

A NEW SPECIES AND A NEW GENUS OF CERVINIIDAE (COPEPODA: HARPACTICOIDA) FROM THE BEAUFORT SEA, WITH A REVISION OF THE FAMILY¹

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Abstract.—*Cervinia unisetosa* n. sp. from the bathyal zone of the Beaufort Sea (Arctic Ocean) is unique in the *Cervinia* in that it possesses a reduced fifth leg, moderate length caudal rami, and only one seta on the bases of the mandible and the maxilliped. The discovery of the male of *Pseudocervinia magna* (Smirnov, 1946) proves that the species should be redesignated as a *Cervinia* as originally described. *Expansicervinia glaciera* n. gen. & n. sp. from the deep-sea of the same area proves to be unique in the Cerviniidae in three expansions; the ventral margins of second thoracic segment; the basal segment of the antennule; and the terminal endopodite of the second leg. The genus *Stratiopontotes* Soyer, 1970 is synonymized with *Ameliotes* Por, 1969. Keys to the genus *Cervinia* and the family Cerviniidae are presented.

Benthic infaunal studies off the northern coast of Alaska conducted by the Oregon State University Marine Benthic Ecology Group have yielded many harpacticoid copepods of the family Cerviniidae Sars, Lang (Montagna and Carey, 1978). Two species, *Cervinia langi* Montagna, 1979 and *Pseudocervinia magna* (Smirnov, 1946) have been discussed in detail elsewhere (Montagna, 1979). More recent sampling has yielded enough specimens of a new species of *Cervinia* and a new genus to warrant description.

Cervinia unisetosa n. sp. is most closely related to *Cervinia tenuicauda* Brodskaya, 1963 in that the P_5 is much reduced, a character previously unique in the genus. However, *C. unisetosa* differs from *C. tenuicauda* in the length of the CR and details of the Md and Mxp.

The discovery and analysis of the male of *P. magna* requires that this species be reinstated to its original designation of *Cervinia magna*. Descriptions of the new species and the males of *C. magna* are presented with a revised key to the genus.

Expansicervinia glaciera n. gen. & n. sp. is a member of the subfamily Cerviniinae Brodskaya, 1963 and is unique in the subfamily in that the P_2 —

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P₄ terminal exopodites have only two outer spines; the antennules have 8 segments and possess lateral expanded knobs on the basal segments; there is no rostrum; and the ventral margin of the second thoracic segment is greatly enlarged.

The family Cerviniidae has not been revised since Brodskaya (1963). Since then, two new genera have been added; however, as will be discussed, *Stratiopontotes* Soyer, 1970 is a synonym of *Ameliotes* Por, 1969. In the present text a new genus is added, and *Pseudocervinia* Brodskaya, 1963 is synonymized with *Cervinia* Norman, 1878. A discussion of the taxonomic decisions and a key to the subfamilies and genera is presented.

All figures were made with the aid of a camera lucida. The nomenclature and descriptive terminology are adopted from Lang (1948, 1965) and Coull (1977). The following abbreviations are used throughout the text, figures and tables: R = rostrum, A₁ = antennule, A₂ = antennae, Md = mandible, Mx1 = maxillula, Mx = maxilla, Mxp = maxilliped, P₁–P₆ = legs 1–6, exp. = exopodite, end. = endopodite, benp. = baseoendopodite, GF = genital field, and CR = caudal ramus. Body length measurements are from the base of the R to the base of the CR, excluding both. CR L/W (=length to width ratio) is measured from the inner proximal edge to the inner distal edge for length, and the outer proximal edge for width.

Family Cerviniidae Sars, 1903; Lang, 1948

Subfamily Cerviniinae Brodskaya, 1963

Genus *Cervinia* Norman, 1878

Cervinia unisetosa, new species

Figs. 1–2

Cervinia sp. B. Montagna and Carey, 1978:119.

Material.—31 ♀♀. Holotype, 1 ♀ USNM 180117 (United States National Museum of Natural History). Paratypes 16 ♀ USNM 180118.

Type-locality.—Bathyal zone of the Beaufort Sea off the northern coast of Alaska, USA (71°45.1'N, 150°35.0'W) 2,325 m, described as station 6 in Bilyard and Carey (1979).

Description.—Female: Based on nonovigerous female 1.63 mm long. Body typical *Cervinia* shape (Fig. 1), cephalothorax broadened anteriorly, segment bearing P₁ distinct. Body tapers greatly through metasome, but to lesser extent in urosome. CR divergent, longer than last 2 segments, L/W = 7.5. R triangular, fused to cephalothorax. A₂ extending beyond A₁.

A₁ (Fig. 1): 7-segmented with aesthetasc on segment-3. 5 setae on terminal segment.

A₂ (Fig. 1): Allobasis with 2 setae, exp. 4-segmented with 2.1.1.3 setae respectively. Terminal segment with 3 proximal, 6 distal broad spines.

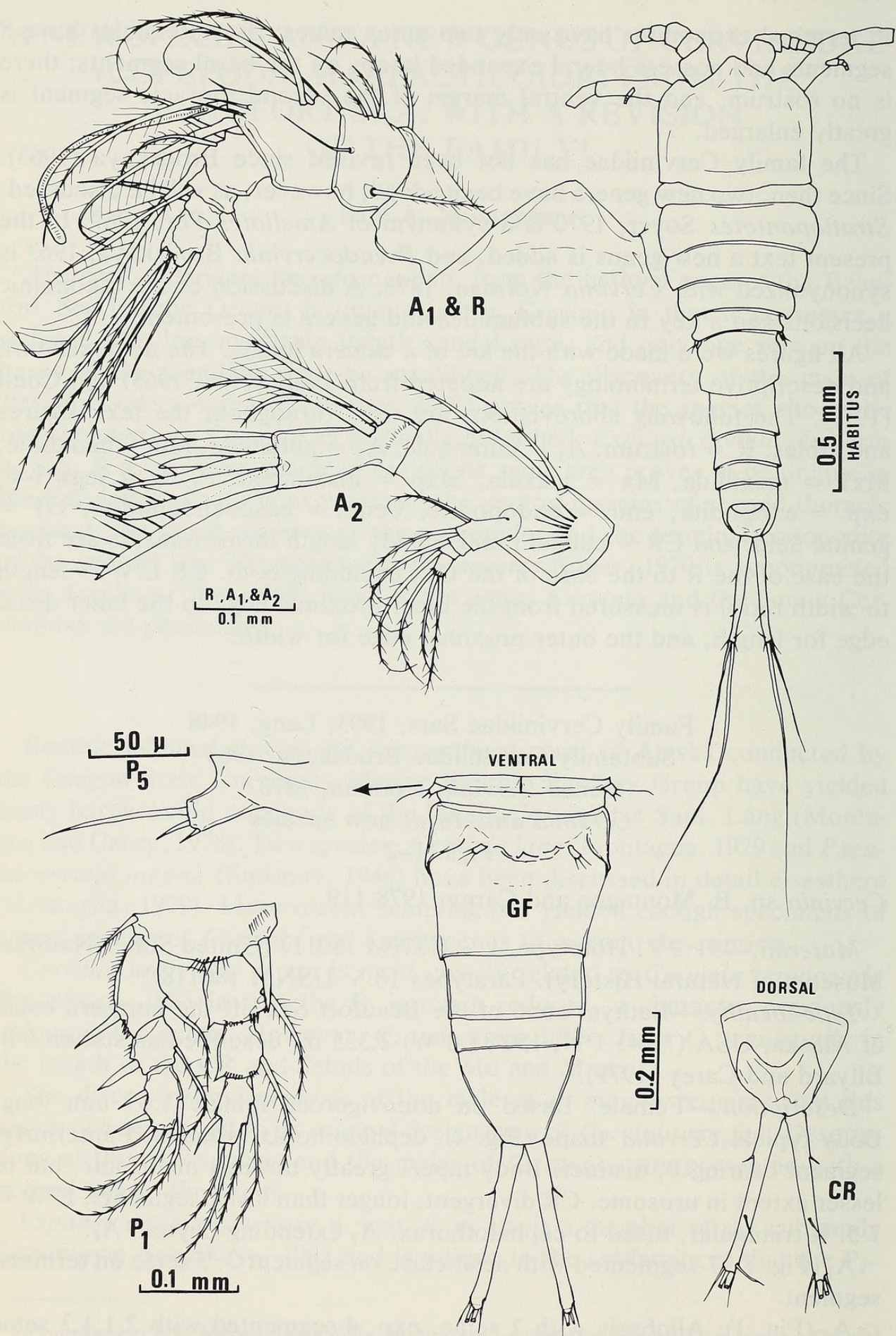


Fig. 1 *Cervinia unisetosa* ♀.

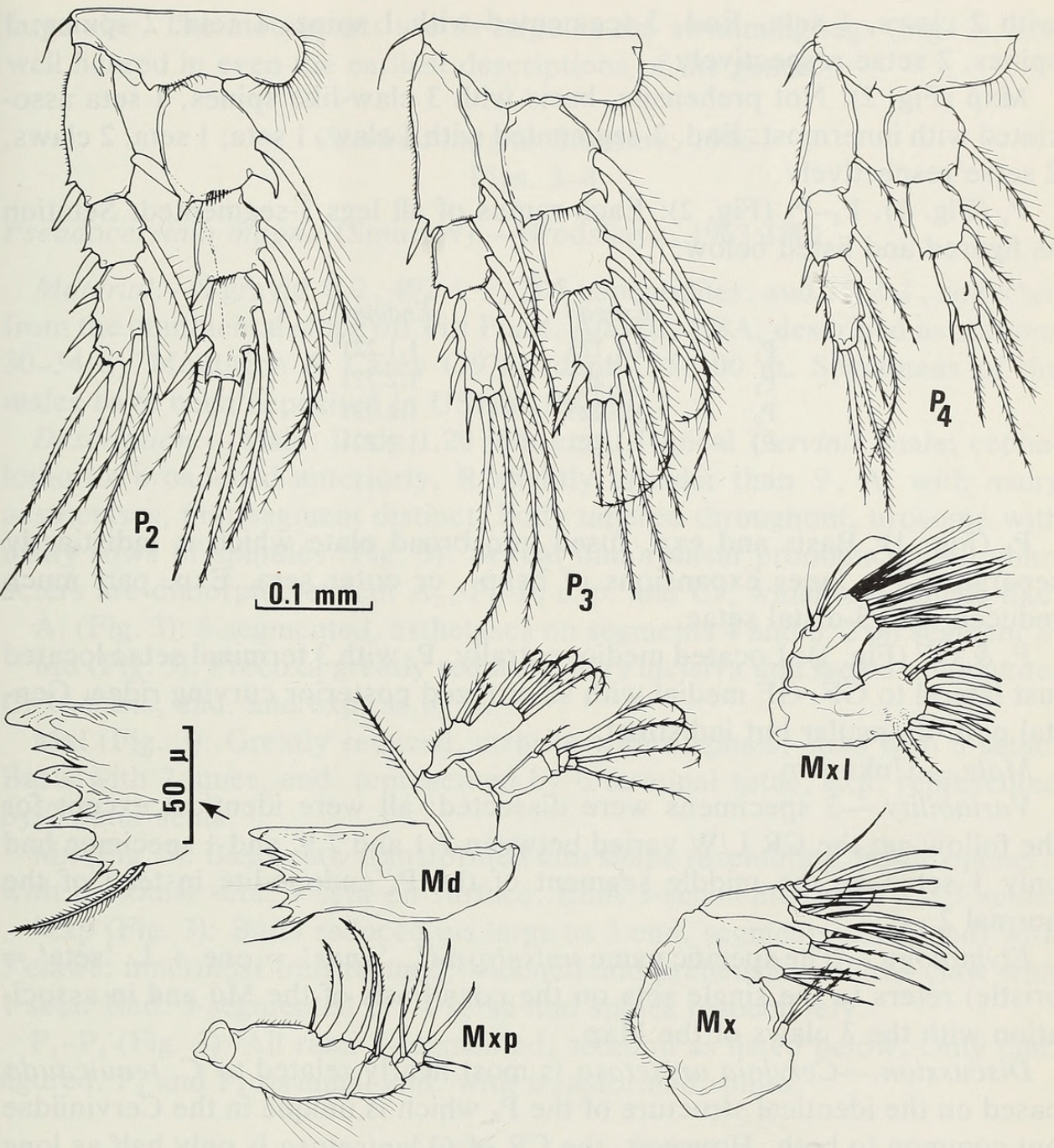


Fig. 2 *Cervinia unisetosa* ♀.

Md (Fig. 2): Precoxa with bidentate pars incisiva, unidentate lacina mobilis, 4 additional spines, 1 seta. Coxa-basis with 1 inner seta. End. 1-segmented with 3 inner, 5 terminal setae. Exp. 4-segmented with 1.1.1.2 setae respectively.

Mx₁ (Fig. 2): Arthrite of precoxa with 9 distal spines, 4 surface setae arranged in opposing pairs on opposite surfaces. Coxa with 6 inner setae. Basis and end. fused with 12 setae. Exp. reduced with 3 setae.

Mx (Fig. 2): Syncoxa with 3 endites, with 2.3.2 setae respectively. Basis

with 2 claws, 1 seta. End. 3-segmented with 1 spine, 1 seta; 2 spines; 3 spines, 2 setae respectively.

Mxp (Fig. 2): Not prehensile, basis with 3 claw-like spines, 1 seta associated with innermost. End. 3-segmented with 1 claw, 1 seta; 1 seta; 2 claws, 2 setae respectively.

P₁ (Fig. 1), P₂–P₃ (Fig. 2): Each ramus of all legs 3-segmented. Setation as figured and listed below:

	<i>Exopod</i>	<i>Endopod</i>
P ₁	1.1.123	1.1.221
P ₂	1.1.223	1.2.221
P ₃	1.1.223	1.2.321
P ₄	1.1.221	1.2.221

P₅ (Fig. 1): Basis and exp. fused into broad plate which is indistinctly separated. No inner expansions of benp., or outer seta. Exp. part much reduced with 3 distal setae.

P₆ & GF (Fig. 1): Located medioventrally. P₆ with 3 terminal setae located just lateral to GF. GF medial with sclerotized posterior curving ridge. Genital pore triangular but indistinct.

Male.—Unknown.

Variability.—3 specimens were dissected; all were identical except for the following: the CR L/W varied between 7.1 and 7.9, and 1 specimen had only 1 setae on the middle segment of the P₄ endopodite instead of the normal 2.

Etymology.—The specific name *unisetosa* (L. 'unus' = one + L. 'seta' = bristle) refers to the single seta on the coxa-basis of the Md and in association with the 3 claws of the Mxp.

Discussion.—*Cervinia unisetosa* is most nearly related to *C. tenuicauda* based on the identical structure of the P₅ which is unique in the Cerviniidae but common to both. However, the CR of *C. unisetosa* is only half as long as that of *C. tenuicauda*, the longest in the genus. *Cervinia unisetosa* is unique in the genus in 2 characters: there is only one seta on the coxa-basis of the mandible, and there is only one seta associated with the 3 claws of the maxilliped basis.

In a previous study of *Cervinia* I concluded that the setation of the swimming legs is a conservative character in this genus (Montagna, 1979). However, the setation of the mandible and the maxilliped are unique among all the species of the genus. Taxonomic decisions in the Harpacticoida usually are not based on the details of the mouthparts. Because of their small size, the details may be difficult to ascertain, particularly for earlier workers who did not have the advantage of modern research microscopes. However, I feel an exception must be made for *Cervinia* because of their unusually

large size. The mouthparts are as large as the swimming legs (Fig. 2), and well figured in even the earliest descriptions of the genus.

Cervinia magna Smirnov, 1946
Figs. 3–4

Pseudocervinia magna (Smirnov).—Brodskaya, 1963:1801.

Material.—9 gravid ♀♀, 492 ♀♀, 205 copepodites, and 75 ♂♂, collected from the continental slope off Pitt Point, Alaska, USA, described as stations 30–34 by Montagna & Carey (1978), depth 25–100 m. Specimens of the males have been deposited in USNM 180119.

Description.—Male: Body 1.20 mm long. Typical *Cervinia* male; cephalothorax broadened anteriorly, R slightly broader than ♀, A₁ with many aesthetascs, first segment distinct, body tapered throughout, urosome with many rows of spinules (Fig. 3). Sexual dimorphism pronounced; all characters are dimorphic except A₂, P₁–P₄ exp. and Cr, which are female-like.

A₁ (Fig. 3): 8-segmented, aesthetascs on segments 4 and 6, 2 on segment 8.

Md (Fig. 3): Precoxa greatly reduced, pars incisiva and lacina unidentate. Coxa-basis, end. and exp. as in ♀.

Mxl (Fig. 3): Greatly reduced, arthrite with 6 spines, coxa with 5 setae. Basis with 2 inner, end. represented by 6 terminal setae, exp. represented by 2 outer setae.

Mx (Fig. 3): Basis claw transformed into shape resembling ‘bottle opener,’ with proximal seta, 1 seta on surface. End. 3-segmented with 1.2.3 setae.

Mxp (Fig. 3): Basis reduced (as large as 3 end. segments combined) with 3 claws; innermost transformed, widened and prehensile; middle claw with 1 seta. End. 3-segmented 2.1.4 setae and spines respectively.

P₁–P₄ (Fig. 3): All rami 3-segmented, setation as listed below. Only end. figured, P₃ and P₄ terminal end. with transformed spines.

	<i>Exopod</i>	<i>Endopod</i>
P ₁	1.1.123	1.1.221
P ₂	1.1.223	1.2.221
P ₃	1.1.223	1.2.321
P ₄	1.1.223	1.2.221

P₅ (Fig. 3): Setation and shape as ♀ except terminal seta greatly enlarged and proximal seta reduced.

P₆ (Fig. 3): Lateral with 3 setae.

Copepodite: The last copepodite stage of *C. magna* resembles an adult in that the urosome has 5 segments (Fig. 4). Just one stage younger specimens have 4 urosomal segments with the last two segments combined. All the appendages of the cephalothorax are the same as the adult ♀, as are the

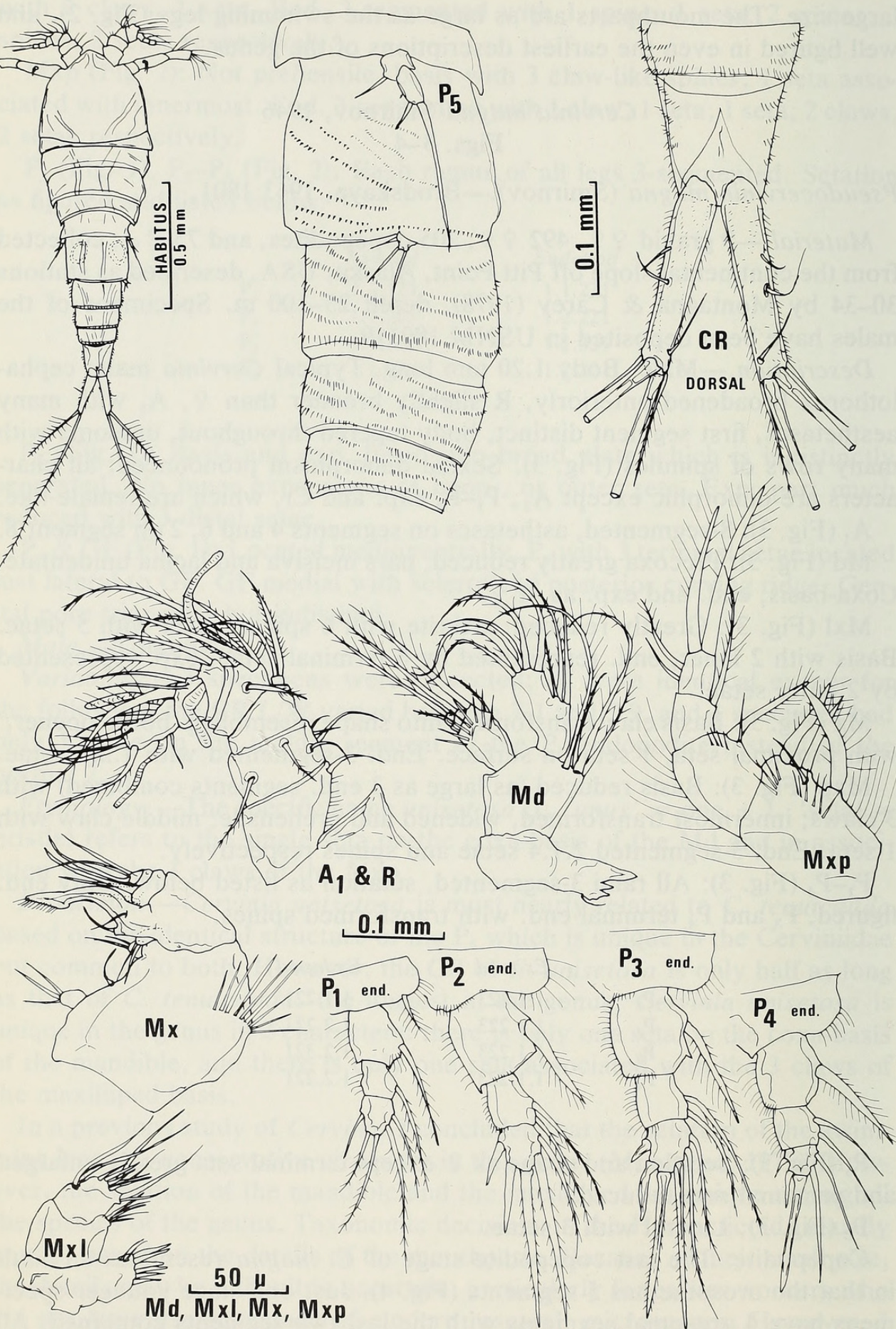


Fig. 3. *Cervinia magna* ♂.

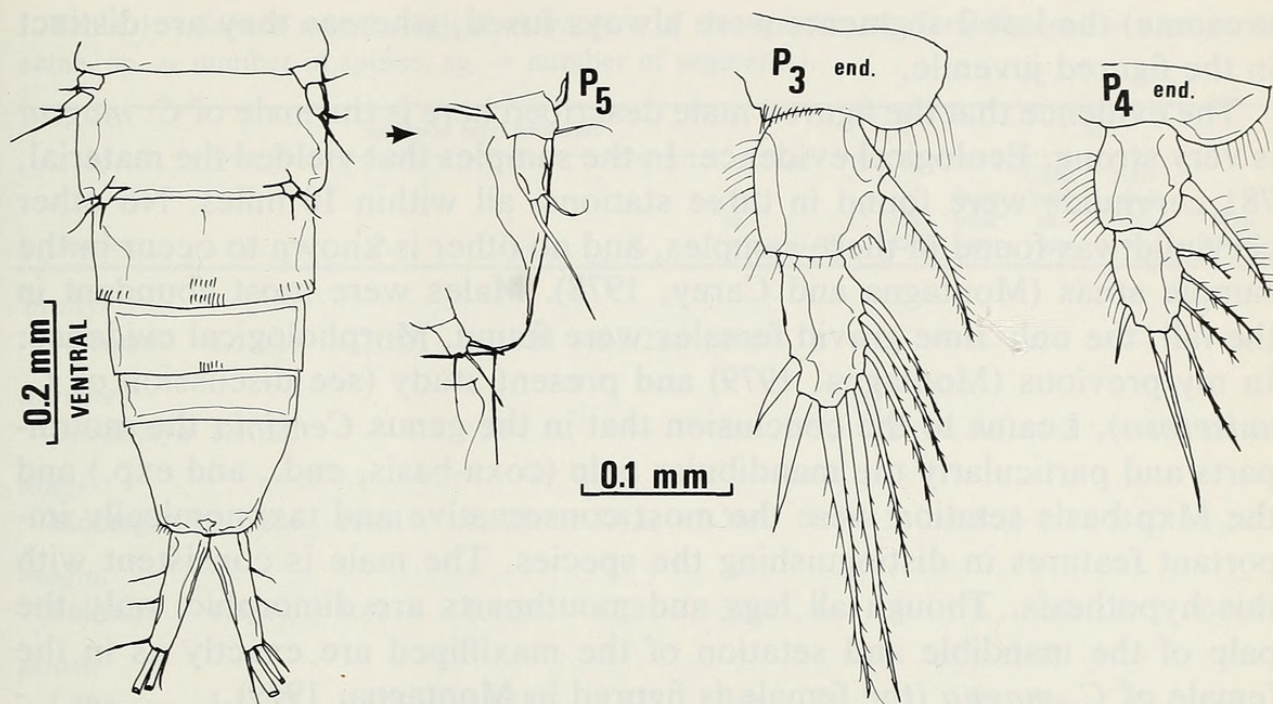


Fig. 4. *Cervinia magna* copepodite.

P_1 and P_2 . But P_3 and P_4 endopodites vary as figured (Fig. 4) with the setal formulae being 1.521 and 1.321 respectively.

Discussion.—In my previous study of this species, I corrected several character misdiagnoses of the female (Montagna, 1979). These character traits were significant because they were the basis of a generic description by Brodskaya (1963). If *C. magna* had possessed opposed CR as previously thought, it would have been in the subfamily Cerviniopsinae, thus requiring a distinct genus. However, since the CR are divergent, *C. magna* belongs in the Cerviniinae (Montagna, 1979). Only one character in the genus description of *Pseudocervinia* remained unique; that the male had a 2-segmented end. on the first leg. On that basis I previously decided that it would be premature to declare *Pseudocervinia* synonymous with *Cervinia* since I had not yet seen the male of the species. Though Smirnov (1946) did not figure the male, he described the P_1 end. as 2-segmented, and the P_2 – P_4 end. as 3-segmented with the setation as described above.

Considering the highly dimorphic nature of the males, I was not sure that I had the male of *C. magna*. In fact, at first I thought the copepodite (Fig. 4) was the male because it was identical to the female except for the P_5 , P_3 and P_4 endopodite setation. Most convincing was that the urosome was composed of five segments as in adult males. But in all 11 of these morphs I never found spermatophores, as I did in all 75 of the true males. Further, dissection of the morphs which undoubtedly were juveniles (i.e., with four urosomal segments, and unfused genital segments) showed the exact structure of P_3 – P_5 found in the juvenile of Fig. 4. In true juveniles (4-segmented

urosome) the last 2 segments were always fused, whereas they are distinct in the figured juvenile.

The evidence that the figured male described here is the male of *C. magna* is very strong. Ecological evidence: In the samples that yielded the material, 781 cerviniids were found in three stations, all within 10 miles. No other cerviniid was found in these samples, and no other is known to occur in the sample areas (Montagna and Carey, 1978). Males were most abundant in the fall, the only time gravid females were found. Morphological evidence: In my previous (Montagna, 1979) and present study (see discussion of *C. unisetosa*), I came to the conclusion that in the genus *Cervinia* the mouthparts and particularly the mandibular palp (coxa-basis, end., and exp.) and the Mxp basis setation were the most conservative and taxonomically important features in distinguishing the species. The male is consistent with this hypothesis. Though all legs and mouthparts are dimorphic, only the palp of the mandible and setation of the maxilliped are exactly as in the female of *C. magna* (the female is figured in Montagna, 1979).

Given that the male described here is the male of *C. magna*, consistent with the definition of *Cervinia* (Lang, 1948) and inconsistent with the definition of *Pseudocervinia*, *C. magna* is restored its original designation and *Pseudocervinia* is a synonym to *Cervinia*.

Key to the Species of *Cervinia*

Based on females. *Cervinia brevipes* Brodskaya, 1963, cannot be placed in the key since its swimming leg morphology is unknown; further, it may not be a *Cervinia* at all, since it has no rostrum as do all others in the genus. Consult Table 1 for *C. brevipes* distinguishing characteristics.

1. P_2 – P_4 with 2-segmented end.—“*synarthra*” group 2
- P_2 – P_4 with 3-segmented end.—“*bradyi*” group 5
2. P_1 with 3-segmented end 3
- P_1 with 2-segmented end *C. magna* Smirnov
3. P_2 – P_4 end. terminal segment with 6, 7, 6 setae and spines respectively 4
- P_2 – P_4 end. terminal segment with 7, 8, 7 setae and spines respectively *C. langi* Montagna
4. CR with long lateral-proximal seta *C. pilosa* Lang
- CR with short lateral-proximal seta *C. synarthra* Sars
5. CR longer than last urosome segment ($L/W \geq 5$) 6
- CR as long as last urosome segment ($L/W = 4$) ... *C. bradyi* Norman
6. Basis of Mxp twice as long as end. segments; P_5 exp. with 3 seta... 7
- Basis of Mxp as long as 3 end. segments; P_5 exp. with 2 setae
- *C. tenuiseta* Brodskaya

Table 1.—Salient morphological characters of the species of *Cervinia* (se. = number of setae, sp. = number of spines, sg. = number of segments).

Species	Endopod setal formulae ¹					CR			Md		
	P ₁	P ₂	P ₃	P ₄	P ₅ se.- s ²	L/W	≥n LUS ³	Prox- imal ⁴ setae	Coxa- basis se.- sp.	Exo- pod sg.- se.	Mxp basis ⁵
<i>bradyi</i>											
Norman	1.1.221	1.2.221	1.2.321	1.2.221	3-e	4	1	S	—	—	—
<i>brevipes</i>											
Brodskaya	1.1.221	—	—	—	3-e	7	2	A	1-2	4-4?	1.1.0
<i>langi</i>											
Montagna	1.1.221	1.421	1.521	1.421	3-e	6	2	S	1-3	3-5	1.2.1
<i>magna</i>											
Smirnov	1.321	1.421	1.421	1.221	3-e	4	1	L	2-2	3-5	0.1.0
<i>pilosa</i>											
Lang	1.1.221	1.321	1.421	1.321	3-e	7	2	L	—	—	—
<i>synarthra</i>											
Sars	1.1.221	1.321	1.421	1.321	3-e	7	2	S	3-0	2-7	1.1.1
<i>tenuicauda</i>											
Brodskaya	1.1.221	1.2.221	1.2.321	1.2.221	3-r	18	3.5	A?	2-1	4-4	1.1.0
<i>tenuiseta</i>											
Brodskaya	1.1.221	1.2.221	1.2.321	1.2.221	2-e	12.5	4	L	4-0	4-6	1.2.1
<i>unisetosa</i>											
n. sp.	1.1.221	1.2.221	1.2.321	1.2.221	3-r	8	2.5	S	1-0	4-5	1.0.0

¹ For all species exp. formula is P₁ = 1.1.123, P₂–P₄ = 1.1.223.
² s = shape, either reduced (r) or elongate (e).
³ ≥n LUS = as long as or longer than n Last Urosome Segments.
⁴ L, S, A = long, short, or absent; short includes reduced.
⁵ n.n.n. = number of se. associated with (inner, middle, outer) claws, respectively.

7. CR as long as last 4 urosome segments (L/W = 12)
..... *C. tenuicauda* Brodskaya
– CR as long as last 2 urosome segments (L/W = 8)
..... *C. unisetosa*, n. sp.

Expansicervinia, new genus

The genus *Expansicervinia* is proposed for *E. glacieria*, and definition preliminary, based on the type species described herein. The genus has two features which are unique in all the described Cerviniidae. (1) The ventral expansion of the second metasomal segment (Fig. 5), with an associated broadening of the entire P₂ end. (2) An outer knoblike expansion on the first

A₁ segment. The genus belongs to the subfamily Cerviniinae (by virtue of the divergent CR) and is unique in the subfamily by having only 2 outer spines on the terminal P₂–P₄ exopodites, no rostrum, and an 8-segmented A₁. P₅ is minute and laterally located; there is an outer expansion of the basis and a very long outer seta.

Expansicervinia glaciera, new species

Figs. 5–6

Cervinia sp. A Montagna and Carey, 1978:119.

Material.—3 ♀♀. Holotype 1 ♀ dissected on slide USNM 180115. Paratype 1 ♀ USNM 180116.

Type-locality.—Deep-sea floor off the Arctic coast of Alaska, USA, described as station 49 (72°58'N, 146°29'W, 3,576 m) and station 50 (72°42'N, 143°40'W, 3,386 m) in Montagna and Carey (1978).

Description.—Female: Based on nonovigerous ♀ 1.1 mm long (Fig. 5). Body *Cervinia*-like, broadened anteriorly and tapering throughout. R absent. Segment bearing P₁ distinct, segment bearing P₂ ventrally expanded. CR divergent, as long as entire urosome. Lateral excrescences on first 2 urosomal segments (Fig. 5).

A₁ (Fig. 6): 8-segmented, basal segment broadened with outer node. Aesthetasc on segments 3 and 4.

A₂ (Fig. 6): Allobasis with 2 setae. Terminal segment bears 3 inner and 7 terminal setae. Exp. 4-segmented with 2.1.1.3 setae respectively.

Md (Fig. 6): Precoxa with bidentate pars incisiva, tridentate lacina mobilis, and 8 associated spines and a seta. Coxa-basis with 4 long setae. Exp. 4-segmented with 2.1.1.2 setae. End. 1-segmented with 3 inner and 6 terminal setae.

Mxl (Fig. 6): Arthrite with 8 spines, 4 surface setae arranged as opposing pairs. Coxa-basis with 5 inner and 1 outer setae. End. with 10 terminal setae. Exp. represented by 2 setae.

Mx (Fig. 6): Syncoxa with 4 endites, with 5.3.3.2 setae respectively. Basis with 2 claws, 3 setae. End. 2-segmented with 2.4 setae respectively.

Mxp (Fig. 6): Not prehensile. Basis as long as remaining segments, with 3 claws and 1.2.1 setae. 3 end. segments with 1 claw, 1 seta; 3 setae; 2 claws, 2 setae.

P₁–P₄ (Fig. 5): All rami 3-segmented as figured, setation also listed below:

	<i>Exopod</i>	<i>Endopod</i>
P ₁	1.1.023	1.1.121
P ₂	1.1.222	1.2.221
P ₃	1.1.222	1.2.221
P ₄	1.1.222	1.1.121

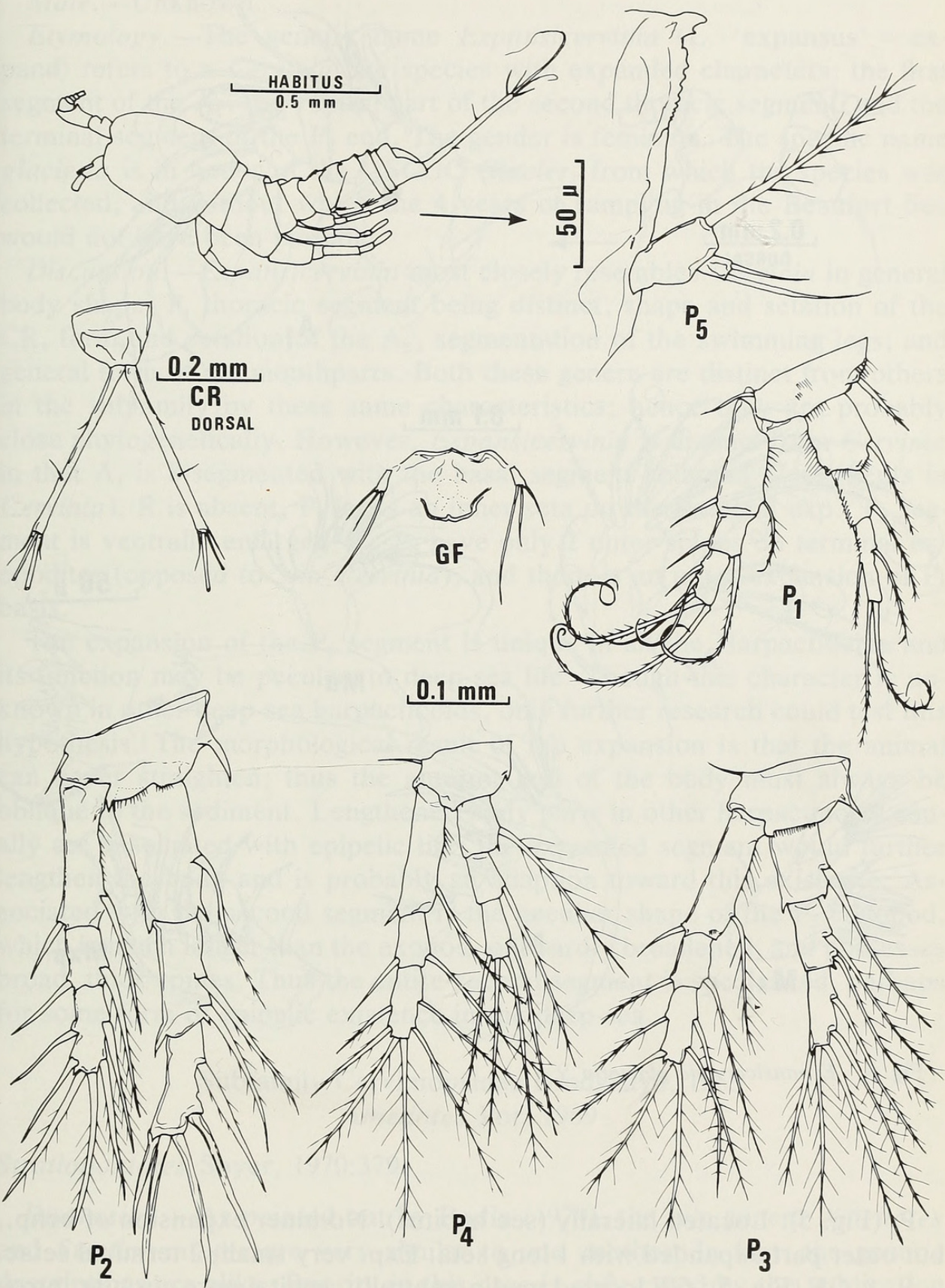


Fig. 5. *Expansicervinia glaciera* ♀.

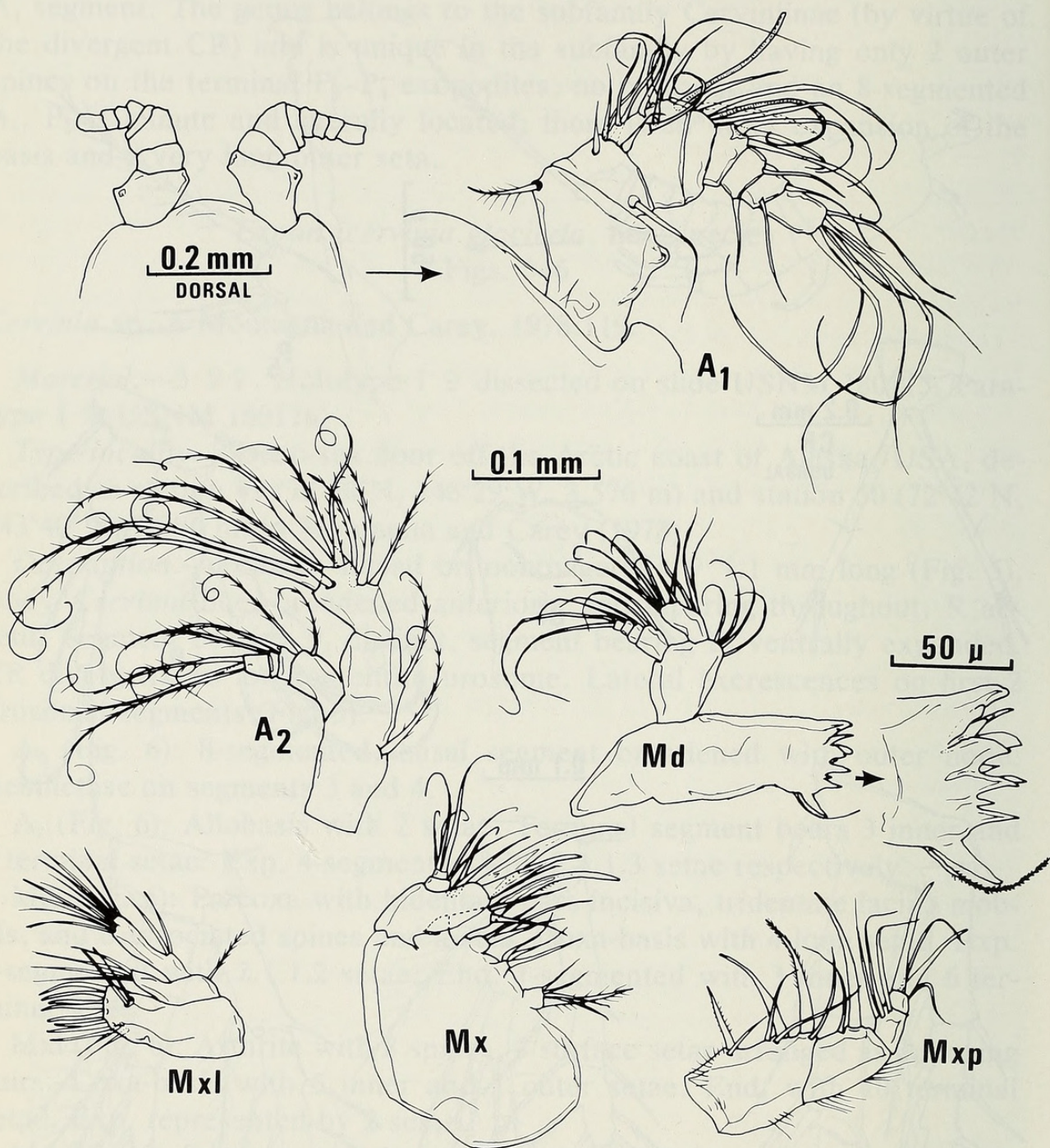


Fig. 6. *Expansicervinia glaciera* ♀.

P_5 (Fig. 5): Located laterally (see habitus). No inner expansion of benp., but outer part expanded with 1 long seta. Exp. very small, 2 terminal setae.

P_6 & GF (Fig. 5): GF located medio-ventrally, genital pore circular, proximal and distal sclerotized ridges. P_6 lateral to GF with 3 terminal seta.

CR (Fig. 5): L/W = 12, 1 short proximal-lateral seta, 1 middorsal seta, 2 distal setae. Terminally with 2 principal caudal setae.

Variability.—None noticed in 3 specimens examined.

Male.—Unknown.

Etymology.—The generic name *Expansicervinia* (L. 'expansus' = expand) refers to a *Cervinia*-like species with expanded characters; the first segment of the A_1 , the ventral part of the second thoracic segment, and the terminal segment of the P_2 end. The gender is feminine. The specific name *glacieria* is in honor of the USCGC *Glacier*, from which the species was collected, and without which the 4 years of sampling in the Beaufort Sea would not have been possible.

Discussion.—*Expansicervinia* most closely resembles *Cervinia* in general body shape, P_1 thoracic segment being distinct, shape and setation of the CR, form and setation of the A_2 , segmentation of the swimming legs, and general form of the mouthparts. Both these genera are distinct from others in the subfamily by these same characteristics; hence they are probably close phylogenetically. However, *Expansicervinia* is distinct from *Cervinia* in that A_1 is 8-segmented with the basal segment enlarged (7 segments in *Cervinia*), R is absent, P_1 lacks an inner seta on the terminal exp., P_2 segment is ventrally enlarged, P_2 – P_4 have only 2 outer spines on terminal exopodites (opposed to 3 in *Cervinia*), and there is an outer expansion of P_5 basis.

The expansion of the P_2 segment is unique in all the Harpacticoida and its function may be peculiar to deep-sea life. Though this character is unknown in other deep-sea harpacticoids, only further research could test this hypothesis. The morphological result of the expansion is that the animal can never straighten; thus the anterior end of the body must always be oblique to the sediment. Lengthened body parts in other harpacticoids usually are associated with epipelagic life; the expanded segment would further lengthen the body and is probably an adaption toward this existence. Associated with the second segment is the peculiar shape of the P_2 endopod, which is much longer than the exopod, outwardly broadened, and possesses broad, thick spines. Thus the entire second segment is specialized, perhaps for some form of epipelagic existence in the deep-sea.

Subfamily Cerviniopsinae Brodskaya, 1963

Ameliotes Por, 1969

Stratiopontotes Soyer, 1970:379.

Discussion.—As pointed out by Bodin (1979), the two genera *Ameliotes* and *Stratiopontotes* are very similar to one another. In fact, the generic descriptions are alike. Priority in this case is obfuscated by the publication date of the journal *Vie et Milieu*; though the cover says 1969, it was printed and published in 1970. Following Corliss (1979) I assign priority to Por's description (1969) over Soyer (1970). The latter's species should now be referred to as *Ameliotes mediterraneus* (Soyer, 1970).

Key to Subfamilies and Genera of Cerviniidae

1. CR divergent subfam. Cerviniinae Brodskaya 2
- CR opposed (parallel) subfam. Cerviniopsinae Brodskaya 6
2. Exp. P₁–P₄ with 3 segments 3
- Exp. P₁–P₄ with 1 or 2 segments *Cerviniella* Smirnov
3. CR at least as long as last urosomal segment; A₁ 7–8 segmented .. 4
- CR at most half as long as urosomal segment; A₁ 6-segmented *Paracerviniella* Brodskaya
4. A₁ 7-segmented; with rostrum 5
- A₁ 8-segmented; rostrum absent; ventral expansion of segment bearing P₂ *Expansicervinia*, n. gen.
5. CR of equal lengths *Cervinia* Norman
- Right CR longer than left *Eucanuella* T. Scott
6. Prosoma segments lacking or with reduced lateral ornamental excrescences 7
- Prosoma with lateral or dorsal ornamentation *Pontostratiotes* Brady
7. A₁ 8-segmented 8
- A₁ 6-segmented *Cerviniopsis* Sars
8. P₁ end. 3-segmented without apophysis 9
- P₁ end. 2-segmented with apophysis *Hemicervinia* (I. C. Thompson)
9. End. of Mx1 3-segmented *Ameliotes* Por
- End. of Mx1 reduced and fused to basis ... *Herdmaniopsis* Brodskaya

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