dissections and mounting of specimens were carried out in glycerol. The appendages of the dissected specimens were examined using an Olympus SZ30 and figures were produced using an Olympus CH20 Leica light microscope with a camera lucida. All illustrations were digitally 'inked' following Coleman (2003). Setae and mouthparts are classified following Watling (1989). The following abbreviations are used: A, antenna; G, gnathopod; HD, head; LL, lower lip; MD, mandible; MX, maxilla; MP, maxilliped; P, pereopod; EP, epimeron; T, telson; U, uropod; UR, urosome; UL, upper lip; R, right; L, left; ♂, male; ♀, female. All material is lodged with the Universiti Kebangsaan Malaysia Muzium Zoologi (UKMMZ).

Systematics

Suborder Senticauda Lowry & Myers, 2013
Maeridae Krapp-Schickel, 2008

***Pareiasmopus* Stebbing, 1888**

Type species. *Megamoera suensis* (Haswell, 1879).

Diagnosis. Head with notch on cheek. Mandible mandibular palp 3-articulate, article 2 much shorter than article 1, article 3 straight, not setiferopectinate. Urosomite 1 with pair of dorsal carinae. Uropod 3 rami length subequal to peduncle; Epimeron 3 posteriorly serrate on lower margin. (After Hughes 2011)

Species composition. *Pareiasmopus* includes 13 species: *P. albidus* (Dana, 1853); *P. aumogo* Hughes, 2011; *P. cymatilis* Lowry & Hughes, 2009; *P. echo* J.L. Barnard, 1972a; *P. dancaui* Ortiz & Lalana, 1997; *P. mallacootaformis* Ledoyer, 1984; *P. poorei* Hughes 2009; *P. setiger* Chevreux, 1901; *P. sowpigensis* Lowry & Springthorpe, 2005; *P. suensis* (Haswell, 1879); *P. suluensis* (Dana, 1852); *P. ya* J.L. Barnard, 1972 and *P. zelei* Ledoyer, 1983.

***Pareiasmopus setiger* Chevreux, 1901**

Figures 2–9

?*Megamoera suensis* Haswell, 1880c: 335–336, pl. 21: fig. 5.

Megamoera suensis. – Miers 1884: 317–318.

Megamoera haswelli Miers, 1884: 318 [name in text].

Not *Megamoera suensis*. – Haswell 1885: 103–104, pl. 15: figs 1–4
 [= *Maera hamigera* (Haswell) fide Stebbing, 1906, but see Stebbing, 1910a: 600].

Elasmopus suensis. – Stebbing 1906: 442–443.

Pareiasmopus setiger Chevreux, 1901: 412–418, fig. 32–39.

Pareiasmopus suluensis. – Chilton 1922: 7–8, fig. 3 [not Dana].

?*Pareiasmopus suluensis*. – Walker 1904: 278, pl. 6: fig. 3 [?not Dana]

Pareiasmopus siamensis Wongkamhaeng, Coleman & Pholpunthin, 2013: 525–532, figs 19–24.



Figure 2. *Parelasmopus setiger* Chevreux, 1901, **A**, male, 10.3 mm, UKMMZ-1527; **B**, female, 9.8 mm, UKMMZ-1528. Pulau Hantu, Singapore. Scale 2 mm.

Material examined. – 1 male, 10.3 mm, UKMMZ-1527, shallow water coral habitat of Pulau Hantu, Singapore, 1°13'37.9"N, 103°44'27.6"E, mesh bath netting, 5 m, coll. E.A. Ali, Tan, Y.K. and Lee, A.C., 26 November 2013: 3 males; 1 female; 2 juveniles, UKMMZ-1529, same station data.

Type locality. Port Of Victoria, Mahé, Seychelles.

Description. Based on male, 10.3 mm, UKMMZ-1527.

Head. Head slightly longer than pereonites 1–2 combined; rostrum small; lateral cephalic lobe broad, moderately produced, anteroventral margin with notch/slit; eyes well developed, ovate. *Urosomite 1–3* serrated dorsally. *Antenna 1* longer than antenna 2; peduncular article 1 subequal to article 2, with 2 robust setae along posterior margin, ventrodistal margin with 1 group of robust setae

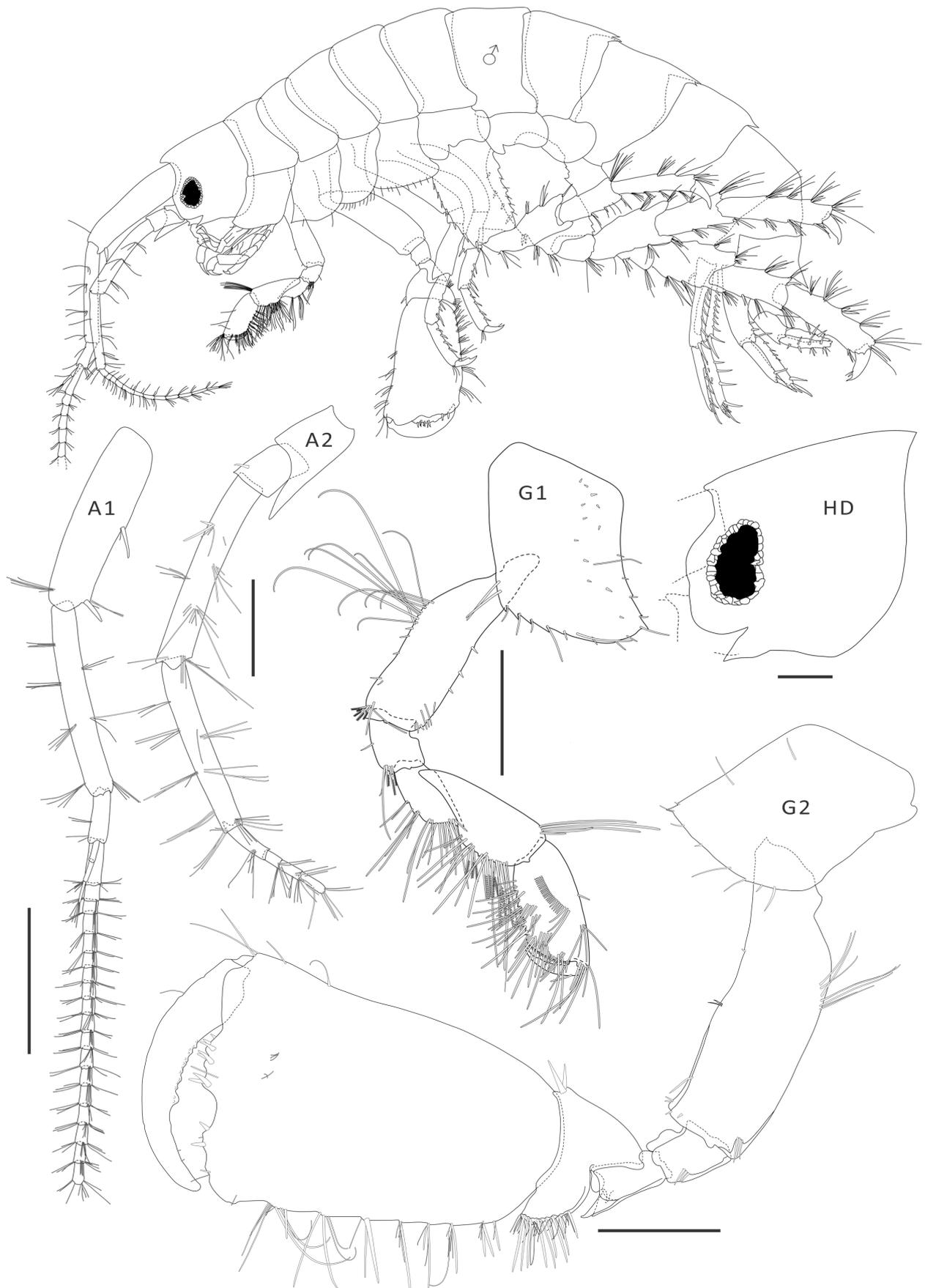


Figure 3. *Pareiasmopus setiger* Chevreux, 1901, male, (UKMMZ-1527), 10.3 mm. Pulau Hantu, Singapore. Scale for **A1** = 0.01 mm; **A2** = 0.005 mm; **HD** = 0.5 mm; **G1** = 0.05 mm; **G2** = 0.005 mm.

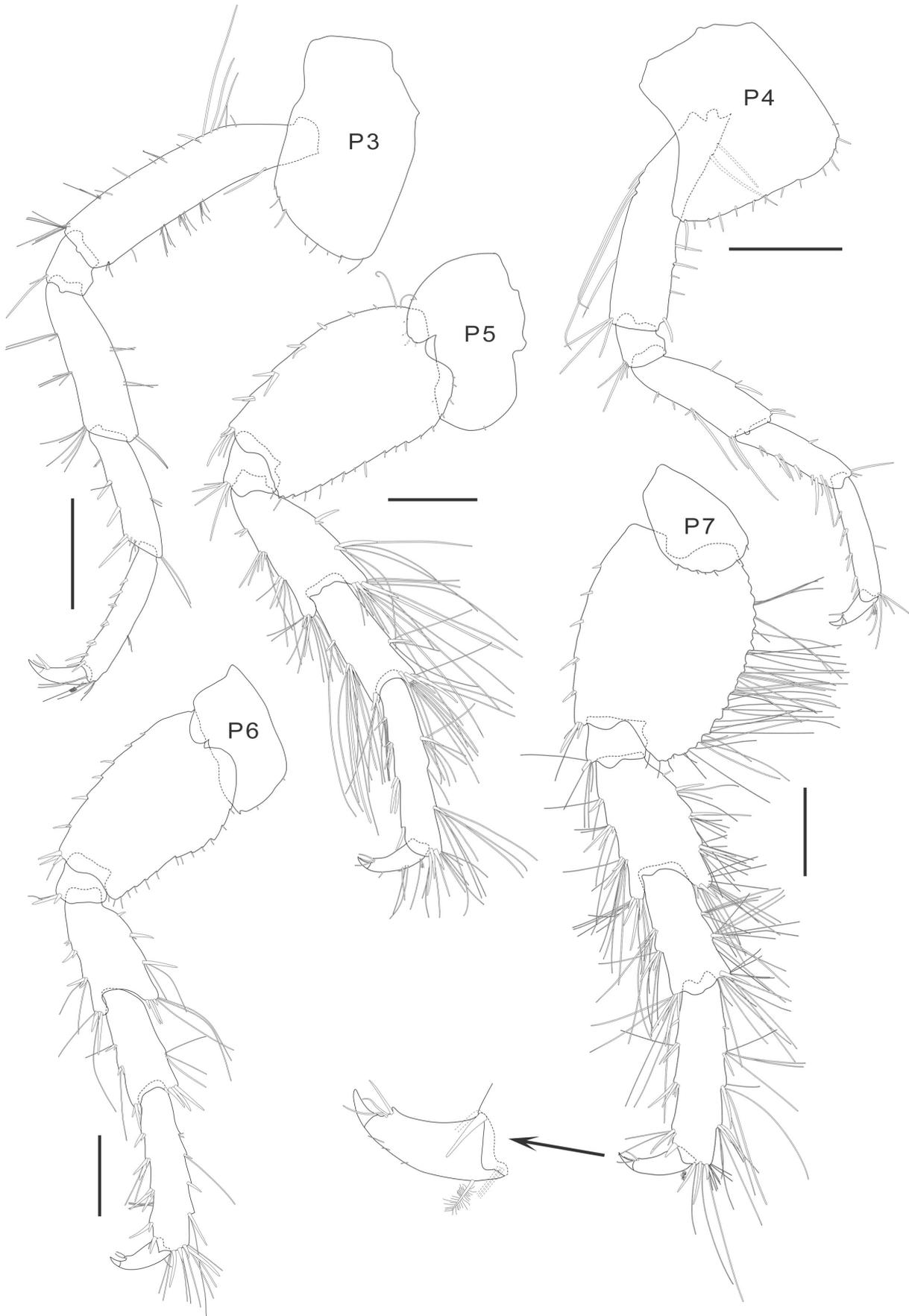


Figure 4. *Parelasmopus setiger* Chevreux, 1901, male, (UKMMZ-1527), 10.3 mm. Pulau Hantu, Singapore. Scale for **P3** = 0.005 mm; **P4** = 0.5 mm; **P5** = 0.5 mm; **P6** = 0.5 mm; **P7** = 0.005 mm.

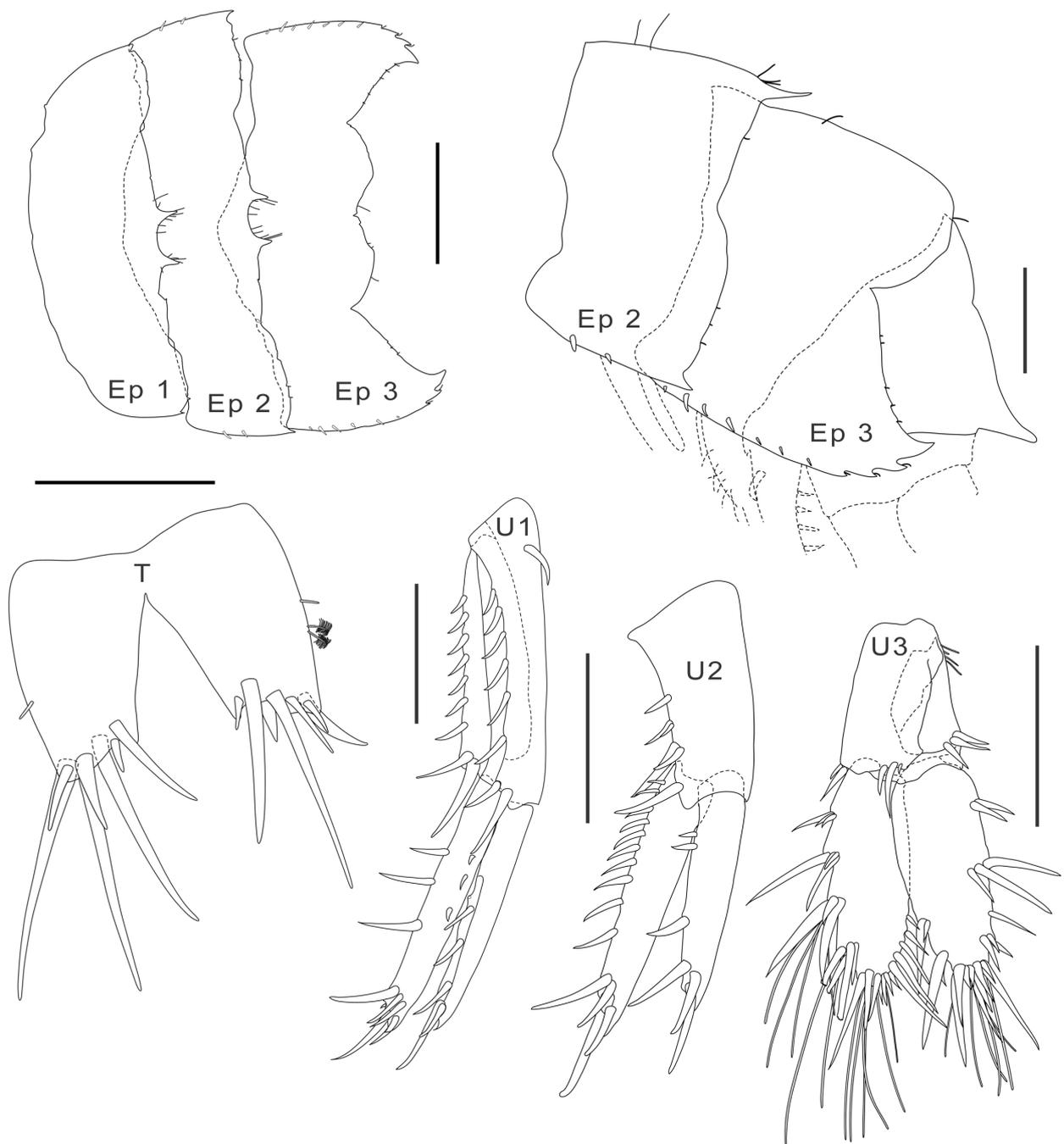


Figure 5. *Parelasmpopus setiger* Chevreux, 1901, male, (UKMMZ-1527), 10.3 mm. Pulau Hantu, Singapore. Scale for EP = 1 mm; U1 = 0.5 mm; U2 = 0.5 mm; U3 = 0.5 mm; T = 0.025 mm.

and 2 fine setae; article 2 with several fine setae along both margins; flagellum articles broader than long, with 18+ articles (broken); accessory flagellum minute, with 3 plus one rudimentary article. *Antenna 2* peduncular article 2 cone gland reaching beyond peduncular article 3; article 4 longer than article 5; flagellum with 11 articles. *Upper lip* semicircular, pubescent. *Lower lip* outer lobes with two pairs of ducts, mandibular lobes apically subacute. *Maxilla 1* inner plate subtriangular, with 2 apical plumose setae; outer plate armed with 6 serrate robust setae, facial side with row of 5 serrate robust setae; palp biarticulate, article 1 shorter than article 2, article 2 with

6 thick setae terminally. *Maxilla 2* outer plate slightly broader than inner plate; inner plate armed with 13 mostly long setae from distal end to inner half margin; outer plate with 10 setae only on apex. *Mandible* (left), incisor armed with 4 teeth; lacinia mobilis serrate apically; accessory setal row well developed and composed of 4 setae and 1 broad plate; molar process well developed, tritritative, provided with 2 plumose setae and 1 stout seta; mandibular condyle well developed; palp triarticulate, article 1 distally swollen, article 2 short almost 2.5 times as long as article 3, article 3 and apically provided with 1 couple of long setae.

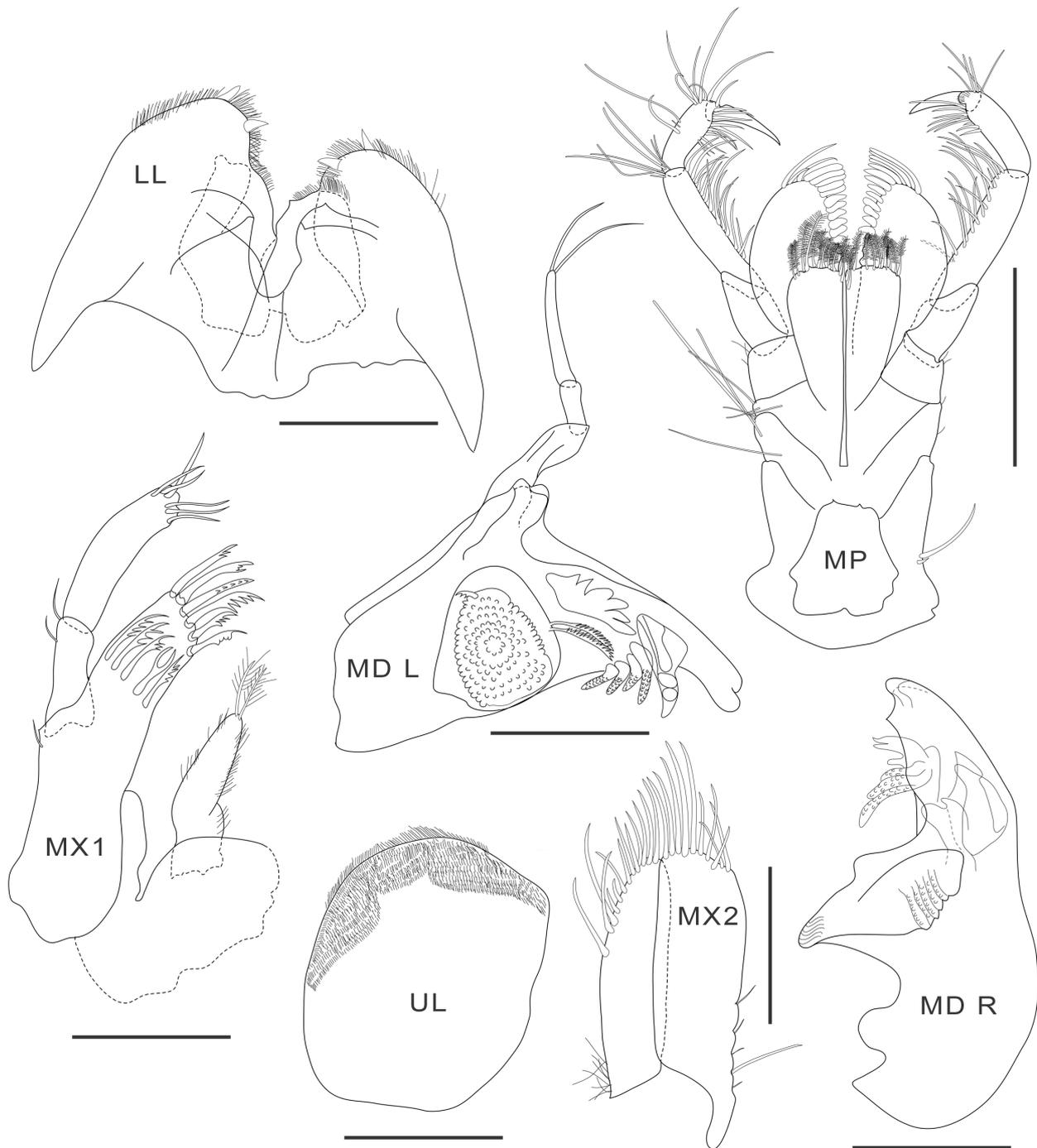


Figure 6. *Parelasmopus setiger* Chevreux, 1901, male, (UKMMZ-1527), 10.3 mm. Pulau Hantu, Singapore. Scale for UL, LL, MX1, MX2, MD(R), MD(L), = 0.25 mm; MP = 0.5 mm.

Pereon. *Gnathopod 1* smaller than gnathopod 2; coxa 1 anterior margin concave, produced forward anteroventrally, posteroventral corner notched; basis anterior margin straight with 3 short robust setae along the margin, posterodistally provided with several plumose setae, posterior margin with several long setae on mid length; ischium subcylindrical, about 33% as long as basis, posterodistally provided by 3 plumose and 2 medium length setae; merus slightly longer than ischium with a row of short and long setae on distal half; carpus as long

as propodus, anterodistally with 3 long and 2 short setae, medial surface with rows of pectinate setae; propodus medial surface with comb, palm convex defined by 1 pronounced spine, marginally provided with about 7 bifid small spines and many minute setae; dactylus falcate, overlapping palm.

Gnathopod 2 coxa 2 subquadrate, posteroventral corner notched; basis slender with slight excavation along anterior margin, anterodistal corner subquadrate, posterior margin with medium length setae on mid length;

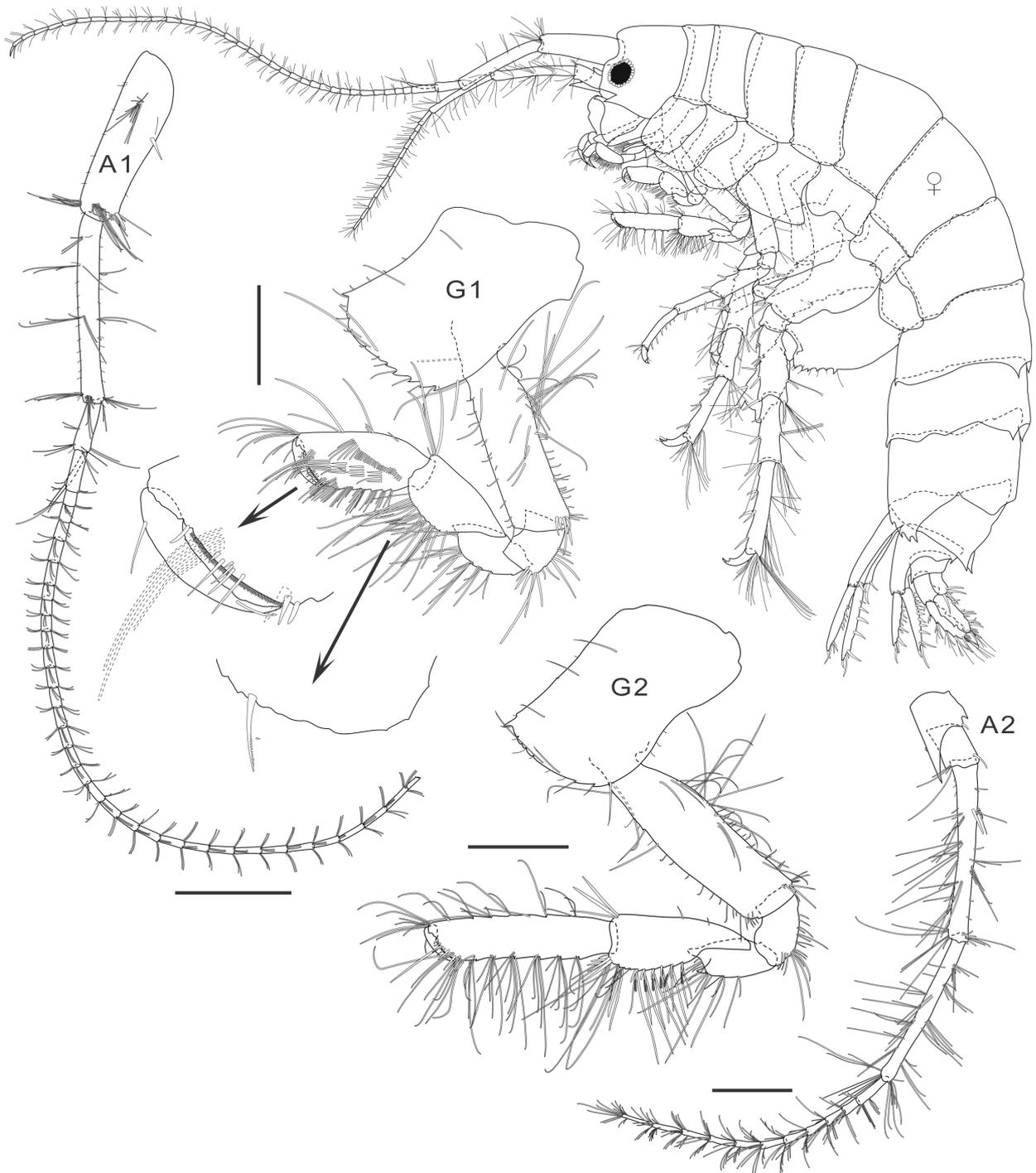


Figure 7. *Pareiasmopus setiger* Chevreux, 1901, female, (UKMMZ-1528), 9.8 mm. Pulau Hantu, Singapore. Scale for **A1** = 1 mm; **A2, G1, G2** = 0.5 mm.

merus acutely produced distoventrally; carpus compressed, subtriangular, posterior expansion densely setaceous in rows, anterodistally with 2 stout setae; propodus expanded and subrectangular, posterior margin with thick setae, palm transverse, defined by 9 robust setae along the palmar margin, deeply concave medially; dactylus falcate, with crenulated posteroproximal shelf.

Pereopods 3–4 *coxa 3* produced forward on ventral half part of anterior margin. *coxa 4* broader than deep,

posteroventral lobe well developed, with subrectangular posteromedial corner. *Pereopods 3–4* similar except for pereopod 3 shorter; carpus posterodistally provided with 2 or more prominent robust setae; propodus posteriorly provided with row of short robust setae. *Pereopods 5–7* *coxae* concave, both anterodistally and posterodistally, basis slightly expanded, posterior margin crenulate, without long slender setae, except for pereopod 7; merus and carpus not broadened; carpus and propodus with,

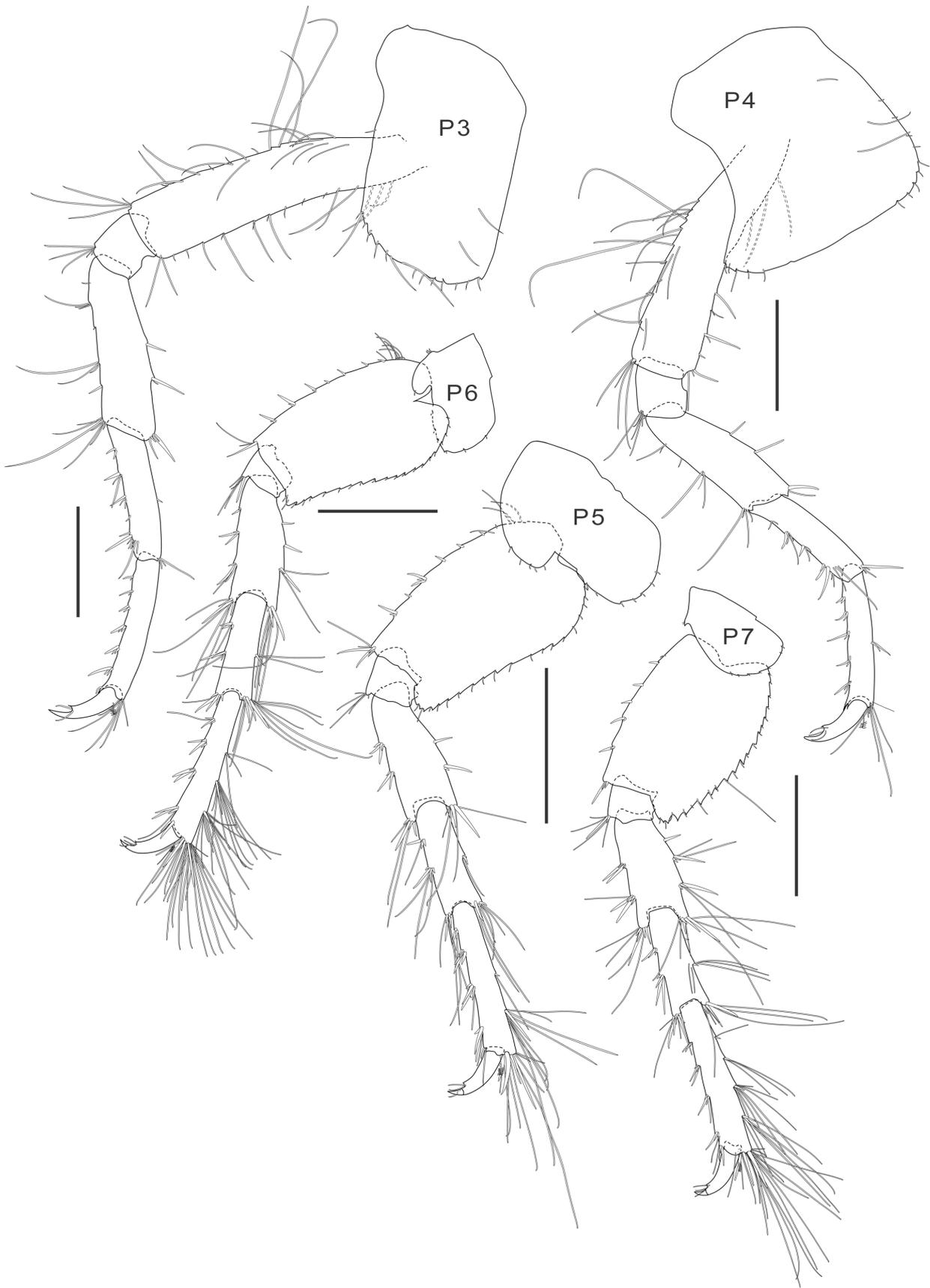


Figure 8. *Parelasmopus setiger* Chevreux, 1901, female, (UKMMZ-1528), 9.8 mm. Pulau Hantu, Singapore. Scale for **P3**, **P4** = 0.5 mm; **P5**, **P6**, **P7** = 1 mm.

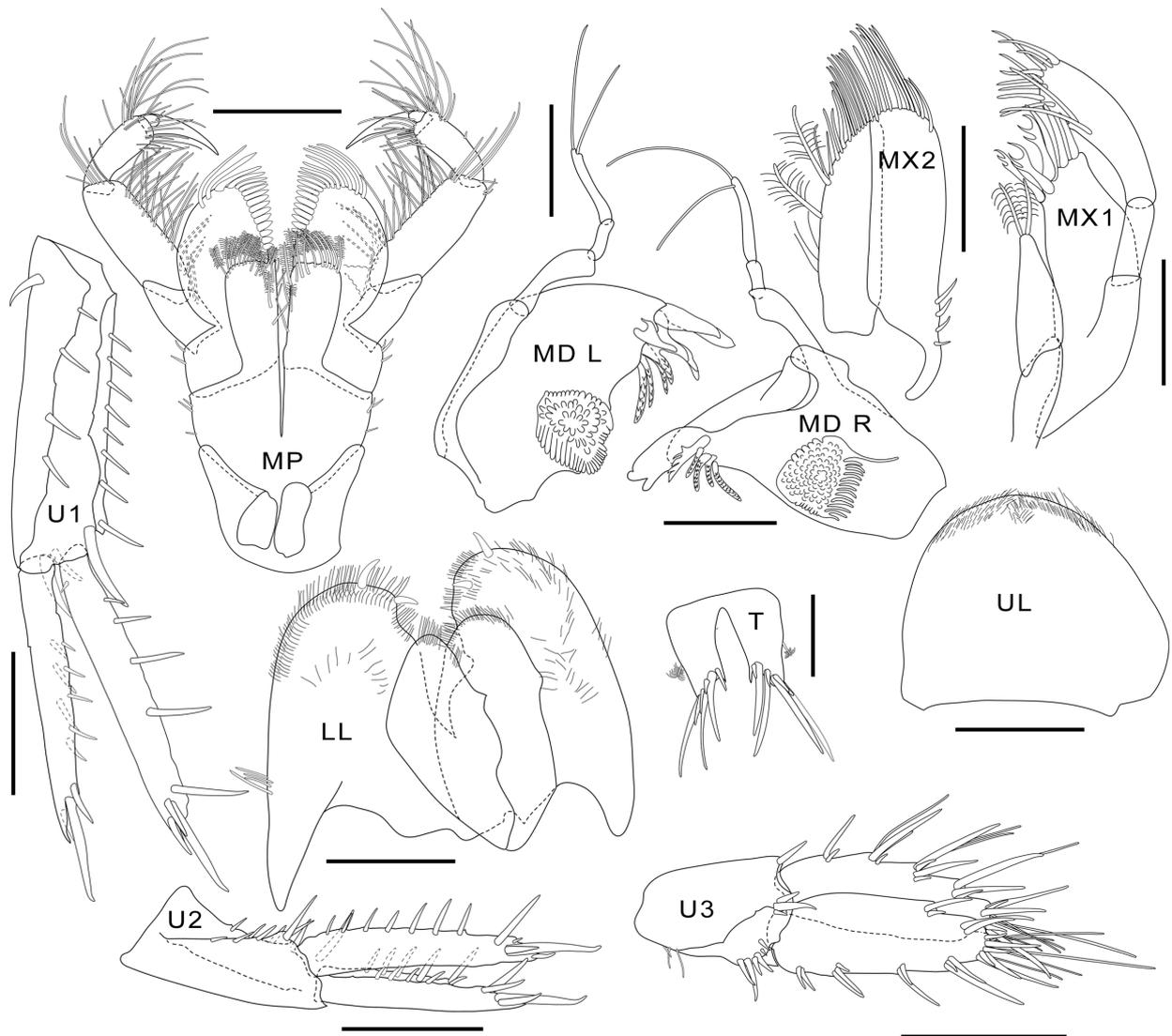


Figure 9. *Pareiasmopus setiger* Chevreux, 1901, female, (UKMMZ-1528), 9.8 mm. Pulau Hantu, Singapore. Scale for UL, LL, MX1, MX2, MD(R), MD(L), MP, T = 0.25 mm; U1, U2, U3 = 0.5 mm.

slender setae along posterior margin; propodus not expanded posterodistally; dactylar ungues simple.

Urosome. *Urosomite 1–3* dorsally bicarinate. *Epimeron 1–3* posteroventral corner with small acute spine. *Epimeron 3* ventral margin serrate distally, posteroventral margin serrate below posteroventral corner, posteroventral corner with strongly produced acute spine. *Uropod 1* extending beyond peduncle of uropod 3; peduncle longer than rami, outer-ventrodistally provided with 1 robust seta, upper margin with 8 inner and 9 outer robust setae; rami subequal, truncate, apically provided with 1 pronounced and 2 robust setae, outer ramus with 3 outer robust setae, inner ramus with 4 outer small setae and 3 inner median robust setae. *Uropod 2* not extending beyond peduncle of uropod 3; peduncle shorter than rami, upper-marginally provided with 5 median robust setae, 1 inner-distal robust seta; rami subequal, truncate, outer ramus provided with 4 median robust setae, 1 distal robust seta and 1 apical robust seta, inner ramus provided

with 10 inner median and 3 inner distal robust seta, and 1 apical robust setae. *Uropod 3* peduncle 33% as long as outer ramus, provided with 2 outer, 3 inner and 2 distal robust setae; rami foliaceous, both rami distally truncated to subacute, with long and short apical robust setae. *Telson* broader than long, small, 5/6 cleft, each lobe with slight ridges on central line, with 7 distal robust setae.

Female (dimorphic characters). Based on female, 9.8 mm, UKMMZ-1528.

Gnathopod 2 carpus relatively long about, 1.5 times as long as wide, slightly lobate; propodus linear, almost five times as long as broad, without distomedial shelf; dactylus apically subacute.

Remarks. Chevreux (1901) described *Pareiasmopus setiger* from Port of Victoria, Mahé, Seychelles. His description was based on a male of 7 mm body length, with figures of a lateral view, mandible, maxilliped, accessory flagellum of antenna 1, gnathopods 1 and 2, uropod 3

and telson. In Barnard (1972), he recorded the occurrence of *P. setiger* from the Philippine Islands and discussed the possible occurrence of *P. setiger* that include tropical Australia, Indonesia and the northern Indian Ocean. He also pointed out the difficulty in working with the Indo-Pacific *Pareiasmopus*, due to growth stage and historic identification being mixed. Barnard identifies *P. albidus*, *P. setiger*, *P. suluensis* and *P. suensis* in particular as requiring revision before further progress can be made. Hughes (2011) identification of *P. cf. suensis* restates this problem (p77).

Both Chevreux's (1901) and Barnard's (1972) figures of the species are similar to ours, antenna 1 peduncle with 2 setae, male gnathopod 2 propodus palm transverse with posteroproximal elevation with 6 robust setae, pereopods 5 to 7 posterior margins with long slender setae and the dorsal carina pattern for pereonite 7 and pleonites 1 to 3. Thus, our male specimen agrees well with the original description of Chevreux (1901), except for a few minor differences, such as the serrated robust setae on the inner surface of the outer plate of maxilla 1. However, this could possibly be the next developing stage of the new growth (internal growth of next instar) of a maxilla 1. Additionally, our female specimens are observed without paired dorsal carina in pereonite 7.

The recently described *P. siamensis* Wongkamhaeng et al. (2013) has close resemblance to our specimens. As both *P. siamensis* and our specimen is considered to be in their terminal adult stage, they share the same form of the gnathopod 2 palmar margin with posteroproximal elevation with 6–7 robust setae, the midposterior toothed dactylus and the serration on coxa 1–3. Therefore *P. siamensis* Wongkamhaeng et al (2013) is here synonymized with *Pareiasmopus setiger* Chevreux (1901). Until now the species was recorded from Seychelles, Philippine Islands, Sulu Sea, Indonesia, Australia, north Indian Ocean, Gulf of Thailand and Singapore. The present records confirm this distribution.

The present comparison suggests that further taxonomic studies on this species group are necessary. Detailed drawings and descriptions provided in this study could aid in eliminating further confusion within the *P. setiger* complex, including and thus establish its definitive characteristics.

Distribution. Seychelles, Philippine Islands, Sulu Sea, Indonesia, Gulf of Thailand, Australia, north Indian Ocean and Singapore (current study).

Acknowledgments

We gratefully acknowledge the generous assistance of Dr. Tan Koh Siang (Head of Marine Biology and Ecology Lab) during the first author visit to the Tropical Marine Science Institute (TMSI), Singapore. Thanks are also due to Dr. Sin Tsai Min (Head of Ecological Monitoring, In-

formatics and Dynamics Lab; Senior Research Fellow for the Coastal Marine Cluster) for her continuous support and encouragement. ABAR was partially supported by the Universiti Kebangsaan Malaysia research grant (AP-2013-005 and FRGS/1/2014/STWN10/UKM/02/6) for his short visit to the TMSI.

Reference

- Barnard JL (1972) Gammaridean Amphipoda of Australia. Part 1. Smithsonian Contributions to Zoology 103: 1–333.
- Chevreux E (1901) Crustacés Amphipodes. In: Mission scientifique de M. Ch. Alluaud aux Iles Séchelles (Mars, Avril, Mai 1892). Mémoires de la Société zoologique de France 14: 388–438.
- Coleman CO (2003) “Digital inking”: How to make perfect line drawings on computers. *Organisms, Diversity and Evolution* 3(14): 1–14. doi: 10.1078/1439-6092-00081
- Dana JD (1852) On the classification of the Crustacea Choristopoda or Tetracapoda. *American Journal of Science and Arts, Series 2*, 14: 297–316.
- Dana JD (1853) Crustacea. Part IS. United States Exploring Expedition 14: 689–1618.
- Haswell WA (1879) On some additional new genera and species of amphipodous crustaceans. *Proceedings of the Linnean Society of New South Wales* 4: 319–350.
- Hughes LE (2011) New species of *Hoho*, *Mallacoota* and *Pareiasmopus* (Maeridae: Amphipoda) from Australian waters. *Zootaxa* 2955: 1–79.
- Krapp-Schickel T (2008) What has happened with the *Maera*-clade (Crustacea, Amphipoda) during the last decades? *Bollettino del Museo Civico di Storia Naturale di Verona, Botanica Zoologia* 32: 3–32.
- Ledoyer M (1983) Crustacés amphipodes gammariens. Familles des Acanthonotozomatidae à Gammaridae. *Faune de Madagascar* 59(1): 1–598.
- Ledoyer M (1984) Les gammariens (Crustacea, Amphipoda) des herbiers de phanérogames marines de Nouvelle Calédonie (région de Nouméa). *Mémoires du Muséum National d'Histoire Naturelle, Series A, Zoology* 129: 1–113.
- Lowry JK, Hughes LE (2009) Maeridae, the *Elasmopus* group. In: Lowry JK, Myers AA (Eds) *Amphipoda of the Great Barrier Reef, Australia*. *Zootaxa* 2260: 643–702.
- Lowry JK, Myers AA (2013) A Phylogeny and Classification of the Senticaudata subord. nov. (Crustacea: Amphipoda). *Zootaxa* 3610(1): 1–80. doi: 10.11646/zootaxa.3610.1.1
- Lowry JK, Springthorpe RT (2005) New and little-known melitid amphipods from Australian waters (Crustacea: Amphipoda: Melitidae). *Records of the Australian Museum* 57: 237–302. doi: 10.3853/j.0067-1975.57.2005.1463
- Mayer P (1903) Die Caprelliden der Siboga-Expedition. *Siboga-Expedition, Monographie* 34: 1–160.
- Ortiz M, Lalana R (1997) Amphipoda. In: Gutu M (Ed.) *Results of the Zoological Expedition Organized by “Grigore Antipa” Museum in the Indonesian Archipelago (1991)*. 1. Peracarida (Crustacea). *Travaux du Muséum National d'Histoire Naturelle “Grigore Antipa”*, 29–113.
- Stebbing TRR (1887) On some new exotic Amphipoda from Singapore and New Zealand. *Transactions of the Royal Society of London* 12(6): 199–209, pls 38–39. doi: 10.1111/j.1096-3642.1887.tb00013.x

-
- Stebbing TRR (1888) Report on the Amphipoda collected by H.M.S. Challenger during the years 1873–1876. Report on the Scientific Results of the Voyage of H.M.S. Challenger during the years 1873–76. Zoology 29: 1–1737.
- Tattersall WM (1922) Amphipoda and Isopoda. The Percy Sladen Trust Expeditions to the Abrolhos Islands (Indian Ocean). Journal of the Linnean Society of London, Zoology 35: 1–19. doi: 10.1111/j.1096-3642.1922.tb01493.x
- Watling L (1989) A classification system for crustacean setae based on the homology concept. In: Felgenhauer BE, Watling L, Thistle AB (Eds) Functional Morphology of Feeding and Grooming in Crustacea. Crustacean Issue 6, Balkema, Rotterdam, 15–27.
- Wongkamhaeng K, Coleman CO, Pholpunthin P (2013) Three new species from the Aoridae and Maeridae (Crustacea, Amphipoda) from Thai waters. Zootaxa 3693: 503–533. doi: 10.11646/zootaxa.3693.4.6
-