

On the Mysid Crustacean Genus *Deltamysis* (Mysidae: Heteromysinae), with a New Species and a New Record from Australia

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ABSTRACT. The genus *Deltamysis*, in the tribe Mysidetini (Mysidae: Heteromysinae), previously contained a single species, *D. holmquistae*, before two additional species, *D. nana* and *D. songkhlaensis*, were transferred from *Heteromysoides* of the related tribe Heteromysini. A new member of the genus, *D. lowryi* sp. nov., found at the mouth of the Clarence River, New South Wales, in 1988, is described here from the Australian Museum collection. The collection also contained two specimens of *D. holmquistae* from the eastern Australian coasts of the Coral Sea and the Tasman Sea, not previously recorded from Australia. *Deltamysis lowryi* sp. nov. differs from the other three species of the genus by the structure of the telson, which has a wide, shallow cleft, armed with a number of spinules, and notably shortened subterminal spiniform setae. The diagnosis and the generic composition of the tribe Mysidetini, and the diagnoses of the genus *Deltamysis* and all its four species are updated. *Deltamysis* has so far been the only genus of the marine subfamily Heteromysinae diversifying in brackish estuarine water. The genus has a clear western Indo-Pacific natural occurrence, but has been introduced also to the Eastern Pacific and more recently to the Atlantic coasts of North America.

Introduction

This paper was prepared for a special issue in memory of James (Jim) Kenneth Lowry (1942–2021). Apart from his immense contribution to the amphipod taxonomy, Jim played a significant role in the organization of zoological research and knowledge. A new species of mysid, described herein, was collected by him together with Stephen Keable, as he collected many other crustaceans during his field trips. The species is named in Jim's honor.

The study is a continuation of the work on the mysid collection of the Australian Museum, which I started in 2015. In the current paper I report about the second part on the subfamily Heteromysinae Norman, 1892, dedicated this time to the genus *Deltamysis* Bowman & Orsi, 1992, of the tribe

Mysidetini Holt & W. M. Tattersall, 1906. In the first part, on the genus *Heteromysis* S. I. Smith, 1873, published in the same journal (Daneliya, 2021), after the revision of *Heteromysoides* Băcescu, 1968 (tribe Heteromysini Norman, 1892) I also transferred *H. nana* Murano, 1998, and *H. songkhlaensis* Yolanda, Sawamoto & Lheknim, 2019, to *Deltamysis*. Here I describe a new species, *D. lowryi* sp. nov., from the mouth of the Clarence River in New South Wales, report the first record of *D. holmquistae* Bowman & Orsi, 1992, in Australia from the Coral Sea and the Tasman Sea coasts, and revise the generic and specific diagnoses. Combining the results from the previous study, on the tribe Heteromysini (Daneliya, 2021), and the current new data on *Deltamysis*, I also revise the diagnostics and composition of the tribe Mysidetini Holt & Tattersall, 1906, to which the genus belongs.

Keywords: *Deltamysis*, Crustacea, Mysida, Mysidae, Heteromysinae, taxonomy

ZooBank registration: urn:lsid:zoobank.org:pub:65F4EF7E-9AD1-4867-AAA5-956B29A17042

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Submitted: 21 February 2022 **Accepted:** 18 April 2023 **Published:** 6 December 2023 (in print and online simultaneously)

Publisher: The Australian Museum, Sydney, Australia (a statutory authority of, and principally funded by, the NSW State Government)

Citation: Daneliya, Mikhail E. 2023. On the mysid crustacean genus *Deltamysis* (Mysidae: Heteromysinae), with a new species and a new record from Australia. In *Festschrift in Honour of James K. Lowry*, ed. P. B. Berents, S. T. Ah Yong, A. A. Myers, and L. Fanini. *Records of the Australian Museum* 75(4): 413–430. <https://doi.org/10.3853/j.2201-4349.75.2023.1881>

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The genus *Deltamysis* was designated for an alien species of unknown source, *D. holmquistae* Bowman & Orsi, 1992, found in the delta of the Sacramento and San Joaquin Rivers in California, USA; hence the name (Bowman & Orsi, 1992). *Deltamysis*, like *Harmelinella* Ledoyer, 1989, and former species of *Heteromysoides* currently considered in *Deltamysis*, had the non-prehensile capropropodus of the pereopod 1 (pereopod 2 in the definition of Bowman & Orsi, 1992), similar to the pereopod 2, but both appendages still somehow differentiated from the rest of the pereopods, and no telson cleft, but the rudimentary pleopods in both sexes, similar to *Heteromysis*. As Bowman and Orsi stated, “If *Harmelinella* is accepted in the Heteromysini, enlargement of pereopod 2 [pereopod 1] is no longer a requirement for membership in this tribe” (Bowman & Orsi, 1992: 738), as well as the presence of the telson cleft. The similarity was also found in the structure of the antennular male process and the size of the penis. Thus, *Deltamysis* became a member of the tribe Heteromysini, at that time within the family Mysidae Haworth, 1885. Jaume & Garcia (1993) expressed hesitation that the distinguishing characters between *Deltamysis* and *Burrinymysis* Jaume & Garcia, 1993, were of the generic level, but kept the genera separate.

A rather similar genus, *Kochimysis* Panampunnayil & Biju, 2007, was subsequently discovered in an estuary of the Laccadive Sea, in India (Panampunnayil & Biju, 2007), and established to accommodate a single member, *K. pillaii* Panampunnayil & Biju, 2007. In the same year, Meland & Willassen (2007) upgraded the subfamily Heteromysinae. However, the most up-to-date concept of Heteromysinae was presented in the monographic work on mysids by Wittmann *et al.* (2014), where the authors further subdivided the subfamily into the three tribes: Heteromysini, Harmelinellini Wittmann, Ariani & Legardère, 2014, and Mysidetini. *Deltamysis* and *Kochimysis* found their position in Mysidetini.

Scripter *et al.* (2020) collected new material on *D. holmquistae* from the US Atlantic coast. After a detailed morphological revision of new and the type material they found that originally *D. holmquistae* males were not carefully studied and revealed that the males had special cuticular prominences on the maxillipeds 2, similar to *K. pillaii*. In addition, a wide variability of the US material also incorporated other features of *K. pillaii*, and the authors synonymized the genus *Kochimysis* with *Deltamysis*. They also suggested a northern Indian or North-West Pacific Ocean origin of *D. holmquistae*.

As mentioned above, the second and the third species, respectively, *Deltamysis nana* (Murano, 1998), from the Timor Sea coast of Australia, and *D. songkhlaensis* (Yolanda, Sawamoto & Lheknim, 2019), from Songkhla Lagoon by the Gulf of Thailand, which both had clear characters of *Deltamysis*, became new members of the genus after their transfer from *Heteromysoides* (Daneliya, 2021). In the same work the concept of Heteromysini was revised, which also affected the diagnostics and the composition of the tribe Mysidetini.

With the inclusion of *D. nana* and *D. songkhlaensis* in *Deltamysis*, the generic range was expanded to include the Eastern Indian Ocean. Discovery in the current study of *D. lowryi* sp. nov. from the mouth of Clarence River, and the new records of *D. holmquistae* from eastern Australia, expands the range of the genus to the South Pacific.

Materials and methods

The new material contains samples from three localities along the New South Wales coast, collected in baited traps, set overnight, in expeditions of the Australian Museum (AM) in 1988. Samples were fixed in 80% ethanol. The holotype of *D. lowryi* sp. nov. and a specimen of *D. holmquistae* were partly dissected, put on permanent slides with Aquatex medium, studied in detail and illustrated using a camera lucida (tracing device) on a compound microscope. The collection is deposited in the Australian Museum, Sydney (AM).

Measurements and counts. Body length: from antero-dorsal margin of carapace to posterior margin of telson, not including terminal spiniform setae. Eye length: from cornea distal surface to proximal margin of stalk, dorsal view. Head width: between anterolateral corners of the carapace, dorsal view. Abdominal segment 6 length: from its dorsal posterior margin to dorsal posterior margin of segment 5, not including posterolateral lobes, dorsal or lateral view. Telson length: from anterior margin to posterolateral margins, excluding terminal spiniform setae, dorsal or lateral view. Telson anterior width: between the most distant points of anterior part. Telson posterior width: between outer margins of terminal spiniform setae. Telson lateral spiniform setae number: including terminal. Pereopod 1 dactylus length includes the dactylus and its unguis combined. Uropodal exopod length in comparison with endopod: from distal margin to the level of endopod proximal margin. Uropodal exopod length in comparison with its width: from distal margin to its proximal margin.

Taxonomy

Mysida Boas, 1883

Mysidae Haworth, 1885

Heteromysinae Norman, 1892

Mysidetini Holt & Tattersall, 1906

Mysidetinae Holt & W. M. Tattersall, 1906: 39.—W. M.

Tattersall, 1908: 32.—Zimmer, 1909: 45, 46, 139.

Mysidetini.—Wittmann *et al.*, 2014: 341.—Wittmann &

Wirtz, 2017: 147.—Wittmann & Ariani, 2019: 5.—

Daneliya, 2021: 5, 6, 46.—Scripter *et al.*, 2020: 504.—

Kou *et al.*, 2020: 3.

Type genus. *Mysidetes* Holt & Tattersall, 1906, by monotypy.

Diagnosis. Pereopod 1 endopod not differentiated from pereopod 2 endopod, not prehensile, with multisegmented carpopropodus. All pleopods reduced to simple plates in both sexes.

Comparison. Mysidetini is distinguished from other heteromysine tribes by the multisegmented carpopropodus of the pereopod 1 (at least 3-segmented). From the tribe Heteromysini it also differs by the similarity of the pereopods 1 and 2. In Heteromysini, the pereopod 1 endopod is prehensile and 2-segmented (except in *Platyops stenoura* [Hanamura & Kase, 2004], in which it is 3-segmented), and pereopod 2 endopod is normal, multisegmented. An additional feature separates Mysidetini from Harmelinellini:

the rudimentary nature of all pleopods in both sexes. In Harmelinellini, the male pleopod 3 is uniquely long and 2-segmented.

Remarks. Originally, this taxon was designated as a subfamily within Mysidae (Holt & W. M. Tattersall, 1906) for a single genus *Mysidetes* Holt & Tattersall, 1906. Closely resembling Mysidellinae Czerniavsky, 1882 and Heteromysinae in the antennal scale, pleopods, and telson, Mysidatinae Holt & Tattersall, 1906 was distinguished from the two mentioned subfamilies by the structure of the maxilliped 1 (termed as “maxillipede” or “first thoracic limb”) and the pereopod 1, respectively, and from Leptomysinae only by the reduced pleopods in both sexes. The characters proposed by Holt & W. M. Tattersall (1906) and Zimmer (1909) were not sufficiently diagnostic to maintain separate status of the subfamily (Hansen, 1910, 1913). In a century, Wittmann *et al.* (2014) re-established the taxon in the status of a tribe within Heteromysinae and included eight genera: *Bermudamysis* Băcescu & Iliffe, 1986, *Burrimysis* Jaume & Garcia, 1993, *Deltamysis*, *Kochimysis*, *Mysidetes*, *Mysifaun* Wittmann, 1996, *Platyops* Băcescu & Iliffe, 1986, and *Pseudomysidetes* W. M. Tattersall, 1936. All members of Mysidetini shared normal, not prehensile pereopods with the multisegmented carpopropodus, the rudimentary, non-modified and non-dimorphic pleopods, and the telson lateral margins with spiniform setae in the distal part only. Certain species of *Mysidetes* have the telson lateral spiniform setae along the entire length (*M. dimorpha* O. S. Tattersall, 1955, *M. hanseni* Zimmer, 1914, *M. microps* O. S. Tattersall, 1955, *M. morbihanensis* Ledoyer, 1995, and *M. posthon* Holt & W. M. Tattersall, 1906) or separated by a gap (*M. antarctica* O. S. Tattersall, 1965, and *M. crassa* Hansen, 1913), which means that this character is not suitable for the diagnosis.

In composing the new diagnosis, I exclude all variable characters, including the size of the male process on the antennulae, the number of the oostegites, the shape of the penes and the telson. In the previous work (Daneliya, 2021), I revised the diagnosis of Heteromysini and transferred *Platyops* and *Bermudamysis* into the redefined tribe. However, I did not provide a revised diagnosis of Mysidetini, which is specifically done here.

Composition. The tribe Mysidetini contains five genera: *Burrimysis*, *Deltamysis*, *Mysidetes*, *Mysifaun*, and *Pseudomysidetes*.

Deltamysis Bowman & Orsi, 1992

Deltamysis Bowman & Orsi, 1992: 733.—Jaume & Garcia, 1993: 234.—Müller, 1993: 218.—Bravo & Murano, 1996: 483.—Smith, 2001: 549.—Price, 2004: 68.—Petryashev, 2005: 15.—Panampunnayil & Biju, 2007: 1957.—Thorp & Rogers, 2010: 155.—Wittmann *et al.*, 2014: 341.—San Vicente & Monniot, 2014: 333–334, 341.—Price, 2016: 702.—Scripser *et al.*, 2020: 501, 504.

Kochimysis Panampunnayil & Biju, 2007: 1955–1957, [synonymized by Scripser *et al.*, 2020].

Type species. *Deltamysis holmquistae* Bowman & Orsi, 1992; by monotypy.

Diagnosis. Male process of antennula rather small, tubercle-like, sometimes barely visible, with setae. Mandibular palp segment 2 with few (up to three) short medial setae in

middle part. Pereopodal endopods 1 and 2 slightly stronger than other pereopods; their carpopropodi 3-segmented, with serrated setae. Pereopodal endopods 3–6 are 4–5-segmented. Penis longer than basis of pereopodal endopod 6. Marsupium with two pairs of oostegites. Uropodal endopods without spiniform setae.

Comparison. *Deltamysis* is uniquely distinguished from other genera of Mysidetini by the very modest mandibular palp setation, with the characteristic two or three setae in the median part of segment 2. The genus is most similar to *Burrimysis* of Jaume & Garcia (1993), clearly differing by having only a few medial setae on the mandibular palp segment 2 (numerous long setae in *Burrimysis*), the pereopodal carpopropodus 1 and 2 being 3-segmented (6-segmented in *Burrimysis*), the longer penis (shorter than the pereopod 6 basis in *Burrimysis*), the unarmed uropodal endopod (with one spiniform seta in *Burrimysis*), and the telson cleft rather shallow or absent (rather deep in *Burrimysis*).

Distribution. Western Indo-Pacific. Originally recorded from Sacramento—San Joaquin Estuary in California (Bowman & Orsi, 1992), and later also along the Atlantic US coast (Scripser *et al.*, 2020), where it was supposed to be introduced. With discovery of *D. lowryi* sp. nov. on the New South Wales coast, and the transfer of the former *Kochimysis pillai* from India (Scripser *et al.*, 2020), the former *Heteromysoides nana* from northern Australian coast and *H. songkhlaensis* from Thailand to *Deltamysis* (Daneliya, 2021), it is now clear that the genus is naturally distributed in the Western Indo-Pacific Region (Fig. 1).

Habitat. Marine-estuarine genus, confined to warm tropical and subtropical shallow waters.

Remarks. The genus was described by Bowman & Orsi (1992) for *D. holmquistae*, distinguished by the presence of the distal suture on the antennal scale, the pereopod 1 (mentioned as pereopod 2) not stronger than other pereopods, the rudimentary pleopods in both sexes, the unarmed uropodal endopod, the penis of moderate size, reaching basis of the pereopod 6 (indicated as pereopod 7) and the entire telson with two, short, apical spiniform setae, flanked by three pairs of longer spiniform setae. From the original generic diagnosis, I excluded the shape of the antennal scale and the pleopods for being general characters for the subfamily and the tribe, and the armature of the telson as species specific. Describing here *D. lowryi* sp. nov., which has the telson cleft, I also exclude the shape of the telson from the generic diagnosis. Jaume & Garcia (1993) expressed hesitation that the distinguishing characters between *Deltamysis* and *Burrimysis* were of generic level. In my opinion, the distinct setation pattern of the mandibular palp, somewhat enlarged endopods of the pereopods 1 and 2, with their 3-segmented carpopropodus, together with other characters make clear gap between *Deltamysis* and *Burrimysis*. Another two potential generic diagnostic characters, found in *D. lowryi* sp. nov., but not studied in other heteromysids, except in the genus *Heteromysis*, are the overlap of the posterolateral lobes of the abdominal segment 6 (Figs 2F, 6E), not overlapping in *Heteromysis* (Daneliya, 2021), and the presence of the subapical wing-like extensions on the maxilliped 1 dactylar claw (Figs 4A, 7E).

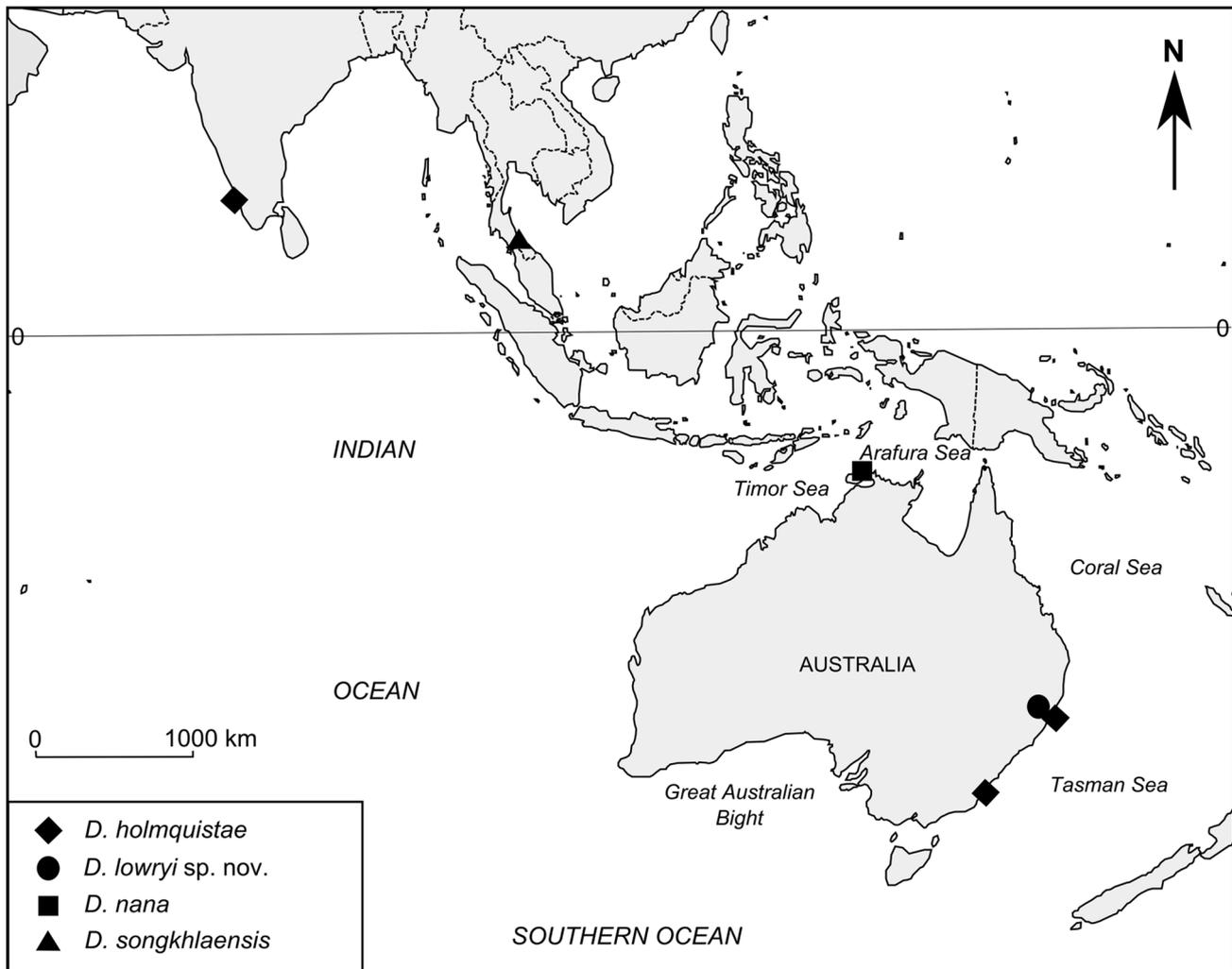


Figure 1. Distribution of the species of the genus *Deltamysis* in the West Indo-Pacific.

Panampunnayil & Biju (2007) distinguished the genus *Kochimysis* from *Deltamysis* on the basis of the male lobe presence on the antennular peduncle, the articulation absence on the antennal scale, the presence of the lacinia mobilis on the mandible and the wide segment 2 of the mandibular palp, equal size of the maxilla 2 endopod segments and the oval shape of its segment 2. Such discrimination was possible partly due to confusion (Scripter *et al.*, 2020), because Bowman & Orsi (1992), describing *Deltamysis*, 1) did not notice the male lobe on the antennulae; 2) mentioned the presence of the lacinia mobilis on the left mandible and its absence of the right mandible (p. 737); 3) it was also the aspect of the mandibular palp illustration that did not show the width of the segment 2; 4) the maxilla 2 was mistakenly illustrated as 3-segmented with rather short segment 2, and the aspect did not clearly show the width of the segments. The presence or absence of the articulation on the antennal scale is a common intraspecific variation in different groups of mysids.

San Vicente & Monniot (2014) mentioned in their key that *Deltamysis* is distinguished from *Kochimysis* by the cornea being as wide as the eyestalk, the antennal peduncle as long as the antennal scale, the peduncular segments subequal and the maxilliped 2 without the notches in males. Some individuals of *D. holmquistae*, *D. lowryi* sp. nov., *D.*

nana and *D. songkhlaensis*, have the cornea narrower than the stalk, the antennal peduncle longer than the antennal scale, with the peduncular segments subequal. The males of *D. holmquistae* and *D. lowryi* sp. nov. have the notches (or processes) on the maxillipeds 2. In all, I support Scripter *et al.* (2020) in their synonymization of *Kochimysis* with *Deltamysis*.

Scripter *et al.* (2020) updated the diagnosis of the genus, based on the redescription of *D. holmquistae*, the single known species at that time. The shape of the carapace, apically rounded in *D. holmquistae*, *D. lowryi* sp. nov. and *D. nana*, but pointed or blunt in *D. songkhlaensis*, is no longer diagnostic. As discussed earlier, the presence or absence of the suture in the antennal scale is a generally variable feature and not suitable for the generic diagnosis. They also included the presence of the processes (“papillations” in their terminology) on the maxilliped 2 carpus and propodus to the diagnosis. This character is absent in *D. nana* (although only a female has been known so far) and *D. songkhlaensis*, and should be excluded from the diagnosis. It is also mentioned that the pereopod 1 endopod (“thoracic endopod 3”) is not stouter than other endopods. Though not prehensile like in the members of Heteromysini, I find that both pereopod 1 and 2 endopod are rather similar and clearly stouter than the endopods 3–6. The latter have 4-segmented carpopropodus in

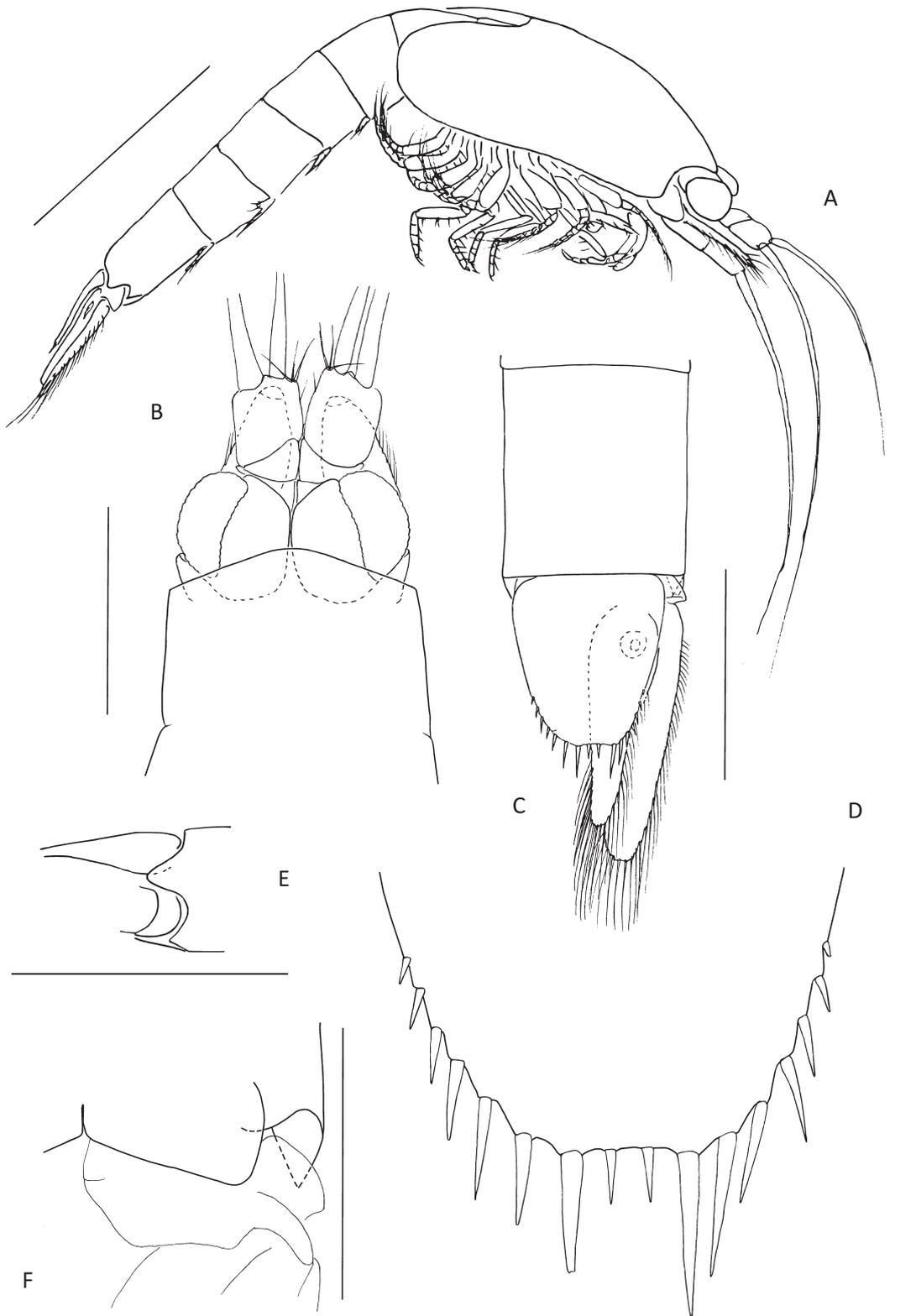


Figure 2. *Deltamysis holmquistae* Bowman & Orsi, 1992, female, 4 mm, New South Wales, Yamba, AM P.98703: (A) habitus, lateral; (B) head, dorsal; (C) posterior part of body with telson and uropods, dorsal; (D) telson posterior part; (E) posterolateral lobe of abdominal segment 6; (F) posteroventral margin of abdominal segment 6, and uropodal protopod. Scales (mm): A = 1; B, C, E = 0.5; D, F = 0.25.

D. holmquistae and *D. songkhlaensis*, but 4- or 5-segmented in *D. lowryi* sp. nov. and 5-segmented in *D. nana*. The rudimentary nature of the pleopods is the tribal character and not necessary in the generic diagnosis. The telsonal characters are also rather variable, particularly with the

presence of the telson cleft in *D. lowryi* sp. nov. and, thus, should be excluded from the diagnosis.

In an updated diagnosis above, I have added new common features, particularly in the setation of the mandibular palp and the similarity of the pereopod endopods 1 and 2.



Figure 3. *Deltamysis holmquistae* Bowman & Orsi, 1992, female, 4 mm, New South Wales, Yamba, AM P.98703: (A) antennular peduncle distal part, dorsal; (B) antennular peduncle and scale, ventral view; (C) mandibular palp, posterior; (D) labrum, ventral; (E) maxilla 2, posterior; (F) pleopod 3, anterior; (G) pleopod 5, anterior. Scales (mm): A, B, F, G = 0.5; C–E = 0.25.

Except for *Deltamysis*, all the genera of the subfamily Heteromysinae contain exclusively marine species. *Deltamysis* is the only heteromysine genus, which has been penetrating estuaries and diversifying in brackish water.

Deltamysis holmquistae was occasionally sampled even in fresh water.

Composition. The genus includes four species: *D. holmquistae*, *D. lowryi* sp. nov., *D. nana* and *D. songkhlaensis*.

Key to the species of the genus *Deltamysis*

- 1 Anterior margin of carapace triangular, apically pointed or blunt. Telson apical spinules as long as or longer than lateral terminal spiniform setae. Pereopod 3–6 carpopropodus, segment 1 longer, as long as or slightly shorter than other segments combined *D. songkhlaensis* (Yolanda, Sawamoto & Lheknim, 2019)
- Anterior margin of carapace apically rounded (Figs 2B, 6B). Telson apical spinules clearly shorter than lateral terminal spiniform setae (Figs 2C, D, 6C, D). Pereopod 3–6 carpopropodus, segment 1 shorter than other segments combined (Figs 5B–E, 8E, F) 2
- 2 Telson rather narrow, 1.5–1.6 times as long as wide anteriorly; terminal spiniform setae 0.12 of telson length. Maxilla 2, exopod and endopod segment 2 with lateral setae *D. nana* (Murano, 1998)
- Telson rather wide (Figs 2C, 6C), 1.1–1.4 times as long as wide anteriorly; terminal spiniform setae 0.2–0.4 of telson length. Maxilla 2, exopod and endopod segment 2 without lateral setae (Figs 3E, 8A) 3
- 3 Telson apically without cleft (Fig. 2C, D), armed with two (rarely three) spinules; lateral subterminal spiniform setae not shorter than preceding lateral spiniform setae. Maxilla 2 exopod rather small, barely reaching half of endopod segment 1 (Fig. 3E). Pereopod dactylus rather thick, nearly as long as wide (Figs 4C, D, 5A–E) *D. holmquistae* Bowman & Orsi, 1992
- Telson with cleft (Fig. 6C, D), armed with seven spinules; lateral subterminal spiniform setae significantly shorter than preceding lateral spiniform setae. Maxilla 2 exopod rather big, nearly reaching endopod segment 2 (Fig. 8A). Pereopod dactylus rather thin, about twice as long as wide (Fig. 8C–G) *D. lowryi* sp. nov.

Deltamysis holmquistae Bowman & Orsi, 1992

Figs 2–5

Deltamysis holmquistae Bowman & Orsi, 1992: 734–741, figs 2–4.—Müller, 1993: 218.—Cohen & Carlton, 1995: 81, 146, appendix 4-2.—Modlin & Orsi, 1997: 439, 445.—Smith, 2001: 547.—Bollens *et al.*, 2002: 91, table 2.—Price, 2004: 68.—Dean *et al.*, 2005: 5, table 1.—Petrashev, 2005: 14, table 1.—Mecum, 2006: 1, 4, plate 2.—Panampunnayil & Biju, 2007: 1962, 1963.—Modlin, 2007: 492, plate 221C–E.—Carlton, 2009: 35, table 2.4C.—Ruiz *et al.*, 2011: 231, 235, 241, appendix 1.—Simberloff & Rejmanek, 2011: 47.—Winder & Jassby, 2011: 684, table 3.—Brown *et al.*, 2016: 11, table 2.—Hiebert & Rasmusson, 2016a: 541; 2016b: 548.—Price, 2016: 706, plates 16.191.02E, 03J.—Scripter *et al.*, 2020: 501–515, figs 2–5.

Deltamysis sp. A.?—Ranasinghe *et al.*, 2005: 681, tables 1, 4.
Kochimysis pillaii Panampunnayil & Biju, 2007: 1957–1963, figs 2–5, [synonymized by Scripter *et al.*, 2020].—Biju & Panampunnayil, 2010: 50, table 1.—Manojkumar & Pavithran, 2016: 42.

Holotype: Male, USA, California, Sacramento—San Joaquin Estuary, between Brown’s Island and Jersey Island, collection dates unknown, coll. J. J. Orsi (Smithsonian Institution, Washington, D.C. [USNM] 251607). **Allotype:** Female, collected together with holotype (USNM 251608). **Paratypes:** 1 male, 4 females, same as previous (USNM

251609); 7 specimens, same as previous (USNM 251610); 2 males, 7 females, Sta. 56, north of Brown’s Island, date unknown, coll. J. J. Orsi coll. (USNM 251618); 1 male, 4 females, exact location unknown, 29 May 1990, coll. J. J. Orsi (USNM 251619). Data on the paratype material from Scripter *et al.* (2020).

Type locality. USA, California, Sacramento—San Joaquin Estuary, between Brown’s Island and Jersey Island (Bowman & Orsi, 1992)

Australian material. Female (+slide), 4 mm, New South Wales, Yamba, northern end of Pippi Beach, 29°26.8'S 153°22.1'E, clean sand, 8 m, st. NSW 326, baited trap, set 16:00, retrieved 08:00, coll. J. K. Lowry, S. J. Keable, 07–08 Jun 1988, AM P.98703; female, 4.5 mm, New South Wales, Twofold Bay, off entrance to Curralo Lagoon, 37°03.2'S 149°55.4'E, sand bottom, 8 m, baited trap, set 15:00–16:30, retrieved 09:00–12:00, coll. J. K. Lowry & S. J. Keable, 26–27 Nov 1988, AM P.98704.

Diagnosis. Anterior margin of carapace angular, apically rounded (Fig. 2B). Cornea about as wide as eyestalk or narrower (0.70–0.96 of stalk width). Telson (Fig. 2C, D) 1.1–1.3 times as long as wide anteriorly; apically without cleft, bearing two (rarely three) spinules; its lateral margins with five to eight spiniform setae (including terminal, but not apical); subterminal spiniform setae about as long as or longer than preceding lateral; terminal spiniform setae 0.2–0.4 of telson length. Maxilla 2 (Fig. 3E), exopod



Figure 4. *Deltamysis holmquistae* Bowman & Orsi, 1992, female, 4 mm, New South Wales, Yamba, AM P.98703: (A) maxilliped 1 endopod, anterior; (B) maxilliped 2 endopod, anterior; (C) pereopod 1 endopod, anterior; (D) pereopod 1 endopod distal part, anterior. Scales (mm): A, B, D = 0.25; C = 1.

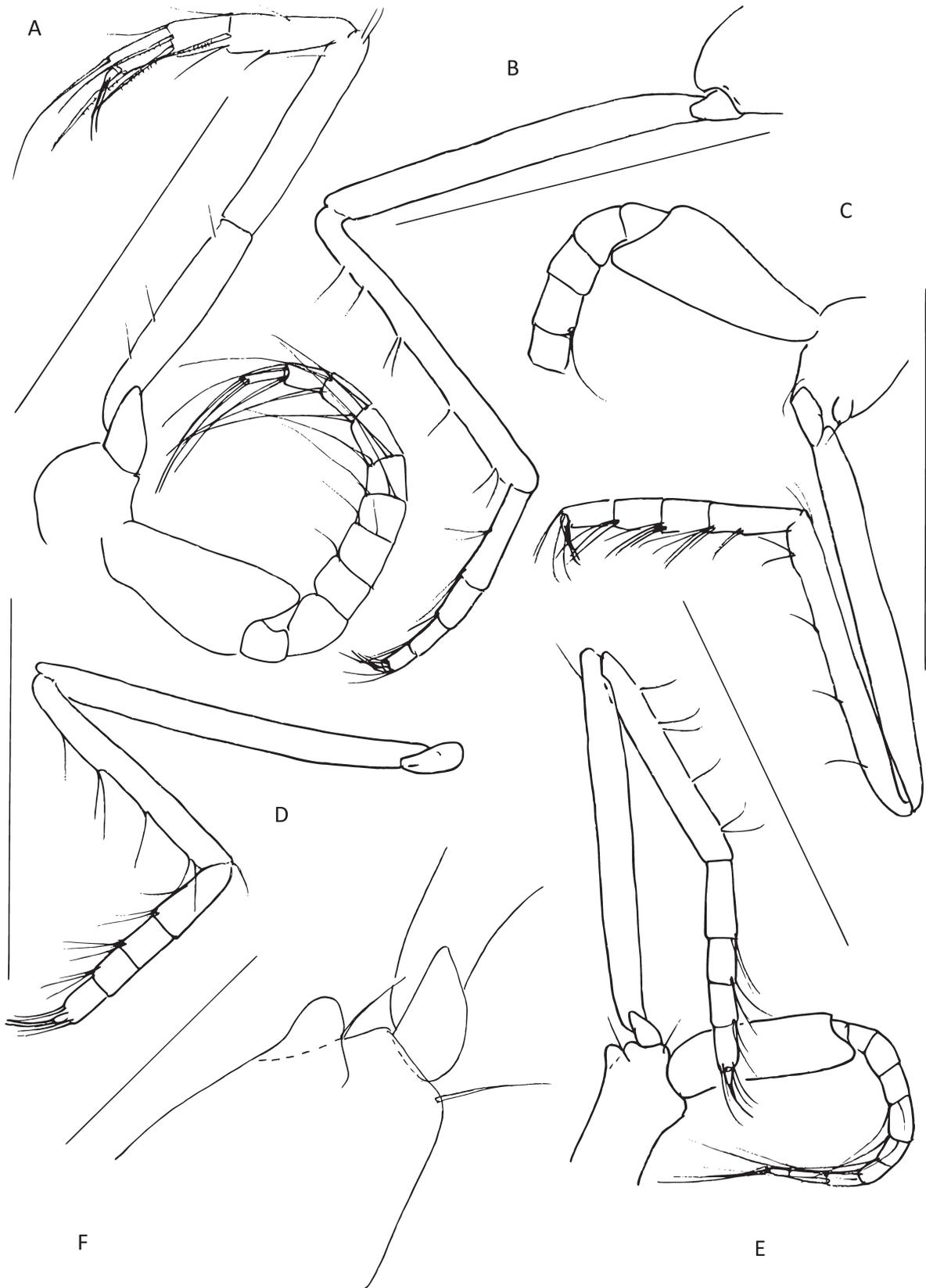


Figure 5. *Deltamysis holmquistae* Bowman & Orsi, 1992, female, 4 mm, New South Wales, Yamba, AM P.98703: (A) pereopod 2 endopod, anterior; (B) pereopod 3 endopod, anterior; (C) pereopod 4, anterior; (D) pereopod 5 endopod, anterior; (E) pereopod 6, anterior; (F) pereopod 6 basis distal part, anterior. Scales (mm): A–E = 0.5; F = 0.25.

reaching half of endopod segment 1, without lateral setae, and with zero to five apical setae; endopod segment 2 without lateral setae. Maxilliped 2 without lateral processes on carpus and propodus in females (Fig. 4B), and armed with triangular, apically pointed processes in males. Pereopod dactylus rather thick, nearly as long as wide (Figs 4C, D, 5A–E). Pereopod 3–6 carpopropodus 4-segmented; segment 1 shorter than segments 2–4 combined.

Body length. Males 2.6–4.5 mm, females 2.8–5 mm (Bowman & Orsi, 1992; Scriptor *et al.*, 2020).

Comparison. *Deltamysis holmquistae* is distinguished from other species of the genus by the telson apically without cleft and armed with two (rarely three) short spinules. It is not possible to establish affinities between the species of *Deltamysis* at the current state of our knowledge. Comparison of the diagnostic morphological characters can be seen in Table 1.

Description of Australian specimens. Telson shorter than last abdominal segment, 1.2 times as long as wide anteriorly. Lateral spiniform setae, subterminal pair about as long as or longer than previous lateral. Terminal spiniform setae 0.21 times as long as telson and 1.1 times as long as longest posterolateral spiniform setae. Telson apical margin truncated, without cleft, bearing two thin and rather long spinules, set apart, 0.33 of lateral terminal spiniform setae.

Cornea well-developed, nearly (0.95) as wide as stalk. Antennular peduncle segment 3 with two plumose and two smooth distomedial setae. Antennal scale 2.9 times as long as wide, nearly reaching distal margin of antennular peduncle segment 3, and about as long as antennal peduncle. Antennal peduncle segment 2 slightly longer than segment 3.

Labrum apically nearly rounded. Mandibular palp rather wide; segment 2 with two medial setae. Maxilla 2 exopod reaching half of endopod segment 1, without lateral setae and with zero or two apical setae; endopod segment 2 without lateral setae. Maxilliped 1 dactylar claw with subapical wing-like extensions. Maxilliped 2 endopod with smooth carpus and propodus.

Pereopod 1 and 2 endopods with ischium and merus nearly on one line, with slight bending capability in relation to each other; carpopropodus 3-segmented, with rather strong, posteriorly serrated setae. Pereopod 1 endopod, ischium 4.7 times as long as wide, with one lateral and one distomedial seta; merus 4.4 times as long as wide and 0.8 times as long as ischium, with two lateral and one distomedial bunches of setae; carpopropodus 3-segmented, segment 1 is 1.1 times as long as segments 2 and 3 combined, with two distomedial bunches of one thin seta and one strong posteriorly serrated seta; segment 3 with two paradactylary setae, posteriorly finely serrated; dactylus rather strong, nearly as long as wide, 0.4 of carpopropodus segment 3 length. Pereopod 2 exopod 9-segmented. Endopod ischium 6

Table 1. Comparison of the diagnostic morphological characters between the species of the genus *Deltamysis* (unique character states indicated in bold).

characters	species (in alphabetic order)			
	<i>D. holmquistae</i>	<i>D. lowryi</i> sp. nov.	<i>D. nana</i>	<i>D. songkhlaensis</i>
Anterior margin of carapace	Apically rounded	Apically rounded	Apically rounded	Apically pointed or blunt
Eye cornea width / stalk width	0.7–0.96	0.7–0.95	0.8	0.57–0.63
Telson				
length / width	1.1–1.3	1.1–1.4	1.5–1.6	1.1–1.2
cleft presence	Absent	Present	Present	Absent
cleft / telson length	—	0.05	0.02	—
apical spinules number	2 or 3	7	2	2
apical spinules length / lateral terminal spiniform setae length	0.23–0.58	0.09–0.25	0.43	1.0–1.1
lateral terminal / subterminal spiniform setae length	0.51–1.5	3.1–3.4	0.94	0.95–1.1
subterminal / previous posterolateral spiniform setae length	1.1–2.4	0.48	1.6	0.95–1.1
lateral terminal spiniform setae length / telson length	0.20–0.42	0.22–0.23	0.12	0.27–0.32
Maxilla 2				
exopod and endopod lateral setae	Absent	Absent	Present	Present
exopod length	Barely reaching half of endopod segment 1	Reaching endopod segment 2	Reaching half of endopod segment 1	Reaching endopod segment 2
Maxilliped 2				
endopod carpus and propodus lateral processes	Present in males	Present in males	Absent in females, ? in males	Absent
Pereopod dactylus	Thick	Thin	Thin	Thick
Pereopod 3–6				
carpopropodus segment number	4	4 or 5	4 or 5	4
segment 1 / segments 2–4 (5) combined length	Shorter	Shorter	Shorter	Longer, as long as or only slightly shorter

times as long as wide and about as long as merus, with three medial setae; merus 6 times as long as wide, with distolateral and distomedial bunches only; carpopropodus 3-segmented, segment 1 as long as segments 2 and 3 combined.

Pereopod 3–6 basis with distomedial tubercle, endopod long and thin, preischium and ischium without setae; ischium and merus bending in relation to each other; dactylus rather thick. Pereopod 3 ischium 9 times as long as wide; merus 11 times as long as wide and 0.9 of ischium length, with five medial bunches of one or two short setae; carpopropodus 4-segmented, segment 1 is 1.3 times as long as segments 2 and 3 combined. Pereopod 4 endopod long and thin, preischium and ischium without setae; ischium 11 times as long as wide; merus 11 times as long as wide and 0.8 of ischium length, with four medial bunches of one or two short setae; carpopropodus 4-segmented, segment 1 as long as segments 2 and 3 combined. Pereopod 5 endopod long and thin, preischium and ischium without setae; ischium 13 times as long as wide; merus 9 times as long as wide and 0.7 of ischium length, with four medial bunches of one or two short setae; carpopropodus 4-segmented, segment 1 is 1.1 times as long as segments 2 and 3 combined. Pereopod 6 exopod 9-segmented, endopod long and thin, preischium without setae; ischium 11 times as long as wide; merus 8 times as long as wide and 0.6 of ischium length, with four medial bunches of one or two short setae; carpopropodus 4-segmented, segment 1 is 0.9 times as long as segments 2 and 3 combined.

Pleopod 2 longest apical seta 0.9 of ramus length. Pleopod 3 longest apical seta 0.8 of ramus length. Pleopod 5 longest apical seta 0.4 of ramus length.

Variation. Scriptor *et al.* (2020) provided rather detailed information on the variation in *D. holmquistae*. I will only mention here the most diagnostically important features. The species has considerable variability in cornea size, from being clearly narrower than the eyestalk (0.7 times as wide as the eye stalk) to nearly as wide (0.96). The antennal scale is 2.5–3.6 times as long as wide and shorter, about as long as or even slightly longer than the antennal peduncle. The telson can be shorter or longer than the last abdominal segment. One of the illustrated males from Florida (Scripter *et al.*, 2020, fig. 3D) had the terminal lateral spiniform setae less than half as long as the subterminal. The telson apex can be rather smoothly rounded, with apical spinules set close together, like in the specimens from India (cf. Panampunnayil & Biju, 2007), or truncated with the spinules set apart, like in the types, illustrated by Bowman & Orsi (1992) and the Australian specimens.

Distribution. USA, California: San Joaquin Estuary, Sacramento (Bowman & Orsi, 1992; Dean *et al.*, 2005); Florida: Port of Jacksonville, the lower St. Johns River and surrounding St. Johns estuarine system, the Indian River lagoon, and Fort Lauderdale brackish water canals; Texas: Gulf of Mexico near Freeport (Scripter *et al.*, 2020). India, Kerala: Arabian Sea inlets near Kochi (Panampunnayil & Biju, 2007). Australia, New South Wales: Coral Sea near Yamba; Tasman Sea, Twofold Bay.

Habitat. Estuarine-marine species, found in salinities from 0 to 32‰. The Australian specimens were trapped at open sea sandy beaches, at depth of 8 m.

Remarks. *Deltamysis holmquistae* was originally described

by Bowman & Orsi (1992) in detail, but with the sexual dimorphism and other considerable variation unreported. The authors also illustrated maxilla 2 endopod as 3-segmented, while it is always 2-segmented in Mysida. Revising the paratypes together with additional new material, Scriptor *et al.* (2020) revealed discrepancies in the original description and redescribed *D. holmquistae*. They also synonymized *K. pillaii* based on the redescription and comparison with the *K. pillaii* description. The pereopod 1 and 2 carpopropodus segment 1 was originally illustrated as longer than the segments 2 and 3 combined (Bowman & Orsi, 1992, fig. 3D). Later, in Panampunnayil & Biju (2007, fig. 4A, B) from the Indian coast, and in Scriptor *et al.* (2020, fig. 2F, G) from the US coast the segment 1 was shown to be shorter than the segments 2 and 3 combined. Previous authors did not give detailed illustrations of maxilliped 1 dactylar claw, which may possess the apical wing-like extensions, described above. These could be additional diagnostic features, but further study is necessary to confirm. After the transfer of more species into the genus *Deltamysis*, it became necessary to provide a diagnosis for *D. holmquistae*, which was previously analogous to the generic diagnosis. Considering the detailed study of Scriptor *et al.* (2020) and comparing the species with the other three members, I attempted above to compose a new diagnosis.

Deltamysis lowryi sp. nov.

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Figs 6–8

Holotype: Male (+slide), 4 mm, Australia, New South Wales, Yamba, off the end of the jetty at the Blue Dolphin Caravan Park, 29°26'S 153°20.5'E, 1 m, *Zostera* with anoxic mud, st. NSW 316, baited trap, set 15:00, retrieved 08:00–09:00, coll. J. K. Lowry, S. J. Keable, 06–07 Jun 1988, AM P.98699.

Etymology. The species is dedicated to carcinologist James Kenneth (Jim) Lowry, one of the two collectors of the holotype, for his support in various crustacean projects, and for his contributions to zoology.

Diagnosis. Anterior margin of carapace angular, apically rounded (Fig. 6B). Cornea narrower than eyestalk (0.7 as wide as stalk). Telson (Fig. 6C, D) rather prolonged with nearly parallel lateral margins, 1.4 times as long as wide anteriorly, apically with shallow cleft, 0.05 of telson length, bearing seven spinules, shorter than one third of lateral terminal spiniform setae; its lateral margins with eight spiniform setae; subterminal spiniform setae shorter than preceding lateral and terminal; terminal spiniform setae 0.22–0.23 of telson length. Maxilla 2 (Fig. 8A), exopod big, reaching endopod segment 2, without lateral setae, but three apical setae; endopod without lateral setae. Maxilliped 2 with lateral processes on carpus and propodus (Fig. 8B). Pereopod dactylus rather thin, about twice as long as wide (Fig. 8C–G). Pereopod 3–6 carpopropodus 4- or 5-segmented; segment 1 shorter than other segments combined (Fig. 8E, F).

Body length. 4 mm.

Comparison. *Deltamysis lowryi* sp. nov. is differentiated from all the species of its genus by having seven spinules in the telson cleft (only two, rarely three spinules in other



Figure 6. *Deltamysis lowryi* sp. nov., holotype, male, 4 mm, New South Wales, Yamba, AM P.98699. (A) habitus, lateral; (B) head, dorsal; (C) posterior part of body with telson and uropods, dorsal; (D) telson posterior part; (E) posteroventral margin of abdominal segment 6, and uropodal protopod; (F) antennular peduncle distal part, dorsal; (G) antennular peduncle and scale, ventral view. Scales (mm): A = 1; B, C, G = 0.5; D–F = 0.25.



Figure 7. *Deltamysis lowryi* sp. nov., holotype, male, 4 mm, New South Wales, Yamba, AM P.98699: (A) mandibular palp, anterior; (B) mandibles, ventral; (C) labrum, ventral; (D) maxilla 1 outer ramus, posterior; (E) maxilliped 1, anterior; (F) pleopod 2, anterior; (G) pleopod 4, anterior; (H) pleopod 5, anterior. Scales (mm): A–D, F–H = 0.25; E = 0.5.

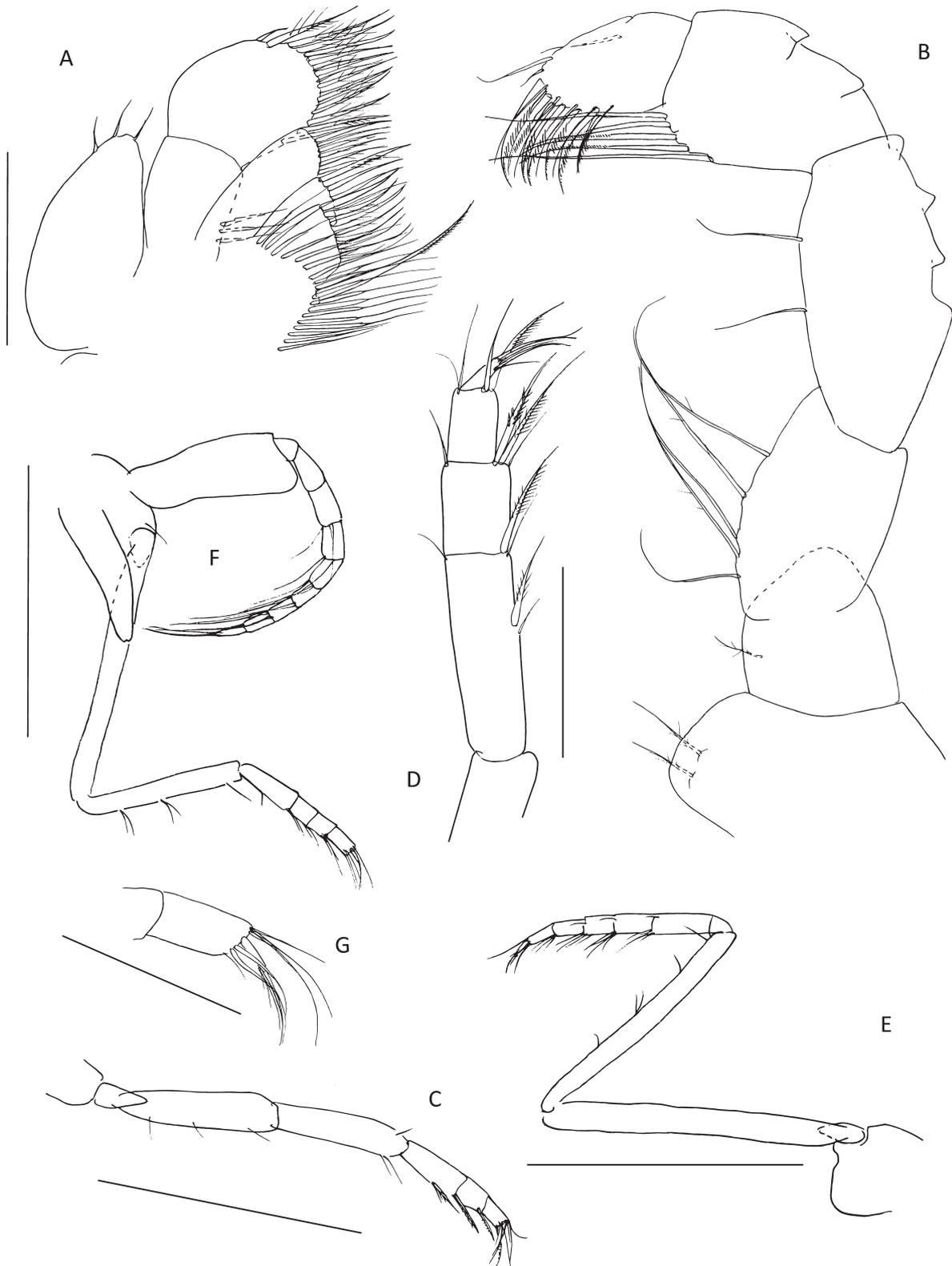


Figure 8. *Deltamysis lowryi* sp. nov., holotype, male, 4 mm, New South Wales, Yamba, AM P.98699: (A) maxilla 2, posterior; (B) maxilliped 2 endopod, anterior; (C) pereopod 1 endopod, posterior; (D) pereopod 1 distal part, posterior; (E) pereopod 4 endopod, anterior; (F) pereopod 6, posterior; (G) pereopod 1 distal part, posterior. Scales (mm): A, D, G = 0.25; B, C, E, F = 0.5.

species) and the telson lateral subterminal spiniform setae significantly shorter than the preceding lateral spiniform setae (longer in other species). Additional differences from particular species can be seen in Table 1.

Description of male holotype. Anterior margin of carapace slightly produced, angular, with rounded apical margin, covering eye stalk bases. Abdomen rather long, more than twice as long as cephalothorax. Abdominal segment 6, posteroventral lobes overlapping. Telson 0.93 of last abdominal segment, rather wide apically, 1.4 times as long as wide and 0.41 times as wide posteriorly (outside of terminal spiniform setae) as anteriorly. Lateral margins almost straight, with eight spiniform setae, gradually increasing in length posteriorly, except for subterminal, half as long as previous lateral and 0.3 of terminal. Terminal spiniform setae 0.22–0.23 times as long as telson and 1.6 times as long as longest posterolateral spiniform setae. Telson apical margin with slight cleft, 0.05 of telson length, bearing seven thin spinules.

Eyes quite large, 0.5 as long as head width, almost globular, 1.2 times as long as wide; stalk anteromedial part slightly produced; cornea lateral, narrower (0.7) than stalk (laterocorneal eyes). Antennular peduncle, segment 3 with one medial and three distomedial plumose setae. Antennal scale reaching about half of antennular peduncle segment 3, slightly longer than antennal peduncle, 2.5–2.6 times as long as wide. Antennal peduncle segment 2 is 1.45 times as long as segment 3. Labrum apically with smoothly rounded marginal plate. Mandible, left incisor and lacinia mobilis with three cusps. Mandibular palp, segment 2 medial margin with two thin median and three distal flagellate setae, lateral margin with one long distal seta; segment 3 is 0.4 times as long as segment 2. Maxilla 1, outer ramus with eight smooth apical spiniform setae. Maxilla 2, exopod oviform, rather big, reaching endopod segment 2, twice as long as wide, with three apical setae and without lateral setae; endopod segment 2 without lateral setae.

Maxilliped 1 exopod 8-segmented. Endopod typical for subfamily; dactylar setae smooth; unguis apically with wing-like expansions. Maxilliped 2 endopod, segments rather strong, with only medial setae (except dactylus). Basis with two plumose setae. Ischium with one plumose seta. Merus 1.6 times as long as wide and 0.8 times as long and about as wide as carpus, with five plumose setae. Carpus 2.2 times as long as wide, with two setae and four distolateral cuticular prominences (or processes). Propodus 1.5 times as long as wide, with five anteriorly finely serrated setae and two lateral prominences. Dactylus 1.7 times as long as wide and 0.7 times as long as carpus, with three lateral setae and lateromedian suture, six distomedial posteriorly serrated setae and thin setae among the latter.

Pereopod 1 endopod with ischium and merus nearly on one line, with slight bending capability in relation to each other; preischium without setae; ischium 4.4 times as long as wide, with three medial setae; merus 4.3 times as long as wide and 0.8 times as long as ischium, with one distomedial bunch of setae; carpopropodus 3-segmented, segment 1 is 1.3 times as long as segments 2 and 3 combined, with two distomedial bunches of one thin seta and one strong anteriorly and posteriorly serrated seta; segment two with distomedial bunch of one thin seta, one stronger seta with anterior and posterior fine serrations and strong seta with robust anterior and posterior serrations; segment 3 with two

paradactylary setae, one smooth and one posteriorly finely serrated; dactylus rather thin, about twice as long as wide, half as long as carpopropodus segment 3, with two smooth and equally strong dactylary setae.

Pereopod 4 endopod long and thin, preischium and ischium without setae; ischium 11 times as long as wide; merus 12 times as long as wide and 0.9 of ischium length, with four medial bunches of one or two short setae; carpopropodus 5-segmented, segment 1 being 1.2 times as long as segments 2 and 3 combined. Pereopod 6 exopod 8-segmented, endopod long and thin, preischium and ischium without setae; ischium 12 times as long as wide; merus 8 times as long as wide and 0.6 of ischium length, with three medial bunches of one or two short setae; carpopropodus 4-segmented, segment 1 is 1.5 times as long as segments 2 and 3 combined; paradactylary and dactylary setae smooth; dactylus rather thin, 0.4 times as long as carpopropodus segment 4.

Penis rather long, tubiform, slightly narrowing apically. Pleopods not modified. Pleopod 2 longest apical seta 0.9 of ramus length. Pleopod 4 longest apical seta 0.7 of ramus length. Pleopod 5 longest apical seta 0.4 of ramus length. Uropodal endopod shorter than exopod, without medial spiniform setae.

Distribution. Australia, New South Wales: Clarence River mouth, Yamba.

Habitat. The only male was trapped in the river mouth conditions, on muddy bottom with *Zostera*, at depth of 1 m.

Deltamysis nana (Murano, 1998)

Heteromysoides nana Murano, 1998: 32–37, figs 4, 5.—
Hanamura & Kase, 2001: 65, 70, fig. 3d; 2004: 2151.—
Lowry & Stoddart, 2003: 450.—Yolanda *et al.*, 2019:
535, 541.

Deltamysis nana.—Daneliya, 2021: 4.

Holotype: Female (with embryos), 3.3 mm, Australia, Northern Territory, Channel Island, mud around mangroves, coll. K. Coombes, 2 Jul 1991, NTM Cr. 008032 (Murano, 1998).

Diagnosis. Anterior margin of carapace angular, apically rounded. Cornea narrower than stalk (0.8 times as wide). Telson rather long, trapezoidal, with tapering lateral margins, 1.5–1.6 times as long as wide anteriorly; apically with barely visible cleft, 0.02 of telson length, with two spinules, less than half as long as lateral terminal spiniform setae; its lateral margins with five spiniform setae; subterminal spiniform setae about twice as long as preceding lateral and about as long as terminal; terminal spiniform setae 0.12 of telson length. Maxilla 2, exopod rather small, not reaching endopod segment 2, with numerous short lateral setae; endopod with lateral setae. Maxilliped 2 without lateral processes on carpus and propodus. Pereopod dactylus rather thin, about twice as long as wide. Pereopod 3–6 carpopropodus 4–5-segmented, segments thin, prolonged; segment 1 significantly shorter than other segments combined.

Body length. Only known female holotype is 3.3 mm (Murano, 1998).

Comparison. *Deltamysis nana* is distinguished from other species of the genus by the narrowest telson. Other specific

differences can be consulted in Table 1.

Distribution. So far known only from its type locality by the Australian coast of the Timor Sea, Northern Territory, near Channel Island (Murano, 1998).

Habitat. Found among the mangroves in mud (Murano, 1998).

Remarks. Murano (1998) described and illustrated this species in detail, and assigned it to the genus *Heteromysoides*. He did not mention any particular reason for such an assignment, but presumably for the somewhat subquadrate, flattened eyes. It was already noted that *H. nana* had the shape of the eyes, telson, mandibular palp and pereopods similar to *Deltamysis*, and the species was transferred to this genus (Daneliya, 2021). Here I compare it with all known species of *Deltamysis* and revise its diagnosis.

Deltamysis songkhlaensis (Yolanda, Sawamoto & Lheknim, 2019)

Heteromysoides songkhlaensis Yolanda *et al.*, 2019: 536–542, figs 2–4.

Deltamysis songkhlaensis.—Daneliya, 2021: 4.

Type material. Holotype, allotype, and numerous paratypes, Songkhla Lagoon, Thailand, Songkhla Province, Singha-Nakhon District, Tambon Bang Khiat, Ban Bang Khiat, Thale Sap, 7°20'58.68"N 100°25'31.56"E (see Yolanda *et al.*, 2019).

Diagnosis. Anterior margin of carapace angular, apically pointed or blunt. Cornea narrower than eyestalk (0.57–0.63 times as wide). Telson rather short, with tapering lateral margins, posteriorly rounded, 1.1–1.2 times as long as wide anteriorly; apically without cleft, rather convex, and spinules nearly undistinguishable in length from neighbouring spiniform setae; its lateral margins with four to seven spiniform setae on each side, gradually increasing in length; longest terminal spiniform setae 0.27–0.32 of telson length. Maxilla 2, exopod rather large, reaching endopod segment 2, with numerous lateral setae; endopod with lateral setae. Maxilliped 2 without lateral processes on carpus and propodus. Pereopod dactylus rather thick. Pereopod 3–6 carpopropodus 4-segmented; segment 1, longer, subequal or only slightly shorter than other segments combined.

Body length. Males 3.2–4.0 mm, females 3.1–3.7 mm (Yolanda *et al.*, 2019).

Comparison. *Deltamysis songkhlaensis* is the most differentiated species in the genus, with unique shape of the carapace anterior margin (see diagnosis), the deepest reduction of the eye cornea, the telson armature and the segment ratio in pereopod 3–6 carpopropodus (Table 1).

Distribution. Currently known only from the Songkhla Lagoon system in Thailand (Yolanda *et al.*, 2019).

Habitat. Found in brackish water conditions (0.47–24.8 psu) on the muddy bottom at depths of 0.6–1.5 m (Yolanda *et al.*, 2019).

Remarks. Yolanda *et al.* (2019) in their detailed description of *D. songkhlaensis* attributed the species to the genus *Heteromysoides* (Daneliya, 2021). They noticed certain similarities of *D. songkhlaensis* to a species formerly known

as *H. nana*, now also a member of *Deltamysis*, as well as other former *Heteromysoides* species, currently belonging to the genus *Platyops* (tribe Heteromysini). *Deltamysis songkhlaensis* is indeed similar to *D. nana*, but not more than to the other three species of *Deltamysis*, equally sharing with them all the generic diagnostic features. In the prior work I transferred *H. songkhlaensis* to *Deltamysis*, and here I update the species diagnosis, comparing it with other members of the genus.

Concerning the structure of the telson, it is not possible to say, whether the apical spinules are entirely missing in *D. songkhlaensis* or they are strongly developed into the large spiniform setae, which are undistinguishable from the lateral spiniform setae. I have been calling these spine-like structures “spinules”, because they are normally attached to the telson without articulation. In *D. songkhlaensis* the apical spine-like structures are clearly articulated, as it was figured by Yolanda *et al.* (2019), but to maintain their presumed homology I prefer to call them “spinules”.

ACKNOWLEDGEMENTS. The material was collected by J. K. Lowry and S. J. Keable of the Australian Museum and Research Institute (AMRI). I would like also to acknowledge the assistance of S. J. Keable and H. E. Stoddart in providing the access to and final deposition of the specimens, as well as other staff of AMRI for creating an excellent and memorable working environment during my stay at the museum. I sincerely appreciate the suggested corrections and changes to the manuscript made by the two reviewers, the journal chief editor, and the special issue editors. This study was made possible for me by the AMRI Visiting Collection Fellowship in 2015.

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