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Research article

urn:lsid:zoobank.org:pub:8FC18411-850C-499C-90C4-5DBFB500137B

A new deepwater species of Calliopiidae, *Halirages helgae* (Crustacea, Amphipoda), with a synoptic table to *Halirages* species from the northeast Atlantic

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Abstract. *Halirages helgae* sp. nov. is recorded from the shelf slopes of the Norwegian Sea at depths of 1000 to 2600 m in the Arctic cold water masses. A total of 50 specimens were found at five stations. The species differs from other known species in the genus *Halirages* Boeck, 1871 by the bilobed posterior margin of pereonite 7. A synoptic table to the northeast Atlantic species of *Halirages* is provided.

Keywords. Amphipoda, Calliopiidae, MAREANO, northeast Atlantic, Norwegian Sea

Ringvold H. & Tandberg A.H.S. 2014. A new deepwater species of Calliopiidae, *Halirages helgae* (Crustacea, Amphipoda), with a synoptic table to *Halirages* species from the northeast Atlantic. *European Journal of Taxonomy* 98: 1–13. <http://dx.doi.org/10.5852/ejt.2014.98>

Introduction

MAREANO, a programme to develop a Marine Areal database for Norwegian waters, was initiated in 2005 and conducts physical, biological, and environmental mapping of the sea bottom within Norwegian waters (Fig. 1). The programme procures information for an ecosystem-based management of Norway's coastal and offshore regions. MAREANO (www.mareano.no) is an ongoing program, and one of the aims is to increase the knowledge of marine benthic species. A new calliopiid species has been found at five of the stations; we suggest placing the new species in the genus *Halirages*.

Calliopiidae is a large cosmopolitan family that includes 79 species in 26 genera worldwide (Barnard & Karaman 1991). Arctic and subarctic regions are particularly rich in species of Calliopiidae (Barnard & Karaman 1991; Weissshappel 2001). In the northeast Atlantic and Norwegian Arctic 12 genera have been recorded in Calliopiidae, with three *Haliragoides* species (Sars 1883; Gurjanova 1951; d'Udekem d'Acoz 2007) and eight *Halirages* species (Sars 1858, 1877; Ohlin 1895; Kamenskaya 1980; Stephensen 1931; Gurjanova 1946; d'Udekem d'Acoz 2012).

Material and methods

Altogether 17 cruises have been undertaken from 2005 through 2013 in the MAREANO program; they included 1013 video stations, of which 252 were physically sampled using a van Veen grab; 246 of these stations also included sampling with a beam trawl and 201 with a Rothlisberg-Piercy (RP) sledge. The survey area up until 2013 has covered 130,000 km²; it has included the shelf and slope off the coast of Nordland and Troms counties, parts of the SE Barents Sea and the banks off mid-Norway. The material for this study was collected in 2008 and 2010. All samples were processed on board to facilitate further handling and sorting. RP samples were decanted before being sieved at 4 mm, 1 mm, and 0.5 mm. Only the decanted fractions were identified for this study. The samples were fixed in 4% borax-buffered formalin and transferred to 75% ethanol after sorting in the lab. All material has been deposited in the Bergen University Museum, Norway (ZMBN). Permanent slides were made with Faure's medium, and drawings were made with a tablet (Wacom Bamboo CTH-470) and Adobe Illustrator (Version CS 5.1) as shown by Coleman (2003). Length measurements are from tip of rostrum to tip of telson.

Results

Class Malacostraca Latreille, 1802
Order Amphipoda Latreille, 1816
Superfamily Eusiroidea Stebbing, 1888
Family Calliopiidae G.O. Sars, 1893

Halirages Boeck, 1871

A total of 50 specimens were found at five stations. The specimens are placed in the genus *Halirages* for the following reasons: labrum rounded apically and acute dorsally, labium with small inner lobes, length of mandible palp article 3 about half that of article 2. Coxal plates small, coxa 1 not expanded distally.

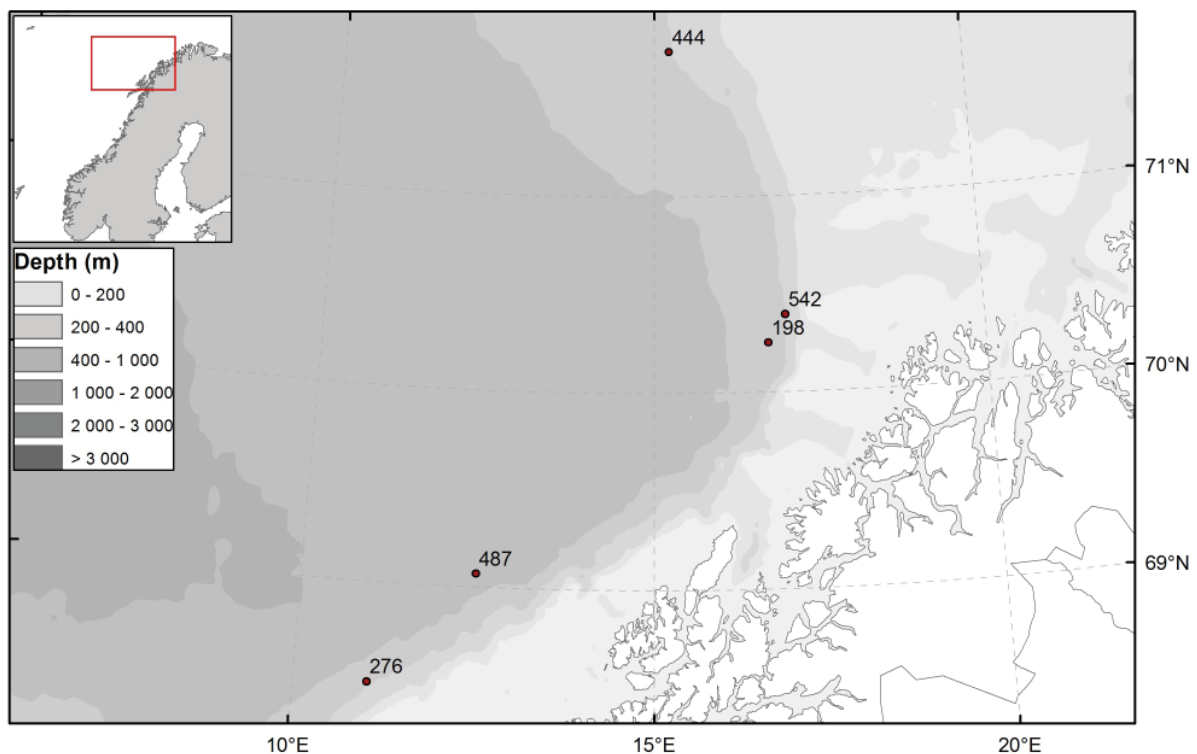


Fig. 1. Part of the MAREANO survey area off northern Norway, with indications of stations where *Halirages helgae* sp. nov. was found.

Gnathopods 1 and 2 subequal, propodi subrectangular, ischium of pereopod 7 with a small posterodistal process, second epimeral plate with small tooth on posteroventral corner, third epimeral plate smooth. Pereonite 7 with bilobed posterior margin. The uropods of all examined specimens were badly damaged, and only peduncles and proximal parts of rami were available for study.

Halirages helgae sp. nov.

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Figs 2–7

Diagnosis

Head with short rostrum, anteroventral corner with small projecting tooth. Eyes present, but very small, whitish in alcohol. Article 3 of mandible palp about half the length of article 2. Pereonite 7, and in large animals (> 11 mm) also pereonite 6 and pleonite 2, with weakly bilobed posterior margin. Length of dactylus on first and second gnathopod about half that of propodus palm. Carpus longer than propodus. Epimeral plate 2 with small tooth posteroventrally, and epimeral plate 3 with posterior corner rounded. Uropods 1 and 2 biramous, with strong setae. Telson entire, longer than wide, acute.

Etymology

The species is named in memory of Helga Ringvold, for encouraging her children in their future endeavours.

Material examined

Holotype

NORWAY: ♀, 10.5 mm long, R/V *G.O. Sars*, cruise 11408, st. 276-030A, Nordland, slope of Moskenesgrunnen, 68°28.86' N, 10°55.81' E, 1292 m, mud, –0.87 °C, salinity 34.92‰, RP sledge, leg. H. Ringvold (ZMBN 90142).

Paratypes

NORWAY: 4 ♀♀, 9–13 mm long, R/V *G.O. Sars*, cruise 10408, st. 198-003A, Troms, slope of Mulegga, 70°14.67' N, 16°44.52' E, 1532 m, cobbles, –0.78°C, salinity 34.92‰ (ZMBN 88021–88024). A total of 31 slides has been made of the holotype and paratypes.

Additional material

NORWAY: 1 ♀, 10 mm long, R/V *G.O. Sars*, cruise 11109, st. 487-157, Nordland, W of Lofoten, 69°04.13' N, 12°26.91' E, 2609 m, mud, clay and gravel, –0.82°C, salinity 34.89‰; 35 ♀♀ (6 with eggs; 3 juveniles), 3–13 mm long, R/V *G.O. Sars*, cruise 10408, st. 198-003A, Troms, slope of Mulegga, 70°14.67' N, 16°44.52' E, 1532 m, cobbles, –0.78°C, salinity 34.92‰; 6 ♀♀, 5–11 mm long, R/V *G.O. Sars*, cruise 11109, st. 444-148, Troms, slope of Eggagrunnen, 71°44.4' N, 15°14.22' E, 997 m, cobbles, –0.73°C, salinity 34.88‰; 3 ♀♀, 7–11 mm, R/V *G.O. Sars*, cruise 11010, st. 542-357, Troms, Vesthola, Egga, 70°23.69' N, 16°58.86' E, 1189 m, gravelly sand and sandy mud, –0.66°C, salinity 34.9‰.

Description

BODY. Up to 13 mm long. Pereonites 1-5 smooth, dorsal posterior margin of pereonite 7 slightly bilobed (Fig. 2B) (also on pereonite 6 and pleonite 2 on some large specimens greater than 11 mm long). Head (Fig. 3A). Rostrum short; corner of cephalic lobe with small projecting tooth; eye small (can be difficult to see in preserved specimens), reniform.

ANTENNA 1 (Fig. 3B). Flagellum broken in all examined specimens. Peduncle of article 1 longer than article 2, article 3 about 1/3 length of article 2, which has a posterodistal process. Eight articles remaining in flagellum, with one short seta on three of them.

ANTENNA 2 (Fig. 3C). Flagellum broken in all examined specimens. Article 5 longer than articles 3–4 combined, articles 4–5 with short spines, article 5 with a posterodistal process.

LABRUM (Fig. 3D). Rounded apically and acute dorsally.

LABIUM (Fig. 3E). With small inner lobes.

MANDIBLE (Fig. 4D). Incisor process with 4 blunt teeth; lacinia mobilis with 4 teeth on left molar; molar triturative, with ridged grinding surface and with row of lateral spines; palp 3-articulate, with elongate article 2, articles 2–3 with elongate setae on ventral margin. Article 3 short.

MAXILLA 1 (Fig. 4A). Inner plate with 9 plumose setae; outer plate with 11 spines of which 5–6 are bifurcate; palp 2-articulate and well developed, article 1 expanded distally, article 2 tapering and with 2 rows of 5–6 spines, one row apically and the other slightly lower. Left article 2 with long marginal

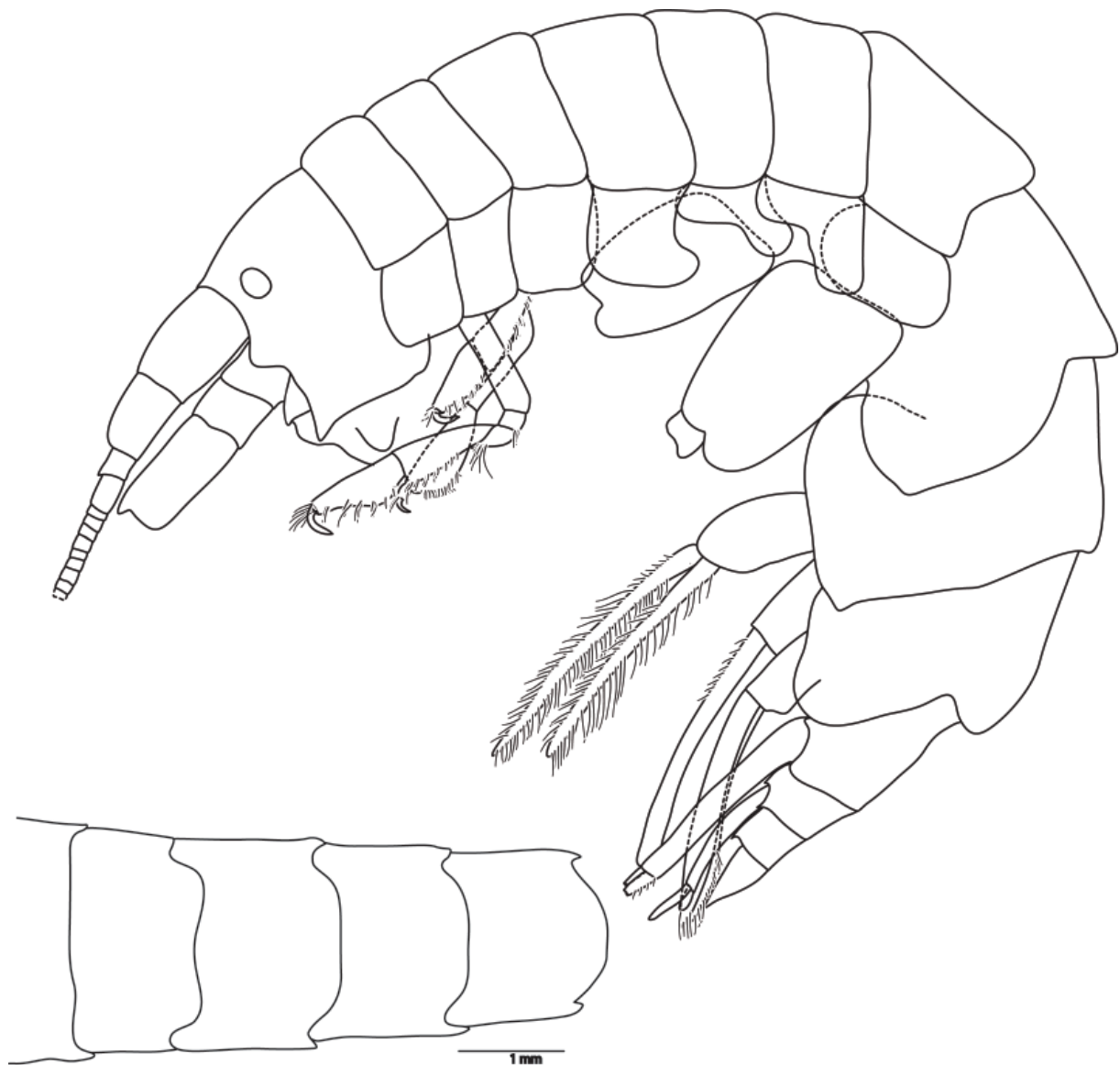


Fig. 2. *Halirages helgae* sp. nov. **A.** Holotype, ♀, 10 mm long. **B.** Dorsal side, showing bilobed posterior margin of pereonite 7; paratype 1, ♀, 10 mm long.

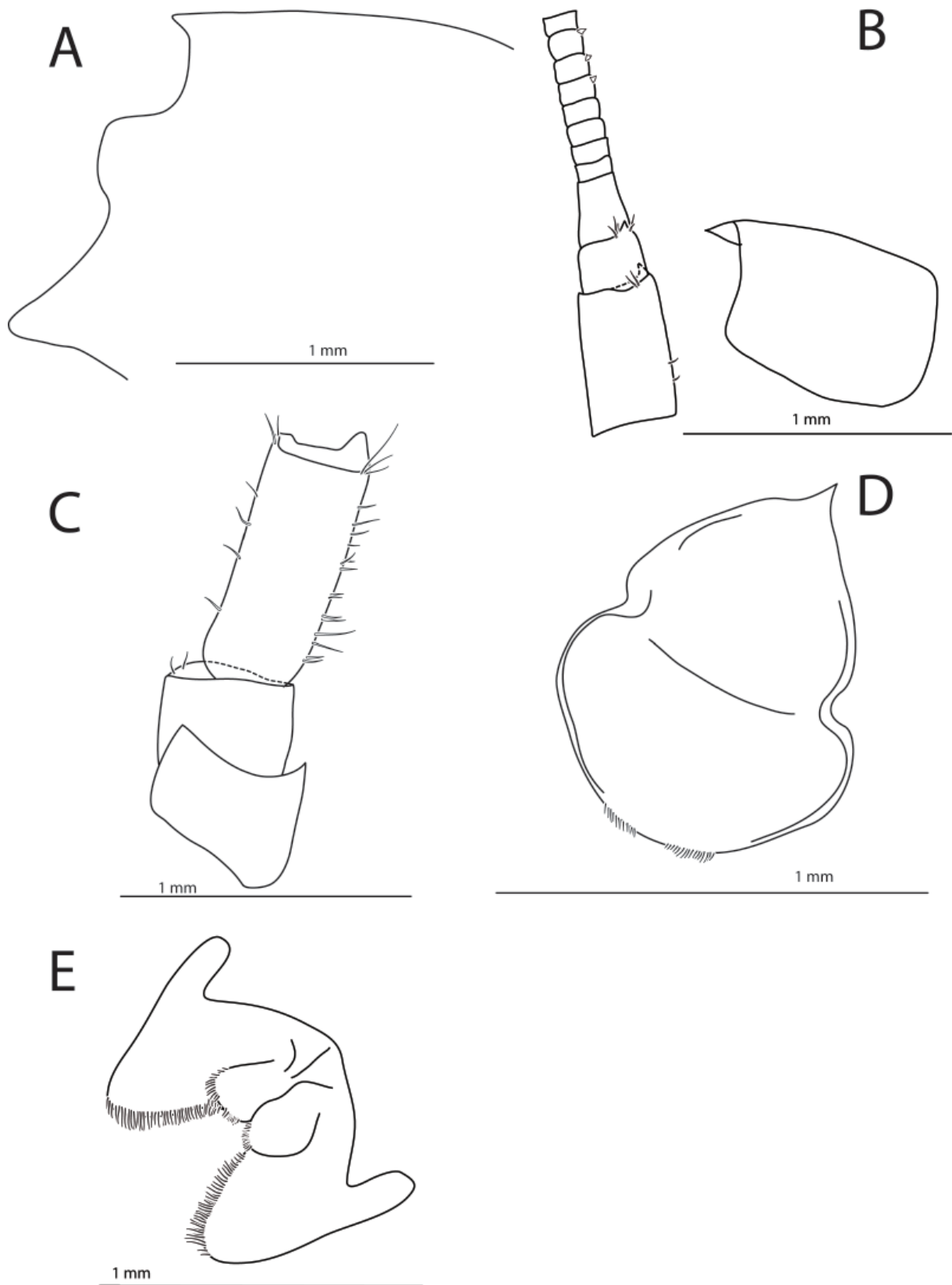


Fig. 3. *Halirages helgae* sp. nov., holotype, ♀, 10 mm long. **A.** Head. **B.** Antenna 1. **C.** Antenna 2. **D.** Upper lip. **E.** Lower lip.

spines and margino-facial setae, right article 2 with a row of 6–7 stout, conical marginal spines with margino-facial row of setae.

MAXILLA 2 (Fig. 4B). Outer plate longer than inner plate, both plates with long setae apically. Upper and inner plate with posterior setae, on inner plate the setae also reach posterodistal area.

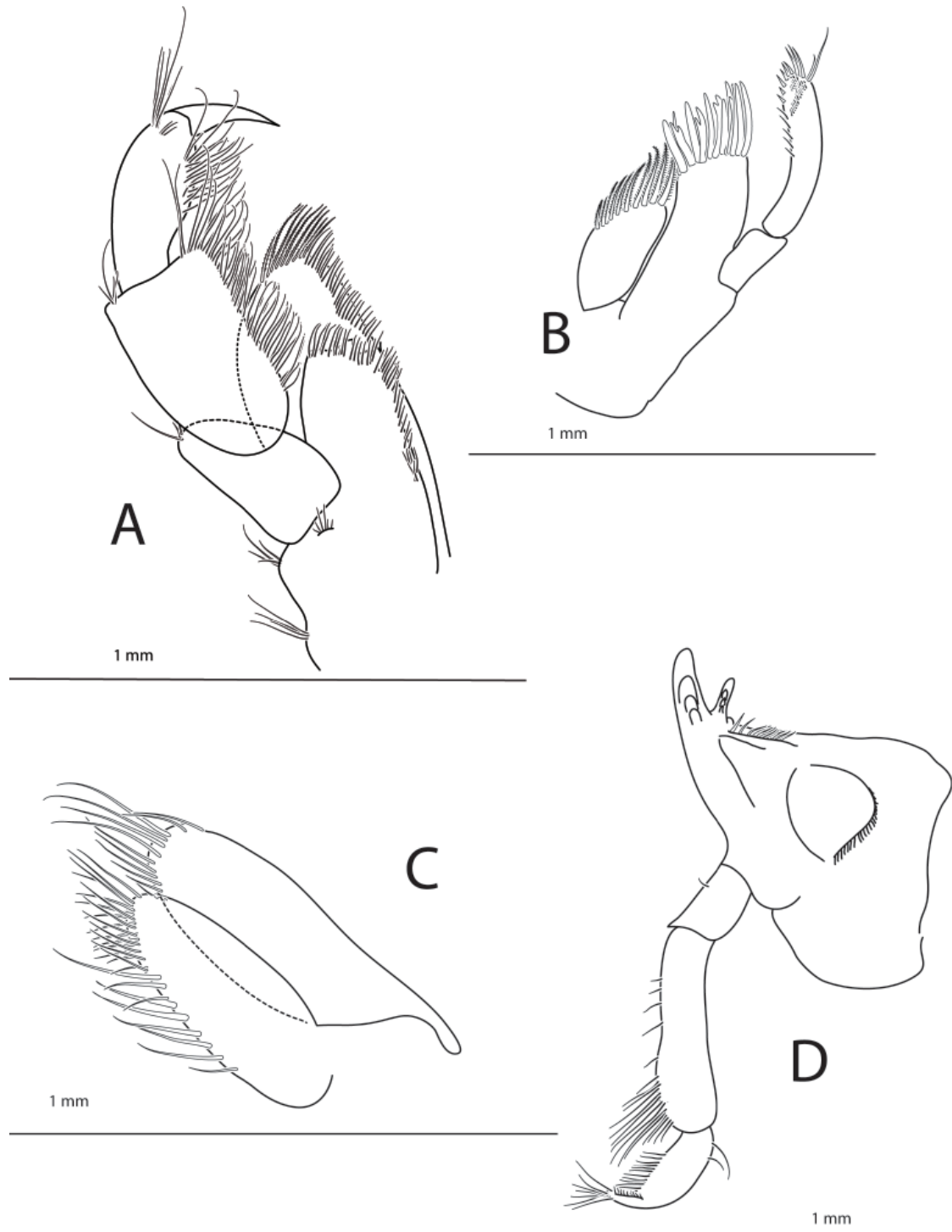


Fig. 4. *Halirages helgae* sp. nov., holotype, ♀, 10 mm long. **A.** Maxilliped. **B.** Maxilla 1. **C.** Maxilla 2. **D.** Mandible.

MAXILLIPED (Fig. 4C). Broad and covered with numerous setae; inner plate short with short setae apically and on inner margins, three apical teeth; outer plate slender with long setae apically and on inner margins; palp articles 2–3 elongate, article 2 longest; article 3 with long setae apically and on inner margins; dactylus stout, about half length of article 3.

GNATHOPODS 1 AND 2 (Fig. 5A and 5B). Quite similar in shape: both coxae sub-quadrate and smooth; bases rectangular with a few short setae; ischia narrow; meri longer than wide, with group of setae apically; propodi shorter than carpi, subovate, carpi subtriangular with rows of setae along posterior margin, propodi subtriangular. Gnathopod 1 carpus length / width ratio 3.0, of propodus 1.9. Gnathopod 2 carpus length / width ratio 2.7, of propodus 1.9; carpus setae along hind margins and palms, with

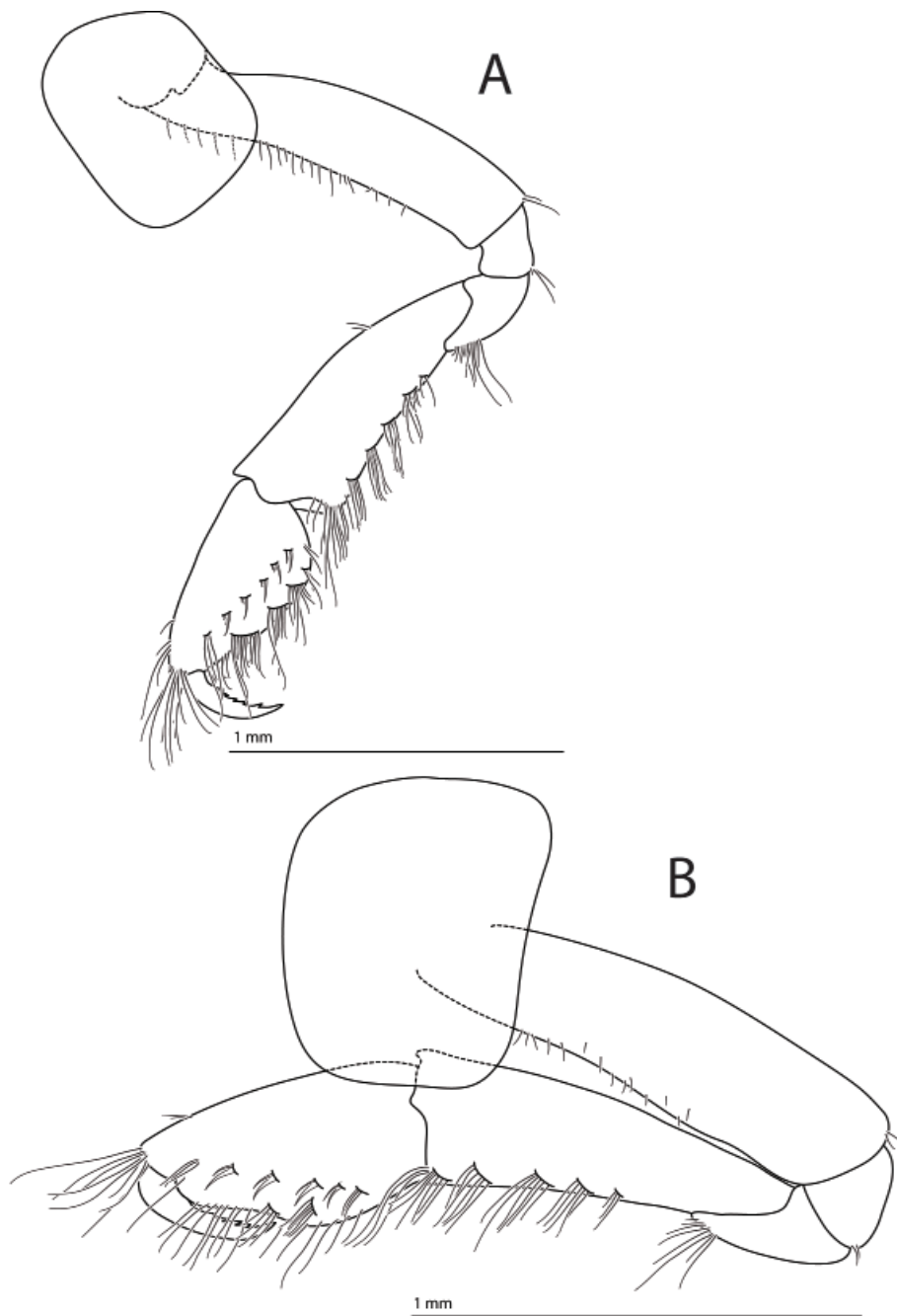


Fig. 5. *Halirages helgae* sp. nov., holotype, ♀, 10 mm long. **A.** Gnathopod 1. **B.** Gnathopod 2.

groups of setae along inner face, palm of gnathopods 1 and 2 similar and slightly excavate; dactyli on both gnathopods about half length of propodus palm, with dentate inner margin.

PEREPODS 3–7 (Fig. 6A–E). Coxa 3 sub-quadrate and smooth, coxa 4 posteriorly excavate, coxae 5 and 6 longer than wide, coxa 7 elliptic and smallest of all coxae; bases of pereopods 5–7 broad and

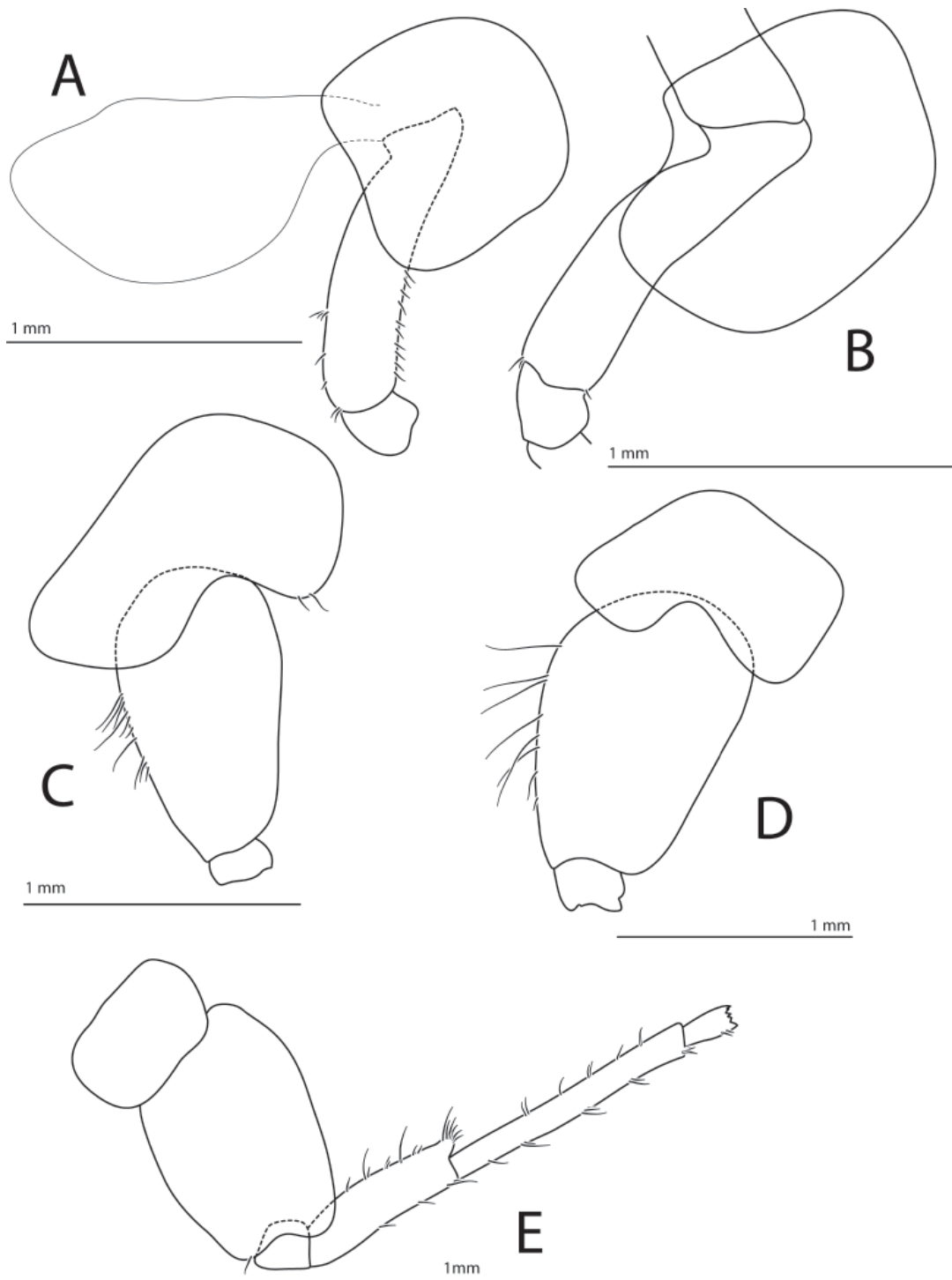


Fig. 6. *Halirages helgae* sp. nov. **A–D.** Holotype, ♀, 10 mm long. **A.** Pereiopod 3. **B.** Pereiopod 4. **C.** Pereiopod 5. **D.** Pereiopod 6. — **E.** Paratype 2, ♀, 9 mm long. Pereiopod 7.

posteriorly smooth. Articles of pereopods 4–7 missing on all specimens except paratype 2, which has one pereopod 7 that includes carpus; ischium short and square-shaped, merus with setae along both margins and long setae apically, carpus with setae on both margins, 7 times as long as wide, and 1.5 times as long as merus.

UROPODS 1 AND 2 (Fig. 7A and 7B). With spines on both margins of peduncles and rami. Rami damaged on all specimens.

UROPOD 3. Missing on all specimens.

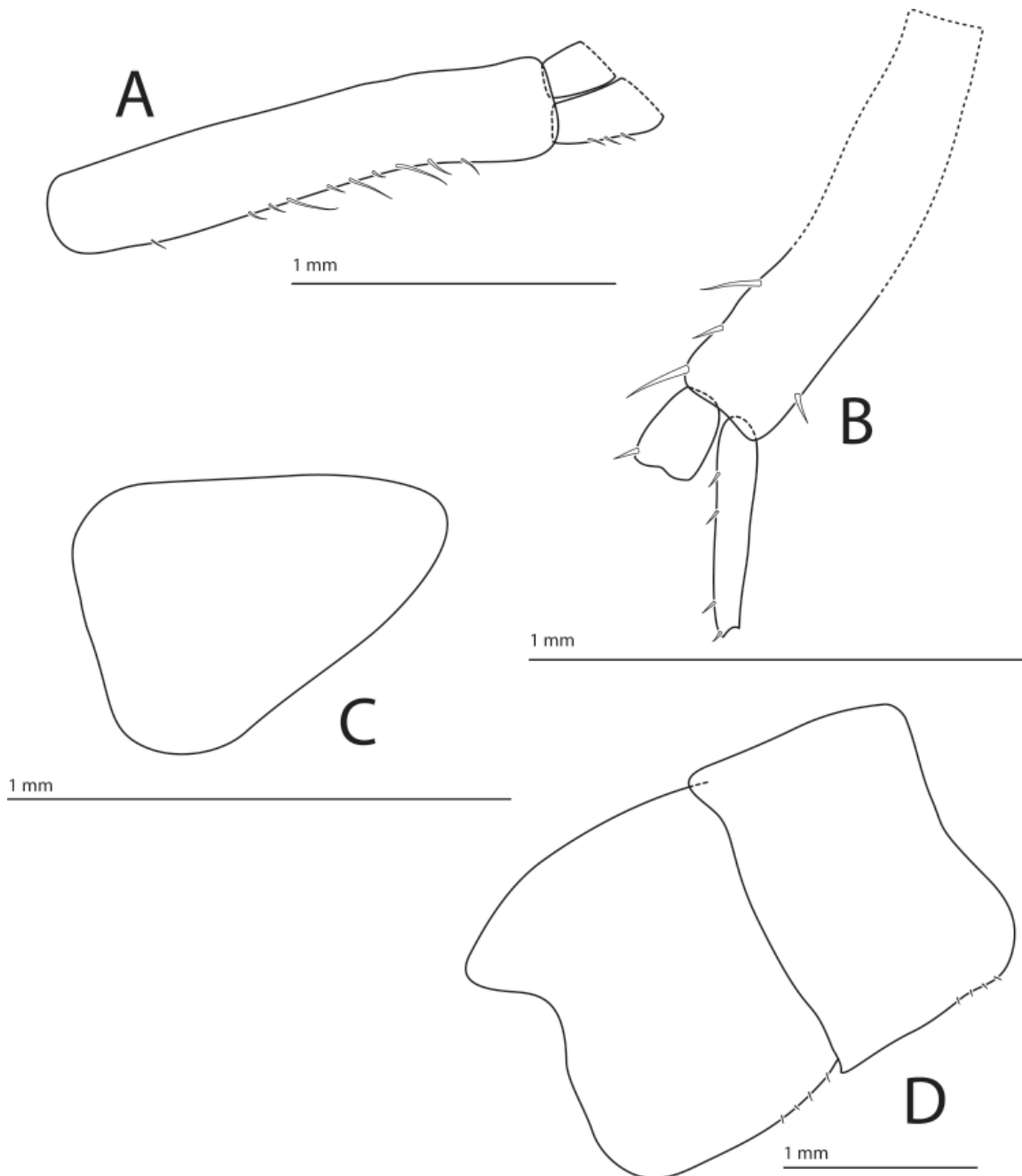


Fig. 7. *Halirages helgae* sp. nov., holotype, ♀, 10 mm long. **A.** Uropod 1. **B.** Uropod 2. **C.** Telson. **D.** Epimeron 2–3.

TELSON. Entire, longer than wide, triangular with blunt tip (Fig. 7C).

EPIMERAL PLATES. Epimeral plate 1 posteriorly rounded, posteroventral corner obtusely angular; epimeral plate 2 with small, posteroventral tooth; epimeral plate 3 with posteroventral corner rounded and with posterior border smooth and nearly straight (Fig. 7D).

COLOUR PATTERN. Colour of live specimens unrecorded.

Distribution

This species has only been found in the northeast Atlantic, off northern Norway. It has been recorded at some of MAREANO's deepest stations, from 997 to 2,609 m, and only in cold water masses (NSAIW, Norwegian Sea Arctic Intermediate Water) (Buhl-Mortensen *et al.* 2012), with mud as the dominant sediment.

Discussion

The entire calliopiid family is in need of revision. Both Stephensen (1931) and d'Udekem d'Acoz (2012) stated that the differences between *Halirages* and *Apherusa* are blurred. It can also be difficult to separate *Halirages* and *Haliragoides* morphologically (Sars 1895; Stephensen 1931; M. Thurston pers. comm.), but differences regarding cephalic lobes, antennal calceoli and the rami on uropod 3 have been suggested as characters useful for separating them. The head of *Halirages helgae* sp. nov. has a small projecting tooth anterodistally. The damaged antennae show no calceoli (only females have been found, and according to Stephensen (1931) and d'Udekem d'Acoz (2012) calceoli are probably present in all males in *Halirages* but not always in the females).

The species fits more or less the characters of the genus *Halirages*, and in the present confused systematic situation, it is preferable to assign it to this genus.

As many Calliopiidae, *Halirages helgae* sp. nov. is a brittle species. The specimens differ somewhat in size (3–13 mm) and probably include both juveniles and adults. The species seems to be morphologically closest to *H. mixtus* Stephensen, 1931 and *H. gorbunovi* Gurjanova, 1946, based on the absence of dorsal spines. One should, however, take into consideration that thorough descriptions are lacking for both species, and that *H. gorbunovi* is only known from its two mutilated type specimens, which actually look similar to *H. quadridentatus* G.O. Sars, 1877 (d'Udekem d'Acoz 2012). The examined specimens of *H. helgae* sp. nov. have a bilobed posterior margin on pereonite 7 and differ from *H. gorbunovi* in the fact that coxae 1 and 2 are not ventrally serrate, and that *H. helgae* sp. nov. has eyes. The telson on *H. mixtus* is emarginate and the posterior margin of epimeron 3 serrate, whereas the telson of *H. helgae* sp. nov. is triangular with a blunt tip, and the posterior margin of the third epimeron is smooth.

Apart from *H. mixtus* and *H. gorbunovi*, six other species within *Halirages* are described from the northeast Atlantic: *H. fulvocinctus* (M. Sars, 1858), *H. quadridentatus*, *H. nilssoni* Ohlin, 1895, *H. caecus* Kamenskaya, 1980, *H. cainae* d'Udekem d'Acoz, 2012, and *H. stappersi* d'Udekem d'Acoz, 2012. *Halirages helgae* sp. nov. differs from all these species by the bilobed posterior margin of pereonite 7. The posteroventral corner of epimeral plate 2 is toothed and that of epimeral plate 3 rounded. See the synoptic table (Table 1) for a more detailed compilation of how the characters are distributed.

It can be debated whether the species *Haliragoides abyssi* Gurjanova, 1951 (we have not been able to study this as no specimens were available for study) should be transferred to the genus *Halirages* due to the dissimilarity it shows with the two other *Haliragoides* species, described by Sars (1883) and d'Udekem d'Acoz (2007). The head of *H. abyssi* does not have a large, sub-cephalic process as in the other *Haliragoides* species. This species also seems to lack eyes. If *H. abyssi* is transferred to *Halirages*,

Table 1. Synoptic table comparing *Haliragoides abyssii* and species of *Halirages* on the basis of literature data.

Species	Dorsal spination	Posterior margin pereonite 7	Eyes	Telson	Coxae 1 and 2	Epimeral plate 3, posterior border	Epimeral plate 3, posterior ventral angle	Epimeral plate 3, development of posteroventral tooth
<i>Halirages caecus</i>	present	one tooth	not present	oval shaped with sharp tip	nearly smooth	straight and smooth	no	---
<i>Halirages cainae</i>	present	one tooth	present	acute	weak crenulations	weakly rounded and serrate	yes	weak tooth
<i>Halirages fulvocinctus</i>	present	one tooth	present	gradually tapering, tip truncated	not ventrally serrate	weakly rounded and serrate	yes	strong tooth
<i>Halirages gorbunovi</i>	pereonite 7 no tooth; rest is missing	not toothed	not present	unknown, pleon is missing	ventrally serrate	unknown, pleon is missing	---	---
<i>Halirages helgae</i>	none	bilobed	present	triangular with blunt tip	smooth	weakly rounded	no	---
<i>Halirages mixtus</i>	none	not bilobed, not toothed	present	emarginate, tip truncated	not ventrally serrate	weakly rounded and serrate	no	---
<i>Halirages nilssoni</i>	present	3 teeth	present	acute, teeth distally	---	posterior border forming an angular protrusion	yes	strong posteroventral tooth
<i>Halirages quadridentatus</i>	present	one tooth	present	tridentate	small crenulations/serrations along ventral margin	weakly rounded and weakly serrate	yes	weak but acute posteroventral tooth
<i>Halirages stappersi</i>	present	one tooth	present	triangular, distally 2 pairs of subdistal teeth	ventrally serrate	posterior border between teeth concave and serrate	yes, two teeth	strong posteroventral tooth
<i>Haliragoides abyssii</i>	none	not bilobed	not present	acute (with pointed apex)	smooth according to figure of coxa 2	weakly rounded	yes	small tooth

H. helgae sp. nov. would still differ from it by the presence of eyes, a bilobed posterior margin on pereonite 7, and a mandibular palp with article 3 half the length of article 2 (Table 1).

Acknowledgements

The Norwegian Institute of Marine Research (IMR), the Geological Survey of Norway and the Norwegian Hydrographic Service all coordinate MAREANO, this multi-disciplinary seabed mapping programme. We would like to thank Olga Lyubina (PhD, Murmansk Marine Biological Institute), Andrei Sikorski (PhD, Akvaplan-Niva as), Andrey Voronkov (PhD, IMR), and Alexander Plotkin (PhD student, University of Bergen) for translation of Russian articles, Arne Hassel (Senior Researcher, IMR) for lab assistance, and Kjell Bakkeplass (Senior Engineer, IMR) for the station map. Professor emeritus Wim Vader (Tromsø Museum) is thanked for his valuable comments on earlier versions of this manuscript.

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Manuscript received: 4 April 2014

Manuscript accepted: 15 August 2014

Published on: 3 October 2014

Topic editor: Rudy Jocqué

Desk editor: Danny Eibye-Jacobsen

Printed versions of all papers are also deposited in the libraries of the institutes that are members of the *EJT* consortium: Muséum National d'Histoire Naturelle, Paris, France; Botanic Garden Meise, Belgium; Royal Museum for Central Africa, Tervuren, Belgium; Natural History Museum, London, United Kingdom; Royal Belgian Institute of Natural Sciences, Brussels, Belgium; Natural History Museum of Denmark, Copenhagen, Denmark.

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Zeitschrift/Journal: [European Journal of Taxonomy](#)

Jahr/Year: 2014

Band/Volume: [0098](#)

Autor(en)/Author(s): Ringvold Haldis, Tandberg Anne Helene Solberg

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