diversity

MDPI

Article

The *Eurycope producta* Sars, 1868 Species Complex (Isopoda, Munnopsidae) at the Transition of the Northern North Atlantic and the Nordic Seas—Including Descriptions of Six New Species and a Key †

Sarah M. Schnurr [1,*], Marina V. Malyutina [2] and Saskia Brix [1,*]

[1] Senckenberg am Meer, German Center for Marine Biodiversity Research (DZMB), c/o Biocentrum Grindel, Martin-Luther-King-Platz 3, 20146 Hamburg, Germany
[2] V. Zhirmunsky National Scientific Center of Marine Biology, Far Eastern Branch of the Russian Academy of Sciences, Palchevsky Street 17, 690041 Vladivostok, Russia; m_malyutina@mail.ru
* Correspondence: sarahschnurr-lutz@hotmail.com (S.M.S.); sbrix@senckenberg.de (S.B.)
† This article is registered in ZooBank: http://zoobank.org/1EDF1763-27A6-4336-B1CD-8047BFA0EE59.

Abstract: *Eurycope producta* Sars, 1868 is a highly abundant and widely distributed munnopsid species complex within Icelandic waters. The complex differs from all other *Eurycope* Sars, 1864 species by having a broad and long rostrum with serrated margins, which is subequal in length and width to article 1 of antenna I. Previous molecular evidence to disentangle the *E. producta* species complex forms the base for the herein-presented taxonomic description of six new species belonging to the genus *Eurycope*. Additionally, descriptions of specimens of *E. producta* sensu stricto and *E. dahli* Svavarsson, 1987, which were included in the analyses, are presented herein for morphological comparison with the new species. The studied species can be divided in two subgroups: (1) *E. producta* sensu stricto, *E. dahli*, *E. mishkai* sp. nov., and *E. nikitai* sp. nov. and (2) *E. gordeyi* sp. nov., *E. emmae* sp. nov., *E. jakobi* sp. nov., and *E. mathiasi* sp. nov. Additionally, a key to the eight studied species of the complex is presented.

Keywords: Asellota; Eurycopinae; morphology; taxonomy; new taxa; deep sea; benthos; Icelandic fauna; Greenland–Scotland Ridge; IceAGE project

Citation: Schnurr, S.M.; Malyutina, M.V.; Brix, S. The *Eurycope producta* Sars, 1868 Species Complex (Isopoda, Munnopsidae) at the Transition of the Northern North Atlantic and the Nordic Seas—Including Descriptions of Six New Species and a Key. *Diversity* **2022**, *14*, 545. https://doi.org/10.3390/d14070545

Academic Editor: Stephan Koblmüller

Received: 4 June 2022
Accepted: 30 June 2022
Published: 7 July 2022

1. Introduction

Asellote isopods are considered to be the most numerous crustacean taxon present within deep-sea macrobenthic samples [1–5]. The family Munnopsidae Lilljeborg, 1864 [6] is a major component of deep-sea communities, being one of the most abundant and diverse isopod families encountered within samples [2,7–10]. The family currently contains 43 genera and more than 320 described species [11]. The subfamily Eurycopinae Hansen, 1916 [12] is the most diverse taxon within munnopsid isopods, currently containing seven genera (*Eurycope* Sars, 1864 [13]; *Disconectes* Wilson and Hessler, 1981 [14]; *Belonectes* Wilson and Hessler, 1981 [14]; *Tytthocope* Wilson and Hessler, 1981 [14]; *Baeonectes* Wilson, 1982 [15]; *Dubinectes* Malyutina; and Brandt, 2006 [16] and *Pirinectes* Malyutina and Brix, 2020 [17]). Relationships within this subfamily still remain unresolved, especially within the most numerous and complex genus *Eurycope*. Thus, Wilson [18,19] indicated a few species complexes without giving them taxonomic status: the *E. complanata* Bonnier, 1896 [20]; the *E. inermis* Hansen, 1916 [12] (the group C); and the *E. longiflagrata* Wilson, 1983 [18] complexes. Svavarsson [21] noted that *E. dahli* Svavarsson, 1987 [21] is similar to *E. producta* Sars, 1868 [22] and that these species may form "a cluster of related species" together with *E. gaussi* Wolff, 1956 [23] from the Indian sector of the Southern Ocean and the two northwest Pacific species *E. linearis* Birstein, 1963 [24] and *E. spinifrons* Gurjanova, 1933 [25].

Eurycope producta sensu stricto was revealed later to be highly abundant and widely distributed within Icelandic waters [26,27] and was presumed to be a species complex [27,28]. Figure 1 shows the thus far known distribution of the unresolved *E. producta* complex specimens within Icelandic Waters based on data of the BIOICE project (Benthic Invertebrates of Icelandic Waters) [27] and the IceAGE project (Icelandic Marine Animals: Genetics and Ecology [28].

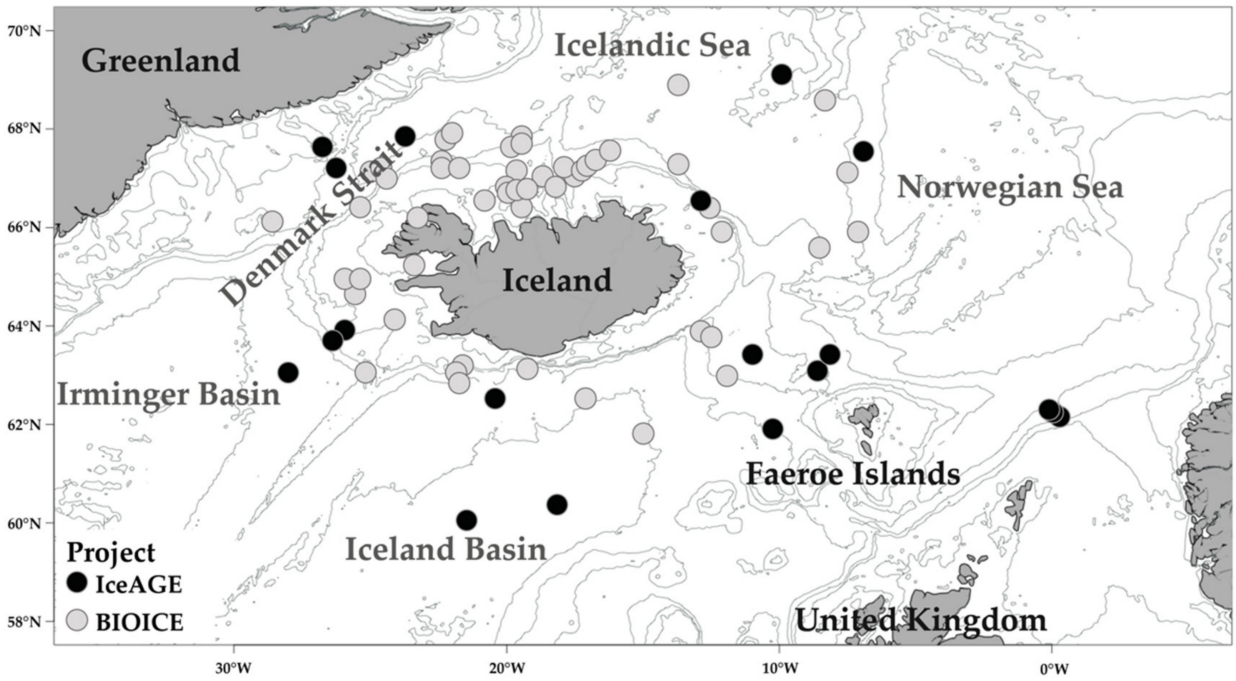

Figure 1. Sampling locations of the *E. producta* complex. *Black dots* indicate *E. producta* complex sampling locations during the IceAGE1 and IceAGE2 cruises used in the current study; *grey dots* indicate *E. producta* complex sampling locations during the BIOICE project. Note: Due to the formalin fixation of BIOICE samples, no genetic data are available. The figure was reprinted and adapted from [28] by permission from Springer Nature, Marine Biodiversity (2018).

Environmental conditions around Iceland are shaped by the Greenland–Scotland Ridge (GSR), extending across the North Atlantic in an east–west direction. This submarine ridge system, with a mean depth of 500 m, separates the deep-sea basins of the North Atlantic from deep-sea basins of the Nordic Seas (Greenland, Iceland, and Norwegian Seas) and the Arctic Mediterranean. Water exchanges of cold and dense water masses occur at depth through channels in the Faroe Bank Channel (840 m), Denmark Strait (620 m) and across the Iceland–Faroe Ridge (480 m) [29]. Major temperature differences of near-bottom water masses could be observed within the area, ranging from −1 to up to 12–14 °C [30]. Thus, this highly variable environment, with such a unique mixture of abiotic factors, is predestined to be studied regarding species' distributional patterns and limits.

Examination and close investigation with a focus on species complexes within this area become highly interesting, since one would expect that species occupy smaller ecological niches than species complexes. For instance, the documented bathymetric depth range of the *E. producta* complex was, prior to Schnurr et al. [28], 103–2029 m depth.

Schnurr et al. [28] examined specimens of *E. producta* within Icelandic waters (see Figure 1 and Table 1 for sampling locations). The authors included not only specimens of the *E. producta* complex, but also some specimens of *E. dahli*, a species closely related to *E. producta*. Schnurr et al. [28] showed that the species clades were geographically and bathymetrically much more restricted than previously assumed. Further, Schnurr et al. [28] revealed that the observed molecular species clades (Figure 2) coincide with morphological findings. The mainly molecular-based study identified eight potential species clades

(including an *E. producta* sensu stricto clade and an *E. dahli* clade). Specimens from all clades, including six potentially new species clades, were available for a thorough morphological investigation of this species complex, whereas only a short summary of morphological characters was presented in Schnurr et al. [28]. The current study is a follow-up of this project and aims to elucidate the species clades further by providing illustrations and thorough morphological species descriptions of: *Eurycope producta* sensu stricto, *E. dahli*, *E. mishkai* sp. nov., *E. nikitai* sp. nov., *E. gordeyi* sp. nov., *E. emmae* sp. nov., *E. jakobi* sp. nov., and *E. mathiasi* sp. nov. along with a key to the species of the complex.

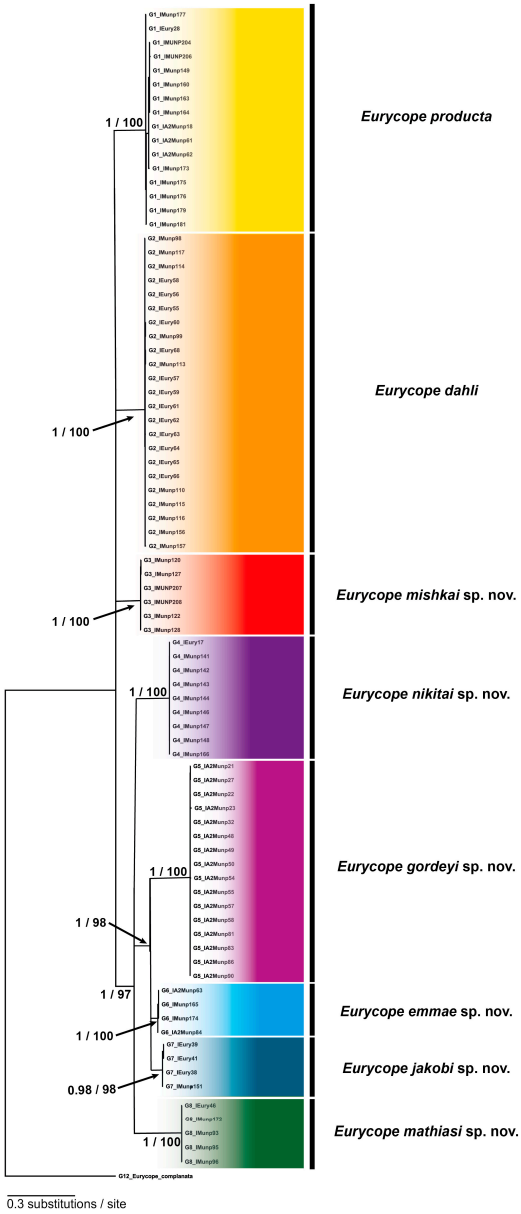

Figure 2. Consensus Bayesian tree for *E. producta* of the concatenated four gene loci dataset (16S, COI, 18S, and H3) of Schnurr et al. [28]. The branch lengths are proportional to the number of substitutions per site considering the models of nucleotide substitution estimated by MrAIC for the respective loci or partition. Posterior probabilities (>0.9) from Bayesian analyses and bootstrap percentages (>70) from maximum likelihood trees are indicated at the nodes. The names of the species are indicated next to the respective clade: *E. producta* sensu stricto, *E. dahli*, *E. mishkai* sp. nov., *E. nikitai* sp. nov., *E. gordeyi* sp. nov., *E. emmae* sp. nov., *E. jakobi* sp. nov., and *E. mathiasi* sp. nov. The figure was reprinted and adapted from [28] by permission from Springer Nature, Marine Biodiversity (2018).

Table 1. Voucher specimen information with reference to voucher name; clade names of Schnurr et al. [28]; species names; type status (H, holotype; P, paratype; d, dissected), sex (F, female; M, male; J, juvenile), German Centre for Marine Biodiversity Research numbers (DZMB HH), Zoological Museum of Hamburg collection numbers (ZMH K), cruise name (Ice1, IceAGE1 cruise; Ice2, IceAGE2 cruise), station number, sampling coordinates, sampling depth, and GenBank Accession numbers of COI, 16S, 18S, and H3. The table was reprinted and adapted from [28] by permission from Springer Nature, Marine Biodiversity (2018).

Voucher Name	Species Clade	Species Name	Type	Sex	DZMB-HH No.	ZMH K-No.	Cruise	Station No.	Coordinates	Depth [m]	GenBank Accession No.			
											COI	16S	18S	H3
IMunp149	Ep_1	*E. producta* sensu stricto		F	34,260	45,586	Ice1	#1010	020°23.71′ W/ 62°33.10′ N	1385		MH056295	MH056370	MH056550
IMunp173	Ep_1	*E. producta* sensu stricto		M	34,284	45,587	Ice1	#1119	026°14.50′ W/ 67°12.81′ N	697		MH056294	MH056373	
IEury28	Ep_1	*E. producta* sensu stricto		F	19,981	45,588	Ice1	#1132	026°45.28′ W/ 67°38.48′ N	318		MH056301	MH056364	
IMunp177	Ep_1	*E. producta* sensu stricto		F	34,288	45,589	Ice1	#1136	026°45.99′ W/ 67°38.15′ N	316		MH056302	MH056366	
IMunp179	Ep_1	*E. producta* sensu stricto		F	34,290	45,590	Ice1	#1136	026°45.99′ W/ 67°38.15′ N	316		MH056304	MH056363	
IMunp181	Ep_1	*E. producta* sensu stricto		F	34,292	45,591	Ice1	#1136	026°45.99′ W/ 67°38.15′ N	316		MH056305	MH056365	
IMunp175	Ep_1	*E. producta* sensu stricto	d	M	34,286	45,592	Ice1	#1136	026°45.99′ W/ 67°38.15′ N	316		MH056303		
IMunp176	Ep_1	*E. producta* sensu stricto		F	34,287	45,593	Ice1	#1136	026°45.99′ W/ 67°38.15′ N	316		MH056306		
IMunp163	Ep_1	*E. producta* sensu stricto		F	34,274	45,594	Ice1	#1212	012°52.48′ W/ 66°32.63′ N	317		MH056297	MH056374	MH056551
IMunp164	Ep_1	*E. producta* sensu stricto		F	34,275	45,595	Ice1	#1212	012°52.48′ W/ 66°32.63′ N	317		MH056298	MH056367	MH056552
IMunp206	Ep_1	*E. producta* sensu stricto		M	59,245	45,596	Ice1	#1212	012°52.48′ W/ 66°32.63′ N	317		MH056300	MH056376	MH056553
IMunp160	Ep_1	*E. producta* sensu stricto		F	34,271	45,597	Ice1	#1212	012°52.48′ W/ 66°32.63′ N	317		MH056296	MH056369	
IMunp204	Ep_1	*E. producta* sensu stricto		F	59,244	45,582	Ice1	#1212	012°52.48′ W/ 66°32.63′ N	317		MH056299	MH056375	
IA2Munp18	Ep_1	*E. producta* sensu stricto		F	34,323	45,583	Ice2	#880_2	008°09.42′ W/ 63°23.36′ N	686		MH056291	MH056372	
IA2Munp61	Ep_1	*E. producta* sensu stricto		F	34,367	45,584	Ice2	#880_2	008°09.42′ W/ 63°23.36′ N	686		MH056292	MH056371	
IA2Munp62	Ep_1	*E. producta* sensu stricto		M	34,368	45,585	Ice2	#880_2	008°09.42′ W/ 63°23.36′ N	686		MH056293	MH056368	

Table 1. *Cont.*

Voucher Name	Species Clade	Species Name	Type	Sex	DZMB-HH No.	ZMH K-No.	Cruise	Station No.	Coordinates	Depth [m]	GenBank Accession No.			
											COI	16S	18S	H3
IMunp98	Ep_2	*E. dahli*		F	20,626	45,599	Ice1	#1155	009°55.02′ W/ 69°06.66′ N	2204	MH056589	MH056311	MH056392	MH056534
IMunp99	Ep_2	*E. dahli*		F	20,627	45,600	Ice1	#1155	009°55.02′ W/ 69°06.66′ N	2204	MH056590	MH056320	MH056394	MH056535
IEury61	Ep_2	*E. dahli*		M	20,591	45,601	Ice1	#1159	009°55.02′ W/ 69°06.66′ N	2203	MH056585	MH056313	MH056384	MH056531
IMunp113	Ep_2	*E. dahli*		F	20,641	45,602	Ice1	#1159	009°55.02′ W/ 69°06.66′ N	2203	MH056592	MH056321	MH056383	MH056536
IEury62	Ep_2	*E. dahli*		F	20,592	45,603	Ice1	#1159	009°55.02′ W/ 69°06.66′ N	2203	MH056586	MH056315	MH056386	
IMunp110	Ep_2	*E. dahli*		M	20,638	45,604	Ice1	#1159	009°55.02′ W/ 69°06.66′ N	2203	MH056591	MH056314	MH056398	
IMunp116	Ep_2	*E. dahli*		F	20,644	45,605	Ice1	#1159	009°55.02′ W/ 69°06.66′ N	2203	MH056595	MH056317	MH056388	
IMunp117	Ep_2	*E. dahli*		F	20,645	45,606	Ice1	#1159	009°55.02′ W/ 69°06.66′ N	2203	MH056596	MH056310	MH056378	
IEury68	Ep_2	*E. dahli*		J	20,598	45,607	Ice1	#1159	009°55.02′ W/ 69°06.66′ N	2203	MH056588	MH056322		MH056533
IEury55	Ep_2	*E. dahli*		F	20,585	45,608	Ice1	#1159	009°55.02′ W/ 69°06.66′ N	2203		MH056307	MH056393	MH056529
IEury56	Ep_2	*E. dahli*	d	M	20,586	45,609	Ice1	#1159	009°55.02′ W/ 69°06.66′ N	2203		MH056308	MH056397	MH056530
IEury64	Ep_2	*E. dahli*		M	20,594	45,610	Ice1	#1159	009°55.02′ W/ 69°06.66′ N	2203		MH056319	MH056379	MH056532
IEury57	Ep_2	*E. dahli*		F	20,587	45,611	Ice1	#1159	009°55.02′ W/ 69°06.66′ N	2203		MH056312	MH056385	
IEury58	Ep_2	*E. dahli*		F	20,588	45,612	Ice1	#1159	009°55.02′ W/ 69°06.66′ N	2203		MH056309	MH056381	
IEury66	Ep_2	*E. dahli*		F	20,596	45,613	Ice1	#1159	009°55.02′ W/ 69°06.66′ N	2203		MH056318	MH056395	
IEury59	Ep_2	*E. dahli*		F	20,589	45,614	Ice1	#1159	009°55.02′ W/ 69°06.66′ N	2203	MH056583		MH056380	
IEury60	Ep_2	*E. dahli*		M	20,590	45,615	Ice1	#1159	009°55.02′ W/ 69°06.66′ N	2203	MH056584		MH056387	
IEury65	Ep_2	*E. dahli*		M	20,595	45,616	Ice1	#1159	009°55.02′ W/ 69°06.66′ N	2203	MH056587		MH056382	
IMunp114	Ep_2	*E. dahli*		F	20,642	45,617	Ice1	#1159	009°55.02′ W/ 69°06.66′ N	2203	MH056593		MH056377	
IMunp115	Ep_2	*E. dahli*		F	20,643	45,618	Ice1	#1159	009°55.02′ W/ 69°06.66′ N	2203	MH05,6594		MH056389	

Table 1. *Cont.*

Voucher Name	Species Clade	Species Name	Type	Sex	DZMB-HH No.	ZMH K-No.	Cruise	Station No.	Coordinates	Depth [m]	GenBank Accession No.			
											COI	16S	18S	H3
IEury63	Ep_2	*E. dahli*		F	20,593	45,619	Ice1	#1159	009°55.02′ W/ 69°06.66′ N	2203			MH056396	
IMunp156	Ep_2	*E. dahli*		F	34,267	45,620	Ice1	#1168	007°00.08′ W/ 67°36.38′ N	2373		MH056316	MH056391	
IMunp157	Ep_2	*E. dahli*		M	34,268	45,598	Ice1	#1168	007°00.08′ W/ 67°36.38′ N	2373		MH056323	MH056390	
IMunp120	Ep_3	*E. mishkai* sp. nov.	P	M	20,648	45,622	Ice1	#1148	023°41.76′ W/ 67°50.79′ N	1249	MH056638	MH056324	MH056360	MH056554
IMunp122	Ep_3	*E. mishkai* sp. nov.	P	F	20,650	45,623	Ice1	#1148	023°41.76′ W/ 67°50.79′ N	1249	MH056639	MH056326	MH056359	MH056555
IMunp128	Ep_3	*E. mishkai* sp. nov.	H	M	20,656	45,621	Ice1	#1148	023°41.76′ W/ 67°50.79′ N	1249	MH056640	MH056327	MH056358	MH056556
IMunp208	Ep_3	*E. mishkai* sp. nov.	P, d	M	59,247	45,624	Ice1	#1148	023°41.76′ W/ 67°50.79′ N	1249	MH056641	MH056329	MH056361	MH056558
IMunp207	Ep_3	*E. mishkai* sp. nov.	P	F	59,246	45,625	Ice1	#1148	023°41.76′ W/ 67°50.79′ N	1249		MH056328	MH056362	MH056557
IMunp127	Ep_3	*E. mishkai* sp. nov.	P	F	20,655	45,626	Ice1	#1148	023°41.76′ W/ 67°50.79′ N	1249		MH056325	MH056357	
IMunp146	Ep_4	*E. nikitai* sp. nov.	P	F	34,257	45,629	Ice1	#963	021°28.06′ W/ 60°02.73′ N	2749	MH056643	MH056336		MH056563
IMunp142	Ep_4	*E. nikitai* sp. nov.	P, d	M	34,253	45,630	Ice1	#963	021°28.06′ W/ 60°02.73′ N	2749		MH056334	MH056419	MH056560
IMunp143	Ep_4	*E. nikitai* sp. nov.	P	F	34,254	45,631	Ice1	#963	021°28.06′ W/ 60°02.73′ N	2749		MH056335	MH056420	MH056561
IMunp144	Ep_4	*E. nikitai* sp. nov.	P	F	34,255	45,632	Ice1	#963	021°28.06′ W/ 60°02.73′ N	2749		MH056337	MH056521	MH056562
IMunp147	Ep_4	*E. nikitai* sp. nov.	P	M	34,258	45,633	Ice1	#963	021°28.06′ W/ 60°02.73′ N	2749		MH056339	MH056421	
IMunp141	Ep_4	*E. nikitai* sp. nov.	P	F	34,252	45,634	Ice1	#963	021°28.06′ W/ 60°02.73′ N	2749			MH056520	
IMunp166	Ep_4	*E. nikitai* sp. nov.	P	F	34,277	45,635	Ice1	#967	021°28.54′ W/ 60°02.77′ N	2750	MH056644	MH056340	MH056422	
IMunp148	Ep_4	*E. nikitai* sp. nov.	H	M	34,259	45,627	Ice1	#979	018°08.24′ W/ 60°21.48′ N	2568		MH056338		
IEury17	Ep_4	*E. nikitai* sp. nov.	P		19,968	45,628	Ice1	#983	018°08.14′ W/ 60°21.44′ N	2568	MH056642	MH056333		MH056559

Table 1. *Cont.*

Voucher Name	Species Clade	Species Name	Type	Sex	DZMB-HH No.	ZMH K-No.	Cruise	Station No.	Coordinates	Depth [m]	GenBank Accession No.			
											COI	16S	18S	H3
IA2Munp21	Ep_5	*E. gordeyi* sp. nov.	P	M	34,326	45,645	Ice2	#868_3	000°15.51′ E/ 62°09.14′ N	587	MH056645	MH056348	MH056408	MH056564
IA2Munp22	Ep_5	*E. gordeyi* sp. nov.	P, d	M	34,327	45,646	Ice2	#868_3	000°15.51′ E/ 62°09.14′ N	587		MH056349	MH056406	
IA2Munp23	Ep_5	*E. gordeyi* sp. nov.	P	F	34,328	45,647	Ice2	#868_3	000°15.51′ E/ 62°09.14′ N	587	MH056646			
IA2Munp27	Ep_5	*E. gordeyi* sp. nov.	P	M	34,332	45,648	Ice2	#869_3	000°01.21′ E/ 62°16.20′ N	846	MH056647	MH056351	MH056407	MH056565
IA2Munp32	Ep_5	*E. gordeyi* sp. nov.	P	F	34,337	45,649	Ice2	#870_4	000°06.10′ W/ 62°19.73′ N	1058		MH056350		
IA2Munp48	Ep_5	*E. gordeyi* sp. nov.	P	F	34,353	45,650	Ice2	#878_1	010°13.77′ W/ 61°53.79′ N	781	MH056648	MH056352	MH056411	MH056566
IA2Munp49	Ep_5	*E. gordeyi* sp. nov.	P	F	34,354	45,651	Ice2	#878_1	010°13.77′ W/ 61°53.79′ N	781		MH056354		MH056567
IA2Munp57	Ep_5	*E. gordeyi* sp. nov.	H	M	34,363	45,636	Ice2	#879_5	008°34.32′ W/ 63°06.10′ N	511		MH056353	MH056410	MH056568
IA2Munp54	Ep_5	*E. gordeyi* sp. nov.	P	F	34,360	45,637	Ice2	#879_5	008°34.32′ W/ 63°06.10′ N	511		MH056356	MH056413	
IA2Munp58	Ep_5	*E. gordeyi* sp. nov.	P	F	34,364	45,638	Ice2	#879_5	008°34.32′ W/ 63°06.10′ N	511		MH056355	MH056414	
IA2Munp55	Ep_5	*E. gordeyi* sp. nov.	P	F	34,361	45,639	Ice2	#879_5	008°34.32′ W/ 63°06.10′ N	511	MH056649		MH056403	
IA2Munp50	Ep_5	*E. gordeyi* sp. nov.	P	F	34,356	45,640	Ice2	#879_5	008°34.32′ W/ 63°06.10′ N	511			MH056412	
IA2Munp86	Ep_5	*E. gordeyi* sp. nov.	P	F	34,392	45,641	Ice2	#882_5	010°58.20′ W/ 63°25.04′ N	441	MH056651		MH056405	
IA2Munp90	Ep_5	*E. gordeyi* sp. nov.	P	F	34,396	45,642	Ice2	#882_5	010°58.20′ W/ 63°25.04′ N	441	MH056652		MH056404	
IA2Munp83	Ep_5	*E. gordeyi* sp. nov.	P	F	34,389	45,643	Ice2	#882_5	010°58.20′ W/ 63°25.04′ N	441	MH056650			
IA2Munp81	Ep_5	*E. gordeyi* sp. nov.	P	F	34,387	45,644	Ice2	#882_5	010°58.20′ W/ 63°25.04′ N	441			MH056409	MH056569
IMunp174	Ep_6	*E. emmae* sp. nov.	H, d	M	34,285	45,652	Ice1	#1136	026°45.99′ W/ 67°38.15′ N	316		MH056343	MH056418	MH056572
IMunp165	Ep_6	*E. emmae* sp. nov.	P	F	34,276	45,653	Ice1	#1212	012°52.48′ W/ 66°32.63′ N	317		MH056342	MH056415	MH056571
IA2Munp63	Ep_6	*E. emmae* sp. nov.	P, d	M	34,369	45,654	Ice2	#880_2	008°09.42′ W/ 63°23.36′ N	686		MH056341	MH056416	
IA2Munp84	Ep_6	*E. emmae* sp. nov.	P	F	34,390	45,655	Ice2	#882_5	010°58.20′ W/ 63°25.04′ N	441		MH056344	MH056417	MH056570

Table 1. *Cont.*

Voucher Name	Species Clade	Species Name	Type	Sex	DZMB-HH No.	ZMH K-No.	Cruise	Station No.	Coordinates	Depth [m]	GenBank Accession No.			
											COI	16S	18S	H3
IMunp151	Ep_7	*E. jakobi* sp. nov.	P	F	34,262	45,659	Ice1	#1010	020°23.71′ W/ 62°33.10′ N	1385		MH056347	MH056399	MH056573
IEury39	Ep_7	*E. jakobi* sp. nov.	H, d	M	20,030	45,656	Ice1	#1069	028°05.70′ W/ 62°59.33′ N	1588		MH056345	MH056400	
IEury41	Ep_7	*E. jakobi* sp. nov.	P	F	20,032	45,657	Ice1	#1069	028°05.70′ W/ 62°59.33′ N	1588		MH056346	MH056401	
IEury38	Ep_7	*E. jakobi* sp. nov.	P, d	F	20,025	45,658	Ice1	#1069	028°05.70′ W/ 62°59.33′ N	1588			MH056402	
IMunp172	Ep_8	*E. mathiasi* sp. nov.	H	F	34,283	45,660	Ice1	#1043	025°57.66′ W/ 63°55.46′ N	214		MH056330	MH056526	
IEury46	Ep_8	*E. mathiasi* sp. nov.	P	F	20,574	45,661	Ice1	#1043	025°57.66′ W/ 63°55.46′ N	214	MH056653		MH056522	
IMunp93	Ep_8	*E. mathiasi* sp. nov.	P, d	F	20,621	45,662	Ice1	#1086	026°23.05′ W/ 63°42.53′ N	698	MH056654	MH056332	MH056523	MH056574
IMunp96	Ep_8	*E. mathiasi* sp. nov.	P	F	20,624	45,663	Ice1	#1086	026°23.05′ W/ 63°42.53′ N	698	MH056656	MH056331	MH056524	MH056575
IMunp95	Ep_8	*E. mathiasi* sp. nov.	P	F	20,623	45,664	Ice1	#1086	026°23.05′ W/ 63°42.53′ N	698	MH056655		MH056525	

2. Materials and Methods

All 83 *E. producta* complex specimens of the current study were sampled during the IceAGE1 and IceAGE2 (Icelandic marine Animals: Genetics and Ecology) expeditions in 2011 and 2013 onboard the RVs Meteor and Poseidon, respectively, using three different types of epibenthic sleds [31–33]. Cooling and fixation in 96% nondenatured ethanol of bulk samples was immediately conducted on deck. Cooled subsamples were already sorted on board and also fixed in 96% nondenatured ethanol. Samples were handled according to Riehl, et al. [34] and kept cool throughout the whole sorting process. A semi-destructive approach of dissection for tissue digestion and DNA amplification was executed, considering that specimens will be needed for further taxonomic investigation. Thus, only one to three posterior pereopods (depending on the size of the individual) were dissected.

The molecular methods applied in order to obtain sequences for 18S, 16S, COI, and H3 gene fragments and the methods used for the conducted analyses were described in detail in Schnurr et al. [28] and are thus not repeated herein. *Eurycope complanata* was chosen as an outgroup for the tree. All sequences can be retrieved from GenBank (see Table 1 for accession numbers). We only present the tree of the concatenated analyses. Further details and a thorough discussion on tree topologies and species delimitation results can be retrieved from Schnurr et al. [28].

Morphological analyses of the specimens were conducted with a Leica M125 binocular microscope and a Leica DM2500 compound microscope, both equipped with a *camera lucida*. The pencil drawings were inked by hand and finalized using Adobe Photoshop 7. The drawings were created following the guidelines of Hessler [35] and Wilson [36] and the terminology of eurycopid structures follows Wilson and Hessler [37] and Wilson [38]. Measurement of the total body length was conducted medially from the anterior edge of the cephalon to the posterior tip of the pleotelson. Body segment length was measured medially from the anterior margin to the posterior margin. If the body was voluminous and the pleotelson was tucked up, its length was measured in the lateral view.

All specimens were deposited in the collections of the Zoological Museum of Hamburg (see Table 1 for accession numbers).

3. Results

3.1. Taxonomy

Asellota Latreille, 1802 [39]
Superfamily Janiroidea G.O. Sars, 1897 [40]
Family Munnopsidae Lilljeborg, 1864 [6]
Subfamily Eurycopinae Hansen, 1916 [12]
Genus *Eurycope* G.O. Sars, 1864 [13]
Type species: *Eurycope cornuta* G.O. Sars, 1864 [13]

Eurycope producta G.O. Sars, 1868 [22] species complex

Diagnosis: Body ovoid; rostrum subequal in width and length to article 1 of antenna I, concave medially. Pereonites 1–4 subequal in medial length, longer than cephalon behind antennae I. Pereonite 7 longer than previous ones (medially), pereonites 5 and 6 subequal in length. Pleotelson about 0.3 times body length. Antenna I article 2 not longer than distomedial lobe of article 1; article 3 not shorter than article 2. Maxilliped palp subequal to basis in width; basis lateral projection near palp insertion acute, subequal in length to article 1. Epipod subequal to basis in length; tip narrow; lateral margin projected midlength. Pereopods V–VII dactylus length subequal to propodus width. Male pleopod I distolateral lobes weak, not longer than distomedial lobes. Male pleopod II distomedial margin with weak notch for exopod emerging. Uropod protopod and rami subequal in length; exopod about half of endopod width.

Description of characters common for all species of the complex: Body about twice as long as wide. Cephalon behind antennulae shorter than pereonite 1. Rostrum width about one third of cephalon width. Anterolateral margin of pereonites acute; coxae of pereopods I–IV visible in dorsal view, subequal in length and in shape, with acute anterior lobe and rounded posterior lobe. Pleotelson broader than long, about 0.3 times body length.

Antenna II squama of article 3 half as long as article 4.

Mandibular molar process distally truncate, denticulate; palp stout, subequal to mandibular body in length; article 3 slightly broader than article 2, twisted; distal seta longest.

Maxilla I mesial endite width about 0.7 times lateral endite width, with fine distal setae and one stout long distomedial seta; lateral endite with 12 robust differently serrated setae.

Maxilla II middle endite shortest, lateral endite longest; mesial endite with tuft of distal setae; distomedial setulated seta longest, middle and lateral endites with two long and two shorter comb-like distal setae.

Maxilliped basis length about three times width; endite width about half basis width; distal margin slightly concave, with several small fan setae and numerous fine small setae. Basis acute lateral projection near palp insertion subequal in length to lateral projection of article 1. Palp article 2 longest, equal in width to basis. Article 3 almost as wide as article 2; medial margin subequal in length to article 2, rounded. Article 4 equal to article 3 in lateral length; medial lobe subequal to article 5. Epipod length about twice width, 0.9 times basis length, width 1.3 times basis width tip narrow rounded, lateral margin projected midlength.

Bases of pereopods I–IV subequal in length, basis V shortest among all bases. Pereopod I broadest on basis–merus, dactylus < 0.3 times propodus length. Pereopods V–VII dactyli elongate, slightly bent, subequal in length to propodi; two setae proximal to claws, dorsal claw twice broader and longer than ventral one, two setae between claws. Pereopods V–VII carpi semirounded; propodi drop-like, broadened distally, about half as broad as carpi; dorsal margin serrated.

Male pleopod I and female pleopod II longer than branchial cavity of pleotelson, overlapping anterior part of anal. Male pleopod II protopod distolateral margin with several plumose setae; endopod and exopod inserted in middle of medial side, Pleopod III endopod with three or more plumose distal setae exopod with one distal seta. Pleopods V embraced laterally pleopods IV and III.

Uropod protopod cylindrical.

Remarks: The complex differs from all *Eurycope* species by having a broad and long rostrum, which is subequal in length and width to article 1 of antenna I. The combination of the other characters mentioned in the diagnosis distinguishes the species complex as well. The broad and long—almost rectangular—rostrum with lateral keels of the *E. producta* complex is similar to that of the genus *Disconectes*. Some species of *Disconectes* also have the pronounced distomedial lobes of male pleopod I. However, *Disconectes* differ in having the pereonites 5 and 6 dorsally fused, which are free in *Eurycope.*

As already noted by Svavarsson [21], *E. gaussi* from the Indian sector of the Southern Ocean and the two northwest Pacific species *E. linearis* and *E. spinifrons* are closely related species to the *E. producta* complex. We may also include to the similar and related species *E. septentrionalis* Malyutina and Kussakin, 1996 [41] from the Canadian Basin of the North Polar Ocean as well as *E. andreyi* Malyutina and Golovan, 2022 [42]. All these mentioned species have a large rostrum, though not as notable as in the studied North Atlantic ones. All of them also possess similar morphological features to the male pleopods I and the maxillipeds. The North Pacific species differ from the studied species of the complex by a reduced distomedial lobe of antenna I article 1, which is shorter than article 2, in contrast to the long lobe of the species of the *E. producta* complex.

3.2. Eurycope producta G.O. Sars 1868

Material examined:

Male (ZMH K-45596), 3.25 mm length; male (ZMH K-45592), 3.15 mm length, used for dissection; female (ZMH K-45583), 2.7 mm length; female (ZMH K-45584); and 12 further specimens (see Table 1 for specimen information).

Diagnosis: Cephalon rostrum tapering distally, length 0.8 times basal width, basal width subequal to antenna I basal width. Maxilliped endite with three coupling hooks. Basis lateral projection near palp insertion length 1.2 times article 1 lateral length. Palp article 4 distomedial lobe length 0.75 times article 5 length. Epipod length 2.0 times width, 0.9 times basis length, width 1.3 times basis width. Male pleopod I length 2.3 times width, distal width 0.6 times basal width; distal margin rounded, lobes not separated. Male pleopod II protopod distomedial notch length 0.4 times medial margin length. Endopod of pleopod III with six plumose distal setae. Uropod protopod length 1.0 times width, endopod length 1.25 times protopod length, width 0.5 times protopod width; exopod length 0.95 times endopod length.

Description of male (ZMH K-45596, Figure 3): Body length 1.95 times pereonite 5 width. Cephalon behind antennulae about half as long as pereonite 1; interantennular distance equal to antenna I basal width, 0.3 times cephalon width. Rostrum basal width subequal to length and antenna I basal width, reaching beyond tip of article 1 of antenna I, tapering distally; distal width 0.55 times basal width; middle groove deep. Pereonite 5 width 1.5 times pereonite 1 width; pereonite 7 posterior width 1.15 times pereonite 1 width. Natasome length 1.4 times anterior body part length. Pereonite 7 medial length 0.7 times pereonites 5 and 6's combined medial length. Pleotelson length 0.8 times width, 0.3 times body length.

Antenna I (male, ZMH K-45592, Figure 4A) broken off; article 1 length 1.25 times width, with five broom dorsal setae, one small UB seta laterally, and two UB setae distomedially. Article 2 length 1.3 times width, 0.4 times article 1 length, 0.85 times length of article 1 distomedial lobe, with three UB distal setae; articles 3 broken off.

Antenna II (male, ZMH K-45596, Figure 3B) broken off after article 4; articles 1–4 subequal in length; squama on article 3 reaching midlength of article 4.

Mandible (male, ZMH K-45592, Figure 4B,C) incisors of both mandibles with four cusps; *lacinia mobilis* of left mandible almost as long as incisor, with seven small distal teeth; spine row with eight and nine spines on left and right mandibles, respectively; molar process distally with six small setae on base of denticles. Palp length 1.1 times mandible body length; article 2 with row of small simple lateral setae and two stout setulated distal setae; articles 2 and 3 length 2.15 and 1.05 times article 1 length, respectively. Article 3 distal seta length 2.1 times other marginal setae length and 0.55 times article 3 length.

Maxilla I (male, ZMH K-45592, Figure 5A) mesial endite width 0.75 times lateral endite width; lateral endite with five robust distolateral setae smooth other setae differently serrated.

Maxilla II (male, ZMH K-45592, Figure 5B) middle endite shortest, lateral endite longest; mesial endite with tuft of distal setae, distomedial setulated seta longest, middle and lateral endites with two long and two shorter comb-like distal setae.

Maxilliped (male, ZMH K-45592, Figure 5C) basis length 2.95 times width, lateral margin setulated; endite width 0.55 times basis width, with three coupling hooks; distal margin with five narrow fan setae. Basis acute lateral projection near palp insertion length 1.2 times article 1 lateral length. Palp length 2.25 times width, 0.75 times basis length. Article 2 length 0.8 times width, as wide as basis, lateral length 1.2 times medial length, each distal angle with small seta; article 3 almost as wide as article 2, medial length equal to article 2 medial length, lateral length 0.4 times article 2 lateral length, medial margin rounded, denticulate, few small setae distally; article 4 equal to article 3 in lateral length, medial lobe slightly shorter than article 5, with three long distal setae, article 5 with four long distal setae. Epipod length 2.0 times width, 0.9 times basis length, width 1.3 times basis width; tip narrow, with three setae.

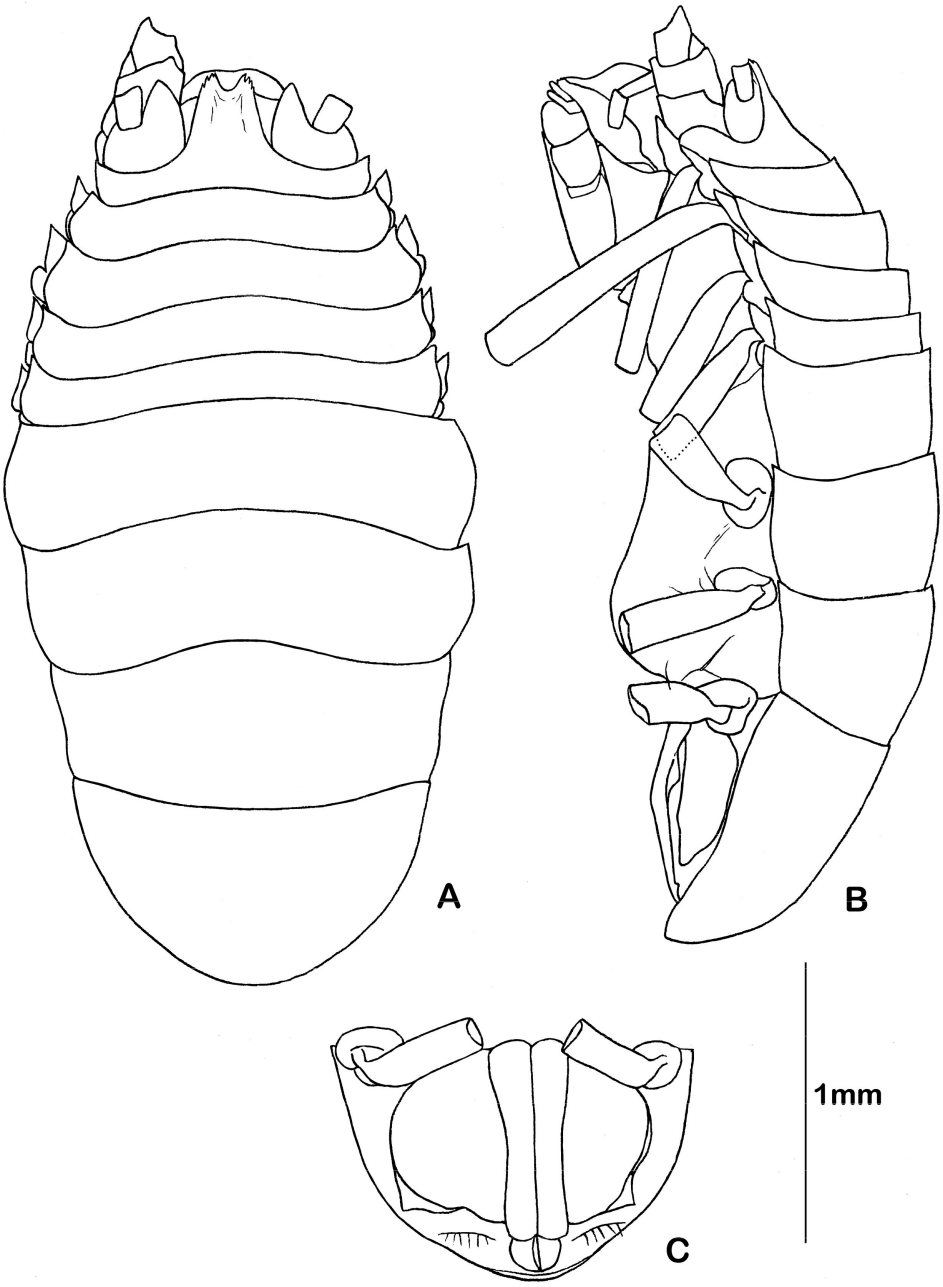

Figure 3. *Eurycope producta* GO Sars, 1868. Male (ZMH K-45596): (**A**) dorsal view; (**B**) lateral view; (**C**) pleotelson, ventral view.

Pereopod I (male, ZMH K-45592, Figure 6C) as long as body, length ratios of ischium–dactylus to basis: 0.4, 0.3, 0.8, 0.65, 0.15. Basis length 7.1 times width, dorsal margin with nine small simple setae and one broom proximal seta, ventral margin with five small simple setae and three longer simple distoventral setae. Ischium length 4.0 times width, with three small simple distal setae. Merus with three simple distal setae. Carpus 0.6 times basis width, length 9.65 times width; with three dorsal and seven ventral simple setae. Propodus with six ventral simple setae and six distal simple setae; dactylus almost straight, claw length 0.4 times dactylus length.

Pereopod II (male, ZMH K-45592, Figure 6D) length 1.9 times pereopod I length. Length ratios of ischium–dactylus to basis: 0.45, 0.4, 1.4, 1.7, 0.5. Basis stout, length 7.7 times width, with scattered small setae along basis, one broom dorsal seta and few distal setae. Ischium with two strong and five small simple ventral setae. Merus with five dorsal and five ventral simple setae. Carpus with 12 simple dorsal setae, seven small simple

and 17 UB ventral setae; distal margin with one broom, one long and six small UB setae. Propodus with 17 simple dorsal setae, one broom seta, and one small UB seta distodorsally and 25 UB ventral setae. Dactylar claw length 0.25 times dactylus length.

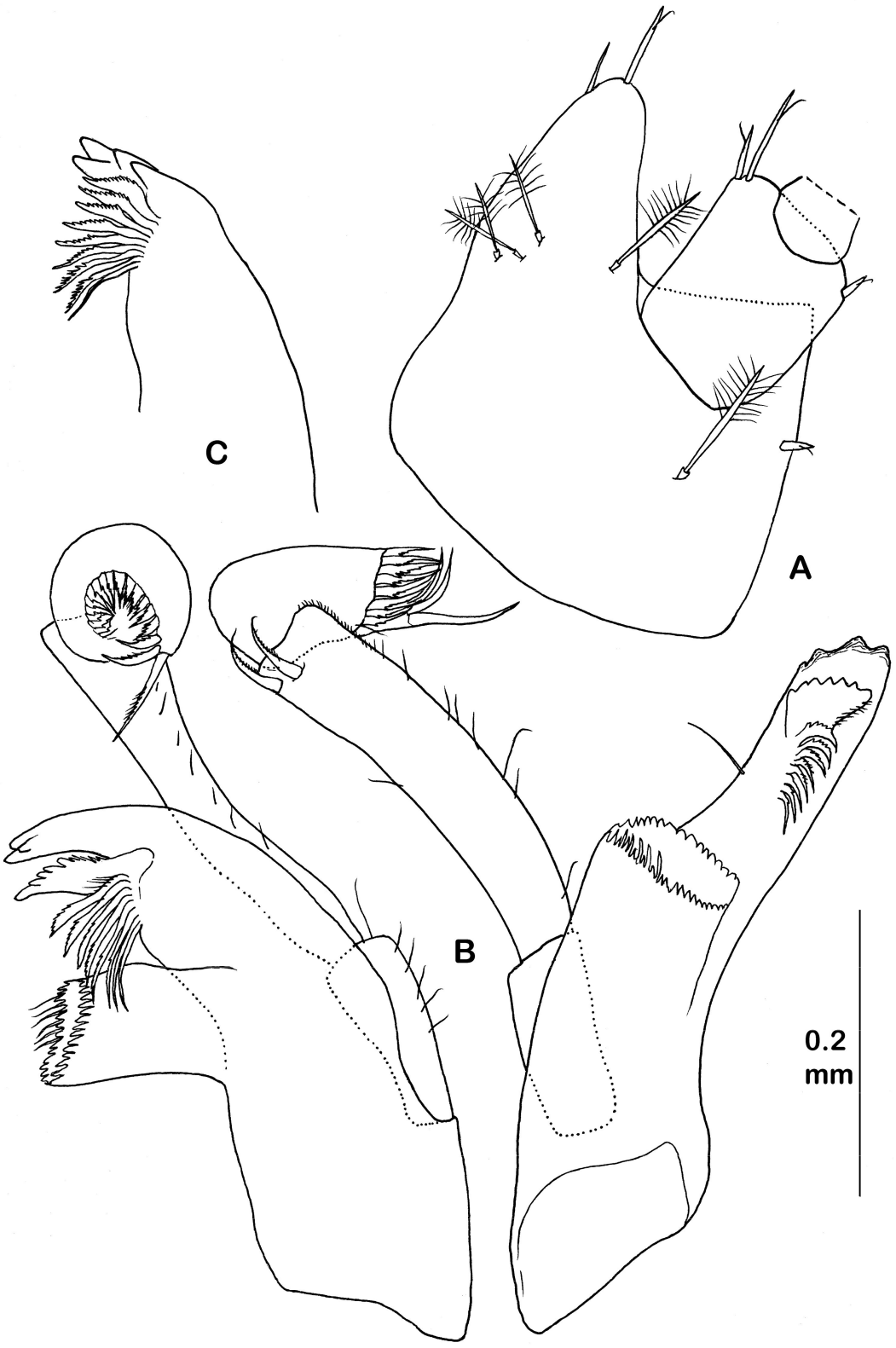

Figure 4. *Eurycope producta* GO Sars, 1868. Male (ZMH K-45592): (**A**) articles 1, 2 of antenna I; (**B**) left mandible ventral and medial view; (**C**) incisor of right mandible.

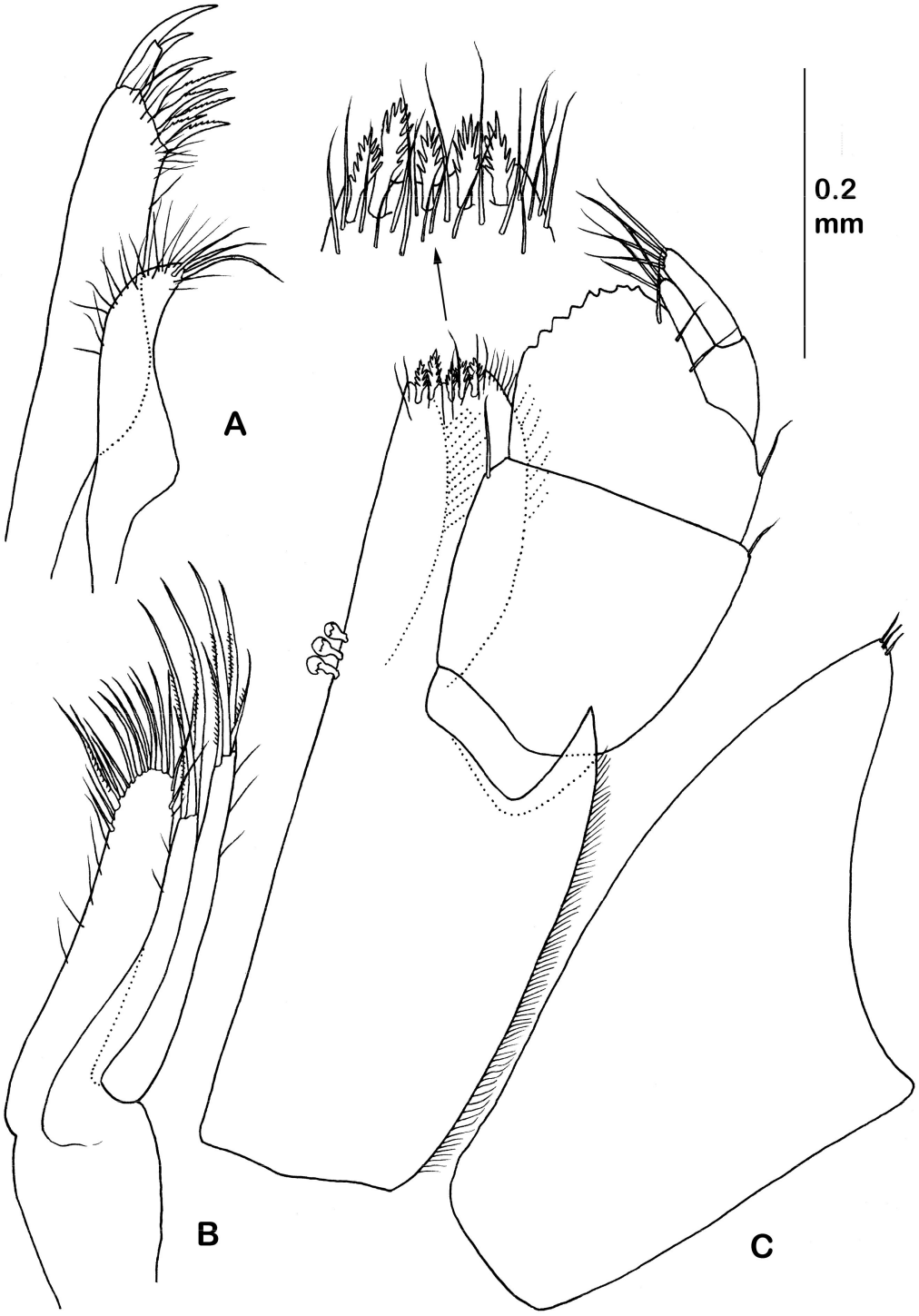

Figure 5. *Eurycope producta* GO Sars, 1868. Male (ZMH K-45592): (**A**) maxilla I; (**B**) maxilla II; (**C**) maxilliped.

Pereopod V (male, ZMH K-45592, Figure 7A) propodus and dactylus broken off, length ratios of ischium–carpus to basis: 1.4, 0.6, 2.0. Basis length 1.8 times width, with one long whip and five broom dorsal setae and four small simple ventral setae. Ischium and merus visibly narrower than basis; ischium with eight plumose dorsal setae and three simple ventral setae. Merus with one dorsal plumose seta and five simple ventral setae. Carpus length 1.6 times width, with 24 dorsal and 18 ventral plumose setae, one broom, one UB, and three simple setae distally.

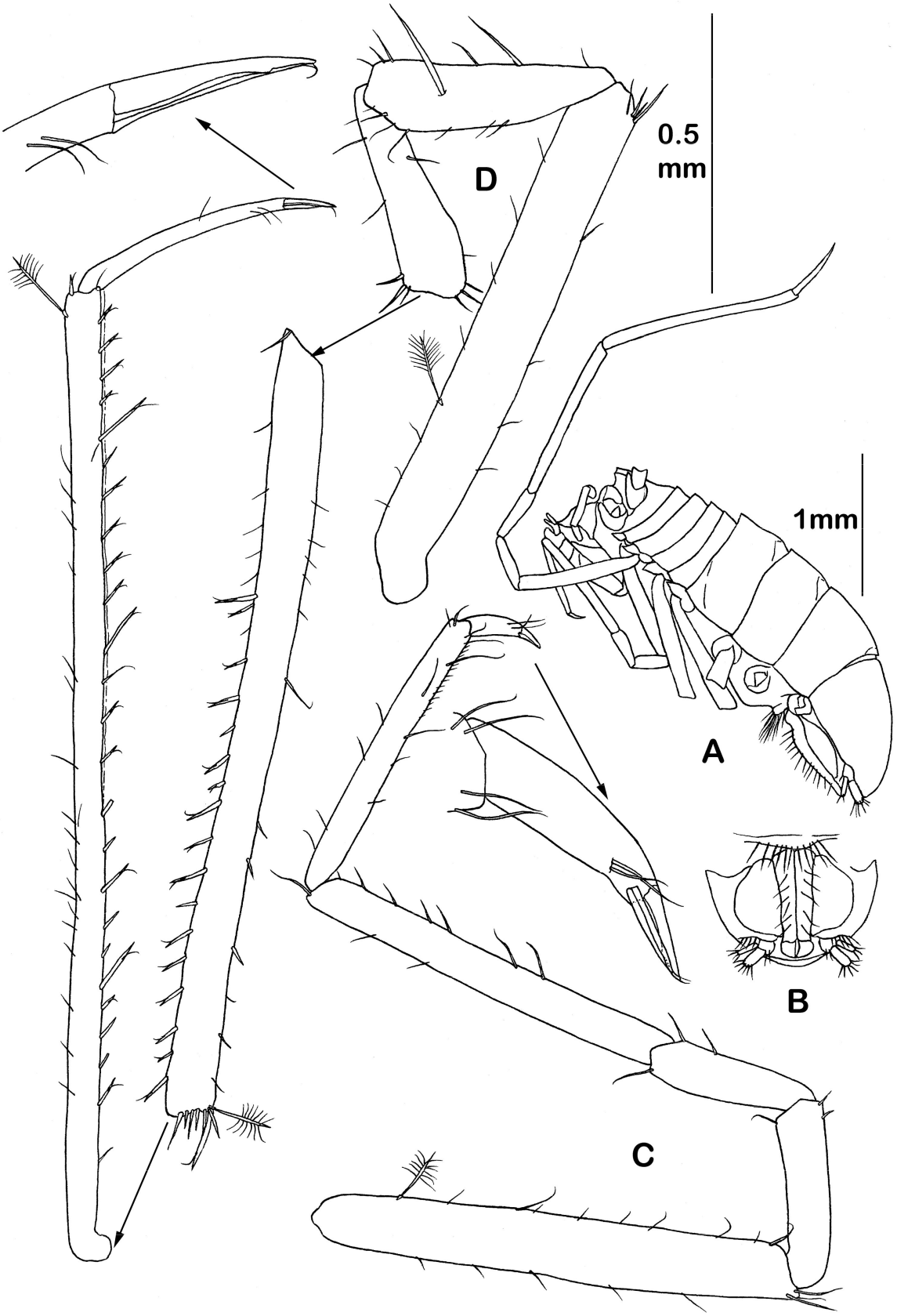

Figure 6. *Eurycope producta* GO Sars, 1868. Male (ZMH K-45592): (**A**) lateral view; (**B**) pleotelson, ventral view; (**C**) pereopod I (dactylus enlarged); (**D**) pereopod II (dactylus enlarged).

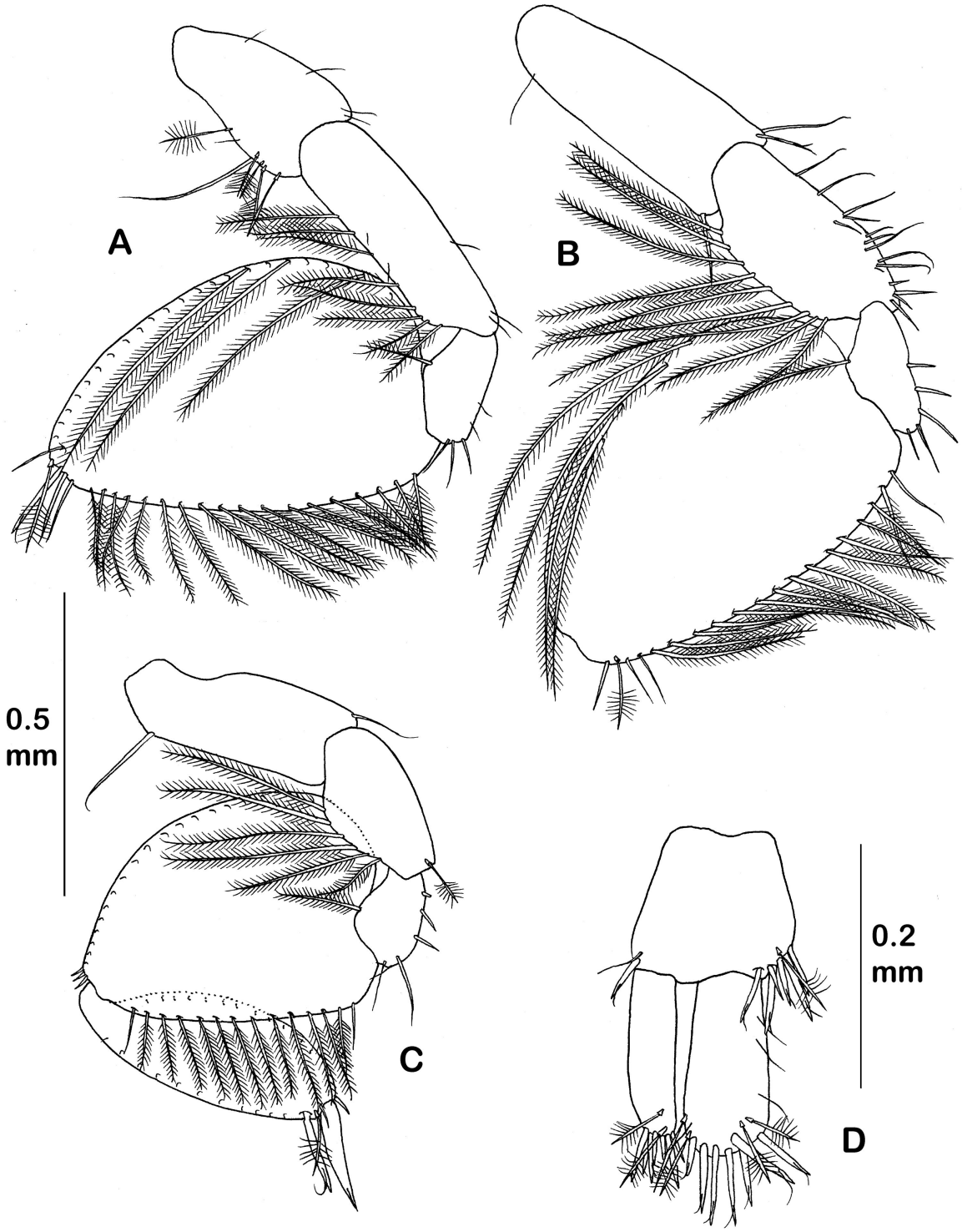

Figure 7. *Eurycope producta* GO Sars, 1868. Male (ZMH K-45592): (**A**) pereopod V; (**B**) pereopod VI; (**C**) pereopod VII; (**D**) uropod.

Pereopod VI (male, ZMH K-45592, Figure 7B) propodus and dactylus broken off, length ratios of ischium–carpus to basis: 0.4, 0.5, 1.4. Basis length 2.7 times width, with three long distal setae. Ischium as wide as basis, with nine plumose dorsal setae and 14 simple ventral setae. Merus with one plumose dorsal seta and five simple ventral setae. Carpus length 1.5 times width, with 22 dorsal and 15 ventral plumose setae, one broom and three simple setae distoventrally.

Pereopod VII (male, ZMH K-45592, Figure 7C) length ratios of ischium–dactylus to basis: 0.75, 0.45, 1.4, 1.3, 0.5. Basis length 2.5 times width, with one long proximodorsal seta and one distoventral simple seta. Ischium as wide as basis with six plumose dorsal setae and one distoventral broom seta. Merus with one plumose dorsal seta and five simple ventral setae. Carpus length 1.3 times width, with 20 dorsal and 14 ventral plumose setae. Propodus length 2.6 times width, with 15 dorsal and 14 ventral plumose setae, one small simple seta distoventrally, one broom seta and one stout long UB seta distodorsally; dactylus slender, spine-like al long as propodus width.

Pleopod I (male, ZMH K-45592, Figure 8A) length 2.3 times basal width, distal width 0.6 times basal width. Distal margin slightly rounded; medial and lateral lobes not separated; distolateral angles with small setulae; seven longer ventral setae posteriorly distolateral lobes, distomedial rounded lobes with small setulae.

Pleopod II (male, ZMH K-45592, Figure 8B,C) protopod length 1.65 times width, 0.9 times pleopod I length; distal margin with five simple setae, distomedial notch weak, length 0.4 times medial margin length. Stylet length 0.8 times protopod length, tip reaching behind pleopod I tip; sperm duct opening at 0.3 times length from proximal margin. Exopod distal article half as wide and 0.8 times as long as basal article.

Pleopod III (male, ZMH K-45592, Figure 8D) protopod length 0.6 times width; endopod length 1.3 times width; three distal plumose setae length 0.4 times pleopod III length; exopod length 1.2 times protopod and endopod's combined length, width 0.4 times width of endopod, with row of fine simple lateral setae; plumose distal seta subequal in length to endopod distal setae.

Pleopod IV (male, ZMH K-45592, Figure 8E) endopod length 1.4 times width; exopod 0.85 times endopod length and 0.4 times endopod width; stout plumose distal seta as long as pleopod III distal setae.

Pleopod V (male, ZMH K-45592, Figure 8F) length 1.45 times width, 1.2 times pleopod IV length.

Uropod (male, ZMH K-45592, Figure 7D) length 0.3 times pleotelson length; protopod length 1.0 times width, with one UB distolateral seta and one broom seta and six UB distomedial setae. Endopod length 1.25 times protopod length, width 0.5 times protopod width, with four broom and seven UB distal setae and three simple medial setae. Exopod length 0.95 times endopod length, width 0.5 times endopod width, with seven UB and two broom distal setae.

Female (ZMH K-45583 and ZMH K-45584, Figure 9A,B) habitus similar to that of male.

Pleopod II (female, ZMH K-45583, Figure 9C) length 0.8 times width, proximolateral margin with one simple setae; distomedial margin rounded, pronounced, overlapping anterior part of anal operculum; distolateral margin with row of simple setae. Ventral keel length 0.7 times pleopod II length with strong UB seta posteriorly.

Remarks: Our specimens were identified as *E. producta* G.O. Sars, 1868 sensu stricto as they fit the original descriptions and illustrations in G.O. Sars [43], though the male pleopod I in Sars's Pl. 65 has more pronounced distomedial lobes than our specimens.

Distribution: *Eurycope producta* occurs according to G.O. Sars [43] along the Norwegian coast from Christiania Fjord (Oslo), Skagerrak in the South to Vadsø in the North at a depth range of 60–400 fathoms (109.7–731.5 m). The species was recorded in many further publications west of Ireland, off the Faroe Islands, south of Iceland, near eastern, southern and southwestern Greenland, and in the southern part of the Davis Strait, featuring a depth range of 72–2087 m [44] (pp. 56–59). The herein-studied specimens of *E. producta* sensu stricto were sampled in the Denmark Strait, the Norwegian Sea, the Iceland–Faroe Ridge, and the Iceland Basin, featuring a depth range of 316–1385 m.

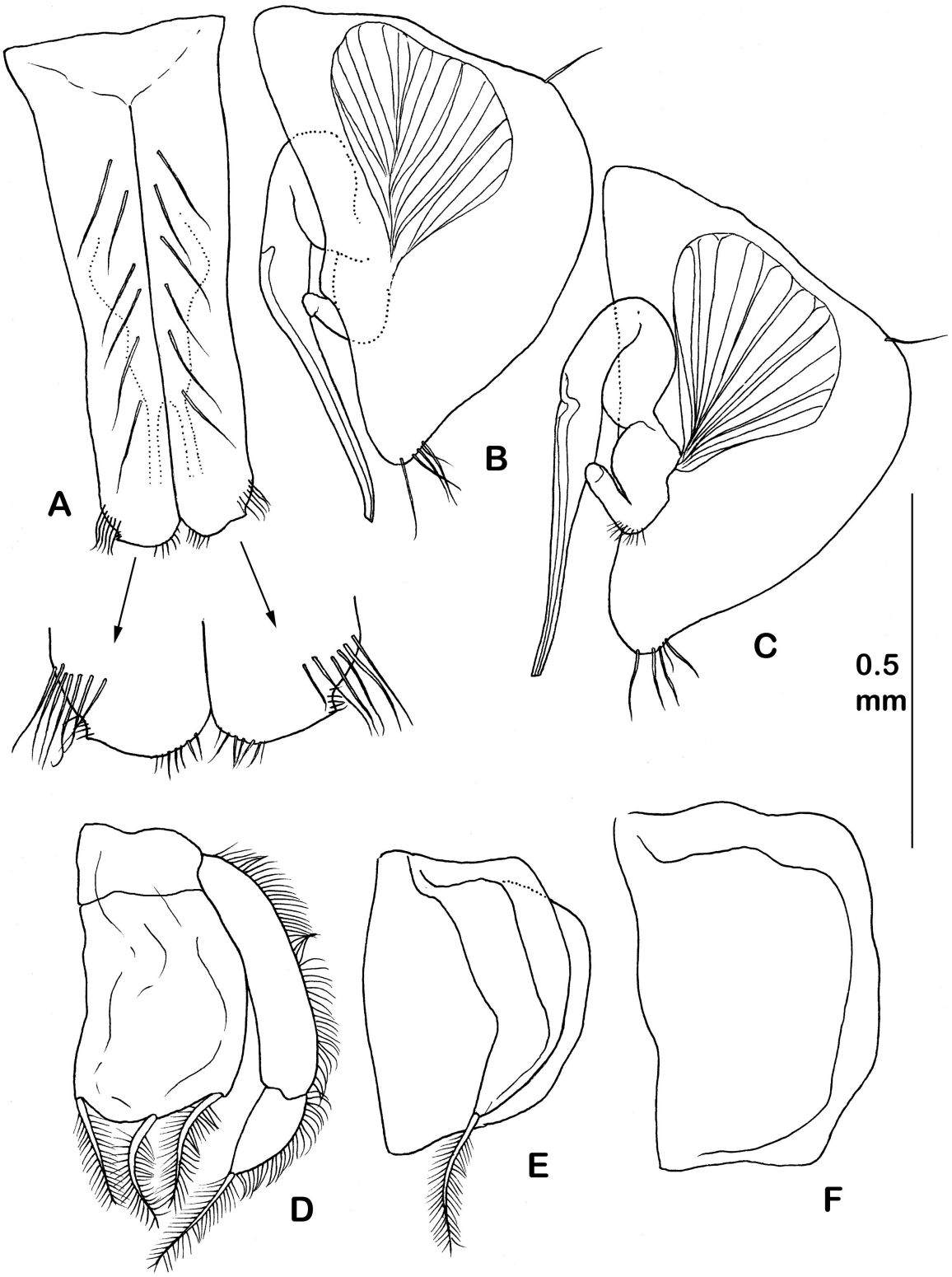

Figure 8. *Eurycope producta* GO Sars, 1868. Male (ZMH K-45592): (**A**) pleopod I (distal margin enlarged); (**B**) left pleopod II, ventral view; (**C**) right pleopod II, dorsal view; (**D**) pleopod III; (**E**) pleopod IV; (**F**) pleopod V.

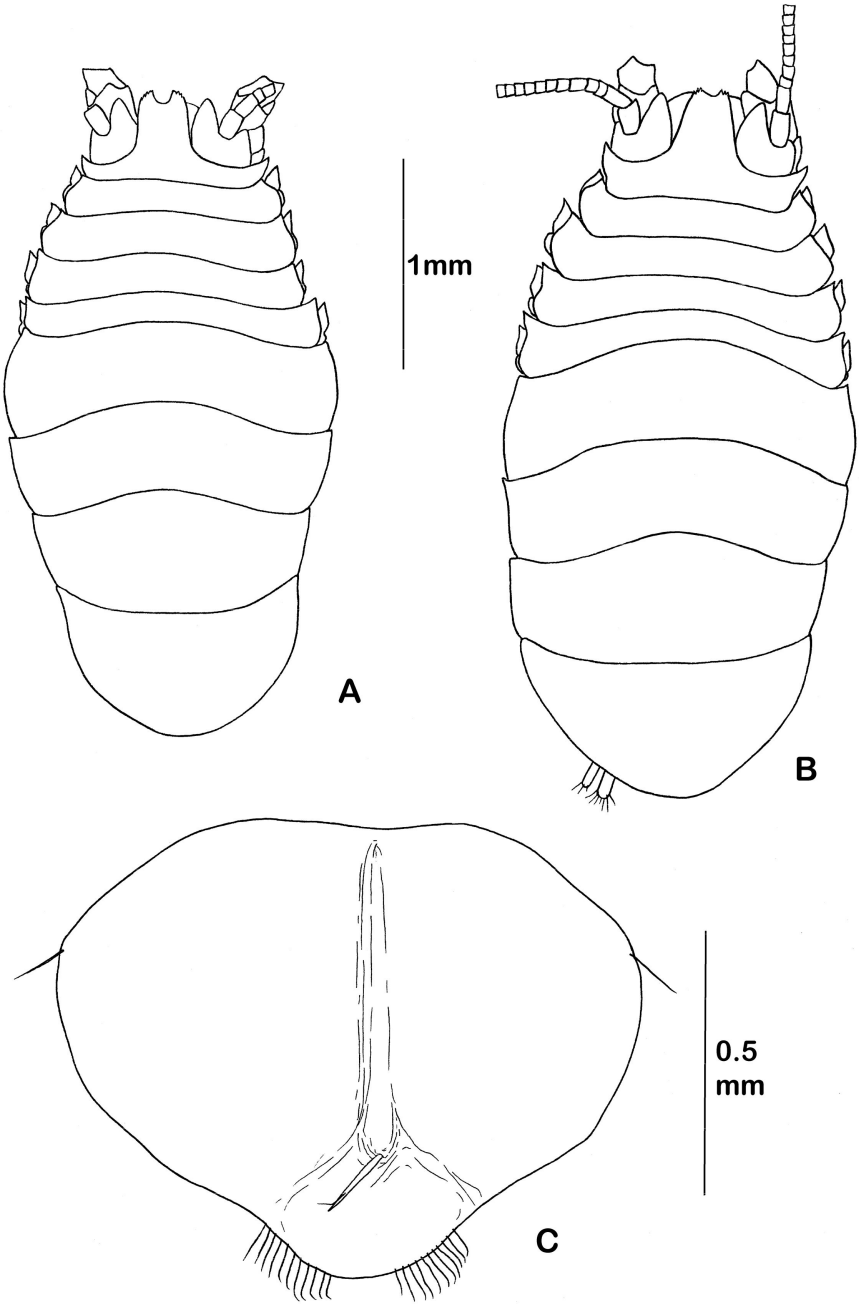

Figure 9. *Eurycope producta* GO Sars, 1868. Female (ZMH K-45583): (**A**) dorsal view; female (ZMH K-45584): (**B**) dorsal view; female (ZMH K-45583): (**C**) pleopod II.

3.3. Eurycope dahli Svavarsson, 1987

Material examined:

Male (ZMH K-45598), 5.7 mm length; male (ZMH K-45609), used for dissection; female (ZMH K-45612), 4.6 mm length; juvenile (ZMH K-45606); and 19 further specimens (see Table 1 for specimen information).

Diagnosis: Cephalon rostrum not tapering distally length 1.0 times basal width, 0.8 times antenna I article I length, basal width 0.75 times antenna I width. Maxilliped endite with four coupling hooks. Basis lateral projection near palp insertion length 1.2 times article 1 lateral length. Palp article 2 length 1.05 times width, width 0.85 times basis width. Article 4 distomedial lobe length 0.8 times article 5 length. Epipod length 2.2 times width, 0.85 times basis length, width 1.2 times basis width. Male pleopod I length 2.7 times basal width, width 0.5 times basal width, distal margin straight, lobes not separated. Male

pleopod II protopod distomedial notch length 0.3 times medial margin length. Endopod of pleopod III with six plumose distal setae. Uropod protopod length 1.0 times width; endopod length 1.35 times protopod length, width 0.35 times protopod width; exopod length 0.95 times endopod length.

Description of male (ZMH K-45598, Figure 10A–C): Body length 2.1 times pereonite 5 width. Cephalon behind antennulae slightly shorter than pereonite 1; interantennular distance 0.65 times antenna I basal width, 0.25 times cephalon width. Rostrum length 1.0 times basal width, 0.8 times antenna I article I length, not reaching tip of article 1 of antenna I, longitudinal groove deep. Pereonites 1–4 subequal in medial length. Pereonite 5 width 1.75 times pereonite 1 width; pereonite 7 posterior width 1.3 times pereonite 1 width. Natasome length 2.0 times anterior body part length. Pereonites 5 and 6 of same length; pereonite 7 longest; medial length 0.8 times pereonites 5 and 6's combined medial length. Ventral projection of pereonites 6–7 0.35 times body length. Pleotelson length 0.9 times width, 0.35 times body length.

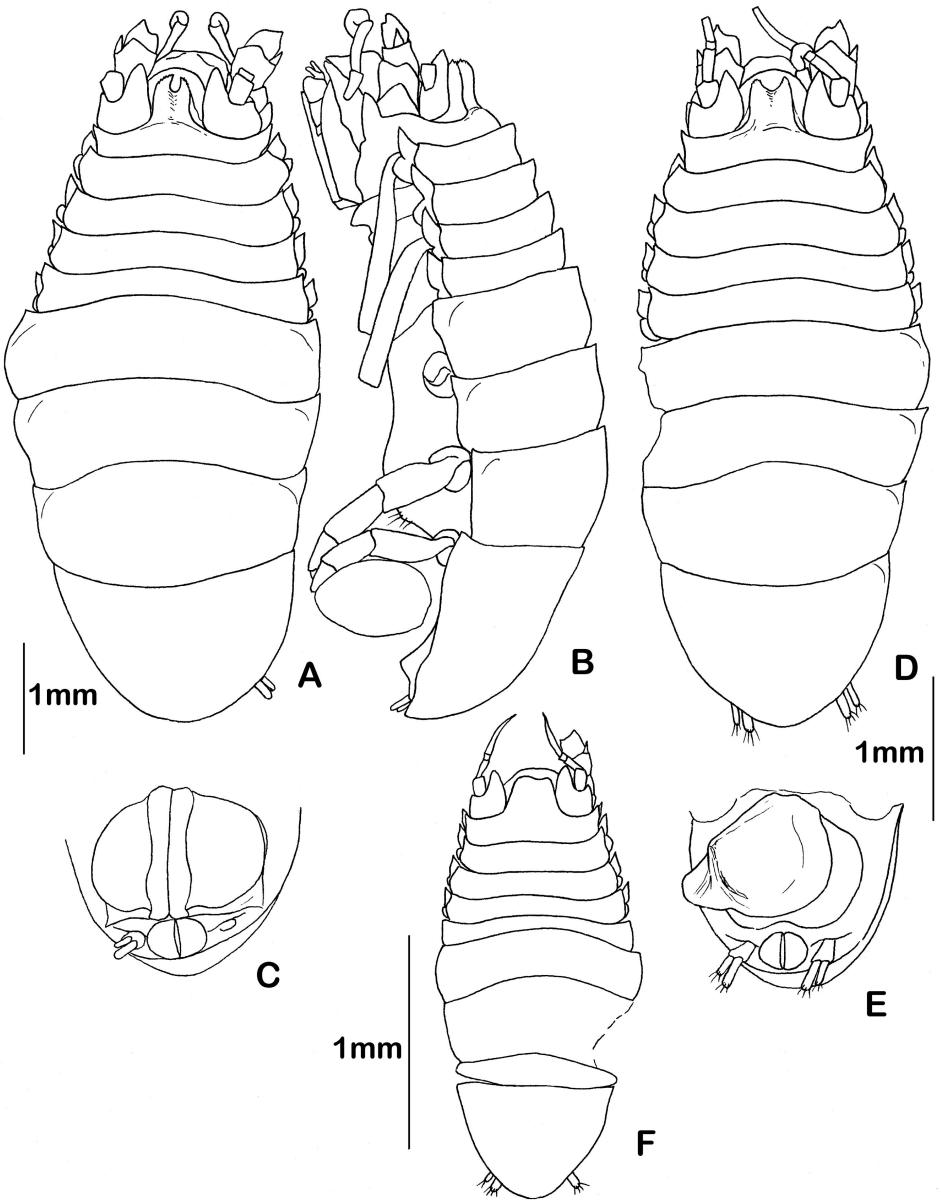

Figure 10. *Eurycope dahli* Svavarsson, 1987. Male (ZMH K-45598): (**A**) dorsal view; (**B**) lateral view; (**C**) pleotelson, ventral view. Female (ZMH K-45612): (**D**) dorsal view; (**E**) pleotelson, ventral view; juvenile (ZMH-K 45606): (**F**) dorsal view.

Antenna I (male, ZMH K-45609, Figure 11A) broken off on article 3; article 1 length 1.15 times width with two distal and two dorsal broom setae; article 2 length 0.35 times article 1 length, not reaching tip of distomedial lobe of article 1, with one distal broom seta; article 3 broken, width 0.4 times article 2 width.

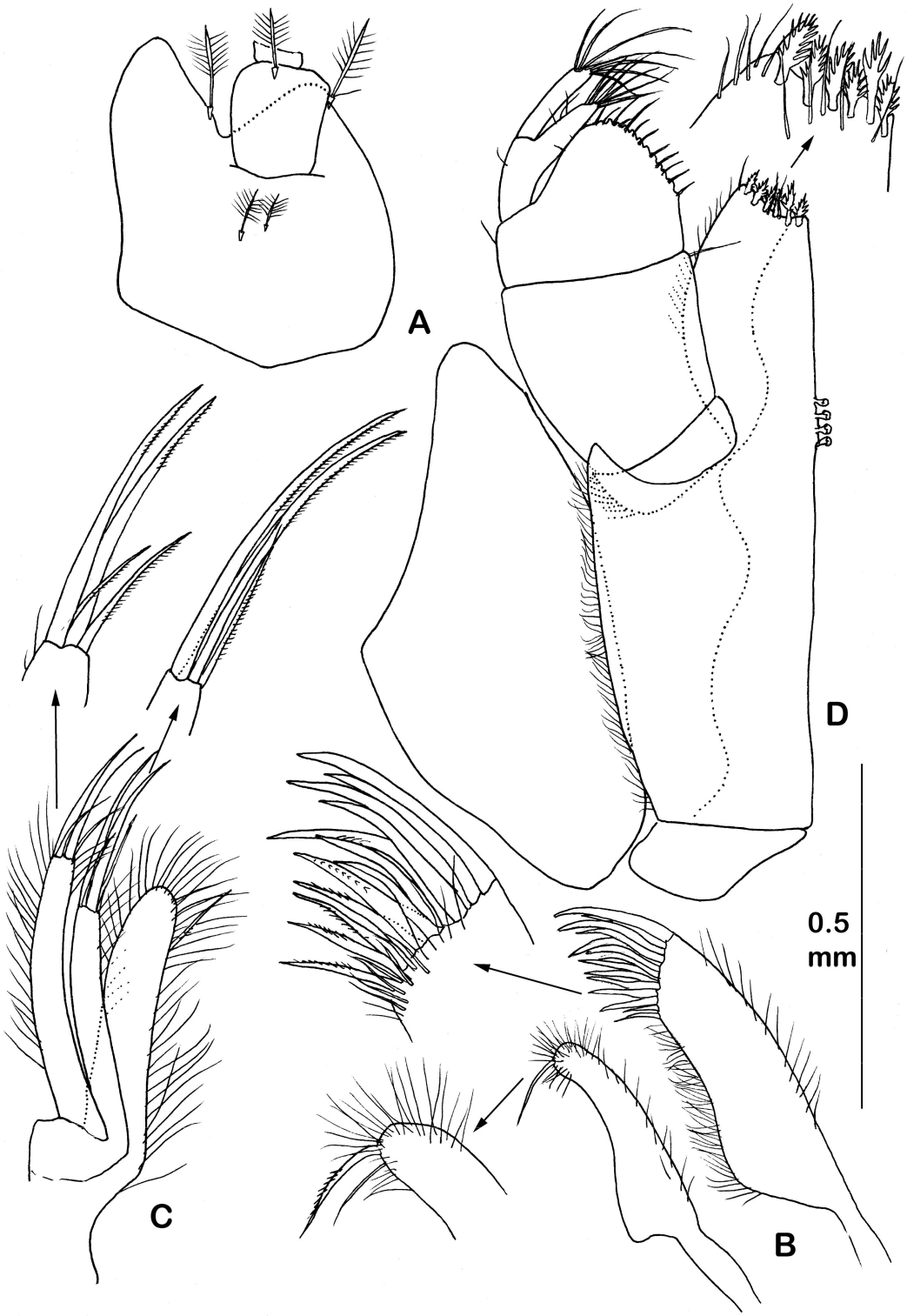

Figure 11. *Eurycope dahli* Svavarsson, 1987. Male (ZMH K-45609): (**A**) antenna I, articles 1 and 2; (**B**) maxilla I (distal parts enlarged); (**C**) maxilla II (distal parts enlarged); (**D**) maxilliped (distal parts of endite enlarged).

Antenna II (male, ZMH K-45598, Figure 12A) broken off after article 4; articles 1–4 subequal in length; squama on article 3 reaching midlength of article 4.

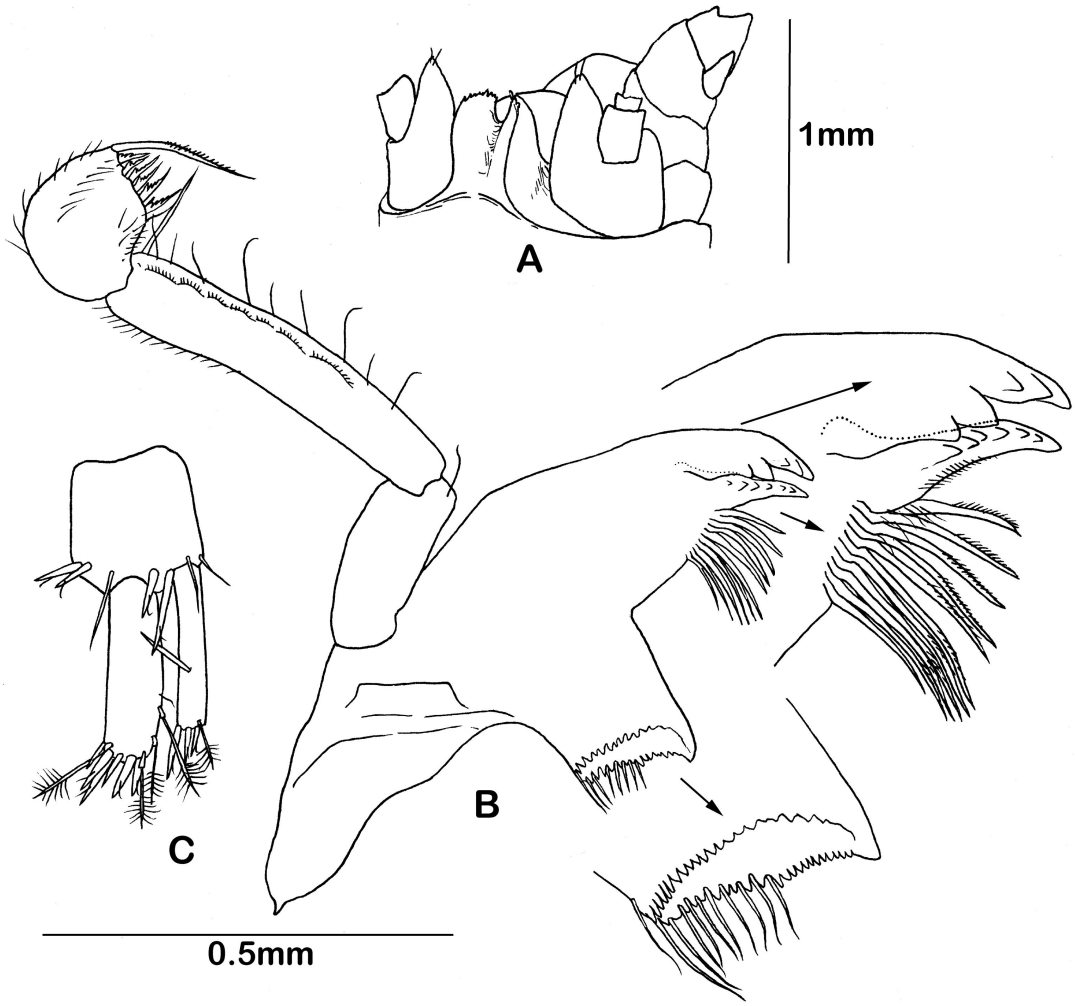

Figure 12. *Eurycope dahli* Svavarsson, 1987. Male (ZMH K-45598): (**A**) cephalon with rostrum antennae I and antenna II; male (ZMH K-45609): (**B**) left mandible (incisor and molar process enlarged); (**C**) uropod.

Mandible (male, ZMH K-45609, Figure 12B) incisors of left mandible with six cusps, lacinia mobilis almost as long as incisor, with seven distal teeth; spine row with 11 spines; molar process distodorsally acute, with 11 small setae on base of denticles; condyle length 0.15 times mandibular body length. Palp length 1.05 times mandibular body length; article 2 with nine thin medial setae and one long distal seta; articles 2 and 3's lengths 2.1 times and 0.85 times article 1 length, respectively. Article 3 distal seta length 3.5 times other marginal setae length and as long as article 3.

Maxilla I (male, ZMH K-45609, Figure 11B) mesial endite width 0.7 times lateral endite width, with fine distal setae, and one stout long distomedial seta; lateral endite with 12 robust setae, four distolateral setae smooth—other setae differently serrated.

Maxilla II (male, ZMH K-45609, Figure 11C) mesial and lateral endites subequal in length, middle endite shortest; mesial endite with tuft of distal setae, one long setulated seta distomedially, middle and lateral endites with two long and two shorter comb-like distal setae.

Maxilliped (male, ZMH K-45609, Figure 11D) basis length 2.85 times width; endite width 0.55 times basis width, with four coupling hooks, distal margin slightly concave, with six small fan setae. Basis acute lateral projection near palp insertion length 1.2 times

article 1 lateral length. Palp length 2.6 times width, 0.75 times basis length. Article 2 length 1.05 times width, width 0.85 times basis width, lateral length 1.4 times medial length. Article 3 almost equal to article 2 in width and medial length, lateral length 0.3 times article 2 lateral length; medial margin rounded, denticulate, with small setae. Article 4 lateral length 1.45 times article 3 lateral length, medial lobe slightly shorter that article 5, with six long distal setae. Article 5 as long as article 4 laterally, with seven long distal setae. Epipod length 2.2 times width, 0.85 times basis length, width 1.2 times basis width.

Pereopods broken off.

Pleopod I (male, ZMH K-45609, Figure 13A) length 2.7 times basal width, distal width 0.5 times basal width, distal margin straight, medial and lateral lobes not separated, distolateral and distomedial angles with small setulae, each lobe with seven small ventral setae subdistally.

Pleopod II (male, ZMH K-45609, Figure 13B) protopod length 1.6 times width, 0.9 times pleopod I length; distal margin with eight simple setae, distomedial notch well defined, length 0.3 times medial margin length. Stylet length 0.7 times protopod length, tip reaching slightly behind pleopod II tip; sperm duct opening at 0.4 times length from proximal margin. Exopod distal article half as wide and almost as long as basal article.

Pleopod III (male, ZMH K-45609, Figure 13C) protopod length 0.45 times width, endopod length 1.3 times width; six plumose setae distally, length 0.35 times pleopod III length; exopod subequal in length to protopod and endopod together, width 0.3 times endopod width, with row of fine simple marginal setae, plumose seta distally, length slightly longer than endopod distal setae length.

Pleopod IV (male, ZMH K-45609, Figure 13D) endopod length 1.4 times width; exopod 0.9 times endopod length and 0.6 times endopod width. Stout plumose distal seta length 1.2 times distal seta of pleopod III exopod length.

Pleopod V (male, ZMH K-45609, Figure 13E) length 1.2 times width.

Uropod (male, ZMH K-45609, Figure 12C) length 0.25 times pleotelson length; protopod cylindrical, length 1.0 times width, with four UB and three simple distal setae. Endopod length 1.35 times protopod length, width 0.4 times protopod width, with four broom and six UB distal setae. Exopod length 0.95 times endopod length, width 0.5 times endopod width, with one broom and three UB distal setae.

Female (ZMH K-45612, Figure 10D) habitus is similar to male.

Antenna I (female, ZMH K-45612, Figure 10D) article 1 length 1.1 times width, distomedial lobe reaching beyond tip of article 2. Article 2 length 0.45 times article 1 length, 0.8 times distomedial lobe of article 1 length. Articles 3 length 1.4 times article 2 length; articles 3–5 width 0.75 times article 2 width; articles 4 and 5 subequal in width. Tip of flagellum broken off.

Pleopod II (female, ZMH K-45612, Figure 10E) length 1.2 times width; distomedial margin overlapping anterior part of anal operculum; ventral keel length 0.7 times pleopod II length.

Remarks: The species differs from other species of the complex by its rostrum, which is shorter (0.8 times) than antenna I article I (in all other species the rostrum is equal in length or longer than antenna I article I) and narrower (0.75 times) than antenna I article I. It is the only species of the complex which has six distal plumose setae on the endopod of pleopod III (all others have only three setae).

Distribution: The Greenland Sea (2470–3709 m), the Norwegian Sea (2085–3672 m), and the North Polar Basin (81°40′N 2°602′E 2400–2500 m). The studied specimens of *E. dahli* were sampled in the Norwegian Sea, featuring a depth range of 2203–2373 m depth.

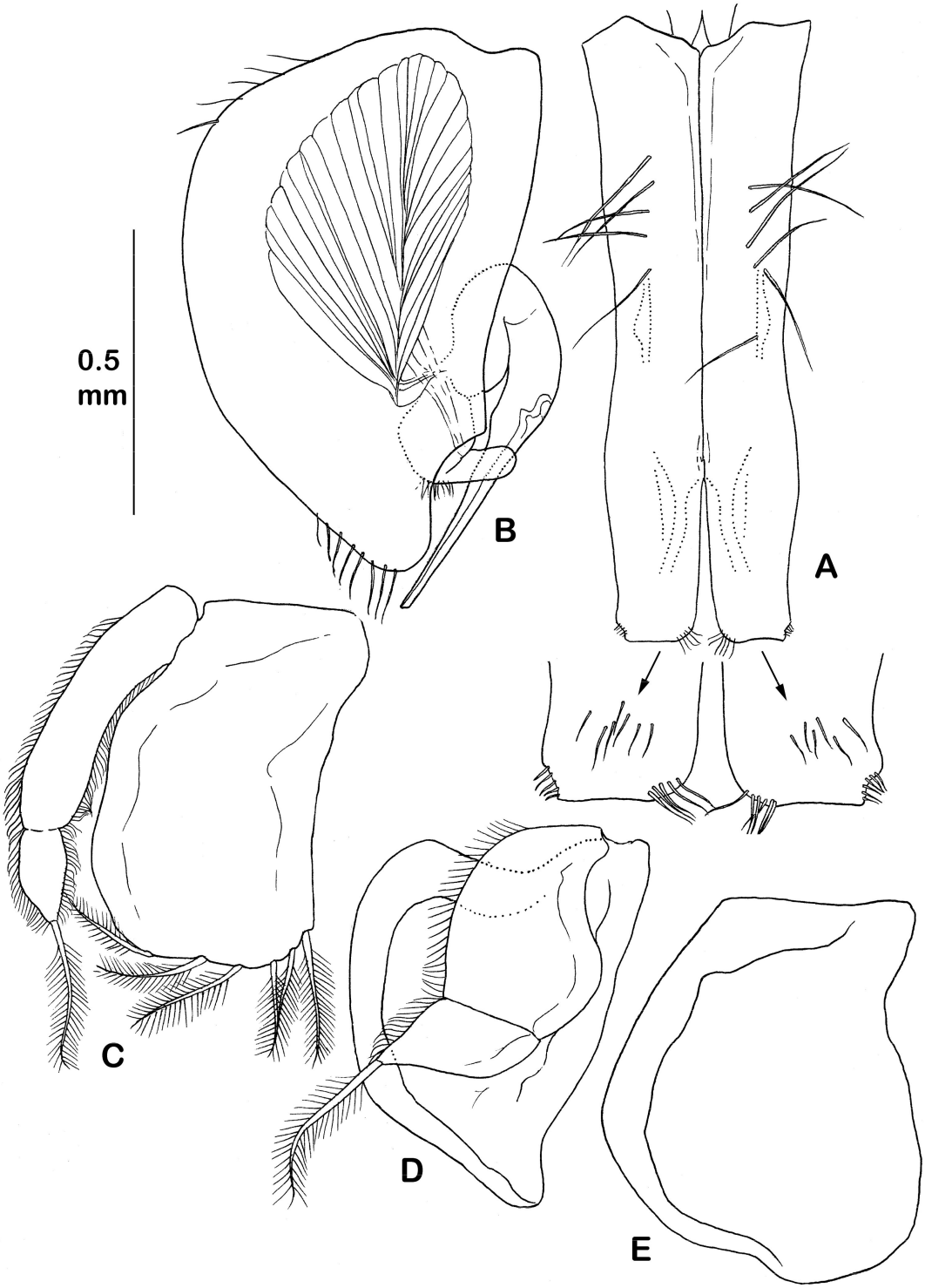

Figure 13. *Eurycope dahli* Svavarsson, 1987. Male (ZMH K-45609): (**A**) pleopod I (distal margin enlarged); (**B**) pleopod II; (**C**) pleopod III; (**D**) pleopod IV; (**E**) pleopod V.

3.4. Eurycope mishkai Malyutina & Schnurr sp. nov.

http://zoobank.org/4EBD065A-900B-4F8B-99C1-F957C591FFB2 (accessed on 3 June 2022)

Material examined:
Holotype: male (ZMH K-45621), 3.1 mm length.

Paratypes: female (ZMH K-45626), 3.1 mm length; female (ZMH K-45625), used for dissection; male (ZMH K-45624), used for dissection; and 2 further specimens (see Table 1 for specimen information).

Diagnosis: Cephalon rostrum tapering distally, length 1.0 times basal width basal width subequal to antenna I basal width, longitudinal groove deep. Maxilliped endite with three coupling hooks. Basis lateral projection near palp insertion as long as article 1. Article 4 distomedial lobe length 1.25 times article 5 length. Epipod length 2.35 times width, 0.95 times basis length, width 1.2 times basis width. Epipod length 2.1 times width, 0.9 times basis length, width 1.35 times basis width. Pleopod I length 4.0 times basal width; distal margin straight, its width 0.5 times basal width; medial and lateral lobes not separated. Male pleopod II protopod distomedial notch length 0.4 times medial margin length. Uropod protopod length 1.0 times width; endopod length 1.25 times protopod length, width 0.5 times protopod width; exopod length 0.95 times endopod length.

Description of male (holotype, ZMH K-45621, Figure 14A–D): Body length 2.2 times pereonite 5 width. Cephalon interantennular distance subequal to antenna I basal width, 0.3 times cephalon width. Rostrum length 1.0 times basal width, slightly reaching behind tip of article 1 of antenna I; longitudinal groove deep. Pereonite 5 width 1.5 times pereonite 1 width; pereonite 7 posterior width 1.2 times pereonite 1 width. Natasome length 2.3 times anterior body part length. Pereonites 5–7 subequal in lateral length; medially, pereonites 5 shortest; pereonite 6 slightly longer; pereonite 7 longest. Pereonite 7 medial length 0.6 times pereonites 5 and 6's combined medial length. Pleotelson length 0.65 times width, 0.25 times body length.

Antenna I (male paratype, ZMH K-45624, Figure 15A) article 1 length 1.3 times width, with one small UB distomedial seta. Article 2 length 0.3 times article 1 length, 0.7 times distomedial lobe of article 1 length, with two distal broom setae. Articles 3 and 4 lengths 1.0 times and 0.2 times article 2 length, respectively; article 3 width 0.75 times article 2 width. Flagellum broken off.

Antenna II (male holotype, ZMH K-45621, Figure 14A,C) broken off after article 4; articles 1–4 subequal in length; squama on article 3 reaching midlength of article 4.

Mandible (male paratype, ZMH K-45624, Figure 15B) incisors of left mandible with four cusps; lacinia mobilis almost as long as incisor, with four distal teeth; spine row with eight spines; molar process distodorsal margin acute, with four small setae on base of denticles; condyle length 0.15 times mandibular body length. Palp length 0.85 times mandibular body length; article 2 with two long distal setae; articles 2 and 3 lengths 1.95 times and 0.95 times article 1 length, respectively. Article 3 distal seta length 1.65 times other marginal setae and 0.85 times article 3 length.

Maxilla I (male paratype, ZMH K-45624, Figure 15C) mesial endite width 0.7 times lateral endite width, with fine distal setae and one stout long distomedial seta; lateral endite with 12 robust setae, four distolateral setae smooth other setae differently serrated.

Maxilla II (male paratype, ZMH K-45624, Figure 15D) mesial and lateral endites subequal in length, middle endite shortest; mesial endite with tuft of distal setae, one long setulated seta distomedially, middle and lateral endites with two long and two shorter comb-like distal setae.

Maxilliped (male paratype, ZMH K-45624, Figure 15E) basis length 2.9 times width; endite width 0.5 times basis width, with three coupling hooks; distal margin slightly concave, with five small fan setae and numerous fine small setae. Basis acute lateral projection near palp insertion as long as article 1. Palp length 2.0 times width, 0.7 times basis length. Article 2 length 0.85 times width, as wide as basis; lateral length 1.05 times medial length. Article 3 almost equal to article 2 in width; medial length 0.7 times medial length of article 2; medial margin rounded, denticulate, with small setae; lateral length 0.3 times article 2 lateral length. Article 4 lateral length equal to article 3 lateral length; medial lobe length 1.1 times article 5 length, with three long distal setae; article 5 with three long distal setae. Epipod length 2.35 times width, 0.95 times basis length, width 1.2 times basis width.

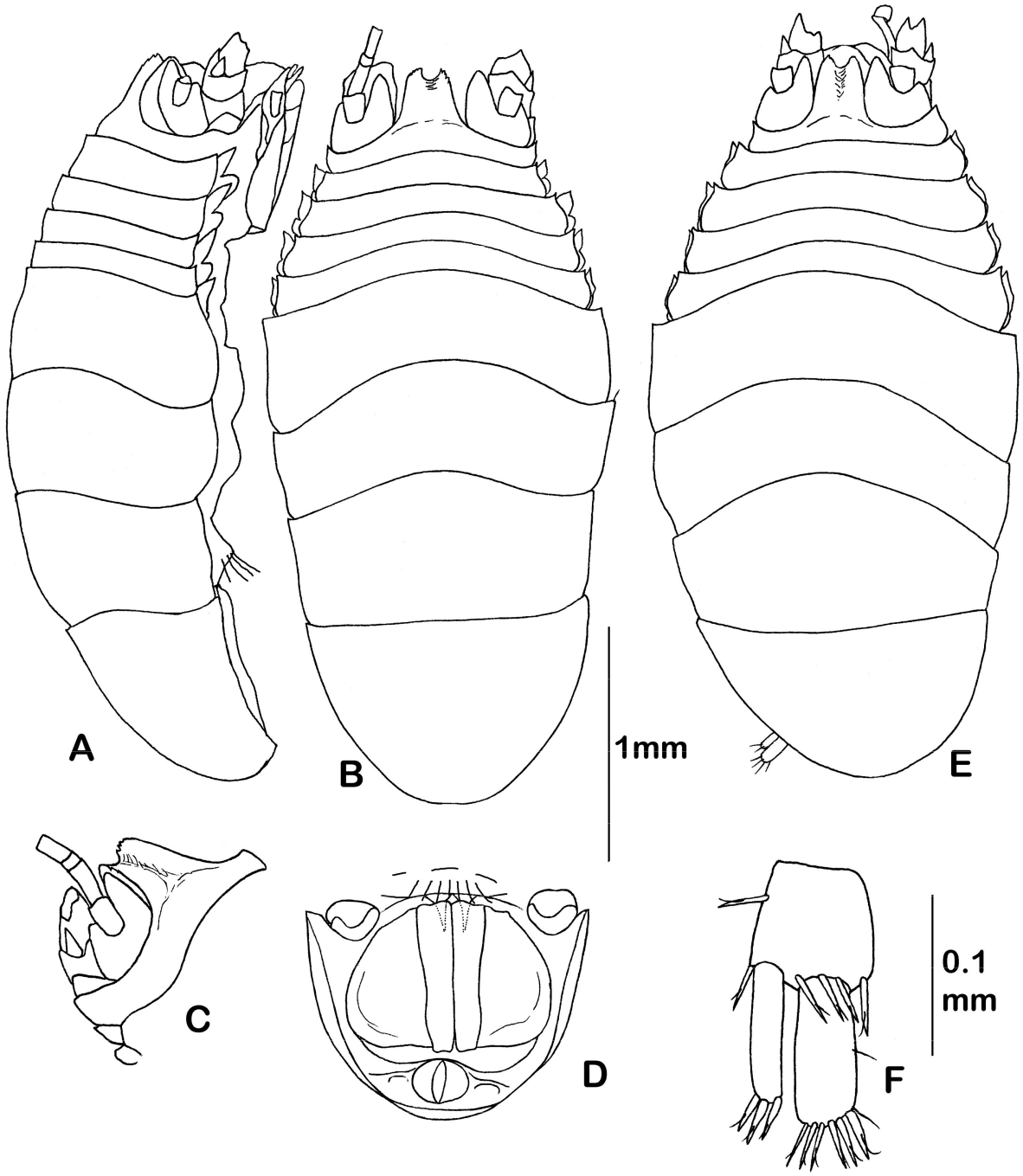

Figure 14. *Eurycope mishkai* sp. nov. Male holotype (ZMH K-45621): (**A**) lateral view; (**B**) dorsal view; (**C**) cephalon with rostrum, antenna I and antenna II; (**D**) pleotelson, ventral view. Female paratype (ZMH K-45626): (**E**) dorsal view. Female paratype (ZMH K-45625): (**F**) uropod.

Pereopods broken off.

Pleopod I (male paratype, ZMH K-45624, Figure 16A) length 2.5 times basal width, distal width 0.5 times basal width; distal margin truncated; medial and lateral lobes not separated. Distolateral and distomedial angles with small setulae.

Pleopod II (male paratype, ZMH K-45624, Figure 16B) Protopod length 1.5 times width, 0.75 times pleopod I length, distomedial weak notch 0.4 times protopod length, distal margin with few simple setae. Stylet length 0.85 times protopod length, tip reaching behind protopod tip; sperm duct opening at 0.35 times length from proximal margin. Exopod distal article half as wide and almost as long as basal article; small setae on outer angle of hook.

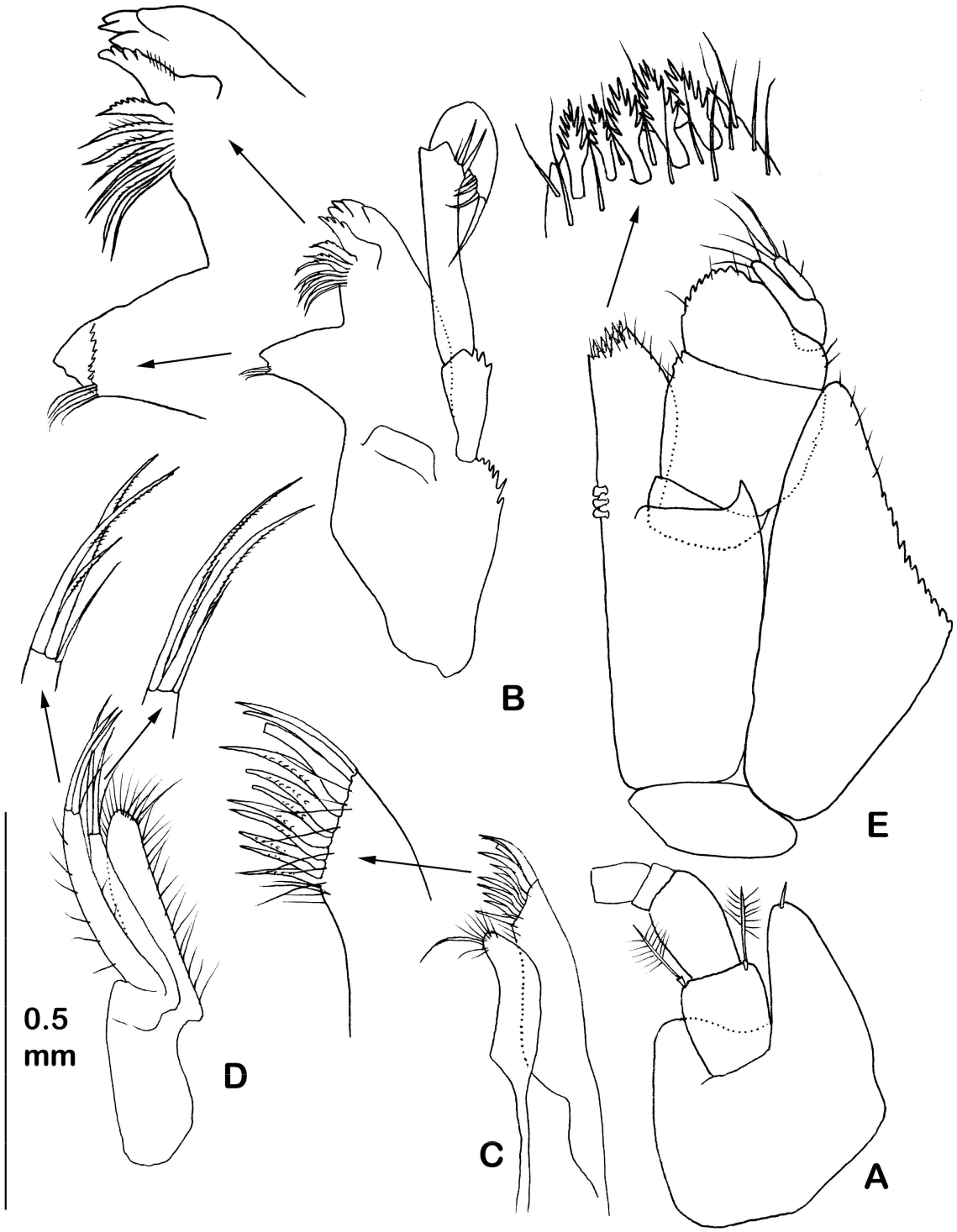

Figure 15. *Eurycope mishkai* sp. nov. Male paratype (ZMH K-45624): (**A**) antenna I; (**B**) left mandible (incisor and molar process enlarged); (**C**) maxilla I (distal parts enlarged); (**D**) maxilla II (distal parts enlarged); (**E**) maxilliped (distal parts of endite enlarged).

Pleopod III (male paratype, ZMH K-45624, Figure 16C) protopod length 0.65 times width; endopod length 1.3 times width, distal margin truncated, width 1.2 times proximal width, with three distal plumose setae, setae length 0.3 times pleopod III length. Exopod subequal in length to protopod and endopod together, width 0.3 times endopod width, with row of fine simple lateral setae; length of thin simple distal seta subequal to endopod distal setae length.

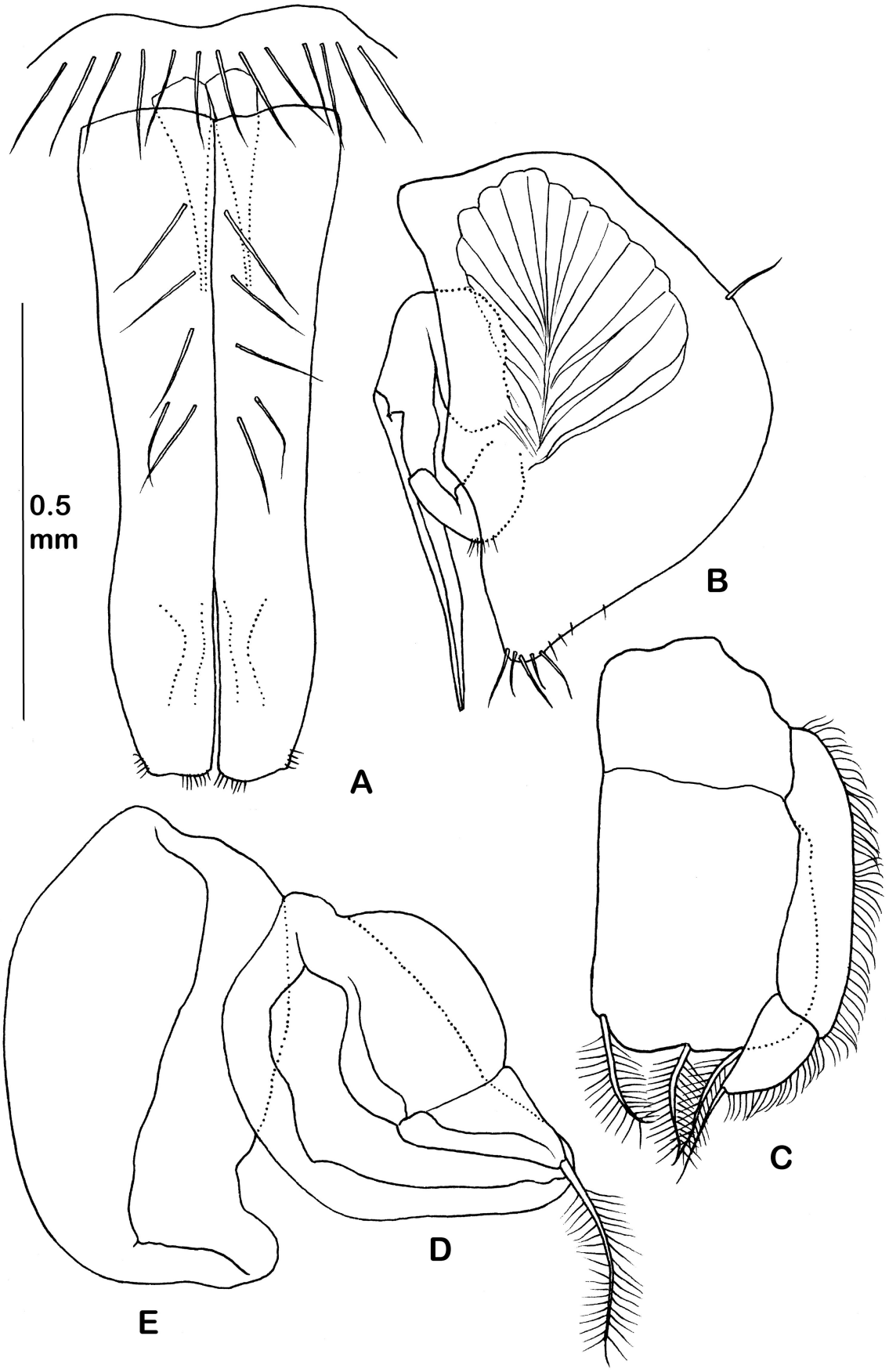

Figure 16. *Eurycope mishkai* sp. nov. Male paratype (ZMH K-45624): (**A**) pleopod I; (**B**) pleopod II; (**C**) pleopod III; (**D**) pleopod IV; (**E**) pleopod V.

Pleopod IV (male paratype, ZMH K-45624, Figure 16D) endopod length 2.1 times width; exopod length 0.9 times endopod length and 0.8 times endopod width. Stout plumose distal seta length 0.6 times exopod length and 1.7 times pleopod III distal setae length.

Pleopod V (male paratype, ZMH K-45624, Figure 16E) length 1.7 times width.

Female (female paratype, ZMH K-45626, Figure 14E) habitus similar to male, length 2.0 times width; natasome broader than in male. Cephalon interantennular distance 0.9 times antenna I basal width, 0.25 times cephalon width. Rostrum length 1.15 times basal width.

Uropod (female paratype, ZMH K-45625, Figure 14F) length 0.15 times pleotelson length; protopod cylindrical, length 1.0 times width, with one lateral and five UB distal setae. Endopod length 1.25 times protopod length, width 0.5 times protopod width, with one simple and six UB distal setae; exopod length 0.95 times endopod length, width 0.5 times endopod width, with three UB distal setae.

Etymology: The name honors Marina Malyutina's son, Mikhail Malyutin (Mishka is a child nickname).

Distribution: Known only in the type locality in the Denmark Strait at a depth of 1249 m.

3.5. Eurycope nikitai Malyutina & Schnurr sp. nov.

http://zoobank.org/AD5AFECD-0F9A-4F6C-9378-EBCFC254C0B6 (accessed on 3 June 2022)

Material examined:
Holotype: male (ZMH K-45627), 3.2 mm length.

Paratypes: female (ZMH K-45629), 3.8 mm length; male (ZMH K-45633); male (ZMH K-45630), used for dissection; and five further specimens (see Table 1 for specimen information).

Diagnosis: Pereonites 5–7 equal in medial length. Cephalon rostrum length 1.0 times basal width, subequal to antenna I basal width. Maxilliped endite with two coupling hooks. Basis lateral projection near palp insertion as long as article 1. Article 4 medial lobe length 0.6 times article 5 length. Epipod length 2.1 times width, 0.9 times basis length, width 1.35 times basis width. Pleopod I length 2.8 times basal width; distal margin with light rounded notch between distomedial and distolateral lobes. Male pleopod II protopod distomedial notch length 0.25 times medial margin length. Uropod protopod length 0.95 times width; endopod length 1.3 times protopod length, width 0.75 times protopod width; exopod as long as endopod.

Description of male (holotype, ZMH K-45627, Figure 17A–C): Body length 2.0 times pereonite 5 width. Cephalon behind antennulae slightly shorter than pereonite 1; interantennular distance 1.35 times antenna I basal width, 0.45 times cephalon width. Rostrum length 0.75 times basal width, reaching tip of article 1 of antenna I; distal width 0.35 times basal width; medial groove small. Ambulosome: pereonites 2 longest, pereonites 1, 3 and 4 subequal in medial length. Natasome length 1.8 times anterior body part length. Pereonite 5 width 1.4 times pereonite 1 width; pereonite 7 posterior width 1.2 times pereonite 1 width. Pereonites 5–7 subequal in medial length, pereonite 7 shortest laterally. Pleotelson length 0.8 times width, 0.35 times body length.

Antenna I (male paratype, ZMH K-45633, Figure 18A) article 1 length 1.0 times width, with one broom dorsal seta, one UB seta and one simple seta distomedially. Article 2 length 0.45 times article 1 length, reaching tip of distomedial lobe of article, with two broom and two simple distal setae. Article 3 and flagellum broken off.

Antenna II (male holotype, ZMH K-45627, Figure 17A,B) broken off after article 4; articles 1–4 subequal in length; squama on article 3 reaching midlength of article 4.

Antenna II (male paratype, ZMH K-45633, Figure 17E) twice longer than BL; article 5 length 0.5 times total body length, article 6 1.2 times article 5 length and slightly narrower than article 5; flagellum length 0.7 times peduncle length.

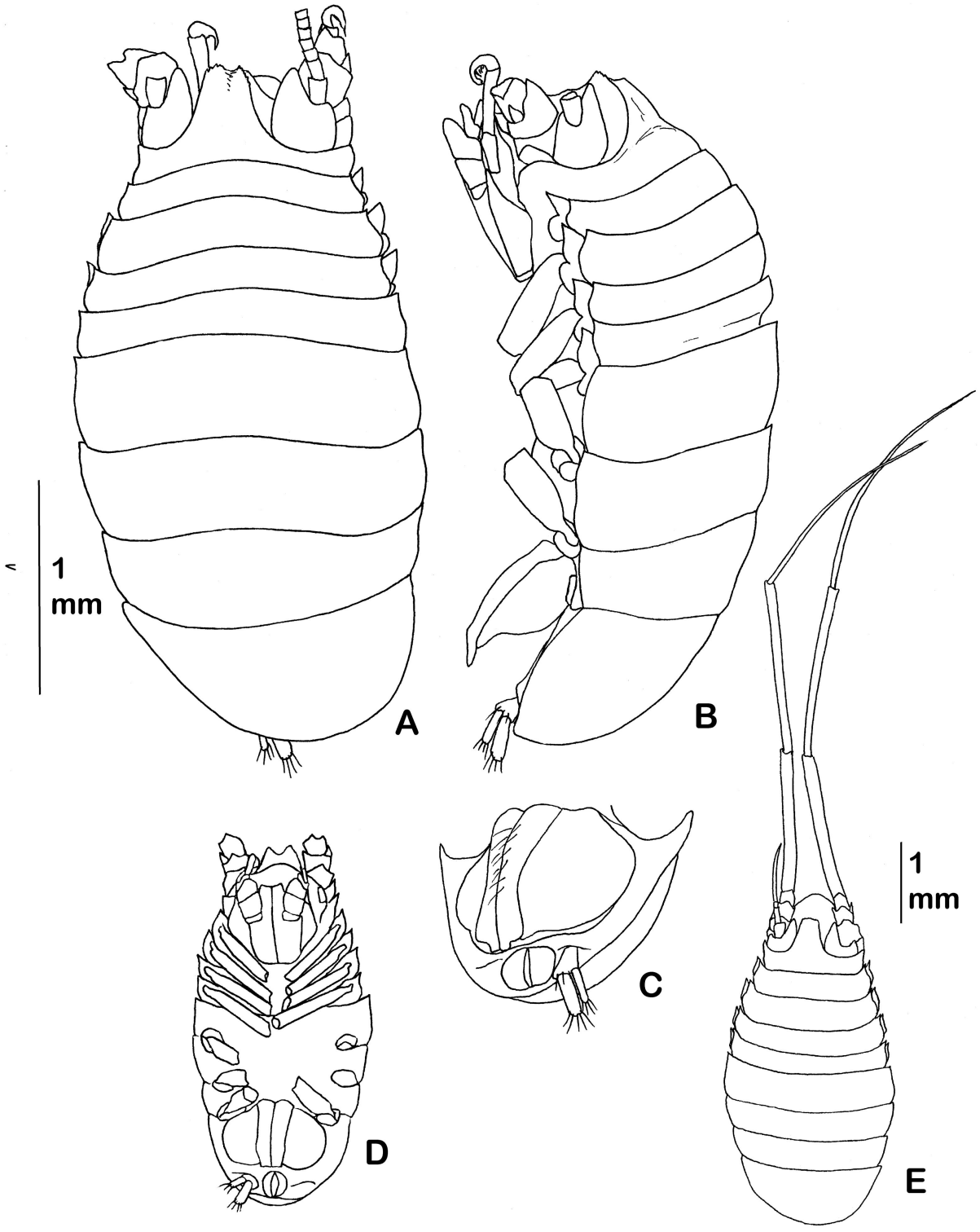

Figure 17. *Eurycope nikitai* sp. nov. Male holotype (ZMH K-45627): (**A**) dorsal view; (**B**) lateral view; (**C**) pleotelson, ventral view. Male paratype (ZMH K-45633): (**A**) dorsal view; (**B**) lateral view; (**C**) pleotelson, ventral view; (**D**) ventral view; (**E**) dorsal view.

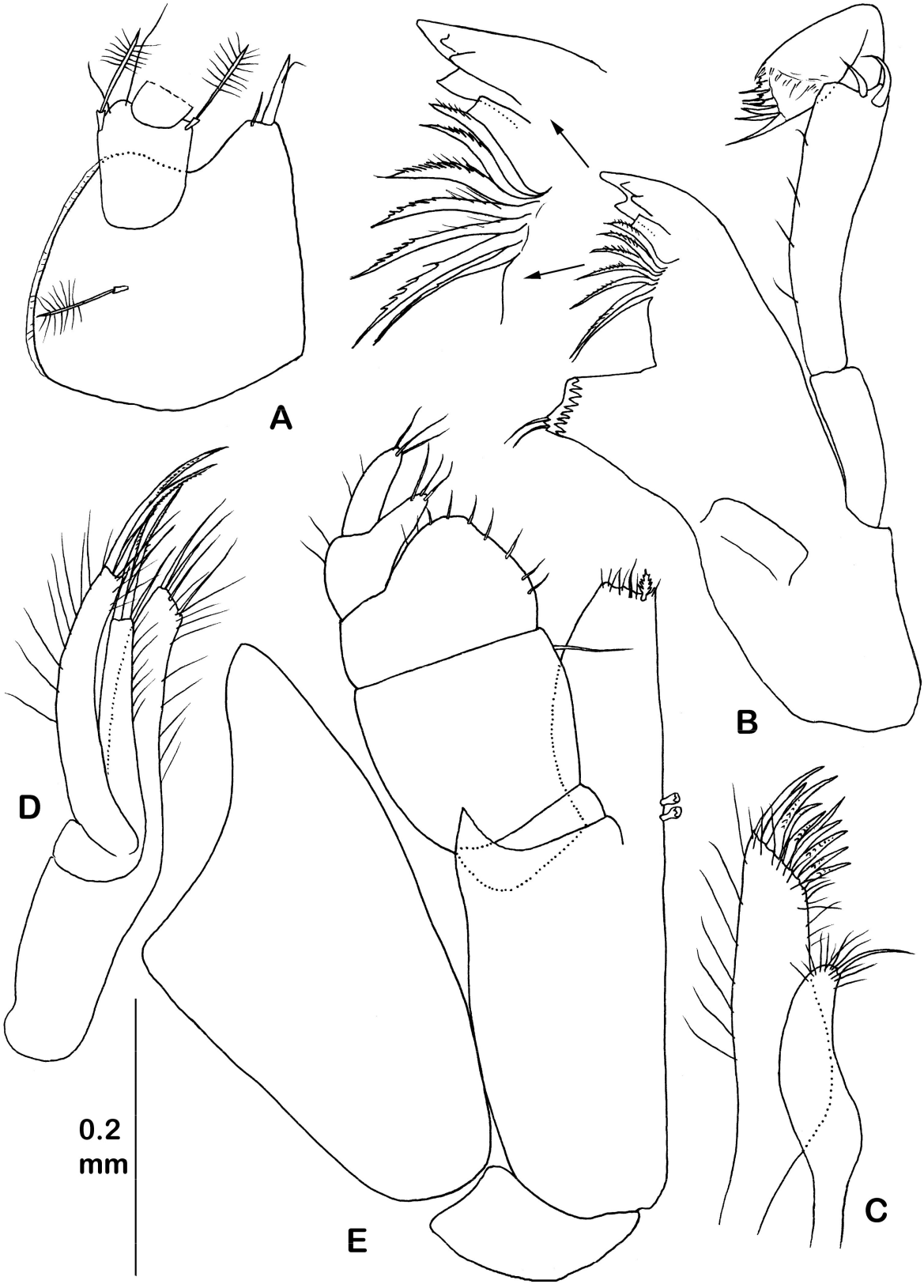

Figure 18. *Eurycope nikitai* sp. nov. Male paratype (ZMH K-45633): (**A**) antenna I, articles 1 and 2; (**B**) right mandible (incisor process enlarged); (**C**) maxilla I; (**D**) maxilla II; (**E**) maxilliped.

Mandible (male paratype, ZMH K-45633, Figure 18B) incisors of right mandible with four cusps, spine row with eight spines, molar process with two small distal setae on base

of denticles; condyle length 0.15 times mandibular body length. Palp length 1.05 times mandible body length; article 2 with two distal setae; articles 2 and 3 lengths 1.85 times and 0.95 times article 1 length, respectively. Article 3 distal seta length 1.65 times other marginal setae and 0.5 times article 3 length.

Maxilla I (male paratype, ZMH K-45633, Figure 18C) mesial endite width 0.65 times lateral endite width, with fine distal setae and one stout long distomedial seta; lateral endite with 12 robust distolateral setae differently serrated.

Maxilla II (male paratype, ZMH K-45633, Figure 18D) middle endite visibly shorter than mesial and lateral endites which subequal in length; mesial endite with row of distal setae, middle and lateral endites with two long and two shorter distal setae.

Maxilliped (male paratype, ZMH K-45633, Figure 18E) basis length 3.1 times width; endite width 0.5 times basis width, with two coupling hooks, distal margin narrow, straight, with one small fan seta. Basis acute lateral projection near palp insertion as long as article 1 laterally. Palp length 2.25 times width, 0.7 times basis length. Article 2 length 0.9 times width, as wide as basis; lateral length 1.15 times medial length; one long distomedial seta. Article 3 almost equal to article 2 in width; medial length 0.9 times article 2 medial length, lateral length 0.35 times article 2 lateral length; medial margin rounded, denticulate, with small setae. Articles 4 and 5 lateral lengths 1.2 times and 1.4 times article 3 lateral length, respectively, medial lobe slightly shorter than article 5, with three simple distal setae; article 5 with three simple distal setae. Epipod length 2.1 times width, 0.9 times basis length, width 1.35 times basis width.

Pereopod I (male paratype, ZMH K-45633, Figure 19A) length 0.75 times body length, length ratios of ischium–dactylus to basis: 0.3, 0.25, 0.9, 0.75, 0.25. Carpus 0.6 times width of basis, length 10.2 times width; nine UB setae ventrally. Propodus with three ventral simple setae and four simple distal setae. Dactylus almost straight, claw length 0.4 times dactylus length.

Pereopod II (male paratype, ZMH K-45633, Figure 19B) broken off after carpus. Basis–carpus length 0.75 times body length, length ratios of ischium–carpus to basis: 0.45, 0.3, and 1.3. Basis stout, length 5.2 times width with five small dorsal and two distal setae. Carpus length 10.7 times width with 14 ventral and three distal UB setae.

Pereopod V (male paratype, ZMH K-45633, Figure 19C) length ratios of ischium–dactylus to basis: 1.75, 0.75, 2.35, 2.2, 1.1. Basis length 1.3 times width, with one long plumose and two small simple dorsal setae. Ischium slightly narrower than basis, with three dorsal plumose setae. Merus with one dorsal and one ventral long simple setae. Carpus length 1.4 times width, with 12 dorsal and 10 ventral plumose setae, one stout UB seta and two long simple setae distodorsally. Propodus length 2.1 times width, dorsal margin serrated with nine plumose setae ventral margin with 10 plumose setae, one stout UB seta and one broom seta distodorsally. Dactylar dorsal claw twice longer than slim ventral claw.

Pereopod VII (male paratype, ZMH K-45633, Figure 19D) length 0.7 times pereopod V length, length ratios of ischium–dactylus to basis: 0.9, 0.5, 1.6, 1.4, 0.7. Basis length 2.1 times width; ischium as broad as basis, with four dorsal plumose setae; merus with one plumose dorsal seta. Carpus length 1.35 times width, with 10 dorsal and eight ventral plumose setae. Propodus length 2.35 times width, dorsal margin serrated with six plumose setae; ventral margin with eight plumose setae and one stout UB seta, one broom seta distodorsally. Dactylar dorsal claw three times longer than tiny ventral claw.

Pleopod I (male paratype, ZMH K-45633, Figure 20A) length 2.7 times basal width, distal width 0.7 times basal width; distal margin almost straight; lateral lobes slightly longer than medial; distomedial lobes with four small setulae each.

Pleopod II (male paratype, ZMH K-45633, Figure 20B) protopod length 1.5 times width, subequal to pleopod I length; distal margin with few simple setae; distomedial notch length 0.25 times medial margin length. Stylet length 0.45 times protopod length, tip not reaching pleopod I tip. Exopod distal article half as wide and almost as long as basal article.

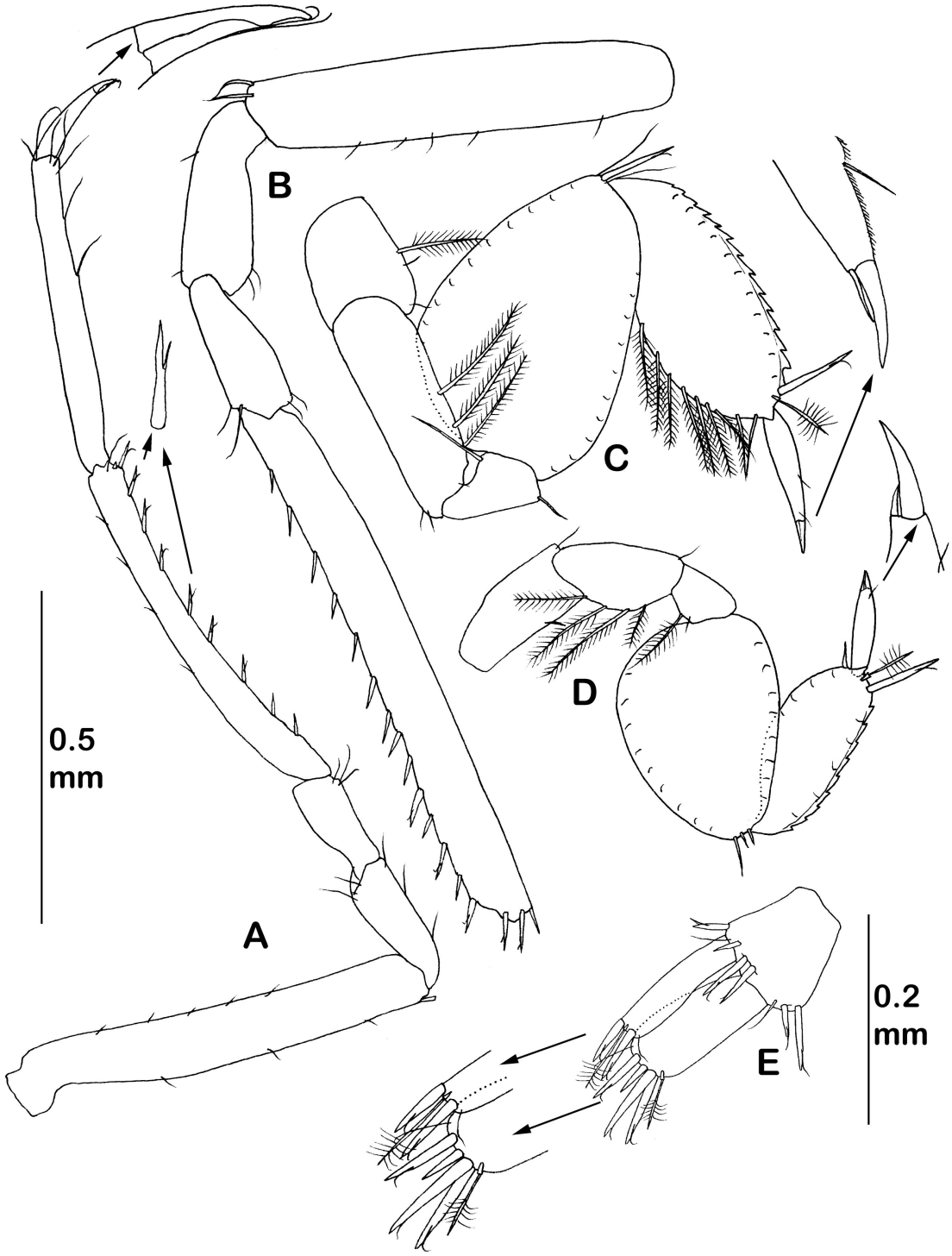

Figure 19. *Eurycope nikitai* sp. nov. Male paratype (ZMH K-45633): (**A**) pereopod I; (**B**) pereopod II; (**C**) pereopod V; (**D**) pereopod VII; (**E**) uropod.

Pleopod III (male paratype, ZMH K-45633, Figure 20C) protopod length 0.65 times width; endopod length 1.4 times width; three distal plumose setae length 0.7 times pleopod III length; exopod subequal in length to protopod and endopod together and 0.3 times width of endopod, with row of fine simple lateral setae; distal seta simple, thin, its length 0.3 times endopod distal setae length.

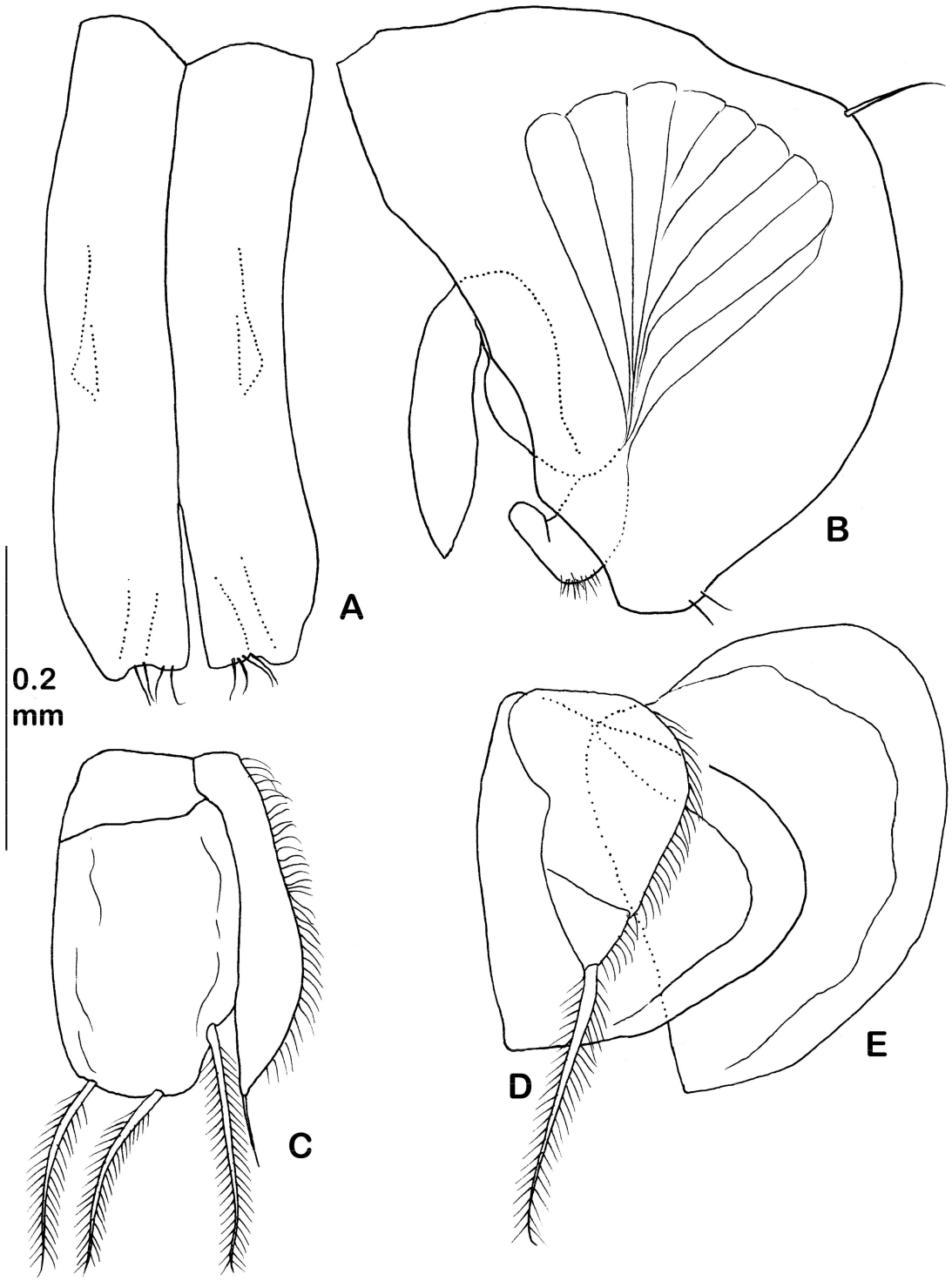

Figure 20. *Eurycope nikitai* sp. nov. Male paratype (ZMH K-45633): (**A**) pleopod I; (**B**) pleopod II; (**C**) pleopod III; (**D**) pleopod IV; (**E**) pleopod V.

Pleopod IV (male paratype, ZMH K-45633, Figure 20D) endopod length 1.2 times width, exopod 0.8 times endopod length and 0.5 times endopod width. Stout plumose distal seta as long as exopod.

Pleopod V (male paratype, ZMH K-45633, Figure 20E) length 1.2 times width, 1.15 times pleopod IV length.

Uropod (male paratype, ZMH K-45633, Figure 19E) length 0.3 times pleotelson length; protopod broadening distally, length 0.95 times width, with two simple and six UB distal

setae. Endopod length 1.3 times protopod length, width 0.5 times protopod width, with one simple, one broom, and four UB distal setae; exopod as long as endopod, width 0.5 times endopod width, with one broom and two UB distal setae.

Female (paratype, ZMH K-45629, Figure 21) habitus is similar to male, length 1.9 times width. Cephalon behind antennulae half as long as pereonite 1; interantennular distance 1.5 of antenna I basal width, 0.4 times cephalon width. Rostrum length 0.8 times basal width, apical width 0.4 times basal width, with small medial groove. In ambulosome pereonites 2–4 subequal in medial length. Pereonite 5 width 1.7 times pereonite 1 width; pereonite 7 posterior width 1.4 times pereonite 1 width.

Antenna I (female paratype, ZMH K-45629, Figure 21A,B) article 1 length 1.1 times width; distomedial lobe reaching midlength of article 2 with small distal seta. Article 2 length 1.15 times width, with two broom long distal setae; articles 3–5 lengths 1.05, 0.2, and 0.55 times article 2 length, respectively; articles 3–5 widths 0.75 times article 2 width; articles 4 and 5 subequal in width, 0.5 times article 2 width. Flagellum broken off.

Pleopod II (female paratype, ZMH K-45629, Figure 21C,D) length 0.9 times width; margins with few small simple setae, distomedial margin rounded, pronounced, overlapping anterior part of anal operculum, with 12 small simple setae; ventral keel length 0.7 times pleopod II length, long UB seta on tip.

Etymology: The name honors Marina Malyutina's eldest grandson, Nikita Malyutin.

Distribution: Known only from the Iceland Basin, featuring a depth range of 2568–2750 m.

3.6. Eurycope gordeyi Malyutina & Schnurr sp. nov.

http://zoobank.org/486D70A6-F43D-47CC-82F8-C623A774D875 (accessed on 3 June 2022)

Material examined:
Holotype: male (ZMH K-45636), 2.6 mm length.

Paratypes: male (ZMH K-45646), 2.9 mm length, used for dissection; male (ZMH K-45645), used for dissection; female (ZMH K-45651), 2.55 mm length; female (ZMH K-45638); and 11 further specimens (see Table 1 for specimen information).

Diagnosis: Cephalon rostrum length 1.1 times basal width, 1.2 times article 1 of antenna I length; width 1.2 times antenna I basal width. Maxilliped endite with five coupling hooks. Basis lateral projection near palp insertion length 0.9 times article 1 lateral length. Palp article 2 length 1.2 times width, article 4 medial lobe as long as article 5. Epipod length 2.5 times width, 0.95 times basis length; width 1.2 times basis width. Pleopod I length 3.25 times basal width, distomedial lobe length 0.05 times pleopod I length, width 0.3 times pleopod I basal width; distolateral lobes tiny, acute, slightly projected. Male pleopod II protopod distomedial notch length 0.35 times medial margin length. Uropod protopod length 1.15 width; endopod length 0.9 times protopod length, width 0.75 times protopod width; exopod length 0.85 times endopod length.

Description of male (holotype, ZMH K-45636, Figure 22A–C): Body length 1.85 times pereonite 5 width. Cephalon behind antennulae slightly shorter than pereonite 1; rostrum width subequal to antenna I basal width, 0.3 times cephalon width. Rostrum length 1.25 times basal width, 1.2 times antenna I article I length; medial groove deep, margins with small simple setae distally. Pereonite 5 width 1.6 times pereonite 1 width; pereonite 7 posterior width 1.35 times pereonite 1 width. Natasome length 2.1 times anterior body part length. Pereonites 5–7 subequal in lateral length; medially, pereonites 5 and 6 subequal in length; pereonite 7 longest, 0.6 times pereonites 5 and 6's combined medial length. Pleotelson length 0.7 times width, 0.3 times body length.

Antenna I (male paratype, ZMH K-45646, Figure 23A) article 1 length 1.0 times width, with three broom dorsal setae, distomedial lobe with two broom and two small UB setae. Article 2 length 1.05 times width, 0.85 times distomedial lobe of article 1 length, with three broom and three UB distal setae. Articles 3–5 subequal in width, 0.7 times article 2 width; lengths 0.9, 0.3, and 0.5 times article 2 length, respectively. Article 4 with one distal broom UB seta. Flagellum broken off after nine articles, last articles with eastetascs.

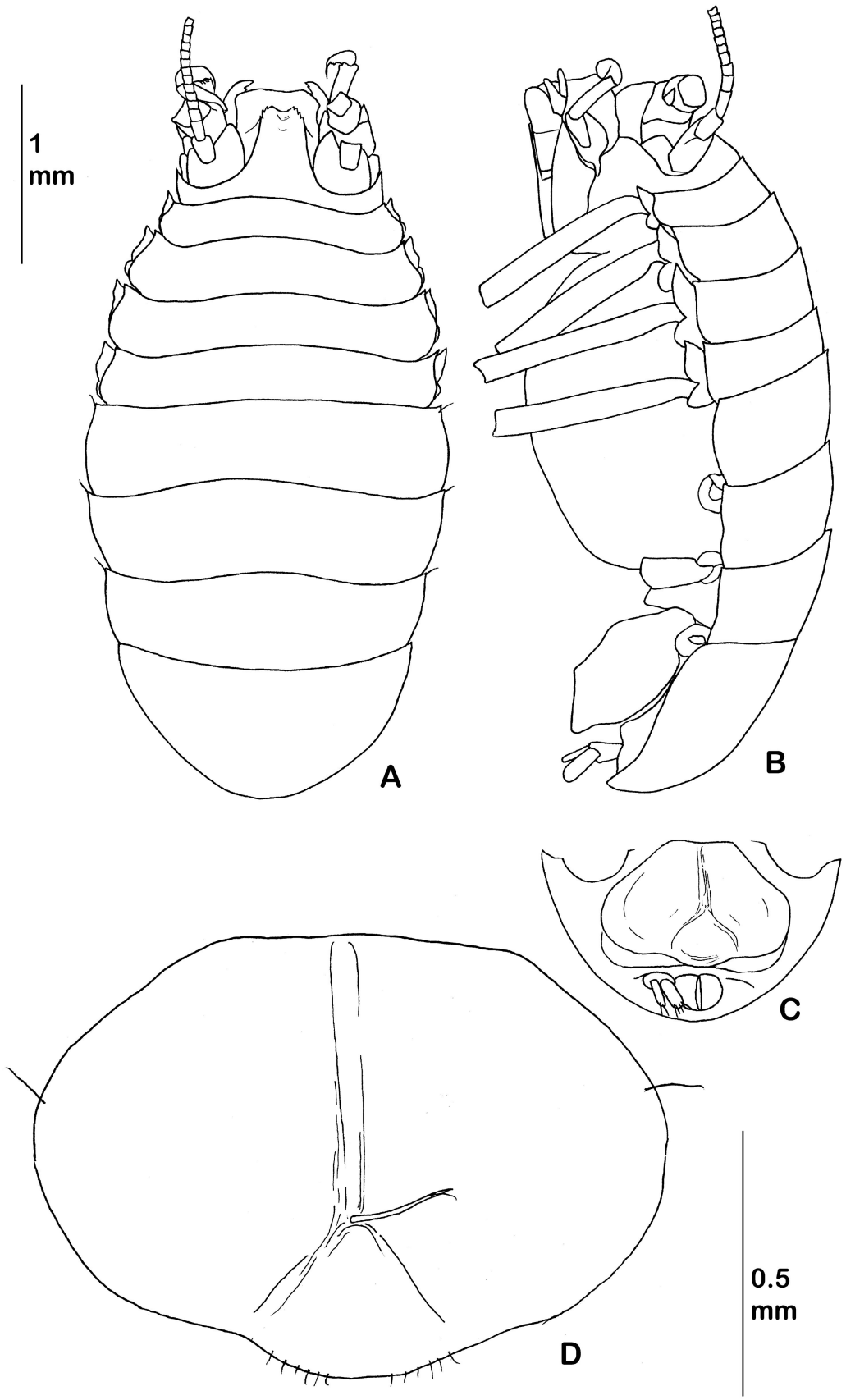

Figure 21. *Eurycope nikitai* sp. nov. Female paratype (ZMH K-45629): (**A**) dorsal view; (**B**) lateral view; (**C**) pleotelson, ventral view; (**D**) pleopod II.

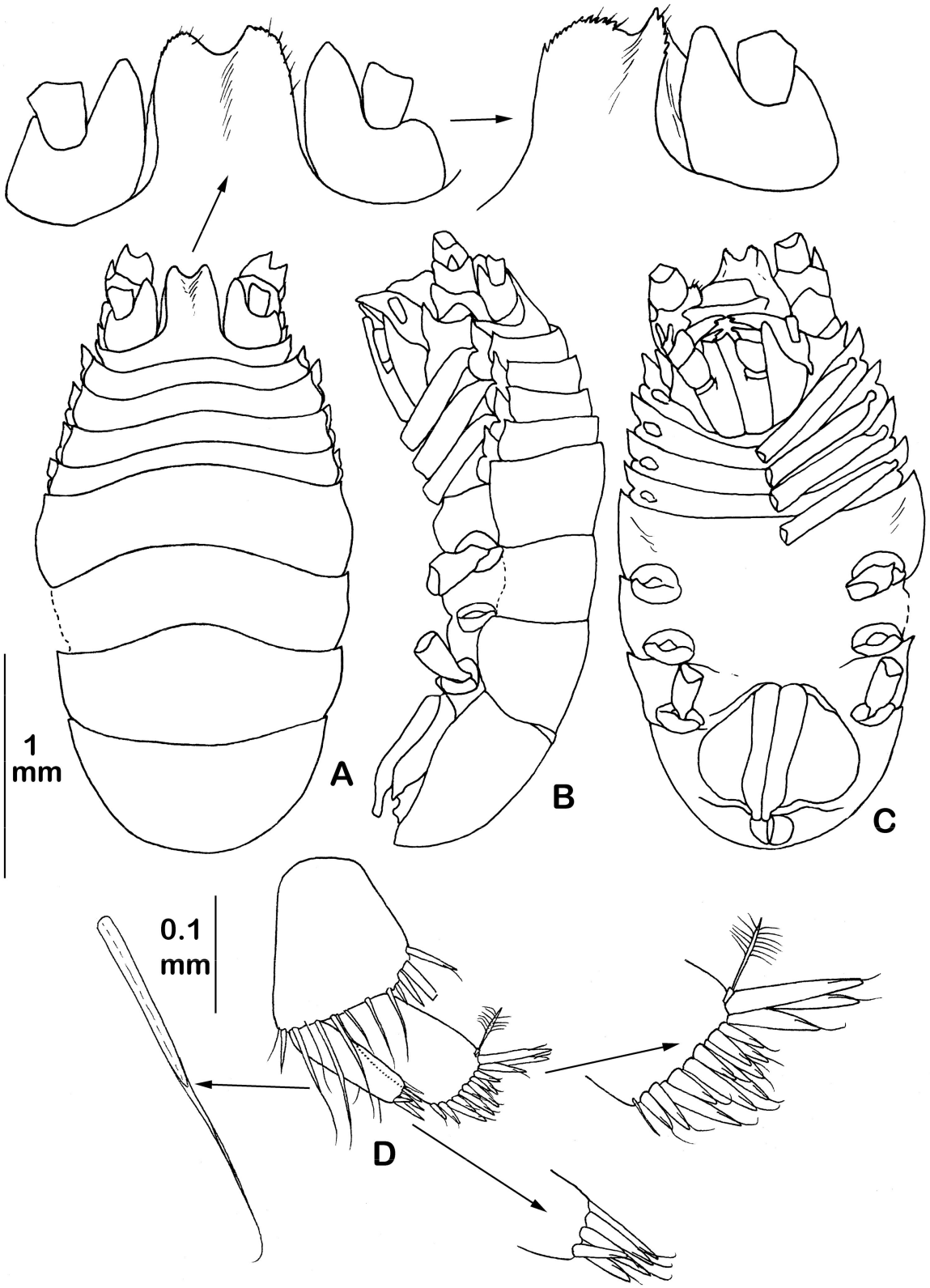

Figure 22. *Eurycope gordeyi* sp. nov. Male holotype (ZMH K-45636): (**A**) dorsal view (rostrum and antennae I enlarged); (**B**) lateral view; (**C**) ventral view. Male paratype (ZMH K-45645): (**D**) uropod (distal parts enlarged).

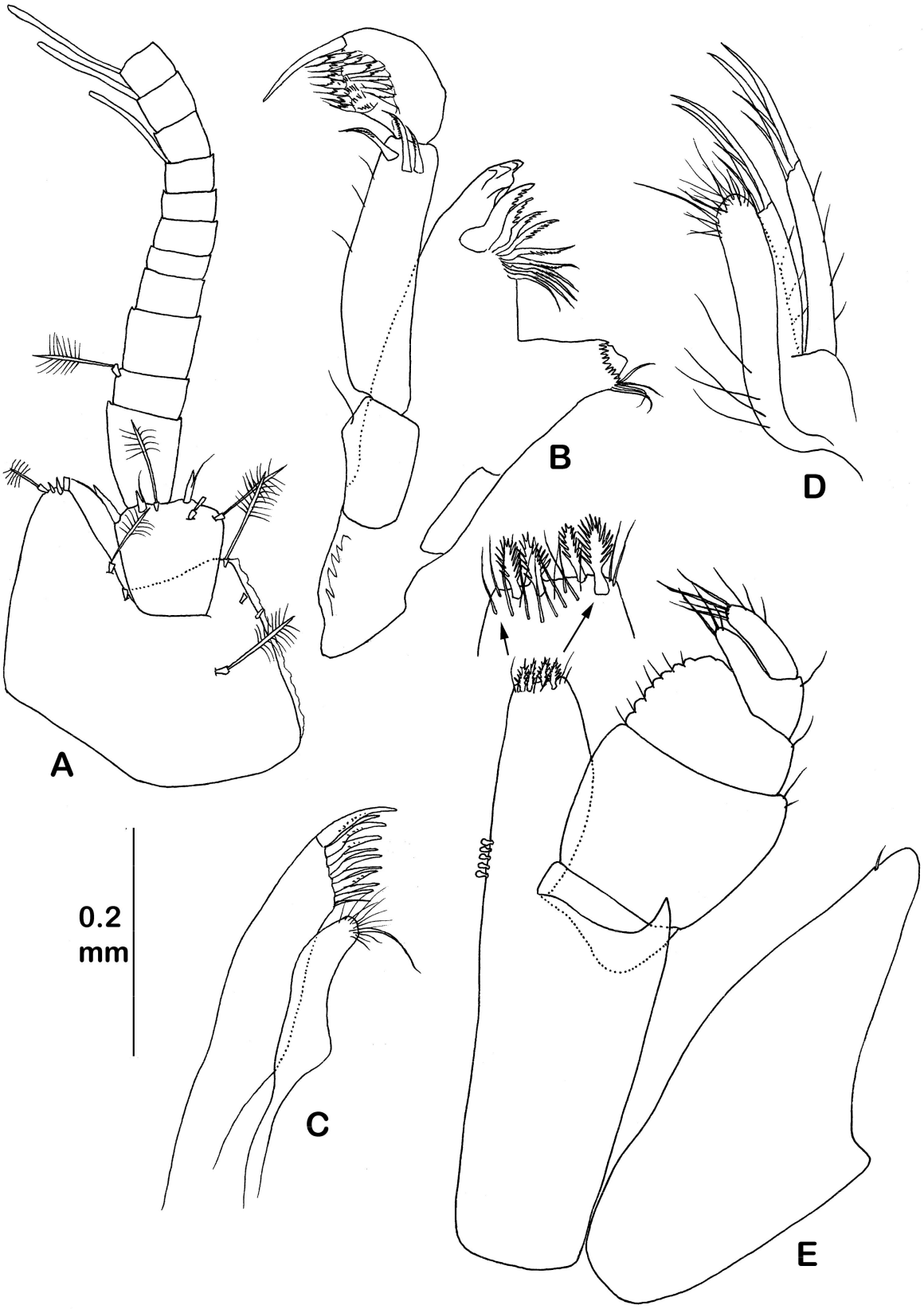

Figure 23. *Eurycope gordeyi* sp. nov. Male paratype (ZMH K-45646): (**A**) antenna I; (**B**) left mandible Male paratype (ZMH K-45645): (**C**) maxilla I; (**D**) maxilla II; (**E**) maxilliped.

Antenna II (male holotype, ZMH K-45636, Figure 22B) articles 1–6 length 0.75 times body length. Squama on article 3 reaching midlength of article 4. Article 6 1.1 times article 5 length and slightly narrower than article 5, flagellum broken off.

Left mandible (male paratype, ZMH K-45646, Figure 23B) incisor and lacinia mobilis with five cusps; spine row with nine spines; molar process distodorsally acute, with four thin setae on base of denticles. Condyle length 0.2 times mandibular body length. Palp length subequal to mandible body length; article 2 with three small simple lateral setae and three strong serrated distal setae; articles 2 and 3 lengths 2.2 times and 1.1 times article 1 length, respectively. Article 3 distal seta length 2.65 times other marginal setae length and 0.8 times article 3 length.

Maxilla I (male paratype, ZMH K-45645, Figure 23C) mesial endite width 0.6 times lateral endite width.

Maxilla II (male paratype, ZMH K-45645, Figure 23D) middle endite shortest, lateral endite slightly longer than mesial endite.

Maxilliped (male paratype, ZMH K-45645, Figure 23E) basis length 3.2 times width; endite width 0.5 times basis width, with five coupling hooks; distal margin with four fan setae. Basis acute lateral projection near palp insertion length 0.9 times article 1 lateral length. Palp length 2.2 times width, 0.7 times basis length. Article 2 length 1.2 times width, width 1.05 times basis width; lateral length 1.1 times medial length; two small setae distolaterally. Article 3 width 0.8 times article 2 width; medial length 0.8 times article 2 medial length; lateral length 0.35 times article 2 lateral length; medial margin denticulate, with seven small setae. Article 4 equal to article 3 in lateral length; medial lobe slightly shorter than article 5, with three distal setae. Article 5 with five long distal setae. Epipod length 2.5 times width, 0.95 times basis length; width 1.2 times basis width, tip narrow and rounded with one small simple seta.

Pereopods broken off after bases (male holotype, ZMH K-45636, Figure 22B,C); bases I–IV of same length—0.25 times body length.

Pleopod I (male paratype, ZMH K-45645, Figure 24A) length 2.3 times basal width; distal margin narrow, width 0.3 times basal width; medial lobes projected, rounded, length 0.05 times total pleopod length, with 12 small setae each; lateral lobes projected in small acute lateral angles, with small setae proximally.

Pleopod II (male paratype, ZMH K-45645, Figure 24B) protopod length 1.6 times width, 0.9 times pleopod I length; distal margin with five simple setae; distomedial notch length 0.35 times medial margin length. Stylet length 0.7 times protopod length, tip reaching protopod tip; sperm duct opening at 0.55 times length from proximal margin. Exopod distal article width 0.6 times basal article width, both articles subequal in length.

Pleopod III (male paratype, ZMH K-45646, Figure 24C) protopod length 0.65 times width; endopod length 1.25 times width; three distal plumose setae length 0.35 times pleopod III total length; exopod as long as protopod and endopod together, reaching endopod tip, width 0.3 times endopod width, with row of fine simple lateral setae; distal seta simple, thin, length 0.8 times endopod distal setae length.

Pleopod IV (male paratype, ZMH K-45646, Figure 24D) endopod length 1.35 times width, exopod as long as endopod, width 0.45 times endopod width. Stout plumose distal seta length 0.7 times exopod length.

Pleopod V (male paratype, ZMH K-45646, Figure 24E) length 1.2 times width.

Uropod (male paratype, ZMH K-45645, Figure 22D) length 0.15 times pleotelson length; protopod length 1.15 times width, with four UB, eight whip, and two simple distal setae. Endopod length 0.9 times protopod length, width 0.5 times protopod width, with one broom, one simple, and 14 UB distal setae; exopod length 0.85 times endopod length, width 0.5 times endopod width, with five UB distal setae.

Female (paratype, ZMH K-45651, Figure 25B–D) habitus length 1.75 times width. Cephalon behind antennulae length 0.3 times pereonite 1 length; interantennular distance 0.8 times antenna I basal width, 0.35 times cephalon width. Rostrum length 1.0 times basal width. Pereonite 5 width 1.6 times pereonite 1 width; pereonite 7 posterior width 1.3 times

pereonite 1 width. Natasome length 1.95 times anterior body part length. Pereonite 7 medial length 0.7 times pereonites 5 and 6's combined medial length. Pleotelson length 0.5 times width, 0.2 times body length.

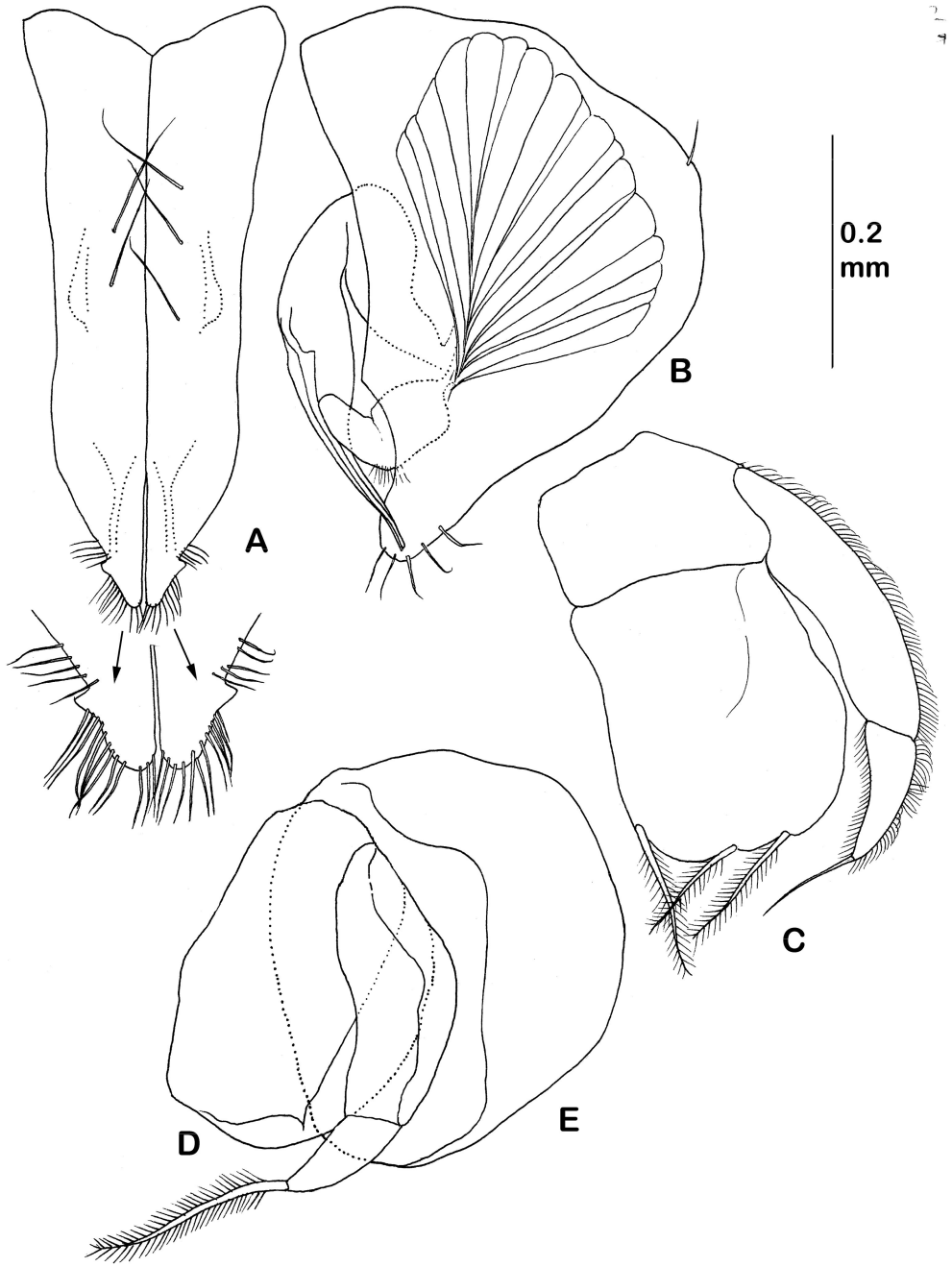

Figure 24. *Eurycope gordeyi* sp. nov. Male paratype (ZMH K-45645): (**A**) pleopod I (distal margin enlarged); (**B**) pleopod II. Male paratype (ZMH K-45646): (**C**) pleopod III; (**D**) pleopod IV; (**E**) pleopod V.

Pleopod II (female paratype, ZMH K-45638, Figure 25E) length 0.65 times width; lateral margin with two small simple setae; distomedial margin rounded, pronounced, overlapping anterior part of anal operculum.

Etymology: The name honors Marina Malyutina's youngest grandson, Gordey Malyutin.

Distribution: Known only from the type locality in the Norwegian Channel and the Iceland–Faroe Ridge, featuring a depth range of 441–1058 m.

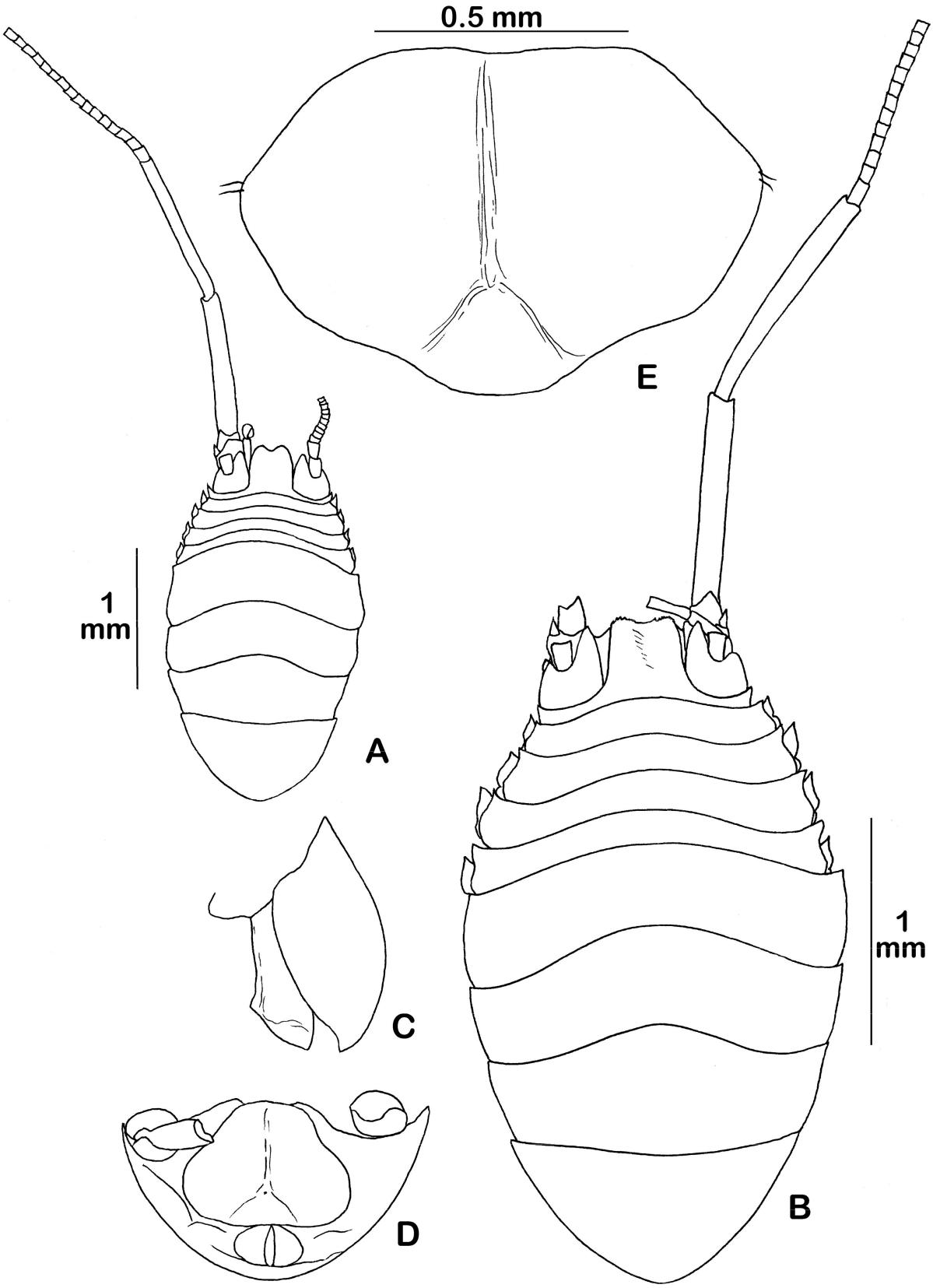

Figure 25. *Eurycope gordeyi* sp. nov. Male paratype (ZMH K-45646): (**A**) dorsal view; female paratype (ZMH K-45651): (**B**) dorsal view; (**C**) pleotelson lateral view; (**D**) pleotelson ventral view. Female paratype (ZMH K-45638): (**E**) pleopod II.

3.7. *Eurycope emmae* Schnurr & Malyutina sp. nov.

http://zoobank.org/9D1F19C9-78D0-4EA9-9ECF-8BFE9EBD3D40 (accessed on 3 June 2022)

Material examined:
Holotype: male (ZMH K-45652), 2.45 mm length, used for dissection.

Paratypes: female (ZMH K-45653), 2.6 mm length; female (ZMH K-45655), used for dissection; male (ZMH K-45654), used for dissection (see Table 1 for specimen information).

Diagnosis: Cephalon rostrum length 0.85 times basal width, 1.5 times antenna I article 1 length, 1.7 times antenna I article 1 width. Maxilliped endite with two coupling hooks. Basis lateral projection near palp insertion length 0.9 times article 1 lateral length. Palp article 4 medial lobe subequal in length to article 5. Epipod length 2.4 times width, 0.95 times basis length; width 1.2 times basis width. Male pleopod I length 2.4 times width; distomedial lobe length 0.05 times pleopod I length, width 0.25 times pleopod I width, distolateral lobes slightly projected. Male pleopod II protopod distomedial notch length 0.3 times medial margin length. Uropod protopod length 1.0 times width; endopod length 1.05 times protopod length, width 0.75 times protopod width; exopod length 1.0 times endopod length.

Description of male (holotype, ZMH K-45652, Figure 26A,B): Body length 1.7 times pereonite 5 width. Cephalon behind antennulae almost hidden under pereonite 1. Rostrum length 0.85 times basal width, 1.5 times antenna I article 1 length; width 0.3 times cephalon width, 1.7 times antenna I article 1 width; medial groove small. Pereonite 5 width 1.8 times pereonite 1 width; pereonite 7 posterior width 1.5 times pereonite 1 width. Natasome length 4.0 times anterior body part length; pereonite 7 longest medially, length 0.7 times pereonites 5 and 6's combined medial length. Pleotelson length 0.5 times width, 0.25 times body length.

Antenna I (male holotype, ZMH K-45652, Figure 26A): article 1 length 1.0 times width; article 2 length 0.6 times article 1 length, as long as distomedial lobe of article 1. Articles 3 and 4 lengths 1.0 times and 0.25 times article 2 length, respectively; articles 3 and 4 widths 0.8 times article 2 width. Flagellum broken off after article 6.

Antenna II (male holotype, ZMH K-45652, Figure 26A,B) broken off after article 4; articles 1–4 subequal in length; squama on article 3 reaching midlength of article 4, with long distal seta.

Mandible (male paratype, ZMH K-45654, Figure 27B,C) incisor with five and four cusps and spine row with nine and eight spines on right and left mandibles, respectively; lacinia mobilis of left mandible slightly shorter than incisor, with four distal teeth. Molar process distodorsally acute, with two thin setae on base of denticles. Palp length subequal to mandible body length; article 2 with three distal setae; articles 2 and 3 lengths 2.2 times and 1.1 times article 1 length, respectively. Article 3 distal seta length 1.45 times other marginal setae length and 0.5 times article 3 length.

Maxilla I (male paratype, ZMH K-45654, Figure 28A) mesial endite width 0.6 times lateral endite width, with fine distal setae and two long distomedial setae; lateral endite with 12 robust differently serrated setae.

Maxilla II (male paratype, ZMH K-45654, Figure 28B) middle endite shortest, lateral endite longest; mesial endite with tuft of distal setae, middle and lateral endites with two long and two shorter distal setae.

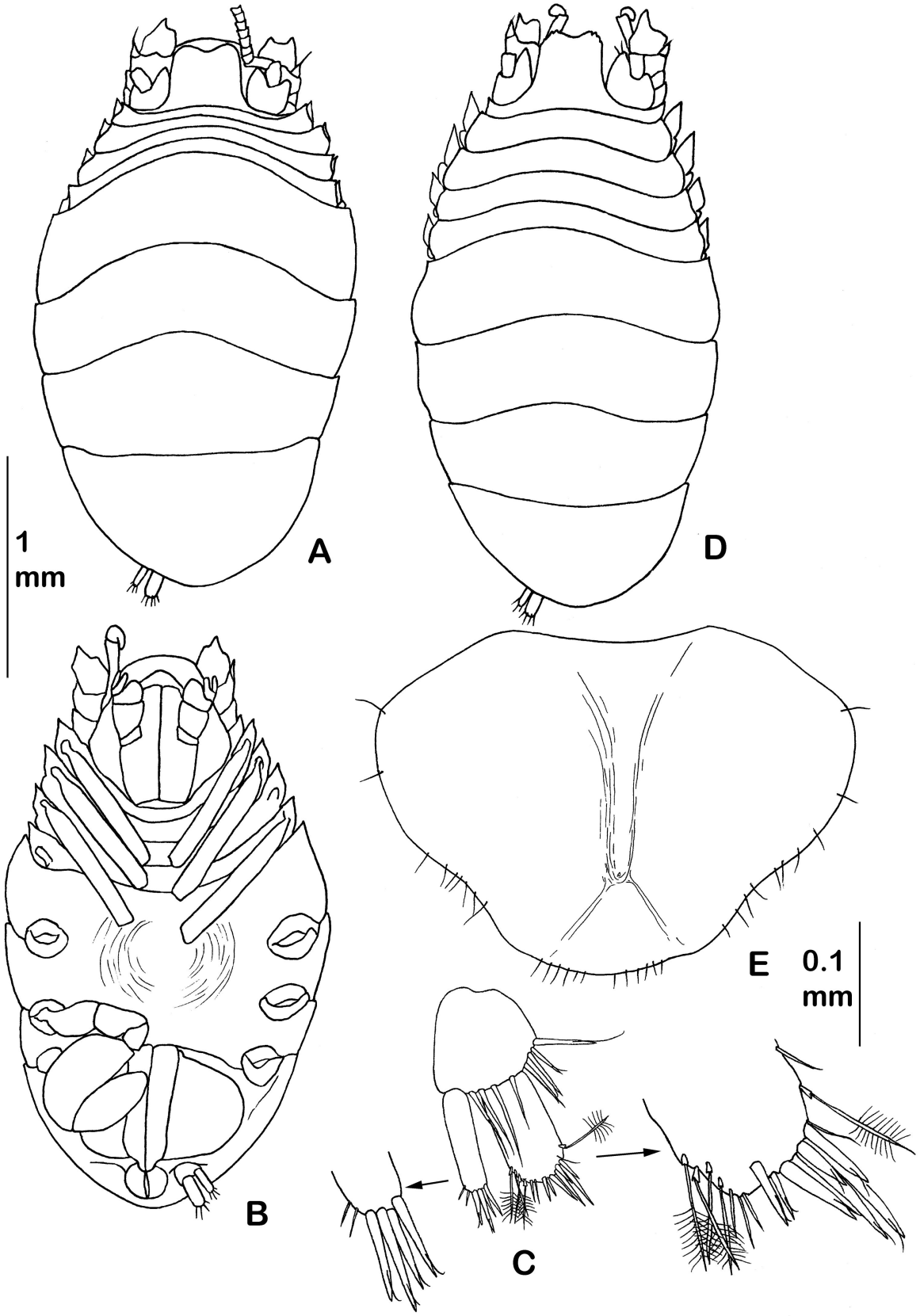

Figure 26. *Eurycope emmae* sp. nov. Male holotype (ZMH K-45652): (**A**) dorsal view; (**B**) ventral view; (**C**) uropod. Female paratype (ZMH K-45653): (**D**) dorsal view. Female paratype (ZMH K-45655): (**E**) pleopod II.

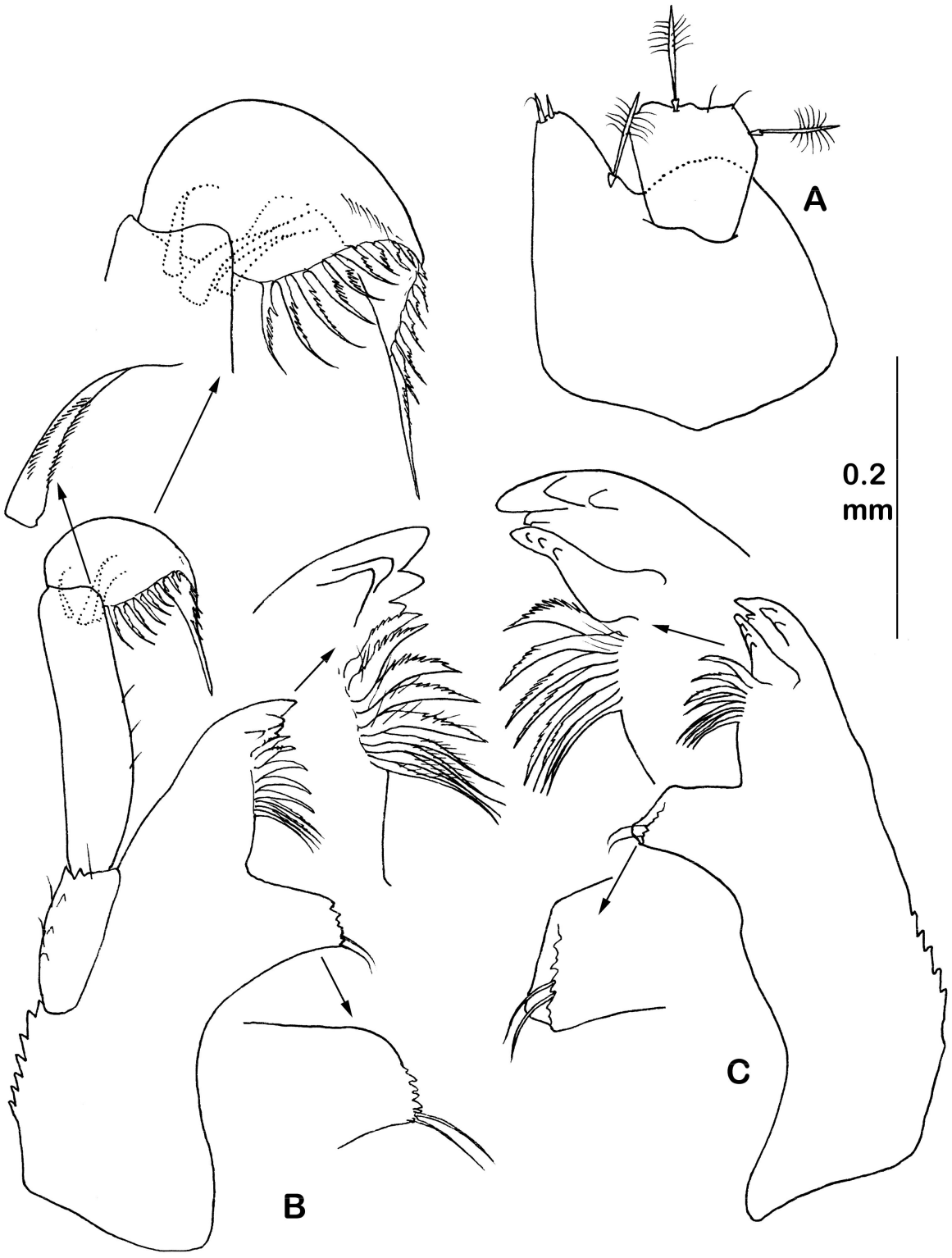

Figure 27. *Eurycope emmae* sp. nov. Male paratype (ZMH K-45654): (**A**) antenna I, articles 1 and 2; (**B**) right mandible (last palp article, incisor and molar process enlarged); (**C**) left mandibles (incisor and molar process enlarged).

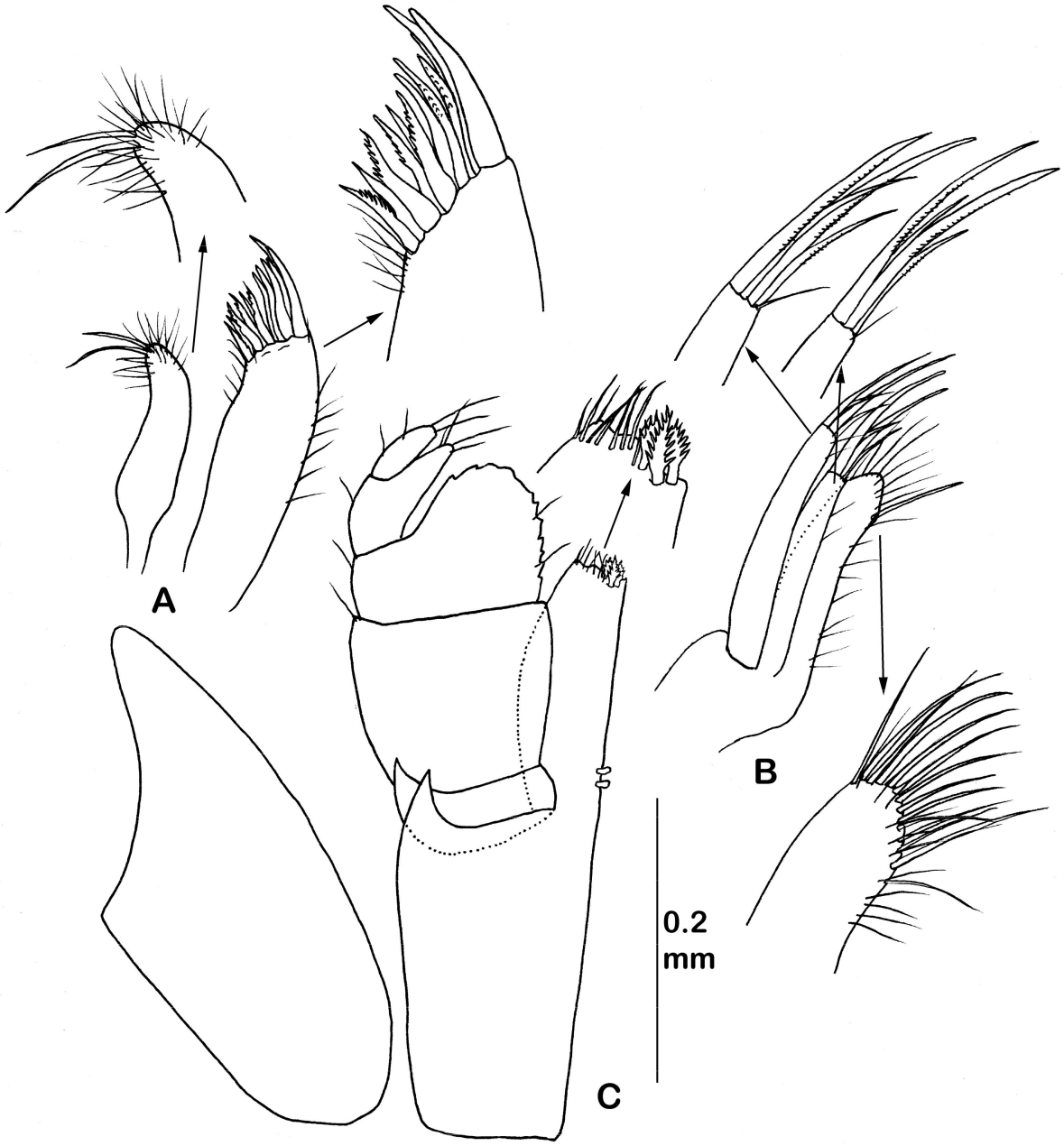

Figure 28. *Eurycope emmae* sp. nov. Male paratype (ZMH K-45654): (**A**) maxilla I; (**B**) maxilla II; (**C**) maxilliped (all mouth parts with enlarged distal parts).

Maxilliped (male paratype, ZMH K-45654, Figure 28C) basis length 3.0 times width; endite width 0.5 times basis width, with two coupling hooks; distal margin with three fan setae. Basis acute lateral projection near palp insertion length 0.9 times article 1 lateral length. Palp length 2.2 times width, 0.95 times basis length. Article 2 length 0.95 times width, slightly wider than basis; lateral length 1.1 times medial length, one small distolateral seta. Article 3 width 0.9 times article 2 width; medial length 0.85 times article 2 medial length; lateral length 0.3 times article 2 lateral length; medial margin denticulate, with few small setae. Article 4 lateral length 1.35 times article 3 lateral length; medial lobe as long as article 5, with four setae. Article 5 with two lateral and three distal setae. Epipod length 2.4 times width, 0.95 times basis length; width 1.2 times basis width.

Pereopod V (male holotype, ZMH K-45652, Figure 29A) length ratios of ischium–dactylus to basis: 1.0, 0.6, 1.7, 1.5, 0.7. Basis length 1.7 times width, with one long plumose distodorsal and two simple dorsal setae and one UB distoventral seta. Ischium as long and as wide as

basis, with seven plumose dorsal setae and four distoventral setae. Merus with four ventral UB and five simple distoventral setae. Carpus length 1.35 times width, with 20 dorsal and 10 ventral plumose setae; four stout UB setae distodorsally. Propodus length 1.85 times width; dorsal margin serrated with nine plumose setae ventral margin with 18 plumose setae, one stout UB seta, and one broom seta distodorsally. Dactylar dorsal claw length 0.3 times slim ventral claw length.

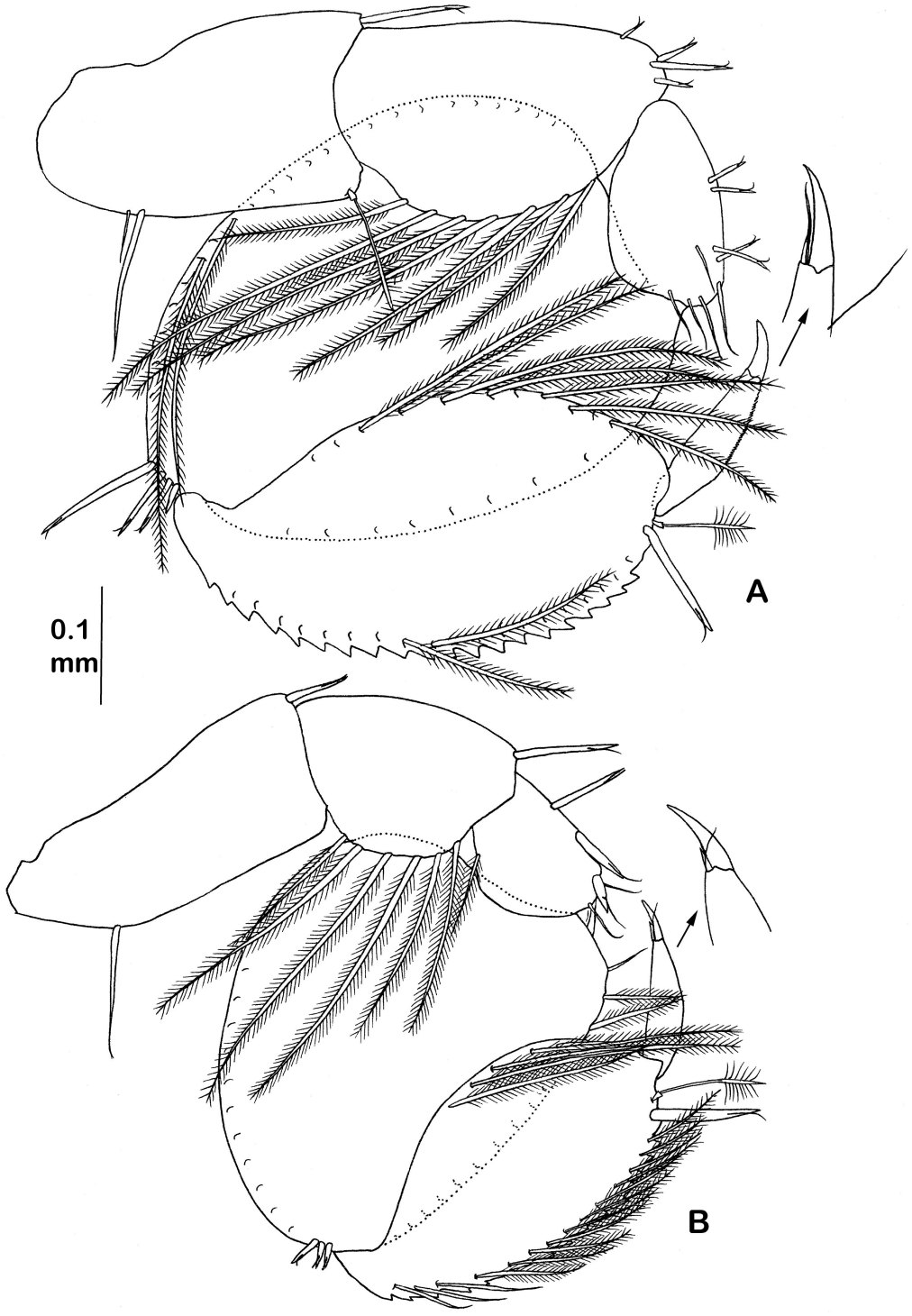

Figure 29. *Eurycope emmae* sp. nov. Male holotype (ZMH K-45652): (**A**) pereopod V; (**B**) pereopod VII.

Pereopod VII (male holotype, ZMH K-45652, Figure 29B) length 0.7 times pereopod V length; length ratios of ischium–dactylus to basis: 0.65, 0.4, 1.3, 1.1, 0.55. Basis length 2.15 times width with one proximodorsal seta and one UB distoventral seta. Ischium width 1.05 basis, with six dorsal plumose setae and one UB distoventral seta. Merus with one plumose dorsal seta and three UB and two simple setae. Carpus length 1.35 times width, with 15 dorsal and 13 ventral plumose setae and three UB setae distodorsally. Propodus length 1.95 times width; dorsal margin serrated with 14 plumose setae; ventral margin with eight plumose setae, one stout UB seta, and one broom seta distodorsally. Dactylar dorsal claw three times longer than tiny ventral claw.

Pleopod I (male holotype, ZMH K-45652, Figure 30A) length 2.4 times basal width; distal margin projected, its width 0.3 times basal width; distomedial lobe length 0.05 times pleopod I length, not separated from distolateral weak projections; distolateral margin with 17 small setae.

Pleopod II (male holotype, ZMH K-45652, Figure 30B) protopod length 1.65 times width, 0.95 times pleopod I length; distolateral margin with few simple setae; distomedial notch length 0.3 times medial margin length. Stylet length 0.55 times protopod length, tip not reaching behind protopod tip; sperm duct opening at midlength. Exopod distal article slightly wider and shorter than basal article.

Pleopod III (male holotype, ZMH K-45652, Figure 30C) protopod length 0.65 times width, endopod length 1.3 times width, length of three distal plumose setae 0.6 times pleopod III length. Exopod subequal in length to protopod and endopod together and 0.4 times as wide as endopod, with row of fine simple marginal setae; plumose distal seta slightly shorter than endopod distal setae.

Pleopod IV (male holotype, ZMH K-45652, Figure 30D) endopod length 1.35 times width; exopod 0.9 times endopod length and 0.6 times endopod width. Stout plumose distal seta length 0.6 times exopod length.

Pleopod V (male holotype, ZMH K-45652, Figure 30E) length 1.2 times width.

Uropod (male holotype, ZMH K-45652, Figure 26C) length 0.3 times pleotelson length; protopod broadening apically, length 1.0 times width, with five whip and three UB distal setae; endopod as long as protopod, width 0.5 times protopod width, with five simple, five broom, and six UB distal setae; exopod as long as endopod, width 0.5 times endopod width, with four UB and two small simple distal setae.

Female (paratype, ZMH K-45653, Figure 26D) habitus is similar to male. Body length 2.1 times pereonite 5 width.

Pleopod II (female paratype, ZMH K-45655, Figure 26E) length 0.7 times width, margins with about 30 small simple setae, ventral keel 0.7 times pleopod II length.

Remarks. The new species differs from other species of the complex by its broad and long rostrum in comparison to the size of antenna I article 1—it is 1.7 times longer than article 1 of antenna I.

Etymology: The name honors Sarah Schnurr's daughter, Emma Lutz.

Distribution: Known only in the type locality in the Denmark Strait, the Norwegian Sea, and the Iceland–Faroe Ridge, featuring a depth range of 316–686 m.

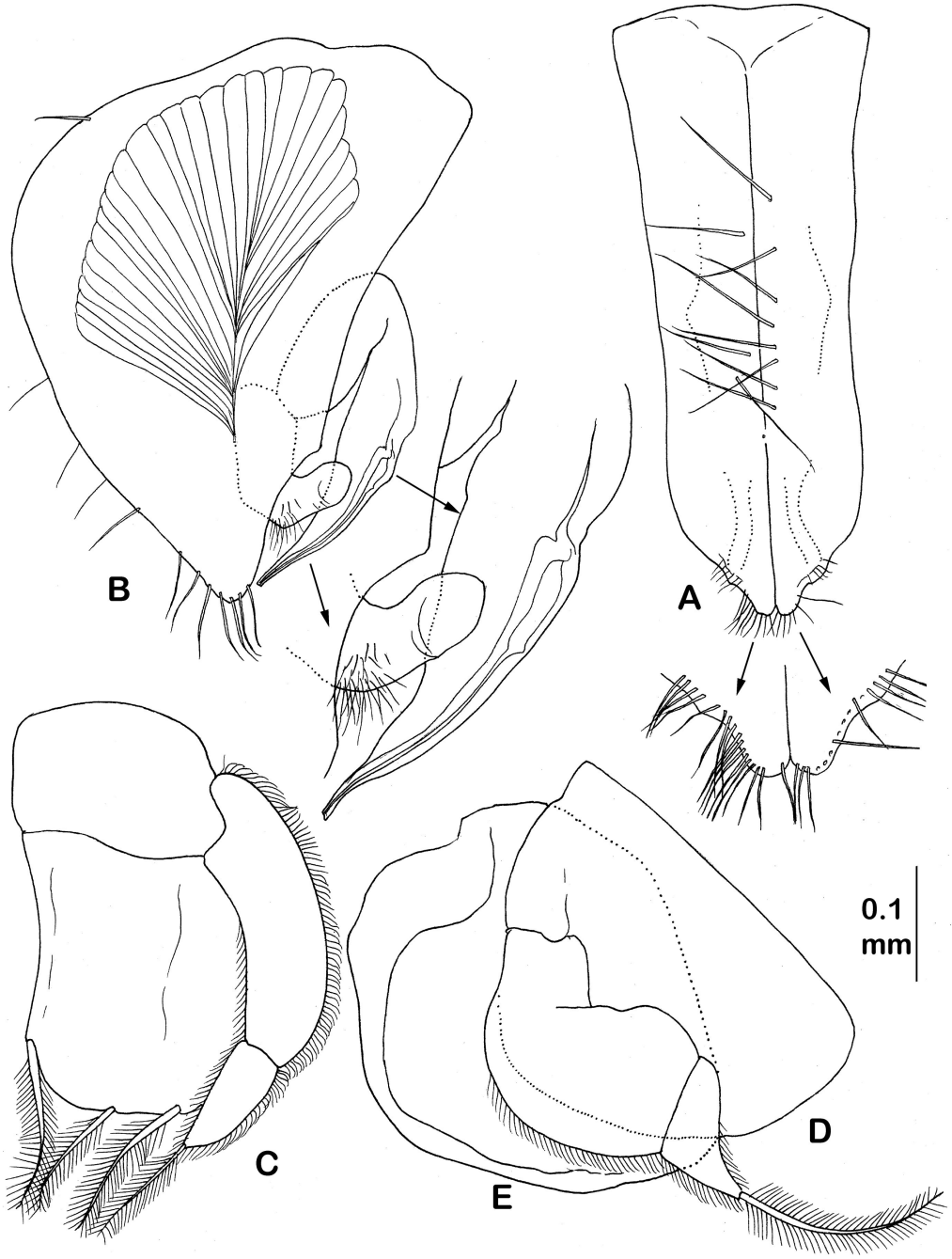

Figure 30. *Eurycope emmae* sp. nov. Male holotype (ZMH K-45652): (**A**) pleopod I (distal margin enlarged); (**B**) pleopod II (distomedial margin enlarged); (**C**) pleopod III; (**D**) pleopod IV; (**E**) pleopod V.

3.8. Eurycope jakobi Schnurr & Malyutina sp. nov.

http://zoobank.org/2F7AD002-ECC6-4871-95CB-184ADC9B33A9 (accessed on 3 June 2022)

Material examined:
Holotype: male (ZMH K-45656), 3.0 mm length, used for dissection.

Paratypes: female (ZMH K-45658), 2.2 mm length, used for dissection; (ZMH K-45657), used for dissection; and 1 further specimen (see Table 1 for specimen information).

Diagnosis: Cephalon rostrum not tapering distally, length 1.1 times basal width, 1.5 times antenna I article I length, width 1.6 times antenna I basal width. Maxilliped endite with three coupling hooks. Basis lateral projection near palp insertion as long as article 1. Palp article 4 medial lobe length 0.8 times article 5 length. Epipod length 2.4 times

width, 0.8 times basis length, width 1.2 times basis width. Male pleopod I length 3.25 times width; distomedial lobe length 0.2 times pleopod I length, width 0.25 times pleopod I width; distolateral lobes slightly projected. Male pleopod II protopod distomedial notch length 0.25 times medial margin length. Uropod protopod length 1.0 times width; endopod length 1.2 times protopod length, width 0.75 times protopod width; exopod length 1.0 times endopod length.

Description of male (holotype, ZMH K-45656, Figure 31A–C): Length 1.95 times pereonite 5 width. Cephalon length behind antennulae half of pereonite 1 length; interantennular distance 1.3 times antenna I basal width, 0.4 times cephalon width. Rostrum length equal width, 1.5 times antenna I article I length; medial groove deep. Pereonite 5 width 1.5 times pereonite 1 width; pereonite 7 posterior width 1.2 times pereonite 1 width. Natasome length 2.4 times anterior body part length. Pereonites 5 and 6 subequal in length; pereonite 7 longest medially, length 0.7 times pereonites 5 and 6's combined medial length. Ventral projection of pereonites 6 and 7 0.4 times body length. Pleotelson length 0.75 times width, 0.3 times body length.

Antenna I (male holotype, ZMH K-45656, Figure 31D) article 1 length 1.2 times width; article 2 length 0.35 times article 1 length, 0.85 times distomedial lobe of article 1 length; articles 3 and 4 lengths 1.0 times and 0.33 times article 2 length, respectively; articles 3 and 4 widths 0.55 times article 2 width. Flagellum broken off.

Antenna II (male holotype, ZMH K-45656, Figure 31C) broken off after article 4; articles 1–4 subequal in length; squama on article 3 reaching midlength of article 4.

Pereopods broken off (male holotype, ZMH K-45656, Figure 31B) basis I length 0.2 times body length; bases II, V, VI, VII lengths 0.1, 0.6, 0.7, 0.7 times basis I length, respectively.

Pleopod I (male holotype, ZMH K-45656, Figure 32A) length 2.3 times basal width; distal width 0.3 times basal width margin, with distomedial lobes projected triangular; length 0.05 times pleopod I length, distolateral lobes almost not visible; distolateral margins with small setulae.

Pleopod II (male holotype, ZMH K-45656, Figure 32B) protopod length 1.55 times width, 0.95 times pleopod I length; lateral margin with one simple seta; distomedial notch length 0.25 times medial margin length. Stylet length 0.6 times protopod length, tip reaching behind protopod tip; sperm duct opening at 0.3 times length from proximal margin. Exopod distal article half as long and wide as basal article.

Pleopod III (male holotype, ZMH K-45656, Figure 32C) protopod length 0.7 times width; endopod length 1.35 times width; three distal plumose setae length 0.3 times pleopod III length; exopod as long as protopod and endopod together and 0.3 times as wide as endopod, with row of fine simple lateral setae; simple distal seta slightly shorter than endopod distal setae.

Pleopod IV (male holotype, ZMH K-45656, Figure 32D) endopod length 1.45 times width, exopod 0.95 times endopod length and 0.5 times endopod width. Stout plumose distal seta as long as pleopod III endopod distal setae.

Pleopod V (male holotype, ZMH K-45656, Figure 32E) length 1.45 times width.

Female (paratype, ZMH K-45658 and ZMH K-45657, Figure 33A,D) habitus is similar to male. Body length 1.9 times pereonite 5 width.

Antenna I (female paratype, ZMH K-45658, Figure 33C) broken off after article 2. Article 1 length 1.15 times width; distomedial lobe tapering distally, with one broom medial and two small medial and three small UB distal setae; one broom seta on distolateral angle. Article 2 length 1.3 times width, with one long broom and two simple small distal setae.

Antenna II (female paratype, ZMH K-45657, Figure 33A) length 1.7 times body length; articles 1–4 subequal in length; squama on article 3 half of article 4 length. Article 5 length 2.3 times articles 1–4 length, width 1.5 times article 4 width; article 6 length 1.05 times article 5 length, width 0.6 times article 5 width; flagellum as long as previous part of antenna II, of about 30 articles.

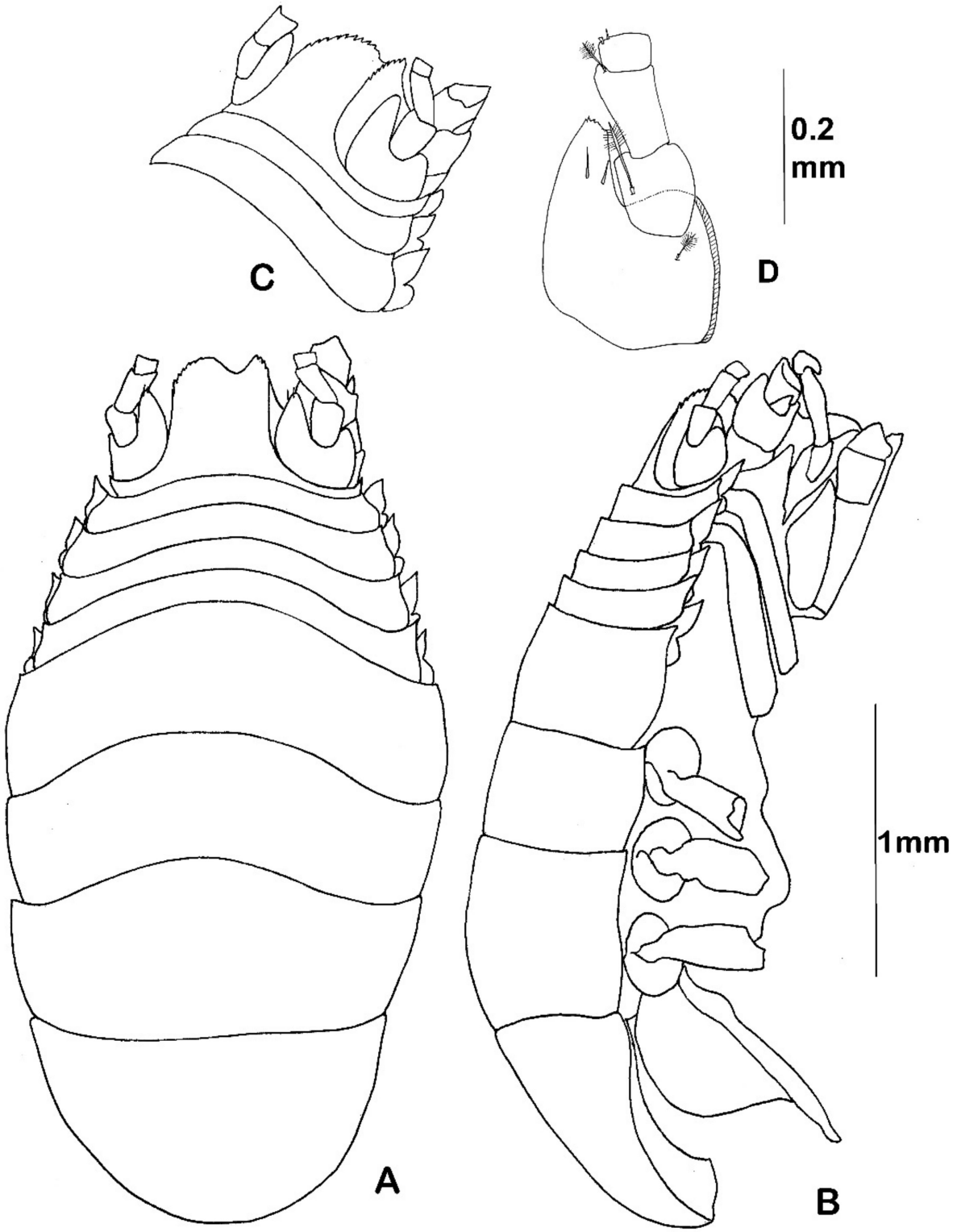

Figure 31. *Eurycope jakobi* sp. nov. Male holotype (ZMH K-45656): (**A**) dorsal view; (**B**) lateral view; (**C**) anterior body part, oblique view; (**D**) antenna I.

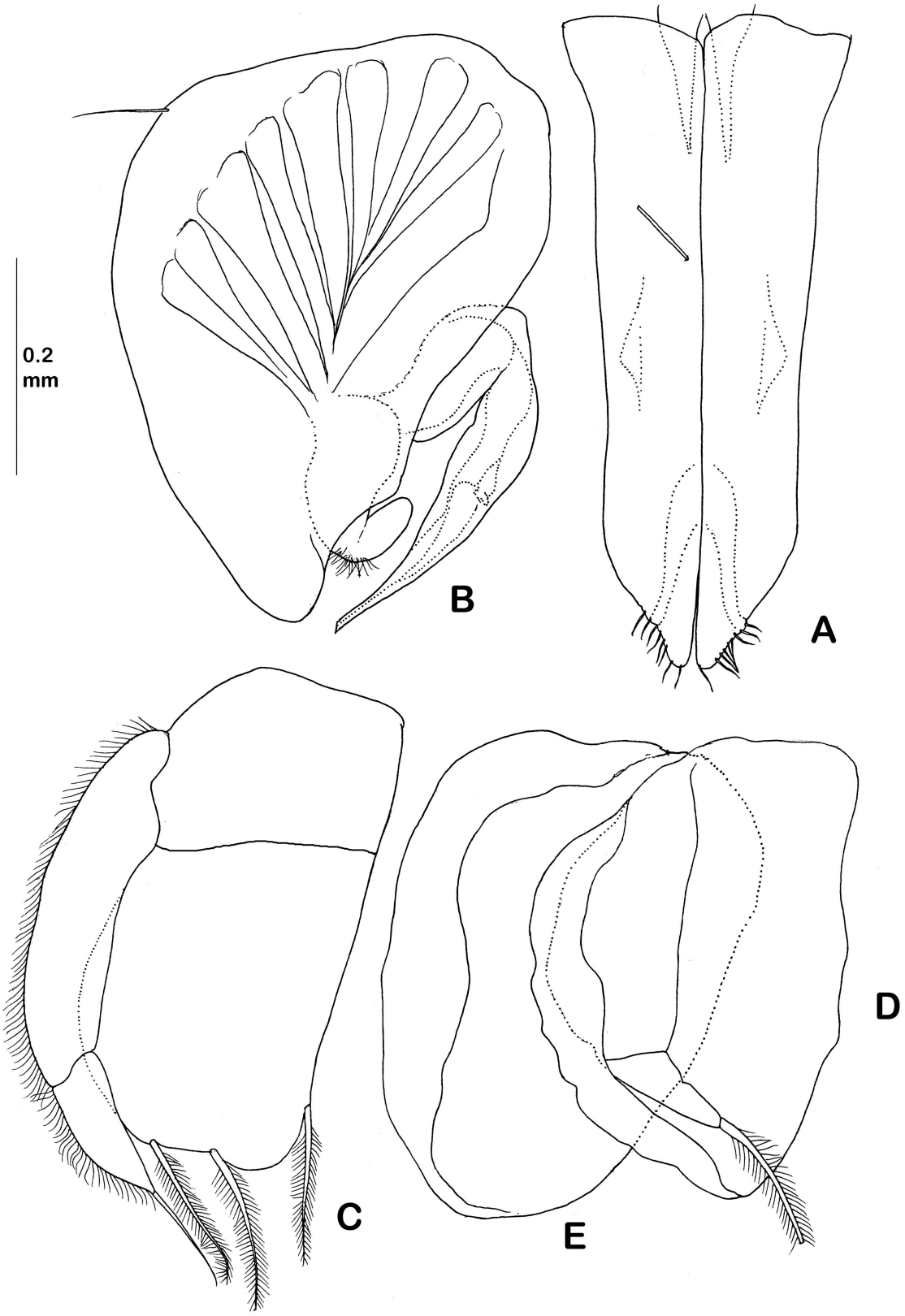

Figure 32. *Eurycope jakobi* sp. nov. Male holotype (ZMH K-45656): (**A**) pleopod I; (**B**) pleopod II; (**C**) pleopod III; (**D**) pleopod IV; (**E**) pleopod V.

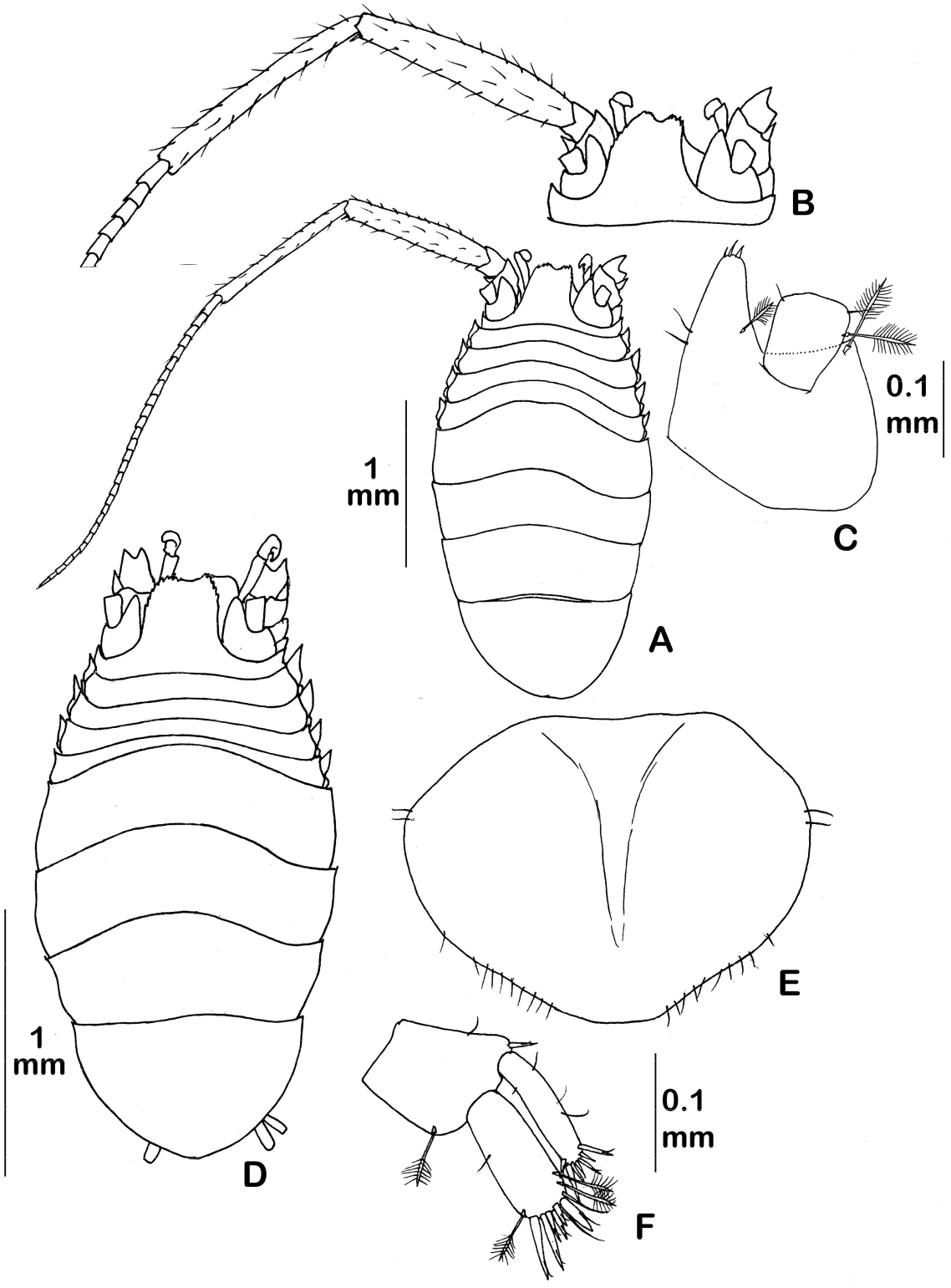

Figure 33. *Eurycope jakobi* sp. nov. Female paratype (ZMH K-45657): (**A**) dorsal view; (**B**) cephalon with rostrum, basal parts of antennae I and antenna II; (**C**) antenna I. Female paratype (ZMH K-45658): (**D**) dorsal view; (**E**) pleopod II; (**F**) uropod.

Mandible (female paratype, ZMH K-45658, Figure 34A,B) incisor with four and three cusps and spine row with nine and eight spines on right and left mandibles, respectively; lacinia mobilis of left mandible visibly shorter than incisor, with three distal teeth; molar process distodorsally acute, with four thin setae on base of denticles. Proximoventral

margin and lateral margin of palp article 1 denticulated. Palp length subequal to mandible body length; article 2 with three distal setae; articles 2 and 3 lengths 1.9 times and 1.0 times article 1 length, respectively. Article 3 distal seta length 2.5 times other marginal setae and 0.7 times article 3 length.

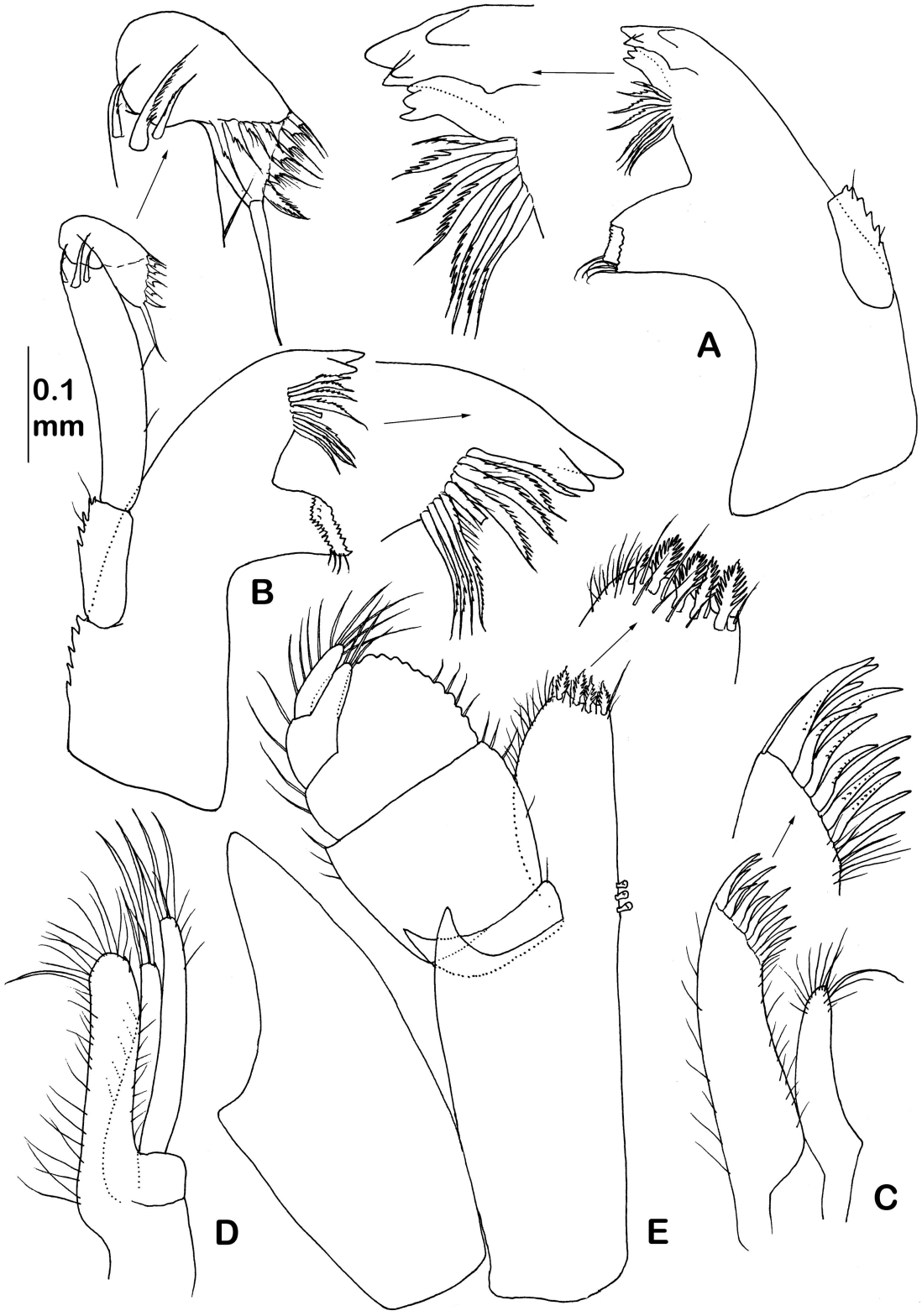

Figure 34. *Eurycope jakobi* sp. nov. Female paratype (ZMH K-45658): (**A**) left mandible, (**B**) right mandible; (**C**) maxilla I; (**D**) maxilla II; (**E**) maxilliped (all mouth parts with enlarged distal parts).

Maxilla I (female paratype, ZMH K-45658, Figure 34C) mesial endite width 0.6 times lateral endite width, with fine distal setae and stout long distomedial seta; lateral endite with 12 robust differently serrated setae.

Maxilla II (female paratype, ZMH K-45658, Figure 34D) middle endite shortest, lateral endite longest; mesial endite with thin distal setae, middle and lateral endites with two long and two shorter distal setae.

Maxilliped (female paratype, ZMH K-45658, Figure 34E) basis length 3.4 times width; endite width 0.5 times basis width, with three coupling hooks; distal margin with four fan setae. Basis acute lateral projection near palp insertion as long as lateral projection on article 1. Palp length 2.1 times width, 0.7 times basis length. Article 2 length 0.8 times width; width 1.1 times basis width; lateral length equal to medial length; three small distal setae laterally and medially. Article 3 width 0.9 times article 2 width; medial length 0.95 times article 2 medial length; lateral length 0.4 times article 2 lateral length; medial margin denticulate, with few small setae. Article 4 equal to article 3 in lateral length, with two lateral setae; medial lobe length 0.8 times article 5 length, with three distal setae. Article 5 with four lateral and five long distal setae. Epipod length 2.4 times width, 0.8 times basis length; width 1.2 times basis width.

Pleopod II (female paratype, ZMH K-45657, Figure 33E) length 0.75 times width; lateral margins with two small simple setae, distolateral margins with 10 setae; ventral keel 0.7 times pleopod II length.

Uropod (female paratype, ZMH K-45658, Figure 33F) length 0.3 times pleotelson length; protopod broadening distally, length 1.0 times width, with one UB and one broom distal setae; endopod length 1.1 times protopod length, width 0.5 times protopod width, with two simple, three broom, and six UB distal setae; exopod as long as endopod, width 0.5 times endopod width, with five UB and two small simple distal setae.

Etymology: The name honors Sarah Schnurr's son, Jakob Lutz.

Distribution: Known only from the type locality in the Iceland Basin and the Irminger Basin, featuring a depth range of 1385–1588 m.

3.9. Eurycope mathiasi Schnurr & Malyutina sp. nov.

http://zoobank.org/F8A0C3CC-3792-46AB-9D8E-6AD4388149D5 (accessed on 3 June 2022)

Material examined:
Holotype: female (ZMH K-45660), 2.95 mm length.

Paratypes: female (ZMH K-45662), used for dissection; female (ZMH K-45663), used for dissection; and 2 further specimens (see Table 1 for specimen information).

Diagnosis: Cephalon rostrum tapering distally, length 0.75 times basal width, 1.15 times antenna I article I length, width 1.4 times antenna I basal width, distomedial lobe of antenna 1 not reaching tip of rostrum. Maxilliped endite with three coupling hooks. Basis lateral projection near palp insertion length 1.1 times article 1 length. Palp article 4 medial lobe length 1.2 times article 5 length. Epipod length 2.1 times width, 0.9 times basis length; width 1.2 times basis width. Uropod protopod length 1.4 times width; endopod length 1.05 times protopod length, width 0.5 times protopod width; exopod length 0.8 times endopod length.

Description of female (holotype, ZMH K-45660, Figure 35): Body length 1.75 times pereonite 5 width. Cephalon behind antennulae half as long as pereonite 1; interantennular distance 1.5 times antenna I basal width, 0.5 times cephalon width. Rostrum length 0.8 times basal width, 1.15 times antenna I article I length; medial groove small; distal width 0.55 times basal width, small setae distally. Pereonite 5 width 1.55 times pereonite 1 width; pereonite 7 posterior width 1.2 times pereonite 1 width. Natasome length 2.2 times anterior body part length. Pereonites 5 and 6 subequal in length; pereonite 7 longest medially. Pereonite 7 medial length 0.65 times pereonites 5 and 6's combined medial length. Ventral projection of pereonite 6 0.35 times body length. Pleotelson length 0.8 times width, 0.35 times body length.

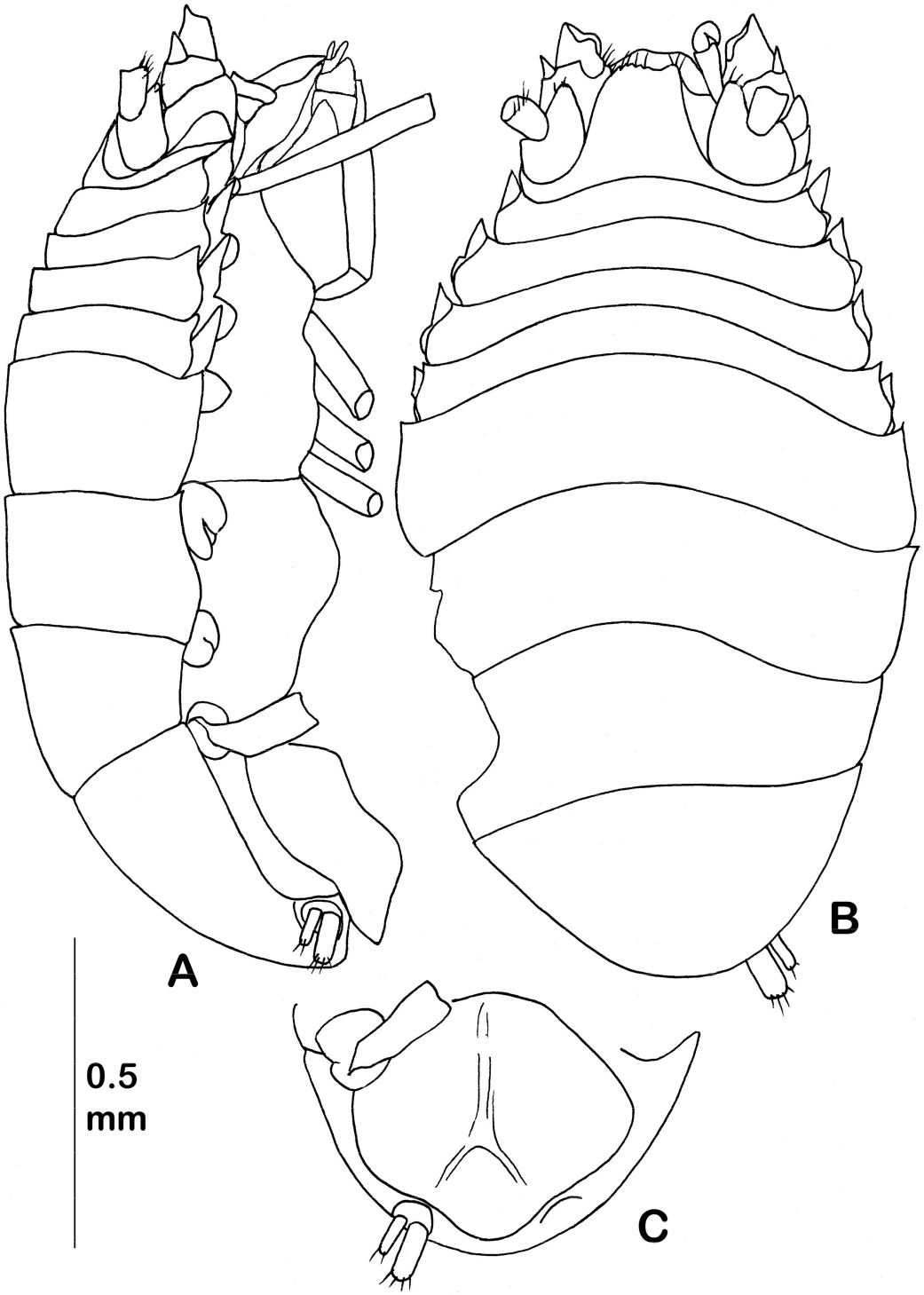

Figure 35. *Eurycope mathiasi* sp. nov. Female holotype (ZMH K-45660): (**A**) lateral view; (**B**) dorsal view; (**C**) pleotelson ventral view.

Antenna I (female paratype, ZMH K-45662, Figure 36A) broken off, article 1 length 1.2 times width, with two broom dorsal setae, one small UB seta, and one small simple seta distomedially; article 2 length 1.4 times width, 0.45 times article 1 length, tip not reaching tip of distomedial lobe of article 1; two broom and three UB distal setae; articles 3 broken off.

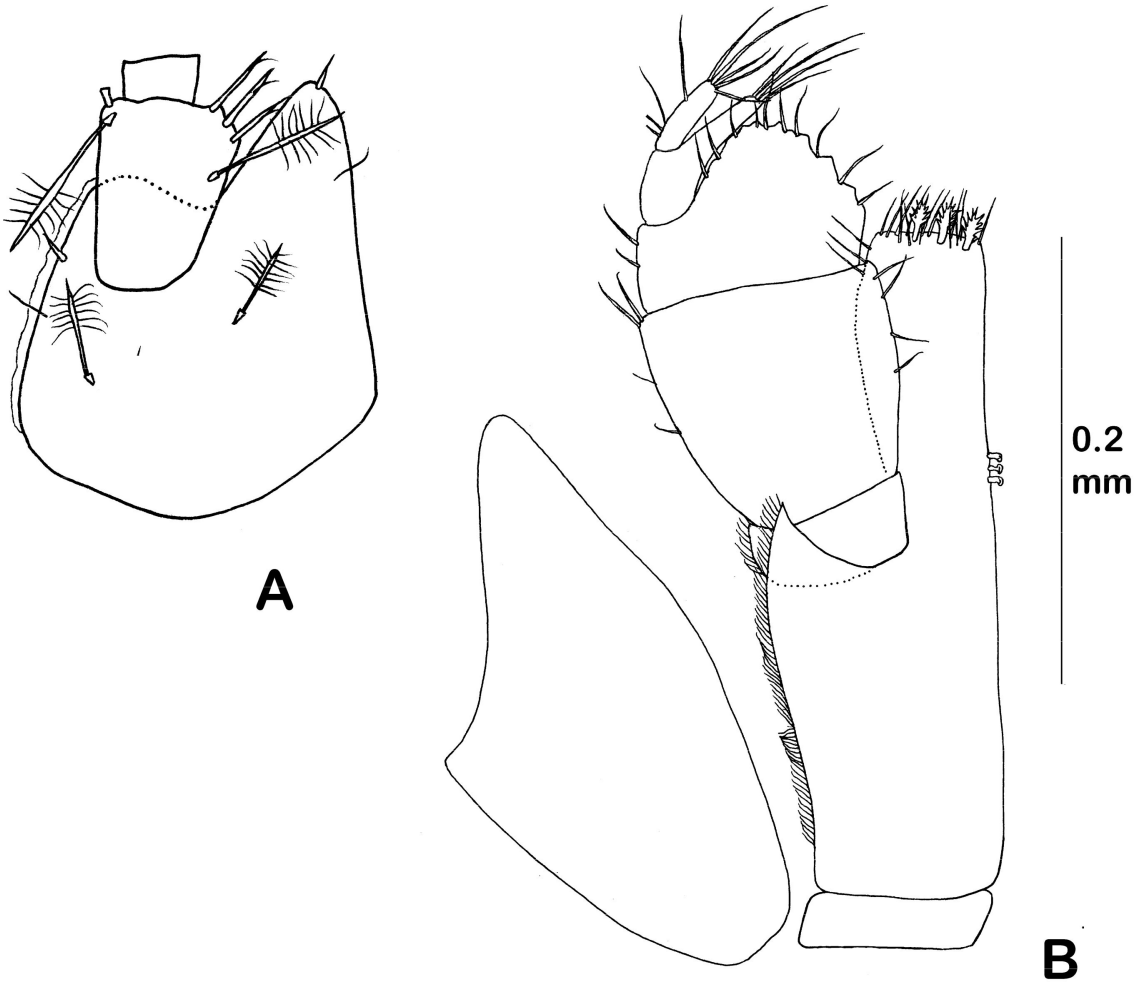

Figure 36. *Eurycope mathiasi* sp. nov. Female paratype (ZMH K-45662): (**A**) antenna I, articles 1 and 2. Female paratype (ZMH K-45663): (**B**) maxilliped.

Antenna II (female holotype, ZMH K-45660, Figure 35B) broken off after article 4; articles 1–4 subequal in length; squama on article 3 reaching midlength of article 4.

Maxilliped (female paratype, ZMH K-45663, Figure 36B) basis length 2.9 times width; endite width 0.6 times basis width, with three coupling hooks; distal margin straight, with three fan setae. Basis acute lateral projection near palp insertion length 1.1 times article 1 lateral length. Palp length 2.1 times width, 0.8 times basis length. Article 2 as long as wide, slightly wider than basis; lateral length 1.15 times medial length; lateral and medial margins with four small setae each. Article 3 almost as wide as article 2; medial margin denticulate, with 10 small setae; medial length 0.85 times article 2 medial length; lateral margin with two small simple setae, length 0.35 times article 2 lateral length. Article 4 equal lateral length 0.8 times article 3 length; medial lobe length 1.2 times article 5 length, with four long distal setae. Article 5 with four lateral and five long distal setae. Epipod length 2.1 times width, 0.9 times basis length; width 1.2 times basis width.

Pereopods broken off.

Pleopod II (female paratype, ZMH K-45662, Figure 37A) length 0.85 times width; lateral margin with one small simple seta; distolaterally three small simple setae; ventral keel 0.7 times pleopod II length.

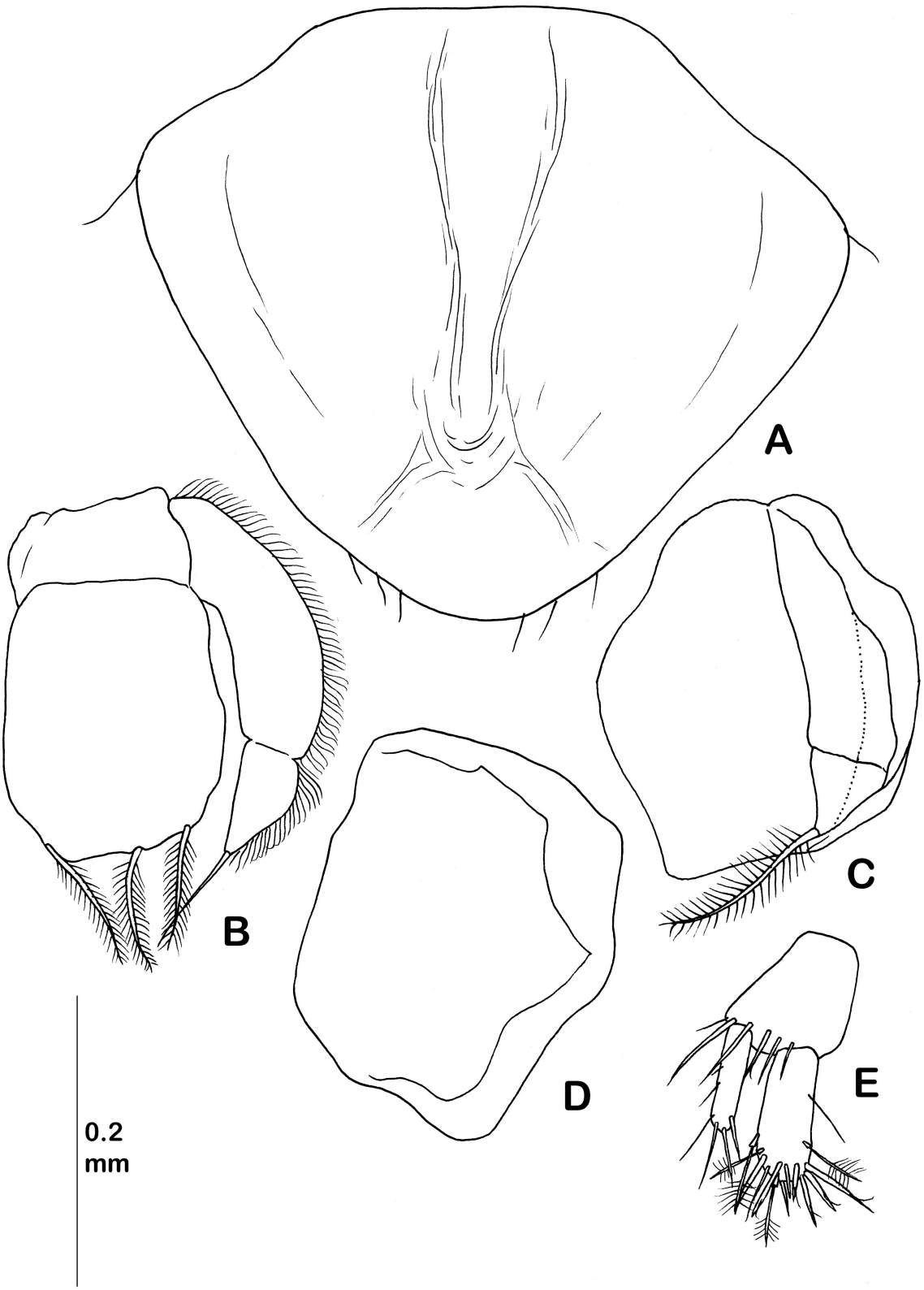

Figure 37. *Eurycope mathiasi* sp. nov. Female paratype (ZMH K-45662): (**A**) pleopod II; (**B**) pleopod III; (**C**) pleopod IV; (**D**) pleopod V; (**E**) uropod.

Pleopod III (female paratype, ZMH K-45662, Figure 37B) protopod length 0.5 times width; endopod length 1.25 times width; three distal plumose setae length 0.4 times pleopod III length; exopod reaching slightly behind endopod distal margin, 0.4 times as wide as

endopod, with row of fine simple lateral setae; distal simple seta length slightly shorter than endopod distal setae.

Pleopod IV (female paratype, ZMH K-45662, Figure 37C) endopod length 1.45 times width; exopod 0.9 times endopod length and 0.45 times endopod width. Stout plumose distal seta length 1.3 times length of pleopod III endopod distal setae.

Pleopod V (female paratype, ZMH K-45662, Figure 37D) length 1.35 times width.

Uropod (female paratype, ZMH K-45662, Figure 37E) length 0.3 times pleotelson length; protopod broadening apically, length 1.1 times width, with one UB and five whip distal setae; endopod length 1.05 times protopod length, width 0.5 times protopod width, with four simple, four broom, and six UB distal setae; exopod length 0.8 times endopod length, width 0.5 times endopod width, with four distal setae.

Etymology: The name honors Sarah Schnurr's husband, Mathias Lutz.

Distribution: Known only from the type locality in the Irminger Basin, featuring a depth range of 214–698 m.

4. Discussion

4.1. Molecular Taxonomy

Taxonomists, evolutionary biologists, ecologists, and conservationists rely on a solid knowledge on species [45,46]. Underestimation of biodiversity due to morphologically similar species and cryptic species is a known issue [47], especially in the deep sea. Thus, a solid backbone of taxonomy is needed. An integrative approach combining molecular and morphological data has shown to help to reveal diversity and "unknowns" within benthic samples. However, formal descriptions of species are a time-consuming process and must be conducted by taxonomic experts of the field. The current study disentangles the morphological diversity of the *E. producta* complex within Icelandic waters. However, the type specimens of *E. producta* and *E. dahli* were not suitable for genetic studies. Thus, genetic data rely only on newly collected specimens of the IceAGE1 and IceAGE2 expeditions, since those samples were fixed in 96% nondenatured ethanol, which makes them suitable for genetic analyses.

Maximum likelihood and Bayesian inference tree construction of the different *Eurycope producta* species complex datasets by Schnurr et al. [28] revealed identical tree topologies, each clade being well-supported by high posterior probabilities and bootstrap support (see Figure 2 for tree topologies of the concatenated dataset. Single gene trees can be retrieved from Schnurr et al. [28]). It has been shown previously that the eight potential genetic species clades are also well-supported by species delimitation methods and hence, further repetition of molecular evidence will be avoided. However, the previous molecular analyses strongly support the distinct species clades of *E. producta* sensu stricto and *E. dahli*, as well as the six herein newly described species *E. mishkai* sp. nov., *E. nikitai* sp. nov., *E. gordeyi* sp. nov., *E. emmae* sp. nov., *E. jakobi* sp. nov., and *E. mathiasi* sp. nov. Thus, the evaluated specimens of the *E. producta* complex represent eight not only genetically, but also morphologically different species.

4.2. Taxonomy

The species of the *E. producta* complex differ from all *Eurycope* species by having a broad and long rostrum, which is subequal in length and width to article 1 of antenna I, with a medial groove, lateral keels are serrated anteriorly. The large, almost rectangular rostrum of the *E. producta* complex is similar in the genus *Disconectes,* though *Disconectes* differs in having pereonites 5 and 6 dorsally fused, which are free in all *Eurycope* species. The above-described elaborate species diagnoses of the eight species of the *E. producta* complex feature specific morphological characters, serving to distinguish them from each other.

Our morphological evaluation shows that the species of the *E. producta* complex can be divided into two subgroups. The first subgroup consists of the species: *E. producta* sensu stricto, *E. dahli*, *E. mishkai* sp. nov., and *E. nikitai* sp. nov., whereas the second subgroup includes: *E. gordeyi* sp. nov., *E. emmae* sp. nov., *E. jakobi* sp. nov., and *E. mathiasi* sp. nov.

The first group is characterized by a relatively narrow tapering rostrum, which is not broader than article 1 of antenna I, a truncate distal margin of the male pleopod I, with distomedial and distolateral lobes of equal length. The species of the second group have a rostrum which is longer than the distomedial lobe of antenna I article 1 and broader than antenna I article 1; in this group the male pleopod I tapers distally and distomedial lobes are elongated, much protruded beyond tiny distolateral lobes.

The most useful diagnostic characters for distinguishing species were revealed. These are the relative size and shape of the rostrum, the correlation between length and width of the rostrum and of article 1 of antenna I, as well as the shape of the distal margin of the male pleopod I. Maxilliped and its palp articles proportions —especially the relation of article 4 distomedial lobe and article 5—can also be used to separate the species from each other.

4.3. Distribution

The elucidated species of the herein-evaluated dataset are geographically much more restricted than previously assumed (see Figure 1 for the assumed distribution prior to Schnurr et al. [28] and also for distribution maps of each resolved species). The resolved species feature much smaller ecological niches than the complex. *Eurycope dahli* was the only species restricted to the deep areas north of the GSR, whereas *E. mishkai*, *E. nikitai*, *E. jakobi*, and *E. mathiasi* were restricted to the deep areas south of the GSR. *Eurycope emmae* occurred along the northern side of the GSR and across the Iceland–Faroe Ridge, whereas *E. gordeyi* occurred only across the Iceland–Faroe Ridge. Thus, the GSR or factors related to this massive submarine ridge system seem to have an effect on the distribution of most of the herein-evaluated species, except for *E. producta* sensu stricto. *Eurycope producta* sensu stricto is the only species, which occurred on both sides of the GSR, showing a trans-GSR distribution and a depth range of over 1000 m.

4.4. Key to the Studied Species of the E. producta Complex within Icelandic Waters

1. (8) Rostrum not broader than article 1 of antenna I, distal margin of male pleopod I truncate, distomedial and distolateral lobes of subequal length
2. (3) Rostrum visibly shorter than article 1 of antenna I, pleopod III with six distal plumose setae.

   E. dahli Svavarsson, 1987
3. (2) Rostrum equal or longer than antenna I article I, pleopod III with three distal plumose setae
4. (5) Maxilliped basis lateral projection near palp insertion length shorter than article 1 (0.85 times). Palp article 4 distomedial lobe longer than article 5 (1.25 times). Pleopod I distal margin straight.

   E. mishkai sp. nov.
5. (4) Maxilliped basis lateral projection near palp insertion length not shorter than article 1. Palp article 4 distomedial lobe shorter than article 5. Pleopod I distal margin not straight.
6. (7) Pereonites 5–7 equal in medial length. Maxilliped endite with two coupling hooks, basis lateral projection near palp insertion as long as article 1. Article 4 distomedial lobe length 0.6 times article 5 length. Pleopod I with light rounded notch between distomedial and distolateral lobes.

   E. nikitai sp. nov.
7. (6) Pereonites 5 and 6 equal in medial length, pereonite 7 longest. Maxilliped endite with three coupling hooks, basis lateral projection near palp insertion length 1.2 times article 1 length. Article 4 distomedial lobe length 0.75 times article 5 length. Pleopod I distal margin rounded.

   E. producta G.O. Sars, 1868
8. (1) Rostrum broader than article 1 of antenna I, distal margin of male pleopod I tapering; distomedial lobes elongated, protruding significantly beyond tiny distolateral lobes

9. (10) Rostrum slightly tapering distally. Maxilliped basis lateral projection near palp insertion longer than article 1 (1.1 times), palp article 4 medial lobe longer than article 5 (1.2 times)

   E. mathiasi sp. nov.
10. (9) Rostrum not tapering distally, almost rectangular. Maxilliped basis lateral projection near palp insertion not longer than article 1, palp article 4 medial lobe not longer than article 5.
11. (12) Rostrum 1.2 times antenna I article 1 length, width 1.1 times antenna I basal width. Maxilliped endite with five coupling hooks. Palp article 4 medial lobe subequal in length to article 5.

    E. gordeyi sp. nov.
12. (11) Rostrum 1.5 times antenna I article 1 length, width > 1.1 times antenna I basal width. Maxilliped endite with less than five coupling hooks.
13. (14) Rostrum width 1.7 times antenna I article 1 width. Maxilliped endite with two coupling hooks. Basis lateral projection near palp insertion length 0.9 times article 1 lateral length. Palp article 4 medial lobe subequal in length to article 5.

    E. emmae sp. nov.
14. (13) Rostrum width 1.6 times antenna I basal width. Maxilliped endite with three coupling hooks. Basis lateral projection near palp insertion as long as article 1. Palp article 4 medial lobe length 0.8 times article 5 length.

    E. jakobi sp. nov.

Author Contributions: Conceptualization S.M.S., M.V.M. and S.B.; methodology, S.M.S., M.V.M. and S.B.; software, S.M.S.; validation, S.M.S. and M.V.M.; formal analysis, S.M.S. and M.V.M.; investigation, S.M.S. and M.V.M.; resources, S.M.S., M.V.M. and S.B.; data curation, M.V.M. and S.B.; writing—original draft preparation, S.M.S. and M.V.M.; writing—review and editing, S.M.S. and M.V.M.; visualization, S.M.S. and M.V.M.; supervision, M.V.M.; project administration, M.V.M. and S.B.; funding acquisition, S.B. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the German Science Foundation (DFG), grant number BR3843/4–1 and 5–1 for collecting the material, the grant to S.B. for "initiating bilateral international collaboration", DFG grant number BR3843/6–1 as well as the Smithsonian grant to S.M.S. in 2015. S.M.S. was supported with a pre-doc fellowship of The National Museum of Natural History Crustacean Research funds. M.V.M. was supported also by the Ministry of Science and Higher Education of the Russian Federation (grant 13.1902.21.0012; contract No 075-15-2020-796).

Institutional Review Board Statement: Not applicable.

Data Availability Statement: Sequence data of Schnurr et al. [28] were deposited in GenBank. The GenBank Accession numbers of the specimens can be retrieved from Table 1.

Acknowledgments: We would like to thank the crews of the RV Meteor and RV Poseidon and participants of the IceAGE1 and IceAGE2 expeditions, as well as all pickers and sorters at the DZMB in Hamburg, Germany and the Nature Centre in Sandgerði, Iceland. Especially, Karen Jeskulke for introducing S.M.S. to lab workflows. Special thanks go to Karen Osborn for all the fruitful discussions, help, and encouragement. We would like to thank the Smithsonian lab staff for their support during the lab visits of S.M.S., especially Amy Driskell and Herman Wirshing. Thank you, Pedro Martinez and Angelika Brandt for supporting the idea of this project for such a long time. Last, but not least, we would like to thank Jörundur Svavarsson. Our *E. producta* project started in your lab during the research stay of M.V.M. and S.M.S.

Conflicts of Interest: The authors declare no conflict of interest.

Abbreviations

GSR = Greenland–Scotland Ridge; UB = unequal bifid seta

References

1. Sanders, H.L.; Hessler, R.R.; Hampson, G.R. An introduction to the study of deep-sea benthic faunal assemblages along the Gay Head-Bermuda transect. *Deep-Sea Res. Oceanogr. Abstr.* **1965**, *12*, 845–867. [CrossRef]
2. Sanders, H.L.; Hessler, R.R. Ecology of the Deep-Sea Benthos. *Science* **1969**, *163*, 1419–1424. [CrossRef] [PubMed]
3. Brandt, A.; Gooday, A.J.; Brandao, S.N.; Brix, S.; Brökeland, W.; Cedhagen, T.; Choudhury, M.; Cornelius, N.; Danis, B.; De Mesel, I.; et al. First insights into the biodiversity and biogeography of the Southern Ocean deep sea. *Nature* **2007**, *447*, 307–311. [CrossRef]
4. Brix, S.; Held, C.; Kaiser, S.; Jennings, R.M.; Driskell, A.; Brandt, A. Evolution and phylogeny of the deep-sea isopod families Desmosomatidae Sars, 1897 and Nannoniscidae Hansen, 1916 (Isopoda: Asellota). *Org. Divers. Evol.* **2021**, *21*, 691–717. [CrossRef] [PubMed]
5. Brix, S.; Osborn, K.J.; Kaiser, S.; Truskey, S.B.; Schnurr, S.M.; Brenke, N.; Malyutina, M.; Martinez Arbizu, P. Adult life strategy affects distribution patterns in abyssal isopods—Implications for conservation in Pacific nodule areas. *Biogeosciences* **2020**, *17*, 6163–6184. [CrossRef]
6. Lilljeborg, W. Bidrag till Kannedomen om de inom Sverige och Norrige frekommende Crustaceen af Isopodernas underordning och Tanaidernas familj. *Inbjud. Offentl.* **1864**, *1*, 1–32.
7. Wilson, G.D.F.; Hessler, R.R. Speciation in the Deep Sea. *Annu. Rev. Ecol. Syst.* **1987**, *18*, 185–207. [CrossRef]
8. Malyutina, M.V.; Brandt, A. Munnopsidae (Crustacea, Isopoda, Asellota) from the Kuril–Kamchatka Trench with a regional and inter-ocean comparison of their biogeographic and richness patterns. *Prog. Oceanogr.* **2020**, *183*, 102289. [CrossRef]
9. Malyutina, M.V.; Brandt, A. Composition and distribution of Munnopsidae (Crustacea, Isopoda, Asellota), collected during the KuramBio expedition 2012 from the Kuril–Kamchatka Trench area. *Deep-Sea Res. PT II* **2015**, *111*, 245–255. [CrossRef]
10. Malyutina, M.; Brandt, A. Diversity and zoogeography of Antarctic deep-sea Munnopsidae (Crustacea, Isopoda, Asellota). *Deep-Sea Res. PT II* **2007**, *54*, 1790–1805. [CrossRef]
11. Wilson, G.D.F.; Schotte, M. Munnopsidae Lilljeborg, 1864. Available online: http://www.marinespecies.org/aphia.php?p=taxdetails&id=118264 (accessed on 4 April 2022).
12. Hansen, H.J. Crustacea Malacostraca: The Order Isopoda. *Dan. Ingolf-Exp.* **1916**, *3*, 1–262.
13. Sars, G.O. On en anomal Gruppe af Isopoder. *Forh. Vidensk. Selsk. Kristiania* **1864**, *1863*, 1–16.
14. Wilson, G.D.F.; Hessler, R.R. A Revision of the Genus *Eurycope* (Isopoda, Asellota) with Descriptions of Three New Genera. *J. Crustacean Biol.* **1981**, *1*, 401–423. [CrossRef]
15. Wilson, G.D.F. Two new natatory asellote isopods (Crustacea) from the San Juan Archipelago, *Baeonectes improvisus* n. gen., n. sp. and *Acanthamunnopsis milleri* n. sp., with a revised description of *A. hystrix* Schultz. *Can. J. Zoolog.* **1982**, *60*, 3332–3343. [CrossRef]
16. Malyutina, M.; Brandt, A. A revaluation of the Eurycopinae (Crustacea, Isopoda, Munnopsidae) with a description of *Dubinectes* gen. nov. from the southern Atlantic deep sea. *Zootaxa* **2006**, *1272*, 1–44. [CrossRef]
17. Malyutina, M.V.; Kihara, T.C.; Brix, S. A new genus of Munnopsidae Lilljeborg, 1864 (Crustacea, Isopoda), with descriptions of two abyssal new species from the Clarion Clipperton Fracture Zone, north-eastern tropical Pacific. *Mar. Biodiv.* **2020**, *50*, 42. [CrossRef]
18. Wilson, G.D.F. An unusual species complex in the genus *Eurycope* (Crustacea: Isopoda: Asellota) from the deep north Atlantic Ocean. *Proc. Biol. Soc. Wash.* **1983**, *96*, 452–467.
19. Wilson, G.D.F. Variation in the deep-sea isopod *Eurycope iphthima* (Asellota, Eurycopidae): Depth related clines in rostral morphology and in populations structure. *J. Crustacean Biol.* **1983**, *3*, 127–140. [CrossRef]
20. Bonnier, J. Edriophthalmes. In *Résultats Scientifiques de la Campagne du "Caudan" dans le Golfe de Gascogne: Annelides, Poissons, Edriophthalmes, Diatomees, Debris Vegetaux et Roches, Liste des Especes Recueillies*; Koehler, R., Ed.; Annales de l'Université de Lyon: Lyon, France, 1896; pp. 527–689.
21. Svavarsson, J. Eurycopidae (Isopoda, Asellota) from bathyal and abyssal depths in the Norwegian, Greenland, and North Polar Seas. *Sarsia* **1987**, *72*, 183–196. [CrossRef]
22. Sars, G.O. Beretning om en i Sommeren 1865 foretagan zoologisk Reise ved Kysterne af Christianias og Christiansands Stifter-Crustaceer. *Forh. Vidensk. Selsk. Kristiania* **1868**, *1868*, 1–47.
23. Wolff, T. Isopoda from depths exceeding 6000 meters. *Galathea Rep.* **1956**, *2*, 85–157.
24. Birstein, J.A. Deep-sea isopods of the north-western part of the Pacific Ocean. *Institue Oceanol. Acad. Sci. USSR* **1963**, 1–214.
25. Gurjanova, E.F. On the fauna of deep-sea crustaceans (Isopoda) of the Pacific. II: New species of Gnathiidae and Asellota. *Issled. Merei SSSR* **1933**, *19*, 79–91.
26. Svavarsson, J.; Strömberg, J.O.; Brattegard, T. The Deep-Sea Asellote (Isopoda, Crustacea) Fauna of the Northern Seas: Species Composition, Distributional Patterns and Origin. *J. Biogeogr.* **1993**, *20*, 537–555. [CrossRef]
27. Schnurr, S.; Brandt, A.; Brix, S.; Fiorentino, D.; Malyutina, M.; Svavarsson, J. Composition and distribution of selected munnopsid genera (Crustacea, Isopoda, Asellota) in Icelandic waters. *Deep-Sea Res. PT I* **2014**, *84*, 142–155. [CrossRef]
28. Schnurr, S.; Osborn, K.J.; Malyutina, M.; Jennings, R.; Brix, S.; Driskell, A.; Svavarsson, J.; Martinez Arbizu, P. Hidden diversity in two species complexes of munnopsid isopods (Crustacea) at the transition between the northernmost North Atlantic and the Nordic Seas. *Mar. Biodiv.* **2018**, *48*, 813–843. [CrossRef]
29. Hansen, B.; Østerhus, S. North Atlantic-Nordic Seas exchanges. *Prog. Oceanogr.* **2000**, *45*, 109–208. [CrossRef]

30. Jochumsen, K.; Schnurr, S.M.; Quadfasel, D. Bottom temperature and salinity distribution and its variability around Iceland. *Deep-Sea Res. PT I* **2016**, *111*, 79–90. [CrossRef]
31. Rothlisberg, P.C.; Pearcy, W.G. An epibenthic sampler used to study the ontogeny of vertical migration of *Pandalus jordani* (Decapoda, Caridea). *Fish. Bull.* **1977**, *74*, 994–997.
32. Brenke, N. An Epibenthic Sledge for Operations on Marine Soft Bottom and Bedrock. *Mar. Technol. Soc. J.* **2005**, *39*, 10–19. [CrossRef]
33. Brandt, A.; Elsner, N.; Brenke, N.; Golovan, O.A.; Riehl, T.; Schwabe, E.; Würzberg, L. Epifauna of the Sea of Japan collected via a new epibenthic sledge equipped with camera and environmental sensor systems. *Deep-Sea Res. PT II* **2013**, *86–87*, 43–55. [CrossRef]
34. Riehl, T.; Brenke, N.; Driskell, A.; Kaiser, S.; Brand, A. Field and laboratory methods for DNA studies on deep-se isopod crustaceans. *Pol. Polar Res.* **2014**, *35*, 203–224. [CrossRef]
35. Hessler, R.R. The Desmosomatidae (Isopoda, Asellota) of the Gay Head-Bermuda Transect. *Bull. Scripps Inst. Oceanogr.* **1970**, *15*, 1–185.
36. Wilson, G.D.F. A review of taxonomic concepts in the Nannoniscidae (Isopoda, Asellota), with a key to the genera and a description of *Nannoniscus oblongus* Sars. *Zootaxa* **2008**, *1680*, 1–24. [CrossRef]
37. Wilson, G.D.F.; Hessler, R.R. Taxonomic characters in the morphology of the genus *Eurycope* (Crustacea, Isopoda) with a redescription of *E. cornuta* Sars, 1864. *Cah. Biol. Mar* **1980**, *21*, 241–263.
38. Wilson, G.D.F. Systematics of a species complex in the deep-sea genus *Eurycope*, with a revision of six previously described species (Crustacea, Isopoda, Eurycopidae). *Bull. Scripps Inst. Oceanogr.* **1982**, *25*, 1–64.
39. Latreille, P.A. Histoire Naturelle des Crustaces et des Insectes. *Orthoptera* **1802**, *3*, 267–284.
40. Sars, G.O. On some additional Crustacea from the Caspian Sea. *Annu. Du Musée Zool. De L´Académie Impériale Des Sci. St. Pétersbourg* **1897**, *2*, 273–305.
41. Malyutina, M.V.; Kussakin, O.G. Additions to the Polar Sea bathyal and abyssal Isopoda (Crustacea, Malacostraca). Part 3. Asellota: Munnopsidae. *Zoosystematica Ross.* **1996**, *5*, 13–27.
42. Malyutina, M.; Golovan, O.A. The first record of Asellota (Isopoda) from hydrothermal vent biotopes of the submarine Piip Volcano, Bering Sea, with descriptions of two new species of Munnopsidae. *Deep-Sea Res. PT II.* **2022**, 105137. [CrossRef]
43. Sars, G.O. An account of the Crustacea of Norway with short descriptions and figures of all the species.Isopoda. *Bergen Mus. Bergen* **1899**, *2*, 1–270.
44. Kussakin, O.G. *Marine and Brackishwater Like-Footed Crustacea (Isopoda) from the Cold and Temperate Waters of the Northern Hemisphere. III. Suborder Asellota. Part 3. Family Munnopsidae*; Izdavaemye Zoologischeskim Institutom Rossiiskoy Akademy Nauk, 171; Nauka: St. Petersburg, Russia, 2003; pp. 1–381.
45. Harrison, R.G. Linking evolutinary pattern and process. The relevance of species concepts fo the study of speciation. In *Endless Forms: Species and Speciation*; Howard, D.J., Berlocher, S., Eds.; Oxford University Press: New York, NY, USA, 1998; pp. 19–31.
46. Kunz, W. Taking more care in using different species concepts—An opinion. *Parasitol Res.* **2001**, *87*, 413–416. [CrossRef] [PubMed]
47. Vrijenhoek, R.C. Cryptic species, phenotypic plasticity, and complex life histories: Assessing deep-sea faunal diversity with molecular markers. *Deep-Sea Res. PT II* **2009**, *56*, 1713–1723. [CrossRef]