

A new species of *Pereionotus* (Amphipoda, Senticaudata, Phliantidae) from Pulau Tinggi, Sultan Iskandar Marine Park, Malaysia

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<http://zoobank.org/D2C2A527-A64F-479B-9F74-BD1BE2E42CF3>

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Academic editor: K. von Rintelen ♦ Received 3 February 2020 ♦ Accepted 20 March 2020 ♦ Published 15 May 2020

Abstract

A new species of *Pereionotus* Spence Bate & Westwood, 1861 from Pulau Tinggi, Sultan Iskandar Marine Park (SIMP) is described and the first record of the genus from Malaysia. It was collected from Kg. Tg. Balang, Pulau Tinggi, Johor, Malaysia (2°16'59.5"N, 104°07'21.9"E) and can be distinguished by having wide and dorsally truncate carinae of pereonites 2–7, maxillipedal palp as long as the outer plate, lacking additional robust seta in the middle of propodi of pereopods 1–4, and the absence of short robust setae on the anterodistal corner of merus and carpus of pereopods 6–7. An updated identification key for the 11 known species in the genus is also presented.

Key Words

Johor, Malaysia, new species, *Pereionotus tinggiensis* sp. nov., Phliantidae, Pulau Tinggi, Sultan Iskandar Marine Park, taxonomy

Introduction

Phliantid amphipods resemble isopods due to their dorsoventral depression body feature (Coleman 2009b). In addition, it has a dorsal keel with humps and laterally splayed coxal plates of pereopods 1–4 (Coleman 2009b). Phliantidae Stebbing, 1899 is composed of seven different genera, namely: i) *Gabophlias* J.L. Barnard, 1972, ii) *Iphinotus* Stebbing, 1899, iii) *Iphiplateia* Stebbing, 1899, iv) *Pariphinotus* Kunkel, 1910, v) *Pereionotus* Spence Bate & Westwood, 1861, vi) *Phlias* Guérin, 1836, and vii) *Quasimodia* J. L. Barnard, 1969. According to Lowry (2003), this family is common in the Southern Hemisphere, as intertidal algal-dwelling amphipods. Currently, the genus *Pereionotus* is composed of 10 species and they

are widely distributed and most diverse in the western Pacific Ocean (Coleman and Lowry 2012).

Sultan Iskandar Marine Park (SIMP), or formerly known as the East Johor Island Archipelago (EJIA), is situated off the east coast of Johor, Malaysia, in the South China Sea. The park comprises 13 small islands off Mersing, Johor, namely Pulau Harimau, Pulau Mensirip, Pulau Goal, Pulau Tengah, Pulau Hujung, Pulau Rawa, Pulau Sibul, Pulau Tinggi, Pulau Mentinggi, Pulau Sibul Hujung, Pulau Pemanggil, Pulau Besar, and Pulau Aur. Pulau Tinggi is about 30 km southeast of Mersing and has an area of about 16 km². Ongoing faunistic investigations of the SIMP, especially at Pulau Tinggi, have yielded over 10 new crustacean taxa, belonging to Mysida, Amphipoda, and Isopoda (e.g., Azman and Melvin 2011; Azman and

Othman 2013; Chew et al. 2014, 2016; Gan et al. 2010; Lim et al. 2010, 2019, 2012, 2015, 2017; Othman and Azman 2007; Tan and Azman 2017, 2018; Tan et al. 2014, 2015). The present study is the first to report the occurrence of phliantid amphipods in the Malaysian waters. In this paper, one new species from Pulau Tinggi is described.

Methods

The materials collected contain only female specimens (three individuals), collected in the rocky intertidal zone of Kg. Tg. Balang, Pulau Tinggi, Johor, (Fig. 1) on the east coast of Peninsular Malaysia. At the laboratory, the materials were preserved in 4% formalin in seawater in vials and later selected for dissection. Whole bodies and dissected appendages were mounted in glycerol on glass slides for illustration. Pencil drawings were made under a compound microscope Olympus BX43 fitted with a camera lucida. Then, line drawings were made following the guidelines described by Coleman (2003, 2009a). The materials are deposited in the Muzium Zoologi, Universiti Kebangsaan Malaysia (UKMMZ). The following abbreviations are used: A, antenna; LL, lower lip; MD, mandible; MX, maxilla; MXP, maxilliped; P, pereopod; PL, pleopod; T, telson; U, uropod; ♀, female.

Results and discussion

Family Phliantidae Stebbing, 1899

Genus *Pereionotus* Spence Bate & Westwood, 1863

Diagnosis (based on Coleman and Lowry 2012). *Pereon* depressed, coxal plates 1–4 somewhat splayed. Urosome flexed under pleon. *Head* flat with short rostrum. *Maxilla 1* with scale-like inconspicuous palp. *Maxilla 2* with basally fused plates. *Maxillipedal* palp 3–articulate. *Pereopods* simple. Basis of pereopods 5 and 6 wide, rounded, and ventrally expanded; basis of pereopod 7 without ventral lobe and narrower. Inner ramus of *pleopod 3* slightly shortened. *Uropod 2* uniramous in female, biramous in male. *Uropod 3* without rami.

Pereionotus tinggiensis sp. nov.

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Figures 2–5

Type material. Holotype, female, 2 mm, UKM-MZ-1603, Kg. Tg. Balang, Pulau Tinggi, Johor, Malaysia, 2°16'59.5"N, 104°07'21.9"E (DMS), intertidal zone, by washing intertidal rock, Hazmi, Melvin & Azman, 31

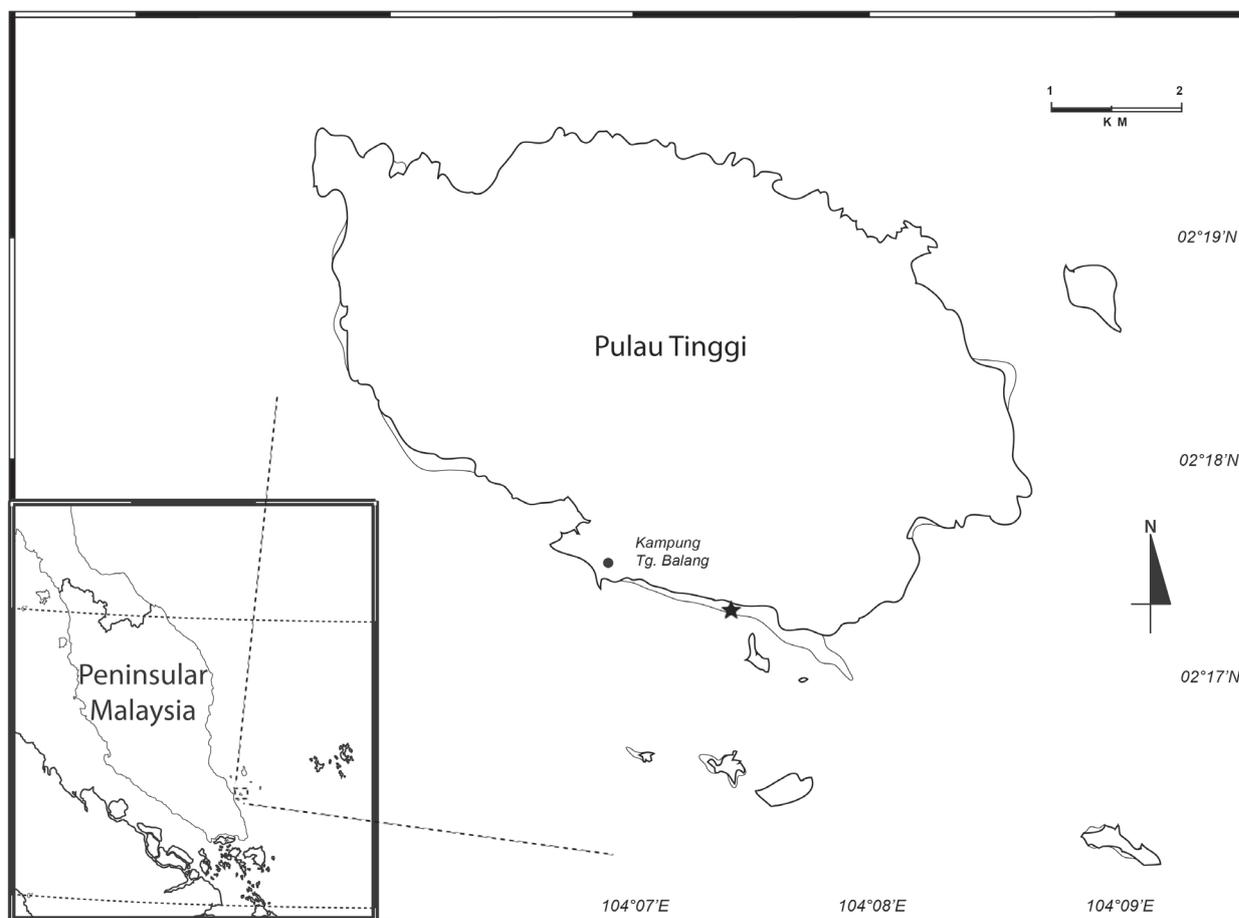


Figure 1. Map of Pulau Tinggi, Johor, Sultan Iskandar Marine Park (SIMP), Malaysia.

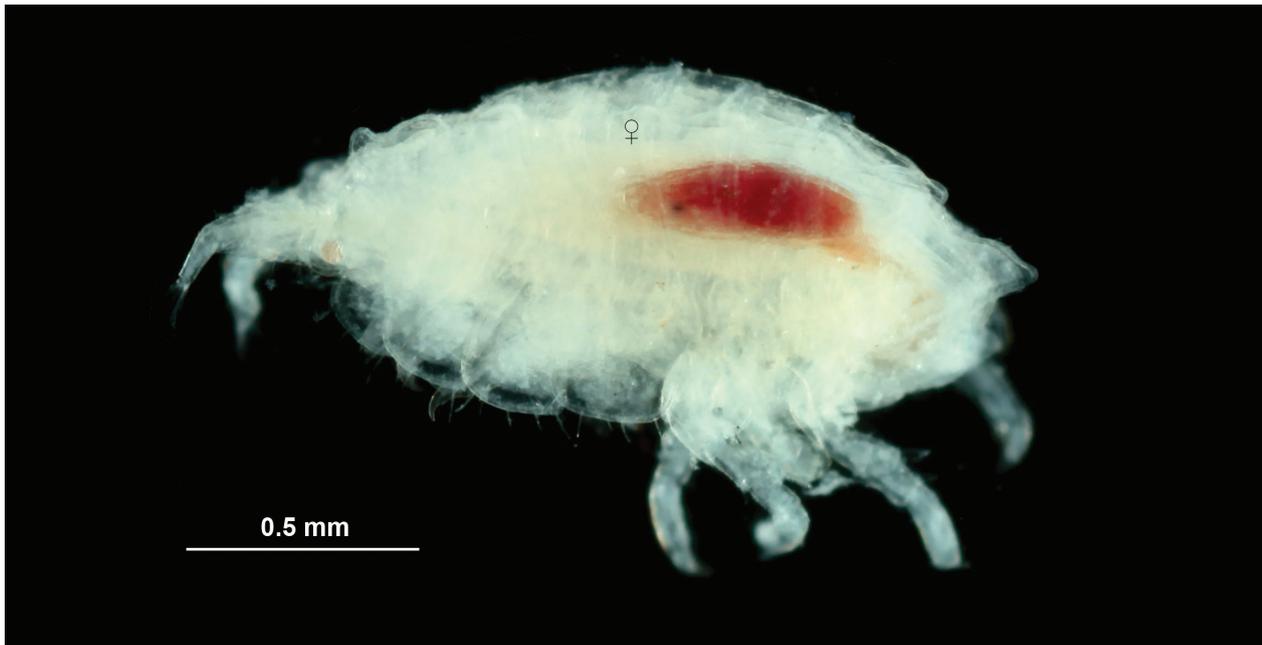


Figure 2. *Pereionotus tinggiensis* sp. nov., holotype female, UKMMZ-1603.

August 2016. Paratypes, 3 specimens (2 females, 1 juvenile), UKMMZ-1604, same data as for holotype.

Species composition. *Pereionotus* contains 11 species: *P. alaniphlias* (J. L. Barnard 1970); *P. dieteri* Coleman & Lowry, 2012; *P. hartmuti* Coleman & Lowry, 2012; *P. hirayamai* Coleman & Lowry, 2012; *P. holmesii* (Gurjanova, 1938); *P. japonicus* (Tzvetkova, 1968); *P. natalensis* (K. H. Barnard, 1940); *P. testudo* (Montagu, 1808); *P. thomsoni* (Stebbing, 1899); *P. tinggiensis* sp. nov.; *P. yongensis* Coleman & Lowry, 2012.

Diagnosis. Dorsal keel consisting of subequal evenly rising dorsal humps on pereonites 2–7. *Antenna 1* robust with subterminal lateral lobe. *Coxae 1–4* with sparse long setae on the distal margin. Propodi of *pereopods 6 and 7* without additional robust setae on the anterodistal corner of merus and carpus.

Description. Based on holotype female, 2 mm. *Body* (Fig. 2) depressed, laterally not much expanded, coxae not much splayed. With shallow dorsal keel, each carina on *pereonites 2–7* is wide and dorsally truncate. *Head* small, shorter than pereonite 1, with protruding eyes.

Antenna 1 (Fig. 3, A1) peduncular article 1 robust with subterminal lateral lobe, almost twice as wide as article 2; peduncular article 2 longer than wide; peduncular article 3 half the width of article 2; flagellum of only one article with long aesthetascs apically. *Antenna 2* (Fig. 3, A2) slender, almost reaching distal margin of article 2 of antenna 1; peduncular article 2 is as long as wide; peduncular article 3 is slightly longer than article 4; peduncular article 4 twice as long as article 5; peduncular article 5 with long flagellum apically.

Upper lip missing. *Lower lip* (Fig. 5, LL) apical margin with short mandibular lobes. *Mandible* (Fig. 5, MD) dentate incisors with four raker spines. *Maxilla 1* (Fig. 5, MX1) outer lobe with six robust setae of differing size; inner lobe with 1 robust seta. *Maxilliped* (Fig. 5, MXP) inner plate subrectangular, apically truncate with four nodular setae and few stout and slender setae; outer plate as long as palp; palp 3-articulate. *Maxilla 2* (Fig. 5, MX2) plates separate apically; inner plate wider than outer plate with three robust setae apically; outer plate with three robust setae apically.

Coxae 1–4 with sparse setae on the distal margin.

Pereopod 1 (Fig. 3, P1) coxa subrectangular; basis slightly expanded posterodistally, one medial seta on the anterior margin, one apical seta each on the posterior and anterior margin; ischium longer than merus, setae as for basis; merus distally oblique, about the length of carpus, three setae on the posterior margin; carpus expanded anterodistally, one medial seta on the posterior margin, one apical seta each on the posterior and anterior margin; propodus longer than wide, almost as long as merus and carpus combined, medial face with row of stout apically setulose setae, one medial seta on the posterior margin, two apical setae each on the posterior and anterior margin, one apical robust seta on the posterior margin; dactylus falcate, with long unguis. *Pereopod 2* (Fig. 3, P2) coxa wider than that of pereopod 1; basis slightly expanded posterodistally, one medial seta on the anterior margin, one apical seta each on the posterior and anterior margin; mid diameter of ischium is more than half the width of distal basis, one medial seta on the anterior margin, one apical seta each on the posterior and anterior margin; merus distally oblique, three setae on the posterior margin; carpus expanded anterodistally, posterior

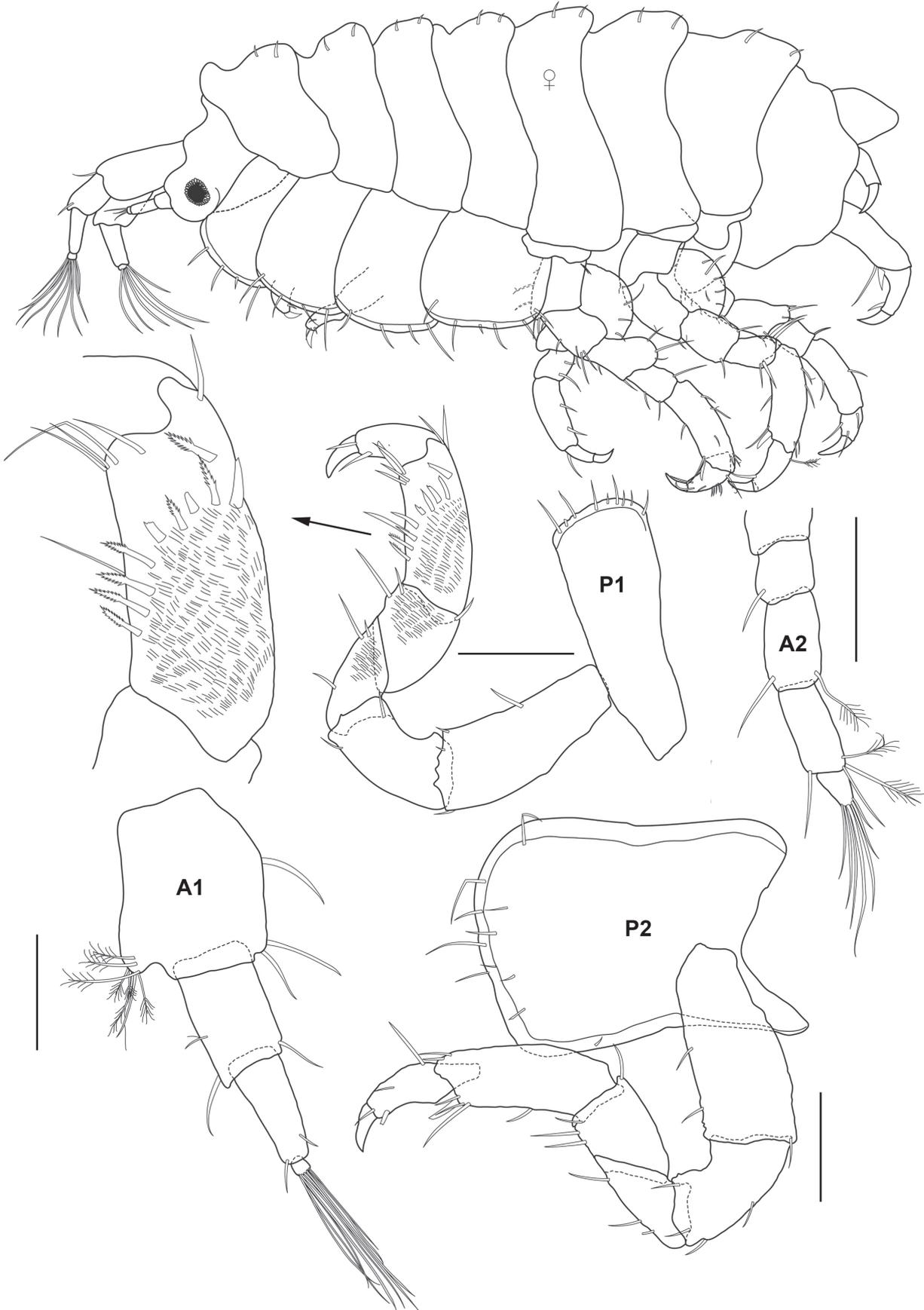


Figure 3. *Pereionotus tinggiensis* sp. nov., holotype female, UKMMZ-1603, 2 mm. Scale bars: 0.1 mm.

margin straight with two setae, one apical seta each on the posterior and anterior margin; propodus similar in shape as pereopod 1, without row of robust setae on medial face, one medial seta on the posterior margin, two apical setae each on the posterior and anterior margin, one apical robust seta on the posterior margin; dactylus falcate, with long unguis. *Pereopod 3* (Fig. 4, P3) coxa similar in shape as pereopod 2; basis slightly expanded posterodistally; ischium expanded postero- and anterodistally with one seta on the posterior margin; merus with straight posterior margin and convex anterior margin, distal margin oblique, two medial and one apical seta on the posterior margin, one apical seta on the anterior margin; carpus expanded anterodistally with straight posterior margin, one apical seta on the anterior margin, posterior margin with three medial setae; propodus longer than wide, one medial seta on the posterior and anterior margin, one apical robust seta on the posterior margin, three apical setae on the anterior margin; dactylus subequal to that of pereopod 2. *Pereopod 4* (Fig. 4, P4) coxa widest with posteromarginal subacute lobe; basis expanded posterodistally, straight anterior margin with two medial setae; mid diameter of ischium is $0.8\times$ the width of distal basis, one apical seta each on the posterior and anterior margin; merus with straight posterior margin and convex anterior margin, distal margin oblique, two medial setae on the posterior margin, one apical seta each on the posterior and anterior margin; carpus expanded anterodistally with one apical seta, two medial seta on the posterior margin; propodus longer than wide, almost as long as merus and carpus combined, two medial, two apical, and one apical robust seta on the posterior margin, one medial and two apical setae on the anterior margin; dactylus subequal to that of pereopod 3. *Pereopod 5* (Fig. 4, P5) basis posteromarginally weakly convex with rounded posterior lobe, expanded ventrally and partly covering the ischium, three medial and two apical setae on the posterior margin; ischium almost as long as wide, two medial and four apical setae on the anterior margin; merus drawn out into slightly rounded posterodistal lobe with three apical setae, one medial and one apical seta on the anterior margin; carpus almost as long as merus, slightly expanded posterodistally with one apical, one medial, and one apical seta on the anterior margin; propodus subequal to the shape of pereopod 4, longer than wide with $2\times$ the width, two medial and three apical setae on the posterior margin, one medial, two apical, and one apical robust seta on the anterior margin; dactylus falcate, slightly longer compared to that of pereopod 4, with long unguis, six medial setae on the posterior margin and one apical seta on the anterior margin. *Pereopod 6* (Fig. 4, P6) basis with straight anterior margin, posteromarginally weakly convex with rounded posterior lobe, expanded ventrally and partly covering the ischium and merus, distal margin oblique, two medial and apical setae on the anterior margin; ischium subrectangular with two medial and apical setae on the anterior margin; merus expanded posterodistally

with one medial and three apical setae; carpus longer than wide as the distal merus, two medial setae on the anterior margin, one apical seta on the posterior margin; propodus longer than wide, $3\times$ the width, one medial and two apical setae each on the posterior and anterior margin, one apical robust seta on the anterior margin; dactylus is as the same as pereopod 5, one medial seta on the posterior margin and one apical seta on the anterior margin. *Pereopod 7* (Fig. 4, P7) basis posteromarginally weakly convex without rounded posterior lobe with one apical seta on the anterior margin; ischium slightly expanded posterodistally, longer than wide, with one apical seta on the anterior margin; merus expanded posterodistally with one apical seta, one apical seta on the anterior margin; carpus almost as long as merus, longer than wide, with one apical seta on the posterior margin, two apical setae on the anterior margin; propodus as long as that of pereopod 5, longer than wide, two medial and apical setae on the posterior margin, one medial and apical seta, and one apical robust seta on the anterior margin; dactylus falcate, with long unguis, as long as pereopod 5 with one apical seta on the anterior margin.

Pleopod 1 (Fig. 5, PL1) with subrectangular peduncle, $0.6\times$ as long as wide, with two coupling hooks; outer ramus slightly longer than inner ramus. *Pleopod 2* (Fig. 5, PL2) peduncle wider than long, with two coupling hooks; rami widened proximally and subequal in length. *Pleopod 3* (Fig. 5, PL3) peduncle wider than long with a tapering medial process ending in an apex with two coupling hooks; outer ramus slightly shortened. *Uropod 1* (Fig. 5, U1) biramous, peduncle as long as outer ramus, slightly expanded anterodistally; outer ramus slightly shorter than inner, with some small setae on the tip. *Uropod 2* (Fig. 5, U2) uniramous, peduncle slightly shorter and wider than rami; both rami subequal, with an apical nodular seta on the tip. *Uropod 3* (Fig. 5, U3) without rami, hidden under telson. *Telson* triangular and slightly longer than wide (Fig. 5, T).

Remarks. *Pereionotus tinggiensis* sp. nov. shares the diagnostic characters of the genus: body depressed dorso-ventrally; coxal plates 1–4 not strongly splayed; maxilla 1 with scale-like inconspicuous palp; maxilla 2 with basally fused palp; maxillipedal palp 3-articulate; basis of pereopods 5 and 6 wide, rounded and ventrally expanded; slightly shortened inner ramus of pleopods 3; uropod 2 uniramous (female), and uropod 3 lacking rami.

The new species shows significant differences from other known species of *Pereionotus*. However, *Pereionotus tinggiensis* sp. nov. appears to have some similarities to the neighbouring Australian species, namely *P. dieteri*, *P. hartmuti*, *P. thomsoni*, and *P. yongensis*. Nonetheless, certain distinct characters were observed, including, i) the presence of additional robust seta half-way on the posterior margin of propodi of pereopods 1–4 and, ii) similar robust setae on the anterior margin of the propodi of pereopods 5–7, distinguishing *P. tinggiensis* sp. nov. from *P. thomsoni*. Besides, *P. hartmuti* and *P. yongensis* were

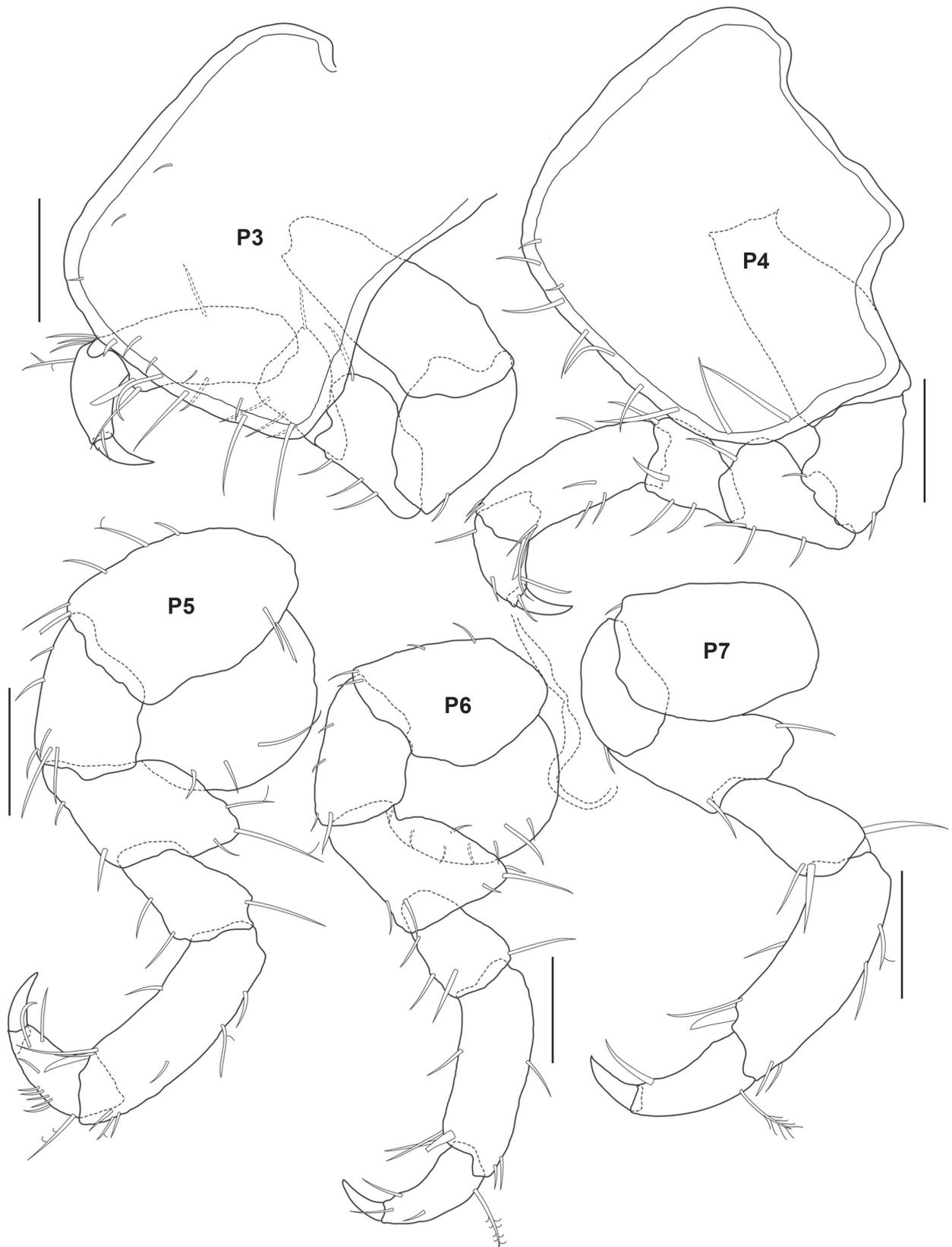


Figure 4. *Pereionotus tinggiensis* sp. nov., holotype female, UKMMZ-1603, 2 mm. Scale bars: 0.1 mm.

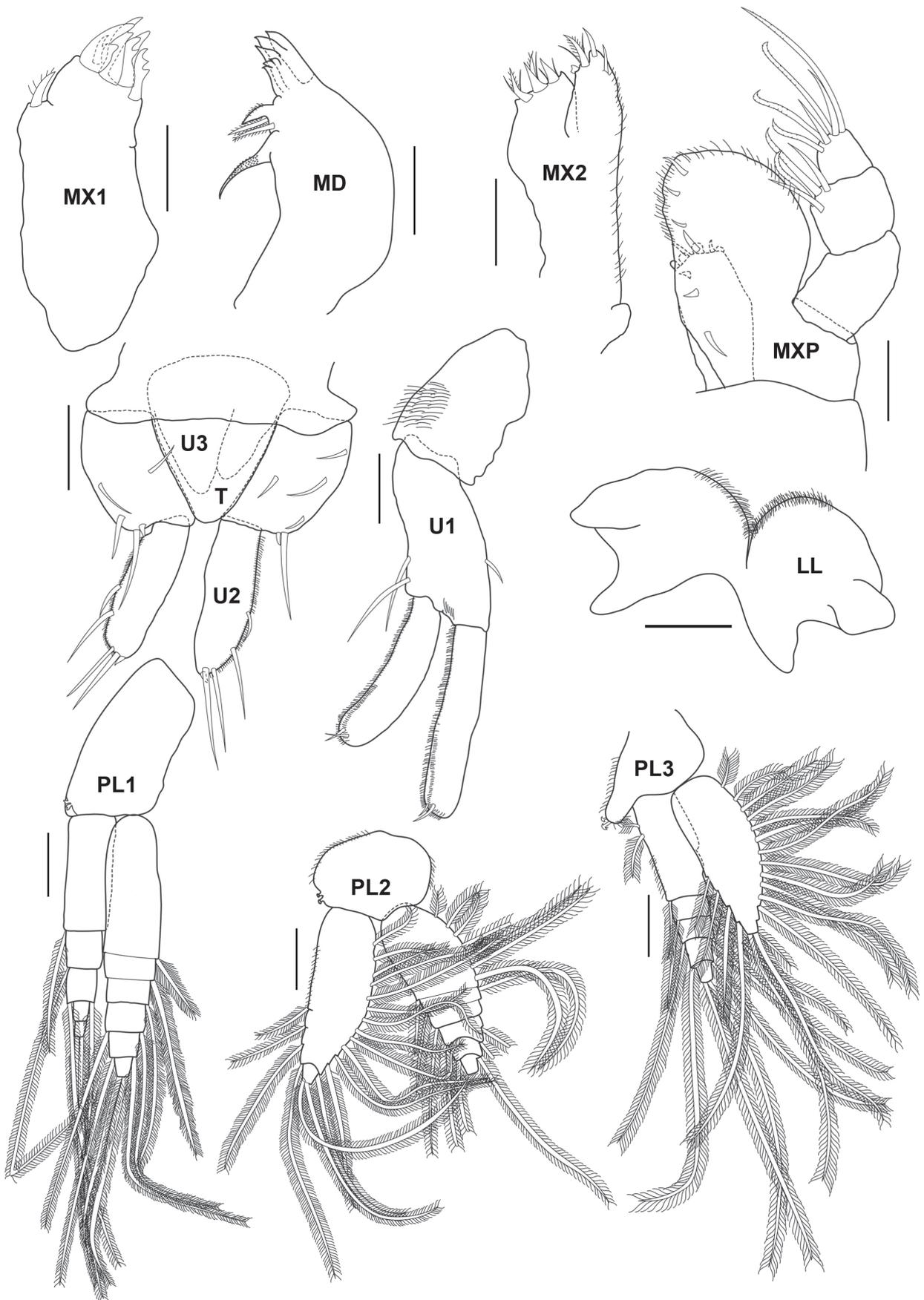


Figure 5. *Pereionotus tinggiensis* sp. nov., holotype female, UKMMZ-1603, 2 mm. Scale bars: 0.05 mm, except for MD and MX2, 0.025 mm.

found to exhibit a dense fringe of long slender setae on the distal margin of coxa 1–4. This unique characteristic is lacking in *P. tinggiensis* sp. nov. The new species is similar to *P. dieteri* in having robust subterminal lateral lobe of peduncular article 1 of antenna 1; not having additional robust seta half-way on the posterior margin of propodi of pereopods 1–4; and lacking robust seta on the

anterior margin of the propodi of pereopods 1–7, but can be distinguished from *P. dieteri* by the absence of one or two short robust setae on the anterodistal corner of merus and carpus of pereopods 6 and 7.

Etymology. This species is named after the type locality, Pulau Tinggi, Johor, Malaysia.

Key to the species of *Pereionotus* (female)

- 1 Propodi of pereopods 1–4 with additional robust seta halfway on the posterior margin and similar robust seta on the anterior margin on propodi of pereopods 5–7.....*P. thomsoni* (Stebbing, 1899)
- Propodi of pereopods 1–7 without additional robust seta halfway on the posterior and anterior margin..... 2
- 2 Pereonites 1–7 with lateral bulges just above coxae..... *P. alaniphias* (J. L. Barnard, 1940)
- Pereonites 1–7 without lateral bulges just above coxae..... 3
- 3 Dorsal keel humps on pereonites 3 and 4 shorter than preceding pereonites..... *P. hartmuti* Coleman & Lowry, 2012
- Dorsal keel consist of subequal evenly rising dorsal humps on pereonites 2–7 4
- 4 Palp on maxilliped longer than the outer plate *P. hirayamai* Coleman & Lowry, 2012
- Palp on maxilliped slightly shorter than the outer plate..... 5
- 5 Basis and merus of pereopod 5 expanded posterodistally.....*P. natalensis* (K. H. Barnard, 1940)
- Basis and merus of pereopod 5 not expanded posterodistally..... 6
- 6 Coxae 1–4 with sparse setae on the distal margin *P. holmesii* (Gurjanova, 1938)
- Coxae 1–4 with dense fringe of long slender setae on the distal margin..... 7
- 7 Antenna 1 peduncular article 1 slender *P. yongensis* Coleman & Lowry, 2012
- Antenna 1 peduncular article 1 robust..... 8
- 8 Antenna 1 peduncular article 2 as long as wide *P. japonicus* (Tzvetkova, 1968)
- Antenna 1 peduncular article 2 longer than wide 9
- 9 Antenna 1 peduncular article 1 with produced terminal lateral lobe*P. testudo* (Montagu, 1808)
- Antenna 1 peduncular article 1 with subterminal lateral lobe 10
- 10 Pereopods 6 and 7 with one or two short robust setae on the anterodistal corner of merus and carpus.....
..... *P. dieteri* Coleman & Lowry, 2012
- Pereopods 6 and 7 lacking short robust setae on the anterodistal corner of merus and carpus*P. tinggiensis* sp. nov.

Acknowledgements

This work is part of the MSc thesis of the first author in the Post-Graduation Program in Marine Science of the Universiti Kebangsaan Malaysia. We are grateful to Dr Alan Myers, Dr Koraon Wongkamhaeng, and one anonymous reviewer for their critical comments on this manuscript. This study was financially supported by the Ministry of Education (Malaysia) under the Fundamental Research Grant Scheme (FRGS/1/2019/WAB13/UKM/02/3)

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