

A new species in the genus *Heteromysoides* (Crustacea, Mysida, Mysidae) from Songkhla Lagoon, southern Thailand

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Abstract

A new mysid, *Heteromysoides songkhlaensis*, is reported from shallow water in the Songkhla Lagoon, southern Thailand. The new species is closely similar to *H. nana* in having a triangular rostrum and the eyestalk without a process at the anteromesial corner. However, the new species can be readily distinguished from *H. nana* by three setae on the inner margin and five setae on distal margin of the second segment of the mandibular palp; the carpopropodus of the fifth and sixth thoracic endopod of the new species is composed of four articles, and the telson of the new species is distally rounded, shorter than the sixth abdominal somite, and 1.3 times longer than its basal width; the spines on the telson form elongated spines from the distal to posterior margin. The new species also resembles *H. dennisi*, *H. simplex*, and *H. stenoura*; however, it differs by (1) the presence of a rounded distal margin of telson, and (2) absence of a sharp process on the distolateral corner of the eyestalk.

Key Words

Brackish water, *Heteromysoides songkhlaensis*, Thale Sap, Thale Sap Songkhla

Introduction

In Southeast Asia, about 210 species in the order Mysida (Crustacea) have been reported (Sawamoto 2014), and 48 of these species have been documented in Thailand (Tattersall 1921; Murano 1988, 1995; Fukuoka and Murano 2002; Hanamura et al. 2008, 2011; Moriya et al. 2015). Information about the mysid fauna in the Songkhla Lagoon system of southern Thailand has not been updated since Tattersall (1921), who reported *Rhopalophthalmus egregius* Hansen, 1910 and *Nanomysis siamensis* W. Tattersall, 1921.

During a study of variability of the recruitment abundance of *Metapenaeus* spp. in the hyperbenthos of Thale Sap and Thale Sap Songkhla in the Songkhla Lagoon system in 2018, several mysid specimens were collected. Among them, an undescribed species was discovered. The species showed morphological characteristics of the

genus *Heteromysoides* Băcescu, 1968: (1) the cornea of the eye, which is restricted to the anterolateral part of the eyestalk, is reduced in size, and (2) the pleopods are not sexually dimorphic. The known species of the genus primarily occupy shallow marine waters, including marine caves, in the tropical and subtropical regions of the world.

To date, 10 species have been reported in the genus *Heteromysoides*: *H. berberae* Băcescu & Müller, 1985 from Somalia, east Africa; *H. cotti* Calman, 1932 from the Canary Islands; *H. dennisi* Bowman, 1985 from the Caribbean Sea; *H. longiseta* Băcescu, 1983 from Heron Island, eastern Australia; *H. macrops* Murano, 1988 from northern Australia; *H. nana* Murano, 1998 from Channel Island, Northern Territory, Australia; *H. sahuensis* Murano, 1998 from the Sahul Shelf, Australia; *H. simplex* Han-

amura & Kase, 2001 from Okinawa, Japan; *H. spongicola* Băcescu, 1968 from Cuba and Grand Cayman; and *H. stenoura* Hanamura & Kase, 2004 from the Caribbean Sea.

In this paper, *Heteromysoides songkhlaensis* is newly described based on specimens collected in the Songkhla Lagoon system. This, the fourth mysid species known to occur in the Songkhla Lagoon and also the 49th in Thailand, is newly added to the Southeast Asian mysid fauna.

Material and methods

The Songkhla Lagoon system, also known as Songkhla Lake, is a large, shallow body of water located on the east coast of the Thai Peninsula in southern Thailand situated between 7°08'N and 7°48'N and between 100°07'E and 100°35'E. The lagoon system covers approximately 1,082 km² and comprises four distinct bodies of water: Thale Noi, Thale Luang, Thale Sap, and Thale Sap Songkhla (Fig. 1). The lagoon exhibits three water regimes, fresh, brackish, and salt water, which are arranged from north to south, respectively. The salty, southern end of the lagoon is connected to the Gulf of Thailand. Within the lagoon system, salinity ranges from 0 to 34 psu in Thale Sap Songkhla to almost zero in Thale Noi. In both Thale Sap and Thale Sap Songkhla, the substratum is primarily mud.

Specimens were collected by using a modified Riley's hand-pushed net. Its mouth frame was 30 × 50 cm (height × width), the mesh sizes were 2 mm and 0.5 mm, and its side length 2.5 m. The net was pushed forward for 30 m along the shallow zone of Songkhla Lagoon at seven stations (Fig. 1). The specimens collected were fixed in 4% formalin in the field and brought back to the laboratory. In the laboratory, mysid specimens were sorted and then transferred to 70% ethanol for further study.

Using a micrometer installed in the eyepiece of the microscope, body length (BL) was measured from the tip of the rostrum to the distal end of the telson, excluding apical denticles. Illustrations were made with the aid of a camera lucida. The marginal setae of some appendages, especially the antennal scale, thoracopodal exopods, and uropod, were omitted from the illustrations. Terminology was based mainly on Tattersall and Tattersall (1951) and Wittmann et al. (2014). Specimens examined in this study are deposited in the collection of Prince of Songkla University Zoological Collection (PSUZYC), at the Princess Maha Chakri Sirindhorn Natural History Museum, Prince of Songkla University in Hat Yai, Songkhla, Thailand; Phuket Marine Biological Centre (PMBC) in Phuket, Thailand; Zoological Reference Collection (ZRC) of the Lee Kong Chian Natural History Museum, National University of Singapore and National Museum of Nature and Science, Tokyo (NSMT), Japan.

Systematic account

Heteromysoides songkhlaensis sp. nov.

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Figs 2–4

Type material. Holotype. Adult male (BL 3.2 mm) (NMST-Cr 26744), Thale Sap, 7°20'58.68"N, 100°25'31.56"E, Ban Bang Khiat, Tambon Bang Khiat, Singha-Nakhon District, Songkhla Province, Thailand, 19 January 2019, at 1.3 m of depth with salinity of 0.39 psu, over a muddy substrate, coll. V. Lheknim, N. Tubtimtong and R. Yolanda.

Allotype. Adult female with empty marsupium (BL 3.7 mm) (PSUZYC 20190119-02.01), Thale Sap Songkhla, 7°15'18.77"N, 100°28'11.86"E, Ban Pa Khad, Singha-Nakhon District, Songkhla Province, Thailand, 19 January 2019, at 1.3 m of depth with salinity of 0.47 psu, over a muddy substrate, coll. V. Lheknim, N. Tubtimtong and R. Yolanda.

Paratypes. 1 adult male (BL 3.6 mm, dissected) (NSMT-Cr 26745), Thale Sap, 7°19'34.50"N, 100°24'31.45"E, Ban Koh Nang Kum, Koh Nang Kum, Pak Payoon District, Phattalung Province, Thailand, 18 May 2018, at 1.3 m of depth with salinity of 3.68 psu, over muddy substrate, coll. V. Lheknim, N. Tubtimtong and R. Yolanda; 1 adult male (BL 3.4 mm, dissected) (PSUZYC 20180618-01.01) Thale Sap Songkhla, 7°13'14.67"N, 100°31'24.12"E, Ban Bo Pab, Sathing Mor, Singha-Nakhon District, Songkhla Province, Thailand, 18 June 2018, at 1 m of depth with salinity of 1.67 psu, over muddy substrate, coll. V. Lheknim, N. Tubtimtong and R. Yolanda.

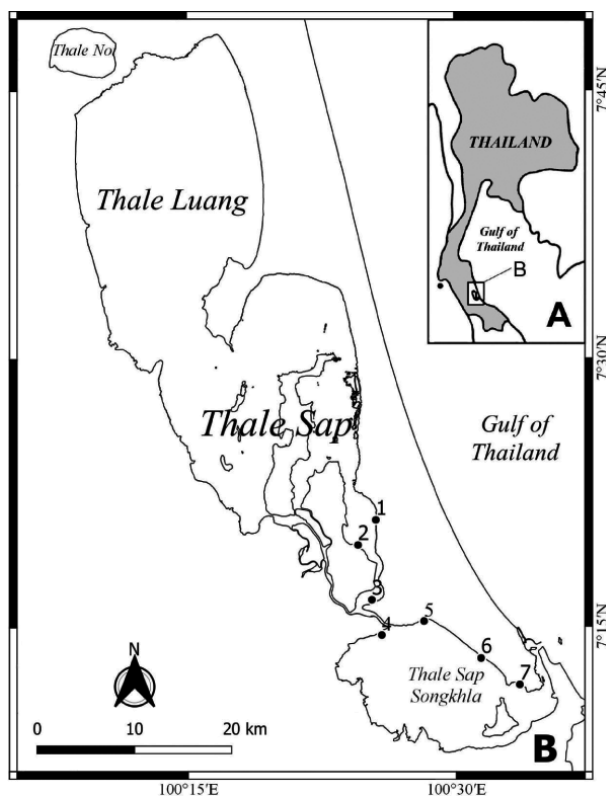


Figure 1. The map of the Songkhla Lagoon system, southern Thailand, shows seven sampling stations (black dot) where *Heteromysoides songkhlaensis* sp. nov. was collected. St. 1. Ban Bang Khiat; St. 2. Ban Koh Nang Kum; St. 3. Ban Laem Chak; St. 4. Ban Tai; St. 5. Ban Pa Khad; St. 6. Ban Bo Pab; St. 7. Ban Hua Khao.

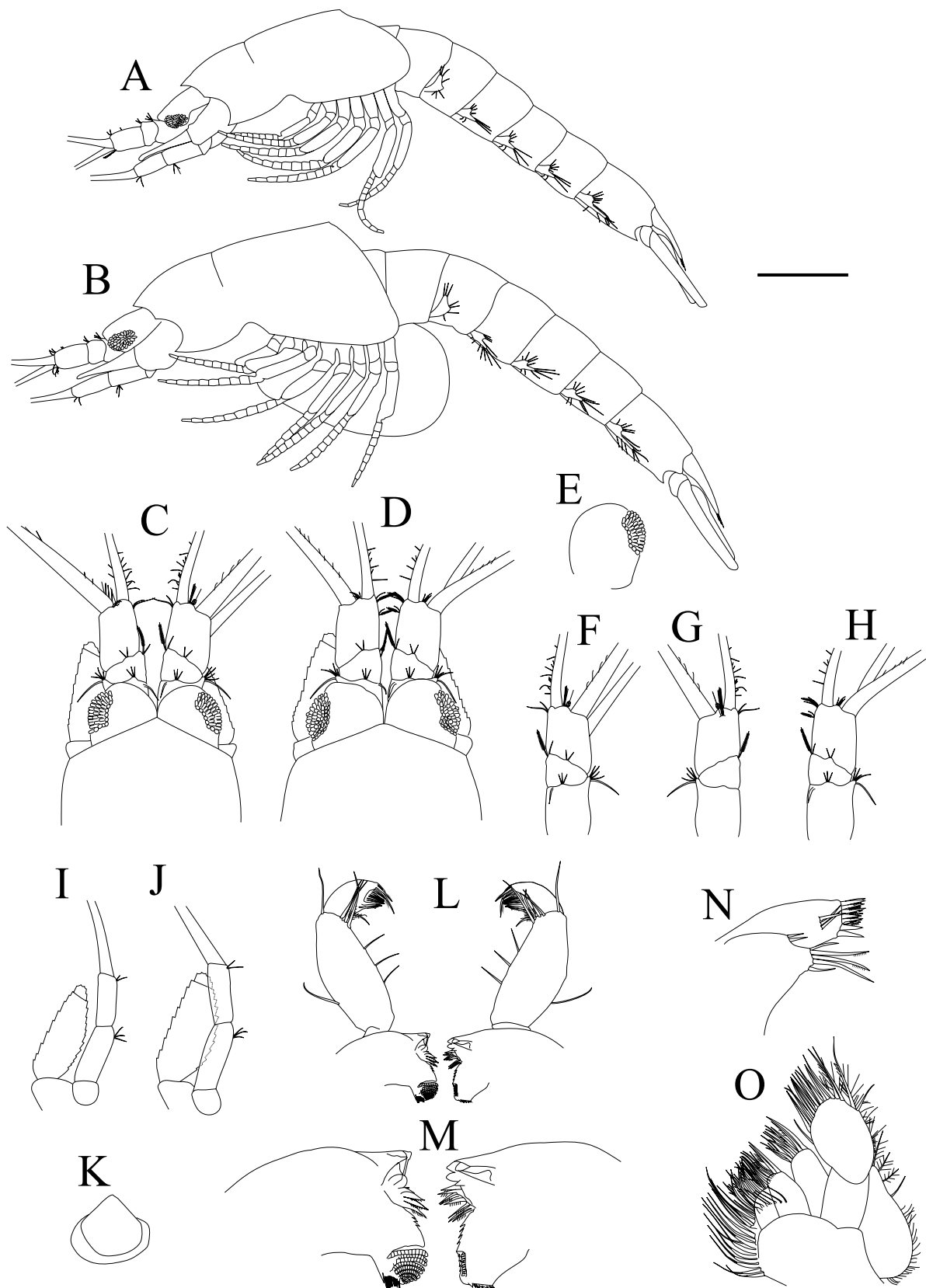


Figure 2. *Heteromysoides songkhlaensis* sp. nov. Holotype, male (BL 3.2 mm, A, C, E, F, G, I) (NSMT-Cr 26744), allotype, female (BL 3.7 mm, B, D, H, J) (PSUZC 20190119-02.01), paratype, male (BL 3.6 mm, L–O) and female (BL 3.6 mm, K) (ZRC 2019.1095). A, B. Lateral view of whole body; C, D. Dorsal view of anterior body; E. Dorsal view of right eye; F, H. Dorsal view of right antennule; G. Ventral view of right antennule; I, J. Ventral view of antenna; K. Ventral view of labrum; L. Ventral view of mandibles with palps; M. External view of mandibles enlarged; N. Right maxillule; O. Right maxilla. Scale bars: 0.5 mm (A, B); 0.3 mm (C, D, F–J); 0.2 mm (L); 0.1 mm (E, K, M–O).

nim, N. Tubtintong and R. Yolanda; 1 adult male (BL 3.5 mm, dissected) (PMBC 11806), Thale Sap, 7°20'58.68"N, 100°25'31.56"E, Ban Bang Khiat, Tambon Bang Khiat, Singha-Nakhon District, Songkhla Province, Thailand, 18 July 2018, at 0.6 m of depth with salinity of 2.72 psu, over a muddy substrate, coll. V. Lheknim, N. Tubtintong and R. Yolanda; 1 adult female (BL 3.7 mm, dissected) (PMBC 11807), Thale Sap, 7°16'30.89"N, 100°25'17.21"E, Ban Laem Chak, Pak Ror, Singha-Nakhon District, Songkhla Province, Thailand, 18 April 2018, at 1.5 m of depth with salinity of 15.1 psu, over muddy substrate, coll. V. Lheknim, N. Tubtintong and R. Yolanda; 1 adult female (BL 3.1 mm, dissected) (NSMT-Cr 26746), Thale Sap Songkhla, 7°11'45.16"N, 100°33'33.76"E, Ban Hua Khao, Hua Khao, Singha-Nakhon District, Songkhla Province, Thailand, 18 April 2018, at 1.4 m of depth with salinity of 24.8 psu, over a muddy substrate, coll. V. Lheknim, N. Tubtintong and R. Yolanda; 2 adult females (BL 3.2 mm [dissected], 3.6 mm [not dissected]) (NSMT-Cr 26747), Thale Sap, 7°20'58.68"N, 100°25'31.56"E, Ban Bang Khiat, Tambon Bang Khiat, Singha-Nakhon District, Songkhla Province, Thailand, 18 May 2018, at 1.1 m of depth with salinity of 7.43 psu, over muddy substrate, coll. V. Lheknim, N. Tubtintong and R. Yolanda; 2 adult males (BL 3.6 mm, [dissected], 4.0 mm [not dissected]); 1 adult female (BL 3.6 mm, dissected) (ZRC 2019.1095), Thale Sap Songkhla, 7°14'32.41"N, 100°25'50.57"E, Ban Tai, Pak Ror, Singha-Nakhon District, Songkhla Province, Thailand, 18 November 2018, at 1.2 m of depth with salinity of 5.25 psu, over muddy substrate, coll. V. Lheknim, N. Tubtintong and R. Yolanda.

Description. Head and cephalic appendages. Carapace with anterior margin obtusely produced into wide, triangular rostrum (Fig. 2C, D); cervical groove distinct at anterior two-fifths, posterior margin excavated, leaving last thoracic somite uncovered in dorsal view, but sufficiently covered laterally (Fig. 2A, B); antero-ventral corner rounded (Fig. 2A, B). Eye slightly depressed, subglobular in dorsal aspect; cornea comprise of small tube-like ommatidia situated in antero-lateral part without ocular process (Fig. 2C–E). Antennule with first segment of peduncle longer than wide, with dorsal projection bearing 3 setae (Fig. 2F, H); distolateral corner of first segment greatly produced anteriorly, distal part with 5 setae; second segment shortest, with dorsal projection bearing 2 setae and distal part with 2 setae; third segment subequal to first segment, with dorsal projection bearing 4 setae dorsally, middle part with 2 setae at the mesial margin for female while no seta on male, respectively and 2 setae at distomesial corner for male while 3 setae for female; the lobe completed with several long setae on male (Fig. 2G) while no long setae on female. Antennal peduncle more robust in male than female and reaching 0.8 length of antennular peduncle and the sympod rounded (Fig. 2I, J); antennal scale elongated, elliptical with apical suture, setose all round, reaching middle part of third segment of antennular peduncle, nearly 3 times as long as wide, not reaching distal end of antennal peduncle (Fig. 2I, J). La-

brum triangular, without process or spine in anterior part but with expanded disto-lateral parts (Fig. 2K). Mandibular palp 3-segmented, second segment longest and widened at mid-length, with barbed setae on both margins, 3 on middle part of inner margin, 1 seta on proximal part of outer margin and 5 setae on the distal margin of the second segment (Fig. 2L); incisor process well developed and comprised of a series of teeth forming serrated sharp ridge; lacinia mobilis showing different shape in right and left mandibles, and spine row and molar process clearly visible (Fig. 2M). Maxillule well developed, basal lobe with spines densely, wider than precoxal lobe (Fig. 2N). Maxilla with 4 distal setae and smooth setae on exopod (Fig. 2O); distal segment of endopod longer than proximal one; basal and coxal endites well developed, with dense setae.

Thoracopods. Flagelliform part of first and eighth thoracopodal exopods composed of 8 segments (Figs 3A, 4C), while second to seventh thoracopodal exopods with 9 segments (Figs 3C, E, G, I, 4A, B). First thoracopodal endopod short and basis well developed, larger than endite; medial margins of carpus, propodus and dactylus heavily setose (Fig. 3A, B). Second thoracopodal endopod stout (Fig. 3C); basis with 2 setae; preischium with 1 seta, shorter than basis; ischium longer than preischium with 6 setae; merus longest, with 2 setae; carpopropodus 0.75 times as long as merus, with several barbed setae (Fig. 3D); dactylus 0.5 times as long as carpopropodus, 1.6 times as long as width, with several barbed setae (Fig. 3D). Third and fourth thoracopodal endopods similar in form (Fig. 3E, G) and more slender than second (Fig. 3C); basis with 2 setae; ischium slightly longer than merus, with 4–6 setae on inner margin; merus slightly shorter than carpopropodus; carpopropodus constituting 3 sub-segments with barbed setae, basal segment longest and second shortest; dactylus short, apex with long barbed seta and several setae (Fig. 3E–H). Fifth thoracopodal endopod longest (Fig. 3I), with similar morphological characters to sixth, seventh, and eighth (Fig. 4A–C). Sixth thoracopodal endopod (Fig. 4A) subequal in length to seventh and eighth (Fig. 4B, C); basis with 1 seta, ischium longer than merus, with several setae; merus with 6 setae; carpopropodus constituting 4 sub-segments, with several setae, basal segment longest, third segment shortest; dactylus short, with several setae. Penis (Fig. 4C) long, 0.8 times as long as ischium of eighth thoracopodal endopod, apex rounded, with several smooth setae.

Pleon and pleopods. Abdominal somites smooth, without hairs, spines or folds, ventral sternites without process, anterior 5 somites subequal in length, sixth somite 1.3 times as long as preceding somite (Fig. 2A, B). Five pleopods reduced to unsegmented lobes, not modified; first pleopod shortest, second to fourth ones subequal in length and fifth pleopod longest, 1.6 times as long as fourth (Fig. 4D–H).

Uropod and telson. Uropodal endopod slightly shorter than exopod, without spine on ventral side of statocyst region (Fig. 4I). Telson (Fig. 4K–N) subtriangular, 0.8 times as long as sixth abdominal somite, 1.3 times as long as basal width, excluding apical denticles, with 11–18 ar-

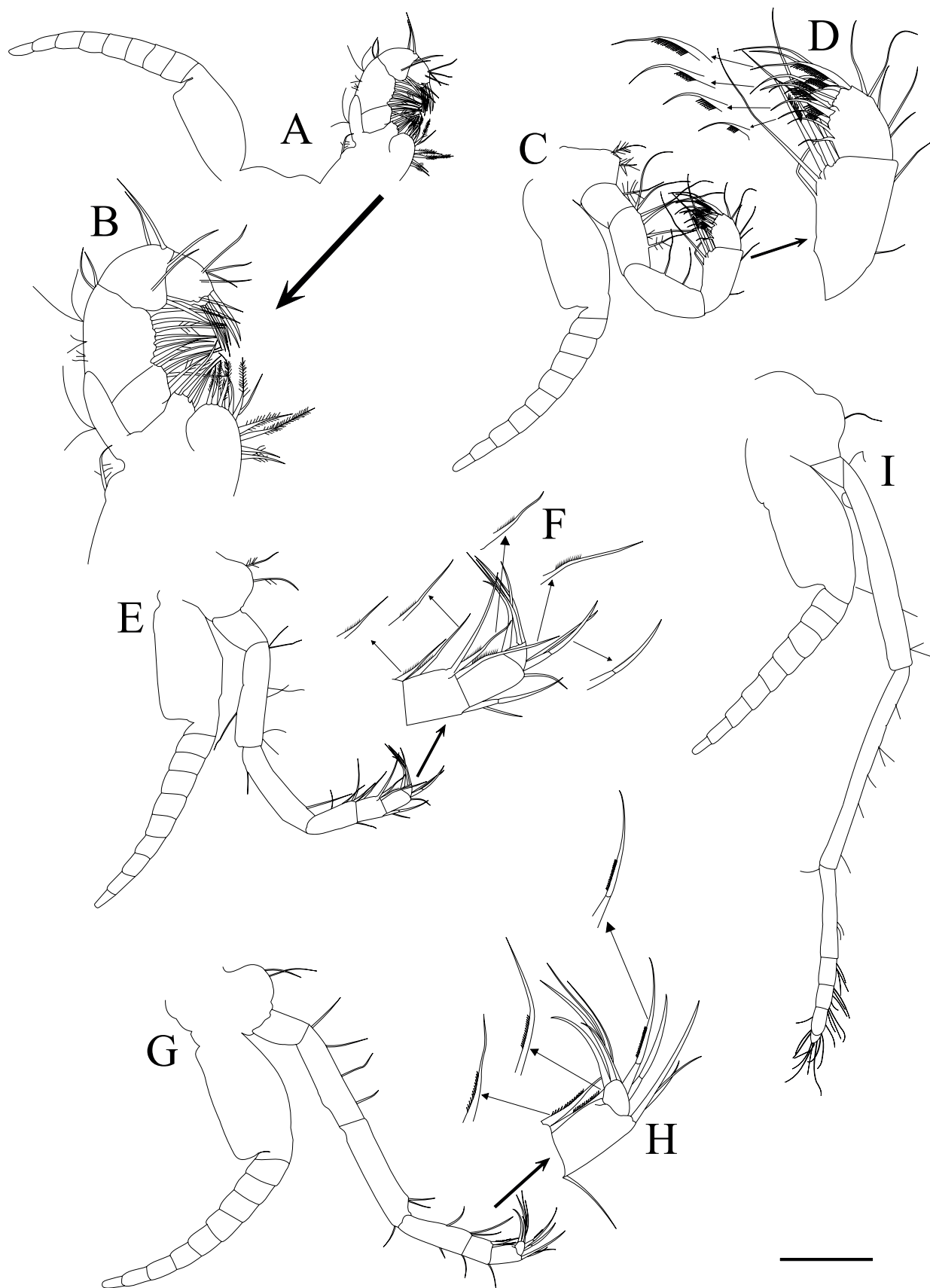


Figure 3. *Heteromysoides songkhlaensis* sp. nov. Paratype, male (BL 3.6 mm, A–I) (ZRC 2019.1095). A. Right first thoracopod; B. Right first thoracopodal endopod enlarged; C. Right second thoracopod; D. Carpopropodus, dactylus and setae enlarged; E. Right third thoracopod; F. Distal part of carpopropodus, dactylus and setae enlarged; G. Right fourth thoracopod; H. Distal part of carpopropodus, dactylus and setae enlarged; I. Left fifth thoracopod. Scale bar: 0.2 mm (A, C, E, G, I); 0.1 mm (B, D, F, H).

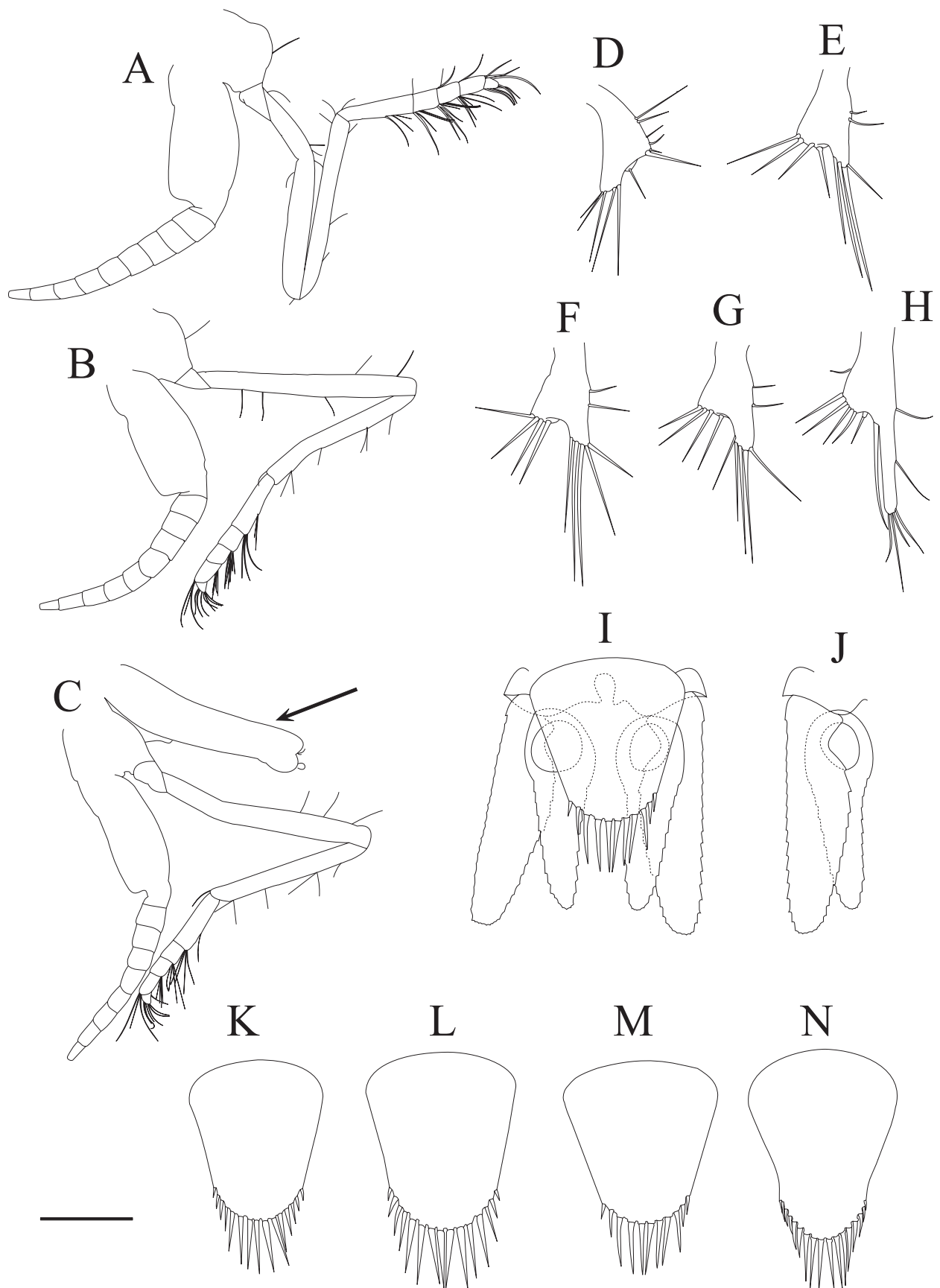


Figure 4. *Heteromysoides songkhlaensis* sp. nov. Holotype, male (BL 3.2 mm, **D–H, K**), (NSMT-Cr 26744), allotype, female (BL 3.7 mm, **L**) (PSUZC 20190119-02.01), paratype, male (BL 3.6 mm, **A–C, I, J, M**) and female (BL 3.6 mm, **N**) (ZRC 2019.1095). **A.** Right sixth thoracopod; **B.** Right seventh thoracopod; **C.** Right eighth thoracopod; **D–H.** Right first to fifth pleiopods; **I.** Dorsal view of telson and uropods; **J.** Ventral view of right uropod; **K–N.** Dorsal view of telson. Scale bars: 0.2 (**A–C, I–N**); 0.1 mm (**D–H**).

Table 1. Body length and the number of spines on the telson of *Heteromysoides songkhlaensis* sp. nov. from Songkhla lagoon, southern Thailand.

No.	Type of specimen	Sex	Body length (mm)	Number of spines
1	Holotype	Male	3.2	15
2	Paratype	Male	3.4	12
3	Paratype	Male	3.5	13
4	Paratype	Male	3.6	14
5	Paratype	Male	3.6	11
6	Paratype	Male	4.0	18
Range			3.2–4.0	11–18
7	Allotype	Female	3.7	15
8	Paratype	Female	3.1	12
9	Paratype	Female	3.2	17
10	Paratype	Female	3.6	19
11	Paratype	Female	3.6	17
12	Paratype	Female	3.7	16
Range			3.1–3.7	12–19

ticulated denticles in males and 12–19 in females on distal quarter margin (Table 1), increasing in length distally.

Etymology. This species is named after the locality, Songkhla Lagoon, where of the specimens were found.

Distribution. This species was captured in brackish waters above a muddy substratum at Thale Sap and Thale Sap Songkhla, Songkhla Lagoon, southern Thailand.

Discussion

Heteromysoides songkhlaensis is closely similar to *H. nana* in (1) having a triangular rostrum of the carapace, and (2) lacking a process at the anteromesial of the eyestalk. However, the new species can be distinguished from *H. nana* by several features: (1) the mandibular palp displays three setae on the inner margin and five setae at the distal margin of the second segment as opposed to two setae on the inner margin and three setae at the distal margin of the second segment in *H. nana*; (2) the carpopropodi of the fifth and sixth thoracic endopods of the new species is composed of four articles compared to five articles in *H. nana*; (3) the telson of the new species is distally rounded, shorter than the sixth abdominal somite, and 1.3 times longer than its basal width, while in *H. nana* the telson is slightly concave, longer than the sixth abdominal somite, and 1.6 times longer than its basal width; and (4) the spines on the telson are noticeably different in their arrangement from those of *H. nana*.

The new species also exhibits similarities to several other *Heteromysoides* species, e.g. *H. dennisi*, *H. simplex*, and *H. stenoura*, in having (1) the telson without a cleft or sinus at its distal end, and (2) the uropodal endopod without a spine on the inner mesial margin. However, the new species differs from them in having (1) the eyestalk without a sharp process at the disto-lateral part, and (2) the telson rounded, not truncated, at the distal margin.

Several species from the family Mysidae in South-east Asia have been found from brackish to full-strength seawater, e.g. *Mesopodopsis orientalis* (e.g., Hanamura et al. 2008), *Acanthomysis thailandica* (e.g., Ramarn et al. 2012), and *Rhopalophthalmus* spp. (e.g., Hanamura et al. 2011). So far, all described species of *Heteromysoides* have been found in seawater, whereas the new species was found in brackish waters. Further study would be needed to elucidate the exact relationship of the current geographical pattern and the origin of *Heteromysoides* species.

Acknowledgements

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