

Taxonomic note on *Mesopodopsis tenuipes* Hanamura, Koizumi, Sawamoto, Siow et Chee, 2008 (Crustacea: Mysida: Mysidae) from Songkhla Lagoon, with an update of its distribution in Southeast Asian Waters

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ABSTRACT: A common Southeast Asian shallow-water mysid *Mesopodopsis tenuipes* Hanamura, Koizumi, Sawamoto, Siow et Chee, 2008 is reported and described from Songkhla Lagoon, southern Thailand. Previously, this species was recorded in the province of Samut Songkhrum, in the northern/upper part of the Gulf of Thailand. The labrum and thoracopods 3, 4 and 5 are illustrated and described for this species for the first time. The distribution of this species in Southeast Asian waters and an update identification key to the species of *Mesopodopsis* are provided.

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KEY WORDS: Mysid shrimp, Songkhla Lagoon, Thale Sap Songkhla, distribution, *Mesopodopsis*.

Таксономические заметки о виде *Mesopodopsis tenuipes* Hanamura, Koizumi, Sawamoto, Siow et Chee, 2008 (Crustacea: Mysida: Mysidae) из лагуны Сонгкхла, с новыми данными по распределению вида в водах Юго-Восточной Азии

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РЕЗЮМЕ: Широко распространенный на мелководьях Юго-Восточной Азии вид мизид *Mesopodopsis tenuipes* Hanamura, Koizumi, Sawamoto, Siow et Chee, 2008 обнаружен в озере Сонгкхла, южный Таиланд, исследована его морфология. Ранее, вид был обнаружен в провинции Самутсонгхрам, в северной части Таиландского залива. Впервые описано строение лябрума и торакоподов 3, 4 и 5 этого вида. Приведены данные по распределению вида в Юго-Восточной Азии, и обновленный определительный ключ для рода *Mesopodopsis*.

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КЛЮЧЕВЫЕ СЛОВА: мизиды, озеро Сонгкхла, Thale Sap Songkhla, распределение, *Mesopodopsis*.

Introduction

The genus *Mesopodopsis* Czerniavsky, 1882 is a widely distributed mysid genus presently composed of 8 species, namely *Mesopodopsis aegyptia* Wittmann, 1992, *M. africana* O.S. Tattersall, 1952, *M. orientalis* (W.M. Tattersall, 1908), *M. slabberi* (van Beneden, 1861), *M. tenuipes* Hanamura, Koizumi, Sawamoto, Siow et Chee, 2008, *M. tropicalis* Wittmann, 1992, *M. wooldridgei* Wittmann, 1992 and *M. zeylanica* Nouvel, 1954. Some of these species can be easily found in the shallow zone of tropical to temperate waters (Delgado *et al.*, 1997; Azeiteiro *et al.*, 1999; Hanamura *et al.*, 2008a, 2009; Biju, Panampunnayil, 2010; Carrasco, 2011). In Thailand, two of these species, *M. orientalis* (W.M. Tattersall, 1908) and *M. tenuipes* Hanamura, Koizumi, Sawamoto, Siow et Chee, 2008 have been reported from the Gulf of Thailand (Hanamura *et al.*, 2008b).

The study of the mysid fauna in the Songkhla Lagoon is very limited. The first information about mysid diversity in this lagoon was reported by W.M. Tattersall (1921) with two recorded species, *Nanomysis siamensis* W.M. Tattersall (1921) and *Rhopalophthalmus egregius* Hansen (1910). In 2019, a species of the genus *Deliamysis* Bowman et Orsi, 1992 (previously as *Heteromysoides*) was found and named after this lagoon (see Yolanda *et al.*, 2019; Daneliya, 2021), and after a century, further information about taxonomy and distribution of *N. siamensis* W.M. Tattersall (1921) was added (Yolanda *et al.*, 2022). A preliminary investigation of the abundance and occurrence of *M. tenuipes* in this lagoon was reported, where this species was

more abundant during the dry season at the Thale Sap Songkhla (see Lheknim et Yolanda, 2020); however, its morphological characteristics have not ever been described from this lagoon. Previously, *M. tenuipes* was identified as *M. orientalis*, but, after morphological observation and molecular examination, *M. tenuipes* was separated from *M. orientalis* (Hanamura *et al.*, 2008b). However, some parts of the appendages from the *M. tenuipes* were not described and illustrated in the original description, presented by Hanamura *et al.* (2008b). In this study, we provide a complete description of *M. tenuipes* from Songkhla Lagoon, southern Thailand.

Material and methods

Samples were collected in the shallow zone of the Thale Sap Songkhla, Songkhla Lagoon system using a Riley hand push net with dimension of 30 × 50 cm (height × width), equipped with two 2.5 m long nets (mesh-size: 2 mm and 0.5 mm). The collected specimens were kept in bottles containing lagoon water with 4% formalin and rose bengal solution, then transported to the laboratory at the Prince of Songkla University for identification. In the laboratory, all samples were sorted and identified according to Hanamura *et al.* (2008b). A total of 20 individuals (10 adult males and 10 adult females) were sent to Prof. Shozo Sawamoto, Tokai University, Japan, for identification and validation. Terminology follows W.M. Tattersall et O.S. Tattersall (1951), Wittmann *et al.* (2014) and Meland *et al.* (2015). Body length was measured from the tip of rostrum to the posterior part of the telson, excluding apical spines. Illustrations were performed by pencil drawings using a camera lucida with an ocular micrometer and digital inking using Adobe Illustrator

software. All specimens are stored in the bottle samples containing 70% ethanol and deposited in the Princess Maha Chakri Sirindhorn Natural History Museum, Prince of Songkla University in Hat Yai, Songkhla, Thailand.

Systematics

Order Mysida Boas, 1883

Family Mysidae Haworth, 1825

Genus *Mesopodopsis* Czerniavsky, 1882

Mesopodopsis tenuipes Hanamura, Koizumi,

Sawamoto, Siow et Chee, 2008

Figs 1, 2, 3.

Mesopodopsis orientalis: Tattersall, 1960: 180 (in part, not Tattersall); Tattersall, 1965: 91 (in part); Pillai, 1968: 16, figs. 2b, h, 4b, 5b, 6a, f, 7a.

Mesopodopsis tenuipes Hanamura et al., 2008b: 2473, figs 5, 6, 7D–F.

MATERIAL EXAMINED. Thailand, Thale Sap Songkhla (PSUZC 20180818-09.01) 2 adult males (BL 7.0 mm [not dissected], 6.7 mm [dissected]), 1 ovigerous female (BL 7.4 mm [not dissected]), 1 adult female (BL 8.1 mm [not dissected]), Ban Hua Khao, Tambon Hua Khao, Singha-Nakhon District, Songkhla Province, Thailand, 7°11'45.16"N, 100°33'33.76"E, 18.08.2018, coll. N. Tubtimtong, R. Yolanda and V. Lheknim.

DESCRIPTION. *Head and cephalic appendages:* Carapace covered with two layers; first layer extending to base of ocular peduncle and produced in a sub-triangular rostrum; anterolateral corner sub-triangular with a pair of short sub-acute apex behind ocular peduncle; second layer just above the first layer, anterior part with a rounded plate, posterolateral corner armed with a pair of sharp spines; cervical sulcus distinct at anterior 2/5 of carapace, posterior margin excavated, leaving 2 last thoracic somite uncovered in lateral view; posterolateral lobe moderately developed (Fig. 1A–D).

Eyes (Fig. 1C, D) sub-rectangular with a well-developed cornea extending to the second article of the antennular peduncle in dorsal view; cornea occupying two-fifths of whole eye in dorsal view and the width slightly wider than the eyestalk.

Antennule: antennular peduncle of male (Fig. 1C); first article longest, 2.7 times as long as broad, sub-distal part with one long-simple seta and distal part with a few simple setae; second article shortest, 1.08 times as long as broad, bearing a few short simple setae at distal part; third article 1.48 times as long as broad and widened distally; male lobe well developed, subequal in length with the first article of antennular peduncle, fringed along fragile, mesial margin with long dense setae; inner margin of the outer flagellum bearing simple short thick setae,

inner flagellum without setae; antennular peduncle of female (Fig. 1D) more slender than male, first article longest 3.0 times as long as broad, sub-distal part with one long-simple seta and distal part with a few simple setae; second article shortest, 1.50 times as long as broad, bearing a few short simple setae at anterodistal part; third article 1.62 times as long as broad and widened distally, distal part with a few short simple setae; female lobe without dense setae, subequal in length with the first article of antennular peduncle; inner margin of the outer flagellum bearing simple short thick setae, inner flagellum without setae.

Antennae: Antennal scale in male extending to antennular peduncle without reaching the lob and antennal flagellum, lanceolate with obtuse apex, setose all around, with apical suture margin, about 2.18 times as long as greatest width; in female, antennal scale extending beyond antennular peduncle and reaching more than basal part of antennal flagellum, lanceolate with obtuse apex, setose all around, with apical suture margin, about 2.18 times as long as the longest axis in broad; sympod rounded; in male, antennal peduncle extending more than half of the scale, first article about 1.5 times as long as the second article; in female antennal peduncle shorter than male and reaching only the middle part of the scale, first article about 1.5 times as long as the second article; distal corner of the sympod bearing a short spine-like process (Fig. 1E, F).

Labrum (Fig. 1G) sub-hexagonal/sub-globular in shape, anterior part with a short and rounded projection without frontal spine; irregular lines present on surface.

Mandible (Fig. 1H, I): mandibular palp with three articles; first article shortest; second article longest and slightly widened at the middle part bearing six to seven short simple setae at the anterodistal part; third article about 1/3 length of the second article, armed with 16 to 17 short barbed setae, one long barbed seta and one short seta; incisor and lacinia mobilis showing different shapes in right and left mandibles, and spine row and molar process well-developed and clearly visible forming several teeth and spines.

Maxillule (Fig. 1J) well-developed, basal lobe with nine stout spines on apical margin and two setae on its surface; precoxal lobe smaller than basal lobe with three barbed setae.

Maxilla (Fig. 1K) exopod slender, reaching distal article of endopod, outer margin with six setae, one short plumose seta and apical margin with one long plumose seta; distal segment of endopod longer than proximal one; basal and coxal endites well-developed, with dense setae.

Thoracopods (Fig. 2A–I): flagelliform part of first thoracopodal exopods composed of eight articles, while second to eighth with nine articles. First

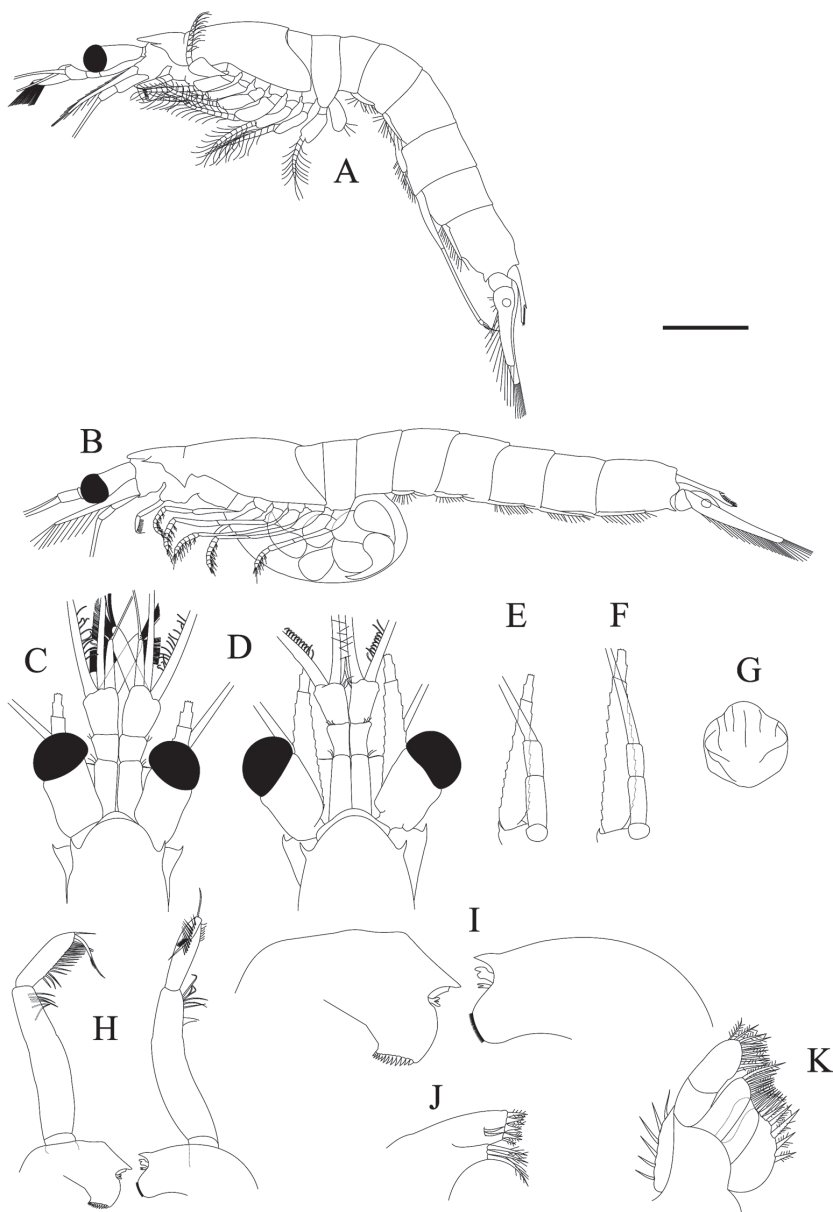


Fig. 1. *Mesopodopsis tenuipes* from Thale Sap Songkhla, Songkhla Lagoon, southern Thailand. Adult male (BL 7.0 mm, A, C, E; BL 6.7 mm, H–K), ovigerous female (BL 7.4 mm, B, D, F), adult female (8.1 mm, G) (PSUZC 20180818-09.01). A, B — habitus of male and female, lateral view; C, D — anterior part of the head, dorsal view; E, F — antennae, ventral view; G — labrum, ventral view; H — mandibles with palps, ventral view; I — external view of mandibles enlarged; J — right maxillule; K — right maxilla. Scale bar: A, B — 1.0 mm; C–F — 0.5 mm; G, H — 0.25 mm; I–K — 0.1 mm.

Рис. 1. *Mesopodopsis tenuipes* из Thale Sap Songkhla, озеро Сонгкхла, южный Таиланд. Взрослый самец (длина 7,0 мм, А, С, Е; длина 6,7 мм, H–K), яйценосная самка (длина 7,4 мм, В, D, F), взрослая самка (8,1 мм, G) (PSUZC 20180818-09.01). А, В — внешний вид самца и самки, вид сбоку; С, D — передняя часть головы, вид сверху; Е, F — антенны, вид снизу; G — лярбрум, вид снизу; H — мандибулы с щупиками, вид снизу; I — внешний вид мандибулы; J — правая максиллула; K — правая максилла. Масштаб: А, В — 1,0 мм; С–F — 0,5 мм; G, H — 0,25 мм; I–K — 0,1 мм.

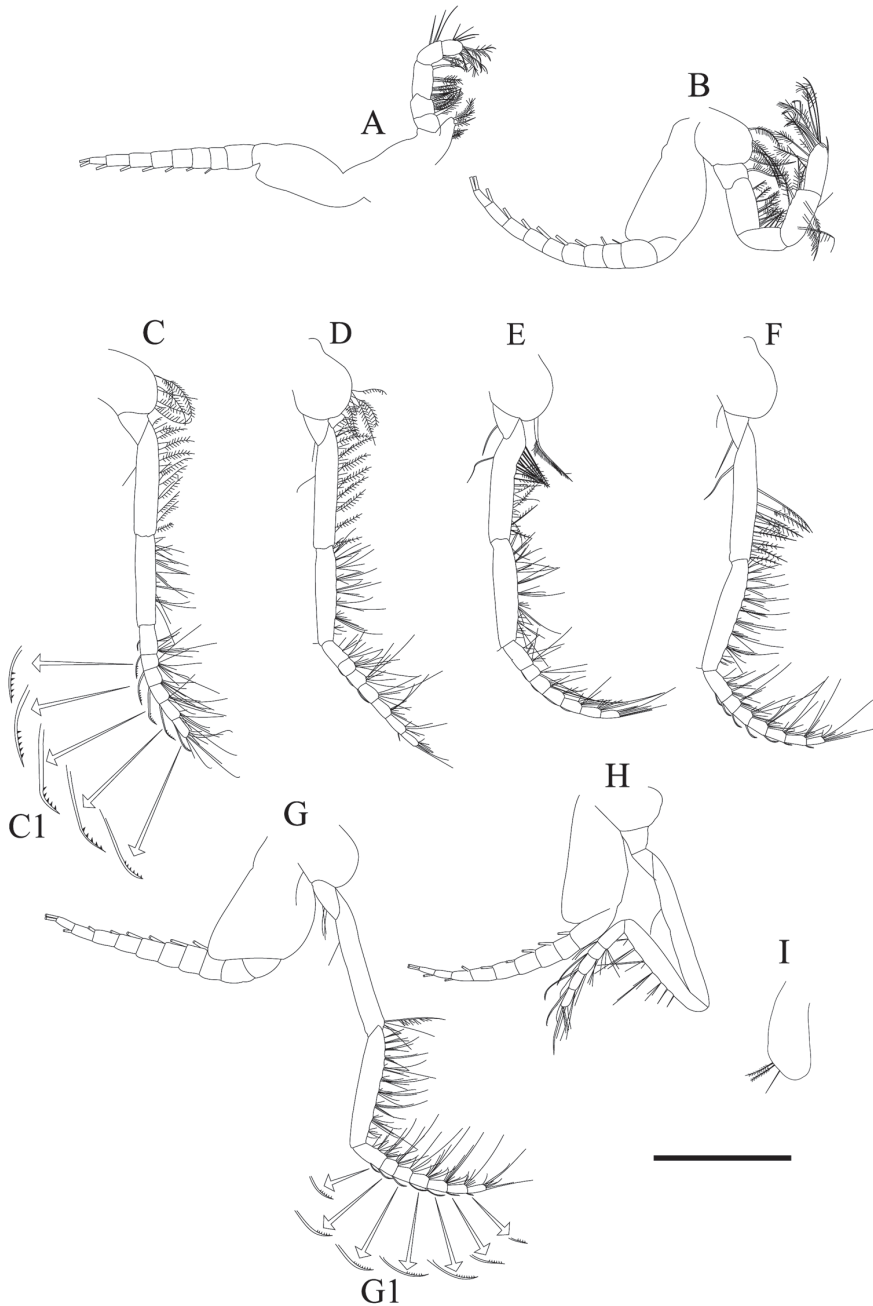


Fig. 2. *Mesopodopsis tenuipes* from Thale Sap Songkhla, Songkhla Lagoon, southern Thailand. Adult male (BL 6.7 mm, A–H) (PSUZC 20180818-09.01). A, B — right first and second thoracopod; C–F — right third to sixth thoracopodal endopod; G, H — right seventh and eighth thoracopod; I — right penis. Scale bar: A–I — 0.5 mm; C1, G1 — 0.1 mm.

Рис. 2. *Mesopodopsis tenuipes* из Thale Sap Songkhla, озеро Сонгкхла, южный Таиланд. Взрослый самец (длина 6,7 мм, А–Н) (PSUZC 20180818-09.01). А, В — первый и второй правые торакоподы; С–F — эндоподиты третьего–шестого правых торакоподов; G, H — седьмой и восьмой правые торакоподы; I — правый пенис. Масштаб: А–I — 0,5 мм; С1, G1 — 0,1 мм.

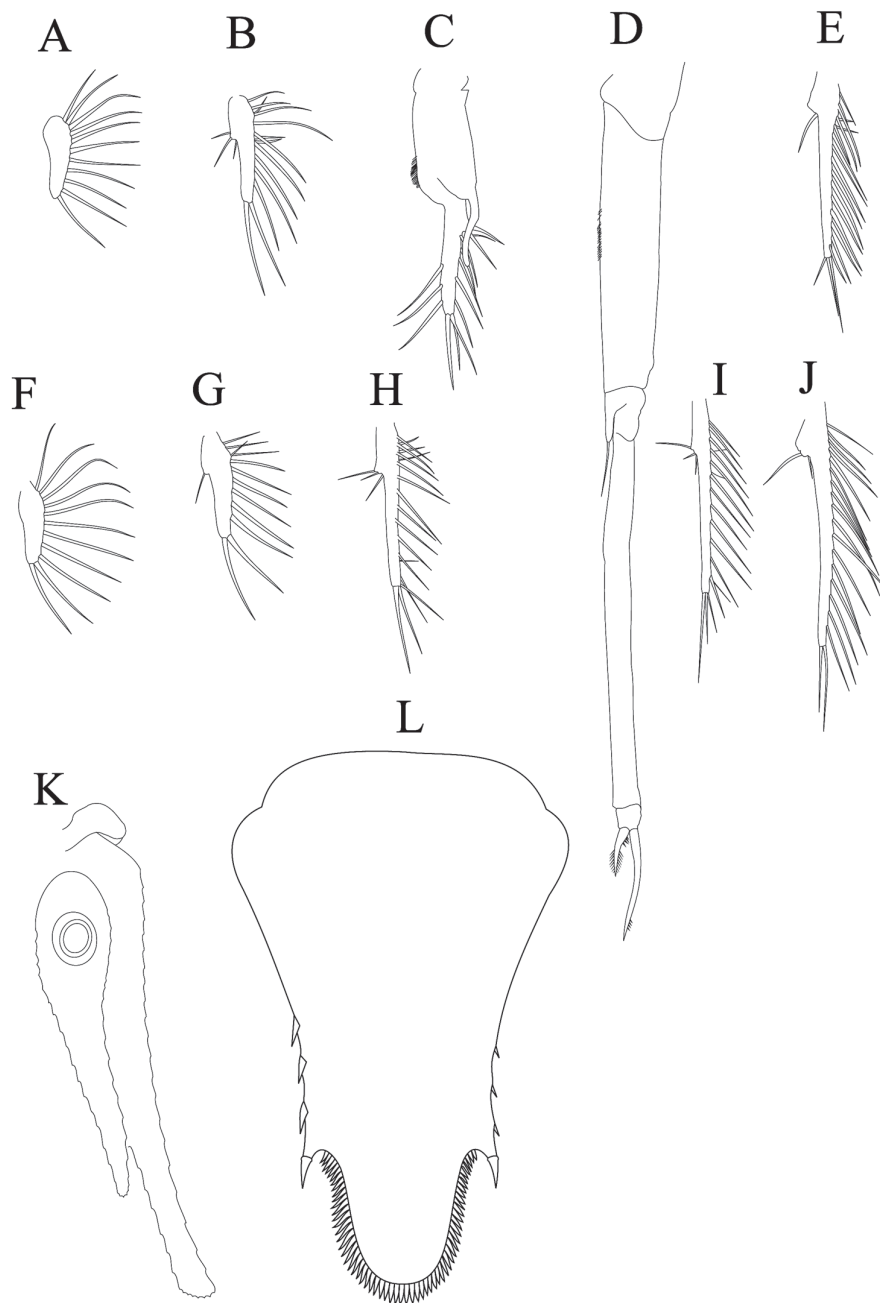


Fig. 3. *Mesopodopsis tenuipes* from Thale Sap Songkhla, Songkhla Lagoon, southern Thailand. Adult male (BL 6.7 mm, A–E, K, L), adult female (8.1 mm, F–J) (PSUZC 20180818-09.01). A–E — right first to fifth pleiopod; F–J — right first to fifth pleiopod; K, L — right uropod and telson, dorsal view. Scale bar: A–K — 0.5 mm; L — 0.25 mm.

Рис. 3. *Mesopodopsis tenuipes* из Thale Sap Songkhla, озеро Сонгкхла, южный Таиланд. Взрослый самец (длина 6,7 мм, А–Е, К, L), взрослая самка (8,1 мм, F–J) (PSUZC 20180818-09.01). А–Е — первый–пятый правые плейоподы; F–J — первый–пятый правые плейоподы; К, L — правый уropод и тельсон, вид сверху. Масштаб: А–К — 0,5 мм; L — 0,25 мм.

thoracopodal endopod (maxilliped 1) (Fig. 2A) short. Basis well developed, larger than endite; medial margins of carpus, propodus and dactylus heavily setose; second thoracopodal endopod (maxilliped 2) (Fig. 2B) stout; basis with five setae; preischium shortest, with one seta; ischium almost equal to preischium in length with nine setae; merus about 1.15 times as long as ischium with eight setae; carpopropodus 0.8 times as long as merus, with several barbed setae; Third to eighth thoracopodal endopods (pereopods) similar in form (Fig. 2C–H) and more slender than second (Fig. 2B); third thoracopodal endopod (Fig. 2C), basis with seven plumose setae; preischium shortest, without seta; ischium subequal to merus in length with dense plumose setae on the inner margin and one simple seta on the outer margin; merus with dense simple setae on the inner margin; carpopropodus with six articles, carpus longest, about 2.0 times as long as succeeding article, with dense setae on the inner margin and one barbed seta situated on each article; fourth thoracopodal endopod (Fig. 2D), basis with eight plumose setae; preischium shortest, with one simple seta; ischium subequal to merus in length with dense plumose setae on the inner margin and one simple seta on the outer margin; merus with dense simple setae on the inner margin and one very short simple seta on the outer part; carpopropodus with seven articles, carpus longest, about 1.5–2.0 times as long as each succeeding article, bearing dense setae on the inner margin and one barbed seta situated on each article; fifth thoracopodal endopod (Fig. 2E), basis with one long plumose seta; preischium shortest, with one simple seta; ischium subequal to merus in length with dense plumose setae on the inner margin and one simple seta on the outer margin; merus with dense simple setae on the inner margin and one very short simple seta on the outer margin; carpopropodus with seven articles, carpus longest, about 1.5–2.0 times as long as each succeeding article, bearing dense setae on the inner margin and one barbed seta situated on each article; sixth thoracopodal endopod (Fig. 2F), basis with one simple seta; preischium shortest, with one simple seta; ischium subequal to merus in length, 1/3 anterior part of inner margin without setae and 2/3 inner margin with dense plumose setae and one simple seta on the outer margin; merus with dense simple setae on the inner margin and one very short simple seta on the outer margin; carpopropodus with seven articles, carpus longest about 1.5–2.0 times as long as each succeeding article, bearing dense setae at the inner margin and one barbed setae situated at each article; seventh thoracopodal endopod (Fig. 2G), basis with one simple seta; preischium shortest, with three simple setae; ischium longer than merus, with one plumose seta and four simple setae on the posterior corner of inner margin, one

simple seta on the outer margin; merus with dense simple setae on the inner margin, no seta on the outer margin; carpopropodus with seven articles, carpus longest, about 1.5–2.0 times as long as each succeeding article, bearing dense setae on the inner margin and outer margin with one barbed setae situated on each article; eighth thoracopod longest (Fig. 2H), basis and preischium without setae; ischium longer than merus without setae on the inner margin and outer margin with one simple seta; merus with several simple setae on the inner margin, no setae on the outer margin; carpopropodus with five articles, carpus longest, about 1.4–2.0 times as long as each succeeding article, and bearing dense setae with three barbed setae; penis rod-shaped situated at the eighth somite, with two plumose setae and one simple seta on distolateral part of posterior margin (Fig. 2I).

Pleon and Pleopods: abdominal somites smooth, without hairs, spines or folds, ventral sternites without processes; first somite shortest about 0.8 times as long as the second to fifth somite and 0.5–0.6 times to the sixth somite, second to third somites subequal in length, sixth somite 1.3–1.7 times as long as the preceding somites (Fig. 1A, B); first, second and fifth male pleopods rudimentary (Fig. 3A, B, E), unsegmented, gradually increasing in length posteriorly with several setae; third pleopod biramous (Fig. 3C), basal part with a few smooth short setae at the outer margin; endopod slender, unsegmented, curving near base and bearing one long terminal seta, exopod longer than endopod bearing several long setae at the outer and inner margin; fourth pleopod longest (Fig. 3D), stout and elongated 2.06 as long as sixth abdominal somite, basal part with a few smooth short setae at the outer margin; endopod rudimentary, simple, unsegmented; exopod strongly elongated overreaching statocyst area of uropodal endopod, excluding terminal setae; first article short, second article longest more than the length of the second segment of the sympod, third article shortest and stout, with two unequal claws, the short one with several short setae and the long one with a few short setae at the terminal part; in female, pleopods unsegmented, increasing in length posteriorly (Fig. 3F–J).

Uropod and Telson: uropodal endopod about 0.7 times as long as exopod; slightly more than 1.2 times as long as telson, without spine on inner ventral side of statocyst region (Fig. 3K); telson trapezoid or human tongue-like (Fig. 3L), 0.8 times as long as sixth abdominal somite, 1.6 times as long as greatest width; lateral margin slightly concave in dorsal aspect, armed with three short sharp spines at 1/3 posterodistal part; posterior part linguiform, armed with a pair of strong sharp spines at the distal corners and 60–62 smaller sharp spines.

GEOGRAPHIC RANGE. *Mesopodopsis tenuipes* presently known from Malaysia, Singapore,

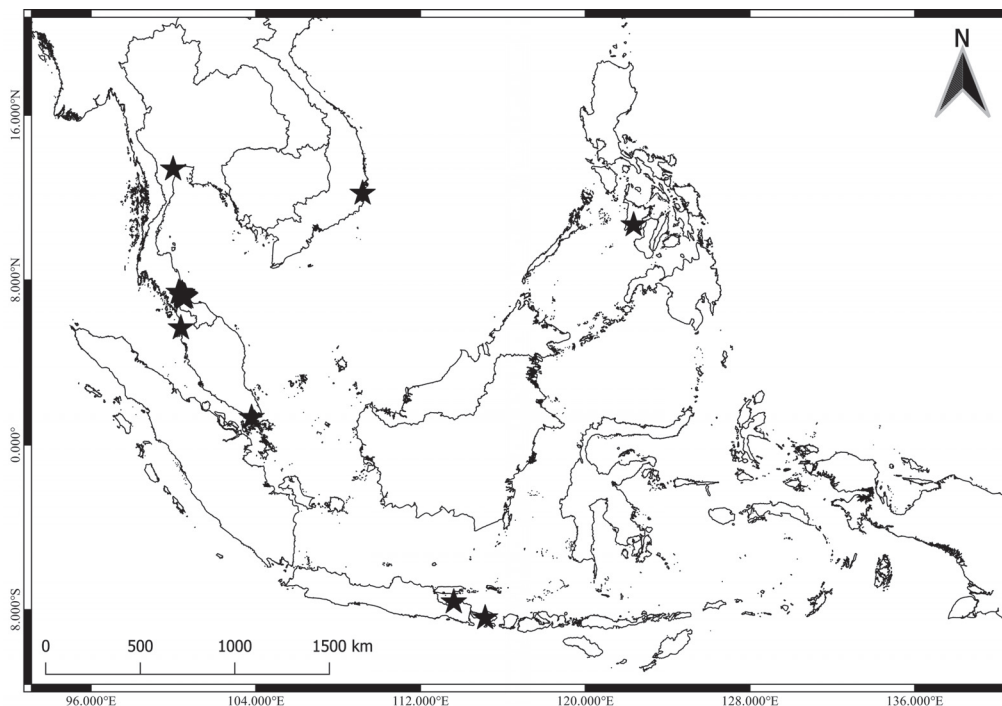


Fig. 4. Distribution of *Mesopodopsis tenuipes* (black stars) in Southeast Asian waters (Sources: Hanamura *et al.*, 2008b; Mantiri *et al.*, 2012; Lheknim et Yolanda, 2020; this study).

Рис. 4. Находки *Mesopodopsis tenuipes* (черные звездочки) в Юго-Восточной Азии (по: Hanamura *et al.*, 2008b; Mantiri *et al.*, 2012; Lheknim et Yolanda, 2020; наши данные).

Thailand, Vietnam, Philippines (Hanamura *et al.*, 2008b; Lheknim, Yolanda, 2020; this study) and Indonesia (Mantiri *et al.*, 2012) (see Fig. 4).

REMARKS. Among the species of the genus *Mesopodopsis*, *M. tenuipes* most closely resembles to *M. orientalis*; however, both of these species can be distinguished as follows: in *M. orientalis*, the cornea is 1.00–1.22 times (mean: 1.09) as broad as the eye stalk measured at the mid-length; the anterior end of the stalk extends well beyond anterior end of the second segment of antennular peduncle in male, while barely reaching the margin in female. The exopod of the fourth male pleopod is without terminal setae and falls slightly short or slightly overreaches the sixth abdominal somite and its length is about 1.53–2.21 times (mean: 1.79) as long as sixth abdominal somite; the sympod of the male fourth pleopod is 0.53–0.66 times (mean: 0.59) as broad as the width of the cornea. In contrast, for *M. tenuipes*, the cornea is 1.17–1.44 times (mean: 1.26) the eye-stalk width measured at mid-length; the anterior end of the stalk reaches distal end of the second segment of antennular peduncle in male, while barely reaching mid-length of second segment in female. The

exopod without terminal setae extends well beyond sixth abdominal somite and fully reaches the statocyst region of the uropodal endopod and its length is about 1.83–2.43 times (mean: 1.79) as long as the sixth abdominal somite; the sympod of the male fourth pleopod is 0.36–0.52 times (mean: 0.59) as broad as the width of the cornea (Hanamura *et al.*, 2008b).

Our observations on the mysid *M. tenuipes* from this lagoon agrees well with the original description by Hanamura *et al.* (2008b); however, some characteristics are newly added in this study. The specimens from Songkla Lagoon showed the marginal setae on the anterior part of the ischium gradually decrease on thoracopodal endopods 4 to 5 and until the middle part of the thoracopodal endopod 6. The setae are completely missing on thoracopodal endopods 7 and 8. For the merus, the setae also decrease from thoracopodal endopods 7 to 8 (see Fig. 2). Hanamura *et al.* (2008b) never mentioned or described these structures before, but we believe that they recognized these characteristics and did not include them in the descriptions as being important morphological features. However, for us, providing

complete descriptions is useful in understanding the characteristics of this species. This contribution provides the description and illustrations of the labrum (Fig. 2D, E) and thoracopods 3–5 for the first time and may be useful for further taxonomic studies.

KEY TO SPECIES OF THE GENUS *MESOPODOPSIS* (MODIFIED FROM WITTMANN, 1992; HANAMURA ET AL., 2008)

- 1 The length of eyestalks is about 2 times corneal length; carpopropodus of fourth thoracopodal endopod is about 5 to 7 articles; uropodal endopod without a spine below statocyst 2
- The length of eyestalks is more than 2 times corneal length; carpopropodus of fourth thoracopodal endopod is about 5 to 12 articles; uropodal endopod with a spine below statocyst 4
- 2 Anterior part of the carapace rounded; second article of endopod of fourth male pleopod longer than second article of sympod; fourth male pleopod exopod slightly overreaching or overreaching sixth abdominal somite 3
- Anterior part of the carapace sub-triangular; second article of endopod of fourth male pleopod shorter than second article of sympod; fourth male pleopod exopod over-reaching sixth abdominal somite *M. zeylanica*
- 3 Cornea is about 1.00–1.22 times as broad as eyestalk measured at mid-length; anterior end of stalk extends well beyond anterior end of the second segment of antennular peduncle in male and fourth male pleopod exopod without terminal setae falling slightly short of, or slightly over-reaching sixth abdominal somite *M. orientalis*
- Cornea is about 1.17–1.44 times as broad as eyestalk measured at mid-length, anterior end of stalk reaches distal end of the second segment of antennular peduncle in male and exopod without terminal setae extending well beyond sixth abdominal somite and fully reaching statocyst region of uropodal endopod *M. tenuipes*
- 4 Accessory flagellum of male antennule longer than appendix masculina 5
- Accessory flagellum not longer than appendix masculina 6
- 5 Carpopropodus of fourth thoracopodal endopod with 5 articles; exopod of third male pleopod as long as endopod *M. africana*
- Carpopropodus of fourth thoracopodal endopod with 9–12 articles; exopod of third male pleopod shorter than endopod *M. wooldridgei*
- 6 Antennal scale distinctly shorter than antennular peduncle; no setae on proximal half of median segment of mandibular palp *M. tropicalis*
- Antennal scale subequal or longer than antennular peduncle; median segment of mandibular palp with setae over almost entire length 7

- 7 Penultimate segment of carpopropodus of third thoracopodal endopod with spine-like setae distally on distal outer border; carpopropodus of fourth thoracopodal endopod with 5–8 articles *M. slabberi*
- Penultimate segment of carpopropodus of third thoracopodal endopod with distally smooth seta at distal outer border; carpopropodus of fourth thoracopodal endopod with 7–9 articles *M. aegyptia*

Compliance with ethical standards

CONFLICTS OF INTEREST: The authors declare no conflicts of interest.

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