



Two new species of the genus *Eurycope* (Isopoda, Munnopsidae) from Icelandic waters

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Abstract: Collections of munnopsid isopods of the BIOICE (Benthic Invertebrates of Icelandic Waters; 1991–2004) and the IceAGE1 (Icelandic Marine Animals: Genetics and Ecology; since 2011) expeditions included ten species of the genus *Eurycope* G.O. Sars, 1864, thereof are two species new to science. Thus, the descriptions of the two new species are presented herein. *Eurycope elianae* sp. n. is distinguished from the other species of the genus mainly by two long, slightly robust, simple setae on the tip of the rostrum in combination with the size and shape of the rostrum itself. *E. elianae* sp. n. shares the presence of two long, slightly robust, simple seta on the tip of the rostrum with *E. tumidicarpus*. The shape of the rostrum itself is more similar to *E. inermis* and species of the *E. complanata* complex. *E. aculeata* sp. n. is characterized by possessing dorsomedial acute projections on pereonites 5–7, which is unusual for the genus. *E. aculeata* sp. n. is most similar to *E. cornuta*. Both new species are, so far, known only from localities south of the Greenland-Scotland Ridge.

Key words: Icelandic waters, *Eurycope elianae*, *Eurycope aculeata*, BIOICE, IceAGE.

Introduction

The asellote isopod family Munnopsidae Lilljeborg, 1864 is one of the most speciose and frequently collected isopod families known. Currently it consists of nine subfamilies, 42 genera and around 320 described species (Schotte *et al.* 2014). Munnopsidae is often the most abundant and diverse isopod family in benthic deep-sea communities and is also widespread in cold waters (Wilson and Hessler 1980, 1981; Svavarsson 1987; Kussakin 2003; Brandt *et al.* 2004; Malyutina and

Brandt 2007). Within Munnopsidae, the subfamily Eurycopinae Hansen, 1916 is one of the most numerous and diverse groups (Svavarsson 1987), which currently contains six genera: *Eurycope* Sars, 1864, *Disconectes* Wilson et Hessler, 1981, *Belonectes* Wilson et Hessler, 1981, *Tythocope* Wilson et Hessler, 1981, *Baeonectes* Wilson, 1982 and *Dubinectes* Malyutina et Brandt, 2006. The genus *Eurycope*, with 54 described species (Schotte *et al.* 2014), is the most numerous, complex, and most speciose genus within the subfamily (Wilson 1983; Kussakin 2003). The heterogeneity of *Eurycope*, including a few species complexes, has already been discussed by different authors (Wolff 1962; Wilson and Hessler 1981; Wilson 1989; Kussakin 2003; Malyutina and Brandt 2006). However, this troublesome genus has not yet been completely revised.

During the BIOICE (Benthic Invertebrates of Icelandic Waters; 1991–2004) and IceAGE1 (Icelandic Marine Animals: Genetics and Ecology; since 2011) cruises, large numbers of specimens belonging to *Eurycope* were sampled. Herein, two new species (*E. elianae* sp. n. and *E. aculeata* sp. n.) are described from these collections. Both new species were so far only present in samples collected south of the Greenland-Scotland Ridge, a topographical feature that constrains water exchanges between the northern North Atlantic and the Nordic Seas without blocking them (Hansen and Osterhus 2000).

Material and methods

Individuals of the two new species were collected during the BIOICE and the IceAGE1 cruises, using different types of epibenthic sledges (Rothlisberg and Percy 1977; Brattegard and Fosså 1991; Brenke 2005; Brandt *et al.* 2013). Samples from the BIOICE project were first fixed in 5% buffered formalin and later, in the laboratory, transferred into 80% ethanol (Svavarsson 1997; Svavarsson *et al.* 2001). Samples from the IceAGE project were immediately fixed in pre-cooled 96% undenatured ethanol and treated according to Brix *et al.* (2011) and Schnurr and Brix (2012).

Five specimens of *E. elianae* sp. n. from the IceAGE1 project were used for DNA extraction and sequencing as described in Riehl *et al.* (2014, this issue). Nucleotide sequences of the mitochondrial ribosomal RNA large subunit (16S) of all five specimens, as well as the nucleotide sequence of the complete nuclear small-subunit ribosomal RNA (18S) of one specimen of *E. elianae* sp. n. can be retrieved from GenBank (Genbank Association Numbers KJ716799–16803; Table 1).

A Leica DM 2500 compound microscope with a *camera lucida* was used for morphological studies. The holotype (ZMH K-44044), a male paratype (allotype, ZMH K-44045), paratypes (ZMH K-44046–44052) and one Scanning Electron Microscope (SEM) stub (ZMH K-44067) of *E. elianae* sp. n. have been deposited at the Zoological Museum of Hamburg (ZMH). Two paratypes of *E. elianae* sp. n.

Table 1
Material available of the two new species *Eurycope elianae* sp. n. and *E. aculeata* sp. n., with information on the place of storage of the individuals (IMNH, Icelandic Museum of Natural History, Reykjavik; f, female; m, male; ZCUI, Zoological Collections of the University of Iceland; ZMH, Zoological Museum, Hamburg).

Species	Sex	Project	Station	Collection number	GenBank accession No.	
					16S	18S
<i>Eurycope elianae</i> sp. n.						
holotype	F	IceAGE1	963	ZMH-44044	KJ716799	KJ716804
paratype, allotype	M	IceAGE1	963	ZMH-44045	–	–
paratype	F	IceAGE1	963	ZCUI-2001	–	–
paratype	M	IceAGE1	963	ZCUI-2002	–	–
paratype	F	IceAGE1	963	ZMH-44046	KJ716800	–
paratype	F	IceAGE1	963	ZMH-44047	KJ716801	–
paratype	F	IceAGE1	963	ZMH-44048	KJ716802	–
paratype	M	IceAGE1	963	ZMH-44049	KJ716803	–
paratype	M	IceAGE1	963	ZMH-44050	–	–
paratype	F	IceAGE1	963	ZMH-44051	–	–
paratype	F	IceAGE1	963	ZMH-44052	–	–
paratype	F	IceAGE1	963	ZMH-44067	–	–
<i>Eurycope aculeata</i> sp. n.						
holotype	F	BIOICE	2330	IMNH-28838	–	–
paratype, allotype	M	BIOICE	2330	IMNH-28837	–	–
paratype	F	BIOICE	2330	ZMH-44053	–	–
paratype	F	BIOICE	2330	ZMH-44054	–	–
paratype	M	BIOICE	2330	ZMH-44055	–	–
paratype	F	BIOICE	2330	ZMH-44056	–	–
paratype	F	BIOICE	2330	ZMH-44057	–	–
paratype	F	BIOICE	2330	ZMH-44058	–	–
paratype	F	BIOICE	2330	ZMH-44059	–	–
paratype	F	BIOICE	2330	ZMH-44060	–	–
paratype	F	BIOICE	2330	ZMH-44061	–	–
paratype	F	BIOICE	2330	ZMH-44062	–	–
paratype	F	BIOICE	2330	ZMH-44063	–	–
paratype	M	BIOICE	2330	ZMH-44064	–	–
paratype	M	BIOICE	2330	ZMH-44065	–	–
paratype	M	BIOICE	2330	ZMH-44066	–	–
paratype	F	BIOICE	2330	ZMH-44068	–	–

(ZCUI-2001 and ZCUI-2002) have been deposited at Zoological Collections of the University of Iceland (ZCUI). The holotype (IMNH-28838) and a male paratype (allotype, IMNH-28837) of *E. aculeata* sp. n. have been deposited at the Icelandic Museum of Natural History in Reykjavik (IMNH). Paratypes (ZMH K-44053–44066) as well as one SEM stub (ZMH K-44068) of *E. aculeata* sp. n. have been deposited at the ZMH (Table 1). The SEM images were taken with a Carl Zeiss Leo 1525 microscope. Standard views were applied following the guidelines of Hessler (1970) and Wilson (2008) and the terminology of the eurycopid structures is following Wilson and Hessler (1980) and Wilson (1982b). Adobe Illustrator CS6 was used for preparing the digital drawings of the specimens following the guidelines of Coleman (2003, 2009).

Abbreviations. — A 1 = antennula; A 2 = antenna; f = female; IMNH = Icelandic Museum of Natural History, Reykjavik; lMd = left mandible; rMd = right mandible; Mx 1 = maxillula; m = male; Mx 2 = maxilla; Mxp = maxilliped; Op = operculum; P I–VII = pereopods I–VII; Pl I–V = pleopods I–V; SEM = Scanning Electron Microscope; Urp = uropod; ZCUI = Zoological Collections of the University of Iceland; ZMB = Zoological Museum Berlin; ZMH = Zoological Museum, Hamburg; ZMUC = Zoologisk Museum, University of Copenhagen.

Taxonomy

Family Munnopsidae Lilljeborg, 1864

Subfamily Eurycopinae Hansen, 1916

Genus *Eurycope* G.O. Sars, 1864

Eurycope: G.O. Sars 1864: 4 (208); 1899: 144; Richardson 1905: 490; Hansen 1916: 137; Wolff 1956: 123; 1962: 143; Menzies 1962: 139; Birstein 1963: 101; Wilson and Hessler 1981: 403; Kussakin 2003: 21.

Type species. — *Eurycope cornuta* G.O. Sars, 1864

Eurycope elianae sp. n.

(Figs 1–7a)

Material. — A total of 12 specimens of *Eurycope elianae* sp. n. were found at IceAGE1 station No. 963. Holotype: preparatory female (ZMH K-44044), 2.4 mm, used for genetics, IceAGE1, EBS station No. 963, 28 Aug 2011, depth: 2749 m, location: 60.0455 N, 21.4677 W. Paratypes: copulatory male (allotype, ZMH K-44045), 2.1 mm; preparatory female (ZMH K-44051), 2.4 mm, used for dissection; preparatory female (ZMH K-44052), 2.4 mm, used for dissection; copulatory male (ZMH K-44050), 2.3 mm, used for dissection; preparatory female (ZCUI-2001), 1.9 mm; preparatory female (ZMH K-44046), 2.2 mm, used for genetics; preparatory female (ZMH K-44047), 2.2 mm, used for genetics; preparatory female (ZMH K-44048), 2.1 mm, used for genetics; copulatory male

(ZCUI-2002), 2.0 mm; copulatory male (ZMH K-44049), 2.0 mm, used for genetics. All paratypes were collected from the same locality as the holotype.

A total of 6 sequences of *E. elianae* sp. n. were retrieved. Five 16S sequences (ZMH K-44044, 44046–44049): GenBank accession numbers KJ716799–16803, as well as one 18S sequence of the holotype (ZMH K-44044): GenBank accession number KJ716804 (Table 1).

The following type material was examined:

Eurycope brevirostris Hansen, 1916; syntype (possibly lectotype) ZMUC CRU-173;

Eurycope brevirostris Hansen, 1916; syntypes ZMUC CRU-170;

Eurycope cryoabyssalis Just, 1980; holotype ZMUC CRU-6162;

Eurycope cryoabyssalis Just, 1980; paratypes ZMUC CRU-6164;

Eurycope diadela Wilson, 1982b; paratypes ZMUC CRU-6276;

Eurycope inermis Hansen, 1916; lectotype ZMUC CRU-6819;

Eurycope inermis Hansen, 1916; paralectotype ZMUC CRU-20541;

Eurycope inermis Hansen, 1916; paralectotypes ZMUC CRU-6804;

Eurycope sandersi Wilson, 1982b; paratype ZMUC CRU-8000;

Eurycope tumidicarpus Schmid, Brenke *et* Wägele, 2002; holotype ZMB 27400.

Etymology. — The name *Eurycope elianae* honours the first author's mother Eliana Schnurr.

Diagnosis. — Body length about twice width, natasome slightly tapering posteriorly, pereonite 5 width about 1.4 pleotelson width. Rostrum elongate, near half of head length, reaching 0.6 antennular article 1 length, apically with two long, slightly robust, simple setae. Anterolateral edges of pereonites 5–7 (and pleotelson of males) with one or two simple setae. Pereonite 7 length about twice pereonite 6 length, slightly shorter than pleotelson length (Figs 1–2). Distomedial lobe of antennular article 1 reaching distal margin of article 2. Maxilliped endite with three retinaculæ, width 0.8 basis width, distal margin width 0.4 endite width, with two fan setae. Palp article 1 without distolateral projection, article 4 distomedial lobe length subequal article 5 length. Epipod slightly longer than basis, lateral projection as long and as wide as apical tip.

Male pleopod I distomedial lobes protruded on 0.1 pleopod length, rounded with three stouter, simple setae medially on each lobe, distolateral lobes laterally expanded, rounded, not projected distally. Male pleopod II protopod medial margin nearly straight, stylet gradually tapered distally, length 0.9 protopod length. Uropod protopod length 0.6 width, lateral margin slightly convex, endopod length 1.7 protopod length, exopod length 0.6 endopod length.

Description. — Body (female holotype, ZMH K-44044, Fig. 1) length 2.5 pereonite 5 width. Head width 2.0 length, length 0.11 body length. Rostrum length 0.37 head length, subtriangular, overhanging frons, reaching 0.57 antennular article 1 length, lateral margins slightly keeled, distal margin width 0.16 antennula

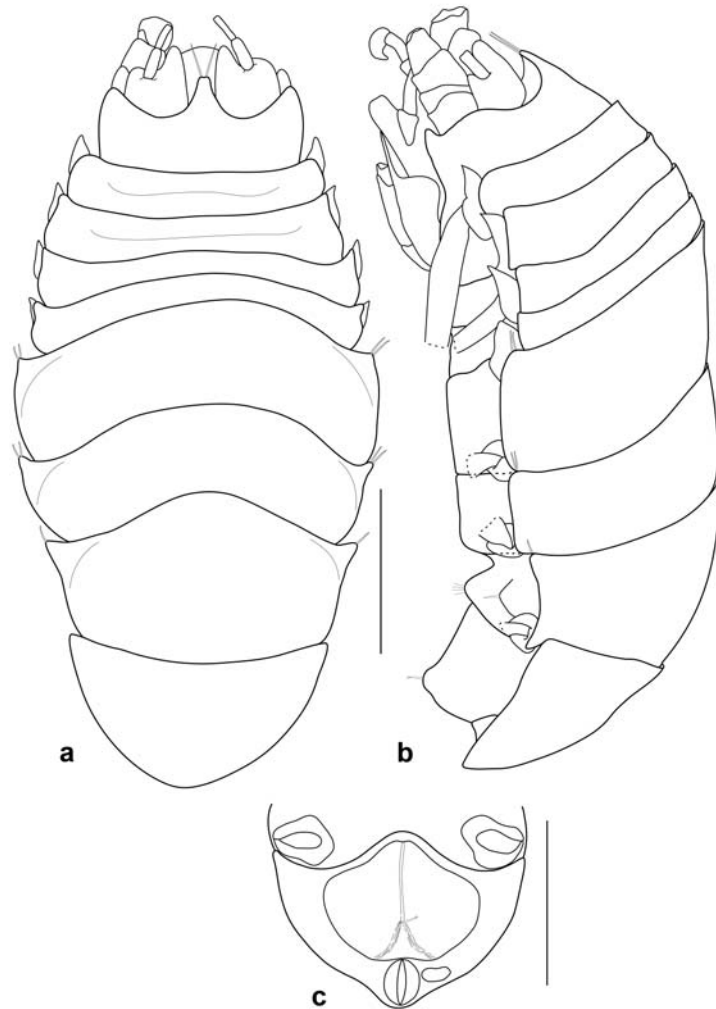


Fig. 1. *Eurycope elianae* sp. n. allotype (ZMH K-44044), preparatory female: **a**, dorsal view; **b**, lateral view; **c**, pleotelson ventral view. Scale bars = 0.5 mm.

width, apically with two long, slightly robust, simple setae subequal in length to rostrum.

Pereonites 2–7 *versus* pereonite 1 length ratios: 0.88, 0.75, 0.71, 3.0, 2.4, 4.1; length–width ratios of pereonites 1–7: 0.18, 0.14, 0.11, 0.10, 0.38, 0.33, 0.63. Anterolateral edges of pereonites 5 and 6 with two simple setae and anterolateral edges of pereonite 7 with one simple seta. Coxae 1–4 similar in size and shape. Anterior processes triangular, acute, in dorsal view near half of corresponding pereonites lateral length. Insertions of pereopods V–VII ventrally on posterior border of pereonites. Venter anteriorly of pereopods VII coxa with bulla, bearing one simple seta. Ventral rounded keel in front of the pleotelson with some simple setae.

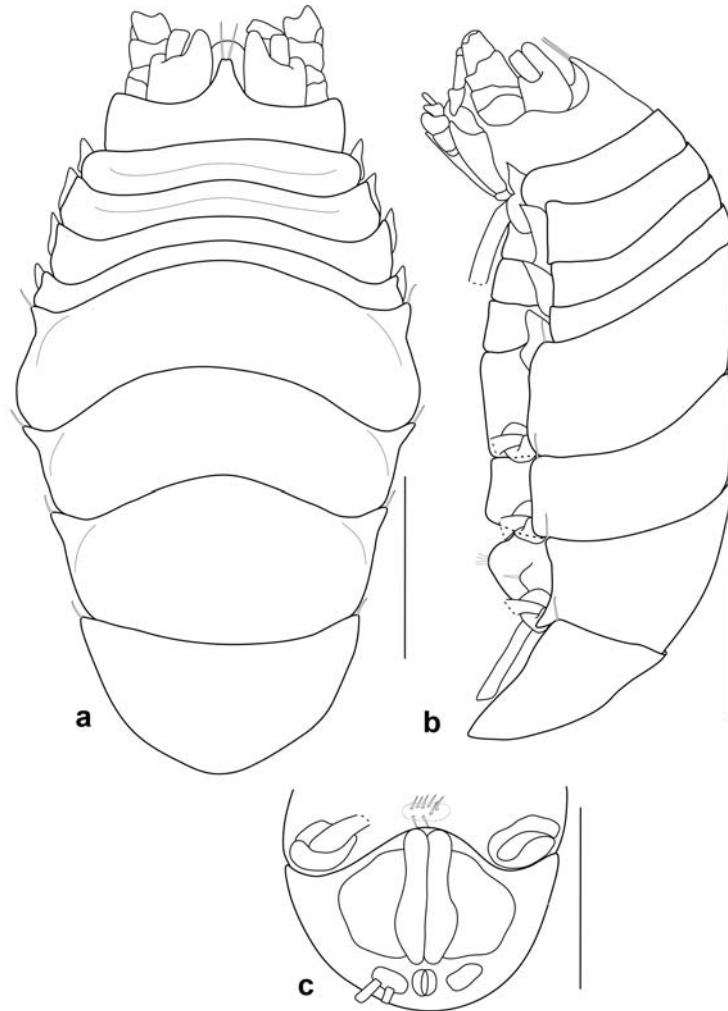


Fig. 2. *Eurycope elianae* sp. n. paratype (ZMH K-44045), copulatory male: **a**, dorsal view, **b**, lateral view, **c**, pleotelson ventral view. Scale bars = 0.5 mm.

Ambulosome length 0.17 body length, natasome length 0.72 body length. Pleotelson length 0.83 width and 0.23 body length, posterior margin smoothly rounded.

Antennal (female paratype, ZMH K-44051, Fig. 3) article 1 medial length 1.2 proximal width, lateral length 0.84 proximal width. Article 1 extending beyond rostrum tip, distomedial lobe well developed reaching distal margin of article 2, medially with three broom setae, distomedially with four unequally bifid and three simple setae, three broom setae on medial margin, distolaterally with two unequally bifid and two simple setae. Length–width ratios of articles 2–5: 2.6, 2.1, 1.3, 2.8. Length ratios of articles 2–5 to medial length of article 1: 0.49, 0.29, 0.14, 0.24. Article 2 distally with three unequally bifid setae, two simple setae and one broom seta. Arti-

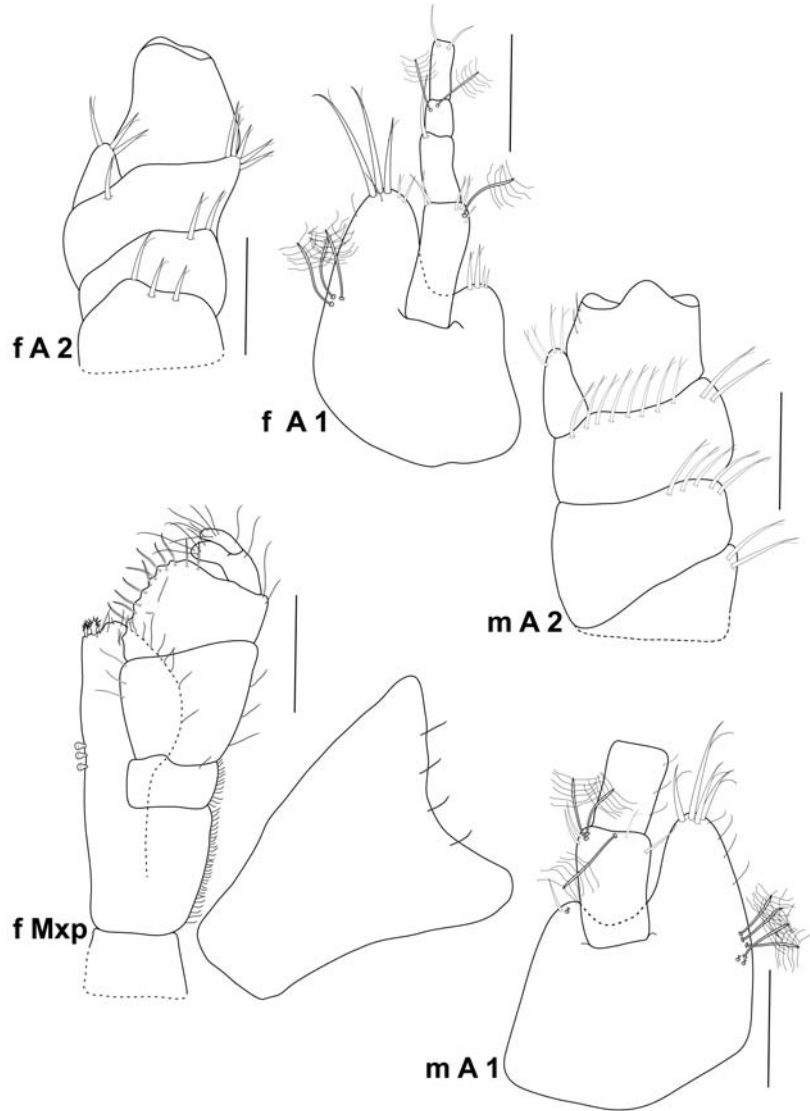


Fig. 3. *Eurycope elianae* sp. n. paratype (ZMH K-44051), preparatory female: antennula, antenna and maxilliped. Paratype (ZMH K-44050), copulatory male: antennula and antenna. Scale bars = 0.1 mm.

cle 3 distally with one simple seta. Article 4 distally with two broom setae. Article 5 distally with two simple setae. Remaining distal articles of antennula broken off.

Antennal (female paratype, ZMH K-44051, Fig. 3) articles 1–4 length–width ratios: 0.55, 0.54, 0.49, 0.88; length ratios of articles 2–4 to article 1: 1.0, 0.95, 1.4. Article 1 distally with three unequally bifid setae. Article 2 distomedially with two unequally bifid setae. Article 3 distomedially with five unequally bifid setae and distally with one unequally bifid seta. Squama length 1.5 width and 0.8 article 3

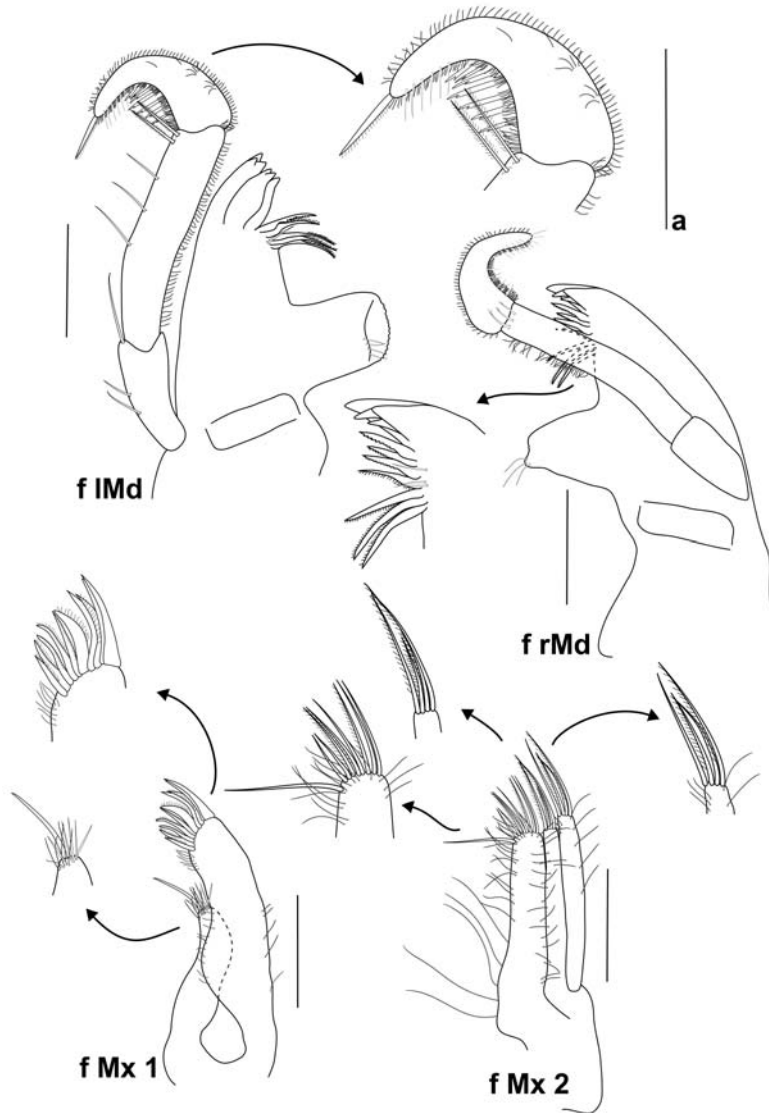


Fig. 4. *Eurycope eliana* sp. n. paratype (ZMH K-44052), preparatory female: right and left mandible, maxillula and maxilla. Scale bars = 0.1 mm and scale bar a = 0.1 mm belongs to all the magnified drawings.

length, distally with three unequally bifid setae. Remaining distal articles of antenna broken off.

Mandible (female paratype, ZMH K-44052, Fig. 4) incisor with four cusps on right and five cusps on left mandible. *Lacinia mobilis* of left mandible with one denticle. Spine row with seven spines on right mandible and five spines on left mandible. Molar process distally slightly tapering, with three simple setae on right

mandible and four simple setae on left mandible. Palp length equal mandibular body length in right and left mandible. Article 1 in left mandible laterally with two simple setae and distolaterally with one simple seta. Article 1 in right mandible without setae. Article 2 length 1.9 article 1 length, medial margin with fine, short, simple setae, lateral margin with three simple setae; in left mandible distolaterally with two serrated setae; in right mandible distally with three unequally bifid setae. Article 3 length 1.3 article 1 length, inner margin with numerous fine, short, simple setae and approximately 15 cleaning setae.

Maxillular (female paratype, ZMH K-44052, Fig. 4) lateral endite margins with fine, simple seta, lateral endite distally with 10 robust setae (seven serrated) and distomedially with slender, simple setae. Mesial endite width 0.6 endite width, distally with one long, stout, simple seta, five shorter, simple setae and some fine, simple setae.

Maxillar (female paratype, ZMH K-44052, Fig. 4) lateral endite longest, distally with two long and two shorter setulated setae. Middle endite distally with two long and two shorter setulated setae. Mesial endite shortest, width 2.0 lateral endite width. Distal margin of mesial endite with six simple setae, three setulated setae and numerous fine, simple setae. Margins of all endites with fine, simple setae.

Maxilliped (female paratype, ZMH K-44051, Fig. 3) with three retinaculae. Basis length 2.5 width, lateral margin fringed with fine, short, simple setae. Endite expanded laterally with several simple setae, width 0.81 basis width, distal margin oblique, 0.44 of endite width, with two fan setae. Palp as long as basis, inserted proximally after 0.40 basis length. Length–width ratios of articles 1–5: 0.57, 0.94, 0.74, 2.4, 3.0. Article 1 lateral margin as long as medial margin, fringed with fine, short, simple setae. Article 2 increasing in width distally, as wide as basis, lateral margin length 1.2 medial length, laterally with three simple setae and medially with three simple setae. Article 3 length 1.2 article 2 medial length, medially with a row of 11 setulose setae (Fig. 7a) and distomedially with two simple setae. Article 4 laterally with one simple seta, distomedial lobe length subequal article 5 length, with four simple setae. Article 5 laterally with one long, simple seta and apically with six long, simple setae. Epipod slightly longer than basis, tapering apically, lateral margin with rounded projection as long as apical tip, distolaterally with four simple setae.

Pereopod V (female paratype, ZMH K-44052, Fig. 5) ischium to dactylus length–width ratios: 2.6, 2.1, 1.4, 1.8, 4.4. Ischium dorsally with 12 plumose setae and distoventrally with four simple setae. Merus ventrally with four simple setae, distoventrally with one simple seta and one unequally bifid seta. Carpus dorsally with 24 plumose setae, distodorsally with two unequally bifid setae, ventrally with 17 plumose setae. Propodus dorsally with 16 plumose setae, distodorsally with two unequally bifid setae, ventrally with 19 plumose setae, distoventrally with one unequally bifid seta, Dactylus with one distal sensillum articulating between the dactylar claws. Claws length 0.23 dactylus length.

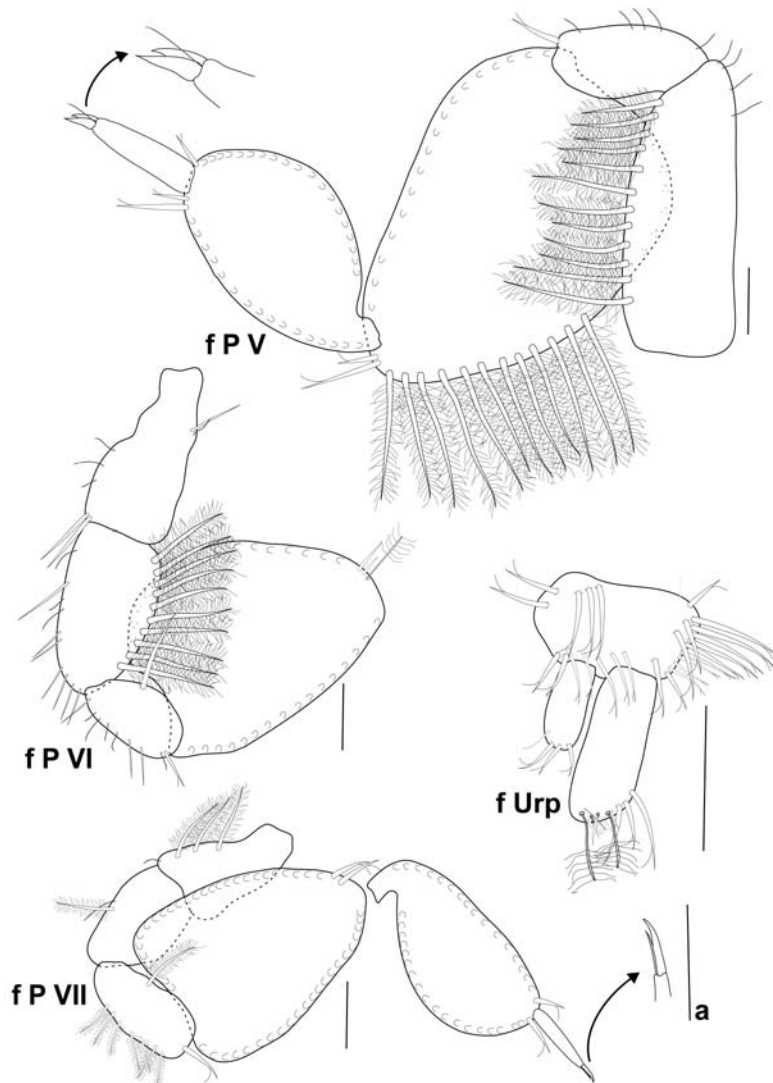


Fig. 5. *Eurycope eliana* sp. n. paratype (ZMH K-44052), preparatory female: pereopods V–VII. Paratype (ZMH K-44051), preparatory female: uropod. Scale bars = 0.1 mm and scale bar a = 0.1 mm belongs to all the magnified drawings.

Pereopod VI (female paratype, ZMH K-44052, Fig. 5) basis to carpus length–width ratios: 2.0, 1.7, 1.8, 1.3; length ratios of ischium–carpus to basis: 0.90, 0.33, 1.4. Basis dorsally with two simple setae, ventrally with three simple setae and, distoventrally with two slightly stouter, simple setae. Ischium dorsally with ten plumose setae, ventrally with six simple setae and distoventrally with four simple setae. Merus dorsally with one stouter, simple seta, ventrally with seven simple setae, distoventrally with one simple seta and one unequally bifid

seta. Carpus dorsally with 20 plumose setae, distodorsally with two stouter, simple setae and one broom seta, ventrally with 16 plumose setae.

Pereopod VII (female paratype, ZMH K-44052, Fig. 5) basis to dactylus length–width ratios: 1.6, 1.5, 2.1, 1.3, 2.1, 4.1; length ratios of ischium–dactylus to basis: 0.93, 0.96, 1.7, 1.9, 0.82. Basis dorsally with three plumose setae, distodorsally with one simple seta. Ischium dorsally with one simple seta and one plumose seta. Merus dorsally with seven plumose setae, distodorsally with one unequally bifid seta, ventrally with one plumose seta. Carpus dorsally with 22 plumose setae, distodorsally with two unequally bifid setae, ventrally with 26 plumose setae. Propodus dorsally with 16 plumose setae, distodorsally with one unequally bifid seta, ventrally with 18 plumose, distoventrally with one unequally bifid seta. Claws 0.24 dactylus length.

Operculum (female paratype, ZMH K-44052, Fig. 6) vaulted, slightly keeled, length 0.79 width. Ventral apex protruding with one unequally bifid seta. Lateral margins with three simple setae, distally with six simple setae.

Pleopod III (female paratype, ZMH K-44052, Fig. 6) protopod length 0.53 width. Endopod length subequal to width, distally with three plumose setae, length subequal endopod length. Exopod bi-articulated, length 3.5 width, 1.4 endopod length, width 0.41 endopod width, margins fringed with fine, short, simple setae, distally with one simple seta slightly shorter than apical article.

Pleopod IV (female paratype, ZMH K-44052, Fig. 6) protopod length 0.35 width. Endopod length 0.84 width, no setae. Exopod bi-articulated, length 3.7 width, 1.4 endopod length, width 0.33 endopod width, margins with fine, short, simple setae, distally with one plumose seta as long as distal setae of pleopod III endopod.

Pleopod V (female paratype, ZMH K-44052, Fig. 6) almost oval, length 1.1 width, no setae.

Uropod (female paratype, ZMH K-44051, Fig. 5) protopod length 0.59 width, lateral margin slightly convex. Arrangement of unequally bifid setae: proximally three, laterally two, distally nine, medially 11 and submedially two; proximally with one simple seta. Endopod length 2.6 width and 1.7 protopod length, distally with six unequally bifid and five broom setae. Exopod length 2.3 width, 0.56 length of endopod, width 0.63 width of endopod, distally with three unequally bifid setae and one simple seta.

Differences in male paratype. — Shape and proportions of body and segments similar to these in female (male allotype, ZMH K-44045, Fig. 2). Anterolateral edges of pereonites 5–7 and pleotelson with one short seta. Pleotelson length 0.24 body length and pleotelson length 0.77 width, posterior margin smoothly rounded.

Antennular (male paratype, ZMH K-44050, Fig. 3) article 1 medial length 1.1 proximal width, lateral length 0.82 proximal width. Article 1 distomedial lobe reaching distal margin of article 2, distomedially with four unequally bifid setae, medial margin with four simple setae and six broom setae, distolateral projection with one simple seta and one broom seta. Article 2 length 1.6 width and 0.47 medial length of

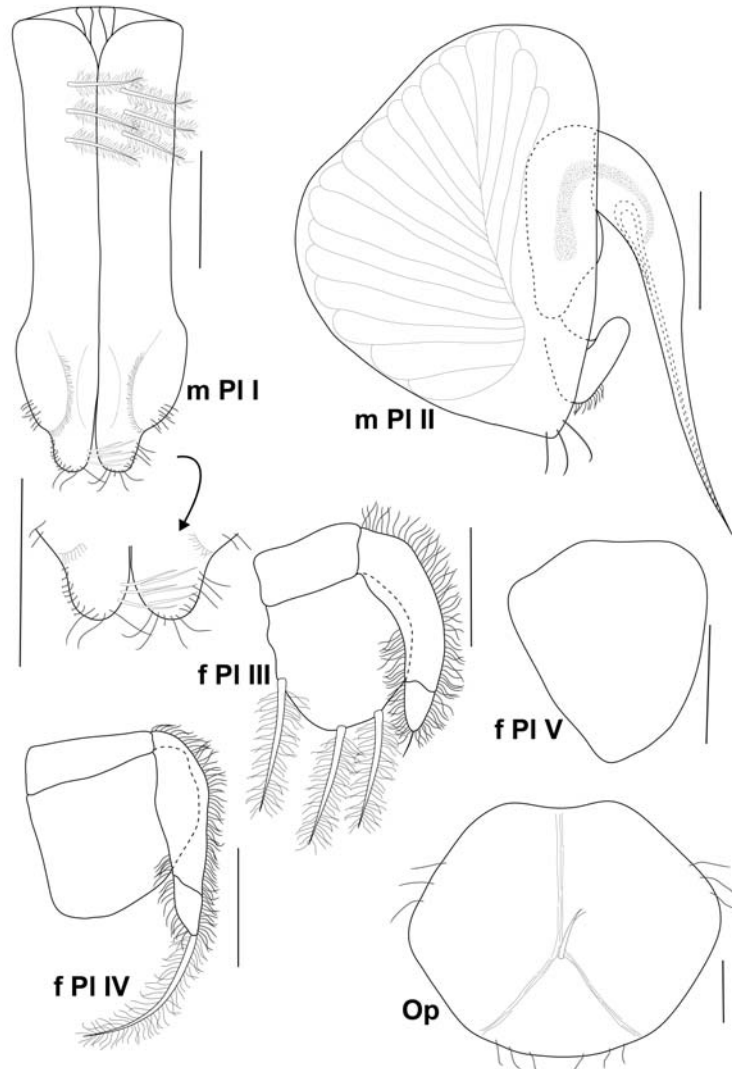


Fig. 6. *Eurycope eliana* sp. n. paratype (ZMH K-44050), copulatory male: pleopod I–II. Paratype (ZMH K-44052), preparatory female: pleopods III–V and operculum. Scale bars = 0.1 mm.

article 1, distally with three simple setae, one unequally bifid seta and three broom setae. Article 3 length 1.5 width and length 0.34 medial length of article 1, medial margin with three simple setae. Remaining distal articles of antennula broken off.

Antennal (male paratype, ZMH K-44050, Fig. 3) articles 1–4 length–width ratios: 0.68, 0.78, 0.52, 0.83. Length ratios of articles 2–4 to article 1: 1.2, 0.92, 1.2. Article 1 distomedially with two unequally bifid setae. Article 2 distomedially with five unequally bifid setae. Article 3 distally with eight unequally bifid setae and distomedially with two unequally bifid setae. Squama length 1.8 width and

0.88 article 3 length, distally with four unequally bifid setae. Article 4 laterally with two simple setae.

Pleopod I (male paratype, ZMH K-44050, Fig. 6) length 2.4 proximal width and 3.1 'waist' width. Proximal third of each side of ventral surface with three plumose setae. Distomedial lobes protruded on 0.1 pleopod length, rounded, distolaterally with 12 fine, simple setae and medially with three stouter, simple setae on each lobe. Distolateral lobes not developed, only slightly convex, with seven fine, simple setae. Dorsal funnels on distal third of pleopod with a row of numerous fine, short, simple setae.

Pleopod II (male paratype, ZMH K-44050, Fig. 6) protopod length 1.4 width, distally with three simple setae. Medial margin nearly straight. Endopod and exopod inserted on distal third of medial margin. The stylet length 5.7 width and 0.94 protopod length. Stylet distally gradually tapered. Sperm duct opening in proximally 0.23 of stylet length. Exopod hook with fine, short, simple setae, distal part length 0.5 basal article of endopod.

Distribution. — Known only from the type locality south of Iceland (northern North Atlantic) in a depth of 2749 m.

Remarks. — *Eurycope elianae* sp. n. can be easily distinguished from any other species of *Eurycope* occurring within this geographic region and elsewhere mainly due to the shape of the rostrum having apically two long, slightly robust, simple setae and the relation of antennula article 1 and 2 to each other. Two long setae at the tip of the rostrum are also known in *E. manifesta* Menzies and George, 1972 from the south-east Pacific and *E. tumidicarpus* Schmid, Brenke et Wägele, 2002 from abyssal depths in the Angola Basin. *E. manifesta* features a broader rostrum than *E. elianae* sp. n. Pereonite 7 is longer than the pleotelson in *E. manifesta*, whereas it is smaller than the pleotelson in *E. elianae* sp. n. Further, the uropodal protopod length is 0.95 endopod length in *E. manifesta*, while the ratio in *E. elianae* sp. n. is 0.56. Moreover, *E. manifesta* also features two small setae next to the two long simple setae on the tip of the rostrum, whereas only two long, slightly robust, simple setae are present in *E. elianae* sp. n. *E. tumidicarpus* has a more elongate body (length 2.8 width), a different shape of the distal lobes of the male pleopod I and pleopod II protopod, and a differently shaped rostrum, which is much shorter than that of *E. elianae* sp. n. Further, the 2 long, simple setae on the tip of the rostrum of *E. tumidicarpus* are shorter than those in *E. elianae* sp. n. The shape of the article 1 of the antennula in *E. elianae* sp. n. is also different, with a long distomedial lobe, which is weakly pronounced in *E. tumidicarpus*. The shape of the rostrum in *E. elianae* sp. n. is most similar to *E. inermis* and the species of the *E. complanata* complex (Wilson, 1982b). However, *E. elianae* sp. n. has a different shape of male pleopods I and II and also the shape of the antennula differs. Further, the maxillipeds of *E. elianae* sp. n. possess three retinaculæ, whereas *E. complanata* features five retinaculæ.

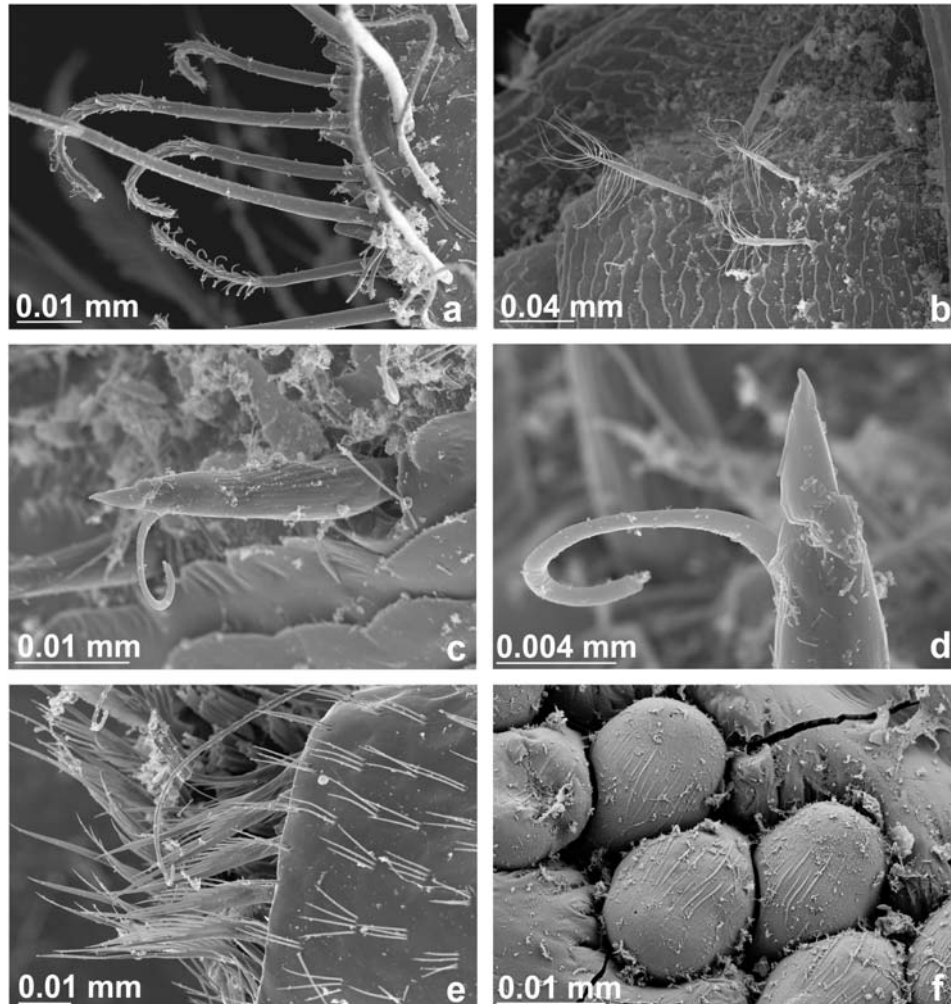


Fig. 7. Scanning Electron Microscope (SEM) images of *Eurycope elianae* sp. n. (ZMH K-44067), preparatory female: **a**, setulose seta, *E. aculeata* sp. n. (ZMH K-44068), preparatory female: **b**, broom seta; **c**, unequally bifid seta; **d**, magnification of unequally bifid seta; **e**, cleaning setae of mandibular palp; **f**, retinaculae of maxilliped.

Eurycope aculeata sp. n.
(Figs 7b–f, 8–14)

Material. — A total of 17 specimens of *E. aculeata* sp. n. were found at BIOICE station No. 2330. Holotype: preparatory female (IMNH-28838), 4.9 mm, BIOICE, Rothlisberg Percy sled, station No. 2330, 30 May 1992, depth: 453 m, Locality: 63.0833 N, 11.3333 W. Paratypes: copulatory male (allotype, IMNH-28837), 4.9 mm; preparatory female (ZMH K-44053), 5.1 mm, used for dissection; preparatory female (ZMH K-44054), 4.9 mm, used for dissection; copulatory

male (ZMH K-44055), 4.9 mm, used for dissection; preparatory female (ZMH K-44056), 5.4 mm; preparatory female (ZMH K-44057), 4.7 mm; preparatory female (ZMH K-44058), 5.2 mm; preparatory female (ZMH K-44059), 5.0 mm; preparatory female (ZMH K-44060), 5.8 mm; preparatory female (ZMH K-44061), 4.6 mm; preparatory female (ZMH K-44062), 5.0 mm; preparatory female (ZMH K-44063), 5.4 mm; copulatory male (ZMH K-44064), 4.3 mm; copulatory male (ZMH K-44065), 4.3 mm; copulatory male (ZMH K-44066), 4.4 mm. All paratypes were collected from the same locality as the holotype.

Etymology. — The name *E. aculeata* sp. n. refers to the anterior margin of pereonites 5–7 with arised dorsomedial projections, which are remarkably visible in the lateral view.

Diagnosis. — Body length about twice width. Natasome slightly tapering posteriorly, pereonite 5 width about 1.2 pleotelson width. Anterior margin of pereonites 5–7 with arised dorsomedial projections. Rostrum elongate, more than half of head length, reaching 0.75–0.8 antennula article 1 length, lateral margins slightly keeled. Anterolateral edges of pereonites 5–7 and pleotelson without setae. Pereonite 7 length about twice pereonite 6 length, 0.6–0.7 pleotelson length (Figs 8–9). Distomedial lobe of antennular article 1 subequal in length to distolateral projection, shorter than article 2. Maxilliped endite with five retinaculae, width 0.7 basis width, distal margin width 0.5 endite width, with six fan setae. Palp article 1 with acute distolateral projection, article 3 medial margin smooth, article 4 distomedial lobe length 0.6 article 5 length. Epipod as long as basis, lateral projection shorter and narrower than apical tip.

Male pleopod I distomedial lobes protruded, length 0.05 pleopod length, with small distolateral acute projections, rounded medial margin of each lobe with five slightly stout, simple setae, distolateral lobes not developed. Male pleopod II exopod emerging on distal slight concavity of protopod medial margin, stylet length subequal protopod length. Uropod protopod as long as wide, distomedial angle weakly expressed. Endopod length 1.3 protopod length, exopod equal to endopod in length.

Description. — Body (female holotype, IMNH-28838, Fig. 8) length 2.3 pereonite 5 width. Head width 2.3 length, length 0.11 body length. Rostrum elongate, more than half of head length, overhanging frons, reaching 0.73 antennula article 1 length, lateral margins slightly keeled, distal margin width 0.24 antennula width.

Pereonites 2–7 versus pereonite 1 length ratios: 1.1, 1.3, 1.3, 3.1, 2.8, 5.1. Length–width ratios of pereonites 1–7: 0.13, 0.12, 0.13, 0.12, 0.27, 0.24, 0.52. Anterior margin of pereonites 5–7 with arised dorsomedial projection. Coxae I–IV similar in size and shape, length subequal to pereonites lateral length in dorsal view. Anterior processes in dorsal view triangular, near half of corresponding pereonites length. Venter anteriorly of pereopods VII coxa with bulla, bearing one

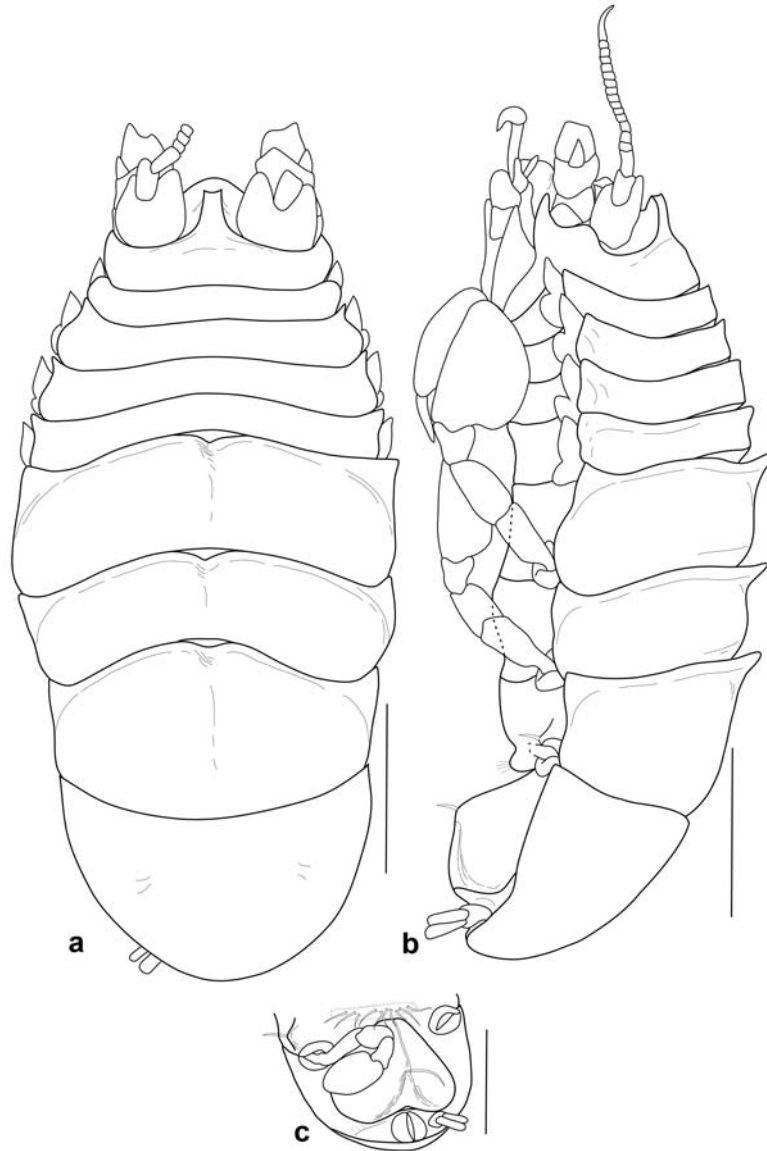


Fig. 8. *Eurycope aculeata* sp. n. holotype (IMNH-28838), preparatory female: **a**, dorsal view; **b**, lateral view; **c**, pleotelson ventral view. Scale bars = 1.0 mm.

simple seta. Ventral rounded keel in front of the pleotelson with some simple setae. Ambulosome length 0.18 body length and natasome length 0.71 body length. Pleotelson length 0.82 width and 0.29 body length, posterior margin rounded.

Antennular (female paratype, ZMH K-44053, Fig. 10) article 1 medial length 0.79 proximal width, lateral length 0.90 proximal width. Article 1 extends beyond the tip of the rostrum, distomedial lobe length subequal distolateral projection

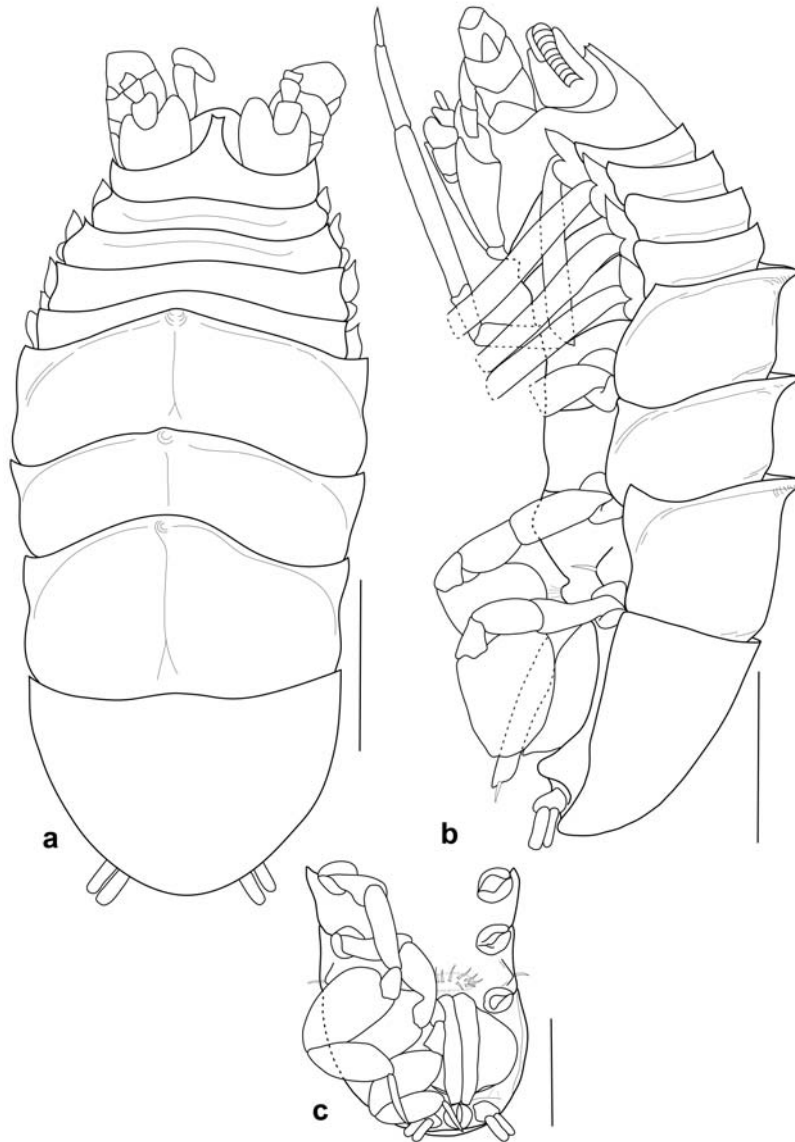


Fig. 9. *Eurycope aculeata* sp. n. paratype (IMNH-28837), copulatory male: **a**, dorsal view; **b**, lateral view; **c**, pleotelson ventral view. Scale bars = 1.0 mm.

length, shorter than article 2. Article 1 distomedially with three unequally bifid setae (Fig. 7c–d) and one simple seta, distally with one simple and one broom seta (Fig. 7b), distolaterally with one unequally bifid seta and one simple seta. Article 2 length 1.4 width and 0.42 article 1 length. Article 2 distally with five unequally bifid setae, one simple seta and one broom seta. Remaining distal articles of antennula broken off.

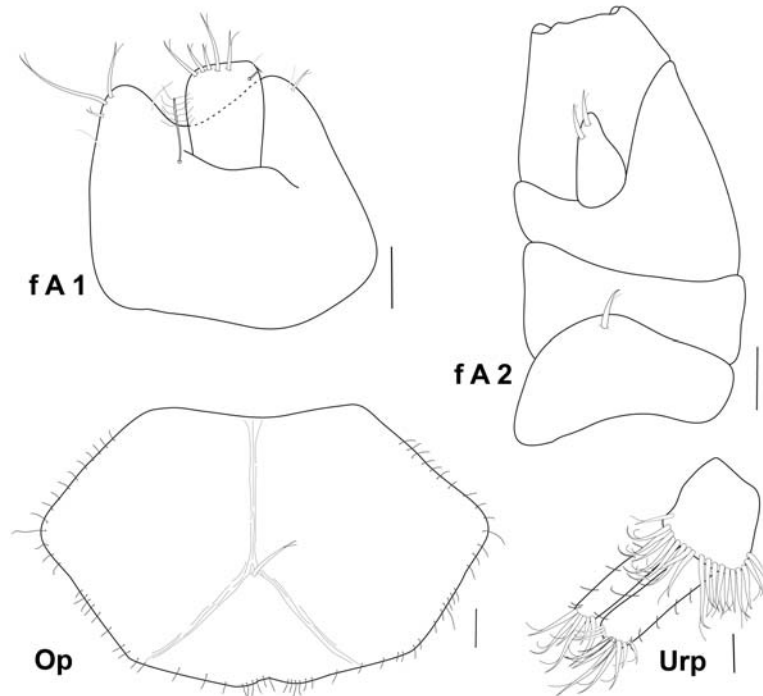


Fig. 10. *Eurycope aculeata* sp. n. paratype (ZMH K-44053), preparatory female: antennula, antenna, operculum and uropod. Scale bars = 0.1 mm.

Antennal (female paratype, ZMH K-44053, Fig. 10) articles 1–4 length–width ratios: 0.51, 0.50, 1.0, 1.2. Length ratios of articles 2–4 to article 1: 1.1, 2.1, 1.8. Article 1 laterally with one unequally bifid seta. Squama length 1.45 width, 0.40 article 3 length, distally with two unequally bifid setae. Remaining distal articles of antenna broken off.

Mandible (female paratype, ZMH K-44054, Fig. 11) incisor with three cusps on right and 4 cusps on left mandible. *Lacinia mobilis* of left mandible with three denticles. Spine row with 10 spines on right and eight on left mandible. Molar process triangular, posterior margin with four simple setae. Condyle equal in length to molar. Palp length subequal mandibular body length. Article 2 length twice article 1 length, broadened distally, distal half of medial margin serrated, marginally with several fine, simple setae and distolaterally with three setulated setae. Article 3 length 1.5 article 1 length, with approximately 20 marginal cleaning setae (Fig. 7e), distally with one long and three shorter, setulated setae.

Maxillular (female paratype, ZMH K-44054, Fig. 12) lateral endite margins with fine, simple setae, lateral endite distally with 11 robust setae (six serrated) and distomedially with slender, simple setae. Mesial endite width 0.65 lateral endite width. Distal margin of mesial endite with some fine, simple setae, one long, stout, setulated seta and one rather robust, simple seta.

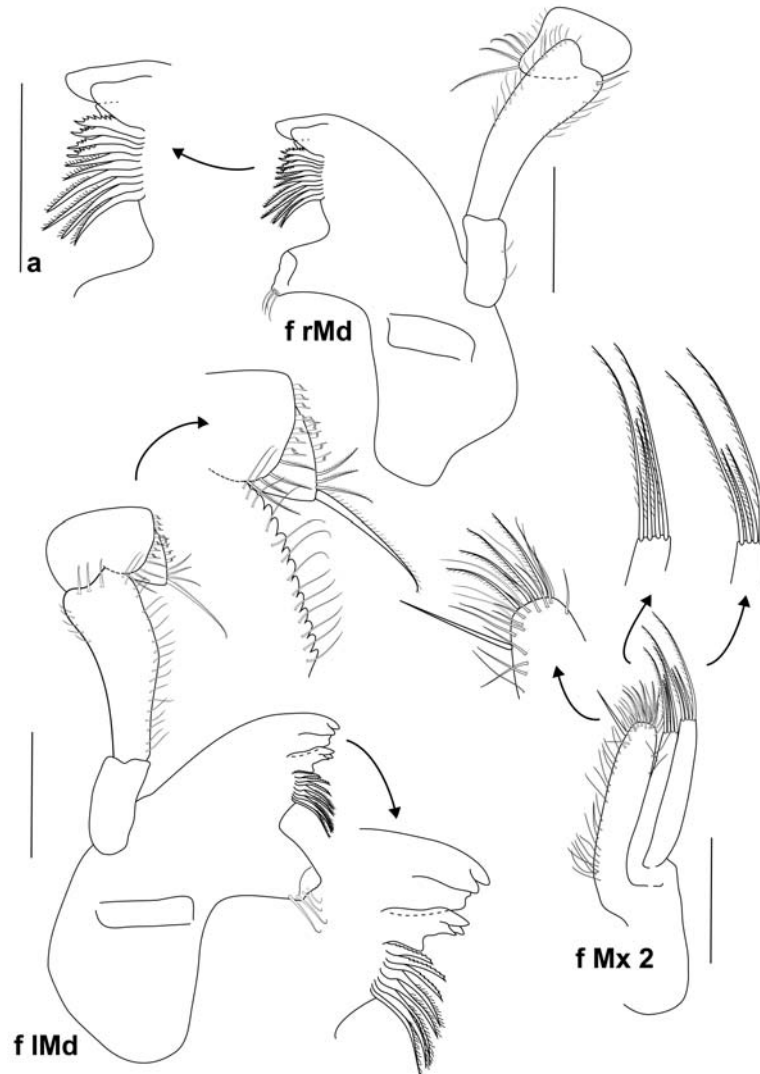


Fig. 11. *Eurycope aculeata* sp. n. paratype (ZMH K-44054), preparatory female: right and left mandible and maxilla. Scale bars = 0.25 mm and scale bar a = 0.25 mm belongs to all the magnified drawings.

Maxillar (female paratype, ZMH K-44054, Fig. 11) lateral endite longest, middle endite shortest, both endites distally with two long and two shorter setulated setae. Mesial endite width 1.7 lateral endite width, distal margin with four setulated setae, distomedially with one long, simple seta and numerous fine, simple setae, medial margin with numerous fine, simple setae.

Maxilliped (female paratype, ZMH K-44054, Fig. 12) with five retinaculae (Fig. 7f). Basis length 2.5 width, lateral margin fringed with fine, short, simple setae. Endite width 0.65 basis width, lateral margin with simple setae, distal mar-

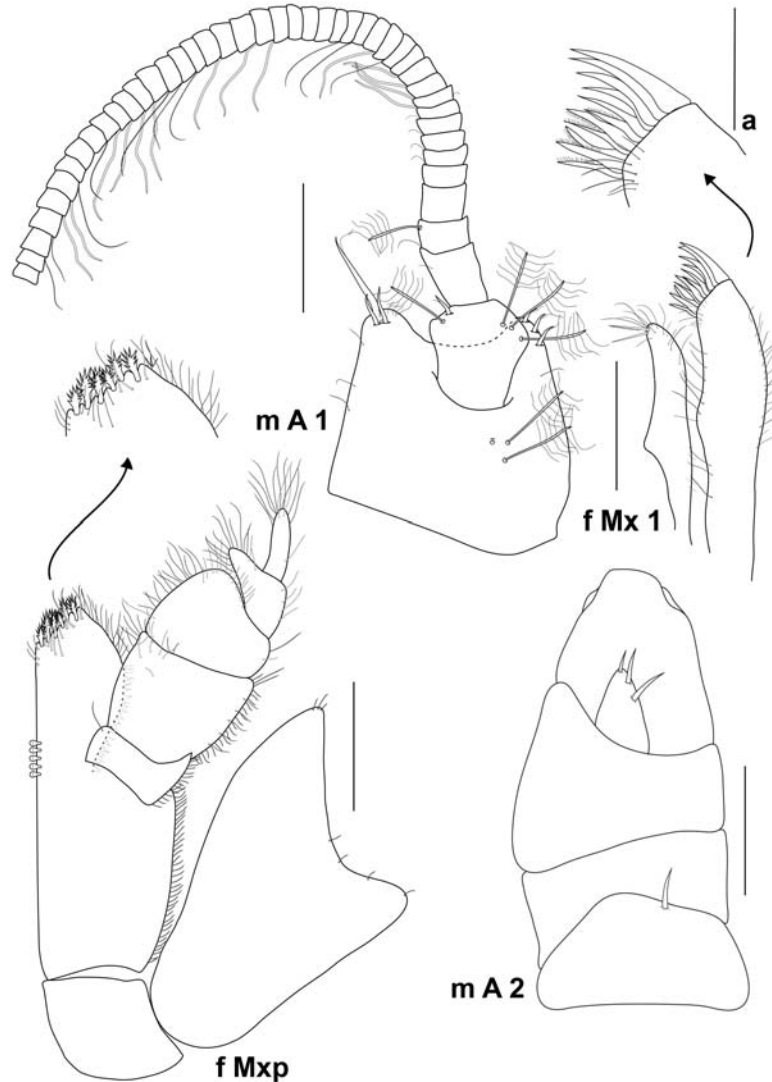


Fig. 12. *Eurycope aculeata* sp. n. paratype (ZMH K-44054), preparatory female: maxillula, maxilliped. Paratype (ZMH K-44055), copulatory male: antennula and antenna. Scale bars = 0.25 mm and scale bar a = 0.1 mm belongs to all the magnified drawings.

gin obliquely cut to medial side, width 0.5 endite width, with six fan setae and several simple setae. Palp inserted after 0.48 basis length, width 0.9 basis width. Length–width ratios of palp articles 1–5: 0.55, 0.87, 0.79, 2.0, 3.2. Article 1 with acute distolateral projection, lateral length 1.8 medial length. Article 2 lateral margin with five simple setae and fringed with several fine, short, simple setae, distolaterally with three simple setae and distomedially with 15 simple setae. Article 3 medial and distal margins smooth with a row of simple setae, lateral margin

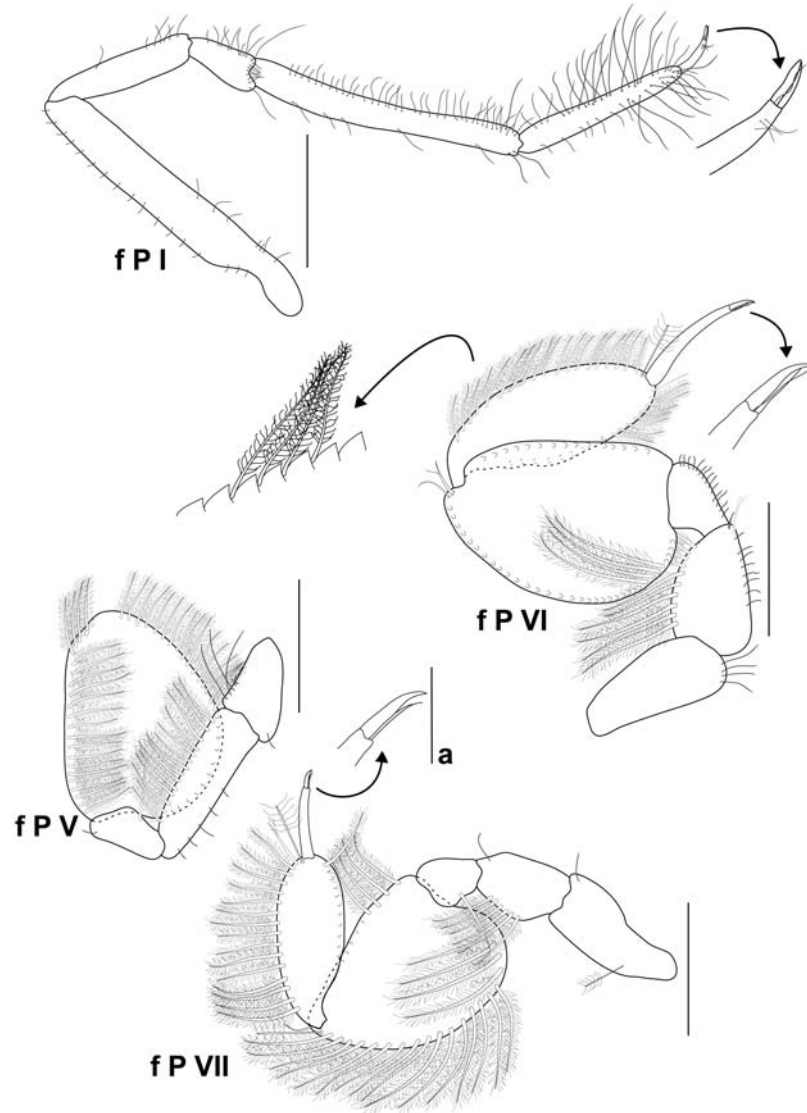


Fig. 13. *Eurycope aculeata* sp. n. paratype (ZMH K-44054), preparatory female: pereopods I and V–VII. Scale bars = 0.5 mm and scale bar a = 0.1 mm belongs to all the magnified drawings.

with two simple setae. Article 4 distally with 12 simple setae, laterally with four simple setae, medial lobe length 0.55 article 5 length. Article 5 distally with 12 simple setae and laterally with one simple seta. Epipod as long as basis, tapering apically, lateral margin with triangular projection shorter and narrower than apical tip, distolaterally with seven simple setae.

Pereopod I (female paratype, ZMH K-44054, Fig. 13) basis to dactylus length–width ratios: 7.0, 4.5, 2.1, 8.8, 6.6, 6.5; ischium–dactylus length to basis

length ratios: 0.47, 0.23, 0.86, 0.56, 0.17. Basis with scattered small simple setae. Ischium ventrally with one simple seta, and distoventrally with six simple setae. Merus distally and ventrally with some simple setae. Carpus dorsally with seven simple and ventrally with numerous simple setae. Propodus dorsally and ventrally with long, simple setae. Dactylus distally with three simple setae and with one distal sensillum articulating between the dactylar claws. Claws length 0.31 dactylus length.

Pereopod V (female paratype, ZMH K-44054, Fig. 13) basis to carpus length–width ratios: 1.5, 3.1, 1.6, 1.3; ischium–carpus length to basis length ratios: 1.7, 0.81, 2.3. Basis dorsally with two short and three long simple setae, distoventrally with one simple seta. Ischium dorsally with 14 plumose and ventrally with five simple setae. Merus dorsally with one plumose seta, distoventrally with one simple seta. Carpus dorsally with 27 plumose and ventrally with 21 plumose setae.

Pereopod VI (female paratype, ZMH K-44054, Fig. 13) basis to dactylus length–width ratios: 2.1, 1.6, 1.2, 1.4, 2.7, 8.0; ischium–dactylus length to basis length ratios: 0.88, 0.53, 1.5, 1.7, 0.9. Basis distoventrally with four simple setae. Ischium dorsally with 10 plumose and ventrally with 12 simple setae. Merus ventrally with 14 simple setae. Carpus dorsally with 34 plumose, distodorsally with one simple seta and one unequally bifid seta, ventrally with 15 plumose setae. Propodus dorsally with 19 plumose, distodorsally with one broom setae, ventrally with 16 plumose setae and distoventrally with one simple seta. Dactylus distally with one distal sensillum articulating between the dactylar claws. Claws length 0.19 dactylus length.

Pereopod VII (female paratype, ZMH K-44054, Fig. 13) basis to dactylus length–width ratios: 2.1, 1.6, 1.1, 1.4, 2.6, 7.0; ischium–dactylus length to basis length ratios: 0.73, 0.42, 1.6, 1.3, 0.68. Basis dorsally with one broom seta and distoventrally with one simple seta. Ischium dorsally with six plumose setae and distoventrally with one simple seta. Merus dorsally with one plumose seta. Carpus dorsally with 24 plumose, distodorsally with one simple seta and one broom seta, ventrally with 14 plumose ventral setae. Propodus dorsally with 15 plumose and distodorsally with one unequally bifid seta and one broom seta, ventrally 16 plumose setae, claw length 0.19 dactylus length.

Operculum (female paratype, ZMH K-44054, Fig. 10) vaulted and keeled, length 0.60 width. Apex protruding ventrally with unequally bifid seta. Lateral margins with 24 short, simple setae, distally 18 short, simple setae.

Pleopod III (female paratype, ZMH K-44054, Fig. 14) protopod length 0.48 width. Endopod as long as wide, distally with three plumose setae (broken off). Exopod bi-articulated, length 4.3 width, 1.5 endopod length, width 0.35 endopod width, margins with fine, short, simple setae, distally with one simple seta, length 0.60 distal article length.

Pleopod IV (female paratype, ZMH K-44054, Fig. 14) protopod length 0.43 width. Endopod length 1.2 width, no setae. Exopod bi-articulated, length 3.5

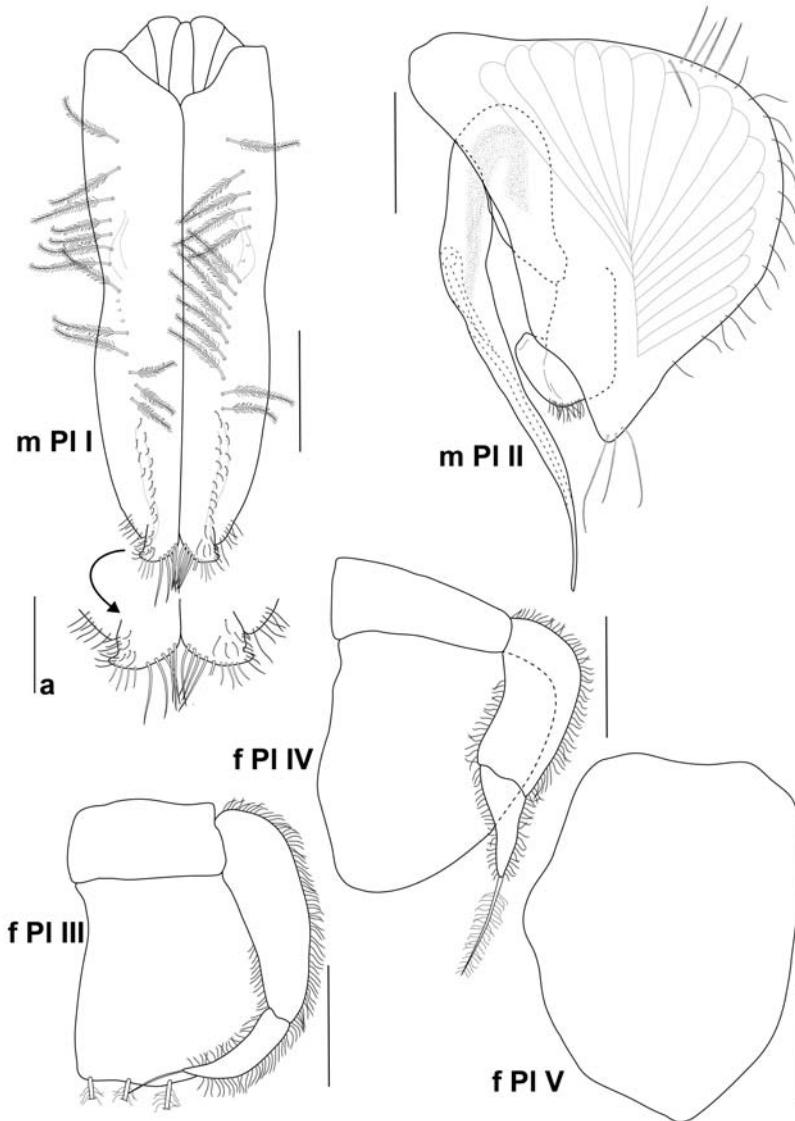


Fig. 14. *Eurycope aculeata* sp. n. paratype (ZMH K-44055), copulatory male: pleopod I–II. Paratype (ZMH K-44054), preparatory female: pleopods III–V. Scale bars = 0.25 mm and scale bar a = 0.1 mm belongs to all the magnified drawings.

width, equal to endopod length, width 0.34 endopod width, margins with fine, short, simple setae, distally with one plumose seta as long as distal article.

Pleopod V (female paratype, ZMH K-44054, Fig. 14) rather oval, length 1.3 width, no setae.

Uropod (female paratype, ZMH K-44053, Fig. 10) protopod length subequal to width, distally with 19 unequally bifid setae. Endopod length 3.4 width and 1.4

protopod length, laterally with two simple setae, medially with five simple setae, distally with 10 unequally bifid and three simple setae. Exopod length 4.8 width, equal to endopod length, width 0.72 endopod width, laterally with four simple setae, distally with six unequally bifid and two simple setae.

Differences in male paratype. — Shape and proportions of body and segments similar to these in female (male allotype, IMNH-28837, Fig. 9). Ambulosome length 0.17 body length and natasome length 0.69 body length. Pleotelson length 0.29 body length and pleotelson length 0.87 width, posterior margin rounded.

Antennular (male paratype, ZMH K-44055, Fig. 12) article 1 medial length 0.84 proximal width, lateral length subequal to proximal width. Article 1 distomedial lobe not reaching distal margin of article 2, medially with three simple setae, distomedially with three unequally bifid setae, laterally with one simple seta and three broom setae, distolaterally with three unequally bifid setae. Length–width ratios of articles 2–5: 1.0, 1.1, 0.69, 0.85; length ratios of articles 2–5 to article 1: 0.45, 0.25, 0.14, 0.15. Article 2 distally with one unequally bifid seta and four broom setae. Article 3 distally with one simple seta and medially with one simple seta. Article 4 distally with one broom seta. Flagellum with more than 40 articles (distal articles broken off), first four articles distolaterally with simple setae, most of the remaining articles each with one long aestetasc or one long simple seta (articles 16–18, 23 and 32–33 without setae).

Antennal (male paratype, ZMH K-44055, Fig. 12) articles 1–4 length–width ratios: 0.53, 0.46, 0.93, 1.2. Length ratios of articles 2–4 to article 1: 0.84, 1.7, 1.6. Article 1 laterally with one simple seta. Squama length 1.5 width, 0.41 article 3 length, distally with three simple setae. Remaining distal articles broken off.

Pleopod I (male paratype, ZMH K-44055, Fig. 14) length 2.6 proximal width and 3.0 ‘waist’ width. Distomedial lobes protruded, length 0.05 pleopod I length, with small distolateral acute projections, each lobe medially with five slightly stout, simple setae, lateral sides with fine, simple setae. Distolateral lobes not pronounced, with six fine, simple setae. Each side of ventral surface with 16 plumose ventral setae on midline, distal third with row of numerous fine, short, simple setae.

Pleopod II (male paratype, ZMH K-44055, Fig. 14) protopod length 1.5 width, lateral margin with a row of simple setae, proximally and distally with a few serrated setae. Endopod stylet narrower than endopod basal article, length 9.4 width and subequal to protopod length. The sperm duct opening is situated in proximal third of the stylet. Exopod emerging on distal slight concavity of medial margin, medially bent, hook with fine, short, simple setae.

Distribution. — *E. aculeata* sp. n. is known only from the type locality, south of Iceland (northern North Atlantic) in a depth of 453 m.

Remarks. — *E. aculeata* sp. n. is easily distinguished from other *Eurycope* species, by having dorsomedial projections on the anterior margins of the pereonites 5–7, which are especially obvious in the lateral view. This feature (if the ante-

rior margin of natasomal pereonites is somewhat raised) is far less pronounced in all the other known *Eurycope* species. Further, *E. aculeata* sp. n. can be also distinguished by the shape of the rostrum and its size relative to the antennular article 1. *E. aculeata* sp. n. is most similar to the type species of the genus, *E. cornuta* Sars, 1864. The differences are: the rostrum of *E. aculeata* sp. n. is longer with a narrower tip in comparison to that of *E. cornuta*. Additionally, the distinct dorso-medial projections on the anterior margins of the pereonites 5–7 in *E. aculeata* sp. n. are more vaulted than in *E. cornuta*. Pereonite 6 is shorter and pereonite 7 is longer in *E. aculeata* sp. n. than in *E. cornuta*. Further, the length ratio of pereonite 7 to pereonite 6 is 2.0 in *E. aculeata* sp. n. and only 1.6 in *E. cornuta*.

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References

- BIRSTEIN J.A. 1963. *Deep water isopods (Crustacea, Isopoda) of the north-western part of the Pacific Ocean*. Institute of Oceanology of the U.S.S.R., Akademii Nauk, Moscow:162–198.
- BRANDT A., BRÖKELAND W., BRIX S. and MALYUTINA M. 2004. Diversity of Southern Ocean deep-sea Isopoda (Crustacea, Malacostraca) – a comparison with shelf data. *Deep Sea Research Part II: Topical Studies in Oceanography* 51: 1753–1768.
- BRANDT A., ELSNER N., BRENKE N., GOLOVAN O. MALYUTINA M.V., RIEHL T., SCHWABE E. and WÜRZBERG L. 2013. Epifauna of the Sea of Japan collected via a new epibenthic sledge equipped with camera and environmental sensor systems. *Deep Sea Research Part II* 86–87: 43–55.
- BRATTEGARD T. and FOSSÅ J.H. 1991. Replicability of an epibenthic sampler. *Journal of the Marine Biological Association of the United Kingdom* 71: 153–166.
- BRENKE N. 2005. An epibenthic sledge for operations on marine soft bottom and bedrock. *Marine Technology Society Journal* 39: 10–19.
- BRIX S., RIEHL T. and LEESE F. 2011. First genetic data for species of the genus *Haploniscus* Richardson, 1908 (Isopoda: Asellota: Haploniscidae) from neighbouring deep-sea basins. *Zootaxa* 2838: 79–84.
- BONNIER J. 1896. Édriophthalmes. *Annales Université de Lyon* 26: 527–689.
- COLEMAN O. 2003. “Digital inking”: How to make perfect line drawings on computers. *Organisms Diversity & Evolution* 3: 1–14.
- COLEMAN O. 2009. Drawing setae the digital way. *Zoosystematics and Evolution* 85: 305–310.
- HANSEN B. and OSTERHUS S. 2000. North Atlantic-Nordic Seas exchanges. *Progress in Oceanography* 45: 109–208.

- HANSEN H.J. 1916. Crustacea Malacostraca: the order Isopoda. *Danish Ingolf Expedition* 3: 1–262.
- HESSLER R.R. 1970. The Desmosomatidae (Isopoda, Asellota) of the Gay Head-Bermuda Transect. *Bulletin of the Scripps Institution of Oceanography* 15: 1–185.
- JUST J. 1980. Polar Sea abyssal and deep bathyal Isopoda (Crustacea). *Steenstrupia* 6: 197–230.
- KUSSAKIN O.G. 2003. Marine and brackishwater like-footed Crustacea (Isopoda) from the cold and temperate waters of the Northern hemisphere. III. Suborder Asellota. Part 3. Family Munnopsidae. *Opredeliteli po Faune Rossii, Nauka, Leningrad* 171: 1–381.
- LILLJEBORG W. 1864. *Bidrag till kännedomen om de inom Sverige och Norrige förekommande Crustaceer af Isopodernas underordning och Tanaidernas familj. Inbjudningsskrift till Ahörande af de Offentliga Föreläsningar*. CA. Leffler, Konglige Academie boktryckare, Uppsala: 32 pp.
- MALYUTINA M. and BRANDT A. 2006. A revaluation of the Eurycopinae (Crustacea, Isopoda, Munnopsidae) with a description of *Dubinectes* gen. nov. from the southern Atlantic deep sea. *Zootaxa* 1272: 1–44.
- MALYUTINA M. and BRANDT A. 2007. Diversity and zoogeography of Antarctic deep-sea Munnopsidae (Crustacea, Isopoda, Asellota). *Deep Sea Research II* 54: 1790–1805.
- MENZIES R.J. 1962. The isopods of the abyssal depths in the Atlantic Ocean. *Vema Research Series* 1: 138–145.
- MENZIES R.J. and GEORGE R.Y. 1972. Isopod Crustacea of the Peru-Chile trench. Scientific results of the Southeast Pacific Expedition. *Anton Bruun Report* 9: 1–124.
- RICHARDSON H. 1905. Monograph on the isopods of North America. *United States National Museum Bulletin* 54: 1–727.
- RIEHL T., BRENKE N., BRIX S., DRISKELL A., KAISER S. and BRANDT A. 2014. Field and laboratory methods for DNA studies on deep-sea isopod crustaceans. *Polish Polar Research* 35 (2): 203–224.
- ROTHLISBERG P.C. and PEARCY W.G. 1977. An epibenthic sampler used to study the ontogeny of vertical migration of *Pandalus jordani* (Decapoda, Caridea). *Fishery Bulletin* 74: 994–997.
- SARS G.O. 1864. On en anomal Gruppe af Isopoder. *Forhandlinger Videnskaps-Selskapet, Anar 1863. Christiania*: 205–221.
- SCHMID C., BRENKE N. and WÄGELE J.W. 2002. On abyssal isopods (Crustacea: Isopoda: Asellota) from the Angola Basin: *Eurycope tumidicarpus* n. sp. and redescription of *Acanthocope galathea* Wolff, 1962. *Organisms Diversity & Evolution* 2: 1–29.
- SCHNURR S. and BRIX S. 2012. *Eugerdella huberti* sp. nov. – a new species of Desmosomatidae Sars, 1897 (Crustacea, Isopoda) from the deep-sea of the South Atlantic Ocean. *Marine Biodiversity* 42: 13–24.
- SCHOTTE M., BOYKO C.B., BRUCE N.L., POORE G.C.B., TAITI S. and WILSON G.D.F. 2013. *World List of Marine, Freshwater and Terrestrial Isopod Crustaceans*. Available online at <http://www.marinespecies.org/isopoda>. Accessed on 5 January 2014.
- SVAVARSSON J. 1987. Eurycopidae (Isopoda, Asellota) from bathyal and abyssal depths in the Norwegian, Greenland, and North Polar Seas. *Sarsia* 72: 183–196.
- SVAVARSSON J. 1997. Diversity of isopods (Crustacea): new data from the Arctic and Atlantic Oceans. *Biodiversity and Conservation* 6: 1571–1579.
- SVAVARSSON J., KRISTJÁNSSON B.K. and BRATTEGARD T. 2001. Depth-size related patterns of marine isopods in the Nordic Seas. *Crustacean Issues* 13: 277–288.
- WILSON G.D.F. 1982a. Two new natatory asellote isopods (Crustacea) from the San Juan Archipelago, *Baeonectes improvisus* n. gen., n. sp. and *Acanthamunnopsis milleri* n. sp., with a revised description of *A. hystrix* Schultz. *Canadian Journal of Zoology* 60: 3332–3343.
- WILSON G.D.F. 1982b. Systematics of a species complex in the deep-sea genus *Eurycope*, with a revision of six previously described species (Crustacea, Isopoda, Eurycopidae). *Bulletin of the Scripps Institution of Oceanography* 25: 1–64.

- WILSON G.D.F. 1983. An unusual species complex in the genus *Eurycope* (Crustacea: Isopoda: Asellota) from the deep north Atlantic ocean. *Proceedings of the Biological Society of Washington* 96: 452–467.
- WILSON G.D.F. 1989. A systematic revision of the Deep-Sea Subfamily Lipomerinae of the Isopod Crustacean Family Munnopsidae. *Bulletin of the Scripps Institution of Oceanography* 27: 1–138.
- WILSON G.D.F. 2008. A review of taxonomic concepts in the Nannoniscidae (Isopoda, Asellota), with a key to the genera and a description of *Nannoniscus oblongus* Sars, 1870. *Zootaxa* 1680: 1–24.
- WILSON G.D.F. and HESSLER R.R. 1980. Taxonomic characters in the morphology of the genus *Eurycope* (Crustacea, Isopoda) with a redescription of *E. cornuta* Sars, 1864. *Cahiers de Biologie Marine* 21: 241–263.
- WILSON G.D.F. and HESSLER R.R. 1981. A revision of the genus *Eurycope* (Isopoda, Asellota) with descriptions of three new genera. *Journal of Crustacean Biology* 1: 401–423.
- WOLFF T. 1956. Isopoda from depths exceeding 6000 m. *Galathea Reports* 2: 85–157.
- WOLFF T. 1962. The systematics and biology of bathyal and abyssal Isopoda Asellota. *Galathea Reports* 6: 1–320.

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