

ANTHURIDEANS (CRUSTACEA, ISOPODA) FROM THE NORTH ATLANTIC AND THE ARCTIC OCEAN

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Eight species of the suborder Anthuridea (Crustacea, Isopoda) were collected in the northernmost part of the North Atlantic and in the Arctic Ocean during the BIOICE project. Two species were new to science: *Haliophasma mjoelniri* sp. nov. found at depths between 340 and 508 m west of Iceland, and *Quantanthura tyri* sp. nov. at depths between 304 and 1212 m south-west and west of Iceland. Other species found were *Ananthura sulcatacauda* BARNARD, 1925, *Calathura brachiata* (STIMPSON, 1853), *Leptanthura affinis* (BONNIER, 1896), *L. chardyi* NEGOESCU, 1992, *L. micrura* KENSLEY, 1982, and *L. victori* NEGOESCU, 1985. All eight species were found in the North Atlantic Ocean, and only *Ananthura sulcatacauda* and *Calathura brachiata* were additionally found in the Arctic Ocean.

A. sulcatacauda and *L. affinis* are redescribed. The male of *L. affinis* shows remarkable sexual dimorphism in the shape of pereopods 4 to 6. A new character, the structure of the comb of setae on article 3 of the mandibular palp, is suggested as valuable for distinguishing the genera within the family Antheluridae.

It is concluded that most of the North Atlantic anthurideans are shallow water species, mostly restricted to the Caribbean Sea. The species living in the northernmost part of the North Atlantic belong mainly to genera with a wide bathymetrical distribution and to species rich genera in the area. The Greenland-Iceland-Faeroe Ridge may restrict the dispersal of the deep-living species into the Arctic Ocean, while a rapid decline in the temperature may restrict the dispersal of the shallow living species into the Arctic.

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KEYWORDS: Isopoda; Anthuridea; North Atlantic; Arctic; Iceland.

Contribution from BIOICE

INTRODUCTION

Despite a long history of crustacean research in the Arctic Ocean and the northernmost part of the North Atlantic Ocean, little is known of the distribution and the species composition of anthurideans (Crustacea, Anthuridea) in these waters. HANSEN (1916) in his extensive study of the isopods of the area sampled by the *Ingolf* Expedition found only three species of anthurideans and BARNARD (1925) described additionally two species from the *Ingolf* Expedition. Until now about 12 species of the suborder are known from the northernmost part of North Atlantic and the Arctic and of these only two species have been reported in the Arctic. The small number of species reported may partly be due to insufficient sampling and/or low diversity of anthurideans in Polar regions. The absence of all but two from the Arctic may also be due to the isolating effects of the Greenland-Iceland-Faeroe Ridge, as has been suggested for the asellote isopods (SVAVARSSON & al. 1993).

In this paper we present new material collected in the North Atlantic and the Arctic Ocean during the BIOICE project (Benthic Invertebrates of Icelandic waters) and new material from the personal collection of Mr. Jón Bogason. We evaluate the pattern of species distribution in relation to the hydrography and the topography of the area.

MATERIAL AND METHODS

The material was collected during cruises with the research vessels *Bjarni Sæmundsson*, *Hákon Mosby* and *Magnus Heinason* in 1991 to 1994 as part of the BIOICE programme. Samples were taken with a modified Rothlisberg-Pearcy epibenthic sled (RP sled; ROTH LISBERG & PEARCY 1976, BRATTEGARD & FOSSA 1991), a detritus sled (J.A. Snelli, in prep.) and a triangular dredge.

The RP sled samples were decanted over 0.5 mm sieve and the residuals later sieved over series of 8, 4, 2, 1 and 0.5 mm sieves. The samples from the detritus sled were sieved through 3 mm and 0.5 mm sieves. The samples were preserved in 10 % formaldehyde and later transferred to 70 % ethanol. The samples were sorted to suborder at

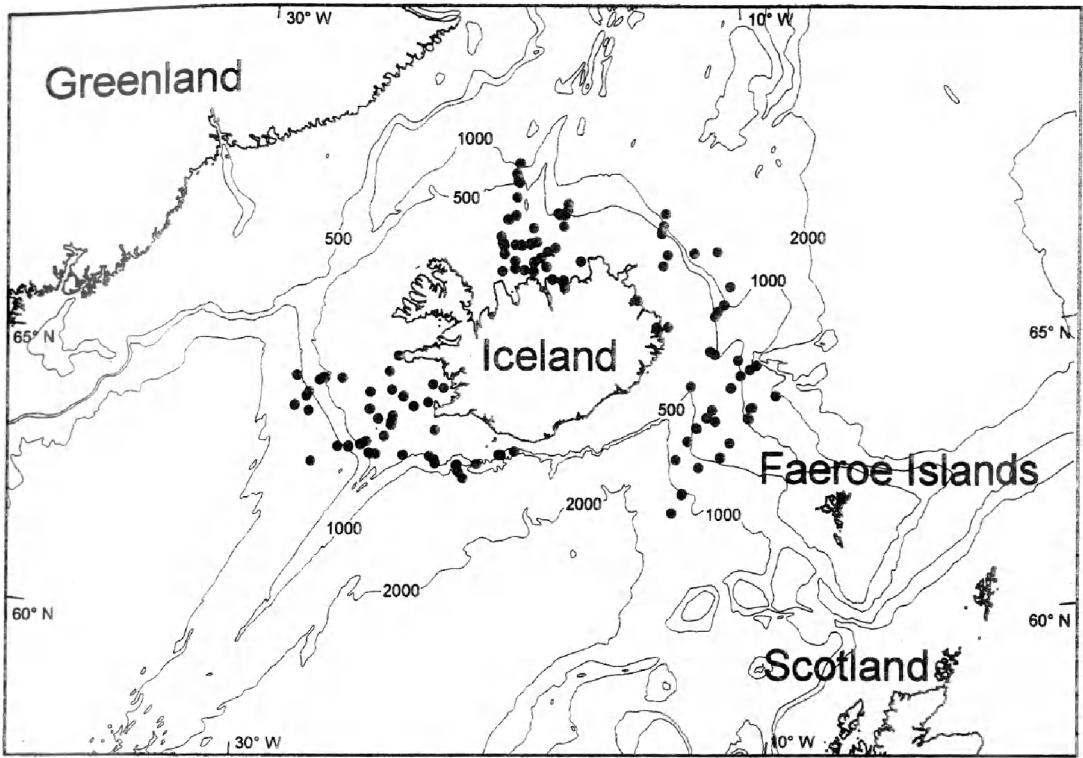


Fig. 1. The study area and locations of samples taken.

the Sandgerði Marine Center, Sandgerði, Iceland. A total of 163 samples (99 RP sled samples, 60 detritus dredge samples, 4 triangular dredge samples) have been sorted to date and 116 of these yielded anthurideans.

We also consulted specimens from the private collection of Mr. Jón Bogason. Those specimens were retrieved from mud attached to trawling gear of a commercial trawler or research vessels.

The specimens were dissected, mounted on slides and drawn with the aid of a camera lucida. The specimens have been deposited in the Icelandic Museum of Natural History (IMNH) in Reykjavik and in the 'Grigore Antipa' National Museum of Natural History (GANMNH) in Bucharest, Romania.

THE STUDY AREA

The study area is the northernmost part of the North Atlantic Ocean and the southernmost part of the Arctic Ocean (Fig. 1). The latter area includes the Iceland Sea and partly the Norwegian Sea. This area has a variety of hydrographical conditions, the past and the present conditions described in detail by SVAVARSSON & al. (1993). In short the area is characterised by a large ridge, the Greenland-Iceland-Faeroe Ridge, with a maximum saddle depth of about 850 m (Faeroe Bank channel) separating the deep Atlantic and the Arctic. South of the ridge at shallow waters, Atlantic water of $> 4^{\circ}\text{C}$ (often $6\text{--}11^{\circ}\text{C}$, STEFANSSON 1962, INGÓLFSSON 1996) occurs and towards

greater depths the water becomes stable with temperatures $\approx 2^{\circ}\text{C}$ at 4000 m. North of the ridge the temperatures range from $2\text{--}8^{\circ}\text{C}$ in shallow water (see INGÓLFSSON 1996), while in deeper water ($> 400\text{--}500\text{ m}$) the temperature is always below 0°C . The hydrographical conditions are rather complicated with a number of different water masses occurring above the saddle of the ridge.

SYSTEMATICS

Suborder Anthuridea LEACH, 1814

Family Antheluridae POORE & LEW TON, 1988

Diagnosis. (from POORE & LEW TON, 1988) Mouthparts of biting form. Maxillipedal endite broad (width more than half length); palp broad, of 4-5 articles. Pereopod 1 not strongly differentiated from pereopods 2 to 7. Pereopod 7 and sometimes pereopod 6 with anterodistal row of strong setae (bipectinate) on mesial face of propodus. One statocyst on pleotelson.

Remarks. NEGOESCU & WÄGELE (1984) originally suggested the affinity of the genera *Ananthura*, *Anthelura*, *Austranthura*, *Anthomuda*, *Bathura*, *Diaphoranthura* and *Valoranthura*. This was further adopted by POORE & LEW TON (1988) who described this family, but placed all species in only three genera, i.e. *Ananthura*, *Anthelura* and *Anthomuda*.

The following characters have been used to distinguish these genera: presence and absence of eyes, structure of the flagellum of the second antenna, number of articles in the maxillipedal palp, length of carpus in pereopods 4 to 7, the number of spines on carpus and propodus of pereopods 4 to 7, visible or not visible suture dorsally between pleonite 6 and pleotelson, pleotelson with a ridge over the statocyst, and the presence or absence of statocyst pore. Presence of the statocyst pore is the only unique character that has been used to discern between these genera. An additional unique character may be the number of setae on the third article of the mandibular palp and the size of these setae. In *Anthomuda* there are always 4 to 5 setae, slightly increasing in length towards the distal end of the third article and the second seta being a little longer. In *Ananthura* and *Anthelura* there are, however, between 6 and 12 setae and the second seta is always twice as long as the other setae.

The genus *Anthomuda* seems to be more homogeneous than the other two genera. The species are similar in most aspects. All species in the genus have the maxillipedal palp with 4 articles (erroneously stated with 4 to 5 articles BY POORE & LEW TON 1988). In the type species, *Anthomuda stenotelson* SCHULTZ, 1979 and in *A. poorei* MÜLLER, 1989 the structure of the maxilliped is somewhat different. In *A. stenotelson* the first article is not shown by SCHULTZ (1979) and the last article of the palp is minute. In *A. poorei* the endite is absent, while it is present in all other species of *Anthomuda*.

The genera *Ananthura* and *Anthelura* are mainly distinguished by the presence or absence of the statocyst pore (POORE & LEW TON 1988). *Anthelura* needs, however, to be critically re-evaluated, being only known from its type species.

Genus *Ananthura* BARNARD, 1925

Ananthura sulcaticauda BARNARD, 1925 (Figs 2-6)

Material examined. BIOICE station 2241, RP sled, 4 September 1992, 63°21.07' N, 25°21.78' W, 305 m, 6.7 °C, 1 manca, IMNH; BIOICE 2265, RP sled, 8 September 1992, 63°09.05' N, 25°15.66' W, 546 m, 6.5 °C, coarse sand, 2 non-ovigerous females, 1 postmanca, IMNH and GANMNH; BIOICE 2268, RP sled, 8 September 1992, 63°08.67' N, 25°11.70' W, 450 m, 6.8 °C, 1 non-ovigerous and 1 ovigerous female, 1 juvenile, IMNH and GANMNH; BIOICE 2720, RP sled, 7 September 1994, 64°25.80' N, 26°24.20' W, 304 m, 4.6 °C, many sponges, 1 non-ovigerous female, 1 manca, IMNH; 62°58' N, 25°36' W, 22 April 1980, 700 m, sponges and sand, collected by Jón Bogason, 1 non-ovigerous female, 1 mutilated male, 1 manca; 63°46' N, 26°28' W, 15 April 1983, 545 m, sponges and corals, 3 non-ovigerous females, collected by Jón Bogason; 66°34.8' N, 13°25.9' W, 27 March 1983, 216 m, sponges, 1 manca, collected by Jón Bogason;

63°35' N, 24°50' W, 2 September 1983, 357 m, 3 non-ovigerous females, 1 female with empty marsupium, 2 manca, collected by Jón Bogason.

Description of non-ovigerous female. (Figs 2-5, BIOICE station 2720)

Length: 8 mm. Integument thin and smooth. Body 11.9 times longer than greatest width; body proportions: $C < 1 \approx 2 \approx 3 < 4 \approx 5 > 6 > 7 < Pln < Plt$; pereonite 7 smallest segment (Fig. 2A). Cephalothorax quadrate; rostrum small and acute, not exceeding anterolateral lobes. Pleonites 1 to 5 free, pleonite 6 with notch on posterior margin.

Pleotelson elongate linguiform, lenticulate in lateral view, 3 times longer than greatest width, apex slightly truncated distally; submarginally fringed with small setae, apically 5 setae; statocyst pore slit-like, 0.4 times pleotelson length (Figs 2B; 4A).

Antennular flagellum with 7 articles; article 1 small, article 2 twice as long as article 1, article 3 to 7 decreasing in size towards distal end; 1 large aesthetasc on article 4, 2 large aesthetascs on article 7 (Fig. 2C).

Antennal flagellum with 9 articles each with tuft of small aesthetascs (Fig. 2D).

Mandibular pars incisiva strongly chitinised; lamina dentata with 7 teeth; pars molaris prominent; article 1 of palp with 1 distal seta, article 2 1.5 times longer than wide, with 1 distal seta, article 3 equal in length to article 1, bulbous, 1.2 times longer than wide, distally with comb of 9 setae, one considerably longest (Fig. 2E).

Maxilla (Fig. 2F). Lateral endite with 6 teeth, medial endite with 2 bristles.

Maxilliped (Fig. 2G). Endite distally with 2 short setae, 1.9 times longer than wide; palp with 5 articles; article 1 short, article 2 with 1 mediobasal seta, article 3 produced mediobasally, with 2 short setae, mediobasal margin with 2 short setae; laterodistally 1 seta; article 4 obliquely set on distal margin of article 3, mediobasally with 2 setae; article 5 minute, with 4 setae.

Pereopod 1 slightly more robust than other pereopods, propodus 1.8 times longer than wide, ventral margin fringed with setulated lobules and with 2 simple setae, ventromedial row of about 5 setae (Fig. 3A). Pereopods 2 and 3 similar in shape, pereopod 2 longer than pereopod 3, propodus oval elongate, 2.1 times longer than wide, with row of 4 to 5 medial setae, ventral margin fringed with transparent setulated lobules, 2 sensory spines, distal one slightly serrated; carpus fringed ventrally with setulated lobules; distally with simple sensory spine (Fig. 3B, C). Pereopods 4 to 6 similar in shape, pereopod 4 shortest pereopod; carpus of pereopods 4 to 6 rectangular, 1.2 to 1.3 times longer than wide, with 1 plumose sensory seta dorsodistally, ventrally with 2 simple sensory spines; propodus elongated rectangular, 2.9 to 3.3 times longer than wide in

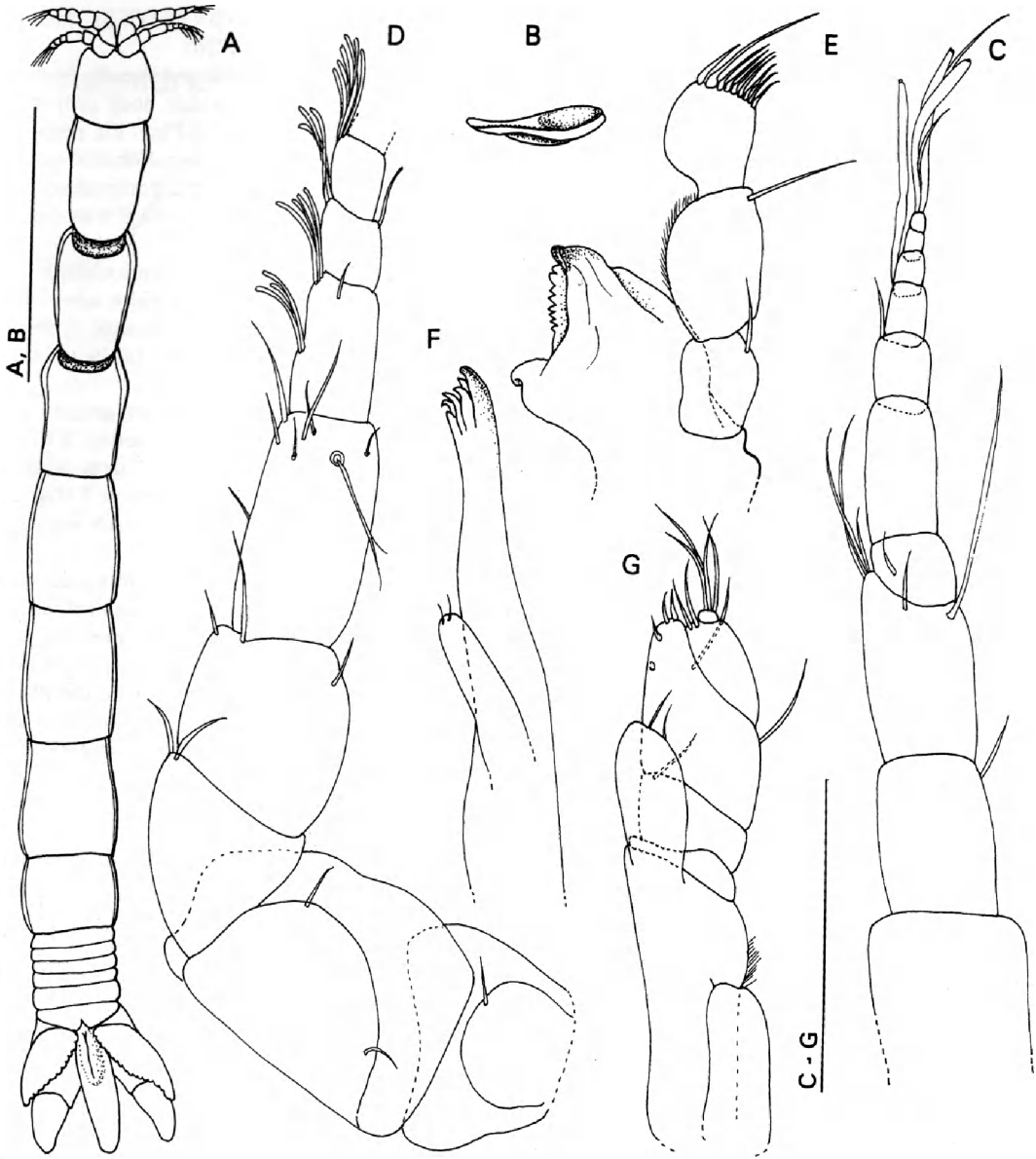


Fig. 2. *Ananthura sulcaticauda* BARNARD. Non-ovigerous female, 8 mm, BIOICE stn. 2720. A. Habitus, dorsal view. B. Pleotelson, lateral view. C. Antennula, right. D. Antenna, right. E. Mandibula. F. Maxilla. G. Maxilliped. Scale: A, B = 2 mm; C-G = 0.2 mm.

pereopods 4 to 6, respectively, ventrally 2 simple sensory spines in pereopods 4 and 5, 3 simple sensory spines in pereopod 6, distal sensory spine of propodus slightly serrated (Fig. 3D-F). Pereopod 7 carpus rectangular, 1.8 times longer than wide, dorsodistally with 1 plumose sensory seta, ventrally with 2 simple sensory spines; propodus rectangular, 3.3 times longer than wide, dorsodistally with row of 4 long, strong bipectinate setae; ventrally 2 simple sensory spines, distal spine

serrated (Fig. 3G, H).

Pleopod 1 sympod with 3 retinaculae; exopod dorsally convex, 2.3 times longer than wide, laterally and distally with about 23 plumose setae, 1.3 times endopod length; endopod 4.4 times longer than wide, distally with 6 plumose setae (Fig. 4B).

Pleopod 2 sympod with 2 retinaculae; exopod distally with 9 plumose setae, endopod distally with 7 plumose setae (Fig. 4C).

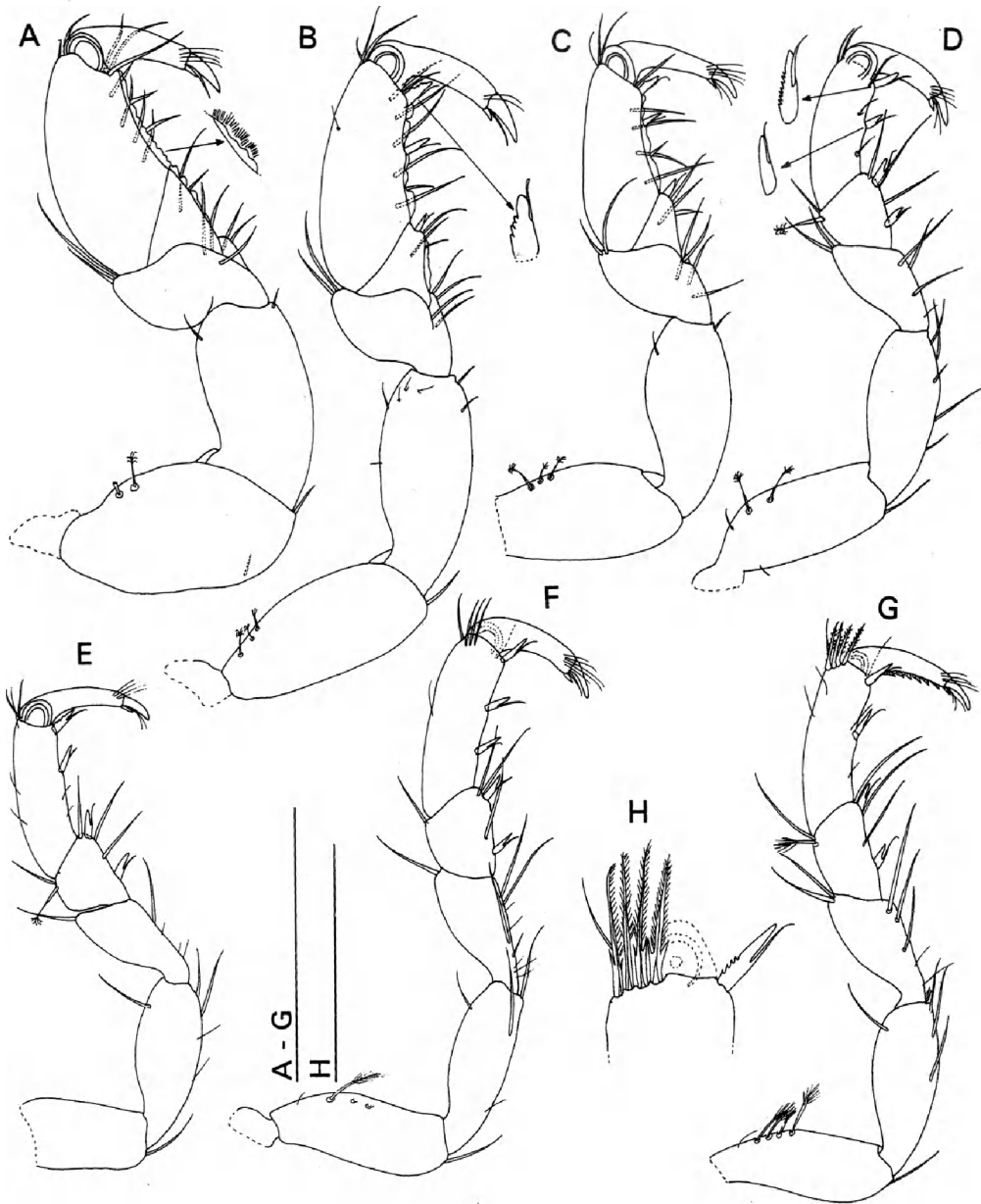


Fig. 3. *Ananthura sulcaticauda* BARNARD. Non-ovigerous female, 8 mm, BIOICE stn. 2720. Pereopods of the right side. A. Pereopod 1. B. Pereopod 2. C. Pereopod 3. D. Pereopod 4. E. Pereopod 5. F. Pereopod 6. G. Pereopod 7. H. Distal end of propodus 7. Scale: A-G = 0.5 mm; H = 0.2 mm.

Uropod sympod rectangular elongate, 2.1 times longer than wide, mediolaterally with 2 plumose setae, laterodistally with 3 plumose setae; endopod elongate pyriform; 2.2 times longer than wide, mediolaterally fringed with about 20 short setae, apically few long setae; exopod elongated auriculiform, 2 times longer than wide, fringed proximally with few plumose setae,

laterodistally and distally with about 22 short setae and few long setae (Fig. 4D, E).

Additional notes on adult females. (Fig. 5, BIOICE stations 2265 and 2268)

Other females were 8-9 mm. Flagellum of antenna with 9 articles (Fig. 5A). Maxillipedal palp had the same number of setae (Fig. 5B, C). Ovigerous female with 4

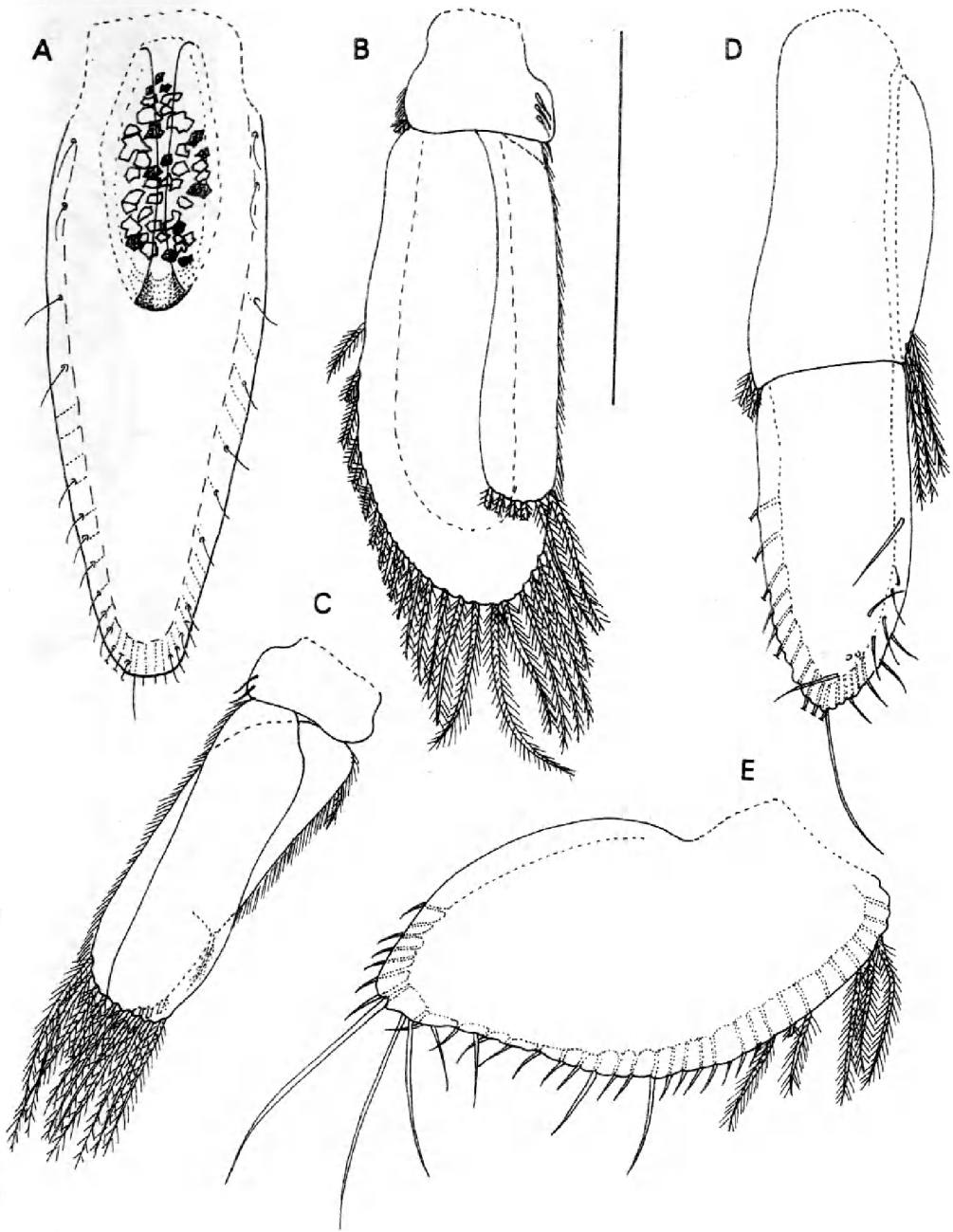


Fig. 4. *Ananthura sulcaticauda* BARNARD. Non-ovigerous female, 8 mm BIOICE stn. 2720. A. Pleotelson. B. Pleopod 1, right (some setae cut off). C. Pleopod 2, right. D. Sympod and endopod of uropod, right (some setae cut off). E. Exopod of uropod, right. Scale = 0.5 mm.

pairs of oostegites located on pereonites 2 to 5 (Fig. 5D). Two eggs present in marsupium (0.7 mm). Descriptive note on postmanca. (Figs 5, 6, BIOICE station 2265)

Body length 4-5 mm, 11.2 times longer than wide (Fig. 5F). In most aspects similar to adult female. Apex of pleotelson slightly truncated (Fig. 5G). Antennula flagellum with 5 articles, single large aesthetasc on each

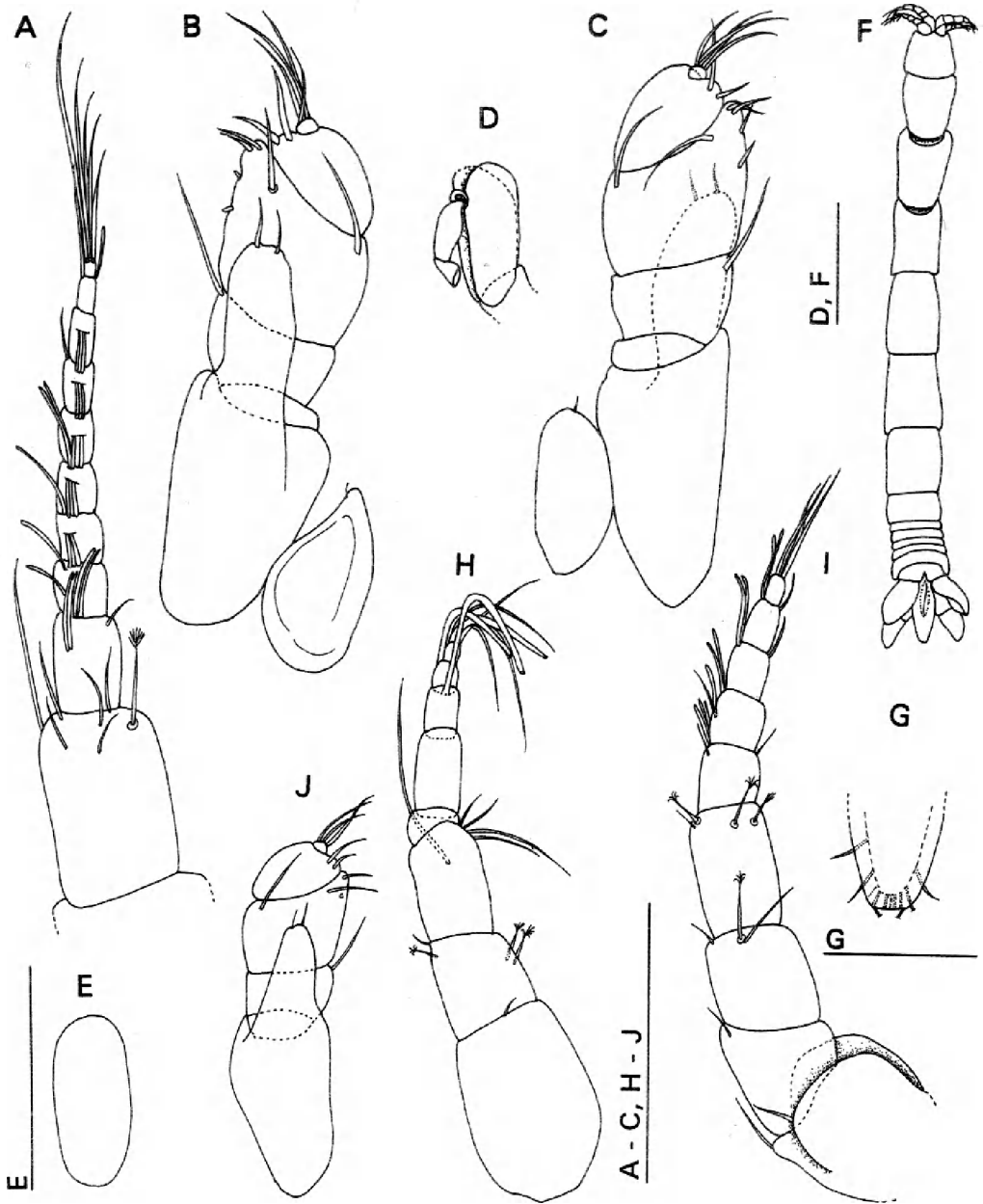


Fig. 5. *Ananthura sulcaticauda* BARNARD. A-B. Non-ovigerous female, 8 mm, BIOICE stn. 2265. C-E. Ovigerous female, 9 mm, BIOICE stn. 2268. F-J. Postmanca, 5 mm, BIOICE stn. 2265. A. Flagellum of antenna. B. Maxilliped, ventral view. C. Maxilliped, dorsal view. D. Oostegite of pereonite 2. E. Egg. F. Habitus, dorsal view. G. Distal end of pleotelson. H. Antennula, right. I. Antenna, left. J. Maxilliped, left. Scale: A-C, H-J = 0.2 mm; D, F = 1 mm; E = 1 mm; G = 0.25 mm.

of articles 3 to 5 (Fig. 5H). Antenna flagellum with 5 articles (Fig. 5I). Mandibula with comb of 5 setae in article 3 of palp; maxilla with 6 teeth. Maxilliped with 3 setae on article 5 of palp (Fig. 5J). All pereopods with fewer setae than in adult female; number of spines on

propodus and carpus as in adult female; pereopod 6 dorsodistally with 3 strong bipectinate setae; ventrally 2 simple sensory spines, distal spine serrated (Fig. 6A-D). Uropod exopod and endopod with fewer setae than in adult female; endopod relatively shorter than in adult

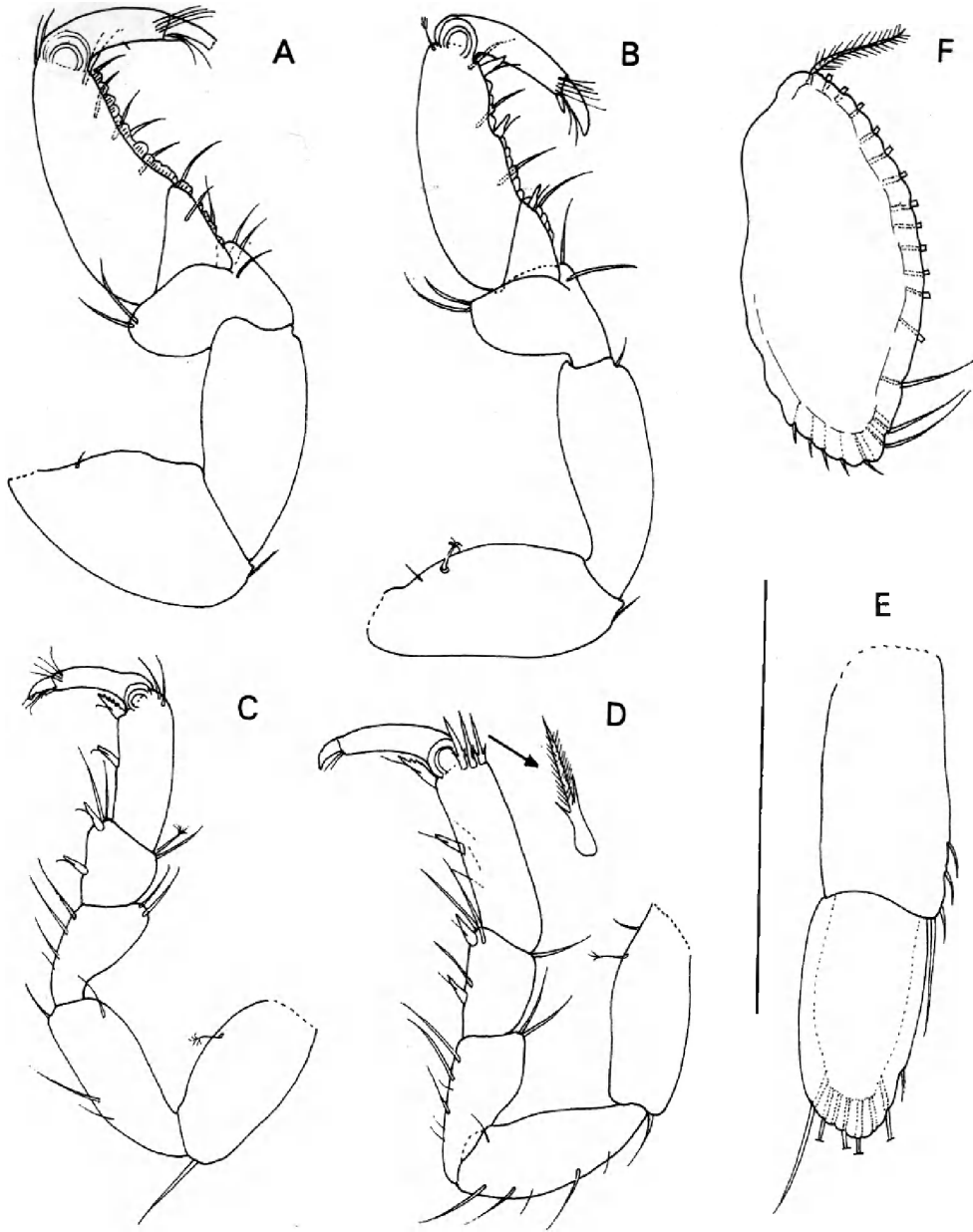


Fig. 6. *Ananthura sulcaticauda* BARNARD. Postmanca, 5 mm, BIOICE stn. 2265. A. Pereopod 1, right. B. Pereopod 2, right. C. Pereopod 4, right. D. Pereopod 6, right. E. Sympod and endopod of uropod. F. Exopod of uropod. Scale = 0.5 mm.

female (Fig. 6E, F).

Remarks. This species was originally inadequately described by BARNARD (1925) who gave only figures of the pleotelson and the uropods. KENSLEY (1987) re-evaluated the species studying one of the original specimens (syntype, non-ovigerous female, 5.8 mm), presenting figures of the antennae, pereopods 1, 2 and 7,

pleopods, uropod and the posterior part of the body. POORE & LEW TON (1988) refigured the species presumably from the other syntype (juvenile, 6.2 mm). This first new material since the discovery of the species allows a full description of a female and notes on the postmanca. The male remains undescribed, the only male at hand in the present study was too mutilated to be described. The male pleon was somewhat longer than in

the females and the appendix masculina was like a simple rod, slightly exceeding the endopod of the pleopod 2. The number of spines on the propodus of pereopods 5 and 6 were the same as in the females, but the propodus of pereopod 7 had three spines instead of two.

There are five articles in the palp of the maxilliped of *A. sulcaticauda*. POORE & LEW TON (1988) state in the diagnosis of the genus *Ananthura* that there are only four articles, but show in the description of their new species (*Ananthura billarderia* POORE & LEW TON, 1988) five articles.

This species has previously only been found at the type localities (64°45' N, 29°06' W, 4.4 °C, 568 Danish fathoms; 60°37' N, 27°52' W, 4.5 °C, 799 Danish fathoms) off western and south-western Iceland at depths between 1071 and 1505 m, being collected during the Danish *Ingolf* Expedition in 1895 and 1896 (BARNARD 1925). The new localities were at depths between 216 and 700 m west of Iceland and the species was observed at a single locality east of Iceland (Fig. 31).

Family Anthuridae Leach, 1814

Genus *Haliophasma* Haswell, 1881

Haliophasma mjoelniri sp. nov. (Figs 7-14)

Holotype. Non-ovigerous female, 13.6 mm, 65°03.30' N, 27°41.00' W, 340 m, 23 January 1991, coral, collected by Jón Bogason, Icelandic Museum of Natural History cat. no. 1996.10.04.1.

Paratypes. Non-ovigerous female (GANMNH), 1 juvenile (IMNH), 1 manca (IMNH), 62°51' N, 25°18' W, 508-478 m, 27 April 1980, sponges and mud, collected by Jón Bogason.

Etymology. The name refers to Mjölñir, the hammer of the god Thor, from the Nordic Mythology. The new species is robust and strong like the powerful Mjölñir and was found in northern waters.

Description of non-ovigerous female holotype. (Figs 7-11)

Length: 13.6 mm. Integument very thick, sculptured and heavily calcified. Body 11.1 times longer than greatest width; body proportions: $C < 1 < 2 \approx 3 > 4 \approx 5 > 6 > 7 > Pln < Plt$ (Fig. 7A). Cephalothorax almost quadrate; rostrum prominent, broadly rounded, exceeding anterolateral lobes; single large, posterior, middorsal elongate protuberance. Visual elements present, no pigments visible. Pereonite 2 longest body segment; pereonite 1 with 2 pairs of weak middorsal ridges; pereonites 2 to 6 with pair of strong middorsal ridges extending full length of pereonites, dorsolaterally strong ridge extending full pereonites length; pereonites 4 to 6

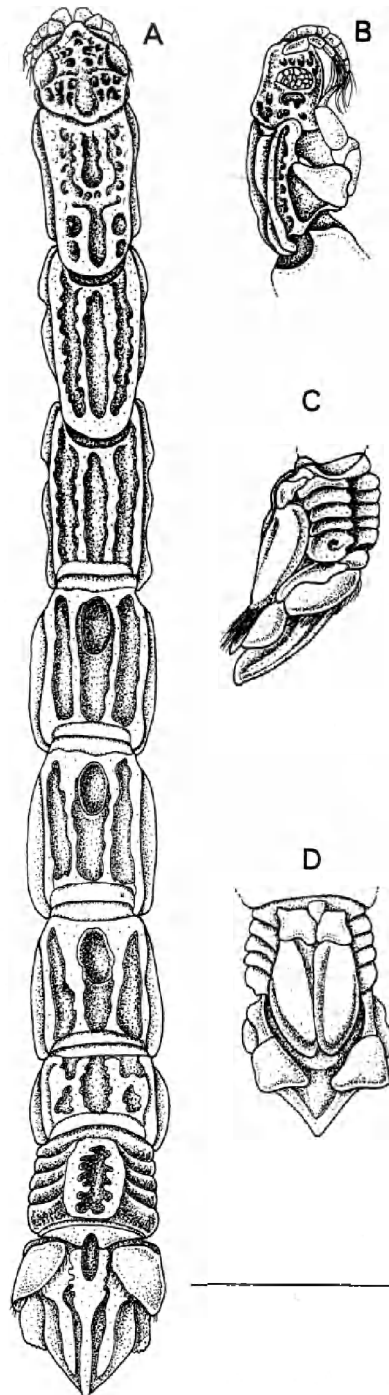


Fig. 7. *Haliophasma mjoelniri* sp. nov. A. D. Non-ovigerous female holotype, 13.6 mm, 65°03.30' N, 27°41.00' W. B. C. Non-ovigerous female paratype, 12 mm, 62°51' N, 25°18' W. A. Habitus, dorsal view. B. Cephalothorax and pereonite 1, lateral view. C. Pleon, pleotelson and uropods, lateral view. D. Pleon, pleotelson and uropods, ventral view. Scale = 2 mm.

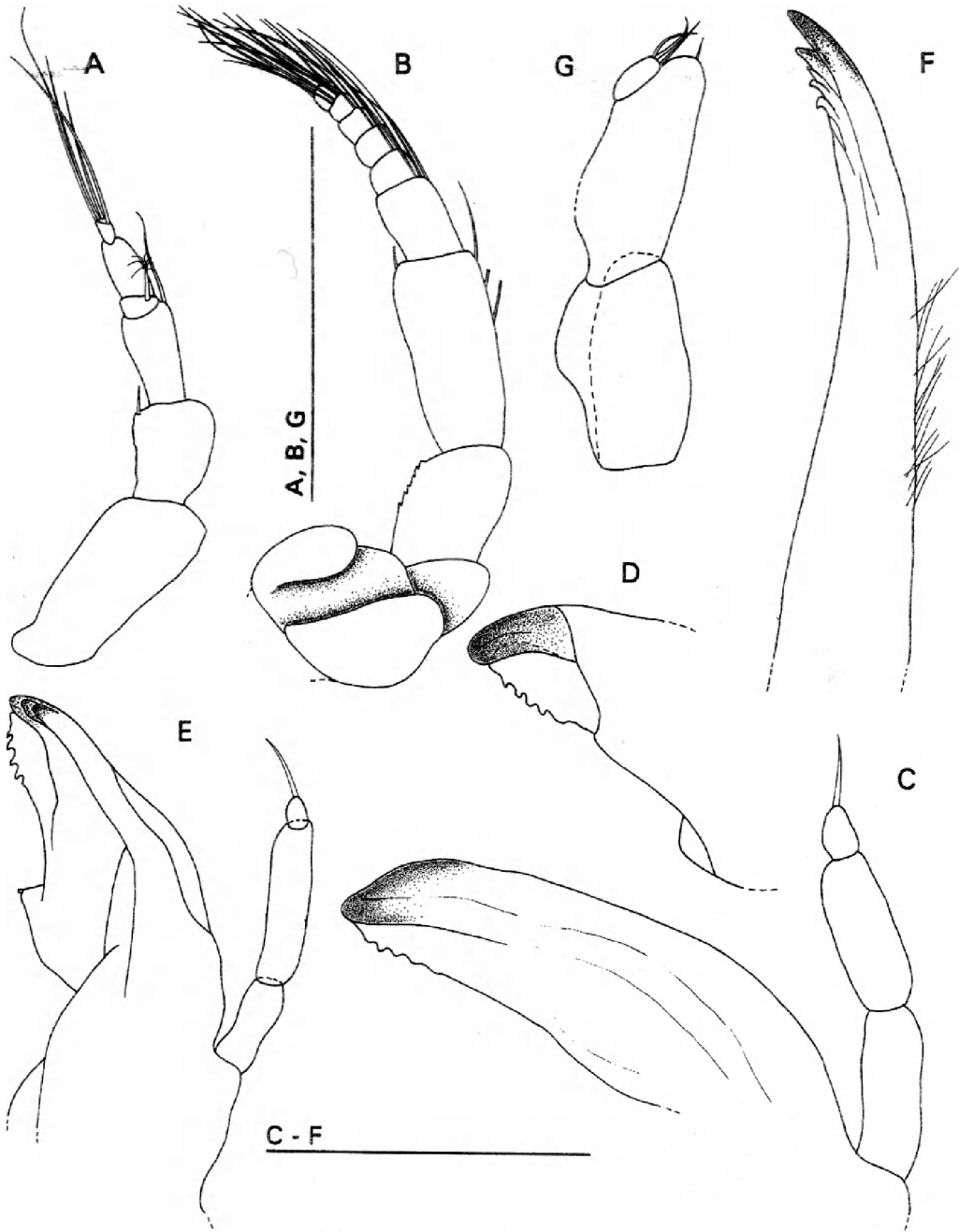


Fig. 8. *Haliophasma mjoelmiri* sp. nov. A-D, F, G. Non-ovigerous female holotype, 13.6 mm, 65°03.30' N, 27°41.00' W. E. Juvenile paratype, 9 mm, 62°51' N, 25°18' W. A. Antennula, left. B. Antenna, left. C. Mandibula, right. D. Pars incisiva, lamina dentata and pars molaris of left mandibula. E. Mandibula, left. F. Maxilla, left. G. Maxilliped, left, dorsal view. Scale: A, B, G = 0.5 mm; C-F = 0.2 mm.

middorsally with large oval groove near anterior margin; pereonite 7 with middle part of middorsal ridges fused to lateral ridges. Pereonites 1 to 7 with well developed epimera, laterally with many small pits. Pereonite 1

ventrally with strong carina to accommodate first pair of strong pereopods, pereonite 2 with wide carina, pereonites 3 to 7 ventrally flat. Pleonites 1 to 5 fused mediodorsally, forming semi-oval plateau with irregu-

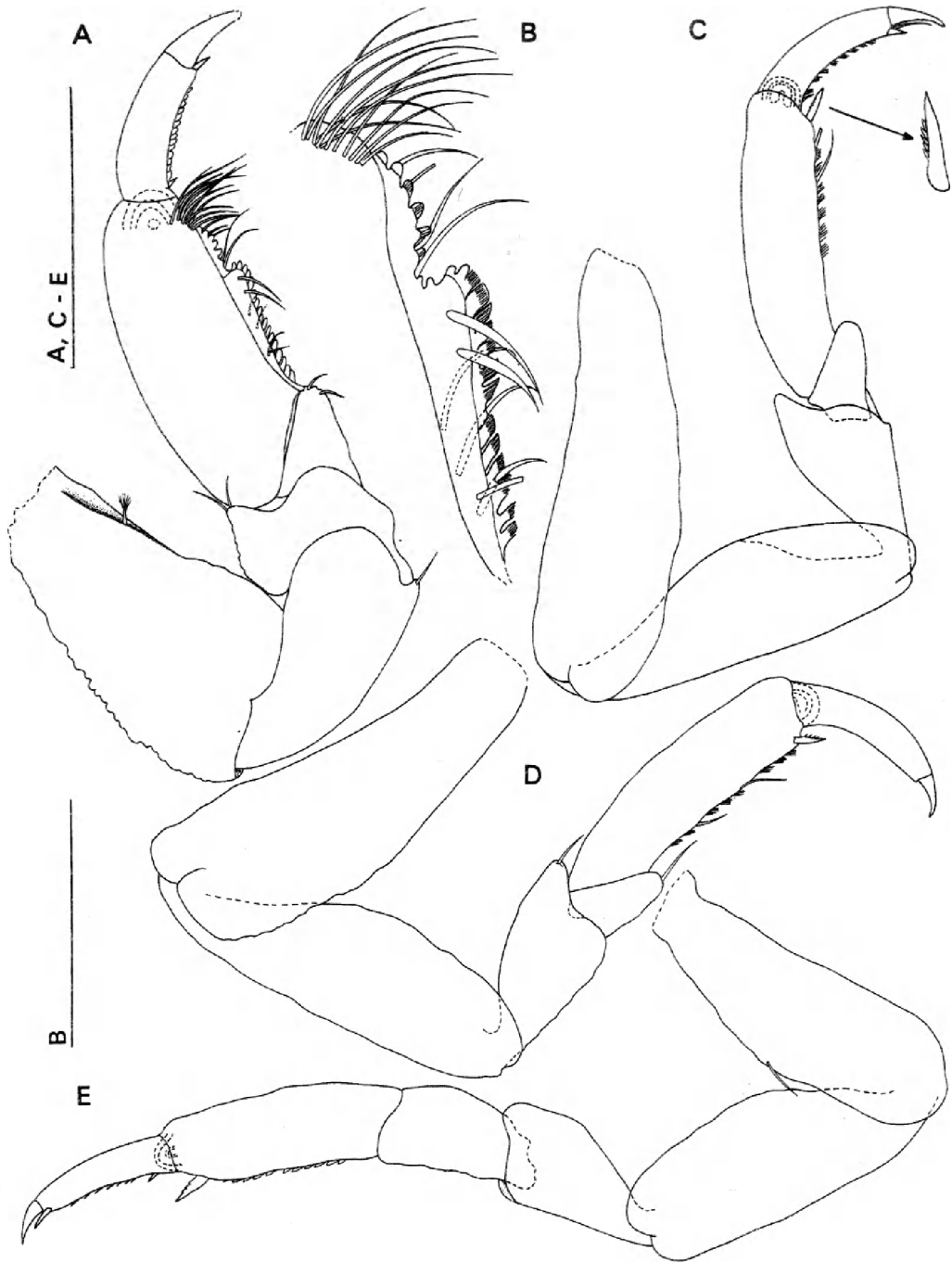


Fig. 9. *Haliophasma mjoelniri* sp. nov. Non-ovigerous female holotype, 13.6 mm, 65°03.30' N, 27°41.00' W. Pereopods of the right side. A. Pereopod 1. B. Ventral margin of propodus of pereopod 1. C. Pereopod 2. D. Pereopod 3. E. Pereopod 4. Scale: A, C-E = 0.5 mm; B = 0.2 mm.

lar, elongated groove (Fig. 7A-D).

Pleotelson linguiform, 1.9 times longer than greatest width, lateral margins slightly concave at the middle part of pleotelson, distally broadly triangular; apex

dorsally curved, dorsally proximal one-fifth of pleotelson bicarinate, distally tricarinate (Figs 7A, C; 11A). Statocyst not discerned because of heavily calcified integument.

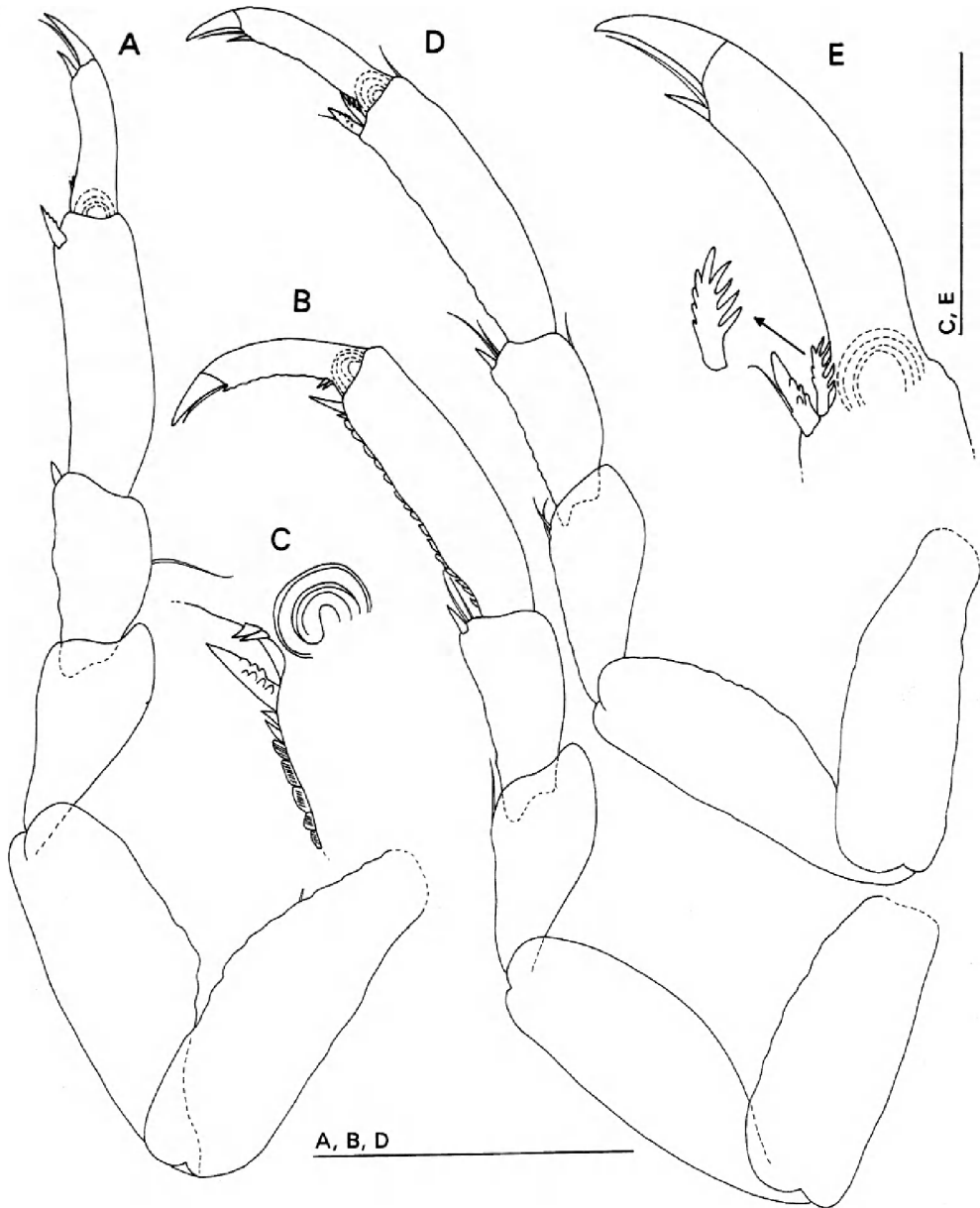


Fig. 10. *Haliophasma mjoelniri* sp. nov. Non-ovigerous female holotype, 13.6 mm, 65°03.30' N, 27°41.00' W. Pereopods of the right side. A. Pereopod 5. B. Pereopod 6. C. Ventrodistal end of propodus 6. D. Pereopod 7. E. Distal end of propodus, dactylus and unguis of pereopod 7. Scale: A, B, D = 0.5 mm; C, E = 0.2 mm.

Antennular flagellum with 3 articles; 1 sensory plumose seta on article 1, article 3 with few long setae (Fig. 8A).

Antennal flagellum of 6 articles, decreasing in length towards distal end, with long filamentous aesthetascs on all articles (Fig. 8B).

Mandibular lamina dentata with 4 to 5 teeth; pars

molaris present in left mandibula, absent in right mandibula; article 2 of palp 3 times longer than article 3, article 3 with 1 long seta (Fig. 8C, D).

Maxilla with 5 teeth (Fig. 8F).

Maxilliped (Fig. 8G). Palp article 1 1.3 times longer than basis, with 1 apical seta. Article 2 with 3 apical setae.

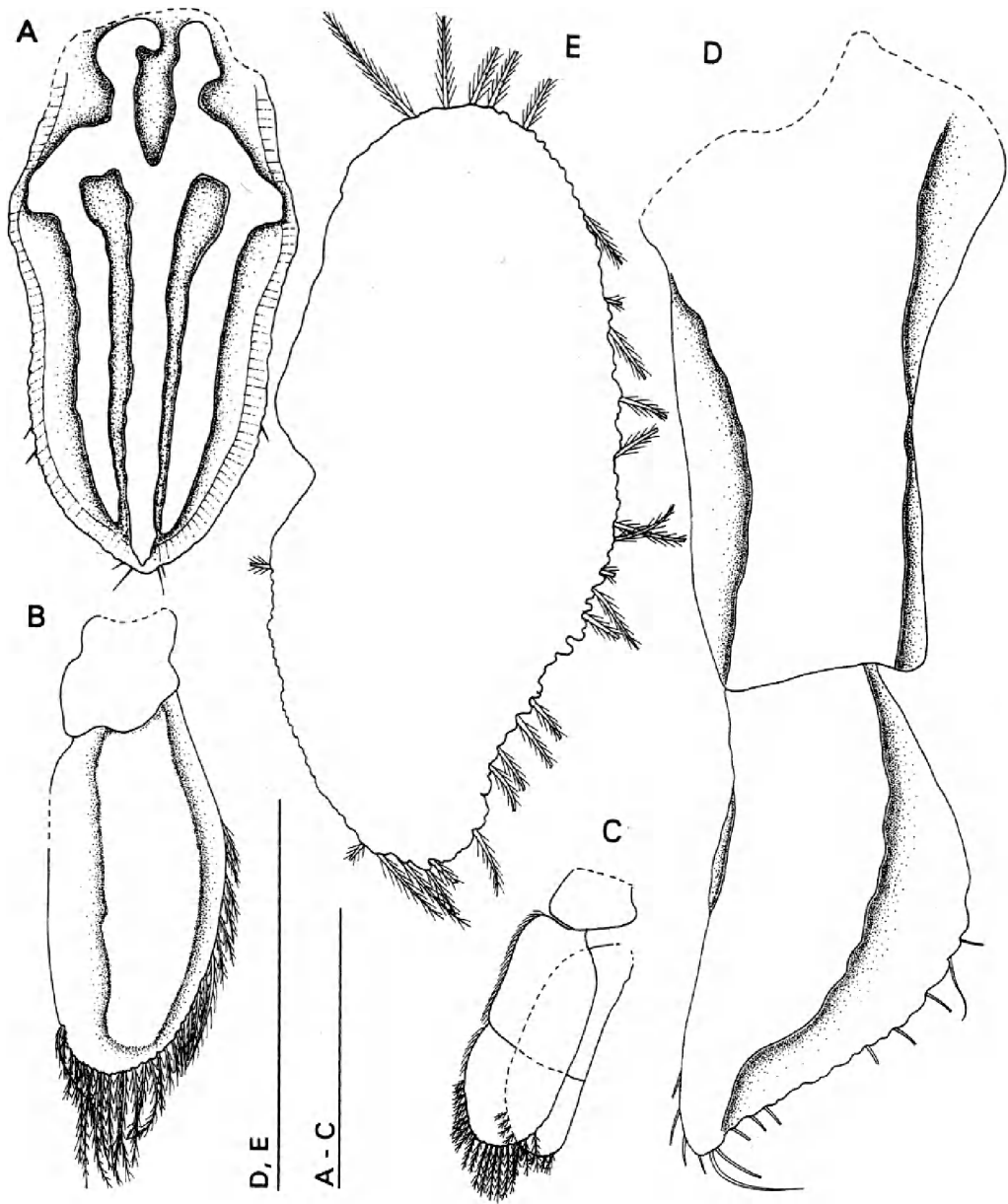


Fig. 11. *Haliophasma mjoelniri* sp. nov. Non-ovigerous female holotype, 13.6 mm, 65°03.30' N, 27°41.00' W. A. Pleotelson, dorsal view. B. Sympod and exopod of pleopod 1, left. C. Pleopod 2, left. D. Sympod and endopod of uropod, right, ventral view. E. Exopod of uropod, right. Scale: A-C = 1 mm; D, E = 0.5 mm.

Pereopod 1 shortest and most robust; propodus oval elongate, 2.3 times longer than wide, with step-formed ventral margin, step 0.4 of ventral margin from distal end, ventral margin fringed with setulated lobules, distally with ventromedial row of about 11 setae, few stout setae near ventral margin (Fig. 9A, B). Pereopods 2 to 7 fringed ventrally on propodus with transparent setulated lobules. Pereopods 2 and 3 longest, similar in

length and shape, propodus elongated and rectangular, 3.9 to 4 times longer than wide, ventrodistally with 1 serrated spine (Fig. 9C, D). Pereopods 4 to 7 similar in shape, pereopod 4 shortest pereopod, pereopods 5 to 7 similar in length; carpus of pereopods 4 to 7 elongated rectangular, 3.3 to 3.8 times longer than wide, with 1 ventrodistal spine; propodus elongated, 3.2 to 3.6 times longer than wide in pereopods 4 to 7, respectively,

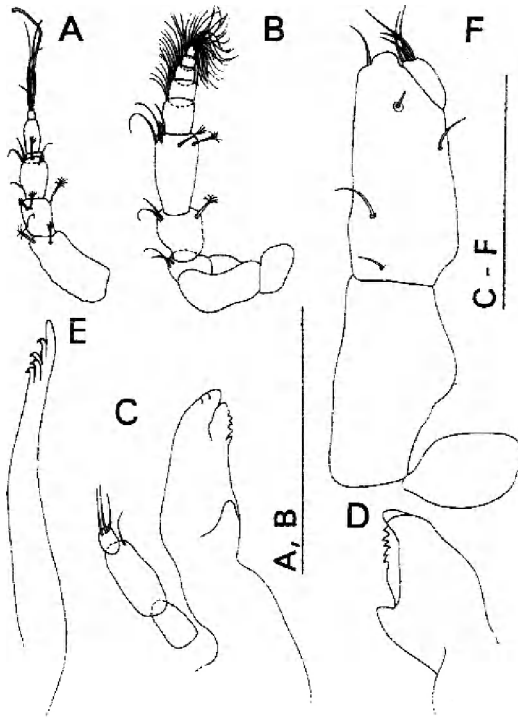


Fig. 12. *Haliophasma mjoelniri* sp. nov. Manca paratype, 6 mm, 62°51' N, 25°18' W. A. Antennula, right. B. Antenna, right. C. Mandibular lamina dentata and pars molaris of left mandibula. D. Pars incisiva, lamina dentata and pars molaris of right mandibula. E. Maxilla, left. F. Maxilliped, right. Scale: A, B = 0.5 mm; C-F = 0.2 mm.

ventrodistally with 1 serrated spine; pereopod 7 ventrodistally with 1 double pectinated seta near the spine (Figs 9E; 10A-E). Dactylus of all pereopods ventroproximally with 1 or 2 spinules (Figs 9; 10).

Pleopod 1 exopod 1.9 times longer than wide, laterally and distally with 30 plumose setae, dorsal surface convex (Fig. 11B).

Pleopod 2 exopod with about 20 plumose setae, endopod with 9 plumose setae (Fig. 11C).

Uropod sympod 1.8 times longer than wide, 1.3 times longer than endopod; wide ridge ventrally (Fig. 11D). Endopod lateral margin widely falciform, slightly crenulated, 1.8 times longer than greatest width, with few simple setae, ventrally with wide ridge. Endopod not extending beyond apex of pleotelson. Sympod and endopod fold lateroventral margin of pleotelson (Fig. 7D). Exopod ovate, 2.1 times longer than wide, fringed with at least 26 plumose setae, lateral margin slightly crenulated, laterodistally weakly concave (Fig. 11E). Exopods slightly folded over pleotelson (Fig. 7A).

Description of manca paratype. (Figs 12-14)
Length: 6 mm. Integument very thick, sculptured and

heavily calcified, as in adult female. Pleotelson similar in shape to pleotelson of adult female (Fig. 14C).

Antennular articles 1 and 2 of peduncle with plumose sensory setae; flagellum with 3 articles; 1 plumose sensory seta on article 1, article 3 with 5 long setae and 1 long aesthetasc (Fig. 12A).

Antennal articles 4 and 5 of peduncle with plumose sensory setae; flagellum of 6 articles, decreasing in length towards distal end, with long filamentous aesthetascs on all articles (Fig. 12B).

Mandibular lamina dentata with 4 to 5 teeth, pars molaris present in left mandibula, absent in right mandibula; article 2 of palp 3.1 times longer than article 3, with 1 distal seta; article 3 with 3 apical long setae (Fig. 12C, D).

Maxilla with 5-6 teeth (Fig. 12E).

Maxilliped (Fig. 12F). Palp article 1 1.1 times longer than basis, with 1 medioapical seta, 3 dorsal setae and 1 laterodistal seta. Article 2 with 5 apical setae.

Pereopod 1 longest and most robust; propodus oval, 2 times longer than wide with slightly step-formed ventral margin, ventral margin proximally fringed with setulated lobules, and distally with spine-like lobules; distally with 3 ventromedial setae and 3 setae near ventral margin (Fig. 13A, B). Pereopods 2 to 6 fringed ventrally on propodus with transparent, setulated lobules. Pereopods 2 and 3 similar in length and shape, propodus elongated and rectangular, 2.8 to 3.2 times longer than wide, ventrodistally with 1 serrated sensory spine (Fig. 13C, D). Pereopods 4 to 6 similar in shape, pereopod 4 shortest pereopod. Carpus of pereopods 4 to 6 rectangular, with 1 ventrodistal sensory spine, ventral margin with spinules; propodus of pereopods 4 to 6 2.5 to 3.3 times longer than wide, respectively, ventrodistally with 1 serrated sensory spine, pereopod 6 ventrodistally with 1 pectinated seta near the spine (Figs 13E; 14A, B). Dactylus of pereopods 2 to 6 ventroproximally with 1 or 2 spinules (Figs 13; 14A, B).

Pleopod 1 sympod with 3 retinaculae; exopod 2 times longer than wide, laterally and distally with 16 to 19 plumose setae, 1.5 times longer than endopod; endopod with 3 to 4 plumose apical setae (Fig. 14D).

Uropod sympod 2.4 times longer than wide, equal in length to endopod; wide ridge ventrally, mediolaterally with few plumose setae (Fig. 14E). Endopod pyriform, 2.1 times wider than long, lateral margin slightly crenulated, with few simple setae. Endopod not extending beyond apex of pleotelson. Exopod 1.9 times longer than wide, fringed with about 20 plumose setae, lateral margin crenulated (Fig. 14E).

Remarks. This species is in many aspects similar to *H. alaticauda* described by AMAR (1966) from the west-

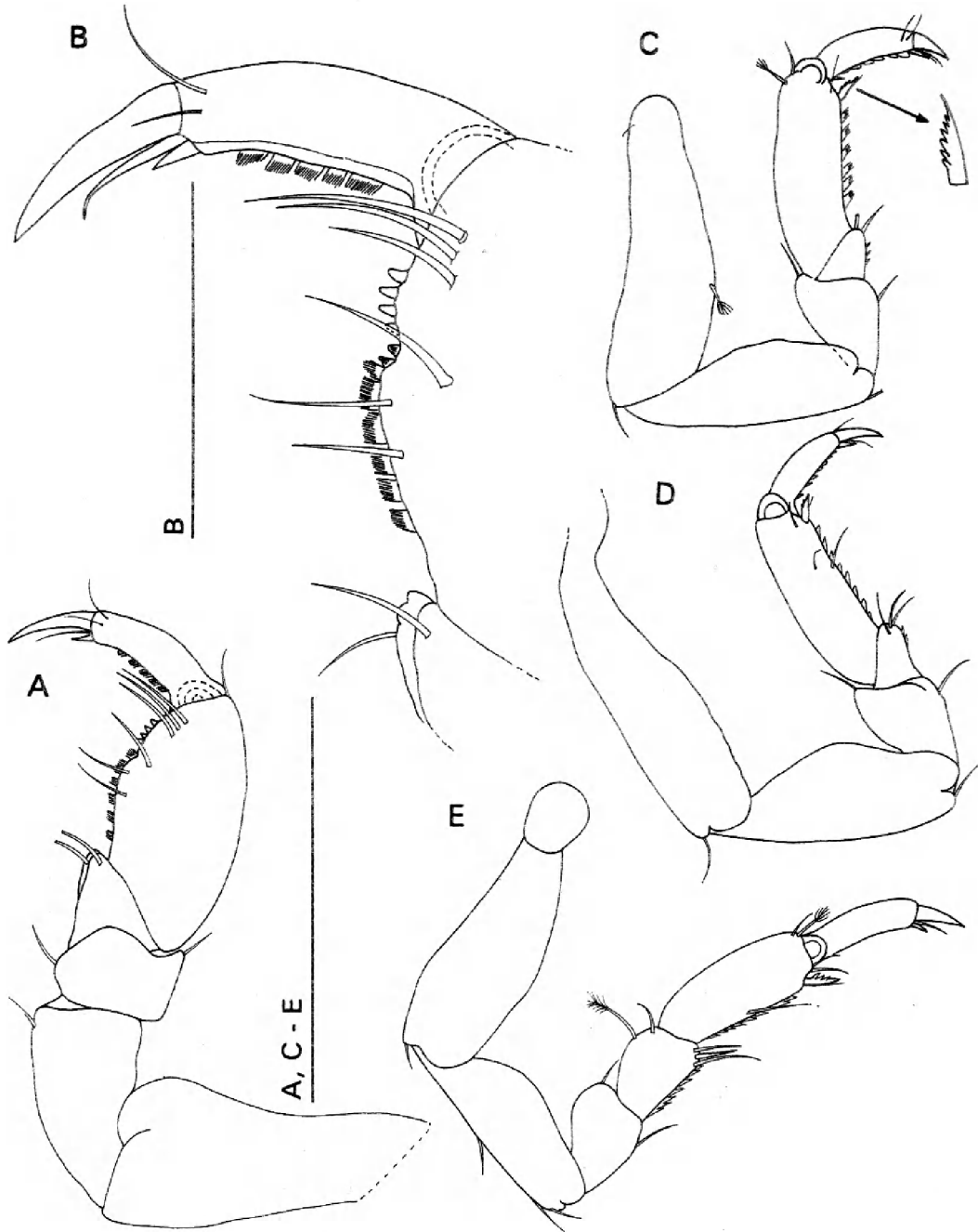


Fig. 13. *Haliophasma mjoelniri* sp. nov. Manca paratype, 6 mm, 62°51' N, 25°18' W. Pereopods of the right side. A. Pereopod 1. B. Ventrodiscal end of carpus, ventral margin of propodus, dactylus and unguis of pereopod 1. C. Pereopod 2. D. Pereopod 3. E. Pereopod 4. Scale: A, C-E = 0.5 mm; B = 0.2 mm.

ern Mediterranean. *H. mjoelniri* can be distinguished from *H. alaticauda* in the aspect of the dorsal surface of the pereonites, pleon and pleotelson, in having a semi-oval plateau with an irregular, elongated groove on the pleon (see also in Fig. 7C; female paratype, 12 mm) and

in having a step-formed ventral margin of the propodus of pereopod 1. *H. alaticauda* and *H. mjoelniri* are the only species of the genus *Haliophasma* which do not have a swollen propodus of pereopod 1.

Many setae and spines were apparently missing from

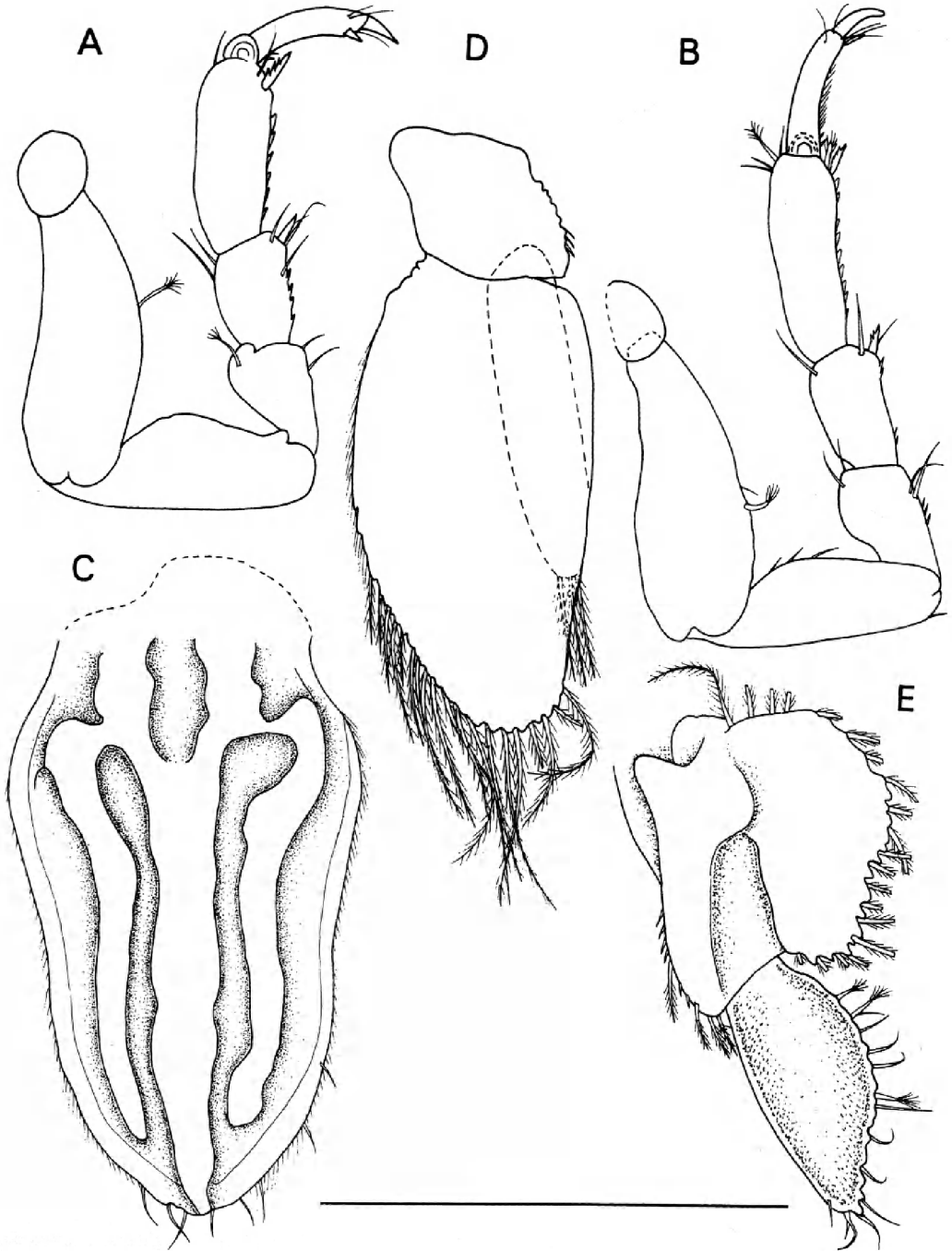


Fig. 14. *Haliophasma mjoelniri* sp. nov. Manca paratype, 6 mm. 62°51' N, 25°18' W. A. Pereopod 5, right. B. Pereopod 6, right. C. Pleotelson. D. Pleopod 1. E. Uropod, right, ventral view. Scale = 0.5 mm.

the indurate adult female; these were more easily observed in the manca. We observed only a single large seta on article 3 of the mandibular palp on the holotype and the juvenile paratype, while the third article on the

manca had three setae.

H. mjoelniri was found at depths between 340 and 508 m west of Iceland among scleractinian corals, sponges and mud (Fig. 31).

Genus *Quantanthura* MENZIES & GEORGE, 1972

Quantanthura tyri sp. nov. (Figs 15-18)

Holotype. Non-ovigerous female, BIOICE station 2255, 5 September 1992, 63°15.49' N, 26°03.50' W, 1025 m, 4.9 °C, sand, Icelandic Museum of Natural History cat. no. 1996.10.03.1.

Paratypes. BIOICE stations 2255, 1 manca, 4 non-ovigerous females, IMNH; BIOICE 2257, RP sled, 5 September 1992, 63°14.61' N, 26°29.14' W, 1209 m, 4.1 °C, muddy shelly-sand, 1 non-ovigerous female, GANMNH; BIOICE 2265, RP sled, 8 September 1992, 63°09.05' N, 25°15.66' W, 546 m, 6.5 °C, coarse sand, 1 manca, IMNH; BIOICE 2268, RP sled, 8 September 1992, 63°08.67' N, 25°11.70' W, 450 m, 6.8 °C, 1 manca, 1 young female, 3 non-ovigerous females, GANMNH; BIOICE 2299, RP sled, 10 September 1992, 63°00.10' N, 22°39.61' W, 775 m, 5.5 °C, sand, 1 non-ovigerous female, GANMNH; BIOICE 2303, RP sled, 10 September 1992, 63°03.88' N, 22°41.22' W, 600 m, 6.8 °C, muddy sand, 1 non-ovigerous female, GANMNH; BIOICE 2401, RP sled, 1 July 1993, 63°07.40' N, 22°53.90' W, 520 m, 6.7 °C, 1 postmanca, 1 non-ovigerous female, IMNH; BIOICE 2691, detritus sled, 31 August 1994, 64°26.10' N, 24°14.20' W, 1162-1212 m, 3.7 °C, sand with silt and gravel, 1 non-ovigerous female, IMNH; BIOICE 2720, RP sled, 7 September 1994, 64°25.80' N, 26°24.20' W, 304 m, 4.6 °C, many sponges, 1 postmanca; 63°46' N, 26°28' W, 15 April 1983, 545 m, 1 manca, collected by Jón Bogason; 63°35' N, 24°50' W, 2 September 1983, 357 m, 5 non-ovigerous females, collected by Jón Bogason.

Etymology. The pleotelson of this species resembles a shield. The name refers to the god Týr from the Nordic Mythology, who was a fighting god. The species was found in northern waters.

Description of non-ovigerous female holotype. (Figs 15-18)

Length: 13.6 mm. Integument smooth and thin, indurate and porcellaneous in aspect. Body 12.4 times longer than greatest width; body proportions: $C < I = 2 = 3 < 4 < 5 > 6 > 7 \approx Pln < Plt$ (Fig. 15A). Cephalothorax almost quadrate; rostrum acute, not exceeding anterolateral lobes. Visual elements present, no pigments visible. Pereonite 5 longest body segment. Pereonites 1 and 2 ventrally with strong carina. Pleonites 1 to 5 fused mediodorsally. Pleonite 6 distinct, with notch on posterior margin.

Pleotelson strongly indurate, dorsally convex, with aspect of a shield, apex widely truncated with about 14 setae on distal margin, short fine setae dorsally along

lateral margin, lenticular in lateral view (Fig. 15B), 2.3 times longer than greatest width, statocysts not visible (Figs 16A; 17A, B) in this specimen, but in other ones (Fig. 17G, H).

Antennular first article of peduncle laterally with about 6 plumose sensory setae, article 3 distolaterally with 3 long, strong setae (Fig. 15C); flagellum with 5 articles, 3 aesthetascs distally.

Antennal peduncle articles 3 to 5 with few simple setae, article 5 with 4 plumose sensory setae; about 6 articles in flagellum, distal articles difficult to discern; first article of flagellum wide and longer than other articles combined; all articles with bunch of long aesthetascs (Fig. 15D).

Mandibular pars incisiva with 3 chitinous teeth; lamina dentata with 5 teeth, pars molaris well developed; article 2 of palp 1.5 times longer than article 1, 2.8 times longer than article 3; article 1 with 1 long, strong seta, article 2 with 1 long, strong distal seta and 1 shorter seta on middle part, article 3 distally with comb of 6 strong finely setulated setae increasing in length towards distal end (Fig. 15E, F).

Maxilla with 7 teeth (Fig. 15G).

Maxilliped (Fig. 15H). Endite broad, exceeding article 2 of palp in length, distally with 1 long and 1 short seta. Palp with 5 articles; article 1 short; article 2 with 1 long mediolateral seta; article 3 with 3 small setae on medial margin and 1 seta ventrodorsally near medial margin, 1 long seta laterodorsally; article 4 with 2 setae mediolaterally, one being setulated; article 5 minute with 4 long setae (Fig. 15H).

Pereopod 1 most robust and longest; propodus swollen, 2.2 times longer than wide, with short straight ventral margin, margin with 9 setae and medially with row of 5 setae; carpus ventrodorsally slightly truncated, ventral margin with about 7 setae (Fig. 16A). Pereopods 2 and 3 similar in shape, pereopod 2 longer than pereopod 3; both with merus ventrally with 5 to 6 long setae; carpus ventrodorsally with 1 simple sensory spine; propodus elongate ovate, 2.3 times longer than wide, with 1 ventrodorsal simple sensory spine and row of 4 setae medially (Fig. 16B, C). Pereopod 4 shortest pereopod; pereopods 4 to 7 similar in shape; merus ventrally with about 4 long setae; carpus widely rectangular, pereopods 4 to 6 carpus 1.1 to 1.3 times longer than wide respectively, carpus of pereopod 7 1.7 times longer than wide; carpus of pereopods 4 to 7 dorsodorsally with 1 strong sensory plumose seta, ventrally 2 simple sensory spines and about 3 long setae; pereopods 4 to 6 with strong bisetulated seta near ventrodorsal spine, pereopod 7 with 2 strong bisetulated setae near ventrodorsal spine (Fig. 16D-F). Propodus of pereopods 4 to 6 elongated rectangular, 2.4 to 2.7 times longer than wide, respectively; propodus of pereopod 7 3.3 times

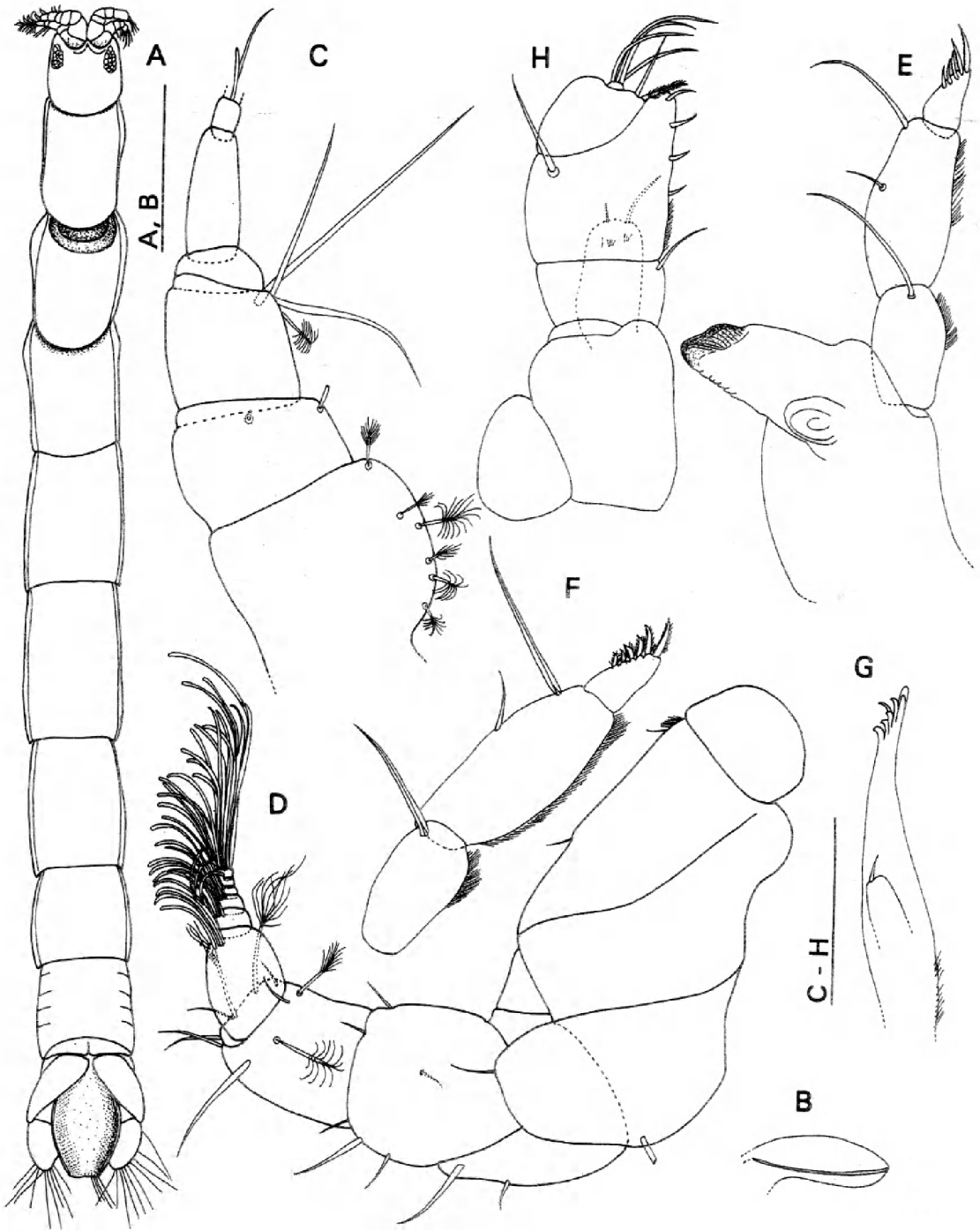


Fig. 15. *Quantanthura tyri* sp. nov. Non-ovigerous female holotype, 13.6 mm, BIOICE stn. 2255. A. Habitus, dorsal view. B. Pleotelson, lateral view. C. Antennula, left (flagellum broken). D. Antenna, right. E. Mandibula, right. F. Palp of mandibula, left. G. Maxilla. H. Maxilliped, left. Scale: A, B = 2 mm; C-H = 0.2 mm.

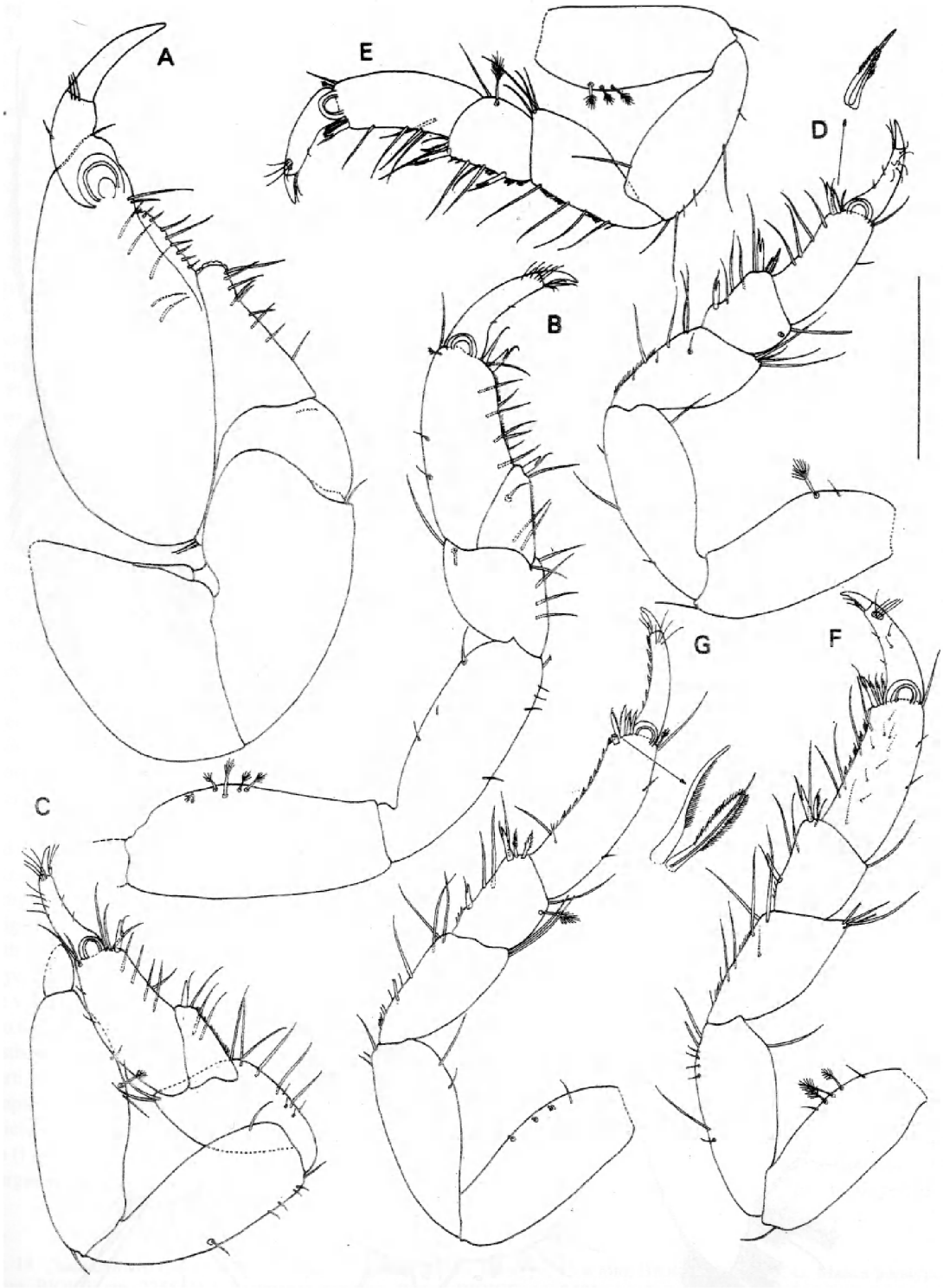
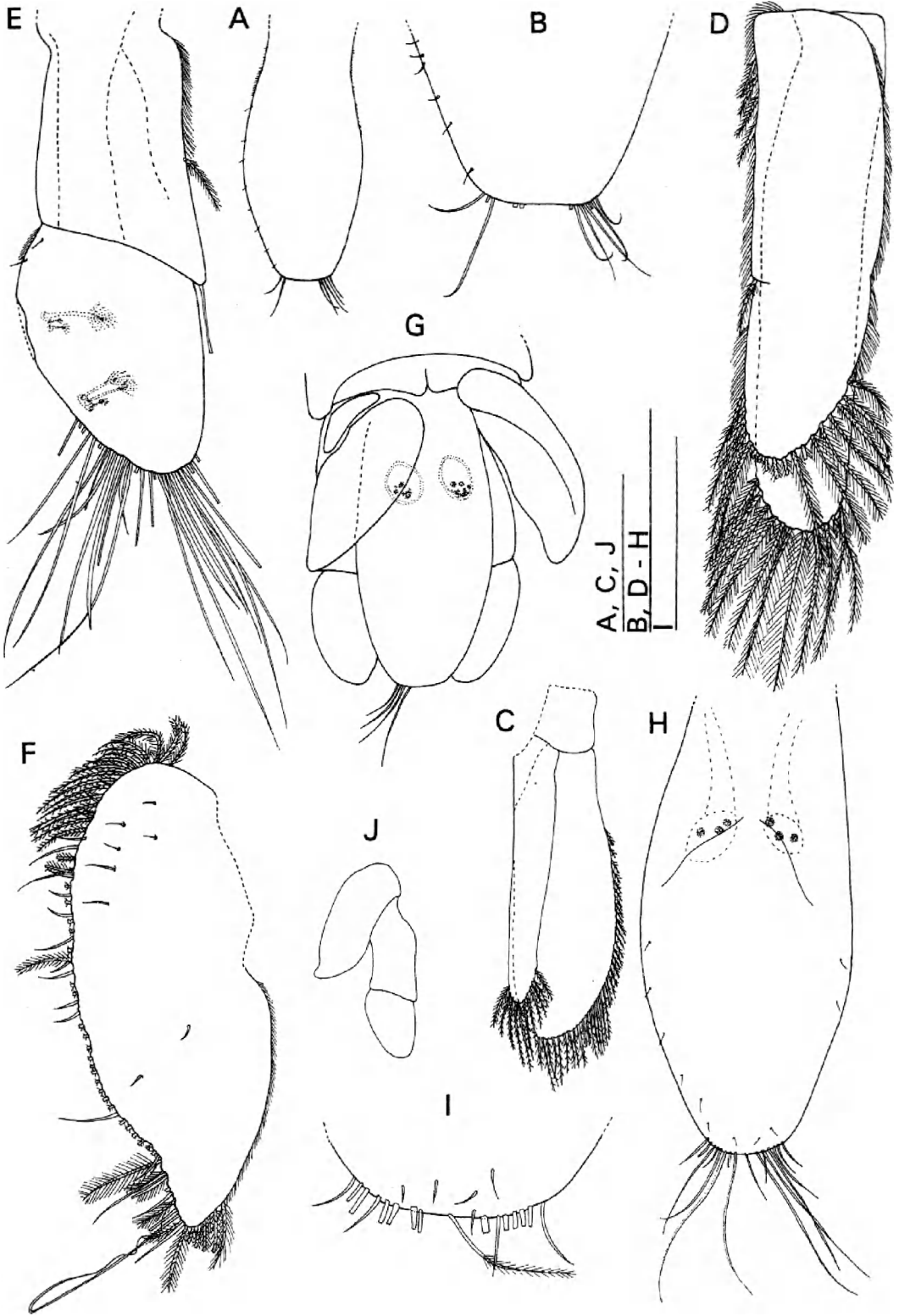


Fig. 16. *Quantanthura tyri* sp. nov. Non-ovigerous female holotype, 13.6 mm, BIOICE stn. 2255. Pereopods of the right side. A. Pereopod 1. B. Pereopod 2. C. Pereopod 3. D. Pereopod 4. E. Pereopod 5. F. Pereopod 6. G. Pereopod 7. Scale = 0.5 mm.



longer than wide; propodus of pereopods 4 to 7 distally with 1 simple sensory spine; pereopods 4 to 6 with 4 long setae on ventral margin; 1 strong bisetulated seta near ventrodistal sensory spine in pereopod 4, 2 strong bisetulated setae in pereopod 5, 3 strong bisetulated setae in pereopod 6; margin of propodus of pereopod 7 with setulated lobules and 4 strong bisetulated setae near ventrodistal sensory spine (Fig. 16G).

Pleopod 1 exopod 2.9 times longer than wide, laterally and distally with about 56 short plumose setae, dorsal surface convex; exopod 2.4 times wider than endopod, and 1.1 times longer than endopod; endopod distally with 11 plumose setae (Fig. 17C).

Pleopod 2 exopod distally with 18 plumose setae, proximally on medial margin with 4 short plumose setae; endopod 1.2 times longer than exopod, distally with 10 plumose setae (Fig. 17D).

Pleopods 3 to 5 exopod distally with 17 to 18 plumose setae; proximally on medial margin with 5 short plumose setae; endopod distally with 8 to 9 plumose setae.

Uropod sympod 1.5 times longer than wide, as long as endopod; wide ridge ventrally (Fig. 17E). Endopod oviform, 1.6 times longer than greatest width, laterodistally and distally with continuous row of about 29 long simple setae (Fig. 17E). Exopod narrowly ovate, laterodistally weakly concave, 2.5 times longer than wide, fringed with at least 64 finely plumose setae and about 20 long simple setae (Fig. 17F). Exopods folded over pleotelson, not overlapping (Fig. 15A).

Additional description of female paratypes. (Fig. 18, BIOICE stations 2255 and 2401) Length of females: 12-17 mm (young and non-ovigerous). Pleotelson 2.0 times longer than wide, apex with about 16 setae on distal margin; statocysts visible in young female, apertures slit-like, particles visible in the vesicles (Fig. 18F, G). Flagellum of antennula with 5 to 6 articles. Articles 2 to 5 each distally with 1 strong aesthetasc (Fig. 18A). Flagellum of antenna with about 7 articles. Second article of mandibular palp with 1 long simple seta (Fig. 18B). Maxilla with 6 teeth. Maxilliped article 3 of palp with 2 or 3 small setae on medial margin (Fig. 18C, D). Propodus of pereopod 1 with ventral margin slightly convex, with 7 strong setae; medially row of 4 setae (Fig. 18E). Propodus of pereopods 5 to 7 in young female with fewer bisetulated setae near ventrodistal sensory spine: pereopod 5 with 1 seta, pereopod 6

with 2 setae and pereopod 7 with 3 setae. All pereopods of young female with fewer setae than in other non-ovigerous females. Pleopod 1 of young female with 3 retinaculae, exopod with about 40 plumose setae, endopod with 6 plumose setae; pleopod 2 with 2 retinaculae, exopod with 10 plumose setae distally and 2 short plumose setae proximally, endopod with 6 plumose setae. Endopod of uropod of young female distally with 26 to 28 simple setae, exopod with about 40 plumose setae, and 17 to 20 simple setae.

Descriptive note on mancas and postmancas. (Fig. 17)

Lengths of mancas: 6 and 12 mm (BIOICE station 2255). Manca similar to young female. Pleotelson of similar length/width ratio as young females; with fewer setae on apex, vesicles of statocysts clearly visible (Fig. 17G).

Postmanca 9 mm in length (BIOICE station 2401). Pleotelson of similar shape, length/width ratio and number of setae as in young females (Fig. 17H, I). Pereopods similar in shape to that of young females, but with fewer setae. Propodus of pereopod 1 with slightly convex ventral margin as in young female, but 5 setae on ventral margin. Pleopod 1 with fewer setae than in young females, exopod of pleopod 1 with about 33 setae; endopod with 4 setae. Exopod of pleopod 2 with 8 plumose setae distally and 1 short plumose seta proximally; endopod with 5 plumose setae. Exopod of uropod 2.7 times longer than wide (Fig. 17J), with about 30 plumose setae and 9-14 simple setae; endopod with 16 to 20 setae.

Remarks. In the shape of the pleotelson this species is similar to *Anthelura truncata* (HANSEN, 1916), which has earlier been recorded in the northern part of the North Atlantic Ocean. We have studied the type specimens of *A. truncata* and this species is clearly different and belongs even to a different family. *Q. tyri* differs from all species of the genus *Quantanthura* in the shape of the pleotelson, except for *Q. caledonensis* NEGOESCU, 1994. POORE & LEW TON (1986) divided the species of *Quantanthura* into two groups based on the aspect of the antennula, the mandibular palp, the maxilliped and the posterior pereopods. This species clearly belongs to the group of *Q. erica* POORE & LEW TON, 1986, *Q. fremata* POORE & LEW TON, 1986 and *Q. pacifica* WÄGELE, 1985. *Q. tyri* can be distinguished from all

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Fig. 17. *Quantanthura tyri* sp. nov. A-F. Non-ovigerous female holotype, 13.6 mm, BIOICE stn. 2255. G. Manca paratype, 6 mm, BIOICE stn. 2255. H-J. Postmanca paratype, 9 mm, BIOICE stn. 2401. A. pleotelson. B. Distal end of pleotelson. C. Pleopod 1, right. D. Pleopod 2 (sympod missing). E. Sympod and endopod of uropod, left, dorsal view. F. Exopod of uropod, left (some of plumose setae cut off). G. Pleonite 6, pleotelson and uropods (setae of uropods omitted). H. Pleotelson. I. Distal end of pleotelson (setae cut off). J. Uropod, left (setae omitted). Scale: A, C, J = 1 mm; B, D-H = 0.5 mm; I = 0.2 mm.

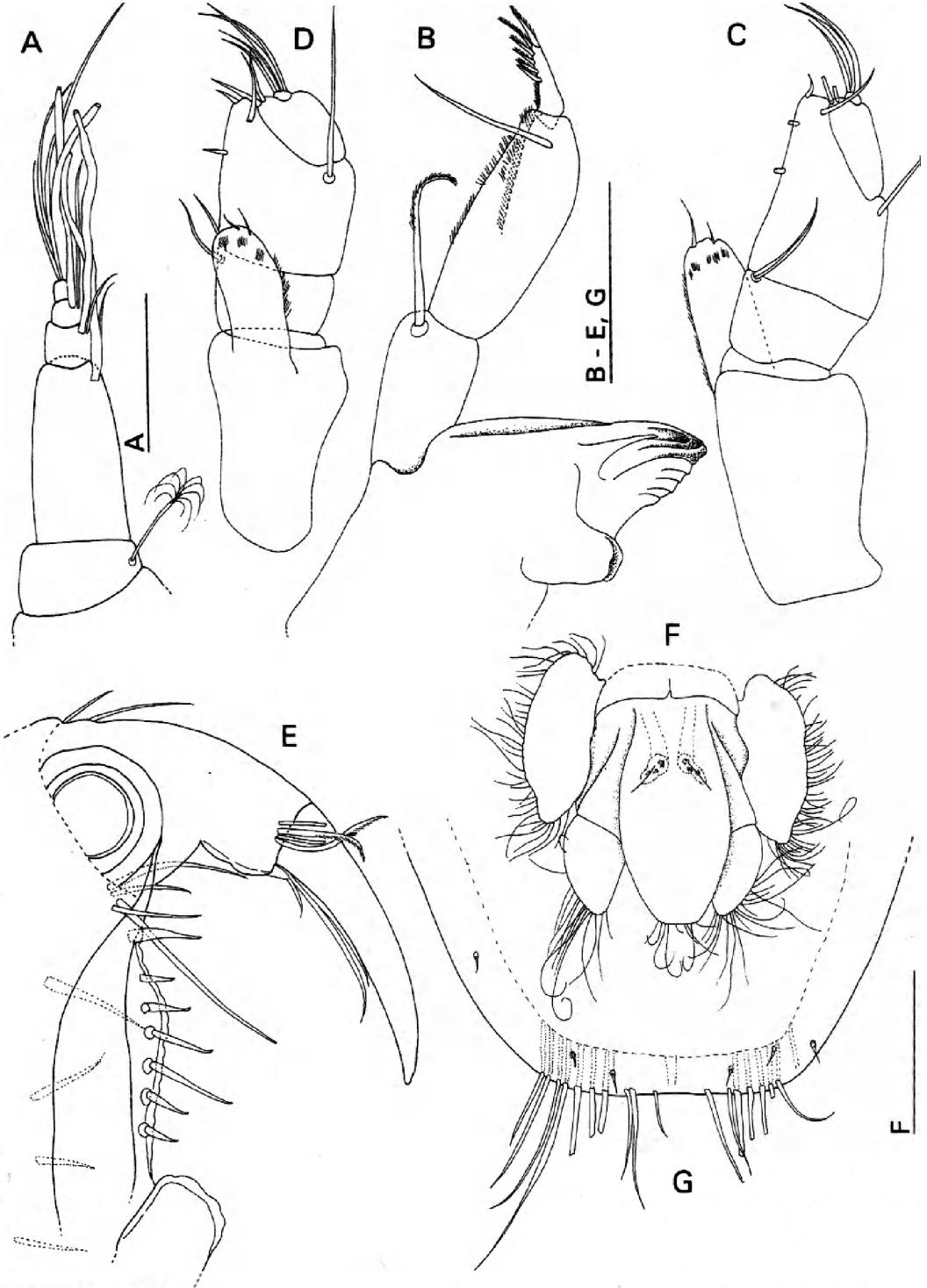


Fig. 18. *Quantanthura tyri* sp. nov. A, D-G. Non-ovigerous female paratype, 12 mm, BIOICE stn. 2401. B, C. Non-ovigerous female paratype, 12 mm, BIOICE stn. 2255. A. Flagellum of antennula, right. B. Mandibula. C. Maxilliped. D. Maxilliped. E. Ventrodistal end of carpus, ventral margin of propodus, dactylus and unguis of pereopod 1, right. F. Pleotelson and uropods. G. Distal end of pleotelson. Scale: A = 0.1 mm; B- E, G = 0.2 mm; F = 1 mm.

these three species on the basis of aspect of the comb of setae on the third article of the mandibular palp and the number of the setae, being six setae in the present species. Additional characters are: the number of setae on article 3 of the maxillipedal palp; pereopods 4 to 6 with carpus narrower than in *Q. erica* and *Q. fremata*, and with a strong bisetulated seta instead of four setae near the ventrodiscal spine as found in *Q. erica*; the carpus of pereopod 7 in *Q. tyri* is more elongate than in the two above mentioned species and with two bisetulated setae near the ventrodiscal spine instead of four setae as in *Q. erica*. In *Q. pacifica* the carpus of pereopod 4 is more elongate than in *Q. tyri*. Additional characters include the exopod of pleopod 2 being larger than the endopod, and the presence of short plumose setae proximally on the exopod of pleopods 2 to 5.

The genus has earlier been found at the northern coast of South America, off south-western South Africa, New Caledonia, south-eastern Australia and New Zealand (NEGOESCU 1994). *Q. tyri* falls within a group of species which have until now only been found in the south-western Pacific Ocean.

Q. tyri was found at depths between 304 and 1212 m off south-western and western Iceland, mainly on sandy bottoms (muddy sand, coarse sand, muddy shelly-sand) and occasionally together with sponges (Fig. 32).

Family Paranthuridae MENZIES & GLYNN, 1968

Genus *Calathura* NORMAN & STEBBING, 1886

Calathura brachiata (STIMPSON, 1853)

Material examined. Material from 95 stations in the study area (exact localities can be obtained from the authors, see also Fig. 33).

Remarks. This species was found in 95 out of 163 localities studied (58 %), both in the North Atlantic Ocean and in the Arctic Ocean, at depths between 19 and 1392 m. This extremely common species is found in both deep and shallow Arctic and boreal waters.

Genus *Leptanthura* SARS, 1897

Leptanthura affinis (BONNIER, 1896) (Figs 19-27)

Material examined. BIOICE station 2337, RP sled, 5 May 1993, 62°27' N, 12°55' W, 1099-1105 m, silty sand and sponge spicules, 4 manca, 2 postmanca, 1 juvenile, 6 non-ovigerous females, 2 copulatory males, 1 fragment, IMNH and GANMNH; BIOICE station 2346, RP sled, 6 May 1993, 63°23.00' N, 12°38.00' W, 501 m, 1 non-ovigerous female, IMNH; BIOICE station 2407, detritus sledge, 10 June 1993, 62°58.60' N, 21°49.30' W, 917-922 m, 4.5 °C, fine silt with many foraminiferans, 1 copulatory male, GANMNH; BIOICE station 2697, RP

sled, 2 September 1994, 64°10.20' N, 27°43.10' W, 1042 m, 4.2 °C, sediment with white foraminiferans (*Pyrgo* spp.), 1 postmanca, IMNH.

Redescription of non-ovigerous females. (Figs 19-22, BIOICE stations 2337 and 2346)

Length: 8.4-12 mm. Integument thin and smooth. Body 12 times longer than greatest width; body proportions: C < 1 < 2 ≈ 3 < 4 > 5 ≈ 6 > 7 ≈ Pln > Plt (Fig. 19A). Cephalothorax almost quadrate; rostrum rounded and small, not exceeding anterolateral lobes. Eyes absent. Pereonite 4 longest pereonite; pereonite 7 longer than pleotelson. Pleon 1.5 times longer than wide, pleonites 1-5 free; pleonite 1 longest, pleonite 6 with slight incision on distal margin (Figs 19A; 22E).

Pleotelson 2.7 times longer than greatest width, linguiform and tapering in the distal extremity to a narrow apex (apex broken), with a few short, apical setae (Fig. 22A, B). Pair of short setae dorsodistally, 0.2 of pleotelson length from distal end. Dorsally pore and vesicle of statocyst with sediment particles visible.

Antennular articles 1 and 2 of peduncle with fine plumose sensory setae (Fig. 19B). Article 3 laterodistally with group of 4 long setae. Flagellum with 4 articles; articles 3 and 4 together 0.3 of length of article 2, article 1 with stout sensory plumose seta, article 4 with 3 stout aesthetascs (Fig. 19C).

Antennal peduncular articles 4 and 5 each distally with bunch of simple, long setae, article 3 with pair of long setae (Fig. 19D). Flagellum of 4 articles, shorter than article 5 of peduncle; article 1 1.6 times longer than articles 2 to 4 (Fig. 19E); long filamentous aesthetascs on all articles.

Mandibular palp shorter than pars incisiva; article 2 widely ovaliform, 1.8 to 2.3 times wider than long; 2.1 times longer than article 1, with 1 distal seta; article 3 of palp reduced, minute in size, one sixth of article 2, with 2 apical bristles (Fig. 19F, G).

Maxilla sharp, with about 17-21 teeth and 3 hooks (apex broken) (Fig. 19H).

Maxilliped basis 2.9 times longer than palp, with 2 mediobasal setae; palp with 2 articles, article 2 minute (Fig. 19I). Article 1 with 1 lateral, 3 medial and 1 mediobasal setae; article 2 with 4 apical long setae. Lateral margin of basis and article 1 of palp folding in dorsal direction, forming funnel for mandibulae and maxillae. Basis mediobasally with short dorsal fold.

Pereopod 1 strongest and longest; ventrodistally on carpus 3 simple sensory spines; propodus swollen, 1.2 times longer than wide, palm with straight margin and proximally thumb-like process, margin bordered by 9-11 hand-like sensory spines (Fig. 20A, B). Pereopods 2 to 3 similar in shape; pereopod 2 longer than pereopod 3.

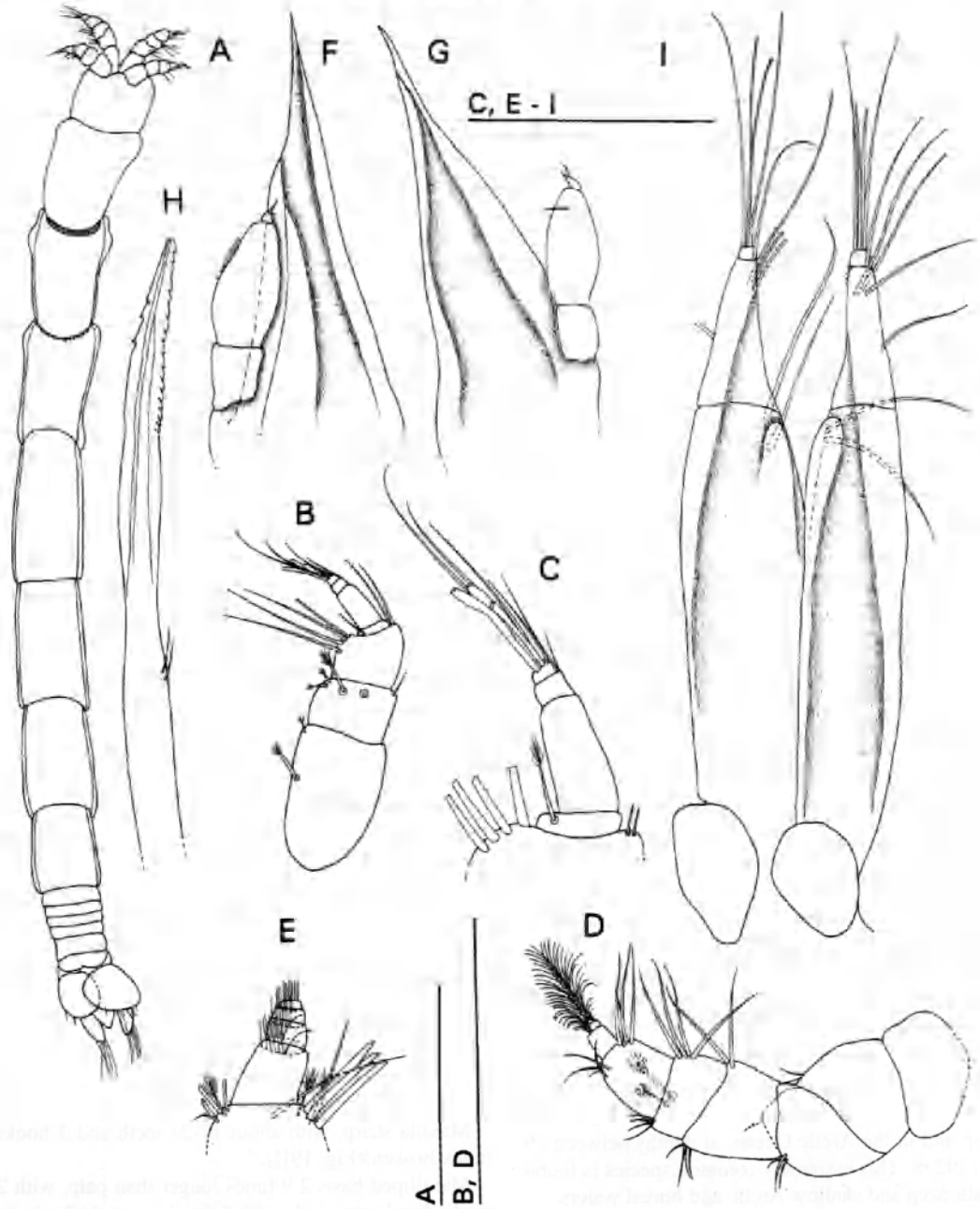


Fig. 19. *Leptanthura affinis* (BONNIER). Non-ovigerous female, 8.4 mm, BIOICE stn. 2337. A. Habitus, dorsal view. B. Antennula, left. C. Flagellum of antennula, left (aesthetascs cut off). D. Antenna, left. E. Flagellum of antenna, left. F. Mandibula, left. G. Mandibula, right. H. Maxilla (end broken). I. Maxillipeds. Scale: A = 2 mm; B, D = 0.5 mm; C, E-I = 0.2 mm.

Pereopod 2 carpus ventrodistally with 2-3 simple sensory spines; propodus broadly ovate, 2 times longer than greatest width, ventrally with 5-7 simple sensory spines, spines decreasing in length towards distal end (Fig. 20C, D); pereopod 3 carpus with 2 simple sensory

spines, propodus ovate, 1.3 times longer than greatest width, ventrally with 6 simple sensory spines (Fig. 20E, F). Pereopods 4 to 7 similar in shape, pereopod 4 shortest pereopod; carpus of pereopods 4 to 7 ventrodistally with 1 simple sensory spine; propodus

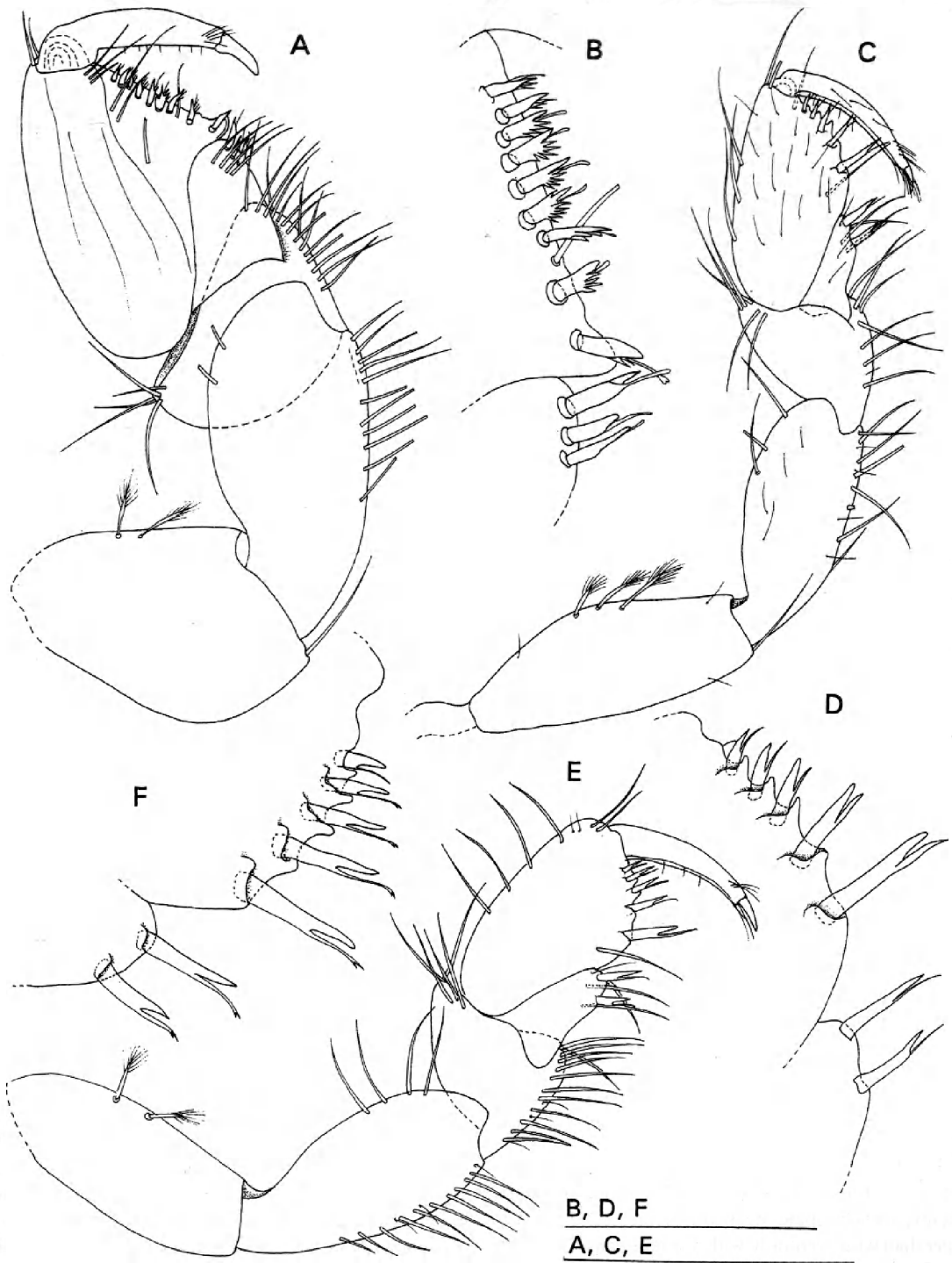


Fig. 20. *Leptanthura affinis* (BONNIER). Non-ovigerous female, 8.4 mm, BIOICE stn. 2337. Pereopods of the right side. A. Pereopod 1. B. Ventrodistal end of carpus and ventral margin of propodus 1. C. Pereopod 2. D. Ventrodistal end of carpus and ventral margin of propodus 2. E. Pereopod 3. F. Ventrodistal end of carpus and ventral margin of propodus 3. Scale: A, C, E = 0.5 mm; B, D, F = 0.2 mm.

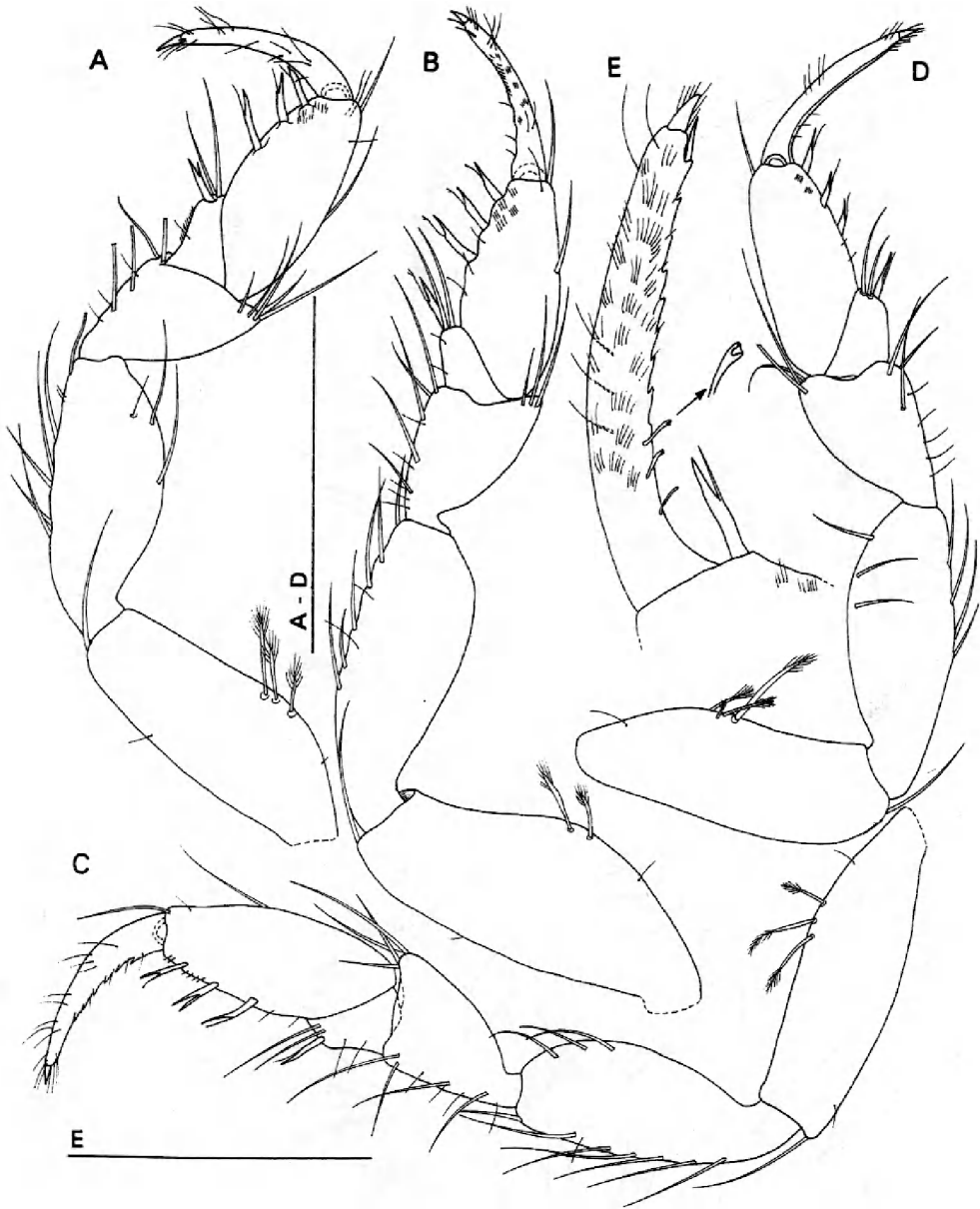


Fig. 21. *Leptanthura affinis* (BONNIER). Non-ovigerous female, 8.4 mm, BIOICE stn. 2337. Pereopods of the right side. A. Pereopod 4. B. Pereopod 5. C. Pereopod 6. D. Pereopod 7. E. Dactylus and unguis of pereopod 7. Scale: A-D = 0.5 mm; E = 0.2 mm.

ovate, 2.2-2.3 times longer than wide, ventrally with 3 simple sensory spines (Fig. 21). Dactylus of pereopod 7 covered with dense groups of fine bristles (Fig. 21E).

Pleopod 1 sympod with 3-5 retinaculæ; exopod 2.7 times longer than wide, distally with 22-29 plumose setae; endopod shorter than exopod, width 0.5 times the width of exopod, distally with 11-13 plumose setae; exopod and endopod distally crenulated (Fig. 22C).

Pleopod 2 sympod with 3 retinaculæ; exopod distally with 14 plumose setae; endopod with 11 plumose setae.

Uropod sympod rectangular, 2 times longer than wide, 1.2 times longer than endopod; mediolaterally 3 long plumose setae; ridge dorsally; lateral margin fringed with row of plumose setae (Fig. 22F). Endopod pyriform, 1.9-2.3 times longer than greatest width, medial margin

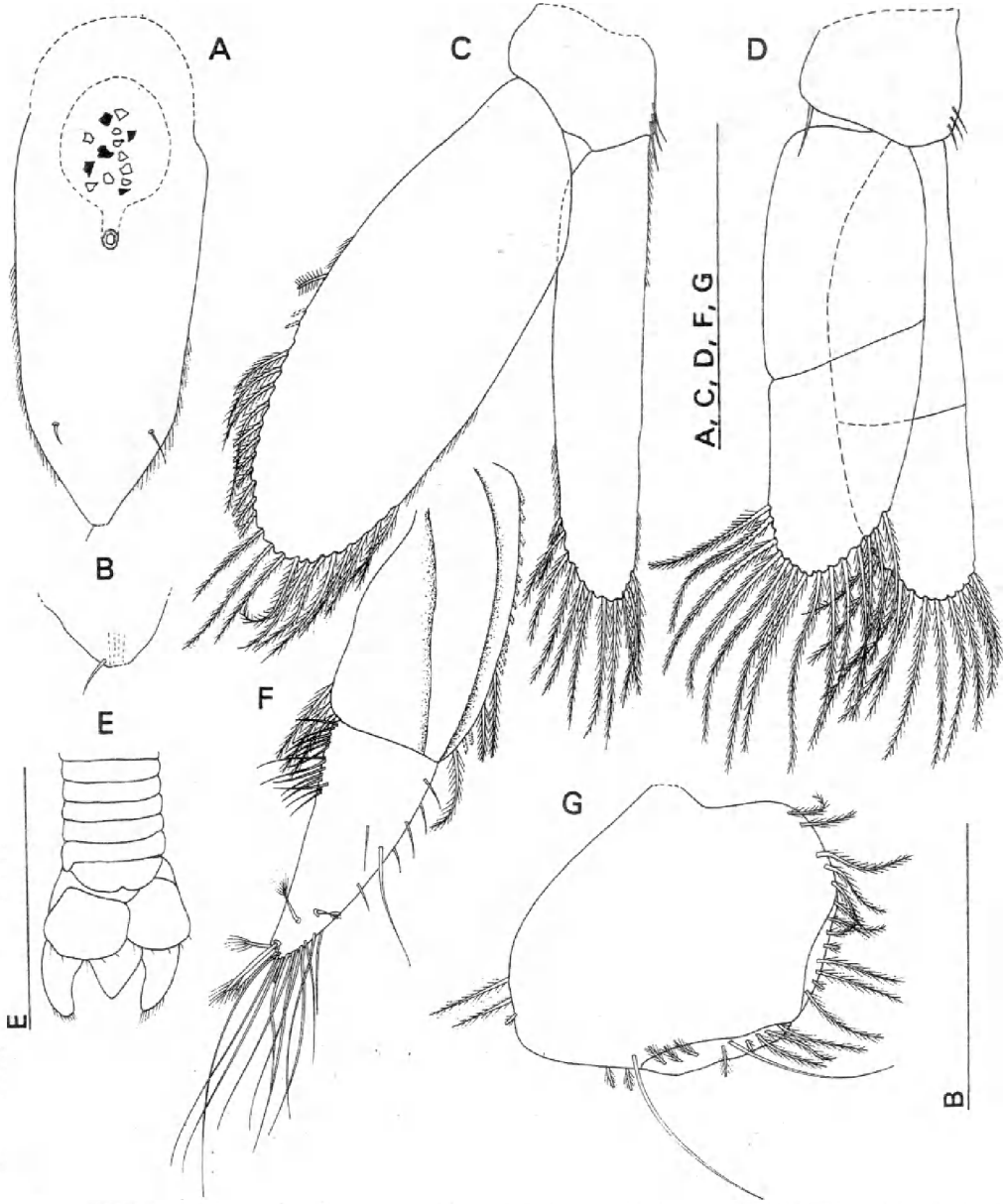


Fig. 22. *Leptanthura affinis* (BONNIER). A-C, F, G. Non-ovigerous female, 8.4 mm, BIOICE stn 2337. D, E. Non-ovigerous female, 12 mm, BIOICE stn. 2337. A. Pleotelson. B. Distal end of pleotelson (broken). C. Pleopod 1, right. D. Pleopod 2, right. E. Pleon, pleotelson and uropods. F. Sympod and endopod of uropod, right. G. Exopod of uropod, right (outer margin folded). Scale: A, C, D, F, G = 0.5 mm; B = 0.2 mm; E = 2 mm.

proximally fringed with about 14 simple setae; about 12 simple long setae apically, lateral margin with few simple short setae (Fig. 22F). Endopods extend beyond apex of pleotelson. Exopod 1.2 times wider than long, fringed with about 26 plumose and 2 long simple setae (Fig. 22G). Exopods folded over pleotelson, covering each other slightly medially (Figs 19A, 22E).

Redescription of copulatory males. (Figs 23-25, BIOICE stations 2337 and 2407)
 Length: 14-15 mm. Integument thin and smooth. Body 11.6 times longer than greatest width; body proportions: $C < 1 \approx 2 \approx 3 < 4 > 5 > 6 > 7 < Pln > Plt$ (Fig. 23A). Cephalothorax quadrate; rostrum rounded and

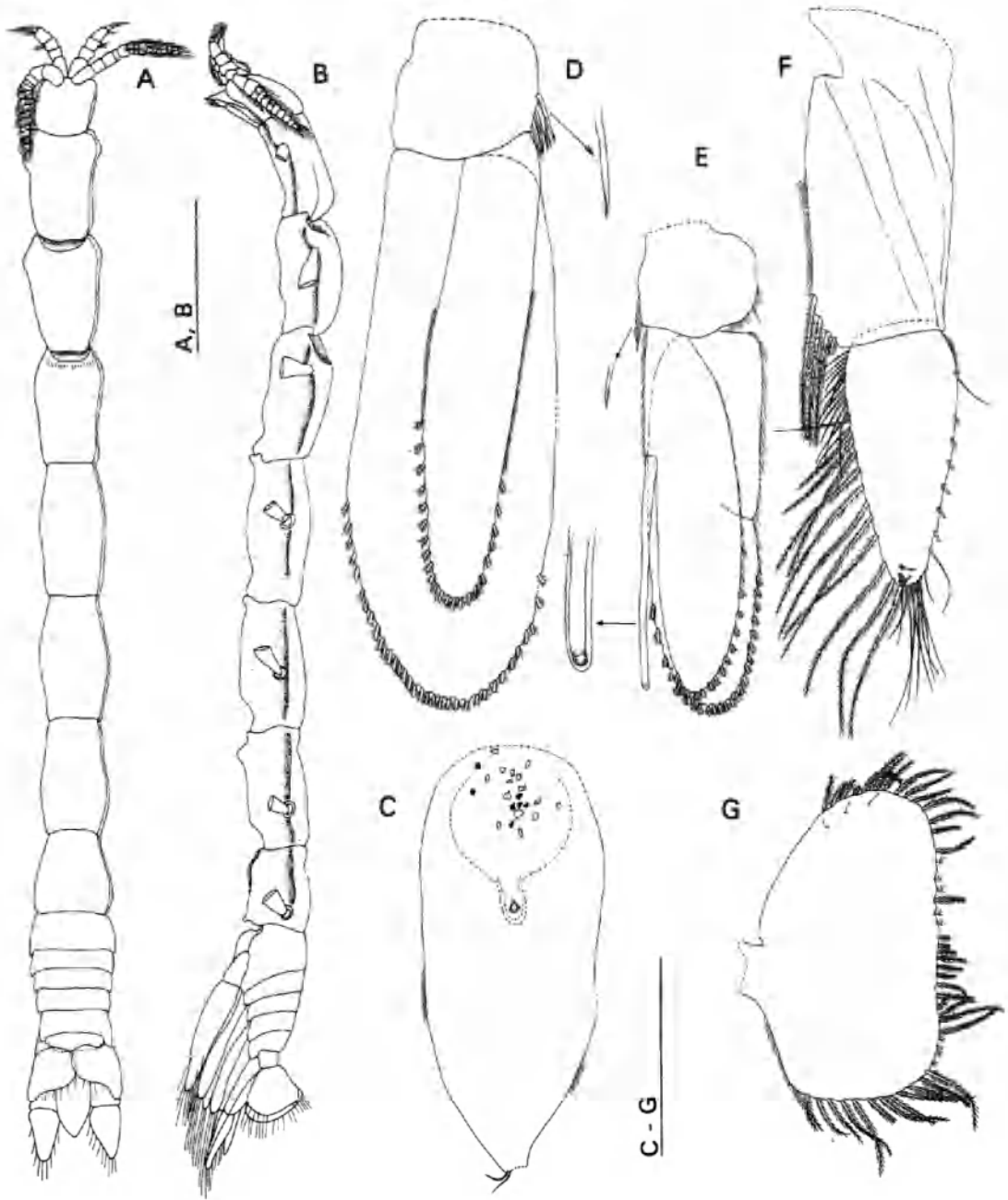


Fig. 23. *Leptanthura affinis* (BONNIER). Copulatory male, 14 mm, BIOICE stn. 2337. A. Habitus, dorsal view. B. Habitus, lateral view. C. Pleotelson (distal end broken). D. Pleopod 1. E. Pleopod 2, right. F. Sympod and endopod of uropod, right. G. Exopod of uropod, right. Scale: A, B = 2 mm; C-G = 0.5 mm.

small, not exceeding anterolateral lobes. Eyes absent. Pereonite 4 longest pereonite; pereonite 7 as long as pleotelson. Pereonites 6 and 7 ventrally each with pair of anterior protuberances (Fig. 23B). Pereonite 7 ventrally with pair of finger-like posterior apophyses

(Fig. 23B). Pleon 1.7 times longer than wide; pleonites 1-5 free, pleonite 1 longest and pleonite 6 narrowest and with distal margin entire (Fig. 23A).

Pleotelson 2.4 times longer than greatest width, linguiform and tapering in the distal extremity to a nar-

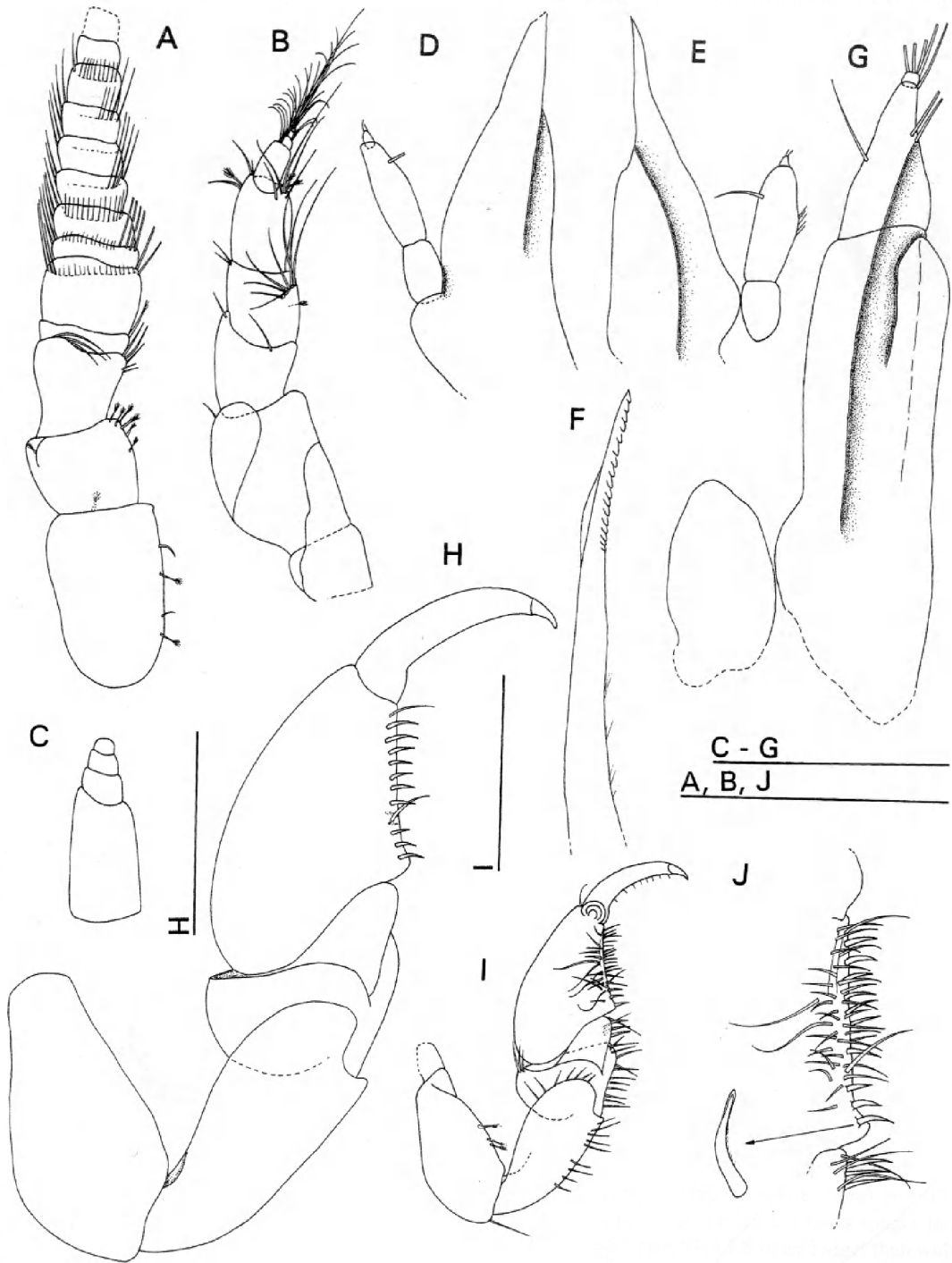
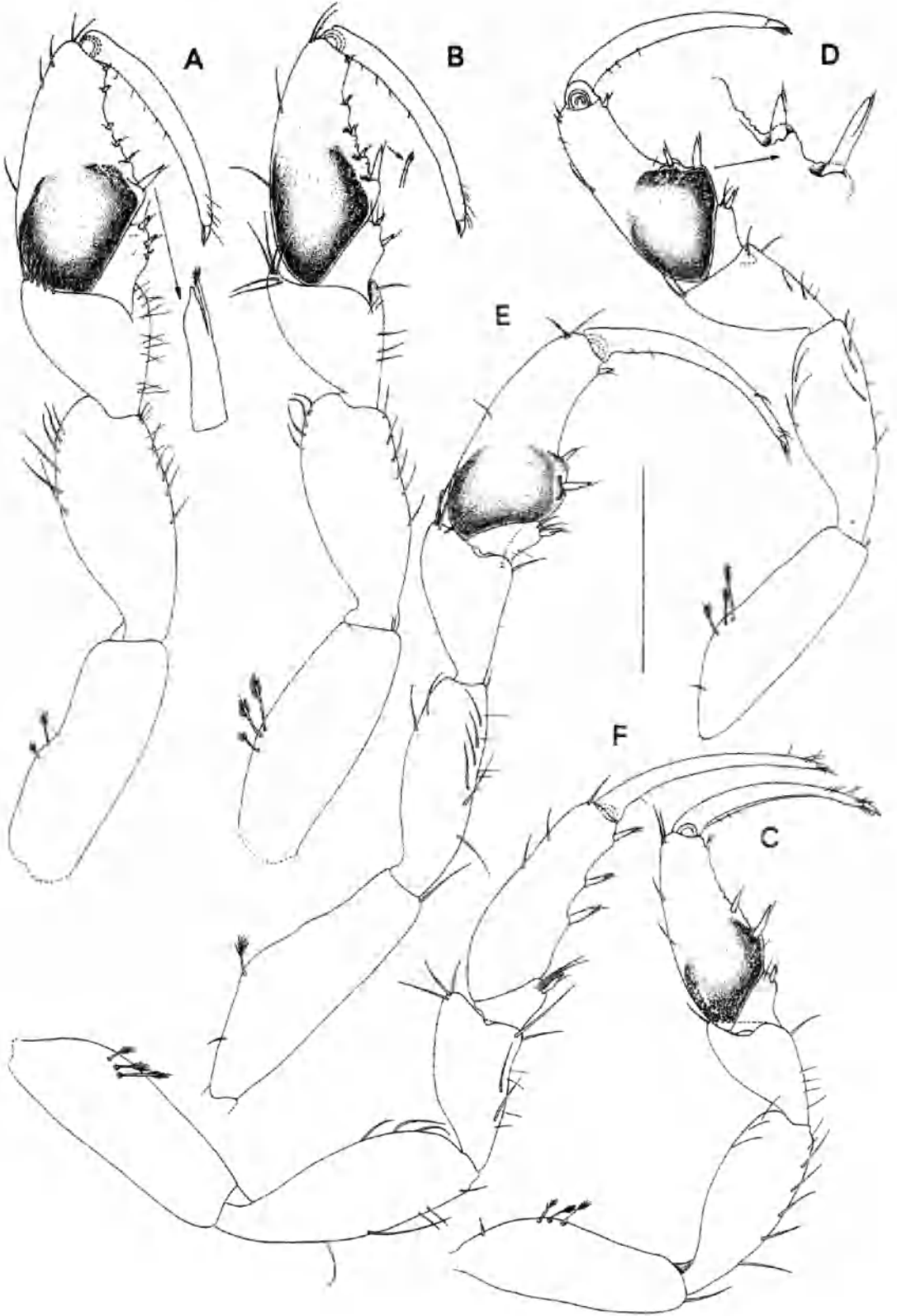


Fig. 24. *Leptanthura affinis* (BONNIER). Copulatory male, 14 mm, BIOICE stn. 2337. A. Antennula, right (flagellum broken, aesthetascs cut off). B. Antenna, right. C. Flagellum of antenna, right (setae omitted). D. Mandibula, left. E. Mandibula, right. F. Maxilla. G. Maxilliped (setae cut off). H. Pereopod 1, right (setae omitted). I. Pereopod 1, right. J. Ventrodistal end of carpus and ventromedial margin of propodus 1. Scale: A, B, J = 0.5 mm; C-G = 0.2 mm; H = 0.5 mm; I = 1 mm.



row apex (apex broken), with a few apical setae (Fig. 23C). Dorsally pore and vesicle of statocyst with sediment particles visible.

Antennula slightly exceed cephalothorax; articles 1 and 2 of peduncle with fine plumose sensory setae (Fig. 24A). Flagellum with 10-11 articles, articles 2 to 10 with long filamentous aesthetascs ranged in circles.

Antennal peduncular articles 4 and 5 each distally with bunch of simple setae (Fig. 24B). Flagellum of 4 articles, slightly smaller than article 5 of peduncle; article 1 1.2 times longer than articles 2 to 4 (Fig. 24C); long filamentous aesthetascs on all articles.

Mandibular palp shorter than pars incisiva; article 2 of palp narrowly ovaliform, 2 times longer than article 1, with 1 long distal seta; article 3 of palp reduced, minute in size, one tenth of article 2, with 2 apical bristles (Fig. 24D, E).

Maxilla sharp, with 17 teeth and without hooks (Fig. 24F).

Maxilliped basis 2.8 times longer than palp, palp with 2 articles, article 2 minute (Fig. 24G). Article 1 with 1 lateral, 2 medial, and 1 mediobasal setae; article 2 with 4 apical long setae. Lateral margin of basis and article 1 of palp folding in dorsal direction, forming funnel for mandibulae and maxillae. Basis mediobasally with short dorsal fold.

Pereopod 1 strongest and longest; ventrodistally on carpus 3 setiform spines; propodus swollen, 1.5 times longer than wide, palm with straight margin and proximally weak thumb-like process, margin bordered by 10 simple setiform spines; medially 3 rows with about 34 simple setae (Fig. 24H-J). Pereopods 2 and 3 quite similar in shape, pereopod 2 longer than pereopod 3; pereopod 2 carpus ventrally with 3 simple sensory spines increasing in size towards distal end; propodus pyriform, swollen proximally, 1.8 times longer than greatest width, ventrally with 6 simple sensory spines, proximate spine largest (Fig. 25A); pereopod 3 carpus ventrally with 2 simple sensory spines of equal size; propodus pyriform, 2 times longer than greatest width, ventrally with 5 sensory spines, proximate spine largest (Fig. 25B). Pereopod 4 shortest pereopod; carpus ventrodistally with small simple sensory spine; propodus pyriform, 2.1 times longer than wide, ventrally with 3 simple sensory spines, proximate spine largest, palm slightly crenulated (Fig. 25C). Pereopods 5 to 6 similar in shape, pereopod 6 longer than pereopod 5; carpus with 1 simple sensory spine; propodus pyriform, proximally swollen, with 2 proximal and 1 smaller distal simple sensory spines; ventral palm margin slightly concave (Fig. 25D,

E). Pereopod 7 longer than pereopod 6; carpus ventrodistally with 1 simple sensory spine; propodus elongate, 2.9 times longer than wide, with 3-4 strong, simple sensory spines (Fig. 25F). Spines on propodus of pereopods 2 to 6 inserted within cusp-like formation. Pereopods 2 to 7 with small unguis; dactylus long and curved.

Pleopod 1 sympod with 6 retinaculae; exopod 3.5 times longer than wide, the distal one third of exopod becomes gradually narrower, distally with 34 plumose setae; endopod shorter than exopod, width 0.5 times the width of exopod, distally with 24 plumose setae (Fig. 23D).

Pleopod 2 sympod with 4 retinaculae; exopod longer than endopod, with 25 plumose setae; endopod with 14 plumose setae (Fig. 23E); plumose setae longer than setae on pleopod 1. Appendix masculina is 0.5 times endopod length, not extending beyond endopod; with aspect of simple, grooved rod (Fig. 23E).

Uropod sympod rectangular, 1.8 times longer than wide, about as long as endopod; distomedially 4 long plumose setae; ridge dorsally (Fig. 23F). Endopod pyriform, 1.8 times longer than greatest width, medial margin fringed with continuous row of setae, proximally 15 setae simple and short, other setae plumose and long; 7 apical and 2 subapical simple setae, lateral margin with 9 simple setae (Fig. 23F). Endopod extending considerably beyond apex of pleotelson. Exopod broadly ovate, 1.7 times wider than long, fringed with about 50 plumose setae (Fig. 23G). Exopods folded over pleotelson, covering each other slightly medially (Fig. 23A).

Descriptive note on manca. (Fig. 26, BIOICE station 2337)

Length: 6 mm. Article 3 of antennula peduncle distally with a group of 3 long lateral setae. Peduncular articles 4 and 5 of antenna distally with 1 and 2 simple, long setae, respectively. Maxilla with 14 to 15 teeth. Carpus of pereopods 1 to 6 with 1 simple sensory spine. Pereopod 1 propodus 1.7 times longer than wide; margin with 5 hand-like sensory spines (Fig. 26C). Propodus of pereopods 2 and 3 with 3 simple sensory spines, decreasing in length towards distal end (Fig. 26D, E); pereopod 2 propodus 1.4 times longer than wide; pereopod 3 propodus 1.8 times longer than wide; merus and ischium of pereopods 1 to 3 only with few long setae. Propodus of pereopods 4 to 6 elongated ovate, margin with 2 simple sensory spines (Fig. 26F-H). Pleopod 1 sympod with 2 retinaculae, endopod distally

←

Fig. 25. *Leptanthura affinis* (BONNIER). Copulatory male, 14 mm, BIOICE stn. 2337. Pereopods of the right side. A. Pereopod 2. B. Pereopod 3. C. Pereopod 4. D. Pereopod 5. E. Pereopod 6. F. Pereopod 7. Scale: 0.5 mm.

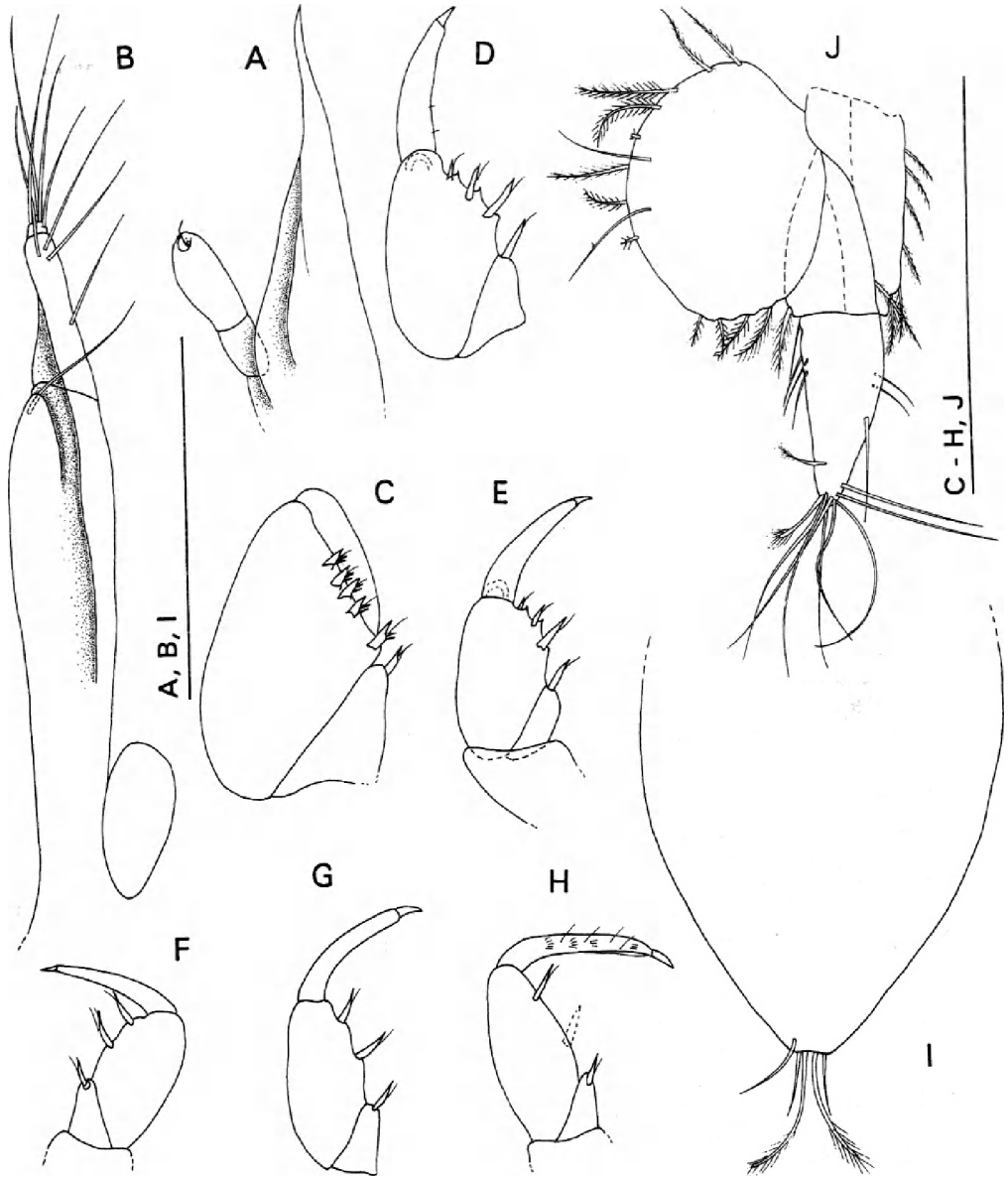


Fig. 26. *Leptanthura affinis* (BONNIER). Manca, 6 mm, BIOICE stn. 2337. A. Mandibula. B. Maxilliped. C-H. Distal end of pereopods of right side (setae omitted). C. Pereopod 1. D. Pereopod 2. E. Pereopod 3. F. Pereopod 4. G. Pereopod 5. H. Pereopod 6. I. Pleotelson. J. Uropod, right, ventral view. Scale: A, B, I = 0.2 mm; C-H, J = 0.5 mm.

with 5 plumose setae, exopod with 12 plumose setae. Pleopod 2 sympod with 1 retinacula, endopod distally with 4 plumose setae, exopod with 6 plumose setae. Uropod (Fig. 26J) sympod rectangular, mediolaterally with 1 long plumose seta, laterally with 6 plumose setae; endopod medial margin proximally with about 4 simple setae, apically with 8 simple setae; exopod widely oval, 1.3 times longer than wide, with about 12 to 13 plumose

setae and 2 simple setae.

Descriptive note on postmanca. (Fig. 27, BIOICE stations 2337 and 2697)

Length: 6-8 mm. Article 3 of antennula peduncle distally with a group of 4 long lateral setae. Peduncular articles 4 and 5 of antenna distally with 4 and 3 simple, long setae, respectively. Maxilla with 17 teeth. Carpus of

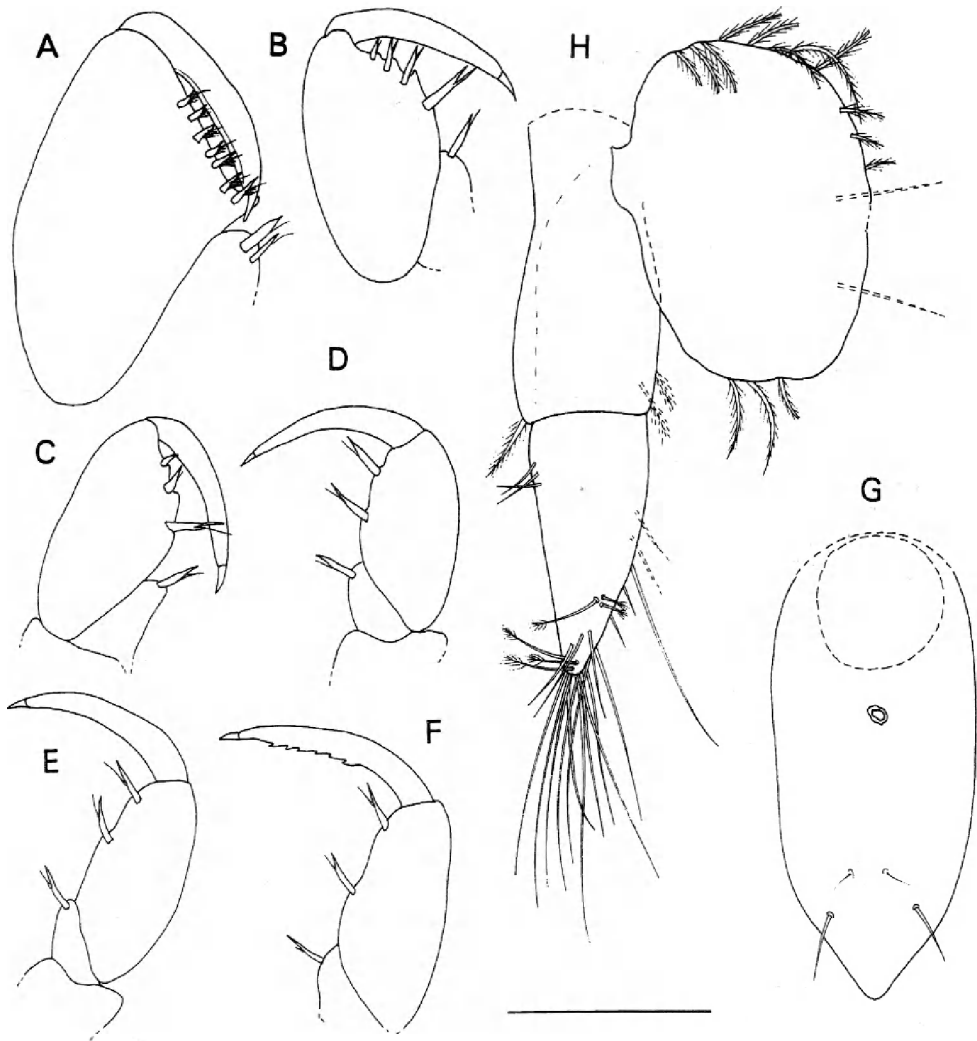


Fig. 27. *Leptanthura affinis* (BONNIER). Postmanca, 8 mm, BIOICE stn. 2337. A-F. Distal end of pereopods of right side (setae omitted). A. Pereopod 1. B. Pereopod 2. C. Pereopod 3. D. Pereopod 4. E. Pereopod 5. F. Pereopod 6. G. Pleotelson. H. Uropod, right, dorsal view. Scale = 0.25 mm.

pereopod 1 with 2 simple sensory spines, carpus of pereopods 2 to 6 with 1 simple sensory spine. Propodus of pereopod 1 1.5 times longer than wide; margin slightly concave, with 7 hand-like sensory spines (Fig. 27A); propodus of pereopods 2 and 3 with 4 and 3 simple sensory spines, respectively, decreasing in length towards distal end (Fig. 27B, C); propodus of pereopod 2 1.9 times longer than wide; propodus of pereopod 3 2.1 times longer than wide; merus and ischium of pereopods 1 to 3 with more long setae than manca; propodus of pereopods 4 to 6 as in manca (Fig. 27D-F). Pleopod 1 sympod with 3 retinaculae, endopod distally with 7 plumose setae, exopod with 14 plumose setae.

Pleopod 2 endopod distally with 4 to 5 plumose setae, exopod with 7 plumose setae. Uropod (Fig. 27H) sympod rectangular, 2.6 times longer than wide, mediolaterally with 1 long plumose seta. Endopod medial margin proximally with about 3 simple setae; apically with about 12 simple, long setae; exopod widely oval, 1.5 times longer than wide, with about 15 plumose setae.

Remarks. The tip of the pleotelson was broken in all adults and postmancas. In the manca the pleotelson had four apical setae, with the medial pair distally plumose (Fig. 26I) and subapically a pair of setae. The pleotelson of the postmanca was 2.3 times longer than wide,

linguiform and bearing dorsodistally two pairs of short setae (Fig. 27G).

L. affinis was described by BONNIER (1896) from the Bay of Biscay. BONNIER had only a single specimen, a male, at hand. He erroneously stated that rudimentary eyes were present. KENSLEY (1982) described the female of *L. affinis* from new material from the Bay of Biscay, the Canary Islands and the Sierra Leone Basin. The present specimens agree well in many aspects with the incomplete descriptions given by BONNIER (1896) and KENSLEY (1982). BONNIER (1896) figured pereopod 3 which, as pereopods 4 to 6, shows a strong sexual dimorphism in the shape of the propodus. Only in the third article of the mandibular palp the present specimens differ from BONNIER's figure, being considerably smaller. KENSLEY (1982) also showed a larger third article (his fig. 20d) than found in the present species and indicated that the length of the second article was three times longer than the third article. He stated that the palp of the maxilliped had three articles, while in the present material the maxilliped had only two articles as shown by BONNIER (1896). In some aspects there is a little concordance between the figures and the text of KENSLEY's (1982) description. He states that pleonites 1 to 4 are subequal in length, but in his scanning electron micrograph (plate 4e) pleonite 1 is about 2 times longer than each of the following three pleonites, as seen in the present specimens.

L. affinis is quite similar in external morphological features to *L. tenuis* (SARS, 1872), also being found in the North Atlantic Ocean. *L. affinis* can mainly be distinguished from *L. tenuis* by being larger, in not having a deeply concave ventral margin of the propodus of pereopod 1, the shape of the propodus of pereopods 4 to 6 of males, having the whole medial margin of the uropodal endopod with setae in males, and an exopod of uropod of different shape. Furthermore, the females of *L. affinis* have an endopod shorter than the sympod, while in *L. tenuis* the sympod is smaller than the endopod, and the species differ also by the number of spines on the propodus and the shape of the propodus in all pereopods. *L. affinis* can not be confused with *L. thori* BARNARD, 1925. That species (male holotype, Zoologisk Museum, University of Copenhagen) does not have the distinctive shape of the posterior pereopods as seen in *L. affinis*.

The small third article of the mandibular palp can further be used to distinguish *L. affinis* from all other known *Leptanthura* species. Reduction of the mandibular palp is known within *Leptanthura*. In *Leptanthura apalpata* the palp is absent (WÄGELE 1981).

Sexual dimorphism is particularly pronounced within *L. affinis*. The pleon is longer in males than in females, anterior protuberances are found ventrally on pereonites

6 and 7 and finger-like posterior apophyses on pereonite 7 in the males, the flagellum of the antennula is different and there are differences in all pereopods, in pleopod 2 and in the uropod. An unusual sexual dimorphic feature among the species of *Leptanthura* is the proximally swollen propodus of pereopods 4 to 6 of the male, and to a lesser extent pereopods 2 and 3, and having the palm of the propodus of pereopods 4 to 6 concave. This feature may indicate different copulatory posture of this species from other *Leptanthura* species.

The number of setae and spines of the pereopods and the number of setae of articles of the peduncles of antennae, the maxilla, pleopods and uropods increase in number from manca to adult. However, in the mandibula and the maxilliped the number of setae does not change from the manca stage towards the adult stage, and furthermore the shape remains the same. The length/width ratio of both sympod and endopod of the uropod and their respective proportions are the same for the manca, postmanca and the adult. The exopod, however, changes from being widely ovate to wide rectangular. The length of the pereopods decreases from pereopod 1 to pereopod 4, while it increases towards pereopod 7 (6 in earlier mancas).

The maxilliped of *L. affinis* forms a funnel by folding the lateral margin of basis and palp dorsally and by a short mediodistal dorsal fold on the basis. Some folding of the maxilliped is common within *Leptanthura* and occurs within at least 17 species, estimated from drawings. A short mediodistal folding has either wrongly been interpreted as endite by some authors (KENSLEY 1982, 1987; NEGOESCU 1991, 1994), or not commented upon but presented in figures (e.g. WÄGELE 1981, 1984, 1985). Only NEGOESCU (1991) suggested a folding and showed this for *L. geocostarioi* NEGOESCU, 1991. This funnel accommodates the mandibulae and the maxillae and may support the extremely narrow mouthparts used to pierce the integument of the prey.

L. affinis was found at depths between 501 and 1105 m south-east, south-west and west of Iceland on silty sand or fine silt (Fig. 34). The species has previously been recorded in the Bay of Biscay, Canary Islands and in the Sierra Leone Basin at depths between 1710 and 2185 m (BONNIER 1896, KENSLEY 1982).

Leptanthura chardy NEGOESCU, 1992 (Fig. 28)

Material examined. BIOICE stations 2226, RP sled, 3 September 1992, 64°44.88' N, 24°56.23' W, 426 m, 5.9 °C, 2 males, IMNH; BIOICE 2257, RP sled, 5 September 1992, 63°14.61' N, 26°29.14' W, 1209 m, 4.1 °C, muddy shelly-sand, 2 females, 1 male, GANMNH; BIOICE 2299, RP sled, 10 September 1992, 63°00.10' N, 22°39.61' W, 775 m, 5.5 °C, sand, 1 juvenile, GA; BIOICE 2406, RP

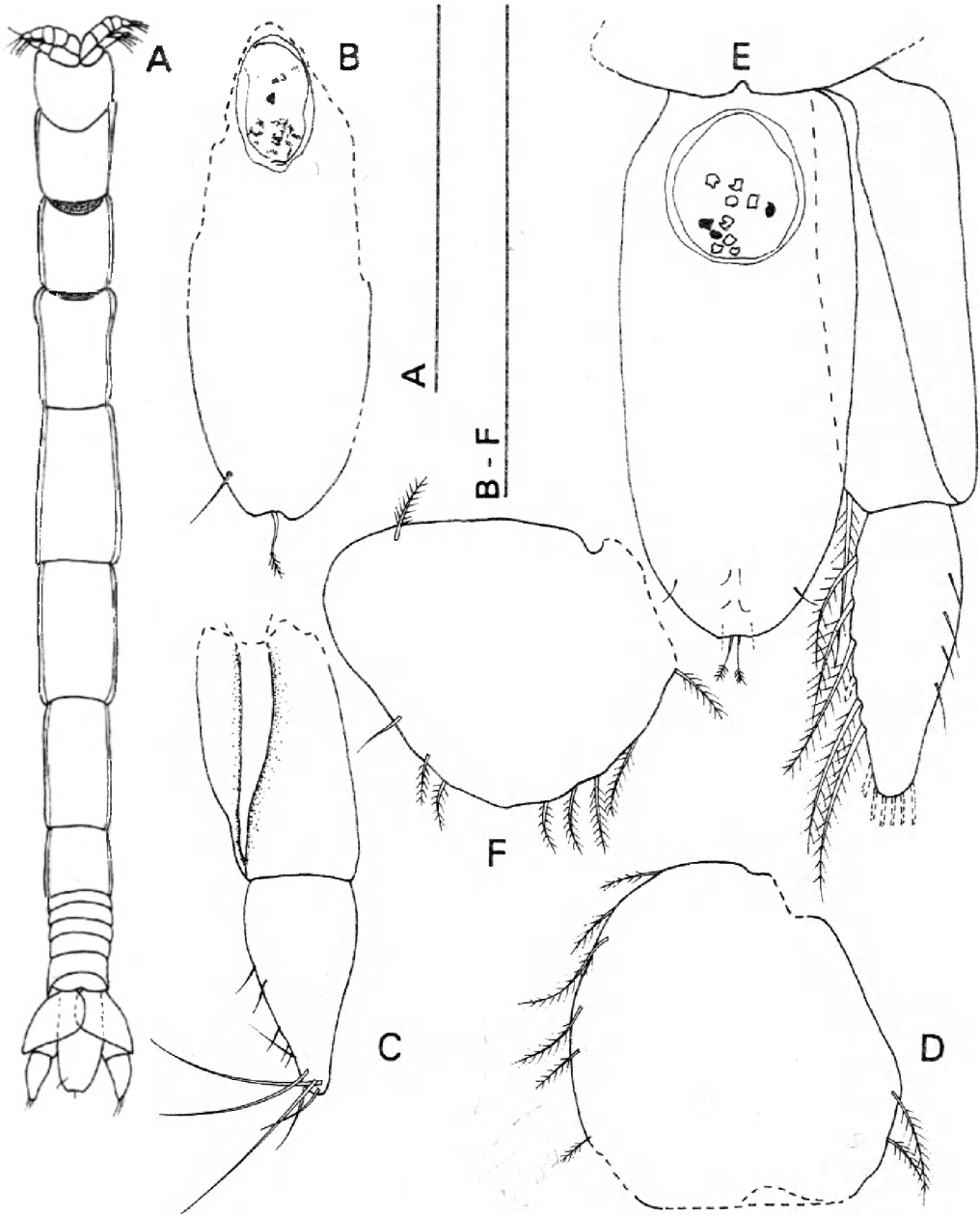


Fig. 28. *Leptanthura chardy* NĚGOESCU. A-D. Non-ovigerous female, 6 mm, BIOICE stn. 2435. E, F. Copulatory male, 7 mm, BIOICE stn. 2435. A. Habitus, dorsal view. B. Pleotelson. C. Sympod and endopod of uropod, right, ventral view. D. Exopod of uropod, right. E. Pleotelson and right sympod and endopod of uropod. F. Exopod of uropod, right. Scale: A = 2 mm; B-F = 0.5 mm.

sled, 1 July 1993, 62°59.20' N, 21°47.00' W, 934 m, 4.6 °C, 1 juvenile, 1 female, 2 males, GANMNH; BIOICE 2407, detritus sled, 1 July 1993, 62°58.60' N, 21°49.30' W, 917 m, 4.6 °C, fine silt, 1 female, IMNH and GANMNH; BIOICE 2410, RP sled, 2 July 1993, 62°51.60' N, 21°44.10' W, 1074 m, 4.0 °C, muddy sand, 2 females, GANMNH;

BIOICE 2412, detritus sled, 2 July 1993, 62°44.86' N, 21°33.17' W, 1170 m, 4.2 °C, silt, 1 male, GA; BIOICE 2435, RP sled, 3 July 1993, 63°13.80' N, 19°31.70' W, 965 m, 5.5 °C, muddy sand, 2 females, 1 male, IMNH; BIOICE 2692, RP sled, 31 August 1994, 64°26.16' N, 28°15.50' W, 1162-1215 m, 3.7 °C, 1 female, 1 male,

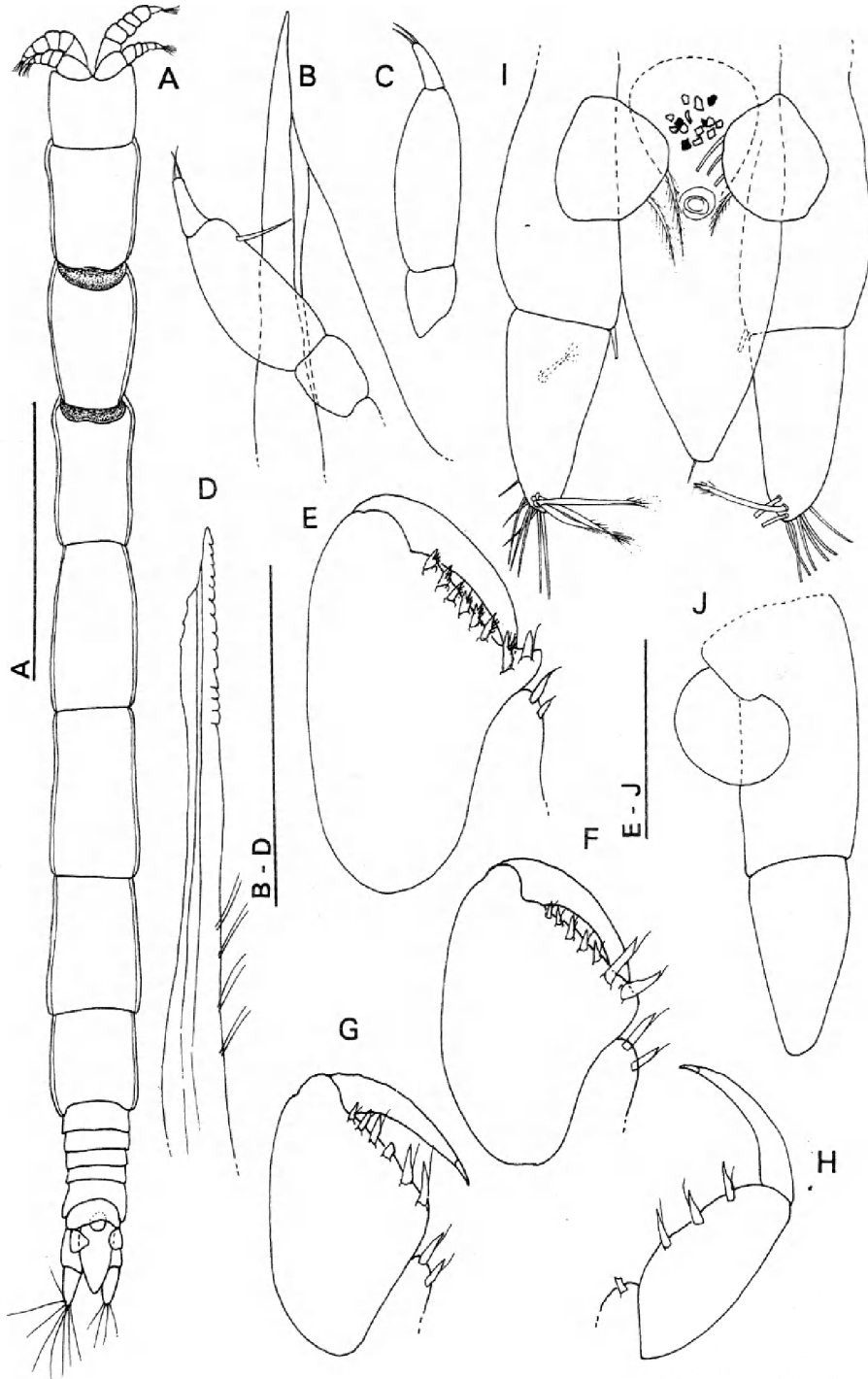


Fig. 29. *Leptanthura micrura* KENSLEY. A-H, J. Non-ovigerous female, 8 mm, BIOICE stn. 2701. I. Non-ovigerous female (broken), BIOICE stn. 2701. A. Habitus, dorsal view. B. Mandibula, left. C. Palp of mandibula, right. D. Maxilla. E-H. Ventrodistal end of carpus, propodus and dactylus of pereopods of the right side (setae omitted). E. Pereopod 1. F. Pereopod 2. G. Pereopod 3. H. Pereopod 4. I. Pleotelson and uropods. J. Uropod, right, ventral view (setae omitted). Scale: A = 2 mm; B-D = 0.2 mm; E-J = 0.25 mm.

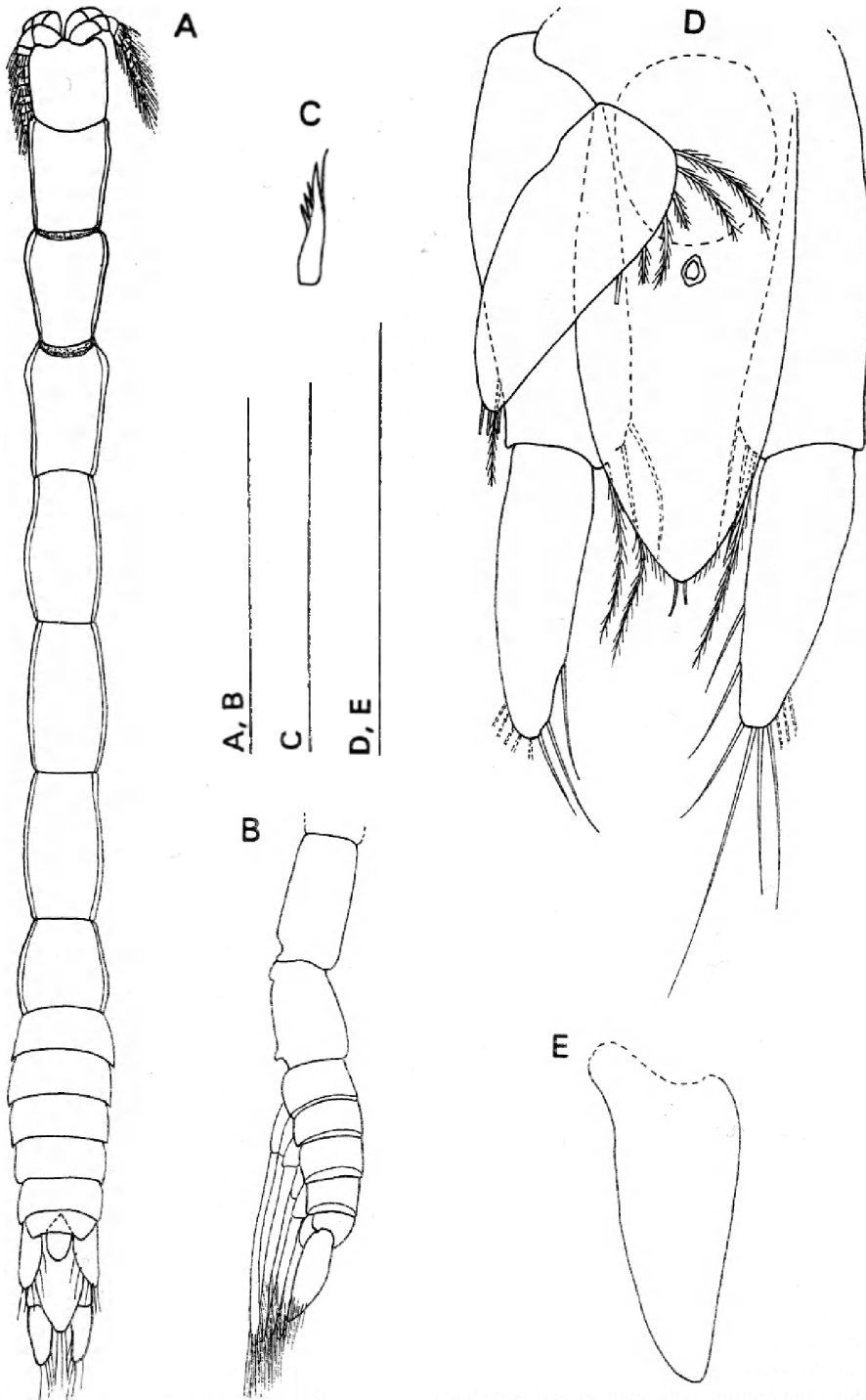


Fig. 30. *Leptanthura victori* NĒGOESCU. Copulatory male, 7.3 mm, BIOICE stn. 2704. A. Habitus, dorsal view. B. Pereonites 6 and 7 and pleon, lateral view. C. Multidentated spine of propodus of pereopods 4 to 7. D. Pleotelson and uropods (right exopod omitted). E. Exopod of uropod, right (setae omitted). Scale: A, B = 2 mm; C = 0.2 mm; D, E = 0.5 mm.

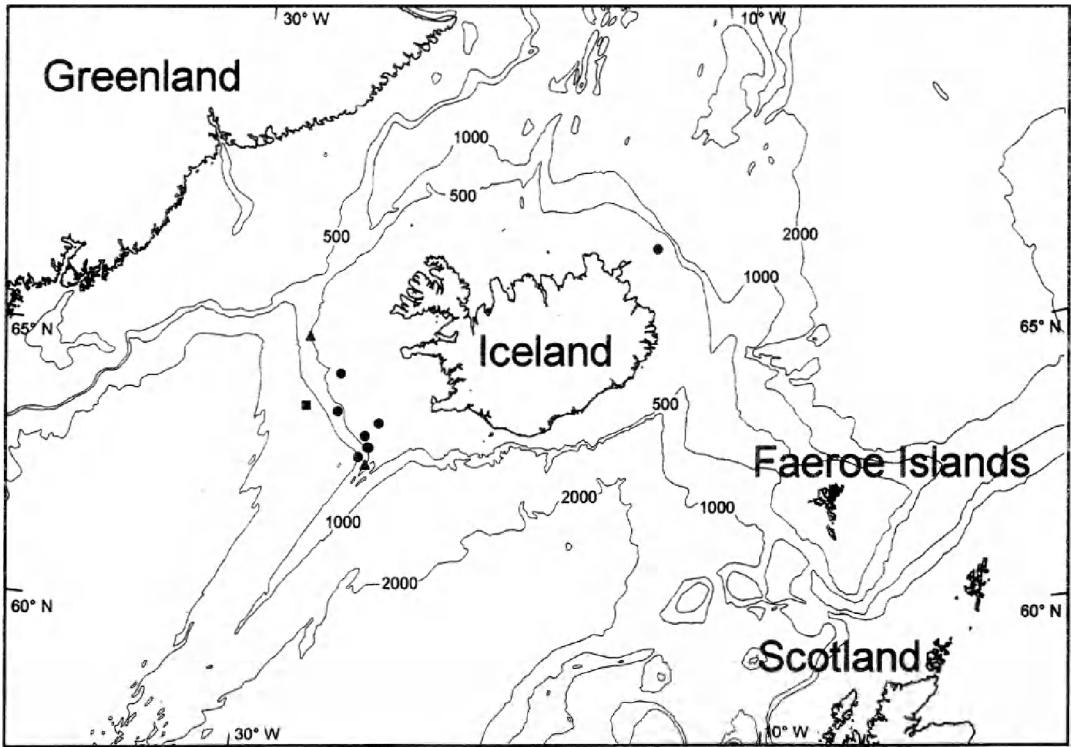


Fig. 31. Localities of *Ananthura sulcatacauda* (dots), *Haliophasma mjoelniri* (triangles) and *Leptanthura victori* (box).

GANMNH; BIOICE 2701, RP sled, 2 September 1994, 64°05.50' N, 27°49.70' W, 1121-1123 m, 3.8 °C, many sponges, echinoderms and molluscs, 1 manca, 1 juvenile, 2 females, 4 males. GANMNH; BIOICE 2704, RP sled, 2 September 1994, 63°50.50' N, 26°42.80' W, 1295 m, 3.8 °C, lots of echinoderms and pennatulaceans, 3 juveniles, 7 females, 5 males. IMNH; BIOICE 2720, RP sled, 7 September 1994, 64°25.80' N, 26°24.20' W, 304 m, 4.6 °C, many sponges, 2 juveniles, 7 females, IMNH.

Remarks. The adult specimens were about 5 to 7 mm in length. In all aspects the present 51 specimens agree with the description of the species given by NEGOESCU (1985, 1992) (see Fig. 21). As in *L. victori* we observed somewhat more multidentated sensory spines on the propodus of pereopods 4 to 7, than previously shown for *L. chardy*.

The species was found at depths between 304 and 1295 m south, south-west and west of Iceland on silty and muddy sand bottom, with sponges and polychaete tubes (Fig. 35). Previous records are from the Bay of Biscay and the Bay of Cadiz, at depths between 1894 and 4659 m (NEGOESCU 1985, 1992).

Leptanthura micrura KENSLEY, 1982 (Fig. 29)

Material examined. BIOICE station 2701, RP sled,

2 September 1994, 64°05.50' N, 27°49.70' W, 1121-1123 m, 3.8 °C, many sponges, echinoderms and molluscs, only a few crustaceans, 4 non-ovigerous females (one fragment), IMNH and GANMNH.

Remarks. The specimens have a small and broadly oval exopod of the uropod, resembling the exopod of *L. micrura* KENSLEY, 1982 (KENSLEY 1982) (Fig. 29A, I, J). In many other characteristics, such as the size, aspects of the mouthparts, the number of spines on the pereopods, the shape of the pereopods, the specimens agree well with the description of *L. micrura*. There are, however, some differences in the length/width ratio of the pleotelson and the length/width ratio of the sympod and the endopod of the uropod (estimated from KENSLEY's fig. 29h, page 40) (Fig. 29I, J). The uropod may, however, be twisted in KENSLEY's figure, making it look more slender.

Further KENSLEY (1982) shows the palp of the maxilliped with three articles. The number of articles in the palp of the maxilliped is a difficult character to observe and may need to be re-evaluated within *Leptanthura*. A broken cuticle may lead to overestimation of the maxillipedal articles.

KENSLEY (1982) did not comment the plumose setae

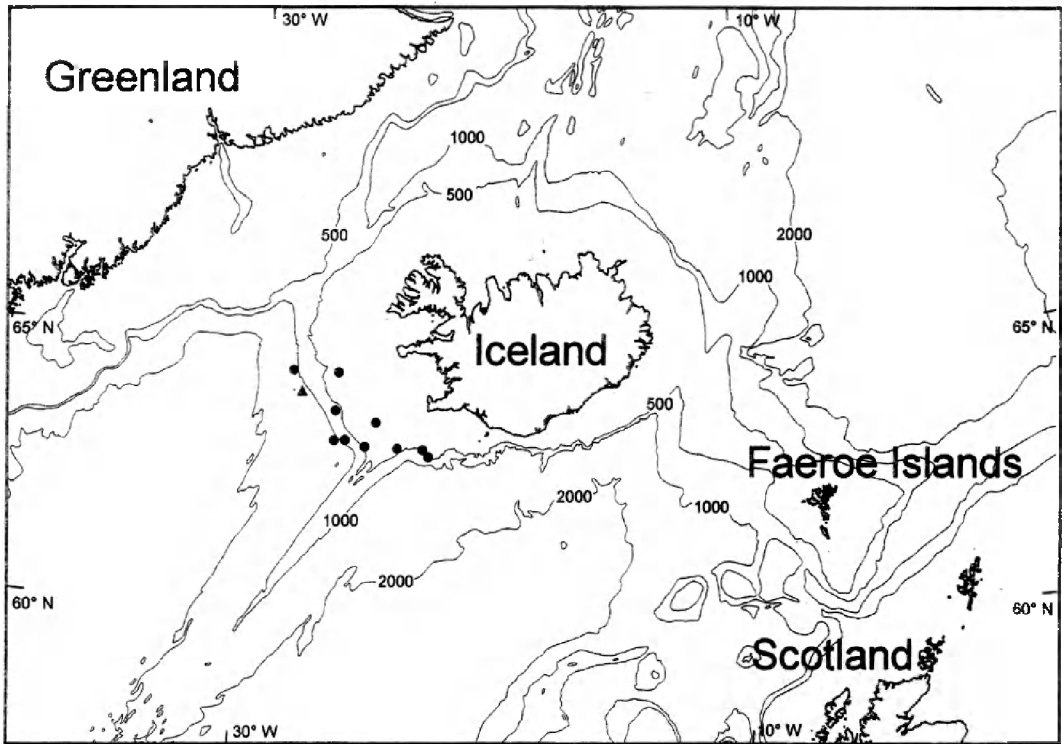


Fig. 32. Localities of *Quantanthurax tyri* (dots) and *Leptanthura micrura* (triangle).

on pleopods 1 and 2. Pleopods 1 and 2 have only a few, short plumose setae on the distal end, which may be characteristic for this species.

L. micrura was only found at depths of 1121-1123 m west of Iceland (Fig. 32). The species has previously been recorded in the Equatorial Atlantic (the Guiana Basin and off Brazil) at depths between 520 and 2494 m (KENSLEY 1982).

Leptanthura victori NEGOESCU, 1985 (Fig. 30)

Material examined. BIOICE station 2704, RP sled, 2 September 1994, 63°50.50' N, 27°42.80' W, 1295 m, 3.8 °C, many echinoderms and pennatulaceans, corals, hyaline polychaete tubes and amphipods, 1 copulatory male, IMNH.

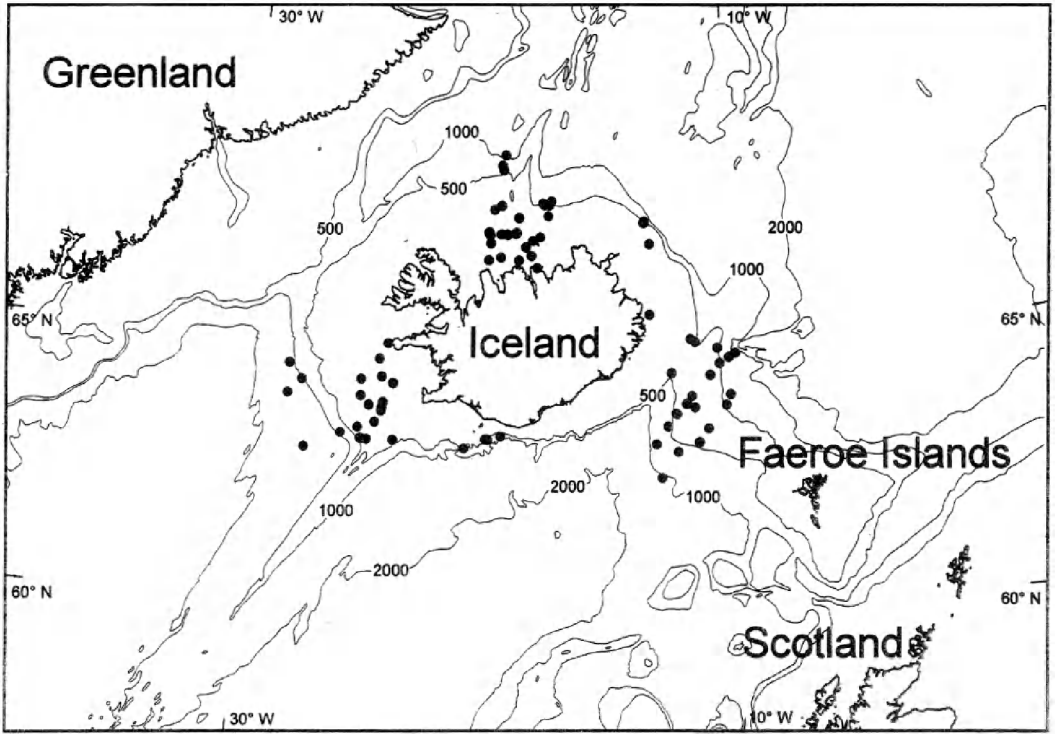
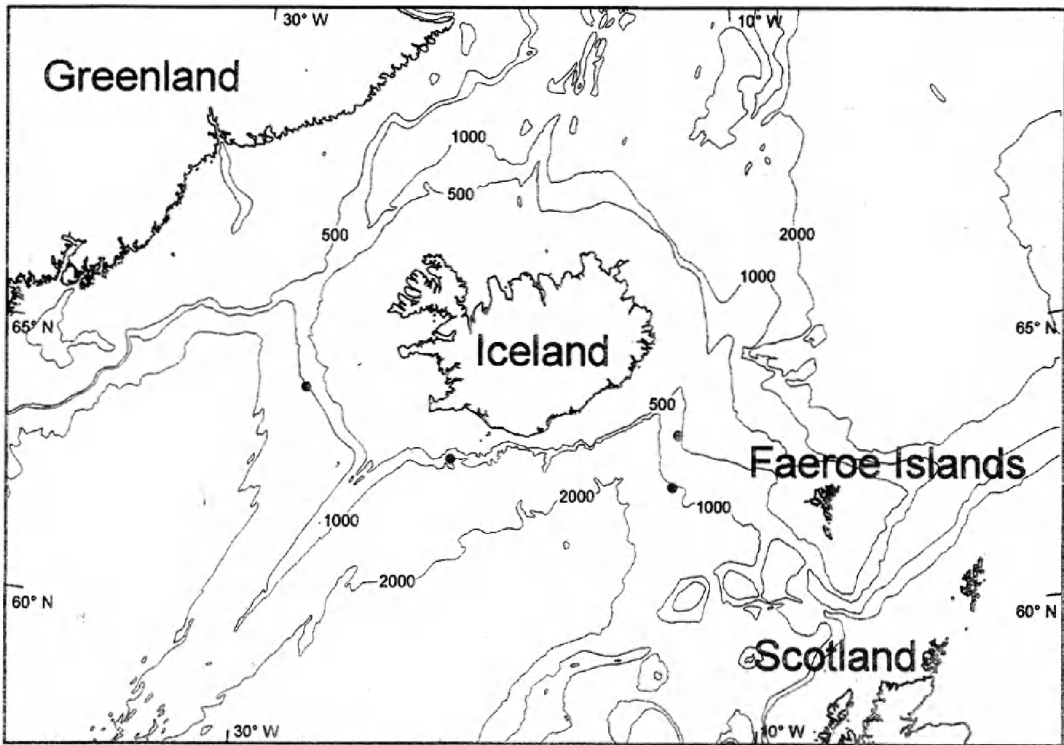
Remarks. The only specimen found, a copulatory male of 7.3 mm, is in nearly all aspects as shown by NEGOESCU (1985) and falls within the range of variation in the shape of pleotelson, in the number of articles of the flagellum of the antennula, and in the number of spines on propodus of all pereopods as given by NEGOESCU (1985)(Fig. 30). Only in the propodus of

pereopods 4 to 7 the sensory spines are multidentate instead of being bidentate (Fig. 30C), suggesting a slight population variation.

L. victori was only found at a single locality west of Iceland at depths of 1295 m (Fig. 31). *L. victori* has earlier been only found at a single locality at depths of 1894-1950 m south-east of the Bay of Biscay (NEGOESCU 1985).

DISTRIBUTIONAL PATTERNS

Only 8 species were found in the study area despite extensive sampling. Only a single species, *Calathura brachiata*, was commonly found and seems widely distributed in the study area. It was found at depths between 189 and 1392 m to the south of the Greenland-Iceland-Faeroe Ridge (off western and southern Iceland), while in the Arctic (north of the ridge; north and east of Iceland) the species was found at depths between 19 and 1141 m. The deeper Arctic localities (> 400 m) have temperatures permanently below 0 °C, while at shallower depths south of Iceland the temperature is commonly between 5 to 8 °C. All other anthuridean species, except *Ananthura sulcaticauda*, were restricted

Fig. 33. Localities of *Calathura brachiata*.Fig. 34. Localities of *Leptanthura affinis*.

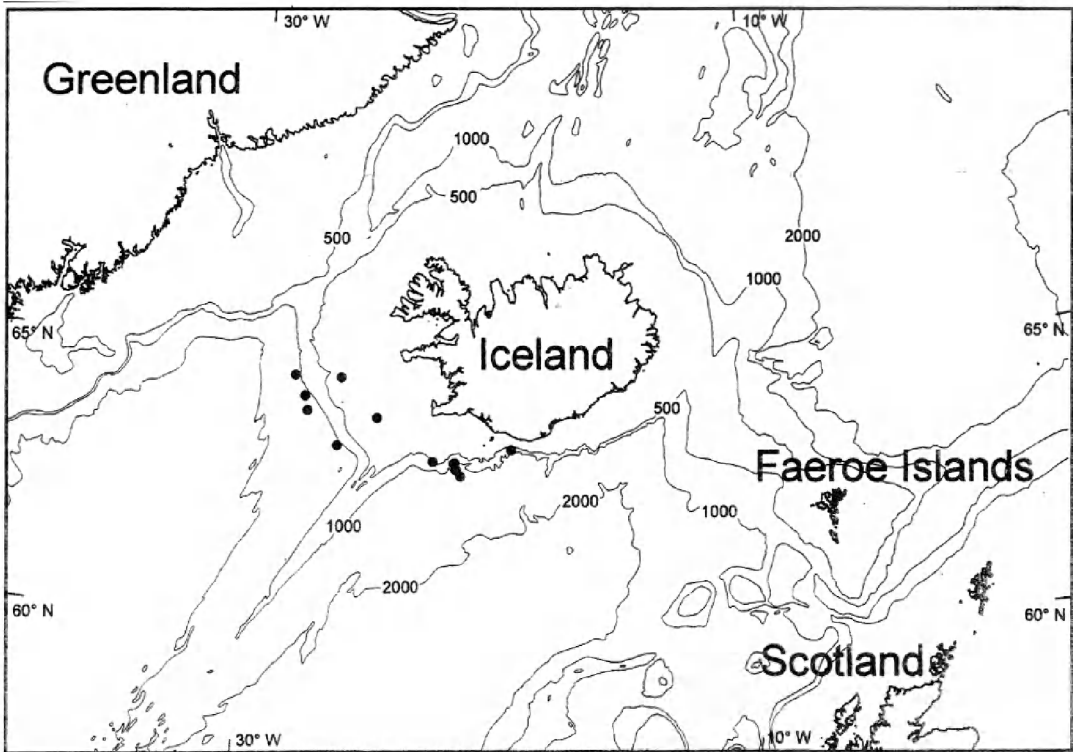


Fig. 35. Localities of *Leptanthura chardy*.

to the area south of the Greenland-Iceland-Faeroe Ridge, where they were observed at temperatures over 3.6 °C.

ZOOGEOGRAPHICAL CONSIDERATIONS

There are around 126 known species of marine anthurideans in the North Atlantic Ocean and the Arctic Ocean (0°N-90°N; Negoescu unpubl.). Of these, 26 species belong to the family Hyssuridae, 6 species belong to the Antheluridae, 62 species belong to the Anthuridae, and 32 species belong to the Paranthuridae (Table 1).

The species of the study area belong mostly to the Paranthuridae (5 species, 16 % of the species), while only 2 species belong to the Anthuridae (3 % of the species), and one species to the Antheluridae. This is in agreement with the findings of BRANDT & NEGOESCU (1997), which showed that the northern anthuridean fauna consists mainly of species of the family Paranthuridae. The majority of the North Atlantic species are, however, known from the Caribbean Sea (Table 1, based on NEGOESCU & WÄGELE 1984, Negoescu unpubl.), where these are often associated with coral reefs. A low proportion of shallow water anthurideans in the northernmost part of the North Atlantic may partly be due to a lack of habitats associated with

hermatypic corals. Most of the North Atlantic species are further shallow water species, many of which have been found at depths shallower than 200 m.

The deep-water species in the northernmost part of the North Atlantic belong mostly to the genus *Leptanthura*. This genus has about 39 species, many of which occur in deeper waters. In the North Atlantic Ocean 11 species of *Leptanthura* have now been found.

Some of the present species belong to genera that have their centre of distribution elsewhere. The genus *Haliophasma* consists of approximately 26 species. These are mainly reported from the southern hemisphere, while only three species have until now been reported from the North Atlantic Ocean. Of these *H. alaticauda* AMAR, 1966 and *H. caprii* WÄGELE, 1981 have been found in the Western Mediterranean and *H. curri* PAUL & MENZIES, 1971 in the Caribbean Sea (NEGOESCU & WÄGELE 1984). *Haliophasma mjoelniri* is clearly most closely related to *H. alaticauda*.

There are ten known species within the genus *Quantanthura* and of these only two species, *Q. menziesi* KENSLEY & KOENING, 1979 and *Q. simuata* KENSLEY, 1982, are reported from the North Atlantic Ocean. These have, however, only been found in the equatorial part of the North Atlantic.

Despite the occurrence of about 126 species of

Table 1. Anthuridean genera recorded from the North Atlantic Ocean and the Arctic. Freshwater species excluded.

Family	Genus	Total number of species in North Atlantic (incl. Mediterranean)	Depth range (m)	Remarks	Number of species in northernmost N. Atlantic and Arctic (>50°N)
Hyssuridae					
	<i>Chalixanthura</i>	3	0-52	3 Caribbean	0
	<i>Eisothis</i>	6	0-35	4 Caribbean/2 Mediterr.	0
	<i>Hyssura</i>	6	350-2900	2 Mediterranean	1
	<i>Kupellomura</i>	4	0-880	1 Caribbean/2 Mediterr.	0
	<i>Neohyssura</i>	3	0-1005	1 Mediterranean	0
	<i>Stellanthura</i>	2	0-60	1 Caribbean/1 Mediterr.	0
	<i>Xenanthura</i>	2	0-145	2 Caribbean	0
Antheluridae					
	<i>Ananthura</i>	4	18-4596	2 Mediterranean	2
	<i>Anthelura</i>	1	1100-1590	Mediterr. and outside	0
	<i>Anthomuda</i>	1	90		0
Anthuridae					
	<i>Alloanthura</i>	1	100	Mediterranean	0
	<i>Amakusanthura</i>	4	0-154	3 Mediterranean	0
	<i>Anthura</i>	1	2-330	1 Mediterr. and outside	1
	<i>Apanthura</i>	8	0-145	2 Caribbean/3 Mediterr.	0
	<i>Apanthuretta</i>	2	4-95	2 Caribbean	0
	<i>Cortezura</i>	1	1.5-10	1 Caribbean	0
	<i>Cyathura</i>	8	0-77	3 Caribbean	1
	<i>Haliophasma</i>	5	0-508	1 Caribbean/2 Mediterr.	1
	<i>Licranthura</i>	2	0-40	2 Caribbean	0
	<i>Malacanthura</i>	3	42-1739	2 Caribbean	1
	<i>Mesanthura</i>	11	0-36	8 Caribbean	0
	<i>Monodanthura</i>	2	0-15		0
	<i>Nemanthura</i>	2	95	2 Caribbean	0
	<i>Notanthura</i>	1	0-?		0
	<i>Pendantura</i>	2	0-30	2 Caribbean	0
	<i>Pilosanthura</i>	1	112-1739	Mediterr. and outside	0
	<i>Ptilanthura</i>	2	0-141		0
	<i>Quantanthura</i>	3	1.4-1212		1
	<i>Skaphomura</i>	3	0-73	2 Caribbean	0
Paranthuridae					
	<i>Accalathura</i>	2	0-131	2 Caribbean	0
	<i>Apanthuroides</i>	2	0-183	1 Caribbean/1 Mediterr.	0
	<i>Bullowanthura</i>	1	641-860		0
	<i>Calathura</i>	1	5-2500		1
	<i>Colanthura</i>	2	0-2	2 Caribbean	0
	<i>Currasanthura</i>	4	0	2 Caribbean	0
	<i>Leptanthura</i>	11	0-4659	3 Mediterranean	6
	<i>Minyanthura</i>	1	0-24	1 Caribbean	0
	<i>Neoanthura</i>	1	1237	1 Caribbean	0
	<i>Paranthura</i>	6	0-355	3 Caribbean	2
	<i>Virganthura</i>	1	30	1 Caribbean	0
Total		126			17

anthurideans in the North Atlantic Ocean only three species, *Ananthura sulcatacauda*, *Calathura brachiata* and *Leptanthura tenuis*, have been found in both the boreal North Atlantic Ocean and the Arctic Ocean. No anthuridean species is restricted to the Arctic Ocean. A number of the North Atlantic species were found quite close to the Arctic Ocean and at least 6 species seem to have their northern distributional limits in the area of the Greenland-Iceland-Faeroe Ridge. Of these species *L. micrura* and *L. victori* were found only at considerable depths and deeper than the saddle depth presumably restricting their entrance into the Arctic. However, *L. affinis*, *L. charnyi*, *Q. tyri* and *H. mjoelniri* had all their upper limits of the bathymetrical distribution at depths well above the saddle depth. The Greenland-Iceland-Faeroe Ridge has previously been suggested as a major zoogeographical barrier (SVAVARSSON & al. 1993), restricting dispersal of pronounced deep-sea genera and families into the Arctic Ocean. It is not yet fully known how this ridge acts as a barrier. SVAVARSSON & al. (1993) suggested that the ridge itself shaped the species composition in the Arctic Ocean by restricting the entry of pronounced deep-sea genera and families into the Arctic, and furthermore that the complicated hydrographic conditions above the ridge may have restricted the migration of deep-sea species into the Arctic. The latter, together with rapid decline in temperature, may restrict the dispersal of the shallow living species into the Arctic Ocean.

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