

*LOUIS S. KORNICKER*

*Ostracoda (Myodocopina)  
from the P̄ru-Chile  
Trench and the  
Antarctic Ocean*

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## ABSTRACT

Kornicker, Louis S. Ostracoda (Myodocopina) from the Peru-Chile Trench and the Antarctic Ocean. *Smithsonian Contributions to Zoology*, 32:1-42. 1970.— Myodocopid ostracods collected on cruise 11 of the RV *Anton Bruun* to the Peru-Chile Trench in 1965 are described, including four new species. Also described are two new species of the genus *Spinacopia* from Antarctica collected in 1964 on cruises 11 and 12 of the RV *Eltanin*. A supplementary description is given of the holotype of *Azygocypridina imperator* (Brady, 1880), the type-species of the genus.

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Louis S. Kornicker

## Ostracoda (Myodocopina) from the Peru-Chile Trench and the Antarctic Ocean

Ostracoda from oceanic trench systems are not well known. Rudjakov (1961a, 1961b, 1962) described several new species from the Kurile-Kamtchatka Trench area and the Java Trench. Poulsen (1962) described the new genus of myodocopid ostracod, *Hadacypridina*, from the Kermadec Deep. On cruise 11 of the RV *Anton Bruun*, deep-sea benthic organisms were collected from the Peru-Chile Trench system. The distribution and number of ostracods collected in benthic trawls during that cruise are listed in Table I, in order of increasing sample depth.

The Myodocopina in the samples consist of six species (four new species and two designated as species A and species B); these are described herein. The

Cruise	Station	Lat. S	Long. W	Depth m	Date	Species
12	1003	62°41'	54°43'	210-222	15 March 1964	<i>Spinacopia antarctica</i>
11	931	70°11'	106°38'	3495	20 January 1964	<i>Spinacopia octo</i>

In addition, I have taken the opportunity to give a supplementary description of the holotype of *Azygocypridina imperator* (Brady, 1880), the type-species of the genus, which is presently in the collections of the British Museum (Natural History).

I wish to thank personnel of the RV *Anton Bruun* and RV *Eltanin* by whose efforts the ostracods described herein were made available for study. The ostracods from the *Anton Bruun* were transferred to me by Dr. Richard Benson, who had received them from Dr. Robert J. Menzies, chief scientist of cruise

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species and depths at which they were collected are listed below:

Station Peru-Chile Trench	Depth m	Species
90	991-1015	<i>Euphilomedes rhabdion</i>
92	1411-1450	<i>Azygocypridina rudjakovi</i>
101	1927-1997	<i>Metavargula ampla</i> , <i>Spinacopia torus</i>
105	2504-2414	<i>Synasterope</i> species A
157	3994-4364	<i>Spinacopia torus</i>
196	4516-4383	<i>Synasterope</i> species B

One of the new species from the Peru-Chile Trench area is a member of the recently established genus *Spinacopia* (Kornicker, 1969a). Two additional species of this genus are described herein from material collected by the RV *Eltanin* in the Antarctic Ocean at the following two stations:

11. Podocopida and Platycopida have been returned to Dr. Benson. I also thank Mrs. Carolyn Bartlett Gast for the shaded drawings of carapaces and for preparing all figures for publication from my penciled camera lucida drawings except figure 10 which was prepared by Mr. Jack Schroeder. Criticisms of all or parts of the manuscript by Dr. Kenneth G. McKenzie, Dr. Joseph Rosewater, and Dr. Thomas E. Bowman are deeply appreciated. I also thank Dr. McKenzie for arranging for a loan of the holotype of *Azygocypridina imperator* from the British Museum (Natural History). *Anton Bruun* and *Eltanin* cruises were financed by the National Science Foundation.

TABLE 1.—Distribution and number of Ostracoda in samples from Peru Chile Trench system, RV Anton Bruun, cruise 11.

Station	Date, 1965	Lat. S	Long. W <sup>a</sup>	Depth m <sup>a</sup>	Temp. °C <sup>a</sup>	Mydocopida			Podocopina	
						Mydocopina	Halocypridina	Cladocopina	Platycopina	Podocopina
85	14 Oct.	7°53'	80°30'	520-520	7.0		2 <sup>e</sup>			
90	14 Oct.	7°59'	80°37'	991-1015	4.7	1	8	1 <sup>b</sup>		
92	14 Oct.	8°10'	81°49'	1411-1450	3.3	1				
4	2 Oct.	3°46'	81°32'	ca. 1500	3.3				1 <sup>e</sup>	
101	16 Oct.	8°13'	81°09'	1927-1997	2.3	24				X <sup>d</sup>
105	17 Oct.	8°15'	80°44'	2504-2514	1.8	1	1			
111	18 Oct.	8°23'	80°45'	3086-3202	1.8		1			
169	2 Nov.	8°46'	80°44'	3909-3970	1.8					X
157	28 Oct.	12°03'	78°48'	3994-4364	1.8	1				X
95	15 Oct.	8°31'	81°40'	4332-4423	1.8		8			X
196	7 Nov.	9°01'	80°40'	4516-4555	1.8	1				X
59	9 Oct.	6°46'	82°11'	4526-4609	1.8		1			X
179	5 Oct.	8°54'	80°41'	4823-4925	1.8					X
36	5 Oct.	5°43'	82°01'	5047	1.8		2			
109	17 Oct.	8°22'	80°43'	5123-2571 <sup>f</sup>			1			X
113	19 Oct.	8°44'	80°45'	6060	1.8					X

<sup>a</sup> Position and depth data to be considered tentative (Menzies and Chin, 1966).

<sup>b</sup> *Polycopse* species.

<sup>c</sup> *Cytherella* species.

<sup>d</sup> X = *Podocopina* present.

<sup>e</sup> Temperature estimated from Figure 5 in Menzies and Chin (1966).

<sup>f</sup> Depth range given is correct (Menzies, written communication, 1968).

<sup>g</sup> One of these specimens is described by Kornicker (1969b).

## Order MYODOCOPIDA Pokorný, 1953

### Suborder MYODOCOPINA Sars, 1866

#### Family CYPRIDINIDAE Baird, 1850

Included herein in the Cypridinidae are two subfamilies, Cypridininae and Azygocypridininae. Recognition of a separate subfamily for the genus *Azygocypridina* was suggested by Skogsberg (1920, p. 196) when the genus was known as *Crossophorus*, before the name was found to be a junior homonym by Sylvester-Bradley (1950). Species in the Azygocypridininae are readily distinguishable from those in the Cypridininae by having 18 or more claws on each furcal lamella and in having claw 1 offset from the remaining claws.

#### Subfamily CYPRIDININAE Baird, 1850

In his comprehensive diagnosis of the Cypridininae, Skogsberg (1920, pp. 179-187) clearly stated how the genus *Crossophorus* (= *Azygocypridina*) differs from the other genera in the Cypridininae. Therefore, a new diagnosis of the Cypridininae is not presented here.

## *Metavargula*, new genus

ETYMOLOGY.—*Meta* from latin meaning "conical or pyramidal figure" in reference to cone-shape medial eye. Gender: feminine.

TYPE-SPECIES.—*Metavargula ampla*, described herein.

This genus has been established to include a new species, *M. ampla*, and the species *M. optilus*, which Kornicker (1968) referred to *Bathyvargula* Poulsen, 1962. In order to include *M. optilus* in the genus *Bathyvargula*, Kornicker (1968) amended the original description of *Bathyvargula* by Poulsen (1962, p. 215). With the discovery of a second species it is expedient to retain *Bathyvargula* as originally delimited and to establish a new genus to include both species.

Known species of the genus are from deep water. *Metavargula optilus* was collected at 1000-1200 m in the Gulf of Mexico; *M. ampla* at 1927-1997 m in the Pacific Ocean.

DIAGNOSIS OF FEMALE (male unknown).—Carapace fairly short, height 54-60 percent of length; carapaces of known two species large, length 3.6-4.65 mm; anterior with broadly rounded rostrum and deep, fairly



broad incisur; posterior with elongate caudal process below valve middle; surface smooth, but minute reticulations or pores apparent under high magnification; infold behind rostrum with 20–24 short bristles plus 1 long bristle proximal on list; list anterior to caudal process with 18–29 backward-pointing processes; lamellar prolongation broad along lower margin of incisur, narrow elsewhere.

First antenna: Sensory bristle of 5th joint with 10 long proximal filaments, 2 slender distal filaments and bifurcate tip.

Second antenna: Protopodite with short bare medial bristle. Endopodite 2- or 3-jointed: 1st joint with 3 or 4 bare proximal bristles, 1 long and 2 or 3 short, and 1 long distal bristle; end joint with long terminal sensory bristle; 3rd joint, where present, only slightly wider than base of bristle, but separated from bristle by suture; when 3rd joint present, 2nd joint bare; same specimen may contain endopodites with both 2 and 3 joints. Exopodite: joints 2–9 with basal spines, spines smaller on proximal joints; bristles of joints 3–9 with natatory bristles and without spines; bristle of 2nd joint reaching 7th or 8th joint and with 5–15 spines on ventral margin, 0–14 spines on dorsal margin, and stout spine near tip; 9th joint with 4 bristles, 3 long, 1 short.

Mandible: Terminal spines of coxale endite spinous and separated by small conical process. Medial bristle of terminal ventral pair on 2nd endopodite joint broad and with teeth on inner margin.

Maxilla: Cutting edge of 1st joint of endopodite with 3 teeth; longest  $\alpha$ -bristle slender, with pointed tip and long marginal spines; limb similar to that of *Bathyvargula*.

Fifth limb: Small process between 4th and 5th joints spinous—a similar spined process has been reported on *Vargula hilgendorfi* (Poulsen, 1962, p. 181) and *Cypridina nobilis* (Cleve, 1908, pl. IX: fig. 22).

Sixth limb: 2 or 3 small bristles present in place of epipodial appendage; 3rd and 4th endites without medial bristles; end joint broad posteriorly.

Seventh limb: Each limb with 13–24 cleaning bristles; terminus with comb of 8–11 elongate, spinous teeth with digitate tips opposing recurved peg with marginal spines.

Furca: Each lamella with 9 claws separated from lamella by suture; 2nd claw almost same length as first, each remaining claw smaller than previous claw.

Brushlike organ: Consisting of numerous (8–12) minute bristles in vicinity of genitalia.

Upper lip: Anterior part unpaired and with crenulate margin; posterior part with 1 pair of tusks.

Lateral eye: Minute.

Medial eye and rod-shaped organ: Medial eye large, cone-shaped; rod-shaped organ short.

COMPARISONS.—*Metavargula* is closely related to *Vargula*, *Paravargula*, and *Bathyvargula*. *Vargula* differs from *Metavargula* in having one or more furcal claws separated from the lamella, well-developed lateral eyes, and a distal bristle on the middle joint of the endopodite of the 2nd antenna. *Paravargula* differs from *Metavargula* in having a 1-jointed endopodite on the 2nd antenna, well-developed lateral eyes, and in not having a broad, toothed, medial bristle distally on the ventral margin of the 2nd endopodite joint of the mandible. *Bathyvargula* differs from *Metavargula* in having only 1 spine on the bristle of the 2nd exopodite joint of the 2nd antenna, and an endopodite on the 2nd antenna limited to no more than 2 joints. Known species of *Bathyvargula* have only 8 furcal claws.

### *Metavargula ampla*, new species

#### FIGURES 1–4

HOLOTYPE.—USNM 123646, valves and some appendages in alcohol, remaining appendages on slides, ♀ with unextruded eggs. Length 4.65 mm, height 2.62 mm.

PARATYPES.—USNM 123647, ♀, valves and some appendages in alcohol, remaining appendages on slides; length 4.65 mm, height 2.70 mm. USNM 123648, 14 juveniles: lengths and heights in millimeters as follows: 3.70, 2.14; 3.01, 1.67; 2.70, 1.61; 2.15, 1.26; 2.08, 1.19; 2.05, 1.19; 1.38, 0.77; 1.64, 0.96; 1.64, 0.97; 1.39, 0.79; 1.63, 0.87; lengths only: 2.04; 1.33; 1.46.

TYPE-LOCALITY.—Pacific Ocean, Peru-Chile Trench system, lat. 08°13'S, long. 81°09'W; bottom depth 1927–1997 m; estimated temperature 2.3°C; station 101, cruise 11, RV *Anton Bruun*, 16 October 1965. Collected in small bottom trawl by R. J. Menzies. Paratypes collected in same sample as holotype.

ETYMOLOGY.—The specific name is from the Latin *amplus*: large, in reference to the great size of the specimen.

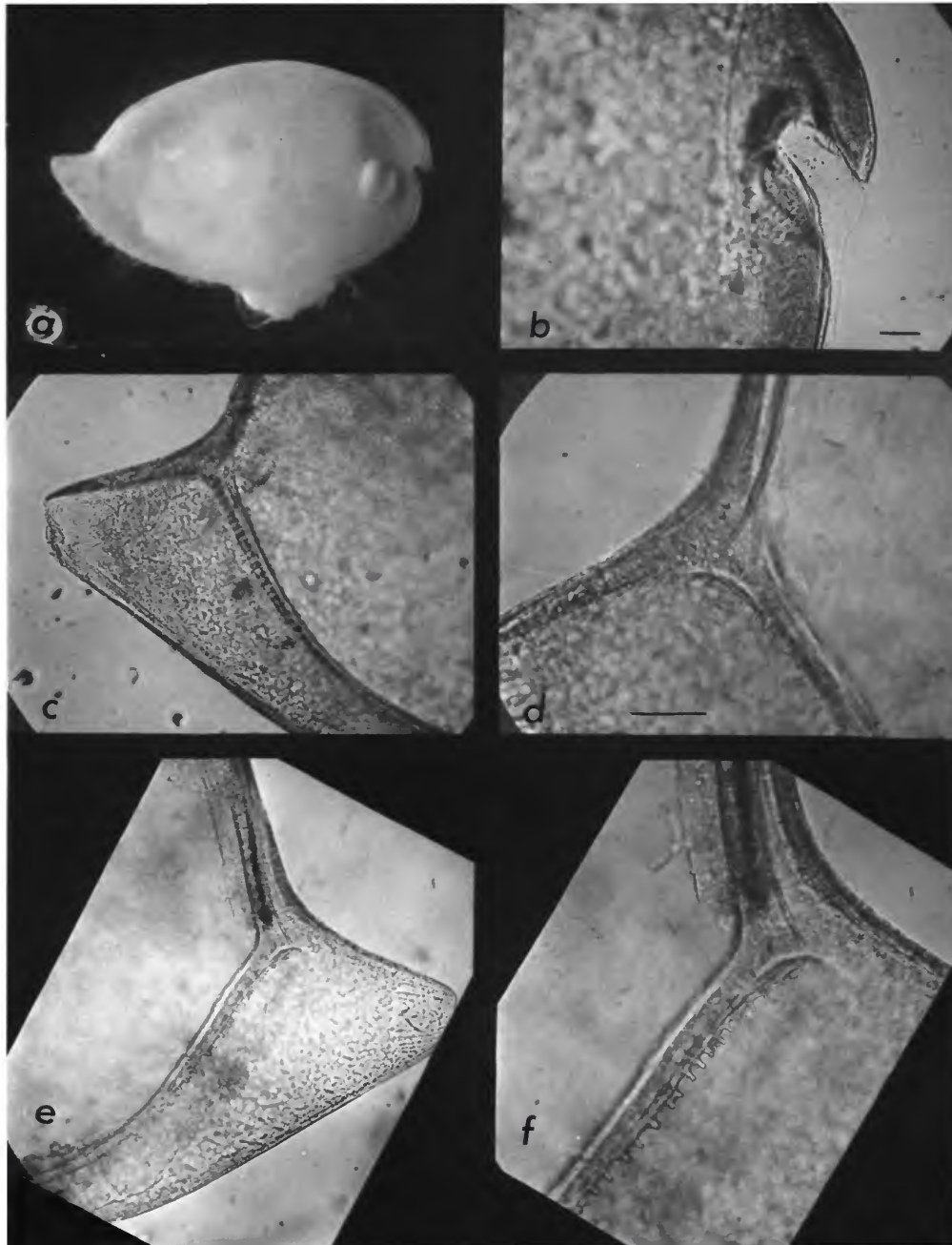


FIGURE 1.—*Metavargula ampla* Kornicker, USNM 123646, length 4.65 mm. Carapace: *a*, right lateral view of complete carapace (bubble trapped between valves behind incisur); *b*, anterior left valve, medial view; *c*, caudal process left valve, medial view; *d*, detail of “*c*”; *e*, caudal process right valve, medial view; *f*, detail of “*e*.” (Same magnification: *b*, *c*, *e*; *d*, *f*. Bars in figures represent 100 microns.)



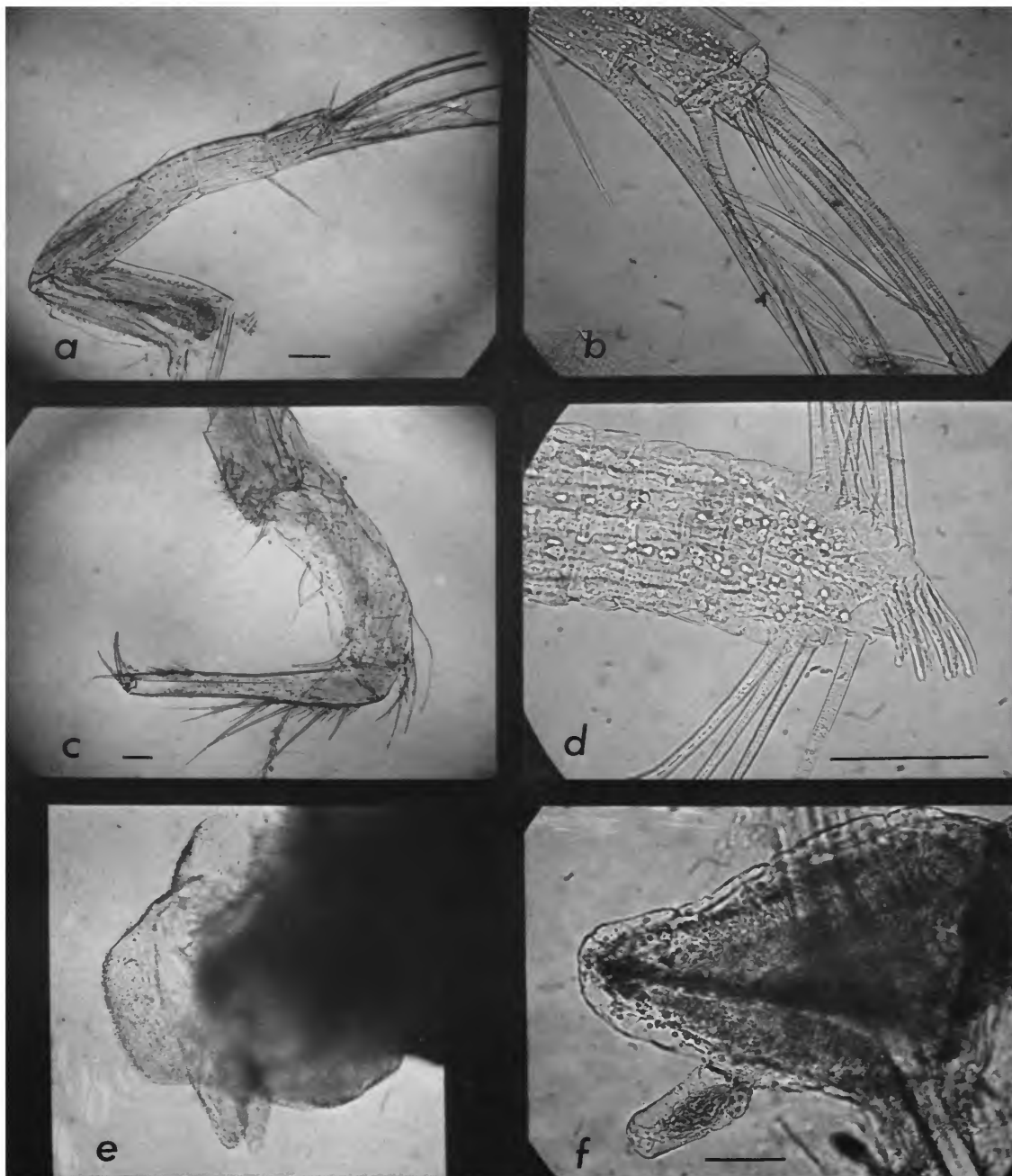


FIGURE 2.—*Metavargula ampla*, USNM 123646: *a*, 1st antenna; *b*, detail of “*a*”; *c*, mandible; *d*, tip of 7th limb; *e*, upper lip, anterior to left; *f*, medial eye and rod-shaped organ. (Same magnification: *a*, *e*; *b*, *f*. Bars in figures represent 100 microns.)



FIGURE 3.—*Metavargula ampla* Kornicker. Carapace: *a*, anterior right valve, medial view; *b*, anterior left valve, medial view; *c*, central muscle scars on left valve, lateral view; *d*, marginal pore canals at tip of caudal process right valve, medial view. Second antenna: *e*, endopodite, left valve, medial view; *f*, endopodite, right valve, medial view; *g*, tip of bristle on 2nd joint of exopodite; *h*, bristle on protopodite, medial view. Mandible: *i*, medial bristle of terminal group on 2nd endopodite joint, medial view; *j*, tip of coxale endite, medial view. Maxilla: *k*, exopodite and part of endopodite, lateral view; *l*, alpha bristles. (Figures *c*, *d*, *f*, *i*, *j*, *k* from USNM 123646; figures *a*, *b*, *e*, *g*, *h*, *l* from USNM 123647. Same magnification, in microns: *c*; *a*, *b*, *d*, *k*, *l*; *e*, *f*, *h*; *g*, *i*, *j*.)

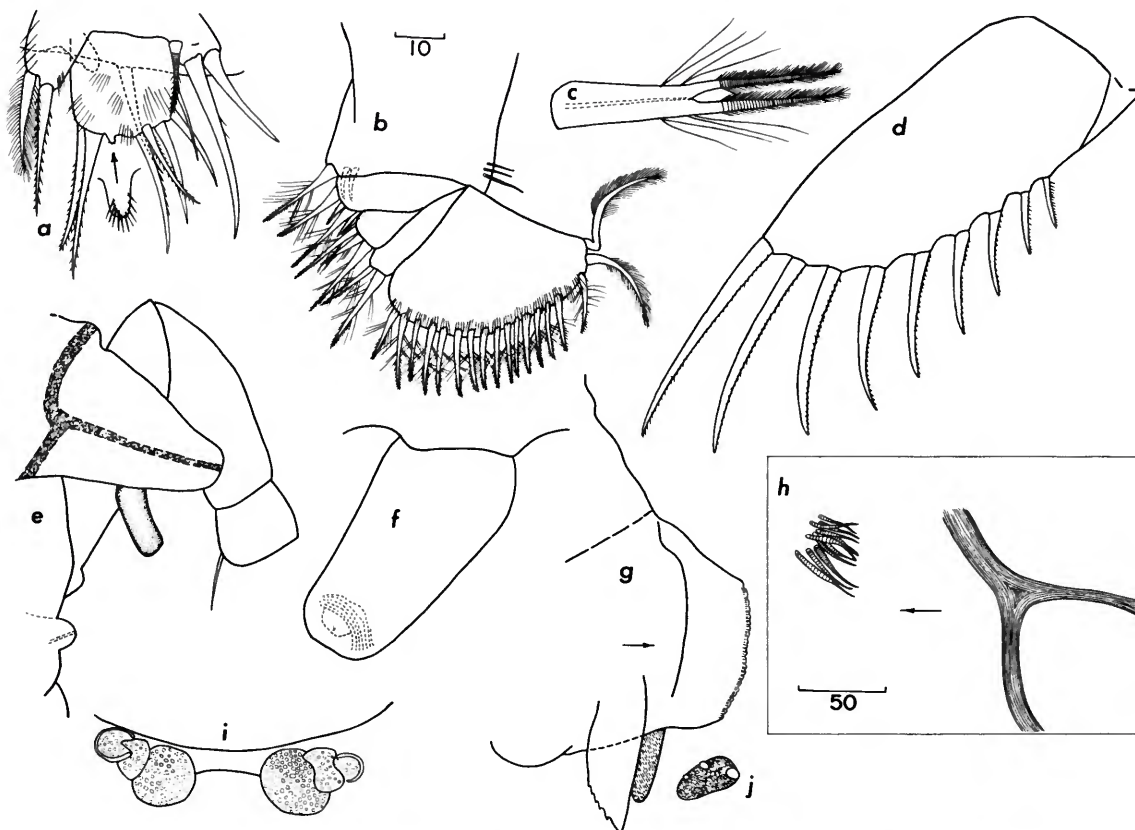


FIGURE 4.—*Metavargula ampla* Kornicker: *a*, Distal part left 5th limb, posterior view; *b*, left 6th limb, lateral view; *c*, abnormal bristle on end joint of right 6th limb; *d*, left furcal lamella, lateral view; *e*, medial eye, rod-shaped organ, and proximal joints of left 1st antenna; *f*, rod-shaped organ; *g*, upper lip, lateral view; *h*, brushlike bristles and Y-shaped sclerite of furca, left lateral view; *i*, genitalia, ventral view, anterior on bottom; *j*, right lateral eye. (Figures *a-c*, *h* from USNM 123646; figures *d*, *g*, *i*, *j* from USNM 123647. Same scale, in microns *b*, *d*, *e*, *g*, *i*, *j*; *a*, *c*, *f*, *h*.)

**DESCRIPTION OF FEMALE** (male unknown).—Shape (Figure 1*a*): Carapace oval in lateral view with greatest height near middle; anterior with broadly rounded rostrum and fairly deep incisur (Figures 1*a*, *b*; 3*a*, *b*); posterior with elongate caudal process below valve middle (Figures 1*c-e*).

**Ornamentation:** Surface smooth, but with minute punctae apparent under high magnification; shell translucent under transmitted light except for a more opaque dorsal-ventral band near middle; surface hairs and spines not present. (Outer surfaces of valves of USNM 123646 and USNM 123647 have linear rows of minute ovals, possibly protozoans; no microconcretions present.)

**Infold:** Infold broad in area of rostrum and caudal process, narrower elsewhere; infold behind rostrum with 20–24 bristles plus 1 long proximal bristle on list (Figures 3*a*, *b*); 2 bristles and transparent process present on inner curvature of incisur; anteroventral and ventral infold with about 50 short bristles fairly equally spaced from incisur to caudal process; list in front of caudal process with 25–29 blunt, backward-pointing processes (Figures 1*c-f*); list on inner margin of posteroventral infold raised forming groove between list and outer margin of infold; caudal process with prominent radial pore canals (Figure 3*d*).

**Selvage:** Finely striate lamellar prolongation with smooth outer edge present along anterior and ventral

margins of carapace; prolongation broadest along lower margin of incisur (Figures 3*a, b*).

Muscle scars: Central muscle scars in anteroventral part of shell consisting of about 10 clusters containing total of about 40 individual scars (Figure 3*c*).

Size: USNM 123646—length 4.65 mm, height 2.62 mm; USNM 123647—length 4.65 mm, height 2.70.

First antenna (Figures 2*a, b*): Surfaces of 2nd and 3rd joints spinous; 3rd and 4th joints each with dorsal and ventral bristle; sensory bristle of 5th joint with 10 long stout proximal filaments, 2 shorter, narrow distal filaments, and bifurcate tip; medial bristle of 6th joint longer than joint and with few marginal spines. Seventh joint: a-bristle with few marginal spines and about same length as bristle of 6th joint; b-bristle with 4 or 5 short, narrow filaments; c-bristle with 10 filaments. Eighth joint: d- and e-bristles bare, with digitate tips, and about one-half length of c-bristle; f- and g-bristles with 10–13 filaments and bifurcate tip; some filaments of c-, f-, and g-bristles with marginal teeth (c-bristle broken on both limbs of holotype).

Second antenna: Protopodite with short bare medial bristle (Figure 3*h*). Endopodite 2- or 3-jointed (Figures 3*e, f*): 1st joint with 1 long and 3 short proximal bristles and 1 long distal bristle; end joint with long terminal sensory bristle; 3rd joint, where present, only slightly wider than base of bristle, but separated from bristle by suture (same specimen may have endopodites with both 2 and 3 joints). Exopodite: joints 2–9 with basal spines, spines smaller on proximal joints; bristles of joints 3–9 with natatory bristles and without spines; 9th joint with 4 bristles, 3 long, 1 short; distal margins of joints 2–8 with minute teeth in row; bristle of 2nd joint reaching 8th joint and with stout spine near tip (Figure 3*g*); distribution of smaller spines on bristle of 2nd joint of two specimens is as follows:

<i>Specimen</i>	<i>limb</i>	<i>dorsal spines</i>	<i>ventral spines</i>
USNM 123646	left	0	5
USNM 123646	right	14	15
USNM 123647	left	2	14
USNM 123647	right	3	12

Mandible (Figure 2*c*): Coxale endite spinose with 2 stout terminal spines with marginal teeth (Figure 3*j*); triangular peg present between terminal spines; short process present at base of endite; dorsal margin of basale with 1 bristle distal to middle and 2 terminal. Bristles of ventral margin of basale: 2 medial a-bristles, 1 long with short marginal spines, and 1 short, bare;

1 short, bare, lateral b-bristle slightly distal to a-bristles; 2 c-bristles, 1 short, bare, other long, spinous; 2 d-bristles, 1 medium with few short spines, other long with long spines. Exopodite about same length as 1st endopodite joint, and with 2 bristles, spinose proximal bristle longer than bare distal bristle; tip of exopodite hirsute. Endopodite: ventral margin of 1st joint with 2 long, spinous bristles and 2 short bristles, 1 bare, 1 spinous; ventral margin of 2nd joint spinous and with 3 groups of bristles having 1, 1, and 2 bristles, all short; medial bristle of terminal group broad and with teeth along inner margin (Figure 3*i*); dorsal margin of 2nd joint spinous and with 7 long bristles and about 16 short, pectinate bristles; end joint with 3 claws and 3 or 4 bristles. (Endopodite of right mandible of USNM 123646 aberrant in having only 2 groups of bristles on ventral margin of 1st joint: 1st group with 1 bristle, 2nd with 2, the latter group subterminal, not terminal as on normal limb.)

Maxilla (Figure 3*k*): Epipodial appendage rounded with marginal hairs; coxale with stout plumose bristle; exopodite broad with 3 bristles of about equal length, proximal bristle and outer terminal bristle plumose, inner terminal bristle with a few spines; endopodite 1st joint with 2  $\alpha$ -bristles (Figure 3*l*), 1 long and slender with long marginal spines, other somewhat shorter and with a few short spines.

Fifth limb (Figure 4*a*): Epipodial appendage with 56 bristles; distoanterior process on protopodite short and lobate; main tooth with peg and 6 pectinate teeth plus proximal bristle; inner lobe of 3rd joint with short plumose proximal bristle and 2 terminal bristles, inner with few marginal spines, outer bristle bare; outer lobe of 3rd joint with 2 bristles, inner bristle with short spines, outer bristle hirsute; 4th and 5th joints not separated by suture; 4th joint with 2 spinous bristles, 5th joint with 5 bristles; process between 4th and 5th joints spinous; surface of joints 3–5 hirsute.

Sixth limb (Figure 4*b*): 3 short bare bristles in place of epipodial appendage; 1st endite with 3 bristles, 2 short medial and 1 long terminal; 2nd endite with 4 or 5 bristles, 2 or 3 short medial and 2 long terminal; 3rd and 4th endites each with 3 terminal bristles; end joint (USNM 123647) with 18 bristles on left limb and 16 (including 1 bristle forked distally, Figure 4*c*) on right limb; distolateral margin of end joint with long spines; medial surface of end joint hirsute. Small space present on end joint between posterior 3 bristles



and bristles anterior to them (end joints missing on both limbs of holotype).

Seventh limb (Figure 2d): Terminal comb with about 11 elongate teeth with digitate tips; elongate incurved peg opposing comb; teeth and peg annulate and with marginal spines. Each limb with 11–16 distal bristles, each with 4 bells, and 6–8 proximal bristles, each with 3–5 bells; total bristles 17–24. Distribution of bristles on two specimens is as follows:

Specimen	limb	distal bristles		proximal bristles		total bristles
		dorsal	ventral	dorsal	ventral	
USNM 123646	left	7	4	3	3	17
USNM 123646	right	8	6	4	3	21
USNM 123647	left	8	8	4	4	24
USNM 123647	right	7	7	5	3	22

Furca (Figure 4d): Each lamella with 9 claws separated from lamella by suture; 2nd claw almost same length as 1st, each remaining claw smaller than previous claw; lateral and medial spines in row along concave margin of each claw; a few minute spines present along anterior margin of each lamella.

Genitalia and brushlike organ: Genitalia with attached ovoid structures (spermatophores?) (Figure 4i). Brushlike cluster of about 12 minute bristles present in vicinity of genitalia (Figure 4h).

Upper lip (Figures 2e, 4g): Anterior part unpaired and with crenulate margin; 1 pair of posterior tusks present; posterior margin of lip hirsute.

Lateral eye (Figure 4j): Eyes small, pigmented, each with about 5 ommatophores.

Medial eye and rod-shaped organ (Figures 2f, 4e): Medial eye large, cone-shaped; rod-shaped organ short, tapering slightly distally (Figure 4f).

Eggs: Holotype with about 26 minute eggs with distinct nuclei present inside body, none in brood chamber.

Parasites: USNM 123646 contained within its shell a female copepod (Choniostomatidae).

COMPARISONS.—This species is considerably larger than *M. optilus*, length 4.65 mm compared to 3.65–3.70 mm. The 7th limb contains a total of 17–24 bristles compared to only 13 for *M. optilus*. The endopodites of the 2nd antennae of the unique specimen of *M. optilus* contain 2 joints, whereas, one endopodite of each of the 2 specimens described herein is distinctly 3-jointed.

### Subfamily AZYGOCYPRIDININAE, new name

*Crossophorinae* Skogsberg, 1920, p. 196

This subfamily contains one genus, *Azygocypridina*.

DIAGNOSIS OF SUBFAMILY.—Carapace large (length 4–15.5 mm), oval in lateral view with small rostrum and incisur and without caudal process; ornamentation lacking except for minute punctae.

First antenna: Joints 2–4 with numerous bristles; b- and c-bristles on 7th joint of male without sucktorial organs of Cypridininae type, but with numerous filaments having spoonlike tips probably having a sucktorial function.

Second antenna: Bristle on 2nd joint of exopodite with numerous natatory secondary hairs; 9th joint of exopodite with more than 4 bristles; endopodite 3-jointed, that of male with 3rd joint reflexed.

Mandible: Coxale endite strongly bifurcate in both sexes; coxale without bristles (Brady, 1880, pl. 38: fig. 6, misinterpreted basale bristles to be on coxale); 2 stout pectinate bristles present on proximal ventral margin of basale adjacent to coxale endite; ventral margin of basale also with 1 long bristle near middle and many (about 16) proximal bristles; dorsal margin of basale with numerous (about 12) bristles forming row extending onto medial surface and 2 stout subterminal bristles; ventral margin of 1st joint of endopodite with 7 bristles; dorsal margin of 2nd joint with numerous bristles.

Fifth limb: 5th joint of exopodite divided into 2 lobes.

Sixth limb: End joint divided into large anterior and small posterior lobe. *Azygocypridina grimaldi* Granata may not have a posterior lobe (see Granata and Caporiacco, 1949, pl. II: fig. 8).

Furca: Distal claw (claw 1) offset from ventral margin of lamella; known species with total of 18–28 claws; slender claws placed between and following stout claws.

?Brushlike organ: Elongate process with 10 or 11 bristles present at base of copulatory limbs.

Rod-shaped organ: Small, pear-shaped.

Lateral eyes: Hirsute, flaplike, without ommatophores.

### Genus *Azygocypridina* Sylvester-Bradley, 1950

TYPE-SPECIES.—*Crossophorus imperator* Brady, 1880 = *Azygocypridina imperator* (Brady): Sylvester-Bradley, 1950.

Species in the genus *Azygocypridina* may be subdivided into three groups delimited by the morphology of the tip of the 7th limb.

Group I, the *A. imperator* group, bears on the tip of the 7th limb a stout jaw opposing either short teeth, long recurved teeth, or long "fingerlike" processes. This group contains *A. imperator* (Brady), *A. imperialis* (Stebbing), *A. species* McKenzie, *A. grimaldi*

(Granata), and *A. africanus* (Stebbing).

Group II, the *A. gibber* group, bears on the tip of the 7th limb only long recurved fingerlike processes, no jaw is present. This group contains *A. gibber* (Müller), *A. birsteini* Rudjakov, and *A. species* Rudjakov.

Group III, the *A. rudjakovi* group, has a 7th limb without a jaw or fingerlike processes at its tip. This group contains only *A. rudjakovi*.

#### Distribution of Species in *Azygocypridina*

Species	Locality	Depth m	Reference
<i>A. imperator</i>	South Pacific, east of New Zealand, lat. 40°28'S, long. 177°43'E	2012	Brady, 1880
<i>A. imperialis</i>	North Atlantic, west of Ireland, lat. 55°11'N, long. 11°31'W	2633	Brady and Norman, 1896
<i>A. africanus</i>	South tip of Africa	165-229	Stebbing, 1901, 1902, 1910
" "	" " " "	156	Müller, 1906a, 1912
<i>A. gibber</i>	Indonesia near Celebes, lat. 5°S, long. 120°E	1158	Müller, 1906b
<i>A. grimaldi</i>	North Atlantic, near Spain, lat. 43°45'30"N, long. 9°41'W	2320	Granata, 1919
<i>A. birsteini</i> and <i>A. species</i>	North Pacific, Kurile-Kamchatka Trench area, lat. 44°09'N, long. 148°38'E.	1050-1070	Rudjakov, 1961
<i>A. species</i>	North Pacific, south coast of Hokkaido, Japan, lat. 41°58'N, long. 142°30'30"E (Albatross sta. 5036)	850	Kornicker, 1969c
<i>A. rudjakovi</i>	South Pacific, Peru-Chile Trench, lat. 8°10'S, long. 80°49'W	1411-1450	herein
<i>A. species</i>	Tasman Sea, off Cronulla, N.S.W., Australia, lat. 34°03'S, long. 151°31'E.	180	McKenzie, 1968

*Azygocypridina imperator* was collected on gray ooze in water at 2°C (Brady, 1880). *Azygocypridina imperialis* was collected at 2.8°C (Brady and Norman, 1896). *Azygocypridina africanus* was collected on a "rough" bottom and on a substrate of sand and shells (Stebbing, 1902). Water temperature was probably in the vicinity of 5°C (Sverdrup, Johnson, Fleming, 1942, chart IV). The bottom where *A. gibber* was collected was reported as coarse sediment, gray mud, with a brown, liquified surface layer (Müller, 1906b, p. 37). The species of *Azygocypridina* from off Japan reported by Kornicker (1969c) was collected over a substrate of brown mud in water at 3.3°C (Anonymous, 1907). I estimate the temperature of the water from which *A. rudjakovi* was collected to be about 3°C based on Hydrocast 519C at lat. 9°09'S, long. 81°32'W (Menzies and Chin, 1966). In summary, the genus *Azygocypridina* has been found in water at temperatures from 2°C to 5°C and at depths of 156-2633 m over various kinds of bottoms.

#### *Azygocypridina rudjakovi*, new species

FIGURES 5-9

HOLOTYPE.—USNM 124024; adult male; carapace and some appendages preserved in alcohol, remaining appendages on slides; specimen unique. Length 10.1 mm, height 9.0 mm.

TYPE-LOCALITY.—Pacific Ocean, lat. 8°10'S, long. 80°49'W; bottom depth 1411-1450 m; estimated temperature 3.0°C; station 92, cruise 11, RV *Anton Bruun*, 14 October 1965; collected in benthic beam trawl by Dr. R. J. Menzies.

ETYMOLOGY.—The species is named for Dr. J. A. Rudjakov.

DESCRIPTION OF MALE (female unknown): Shape (Figure 5a): Carapace oval in lateral view with greatest height near middle and without caudal process; rostrum relatively small and acuminate; incisor small, rounded with continuous margin (Figure 5d); dorsal margin of incisor beveled (Figure 5c).



Ornamentation: Surface smooth with minute punctae (Figure 5*b*).

Infold: Infold broad along anterior and anteroventral margins becoming narrower posteriorly; inner flange paralleling inner margin becoming more prominent posteriorly; infold behind rostrum with about 32 bristles along anterior margin and about 21 bristles along posterior margin (Figures 5*d,e*); bristles present along anteroventral margin near outer edge.

Selvage: Finely striate lamellar prolongation with smooth outer edge present along anterior and ventral margins of carapace; outer margin finely serrate along inner curvature of incisur; prolongation continuous around incisur.

Muscle scars: Central muscle scars in anteroventral part of shell are shown in Figure 5*a*; the ends of the muscles after shell is removed are shown in figure 5*f*.

Size: USNM 124024—length 10.1 mm, height 9.0 mm.

First antenna (Figures 5 *g, i*): Proximal ventral margin of 2nd joint with cluster of 4 bristles having short marginal spines distally; 2 short bristles present on lateral surface of 2nd joint near the 4 bristles on ventral margin, and 2 subterminally; dorsal margin with about 20 bristles, some with short marginal spines distally. Ventral margin of 3rd joint with 8 bristles; dorsal margin of 3rd joint with 17 bristles. Ventral margin of 4th joint with 9 subterminal bristles; dorsal margin of 4th joint with 6 bristles. Sensory bristle of 5th joint with numerous filaments; distal margin of 6th joint with medial bristle about same length as 5th joint; 7th joint with a-, b-, and c-bristles: a-bristle stout, spinelike; b-bristle about three times longer than sensory bristle of 5th joint and with numerous short filaments, some having spoon-shaped tips (Figure 5*h*), others with pointed tips; c-bristle same length as b-bristle and with similar filaments; 8th joint with d-, e-, f-, and g-bristles but not distinguishable from 7th joint; d- and e-bristles without filaments and about one-fourth length of b-bristle; f-bristle slightly longer than b-bristle and with numerous filaments having pointed tips, some filaments with short marginal spines; g-bristle similar to f-bristle.

Second antenna: Protopodite with bare medial bristle (Figure 5*l*). Endopodite 3-jointed (Figures 5 *j, k*): 1st joint with proximal group of 1 long and 3 short bristles and distal group of 1 long and 5 short bristles; 2nd joint with about 20 bristles; 3rd joint re-

curved, with long proximal sensory bristle and 2 short terminal spines. Exopodite: joint 1 with clusters of minute spines on distal surface; joints 2–9 with basal spines, lateral basal spine on joint 9 about half length that on joint 8; joints 2–8 with clusters of minute spines along distal margin; bristle of joint 2 reaching past 9th joint and bearing natatory hairs; joint 9 with 7 bristles: 5 long, 1 medium, 1 short, all with natatory hairs; bristles of joints 3–8 with natatory hairs and without marginal spines.

Mandible (Figure 6*a*): Coxale endite spinose with 2 stout terminal spines with marginal teeth (Figure 6 *b*); dorsal margin of coxale hirsute. Basale: proximal ventral margin with 2 stout pectinate spines; proximal end of ventral margin with 7 bristles in row; proximal half of ventral side with 9 additional bristles; medial surface hirsute; long stout spinous bristle present distal to middle of ventral margin; dorsal margin with 12 bristles forming row extending onto medial side and 2 subterminal bristles. Exopodite with 2 subterminal bristles on ventral margin, proximal bristle slightly longer than distal bristle. Endopodite: 1st joint with 4 long and 5 short ventral bristles; dorsal margin of 2nd joint with abundant bristles; ventral margin of 2nd joint with about 10 subterminal bristles forming row extending onto lateral and medial surfaces; end joint with 2 long claws, 1 short claw, and about 4 bristles.

Maxilla (Figures 6 *c–i*): Epipodial appendage hirsute; coxale with stout plumose bristle; exopodite broad with 1 short spinose subterminal bristle and 2 long bare terminal bristles; outer margin of exopodite hirsute; basale with 1 long spinous posterior bristle near base of exopodite, 1 bristle near endite III, and 5 bristles in row on medial margin. Endopodite: 1st joint with 7  $\alpha$ -bristles and 5  $\beta$ -bristles—outer  $\beta$ -bristle stout pectinate, others slender bare; 2nd joint with 7 bare  $\alpha$ -bristles, 6 slender pectinate bristles forming subterminal cluster on inside surface, and 8 stout pectinate terminal clawlike bristles. Endites: 1st endite with about 13 marginal bristles, most with tridentate tips, and 5 short spinous medial bristles with tridentate tips; 2nd endite with about 13 distal bristles, some with tridentate tips, 1 proximal bristle, and numerous spinelike bristles on medial surface; 3rd endite with about 9 bristles on distal margin and 1 long and 4 short bristles along leading margin.



FIGURE 5.—*Azygocypridina rudjakovi* Kornicker, adult female, length 10.1 mm. Carapace: *a*, left lateral view; *b*, detail of valve surface; *c*, anterior part left valve, lateral view; *d*, anterior left valve, medial view; *e*, anterior right valve, medial view. Adductor muscle: *f*, lateral view of left end of muscles after removal of carapace. First antenna: *g*, right limb, medial view; *h*, front and side view of tips of filaments on b-bristle; *i*, right limb, detail of end of right limb, medial view. Second antenna: *j*, lateral view of right endopodite; *k*, detail of tip of 3rd joint of endopodite shown in "j"; *l*, medial bristle of protopodite, lateral view. *m*, Posterior part of body with end of furca. (Same magnification, in microns: *b*, *d*, *e*, *j*; *l*, *i*, *m*; *c*, *g*.)

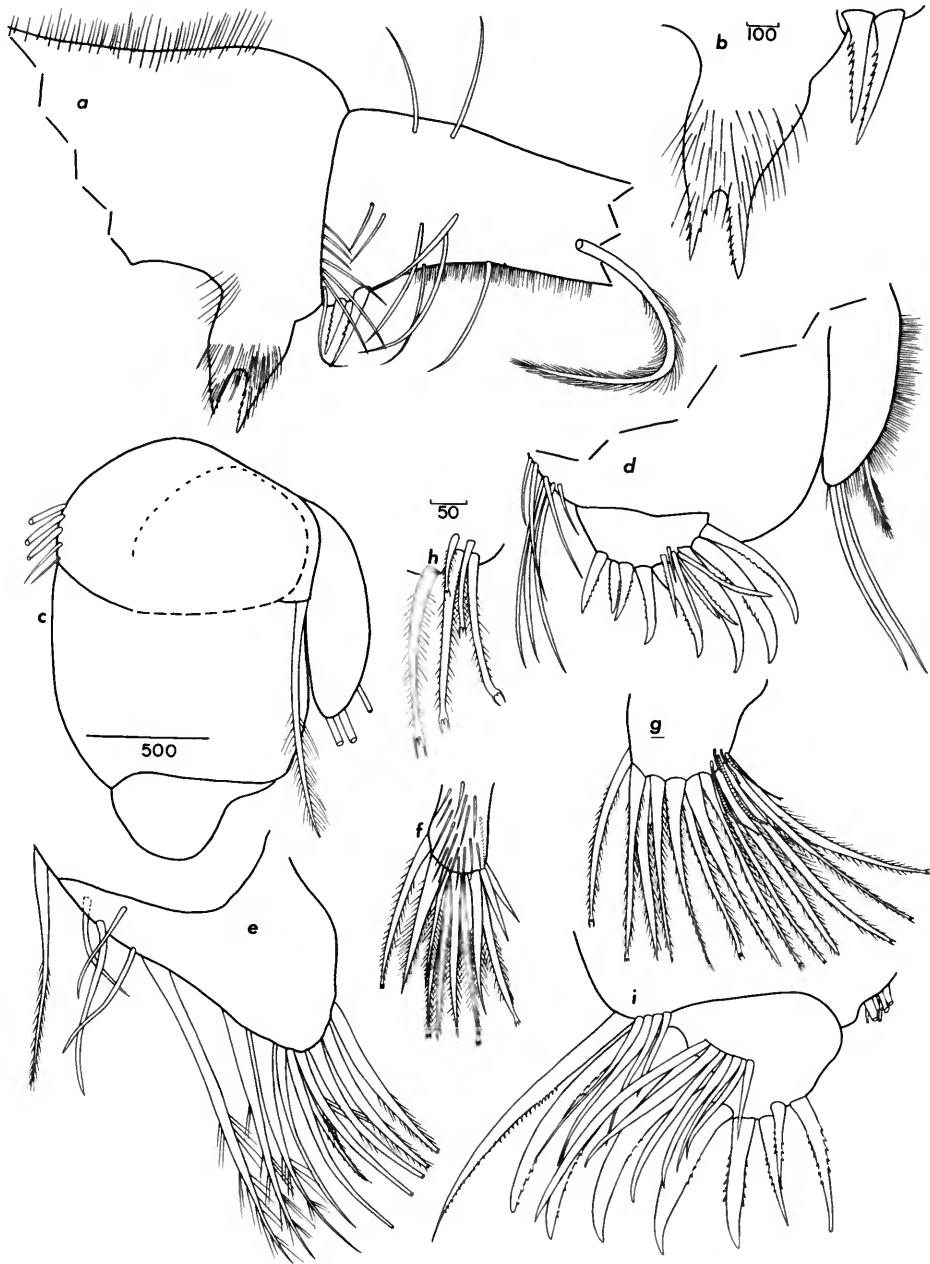


FIGURE 6.—*Azygocypridina rudjakovi* Kornicker. Mandible: *a*, coxale endite and part of basale, ventral view; *b*, detail of coxale endite and pectinate bristles of basale. Maxilla: *c*, right limb without endites, medial or posterior view; *d*, detail of "c" with bristles; *e*, endite III, medial view; *f*, endite II, medial view; *g*, endite I, medial view; *h*, detail of bristles with tridentate teeth on "g"; *i*, end joints of right maxilla shown in "c," anterior or lateral view. (Same magnification, in microns: *b*, *d-g*, *i*.)

Fifth limb (Figures 7 *a, b*): Epipodial appendage with about 104 bristles; endites 1–3 with numerous bristles; distoanterior process on protopodite acuminate, slightly recurving; main tooth of 1st exopodite joint with peg, 6 pectinate teeth, and proximal bristle; 2nd joint with 6  $\alpha$ -bristles, 9  $\beta$ -bristles, 1 *c*- and 1 *d*-bristle; inner lobe of 3rd joint with 10 bristles, outer lobe with 2 hirsute bristles; 4th joint with 12 bristles; 5th joint divided into proximal and distal lobes—proximal lobe with 7 bristles, distal lobe with 9 bristles.

Sixth limb (Figures 7 *c–g*): 11 bristles in place of epipodial appendage; 1st endite with 4 bristles and 2 short spines; 2nd endite with about 17 bristles and 1 short spine; 3rd endite with about 16 bristles; 4th endite with about 26 bristles; end joint divided into large anterior lobe and short posterior lobe; anterior lobe with numerous bristles, some with wreaths of long marginal spines, others bare; posterior lobe with 10 bristles with long marginal spines proximally and short spines distally; dorsal margin of posterior lobe and medial surface of end joint hirsute.

Seventh limb (Figures 8 *a, b*): Terminus without teeth or fingerlike processes; short segment of distal end with smaller diameter than proximal part; right limb with 9 distal bristles, and 47 proximal bristles; left limb with 11 distal bristles and 58 proximal bristles; each bristle with 4–7 bells and distal marginal spines; total bristles 56–69.

Furca (Figures 8 *c–e*): Right lamella with 27 claws, left with 23; claw 1 shorter than claw 2 and with recessed base proximal to base of claw 2; starting with claw 2, claws arranged in 5 groups with claws decreasing in length and diameter in each group; distribution and number of claws in groups on left and right lamellae are as follows:

	Group				
	<i>I</i>	<i>II</i>	<i>III</i>	<i>IV</i>	<i>V</i>
Left	3	3	3	2	11
Right	3	4	4	2	13

Copulatory organ (Figures 8 *g, h*): Small conical penis present between bilobed copulatory limbs; genital opening at tip of cone; outer lobe of copulatory limb with about 39 bristles and short fingerlike inturned process distally; inner lobe of copulatory limb with about 15 bristles and transparent scooplike tip.

Brushlike organ (Figure 8 *h*): Elongate process with 11 bristles present at base of each copulatory limb.

Upper lip (Figure 9): Glands opening onto narrow vertical anterior ridge; 2 lobes, with surface hairs, present below and lateral to ridge; lobes supported by sclerotized skeleton characteristic of genus; mouth slit-like; esophagus corrugated.

Lateral eye (Figure 8 *f*): Each eye elongate, flap-like with marginal hairs and without ommatophores, projecting anteriorly.

Rod-shaped organ (Figure 7 *h*): Small, pear-shaped.

Posterior (Figure 5 *m*): Spines in clusters present along posterior.

Parasites: The holotype contained in the brood chamber and above the posterior part of the animal 7 isopod larvae, probably belonging to the genus *Cyproniciscus*. A female may also have been present but was not recognized with certainty.

Gut: Contents consisting of many exoskeletons of small crustaceans (probably mysids, according to T. E. Bowman) and 1 pellet of fine-grained sediment in combination with crustacean exoskeletons.

COMPARISON.—The absence of teeth or fingerlike processes at the tip of the 7th limb distinguishes *A. rudjakovi* from previously described species.

### *Azygocypridina imperator* (Brady)

#### FIGURE 10

*Crossophorus imperator* Brady, 1880, p. 158, pl. 38: figs. 1–11.  
*Azygocypridina imperator* (Brady): Sylvester-Bradley, 1950, p. 11 [new name].

HOLOTYPE.—*Crossophorus imperator* Brady, 1880, unique specimen. In collection of British Museum (Natural History). The glass slide has on it numbers 223 and 92 and a label containing the name of the species and the following information: “‘Challenger’ No. 168, Depth 1100 faths., (81–5).61., G. S. Brady, 8/7/74.”

With the exceptions of the furca and terminus of the 7th limb, appendages differ from *A. rudjakovi* mainly in the number of bristles they bear. For this reason figures of most appendages of *A. imperator* are not presented herein.

SUPPLEMENTARY DESCRIPTION OF APPENDAGES.—First antenna: Proximal ventral margin of 2nd joint with cluster of 4 bristles; 3 short bristles present on lateral surface near the 4 bristles on ventral margin; 1 or no subterminal bristle present on lateral surface; dorsal margin with 16 or 17 bristles; ventral margin of 3rd joint with 7 to 9 bristles; dorsal margin of 3rd joint



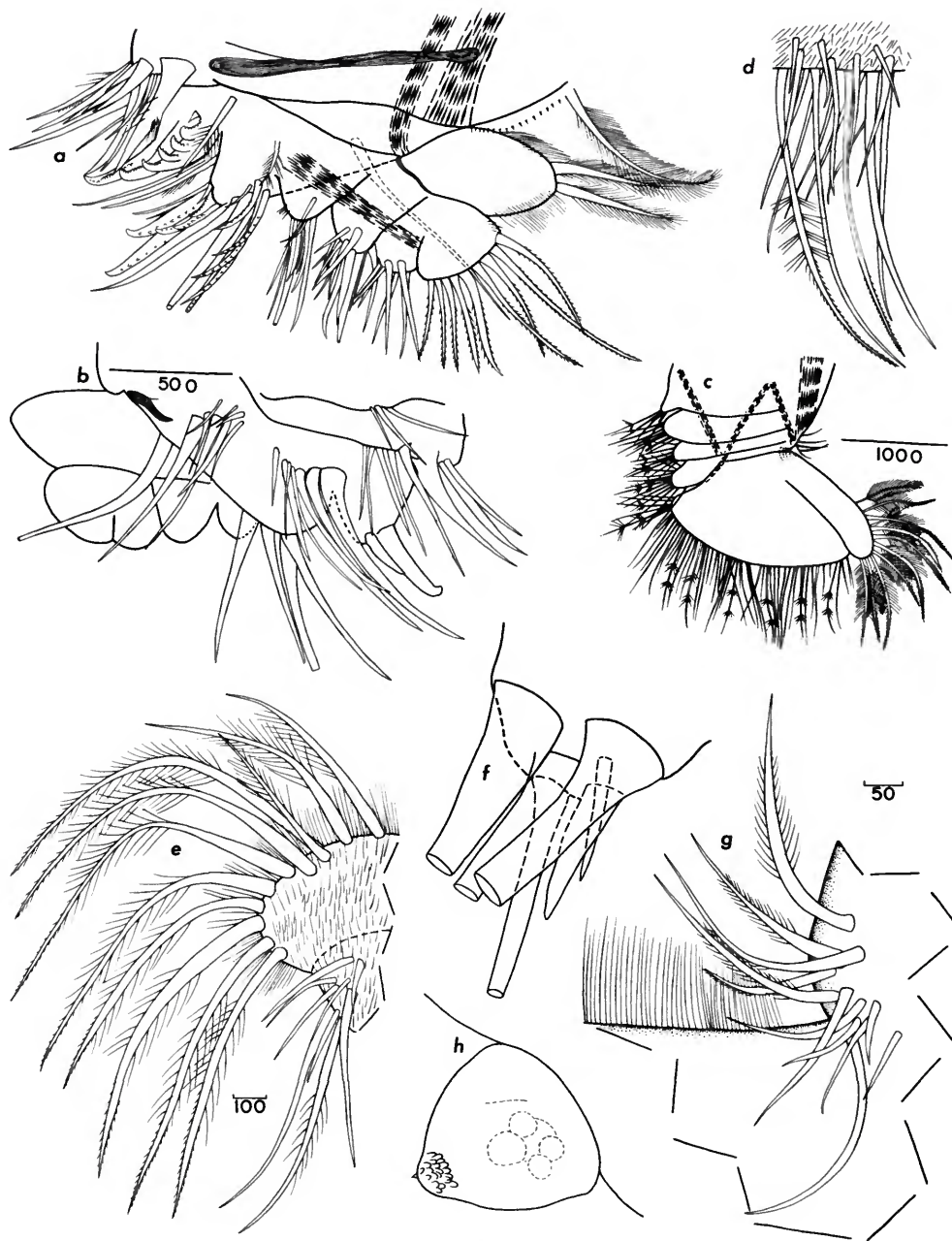


FIGURE 7.—*Azygocypridina rudjakovi* Kornicker. Fifth limb: *a*, posterior or medial view; *b*, same limb, anterior or lateral view. Sixth limb: *c*, left limb, lateral view; *d*, detail of margin of end joint of “*c*”; *e*, detail of posterior of end joint of left limb, medial view; *f*, endite I, right limb, medial view; *g*, details of bristles in place of epipodial appendage, left limb, medial view; *h*, rod-shaped organ. (Same magnification, in microns: *a*, *b*; *d*, *e*; *f*-*h*.)

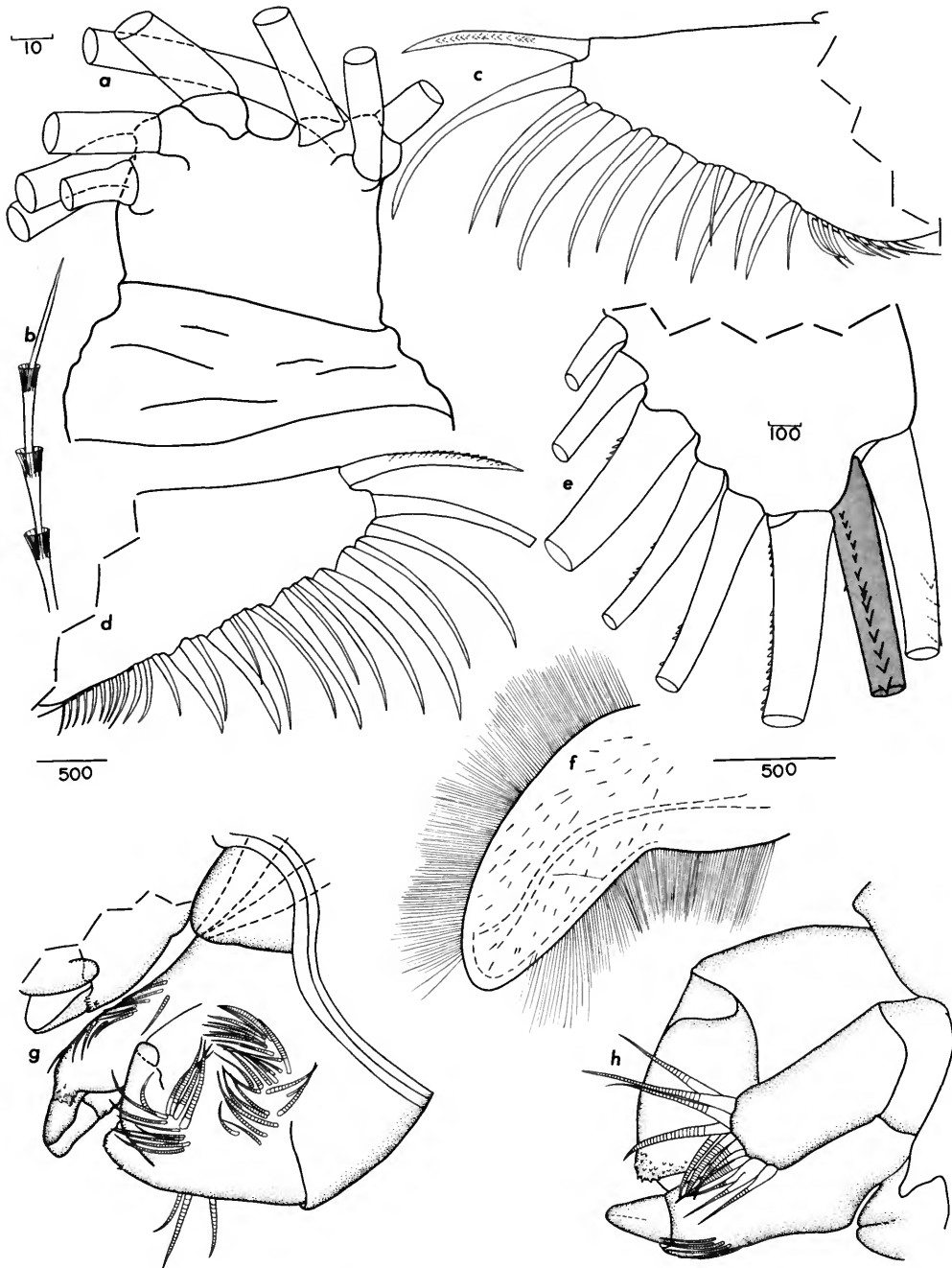


FIGURE 8.—*Azygocypridina rudjakovi* Kornicker. Seventh limb: *a*, terminus of right limb; *b*, distal end of bristle. Furca: *c*, left lamella, lateral view; *d*, right lamella, lateral view; *e*, anterior part of furca (patterned claw is claw 1 of left lamella). *f*, Left lateral eye. Copulatory organ: *g*, left organ, penis, and part of right; *h*, right organ, penis, brushlike organ. (Same magnification, in microns: *e*, *g*, *h*; *a*, *b*; *c*, *d*.)



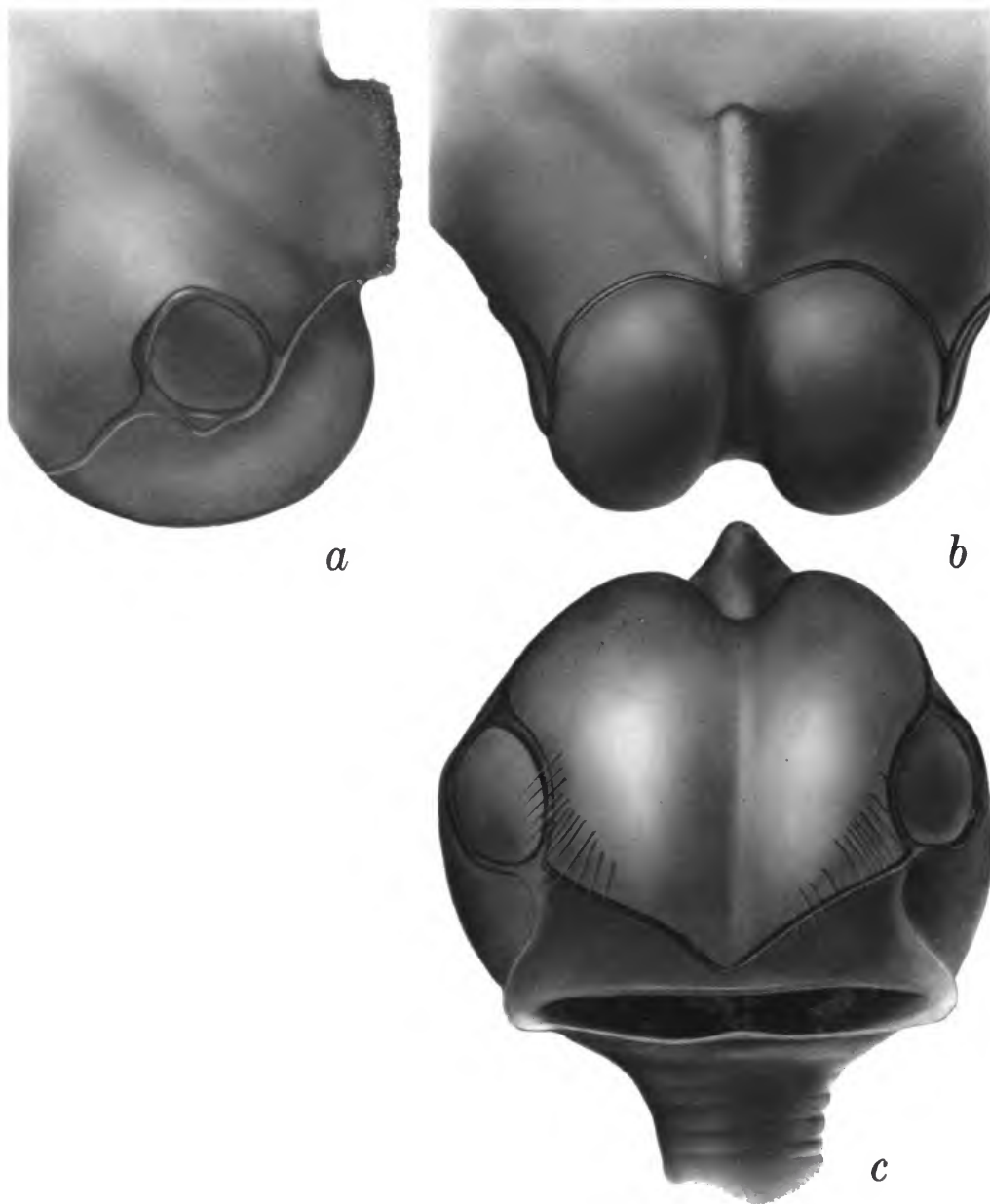


FIGURE 9.—*Azygocypridina rudjakovi* Kornicker. Upper lip: *a*, right lateral view; *b*, anterior view; *c*, ventral view (slit near bottom is mouth, and, below that, part of esophagus).

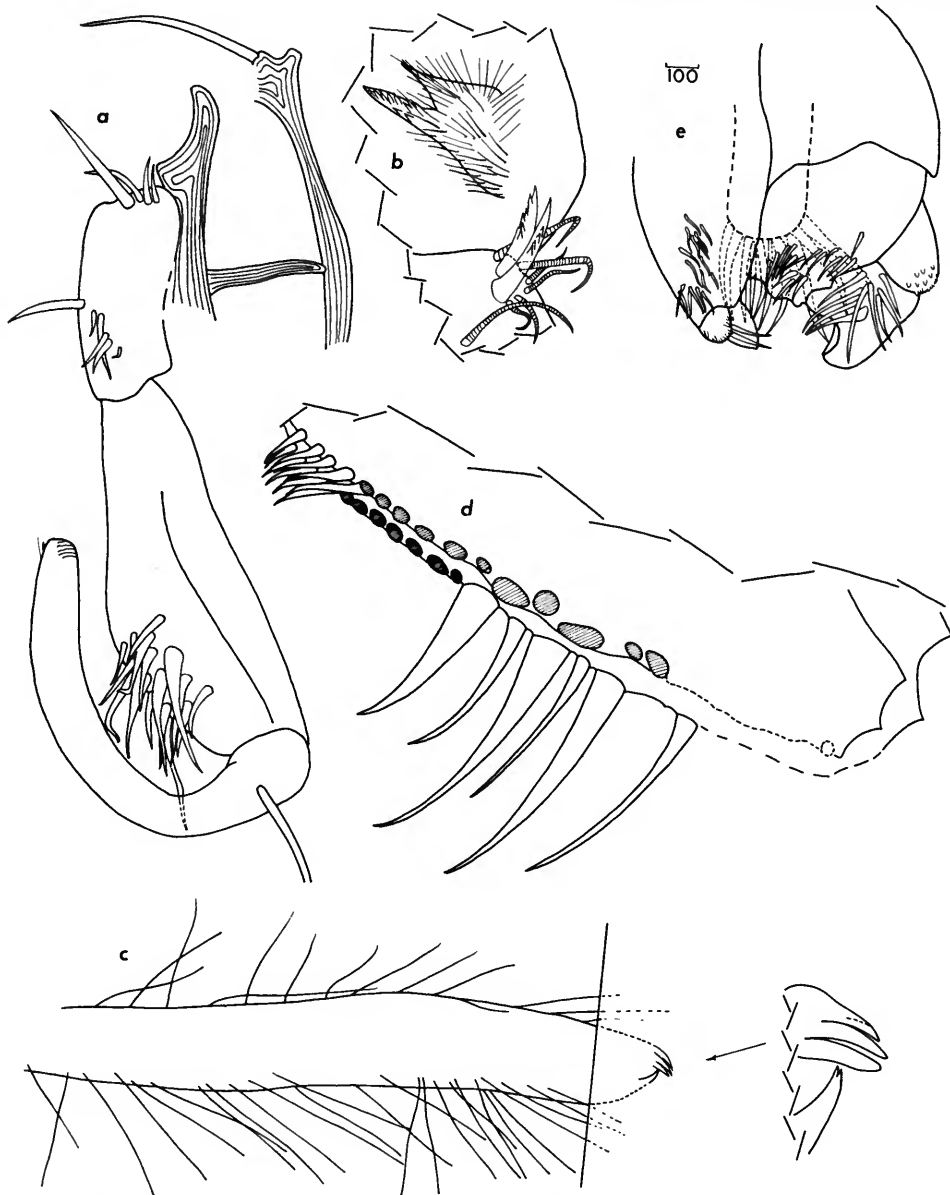


FIGURE 10.—*Azygocypridina imperator* (Brady), holotype: *a*, 2nd antenna, endopodite, and part of protopodite, lateral view; *b*, mandible, coxale endite, and part of basale, medial view; *c*, 7th limb (vertical line on right represents end of cover slip, part of limb shown on right is outside of cover slip); *d*, furca, right lateral view; *e*, copulatory organ. (Same magnification, in microns: *a-e*.)

with 14 or 15 bristles; ventral margin of 4th joint with 4 or 5 terminal bristles; dorsal margin of 4th joint with 5 bristles; sensory bristle of 5th joint broken but with numerous filaments on remaining stump; 6th joint with medial bristle slightly longer than 5th joint; 7th joint with a-, b-, and c-bristles: a-bristle missing on limb; b-bristle long, stout with many filaments, a few with spoon-shaped tips; c-bristle broken off near base but similar in diameter to b-bristle. 8th joint with d-, e-, f-, and g-bristles: d- and e-bristles both broken off near base, but stumps obviously belonging to sensory type bristle and without filaments; f- and g-bristles similar to b-bristle, but no filaments observed with spoonlike tips.

Second antenna: Protopodite with bare medial bristle (Figure 10a). Endopodite 3-jointed (Figure 10a): 1st joint with proximal group of 1 long bristle and 3 short bristles and distal group of 1 long and 5 short bristles; 2nd joint with 16 bristles; 3rd joint recurved, with 1 long proximal bristle and a faint terminal spine; ridges present on terminus. Exopodite: joints 2–9 with basal spines; lateral basal spine of 9th joint small; joints 2–8 with clusters of minute spines along distal margin; bristle of joint 2 reaching past 9th joint and bearing natatory hairs; joint 9 with 7 bristles; bristles of joints 3–9 with natatory hairs.

Mandible (Figure 10b); Coxale endite spinose with 2 stout terminal spines with marginal teeth. Basale: proximal ventral margin with 2 stout pectinate spines; proximal end of ventral margin with 7 short bristles; proximal half of ventral margin with 4 additional bristles; long stout bristle present distal to middle of ventral margin; dorsal margin with 11 bristles forming fanlike row extending onto medial side, and 2 subterminal bristles. Exopodite with 2 subterminal bristles on ventral margin, proximal bristle longer than distal bristle. Endopodite: 1st joint with 5 long, 1 medium, and 5 short bristles; dorsal margin of 2nd joint with abundant bristles; ventral margin of 2nd joint with about 10 subterminal bristles forming row extending onto lateral and medial surfaces; end joint with 2 long claws, 1 short claw, and several bristles.

Maxilla: Coxale with stout plumose bristle; exopodite broad with short subterminal bristle and 2 long bare terminal bristles; outer margin of exopodite hirsute; basale with 1 bristle near endite III and 8 bristles in cluster on medial margin. Endopodite: 1st joint with 6  $\alpha$ -bristles and 4  $\beta$ -bristles—outer  $\beta$ -bristle stout pectinate, others slender bare; 2nd joint with 7

bare a-bristles, 7 stout pectinate terminal clawlike bristles, and 4 medial terminal bristles. Endites: 1st endite with about 19 bristles, some with tridentate tips; 2nd endite with numerous short slender bristles on medial surface and many long marginal bristles; 3rd endite present and with many marginal bristles.

Fifth limb: Epipodial appendage with about 112 bristles; endites 1–3 with numerous bristles; main tooth of 1st exopodite joint with peg, 6 pectinate teeth, and proximal bristle; 2nd joint with total of about 18 pectinate teeth and bristles; inner lobe of 3rd joint with about 7 bristles; outer lobe with 2 hirsute bristles; 4th joint with about 9 bristles; 5th joint with 9 bristles.

Left sixth limb: 4 bristles in place of epipodial appendage; 1st endite with 3 long bristles and 3 short spines; 2nd endite with about 16 bristles; 3rd endite with about 17 bristles; 4th endite with about 22 bristles; end joint divided into large anterior lobe and short posterior lobe; anterior lobe with numerous bristles, some with wreaths of long spines, some with short spines, and some bare; posterior lobe with 7 bristles with long marginal spines proximally and short spines distally; posterior margin of end joint with 6 spinous bristles; medial surface of end joint hirsute.

Right sixth limb: 13 bristles in place of epipodial appendage; 1st endite with 3 long bristles and 3 short spines; posterior lobe of end joint with 5 spinous bristles; posterior margin of end joint with 1 spinous bristle near middle; appendage otherwise similar to left limb.

Seventh limb (Figure 10c): (Only one complete 7th limb is present on the slide and the tip of this extends past the edge of the cover slip. The tip is obscured by the sealing medium but fortunately is sufficiently visible to observe its general character.) Terminus with large jaw with bifurcate tip opposing comb containing at least 3 or 4 large recurved teeth; 39 proximal bristles counted but a few more probably present; each bristle with up to 6 bells; distal bristles not clearly visible.

Furca (Figure 10d): (Furca has most claws missing and is also partly obscured on the slide. The furca figured by Brady (1880, pl. 38: fig. 11) has no claws on the left lamella and 6 claws near the middle of the right lamella. Apparently the figure was reversed in printing, because the claws are actually on the left lamella.) Starting with the posterior end, the left lamella bears, or has sockets for, 12 short bristles which

are followed by a stout bristle, a slender bristle, another stout and slender bristle, and then a stout bristle; bristles anterior to these mostly missing. Right lamella with only 10 posterior bristles or sockets for them.

Copulatory organ and ?brushlike organ (Figure 10e): Similar to *A. rudjakovi*.

Posterior: Spines present along posterior.

#### Family SARSELLIDAE Brady and Norman, 1896

#### Genus *Spinacopia* Kornicker, 1969

**TYPE-SPECIES.**—*Spinacopia sandersi* Kornicker, 1969.

Kornicker (1969a) described four species of this genus: *S. sandersi* from the North Atlantic, *S. variabilis* from the South Atlantic, *S. bisetula* from the southern Indian Ocean, and *S. menziesi* from the Antarctic Ocean. A new species described herein, *S. torus* from the Peru-Chile Trench, extends the range of the genus to the South Pacific. Two new species described herein, *S. octo* and *S. antarctica*, extend the range farther south into the Antarctic. Depths of occurrence of the new species (210–2504 m) support the probability that members of the genus are confined to deep water; known depth range of all species is 135 m to 3500 m.

#### *Spinacopia antarctica*, new species

##### FIGURES 11–14

**HOLOTYPE.**—USNM 123340, adult ♀, length 1.92 mm, height 1.74 mm.

**ALLOTYPE.**—USNM 123341, juvenile ♂ (?N-1), length 1.61 mm, height 1.30 mm.

**PARATYPES.**—USNM 123342, adult ♀ with 6 eggs in brood chamber, length 1.81 mm, height 1.65 mm. USNM 123343, adult ♀ with eggs in brood chamber, length 1.86 mm, height 1.70 mm. USNM 123344, adult ♀ with eggs, length 1.71 mm, height 1.67 mm. USNM 123345, 3 juveniles: length 1.01 mm, height 0.92 mm; length 1.01 mm, height 0.86 mm; length 0.89 mm, height 0.72 mm.

**TYPE-LOCALITY.**—Antarctic Ocean, lat. 62°41'S, long. 54°43'W; bottom depth 210–220 m; station 1003, cruise 12, RV *Eltanin*, 15 March 1964. Collected in 10-foot Blake trawl on bottom 15 minutes by University of Southern California. All specimens from same sample.

**DESCRIPTION OF FEMALE.**—Carapace oval in lateral view with greatest height near middle (Figure 11); anterior produced in area of rostrum and with shallow but distinct incisur; posterior with short caudal process below valve middle; carapace widest in posterodorsal part.

**Ornamentation:** Surface completely covered with short spines (Figure 12e); long hairs present along anterior and anteroventral margin of each valve; a few long hairs present on lateral surface; prominent rim present slightly within and parallel to valve edge; several distinct but vaguely defined nodes and ridges present on valve surface (Figure 11).

**Infold:** Infold below shallow incisur with minute bristle near inner margin (Figure 12d); infold in front

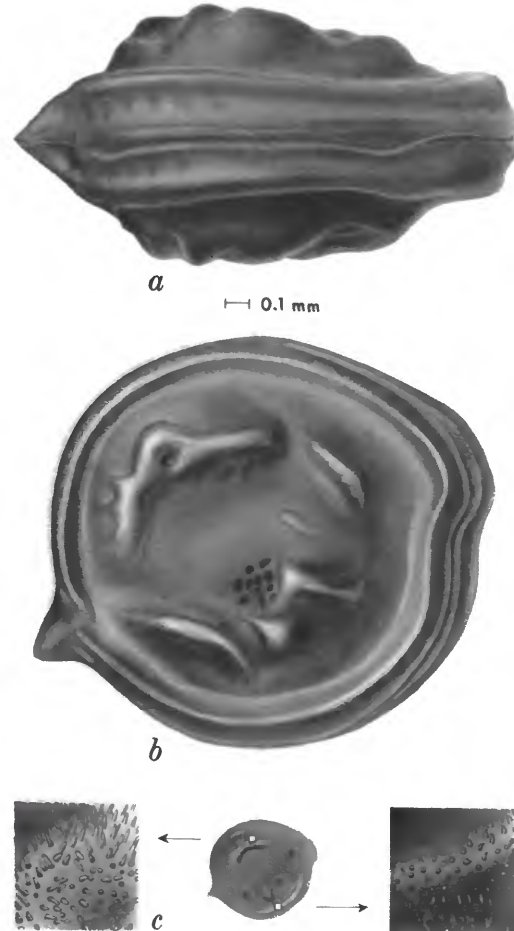


FIGURE 11.—*Spinacopia antarctica* Kornicker, adult female: a, dorsal view; b, right lateral view; c, detail of surface spines.



of caudal process of right valve with 7 spinous bristles, 4 large above and 3 below (Figure 12*b*); left valve with 5 above and 4 below (Figure 12*a*); about 16 minute bristles present near inner margin of posteroventral section of infold.

Selvage: Lamella prolongation with smooth outer margin present along anterior, ventral and posterior margins of both valves; prolongation broad along anterior and caudal process, narrow elsewhere; prolongation continuous across incisur.

Muscle scars: Central muscle scars consisting of about 14 individual scars (Figure 12*c*). Posterodorsal and dorsal scars (Figure 12*f*) not visible through shell.

Pore canals: Radial pore canals numerous around anterior, ventral, and posterior margins (Figures 12*e*); canals along ventral margin terminating at minute spines at valve edge.

Size: The dimensions of four adult females are as follows:

	Length mm	Height mm	Remarks
USNM 123340	1.92	1.74	holotype
USNM 123342	1.81	1.65	6 eggs in brood chamber
USNM 123343	1.86	1.70	eggs in brood chamber
USNM 123344	1.71	1.67	eggs in body or chamber

First antenna (Figures 12 *g, h*): 2nd joint with spinous dorsal bristle and short spines in clusters along ventral and dorsal margins; 3rd joint with 2 spinous bristles, 1 ventral and 1 dorsal; 4th joint with 3 spinous bristles, 2 ventral, 1 dorsal; 3rd and 4th joints not separated by suture; sensory bristles of 5th joint with 2 short filaments near middle and 1 near tip; 6th joint with minute medial bristles on left limb, and with stump of bristle on right limb; 7th joint with a-, b-, and c-bristles: a-bristle spinous and about same length as b-bristle; b-bristle about half length of sensory bristle of 5th limb and with short filament near middle; c-bristle same length as sensory bristle and with 3 short filaments near middle and one near tip; 8th joint with d-, e-, f-, g-bristles: d- and e-bristles bare and of similar length; f-bristle with 1 short filament distally and 1 near tip; g-bristle with 3 short filaments near middle and 1 at tip.

Second antenna (Figures 12 *i-l*): Protopodite bare and without medial bristles. Endopodite 2-jointed: 1st joint with 2 or 3 short bare bristles, 2nd joint with 1 short bare bristle and 1 long terminal bristle. Exopodite: distal margin of 1st joint with short curved medial spine; bristle of 2nd joint with single ventral spine near middle and few distal natatory hairs; bristles of

joints 3-8 with sparse natatory hairs; ninth joint with 1 short spinous bristle and 1 long bristle with sparse natatory hairs; distal margins of joints 2-8 with comb of short spines.

Mandible (Figure 12*m*): Ventral margin of coxale hairs; coxale endite with bifurcate tip and spinous process near base (Figure 12*p*). Basale: dorsal margin with short spine near middle and 1 or 2 longer spines distally; ventral margin with total of 3 spines and bristles in proximal group and 4-6 in distal group: proximal group with 2 short medial spines and 1 longer marginal bristle; distal group with 1 short spine on medial surface, 1 very long spinous marginal bristle and 2-4 shorter lateral bristles forming row; a bilobed sclerotized glandular process present on lateral side between proximal and distal groups (Figure 12*o*). Exopodite blunt, short and with single ventral bristle (Figure 12*n*). Endopodite: 1st joint with spines forming row on distal dorsal margin, shorter spines in clusters distally on medial surface, and 2 medial spines near base of main ventral claw; 2nd joint with subterminal spine on dorsal margin, and small lateral spine at base of main claw; 3rd joint with 1 short medial spine dorsal to main claw and 1 or 2 somewhat longer spines ventral to base of main claw.

Maxilla (Figures 13*a, b*): Coxale with anterior bristle having 2 small subterminal spines; basale with 1 bristle with subterminal spine; exopodite with 1 short bare bristle and 2 long bristles with short spines distally; 1st and 3rd endites each with 6 bristles; 1st joint of endopodite with spinous  $\alpha$ - and  $\beta$ -bristles, and a few short spines distally on anterior margin; 2nd joint of endopodite with 2 spinous a-bristles, 1 bare c-bristle, and usual 5 pectinate bristles.

Fifth limb (Figure 13*c*): Endite with 1 bare bristle. Exopodite: 1st joint with 3 spinous bristles, 1 long and 2 short; 2nd joint with 5 spinous bristles; short lobe between 2nd and 3rd joint (may be part of 2nd joint) with 1 small spinous bristle; 3rd joint with 3 spinous bristles on inner lobe and 1 on outer lobe; joints 4+5 with 3 bristles; surface of joints hairs. Epipodial appendage with 43 hairs.

Sixth limb (Figures 13*d, e*): Four endites present: 1st endite with 2-4 bristles, 2nd with 2, 3rd with 4, 4th with 3, all bristles spinous. End joint with 3 or 4 spinous anterior bristles, 1 spinous bristle near middle, and 2 stout hairs posterior bristles; clusters of hairs present on medial and lateral surfaces and along margin of end joint on each side of posterior bristles.

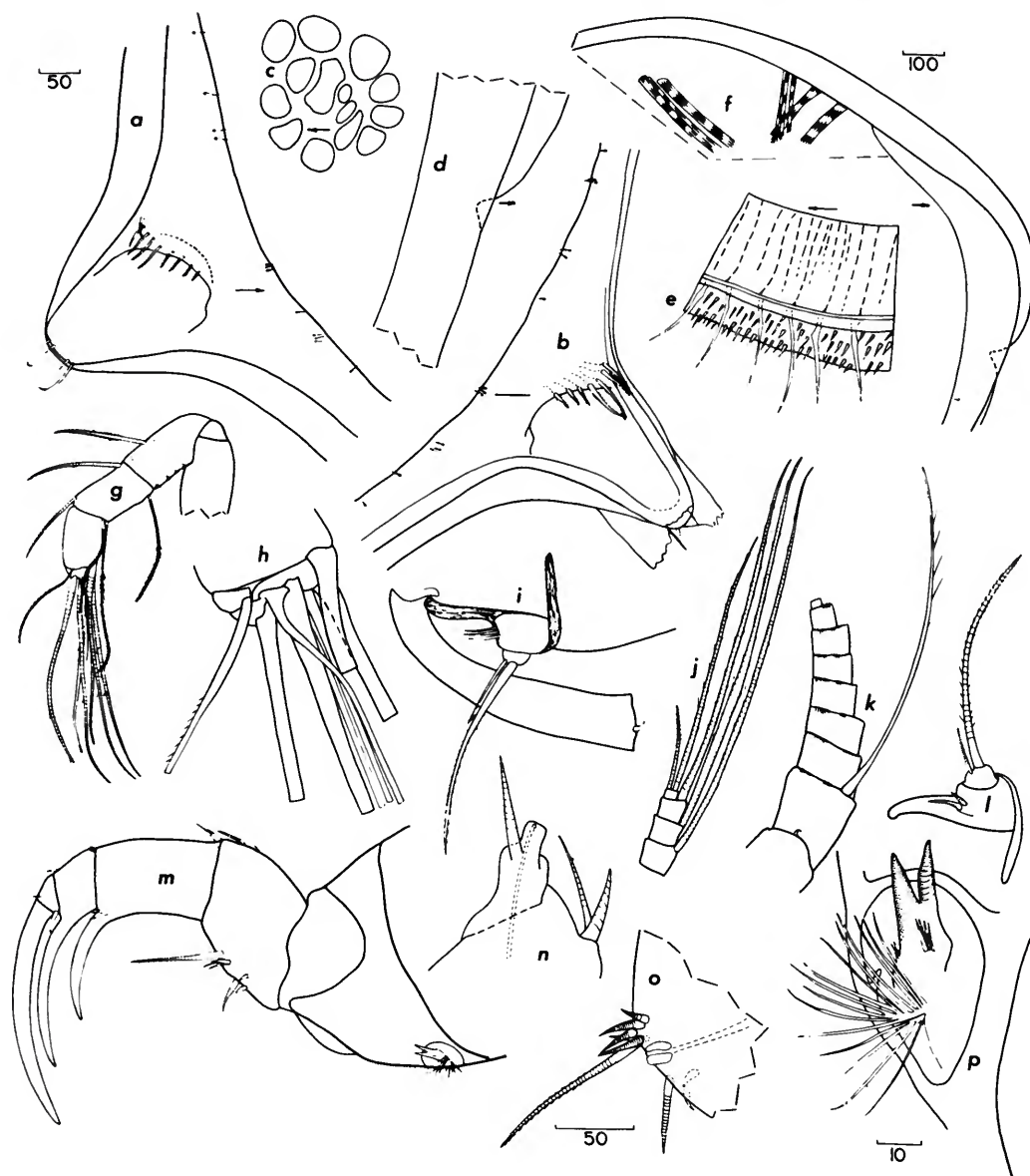


FIGURE 12.—*Spinacopia antarctica* Kornicker, USNM 123340, adult female. Carapace: *a*, caudal process left valve, medial view; *b*, caudal process right valve, medial view; *c*, central muscle scars left valve, lateral view; *d*, anterior left valve, medial view; *e*, part of ventral margin, right valve, medial view; *f*, dorsal area of left valve showing muscle attachments, medial view. First antenna: *g*, right limb, medial view; *h*, detail of tip of "g." Second antenna: *i*, endopodite and 1st joint of exopodite of right limb, medial view; *j*, tip of exopodite of right limb, medial view; *k*, part of right limb without bristles of joints 3-9; *l*, endopodite of left limb, medial view. Mandible: *m*, right limb, medial view; *n*, exopodite left limb; *o*, ventral part of basale, left limb, lateral view; *p*, coxale endite, right limb. (Same magnification, in microns: *f*, *g*; *a-d*, *i-m*; *e*, *h*, *o*; *n*, *p*.)



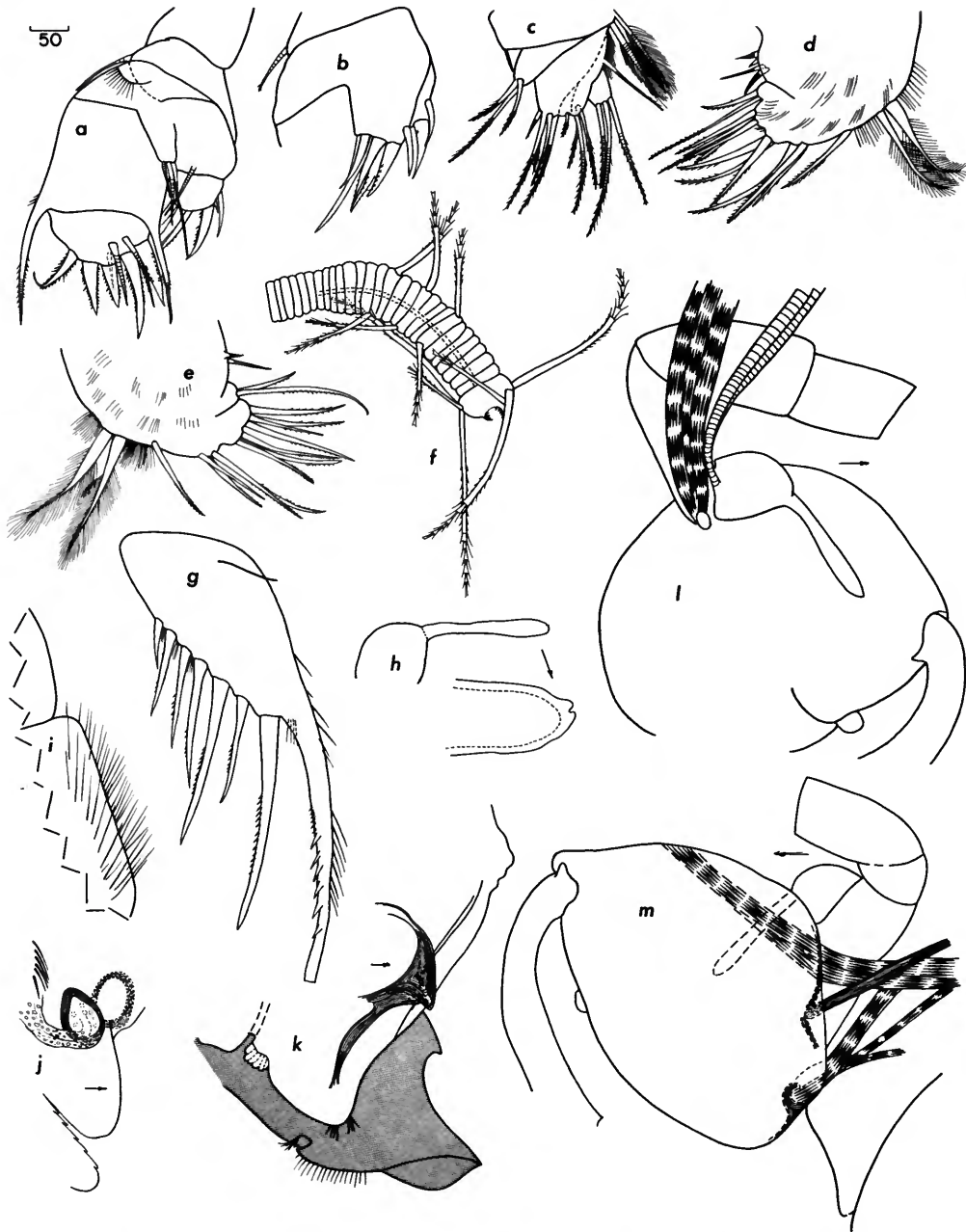


FIGURE 13.—*Spinacopia antarctica* Kornicker, USNM 123340, adult female: *a*, left maxilla, lateral view; *b*, part of right maxilla, medial view; *c*, right 5th limb, medial view; *d*, left 6th limb, lateral view; *e*, right 6th limb, lateral view; *f*, right 7th limb; *g*, right lamella of furca, lateral view; *h*, medial eye and rod-shaped organ; *i*, posterior of body; *j*, genitalia and brushlike organ; *k*, anterior of body showing upper lip, and coxale endite of left mandible; *m*, muscles and rodlike sclerite attached to protopodite of left 2nd antenna; *l*, dorsal shell muscles attached to head region and medial eye. (Same magnification, in microns: *a*–*m*.)

Seventh limb (Figure 13f): Proximal and distal groups each with 6 bristles, 3 on each side; each bristle with 2–5 bells and marginal spines distally; terminus with opposing combs.

Furca (Figure 13g): Each lamella with 8 claws: claw 1 continuous with lamella, remaining claws separated from lamella by suture; claw 3 more slender and shorter than claw 4; each claw with teeth along posterior margin; clusters of spines present along anterior margin of each lamella and at bases of claw 1 and claws 5–8.

Eyes: Lateral eyes absent. Medial eye fairly large, elongate.

Rod-shaped organ (Figures 13h, l, m): Elongate, single jointed, with minute terminal process.

Genitalia: Oval, amber-colored spermatophore present on each side.

Brushlike organ (Figure 13j): Minute ringed bristles posterior to and above genitalia.

Upper lip (Figure 13k): Simple curvature with several clusters of hairs. Triangular process present on each side between lip and 1st antenna above mandible attachment.

Posterior (Figure 13i): Posterior margin of thorax above furca with clusters of long hairs.

Eggs: 6 eggs present in brood chamber and about the same number unextruded in specimen USNM 123342.

DESCRIPTION OF JUVENILE MALE USNM 123341 (?N-1).—Carapace more elongate than adult female but with similar ornamentation and surface spinosity (Figure 14a); length 1.61 mm, height 1.30 mm. Endopodite of 2nd antenna with 3 segments (Figure 14d): 1st segment with 3 short bristles and surface spines; 2nd segment elongate with 1 long and 2 shorter bristles; 3rd segment elongate with 2 short terminal bristles. Exopodite of 2nd antenna with 1 long and 2 short bristles on 9th segment (Figure 14b). Furca with 7 claws (Figure 14g): claw 1 united with lamella; claw 3 smaller than claw 4; main claws with teeth forming lateral and medial rows along posterior margin. Left 7th limb with 6 bristles in proximal group (Figure 14f), right limb with only 3; each limb with 4 bristles in terminal group and small indentation in place of terminal comb. Copulatory organ undeveloped, consisting of small lobes. Remaining appendages similar to those of adult female.

COMPARISONS.—The configuration and distribution of nodes and ridges of the shell distinguishes *S. antarctica* from previously described species.

### *Spinacopia octo*, new species

FIGURES 15–17

HOLOTYPE.—USNM 123541, ♂ juvenile, length 2.37 mm, height 1.93 mm.

PARATYPE.—USNM 123542, ♂ juvenile, length 2.34 mm, height 1.92 mm.

TYPE-LOCALITY.—Antarctic Ocean, lat. 70°11'S, long. 106°38'–106°26'W; bottom depth 3495; station 931, cruise 11, RV *Eltanin*, 20 January 1964. Collected in 5-foot Blake trawl by University of Southern California. Smithsonian Oceanographic Sorting Center reference number 58. Both specimens were collected in same sample. Bottom temperature 0.34°C, bottom salinity 34.700 parts per thousand—data from Lamont Geological Observatory Station 248.

ETYMOLOGY.—Specific name from the Latin noun *octo* (eight) for the ornamentation on the carapace, which vaguely resembles the figure 8.

DESCRIPTION OF JUVENILE MALE (instar IV?).—Carapace oval in lateral view with shallow incisur and short caudal process (Figures 15, 16a).

Ornamentation: Surface with short spines, many of these having parallel sides except near tip (Figures 16c, d); long hairs present along ventral and anterior margins (Figure 16e); narrow rim present slightly within and parallel to valve edge; posterodorsal part of each valve with about 4 pits vaguely defined by low marginal ridges (Figure 15).

Infold: Infold below incisur with minute bristle near inner margin (Figure 16b); infold in front of caudal process with 9 bristles, 5 large spinous bristles above and 4 bristles below (latter bristles were obscured somewhat by debris so that whether or not they are spinous could not be observed); minute bristles present at inner margin of infold of caudal process (Figure 16c).

Selvage: Lamella prolongation with smooth outer margin present along anterior, ventral, and posterior margins of both valves; prolongation continuous across incisur.

Muscle scars: Central scars consisting of about 12 oval scars.

Pore canals: Normal for genus.

Size: The dimensions of two juvenile males (instar IV?) are as follows:

	Length mm	Height mm	Remarks
USNM 123541	2.37	1.93	holotype
USNM 123542	2.34	1.92	paratype

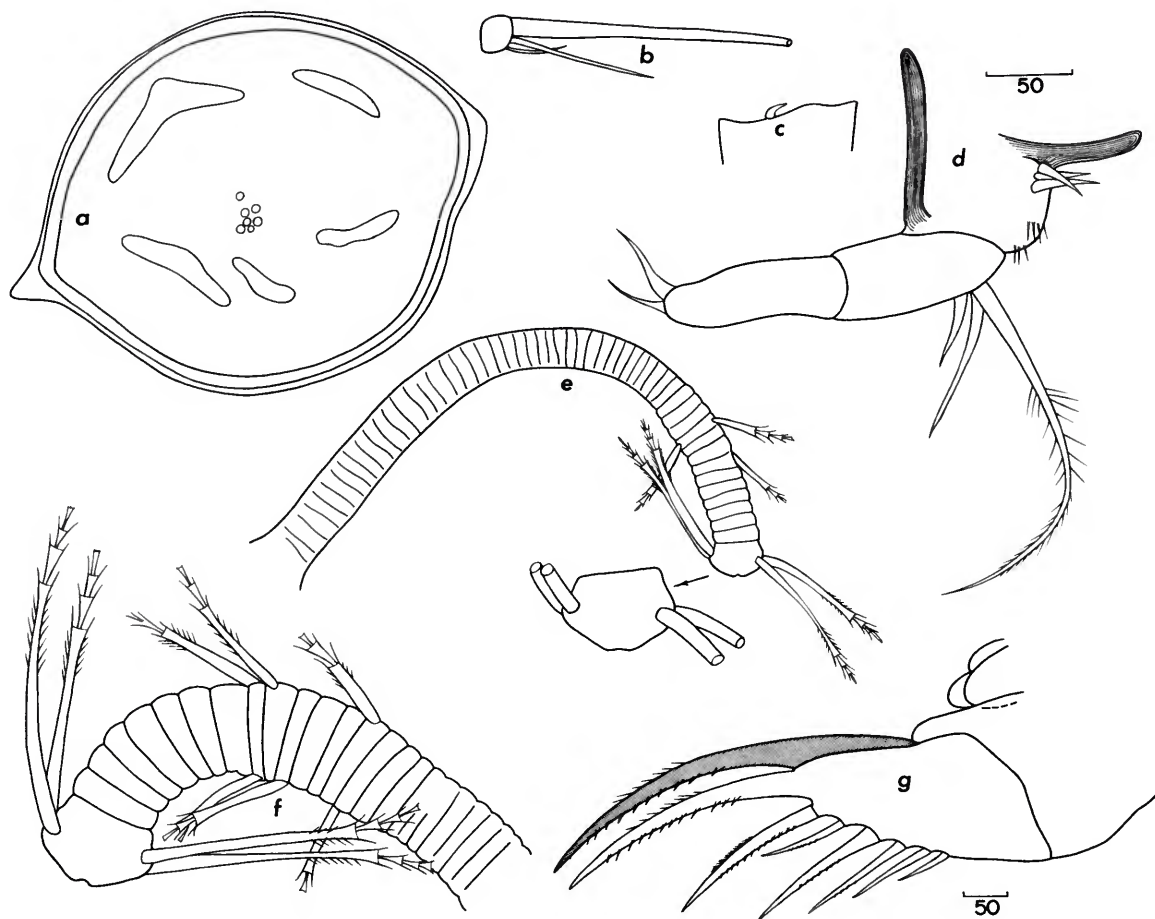


FIGURE 14.—*Spinacopia antarctica* Kornicker, USNM 123341, juvenile male. Carapace: *a*, right lateral view. Second antenna: *b*, 9th joint of exopodite, left limb, medial view; *c*, medial bristle, 1st joint, left limb; *d*, endopodite, left limb, medial view. Seventh limb: *e*, right; *f*, left. Furca and copulatory lobes: *g*, left lateral view. (Same magnification, in microns: *a*; *e*, *g*; *b*–*d*, *f*.)

First antenna (Figure 17*a*): Similar to *S. antarctica*.

Second antenna (Figures 16*f*, 17*b*): Endopodite 2-jointed: 1st joint with 2 or 3 small bristles; 2nd joint with 2 spinous bristles proximally, 1 long, 1 medium, and 1 short bare terminal bristle. Exopodite: 1st joint with short medial spine; 9th joint with 1 short and 1 long bristle; joints 2–8 with comb of short spines along distal margins.

Mandible (Figures 16*g*, *h*, 17*c*): Similar to *S. antarctica*. Distal group of bristles near ventral margin of basal with 1 short spine on medial surface, 1 long spinous marginal bristle and 3 short bristles forming row on lateral surface.

Maxilla (Figure 17*d*): Similar to *S. antarctica*. Endite I with 6 or 7 bristles; endite II with 5 or 6 bristles; endite III with 5 or 6 bristles.

Fifth limb (Figure 17*e*): Endite with 1 bare bristle. Exopodite: 1st joint with 4 bristles; 2nd joint with 5 bristles; small bristle between joints 2 and 3; 3rd joint with 3 or 4 bristles on inner lobe and 1 on outer lobe; joints 4+5 with 4 or 5 bristles; surface of joints hirsute. Epipodial appendage with 43 bristles.

Sixth limb: Endite I with 1 long and 2 short bristles; endite II with 2 bristles; endite III with 3 bristles; endite IV with 4 bristles. End joint with 3 anterior bristles, 2 spinous bristles near middle, and 1 or 2 stout



FIGURE 15.—*Spinacopia octo* Kornicker, holotype, length 2.37 mm.

hirsute posterior bristles; clusters of hairs present on medial and lateral surfaces and along margin of end joint on each side of posterior bristles.

Seventh limb: Proximal group with 5 bristles, distal group with 6, each bristle with 2–4 bells and marginal spines distally; terminus with a few short teeth projecting vertically from end of limb (Figures 16i, 17f).

Furca: Left lamella with 7 claws, right lamella with 8; claw 1 continuous with lamella, remaining claws separated from lamella by suture; claw 3 more slender and shorter than claw 4; claws 1, 2, 4, 5 with spines along posterior margin; clusters of hairs present medially at base of claw 1.

EYES, ROD-SHAPED ORGAN, UPPER LIP, POSTERIOR: Similar to *S. antarctica*.

Copulatory organ: Undeveloped.

COMPARISONS.—The configuration of pits and surrounding ridges in the posterodorsal part of each shell and the parallel-sided surface hairs distinguish *S. octo* from previously described species. This species is also larger than previously described species of *Spinacopia* with the exception of *S. menziesi* Kornicker, 1969. (It is possible that the pit and ridge structure of the shell is an artifact, occurring by collapse of the shell after death of the animal.)

#### *Spinacopia torus*, new species

FIGURES 18–20

HOLOTYPE.—USNM 123519, adult ♀, length 2.13 mm, height 1.82 mm.

PARATYPES.—USNM 123518, adult ♀, length 2.04 mm, height 1.78 mm; USNM 123520, adult ♀ with 4 unextruded eggs and 7 in brood chamber, length 2.18

mm, height 1.72 mm; USNM 123521, 3 juveniles: length 0.94 mm, height 0.76 mm; length 0.97 mm, height 0.67 mm; length 1.40 mm, height 1.02 mm; USNM 123531, juvenile, length 1.84 mm, height 1.55 mm; USNM 123522, juvenile instar II, length 1.20 mm, height 0.98 mm.

TYPE-LOCALITY.—Pacific Ocean, Peru-Chile Trench system, lat. 08°13'S, long. 81°09'W; bottom depth 1927–1997 m; estimated temperature 2.3°C; station 101, cruise 11, RV *Anton Brunn*, 16 October 1965. Collected in small bottom trawl by Dr. R. J. Menzies. (USNM 123518–USNM 123521 and USNM 123531 collected in same sample.)

OTHER LOCALITIES.—USNM 123522 collected south of type-locality; lat. 12°03'S, long. 78°45'W; bottom depth 3994–4364 m; estimated temperature 1.8°C; station 157, cruise 11, RV *Anton Bruun*, 28 October 1965. Collected in small bottom trawl under supervision of Dr. R. J. Menzies.

ETYMOLOGY.—The specific name is from the Latin *torus* meaning round elevation, protuberance, in reference to the node in the posterodorsal region of each valve.

DESCRIPTION OF FEMALE.—Carapace oval in lateral view with shallow sinus and short caudal process (Figures 18b, 20a); carapace with greatest height near middle and greatest width in posterodorsal part (Figure 18a).

Ornamentation: Surface with short spines around shallow depressions; long hairs present around margins (Figure 20e); low rim present slightly within and parallel to valve edge; posterodorsal part of shell inflated.

Infold: Infold below shallow incisur with usual minute bristle near inner margin (Figure 20b); infold in front of caudal process with 5 large spinous bristles above and 3 or 4 below (Figures 20c, d).

Selvae, muscle scars, pore canals typical for genus.

Size: (All adult females in collection somewhat deformed.) The dimensions of three are as follows:

	Length mm	Height mm	Remarks
USNM 123518	2.04	1.78	
USNM 123519	2.13	1.81	holotype
USNM 123520	2.18	1.72	7 eggs in brood chamber

First antenna (Figures 19a, 20f): Similar to 1st antenna of *S. antarctica*.

Second antenna (Figures 19b, 20g): Endopodite 2-jointed: 1st joint with 3 short bare bristles, 2nd joint with 1 long spinous bristle. Exopodite: distal margin



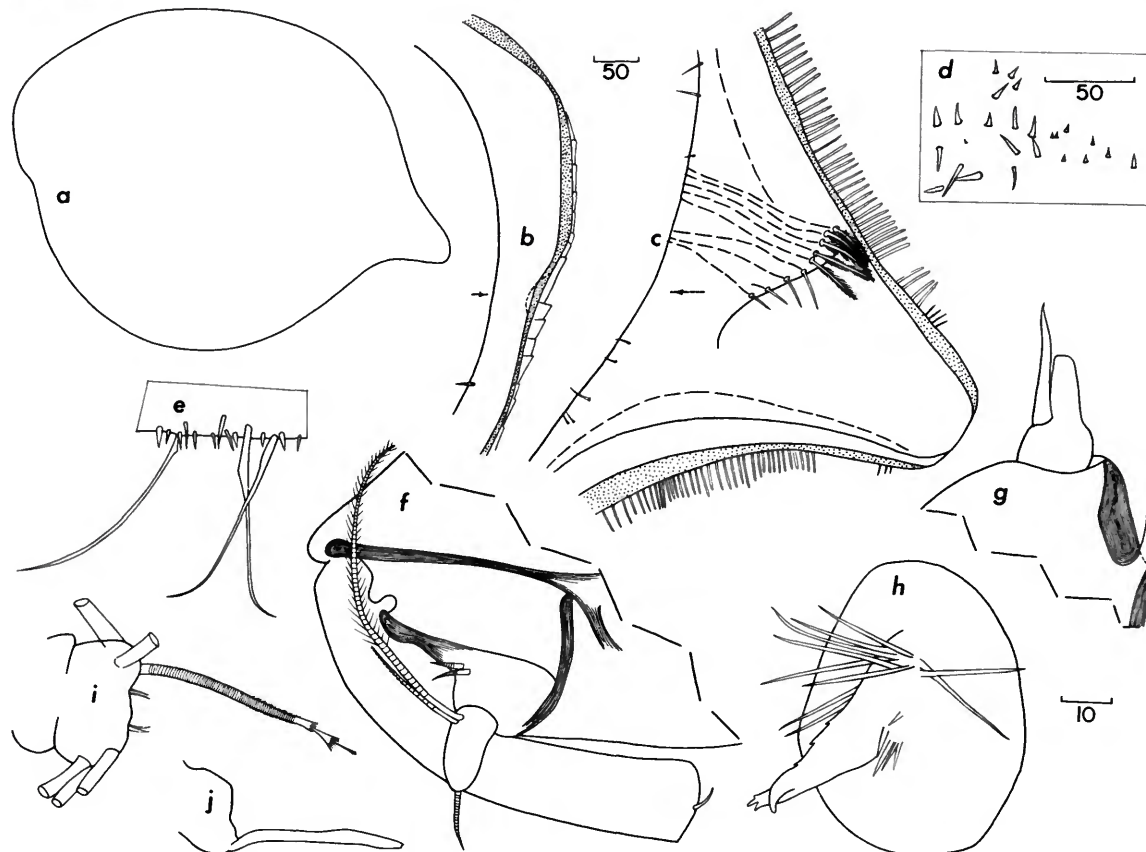


FIGURE 16.—*Spinacopia octo* Kornicker, USNM 123541. Carapace: *a*, outline, lateral view; *b*, anterior left valve, medial view; *c*, caudal process right valve, medial view; *d*, detail of spines, posteroventral part of left carapace, lateral view; *e*, detail of spines and bristles, ventral edge, left valve, lateral view. First antenna: *f*, endopodite and 1st joint of exopodite of right limb, medial view. Mandible: *g*, exopodite left limb, lateral view; *h*, coxale endite, right limb. Seventh limb: *i*, tip, only 1 bristle completely shown. Head region: *j*, medial eye and rod-shaped organ. (Same magnification, in microns: *a*; *b*, *c*, *f*, *j*; *d*, *e*, *i*; *g*, *h*.)

of 1st joint with short curved medial spine; bristle of 2nd joint with single short spine dorsally about one-fourth distance from base followed by short marginal hairs; bristle of joints 3–8 with short natatory hairs; 9th joint with 1 short bristle with few spines and longer bristle with natatory hairs; distal margins of joints 2–8 with comb of short spines.

Mandible (Figure 19c): Coxale similar to *S. antarctica*. Basale: dorsal margin with short spine near middle and 2 short spines distally; ventral margin with total of 2 spines and bristles in proximal group and 5 in distal group; proximal group with 2 short medial spines and 1 longer marginal bristle; distal group with

1 short spine on medial surface, 1 long spinous marginal bristle and 3 shorter bristles forming row on lateral surface; glandular process present on lateral side as in *S. antarctica*. Exopodite similar to *S. antarctica* but with bristle reaching one-fourth length of 1st endopodite joint on right mandible of USNM 123519 and one-third on left mandible. Endopodite: 1st and 2nd joints similar to *S. antarctica*; 3rd joint with short medial spine dorsal to main claw and 2 longer spines ventral to base of main claw.

Maxilla (Figure 19d): Coxale, basale, exopodite, and endopodite similar to *S. antarctica*. Endites I, II, III with 6, 4, 6 bristles.

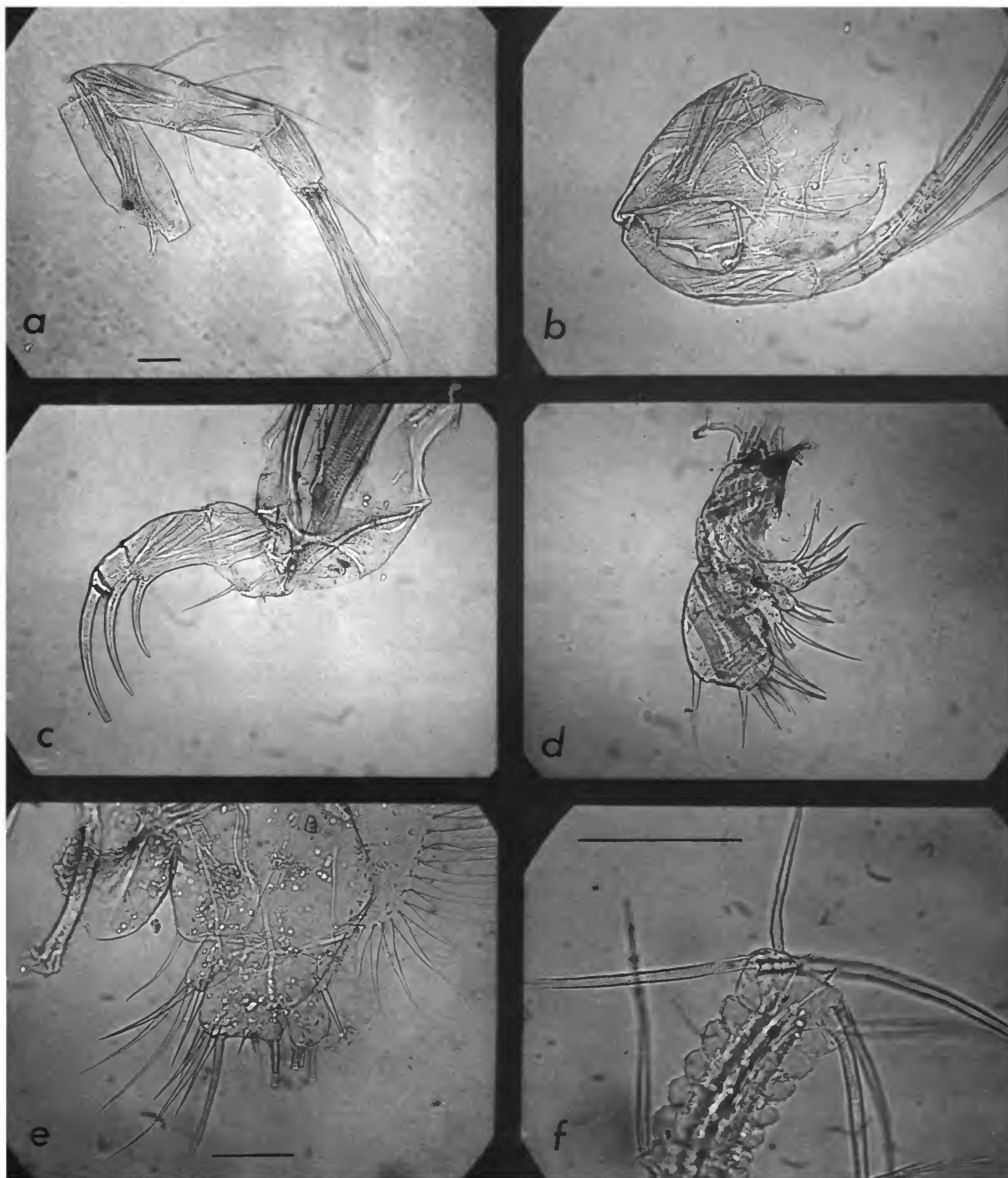


FIGURE 17.—*Spinacopia octo* Kornicker, USNM 123541, juvenile male. Appendages: *a*, 1st antenna; *b*, 2nd antenna; *c*, mandible; *d*, maxilla; *e*, 5th limb; *f*, tip of 7th limb. (Same magnification: *a-d*, *f*. Bars in figures represent 100 microns.)



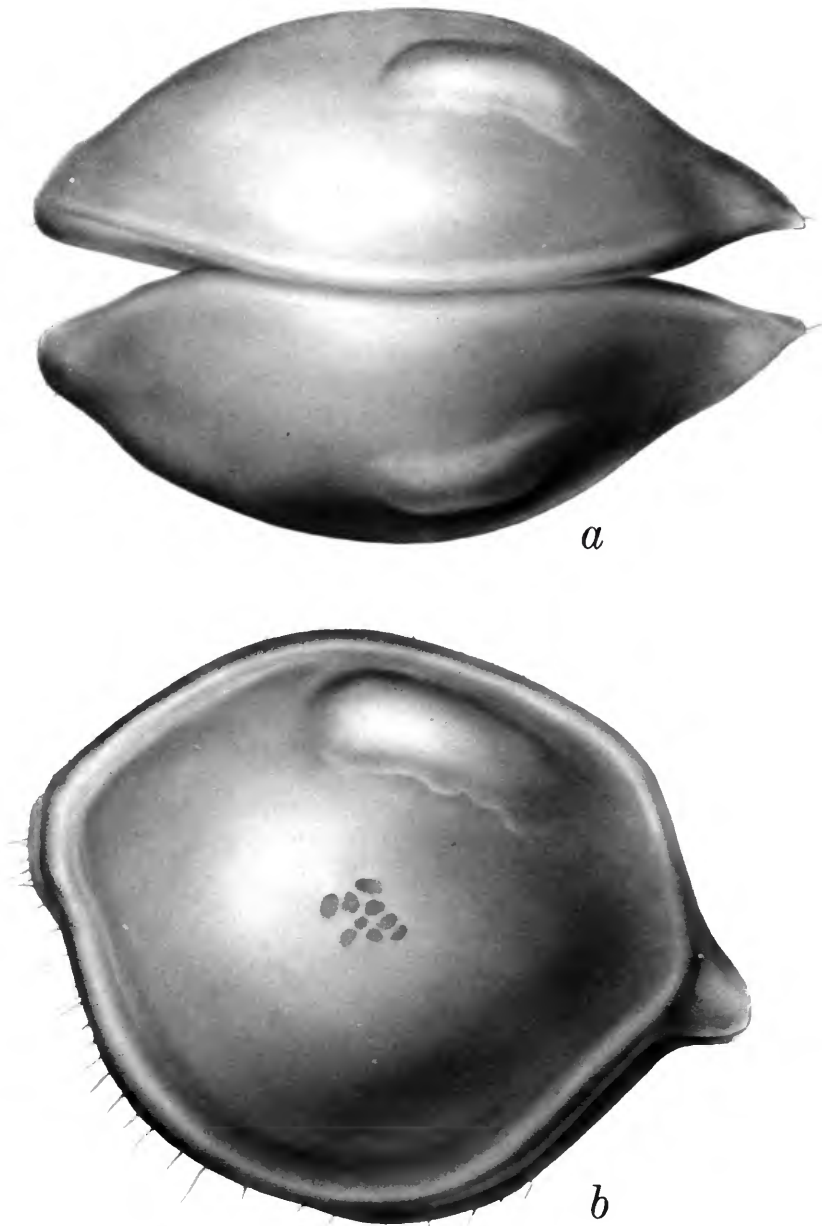


FIGURE 18.—*Spinacopia torus* Kornicker, juvenile female, USNM 123522, length 1.20 mm:  
*a*, dorsal view; *b*, left lateral view.

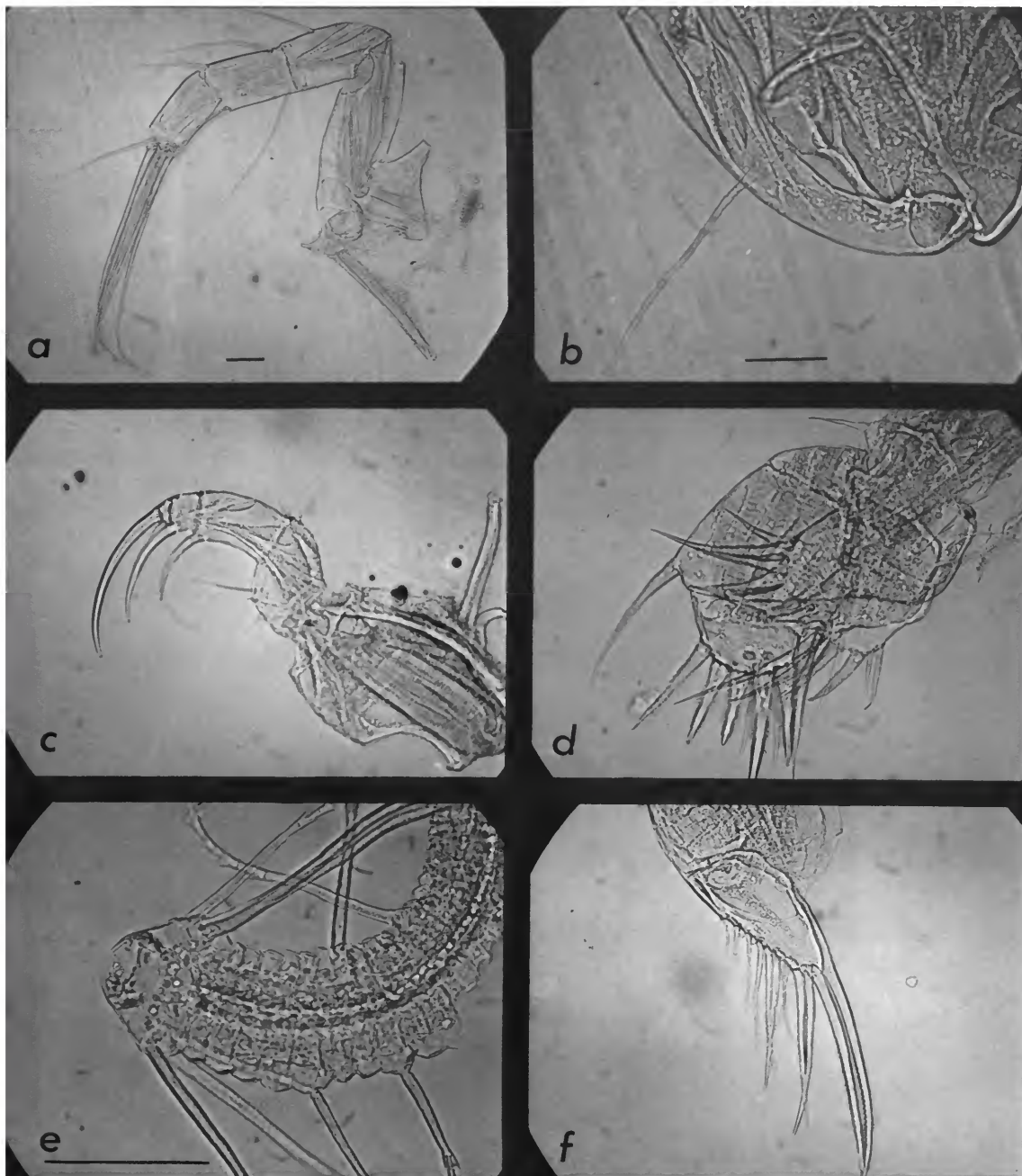


FIGURE 19.—*Spinacopia torus* Kornicker, adult female, USNM 123519: *a*, 1st antenna; *b*, part of 2nd antenna; *c*, mandible; *d*, maxilla; *e*, tip of 7th limb; *f*, furca. (Same magnification: *a*, *c*, *f*; *b*, *d*. Bars in figures represent 100 microns.)

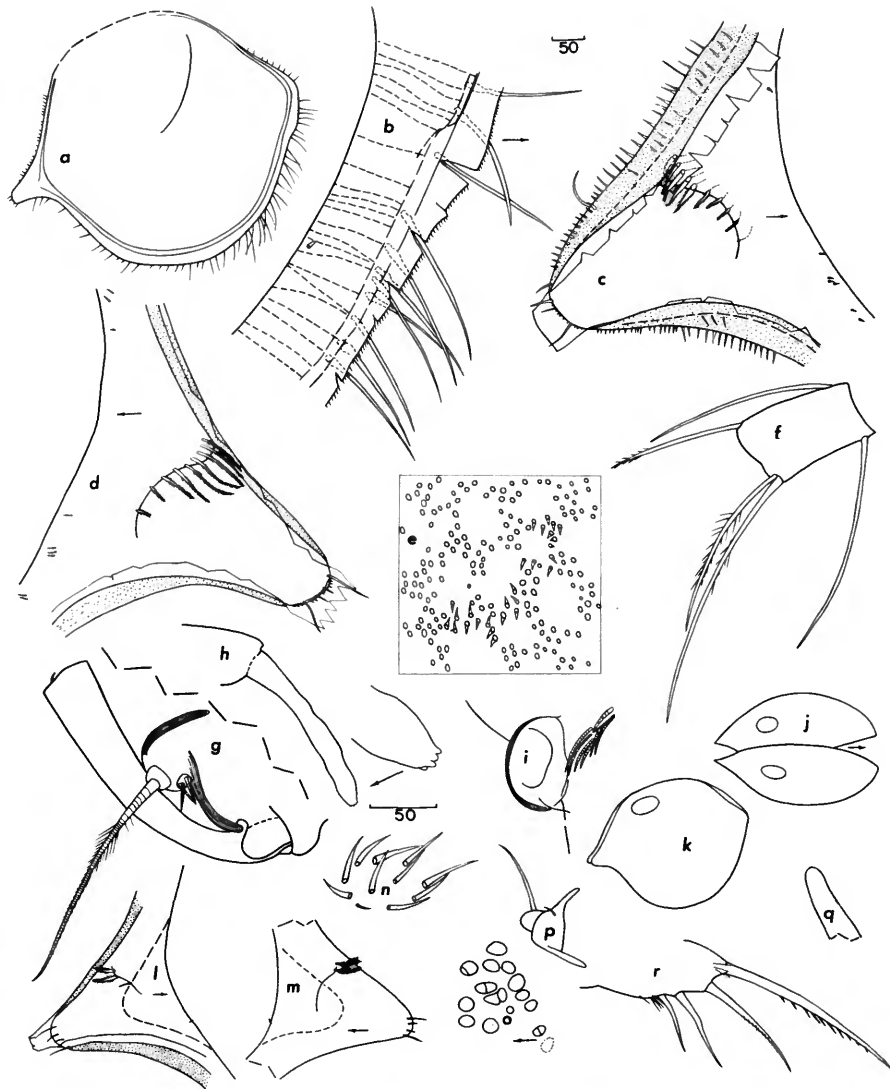


FIGURE 20.—*Spinacopia torus* Kornicker, adult female. Carapace: *a*, outline of right valve, lateral view; *b*, anterior left valve, medial view; *c*, caudal process left valve, medial view; *d*, caudal process right valve, medial view; *e*, detail of shell surface (only base pores of most spines shown in figure). Appendages: *f*, 3rd and 4th joint of 1st antenna; *g*, endopodite and 1st joint of exopodite of left 2nd antenna, medial view; *h*, medial eye and rod-shaped organ; *i*, brushlike organ and genitalia. *Spinacopia torus* Kornicker, juvenile female. Carapace: *j*, dorsal view; *k*, right lateral view; *l*, caudal process, left valve, medial view; *m*, caudal process right valve, medial view; *n*, detail of surface spines; *o*, central muscle scars right valve, medial view. Appendages: *p*, endopodite, 2nd antenna; *q*, 7th limb; *r*, left lamella of furca, medial view. (Figures *a-d*, *f-i*, from USNM 123519; figure *e* from USNM 123518; figures *j-r* from USNM 123522. Same magnification in microns: *a, j, k; b-g, i, l, m, o-r; h, n.*)

Fifth limb: Similar to *S. antarctica* except with 4 bristles on joints 4 and 5.

Sixth limb: Endite I with 3 bristles; endite II with 1–3 bristles; endite III with 3 or 4 bristles; endite IV with 3 bristles, all bristles spinous. End joint with 4 anterior spinous bristles, 2 spinous bristles near middle, and 2 stout hirsute posterior bristles; clusters of hairs present on medial and lateral surfaces and along margin of end joint on each side of posterior bristles. The distribution of bristles on 6th limbs of three adult females is tabulated below:

	Endites				End joint		
	I	II	III	IV	Anterior	Middle	Posterior
USNM 123518	3	2	3	3	4	2	2
USNM 123519	3	1	4	3	4	2	2
USNM 123519	3	2	4	?	4	2	2
USNM 123520	3	3	4	3	4	2	2
USNM 123520	3	3	4	3	4	2	2

Seventh limb (Figure 19e): Distal group with 6 bristles, proximal group with 5 or 6 bristles, each with 2–5 bells and marginal spines distally; terminus with opposing combs, each comb with about 12 teeth.

Eyes: Lateral eyes absent, medial eye present.

Rod-shaped organ (Figure 20h): Elongate, 1-jointed with 4 minute protuberances on tip.

Furca (Figure 19f), brushlike organ (Figure 20i), upper lip, posterior: Similar to *S. antarctica*.

Eggs: Specimen USNM 123520 with 7 eggs in brood chamber and 4 unextruded.

**DESCRIPTION OF JUVENILE FEMALE INSTAR II (USNM 123522) (Figures 20j–r).**—Carapace with abundant short spines and scattered longer hairs (Figure 20n); infold below rostrum with usual minute bristle; infold anterior to caudal process with 2 spinous bristles above and 0 to 1 short bristle below (Figures 20l, m); small distinct node present in posterodorsal part of shell; length 1.20 mm, height 0.98 mm. First antenna with 1 bristle on 2nd joint, 2 on 3rd joint and none on 4th joint; endopodite of 2nd antenna with 1 bristle on 1st joint and 2nd joint (Figure 20p); mandible with exopodite typical of genus; 6th limb with 1 bristle; 7th limb present but without bristles or terminal comb (Figure 20q); furca with 4 claws on each lamella, claw 1 united to lamella, other claws separated by suture, claws decreasing in length posteriorly on lamella (Figure 20r).

**COMPARISONS.**—The high relief of the node in the posterodorsal region of the juvenile valve distinguishes this species from some previously described. The

carapace is about the same size as *S. bisetula*, but it does not have a row of long bristles marking the ventral margin of the posterodorsal bulge characterizing the species. *Spinacopia torus* also differs from *S. bisetula* in having 3 bristles compared to 2 on the 1st joint of the endopodite of the 2nd antenna.

## Family PHILOMEDIDAE Müller, 1912

### Subfamily PHILOMEDINAE Müller, 1912

#### Genus *Euphilomedes* Poulsen

FIGURES 21–23

**TYPE-SPECIES.**—*Euphilomedes nodosa* Poulsen, 1962, by subsequent designation (Kornicker, 1967, p. 18).

#### *Euphilomedes rhabdion*, new species

**HOLOTYPE.**—USNM 123611, length 1.24 mm, height 0.73 mm.

**TYPE-LOCALITY.**—Pacific Ocean, lat. 07°59'S, long. 80°37'W; bottom depth 991–1015 m; estimated temperature 4.7°C; station 90, cruise 11, RV *Anton Bruun*, 14 October 1965; collected in benthic trawl, 520 mesh, by Dr. R. J. Menzies.

**ETYMOLOGY.**—Specific name from Greek *rhabdion* (n. dim.) meaning rod, in reference to the small rod-shaped organ of the species.

**DESCRIPTION OF FEMALE (may not be mature).**—Carapace oval in lateral view with greatest height near middle (Figure 21); broad rostrum overlapping large, wide incisur; posterior one-third of rostrum projecting from valve surface and forming process tapering to point at inferior corner of rostrum; anterior edge of valves below incisur with 1 or 2 low nodes; each valve with large caudal process below valve middle, that on left valve having more squarish posterovertral corner.

**Ornamentation:** Surface punctate with scattered hairs (Figure 22d), the latter more dense along margins; caudal process with hairs in row parallel to posterior margin (Figure 22e).

**Infold:** Infold of rostrum with 4 long spinous bristles (Figure 22a); infold posterior to incisur with short bristle; anteroventral part of infold striate; list of caudal process with 6 bristles on posterior half, 5



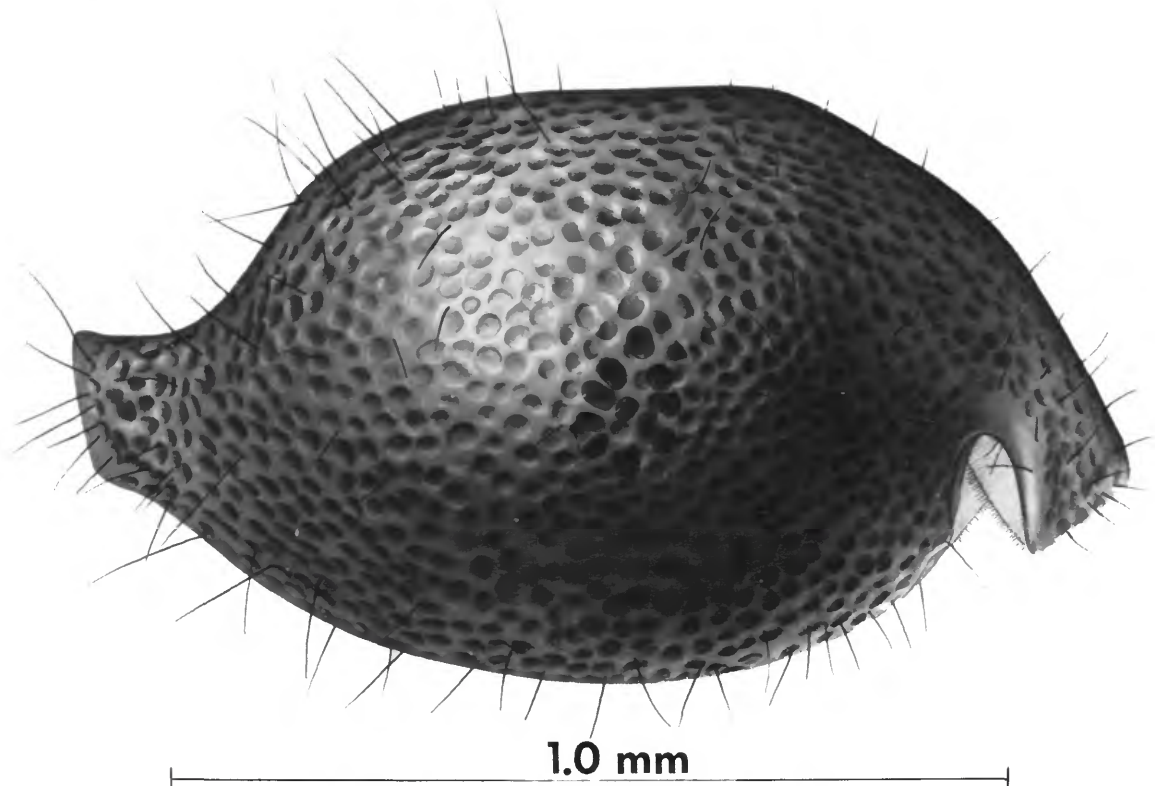


FIGURE 21.—*Euphilomedes rhabdion*, holotype, length 1.24 mm.

long spinous bristles above and 1 shorter bristle below (Figures 22*b, c*); bifurcate bristle and 2 or 3 minute bristles present on posterior edge of caudal process.

Selvage: Lamella prolongation with fringed edge present on all except hinge margins of each valve.

Muscle scars: Central muscle scars consisting of about 11 individual scars.

Size: Length 1.24 mm, height 0.73 mm.

First antenna (Figure 22*f*): 1st joint with surface spines; 2nd joint with 1 ventral and 1 dorsal spinous bristles and clusters of spines on lateral and medial surfaces; 3rd joint with 3 spinous bristles, 1 ventral and 2 dorsal, and surface spines; 4th joint with 3 spinous bristles, 2 ventral and 1 dorsal, and with surface spines; sensory bristle of 5th limb with 3 short proximal filaments and 1 long filament near tip; 6th joint with distal bristle about two-thirds length of a-bristle on 7th joint; 7th joint with a-, b-, and c-bristles: a-bristle spinous, about one-third length of sensory bristle of 5th joint; b-bristle shorter than sensory bristle and with

2 filaments; c-bristle with 4 proximal filaments plus 1 long terminal filament; 8th joint with d-, e-, f-, and g-bristles: d- and e-bristles about same length as sensory bristle of 5th limb, f-bristle with 3 short proximal filaments and 1 short and 2 long distal filaments; g-bristle with 3 short proximal filaments and 1 short and 2 long distal filaments.

Second antenna: Endopodite 2-jointed (Figure 22*g*): 1st joint with 3 or 4 short bare bristles; 2nd joint elongate with 1 long spinous proximal bristle and 1 short bare subterminal bristle. Exopodite: 1st joint elongate, 2nd–9th joints decreasing in length distally; joints 2–8 with clusters of spines along distal margins; bristle on joints 2–8 with stout marginal spines (Figure 22*h*); bristles on joints 5–8 also with few marginal hairs proximally; 9th joint with 1 long and 2 short bristles: long bristle with stout marginal spines, short bristles with short slender marginal spines (Figure 22*i*); bristle of 2nd joint reaching past 9th joint; basal spines absent.



FIGURE 22.—*Euphilomedes rhabdion* Kornicker, USNM 123611. Carapace: *a*, anterior left valve, medial view; *b*, caudal process right valve, medial view; *c*, caudal process left valve, medial view; *d*, anterior left valve, lateral view; *e*, caudal process left valve, lateral view. First antenna: *f*, left limb, lateral view. Second antenna: *g*, right endopodite, medial view; *h*, part of bristle on 5th joint of exopodite; *i*, bristles on 9th joint of exopodite. Mandible: *j*, left limb, lateral view; *k*, dorsal bristles on 2nd joint of endopodite, medial view; *l*, coxale endite and medial bristles on basale. (Same magnification in microns: *d*, *e*; *a-c*, *f*, *j*; *g*, *k*, *l*; *h*, *i*.)

Mandible (Figure 22*j*): Bifurcate coxale endite present (Figure 22*l*). Basale: medial side with 4 short bristles near ventral margin; ventral margin with 4 spinous bristles; dorsal margin with 1 bristle near middle and 2 terminally; surface with spines in clusters; exopodite about three-fourths length of 1st joint of endopodite and with 2 spinous bristles. Endopodite: dorsal margin of 2nd joint with 2 groups of bristles, proximal group with 2 bristles, distal group with 6

(Figure 22*k*); ventral margin with 2 groups of bristles distally, both with 2 spinous bristles; end joint with 1 small and 2 large claws and 3 bristles (longest bristle with marginal spines); clusters of spines present on medial surfaces of all joints of endopodite.

Maxilla (Figures 23*a-c*): 3 elongate endites present: 1st endite with 6 spinous bristles; 2nd endite with about 5 bristles; 3rd endite with 1 proximal bristle and about 6 terminal bristles. Precoxa and coxa with

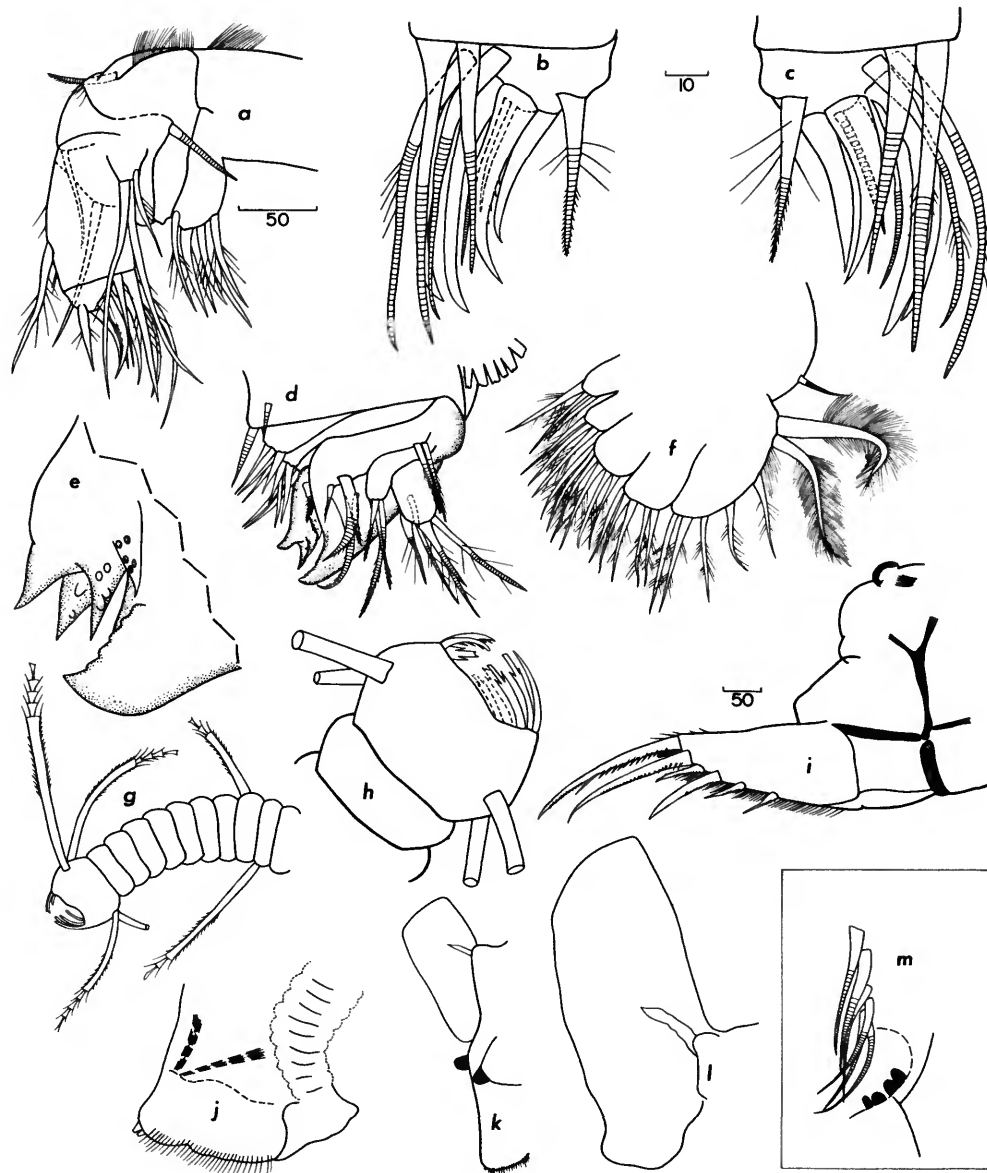


FIGURE 23.—*Euphilomedes rhabdion* Kornicker, USNM 123611. Maxilla: *a*, left limb, lateral view; *b*, tip right limb, lateral view; *c*, tip left limb, lateral view. Fifth limb: *d*, right limb, posterior view; *e*, main tooth and part of tooth on 2nd joint, right limb, posterior view. Sixth limb: *f*, left limb, lateral view. Seventh limb: *g*, distal part; *h*, detail of tip. Posterior region: *i*, furca and brushlike bristles; *m*, brushlike bristles and genital opening. Anterior region: *j*, upper lip; *k*, anterior profile; *l*, rod-shaped organ and 1st joint of 1st antenna. (Same magnification, in microns: *i*, *k*; *a*, *d*, *f*, *g*, *j*, *l*; *b*, *c*, *e*, *h*, *m*.)

fringe of hairs along anterior margin; coxa with anterior bristle with short marginal spines; exopodite with 3 spinous bristles, 2 long and 1 short; basale with 3 long bristles along distal margin; 1st endopodite joint with 1 spinous  $\alpha$ -bristle and 2 long stout  $\beta$ -bristles; end joint with 4 claws and 5 bristles.

Fifth limb (Figure 23*d*). Epipodial appendage with 46 bristles. Three endites present: 1st endite with 2 bristles; 2nd endite with 5 bristles; 3rd endite with about 7 bristles. Main tooth of 1st exopodite joint consisting of 4 teeth of equal size (Figure 23*e*); a spinous bristle and short spine present on posterior side of 1st joint proximal to main tooth. Second exopodite joint: inner curved margin of large tooth with 4 low teeth; posterior side of joint with 4 spinous bristles, 2 long and stout, 2 short and slender. Third exopodite joint with 6 spinous bristles, 3 on inner lobe and 2 on outer lobe. Fourth + fifth exopodite joint with 5 spinous bristles.

Sixth limb: Four endites present: 1st and 2nd endite each with 3 bristles, 3rd endite with 6 bristles, 4th endite with 5 bristles. End joint with 6 bristles of which latter 2 are stout, hirsute. Only 1 bristle in place of epipodial appendage.

Seventh limb (Figures 23*g, h*): Proximal group with 2 bristles, 1 on each side, each with 2 bells; distal group with 4 bristles, 2 on each side, each with 4 bells; bristles with marginal spines distally; terminus consisting of comb with about 7 curved spines opposed by 3 spines bearing marginal spinules.

Furca (Figure 23*i*): Each lamella with 6 claws, all claws separated from lamella by suture; claw 3 shorter and more slender than claw 4; claws 5 and 6 about half length of claw 4; each claw with lateral and medial row of spines along posterior margin; claw 1 with large medial spine about one-fourth distance from tip; ventral margin of each lamella hirsute.

Eyes: Lateral eyes absent, medial eye minute.

Rod-shaped organ (Figures 23*k, l*): Organ 1-jointed, elongate, but only 45 microns long, about half width of 1st joint of 1st antenna.

Genitalia (Figure 23*m*): Obscure, but apparently oval with sclerotized rim having crenulations along inner margin.

Brushlike organ (Figure 23*m*): About 6 minute bristles posterior to genitalia.

Upper lip (Figures 23*j, k*): Helmet-shaped, hirsute and with faint projections on anteroventral corner;

sclerotized processes present on each side between lip and 1st antenna (Figure 23*k*).

STAGE OF DEVELOPMENT AND SEX OF SPECIMEN.—The absence of the male copulatory organ identifies the specimen as female, although female genitalia were not observed with certainty. Eggs were not present in the brood chamber so that the stage of development of the specimen is in doubt. It is either an adult or late larval stage.

COMPARISONS.—*Euphilomedes rhabdion* resembles closely *Philomedes* (= *Euphilomedes*) *paucichelata* Kornicker, 1959, but it is much larger, length 1.24 mm, compared to 0.80–0.87 mm, and does not have horizontal ripples on the carapace such as those on *P. paucichelata*. The distribution of bristles on the list of the caudal process differs from that on previously described species of *Euphilomedes*. The rod-shaped organ of *E. rhabdion* is considerably smaller than rod-shaped organs previously described for this genus. Relatively few species of *Euphilomedes* have 6th limbs like *E. rhabdion*, with end joints not produced posteriorly. The number of bristles on the 1st joint of endopodite of the 2nd antenna, the 9th joint of the exopodite of the 2nd antenna, the 1st joint of the endopodite of the maxilla, the end joint of the 6th limb, the 7th limb, and the infold of the rostrum on each valve, are fewer than generally possessed by species of this genus, but this may be due, in part, to immaturity of the specimen. The carapace of *E. rhabdion* resembles that of *Philomedes reticulata* Hartmann, 1965, but the furca is quite different.

## Family CYLINDROLEBERIDIDAE Müller, 1906

### Subfamily CYLINDROLEBERIDINAE Müller, 1906

#### Genus *Synasterope* Poulsen, 1965

Only two specimens in the collection have been assigned to this genus. Both are immature and also incomplete in that the coxale endites of the mandibles are missing. Therefore, they have not been given specific names but instead have been designated *Synasterope* species A, and *Synasterope* species B. The first species does not fit one of the typical characters of the genus listed by Poulsen (1965, p. 401) in that the length of the exopodite of the mandible is only 44% of the 1st endopodite joint instead of more than 50%. The second species has all characters of the genus.



*Synasterope species A*

## FIGURE 24

MATERIAL.—USNM 124088, juvenile male, length 2.19 mm, height 1.16 mm.

LOCALITY.—Pacific Ocean, lat. 8°15'S, long. 80°44'W; bottom depth 2504–2514 m; estimated temperature 1.8°C; station 105, cruise 11, RV *Anton Bruun*, 17 October 1965; collected in benthic trawl by Dr. R. J. Menzies.

DESCRIPTION OF JUVENILE MALE FROM STATION 105.—Shell elongate with height 53% of length (Figure 24a); rostrum and sinus of usual type for genus; central muscle scars consisting of about 11 individual scars, Figure 24a; infold behind rostrum and below sinus with numerous scattered bristles; infold anterior to posterior end of shell with about 14 broad flaplike bristles along inner margin and 1 or 2 slender bristles between each flap; middle of ventral infold with about 20 bristles forming anterior-posterior row. Size: USNM 124088—length 2.19 mm, height 1.16 mm.

First antenna (Figures 24c, d): 1st and 2nd joints with short spines forming clusters on medial and lateral surfaces; 2nd joint with bare distolateral bristle reaching 4th joint and stout, spinous, subterminal, dorsal bristle; suture separating 3rd and 4th joints only visible near dorsal margin; dorsal margin of 3rd joint with 6 bristles, all except distal-medial bristle with long spines; ventral margin of 3rd joint with short bare bristle; dorsal margin of 4th joint with long stout bristle with short marginal spines; ventral margin of 4th joint with 2 bristles: 1 short and bare, other long and with short marginal spines; suture separating 4th and 5th joints only faintly visible; sensory bristle of 5th joint with stout proximal part and with 6 terminal filaments; lateral bristle of 6th joint longer than joints 5–8 and without marginal spines; 7th joint with clawlike a-bristle, stout b-bristle with 3 marginal filaments, and c-bristle with numerous short proximal filaments and about 10 longer marginal filaments; 7th joint fused with 8th; 8th joint with minute d-bristle, e-bristle about two-thirds length of c-bristle, f-bristle with about 6 proximal filaments and 4 marginal filaments, and g-bristle with about 2 short proximal filaments and 5 or 6 longer marginal filaments. (Numerous proximal filaments on the c- and f-bristles are not uncommon on juvenile males in the *Cylindroleberididae*—see Poulsen, 1965, p. 444, for discussion.)

Second antenna (Figure 24e): Protopodite with small annulate medial bristle and several hairs along leading edge; elongate endopodite 3-jointed, terminal joint with bare bristle at base; exopodite without basal spines; 1st joint with long hairs in cluster distally on inner margin; 9th joint with 4 bristles, 1 short, 1 medium, 2 long.

Mandible (Figure 24f): Coxale endite broken off both limbs; basal endite with 4 pectinate terminal bristles, 2 dwarf bristles, short glandular peg, 3 triaenid bristles plus a 4th bristle proximal to triaenid bristles; triaenid bristles with about 8 pairs of distal spines; dorsal margin of basale with 1 fairly long bare mid-bristle and 2 bare terminal bristles; exopodite about 44% length of dorsal margin of 1st joint of endopodite and with 2 small terminal spines and numerous distal marginal hairs (Figure 24g); ventral margin of 1st endopodite joint with 3 long bristles, 2 with long marginal spines, other with short spines; ventral margin of 2nd endopodite joint with 3 terminal bristles; dorsal margin of 2nd endopodite joint with 2 short bare proximal bristles, bare a-, b-, c-bristles, spinous d-bristle, 1 short bristle between a- and b-bristles, 2 short medial bristles between b- and c-bristles, 1 long stout bristle between c- and d-bristles, 1 medium bristle following d-bristle; medial side of joint with 5 bristles forming row near c-bristle; end joint with 1 dorsal claw, 3 long clawlike bristles and 2 bristles.

Maxilla: Epipodite acuminate and hirsute distally; proximal endite with 4 bristles, 3 long, 1 short; distal endite with 3 long bristles; dorsal margin of basale hirsute and with short proximal and distal bristle; ventral margin of basale with short middle bristle and long terminal bristle; 1st endopodite joint with very short dorsal bristle and ventral  $\beta$ -bristle about twice length of joint; end joint with terminal bristle slightly longer than  $\beta$ -bristle; 2 short bristles present distal to base of spear-shaped bristle.

Fifth limb: Dorsal margin of comb bare except for long hairs near rounded tip; long plumose bristle of comb reaching past comb tip; about 4 short bristles present between plumose bristle and ventral margin of comb; comb with about 64 bristles.

Sixth limb (Figures 24h, i): Hirsute anterior margin with 2 endite bristles; anterior tip of end joint with 5 short hirsute bristles followed by space and then 16 or 17 spinous bristles along ventral margin; posterior corner of end joint with 5 spinous bristles of which posterior 3 longer than others; medial surface and

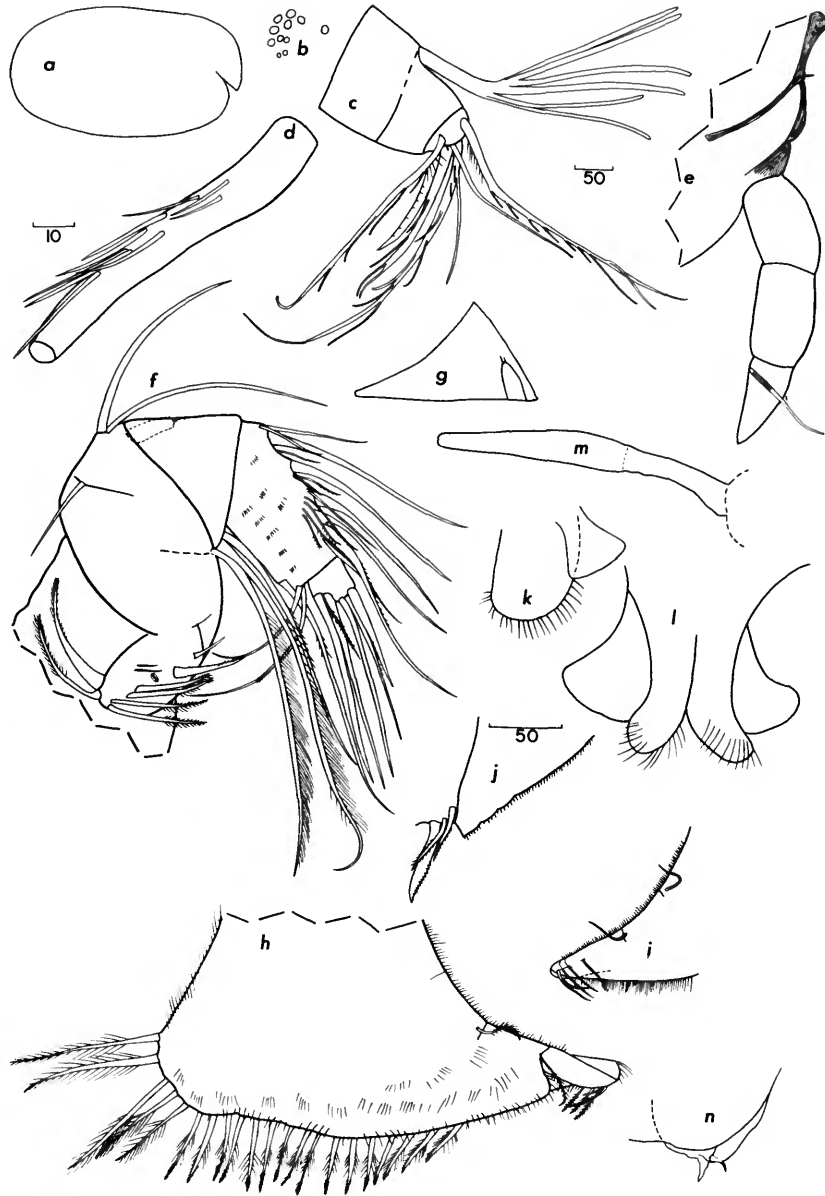


FIGURE 24.—*Synasterope* species A, juvenile male, length 2.19 mm: *a*, right lateral view of carapace; *b*, central muscle scars, right valve, lateral view; *c*, end joints of left 1st antenna, lateral view; *d*, proximal section of c-bristle right 1st antenna; *e*, endopodite of 2nd antenna; *f*, left mandible, medial view; *g*, exopodite and 1st endopodite joint of left mandible, lateral view; *h*, left 6th limb, medial view; *i*, anterior tip of right 6th limb, medial view; *j*, posterior end of furca; *k*, upper lip, left lateral view; *l*, upper lip, anterior view; *m*, rod-shaped organ; *n*, copulation organ. (Same magnification, in microns: *c*, *e-i*, *k-m*; *j*, *n*, *d*.)

ventral and posterior margins hirsute; total number of ventral-posterior corner bristles being 21 or 22.

Seventh limb: Terminus with 4 bristles, 2 on each side; 1st segment below terminus with 2 bristles, 1 on each side; 8th, 9th, and 10th segments below terminus with 2 bristles, 1 on each side; total bristles 12; each bristle with 2-4 bells; terminus with opposing combs, each having about 13 teeth with spinous margins and recurved tips.

Furca: Each lamella with 9 claws of which posterior 2 are secondary, very short and located dorsal to ventral margin of lamella; posterior corner of lamellae with small ventral projection. (Figure 24j).

Copulatory limb (Figure 24n): Weakly developed

Upper lip (Figures 24k, l): Lip consisting of a pair of lobes, each with lateral somewhat angular flap.

Eyes: No lateral eyes; medial eye of usual size.

Rod-shaped organ (Figure 24m): Elongate with broadening near middle; questionable suture proximal to broadened part.

COMPARISONS.—Although the only representative of this species is a juvenile male, it is larger (2.19 mm) than previously described species, which range in length from 1.1 to 1.9 mm (Poulsen, 1965, p. 402). In the key to the genus given by Poulsen (1965, p. 402), this species keys out to *S. quadrata* (G. S. Brady), but it differs from that species in many ways: larger carapace, more claws on furca, more bristles on 7th limb, no lateral eye, shorter stem on sensory bristle of 1st antenna, only 1 bristle in middle of dorsal margin of mandibular basale. The short stem of the sensory bristle of the 1st antenna resembles that of *S. serrata* Poulsen, 1965, from which it differs in size and many other characters. Hartmann (1965, pp. 316-325) described *Cylindroleberis pseudoquadrata* Hartmann and *Cylindroleberis dimorpha* Hartmann from the coast of Chile. Both are smaller than the species described herein. The mandibular exopodite of *C. dimorpha* differs considerably from that of the present species.

### *Synasterope* species B

#### FIGURE 25

MATERIAL.—USNM 124089, juvenile female, length 1.45 mm, height 0.74 mm.

LOCALITY.—Pacific Ocean, lat. 9°01' S, long. 80°40' W, bottom depth 4516-4383 m; estimated temperature

1.8° C; station 196, cruise 11, RV *Anton Bruun*, 7 November 1965; collected in benthic trawl by Dr. R. J. Menzies.

DESCRIPTION OF JUVENILE FEMALE FROM STATION 196.—Shell elongate with height 51% of length (Figure 25a). In general similar to specimen from station 105. Size: USNM 124089—length 1.45 mm, height 0.74 mm.

First antenna: Joints 1-6 similar to specimen from station 105 except for lateral bristle of 2nd joint being shorter and not reaching 4th joint. Bristles on joints 7 or 8 also similar to specimen from station 105 except for absence of short proximal filaments on c-, f-, and g-bristles.

Second antenna (Figure 25b): Protopodite and exopodite similar to specimen from station 105 except for 9th joint having only 3 bristles, 1 long, 1 medium, and 1 short. Endopodite weakly 3-jointed with 1 long terminal bristle.

Mandible: Coxale endite broken off both limbs; bristles on basale endite similar to specimen from station 105 except for having only 1 dwarf bristle and for having triaenid bristles with only 6 pairs of distal spines; bristles on basale and 1st endopodite joint similar to those on specimen from station 105; exopodite also similar except for length being 56% of dorsal margin of 1st endopodite joint (Figure 25c); ventral margin of 2nd endopodite joint with 3 bristles, 2 with short marginal spines, 1 bare; dorsal margin of 2nd endopodite joint with 1 short bare proximal bristle, bare a-, b-, c-bristles, spinous d-bristle, 1 short bristle present medially at base of c-bristle, 1 long bristle present between c- and d-bristles, 1 medium bristle following d-bristle; bristles of end joint similar to those of specimen from station 105.

Maxilla: Similar to that of specimen from station 105.

Fifth limb: Similar to specimen from station 105; epipodial appendage with about 60 bristles.

Sixth limb (Figure 25e): Hirsute anterior margin with 2 endite bristles; acuminate anterior tip with 4 short spinous bristles; rounded anterior flap with 1 spinous bristle and numerous upturned hairs; anterior space present on ventral margin followed by 11 spinous bristles; posterior corner with 3 bristles longer than those of ventral margin; ventral and posterior margins hirsute; total number of ventral-posterior corner bristles being 14.

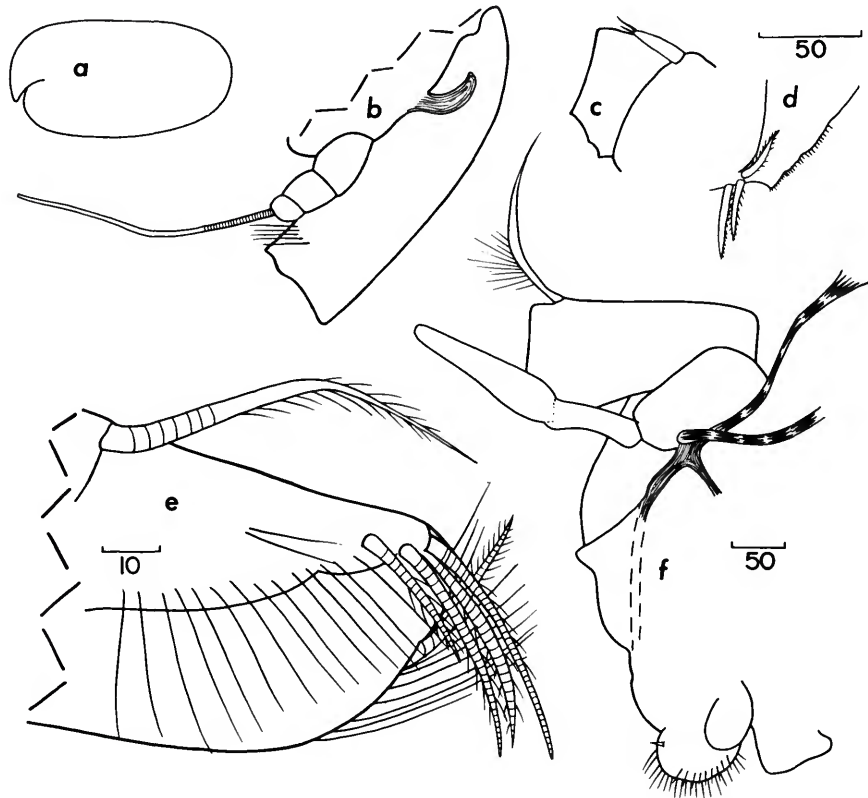


FIGURE 25.—*Synasterope* species B, juvenile female, length 1.45 mm: *a*, left lateral view of carapace; *b*, 2nd antenna, endopodite, and 1st joint of exopodite, medial view; *c*, mandible, exopodite, and 1st joint of endopodite, lateral view; *d*, posterior end of furca; *e*, anterior tip of 6th limb; *f*, anterior of animal showing rod-shaped organ and upper lip. (Same magnification, in microns: *b*, *c*, *f*.)

Seventh limb: Terminus with 4 bristles, 2 on each side; 2nd segment below terminus with 2 bristles, 1 on each side; 7th and 9th segments each with 1 bristle; 10th and 11th segments each with 2 bristles, 1 on each side; total number of bristles being 12; each bristle with 1–3 bells; terminus obscured on observed appendage, but with opposing combs of teeth with spinous margins. (Only left limb examined in detail, but right also with total of 12 bristles.)

Furca: Each lamella with 8 claws, last 2 secondary; posterior corner of lamella with small ventral projection (Figure 25*d*).

Rod-shaped organ (Figure 25*f*), lateral and medial eyes: Similar to specimen from station 105.

Upper lip (Figure 25*f*): Bilobed as on specimen from station 105 but with round lateral flaps, and with small anterior spine on each lobe.

COMPARISONS.—This specimen may be conspecific with that described above as *Synasterope* species A. Many observed differences are due to the present specimen being younger as well as of different sex than that described as *S. species A*. It has been kept separate primarily because *S. species B* has an anterior spine on each lobe of the upper lip, which was not observed on *S. species A*. Also, the length of the mandibular exopodite of *S. species B* is 56% of the length of the dorsal margin of the 1st endopodite joint compared to 44% for *S. species A*.



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