

Description of *Stenothoe lowryi* sp. nov. (Crustacea: Amphipoda: Stenothoidae), from the Straits of Malacca, Malaysia

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ABSTRACT. *Stenothoe lowryi* sp. nov. from samples collected in an intertidal pool of Pangkor Island is described and illustrated. Diagnostic features of *Stenothoe lowryi* are almost exclusively related to Salman's material of *Stenothoe gallensis* Walker, 1904 from the Arabian Gulf (Salman, 1985), in the shape of male gnathopod 2, outer plate of maxilla 2 with 2 articles, and moderately convex dorsal margin of male gnathopod 2. However, *S. gallensis* and *S. lowryi* sp. nov. have shown slight differences by the latter in having: 1) gnathopod 2 propodus with palmar margin moderately convex; 2) uropod 2 rami with only one robust seta on medial margin, and; 3) uropod 3 article 2 distinctly longer than article 1, proximally swollen, not rugose.

Introduction

In recent years, there has been an increasing interest in the amphipod fauna of the Southeast Asian (SEA) region. Lowry (2000) published the first comprehensive distributional checklist of SEA amphipods with a more recent checklist by Azman *et al.* (2022). Various taxonomic works were also focussed on amphipods from the waters of Thailand (Lowry & Berents, 2002; Lowry & Stoddart 2002; Lowry & Watson, 2002; Myers, 2002; Peart, 2002; Takeuchi & Guerra-Garcia, 2002; Taylor, 2002; Wongkamhaeng *et al.*, 2009; Wongkamhaeng *et al.*, 2012a; Wongkamhaeng *et al.*, 2012b; Wongkamhaeng *et al.*, 2013a; Wongkamhaeng *et al.*, 2013b; Wongkamhaeng *et al.*, 2016; Wongkamhaeng *et al.*, 2018, Wongkamhaeng & Boonyanusith, 2015), Indonesia (Arfianti & Wongkamhaeng 2017; Ortiz & Lalana, 2003), the Philippines (Sawicki *et al.*, 2005; Stoddart & Lowry, 2004), Vietnam (Dang & Le, 2005; Dang & Le, 2011; Dang & Le, 2012; Dang & Le, 2013), Malaysia (Azman, 2021; Azman & Melvin, 2011; Azman & Othman, 2012; Azman &

Othman, 2013; Feirulsha & Rahim, 2020; Lim *et al.*, 2010; Nurshazwan *et al.*, 2020; Othman & Morino, 2006; Othman & Azman, 2007; Shin *et al.*, 2015), Singapore (Ali-Eimran *et al.*, 2020) and Timor-Leste (Hughes, 2015).

Nonetheless, stenothoid Amphipoda remain poorly studied in Southeast Asian waters, with only one species (*Stenothoe gallensis* Walker, 1904) recorded, until Krapp-Schickel (2015) described another species (*S. andamanensis* Krapp-Schickel, 2015) from the harbour of Havelock, Andaman Islands. The most recently described species are *S. irinae* Marin & Sinelnikov, 2018 and *S. nhatrangensis* Marin & Sinelnikov, 2018, from Nha Trang Bay, Vietnam.

While undertaking a faunal survey along the Straits of Malacca off the Malaysian west coast (1995–1996), a number of specimens were collected from intertidal rocks during a study of associated macrocrustaceans (including decapods and other peracarids) of Pangkor Island. This paper gives an illustrated description of a new species of *Stenothoe* from this region.

Keywords: Amphipoda, taxonomy, *Stenothoe*, *Stenothoe lowryi*, new species, Pangkor Island

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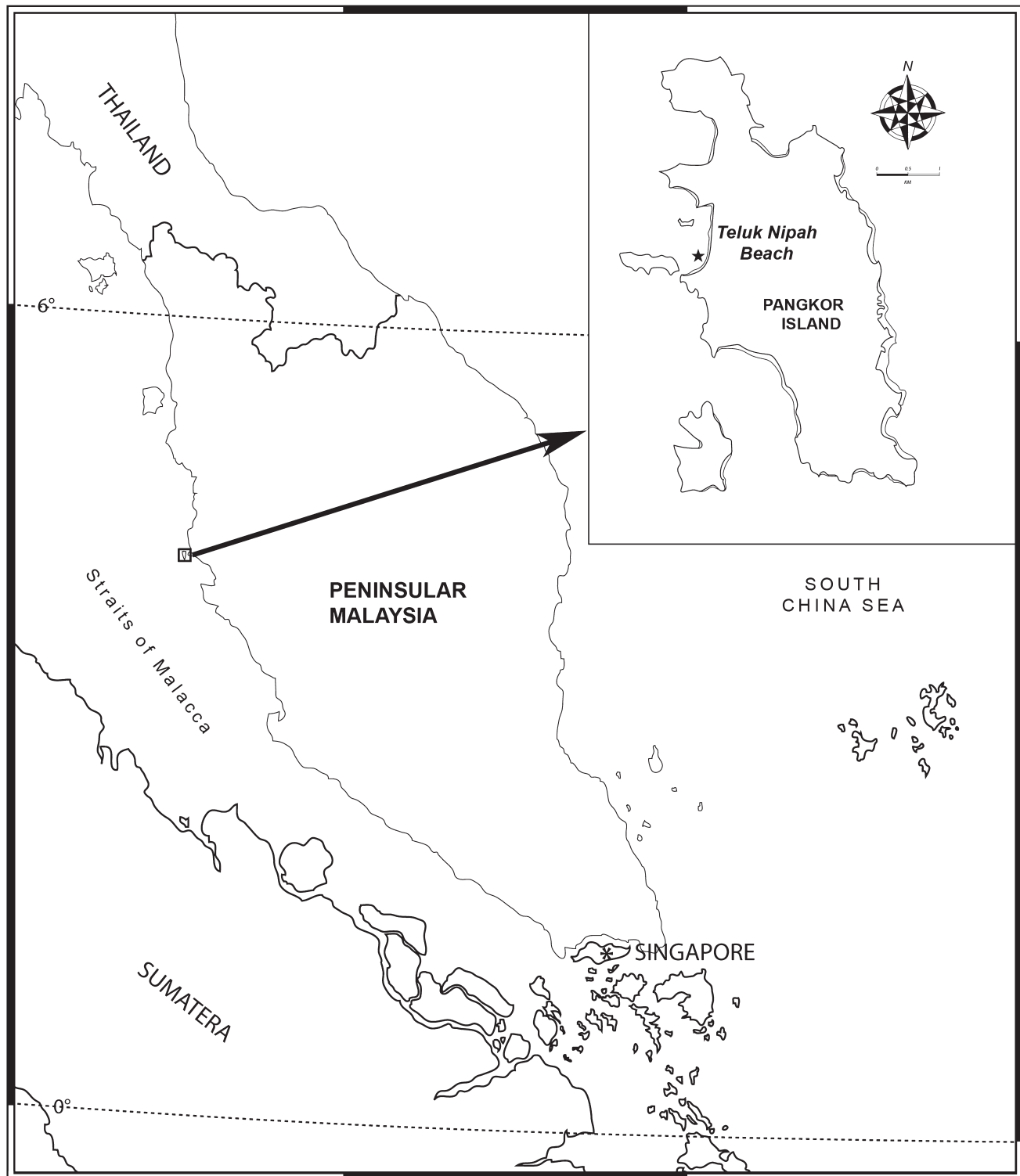


Figure 1. Map of Peninsular Malaysia with sampling site on Pangkor Island.

Materials and methods

The crustaceans were collected from washing intertidal rocks in January 1996 at the Teluk Nipah beach ($4^{\circ}14'00.0''\text{N}$ $100^{\circ}31'00.0''\text{E}$), Pangkor Island (Fig. 1). Intertidal rocks were collected manually and placed in a bucket with seawater. Alcohol solution was then added into the bucket and left to stand for about 30–45 min. Next, the samples were rinsed and washed with seawater passing through a $300\ \mu\text{m}$ sieve. In the field, samples were fixed with about

10% formalin in seawater. Taxonomic descriptions were generated from a DELTA (Dallwitz, 2005) database to stenothoid genera and species. Material described in this study is lodged at the Universti Kebangsaan Malaysia Muzium Zoologi, Bangi, Malaysia (UKMMZ). The following abbreviations are used on the plates: **A**, antenna; **Ep**, epimeron; **G**, gnathopod; **Hd**, head; **L**, labium; **Mn**, mandible; **Mxp**, maxilliped; **Mx**, maxilla; **P**, pereopod; **T**, telson; **U**, uropod; **Ur**, urosomite; **l**, left; **r**, right.

Systematics

Family Stenothoidae Boeck, 1871

Genus *Stenothoe* Dana, 1852

Type species. *Stenothoe valida* Dana, 1852.

Stenothoe lowryi sp. nov.

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Figs 2–4

Holotype: Male, 5.3 mm (from tip of rostrum to apex of telson), UKMMZ-1133, Peninsular Malaysia, Pangkor Island, Teluk Nipah beach, 4°14'00.0"N 100°31'00.0"E, intertidal area, rock washing, 0–1 m depth, B. A. R. Azman, S. Y. Gan, J. H. C. Lim, C. F. Liang, 12 January 1996 (UKM I.D. PKR 1.3923). **Allotype:** Female, UKMMZ-1134, same station data as holotype; dissected appendages were kept in five semi-permanent slides mounted on glycerol.

Diagnosis. Stenothoidae with long antenna 1 (distinctly longer than head and pereonites 1–4) with peduncular article 1 2× longer than broad. Maxilliped palp article 3 short. Maxilla 2 well developed, with outer plate 2-articulate. Gnathopod 1 propodus about 2× as long as broad. Gnathopod 2 propodus with palmar margin moderately convex. Pereopod 7 basis proximally or slightly expanded (more than 1.5–1.8× as long as broad). Uropod 2 rami with single robust seta on medial margin. Uropod 3 article 2 distinctly longer than article 1, not rugose. Telson apically subacute.

Description. Male (based on holotype, 5.3 mm). Body smooth.

Head. Antenna 1 long (distinctly longer than head and pereonites 1–4), subequal in length to antenna 2; peduncle not geniculate; peduncular article 1 2× longer than broad, without anterodistal lobe, without posterodistal lobe; peduncular article 2 without anterodistal lobe; accessory flagellum absent; flagellum 20-articulate. Mandible palp absent; incisor process well developed. Maxilliped palp article 3 short. Maxilla 1 palp 2-articulate. Maxilla 2 well developed with outer plate 2-articulate.

Pereon. Gnathopods 1–2 dissimilar in shape; gnathopod 1 subchelate; merus enlarged, produced distally; carpus short (about as long as broad); propodus anterior and posterior margins subparallel (not expanded distally), about 2× as long as broad. Gnathopod 2 coxa posterior margin straight; basis anterodistal margin smooth; merus posterior margin convex, with setae; propodus narrow, oval, without posterodistal expansion, medium length (about twice as long as broad) (2.1), not transverse, palmar margin moderately convex, ventral margin with crenulation, (distally crenulate), with dense row(s) of fine setae; dactylus reaching distinctly further than half length of propodus, acute. Pereopod 3–7 setose. Pereonite 4 not elongate (similar length to pereonite 3); without dorsal carina. Pereopod 4 coxa ventral margin convex. Pereopod 5 basis not expanded. Pereopod 6 basis fully expanded; posterior margin straight. Pereopod 7 basis proximally or slightly expanded (more than 1.5× as long as broad), posterior margin convex (slightly), with crenulation; merus distally twice as wide as ischium, with ventral row of robust setae, expansion not reaching to mid-length of carpus; dactylus small (distinctly smaller than carpus).

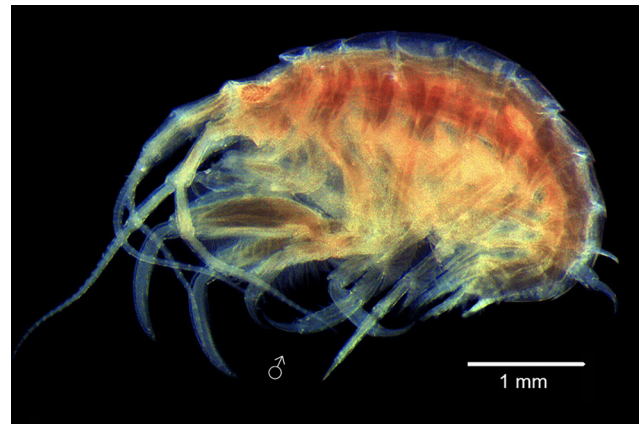


Figure 2. *Stenothoe lowryi* sp. nov., holotype male, 5.3 mm, UKMMZ-1133.

Pleon. Epimeron 3 posteroventral corner subquadrate/rounded. Uropod 1 peduncle with a distoventral spur; inner ramus well developed, subequal in length to outer ramus. Uropod 2 inner ramus well developed, subequal in length to outer ramus, rami with single robust seta on medial margin. Uropod 3 with peduncle and ramus; ramus subequal or longer than peduncle; peduncle longer than article 1; ramus 2-articulate; article 1 without marginal robust setae; article 2 distinctly longer than article 1, proximally swollen, not rugose. Telson laminar, with dorsolateral robust setae, apically subacute.

Female (sexually dimorphic characters). Gnathopod 1 propodus about 3× as long as broad. Gnathopod 2 propodus medium length (about 2 times as long as broad). Uropod 3 article 2 not swollen. Telson apically acute or subacute.

Etymology. This species is named after the late Dr J. K. Lowry, world-renowned amphipod taxonomist, in recognition for his outstanding taxonomic and systematic work on the amphipod fauna of the world.

Remarks. The material at hand is similar to *Stenothoe gallensis* Walker, 1904, a distinctive species originally described from Galle, Sri Lanka. It should be noted, however, that in Walker's original illustration, he mistakenly labelled pereopod 7 as pereopod 5. After thorough observation of the specimens from Pangkor Island, it is clear that they are not attributable to *S. gallensis*. Table 1 summarizes the characters and states reviewed from literature and the present study. Krapp-Schickel (2015) reviewed and reassessed most of the previously synonymized records of *S. gallensis* from various localities and placed *S. irakiensis* Salman, 1985 as a junior synonym of *S. gallensis*.

Comparing the descriptions and illustrations in the original texts (Salman, 1985), this new species is most morphologically similar to Salman's material of *S. gallensis* Walker, 1904 from the Arabian Gulf, in the shape of male gnathopod 2; outer plate of maxilla 2 with 2 articles; and article 2 longer than article 1 of uropod 2. Despite showing greatest morphological similarity, *S. gallensis* and *S. lowryi* sp. nov. have slight differences, with the latter having: 1) gnathopod 2 propodus with palmar margin moderately convex; 2) uropod 2 rami with only one robust seta on medial margin; 3) uropod 3 article 2 distinctly longer than article 1, proximally swollen, not rugose.

In *S. lowryi*, the separated articles of the outer plate of the

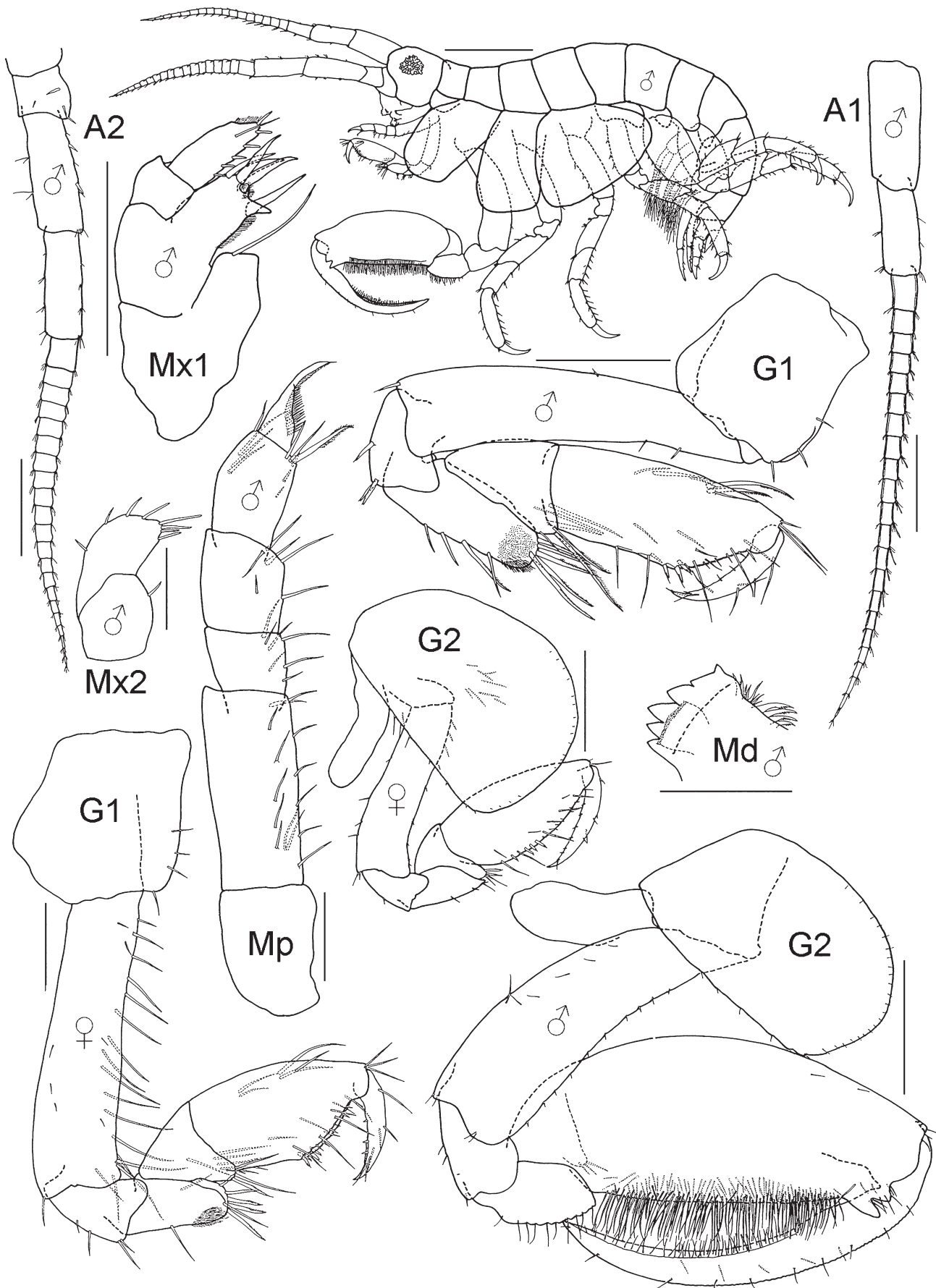


Figure 3. *Stenothoe lowryi* sp. nov., from Pangkor Island, Malaysia. Holotype male, 5.3 mm, UKMMZ-1133. Allotype female, 4.9 mm, UKMMZ-1134. Scales: A1, A2 = 0.4 mm; Mx2, Md = 0.1 mm; Mx1, Mp, G1 = 0.2 mm; remainder = 0.5 mm.

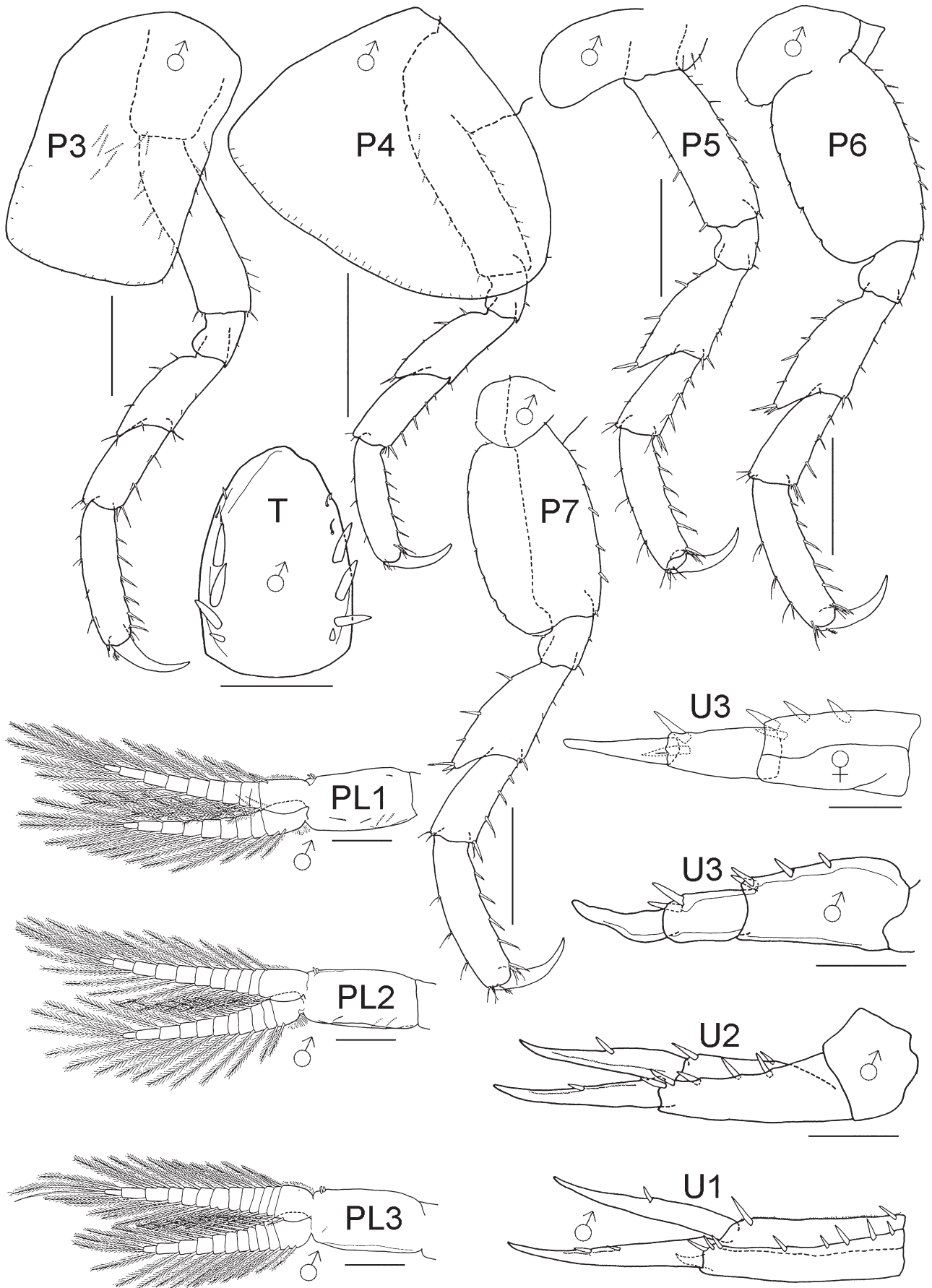


Figure 4. *Stenothoe lowryi* sp. nov., from Pangkor Island, Malaysia. Holotype male, 5.3 mm, UKMMZ-1133. Allotype female, 4.9 mm, UKMMZ-1134. Scales: P3–P7 = 0.5 mm; PL1–PL3 = 0.2 mm; remainder = 0.1 mm.

Table 1. Morphological variation in species of *Stenothoe* from Southeast Asia, including *S. lowryi* sp. nov.

| Character | <i>S. irakiensis</i> | <i>S. irinae</i> | <i>S. nhatrangensis</i> | <i>S. andamanensis</i> | <i>S. lowryi</i> sp. nov. |
|-----------------------------------|--|------------------|--|------------------------|--|
| Maxilla 2 outer plate | separated | fused | fused | separated | separated |
| Gnathopod 2 palmar margin (male) | moderately concave | convex | concave | moderately concave | moderately convex |
| Coxa 2 posterior margin | n/a | rounded | rounded | rounded and concave | straight |
| Uropod 2 rami medial margin setae | 2 or more robust setae | 1 robust setae | 2 or more robust setae | 2 or more robust setae | 1 robust seta |
| Uropod 3 article length | article 2 slightly longer than article 1 | subequal | article 2 distinctly longer than article 1 | articles subequal | article 2 distinctly longer than article 1 |
| Uropod 3 article 2 surface | rugose | rugose | not rugose | rugose | not rugose |

Stenothoe irakiensis Salman, 1985 (junior synonym: *S. gallensis* Walker, 1904); *S. irinae* Marin & Sinelnikov, 2018; *S. nhatrangensis* Marin & Sinelnikov, 2018; *S. andamanensis* Krapp-Schickel, 2015.

second maxilla is also present in *S. andamanensis* Krapp-Schickel, 2015, but the new species can be recognized by: uropod 2 with only one robust seta on medial margin of rami (versus 2 or more robust setae in *S. andamanensis*); uropod 3, article 2 distinctly longer than article 1 (length subequal in *S. andamanensis*); and uropod 3 article 2 not rugose (article 2 rugose in *S. andamanensis*).

From *S. nhatrangensis* Marin & Sinelnikov, 2018, *S. lowryi* can be distinguished by the following features: maxilla 2 outer plate with separated articles (fused in *S. nhatrangensis*); gnathopod 2 palmar margin of male moderately convex (concave in *S. nhatrangensis*); coxa 2 posterior margin straight (rounded in *S. nhatrangensis*); and uropod 2 with only one robust seta on the medial margin of the rami (with two or more robust setae in *S. nhatrangensis*).

Finally, *S. lowryi* sp. nov. can be distinguished from *S. irinae* Marin & Sinelnikov, 2018 by: maxilla 2 outer plate with separated articles (fused in *S. irinae*); coxa 2 posterior margin straight (rounded in *S. irinae*); uropod 3 article 2 distinctly longer than article 1 (subequal in length in *S. irinae*); and uropod 3 article 2 not rugose (article 2 rugose in *S. irinae*).

Distribution. Pangkor Island, Peninsular Malaysia.

Discussion

Of the cosmopolitan species of *Stenothoe*, *S. gallensis* Walker, 1904 is one of the most widespread, recorded from localities ranging from East Africa (Indian Ocean) to South China Sea (Krapp-Schickel, 2015). Prior to the excellent summary by Krapp-Schickel (2015) of the problems associated with available names for species of the “*Stenothoe gallensis* group”, *S. gallensis* had been reported from many disparate localities around the world (Table 2). In the

Table 2. Literature records of *Stenothoe gallensis* Walker, 1904; * indicates type locality.

| location | author | illustrations |
|--------------------------|----------------------------|---------------|
| Indian Ocean | | |
| * Galle, Sri Lanka | Walker (1904) | yes |
| East coast, India | Sivaprakasam (1968) | no |
| Madras Coast, India | Nayar (1959) | yes |
| Dar-es-Salaam | Schellenberg (1928) | no |
| Seychelles | Walker (1909) | no |
| Zanzibar | Walker (1909) | no |
| Mauritius | Ledoyer (1978) | no |
| Tuléar, Madagascar | Ledoyer (1972, 1979, 1986) | yes |
| Mozambique | Griffiths (1973) | no |
| South-eastern Africa | K. H. Barnard (1916, 1925) | no |
| Natal | Griffiths (1974a, b) | no |
| Red Sea | K. H. Barnard (1937) | no |
| Red Sea | Ruffo (1969) | no |
| Suez Canal | Monod (1937) | yes |
| Atlantic Ocean | | |
| Banjul, Gambia | Reid (1951) | yes |
| Roscoff, France | Chevreaux & Fage (1925) | yes |
| Plymouth, England | Lincoln (1979) | yes |
| Puerto Rico | Shoemaker (1935) | yes |
| Cuba | Ortiz & Lalana (1993) | no |
| North Carolina Estuaries | Williams & Bynum (1972) | no |
| Chesapeake Bay, USA | Feeley & Wass (1971) | no |
| York River, Va, USA | Marsh, 1973 | no |
| Pacific Ocean | | |
| Hong Kong | Ren (1994) | yes |
| Seto Inland Sea, Japan | Nagata (1965) | no |
| French Polynesia | Chevreaux (1907, 1908) | yes |

Indian Ocean (excluding the Red Sea), *S. gallensis* has been reported from at least 11 different localities but only three of these records can be confirmed. Only one of the three records from the Red Sea is illustrated (Monod, 1937), but not well enough for identification. *Stenothoe gallensis* has been reported at least eight times from the Atlantic Ocean, in refereed journals, but also on government websites recording invasive species along the east coast of the United States; in only four cases are the records illustrated (Chevreux & Fage, 1925; Shoemaker, 1935; Reid, 1951; Lincoln, 1979). In the Pacific Ocean there are four records from disparate localities (Chevreux, 1907, 1908; Nagata, 1965; Ren, 1994). Ren's (1994) record from Hong Kong is well documented and illustrated but only record from Japan (Nagata, 1965) is not illustrated with no chance of confirmation. Amazingly, this small tropical amphipod has been reported from all oceans except the Arctic Sea and the Southern Ocean. This paper increases the number of stenothoids from Southeast Asia and neighbouring regions (Azman *et al.*, 2022; Marin & Sinelnikov, 2018) from four to five, all being attributed to the genus *Stenothoe*. It also demonstrates the diversity of stenothoid amphipods in this region may be much greater than previously assumed.

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