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Macrostylis cerritus sp. nov., a new species of Macrostylidae (Isopoda: Asellota) from the Weddell Sea, Southern Ocean*

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Abstract

Macrostylis cerritus sp. nov. (Macrostylidae) is described from the Weddell Sea, Antarctica, at a depth of 2149 m. The new species differs from other species of *Macrostylis* due to the incisor with 4 cusps; the strongly hook-shaped ischium of pereopod 3; pereopod 4 being greatly reduced and juvenile in appearance; the operculum bearing a ventral spine-like seta; and the absence of pleopod 5. This species is the fourth deep-sea macrostylid identified from the Southern Ocean, and is one more species described from the specimens of ANDEEP I–III expeditions.

Key words: *Macrostylis*, Antarctica, deep sea, taxonomy

Introduction

Recent evidence indicates that a diverse and unique array of deep-sea Isopoda exists in the Southern Ocean (Brandt 2004, Brandt *et al.* 2007a,b). This is partly due to thermal and oceanographic isolation amongst other factors on the shelf (Kaiser & Brandt 2007), or due to habitat heterogeneity (e.g. grain size, drop stones or different sediments), currents and oxygen levels amongst other factors in the deep sea (e.g. Etter and Grassle 1992, Gage 1997, Levin & Gage 1998, Rex 2005, 2006). Recent ANDEEP studies have collected more than 13,000 specimens of 674 different species, 585 (86%) of which are new to science (Brandt *et al*. 2007a). These findings challenge previous knowledge of high-latitude deep-sea biodiversity, and indicate that the Southern Ocean deep-sea environment may play a greater role in ecological and evolutionary processes than previously believed.

The family Macrostylidae Hansen, 1916 is a group of specialised deep-sea asellotes comprising about 60 species in two genera worldwide: *Desmostylis* Brandt, 1992 and *Macrostylis* Sars, 1864 (Brandt 2004), both of which are present in the Antarctic deep sea. *Macrostylis* is found worldwide, with only *Macrostylis longeremis* Meiner, 1890, *M. spinifera* Sars, 1864, and *M. polaris* Malyutina & Kussakin, 1996 known from shallow continental waters, whereas the two *Desmostylis* species, *D. gerdesi* and *D. obscurus*, are exclusively Antarctic deep-sea species (Brandt 2002). The first species of the family Macrostylidae to be described from the Southern Ocean region was *M. spiniceps* Barnard, 1920, (from South African waters), and since then eight more have been described (see Table 1).

This contribution describes a new species of deep-sea *Macrostylis* from the Southern Ocean. Previously, only three *Macrostylis* species had been found in the deep Southern Ocean, but this new species is only one (species number 12) of thirty-one species of Macrostylidae (Stefanie Kaiser, personal communication)

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recovered by ANDEEP expeditions from this area still to be described. Within the framework of CeDAMar, 500 new species are planned to be described by the year 2010. Although the present contribution is only one small part of this aim, such species descriptions are an essential step in gaining knowledge of the Southern Ocean fauna so that further studies will be able to elucidate the role and importance of deep-sea communities in atmospheric processes.

TABLE 1. List of species and distribution of all Southern Ocean Macrostylidae previously described.

Species	Locality	Position	Depth (m)
Desmostylis Brandt, 1992			
D. gerdesi Brandt, 2002	Weddell Sea	71°32.90'S, 13°31.20'W	238
D. obscurus Brandt, 2002	Antarctic	65°10.5'S, 0°27.4'W	4335
Macrostylis G.O. Sars, 1864			
M. bifurcatus Menzies, 1962	S.E. Atlantic		4588–4960
M. bipunctatus Menzies, 1962	S.W. Atlantic		3954–5024
M. hirsuticaudis Menzies, 1962	S.E. Atlantic		2997
M. sarsi Brandt, 1992	Antarctic	65°10.5'S, 0°27.4'W	4335
M. setulosa Mezhov, 1992	Antarctic Ocean		757
M. spiniceps Barnard, 1920	South Africa		1280
M. vinogradovae Mezhov, 1992	Antarctic Ocean		2925

Materials and methods

Material was collected during the ANDEEP III expedition ANTXXII/3, between January and April 2005 on the RV *Polarstern* (Brandt *et al.* 2004). Samples were collected from 19 stations in the Southern Ocean deep-sea by an epibenthic sledge (EBS), with both supra- and epinet data gathered. The *Macrostylis* specimens for this description were taken from station 78-9-E, 71°09.52'S, 14°00.76'W-71°09.34'S, 13°58.85'W, at a depth of 2149 m.

Samples were immediately transferred to pre-cooled 96% ethanol on deck, and kept for 48 hours at 0°C, for DNA extraction. Specimens were sorted on board or later in the laboratory of the Zoological Museum (ZMH), Hamburg University.

The taxonomic drawings were prepared under a Leica MX 12.5 dissecting microscope and illustrated using a Leitz Wetzlar microscope with a camera lucida. The dorsal and lateral habitus drawings were made with the holotype or the paratype kept in glycerine stained with methylene green. All appendages (antennula, antenna, mouthparts, pereopods and pleopods) were dissected from a paratype and mounted in glycerine. Slides deposited in the ZMH were fixed in glycerine jelly.

Confocal Laser Scanning Microscopy (CSLM) methods were used to visualize the mandible and maxilliped of *M. cerritus*. Prior to preparation, the specimen was soaked in ethanol (96%) for a number of hours. The isopod was immersed in a droplet of glycerine, and the mandible and maxilliped dissected using a stereomicroscope (Leica MZ 12). The body parts were then placed in a drop of glycerine jelly on a microscope slide and a cover slip placed on top. This was carefully depressed in order to gain the least distance between the glass and specimen, taking care not to make contact between the two. The preparations were left at room temperature overnight in order to harden the glycerine jelly. A Leica TCS SP5 was used to view the specimens. A full method and discussion can be found in Michels (2007).

For measurements and terminology see (Hessler 1970, Watling 1989, Brandt 2002 and Brix 2007).

Abbreviations: A1 = antennula; A2 = antenna; ip = incisor; lMd = left mandible; rMd = right mandible; Mx1 = maxillula; lm = lacinia mobilis; mp = molar; Mx2 = maxilla; Mxp = maxilliped; Op = operculum; P1–7 = pereopods 1–7; Plt = pleotelson; Plp 1–5 = pleopods 1–5; Prn 1–7 = pereonites 1–7; Urp = uropods; ZMH = Zoological Museum of Hamburg.

Taxonomy

Asellota Latreille, 1803
Macrostylidae Hansen, 1916
***Macrostylis* G.O. Sars, 1864**

Synonymy: see Kussakin (1999), Mezhov (2000, 2004).

Type species: Macrostylis spinifera Sars, 1864.

Composition: *Macrostylis abyssicola* Hansen, 1916, *M. affinis* Birstein, 1963, *M. amplinexa* Mezhov, 1989b, *M. angulata* Mezhov, 1999, *M. belyaevi* Mezhov, 1989a, *M. bifurcatus* Menzies, 1962, *M. bipunctatus* Menzies, 1962, *M. birsteini* Mezhov, 1993, *M. capito* Mezhov, 1989b, *M. carribicus* Menzies, 1962, *M. carinifera carinifera* Mezhov, 1988, *M. carinifera dilatata* Mezhov, 1988, *M. compactus* Birstein, 1963, *M. curticornis* Birstein, 1963, *M. elongata* Hansen, 1916, *M. dellacrocei* Aydogan, Wägele & Park, 2000, *M. emarginata* Mezhov, 2000, *M. expolita* Mezhov, 2004, *M. foveata* Mezhov, 2000, *M. galatheae* Wolff, 1956, *M. gestuosa* Mezhov, 1993, *M. hadalis* Wolff, 1956, *M. hirsuticaudis* Menzies, 1962, *M. latifrons* Beddard, 1886, *M. lacunosa* Mezhov, 2004, *M. latiuscula* Mezhov, 2004, *M. longifera* Menzies & George, 1972, *M. longipes* Hansen, 1916, *M. longiremis* (Meinert, 1890), *M. longissima* Mezhov, 1981, *M. longiuscula* Mezhov, 1981, *M. longula* Birstein, 1970, *M. magnifica* Wolff, 1962, *M. mariana* Mezhov, 1993, *M. minutus* Menzies, 1962, *M. polaris* Malyutina & Kussakin, 1996, *M. porrecta* Mezhov, 1988, *M. rectangulata* Mezhov, 1989b, *M. reticulata* Birstein, 1963, *M. sarsi* Brandt, 1992, *M. setifer* Menzies, 1962, *M. setulosa* Mezhov, 1992, *M. spiniceps* Barnard, 1920, *M. spinifera* Sars, 1864, *M. squalida* Mezhov, 2000, *M. strigosa* Mezhov, 1999, *M. subinermis* Hansen, 1916, *M. truncatex* Menzies, 1962, *M. tumulosa* Mezhov, 1989, *urceolata* Mezhov, 1989b, *M. vemae* Menzies, 1962, *M. vigorata* Mezhov, 1999, *M. vinogradovae* Mezhov, 1992, *M. viriosa* Mezhov, 1999, *M. vitjazi* Birstein, 1963, *M. wolffi* Mezhov, 1988, *M. zenkevitchi* Birstein, 1963 and *M. cerritus* sp. nov.

Diagnosis. Body elongate, five times as long as wide. Head free, broader than long. Antennula short or minute, with 3–5 joints, with at least one thick distal aesthetasc. Molar with many setae at apex. Maxilliped palp of 5 articles. Pereopods subsimilar, pereopod 3 with ischium bearing a big dorsal lobe with a strong and acute spine at its tip; pereopod 4 with short dactylus, bearing some spine-like setae. Operculum of female oval, with some setae at caudal tip, covering the anus. Uropod uniramous, ramus length one-third of sympod, distally with broom and sensory setae.

Macrostylis cerritus sp. nov. (Figures 1–7)

Holotype: Female preparatory, length 1.8 mm, ZMH K-41431, station 78-9-E, Brenke sledge, depth 2149 m, RV Polarstern.

Paratypes: 1 subadult male, length 1.9 mm, not drawn for description, ZMH K-41432, allotype, same sample data as holotype; 3 females, ZMH K-41433: 1 preparatory, length 2.8 mm, 2 unknown, lengths 2.3 mm, 2.0 mm, same sample data as holotype; 9 females, ZMH K-41434: 3 adult brooding, lengths 2.2 mm, 2.3 mm, 2.0 mm, 4 preparatory, lengths 1.6 mm, 1.7 mm, 1.8 mm, 1.7 mm, 2 unknown, lengths 2.0 mm, 2.4 mm, same sample data as holotype.

Type locality: ANDEEP III, station 78-9-E (71°09.52'S, 14°00.76'W).

Distribution. Known only from type locality.

Etymology. "cerritus", Latin, meaning "crazy", referring to the appearance of the species. During description we were talking about labelling the species as such because the ventral spines and dorsally oriented pereopod 3 with hook-like ischium make the species look like a "crazy little thing".

Diagnosis. Body elongate, at least 4 times as long as broad. Head broader than long, not fused to first pereonite. Antennula short, of 5 articles, with one thick distal aesthetasc. Antenna with broom setae present only on article 5. Mandibles truncated and robust, incisor with 4 cusps, molar with many setulose setae at apex. Mandible with long robust seta laterally. Maxilliped palp with 5 articles and many short setae. Ventral spines present on pereonites 1, 6 and 7. Pereopod 3 with long, thin, curved ischium lobe. Pereopod 4 greatly reduced in size, juvenile looking. Operculum with strong spine-like unequally bifid setae ventrally. Pleopod 5 absent.

Description. Body approximately 3.1 mm long, almost 5 times as long as wide, body dorsum and margins smooth, without setae. Head almost as long as wide, almost as wide as pereonite 1, without eyes. Coxae not visible in dorsal view. *Pereonites* 1–3 strongly fused, with 1 and 2 shortest, 3 widest. Pereonites 5–7 with posteriorly directed small spines inserting apically. Distinct anterior-oriented spine on pereonite 1 ventrum, posterior-oriented spines on pereonite 6 and 7 ventrum. *Pleotelson* 0.24 times body length, 0.8 times body width, 1.4 times longer than wide, slightly shorter than pereonites 5–7 together. Anterior and posterior dorsal margins rounded.

Antennula (Figure 2D) short, approximately 0.1 times body length, with 5 articles. Article 1 longest and widest, length 0.07 mm, width 0.04 mm, with 3 simple setae and 1 broom seta. Article 2 length 0.6 times article 1 length, width 0.8 times article 1 width, with 3 broom setae. Article 3 length 0.5 times article 1 length, width 0.6 times article 1 width, without setae. Article 4 length 0.25 times article 1 length, width 0.45 times article 1 width, distally with 1 simple seta. Article 5 minute, terminally with 1 aesthetasc.

Antenna (Figure 2C) approximately 0.3 times body length, with 12 articles. Articles 1–3 small, article 1 with lateral simple seta, article 2 without setae, article 3 with 2 slender setae. Article 4 longest, slightly longer than article 5, without setae. Article 5 long and slender, distally with 5 broom setae and 2 whip (as in Brandt 1992) setae. Distal 7 flagellar articles small, of subequal length, eighth, ninth and eleventh article each with 1 slender seta, terminal article with distal sensory setae.

Mandibles (Figure 3A, 3B, 6A) without palp, palp replaced with robust seta (missing on left mandible), both with 4 cusps on incisor. Right setal row with 5 robust setulose setae and 2 attenuating simple setae, left setal row with 5 robust setulose, 1 setulose simple attenuating seta and 1 simple attenuating seta. Lacinia mobilis of left mandible with 3 teeth, right with 2. Molar a distinct process, with a dense row of 9 setulose slender setae.

Maxillula (Figure 2B) mesial lobe stalked, with 12 setae, and slightly smaller than lateral lobe. Lateral lobe length 2.2 times width, dorsal margin with 12 setae, ventral margin with 8 setae, terminally with 11 strong spines (3 of which serrated).

Maxilla (Figure 2A) mesial lobe shorter than middle and lateral lobes. Mesial and lateral lobes distally with 2 long and 1 setulose setae, and a number of setae pairs laterally. Lateral lobe length 6.9 times width. Mesial lobe length 4.7 times width, distally with 3 large and 3 small robust setae. Laterally with 12 long slender setae.

Maxilliped (Figure 2E, 6B) epipodite length 2.7 times width, length 0.8 times endite length. Endite with 2 retinaculae, 1 lateral simple seta, distally with 3 fan setae, 8 simple setae and many marginal fine setae. Palp inserted at approximately two thirds the basis length, width 0.6 times length and palp length about 0.5 times basis length; palp article 1 with some marginal fine setae; palp article 2 about 5 times as long as article 1, almost twice as wide as article 1, with 4 medial and 1 distolateral setae; article 3 approximately a third the length of article 2, with 6 setae; article 4 less than half the width of article 3 width, with 3 distal setae; article 5 narrower than article 4, with 5 setae.

Pereopod 1 (Figure 3C) basis length 2.9 times width, dorsally with 4 short setae, ventrally with 1 short

slender and 1 long slender setae. Ischium length 2.4 times width, dorsally with 2 long slender setae, ventrally with 1 robust simple seta, laterally with 3 long slender setae. Merus length 1.8 times width, dorsally with 1 distally setulate seta, ventrally with 2 robust setae, laterally with 4 long slender setae. Carpus length 1.4 times width, ventrally with 1 distally setulate and 1 robust setae, laterally with 1 robust simple and 1 short robust simple setae, distally with 1 long robust seta. Propodus length 3 times width, dorsally with 1 slender seta, ventrally with 3 short simple setae. Dactylus length 4.4 times width, claw composed of 1 conate and 1 cuspidate setae with 2 slender setae inserting in between, 2 slender setae inserting terminally into conate setae.

Pereopod 2 (Figure 3D) basis length 3.1 times width, dorsally with 4 simple setae, ventrally with 3 simple and 1 long slender setae. Ischium length 2.9 times width, dorsally with 2 simple setae, ventrally with 1 minute seta, laterally with a composed row of 5 long slender setae. Merus length 1.6 times width, dorsally with 1 robust unequally bifid seta, ventrally with 2 unequally bifid and 1 simple setae, laterally with a (composed) row of 5 long slender setae. Carpus length 2.4 times width, dorsally with 2 long simple, 1 small broom and 1 long simple setae, ventrally with 2 unequally bifid setae. Propodus length 3.1 times width, dorsally with 1 unequally bifid and 1 broom setae, ventrally with 1 simple seta. Dactylus length 3.7 times width, claw composed of 1 conate and 1 cuspidate setae with 2 slender setae inserting in between, 2 slender setae inserting into conate seta.

Pereopod 3 (Figure 3E) basis length 2.4 times width, dorsally with 1 simple seta, ventrally with 3 simple slender and 1 unequally bifid setae. Ischium length 2.3 times width, dorsally with large hook-shaped triangular lobe, 1 short slender and 4 long slender setae. Merus length 1.4 times width, dorsally with a row of 4 long simple setae and a row of 4 robust unequally bifid setae, ventrally with 1 small simple seta. Carpus length 2.8 times width, dorsally with a row of 5 long simple setae. Propodus length 2.5 times width, dorsally with 1 small simple seta, ventrally with 1 simple seta, distally with 1 simple seta. Dactylus length 1.1 times width, claw composed of 1 conate and 1 cuspidate setae with 2 slender setae inserting in between, 1 terminal slender seta and 1 simple seta inserting ventrally into conate seta.

Pereopod 4 (Figure 4A) short, only half the length of pereopod 3. Basis length 3.4 times width, dorsally with 1 broom seta, ventrally with 1 broom and 3 slender simple setae. Ischium length 2.8 times width, dorsally with 1 slender simple and 1 simple setae. Merus length 1.7 times width, ventrally with 2 distal simple robust setae, distally with 1 simple robust and 1 long simple robust setae. Carpus length 2.3 times width, ventrally with 2 robust setae, distally with 1 long and 1 short robust setae. Propodus length 2.3 times width, distally with 1 short robust and 1 long robust setae. Dactylus very compressed with one terminal robust seta.

Pereopod 5 (Figure 4B) basis length 2.9 times width, dorsally with 2 long simple robust (1 broken) setae, ventrally with 2 small broom, 1 simple slender and 1 large broom setae, distally with 1 robust simple seta. Ischium length 3.3 times width, dorsally with 1 unequally bifid seta, ventrally with 2 simple and 1 long slender setae, distally with 2 long slender setae. Merus length 2.4 times width, ventrally with 2 sets of an unequally bifid and simple setae, distally with 4 unequally bifid setae. Carpus length 4.5 times width, dorsally with 1 broom seta, ventrally with 1 unequally bifid seta, distally with 3 short unequally bifid and 1 long unequally bifid setae. Propodus length 5.1 times width, dorsally with 1 simple and 1 broom setae, ventrally with 1 unequally bifid seta, distally with 1 unequally bifid and 1 long slender setae. Dactylus length 3.5 times width, terminally with 2 unequally bifid setae with setulose smaller lobes.

Pereopod 6 (Figure 4C) basis length 2.7 times width, dorsally with 1 unequally bifid, 1 simple and 3 slender setae, ventrally with 3 slender setae, distally with 1 robust seta. Ischium length 2.7 times width, dorsally with 2 simple and 1 unequally bifid setae, ventrally with 5 slender setae. Merus length 2 times width, ventrally with 1 simple seta, dorsally with 5 short, 2 long unequally bifid and 1 simple setae. Carpus length 6 times width, dorsally with 1 broom seta, ventrally with 1 simple seta, distally with 1 unequally bifid and 1 long setae. Propodus length 8 times width, distally with 1 long slender, 1 unequally bifid and 1 broom setae. Dactylus length 5.8 times width, distally with 1 open-ended sensory seta and 1 unequally bifid seta.

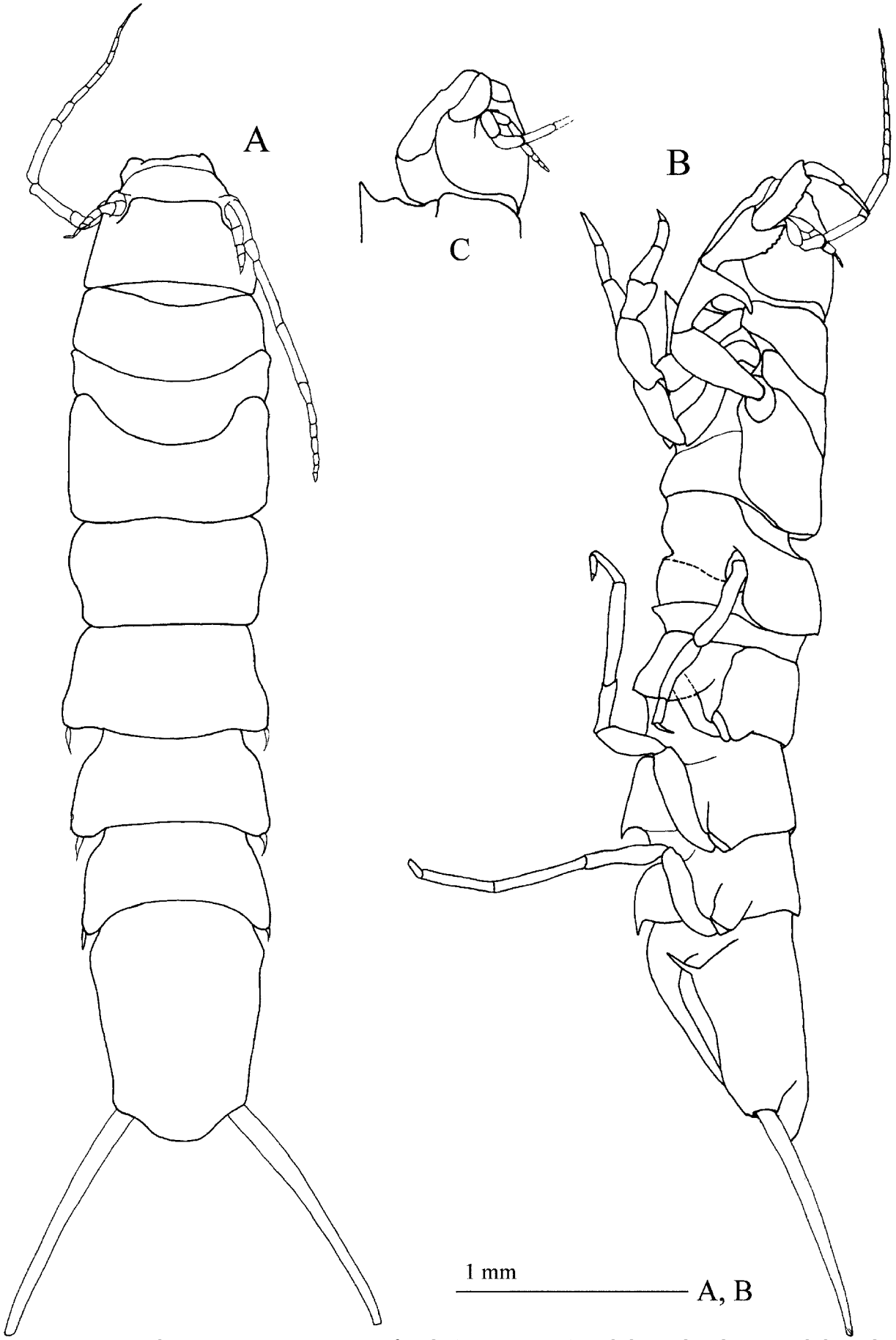

FIGURE 1. *Macrostylis cerritus* sp. nov., paratype female (ZIM K-41433). A, habitus, dorsal view; B, habitus, lateral view; C, head, lateral view with P3 removed. Scale = 1 mm.

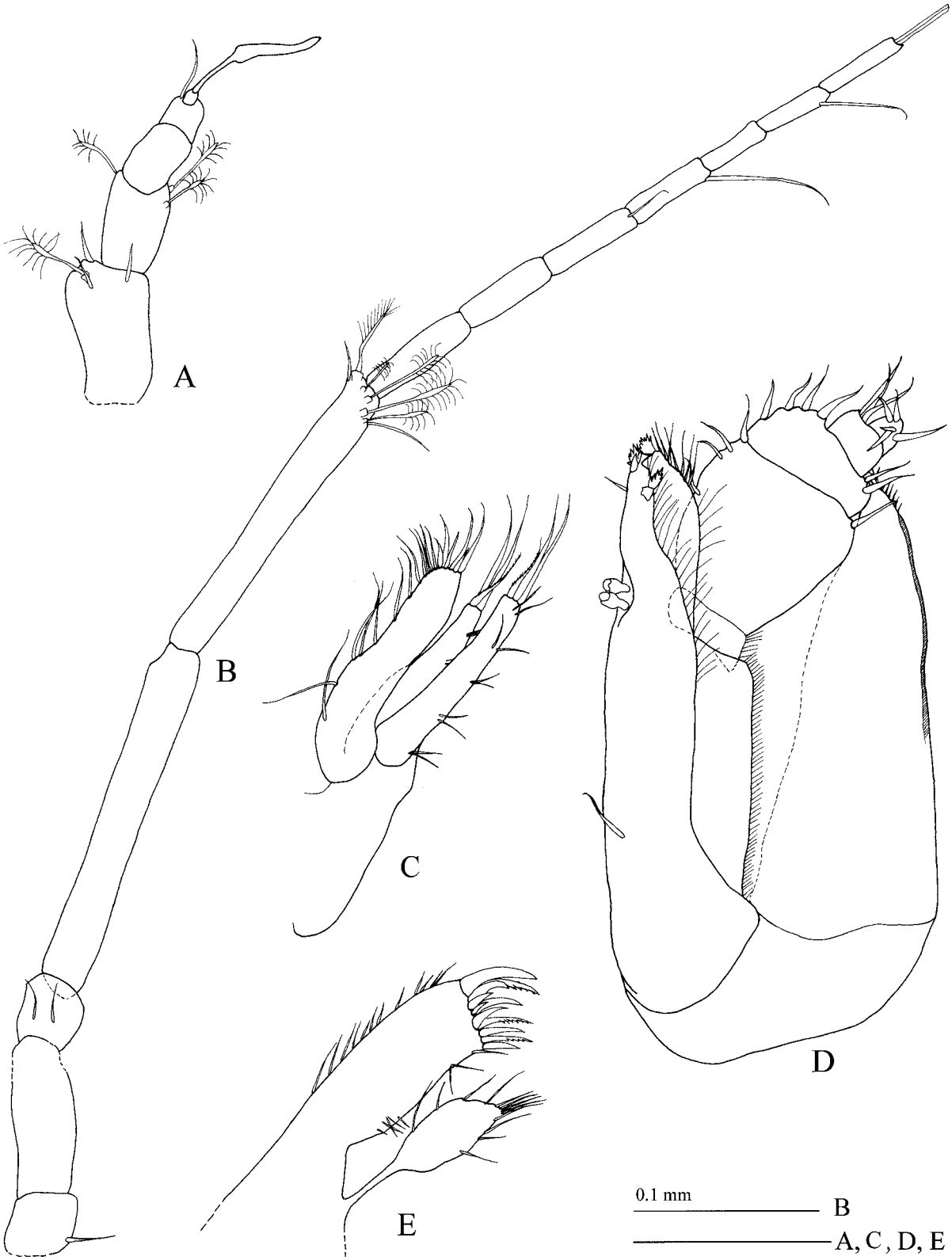

FIGURE 2. *Macrostylis cerritus* sp. nov., paratype female (ZIM K-41433). A, A1; B, A2; C, Mx 2; D, Mxp; E, Mx 1. Scales = 0.1 mm.

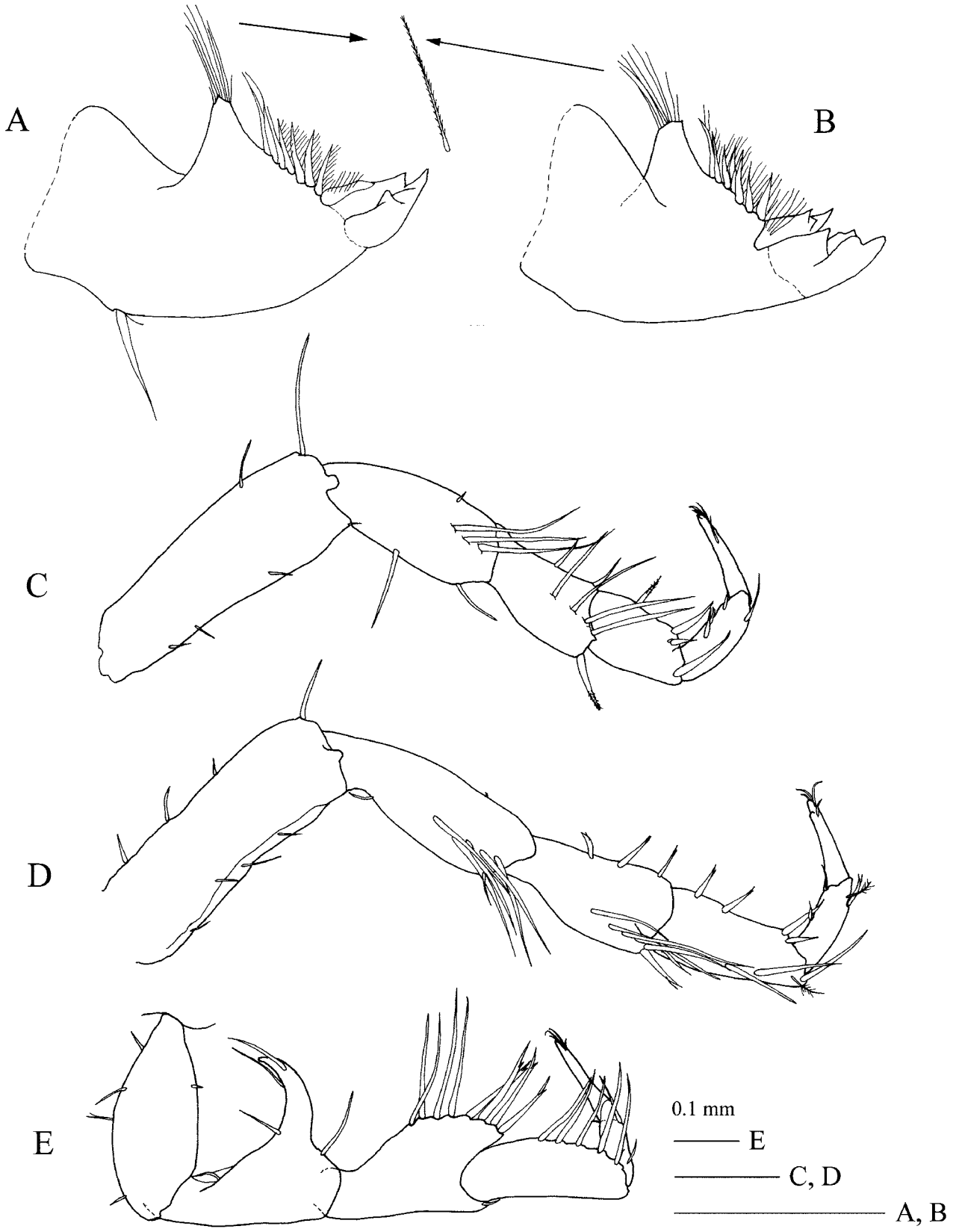

FIGURE 3. *Macrostylis cerritus* sp. nov., paratype female (ZIM K-41434). A, rMd; B, lMd; C, P1; D, P2; E, P3. Scales = 0.1 mm.

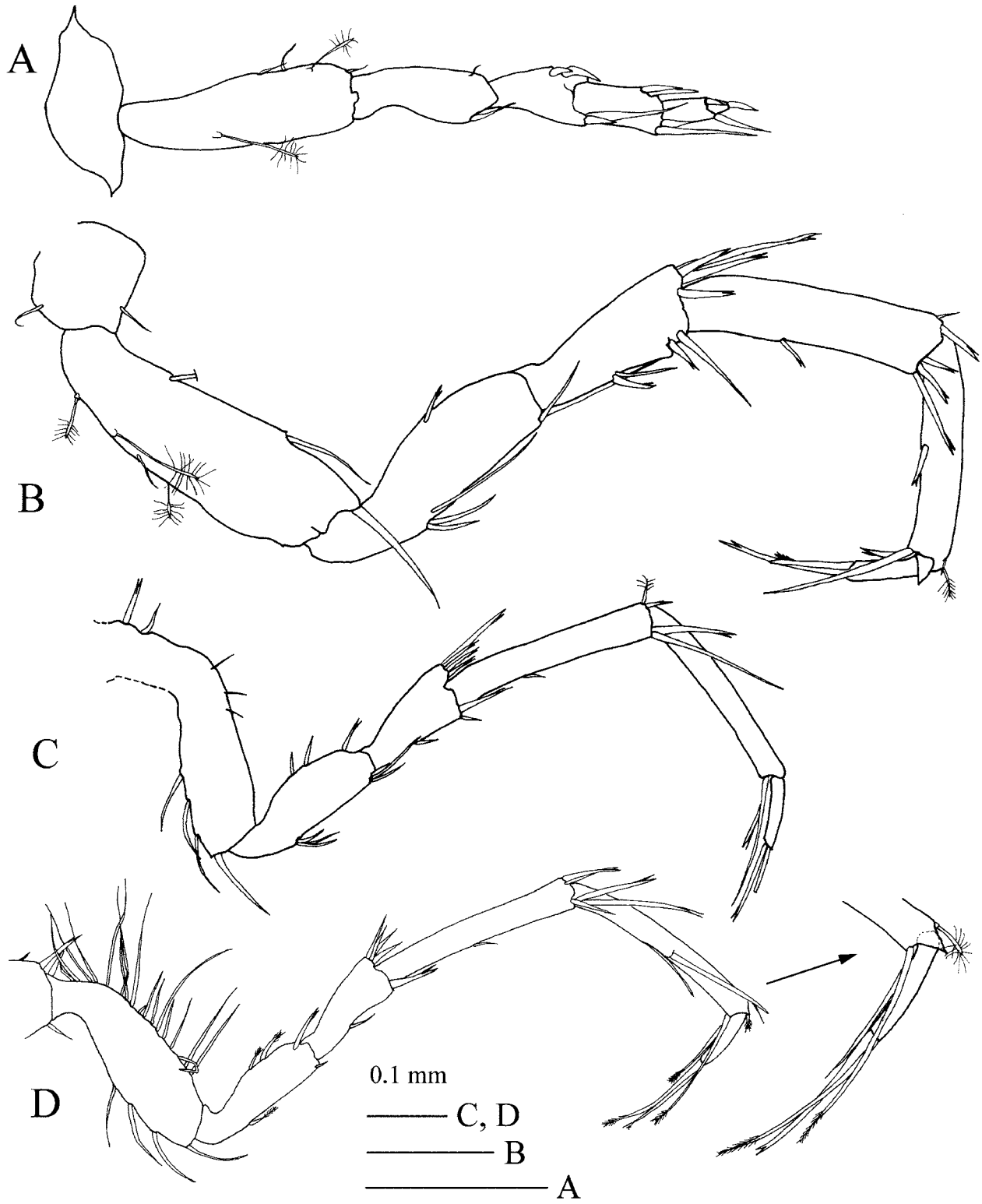

FIGURE 4. *Macrostylis cerritus* sp. nov., paratype female (ZIM K-41434). A, P4; B, P5; C, P6; D, P7. Scales = 0.1 mm.

Pereopod 7 (Figure 4D) basis length 3 times width, dorsally with 10 long distally slender plumose setae, 6 slender setae (1 broken), 1 short simple seta and 1 unequally bifid seta, ventrally with 4 slender setae. Ischium length 3.4 times width, dorsally with 2 distally setulate and 1 unequally bifid setae, ventrally with 1 distally setulate and 1 distal simple setae. Merus length 2.4 times width, ventrally with 1 simple seta, distally with 4 unequally bifid and 1 robust unequally bifid setae. Carpus length 6.3 times width, ventrally with 1 simple seta,

distally with 2 unequally bifid, 2 simple and 1 short robust setae. Propodus length 8.8 times width, dorsally with 1 broom seta, ventrally with 2 slender setae, distally with 2 long distally setulate setae. Dactylus length 4.7 times width, terminally with 1 long distally setulose and 1 long unequally bifid setae.

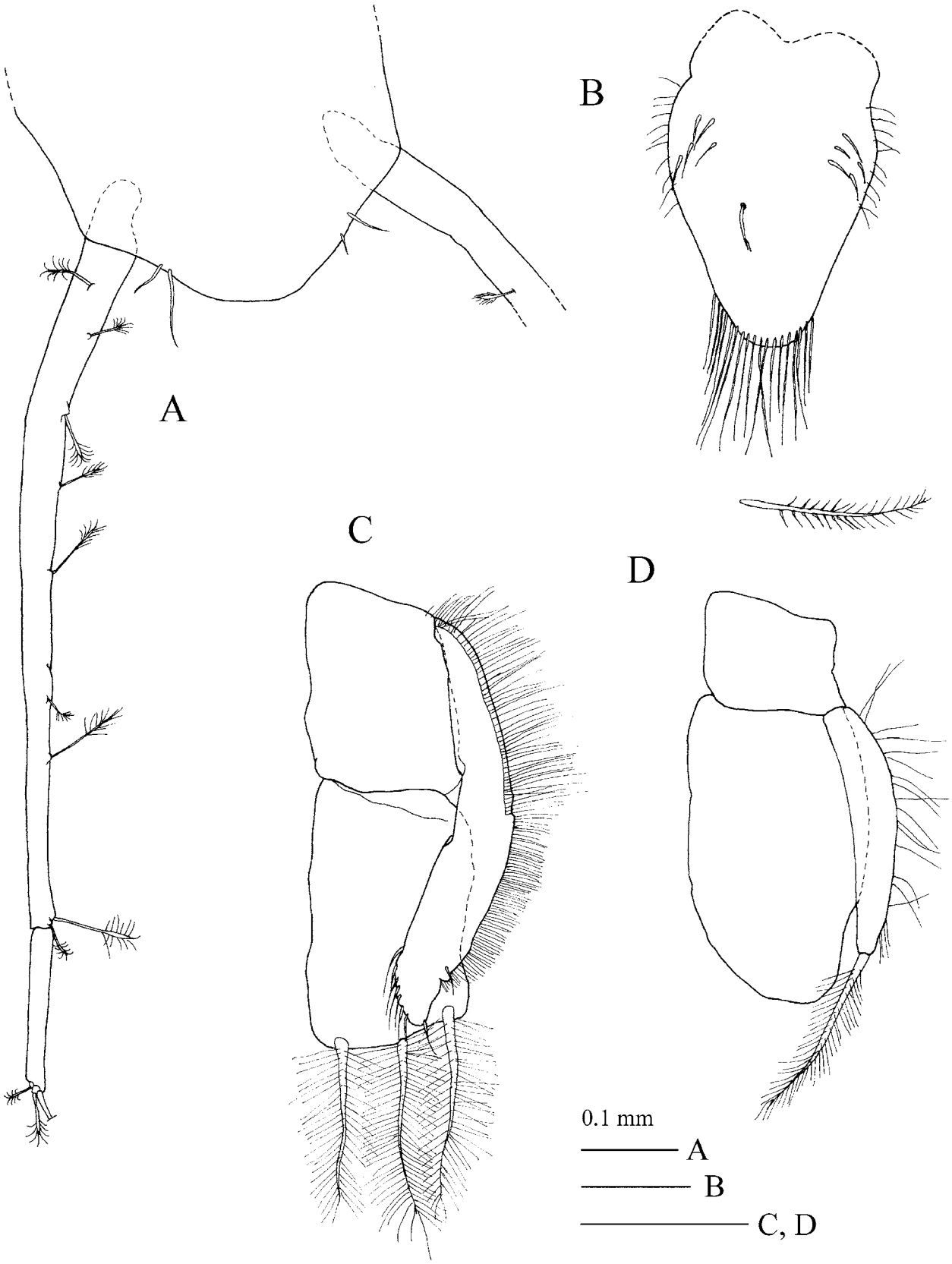

FIGURE 5. *Macrostylis cerritus* sp. nov., paratype female (ZIM K-41434). A, Urp; B, Op; C, Plp 3; D, Plp 4. Scales = 0.1 mm.

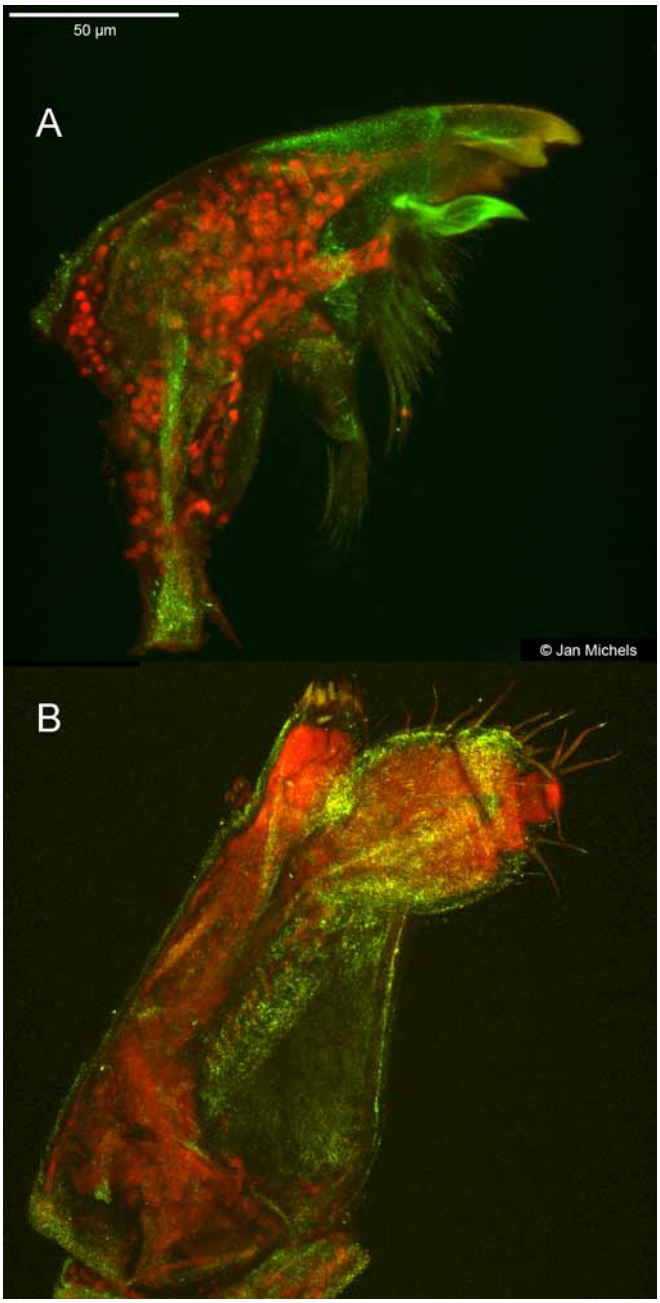

FIGURE 6. *Macrostylis cerritus* sp. nov., paratype female (ZIM K-41433). A, lMd; B, Mxp. Pictures taken with a Confocal Laser Scanning Microscope. Scale = 50 µm.

Operculum (Figure 5B) length 1.5 times width. Ovoid, tapering towards posterior, broadest medially, narrower towards anterior. Mediolaterally with 11 slender setae on both sides. Ventrally with 5 robust setae inserting towards both the left and right margins. One distally setulose unequally bifid seta inserting towards posterior near the mediocentral line. Caudally with a row of 18 long and slender plumose setae.

Pleopod 3 (Figure 5C) endopod length 1.5 times width, distally with 3 plumose setae. Exopod length 6.2 times endopod length, reaching almost as far as endopod, laterally with many slender setae, of which the anterior half are long and insert into a groove, distally with 9 setae.

Pleopod 4 (Figure 5D) endopod quadrangular, length 1.6 times width, distally with 1 minute seta. Exopod length 5.5 times width, outer margin with row of 20 slender setae, distally with 1 plumose seta, exceeding length of endopod.

Pleopod 5 absent

Uropods (Figure 5A) uniramous, sympod 4 times ramus length, 17 times longer than wide, with 9 broom setae of varying lengths. Ramus 5 times longer than wide, distally with 2 broom setae and 1 (broken) seta.

Key to the Southern Ocean species of *Macrostylis*

1	Pleotelson rounded laterally	4
-	Pleotelson not rounded laterally	2
2	Pleotelson laterally straight, with plumose setae	*M. hirsuticaudis*
-	Pleotelson not laterally straight, without plumose setae	3
3	Cephalon quadrate, pleotelson with lateral indentation	*M. bifurcatus*
-	Cephalon triangular, pleotelson slightly produced	*M. spiniceps*
4	Pereonites 5–7 and pleotelson dorsally setulose	*M. setulosa*
-	Pereonites 5–7 and pleotelson not dorsally setulose	5
5	Pereonite 7 and pleotelson with dorsal spine-like setae	*M. sarsi*
-	Pereonite 7 and pleotelson without dorsal spine-like setae	6
6	Pereonites 1–7 subequal, 5–7 with postero-lateral spines	*M. cerritus* sp. nov.
-	Anterior pereonites wider than posterior pereonites	7
7	Distinct postero-lateral spines on pereonites 4–7, cephalon anterior edge straight	*M. vinogradovae*
-	Small postero-lateral spines on pereonites 4–7, cephalon anterior edge slightly rounded	*M. bipunctatus*

Discussion

Macrostylis cerritus is placed within Macrostylidae due to the following characters: pereonites 1–3 fused together forming a quadrate section; mandible palp absent; pereopod 3 fossorial, setose, with the ischium in particular laterally produced; pereopod 4 shorter than all other pereopods; and uniramous uropods (Brix *et al.* submitted). A number of autapomorphies clearly distinguish *M. cerritus* from the other genus of Macrostylidae, *Desmostylis* (see Table 2). Most obvious is that the head and pereonite 1 are not fused. Furthermore, the ischium of pereopod 3 is dorsally enlarged into a lobe, and pereopod 4, although strongly reduced, still has a dactylus, whereas in *Desmostylis* it is absent. An apomorphy of *Desmostylis* is the reduced mandibular incisor with only 1 cusp; *Macrostylis* normally have between 1 and 3 cusps, and *M. cerritus* has 4 cusps. *M. cerritus* can be distinguished from the other Southern Ocean *Macrostylis* due to the following autapomorphies: pleopod 5 absent (vs pleopod 5 present); stunted, juvenile-looking pereopod 4; incisor with 4 cusps (vs incisor with 1–3 cusps); strongly hook-shaped pereopod 3 ischium (vs dorsal lobe on pereopod 3 ischium); and ventral spine-like seta on operculum (vs no ventral spine-like seta on operculum).

It must also be noted that while a family character is the absence of a mandibular palp (Wägele 1989), *M. cerritus* has a robust seta in its place. One would presume that this has a role in feeding, but why only this species within the genus displays it is unclear.

Within *Macrostylis*, *M. cerritus* is most similar to *M. setulosa* and *M. vinogradovae*. Whilst a generic character is an incisor with 1–3 cusps, *M. cerritus* has 4, whereas *M. setulosa* has 3 or 4 and *M. vinogradovae* 4 or more cusps. These three species are also the only *Macrostylis* to have ventral spine-like projections on the pereonites (or sternites in Mezhov 1992). In *M. cerritus* these are not as developed as in the other species, with the spines present only on pereonites 1 (anteriorly oriented) and 6 and 7 (posteriorly oriented). Both *M. setulosa* and *M. vinogradovae* display an additional projection on pereonite 3 (posteriorly oriented), and in the latter, the spines increase in length from pereonite 5 to 7. Further similarities include: pleotelson posterior rounded and bearing no plumose setae; and antennule of 5 articles with an aesthetasc on article 5. *M. cerritus* can be distinguished from *M. setulosa* and *M. vinogradovae* by: 18 long posterior plumose setae on the operculum (vs 10–12 short plumose setae); the well developed hook-like lobe on pereopod 3 ischium (ischium angular or not so produced); and postero-lateral spines on pereonites 5–7 (postero-lateral spines on pereonites 4–7 (and small spines on pereonite 3 in *M. setulosa*)).

TABLE 2. Generic and *M. cerritus* character differences.

Character	*Desmostylis*	*Macrostylis*	*M. cerritus*
Body	Elongate Length 3x width	Elongate Length 3x width	Elongate Length 5x width
Head	Fused with Prn 1	Free	Free
A1	Short 5 articles 1 long thick aesthetasc	Short/minute 3–5 articles 1+ thick aesthetasc	Short 5 articles 1 aesthetasc
A2 last pedunclar article	Many broom setae	1 broom setae	1 broom setae
ip	Slender, narrow 1 cusp	Slender, narrow 1–3 cusps	Robust 4 cusps
lm	Left- small	Left-small	absent
mp	2–3 apex setae	4 or more apex setae	Many (9)
Mxp palp	5 articles	5 articles	5 articles
Mxp epipod	Long-oval, slender Distally rounded	Long-oval, slender Distally rounded	Long-oval, slender Distally rounded
P1-7	Subsimilar Ischium long, 1 ventral seta	Subsimilar	Subsimilar
P3	No enlarged ischium	Ischium lobed Strong spine at tip	Ischium lobed Tip setae
P4	No dactylus	Short dactylus with some spine setae	Short dactylus with some spine setae
P5 and 6	Long whip and sensory setae at dactylus tip	None	None
O (female)	Long-oval Some plumose caudal setae	Oval Some plumose caudal setae	Oval Some plumose caudal setae
Plp5	Present	Present	Absent
Urp	Uniramous Ramus and sympod subequal Distal broom and sensory setae	Uniramous Ramus 3 x sympod l Distal broom and sensory setae	Uniramous Ramus 0.2 as long as sympod l Distal broom and sensory setae

Although the use of the ventral pereonite spines (in *M. cerritus*, *M. setulosa* and *M. vinogradovae*), and the dorsally enlarged pereopod 3 ischium lobe is not clearly known, it could be suggested that these are aids to a tubiculous lifestyle. Using morphological data, Wägele (1989) stated that Desmosomatidae and Nannoniscidae are sister groups, whereas Raupach *et al.* (2004) redefined this to Desmosomatidae and Munnopsidae. Brix (2006, work in progress) suggests to consider Nannoniscidae and Desmosomatidae to be one family with the valid name Desmosmatidae being the sister taxon to Macrostylidae. In either case, Macrostylidae is closely related to both the Munnopsidae and Desmosomatidae.

In his paper on locomotion, Hessler (1982) observed that desmosomatids remain on the bottom, either walking or burrowing with their anterior pereopods. If the case is the same in Macrostylidae (as they are closely related to Desmosomatidae), then the enlarged dorsal lobe on the ischium of pereopod 3 could serve to wedge the individual into a burrow, whilst the anterior two pereopods excavate. *M. cerritus* displays a shortened pereopod 4, another characteristic of burrowers e.g. *Zenobiana* (Brandt 1992). Hessler (1982) also

notes that when startled, desmosomatids use their posterior three pereopods to swim backwards. Although pereopods 5 and 6 of *M. cerritus* are unlikely to be used for swimming, as they are long, thin and have few long setae, the long setae on the basis of pereopod 7 may have been retained for this escape mechanism.

The loss of natatory setae, long and slender posterior pereopods (Wägele 1989), the strange spine-like projections and the dorsally enlarged ischium of pereopod 3 all seem to be adaptations for a fossorial (digging) lifestyle. More research is needed into the ecology of this and other deep-sea organisms collected on ANDEEP expeditions to elucidate the roles each plays within the deep-sea habitats, in order to provide data for more comprehensive studies into Southern Ocean ecosystems and their effect on atmospheric processes.

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