GAYLE A. HERON
and DAVID M. DAMKAER

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ABSTRACT

Heron, Gayle A., and David M. Damkaer. Five Species of Deep-Water Cyclopoid Copepods from the Plankton of the Gulf of Alaska. *Smithsonian Contributions to Zoology,* 20: 1–24. 1969.—This report considers five species of Cyclopoida found in samples collected from 340 to 1275 meters in the Gulf of Alaska. *Lubbockia wilsonae,* new species, is described. Other descriptions are given for *Lubbockia glacialis, Pseudolubbockia dilatata, Ratania atlantica,* and *Pontoeciella abyssicola.*

The International Pacific Halibut Commission (IPHC), Seattle, Washington, collected more than 3000 plankton samples in the Gulf of Alaska between 1928 and 1938 as a part of a study on the life history of the Pacific halibut (Thompson and Van Cleve, 1936). In 1964, F. Heward Bell, Director of the IPHC, kindly arranged to give the collection to the Smithsonian Institution. Initial examination of the Copepoda revealed many species which have not yet been adequately described. The present report covers five species of Cyclopoida from samples collected from 340 to 1275 meters. *Lubbockia wilsonae,* new species, is described. First descriptions are included for males of *Lubbockia glacialis, Pseudolubbockia dilatata,* and *Ratania atlantica.* Supplementary descriptions of females are given for *Pseudolubbockia dilatata, Ratania atlantica,* and *Pontoeciella abyssicola.*

The IPHC plankton samples were taken along the coast of British Columbia and Alaska, from Cape Flattery to the Aleutian Islands and the entrance to the Bering Sea, and throughout the Gulf of Alaska north of 54° N. The samples were collected with open 1-meter ring nets with filtering cones of 1-millimeter mesh aperture. The tows were made horizontally; at the end of 20 and 40 minutes of hauling, 100 meters of cable were taken in, and at the end of 1 hour the net was brought aboard. Each sample, therefore, is a composite of towing at three depths and during retrieval.

Twenty-seven samples, taken in 1930 and 1931, were examined (Table 1). The scarcity of the five species and their absence in the shallowest samples suggest that they were not captured in shallow water during retrieval of the net. The shallowest sample containing any of the five species was from 340 to 510 meters.

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Body length measurements are from anterior border of rostrum to posterior edge of caudal rami (not including caudal setae). Figures were drawn with the aid of a camera lucida. Single-line scale on figures represents 0.10 millimeter; double-line scale represents 0.01 millimeter. When available, representative specimens have been deposited in the United States National Museum, and female *Pseudolubbockia dilatata* have been deposited in the Musée Océanographique de Monaco.

TABLE 1.—*IPHC samples examined for Cyclopoida. Samples marked (*) contained none of the five species*

Sample	*Location*	*Date*	*Depth, m*		
*1	58°16′N, 139°34′W	4 Mar 30	85	170	255
2	same		595	680	765
3	same		850	935	1020
4	56°09′N, 137°05′W	29 Mar 30	850	935	1020
*5	54°27′N, 158°03′W	11 Apr 30	85	170	255
6	same		340	425	510
*7	53°34′N, 136°26′W	30 Apr 30	85	170	255
8	same		850	935	1020
9	52°36′N, 132°14′W	3 May 30	850	935	1020
10	51°57′N, 133°15′W	4 May 30	850	935	1020
*11	54°34′N, 139°00′W	22 May 31	85	170	255
12	54°34′N, 139°00′W	25 May 31	340	425	510
13	same		595	680	765
14	54°42′N, 141°25′W	25 May 31	850	935	1020
15	same		1105	1190	1275
16	54°58′N, 145°55′W	26 May 31	850	935	1020
17	55°16′N, 150°30′W	27 May 31	850	935	1020
*18	56°07′N, 150°52′W	30 May 31	595	680	765
19	55°45′N, 149°50′W	30 May 31	1105	1190	1275
*20	55°45′N, 148°26′W	30 May 31	595	680	765
21	55°44′N, 147°02′W	31 May 31	595	680	765
*22	56°03′N, 148°06′W	31 May 31	595	680	765
23	same		850	935	1020
24	55°25′N, 141°12′W	7 Jun 31	850	935	1020
25	same		1105	1190	1275
*26	57°19′N, 147°22′W	9 Jun 31	850	935	1020
27	57°38′N, 148°26′W	9 Jun 31	850	935	1020

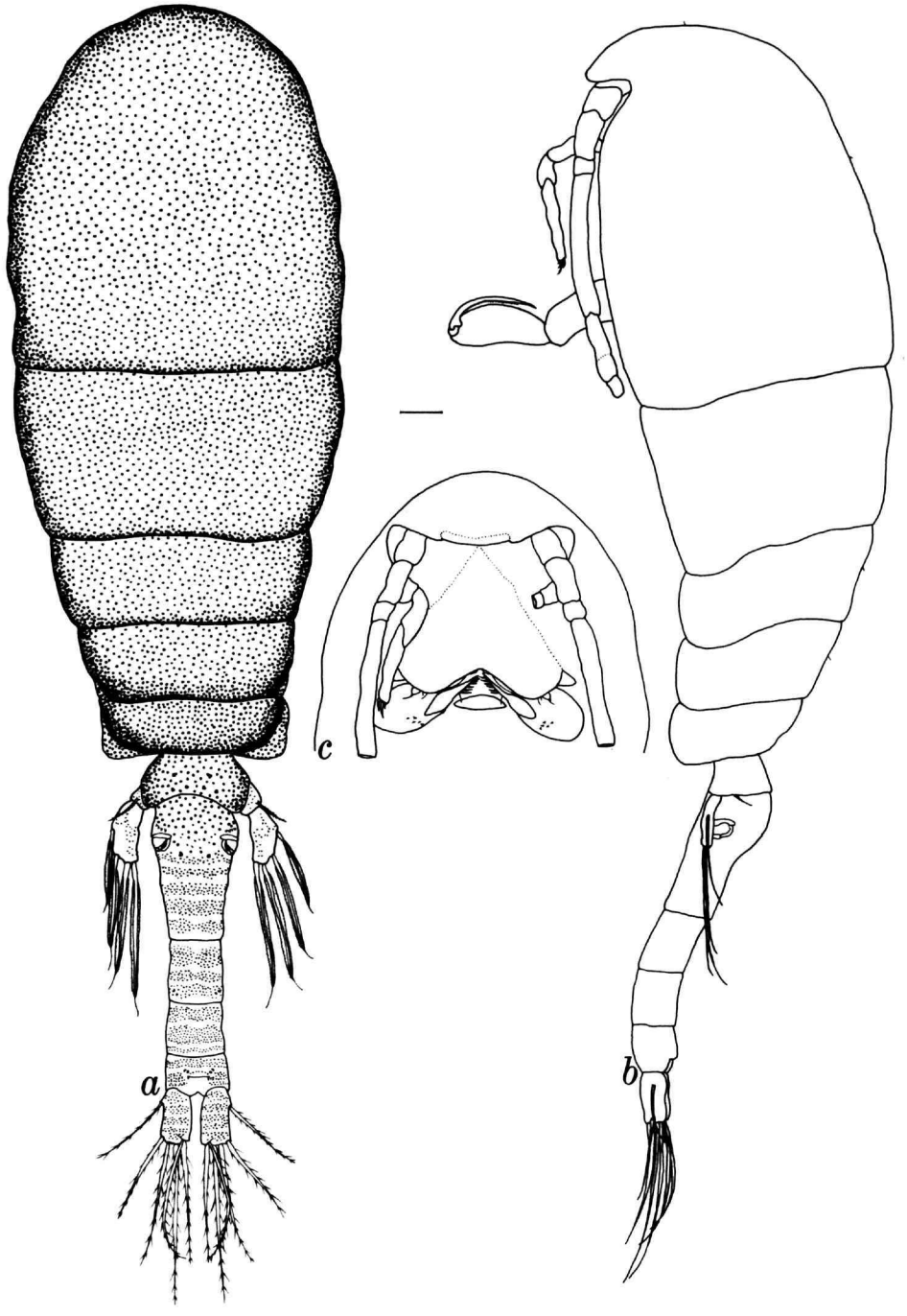


FIGURE 1.—*Pseudolubbockia dilatata* female: *a,* habitus, dorsal view; *b,* habitus, lateral view; *c,* oral area, ventral view.

Drs. Thomas E. Bowman and Roger F. Cressey read the manuscript critically; Drs. T. Saunders English, Paul L. Illg, and John P. Murnane gave helpful suggestions. Mrs. Kirsti Gmaty translated several references. This study was supported by Smithsonian Research Award Sg 2500001.

POECILOSTOMA

Family ONCAEIDAE

Pseudolubbockia dilatata Sars, 1909

FIGURES 1–10

Pseudolubbockia dilatata Sars, 1909, pp. 4–6, fig. 2.

Sars' (1909) brief description of *P. dilatata* was based on females collected at two stations in the Azores, between the surface and 2500 m and 3000 m. Sars did not indicate the number of specimens caught. The Musée Océanographique de Monaco has three specimens from the deeper sample (Dr. G. Testa, personal communication). Until the present records, no other specimens appear to have been reported. C. B. Wilson (1932), Sars (1916, 1918, 1938), and Belloc (1960) refer only to the original record.

MATERIAL STUDIED.—18 samples contained *P. dilatata*:

sample	2	3	4	8	9	10	12	13	14
female	1	3	3	6	2	4	4	3	3
male							1		
sample	15	16	17	19	21	23	24	25	27
female	6	5	11	3	1	5	6	1	9
male			1						

Fifteen females deposited in the United States National Museum (121429–121431) and three in the Musée Océanographique de Monaco (5368).

FEMALE.—Body (Figures 1*a, b*) length 2.73 mm (mean of 30 specimens; range 2.31 to 3.02 mm). Prosome oblong in dorsal view, with distal corners of 5th segment flared laterally. Most of body surface, appendages, and mouthparts densely covered with minute papillae or minute setules. Prosome with robust dorsal and lateral appearance. Epimera of prosomal segments rounded ventrally. Rostral region (Figure 1*c*) a widened ridge with central margin slightly depressed and indented.

Urosome 5-segmented; genital segment long, with lateral ovisacs. Caudal rami twice as long as wide and approximately the length of anal segment.

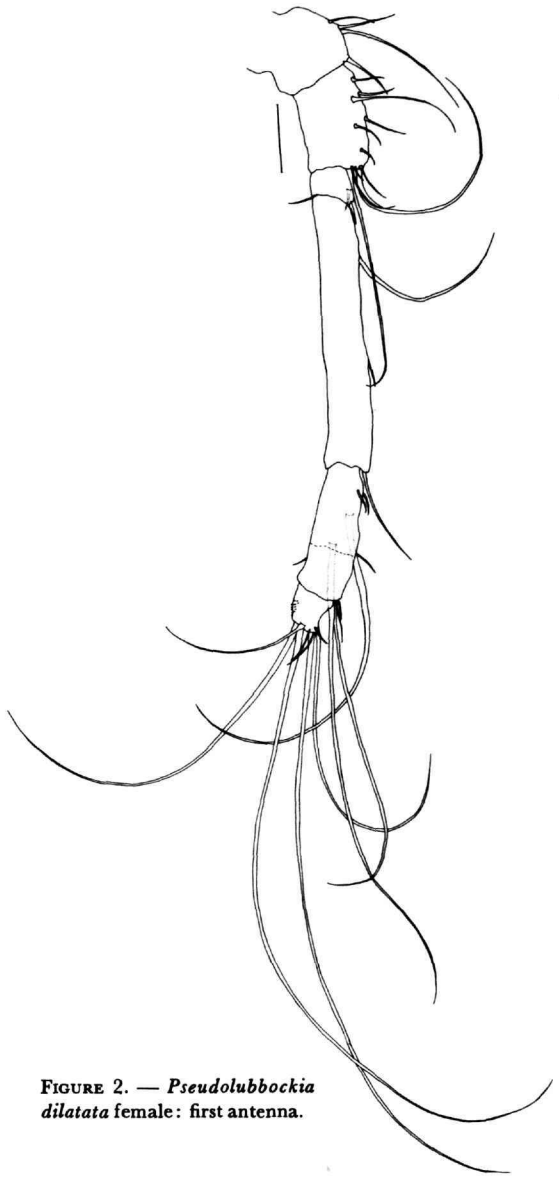


FIGURE 2. — *Pseudolubbockia dilatata* female: first antenna.

First antenna (Figure 2) 6-segmented; trace of suture dividing 5th segment on some specimens. Armature: segment I–4; II–11; III–2 spines; IV–4; V–9; VI–8. Segment VI also with cluster of small spinules on inner margin.

Second antenna (Figure 3*a*) subprehensile, with last 2 segments at right angle to 1st; 2nd segment

with 1 spine. Last segment armed with 2 spines along outer margin, terminating with 2 strong hooks, a short hook, and 3 setae, 1 plumose. Patches of setules on most surfaces.

Labrum (Figure 3*b*) with 2 widely divergent ventral lobes; flanges extending below free margin, each bordered with row of minute denticles (see Figure 1*c*).

Mandible (Figure 4*a*) underlying labrum, except for extreme basal portion; flat, with sclerotized margins associated with base of anterior barbed seta and 2 posterior spines. Row of graduated disklike denticles borders outer convex side of blade, which ends in serrate tip, usually with 6 teeth (1 specimen with 5). Middle concave edge of blade armed with close-set row of dentiform spinules.

First maxilla (Figure 4*b*) simple, divided distally into 2 lobes, the smaller with 2 barbed setae, the larger with 1 barbed seta and 1 short seta. Small spinules on inner surface.

Second maxilla (Figure 4*c*) 2-segmented; 1st segment expanded, with clusters of denticles and spinules on both surfaces. Second segment terminating with 1 spinulose spine and larger hyaline broader spine with longer spinules. Barbed seta inserted subapically.

Maxilliped (Figure 5) 4-segmented; stout 2nd segment expanded, bearing irregular patches of

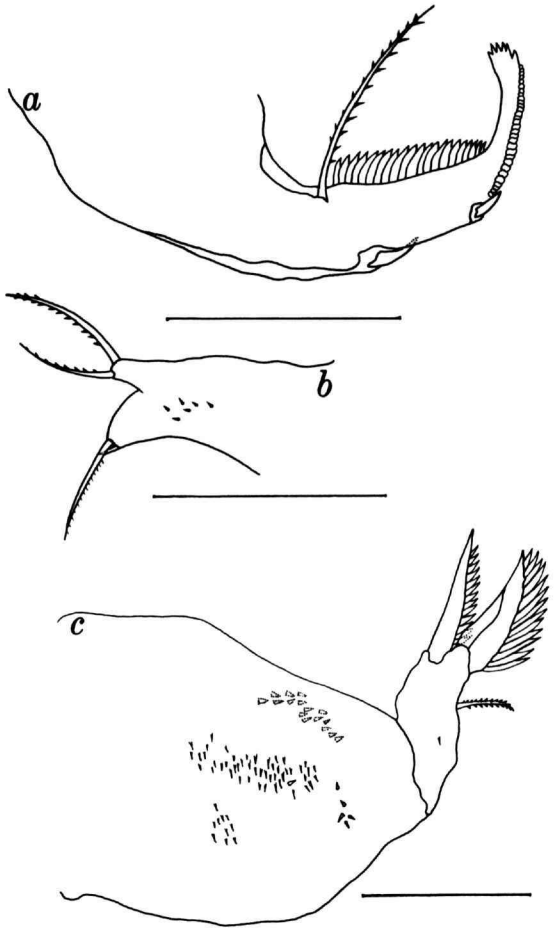


FIGURE 4.—*Pseudolubbockia dilatata* female: *a*, mandible; *b*, first maxilla; *c*, second maxilla.

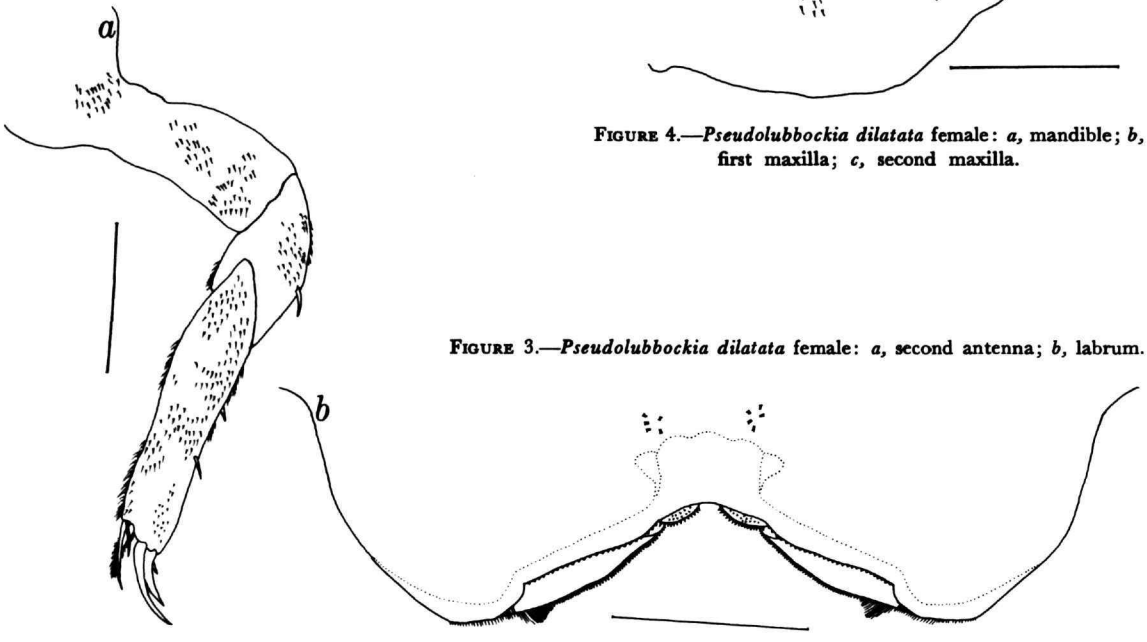


FIGURE 3.—*Pseudolubbockia dilatata* female: *a*, second antenna; *b*, labrum.

spinules and a spine on anterior margin. Third segment short and unarmed. Terminal segment produced as recurved claw with spinous process on interior of dilated base; more than one-half of concave margin bearing row of spinules.

Legs 1–4 (Figures 6–7) with trimerous rami, bearing minute spinules on anterior surfaces; spines with serrulate, hyaline flanges, except long apical spine of exopods has exterior serrulate flange and interior plumose margin. Armature of swimming legs [shown by Sewell's (1949) method; setae are represented by Arabic and spines by Roman numerals, Si=inner border of segments, Se=outer border of segments, St=terminal border of segments]:

	Protopod		*Endopod*					*Exopod*					
	1	*2*	*1*	*2*	*3*			*1*	*2*		*3*		
Leg	*Si*	*Se*	*Si*	*Si*	*Si*	*St*	*Se*	*Se*	*Si*	*Se*	*Si*	*St*	*Se*
1	1	1	1	1	4	1	I	I	1	I	4	I	II
2	1	1	1	2	3	II	I	I	1	I	5	I	II
3	1	1	1	2	2, I	II	I	I	1	I	5	I	II
4	1	1	1	2	1, I	II	I	I	1	I	5	I	II

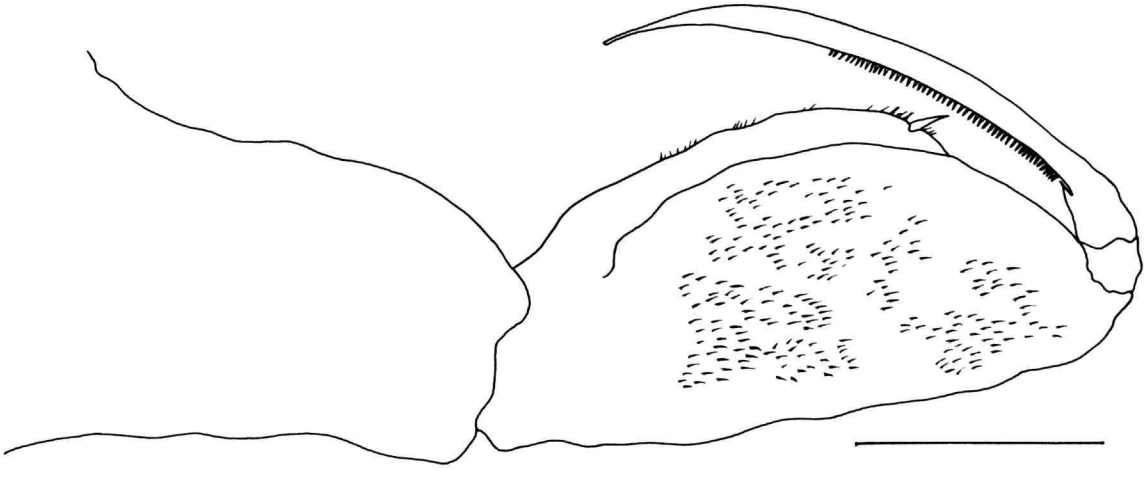
Leg 5 (see Figure 1*a*) with free segment flat, with 4 setae of graduated length fringed with finely serrated lamellae; inner seta is longest, extending to distal margin of 3rd urosomal segment. Feathered seta on body near insertion of free segment.

Leg 6 probably represented by small lobe, protruding laterally from aperture of oviduct and bearing 2 small spines.

Dr. G. Testa, Musée Océanographique de Monaco, kindly loaned us one of Sars' specimens, which was examined without dissection. Its 2nd antennae are similar to those of the IPHC specimens, not armed with only 2 claws as stated by Sars (1909). The spines of leg 5 have relative lengths similar to those of IPHC specimens.

MALE.—Body (Figure 8) length of 2 males 1.35 and 1.40 mm. Most of body surface with papillae or setules as in female. Habitus as in female, but less robust. Urosome 6-segmented; caudal rami almost as wide as long, about same length as anal segment and

FIGURE 5.—*Pseudolubbockia dilatata* female: maxilliped.



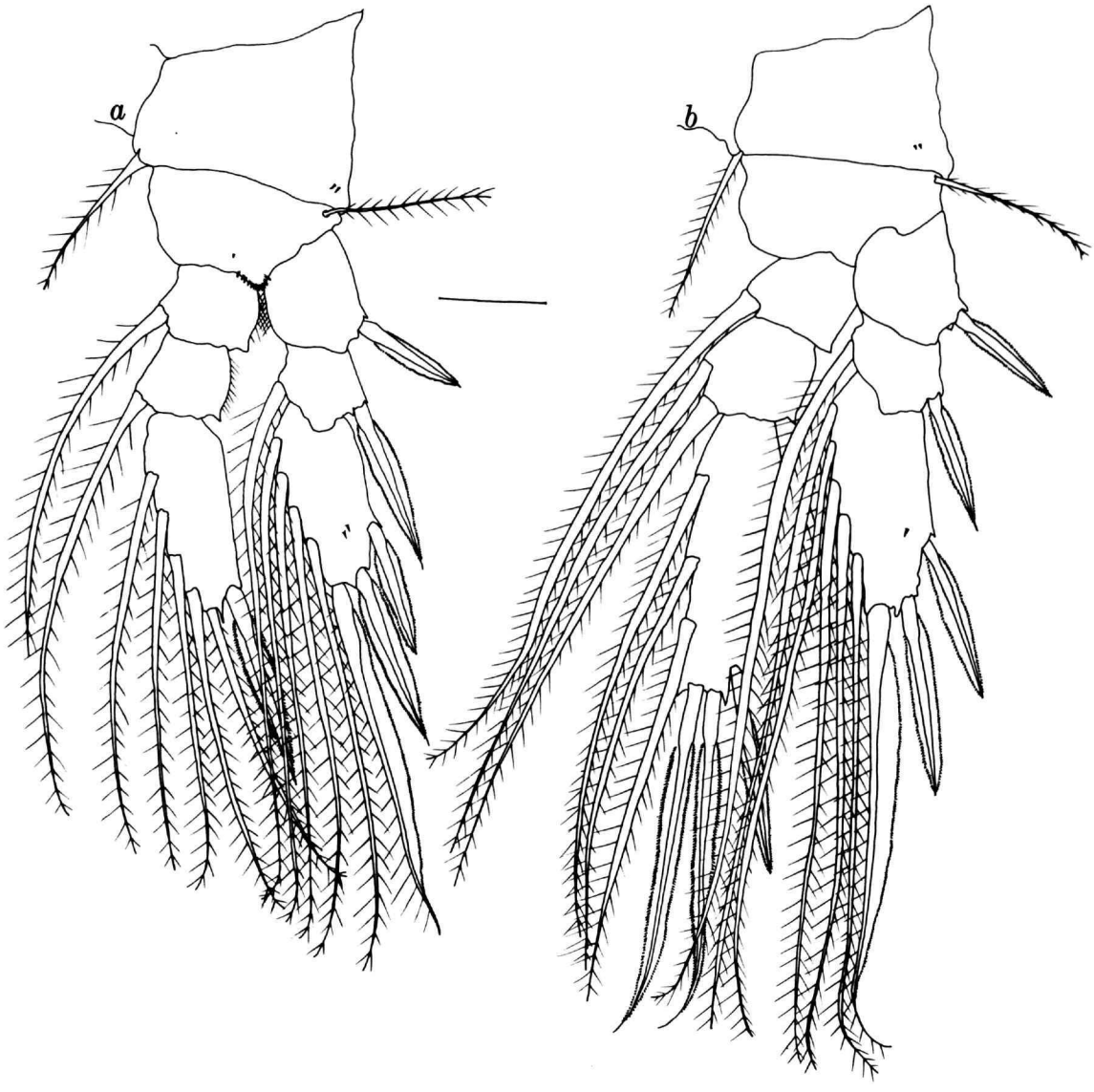


FIGURE 6.—*Pseudolubbockia dilatata* female: *a*, leg 1; *b*, leg 2.

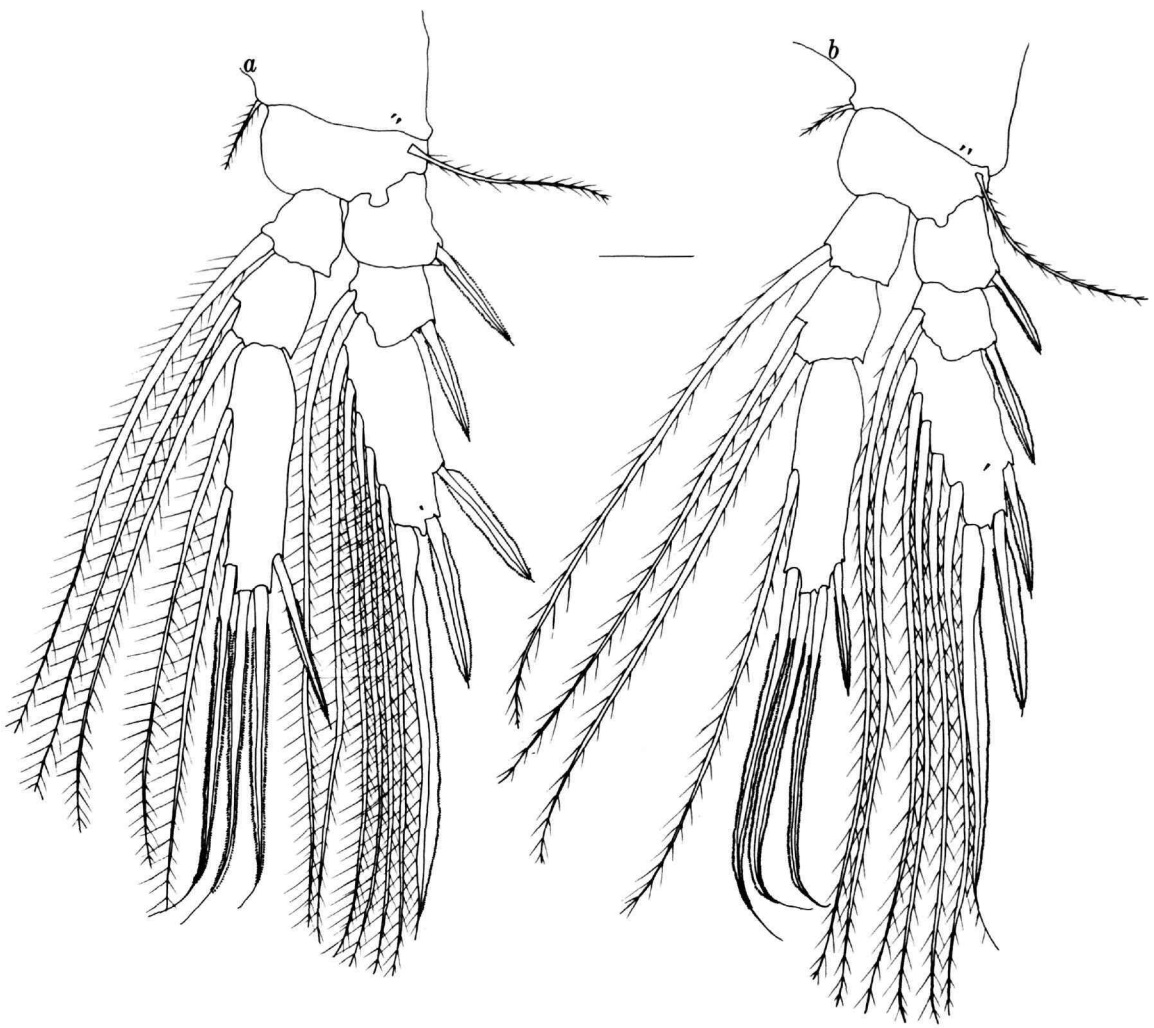


FIGURE 7.—*Pseudolubbockia dilatata* female: *a*, leg 3; *b*, leg 4.

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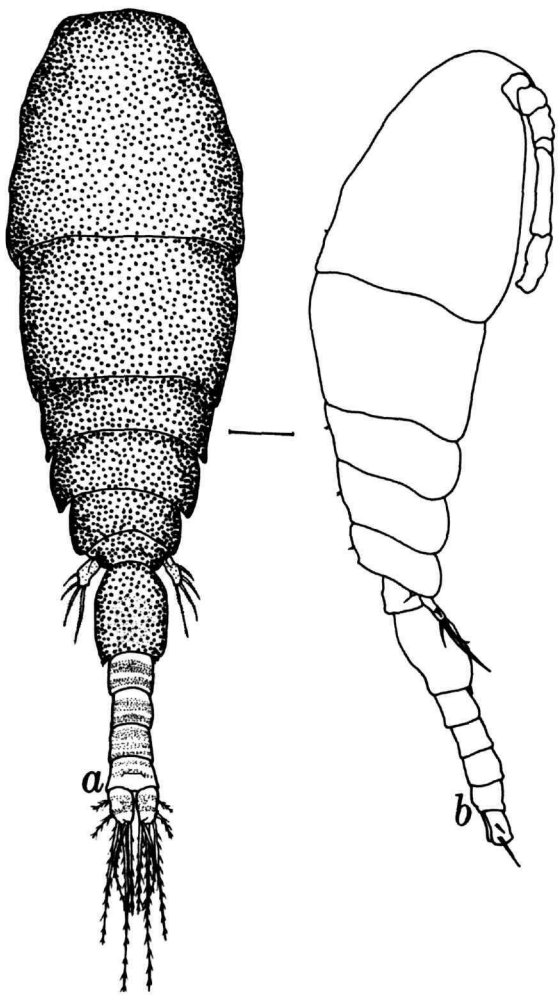


FIGURE 8.—*Pseudolubbockia dilatata* male: *a*, habitus, dorsal view; *b*, habitus, lateral view.



FIGURE 9.—*Pseudolubbockia dilatata* male: first antenna.

each of 2 preceding segments. Caudal setae proportionally longer in male, except the 2 lateral setae, which are proportionally shorter.

First antenna (Figure 9) differs from that of female; 5-segmented with 2 faint sutures on terminal segment. Armature similar to female except 1 less seta discerned on segment II and the section corresponding to segment V of female.

Second antenna, labrum, mandible, and 1st and 2nd maxillae like those of female.

Maxilliped (Figure 10*a*) differs from maxilliped of female, with 2 small segments between 2nd and terminal segments. Second segment with 2 strong spines. Fourth segment with 1 long and 1 short seta.

Leg 1 (Figure 10*b*) with margins of long exterior spine on endopod 3 bearing rows of small denticles in place of flange.

Legs 2–4 similar to those of female; length of setae proportionally longer in male. Spines less wide because of narrower flange.

Leg 5 (see Figure 8*a*) similar to that of female; inner spine not reaching posterior margin of genital segment.

Leg 6 ventrolateral on posterior edge of genital segment, bearing 1 small seta.

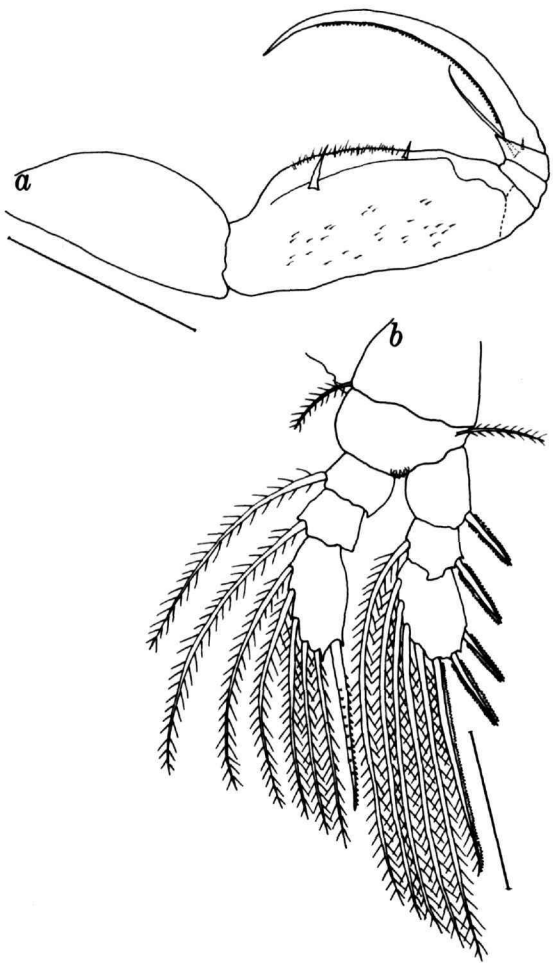


FIGURE 10.—*Pseudolubbockia dilatata* male: *a*, maxilliped; *b*, leg 1.

Lubbockia wilsonae, new species

FIGURES 11–19

Lubbockia aculeata.—Vervoort, 1951, p. 151; 1957, p. 148.

MATERIAL STUDIED.—1 female in each of samples 6 and 17; body lengths 2.70 and 2.75 mm (holotype). Holotype on slide deposited in the United States National Museum (123515).

FEMALE.—Body (Figures 11–12) slender, urosome slightly longer than prosome. Rostral area moderately well developed. Urosome with small spinules in distinctive patterns on ventral posterior margin of each seg-

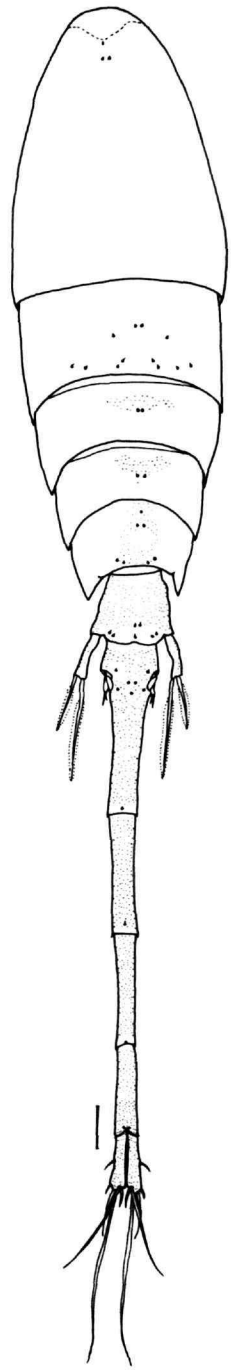


FIGURE 11.—*Lubbockia wilsonae*, new species, female: habitus, dorsal view.

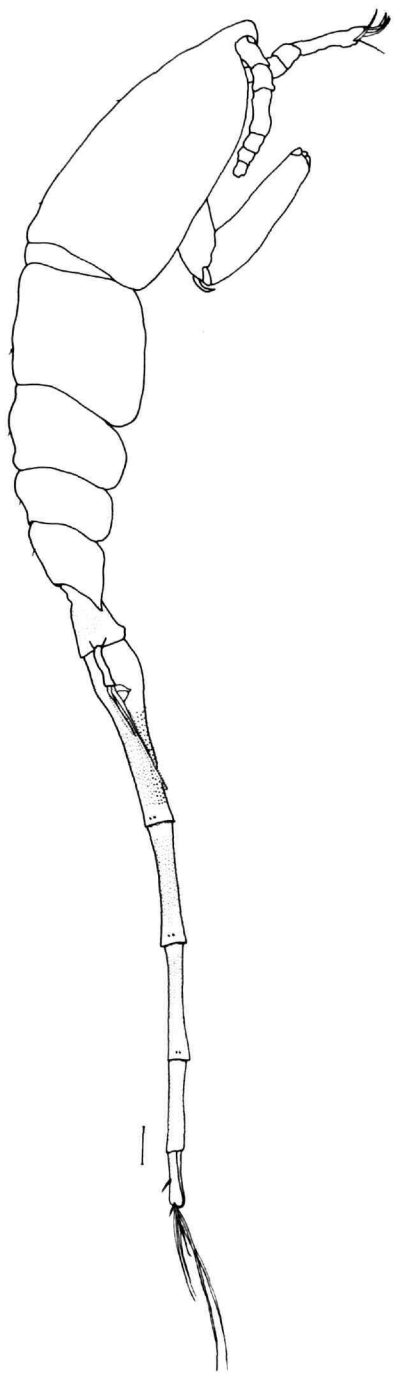


FIGURE 12.—*Lubbockia wilsonae* female: habitus, lateral view.

ment (Figure 13). Segment of leg 5 with minute spinules on dorsal and ventral surfaces. Genital apertures lateral, each encircled with ring of sclerotization from which leg 6 protrudes.

Caudal rami about one-half the length of anal segment. Dorsal surfaces of the prosome and urosome bear minute setules, the more conspicuous ones as indicated in Figure 11.

First antenna (Figure 14) 6-segmented; less than one-half the length of cephalosome. Armature: segment I–4; II–6, 1 esthete, 1 spine; III–4; IV–3, 1 esthete; V–2, 1 esthete; VI–6, 2 esthetes.

Second antenna (Figure 15*a*) subprehensile, 3-segmented; 2 subapical setae, 1 nude and 1 with row of hairs on concave edge; armed terminally with 3 claws, 1 twice the width of the other 2, and 1 seta with row of hairs.

Labrum (Figure 15*b*) with 2 posteroventral lobes bearing marginal spinules.

Mandible (Figure 16*a*) with posterior margin of base sclerotized and followed distally by slightly curved element with row of graduated hairs on outer edge. Large U-shaped central area of surface sclerotization encircles wide, flat, hirsute seta and 2 clusters of hairs, 1 long and 1 short. Second wide hirsute seta on posterior distal margin of surface sclerotization. Mandible terminates in long blade with row of graduated, obtuse, scalelike denticles on outer margin.

First maxilla, with the middle seta broken from larger lobe, appeared to be similar to Giesbrecht's (1892, pl. 48, fig. 9) illustration for *L. aculeata*.

Second maxilla (Figure 16*b*) with 1st segment expanded and bearing 2 clusters of fine hairs. Second segment with small setule on outer margin and bladelike seta on posterior surface; inner margin with plumose, lashlike seta with row of long hairs arising near the base; distal part of segment bearing a strong nude element; a seta, fringed with a row of spinules grading to hairs, arises near the base of this element. A thin, flat element arises at the base of the seta; one preparation suggested that additional thin, flat elements are hidden by the first.

Maxilliped (Figure 17) with patch of small denticles on basal segment; anterior margin of 2nd segment with 5 or 6 triangular spines and short and long row of small denticles. Number and pattern of spines and denticles varied between the 2 specimens, as well as between right and left maxilliped; 1 specimen with 6 triangular spines on left 2nd segment of maxilliped and 5 on right. Third segment short and unarmed;

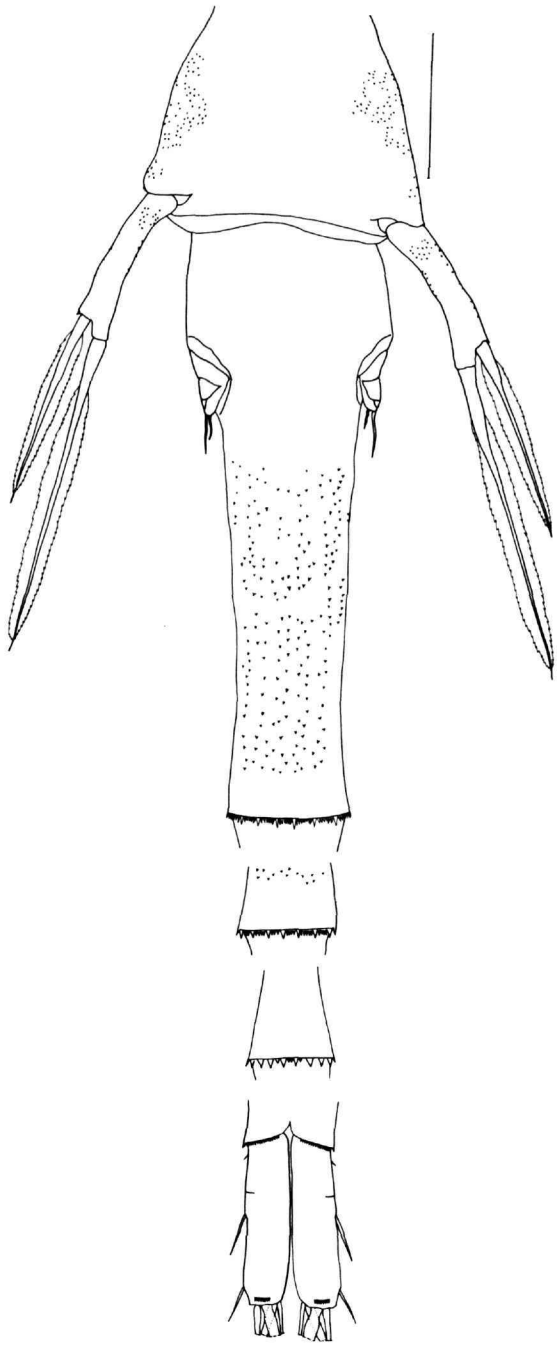


FIGURE 13.—*Lubbockia wilsonae* female: urosome, ventral view, showing posterior margin of urosomal segments.



FIGURE 14.—*Lubbockia wilsonae* female: first antenna.

terminal claw with 1 small proximal denticle and row of dentiform spines on concave margin, number varying between the 2 specimens.

Legs 1–4 (Figures 18–19) with trimerous rami; endopod and exopod spines with serrate, hyaline flanges, except long apical spine of exopods has exterior flange and interior feathered margin. Armature of swimming legs:

	Protopod			*Endopod*					*Exopod*					
	1	*2*		*1*	*2*	*3*			*1*	*2*		*3*		
Leg	*Si*	*Si*	*Se*	*Si*	*Si*	*Si*	*St*	*Se*	*Se*	*Si*	*Se*	*Si*	*St*	*Se*
1	1	I	1	1	1	4	1	I	I	1	I	4	I	II
2	1		1	1	2	3	II	I	I	1	I	5	I	II
3	1		1	1	2	2	II	I	I	1	I	5	I	II
4	1		1	1	2	1	II	I	I	1	I	5	I	II

Leg 5 (see Figure 13) with free segment one-fourth the length of genital segment and bearing patches of minute surface spinules. Armature consisting of 2 flanged setae, the inner nearly twice the length of the outer. Outer distal margin of segment with small process.

Leg 6 (see Figure 13) probably represented by well-developed segment protruding from genital aperture. Segment with chitinous plaque on ventral surface and 2 nude terminal setae of unequal length.

It is a pleasure to name this species in honor of Mildred Stratton Wilson, Anchorage, Alaska, in recognition of her many contributions to the study of North American copepods and in gratitude for her guidance and inspiration to the authors.

Lubbockia wilsonae is close to *L. aculeata* Giesbrecht, 1891, but can be distinguished without dissection by differences in legs 5 and 6 and proportional lengths of urosomal segments.

Vervoort (1951, 1957) identified an Antarctic species of *Lubbockia* as *L. aculeata,* but mentioned that the 1st segment of the maxilliped on his specimens had, instead of 1 large spine, a cluster of small spines. Dr. W. Vervoort kindly sent us a female specimen, 2.60

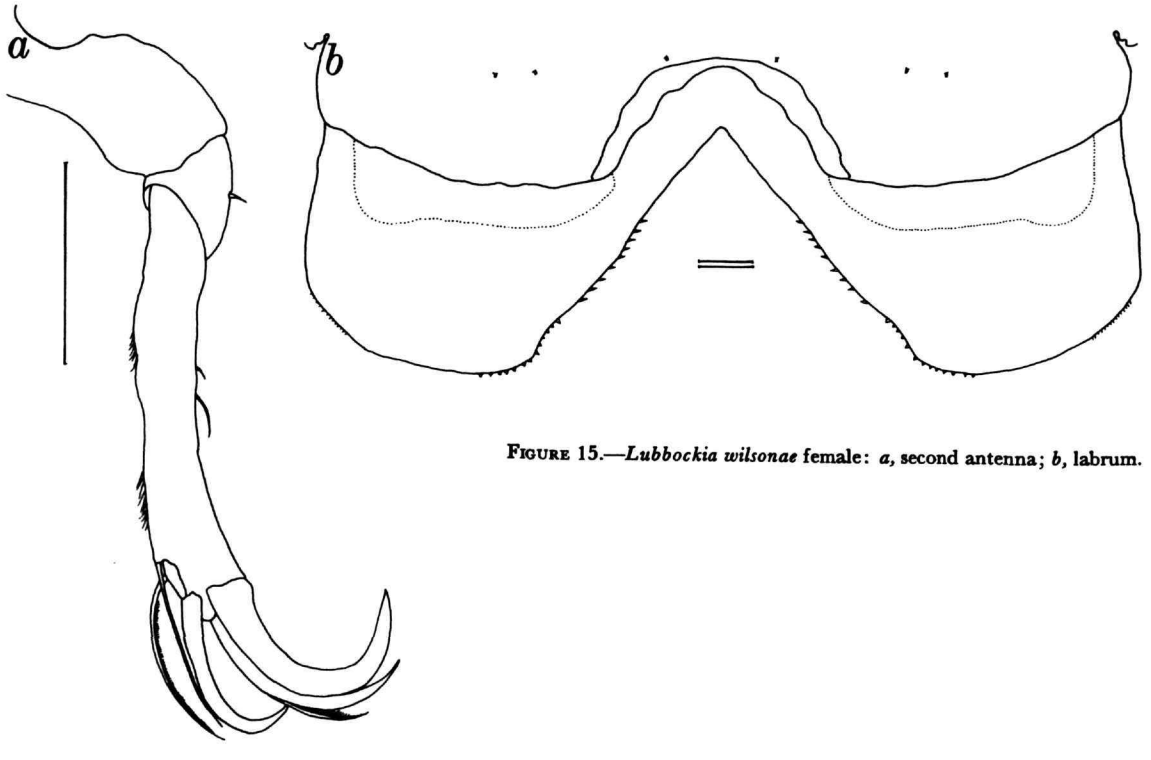


FIGURE 15.—*Lubbockia wilsonae* female: *a,* second antenna; *b,* labrum.

mm, from British, Australian and New Zealand Antarctic Research Expedition station 44. We have identified the specimen as *L. wilsonae,* extending the distribution record from the Gulf of Alaska to the Antarctic Ocean. This specimen has been deposited in the United States National Museum (277051).

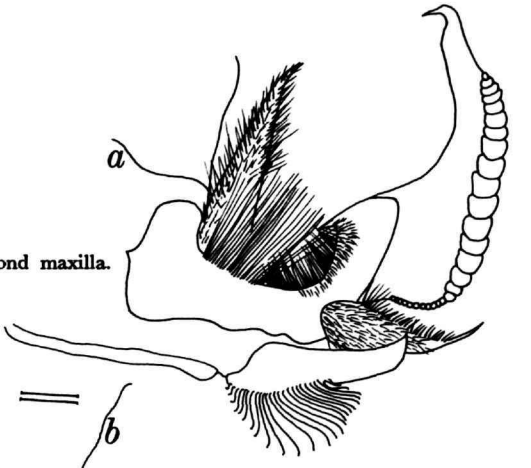


FIGURE 16.—*Lubbockia wilsonae* female: *a,* mandible; *b,* second maxilla.

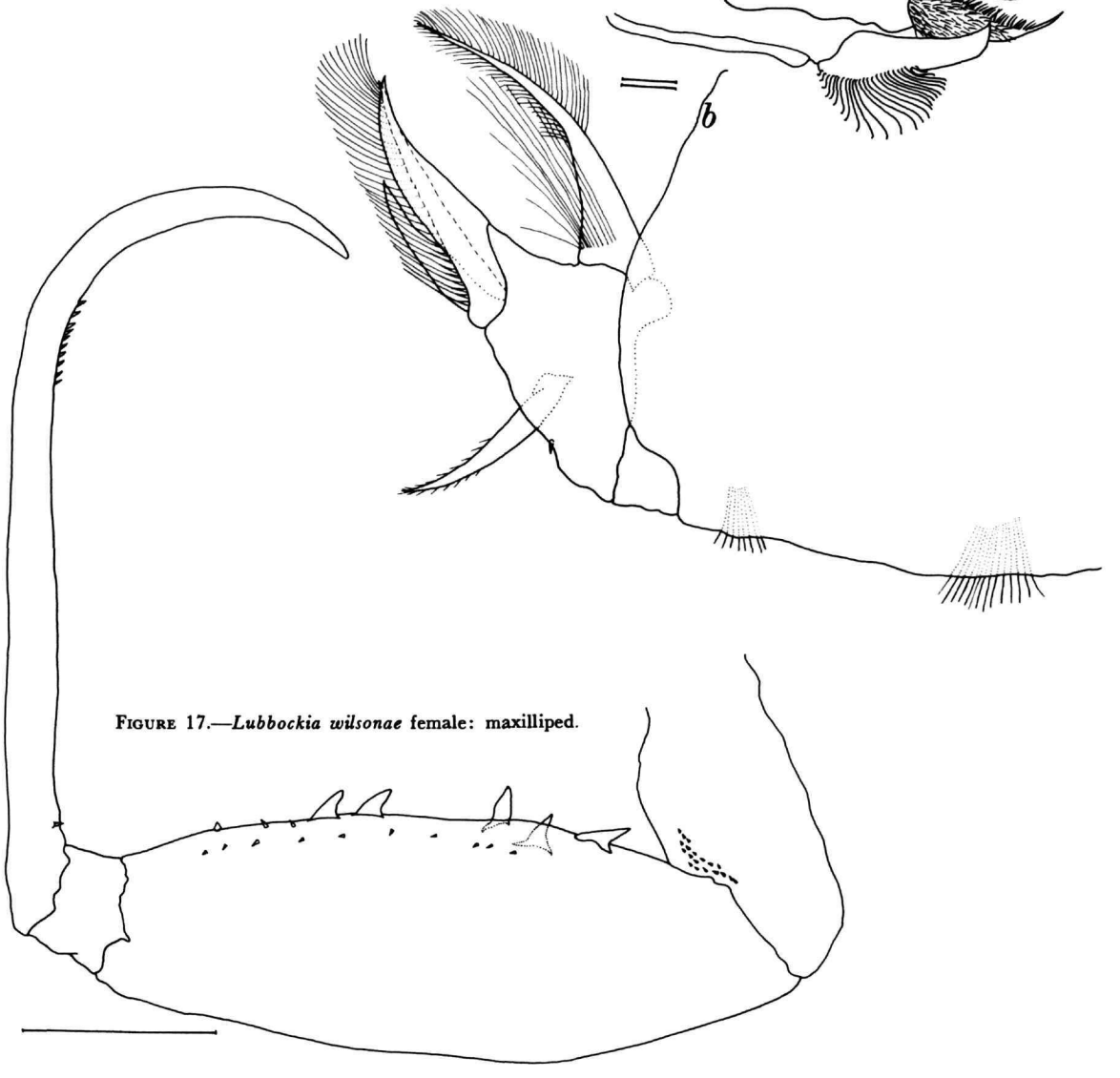


FIGURE 17.—*Lubbockia wilsonae* female: maxilliped.

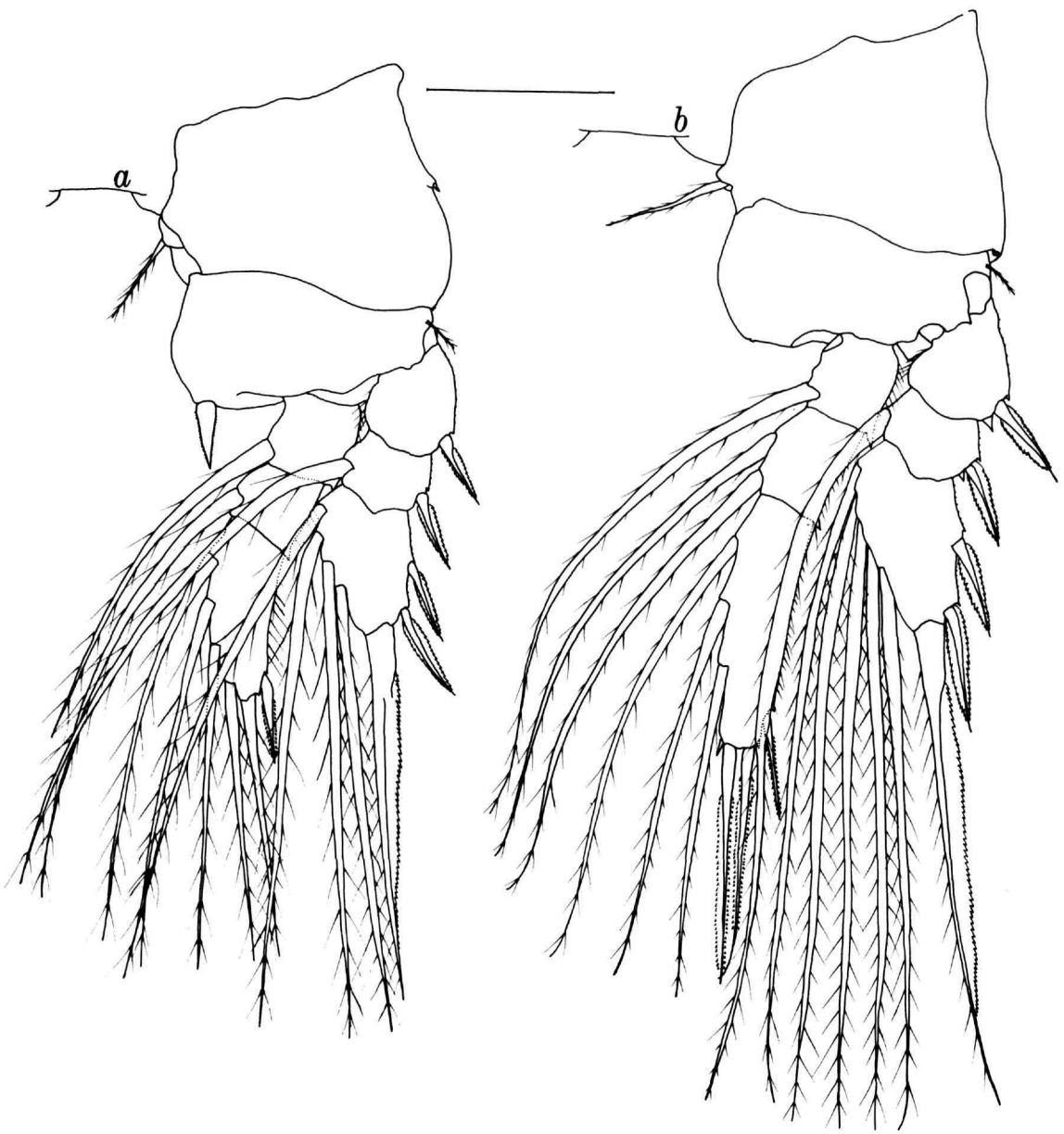


FIGURE 18.—*Lubbockia wilsonae* female: *a*, leg 1; *b*, leg 2.

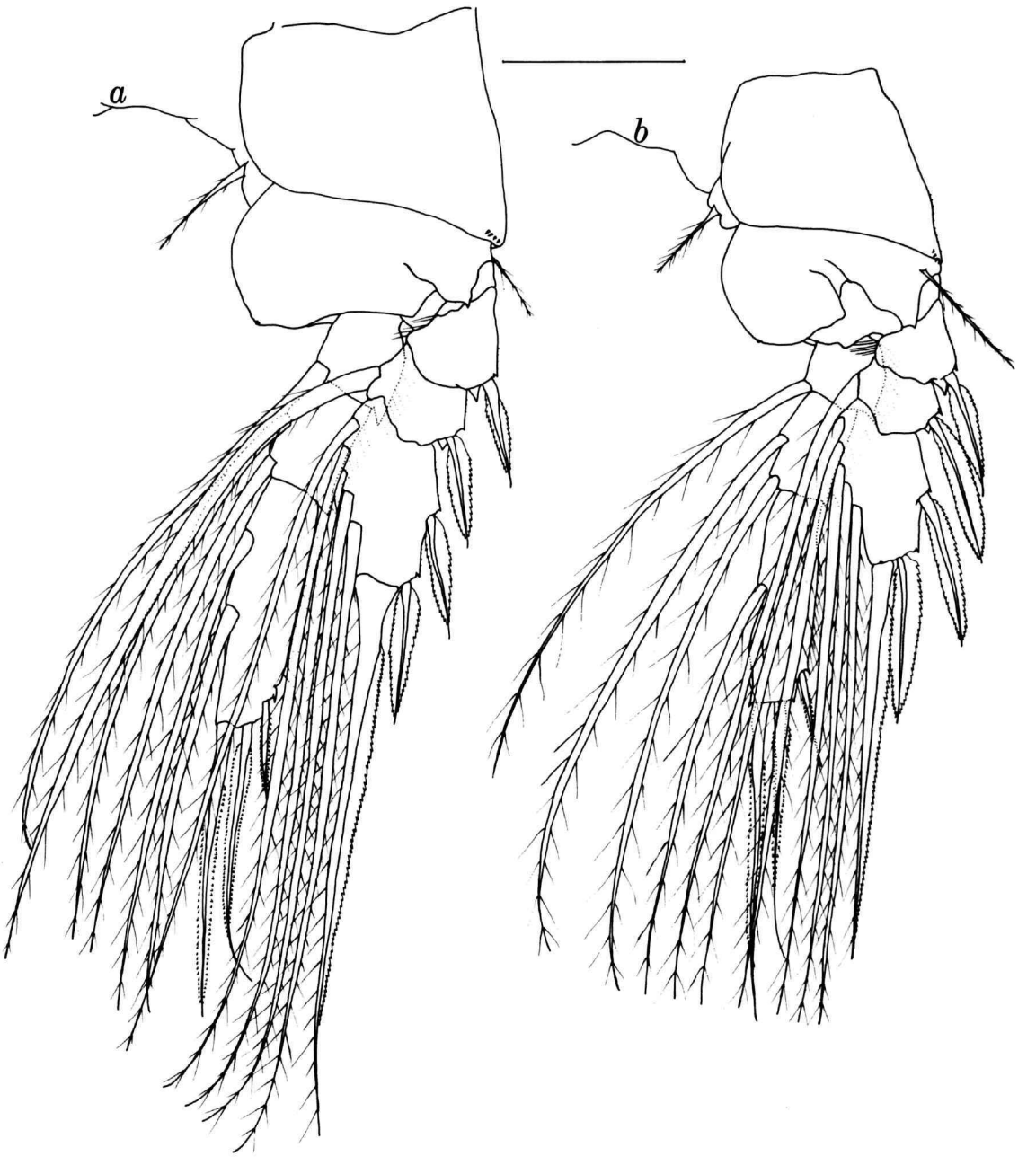


FIGURE 19.—*Lubbockia wilsonae* female: *a*, leg 3; *b*, leg 4.

Lubbockia glacialis Sars, 1900

FIGURES 20–21

Lubbockia glacialis Sars, 1900, pp. 114–118, pl. 33: figs. 1–15.

MATERIAL STUDIED.—1 male from sample 3; body length 2.21 mm.

MALE.—Body (Figure 20) elongate, similar to Sars' (1900) description of female, except male urosome longer than prosome. Rostrum a small, rounded protrusion between bases of 1st antennae, not delimited ventrally from tergum of cephalosome. Prosome with greatest depth at junction of first 2 segments.

Urosome 6-segmented, each segment with smooth posterior margins. Fifth and anal segments with lateral margins slightly concave.

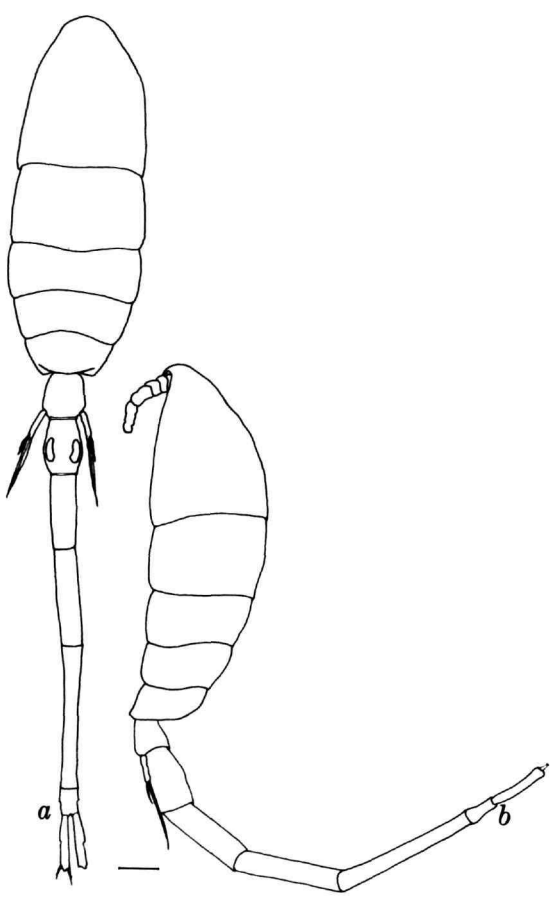


FIGURE 20.—*Lubbockia glacialis* male: *a*, habitus, dorsal view; *b*, habitus, lateral view.

Caudal rami about same length as genital segment. All caudal setae, except 2 on left ramus, were missing from specimen.

First antenna (Figure 21*a*) with 4 distinct segments. Faint line suggesting coalescence on proximal third of segment III corresponds to segmentation between segments III and IV of female. Fourth segment of male 1st antenna corresponds to segments V, VI, and VII of female. Armature may be incomplete on this damaged specimen: segment I–3; II–2, 1 esthete; III–1, 2 esthetes; IV–7, 1 esthete. Segment IV also with a few spinules. Longest esthete, on segment III, almost twice the length of 1st antenna.

Second antenna (Figure 21*b*) subprehensile, 3-segmented. Basal segment unarmed; 1 seta on short 2nd segment. Distal segment with terminal grouping of 7 setae, 1 three times the length of the remaining 6, 1 of which is plumose. Inner surface of 3rd segment with patches of hairs and 1 small spine near base of long seta; 2 setae on outer margin.

Mandible and first maxilla reduced to vestiges, represented only by the bases; each with undefined margins.

Second maxilla (Figure 21*c*) with 2 terminal spines, 1 nude and 1 with unilateral row of hairs; 1 seta on lateral margin. Slightly sinuate spine, with unilateral patches of hairs, on small lobe protruding subapically. Segmentation as illustrated by Sars (1900, pl. 33, fig. 7) for this appendage could not be discerned on the IPHC male.

Maxilliped (Figure 21*d*) 3-segmented; 2nd segment with spine and graduated row of coarse spinules on medial margin, followed by row of rugose striations. The recurved claw tapers to slight distal expansion.

Legs 1, 3, and 4 with trimerous rami, as described by Sars (1900) for female; leg 2 missing from IPHC specimen. Armature of legs 1 and 3 similar to Sars' description for female, except the hyaline flange of spines finely serrate rather than smooth. Right leg 4 abnormal; differed by having 3 instead of 2 spines on lateral margin of 3rd exopod.

Leg 5 (see Figure 20*a*) similar to female, free segment elongate, extending two-fifths the length of genital segment; armature consists of 2 lanceolate setae, terminal seta about three times the length of lateral seta.

Leg 6 (Figure 21*e*) probably represented by small triangular sclerotized ridge on ventrolateral posterior margin of genital segment, bearing 1 setule.

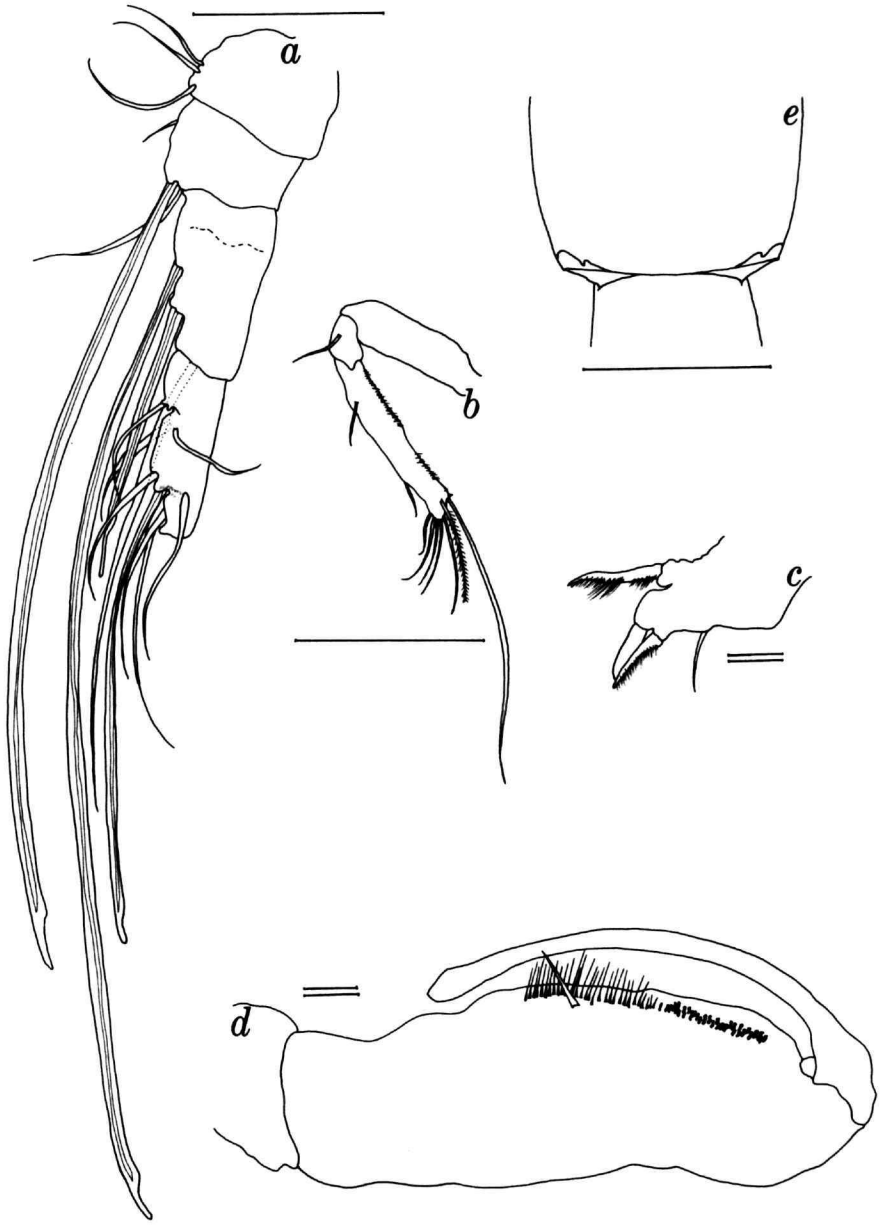


FIGURE 21.—*Lubbockia glacialis* male: *a*, first antenna; *b*, second antenna; c, second maxilla; *d*, maxilliped; *e*, posterior margin of genital segment, ventral view.

DISTRIBUTION.—Sars (1900) recorded "some few" female *L. glacialis* from the Norwegian North Polar Expedition. He described a female measuring 2.45 mm. Olson (1949) recorded 1 female, 1.30 mm, from 0–800 m off the Oregon coast, but his description and illustrations suggest the specimen was *L. minuta* Wolfenden.

Grice (1962) listed 1 specimen, and Johnson (1963) listed 1 specimen in each of 2 samples from the high North Polar Basin.

SIPHONOSTOMA

Sars' (1918) classification of the Siphonostoma has been generally accepted. This system is a modification of Giesbrecht's (1899) series of subfamilies, raised to family level by Sars, with the addition of some other families. Sars did not encounter either *Ratania* (in Rataniinae Giesbrecht) or *Pontoeciella* (in Pontoeciellinae Giesbrecht) in the Crustacea of Norway, although Sars (1909, 1916) used Pontoeciellidae for *Pontoeciella* and a new genus, *Hyalopontius*. Rataniidae appears to have been used first, for *Ratania*, by Saraswathy (1961).

Family RATANIIDAE

Ratania atlantica Farran, 1926

FIGURES 22–26

Ratania atlantica Farran, 1926, p. 296, pl. 9: fig. 18; pl. 10: figs. 11–12.—Vervoort, 1957, p. 146.

Ratania and the Myzopontiidae have no mandibular palp, and the terminal segment of the 1st antenna bears an esthete. However, *Ratania* differs from genera within Myzopontiidae in that *Ratania* 1st antenna has fewer segments, the 2nd antenna is uniramous, the oral cone is less produced, and the mandibular blade is more of a cutting-type, than a piercing-type.

Farran (1926) stated that *R. atlantica* closely resembles *R. flava* Giesbrecht, 1892, and gave only a brief description of the female.

MATERIAL STUDIED.—11 samples contained *R. atlantica*:

sample	2	10	13	15	16	17	19	21	23	24	25
female	1	1	1	3	2	1		1	1	2	2
male					1	1	1		1		1
juvenile						1					

R. atlantica was found only in samples which also contained *Pseudolubbockia dilatata*. Four females deposited in the United States National Museum (121432–121434).

FEMALE.—Body (Figure 22) length 2.46 mm (mean of 10 specimens; range 2.21 to 2.63 mm). Prosome 4-segmented with cephalosome expanded laterally. Rostrum a ridge produced ventrally from tergum of cephalosome. Urosome 5-segmented; genital segment slightly longer than combined length of 2 postgenital segments. Caudal rami slightly more than twice as long as wide, almost twice the length of anal segment. Anal segment and caudal rami with row of spinules on ventral posterior borders. Dorsal surface of prosome and urosome bear scattered refractile points; minute spinules densely cover most body surfaces, giving appearance of coarse-grained texture.

First antenna (Figure 23) 7-segmented. Armature: segment I–7; II–2, 1 esthete, 1 spine; III–1, 1 spine; IV–2, 1 spine; V–2; VI–1, 1 spine; VII–11, 2 esthetes. Terminal segment with 2 setae arising from same base; 2 esthetes on this segment each about twice the length of the 1st antenna, the proximal esthete with a thickening of the anterior margin.

Second antenna similar to Giesbrecht's (1892, pl. 48: fig. 40; 1899, pl. 10: fig. 21) illustrations for *R. flava*, except stronger terminal seta than in *R. flava*.

Labrum (Figure 24*a*) slightly produced from oral area; cone shaped, with distal row of short setules.

Mandible (Figure 24*b*) with long, narrow, stalklike neck; appendage terminates in a tip with 5 serrations and apical indentation setting off 3 more serrations, all of which are irregular.

First maxilla (Figure 24*c*) differs from that of *R. flava* in proportional lengths of 3 spinulose setae of coxa and in having clusters of setules on outer margin. Palp with 3 long spinulose setae and 1 small nude seta.

Second maxilla (Figure 24*d*) 2-segmented; basal segment with cluster of setules on inner surface. Second segment with 2 indistinct lines of fusion; 1 at midlength, accentuated by a small spine and a few setules, and 1 distally. Distal half of segment produced as slightly curving claw, with scattered setules.

Maxilliped as shown by Giesbrecht (1892, pl. 48: fig. 43; 1899, pl. 10: fig. 22) and Saraswathy (1961, fig. 7) for *R. flava*. Giesbrecht's drawings differ; the 1899 figure shows line of segmentation on the hook. IPHC specimens show an indistinct line of fusion at that point.

Legs 1–4 with trimerous rami, resembling illustrations of Giesbrecht (1892, pl. 48: figs. 42 and 47) and Saraswathy (1961, figs. 10–13) for *R. flava*.

Leg 5 (Figure 24*e*) with flat free segment armed with finely barbed setae; the lengths of the 2 short medial setae and 3 longer lateral setae varied between specimens. A finely barbed seta arises from body near insertion of free segment.

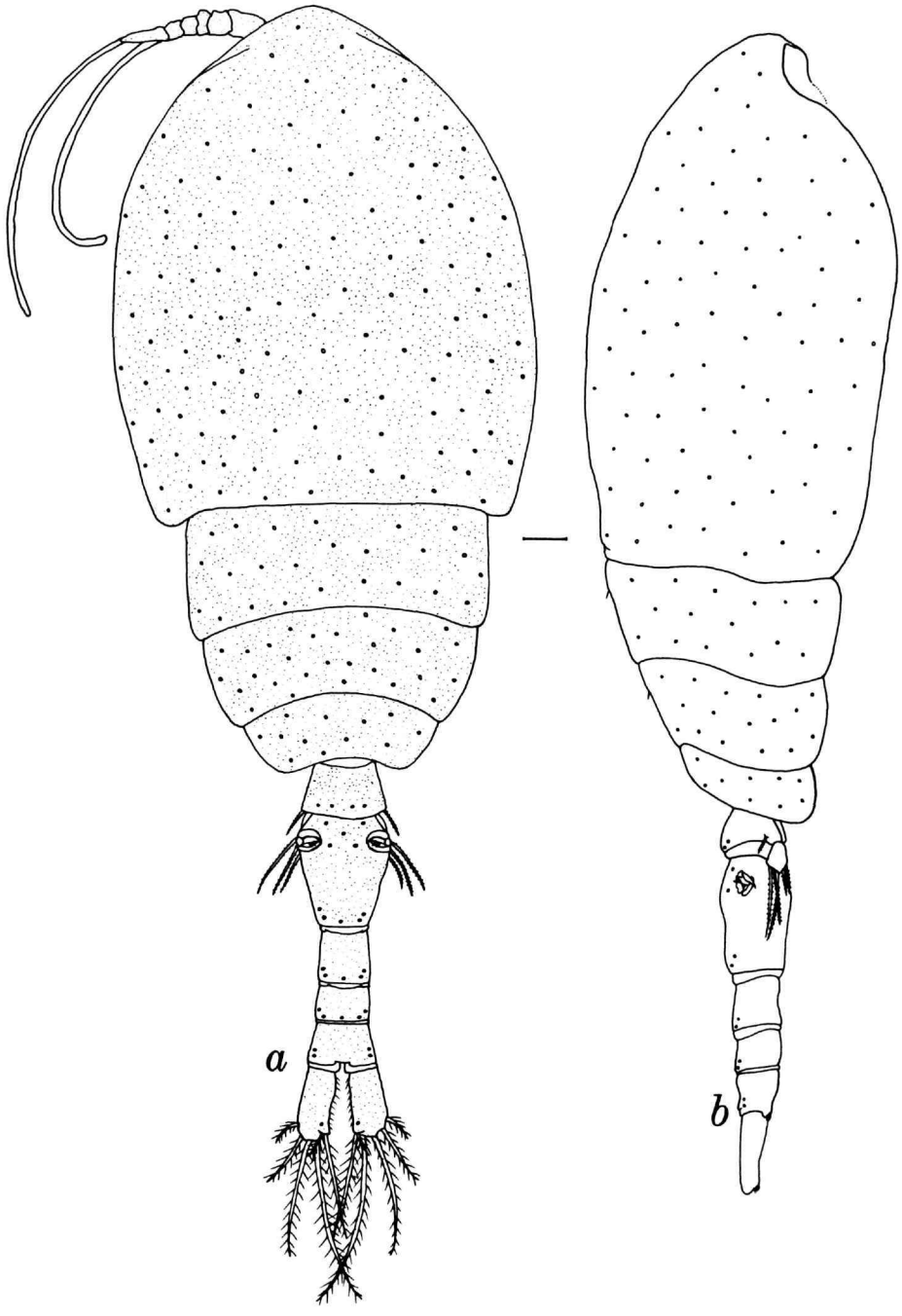


FIGURE 22.—*Ratania atlantica* female: *a,* habitus, dorsal view; *b,* habitus, lateral view.

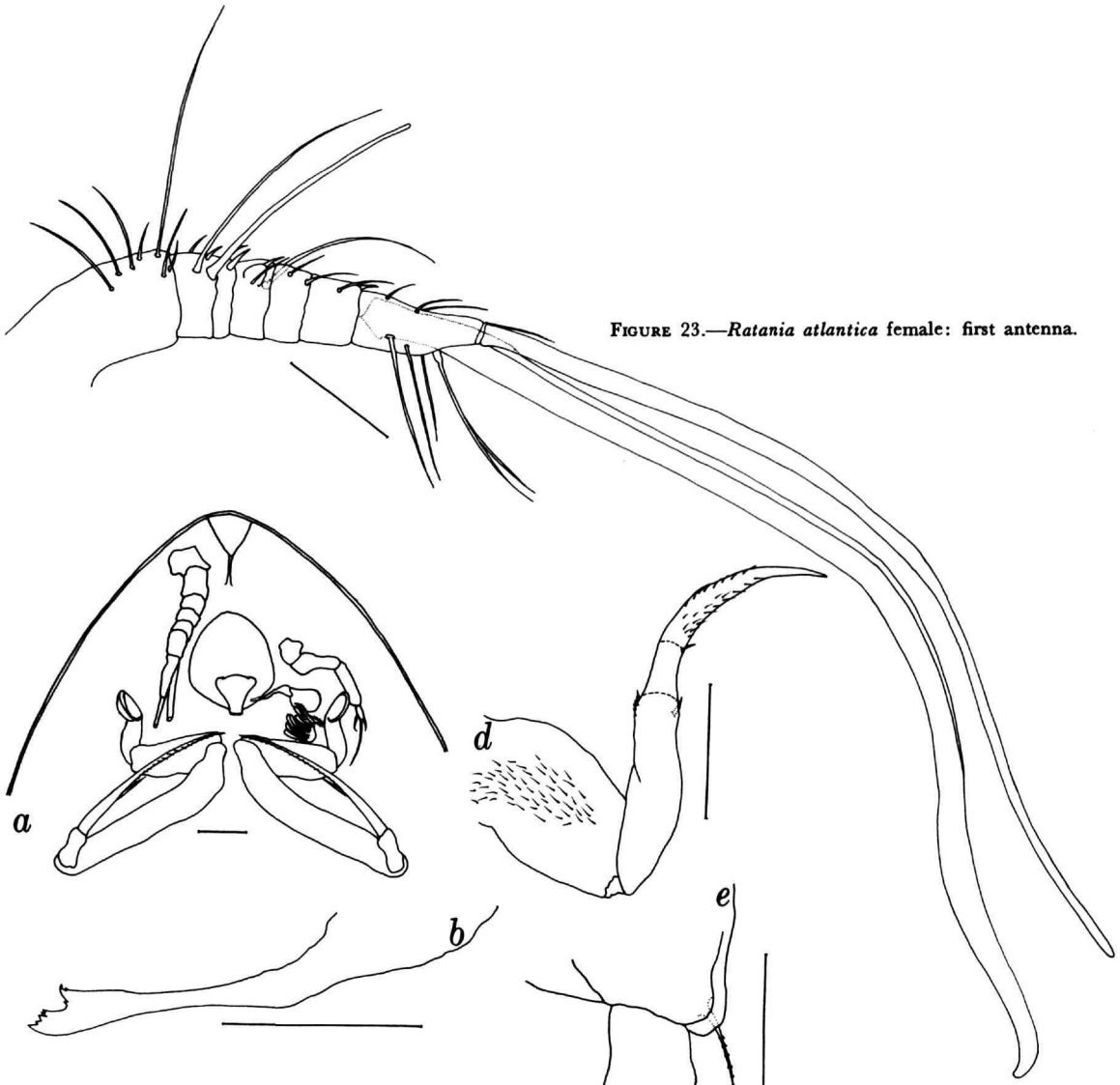


FIGURE 23.—*Ratania atlantica* female: first antenna.

FIGURE 24.—*Ratania atlantica* female: *a*, oral area, ventral view; *b*, mandible; *c*, first maxilla; *d*, second maxilla; *e*, leg 5.

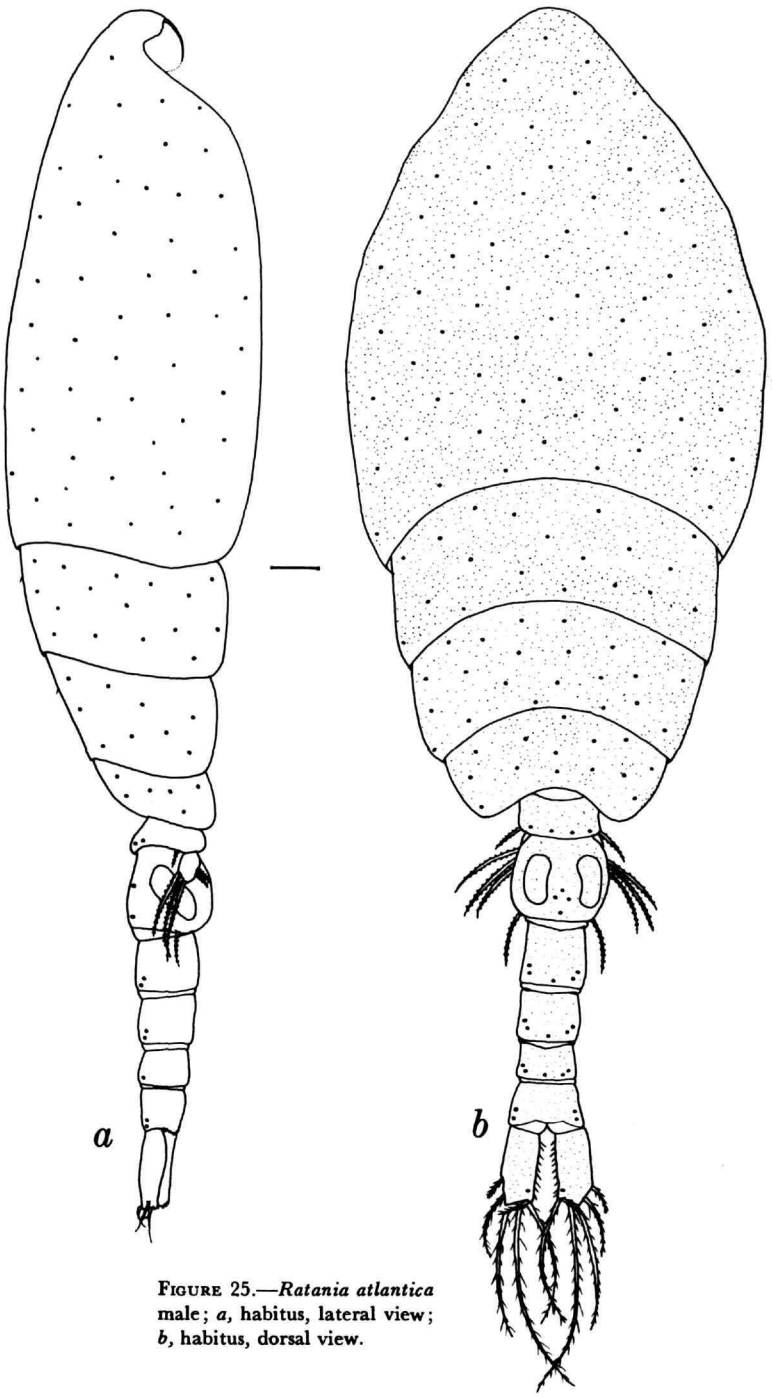


FIGURE 25.—*Ratania atlantica* male; *a*, habitus, lateral view; *b*, habitus, dorsal view.

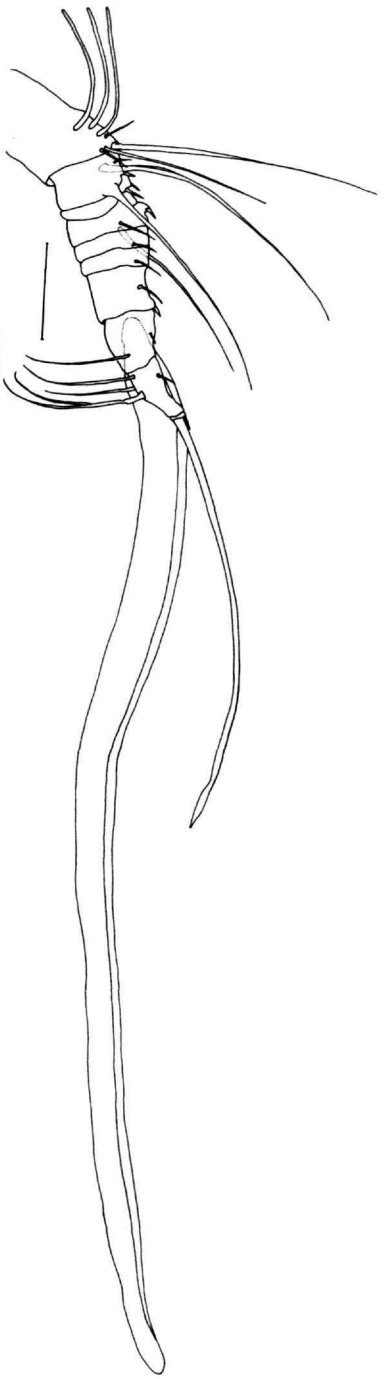


FIGURE 26.—*Ratania atlantica* male: first antenna.

Leg 6 (see Figure 22*a*) probably represented by ridge on anterior margin of opening of oviduct, bearing 2 small spines.

MALE.—Body (Figure 25) length 2.53 mm (mean of 5 specimens; range 2.43 to 2.62 mm). Prosome resembles that of female, more tapered anteriorly. Urosome 6-segmented; genital segment slightly wider than long. Refractile points scattered over prosome and urosome, as in female, and most body surfaces, appendages, and mouthparts densely covered with minute setules more conspicuous than on female. Rostral area similar to that of female.

First antenna (Figure 26) 9-segmented, nonclasping. Armature: segment I–4, 3 esthetes; II–3, 1 spine; III–1, 1 spine; IV–2, 1 spine; V–1; VI–1; VII–1, 1 spine; VIII–2, 1 esthete; IX–8, 1 esthete. Segments V–VI and VIII–IX correspond to segments V and VII in female. Dimorphism in male 1st antenna further expressed on segment I, where 3 esthetes replace 3 setae of female, and on segment II, where a long seta arises from site of esthete on female. In other respects, armature similar to corresponding areas of female, except for apparent lack of small seta on terminal segment.

Second antenna, labrum, mandible, 1st and 2nd maxillae, and maxilliped resemble those of female.

Legs 1–5 as in female.

Leg 6 ventrolateral on genital segment, armed with 1 seta.

DISTRIBUTION.—This record extends the distribution of *R. atlantica* to the Pacific Ocean. Previous records are of 1 female from the Bay of Biscay (Farran, 1926), 2 females from the Antarctic Ocean (Farran, 1929), 4 females, 1 male, and 1 juvenile from the Antarctic Ocean (Vervoort, 1957), and a few specimens from the Florida Current off Miami (Owre and Foyo, 1967).

Family PONTOECIELLIDAE

Pontoeciella abyssicola (T. Scott, 1894)

FIGURES 27–28

?Artotrogus abyssicolus T. Scott, 1894, pp. 128–129, pl. 12: figs. 5–9; pl. 14: figs. 11–18.

Pontoeciella abyssicola (T. Scott).—Giesbrecht, 1895, p. 186; 1899, pp. 20–22, 83, 105, pl. 5: figs. 15–27.—Farran, 1936, pp. 125–126, fig. 24.—Saraswathy, 1967, p. 89, fig. 2 [7–8].

Ratania sp. Rose, 1939, pp. 24–30, figs.

Carnegiella gracilis C. B. Wilson, 1942, p. 176, figs. 20–25.

Danodes plumata C. B. Wilson, 1942, pp. 182–183, figs. 57–68.—Olson, 1949, pp. 51–54, pl. 4: figs. 8–11.

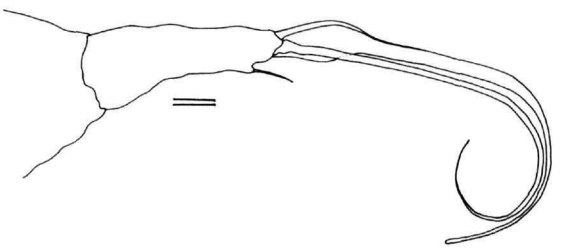


FIGURE 27.—*Pontoeciella abyssicola* female: first maxilla.

Carnegietta gracilis (C. B. Wilson).—Schmitt, *in* C. B. Wilson, 1950, pp. viii–ix.

Pontoeciella is close to the Ascomyzontidae, but *Pontoeciella* has no mandibular palp and fewer segments in female 1st antenna and 1st maxilla.

Giesbrecht (1899) and Farran (1936) have discussed the variable shape of the prosome and irregularities in the armature of the swimming legs of *P. abyssicola.*

Examination of C. B. Wilson's type specimens, deposited in the United States National Museum, confirmed Sewell's (1948) supposition that *Carnegietta gracilis* (C. B. Wilson, 1942) is the male and *Danodes plumata* C. B. Wilson, 1942, is the female *Pontoeciella abyssicola.* Armature is highly variable in this species, and several of Wilson's illustrations reflect this.

Records indicate a wide distribution and a variable length in female:

Author	*Location*	*Length, mm*	*Depth, m*
Scott (1894)	Gulf of Guinea	1.1	450–700
Giesbrecht (1899)	Naples	1.5	—
	Tropical Eastern Pacific	0.9–1.17	1000–1800
Farran (1926)	Bay of Biscay	1.15	200–750
Farran (1936)	Great Barrier Reef	0.7–0.93	0–580
Rose (1939)	Bay of Algiers	1.3	0–200
Wilson (1942)	Eastern and Central Pacific	1.25–1.45	0–100
Olson (1949)	Baja California Coast	0.90	0–800
Saraswathy (1967)	Trivandrum Coast	1.0	—
IPHC	Gulf of Alaska	1.65	850–1020

MATERIAL STUDIED.—1 female from sample 4; body length 1.65 mm.

FEMALE.—IPHC specimen and Scott's (1894) description of female appeared to be similar in most respects; both differ in some details from descriptions of Giesbrecht (1899) and Rose (1939): differences in proportion of urosomal segments; terminal spines of

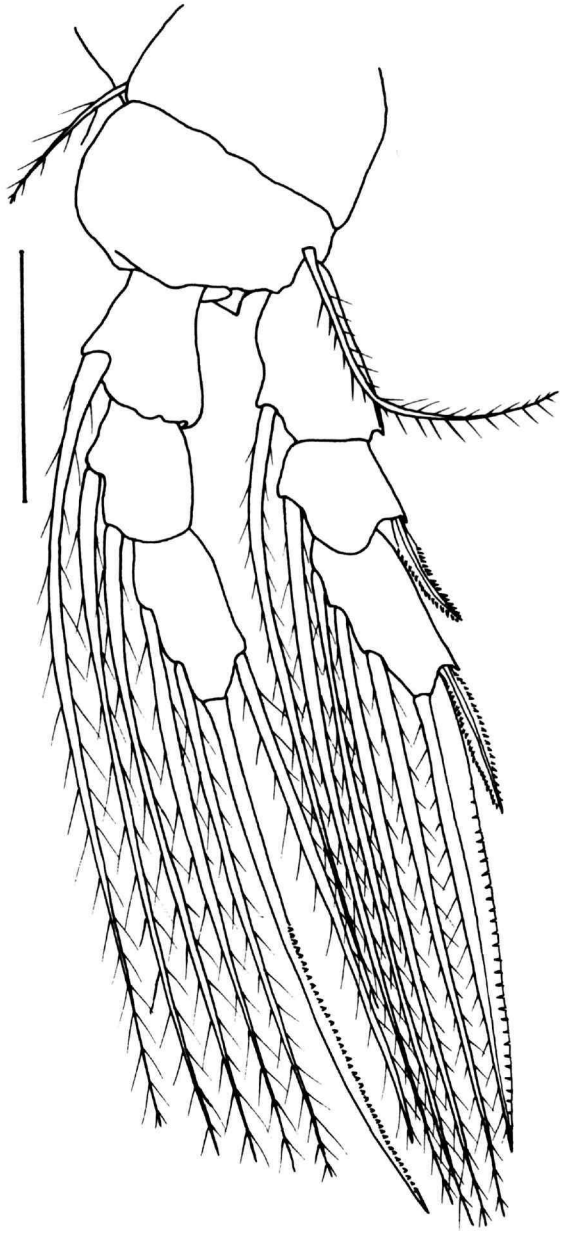


FIGURE 28.—*Pontoeciella abyssicola* female: leg 4.

2nd antenna vary in length and width; mandible straight rather than curved; claw of 2nd maxilla inclined 65° (also shown by Saraswathy, 1967, fig. 2[7]) rather than 90°; leg 3 exopod spines are slightly longer than on Giesbrecht's and Rose's illustrations; leg 4 shows differences in spine of exopod 2 and seta of protopod 2. Second maxilla of IPHC specimen with spine and 1st endopod of leg 1 with inner seta as described by Saraswathy (1967).

First maxilla (Figure 27) differs from illustrations of Scott (1894, pl. 14: fig. 14) and Giesbrecht (1899, pl. 5: fig. 22), which resembled each other. First maxilla of IPHC specimen 2-segmented with expanded basal segment. Apex of 2nd segment with 1 long seta arising within demisheathed expanded base of 2nd long, lashlike seta. Small subapical protrusion with short seta.

Leg 4 (Figure 28) showed some minor differences in armature from descriptions given by Scott and Giesbrecht.

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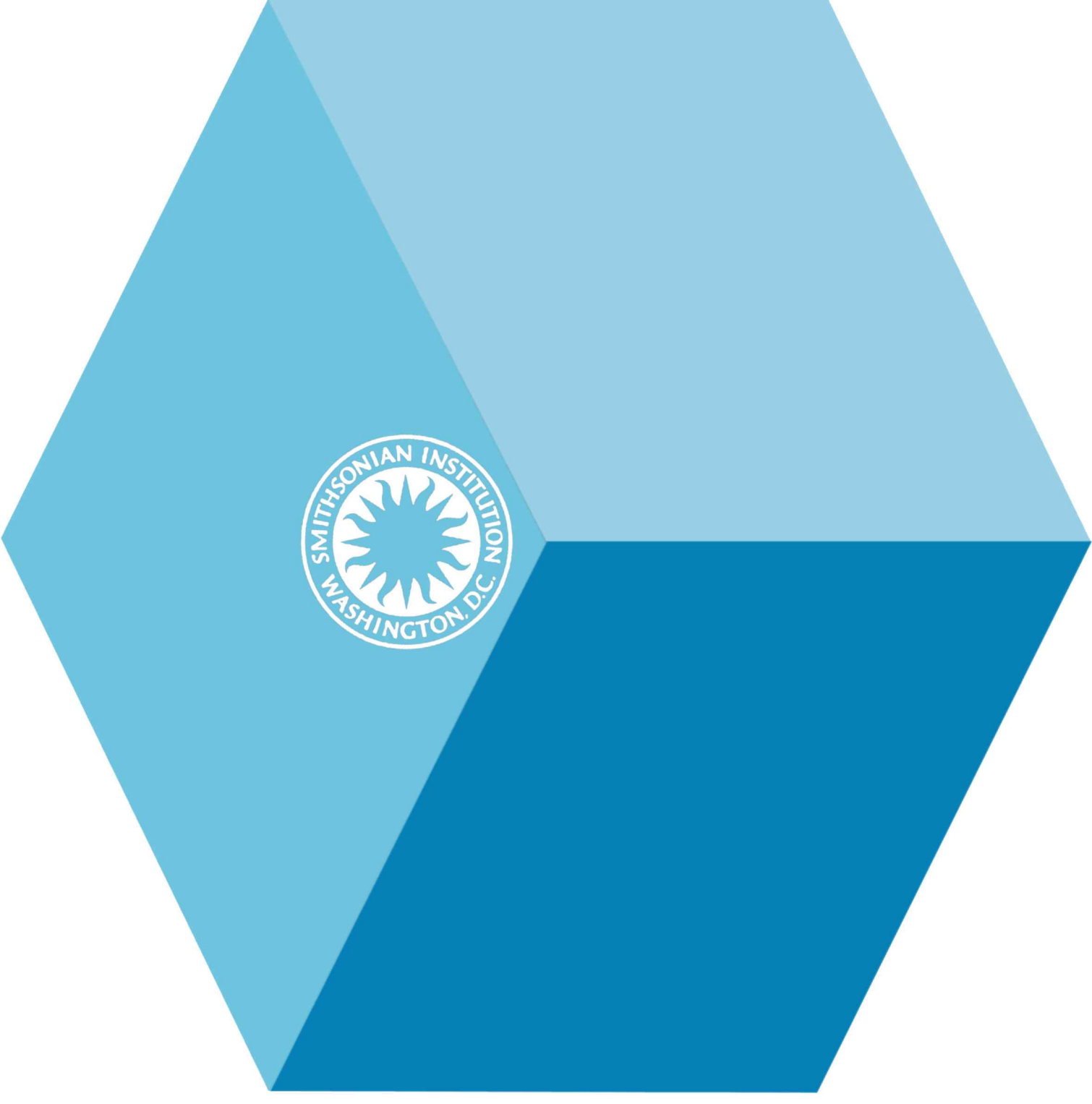
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