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CERVINIA LANGI N. SP. AND *PSEUDOCERVINIA MAGNA* (COPEPODA: HARPACTICOIDA) FROM THE BEAUFORT SEA (ALASKA, USA)[1]

PAUL A. MONTAGNA
School of Oceanography, Oregon State University,
Corvallis, Oregon 97331

MONTAGNA, P. A. 1979. *Cervinia langi* n. sp. and *Pseudocervinia magna* (Copepoda: Harpacticoida) from the Beaufort Sea (Alaska, USA). *Trans. Amer. Micros. Soc.*, 98: 77–88. Two species of the family Cerviniidae have been collected from the Beaufort Sea off the coast of Alaska. *Pseudocervinia magna* (Smirnov, 1946) and *Cervinia langi* n. sp. were found in association. Lang (1936, 1948) described the new species as a variant of *Cervinia synarthra* Sars, 1911. However, *C. langi* is consistent and unique in the setation of its swimming legs and in details of the mandible and maxilliped. A key to the species and a table of salient morphological characters of the genus *Cervinia* are given. Appendages from the cephalothorax of *P. magna* are also figured, and its taxonomic position is discussed.

Reports of Harpacticoida from the Beaufort Sea shelf and slope of northern Alaska are rare. Willey (1920) reported two species, taken intertidally from under the surface of the sea ice. Mohr et al. (1961) and Wilson (1965) reported other species from a brackish lake on the peninsula of Point Barrow. Paul &

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TRANS. AMER. MICROS. SOC., 98(1): 77–88. 1979.

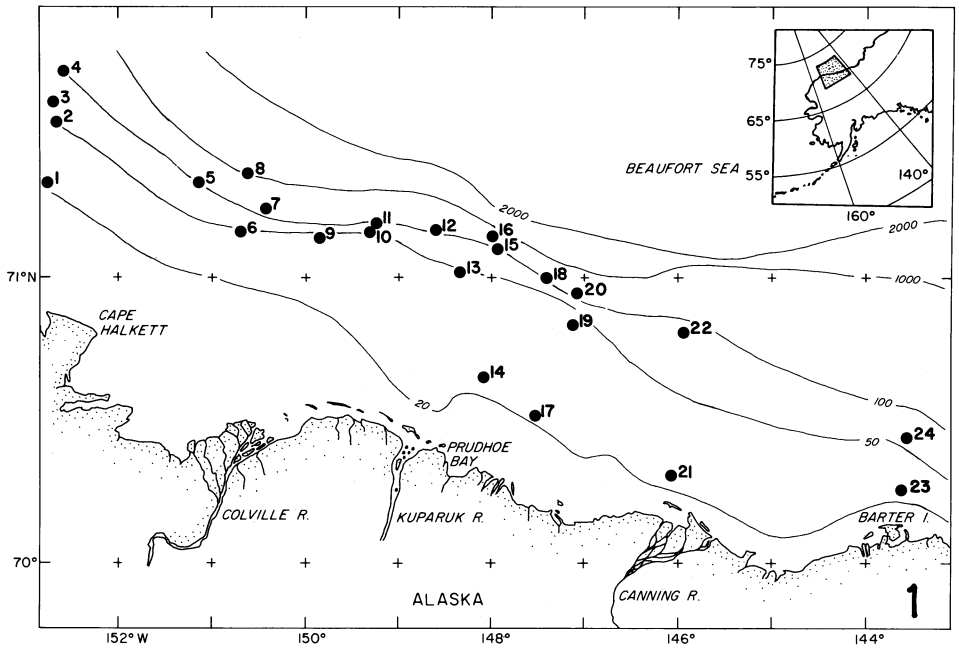

FIG. 1. Station location chart.

Menzies (1974) have reported five species from Ice Island T3 as it drifted in the Beaufort Gyre of the high Arctic Ocean. Since ice covers the Beaufort shelf and slope during 10 months of the year, there are no reports of offshore harpacticoids.

Carey et al. (1974) and Carey & Ruff (1977) have conducted extensive macro-infaunal studies of this area, which have yielded some of the larger-sized harpacticoids. The two species reported here are in the family Cerviniidae: *Pseudocervinia magna* (Smirnov, 1946) and *Cervinia langi* n. sp. *Cervinia langi* was found with *P. magna* on the slope from depths averaging 100 m. *Pseudocervinia magna* had a broader distribution, occurring across the full range of the study area (Fig. 1) and from depths of 25–355 m (Table I). The new species is closely allied to *Cervinia synarthra* Sars, 1911, but differs in setation of the mandibles, maxillipeds, and P_2–P_4 endopods. Lang (1936) described as a variant of *C. synarthra* a specimen with P_2–P_4 setation like the present species. Dissection of 12 females has shown these characters to be consistent and not variable. Examination of 83 females has not yielded a specimen with the endopodite setation found in *C. synarthra*. Presented here is a description of the new species, a discussion of its uniqueness, a key to the genus *Cervinia*, and notes on the other Cerviniidae found.

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: R = rostrum, A_1 = antennule, A_2 = antennae, Md = mandible, Mxl = maxillula, Mx = maxilla, Mxp = maxilliped, P_1–P_6 = legs 1–6, CR = caudal rami, GF = genital field. Body length measurements are from the base of the R to the base of the

TABLE I
Occurrence of *Pseudocervinia magna* and *Cervinia langi* in the Beaufort Sea (number of females per station)

Station	Latitude (N)	Longitude (W)	Depth (m)	*P. magna*	*C. langi*
1	71°09.5′	152°47.5′	25	7	—
2	71°17.6′	152°41.5′	55	30	—
3	71°09.2′	152°47.5′	70	11	—
4	71°26.5′	152°38.7′	100	28	1
5	71°19.5′	151°08.5′	101	1	—
6	71°09.2′	150°32.0′	47	13	3
7	71°14.8′	150°27.6′	132	3	—
9	71°08.3′	149°47.7′	45	12	—
10	71°10.0′	149°18.9′	50	8	4
11	71°12.0′	149°15.0′	63	1	—
12	71°12.0′	148°36.0′	133	5	—
13	71°01.0′	148°22.7′	47	3	—
14	70°38.4′	148°04.0′	27	1	—
15	71°06.0′	147°57.0′	94	29	68
16	71°08.9′	148°00.8′	355	1	—
17	70°31.2′	147°31.2′	26	1	—
18	70°59.0′	147°24.0′	128	5	3
19	70°48.5′	145°56.1′	84	—	1
20	70°56.4′	147°05.9′	125	3	1
21	70°18.0′	146°05.0′	26	3	—
22	70°48.5′	145°56.1′	84	—	1
23	70°15.5′	143°39.6′	33	2	—
24	70°27.0′	143°34.0′	48	2	1

CR, excluding both. CR L/W (= length to width ratio) is measured from the inner proximal edge to the outer proximal edge for width, and to the inner distal edge for length.

Systematic Description

Family Cerviniidae Sars, 1903
Genus *Cervinia* Norman, 1878
Cervinia langi n. sp.
(Figs. 2–4)

Material: 83 ♀♀. Holotype, 1 ♀, USNM 171231 (United States National Museum of Natural History). Paratypes 10 ♀♀, USNM 171232. Paratypes, 29 ♀♀, OSUBI No. 00869 (Oregon State University Benthic Invertebrate Reference Museum).

Type-locality: Continental slope of the Beaufort Sea off northern Alaska, USA (71°06.0′N, 147°57′W) Station 15 (Table I, Fig. 1), 94 m. The area is characterized by muddy bottoms (Carey et al., 1977).

Description

Female: Based on nonovigerous female 1.35 mm long. Body typical *Cervinia* shape (Fig. 2), cephalothorax broadened anteriorly, segment bearing first legs distinct. Body tapers throughout to last segment of urosome. R small, pointed; A_2 extending farther laterally than A_1. Anal operculum rounded. CR longer than last two urosome segments, L/W = 7.4.

A_1 (Fig. 2). 7-segmented with aesthetasc on third segment. Many setae curved and curled.

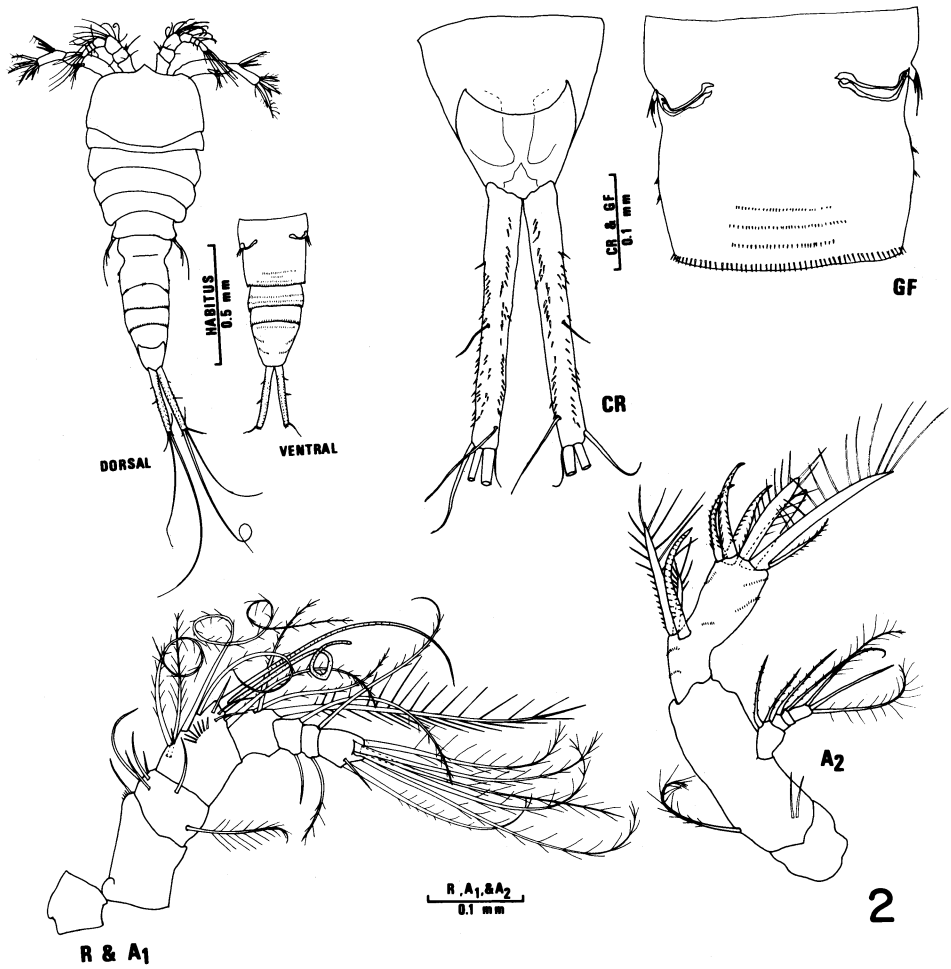

FIG. 2. *Cervinia langi* n. sp., ♀.

A_2 (Fig. 2). 3-segmented with allobasis. Terminal segment with three proximal and six distal broad spines. Exopod 4-segmented with 2.1.1.3 setae, respectively.

Md (Fig. 3). Precoxa with blunt unidentate pars incisiva, four-dentate lacina, three additional bifid spines and one seta. Coxa-basis with one long seta and three short spines. Exopod 3-segmented with 2.1.2 setae, respectively. Endopod 1-segmented with three inner and seven terminal setae (two of terminal setae short and slender and show origin from first and third innermost terminal setae).

Mxl (Fig. 3). Arthrite of precoxa with seven distal spines and four surface setae arranged in opposing pairs. Coxa-basis with four inner and one outer setae. Endopod with four inner and eight outer setae, exopod reduced with two setae.

Mx (Fig. 3). Syncoxa with three endites, each endite with three setae. One

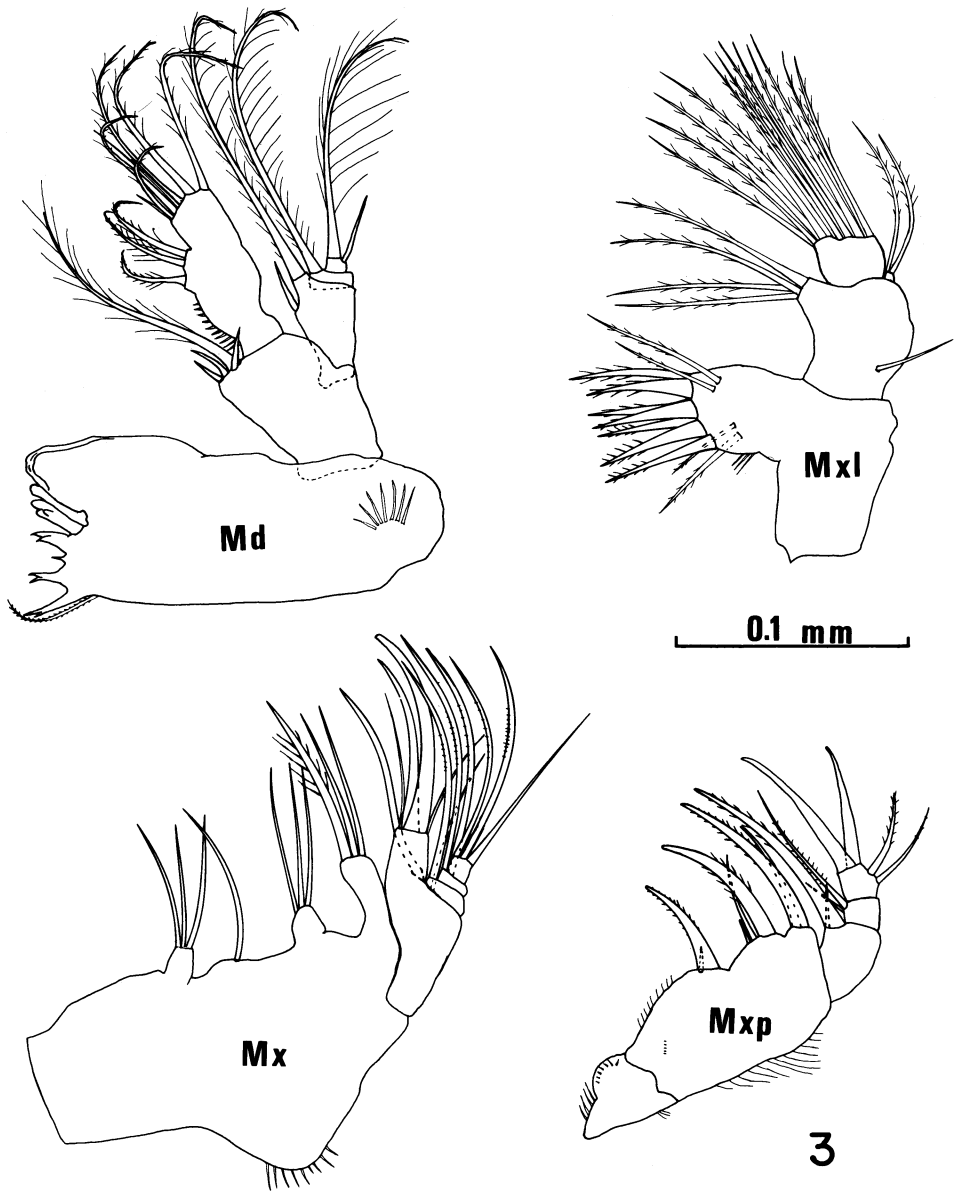

FIG. 3. *Cervinia langi* n. sp., ♀.

seta on syncoxa between two innermost endites. Basis with claw, spine, and two setae. Endopod 3-segmented with 3.2.3 spines and setae, respectively.

Mxp (Fig. 3). Not prehensile. Basis with three claw-like spines, one small seta associated with innermost spine, two setae with middle claw, and one seta with distal claw. Endopod 3-segmented. First segment with inner claw and seta, second segment with two inner setae, third segment with two terminal claws and two outer setae.

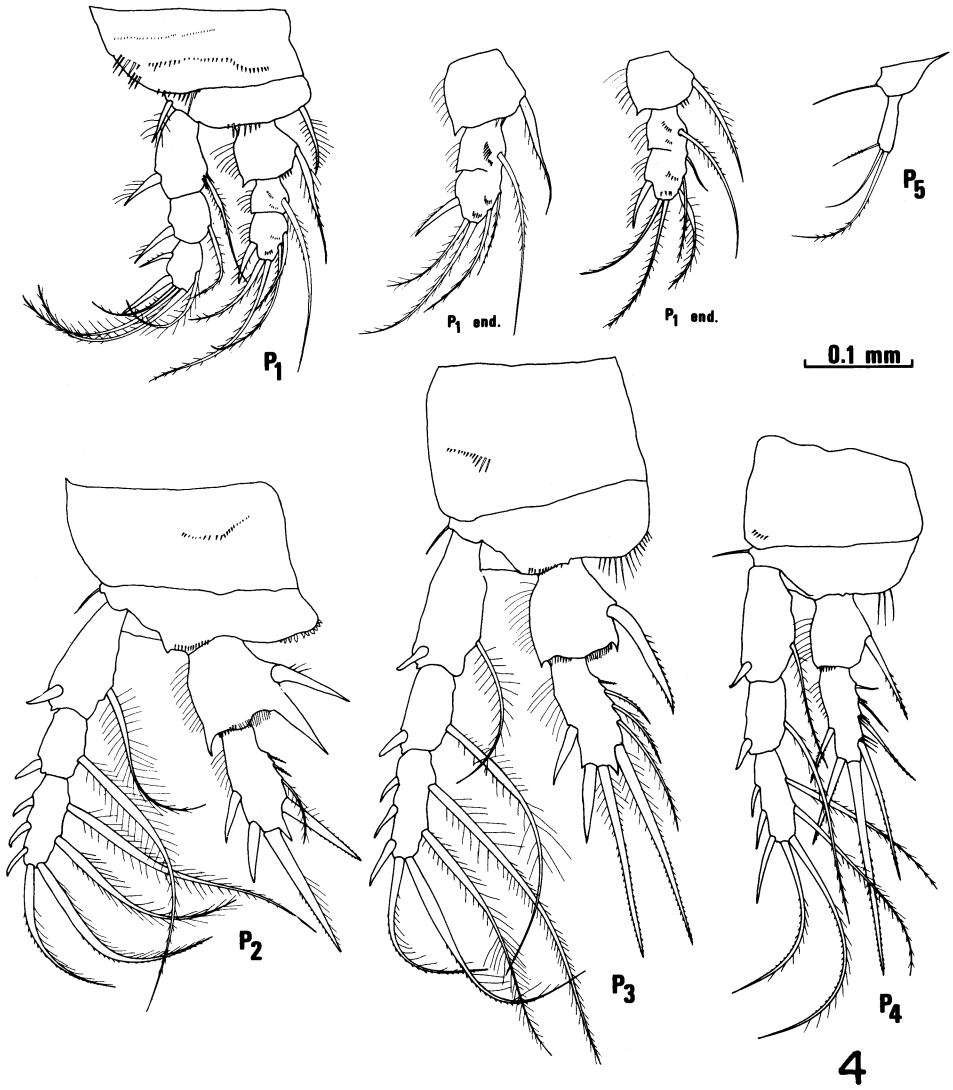

FIG. 4. *Cervinia langi* n. sp., ♀.

P_1 (Fig. 4). Exopod and endopod with three segments each. Setation as listed below.

P_2 (Fig. 4). Exopod 3-segmented, endopod 2-segmented. Setation as listed and figured below. The two small proximal setae on the terminal endopodite were often broken in specimens examined.

P_3 (Fig. 4). Exopod 3-segmented, endopod 2-segmented as listed and figured below. Largest leg in all specimens examined.

P_4 (Fig. 4). Exopod 3-segmented, endopod 2-segmented. Setation as listed and figured below. Terminal endopodites of P_4 were only segments to have ornamentation associated with setae.

TABLE II
Summary of salient morphological characters of *Cervinia*

	No. endopod segments P_2–P_4	Endopod setal formula[1]			No. exopod setae P_5	CR L/W	CR ≥ LUS[2]	Proximal setae CR L,S,A[3]
		P_2	P_3	P_4				
C. bradyi Norman	3	1.2.221	1.2.321	1.2.221	3	4	=	S
C. brevipes Brodskaya	–	UNKNOWN			3	7	>	A
C. langi n. sp.	2	1.421	1.521	1.421	3	6	>	S
C. pilosa Lang	2	1.321	1.421	1.321	3	7	>	L
C. synarthra G. O. Sars	2	1.321	1.421	1.321	3	7	>	S
C. tenuicauda Brodskaya	3	1.2.221	1.2.321	1.2.221	3	18	>	A?
C. tenuiseta Brodskaya	3	1.2.221	1.2.321	1.2.221	2	12.5	>	L

[1] For all species: P_2–P_4 exopod formula is 2.2.3, P_1 exopod is 1.1.123, and P_1 endopod is 1.1.221.
[2] CR ≥ LUS = CR more than or equal to last urosomal segment.
[3] L,S,A = Long, short or absent, short includes much reduced.

Setal formula for *C. langi* n. sp.

	Exopod	Endopod
P_1	1.1.123	1.1.221
P_2	1.1.223	1.421
P_3	1.1.223	1.521
P_4	1.1.223	1.421

P_5 (Fig. 4). No inner expansion of baseoendopodite, one outer seta. Exopod narrow with three distal setae.

GF (Fig. 2). Two hyalinized areas each located ventrolaterally and reaching laterally to base of P_6, which has three setae.

Male: Unknown.

Variability: Twelve specimens were dissected and examined thoroughly. The mean body size was 1.33 mm and varied between 1.20 and 1.42 mm. Mean CR L/W was 6.03 and varied considerably (s = ±1.08). However, the CR were always longer than the last segment of the urosome and appeared long and narrow. The P_1–P_4 exopodites were consistent, except for one terminal P_4 exopodite which lacked one inner seta (123 instead of 223). Two of the 12 specimens dissected had indistinctly 3-segmented P_1 endopodites, and in one case the setation varied, as shown in Fig. 4. Setation of the P_2–P_4 endopodites were consistent in size and number (Fig. 3) except for one individual which had longer setae.

Etymology: The specific name *langi* is dedicated to the late Professor Karl Lang who first noted the new species.

Discussion

On first examining the material at hand, I suspected that *C. langi* and *P. magna* were variants of *C. synarthra*, and perhaps all were pedomorphic variants of *Cervinia bradyi* Norman, as suggested by Por (1967). It appeared that the 2-segmented P_1 endopod of *P. magna* was an incompletely developed juvenile character with the indistinctly 3-segmented P_1 endopod of *C. langi* an intermediate condition. Since Lang (1936, 1948) had already noted the variation of P_2–P_4 endopodite setation, I dismissed this as a variable character

and aligned both species with *C. synarthra*. The male of *P. magna* offers additional evidence for this synonymy, the P_1 endopod is 2-segmented and the P_2–P_4 endopods are 3-segmented. Further, if males of *P. magna* could be found with indistinctly 3-segmented P_1 endopodites as in *C. langi*, all species may be morphs of *C. bradyi*. This has been suggested by Por (1967) who noted that males of *C. synarthra* are unknown, and the P_2–P_4 endopodite setation of *P. magna* are as in *C. bradyi*. In this light, I undertook the present study to determine if these characters were indeed variable. Twelve adult females of *P. magna* and *C. langi* were dissected and examined in detail.

The endopodite setation of *P. magna* and *C. langi* were each found to be consistent and unique. Both were also different from Sars' (1911) description of *C. synarthra* (Table II). *Pseudocervinia magna* was never found with an indistinctly 3-segmented endopod. And the occurrence of that character in *C. langi* turned out to be a rare morph in the population (asymmetric in 2 of 12). *Pseudocervinia magna* and *C. langi* could be further separated on the basis of CR L/W, averaging around four for *P. magna*, and six for *C. langi*. Though the L/W of *C. langi* was highly variable, that of *P. magna* was not. They could always be separated because *P. magna* appeared distinctly broad, while *C. langi* appeared narrow.

The setation of the CR differed for the two species. Each possessed three lateral setae; one proximal on the ventral edge, another located medially on the lateral edge, and the third distal on the dorsal edge. The proximal seta was long for *P. magna* and much reduced on *C. langi*. The differences between these combinations of characters (CR L/W, P_1–P_4 segmentation, and setation) were consistent in all 171 specimens of *P. magna* and 83 specimens of *C. langi* examined. The only variant found was one specimen of *C. langi* with CR L/W ratio of 3.3. This specimen also varied in the size of the P_2–P_4 endopodite setae, though setae number and arrangement were consistent. Two other characters of *C. langi* differed consistently from *P. magna* and the descriptions of *C. synarthra*. The maxilliped basis in all three species has three claw-like spines, but *P. magna* has one additional seta, *C. langi* has two, and *C. synarthra* has three. On the mandibular basis *C. langi* has one long seta with three short spines, *P. magna* has two long setae and two short spines, and *C. synarthra* has three long setae. An additional difference occurs in the endopod of the Md, both *C. langi* and *P. magna* have five setae, whereas *C. synarthra* has seven.

Cervinia langi and *P. magna* are distinct, and both are different from their most closely related *C. synarthra*. Sars (1911) has already discussed the relationship of *C. synarthra* and *C. bradyi* and found them easily separable. Hence, all four species are separated and *C. langi* is unique (Table II). A key to the species of *Cervinia* follows.

Key to the Species of *Cervinia*

Based on females, adapted from Brodskaya (1963). Though the swimming legs of *C. brevipes* are unknown, Brodskaya placed it in the *"bradyi"* group in her key. I have followed this tentative assignment.

1. P_2–P_4 with 2-segmented endopods—*"synarthra"* group 2
   P_2–P_4 with 3-segmented endopods—*"bradyi"* group 4
2. P_2–P_4 terminal endopodites with six, seven, six setae and spines, respectively 3

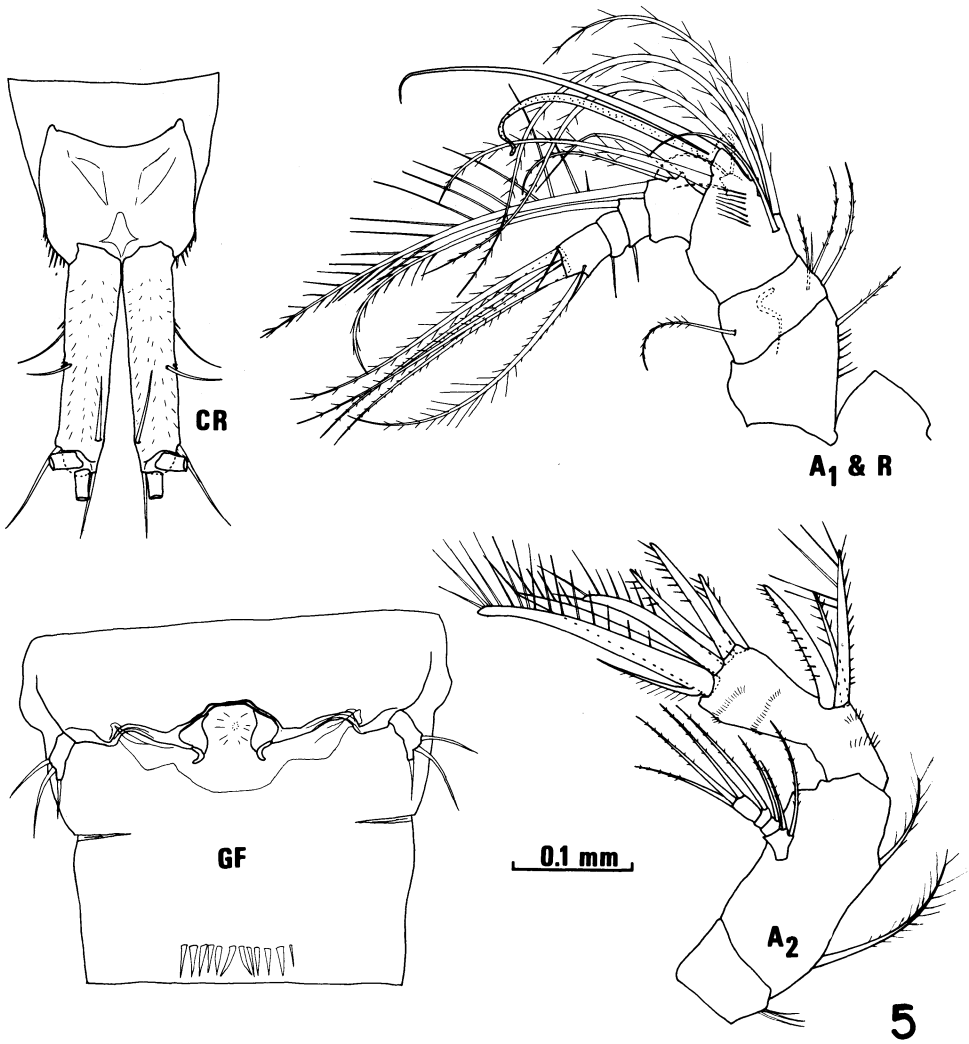

FIG. 5. *Pseudocervinia magna* (Smirnov, 1946), ♀.

P_2–P_4 terminal endopodites with seven, eight, seven setae and spines, respectively; basis of Mxp with three spines, four setae ..... *C. langi* n. sp.

3. CR with long lateral proximal seta ..... *C. pilosa* Lang
   CR with short lateral proximal seta ..... *C. synarthra* Sars
4. CR much longer than last urosomal segment, L/W = 7 or higher, no inner expansion of P_2 basal endopodite 5
   CR about as long as last urosomal segment, L/W ratio ca. 4; basal endopodite of P_2 with large inner expansion ..... *C. bradyi* Norman
5. Basis of Mxp twice as long as other segments combined, P_5 exopod with three setae 6

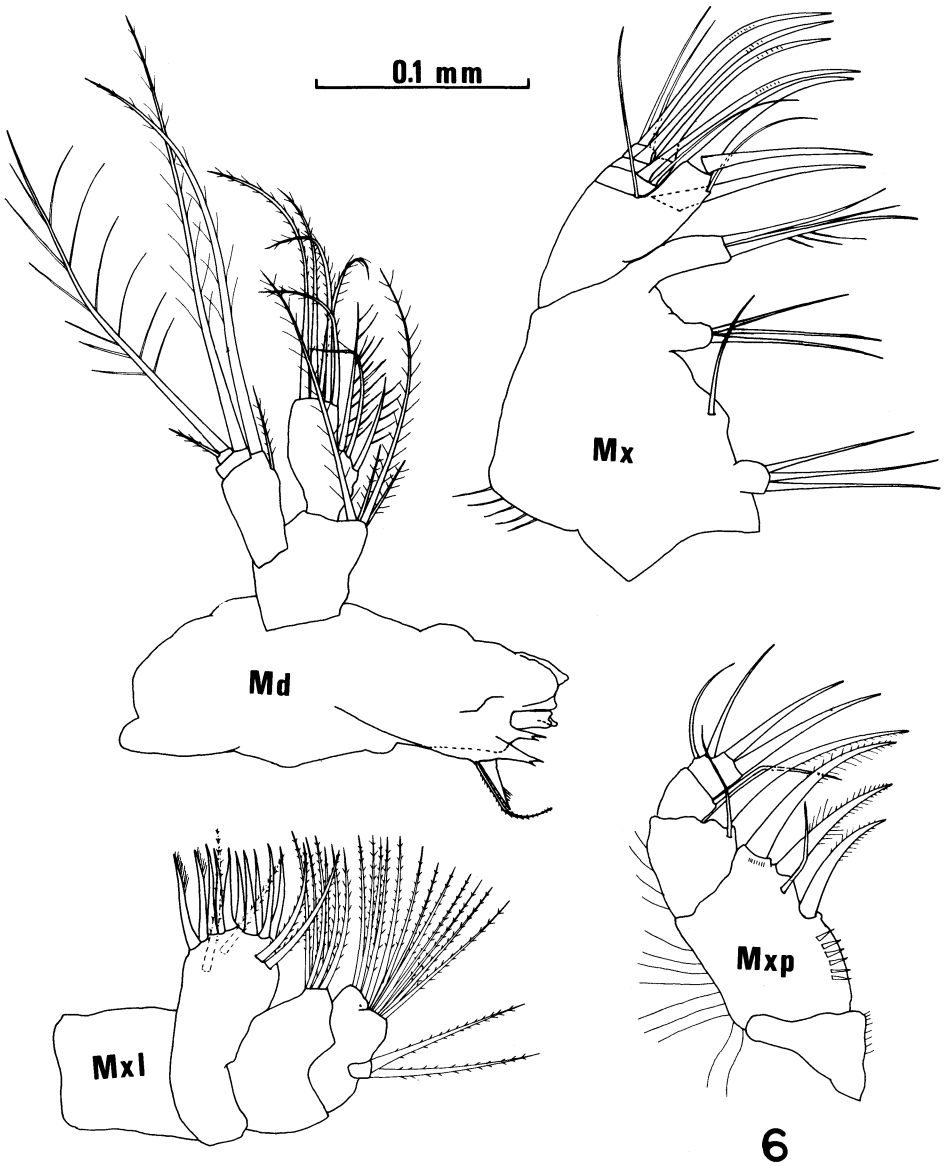

FIG. 6. *Pseudocervinia magna* (Smirnov, 1946), ♀.

Basis of Mxp as long as next three segments, P_5 exopod with two setae ..... *C. tenuiseta* Brodskaya

6. CR as long as last three urosomal segments, Mxp basis with three spines, two setae ..... *C. tenuicauda* Brodskaya
   CR much shorter, longer than last urosomal segment, L/W ca. 7, Mxp basis with only three spines, no rostrum ..... *C. brevipes* Brodskaya

Genus *Pseudocervinia* Brodskaya, 1963
Pseudocervinia magna (Smirnov, 1946)
(Figs. 5–6)

Broadly distributed between 25–355 m (Table I, Fig. 1); 171 female specimens found. Consistent with Smirnov's (1946) description. First segment distinctly separate from cephalothorax, not fused as stated by Brodskaya (1963). CR about equal in length to last urosomal segment and diverge slightly (Fig. 5). CR L/W ca. 4.0 with very little variation. R, A_1 and A_2 as in Fig. 5.

Md (Fig. 6). Precoxa with tri-dentate pars incisiva, and tri-dentate lacina. Coxa-basis with two long setae and two short spines. Exopod 3-segmented with 2.1.2 setae. Endopod with three inner and five terminal setae.

Mxl (Fig. 6). Arthrite of coxa with 10 spines and four surface setae. Basis with six inner setae. Endopod with four inner and eight outer setae, exopod with two setae.

Mx (Fig. 6). Syncoxa with three endites. Basis with claw, two spines and two setae. Endopod 3-segmented with 3.1.3 setae and spines, respectively.

Mxp (Fig. 6). Not prehensile. Basis with three claw-like spines, one seta associated with middle one. Exopod 3-segmented with 2.1.4 setae and spines, respectively.

P_1–P_4 setal arrangement as figured in Smirnov (1946) and listed below:

	Exopod	Endopod
P_1	1.1.123	1.321
P_2	1.1.223	1.421
P_3	1.1.223	1.421
P_4	1.1.223	1.221

Eleven ♀♀ deposited with National Museum of Natural History, USNM 171233, and 29 ♀♀ in OSU Invertebrate Reference Museum OSUBI 01623.

Brodskaya (1963) erected the genus *Pseudocervinia* for *P. magna* because the CR were considered closely opposed as in the subfamily Cerviniopsinae. Of 171 specimens examined, only two appeared closely opposed, so I am led to conclude the CR are divergent as in the Cerviniinae. Since *P. magna* shows many affinities to the "*synarthra*" group, future revision of the Cerviniidae might reassign it to *Cervinia* where it was originally placed by Smirnov (1946).

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CORTICAL AMPULES OF THE CILIATE *EUPLOTES CRASSUS*: CYTOCHEMICAL STUDY OF THEIR CONTENTS DURING PRECONJUGANT INTERACTION[1]

G. ROSATI and F. VERNI
Istituto di Zooligia dell'Università di Pisa, via Volta 4, Pisa, Italy

ROSATI, G. & VERNI, F. 1979. Cortical ampules of the ciliate *Euplotes crassus*: cytochemical study of their contents during preconjugant interaction. *Trans. Amer. Micros. Soc.*, 98: 88–95. The chemical nature of the contents of cortical ampules of *Euplotes crassus* during preconjugant interaction have been investigated. Different fixation techniques as well as chemical treatments and stainings were used. Results obtained led to the conclusion that these ampules contain a considerable amount of lipid associated with some protein. The presence of mucopolysaccharides was, on the contrary, not evident. Thus an analogy between these cortical organelles in *Euplotes* and mucocysts of other ciliates cannot be confirmed.

Cortical ampules associated with dorsal bristles as well as with ciliary compound organelles of the ventral surface of *Euplotes* have been described by many authors (e.g., Fauré-Fremiet & André, 1968; Gliddon, 1966; Roth, 1957; Ruffolo, 1976); however, their functions remain obscure.

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