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Red Sea Leucothoidae (Crustacea: Amphipoda) including new and re-described species

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Abstract. Examination of leucothoid amphipods of the Red Sea has revealed seven species not previously reported from this location. *Leucothoe minoculis* sp. nov., *Leucothoe pansa* sp. nov., *Leucothoe reimeri* sp. nov., and *Paranamixis sommelieri* sp. nov. are described and the range of *Leucothoe predenticulata* Ledoyer, 1978, *L. acutilobata* Ledoyer, 1978 and *L. squalidens* Ledoyer, 1978 is expanded to include the Red Sea. Clarification of reports of *L. acanthopus* Schellenberg, 1928 and *L. bannwarthi* (Schellenberg, 1928) is provided and *Leucothoe alani* sp. nov. is described from outside the Red Sea.

Keywords. Leucothoidae, Red Sea, *Leucothoe*, *Paranamixis*, new species.

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Introduction

Leucothoid amphipods are common peracarid crustaceans in surveys from all marine ecosystems from the intertidal to the abyssal zone, and are among the earliest amphipods described. Many of these early species descriptions lacked taxonomic detail and were often poorly illustrated, making subsequent identification difficult (Minelli 1993; Thomas 2015). Including the species described here, Leucothoidae currently comprise 185 species in five genera: *Anamixis* Stebbing, 1897 (23 spp.); *Nepanamixis* Thomas, 1997 (4 spp.); *Paranamixis* Schellenberg, 1938 (16 spp.); *Leucothoe* Leach, 1814 (140 spp.); and *Paraleucothoe* Stebbing, 1899 (2 spp.). Leucothoids are typically endocommensal associates of sessile invertebrates such as sponges, ascidians, or bivalve mollusks, and are often incidentally collected from coral rubble samples.

Thirty-one leucothoid species have been previously reported from the Indian Ocean (Table 1), with six of these species collected from the Red Sea (*Leucothoe acanthopus* Schellenberg, 1928; *L. bannwarthi* (Schellenberg, 1928); *L. crassimana* Kossmann, 1880; *L. furina* (Savigny, 1816); *L. safae* Lyons & Myers, 1991; and *Paranamixis bocki* Schellenberg, 1938). *Leucothoe acanthopus* was first described (poorly) from the Suez Canal (Schellenberg 1928) and reported from the Dahlak Archipelago in the

Red Sea (Ruffo 1969). *Leucothoe bannwarthi* was described from the Suez Canal (Schellenberg 1928; Monod 1937) and later reported from the Red Sea (Barnard 1937; Ruffo 1969; Ledoyer 1967, 1979, 1986). Subsequent reports of *L. bannwarthi* from the Western Indian Ocean represent a different species and are here described as such. *Leucothoe crassimana* has been reported several times from the Red Sea (Kossmann 1880; Sowinsky 1897, 1898; Stebbing 1906). *Leucothoe furina* was described from the Suez Canal (Savigny 1816) as *Lycesta furina*, and later reported from the Red Sea (Walker 1909; Barnard 1937; Ruffo 1969). *Leucothoe safiae* was described from Safi in the Gulf of Aqaba (Lyons & Myers 1991). Lastly, *Paranamixis bocki* was originally described from the Gilbert Islands (Schellenberg 1938) and later reported from the Red Sea (Ruffo 1969). Ruffo (1969) reported *Anamixis cavatura* Thomas, 1997 from the Red Sea as *Leucothoides pottsi* Shoemaker, 1933. However, a discussion of this species is not included here as it is unlikely that a species from the Caribbean Sea also inhabits the Red Sea. This material was most probably a leucomorph of a *Paranamixis* species.

Examination of material collected by Ulrich Schiecke and James Davis Reimer has revealed several more leucothoid amphipod species that have not been previously reported from the Red Sea. Three new species of *Leucothoe* and one new species of *Paranamixis* are here described from the Red Sea. *Leucothoe acanthopus* is re-described with designation of a neotype. A new locality is recorded for *Leucothoe predenticulata*, *L. acutilobata* and *L. squalidens*, all Ledoyer, 1978, and clarification of *Leucothoe bannwarthi* from specimens collected in the Red Sea is provided. A new species is described for material collected in the Fiji islands, which was originally assigned to *L. bannwarthi*.

Material and methods

A marine sponge containing specimens of *Leucothoe reimeri* sp. nov. was collected via SCUBA by James Davis Reimer from Shi'b Pelam, Jazirat Burcan, and dissected in the laboratory. Ulrich Schiecke collected sponges, algae and coral rubble throughout the Red Sea. Specimens were preserved in 99.5% EtOH. Specimens used for morphological analyses were transferred to glycerin, dissected, mounted on slides, and illustrated using a drawing tube attached to a compound microscope. Pencil drawings were scanned and digitally inked in Adobe® Illustrator CC 2015 using a Wacom® Tablet, following the methods of Coleman (2003).

Material (type and additional material examined) is deposited at the Museum für Naturkunde of the Humboldt Universität, Berlin (Germany) with the prefix MNHB or ZMB, and at the Museo civico di Storia naturale, Verona (Italy) with the prefix MVRCr.

Abbreviations

Figure legends:

+	= enlarged	m	= medial
Cx	= coxa	Md	= mandible
E	= epimeron	Mx	= maxilla
G	= gnathopod	P	= pereopod
Hd	= head	R	= right
j	= juvenile	T	= telson
l	= lateral	U	= uropod
L	= left	UL	= upper lip
LL	= lower lip	Xpd	= maxilliped

Acronyms:

AM	= Australian Museum
MNHB or ZMB	= Museum für Naturkunde der Humboldt Universität Berlin, Germany
MVRCr	= Museo civico di Storia naturale, Verona, Italy

Table 1 (continued on next page). Reports of Leucothoidae from the Indian Ocean until now (* denotes previous collections from the Red Sea; + denotes previously known species now reported from the Red Sea; # denotes an identification we consider dubious).

Species	Type locality	Additional reports	Depth (m)	Host	Size (mm)
<i>Anamixis aldabra</i> Thomas, 1997	Seychelles	–	2–3	coral rubble	2.5
<i>Anamixis barnardi</i> Sasidharan, 1983	Gulf of Mannar	Gulf of Mannar (Thomas 1997)	littoral	sponges	?
# <i>Anamixis cavatura</i> Thomas, 1997	Western Atlantic	#Madagascar (Ledoyer 1967, 1978, 1979); #Red Sea (Ruffo, 1969)	0–240	among coral	2.4
<i>Anamixis mahe</i> Thomas, 1997	Seychelles	–	0–1	coral rubble	2.5
* <i>Leucothoe acanthopus</i> Schellenberg, 1928	Suez, Egypt	Red Sea: Dahlak (Ruffo 1969)	?	?	3
+ <i>Leucothoe acutilobata</i> Ledoyer, 1978	Mauritius, Madagascar	–	0–25	among coral	3
<i>Leucothoe angusticoxa</i> Ledoyer, 1972	Tulear, Madagascar	Madagascar, Mauritius (Ledoyer 1978, 1979, 1986)	0–150	among coral	4.8
* <i>Leucothoe bannwarthi</i> (Schellenberg, 1928)	Suez Canal	Suez Canal (Monod 1937); Red Sea (K.H. Barnard 1937; Ruffo 1969); #Madagascar (Ledoyer 1967, 1972, 1978, 1986)	0–120	coral, seagrass, sponge	3.8
* <i>Leucothoe crassimana</i> Kossman, 1880	Red Sea	Red Sea (Sowinsky 1897, 1898; Stebbing 1906)	?	?	7
<i>Leucothoe crenatipalma</i> Ledoyer, 1972	Madagascar	Madagascar (Ledoyer 1979, 1986)	24–34	?	4
<i>Leucothoe ctenochir</i> K.H. Barnard, 1925	Port Shepstone, South Africa	South Africa (Griffiths 1974b, 1974c, 1975); Madagascar (Ledoyer 1979, 1986)	0–105	among coral	5.5
<i>Leucothoe dentata</i> Ledoyer, 1972	Tulear, Madagascar	Madagascar (Ledoyer 1986)	3–48	muddy sand, among coral	4
<i>Leucothoe euryonyx</i> (Walker, 1901)	Cannes, Mediterranean	#Madagascar (Ledoyer 1986)	?	?	2.5
* <i>Leucothoe furina</i> (Savigny, 1816)	Suez Canal	#Sri Lanka (Walker 1904); Maldives (Walker 1905); Red Sea (Walker 1909; Schellenberg 1928; K.H. Barnard 1937; Ruffo 1969; #Lowry & Stoddart 2003); South Arabian coast (Ruffo 1938; Rudwick 1951); #Thailand (Ledoyer 1979; Bussarawich 1984)	8–50	ascidians, sand, <i>Chaetopterus</i>	6–10

Species	Type locality	Additional reports	Depth (m)	Host	Size (mm)
<i>Leucothoe hyhelia</i> J.L. Barnard, 1965	Marshall Islands	#Madagascar (Ledoyer 1978, 1979, 1986); #Tonga (Myers, 1986)	0–34	among coral	3.4
<i>Leucothoe laticoxa</i> Ledoyer, 1978	Nosy-Bé, Madagascar	Madagascar (Ledoyer 1986)	250–550	?	5
<i>Leucothoe lihue</i> J.L. Barnard, 1970	Oahu, Hawaii	#Madagascar (Ledoyer 1978, 1979, 1986)	0–33	black coral	3
<i>Leucothoe macrodonta</i> Ledoyer, 1986	Nosy-Bé, Madagascar	–	245–255	among coral	8
<i>Leucothoe madrasana</i> Sivaprakasam, 1969	Madras, India	#Madagascar (Ledoyer 1972, 1978, 1979, 1986)	0–34	holothurians, among coral	3–5
<i>Leucothoe micronesiae</i> J.L. Barnard, 1965	Caroline Islands	#Madagascar (Ledoyer 1978, 1979, 1986)	0–400	algae, among coral	2.5
+ <i>Leucothoe predenticulata</i> Ledoyer, 1978	Mauritius, Madagascar	Madagascar (Ledoyer 1986)	0–25	among coral	4
<i>Leucothoe richiardii</i> Lessona, 1865	Genova, Mediterranean	#South Africa (K.H. Barnard 1916; Griffiths 1974b, 1974c, 1975); #Madagascar (Ledoyer 1979, 1986)	0–255	among coral	6–8
* <i>Leucothoe saftiae</i> Lyons & Myers, 1991	Aqaba, Jordan	–	5–10	?	3.6
+ <i>Leucothoe squalidens</i> Ledoyer, 1984	New Caledonia	Madagascar (Ledoyer 1986)	?	seagrass, among coral	3
<i>Leucothoe stegoceras</i> Walker, 1904	Singapore	Sri Lanka (Stebbing 1906; Walker 1909); East Africa (Walker 1909)	?	ascidian	6
<i>Nepanamixis grossimana</i> (Ledoyer, 1978)	Mauritius, Madagascar	Madagascar (Thomas 1997)	0–25	among coral	3
* <i>Paranamixis bocki</i> Schellenberg, 1938	Gilbert Islands	#Mauritius (Ledoyer 1967); #Red Sea (Ruffo 1969)	2–3	<i>Seriatopora</i>	3
<i>Paranamixis clarkae</i> Thomas, 1997	Seychelles	–	1–2	coral rubble, algae	3
<i>Paranamixis excavatus</i> Ledoyer, 1978	Mauritius, Madagascar	Madagascar (Thomas 1997)	0–25	among coral	3
<i>Paranamixis indicus</i> Sivaprakasam, 1968	Gulf of Mannar, Madras, India	Gulf of Mannar, Madras, India (Thomas 1997)	littoral	sponges	3
<i>Paranamixis madagascarensis</i> Ledoyer, 1982	Mauritius, Madagascar	Mauritius, Madagascar (Thomas 1997)	0–4	among coral	3

Results

Subphylum Crustacea Brünnich, 1772
Class Malacostraca Latreille, 1802
Order Amphipoda Latreille, 1816
Family Leucothoidae Dana, 1852

Genus *Leucothoe* Leach, 1814

Type species

Cancer articulatus Montagu, 1804.

Leucothoe acanthopus Schellenberg, 1928
Figs 1–2

Leucothoe acanthopus Schellenberg, 1928: 637–638, fig. 1 (re-description).

Leucothoe acanthopus – Ruffo 1969: 11.

Diagnosis

Head anterior margin rounded. Maxilla 1 palp 1-articulate, margins constricted. Gnathopod 1 carpus curved; dactylus talon-like. Gnathopod 2 carpus reaching 0.4 times propodus length; propodus palm smooth; dactylus distally tapered and very thin. Pereopods 5–7 bases very narrowly expanded.

Material examined

Neotype

RED SEA: ♂, 3.3 mm, Suez Canal, 1924, E. Bannwarth leg. (MNHB-21542a).

Additional material examined

RED SEA: ♂, 2.9 mm, Suez Canal, 1924, E. Bannwarth leg. (MNHB-21542b) (original type material).

Redescription

Male

LENGTH. 3.3 mm.

HEAD. Anterior margin rounded, anterodistal margin evenly rounded, distal margin straight; ventral cephalic keel anterior margin transverse, anteroventral margin rounded, ventral margin straight; eyes present with many ommatidia, round. Antenna 1 length 0.2 times body length, flagellum 3-articulate, peduncle article 1 less than 2 times as wide as article 2, accessory flagellum present, 1-articulate. Antenna 2 length 0.2 times body length, shorter than antenna 1, flagellum 3-articulate. Mandibular palp ratio of articles 1–3 1.0:2.8:1.5, article 2 with 1 distal seta, article 3 bare, left and right mandibles and upper lip lost in dissection. Lower lip inner lobes fused, setose; outer lobes with large gape, anterior margins setose. Maxilla 1 palp 1-articulate, margins constricted, with 3 distal setae; outer plate with 2 distal robust setae and 7 distal setae. Maxilla 2 inner and outer plates each with 3 distal setae. Maxilliped inner plates distal margin rounded with v-shaped indentation, with several small robust setae; outer plate inner margin smooth, reaching 1.2 times palp article 1, with simple marginal seta; palp article 4 subequal in length with article 3, distally acute.

PEREON. Coxae 1–4 relative widths: 1.0:1.3:1.4:1.6. Gnathopod 1 coxa smooth, bare, anterodistal margin produced, rounded, distal margin rounded, posterior margin excavate; basis slightly inflated,

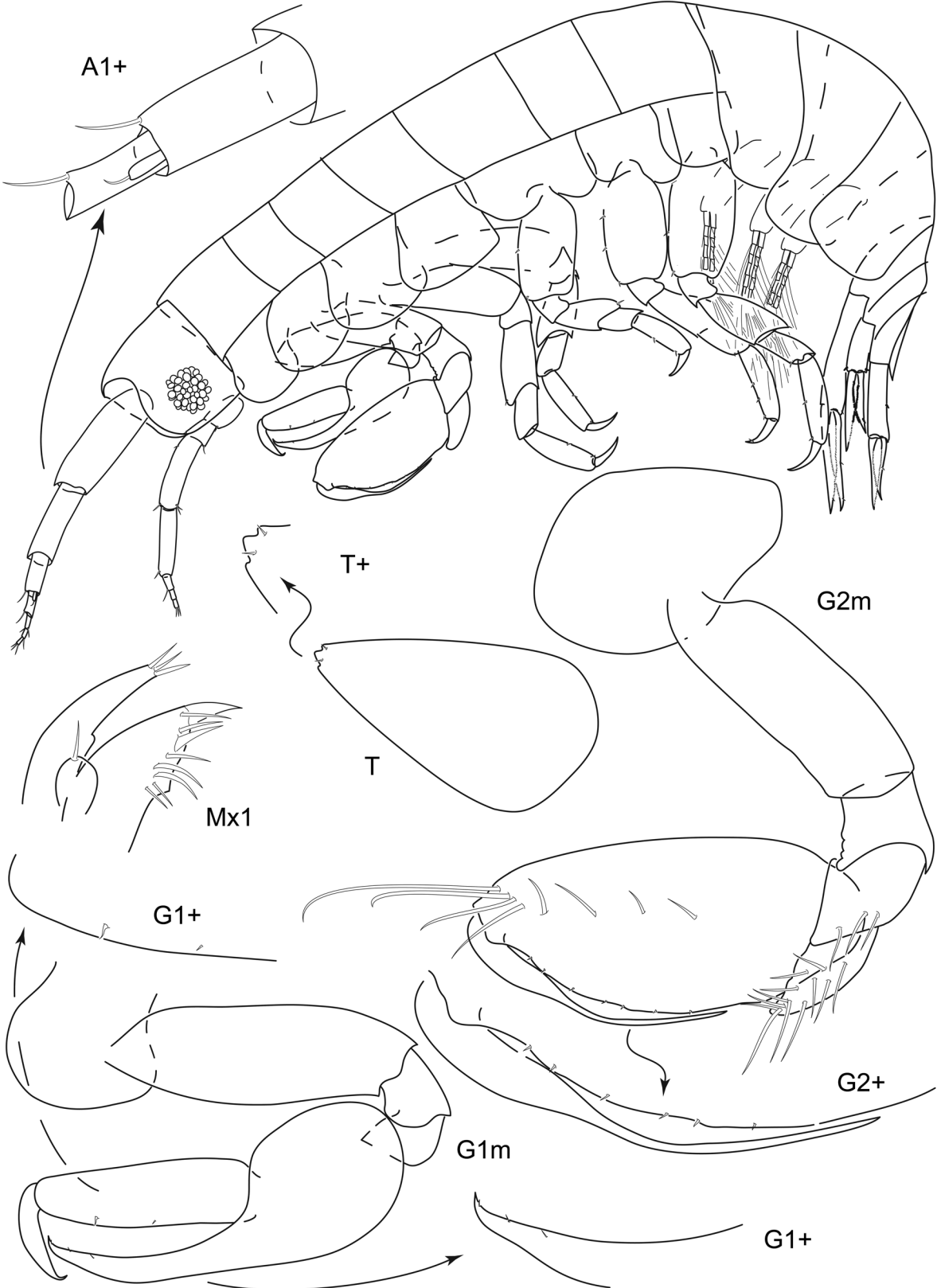


Fig. 1. *Leucothoe acanthopus* Schellenberg, 1928, neotype, ♂, length 3.3 mm (MNHB-21542a).

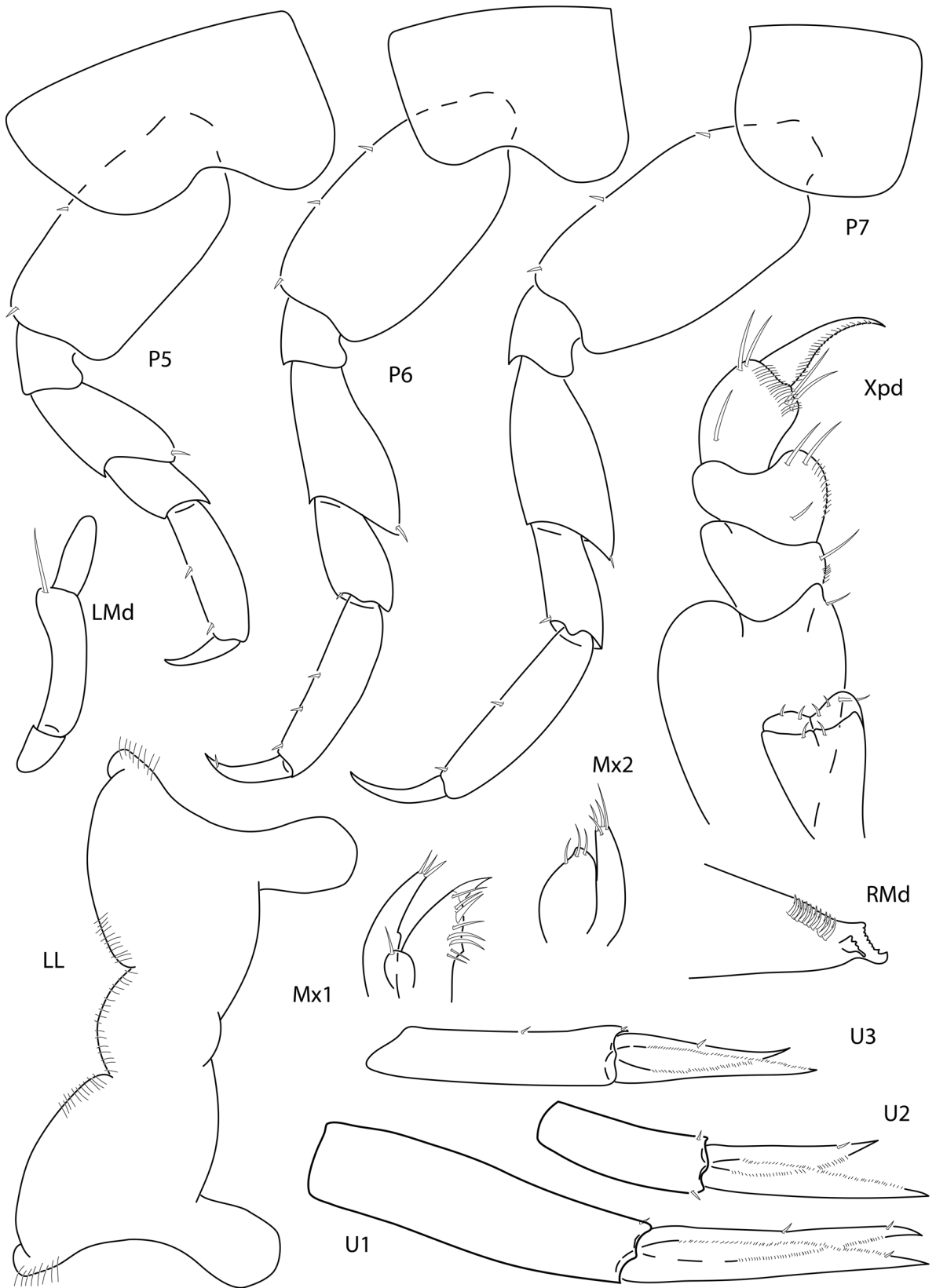


Fig. 2. *Leucothoe acanthopus* Schellenberg, 1928, neotype, ♂, length 3.3 mm (MNHB-21542a).

anterior and posterior margins bare; ischium bare; carpus curved, distal length 7.0 times width, proximal margin smooth; propodus straight, palm smooth with 2 small distal setae; dactylus smooth, talon-like, reaching 0.5 times propodus length. Gnathopod 2 coxa broader than long, subequal to coxa 3, smooth, bare, anterior margin rounded, anterodistally rounded, distal margin rounded, posterior margin slightly excavate; basis straight, anterior and posterior margins bare; carpus 0.4 times propodus length, curved, distally tapered, anterior margin smooth; propodus with 1 mediofacial setal row reaching 0.6 times propodus length, posterior margin smooth, palm convex, smooth; dactylus curved, reaching 0.6 times propodus length, proximal margin smooth, bare, anterior margin distally tapered, acute. Pereopod 3 coxa length 0.9 times width, anterodistal corner overriding distal face of coxa 2, smooth, anterior margin rounded, distal margin rounded, posterior margin slightly excavate. Pereopod 4 coxa smooth, anterior margin tapered, distal margin slightly produced, posterior margin tapered. Pereopods 5–7 bases width-length ratios 1 : 1.9, 1 : 2.0, 1 : 1.9, posterior margins smooth, bare.

PLEON. Epimera 1–3 bare, epimeron 3 posteroventral corner rounded. Uropods 1–3 relative lengths 1.0: 0.6: 0.7. Uropod 1 peduncle length 1.1 times inner ramus length, outer ramus 0.9 times inner ramus length. Uropod 2 peduncle length 0.8 times inner ramus length, outer ramus 0.8 times inner ramus length. Uropod 3 peduncle subequal in length with inner ramus, outer ramus 0.8 times inner ramus length. Uropod 1 inner and outer rami and uropods 2–3 outer ramus with robust setae, uropods 1–3 inner margins of inner and outer rami lined with fine setae. Telson 1.9 times longer than wide, apex tridentate.

Female (sexually dimorphic characters)

Unknown.

Distribution

Red Sea: Suez Canal (Schellenberg 1928; present study), Dahlak Archipelago (Ruffo 1969).

Depth range

Unknown.

Remarks

In the text about the single specimen of 3.8 mm from the Dahlak Archipel off Eritrea, Ruffo (1969) stresses the only difference to the original description is a lanceolate-acuminate telson tip instead of a truncate one, but this is already illustrated in Schellenberg (1928). *Leucothoe acanthopus* shares characters such as the uni-articulate maxilla 1 palp and short gnathopod 1 dactylus with the new generic-level clade documented in White & Reimer (2012). The relationships of these species need further examination to determine if they should be placed in a different genus. The host for this species is unknown.

Leucothoe acutilobata Ledoyer, 1978

Fig. 3A

Leucothoe acutilobata Ledoyer, 1978: 295–97, fig. 36.

Type locality

Mauritius.

Material examined

ISRAEL: 3 specimens, Eilat, stn 108, 4 May 1969, U. Schiecke leg. (MVR).

SUDAN: 2 specimens, Port Sudan, stn 154, Dec. 1970, U. Schiecke leg.; 6 specimens, Massa Sheik Ibrahim near Port Sudan, stn 173, 14 Dec. 1970, U. Schiecke leg.; 6 specimens, same locality and date as previous, stn 175, U. Schiecke leg.; 2 specimens, Massa Arakiyai near Port Sudan, from sponge, 1–3 m, 8 Dec. 1970, U. Schiecke leg.; 11 specimens, same locality and date as previous, U. Schiecke leg. All material deposited at MVR.

Distribution

Red Sea (present study); Western Indian Ocean: Madagascar, Mauritius (Ledoyer 1978).

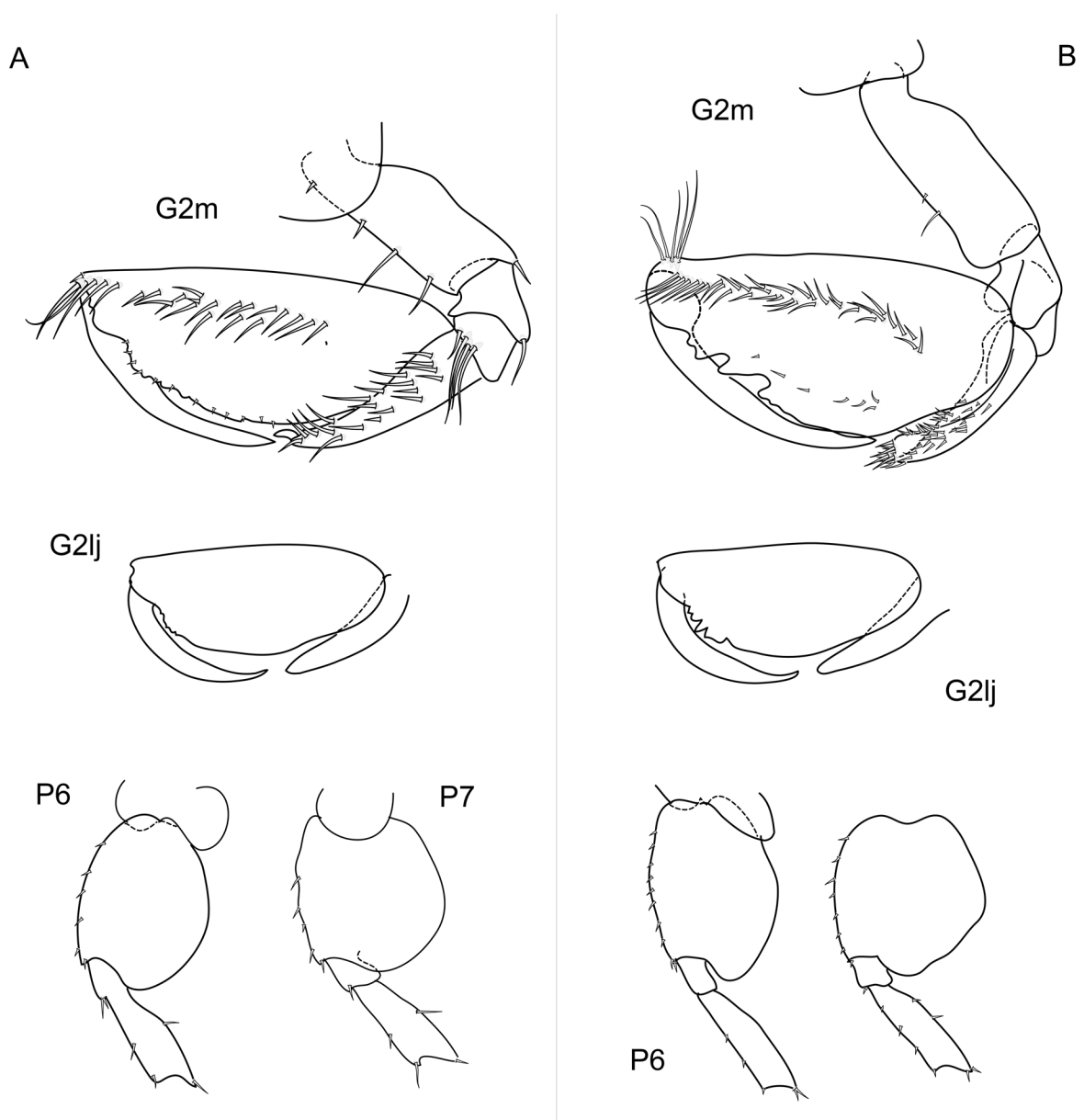


Fig. 3. A. *Leucothoe acutilobata* Ledoyer, 1978, ♀, length 6.0 mm. B. *Leucothoe predenticulata* Ledoyer, 1978, length 4.5 mm.

Remarks

Differences between this species and *L. predenticulata* Ledoyer, 1978 are difficult to determine (see Ledoyer 1978: 300 and this paper), but the posterodistal lobes of the bases of pereopods 5–7 are always clearly lengthened and widened in regular progression, and the inferior half of the posterior margin of pereopod 7 is evenly rounded (vs abrupt corner in the middle in *L. predenticulata*). Young specimens have a gnathopod 2 propodus palm nearly smooth; the serrations become more visible with age, but remain regular (vs irregular in *L. predenticulata*). Mature specimens of this species can reach 5–6 mm, while most of the collected material is 3.5–4.5 mm, similar to *L. predenticulata*.

Ecology

This species has been collected among sponges (present study) and among coral (Ledoyer 1978).

Leucothoe alani sp. nov.

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Leucothoella bannwarthi Myers, 1985: 94, figs 74–75.

?*Leucothoella bannwarthi* – Barnard 1965: 492, fig. 7.

?*Leucothoella banwarthii* [sic] – Myers 2013: 307.

Diagnosis

Coxal plates 2–7 clearly wider than deep, coxae 1 and 2 anterodistally serrate with acute tip, coxa 4 smooth, anterodistal corner with blunt tip. Gnathopod 1 dactylus reaching half the length of propodus. Gnathopod 2 propodus palm regularly scalloped with 2–3 distal humps. Uropod 3 ratio of inner to outer rami 2 : 1, inner ramus equal to length of peduncle. Telson relatively short and broad, distally rounded.

Etymology

With gratitude, reminding our friendship with Alan Myers; especially long-lasting with the second author.

Type material

Holotype

FIJI: ♂, Viti Levu, Nasese, 18°10' S, 178° 27' E, shoreward margin of inner moat, 7 Aug. 1979 (AM P35299).

Additional material

Deposited in Alan Myers' own collection.

Description

LENGTH. 2.2–2.5 mm.

HEAD. Antennae 1 and 2 about half length of body. Antenna 1 flagellum less than half length of peduncle, 6-articulate, accessory flagellum 1-articulate. Antenna 2 flagellum less than length of peduncle, 5-articulate.

PEREON. Coxa 1 anterior margin serrate, anterodistal corner acute, deeper than wide. Gnathopod 1 carpus proximally rounded, process elongate and slender, distally curved; propodus length 5 times width; dactylus about half length of propodus. Gnathopod 2 coxa almost twice as wide as deep, anterior margin

serrate, anterodistal corner with acute lengthened tooth; carpus elongate, with distal strong spine; propodus length greater than 2 times width, palm oblique, regularly scalloped distally with 2–3 humps; dactylus fitting palm which is longer than half propodus length. Coxa 4 anterodistal margin produced, corner blunt.

PLEON. Epimera 1–3 posterodistally rounded. Uropods 1–3 relative lengths 1.0: 0.6: 0.9. Uropod 1 peduncle subequal in length with inner ramus, outer ramus 0.9 times inner ramus length. Uropod 2 peduncle 0.4 times inner ramus length, outer ramus 0.7 times inner ramus length. Uropod 3 peduncle subequal in length with inner ramus, outer ramus 0.6 times inner ramus length. All uropods bare. Telson length-width ratio 3 : 2, distally rounded.

Ecology

Collected among *Halimeda*, sponges, including *Melophlus sarasinorum* Thiele and coral rubble.

Distribution

Fiji (Myers 1985); Micronesia: Ifaluk Atoll (Barnard 1965); Palau (Myers 2013).

Remarks

As we generally do not believe in a widespread distribution of leucothoid species, it was tempting to check carefully the admitted morphological similarity to the type material of *L. bannwarthi* from the Suez Channel. The species here described is clearly smaller in size and mainly presents differences in the structure of the urosome: the telson is short and rounded, and uropod 3 rami are very different in length (the inner about twice the length of the outer).

Leucothoe bannwarthi (Schellenberg, 1928)

Figs 4–5

Leucothoella bannwarthi Schellenberg, 1928: 638–640, fig. 199.

Leucothoella bannwarthi – Monod 1937: 13, fig. 8. — Barnard 1937: 153. — Schellenberg 1938: 26. — Ruffo 1969: 11–12. — Ledoyer 1967: 127, fig. 5A; 1972: 250; 1978: 300; 1979a: 107, fig. 68/1; 1986: 680, fig. 262.

non Leucothoella bannwarthi – Barnard 1965: 492, fig. 7. — Olerød 1970: 370. — Myers 1985: 4, figs 4–75. — Ortiz & Lalana 1997: 108.

non Leucothoella banwarthii [sic] – Myers 2013: 307.

Type material

Type material collected by Schellenberg and deposited at the Berlin Museum, MNHB-19936 (examined).

Type locality

Suez Channel, Red Sea.

Additional material examined

SUDAN: 19 specimens, Port Sudan, stn 160, Dec. 1970, U. Schiecke leg.; 19 specimens, Port Sudan, stn 168, Dec. 1970, U. Schiecke leg. (slide MVRCr 7726); 1 ♂, 3 mm, Port Sudan, stn 188, Dec. 1970, U. Schiecke leg. (slide MVRCr 7731); 54 specimens, same data as previous; 1 ♀ (ovigerous), 3 mm, near Port Sudan, Marsa Arakiyai, stn 195, 1–3 m, sponge, 12 Aug. 1970, U. Schiecke leg. (slide MVRCr 7725); 1 ♂, 3 mm, same data as previous (slide MVRCr 7728); 42 specimens, same data as previous.

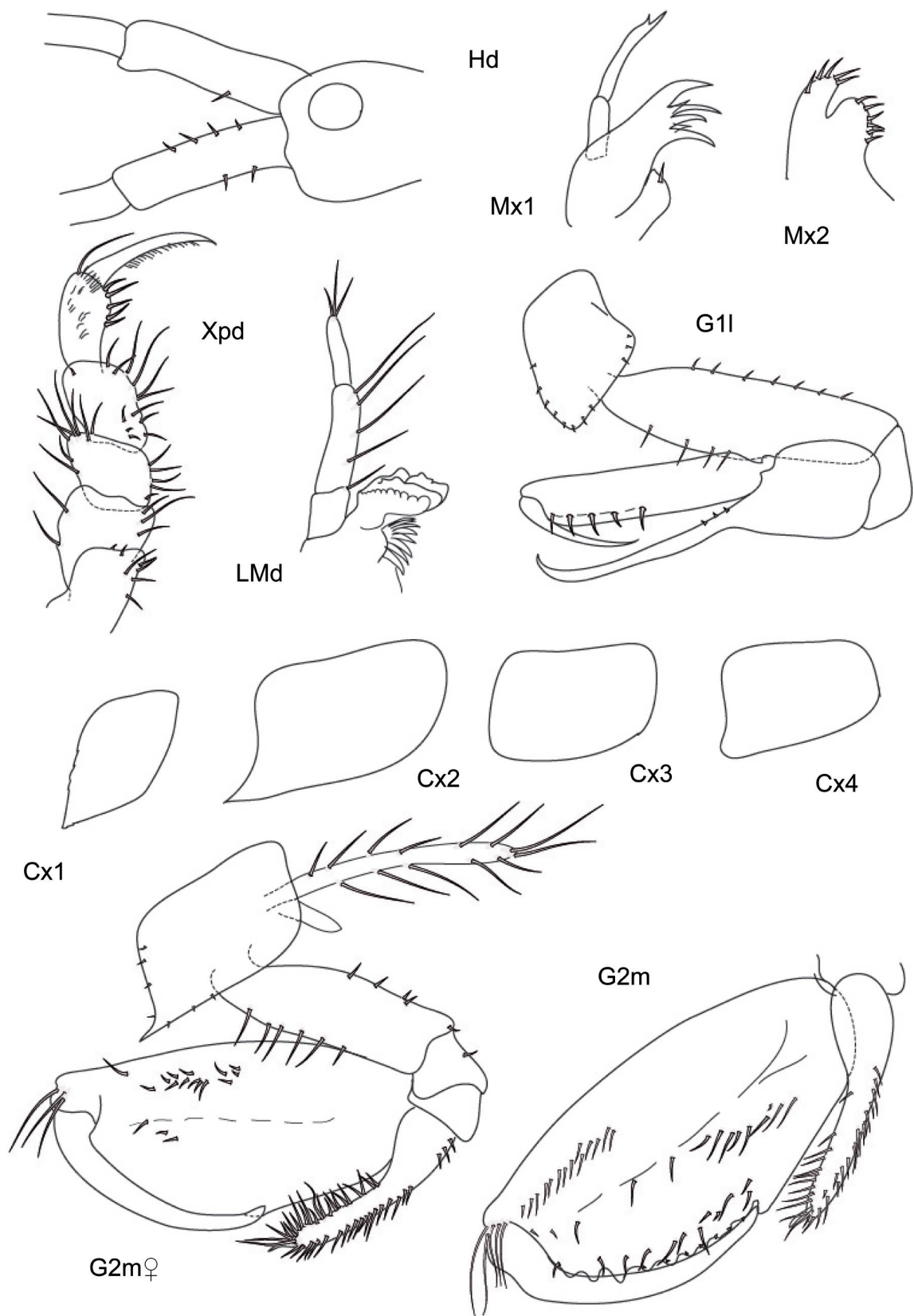


Fig. 4. *Leucothoe bannwarthi* (Schellenberg, 1928), ♂, length 3.0 mm (MCRCr 7726); ♀, length 3.0 mm (MVRCr 7725).

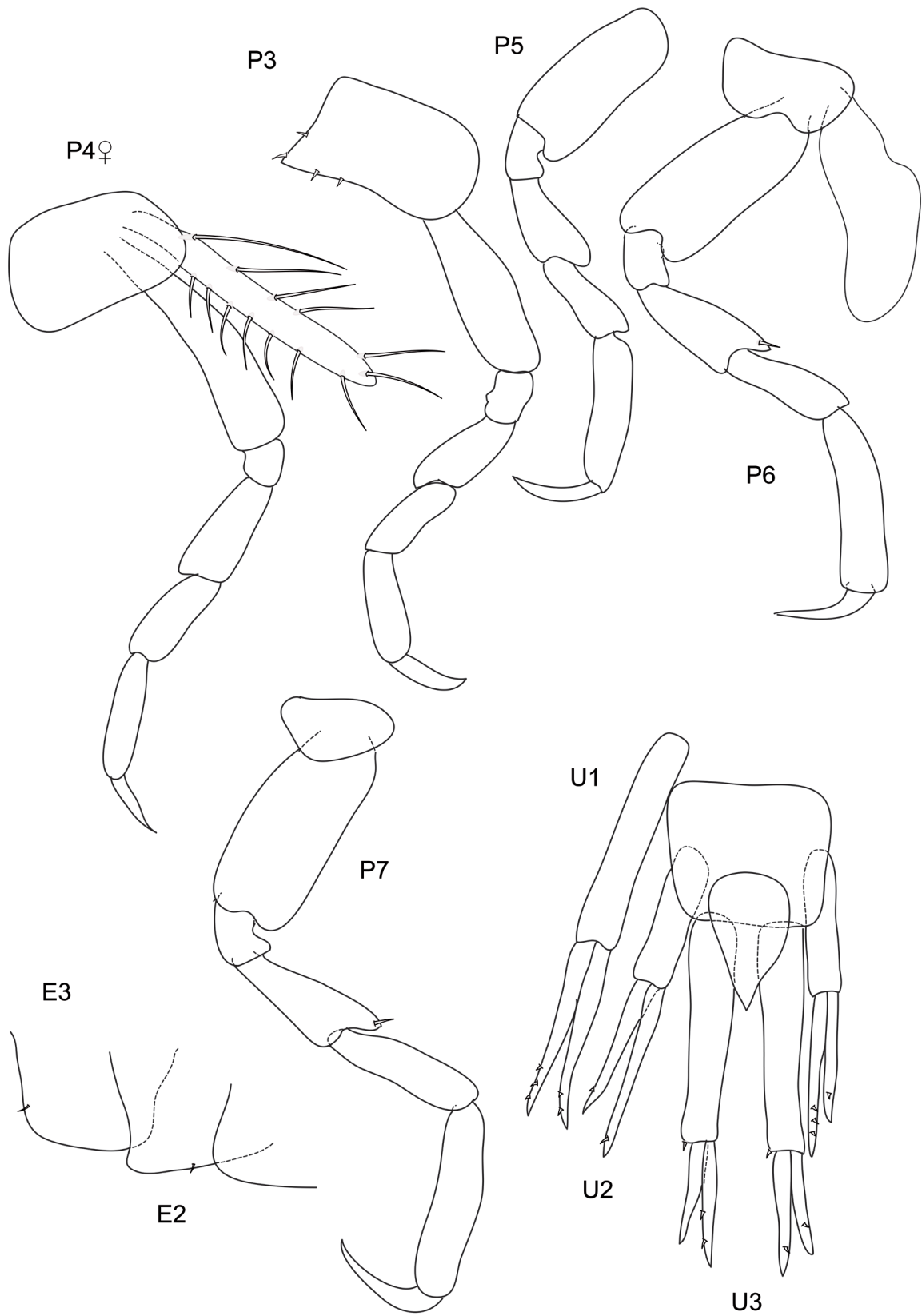


Fig. 5. *Leucothoe bannwarthi* (Schellenberg, 1928), ♂, length 3.0 mm (MRCr 7726); ♀, length 3.0 mm (MVRCr 7725).

Diagnosis (male)

Head anterior margin rounded. Coxa 1 trapezium-shaped, antero-distal corner acute, rounded in larger ones (due to abrasion?). Gnathopod 1 carpus curved; dactylus reaching 0.5 times propodus length. Gnathopod 2 carpus reaching 0.4 times propodus length; propodus palm scalloped. Pereopods 5–7 bases rectilinear, posterodistal corner lengthened but not widened. Telson distally acute.

Redescription

LENGTH. 3–3.3 mm.

HEAD. Anterior margin rounded, anterodistal margin evenly rounded, distal margin straight; eyes present with more than 10 ommatidia, round. Antenna 1 about half body length, flagellum 8-articulate, peduncle article 1 width less than 2 times article 2, accessory flagellum 1-articulate. Antenna 2 subequal in length with antenna 1, flagellum 8-articulate. Mandibular palp ratio of articles 1–3 1.0:2.4:1.5, article 2 with marginal setae, article 3 with distal setae. Maxilla 1 palp 2-articulate. Maxilla 2 inner and outer plates each with several short distal setae. Maxilliped inner plates distal margin rounded, with several small setae; outer plate inner margin smooth, reaching 0.1 times palp article 1, with marginal seta; palp article 4 length 1.3 times article 3 length.

PEREON. Coxae 1–4 relative widths 1.0:2.1:1.6:1.5. Gnathopod 1 coxa deeper than wide, smooth or weakly serrate, beset with many short setae on anterior and inferior margin, anterodistal margin pointed in young specimens, rounded in larger ones (due to abrasion?), distal margin straight, posterior margin excavate; basis slightly inflated, anterior and posterior margins with short setae; ischium bare; carpus curved, distal length 16 times width; propodus straight, palm smooth with small subdistal setae; dactylus smooth, reaching 0.5 times propodus length. Gnathopod 2 coxa wider than deep, smooth, beset with short setae, anterior margin concave, anterodistally acutely lengthened with long and thin tooth, distal margin straight, posterior margin not excavate; basis straight, anterior margin with six medium setae, posterior margin with 4 short setae; carpus 0.4 times propodus length, curved, distally tapering, densely setose, with strong distal spine; propodus with primary mediofacial setal row reaching 0.5 times propodus length, secondary mediofacial setal row parallel to anterior margin with three setae, scalloped; dactylus curved, reaching 0.6 times propodus length, smooth, bare, distally tapered. Pereopod 3 coxa rectangular, much wider than deep, smooth, anterior margin rounded, distal margin rounded, posterior margin not excavate. Pereopod 4 coxa anterior margin slightly protruding, anterodistal corner blunt, inferior margin straight. Pereopods 5–7 coxae shallow. Pereopods 5–7 bases width-length ratios 1:2.9, 1:2.5, 1:2.3, rectilinear, posterior margins smooth, bare, posterodistal corner rounded, lengthened, but not widened.

PLEON. Epimeron 1 bare, epimera 2–3 each with one seta, epimeron 3 posteroventral corner rounded. Uropods 1–3 relative lengths 1.0:0.9:1.1. Uropod 1 peduncle 1.2 times inner and outer rami lengths, rami subequal in length. Uropod 2 peduncle and outer ramus 0.8 times inner ramus length. Uropod 3 peduncle 1.7 times inner ramus length, outer ramus 0.8 times inner ramus length. All uropods beset with short spines. Telson 1.8 times longer than wide, apex acute.

Female (sexually dimorphic characters)

Gnathopod 2 propodus palm smooth.

Remarks

In the original description of material from the Suez Channel, Schellenberg (1928) reports a male of 4 mm and a female of 3.6 mm. Coxa 1 is described as anteriorly and inferiorly serrate, clearly very acuminate and obviously broader than deep.

Ruffo (1969: 11–12) writes about five specimens from Museri, off Eritrea: “I compared these animals with Schellenberg 1928, Monod 1937 and J.L. Barnard 1965 and find large correspondence besides the coxa 1, which is much more rounded.”

Ledoyer (1979: fig. 68/1) shows the coxa 1 of a specimen from Madagascar with an acute anterior corner of about 60 degrees (no indication of length), while in 1986 (fig. 262) he describes other material from Madagascar, among which a male of 4 mm shows coxa 1 is similar to ours in the length to width ratio, but also definitely with an acute antero-distal corner, and slightly serrate.

In 1972, Ledoyer describes *Leucothoe angusticoxa* with an anteriorly pointed coxa 2 and a rounded coxa 1, where the gnathopods would also match quite well with the material here studied. However, pereopods 5–7 bases are in *L. angusticoxa* much wider and rounded, with telson longer in relation to width and not distally pointed, and uropod 3 rami longer in relation to the peduncle.

Our material is mainly with an anteriorly rounded coxa 1; only in station 188 did we find two smaller specimens with an acute corner. For the moment we assume that these two forms are probably not two different species, and ascribe both to *L. bannwarthi*.

From outside this region, J.L. Barnard (1965) illustrated material from Micronesia with a male of 2.5 mm where coxa 1 is deeper than wide, serrate anteriorly and inferiorly.

Myers (1985) also described much smaller specimens from Fiji (male of 2.1 mm), with the telson much shorter and rounded, uropod 3 outer ramus 2 times inner ramus length, and coxa 2 anterior margin serrate.

Thus we think that the material from the Red Sea and Madagascar may both deal with Schellenberg’s *Leucothoe bannwarthi* where coxa 1 anterodistal corner is acute but can be smoothed by abrasion, whereas the specimens from the South Pacific (Fiji and Micronesia) are a separate smaller species deserving another name (see *L. alani* sp. nov. above).

Ecology

This species was collected among sponges and coral rubble.

Distribution

Red Sea: Suez Canal (Schellenberg 1928; Monod 1937; K.H. Barnard 1937); Museri Island off Eritrea (Ruffo 1969); Port Sudan (present study).

Leucothoe minoculis sp. nov.

[urn:lsid:zoobank.org:act:3276B9C4-ECF6-4DB2-895F-938FAED8647D](https://doi.org/10.3896/BI.2019.3276B9C4-ECF6-4DB2-895F-938FAED8647D)

Figs 6–7

Diagnosis

Head anterior margin oblique, produced, distal margin excavate with acute projection. Eyes round, rather small. Accessory flagellum present, 2-articulate. Maxilla 1 palp 1-articulate. Gnathopod 1 coxa longer than wide; carpus curved, very thin; propodus proximally not inflated, rectangular; dactylus reaching 0.3 times propodus length. Gnathopod 2 basis rectangular; carpus distally rounded, serrate, with one strong apical spine; propodus palm partially concave with many small tubercles distally. Pereopods 5–7 bases narrowly expanded; meri and carpi posteriorly lengthened and moderately widened.

Etymology

Stressing the fact that this species has smaller eyes than the other ones; '*minoculis*' (composed from Latin '*minor*' = less and '*oculi*' = eyes), used as an adjective.

Type material

Holotype

ISRAEL: ♂, 5 mm, Red Sea, Eilat, stn 65, Apr.–May 1969, U. Schiecke leg. (ZMB 29752).

Paratype

ISRAEL: ♀, 3.5 mm, same data as holotype (slide MVRCr 7729).

Additional material examined

ISRAEL: 1 ♂, 3.5 mm, same data as holotype (slide MVRCr 7730); 2 specimens in alcohol, same data as holotype (MVRCr).

Description

Male

LENGTH. 5 mm.

HEAD. Anterior margin medially acute, anterodistally oblique, inferiorly straight; eyes rather small, round. Antenna 1 length 0.5 times body length, flagellum 6-articulate, peduncle article 1 width subequal to article 2, accessory flagellum present, 2-articulate. Antenna 2 length 0.4 times body length, shorter in length than antenna 1, flagellum 6-articulate. Mandibular palp ratio of articles 1–3 1.0:2.2:1.6, article 2 with several marginal and distal setae, article 3 with 1 distal seta, incisors weakly dentate; left mandible with 5 raker spines, lacinia mobilis large, weakly toothed. Maxilla 1 palp 1-articulate, articulation not well visible, with distal slender setae; outer plate with 5 distal robust setae and additional slender setae. Maxilla 2 inner plate with marginal and distal slender setae, outer plate with distal slender setae. Maxilliped inner plates distal margin rounded, with short simple robust setae; outer plate inner margin smooth, reaching 0.3 times palp article 1; palp article 4 subequal in length with article 3, distally acute.

PEREON. Coxae 1–4 relative widths 1.0:1.1:1.0:1.3. Gnathopod 1 coxa smooth, anterodistal margin produced, rounded, distal margin rounded, posterior margin curved; basis distally not expanded, anterior margin with 2 short setae, posterior margin bare; ischium bare; carpus curved, distal length 30 times width, distally very narrow, anterior margin with small short setae; propodus straight, palm smooth with short setae; dactylus smooth, reaching 0.3 times propodus length. Gnathopod 2 coxa subquadrate, wider than coxa 3, smooth, margins straight; basis not expanded, stout, anterior margin with 13 medium setae, posterior margin bare; ischium bare; carpus 0.5 times propodus length, curved, setose, distally rounded, serrate; propodus primary mediofacial setal row reaching 0.8 times propodus length, secondary mediofacial setal row with three setae, anterior margin gently curved, smooth, palm with many small tubercles; palmar corner clearly defined as prominent hump, remaining posterior margin straight; dactylus curved, proximal margin smooth, bare, anterior margin distally acute, reaching 0.6 times propodus length. Pereopod 3 coxa smooth, anterior margin rounded, distal margin slightly rounded, posterior margin straight. Pereopod 4 coxa trapezium-shaped, smooth, antero-distally produced, anterior margin straight, longer than straight posterior one, distal margin scarcely rounded. Pereopods 5–7 bases width-length ratios 1:1.9, 1:1.9, 1:1.7, posterior margins smooth and bare; Pereopods 5–6 bases with anterior and posterior margin nearly parallel, pereopod 7 basis longer and wider than the ones of pereopods 5 and 6, posteriorly moderately rounded.

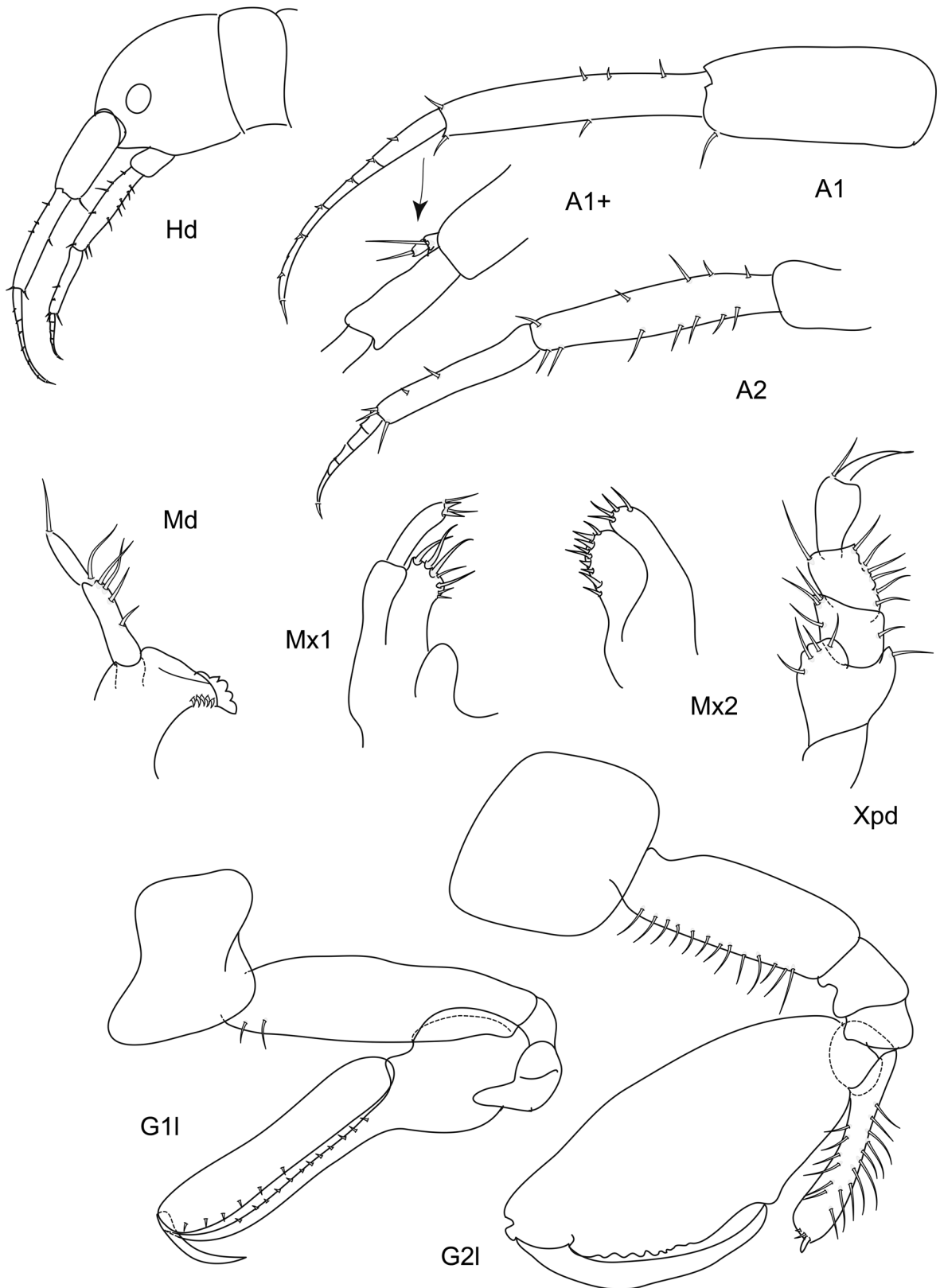


Fig. 6. *Leucothoe minoculis* sp. nov., holotype, ♂, length 5.0 mm (MVRCr 7729).

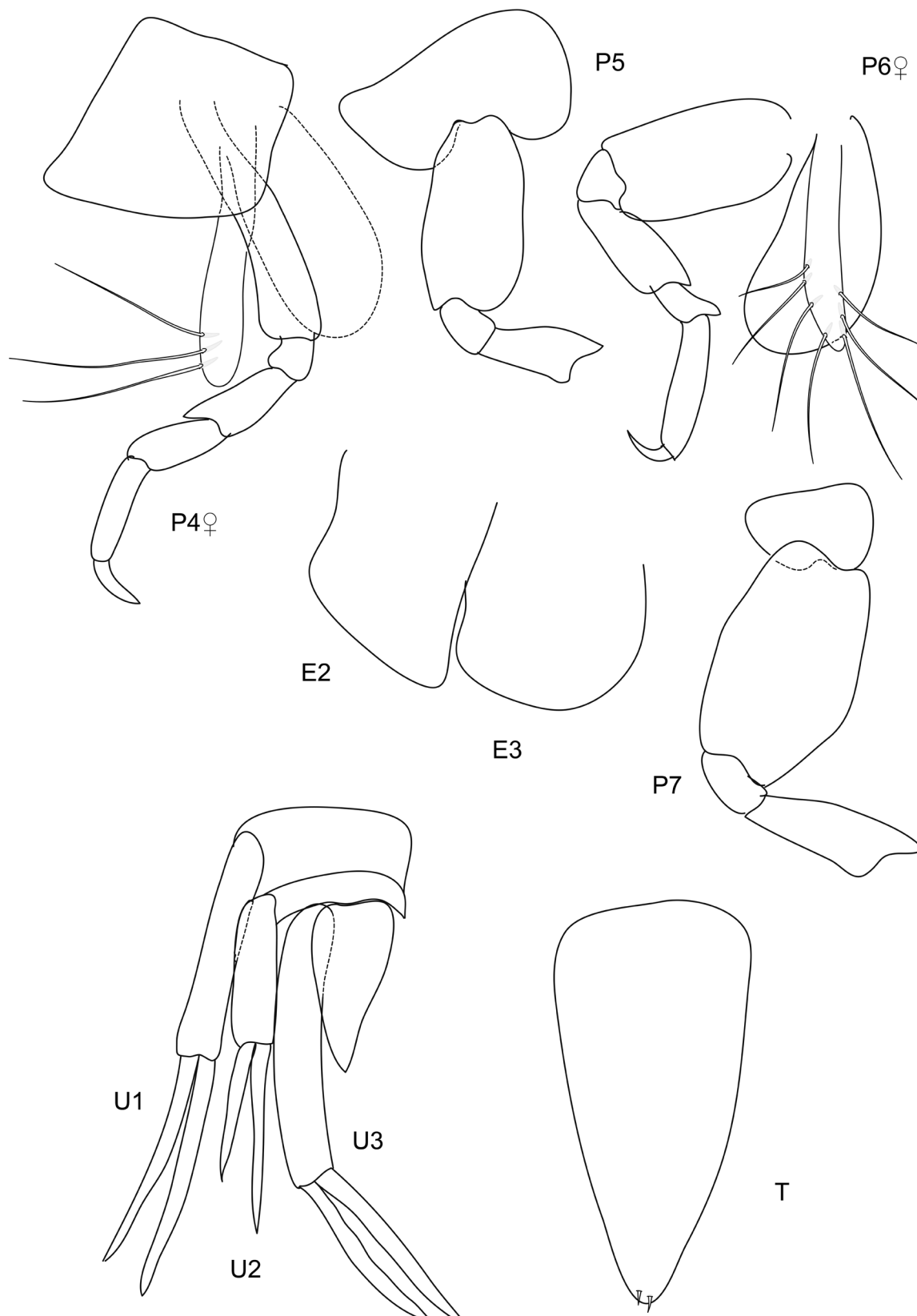


Fig. 7. *Leucothoe minoculis* sp. nov., holotype, ♂, 5.0 mm (MVRCr 7729); paratype, ♀, 3.5 mm (MVRCr-7729).

PLEON. Epimera 1–3 bare, epimeron 3 posteroventral corner rounded. Uropods 1–3 relative lengths 1.0:0.7:1.0. Uropod 1 peduncle subequal in length with rami, outer ramus 0.9 times inner ramus length. Uropod 2 peduncle subequal in length with outer ramus, inner ramus about 1.4 times outer ramus length. Uropod 3 peduncle 1.2 times inner ramus length, outer ramus 0.9 times inner ramus length. Uropods 1–3 inner and outer rami bare. Telson 1.8 times longer than wide, apex rounded, beset with two short setae.

Female (sexually dimorphic characters)

Similar in all aspects to male.

Depth range

Unknown.

Remarks

Leucothoe minoculis sp. nov. resembles *L. reimeri* sp. nov. in the shape of the head and the narrowly expanded bases on pereopods 5–7. It differs in having a very small eye, and in the shapes of the coxae. This species is unique in having a 2-articulate accessory flagellum, not documented in any other known species of *Leucothoe*.

Distribution

Red Sea (present study).

Leucothoe pansa sp. nov.

[urn:lsid:zoobank.org:act:EA53097A-C5E3-4B72-B3F8-E07C59D917B4](https://doi.org/10.21203/rs.3.rs-10000000/v1)

Figs 8–9

Diagnosis

Head anterior margin oblique, produced, distal margin excavate with rounded projection. Maxilla 1 palp 1-articulate. Gnathopod 1 coxa broader than long; carpus curved; propodus proximally inflated; dactylus reaching 0.3 times propodus length. Gnathopod 2 basis distally expanded, stout; carpus distally tapered, pointed; propodus palm concave with 2 small tubercles. Pereopods 5–7 bases narrowly expanded; meri and carpi posteriorly expanded.

Etymology

After the Latin ‘*pansus*’, meaning ‘stretch, spread, expand’ and referring to the distinctly expanded meri of pereopods 5–7, used as adjective.

Type material

Holotype

SUDAN: ♂, 3.4 mm, Port Sudan, Marsa Arakiyai, stn 195, 1–3 m, sponge, 12 Aug. 1970, U. Schiecke leg. (ZMB 29748, slide 5094).

Paratype

SUDAN: ♀, 3.2 mm, same data as holotype (ZMB 29749, slide 5095).

Additional material examined

SUDAN: 1 ♂, 3 mm, Port Sudan, Dec. 1970. U. Schiecke leg.

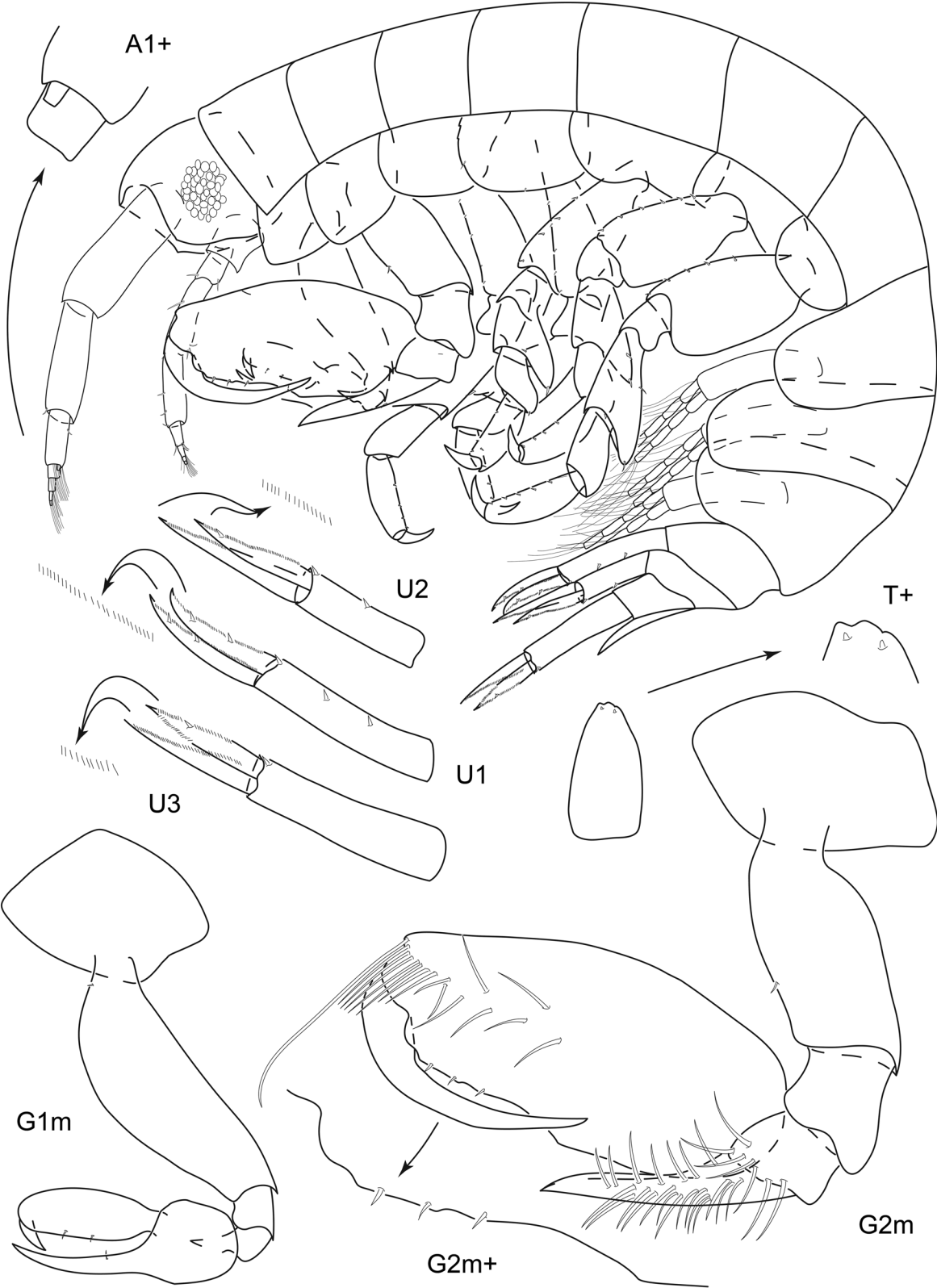


Fig. 8. *Leucothoe pansa* sp. nov, holotype, ♂, length 3.4 mm (ZMB 29748, slide 5094).

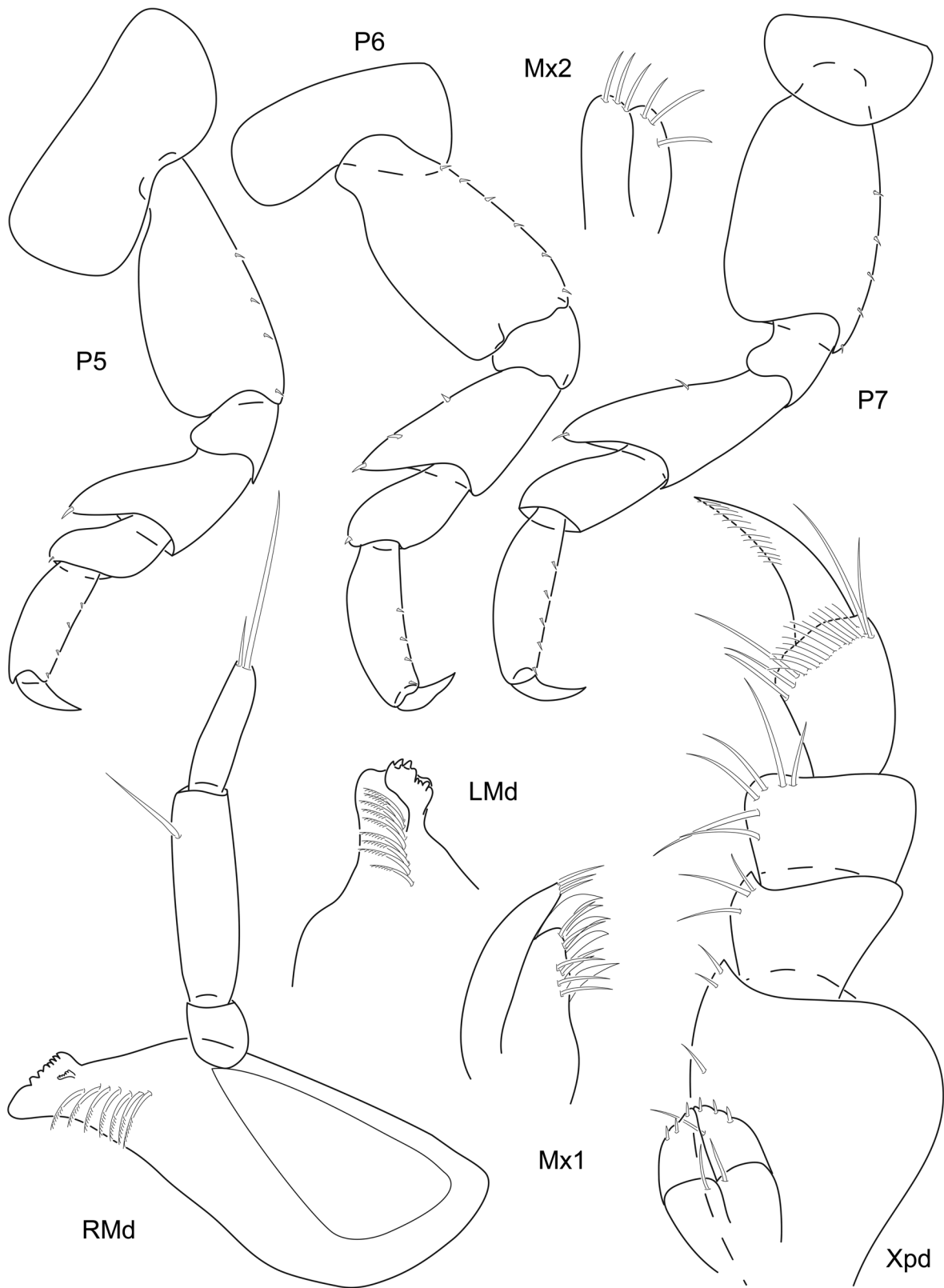


Fig. 9. *Leucothoe pansa* sp. nov., holotype, ♂, length 3.4 mm (ZMB 29748, slide 5094).

Description

Male

LENGTH. 3.4 mm.

HEAD. Anterior margin oblique, anterodistal margin subquadrate, distal margin straight; ventral cephalic keel anterior margin excavate; anteroventral margin quadrate, ventral margin produced; eyes present with many ommatidia, round. Antenna 1 0.2 times body length, flagellum 3-articulate, peduncle article 1 width less than 2 times article 2, accessory flagellum present, 1-articulate. Antenna 2 length 0.18 times body length, shorter in length than antenna 1, flagellum 3-articulate. Mandibular palp ratio of articles 1–3 1.0:2.2:1.3, article 2 with 1 distal seta, article 3 with two distal setae, incisors weakly dentate; left mandible with 8 raker spines, lacinia mobilis large, strongly toothed; right mandible with 7 raker spines, lacinia mobilis very small, weakly toothed. Upper lip asymmetrically lobate, anterior margin weakly setose. Lower lip inner lobes fused, setose; outer lobes with moderate gape, anterior margins setose. Maxilla 1 palp 1-articulate, with 3 distal slender setae; outer plate with 4 distal robust setae and 7 distal slender setae. Maxilla 2 inner and outer plates each with 3 distal slender setae. Maxilliped inner plates distal margin rounded with v-shaped indentation, with short and long simple setae; outer plate inner margin smooth, reaching 0.2 times palp article 1, with simple marginal setae; palp article 4 subequal in length with article 3, distally acute.

PEREON. Coxae 1–4 relative widths 1.0:1.0:1.1:1.3. Gnathopod 1 coxa smooth, bare, anterodistal margin produced, subquadrate, distal margin straight, posterior margin slightly excavate; basis proximally expanded, anterior and posterior margins bare; ischium bare; carpus curved, distal length 8.5 times width, proximal margin smooth; propodus proximally inflated, palm smooth with 2 distal setae; dactylus smooth, reaching 0.3 times propodus length. Gnathopod 2 coxa broader than long, subequal in size with coxa 3, smooth, bare, anterior margin straight, anterodistally rounded, distal margin straight, posterior margin straight; basis distally expanded, stout, anterior margin with 1 seta, posterior margin bare; carpus 4.8 times propodus length, curved, distally tapered, pointed, anterior margin smooth; propodus with 1 mediofacial setal row at midline, reaching 0.5 times propodus length, posterior margin smooth, palm concave with 2 minor tubercles; dactylus curved, proximal margin smooth, bare, anterior margin distally acute, reaching 0.5 times propodus length. Pereopod 3 coxa length 0.7 times width, anterodistal corner overriding distal face of coxa 2, smooth, anterior margin rounded, distal margin slightly rounded, posterior margin slightly excavate. Pereopod 4 coxa anterior margin rounded, serrate, distal margin rounded, posterior margin straight. Pereopods 5–7 bases width-length ratios 1:1.9, 1:1.9, 1:1.4, posterior margins smooth, bare; meri and carpi posteriorly expanded.

PLEON. Epimera 1–3 bare, epimeron 3 posteroventral corner rounded. Uropods 1–3 relative lengths 1.0:0.9:1.0. Uropod 1 peduncle 0.7 times inner ramus length, outer ramus subequal in length with inner ramus. Uropod 2 peduncle and outer ramus 0.8 times inner ramus length. Uropod 3 peduncle 1.3 times inner ramus length, outer ramus 0.9 times inner ramus length. Uropod 1 inner ramus with robust setae, uropods 1–3 outer rami with robust seta(e). Uropods 1–3 inner and outer rami lined with fine setae. Telson 1.8 times longer than wide, apex weakly tridentate.

Female (sexually dimorphic characters)

Similar in all aspects to male.

Remarks

Leucothoe pansa sp. nov. shares the characters mentioned for *L. acanthopus* such as the uni-articulate maxilla 1 palp and short gnathopod 1 dactylus with the sub-species level clade documented in White & Reimer (2012) as well as the inflated gnathopod 1 propodus. This species is also similar to *L. acanthopus* in having pereopods 5–7 bases narrowly expanded and a smooth gnathopod 2 propodus

palm. The gnathopod 2 propodus differs from that of *L. acanthopus* in having a concave palm. The host for this species is an unidentified sponge species (Porifera).

Distribution

Red Sea (present study).

Depth range

1–3 m.

Leucothoe predenticulata Ledoyer, 1978

Fig. 3B

Leucothoe predenticulata Ledoyer, 1978: 299–300, fig. 37.

Leucothoe predenticulata – Ledoyer 1986: 670–672, figs 246, 257.

Type locality

Mauritius.

Material examined

ISRAEL: 2 specimens, Eilat S-Reef, stn 14, 1–4 m, with corals, 5 Feb. 1969, U. Schiecke leg.; 2 specimens, Eilat, stn 15, middle-fine to fine sand, Apr.–May 1969, U. Schiecke leg.; 4 specimens, Eilat, stn 51, U. Schiecke leg.

SUDAN: 1 specimen, 4.5 mm, Port Sudan, stn 60, Dec. 1970, U. Schiecke; 1 juv., Port Sudan, stn 66, Dec. 1970, U. Schiecke leg.; 3 specimens, Port Sudan, stn 70, Dec. 1970, U. Schiecke leg.; 2 specimens, Port Sudan, stn 160, Dec. 1970, U. Schiecke leg.; 7 specimens, Port Sudan, Marsa Arakiyai, st 162, Dec. 1970, U. Schiecke leg.; 2 specimens, Port Sudan, Marsa Arakiyai, stn 166, Dec. 1970, U. Schiecke leg.; 11 juvs, Port Sudan, Marsa Arakiyai, stn 168, Dec. 1970, U. Schiecke leg.; 11 specimens, Port Sudan, Marsa Arakiyai, stn 180, Dec. 1970, U. Schiecke leg.; 7 specimens, Port Sudan, Marsa Arakiyai, stn 94, sponge, Dec. 1970, U. Schiecke leg.; 1 specimen, Port Sudan, Flamingo Bay, stn 196, reef and epiphytes, 12 Nov. 1970, U. Schiecke leg.; 2 specimens, same locality and date as previous, stn 198, reef and epiphytes, U. Schiecke leg.; 3 specimens, same locality and date as previous, stn 204, reef and epiphytes, U. Schiecke leg.

Remarks

Differences between this species and *L. acutilobata* Ledoyer, 1978 are not readily apparent (see Ledoyer 1978: 300 and this paper), but the posterodistal lobes of the bases of pereopods 5–7 are also scarcely lengthened in young specimens, the posterior margin of pereopod 7 is always with the inferior half straight or somewhat concave, ending with a clear-cut corner at about the middle of the posterior margin and the widest point of the basis (vs regularly rounded in *L. acutilobata*). In young specimens gnathopod 2 propodus palm is irregularly serrate, and incisions become deeper and wider with age (vs smooth in young specimens and regularly shallowly serrate in adult). This species has been collected among coral (Ledoyer 1978).

Distribution

Red Sea (present study); Western Indian Ocean: Madagascar, Mauritius (Ledoyer 1978, 1986).

Leucothoe reimeri sp. nov.

urn:lsid:zoobank.org:act:469B3C52-F3F3-439F-B52C-D7C185CEC896

Figs 10–11

Diagnosis

Head unusually small, anterior margin rounded. Right mandible lacinia mobilis with two layers. Eyes large, round. Gnathopod 1 basis distally expanded; carpus and propodus curved. Gnathopod 2 basis proximally expanded, stout; carpus reaching 0.2 times propodus length; propodus palm concave, smooth, with dense row of submarginal spine-setae. Coxae short. Pereopods 5–7 bases narrowly expanded, pereopods 6–7 bases posterior margins serrate. Telson apex rounded.

Etymology

Named for James Davis Reimer, the collector. Jamie has provided tremendous support for leucothoid amphipod research over the past several years, always willing to share knowledge and resources, eh.

Type material

Holotype

RED SEA: ♂, 5.9 mm, Jazirat Burcan, Shi'b Pelam, 27°49.003' N, 35°06.397' E, 29.8 m, inside sponge, 29 Sep. 2013, J.D. Reimer leg. (ZMB 29750, slide 5096, RS93).

Paratype

RED SEA: ♀, 5.5 mm, same station data (ZMB 29751, slide 5097).

Additional material examined

RED SEA: 2 ♂♂, 6 mm, 3 juvs, 2–4 mm, same station data (K.N. White pers. coll.).

Description

Male

LENGTH. 5.9 mm.

HEAD. Small; anterior margin rounded, anterodistal margin rounded, distal margin straight; ventral cephalic keel anterior produced with cusp; anteroventral margin rounded, ventral margin tapered; eyes large, round. Antenna 1 length 0.2 times body length, flagellum 6-articulate, peduncle article 1 width less than 2 times article 2, accessory flagellum present, 1-articulate. Antenna 2 length 0.2 times body length, subequal in length with antenna 1, flagellum 4-articulate. Mandibular palp ratio of articles 1–3 1.0: 3.4: 2.1, article 2 with 2 distal setae, article 3 with 2 distal setae, incisors weakly dentate; left mandible with 14 raker spines, lacinia mobilis large, weakly toothed; right mandible with 14 raker spines, lacinia mobilis small, weakly toothed, with two layers. Upper lip asymmetrically lobate, anterior margin weakly setose. Lower lip inner lobes fused, setose; outer lobes with large gape, anterior margins setose. Maxilla 1 palp 2-articulate, with 3 distal slender setae; outer plate with 5 distal robust setae and 4 slender setae. Maxilla 2 inner plate with 4 distal slender setae outer plate with 7 distal slender setae and several marginal fine setae. Maxilliped inner plates distal margin rounded with v-shaped indentation, with short simple robust setae; outer plate inner margin smooth, reaching 0.4 times palp article 1, with simple marginal setae; palp article 4 subequal in length with article 3, distally acute.

PEREON. Coxae 1–4 relative widths 1.0: 1.4: 1.5: 1.3. Gnathopod 1 coxa smooth, anterodistal margin produced, rounded, distal margin rounded, posterior margin straight; basis distally expanded, anterior margin with 4 short setae, posterior margin bare; ischium bare; carpus curved, distal length 14.1 times width, proximal margin with two rows of dentition; propodus curved, palm dentate with 8 proximal

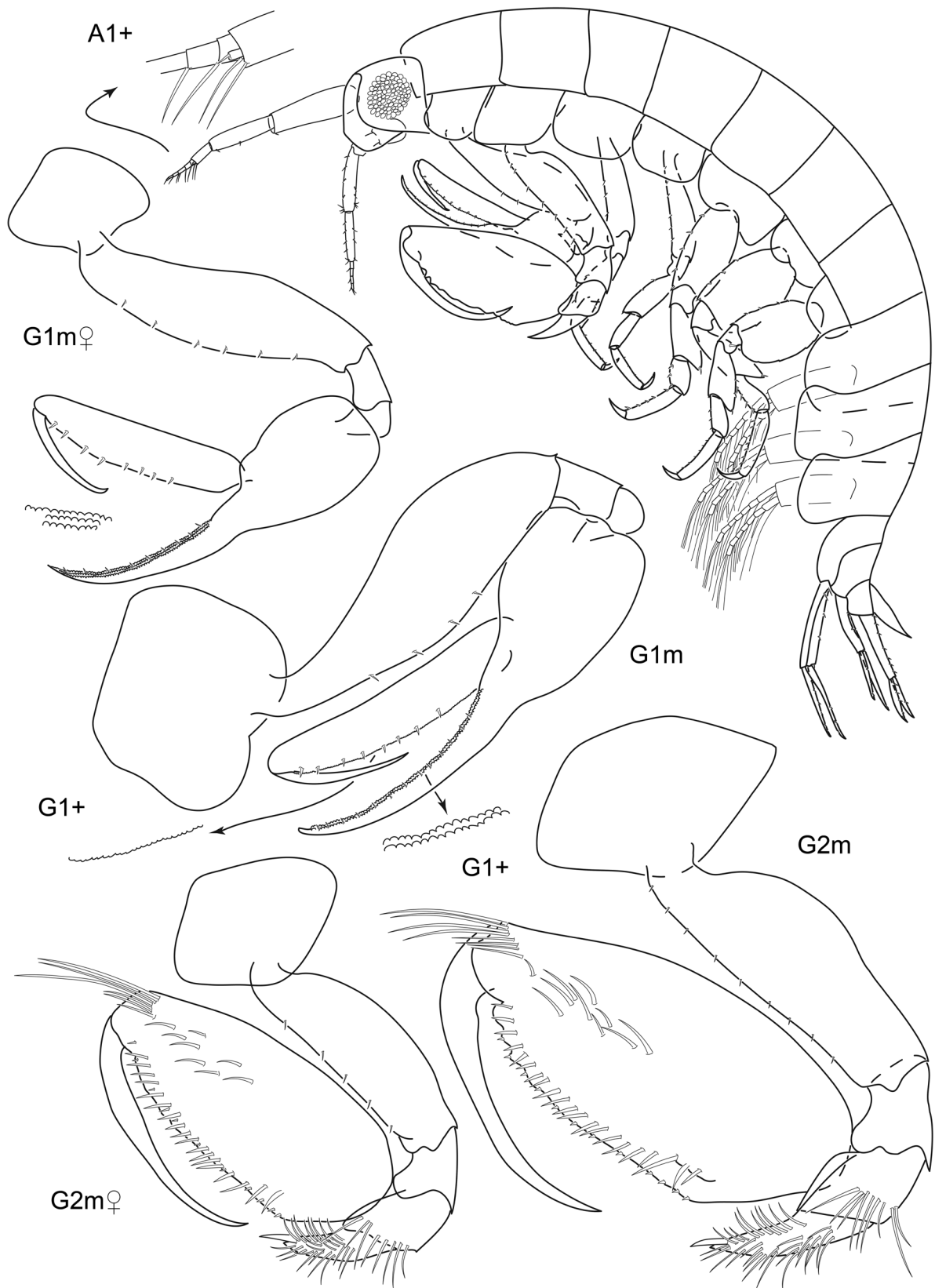


Fig. 10. *Leucothoe reimeri* sp. nov., holotype, ♂, length 5.9 mm (ZMB 29750, slide 5096); paratype, ♀, length 5.5 mm (ZMB 29751, slide 5097).

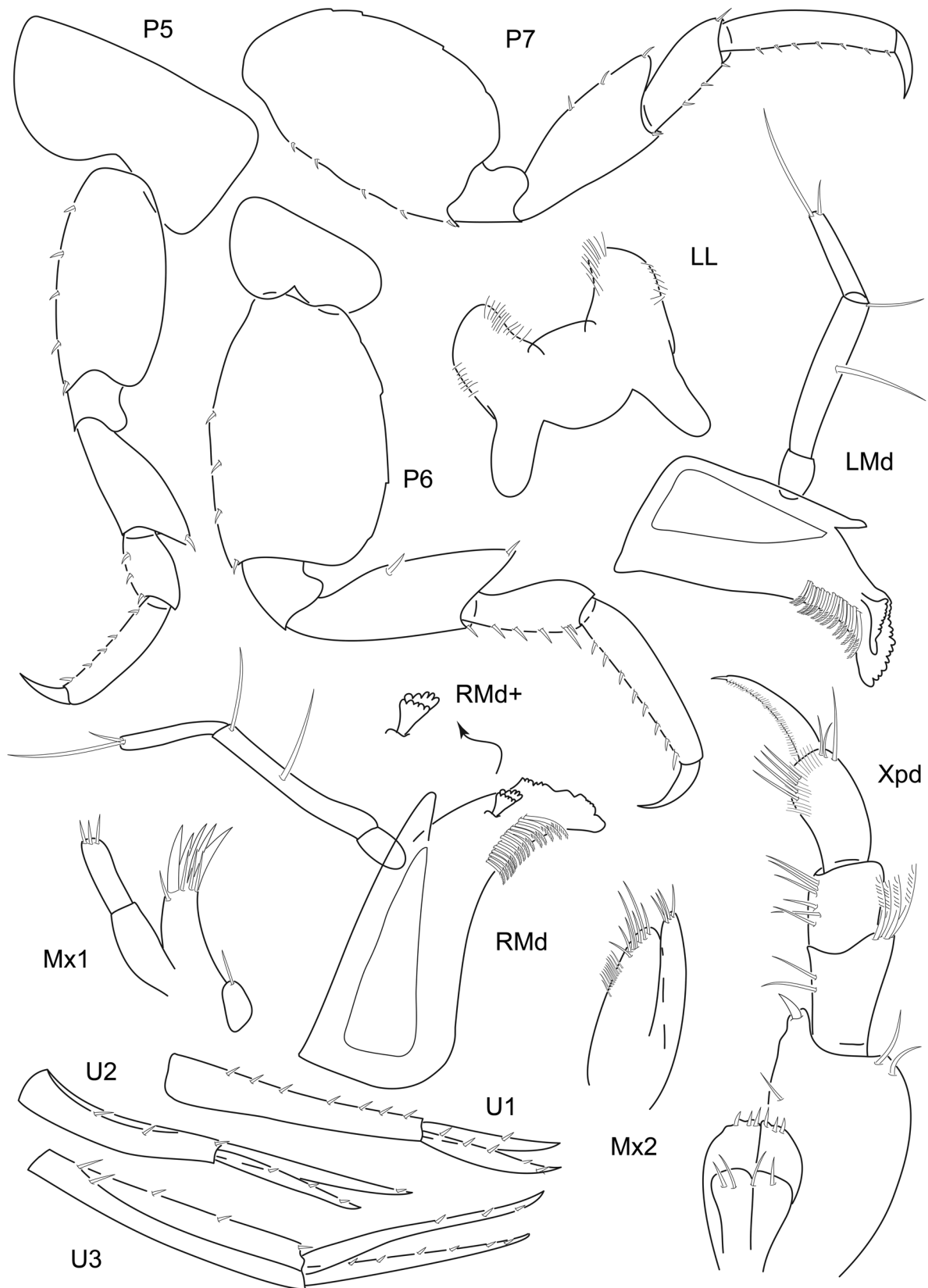


Fig. 11. *Leucothoe reimeri* sp. nov., holotype, ♂, length 5.9 mm (ZMB 29750, slide 5096).

setae; dactylus smooth, reaching 0.4 times propodus length. Gnathopod 2 coxa broader than long, subequal in size with coxa 3, smooth, anterior margin straight, anterodistally rounded, distal margin straight, posterior margin straight; basis proximally expanded, stout, anterior margin with 9 short setae, posterior margin bare; ischium bare; carpus 0.2 times propodus length, curved, distally tapered, anterior margin smooth; propodus with 1 mediofacial setal row displaced to midline, reaching 0.5 times propodus length, with dense row of submarginal spine-setae, posterior margin smooth, palm convex with 2 minor tubercles; dactylus curved, proximal margin smooth, bare, anterior margin distally acute, reaching 0.6 times propodus length. Pereopod 3 coxa length 0.8 times width, anterodistal corner overriding distal face of coxa 2, smooth, anterior margin rounded, distal margin slightly rounded, posterior margin straight. Pereopod 4 coxa smooth, anterior margin rounded, distal margin rounded, posterior margin straight. Pereopods 5–7 bases width to length ratios 1:2.2, 1:1.4, 1:1.6, pereopod 5 basis posterior margin smooth, bare; pereopods 6–7 posterior margins serrate, bare.

PLEON. Epimera 1–3 bare, epimeron 3 posteroventral corner rounded. Uropods 1–3 relative lengths 1.0:1.0:1.4. Uropod 1 peduncle 1.8 times inner ramus length, outer ramus 0.9 times inner ramus length. Uropod 2 peduncle subequal in length with inner ramus, outer ramus 0.8 times inner ramus length. Uropod 3 peduncle 1.2 times inner ramus length, outer ramus 0.9 times inner ramus length. Uropods 1–3 inner and outer rami with robust seta(e). Telson 1.8 times longer than wide, apex rounded.

Female (sexually dimorphic characters)

Gnathopod 1 basis slightly distally expanded, anterior margin with 6 short setae; carpus proximal margin with three rows of dentition. Gnathopod 2 basis slightly proximally expanded, stout, anterior margin with 5 short setae.

Remarks

Leucothoe reimieri sp. nov. is unique in having a dense row of submarginal spine-setae on the propodus palm. The narrowly expanded pereopod 5–7 bases are similar to those of *L. acanthopus* and *L. pansa* sp. nov. This species inhabits the interior canals of an unidentified marine sponge.

Distribution

Red Sea: Shi'b Pelam (present study).

Leucothoe safiae Lyons & Myers, 1991

Leucothoe safiae Lyons & Myers, 1991: 607–610, figs 7–8.

Leucothoe richiardii – Ledoyer 1979: 106–108, fig. 66; 1986: 672–673.

non *Leucothoe richiardii* Lessona, 1865: 427.

Type locality

Gulf of Aqaba, Red Sea.

Material examined

ISRAEL: 1 ♂, 4 mm, stn 39, Eilat, U. Schiecke leg., April–May 1969.

Remarks

There are no sexual differences to the female described in the original paper, except that pereopods 6 and 7 have obviously confounded labels in fig. 8 of Lyons & Myers (1991). The only addition which seems

worth mentioning is the rather small head with large round eyes (illustrated but not stressed verbally) and a quite remarkable bulge anteriorly.

Kossman's (1880) description of *L. crassimana* from the Red Sea is poor; the drawings of the gnathopods, however, would match this species except for the length of 7 mm (vs 3.6–4 mm here). Ledoyer (1979: 106–108, fig. 66 and 1986: 672–73) named his material, found in Madagascar, *L. richiardi* Lessona, 1865 but it matches perfectly with the material herein studied, while *L. richiardi* has Genova (Mediterranean) as the type locality with a length of 6–8 mm. In both mentioned publications he also illustrates the anterior bulge of the head and the deep insertion of antenna 1.

This species remains the only *Leucothoe* with a posterodistal tooth on epimeron 3 to have been identified in the Red Sea.

Distribution

Red Sea (present study), Gulf of Aqaba (Lyons & Myers 1991); Western Indian Ocean: Madagascar (Ledoyer 1979, 1986).

Leucothoe squalidens Ledoyer, 1984

Fig. 12

Leucothoe squalidens Ledoyer 1984: 82, fig. 40A.

Leucothoe squalidens – Ledoyer 1986: 679, fig. 261.

Type locality

New Caledonia.

Material examined

ISRAEL: 2 juvs, 1.6 mm, Eilat, stn 105, Apr.–May 1969, U. Schiecke leg. (slide MVRCr 7732).

SUDAN: 1 specimen, Port Sudan, stn 160, Dec. 1970, U. Schiecke leg.; 2 specimens, 2 mm, Port Sudan, stn 168, Dec. 1970, U. Schiecke leg. (slide MVRCr 7733).

Remarks

The name chosen by Ledoyer indicates that the first gnathopods of this species are beset with many very small spines making them look “scaly” on the margins between the very thin propodus and carpus. The dactylus of the first gnathopod is very short; that of the second gnathopod is longer than $\frac{3}{4}$ of the propodus hind margin.

Distribution

Red Sea (present study); South Pacific Ocean: New Caledonia, Noumea (Ledoyer 1984); Madagascar, Tulear (Ledoyer 1986).

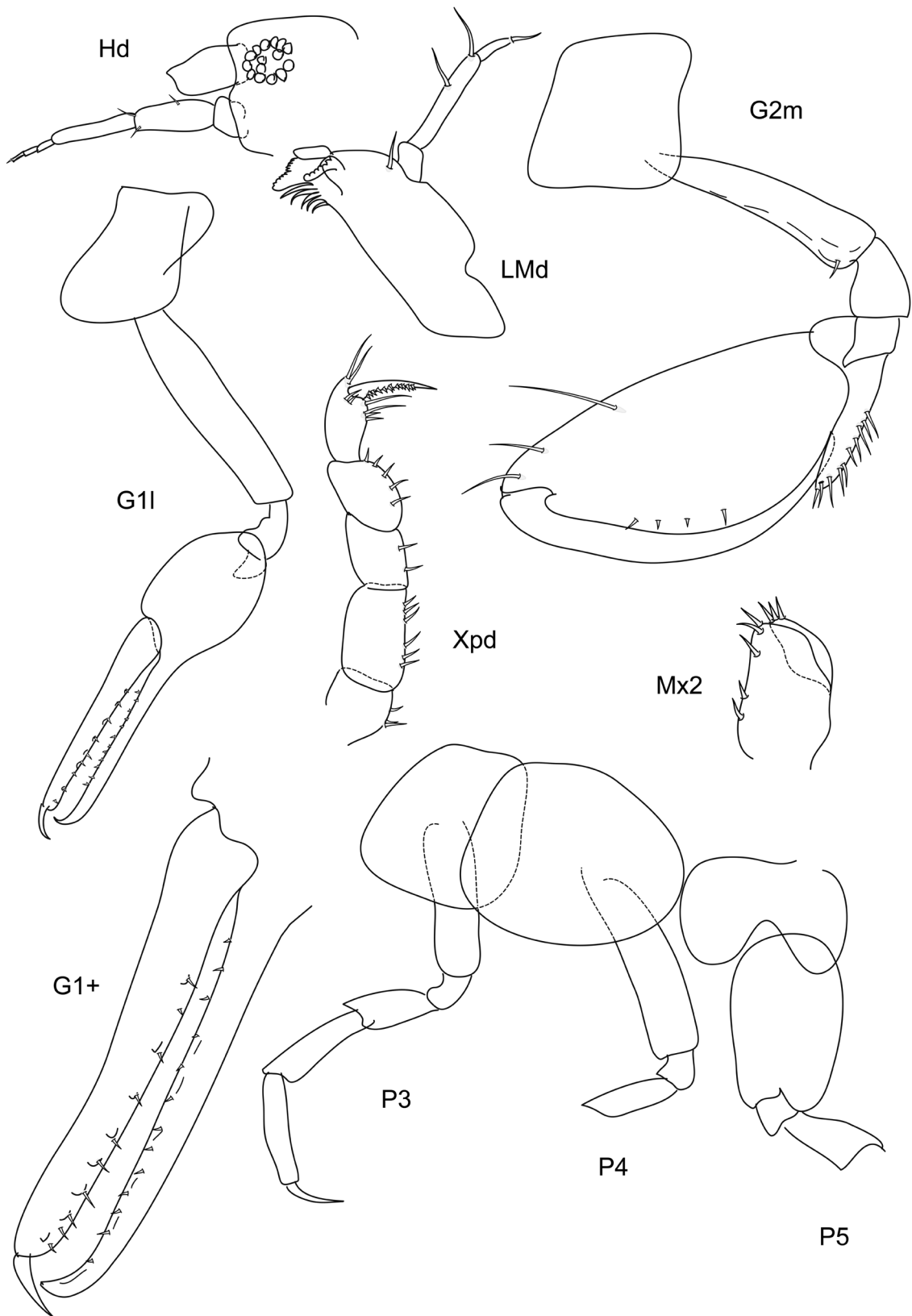


Fig. 12. *Leucothoe squalidens* Ledoyer, 1984, juv., length 1.6 mm (MVRCr 7732); ♂, length 2.0 mm (MVRCr 7733).

Genus *Paranamixis* Schellenberg, 1938

Paranamixis sommelieri sp. nov.

[urn:lsid:zoobank.org:act:0A521B78-39B5-4038-AAC6-ABF049671046](https://zoobank.org/urn:lsid:zoobank.org:act:0A521B78-39B5-4038-AAC6-ABF049671046)

Figs 13–16

Paranamixis bocki – Ledoyer 1967: 125; 1978: 231, fig. 14. — Ruffo 1969: 13.

?*Leucothoides pottsi* – Ruffo 1959: 2, pl. 1, figs 1–2. — Ledoyer 1967: 127, fig. 5b; 1979b: 111, fig. 68/2.

?*Leucothoides torrida* – Ledoyer 1986: 682–84, fig. 263.

non Paranamixis bocki Schellenberg, 1938: 29–30, fig. 14.

Diagnosis

Coxae 2–4 inferior margin thickened and fortified. Gnathopod 2 propodus anterodistal corner with small shallow hump followed by a triangular protrusion of about half width of dactylus, followed by some small triangular knobs along the margin; dactylus curved, reaching about 0.6–0.8 times propodus length, inner margin with two long setae inserted in excavation, after which the dactylus continues abruptly narrowed. Pereopods 5–7 bases widened, not much longer than wide, anterior margin with short setae, posterior margin medially the widest, lower half straight (not concave), upper half rounded. Uropods 1–3 rami unequal.

Etymology

Our friend Ulrich Schiecke always collected with enormous enthusiasm and idealism, content with a minimum of finances and time on disposition. Numerous species have already been dedicated to him, using the genitive of his first or surname. Thus we reflected on the most striking aspects of his character, and settled on one trait for which he is renowned: he is the best connoisseur of Italian wines we know, and the only person who ever dared to send back not one, but three bottles of already opened wine, much to the surprise of the waiters, who were too stunned to protest, but deeply impressed by his sense of taste. The specific name is used as genitive.

Type material

Holotype

SUDAN: ♂ anamorph, 2.8 mm, Port Sudan, stn 168, Dec. 1970, U. Schiecke leg. (ZMB 29753).

Paratype

SUDAN: ♂ leucomorph, 1.4 mm, N of Port Sudan, Flamingo Bay, stn 203, 1 m, sponge, 29 Nov. 1970, U. Schiecke leg. (ZMB 29754).

Additional material examined

SUDAN: 2 leucomorphs, N of Port Sudan, Flamingo Bay, stn 203, 1 m, sponge, 29 Nov. 1970, U. Schiecke leg. (slides MVRCr 7723 and MVRCr 7724); 1 anamorph, Port Sudan, Dec. 1970, U. Schiecke leg.; 30 anamorphs, near Port Sudan, Massa Sheik Ibrahim, stn 168, U. Schiecke leg.; 3 anamorphs, 50 leucomorphs, near Port Sudan, Massa Sheik Ibrahim, stn 173, 14 Dec. 1970, U. Schiecke leg.; 40 leucomorphs, Port Sudan, Marsa Arakiyai, stn 180, Dec. 1970, U. Schiecke leg.; 30 leucomorphs, Port Sudan, Flamingo Bay, stn 188, Dec. 1970, U. Schiecke leg.; 1 anamorph, 1 leucomorph, Port Sudan, stn 196, reef and epiphytes, 12 Nov. 1970, U. Schiecke leg.; 6 leucomorphs, Port Sudan, stn 198, Dec. 1970, U. Schiecke leg.; 1 leucomorph, N of Port Sudan, Flamingo Bay, 1 m, sponge, 29 Nov. 1970, U. Schiecke leg.; ♂ anamorph, 2 mm, near Port Sudan, Massa Sheik Ibrahim, 14 Dec. 1970, U. Schiecke leg. (slide MVRCr 7722).

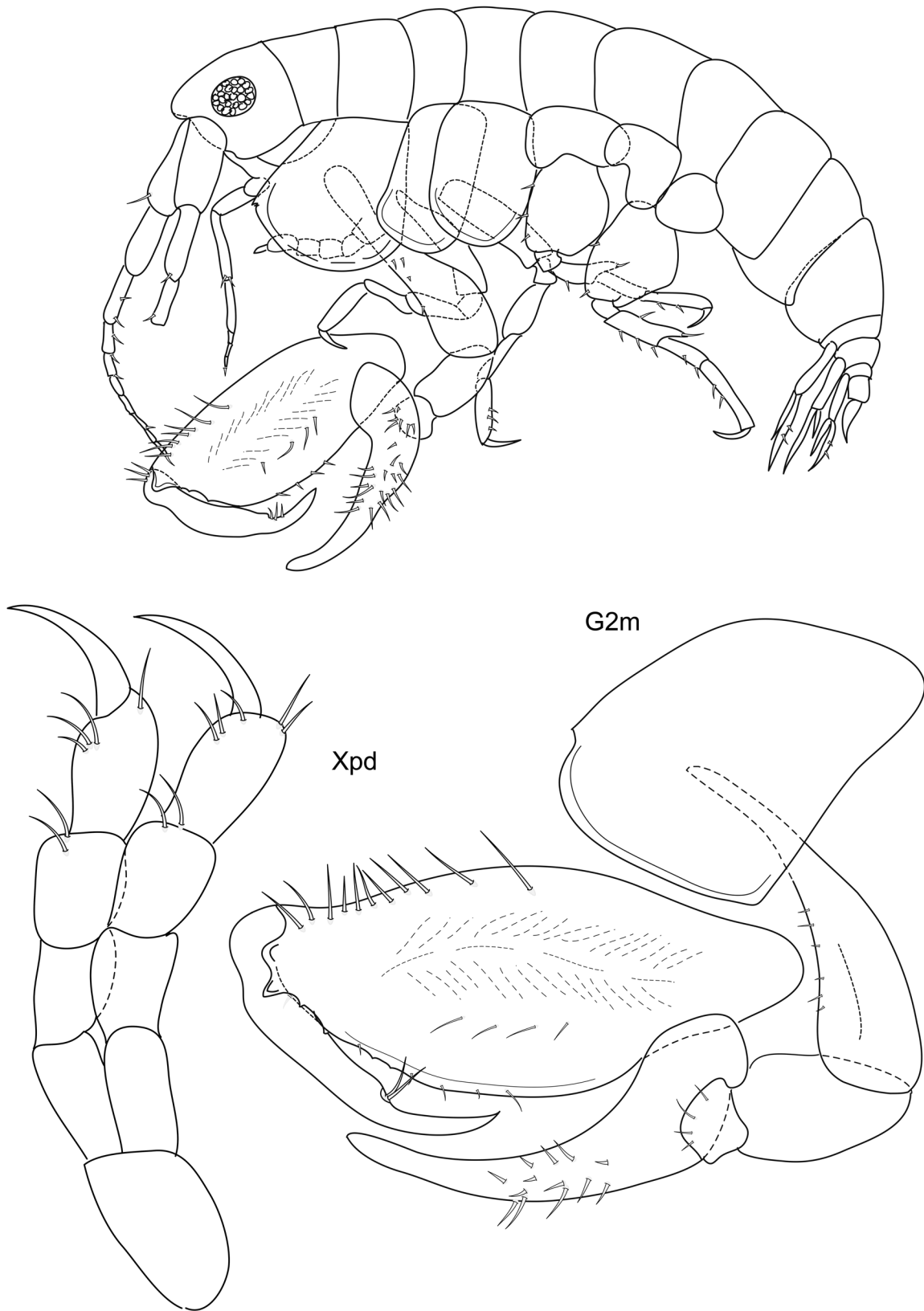


Fig. 13. *Paranamixis sommelieri* sp. nov., holotype, anamorph ♂, length 2.8 mm (ZMB 29753).

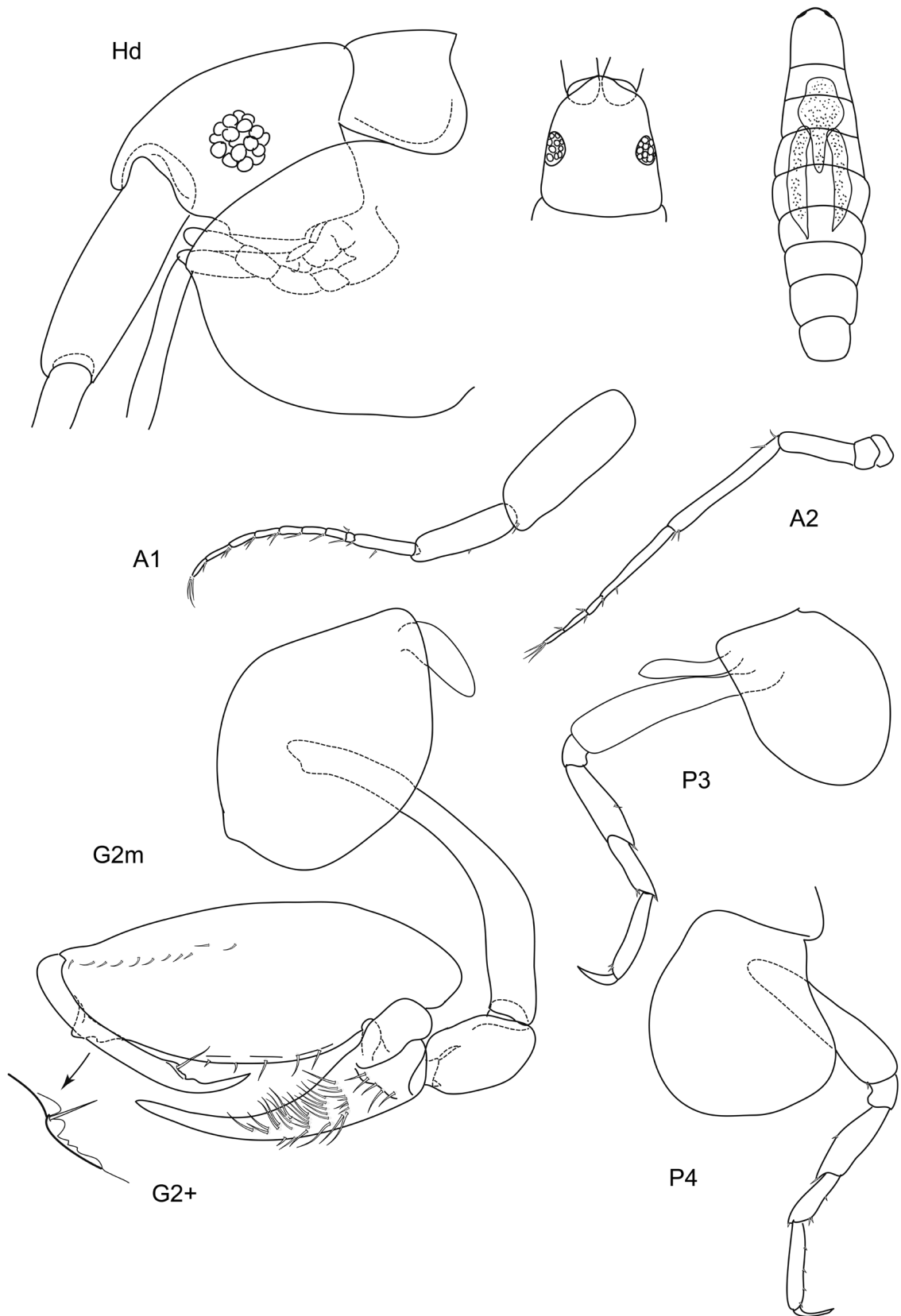


Fig. 14. *Paranamixis sommelieri* sp. nov., holotype, anamorph ♂, length 2.8 mm (ZMB 29753).

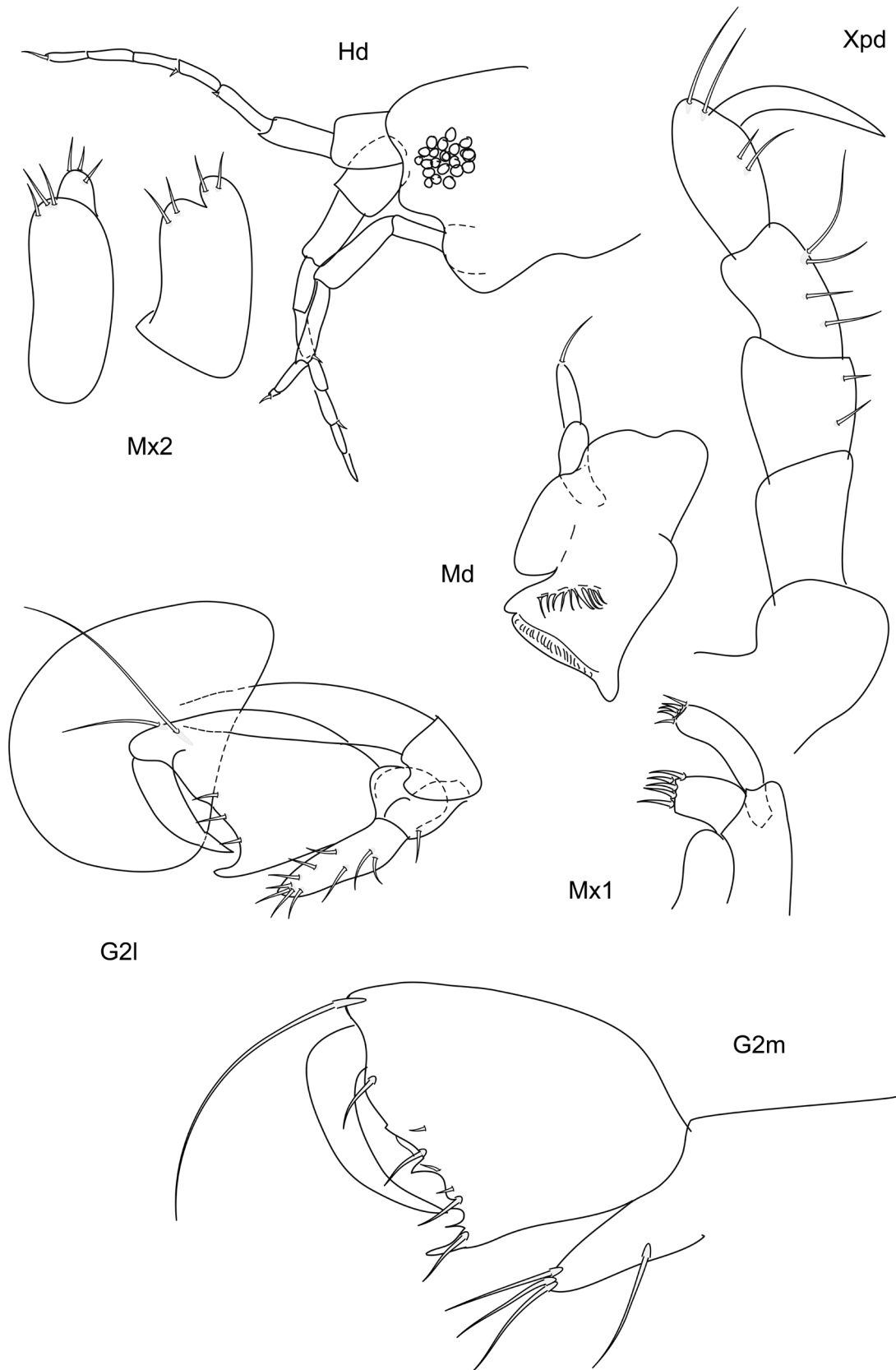


Fig. 15. *Paranamixis sommelieri* sp. nov., paratype, leucomorph ♂, length 1.4 mm (ZMB 29754).

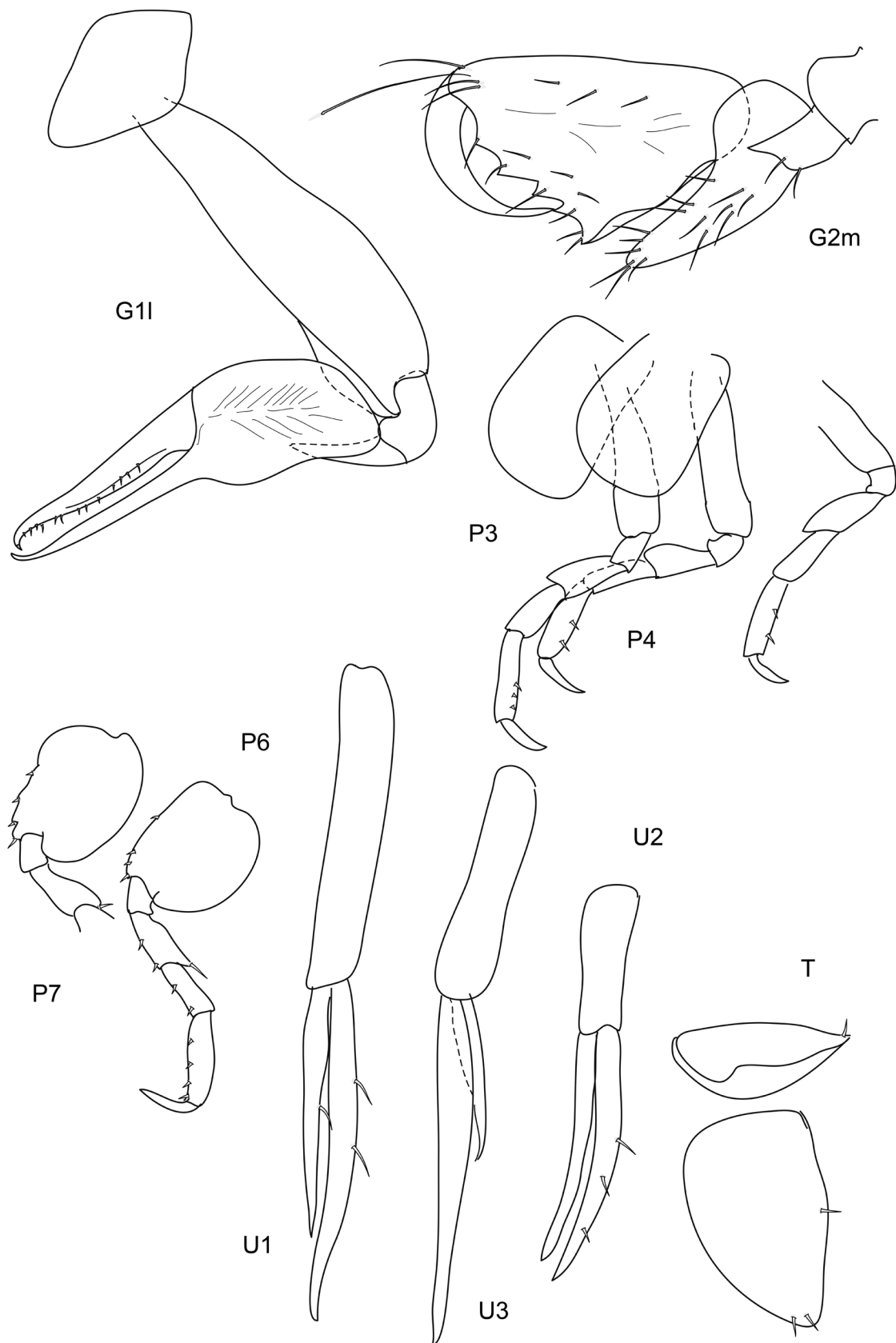


Fig. 16. *Paranamixis sommelieri* sp. nov., paratype, leucomorph ♂, length 1.4 mm (ZMB 29754).

Description**Male anamorph**

LENGTH. 2.8–3 mm.

HEAD. Anterior margin rounded, anterodistal margin notched, distal margin rounded; ventral cephalic keel anterior margin transverse, anteroventral margin rounded, ventral margin straight; eyes present with more than 10 ommatidia, round. Antenna 1 length 0.4 times body length, flagellum 8-articulate, peduncle article 1 width less than 2 times article 2, accessory flagellum absent. Antenna 2 length 0.2 times body length, shorter than antenna 1, flagellum 5-articulate. Mouthparts reduced. Maxilliped inner and outer plates smooth, lacking inner lobes; palp 4-articulate, palp article 4 elongate, slender, strongly recurved.

PEREON. Coxae 1–4 relative widths 1.0: 2.5: 1.5: 1.7. Gnathopod 1 coxa reduced, smooth, bare. Gnathopod 1 absent. Gnathopod 2 coxa longer than broad, much wider than coxa 3, smooth, bare, anterior margin rounded, anterodistal corner with notch, distal margin rounded, posterior margin straight; basis distally expanded, anterior margin with six short setae, posterior margin bare; carpus 0.8 times propodus length, curved, distally tapered, anterior margin smooth; propodus with 1 mediofacial setal row reaching 0.5 times propodus length, 1 submarginal setal row of four setae, posterior margin smooth, palm convex, with one large and several small triangular protrusions and small setae; dactylus curved, reaching 0.5 times propodus length, proximal margin with excavation and two long setae, anterior margin distally tapered, acute. Pereopod 3 coxa length 1.8 times width, anterodistal corner overriding distal face of coxa 2, smooth, anterior margin rounded, distal margin rounded, posterior margin straight. Pereopod 4 coxa smooth, anterior margin rounded, distal margin rounded, posterior margin rounded. Pereopods 5–7 coxae, facial setae absent. Pereopods 5–7 bases width-length ratios 1 : 1.3, 1 : 1.2, 1 : 1.2, posterior margins smooth, bare.

PLEON. Epimera 1–3 bare, epimeron 3 posteroventral corner subquadrate. Uropods 1–3 relative lengths 1.0 : 1.0 : 0.7. Uropod 1 peduncle 0.8 times inner ramus length, outer ramus 0.6 times inner ramus length. Uropod 2 peduncle subequal in length with inner ramus, outer ramus 0.4 times inner ramus length. Uropod 3 peduncle subequal in length with inner ramus, outer ramus 0.8 times inner ramus length. Uropods moderately setose. Telson 1.6 times longer than wide, apex blunt.

Female and male leucomorph

LENGTH. 1.2–1.8 mm.

HEAD. Anterior margin truncate, anterodistal margin subquadrate, distal margin straight; eyes present with about 20 ommatidia, round. Antenna 1 half of body length, flagellum 5-articulate, peduncle article 1 robust, articles 2 and 3 narrower, accessory flagellum absent. Antenna 2 length 0.3 times body length, subequal to antenna 1 length (but geniculate), flagellum 3-articulate. Mandibular palp 2-articulate, article 2 with one distal seta, mandibles with 10 raker spines. Maxilla 1 palp 1-articulate, with 4 distal slender setae; outer plate with 5 distal robust setae. Maxilla 2 inner and outer plates each with 2–3 distal slender setae. Maxilliped outer plate vanishing; palp 4-articulate, article 4 subequal in length with article 3, distally acute.

PEREON. Coxae 1–4 relative widths 1.0: 1.5: 0.9: 0.9. Gnathopod 1 coxa smooth, trapezium-shaped, anterodistal margin produced, distal margin straight; basis long and smooth, distally moderately expanded, anterior and posterior margins bare; ischium bare; carpus straight, distally thin, length 14 times width, proximal margin smooth; propodus strongly narrowing distally, palm smooth with many marginal setae; dactylus minute. Gnathopod 2 coxa longer than broad, wider than coxa 3, smooth, anterior margin regularly rounded, anterodistally rounded, distal margin nearly straight, posterior margin straight or somewhat concave; basis not expanded, anterior margin with few short setae, posterior margin bare;

ischium bare; carpus 0.4 times propodus length, straight, distally tapered, margins smooth but setose; propodus with 1 mediofacial setal row, with row of submarginal setae, posterior margin smooth, posterior margin triangular, palm with long acute tooth on rectangular palmar corner, with triangular tubercles; dactylus strongly curved, distally acute, margins smooth, bare. Pereopod 3 coxa length 1.5 times width, anterodistal corner overriding distal face of coxa 2, smooth, anterior margin rounded, distal margin slightly rounded, posterior margin straight. Pereopod 4 coxa smooth, similar to coxa 3, anterior margin rounded, distal margin rounded, posterior margin straight. Pereopods 5–7 bases width-length ratios 1 : 1.4, 1 : 1.3, 1 : 1.2, posterior margins rounded, smooth, bare.

PLEON. Epimera 1–3 bare, epimeron 3 posteroventral corner subrectangular. Uropods 1–3 relative lengths 1.0:0.8:0.6. Uropod 1 peduncle subequal in length with inner ramus, outer ramus 0.7 times inner ramus length. Uropod 2 peduncle 0.8 times inner ramus length, outer ramus 0.5 times inner ramus length. Uropod 3 peduncle shorter than subequal rami. Uropods 1–3 rami with robust setae. Telson 1.6 times longer than wide, with 2 distal and one marginal setae, apex bluntly rounded.

Remarks

The only species of *Paranamixis* cited until now from the Red Sea is *P. bocki* Schellenberg, 1938 (Ruffo 1969). Ruffo (loc. cit.) discussed two specimens only verbally and ascribed them to the material published by Ledoyer (1967). Schellenberg (1938) illustrated from his single specimen of 3 mm (from the Gilbert Islands, Central Pacific) an elliptical coxa 2 with a sharp protruding rectangular tooth, while Ledoyer's drawings (no length of the specimen indicated) show a subquadrate coxa 2 with a small incision on the anterior margin. Coxa 2 as figured by Ledoyer (1967: fig. 5) is malformed in the upper-left corner of the sketch of the head; it also seems clear that the rostrum is not as acute as it is drawn. Ledoyer (1978) compared the material from Tuléar (Madagascar) published in 1967 with his specimens from Mauritius and thought that both belonged to the same species, but the attribution to *P. bocki* is cited with a question mark. Thomas (1997) repeated this doubt: he cited the original description of *P. bocki* by Schellenberg but did not attribute the material of Ledoyer (1967, 1978) to this species. There is also a quite different gnathopod 2 propodus (in Schellenberg's illustration without the characteristic triangular protrusion on propodus anterodistal corner), but this could be due to allometry, as only small and shallow humps instead of strikingly prominent ones were also observed in our material sometimes. However, the difference in the coxa 2 shape is too strong to be changed with age.

Thomas (1997) described *P. clarkae* from the Seychelles, and illustrations of his material (length 2.7–3.15 mm) bear quite a good resemblance to material studied herewithin. The major difference is the posterior margin of pereopod bases 5 and 6, which is clearly excavated in the inferior half vs straight in our material. Thomas (1997) compared his material with *P. excavatus* Ledoyer, 1978 from Mauritius, but here we find clear differences: coxa 2 again shows the blunt corner followed by a short concave margin similar to *P. bocki*, and uropod 3 has subequal rami. *Paranamixis madagascariensis* Ledoyer, 1982 has quite small eyes and a regularly rounded coxa 2, similar to *P. indicus* Sivaprakasam, 1968 in the illustration of the holotype, where gnathopod 2 dactylus also has a deep excavation on the proximo-inferior half; figures of males from station 4 fit well to our material, showing the blunt corner on coxa 2 antero-distal margin and no excavation on the dactylus.

Ecology

This species was collected among sponges.

Distribution

Red Sea (present study).

Discussion

Cryptic species complexes within Leucothoidae are becoming apparent around the world (Thomas & Klebba 2006, 2007; Krapp-Schickel & De Broyer 2014; Thomas 2015). Examination of many reports pertaining to one species (i.e., *Leucothoe spinicarpa* Abildgaard, 1789) often reveal several different, yet morphologically similar species. Even without cryptic species complexes, invertebrates from the Red Sea are poorly known, and the need for an expansion of research into coral reefs of the Red Sea has been documented (Berumen *et al.* 2013).

This study increases the number of leucothoid species reported from the Red Sea from six to 14 (see * signs in Table 1 for the six species already known). It widens the known range of *L. acutilobata*, *L. predeuticulata* and *L. squalidens* from the Western Indian Ocean (and the South Pacific) to include the Red Sea (see + signs in Table 1), and describes three new species of *Leucothoe* as well as one new species of *Paranamixis* from the Red Sea.

The long-overdue re-description of *Leucothoe acanthopus* Schellenberg, 1928 provides clarification of its morphology. It is now apparent that the many reports of *L. bannwarthi* actually represent a species complex with multiple similar species, one of which is described herein. Further examination of specimens reported from Micronesia (J.L. Barnard 1965; Myers 2013), the Philippines (Olerød 1970), the wider tropical Pacific (Schellenberg 1938; Myers 1985), Madagascar (Ledoyer 1967, 1972, 1978, 1979, 1986), and the Indo-Pacific (Ortiz & Lalana 1997) is necessary to determine how many species this complex represents and which report can be attributed to which species.

As shown in Table 1, Ledoyer (1967, 1972, 1978, 1979, 1986) cites six species described from distant localities. It will be necessary to check and most probably redescribe the following five species collected by him: *Leucothoe euryonyx* (type locality W-Mediterranean), *L. hyhelia* (type loc. Marshall Islands), *L. lihue* (type loc. Hawaii), *L. madrasana* (type loc. India), *L. micronesiae* (type loc. Caroline Isl.). The sixth, *L. richiardii* (type loc. central Mediterranean), could already be ascribed to *L. safiiae* Lyons & Myers here in this paper.

It is well known that *Leucothoe* species are living with or within other animals, and they are certainly neither cosmopolitan (as long thought for *L. spinicarpa* (Abildgaard, 1789)), nor widespread. In most cases, different species have developed with rather small morphological variations or even as cryptic species, which can only be detected by molecular studies.

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