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NEW SPECIES OF *LEPTOCHELIA* (CRUSTACEA: TANAIDACEA) FROM THE ANDAMAN SEA, NORTH-EASTERN INDIAN OCEAN

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ABSTRACT

Two new species, *Leptochelia elongata* and *L. tarda,* are described from the Andaman Sea off Thailand. *Leptochelia elongata* differs from other known species in lacking of dorsal spiniform seta on antenna article 2 and in antennule articles 2–4 being subequal in length. These differences may require a redefinition of the genus. *Leptochelia tarda* appears similar to *L. dubia* (Krøyer, 1842), but differs in features of spination. The problem with the *L. savignyi/L. dubia* species complex is discussed.

INTRODUCTION

The tanaid fauna of the Indo-Pacific is little known compared with that of the northeastern Atlantic Ocean (Larsen and Wilson, 1998). Extensive material from the Andaman Sea has been collected by the BIOSHELF program (see introduction to this volume) and was sorted to order for the International Workshop on the Biodiversity of Crustaceans in the Andaman Sea. Apart from the numerous apseudomorphans, the shallow-water tanaid fauna proved to consist mainly of tanaidomorphans from the superfamily Tanaidea. The superfamily Paratanaoidea was only represented by numerous specimens of *Leptochelia*.

Leptochelia is highly polymorphic and this presents difficulties in the taxonomy of the genus (Lang, 1973; Sieg, 1978; 1983a; Masunari, 1983; Ishimaru, 1985; Schram, 1986; Bamber and Bird, 1997). The problems resulting from this polymorphism can only be solved by the application of molecular methods (Larsen, 2000b). However, species can still be identified and described using traditional morphological characters.

The diagnostic characters of *Leptochelia* are poorly defined and open to wide interpretation. Even family-level characters, such as the number of antennule and uropod articles, are not fixed. Such characters have recently been shown to be ontogenetically dependent in other tanaidomorphan genera including *Bathytanais* (Larsen and Wilson, 1998), *Collettea* (Larsen, 2000) and *Paratanais* (Larsen, 2001) as well as being known to occur in *Leptochelia* (Masunari, 1983). Further inconsistencies in diagnosis to *Leptochelia* are shown to exist with the description of the new species (see discussion) here. The diagnosis of *Leptochelia* clearly needs to be re-assessed but that task is not within the scope of this work. It is, however, important to note that all species of *Leptochelia* have eyes, females have a biramous multiarticulated uropod, and males have a slender elongated cheliped. *Leptochelia* is probably the most numerically abundant shallow-water genus worldwide.

MATERIALS AND METHODS

Paratypes are deposited in the collection of the Zoological Museum, University of Copenhagen (ZMUC), Denmark. Holotypes, SEM stubs, slides and the remaining specimens are deposited at the Phuket Marine Biological Center (PMBC), Thailand.

Previously collected material was sorted by PMBC staff. Additional SCUBA samples were taken during the workshop. The sampling sites are shown in 'The 1996–1998 BIOSHELF cruises' (Bussarawit and Aungtonya, 2002). Samples were washed in fresh water for 1–2 min. to osmotically shock tube dwellers and other infauna. The larger pieces were removed by hand and the remains were transferred to seawater for live sorting under the dissecting scope. This procedure proved particularly effective on the numerous coral rubble samples. Body length is abbreviated bl.

Notes on terminology of appendage orientation: The terms sternal and tergal were originally synonymous with ventral and dorsal and were intended to identify the orientation of the chelipeds and pereopods as on a live animal (Sieg, 1977; Dojiri and Sieg, 1997). Due to their morphology, the chelipeds and pereopods orientate in lateral view when mounted on a slide and thus what are ventral and dorsal in situ will appear as left and right sides. However, while sternal/tergal correspond to ventral/dorsal for the cheliped, the opposite holds true for the pereopods. Therefore, to use the terms dorsal and ventral in this situation would be erroneous and confusing. The terms sternal and tergal are used extensively in recent tanaid literature and are retained here to avoid further confusion but should not be considered synonymous with ventral/dorsal (see Fig. 1). These terms are used here only to describe features on the surface or margin of the chelipeds and pereopods.

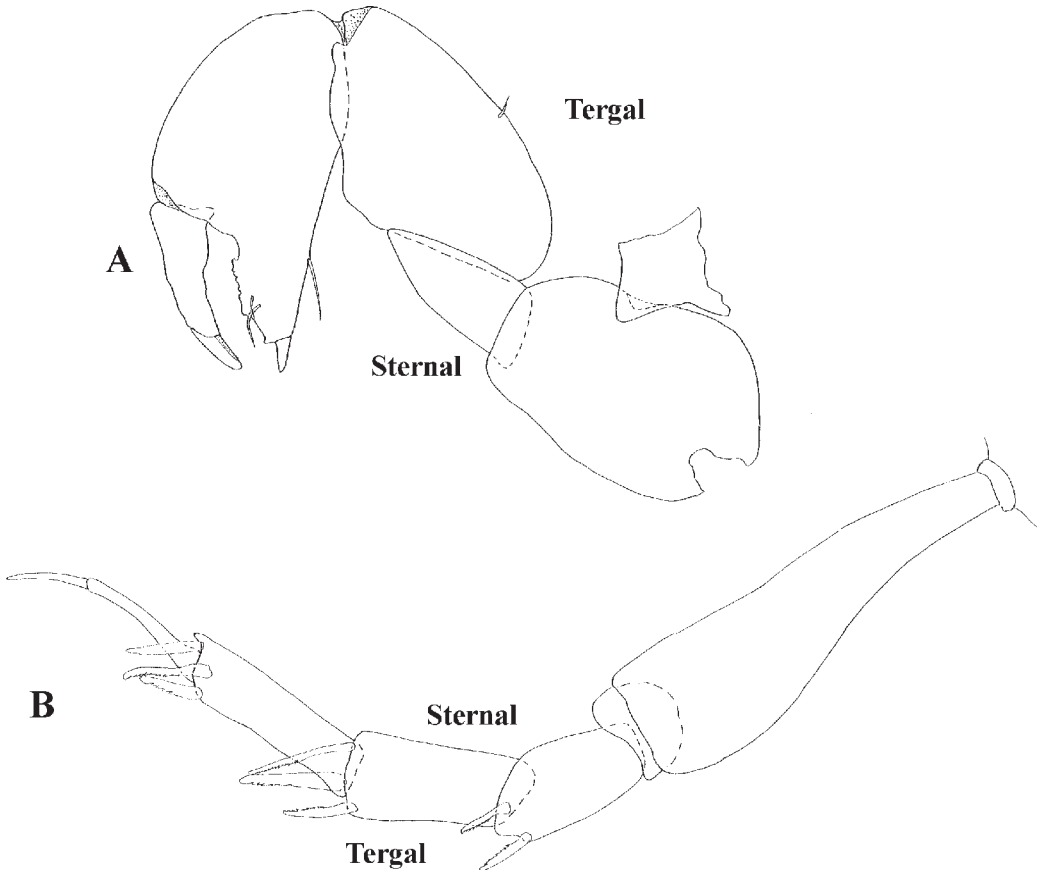

Figure 1 Terminology of tanaid appendage orientation. A, cheliped; B, pereopod.

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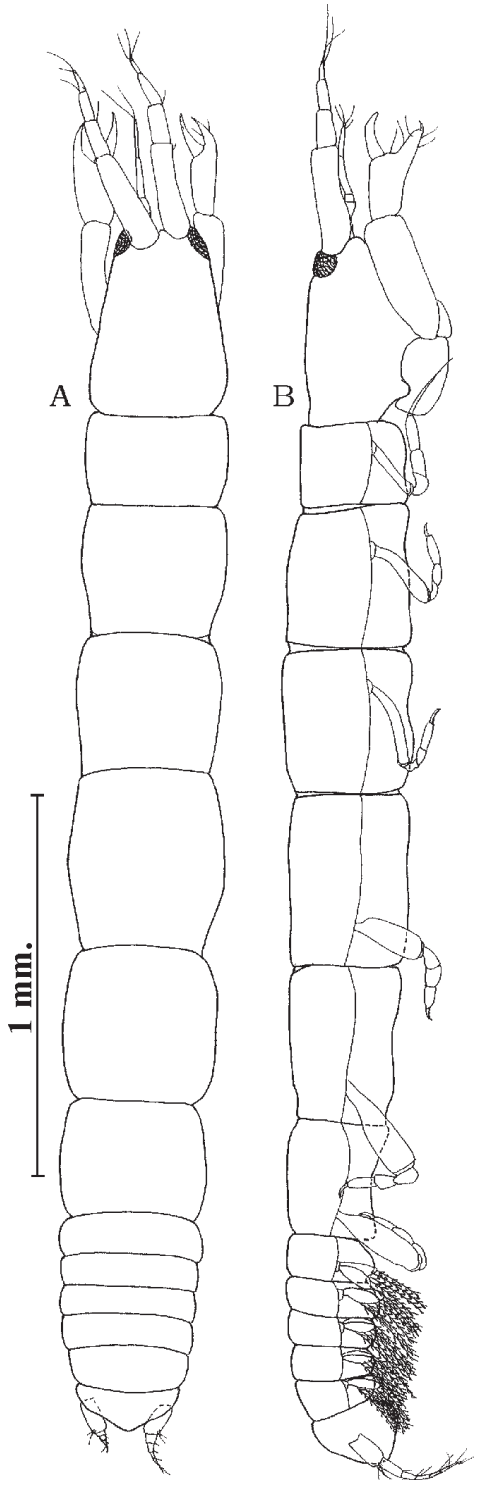

Figure 2 *Leptochelia elongata* sp. nov. Holotype female, PMBC 17479; A, dorsal view; B, lateral view.

TAXONOMY

Genus *Leptochelia*

Leptochelia elongata sp. nov.
(Figs 2–4)

Material examined
Holotype: PMBC 17479, 1 non-ovigerous female, bl 3.2 mm. Racha Yai Island, Phuket Province, SCUBA, 18 m, coll. K. Larsen, 05.12.1998.
Paratype: ZMUC CRU-3677, 1 ovigerous female, bl 3.0 mm, same data as holotype.
Other material: PMBC 15338, 6 females, 4 mancas, same data as holotype.

Habitat
Coral rubble.

Etymology
Named to reflect the elongated body shape and dactylus and terminal seta of pereopod 1 (Latin: *elongata* = elongated).

Diagnosis
Body elongated, L/W ratio 7.5/1. Antennule with 5 articles, articles 2, 3, and 4 nearly subequal in length. Antenna articles 2 and 3 without spiniform dorsal setae. Pereopod 1 dactylus and terminal seta longer than propodus.

Description (female)
Body: (Fig. 2A, B) Slender, subcylindrical, 7.5 times longer than wide.
Cephalothorax: As long as pereonite 4.
Pereonites: Pereonite 1 length 0.5 times width. Pereonite 2 length 1.7 times as long as pereonite 1. Pereonite 3 marginally shorter than wide. Pereonite 4 longer than wide. Pereonite 5 square. Pereonite 6 length 0.6 times width.
Pleon: Gradually tapering distally. Pleotelson as long as length of 2 last pleonites.
Antennule (Fig. 3A): With 5 articles. Marginally longer than cephalothorax. Article 1 as long as articles 2 –5 together, with 2 proximal simple setae and 2 distal plumose setae. Article 2 0.45 times as long as article 1, smooth. Article 3 0.9 times as long as article 2, with 1 simple medial seta. Article

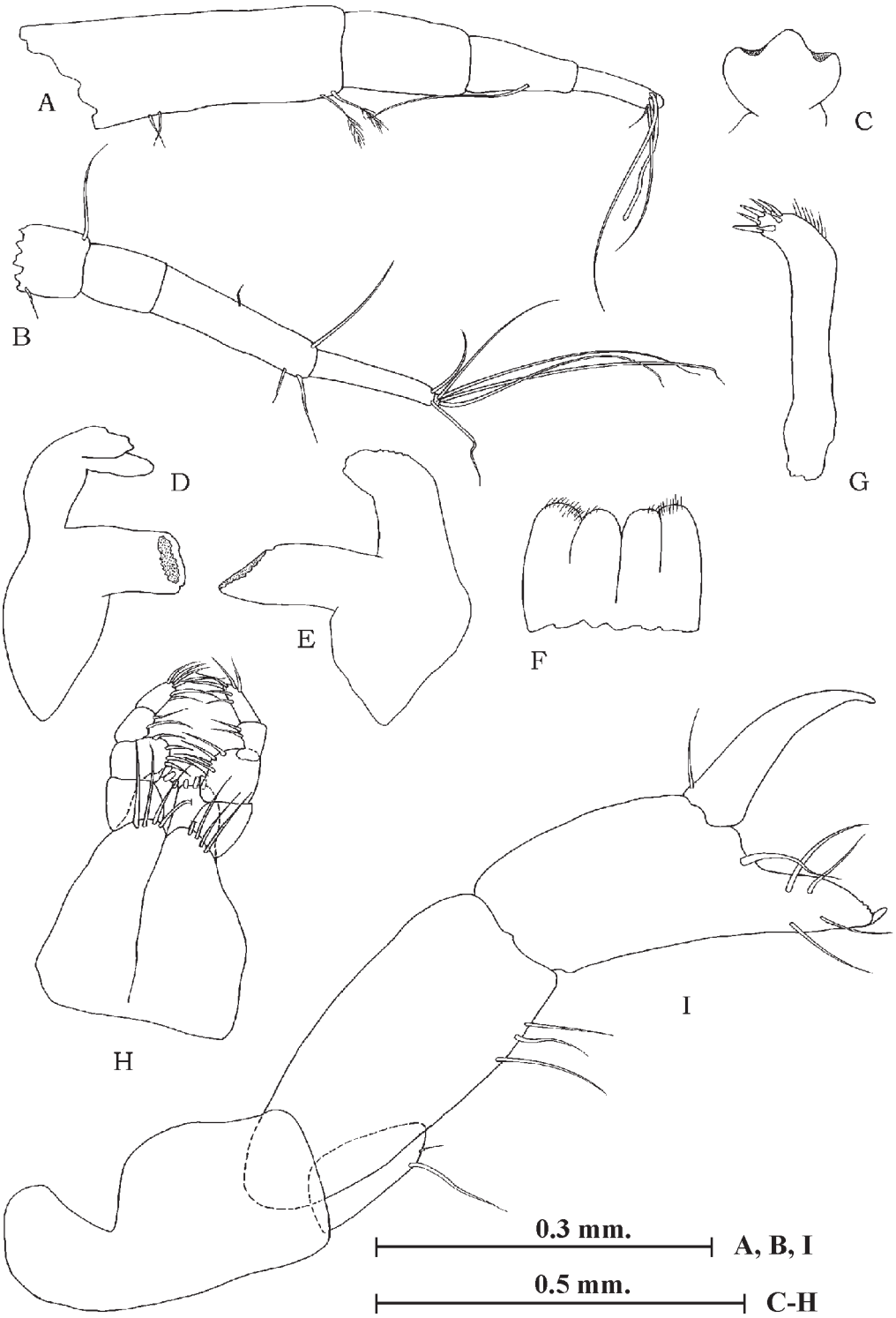

Figure 3 *Leptochelia elongata* sp. nov. Paratype female. A, antennule; B, antenna; C, labrum; D, left mandible; E, right mandible; F, maxillule; G, labium; H, maxilliped; I, cheliped.

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4 length 0.8 times as long as article 3, with 3 simple distal setae and 1 aesthetasc. Article 5 minute, smooth.

Antenna (Fig. 3B): With 6 articles, length 0.85 times as long as antennule. Article 1 not recovered. Article 2 as long as article 3, with 1 simple proximal seta and 1 simple distal seta. Article 3 with 1 simple seta. Article 4 longer than combined lengths of articles 2 and 3, with 1 medial and 3 distal setae. Article 5 length 0.75 times article 4, with 2 distal simple setae. Article 6 minute, with 4 long setae.

Mouthparts: Labrum (Fig. 3C) with medial process. Mandibles (Figs. 3D and E) molar process broad with serrated edges; left mandible (Fig. 3D) lacinia mobilis longer than incisor, incisor with medial process and decreasing in width midlength; right mandible (Fig. 3E) incisor broad and blunt, with serration on upper margin. Labium (Fig. 3F) with 2 pairs of lobes, distal margins with sparse setulation. Maxillule (Fig. 3G) endite with 7 distal spiniform setae and several small setules on outer distal margin; palp not recovered. Maxilla not recovered. Maxilliped (Fig. 3H) endites with 3 flat setae on distal margin; basis with 4 long distal setae; palp article 1 smooth, article 2 with 4 setae on inner margin, article 3 only half as wide as articles 1 and 2, with 2 setae on inner margin; article 4 with numerous distal setae. Epignath not recovered.

Cheliped (Fig. 3I): Basis divided unequally by sclerite, shorter than carpus. Merus triangular with 2 sternal setae. Carpus as long as propodus, with 3 tergal setae. Propodus length 1.2 times as long as basis; fixed finger with 2 sternal setae and 3 setae on inner margin. Dactylus with 1 small seta proximal on outer margin.

Pereopod 1 (Fig. 4A): Almost twice as long as other pereopods. Coxa smooth. Basis longer than 3 succeeding articles, slightly bent, with 2 simple sternal setae. Ischium with 1 simple tergal seta. Merus as long as carpus, with 1 simple tergal seta. Carpus 0.5 times as long as propodus, rectangular, with 4 simple distal setae. Propodus 0.9 times as long as basis, with 3 simple setae and 1 spiniform distal seta. Dactylus and terminal seta longer than propodus.

Pereopod 2 (Fig. 4B): Coxa as pereopod 1. Basis straight. Ischium smooth. Merus marginally longer than carpus, smooth. Carpus 0.8 times as long as propodus, with 1 small distal seta. Propodus longer than dactylus and terminal seta, with 3 distal setae. Dactylus and terminal seta shorter than carpus.

Pereopod 3 (Fig. 4C): Similar to pereopod 2 except: Ischium with 2 setae. Merus with 2 small thick setae. Propodus with 1 simple and 1 small spiniform distal seta.

Pereopod 4 (Fig. 4D): Basis twice as wide as pereopods 1–3, with 3 sternal plumose setae. Ischium with 1 seta. Merus as long as carpus, with 1 small tergal distal spiniform seta and 1 simple sternal seta. Carpus as long as propodus, with 1 distal spiniform seta. Propodus longer than carpus, with 1 medial sternal simple seta, 1 tergal spiniform seta and 1 long serrated distal seta. Dactylus and terminal seta fused and shorter than propodus.

Pereopod 5 (Fig. 4E): Similar to pereopod 4 except: Basis with 3 simple tergal setae. Ischium with 2 sternal setae. Merus with 2 small spiniform tergal setae. Carpus with 2 spiniform distal setae. Propodus with 1 sternal distal spiniform seta, 1 simple and 3 serrated distal setae.

Pereopod 6 (Fig. 4F): Similar to pereopod 4 except: Basis smooth. Merus smooth. Propodus with 1 small spiniform, 1 small serrated hook-shaped and 2 serrated distal setae.

Pleopods (Fig. 4G): All 5 pairs similar. Protopod square and smooth. Exopod with 16 plumose setae. Endopod with 10 plumose setae on inner margin and 1 seta on outer margin.

Uropods: (Fig. 4H): Protopod smooth. Endopod with 6 articles. All articles with setae. Exopod with 2 articles, article 1 with 1 short simple seta, article 2 with 2 simple setae.

Remarks

Leptochelia elongata can be separated from all other species in the genus by the lack of spiniform setae on antenna articles 2 and 3. The pereopod dactylus and terminal seta combined being longer than propodus is a character state shared with *L. itoi* but the dactylus and terminal seta are more curved and shorter than those of *L. elongata.*

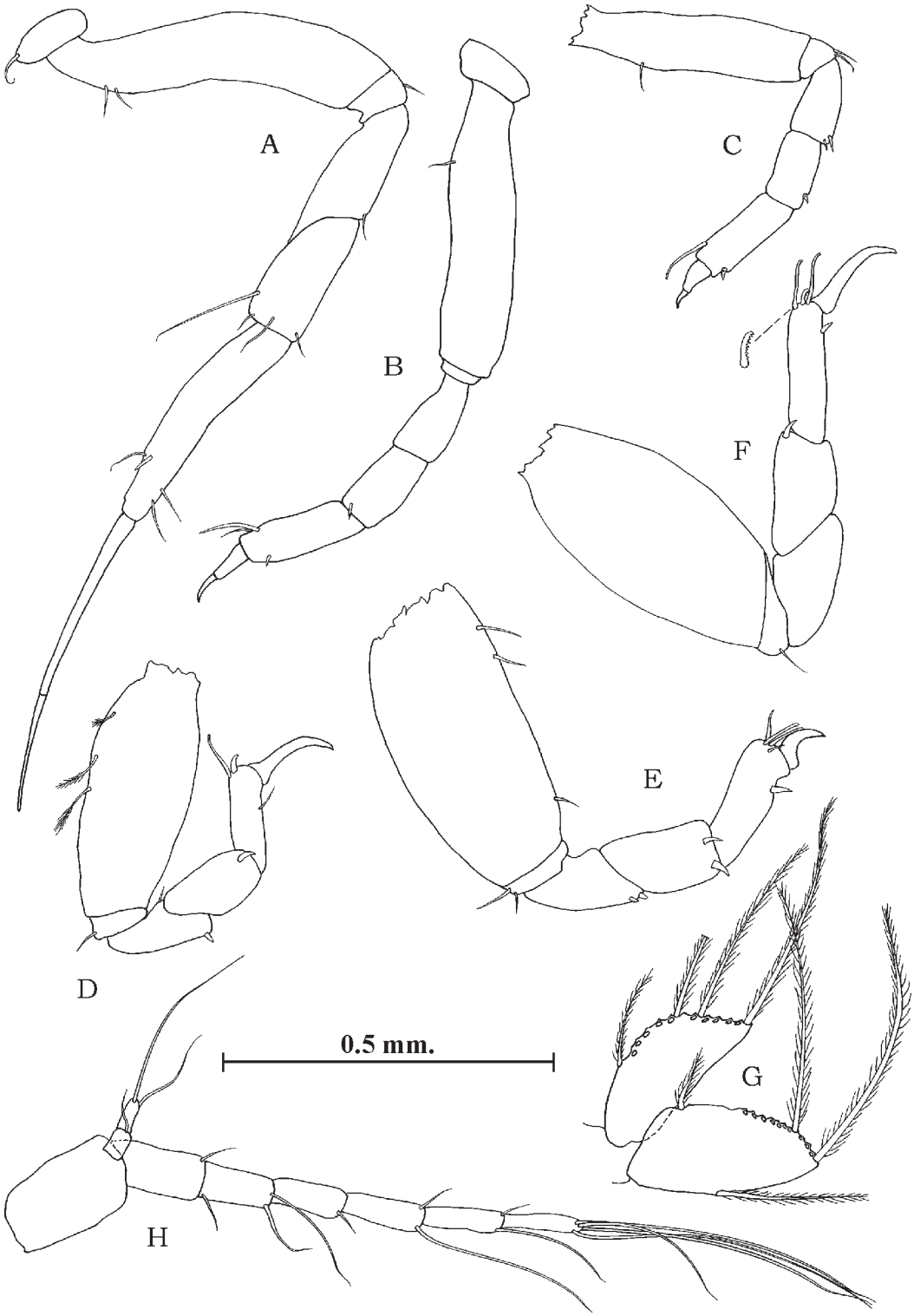

Figure 4 *Leptochelia elongata* sp. nov. Paratype female. A, pereopod 1; B, pereopod 2; C, pereopod 3; D, pereopod 4; E, pereopod 5; F, pereopod 6; G, pleopod; H, uropod.

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Leptochelia tarda sp. nov.
(Figs 5–8)

Material examined

Holotype: PMBC 17480, non-ovigerous female, bl 2.5 mm, Kho Bae Na seagrass-bed, Had Chao Mai National Park, 07º24´N, 099º20´E, coll. B. Bendell, 03.03.1997.

Paratype: ZMUC CRU-3625, 1 male, bl 2.0 mm; 1 non-ovigerous female, bl 2.4 mm, same data as holotype, coll. B. Bendell, 03.03.1997.

Other material: PMBC16038, 1 specimen, same data as holotype, coll. B. Bendell, 03.03.1997; PMBC18139, 1 specimen, same data as holotype, coll. B. Bendell, 04.01.1997; PMBC18140, 1 specimen, same data as holotype, coll. B. Bendell, 10.05.1996; PMBC18141, 7 specimens, same data as holotype, coll. B. Bendell, 13.03.1997; PMBC18138, 9 specimens, same data as holotype, coll. B. Bendell, 10.03.1996

Locality

Had Chao Mai National park, Khao Bae Na, Trang, Thailand.

Habitat

Intertidal, seagrass.

Etymology

Named to reflect the junior authors feelings towards this species (Latin: *tarda* = tedious).

Diagnosis (female)

L/W ratio 6/1. Antennule with 4 articles. Antenna article 2 without spiniform dorsal setae.

Description of female

Body: (Figs. 5A and B) Slender, subcylindrical, about 6 times longer than wide.

Cephalothorax: Longer than combined length of pereonite 1 and 2.

Pereonites: Pereonite 1 length 0.9 times as long as pereonite 2. Pereonite 2 and 3 subequal. Pereonite 4 and 5 subequal. Pereonite 6 marginally shorter than pereonite 5.

Pleon: Pleonite 1 marginally longer than succeeding pleonites. Pleotelson marginally shorter than combined lengths of pleonites 2–4.

Antennule (Fig. 5C): With 4 articles, 0.6 times as long as cephalothorax; article 1 longer than articles 2–4 together, with several setae; article 2 longer than article 3 with 3 distal setae; article 3 length 0.3 times as long as article 1, with 3 distal setae; article 4 minute, with 2 setae.

Antenna (Fig. 5B): With 6 articles, marginally shorter than antennule; article 1 broken; article 2 width as wide as succeeding articles, with 2 distal setae; article 3 rectilinear, with dorsal spiniform seta; article 4 as long as combined length of 3 preceding articles, with 3 distal setae; article 5 length 0.5 times article 4, with 2 distal setae; article 6 minute, with 1 long seta.

Mouthparts: Labrum (Fig. 6A) with medial process and lateral setation. Mandibles (Fig. 6B, C) with broad molar process with serrated edges; right mandible (Fig. 6B) incisor broad, with medial depression, upper margin heavily serrated; left mandible (Fig. 6C) with lacinia mobilis longer than incisor and decreasing in width midlength. Labium (Fig. 6D) with 2 pairs of lobes, distal margins setose. Maxillule (Fig. 6E) endite with 9 distal spiniform setae and several small simple setae on outer distal margin; palp not recovered. Maxilla not recovered. Maxilliped (Fig. 6F) endites with 3 flat setae on distal margin, outer anteriomedial corners with a few short simple setae; basis with 4 long distal setae; palp article 1 smooth, article 2 with 1 seta on outer margin, article 3 with numerous long setae on inner margin, article widening distally with numerous distal setae. Epignath not recovered.

Cheliped (Fig. 5F): Basis divided unequally by sclerite, shorter than carpus. Merus triangular, with 3 sternal setae. Carpus longer than propodus, with 3 tergal and 3 sternal setae. Propodus length 1.2 times basis, fixed finger with 2 sternal setae and 3 setae on inner margin. Dactylus as long as propodus.

Pereopod 1 (Fig. 6G): Longer than other pereopods. Basis longer than 3 succeeding articles, smooth. Ischium with 1 tergal seta. Merus as long as carpus, with 1 sternal seta. Carpus length 0.85 times as long as propodus, rectangular, with 2 distal setae. Propodus length 0.5 times basis, with 5 distal setae. Dactylus and terminal seta length subequal to propodus.

Pereopod 2 (Fig. 6H): Coxa smooth. Basis straight.

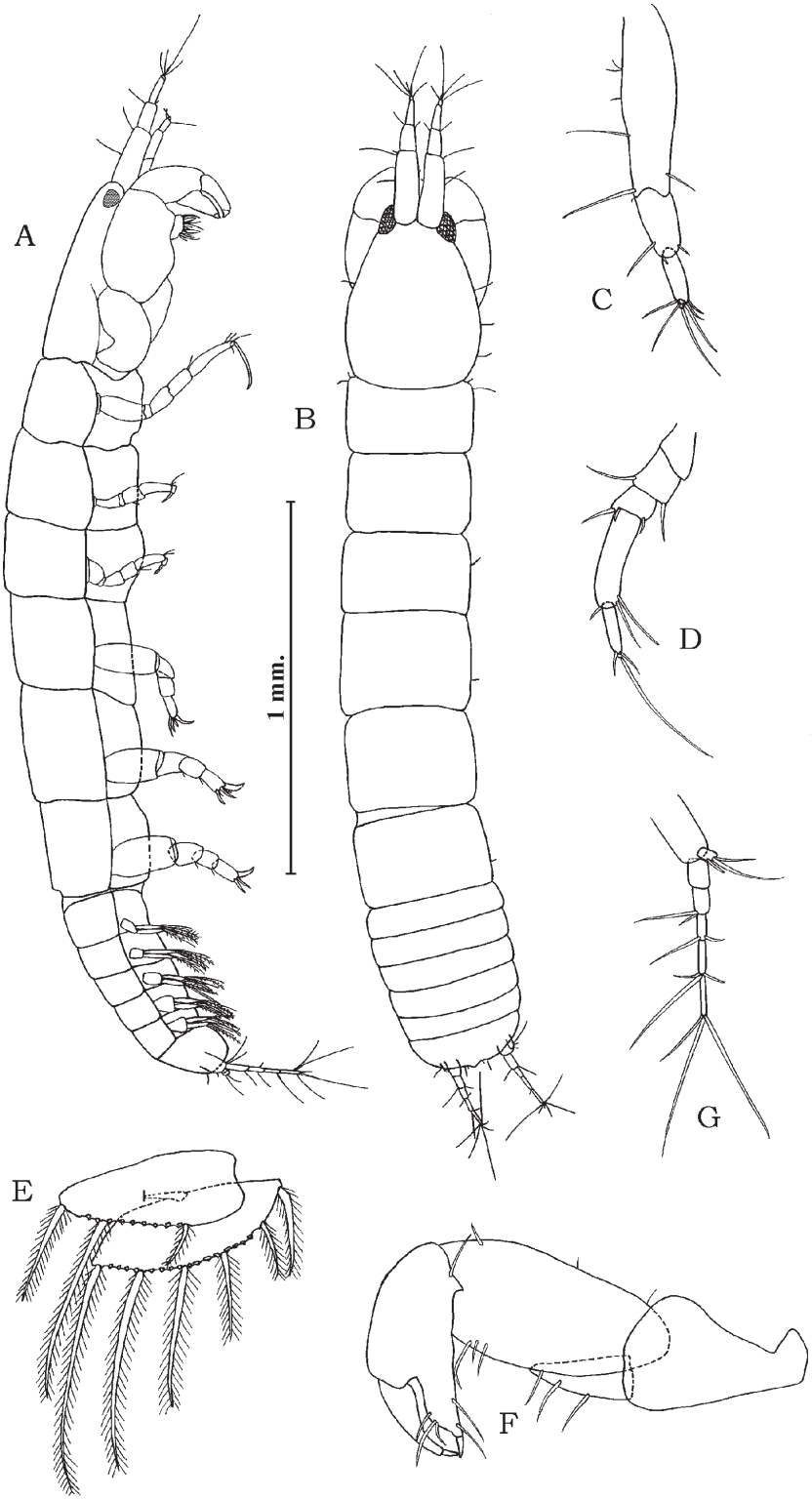

Figure 5 *Leptochelia tarda* sp. nov. A and B, holotype female, PMBC 17480. C–G, paratype female. A, dorsal view; B, lateral view; C, antennule; D, antenna; E, cheliped; F, pleopod; G, uropod.

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Ischium with 1 tergal seta. Merus marginally shorter than carpus, with 1 tergal seta. Carpus length 0.80 times propodus with 2 distal setae. Propodus longer than dactylus and terminal seta, with 3 distal setae. Dactylus and terminal seta longer than carpus.

Pereopod 3 (Fig. 6I): Similar to pereopod 2 except: Merus with 2 setae. Propodus with 2 distal setae. Dactylus broken.

Pereopod 4 (Fig. 6J): Basis wider than pereopods 1–3, smooth. Ischium with 1 tergal seta. Merus as long as carpus, with 1 small tergal distal seta. Carpus shorter than propodus, with 2 distal spiniform setae. Propodus length 1.1 times merus, with 1 small spiniform seta and 3 distal setae. Dactylus and terminal seta thicker and shorter than on pereopods 1–3 but not completely fused.

Pereopod 5 (Fig. 6K): Similar to pereopod 4 except: Basis with 1 sternal seta. Merus smooth. Propodus with 4 distal setae.

Pereopod 6 (Fig. 6L): Similar to pereopod 4 except: Basis with 2 setae. Merus and carpus smooth. Dactylus and terminal seta fused.

Pleopods (Fig. 5E): All 5 pairs similar. Protopod square and smooth. Endopod with 22 plumose setae on inner margin and 1 on outer margin. Exopod with 11 plumose setae.

Uropod (Fig. 5G): Protopod smooth. Endopod with 5 articles. All articles with setae. Exopod with uniarticulated with 3 setae.

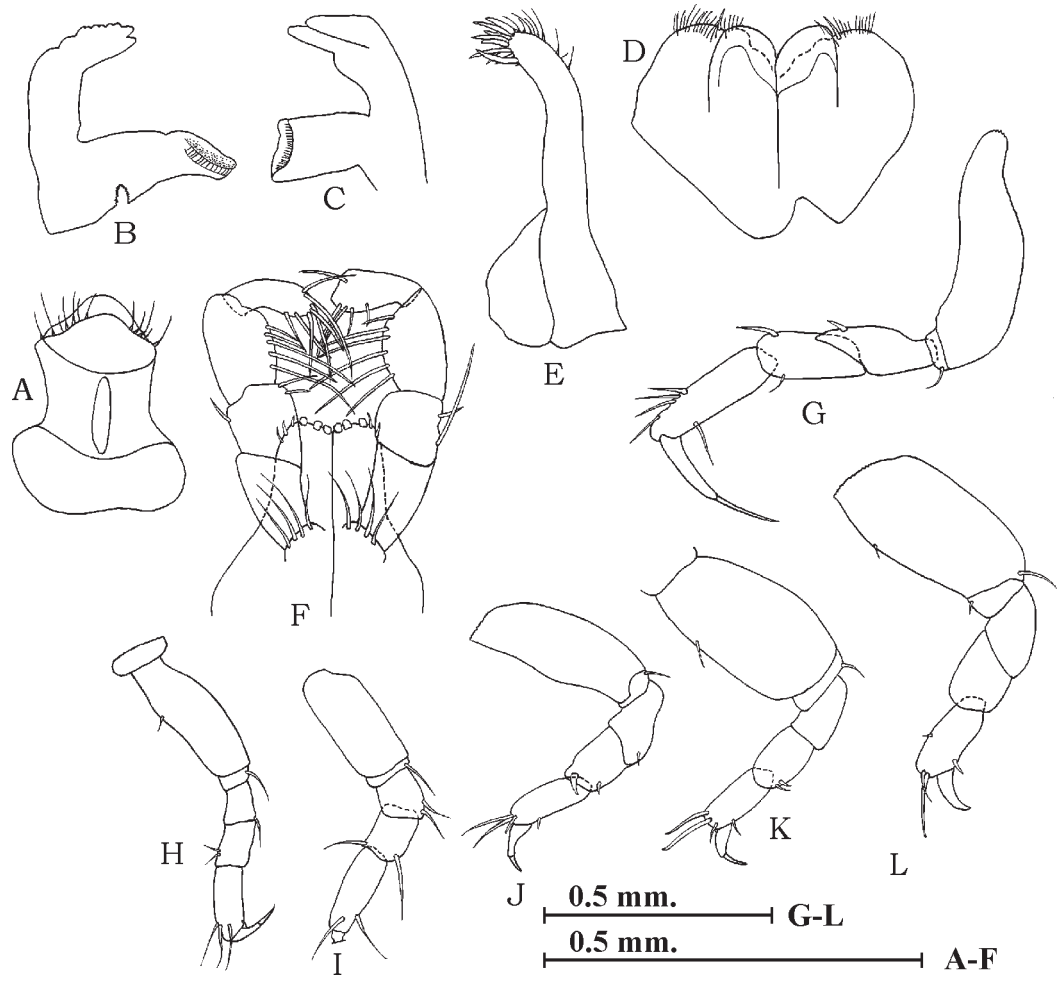

Figure 6 *Leptochelia tarda* sp. nov. Paratype female. A, labrum; B, right mandible; C, left mandible; D, maxilliped; E, labium; F, maxilliped; G, pereopod 1; H, pereopod 2; I, pereopod 3; J, pereopod 4; K, pereopod 5; L, pereopod 6.

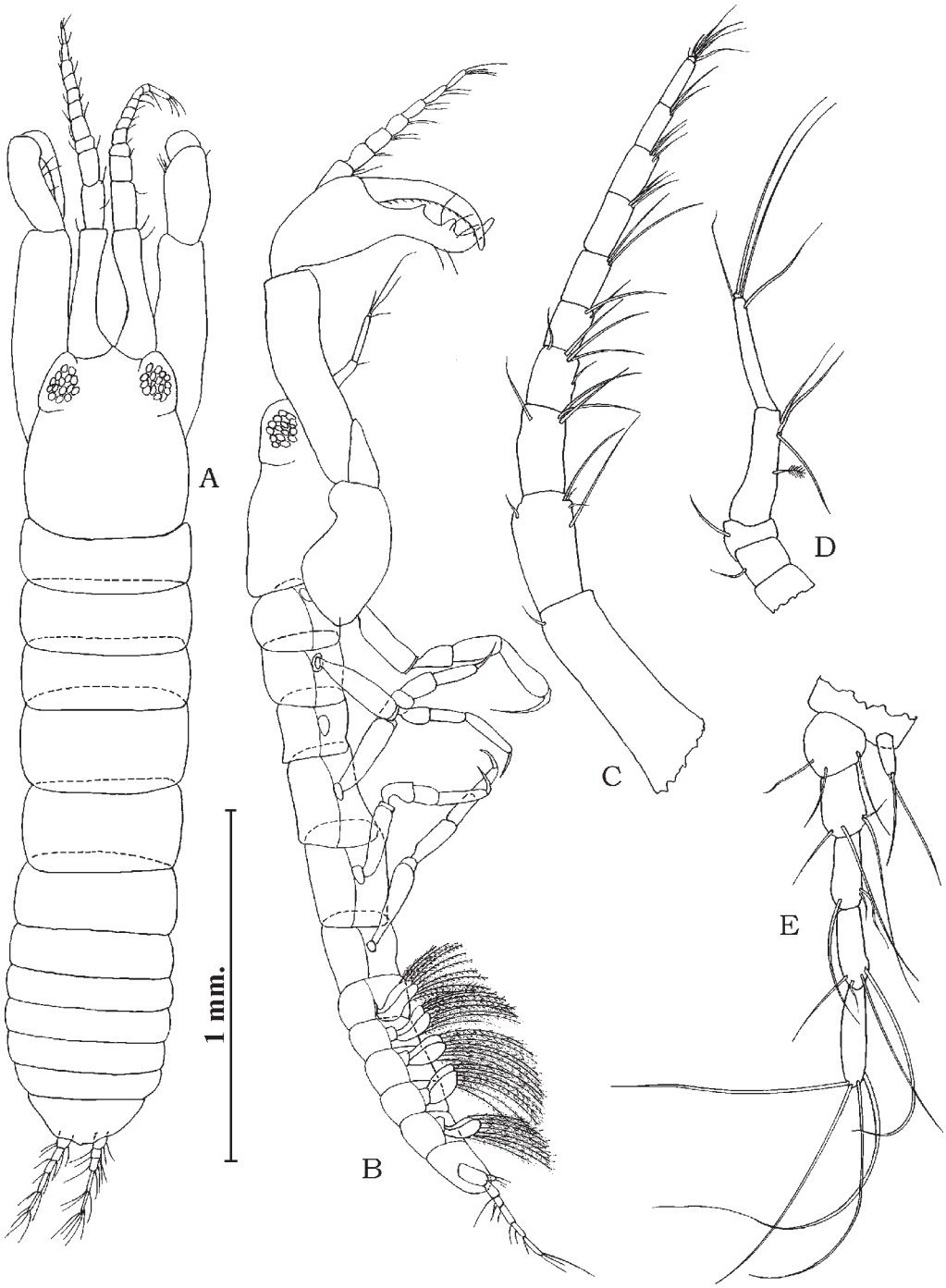

Figure 7 *Leptochelia tarda* sp. nov. Paratype male. A, dorsal view; B, lateral view; C, antennule; D, antenna; E, uropod.

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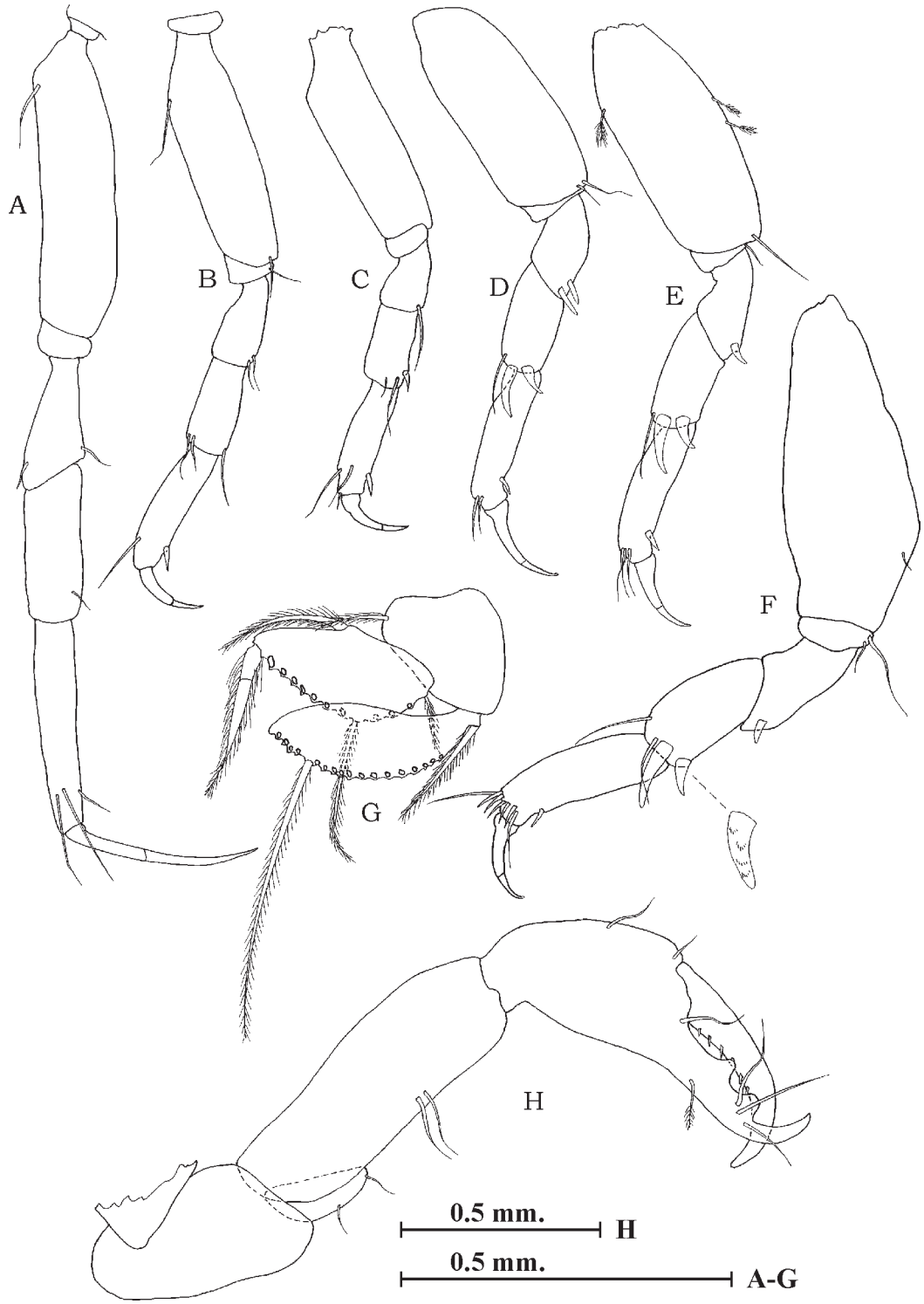

Figure 8 *Leptochelia tarda* sp. nov. Paratype male. A, pereopod 1; B, pereopod 2; C, pereopod 3; D, pereopod 4; E, pereopod 5; F, pereopod 6; G, pleopod; H, cheliped.

Description of male (Figs 7 and 8)
Body (Fig. 7A, B): About 4.5 times as long as wide. More dorsoventrally flattened than in female. Depth of pereonites only 0.6 times those of female.
Cephalothorax: Longer than 3 succeeding pereonites together. Eyes twice as large as in female.
Pereonites: Pereonites 1–3 subequal, 0.3 times as long as wide. Pereonite 4 twice as long as pereonite 3. Pereonite 5 marginally shorter than pereonite 4. Pereonite 6 marginally shorter than pereonite 5.
Pleon: Slightly expanded midlength. Pleotelson 1.5 times as long as pleonite 5.
Antennule (Fig. 7C): With 11 articles, twice as long as cephalothorax, all articles setose.
Antenna (Fig. 7D): With 6 articles, 0.85 times as long as cephalothorax. Articles 1–3 relatively square. Articles 4 and 5 both 3 times as long as article 2. Article 6 minute, with 3 long setae.
Mouthparts: Reduced, only rudimentary maxilliped present. Epignath not recovered.
Cheliped (Fig. 8G): Longer 0.5 times than total body length. Basis divided unequally by sclerite, length 0.5 times as long as carpus. Merus triangular, with 2 sternal setae. Carpus marginally shorter than propodus, with 2 sternal setae. Propodus longer than cephalothorax, with 2 tergal setae. Fixed finger inner margin with 4 setae and 2 processes, outer margin with 1 sternal plumose seta. Dactylus as long as fixed finger, with row of small evenly spaced setae on inner margin.
Pereopod 1 (Fig. 8A): Almost twice the length of other pereopods. Coxa smooth. Basis as long as 3 succeeding articles, with 1 simple sternal proximal seta. Ischium smooth. Merus subequal in length to carpus, widening distally, with 2 distal simple setae. Carpus 0.6 times as long as propodus, rectangular, with 1 simple distal seta. Propodus longer than dactylus and terminal seta, with 3 distal simple setae. Dactylus and terminal seta not fused and subequal in length.
Pereopod 2 (Fig. 8B): Coxa as pereopod 1. Basis longer than 3 succeeding articles, with 1 simple proximal sternal seta. Ischium with 2 tergal setae. Merus marginally shorter than carpus, with 2 tergal setae. Carpus length 0.7 times propodus with 3 distal setae. Propodus twice as long as dactylus and terminal seta, with 1 simple seta and 1 spiniform distal seta. Dactylus and terminal seta not fused, shorter than carpus.
Pereopod 3 (Fig. 8C): Similar to pereopod 2 except: Ischium smooth. Merus with 1 simple seta. Propodus with 3 simple setae and 1 spiniform distal seta.
Pereopod 4 (Fig. 8D): Basis twice as wide as pereopods 1–3, with 2 simple distal setae. Ischium smooth. Merus as long as carpus, with 2 tergal distal spiniform setae. Carpus with 1 simple seta and 2 spiniform curved distal setae. Propodus with 2 simple setae and 1 spiniform distal seta. Dactylus and terminal seta not fused, shorter than carpus.
Pereopod 5 (Fig. 8E): Similar to pereopod 4 except: Basis with 3 plumose setae. Ischium with 1 tergal seta. Merus with 1 curved spiniform tergal seta. Propodus with 3 simple setae and 1 spiniform distal seta.
Pereopod 6 (Fig. 8F): Similar to pereopod 5 except: Basis with 1 simple seta. Carpus with 2 simple and 2 spiniform curved distal setae. Propodus with 1 spiniform seta and row of simple distal setae.
Pleopods (Fig. 8G): All 5 pairs similar. Protopod with 1 plumose seta. Exopod with 14 plumose setae. Endopod with 18 plumose setae on inner margin and 1 on outer margin.
Uropods (Fig. 8H): Protopod smooth. Endopod with 5 articles, all articles with setae. Exopod with 2 simple setae.

Remarks

This species most closely resembles *Leptochelia dubia,* which has also been recorded from the Indo-Pacific (as *L. savignyi*) by Shiino (1965). *Leptochelia tarda* can be distinguished from *L. dubia* by the lack of spiniform setae on antenna article 2, the presence of 3 flat setae on the maxilliped endite, the sparse armament on the carpus and propodus of pereopods 4–6. There is also variation in the structure of the male cheliped carpus and fixed finger, but such variation may be intraspecific (Lang, 1973).

Leptochelia savignyi as described by Ishimaru (1985) does, however, have the 3 flat setae on maxilliped endites but can be distinguished from *L. tarda* by the presence of spiniform setae on the antenna.

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DISCUSSION

Leptochelia as defined by Lang (1973) has spiniform setae on antenna articles 2 and 3 and also 3 flat setae on the maxilliped endite. The lack of spiniform setae on the antenna of *L. elongata* and lack of flat setae on maxilliped endites of *L. savignyi* (as described by Shiino, 1965) indicates that the generic diagnosis needs re-assessment. The lack of the 3 flat setae on the maxilliped endites of *L. savignyi* is puzzling since this is normally a reliable generic character (Lang, 1973). However, as stated by several authors (Sieg, 1983b; Ishimaru, 1985; Bamber and Bird, 1997), the confusing synonymy of *L. dubia* may indicate a species complex. We concur with the notion of a species complex and with the statement of Ishimaru (1985) that it is likely that some of the species Lang (1973) synonymised as *L. savignyi,* and later as *L. dubia* (Sieg, 1983b), are valid species. We do not, however, consider this to be due to an 'overestimation' of the polymorphism but rather due to the co-occurrence of cryptic species as well as significant polymorphism (as seen in *Paratanais* see Larsen, 2001). Preliminary DNA results indicates that this is indeed the case for *Leptochelia* (Larsen, research in progress). Further support for Ishimaru's statement is the fact that *L. savignyi* has been collected from localities separated by large distances (Woods Hole, northwest Atlantic; Madeira, mideast Atlantic; Brazil; the European Atlantic coast: Hokkaido, North Pacific; Bismarck archipelago, South Pacific; Gulf of Manaar, northern Indian Ocean and many more localities). With the knowledge of the limited dispersal capacity shown by tanaids, it is logical to assume that some of these specimens must be distinct species. *Leptochelia tarda* probably belongs to this species complex.

Ishimaru (1985) and Bamber and Bird (1997) gave a number of characters for species identification for some parts of this species complex. While most of these characters are good, recent research has shown that some of these can be ontogenetically dependent in *Leptochelia* or other genera. Those characters are: the number of articles in the female uropod endopod (Masunari, 1983), body size and pleopod setae number (Larsen, 2001).

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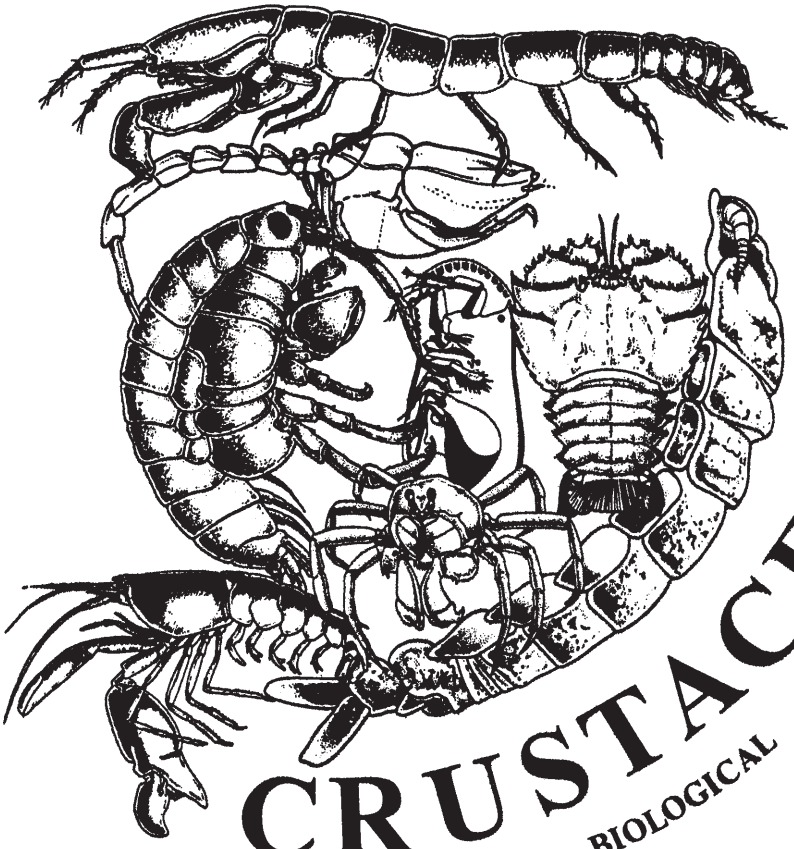

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