

***Archimisophria* (Copepoda: Misophrioida: Speleophriidae) first recorded from Arctic Ocean with the description of the new species**

Первая находка *Archimisophria* (Copepoda: Misophrioida: Speleophriidae) из Северного Ледовитого океана с описанием двух новых видов

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КЛЮЧЕВЫЕ СЛОВА: Copepoda, Calanoida, Misophrioida, *Archimisophria*, глубоководные бентопелагические, Северный Ледовитый океан.

ABSTRACT. Two new deep-water benthopelagic misophrioid copepods of the genus *Archimisophria* Boxshall, 1983 were collected from the High Arctic. A new species *Archimisophria paradiscoveryi* sp.n. is described based on specimens of both sexes. It is related to *A. discoveryi* Boxshall, 1983, but differs in several characters: 1) male antennular ancestral segments XIX–XX are armed with two long and one short setae, 2) segments XXI–XXII carry a narrow ribbon-like chitinous thickening and lack a seta, 3) antenna proximal exopodal segment lacks a seta, and 4) the P5 is 5-segmented. The female of *A. paradiscoveryi* sp.n. is distinguished from *A. discoveryi* in the P5 having more than 3 segments and from all known congeners in having a P6 lateral seta reaching beyond posterior border of urosomite 3. The new species *Archimisophria arctica* sp.n. is known only from female. It shares the presence of sensory setae on the maxillule coxal and proximal endites with *A. squamosa* Alvarez, 1985 and *A. paradiscoveryi* sp.n., but differs from its congeners in P6 lateral seta short, not reaching posterior border of Gns in combination with tiny medial seta.

The genus *Archimisophria* has been recorded from about 34°N and 24°S in the Atlantic Ocean and in the Indian Ocean without given locality and for the first time it is recorded from the high Arctic (82°N), thus representing the northernmost finding of the genus. This discovery is also the first record of the genus *Archimisophria* and family Speleophriidae in the Arctic Ocean.

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РЕЗЮМЕ. Два новых вида глубоководных бентопелагических копепод мизофриоид рода *Archimisophria* Boxshall, 1983 были собраны из высоких широт Арктики. Новый вид *Archimisophria paradiscoveryi* sp.n. описан по экземплярам обоих полов. Он родственен *A. discoveryi* Boxshall, 1983, но отличается от него тем, что 1) анцестральные сегменты антеннулы XIX–XX самца вооружены двумя длинными и одной короткой щетинками, 2) сегменты XXI–XXII снабжены узким лентовидным хитиновым утолщением, но лишены щетинок, 3) проксимальный сегмент экзоподита антенны лишен щетинок, и 4) P5 5-сегментная. Самка *A. paradiscoveryi* sp.n. отличается от *A. discoveryi* P5, состоящей из более чем 3 сегментов и от всех остальных сородичей латеральной щетинкой P6, достигающей уросомита 3 в комбинации с крошечной медиальной щетинкой. Новый вид *Archimisophria arctica* sp.n. известен только по самкам. Он как *A. squamosa* Alvarez, 1985 и *A. paradiscoveryi* sp.n. имеет сенсорные щетинки на коксальных и проксимальных эндитах максиллулы, но отличается от всех своих сородичей короткой латеральной щетинкой P6, не достигающей задней границы Gns, в комбинации с крошечной медиальной щетинкой.

Род *Archimisophria* отмечался в Атлантическом океане в широтах 34°с.ш. и 24°ю.ш., и известен из Индийского океана без указания местонахождения. Род впервые найден в высоких широтах Арктики (82° с.ш.) и представляет собой самую северную находку рода. Род *Archimisophria* и семейство Speleophriidae впервые зарегистрированы в Северном Ледовитом океане.

Introduction

Representatives of the copepod order Misophrioida are distributed in deep benthopelagic and shallow waters all over the world's oceans and many misophrioid species inhabit anchialine caves [Boxshall, 1983; Alvarez, 1985; Boxshall, Iliffe, 1986, 1990, Huys, 1988, Jaume, Boxshall, 1996a,b, 1997, Boxshall, Jaume, 1999, Jaume *et al.*, 1998, 2001, Boxshall *et al.*, 2014; Suárez Morales *et al.*, 2017 and others]. In high Arctic latitudes, however, only three misophrioid species have been recorded, namely *Arcticomisophria bathylaptevensis* Martínez Arbizu *et Seifried*, 1996, *Fosshageniella glabra* Jaume *et Boxshall*, 1997 [Martínez Arbizu, Seifried, 1996; Jaume, Boxshall, 1997] and according to data by Razouls, Desreumaux, Kouwenberg, de Bovée F. [2005–2025], also *Misophria pallida* Boeck, 1864. All of these species belong to the family Misophriidae [Boxshall, Jaume, 2000] and until now no other misophrioid families have been reported from the Arctic Ocean.

As a result of the study of samples collected by Giant Box Corer in the High Arctic Ocean during the 2023–2024 expedition on board the R/V *Severniy Polus*, a few specimens of the family Speleophriidae were sorted. All specimens were recognized as members of the genus *Archimischophria* Boxshall, 1983, and they are herein described as a new species of the genus.

The misophrioid copepod family Speleophriidae includes eight genera [Boxshall, Jaume, 2000; Boxshall, Hulsey, 2004; Boxshall *et al.*, 2014] that predominantly inhabit cavernicolous anchialine biotopes. The genus *Archimischophria* Boxshall, 1983 is the only known speleophriid that inhabits the deep-water benthopelagic environment of the World Ocean (Table 1). The genus fits least well into this family and although it shares the speleophriid apomorphies, its taxonomic position may change [Boxshall, Jaume, 2000].

With the addition of these two new species, the genus *Archimischophria* now includes four species in addition to *A. discoveryi* Boxshall, 1983 and *A. squamosa* Alvarez, 1985.

Material and methods

Benthopelagic misophrioid copepods of the genus *Archimischophria* (2 females and 1 male) were collected in the High Arctic in 2023 and 2024 during the expedition of drifting research station “North Pole – 41” organized by the Federal State Budgetary Institution “Arctic and Antarctic Research Institute” (FSBI “AARI”) of Roshydromet based on the R/V “SEVERNIY POLUS”.

The samples were collected in the area of the continental slope north of Franz Josef Land at depths of about 1300 m. Along the edge of the continental slope to the east runs one of the branches of the warm West Spitsbergen Current, which carries transformed Atlantic waters. The thickness of the Atlantic water layer in the slope area reaches 500–800 m (Rudels, Carmack, 2022).

The samples were collected using a Giant Box Corer with a box area of 50×50 cm. The entire volume of bottom sediment from the box corer was washed with seawater through a

nylon sieve with a 0.5 mm mesh size. The collected copepods were fixed in 96% ethanol and then stained with a solution of chlorazol black E dissolved in 70% ethanol/ 30% water. The taxonomically important appendages, including the mouthparts and swimming legs were dissected, mounted in glycerin and figured using a *camera lucida* attached to a compound microscope.

The following abbreviations are used in the descriptions: P1–P5, legs 1–5. Free segments of the antennule are designated by Arabic numerals, ancestral segments by Roman numerals. One seta and one aesthetasc on a segment of the antennule are designated: 1s + 1ae, “1?” indicates that a setal element was broken and only the scar at the location of its attachment was counted. The morphological terminology and definitions follows Huys & Boxshall [1991], for maxilla and maxilliped segmentation Ferrari & Ivanenko [2008].

The type material and additional specimens are deposited the Zoological Institute, Russian Academy of Sciences, St. Petersburg (ZIN).

Taxonomy

Order Misophrioida Gurney, 1933
Family Speleophriidae Boxshall *et Jaume*, 2000
Genus *Archimischophria* Boxshall, 1983

Archimischophria paradiscoveryi sp.n.
Figs 1–7.

MATERIAL. Holotype, adult male, dissected, body length 1.35 mm (91200), Arctic Ocean, 82°13.138'N 40°32.903'E, “North Pole – 41” expedition based on the R/V “Severniy Polus”, station 197, 13 January 2024, box corer at a depth of 1360 m. Paratype, adult female, dissected, body is not measured, smashed in poor shape (91201), same metadata data as for holotype.

DESCRIPTION. Adult male, total length 1.35 mm. Prosome not compressed laterally, large with 4 free pedigerous somites (Fig. 1A–B). Prosome-urosoma articulation between pedigerous somite 4 and 5. Urosome of 6 somites. Genital double-somite slightly swollen in dorsal view and significantly swollen posteriorly in lateral view (Fig. 1F–H). Caudal rami armed with 6 setae (Fig. 1I). Rostrum large, not fused to cephalon (Fig. 1C–E).

Antennules (Fig. 2A) geniculate on both sides, 25-segmented; armature as follows: I–2s, II–1s, III–2s+ae, IV–1s, V–VI–2s each, VII–2s+ae, VIII–IX–2s each, X–1s, XI–2s+ae, XII–1s, XIII–XIV–2s each, XV–1s, XVI–2s+ae, XVII–XXVIII–2s each, XIX–XX fused with 3s, 2 long and 1 short, XXI–XXII fused without armament, XXIII–1s, XXIV–XXVI–2s each, segments XXVII–XXVIII with 4s +ae.

Antenna (Fig. 2B), coxa and basis without seta, 1st endopod segment without seta, 2nd segment (partly separate from third) with 4 setae, 3rd endopod segment with 9 setae, 1 short and thin and with spineles; exopod 8-segmented, setal formula 0,0,?,1,1,1,0 and 4 setae (one seta broken).

Mandible (Fig. 2C–E), gnathobase strong, with setules; cutting edge with 5–6 acute teeth; basis with seta, exopod 5-segmented, with 1, 1, 1, 1, and 2 setae; endopod segment one with 1 seta, segment 2 with 7–8 setae.

Maxillule (Fig. 3A–B), praecoxal arthrite with 9 robust and 1 thin terminal spines, 2 anterior and 3 posterior setae; coxal epipodite with 7 setae, coxal endite with 4 setae, 1 sensory (Fig. 3B), proximal basal endite with 2 setae, one sensory (Fig. 3B), distal basal endite with 4 setae, endopod with 2 proximal and 8 terminal setae, exopod with 11 setae (of them 5 broken).

Maxilla (Fig. 3C–F), praecoxal endite with 6 setae; coxal endite and basal endites with 3 setae each; allobasis fused to

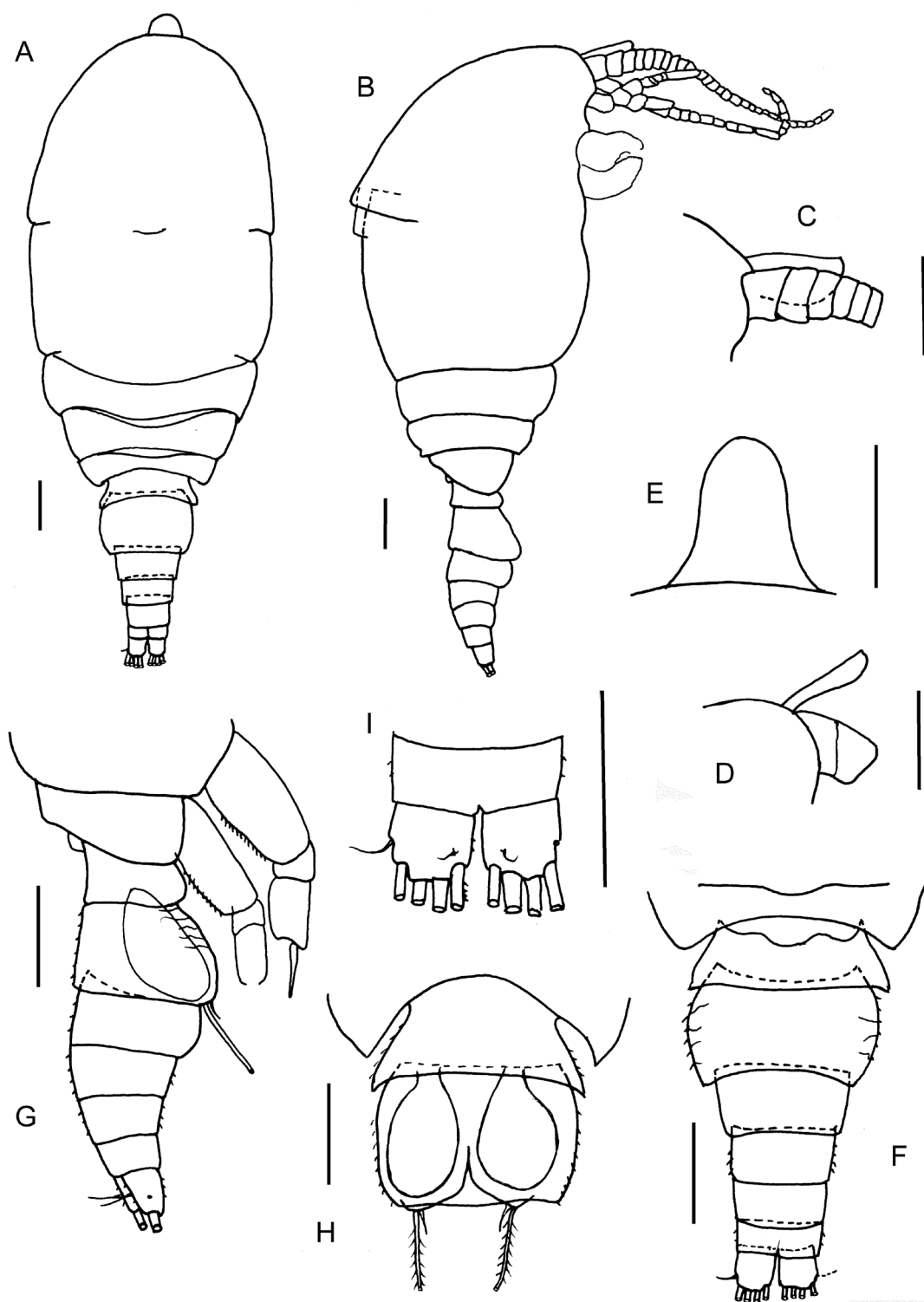


Fig. 1. *Archimisophria paradiscoveryi* sp.n. Male, holotype: A — habitus, dorsal view; B — habitus, lateral view; C, D — rostrum, lateral view; E — rostrum, ventral view, not dissected; F — pedigerous somite 4 and urosome, dorsal view; G — pedigerous somites 3–4 and urosome, lateral view; H — pedigerous somites 4–5, genital double somite and P6, ventral view; I — urosome somite 5 and caudal rami dorsal view. Scale bars 0.1 mm.

Fig. 1. *Archimisophria paradiscoveryi* sp.n. Самец, голотип: А — общий вид дорсально; В — общий вид латерально; С — D — рostrum, латерально; D — рostrum, латерально; Е — рostrum вентрально, не отпрепарирован; F — уросома, дорсально; G — сомиты, несущие 3–4 пары ног, латерально; H — сомиты, несущие 4–5-е пары ног, генитальный сомит и P6, вентрально; I — сомит уросомы 5 и каудальные ветви, дорсально. Масштаб 0,1 мм.

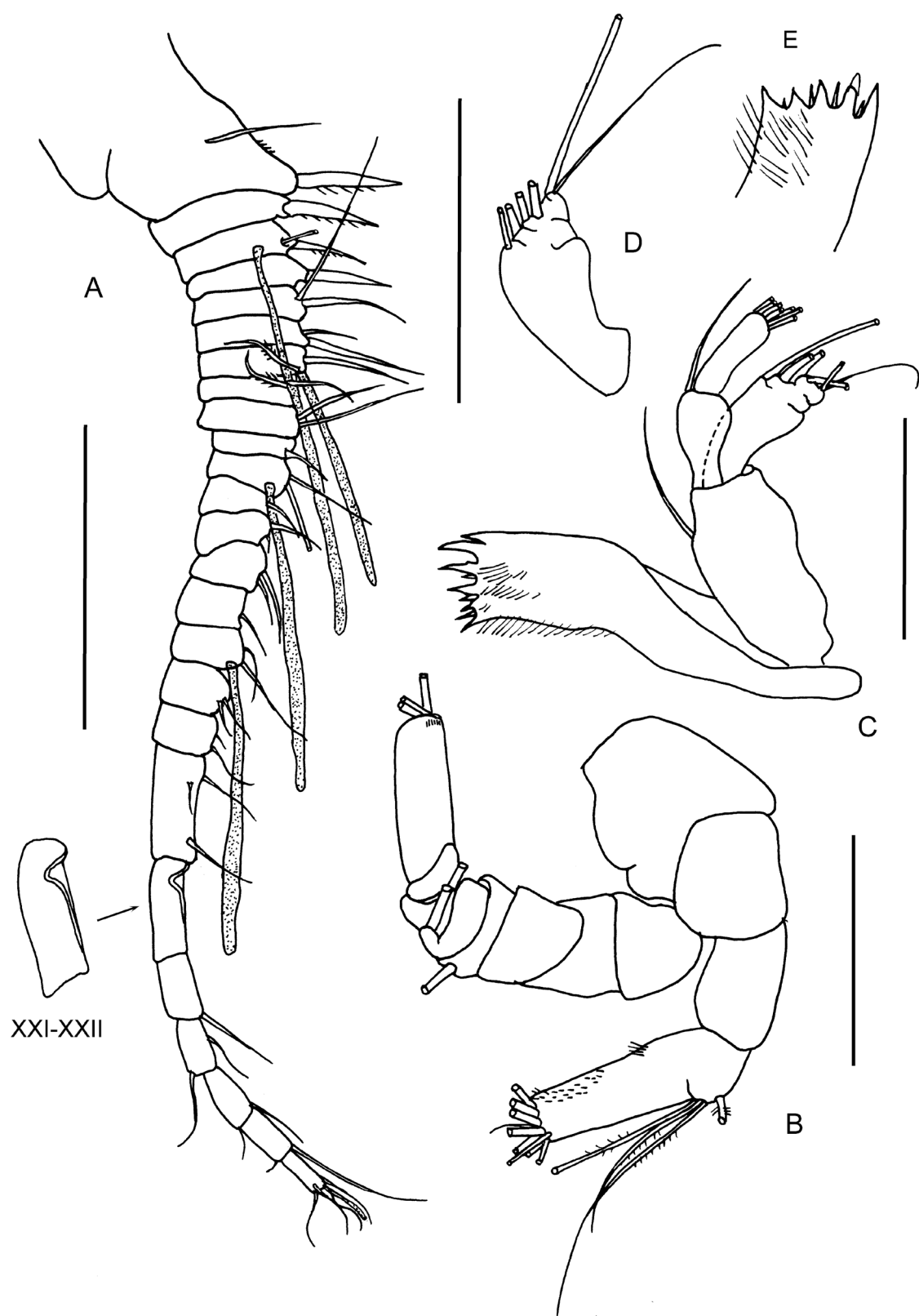


Fig. 2. *Archimisophria paradiscoveyi* sp.n.. Male, holotype: A — right antennule; B — antenna; C — mandible; D — mandible, exopod; E — mandible gnathobase (part.). Scale bars 0,1 mm.

Рис. 2. *Archimisophria paradiscoveyi* sp.n. Самец, голотип: А — правая антеннула; В — антенна; С — мандибула; D — экзоподит мандибула; E — гнатобаза мандибула (частично). Масштаб 0,1 мм.

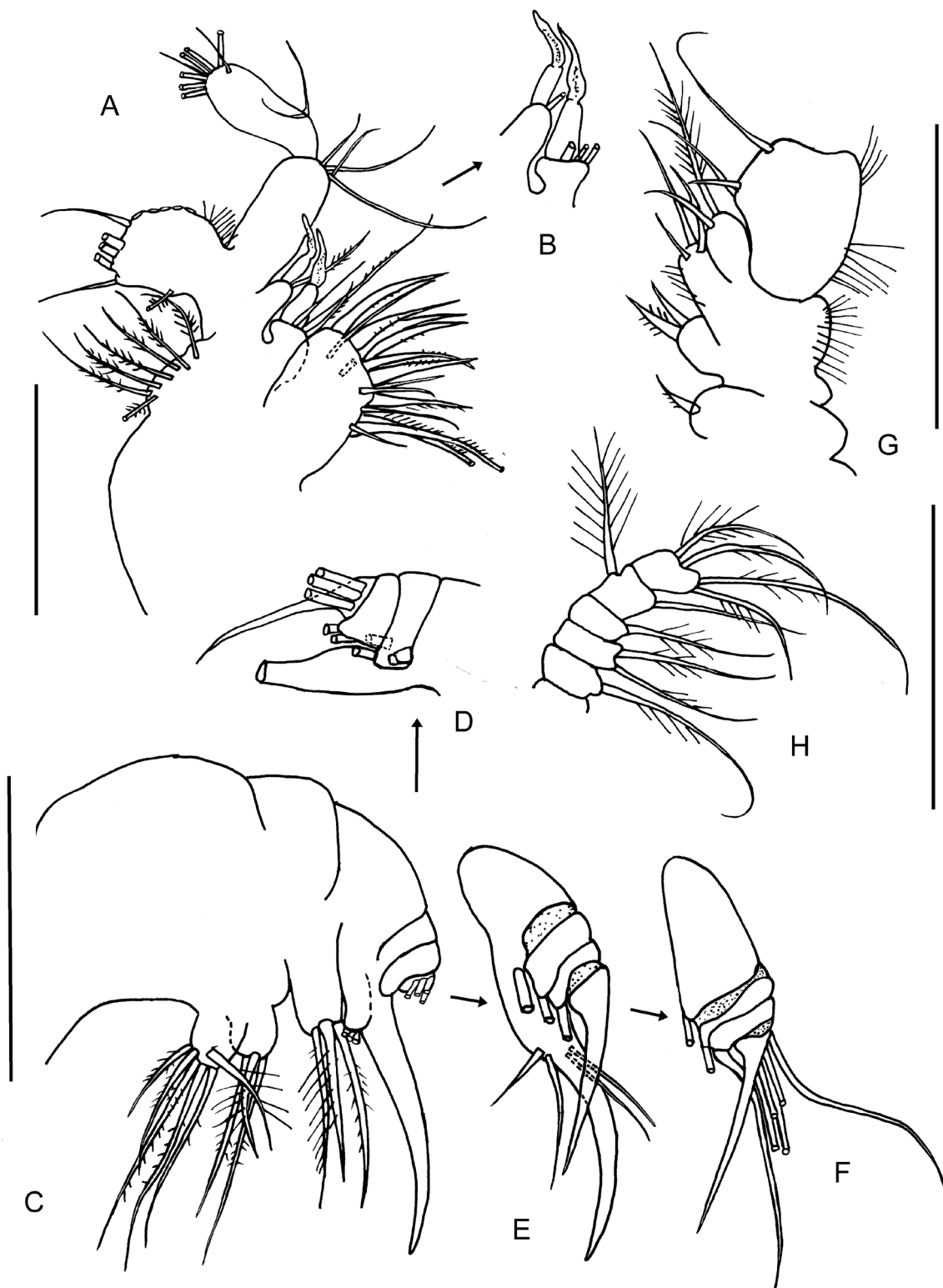


Fig. 3. *Archimisophria paradiscoveryi* sp.n. Male, holotype: A — maxillule; B — maxillule, coxal and proximal basal endites; C — maxilla, setation of allobasis and endopod not figured; D–F — maxilla, allobasis and endopod, different views; G — maxilliped, syncoxa and basis; H — maxilliped, endopod. Scales bars 0.1 mm.

Рис. 3. *Archimisophria paradiscoveryi* sp.n. Самец, голотип: А — максиллула; В — максиллула, коксальный и проксимальный базальный эндиты; С — максилла, вооружение аллобазиса и эндоподита не изображено; D–F — максилла, аллобазис и эндоподит, вид с разных позиций; G — максиллипеда, синкокса, кокса и базис; H — максиллипеда, эндоподит. Масштаб 0,1 мм.

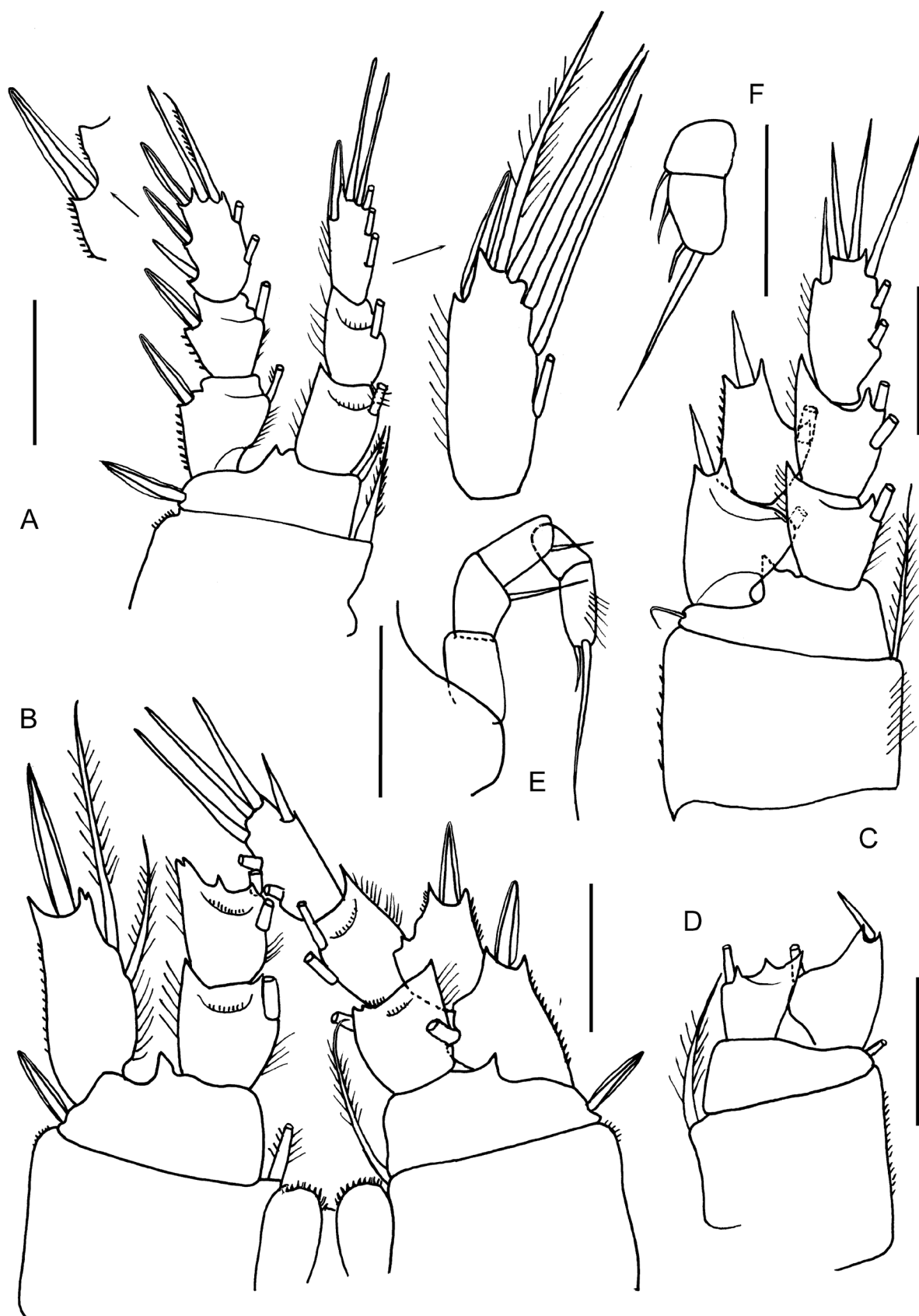


Fig. 4. *Archimisophria paradiscoveyi* sp.n. Male, holotype: A — P1; B — P2; C — P3; D — P4; E, F — P5. Scales bars 0.1 mm.
 Рис. 4. *Archimisophria paradiscoveyi* sp.n. Самец, голотип: А — P1; В — P2; С — P3; D — P4; E, F — P5. Масштаб: 0.1 мм.

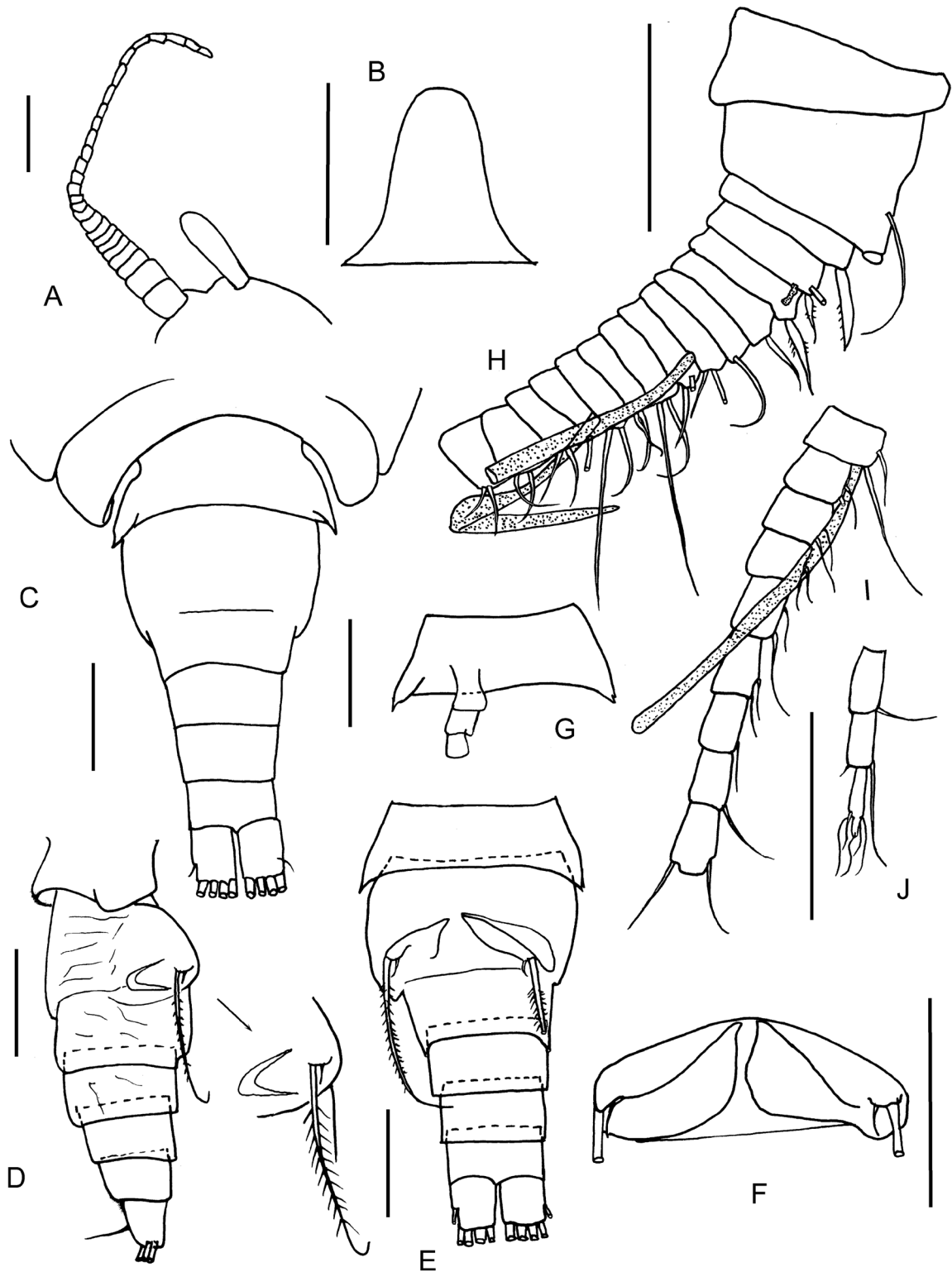


Fig. 5. *Archimisophria paradiscoveryi* sp.n. Female, paratype: A — cephalon, anterior, rostrum and antennule; B — rostrum, ventral view; C — pedigerous somites 3-4 and urosome, dorsal view; D — urosome, lateral view; E — urosome, ventral view; F — P6; G — pedigerous somite P5; H — antennule, ancestral segments I-XV; I — antennule, ancestral segments XVI-XXIV; J — antennule, ancestral segments XXV-XXVIII. Scales bars 0.1 mm.

Рис. 5. *Archimisophria paradiscoveryi* sp.n. Самка, паратип: А — цефалон, anteriорно, рoструм и антеннула; В — рoструм, вентрально; С — сомиты несущие 3-4-е пары ног, уросома, дoсально; D — уросома, латерально; E — уросома, вентрально; F — P6; G — сомиты несущий P5; H — антеннула, анцестральные сегменты I-XV; I — антеннула, анцестральные сегменты XVI-XXIV; J — антеннула, анцестральные сегменты XXV-XXVIII. Масштаб 0,1 мм.

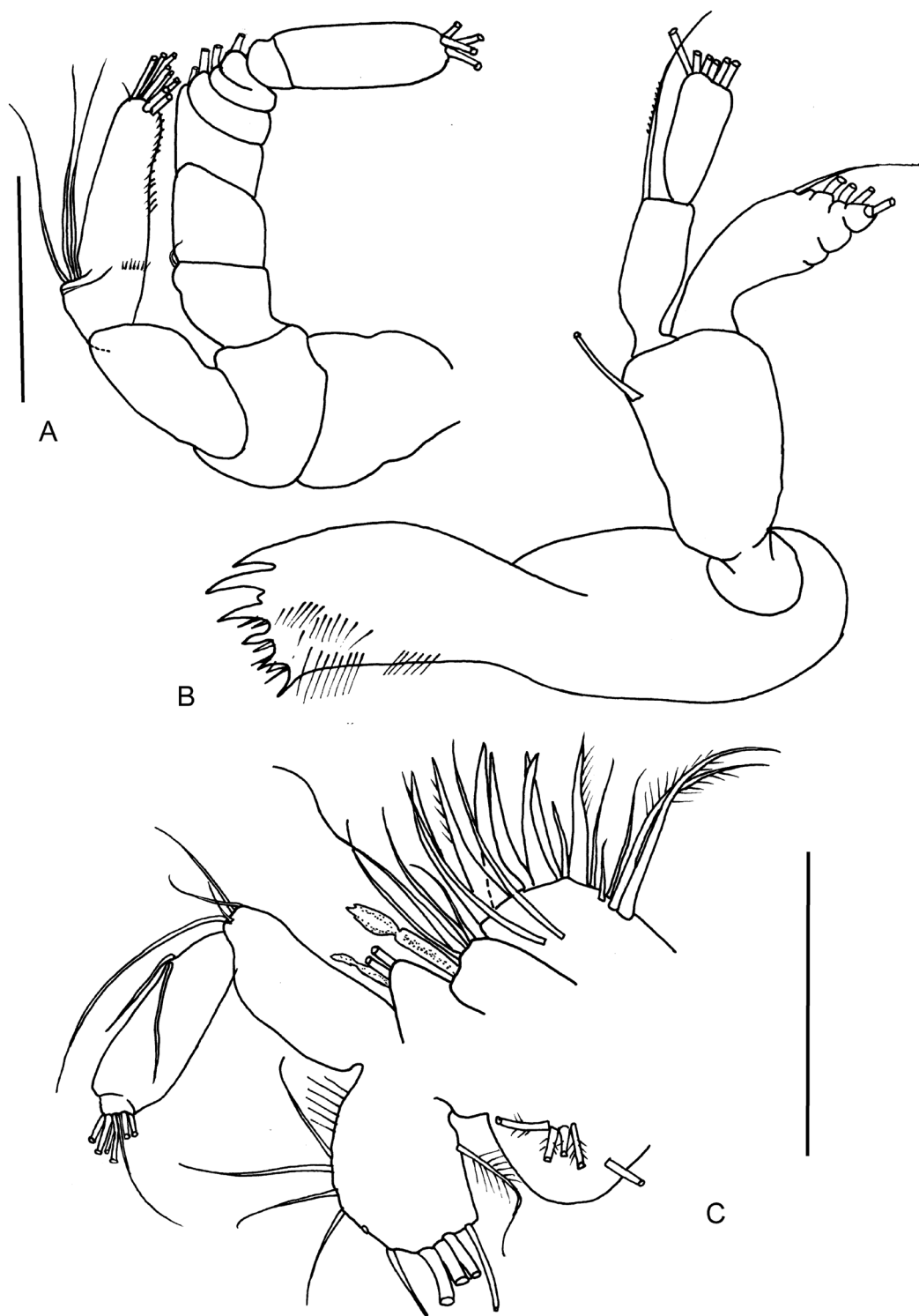


Fig. 6. *Archimisophria paradiscoveyi* sp.n. Female, paratype: A — antenna; B — mandible; C — maxillule. Scales bars 0.1 mm.

Рис. 6. *Archimisophria paradiscoveyi* sp.n. Самка, паратип: А — антенна; В — мандибула; С — максиллула. Масштаб 0,1 мм.

endopod segment with strong claw and 5–6 setae, free endopod segments with 2+2+4 setae, one terminal seta fused to terminal endopod segment.

Maxilliped (Fig. 3G–H), praecoxal endites of syncoxa with 1, 2 and 3 setae (from proximal to distal, one seta apparently broken) and lateral spinules; coxal endite of syncoxa with 2

setae, basis with 2 proximal medial setae and 1 distal seta, 2 patches of spinules proximally and distally; free endopod segments with 1, 2, 1, 2, and 4 setae.

P1 (Fig. 4A), coxa with medial seta and distolateral short spinules; basis with lateral spine and medial seta distomedially; endopod segments 1 and 2 with one medial seta each, segment

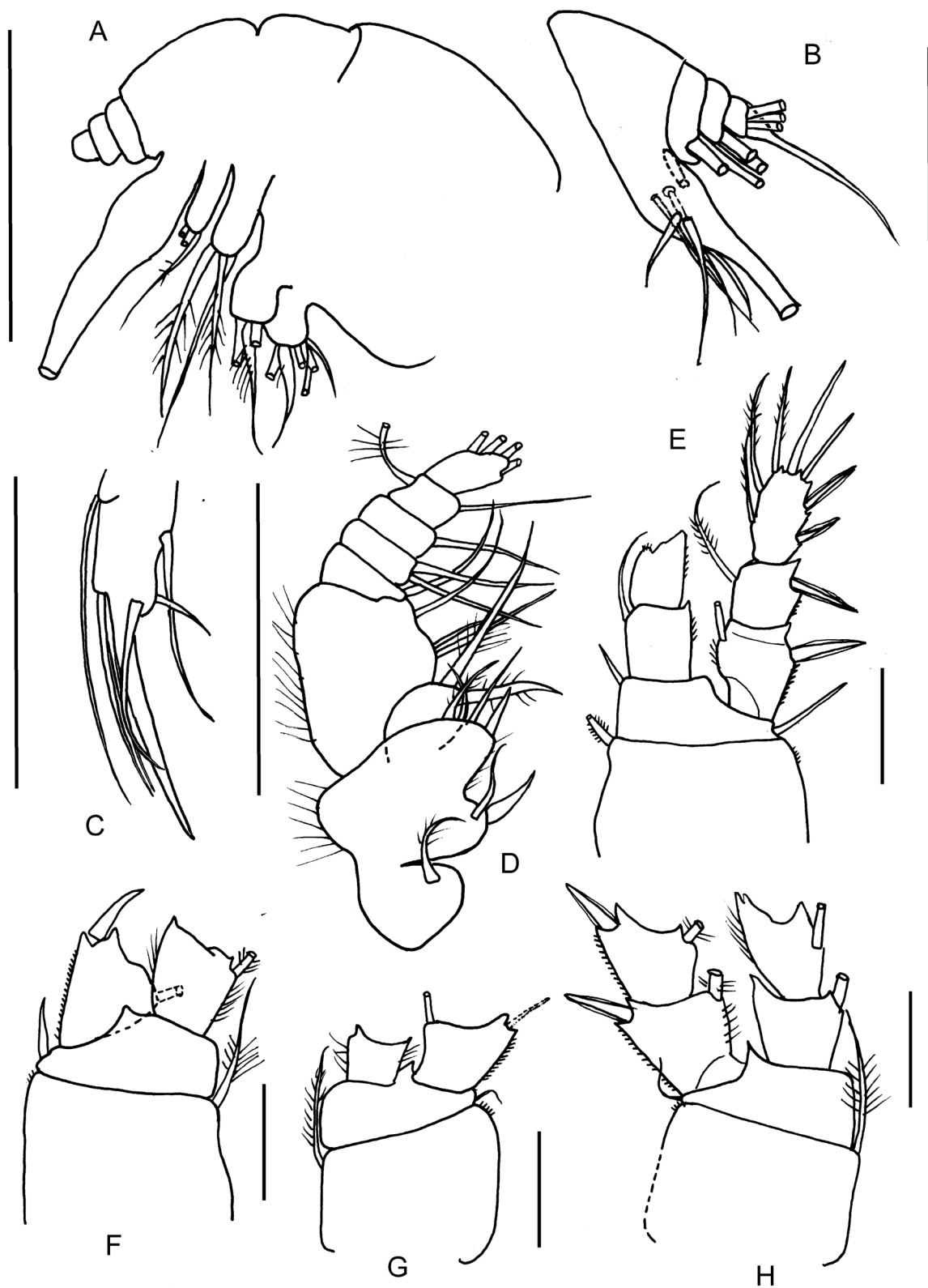


Fig. 7. *Archimisophria paradiscoveryi* sp.n.. Female, paratype: A — maxilla, armament of allobasis and endopod not figured; B — maxilla, allobasis and endopod; C — maxilla, allobasis; D — maxilliped; E — P1; F — P2; G — P3; H — P4. Scales bars 0.1 mm.

Рис. 7. *Archimisophria paradiscoveryi* sp.n. Самка, паратип: А — максилла, вооружение аллобазиса и эндоподита не изображено; В — максилла, аллобазис и эндоподит; С — максилла, аллобазис; D — максиллипеда; E — P1; F — P2; G — P3; H — P4. Масштаб 0,1 мм.

Table 1. The list of recorded specimens of *Archimisophria*.
Таблица 1. Список находок видов *Archimisophria*.

Author	Species name	Expedition or/and Vessel	Station and device	Date	Locality	Depth (m) (near-bottom tow)	Number of adult specimens, body length (mm) and 1 figure references
Boxshall [1983]	<i>A. discoveryi</i>	Discovery	10379#37	–	34°57'N, 32°55'W	3000 m	female, holotype, total length 1.10–1.40 mm; figs 1–2; 3 males, paratypes; total length 1.10–1.30; figs 3–4
Alvarez [1985]	<i>A. squamosa</i>	–	–	2.09.1970	24°08'S, 42°28'W	1020 m	1 female, total length 1.60 mm figs 1–20
Huys, Boxshall [1991]	<i>A. squamosa</i>	BALGIM R/V Cryos	DW 16	30.05.1984	–	1280 m	5 females, total length not given; figs 2.3.7A,B; 2.3.9B,C; 2.3.10 A,B; 2.3.13,2.3.17
	<i>A. discoveryi</i>	for type series see locality data Boxshall [1983]					1 female, paratype, 3 males paratypes; figs 2.3.1; 2.3.6A,B; 2.3.7C; 2.3.10C; 2.3.11C*,2.3.13 2.3.14
herein	<i>A. arctica</i> sp.n.	Drifting research station “North Pole – 41” based on the R/V “SEVERNIIY POLUS”.	180 Box corer	2.12.2023	82°42.286'N 48°53.626'E	1373 m	1 female, total length 1.30 mm Figs 8–11
herein	<i>A. paradiscoveryi</i> sp.n.	Drifting research station “North Pole – 41” based on the R/V “SEVERNIIY POLUS”.	197 Box corer	13.01.2024	82°13.138'N 40°32.903'E	1360 m	1 female, body smashed not measured, Figs. 5–7 1 male, total length 1.35 mm, Figs 1–7

* non *A. discoveryi* fig. 2.3.11 A, B in Huys & Boxshall [1991], see Alvarez [1985, fig.2].

Table 2. Selected characters of *Archimisophria* species.
Таблица 2. Основные диагностические признаки видов *Archimisophria*.

Character	<i>A. discoveryi</i> after Boxshall [1983] and Huys & Boxshall [1991]	<i>A. squamosa</i> after Alvarez [1985] and Huys & Boxshall [1991]	<i>A. paradisciveryi</i> sp.n.	<i>A. arctica</i> sp.n.
Females				
Total length (mm)	1.10–1.40mm	1.60	? smashed	1.30
Shape of GNS in lateral view	slightly swollen	undescibed	slightly swollen	not swollen
Antenna Exp setation	1, 0, 1, 1, 1, 1, 0, 4	1, 0, 1, 1, 1, 1, 0, 4	1, 0, 1, 1, 1, 1, 0, 4	1, 0, 1, 1, ?, 1, 0, 4
Maxillule:				
setation of praecoxal endite	14	15?	15[9+3+1+2]	15[9+3+1+2]
setation of coxal endite	4	4[3sc+1 sensory]	5[4sc+1 sensory]	4[3sc+1 sensory]
setation of proximal basal endite	3	3[2sc+1 sensory]	3[2sc+1 sensory]	3[2sc+1 sensory]
setation of distal basal endite	3?	4	4	4
setation of Enp	2+6	2+8	2+7-8	2+9
setation of Exp	9	11	11	11
setation of epipodite	6	7	5?	7
P5 segmentation and setation	3 segmented I–0, I–0, 0, II, 0	?4-segmented ?I–0, I–0, 0–1, 0, II, 1	broken, more than 3 segmented, setae broken	4 segmented 0–0, I–0, I–0, 0, II, 0
P6 lateral (outer) and medial setae length in ventral view	lateral seta reaching posterior border of Gns, in combination with medial seta short	lateral seta not reaching posterior border of Gns in combination 2 tiny teeth	lateral seta long, exceeding posterior border of Gns, reaching beyond posterior border of urosomite 3 in combination with tiny medial seta	lateral seta short, not reaching posterior border of Gns in combination with tiny medial seta
Males				
Total length (mm)	1.10–1.30 mm	Male unknown	1.35 mm	Male unknown
Shape of GNS in lateral view	undescibed		significantly swollen posteriorly	
Antennule selected ancestral segments armament	XIX–XX–4s, XXI–XXII–2s+1 spine		XIX–XX–3s, XXI–XXII–0s, narrow ribbon-like chitinous thickening	
Antenna Exp setation	as in female (1, 0, 1, 1, 1, 1, 0, 4)		0, 0, ?, 1, 1, 1, 0, 4	
Maxillule setation of	as in female			
setation of praecoxal endite			15[9+3+1+2]	
setation of coxal endite			4[3sc+1 sensory]	
setation of proximal basal endite			2[1sc+1 sensory]	
setation of distal basal endite			4	
setation of Enp			2+8	
setation of Exp			11	
setation of epipodite			7	
P5 segmentation and setation	4 segmented I–0, I–0, 0–1, 0, II, 1		5 segmented 0–0, I–0, I–0, 0–1, 0, II, 1	
P6 lateral (outer) seta length	exceeds posterior border of Gns		exceeds posterior border of Gns	

3 with one lateral spine, two terminal spines and 3 medial setae; exopod segments 1 and 2 with lateral and medial seta each, and exopod segment 3 with three lateral spines, terminal spine and three medial setae. All exopod lateral spines with fine membrane and lateral margins of exopod segments with spinules.

P2 (Fig. 4B), coxa with medial seta and distolateral short spinules; basis with lateral seta; endopods 3-segmented, exopod in one leg segment broken, in other abnormal, endopod segment 1 with one medial seta, endopod segment 2 with two medial setae and endopod segment 3 with one lateral spine, two terminal and 3 medial setae; exopod segments 1 and 2 with one lateral and one medial seta each. All exopod lateral spines with fine membrane and lateral margins of exopod segments with spinules.

P3 (Fig. 4C), coxa with medial seta and lateral short spinules and medial spinules; basis with lateral seta; endopods and exopods 3-segmented, endopod segment 1 with one medial seta, endopod segment 2 with two medial setae and endopod segment 3 with one lateral spine, two terminal and 3 medial setae; exopod segments 1 and 2 with one lateral and one medial seta, segment 3 broken. All lateral margins of exopod segments with spinules.

P4 (Fig. 4D), coxa with medial seta and lateral short spinules; basis with lateral seta; endopods and exopods segments 2 and 3 broken, endopod segment 1 with one medial seta; exopod segments 1 with one lateral and one medial seta.

P5 (Fig. 4E–F), uniramous, 5-segmented, proximal segment without setae, two following segments (second and third) with one lateral seta each, penultimate segment with one medial seta and terminal segment with one medial and two terminal setae, one long and one short.

P6 (Fig. 1G–H) flattened plate and long plumose lateral seta and medial setae, lateral seta in distal part broken, however, intact part exceeds posterior border of Gns, and medial seta very short.

Adult female, total length is not measured, body smashed. Prosome-urosome articulation between pedigerous somite 4 and 5. Urosome of 5 somites. Genital double-somite slightly swollen anterolaterally in dorsal and lateral view (Fig. 5C–E). Five setae observed at caudal rami (Fig. 5E). Rostrum large not fused to cephalon (Fig. 5A–B).

Antennules (Fig. 5H–J), 27-segmented; armature as follows: I–2s, II–1s, III–2s+ae, IV–1s, V–1+1s, VI–1s, VII–2s+ae, VIII–IX–2s each, X–2s, XI–2s+ae, XII–1s, XIII–XIV–2s each, XV–2s, XVI–2s+ae, XVII–XVIII–2s each, XIX–XXI–2s each, XXII–XXIII–1s, XXIV–2s, XXV–1s, XXVI–2s, and segments XXVII–XXVIII with 5s+ae.

Antenna (Fig. 6A), coxa and basis without seta, first endopod segment without seta, 2nd segment (partly separate from third) with 4 setae, 3rd endopod segment with 9 setae, 1 short and thin, and with spineles; exopod 8-segmented, setal formula 1,0,1,1,1,1,0 and 4 setae.

Mandible (Fig. 6B), gnathobase strong, with setules; cutting edge with 6 acute teeth; basis with seta, exopod 5-segmented, with 1, 1, 1, 1, and 1 setae (one terminal setae apparently broken); endopod segment one with 1 seta, segment 2 with 6 setae observed (probably one seta broken).

Maxillule (Fig. 6C), praecoxal arthritis with 9 robust and 1 thin terminal spines, 2 anterior and 3 posterior setae; coxal epipodite with 5 setae observed (probably setae partly broken), coxal endite with 5 setae, 1 sensory, proximal basal endite with 3 setae, one sensory, distal basal endite with 4 setae, endopod with 2 proximal and 7–8 terminal setae, exopod with 11 setae (of them 1 broken).

Maxilla (Fig. 7A–C), praecoxal endite with 6 setae; coxal and basal endites with 3 setae each; allobasis fused to endopod segment with strong claw and 6 setae, free endopod segments

with 2+2+4 setae, one terminal seta fused to terminal endopod segment.

Maxilliped (Fig. 7D), praecoxal endites of syncoxa with 1, 2 and 4 setae (from proximal to distal) and lateral spinules; coxal endite of syncoxa armed with 2 setae, basis with 2 proximal medial setae and 1 distal seta, 2 patches of spinules proximally and distally; free endopod segments with 1, 2, 1, 2, and 4 setae.

P1 (Fig. 7E), coxa with medial seta and distolateral short spinules; basis with lateral spine and medial seta distomedially; endopod segment 1 with one medial, seta at segment 2 broken, endopod segment 3 broken; exopod segments 1 and 2 with lateral and medial seta each, and exopod segment 3 with three lateral spines, terminal spine and three medial setae. All exopod lateral spines with fine membrane and lateral margins of exopod segments with spinules.

P2–P3 (Fig. 7F–G), coxa with medial seta and distolateral short spinules; basis with lateral seta; endopod and exopod segments 2 and 3 broken.

P4 (Fig. 7H), coxa with medial seta and lateral short spinules; basis with lateral seta; endopod and exopod segments 3 broken, endopod segment 1 with one medial seta, endopod segment 2 with one medial seta, one broken; exopod segments 1 and 2 with one lateral and one medial seta, segment 3 broken. All lateral margins of exopod segments with spinules.

P5 (Fig. 5G), uniramous, terminal segment(s) broken, three segments intact.

P6 (Fig. 5D, F), flattened plate and lateral seta long, exceeding posterior border of Gns, reaching beyond posterior border of urosomite 3 in combination with tiny medial seta.

ETYMOLOGY. The species name “*paradiscoveryi*” refers to the close relation of the new species with *A. discoveryi* Boxshall, 1983.

REMARKS. *Archimisophria paradiscoveryi* sp.n. is closely related to *A. discoveryi* Boxshall, 1983 (Table 2). Males of *A. paradiscoveryi* sp.n. share with *A. discoveryi* (males of other congeners unknown) their size, 1.35 mm and 1.10–1.30 respectively and the P5 setation pattern of terminal and three preceding segments.

Males of *A. paradiscoveryi* sp.n. differ from *A. discoveryi* in the following characters: 1) antennule fused ancestral segments XIX–XX armed with two long and one short setae (vs two long and two short setae in *A. discoveryi*), 2) fused ancestral segments XXI–XXII carrying narrow ribbon-like chitinous thickening, seta absent (vs spine and two tiny setae present in *A. discoveryi*), 3) antenna proximal exopodal segment unarmed (vs single seta present in *A. discoveryi*), and 4) P5 5-segmented (vs 4-segmented in *A. discoveryi*) (Table 2).

The female of *A. paradiscoveryi* sp.n. is distinguished from *A. discoveryi* in the following characters: 1) maxillule coxal endite with 5 setae, 1 sensory (vs 4 setae in *A. discoveryi*), 2) P5 with more than 3-segments (vs 3-segmented in *A. discoveryi*), and 3) P6 lateral seta reaching beyond posterior border of urosomite 3 (vs P6 lateral seta barely reaching anterior border of urosomite 3 in *A. discoveryi*).

Females of *A. paradiscoveryi* sp.n. differ from their known congeners in the armature of the maxillule coxal endite, with 5 setae (vs 4 setae in congeners) and in a very long P6 lateral seta reaching well beyond the posterior border of Gns in combination with tiny medial seta (Table 2).

Archimisophria arctica sp.n.

Figs 8–11.

MATERIAL. Holotype, adult female, dissected, body length 1.30 mm (91202), Arctic Ocean, 82°42.286'N 48°53.626'E, “North Pole – 41”

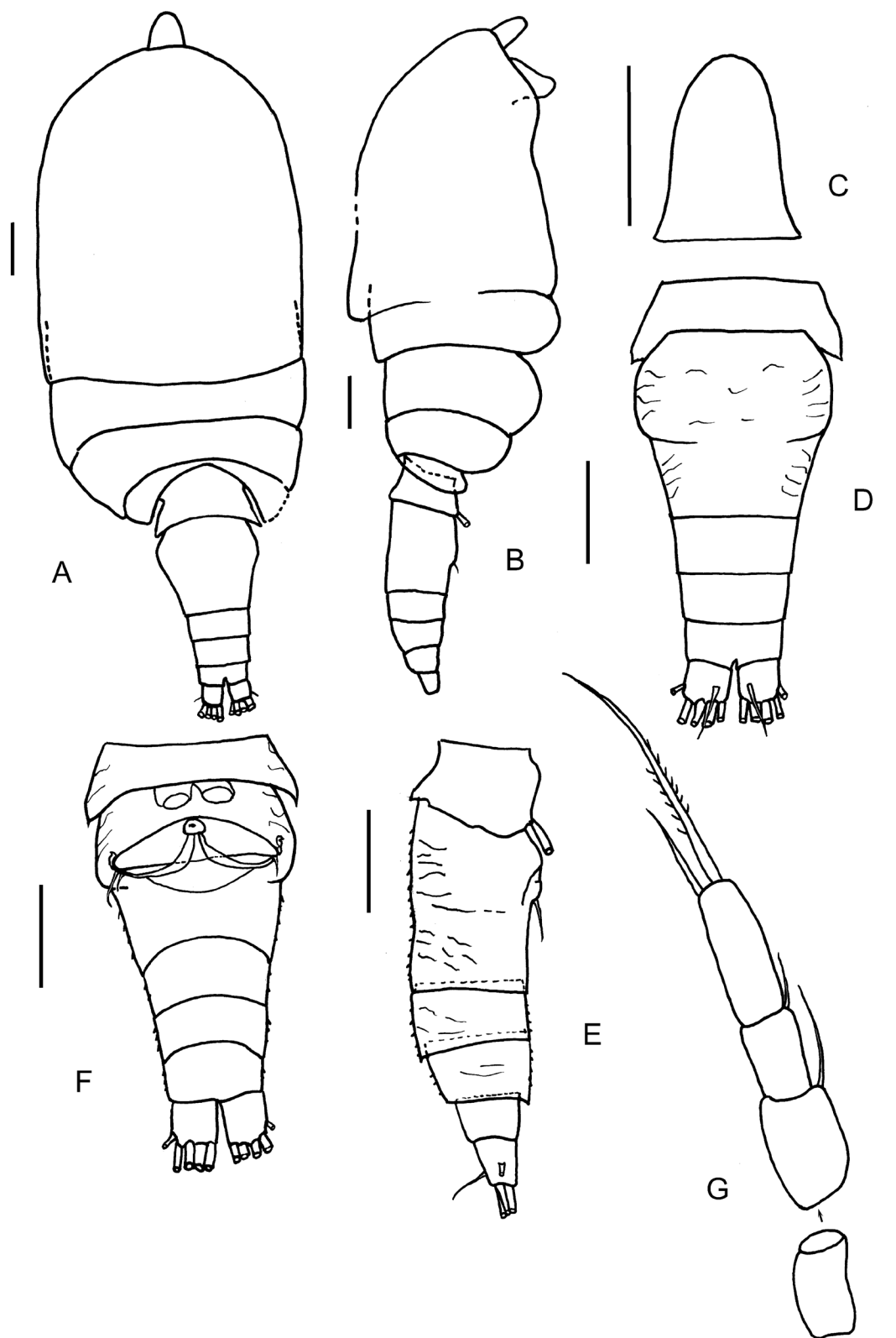


Fig. 8. *Archimisophria arctica* sp.n. Female, holotype: A — habitus, dorsal view; B — habitus, lateral view; C — rostrum, ventral view, dissected; D — urosome, dorsal view; E — urosome, lateral view; F — urosome, ventral view; G — P5. Scales bars 0.1 mm.

Рис. 8. *Archimisophria arctica* sp.n. Самка, голотип: А — общий вид, дорсально; В — общий вид, латерально; С — роstrum, вентрально, отчленен; D — уросома, дорсально; E — уросома, латерально; F — уросома, вентрально; G — P5. Масштаб 0,1 мм.

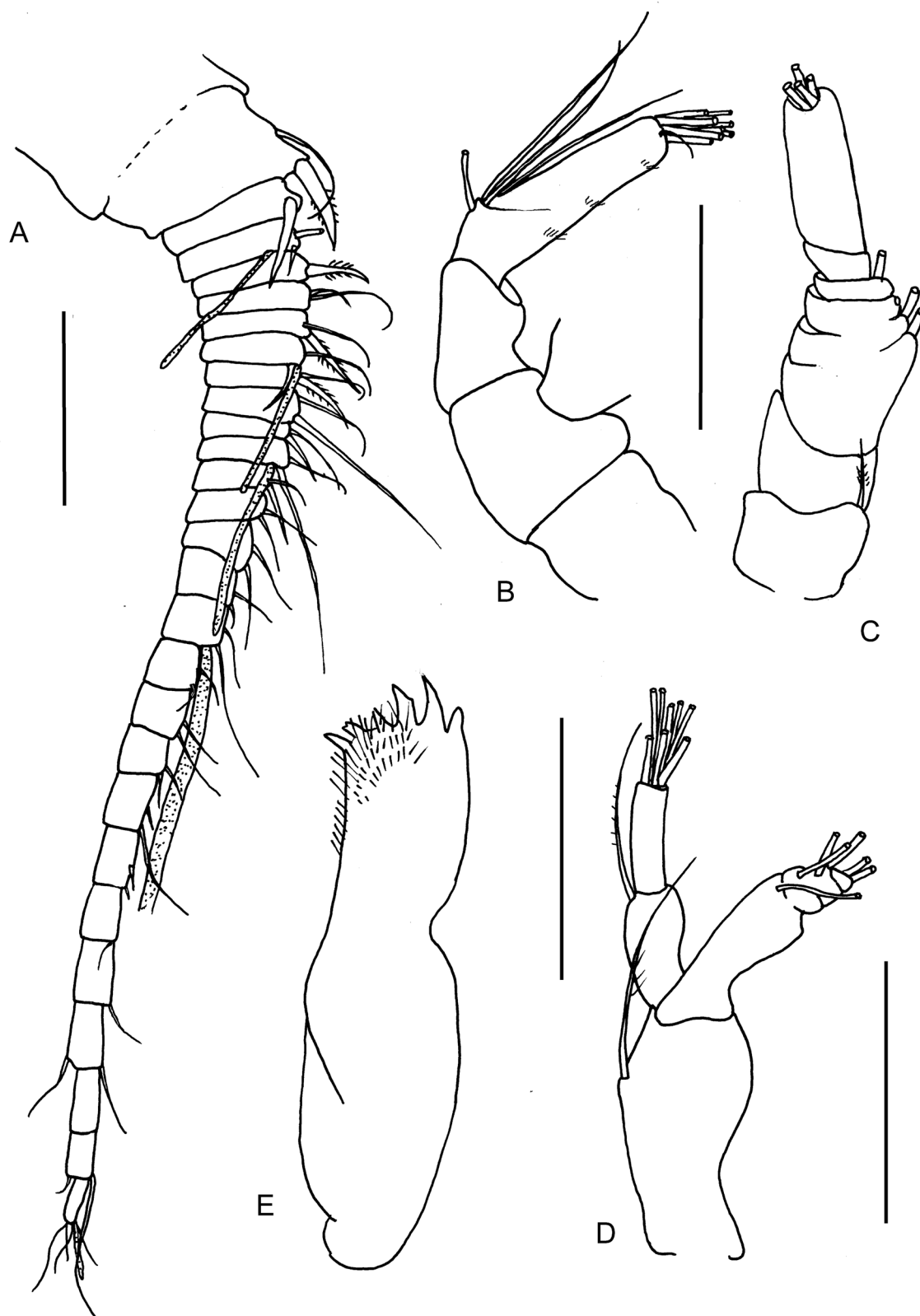


Fig. 9. *Archimisophria arctica* sp.n. Female, holotype: A — antennule; B — antenna, endopod; C — antenna, exopod; D — mandible, palp; E — mandible, gnathobase. Scales bars 0.1 mm.

Рис. 9. *Archimisophria arctica* sp.n. Самка, голотип: A — антеннула; B — антенна, эндоподит; C — антенна, экзоподит; D — пальпа мандибулы; E — мандибула, гнатобаза. Масштаб 0,1 мм.

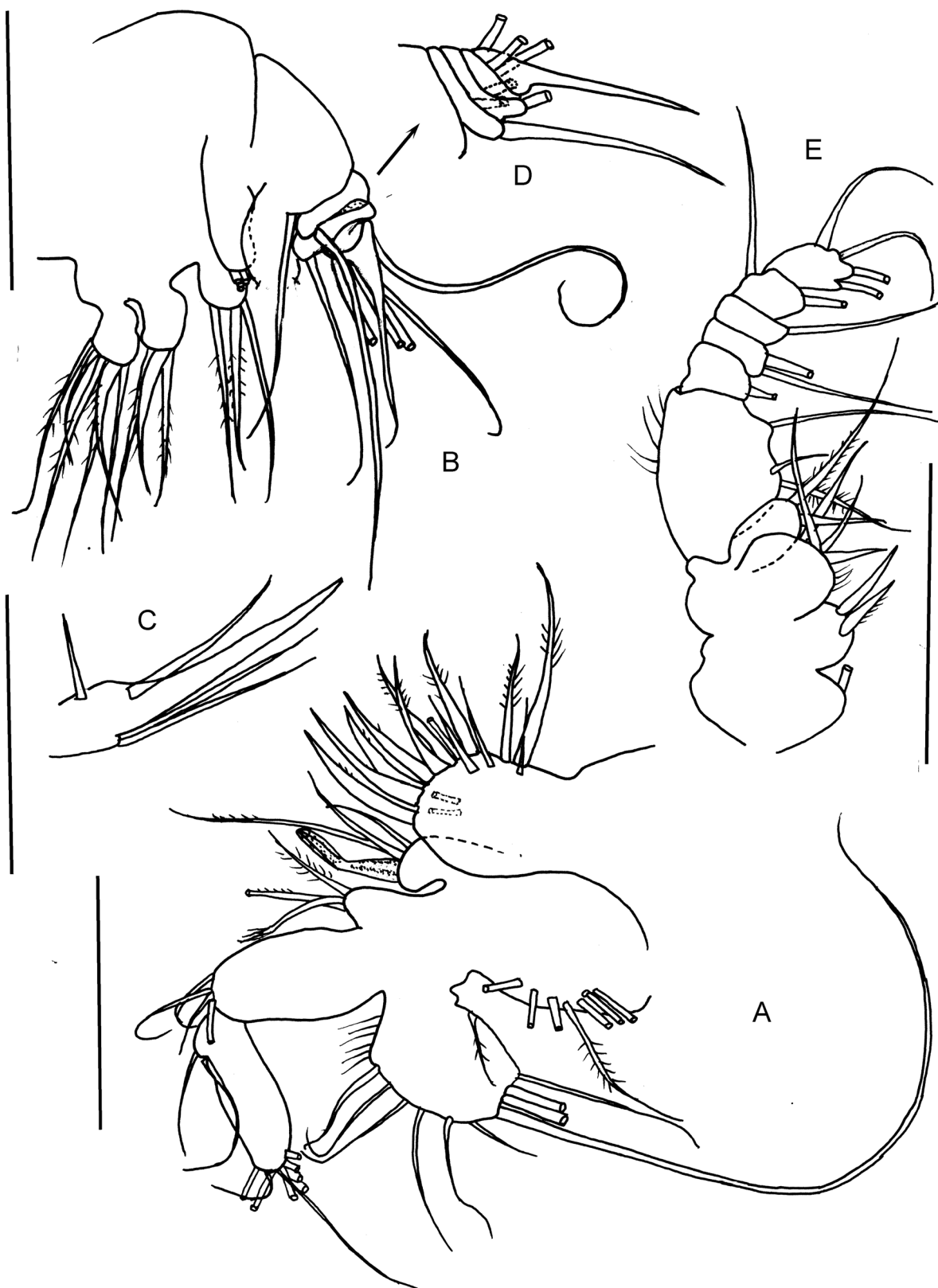


Fig. 10. *Archimisophria arctica* sp.n. Female, holotype: A — maxillule; B — maxilla; C — maxilla, allobasis; D — maxilla, endopod; E — maxilliped. Scales bars 0.1 mm.

Рис. 10. *Archimisophria arctica* sp.n. Самка, голотип: А — максиллула; В — максилла; С — максилла, аллобазис; D — максилла, эндоподит; Е — максиллипеда. Масштаб 0,1 мм.

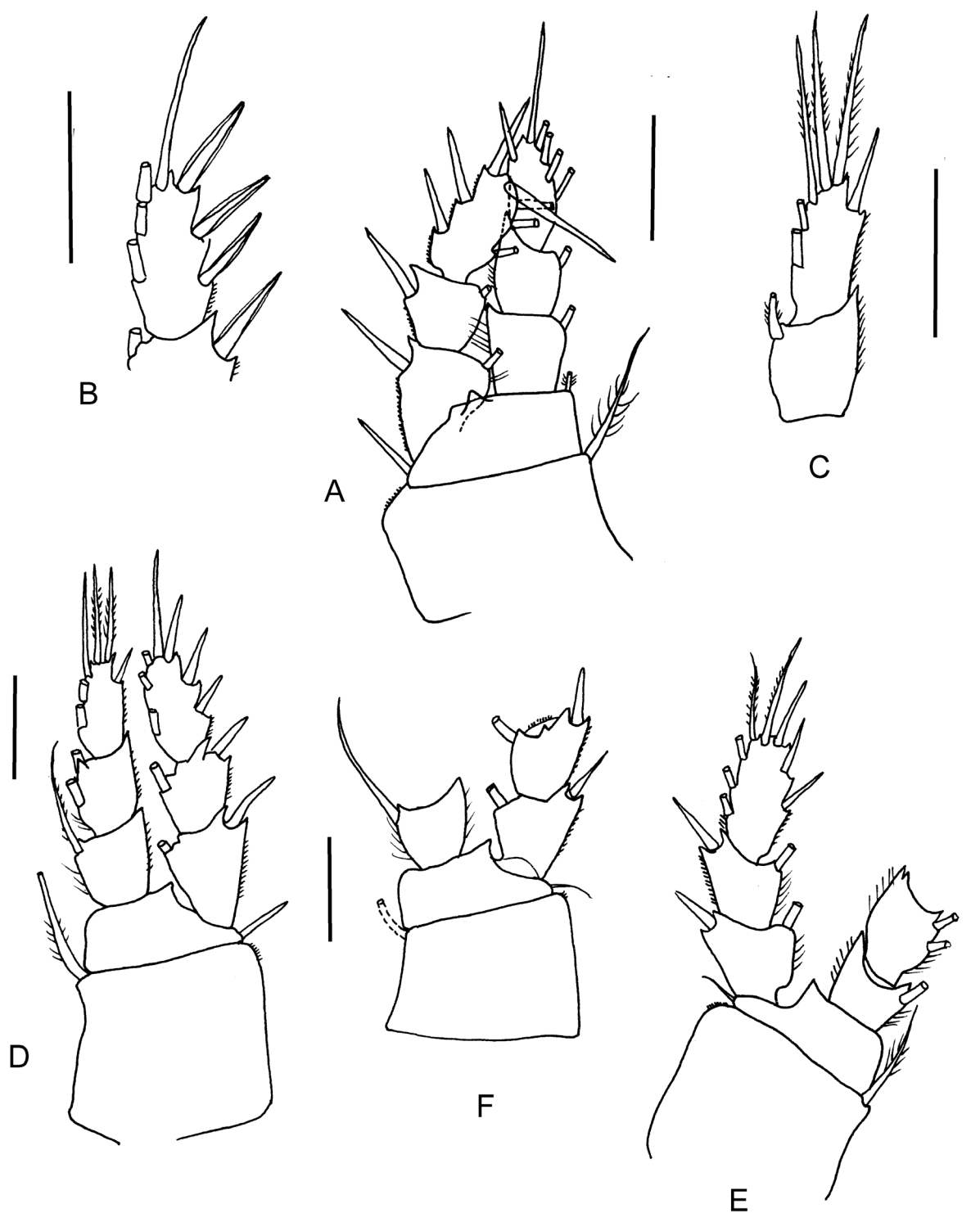


Fig. 11. *Archimisophria arctica* sp.n. Female, holotype: A — P1; B — P1, exopod segment 3; C — P1, endopod segments 2 and 3; D — P2; E — P3; F — P4. Scales bars 0.1 mm.

Рис. 11. *Archimisophria arctica* sp.n. Самка, голотип: А — P1; В — P1, экзоподит, сегмент 3; С — P1, эндоподит сегменты 2 и 3; D — P2; E — P3; F — P4. Масштаб 0,1 мм.

expedition based on the R/V “Severniy Polus”, station 180, 2 December 2023, box corer at a depth of 1373 m.

DESCRIPTION. Adult female, total length 1.30 mm. Prosome not compressed laterally, large with 4 free pedigerous somites (Fig. 8A–B). Prosome-urosoma articulation between pedigerous somite 4 and 5. Genital double-somite slightly swollen anterolaterally in dorsal view and not swollen in lateral view (Fig. 8D–F). Urosome of 5 somites. Five setae observed at caudal rami (Fig. 8F). Rostrum large not fused to cephalon (Fig. 8C).

Antennules (Fig. 9A), 27-segmented; armature as follows: I–2s, II–1s, III–2s+ae, IV–1s, V–2s, VI–2s, VII–2s+ae, VIII–IX–2s each, X–2s, XI–2s+ae, XII–2s, XIII–XV–2s each, XVI–2s+ae, XVII–XXI–2s each, XXII–XXIII–1s, XXIV–2s, XXV–?, XXVI–2s, and segments XXVII–XXVIII with 4s+ae.

Antenna (Fig. 9B–C), coxa and basis without seta, 1st endopod segment without seta, 2nd segment (partly separate from third) with 4 setae, 3rd endopod segment with 9 setae, 1 short and thin and with spineles; exopod 8-segmented, setal formula 1,0,1,1,?,1,0 and 4 setae.

Mandible (Fig. 9D–E), gnathobase strong, with setules; cutting edge with 6 acute teeth; basis with seta, exopod 5-segmented, with 1, 1, 1, 1, and 2 setae; endopod segment one with 1 seta, segment 2 with 8 setae.

Maxillule (Fig. 10A), praecoxal arthrite with 9 robust and 1 thin terminal spines, 2 anterior and 3 posterior setae; coxal epipodite with 7 setae, coxal endite with 4 setae, 1 sensory, proximal basal endite with 3 setae, one sensory, distal basal endite with 4 setae, endopod with 2 proximal and 9 terminal setae, exopod with 11 setae.

Maxilla (Fig. 10B–D), praecoxal endite with 6 setae; coxal and basal endites with 3 setae each; allobasis fused to endopod segment with strong claw and 5 setae, free endopod segments with 2+2+4 setae, one terminal seta fused to terminal endopod segment.

Maxilliped (Fig. 10E), praecoxal endites of syncoxa with 1, 2 and 4 setae (from proximal to distal) and spinules; coxal endite of syncoxa with 2 setae, basis with 2 proximal medial setae and 1 distal seta, patches of spinules distally; free endopod segments with 1, 2–3, 1, 2, and 4 setae.

P1 (Fig. 11A–C), coxa with medial seta and distolateral short spinules; basis with lateral spine and medial seta distomedially; endopod segments 1 and 2 with one medial each, endopod segment 3 with one lateral spine, two terminal spines and 3 medial setae; exopod segments 1 and 2 with lateral and medial seta each, and exopod segment 3 with three lateral spines, terminal spine and three medial setae. All lateral margins of exopod segments with spinules.

P2 (Fig. 11D), coxa with medial seta and distolateral short spinules; basis with lateral seta; endopod segment 1 with one medial seta, endopod segment 2 with two medial setae, endopod segment 3 with three medial, two terminal and one lateral setae; exopod segments 1 and 2 with one lateral and one medial seta, segment 3 with three lateral, one terminal and three medial setae. All lateral margins of exopod segments with spinules.

P3 (Fig. 11E) coxa with medial seta and lateral short spinules; basis with lateral seta; endopod segment 1 with one medial seta, endopod segment 2 with two medial setae, endopod segment 3 broken; exopod segments 1 and 2 with one lateral and one medial seta, segment 3 with three medial, two terminal setae and three lateral spines. Lateral margin of exopod segment 2 with spinules.

P4 (Fig. 11F), coxa with medial seta and lateral short spinules; basis with lateral seta; endopod segments 2 and 3 broken, endopod segment 1 with one medial seta; exopod segments 1 and 2 with one lateral and one medial seta, segment 3 broken.

All lateral margins of exopod segments with spinules.

P5 (Fig. 8G), uniramous, 4-segmented, proximal segment without seta, segments 2 and 3 with one lateral seta each and terminal segment with two setae, one long and one short.

P6 (Fig. 8E–F) flattened plate and two setae, lateral seta short, not reaching posterior border of Gns in combination with tiny medial seta.

Male unknown.

ETYMOLOGY. The species name “*arctica*” refers to the locality of the species collection.

REMARKS. *Archimisophria arctica* sp.n. is distinguished from its congeners by its P6 armament presented by a combination of a short lateral seta and tiny medial seta. In *A. paradiscoveryi* sp.n. and *A. discoveryi* the P6 lateral seta is longer (see Fig. 5D–F and Boxshall [1983, fig. 1C]). In *A. squamosa*, the P6 armed with a short lateral seta in combination with two tiny medial teeth (see Alvarez [1985, fig. 2], not Huys & Boxshall [1991, fig. 2.3.11A,B] where *A. squamosa* is marked as *A. discoveryi* probably due to a technical error).

The new species shares sensory setae present at the maxillule coxal and proximal basal endites with *A. squamosa*, however, differs in its smaller size (1.30 mm vs 1.60 mm in *A. squamosa*) and P5 segmentation (Table 2).

Discussion

Specimens of the genus *Archimisophria* (Speleophriidae) are extremely rare with only ten individuals (Table 1) of two species having been described to date [Boxshall, 1983; Álvarez, 1985]. Data on the morphology of the species, namely *A. discoveryi* and *A. squamosa* were later supplemented by Huys & Boxshall [1991] in their review of the Misophrioida contributing to our knowledge of the genus morphology. The descriptions of the new species *A. paradiscoveryi* sp.n. and *A. arctica* sp.n. add new characters to the morphological diversity of *Archimisophria*.

Both of the previously known species were originally collected above the bottom: *A. discoveryi* was collected in the North Atlantic at abyssal depths [Boxshall, 1983], *A. squamosa* was collected in the South Atlantic at a depth of 1020 m [Álvarez, 1985] (Table 1) and a yet undescribed species was recorded from the Indian Ocean [Boxshall, 1989]. The collection locality remains undocumented for a few females of *A. squamosa* [Huys, Boxshall, 1991].

Other speleophriids are cave-dwelling forms exclusively known from anchialine habitats from the Mediterranean, Atlantic and Pacific Oceans [Boxshall, Jaume, 2000 and see Suárez-Morales *et al.*, 2017 for a detailed citation].

As this rare benthopelagic genus has so far been known only from the Atlantic, its discovery in the Arctic Ocean is particularly interesting. Atlantic waters in the area of the continental slope of the Arctic Basin spread with a branch of the West Spitsbergen Current through the Fram Strait to the east along the slope [Rudels, Carmack, 2022]. The thickness of the Atlantic water layer in the sampling area reaches 800 m from the surface. Specimens of the described species were found at a depth of about 1300 m. However, a gradual spread of species from the western regions with Atlantic waters is quite possible. Data on the occurrence of species are insufficient due to the poor study of the area.

The discovery of two new species of the order Misophrioida in the Arctic Ocean not only expands the known diversity of this copepod order, but represents the first finding of the family Speleophriidae and the genus *Archimisophria* in the High Arctic. *Archimisophria arctica* sp.n. and *A. paradiscoveryi* sp.n. are currently the northernmost records of this order.

Author Contributions. Both authors have made absolutely equal contributions to all parts of the study.

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

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