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Three new species of *Cerviniella* Smirnov, 1946 (Copepoda: Harpacticoida) from the Arctic

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Abstract

Considered one of the most common harpacticoid families in deep-sea benthos, the Aegisthidae can be found in various types of marine sediments and at different depths. During the fourth leg of the ninth expedition of RV *Polarstern* in the Arctic Ocean (ARK-IX/4) in September 1993, three new representatives of the genus *Cerviniella* were collected in multicorer samples from the Laptev Sea at depths of 760-2017 m. The new species have a close relationship, as indicated by the combination of shared characters: distal segment of antennule with aesthetasc, antennary endopod with two setae and one spine laterally, and four spines and three setae apically; and the same number of armature elements on the maxillula and maxilla. *Cerviniella danae* **sp. nov.** and *C. hitoshii* **sp. nov.** can be easily distinguished from their congeners primarily by the reduction of the antennules to only five segments, which is common to both species but unique in *Cerviniella*. *Cerviniella danae* **sp. nov.** is most readily separated from other described species by the armature of the antennule and maxilliped, and the spine and seta formulae of the swimming legs. For *C. hitoshii* **sp. nov.**, major diagnostic differences are found in the maxilliped, segmentation and setation of P3 and P4 endopods, and P6 represented by three setae. *Cerviniella arctica* **sp. nov.** is unique in the combination of the following characters: caudal rami extremely elongated, armature of the antennules and mandible, and the spine and seta formulae of the swimming legs. Based on a review of the literature, an updated listing of the P1-P4 armature and a key to species of the genus are presented.

Key words: Aegisthidae, deep-sea, Laptev Sea, meiobenthos, meiofauna, taxonomy

Introduction

The family Aegisthidae was established by Giesbrecht (1892) to accommodate two species of *Aegisthus* Giesbrecht 1891, and for a long time this genus contained the only members within the family. Later, Conroy-Dalton & Huys (1999) and Lee & Huys (2000) added four genera and five species to the family, and considered aegisthids one of the most common harpacticoid groups in deep-sea benthos.

More recently, in their study of phylogenetic relationships at the base of Oligoarthra, Seifried & Schminke (2003) characterised Aegisthidae Giesbrecht, 1892 to include the taxon Cerviniidae Sars, 1903. They also suggested that the systematics of the group remains problematic, as species of Aegisthinae (formerly Aegisthidae) are derived Cerviniopseinae, and decided to maintain the subfamilial subdivision, as Aegisthinae Giesbrecht, 1892, Cerviniinae Sars, 1903, and Cerviniopseinae Brotskaya, 1963, until a phylogenetic analysis at species level is performed. Later, Huys (2009) discussed the priority of the subfamily name Pontostrationinae A. Scott, 1909 over Cerviniopseinae Brotskaya, 1963, and reinstated the former.

Based on Wells (2007), the subfamilies and the genera allocated to these subfamilies are as follows: Aegisthinae - *Aegisthus* Giesbrecht, 1891; *Andromastax* Conroy-Dalton & Huys, 1999; *Jamstecia* Lee & Huys, 2000; *Nudivorax* Lee & Huys, 2000; and *Scabrantenna* Lee & Huys, 2000;

Cerviniinae - *Cervinia* Norman, 1878; *Cerviniella* Smirnov, 1946; *Eucanuella* T. Scott, 1900; *Expansicervinia* Montagna, 1981; and *Paracerviniella* Brodskaya, 1963; Pontostrationinae - *Pontostratiotes* Brady, 1883; *Cerviniopsis* Sars, 1909; *Hemicervinia* Lang, 1935; *Herdmaniopsis* Brotskaya, 1963; *Ameliotes* Por, 1969; *Stratiopontotes* Por, 1969; and *Tonpostratiotes* Itô, 1982.

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Since the publication of the checklist of Wells (2007), the monotypic genus *Arcticocarella* Kornev & Chertoprud, 2008 has been added to Aegisthidae (see Kornev & Chertoprud 2008), and the family is now considered to comprise 78 species distributed among 18 genera.

From the time when the genus *Cerviniella* was established by Smirnov (1946) to accommodate *Cerviniella mirabilipes* Smirnov, 1946, seven new species have been recorded from polar and tropical waters, and occur from shallow water to the deep sea (Table 1).

During a multidisciplinary oceanographic expedition (ARCTIC'93) to the Eurasian continental margin of the Barents and Laptev seas, three new species of *Cerviniella* were discovered. Although this genus was previously recorded from the Arctic Ocean by Smirnov (1946), the present study increases the number of known Arctic species from one to four, and to 11 worldwide.

TABLE 1. List of species of *Cerviniella*, including known distribution, total number of specimens recorded, and references; f = female, j = juvenile.

Species	Location	Depth (m)	No. inds.	Reference
Cerviniella mirabilipes Smirnov, 1946	Arctic	65	4 (f)	Smirnov, 1946
Cerviniella talpa (Por, 1964)	Eastern Mediterranean - Israel shores	137–292	27 (f) 18 (j)	Por, 1964
	Western Mediterranean - Alberes shores	80–640	34 (f)	Soyer, 1970
Cerviniella lagarderei Bodin, 1968	Atlantic - Gulf of Gascogne	4850	2 (f)	Bodin, 1968
Cerviniella langi Bodin, 1968	Atlantic - Gulf of Gascogne	700	1 (f)	Bodin, 1968
Cerviniella brodskayae Por, 1969	Western Indian	1530	2 (f) 1 (j)	Por, 1969
Cerviniella bodini Coull, 1973	Atlantic - East Coast USA	500	4 (f)	Coull, 1973
Cerviniella hamata Coull, 1973	Atlantic - East Coast USA	1000	2 (f)	Coull, 1973
Cerviniella peruana Becker, 1974	Pacific - Peru	5000	1 (f)	Becker, 1974
Cerviniella danae **sp. nov.**	Arctic - Laptev Sea	1009	3 (f)	
Cerviniella arctica **sp. nov.**	Arctic - Laptev Sea	2019	1 (f)	
Cerviniella hitoshii **sp. nov.**	Arctic - Laptev Sea	796	1 (f)	
		1009	3 (j)	

Material and methods

To investigate the meiofaunal diversity in the Laptev Sea samples were taken with a multiple corer (MUC) (Barnett *et al*. 1984) at 22 stations on two transects (Fütterer 1994), at depths ranging from 37 to 3427 m, during the fourth leg of the ninth expedition of RV *Polarstern* to the Arctic Ocean in 09/1993. Twelve sites on Transect H between 79°38' N, 130°33' E (Amundsen Basin) and 76°30' N, 133°10' E (Laptev Sea shelf) and ten sites on Transect G from 77°02' N, 126°25' E (along the Lena River delta to the northern part of the shelf) to 79°15' N, 122°53' E (Amundsen Basin) were sampled (Table 2).

General information about sediments from the Laptev Sea shelf and continental margin can be found in Damm *et al.* (1994). A description of the sampling methodology and sample treatment was given by Martínez Arbizu (1994).

For the taxonomic study, before dissection, the specimens were stained with Congo Red and mounted on slides following the procedure described by Michels & Büntzow (2010) for confocal laser scanning microscopy (CLSM), using a Leica TCS SP5 (Leica, Wetzlar, Germany) equipped with a Leica DM5000 B upright microscope (Leica, Wetzlar, Germany) and 3 visible-light lasers (DPSS 10 mW 561 nm; HeNe 10 mW 633 nm; Ar 100 mW 458 nm, 476 nm, 488 nm and 514 nm), combined with the software LAS AF 2.2.1. - Leica Application Suite Advanced Fluorescence (Leica, Wetzlar, Germany).

Series of stacks were obtained, collecting overlapping optical sections throughout the whole preparation; the optimal number of scans and the imaging settings according to the software, are given in Table 3. Final images were obtained by maximum projection, and CLSM illustrations were composed and adjusted for contrast and brightness using the software Adobe Photoshop CS4 (Adobe Systems, San José, U.S.A.).

The habitus was drawn from whole specimens temporarily mounted in slides with glycerin, and adhesive plastic discs were used to support the coverslip. Specimens were dissected in lactic acid under a Leica MZ12 stereomicroscope (Leica, Wetzlar, Germany). Dissected parts were mounted on slides using glycerin as mounting medium, and preparations were sealed with transparent nail varnish. The material was studied with a Leica DMR differential interference contrast microscope (Leica, Wetzlar, Germany) equipped with a drawing tube.

Total body length was measured from the anterior margin of the rostrum to the posterior margin of the caudal rami. The descriptive terminology follows Huys *et al.* (1996). Abbreviations used in the text are: ae, aesthetasc; P1–P6, swimming legs 1–6; exp and enp, exopod and endopod respectively; exp (enp)-1 (-2, -3), proximal (middle, distal) segments of a ramus.

The type material of all tree species is deposited in the collection of the Forschungsinstitut Senckenberg, Frankfurt, Germany.

TABLE 2. List of stations sampled during the fourth leg of the ninth expedition of RV *Polarstern* to the Arctic Ocean in 09/1993 where *Cerviniella* occurs, including date, geographical coordinates, processed cores, and water depth; Lat. = latitude, Long. = longitude, f = female, j = juvenile.

Station No.	Date	Coordinates		Cores	Depth	Material
		Lat. N	Long. E		(m)	
PS27#035/2457-1	04/09/1993	78°23.19'	133°11.43'	MUC 5,6	2019	*C. arctica* 1(f)
PS27#038/2458-1	05/09/1993	78°08.19'	133°19.94'	MUC 1,4,5,6,7	796	*C. hitoshii* 1(f)
PS27#047/2465-1	08/09/1993	77°10.74'	126°12.29'	MUC 1-4,5	1009	*C. danae* 3(f) *C. hitoshii* 3(j)

TABLE 3. Microscope lens and confocal laser scanning microscopy (CLSM) settings used for the observation of the specimens; Ch1 and Ch2 = detection channels 1 and 2.

Lens	HC PL APO CS (High-grade colour-corrected Plan Apochromat lens for confocal)
Objective	10X
Numerical aperture	0.4
Immersion	No immersion - air
Excitation wavelength	561 nm
Laser power	80%
Excitation beam splitter	Double dichroic filter 488/561
Detected emission wavelength	Ch1: 585 – 645 nm Ch2: 645 – 775 nm
Detector gain	733.7 – 800.4 V
Amplitude offset	-3.5 %
Electronic zoom	3X
Pinhole aperture	26.48 µm
Image format	2048 x 2048 dpi

Taxonomic account

Order Harpacticoida Sars, 1903
Family Aegisthidae Giesbrecht, 1892
Subfamily Cerviniinae Sars, 1903

Genus *Cerviniella* Smirnov, 1946

Amended diagnosis. Marine, free living Cerviniinae. Body with clear distinction between prosome and urosome. Prosome 4-segmented, with first pedigerous somite incorporated into cephalothorax. Urosome 5-segmented, comprising P5-bearing somite, genital double-somite, 2 free abdominal somites and anal somite. Genital double-

somite with P6 bearing 2–3 setae, lateral projections (when present) hook-like. Anal somite with operculum and large anal opening. Caudal rami elongate, slightly to markedly divergent, slightly to markedly asymmetrical, each ramus with 7 setae.

Rostrum fused to cephalic shield. Antennule of female 5- to 7-segmented; with aesthetasc on segment II or III; additional aesthetasc present or absent on most distal segment. Antenna with allobasis or distinct basis; endopod 1- or 2-segmented, distal segment with 4 –7 apical elements and 2–3 elements laterally; exopod 4-segmented with armature formula: I-[1–2 setae], II-[1–2 setae], III-[1 seta], IV-[2–3 setae]. Mandible with gnathobase bearing multicuspidate teeth and 1 seta around distal margin; basis with 3–4 setae; endopod 1- or 2-segmented with 6–10 setae on distal segment; and exopod 1- to 4-segmented with 3–6 setae in total. Maxillule with well developed arthrite with 7–14 elements in total; coxa with endite bearing 2–6 setae and epipodite represented by 1 seta or completely absent; basis and endopod fused, with 5–14 setae; exopod 1-segmented, with 3 setae. Maxillary syncoxa with 4 endites, formula [3–4, 3, 2–3, 3]; allobasis with well developed basal endite forming claw with 1–3 accessory elements, endopodal armature of allobasis represented by 2 elements; endopod 1- to 3-segmented, with 4–8 setae in total. Maxilliped with syncoxa and basis or with elongated protopod; syncoxal endites formula [1–2, 2–3, 2], basal endite represented by 2 elements; endopod 2-segmented, formula: I-[0–1], II-[3–4].

P1 basis with 1 inner and 1 outer seta, exopod 1-segmented and endopod 1- or 2-segmented. P2–P3 basis with outer seta, exopod 1-segmented, and 1- or 2-segmented endopod. P4 basis with outer seta, 1- or 2-segmented exopod, and endopod 1-segmented or absent. P1–P4 spine and seta formulae as follows:

	Exopod	Endopod
P1	[1–3]2[4–5]	[0–4]2[0–1] or 1.121
P2	[3–4]25	[4–5]21 or [0–1].[3–4]21
P3	[2–4]25	[1–5]2[0–1] or 1.[0–3][1–2]0
P4	[0–4][1–2][1–5] or 4.123	Absent or [0–4][1–2][0–1] or 1.110

Female fifth pair of legs with protopod fused to supporting somite bearing 1 outer seta; exopod with 2–3 elements.

Male unknown.

Type species. *Cerviniella mirabilipes* Smirnov, 1946.

Other species. *Cerviniella arctica* **sp. nov.**, *C. bodini* Coull, 1973, *C. brodskayae* Por, 1969, *C. danae* **sp. nov.**, *C. hamata* Coull, 1973, *C. hitoshii* **sp. nov.**, *C. lagarderei* Bodin, 1968, *C. langi* Bodin, 1968, *C. peruana* Becker, 1974, *C. talpa* (Por, 1964).

Distribution. See Table 1.

Cerviniella danae sp. nov.

(Figs 1–6A, B, 16–17)

Type locality. Arctic Ocean, Laptev Sea (77°10.74' N, 126°12.29' E), 1009 m depth.

Type material. Holotype female dissected on 13 slides (reg. no. SMF 37027) from station PS27#047/2465-1, multi corer 1–4, collected 08/09/1993. Undissected paratypes consist of 2 females (reg. nos. SMF 37028 and 37029) from station PS27#047/2465-1, MUC 1–4, collected 08/09/1993. All material collected from the type locality by the junior author during Expedition ARCTIC'93, Leg ARK-IX/4 of RV *Polarstern*.

Description. FEMALE. Total body length 835.2–888.0 μm (*N* = 3; mean = 864.5 μm; holotype = 888.0 μm). Largest width measured at midlength of cephalic shield: 320.0–335.2 μm (*N* = 3; mean = 328.2 μm; holotype = 320.0 μm). Body (Figs 1A, 16A–C) with no clear distinction between prosome and urosome, body somites gradually tapering posteriorly.

Prosome (Figs 1A, 16A–C) 4-segmented, with first pedigerous somite incorporated into cephalothorax. Cephalothorax with reticulated surface (Fig 1B), anastomosing pattern more accentuated towards rostrum (Fig. 17A) and along margins (Figs 1A, 16A–B); additional ornamentation consisting of sensilla and pores as illustrated

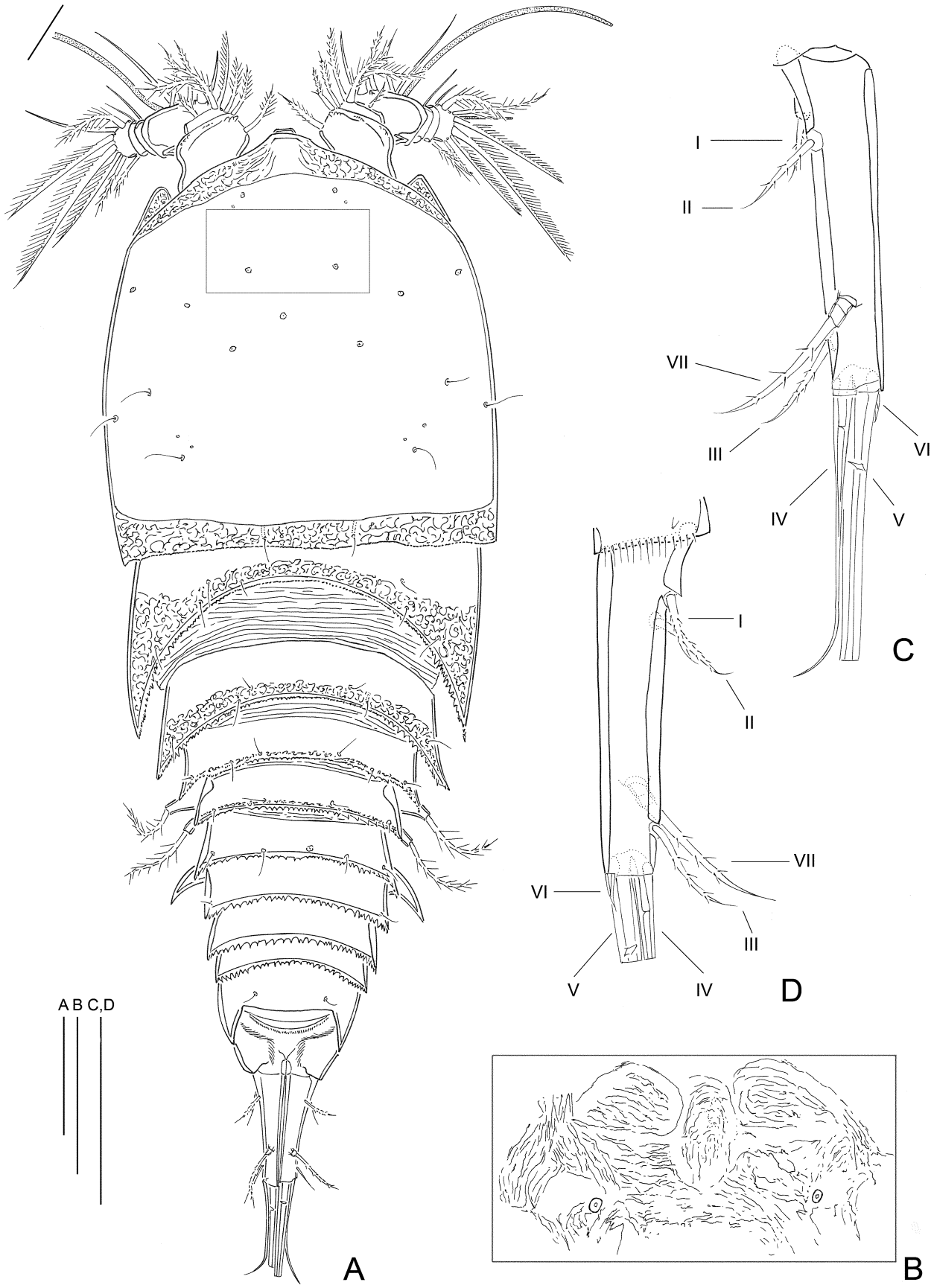

FIGURE 1. *Cerviniella danae* **sp. nov.** (female): A, habitus, dorsal; B, detail of cephalothorax, showing reticulated surface, dorsal; C, caudal ramus, dorsal; D, caudal ramus, ventral. Scale bars: (A) 100 μm; (B–D) 50 μm.

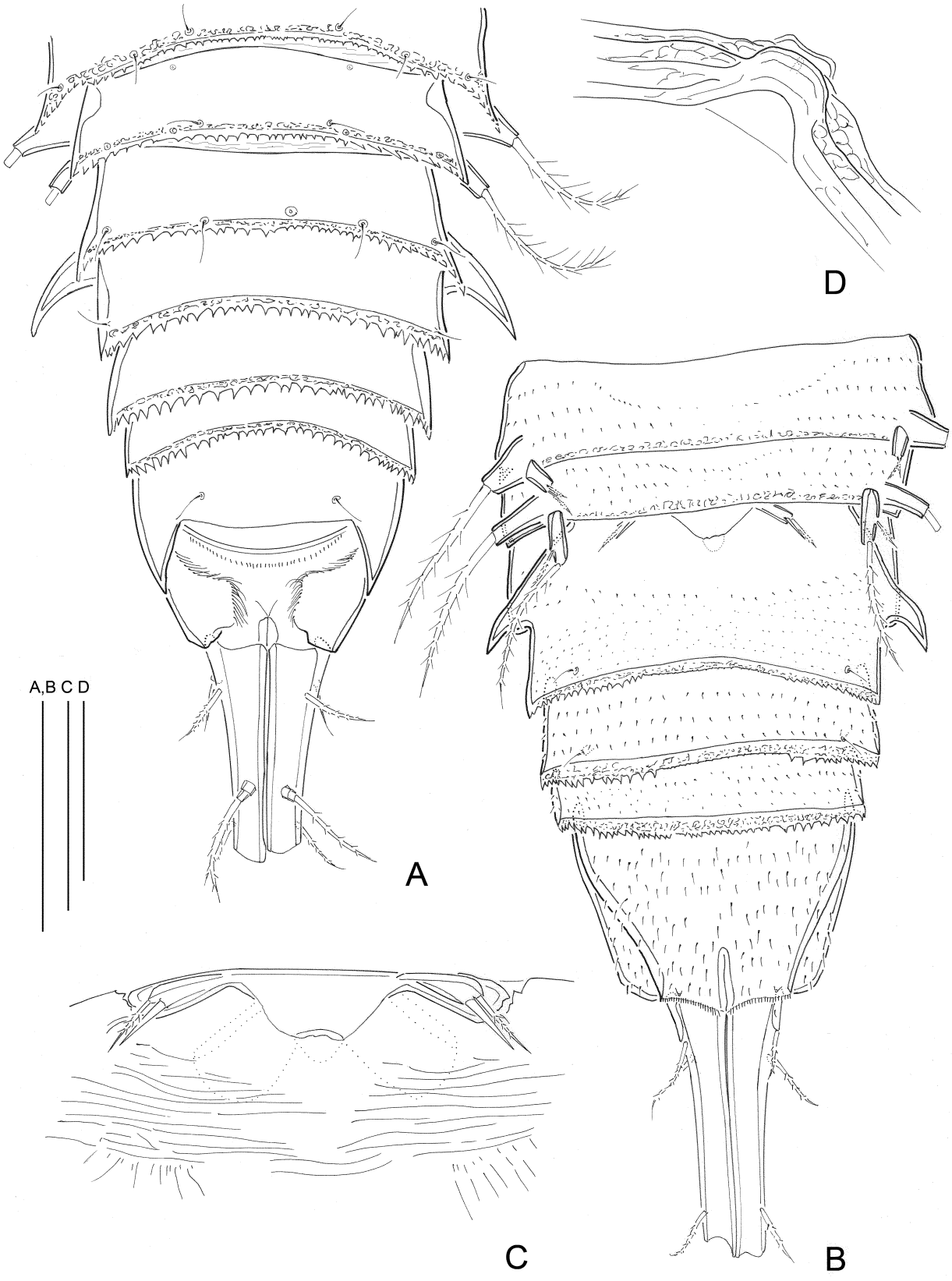

FIGURE 2. *Cerviniella danae* **sp. nov.** (female): A, urosome + somite bearing P4, dorsal; B, urosome + somite bearing P4, ventral; C, genital field; D, rostrum, dorsal. Scale bars: (A, B) 100 μm; (C, D) 50 μm.

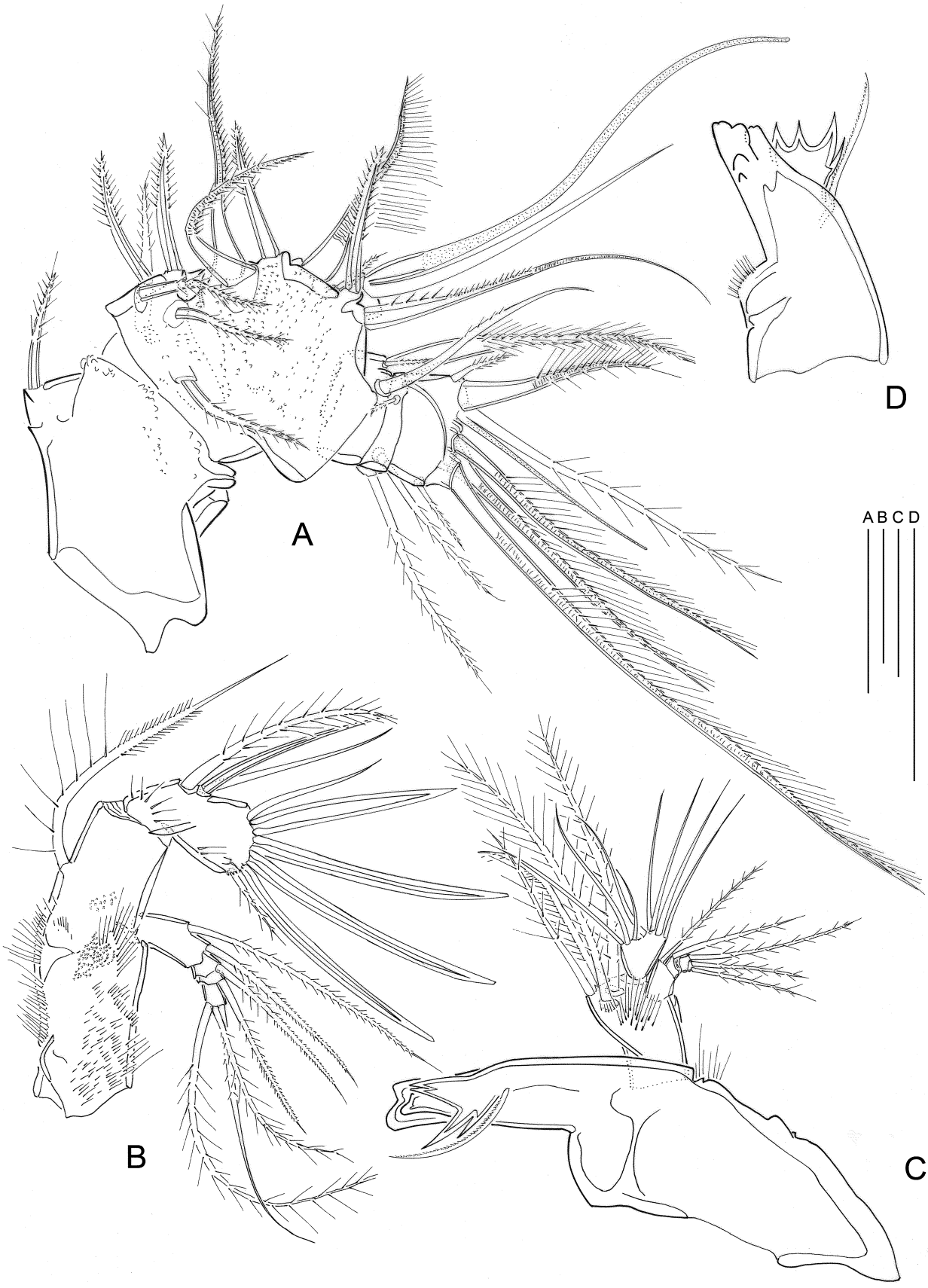

FIGURE 3. *Cerviniella danae* **sp. nov.** (female): A, antennule, dorsal; B, antenna; C, mandible; D, mandibular coxal gnathobase. Scale bars: 50 μm.

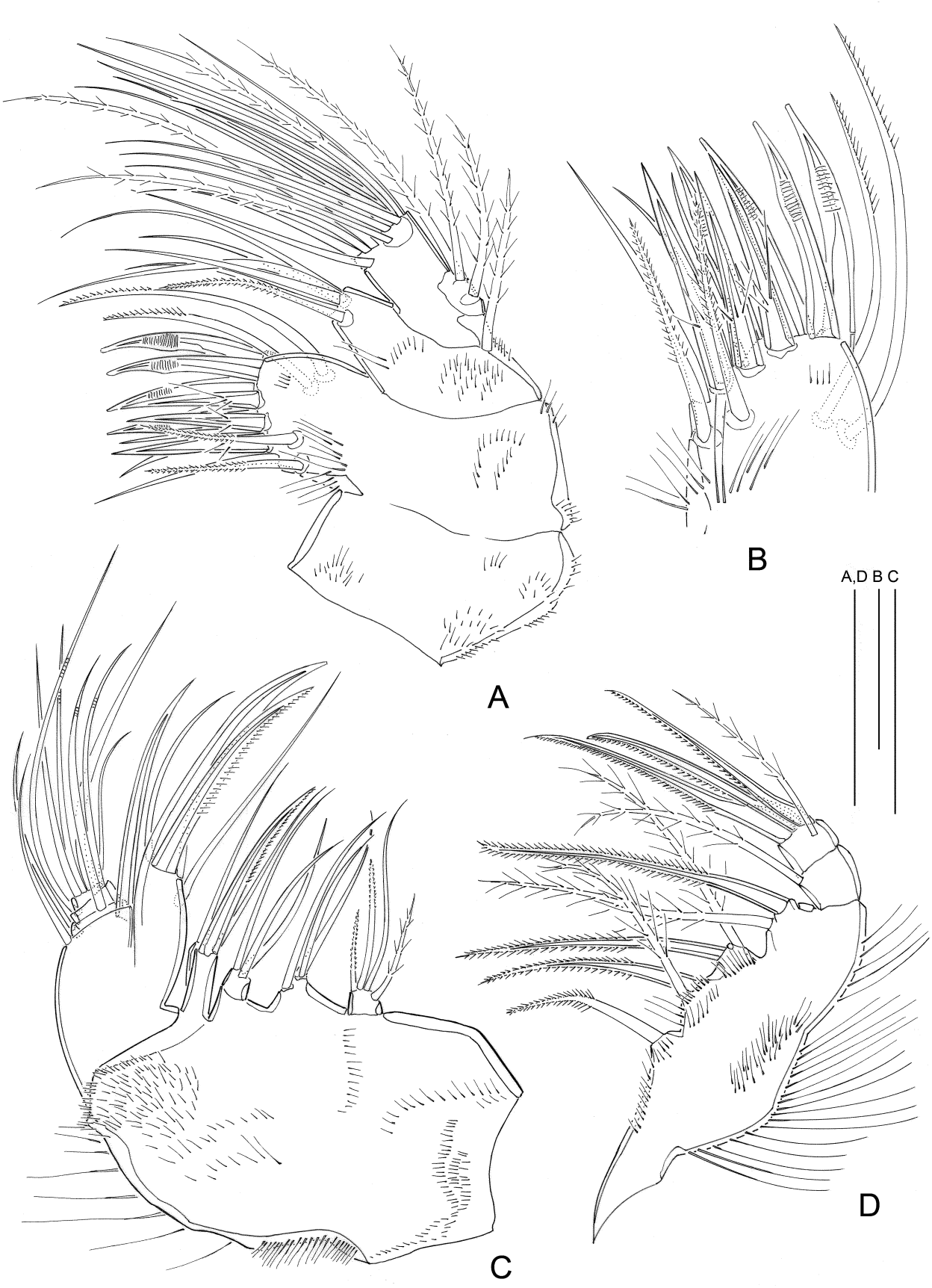

FIGURE 4. *Cerviniella danae* **sp. nov.** (female): A, maxillule; B, maxillular arthrite; C, maxilla; D, maxilliped. Scale bars: 50 μm.

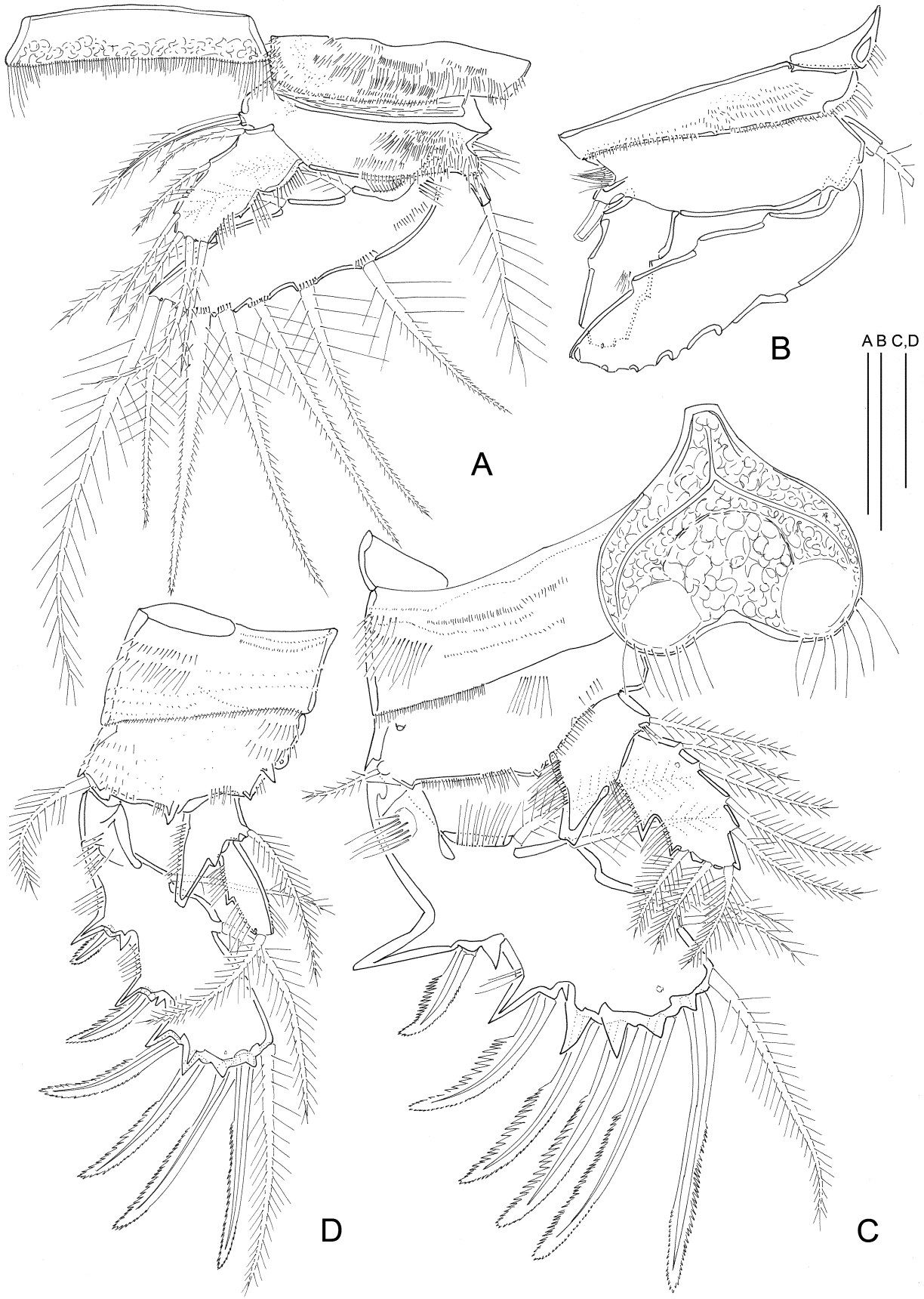

FIGURE 5. *Cerviniella danae* **sp. nov.** (female): A, P1, anterior; B, P1, posterior [armature omitted]; C, P2, anterior; D, P3, anterior. Scale bars: 50 µm.

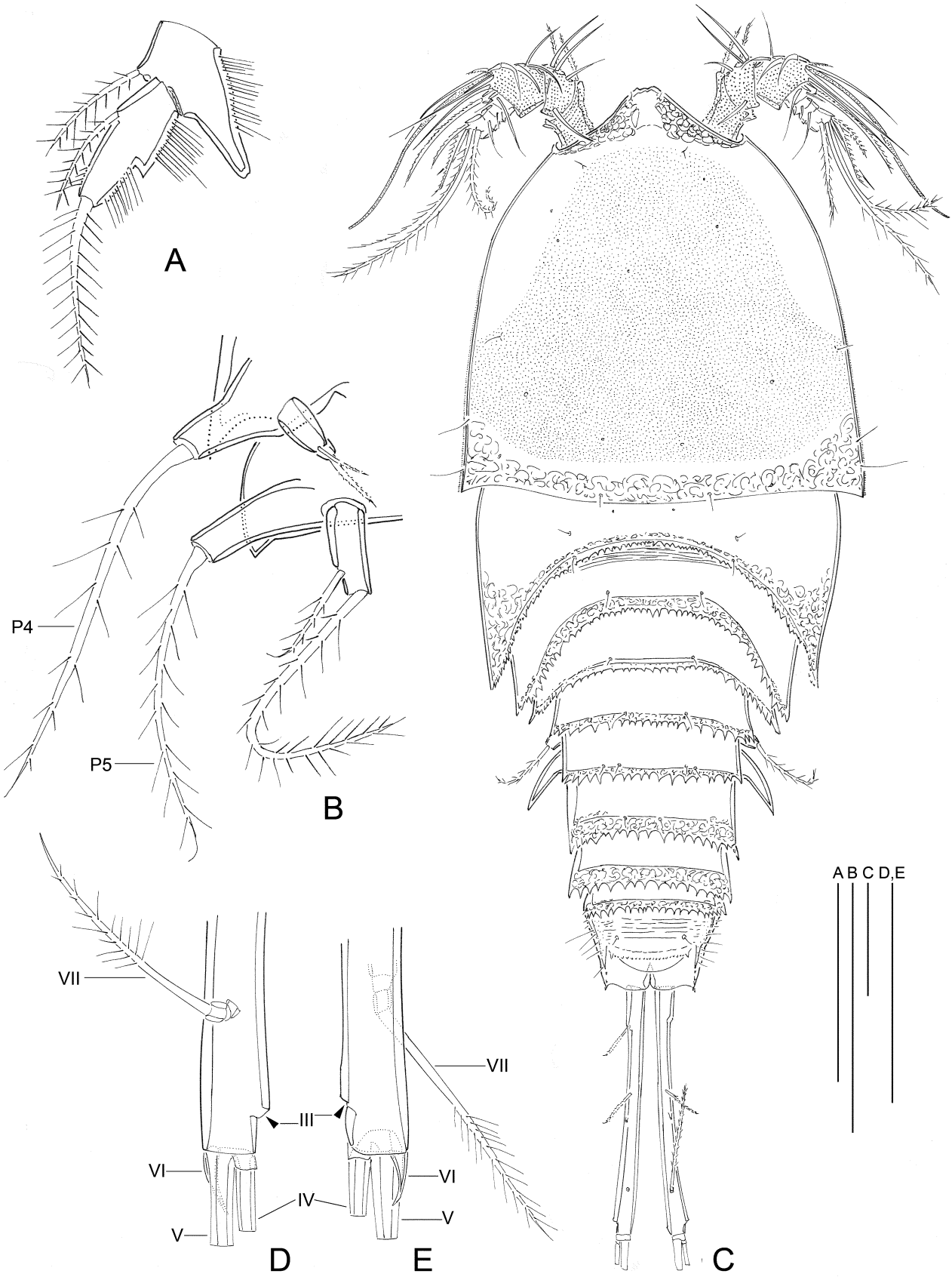

FIGURE 6. *Cerviniella danae* **sp. nov.** (female): A, P3 endopod with aberrant setal formation on enp-2; B, P4 and P5, anterior. *Cerviniella arctica* **sp. nov.** (female): C, habitus, dorsal; D, caudal ramus distal third, dorsal [arrow indicating insertion scar of dislodged seta]; E, caudal ramus distal third, ventral [arrow indicating insertion scar of dislodged seta]. Scale bars: (A, B, D, E) 50 μm; (C) 100 μm.

in Figures 1A, 16A–B; posterior margin slightly serrate. Pedigerous somites with reticulation along posterior margins (Figs 1A, 16A–B, 17B) and ornamentation consisting of sensilla as illustrated in Figures 1A, 16A–B; epimera of second to fourth pedigerous somites expanded posteriorly; posterior margins serrate.

Urosome (Figs 1A, 2A–B, 16A–C) 5-segmented, comprising P5-bearing somite, genital double-somite, 2 free abdominal somites and anal somite. Urosomites with surface ornamentation consisting of sensilla and minute spinules, spinules more conspicuous ventrally; posterior margin serrate and with reticulated surface.

Genital double-somite (Figs 1A, 2A–B, 16A–B) original segmentation indicated by transverse, serrate surface ridge with reticulation and sensilla dorsally, and hook-like projections laterally (Figs 17C–F), completely fused ventrally; genital field (Fig. 2C) with surface striations, copulatory pore located in median depression; gonopores covered by opercula derived from sixth legs and by anteriorly directed flap arising from somite wall; P6 bearing 1 pinnate and 1 naked setae.

Anal somite (Figs 1A, 2A–B, 16A–C) with reduced anal operculum; large anal opening with fringe of fine setules; surface ornamentation consisting of pair of sensilla dorsally, minute spinules and pair of pores ventrally; ventral posterior margin with minute setules.

Caudal rami (Figs 1A, C–D) slightly asymmetrical; approximately 3.5X as long as maximum width, tapering posteriorly. Each ramus with 7 setae: seta I closely set to seta II, both setae pinnate and inserted at proximal third; seta III pinnate and positioned ventrolaterally; setae IV and V fused basally and naked, both bases covered by membranous extension; seta VI minute and flattened, displaced ventrally; seta VII tri-articulate at base and pinnate. Rostrum (Figs 2D, 17A) fused to cephalic shield; bluntly triangular; with midventral tube-pore near apex.

Antennule (Figs 3A, 17E) 5-segmented and surface ornamentation consisting of small denticles as shown in Figure 3A. Segment I with blunt protuberance on posterior distal corner; segment II longest, a double segment completely fused dorsally but with original segmentation apparent in ventral view (arrowed in Figure 17E), with aesthetasc fused basally to seta and set on distinct pedestal; segment V with aesthetasc fused basally to 1 pinnate seta. Armature formula: I-[1 pinnate], II-[10 pinnate + 4 pinnate spines + (1 + ae)], III-[3 pinnate], IV-[4 pinnate], V-[6 pinnate + (1 pinnate + ae)].

Antenna (Fig. 3B) 3-segmented, comprising coxa, allobasis, and 1-segmented endopod. Coxa (not illustrated) small, with no ornamentation. Basis and enp-1 fused, forming elongate allobasis, with spinules along abexopodal margin and patch of spinules and denticles as shown in Figure 3; abexopodal seta pinnate. Free endopod about half length of allobasis; ornamented with row of spinules proximally, row of minute spinules along distal corner and sparse spinules along outer margin; medial armature consisting of 2 setae (1 naked and 1 pinnate) and 1 spine; apical armature consisting of 4 spines and 3 setae (2 naked and 1 pinnate), subdistal seta shortest. Exopod 4-segmented; exp-1 as long as next 3 segments combined; armature formula: I-[2 pinnate], II-[1 pinnate], III-[1 pinnate], IV-[3 pinnate].

Mandible (Figs 3C–D). Coxa with well developed gnathobase bearing several multicuspidate teeth and 1 pinnate seta around distal margin (Fig. 3D). Palp well developed, comprising basis, endopod and exopod. Basis with 4 pinnate setae and surface ornamentation as indicated in Figure 3C. Endopod 1-segmented with 8 naked setae (3 lateral and 5 apical). Exopod 4-segmented, exp-1 as long as the next 3 segments combined; armature formula: I-[1 pinnate], II-[1 pinnate], III-[1 pinnate], IV-[2 pinnate].

Maxillule (Figs 4A–B). Praecoxa with transverse fold and rows of spinules as shown in Figure 4A; arthrite well developed, with 2 pinnate setae on anterior surface, with 7 spines (3 pinnate and 4 striated) and 3 naked setae along distal margin, posterior surface with patches of spinules and 2 pinnate setae (Fig. 4B). Coxa with spinules scattered on posterior surface and along outer margin; endite cylindrical, bearing 6 setae (1 pinnate and 5 naked) distally; epipodite represented by 1 pinnate seta. Basis and endopod fused; basis with 11 setae (3 pinnate and 8 naked); endopod incorporated into basis, represented by 3 naked setae. Exopod 1-segmented, with 3 pinnate setae.

Maxilla (Fig. 4C) comprising syncoxa, allobasis and 3-segmented endopod. Syncoxa with 4 endites; proximal praecoxal endite with 4 setae (3 pinnate and 1 naked); distal praecoxal endite almost completely incorporated into syncoxa, with 3 naked setae; proximal coxal endite with 3 naked setae; distal coxal endite with 2 setae and 1 pinnate spine; rows of spinules and setules along outer margin and additional ornamentation as shown in Figure 4C. Allobasis endite forming strong claw; accessory armature consisting of 2 naked setae and 1 pinnate spine; endopodal armature of maxillary allobasis represented by 1 seta and 1 spine. Endopod with armature formula: I-[1 + 1 geniculate], II-[2 geniculate], III-[3 + 1 geniculate].

Maxilliped (Fig. 4D) with elongated protopod and 2-segmented endopod. Protopod with rows of long setules along outer margin and rows of spinules along proximal inner margin and anterior surface; syncoxal endites represented proximal to distal by 1 pinnate seta, 1 pinnate seta and 1 pinnate spine, and 1 pinnate seta and 1 pinnate spine; basal endite represented by 1 pinnate seta and 1 pinnate spine. Endopod with armature formula: I-[1 pinnate], II-[3 pinnate spines + 1 pinnate seta].

P1 (Figs 5A–B, 17D) biramous. Intercoxal sclerite well developed, approximately 4.0X wider than long, with reticulated surface and row of setules along distal margin. Praecoxa with row of spinules along outer margin. Coxa with rows of minute spinules and setules on anterior surface, patches of minute spinules on posterior surface, small setules along distal margin, and long setules along outer margin. Basis with long pinnate spine on inner distal corner and pinnate seta on outer distal corner; ornamentation consisting of patches of setules on anterior surface and along inner and distal margins. Exopod 1-segmented; with rows of setules along the margins and anterior surface of proximal area, and rows of minute spinules around bases of outer setae; 5 setae (with setules proximally and pinnate distally) along outer margin, 2 apical setae (1 pinnate and 1 with setules proximally and pinnate distally), and 3 pinnate setae along inner margin. Endopod 1-segmented, half length of exopod, and with rows of spinules along inner and outer margins; 3 pinnate setae along inner margin, 2 pinnate setae apically, and 1 pinnate seta on distal outer corner.

P2–P3 (Figs 5C–D, 6A, 16C, 17D) biramous. Intercoxal sclerite well developed (cordiform in P2 and subrectangular in P3), with reticulated surface and row of setules along distal margin. Praecoxa well developed. Coxa with rows of minute spinules and setules on anterior surface, and small setules along distal margin. Basis with row of spinules along distal margin and rows of spinules on anterior surface, with (P2) or without (P3) pore on proximal outer corner, 1 pinnate seta on distal outer corner. Exopod-1 segmented and elongated; with row of setules along inner and outer margins, anterior surface with patch of setules proximally and pore distally; outer and distal margins with acute projections. Endopod 2-segmented; enp-1 outer corner drawn out into bifid (P2) or blunt (P3) projection, with row of setules along outer (P2–P3) and distal (P2) margins; enp-2 outer margin with rows of setules and conspicuous acute projection at midlength of segment. P2 enp-2 approximately 3X as long as enp-1; P3 enp-2 approximately 2X as long as enp-1.

P4 (Figs 6B, 17F) uniramous. Protopod fused to supporting somite and with 1 outer pinnate seta. Exopod 1-segmented, with 1 outer and 1 apical pinnate seta. Endopod absent.

P1–P4 spine and seta formulae as follows:

	Exopod	Endopod
P1	325	321
P2	425	1.421
P3	225	1.[0–1]10
P4	011	absent

P5 (Figs 6B, 17F). Protopod fused to supporting somite and with 1 outer pinnate seta. Exopod with 1 outer and 1 apical pinnate seta.

MALE. Unknown.

Variability. P3 enp-2 presumably bears only 1 distal seta in the normal condition (formula [010], 3 females). However, in two females, P3 enp-2 displayed [110] on one side and [010] on the other side.

Etymology. The species name *danae* refers to Дана (Dana), goddess of the sea in Slavic mythology.

***Cerviniella arctica* sp. nov.**
(Figs 6C–E, 7–10, 18–19)

Type locality. Arctic Ocean, Laptev Sea (78°23.19' N, 133°11.43' E), 2019 m depth.

Type material. Holotype female dissected on 14 slides (reg. no. SMF 37030) from station PS27#035/2457-1, multi corer 5, collected 04/09/1993. Material collected from the type locality by the junior author during the Expedition ARCTIC'93, Leg ARK-IX/4 of RV *Polarstern*.

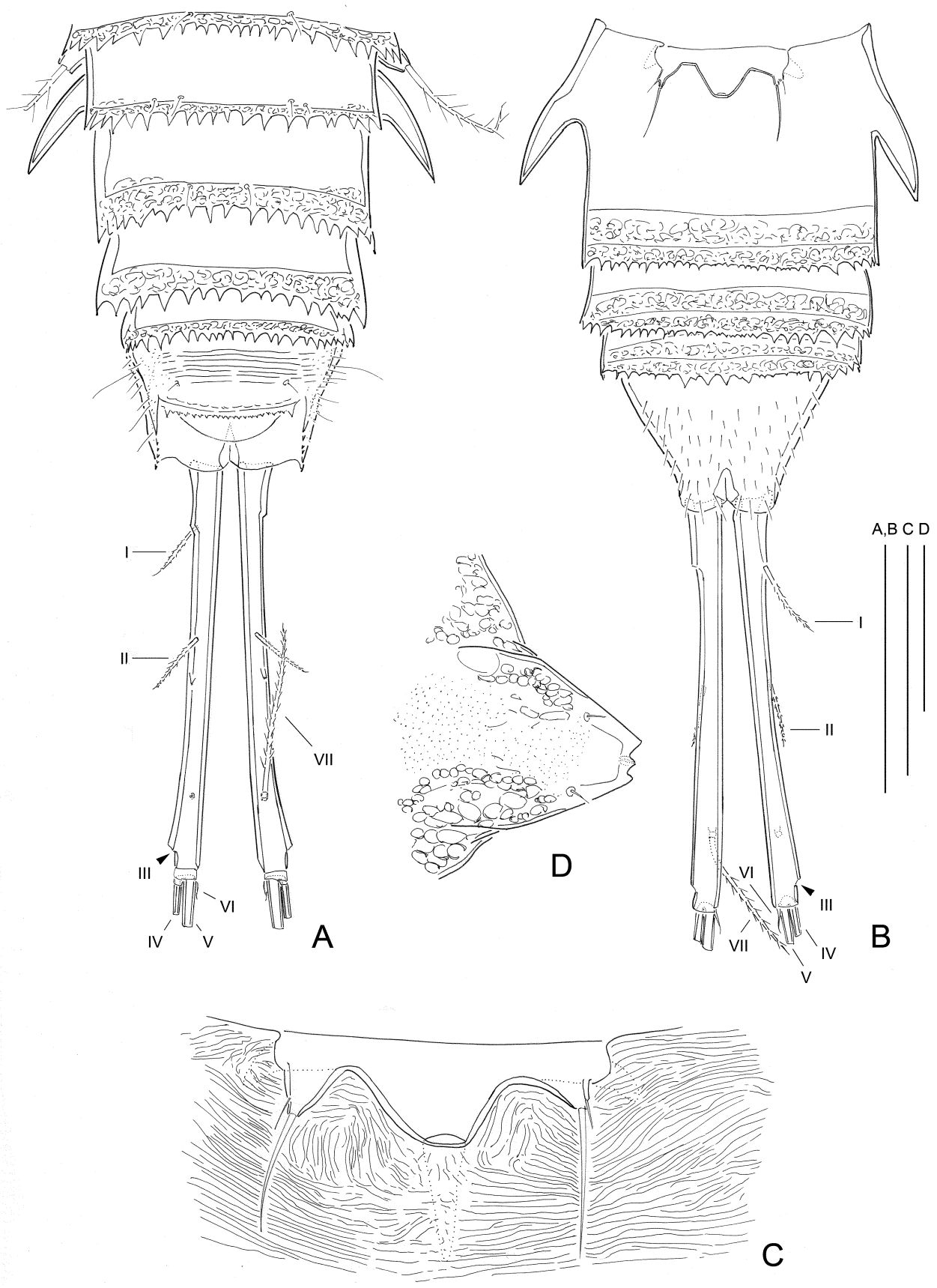

FIGURE 7. *Cerviniella arctica* **sp. nov.** (female): A, urosome [P5-bearing somite omitted], dorsal; B, urosome [P5-bearing somite omitted], ventral; C, genital field; D, rostrum, dorsal. Scale bars: (A, B) 100 μm; (C, D) 50 μm.

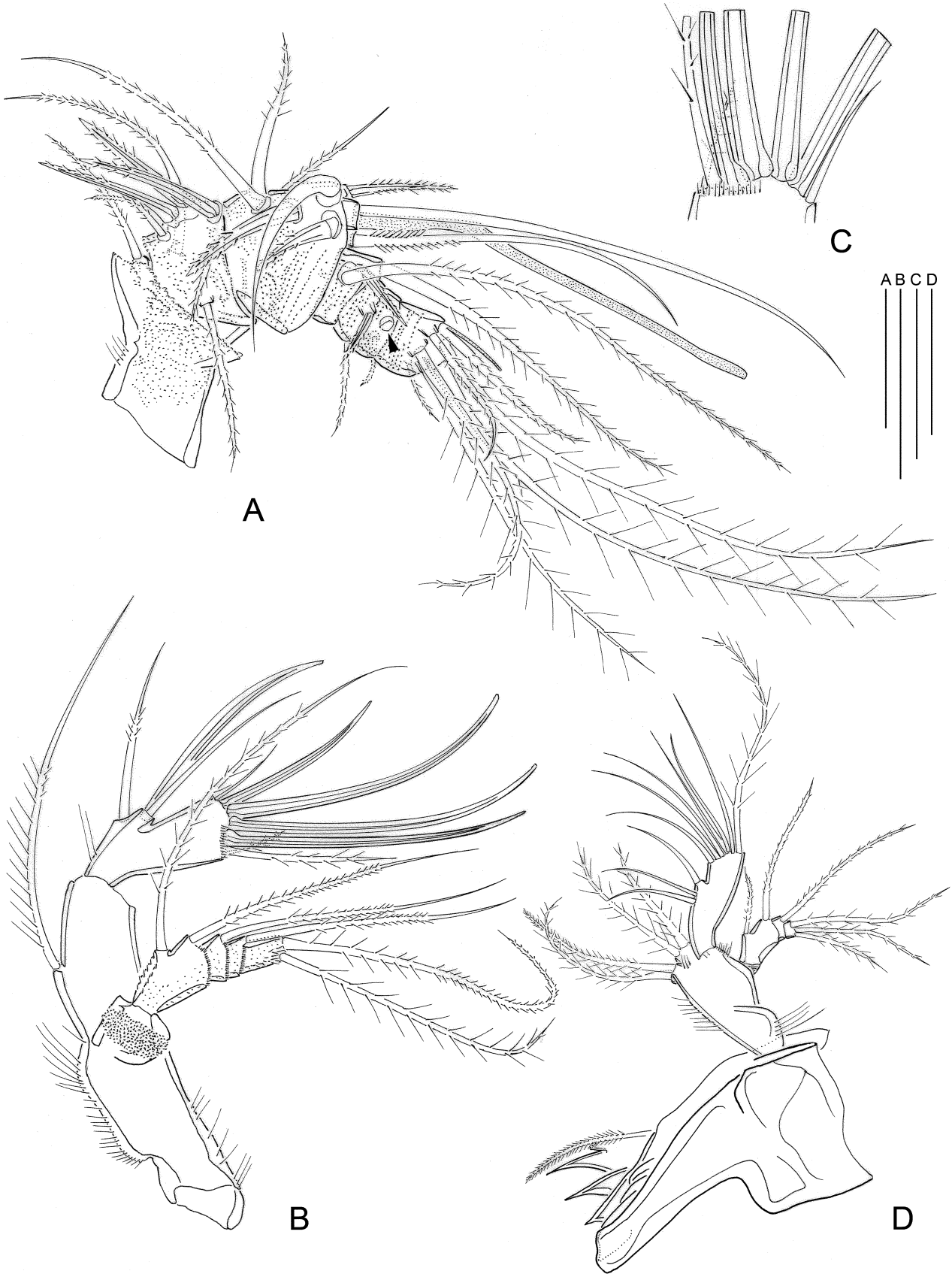

FIGURE 8. *Cerviniella arctica* **sp. nov.** (female): A, antennule, dorsal [arrow indicating insertion scar of dislodged element]; B, antenna; C, detail of antenna, showing distal margin of endopod; D, mandible. Scale bars: (A, B, D) 50 μm; (C) 25 μm.

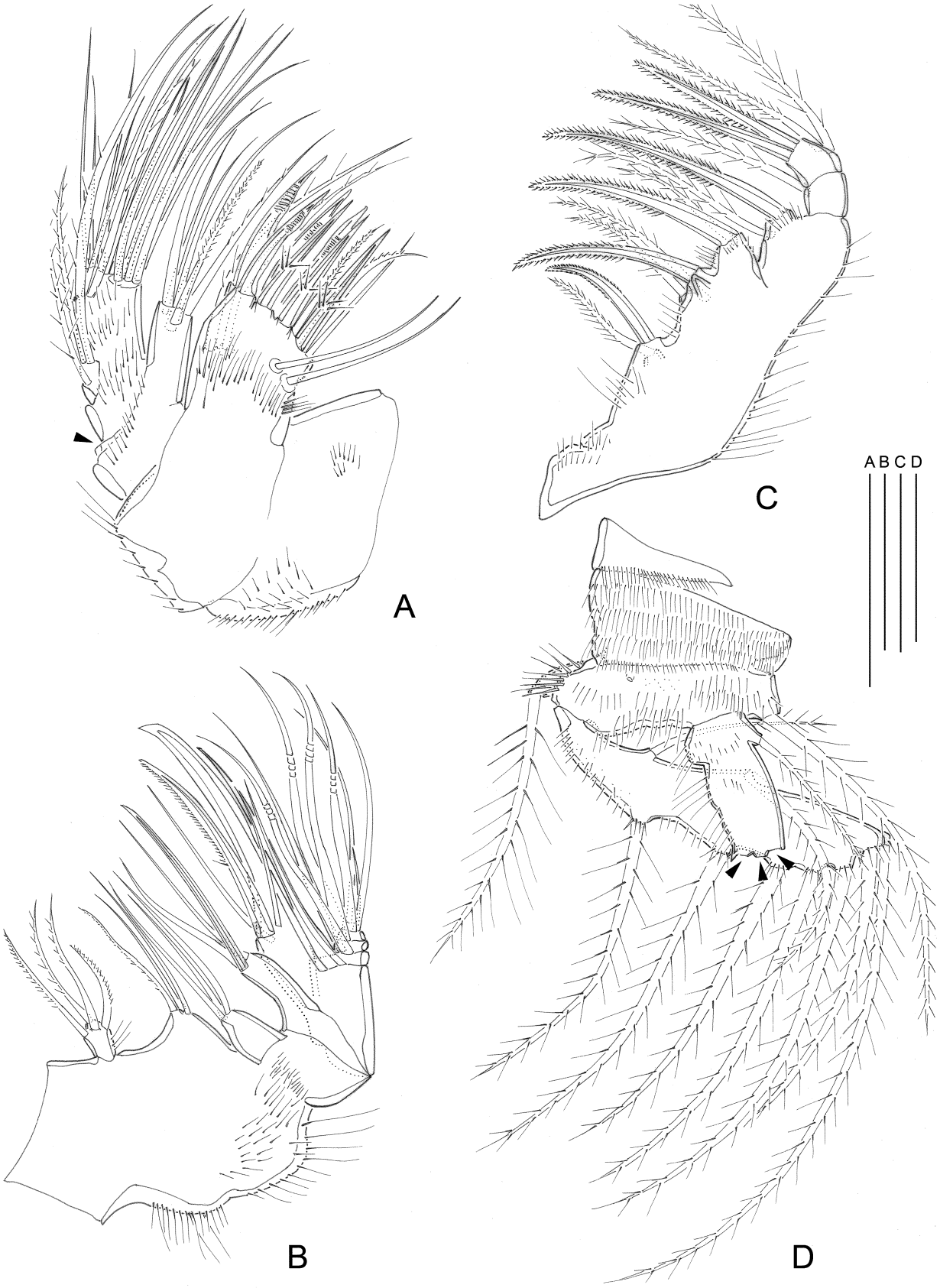

FIGURE 9. *Cerviniella arctica* **sp. nov.** (female): A, maxillule [arrow indicating insertion scar of dislodged element]; B, maxilla; C, maxilliped; D, P1, anterior [arrows indicating insertion scars of dislodged setae]. Scale bars: 50 μm.

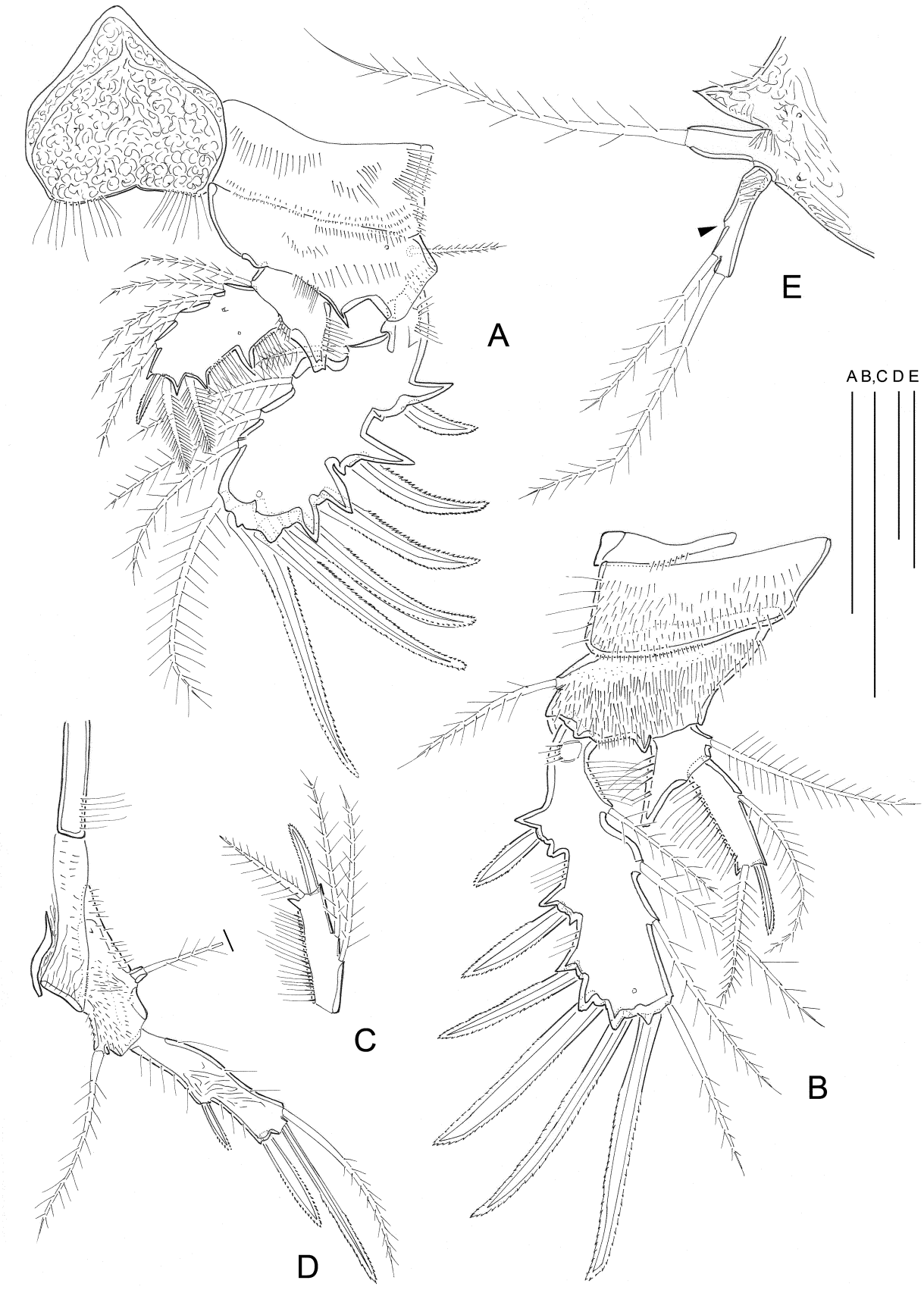

FIGURE 10. *Cerviniella arctica* **sp. nov.** (female): A, P2, anterior; B, P3, right side, anterior; C, P3 endopod, left side, anterior; D, P4, anterior; E, P5, anterior [arrow indicating insertion scar of dislodged element]. Scale bars: 50 μm.

Description. FEMALE. Total body length 1014.7 μm. Largest width measured at posterior border of cephalic shield: 352.9 μm. Body (Figs 6C, 18A–C) with no clear distinction between prosome and urosome, body somites gradually tapering posteriorly.

Prosome (Figs 6C, 18A–C) 4-segmented, with first pedigerous somite incorporated into cephalothorax. Cephalothorax covered by minute scales (Fig. 6C); cuticle with anastomosing pattern near the rostrum (Fig. 19E) and along margins (Figs 6C, 18A–B); additional ornamentation consisting of sensilla and pores as illustrated in Figure 6C; posterior margin smooth. Pedigerous somites with reticulation along posterior margins and ornamentation consisting of sensilla as illustrated in Figure 6C; epimera of second to fourth pedigerous somites expanded posteriorly; posterior margins serrate.

Urosome (Figs 6C, 7A–B, 18A–C) 5-segmented, comprising P5-bearing somite, genital double-somite, 2 free abdominal somites and anal somite. Urosomites with surface ornamentation consisting of sensilla and reticulation as shown in Figures 7A–B; posterior margin serrate.

Genital double-somite (Figs 6C, 7A–B, 18A–B) original segmentation indicated by transverse, serrate surface ridge with reticulation and sensilla dorsally, and hook-like projections laterally (Figs 19B–F), completely fused ventrally; genital field (Fig. 7C) with surface striations, copulatory pore located in median depression; gonopores covered by opercula derived from sixth legs and by anteriorly directed flap arising from somite wall; P6 bearing 2 naked setae.

Anal somite (Figs 6C, 7A–B, 18A–C, 19D). Anal operculum with posterior border serrate; large anal opening flanked by rows of spinous processes laterally (Fig. 19D); surface striated with ornamentation consisting of setules and pair of sensilla dorsally, and setules ventrally.

Caudal rami (Figs 6C–D, 7A–B) elongated, 12.5X as long as maximum width, and with pore on middle of outer margin. Each ramus with 7 setae: seta I naked and inserted at proximal third, seta II pinnate and inserted at middle third; seta III subdistal, unconfirmed shape and size (missing in holotype); setae IV and V fused basally, unconfirmed shape and size of both setae (broken in holotype), both bases covered by membranous extension; seta VI minute and flattened, displaced ventrally; seta VII tri-articulate at base and pinnate.

Rostrum (Figs 7D, 19E) fused to cephalic shield; subtriangular; apex concave with tube-pore; pair of sensilla and additional surface ornamentation as illustrated in Figure 7D.

Antennule (Figs 8A, 19A) 7-segmented, with surface ornamentation consisting of rows of small denticles as shown in Figure 8A. Segment I enlarged distally; segment III longest, with aesthetasc fused basally to seta and set on distinct pedestal; segment VI missing 1 spine/seta on both sides of holotype, insertion area arrowed in Figure 8A; segment VII with aesthetasc fused basally to pinnate seta. Armature formula: I-[1 pinnate], II-[4 pinnate + 3 pinnate spines], III-[1 + 4 pinnate + 3 pinnate spines + (1 + ae)], IV-[2 pinnate + 1 pinnate spine], V-[1 pinnate + 1 pinnate spine], VI-[1 pinnate + 1 element], V-[6 pinnate + (1 pinnate + ae)].

Antenna (Figs 8B–C) 3-segmented, comprising coxa, allobasis, and 1-segmented endopod. Coxa (not illustrated) small, with no ornamentation. Basis and enp-1 fused, forming elongate allobasis, with rows of spinules along inner and outer margins, insertion area of exopod swollen and covered by minute tubercles, abexopodal seta pinnate. Free endopod about half the length of allobasis; ornamented with long spinules along outer margin, and row of minute spinules along distal corner; medial armature consisting of 2 setae (1 naked and 1 pinnate) and 1 spine; apical armature consisting of 4 spines and 3 setae (1 naked and 2 pinnate), the shortest seta subdistal (Fig. 8C). Exopod 4-segmented; with ornamentation as shown in Figure 8B; exp-1 as long as next 3 segments combined; armature formula: I-[2 pinnate], II-[1 pinnate], III-[1 pinnate], IV-[2 pinnate].

Mandible (Fig. 8D). Coxa with well developed gnathobase bearing several multicuspidate teeth and 1 pinnate seta around distal margin. Palp well developed, comprising basis, endopod and exopod. Basis with rows of spinules along inner, outer and distal margins, and 4 pinnate setae. Endopod 1-segmented, medial armature consisting of 3 naked setae; apical armature consisting of 7 setae (6 naked and 1 pinnate). Exopod 3-segmented; armature formula: I-[2 pinnate], II-[1 pinnate], III-[3 pinnate].

Maxillule (Fig. 9A). Praecoxa with transverse fold and rows of spinules as shown in Figure 9A; arthrite well developed, with 2 pinnate setae on anterior surface, with 7 spines (3 pinnate and 4 striated) and 3 setae (2 pinnate and 1 naked) along distal margin, posterior surface with patches of spinules and 2 naked setae. Coxa with row of spinules along distal margin of posterior surface; endite cylindrical, bearing 6 setae (2 pinnate and 4 naked) distally; epipodite represented by 1 missing element (insertion area arrowed in Figure 9A). Basis and endopod fused; ornamentation consisting of rows of spinules on posterior surface; basis with 11 setae (1 pinnate and 10 naked); endopod incorporated into basis, represented by 3 naked setae. Exopod 1-segmented, with 3 pinnate setae.

Maxilla (Fig. 9B) comprising syncoxa, allobasis and 3-segmented endopod. Syncoxa with 4 endites; proximal praecoxal endite cylindrical, ornamented with setules, and with 4 pinnate setae; distal praecoxal endite almost completely incorporated into syncoxa, with 3 setae (1 pinnate and 2 naked); proximal coxal endite with 3 naked setae; distal coxal endite with 2 naked setae and 1 naked spine; rows of spinules and setules along outer margin and additional ornamentation as shown in Figure 9B. Allobasis endite forming strong claw; accessory armature consisting of 2 naked setae and 1 pinnate spine; endopodal armature of maxillar allobasis represented by 1 seta and 1 spine. Endopod with armature formula: I-[1 + 1 geniculate], II-[2 geniculate], III-[3 + 1 geniculate].

Maxilliped (Fig. 9C) with elongated protopod and 2-segmented endopod. Protopod with rows of long setules along outer and inner margins; syncoxal endites represented proximal to distal by 1 pinnate seta and 1 pinnate spine, 2 pinnate setae and 1 pinnate spine, and 1 pinnate seta and 1 pinnate spine; basal endite represented by 1 pinnate seta and 1 pinnate spine. Endopod with armature formula: I-[1 pinnate], II-[2 pinnate spines + 2 pinnate setae].

P1 (Figs 9D, 18C, 19C) biramous. Intercoxal sclerite well developed (Fig. 18C), and with reticulated surface. Praecoxa with row of spinules along distal margin. Coxa with rows of spinules on anterior surface. Basis with 1 pinnate seta on inner corner and 1 pinnate seta on outer distal corner; ornamentation consisting of pore and patches of setules on anterior surface, and rows of spinules along outer margins. Exopod 1-segmented; with rows of setules along outer margin, and rows of minute spinules around bases of outer and apical setae; 5 pinnate setae along outer margin, 2 pinnate setae apically, and 2 pinnate setae along inner margin. Endopod 1-segmented, half length of exopod; ornamented with patches of spinules on anterior surface, and with rows of setules along outer margin; 1 pinnate seta along inner margin, 2 pinnate setae apically, and 1 pinnate seta on distal outer corner (outer and apical elements missing on both sides of holotype for drawing, but present during confocal imaging, insertion areas arrowed in Figure 9D).

P2–P3 (Figs 10A–C, 18C, 19F) biramous. Intercoxal sclerite well developed (cordiform in P2 and subrectangular in P3), with reticulated surface and row of setules along distal margin. Praecoxa well developed. Coxa with rows of minute spinules and setules on anterior surface, small spinules along distal margin, and long setules along outer margin. Basis with row of spinules along distal margin and rows of spinules on anterior surface, distal border with acute projection near endopod insertion, 1 pinnate seta on outer distal margin. Exopod-1 segmented; with row of setules along inner and outer margins (P3), anterior surface with patch of setules proximally and pore distally; outer and distal margins with acute projections. Endopod 2-segmented; enp-1 outer corner drawn out into bifid (P2) or blunt (P3) projection, with row of setules along outer (P2–P3) and distal (P2) margins; enp-2 outer margin with rows of setules and acute projections along outer (P2) and distal (P2–P3) margins. P2 enp-2 3X as long as enp-1; P3 enp-2 elongated and 2.5X as long as enp-1.

P4 (Figs 10D, 19B, F) biramous. Intercoxal sclerite rectangular and with row of setules along distal margin. Praecoxa well developed. Coxa slightly striated, with rows of minute spinules on anterior surface. Basis with rows of spinules along inner and outer margins, and spinules on anterior surface. Exopod 1-segmented; slightly striated, ornamented with rows of setules along inner and outer margins. Endopod 1-segmented; reduced to cylindrical pedestal, bearing 1 pinnate seta.

P1–P4 spine and seta formulae as follows:

	Exopod	Endopod
P1	225	121
P2	425	1.421
P3	325	1.[1–2]20
P4	022	010

P5 (Figs 10E, 19B). Protopod fused to supporting somite and with 1 outer pinnate seta. Exopod slightly striated; with 2 outer elements (proximal outer element missing in holotype, insertion area arrowed in Figure 10E) and 1 apical pinnate seta.

MALE. Unknown.

Variability. The P3 enp-2 displayed [120] on one side and [020] on the other side of the same specimen.

Etymology. The species name is derived from the Latin *arcticus*, referring to the Arctic provenance of the material.

***Cerviniella hitoshii* sp. nov.**
(Figs 11–15, 20–21)

Type locality. Arctic Ocean, Laptev Sea (78°08.19' N, 133°19.94' E), 796 m depth.

Type material. Holotype female dissected on 16 slides (reg. no. SMF 37031) from station PS27#038/2458-1, multi corer 6, collected 05/09/1993. Undissected paratypes consist of 3 copepodites (CII, CIII and CIV with reg. nos. SMF 37032, 37033 and 37034, respectively) from station PS27#047/2465-1, multi corer 1–4, collected 08/09/1993. All material collected by the junior author during the Expedition ARCTIC'93, Leg ARK-IX/4 of RV *Polarstern*.

Description. FEMALE. Total body length 772.0 μm. Largest width measured at posterior margin of cephalic shield: 272.0 μm. Body (Figs 11A, 20A–C) with no clear distinction between prosome and urosome, body somites gradually tapering posteriorly.

Prosome (Figs 11A, 20A–C, 21D) 4-segmented, with first pedigerous somite incorporated into cephalothorax. Cephalothorax with anastomosing pattern near rostrum (Fig. 21C) and along margins (Figs 11A, 20A–B); additional ornamentation consisting of sensilla and pores as illustrated in Figure 11A; posterior margin smooth. Pedigerous somites with reticulation along posterior margins and ornamentation consisting of sensilla as illustrated in Figure 11A; epimera of second and third pedigerous somites expanded posteriorly; posterior margins serrate. Gonads extending from posterior region of mouth parts until middle area of somite bearing P2 (Fig. 21D).

Urosome (Figs 11A, 12A–B, 20A–C) 5-segmented, comprising P5-bearing somite, genital double-somite, 2 free abdominal somites and anal somite. Urosomites with surface ornamentation consisting of sensilla and minute spinules as illustrated in Figures 12A–B; posterior margin serrate.

Genital double-somite (Figs 11A, 12A–B, 20A–B) original segmentation indicated by transverse, serrate surface ridge with reticulation and sensilla dorsally, and hook-like projections laterally (Fig. 21B), completely fused ventrally; genital field (Fig. 12C) with surface smooth, copulatory pore located in median depression; gonopores covered by opercula derived from sixth legs and by anteriorly directed flap arising from somite wall; P6 bearing 3 pinnate setae.

Anal somite (Figs 11A–B, 12A–B, 20A–C) with reduced anal operculum with large anal opening; surface ornamentation consisting of pair of sensilla dorsally and setules ventrally; posterior margin smooth.

Caudal rami (Figs 11A, C–D) slightly asymmetrical; 3.5X as long as maximum width, tapering posteriorly. Each ramus with 7 setae: seta I closely set to seta II, both pinnate and inserted at proximal third; seta III pinnate and positioned ventrolaterally; setae IV and V fused basally, seta IV pinnate and seta V naked, both bases covered by membranous extension; seta VI minute and flattened, displaced ventrally; seta VII tri-articulate at base and pinnate.

Rostrum (Figs 11E, 21C) fused to cephalic shield; bluntly triangular; with midventral tube-pore near apex.

Antennule (Figs 12D, 21A) 5-segmented, and surface ornamentation consisting of small denticles as shown in Figure 12D. Segment I with pointed projection on posterior distal corner; segment II longest, double segment completely fused dorsally but with original segmentation apparent in ventral view, with aesthetasc fused basally to seta and set on distinct pedestal; segment V with aesthetasc fused basally to pinnate seta. Armature formula: I-[1 pinnate spine], II-[15 pinnate + 7 pinnate spines + (1 + ae)], III-[3 pinnate], IV-[4 pinnate], V-[5 pinnate + (1 pinnate + ae)].

Antenna (Fig. 13A) 3-segmented, comprising coxa, allobasis, and 1-segmented endopod. Coxa small, with no ornamentation. Basis and enp-1 fused, forming elongate allobasis, with spinules along abexopodal margin and patch of spinules and denticles as shown in Figure 13A, abexopodal seta pinnate. Free endopod about half length of allobasis; ornamented with row of spinules proximally, row of spinules along distal corner and sparse spinules on posterior surface; medial armature consisting of 2 pinnate setae and 1 spine; apical armature consisting of 4 spines and 3 setae (2 naked and 1 pinnate), subdistal seta shortest. Exopod 4-segmented; exp-1 as long as next 3 segments combined; armature formula: I-[2 pinnate], II-[1 pinnate], III-[1 pinnate], IV-[3 pinnate].

Mandible (Fig. 13B). Coxa with well developed gnathobase bearing several multicuspidate teeth and 1 pinnate seta (detailed drawing in Fig. 13B) around distal margin. Palp well developed, comprising basis, endopod and exopod. Basis with 4 pinnate setae and surface ornamentation as indicated in Figure 13B. Endopod 1-segmented; medial armature consisting of 3 setae (1 naked and 2 pinnate); apical armature consisting of 5 setae (4 naked and 1 pinnate). Exopod 3-segmented; armature formula: I-[2 pinnate], II-[1 pinnate], III-[3 pinnate].

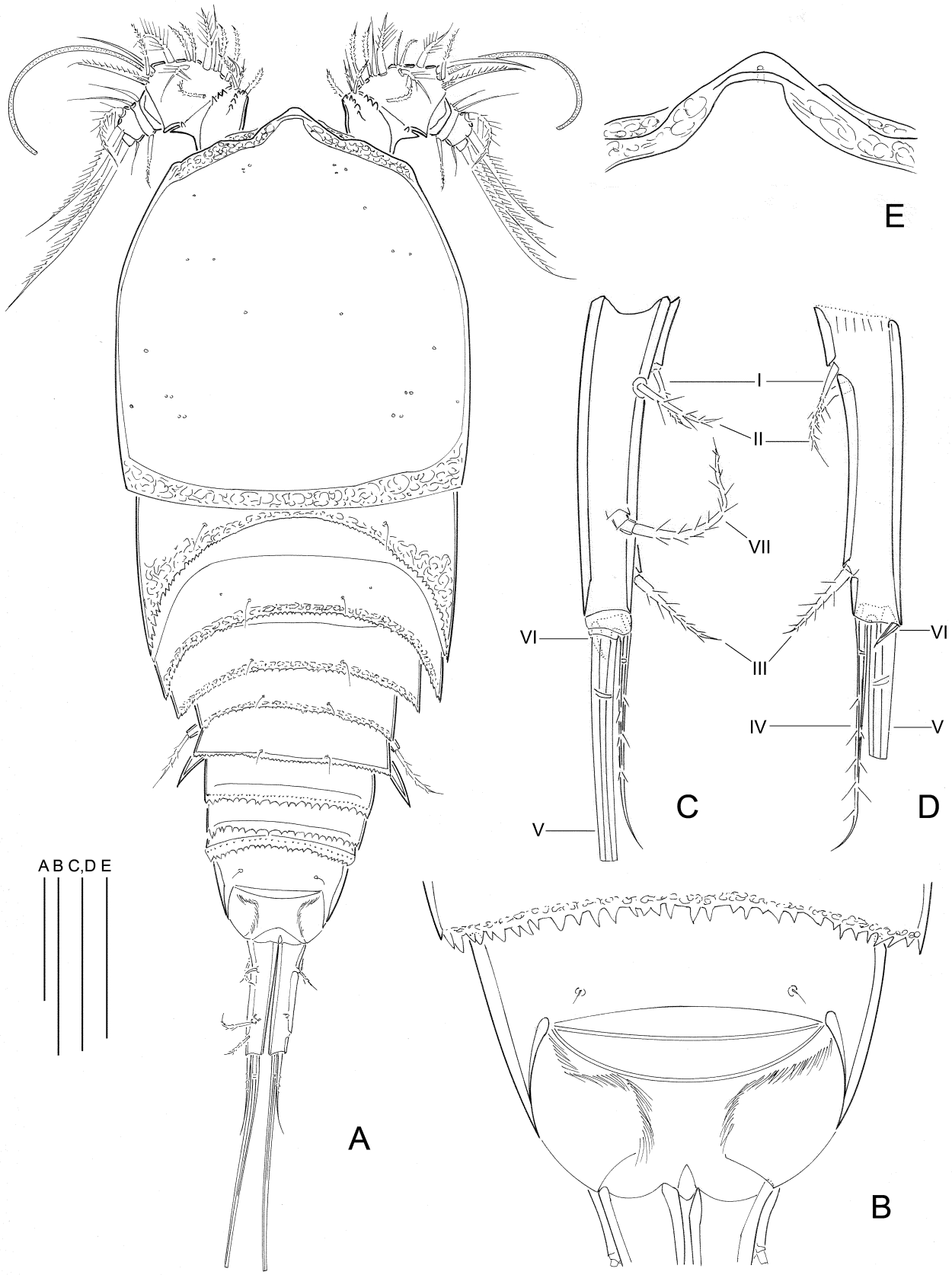

FIGURE 11. *Cerviniella hitoshii* **sp. nov.** (female): A, habitus, dorsal; B, anal somite, dorsal; C, caudal ramus, dorsal; D, caudal ramus, ventral; E, rostrum, dorsal. Scale bars: (A) 100 μm; (B–E) 50 μm.

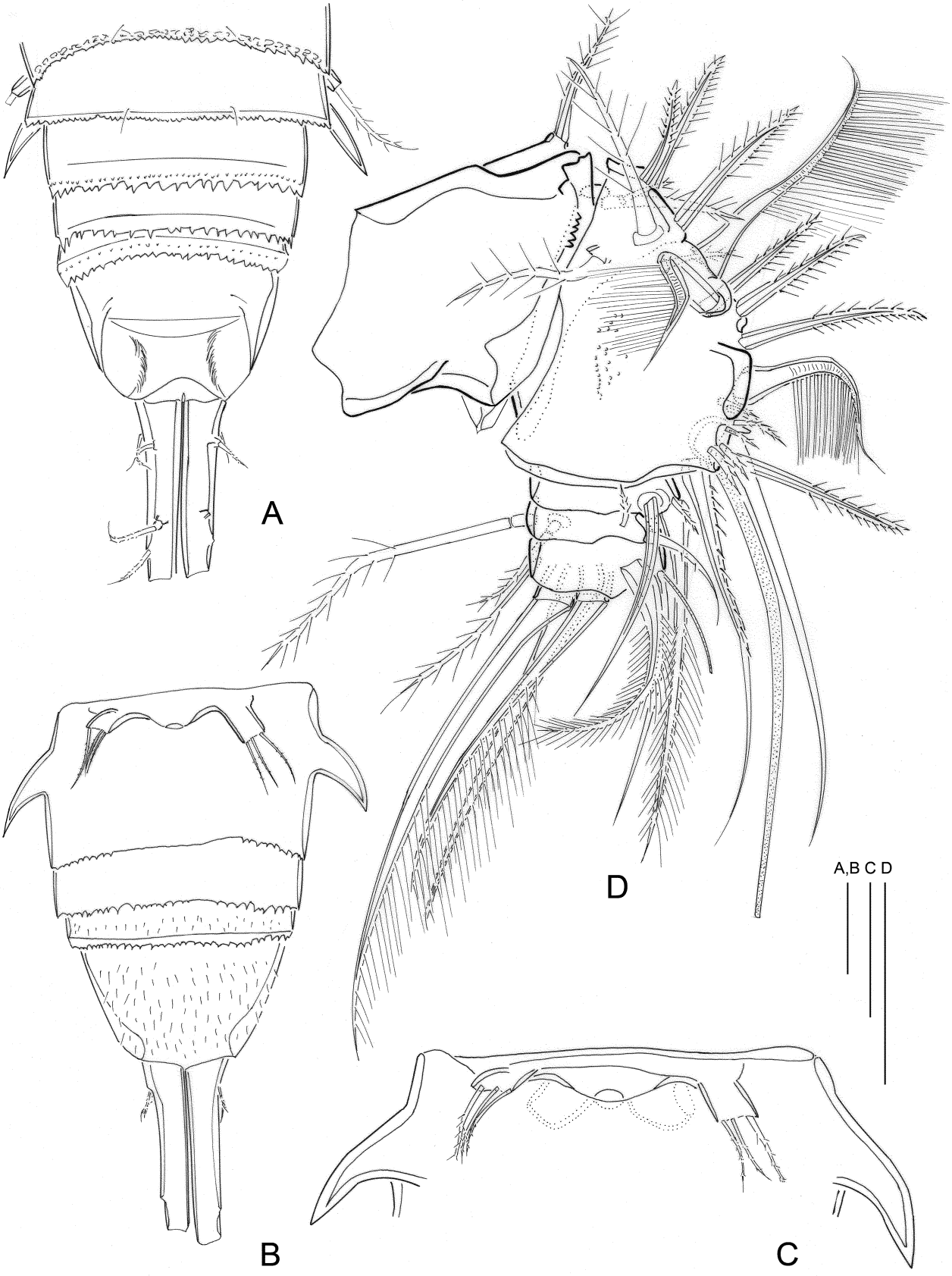

FIGURE 12. *Cerviniella hitoshii* **sp. nov.** (female): A, urosome [P5-bearing somite partially omitted], dorsal; B, urosome [P5-bearing somite omitted], ventral; C, genital field; D, antennule, dorsal. Scale bars: 50 μm.

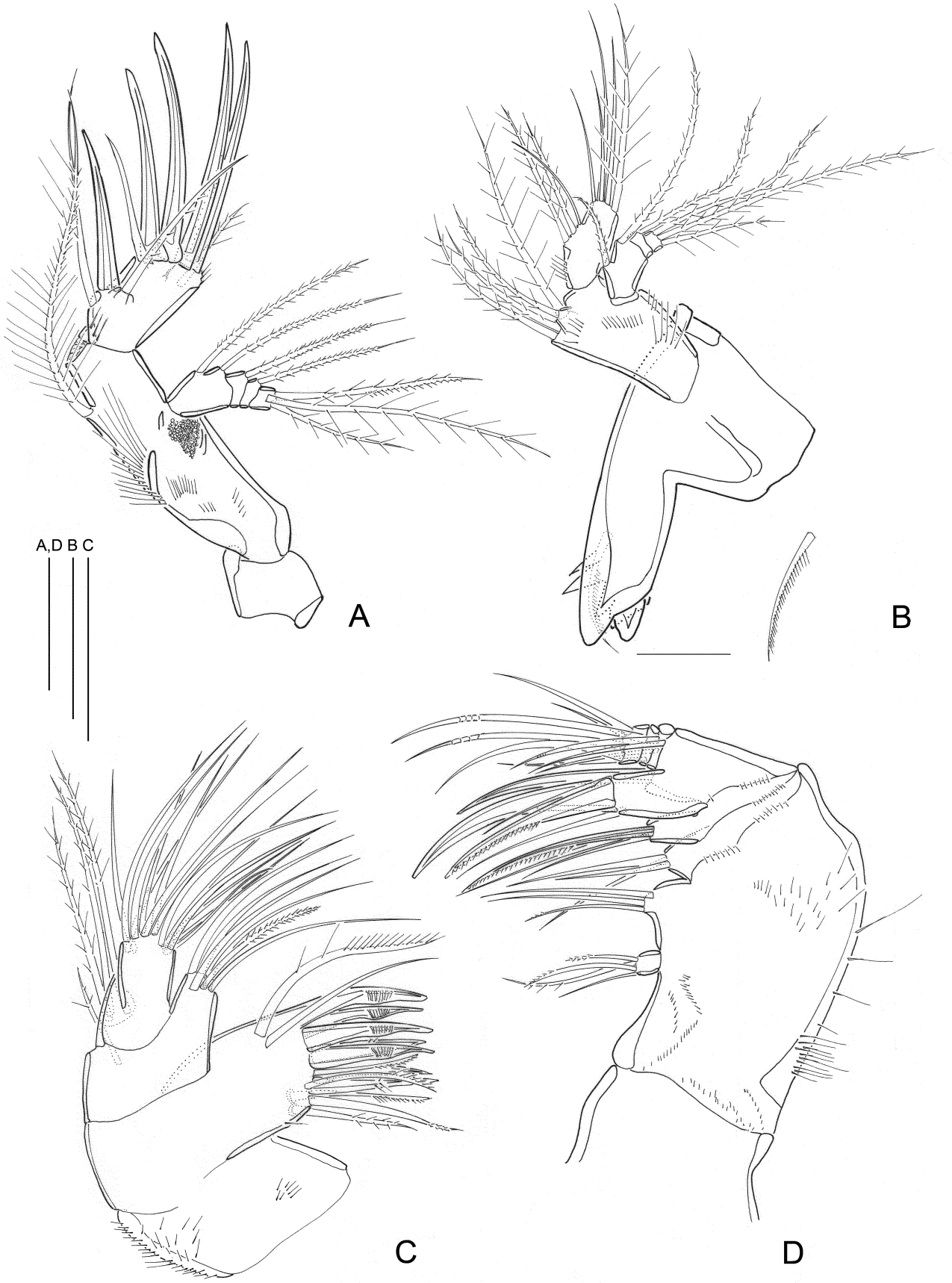

FIGURE 13. *Cerviniella hitoshii* **sp. nov.** (female): A, antenna; B, mandible, showing detail of pinnate seta of gnathobase; C, maxillule; D, maxilla. Scale bars: 50 μm.

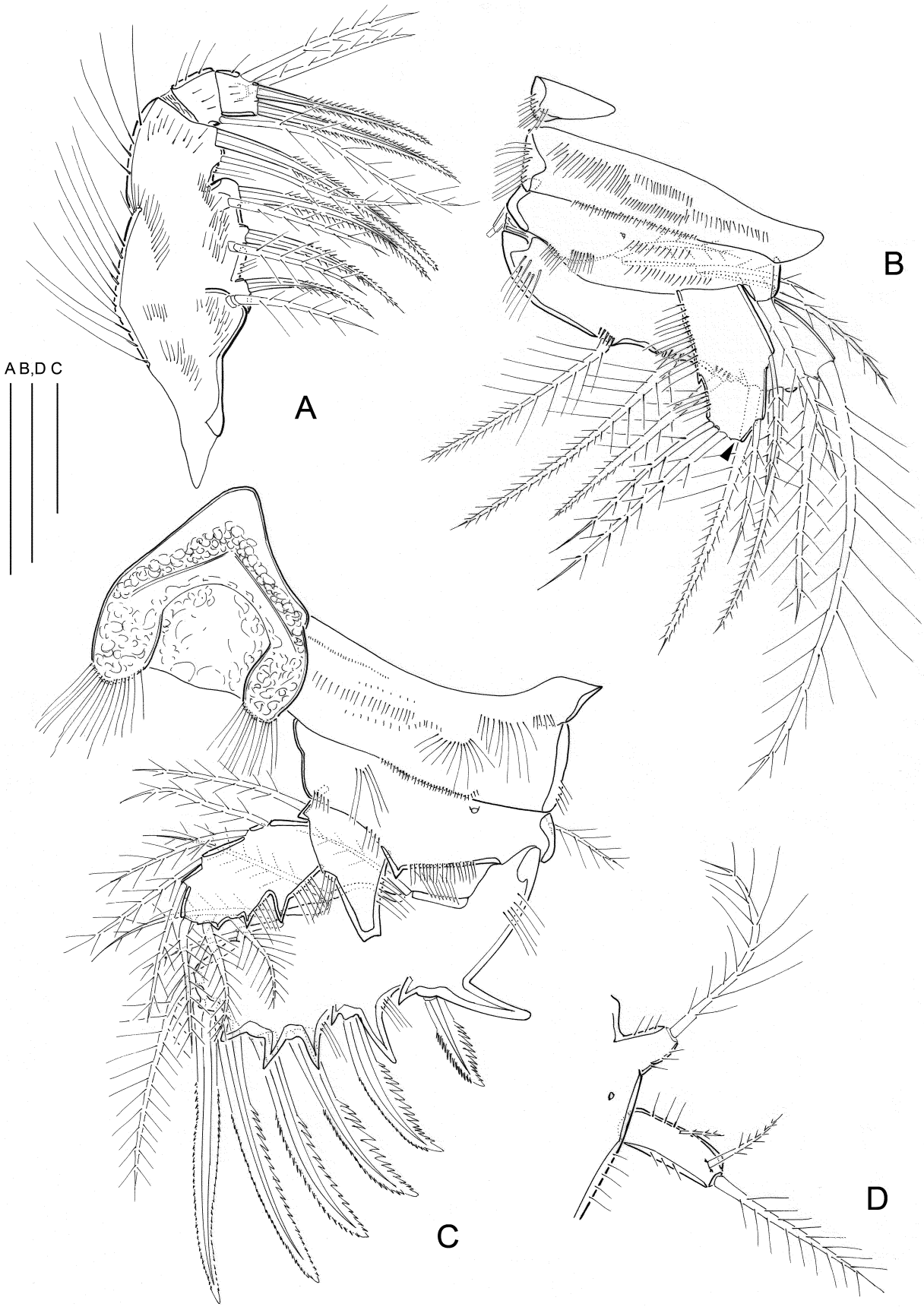

FIGURE 14. *Cerviniella hitoshii* **sp. nov.** (female): A, maxilliped; B, P1, anterior [arrow indicating insertion scar of dislodged element]; C, P2, anterior; D, P5, anterior. Scale bars: 50 μm.

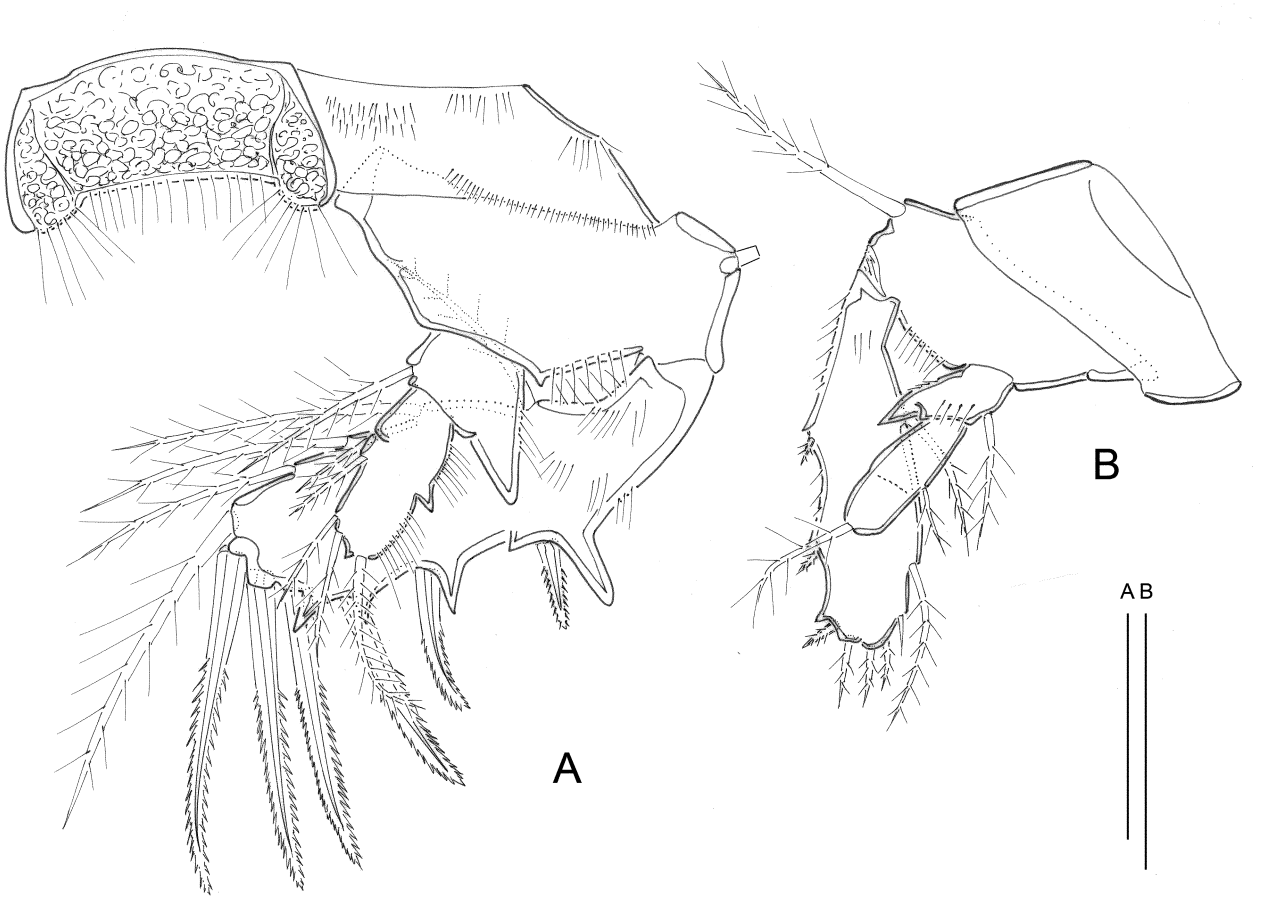

FIGURE 15. *Cerviniella hitoshii* **sp. nov.** (female): A, P3, anterior; B, P4, anterior. Scale bars: 50 μm.

Maxillule (Fig. 13C). Praecoxa with transverse fold and rows of spinules as shown in Figure 13C; arthrite well developed, with 2 setae (1 naked and 1 pinnate) on anterior surface, with 7 spines (3 pinnate and 4 striated) and 3 pinnate setae along distal margin, posterior surface with 2 pinnate setae. Coxa with cylindrical endite, bearing 6 setae (5 naked and 1 pinnate) distally; epipodite represented by 1 pinnate seta. Basis and endopod fused, with row of spinules on anterior surface (not represented); basis with 11 naked setae; endopod incorporated into basis, represented by 3 naked setae. Exopod 1-segmented, with 3 pinnate setae.

Maxilla (Fig. 13D) comprising syncoxa, allobasis and 3-segmented endopod. Syncoxa with 4 endites; proximal praecoxal endite with 4 setae (1 naked and 3 pinnate); distal praecoxal endite almost completely incorporated into syncoxa, with 3 setae (1 pinnate and 3 naked); proximal coxal endite with 3 naked setae; distal coxal endite with 2 naked setae and 1 pinnate spine; rows of spinules and setules along outer margin and additional ornamentation as shown in Figure 13D. Allobasis endite forming strong claw; accessory armature consisting of 2 naked setae and 1 pinnate spine; endopodal armature of maxillar allobasis represented by 1 seta and 1 spine. Endopod with armature formula: I-[1 + 1 geniculate], II-[2 geniculate], III-[3 + 1 geniculate].

Maxilliped (Fig. 14A, 21D) with elongated protopod and 2-segmented endopod. Protopod with rows of long setules along outer margin and rows of spinules on anterior surface; each syncoxal endite with 1 pinnate seta and 1 pinnate spine; basal endite represented by 1 pinnate seta and 1 pinnate spine. Endopod with spinules along outer margin and anterior surface; armature formula: I-[1 pinnate], II-[2 pinnate spines + 2 pinnate setae].

P1 (Figs 14B, 21D) biramous. Intercoxal sclerite well developed, and with reticulated surface. Praecoxa with row of spinules along outer margin. Coxa with rows of spinules on anterior surface, small setules along distal margin, and long spinules along outer margin. Basis with 1 pinnate seta on inner corner of anterior surface and 1 pinnate seta on outer distal margin (not illustrated); ornamentation consisting of patches of setules on anterior surface. Exopod 1-segmented; with rows of setules on proximal area, and rows of minute spinules around bases of outer

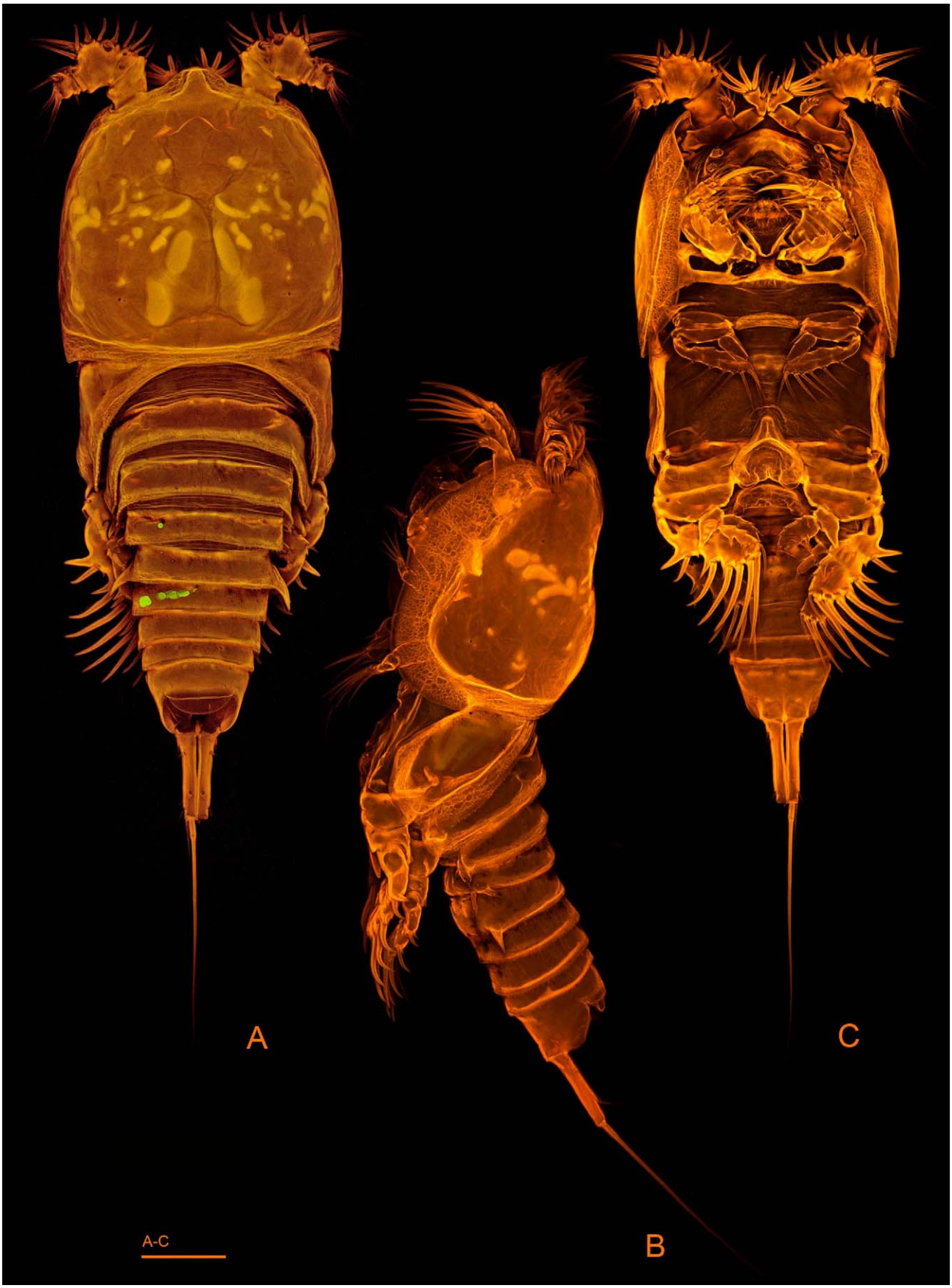

FIGURE 16. *Cerviniella danae* **sp. nov.** (female), confocal laser scanning microscopy images: A, habitus, dorsal, green region representing material released from the pores; B, habitus, lateral; C, habitus, ventral. Scale bars: 100 µm.

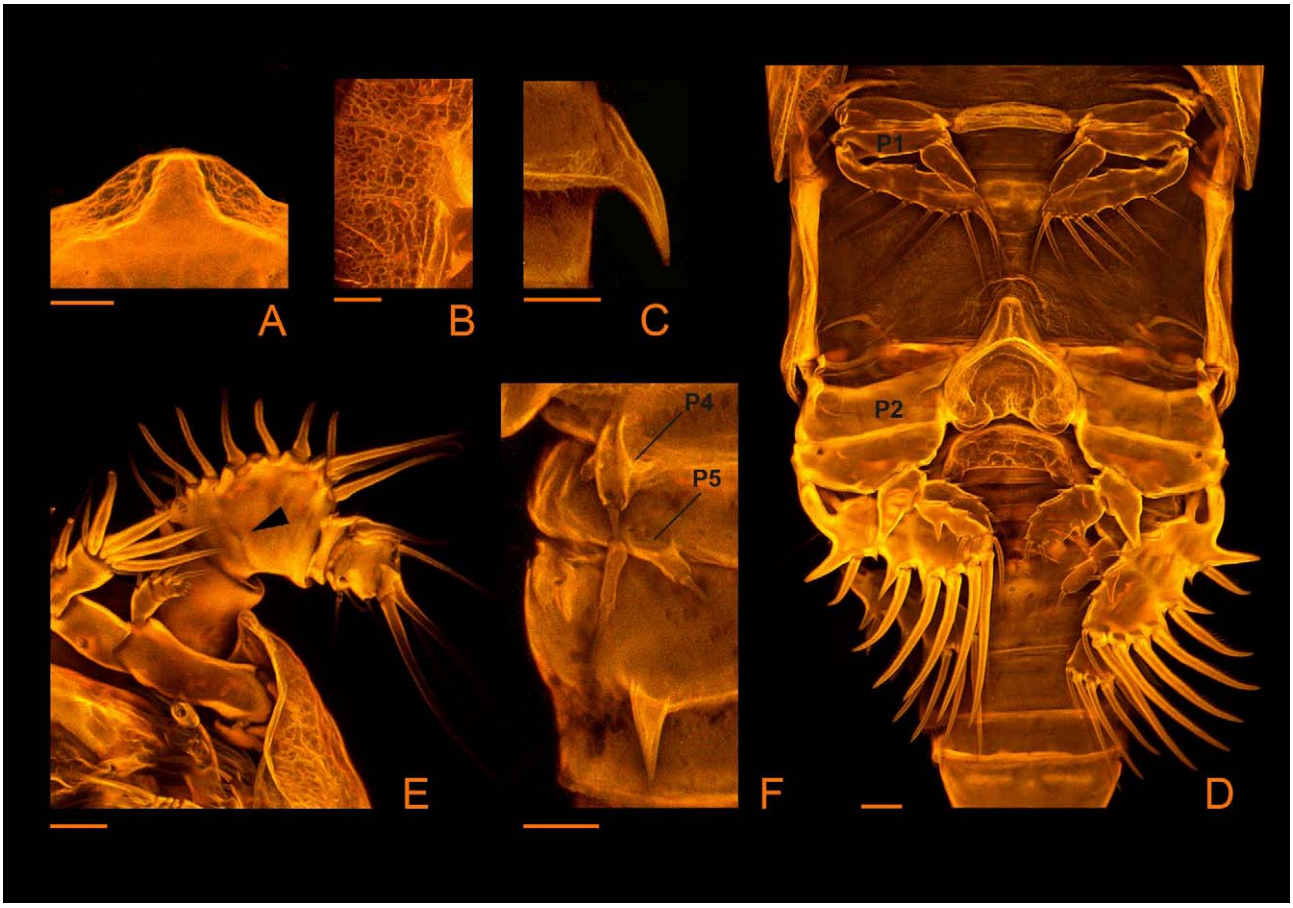

FIGURE 17. *Cerviniella danae* **sp. nov.** (female), confocal laser scanning microscopy images: A, rostrum, dorsal; B, Detail of reticulation along posterior margin of pedigerous somites; C, Detail of hook-like projection of the genital double-somite, dorsal; D, P1 and P2, anterior; E, antennule, ventral [arrow indicating original segmentation]; F, P4 and P5, anterior. Scale bars: 25 μm.

setae; 5 setae (with setules proximally and pinnate distally) along outer margin, 2 pinnate setae apically, and 3 pinnate setae along inner margin. Endopod 1-segmented, half length of exopod, and with rows of spinules along outer margin; 2 pinnate setae along inner margin, 2 elements apically (outer apical element 1 pinnate seta and inner apical element missing on both sides of holotype) and 1 pinnate seta on distal outer corner.

P2–P4 (Figs 14C, 15A–B) biramous. Intercoxal sclerite well developed (cordiform in P2 and almost rectangular in P3–P4), with reticulated surface and row of setules along distal margin. Praecoxa well developed (not illustrated). Coxa with rows of spinules and setules on anterior surface, small setules along distal and outer margins (P2–P3). Basis with scattered spinules on anterior surface (P2), distal margin with acute projection (P2–P3) and row of spinules (P2–P4), 1 pinnate seta on outer margin. Exopod-1 segmented; with row of setules along inner and outer margins, anterior surface with patch of setules proximally; outer and distal margins with acute projections. Endopod 2-segmented; enp-1 outer corner drawn out into blunt (P2) or acute (P3–P4) projection, with row of setules along outer margin, and 1 pinnate seta on inner distal corner; enp-2 outer margin with rows of setules (P2–P3) and conspicuous acute projection at midlength of the segment (P2–P3).

P1–P4 spine and seta formulae as follows:

	Exopod	Endopod
P1	325	221
P2	425	1.421
P3	425	1.320
P4	423	1.110

FIGURE 18. *Cerviniella arctica* **sp. nov.** (female), confocal laser scanning microscopy images: A, habitus, dorsal; B, habitus, lateral; C, habitus, ventral. Scale bars: 100 μm.

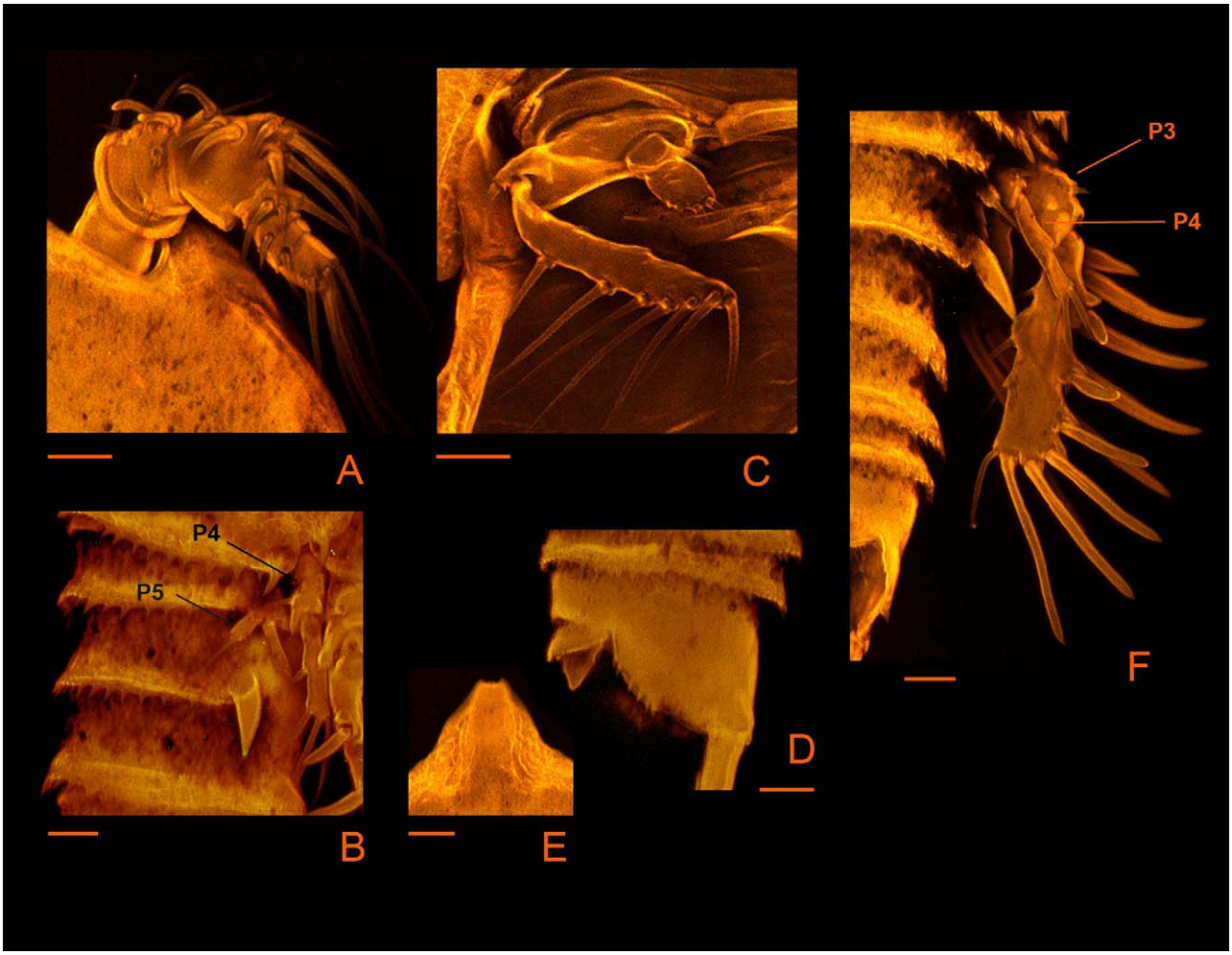

FIGURE 19. *Cerviniella arctica* **sp. nov.** (female), confocal laser scanning microscopy images: A, antennule, dorsal; B, P4, P5 and genital double-somite, lateral; C, P1, anterior; D, anal somite, lateral; E, rostrum, dorsal; F, P3 and P4, posterior. Scale bars: 25 μm.

FIGURE 20. *Cerviniella hitoshii* **sp. nov.** (female), confocal laser scanning microscopy images: A, habitus, dorsal; B, habitus, lateral; C, habitus, ventral. Scale bars: 100 μm.

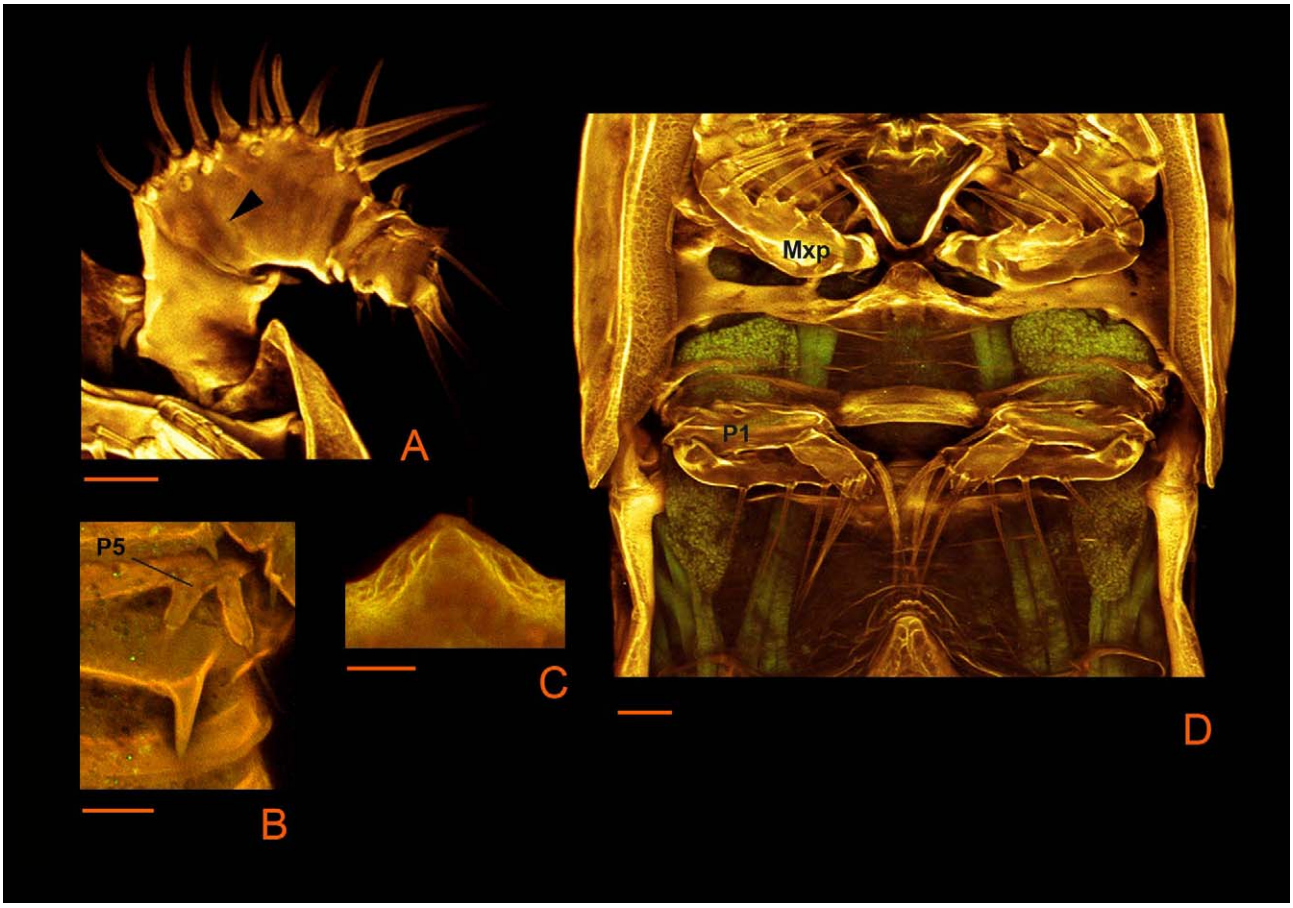

FIGURE 21. *Cerviniella hitoshii* **sp. nov.** (female), confocal laser scanning microscopy images: A, antennule, ventral [arrow indicating original segmentation]; B, P5 and genital double-somite, lateral; C, rostrum, dorsal; D, maxilliped (Mxp) and P1, anterior, green area representing gonads and musculature. Scale bars: 25 μm.

P5 (Figs 14D, 21B). Protopod fused to supporting somite and with 1 outer pinnate seta. Exopod with spinules along inner and outer margins; with 1 apical and 2 outer pinnate setae.

MALE. Unknown.

Etymology. The specific name *hitoshii* is dedicated to the senior author's father, Getulio Hitoshi Kihara.

Discussion

The new species are placed in *Cerviniella* on account of having the first pedigerous somite incorporated into the cephalothorax; the caudal rami elongate and slightly divergent; the mandible with elongated exopod and endopod; the maxillula with a reduced exopod; the maxillar allobasis with a posterior spine; the P1–P4 exopods 1- or 2-segmented; and the P5 without an endopodal lobe.

The close relationship among these species is indicated by the combination of shared characters: distal segment of antennule with aesthetasc, antennary endopod with two setae and one spine laterally, and four spines and three setae apically; and the same number of armature elements on the maxillula and maxilla.

There is an undeniable, close relationship between *C. danae* **sp. nov.** and *C. hitoshii* **sp. nov.** based on the reduction of antennules to only five segments, which is unique in the genus but common to both. Seifried (2003) recognized as an autapomorphy of Aegisthidae the reduction of the female antennules to eight segments, due to fusion of Oligoarthra segments three and four. Observing the other representatives of the genus, the basic pattern in *Cerviniella* seems to be an antennule that is 7-segmented, with fusion of Oligoarthra segments [3+4] and [5+6]. In the 5-segmented antennule of *C. danae* **sp. nov.** and *C. hitoshii* **sp. nov.**, the reduction goes even further, with the fusion of Oligoarthra segments [2+3+4], [5+6] and [7+8].

An intermediate state can be observed in *C. langi*, which has a 6-segmented antennule. Although Bodin (1968) described the antennule with seven segments and commented that the seventh segment was broken in his specimen, observing his drawings, the typical setae of the terminal segment are recognizable and the fusion of Oligoarthra segments [3+4], [5+6] and [7+8] is identifiable by the number and positions of the elements on these segments.

In addition, *C. danae* **sp. nov.** and *C. hitoshii* **sp. nov.** are the smallest representatives of the group with 864.5 and 772.0 μm, respectively, whereas the body lengths of other congeners range between 900 and 2115 μm. The reduced size is also reflected in the caudal rami length-to-width ratio of 3.5 in these species; 7.0 is the mean value for the group.

Even sharing these characteristics, *C. danae* **sp. nov.** is most readily separated from *C. hitoshii* **sp. nov.**, and other described species, by the armature of the antennules and the unique combination of the spine and seta formulae of the swimming legs (Table 4). Other exclusive characteristics are: the maxilliped with the distal segment of the endopod with three spines and one seta, and the presence of one spine instead of a seta on the inner distal corner of the P1 basis.

TABLE 4. Swimming leg armature formulae of known *Cerviniella* species.

	P1		P2		P3		P4	
	Exp	Enp	Exp	Enp	Exp	Enp	Exp	Enp
Cerviniella bodini Coull, 1973	125	1.121	424	1.421	325	1.220	023	010
Cerviniella brodskayae Por, 1969	324	120	425	521	425	120	425	010
Cerviniella hamata Coull, 1973	124	120	425	1.321	225	220	124	220
Cerviniella lagarderei Bodin, 1968	324	321	425	521	325	120	4[1].123	absent
Cerviniella langi Bodin, 1968	325	421	425	1.421	425	1.220	020	absent
Cerviniella mirabilipes Smirnov, 1946	225	021	425	1.421	325	1.020	023	absent
Cerviniella peruana Becker, 1974	325	321	425	421	425	521	324	421
Cerviniella talpa (Por, 1964)	125	321	325	0.421	325	1.220	022	absent
Cerviniella talpa (Por, 1964) – Bodin 1968[2]	325	121	425	1.321	325	1.010	022	absent
Cerviniella danae **sp. nov.**	325	321	425	1.421	225	1.[0–1]10	011	absent
Cerviniella arctica **sp. nov.**	225	121	425	1.421	325	1.[1–2]20	022	010
Cerviniella hitoshii **sp. nov.**	325	221	425	1.421	425	1.320	423	1.110

[1] - P4 exopod 2-segmented; exp-1 a double segment, with the original segmentation indicated only by a slight thinning of the cuticle, and bearing 4 elements - 2 pinnate setae on the inner margin and 2 pinnate spines on the outer margin.

[2] - Bodin (1968) re-described the chaetotaxy of *C. talpa* based on 2 paratypes provided by Prof. Dr. Francis Dov Por.

For *C. hitoshii* **sp. nov.**, other major diagnostic differences that have never been reported in previous descriptions of congeners are: maxilliped with two elements on each endite, P3 endopod 2-segmented and enp-2 with five setae, P4 endopod 2-segmented, and P6 with three setae.

Cerviniella arctica **sp. nov.** seems to share some morphological features with several other species of this genus. However, it can be unequivocally separated from them by the combination of the following characters: armature of the antennule, mandibular endopod with ten setae, P1 endopod with four setae, and P3 enp-2 with three setae. Another remarkable characteristic of *C. arctica* is the extremely elongated caudal rami, 12.5 longer than wide and representing almost 20% of the total body length.

Including the presently described *C. danae* **sp. nov.**, *C. arctica* sp. nov and *C. hitoshii* **sp. nov.**, 11 species are currently assigned to the genus *Cerviniella.* A key to the species of the genus is presented below.

Key to species of *Cerviniella*

1. P1 endopod 1-segmented 2
- P1 endopod 2-segmented . . . . . *C. bodini* Coull, 1973
2. P4 exopod 1-segmented 3
- P4 exopod 2-segmented . . . . . *C. lagarderei* Bodin, 1968
3. P4 endopod absent 4

- P4 endopod 1-segmented 7
- P4 endopod 2-segmented . . . . . *C. hitoshii* **sp. nov.**
4. P5 exopod with 2 setae 5
- P5 exopod with 3 setae, P4 exopod with 5 setae . . . . . *C. mirabilipes* Smirnov, 1946
5. P4 exopod with 2 setae 6
- P4 exopod with 4 setae . . . . . *C. talpa* (Por, 1964)
6. P3 exopod with 11 setae, P3 enp-2 with 4 setae . . . . . *C. langi* Bodin, 1968
- P3 exopod with 9 setae, P3 enp-2 with 1 or 2 setae . . . . . *C. danae* **sp. nov.**
7. P2 endopod 1-segmented 8
- P2 endopod 2-segmented 9
8. P3 endopod with 3 setae . . . . . *C. brodskayae* Por, 1969
- P3 endopod with 8 setae . . . . . *C. peruana* Becker, 1974
9. P3 endopod 1-segmented . . . . . *C. hamata* Coull, 1973
- P3 endopod 2-segmented . . . . . *C. arctica* **sp. nov.**

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