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A new species of *Longitarsus* Latreille, 1829 (Coleoptera, Chrysomelidae, Chrysomelidae) pupating inside stem aerenchyma of the hydrophyte host from the Oriental Region

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Abstract

A new species of subaquatic *Longitarsus* pupating inside the stem aerenchyma of its hydrophyte host plant is described. Eggs are laid on tender leaves and buds and the larvae are open feeders. This is the first report of an Oriental flea beetle pupating inside the stem of its hydrophyte host. A key to the species of southern Indian *Longitarsus* is provided.

Keywords

Chrysomelidae, subaquatic *Longitarsus*, new species, key, stem aerenchyma pupation, *Limnophila*

Introduction

Larvae of flea beetles, in general, are subterranean root feeders. A few of them mine the leaves or feed exposed on it, while fruit borers and stem borers are extremely rare (Jolivet and Hawkeswood 1995, Konstantinov and Vandenberg 1996). As a rule, flea beetle larvae associated with terrestrial plants, including leaf feeders, pupate in soil or litter. However, root and soil under submergence are inaccessible to all life stages of flea beetles due to lack of adaptation for a true aquatic life. Still a few of them have adopted strategies to circumvent this limitation to harness aquatic and subaquatic plants. Jolivet (2003) reviewed the biology of subaquatic Chrysomelidae, including subaquatic flea beetles. In many such flea beetles, larvae feed on leaves and pupation occurs in the soil on shore or facultatively on the plant itself when soil is not available. In the case of beetles living on rooted emergents and floating plants, inaccessibility to soil force all life stages, including pupae, to adapt to the portions of the plant above water level. For example, *Pseudolampsis guttata* (LeConte) that feeds on the floating water fern *Azolla caroliniana* Willd. pupates on leaf surface (Buckingham and Buckingham 1981). Species of *Agasicles* Jacoby, 1904 are unique among the subaquatic flea beetles as they pupate only inside the stem internode cavity of their amaranthaceous hosts (Vogt et al. 1979). A pair of modified T-shaped urogomphi secures the pupa from falling into the wedged position inside the internode cavity, from which emergence might be impossible (Vogt et al. 1979; Cox 1998). A new species of *Longitarsus* Latreille, 1829 from the Oriental Region, similarly adapted for pupation in stem aerenchyma is described here. Aerenchyma is a large intercellular space that acts as a mediator of internal gas exchange and maintains strength with the least tissue (Jung et al. 2008).

The cosmopolitan *Longitarsus* is the most speciose genus of flea beetles with about 700 species. Though about 100 species are known from the Oriental Region, only eight named species of *Longitarsus* occur in south India (Maulik 1926; Scherer 1969; Gruev and Askevold 1988; Prathapan et al. 2005) and several of them still await naming and description. Known host plants of the genus belong to at least a dozen families with marked preference for members of Boraginaceae, Lamiaceae, Asteraceae, and Verbenaceae (Jolivet and Hawkeswood 1995). Species of *Longitarsus* are small to medium sized flea beetles easily identified by a very long first metatarsomere which is at least half as long as the metatibia. Other salient features of the genus are the lack of transverse or longitudinal impressions on the pronotum, open procoxal cavities and the confused elytral punctures rarely forming regular striae. Members of *Longitarsus* are generally terrestrial and their larvae feed on the roots (Furth 1980, Ireson et al. 1991, Schwarzländer 2000, Baars 2001 and Simelane 2010). Exceptions include the European *Longitarsus nigerrimus* (Gryllenhal) that lives in peat bogs and swamps. Booth (2000) reviewed its records from the British Isles and Jolivet (2003) summarized information on its biology.

Methods

Natural populations of the beetle under field conditions were observed during 2009–2011 at Vembayam, Trivandrum, Kerala, India during several visits. The host plant, *Limnophila aquatica* (Roxb.) Alston was grown in a concrete tank partially filled with soil and water at Vellayani and live beetles were released on to these plants to confirm the biology observed in the field.

Descriptive terminology follows Konstantinov (1998). The holotype of the new species is deposited in the Natural History Museum, London (BMNH). Paratypes will be deposited in the National Pusa Collection, Indian Agricultural Research Institute, New Delhi (NPC), University of Agricultural Sciences, Bangalore (UASB), National Museum of Natural History, Smithsonian Institution, Washington DC (USNM), and in the personal collection of the first author (PKDC). Plant vouchers are deposited in the Calicut University Herbarium (Accession nos 6426, 6427, 113059, 113060). The immature stages are being retained by the first author for further studies.

Systematics

Longitarsus limnophilae **Prathapan & Viraktamath, sp. n.**
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Figs 1–8, 12–15

Holotype ♂, with labels as follows: "INDIA Kerala / Vembayam / 12. ix. 2009 Prathapan Coll." "*Longitarsus limnophilae* sp. nov. / Prathapan & Viraktamath" "HOLOTYPE [red printed label]" (BMNH).

Paratypes (30 specimens): 7 ♂, 3 ♀. The same labels as holotype; 5 ♀. same data as for holotype except dating 3.x.2009; 5 ♂. same data except dating 24.x.2009; 9 ♂, 1 ♀. same data except dating 16.i.2010 (5 BMNH, 5 USNM, 5 UASB, 12 NPC, 3 PKDC).

Etymology. This unique species is named after its host plant. The name is a noun in the genitive case.

Description. Length 1.89 – 2.15 mm; width 0.91 – 1.08 mm; female (2.09 – 2.15 mm) slightly larger than male (1.89 – 2.12 mm). General color brown (Fig. 1). Fore- and middle legs, hind tibia and tarsi light brown. Antenna piceous with proximal three to five antennomeres gradually turning brown. Labrum dark brown to piceous, suture narrowly piceous. Ventrites lighter than dorsum.

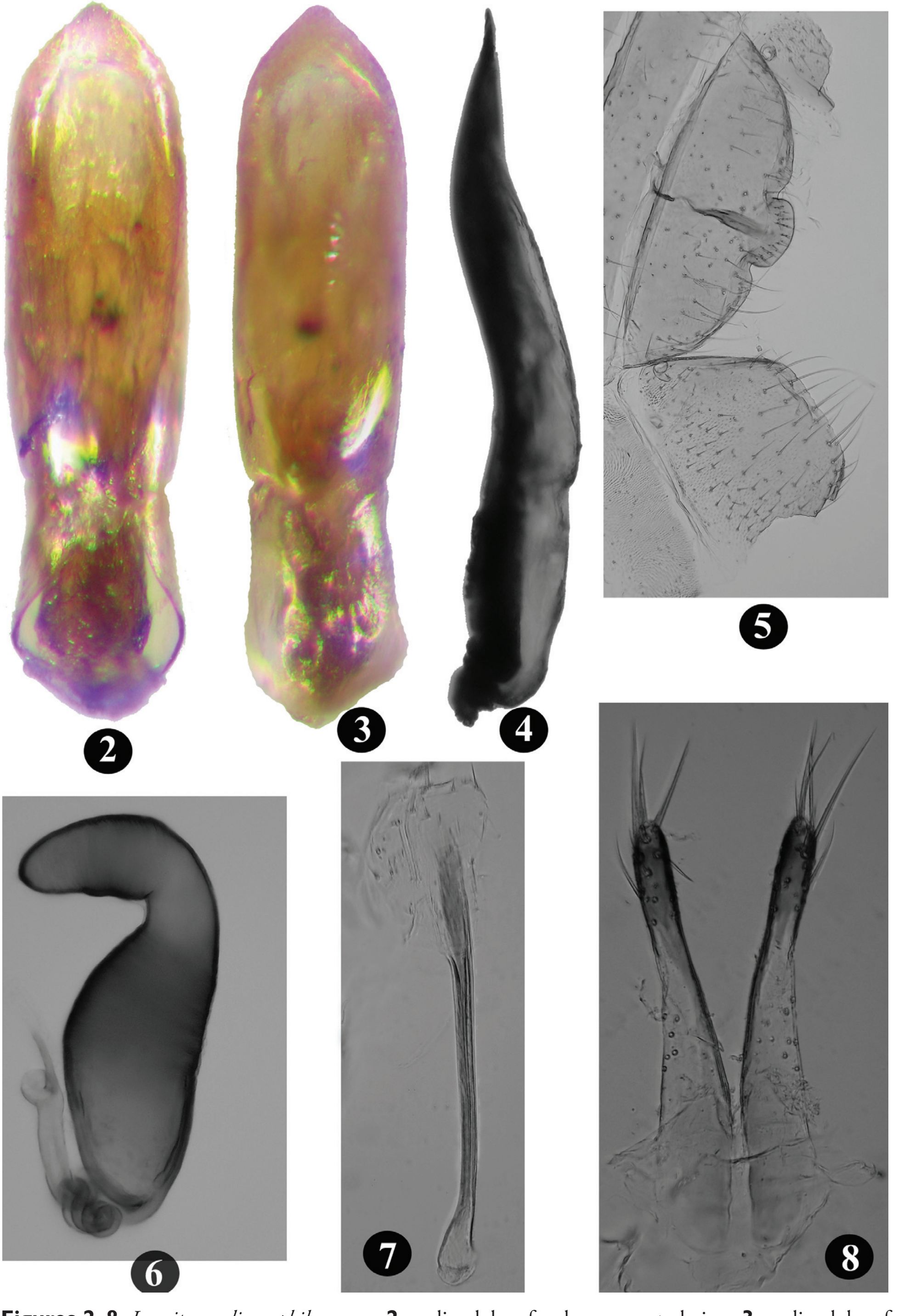
Vertex shiny, impunctate, minutely wrinkled. Ommatidia fully developed. Postcallinal sulcus weak but distinct. Frontal ridge unusual, broad and not sharply raised, anteriorly widening towards frontoclypeal suture, anteriorly forming ill-defined denticle in middle of flat, poorly developed anterofrontal ridge. Maxillary palpus with last palpomere longest. Antenna extends well beyond apex of elytra over pronotum. Second antennomere longer than half of third; second and third together longer than first, subequl to fourth; fifth longer than fourth; fifth to seventh subequal, eighth to tenth progressively shorter than previous antennomere. Pronotum anteriorly wider than posteriorly; 1.27 – 1.34 times wider than long; anterolateral callosity posteriorly lower than anteriorly, not forming denticle at pore; posterolateral callosity protrudes beyond lateral margin; lateral margin weakly curved,

Figure 1. *Longitarsus limnophilae* sp. n., dorsal habitus

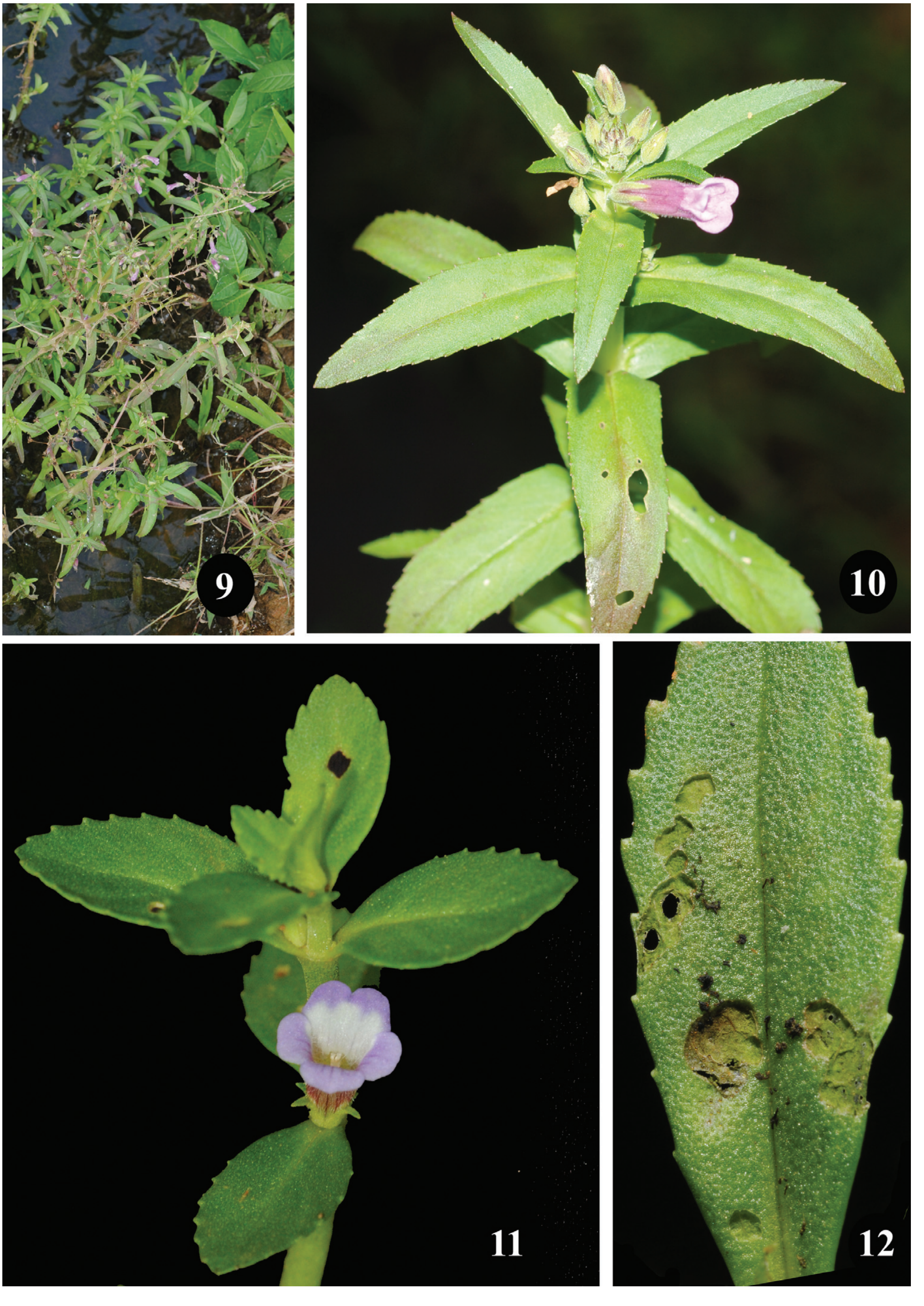
anteriorly broader than posteriorly; disc shiny with minute punctures more evident posteriorly. Elytra with well developed humeral calli, punctures distinct, width of interstices smaller than diameter of one puncture in middle of elytron. Elytral apex convex, with one long seta. Hind wings well developed. Scutellum triangular. First male protarsomere 1.60 – 1.67 times longer than wide; first female protarsomere 2.00 – 2.43 times longer than wide. Metatibia strongly curved in dorsal view, slightly curved in lateral view. Number of spinules on dorsolateral margin of metatibia, proximal to row of stiff bristles, vary from seven to ten. In lateral view, first metatarsomere 0.55 – 0.57 times as long as metatibia. Proximal end of first metatarsomere ventrally with thick characteristic patch of short pointed and capitate setae in both sexes. Last male ventrite internally with longitudinal ridge along middle (Fig. 5); posterior margin bisinuate.

Aedeagus in lateral view gently curved, apex acutely pointed and slightly recurved (Fig. 4); ventral side depressed with transparent window, lateral edges raised (Fig. 2); dorsal opening covered with lamina not extending to apex (Fig. 3). Arms of tegmen subequal to or slightly shorter than stem.

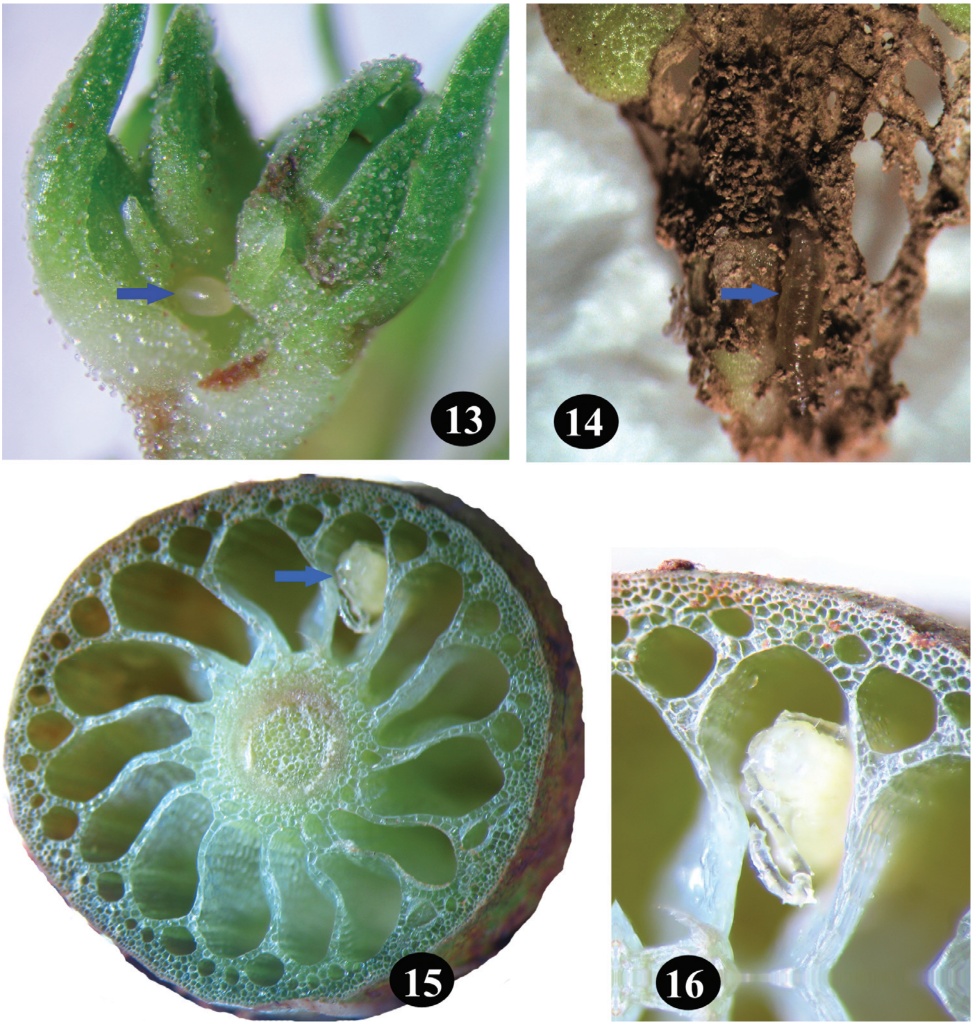
Spermatheca with receptacle widest in middle, internal side strongly convex, external side weakly concave; pump with horizontal part longer than vertical; spermathecal duct curved towards receptacle, coiled thrice proximally, not reaching half of receptacle



Figures 2–8. *Longitarsus limnophilae* sp. n. **2** median lobe of aedeagus, ventral view; **3** median lobe of aedeagus, dorsal view; **4** median lobe of aedeagus, lateral view; **5** last abdominal ventrite of male (macerated specimen); **6** spermatheca; **7** tignum; **8** vaginal palpi.



Figures 9–12. *Longitarsus limnophilae* sp. n. **9** habitat; **10** *Limnophila aquatica*; **11** *L. repens*; **12** adult feeding scars on leaf.



Figures 13–16. *Longitarsus limnophilae* sp. n. **13** egg; **14** larva; **15, 16** pupa inside stem aerenchyma.

(Fig. 6). Vaginal palpus narrow at distal 1/3, widest at proximal 1/4; distal sclerotization shorter than proximal sclerotization or lateral membranous area (Fig. 8). Tignum nearly straight, anterior sclerotization slightly wider than posterior (Fig. 7).

Remarks. *Longitarsus limnophilae* can easily be separated from all other south Indian species of *Longitarsus* by the anteriorly widening, flat frontal ridge (in the other species, the frontal ridge is more or less narrowly raised). *Longitarsus belgaumensis* Jacoby closely resembles *Longitarsus limnophilae* in having narrowly piceous elytral suture and dark distal antennomeres. But *Longitarsus limnophilae* can be separated from *Longitarsus belgaumensis* based on the antenna extending slightly beyond the apex of elytra over pronotum (in *Longitarsus belgaumensis*, antenna does not extend beyond the apex of elytra over pronotum), pronotum anteriorly wider than posteriorly (in *Longitarsus belgaumensis*, pronotum is anteriorly as wide as posteriorly with the maximum width in the middle), structure of frontal ridge (frontal ridge sharply raised along middle in *Longitarsus belgaumensis*) and genitalia.

Host plants. *Limnophila aquatica* (Roxb.) Alston (Scrophulariaceae) (Fig. 10) is a rooted emergent hydrophyte growing in shallow streams, marshes and rice fields (Fig. 9). Species of *Limnophila* R. Br., 1810 are widely distributed in the tropics and subtropics of the Old World and also occur as weeds. Stem aerenchyma in *L. aquatica* resembles the same in *L. sessiliflora* (Vahl) Blume termed as "wheel-type" by Jung et al. (2008). *Longitarsus limnophilae* was also found to feed on *L. repens* (Benth.) Benth. (Fig. 11).

Biology. Eggs (Fig. 13) are laid on tender leaves and buds and the larvae are open feeders (Fig. 14). The closely oriented tender leaves provide sufficient cover for the larva. Mature larva enters the stem aerenchyma in the internode by boring a tiny hole and pupation occurs in it, a little above the entry hole (Figs 15, 16). Adult emerges through an exit hole nearly circular in shape with irregular margin. Adult feeds on both adaxial and abaxial surface of, mostly, tender leaves by scraping, often resulting in holes on the lamina (Fig. 12). Adults when thrown in water floated initially and then swam with raised antennae held back over the sides of the pronotum. After swimming for a while, some performed a short jump on to the shore.

Distribution. The types were collected from a single locality only. India (Kerala, Vembayam, 8°38'28"N; 76°56'39"E).

Discussion. Jolivet and Hawkeswood (1995) have listed *Bacopa* Aublet, 1775 (Scrophulariaceae), a genus of hydrophytes, among host plants of *Longitarsus*. But no further information is available on its biology on *Bacopa*. *Longitarsus limnophilae* and species of *Agasicles* represent two independently evolved lineages in Alticini adapted for larval leaf feeding and pupation inside the stem. *Agasicles* and *Longitarsus limnophilae* are the only flea beetles known to pupate inside the stem of their aquatic host plant above the water level. Wheel shaped stem aerenchyma of *Limnophila aquatica* serve as a safe abode for the pupa offering protection against natural enemies. Species of *Limnophila* being widely distributed aquatic weeds, *Longitarsus limnophilae* could be a potential biocontrol agent for them.

This is the first report of an Oriental flea beetle pupating inside the stem of its hydrophyte host.

Key to the southern Indian species of *Longitarsus*

1	Vertex with conspicuous deep punctures................. ***L. rangoonensis* Jacoby**
–	Vertex impunctate to minutely punctuate.. **2**
2	Elytra laterally with prominent longitudinal ridge extending backwards from the humerus.. ***L. liratus* Maulik**
–	Elytra laterally without longitudinal ridge extending from humerus........... **3**
3	Metatibial spur minutely serrulated on either side dorsally.......................... .... ***L. serrulatus* Prathapan, Faizal & Anith**
–	Metatibial spur not serrulated.. **4**

4 Elytral suture narrowly piceous compared to rest of elytra........................... **5**
– Elytral suture not distinctly darker than rest of elytra.................................. **6**
5 Frontal ridge broad, widening towards frontoclypeal suture, not sharply raised; antenna extends well beyond apex of elytra over pronotum............... .... ***L. limnophilae*** **Prathapan & Viraktamath, sp. n.**
– Frontal ridge sharply raised, narrow; antenna hardly reaches apex of elytra over pronotum.. ***L. belgaumensis*** **Jacoby**
6 Dorsum red .... ***L. rufipennis*** **Jacoby**
– Dorsum yellow brown or dark brown **7**
7 Three basal and four apical antennomeres light brown, four intermediate antennomeres dark brown to piceous..................... ***L. gilli*** **Gruev & Askevold**
– Middle antennomeres not distinctly darker than distal or basal antennomeres **8**
8 Dorsum uniform light brown; hind wings well developed; elytral punctures tend to be regular.. ***L. sari*** **Maulik**
– Elytra dark brown with lighter margins; hind wings absent; punctures confused... ***L. fumidus*** **Maulik**

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A new species of the rare chrysidid subfamily Loboscelidiinae from China: the third species of *Rhadinoscelidia* Kimsey, 1988 (Hymenoptera, Chrysididae)

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Abstract

Rhadinoscelidia delta Liu, Yao & Xu, **sp. n.** (Chrysididae, Loboscelidiinae) is described and illustrated based on two female specimens from Hainan province. It represents the first record of the genus *Rhadinoscelidia* Kimsey, 1988 for China. A key to the world species of this genus is given. All specimens are preserved in the Hymenopteran Collection, South China Agricultural University (SCAU).

Keywords

Aculeata, Chrysidoidea, Oriental Region

Introduction

Loboscelidiinae is a small subfamily of Chrysididae distributed in the Oriental and Australian regions (Cameron 1910, Kieffer 1916, Fouts 1925, Maa and Yoshimoto 1961, Lin 1964, Day 1979, Terayama et al. 1998), which includes two genera: *Loboscelidia*

Westood, 1874 and *Rhadinoscelidia* Kimsey, 1988. Thirty-five species in total are recognized in Loboscelidiinae (Kimsey and Bohart 1990, Kojima and Ubaidillah 2003, Xu et al. 2006), of which thirty-three species belong to the genus *Loboscelidia*, and two species belong to the genus *Rhadinoscelidia*: *R. malaysiae* Kimsey, 1988 from Malaysia and *R. halimunensis* Ubaidillah, 2003 from Indonesia (Kimsey 1988, Kojima and Ubaidillah 2003).

Hosts of most species of this subfamily are unknown, but a few species are suggested to be parasitoids of Formicidae or Phasmatidae. Fouts (1922) suggested that Loboscelidiinae were probably myrmecophilous because they have the habitus of ants and the woolly appearance of the neck which is the characteristic of many myrmecophiles. Some species of *Loboscelidia* were inferred to be egg parasitoids of Phasmatidae (Hadlington and Hoschke 1959, Heather 1965, Riek 1970, Krombein 1983, Kimsey and Bohart 1990). However, there are no any host records of the genus *Rhadinoscelidia*. Most chrysidids are diurnal, but species of Loboscelidiinae are probably active during dusk or nocturnally based on their dark brown body and large ocelli (Kimsey and Bohart 1990).

Males of Loboscelidiinae are much more commonly collected than females (Kimsey and Bohart 1990). Recently, two specimens of the genus *Rhadinoscelidia* were discovered in Hainan, China, representing a new species, *Rhadinoscelidia delta* Liu, Yao & Xu, sp. n. It represents the first record of this genus for China.

Materials and methods

Two specimens of the genus *Rhadinoscelidia* were collected in 2007 from Hainan. Type specimens are deposited in the Hymenopteran Collection of South China Agricultural University (SCAU).

The antenna, wings and legs on one side of the type specimen were cut off and mounted on a slide using Canada balsam. Specimens were examined and described using stereomicroscopes Leica MZ12.5 and Olympus SZ61. All pictures were made by Zeiss Imager A1 attached to a digital camera, CoolSNAP, and software Image-Pro Plus.

Abbreviations used in the descriptions as follows: POL= posterior ocellar line, the shortest distance between the posterior ocelli; MOD= mid ocellar diameter; OL= distance between middle and posterior ocelli; OOL=oculo-ocellar line, the shortest distance between the posterior ocellus and compound eye.

Morphological terminology and wing vein nomenclature are mostly based on that of Kimsey and Bohart (1990). However, *mesoscutum* and *metasoma* are used, respectively, for ‘scutum’ and ‘abdomen’.

Taxonomy

Rhadinoscelidia Kimsey, 1988

Rhadinoscelidia Kimsey 1988: 77. Type species: *Rhadinoscelidia malaysiae* Kimsey 1988, original designation.

Diagnosis. Antenna with scape distinctly longer than head (Figs 1, 4); vertex sharply declivitous behind ocelli (Figs 3, 5); cervical projection of head with posterior shield-like expansion clearly separate from rest of head (Fig. 3); fore wing (Fig. 10) venation highly reduced, restricted to basal sixth or less; all tibiae (Figs 7–9) without longitudinal semitransparent flanges.

Host. Unknown.

Distribution. China (Hainan), Malaysia, Indonesia.

Rhadinoscelidia delta Liu, Yao & Xu, sp. n.

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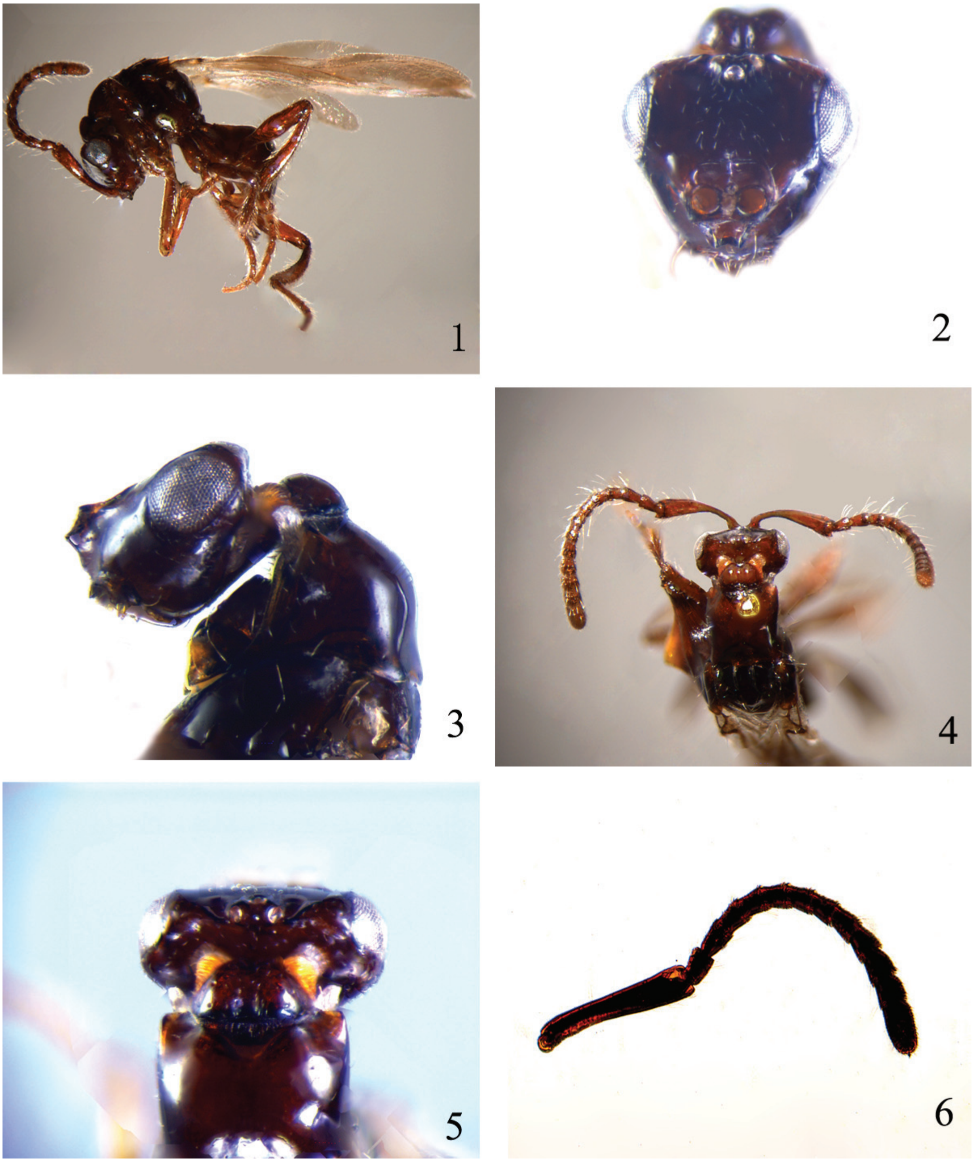
Figs 1–12

Diagnosis (Female). This new species can be distinguished from *R. halimunensis* Ubaidillah, 2003 by having the scape (Figs 4, 6) without transparent flange (the latter species with transparent flange), and frons (Fig. 2) with median carina not forked at upper end (the latter with median carina of frons forked at upper end); it is also easily separated from *R. malaysiae* by fore wing venation restricted to basal 1/7 (Fig. 10) (the latter species with fore wing venation restricted to basal 1/13) and first anal vein distinct (the latter with first anal vein indistinct).

Description. Holotype Female. Body length 2.3 mm; fore wing length 2.5 mm. Body shiny, with sparse setae.

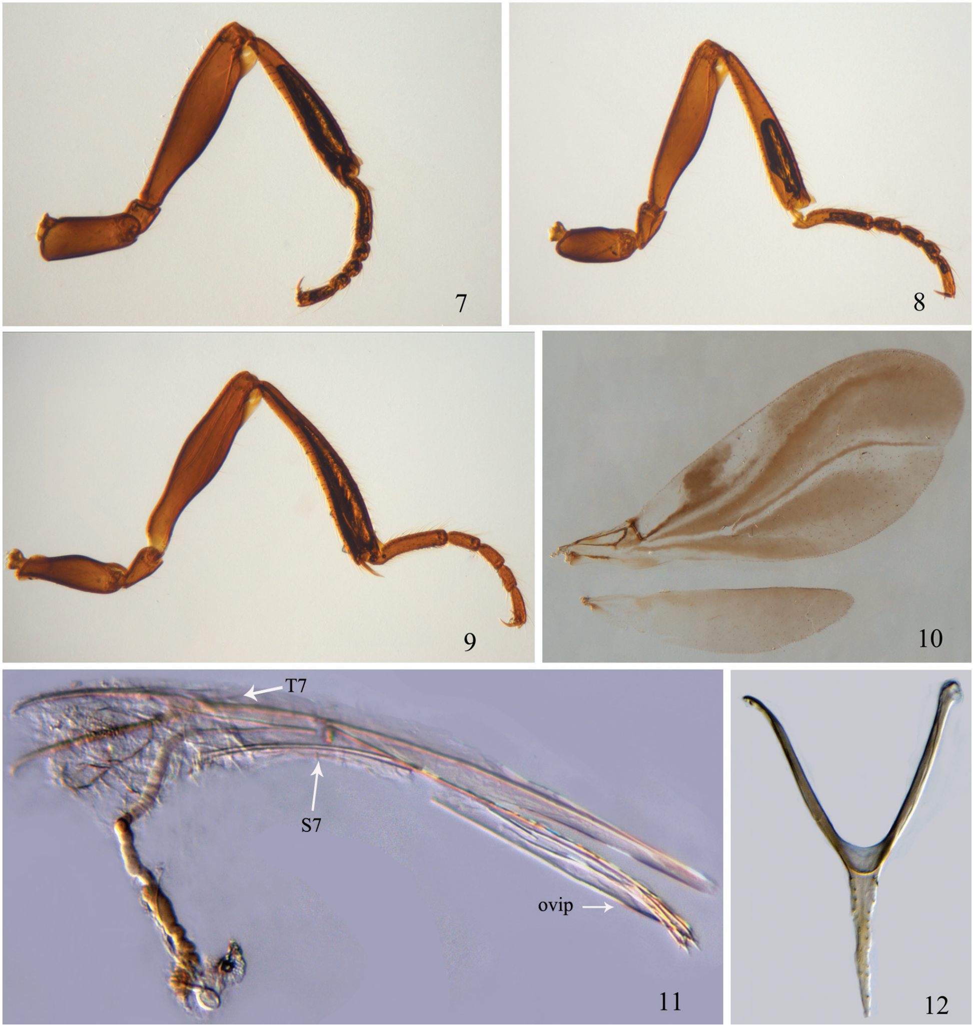
Head. Head in anterior view triangular, as wide as width of mesosoma at tegulae and 1.5 times the interocular distance; head in lateral view oblong (Fig. 3). Eyes situated on dorsal upper half of head (Fig. 3). Clypeus with short and erect setae. Frontal projection (Figs 2–3) in frontal view bilobate and trapezoid, in lateral view weakly up curved and obliquely truncate, lower lateral corner with transverse carinae extending to two sides of clypeus, upper lateral corner with carinae extending backward along middle of inner margin of eye then to posterior ocelli. Frons sparsely and finely punctuate, with a reverse triangular depression area. Gena polished. Ocelli oval, with some micropunctures and short wrinkles around, MOD=2, POL=3, OL=1, OOL=8. Vertex (Figs 3, 5) abruptly sloping and angulate posteriad lateral ocelli. Cervical projection (Fig. 5) strongly constricted behind ocelli and eyes, and posteriorly expanded and shield-like dorsally, centrally with a shallow longitudinal furrow. Vertex, gena and anterior lateral sides of cervical projection with ribbon-like setae. Antenna stout (Fig. 4, 6), covered with long and dense setae, about equals to the length of body. Scape 5.0 times



Figures 1–6. *Rhadinoscelidia delta* Liu, Yao & Xu, sp. n. holotype. **1** lateral habitus **2** head in frontal view **3** head and pronotum in lateral view **4–5** dorsal view of head and pronotum **6** antenna.

as long as wide (Fig. 6), curved, without transparent flange. Pedicel similar to flagellar segments, 1.8 times as long as wide. Relative proportion of length to width of flagellomeres as follows: 40 : 32; 36 : 32; 36 : 32; 36 : 32; 36 : 32; 36 : 32; 36 : 34; 32 : 37; 31 : 39; 33 : 41; 67 : 40.

Mesosoma. Pronotum polished, with maximum width 1.4 times as long as maximum length, proximal basal width 0.8 times as long as ultimate apical width. Lateral margin of



Figures 7–12. *Rhadinoscelidia delta* Liu, Yao & Xu, sp. n. holotype. **7** fore leg **8** mid leg **9** hind leg **10** fore wing and hind wing **11** seventh tergite, seventh sternite and ovipositor (indicated by T7, S7 and ovip) **12** sixth tergite.

pronotum rounded (Fig. 3), not sharp; anterior lateral sides of pronotum with short, narrow row of ribbon-like setae. Mesoscutum smooth, posterolateral projections lamellate, sparsely setose. Notauli complete, mesoscutum between notauli weakly concave. Parapsides indistinct. Tegula as long as pronotum, sparsely setose, and extending to posterior margin of scutellum. Scutellum smooth. Propodeal projection obtuse, inconspicuous.

Legs (Figs 7–9). Slender, with sparse bristles; all femora with small apical transparent flanges 1/8 times as long as femur; all tibiae without transparent flanges.

Wings. Fore wing (Fig. 10) infuscate, with hyaline streaks, covered with dense pubescence; venation highly reduced, restricted to basal 1/7; first anal vein distinct, parallel to and as long as M+Cu vein, cu-a vein indistinct, short. R1 vein 0.9 times, Rs vein 2.8 times and cu-a vein 0.3 times as long as length of stigmal vein. Hind wing veinless.

Metasoma (Fig. 1). First tergite subtriangular, maximum length 0.5 times the maximum width; second tergite weakly trapezoid, with maximum length 0.75 times maximum width; third tergite narrow, 0.5 times as long as wide; fourth tergite weakly exposed; all tergites smooth, scattered with sparse setae. Segments and ovipositor that retracted within metasoma as illustrated (Figs 11, 12).

Colour. Body dark red. Antennae and legs reddish brown.

Male. Unknown.

Materials examined. Holotype, female, China: Hainan, Mt.Wuzhishan (18.85°N, 109.66°E), May 16–20, 2007, Li-qiong Weng, No. 200800122. Paratype: 1 female, same data as type, No. 200800160.

Etymology. The specific name derives from Greek 'delta', meaning triangular, referring to the triangular depression on frons.

Remarks. The terminal segments and ovipositor structure of these females from China are similar to those of the genus *Loboscelidia* as described by Day (1979).

Key to species of *Rhadinoscelidia* of the World

Males are not known for *R. delta* and females are not known for *R. halimunensis* and *R. malaysiae,* so the following key has limited utility.

1 Male. Metasoma with five visible segments **2**

– Female. Metasoma with four visible segments. Fore wing venation restricted to basal 1/7; first anal vein distinct; frons with a reversed triangular depression near antennal sockets. China (Hainan) .... ***R. delta* sp. n.**

2 Scape with transparent flange on basal 1/4; frons with median carina forked at upper end near anterior margin of anterior ocellus. Indonesia.................. .... ***R. halimunensis* Ubaidillah**

– Scape without transparent flange on basal 1/4; frons with median carina not forked at upper end near anterior margin of anterior ocellus. Malaysia .... ***R. malaysiae* Kimsey**

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Two new species of *Urothoe* (Crustacea, Amphipoda, Gammaridea) From The East Johor Islands Archipelago, Malaysia

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Abstract

Two new species of urothoid amphipods from Pulau Sibu and Pulau Tinggi, Johor are described and illustrated. The specimens of *Urothoe sibuensis* new species were collected by vertical haul plankton net and is distinctively different from other existing *Urothoe* species by these combination of special characters; similar gnathopods 1–2 with short and stout propodus expanded into poorly defined palms; large eyes and epimeron 3 smooth. *Urothoe tinggiensis* new species as collected using an airlift suction sampler at seagrass area is characterized by its different gnathopodal configuration with setose dactylus of 5th pereopod; eyes minute; carpus is wider than merus in the 5th pereopod; subquadrate coxa 4; merus and carpus of pereopods 6–7 are linear.

Keywords

Crustacea, Amphipoda, Urothoidae, *Urothoe tinggiensis*, *Urothoe sibuensis*, East Johor Islands Archipelago

Introduction

The genus *Urothoe* Dana, 1852 has been known to be cosmopolitan and is one of the most diverse genus of the family Urothoidae Bousfield, 1978. They are easily recognized by their small sized body and furnished with various fossorial adaptations in the form of extremely setose appendages (Barnard and Drummond 1982). They are also known to be very diverse in shallow habitats and act as an important component of the burrowing fauna of intertidal and shallow subtidal areas but scarce in the deep sea (Barnard and Karaman1991).

According to Bousfield's (1978) classification, the family Urothoidae is characterized by a 7-segmented pereopod 5 with merus and propodus stoutly expanded. He included nine genera, namely *Urothoe* Dana, 1852 as type genus; *Carangolia* Barnard, 1961; *Cunicus* Griffiths, 1974; *Haustoriella* K.H. Barnard, 1931; *Phoxocephalopsis* Schellenberg, 1931; *Urothopsis* Ledoyer, 1969; *Urohaustorius* Sheard, 1936; *Urothoides* Stebbing, 1891; and *Zobracho* Barnard, 1961. However in 1982, Barnard and Drummond made a revision on the family and only retained *Urothoides*, *Cunicus*, *Carangolia* and *Urothoe* as members of the Urothoidae that possess the large ventral cheek on the head, the styliform-lanceolate and setose rami of uropods 1 & 2. Later, an additional two genera (*Urothopsis* and *Pseudourothoe*) were added bringing it to a total of six genera under the family Urothoidae (Barnard and Karaman 1991).

Up till now, only one species, *Urothoe gelasina* Imbach, 1969 was recorded in Malaysian waters by Azman (2007), which was previously recorded in the Bay of Nhatrang, Vietnam. Taxonomic studies on Amphipoda in this region particularly in Malaysian waters is still sparse, nevertheless there is an increasing attempt to improve the knowledge and several contributions have been recently published such as Müller (1993), Othman and Morino (1996, 2006), Othman and Azman (2007), Azman (2007), and Lim et al. (2010). In this paper we describe two new species from this region: *Urothoe sibuensis* new species and *Urothoe tinggiensis* new species.

Material and methods

The amphipods in this study were obtained from Pulau Tinggi for *Urothoe tinggiensis* and Pulau Sibu for *Urothoe sibuensis*; both from the waters of Johor, southeast coast of Peninsular Malaysia (Figure 1). Airlift suction sampler and plankton net of 100 μm mesh size were used in the collection of the specimens. All materials are lodged in the Universiti Kebangsaan Malaysia Muzium Zoologi (UKMMZ). The following abbreviations are used on the plates: A, antenna; G, gnathopod; HD, head; LL, lower lip; MD, mandible; MX, maxilla; MP, maxilliped; P, pereopod; PL, pleopod; EP, epimeron; T, telson; U; uropod; UR, urosome; UL, upper lip; ♂, male; ♀, female.

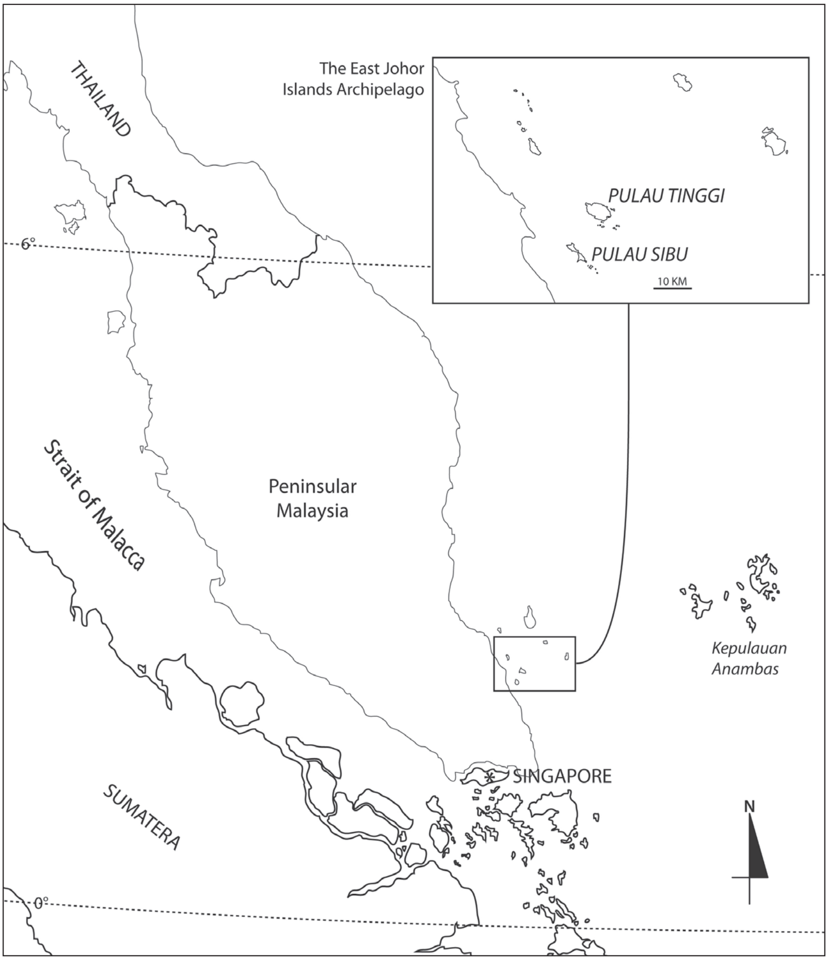

Figure 1. Pulau Tinggi and Pulau Sibu of East Johor Islands Archipelago, Malaysia.

Results

Systematics

Urothoidae Bousfield, 1978

Urothoe Dana, 1852

Type species. *Urothoe irrostratus* Dana, 1853, original designation.

Diagnosis. Molar process moderately to strongly developed. Gnathopods weak, subequal, variously subchelate. Pereopod 5 distinctly 7-segmented. Pereopods 6 and 7 subsimilar in form and size, strongly fossorial. Pereopod 7 not of phoxocephalid form, basis not shield-like. Abdomen not sharply narrowing or flexed at urosome. Uropod 3 rami subequal; long and slender. Telson deeply cleft.

Species composition. *Urothoe* contains fourty-five species: *U. abbreviata* Sars, 1879; *U. atlantica* Bellan-Santini & Menioui, 2004; *U. bairdii* Bate, 1862; *U. brevicornis* Bate, 1862; *U. carda* Imbach, 1969; *U. chosani* Hirayama, 1992; *U. corsica* Bellan-Santini, 1965; *U. convexa* Kim & Kim, 1992; *U. coxalis* Griffiths, 1974; *U. cuspis* Imbach 1969; *U. dentata* Schellenberg, 1925; *U. denticulata* Gurjanova, 1951; *U. elegans* Bate, 1857; *U. elizae* Cooper & Fincham, 1974; *U. falcata* Schellenberg, 1931; *U. gelasina* Imbach, 1969; *U. gelasina ambigua* Hirayama, 1988; *U. grimaldii* Chevreux, 1895; *U. grimaldii japonica* Hirayama, 1988; *U. irrostrata* Dana, 1853; *U. hesperiae* Conradi, Lopez-Gonzalez & Bellan-Santini 1995; *U. intermedia* Bellan-Santini & Ruffo, 1986; *U. latifrons* Ren 1991; *U. leone* Reid, 1951; *U. marina* (Bate, 1857); *U. marionis* Bellan-Santini & Ledoyer, 1986; *U. oniscoides* (K.H. Barnard, 1932); *U. orientalis* Gurjanova, 1938; *U. pestai* Spandl, 1923; *U. pinnata* K.H. Barnard, 1955; *U. platydactyla* Rabindranath, 1971; *U. platypoda* Griffiths, 1974; *U. poseidonis* Reibisch, 1905; *U. poucheti* Chevreux, 1888; *U. pulchella* (Costa, 1853); *U. rotundifrons* J.L. Barnard, 1962; *U. ruber* Giles, 1888; *U. serrulidactyla* K.H. Barnard, 1955; *U. sibuensis* sp. n. ; *U. spinidigitus* Walker, 1904; *U. tinggiensis* sp. n.; *U. tumorosa* Griffiths, 1974; *U. varvarini* Gurjanova, 1953; *U. vemae* J.L. Barnard, 1962; *U. wellingtonensis* Cooper, 1974.

Remarks. Dana established the genus *Urothoe* in 1852 with the description of *U. irrostrata*, which was originally classified under the family Haustoriidae. However, in 1978, Bousfield did a thorough revision on the phylogenetic classification of the genus *Urothoe* and it was decided that the genus *Urothoe* was to be moved to the Urothoidae family. The genus *Urothoe* is closely related to *Urothoides* Stebbing, 1891, but differs in not presenting the phoxocephalid-like protruding shield of basis on pereopod 7 (Barnard and Drummond 1979). There are about 45 species of *Urothoe* recorded to date (including the two present species), ten species were found from the South China Sea while the others were recorded from the waters of northeast Atlantic, Mediterranean Sea, New Zealand, Japan, Korea, South Africa, Australia and the North East Atlantic.

Urothoe sibuensis, sp. n.

urn:lsid:zoobank.org:act:05F15CE6-9C13-4481-B623-A7D9F2F1A41D
Figs 2A–2E

Type material. Holotype, male, 2.9 mm, UKMMZ-1394, seagrass area (*Halophila ovalis*, *Halodule uninervis*, *Cymadocea serrulata*, *Halophila spinulosa*) of Pulau Sibu, Johor, 2°13'55"N, 104°3'14"E, vertical haul plankton net (100 µm), 8 m, B.A.R. Azman, Melvin, C.W.H., Yoshida, T., 16 October 2008 (UKM I.D. 9047). Paratypes: 8 males, UKMMZ-1396, same station data.

Type locality. Pulau Sibu, Johor, Malaysia, South China Sea.

Etymology. This species is named after the type locality, Pulau Sibu, Johor.

Description. Based on holotype male, 2.9 mm, UKMMZ-1394.

Figure 2a. *Urothoe sibuensis* sp. n., holotype, male, (UKMMZ-1394), 2.9 mm. Pulau Sibu, Johor, South China Sea.

Head subequal in length to pereonite 1 – 3 combined, rostrum absent, lateroventral cephalic lobe less pronounced. *Eyes* present, well-developed, elliptic shape and large, lateral cephalic lobe of eye advanced slightly forward. *Antenna 1* shorter than antenna 2; peduncular article 1 slightly longer than article 2, provided with a band of setae on anterior margin; main flagellum with about 7 articles, distinctively shorter than peduncle; accessory flagellum biarticulate. *Antenna 2* about as long as body length; peduncle article 4 about twice as broad as long; gland cone absent; peduncular article 4 with robust setae along anterior margin; peduncular article 4 about as long as peduncular article 5; calceoli present; flagellum with about 30 articles. *Upper lip* semicircular. *Lower lip* inner plate large, shoulders broad, mandibular process significantly winged outward. *Maxilla 1* inner plate with one plumose setae apically; outer plate biarticulate, one setae and one plumose setae apically; palp with10 robust setae apically. *Maxilla 2* inner and outer plate covered with pinnate and simple setae apically. *Mandible* with molar semicircular and not well-developed; incisors smooth. *Maxilliped* inner plate elongated, bearing two blunt robust setae; outer plate suboval, with about 8 robust setae; palp 4-articulate, first article subquadrate, second article the widest, strongly setose on the inner margin, third article subtriangular, with several long setae; fourth article small and slender.

Pereon *Gnathopod 1* coxa subrectangular, narrow; basis elongate, posterior margin with several long and short setae; ischium subtriangular with several short setae along posterior margin; merus semicylindrical; carpus longer than propodus, about twice as broad as long, posterior margin densely setose; propodus slightly expanded distally; palm with several setae; dactylus large with setae at base. *Gnathopod 2* coxa expanded ventrally; basis elongate with several long setae along posterior margin; ischium subtriangular with several long setae along posterior margin; merus subtriangular with rarely long and short setae present; carpus broad, longer than propodus, propodus subtriangular; dactylus similar to the dactylus of gnathopod 1.

Figure 2b. *Urothoe sibuensis* sp. n., holotype, male, (UKMMZ-1394), 2.9 mm. Pulau Sibu, Johor, South China Sea. All scales represent 0.1 mm.

Figure 2c. *Urothoe sibuensis* sp. n., holotype, male, (UKMMZ-1394), 2.9 mm. Pulau Sibu, Johor, South China Sea. All scales represent 0.05 mm.

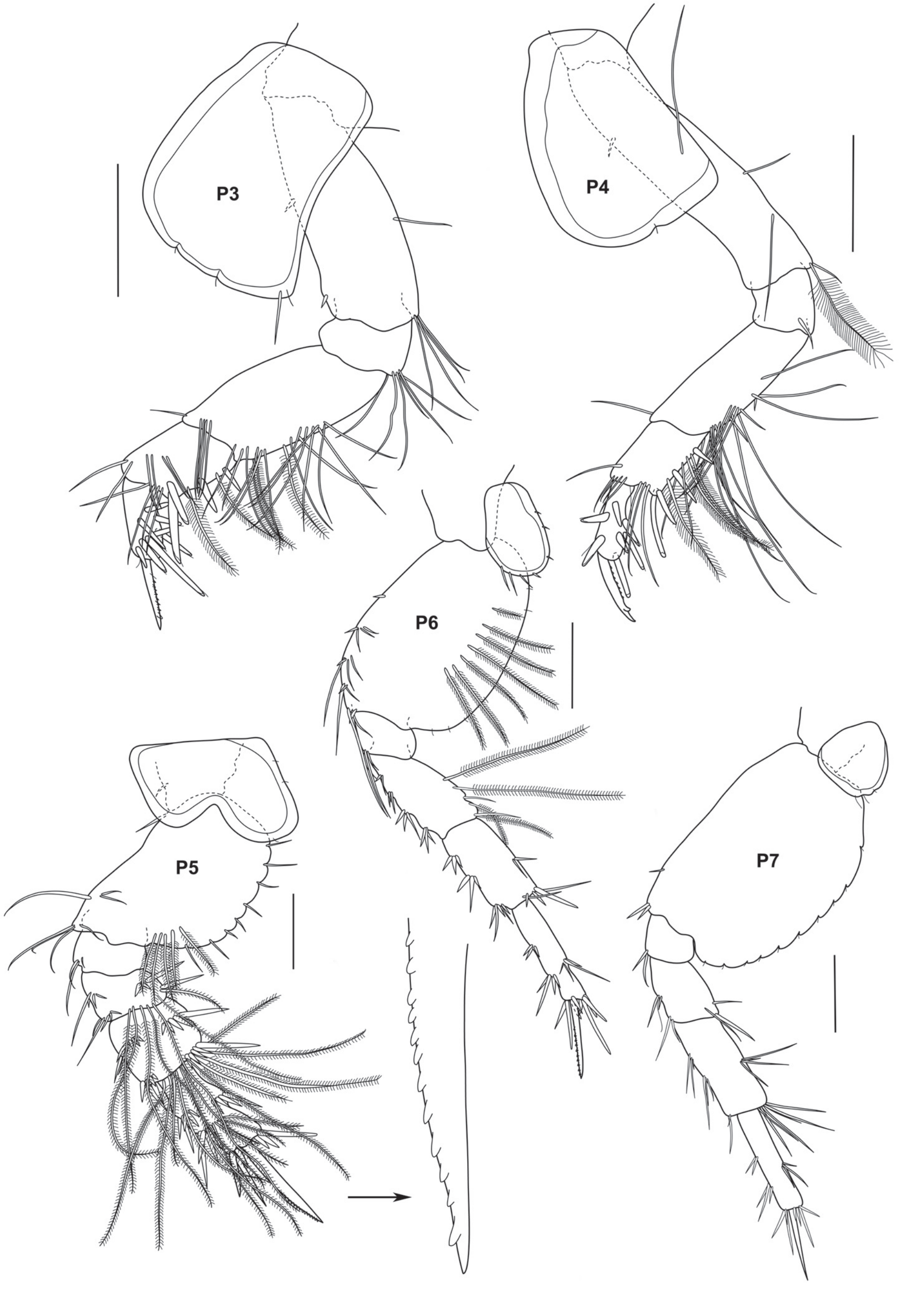

Figure 2d. *Urothoe sibuensis* sp. n., holotype, male, (UKMMZ-1394), 2.9 mm. Pulau Sibu, Johor, South China Sea. All scales represent 0.1 mm.

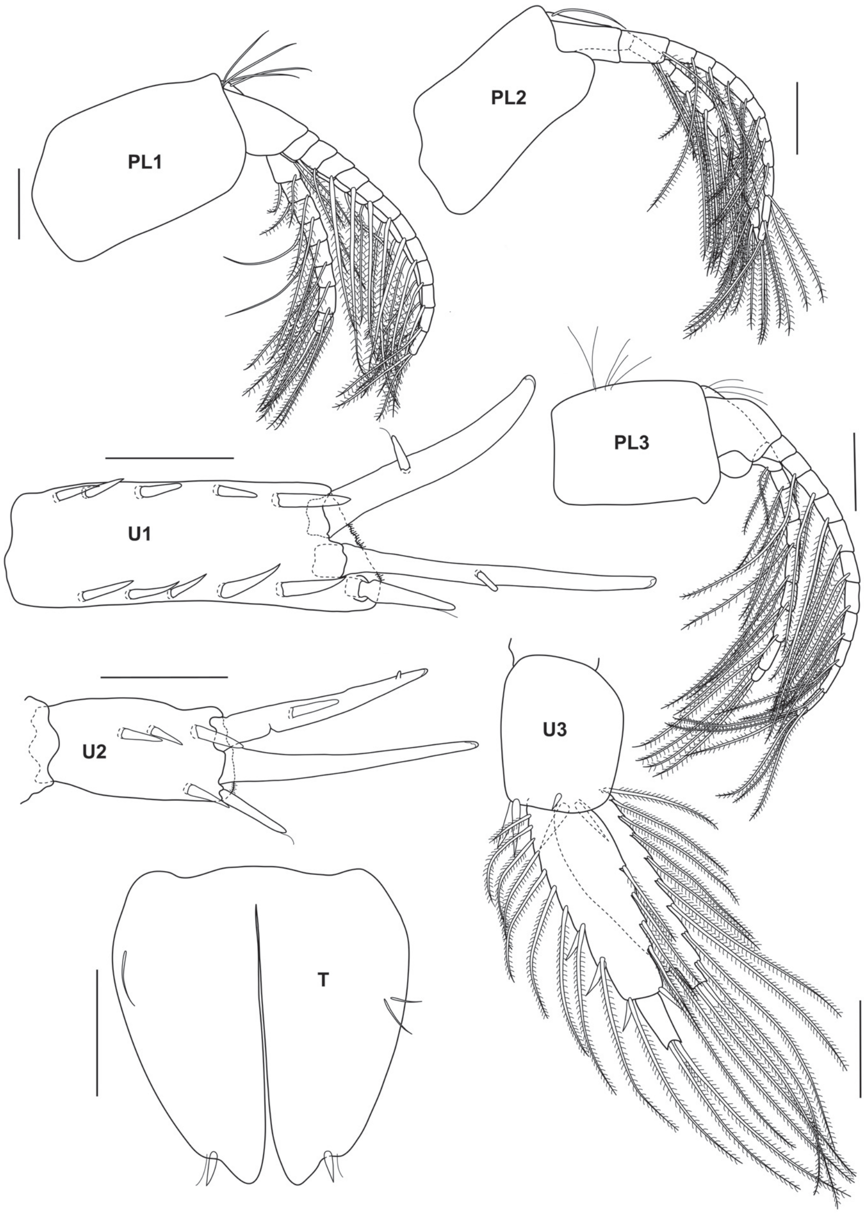

Figure 2e. *Urothoe sibuensis* sp. n., holotype, male, (UKMMZ-1394), 2.9 mm. Pulau Sibu, Johor, South China Sea. All scales represent 0.05 mm.

Pereopod 3 – 4 almost homopodous except pereopod 3 slightly broader than pereopod 4. *Pereopod 3* coxa slightly expanding ventrally, basis elongate with few long setae at distal end of posterior margin; ischium broader than long with few long setae; merus twice as long as carpus, posterior margin with dense setae and several plumose setae; carpus subquadrate, several setae, plumose setae and robust setae present; propodus narrow, armed with several robust setae along posterior margin; dactylus nodulate. *Pereopod 4* coxa subtriangular; basis elongate, few long setae with a plumose setae; ischium rarely setose; merus elongate, setose at posterior margin; carpus covered with several robust setae, setae and plumose setae; propodus narrow, with several robust setae; dactylus nodulate. *Pereopod 5* coxa bilobial; basis expanding backward, several setae in the notch of posterior margin, several plumose setae situated distally; ischium wider than long; merus wider than long provided with transverse rows of robust setae medially and distally, several long plumose setae distally; carpus subequal of length and width, provided with traverse rows of spines medially and distally, several long plumose setae distally; propodus provided with 3 traverse rows of robust setae ventrally and 2 transverse rows of robust setae posteriorly, several long plumose setae medially; dactylus nodulate. *Pereopods 6 – 7* slender from basis to propodus except for dactylus of pereopod 6 nodulate whereas dactylus of pereopod 7 slender and smooth, basis rounded posteriorly.

Pleon *Pleopods 1–3* peduncle distinctly longer than broad; biramous, multiarticulate. *Uropod 1* peduncle with two rows of robust setae; rami subequal in length with long robust setae medially. *Uropod 2* peduncle provided with several robust setae; rami subequal in length, outer ramus with a long robust setae medially and a distal setae. *Uropod 3* well developed; both rami with long plumose setae; outer ramus 2 biarticulate; inner ramus shorter than outer ramus. *Telson* about 5/6 cleft; both lobes with robust setae apically and few setae medially and distally.

Remarks. *Urothoe sibuensis* is very closely related to the 'elegans' group, defined by J.L. Barnard (1962), which included twenty other *Urothoe* species. This group of species is characterized by having similar gnathopods 1 – 2 with short and stout propodus expanded into poorly defined palms. Despite of that, detectable distinctions of morphological characters are found between the present species and the members of this group. As such, *U. sibuensis* differs in not having defining robust setae in propodus of gnathopods 1 – 2 (defining robust setae present in *U. gelasina*, *U. gelasina ambigua*, *U. poucheti*, *U. varvarini*), the antenna 2 significantly longer than antenna 1 (antenna subequal in length in *U. bairdii*, *U. brevicornis*, *U. hesperiae*, *U. intermedia*, *U. marina*), epimeron 3 smooth (epimeron 3 having distinct tooth in *U. chosani*, U. *dentata*, *U. denticulata*, *U. marionis*), presence of eyes (absence of eyes in *U. abbreviata*, *U. latifrons*, *U.vemae*), merus and carpus of pereopod 5 are both subequal in width (merus is wider than carpus of pereopod 5 in *U. pulchella*, *U. spinidigitus*), epimeron 2 having several plumose setae (epimeron 2 naked in *U. elegans*) and a less pronounced cephalic lobe (lateroventral cephalic corner of *U. corsica* produced and upturned).

The present species is especially close to *U. spinidigitus* Walker, 1904. It differs from *U. spinidigitus* by the absence of rostrum in the present species (small rostrum present in *U. spinidigitus*) and the absence of defining palmar spines in both gnathopods. The dactylus of pereopod 5 in Walker's species bears 4 short and 4 long robust setae whereas *U. sibuensis* possesses a nodulate dactylus in its pereopod 5. The subequal merus and carpus of pereopod 5 in the present species clearly distinguish it from *U. spinidigitus* that has carpus twice as broad as merus.

Distribution. *Malaysia*. Johor, Pulau Sibu.

***Urothoe tinggiensis*, sp. n.**
urn:lsid:zoobank.org:act:806054F6-4A04-4F49-B13C-1A80B65A11C7
Figs 3A–3E

Type material. Holotype, female, 2.0 mm, UKMMZ-1399, muddy-sand substrate of Pulau Tinggi, 2°16'51.70"N 104°7'15.96"E, airlift suction sampler, 9 m, B.A.R. Azman, C.W.H. Melvin, J.H.C. Lim, 19 July 2007, UKM I.D. 8632. Paratype: 4 females UKMMZ-1401, same station data.

Type locality. Pulau Tinggi, Johor, Malaysia, South China Sea

Etymology. Named after the type locality, Pulau Tinggi in East Johor, Malaysia.

Description: Based on holotype female, 2.0 mm, UKMMZ-1399.

Head lateroventral cephalic lobes rounded and very pronounced, rostrum absent. *Eyes* minute, circular. *Antenna 1* peduncular articles 1 – 2 provided with setae along the ventral margin; accessory flagellum triarticulate; main flagellum distinctly shorter than peduncle, about as long as peduncle article 3, 5 articulate. *Antenna 2* subequal to antenna 1; flagellum biarticulae; first article with several robust setae and long setae all over; second article with several robust setae and long setae. *Upper lip* semicircular. *Lower lip* inner plate large, shoulders broad, mandibular process prominently winged

Figure 3a. *Urothoe tinggiensis* sp. n., holotype, female, (UKMMZ-1399), 2.0 mm. Pulau Tinggi, Johor, South China Sea.

Figure 3b. *Urothoe tinggiensis* sp. n., holotype, female, (UKMMZ-1399), 2.0 mm. Pulau Tinggi, Johor, South China Sea. All scales represent 0.1 mm.

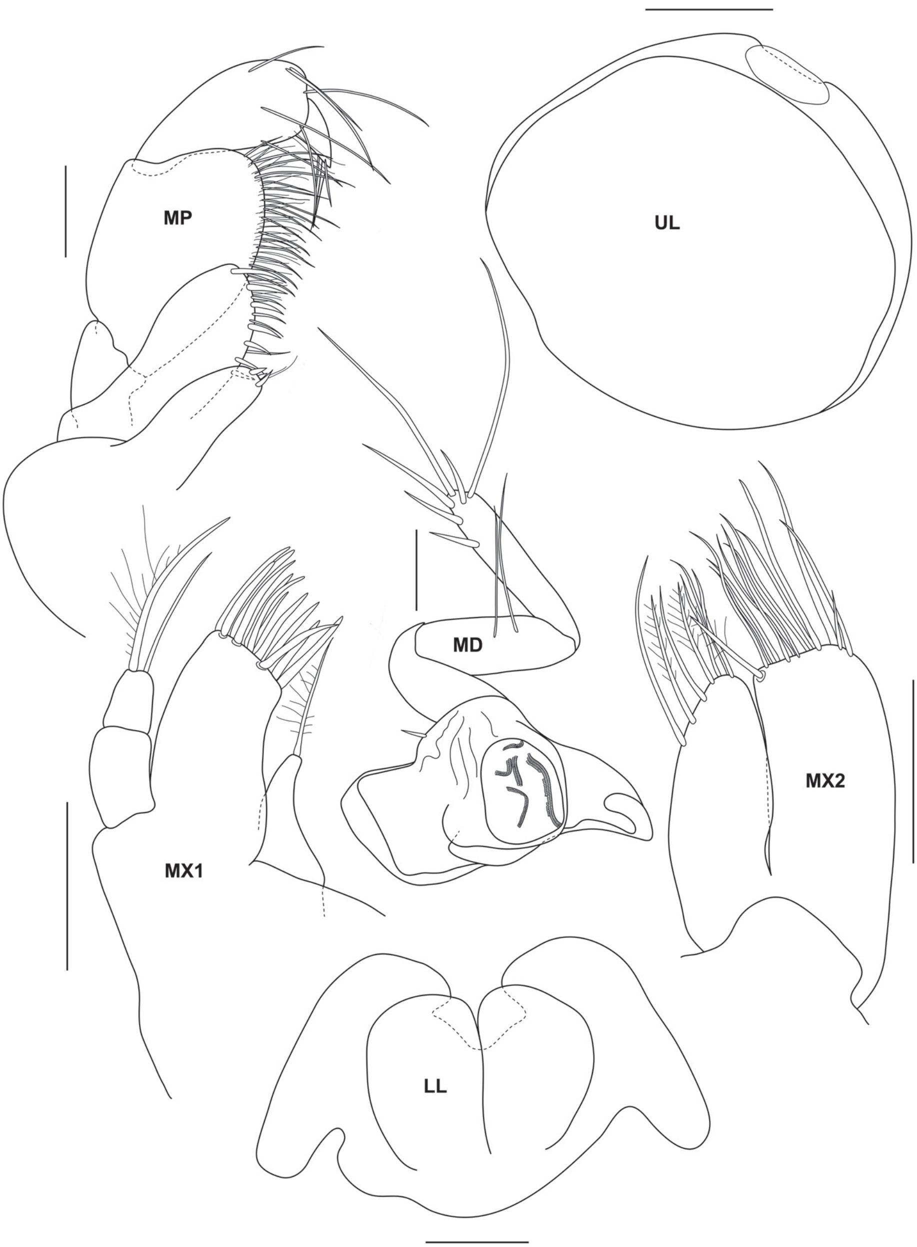

Figure 3c. *Urothoe tinggiensis* sp. n., holotype, female, (UKMMZ-1399), 2.0 mm. Pulau Tinggi, Johor, South China Sea. All scales represent 0.05 mm.

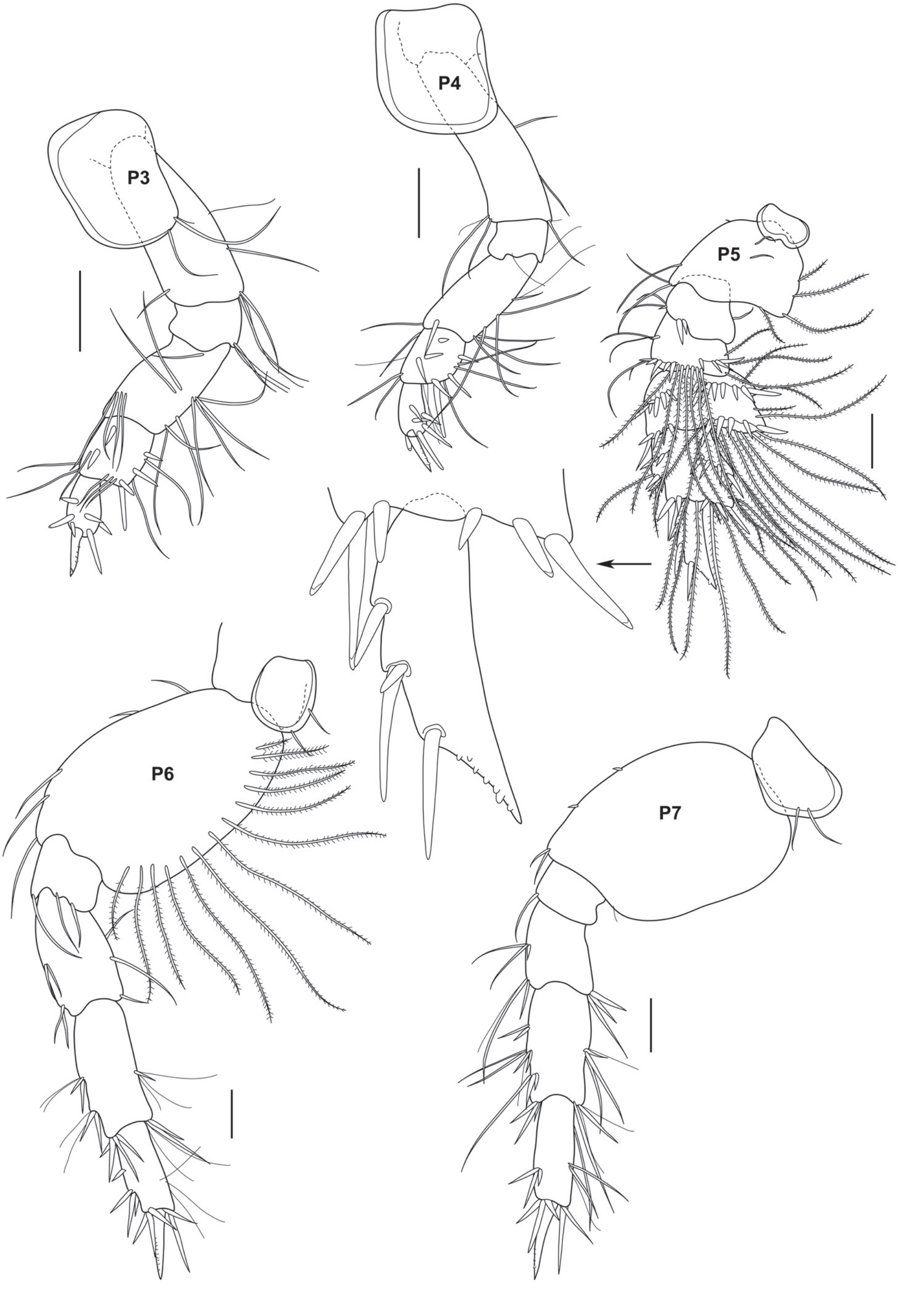

Figure 3d. *Urothoe tinggiensis* sp. n., holotype, female, (UKMMZ-1399), 2.0 mm. Pulau Tinggi, Johor, South China Sea. All scales represent 0.1 mm.

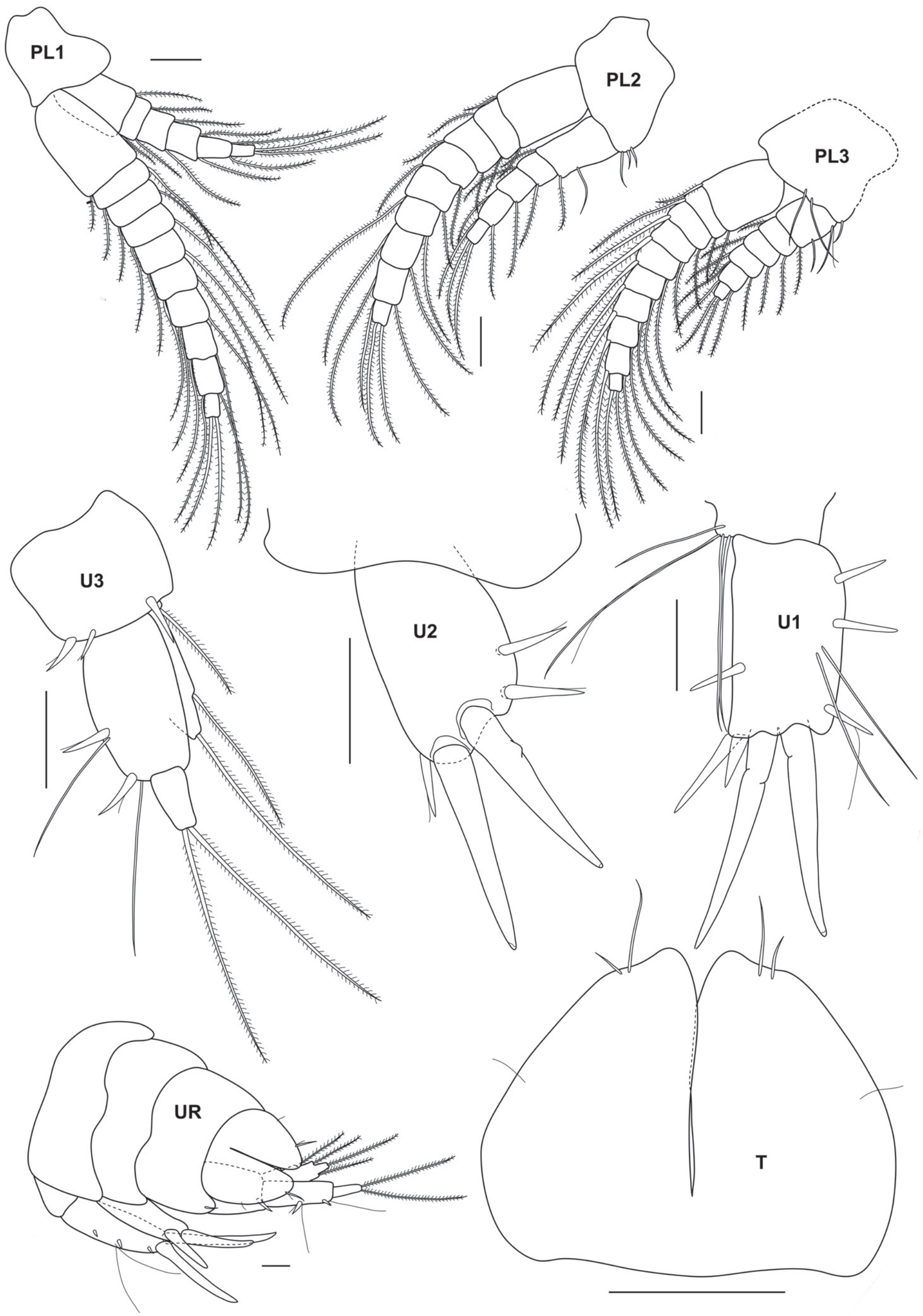

Figure 3e. *Urothoe tinggiensis* sp. n., holotype, female, (UKMMZ-1399), 2.0 mm. Pulau Tinggi, Johor, South China Sea. All scales represent 0.05 mm.

outward. *Maxilla 1* inner plate with pinnate seta apically; outer plate with two setae, one pinnate and a seta; palp densely filled with robust setae apically. *Maxilla 2* inner and outer plates furnished with pinnate and simple setae. *Mandible* molar rounded and well-developed; incisor smooth; palp strong; first article shorter than second article; second and third article subequal in length; third article with several robust setae distally. *Maxilliped* inner plate elongate with about 2 blunt robust setae; outer plate suboval with several spines and setae; palp 4-articulate, second article wide and densely setose on inner margin, third article subtrianglular with several long setae, fourth article subtriangular and small.

Pereon *Gnathopod 1* coxa narrow, subrectangular; basis elongate with several long setae along the posterior margin; carpus broad furnished with several setae at posterior margin, about as broad as long; propodus wide with several long setae situated anterodistally; dactylus normal. *Gnathopod 2* coxa narrow, subrectangular; basis elongate with several long setae along the posterior margin; carpus suboval in shape; propodus wide provided with several long setae at anterodistal angle; dactylus falcate, slightly extending palm when closed.

Pereopod 3 – 4 homopodous, coxa subquadrate; basis elongate provided with few long setae; carpus twice as long as merus; propodus narrow; dactylus nodulate. *Pereopod 5* coxa small, bilobate; basis semicircular, few plumose setae along posterior margin; ischium wider than long; merus wider than long, provided with two transverse rows of robust setae and a row of plumose setae; carpus twice as long as wide, 4 transverse rows of robust setae, one traverse row of plumose setae; propodus longer than wide, provided with 3 traverse rows of robust setae; dactylus large, with 3–4 robust setae along anterior margin. *Pereopod 6* coxa subquadrate; basis wide, oval shape, several plumose setae along posterior margin; merus longer than wide; carpus longer than wide, robust setae along anterior margin; propodus shorter than merus, robust setae along anterior margin; dactylus nodulate. *Pereopod 7* coxa subtriangular; basis oval shape; merus longer than wide, few robust setae; carpus longer than wide, robust setae along anterior margin and posterior margin; propodus longer than wide provided with several robust setae; dactylus nodulate.

Pleon *Pleopods 1–3* peduncle shortened and slightly expanded distally; outer ramus longer than inner ramus; rami multiarticulate. *Uropod 1* peduncle with several robust setae lining at the medial margin and distally; rami subequal in length. *Uropod 2* peduncle provided with 2 robust setae and a robust seta distally; rami subequal in length. *Uropod 3* well developed; both rami with long plumose setae; outer ramus 2 biarticulate; inner ramus shorter than outer ramus. *Telson* about 5/6 cleft; both lobes with 2 setae apically and a seta medially.

Remarks. According to the proposed classification of the '*falcata*' group by Barnard (1962), members of this group possess dissimilar gnathopods; gnathopod 1 simple, elongated and slender propodus, bearing no palm; gnathopod 2 has a suboval or slightly expanding propodus with a distinct, rounded palm. With these characters our species is clearly attributed to the '*falcata*' group. However, there are perceivable differences that can be ruled out between the new species and all the members of the group.

As such, the setose dactylus of pereopod 5 in *U. tinggiensis* is readily distinguished from the non-spinose dactylus of pereopod 5 in *U. pinnata* and *U. tumorosa*. Differing from *U. platydactyla* in the expanding and elliptical shape of the pereopod 5 dactylus. Both the pereopod 6 and 7 are somewhat different from *U. platypoda*; the merus and carpus in *U. tinggiensis* is considerably linear and elongated while the merus and carpus of both pereopod 6 and 7 in *U. platypoda* are lobed posteriorly. The enormously produced coxa 4 in *U. coxalis* is contrastingly distinctive from the normal subquadrate coxa 4 of *U. tinggiensis*. The new species appears to have close affinities to *U. orientalis* due to the wide carpus of pereopod 5 but clearly distinguished from the latter in the shape of propodus of gnathopod 1 and the absence of robust setae on the outer ramus of uropods 1 and 2. *Urothoe tinggiensis* is also distinguished from *U. oniscoides* by the presence of eyes. The new species has some remarkable similarities with *U. cuspis* Imbach, 1969 from Bay of Nhatrang, Vietnam, but seem to be different from the latter in the acuminate cuspidate coxa 2.

Distribution. *Malaysia*. Johor: Pulau Tinggi.

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RESEARCH ARTICLE

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Tanaidaceans (Crustacea) from the Central Pacific Manganese Nodule Province. I. The genera *Collettea*, *Robustochelia* and *Tumidochelia*

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Abstract

Three new species of are described from the manganese nodule province between the Clarion and the Clipperton Fracture Zone of the equatorial North Pacific Ocean, and collected during the Nodinaut expedition on board the r/v *l´Atalante* in the summer of 2004. The new species belongs to three genera as: *Collettea* (*C. longisetosa*), *Robustochelia* (*R. pacifica*), and *Tumidochelia* (*T. tuberculata*). A key to the genus *Tumidochelia* is presented and the validity of the genera *Robustochelia* and *Collettea* is discussed.

Keywords

Tanaidacea, Tanaidomorpha, *Collettea, Robustochelia*, *Tumidochelia*, Manganese nodule province

Introduction

The aim of this paper is to present the first part of the taxonomic results from a survey of the Central Pacific Manganese Nodule Province between the Clarion and the Clipperton Fracture Zone of the equatorial North Pacific Ocean. This region has, due to the rich manganese deposits, been a tempting area for mineral exploration. This fact has made the area one of the best surveyed deep-sea regions in the Pacific. For the Tanaidacea alone this has resulted in a couple of publications (Wilson 1987; Larsen 1999b; 2000) and more are under way (Gurreo-Kommritz pers comm.; Larsen research in progress).

The phylogeny and systematics of the Tanaidacea is still very much unresolved despite recent advances. Large groups of genera are still left without family affiliation and the diagnoses of many families are incomplete or even contradictory. Unfortunately the reduced general morphology of tanaidaceans, the conservative morphology of many otherwise not closely related taxa, and the huge diversity of especially the deep-sea taxa, makes it hard to resolve the systematic confusion without genetic data (Larsen and Froufe 2010).

Any collection in remote deep-sea habitats will reveal a significant proportion of undescribed species relative to known species (Larsen and Froufe 2010): the ratio of unknown/known species in deep-sea sampling is estimated to be about 80/20 and even higher at remote or previously unstudied locations (Larsen unpublished data). An additional problem is the fact that most species are represented by one specimen only further hampering systematic treatment.

Material and methods

Samples were taken during the Nodinaut expedition (17 May – 28 June 2004) from on board of the research vessel *l´Atalante* using an Usnel Box corer and the submersible *Nautile* with a spade corer (Carottier a lame). The material was sieved over a 0.5 mm sieve and fixed in 4% buffered formalin and stored in 70% alcohol afterwards.

Dissections were made in glycerine using chemically sharpened tungsten wire needles. Body length was measured from the tip of the cephalothorax to the apex of the pleotelson. The terminology in the descriptions is based on Larsen (2003). Types are deposited in the Museum National d'Histoire Naturelle Paris (MNHN).

Taxonomy

Order Tanaidacea Dana, 1849
Suborder Tanaidomorpha Sieg, 1980
Superfamily Paratanoidea Lang, 1949

Family Colletteidae Larsen & Wilson, 2002

Genus *Collettea* (G.O. Sars, 1882)

Type species. *Strongylura cylindrata* (G.O. Sars, 1882).

Diagnosis. (Modified after Larsen 2005) Female. Body almost completely cylindrical. Carapace longer than wide. Eye-lobes small but present, without visual elements. Pleon and pleotelson not fused. Pleotelson mostly longer than last three free pleonites combined, terminating in dorsal plate covering uropods. Antennule with 4–5 (minute terminal article) articles. Antenna with 6–7 (fusion line) articles. Mandibles with small, but not pointed crushing area. Maxillule setal number varying, some setae may be bifurcate or setulose. Maxillipedal endites without inner distal setae. Maxilliped palp article 2 without multifurcate seta. Chelipeds attached via lateral sclerite. Pereopods slender, with coxae, and with dactylus and unguis not fused to hook. Pleopods absent in females. Uropods biramous; endopod with one or two articles; exopod uniarticulated.

Male. Similar to female. Functional mouthparts retained in adult. Antennule thicker than in female. Pleopods present, most often with simple setae.

Remarks. *Collettea* is a genus well represented in all major oceans from less than 100 meters (G.O. Sars 1896) to abyssal depths exceeding 5000 meter (Kudinova-Pasternak 1973; 1983). It is recognized by elongated pleotelson. The genus currently consists of 18 species including the one described herein.

Gender. Feminine.

Species currently assigned to *Collettea*: *C. alicjae* Błażewicz-Paszkowycz & Larsen, 2005; *C. antarctica* (Vanhöffen, 1914); *C. arnaudi* (Shiino, 1978); *C. cylindrata* (G.O. Sars, 1882)*; C. cylindratoides* Larsen, 2000, *C. elongata* Larsen, 2002, *C. humbolti* Larsen, 2000, *C. larviformis* (Kudinova-Pasternak, 1973); *C. lilliputa* Błażewicz-Paszkowycz & Larsen, 2005; *C. longipedia* Kudinova-Pasternak, 1986; *C. longipleona* Błażewicz-Paszkowycz & Larsen, 2005; *C. longisetosa* sp. n.; *C. minima* (Hansen, 1913); *C. pegmata* Bamber, 2000; *C. rotundicauda* Kudinova-Pasternak, 1983; *C. subtilis* Kudinova-Pasternak, 1981; *C. vermiformis* (Lang, 1971); *C. wilsoni* Larsen, 1999a

Collettea longisetosa sp. n.

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Figs 1–3

Material examined. Holotype male (MNHN-Ta1029) SUB-C Station MAC 3 #43, 07/06–2004, 13°42.3490'N, 131°29.9940'W, depth > 4000 m.

Diagnosis male. Body 19 times longer than broad. Antenna article 4 without fusion line. Maxilliped endite with small inner process. Cheliped propodus with setulose inner ridge; fixed finger with multiple prominent sharply pointed processes. Cheliped dactylus not longer than fixed finger. Heavy armament with spiniform setae on all pereopods. Pleopods uniramous and strongly elongated; endopod with four long (longer than antennule) plumose setae. Uropods long (0.3 times pleotelson length), endopod biarticulated.

Etymology. Named to reflect the long setae of the pleopods.

Description. Adult male, 2.9 mm (body and appendages of holotype).

Body (Fig. 1A) strongly elongated, 19 times as long as broad.

Cephalothorax longer than combined length of pereonite 1 and 2.

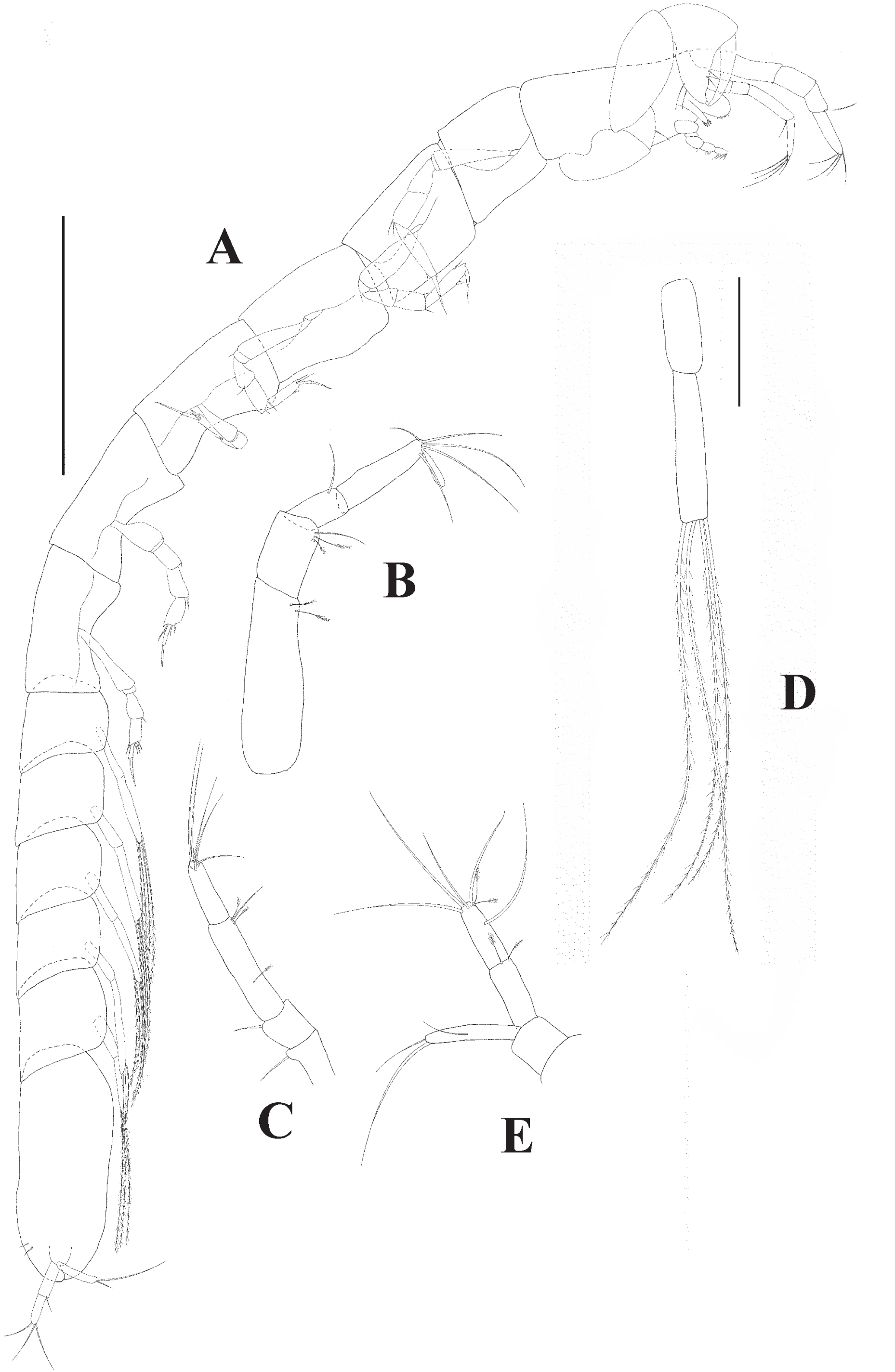

Figure 1. *Collettea longisetosa* sp. n., male. Holotype **A** lateral view, scale bar = 0.5 mm **B** antennule **C** antenna **D** pleopod **E** uropod. Scale bars = 0.1 mm.

Pereon. Pereonites 1 and 2 wider than long. Pereonites 3–6 longer than wide.

Pleon long (about 75% as long as rest of body). All pleonites subequal, bearing long uniramous setae.

Pleotelson as long as combined length of three pleonites.

Antennule (Fig. 1B) with four articles, terminal article fused with article 4 and creating a dorsal projection. As long as cephalothorax. Article 1 marginally shorter than rest of antennule, with two setulated distal setae. Article 2 shorter than article 4, with one simple and two setulated distal setae. Article 3 half as long as article 4, with one simple distal seta. Article 4 half as long as article 1, with five simple distal setae and one short but wide aesthetasc.

Antenna (Fig. 1C) length 0.8 times length of antennule. Article 1 naked and fused to the cephalon. Article 2 elongated and widening distally, with one robust dorsodistal seta. Article 3 shorter than article 2, with one robust dorsodistal seta. Article 4 longer than other articles, with one medial setulose seta but without recognizable fusion line, with one simple and two setulated distal setae. Article 5 longer than article 2, with one simple distal seta. Article 6 minute with four distal setae.

Mouthparts: Labrum (Fig. 2A) acorn-shaped, with finely setulose apex. Mandibular molar with very wide basis, tapering into a small crushing area with five-six terminal spines. Left mandible (Fig. 2B) incisor with two indiscrete distal denticles, *lacinia mobilis* prominent but simple. Right mandible (Fig. 2C) incisor wide, with two distal denticles. Labium (Fig. 2D) with medially setulose projections and finely setulose apex. Maxillule (Fig. 2E) endite with ten spiniform distal setae and dorsal setulation. Palp longer than endite, with two long terminal setae. Maxilla (Fig. 2F) acorn. Maxilliped (Figure 2G) basis with one small simple seta. Endites with small inner distal process and fine outer setulation. Palp article 1 smooth. Article 2 with three outer setae. Article 3 with three finely setose setae. Article 4 with four finely setose and one simple distal setae. Epignath (Fig. 2H) longer than maxillule endite, with finely setose inner margin but naked apex.

Cheliped (Fig. 3A) basis divided unequally by sclerite, marginally shorter than carpus. Merus triangular with one ventral seta. Carpus longer than propodus including fixed finger, with two small simple ventromedial setae and one small simple seta dorsoproximal and dorsodistal. Propodus with setulose inner ridge, with two robust setae, with one simple outer seta at dactylus insertion; fixed finger with multiple prominent sharply pointy processes and three inner seta and one ventral seta arising from a prominent tubercle; with ventral ridge terminating in unguis. Dactylus with conspicuous inner seta, row of setules and one inner spine.

Pereopod 1 (Fig. 3B) coxa with one simple seta. Basis fairly robust, shorter than three succeeding articles together, naked. Ischium with one robust simple seta. Merus shorter than carpus, widening distally, with one simple ventrodistal seta. Carpus shorter than dactylus, with one spiniform and two simple distal setae. Propodus more than half as long as basis, with three spiniform subdistal setae, row of scales and dorsal spine. Dactylus and unguis combined shorter than propodus. Unguis with subdistal ventral expansion at exit of spinning gland.

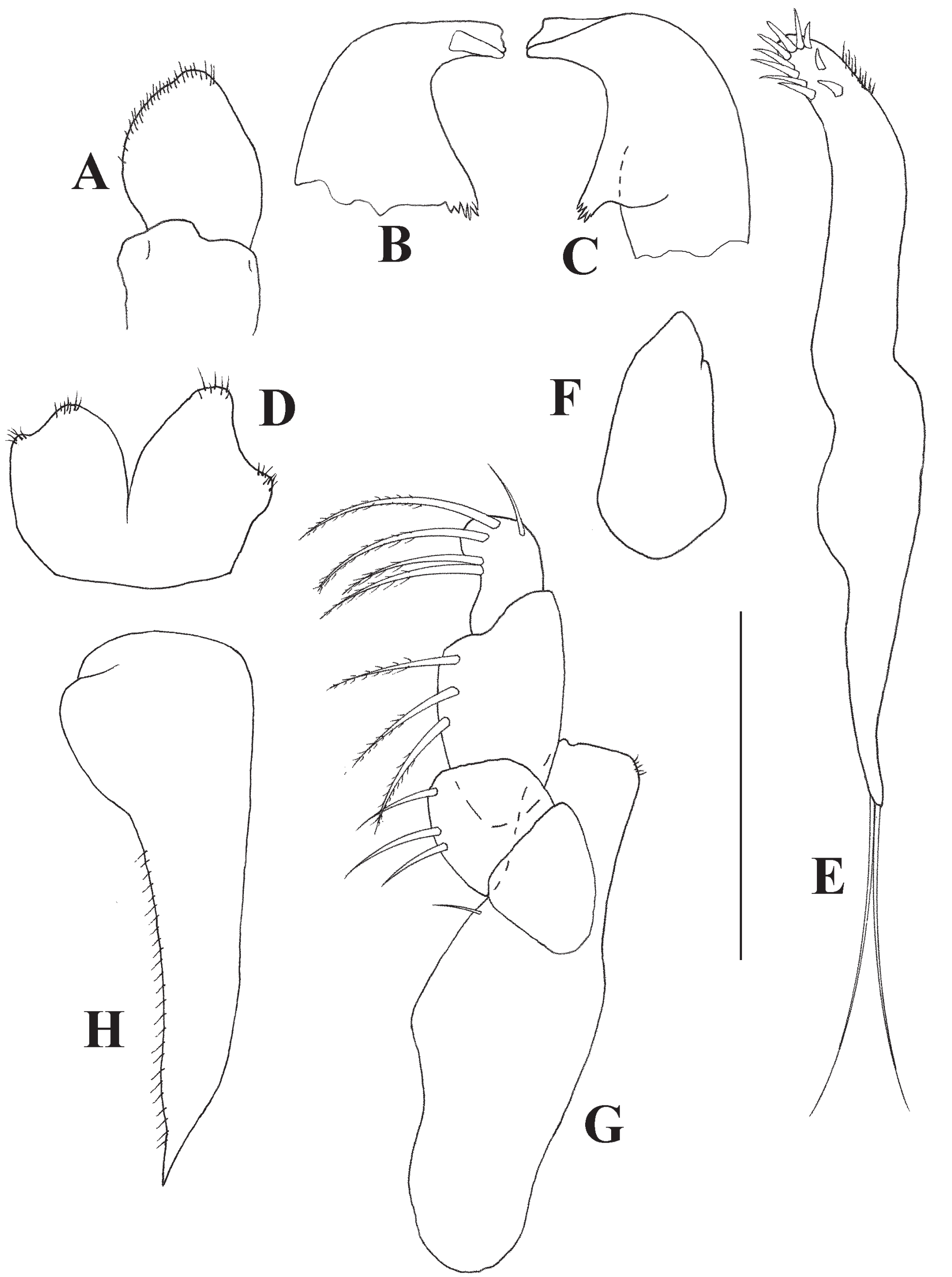

Figure 2. *Collettea longisetosa* sp. n., male. Holotype **A** labrum **B** left mandible **C** right mandible **D** labium **E** maxillule **F** maxilla **G** Maxilliped **H** epignath. Scale bars = 0.1 mm.

Pereopod 2 (Fig. 3C) as pereopod 1 except: basis with medioventral setulated seta, merus with one spiniform distal seta, propodus with two spiniform and one simple

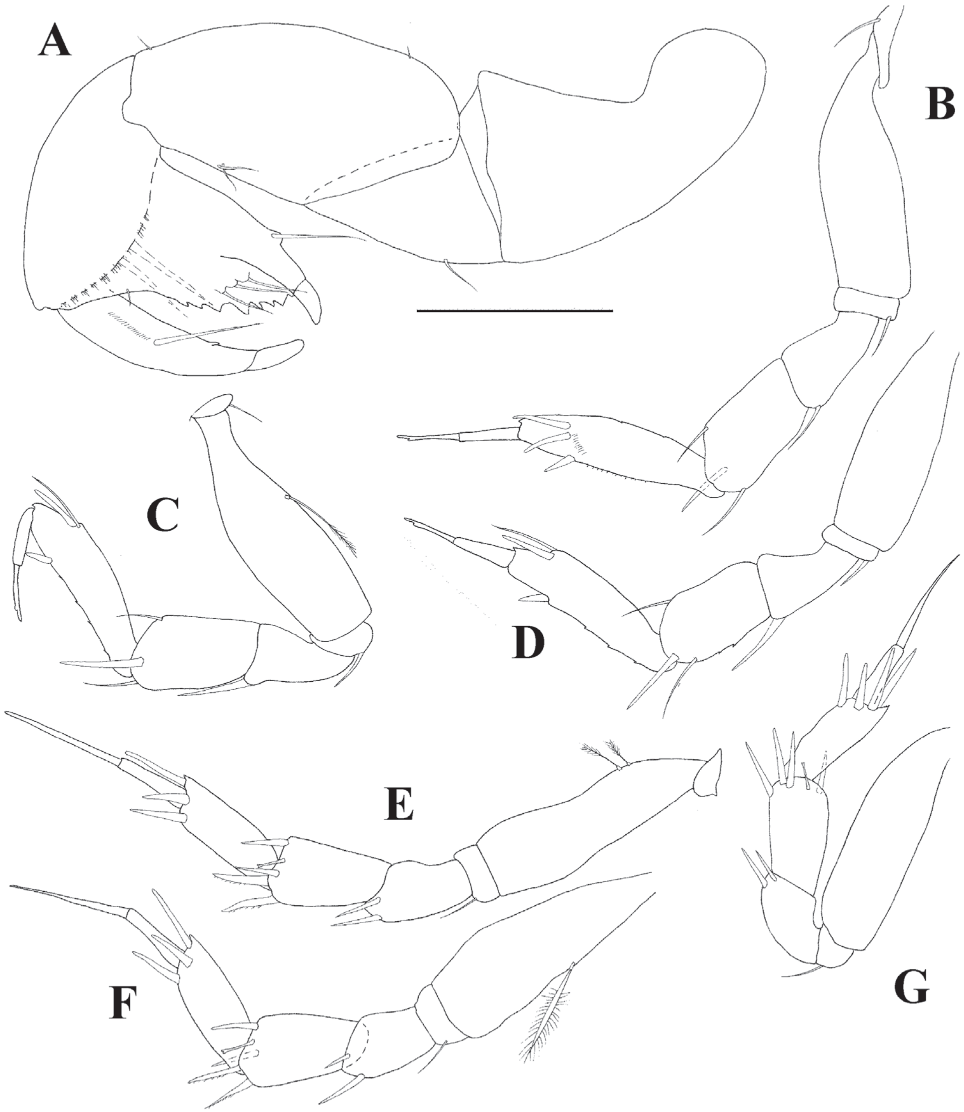

Figure 3. *Collettea longisetosa* sp. n., male. Holotype **A** cheliped **B** pereopod 1 **C** pereopod 2 **D** pereopod 3 **E** Pereopod 4 **F** pereopod 5 **G** pereopod 6. Scale bar = 0.1 mm.

subdistal setae and dorsal spine; ventral margin with row of spines.

Pereopod 3 (Fig. 3D) as pereopod 2 except basis naked.

Pereopod 4 (Fig. 3E) coxa indistinct. Basis with two dorsoproximal setulated setae. Ischium with regular simple ventral seta. Merus with two spiniform ventrodistal setae. Carpus with four spiniform (two of which are finely serrated) and one bone-shaped distal setae. Propodus as long as carpus, with three spiniform distal setae. Dactylus and unguis combined longer than propodus, not fused, and without spinning gland exit.

Pereopod 5 (Fig. 3F) as pereopod 4 except basis with one medioventral setulated seta.

Pereopod 6 (Fig. 3G) as pereopod 4 except basis naked. Propodus with four spiniform distal setae.

Pleopods (Fig. 1D) uniramous and strongly elongated. Basal article shorter than endite, naked. Endopod with four long (longer than antennule) sparsely plumose setae.

Uropod (Fig. 1E) basal article shorter than exopod, naked. Endopod with two articles subequal length articles; article 1 with two setulated distal setae; article 2 with one long subdistal, four long simple and two setulated distal setae. Exopod longer than endopod article 1, with one medial and two unequally length distal setae.

Remarks. It is hard to compare *C. longisetosa* and other *Collettea* species given that it is a male and most other species are described from females only. The sexual dimorphism of *Collettea*, know from the species, which have described male (*C. minima* (Larsen, 2000) *C. elongate* (Larsen, 2002) and *C. lilliputa* (Błażewicz-Paszkowycz & Larsen, 2005) indicate only minor differences between the sexes in the antennule and absence of pleopods in the females. The remarkable uniramous pleopods and their equally remarkable setae of this species separate it from any other male described.

A similar armament of the cheliped fixed finger with its strong inner serration and transverse row of inner setae/setules is also seen in *C. subtilis* Kudinova-Pasternak, 1981 and *C. rotundicauda* Kudinova-Pasternak, 1983, but none of these species have the ventral fixed finger setae arising from a tubercle or the prominent dactyli seta. Furthermore in the case of *C. subtilis* the pereonites 2–5 are of similar size and in *C. rotundicauda* the antennule is much more robust (despite being a female, which usually have slender antennules than male), a shorter antennule article 4, and a shorter pleon. The powerful setae of the pereopods is also recorded from *C. longipleona* Błażewicz-Paszkowycz & Larsen, 2005, but this species have shorter and uniarticulated uropod. Another important feature of this species is the ischial setae on the pereopods 1–3, which are much more robust than usually seen in tanaidacean ischial setae. The crushing area of the mandibular molar, while not exactly pointed, is unusual small compared to what is seen in other species of *Collettea.* However, the long pleotelson still indicate that the species belong to *Collettea*, or to a new genus if/when *Collettea* is spilt into several genera. The only other genus that show some similarities, like the elongated body, cheliped structure and species with variable mandibular molar width, is *Filitanais* Kudinova-Pasternak, 1973 but the pleon is too short and the pleotelson too long in the new species to fit the diagnosis of that genus.

***Collettea* sp.**

Fig. 4

Material examined. Manca II SUB-C Station SUB-C # 1, 05/06–2004, 14°01.7913'N, 130°08.1755'W, depth 4987 m.

Description. Manca II

Body (Fig. 3A) length 1.9 mm. Ten times as long as broad. Cephalothorax shorter than combined length of pereonite 1 and 2.

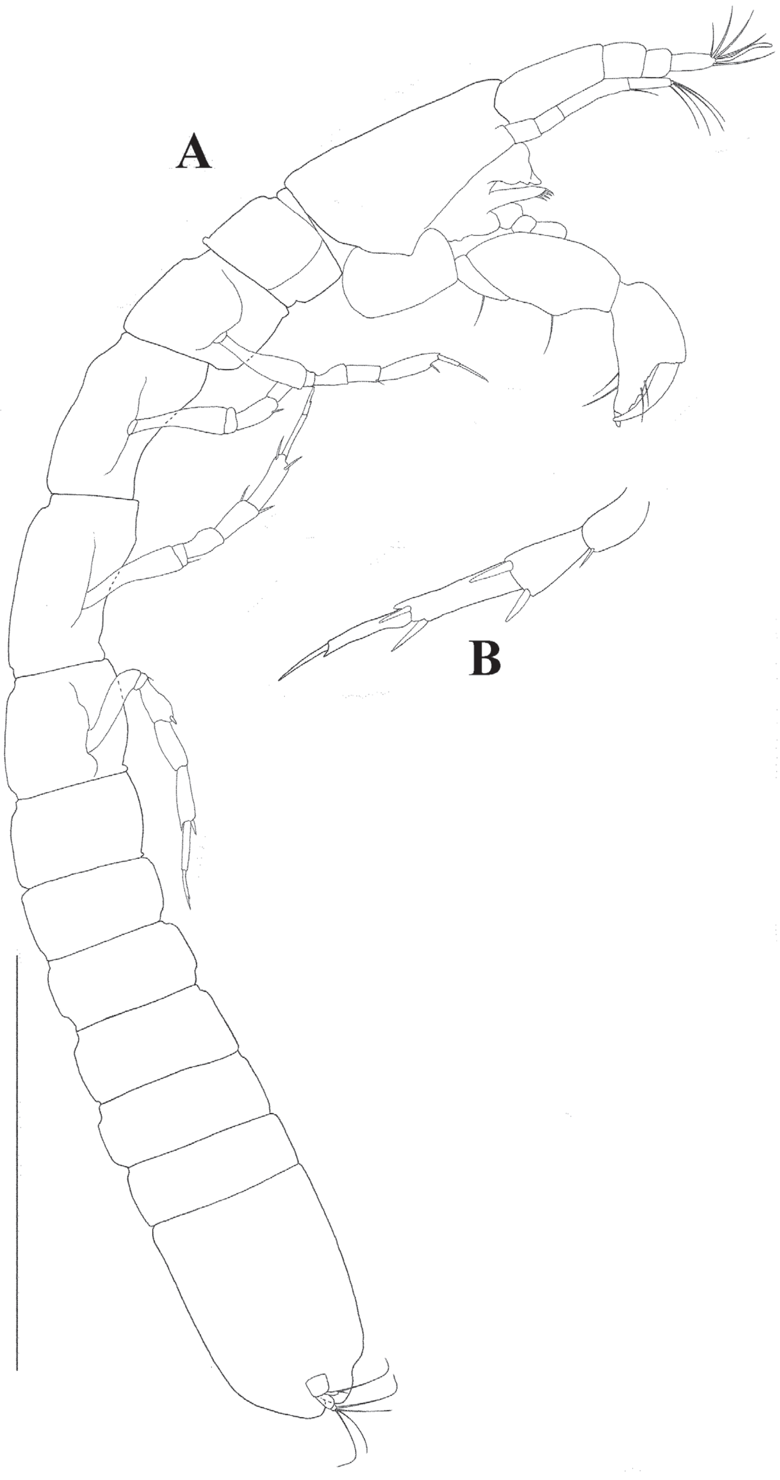

Figure 4. *Collettea sp* **A** lateral view, scale bar = 0.5 mm **B** tip of pereopod 4, scale bar = 0.5 mm.

Pereon. Pereonites 1, 5, and 6 wider than long. Pereonite 2–4 longer than wide.

Pleon relatively short, about half as long as rest of body. All pleonites subequal but progressively deeper towards pleotelson.

Pleotelson longer than combined length of three pleonites, deeper than pleonites.

Pereopod 4 (Fig. 3B) dactylus with clear ventral spine at unguis insertion.

Remarks. As this species was only recorded from one specimen of stage manca II it is not justifiable to erect a new species. The short uropods indicate however that it is not conspecific with *C. longisetosa.* This manca could be conspecific with *Collettea* sp. (Larsen 2000) which was collected in the same ocean basin (09°37.41'N, 151°45.00´W), however, since that species was not dissected, no further comparisons can be made. Several other species of *Collettea* share the ventral dactylus spine on pereopods 4–6 (*C. alicjae* Błażewicz-Paszkowycz & Larsen, 2005; *C. humbolti* Larsen, 2000; *C. longipleona* Błażewicz-Paszkowycz & Larsen 2005) and the species recorded here and thus this character is not good for species identification.

Genus *Tumidochelia* Knight, Larsen & Heard, 2003

Type species. *Tumidochelia randyi* Knight, Larsen & Heard, 2003.

Diagnosis. See Larsen and Shimomura (2007)

Gender. Feminine.

Remarks. The genus *Tumidochelia* is a much rarer genus than *Collettea*, but is fairly well defined by the combination of a large cheliped carpus shield and a biramous uropod with an additional spiniform distal process on inner margin of the basal article. The genus is encountered both in fairly shallow water around 100 meters (G.O. Sars 1896) and at abyssal depths below 5000 meters (this study). It currently consists of five species including the one described herein.

The mouthparts of this genus are remarkably small relative to the size of the whole animal. When compared to a specimen of the genus *Tanais* or most other shallow-water tanaidomorphans of a similar body size, the differences in the size of the mouthparts are several hundred percent.

Species currently assigned to this genus. *T. dentifera* (G.O. Sars, 1896); *T. knighti* Larsen and Shimomura, 2007; *T. randyi* Knight, Larsen & Heard, 2003; *T. tuberculata* sp. n.; *T. uncinata* (Hansen, 1913).

Tumidochelia tuberculata sp. n.

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Figs 5–7

Material examined. Holotype, non-ovigerous female (MNHN-Ta1031), Station CAROT-0 # 15, 04/06–2004, 14°02.8654'N, 130°05.3508'W, depth 5044 m.

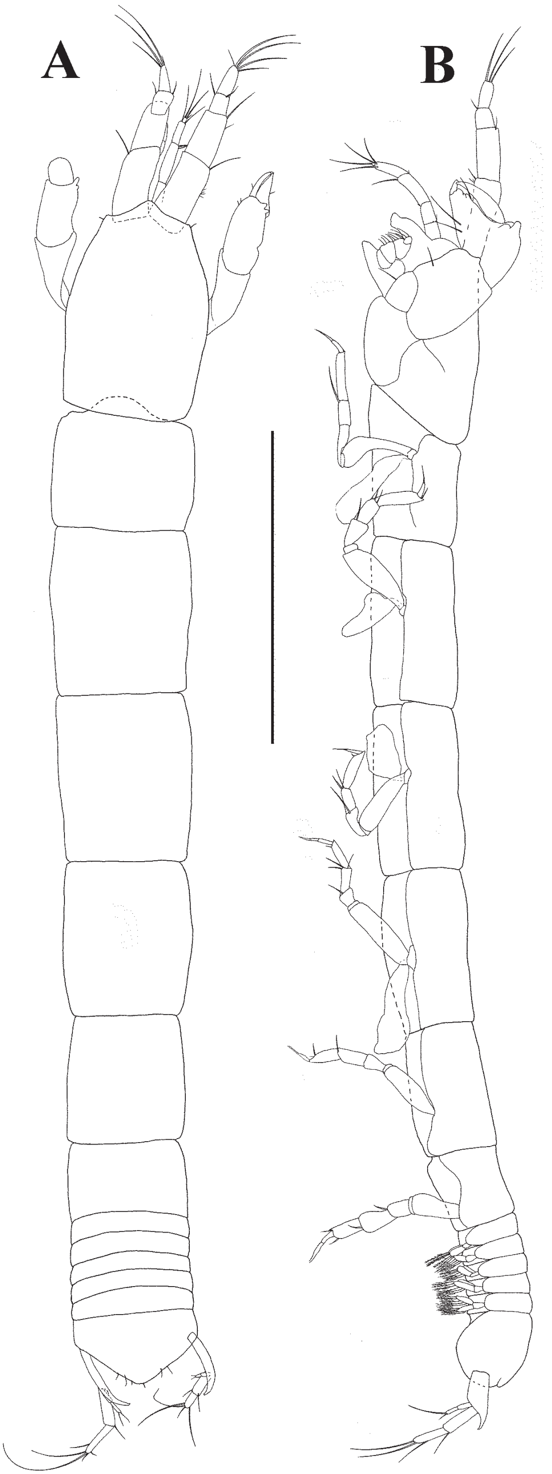

Figure 5. *Tumidochelia tuberculata* sp. n. Holotype **A** dorsal view **B** lateral view Scale bar 0.5 mm.

Diagnosis. Female. Pereonites 2–4 longer than wide. Pleotelson longer than combined length of four pleonites. Antenna with six articles (+ fusion line), article 4 longer than other articles, with clear fusion line. Cheliped propodus with large paired dorsal tubercles near dactylus insertion. Pereopod 1 merus and carpus with long (longer than length of merus) robust setae.

Male. Unknown.

Etymology. The species is named after the diagnostic character of the tubercles on the cheliped propodus.

Description. Female (body and appendages of holotype).

Body (Fig. 5A, B). Body length 2.0 mm. Subcylindrical, elongate, approximately 8.5 times longer than wide. Lateral edges almost completely straight.

Cephalothorax longer than wide (l/w 1.5). Eyes and eye-lobes absent.

Pereon. Pereonites 1 and 6 wider than long. Other pereonites longer than wide, pereonites 3 longest.

Pleonites all wider than long, subequal, bearing pleopods.

Pleotelson longer than combined length of four pleonites.

Antennule (Fig. 6A) with four articles. Stout at base- tapering distally, almost as long as carapace. Article 1 with one simple distal seta and three subdistal setulated setae; article 2 approximately 0.80 times as long as article 1, with two simple and three setulated distal setae; article 3 approximately 0.3 times length of article 2, with two simple distal setae; article 4 approximately twice length of article 3, with four long and one short simple distal setae and one prominent aesthetasc.

Antenna (Fig. 6B) approximately 0.7 times as long as antennule. Article 1 naked and fused to cephalon. Article 2 wider than other articles, with dorsodistal process and one stout dorsodistal seta. Article 3 band-shaped, with one dorsodistal seta, Article 4 longer than other articles, with clear fusion line, with one medial (distal on first article component) setulose seta, with two long and one short simple setae distally and with one subdistal setulated setae. Article 5 with one simple distal seta. Article 6 approximately 0.25 length of article 5, with three simple distal setae and one aesthetasc.

Mouthparts: Relatively small compared to body size (mandibular body less than 0.1 mm, see remarks). Labrum (Fig. 6C) apex pointed, apparently naked. Mandibular molar tapering. Left mandible (Fig. 6D) incisor with three distal denticles; *lacinia mobilis* blunt with two denticles. Right mandible (Fig. 6E) incisor with two denticles. Labium (Fig. 6F) with one pair of lobes, without setules or process. Maxillule (Fig. 6G) endite with nine terminal spiniform setae of which two are serrated; palp with two terminal setae. Maxilla (Fig. 6H) narrow and long (as long as maxillule endite), featureless. Maxilliped (Fig. 6I) endites with blunt distal process and small outer seta, fairly wide (almost as wide as basis) and long (reaching palp article 4). Basis fused. Palp article 1 naked; article 2 with two inner setae and one outer seta; article 3 with three inner setae; article 4 with four setae. Epignath not recovered.

Cheliped (Fig. 7A) attached to cephalothorax by a large sclerite. Basis naked, narrow in posterior part, approximately as long as carpus. Merus with one ventral seta. Carpus widening distally, with two small dorsal setae and two simple ventromedial

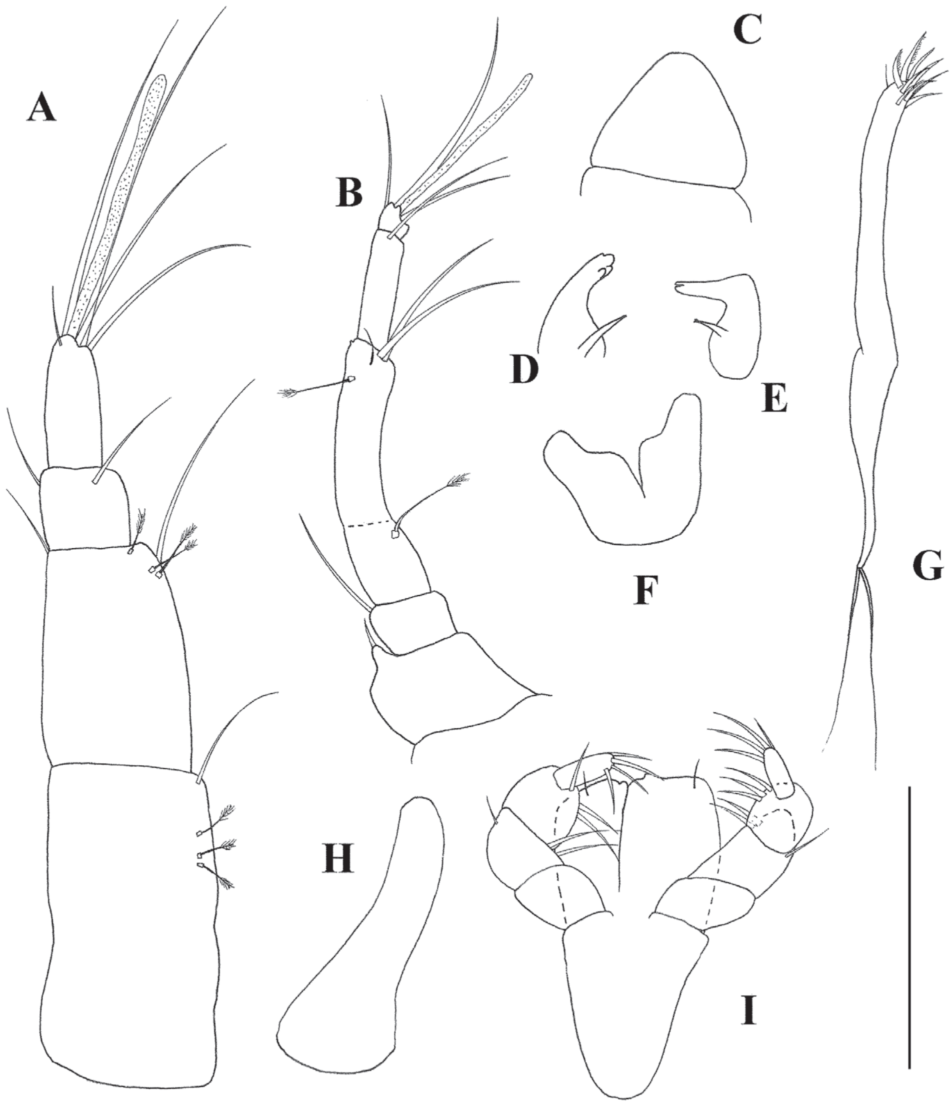

Figure 6. *Tumidochelia tuberculata* sp. n. Holotype **A** antennule **B** antenna **C** labrum **D** right mandible **E** left mandible **F** labium **G** maxillule **H** maxilla **I** Maxilliped. Scale bar 0.1 mm.

setae, ventrodistal part inflated into a large carpal shield, extending distally past propodus articulation. Propodus as long as basis, with two simple (thick) ventral setae mid-length and three (one longer than the other two) inner setae proximal to dactylus insertion, with paired dorsal crest next to dactylus insertion. Fixed finger with three inner setae and three blunt denticles. Dactylus as long as fixed finger

Pereopod 1 (Fig. 7B) longer than other pereopods. Coxa naked. Basis robust without seta. Ischium with one simple distal seta; merus widening distally, longer than

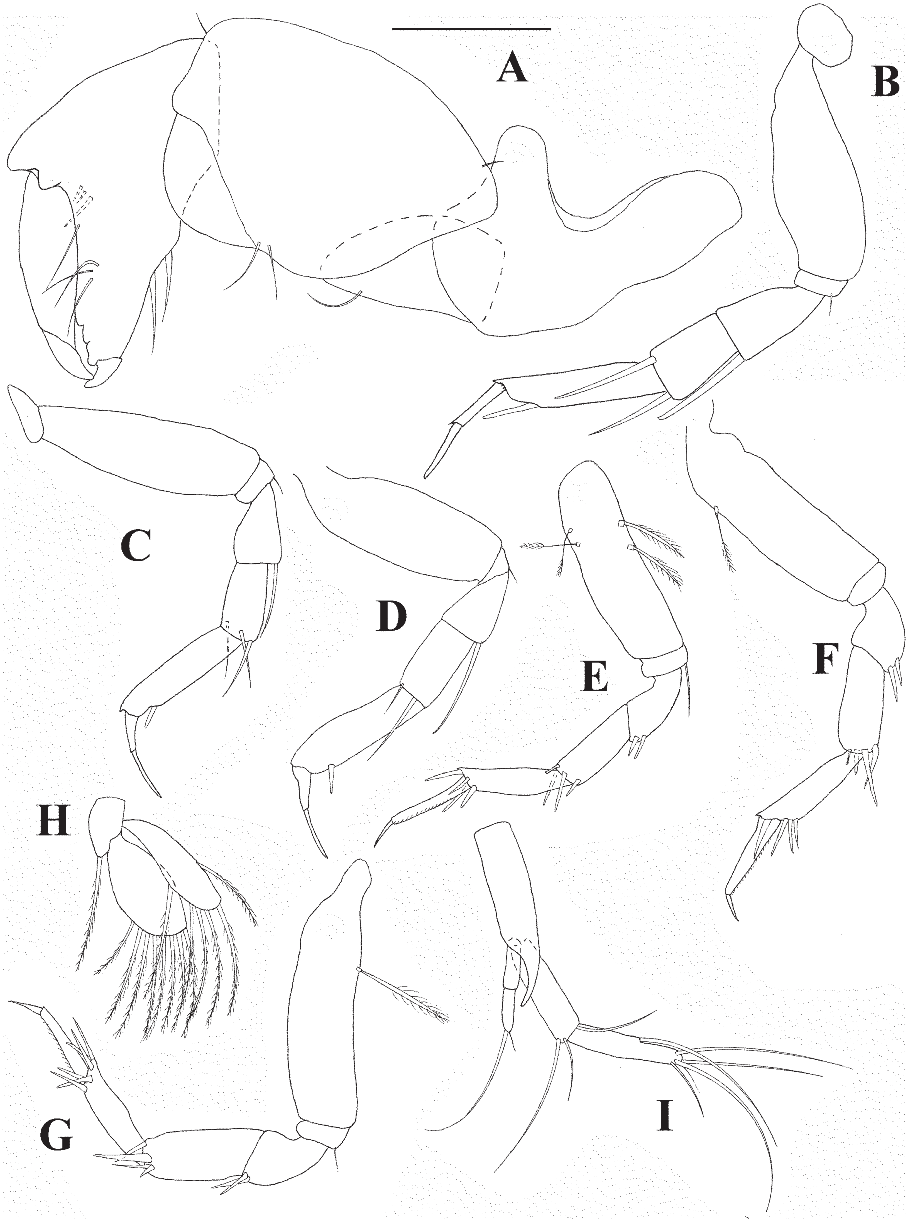

Figure 7. *Tumidochelia tuberculata* sp. n. Holotype **A** cheliped **B** pereopod 1 **C** pereopod 2 **D** pereopod 3 **E** Pereopod 4 **F** pereopod 5 **G** pereopod 6 **H** pleopod **I** uropod. Scale bar 0.1 mm.

carpus, with one ventrodistal, long (longer than merus) bayonet-shaped setae. Carpus rectangular, half as long as propodus, with two long (longer than merus) bayonet-shaped distal setae. Propodus elongate, longer than merus, with one spiniform ventro-subdistal seta and dorsal spine. Dactylus and unguis combined shorter than propodus, dactylus with distal spine at unguis insertion. Unguis as long as dactylus.

Pereopod 2 (Fig. 7C) as pereopod 1 except it is smaller; carpus with three long setae; dactylus without spine.

Pereopod 3 (Fig. 7D) as pereopod 2 except: carpus with two setae.

Pereopod 4 (Fig. 7E) coxa absent. Basis with two medial setulated setae on both margins (the ventral ones much the larger). Merus with two short spiniform ventral setae. Carpus with three spiniform ventral setae and one bone-shaped seta. Propodus with four spiniform distal setae. Dactylus (including unguis) as long as propodus, with ventral serration; unguis less than 0.3 times as long as dactylus.

Pereopod 5 (Fig. 7F) as pereopod 4 except: basis with only one dorsal setulated seta. Ischium apparently naked.

Pereopod 6 (Fig. 7G) as pereopod 4 except: basis with only one ventral setulated seta. Propodus, with six distal setae.

Pleopods (Fig. 7H). Basal article with one plumose seta. Endopod rectangular, with numerous simple distal setae. Exopod rectangular, with one robust proximal seta, and numerous simple distal setae.

Uropod (Fig. 7I) biramous, basal article naked, with dorsomedial spiniform process. Endopod with two subequal articles; article 1 with three simple distal setae; article 2 with one long simple subdistal seta, three long and two short simple distal setae. Exopod reaching beyond midlenght of first endopod article, with two subequal articles; article 1 naked, article 2 with two simple but unequally length distal setae.

Remarks. *Tumidochelia tuberculata* can be separated from *T. uncinata* by the cheliped propodus having paired dorsal crest next to dactylus insertion; from *T. dentifera* by the pleotelson being longer than last three pleonites combined; from *T. randyi* by the pereonite 2 being longer than other pereonites; from the only other Pacific species, *T. knighti,* by the straight lateral margins (with no segment indentations), the longer pleotelson, the antenular fusion line, the cheliped propodus tubercles, and a longer uropodal exopod.

Key to the species of *Tumidochelia*, females

1	Pleotelson longer than last three pleonites	**2**
–	Pleotelson shorter than last three pleonites	**4**
2	Pereonites of subequal length and width. Antenna article 4 without fusion line	***T. randyi***
–	Pereonite 2 longer than other pereonites. Antenna article 4 with clear fusion line	**3**
3	Cheliped propodus with paired dorsal crest next to dactylus insertion	***T. tuberculata***
–	Cheliped propodus without paired dorsal crest next to dactylus insertion	***T. uncinata***
4	Antenna article 4 with clear fusion line. Uropodal exopod almost reaching the end of first endopod article	***T. dentifera***
–	Antenna article 4 without fusion line. Uropodal exopod barely reaching beyond midlenght of first endopod article	***T. knighti***

Family *Incertae sedis*

Genus *Robustochelia* Kudinova-Pasternak, 1983

Type species. *Leptognathia robusta* (Kudinova-Pasternak, 1970)

Diagnosis. (Modified after Józwiak and Błażewicz-Paszkowycz 2007) Female. Antennule with four visible articles and one minute terminal article (often not visible in the compound scope as with *Collettea* and many other tanaidomorphans). Antenna with six articles, articles 2 and 3 with robust dorsodistal setae. Mandibular molar pointed. Labium consists of one pair of lobes with minute distal setulation, usually with medial processes (e.i. ′lobes′ sensu Józwiak and Błażewicz-Paszkowycz 2007). Maxillipedal palp robust; endites not fused, with distal setae but without distal denticles, narrower than basis. Chelipeds attached by ventral sidepiece, carpus and propodus massive, dactylus and fixed finger shorter than rest of propodus, and heavily chitinized. Pereopods 1–3 with coxa, dactylus and unguis combined shorter than, or as long as, propodus, unguis longer than dactylus. Pereopods 4–6 without coxa, dactylus and unguis not fused to a claw. Pleopods present. Uropodal exopod uniarticulated, endopod consisting of one (with pseudoarticulation) or two articles.

Male: Similar to female, but antennule articles 1–3 much wider than in female.

Gender. Feminine.

Species currently assigned to this genus. *R. angusticephala* Kudinova-Pasternak, 1986; *R. longa* Kudinova-Pasternak, 1983; *R. pacifica* sp. n.; *R. robusta* (Kudinova-Pasternak, 1970); *R. virilis* Józwiak and Błażewicz-Paszkowycz, 2007.

Remarks. The genus *Robustochelia* is a rare, and exclusively deep-sea, genus (Larsen 2005; Józwiak and Błażewicz-Paszkowycz, 2007). It is primarily recognized by the heavy cheliped with a calcified keel on the cheliped fixed finger but despite the recent clarifications by Józwiak and Błażewicz-Paszkowycz (2007) it i still poorly defined and poorly studied genus, due to the rarity of both species and specimens. The genus currently consists of five species including the one described herein. Apart from the heavy cheliped, the defining characters of *Robustochelia* are the combination of a ‘general leptognatid′ morphology: consisting of an antennule with four plus one minute articles, a pointed mandibular molar, and a uniarticulated exopod. However the calcified cheliped keel is found in species of other genera (*Leptognathioides, Siphonolabium*, *Monstrotanais*, and *Robustochelia*[?] *solida*) and the combination of the other ′general leptoganthid′ characters all present in several other deep-sea genera (*Caudalonga, Filitanais, Forcipatia, Leptognathia, Leptognathiella, Stenotanais*). No other synapomorphic characters are present and several of the species of *Robustochelia* are only incompletely described. Unfortunately it is not unusual for tanaid systematists to have to rely on a character combination as this for genus diagnosis, but the homoplastic nature of all the characters in *Robustochelia* indicates that it is probably not monophyletic. Further studies, particularly genetic studies, needs to verify the status of this genus (Larsen and Froufe in progress).

The labial medial processes or ´lobes´ sensu Józwiak and Błażewicz-Paszkowycz (2007) are in this authors opinion note ´lobes´ in the true sence as seen in *Leptochelia* or *Tanais* but thin membranous lateral extensions).

***Robustochelia pacifica* sp. n.**
urn:lsid:zoobank.org:act:64828C04-B759-4400-A3DD-B35DC486A0D1
Figs 8–10

Material examined. Holotype manca II (MNHN-Ta1030) SUB-C Station CAR-OT-0 # 18, 05/06–2004, 14°02.6665'N, 130°05.9948'W, 5045 m.

Diagnosis. Manca II. Carapace longer than the lengths of pereonites 1 and 2 combined. Pereonites 2–5 longer than wide. Pleotelson longer than combined length of three pleonites. Mandibular molar tapering. Maxillipedal endites with medial setae. Cheliped propodus and proximal part of fixed finger with calcified keel; fixed finger with clear tubercle distal from the keel; dactylus with dorsoproximal seta. Pereopods 1–3 propodus setae only reaching unguis insertion. Uropods as long as pleotelson.

Male. Unknown.

Etymology. Named after the Pacific Ocean.

Description. Manca II (body and appendages of holotype).

Body (Fig. 8A) length 1.7 mm. About ten times as long as wide (owing to the curved nature of the holotype, body morphometric calculations are based on the lateral view).

Cephalothorax more than 1.5 times as long as wide. Shorter than the lengths of pereonites 1 and 2 combined. Eye-lobes absent.

Pereon lateral margins almost straight. Pereonite 1 and 6 wider than long. Pereonites 2–5 longer than wide.

Pleon short (including pleotelson about 0.25 times total body length).

Pleotelson longer than the lengths of three free pleonites combined, apex blunt and covered by dorsal plate.

Antennule (Fig. 9A) 0.67 times as long as carapace, with four plus one minute terminal articles. Article 1 shorter than rest of antennule, with three setulose setae medially. Article 2 longer than article 3, with two setulated and one simple distal setae. Article 3 shorter than article 4, with one simple distal seta. Article 4 longer than article 2, with two long and one short simple distal setae, with one very wide distal aesthetasc. Article 5 minute, with two aesthestascs and one seta.

Antenna (Fig. 9B) with six articles. Almost as long as antennule. Article 1 wider than long, naked, not significantly wider than other articles. Article 2 longer than article 3, with one simple dorsal and ventral setae. Article 3 longer than article 5, with one simple dorsal seta. Article 4 longer than other articles, with three setulose and one simple distal setae. Article 5 as long as article 2, with two simple distal setae. Article 6 minute, with four distal setae.

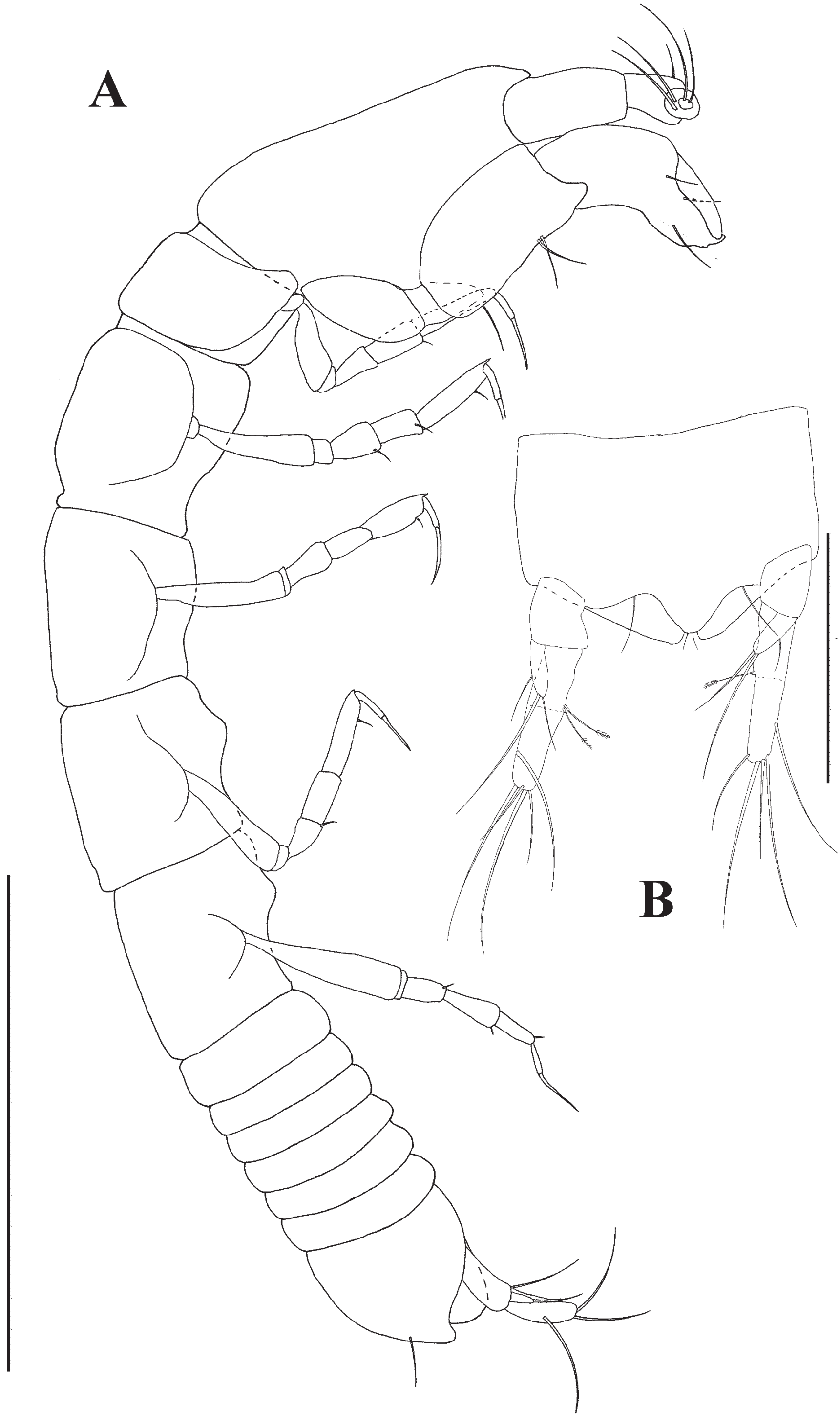

Figure 8. *Robustochelia pacifica* sp. n. Holotype **A** lateral view **B** Pleotelson and uropods. Scale bars 0.5 mm.

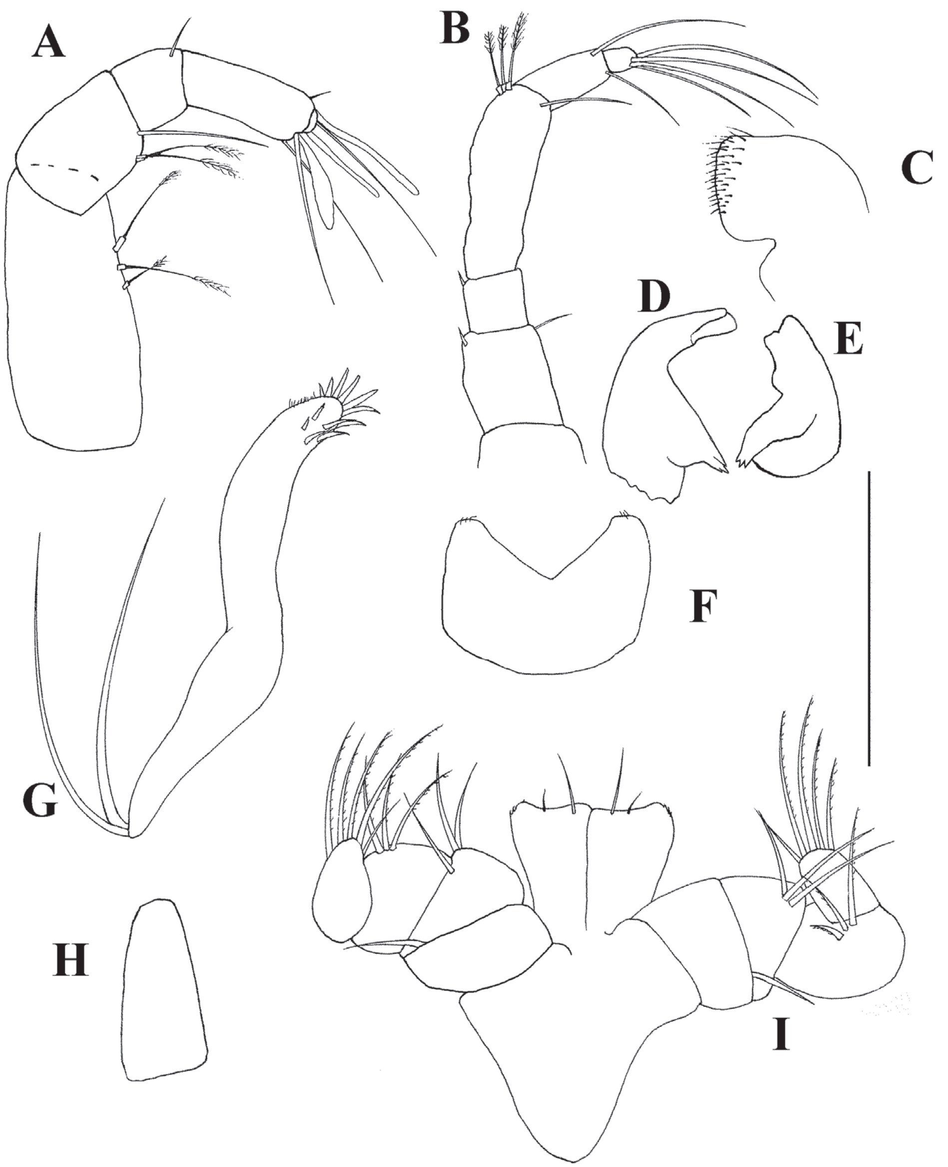

Figure 9. *Robustochelia pacifica* sp. n. Holotype **A** antennule **B** antenna **C** labrum **D** left mandible **E** right mandible **F** labium **G** maxillule **H** maxilla **I** Maxilliped. Scale bar 0.1 mm.

Mouthparts: Labrum (Fig. 9C) finely setose, with flat apex. Mandibular molar tapering, ending in a few small spines. Left mandible (Fig. 9D) *lacinia mobilis* longer and broader than incisor; incisor blunt. Right mandible (Fig. 9E) incisor with medial depression. Labium (Fig. 9F) as wide as maxillipedal endites, outer corners with only a few setules. Maxillule (Fig. 9G) endite with 12 spiniform distal setae; palp with two terminal setae. Maxilla (Fig. 9H) elongated and featureless. Maxilliped (Fig. 9I) endites without denticles but with two distal setae, the medial one longest; palp article 1 with one outer seta, article 2 with three inner setae, article 3 with three setae on inner margin, article 4 with five setae. Epignath not recovered.

Cheliped (Fig. 10A, B) basis shorter than carpus, naked. Merus prominent with one simple ventral seta. Carpus appears twisted in relation to propodus, shorter than propodus including fixed finger, with two simple ventral setae and prominent distal process. Propodus massive, with one seta at dactylus insertion and ventral calcified keel. Fixed finger with keel only on proximal part, but with a clear tubercle distally from the keel, with one ventral seta and two on inner margin, and with one large distal process. Dactylus as long as fixed finger, with small medial process and small dorso-proximal seta.

Pereopod 1 (Fig. 10C) coxa with one simple seta. Basis longer than the three succeeding articles combined. Ischium with one ventral seta. Merus as long as carpus, widening distally, naked. Carpus shorter than 0.5 times propodus, with two spiniform and one simple distal setae. Propodus with spinnules and one distal seta on both margins and dorsal spine. Dactylus and unguis combined shorter than propodus, not fused, dactylus shorter than unguis.

Pereopod 2 (Fig. 10D) as pereopod 1 except: coxa apparently without seta. Merus with ventral seta. Carpus with simple ventral seta.

Pereopod 3 (Fig. 10E) as pereopod 1 except: basis with ventromedial setulose seta.

Pereopod 4 (Fig. 10F) with no visible coxa. Basis about as long as the three succeeding articles combined, naked. Ischium naked. Merus with one simple ventral seta. Carpus with two small spiniform and one simple distal setae. Propodus longer than carpus, with two spiniform ventral and one simple dorsal setae. Dactylus and unguis combined shorter than propodus, not fused, with spinnules on both margins. Unguis still longer than dactylus, but shorter than in pereopod 1–3.

Pereopod 5 (Fig. 10G) as pereopod 4 except merus with two spiniform setae and carpus with three.

Pereopod 6 absent in manca II.

Pleopods absent in manca II.

Uropod (Fig. 8B) longer than pleotelson. Basal article naked and about as long exopod. Endopod with weak traces of a medial pseudo-articulation, with two medial setulose setae, one subdistal seta and four distal setae. Exopod less than half of endopod length, with two distal setae of unequal length.

Remarks. Bacause the studied specimen represent manca stage it is difficult to compare it with the other species of the genus. The carapace being longer than combined length of pereonites 1 and 2 and the weak armament of the pereopods (particularly the carpus) differentiate *R. pacifica* sp. n. from *R. longa*. As for *R. angusticephala***,** this species is only incompletely described and nothing is known about the mouthparts so comparison with this species is difficult. However, the weaker fixed finger of *R. pacifica* and the shape of the cephalothorax indicates that these are not conspecific. *Robustochelia pacifica* most closely resemble *R. robusta,*

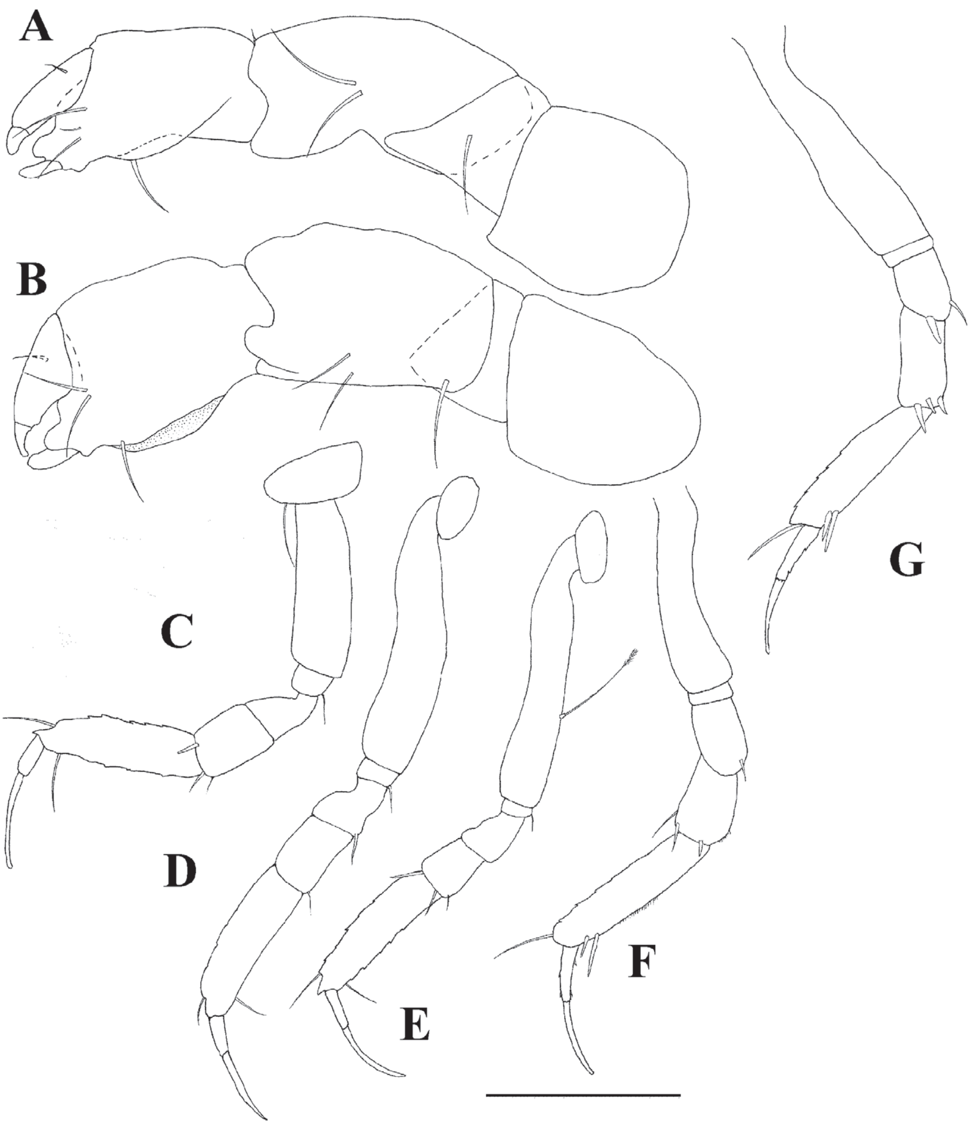

Figure 10. *Robustochelia pacifica* sp. n. Holotype **A** left cheliped, inner view **B** right cheliped, outer view **C** pereopod 1 **D** pereopod 2 **E** pereopod 3 **F** Pereopod 4 **G** pereopod 5 **H** pereopod 6 **I** pleopod. Scale bar = 0.1 mm.

but differs in the stout antennule (particularly article 4) and antenna, but also the more rectangular shape of the cephalothorax, the pereonites 2–5 being longer than wide, the large tubercle distally on the fixed finger, and the much longer pleotelson. *R. pacifica* differs from *R. virilis* by the pereonite 4 and 5 being longer than wide and by the pereopods 1–3 propodus setae not reaching longer than unguis insertion.

The species *R. solida* Larsen, 2005 was removed from the genus by Józwiak and Błażewicz-Paszkowycz 2007, based primary on the present of the present of a broad molar. This removal is undoubtly correct and thus clearly illustrate that the heavy cheliped is not a sufficient character for defining the genus *Robustochelia.*

Acknowledgments

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