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New genus and new species of Caprellidae (Crustacea: Peracarida: Amphipoda) from the mesophotic coral ecosystems of Puerto Rico and St. Croix, Caribbean Sea

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Abstract

A new genus and two new species are described based on material collected from the mesophotic coral ecosystems of the U.S. Caribbean. The new genus *Borikenella* can be distinguished from other related genera such as *Pseudaeginella*, *Paradeutella*, *Acicomula* and *Deutella* by the combination of the following characters: pereopods 3 and 4 three-articulate, pereopods 5–7 six-articulate, mandible molar present, palp of the mandible with a setal formula 1-x-0, abdomen without appendages. The new species *Liropus gurui*, can be distinguished from the closely related *L. japonicus* mainly by the lack of anteroventral margin extended forward in pereonite 3, the lack of cleft and serration in the propodus of gnathopod 2, the longer pereopod 3 and the larger abdominal appendages.

Key words: Caprellidae, new genus, new species, *Borikenella spinosa*, *Liropus gurui*, Puerto Rico, mesophotic reefs, Caribbean Sea

Introduction

Mesophotic coral reef ecosystems (MCEs) are warm water, light-dependent reef communities starting at 30–40 m, extending as deep as 150 m in some regions (Kahng et al., 2010). They are usually found on the insular and continental slopes of islands and are visually dominated by macroalgae, sponges and scleractinian corals (Sherman et al., 2010). Despite their close proximity to well-studied coastal coral reefs, MCEs remain poorly understood due to the logistical difficulties and safety issues of working near or below the depth limits of recreational SCUBA diving (Menza et al., 2008). Although MCE studies reveal extensive, productive habitats and rich communities, which differ significantly from their shallow-water counterparts, information regarding the taxonomic composition, depth range, and habitat preferences of MCE species is very scarce compared to shallow-water reefs (Kahng et al., 2010). New diving technology that combines Tri-Mix Diving and Rebreathers allows divers to safely collect specimens from these depths. This method is advisable because it offers an alternative approach to benthic collections compared to the more destructive method of dredging (Petrescu et al., 2012). As for the majority of small peracarids (e.g. Senna et al., 2014), caprellids have not been properly studied in MCE environments, and most of the studies have been focused in waters shallower than 30–40 meters.

The Caribbean Sea is a large sea, closed off to the West and to the South by the Americas, and bordered to the North and to the East by the islands chains of the Greater and Lesser Antilles (Spalding, 2004). It covers about 2,754,000 km², has a volume of 6.5 x 10⁶ km³, borders over 13,500 km of coastline, and is home to 12 island countries, nine continental countries, and 12 island dependencies (to France, the Netherlands, UK and USA (Martin et al., 2013). During the last few years, several studies dealing with shallow waters caprellids from the Caribbean Sea have been published, focused on Venezuela (Guerra-García, 2003a; Díaz et al., 2004), Colombia

(Guerra-García et al., 2005) and Cuba (Ortiz et al., 2009). The regional diversity of Amphipoda in the Caribbean Sea has been recently reviewed (Martin et al., 2013) with a total of 25 caprellid species in 12 genera recorded in the area. Of these, more than 30% could be considered endemic for the region (Martin et al., 2013). Most of the studies are focused on shallow coastal waters, whereas no previous studies have focused on caprellids from the mesophotic environment.

During a NOAA funded program (DeepCres) and subsequent research cruises (Sherman et al. 2013), general surveys were carried out to characterise the macrofauna biodiversity in mesophotic habitats of Puerto Rico and US Virgin Islands. These surveys yielded several caprellid specimens corresponding to two undescribed species, one belonging to the genus *Liropus*, and the other belonging to an undescribed genus, herein described as *Borikenella*.

The new taxa discovered indicate the lack of knowledge of caprellid diversity from mesophotic environments and the need for extensive collections in these areas to properly characterise the global biodiversity of coral reef ecosystems.

Material and methods

Materials studied in this paper were collected near the shelf edge of southwest Puerto Rico by personnel from the University of Puerto Rico-Mayagüez, Department of Marine Sciences (UPRM-DMS) during the 2011–2013 mesophotic cruises (Sherman et al. 2013). Divers equipped with Tri-Mix Rebreathers collected substrata (loose rubble, corals, sponges, algae). The loose substrata were placed over 1 mm and 0.125 mm sieves and washed with filtered seawater; the materials retained on the 0.125 mm sieve were examined for meiofauna and small macrofauna. The caprellids were sorted and preserved in ethanol 100%. For morphological observations, the caprellids were dissected in glycerine and all dissected appendages were mounted in polyvinyl-lactophenol. The figures were drawn using a Leica compound microscope equipped with a camera lucida. Body length was measured from the anterior end of the head to the posterior end of pereonite 7. The symbols used in the present work are: A1, 2 = Antenna 1, 2; LL = Lower lip; LMd = Left mandible; RMd = Right mandible; Mx 1, 2 = Maxilla 1, 2; Mxp = Maxilliped; Gn 1, 2 = Gnathopod 1, 2; P 5–7 = Pereopod 5–7; Ab = Abdomen. In the descriptions, the term “spine” is used for stout, inflexible articulated structures, “seta” for slender, flexible articulated structures and “setule” for very short setae. Specimens of the new species are deposited in the collections of the Museo Nacional de Ciencias Naturales (MNCN), Madrid, Spain.

Systematics

(see classification of Lowry and Myers, 2013)

Superfamily Caprelloidea Leach, 1814

Family Caprellidae Leach, 1814

Subfamily Caprellinae Leach, 1814

Borikenella gen. nov.

Diagnosis. Flagellum of antenna 1 more than 2-articulate. Flagellum of antenna 2 two-articulate, swimming setae absent. Gills on pereonites 3 and 4. Pereopods 3 and 4 three-articulate. Pereopods 5–7 six-articulate. Mandible molar present; palp 3-articulate, setal formula for distal article 1-x-0. Outer plate of maxilliped longer than inner plate. Abdomen without appendages.

Type species. *Borikenella spinosa* sp. nov.

Etymology. The original inhabitants of Puerto Rico were the Taino Indians who came originally from South America between 3000 and 2000 B.C. *Boriken* was the name given by the Tainos to Puerto Rico, and means “the great land of the valiant and noble lord”. The suffix *-ella* (latin) means little and it has been often used for caprellid genera (*Caprella*, *Deutella*, *Pseudaeginella*, *Pseudoprotella*, etc.).

***Borikenella spinosa* sp. nov.**

(Figs. 1–6)

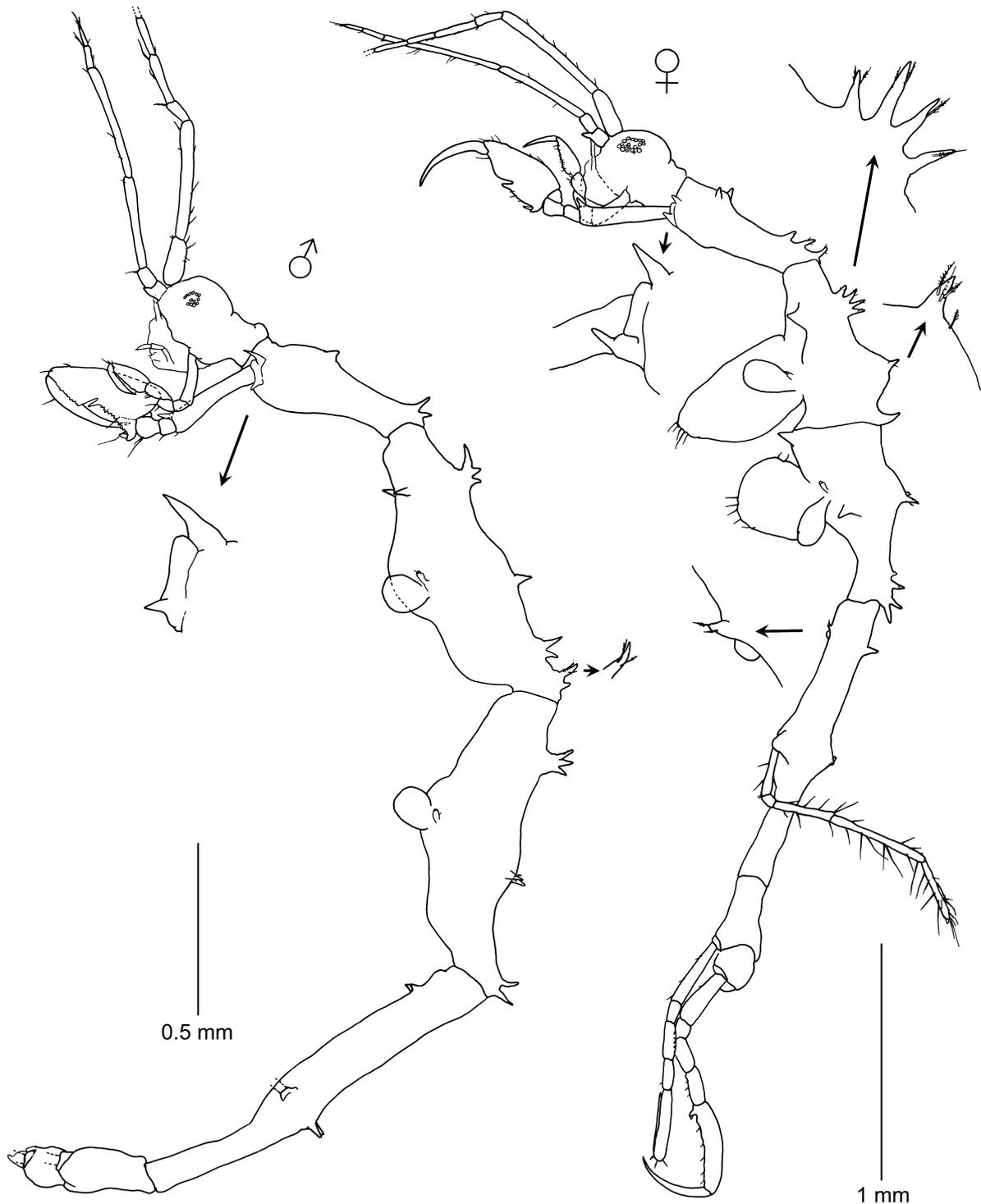


FIGURE 1. *Borikenella spinosa* gen. nov., sp. nov. Lateral view of holotype male, 4.2 mm, and paratype female “a”, 4.1 mm.

Type material. Holotype, male 4.2 mm (used for drawings of lateral view, antennae, gnathopods, pereopods 3–4, mouthparts and abdomen) (vial and two slides, mouthparts dissected) (vial: MNCN 20.04/10061, slides: MNCN 20.04/10062, 20.04/10063) Abrir la Sierra, GPS coordinates N 18.76197, W –67.15696, W Puerto Rico, Caribbean Sea, 70 meters depth, 26 April 2012. All specimens, except paratype “a”, were collected during the 2012 Mesophotic Cruise organized by the Caribbean Coral Reef Institute (CCRI) with the vessel Spree (Sherman et al. 2013).

Paratype "a", female 4.1 mm (used for drawings of lateral view, gnathopod 2, pereopods 3–7 and abdomen) (vial and one slide, mouthparts not dissected) (vial: MNCN 20.04/10064, slide: MNCN 20.04/10065), Weinberg, La Parguera, GPS coordinates N 17.890440 W -66.989020, SW Puerto Rico, Caribbean Sea, 45 meters depth, 13 March 2008.

Paratype "b", male 3.6 mm (vial and one slide, mouthparts dissected) (vial: MNCN 20.04/10066, slide: MNCN 20.04/10067), Abrir la Sierra, GPS coordinates N 18.76197, W -67.15696, W Puerto Rico, Caribbean Sea, 70 meters depth, 26 April 2012.

Paratype "c", female 3.3 mm (vial and one slide, mouthparts dissected) (vial: MNCN 20.04/10068, slide: MNCN 20.04/10069), Abrir la Sierra, GPS coordinates N 18.76197, W -67.15696, W Puerto Rico, Caribbean Sea, 70 meters depth, 26 April 2012.

Paratype "d", female 2.9 mm (vial and one slide, mouthparts dissected) (vial: MNCN 20.04/10070, slide: MNCN 20.04/10071), Abrir la Sierra, GPS coordinates N 18.76197, W -67.15696, W Puerto Rico, Caribbean Sea, 70 meters depth, 26 April 2012.

Other paratypes (not dissected): 4 juveniles (MNCN 20.04/10072, 20.04/10073, 20.04/10074, 20.04/10075), Weinberg La Parguera, GPS coordinates N 17.890440 W -66.989020, SW Puerto Rico, Caribbean Sea, 45 meters depth, 13 March 2008; 2 juveniles (MNCN 20.04/10076, 20.04/10077), Bajo de Sico, GPS coordinates N 18.23075, W -67.43177, W Puerto Rico, Caribbean Sea, 50 meters depth, 28 April 2012; 2 females (MNCN 20.04/10078, 20.04/10079), Tourmaline, GPS coordinates N 18.17530, W -67.32730, W Puerto Rico, Caribbean Sea, 54 meters depth, 29 April 2012.

Additional material examined. 5 females collected from Weinberg La Parguera, GPS coordinates N 17.890440 W -66.989020, SW Puerto Rico, Caribbean Sea, 45 meters depth, 13 March 2008; 2 males, 1 female, 1 juvenile collected from Salt River Canyon, St. Croix. U.S. Virgin Islands, GPS coordinates N 17.78689, W -64.75856, Caribbean Sea, 70 meters depth, 4 May 2012; 1 male (immature), 3 females (premature), 1 juvenile collected from Hole-in-the-Wall, La Parguera, GPS coordinates N 17.88476, W -67.02192, SW Puerto Rico, Caribbean Sea, 90 meters depth, 8 June 2010.

Diagnosis. Eyes present. Head, pereonite 1, 6 and 7 smooth. Pereonites 2–5 with abundant projections. Gnathopod 1 with one grasping spine. Basis of gnathopod 2 shorter than pereonite 2. Propodus of gnathopod 2 triangular in males. Pereopod 3 and 4 three-articulate. Pereopod 5 (morphologically different to pereopod 6 and 7) six-articulate, elongate and provided with long setae; distal article reduce to a very small cone. Molar of the mandibles fully developed. Distal article of the mandibular palp provided with setae and small tubercle. Abdomen without appendages

Etymology. The specific name '*spinosa*' indicates the abundant projections along the body in this species.

Description. Holotype male (4.2 mm)

Lateral view (Fig. 1). Head rounded, lacking any projections, eyes present and distinctive. Pereonite 1 fused with head, suture present. Head and pereonite 1 smooth. Pereonite 2 with a dorsal projection medially, two distal projections and a lateral projection near the coxa. Coxa of gnathopod 2 with a small acute projection ventrally. Pereonites 3 and 4 similar in size and shape provided with two ventral projections proximally and numerous projections dorsally. Some of these projections start from the same base. Pereonite 5 with two ventral projections proximally and two dorsal projections medially. Pereonite 5 the longest. Pereonite 7 the shortest.

Gills (Fig. 1). Present at middle of pereonites 3–4, small and oval, length about 1.2 times width.

Mouthparts (Fig. 2). Mandibles with tritritive molar, moderately developed and dentate marginally. Three-articulate palp; distal article of palp the longest, with a setal formula 1-x-0, being x=4, with presence of small tubercles besides the setae, medial article provided with a single setae; left mandible with incisor and lacinia mobilis five-dentate, followed by three accessory blades; incisor of right mandible five-dentate, lacinia mobilis looking like a blade, followed by two more blades; no sign of molar flake. Lower lip without setae; inner lobes with rectangular margin. Maxilla 1 outer lobe carrying seven spines distally serrate, palp two-articulate, distal article with three apical spines and two medial seta. Maxilla 2 inner lobe small, shorter than outer lobe, both with four apical setae. Maxilliped inner plate small and rectangular, about 1/3 of outer plate in length, carrying two setae and a short and blunt spine; outer plate oval, with two apical setae and three medial setae; palp four-articulate, scarcely setose, distal article (dactylus) curved.

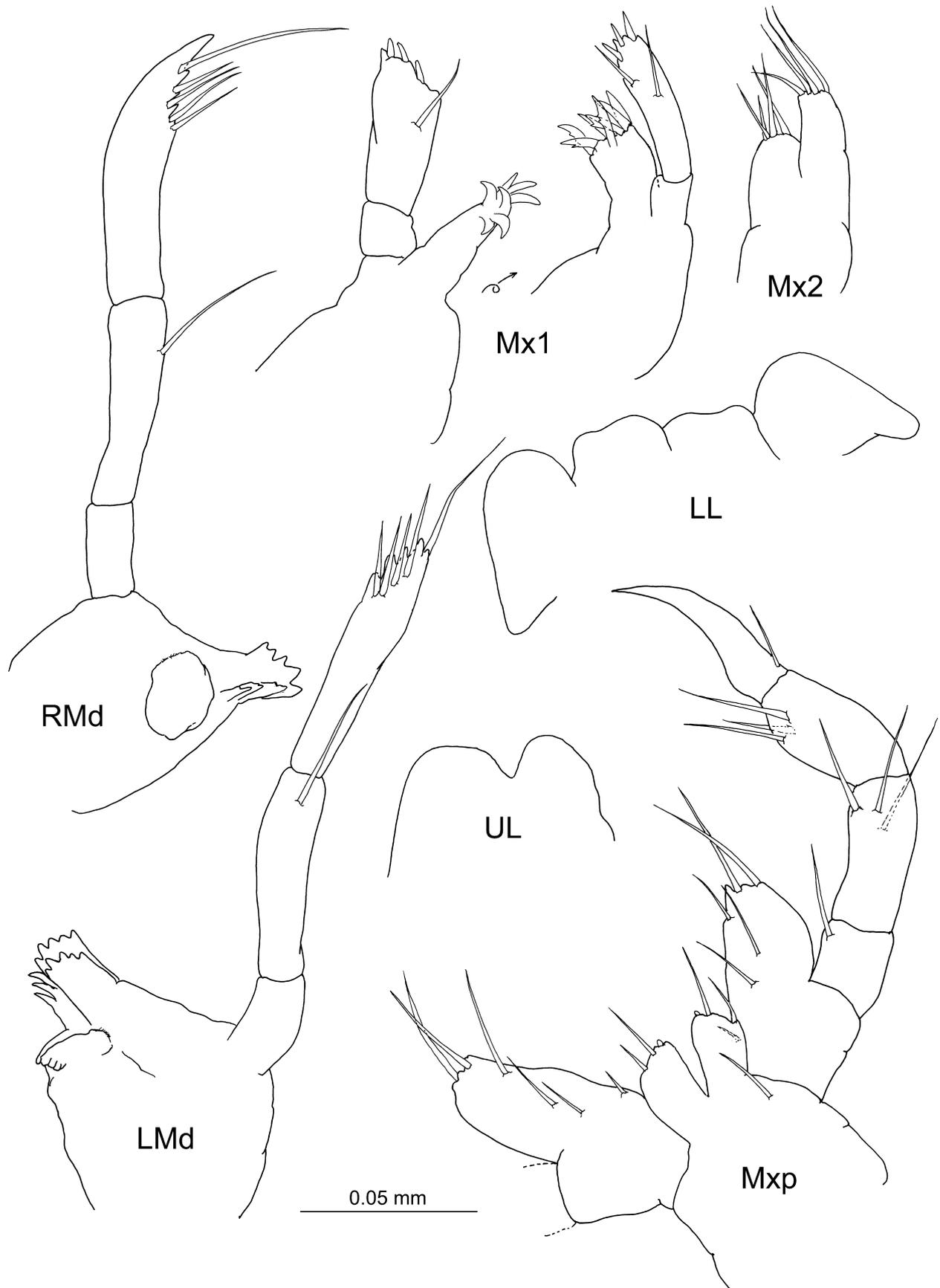


FIGURE 2. *Borikenella spinosa* gen. nov., sp. nov. Mouthparts of holotype male, 4.2 mm.

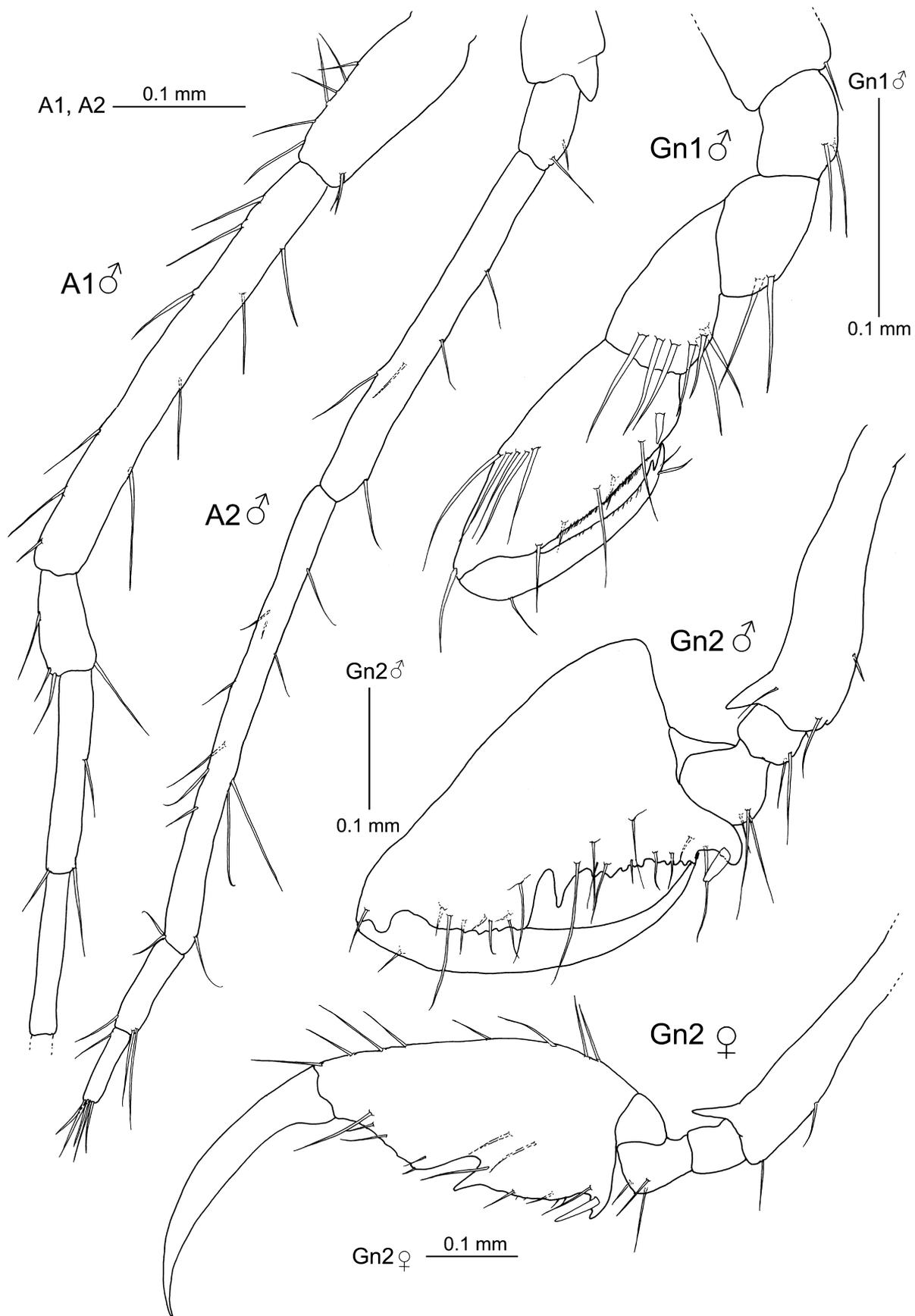


FIGURE 3. *Borikenella spinosa* gen. nov., sp. nov. Antennae, gnathopod 1 and 2 of holotype male, 4.2 mm. Gnathopod 2 of paratype female “a”, 4.1 mm.

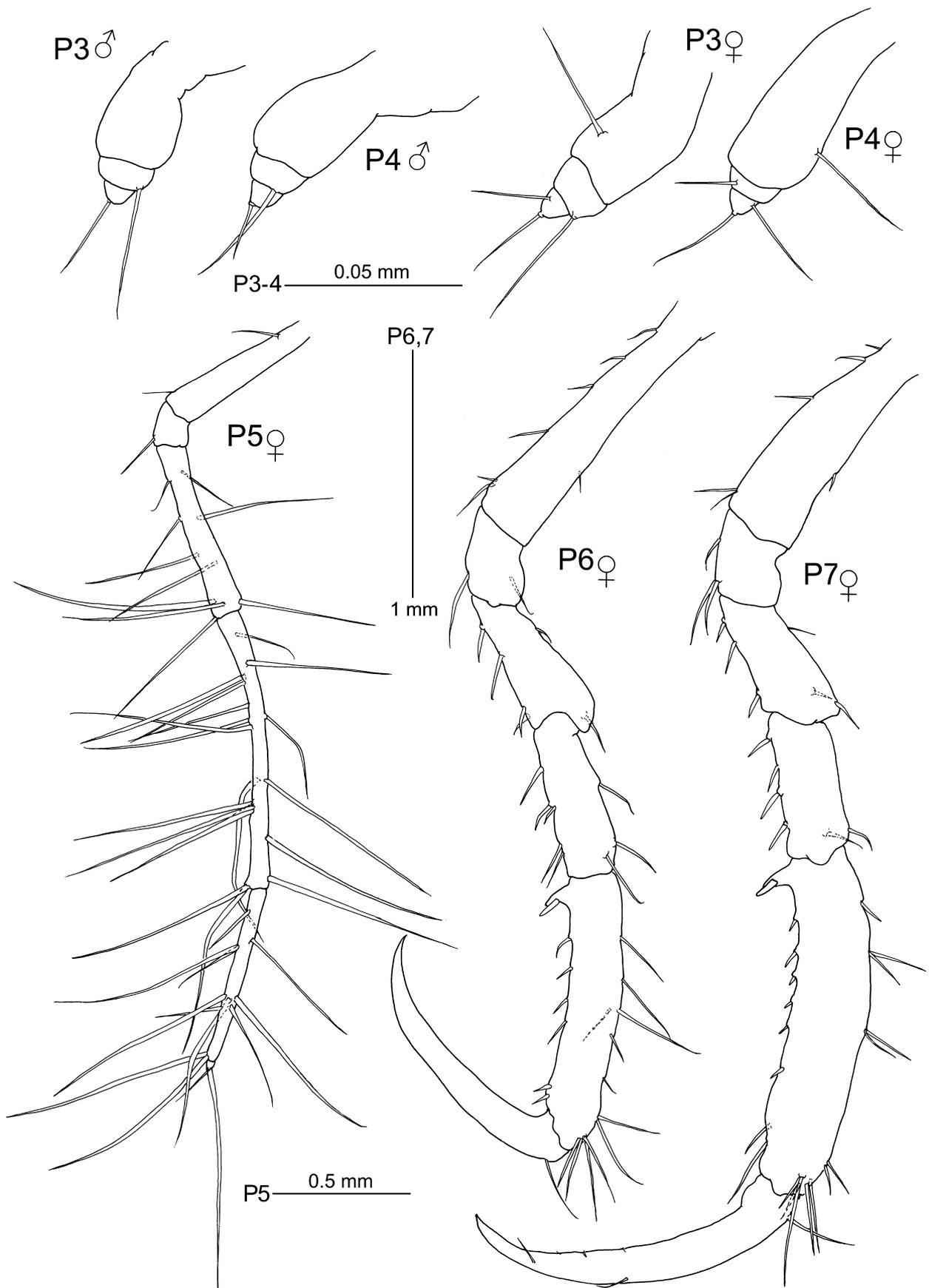


FIGURE 4. *Borikenella spinosa* gen. nov., sp. nov. Pereopods 3 and 4 of holotype male, 4.2 mm. Pereopods 3–7 of paratype female “a”, 4.1 mm.

Antennae (Figs. 1 and 3). Peduncle of antenna 1 of the same length that head and pereonites 1 and 2 combined; second article the longest; third article shorter than the articles of the flagellum; flagellum broken. Antenna 2 longer than peduncle of antenna 1; proximal peduncular article with a well developed acute gland cone distally; swimming setae absent; flagellum two-articulate.

Gnathopods (Figs. 1 and 3). Gnathopod 1 basis of the same length than the combination of ischium, merus and carpus; grasping margin of propodus with minute setulae; one proximal grasping spine, dactylus bifid distally. Gnathopod 2 inserted on the anterior end of pereonite 2; basis shorter than pereonite 2, with a distal acute projection; ischium small rectangular; merus rounded; carpus short and triangular; propodus of gnathopod 2 unique, with triangle shape, palm slightly setose, with proximal projection provided with one large grasping spine, followed by denticulate margin, projection, U-notch and denticulate margin; dactylus smooth and elongate.

Pereopods (Figs. 1 and 4). Pereopod 3 and 4 very reduced, three-articulate; proximal article the longest, second article rectangular with a seta and third article small and conical with a seta. Pereopod 5–7 described from the female paratype “a”.

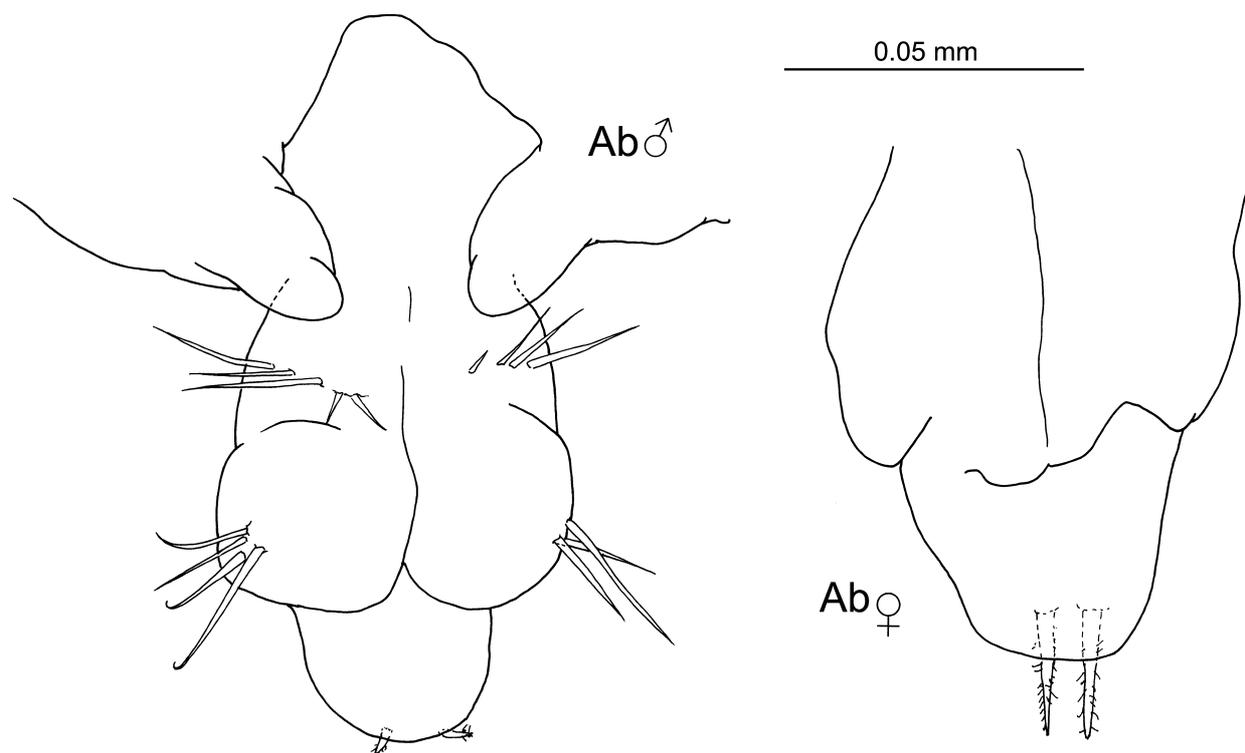


FIGURE 5. *Borikenella spinosa* gen. nov., sp. nov. Abdomen of holotype male, 4.2 mm, and paratype female “a”, 4.1 mm.

Penes (Fig. 5) large, situated laterally, distinctive, oval, length ca 2 times width.

Abdomen (Fig. 5) without appendages, with two lateral globose lobes provided with bunches of setae and a single dorsal lobe provided with two plumose setae.

Paratype female “a” (4.1 mm) (Figs. 1, 3, 4, 5)

Similar to the male except for the following characteristics: presence of oostegites on pereonites 3 and 4, both setose. Pereonite 3 and 4 with strong lateral acute projections. Gills more elongate than in males. Gnathopod 2 propodus elongate, without triangular shape, margin not denticulate. Lateral lobes of abdomen not globose, lacking setae.

Description of pereopods 5–7: Pereopod 5, morphologically different to pereopod 6 and 7, attached to the middle of pereonite 5, six-articulate, elongate and provided with long setae; distal article reduce to a very small cone; pereopod 6 and 7 attached to the posterior end of the pereonites, six-articulate, basis without carina, ischium short and rectangular, merus, carpus and propodus palm carrying row of robust setae, propodus with a proximal grasping spine, dactylus elongate. Pereopod 7 longer and more robust than pereopod 6.

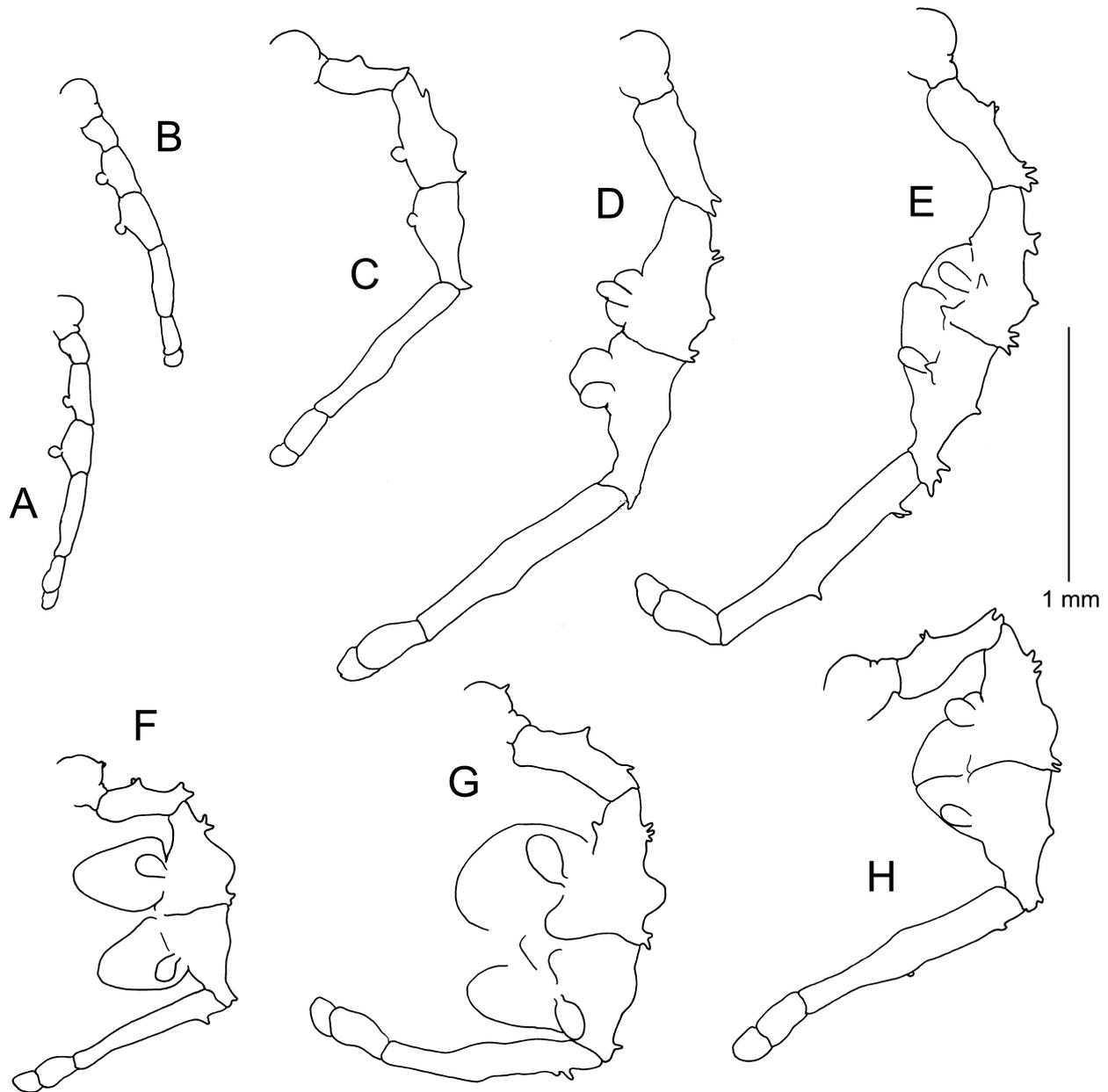


FIGURE 6. *Borikenella spinosa* gen. nov., sp. nov. Variation in size and body projections. A, B: juveniles; C: immature male; D, E: premature females; F-H: mature females.

Intraspecific variation. The morphological characteristics of the species are rather constant in all the specimens examined. The number or location of the dorsal and lateral acute projections can change depending on the specimens and along the developmental stage. Some specimens are provided with one or two small acute projections on the head (Fig. 6 F, G). The first stages of development lack projections (Fig. 6 A, B). Antennae I flagellum was broken in most of the specimens, but at least, five articles were maintained in some specimens. Mouthparts were similar in the four specimens dissected, and all of them showed the same formula in the mandibular palp, 1-x-0, being x=4 in most of specimens, with x=3 and x=5 in some individuals. The number of articles of pereopods 3–7 did not change along the development, being always pereopods 3 and 4 three-articulate and pereopod 5–7 six-articulate. The size of females was variable, with some premature females being larger (3–4 mm) (e.g. Fig. 6D) than some mature females with very reduced size (2–3 mm) (e.g. Fig. 6F).

Remarks. *Borikenella spinosa* resembles externally some species of the genus *Deutella* (such as *Deutella caribensis* Guerra-García, Krapp-Schickel & Müller, 2006) or *Aciconula*, especially based on the weak pereopod 5, very elongated and provided with long setae. However, *Borikenella* and *Deutella* clearly differ in that *Deutella* furnishes abdominal appendages (Guerra-García, 2003a), which are lacking in *Borikenella*. *Aciconula* is very closely related to *Borikenella*, but they differ in the number of articles of pereopods 3 and 4 and the shape and length of antennae and pereopods 5–7 (see Guedes-Silva & Souza-Filho, 2013). Although mouthparts are rather similar in both genera, the mandible molar is very small in most *Aciconula* species (Guedes-Silva & Souza-Filho, 2013), while it is well developed in *Borikenella*; the size and shape of maxilliped plates also differ significantly between these two genera. *Borikenella* is also similar to *Pseudaeginella* in the abdomen structure, but these two genera can be clearly distinguished in that *Pseudaeginella* lacks mandible molar (Guerra-García et al., 2006). The abdomen (lacking appendages) is also similar in *Paradeutella*, but *Borikenella* can be differentiated from *Paradeutella* in that pereopods 3 and 4 are 3-articulate instead of 1-articulate in *Paradeutella* (see Laubitz, 1991); furthermore, the setal formula of the mandibular palp also differs, being 1-x-1 in *Paradeutella* and 1-x-0 in *Borikenella*. In fact, the formula 1-x-0 is unique in caprellids, since they usually have one long seta followed by one or two rows of shorter setae and another long seta (formulas 1-x-1 or 1-x-y-1) or there are only one or two apical setae. But the presence of a long seta, followed by a row of setae and lack of another long seta on the mandibular palp is a synapomorphy of the new genus *Borikenella*.

Genus *Liropus* Mayer, 1890

Liropus gurui sp. nov.

(Figs. 7–10)

Type material. *Holotype*, male 4.4 mm (used for drawings of lateral view, antennae, gnathopods, pereopods 3–5 and abdomen) (vial and one slide, mouthparts dissected) (vial: MNCN 20.04/10080, slide: MNCN 20.04/10081), Abrir la Sierra, GPS coordinates N 18.76197, W -67.15696, W Puerto Rico, Caribbean Sea, 70 meters depth, 26 April 2012. All specimens, except those from La Parguera, SW Puerto Rico were collected during the 2012 mesophotic cruise organized by the CCRI-DMS-UPRM team (Sherman et al. 2013).

Paratype “a”, female 3.5 mm (used for drawings of lateral view, gnathopod 2, pereopods 3–4 and abdomen) (vial and one slide, mouthparts not dissected) (vial: MNCN 20.04/10082, slide: MNCN 20.04/10083), Salt River Canyon, St. Croix. U.S. Virgin Islands, GPS coordinates N 17.78689, W -64.75856, Caribbean Sea, 70 meters depth, 4 May 2012.

Paratype “b”, male 2.3 mm (used for drawings of mouthparts) (vial and one slide, mouthparts dissected) (vial: MNCN 20.04/10084, slide: MNCN 20.04/10085), Bajo de Sico, GPS coordinates N 18.23075, W -67.43177, W Puerto Rico, Caribbean Sea, 50 meters depth, 28 April 2012.

Paratype “c”, male 2.1 mm (used for drawings of pereopods 6–7) (vial and one slide, mouthparts not dissected) (vial: MNCN 20.04/10086, slide: MNCN 20.04/10087), Precipicio, La Parguera, GPS coordinates N 17.87516, W -67.04882, SW Puerto Rico, Caribbean Sea, 50–55 meters depth, 24 February 2011.

Paratype “d”, female 2.5 mm (vial and one slide, mouthparts dissected) (vial: MNCN 20.04/10088, slide: MNCN 20.04/10089), Bajo de Sico, GPS coordinates N 18.23075, W -67.43177, W Puerto Rico, Caribbean Sea, 50 meters depth, 28 April 2012.

Paratype “e”, female 1.9 mm (vial, mouthparts not dissected) (vial: MNCN 20.04/10090), Bajo de Sico, GPS coordinates N 18.23075, W -67.43177, W Puerto Rico, Caribbean Sea, 50 meters depth, 28 April 2012.

Additional material examined. 1 mature male and 2 mature females collected from Tourmaline, GPS coordinates N 18.17530, W -67.32730, W Puerto Rico, Caribbean Sea, 54 meters depth, 29 April 2012; 1 mature female collected from Weinberg, La Parguera, GPS coordinates N 17.890440 W -66.989020, SW Puerto Rico, Caribbean Sea, 45 meters depth, 13 March 2008; 1 premature female collected from Precipicio, La Parguera, GPS coordinates N 17.87516, W -67.04882, SW Puerto Rico, Caribbean Sea, 50–55 meters depth, 24 February 2011.

Diagnosis. Eyes present, but with few ommatidia. Body dorsally smooth except for a dorsal acute projection located distally on pereonite 4. Anterolateral projections absent. Flagellum of antenna 1 two-articulate. Basis of gnathopod 2 shorter than pereonite 2. Pereopods 3 and 4 one-articulate. Pereopods 5 two-articulate. Abdomen with a pair of very short appendages in males, reduced to strong setae in females.

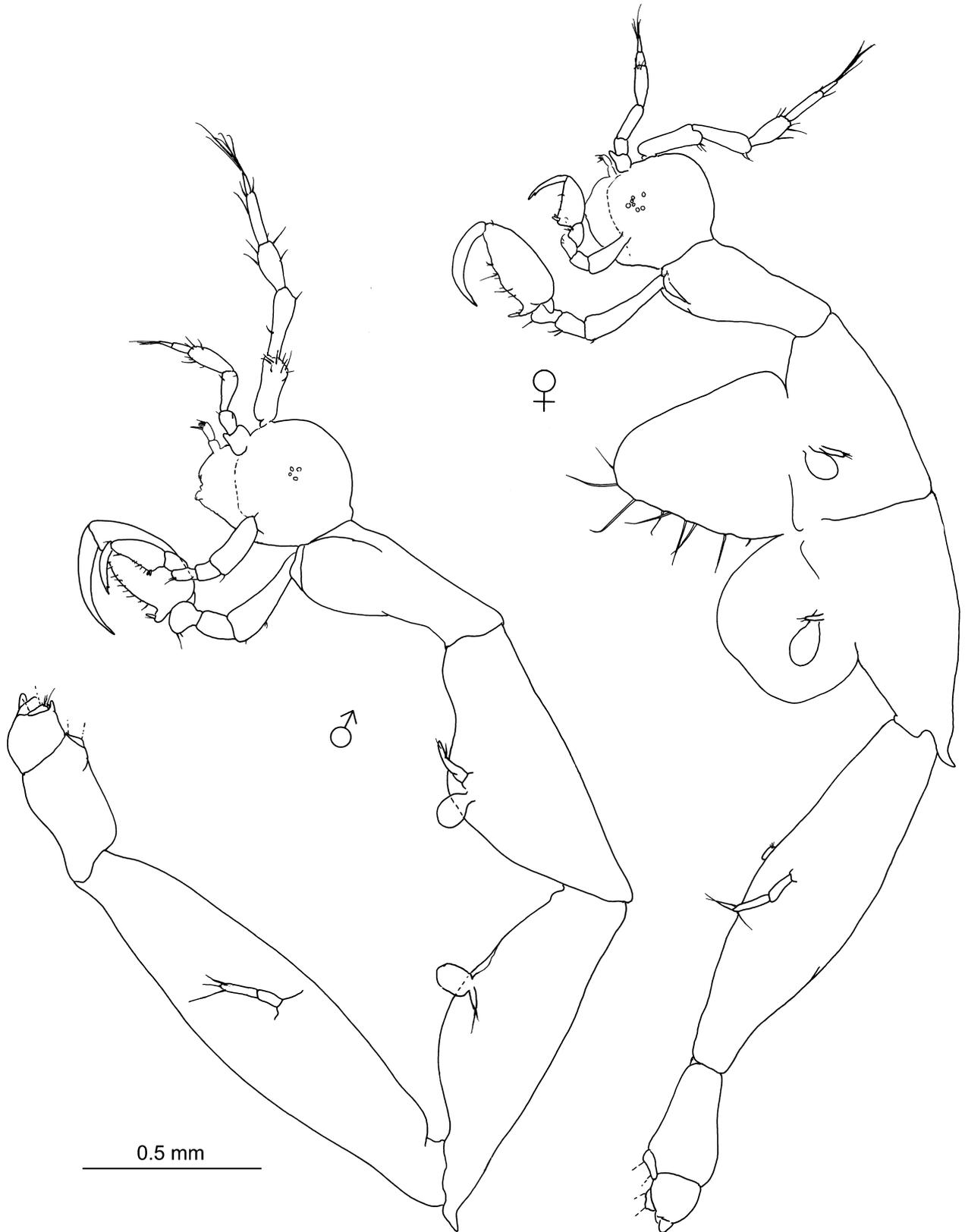


FIGURE 7. *Liropus gurui* sp. nov. Lateral view of holotype male, 4.4 mm, and paratype female “a”, 3.5 mm.

Etymology. The species is dedicated in honour of Prof. B. C. Guru, Utkal University, Bhubaneswar, Orissa, India, D. Sc. Thesis advisor of the second author (TC).

Description. Holotype male (4.8 mm)

Lateral view (Fig. 7). Body dorsally smooth except for a dorsal acute projection located distally on pereonite 4. Head rounded, lacking any projections, eyes present but with few ommatidia. Pereonite 1 fused with head, suture indistinct. Pereonites 2, 3 and 4 without anterolateral projections. Pereonite 5 the longest. Pereonite 7 the shortest.

Gills (Fig. 7). Present at middle of pereonites 3–4, small and oval, length about 1.5 times width.

Mouthparts (Fig. 8, figured and described from the male paratype “b”). Mouthparts remarkably small (ca. 0.05 mm). Mandibles with tritritive molar, moderately developed and dentate marginally. Three-articulate palp; distal article of palp the longest, with a setal formula 1-x-1, being $x=4$; left mandible with incisor and lacinia mobilis five-dentate, followed by two accessory blades; incisor of right mandible five-dentate, lacinia mobilis looking like a blade, followed by two more blades; no sign of molar flake. Lower lip without setae; inner lobes small and globose, almost fused. Maxilla 1 outer lobe carrying six spines, palp two-articulate, distal article with three apical spines and one medial seta. Maxilla 2 inner lobe small, shorter than outer lobe, both with two apical setae. Maxilliped inner plate small, about 1/5 of outer plate in length, carrying two setae; outer plate oval, with five setae; palp four-articulate, third article the longest, with four setae and lacking distal projection; dactylus with two setulae distally.

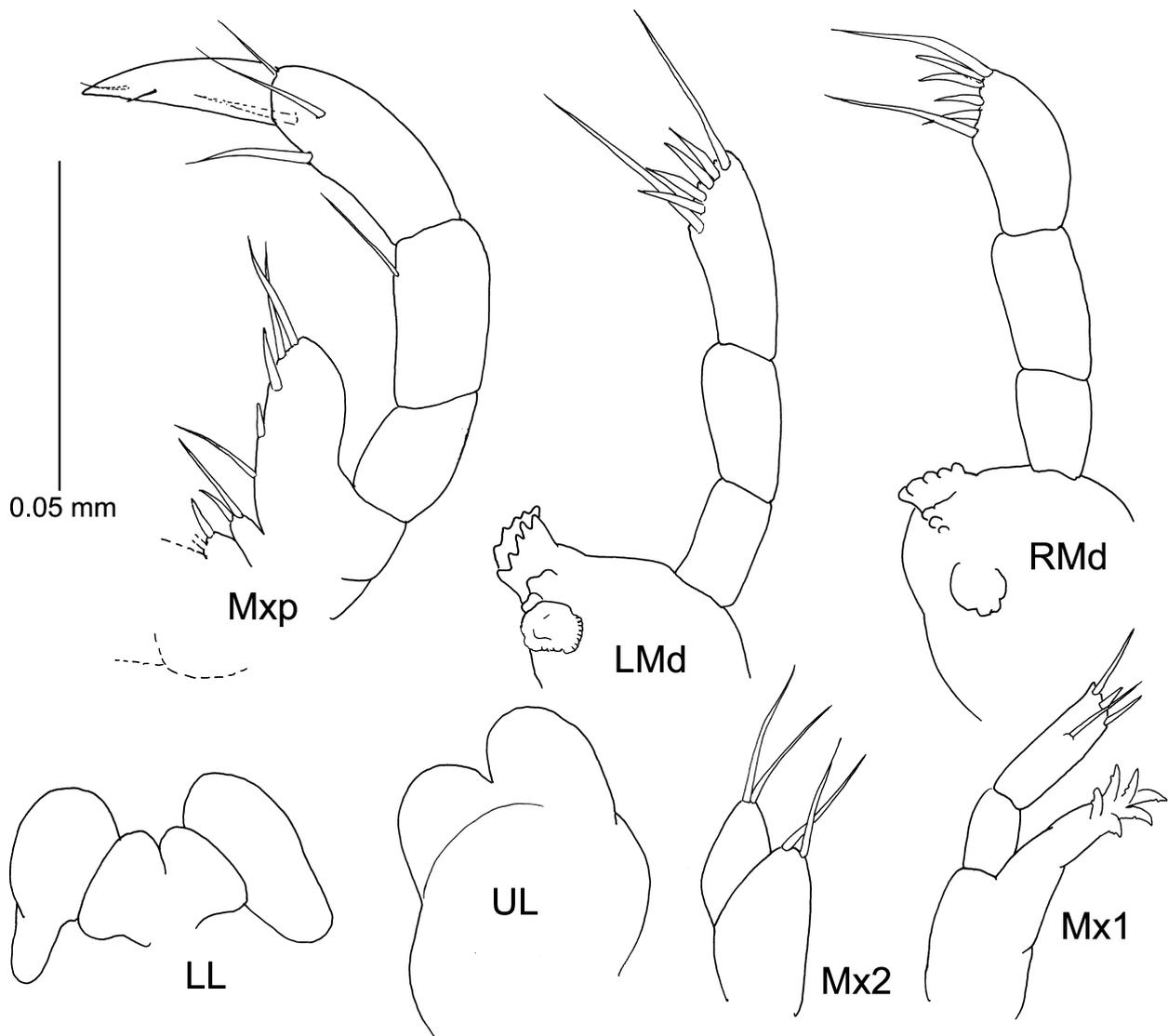


FIGURE 8. *Liopos gurui* sp. nov. Mouthparts of paratype male “b”, 2.3 mm.

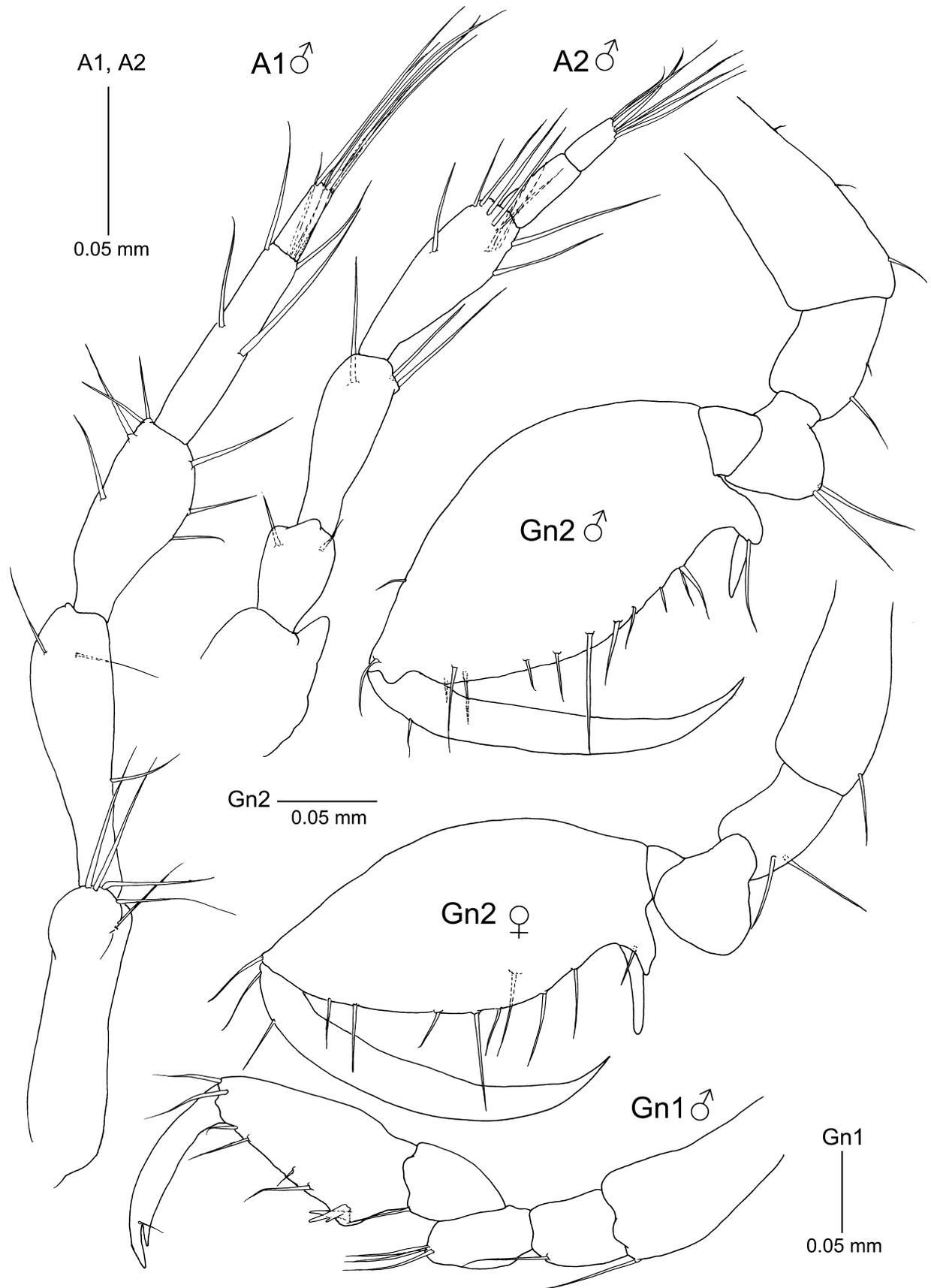


FIGURE 9. *Liropus gurui* sp. nov. Antennae, gnathopod 1 and 2 of holotype male, 4.4 mm. Gnathopod 2 of paratype female “a”, 3.5 mm.

Antennae (Figs. 7 and 9). Antenna 1 ca. 1/5 of body length; peduncular article 1 with lateral bulge at distal end bearing several setae; peduncular articles 2 and 3 swollen distally; flagellum 2-articulate, longer than peduncular article 3, provided with long setae. Antenna 2 shorter than peduncle of antenna 1; peduncular articles 3–4 slightly swollen distally, proximal peduncular article with a well developed acute gland cone distally; swimming setae absent; flagellum two-articulate.

Gnathopods (Figs. 7 and 9). Gnathopod 1 basis of the same length than the combination of ischium, merus and carpus; grasping margin of propodus smooth with several setae; two proximal grasping spines, dactylus bifid distally. Gnathopod 2 inserted on the anterior half of pereonite 2; basis shorter than pereonite 2; ischium rectangular; merus rounded; carpus short and triangular; propodus elongated, palm long and convex, slightly setose, with proximal projection provided with one large grasping spine; dactylus smooth and not narrowed medially or distally.

Pereopods (Figs. 7 and 10). Pereopod 3 and 4 one-articulate, with two setae distally. Pereopod 3 larger than pereopod 4 and slightly curved upward (Fig. 7). Pereopod 5 two-articulate, inserted on the middle of pereonite 5, with 3 setae distally. Pereopod 6 and 7 figured from the male paratype “c”, attached to the posterior end of the pereonites, six-articulate, basis without carina, ischium short and rectangular, merus, carpus and propodus palm carrying row of robust setae, dactylus curved. Pereopod 7 slightly larger than pereopod 6.

Penes (Fig. 10) large, situated medially, distinctive, oval, length ca 2 times width.

Abdomen (Fig. 10) with a pair of very short appendages, provided with three setae, a pair of lobes, and a single dorsal lobe.

Paratype female “a” (3.5 mm) (Figs. 7, 9, 10)

Similar to the male, except for the following characteristics: presence of oostegites on pereonites 3 and 4, oostegites setose on pereonite 3 (Fig. 7). Pereopod 3 smaller than in male and not curved upward (Fig. 10). Abdominal appendages reduced to strong setae (Fig. 10).

Intraspecific variation. The morphological characteristics of the species are rather constant in the specimens examined. Mouthparts were similar in the three specimens dissected, except for the number of setae in the mandibular palp 1-x-1 with x varying between 3 and 5. The flagellum of antenna 1 was always provided with two articles. Pereopods 3 in immature males were morphologically similar to pereopod 4 and not enlarged and curved upward as in the holotype male.

Remarks. The genus *Liropus* was established by Mayer (1890) and presently includes eleven species: *Liropus africanus* Mayer, 1920; *L. azorensis* Guerra-García, 2004; *L. cachuchoensis* Guerra-García, Sorbe & Frutos., 2008; *L. elongatus* Mayer, 1890 (type species); *L. gracilis* Chevreux, 1927; *L. gurui* sp. nov.; *L. isabelensis* Sánchez-Moyano, García-Asencio & Guerra-García, 2015; *L. japonicus* Mori, 1995; *L. minimus* Mayer, 1890; *L. minusculus* Guerra-García & Hendrycks, 2013; and *L. nelsonae* Guerra-García, 2003b. A morphological comparison among *Liropus* species and an illustrated key of the genus is provided by Guerra-García & Hendrycks (2013) and Sánchez-Moyano et al. (2015). The new species *Liropus gurui* is closely related to *L. japonicus*. These two species are the only ones in the genus with 2-articulated flagellum of antenna 1, peduncular article 1 of antenna 1 with lateral bulge on distal end and peduncular articles 2–3 swollen distally. These characteristics of the antennae are shared with the genus *Pedoculina*, as pointed out by Mori (1995), but both genera clearly differ in that *Pedoculina* is lacking mandibular palp. On the basis of these characters of antennae 1, and differences in the morphology of the mouthparts of *P. gurui* and *P. japonicus* in comparison with the remaining species of *Liropus*, a further phylogenetic analysis in the genus *Liropus* should be necessary to explore if these two species could be assigned to a new genus or not. At the moment, taking into account that the remaining morphological characters are in agreement with the diagnosis of the genus *Liropus*, and that we can find variation in some features within the genus such as the number of articles of pereopods and abdominal appendages (see Table 1, pp. 473 in Guerra-García & Hendrycks, 2013), it is proposed to maintain these two species in the genus *Liropus*.

The most important differences between *Liropus gurui* and *L. japonicus* are: (1) pereonite 3 in *L. japonicus* has an anteroventral margin extended forward, which is lacking in *L. gurui*; (2) gnathopod 2 propodus in males of *L. japonicus* has a medial deep triangular cleft and is roughly serrate distally (see Fig. 3a, pp. 333 in Mori, 1995), while it is smooth and lacks the cleft in *L. gurui*; (3) pereopod 3 is twice as long in males of *L. gurui* than in males of *L. japonicus*; (4) inner lobes of lower lip are slightly bilobed at the middle section in *L. japonicus* and not bilobed in *L. gurui*; (5) abdominal appendages are vestigial in *L. japonicus* and slightly developed in *L. gurui*.

Most of the *Liropus* species have been collected from Atlantic or Mediterranean waters, except for *L. isabelensis*, *L. japonicus* and *L. minusculus* which have been found in the Pacific. All the species, apart from *L. nelsonae*, are distributed in the Northern Hemisphere, being more abundant in the border areas of temperate and tropical zones (see Guerra-García & Hendrycks, 2013).

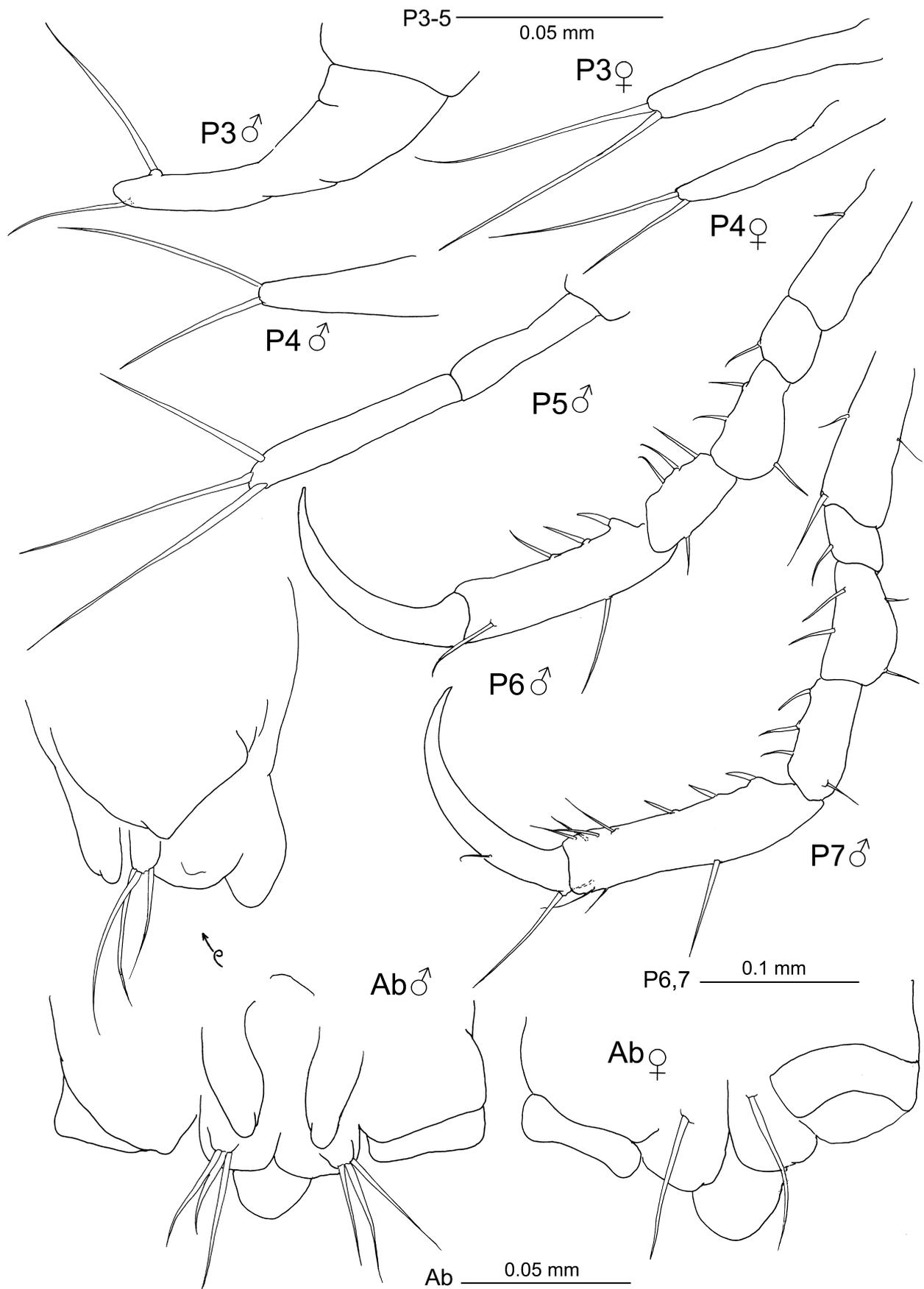


FIGURE 10. *Liropus gurui* sp. nov. Pereopods 3, 4 and 5, and abdomen (lateral and ventral view) of holotype male, 4.4 mm. Pereopods 3 and 4 and abdomen of paratype female “a”, 3.5 mm. Pereopods 6 and 7 of paratype male “c”, 2.1 mm.

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