



Myodocopid Ostracoda of  
the Beaufort Sea, Arctic Ocean

LOUIS S. KORNICKER

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## ABSTRACT

Kornicker, Louis S. Myodocopid Ostracoda of the Beaufort Sea, Arctic Ocean. *Smithsonian Contributions to Zoology*, number 456, 40 pages, 19 figures, 3 tables, 1988.—Numerous bottom samples collected during 1971–1977 from the western half of the Beaufort Sea contained four species of myodocopid ostracodes, three new. The new species are described and illustrated, and a supplementary description is presented of *Philomedes brenda* (Baird, 1850) based on the specimens from the Beaufort Sea. The most abundant species is *P. brenda*, which is circumpolar. The new species are endemic to the Beaufort Sea. Of these *Scleroconcha ruffi* is common, and the remaining two are extremely rare (*Empoulsenia monothrix* and *Bathyleberis thrix*). Samples were collected at depths of 25–4200 m, but myodocopid ostracodes were not present deeper than 1926 m. Relative abundances of *P. brenda* and *S. ruffi* differed in August of the adjacent years 1976, 1977, at depths of 50–100 m, but not at depths of 25–40 m. Samples collected during October 1975, March, May, August, November 1976, and August 1977, suggest that *P. brenda* may be more abundant during March and May. Whether stations were with or without an ice cover seemed to have little effect on ostracode abundance. Females of both *P. brenda* and *S. ruffi* appear to bear eggs year-round. Species and genera between depths of 0–200 m (continental shelf and part of upper slope) in the Arctic and Antarctic are compared: Five of seven genera on the Arctic shelf also live on the Antarctic shelf (Simpson Index 71.4), but with no species in common. A hydrozoan colonizes the carapaces of some adult and ovigerous females of *Philomedes brenda*.

Four other taxonomic actions not directly pertinent to this study are taken: *Philomedes globosa digitiformis* Chavtur, 1983, is raised to species rank as *Philomedes digitiformis* Chavtur; *Asterope abyssicola* Sars, 1869, is recombined as *Prionotoleberis abyssicola* (Sars), *Asterope norvegica* Sars, 1869, is recombined as *Prionotoleberis norvegica* (Sars), and *Philomedes kadjakiensis* Chavtur, 1983, is referred to *Philomedes* species inquirenda.

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# Myodocopid Ostracoda of the Beaufort Sea, Arctic Ocean

*Louis S. Kornicker*

## Introduction

The Beaufort Sea forms that part of the Arctic Ocean that lies north of Alaska and Canada, eastward of Point Barrow and west of Banks Island and Prince Patrick Island. The Chukchi Sea lies to the west, the straits and channels between arctic islands to the east, and the main part of the Arctic Ocean to the north. A symposium volume entitled *The Coast and Shelf of the Beaufort Sea*, edited by John C. Reed and John E. Sater (1974) covers the oceanography, geology, meteorology, and some aspects of the biology and ecology of the area. A paper in that volume by Carey et al. (1974:665) discusses the 1971 samples from which some of the ostracodes in the present paper were obtained. Those specimens, as well as additional ostracodes from 1975–1977 samples, were collected by personnel of the School of Oceanography, Oregon State University, in a comprehensive research program under the direction of Dr. A.G. Carey, Jr. The area covered by samples (from 141°25'00" to 154°33'30"W) is roughly the western half of the Beaufort Sea. The samples were from depths of 25–4200 m, but myodocopid ostracodes were not present deeper than 1926 m. In the study area the continental shelf is narrow with the shelf break at 70 m, then a steep slope to a depth of 1647 to 2013 m, followed by a gentler slope to the floor of the Canadian Basin at 3470 m (Carey et al., 1974:666).

The samples herein from the Beaufort Sea were collected with a Smith-McIntyre bottom grab (SMG) covering 0.1 square meter; they are quantitative, although not strictly so, because some grabs may be more successful than others. Five grabs were collected at each station. Specimens of *Philomedes brenda* from sample SMG-0936-15 and *Scleroconcha ruffi* from sample SMG-1340-9 were returned to the University of Oregon. The remaining specimens have been deposited at the National Museum of Natural History, Smithsonian Institution, Washington, D.C., and have been assigned USNM collection

numbers. With the exception of USNM numbers listed under the appropriate species discussion and under the appropriate station in the appendix, specimens of *Philomedes brenda* have been assigned USNM 193311, and specimens of *Scleroconcha ruffi* have been assigned USNM 193310.

In a comprehensive study of the biota off Point Barrow (MacGinitie, 1955:147) two species of myodocopid ostracodes were listed (identification was credited to Willis L. Tressler). The specimens, which are in the USNM collections of the National Museum of Natural History, were examined, and the specific locality data are included in the appendix. Both species are present in the area of the Beaufort Sea sampled by the University of Oregon.

Included in the study are two samples collected in epibenthic sleds from bathyal depths in the Barents Sea by the Swedish YMER-80 expedition. The specimens have been returned to the Swedish Museum of Natural History. For comparative purposes, I studied syntypes of *Philomedes dentata* Poulsen (1962:349) from the Strait of Georgia (70 m) and off Lasqueti Island, west coast of Canada, and have presented a supplementary description of the species herein.

## DISTRIBUTION

*Philomedes brenda*.—The shallowest depth at which the species was collected in the Beaufort Sea is 27 m, but only 1 early instar was in a single sample. The species was absent in 3 additional samples from the same station, and also from 61 other samples from 11 other stations at depths of 21–30 m, indicating that it generally does not occupy those depths. Additional specimens were collected at depths of 33–35 m but the species does not become abundant until depths of 48 m. The species appears to reach maximum abundance between 50 and 100 m, but it is well represented to depths of 831 m. A single female (juvenile) was collected in a sample at 1000 m and a single juvenile male (A-1 instar) was collected at 1926 m. The species was absent from 9 additional samples (3 stations) at depths between 1000 and 2000 m, from 6 samples

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(3 stations) between 2000 and 3000 m; and from 5 samples (2 stations) between 3511 and 4200 m. Within depths of 50 and 830 m the species is well represented within the latitudes of 141°28' to 154°33'W covered by this study. (The samples without myodocopids are not shown in the appendix.)

In the Barents Sea specimens were collected in an epibenthic sled at a depth of 235–240 m (2 samples). The species was not collected in 5 epibenthic sled samples from greater depths (340–357 m, 350–360 m, 970–1020 m, 2400–2500 m, 3920 m), suggesting that it is absent at great depths here as well as in the Beaufort Sea.

*Philomedes dentata*.—According to Poulsen (1962:30), the species had been collected in the Strait of Georgia (70 m) and off Lasqueti Island (45 m), west coast of Canada.

*Scleroconcha ruffi*.—The shallowest depth at which the species was collected is 35 m and the deepest is 189 m. It is extremely sparse in samples east of about 148°W, and becomes more abundant west of 152°W. In the latter area samples were collected only between depths of 35–101 m; the species is fairly abundant between depths of 39–101 m. It was absent from samples deeper than 189 m containing *Philomedes brenda* and from very deep samples in which *P. brenda* was also absent.

*Empoulsenia monothrix*.—This species was represented in only 1 sample in the collection, at a depth of 101 m, in August 1977.

*Bathyleberis thrix*.—This species was represented in the collection in 2 samples from 53 m and 92 m, in August 1976, and in one sample from 225 m in August 1949. The 1949 sample was collected by MacGinitie (1955:72).

#### ABUNDANCE

Samples were taken (August 1976 and August 1977) when the sampling area was free of ice. At the shallowest station (PP-25) at a depth of 24–27 m myodocopids were absent during both years. At 38–40 m (sta PP-40) *P. brenda* was absent, and specimens of *Scleroconcha ruffi* were similar in number in both years. At a depth of 52–55 m (sta PP-55) the number of *P. brenda* was considerably higher in 1977, and that of *S. ruffi* was considerably lower. At a depth of 66–79 m (sta PP-70) the number of *P. brenda* was higher in 1977, whereas that of *S. ruffi* remained the same. At a depth of 83–101 m (sta PP-100) the number of *P. brenda* was higher in 1976 and that of *S. ruffi* was considerably lower. In 1976 at sta PP-55 the ratio of *P. brenda* to *S. ruffi* was about 3:4, whereas in 1977 at that station the ratio was reversed, at about 60:1. Although the data do not permit firm conclusions, they suggest that in this transect the relative abundance of each species changes little in adjacent years between depths of 25–40 m, but considerable changes may occur at depths of 50–100 m.

In the western transect the same five stations were sampled during October 1975, March, May, August, November 1976, and August 1977. Stations PP-40 and PP-70 were missed in October 1975, and sta PP-40 was missed in November 1976.

#### Specimens per Sample

	Sta PP-25 24–27 m 1976:1977	Sta PP-40 38–40 m 1976:1977	Sta PP-55 52–55 m 1976:1977	Sta PP-70 66–79 m 1976:1977	Sta PP-100 83–101 m 1976:1977
<i>P. brenda</i>	0:0	0:0	59:115	29:95	63:43
<i>S. ruffi</i>	0:0	15:18	78:2	1:1	3:36

At the shallowest station (PP-25) at depths of 24–27 m both *P. brenda* and *S. ruffi* were absent in all months sampled; the same holds for *P. brenda* at sta PP-40 at depths of 35–40 m. At the same station (PP-40) *S. ruffi* was more abundant in August of 1976 and 1977 than in other months (March, May 1976). At sta PP-55 (52–55 m) *S. ruffi* was most abundant in August 1976, whereas *P. brenda* shows no definite trend. At sta 70 (66–73 m) and sta 100 (83–102 m) *P. brenda* was more abundant in March and May than in other months. At sta PP-100 *S. ruffi* was extremely abundant in August 1977 but not in August 1976. The data suggest that at depths of about 70–100 m *P. brenda* might be more abundant during March and May, but otherwise they show no definitive trends attributable to the time of year samples were obtained. The transect was free of ice cover only during the August samples, but whether the stations were with or without an ice cover seemed to have little effect on ostracode abundance. (In the tabulation below "nd" indicates no data.)

#### Specimens per Sample

	Oct 1975	Mar 1976	May 1976	Aug 1976	Nov 1976	Aug 1977
Sta PP-25 (24–27 m)						
<i>P. brenda</i>	0	nd	nd	0	0	0
<i>S. ruffi</i>	0	nd	nd	0	0	0
Sta PP-40 (35–40 m)						
<i>P. brenda</i>	0	0	0	0	0	0
<i>S. ruffi</i>	nd	1	2	15	nd	18
Sta PP-55 (52–55 m)						
<i>P. brenda</i>	73	78	86	59	41	115
<i>S. ruffi</i>	5	1	2	78	2	2
Sta PP-70 (66–79 m)						
<i>P. brenda</i>	nd	172	155	29	94	95
<i>S. ruffi</i>	nd	2	1	1	5	1
Sta PP-100 (83–102 m)						
<i>P. brenda</i>	64	123	142	63	88	43
<i>S. ruffi</i>	11	9	3	3	2	36

About half (253) of the samples collected in the 1971–1977 collections from the Beaufort Sea contained myodocopids. Kornicker (1974:8) reported that 65 percent of samples collected in Discovery Bay and English Strait, Antarctica, and 8 percent of samples collected in Cape Cod Bay, North America, contained myodocopids. In those samples ostracodes were removed from the fraction retained on a 1.0 mm sieve,



whereas in the Beaufort Sea samples they were removed from the fraction retained on a 0.42 mm sieve. More juveniles would be collected in the latter samples, so the relative numbers in the areas are not directly comparable. Myodocopids are extremely rare between 1000–2000 m and seem absent below 2000 m. Therefore, if depths below about 1000 m in the Beaufort Sea are excluded, myodocopids are more widely distributed in the Beaufort Sea than in Cape Cod Bay and are about as abundant in the Beaufort Sea as in Discovery Bay and English Strait, Antarctica.

About 28 percent of the samples (each representing 0.1 square meter) with myodocopids contained 1–10 specimens of *P. brenda*, about 12 percent contained 11–20 specimens, about 12 percent contained 21–30 specimens, and lower percentages of samples contained higher numbers of specimens (Table 1). The largest number of specimens of *P. brenda* in a sample was 287, which is probably the largest number of a benthic myodocopid ever recorded in an area of 0.1 square meter. The same sample also contained 5 specimens of *S. ruffi*. About 33 percent of the samples contained 1–10 specimens of *S. ruffi*, about 11 percent contained 11–20 specimens, about 6 percent contained 21–30 specimens, and

lower percentages of samples contained higher number of specimens (Table 1). The largest number of specimens of *S. ruffi* in a sample was 48.

REPRODUCTION

Females of both *Philomedes brenda* and *Scleroconcha ruffi* appear to bear eggs year-round. No adult males of *P. brenda* were present in 10 samples (86 specimens) collected in June 1976. Adult males of *P. brenda* and *S. ruffi* are rare compared to ovigerous females; greater absence of males of the latter species could be in part the result of its having fewer total specimens in the collections. After copulation, sperm remains viable in the receptaculum seminalis of females; this allows production of fertile eggs without additional copulation. Thus the presence of eggs year-round does not indicate that mating takes place year-round. Evidence as to when mating occurs would require sampling the plankton for the presence of adult females having natatory setae on their 2nd antennae. In the North Sea and Skagerrak mating by *P. brenda* is confined to the period April–June (Apstein, 1911:168). Elofson (1969:156) found no ovigerous females of *P. brenda* in the benthos of the Skagerrak during April–July. This differs from the benthic samples in the Beaufort Sea listed in the following tabulation (+ indicates present; 0 indicates absent).

TABLE 1.—The frequency distribution of the number of specimens of *Philomedes brenda* and *Scleroconcha ruffi* in 252 samples (each 0.1 sq.m) in the Beaufort Sea.

Specimens per sample	<i>Philomedes brenda</i>		<i>Scleroconcha ruffi</i>	
	No. of samples	Total specimens	No. of samples	Total specimens
1–10	71	320	83	246
11–20	31	441	27	394
21–30	31	765	14	346
31–40	18	638	3	102
41–50	10	453	1	48
51–60	14	764	0	0
61–70	5	326	0	0
71–80	7	527	0	0
81–90	9	772	0	0
91–100	4	385	0	0
101–110	7	739	0	0
111–120	5	579	0	0
121–130	4	494	0	0
131–140	2	274	0	0
141–150	2	284	0	0
151–160	7	1093	0	0
161–170	1	168	0	0
171–190	1	176	0	0
191–200	1	197	0	0
201–210	1	210	0	0
211–220	0	0	0	0
221–230	1	222	0	0
231–280	0	0	0	0
281–290	1	287	0	0
Total	233	10,114	128	1136

	Aug 1971	Sep 1971	Oct 1975	Mar 1976	May 1976	Jun 1976	Aug 1976	Nov 1976	Aug 1977
<i>Philomedes brenda</i>									
Ovigerous females	+	+	+	+	+	+	+	+	+
Adult males	+	+	+	+	+	0	+	+	+
<i>Scleroconcha ruffi</i>									
Ovigerous females	+	+	+	+	+	0*	+	+	+
Adult males	0	0	0	0	+	0*	0	0	0

\*No specimens of *S. ruffi* in samples (10).

DIVERSITY

The Beaufort Sea samples produced 4 species (in 2 families, 2 subfamilies, and 4 genera), with 2 of the species being extremely sparse (total of 3 specimens). Diversity east and west of about 150°W differed: east of 150°W, 93 samples (93 percent) contained only 1 species and 7 samples (7 percent) contained 2 species; whereas west of 150°W, 48 samples (34 percent) contained 1 species, 91 samples (64 percent) contained 2 species, and 3 samples (2 percent) contained 3 species. In part, this could be a result of samples west of 150°W generally having more specimens. Four species were collected on the shelf between depths of 27–200 m, but only 1 species was collected below 200 m, and no species were collected deeper than 2000 m.

TABLE 2.—Distribution of benthic myodocopid ostracodes in Arctic seas arranged clockwise (depth in meters, + present, - absent, \* maximum depth at which species was collected).

Taxon	Beaufort Sea	Chukchi Sea	East Siberian Sea	Laptev Sea	Kara Sea	Barents Sea
<b>CYPRIDINIDAE</b>						
<i>Vargula norvegica</i> (Baird, 1860)	-	-	-	-	-	+
<b>PHILOMEDIDAE</b>						
<i>Philomedes brenda</i> (Baird, 1850)	27-1926	+	+	10-200	400*	+
<i>Philomedes lilljeborgii</i> (Sars, 1865)	-	-	-	-	-	+
<i>Scleroconcha lucasae</i> Chavtur, 1983	-	167*	-	-	-	-
<i>Scleroconcha ruffi</i> , new species	35-189	-	-	-	-	-
<b>CYLINDROLEBERIDIDAE</b>						
<i>Prionotoleberis abyssicola</i> (Sars, 1870), new combination	-	-	-	-	-	348
<i>Prionotoleberis norvegica</i> (Sars, 1869), new combination	-	-	-	-	-	-
<i>Bathyleberis kurilensis</i> (Chavtur, 1978)	-	1070*	-	-	-	-
<i>Bathyleberis thrix</i> , new species	53-225	-	-	-	-	-
<i>Empoulsenia monothrix</i> , new species	101	-	-	-	-	-
<i>Diasterope perseyiensis</i> Chavtur, 1983	-	-	-	-	-	163

Locality	Percent of Samples		
	1 species	2 species	3 species
East of 150°W	93	7	0
West of 150°W	34	64	2

#### BIOGEOGRAPHY

"Arctic Regions: The Arctic Ocean and lands in it and adjacent to it, about to lat. 70°N" (*Websters New Geographical Dictionary*, 1977:66). Chavtur (1983) has recently reported on the Myodocopa of temperate and cold waters of the northern hemisphere based to a large degree on collections by Russian vessels from many seas bordering the Arctic Ocean, but no samples were from the Beaufort Sea; thus, the present study adds to distributions reported by Chavtur (Table 2).

*Philomedes brenda* is circumpolar and the dominant species in the Arctic. In the Atlantic the species extends as far south as England in the east and Nova Scotia in the west (Kornicker, 1982:7). Chavtur (1983:24) described a new subspecies of *P. globosa* [= *brenda*] *digitiformis* from the Bering Sea, which I have raised to species rank herein (p. 6), as *Philomedes digitiformis* Chavtur. Except for that record by Chavtur, *P. brenda* is unknown from the Bering Sea. It is also unknown from the Pacific, although *P. dentata* Poulsen, 1962, described from specimens collected in the Vancouver Island area of Canada, could be *P. brenda*. The wide distribution of *P. brenda* throughout the Arctic and North Atlantic suggests that it probably will be found eventually in the Bering Sea and North Pacific.

Most species in the Norwegian and Barents seas also live in the vicinity of northern Europe (*Philomedes lilljeborgii*,

*Vargula norvegica*, *Prionotoleberis abyssicola* (new combination for *Asterope abyssicola* Sars 1869:359), *P. norvegica* (new combination for *Asterope norvegica* Sars, 1869:357)). These 4 species are absent from the distant Beaufort and Chukchi seas, which have species (*Scleroconcha ruffi*, *Bathyleberis kurilensis*, *B. thrix*) in genera that also live in the Bering and Okhotsk seas and in the northern Pacific. This suggests that the species of *Scleroconcha* and *Bathyleberis* in the Beaufort Sea were derived from genera from the Pacific.

The known distribution of members of the genus *Empoulsenia* suggests a bipolar distribution. *Empoulsenia monothrix* is described herein from the Beaufort Sea, and Chavtur (1983:80) reports *E. polythrix* from the Sea of Japan (only in the subarctic part), Okhotsk and Bering seas, and Pacific waters adjacent to the Kuril Islands and Kamchatka. The northernmost locality that the genus has been reported in southern oceans is 49°50'S in the subantarctic region of the Atlantic (Kornicker, 1975:501).

Five of the 7 genera on the Arctic shelf (0-200 m) have also been collected on the Antarctic shelf (Kornicker, 1975)(Table 3). The Simpson Index between the genera on the two shelves is a relatively high 71.4. Seventeen species (9 genera) have been collected on the Antarctic shelf and 11 species (7 genera) on the Arctic shelf, with no species in common. Also of significance are the taxa absent from both shelves although common on shelves in lower latitudes: families Rutidermatidae and Sarsiellidae; subfamilies Cyclasteropinae and Asteropterinae of the family Cyndroleberididae; subfamily Pseudophilomedinae of the family Philomedidae; and genus *Euphilomedes* in the subfamily Philomedinae. The absence of the Rutidermatidae and Sarsiellidae suggests that feeding type may be a factor, because those 2 families are carnivores,

TABLE 2.—Continued.

Taxon	White Sea	Norwegian Sea	Central Greenland Sea	Baffin Bay	Foxe Basin	Arctic Ocean
<b>CYPRIDINIDAE</b>						
<i>Vargula norvegica</i> (Baird, 1860)	—	375*	—	—	—	—
<b>PHILOMEDIDAE</b>						
<i>Philomedes brenda</i> (Baird, 1850)	+	500*	+	+	59–68	+
<i>Philomedes liljeborgii</i> (Sars, 1865)	—	150–680	—	—	—	—
<i>Scleroconcha lucasae</i> Chavtur, 1983	—	—	—	—	—	—
<i>Scleroconcha ruffi</i> , new species	—	—	—	—	—	—
<b>CYLINDROLEBERIDAE</b>						
<i>Prionotoleberis abyssicola</i> (Sars, 1870), new combination	—	220	—	—	—	—
<i>Prionotoleberis norvegica</i> (Sars, 1869), new combination	—	37–110	—	—	—	—
<i>Bathyleberis kurilensis</i> (Chavtur, 1978)	—	—	—	—	—	—
<i>Bathyleberis thrix</i> , new species	—	—	—	—	—	—
<i>Empoulsenia monothrix</i> , new species	—	—	—	—	—	—
<i>Diasterope perseyiensis</i> Chavtur, 1983	—	—	—	—	—	—

whereas families present on the shelves are either filter feeders, detritus feeders, or scavengers.

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TABLE 3.—Genera and numbers of species present on the Arctic and Antarctic shelves (0–200 m).

Taxon	Antarctic species	Arctic species
<b>CYPRIDINIDAE</b>		
<i>Vargula</i>	1	1
<i>Doloria</i>	2	0
<b>PHILOMEDIDAE</b>		
<i>Philomedes</i>	5	2
<i>Scleroconcha</i>	2	2
<b>CYLINDROLEBERIDAE</b>		
<i>Bathyleberis</i>	0	2
<i>Empoulsenia</i>	1	1
<i>Prionotoleberis</i>	0	2
<i>Diasterope</i>	1	1
<i>Homasterope</i>	3	0
<i>Parasterope</i>	1	0
<i>Skogsbergiella</i>	1	0

sent the specimens and supplied station data. Collections by A.G. Carey, Jr., were supported by the Minerals Management Service through an interagency agreement with the National Oceanic and Atmospheric Administration as part of the Alaskan Outer Continental Shelf Environmental Assessment Program and by NSF Grants GA-36679 and OCE75-14703. The specimens from the Barents Sea were obtained from the Swedish Museum of Natural History through Roy Olerod and Jarl-Ove Stromberg. I also thank the following people for their help: Dolores Hill, summer assistant from Mount Holyoke College, Massachusetts, for assistance in separating species in the numerous samples; Carolyn Gast for rendering the shaded drawings of the carapaces; Kathyryn Schroeder Brown and Jack Schroeder for assisting in preparation and inking of appendage drawings; I.G. Sohn and T.E. Bowman for reviewing the manuscript; Elizabeth Harrison for general assistance; and especially Anne C. Cohen for her considerable help in the initial phase of the work and Joan Horn for final editing and preparation of the manuscript for publication.

#### PHILOMEDIDAE Müller, 1906

The Philomedidae comprise 2 subfamilies, Philomedinae Müller, 1906, and Pseudophilomedinae Kornicker, 1967. Only the former is represented in the study area.

#### PHILOMEDINAE Müller, 1906

This subfamily is represented in the Beaufort Sea by 2 genera, *Philomedes* Liljeborg, 1853, and *Scleroconcha* Skogsberg, 1920.

***Philomedes* Liljeborg, 1853**

TYPE-SPECIES.—*Philomedes longicornis* Liljeborg, 1853:176 [= *Cypridina Brenda* Baird, 1850].

COMPOSITION.—This genus has numerous species but only *P. brenda* was collected in the Beaufort Sea. Chavtur (1983:11) described 8 species from the northwestern Pacific, 5 of them having several short pegs at the tip of the 7th limb characteristic of *P. brenda*: *P. subarcuata*, *P. brachystylus*, *P. vitjaziensis*, *P. hanai*, and *P. sagittata*. Chavtur (1983:40) also described from the northwestern Pacific a new subspecies of *P. brenda*: *P. globosa* (= *brenda*) *digitiformis*. I herewith raise the subspecies to species rank as *P. digitiformis* Chavtur, because

the digitate peg of the 7th limb is sufficiently unusual among species of the genus to warrant the action. Chavtur (1983:56) described from the vicinity of Kodiak Island (Aleutians) a new species, *P. kadjakiensis*, based on a single instar II. At that early stage the 7th limb is bare. I herewith refer the species to *Philomedes* species inquirenda.

DISTRIBUTION.—Eight species were reported by Chavtur (1983) from the northwestern Pacific, mainly from the vicinity of the Sea of Japan, the Sea of Okhotsk, and the Bering Sea, but only 2 species have been reported from similar latitudes along the western coast of North America (*P. kadjakiensis*, *P. dentata* Poulsen, 1965), and only 1 species (*P. brenda*) is known in the Beaufort Sea. The specimens from these areas were collected at shelf and slopes depths.

**Key to Adult Females of Certain Species of *Philomedes* in Northern Oceans**

(with 4 or more short pegs opposite the comb of the 7th limb)

1. Dorsal margin of mandibular basale with 6 bristles . . . . . *P. vitjaziensis*  
Dorsal margin of mandibular basale with 4 bristles . . . . . 2
2. Tip of Bellonci organ with pointed tip . . . . . *P. subarcuata*  
Tip of Bellonci organ broadly or narrowly rounded . . . . . 3
3. Tip of 7th limb with 12–15 comb teeth . . . . . *P. brachystylus*  
Tip of 7th limb with 7–10 comb teeth . . . . . 4
4. Tip of 7th limb with 10 comb teeth . . . . . *P. sagittata*  
Tip of 7th limb with 7–9 comb teeth . . . . . 5
5. Tip of 7th limb with 4 short pegs (and 1 longer peg) . . . . . *P. hanai*  
Tip of 7th limb with 6–9 short pegs (and 1 longer peg) . . . . . 6
6. Long peg of 7th limb digitate . . . . . *P. digitiformis*, new rank  
Long peg of 7th limb smooth . . . . . 7
7. Midwidth of posteroventral infold of valve with no more than 8 bristles . *P. brenda*  
Midwidth of posteroventral infold with 10 or more bristles . . . . . *P. dentata*

***Philomedes brenda* (Baird, 1850)**

FIGURES 1–9a

*Cypridina Brenda* Baird, 1850:181, pl. 23 [see Kornicker, 1982:3, for comprehensive synonymy].

*Philomedes globosa*.—MacGinitie, 1955:68, 72, 148.

*Philomedes globosa globosa*.—Chavtur, 1983:41.

Not *Philomedes globosa digitiformis* Chavtur, 1983:40.

LECTOTYPE.—Dried and broken carapace in British Museum (Natural History), B.M. no. 1945.9.26 91; by subsequent designation (Silvester-Bradley, 1950:777).

MATERIALS.—For Beaufort Sea and Bering Sea material see appendix.

DISTRIBUTION.—Collected in the Beaufort Sea at shelf and upper slope depths (27–1926 m). Widespread in the Arctic Ocean and in the North Atlantic (to 54°N in eastern Atlantic, and 44°N in western Atlantic). Generally collected at shelf and upper slope depths. During breeding season adults also collected in plankton.

SUPPLEMENTARY DESCRIPTION OF ADULT FEMALE (Figures 1–5a–c, 9a).—Carapace oval in lateral view with ventral margin more convex than dorsal margin; truncate prominent rostrum with anterior margin with minute protuberance on ventral corner; incisur deep; posteroventral corner evenly rounded or with minute projecting caudal process (Figures 1–3a,c–f).

Ornamentation (Figures 1, 2, 3d–f): Anteroventral margin just posterior to incisur with lip having minute projection at

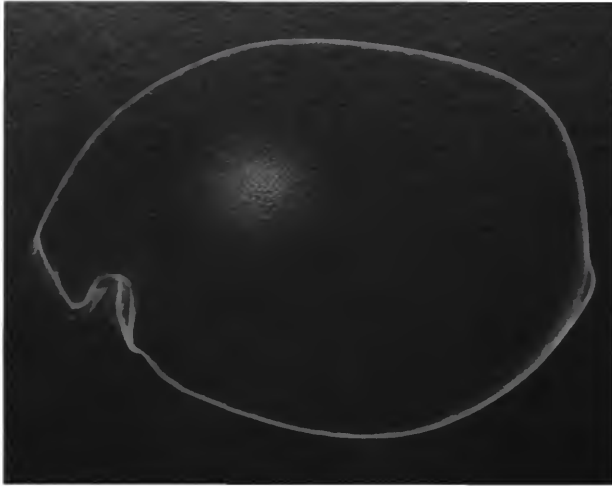


FIGURE 1.—*Philomedes brenda*, USNM 157836, ovigerous female, length 3.06 mm, lateral view of complete specimen (bristles not shown).

ventral end extending slightly past valve margin; valve surface with closely spaced oval fossae and abundant short pointed bristles; longer bristles sparsely distributed on valve.

Infold (Figure 3c,d,f): Rostral infold with 20–23 setose bristles forming row paralleling dorsal, anterior, and ventral margins of rostrum; 1 small bristle near middle of infold posterior to inner end of incisur; 15 spinous bristles present forming row at anterior end of ventral margin starting just posterior to minute projection at ventral end of lip posterior to incisur; infold of caudal process without “pocket” but with 3–7 minute bristles mostly forming row; many bristles (single or in groups of 3 or 4) present along inner edge of posteroventral and posterior infold; anteroventral infold with about 11 ridges parallel to margin.

Selvae (Figures 1, 9a): Fringed lamellar prolongation present along anterior, ventral, and posterior margins, but fringe absent in immediate vicinity of caudal process; selvae divided at inner end of incisur.

Central Adductor Muscle Attachments (Figure 3b): Consisting of about 14 individual ovoid attachments.

Size: USNM 157832, length 2.86 mm, height 2.01 mm; USNM 157836, length 3.06 mm, height 2.27 mm; USNM 158230, 4 ovigerous females: length 2.94 mm, height 2.07 mm; length 2.85 mm, height 1.97 mm; length 2.90 mm, height 2.09 mm; length 2.80 mm, height 1.93; USNM 157836, length 3.06 mm, height 2.27 mm.

First Antenna (Figure 4a): 1st and 2nd joints with long hairs and spines. 2nd joint with 3 spinous bristles (1 ventral, 1 dorsal, 1 lateral). 3rd joint short, with 3 spinous bristles (1 ventral, 2 dorsal). 4th joint long, with 5 spinous bristles (4 ventral, 1 dorsal). Sensory bristle of long 5th joint with 5 short marginal filaments and 5 longer terminal filaments. Medial bristle of 6th joint spinous. 7th joint: a-bristle spinous, about one-third longer than bristle of 6th joint; b-bristle with 1

proximal filament and 4 longer terminal filaments, about one-fourth longer than a-bristle; c-bristle with 5 short marginal filaments and 5 longer terminal filaments, almost same length as sensory bristle of 5th joint. 8th joint: d- and e-bristle bare with blunt tips, both longer than b-bristle; f-bristle with 4 short marginal filaments and 5 terminal filaments, about same length as c-bristle; g-bristle with 3 marginal filaments and 5 terminal filaments, about same length as sensory bristle.

Second Antenna (Figure 3g,h): Protopodite bare. Endopodite 2-jointed: 1st joint with 5 proximal bristles and 1 distal bristle; 2nd joint elongate with 1 spinous proximal bristle and 1 recurved, bare, terminal bristle (Figure 3g). Exopodite: 1st joint elongate with minute medial terminal bristle with open tip; bristles of joints 2–5 fairly short, bare; bristles of joints 6–8 broken (remaining part bare); 9th joint with 7 bristles (4 long, broken, 1 medium length, broken, 1 short, complete, with long marginal hairs, 1 very small, complete, bare); joints 2–8 with spines along distal edges; small basal spines present on joints 2–8; lateral spine not observed on 9th joint (Figure 3h).

Mandible (Figure 5a): Coxale endite hirsute, bifurcate, pectinate, with minute bristle near base. Basale: medial surface spinous, and with 3 pectinate bristles and 3 slender spinous bristles proximally near middle part of joint; ventral margin with 7 spinous bristles; dorsal margin with 2 single bristles near middle and 2 terminal. Exopodite about three-fourths length of dorsal margin of 1st endopodial joint, hirsute distally, terminating in spinous pointed tip, with 2 inner bristles near tip (distal of these shorter than other or both about same length). 1st endopodial joint with 4 ventral bristles. 2nd endopodial joint: dorsal margin with 9 bristles forming 2 or 3 groups; ventral margin with bristles forming 2 distal groups, 3 bristles in each group; medial surface with spines. End joint with 3 claws (shortest of these with few medial teeth, others with few lateral teeth), and 4 bristles.

Maxilla: Dorsal margins of precoxale and coxale with fringe of long hairs; coxale with hirsute dorsal bristle. Basale with 3 long bristles along distal margin. Exopodite small with short proximal bristle with few long hairs, and 2 terminal bristles, both with few long hairs. 1st endopodial joint with 1 alpha-bristle with few long hairs, and 4 beta-bristles with few long hairs (outer of these tending to be claw-like, with few short spines). End joint with several pectinate claw-like bristles and several annulate bristles. 3 endites with numerous pectinate and ringed bristles.

Fifth Limb (Figures 3i, 4b,c): Endites I to III with numerous bristles. 1st exopodial joint: main tooth consisting of 3 pectinate teeth followed by smooth peg-like tooth; anterior protuberance of largest of the main teeth smooth, rounded; anterior edge of joint with 2 bristles (outer of these with long hairs followed by short spines; inner bristle with short marginal spines); short stout bristle with hairs near base present on anterior side of outer corner of joint (Figure 4b). 2nd exopodial joint consisting of large flat tooth with 2 protuberances along inner margin; posterior side with small bristle near outer corner (Figure 3i). Inner lobe of 3rd exopodial joint with 3 bristles;

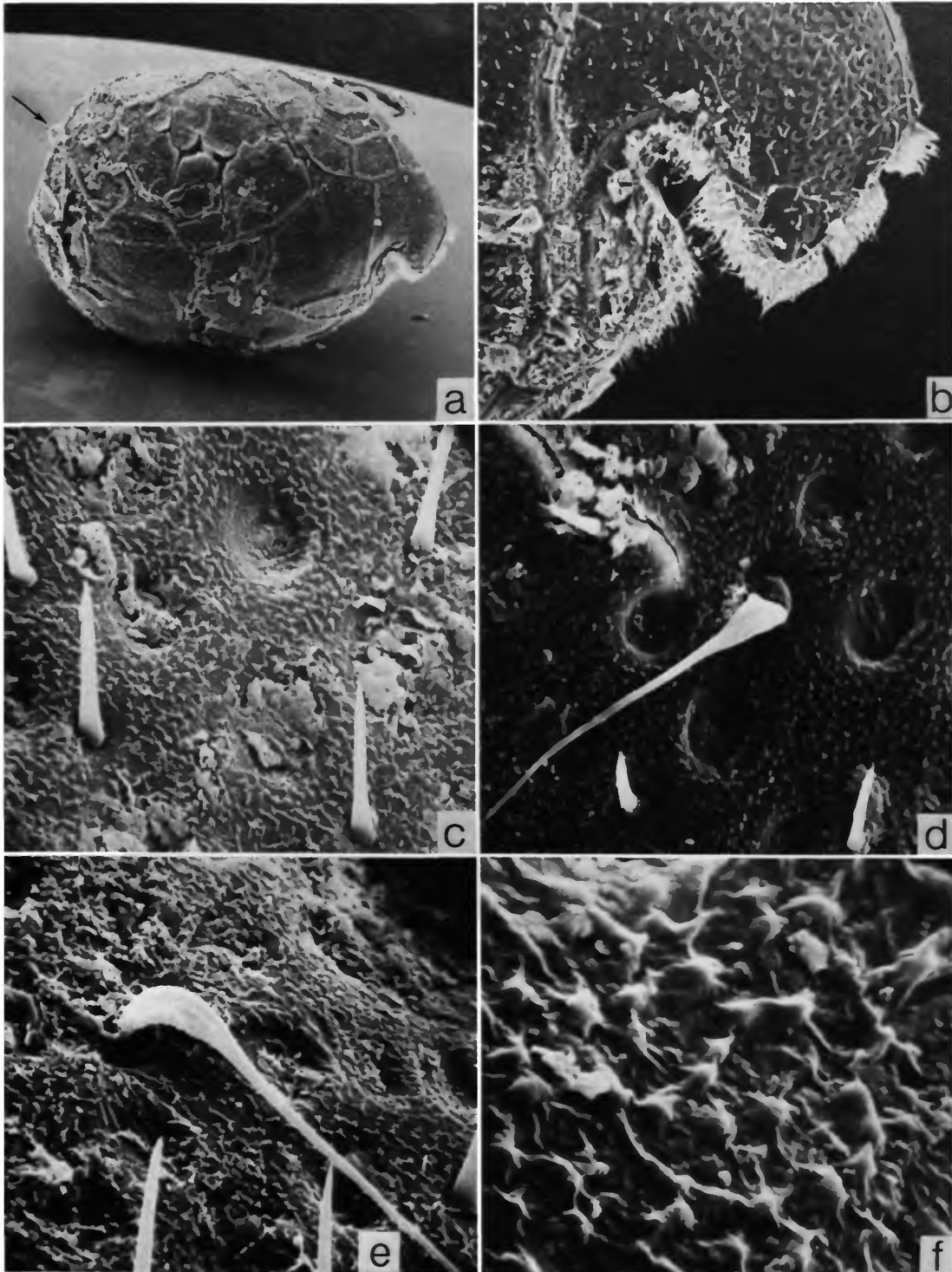


FIGURE 2.—*Philomedes brenda*, USNM 158466, adult female, length about 3 mm, outside views of right valve: *a*, complete valve with filiform hydrorhiza and polyp (arrow),  $\times 33$ ; *b*, rostrum and incisor,  $\times 110$ ; *c,d,e*, details from *a* showing fossae and short and long bristles,  $\times 1300$ ,  $\times 950$ ,  $\times 1400$ , respectively; *f*, detail from *c* showing irregular surface between fossae (surface may be an artifact of drying),  $\times 6500$ . Photograph reduced to 81 $\frac{1}{2}$ %.



FIGURE 3.—*Philomedes brenda*, USNM 157832, ovigerous female, length 2.86 mm: *a*, outline of complete specimen; *b*, outside view of central adductor muscle attachments of right valve, anterior to right; *c*, inside view of rostrum of left valve; *d*, inside view of caudal process of left valve; *e*, inside view of tip of rostrum and incisur of right valve (bristles not shown); *f*, inside view of caudal process of right valve; *g*, endopodite of right 2nd antenna, medial view; *h*, exopodite of right 2nd antenna, lateral view (bristles omitted); *i*, distal part of left 5th limb, posterior view; *j, k*, tip of 7th limb.



FIGURE 4.—*Philomedes brenda*, USNM 157832, ovigerous female, length 2.86 mm: *a*, left 1st antenna, medial view; *b*, distal end of right 5th limb, anterior view; *c*, detail of 1st and 2nd exopodal joints of left 5th limb (from Figure 3f); *d*, left 6th limb, medial view. *e*, USNM 158417, ovigerous female, length of left valve 2.86 mm, medial eye and Bellonci organ.



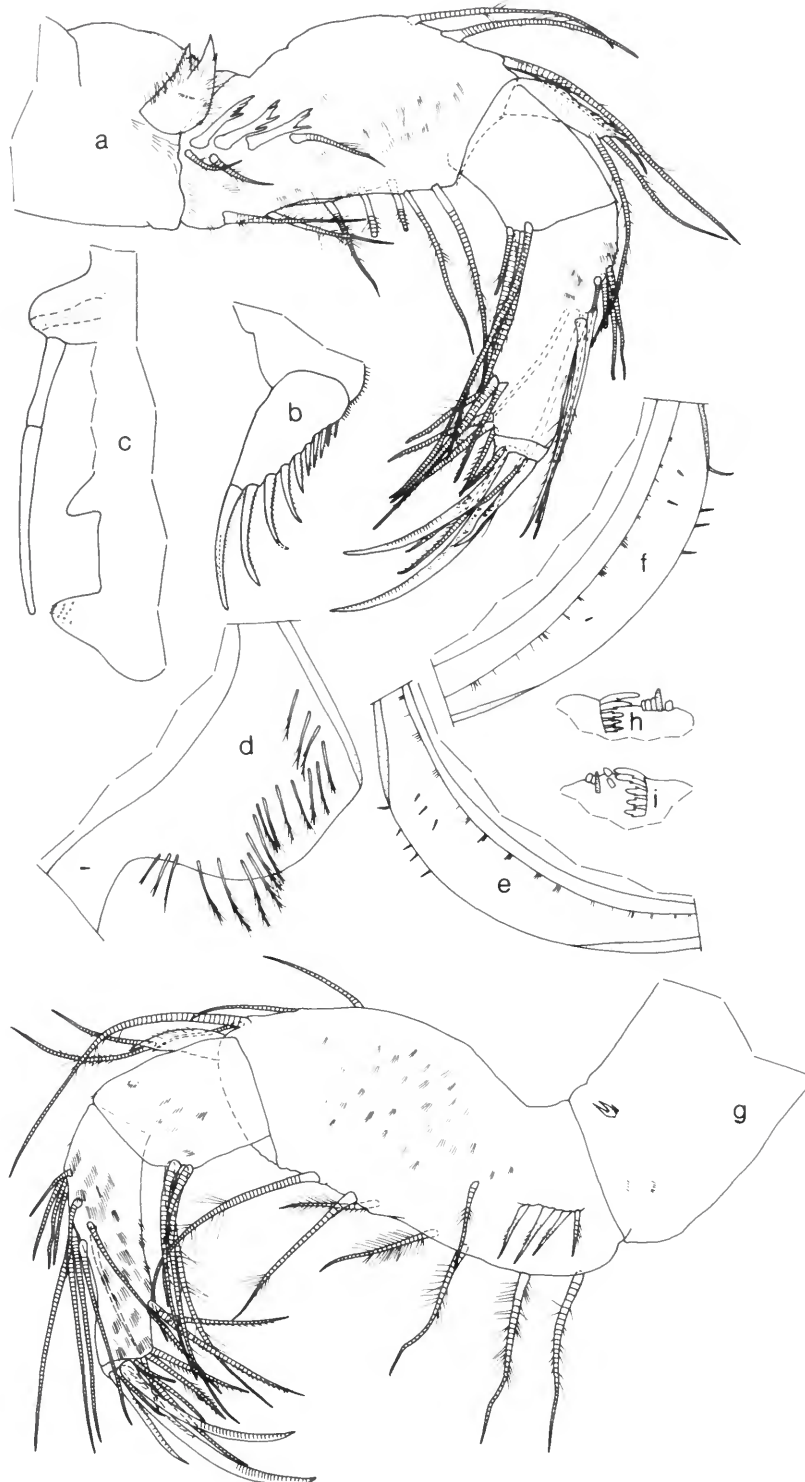


FIGURE 5.—*Philomedes brenda*, USNM 157832, ovigerous female, length 2.86 mm: *a*, left mandible, medial view; *b*, left furcal lamella, lateral view; *c*, anterior of body from left showing medial eye, Bellonci organ, anterior process, and upper lip. USNM 157834A, adult male, length 2.89 mm: *d*, inside view of rostrum of left valve; *e*, inside view of caudal process of left valve; *f*, inside view of caudal process of right valve; *g*, right mandible, medial view; *h*, *i*, tips of 7th limbs.

outer lobe with 2 hirsute bristles. 4th and 5th joints fused, with total of 6 bristles with long proximal and short distal spines. Epipodial appendage with about 57 bristles.

Sixth Limb (Figure 4d): 4 hirsute bristles in place of epipodial appendage. Endite I with 3 bristles (1 long, 2 short) with long marginal hairs; endite II with 1 proximal and 3 terminal bristles; endite III and IV each with 1 proximal and 8 terminal bristles. End joint with about 27 spinous bristles.

Seventh Limb (Figure 3j,k): Each limb with 34 bristles; peg side with 20 or 21 bristles (7 or 8 on terminal segment, 13 on proximal segments); comb side with 13 or 14 bristles (3 or 4 on terminal segments, 10 on proximal segment). Each bristle with up to 8 distal bells and marginal spines proximal to bells. Terminus consisting of comb with 9 alate teeth opposite 8 short pegs and 1 slightly longer sclerotized peg; sclerotized peg located just outside shorter pegs.

Furca (Figure 5b): Each lamella with 10 claws decreasing in length and width posteriorly along lamella; claw 1 with lateral and medial teeth forming row along posterior edge; lateral row with teeth of fairly uniform size; medial row with about 4 or 5 large distal teeth and smaller proximal teeth; remaining claws with teeth along posterior margins; the proximal 5 smaller claws also with spines along anterior margin; hairs present at base of claws and on margin of lamellae following claws.

Bellonci Organ (Figures 4e, 5c): Elongate with suture proximal to middle and rounded tip.

Eyes: Lateral eyes minute, unpigmented. Medial eye with brown pigment (Figures 4e, 5c).

Upper Lip (Figure 5c): Typical for genus.

Anterior of Body (Figure 5c): Single rounded process present between medial eye and upper lip.

Posterior of Body: Hairs forming rows dorsal to furca (Figure 5b).

Y-Sclerite: Typical for genus.

Eggs: USNM 157832 with 20 eggs in marsupium; USNM 157836 with 11 eggs.

**DESCRIPTION OF ADULT MALE (Figures 5d-i, 6-8).**—Carapace more elongate than that of adult female; ventral margin of rostrum forming right angle with anterior margin of valve ventral to rostrum; anteroventral corner of rostrum rounded; incisur much broader than that of female; caudal process narrow, evenly rounded (Figure 6).

**Ornamentation:** Surface with small shallow fossae, and widely scattered long bristles, some with broad base: bristles more numerous near posterior end of valves; ventral edge of valves with long slender bristles without broad bases; short pointed bristles (abundant on female valves) fairly sparse on male; 3 or 4 short bristles present along posterior edge of caudal process (Figure 5e,f).

**Infold:** Infold of rostrum with 19 bristles forming row parallel to outer edge of rostrum (Figure 5d); 1 small bristle present on infold just ventral to inner end of incisur (Figure 5d); anteroventral infold with 10 or 11 bristles forming row parallel to valve margin; infold along middle of ventral margin



FIGURE 6.—*Philomedes brenda*, USNM 157837, adult male, length 3.08 mm, lateral view of complete specimen (bristles not shown).

bare; numerous small slender bristles forming groups (1-4 bristles per group) present along narrow posteroventral and posterior list; infold of caudal process with 3 small bristles between list and valve edge (Figure 5e,f).

**Selvage (Figure 6):** Similar to that of female, except lamella prolongation having bare margin along only dorsal half of caudal process.

**Size:** USNM 157837, length 3.08 mm, height 1.87 mm; USNM 157834A, length 2.89 mm, height 1.81 mm; USNM 157834B, length 3.04 mm, height 1.79 mm; USNM 158418, length 2.87 mm, height 1.45 mm; USNM 158424, length 2.95 mm, height 1.66 mm; USNM 158420, 2 specimens: length 2.80 mm, height 1.69 mm; length 3.00 mm, height 1.73 mm.

**First Antenna (Figure 7a):** 1st joint with lateral hairs. 2nd joint with medial and lateral hairs and spines, and 2 bristles (1 lateral, 1 ventral). 3rd joint short, with medial spines forming rows, and 5 bristles (4 ventral, 1 dorsal). 5th joint wedged ventrally between 4th and 6th joints; sensory bristle with abundant filaments on proximal two-thirds, and about 5 terminal filaments. 6th joint with spinous medial bristle near dorsal margin. 7th joint: a-bristle about same size as bristle of 6th joint; b-bristle about one-third longer than a-bristle, with 3 marginal filaments (the distal of these subterminal), and 4 terminal filaments; c-bristle extremely long, with 12 short marginal filaments. 8th joint: d- and e-bristles bare, longer than b-bristle, with blunt tips; f-bristle similar to c-bristle; g-bristle about one-fourth longer than b-bristle, with 3 proximal and 5 terminal filaments.

**Second Antenna:** Protopodite bare. Endopodite 3-jointed (Figure 7b): 1st joint with 6 short bristles; elongate 2nd joint with 3 bristles near middle; elongate 3rd joint reflexed on 2nd, with 1 short proximal bristle, and ridged tip with 2 small bristles. Exopodite: long 1st joint with faint spines forming rows, but without small medial bristle on distal margin; 2nd joint about one-half length of 1st joint, with slender bristle (with few spines) having tip reaching 4th to 6th joint; 3rd joint about



FIGURE 7.—*Philomedes brenda*, USNM 157834A, adult male, length 2.89 mm: *a*, left 1st antenna, medial view; *b*, endopodite of left 2nd antenna, medial view; *c*, distal part of 5th limb; *d*, posterior of body from left showing left lamella of furca, outline of copulatory organs, and left Y-sclerite; *e*, anterior of body from right showing lateral eye, medial eye, Bellonci organ, upper lip.



FIGURE 8.—*Philomedes brenda*, USNM 157834A, adult male, length 2.89 mm: a, maxilla; b, exopodite of maxilla; c, left 6th limb, medial view.

one-third longer than 2nd joint; joints 3–8 with long natatory bristles; 9th joint with 6 bristles (4 long, 2 short) all with long hairs; joints 2–8 with slender basal spines (basal spine of 8th joint almost as long as 9th joint).

**Mandible (Figure 5g):** Coxale endite consisting of small bifurcate process; minute bristle present near base of endite. Basale: dorsal margin with 4 bristles (1 near middle, 1 distal to middle, 2 subterminal); medial surface spinous, with 4 or 5 bristles in proximal ventral corner, and 1 closer to middle; ventral margin with 7 bristles, some with bases on lateral side. Exopodite hirsute, with 2 subterminal bristles. 1st endopodial joint with 4 spinous ventral bristles, and spines on medial surface. 2nd endopodial joint: medial surface with long spines forming rows; middle of dorsal margin with 10 or 11 bristles (some with bases on medial and lateral sides); ventral margin with 2 distal groups of bristles with short marginal spines (each group with 3 bristles). 3rd endopodial joint with 3 claws (with proximal ventral spines), and 4 ringed bristles.

**Maxilla (Figure 8a,b):** Limb reduced. Endite I with 10 hirsute ringed bristles; endite II obscure, with about 8 hirsute, mostly ringed, bristles; endite III longer than others, with about 8 hirsute bristles (at least 2 without rings). Precoxale and coxale with fringed dorsal margin; coxale with stout hirsute dorsal bristle. Basale with 3 hirsute distal bristles (1 medial, near dorsal margin, 1 medial and 1 lateral, both near ventral margin). Exopodite small, with 3 hirsute bristles (2 long, 1 short) (Figure 8b). Endopodite: 1st joint hirsute, with 1 hirsute alpha-bristle, and 4 hirsute beta-bristles; end joint with 11 or 12 weakly developed bristles, mostly bare.

**Fifth Limb (Figure 7c):** 1st endite with about 4 bristles; endites II and III each with about 7 bristles (not shown on illustrated limb). 1st exopodial joint with 1 stout, flat, hirsute, unringed bristle, and 1 slender ringed bristle. 2nd exopodial joint with stout, flat, hirsute, terminal process (appearing sclerotized at tip), 2 slender distal bristles, and 2 or 3 proximal bristles. 3rd exopodial joint with 3 (possibly 4) slender bristles on inner lobe and 2 stout hirsute bristles on outer lobe. 5th + 6th joints with clusters of hairs and 6 bristles. Epipodial appendage with about 60 bristles.

**Sixth Limb (Figure 8c):** Endite I with 2 bristles; endite II with 4 bristles (1 proximal, 3 terminal); endite III with 9 bristles (1 proximal, 8 terminal); endite IV with 8 or 9 bristles (1 proximal, 7 or 8 terminal). End joint with 21 bristles. 3 bristles in place of epipodial appendage.

**Seventh Limb:** Each limb with 37 or 38 bristles: peg side with 21 or 22 bristles (8 on terminal segment, 13 or 14 on proximal segments); comb side with 12–15 bristles (4 or 5 on terminal segment, 11 or 12 on proximal segments). Each bristle with up to 6 bells, some bristles with few distal marginal spines. Terminus obscure on specimen examined, consisting of comb with about 9 alate teeth opposite about 4 short pegs and 1 slightly longer sclerotized peg (Figure 5h,i).

**Furca (Figure 7d):** Each lamella with 9 claws decreasing in length and width posteriorly along lamella; claw 1 with lateral and medial teeth forming row along posterior edge; teeth

in medial row slightly larger than those in lateral row but without large distal teeth as on claw 1 of female; some teeth in both rows smaller than others; remaining claws with teeth along posterior margin; teeth on proximal 3 claws very fine; claws 1–6 with long medial hairs forming row near base; anterior edge of right lamella with few faint spines and distal hairs; hairs present on edge of lamella between claws 7–9 and following claw 9.

**Bellonci Organ (Figure 7e):** Elongate with suture proximal to middle and tapering to narrowly rounded tip.

**Eyes (Figure 7e):** Lateral eyes well developed, slightly larger than medial eye, with brown or black pigment, each eye with about 28 ommatidia. Medial eye bare, with brown pigment.

**Upper Lip (Figure 7e):** Typical for genus, with anterior processes at tip.

**Copulatory Organ (Figure 7d):** Consisting of short narrow lobes.

**Anterior of Body:** Margin immediately above lip hirsute (Figure 7e).

**Posterior of Animal:** Hairs present along dorsal margin and lateral surfaces dorsal to furca (Figure 7d).

**Y-Sclerite (Figure 7d):** Typical for genus.

### *Philomedes dentata* Poulsen, 1962

FIGURE 9b–f

*Philomedes dentata* Poulsen, 1962:349.—Kornicker, 1982:16 [comparison with *P. brenda*].

**HOLOTYPE.**—None selected.

**SYNTYPE LOCALITY.**—Strait of Georgia, 70 m, and off Lasqueti Island, 45 m, west coast of Canada.

**MATERIALS.**—Through the courtesy of Dr. Jean Just, Curator, Crustacea, Zoological Museum, Copenhagen, Denmark, I received 2 vials of *P. dentata*, each vial with 2 labels. The labels in the vial that is designated here vial 1 are (1) "Dr. Th. Mortensens Pacific Exped. 1914–1916, Str. of Georgia Nanaimo, 40 Fv. Svamp. Trawl, 16 VI 1915," (2) "*Philomedes dentata* n. sp., ZM. Str. of Georgia, Nanaimo, W-Canada, 70 m, 16-6-1915, Mortensen leg. E.M.P. det., Type." Vial 1 contains 2 separated valves of the same specimen (posterior of right valve illustrated herein, Figure 9b); 2 hinged valves (without body of specimen); 2 hinged valves of a juvenile containing the attached posterior of the body; 3 whole specimens; a body of a specimen without the left 1st antenna and right mandible; 2 1st antennae (part of one of these illustrated herein, Figure 9c); a single 6th limb; paired 6th limbs; a fragment of 7th limb attached to fragment of body; a fragment of body with 1st antennae, mandibles, and maxillae; 3 furcal lamellae; a 7th limb (tip illustrated herein, Figure 9f); a mandible (exopodite and largest claw of 3rd joint illustrated herein, Figure 9d,e, respectively); several ostracode fragments, and 1 gnathiid isopod. The labels in the 2nd vial that is

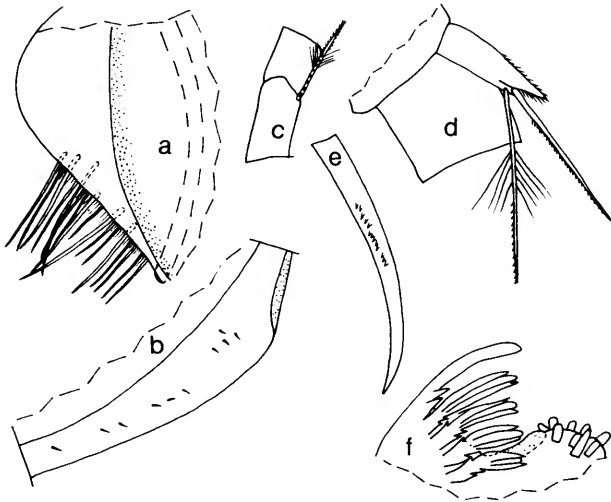


FIGURE 9.—*Philomedes brenda*, USNM 77794, female from northwest Greenland (see Kornicker, 1982:2, for station data): *a*, inside view of lamellar prolongation along anteroventral margin just ventral to incisur of right valve. *b-f*, *Philomedes dentata*, syntypes, female: *b*, inside view of posteroventral infold of right valve; *c*, 4th and 5th joints of right 1st antenna showing dorsal bristle of 4th joint, medial view; *d*, exopodite and 1st endopodial joint of right mandible, lateral view; *e*, longest claw of end joint of same mandible as in *d*, lateral view; *f*, tip of 7th limb.

designated here vial 2 are (1) "Ostrac. Lasqueti Isl., Str. of Georgia, 25 Fv., hard Bd., 22-7-1915., Dr. Th. Mortensen," (2) "*Philomedes dentata* n. sp. ZM. Lasqueti Isl. W-Canada, 45 m, 16-6-1915, Mortensen leg., E.M. Poulsen det." The vial contains a total of about 18 specimens and parts of specimens. Most of the valves are distorted.

**DISTRIBUTION.**—East Pacific, 40–70 m depth in Strait of Georgia, off coast of Canada (Poulsen, 1962:355).

**DISCUSSION.**—After studying the variability of *P. brenda*, Kornicker (1982:16) stated that *P. dentata* differs from *P. brenda* in (1) having numerous long hairs on the medial side of the anteroventral lamellar prolongation of the selvage, (2) having flat distal teeth on the lateral side of the longest claw on the end joint of the mandible, and (3) absence of a narrow peg with rounded tip among the short, flat-tipped pegs on the 7th limb. I examined specimens from vial 1 of the type collection of *P. dentata* (see "Materials"). A single female left valve that was examined has no medial hairs on the anteroventral lamellar prolongation of the selvage. That valve is not illustrated herein, but the hairs were lateral as on the lamellar prolongation of an adult female *P. brenda* (USNM 77794) from northwest Greenland (Figure 9*a*). The lateral teeth on the longest claw of a mandible from vial 1 form a row mostly proximal to middle (Figure 9*e*), not distal to middle as illustrated by Poulsen (1962, fig. 153*a*). A 7th limb from vial 1 has 1 long slender peg with a rounded tip in addition to 4 pairs of shorter pegs with mostly flattened tips (Figure 9*f*) (the long peg is not shown on the illustrated limb of *P. dentata* by Poulsen, 1962, fig. 153*e*). Poulsen (1962:350) states that the

4th joint of the female 1st antenna of *P. dentata* bears a dorsal bristle as long as the 5th joint. A female 1st antenna from vial 1 has a dorsal bristle of the 4th joint reaching well past the 5th joint (Figure 9*c*, note tip of bristle broken off). The proximal bristle of an exopodite on a female mandible from vial 1 is 160 percent the length of the stem and the distal bristle is 136 percent (Figure 9*d*). This compares with 179–240 percent and 143–192 percent, respectively, for the 4 specimens measured by Poulsen (1962:352). The relative lengths of the bristles of the exopodite vary considerably as shown in Kornicker (1982:9, 13, 14, 16). A single right valve from vial 1 has 10 small bristles near midwidth of the posteroventral infold (Figure 9*b*) compared to 11 on the illustration of Poulsen (1962, fig. 152*d*). An adult female of *P. brenda* from Bergen, Norway, described by Kornicker (1982:14) has only 8 bristles along the posteroventral infold, and an adult female from the Beaufort Sea described herein had only 4 bristles on the right valve and 7 bristles on the left. The length of the carapace of the adult female of *P. dentata* measured by Poulsen (1962:351) is 2.6 mm, which is shorter than the specimens of *P. brenda* from the Beaufort Sea (length 2.80–3.06 mm). The length of Poulsen's *P. dentata* is, however, within the length range of 2.3–3.1 given for *P. brenda* by Skogsberg (1920:382).

Are *P. brenda* and *P. dentata* conspecific? My study of Poulsen's types of *P. dentata* indicates that many characters used by Poulsen (1962:355) to identify *dentata* are variable and overlap those of *P. brenda*. The only character that may separate the two species is the number of bristles on the posteroventral infold (not more than 8 for *P. brenda*, and not less than 10 for *P. dentata*). Because the number of bristles vary on different specimens of both species, as well as on left and right valves of the same specimen, further study will be required to determine whether the character is reliable. I find it expedient to consider *dentata* and *brenda* distinct but closely related species.

### *Scleroconcha* Skogsberg, 1920

**TYPE-SPECIES.**—*Philomedes (Scleroconcha) appelloefi* Skogsberg, 1920.

**COMPOSITION.**—This genus has 14 species including a new species described herein from the Beaufort Sea. No species has yet been reported from the western Atlantic. Only 1 species has been reported from the west coast of North America, *S. trituberculatus* (Lucas, 1931), from the Vancouver Island area of Canada. Six species have been reported from the northwestern Pacific: *S. ochotensis* Chavtur, 1978; *S. kubotai* Hiruta, 1981, *S. pavljuchkovi* Chavtur, 1983, *S. lucasae* Chavtur, 1983, *S. rectangularis* Chavtur, 1983, and *S. nanocristata* Chavtur, 1983.

**DISTRIBUTION.**—Members of the genus have been collected at shelf and slope depths (intertidal to 1226 m; Kornicker and Carain, 1977:40). The occurrence in the Beaufort Sea extends the northern range of the genus.

*Scleroconcha ruffi*, new species

FIGURES 10–15

ETYMOLOGY.—The species is named for Dr. Eugene Ruff who collected the material reported upon herein.

HOLOTYPE.—USNM 157835, dissected specimen in alcohol.

TYPE-LOCALITY.—Sta PP-100, 71°23'12"N, 152°41'48"W, 101 m (SMG-1579-10: USCGC *Glacier*, cruise OCS-7, 12 Aug 1977).

PARATYPES.—USNM 157833, 1 ovigerous female (sta PP-55, SMG-1541-12); USNM 157838, 1 adult female (sta PP-100, SMG-1579-10); USNM 158459, 1 juvenile male (sta PP-100, SMG-1096-14); USNM 158471, 1 juvenile male (sta PP-100, SMG-1093-17); USNM 158518, 1 juvenile male (sta PP-70, SMG-1109-15); USNM 158546, 1 adult male (sta PP-100, SMG-1162-13); USNM 158555, 1 adult male (sta PP-100, SMG-1162-13); USNM 158572, 1 ovigerous female (sta PP-100, SMG-1096-14); additional specimens are listed in the appendix.

DISTRIBUTION.—Beaufort Sea, 35–189 m.

DESCRIPTION OF ADULT FEMALE (Figures 10–12).—Carapace oval in lateral view with prominent rostrum and small rounded caudal process (Figures 10, 11a–c).

Ornamentation (Figures 10, 11a–c): Lateral surface with prominent rib just within ventral margin terminating anteriorly in small anteroventral process, and terminating posteriorly on caudal process; a 2nd small process present on edge of anteroventral margin anterior to previously mentioned process; a 2nd rib just ventral to central adductor muscle attachments does not reach anterior margin of valve, and terminates posteriorly on distinct bulge of carapace; a 3rd rib dorsal to central muscle attachments terminates anteriorly as process extending past anterior edge of rostrum, and posteriorly joins an oblique rib terminating on caudal process (the oblique rib bears 2 weakly defined processes near its dorsal end) (Figure 10); a 4th rib lies just within the dorsal margin of valve; a 5th very faint rib located between the 3rd and 4th ribs terminates anteriorly on rostrum, and posteriorly does not reach valve midline. Surface of valve with abundant, weakly developed, round fossae; some specimens with reticulations encompassing several fossae in the posterodorsal part of the valve. Undivided bristles, some with broad bases, sparsely distributed over valve surface.

Infold (Figure 11a–c): Rostral infold with 6 or 7 bristles; 2 bristles present on valve edge medial to selvage at inner end of incisur; 1 small bristle present ventral to inner edge of incisur (Figure 11a); anteroventral infold with about 8 ridges and, also, 8 or 9 bristles forming row parallel to valve edge; infold along middle of ventral margin bare; posterior end of ventral infold and posterior infold in vicinity of caudal process with numerous slender bristles forming groups of up to 5 bristles (Figure 11b–c); infold of caudal process with narrow flap bearing 3 or 4 small bristles (Figure 11b,c): some bristles missing on illustrated specimen but represented by empty



FIGURE 10.—*Scleroconcha ruffi*, new species, holotype, USNM 157835, ovigerous female, length 2.58 mm, lateral view of complete specimen (bristles not shown).

pores); edge of flap with faint, narrow, lamella prolongation; 1 small bristle present between shelf and valve edge (Figure 11b,c).

Selvage: Broad lamella prolongation with marginal fringe present along anterodorsal, anterior, and ventral margins of valve; lamella prolongation narrower and with minute fringe along posterior edge of valve and caudal process. Selvage divided at inner edge of incisur (Figure 10).

Size: USNM 157833, length 2.51 mm, height 1.81 mm; USNM 157835, length 2.58 mm, height 2.03 mm; USNM 157838, length 2.64 mm, height 1.78 mm; USNM 158425, length 2.54 mm, height 1.75 mm; USNM 158572, length 2.65 mm, height 1.81 mm.

First Antenna (Figure 12a): 1st joint with faint medial and lateral spines forming rows. 2nd joint spinous, with 3 bristles (1 ventral, 1 dorsal, 1 lateral). Short 3rd joint with few medial spines and 3 bristles (1 ventral, 2 dorsal). 4th joint spinous, with 6 bristles (4 ventral, 2 dorsal). Long 5th joint with few faint spines; sensory bristle with 7 short proximal filaments and 5 terminal filaments including tip of stem. 6th joint minute, fused with 5th joint; medial bristle with long proximal and short distal spines. 7th joint: a-bristle similar to bristle of 6th joint except with 2 wreaths of long proximal hairs; b-bristle about twice length of a-bristle, with 2 proximal and 4 terminal filaments; c-bristle about same length as sensory bristle of 5th joint, with 7 proximal and 5 terminal filaments. 8th joint: d- and e-bristles slightly longer than b-bristle, about same length as c-bristle, bare with blunt tips; f-bristle about same length as c-bristle, with 5 proximal and 5 terminal filaments; g-bristle same length as c-bristle, with 6 proximal and 5 terminal filaments.

Second Antenna: Protopodite bare. Endopodite 2-jointed (Figure 11d): 1st joint short, with 5 proximal bristles (1 longer than others) and 1 distal bristle; 2nd joint with 1 very long

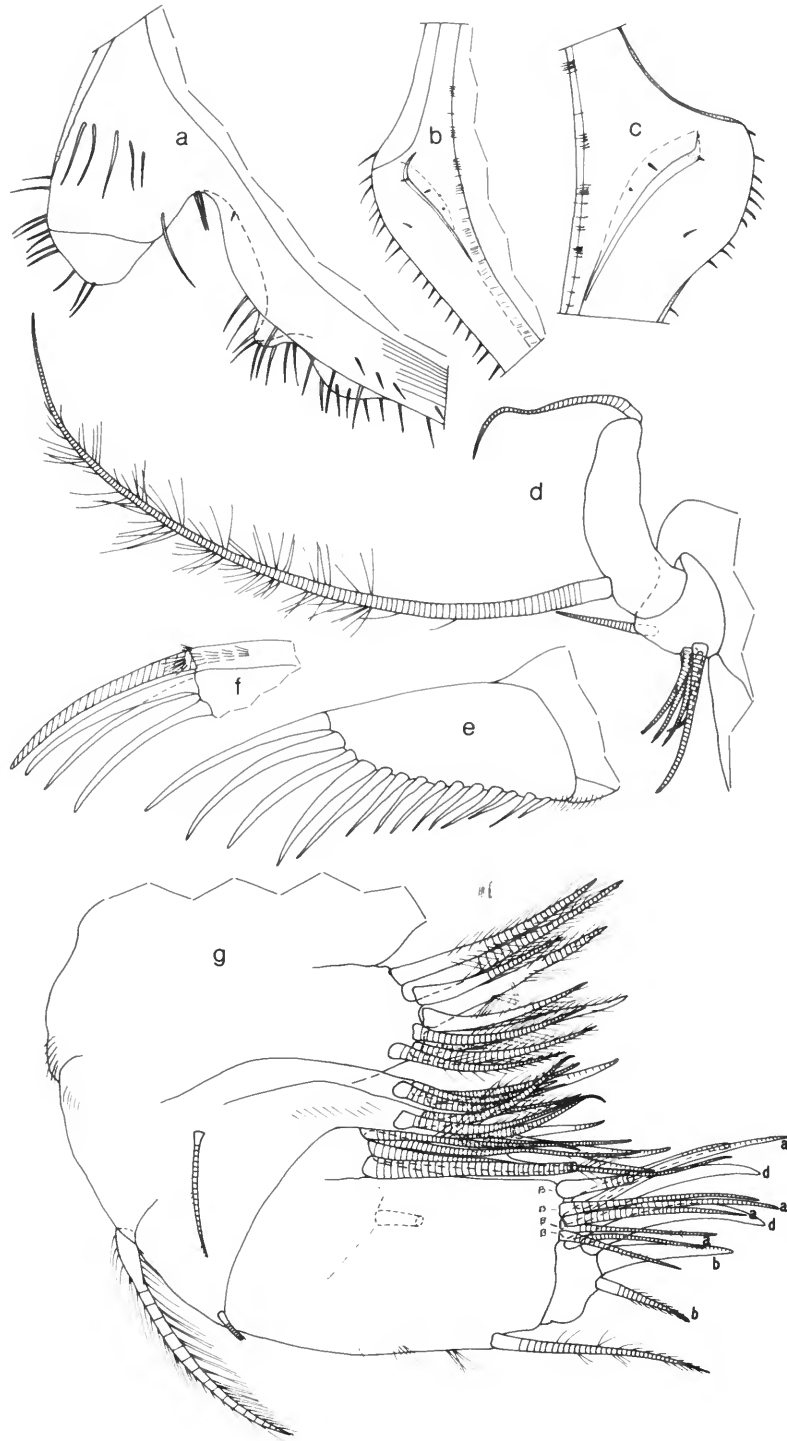


FIGURE 11.—*Scleroconcha ruffi*, new species, holotype, USNM 157835, ovigerous female, length 2.58 mm: *a*, inside view of rostrum and caudal process of right valve (selvage not shown); *b*, inside view of caudal process of left valve; *c*, inside view of caudal process of right valve. Paratype, USNM 157833, ovigerous female, length 2.51 mm: *d*, endopodite of left 2nd antenna, medial view; *e*, left lamella of furca, lateral view; *f*, 1st and 2nd furcal claws of right and left lamellae; *g*, maxilla.





FIGURE 12.—*Scleroconcha ruffi*, new species, paratype, USNM 157833, ovigerous female, length 2.51 mm: *a*, left 1st antenna, medial view; *b*, left 6th limb, medial view; *c*, 7th limb; *d*, detail from *c*; *e*, anterior of body from right showing medial eye, Bellonci organ, anterior process, and upper lip; *f*, right 5th limb, posterior view; *g*, left 5th limb, anterior view; *h*, detail of distal tooth of main tooth, from *f*. Paratype, USNM 157838, ovigerous female, length 2.64 mm: *i*, medial eye and proximal part of Bellonci organ; *j*, right lateral eye.

spinous proximal bristle, and 1 shorter terminal bristle. Exopodite: 1st joint with minute medial bristle on distal margin; bristles of joints 2–4 bare, fairly short but all reaching well past 9th joint; bristles of joints 5–8 broken; 9th joint with 7 bristles (3 long, stout, broken; 1 medium, broken, with few natatory hairs; 2 short with few long hairs; 1 very short, bare); joints 2–8 with slender spines forming row along distal margin, and with minute basal spine.

**Mandible:** Coxale with medial hairs and spines forming rows; minute bristle present near base of endite; endite bifurcate, hirsute proximally, pectinate distally. Basale: dorsal margin with 3 spinous bristles (1 distal to middle, 2 subterminal); medial surface hirsute, with 5 bristles (3 pectinate, unringed; 2 ringed with long proximal and short distal spines) in proximal ventral corner and 1 ringed spinous bristle closer to middle of joint; ventral margin with 8 spinous bristles (some with bases on medial surface near ventral margin). Exopodite hirsute, length about three-fourths length of dorsal margin of 1st endopodial joint, with 2 bristles bearing wreaths of long spines (distal outer bristle about three-fourths length of inner bristle). 1st endopodial joint with 4 ventral bristles bearing wreaths of long spines. 2nd endopodial joint: ventral margin with bristles forming 2 distal groups (3 bristles in each group); dorsal margin with 8 or 9 bristles near middle, some with bases on medial and lateral sides of joint; medial surface and proximal dorsal margin spinous. End joint with 3 bare claws (dorsal claw about two-thirds length of ventral claw; middle claw slightly shorter than ventral claw), and 4 ringed bristles.

**Maxilla (Figure 11g):** Precoxale and coxale with dorsal hairs; coxale with hirsute dorsal bristle. Endite I with 10 spinous and pectinate bristles; endites II and III narrow, with terminal bristles; endite III also with 1 proximal bristle. Basale with 3 bristles along distal margin (dorsal of these relatively small). Exopodite with 3 spinous bristles. 1st endopodial joint spinous, with 1 spinous alpha-bristle and 5 beta-bristles (bare or with few short spines). End joint: 3 bare a-bristles; 2 b-bristles (1 ringed and bearing small spines, 1 stout, unringed, claw-like, bare); 2 of the d-bristles stout, unringed, claw-like, bare; remaining c- and d-bristles slender, ringed, bristle-like.

**Fifth Limb (Figure 12f–h):** Endite I with about 5 spinous bristles; endite II with about 7 spinous bristles; endite III with about 9 spinous bristles. 1st exopodial joint: anterior margin with 2 spinous bristles at middle, and 1 bristle with long marginal hairs on lobe near outer edge (Figure 12g); main tooth with 4 constituent teeth consisting of 3 pectinate teeth and 1 proximal, smooth, pointed tooth; 1 spinous bristle proximal to pointed tooth (Figure 12f); distal, constituent tooth with proximal tooth-like process (Figure 12h). 2nd exopodial joint: large tooth with 1 small pointed tooth along inner margin (Figure 12f); distal outer corner of large tooth with minute posterior bristle (Figure 12g); long proximal posterior bristle bare; outer of group of 3 posterior bristles short; inner bristle about two-thirds length of middle bristle, all bare (Figure 12f). 3rd endopodial joint: inner lobe with 3 bristles; outer lobe

with 2 bristles. 4th and 5th joints fused, hirsute with total of 6 spinous bristles. Epipodial appendage with 51 bristles.

**Sixth Limb (Figure 12b):** Endite I with 3 spinous bristles; endite II with 1 proximal and 3 terminal spinous bristles; endite III with 1 proximal and 6–8 terminal spinous bristles; endite IV with 1 proximal and 6 or 7 terminal bristles. End joint with total of 30 spinous and hirsute bristles. Three bristles with long proximal hairs and short distal spines present in place of epipodial appendage.

**Seventh Limb (Figure 12c,d):** Terminus consisting of comb with 4–7 small teeth (some with few faint marginal spines) opposite 1 smooth peg. Each limb with 12–15 bristles, 6 in terminal group (3 on each side) and 5–8 in proximal group. The distribution of proximal bristles on both 7th limbs of 4 specimens is as follows.

	Limb A	Limb B
USNM 157833	7(4+3)	8(5+3)
USNM 157835	7(4+3)	5(3+2)
USNM 157838	7(4+3)	7(4+3)
USNM 158425	6(3+3)	8(4+4)
USNM 158460	6(3+3)	6(3+3)

**Furca (Figure 11e,f):** Each lamella with 12–15 claws (usually 14 or 15); claw 3 more slender than claw 4; left and right lamellae may have slightly different numbers of claws; teeth present along dorsal margin of all claws (teeth not shown on illustrated lamella); claws 6 to 12 or 15 with distal teeth along anterior margin; right lamella with medial hairs forming clusters near anterior margin, and positioned slightly anterior to left lamella (Figure 11f); hairs present at bases of some claws and on margin of lamella following claws. The number of claws on the left and right lamella of 5 specimens are as follows.

	Left lamella	Right lamella
USNM 157833	14	12
USNM 157835	15	15
USNM 157838	15	15
USNM 158425	14	13
USNM 158460	14	14

**Bellonci Organ (Figure 12e,i):** Elongate with about 18 sutures; minute spines observed in vicinity of sutures on some specimens; part distal to sutures generally same width and terminating in broadly rounded tip with 1–3 spines, but narrowing slightly near rounded tip on some specimens.

The morphology of the tips of 4 specimens is as follows.

USNM 157833	Narrowing to broadly rounded tip with 2 spines
USNM 157835	Broadly rounded with spine at tip
USNM 157838	Broadly rounded with 3 spines at tip
USNM 158425	Broadly rounded with spine at tip

**Eyes:** Medial eye with brown pigment, bare (Figure 12e,i). Lateral eye minute, with 2 small ommatidia (Figure 12j); lateral eyes not observed on all specimens.



FIGURE 13.—*Scleroconcha ruffi*, new species, paratype, USNM 158546, adult male, length 2.53 mm, lateral view of carapace (bristles not shown).

**Upper Lip (Figure 12e):** Normal for genus, with small anterior process.

**Anterior of Body (Figure 12e):** Single rounded process between upper lip and medial eye.

**Posterior of Body:** A few minute spines forming rows in vicinity of posterodorsal corner.

**Y-Sclerite:** Normal for genus.

**Eggs:** USNM 157833, 158460, each with 12 eggs; USNM 157835 with 15 eggs; USNM 157838, 158425, each with 6 eggs.

**DESCRIPTION OF ADULT MALE (Figures 13–15).**—Carapace more elongate than that of the female and with more open incisur (Figure 13).

**Ornamentation (Figure 13):** Lateral surface with weakly developed ribs in posterior half; surface with faint minute fossae.

**Infold and Selvage:** Similar to that of female.

**Size:** USNM 158546, length 2.53 mm, height 1.41 mm.

**First Antenna (Figure 14a):** 1st joint bare. 2nd joint with medial spines forming rows and 3 spinous bristles (1 ventral, 1 dorsal, 1 lateral). 3rd joint with medial spines and 3 spinous bristles (2 dorsal, 1 lateral near ventral margin). 4th joint with medial spines and 5 or 6 spinous bristles (3–4 ventral, 2 dorsal). 5th joint minute, wedged ventrally between 4th and 6th joints, with stout sensory bristle bearing abundant long thin filaments on broad proximal half; distal end of bristle with 3 short marginal filaments and bifurcate tip. 6th joint about same length as 4th joint, with lateral spines and spinous medial bristle (missing on illustrated specimen). 7th joint: a-bristle short, spinous (slightly shorter than bristle on 6th joint); b-bristle with 4 marginal filaments and bifurcate tip; c-bristle very long, with about 14 marginal filaments. 8th joint: d- and e-bristles about same length as b-bristle, bare with blunt tips; f-bristle similar to c-bristle; g-bristle with 6 short, proximal, and 2 distal marginal filaments, and bifurcate tip.

**Second Antenna (Figure 14b):** Protopodite bare. Endopodite 3-jointed: 1st joint with 5 proximal bristles and 1 distal bristle; 2nd joint with 1 long spinous proximal bristle, and 3

or 4 short, spinous bristles near middle (spines on midbristles not shown on illustrated endopodite, Figure 14b); 3rd joint reflexed toward 2nd joint, with 1 bare proximal bristle, 2 or 3 short, bare, subterminal bristles, 4 minute sclerotized teeth on concave side distal to middle, and about 5 ridges at tip. Exopodite: 1st joint with minute medial bristle on distal margin; 2nd about one-third length of 1st joint and about one-half length of 3rd joint; bristle of second joint bare, reaching to about 8th joint; bristles of joints 3–8 long, with natatory hairs; 9th joint obscure on specimen examined, but with at least 5 bristles (3 long with natatory hairs, 2 short); joints 2–8 with spines forming row along distal margin; joints 3–8 each with short basal spine (basal spine of 8th joint slightly longer than others, about one-third length of 9th joint).

**Mandible (Figure 14c):** Coxale endite consisting of 2 stout spines bearing minute marginal spines; a small bristle with drawn-out tip present dorsal to spines. Basale: dorsal margin with 3 spinous bristles (1 distal to middle, 2 subterminal); medial surface hirsute, with 5 spinous bristles in proximal ventral corner, and 1 spinous bristle closer to middle of joint; ventral margin with 7 or 8 spinous bristles (some with bases on medial surface near ventral margin). Exopodite hirsute, length about two-thirds of dorsal margin of 1st endopodial joint, with 2 bristles with long spines (distal outer bristle about three-fourths length of inner bristle). 1st endopodial joint with medial spines and 4 or 5 ventral bristles. 2nd endopodial joint: ventral margin with bristles forming 2 distal groups (3 bristles in each group); dorsal margin with 9 bristles near middle, some with bases on medial and lateral sides of joint; medial surface spinous. End joint with 3 stout claws (medial claw slightly smaller than lateral claw, dorsal claw about two-thirds length of medial claw) and 4 ringed bristles.

**Maxilla (Figure 15a):** Limb reduced. Precoxale and coxale with dorsal hairs; coxale with hirsute dorsal bristle. Endite I broad, with numerous ringed bristles; endites II and III narrow, with numerous ringed bristles. Basale with 3 bristles along distal margin. Exopodite with 3 spinous bristles. 1st endopodial joint spinous, with 1 spinous alpha-bristle and 4 beta-bristles. End joint with 11 bristles (3 of these stouter than others).

**Fifth Limb (Figure 15b,c):** Endite I with 6 short bristles; endite II with about 7 bristles; endite III with 9–11 bristles. 1st exopodial joint with about 5 slender bristles and 2 finger-like, hirsute, terminal bristles. 2nd exopodial joint with several ringed bristles and 1 finger-like hirsute bristle. 3rd exopodial joint with 3 bristles on inner lobe and 2 stout hirsute bristles on outer lobe. 4th and 5th joints fused, hirsute, with total of 6 spinous bristles.

**Sixth Limb (Figure 15d):** Endite I with 3 spinous bristles; endite II with 1 proximal and 3 terminal spinous bristles; endite III with 1 proximal and 7 terminal spinous bristles; endite IV with 1 proximal and 6 terminal spinous bristles. End joint with total of 25 spinous and hirsute bristles. 3 spinous bristles in place of epipodial appendage.

**Seventh Limb (Figure 14d):** Terminus consisting of comb with 3 short teeth with faint marginal spines opposite 1 smooth

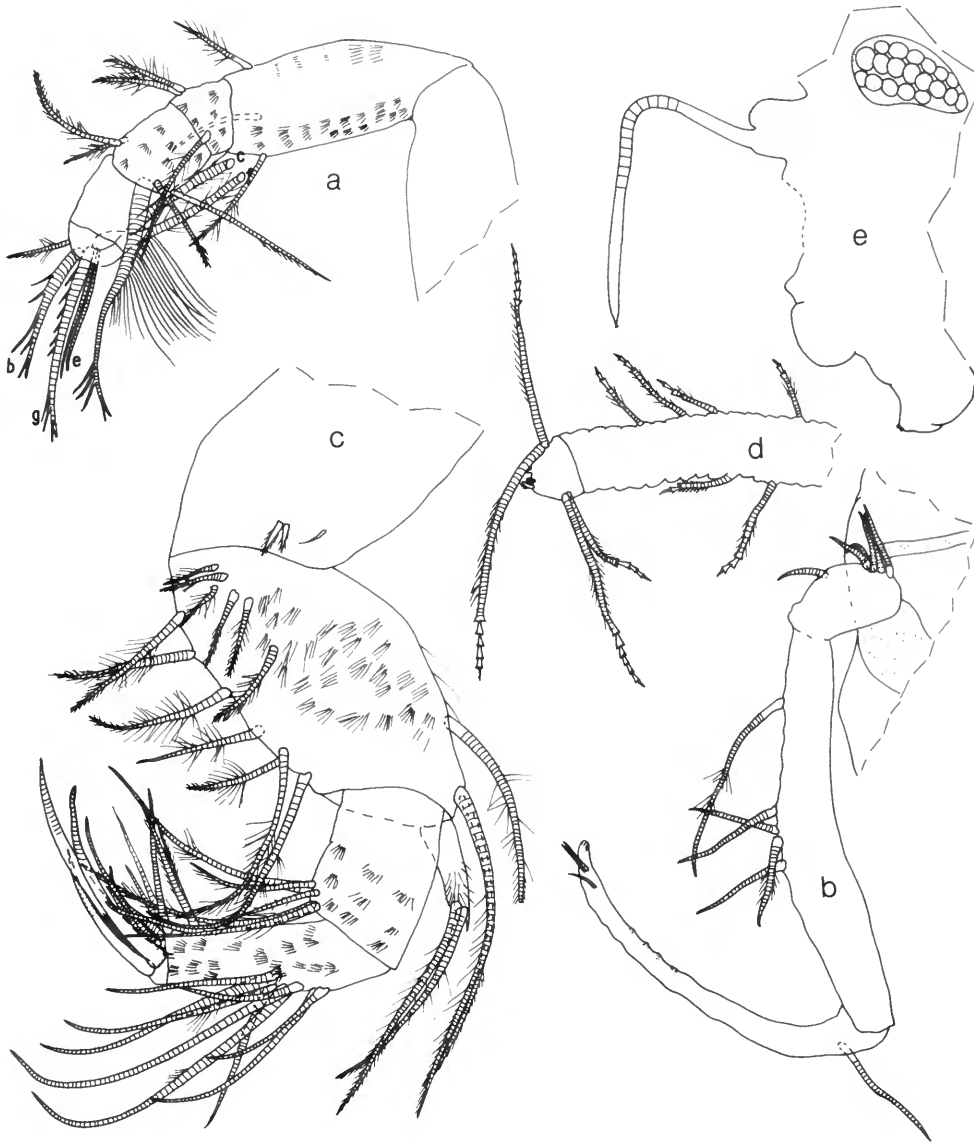


FIGURE 14.—*Scleroconcha ruffi*, new species, paratype, USNM 158546, adult male, length 2.53 mm: *a*, right 1st antenna, medial view (bristle of 6th joint not present on limb); *b*, endopodite of right 2nd antenna, medial view; *c*, left mandible, medial view; *d*, 7th limb; *e*, anterior of body from left showing lateral eye, medial eye, Bellonci organ, and upper lip.

peg. Each limb with 10 bristles, 4 in terminal group (2 on each side) and 6 in proximal group (2 to 4 on each side).

**Furca:** Each lamella with 13 claws; claw 3 more slender than claw 4; distribution of claws similar to those of female; medial hairs present at bases of claws; few hairs on lamella following claws; claw 1 of right lamella anterior to claw 1 of left lamella.

**Bellonci Organ (Figure 14e):** Elongate with about 14 sutures in middle part; tip pointed and with minute terminal spines.

**Eyes (Figure 14e):** Medial eye with brown pigment, bare. Lateral eye well developed, about twice size of medial eye, with black pigment obscuring number of ommatidia (about 19).

**Upper Lip (Figure 14e):** Normal for genus, with small anterior processes.

**Posterior of Body:** With long hairs forming row extending from posterior end of Y-sclerite to midheight of posterior end of body; minute spines in vicinity of posterodorsal corner.

**Copulatory Organ:** Consisting of 3 lobes on each side of body, with few bristles.

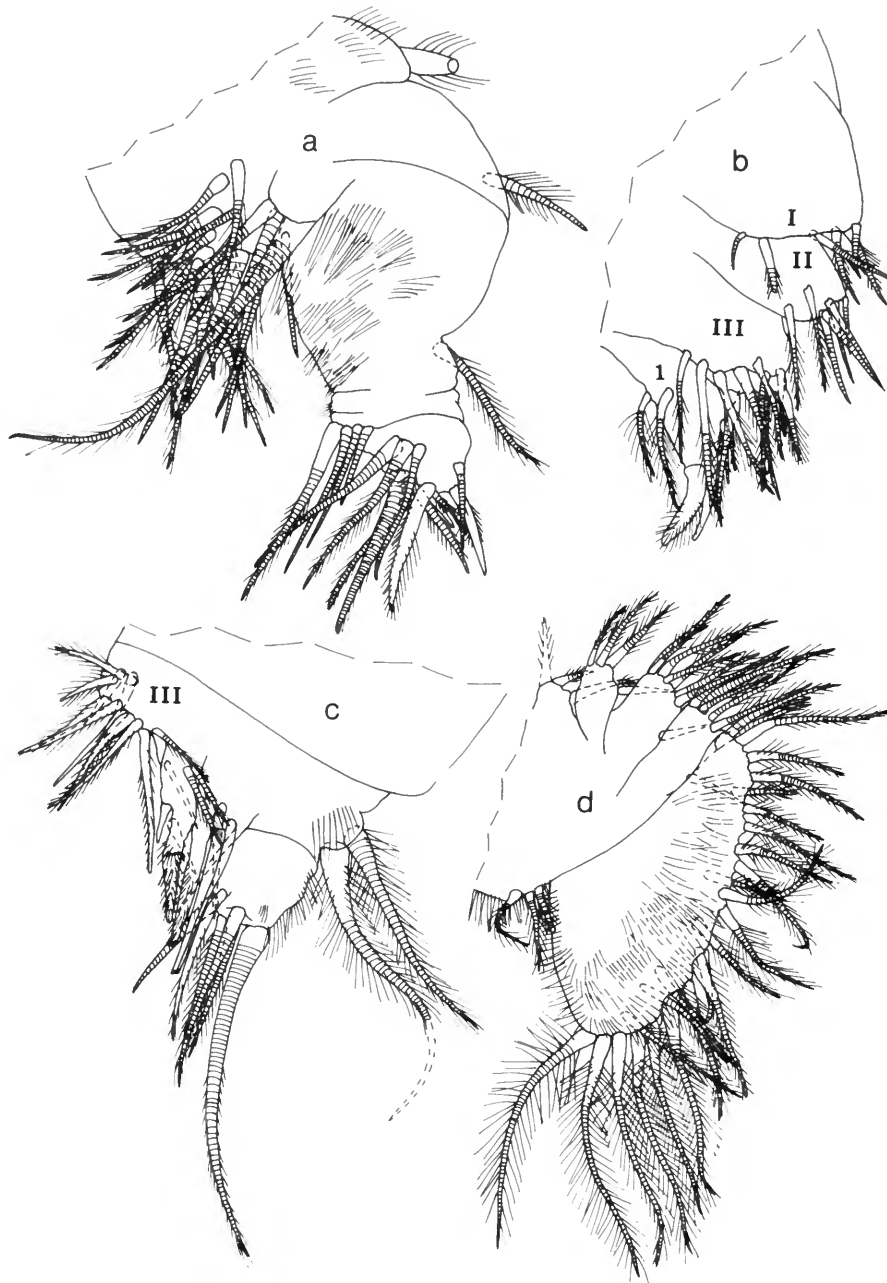


FIGURE 15.—*Scleroconcha ruffi*, new species, paratype, USNM 158546, adult male, length 2.53 mm: *a*, right maxilla, lateral view; *b*, endites and 1st exopodial joint of 5th limb; *c*, 5th limb opposite that shown in *b* (not all bristles shown); *d*, right 6th limb, lateral view.

Y-Sclerite: Typical for genus.

COMPARISONS.—The new species, *S. ruffi*, differs from *S. trituberculatus* (Lucas, 1931) in having no more than 15 claws on the furca, and in the distal bristle of the 1st endopodial joint of the 2nd antenna of the female being about the same length as the shorter proximal bristles. Only 2 previously described

species have the tip of the Bellonci organ of the female rounded: *S. rectangularis* Chavtur, 1983, and *S. pavluchkovi* Chavtur, 1983. The carapace of *ruffi* differs from that of *rectangularis* in having fewer bristles on the rostral infold (6 or 7 compared to 16–18) and in not having the lower horizontal lateral midrib bending ventrally to meet the ventral rib. The

carapace of *ruffi* differs from that of *pavluchkovi* in not having a process at the anterior end of the lower horizontal midrib.

#### CYLINDROLEBERIDIDAE Müller, 1906

The family Cyndroleberididae comprises 3 subfamilies: Cyndroleberidinae Müller, 1906; Cyclasteropinae Poulsen, 1965; and Asteropteroinae Kornicker, 1981. Only the first subfamily was present in the Beaufort Sea.

#### CYLINDROLEBERIDINAE Müller, 1906

This subfamily is represented in the Beaufort Sea by 2 genera, *Empoulsenia* Kornicker, 1975, and *Bathyleberis* Kornicker, 1975.

#### *Empoulsenia* Kornicker, 1975

TYPE-SPECIES.—*Asterope quinquesetae* Skogsberg, 1920.

COMPOSITION.—Only 1 species, *E. polythrix* Chavtur, 1983, has been described previously from northern seas, whereas 4 species, *E. quinquesetae* (Skogsberg, 1920), *E. pentathrix* (Kornicker, 1971), *E. antarctica* Kornicker, 1975, and *E. weddellensis* Kornicker, 1975, have been described from southern oceans.

DISTRIBUTION.—*Empoulsenia polythrix*, according to Chavtur (1983:81), is widespread in the Northwest Pacific at depths of 85–2579 m; in the Sea of Japan (only in the subarctic), and Okhotsk and Bering seas at 300 m, but in adjacent Pacific (Kuril Islands, Kamchatka) at depths of 510–2570 m. The new species, *E. monothrix*, was collected only at 1 locality in the Beaufort Sea at a depth of 101 m. The 4 species reported in the southern oceans were collected south of 49°50'S at depths of 40–1212 m, but seldom at less than 200 m (Kornicker, 1975:501). The known localities of members of the genus suggest a bipolar distribution.

#### Key to Species of *Empoulsenia*

1. Anterior margin of 6th limb with 2 bristles on at least 1 limb and usually on both . 2  
Anterior margin of 6th limb with 1 bristle . . . . . 5
2. Seventh limb with 12 bristles . . . . . *E. polythrix*  
Seventh limb with more than 15 bristles . . . . . 3
3. Carapace shorter than 2.7 mm . . . . . *E. pentathrix*  
Carapace longer than 3.2 mm . . . . . 4
4. Seventh limb with 16 or 17 bristles . . . . . *E. weddellensis*  
Seventh limb with more than 25 bristles . . . . . *E. antarctica*
5. Seventh limb with 12 bristles . . . . . *E. monothrix*, new species  
Seventh limb with 22–26 bristles . . . . . *E. quinquesetae*

#### *Empoulsenia monothrix*, new species

FIGURES 16, 17

ETYMOLOGY.—From the Greek *mono* (one) and *thrix* (hair) in reference to the presence of only 1 bristle on the anterior margin of the 6th limb.

HOLOTYPE.—USNM 193280, adult female on slide and in alcohol.

TYPE-LOCALITY.—Sta PP-100, 71°23'30"N, 152°43'00"W, 101 m (SMG-1577-11: USCGC *Glacier*, cruise OCS-7, 12 Aug 1977).

DISTRIBUTION.—Collected only at type-locality.

DESCRIPTION OF FEMALE (Figures 16, 17).—Carapace elongate with evenly rounded anterior and posterior; incisure below midheight (Figure 16a).

Infold (Figure 16b,h): Anterior and anteroventral infold with numerous bristles (Figure 16b); broad list of posterior infold with about 25 broad flap-like bristles, 6 or 7 long slender bristles, and about 75 minute bristles (Figure 16h); posterior infold between broad list and posterior end of valve with 3 or

4 processes and about 25 bristles (Figure 16h). List along ventral margin narrow convex, close to ventral edge of valve at midlength.

Selvage: Normal for subfamily.

Central Adductor Muscle Attachments (Figure 16c): Comprising about 19 ovoid individual attachments near valve midlength and midheight.

Size: USNM 193280, holotype, length 2.76 mm, height 1.68 mm.

First Antenna (Figure 16d): 1st joint with spines on ventral and dorsal margins and medial and lateral surfaces. 2nd joint spinous, with 2 bristles (1 lateral, 1 dorsal). 3rd joint with well-defined distal margin and with 7 bristles (1 ventral, 6 dorsal). Sensory bristle of 5th joint long, with 1 short proximal filament and 6 long terminal filaments. 5th and 6th joints fused; medial bristle of 6th joint spinous. 7th joint: a-bristle claw-like; b-bristle shorter than sensory bristle of 5th joint, with 3 long marginal filaments; c-bristle longer than sensory bristle of 5th joint, with 5 marginal filaments. 8th joint: d- and e-bristles well developed with blunt tips, e-bristle stouter and slightly longer than d-bristle; f-bristle bent dorsally, with 5 short



FIGURE 16.—*Empoulsenia monothrix*, new species, holotype, USNM 193280, adult female, length 2.76 mm: *a*, lateral view of complete specimen (circle indicates area of central adductor muscle attachments; dashed oval represents outline of parasitic chionostomatid within carapace); *b*, inside view of anterior of right valve; *c*, central adductor muscle attachments of right valve, anterior to right; *d*, left 1st antenna, medial view; *e*, left mandible, medial view; *f*, left 6th limb, medial view; *g*, posterior of body from left side showing Y-sclerite and girdle; *h*, inside view of posterior of right valve (arrow indicates anterior of valve).

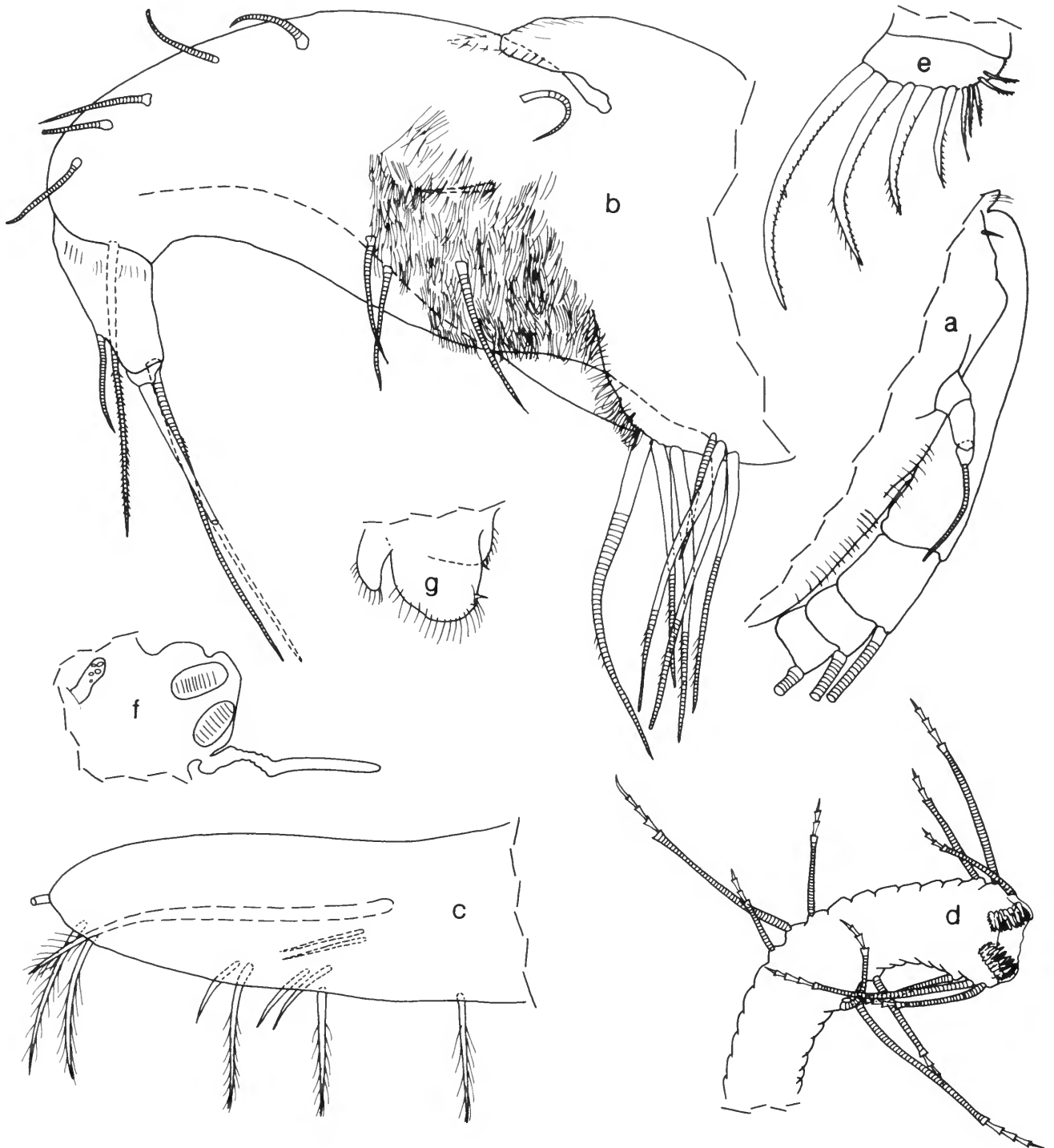


FIGURE 17.—*Empoulsenia monothrix*, new species, holotype, USNM 193280, adult female, length 2.76 mm: *a*, distal part of protopodite, endopodite, and joints 1–4 of exopodite of left 2nd antenna, medial view; *b*, right maxilla, medial view; *c*, comb of right 5th limb, medial view; *d*, 7th limb; *e*, left lamella of furca; *f*, right lateral eye, medial eye, and Bellonci organ; *g*, upper and lower lips, from right.



marginal filaments, some with marginal spines; g-bristle slightly longer than c-bristle, with 5 short marginal filaments.

Second Antenna (Figure 17a): Protopodite with small distal medial bristle, and spines along dorsal and ventral margins and on medial surface near dorsal margin. Endopodite with 3 well-defined joints; terminal filament only slightly longer than total length of joints. Exopodite: bristle of 2nd joint reaching just past 9th joint, with ventral hairs; bristles of joints 3–8 with natatory hairs, no spines; 9th joint with 4 bristles (2 long with natatory hairs, 1 short with short marginal hairs; 1 very short, dorsal); joint 1 with fine hairs along concave dorsal margin; joints 2–8 with fine hairs forming distal row, no basal spines; 9th joint with stout lateral spine having length about 1/3 that of joint.

Mandible (Figure 16e): Coxale endite broken off both limbs of holotype, but with slender bristle near base of ventral branch. Basale endite with 4 stout end-bristles, glandular peg, 2 dwarf bristles, and 2 triaenid bristles (proximal with 5 pairs of marginal spines proximal to terminal pair, distal with many fine spines becoming stouter distally along bristle). Basale: ventral margin with triaenid bristle (with 4 pairs of marginal spines proximal to terminal pair) close to endite and with distal U-shaped depression; dorsal margin with proximal hairs, 4 or 5 short spinous midbristles forming row, and 2 stout spinous terminal bristles; medial and lateral surfaces with proximal hairs near dorsal margin. Exopodite hirsute, reaching to about midlength of dorsal margin of 1st endopodial joint, with 2 short subterminal bristles. 1st endopodial joint with 3 stout ventral bristles. 2nd endopodial joint: dorsal margin with 2 slender proximal bristles, and stout spinous a-, b-, c-, and d-bristles; lateral surface with long slender spinous bristle between b- and c-bristles and c- and d-bristles (latter missing on illustrated left limb but present on right); medial surface with 5 cleaning bristles forming oblique row between b- and c-bristles, 5 cleaning bristles forming oblique row between c- and d-bristles, 1 long spinous bristle just distal to base of d-bristle, and spines forming rows near ventral margin; ventral margin with 3 stout spinous terminal bristles. End joint with stout dorsal claw with ventral spines at midlength, and 4 or 5 spinous bristles (3 or 4 stout, 1 slender).

Maxilla (Figure 17b): Epipodite with hirsute pointed tip not reaching midlength of dorsal margin of basale (illustrated limb with distorted epipodite). Endite I with 1 small bare bristle and 3 stout spinous bristles; endite II with 3 stout spinous bristles. Basale: medial surface near dorsal margin with 6 bare bristles (1 proximal, 5 distal); medial surface near ventral margin with 3 bare bristles just proximal to midlength; lateral surface with proximal bristle at midheight; ventral margin with long spinous terminal bristle; medial surface and dorsal margin of joint spinous (not all spines shown on illustrated limb). Endopodite: 1st joint with proximal medial spines (not all shown on illustrated limb), small bare alpha-bristle and long beta-bristle (bare or with few faint spines); 2nd joint with terminal bristle about same length as beta-bristle of 1st joint.

Fifth Limb (Figure 17c): Lateral side of comb with stout

spinous exopodial bristle reaching past tip of comb, 2 slender bristles ventral to base of stout bristle, 2 pairs of bristles near ventral margin of comb, and 4 additional bristles with bases just proximal to ventral margin of comb. Ventral margin of comb with about 40 spinous bristles of unequal length (only distal bristle shown on illustrated comb); dorsal margin of tip of comb with long hairs (not shown on illustrated comb).

Sixth Limb (Figure 16f): Limb hirsute. Small medial bristle present near proximal anterior corner. Anterior margin with fairly long bristle at upper suture but without bristle at lower suture. Anteroventral corner with 4 slender bristles. Lateral flap hirsute but without bristles. Posteroventral margin with 16–19 spinous bristles; bristles becoming longer posteriorly along margin.

Seventh Limb (Figure 17d): Each limb with 12 bristles: 6 proximal (3 on each side, each with 3 or 4 bells) and 6 distal (3 on each side, each with 3 or 4 bells). Terminus with opposing combs, each with 15 or 16 spinous teeth of similar length.

Furca (Figure 17e): Each limb with 9 claws (anterior 5 claws stout and curved, 6th and 7th claws weak and straight, 8th and 9th claws weak, bristle-like, oriented posteriorly; claws 1–7 with teeth along posterior edge; claws 1–3 with distal hairs along anterior edge; edge of lamella following claw 9 with minute spines.

Bellonci Organ (Figure 17f): Elongate, proximal half crinkled, tip rounded.

Eyes (Figure 17f): Medial eye unpigmented, bare. Lateral eyes minute, unpigmented, with 4 or 5 minute cells, no ommatidia.

Upper Lip (Figure 17g): Hirsute lobe on each side of indented saddle; each lobe with small anterior spine; hirsute lateral flap on each side of mouth.

Posterior of Body (Figure 16g): Margin dorsal to indentation marking muscle attachments hirsute; posterodorsal corner of holotype appearing rounded, but corner folded and could have short thumb-like process; corner with long spines; 7 narrow gills present on each side of posterior of body.

Y-Sclerite (Figure 16g): Typical for subfamily.

Genitalia: Oval structure on each side of body anterior to furca.

PARASITES.—Holotype with female choniostomatid copepod and 5 clutches of its eggs within carapace.

COMPARISONS.—*Empoulsenia monothrix* differs from *E. polythrix*, the only other species of the genus known from the vicinity, in having 1 instead of 2 anterior endite bristles on the 6th limb. Also, the basale of the maxilla of *monothrix* bears proximally 4 ventral bristles compared to 6 (rarely 5) on *polythrix*.

#### *Bathyleberis* Kornicker, 1975

TYPE-SPECIES.—*Bathyleberis grossmani* Kornicker, 1975.

COMPOSITION.—Five species, *B. yamadai* Hiruta, 1979, *B. kurilensis* (Chavtur, 1978), *B. californica* Baker, 1979, *B. garthi* Baker, 1979, and *B. hancocki* Baker, 1979, have been

described from northern seas. Three species have been described from southern oceans, *B. grossmani* Kornicker, 1975, *B. monothrix* Kornicker, 1975, and *B. oculata* Kornicker, 1975. The new species from the Beaufort Sea, *B. thrix*, brings to 8 the number of species referred to the genus.

**DISTRIBUTION.**—*Bathyleberis yamadai* was collected at 3–5 m at Oshoro, on the Japan Sea coast of Hokkaido (Hiruta, 1979:99). The type-locality of *B. kurilensis*, according to Chavtur (1978:154), is off the Sea of Okhotsk coast of Urop Island (Bay of Shchukina), depth 20 m. Additional specimens were collected on the Sea of Okhotsk coast of Kunashir Island (Bay of Izmena), depth 6–8 m, and off the Pacific coast of Urop Island (Temnyy Cape), depth 20 m (Chavtur, 1978:154). Chavtur (1983: 81) gave the distribution of the species as the Northwest Pacific from Hokkaido Island to Chukchi Sea, including the far eastern sea off Russia and in the northeast area off Unimak Island, Vancouver Island, depth 2–1070 m. Chavtur (1983:81) had collected specimens in 63 samples from the subarctic Pacific (regions off Japan, Aleutian Islands, Kamchatka, and Vancouver Island), Japan, Okhotsk, Bering, and Chukchi seas. The 3 species from off Southern California had similar depth ranges of approximately 9–400 m (Baker,

1979:288, 294, 297). The 3 species from southern oceans were from the Atlantic and Pacific and in the vicinity of New Zealand, between latitudes of 41°S and 61°S, at depths of 71–4303 m (Kornicker, 1975:539). *Bathyleberis thrix* was collected in the Beaufort Sea at depths of 53–225 m.

**REMARKS.**—Hiruta (1983:75) reported that some ovigerous females of *B. yamadai* had additional clusters of eggs in the ovary, suggesting that females are able to brood at least twice. It is the only report of eggs being in both the marsupium and ovaries among the *Cylindroleberidinae*. The record was overlooked by the author in his list of species of *Myodocopina* having eggs in both the ovaries and marsupium (Kornicker, 1986, table 7).

Chavtur (1983:81) emended the description of *B. kurilensis* including the statement that the 7th limb bears 6–20 proximal bristles (largest number in the Sea of Japan samples, the least from the Bering and Chukchi seas). In the original description of specimens from the Sea of Okhotsk the 7th limb was reported as having 6 terminal and 7 proximal bristles (Chavtur, 1978:157). A range of 6 to 20 proximal bristles on 7th limbs is greater than normally encountered in a species.

#### Key to Species of *Bathyleberis*

1. Sensory bristle of 1st antenna with 7 long terminal filaments, anterior margin of 6th limb with 6 or 7 bristles . . . . . *B. grossmani*  
Sensory bristle of 1st antenna with 1 short proximal and six long terminal filaments . . . . . 2  
Sensory bristle of 1st antenna with 6 long terminal filaments . . . . . 7
2. Anterior margin of 6th limb with 1 bristle . . . . . *B. monothrix*  
Anterior margin of 6th limb with 2 bristles . . . . . 3
3. Exopodite of mandible minute . . . . . *B. yamadai*  
Exopodite of mandible at least 1/2 length of dorsal margin of 1st endopodial joint . 4
4. Dorsal margin of mandibular basale with 3 or 4 midbristles . . . . . *B. oculata*  
Dorsal margin of mandibular basale with 1 midbristle . . . . . 5
5. Basale of maxilla with 2 proximal ventral bristles . . . . . *B. garthi*  
Basale of maxilla with 1 proximal ventral bristle . . . . . 6
6. Length of female carapace 2.1–2.6 mm . . . . . *B. hancocki*  
Length of female carapace more than 3 mm . . . . . *B. kurilensis*
7. 7th limb with 12 bristles . . . . . *B. californica*  
7th limb with about 30 bristles . . . . . *B. thrix*, new species

#### *Bathyleberis thrix*, new species

FIGURES 18, 19

*Asterope mariae*.—MacGinitie, 1955:72, 148.

**ETYMOLOGY.**—From the Greek *thrix* (hair); in reference to long spines on the terminal bristles of the mandibular exopodite.

**HOLOTYPE.**—USNM 193381, female (adult or late instar)

on slide and in alcohol.

**TYPE-LOCALITY.**—Sta PP-55, 71°17'54"N, 154°33'130"W, 53 m (SMG-1350: USCGC *Glacier*, cruise OCS-4, 31 Aug 1976).

**PARATYPES.**—USNM 157921, 1 female instar III, on slide and in alcohol (sta PP-100, SMG-1318-13). USNM 92216, A-1 female in alcohol (MacGinitie Coll., sta 32).

**DISTRIBUTION.**—Beaufort Sea, 53–225 m.

**DESCRIPTION OF LATE INSTAR FEMALE** (Figures 18, 19b).—

Carapace oval in lateral view with evenly rounded posterior and slit-like incisur ventral to midheight (Figure 18a).

**Infold (Figure 18b):** Rostral infold dorsal to list with about 50 long bristles and additional minute bristles; rostral infold between list and incisur with 7 additional bristles (5 forming horizontal row); anteroventral infold with small bristle just ventral to inner end of incisur followed by about 30 mostly longer bristles; narrow list (with anterior end just ventral to incisur) paralleling and close to inner margin of anteroventral infold and close to valve edge along ventral infold, then broadening along posteroventral and posterior infold; infold ventral to anterior end of broad posteroventral list with about 15 bristles forming row on list or between list and valve edge; broad posteroventral and posterior list with about 30 flap-like bristles and about 45 short and long bristles along proximal edge of list, up to 3 bristles between each pair of flap-like bristles; infold between broad list and valve edge with about 25 bristles forming row (Figure 18b); infold posterior to dorsal half of broad list with 7 or 8 processes forming row plus 4 or 5 less distinct structures that may be processes (smaller circles in illustrated posterior and posteroventral infold, Figure 18b).

**Size:** Holotype, length 2.14 mm, height 1.24 mm.

**First Antenna (Figure 18c):** 1st joint spinous. 2nd joint spinous, with 2 spinous bristles (1 lateral, 1 dorsal). 3rd joint separated from 4th joint by distinct medial and lateral sutures, with 7 bristles (1 small, ventral, 6 spinous, dorsal), and with lateral spines forming rows near ventral margin. 4th joint with slightly concave distal margin, especially laterally, with 3 spinous bristles (2 ventral, 1 dorsal). Sensory bristle of 5th joint with 6 terminal and no proximal filaments. Medial bristle of 6th joint with short marginal spines. 7th joint: a-bristle claw-like, about same length as bristle of 6th joint, bare; b-bristle about 1/3 longer than a-bristle, with 4 marginal filaments (1 short proximal and 3 longer distal); c-bristle reaching slightly past tip of sensory bristle of 5th joint, with 6 short marginal filaments (tip of bristle broken on illustrated limb). 8th joint: d-bristle about same length or slightly shorter than a-bristle, bristle-like with pointed tip; e-bristle about 1/4 longer than d-bristle, filament-like with blunt tip; f-bristle bent dorsally, with 5 short marginal filaments, each with terminal spine; g-bristle about same length as c-bristle (tip of bristle broken on illustrated limb), with 6 marginal filaments (distal filament quite short).

**Second Antenna (Figure 18d):** Prodopodite with hairs along dorsal and ventral margins and 1 small medial distal bristle. Endopodite with 3 well-defined joints; terminal filament about same length as stem. Exopodite: bristle of 2nd joint reaching 9th joint, with long ventral hairs; bristles of joints 3–8 with natatory hairs, no spines; 9th joint with 4 bristles (2 long with natatory hairs, 1 short with small marginal hairs, 1 minute, dorsal, bare); joints 2–8 with fine spines forming distal row; 9th joint with lateral spine about half length of joint; basal spines absent.

**Mandible (Figure 18e,f):** Coxale endite: ventral branch

with ventral spines forming 5 oblique rows and tip with 2 fairly long spines (Figure 18e); small bristle near base of branch; dorsal branch broken off on both limbs of holotype; medial surface of coxale spinous. Basale: endite with 4 end bristles, 3 triaenid bristles (distal with 11 pairs of spines proximal to terminal pair; others with 4–6 pairs proximal pairs), 2 dwarf bristles and glandular peg; ventral margin of basale with U-shaped depression; dorsal margin with 1 fairly long, backward oriented, spinous bristle, and 2 spinous terminal bristles (proximal less than half length of other); medial surface with spines forming row along proximal margin and also along dorsal edge; lateral surface with spines forming row along dorsal edge. Exopodite tapering distally, almost reaching 1st endopodial joint, hirsute, with 2 short terminal bristles with long marginal spines. 1st endopodial joint: ventral margin with 3 stout spinous bristles. 2nd endopodial joint: dorsal margin with 2 proximal bristles, stout a-, b-, c-, and d-bristles; lateral side near dorsal margin with long bristle between b- and c-bristles, and c- and d-bristles; medial surface with spines forming rows, 2 cleaning bristles between a- and b-bristles, 3 cleaning bristles forming oblique row between b- and c-bristles, 5 cleaning bristles forming row between c- and d-bristles, and 1 long spinous bristle just distal to base of d-bristle; ventral margin with 3 terminal bristles. End joint with fairly straight, bare dorsal claw and 5 spinous bristles (4 stout, 1 slender; all spines not shown on bristles).

**Maxilla (Figure 18g):** Epipodial appendage fairly short, not reaching midlength of dorsal margin of basale, hirsute distally, with pointed tip. Endite I with 4 spinous bristles (3 long stout, 1 less than half length of others, but longer than usual); endite II with 3 stout spinous bristles. Basale: medial surface spinous (not all spines shown on illustrated limb), with 3 bristles near dorsal margin (proximal shorter than others); lateral surface near midheight with 1 short proximal bristle; ventral margin with 1 proximal, backward oriented bristle, 1 minute, indistinct, distal bristle, and 1 long spinous terminal bristle. Endopodite: 1st joint with short alpha-bristle and long spinous beta-bristle; end joint with spinous terminal bristle about same length as beta-bristle.

**Fifth Limb (Figure 18h):** Lateral side of comb with stout spinous exopodial bristle, 1 slender bristle just ventral to base of exopodial bristle; 2 pairs of bristles closer to ventral margin (illustrated limb with additional bristle near proximal pair), and 4 additional bristles almost on ventral margin (1 proximal, 1 medial near proximal paired bristles, and 2 distal); ventral margin of comb with long and short bristles forming single row (distal 5 bristles longer than others).

**Sixth Limb (Figure 18i):** Small medial bristle near proximal anterior corner of trunk; anterior margin with upper and lower bristles on well-defined endite sutures; anteroventral corner of skirt with 2 or 3 small spinous bristles; lateral flap with slender spinous bristle; posteroventral margin of skirt with 16–18 spinous bristles (those at posterior corner longer).

**Seventh Limb (Figure 19a):** Bristles fairly evenly distri-



FIGURE 18.—*Bathyleberis thrix*, new species, holotype, USNM 193381, female, adult or late instar, length 2.14 mm: *a*, lateral view of complete specimen; *b*, inside view of posterior of left valve; *c*, right 1st antenna, medial view; *d*, endopodite of 2nd antenna; *e*, ventral branch of coxale endite of right mandible, medial view; *f*, left mandible, medial view (coxale endite not shown); *g*, right maxilla, medial view; *h*, comb of right 5th limb, lateral view; *i*, right 6th limb, medial view; *j*, right lamella of furca; *k*, anterior of body showing left lateral eye, medial eye, Bellonci organ, and upper and lower lips.

buted, not divided into proximal and distal groupings; each limb with 29–31 bristles (13 on one side, 16–18 on other); each bristle with 2–4 bells; most bristles short, but a few twice length of others; bristles present on most distal 16 segments (excluding terminal segment bearing comb teeth), some segments with 2 bristles (1 on each side); terminal segment with 1 or 2 bristles on each side. Terminus with opposing combs, each with about 11 spinous teeth (all spines not shown on illustrated limb).

**Furca (Figure 18j):** Each lamella with 8 claws and bristles; claws 1–6 recurved, claw 7 straight, 8th claw bristle-like, all with marginal spines or teeth; claws of right lamella anterior to like-numbered claws of left lamella; edge following lamellae with minute spines.

**Bellonci Organ (Figure 18k):** Elongate, broadening and with suture or wrinkle near midlength; tip broadly rounded.

**Eyes (Figure 18k):** Medial eye extremely hirsute but unpigmented; lateral eyes small, with 3 or 4 amber ommatidia.

**Upper Lip (Figure 18k):** With hirsute lobe on each side of saddle; each lobe with 1 or 2 minute anterior spines; lateral hirsute flap on each side of mouth.

**Posterior of Body (Figure 19b):** Segment dorsal to furcal lamellae with minute spines on ventral part; following segment (between 2 indentations marking muscle insertions; upper indentation opposite upper end of girdle) with long hairs; segment dorsal to upper indentation with short stout teeth-like spines along ventral part and long hairs and slender spines along distal part, and terminating in thumb-like process.

**Genitalia:** None observed.

**Y-Sclerite (Figure 19b):** Typical for genus.

**Gills:** 7 well-developed gills with broadly rounded tips on each side of posterior of body.

**DESCRIPTION OF INSTAR III FEMALE (Figure 19c–f).—**Carapace oval in lateral view with posterodorsal corner more oblique than posteroventral corner; incisur ventral to valve midheight (Figure 19c).

**Size:** USNM 157921, length 1.49 mm, height 0.84 mm.

**First Antenna:** 1st joint spinous. 2nd joint spinous, with 2 spinous bristles (1 short, lateral, 1 long, spinous, dorsal). 3rd joint with lateral spines forming rows along distal edge near ventral margin, 1 small ventral bristle, and 2 long spinous dorsal bristles. 4th joint with 2 bristles (1 ventral, 1 dorsal). Sensory bristle of 5th joint with 6 long terminal filaments. 6th joint with long medial bristle. 7th joint: a-bristle claw-like, bare; b-bristle about 1/4 longer than a-bristle, with 3 marginal filaments (1 short, proximal, 2 longer distal); c-bristle about twice length of a-bristle, with 5 marginal filaments (distal shorter than others). 8th joint: d-bristle slightly shorter than a-bristle, bristle-like with pointed tip; e-bristle about twice length of d-bristle, filament-like with blunt tip; f-bristle bent dorsally, about 1/3 longer than a-bristle, with 4 marginal filaments (distal shorter than others); g-bristle about same length as c-bristle, with 6 marginal filaments (distal shorter than others).

**Second Antenna:** Similar to that of holotype except 9th

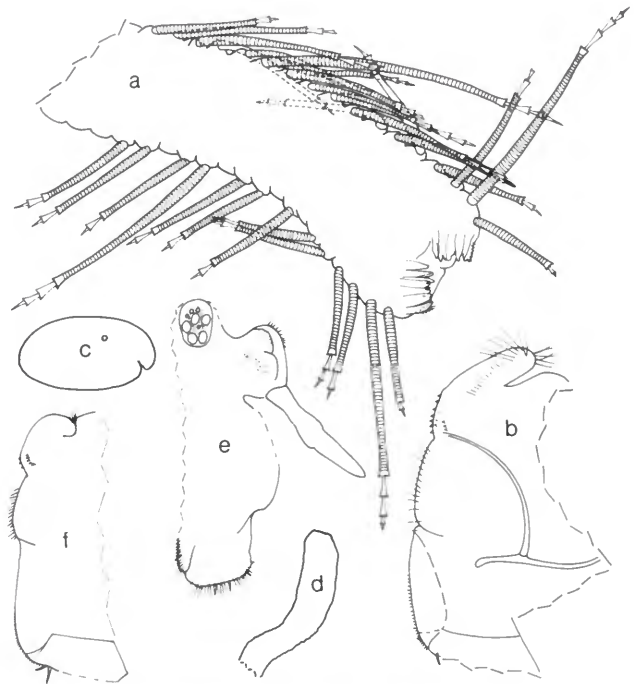


FIGURE 19.—*Bathyleberis thrax*, new species, holotype, USNM 193381, female, adult or late instar, length 2.14 mm: a, 7th limb; b, posterior of body showing dorsal process, Y-sclerite and girdle. Paratype, USNM 157921, instar III female, length 1.49 mm: c, lateral view of complete specimen (circle indicates lateral eye); d, 7th limb; e, anterior of body showing right lateral eye, medial eye, Bellonci organ, upper and lower lips; f, posterior of body showing dorsal process and 2 posterior furcal claws of right lamella.

joint with only 3 bristles (2 long with natatory hairs, 1 short, bare, dorsal).

**Mandible:** Coxale endite broken off single limb examined of USNM 157921. Basale endite with 3 end bristles, 2 triaenid bristles, 2 dwarf bristles and glandular peg, basale otherwise similar to that of holotype. Exopodite and 1st endopodial joint similar to that of holotype. 2nd endopodial joint: dorsal margin with only 1 proximal bristle; medial surface with 1 cleaning bristle between a- and b-bristles, 4 cleaning bristles forming oblique row between b- and c-bristles, and no cleaning bristles between c- and d-bristles; joint otherwise similar to that of holotype. End joint similar to that of holotype.

**Maxilla:** Epipodite similar to that of holotype. Endite I broken off limb examined; endite II with 3 long spinous bristles. Basale: medial side near dorsal margin with 2 proximal bristles and 1 distal bristle; ventral margin with 1 proximal backward pointing bristle, 1 minute distal bristle and 1 long spinous terminal bristle; endopodite similar to that of holotype.

**Fifth Limb:** Well developed but not examined in detail.

**Sixth Limb:** Not examined in detail but well developed with upper and lower bristles on anterior endites, 1 or 2 small bristles at anterior tip of skirt, 1 small bristle on lateral flap, and 10 posteroventral bristles.

Seventh Limb (Figure 19d): Elongate, bare.

Furca (Figure 19f): Each lamella with 7 claws; claws 1–5 recurved; claw 6 straight; claw 7 bristle-like. Claws with teeth similar to those on claws of holotype. Edge following lamellae with minute spines.

Bellonci Organ (Figure 19e): Similar to that of holotype.

Eyes (Figure 19e): Medial eye similar to that of holotype. Lateral eye with 5 amber ommatidia (eye relatively larger and better developed than that of holotype).

Upper Lip (Figure 19e): Similar to that of holotype.

Posterior of Body (Figure 19f): Similar to that of holotype but dorsal process obscure on specimen.

Gills: Each side with 7 posterodorsal gills.

DESCRIPTION OF A-1 FEMALE.—Carapace similar in shape to that of adult female.

Size: USNM 92216, length 1.91 mm, height 1.04 m.

First Antenna: 1st and 2nd joint similar to those of adult female. 3rd and 4th joints differ from that of adult female in having no visible suture separating them either on medial or lateral surfaces; 3rd joint with small ventral bristle and 4 dorsal bristles; 4th joint with 2 ventral and 1 dorsal bristle. Sensory bristle of 5th joint with 6 long terminal filaments (similar to that of adult female). 6th joint with medial bristle reaching just past tip of a-bristle of 7th joint. 7th joint: a- and b-bristles similar to those of adult female; c-bristle with 5 marginal filaments. 8th joint: d-bristle about same length as a-bristle of 7th joint, tapering to point; e-bristle only slightly longer than d-bristle, with blunt tip; f-bristle similar to that of adult female but not bent dorsally; g-bristle slightly longer than c-bristle of 7th joint, with 5 marginal filaments.

Second Antenna: Similar to that of adult female.

Mandible: Coxale and basale endites obscured. Basale: ventral margin with U-shaped depression close to endite; dorsal margin with bristles similar to those of adult female. Exopodite and 1st endopodial joint similar to those of adult female. 2nd endopodial joint: dorsal margin with 1 short proximal bristle, stout a-, b-, c-, and d-bristles; lateral side near dorsal margin with long slender bristle between b- and c-bristles (about 2/3 length of c-bristle) and between c- and d-bristles; medial side with 1 cleaning bristle between a- and b-bristles, 2 cleaning bristles between b- and c-bristles, 5 cleaning bristles forming oblique row between c- and d-bristles, and 1 slender spinous

bristle just distal to base of d-bristle; ventral margin with 3 terminal bristles. End joint similar to that of adult female.

Seventh Limb: With about 12 bristles on ventral edge (those along dorsal edge obscured on specimen); most bristles cylindrical, a few with slight taper; observed bristles with 1 or 2 bells, rarely 3 bells; distribution of bristles similar to those of adult female (not divided into 2 groups and many segments with 2 bristles, 1 on each side). Combs of tip similar to those of adult female.

Furca: Each lamella with 7 claws; last claw bristle-like and with base set back from edge; claws of right lamella slightly anterior to those of left lamella; edge following lamellae with minute spines.

Bellonci Organ: Similar to that of adult female.

Eyes: Lateral eyes very small, with about 5 indistinct ommatidia.

Posterior of Body: Similar to that of adult female.

COMPARISONS.—*Bathyleberis thrix* differs from previously described species in having the following combination of characters: 6 terminal filaments and no proximal filament on the sensory bristle of the 5th joint of the 1st antenna, 2 bristles on the anterior margin of the trunk of the 6th limb, and in having about 30 bristles on the 7th limb. Development of the lateral eye is also useful in discriminating species. (In tabulation below, depth is in meters.)

Species	Depth	Lateral eye
<i>B. oculata</i>	117	Well developed with 18 ommatidia
<i>B. yamadai</i>	3–5	Well developed with 16 ommatidia
<i>B. californica</i>	9.1–401.4	Male with 8 ommatidia
<i>B. garthi</i>	15.2–401.4	Female with 5 or 6 ommatidia*
<i>B. thrix</i>	53–92	Small with 3–5 ommatidia
<i>B. hancocki</i>	9.1–401.7	Absent
<i>B. kurilensis</i>	2–1070	Absent
<i>B. grossmani</i>	3431–4303	Absent
<i>B. monothrix</i>	71–601	Absent

\*Baker (1979:293) did not mention a lateral eye, but the adult female paratype at the National Museum of Natural History, USNM 151396, has lateral eyes with 5 or 6 ommatidia.

# Appendix

## Station Data with Specimens Collected

(arranged by Smith-McIntyre Grab sample number (SMG))

### USCGC *Glacier*, Cruise WEBSEC71

Sta C7101; 19 Aug 1971; 71°8'19"N, 143°39'36"W.

SMG 0829-13; 35 m.

*Philomedes brenda*: 12 (includes 1 ovigerous female).

SMG 0830-14; 33 m.

*Philomedes brenda*: 3.

Sta C7103; 20 Aug 1971; 70°27'00"N, 143°34'00"W; 48 m.

SMG 0834-14.

*Philomedes brenda*: 55 (includes 4 ovigerous females).

*Scleroconcha ruffi*: 2.

SMG-0835-14.

*Philomedes brenda*: 52 (includes 4 ovigerous females).

SMG-0836-13.

*Philomedes brenda*: 61 (includes 4 ovigerous females).

SMG-0837-14.

*Philomedes brenda*: 57 (includes 3 ovigerous females and 1 adult male).

SMG-0838-16.

*Philomedes brenda*: 45 (includes 3 ovigerous females and 1 adult male).

Sta C7105; 20 Aug 1971; 70°34'36"N, 143°38'00"W.

SMG-0839-13; 106 m.

*Philomedes brenda*: 12 (includes 1 ovigerous female and 1 adult male).

SMG-0840-09; 106 m.

*Philomedes brenda*: 2.

SMG-0842-10; 105 m.

*Philomedes brenda*: 5.

SMG-0843-11; 109 m.

*Philomedes brenda*: 6.

Sta C7107; 21 Aug 1971; 71°00'30"N, 145°35'00"W.

SMG-0851-09; 450 m.

*Philomedes brenda*: 3.

SMG-0852-10; 447 m.

*Philomedes brenda*: 3.

SMG-0853-15; 476 m.

*Philomedes brenda*: 3.

Sta C7108; 22 Aug 1971; 70°48'30"N, 145°56'06"W.

SMG-0854-12; 84 m.

*Philomedes brenda*: 7 (includes 1 ovigerous female).

SMG-0855-08; 84 m.

*Philomedes brenda*: 7.

SMG-0856-16; 84 m.

*Philomedes brenda*: 21.

SMG-0857-15; 83 m.

*Philomedes brenda*: 4.

SMG-0858-10; 81 m.

*Philomedes brenda*: 10 (includes 2 ovigerous females).

Sta C7109; 22 Aug 1971; 70°44'00"N, 145°52'00"W.

SMG-0859-10; 57 m.

*Philomedes brenda*: 5.

SMG-0860-13; 58 m.

*Philomedes brenda*: 34.

SMG-0861-15; 57 m.

*Philomedes brenda*: 24.

SMG-0862-14; 57 m.

*Philomedes brenda*: 23.

SMG-0863-13; 57 m.

*Philomedes brenda*: 2.

Sta C7117; 23 Aug 1971; 70°50'00"N, 147°06'36"W; 46 m.

SMG-0875-16.

*Philomedes brenda*: 12 (includes 1 adult male).

SMG-0876-13.

*Philomedes brenda*: 2.

SMG-0877-10.

*Philomedes brenda*: 1 ovigerous female.

SMG-0878-12.

*Philomedes brenda*: 2.

SMG-0879-11.

*Philomedes brenda*: 8 (includes 2 ovigerous females).

Sta C7118; 23 Aug 1971.

SMG-0880-13; 70°56'24"N, 147°05'54"W; 125 m.

*Philomedes brenda*: 30 (includes 5 ovigerous females and 1 adult male).

SMG-0881-12; 70°56'18"N, 147°05'48"W; 146 m.

*Philomedes brenda*: 6 (includes 2 ovigerous females).

SMG-0882-12; 70°56'12"N, 147°05'42"W; 145 m.

*Philomedes brenda*: 24 (includes 2 ovigerous females).

SMG-0884-09; 70°56'00"N, 147°05'30"W; 146 m.

*Philomedes brenda*: 34 (includes 2 ovigerous females).

Sta C7119; 24 Aug 1971; 71°00'00"N, 147°04'00"W.

SMG-0885-11; 689 m.

*Philomedes brenda*: 27.

SMG-0886-15; 594 m.

*Philomedes brenda*: 13 (includes 1 adult male).

SMG-0887-11; 633 m.

*Philomedes brenda*: 9.

Sta C7127; 29 Aug 1971.

SMG-0903-08; 70°56'00"N, 147°19'42"W; 50 m.

*Philomedes brenda*: 8 (includes 1 adult male).

SMG-0904-10; 70°56'06"N, 147°19'18"W; 50 m.

*Philomedes brenda*: 3 (includes 1 ovigerous female).

SMG-0906-08; 70°56'18"N, 147°18'36"W; 51 m.

*Philomedes brenda*: 3.

SMG-0907-12; 70°56'24"N, 147°17'24"W; 50 m.

*Philomedes brenda*: 6.

Sta C7128; 29 Aug 1971; 70°59'00"N, 147°24'00"W.

SMG-0908-15; 128 m.

*Philomedes brenda*: 38 (includes 2 ovigerous females).

SMG-0909-18; 108 m.

*Philomedes brenda*: 54 (includes 4 ovigerous females and 1 adult male).

- SMG-0910-09; 105 m.  
*Philomedes brenda*: 24.
- SMG-0911-10; 91 m.  
*Philomedes brenda*: 2.
- SMG-0912-10; 84 m.  
*Philomedes brenda*: 7 (includes 1 ovigerous female).
- Sta C7129; 29 Aug 1971.  
SMG-0913-11; 71°08'29"N, 148°00'00"W; 439 m.  
*Philomedes brenda*: 14 (includes 1 ovigerous female and 1 adult male).
- SMG-0914-12; 71°08'36"N, 148°00'18"W; 359 m.  
*Philomedes brenda*: 21 (includes 4 ovigerous females and 1 adult male).
- SMG-0915-09; 71°08'42"N, 148°00'24"W; 355 m.  
*Philomedes brenda*: 21 (includes 4 ovigerous females).
- SMG-0916-12; 71°08'54"N, 148°00'48"W; 335 m.  
*Philomedes brenda*: 2.
- SMG-0917-12; 71°09'00"N, 148°01'00"W; 324 m.  
*Philomedes brenda*: 2.
- Sta C7130; 30 Aug 1971; 71°06'00"N, 147°57'00"W.  
SMG-0918-13; 94 m.  
*Philomedes brenda*: 13 (includes 1 ovigerous female).  
*Scleroconcha ruffi*: 14.
- SMG-0919; 85 m.  
*Philomedes brenda*: 34 (includes 2 ovigerous females).  
*Scleroconcha ruffi*: 5.
- SMG-0920-09; 100 m.  
*Philomedes brenda*: 1.  
*Scleroconcha ruffi*: 3.
- SMG-0921-10; 106 m.  
*Philomedes brenda*: 8 (includes 1 ovigerous female).  
*Scleroconcha ruffi*: 8 (includes 2 ovigerous females).
- SMG-0921; 106 m.  
*Philomedes brenda*: 24.  
*Scleroconcha ruffi*: 16.
- SMG-0922-10; 111 m.  
*Philomedes brenda*: 14 (includes 3 ovigerous females).  
*Scleroconcha ruffi*: 3.
- Sta C7131; 30 Aug 1971; 71°01'00"N, 147°59'00"W; 52 m.  
SMG-0923-14.  
*Philomedes brenda*: 3.
- SMG-0924-13.  
*Philomedes brenda*: 2.
- SMG-0925-13.  
*Philomedes brenda*: 24 (includes 2 ovigerous females).
- SMG-0926-11.  
*Philomedes brenda*: 8 (includes 2 ovigerous females).
- SMG-0927-10.  
*Philomedes brenda*: 1.
- Sta C7142; 31 Aug 1971; 71°12'00"N, 148°36'00"W.  
SMG-0928-10; 156 m.  
*Philomedes brenda*: 13.  
*Scleroconcha ruffi*: 1.
- SMG-0929-09; 152 m.  
*Philomedes brenda*: 26.
- SMG-0930-09; 141 m.  
*Philomedes brenda*: 14 (includes 2 ovigerous females).
- SMG-0931-14; 126 m.  
*Philomedes brenda*: 16.
- SMG-0932-08; 80 m.  
*Philomedes brenda*: 11 (includes 1 ovigerous female).
- Sta C7144; 31 Aug 1971; 71°01'00"N, 148°22'42"W.  
SMG-0933-09; 57 m.  
*Philomedes brenda*: 28.
- SMG-0934-15; 47 m.  
*Philomedes brenda*: 1.
- SMG-0935-12; 47 m.  
*Philomedes brenda*: 12 (includes 1 ovigerous female).
- SMG-0936-15; 47 m.  
*Philomedes brenda*: 23 (includes 3 ovigerous females).
- SMG-0937-13; 47 m.  
*Philomedes brenda*: 33 (includes 2 ovigerous females).
- Sta C7157; 4 Sep 1971; 71°21'00"N, 149°26'12"W; 1926 m.  
SMG-0943-12.  
*Philomedes brenda*: 1 A-1 male.
- Sta C7158; 5 Sep 1971.  
SMG-0948-10; 71°15'12"N, 149°28'48"W; 1000 m.  
*Philomedes brenda*: 1 juvenile female.
- SMG-0949-14; 71°14'30"N, 149°24'18"W; 503 m.  
*Philomedes brenda*: 22 (includes 2 ovigerous females and 1 adult male).
- SMG-0950-09; 71°14'18"N, 149°23'00"W; 704 m.  
*Philomedes brenda*: 10.
- SMG-0950-12; 71°14'18"N, 149°23'00"W; 704 m.  
*Philomedes brenda*: 7.
- SMG-0951-12; 71°14'12"N, 149°22'18"W; 726 m.  
*Philomedes brenda*: 14 (includes 3 ovigerous females).
- SMG-0952-11; 71°14'06"N, 149°21'42"W; 612 m.  
*Philomedes brenda*: 14 (includes 3 ovigerous females).
- Sta C7160; 71°12'00"N, 149°15'00"W.  
SMG-0953-14; 5 Sep 1971; 63 m.  
*Philomedes brenda*: 41 (includes 1 adult male).
- SMG-0954-17; 5 Sep 1971; 65 m.  
*Philomedes brenda*: 52 (includes 2 ovigerous females).  
*Scleroconcha ruffi*: 1.
- SMG-0955-19; 6 Sep 1971; 63 m.  
*Philomedes brenda*: 29 (includes 1 ovigerous female).
- SMG-0956-12; 6 Sep 1971; 64 m.  
*Philomedes brenda*: 17.
- SMG-0957-09; 6 Sep 1971; 64 m.  
*Philomedes brenda*: 2.
- Sta C7161; 6 Sep 1971; 71°10'00"N, 149°18'54"W; 50 m.  
SMG-0962-11.  
*Scleroconcha ruffi*: 1.
- Sta C7174.  
SMG-0978-11; 10 Sep 1971; 71°19'42"N, 151°09'48"W; 99 m.  
*Philomedes brenda*: 52 (includes 4 ovigerous females).  
*Scleroconcha ruffi*: 3 (includes 2 ovigerous females).
- SMG-0979-12; 71°19'36"N, 151°09'24"W; 101 m.  
*Philomedes brenda*: 56 (includes 3 ovigerous females).  
*Scleroconcha ruffi*: 1.
- SMG-0980-11; 71°19'31"N, 151°09'06"W; 102 m.  
*Philomedes brenda*: 56 (includes 4 ovigerous females and 3 adult males).  
*Scleroconcha ruffi*: 4.
- SMG-0981-12; 71°19'30"N, 151°08'30"W; 101 m.  
*Philomedes brenda*: 41 (includes 4 ovigerous females and 1 adult male).  
*Scleroconcha ruffi*: 1.
- SMG-0982-12; 71°19'30"N, 151°08'30"W; 102 m.  
*Philomedes brenda*: 48 (includes 2 ovigerous females and 1 adult male).  
*Scleroconcha ruffi*: 5.
- Sta C7175; 10 Sep 1971; 71°14'48"N, 150°27'36"W.  
SMG-0983-12; 132 m.  
*Philomedes brenda*: 38 (includes 6 ovigerous females and 1 adult male).  
*Scleroconcha ruffi*: 9.
- SMG-0984-09; 134 m.  
*Philomedes brenda*: 25 (includes 4 adult males).  
*Scleroconcha ruffi*: 10.



- SMG-0985-12; 137 m.  
*Philomedes brenda*: 37 (includes 1 ovigerous female).  
*Scleroconcha ruffi*: 3.
- SMG-0987-06; 140 m.  
*Philomedes brenda*: 10 (includes 1 adult male).  
*Scleroconcha ruffi*: 3.
- Sta C7176; 10 Sep 1971.  
SMG-0988-12; 71°09'12"N, 150°32'00"W; 48 m.  
*Philomedes brenda*: 2.  
*Scleroconcha ruffi*: 13.
- SMG-0989-16; 71°09'06"N, 150°36'12"W; 47 m.  
*Philomedes brenda*: 2.  
*Scleroconcha ruffi*: 11 (includes 2 ovigerous females).
- SMG-0990-15; 71°08'24"N, 150°50'06"W; 47 m.  
*Philomedes brenda*: 1.  
*Scleroconcha ruffi*: 11.
- SMG-0991-16; 71°08' 18"N, 150°53'30"W; 46 m.  
*Philomedes brenda*: 7 (includes 1 adult male).  
*Scleroconcha ruffi*: 11 (includes 1 ovigerous female).
- SMG-0992-14; 71°08'18"N, 150°54'24"W; 46 m.  
*Scleroconcha ruffi*: 14 (includes 1 ovigerous female).
- Sta C7183; 11 Sep 1971; 71°12'12"N, 149°44'48"W.  
SMG-1008-17; 169 m.  
*Scleroconcha ruffi*: 2.
- SMG-1009-12; 189 m.  
*Scleroconcha ruffi*: 1 ovigerous female.
- SMG-1010-13; 204 m.  
*Philomedes brenda*: 1.
- SMG-1011-09; 216 m.  
*Philomedes brenda*: 3.
- Sta C7184; 12 Sep 1971.  
SMG-1013-12; 71°18'18"N, 150°21'36"W; 549 m.  
*Philomedes brenda*: 26 (includes 3 ovigerous females and 2 adult males).
- SMG-1014-12; 71°17'54"N, 150°20'54"W; 676 m.  
*Philomedes brenda*: 30 (includes 2 ovigerous females).
- SMG-1015-13; 71°17'30"N, 150°20'00"W; 676 m.  
*Philomedes brenda*: 37 (includes 1 ovigerous female).
- SMG-1016-08; 71°17'18"N, 150°19'30"W; 759 m.  
*Philomedes brenda*: 4 (includes 1 adult male).
- SMG-1017-11; 71°16'48"N, 150°18'30"W; 831 m.  
*Philomedes brenda*: 16 (includes 1 ovigerous female and 1 adult female, USNM 193284A,B, both with hydrozoan colonies on carapace).
- Ice Stations, OCS-1**  
(collected via helicopter from Point Barrow)
- Sta PP-55; 29 Oct 1975; 71°19'06"N, 152°34'00"W; 59 m.  
SMG-1088-17.  
*Philomedes brenda*: 116 (includes 2 ovigerous females, USNM 158442, and 114 specimens, USNM 158444).  
*Scleroconcha ruffi*: 1 juvenile, USNM 158441.
- SMG-1089-18.  
*Philomedes brenda*: 36 (includes 3 ovigerous female, USNM 158417, 158421; 2 adult males, USNM 158420; and 31 specimens, USNM 158431).  
*Scleroconcha ruffi*: 1 juvenile, USNM 158428.
- SMG-1090-14.  
*Philomedes brenda*: 65 (includes 4 ovigerous females).  
*Scleroconcha brenda*: 6 (includes 3 ovigerous females).
- SMG-1091-12.  
*Philomedes brenda*: 102 (includes 1 adult female with hydrozoan colonies, USNM 158422; 4 ovigerous females, USNM 158423; and 97 specimens, USNM 158430).
- Scleroconcha ruffi*: 3 (includes 1 ovigerous female, USNM 158425; and 2 specimens, USNM 158427).
- SMG-1092-16.  
*Philomedes brenda*: 47 (includes 6 ovigerous females, USNM 158419; 1 adult male, USNM 158418; and 40 specimens, USNM 158429).  
*Scleroconcha ruffi*: 7 (USNM 158426).
- Sta PP-100; 30 Oct 1975; 71°21'36"N, 152°35'00"W; 102 m.  
SMG-1093-17.  
*Philomedes brenda*: 197 (includes 15 ovigerous females, USNM 158465; 1 ovigerous female with hydrozoan colonies, USNM 158466; 1 adult male, USNM 158463; and 180 specimens, USNM 158465).  
*Scleroconcha ruffi*: 25 (includes 1 ovigerous female, USNM 158468; 1 juvenile male, USNM 158471; and 23 specimens, USNM 1584721).
- SMG-1094-08.  
*Philomedes brenda*: 15 (USNM 158438).  
*Scleroconcha ruffi*: 7 (includes 1 ovigerous female, USNM 158439; and 6 specimens).
- SMG-1095-16.  
*Philomedes brenda*: 36 (includes 4 ovigerous females; 2 adult males; and 30 specimens, USNM 158467).  
*Scleroconcha ruffi*: 3 (includes 1 ovigerous female, USNM 158470; and 2 specimens, USNM 158469).
- SMG-1096-14.  
*Philomedes brenda*: 76 (includes 3 ovigerous females, USNM 158450; 2 adult males, USNM 158451; and 71 specimens, USNM 158452).  
*Scleroconcha ruffi*: 17 (includes 3 ovigerous females, USNM 158460, 158572; 1 juvenile male, USNM 158459; and 13 specimens, USNM 158458).
- SMG-1097-10.  
*Philomedes brenda*: 2 (USNM 158453).
- Ice Station, OCS-2**
- Sta PP-70; 13 Mar 1976; 71°19'12"N, 152°40'30"W; 73 m.  
SMG-1108-14.  
*Philomedes brenda*: 160 (includes 16 ovigerous female, USNM 148455; 4 adult males; and 140 specimens, USNM 158456).  
*Scleroconcha ruffi*: 1 juveniles (USNM 158457).
- SMG-1109-15.  
*Philomedes brenda*: 287 (USNM 158510, including 16 ovigerous females).  
*Scleroconcha ruffi*: 5 (includes 1 juvenile male, USNM 158518; and 4 specimens, USNM 158514).
- SMG-1110-12.  
*Philomedes brenda*: 120 (USNM 158511, including 16 ovigerous females and 2 adult males).  
*Scleroconcha ruffi*: 2 juvenile (USNM 158515).
- SMG-1111-14.  
*Philomedes brenda*: 168 (USNM 158512, including 26 ovigerous females and 1 adult male).
- SMG-1114-14.  
*Philomedes brenda*: 125 (USNM 158513, including 12 ovigerous females).  
*Scleroconcha ruffi*: 2 (USNM 158516, including 1 ovigerous female).
- Sta PPB-40; 15 Mar 1976; 71°11'00"N, 152°50'00"W; 35 m.  
SMG-1115-11.  
*Scleroconcha ruffi*: 1 ovigerous female (USNM 158517).
- SMG-1119-10.  
*Scleroconcha ruffi*: 1 (USNM 158324).
- Sta PP-55; 18 Mar 1976; 71°17'36"N, 152°41'30"W; 58 m.  
SMG-1121-15.  
*Philomedes brenda*: 95 (USNM 158501, including 17 ovigerous females and 2 adult males).

- Scleroconcha ruffi*: 3 (USNM 158505).
- SMG-1122-12.  
*Philomedes brenda*: 121 (USNM 158521, including 12 ovigerous females).  
*Scleroconcha ruffi*: 1 (USNM 158519).
- SMG-1123-15.  
*Philomedes brenda*: 158 (USNM 158522, including 15 ovigerous females).  
*Scleroconcha ruffi*: 2 (USNM 158520).
- SMG-1124-10.  
*Philomedes brenda*: 4 (USNM 158523).
- SMG-1125-11.  
*Philomedes brenda*: 7 (USNM 158524).
- SMG-1126-12.  
*Philomedes brenda*: 76 (USNM 158526, including 12 ovigerous females).  
*Scleroconcha ruffi*: 1 ovigerous female (USNM 158531).
- SMG-1127-11.  
*Philomedes brenda*: 21 (USNM 158527, including 2 ovigerous females).
- SMG-1129-09.  
*Philomedes brenda*: 5 (USNM 158528).
- SMG-1130-12.  
*Philomedes brenda*: 67 (USNM 158502, including 11 ovigerous females).
- Sta PP-100; 19 Mar 1976; 71°26'30"N, 152°38'42"W; 99 m.
- SMG-1131-14.  
*Philomedes brenda*: 126 (USNM 158529, including 10 ovigerous females).  
*Scleroconcha ruffi*: 16 (USNM 158538).
- SMG-1132-13.  
*Philomedes brenda*: 53 (USNM 158530, including 4 ovigerous females).  
*Scleroconcha ruffi*: 2 (USNM 158539).
- SMG-1133-12.  
*Philomedes brenda*: 110 (USNM 158531, including 5 ovigerous females).  
*Scleroconcha ruffi*: 7 (USNM 158540, including 1 ovigerous female).
- SMG-1134-10.  
*Philomedes brenda*: 14 (USNM 158532).
- SMG-1135-14.  
*Philomedes brenda*: 19 (USNM 158533, including 1 ovigerous female).
- SMG-1136-12.  
*Philomedes brenda*: 15 (USNM 158534, including 3 ovigerous females).  
*Scleroconcha ruffi*: 3 (USNM 158541).
- SMG-1137-14.  
*Philomedes brenda*: 143 (1 adult female with hydrozoan colony, USNM 158536; and 142 specimens including 14 ovigerous females, USNM 158535).  
*Scleroconcha ruffi*: 8 (USNM 158452).
- SMG-1138-13.  
*Philomedes brenda*: 42 (USNM 158503, including 8 ovigerous females and 2 adult males).  
*Scleroconcha ruffi*: 5 (USNM 158504, including 2 ovigerous females).
- SMG-1139-15.  
*Philomedes brenda*: 84 (USNM 158544, including 9 ovigerous females).  
*Scleroconcha ruffi*: 7 (USNM 158545, including 1 ovigerous female).
- SMG-1140-12.  
*Philomedes brenda*: 53 (USNM 158556, including 9 ovigerous females).  
*Scleroconcha ruffi*: 3 (USNM 158547).
- Ice Station, OCS-3
- Sta PP-55; 20 May 1976; 71°18'00"N, 152°41'18"W; 55 m.
- SMG-1151-10.  
*Philomedes brenda*: 44 (USNM 158557).  
*Scleroconcha ruffi*: 2 (USNM 158548).
- SMG-1155-11.  
*Philomedes brenda*: 82 (USNM 158558, including 2 ovigerous females).  
*Scleroconcha ruffi*: 2 (USNM 158549).
- SMG-1156-12.  
*Philomedes brenda*: 106 (USNM 158559, including 4 ovigerous females).  
*Scleroconcha ruffi*: 2 (includes 1 ovigerous female, USNM 158551; and 1 specimen, USNM 158550).
- SMG-1158-11.  
*Philomedes brenda*: 109 (USNM 158560, including 4 ovigerous females).  
*Scleroconcha ruffi*: 3 (USNM 158552).
- SMG-1159-13.  
*Philomedes brenda*: 84 (USNM 158500, including 6 ovigerous females and 1 adult male).  
*Scleroconcha ruffi*: 7 (USNM 158506, including 1 ovigerous female).
- SMG-1160-14.  
*Philomedes brenda*: 87 (USNM 158561, including 1 ovigerous female and 1 adult male).  
*Scleroconcha ruffi*: 1 (USNM 158553).
- Sta PP-100; 21 May 1976; 71°19'30"N, 152°39'18"W; 101 m.
- SMG-1161-12.  
*Philomedes brenda*: 176 (USNM 158562, including 7 ovigerous females and 1 adult male).
- SMG-1162-13.  
*Philomedes brenda*: 222 (USNM 158563, including 20 ovigerous females).  
*Scleroconcha ruffi*: 5 (includes 2 adult males, USNM 158546, 158555; and 3 specimens, USNM 158554).
- SMG-1166-13.  
*Philomedes brenda*: 122 (USNM 157895, including 18 ovigerous females).  
*Scleroconcha ruffi*: 2 (USNM 157902).
- SMG-1168-13.  
*Philomedes brenda*: 136 (USNM 157896, including 11 ovigerous females).  
*Scleroconcha ruffi*: 3 (USNM 157903).
- SMG-1169-12.  
*Philomedes brenda*: 156 (USNM 157897, including 9 ovigerous females and 6 adult males).
- Sta PP-70; 26 May 1976; 71°18'36"N, 152°40'12"W; 70 m.
- SMG-1171-12.  
*Philomedes brenda*: 160 (USNM 157898, including 11 ovigerous females and 2 adult males).  
*Scleroconcha ruffi*: 1 (USNM 157904).
- SMG-1173-12.  
*Philomedes brenda*: 210 (USNM 158507, including 15 ovigerous females).
- SMG-1174-12.  
*Philomedes brenda*: 141 (USNM 157899, including 15 ovigerous females).  
*Scleroconcha ruffi*: 1 (USNM 157905).
- SMG-1178-12.  
*Philomedes brenda*: 114 (USNM 157900, including 7 ovigerous females).
- SMG-1180-12.  
*Philomedes brenda*: 152 (USNM 157901, including 17 ovigerous females and 1 adult male).  
*Scleroconcha ruffi*: 2 (USNM 157906, including 1 ovigerous female).
- Sta PP-40; 27 May 1976; 71°12'24"N, 152° 44'24"W; 37 m.
- SMG-1187-6.  
*Scleroconcha ruffi*: 1 ovigerous female (USNM 157907).
- SMG-1188-3.  
*Scleroconcha ruffi*: 2 (USNM 157908).

- SMG-1189-10.  
*Scleroconcha ruffi*: 4 (USNM 157909, including 1 ovigerous female).
- SMG-1190-8.  
*Scleroconcha ruffi*: 2 (USNM 157910).
- Sta NI-55; 1 June 1976; 70°50'48"N, 146°58'00"W; 52 m.  
SMG-1192-07.  
*Philomedes brenda*: 2 (USNM 158508).
- SMG-1193-11.  
*Philomedes brenda*: 7 (USNM 157912).
- SMG-1194-10.  
*Philomedes brenda*: 31 (USNM 157913, including 4 ovigerous females).
- SMG-1195-10.  
*Philomedes brenda*: 6 (USNM 157914, including 1 ovigerous females).
- SMG-1197-08.  
*Philomedes brenda*: 1 (USNM 157915).
- Sta NI-40; 1 June 1976; 70°43'30"N, 147°00'00"W; 43 m.  
SMG-1198-12.  
*Philomedes brenda*: 6 (USNM 157916).
- SMG-1199-11.  
*Philomedes brenda*: 1 (USNM 157917).
- SMG-1200-09.  
*Philomedes brenda*: 7 (USNM 157918, including 1 ovigerous female).
- SMG-1202-06.  
*Philomedes brenda*: 4 (USNM 158509).
- SMG-1204-11.  
*Philomedes brenda*: 21 (USNM 157919, including 3 ovigerous females).

## USCGC Glacier, OCS-4

- Sta PP-100; 30 Aug 1976.  
SMG-1318-13; 71°22'48"N, 152°23'06"W; 92 m.  
*Philomedes brenda*: 81 (USNM 157920, including 6 ovigerous females and 2 adult males).  
*Scleroconcha ruffi*: 3 (USNM 157911).  
*Bathyleberis thrix*: 1 (USNM 157921).
- SMG-1319-15; 71°22'48"N, 152°22'54"W; 90 m.  
*Philomedes brenda*: 50 (USNM 157927, including 5 ovigerous females and 1 adult male).  
*Scleroconcha ruffi*: 1 (USNM 157927).
- SMG-1320-14; 71°22'30"N, 152°22'48"W; 88 m.  
*Philomedes brenda*: 72 (USNM 157923, including 8 ovigerous females and 3 adult males).  
*Scleroconcha ruffi*: 4 (USNM 157928).
- SMG-1322-12; 71°22'24"N, 152°21'54"W; 84.  
*Philomedes brenda*: 52 (USNM 157924, including 1 ovigerous female and 1 adult male).  
*Scleroconcha ruffi*: 1 (USNM 157929).
- SMG-1323-15; 71°22'24"N, 152°21'30"W; 83 m.  
*Philomedes brenda*: 59 (USNM 157925, including 10 ovigerous females and 4 adult males).  
*Scleroconcha ruffi*: 4 (USNM 157930, including 1 ovigerous female).
- Sta PP-70; 31 Aug 1976; 71°22'24"N, 152°06'06"W.  
SMG-1325-11; 73 m.  
*Philomedes brenda*: 34 (includes 2 ovigerous females USNM 158432; 1 adult male, USNM 158433; and 31 specimens, USNM 158434).
- SMG-1326-12; 73 m.  
*Philomedes brenda*: 32 (USNM 157936, including 5 ovigerous females and 1 adult male).
- SMG-1327-11; 73 m.  
*Philomedes brenda*: 38 (USNM 157925, including 2 adult males).  
*Scleroconcha ruffi*: 2 (USNM 157931, including 1 ovigerous female).
- SMG-1328-11; 71 m.  
*Philomedes brenda*: 22 (USNM 157933).

- SMG-1329-11; 71 m.  
*Philomedes brenda*: 17 (USNM 157934).  
*Scleroconcha ruffi*: 1 juvenile male (USNM 157938).
- Sta PP-55; 31 Aug 1976; 71°18'05"N, 152°32'12"W; 55 m.  
SMG-1330-10.  
*Philomedes brenda*: 8 (USNM 157937, including 1 ovigerous female).  
*Scleroconcha ruffi*: 24 (USNM 157937, including 5 ovigerous females).
- SMG-1331.  
*Philomedes brenda*: 11.  
*Scleroconcha ruffi*: 28.
- SMG-1333.  
*Philomedes brenda*: 11.  
*Scleroconcha ruffi*: 25.
- SMG-1334.  
*Philomedes brenda*: 6.  
*Scleroconcha ruffi*: 30.
- SMG-1335-12.  
*Philomedes brenda*: 16.  
*Scleroconcha ruffi*: 26.
- SMG-1336-9.  
*Philomedes brenda*: 11.  
*Scleroconcha ruffi*: 14.
- SMG-1337.  
*Philomedes brenda*: 9.  
*Scleroconcha ruffi*: 13.
- SMG-1338.  
*Philomedes brenda*: 8.  
*Scleroconcha ruffi*: 23.
- SMG-1339.  
*Philomedes brenda*: 10.  
*Scleroconcha ruffi*: 17.
- SMG-1340-9.  
*Philomedes brenda*: 2.  
*Scleroconcha ruffi*: 18.
- SMG-1341-8.  
*Philomedes brenda*: 9.  
*Scleroconcha ruffi*: 21.
- SMG-1342.  
*Philomedes brenda*: 21.  
*Scleroconcha ruffi*: 23.
- Sta PP-55; 31 Aug 1976; 71°17'54"N, 154°33'30"W; 53 m.  
SMG-1343.  
*Philomedes brenda*: 25.  
*Scleroconcha ruffi*: 2.
- SMG-1345.  
*Philomedes brenda*: 21.  
*Scleroconcha ruffi*: 13.
- SMG-1346.  
*Philomedes brenda*: 27.  
*Scleroconcha ruffi*: 14.
- SMG-1347.  
*Philomedes brenda*: 8.  
*Scleroconcha ruffi*: 21.
- SMG-1348.  
*Philomedes brenda*: 46.  
*Scleroconcha ruffi*: 24.
- SMG-1349.  
*Philomedes brenda*: 12.  
*Scleroconcha ruffi*: 24.
- SMG-1350.  
*Philomedes brenda*: 20.  
*Scleroconcha ruffi*: 13.  
*Bathyleberis thrix*: 1 (holotype, USNM 192381).

SMG-1351.

*Philomedes brenda*: 14.  
*Scleroconcha ruffi*: 16.

Sta PP-40; 31 Aug 1976; 71°13'00"N, 152°46'00"W; 40 m.

SMG-1353-6.

*Scleroconcha ruffi*: 13.

SMG-1354-8.

*Scleroconcha ruffi*: 18.

SMG-1355-9.

*Scleroconcha ruffi*: 13.

SMG-1356-6.

*Scleroconcha ruffi*: 16.

SMG-1357-9.

*Scleroconcha ruffi*: 16.

Sta PP-25; 1 Sep 1976; 71°08'12"N, 152°57'30"W; 27 m.

SMG-1361-6.

*Philomedes brenda*: 1 juvenile.

## Ice Station, OCS-5?

Sta PP-70; 2 Nov 1976; 71°20'18"N, 152°37'48"W; 66 m.

SMG-1485-0.

*Philomedes brenda*: 89.*Scleroconcha ruffi*: 5 (includes 1 ovigerous female).

SMG-1486-09.

*Philomedes brenda*: 113.*Scleroconcha ruffi*: 4.

SMG-1487-10.

*Philomedes brenda*: 89.*Scleroconcha ruffi*: 4.

SMG-1488-09.

*Philomedes brenda*: 76.*Scleroconcha ruffi*: 2.

SMG-1489-11.

*Philomedes brenda*: 105.*Scleroconcha ruffi*: 11 (includes 1 ovigerous female).

## Ice Station, OCS-6

Sta PP-100; 3 Nov 1976; 71°21'54"N, 152°33'24"W; 99 m.

SMG-1490-09.

*Philomedes brenda*: 79.*Scleroconcha ruffi*: 1.

SMG-1491-09.

*Philomedes brenda*: 88 (includes 1 adult female with hydrozoan colony, USNM 193282).

SMG-1492-10.

*Philomedes brenda*: 76 (includes 10 ovigerous females, USNM 158435, 158443; 1 adult male, USNM 158436; and 65 specimens, USNM 158437).

SMG-1493-11.

*Philomedes brenda*: 105.*Scleroconcha ruffi*: 1.

SMG-1494-10.

*Philomedes brenda*: 93 (includes 1 ovigerous female, USNM 193283).

Sta PP-55; 4 Nov 1976; 71°17'36"N, 152°43'24"W; 53 m.

SMG-1495-9.

*Philomedes brenda*: 68.*Scleroconcha ruffi*: 4 (includes 1 ovigerous female).

SMG-1496-9.

*Philomedes brenda*: 72.*Scleroconcha ruffi*: 3 (includes 1 ovigerous female).

SMG-1497-10.

*Philomedes brenda*: 32.*Scleroconcha ruffi*: 2.

SMG-1498-9.

*Philomedes brenda*: 29.*Scleroconcha ruffi*: 1.

SMG-1499-8.

*Philomedes brenda*: 3.

## USCGC Glacier, OCS-7

Sta PP-55; 11 Aug 1977.

SMG-1541-12; 71°19'00"N, 152°50'00"W; 54 m.

*Philomedes brenda*: 153 (includes 1 ovigerous female, USNM 157832; and 2 adult male, USNM 157834).*Scleroconcha ruffi*: 3 (includes 1 ovigerous female, USNM 157833).

SMG-1542-13; 71°19'00"N, 152°52'00"W; 52 m.

*Philomedes brenda*: 138.*Scleroconcha ruffi*: 1.

SMG-1543-13; 71°19'00"N, 152°52'00"W; 53 m.

*Philomedes brenda*: 98.*Scleroconcha ruffi*: 2.

SMG-1545-11; 71°19'30"N, 152°58'00"W; 55 m.

*Philomedes brenda*: 88.*Scleroconcha ruffi*: 4.

SMG-1546-13; 71°19'30"N, 152°58'00"W; 55 m.

*Philomedes brenda*: 99.*Scleroconcha ruffi*: 1.

Sta PP-40; 11 Aug 1977.

SMG-1549-9; 71°14'42"N, 152°53'30"W; 39 m.

*Scleroconcha ruffi*: 20.

SMG-1550-12; 71°14'42"N, 152°53'30"W; 38 m.

*Scleroconcha ruffi*: 20.

SMG-1552-10; 71°13'48"N, 152°57'54"W; 38 m.

*Scleroconcha ruffi*: 15.

SMG-1556-11; 71°13'48"N, 152°57'54"W; 40 m.

*Scleroconcha ruffi*: 11.

SMG-1557-9; 71°13'48"N, 152°57'54"W; 40 m.

*Scleroconcha ruffi*: 24.

Sta PP-70; 12 Aug 1977.

SMG-1570-12; 71°19'00"N, 152°50'00"W; 66 m.

*Philomedes brenda*: 154.

SMG-1571-12; 71°19'12"N, 152°50'36"W; 68 m.

*Philomedes brenda*: 116.

SMG-1572-12; 71°19'12"N, 152°51'00"W; 70 m.

*Philomedes brenda*: 102.

SMG-1573-11; 71°19'54"N, 152°50'12"W; 79 m.

*Philomedes brenda*: 65.*Scleroconcha ruffi*: 2.

SMG-1574-9; 71°20'48"N, 152°49'00"W; 72 m.

*Philomedes brenda*: 40.

Sta PP-100; 12 Aug 1977.

SMG-1575-10; 71°23'12"N, 152°43'00"W; 99 m.

*Philomedes brenda*: 59.*Scleroconcha ruffi*: 32.

SMG-1576-11; 71°23'24"N, 152°43'00"W; 100 m.

*Philomedes brenda*: 25 m.*Scleroconcha ruffi*: 35.

SMG-1577-11; 71°23'30"N, 152°43'00"W; 101 m.

*Philomedes brenda*: 54.*Scleroconcha ruffi*: 35.*Empoulsenia monothrix*: 1 (holotype, USNM 193280).

SMG-1578-8; 71°23'24"N, 152°42'24"W; 101 m.

*Philomedes brenda*: 26.

*Scleroconcha ruffi*: 28.

SMG-1579-10; 71°23'12"N, 152°41'48"W; 101 m.

*Philomedes brenda*: 49 (includes 1 ovigerous female, USNM 157836; and 1 adult female, USNM 157837).

*Scleroconcha ruffi*: 48 (includes holotype, ovigerous female, USNM 157835; and 1 adult female, USNM 157838).

Sta C-7739; 26 Aug 1977.

SMG-1637-11; 70°10'42"N, 141°28'00"W; 50 m.

*Philomedes brenda*: 16.

SMG-1638-10; 70°10'30"N, 141°25'00"W; 50 m.

*Philomedes brenda*: 3.

SMG-1639-11; 70°10'24"N, 141°22'00"W; 50 m.

*Philomedes brenda*: 13.

SMG-1640-9; 70°10'18"N, 141°20'48"W; 50 m.

*Philomedes brenda*: 38.

Sta C-7740; 27 Aug 1977; 70°28'00"N, 141°34'30"W.

SMG-1643-10; 158 m.

*Philomedes brenda*: 25.

SMG-1644-11; 160 m.

*Philomedes brenda*: 30.

SMG-1645-11; 164 m.

*Philomedes brenda*: 20.

SMG-1646-10; 148 m.

*Philomedes brenda*: 3.

SMG-1647-10; 136 m.

*Philomedes brenda*: 36.

#### Barents Sea, YMER-80 Expedition, Sta MB-15

DE-7; 2 Aug 1980; 79°19'09"N, 33°30'06"E; 230-240 m; soft brown clay; epibenthic dredge (modified Hessler and Sanders' sled with a

delayed action closing device); specimens retained on 1 mm sieve.

*Philomedes brenda*: 12 (includes 4 ovigerous females and 1 adult male).  
DW-3; 3 Aug 1980; 79°19'04"N, 33°32'06"E; 240 m; soft brown clay; Waren sled (small epibenthic sled); specimens retained on 1 mm sieve.

*Philomedes brenda*: 2.

#### Collection of G.E. MacGinitie off Point Barrow, Alaska

(arranged by station number)

Sta 20; no. 432, 9 Sep 1948; 125 ft (38 m); stones (sea urchins, *Psolus*, sea anemones); dredge.

*Philomedes brenda*: 2 juveniles (USNM 92203).

Sta 32; 12.1 miles (19.5 km) out from Point Barrow; 17 Aug 1949; 741 ft (225 m); mud (worm tubes); dredge.

*Philomedes brenda*: 14 (includes 3 ovigerous females, 1 juvenile, USNM 92201; 1 juvenile, USNM 92202; 3 ovigerous females, 2 adult females, 4 juveniles, USNM 92208).

*Bathyleberis thrax*: 1 A-1 female (USNM 92216).

Sta 33; 5 miles (8 km) out from Point Barrow; 30 Aug 1949; 184 ft (56 m); stones, boulders (*Psolus* and sea urchins: many); dredge.

*Philomedes brenda*: 1 adult female (USNM 92205).

Sta 35; 7.5 miles (12.1 km) out from Point Barrow; 1 Sep 1949; 328 ft (99 m); gravel (coarse), stones (few large); dredge.

*Philomedes brenda*: 1 ovigerous female (USNM 92204).

Sta 36; 16 miles (25.8 km) out from Point Barrow; 6 Sep 1949; 477 ft (145 m); rocks (few) (worm tubes); dredge.

*Philomedes brenda*: 1 adult female (USNM 92207).

Sta 46; 4 miles (6.4 km) out from Point Barrow; 14 Oct 1949; 175 ft (53.3 m); gravel, stones (small) (sea urchins); dredge.

*Philomedes brenda*: 1 adult female (USNM 92206).

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