

Description of *Floresorchestia samroiyodensis*, a new species of landhopper (Crustacea, Amphipoda, Talitridae) from Thailand

B. A. R. Azman^{1,†}, K. Wongkamhaeng^{2,‡}, P. Dumrongrojwattana^{3,§}

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

2 Marine and Coastal Resources Institute (MACORIN), Prince of Songkla University, 90112 Thailand

3 Department of Biology, Faculty of Science, Burapha University, Bangsaen, Chonburi 20131 Thailand

† <http://zoobank.org/9DF66EC5-44B0-4238-88EF-D7E1601234B7>

‡ <http://zoobank.org/801FBB8E-B12E-4C91-A592-ADEEB2417BEA>

§ <http://zoobank.org/7BB11A7C-C6DC-4681-8030-F9648DFC0A55>

<http://zoobank.org/64FD7F03-7892-4094-80C7-6930508E0CDE>

Corresponding author: B. A. R. Azman (abarahim@gmail.com)

Abstract

Received 26 Nov 2013
Accepted 4 Jan 2014
Published 28 March 2014

Academic editor:
Matthias Glaubrecht

Key Words

Amphipoda
Talitridae
Thailand
new species
Floresorchestia samroiyodensis
taxonomy

A new species of landhopper from Thailand is described. Its main diagnostic features are its large eyes; antenna 1 short; antenna 2 slender; maxilliped palp article 4 reduced, button-shaped; mandible right lacinia mobilis 6-dentate; gnathopod 1 subchelate with palmate lobes on the carpus and propodus; gnathopod 2 subchelate; pereopods cuspidately, with dactylus of pereopod 4 thickened and pinched; epimera 2-3 with stridulating organ just above ventral margins; uropod 1 outer ramus with a row of 3-4 robust setae; telson apically incised.

Introduction

Members of the talitrid amphipods are known to inhabit a wide range of habitats including forests, marshes and coastal environments (Bousfield 1982). Currently there are 59 recognised talitrid amphipod genera ranging from the palustral talitrids (marsh-hoppers), beach fleas (beach-hoppers), sand hoppers and the land hoppers (Lowry and Coleman 2012). Nevertheless, the landhoppers in Southeast Asian region particularly, is as yet poorly known. Only seven species have so far been recorded

in this region. The first known Southeast Asian region landhopper (*Parorchestia luzonensis*) was described by Baker (1915) from the summit of Mt. Maquiling, and in the same paper he described another species (*Parorchestia lagunae*) from the freshwater lake of central Luzon (Bay Lake), Philippines. Still in the early 20th century, another high altitude landhopper species *Parorchestia kinabaluensis*, was reported from Mt. Kinabalu, Sabah (Shoemaker 1935). Bussarawich et al. (1984) recorded two unnamed species of *Microrchestia* and *Floresorchestia* from the mangrove area of Southern Thailand. While

Miyamoto and Morino (2008) reported *Floresorchestia anomala* (Chevreux, 1901) from Malaysia. Recently, Lowry and Coleman (2012) described a new genus *Curiotalitrus* from rainforests in the Philippines. In this paper, we describe a 6-dentate cuspidactylate terrestrial amphipod discovered from a swamp forest in central Thailand.

Materials and methods

This study is based upon material collected from leaf litter of Khao Sam Roi Yod National Park (Fig. 1), Inner Gulf of Thailand in July 2011. Samples were collected using hand-nets and were then carefully transferred into plastic containers and fixed in 10% buffered formalin. In the laboratory, amphipod specimens were sorted out and stored in 70% alcohol. The animals were then examined under a compound microscope and later selected for dissection. The appendages of the dissected specimens were examined and figures were produced using a Leica DMLB light microscope with a camera lucida. All illustrations were digitally 'inked' following Coleman (2003). Setal and mouthpart classifications following Watling (1989). Figure legend: A, antenna; G, gnathopod; HD, head; LL, lower lip; MD, mandible; MX, maxilla; MP, maxilliped; P, pereopod; Pl, pleopod; T, telson; U, uropod; UR, urosome; UL, upper lip; R, right; L, left; ♂, male; ♀, female. Type material is deposited at Prince of Songkla University Zoological Collection with the prefix PSUZC for museum numbers and the Universiti Kebangsaan Malaysia Muzium Zoologi with the prefix UKMMZ for museum numbers.

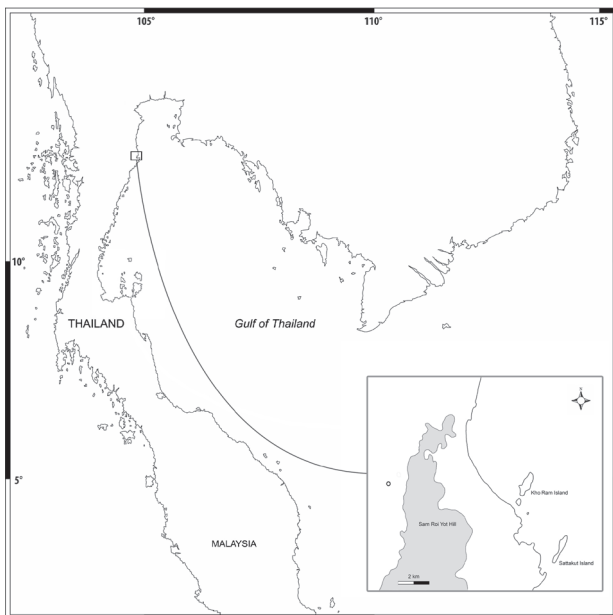


Figure 1. Map of the Inner Gulf of Thailand and the collection site (Sam Roi Yod National Park).

Systematic results

Suborder Senticauda Lowry & Myers, 2013

Infraorder Talitrida Rafinesque, 1815, emended Serejo 2004

Superfamily Talitroidea Bulycheva, 1957, emended Serejo 2004

Family Talitridae Rafinesque, 1815, emended Serejo 2004

Floresorchestia Bousfield, 1984

Floresorchestia samroiiodensis sp. n.

<http://zoobank.org/B4E6B5F4-A905-47D2-A2E7-9D048913A121>

http://species-id.net/wiki/Floresorchestia_samroiiodensis

(Figures 2-10)

Type material. Holotype, female, 10.6 mm, PSUZC-CR-0275, leaf litter of Khao Sam Roi Yod National Park, 12°14'36.93" N, 99°55'57.55" E, hand net, Pongrat Damrongrojwattana, 1 July 2011. Paratypes: 2 males, 13 females, 3 juveniles UKMMZ-1476, same station data.

Type locality: Khao Sam Roi Yod National Park, Sam Roi Yod district, Prachuap Khiri Khan Province, Thailand.

Diagnosis: Antenna 1 having 3 short articles of flagellum, reaching $\frac{1}{4}$ of peduncular article 5 of antenna 2; antenna 2 bearing more than 12 articles of flagellum; anterior coxal lobe of pereopod 6 not well developed; Mandible (female) right lacinia mobilis 6-dentate. Maxilliped palp



Figure 2. Live *Floresorchestia samroiiodensis* sp. n. in their natural habitat; photo taken by Mr. Komson Hongphattharakeeree.

article 2 distomedial lobe well developed, article 4 reduced, button-shaped. Gnathopod 1 parachelate; posterior margin of carpus and propodus each with lobe covered in palmate setae in male, posterior margin of merus, carpus and propodus each without lobe covered in palmate setae in female; palm slightly obtuse in male. Gnathopod 2 subchelate in male; mitten-shaped in female. Pereopods 2–4 coxae as wide as deep. Pereopods 3–7 cuspidate. Pereopods 6–7 longer than pereopods 3–5, with slender setae along posterior margin of dactyli. Pereopod 6 basis expanded in male. Epimera 2–3 with stridulating organ just above ventral margins (also presenting males where known). Pleopods well developed, similar in form and length; Uropod 1 peduncle distolateral robust seta present; inner ramus with marginal robust setae. Uropod 2 inner and outer rami with marginal robust setae. Uropod 3 ramus subequal in length to peduncle with 2 peduncular robust setae and 2 apical ones on ramus. Telson apically incised with marginal and apical robust setae, with 5 robust setae per lobe.

Description: (Based on holotype female, 10.6 mm, PSU-CR-0275)

Body compressed laterally, dorsal surface smooth. Head, height subequal to length. Eyes large, (greater than 1/3 head length). Antenna 1 short, ca. 1/3 of antenna 2; flagellum with 4 articles, shorter than peduncle; peduncular articles subequal in length. Antenna 2 peduncular articles narrow; article 5 longer than article 4; flagellum of 15 articles, longer than peduncle.

Upper lip broad, deep, apex rounded and densely pilose.

Lower lip broad, densely pilose on inner shoulder, distally in central trough and outer margin; lateral lobes long.

Left mandible incisor 5-toothed; molar process strong, with 15 striate (Sexually dimorphic in males; left lacinia mobilis with 4 teeth and right with 3 teeth). Right mandible incisor 6-toothed; molar process strong, with 16–17 striate.

Maxilla 1, inner plate slender with 2 terminal setae; outer plate with 9 articulating seta, medially with a row of 8 articulating seta.

Maxilla 2 plates narrow, inner plate slightly shorter than outer; inner plate with ca. 19 subapical robust setae, 1 plumose robust seta located at inner corner; outer plate with ca. 27 subapical robust setae more or less in 2 rows.

Maxilliped inner plate distally rounded, with apical and subapical plumose setae and 2 large conical robust setae; outer plate apically blunt, with a group of subapical setae.

Maxilliped palp broad; article 1 with 2 marginal and submarginal setae; article 2 with well-developed medial lobe, inner margin scalloped, with a row setae; outer margin of article 3 with several long setae, article 4 visible with robust setae apically.

Coxae 3–4 of medium depth, subquadrate, spinose lower margin slightly curvy or almost flat, posterior process

small and acute; coxa 5 deep, subequal to depth of coxa 4, anterior lobe large, posterior and ventral margins spinose, posterior lobe small; coxa 6 depth subequal to length, anterior lobe small, margin rounded distally; coxa 7 not deeper than coxa 6, gently curving below, weakly spinose.

Gnathopod 1, coxa anterior margin straight, ventral margin with 5 setae; basis straight almost parallel-sided; merus lacking tumescent lobe, posterior margin with 5 robust setae; carpus without tumescent protuberance; propodus without tumescent protuberance, anterior margin with a row of 7–8 robust setae, posterior margin with 6 robust setae; dactylus, 4 simple setae on anterodistal corner, inner lateral posterior margin with 1 robust seta, slightly acute.

Gnathopod 2 coxa as wide as deep with posterior process, convex ventral margin with 6 fine setae; basis expanded anteroproximally, posterior margin slightly straight; ischium subequal to merus in length; carpus elongate; propodus with posterodistal tumescent protuberance elongated distally, scabrous region from posteroproximal end to posterodistal end, outer lateral surface with several serrate setae, palm margin short, anterodistal corner with 3–4 simple setae; dactylus curved.

Sexual dimorphism present in gnathopods.

Gnathopod 1 of male short; basis strong, anterior margin with 4 setae and posterior margin with 2 setae; merus without posterior tumescent lobe; carpus deep, with posterior tumescence lobe; propodus slightly curved, shorter than carpus, posterodistal tumescent lobe large; subchelation strong, dactylus not exceeding palm and slightly obtuse.

Gnathopod 2 of male strongly subchelate, larger than 1; basis, anterior margin smooth, widened distally; ischium lobed anteriorly; merus subequal in length with ischium; propodus long ovate, bearing a row of small robust setae near dactylar hinge; palm oblique; dactylus curved, attenuated distally with smooth inner margin.

Pereopods 3–7 cuspidactylate. Pereopod 3 coxa subquadrate with posterior process, ventral margin slightly convex; basis longest; ischium shortest, anteroproximal margin notched; merus longer than carpus, anterior margin slightly convex, posterior margin straight; carpus anterior and posterior margins parallel; propodus slender, longer than carpus; dactylus subequal to ischium in length.

Pereopod 4 similar to pereopod 3, shorter, coxa wider than long, with posterior process, ventral margin straight; basis longest, convex; ischium shortest, anteroproximal margin notched; merus longer than carpus, anterior margin convex, posterior margin straight; carpus short; propodus slender, subequal to merus; dactylus posterior nail base with 1 simple seta.

Pereopod 5 coxa bilobed, anterior lobe larger than posterior lobe; basis oval; ischium shortest, posteroproximal margin notched; merus shorter to carpus in length, anterior margin straight, posterior margin slightly convex; carpus both margins parallel; propodus slender; dactylus short.

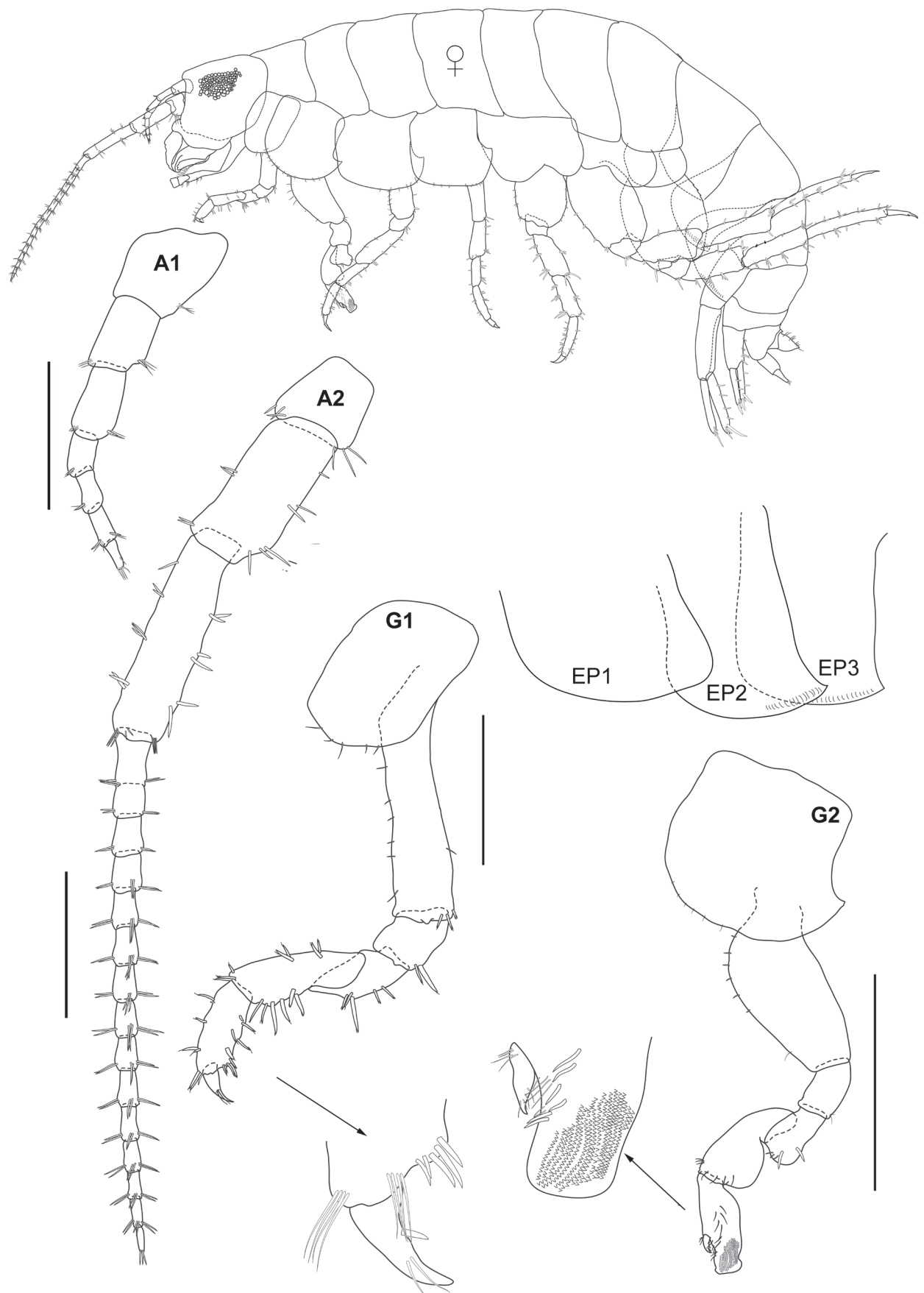


Figure 3. *Floresorchestia samroioidensis* sp. n., holotype, female, (PSUZC-CR-0275) 10.6 mm. Khao Sam Roi Yod National Park. Scales for A1 and A2 represent 0.5 mm, G1 and G2 represent 0.2 mm.

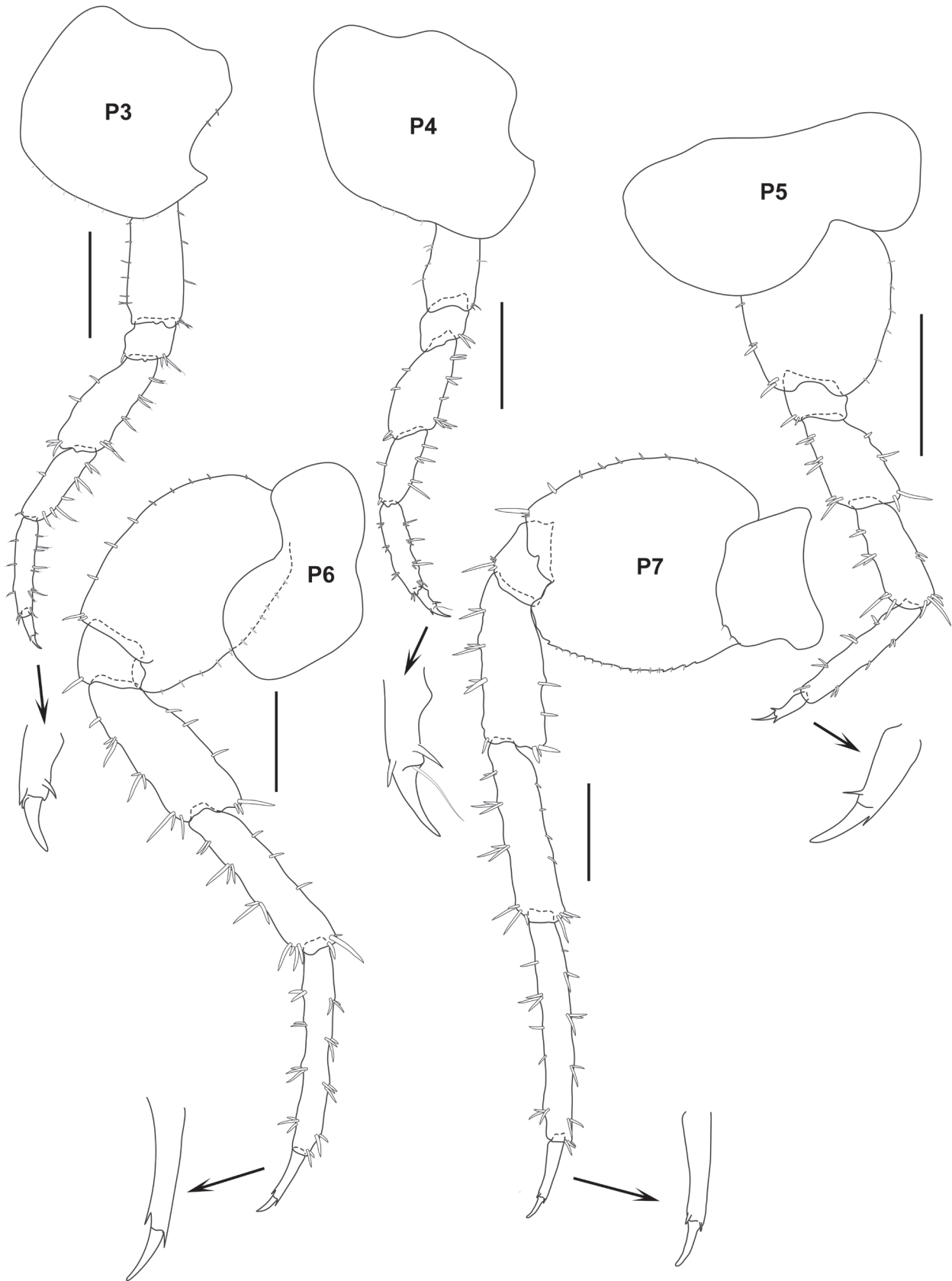


Figure 4. *Floresorchestia samroiiodensis* sp. n., holotype, female, (PSUZC-CR-0275) 10.6 mm. Khao Sam Roi Yod National Park. All scales represent 0.5 mm.

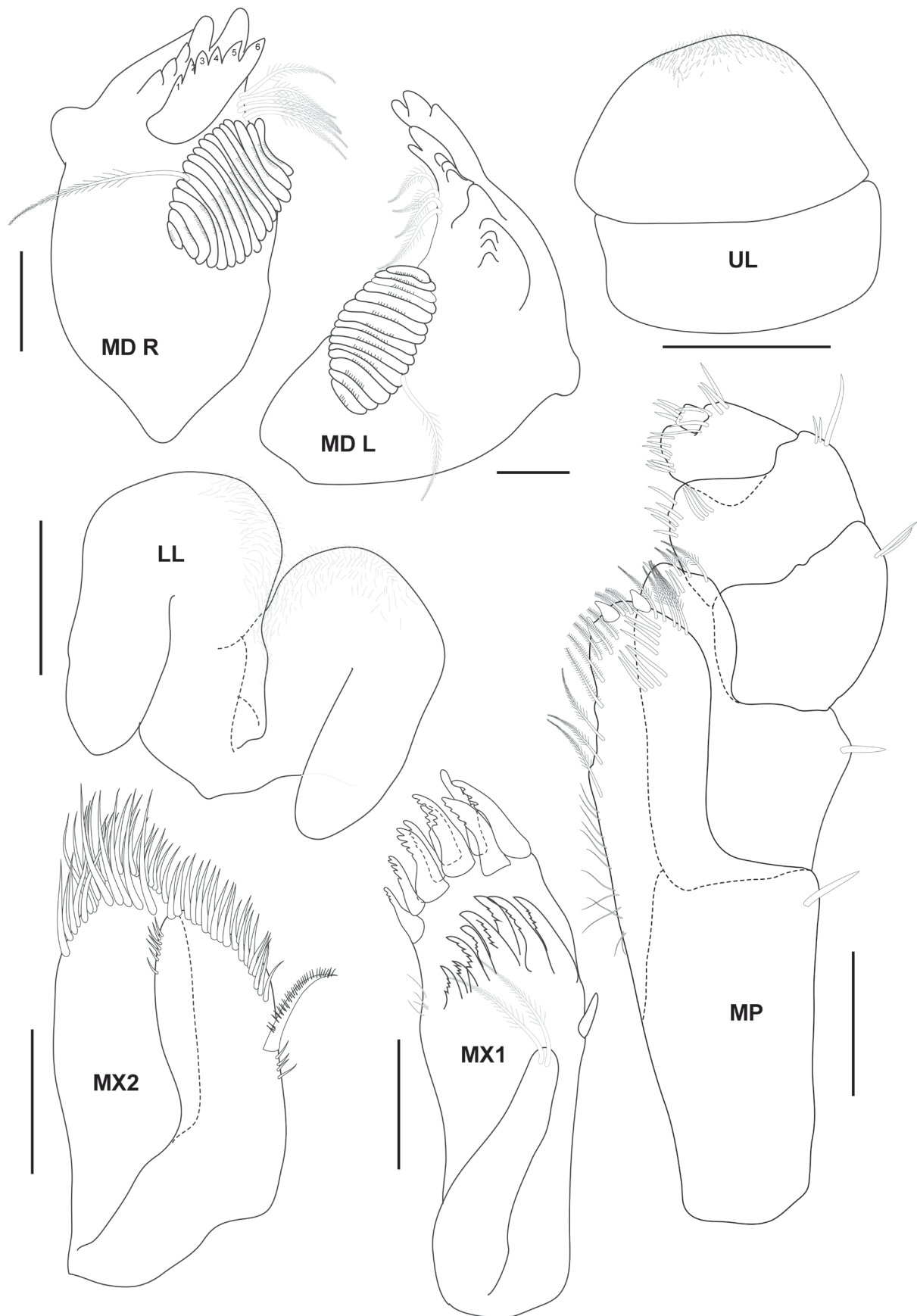


Figure 5. *Floresorchestia samroioidensis* sp. n., holotype, female, (PSUZC-CR-0275) 10.6 mm. Khao Sam Roi Yod National Park. Scales for IMD, MX1, MP and MX2 represent 0.1 mm; rMD, UL and LL represent 0.2 mm.

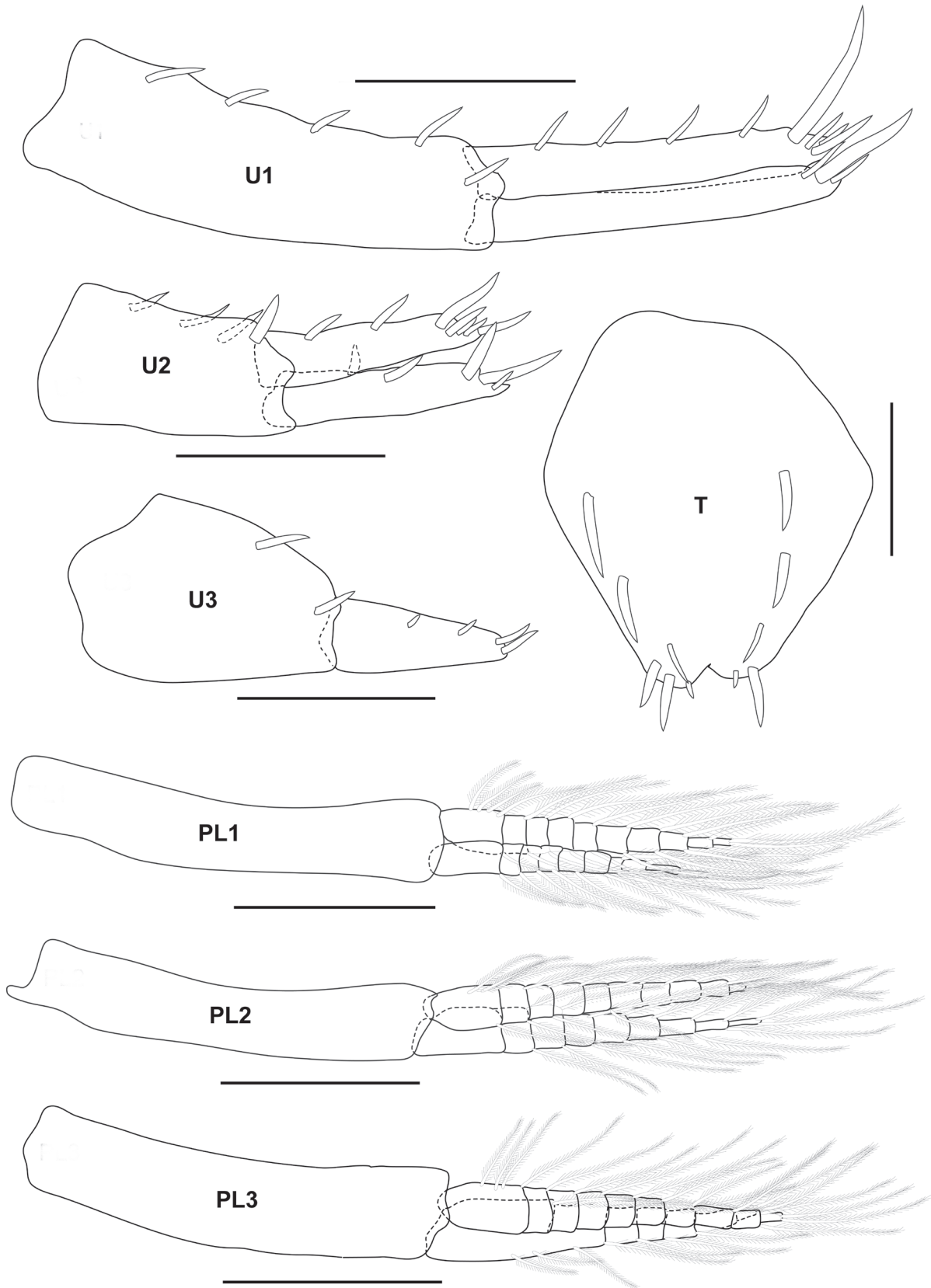


Figure 6. *Floresorchestia samroiiodensis* sp. n., holotype, female, (PSUZC-CR-0275) 10.6 mm. Khao Sam Roi Yod National Park. Scales for U1, U2, PL1, PL2 and PL3 represent; 0.5 mm, U3 and T represent 0.2 mm.

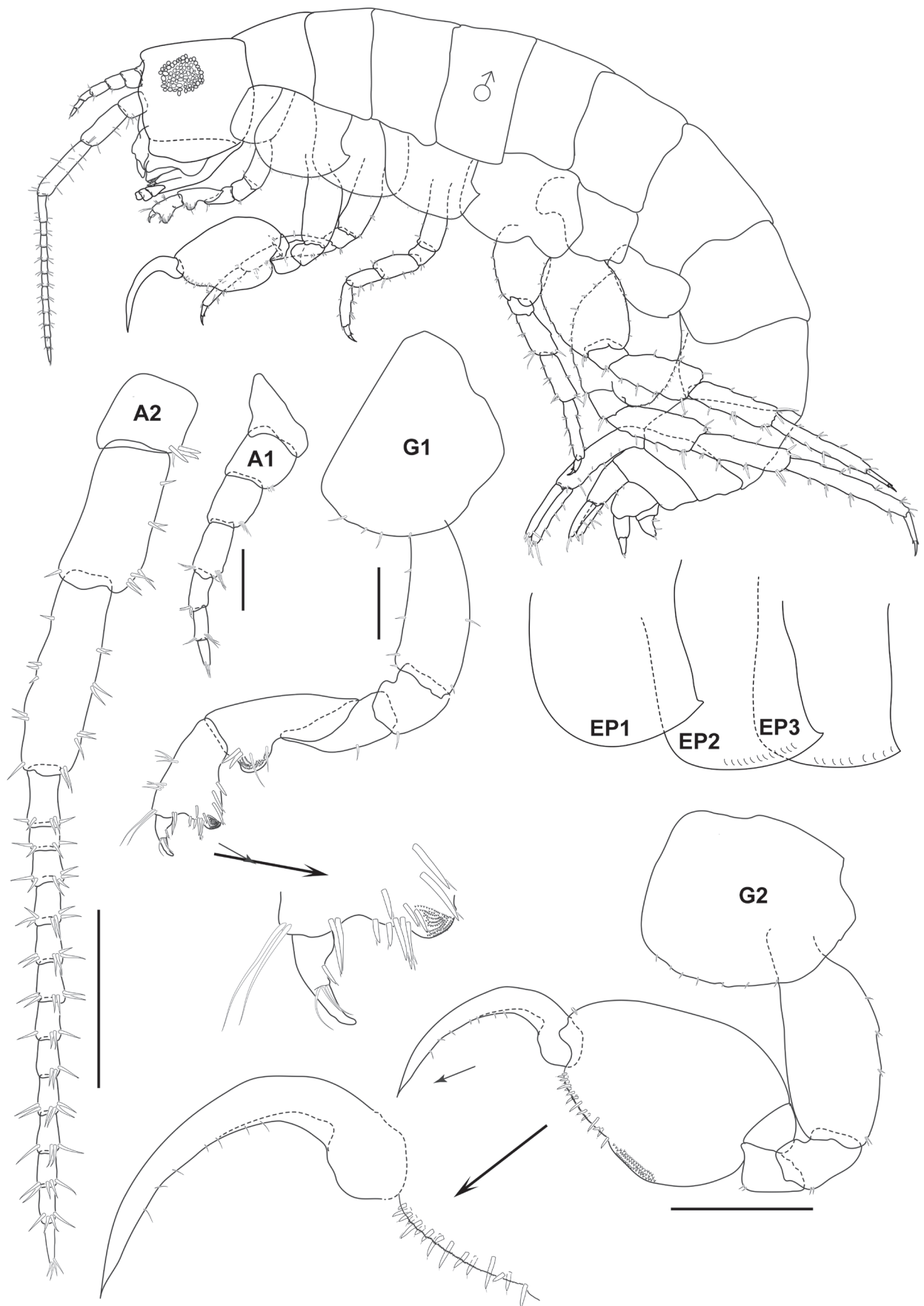


Figure 7. *Floresorchestia samroi yodensis* sp. n., allotype, male, (PSUZC-CR-0274) 10.5 mm. Khao Sam Roi Yod National Park. Scales for A2 and G2 represent 0.5 mm; A1, G1 represent 0.2 mm.

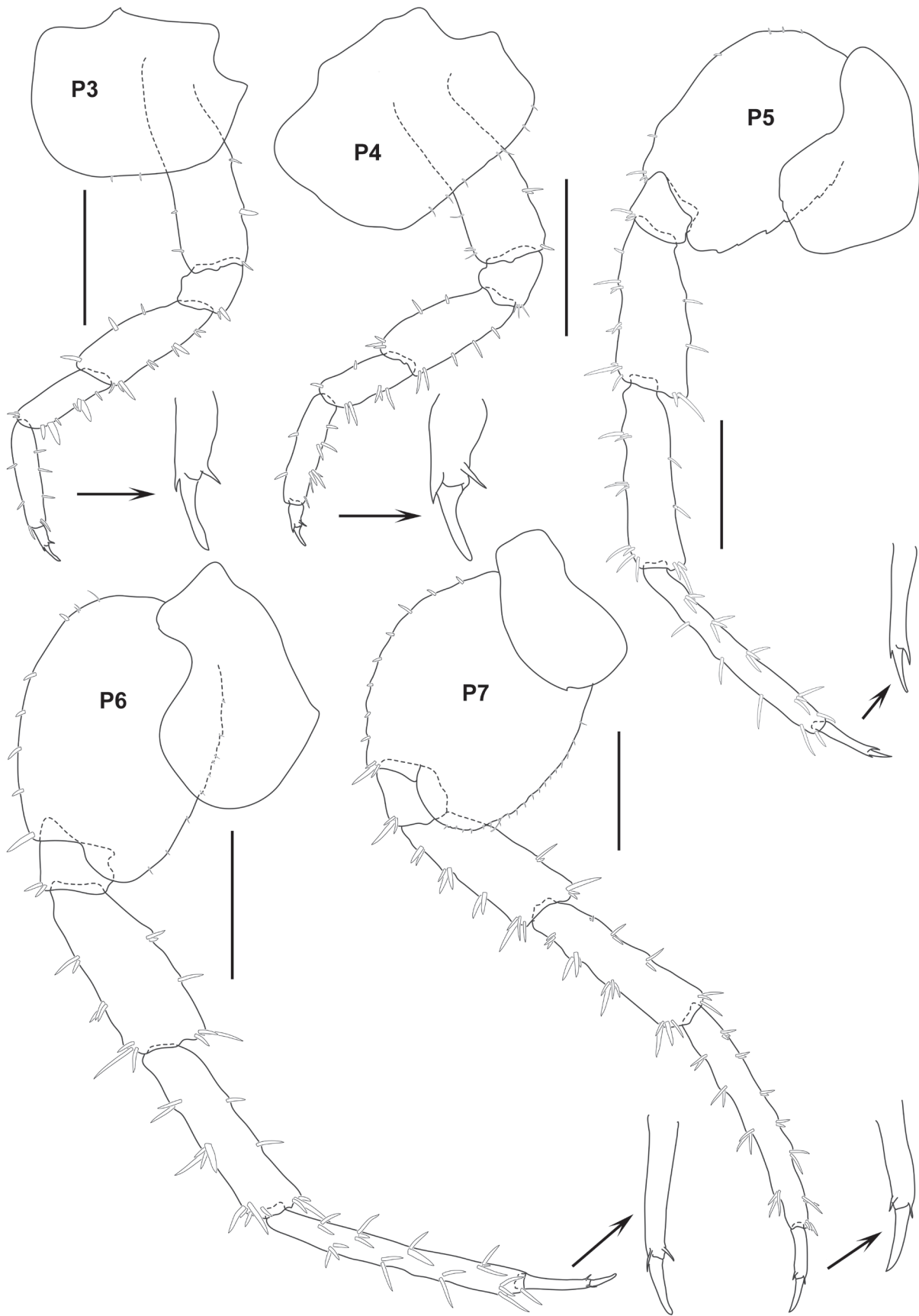


Figure 8. *Floresorchestia samroiiodensis* sp. n., allotype, male, (PSUZC-CR-0274) 10.5 mm. Khao Sam Roi Yod National Park. All scales represent 0.5 mm.

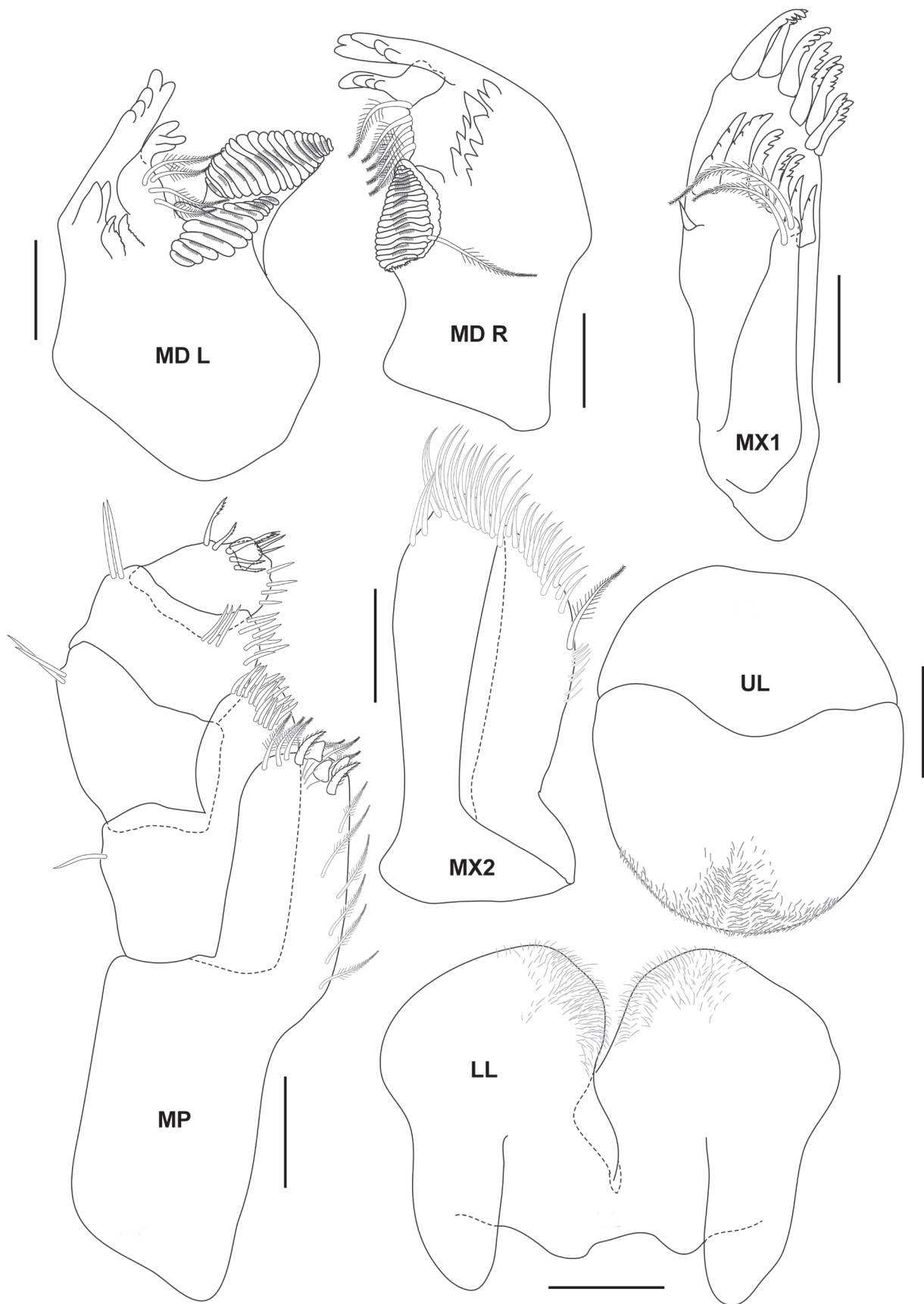


Figure 9. *Floresorchestia samroiiodensis* sp. n., allotype, male, (PSUZC-CR-0274) 10.5 mm. Khao Sam Roi Yod National Park. Scales for IMD, rMD and UL represent 0.1 mm; MP and MX1 represent 0.2 mm.

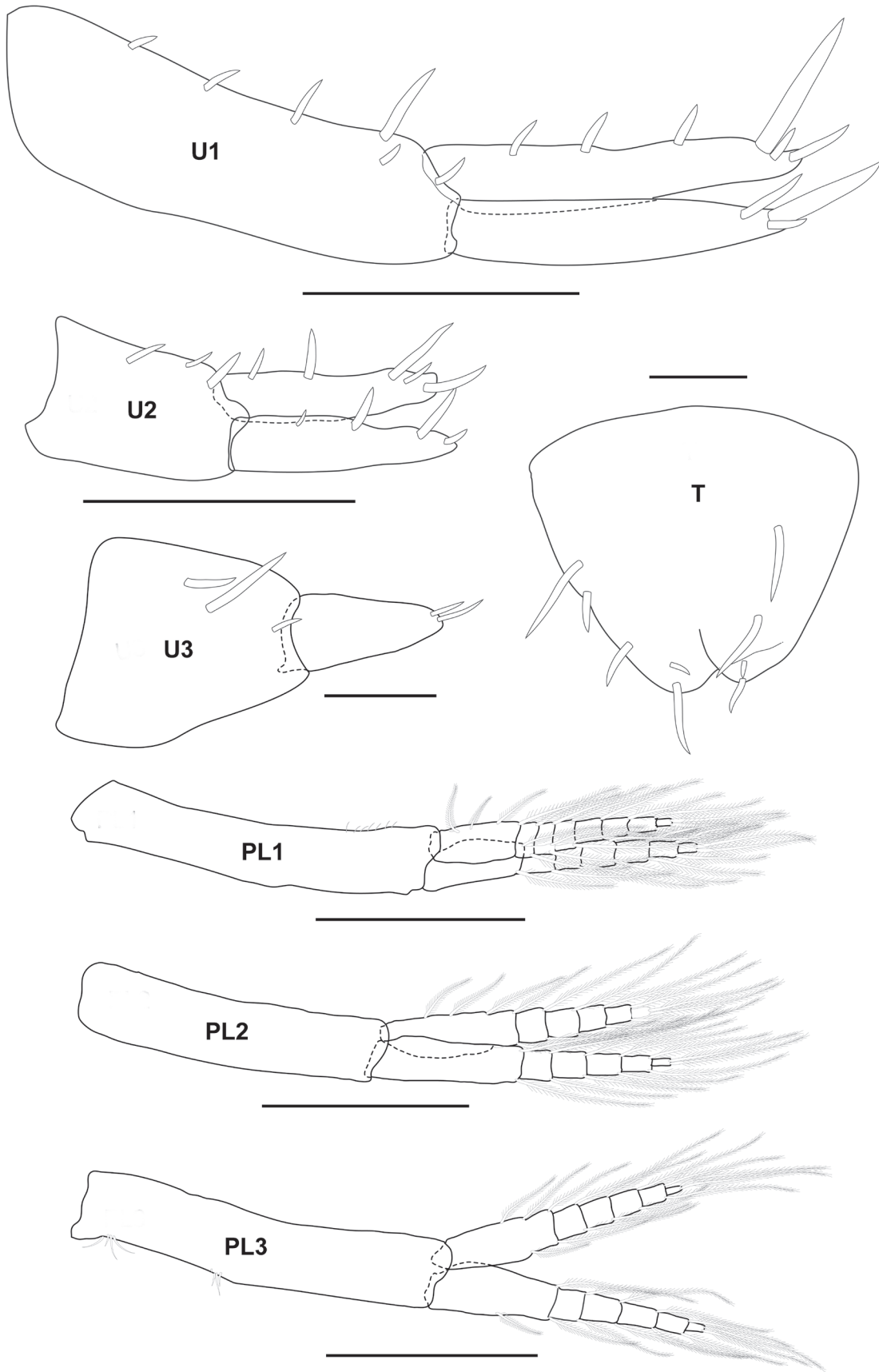


Figure 10. *Floresorchestia samroiiodensis* sp. n., allotype, male, (PSUZC-CR-0274) 10.5 mm. Khao Sam Roi Yod National Park. Scales for U1, U2, PL1, PL2 and PL3 represent 0.5 mm; U3 represent 0.1 mm; T represents 0.2 mm.

Pereopod 6 coxa bilobed, anterior lobe much smaller than posterior lobe; basis oval, anterior margin with short robust setae; ischium shortest, posteroproximal margin notched; merus slightly shorter than carpus in length, anterior margin straight, posterior margin slightly convex; carpus both margins parallel; propodus slender, longest; dactylus short.

Pereopod 7 coxa small, subquadrate; basis oval, posterodistal lobe broader than pereopod 5–6; ischium shortest; merus slightly shorter in length to carpus, anterior margin straight, posterior margin slightly convex; carpus anterior and posterior margins parallel; propodus slender, longest; dactylus narrow.

Epimeral plates, plate 1 smoothly rounded anterodistally and distally, posterodistal corner slightly protruded, hind margin slightly sigmoid; plate 2 slightly longer than plate 3, anterodistally rounded with a row of slits (16–21 slits) along ventral margin, posterodistal corner produced; plate 3 also with a row of slits (13–15 slits) along ventral margin and posterodistal corner produced.

Pleopods well developed, subsimilar in form and length. Peduncles sublinear; all pleopods biramous. Rami shorter than peduncles, with distinct segmentation.

Uropod 1 peduncle longer than rami, peduncle bearing 1 outer marginal robust setae and 4 inner marginal robust setae; rami slender, subequal in length, outer ramus lacking marginal robust setae, inner ramus with 4 robust marginal setae, both with large apical and subapical robust setae.

Uropod 2, peduncle subequal to rami in length; peduncle bearing 1 outer marginal and 3 inner marginal robust setae; rami slender, subequal in length, outer ramus and inner ramus with 2 marginal robust setae, apical robust setae with tapering acute tips.

Uropod 3, peduncle expanded proximally, narrowing distally, longer than deep, 2 robust setae set submarginally; ramus slightly shorter than peduncle, tapering distally, bearing 2 robust setae apically and another 2 along the margin.

Telson as broad as long, and apically shallow incised; each side with several robust setae (normally with 5–6).

Remarks. The new species is characterized by having the mandibular left lacinia mobilis 6-dentate; dactylus of pereopod 4 thickened and pinched, and also shows the following features: large eyes; antenna 1 short; antenna 2 slender; maxilliped palp article 4 reduced, button-shaped; gnathopod 1 subchelate with palmate lobes on the carpus and propodus; gnathopod 2 subchelate; pereopods cuspidactylate; epimera 2–3 with stridulating organ just above ventral margins; uropod 1 outer ramus with a row of 3–4 robust setae; telson apically incised. Individuals belonging to this new species are found underneath the moist environment of the forest leaf litter.

The species of *Floresorchestia* are known to be tropical and widespread which is, distributed in terrestrial habitats of rain forests of the tropical Indo-Pacific (Bousfield 1984) and also in the Caribbean Sea (Lowry and

Springthorpe 2009). Bousfield (1984) documented *Floresorchestia* for a group of described species with unique stridulating organs on the epimera. These epimeral slits are considered to be a powerful autapomorphy for *Floresorchestia* (Lowry & Bopiah, 2012) and they are found in various combinations: epimera 1–3; epimera 2–3 (most common); epimeron 2; epimeron 3. Recently Miyamoto and Morino (2008) and Lowry and Springthorpe (2009) have both discussed the morphology of the genus, refining characters and describing additional new species that brings a total of 16 valid species.

Floresorchestia samroiiodensis sp. n. shares several unique characters with *F. ancheidos* (K.H. Barnard, 1916) and *F. guadalupensis* (Ciavatti, 1989) in having the stridulating organs on epimera 2–3 and palmate lobes on the carpus and propodus of gnathopod 1. However the new species differs from any other members of *Floresorchestia* in its more developed dentitions (6-dentate) of lacinia mobilis on the female right mandible, as well as in having two rows of spine-like teeth in outer plate of maxilla 1, and the telson with 4–5 setae per lobe.

Acknowledgements

Thanks are due to Drs. Jaruwat Nabhitabhata, Pornsilp Pholphunthin and Mr. Kwan Nualcharoen for their vital support, insight and expertise that greatly assisted the research. Appreciations are also extended to Dr. Charles Oliver Coleman from the Museum für Naturkunde Berlin, Germany and Dr. Jim Lowry from the Australian Museum, Sydney for reading the manuscript and for their invaluable comments and also for their assistance with literature. Universiti Kebangsaan Malaysia research grant (DIP-2012-020) has also provided travel grant to first author which helped in conducting field visit. Thanks to our colleague Mr. Komson Hongphattharakeeree in providing the amphipod photo for this study.

Reference

- Baker CF (1915) Two Amphipoda of Luzon. Philippine Journ. Sci. 10: 251–255.
- Bousfield EL (1982) The amphipod superfamily Talitroidea in the north-eastern Pacific region. I. Family Talitridae: systematics and distributional ecology. Publications in Biological Oceanography 11: 1–75.
- Bousfield EL (1984) Recent advances in the systematics and biogeography of landhoppers (Amphipoda: Talitridae) of the Indo-Pacific region. In: Radovsky FJ, Reven PH, Sohmer SH (Eds) Biogeography of the tropical Pacific, proceedings of a symposium. Bernice P. Bishop Museum, (Special Publication) 72: 171–210.
- Bulycheva AI (1957) Sea-fleas of the seas of the USSR and adjacent waters (Amphipoda - Talitroidea). Akademiya Nauk SSSR, Opre-delitelni po Faune SSSR 65: 1–185.
- Bussarawich S, Nateewathana A, Hylleberg J (1984) Distribution of Marine Benthic Amphipods Off Phuket Island, with Emphasis on Tin Mining and a Model of Species Individual Relationships. Phuket Marine Biological Center Research Bulletin 32:1–21.

- Chevreaux E (1901) Crustacés Amphipodes. In: Mission scientifique de M. Ch. Alluaud aux Iles Séchelles (Mars, Avril, Mai 1892). Mém. Soc. zool. France 14: 388–438.
- Ciavatti G (1989) Les Talitres (Crustacea, Amphipoda) des plages de la Guadeloupe. Description de deux espèces nouvelles. Ann. Inst. océanogr., Paris 65(2): 127–146.
- Coleman CO (2003) “Digital inking”: How to make perfect line drawings on computers. Organism Diversity & Evolution 3: 1–14. doi: 10.1078/1439-6092-00081
- Lowry JK, Bopiah A (2012) *Britorchestia*, a new talitrid genus from western Europe and the Mediterranean Sea and a revision of *Pseudorchestoidea* and *Sardorchestia* (Crustacea, Amphipoda, Talitridae). Zootaxa 3451: 60–67.
- Lowry JK, Coleman CO (2012) A new terrestrial talitrid genus from the Philippine Islands (Crustacea, Amphipoda, Talitrida, Talitridae) and the designation of two informal groups. Zootaxa 3400: 64–68.
- Lowry JK, Springthorpe RT (2009) The genus *Floresorchestia* (Amphipoda: Talitridae) on Cocos (Keeling) and Christmas Islands. Memoirs of Museum Victoria 66: 117–127.
- 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
- Miyamoto H, Morino H (2008) Taxonomic studies on the Talitridae (Amphipoda) from Taiwan, III. The genus *Floresorchestia* Bousfield, 1984. Crustaceana 81(7): 837–860. doi: 10.1163/156854008784771667
- Serejo CS (2004) Cladistic revision of talitroidean amphipods (Crustacea, Gammaridea), with a proposal for a new classification. Zoologica Scripta 33: 551–586. doi: 10.1111/j.0300-3256.2004.00163.x
- Rafinesque CS (1815) Analyse de la Nature ou Tableau de l’Univers. Palerme, 224.
- Shoemaker CR (1935) A new species of amphipod - from Mt. Kinabalu, North Borneo. Bull. Raffles Mus., Singapore 10: 63–67.
- 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 Issues 6: 15–27.