

# Two New Amphipods Associated with a Hermit Crab from the Kumano-nada, Central Japan (Crustacea: Amphipoda: Isaeidae, Stenothoidae)

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**ABSTRACT.** Two new species of amphipods associated with a hermit crab *Propagurus obtusifrons* were collected from the bottom of a 190–380 m depth in Kumano-nada, central Japan. *Metopelloides lowryi* sp. nov. is characterized by the short article 2 of antenna 1, the slender mandibular palp with 3 setae, and the oblique palm of gnathopod 2. *Isaea concinnoides* sp. nov. can be distinguished from its congeners by the short carpus of gnathopod 2, the relatively stout antennae with short setae, and the oval basis of pereopod 5. Both species have prehensile pereopods 3–7 for clinging to the setae of the hermit crab.

## Introduction

Amphipods live in various habitats and many associations of benthic amphipods with other animals are known; e.g., sponges, actinarians, medusae, molluscs, brachiopods, echinoderms and tunicates (Bellan-Santini, 2015). Benthic amphipods are also associated with large decapod crustaceans and eight amphipod families are recorded as direct associates of decapods: Amphilochidae Boeck, 1871; Calliopiidae G. O. Sars, 1893; Caprellidae Leach, 1814; Iphigenellidae Kamal'tynov, 2002; Isaeidae Dana, 1852; Ischyroceridae Stebbing, 1899; Pleustidae Buchholz, 1874; and Stenothoidae Boeck, 1871 (Vader & Tandberg, 2015), most of which have prehensile pereopods for clinging (Vader, 1983).

During our survey of animals on the bottom of the Kumano-nada (Ariyama & Moritaki, 2020), two amphipod species associated with the hermit crab *Propagurus obtusifrons* (Ortmann, 1892) were obtained. Closer examination revealed that they are new to science and herein we describe them as new species in detail.

## Materials and methods

The hermit crab with which amphipods were associated was collected by a commercial trawl net in the Kumano-nada. The Kumano-nada is a small sea area located in the south of Mie and Wakayama Prefectures, central Japan. The hermit crab was transported to Toba Aquarium (TA) and was observed there. The amphipods dwelled on the surface of the hermit crab and usually clung to the setae. Six specimens of the amphipods were collected from the hermit crab. All the specimens were dissected and appendages were drawn using a phase-contrast microscope with an attached drawing tube. Body length (BL) was measured from the apex of rostrum to the distal end of urosomite 3 (Barnard & Drummond, 1978). The type specimens are deposited in the Osaka Museum of Natural History, Japan (OMNH).

Abbreviations used in the figures are: A, antenna; C, coxa; EP, epimeral plate; G, gnathopod; L, left; LL, lower lip; LM, large male; Md, mandible; Mp, maxilliped; Mx, maxilla; P, pereopod; Pl, pleopod; PS, plumose seta; R, right; SF, small female; SM, small male; T, telson; U, uropod; and UL, upper lip.

**Keywords:** Amphipoda, hermit crab associate, Isaeidae, Japan, Paguridae, prehensile pereopods, Stenothoidae, symbiosis

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## Systematics

Order Amphipoda Latreille, 1816

Suborder Amphilochidea Lowry & Myers, 2017

Infraorder Amphilochida Lowry & Myers, 2017

Parvorder Amphilochidira Lowry & Myers, 2017

Superfamily Amphilochoidea Boeck, 1871

Family Stenothoidae Boeck, 1871

[Japanese name: Tatesokoebi-ka]

### Genus *Metopelloides* Gurjanova, 1938

[Japanese name: Yadokari-tatesokoebi-zoku, new]

*Metopelloides* Gurjanova, 1938: 281, 390.—Gurjanova, 1951: 454.—Barnard & Karaman, 1991b: 693.—Lowry & Myers, 2017: 53.

**Type species.** *Metopella micropalpa* Shoemaker, 1930, original designation.

**Diagnosis.** Antenna 1 peduncle lacking nasiform process on article 1; accessory flagellum absent or vestigial. Mandibular palp 1-articulate; palp of maxilla 1 1-articulate; inner plates of maxillipeds partially fused together. Coxa 1 very small, coxae 2–4 enlarged, coxae 5–7 small. Gnathopod 1 small, subchelate; carpus not lobate; propodus subequal to carpus in length, palm oblique. Gnathopod 2 enlarged, subchelate; carpus short, lobate; propodus broad, palm oblique or transverse. Pereopods 3–7 prehensile, bases rectilinear. Pleonite 3 and urosomite 1 lacking dorsal process, urosomites 1–3 free. Uropods 1, 2 biramous; uropod 3 uniramous, ramus 2-articulate. Telson flat, entire.

**Included species.** *Metopelloides lowryi* sp. nov. [Northwest Pacific]; *M. micropalpa* (Shoemaker, 1930) [Northwest Atlantic]; *M. paguri* Marin & Sinelnikov, 2012 [Sea of Okhotsk and Sea of Japan]; *M. stephensi* Gurjanova, 1938 [Sea of Japan] and *M. tattersalli* Gurjanova, 1938 [Sea of Japan].

**Remarks.** Shoemaker (1955) also recorded *M. stephensi* and *M. tattersalli* from the Arctic Ocean; however, his *M. stephensi* is probably *M. micropalpa* because of the high degree of similarity between them.

### *Metopelloides lowryi* sp. nov.

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[Japanese name: Yadokari-tatesokoebi, new]

Figs 1–5

**Holotype:** OMNH-Ar-12498 (TAMBL-CR 1775), male, 4.3 mm, Kumano-nada, off Owase City, Mie Prefecture, 34°01'22.0"N 136°20'57.6"E, 190–350 m depth, associated with *Propagurus obtusifrons* (Ortmann, 1892) (Paguridae), coll. T. Moritaki, 13 October 2016.

**Type locality.** Kumano-nada, off Owase City in Mie Prefecture, Japan.

**Etymology.** The species name is dedicated to the late Dr

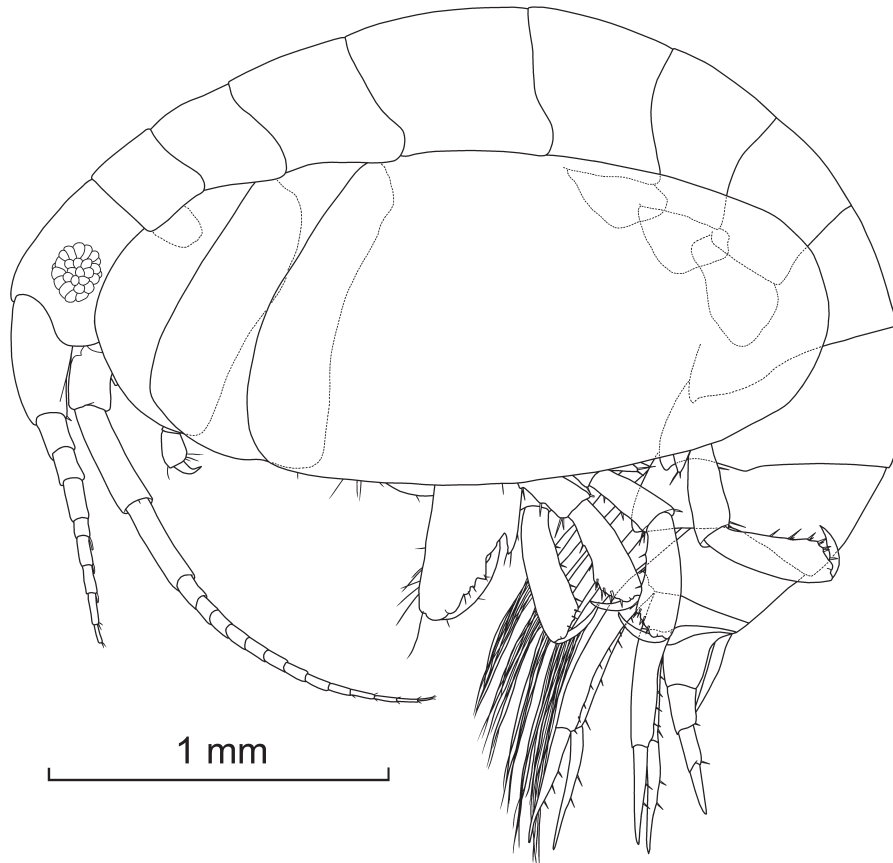
James K. Lowry for his great contribution to amphipod taxonomy.

**Diagnosis.** Antenna 1 short, peduncular article 2 0.3 times length of article 1. Gnathopod 1 small, posterior margin of dactylus bare. Gnathopod 2 stout, anterior margin of basis with several setae, palm oblique. Telson without robust setae.

**Description** (based on holotype, male, 4.3 mm). Body (Fig. 1) oval. Coxa 1 small, perfectly hidden by coxa 2; coxae 2, 3 large, coxa 4 extremely large; coxae 5–7 small, perfectly hidden by coxa 4.

Head (Figs 1, 2). *Rostrum* small. *Ocular lobes* rounded. *Eyes* large (diameter: ca. 0.4 times head length). *Antenna 1* short, ca. 0.25 times BL; peduncular articles 1–3 with length ratio of 1.0:0.3:0.25, article 1 stout, lacking setae; accessory flagellum vestigial, with 3 minute setae on tip; primary flagellum with 6 articles, article 2 short, articles 3–5 each bearing aesthetasc posterodistally. *Antenna 2* longer than antenna 1 (ca. 1.55 times), slender, sparsely setose; peduncular articles 3–5 with length ratio of 1.0:2.0:1.7, anteromedial surfaces with 4, 4, 2 robust setae, respectively; flagellum with 13 articles, terminal article narrow. *Upper lip* asymmetrical, ventral margin hollowed. *Mandibles*, incisors wide, with 9–10 distal denticles; laciniae mobilis broad, left one fan-shaped, with 11 denticles, right one rectangular, composed of 4 quadrate blades; accessory blades 9 in left, 11 in right; palpi relatively short, slender (length ca. 4.7 times width), with 3 setae. *Lower lip*, outer plate with mandibular lobe, mediodistal corner with 3 short setae. *Maxilla 1* with small inner plate bearing single short seta; outer plate with 7 robust setae apically, medial margin bearing several feeble setae; tip of palp acutely projected, with long robust seta, medial margin lined with 5 robust setae. *Maxilla 2*, inner plate triangular, tip with several setae; outer plate longer, rounded and setose distally. *Maxilliped* enlarged; distal margins of inner plates each bearing 3 short setae; distomedial lobe of outer plate short and narrow, tip with short robust seta, lateral margin bearing many feeble setae; palp stout, articles 1–3 wide, medial margins each with several robust setae, article 4 falcate, medial margin bearing many feeble setae.

Pereon (Fig. 3). *Gnathopod 1* small; basis straight, anterior margin and posterodistal corner with 3 and 1 setae, respectively; merus setose distally; carpus moderately elongate, anterodistal corner and posterior margin setose; propodus subequal to carpus in length, palm strongly oblique, defined by 2 lateral and 2 medial robust setae; dactylus almost straight. *Gnathopod 2* stout; basis straight, anterior margin lined with several evenly-spaced setae, posterodistal corner setose; ischium, posterodistal corner setose; merus rounded distally, posterior margin with several setae; carpus with posterior lobe setose distally; propodus broad, ca. 2.65 times length of carpus, anterodistal corner setose, palm oblique, defined by acute projection, distal half of palm convex and serrated, with several robust setae, proximal half concave; dactylus slightly curved posteriorly. *Pereopod 3* slender, longer than gnathopod 2; basis–carpus sparsely setose; propodus ca. 1.45 times length of carpus, slightly widened distally, distal and posterior margins with 2+3+3+3 and 2+2+1+1 robust setae, respectively; dactylus narrow. *Pereopod 4* slender, similar to pereopod 3; propodus, distal and posterior margins with 2+3+3+3 and 3+2+1 robust setae, respectively. *Pereopod 5* shorter than pereopod 4;



**Figure 1.** *Metopelloides lowryi* sp. nov., holotype male, 4.3 mm, OMNH-Ar-12498, habitus.

basis straight, anterior margin lined with several robust setae; merus, anterior and posterior margins and carpus, anterior margin each with several robust setae; propodus slightly widened distally, distal and anterior margins with 2+3+3 and 3+3+1 robust setae, respectively. *Pereopod 6* slightly shorter than pereopod 5; basis straight, posterodistal corner slightly swollen, anterior margin lined with several robust setae; merus, anterior and posterior margins each with several robust setae; carpus, anterior margin and posterodistal corner bearing several and a few robust setae, respectively; propodus slightly widened distally, distal and anterior margins with 2+3+3 and 3+3+1+1 robust setae, respectively. *Pereopod 7* subequal to pereopod 6 in length; basis straight, wider than that of pereopod 6, posterodistal corner weakly swollen, anterior margin lined with several robust setae; merus, anterodistal corner and posterior margin with a few and several robust setae, respectively; carpus, anterior margin and posterodistal corner bearing several and a few robust setae, respectively; propodus slightly widened distally, distal and anterior margins with 2+3+3 and 3+3+2 robust setae, respectively.

Pleon (Fig. 4). *Epimeral plates 1–3*, posterodistal corners strongly, moderately, and weakly produced, respectively; ventral margins bare. *Pleopods* slender, pleopod 3 shortest; pleopods 1–3, peduncles with 7, 10, 1 simple setae, respectively, outer rami longer than inner rami, former with 12, 11, 10 and latter with 8, 8, 7 articles, respectively. *Uropod 1* long; peduncle with 9 dorsolateral and 4 dorsomedial robust setae; rami shorter than peduncle, outer ramus shorter than

inner ramus, with 3 dorsal robust setae, inner ramus bearing 2 dorsal robust setae. *Uropod 2* ca. 0.75 times length of uropod 1, peduncle with 5 dorsolateral and 1 dorsomedial robust setae; outer ramus ca. 0.85 times length of peduncle, with 2 dorsal robust setae; inner ramus subequal to peduncle in length, bearing 2 dorsal robust setae. *Uropod 3* ca. 0.65 times length of uropod 2, peduncle with 2 dorsodistal robust setae; single ramus 2-articulate, article 1 with 2 dorsodistal robust setae, article 2 slightly longer than article 1, tip acute. *Telson* ca. 2.05 times longer than broad, bare.

**Colour in life** (Fig. 5). Eyes light red. Body white with light orange bands on pereonites 1–3, 4, 6–7, coxae 2–4 (anterior part) and coxa 4 (posterior part). This coloration resembles that of the hermit crab (see Fig. 11) and is probably useful for camouflage.

**Remarks.** *Metopelloides lowryi* sp. nov. is characterized by: (1) a short article 2 of antenna 1 (0.3 times length of article 1); (2) a slender mandibular palp with 3 setae (length ca. 4.7 times width); and (3) an oblique palm of gnathopod 2. No other congeners have this combination of characters. Although *M. lowryi* has a similar gnathopod 2 to *M. micropalpa*, this new species can be distinguished by the short article 2 of antenna 1 (0.6 times length of article 1 in *M. micropalpa*).

**Habitat.** Bottom sediment unknown, 190–350 m depth, associated with *Propagurus obtusifrons*.

**Distribution.** Japan: Kumano-nada (present study).

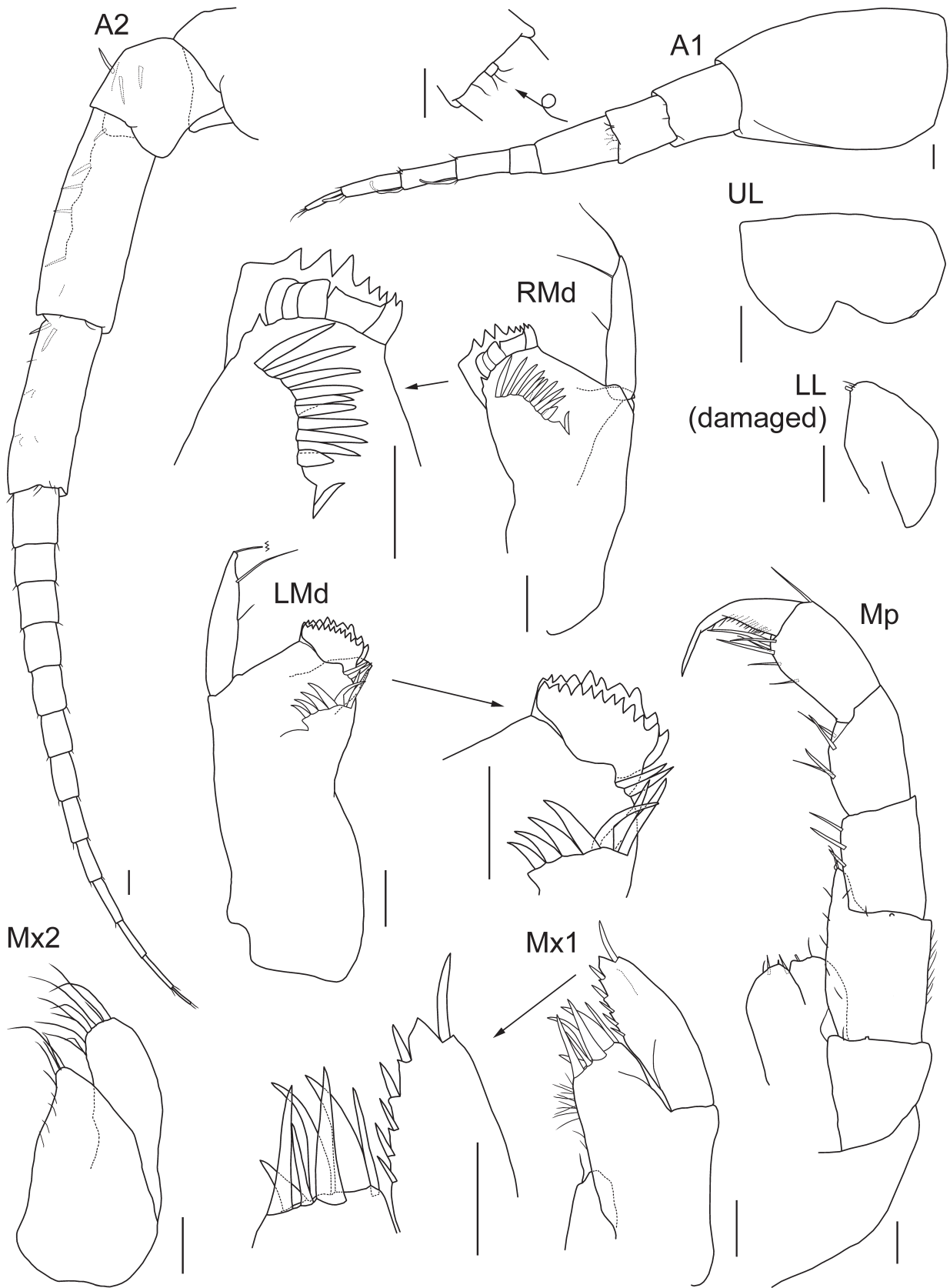


Figure 2. *Metopelloides lowryi* sp. nov., holotype male, 4.3 mm, OMNH-Ar-12498. Scale bars = 0.04 mm.

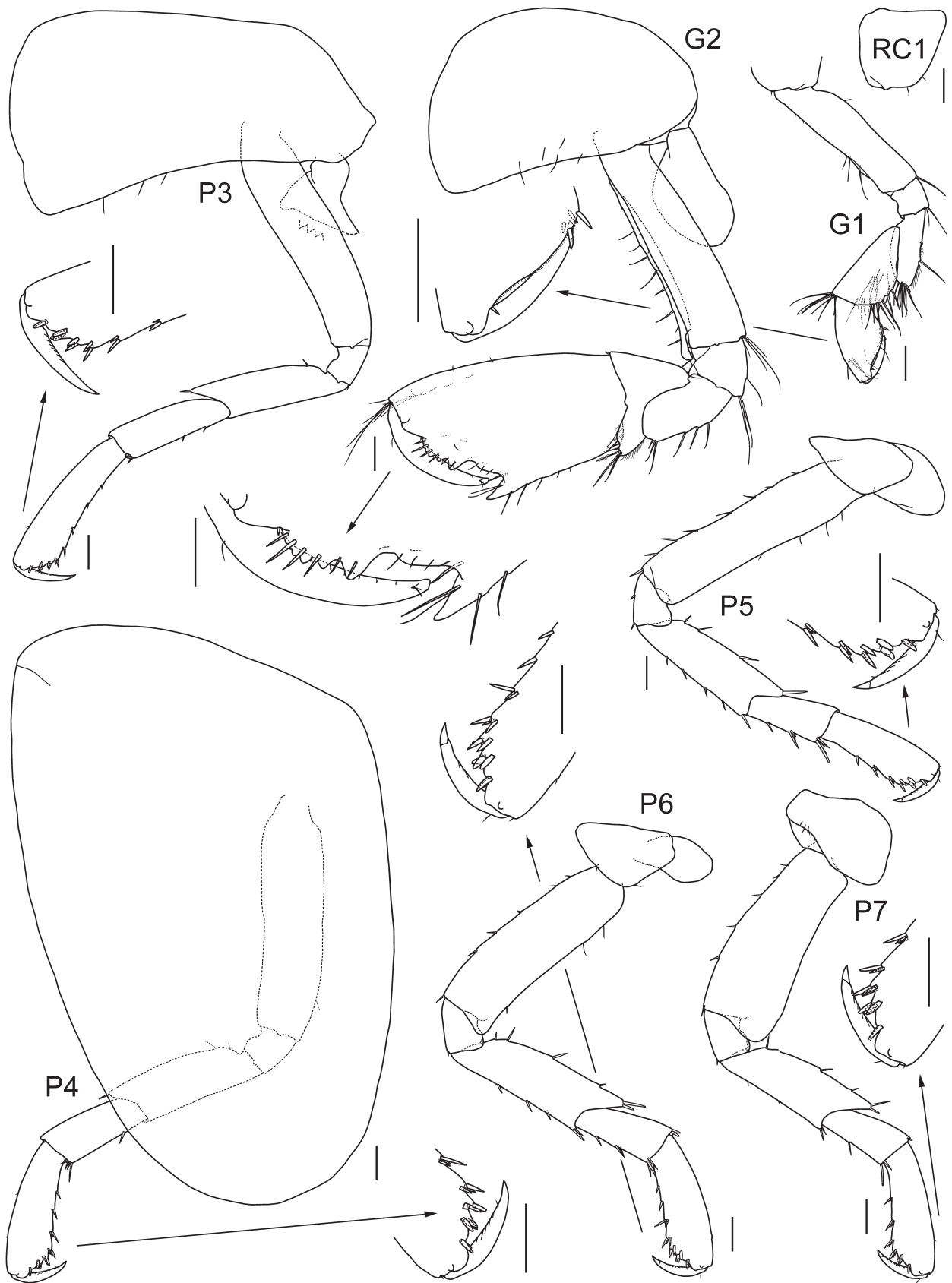


Figure 3. *Metopelloides lowryi* sp. nov., holotype male, 4.3 mm, OMNH-Ar-12498. Scale bars = 0.1 mm.

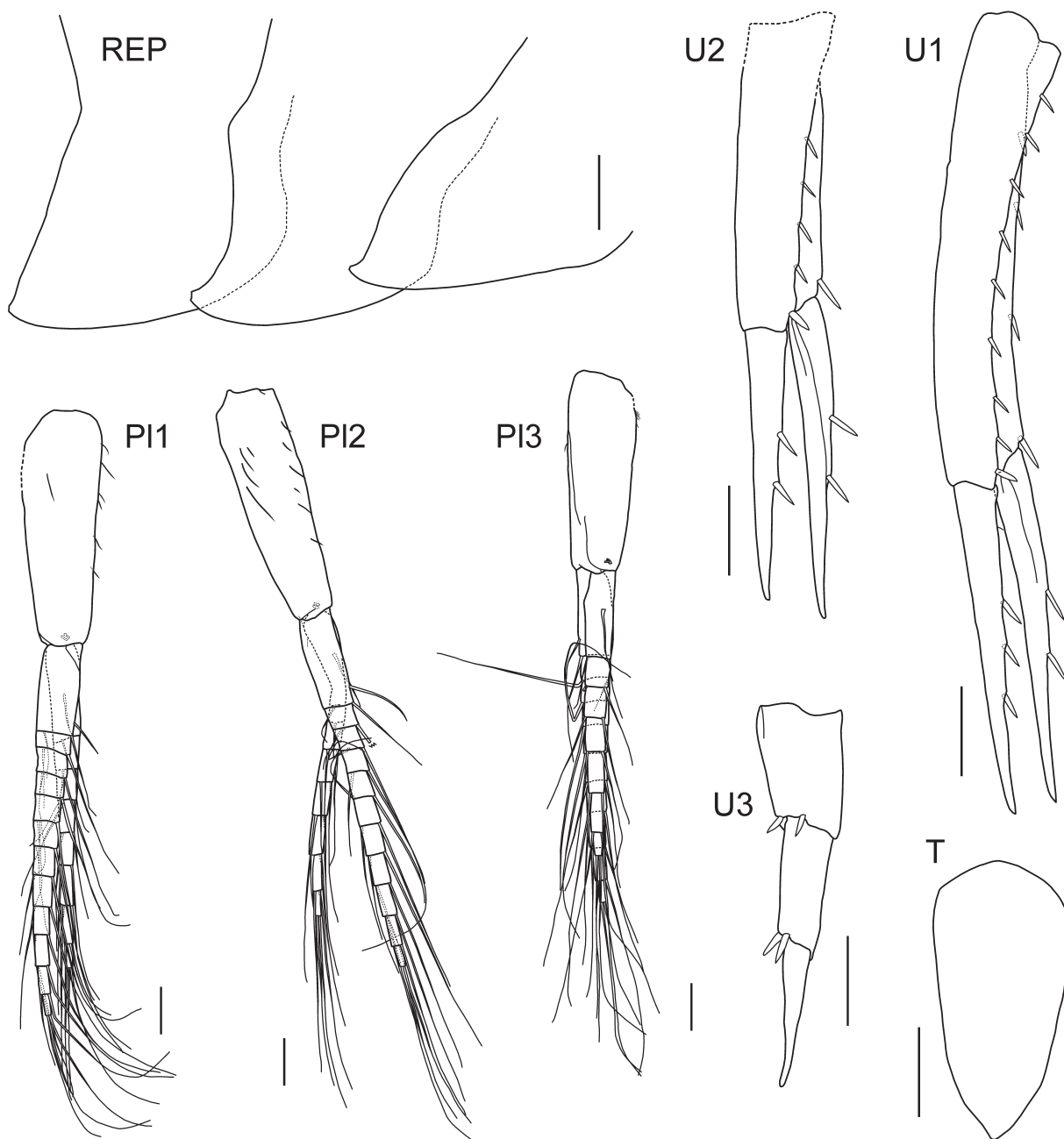


Figure 4. *Metopelloides lowryi* sp. nov., holotype male, 4.3 mm, OMNH-Ar-12498. Scale bars = 0.1 mm.

**Key to species of *Metopelloides* Gurjanova, 1938**

- 1 Antenna 1, peduncular article 2 short (less than half length of article 1) ..... 2
- Antenna 1, peduncular article 2 long (more than half length of article 1) ..... 3
- 2 Gnathopod 1, posterior margin of dactylus setose; palm of gnathopod 2 transverse ..... *M. tattersalli*
- Gnathopod 1, posterior margin of dactylus bare; palm of gnathopod 2 oblique ..... *M. lowryi* sp. nov.
- 3 Gnathopod 2, anterior margin of basis setose ..... *M. micropalpa*
- Gnathopod 2, anterior margin of basis bare ..... 4
- 4 Telson with 2 robust setae ..... *M. stephenseni*
- Telson without robust setae ..... *M. paguri*



Figure 5. *Metopelloides lowryi* sp. nov., holotype male, 4.3 mm, OMNH-Ar-12498, photographed immediately after fixation, T. Moritaki.

### Suborder Senticaudata Lowry & Myers, 2013

Infraorder Coroppiida Leach, 1814

Parvorder Caprellidira Leach, 1814

Superfamily Isaeoidea Dana, 1852

Family Isaeidae Dana, 1852

[Japanese name: Ishiku-yokoebi-ka]

### Genus *Isaea* Milne Edwards, 1830

[Japanese name: Yadokari-yokoebi-zoku, new]

*Isaea* Milne Edwards, 1830: 380.—Chevreux & Fage, 1925: 328.—Lincoln, 1979: 496.—Barnard & Karaman, 1991a: 197.—Myers & Lowry, 2003: 471.

**Type species.** *Isaea montagui* Milne Edwards, 1830, monotypy.

**Diagnosis.** Antenna 1, peduncular article 3 0.7–1.1 times as long as article 1; accessory flagellum with 2–6 articles. Mouth parts ordinary. Coxae 1–4 long, strongly overlapping, progressively more elongate from 1 to 4, coxae 6, 7 much smaller than anterior coxae. Gnathopods subchelate, palm oblique; gnathopod 1, propodus longer than or subequal to carpus; gnathopod 2 much larger than 1, propodus dilated, longer than carpus. Pereopods prehensile, pereopods 3, 4 not glandular. Urosomites 1–3 free. Uropods 1–3 biramous, inner ramus of uropod 3 longer than or subequal to outer ramus. Telson fleshy, entire.

**Included species.** *Isaea concinna* Gurjanova, 1938 [Sea of Japan and Sea of Okhotsk (Kudrjashov, 1972)]; *I. concinnoides* sp. nov. [Northwest Pacific]; *I. elmhirsti* Patience, 1909 [Northeast Atlantic]; and *I. montagui* Milne

Edwards, 1830 [Northeast Atlantic and Mediterranean (Lincoln, 1979)].

**Remarks.** The Isaeidae include only two genera: *Isaea* and *Pagurisaea* Moore, 1983. *Pagurisaea* is distinguishable from *Isaea* in the glandular pereopods 3 and 4 and the uropod 3 with shortened inner ramus (Moore, 1983).

### *Isaea concinnoides* sp. nov.

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[Japanese name: Yadokari-yokoebi, new]

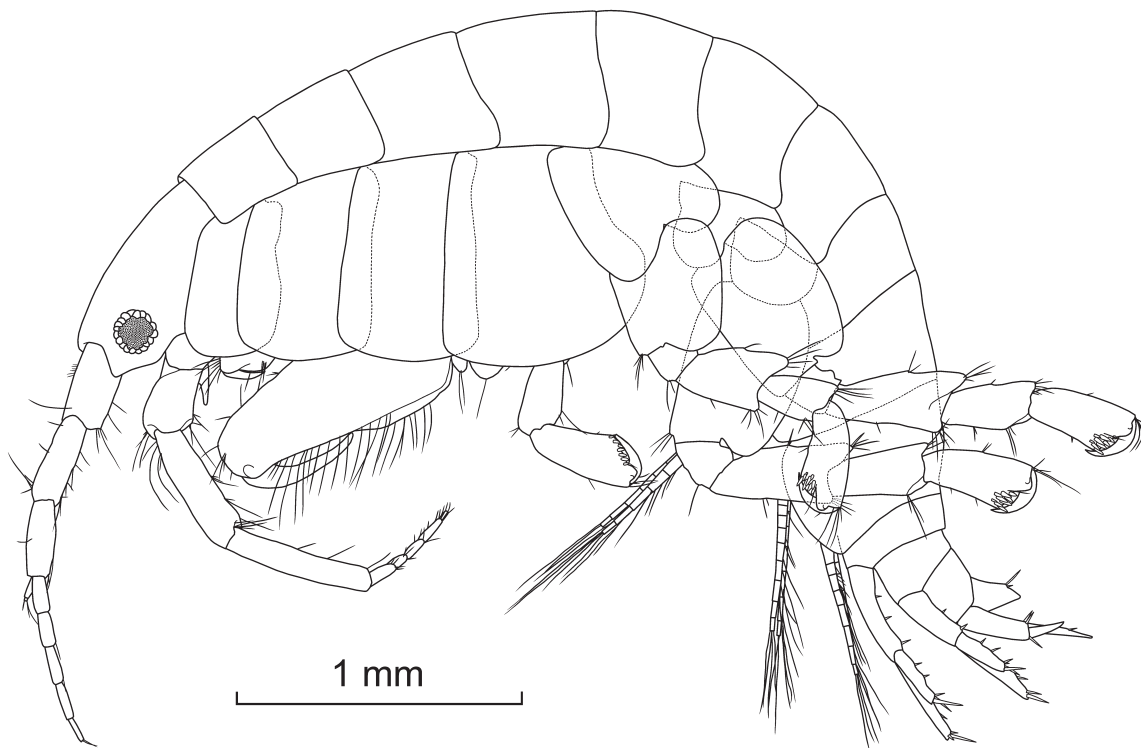
Figs 6–11

**Holotype:** OMNH-Ar-12499, male, 4.8 mm, Kumano-nada, off Kumano City, Mie Prefecture, 33°48'54.0"N 136°11'42.1"E, 190–380 m depth, associated with *Propagurus obtusifrons*, coll. T. Moritaki, 7 February 2022. **Paratypes** (TAMBL-CR 1776): OMNH-Ar-12500, male, ca. 5.6 mm (damaged); OMNH-Ar-12501, male, 3.4 mm; OMNH-Ar-12502, male, 3.0 mm; OMNH-Ar-12503, female, 3.6 mm, off Owase City, Mie Prefecture, 34°01'22.0"N 136°20'57.6"E, 190–350 m depth, associated with *Propagurus obtusifrons*, coll. T. Moritaki, 13 October 2016.

**Type locality.** Kumano-nada, off Kumano City in Mie Prefecture, Japan.

**Etymology.** From *concinna* (closely related species) + the Greek *oides* (= resembling).

**Diagnosis.** Eyes medium-sized. Antennae relatively stout, with short setae on posterior margins; accessory flagellum with 2 articles. *Gnathopod* 2 stout, carpus short. Basis of pereopod 5 oval. Posterodistal corner of epimeral plate 3 angular.



**Figure 6.** *Isaea concinnoides* sp. nov., holotype male, 4.8 mm, OMNH-Ar-12499, habitus.

**Description. Male** (based on holotype, 4.8 mm). Body (Fig. 6) subovate, smooth. *Coxae* 1–4 long, *coxae* 5–7 short.

Head (Figs 6, 7). *Rostrum* small. *Ocular lobes* subtriangular. *Eyes* medium-sized (diameter: *ca.* 0.25 times head length). *Antenna 1* relatively short, *ca.* 0.3 times BL; peduncular articles 1–3 with length ratio of 1.0:1.3:1.0, article 1 stout, posterodistal corner setose (twisted in preparation), anterodistal corner of article 2 setose; accessory flagellum short, 2-articulate, tip with several setae; primary flagellum with 5 articles, poorly setose. *Antenna 2* subequal to antenna 1 in length, stout, weakly setose; peduncular articles 3–5 with length ratio of 1.0:2.5:2.2; flagellum short, with 5 articles, terminal article minute, articles 1–4 bearing 6, 3, 3, 2 robust setae, respectively. *Upper lip* rounded ventrally, ventral margin with many minute setae. *Mandibles* stout, left and right incisors with 3 and 5 cusps, respectively, left lacinia mobilis 4-toothed and right 3-toothed, accessory blades 4 in left and 3 in right, molar well-developed, fan-shaped structure attached on distal side of left molar; palp strong, article length ratio 1.0:2.8:1.9, article 1 bare, articles 2, 3 weakly and strongly setose, respectively, article 3 clavate. *Lower lip* with acute-tipped mandibular process, mediobasal margin of outer lobe setose, dorsomedial surface covered with short thin setae; distal margin of inner plate with thin setae. *Maxilla 1* small; inner plate reduced, bullet-shaped, with bare tip; outer plate with 9 robust setae apically; tip of palp with 5 robust and 4 slender setae. *Maxilla 2* small; inner plate setose mediobasally; outer plate longer, tip setose. *Maxilliped* with inner plate bearing 4 robust and 4 plumose setae mediobasally; outer plate broad, not reaching apex of palp article 2, distomedial margin with 13 long-to-short robust setae; palp slender, weakly setose, article 4 bearing 2 long robust setae on tip.

*Pereon* (Figs 8, 9). *Gnathopod 1* small; basis slightly

curved anteriorly, bare; posterior margins of merus and carpus heavily setose; propodus *ca.* 1.3 times as long as carpus, palm rounded, defined by long robust seta; dactylus slightly curved, posterior margin minutely serrated. *Gnathopod 2* stout; basis slightly curved anteriorly, anterior margin with 2 short setae, anterodistal corners of basis and ischium produced roundly; merus short and broad, posterodistal corner setose; carpus narrow, triangular, with setose posterior lobe, anterolateral surface with long robust seta; propodus greatly expanded, broad, *ca.* 5.5 times carpal length, palm strongly oblique, defined by short robust seta, bearing numerous plumose setae, distal part of palmer margin with triangular process; dactylus short, strongly curved posteriorly. *Pereopod 3* slender; basis poorly setose; merus, anterodistal and posterodistal corners setose; carpus short, setose posterodistally; propodus long, *ca.* 1.65 times length of carpus, widened distally, palm oblique, with 7 and 5 robust setae on lateral and medial surfaces, respectively; dactylus strongly curved posteriorly. *Pereopod 4* slender, similar to pereopod 3 except for coxa; coxa wide, posterior margin weakly excavated; palm oblique, with 5 and 4 robust setae on lateral and medial surfaces, respectively. *Pereopod 5* shorter than pereopod 4; coxa bilobed; basis broad, oval, length *ca.* 1.1 times width, posterodistal corner expanded, rounded distally, anterodistal corner setose; merus produced posterodistally, anterodistal and posterodistal corners of merus and carpus setose; propodus widened distally, palm slightly oblique, with 2+3+4 and 3 robust setae on lateral and medial surfaces, respectively. *Pereopod 6* slightly longer than pereopod 5; coxa bilobed; basis broad, subrectangular, length *ca.* 1.35 times width, posterodistal corner expanded, rounded distally, lateral surface with vertical ridge in middle, posterior half slightly bending mediobasally; propodus widened distally, palm slightly oblique, with 2+3+5 and



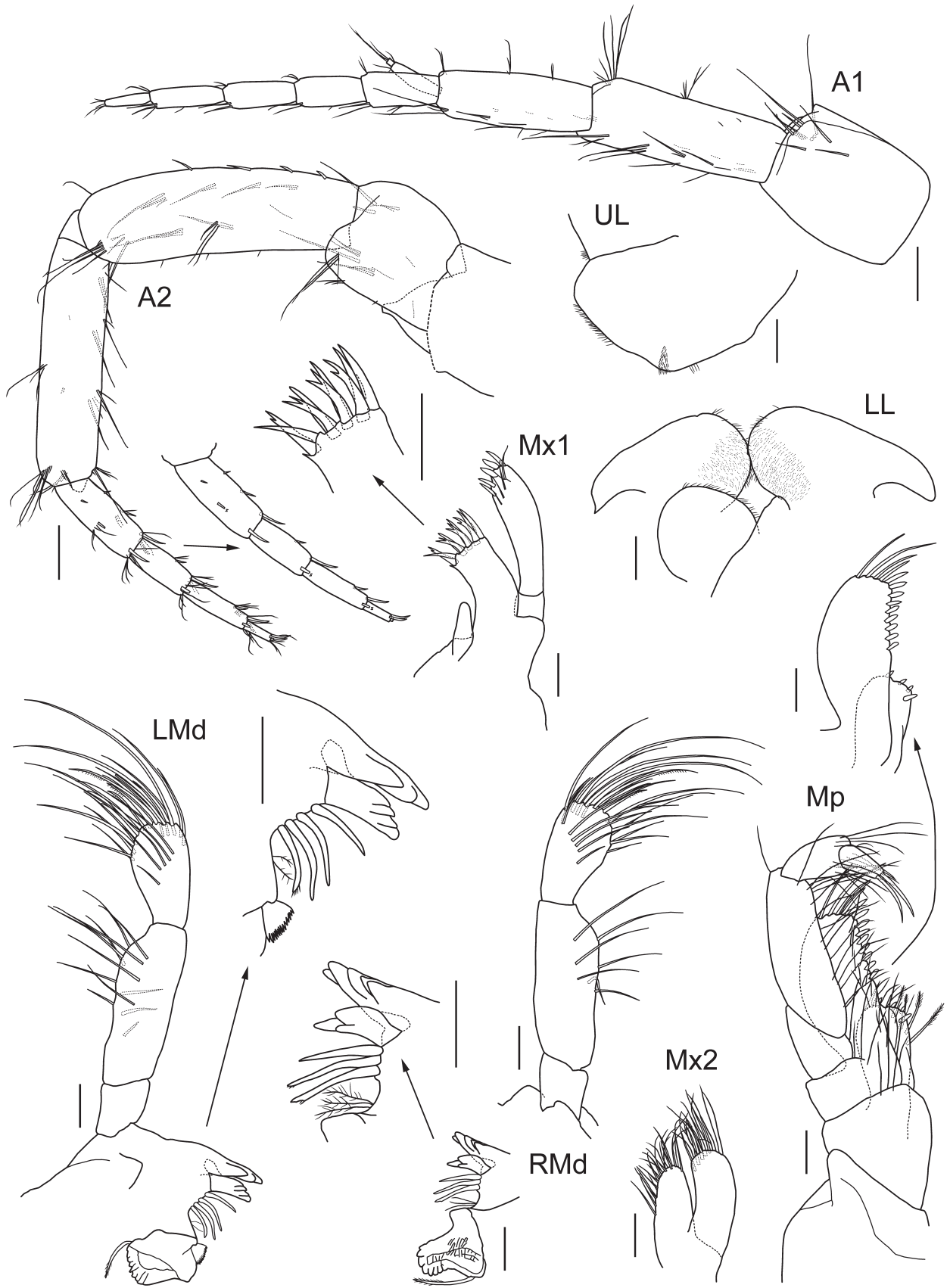


Figure 7. *Isaea concinnoides* sp. nov., holotype male, 4.8 mm, OMNH-Ar-12499. Scale bars = 0.1 mm.

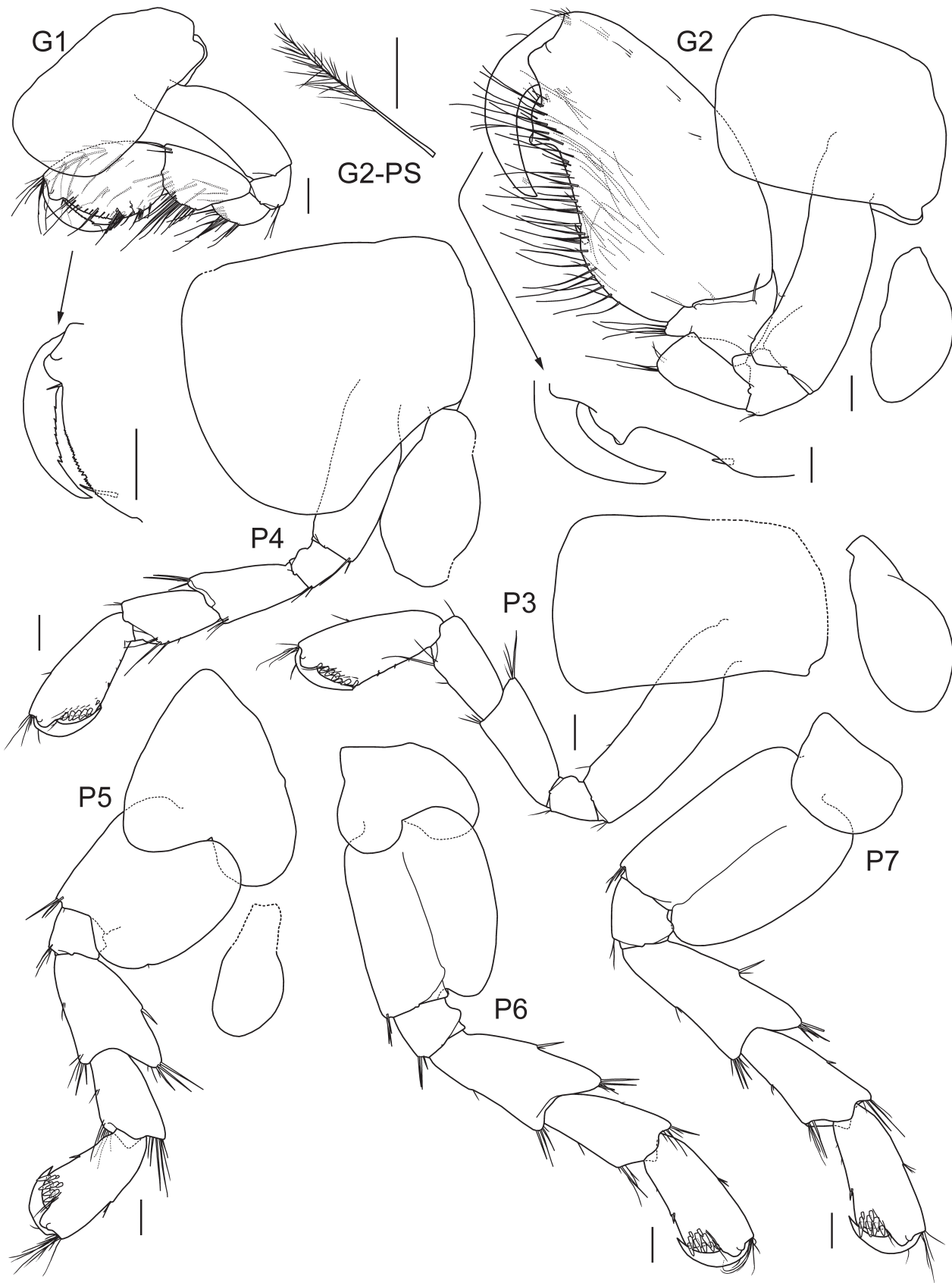
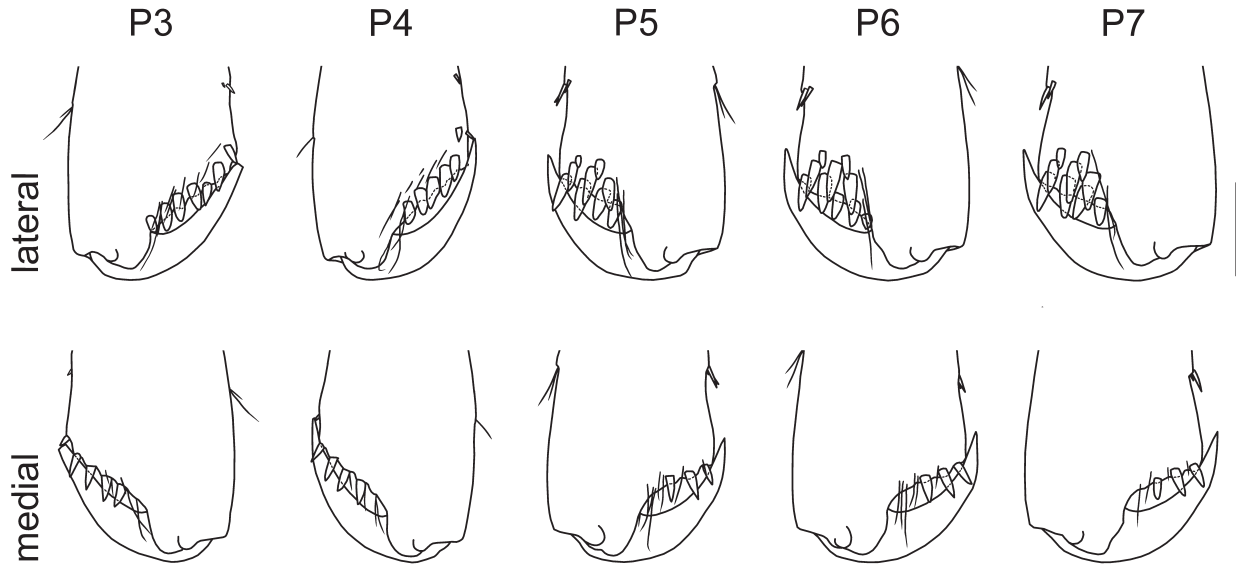


Figure 8. *Isaea concinnoides* sp. nov., holotype male, 4.8 mm, OMNH-Ar-12499. Scale bars = 0.1 mm.



**Figure 9.** *Isaea concinnoides* sp. nov., holotype male, 4.8 mm, OMNH-Ar-12499, distal parts of pereopods 3–7. Scale bars = 0.1 mm.

3 robust setae on lateral and medial surfaces, respectively. *Pereopod 7* longer than *pereopod 6*; coxa not lobate; basis subrectangular, length *ca.* 1.4 times width, posterodistal corner expanded, rounded distally, lateral surface with vertical ridge in middle, posterior half slightly bending mediolaterally; propodus widened distally, palm slightly oblique, with 2+3+4 and 3 robust setae on lateral and medial surfaces, respectively.

*Pleon* (Fig. 10). *Epimeral plates 1–3*, posterodistal corners round, weakly angular and angular, respectively; ventral margins bare. *Pleopods* slender, *pleopod 3* shortest; peduncles with 1, 5, 8 plumose setae in *pleopods 1–3*, respectively; outer rami subequal to inner rami in length, former with 9, 9, 8 articles, respectively and latter each with 7 articles. *Uropod 1*, peduncle with inter-ramal process (*ca.* 0.2 times length of peduncle), bearing 3 dorsolateral and 2 dorsomedial robust setae; outer ramus shorter than peduncle, with 2 dorsolateral, 1 dorsomedial and 4 terminal robust setae; inner ramus as long as peduncle, bearing 1 dorsolateral, 2 dorsomedial and 4 terminal robust setae. *Uropod 2 ca.* 0.85 times length of *uropod 1*; peduncle with minute inter-ramal process (*ca.* 0.08 times length of peduncle), bearing 2 dorsolateral and 1 dorsomedial robust setae; outer ramus *ca.* 0.9 times length of peduncle, with 2 dorsolateral, 1 dorsomedial and 4 terminal robust setae; inner ramus *ca.* 1.15 times length of peduncle, bearing 1 dorsolateral, 3 dorsomedial and 4 terminal robust setae. *Uropod 3 ca.* 0.75 times length of *uropod 2*; peduncle lacking inter-ramal process, bearing 1 robust and 3 short setae medioproximally, distal part with 3+3+2 robust setae; outer ramus curved laterally, *ca.* 0.75 times length of peduncle, with 1 dorsomedial robust seta and 1 terminal minute robust seta; inner ramus *ca.* 0.9 times as long as

peduncle, bearing 1 dorsolateral and 1 dorsomedial robust setae and 1 terminal minute robust seta. *Telson* roundish triangular, length *ca.* 0.9 times width, with pair of subapical cusps bearing 2 robust setae (1 long and 1 short) and a sensory seta, each lateral margin with 2 sensory setae.

**Female** (based on paratype, OMNH-Ar-12503, 3.6 mm). Immature (oostegites very small). *Gnathopod 2* (Fig. 10SF-RG2), distal process on palmer margin smaller than that of holotype.

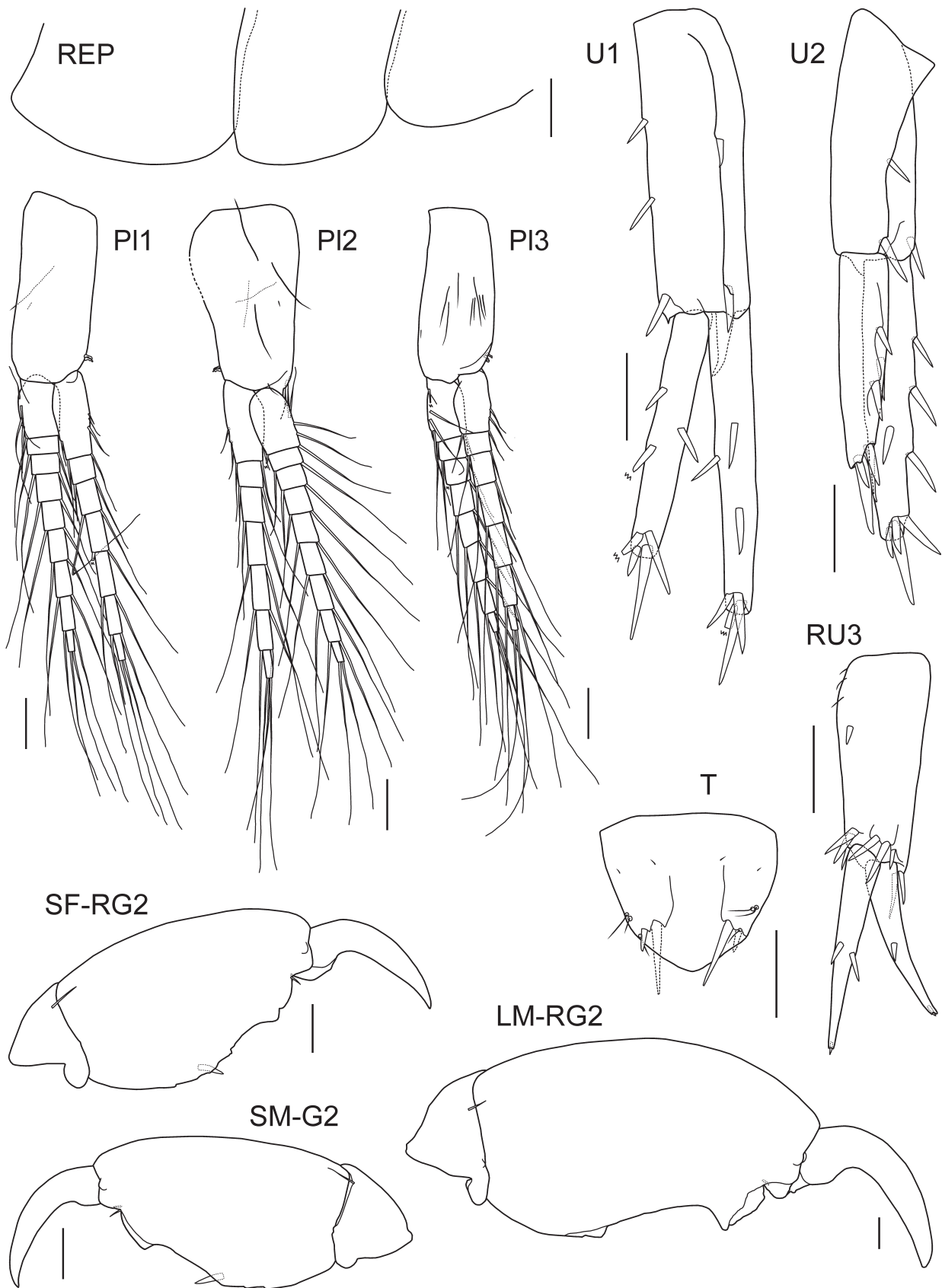
**Variation in male gnathopod 2.** Paratype, large male (OMNH-Ar-12500, *ca.* 5.6 mm; Fig. 10LM-RG2), posterodistal corner of propodus produced roundly, posterior margin with large distal and small proximal processes and without robust seta. Paratype, small male (OMNH-Ar-12501, 3.4 mm; Fig. 10SM-G2), distal process on palmar margin small.

**Colour in life** (Fig. 11). Eyes black (they appear silver in the figure probably due to reflection of light). Body almost translucent, with poorly-defined pale yellow bands, pale brown internal organs visible.

**Remarks.** *Isaea concinnoides* sp. nov. is quite different from *I. elmhirsti* and *I. montagui* in the shape of the male gnathopod 2. The male gnathopod 2 of the new species closely resembles that of *I. concinna*; however, *I. concinnoides* can be distinguished from *I. concinna* by the relatively stout antennae with short setae (slender, with long setae in *I. concinna*) and the oval basis of *pereopod 5* (subrectangular in *I. concinna*).

**Habitat.** Bottom sediment unknown, 190–380 m depth, associated with *Propagurus obtusifrons*.

**Distribution.** Japan: Kumano-nada (present study).



**Figure 10.** *Isaea concinnoides* sp. nov.: holotype male, 4.8 mm, OMNH-Ar-12499 (except for LM, SM, and SF); LM: paratype male, ca. 5.6 mm, OMNH-Ar-12500; SM: paratype male, 3.4 mm, OMNH-Ar-12501; SF: paratype female, 3.6 mm, OMNH-Ar-12503. Slender setae of gnathopods omitted. Scale bars = 0.1 mm.



**Figure 11.** *Isaea concinnoides* sp. nov., paratype male, ca. 5.6 mm, OMNH-Ar-12500, photographed in aquarium, T. Moritaki.

### Key to species of *Isaea* Milne Edwards, 1830

- |   |   |                                 |
|---|---|---------------------------------|
| 1 | Accessory flagellum with 3–6 articles, carpus of gnathopod 2 long (0.50–0.65 times length of propodus) .....            | 2                               |
| — | Accessory flagellum with 2 articles, carpus of gnathopod 2 short (0.15–0.25 times length of propodus) .....             | 3                               |
| 2 | Eyes very large; epimeral plate 3 with posterodistal tooth, posterior margin almost straight .....                      | <i>I. montagui</i>              |
| — | Eyes medium-sized; epimeral plate 3 bearing minute posterodistal tooth with inset setule, posterior margin convex ..... | <i>I. elmhirsti</i>             |
| 3 | Antennae slender, with long setae on posterior margins, basis of pereopod 5 subrectangular .....                        | <i>I. concinna</i>              |
| — | Antennae relatively stout, with short setae on posterior margins, basis of pereopod 5 oval .....                        | <i>I. concinnoides</i> sp. nov. |

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