Antarctic Ostracoda (Myodocopina)

[IN TWO PARTS]

Part 2

LOUIS S. KORNICKER

SMITHSONIAN CONTRIBUTIONS TO ZOOLOGY · NUMBER 163

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[IN TWO PARTS]

Part 2

Louis S. Kornicker

CYLINDROLEBERIDIDAE Müller, 1906

The family Cylindroleberididae contains two subfamilies, Cylindroleberidinae Müller, 1906, and Cyclasteropinae Poulsen, 1965; both subfamilies are represented in the study area.

DIAGNOSIS OF FAMILY.—Carapace in lateral view elongate to ovoid; incisur in Cylindroleberidinae slitlike with upper margin overlapping lower margin proximally; incisur in Cyclasteropinae formed by minute projection of rostrum or as small open indentation without overlap of upper margin over lower margin; posterior without projecting caudal process; surface smooth in Cylindroleberidinae, and ornamented with imbricate structure, ribs, ridges, and lobate processes in Cyclasteropinae; posterior infold of Cylindroleberidinae with translucent flaplike bristles along list.

Mandible: Coxale with scythe-formed endite consisting of small ventral and large dorsal branches. (In life this endite projects into the mouth and esophagus and often remains there when mandible is removed during dissection, but can be removed from mouth with fine dissection needle.)

Maxilla: Limb with 2 small endites, triangular epipodite, baleen comb, elongate basale, and 2-jointed endopodite.

Fifth limb: Limb with long flat comb projecting anteriorly; comb with stout spinous lateral bristle and several slender bristles between stout bristle and ventral margin of comb; ventral margin of comb with numerous spinous bristles.

Sixth limb: Anterior margin without lobate endites; anteroventral end with lateral flap; anterior margin with 1 or more bristles; posteroventral margin with many bristles on most species but bare on some.

Seventh limb: Limb present on both sexes; terminus with opposing combs, each with 2 to 40 teeth, often with marginal spines (terminus of limb on species of the genus *Cycloleberis* with double combs on each side); each limb with 6 to over 200 bristles.

Gills: 7 or 8 flat "gills" present along each side of posterior (an exception may be the genus *Bruuniella*); on a few species gills rudimentary, but on most well developed.

Key to Subfamilies

(Adapted from Poulsen's (1965:167) key)

Surface of carapace smooth without ornamentation; 1st antenna with 1 dorsal bristle on 2nd joint; end joint of endopodite of maxilla with 1 (rarely 2) bristles ..... CYLINDROLEBERIDINAE

Surface of carapace either smooth or ornamented; 1st antenna with 2 or more dorsal bristles on 2nd joint; end joint of endopodite of maxilla with 4–6 bristles ..... CYCLASTEROPINAE

Posterior: Thumblike dorsum present on many species.

DISTRIBUTION.—Members of this family are widespread and have been collected at depths of 1 to 4500 m. Members of the Cyclasteropinae, however, have not been collected in the Antarctic or Subantarctic and are restricted to shelf depths.

CYLINDROLEBERIDINAE Müller, 1906

This subfamily is represented in the study area by nine genera: *Empoulsenia*, new genus; *Skogsbergiella*, new genus; *Homasterope*, new genus; *Parasterope* Poulsen, 1965; *Synasterope* Poulsen, 1965; *Archasterope* Poulsen, 1965; *Diasterope* Poulsen, 1965; *Bathyleberis*, new genus; *Dolasterope* Poulsen, 1965. The three remaining genera in the subfamily, not represented in the study area, are: *Bruuniella* Poulsen, 1965; *Cylindroleberis* Brady, 1868; and *Heptonema* Poulsen, 1965.

DIAGNOSIS OF THE SUBFAMILY.—Carapace in lateral view generally elongate or slightly tumid; incisur narrow, slitlike; on males, rostrum often projecting more than on females; upper margin of incisur overlapping lower margin; projecting caudal process not present, but posterior infold usually reaching broadest width below middle of valve margin; broad list on posterior infold with flat transparent bristles with pores anterior to base of bristles; some species with protuberant processes on posterior infold between list and posterior margin of valve; outer surface of carapace without ornamentation with exception of small pores visible only under high magnification; adult males with vertical row of hairs near posterior end; in lateral outline and in size, male carapace differing from that of female in many species.

First antenna: Female: 1st joint without bristles, 2nd joint with 1 subterminal dorsal bristle, and 0 or 1 lateral bristle; 3rd joint with 4–6 dorsal bristles and 1 ventral bristle, except in *Bruuniella* which has 8 dorsal and no ventral bristles; 4th joint with 1 dorsal bristle and 1 or 2 ventral bristles; 5th joint with stout ventral sensory bristle with 0 or 1 proximal and 6 or 7 terminal filaments (an exception is the genus *Dolasterope* which bears 23 filaments); 6th limb with 1 fairly long medial bristle; 7th joint with clawlike a-bristle, stout b-bristle, and longer c-bristle; 8th joint with d- to g-bristles: d-bristle lacking or minute in some genera, developed as a pointed bristle in *Bathyleberis*, and as a filament with a suaged tip in other genera; e-bristle formed as a filament with suaged tip and well developed in all genera; f- and g-bristles well developed. Adult male limb differing in many characters, but primarily in having numerous filaments on sensory bristle of 5th joint except in *Homasterope*, on which the sensory bristle is the same as on the female limb.

Second antenna: Endopodite on female with 3 joints, but 2nd and 3rd joints fused on some species (on these species, the endopodite could be considered 2-jointed); 3rd joint with long terminal filament. Endopodite on male with 3 joints: 1st joint bare; 2nd joint with 2 or 3 ventral bristles; 3rd joint reflexed on 2nd, with 1 proximal dorsal bristle and ridges at tip.

Mandible: Exopodite always present but varying in length from about one-fourth to full length of the dorsal margin of the 1st endopodite joint. Endopodite: 1st joint with 3 ventral bristles (*Dolasterope* has only 2 bristles on the 3rd joint, but the genus is known from only 1 juvenile female); ventral margin of 2nd joint with 2 or 3 bristles (usually 3); dorsal margin with 0–4 proximal bristles, stout a-, b-, c-, and d-bristles; lateral surface with 0 or 1 bristle between b- and c-bristles, and 1 long bristle between c- and d-bristles; medial surface with short cleaning bristles between a- and c-bristles, and usually 1 bristle near base of d-bristle. (In the genus *Bruuniella* the 2nd and 3rd endopodite joints are fused and together bear 3 stout and several slender bristles.)

Maxilla: 2nd endopodite joint with 1 or 2 terminal bristles.

Fifth limb: Dorsal margin of comb without bristles.

Sixth limb: Limb without posterior projection; anterior margin with 0–7 bristles (usually 2); 1 or 2 dwarf medial bristles generally present on anterodorsal corner; anteroventral corner generally with 0–7 bristles; lateral flap general with 0–3 bristles; posteroventral margin with 0–40 bristles.

Seventh limb: Each limb with 6–28 bristles; terminus consisting of opposing combs, each with 2–16 teeth.

Furca: Each lamella with 7–10 claws; posterior 1–3 claws generally bristlelike and oriented posteriad. *Dolasterope* with bristles placed between claws.

Upper lip: Consisting of 2 hirsute lobes anterior to mouth and a hirsute lateral flap on each side of mouth; on some species spines present on anterior of lobes and on anterior of saddle between lobes.

Posterior: Posterior usually with hairs or spines; thumblike dorsal process present on some species.

Brushlike organ: Reported on females of some species, but probably present on many more.

Medial eye and rod-shaped organ: Medial eye with and without dorsal hairs. Rod-shaped organ elongate, on some species with 1 or 2 sutures.

Lateral eye: Absent on some species, well developed with numerous ommatidia on others; eyes on males often larger and with more ommatidia than eyes on female; eyes on some species appear reddish in female and black in male.

DISTRIBUTION.—Members of the subfamily Cylindroleberidinae have been collected in the Arctic as well as the Antarctic and in intervening seas. The depth range of the subfamily is considerable—from about 1 to 4500 m.

Key to Genera [1]

(Adapted from Poulsen's (1965:316) key)

1. End joint of maxilla with 2 equal long bristles; bristles between primary claws on furca ..... *Dolasterope*
   End joint of maxilla with 1 bristle (rarely with 1 long and 1 short bristle); no bristles between primary claws on furca 2
2. 2nd and 3rd joints of mandibular endopodite fused, shorter than 1st joint ..... *Brunniella*
   2nd and 3rd joints of mandibular endopodite separated by suture and longer than 1st joint 3
3. 8th joint of 1st antenna with d-bristle at least one-fifth as long as e-bristle 4
   8th joint of 1st antenna with d-bristle lacking or less than one-fifth length of e-bristle 5
4. d-bristle bare or with faint marginal hairs, tapering to sharp point (bristlelike) ... *Bathyleberis*
   d-bristle bare with subparallel sides and suaged tip (filamentlike) 6
5. Mandibular exopodite less than one-third length of dorsal margin of 1st endopodite joint ... *Cylindroleberis*
   Mandibular exopodite more than one-half length of dorsal margin of 1st endopodite joint ... 7
6. d-bristle about one-half length of e-bristle ..... *Archasterope*
   d-bristle at least three-fourths length of e-bristle 8
7. Without long lateral bristle between b- and c-bristles on dorsal margin of 2nd joint of mandibular endopodite ..... *Synasterope*
   With one long lateral bristle between b- and c-bristles on dorsal margin of 2nd joint of mandibular endopodite 9
8. Posterior infold of right valve with linear ridge between list and valve margin, dorsal margin of 1st joint of mandibular endopodite with 3 or 4 terminal spines *Shogsbergiella*
   Posterior infold of right valve without linear ridge between list and valve margin, no terminal spines on dorsal margin of 1st endopodite joint of mandible ..... *Empoulsenia*
9. Sensory bristle on 5th joint of female 1st antenna without proximal filament, and with 7 long terminal filaments; tip of ventral branch of mandibular coxale endite pointed, bare ... *Heptonema*
   Sensory bristle on 5th joint of female 1st antenna with 0 or 1 short proximal filament and 6 long terminal filaments; tip of ventral branch of mandibular coxale endite with small hairs, spines or teeth 10
10. Dorsal margin of 3rd joint of female 1st antenna with 4 or 5 bristles; sensory bristle of male 1st antenna same as on female ..... *Homasterope*
    Dorsal margin of 3rd joint of female 1st antenna with 6 bristles [2]; sensory bristle of male 1st antenna with numerous filaments 11
11. Sensory bristle on 5th joint of female 1st antenna with short proximal filament ... *Diasterope*
    Sensory bristle on 5th joint of female 1st antenna without proximal filament ..... *Parasterope*

[1] Does not include *Polyleberis* Kornicker, 1974, or *Prionotoleberis* Kornicker, 1974.

[2] An exception is *Parasterope pollex* Kornicker, 1967.

Microstructure

PORES ON THE SPINE-BEARING LIST.—This term "spine-bearing list" was used by Skogsberg (1920: 458) for the list inside the posterior margin of the shell. All members of the Cylindroleberidinae bear broad transparent bristles called hyaline spines by Skogsberg (1920:471), and broad, thin, flaplike bristles by Poulsen (1965:312) (both terms and, also, "broad transparent bristles" have been used herein). The high magnification photographs revealed that pores are present medial to the base of these bristles. The pores vary in number, some have raised rims around their edges, others have long tubes extending from them. The function of the pores is not known, but possibly the substance from which this group makes nests extrudes from them. When the valves of the living animal are closed, or almost closed, the transparent bristles opposite each other on the valves may form a funnel guiding the substance being extruded to a point outside the shell.

In order to determine whether these pores are characteristic of the subfamily, and to see how they vary from species to species, they were photographed on 21 species, representing 8 genera. The number of pores, their position and length of tubes were found to vary on the same specimen. Pores were present on all specimens examined.

Archasterope: The pores on *A. bulla* (Figure 244*c-f*) are of two types, rimmed and with tubes. The rimmed pores vary considerably in size, and the diameter of the largest ones are one-third to more than one-half the width of the flat bristle lateral to them. The two photographed pore groupings have about 4 to 8 pores. The pores with tubes are located lateral to the rimmed pores.

Diasterope: The pores on *D. schmitti* (Figure 251*d-f*) are rather small, the largest diameter being about one-fifth the width of the bristle. The pore with the longest tube in each group is closest to the flaplike bristle. That tube is more than twice the length of the next longest tube. The three pore groups photographed have 6–10 pores. The rimmed pores have a greater diameter than pores with tubes. Rimmed pores could be considered to be pores with short tubes. In *D. schmitti* the lengths of the tubes seem to be gradational and whether some are considered rimmed or having short tubes is subjective. The pore group shown in Figure 251*d* has 1 rimmed pore, 4 tube pores, and 4 intermediate pores; the pore group in Figure 251*e* has 3 rimmed pores, 6 tubed pores and 1 intermediate pore; the pore group in Figure 251*f* has 5 tubed pores and 1 obscure pore. At their base the tubed pores have a large diameter, but the diameter decreases rapidly distally and the sides of the tubes are parallel.

Parasterope: The pores of the spine-bearing list were photographed on the following species: *P. longiseta* (Figure 257*d*), *P. crinita* (Figure 266*d,e*), *P. anommata* (Figure 269*c-f*), *P. styx* (Figure 271*c-f*). Pores seem to be similar to those on *D. schmitti*. The variation in number of pores in groups on the same specimen is considerable. In Figure 269*c* the pore group contains about 6 pores and that in Figure 269*e* from the same specimen of *P. anommata* has only 1 pore. Smaller flaplike bristles have fewer pores at their bases than larger bristles.

Synasterope: Photographs of pore groups on *S. duplex* are shown in Figures 279*d-f*. Each of the two different groups shown have 8 pores. Two large rimmed pores are medially located, and 6 small diameter pores with very small tubes form a row parallel to the curvature of the bristle.

Skogsbergiella: The pores on the spine-bearing list were photographed on the following species: *S. spinifera* (Figure 287*d,e*), *S. scotti* (Figure 292*c,d*), *S. macrothrix* (Figures 295*f*, 297*a-d*), *S. plocus* (Figures 301*f*, 302*a-c*), *S. pax* (Figure 304*f,g*). The pore group on *S. spinifera* shown in Figure 287*e* has 5 pores, of which the medial 4 have short tubes, the 5th pore which is near the middle of the flaplike bristle is obscure, but seems to have a tube larger than the others. The base area between the pore bears riblets. The pores of *S. scotti* shown in Figure 292*d* are somewhat obscured by the flaplike bristle, but the group has 5 or 6 pores. A few riblets are present at their bases. As can be seen on Figure 297*a-d*, basal riblets are very well developed on *S. macrothrix*. Some of the riblets have crosspieces connecting them (Figure 297*c*). The pore group in Figure 297*b* has 7 large diameter rimmed pores medial to 2 or 3 small diameter pores with short tubes. Details of the pore groups of *P. plocus* are shown in Figure 302*a-c*. The three groups shown have 3, 5, and 9 pores, respectively. Each of the groups shown in Figure 302*b,c* has a small diameter pore

with a short tube close to the flaplike bristle, the remaining pores are larger and rimmed; the medial pore has the greatest diameter. The base between pores has riblets, but they are not as well developed as on *S. macrothrix*. The pore groups of *P. pax* are similar to those on *P. plocus* in having a small tubed pore close to the flaplike bristle. These tubes are longer than those observed on *P. plocus*. The total number of pores in the three groups photographed varies from about 5 to 10.

Empoulsenia: The pores were photographed on the following species: *E. quinquesetae* (Figure 306*b-d*), *E. pentathrix* (Figure 310*b-e*), *E. weddellensis* (Figures 320*f*; 321*a,b*), *E. antarctica* (Figure 317*c-f*). Branching filaments are present on and in some pores of *E. pentathrix* (Figure 310*c-e*). It is not known whether this is a foreign growth or represents substance being extruded from the pores. The pores of *E. weddellensis* (Figure 321*a,b*) may have flaplike bristles along the lateral edge, but these cannot be seen with certainty. A few of the smaller pores on *E. antarctica* (Figure 317*c-d*) have elliptical openings. The four groups of pores of *E. antarctica* that were photographed have 5, 6, 10, and 13 pores. None of the species of *Empoulsenia* examined had riblets between the pores similar to those on *Skogsbergiella*, nor were the pore tubes as long as those observed on *Diasterope* and *Parasterope*.

Homasterope: The pore groups of *H. maccaini* (Figure 325*d-f*) and *H. micra* (Figure 331*e,f*) were photographed, but the pores are obscure on the photographs of both specimens. Some of the tubes are long as on members of *Parasterope* and *Diasterope*.

Bathyleberis: The pores were photographed on *B. grossmani* (Figure 335*d-f*), *B. monothrix* (Figure 337*f,g*), and *B. oculata* (Figure 341*f,g*). The number of pores in each group is quite variable on the same specimen; for example, 2 pore groups on *B. grossmani* had 2 or 3 pores, 1 pore group had 7, and another 11. The tubes on some of the pores (Figure 341*g*) are as long as those on *Parasterope*, *Diasterope*, or *Homasterope*. Pores with tubes are positioned close to the flaplike bristle. A few small riblets are visible at the base of the pores in Figure 335*e*. The medial pore shown in Figure 335*f* is almost closed.

Cylindrical Bristles on the Spine-Bearing List.—In addition to the flaplike bristles on the spine-bearing list, short and long tapering cylindrical bristles are present.

Archasterope: 2 long bristles and 1 short bristle are shown on the spine-bearing list of *A. bulla* in Figure 244*d*. They project from simple pores with a low rim. Bristles are located between flaplike bristles and form a row medial to them.

Diasterope: Bulbous bristles on the spine-bearing list of *D. schmitti* are shown in Figure 251*d,e*. The bristle to the left on Figure 251*e* is bifurcate where it leaves the bulbous part and appears to have an opening at the tip. The function of these bristles is not known. Bristles are located between flaplike bristles and form a row medial to them.

Parasterope: The bristles on *P. longiseta* project from simple pores and have 2 or 3 branches at the tip (Figure 257*d,e*). Some of the bristles on *P. crinita* (Figure 266*f,g*) appear to have struts at their base, something like the sieve pores of podocopids. The bristle of *P. anommata* illustrated in Figure 269*c-f* branch near the tip and may have openings at the tips. Bristles are located between flaplike bristles, and form a row medial to them.

Synasterope: The bristles of *S. duplex* are not clearly shown on Figure 279*d*, but they appear to be similar to those on species of *Parasterope*. The bristles are located between flaplike bristles and form a row medial to them.

Skogsbergiella: Bristles on *S. spinifera* have 2 or 3 branches (Figure 287*d,e*). The bristles are present both between flaplike bristles and medial to them. The bristles on *S. scotti* (Figure 292*c,d*) are similar to those on *S. spinifera* except bristles are rarely present medial to the flaplike bristles. Bristles of *S. macrothrix* (Figures 295*f*; 297*a,b*), *S. plocus* (Figure 301*f*), and *S. pax* (Figure 304*f,g*) are similar to those on *S. spinifera*. Some of the bristles on *S. macrothrix* are bulbous (Figures 296*b*, 297*a*), but this could be an artifact.

On *S. pax*, a long bristle is present between the flaplike bristles, and shorter bristles are medial to the flaplike bristles (Figure 304*f*). A similar arrangement of bristles is present on some of the other species of *Skogsbergiella*.

Empoulsenia: *E. antarctica* has short divided bristles medial to the flaplike bristles and long bristles between the flaplike bristles (Figure 317*c-e*). Not all the flaplike bristles, however, have short bristles medial to them; for example, the lower flaplike bristle in Figure 317*c*. The bristles

on *E. pentathrix* are similar to those on *E. antarctica*, but are more numerous (Figure 310*b*). The bristles on *P. quinquesetae* (Figure 306*b*) seem similar to those on *E. antarctica*.

Homasterope: The bristles of *H. maccaini* (Figure 325*c,d*) and *H. micra* (Figure 331*e,f*) are similar to those on species of *Parasterope* in having divided tips and being located only between flaplike bristles.

Bathyleberis: The branching of a bristle is shown for *B. oculata* on Figure 341*f*. A long bristle, which may be divided, is shown for *B. grossmani* in Figure 335*d*. The bristles of *B. monothrix* (Figure 337*f*) seem to be covered with a film, but it is clearly seen that bristles are present both between flaplike bristles and medial to them.

Pores between Spine-Bearing List and Posterior Margin of Valve.—Several different types of pores are present on some species between the posterior list and margin of shell.

Parasterope: *P. crinita* has pores forming a row parallel and posterior to the spine-bearing list (Figure 265*f*). These pores have a horseshoe-shaped lip along their anterior sides (Figure 266*a-c*). These pores seem to be characteristic of the species and have not been observed on other species. A minute tubelike pore with 2 simple pores near its base is present near the dorsal end of the spine-bearing list on *P. styx* (Figure 271*d*).

Skogsbergiella: Bristles on *S. pax* have pores with spokes that resemble the sieve pores of some podocopids (Figure 305*c,d*).

Empoulsenia: Moundlike processes on *E. weddellensis* are shown in Figure 321*c,d*. These may be related to the hyaline pegs or process present on other species of *Empoulsenia* described later.

Hyaline Pegs or Processes between the Spine-Bearing List and Posterior Margin of Valve.—On some species, processes called "hyaline pegs" by Skogsberg (1920:446) are present posterior to the spine-bearing list. The SEM photographs show these pegs to have open ends so that they may be considered to be pores.

Skogsbergiella: One of the processes in *S. scotti* is shown in Figure 292*c,e*. It is cone-shaped, open at the tip, and has a flap along the posterior margin of the opening. A similar process on *S. macrothrix* is shown in Figures 295*f*, 286*a*, and on *S. plocus* in Figure 302*d*. Processes with longer posterior flaps present on *S. pax* are shown in Figure 305*a,b*.

Empoulsenia: A process on *E. antarctica* similar to those on *Skogsbergiella* is shown in Figure 317*b*. Similar processes are present on *E. pentathrix* (Figure 310*a*) and *E. quinquesetae* (Figure 306*e,f*).

Bathyleberis: A process on *B. monothrix* that has the general outline of the processes described above, but appears to be covered over, is shown in Figure 337*e*.

Selvage at the Inner End of the Incisur.—A lamellar prolongation with a fringe of hairs or serrations is present at the inner lower margin of the incisur. The prolongation does not continue on to the upper margin of the incisur.

Archasterope: A fringed selvage is visible but obscure on the photographs of *A. bulla* (Figure 244*b*).

Diasterope: A fringed prolongation of *D. schmitti* is shown in Figure 251*b*.

Parasterope: A fringed prolongation is shown on photographs of the following species: *P. longiseta* (Figure 257*b,c*), *P. crinita* (Figure 265*b*), *P. anommata* (Figure 269*b*), *P. styx* (Figure 271*b*).

Skogsbergiella: A fringed prolongation is shown on photographs of the following species: *S. scotti* (Figure 292*f*), *S. macrothrix* (Figure 295*b*), *S. pax* (Figure 304*b*). The prolongation on *S. plocus* differs from those described above in having serrations in place of hairs along the outer margin (Figure 301*c,d*).

Empoulsenia: A fringed prolongation is shown on photographs of the following species: *E. antarctica* (Figure 316*b*), *E. pentathrix* (Figure 309*b*).

Homasterope: The fringe on the lamellar prolongation on *H. micra* is shown in Figure 331*b,c*.

Bathyleberis: Although not clearly shown, the lamellar prolongation of *B. grossmani* (Figure 335*b*), and *B. oculata* (Figure 341*b*) appears to have a few long hairs along its outer margin. Ventral to the long hairs the edge of the lamellar prolongation on *B. oculata* is serrate (Figure 341*c,d*).

Selvage along the Ventral Margin of Carapace.—Photographs of the selvage along the ventral margin were obtained on only a few specimens. A serrate margin on the selvage along the posterior part of the ventral margin of *Skogsbergiella macrothrix* is shown in Figure 296*d*. The edge of the selvage along the middle part of the ventral margin

of *Empoulsenia antarctica* appears smooth (Figure 316*f*).

SELVAGE ALONG THE POSTERIOR END OF THE CARAPACE.—Several species have serrations along the outer edge of the posterior selvage.

Skogsbergiella: Serrations along the outer edge of the selvage on the posterior ridge on the right valve of *S. macrothrix* is shown in Figure 296*b,c*. A serrate margin on the posterior selvage of *S. plocus* is shown in Figure 302*d,f*, and on the posterior selvage of *S. pax* in Figure 304*e*.

Parasterope: A serrate margin in the dorsal part of *P. crinita* is shown in Figure 266*h*.

Empoulsenia: A serrate margin on the dorsal part of the posterior selvage of *E. antarctica* is shown in Figure 317*a*, and on the middle part of the posterior selvage of *E. weddellensis* in Figure 320*e*.

Bathyleberis: The selvage along the posterior margin of *B. grossmani* (Figure 335*c*) differs from that on *Skogsbergiella* and *Empoulsenia* in that the serrations are more bristlelike.

SELVAGE AT POSTERODORSAL CORNER OF CARAPACE.—On many species the selvage at the posterodorsal corner of the carapace consists of a lamellar prolongation with a fringe of hairs along the outer edge. The selvage in this area is similar in appearance to that along the inner end of the lower margin of the incisur. On *Skogsbergiella pax* (Figure 304*c,d*), the fringed selvage is separated by a narrow gap from the serrated selvage along the posterior margin of the carapace.

SELVAGE ON THE ANTERODORSAL MARGIN OF CARAPACE.—A fringed selvage along the anterodorsal margin of the right valve of *S. macrothrix* is shown in Figure 295*c*.

HAIRS ON THE ANTERIOR PART OF VESTMENT.—Hairs were observed on the anterior part of the vestment of many species. These are commonly, but not always, located in the dorsal part of the anterior vestment. Hairs were previously described on the posterior part of the vestment of *Scleroconcha gallardoi* (Figure 200*a,c*).

Synasterope: Short spines or hairs forming rows are visible posterior to the incisur of *S. duplex* (Figure 279*b*).

Skogsbergiella: Slender hairs are present in the anterodorsal corner of the vestment of *S. macrothrix* (Figure 295*c*).

Empoulsenia: Hairs forming rows are visible in the anterodorsal corner on *E. antarctica* (Figure 316*c,d*).

Homasterope: Short spines or hairs forming rows are visible posterior to the incisur of *H. micra* (Figure 331*b*).

Bathyleberis: Numerous rows of hairs are present in the anterodorsal corner of the vestment of *B. monothrix* (Figure 337*a,c*).

TEXTURE OF INFOLD.—At high magnification the infold on the rostrum of *Parasterope longiseta* has a pitted appearance (Figure 257*f*). Whether or not the pits are actually pores could not be resolved. A similar texture was observed on the posterior infold and selvage of *Skogsbergiella macrothrix* (Figure 296*a,c*).

CENTRAL ADDUCTOR MUSCLES.—The adductor muscles of *Scleroconcha gallardoi* (Figure 200*d,e*) were previously described. Photographs of the muscles scars of *Parasterope crinita* are shown in Figure 265*c-e*, and of *Empoulsenia pentathrix* in Figure 309*d-f*. At high magnification the texture of the muscle fibers for the two species of *Cylindroleberidinae* are quite similar (compare Figures 265*e* and 309*f*).

FIRST ANTENNA.—The 1st antenna of *Empoulsenia pentathrix* is illustrated in Figure 311*a-e*. The spines or teeth on the a-claw of the 7th joint is shown in Figure 311*c*. The tip of the d-bristle (Figure 311*e*) differs from the tip of the c-bristle (Figure 311*d*) and the tip of the sensory bristles of the 5th joint (Figure 311*f*).

SECOND ANTENNA.—The exopodite of the 2nd antenna of *Homasterope maccaini* is illustrated in Figure 327. This species bears narrow spines on the 1st joint (Figure 327*b*), slender spines on the bristle of the 2nd joint (Figure 327*e*), short spines forming a row along the distal margins of joints 2–8, and a lateral spine and a row of short spines on the 9th joint (Figure 327*d*). Typical rings on bristles are shown in Figure 327*f*.

MANDIBLE.—The U-shaped process in the middle of the dorsal margin of the basale of *Empoulsenia pentathrix* (see Figure 312*a* for location) is shown in Figure 313*a*. It can be seen from examination of the photograph that no pores are present, indicating that the U-shaped process cannot be a glandular opening. The U-shaped process on *Bathyleberis monothrix* is shown in Figure 338*f*. The glandular process on the basale endite of *E. pentathrix* is shown in Figure 313*b,c*, and of *B.*

monothrix in Figure 338*e*. The fingerlike tubules that are sometimes visible on these processes using a biological compound microscope apparently collapsed during the preparation of the specimens for the SEM.

Dwarf bristles on the basale endite of *Empoulsenia pentathrix* are shown in Figures 313*b-e*. The tips of these bristles form a cylindrical process, suggesting they have a sensory function. The basale endite of *Bathyleberis monothrix* in its natural position in front of the upper lip is shown in Figure 339*d*. The baleen comb of the maxilla is visible behind the basale endite.

Details of end bristle on the basale endite of *Homasterope maccaini* are shown in Figure 328*e,f*. Details of triaenid bristles are illustrated in Figure 338*d* for *Bathyleberis monothrix*, and in Figure 313*f* for *Empoulsenia pentathrix*. The hirsute tip of the exopodite of *E. pentathrix* is illustrated in Figure 311*g*.

Bristles on the dorsal margin of the basale of *Empoulseni pentathrix* are shown in Figure 312*b*. Details of the coxale endite of *E. pentathrix* are shown in Figure 312*c-e*, and details of the spines on the 2nd endopodite joint of that species are shown in Figure 312*f*.

Seventh Limb.—A detail of one of the bristles on the 7th limb of *Homasterope maccaini* is illustrated in Figure 328*a*, and of *Bathyleberis monothrix* in Figure 339*e*. The opposing combs at the tip of the 7th limb of *Homasterope maccaini* are shown in Figure 328*b,c*. Whether or not the comb teeth have terminal pores cannot be ascertained from the photographs.

Furca.—Details of the furca of *Bathyleberis monothrix* are illustrated in Figure 338*a-c*. Each claw bears groups of teeth which increase in length distally on the claw (Figure 338*c*).

Rod-Shaped Organ.—The tip of the rod-shaped organ of *Bathyleberis monothrix* is evenly rounded (Figure 339*a*).

Upper Lip.—The upper lip of *Cylindroleberidinae* consists of 2 hirsute lobes divided by ventral indentation. Posterior to the lobes and on each side of them is a lateral hirsute flap. The lobes on many species have several spines. Spines may also be present between the lobes. My preparations of lips with spines were unsatisfactory, so that I was unable to determine whether the spines have pores at their tips. The upper lip of *Empoulsenia pentathrix* is shown in Figure 311*h;* the upper lip of *Bathyleberis monothrix* is shown in Figure 339*b-d*.

Gill-like Structures.—The gill-like structures at the posterior part of the body of *Bathyleberis monothrix* have squarish tips (Figure 339*f*).

Archasterope Poulsen, 1965

Type-Species.—*Archasterope dentata* Poulsen, 1965:339, monotypy.

This genus contains only two species, both collected in or near the study area, *A. dentata* Poulsen, 1965, and *A. bulla*, new species.

Diagnosis of Genus.—Carapace elongate with subparallel ventral and dorsal margins; posterior infold with or without processes between list and edge of valve.

First antenna: Sensory bristle of 5th joint with 7 filaments, 1 proximal, 6 terminal; d-bristle of 8th joint about half length of e-bristle.

Mandible: Dorsal margin of basale with 4 or 5 midbristles; exopodite about one-half length of dorsal margin of 1st endopodite joint.

Maxilla: Basale bare or hirsute; dorsal margin of basale with 3 or 4 distal bristles, ventral margin with 4–6 proximal bristles; endite II with 3 bristles.

Sixth limb: Anterior margin with 1 upper and 1 lower bristle; end joint with 16–25 posteroventral bristles.

Seventh limb: Each limb with 6 to 8 proximal bristles and 6 terminal bristles; terminal comb with 14 or 15 opposing teeth.

Furca: Each lamella with 8 or 9 claws, posterior 1–3 of these bristlelike.

Lateral eye: Absent or reduced with 8–12 small ommatidia.

Distribution.—The northernmost occurrence of

Key to Species

Carapace with 4 processes on the posterior infold, animal without lateral eyes ..... 60. *A. bulla*
Carapace without processes on the posterior infold, animal with lateral eyes ..... 59. *A. dentata*

the genus *Archasterope* is 34°35′S, at a station included in this study, although slightly north of the study area. The southernmost locality of the genus is about 55°S, 59°W, just outside the Antarctic Convergence (Figure 241). Members of the genus have been collected on the bottom at depths of 180 to 1861 m, and in an Isaac-Kidd Midwater Trawl dragged at a depth of 1812–2145 m.

59. *Archasterope dentata* Poulsen, 1965

Archasterope dentata Poulsen, 1965:339, figs. 113, 114.

HOLOTYPE.—♀ with large eggs in ovary; carapace length 1.89 mm.

TYPE-LOCALITY.—Off southeast Australia, 38° 12′S, 149°40′E, 180 m.

MATERIAL EXAMINED.—None.

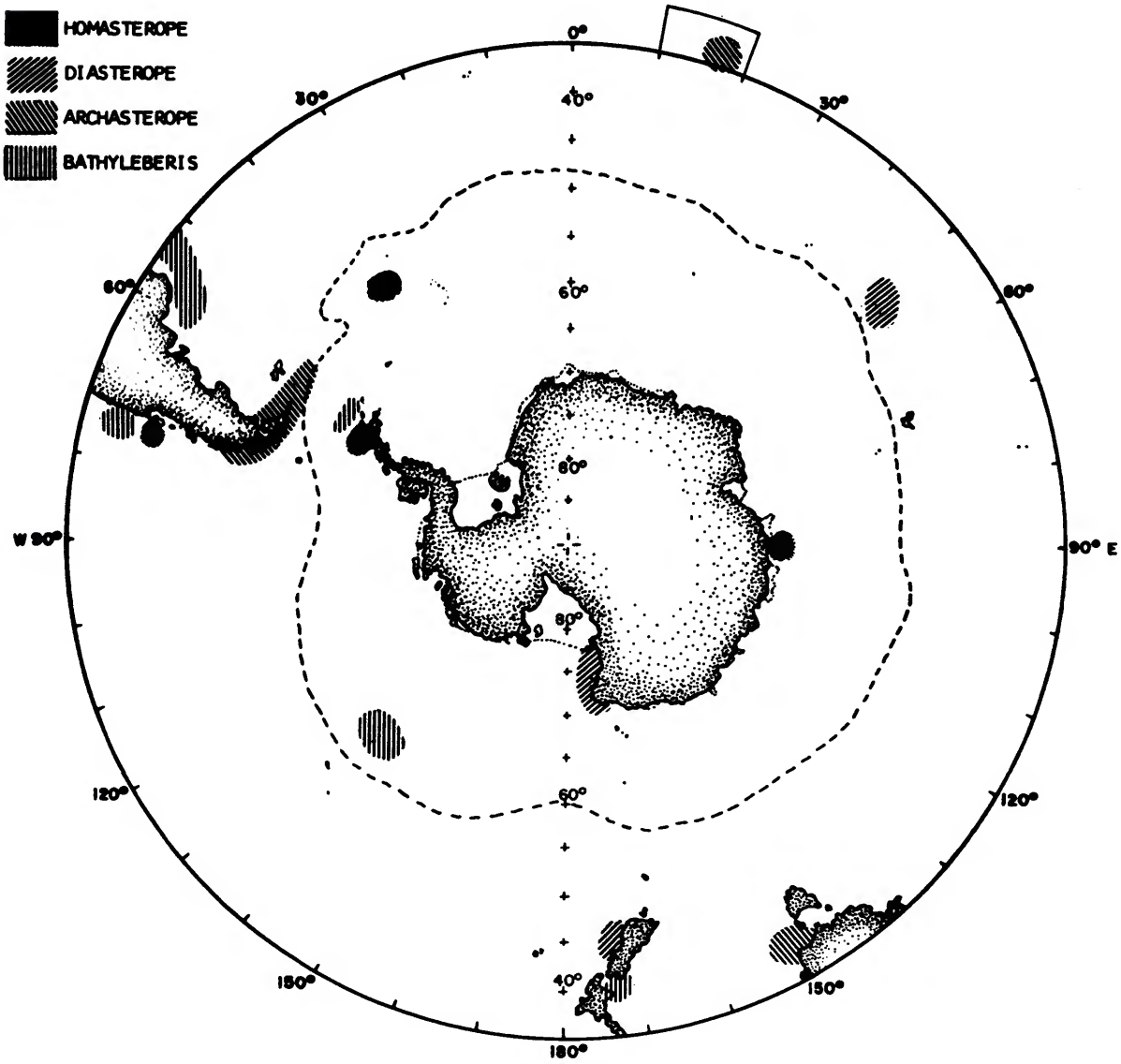

FIGURE 241.—Distribution map.

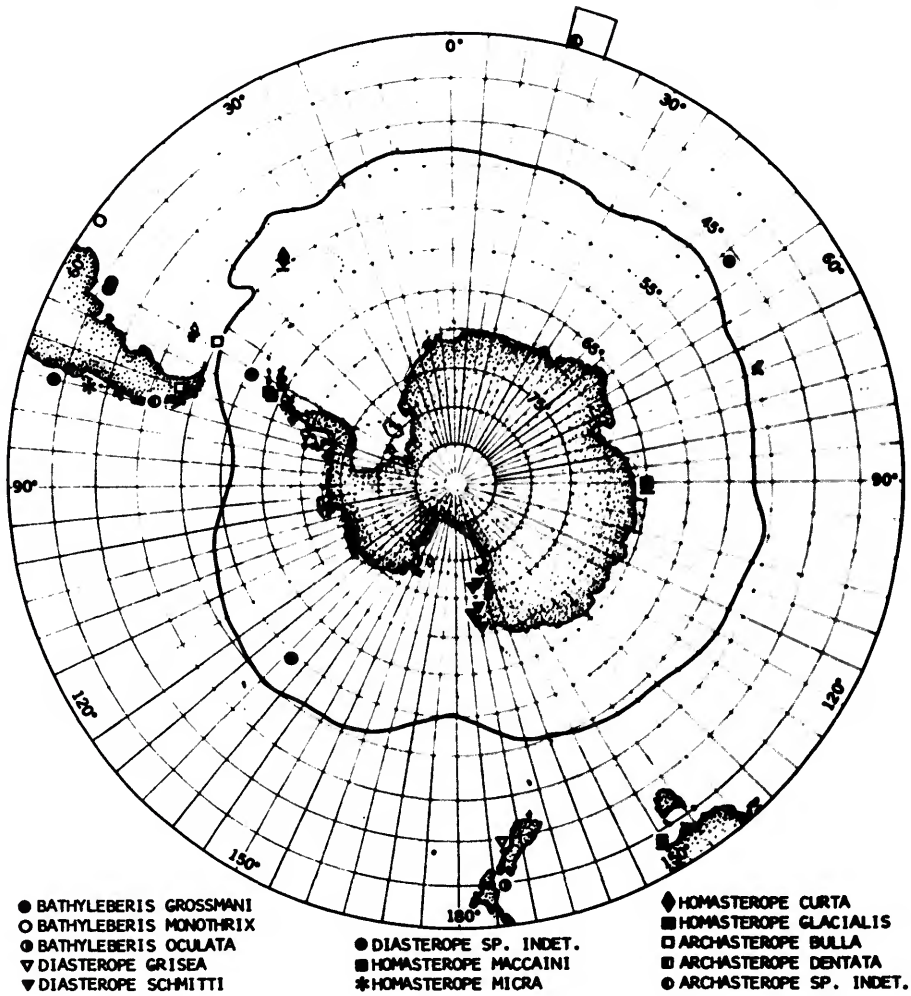

FIGURE 242.—Distribution map.

DIAGNOSIS OF ADULT FEMALE.—Posterior margin of carapace steep (large radius of curvature); posterior infold without processes between list and posterior edge of valve; long bristles between flap-like bristles along posterior list; carapace length 1.89–1.90 mm.

Mandible: Ventral margin of basale with 1 small triaenid bristle near base of endite; dorsal margin of basale with 5 midbristles.

Maxilla: Ventral margin of basale with 7 midbristles; dorsal margin of basale without hairs.

Sixth limb: Posteroventral margin of end joint with 25 bristles.

Lateral eyes: Eyes small with 8 to 12 ommatidia.

Distribution: Known by 2 specimens, both from type-locality (Figure 242).

60. *Archasterope bulla*, new species

FIGURES 243, 244

HOLOTYPE.—USNM 128964, gravid ♀, length 2.04. Valves and some appendages in alcohol, remaining appendages on slides.

TYPE-LOCALITY.—*Vema* Cruise 17, station V–17–23.

FIGURE 243.—*Archasterope bulla*, female, USNM 128964, length 2.04 mm, carapace: *a*, complete specimen, lateral view. Right valve, medial view: *b*, anterior; *c*, posterior. Left valve, medial view: *d*, posterior. First antenna: *e*, tip of right limb, lateral view. Second antenna: *f*, 9th exopodial joint of left limb, lateral view (not all bristles shown); *g*, 9th exopodial joint of right limb, lateral view (not all bristles shown); *h*, endopodite and part of protopodite of right limb, medial view. Mandible: *i*, part of right limb, medial view (not all bristles shown); *j*, ventral branch of coxale endite of left limb, medial view; *k*, tip of dorsal branch of coxale endite of left limb, medial view. Maxilla: *l*, left limb, medial view. Fifth limb: *m*, exopodial bristles of right limb, medial view. Sixth limb: *n*, right limb, medial view. Anterior: *o*, medial eye and rod-shaped organ, anterior process; *p*, upper lip. Posterior: *q*, posterior with folded dorsal process, anterior to left. Female, USNM 128965, length 2.16 mm, carapace: *r*, complete specimen, lateral view; *s*, sketch of adductor muscle scars on right valve, lateral view. (Same magnification in microns: *c-e,i,l,n,o,q; f,g,k,m.*)

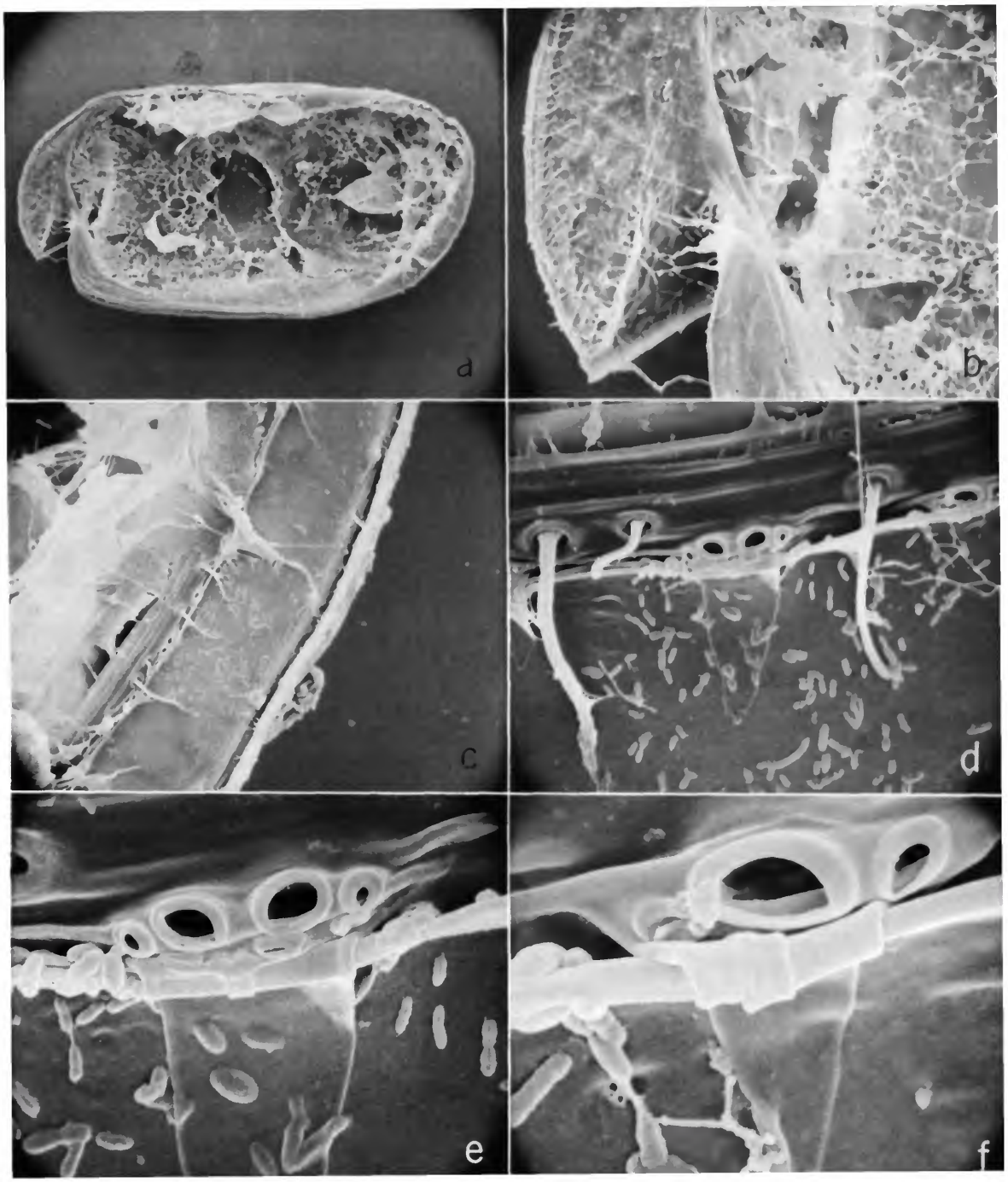

FIGURE 244.—*Archasterope bulla*, female, USNM 128964, right valve, medial view: *a*, complete valve, × 47; *b*, anterior, × 190; *c*, posterior infold, × 480; *d*, detail from "c," × 1900 (small ovoid objects are probably bacteria); *e*, detail from "*d*," × 4700; *f*, detail from "*d*," × 9500.

ETYMOLOGY.—The specific name is derived from the Latin "bulla" [= bubble, knob, boss, seal, edict, ornament] and refers to the 4 processes or knobs on the posterior infold of each valve.

PARATYPES.—USNM 128965, adult ♀; USNM 128966, juvenile (not dissected). Both paratypes from same sample as holotype.

ADDITIONAL SPECIMENS.—USNM 138033, N-1 ♂, length 1.78 mm, height 1.00 mm, from *Eltanin* Cruise 6, station 354.

DIAGNOSIS OF ADULT FEMALE.—In lateral view, posterior of carapace more broadly rounded in ventral half; 4 short processes forming row on infold between list and posterior shell margin; length about 2.04–2.16 mm.

Mandible: Ventral margin of basale with 3 small triaenid bristles near base of endite; dorsal margin of basale with 4 or 5 midbristles.

Maxilla: Ventral margin of basale with 4 midbristles; dorsal margin of basale hirsute.

Sixth limb: Posteroventral margin of end joint with 16 bristles.

Lateral eyes: Absent.

DESCRIPTION OF ADULT FEMALE (Figures 243, 244).—Carapace elongate; posterior end more broadly rounded in ventral half in lateral view; both ventral and dorsal margins fairly linear (Figure 243*a,r*).

Infold (Figures 243*b-d*; 244): About 60 bristles forming 1 or 2 rows just within and parallel to anterodorsal margin above incisur; about 20 minute bristles present between rows of longer bristles and list; about 25 bristles present on list and between list and incisur; about 50 bristles present below incisur and on anteroventral infold; single row of 20 bristles present along ventral infold to point opposite 1st hyaline spine of posterior list; posterior list with 24 or 25 hyaline spines posterior to about 32 or 33 bristles (7 or 8 long, remaining short); 4 short processes forming row between list and posterior shell margin; 7 to 9 bristles (2 to 4 long, remaining short) present between lowermost hyaline spine on list and lowermost process in area between list and posterior shell margin.

Size: USNM 128964, length 2.04 mm, height 1.17 mm; USNM 128965, length 2.16 mm, height 1.20 mm.

First antenna (Figure 243*e*): 1st and 2nd joints extremely spinous; 2nd joint with 1 long dorsal and 1 short lateral bristle, both with spines; 3rd joint with 6 long spinous dorsal bristles and 1 short bare ventral bristle; 4th joint with 1 long dorsal bristle with short marginal spines and 2 short ventral bristles about same length as ventral margin of 5th joint, both bristles with short marginal spines; ventral margin of 4th joint with spines forming clusters; sensory bristle of 5th joint long with short proximal and 6 long terminal filaments; medial bristle of 6th joint with short marginal spines. Seventh joint: a-claw with minute flat teeth near middle of lateral surface; b-bristle with 5 filaments including stem; c-bristle with 6 filaments including stem. Eighth joint: d- and e-bristles bare, d-bristle about 60 percent length of e-bristle, and tapering to suaged tip; f-bristle almost at right angles to stem, with 5 spinous filaments including stem; g-bristle with 7 filaments including stem.

Second antenna (Figure 243*f-h*): Protopodite with short medial bristle and slender spines along ventral and dorsal margin and medial surface. Endopodite 3-jointed with long terminal bristle. Exopodite: 1st joint elongate with hairs forming clusters along distal inner margin; joints 3 to 8 with short spines forming row along distal margin; bristle of 2nd joint reaching 9th joint and with numerous slender spines or hairs along ventral margins; bristles of joints 3 to 8 with natatory hairs; bristles of joints 3 to 5 with few stout proximal ventral spines; 9th joint with 4 bristles, 2 stout with natatory hairs, 2 short with short marginal spines; lateral spine with digitate tip present on 9th joint.

Mandible (Figure 243*i-k*): Coxale with small bristle at base of endite; ventral margin of dorsal branch of coxale endite with 5 or 6 angular and rounded teeth and short main spine; dorsal bristle proximal to tip of endite with short marginal spines; ventral branch of coxale endite with spines forming 4 or 5 oblique rows and a pointed tip with 2 backward-pointing spines. Basale: endite with 4 spinous terminal bristles, 2 triaenid bristles with 4 and 8 pairs of marginal spines excluding terminal pair, 2 dwarf bristles and small glandular peg; 3rd smaller triaenid bristle with 6 spines (2 on one side, 4 on other or 3 pairs) excluding distal pair present near base of endite proximal to U-shaped sclerotized process; dorsal margin of basale with 2 long terminal bristles with short marginal spines and 5 short spinous midbristles on left

limb and 4 on right. Exopodite about one-half length of dorsal margin of 1st endopodite joint, with hirsute rounded tip and 2 short subterminal bristles. Endopodite: 1st joint with 3 long spinous bristles; medial and lateral surfaces of 2nd joint with short spines forming clusters; ventral margin with 3 long stout terminal bristles with short marginal spines; dorsal margin with 1 or 2 spinous proximal bristles and stout spinous a-, b-, c-, and d-bristles; 1 long spinous bristle present between b- and c-bristles; 3 spinous medial cleaning bristles forming oblique row between b- and c-bristles; 5 or 6 spinous medial cleaning bristles forming oblique row present between c- and d-bristles; 1 long stout spinous lateral bristle present between c- and d-bristles; 1 long stout spinous medial bristle present distal to base of d-bristle; 3rd joint with short pointed dorsal claw with minute teeth near middle, 3 long spinous clawlike bristles, and 2 slender spinous bristles.

Maxilla (Figure 243*l*): Epipodial appendage short hirsute. Endite I with 1 short and 3 long spinous bristles; endite II with 3 long bristles. Basale hirsute; 1 lateral and 1 bare medial bristle present near base of epipodite; dorsal margin with 3 short bare distal bristles; ventral margin with 4 bare midbristles, 1 short distal bristle and 1 long spinous terminal bristle. Endopodite: 1st joint with 1 short bare middorsal bristle and 1 long spinous 6-bristle; end joint with spinous bristle slightly longer than 6-bristle.

Fifth limb (Figure 243*m*): Epipodial appendage with about 64 bristles. Comb with 1 long stout spinous exopodial bristle and 4 slender bristles near ventral margin distal to base of stout bristle (2 thin bristles may be close to base of stout bristle but not seen with certainty).

Sixth limb (Figure 243*n*): Anterior margin with 1 upper and 1 lower bristle; anteroventral corner with 3 or 4 bristles plus 1 on margin of lateral flap; posteroventral margin with 16 bristles; limb hirsute.

Seventh limb: Each limb with 14 bristles, 8 proximal (4 + 4), 6 terminal (3 + 3), each with 3 or 4 bells; opposing terminal combs with about 14 opposing teeth.

Furca: Each lamella with 9 claws; last 2 or 3 claws bristlelike, straight or bent backward; remaining claws strongly curved, spines present on both concave and convex margins.

Medial eye and rod-shaped organ (Figure 243*o*): Medial eye large with few hairs along dorsal margin; rod-shaped organ broadening proximally, with restriction near middle, tip rounded.

Lateral eye: Absent.

Upper lip (Figure 243*p*): Central part with small anterior spines; each anterolateral lobe with 2 anterior spines, 1 small and 1 large; hirsute lateral flap present on each side of mouth; all lobes hirsute.

Posterior (Figure 243*q*): Dorsal process thumblike with short and long spines (process bent backward on holotype).

Eggs: USNM 128964 with 11 eggs in marsupium.

COMPARISONS.—The only species previously assigned to this genus is *Archasterope dentata* Poulsen, 1965. *A. bulla* differs from *A. dentata* in having 4 processes on the posterior infold of each valve and in not having lateral eyes.

REMARKS.—USNM 138033, a male (N-1) also without lateral eyes.

DISTRIBUTION.—This species was collected on the bottom at one locality in the Magellanic subregion at 279 m depth (Figure 242). It was also collected just outside the Magellanic subregion in a midwater trawl fished at a depth of 1812–2145 m at a station where the bottom depth was 3880–4118 m.

Archasterope Species Indeterminate

MATERIAL.—USNM 138154, 1 juvenile ♀, length only 1.80 mm (carapace contained large nematode—probably parasitic), from *Vema* Cruise 14, station V-14-32; USNM 139110, 1 juvenile ♂, length 1.51 mm, height 0.87 mm, from *Hero* Cruise 69-5, station 213; USNM 139115, 1 juvenile ♂, length 1.47 mm, height 0.85 mm, from *Hero* Cruise 69-5, station 57; USNM 139117, 1 juvenile ♂, length 1.54 mm, height 0.78 mm, from *Hero* Cruise 69-5, station 57.

DISTRIBUTION.—The distribution of this taxon is shown in Figure 242.

Diasterope Poulsen, 1965

TYPE-SPECIES.—*Diasterope pilosa* Poulsen, 1965, designated herein.

Diasterope is represented in the study area by

two species, *D. grisea* (Brady) and *D. schmitti*, new species.

DIAGNOSIS OF GENUS.—Carapace smooth, elongate, with slitlike incisur.

First antenna: Sensory bristle of 5th joint with 1 short proximal and 6 long terminal filaments.

Mandible: Length of exopodite more than one-half length of dorsal margin of 1st endopodite joint. Long lateral bristle present between b- and c-bristles on dorsal margin of 2nd joint of endopodite.

Seventh limb: Each limb with 12 bristles, 6 proximal, 6 terminal, except *D. schmitti* which bears 31 bristles.

Furca: Each lamella with 8 or 9 claws, posterior 2 or 3 of these bristlelike.

DISTRIBUTION.—Species in the genus *Diasterope* are widespread. The northernmost latitude at which the genus has been collected is about 49°N in the Strait of Georgia, Canada. The southernmost locality at which the genus has been collected is in the Ross Sea, Antarctica (Figure 241). The known depth range of the genus is 11 to 400 m; adult males have been collected in plankton nets at the water's surface.

Key to Species

(Includes only species south of 35°S)

Carapace length greater than 3.1 mm, dorsal margin of mandibular basale with cluster of 5 midbristles, 7th limb with more than 25 bristles ..... 62. *D. schmitti*

Carapace length smaller than 2.9 mm, dorsal margin of mandibular basale with 3 midbristles, 7th limb with 12 bristles ..... 61. *D. grisea*

61. *Diasterope grisea* (Brady, 1898)

FIGURES 245, 246

Asterope grisea Brady, 1898:432, pl. 43: figs. 9–14.—Müller, 1912:43 [key], 46.—Skogsberg, 1920:440.
Cylindroleberis? grisea (Brady).—Eagar, 1971:61.

HOLOTYPE.—Not designated.

SYNTYPE-LOCALITY.—Akaroa Harbor, New Zealand, 11 meters.

MATERIAL.—Dr. K. G. McKenzie provided me with material identified by Brady as *Asterope grisea*, which Dr. McKenzie had on loan from the Hancock Museum. This consisted of three slides and one vial of specimens in alcohol. Labels on the slides are as follows: "*Asterope grisea* Brady ♂, Akaroa Harbour, N. Z. 6 fathoms"; "*Asterope grisea* n. sp., Akaroa Harbour, N. Z. 6 fathoms, H. Suter. 8.97"; "*Asterope grisea* n. sp. ♀, Akaroa Harbour, N. Z., 6 fathoms, H. Suter. 8.97." The slides are also marked "Syntype" and "B501," but at a later date than that of the original writing. The label on the vial is as follows: "*Asterope grisea* Brady, Akaroa Harbour, N. Z. 6 fathoms." The label also bears the number "B501" and a Hancock Museum sticker.

The mounted specimens on the three slides are in only fair condition. Therefore, the supplementary description of the species which follows is based on material in the vial which contained 310 specimens of the species and 10 specimens of another species (see remarks following description).

DIAGNOSIS OF ADULT FEMALE.—Carapace length 2.55–2.64 mm; 3 short processes forming row on posterior infold between list and shell margin.

Mandible: Dorsal margin of mandibular basale with 3 midbristles.

Seventh limb: With 12 bristles.

SUPPLEMENTARY DESCRIPTION OF FEMALE (Figure 245).—Carapace elongate with posterior end equally rounded in ventral and dorsal halves when viewed laterally; both ventral and dorsal margins linear (Figure 245*a*).

Infold (Figure 245*b-d*): About 37 bristles forming single row just within and parallel to anterodorsal margin above incisur; about 10 minute bristles present between row of longer bristles and list; about 13 bristles present on list and between list and incisur; about 24 bristles present below incisur and on anteroventral infold; single uneven row of about 50 bristles present along ventral infold to point opposite 1st hyaline spine of posterior list; posterior list with 22 hyaline spines forming row posterior to about 94 bristles (about 19 long,

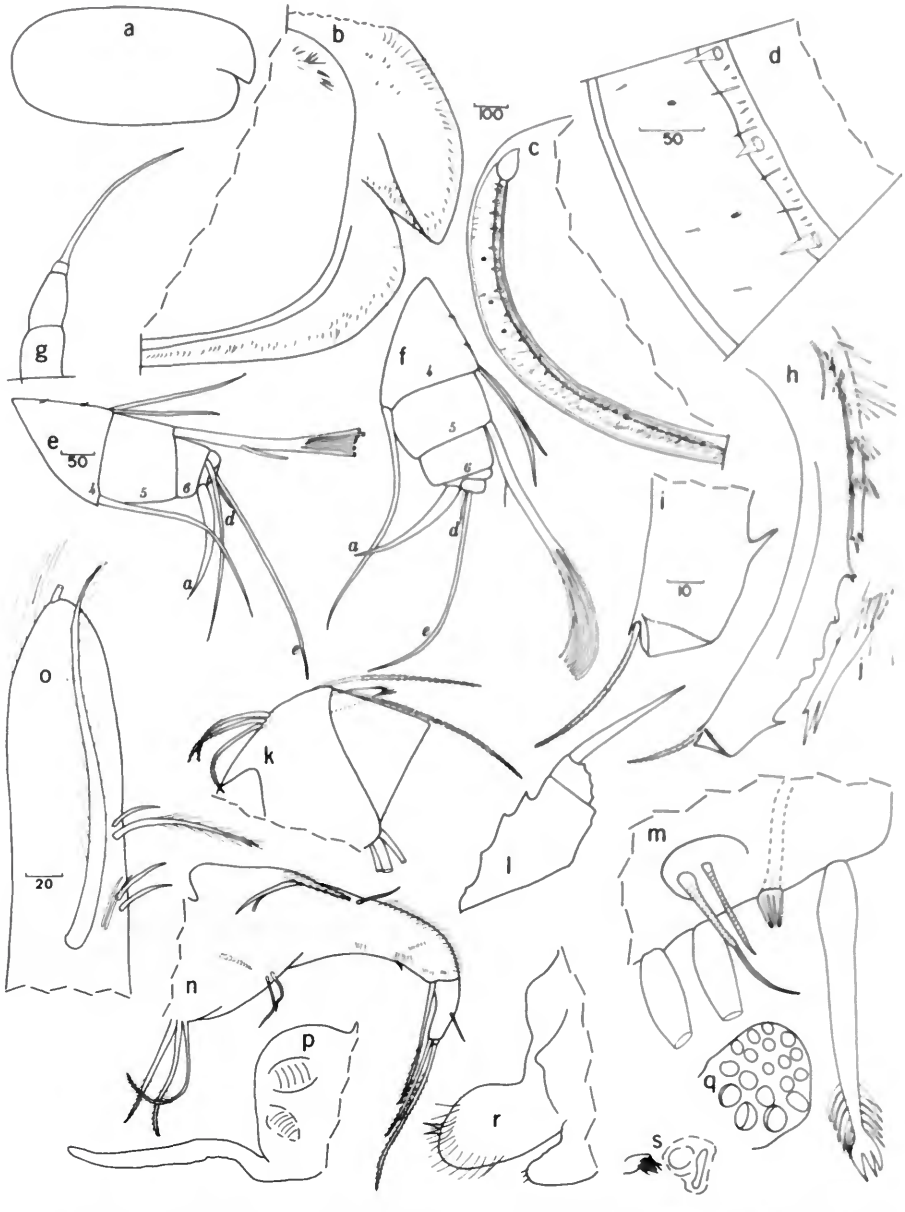

FIGURE 245.—*Diasterope grisea*, female, B501, length 2.62 mm, carapace: *a*, complete specimen, lateral view. Left valve, medial view: *b*, anterior; *c*, posterior; *d*, detail of "*c*." First antenna: *e*, tip of right limb, medial view (not all bristles shown); *f*, tip of left limb, lateral view (not all bristles shown). Second antenna: *g*, endopodite of left limb, lateral view. Left mandible, medial view: *h*, coxale endite; *i*, tip of dorsal branch shown in "*h*"; *j*, tip of ventral branch shown in "*h*"; *k*, basale and exopodite; *l*, 2nd and 3rd endopodial joints (not all bristles shown); *m*, dwarf bristles, glandular peg, and triaenid bristles of basale. Maxilla: *n*, left limb, medial view. Fifth limb: *o*, exopodial bristles on right limb, lateral view. Anterior: *p*, medial eye and rod-shaped organ; *q*, left lateral eye; *r*, upper lip. Genitalia and brushlike organ: *s*, anterior to right. (Same magnification in microns: *b,c; e,f,k,l,n,p-s; d,g,h,o; i,j,m*.)

remaining short); 3 short processes forming row present between list and posterior margin; 45 bristles, mostly long, present between lowermost hyaline spine on list and lowermost process in area between list and posterior shell margin; 1 small bristle present near middle process; 5 to 8 small bristles present dorsal to upper process.

Size (Figure 247): Dissected gravid ♀, length 2.62 mm, height 1.27 mm. Four gravid ♀♀: length 2.55 mm, height 1.27 mm; length 2.72 mm, height 1.30 mm; length 2.64 mm, height 1.24 mm; length 2.56 mm, height 1.19 mm.

First antenna (Figure 245*e,f*): 1st and 2nd joints with short spines forming clusters on lateral surfaces; 2nd joint with 2 spinous bristles, 1 distolateral, 1 dorsal; 3rd joint with 6 long spinous dorsal bristles and 1 short bare ventral bristle; 4th joint with faint spines forming clusters along ventral margin, 1 long spinous dorsal bristle and 2 short slender ventral bristles, longer ventral bristle almost reaching terminal margin of 8th joint; sensory bristle of 5th joint with 1 short proximal and 6 long terminal filaments; 6th joint with 1 long spinous medial bristle. Seventh joint: a-claw with smooth margins; b-bristle with 4 long filaments; c-bristle with 7 filaments including stem. Eighth joint: d-bristle represented by short tapered bare bristle about one-seventh length of e-bristle; e-bristle bare, reaching past tip of filaments on sensory bristle of 5th limb; f-bristle with 5 spinous marginal filaments excluding stem, anterior margin of stem between 4th and 5th filaments with short spines; g-bristle with 6 marginal filaments excluding tip.

Second antenna (Figure 245*g*): Protopodite: anterior margin with faint spines, posterior margin bare; short medial bristle present. Endopodite 3-jointed with terminal bristle about one and one-half times length of stem. Exopodite: joints 4 to 9 with short stout basal spine; joints 2 to 8 with short spines forming row along distal margins; bristle of 2nd joint reaching past 9th joint and with short slender spines along ventral margin; bristles on joints 3 to 8 and 2 long bristles of joint 9 with natatory hairs, 2 small bristles of 9th joint with short marginal spines.

Mandible (Figure 245*h-m*): Ventral branch of coxale endite with spines forming 5 oblique rows and tip with 3 pointed teeth; ventral margin of dorsal branch with 1 pair of pointed teeth followed by 1 pair of rounded teeth and then 2 single rounded teeth and short main spine; dorsal margin with long subterminal bristle with short marginal spines; slender bristle present on endite near base. Basale endite with 4 pectinate end bristles and 3 triaenid bristles with 5 to 8 pairs of lateral spines; 2 dwarf bristles present near digitate glandular peg. Ventral margin of basale with 1 triaenid bristle with 4 pairs of lateral spines and U-shaped process; dorsal margin with 2 long terminal bristles and 3 short midbristles, all bristles with short marginal spines. Exopodite with 2 short terminal bristles and hirsute tip, length slightly more than 50 percent of dorsal margin of 1st endopodite joint. Endopodite: 1st joint with 3 spinous ventral bristles; ventral margin of 2nd joint with 3 long spinous terminal bristles; dorsal margin with 2 proximal bristles and stout a-, b-, c-, and d-bristles, all bristles with distal marginal spines; long slender spinous lateral bristle present between b- and c-bristles; oblique row of 6 spinous cleaning bristles present on medial side between b- and c-bristles, 2nd row of 5 spinous cleaning bristles present on medial side between b- and c-bristles, but closer to c-bristle; 1 long spinous lateral bristle present between c- and d-bristles; 1 long spinous bristle present on medial side near d-bristle. Third joint: dorsal claw smooth, less than combined length of 2nd and 3rd endopodite joints; 3 long clawlike bristles with distal marginal spines, 2 remaining more slender bristles also spinous.

Maxilla (Figure 245*n*): Epipodite with prolonged hirsute tip; proximal endite with 1 short slender bristle and 3 long spinous bristles; distal endite with 3 long spinous bristles; dorsal margin of basale spinous and with 2 bristles, 1 near tip of epipodite, other near base; ventral margin of basale with 2 bare proximal bristles, 1 minute distal bristle and 1 long spinous terminal bristle; lateral surface of basale with short proximal bristle. Endopodite: 1st joint with 1 short bristle near middle of dorsal margin and 1 long terminal bristle on ventral margin; end joint with 1 long spinous terminal bristle.

Fifth limb (Figure 245*o*): Epipodial appendage with 76 bristles; long stout exopodite bristle reaching past end of comb; 3 pairs of bristles, some with marginal spines, present on lateral surface of comb below stout exopodite bristle; dorsal margin of comb without hairs except at tip.

FIGURE 246.—*Diasterope grisea*, male, B501, length 2.68 mm, carapace: *a*, complete specimen, lateral view. First antenna: *b*, tip of right limb, medial view (not all bristles shown); *c*, tip of left limb, lateral view. Right 2nd antenna: *d*, endopodite, lateral view; *e*, endopodite, medial view. Right mandible, medial view: *f*, tip of dorsal branch of coxale endite; *g*, tip of ventral branch of coxale endite; *h*, basale and exopodite. Sixth limb: *i*, left limb, lateral view (bristles not shown); *j*, bristle on proximal anterior corner of right limb, medial view. Furca: *k*, left lamella (all claws not shown). Anterior: *l*, medial eye and rod-shaped organ dorsal view; *m*, left lateral eye; *n*, upper lip. Copulatory lobes: *o*, right lateral view. Body: *p*, anterior view showing medial eye and rod-shaped organ, lateral eye, upper lip, and sclerotized elements (cross-hatching); *q*, ventral view of upper lip and mouth with sclerotized elements (cross-hatching); *r*, posterior view of "*p*." (Same magnification in microns: *b-e,h,l-n; f,g; i,k,q,r; j,o*.)

Sixth limb: Anterior margin with upper and lower bristle; anterior tip with 5 bristles, posteroventral margin with 24 bristles; margin and medial surface hirsute (limb similar to that of *Diasterope schmitti*.

Seventh limb: Each limb with 12 bristles, 6 in proximal group (3 + 3) and 6 in distal group (3 + 3), each bristle with 3 or 4 bells; opposing terminal combs with 18 to 21 spinous teeth.

Furca: Distribution and number of claws same as on furca of *D. schmitti*—each lamella with 9 claws, 7 primary, 2 secondary.

Posterior: Thumblike dorsal process same as on *D. schmitti*.

Lateral eye (Figure 245*q*): Only slightly smaller than medial eye and with 18 ommatidia; ventral 2 or 3 ommatidia larger than others.

Medial eye and rod-shaped organ (Figure 245*p*): Medial eye large, rod-shaped organ 1-jointed with rounded tip.

Upper lip (Figure 245*r*): Lip consisting of 2 hirsute lobes, each with 2 spines and lateral hirsute flap.

Brushlike organ: Organ consisting of 7 minute bristles near left and right genitalia (Figure 245*s*).

Eggs: Dissected specimen with 20 eggs.

Attached organisms: Segmented filaments attached to many appendages.

Supplementary Description of Adult Male (Figure 246).—Carapace finely punctate, differs in shape from female in having more open incisur and truncate posterodorsal margin (Figure 246*a*). Hairs forming row across posterior part of shell. Size of two specimens (Figure 247): length 2.68 mm, height 1.16 mm; length 2.72 mm, height 1.25 mm.

First antenna (Figure 246*b,c*): 1st joint with long spines on lateral surface; 2nd joint with short spines forming clusters on lateral surface and with 2 bristles, 1 dorsal, 1 lateral; 3rd joint with 6 stout dorsal bristles and 1 short ventral bristle; 4th joint with few spines along ventral margin, 1 long stout dorsal bristle and 2 short slender ventral bristles; sensory bristle of 5th joint reaching past 8th joint and with abundant filaments, several terminal filaments stouter than others; medial bristle of 6th joint long, stout and with short marginal spines; dorsal margin of 5th and 6th joints undulating. Seventh joint: a-claw with numerous spines; b-bristle with 5 spinous marginal filaments excluding stem; c-bristle with 40 filaments. Eighth joint: d-bristle about same size as that on female; e-bristle bare about twice length of a-claw; f-bristle with 37 filaments; g-bristle with 7 spinous proximal filaments and 3 bare distal filaments including tip.

Second antenna (Figure 246*d,e*): Protopodite with short medial bristle as on female. Endopodite 3-jointed: 1st joint elongate bare; 2nd joint with 2 or 3 bristles near middle of ventral margin, and recessed palm on lateral side to receive tip of reflexed 3rd joint; 3rd joint with 1 proximal bristle and serrated tip. Exopodite: 1st joint with spines forming clusters along distal ventral margin; 2nd joint elongate with about 10 clusters of short spines along ventral margin; joints 2 to 8 with long hairs present on distal dorsal margins and short spines forming row along terminal margins; basal spines not observed; 9th joint with 2 long and 1 medium bristles; all bristles on joint with natatory hairs.

Mandible (Figure 246*f-h*): Limb larger than that on female. Ventral branch of coxale endite with spines forming 6 oblique rows and tip with 3 pointed teeth; ventral margin similar to that of female; 4 short spines present in middle of dorsal margin between main spine and tip of branch (in addition to numerous marginal spines near tip); tip of branch with short slender spine (spine not observed on tip of branch on female which was folded in mounted appendages); subterminal bristle of dorsal margin and bristle near base of endite similar to those on female. Bristles on basale and endite similar in type and distribution to those on female. Exopodite similar to that on female except much shorter, about 38 percent length of dorsal margin of 1st endopodite joint. Endopodite: 1st joint with 3 ventral bristles near middle of margin; 2nd joint only slightly longer than 1st joint, ventral margin with 3 terminal bristles; dorsal margin with 3 proximal bristles, lateral of these almost as stout and long as a-bristle; a-, b-, c-, and d-bristles with distal marginal spines; lateral bristle between b- and c-bristles about three-fourths length of b-bristle; oblique row of 8 spinous cleaning bristles present on medial side between b- and c-bristles; 2nd row of 6 spinous cleaning bristles on medial side present between b- and c-bristles but closer to c-bristle than 1st row; 1 long spinous bristle present between c- and d-bristles; 1 long spinous bristle present on medial side near d-bristle; end joint similar to that on female.

Maxilla and 5th limb: Same as those on female.

Sixth limb (Figure 246*i,j*): Anterior margin, tip, and posteroventral margin with same number of bristles as on that of female; minute bristle present on medial side near anterior proximal corner (probably also present on female but not seen with certainty).

Seventh limb: Same as that on female.

Furca (Figure 246*k*): Each lamella with 8 claws; last claw weak but similar in shape to other claws (not secondary type).

Posterior: Thumblike process similar to that on female.

Lateral eye (Figure 246*m*): Lateral eye larger than that on female and with about 22 ommatidia.

Medial eye and rod-shaped organ (Figure 246*p*): Medial eye slightly smaller than lateral eye; both medial eye and rod-shaped organ similar to those on female.

Upper lip (Figure 246*n,p-r*): Similar to that on female.

Copulatory organ (Figure 246*o*): Indistinct, lobate, with 1 or 2 bristles on some lobes.

POPULATION STRUCTURE OF SAMPLE FROM AKAROA HARBOR.—The sample I received contained 310 specimens of *Diasterope grisea*: 66 adult ♀♀ (including 32 gravid specimens), 2 adult ♂♂, and 242 juveniles of both sexes.

REMARKS.—A characteristic of this species is the presence of a tuft of 3 midbristles on the dorsal margin of the mandibular basale. The presence of these bristles on the mandible of the specimens mounted on the 3 slides obtained from Dr. McKenzie verifies that the specimens I describe herein

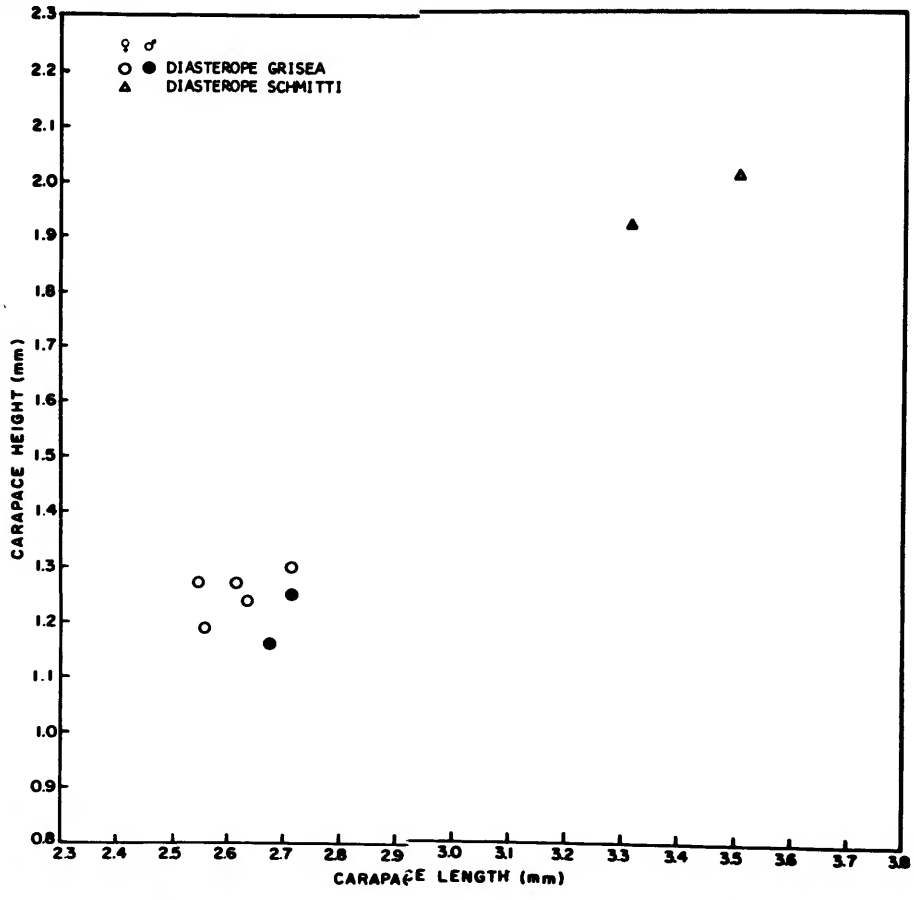

FIGURE 247.—Comparison of relationship between shell length and height of adults of *Diasterope grisea* and *D. schmitti*.

are conspecific with those studied by Brady. The description of the species by Brady (1898) is too sketchy to permit its use in identification, but it contains no information that might contradict my contention that the specimens I describe are conspecific with *Asterope grisea* Brady. The length of the female carapace given by Brady (1898:432) of 2.88 mm is somewhat greater than lengths of the 5 females I measured (2.56 to 2.72 mm). Müller (1912:46) gave the length of the female as 2.5–2.8 mm, but does not say where he obtained the measurements.

DISTRIBUTION.—This species has been collected only in Akaroa Harbor, New Zealand, at a depth of 11 m (Figure 242).

62. *Diasterope schmitti*, new species

FIGURES 248–251

HOLOTYPE.—USNM 125979, adult ♀, length 3.51 mm, height 2.01 mm. Valves and some appendages in alcohol, remaining appendages on slides.

TYPE-LOCALITY.—Station S.I.-2, Deep Freeze IV, USS *Staten Island*, Robertson Bay, west of Cape Adare.

ETYMOLOGY.—The species is named after Dr. Waldo L. Schmitt.

PARATYPES.—USNM 125982, 2 juveniles from same sample as holotype; USNM 125975, juvenile ♀; USNM 125976, juvenile, length 2.17 mm, height 1.28 mm; USNM 125977, 2 juveniles. USNM 125975–125977 from Deep Freeze IV, USCGC *Northwind*, station 8, Ross Sea.

ADDITIONAL SPECIMENS.—USNM 126101, gravid ♀; USNM 126102, 34 adults and juveniles; USNM 127488, 1 juvenile ♂, length 2.02 mm, height 1.22 mm; USNM 127501, 1 juvenile ♂; USNM 136580, 1 juvenile ♀. USNM 136580 from *Eltanin* Cruise 27, station 1896; others from Deep Freeze I, USS *Edisto* stations 5, 6, 8; USNM 136580, 1 juvenile ♀, length 2.68 mm, height 1.69 mm, from *Eltanin* Cruise 27, station 1896.

DIAGNOSIS OF ADULT FEMALE.—Carapace length about 3.32–3.51 mm; 6 processes forming row on posterior infold between list and valve margin.

Mandible: Dorsal margin of basale with 5 mid-bristles.

Seventh limb: With 31 bristles.

DESCRIPTION OF ADULT FEMALE (Figures 248–249, 250*a-h*).—Carapace elongate; anterior and posterior margins evenly rounded; ventral and dorsal margins slightly convex (Figures 248, 249 *a,b*).

Infold: 6 processes forming row between list and posterior shell margin.

Size (Figure 247): USNM 125979, length 3.51 mm, height 2.01 mm; USNM 126101, length 3.32 mm, height 1.92 mm.

First antenna (Figure 249*c,d*): 1st and 2nd joints with short spines forming clusters on lateral surfaces; 2nd joint with 2 spinous bristles, 1 disto-lateral, 1 dorsal; 3rd joint with 6 or 7 long spinous dorsal bristles and 1 short bare ventral bristle; 4th joint with 1 long spinous dorsal bristle and 2 short terminal ventral bristles; sensory bristle of 5th limb with 1 short proximal filament and 6 long terminal filaments; 6th joint with 1 long spinous medial bristle. Seventh joint: a-claw with smooth margins; b-bristle with 4 long filaments; c-bristle with about 4 filaments. Eighth joint: d-bristle represented by short spine; e-bristle bare, almost as long as sensory bristle of 5th joint; f-bristle with 5 spinous marginal filaments, part of bristle distal to 4th filament bearing marginal spines; g-bristle with at least 5 marginal filaments (bristle broken near tip).

Second antenna (Figure 249*e*): Protopodite: anterior margin with faint spines, posterior margin bare; medial bristle absent on right limb of holotype and represented by short stump on left limb, but present on paratype. Endopodite 3-jointed with terminal bristle about one and one-half times length of stem. Exopodite: joints 3 to 9 with short basal spines; joints 2 to 8 with short spines forming row

FIGURE 248.—*Diasterope schmitti*, female, USNM 125979, length 3.51 mm.

FIGURE 249.—*Diasterope schmitti*, female, USNM 125979, length 3.51 mm, carapace: *a*, complete specimen, lateral view; *b*, sketch of central muscle scars on right valve, lateral view. Right 1st antenna, lateral view: *c*, complete limb; *d*, detail of tip. Right 2nd antenna, medial view: *e*, endopodite, part of protopodite and 1st exopodial joint. Right mandible: *f*, limb without coxale endite, medial view; *g*, coxale endite, lateral view. Right maxilla: *h*, limb without endite, medial view. Right 5th limb, medial view: *i*, comb showing exopodial bristles and 6 hairs on tip. (Same magnification in microns: *b,h; c,f,g; e,i*.)

along distal margins; bristle of 2nd joint reaching past 9th joint and with short slender spines along outer margin. Ninth joint with 4 bristles: 3 long with natatory spines, 1 medium with few slender spines, 1 short with short marginal spines. Ninth joint of right limb of holotype aberrant. Exopodite of both limbs of holotype with 3 to 5 elliptical forms of unknown taxonomic affinity (Figure 250*h*).

Mandible (Figure 249*f,g*): Ventral branch of coxale endite with spines forming 6 or 7 oblique rows, and tip with 2 or 3 rounded teeth; ventral margin of dorsal branch with 3 or 4 rounded teeth and short main spine, dorsal margin with long subterminal bristle with short marginal spines; slender bristle present on endite near base. Basale endite with 4 pectinate end bristles and 2 triaenid bristles, one with 6 pairs of lateral spines, other with 15; 2 dwarf bristles present near low glandular peg. Ventral margin of basale with 1 triaenid bristle with 5 pairs of lateral spines and U-shaped process; dorsal margin with 2 long terminal bristles and 5 midbristles with common basal area, all bristles with distal marginal spines. Exopodite with 2 short terminal bristles and hirsute tip, length slightly more than 50 percent of dorsal margin of 1st endopodite joint. Endopodite: 1st joint with 3 spinous ventral bristles; ventral margin of 2nd joint with 3 long spinous terminal bristles; dorsal margin with 2 proximal bristles, and stout a-, b-, c-, and d-bristles, all bristles with distal marginal spines; long slender bristle present between b- and c-bristles, with base slightly lateral to base of c-bristle; 3 short pectinate bristles present medially between b- and c-bristles; 3 pectinate medial bristles present near base of c-bristle; about 6 pectinate medial bristles present between bases of c- and d-bristles; 1 long spinous lateral bristle present

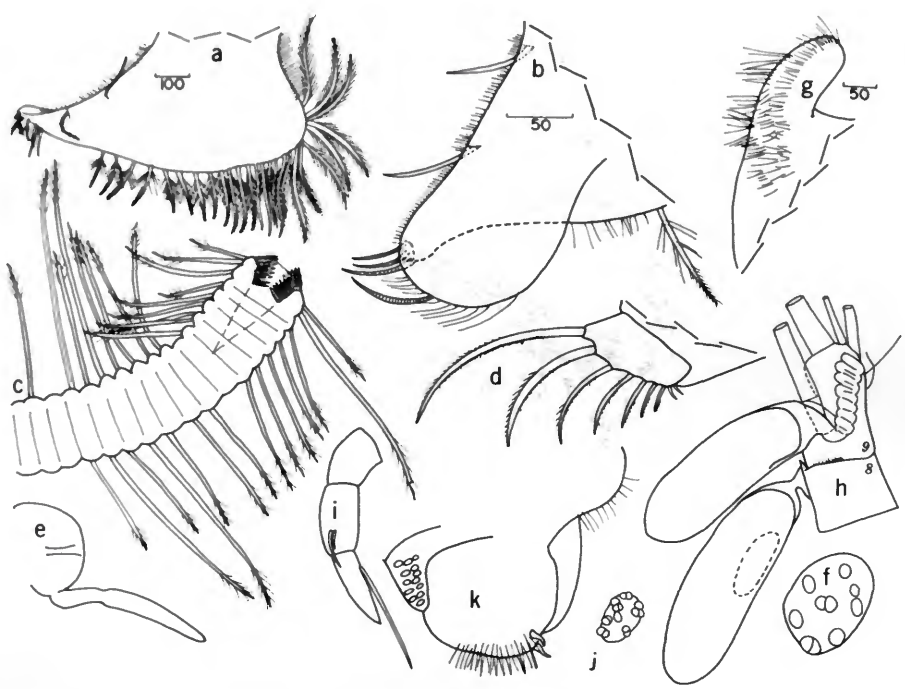

FIGURE 250.—*Diasterope schmitti*, female, USNM 125979: *a*, right 6th limb, medial view; *b*, anterior of left 6th limb, lateral view; *c*, right 7th limb; *d*, left lamella of furca; *e*, medial eye and rod-shaped organ; *f*, right lateral eye; *g*, posterior process; *h*, organisms attached to exopodite of right 2nd antenna. N-2 male, USNM 127501, length 2.37 mm; *i*, endopodite of left 2nd antenna, lateral view; *j*, right lateral eye. Juvenile female, USNM 125975, length 2.57 mm: *k*, upper lip. (Same magnification in microns: *a,d,e; c,g,i,j,k*.)

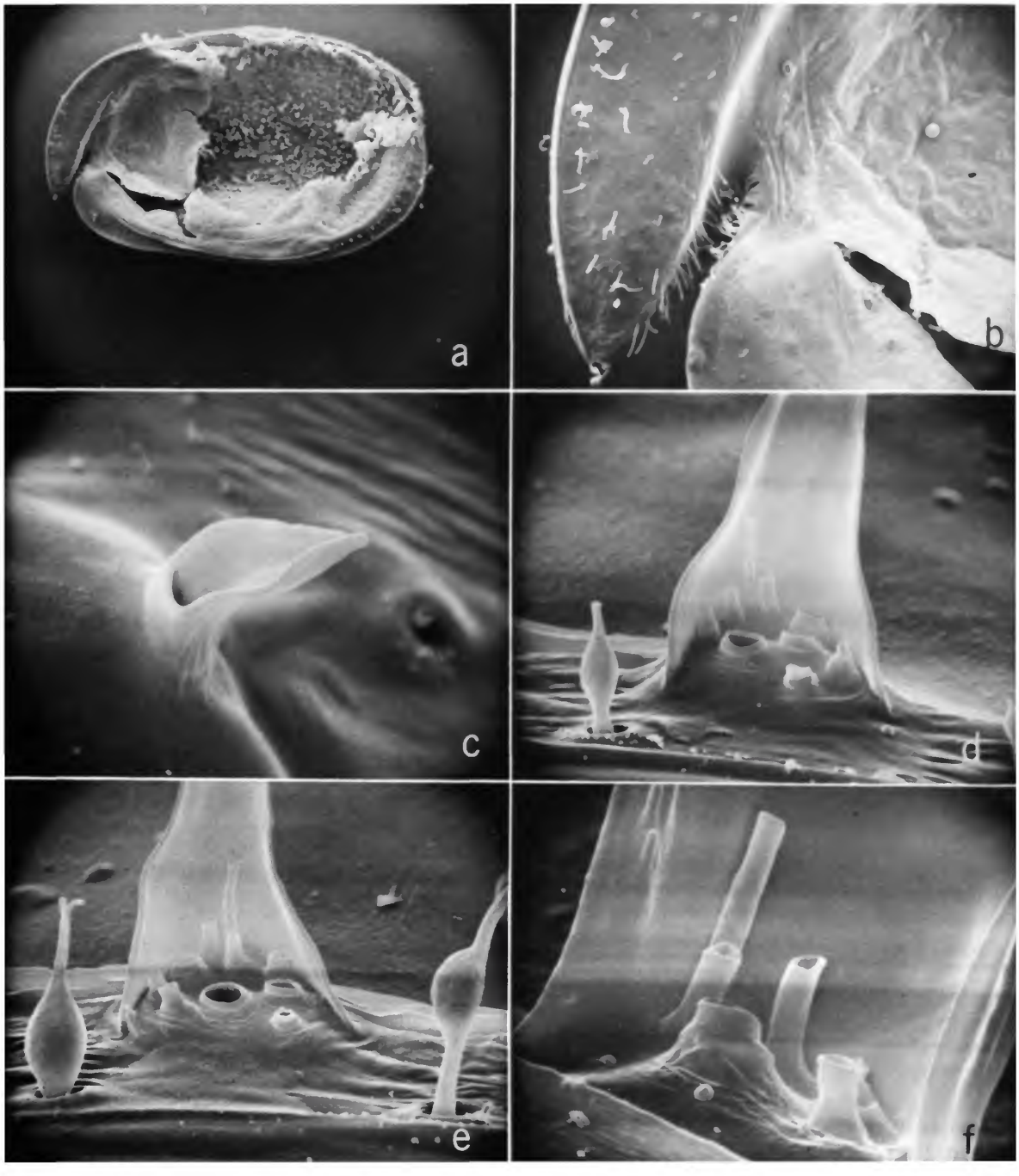

FIGURE 251.—*Diasterope schmitti*, N–1 female, USNM 136580, right valve, medial view: *a*, complete valve, × 32; *b*, anterior, × 160; *c*, process between posterior list and valve margin, × 8200; *d,e*, detail of pores and bristles on list, × 3100; *f*, detail of pores and tubes at base of bristles on list, × 7800.

between c- and d-bristles; 1 long spinous bristle present distal to d-bristle with base slightly medial to base of d-bristle; all medial spines with bases very close to dorsal margin of joint. Third joint: dorsal claw smooth, about same length as combined 2nd and 3rd endopodite joints; 3 long claw-like bristles with distal marginal spines, 2 remaining more slender bristles also spinous.

Maxilla (Figure 249*h*): Epipodite triangular with hairs along acute tip; proximal endite with short, slender, bare bristle and 3 long spinous bristles; distal endite with 3 long spinous bristles; dorsal margin of basale spinous and with 2 bristles, 1 near tip of epipodite, other near base; ventral margin of basale with 2 bare proximal bristles and 1 long spinous terminal bristle; lateral side of basale with 1 short proximal bristle. Endopodite: 1st joint with 1 short bristle near middle of dorsal margin and 1 long terminal bristle on ventral margin; 2nd joint with 1 long spinous terminal bristle.

Fifth limb (Figure 249*i*): Epipodial appendage with about 79 bristles; long stout exopodite bristle reaching past end of comb; 3 pairs of bristles, some with marginal spines, present on lateral surface of comb below stout exopodite bristle; dorsal margin of comb without hairs.

Sixth limb (Figure 250*a,b*): Anterior margin with 2 slender bristles, lower bristle with a few marginal spines; anterior tip with 6 or 7 bristles; posteroventral margin with 26 bristles; margin and medial surface hirsute.

Seventh limb (Figure 250*c*): Limb with total of 31 bristles consisting of 5 long bristles, each with 4 distal bells, and 27 short bristles, each with 3 distal bells; opposing terminal combs with 16 to 20 spinous teeth.

Furca (Figure 250*d*): Each lamella with 9 claws, 7 primary, 2 secondary; primary claws with teeth along concave margin, some also with hairs along convex margin.

Posterior (Figure 250*g*): Thumblike dorsal process with long spines forming clusters present.

Lateral eye (Figure 250*f*): Eye small with about 8 ommatidia.

Medial eye and rod-shaped organ (Figure 250*e*): Medial eye larger than lateral eye; rod-shaped organ 1-jointed, widened at middle and with rounded tip.

Attached organisms (Figure 250*h*): Exopodites of the 2nd antennae of the holotype with 3 to 5 elliptical objects attached by cylindrical trunk (possibly egg case, organism unknown). Also attached to limbs are a few segmented filaments.

Eggs: USNM 126101 with 12 eggs in brood chamber.

DESCRIPTION OF JUVENILE FEMALE.—USNM 136580, N–1 instar, length 2.68 mm, height 1.69 mm (Figure 251); USNM 125975, ?N–1 instar, length 2.57 mm, height 1.50 mm.

Upper lip: See Figure 250*k*.

DESCRIPTION OF JUVENILE (?N–2) MALE (Figure 250*i,j*).—Carapace similar in shape to adult female. Size: USNM 127501, length 2.37 mm, height 1.50 mm.

First antenna: Sensory bristle of 5th joint similar to that on adult female.

Second antenna: Endopodite 3-jointed: 1st joint short bare; 2nd joint elongate with 2 small distal lateral bristles; 3rd joint elongate with 1 long proximal dorsal bristle (Figure 250*i*).

Lateral eye: Well developed with about 9 divided ommatidia (Figure 250*j*).

COMPARISONS.—The carapace of this species is more than a millimeter longer than previously described species of the genus *Diasterope*. The cluster of 5 midbristles on the dorsal margin of the basale of the mandible and the large number of bristles on the 7th limb (31) distinguishes *D. schmitti* from other species of the genus.

DISTRIBUTION.—This species was collected in the Ross Sea at shelf to possibly bathyal depths (75–?400 m) (Figure 242).

Diasterope Species Indeterminate

MATERIAL.—1 N–1 ♂, length 1.46 mm, height 1.03 mm. This specimen was in a sample obtained from the South Australian Museum labeled Residue 155. I was informed by Patricia M. Thomas (letter, 15 June 1971) that the residue was obtained from "Coll. 317 Crozet Island (Possession I) 21.11.29. Swamp." This sample is probably from an unnumbered station located between *Discovery* Cruise 1, stations 2 and 3 of the B.A.N.Z. Antarctic Expedition (see Johnston, 1937:13). The date given by Johnston is "2nd-3rd November, 1929," but I contribute the discrepancy to a possible lapse in labeling the sample.

DISTRIBUTION.—This catagory was collected only in the locality discussed above (Figure 242).

Dolasterope Poulsen, 1965

TYPE-SPECIES.—*Dolasterope johanseni* Poulsen, 1965:317, monotypy.

DIAGNOSIS OF FEMALE.—Carapace elongate; incisur continuous at inner end.

First antenna: Sensory bristle of 5th joint of female with numerous filaments (23 in *D. johanseni*); d- and e-bristles of 8th joint well developed and of similar length.

Second antenna: Natatory bristles of exopodite without marginal spines.

Mandible: Long lateral bristle present between b- and c-bristles of dorsal margin of 2nd endopodite joint.

Maxilla: End joint with 2 long bristles.

Sixth limb: Ventral margin with large number of bristles (30–35 for *D. johanseni*). Anterior margin of limbs on *D. johanseni* with 2 upper and 1 lower bristle.

Seventh limb: Limb with numerous bristles (25–30 on *D. johanseni*).

Furca: Each lamella broad, triangular with bristles present between claws.

Lateral eyes: Not observed on *D. johanseni*.

DISTRIBUTION.—The genus is known only from one specimen collected at entrance to Milford Sound, New Zealand (Figure 252).

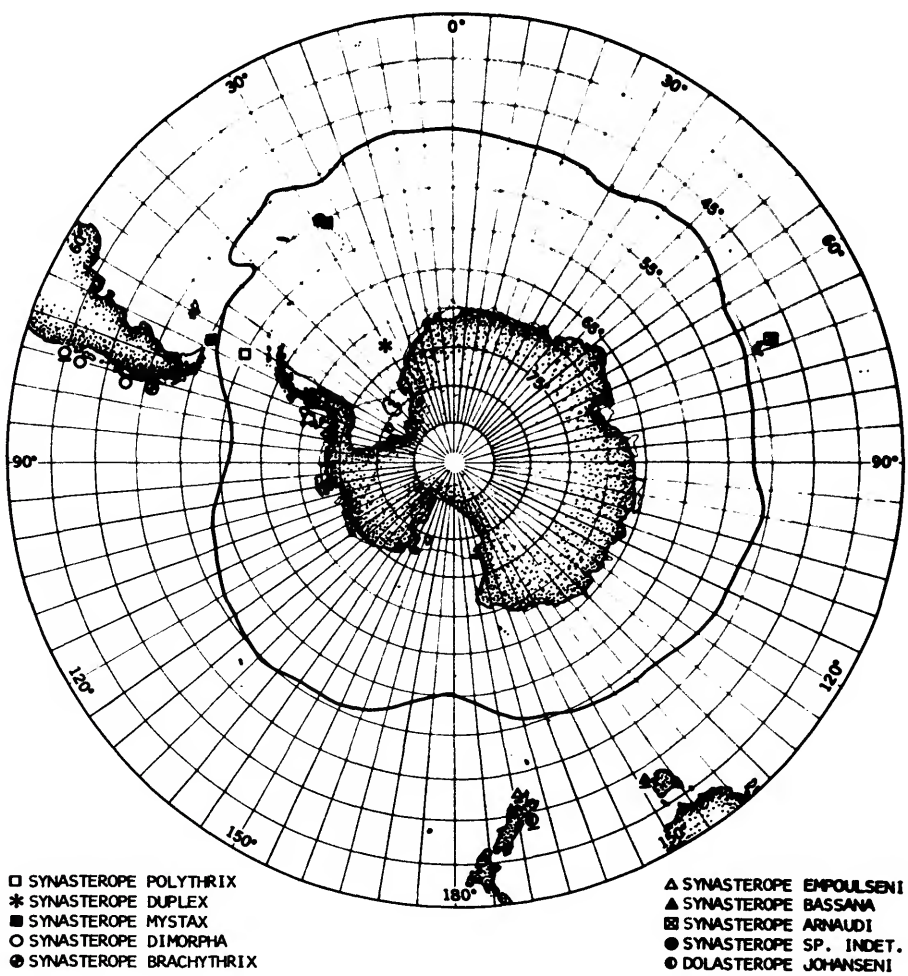

FIGURE 252.—Distribution map.

63. *Dolasterope johanseni* Poulsen

Dolasterope johanseni Poulsen, 1965:318, figs. 105, 106.—Eagar, 1971:61.

HOLOTYPE.—A female without embryos, length only 2.9 mm, unique specimen.

TYPE-LOCALITY.—*Galathea* station 619, entrance to Milford Sound, New Zealand, 44°34′S, 167°48′E, 136 m.

MATERIAL EXAMINED.—None.

DIAGNOSIS.—Same as genus.

DISTRIBUTION.—Known only from type-locality (Figure 252).

Parasterope Poulsen, 1965

TYPE-SPECIES.—*Asterope muelleri* Skogsberg, 1920, designated herein.

One species, *P. curta* (Skogsberg, 1920) included by Poulsen (1965:362) in the genus *Parasterope* has been referred herein to the new genus *Homasterope*.

Parasterope is represented by nine species in the study area: *P. anommata*, new species; *P. crinita*, new species; *P. longiseta* (Skogsberg, 1920); *P. styx*, new species; *P. micrommata*, new species; *P. ohlini* (Skogsberg, 1920); *P. prolixa*, new species; *P. pseudoquadrata* (Hartmann, 1965); *P. quadrata* (Brady, 1898).

DIAGNOSIS OF GENUS.—Carapace in most species reaching greatest height posterior to middle, especially in females; some species with ventral and posterior margins subparallel; no ridge present on infold between posterior list and edge of valve.

First antenna: Dorsal margin of 3rd joint with 6 spinous bristles; sensory bristle of 5th joint of female with 6 terminal filaments (juvenile males of some species with 1 short proximal filament in addition to 6 terminal filaments); d-bristle of 8th joint minute or missing.

Second antenna: Endopodite of adult male 3-jointed with elongate 3rd joint reflexed upon 2nd.

Mandible: Exopodite extending beyond middle of dorsal margin of 1st exopodite joint; tip of ventral branch of coxale endite with 1 to 3 short hairs or teeth.

Maxilla: Distal endite with 3 spinous bristles; end joint of endopodite with 1 bristle.

Sixth limb: Anterior margin with 1 upper and 1 lower bristle, except *P. styx* which bears 6 or 7 upper bristles and no lower bristle.

Furca: Each lamella with 8–10 claws with posterior 1–3 claws bristlelike, often pointing backward.

DISTRIBUTION.—Members of *Parasterope* are widespread. The northernmost locality from which species of the genus have been reported is from the Atlantic Ocean in the vicinity of Ireland. The

Key to Species

(Includes only species south of 35°S)

1. 6th limb with 6 or 7 upper bristles on anterior margin, lateral eyes absent on female (male unknown) ..... 72. *P. styx*
   6th limb with only 1 upper bristle, lateral eyes on female either present or absent 2
2. Carapace length equal to or greater than 2.00 mm, lateral eyes present on female ..... 64. *P. ohlini*
   Carapace length smaller than 1.85 mm, lateral eyes either present or absent on female 3
3. Carapace length greater than 1.55 mm, lateral eyes either present or absent on female 4
   Carapace length smaller than 1.45 mm, lateral eyes present on female 5
4. Lateral eyes absent on female (male unknown) ..... 71. *P. anommata*
   Lateral eyes of female with 3 ommatidia (male unknown) ..... 69. *P. micrommata*
   Lateral eyes of females with 9 ommatidia ..... 68. *P. pseudoquadrata*
   Lateral eyes of female with 16 ommatidia (male unknown) ..... 65. *P. longiseta*
5. Dorsal margin of mandibular basale with long hairs and short spines ..... 70. *P. crinita*
   Dorsal margin of mandibular basale without hairs and spines 6
6. Distal bristle on dorsal margin of basale of maxilla only slightly longer than proximal bristle ..... 66. *P. quadrata*
   Distal bristle on dorsal margin of basale of maxilla almost twice length of proximal bristle ..... 73. *P. prolixa*

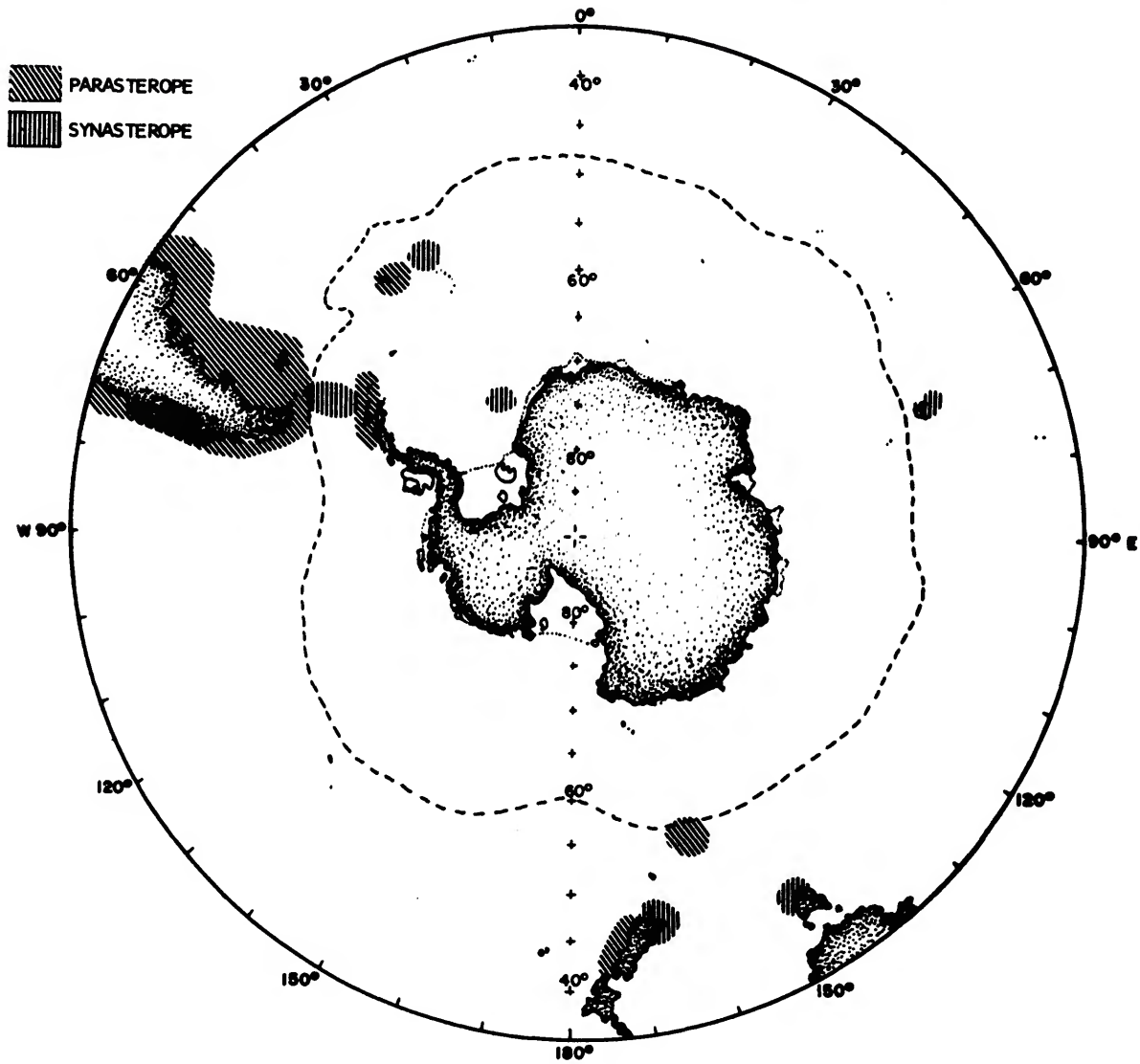

FIGURE 253.—Distribution map.

southernmost locality is in the Palmer Archipelago, 64°45′46″S, 64°06′17″W (Figure 253). Species of the genus are generally found in waters shallower than 1000 m, but one species, *P. styx*, was collected at 4303 m in the Pacific Ocean off the coast of Chile.

64. *Parasterope ohlini* (Skogsberg)

Asterope ohlini Skogsberg, 1920:467, 493, figs. 91, 92.

Parasterope ohlini (Skogsberg).—Poulsen, 1965:363 [key].—Kornicker, 1971:203, figs. 23c,d, 24, 25 [supplementary description].

Parasterope lowryi Kornicker, 1971:197, figs. 20–22, 23a,b.

Not *Parasterope ohlini* (Skogsberg).—Lofthouse, 1967:143.

HOLOTYPE.—Swedish State Museum (Riksmuseum), Stockholm (see Skogsberg, 1920:504).

TYPE-LOCALITY.—South Georgia, S.A.E. Station 25, off Grytviken, 54°22′S, 36°27′W, 24–52 m, gray clay with scattered algae.

MATERIAL.—USNM 125817, gravid ♀; USNM 125816, gravid ♀; USNM 125821, 3 gravid ♀♀, 3 juveniles; USNM 125827, gravid ♀; USNM 125830, 1 juvenile (right valve missing); USNM 127381, gravid ♀; USNM 127480, gravid ♀; USNM 138165, 1 gravid ♀; USNM 138653, 1 adult ♀ without eggs; USNM 138654, 1 adult ♀ without eggs.

USNM 125817, 125816, 125821 from *Eltanin* Cruise 12, station 1003; USNM 125827, 125830 from *Eltanin* Cruise 6, station 418; USNM 127381 from Palmer Station AH4–70; USNM 127480 from *Hero* Cruise 69–1, station 9; USNM 138165, 138653, 138654 from XXIII Chilean Antarctic Expedition, *Hero* station 69–24.

In addition, 3 juveniles from *Hero* station 69–24 were returned to the Instituto Central de Biología, Chile.

DIAGNOSIS OF ADULT FEMALE.—Carapace with greatest height posterior to middle; 13–21 bristles on infold between list and posterior margin of carapace; carapace length 2.00–2.36 mm, height 1.42–1.71 mm (Figure 254).

Mandible: Dorsal margin of basale without mid-bristle.

Maxilla: Proximal endite with 4 bristles, 3 long, 1 short; distal endite with 3 long bristles; dorsal margin of basale with fairly long proximal and longer distal bristle; ventral margin of basale with fairly long proximal bristle, minute distal bristle,

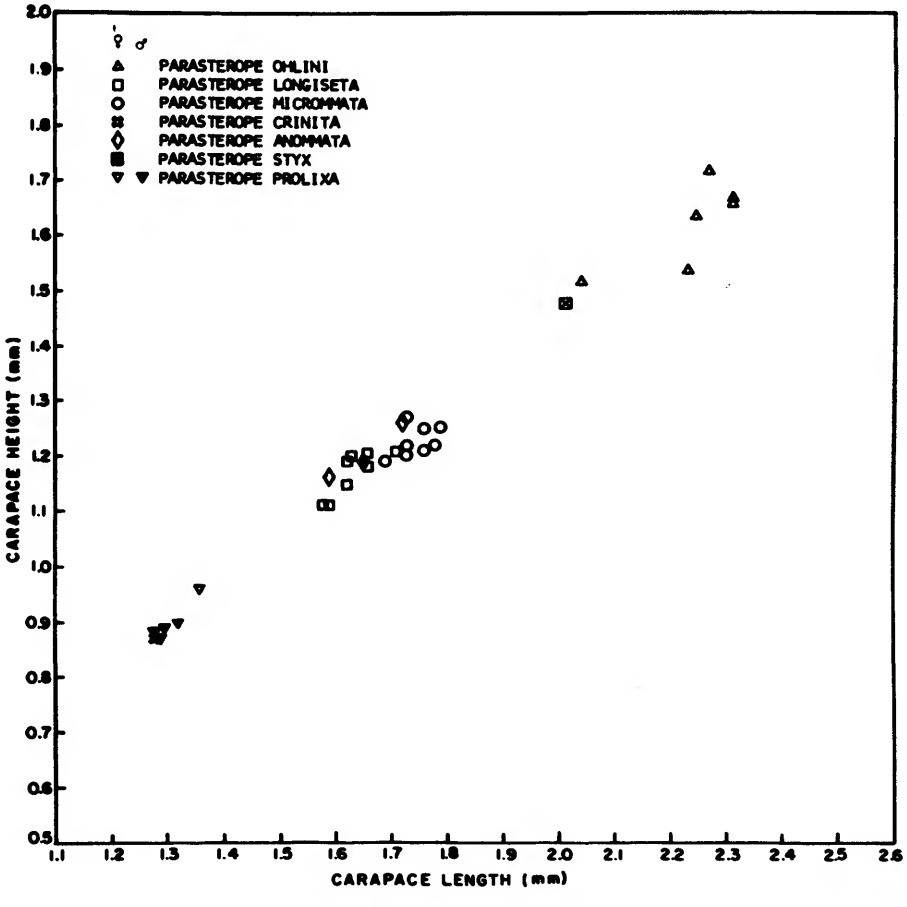

FIGURE 254.—Comparison of relationship between shell length and height of adults of *Parasterope*.

on 1st and long terminal bristle: terminal bristles of fine and 2nd joints of endopodite bare or with marginal spines. joint

Sixth limb: Posteroventral margin of end with 21–25 bristles. istles.

Seventh limb: Each limb with 12 or 13 br angle,

Posterior: Dorsum forming almost right hirsute. om-

Lateral eyes: Well developed with 9–11 matidia. Fe-

Supplementary Description of Adult male.—Size of carapace (Figure 254): USNM 125817, length 2.31 mm, height 1.67 mm; USNM 125816, length 2.04 mm, height 1.52 mm; USNM 125827, length 2.23 mm, height 1.59 mm; USNM 127381, length 2.31 mm, height 1.66 mm; USNM 127480, length only 2.36 mm; USNM 138165, length 2.24 mm, height 1.64 mm; USNM 138653, length 2.27 mm, height 1.71 mm.

Eggs: USNM 125817, 14 eggs; USNM 125816, 9 eggs; USNM 125827, 8 eggs; USNM 127381, 15 eggs; USNM 127480, 8 eggs; USNM 138165, 15 eggs.

Remarks Concerning *P. lowryi*.—Because some of the specimens in the present collection have characters intermediate between *P. lowryi* and *P. ohlini*, I have placed the former species in the synonymy of the latter species. In general, the

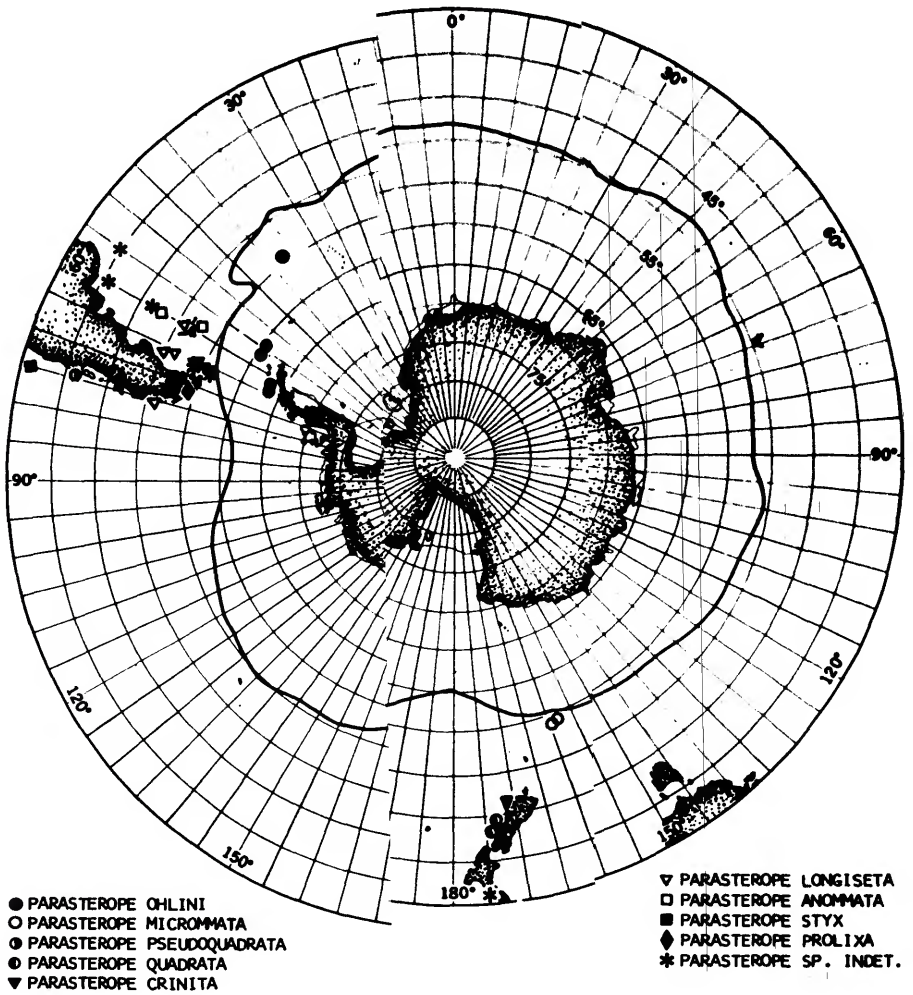

Figure 255.—Distribution map.

population in the vicinity of Palmer Archipelago, and within the Antarctic Convergence, differs from the population in the vicinity of South Georgia in having fewer bristles on the posterior infold and fewer spines on the terminal bristles on the endopodite joints of the maxilla. Exceptions are specimens from *Hero* Station 69–24 that bear 19 bristles on the posterior infold and have spinous terminal bristles on endopodite joints of the maxilla.

REMARKS CONCERNING SPECIMEN FROM NEAR KERGUELEN ISLAND IDENTIFIED BY LOFTHOUSE (1967: 143) AS *Parasterope ohlini*.—Through Dr. K. G. McKenzie I received two slides, each bearing the label, "*Parasterope ohlini* (Skogsberg). ? juv. Res. 92 Kerguelen, B.A.N.Z.A.R.E 1966.F.20.59." This residue is from *Discovery* Cruise 1, station 51. One slide bears appendages, the other, 2 valves. The condition of the appendages on the slide does not permit my verification of Lofthouse's identification of the genus to which the specimen, a juvenile ♂, belongs. One of the valves bears on the posterior infold, between the list and the posterior edge of the shell, a ridge similar in position to the ridge present on the right valve of *Skogsbergiella spinifera* (Skogsberg). The ridge, unlike that on *S. spinifera*, bears 14 or more obscure processes. Because specimens of *Parasterope ohlini* have neither a ridge nor processes between the list and posterior edge of the valve, I disagree with the identification by P. Lofthouse, but because of lack of material I am not able to identify the species. The specimen has been listed herein as Cylindroleberidinae genus indeterminate,

Through Mr. David C. Lee I received from the South Australian Museum two slides bearing the labels, "*Parasterope ohlini* B.A.N.Z.A.R.E., Res. 197." Presumably the identification was made by Lofthouse. This residue is from *Discovery* Cruise 1, station 53. One of the slides bears 2 valves, the other appendages. The right valve bears a posterior ridge anterior to the posterior margin of the valve. A ridge of this type is not present on *Parasterope ohlini*. The appendages are somewhat obscure. The shape of the shell, the absence of the d-bristle on the 1st antenna, the presence of a long lateral bristle between the b- and c-bristles on the dorsal margin of the 2nd endopodite joint of the mandible indicate that the specimen may be a *Parasterope*, but obscurity of some features on the appendages does not permit certain identification. Therefore, the specimen is considered Cylindroleberidinae genus indeterminate herein.

DISTRIBUTION.—This species was collected in the vicinity of South Georgia, Palmer Archipelago, Bransfield Strait, and South Shetland Islands from depths of about 13 to 368 m (Figure 255).

65. *Parasterope longiseta* (Skogsberg)

FIGURES 256, 257

Asterope Mülleri var. *longiseta* Skogsberg, 1920:467, 497, fig. 90.

Parasterope muelleri longiseta (Skogsberg).—Poulsen, 1965: 469, fig. 155 [map].

HOLOTYPE.—Swedish State Museum (Riksmuseum), Stockholm (see Skogsberg, 1920:493).

TYPE-LOCALITY.—Falkland Islands, S.A.E., station 51, Port William.

MATERIAL.—USNM 136162, gravid ♀; USNM 136163, 3 gravid ♀♀ + 2 juveniles (not dissected); USNM 137097, 4 gravid ♀♀ + 2 juveniles; USNM 137083, 1 gravid ♀ + 1 adult ♀ without eggs + 4 juveniles; USNM 137102, 3 gravid ♀♀; USNM 137389, 1 gravid ♀; USNM 137444, 1 juvenile ♀, length 1.45 mm, height 1.00 mm, + 1 juvenile; USNM 137447, gravid ♀ (not dissected); USNM 137449 1 specimen without carapace; USNM 138026, 2 gravid ♀♀.

USNM 136162, 136163, 137097 from *Vema* Cruise 15, station V–15–107; USNM 137083 from *Vema* Cruise 17, station V–17–47; USNM 137102 from *Vema* Cruise 15, V–15–93; USNM 137389 from *Vema* Cruise 14, station V–14–14; USNM 137444, 137447, 137449 from *Vema* Cruise 15, station V–15–102; USNM 138026 from *Eltanin* Cruise 11, station 958.

I have raised the rank of this taxon to species because there seems little reason to consider this group to be closer to *P. muelleri* than many other species in the genus.

DIAGNOSIS OF ADULT FEMALE.—Carapace tumid with greatest height posterior to middle; 15–17 bristles present on infold between list and posterior margin of valve; carapace length 1.59–1.71 mm.

Mandible: Dorsal margin of basale without midbristle; basale with spines and hairs forming clusters.

Maxilla: Midbristle on dorsal margin of basale

as long as terminal bristle on end joint of endopodite; ventral margin of basale with 3 bristles, 1 proximal, 1 short distal, 1 long terminal.

Sixth limb: Posteroventral margin of end joint with 21 bristles.

Seventh limb: Each limb with 12 bristles.

Lateral eyes: Well developed with about 16 ommatidia.

SUPPLEMENTARY DESCRIPTION OF FEMALE.—Carapace tumid with greatest height posterior to middle; incisur short, placed below valve middle; ventral and posterior margins rounded; surface smooth, minute punctae visible under high magnification (Figures 256*a*, 257).

Infold: Rostral infold with 16 bristles on or posterior to list, and only 19 fairly long bristles and a few minute bristles anterior and dorsal to list; 9 short bristles forming row along anterodorsal infold observed on only right valve. List present starting near inner margin of anterior part of infold, extending along ventral infold and continuing on posterior infold where it broadens; broad infold below incisur with about 28 bristles, an additional 24 bristles present along ventral infold to point opposite broad posterior list; broad posterior list with 29 or 30 broad transparent bristles and about 24 small bristles—0 to 2 bristles (usually 1), small bristle between spines; 15 to 17 bristles present between broad posterior list and posterior margin of shell (12 to 14 in ventral half and 2 or 3 in upper part of dorsal half) (Figure 257).

Selvage: Faint broad selvage present along ventral margin of incisur (Figure 257*b,c*).

Size (Figure 254): USNM 136162, length 1.66

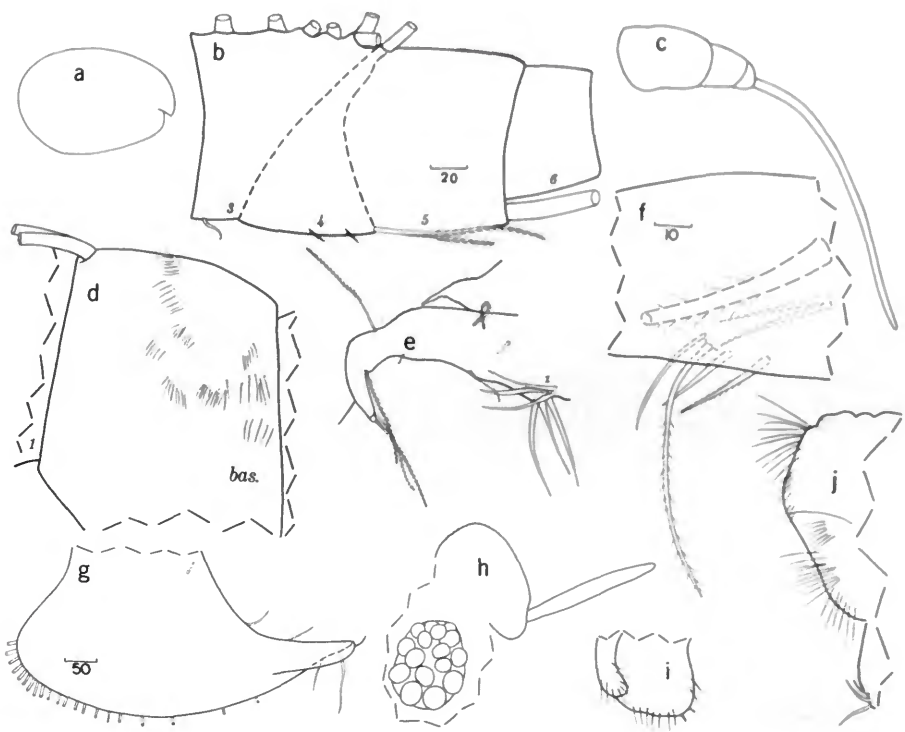

FIGURE 256.—*Drassiterope longiseta*, female, USNM 136162, length 1.66 mm: *a*, complete specimen, lateral view; *b*, joints 3–6 of right 1st antenna, lateral view; *c*, endopodite of left 2nd antenna, medial view; *d*, basale of right mandible, medial view (dorsal margin toward top); *e*, right maxilla, medial view; *f*, exopodial bristles on right 5th limb, medial view; *g*, right 6th limb, lateral view (only proximal ends of bristles on end joint shown); *h*, medial eye, rod-shaped organ, and right lateral eye; *i*, upper lip; *j*, posterior and posterior 3 claws on furca. (Same magnification in microns: *b-d; g-j*.)

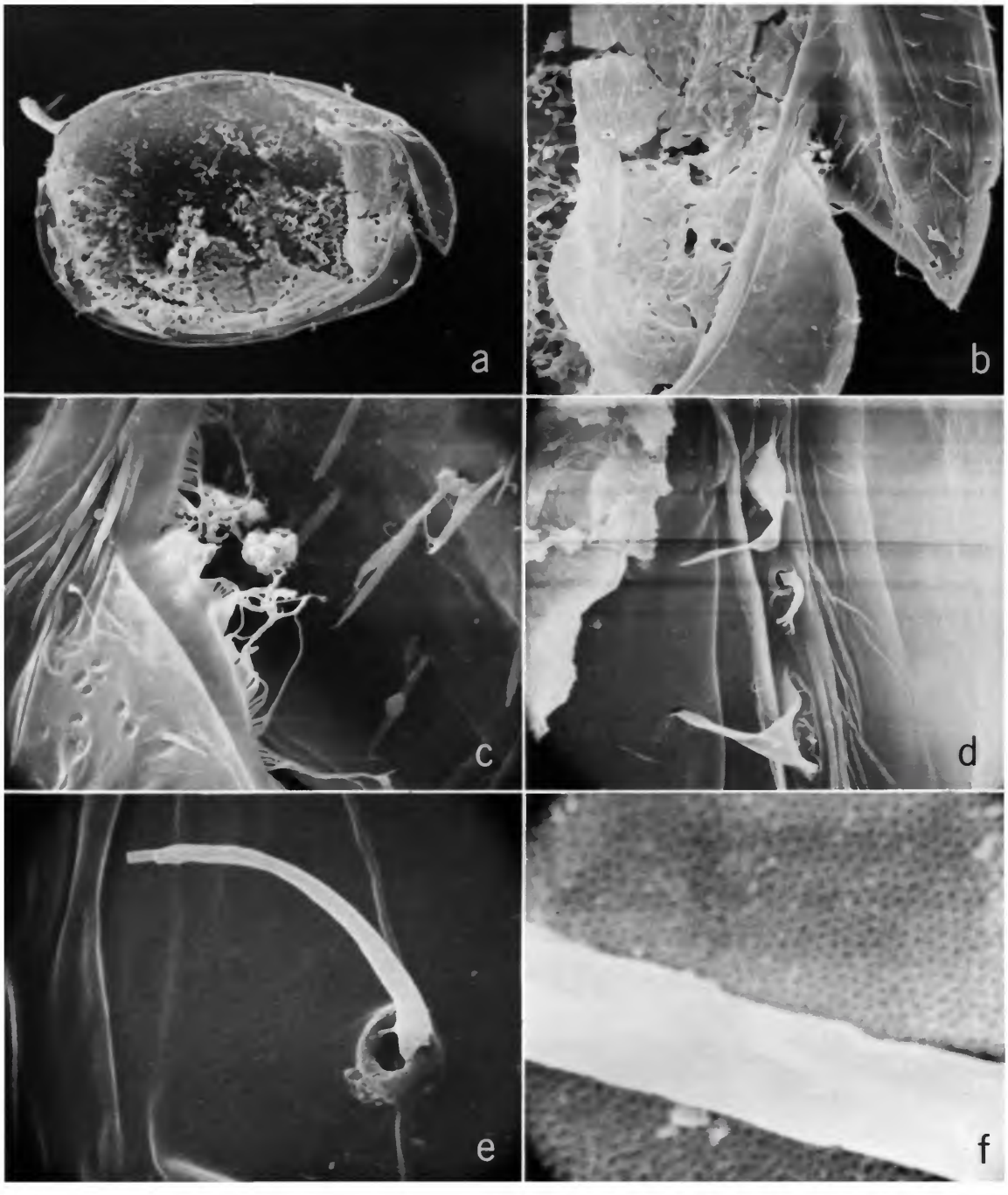

FIGURE 257.—*Parasterope longiseta*, female, USNM 136162, left valve, medial view: *a*, complete valve, × 50; *b*, anterior, × 200; *c*, lamella prolongation of selvage along incisur, × 875; *d*, posterior list showing flaplike bristles, × 4500; *e*, detail bristle between posterior list and posterior shell margin, × 3250; *f*, detail of rostrum showing bristle and texture of infold, × 17,500.

mm, height 1.18 mm; USNM 136163, length 1.63 mm, height 1.20 mm, + length 1.62 mm, height 1.19 mm; USNM 137083, length 1.71 mm, height 1.21 mm; USNM 137102, length 1.62 mm, height 1.19 mm; USNM 137389, length 1.66 mm, height 1.21 mm; USNM 137447, length 1.62 mm, height 1.15 mm; USNM 138026, length 1.59 mm, height 1.11 mm.

First antenna: Medial and lateral surfaces of 1st joint spinous; 2nd joint spinous with long spinous dorsal bristle with long anterior spines, short lateral bristle with short marginal spines; 3rd joint with 6 long dorsal bristles and 1 short ventral bristle; 4th joint with spines along dorsal margin, 1 long ventral bristle, and 2 slender dorsal bristles (longest of these reaching past end of 5th joint to point about one-third distance up 6th joint). Sensory bristle of 5th joint with 6 terminal filaments; dorsal margin of 5th joint with numerous minute teeth; medial bristle of 6th joint with short marginal spines. Seventh joint: a-claw with minute teeth near tip; b-bristle with 5 filaments including tip; c-bristle with 6 filaments including tip. Eighth joint: d-bristle respresented by minute process; e-bristle bare; f-bristle at angle to stem, with 5 filaments including tip, filaments with short marginal spines; g-bristle with 5 or 6 filaments (Figure 256*b*).

Second antenna: Protopodite with small medial bristle and spines forming clusters along anterior margin. Endopodite 3-jointed with long terminal filament. Exopodite: bristle of 2nd joint reaching past end of 9th joint and with slender ventral spines; bristles of joints 3 to 8 with natatory hairs; bristles of joints 3 to 5 (possibly others) with few spines along ventral margins; joint 9 with 4 bristles, 2 long with natatory hairs, 2 short with short marginal spines; joints 4 to 9 with basal spines; joints 2 to 8 with short spines forming row along distal margins.

Mandible: Medial surface of coxale spinous (scythe-shaped process broken off on limb examined). Basale: endite with 4 spinous end bristles, 1 dwarf bristle, glandular peg, and 3 triaenid bristles, each with 4 or 5 pairs of spines excluding terminal pair; ventral margin of basale near endite with 1 triaenid bristle with 4 pairs of marginal spines excluding terminal pair (bristle proximal to U-shaped process); medial surface of basale with spines forming clusters, some of these on dorsal margin; lateral surface with long hairs forming clusters in proximal dorsal corner; dorsal margin with 2 long spinous terminal bristles. Exopodite with 2 short bristles reaching end of 1st endopodite joint. Endopodite: 1st joint with 3 long spinous ventral bristles (shortest of these with only short marginal spines, remaining 2 with wreaths of long spines near middle); ventral margin of 2nd joint with 3 long terminal bristles with short marginal spines; dorsal margin of 2nd joint with 1 short proximal bristle and stout spinous a-, b-, c-, and d-bristles; 1 long lateral bristle present between b- and c-bristles and c- and d-bristles; 2 spinous cleaning bristles present at base of c-bristle; 6 spinous cleaning bristles present near base of c-bristle, 1 long spinous medial bristle present at base of d-bristles; end joint with dorsal claw with teeth along ventral margin and 5 spinous bristles, 4 long, 1 short (Figure 256*d*).

Maxilla: Epipodial appendage hirsute; proximal endite with 4 spinous bristles, 3 long, 1 short; distal endite with 3 spinous bristles (midbristle shorter than others); basale hirsute with 1 proximal bristle on medial side below epipodial appendage, 1 short lateral proximal bristle, 1 long spinous midbristle on dorsal margin, and 3 bristles on ventral margin, 1 proximal, 1 short distal, and 1 long spinous terminal. Endopodite: 1st joint with short anterior bristle and 1 long spinous posterior terminal bristle; end joint with long spinous terminal bristle (terminal bristle same length as midbristle on dorsal margin of basale) (Figure 256*e*).

Fifth limb: Dorsal margin of comb bare except near tip; stout spinous exopodial bristle reaching past end of comb; 2 short slender bristles ventral to base of stout exopodite bristles; 4 additional bristles present near ventral margin of comb (Figure 256*f*).

Sixth limb: Medial surface with minute bristle in anterodorsal corner; anterior margin with 1 upper and 1 lower bristle; anteroventral corner with 3 bristles; posteroventral margin (only right limb observed) with 21 bristles; bristles increasing in length posteriorly along margin; medial and lateral surfaces hirsute (Figure 256*g*).

Seventh limb: Proximal and distal groups each with 6 bristles, 3 on each side in each group, each bristle with 3 or 4 bells. Terminus with opposing combs, each comb with 10 spinous teeth.

Furca: Each lamella with 9 claws of which pos-

terior 3 are bristlelike, annulate; claws 1 to 7 with teeth along posterior margin forming row consisting of short and long teeth; claws 1 to 3 with hairs along anterior margin.

Rod-shaped organ: Elongate with rounded tip.

Eyes: Medial eye pigmented with hairs along dorsal margin. Lateral eye about same size as medial eye, pigmented with 16 ommatidia (Figure 256*h*).

Posterior: Posterior spinous without thumblike process (Figure 256*j*).

Upper lip: Lip hirsute with 2 anterior spines (Figure 256*i*).

Eggs: USNM 136162 with 2 eggs; USNM 136173, 3 ♀♀ with 7, 2, 3 eggs; USNM 137083, 9 eggs; USNM 137102, 12 eggs; USNM 137389, 9 eggs; USNM 137447, 5 eggs; USNM 138026, 6 eggs.

COMPARISONS.—This species is characterized by having a midbristle on the dorsal margin of the basale of the maxilla as long as the terminal bristle on the end joint of the endopodite. It also has relatively few transparent flaplike bristles on the posterior list and relatively few bristles between the posterior list and posterior shell margin. It also differs from many species in having spines and hairs forming clusters on the mandibular basale.

DISTRIBUTION.—This species has been collected from the Falkland Islands, the Argentine shelf, between 50°–55°S. Depth range is approximately 12–108 m (Figure 255).

66. *Parasterope quadrata* (Brady)

FIGURES 258*a-j*

Asterope quadrata Brady, 1898:432, pl. 45: figs. 17–21.—Müller, 1912:43 [key], 45.—Skogsberg, 1920:440, 465.

Synasterope quadrata (Brady) [part].—Eagar, 1971:61 [Brady's New Zealand specimens only included].

Not *Synasterope quadrata* (Brady).—Poulsen, 1965:406, fig. 135.

HOLOTYPE.—Not designated.

SYNTYPE-LOCALITY.—Lyttelton Harbor, New Zealand, dredge at depth of 1–5 fathoms.

MATERIAL.—Through Dr. K. G. McKenzie, I received some of Brady's material in the collection of the Hancock Museum, Newcastle-on-Tyne: 1 slide containing a dissected adult ♂ and labeled "*Asterope quadrata* n. sp. ♂, Lyttelton Harb. N. Z., 1–5 fath."; 1 slide containing a dissected ♀ and labeled, "*Asterope quadrata* n. sp. ♀, Lyttelton Harb. N. Z., 1–5 fath." (I have called this "my slide 1" in the supplementary description of the appendages); 1 slide containing appendages of 1 N–1 ♂ and 1 ♀ and labeled, "*Asterope quadrata* n. sp. ♀, Lyttelton Harb. N. Z., 1–5." (I have designated this "my slide 2" in the supplementary description); 1 vial labeled, "*Asterope quadrata* n. sp., Lyttelton Harb. N. Z., 1–5 fath." containing 3 complete specimens, 1 specimen without valves and furca, 2 articulated valves without bodies, several loose appendages in alcohol. Because the appendages on the slides in the Brady collection are obscure, I dissected and mounted in glycerine the specimen (N–1 ♂) in the vial that has the valves and furca missing. I have described that specimen, also those on the slides in the Brady collection. The Lyttelton Harbor material bears the number B500.

REMARKS.—The description of *Asterope quadrata* by Brady (1898) is so brief that it is almost necessary to assume that it and his figures of the species are based on the mounted specimens and preserved specimens in the collection of the Hancock Museum. I have compared the mounted specimens on the slides with a preserved specimen from the type-locality identified by Brady as *A. quadrata* and am satisfied that they are conspecific. I did not measure carapaces of specimens on hand because of their poor condition. Brady (1898:431) gave the length as 1.3 mm.

DIAGNOSIS OF ADULT? FEMALE.—Carapace length about 1.3 mm.

Mandible: Dorsal margin of basale without midbristle; basale without hairs or spines.

Maxilla: Distal bristle on dorsal margin of basale only slightly longer than proximal bristle.

Sixth limb: Posteroventral margin with about 15 or 16 bristles.

Seventh limb: With 12 bristles.

Lateral eye: With about 17 ommatidia.

SUPPLEMENTARY DESCRIPTION OF ADULT MALE (Brady's slide).—Carapace flattened, details obscure.

First antenna: d-bristle of 8th joint either minute or not present. Limb typical of subfamily.

Second antenna (Figure 258*a*): Exopodite: 9th joint with 4 bristles. Endopodite: 3-jointed with 3 short ventral bristles near middle of 2nd joint

(these are difficult to see in mount) and 1 long proximal bristle on 3rd joint.

Mandible (Figure 258*b*): Ventral branch of coxale endite with spines forming 4 oblique rows, and tip with 3 pointed teeth; ventral margin of dorsal branch with 2 paired and 2 or 3 single teeth and short main spine; dorsal margin with long subterminal bristle. Basale endite with 1 dwarf

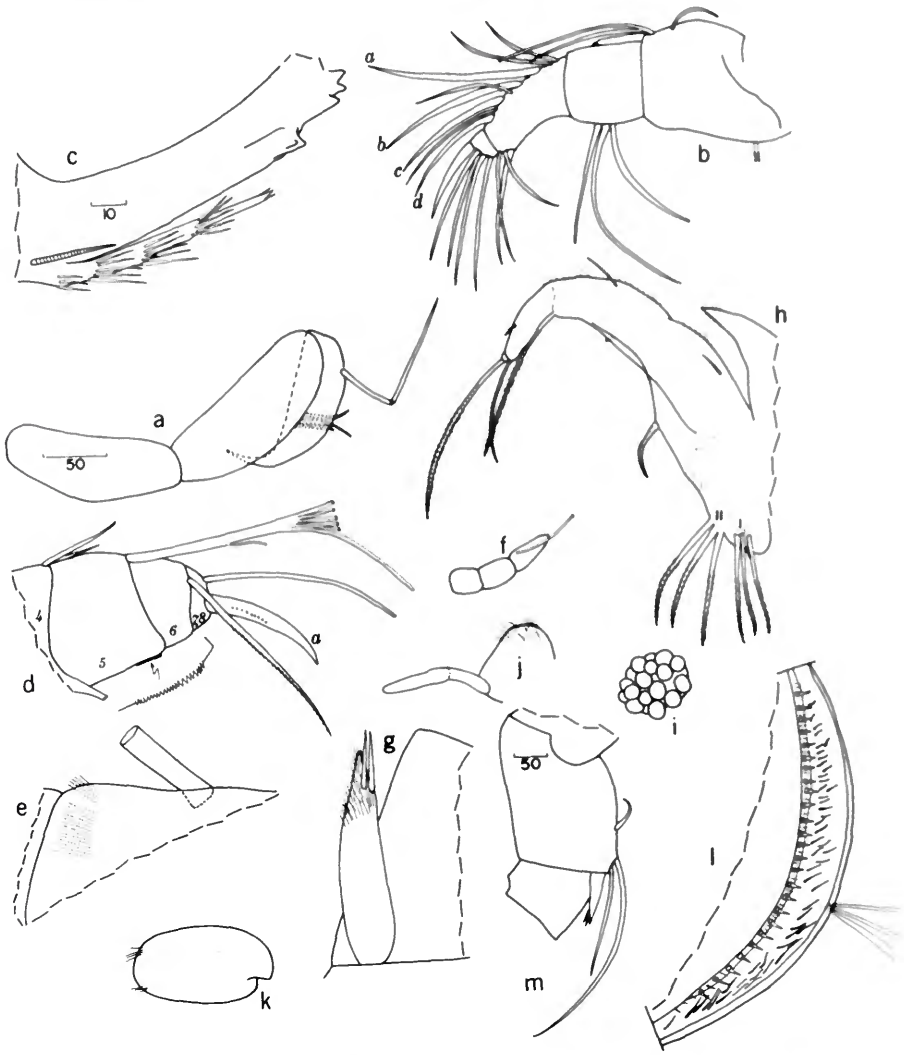

FIGURE 258.—*Parasterope quadrata*, male, Lyttelton Harbor, slide mounted by Brady, B500 Hancock Museum, Newcastle-on-Tyne: *a*, endopodite of right 2nd antenna, medial view; *b*, left mandible, lateral view; *c*, proximal part of coxale endite. N-1 male, Lyttelton Harbor, in alcohol collection of Hancock Museum: *d*, tip of right 1st antenna, medial view; *e*, distal dorsal corner of 2nd joint of left 1st antenna, lateral view; *f*, endopodite of right 2nd antenna, medial view (bristle broken); *g*, exopodite of right mandible, lateral view; *h*, right maxilla, medial view; *i*, left lateral eye; *j*, medial eye and rod-shaped organ. *Parasterope ?quadrata*, male, Lyttelton Harbor, identified as *Asterope australis* by Brady, in alcohol collection of Universitets Zoologiske Museum, Copenhagen, length 1.55 mm: *k*, complete specimen, lateral view; *l*, posterior of right valve, medial view; *m*, basale and exopodite of right mandible, lateral view. (Same magnification in microns: *b,f,i,j,l,m; a,d,h; c,e,g.*)

bristle and 2 or 3 triaenid bristles with few marginal spines in addition to usual end bristles. Ventral margin of basale with 1 triaenid bristle with 3 pairs of marginal spines; dorsal margin with 2 long terminal bristles and 1 short bristle distal to middle. Exopodite with 2 short terminal bristles, length slightly more than 50 percent of dorsal margin of 1st endopodite joint. Endopodite: 1st joint with 3 stout ventral bristles; ventral margin of 2nd joint with 3 stout terminal bristles; dorsal margin with 2 proximal bristles and stout a-, b-, c-, and d-bristles (base of c-bristle slightly broader than bases of other bristles); long slender lateral bristle present between b- and c-bristles and c- and d-bristles; bristles on medial side obscure but 2 rows of cleaning bristles evident. Third joint with dorsal claw, 4 stout bristles and 1 short bristle.

Maxilla: Missing from slide.

Fifth limb: Obscure and fragmented.

Sixth limb: Obscure but with about 16 postero-ventral bristles.

Seventh limb: Each limb with 6 bristles in proximal and distal groups, each bristle with up to 4 bells.

Furca: Each lamella with 6 primary and 3 secondary claws; teeth forming row along the concave margin of primary claws uniform in size (confirms observation of Brady, 1898:432).

SUPPLEMENTARY DESCRIPTION OF N–1 MALE FROM LYTTELTON HARBOR.—Carapace not present on described specimen, which is part of Brady's collection preserved in alcohol.

First antenna: Medial surfaces of 1st, 2nd, 4th, and 5th joints spinous; 2nd joint with 2 bristles, 1 dorsal, 1 lateral (Figure 258*e*); 3rd joint with 6 long dorsal bristles and 1 short ventral bristle; 4th joint with 1 long dorsal bristle and 2 short ventral bristles, longer of ventral bristles reaching just beyond ventral margin of 5th joint; about 20 teeth forming row present along distal part of dorsal margin of 5th joint; sensory bristle of 5th joint with 1 short proximal filament and 6 long terminal filaments; 7th joint with 1 long spinous medial bristle. Eighth joint: d-bristle missing; e-bristle reaching tips of filaments of sensory bristle of 5th joint (Figure 258*d*).

Second antenna (Figure 258*f*): Protopodite with small medial spines and spines along dorsal margin. Endopodite 3-jointed: 1st and 2nd joints bare, 3rd joint elongate with 1 long proximal bristle. Exopodite: bristle of 2nd joint and bristles of joints 3 to 8 with spines along ventral margin, long bristles of joints 3 to 8 with natatory hairs; distal joints with basal spines; 9th joint with lateral spines, 3 long bristles with natatory hairs and 1 short dorsal bristle.

Mandible (Figure 258*g*): Coxale endite similar to that on adult male; basale endite with 1 dwarf bristle, glandular peg, 4 pectinate end bristles and 3 triaenid bristles with 3 or 4 pairs of marginal spines; dorsal margin of basale without midbristle; exopodite similar to that of adult male but longer, about 80 percent length of 1st endopodite joint; 2nd joint of endopodite with only 1 proximal bristle on dorsal margin; lateral bristle between b- and c-bristles more than three-fourths length of b-bristle.

Maxilla (Figure 258*h*): Epipodite triangular with hairs along acute tip; proximal endite with 1 short and 3 long bristles; distal endite with 3 long bristles; dorsal margin of basale with 1 proximal and 1 distal bristle and hairs along dorsal margin; ventral margin of basale with 1 coarsely spinous proximal bristle, 1 minute distal bristle and 1 long spinous terminal bristle; lateral side of basale with 1 short proximal bristle. Endopodite: 1st joint with 1 short bristle near middle of dorsal margin and 1 long terminal bristle on ventral margin; 2nd joint with 1 long spinous terminal bristle.

Fifth limb: Limb usual type but obscure on slide.

Sixth limb: Anterior margin with 1 upper and 1 lower bristle; anterior tip with 2 bristles, postero-ventral margin with about 15 bristles; anterior proximal corner with minute medial bristle.

Seventh limb and furca: Both missing on specimen.

Lateral eye (Figure 258*i*): Large with about 17 ommatidia.

Medial eye and rod-shaped organ (Figure 258*j*): Medial eye about same size as lateral eye and with abundant dorsal hairs; rod-shaped organ single jointed or weakly 2-jointed, broadening near middle and with rounded tip.

SUPPLEMENTARY DESCRIPTION OF SPECIMEN MOUNTED ON SLIDE MARKED "♀" IN BRADY COLLECTION (Kornicker's slide 1).—Carapace not present.

First antenna: Same as limb described herein from N–1 male, except sensory bristle of 5th joint without proximal filament.

Second antenna: Limb obscure but endopodite 3-jointed with terminal bristle on end joint showing that the specimen is female.

Mandible: Partly obscure but similar to that on N–1 male, including no midbristle on dorsal margin of basale, exopodite more than 50 percent length of dorsal margin of 1st endopodite joint, and presence of long lateral bristle between b- and c-bristles on dorsal margin of 2nd endopodite joint.

Maxilla: Obscure on slide, with 3 bristles, all long, on distal endite; epipodite hirsute; 1 proximal bristle present on ventral margin of basale.

Fifth limb: Obscure on slide.

Sixth limb: Similar to that on N–1 male.

Seventh limb: Limb with 12 bristles, 6 proximal (3 on each side), 6 terminal (3 on each side); terminal combs each with about 12 teeth.

Furca: Each lamella with 8 claws; proximal 2 claws secondary, distal 6 primary; marginal teeth of primary claws consisting of long teeth separated by 4 or 5 short teeth.

Lateral eye: Eye squashed, with 17 ommatidia, about same size in squashed condition as that of the N–1 male.

Supplementary Description of Specimen Mounted on Slide Marked "♀" in Brady Collection (Kornicker's slide 2).—This thick slide contains obscure appendages of two specimens, a N–1 male and a female. None of 4 mandibles on slide bear midbristles on dorsal margin of basale and all have 1 long lateral bristle between b- and c-bristles of 2nd endopodite joint. Two endopodites of 2nd antennae on slide are similar to those described for N–1 male, and 2 are similar to those on female.

Sexual Dimorphism.—Because of sexual dimorphism it is difficult to eliminate uncertainty as to whether males and females, even when captured together, are conspecific. The adult male of *P. quadrata* bears a single midbristle on the dorsal margin of the mandibular basale, whereas, both females and N–1 males examined have no midbristle on the basale. A similar difference between adult males and females of *Homasterope maccaini* has been noted herein.

The sensory bristle on the 5th joint of the 1st antenna of the N–1 male bears a short proximal bristle, which is absent on the female. A similar difference was noted between the adult female and N–1 male of *Parasterope pollex* (Kornicker, in Bowman and Kornicker, 1967:16).

Distribution.—Collected only in Lyttelton Harbor, New Zealand (Figure 255).

67. *Parasterope quadrata?* (Brady, 1898)

Figures 258*k–m*, 259

Asterope australis Brady.—Brady, 1898:431, pl. 43: figs. 1–8.—Skogsberg, 1920:483 [discussion].—Müller, 1912:45 [part].—Thomson and Anderton, 1921:117 [list].

Not *Asterope australis* Brady, 1890:515, pl. 4: figs. 3,4.

[?]*Cylindroleberis australis* (Brady) (?).—Müller, 1906a:34.

Parasterope australis (Brady) [part].—Eagar, 1971:61 [only New Zealand specimens included].

Material.—At my request for specimens from New Zealand identified as *Asterope australis* by Brady, I received 2 vials from the Universitetets Zoologiske Museum, Copenhagen, Denmark, through Dr. Torben Wolff. One vial contained a female specimen and a label, "*Asterope australis* Brady, Akaroa Harbor, 6 fm. Brady det." The second vial contained an adult male and the label, "*Asterope australis* Brady, Lyttelton Harb., 1–5 fm., Brady det." I removed both specimens from their shells and removed one 2nd antenna from both specimens; I also removed both mandibles from the female. As I could not detect any differences between these specimens and those of *P. quadrata*, which I had previously studied, I did not dissect them further. Both specimens and removed appendages were returned to their respective vials and returned to Copenhagen.

In addition to the specimens identified by Brady as *A. australis*, now in Copenhagen, I received through Dr. K. G. McKenzie, some of Brady's material labeled *Asterope grisea* from Akaroa Harbor, in the collection of the Hancock Museum. Among those specimens I found 9 which I identified as *Parasterope quadrata?*. I have described herein a N–1 ♂ and N–1 ♀ from the collection. The material from Akaroa Harbor bears the number B501.

Remarks Concerning Material.—Brady (1898: 431) stated that a collection of this species consisting almost entirely of males was obtained in a surface net in Otago Harbor. I have not seen this material. He also stated that a single female

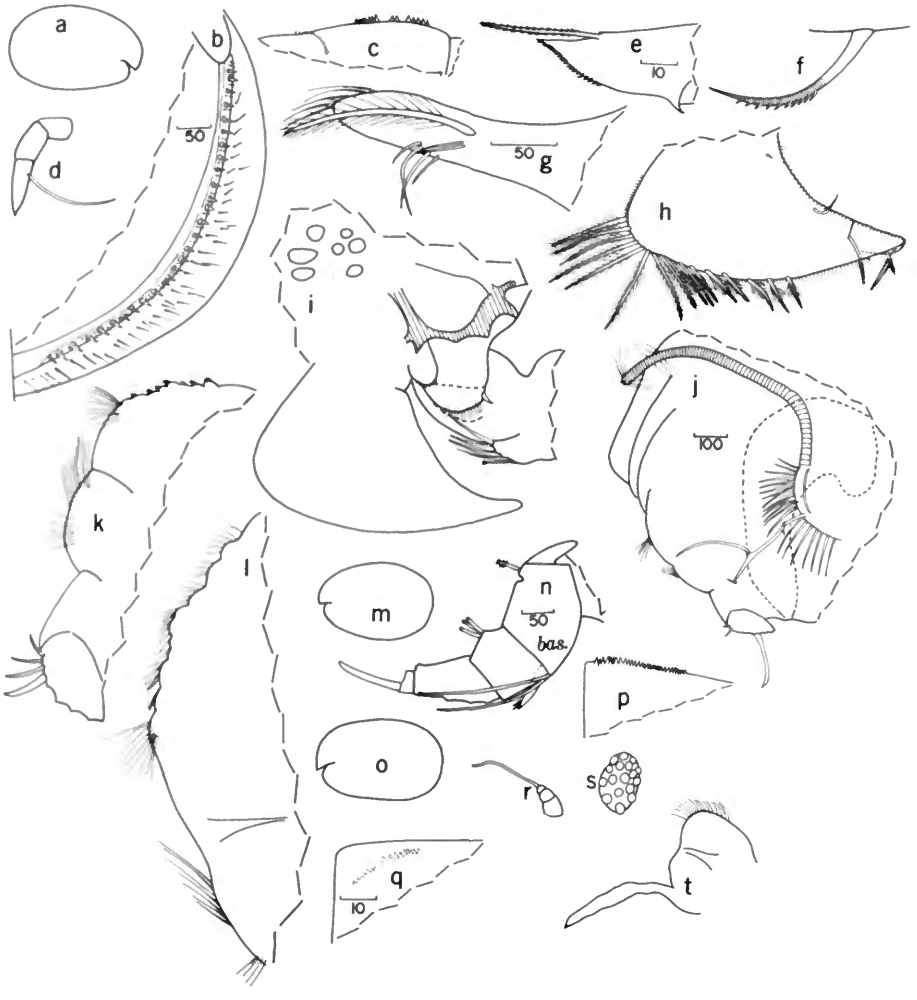

FIGURE 259.—*Parasterope ?quadrata*, N–1 male, identified as *Asterope grisea* by Brady, Akaroa Harbor, B501 Hancock Museum, length 1.46 mm, carapace: *a*, complete specimen, lateral view; *b*, posterior of right valve, medial view. Appendages: *c*, distal dorsal corner of 5th joint of left 1st antenna, medial view; *d*, endopodite of right 2nd antenna, medial view; *e*, tip of dorsal branch of coxale endite on right mandible, lateral view; *f*, midbristle on dorsal margin of basale on right mandible, medial view; *g*, exopodial bristles on left 5th limb, lateral view; *h*, left 6th limb, medial view; *i*, central adductor muscle ends, upper lip, outline of 6th limb, basale endite of mandible; *j*, posterior showing 7th limb, furca with some claws not shown, part of epipodial appendage of 5th limb, outline of 6th limb; *k*, posterior showing posterior 3 furcal claws; *l*, detail of posterior shown in "*k*." Female (?adult), identified as *Asterope australis* by Brady, Akaroa Harbor, Copenhagen museum, length 1.48 mm; *m*, complete carapace, lateral view; *n*, left mandible, medial view (all bristles not shown). N–1 female, identified as *Asterope grisea* by Brady, Akaroa Harbor, B501 Hancock Museum, length 1.35 mm: *o*, complete specimen, lateral view; *p*, distal dorsal corner of 5th joint of left 1st antenna, lateral view with anterior to left; *q*, distal dorsal corner of 5th joint of right 1st antenna, medial view with anterior to left; *r*, endopodite of right mandible, medial view; *s*, left lateral eye; *t*, medial eye and rod-shaped organ. (Same magnification in microns: *b,d,h,i,k,n,s,t; g,l; c,e,p-r*.)

was obtained from the bottom in Akaroa Harbor and Lyttelton Harbor. The Copenhagen material included a female from Akaroa Harbor and a male from Lyttelton Harbor. The latter specimen was not mentioned by Brady, unless he thought it was a female.

SUPPLEMENTARY DESCRIPTION OF N–1 MALE FROM AKAROA HARBOR IDENTIFIED AS *A. grisea* BY BRADY.—Carapace with posterior evenly rounded; dorsal margin with slightly greater slope in anterior half than in posterior half (Figure 259a).

Infold: (Figure 259*b*): About 48 bristles present on rostrum above list; about 8 bristles present between rostral list and incisur; about 28 bristles present below incisur and on anteroventral infold; row of about 40 bristles present along ventral infold to point opposite 1st hyaline spines of posterior list; posterior list with 29 hyaline spines and 24 short bristles (1 bristle generally present between each 2 hyaline spines); 39 bristles present in area between list and posterior shell margin.

Size: Length 1.46 mm, height 0.95 mm; height 65.1 percent of length.

First antenna (Figure 259*c*), *2nd antenna* (Figure 259*d*), *mandible* (Figures 259*e,f*), *maxilla, sixth limb* (Figures 259*g–i*), *eyes, rod-shaped organ*: Similar to those on N–1 male of *P. quadrata* from Lyttelton Harbor.

Fifth limb: Long stout spinous exopodite bristle reaching just past end of comb; 2 short slender bristles present ventral to base of exopodite bristle; 4 additional bristles present near ventral margin; dorsal margin of comb without hairs except at distal tip.

Seventh limb (Figure 259*j*): Limb with total of 12 bristles, 6 in proximal group (3 + 3), 6 in terminal group (3+3); terminal combs each with about 12 spinous teeth.

Furca: Each lamella with 8 claws of which proximal 1 or 2 are secondary type; teeth along concave margins of primary claws consisting of long teeth separated by 4 to 6 smaller teeth.

Posterior (Figure 259*k,l*): Long spines and hairs present along posterior margin; dorsal part with small corrugations with short hairs; no thumblike process.

SUPPLEMENTARY DESCRIPTION OF N–1 FEMALE FROM AKAROA HARBOR IDENTIFIED AS *A. grisea* BY BRADY.—Carapace slightly more tumid than that of N–1 male (Figure 259*o*). Size: length 1.35 mm, height 0.90 mm; height 66.7 percent of length.

First antenna (Figure 259*p,q*): Similar to that of N–1 male except no short proximal bristle present on sensory bristle of 5th joint which has 6 terminal filaments.

Second antenna: Endopodite 3-jointed, much smaller than that on N–1 male and with bristle of short 3rd joint terminal.

Mandible (Figure 259*r*): Similar to that of N–1 male except for having few small spines forming clusters on proximal part of dorsal margin of basale.

Maxilla, fifth limb, sixth limb, seventh limb, furca, posterior: Similar to that of N–1 male.

Lateral eye: Slightly smaller than on N–1 male but with same number of ommatidia (Figure 259*s*).

Medial eye and rod-shaped organ (Figure 259*t*): Both medial eye and rod-shaped organ slightly smaller than that on N–1 male. Rod-shaped organ 1-jointed with minute pointed projection on tip.

Genitalia: Sclerotized oval rings of genitalia easily visible.

Eggs: 10 very small unextruded eggs visible within body.

REMARKS CONCERNING MATURITY OF SPECIMEN.—The interpretation that the specimen is not a mature female is based on relative size of the carapace of this specimen and that of the N–1 male.

SUPPLEMENTARY DESCRIPTION OF ADULT MALE FROM LYTTELTON HARBOR IDENTIFIED BY BRADY AS *Asterope australis* (Figure 258*k-m*).—Carapace oval in lateral view, with prominent rostrum; dorsal and ventral margins subparallel (Figure 258*k,l*).

Infold: Rostral infold with about 13 bristles on or posterior to list, and about 30 fairly long bristles anterior and dorsal to list; about 10 short bristles forming row along anterodorsal infold anterior to juncture; list present starting near inner margin of anterior part of infold, extending along ventral infold and continuing on posterior infold where it broadens; posterior broad list with about 25 broad transparent bristles and about 24 small bristles, about 1 small bristle between each transparent bristle; about 49 bristles present between broad posterior list and posterior margin of valve; about 25 bristles present on anteroventral infold below incisur; about 30 bristles present along ven-

tral infold between list and ventral margin of valve.

Size: Carapace length 1.55 mm, height 0.94 mm.

First antenna: Sensory bristle of 5th joint with numerous filaments; no d-bristle on 8th joint; e- and f-bristles extremely long.

Second antenna: Protopodite with spines along anterior margin. Endopodite 3-jointed: 2nd joint with 3 short proximal bristles on ventral margin; end joint reflexed and with 1 long proximal bristle.

Mandible (Figure 258*m*): Basale with 1 short midbristle on dorsal margin.

Maxilla and fifth limb: Not studied in detail, but in general similar to that described on N–1 male.

Sixth limb: Posteroventral margin with 15 bristles.

Seventh limb: Each limb with 12 bristles, 6 proximal, 6 terminal; terminus consisting of opposing combs.

Furca: Each lamella with 9 claws; posterior 3 claws secondary.

Rod-shaped organ: 2-jointed, broadening near middle and with rounded tip.

Lateral eye: About same size at medial eye and with about 17 ommatidia.

Posterior: Posterior margin with spines and hairs, no thumblike process.

SUPPLEMENTARY DESCRIPTION OF FEMALE (adult?) FROM AKAROA HARBOR IDENTIFIED BY BRADY AS *Asterope australis*.—Carapace slightly more acuminate than that of male; length 1.48 mm, height 0.87 mm (Figure 259*m*).

First antenna: Sensory bristle of 5th joint with 6 terminal and no proximal filaments; d-bristle absent.

Second antenna: Protopodite with spines along anterior margin. Endopodite weakly 3-jointed, with 1 terminal bristle.

Mandible (Figure 259*n*): Basale without midbristle or spines on dorsal margin.

Maxilla and fifth limb: Not studied in detail but similar to that on N–1 male.

Sixth limb: Posteroventral margin with 17 bristles.

Seventh limb: Similar to that on adult.

Furca: Each lamella with 8 claws; posterior 2 or 3 claws secondary; concave margin of main claws with long and short teeth.

Lateral eye: Slightly smaller than medial eye and with about 16 ommatidia.

Posterior: Similar to that on male.

REMARKS CONCERNING IDENTIFICATION.—Specimens of *A. australis* Brady, 1890, are more elongated than the New Zealand specimens placed in that species by Brady (1898), and it is not likely that they are conspecific. Although I think it probable that the specimens I examined are *P. quadrata*, I believe that additional study is necessary before they can be placed in that species with certainty.

DISTRIBUTION.—New Zealand: Otago Harbor, at surface; Lyttelton Harbor, at 1.8–9.1 m; Akaroa Harbor, at 11 m.

68. *Parasterope pseudoquadrata* (Hartmann)

FIGURES 260, 261

Cylindroleberis pseudoquadrata Hartmann, 1965:316, figs. 15–22.

HOLOTYPE.—According to Hartmann (1965:316), "*Holotypus zergliedert.*"

TYPE-LOCALITY.—Probe 87, Bahia Inglés, North Chiloë, 41°48′S, 73°53′W, 12 m water depth.

PARATYPES.—Hamburg Zoological Museum, K 27 286, from same locality as holotype.

OTHER LOCALITIES.—Hartmann (in Hartmann-Schröder and Hartmann, 1962:171) states that a larva which he identified as *Asterope* cf. *pseudoquadrata*, new species (species to be described in a later publication) was collected near Caldera, Chile (about 27°S, 70°W).

MATERIAL.—At my request, Dr. Gerd Hartmann forwarded for study paratypes K 27 286 of *Cylindroleberis pseudoquadrata* from the Hamburg Zoological Museum. The label in the vial contains the following information, "*Asterope pseudoquadrata* n. sp. Mar Chile I, Chiloe, Bahia Inglés." The vial contained several dissected and partly dissected males and females and 2 undissected adult males. I partly dissected one of the males and have designated it "specimens X" and have returned it in a separate vial to the Hamburg museum. The supplementary description of the species which follows is based both on the specimen I dissected and the previously dissected specimens.

DIAGNOSIS OF ADULT FEMALE.—Carapace slightly tumid in lateral view; about 42 bristles present on

posterior infold between list and valve margin; carapace length 1.80–1.84 mm.

Mandible: Dorsal margin of basale without mid-bristle.

Maxilla: Dorsal margin of basale with 1 rather long proximal bristle and 1 short distal bristle; ventral margin with 1 medium bristle near middle, 1 small distal bristle and 1 long terminal bristle.

Sixth limb: Posteroventral margin with about 18 bristles.

Seventh limb: With 12 bristles.

Lateral eye: With about 9 ommatidia.

SUPPLEMENTARY DESCRIPTION (Figures 260, 261).—Carapace of female slightly tumid with greatest height behind valve middle, all margins evenly rounded; incisur placed below valve middle (Figures 260*a-c*). Carapace of male not tumid and with greatest height near middle of valve (Figure 261*a*).

Infold of female (Figure 260*a-c*): Infold behind rostrum with about 42 bristles plus about 17 bristles in vicinity of incisur; infold below incisur with about 34 bristles; about 41 bristles present along ventral infold; list present starting near inner margin of anterior part of infold below incisur, extending along ventral infold, and continuing on posterior infold where it broadens; posterior ventral list with about 54 broad transparent bristles, 5 or 6 long bristles (long bristles on ventral half of list), and 23 short bristles; about 42 short bristles present between posteroventral margin of valve and the broad list.

Selvage of female: Small lamellar prolongation with fringe of hairs present along lower margin of incisur.

Size of female: Right valve, length 1.82 mm, height 1.16 mm; left valve length 1.81 mm, height 1.14 mm; right valve, length 1.84 mm, height 1.08

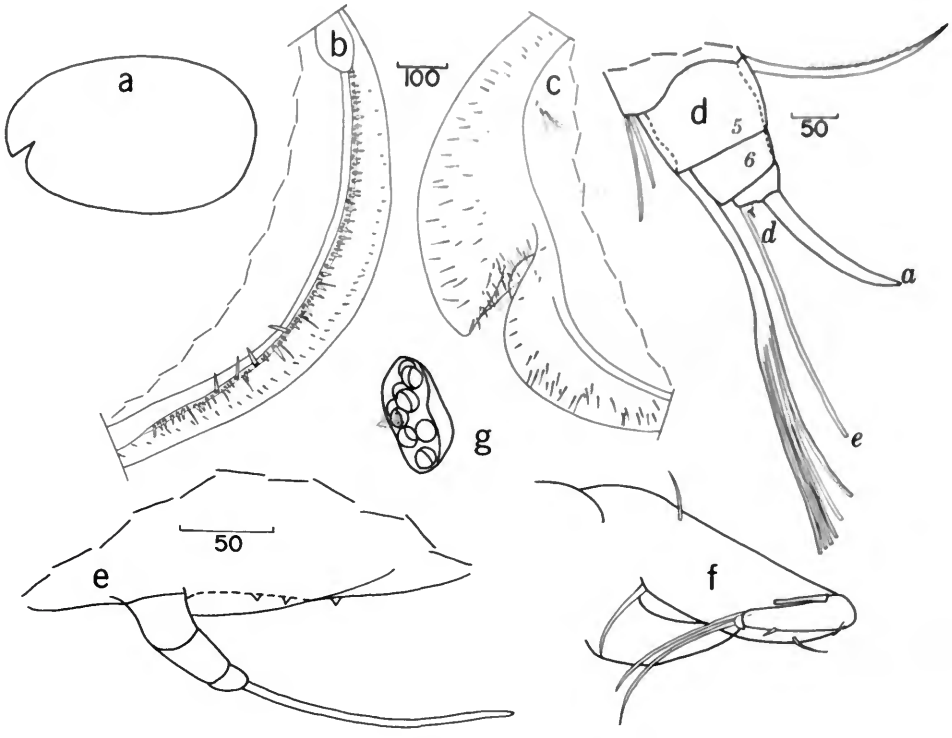

FIGURE 260.—*Parasterope pseudoquadrata*, female, K 27 286 Hamburg Zoological Museum, right valve, medial view: *a*, outline of valve, length 1.84 mm; *b*, posterior; *c*, anterior; *d*, tip of left 1st antenna, medial view (not all bristles shown); *e*, endopodite and part of protopodite of right 2nd antenna, medial view; *f*, part of left maxilla, medial view; *g*, lateral eye. (Same magnification in microns: *b,c; d,e*.)

mm. Hartmann (1965:320) gave the length of females as 1.8 mm and height as 1.1–1.2 mm. Male: complete specimen, length 1.79 mm, height 1.07 mm. Hartmann (1965:320) gave length of male as 1.8 mm, height 1.0–1.1 mm.

First antenna of female (Figure 260*d*): 2nd joint with short spines forming clusters along ventral margin and 1 spinous dorsal bristle (no lateral bristle); ventral margin of 3rd joint with 1 short bare bristle; dorsal margin with 6 spinous bristles; 3rd plus 4th joints quadrate, suture separating joints distinct; distal margin of 4th joint concave; dorsal margin of 4th joint with 1 spinous bristle; ventral margin with few spines and 2 slender bristles, 1 reaching proximal end of 5th joint, 1 reaching middle of 5th joint; sensory bristle of 5th joint with 6 long terminal filaments; medial bristle of 6th joint reaching past a-claw of 7th joint. Seventh joint: a-claw bare; b-bristle with 5 filaments including tip; c-bristle with 6 filaments including tip. Eighth joint: d-bristle represented by minute spine; e-bristle bare, slightly shorter than b-bristle; f-bristle bent at angle to stem, with 6 filaments including tip; g-bristle with 6 filaments including tip.

First antenna of male (Figure 261*b*): 1st joint without spines; 2nd joint with spinous dorsal bristle and spines along ventral margin (no lateral bristle present); 3rd joint with minute ventral bristle and 5 spinous dorsal bristles; 4th joint with stout dorsal bristle and 2 slender ventral bristles; sensory bristle of short 5th joint stout plumose; bristle of long 6th joint reaching past a-claw of 7th joint; dorsal margin of 5th and 6th joints undulate. Seventh joint: a-claw on fairly long stump; b-bristle with 6 filaments including tip; c-bristle long with 2 filaments including tip. Eighth joint: d-bristle absent; e-bristle bare, shorter than b-bristle; f-bristle long (broken off on specimen examined); g-bristle with 8 filaments including tip.

Second antenna of female (Figure 260*e*): Protopodite with small medial bristle, slender spines along dorsal margin and 3 small pustules along ventral margin. Endopodite 3-jointed with terminal filament longer than stem. Exopodite: bristle of 2nd joint reaching past end joint and with numerous short slender spines along ventral margin; bristles of joints 3–8 with natatory hairs and with stout spines proximally along ventral margin; 9th joint with 4 bristles, 2 long with natatory hairs and short spines along ventral margin, 2 short with short marginal spines; comb of short spines present along distal margins of joints 2 to 8; basal spines present on joints 2 or 3 to 8, spines larger on distal joints; large lateral spine on 9th joint.

Second antenna of male (Figure 261*c-f*): Protopodite larger than that of female, with small medial bristle and bare margins. Endopodite 3-jointed; 1st joint elongate bare; 2nd joint with 3 bristles on bulbous ventral margin; 3rd joint reflexed on 2nd, with long proximal bristle, small pustules on outer margin distal to bristle, and minute spines on proximal inner margin; inner margin of tip with transverse ridges. Exopodite with basale spines on joints 2 to 8 and 2 lateral spines on 9th joint.

Mandible: Coxale endite broken on specimen examined. Basale endite with 4 terminal bristles, glandular peg, 1 dwarf bristle, and 3 triaenid bristles with 4 or 5 pairs of marginal spines excluding distal pair. Basale: 1 triaenid bristle with 3 pairs of marginal spines present on ventral margin near basis of endite proximal to U-shaped sclerotized area; dorsal margin with 2 long spinous terminal bristles; medial surface of joint bare. Exopodite with hirsute tip and 2 short spinous bristles almost reaching end of joint. Endopodite: 1st joint with 3 long spinous ventral bristles; dorsal margin of 2nd joint with 2 proximal bristles and spinous a-, b-, c-, and d-bristles; 1 long lateral bristle present between b- and c-bristles; proximal row of 3 spinous bristles and distal row of 6 spinous bristles present on medial surface between b- and c-bristles; 1 long lateral bristle present between c- and d-bristles; 1 medial bristle present near base of d-bristle; c- and d-bristles stouter than a- and b-bristles; ventral margin with 3 long spinous terminal bristles; end joint with 5 spinous bristles and long dorsal claw with minute teeth along middle of inner margin. (No midbristle present on dorsal margin of basale of both male and female mandibles.)

Maxilla (Figure 260*f*): Epipodite elongate. Basale: dorsal margin with 1 rather long proximal bristle on medial surface and 1 short distal bristle; ventral margin with 1 medium bristle near middle, 1 small distal bristle and 1 long terminal bristle. Endopodite: 1st joint with short anterior distal bristle and 1 long 6-bristle; end-joint with terminal bristle reaching past 6-bristle.

Fifth limb: Dorsal margin of comb bare, hairs present at distal end. Exopodite: main hirsute bristle reaching past end of comb; several narrow bristles present between main bristle and ventral margin of comb, but exact number obscure.

Sixth limb of male (Figure 261*g*): Anterior margin with 1 upper and 1 lower bristle; anteroventral corner with 2 bristles; posteroventral margin with 18 spinous bristles; minute bristle present in upper anterior corner of medial side.

Seventh limb: Each limb with 12 bristles, 6 in proximal group (3 + 3), 6 in distal group (3 + 3), each bristle with 3 to 4 bells. Terminus with opposing combs, each with about 15 spinous teeth.

Furca of male: Each lamella with 8 claws, last 2 or 3 claws secondary.

Rod-shaped organ and medial eye (Figure 261*h*): Rod-shaped organ 1-jointed, elongate with rounded tip; medial eye pigmented bare.

Lateral eye: Lateral eye of female smaller than medial eye and with about 9 ommatidia (Figure 260*g*); lateral eye of male slightly larger than medial eye, about twice diameter of female lateral eye and with about 20 ommatidia (Figure 261*h*).

Upper lip of male (Figure 261*i*): Lip consisting of a hirsute lobe with anterior spine on each side of small midlobe also bearing small anterior spine; hirsute lateral flap present on each side of mouth.

Posterior of male (Figure 261*j*): Posterior with long hairs; dorsum rounded spinous.

COMPARISONS.—This species has more broad transparent flaplike bristles (about 54) on the posteroventral list than do other species of *Parasterope*. Unlike *P. quadrata*, *P. crinita*, *P. microm-*

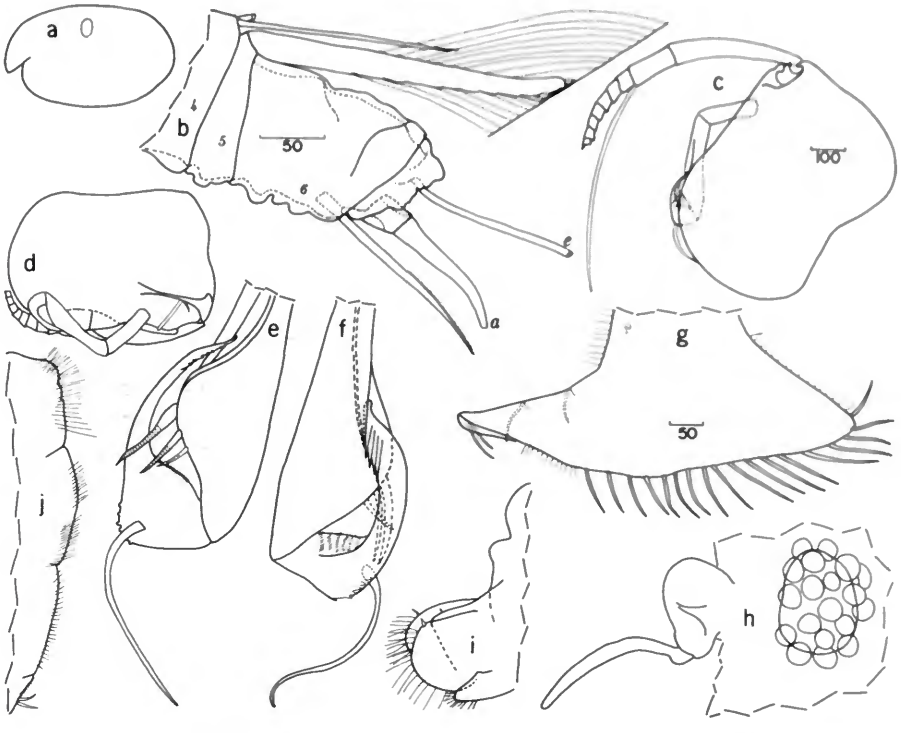

FIGURE 261.—*Parasterope pseudoquadrata*, male, *specimen X* (except *d,f*), K 27 286 Hamburg Zoological Museum: *a*, complete specimen, lateral view, length 1.73 mm, position of eye indicated; *b*, tip of left 1st antenna, lateral view (not all bristles shown); *c*, left 2nd antenna, lateral view (all exopodial bristles not shown); *d*, left 2nd antenna, medial view (from different specimen than that shown in "*c*"); *e*, detail of tip of endopodite shown in "*c*"; *f*, detail of tip of endopodite shown in "*d*"; *g*, left 6th limb, lateral view (marginal spines on bristles not shown); *h*, left lateral eye, medial eye and rod-shaped organ; *i*, upper lip; *j*, posterior 2 claws of furca. (Same magnification in microns: *b,e; c,d,f; g-j*.)

mata, the 2nd joint of the 1st antenna of *P. pseudoquadrata* does not bear a lateral bristle.

DISTRIBUTION.—Coast of Chile at about 12 m depth (Figure 255).

69. *Parasterope micrommata,* new species

FIGURE 262

HOLOTYPE.—USNM 128052, gravid ♀, length 1.78 mm., height 1.22 mm. Valves and some appendages in alcohol, remaining appendages on slides.

TYPE-LOCALITY.—*Eltanin* Cruise 27, station 1974.

ETYMOLOGY.—The specific name "micrommata" is derived from the Greek "mikrommatos" [= small-eyed] and refers to the small lateral eyes of this species.

PARATYPES.—USNM 128053, 1 gravid ♀; USNM 128054, 29 gravid ♀♀; USNM 128055, 5 adult ♀♀ without eggs in brood chamber and 18 juveniles; USNM 128274, 1 gravid ♀; USNM 128276, 1 gravid ♀ (not dissected); USNM 128277, 4 gravid ♀♀, 1 adult ♀ without eggs, 6 juveniles. USNM 128053, 128054, 128055 from same sample as holotype; USNM 128274, 128276, 128277 from *Eltanin* Cruise 16, station 1418.

DIAGNOSIS OF ADULT FEMALE.—Carapace tumid in lateral view; 6 or 7 bristles present on posterior infold between lower half of broad list and valve margin; carapace length 1.73–1.79 mm.

Mandible: Dorsal margin of basale without mid-bristle; basale with spines forming clusters on medial surface and dorsal margin.

Maxilla: Dorsal margin hirsute, with 1 proximal and 1 fairly long distal bristle; ventral margin with 1 medium length bristle near middle, 1 short distal bristle and 1 long terminal bristle.

Sixth limb: Posteroventral margin with 21–25 bristles.

Seventh limb: Each limb with 16 bristles.

Lateral eyes: With 3 ommatidia.

DESCRIPTION OF FEMALE.—Shape of carapace shown in Figure 262*a*.

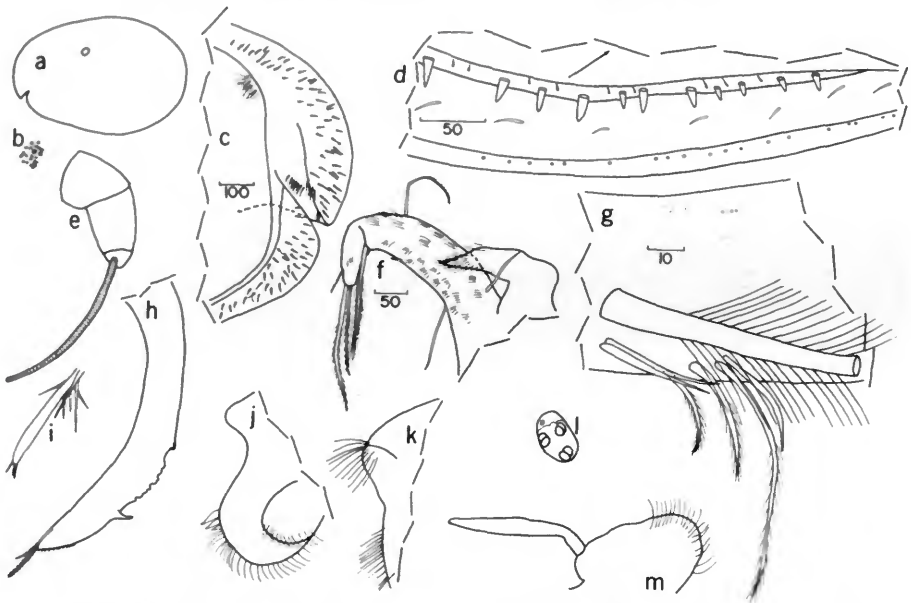

FIGURE 262.—*Parasterope micrommata,* female, USNM 128052, length 1.78 mm, carapace: *a,* complete specimen, lateral view, position of lateral eye indicated; *b,* central muscle scars on left valve, medial view; *c,* anterior of left valve, medial view; *d,* posteroventral corner of left valve, medial view. Appendages: *e,* endopodite of left 2nd antenna, medial view; *f,* right maxilla, medial view; *g,* exopodial bristles on right 5th limb, lateral view; *h,* dorsal branch of coxale endite of mandible; *i,* tip of ventral branch of coxale endite of left mandible, medial view; *j,* upper lip; *k,* posterior of body, anterior to right; *l,* left lateral eye; *m,* medial eye and rod-shaped organ. (Same magnification in microns: *d,e,h; f,j-m.*)

Infold (Figure 262*c,d*): Infold behind rostrum with about 50 to 60 bristles between list and outer margin; about 9 bristles present on rostral list; 8 bristles forming row between rostral list and incisur; infold below incisur with about 25 or 30 bristles; about 30 bristles present on infold along ventral margin; 6 or 7 bristles present between posteroventral margin of valve and lower half of broad list near inner margin of infold; list present starting near inner margin of anterior part of infold below incisur, extending along ventral infold, and continuing on posterior infold where it broadens; posterior list with 27 broad transparent bristles and 24 small bristles, generally 1 small bristle present between transparent bristles. Spines present on anterodorsal part of vestment proximal to infold (Figure 262*c*).

Selvage: Small lamellar prolongation with fringe of hairs present along lower margin of incisur.

Muscle scars: Central muscle scars consisting of about 22 individual scars below valve middle (Figure 262*b*).

Size: (Figure 254): USNM 128052, length 1.78 mm, height 1.22 mm; USNM 128053, length 1.73 mm, height 1.22 mm. USNM 128054, 3 gravid females, undissected: length 1.73 mm, height 1.20 mm; length 1.79 mm, height 1.25 mm; length 1.73 mm, height 1.27 mm. USNM 128055, 1 adult female without eggs in brood chamber undissected, length 1.76 mm, height 1.26 mm; USNM 128274, length 1.69 mm, height 1.19 mm; USNM 128276, length 1.76 mm, height 1.21 mm.

First antenna: Medial and lateral surfaces of 1st joint with short spines forming clusters; 2nd joint with spines on medial and lateral surfaces and ventral and dorsal margins, 1 long spinous bristle distal to middle of dorsal margin and 1 short spinous lateral bristle; ventral margin of 3rd joint with 1 short bare bristle and short spines; dorsal margin with 6 bristles in 4 groups of 1, 1, 2, and 2 bristles, medial bristle of distal pair with short marginal spines, remaining bristles with long spines; 3rd plus 4th joints quadrate; medial proximal margin of 3rd joint concave, lateral margin linear; medial distal margin of 4th joint distinct, concave, lateral margin also concave but indistinct near middle; suture between 3rd and 4th joints distinct; dorsal margin of 4th joint with 1 long bristle with short marginal spines; ventral margin with short spines and 2 slender spinous bristles reaching past end of 5th joint; sensory bristle of 5th joint with 6 terminal filaments, tip of each filament with 3 or 4 short spines; medial bristle of 6th joint spinous, long. Seventh joint: a-claw with short spines along middle of dorsal margin; b-bristle with 5 or 6 spinous filaments including tip; c-bristle with 6 filaments including tip. Eighth joint: d-bristle bare, minute; e-bristle bare, reaching tip of sensory bristle of 5th joint; f-bristle bent at right angle to stem, with 5 spinous filaments including tip; g-bristle with 6 or 7 filaments including tip. Minute teeth present on distal margin of 5th joint.

Second antenna (Figure 262*e*): Protopodite with small medial bristle and spines along dorsal margin and dorsal part of medial surface. Endopodite 3-jointed with terminal filament longer than stem. Exopodite: 1st joint with clusters of long distal spines on inner margin; bristle of 2nd joint reaching past 9th joint and with numerous narrow spines along ventral margin; bristles of joints 3 to 8 with natatory hairs and short spines along ventral margins; 9th joint with 4 bristles, 2 long with natatory hairs and few small spines, 2 short with short marginal spines; joints 3 to 8 with basal spines, joint 9 with lateral spine (lateral spine missing on right limb of USNM 128052); comb of short spines present along distal margins of joints 2 to 8 (comb of spines present in place of lateral spine on 9th joint of right limb of USNM 128052).

Mandible (Figure 262*h,i*): Ventral branch of coxale endite with 4 or 5 rows of spines and 3 slender spines at tip; ventral margin of dorsal branch with about 6 weakly developed teeth and small main spine; dorsal bristle with short marginal spines; small bristle present at basis of endite. Basale endite with elongate glandular peg, 4 terminal bristles, 3 triaenid bristles with 5 or 6 pairs of marginal spines excluding terminal pair, and 1 dwarf bristle. Basale: 1 triaenid bristle with 4 or 5 pairs of marginal spines present on ventral margin near basis of endite proximal to U-shaped sclerotized area; dorsal margin with 2 long spinous terminal bristles; medial surface and dorsal margin with small spines forming clusters. Exopodite with hirsute tip and 2 short terminal spines reaching end of 1st endopodite joint. Endopodite: 1st joint with 3 long spinous ventral bristles; dorsal margin of 2nd joint with single short spinous proximal bristle, and spinous a-, b-, c-, and d-bristles;

1 small spinous medial bristle present near base of b-bristle; 3 short medial bristles and 1 long lateral bristle present between b- and c-bristles (lateral bristle missing on left limb of USNM 128052); oblique row of 5 spinous medial bristles present near base of c-bristle; 1 long spinous lateral bristle present between c- and d-bristles; 1 long spinous medial bristle present distal to base of d-bristle; ventral margin with 3 long spinous terminal bristles; clusters of surface spines present on medial surface of 2nd joint; end joint with long dorsal claw with minute teeth along middle of inner margin and 5 long spinous bristles.

Maxilla (Figure 262*f*): Epipodite elongate hirsute; proximal endite with 4 bristles, 3 long, 1 short; distal endite with 3 long bristles. Basale: dorsal margin and medial surface with hairs forming clusters; dorsal margin also with 1 spinous proximal bristle on medial surface, and 1 fairly long spinous distal bristle; ventral margin with 1 medium bristle near middle, 1 short distal bristle and a long plumose terminal bristle. Endopodite: 1st joint with few clusters of spines, short anterior bristle and long spinous 6-bristle about three-fourth length of spinous bristle of end-joint.

Fifth limb: Epipodial appendage with about 56 bristles. Dorsal margin of comb bare, hairs present at distal end. Exopodite: stout plumose bristle reaching past end of comb; 2 slender bristles present near basis of main bristle; 4 bristles present near ventral margin (Figure 262*g*).

Sixth limb: Anterior margin with 1 upper and 1 lower bristle; anteroventral corner with 1 minute medial bristle; anteroventral corner with 3 or 4 bristles; posteroventral margin with 21 to 25 bristles; medial and lateral surfaces hirsute.

Seventh limb: Each limb with 16 bristles: 6 in distal group, 10 in proximal group, each bristle with 3 or 4 bells. Terminus with 2 opposing combs, each with 11 spinous teeth.

Furca: Each lamella with 9 claws including 1 or 2 posterior secondary bristlelike claws with faint annulae. Primary claws with teeth along posterior margins, some also with thin hairs along anterior margins; shorter posterior claws with less curvature than longer anterior claws; long slender teeth present at intervals among more numerous short teeth on claws 1 to 3 or 4.

Posterior: Posterior hirsute; dorsum rounded with long spines (Figure 262*k*).

Lateral eye: Eyes small with 3 ommatidia (Figure 262*l*).

Medial eye and rod-shaped organ (Figure 262*m*): Medial eye with long dorsal hairs; maximum length of eye almost 3 times diameter of lateral eye. Rod-shaped organ elongate, 1-jointed with rounded tip, broadest near middle.

Upper lip: See Figure 262*j*.

Genitalia: Genitalia visible as sclerotized ring, brushlike organ not observed.

Eggs: USNM 128052 and 128053 with 12 eggs in brood chamber; USNM 128274 with 11 eggs.

Epizoa: Sparse segmented filaments adhering to some appendages of USNM 128052, 128053.

Population structure: Sample from *Eltanin* station 1974 with 31 gravid females, 5 adult females without eggs in brood chambers, and 18 juveniles (sex undetermined). Sample from *Eltanin* station 1418 with 5 gravid females, 1 adult female without eggs and 6 juveniles.

COMPARISON.—This new species, *P. micrommata*, differs from previously described species in the genus in having a very small lateral eye with only 3 ommatidia. In *Parasterope longungues* Poulsen, 1965, lateral eyes are completely lacking, but other species of the genus have at least 10, usually about 20, ommatidia. The new species differs from many species in having 16 bristles on the 7th limb.

DISTRIBUTION.—This species was collected near Macquarie Island at depths of 93–118 m (Figure 255).

70. *Parasterope crinita*, new species

FIGURES 263–266

HOLOTYPE.—USNM 128278, gravid ♀, length 1.28 mm, carapace and some appendages in alcohol, remaining appendages on slides.

TYPE-LOCALITY.—*Eltanin* Cruise 16, station 1431, Subantarctic.

ETYMOLOGY.—The specific name "crinita" is derived from the Latin "crinitus" [= hairy, long haired] and refers to the long hairs and spines on the dorsal margin of the mandibular basale.

PARATYPE.—USNM 128279, 1 juvenile (not dissected), length 0.80 mm, height 0.50 m; from same sample as holotype.

DIAGNOSIS OF ADULT FEMALE.—Carapace tumid, 33 or 34 bristles on infold between list and posterior margin of valve; length 1.28 mm.

Mandible: Dorsal margin of basale without mid-bristle, but with numerous long hairs and short spines, especially on proximal half; minute bristle present at base of coxale endite.

Maxilla: Dorsal margin of basale with faint hairs and 1 short distal bristle; epipodial appendage hirsute.

Sixth limb: Posteroventral margin with 16–19 bristles.

Seventh limb: With 12 bristles.

Lateral eyes: Well developed with about 16 ommatidia.

Description of Female (Figures 263-266).—Carapace tumid, small, greatest height behind valve middle; incisur short, placed below valve middle; ventral and posterior margins rounded; surface smooth, minute punctae visible under high magnification (Figure 263*a*).

Infold (Figures 263*b-e;* 265*a,b,f;* 266): Infold behind rostrum of right valve with 11 bristles on or posterior to list, and 43 fairly long bristles anterior and dorsal to list; in addition to fairly long bristles, numerous minute spines or bristles present (some of these could be remnants of longer bristles); 10 minute bristles present forming row along anterodorsal infold. Infold behind left rostrum with 14 bristles on or behind list and only 21 anterior and dorsal to list, of these, most present in anterodorsal part of list; numerous minute spines also present anterior to list (some could be remnants of longer bristles); 10 minute bristles present forming row along anterodorsal infold. List present starting near inner margin of anterior part of infold, extending along ventral infold and continuing on posterior infold where it broadens; posterior broad list with about 25 broad transparent bristles and about 21 small bristles—about 1 small bristle between each transparent bristle; 33 or 34 bristles present between broad posterior list and posterior margin of valve; about 40 to 50 bristles present along ventral infold between list and ventral margin of valve.

Selvage: Not observed.

Muscle scars: Central muscle scars consisting of about 15 individual scars below valve middle (Figure 265*c,d*).

Size: USNM 128278, length 1.28 mm, height 0.87 mm (Figure 254).

First antenna (Figure 263*f,g*): Medial and lateral surfaces of 1st joint spinous. Second joint with long dorsal bristle with long spines along anterior margin, and short lateral bristle with short marginal spines; ventral and dorsal margins with 2 or 3 clusters of spines; lateral surface with row of short spines along distal margin, spines longer in distal dorsal corner. Distinct suture present separating 3rd and 4th joints; 3rd joint with short bare ventral bristle and 6 long spinous dorsal bristles; all dorsal bristles slightly shorter than dorsal bristle of 2nd joint; proximal dorsal bristle stouter than bristle on 2nd joint and remaining dorsal bristles of 3rd joint. Suture separating 4th and 5th joints distinct except for small part near middle of lateral suture; 4th joint with 1 long dorsal bristle with short marginal spines and 2 short ventral bristles, both with short marginal spines; longer of 2 ventral bristles reaching just past distal suture of 5th joint, shorter reaching point on ventral margin of 5th joint about three-fourths from proximal suture; ventral margin of 4th joint with few spines near base of terminal bristles. Sensory bristle of 5th joint with 6 terminal filaments; distal dorsal margin of 5th joint with minute teeth; medial bristle of 6th joint with short marginal spines, and about 3 times length of ventral margin of 6th joint. Seventh joint: a-claw with faint teeth along dorsal margin and near tip on ventral margin; b-bristle slightly longer than a-claw and with 4 or 5 filaments including tip; c-bristle with 6 filaments including tip. Eighth joint: d-bristle missing; e-bristle bare, about length of b-bristle; f-bristle at right angle to stem, with 5 filaments including stem, filaments with short marginal spines; g-bristle with 5 filaments including tip; f- and g-bristles slightly shorter than c-bristle.

Second antenna (Figure 263*h*): Protopodite with small medial bristle, few spines on ventral margin near endopodite, many spines along anterior margin and on anterior half of medial surface. Endopodite short, 3-jointed, joints fairly well defined; 3rd joint with stout terminal bristle broken off near base on holotype. Exopodite: bristle of 2nd joint reaching 9th joint and with slender ventral spines; bristles of joints 3 to 8 with natatory hairs; joints 2 to 8 with short spines forming row along distal margin; joints 3 to 8 with basal spines; joint 9 with lateral spine and 4 bristles, 2 long and 1 medium with natatory hairs, 1 short with short marginal spines; bristles of joints 3 to 7 with marginal spines proximal along ventral margin.

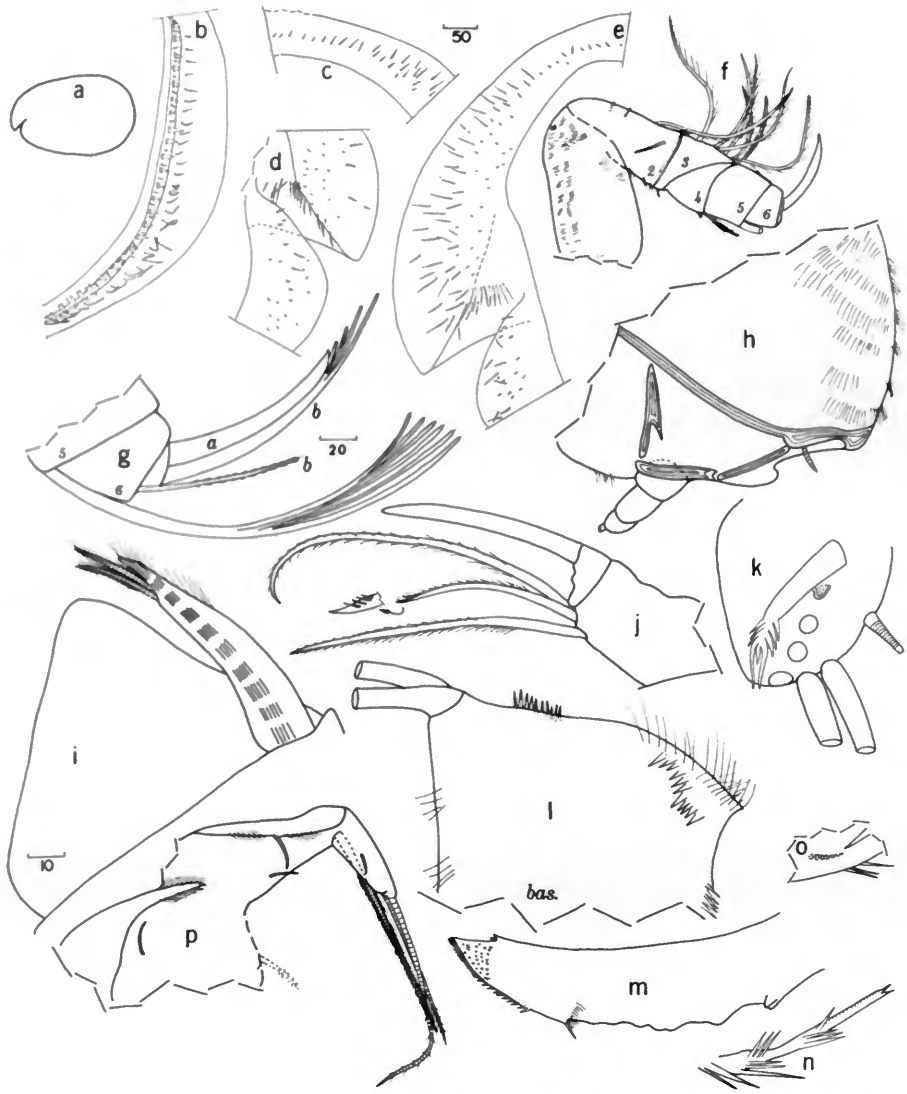

FIGURE 263.—*Parasterope crinita*, female, USNM 128278, length 1.28 mm, carapace: *a*, complete specimen, lateral view; *b*, posterior of right valve, medial view; *c*, anterodorsal infold on left valve, medial view; *d*, anterior of left valve, medial view; *e*, anterior of right valve, medial view. First antenna: *f*, right limb, lateral view (not all bristles shown); *g*, tip of left limb, medial view (not all bristles shown). Left 2nd antenna: *h*, endopodite and part of protopodite, medial view (terminal bristles broken). Mandible: *i*, exopodite of left limb, lateral view; *j*, tip of left limb, medial view (not all bristles shown); *k*, basale endite of right limb, medial view (not all bristles shown); *l*, dorsal margin of basale on right limb, medial view: *m*, tip of dorsal branch of coxale endite of left limb, medial view (dorsal bristle broken); *n*, tip of ventral branch of coxale endite on right limb, medial view; *o*, bristle (dashed) at base of coxale endite on left limb, lateral view. Maxilla: *p*, right limb, lateral view (dorsal margin of basale folded). (Same magnification in microns: *b-f; g,h,j,p; i,k-n.*)

Mandible (Figure 263*i-o*): Coxale: minute bristle present at base of endite; ventral branch of endite with 3 oblique rows of spines and 2, possibly 3, minute spines on tip; dorsal branch with 4 or 5 low rounded nodes and small main spine; margin between main spine and tip of dorsal branch with bare space followed by coarse and then fine spines; bristle of dorsal margin of dorsal branch missing on left mandible of holotype, but extending past tip of branch on right limb. Basale: end bristles broken on basale endite of holotype; endite with 3 triaenid bristles bearing 3 or 4 pairs of spines plus long terminal pair, small glandular peg and single dwarf bristle; ventral margin of basale near endite with triaenid bristle with 2 pairs of marginal spines; U-shaped process present on margin distal to base of bristle; dorsal margin of basale without midbristle but with numerous long hairs and short spines, especially on proximal half, and 2 long spinous terminal bristles. Exopodite almost reaching distal end of 1st joint of endopodite and with 2 short spinous bristles. Endopodite: 1st joint with 3 long ventral bristles, 1 (the shortest of the 3) with short marginal spines, 2 with long spines (proximal spines shorter than distal spines); ventral margin of 2nd joint with 3 bristles with short marginal spines, middle bristle about one-half length of other bristles and with spines only along inner margin (tip of bristle knifelike); dorsal margin with 1 short spinous proximal bristle and stout a-, b-, c-, and d-bristles; 1 long spinous lateral bristle present between b- and c-bristles and c- and d-bristles; 3 medial spinous cleaning bristles present near base of b-bristle; 6 medial cleaning bristles present near base of c-bristle, all either pectinate or with spines; 1 long spinous medial bristle present at base of d-bristle; medial surface with few spines forming clusters; end joint with dorsal claw and 5 bristles, 4 long, 1 short, all bristles with spines.

Maxilla (Figure 263*p*): Epipodial appendages hirsute; both endites obscure on holotype; basale with 1 proximal bristle below epipodial appendage, 1 short bare distal bristle on dorsal margin; ventral margin with 1 proximal spinous bristle, 1 short bristle near middle, and 1 long spinous terminal bristle; dorsal margin of basale with faint hairs. Endopodite: 1st joint with short bare distal bristle on anterior margin and 1 long 6-bristle with faint spines or bare; 6-bristle almost twice length of endopodite; end joint with long terminal bristle with faint marginal spines, bristle more than twice length of endopodite.

Fifth limb (Figure 264*a*): 2 small bristles present just ventral to base of stout spinous exopodial bristle (it could not be ascertained from holotype

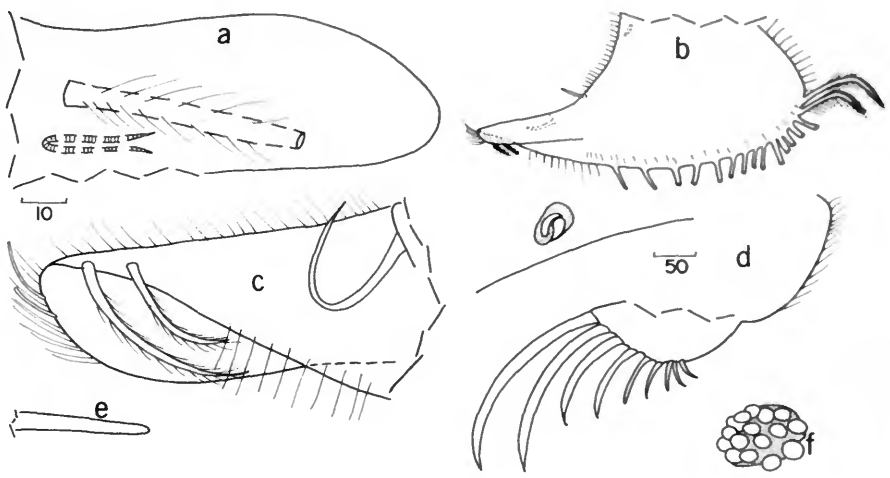

FIGURE 264.—*Parasterope crinita*, female, USNM 128278: *a*, tip of comb of right 5th limb, medial view; *b*, left 6th limb, lateral view (distal ends of bristles on end joint not shown); *c*, anterior tip of right 6th limb, medial view; *d*, left lamella of furca and genitalia; *e*, tip of rod-shaped organ; *f*, left lateral eye. (Same magnification in microns: *a,c*; *b-f*.)

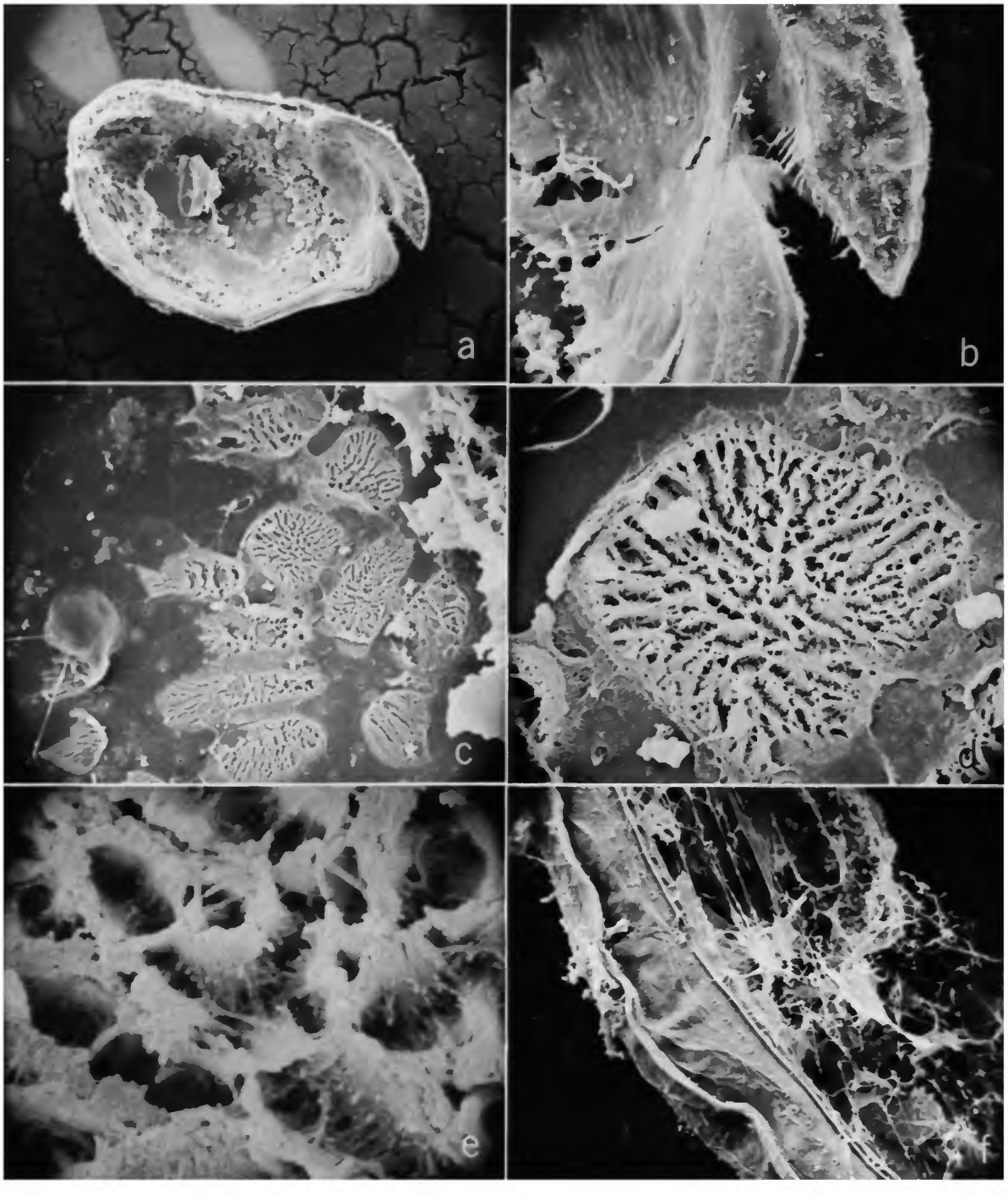

FIGURE 265.—*Parasterope crinita*, female, USNM 128278, left valve, medial view: *a*, complete valve, × 60; *b*, anterior, × 240; *c*, central muscle scars, × 450; *d*, detail muscle scars shown in "*c*," ×1800; *e*, detail of "*d*," × 9000; *f*, posterior margin, ventral half, × 280.

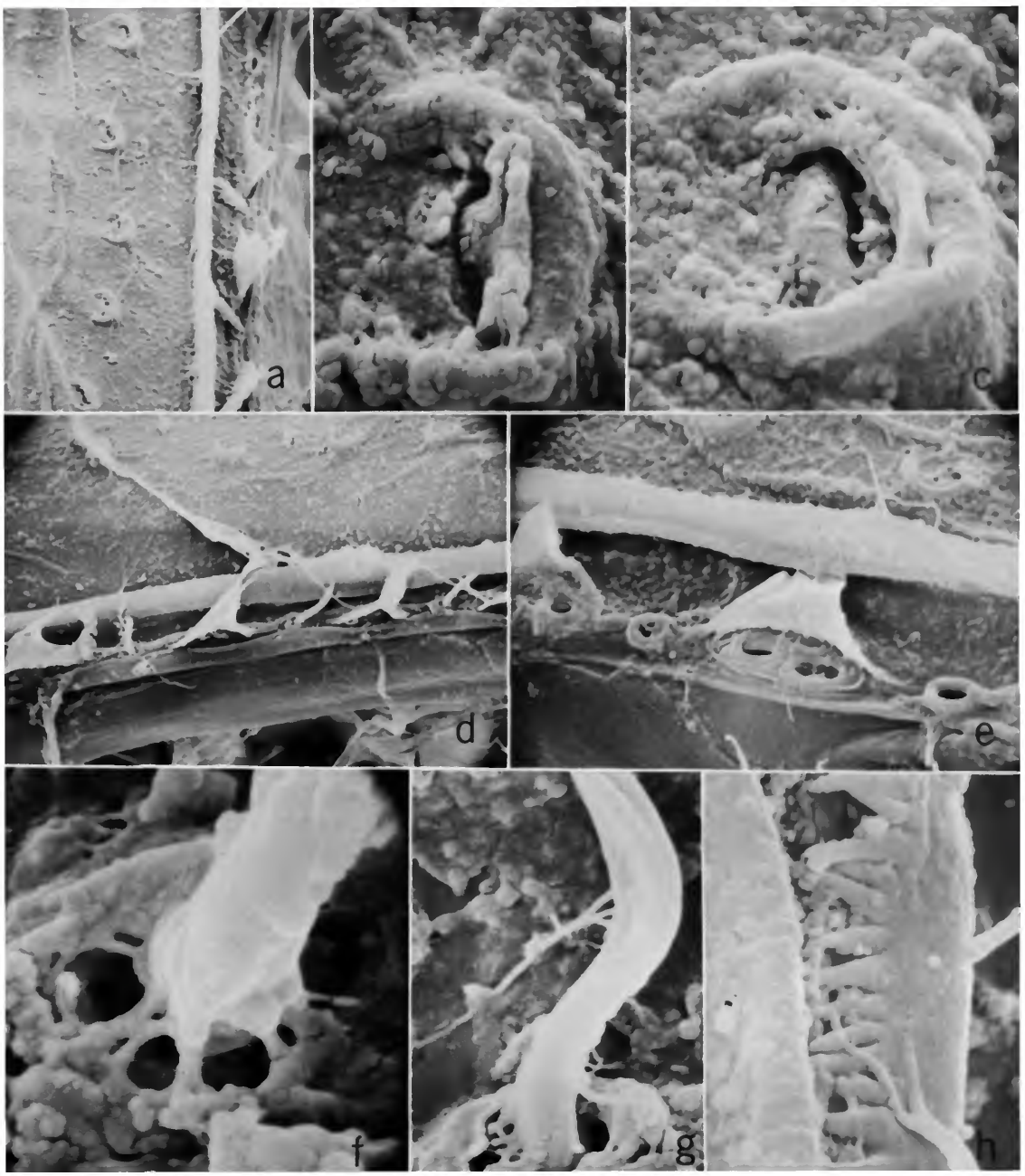

FIGURE 266.—*Parasterope crinita*, female, USNM 128278, left valve, medial view: *a*, posterior infold showing crescent processes and flaplike bristles, anterior of valve toward lower right, × 1400; *b,c*, detail of crescentlike processes, × 14,000; *d*, flaplike bristles and bristles between them, anterior of valve to lower left, × 1350; *e*, pores at base of flaplike bristles, × 2700; *f*, base of bristle between flaplike bristles, × 27,000; *g*, bristle between flaplike bristles, × 13,500; *h*, edge of selvage at dorsal end of posterior infold, × 10,000.

whether additional exopodial bristles are present close to ventral margin of comb).

Sixth limb (Figure 264*b,c*): Medial surface with minute bristle in anterodorsal corner; anterior margin with 1 upper and 1 lower bristle; lateral flap with 2 or 3 faint bristles; anteroventral corner with 2 spinous bristles; left limb of holotype with 16 spinous posteroventral bristles, right limb with 19; medial and lateral surfaces hirsute.

Seventh limb: Proximal and distal groups each with 6 bristles (3 + 3); each bristle with 3 or 4 bells. Terminus consisting of opposing combs, each with 10 or 11 spinous teeth.

Furca (Figure 264*d*): Each lamella with 9 claws of which posterior 2 are small, bristlelike; claws 1 to 7 with teeth along posterior margin; some main claws with faint hairs along anterior margins.

Rod-shaped organ: Elongate with rounded tip (Figure 264*e*).

Lateral eye: Eyes well developed with about 16 large ommatidia (Figure 264*f*).

Posterior: Posterior hirsute; dorsum forming right angle; no chitinized bars present as on *P. pectinata*.

Genitalia: Oval sclerotized process on each side. Brushlike organ not observed.

Eggs: USNM 128278 with 13 eggs in marsupium.

COMPARISONS.—*P. crinita* differs from *P. longiseta* in not having a long midbristle on the dorsal margin of the basale of the maxilla and in having more bristles between the posterior list and posterior shell margin. It is also smaller. The lateral eye of *P. crinita* bears 16 ommatidia compared to only 3 in the lateral eye of *P. micrommata*. The presence of hairs and spines on the dorsal margin of the mandibular basale distinguishes this species from *P. muelleri* (Skogsberg, 1920) and *P. quadrata*. The presence of hairs and spines on the dorsal margin of the basale and on the epipodial appendage of the maxilla distinguishes the new species from *P. skogsbergi* Poulsen, 1965. *Parasterope pectinata* Poulsen, 1965, differs from *P. crinita* in having fewer bristles on the infold between the list and posterior edge of the shell, no bristle at the base of the coxale endite of the mandible, no hairs and spines on the dorsal margin of the mandible, no marginal spines on the terminal bristle on the ventral margin of the basale of the maxilla, only a few spines present on the anterior margin of the protopodite of the 2nd antenna, 3 chitinous bars along posterior of the body above furca, and in general having many bristles bare that are spinous on *P. crinita*. *Parasterope obesa* Poulsen, 1965, has no spines on the anterior margin of the protopodite of the 2nd antenna and no bristle at the base of the coxale endite of the mandible; it also has 1 small bristle near the base of the stout exopodial bristle of the 5th limb where *P. crinita* has 2. Many bristles that are bare on appendages of *P. obesa* have spines on *P. crinita*. *Parasterope mckenziei* Kornicker, 1970, differs from *P. crinita* in having 10 furcal claws and much longer ventral bristles on the 4th joint of the 1st antenna.

DISTRIBUTION.—This species was collected at only the type-locality, on the shelf of South Island, New Zealand, at a depth of 51 m (Figure 255).

71. *Parasterope anommata*, new species

FIGURES 267–269

HOLOTYPE.—USNM 137087, gravid ♀, length 1.65 mm. Valves and some appendages in alcohol, remaining appendages on slides; right valve gold plated.

TYPE-LOCALITY.—*Vema* Cruise 18, station V–18–12.

ETYMOLOGY.—The specific name "anommata" is derived from the Greek "an" [= not, without, privative] + "omma, -tos" [= eye] and refers to the absence of lateral eyes on this species.

PARATYPES.—USNM 137088, 1 juvenile ♂; USNM 137093, 1 adult (?) ♀; USNM 137094, 2 juveniles (not dissected), approximate lengths only, 1.39 mm, 1.31 mm. Paratypes from same sample as holotype.

ADDITIONAL SPECIMENS.—USNM 128046, 1 adult ♀ with unextruded eggs, length 1.72 mm, height 1.26 mm, from *Eltanin* Cruise 6, station 340.

DIAGNOSIS OF ADULT FEMALE.—Carapace tumid in lateral view; 31–34 bristles present on posterior infold between broad list and valve margin; carapace length 1.59–1.72 mm.

Mandible: Dorsal margin of basale without midbristle; basale with spines forming clusters on medial surface and on proximal half of dorsal margin.

Maxilla: Dorsal margin of basale hirsute with 1 proximal bristle and 1 long distal bristle.

Sixth limb: Posteroventral margin with 18 bristles.

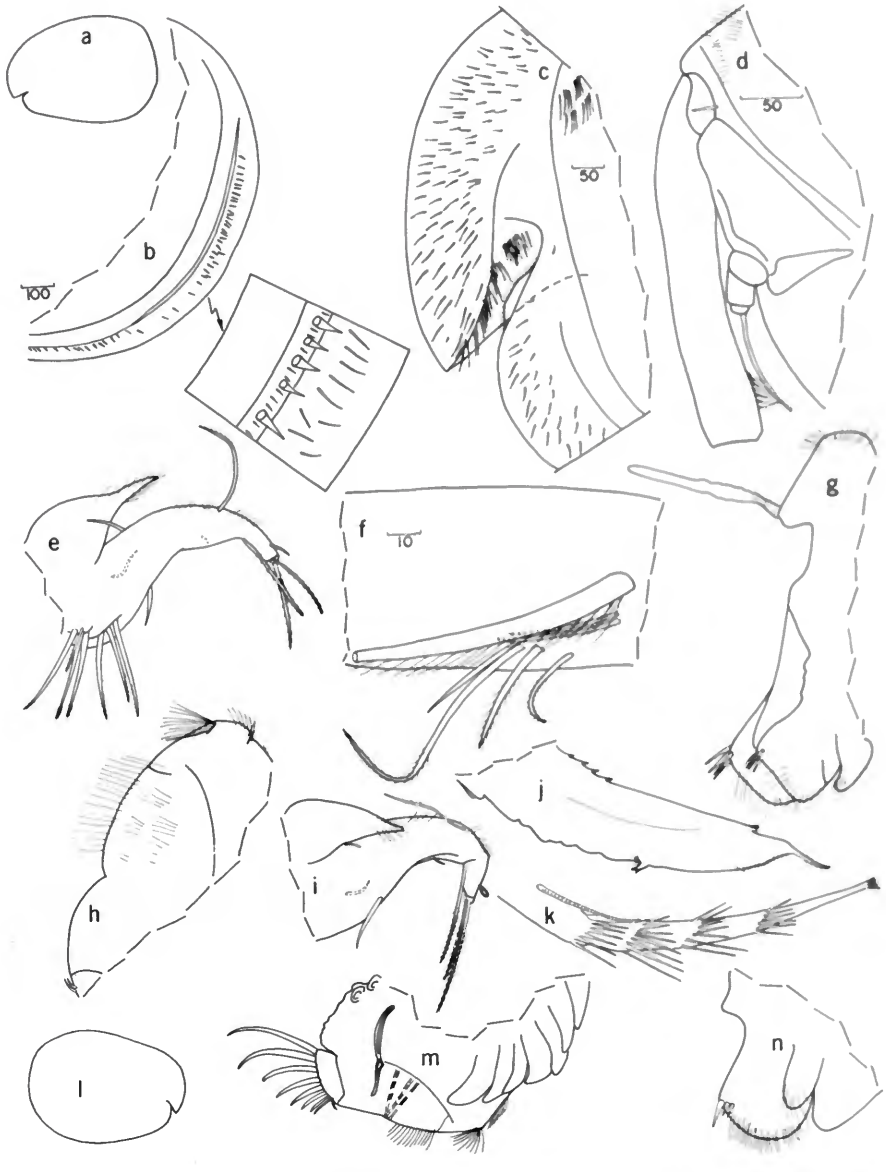

FIGURE 267.—*Parasterope anommata*, female, USNM 137087, length 1.65 mm, carapace: *a*, complete specimen, lateral view. Right valve, medial view: *b*, posterior; *c*, anterior. Appendages: *d*, endopodite and part of protopodite and exopodite of right 2nd antenna, medial view; *e*, right maxilla, medial view; *f*, exopodial bristles of left 5th limb, lateral view; *g*, medial eye and rod-shaped organ, upper lip; *h*, posterior and posterior 2 furcal claws on right lamella. Female, ?adult, USNM 137093, length 1.59 mm: *i*, left maxilla, medial view; *j*, tip of dorsal branch of coxale endite on right mandible, medial view; *k*, ventral branch and proximal bristle on coxale endite of right mandible, medial view. Female, ?adult, USNM 128046, length 1.72 mm: *l*, complete specimen, lateral view; *m*, posterior showing gill-like structures, left furcal lamella, genitalia, anterior toward top; *n*, upper lip. (Same magnification in microns: *b,m; c,e,g,i,n; f,j,k*.)

Seventh limb: With 12 (?17) bristles.

Lateral eyes: Absent.

DESCRIPTION OF FEMALE (Figures 267, 269).—Carapace tumid, greatest height behind valve middle; incisur short, placed below valve middle; ventral, dorsal, and posterior margins rounded; surface smooth with minute punctae visible under high magnification (Figure 267*a,l*).

Infold (Figures 267*b,c*; 269): Infold behind rostrum with about 17 bristles along list, about 16 bristles between list and incisur, and about 90 bristles anterior and dorsal to list; about 14 small bristles forming row along anterodorsal infold; about 50 bristles on broad anteroventral infold; about 25 bristles along ventral infold to point opposite lowermost hyaline flaplike bristle on posterior list. List beginning near inner margin of anterior part of infold, extending along ventral infold and continuing on posterior infold where it broadens; posterior broad list with about 26 broad transparent bristles and about 63 small bristles—2 or 3 small bristles between each transparent bristle; 31 to 34 bristles between broad posterior list and posterior margin of valve.

Selvage: Lamellar prolongation with marginal fringe present along lower margin of incisur.

Size (Figure 254): USNM 137087, length 1.65 mm, height 1.19 mm; USNM 137093, length 1.59 mm, height 1.16 mm; USNM 128046, length 1.72 mm, height 1.26 mm.

First antenna: Medial and lateral surfaces of 1st joint spinous. Second joint with long dorsal bristle with long spines along anterior margin and short lateral bristle with short marginal spines; ventral and dorsal margins with spines forming clusters; lateral surface with spines along distal margin. Distinct suture separating 3rd and 4th joints; 3rd joint with short bare ventral bristle and 6 long spinous dorsal bristles; proximal dorsal bristle of 3rd joint stouter than dorsal bristle of 2nd joint and remaining bristles of 3rd joint; 4th joint with 1 long dorsal bristle with short marginal spines and 2 short ventral bristles (both with short marginal spines) reaching just past distal margin of 5th joint; ventral margin of 4th joint with spines forming clusters along distal half. Sensory bristle of 5th joint with 6 terminal filaments, proximal of these almost twice width of others; dorsal margin of joint with minute teeth along distal part. Medial bristle of 6th joint with short marginal spines and about 4 times length of ventral margin of 6th joint. Seventh joint: a-claw with faint teeth along dorsal margin and near tip on ventral margin; b-bristle about one-third longer than a-claw and with 4 filaments including tip, some with marginal spines; c-bristle with 6 filaments including tip. Eighth joint: d-bristle absent or represented by minute process; e-bristle bare, slightly shorter than b-bristle; f-bristle forming right angle with stem, broken on holotype but with 3 marginal filaments on remaining part; g-bristle with about 7 filaments and about same length as c-bristle.

Second antenna (Figure 267*d*): Protopodite with small medial bristle; few spines forming clusters on anterodorsal margin and medial surface near anterodorsal corner. Endopodite short with 3 well-defined joints; terminal bristle on 3rd joint reaching distal end of 1st exopodite joint. Exopodite: 1st joint with long hairs on distal part of dorsal margin; bristle of 2nd joint reaching past distal end of 9th joint and with slender ventral spines; bristles of joints 3 to 8 with natatory hairs; joints 7 and 8 with minute basal spines; joint 9 with short lateral spine, and 4 bristles, 2 long with natatory hairs, 2 short with short marginal spines; joints 2 to 8 with short spines forming row along distal margin; bristles of joints 3 to 7 with faint marginal spines proximal along ventral margin.

Mandible (Figure 267*j,k*): Coxale broken off both limbs of holotype, but minute bristle present near base of ventral branch. Basale: endite with usual 4 spinous end bristles, 2 or 3 triaenid bristles with 4 or 5 pairs of marginal spines excluding terminal pair, glandular peg and single dwarf bristle; ventral margin of basale near endite with 1 triaenid bristle with 3 pairs of marginal spines excluding terminal pair; U-shaped process present on margin distal to base of bristle; dorsal margin of basale bare except for 2 long spinous terminal bristles; medial surface of joint with spines forming clusters near middle and along dorsal half of proximal margin; lateral surface with spines forming clusters near dorsal margin. Exopodite almost reaching distal end of 1st joint of endopodite and with 2 short spinous bristles. Endopodite: 1st joint with 3 long ventral bristles, the shortest of the 3 with short marginal spines, the others with short proximal and long distal spines; ventral margin of 2nd joint with 3 terminal bristles with short marginal spines, middle bristle only half

length others and with spines restricted to inner margin; dorsal margin with 1 short spinous proximal bristle and stout spinous a-, b-, c-, and d-bristles; 2 spinous cleaning bristles present near base of b-bristle; 6 spinous cleaning bristles forming oblique row near base of c-bristle; 1 long spinous lateral bristle present between b- and c-bristles and c- and d-bristles; 1 long spinous medial bristle present near base of d-bristle; medial surface of 2nd joint with spines forming clusters; end joint with dorsal claw with few teeth along middle part of ventral margin, and 5 spinous bristles, 4 long, 1 short. Coxale endite of left limb of paratype USNM 137093: ventral branch of endite with 4 oblique rows of spines and 4 or 5 minute spines on tip, and minute bristle near base; dorsal branch with undulating ventral margin and very small main spine; margin between main spine and tip of dorsal branch with distal spines; bristle of dorsal margin of dorsal branch missing on specimen.

Maxilla (Figure 267*e*): Epipodial appendage hirsute; endite I with 3 long bristles and 1 short bristle, endite II with long bristles. Basale: dorsal margin hirsute, with 1 proximal bristle near base of epipodite and 1 distal long bristle with few marginal spines; ventral margin with 1 medium proximal bristle, 1 minute distal bristle, and long spinous terminal bristle; lateral surface with 1 proximal bristle near middle. Endopodite: 1st joint with 1 short dorsal bristle and long 6-bristle with faint marginal spines; end joint with long terminal bristle with faint marginal spines.

Fifth limb (Figure 267*f*): Dorsal margin of comb bare except at distal end; spinous exopodial bristle extending past end of comb; 2 slender bristles near base of main exopodial bristle, 4 additional bristles near ventral margin of comb.

Sixth limb: Medial surface with minute bristle in anterodorsal corner; anterior margin with upper and lower bristle; anteroventral corner and lateral flap with 1 to 4 spinous bristles; posteroventral margin with 18 spinous or hirsute bristles; medial and lateral surfaces and anterior and posterior margins hirsute.

Seventh limb of holotype: Proximal and distal groups each with 6 bristles (3 + 3); each bristle with 3 or 4 bells. Terminus consisting of opposing combs, each with 12 or 13 spinous teeth.

Seventh limb of paratype USNM 137093: One limb with 14 bristles, other with 17, 7 to 9 in proximal group, 8 in distal group (distal group scattered over distal part of limb); each bristle with 1 to 3 bells; many bristles strongly tapering (juvenile character); terminus consisting of opposing combs, each with about 10 spinous teeth.

Furca (Figure 267*m*): Each lamella of holotype with 9 claws, posterior 2 oriented posteriad; claws 1 to 7 with spines along concave margin; some main claws with hairs along anterior margin. USNM 137093 with 8 claws on each lamella.

Rod-shaped organ (Figure 267*g*): Elongate, crinkled proximally and rounded terminally.

Eyes (Figure 267*g*): Medial eye large with hairs along dorsal margin; lateral eyes absent.

Posterior (Figure 267*h,m*): Posterior hirsute with rounded dorsum; long spines forming cluster near dorsum.

Upper lip (Figure 267*g,n*): Lip consisting of 2 hirsute lobes and hirsute lateral flap on each side; 4 large spines on anteroventral corner of each lobe.

Eggs: USNM 137087 with 3 eggs.

Epizoa: USNM 137093 with 1 or 2 stalked elliptical bodies (eggs?) attached to bristles of 1st antenna.

Description of Juvenile Male (Figure 268).—Carapace similar in shape and size to that of adult female (Figure 268*a*). Size: USNM 137088, length 1.61 mm, height 1.22 mm.

Second antenna: Endopodite 3-jointed, much

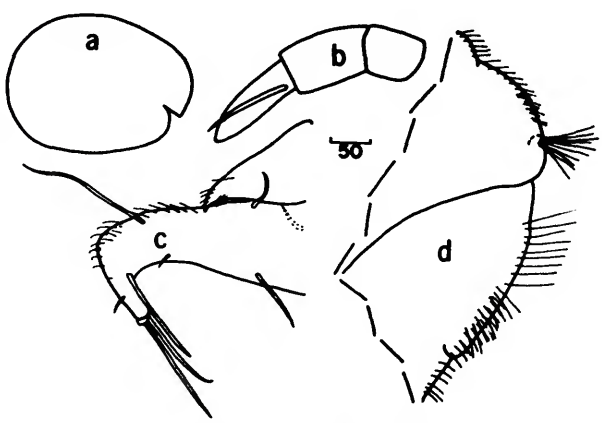

Figure 268.—*Parasterope anommata*, juvenile male, USNM 137088, length 1.61 mm: *a*, complete carapace, lateral view; *b*, endopodite of right 2nd antenna, medial view; *c*, right maxilla, medial view (marginal spines on bristles not shown); *d*, posterior, anterior to left. (Same magnification in microns: *b-d*.)

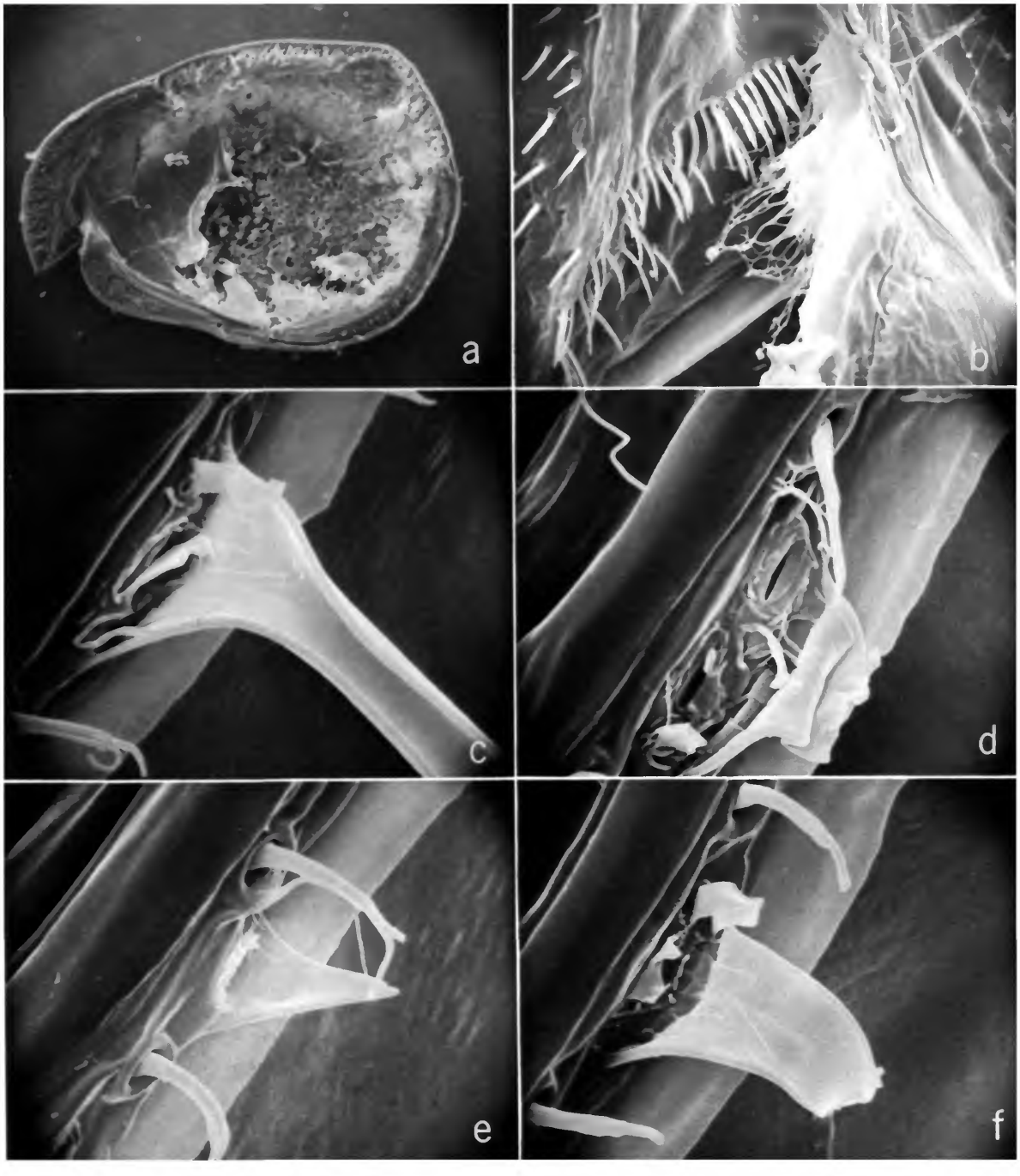

FIGURE 269.—*Parasterope anommata*, female, USNM 137087, right valve, medial view: *a*, complete valve, × 58; *b*, incisur area, × 500; *c-f*, details of pores at bases of transparent flaplike bristles of posteroventral infold, × 5000.

larger than that of female, and with proximal bristle on 3rd joint (Figure 268*b*).

Seventh limb: Each limb with 12 bristles, 6 in proximal group (3 + 3) and 6 in distal group (3 + 3); each bristle with 1 to 3 bells. Terminus with opposing combs with 11 or 12 spinous teeth.

Furca: Each lamella with 8 claws; posterior claw oriented posteriorly.

Lateral eyes: Absent.

First antenna, mandible, maxilla (Figure 268*c*), *upper lip, posterior* (Figure 268*d*), *medial eye and rod-shaped organ*: Similar to those on female.

REMARKS CONCERNING PARATYPE USNM 137093.—This specimen is considered conspecific with the holotype because of the lack of lateral eyes and similarities in morphology of the maxilla and mandible. On the other hand, it has more bristles on the 7th limb (these are strongly tapered, a juvenile character) and only 8 claws on each lamella of the furca. The specimen did not bear eggs, and is questionably considered an adult mainly because of its similarity in size with the holotype, a gravid female (Figure 267*i-n*).

COMPARISONS.—This species differs from many previously referred to the genus in lacking lateral eyes. Spines on the anteroventral margin of the two lobes forming the upper lip are larger than those usually present in species of *Parasterope*. Few species have so long a distal bristle on the dorsal margin of the basale of the maxilla.

DISTRIBUTION.—This species was collected at bathyal depths (about 426–572 m) east of Argentina between 47° and 54°S (Figure 255).

72. *Parasterope styx*, new species

FIGURES 270, 271

HOLOTYPE.—USNM 137259, gravid ♀, length 2.01 mm. Valves and some appendages in alcohol, remaining appendages on slides.

TYPE-LOCALITY.—*Vema* Cruise 17, station V–17–6.

ETYMOLOGY.—The specific name "styx" is derived from the Greek and Latin "Styx" [= a river in the nether world of mythology] in reference to the great depth from which the specimen was collected.

MATERIAL.—Holotype.

DIAGNOSIS OF ADULT FEMALE.—Carapace oval in lateral view with greatest height near middle; 1 bristle present on posterior infold between broad list and valve margin; carapace length about 2.01 mm.

Mandible: Dorsal margin of basale with 2 faint rows of short spines on proximal part and without midbristle.

Maxilla: Basale hirsute with 1 distal bristle on dorsal margin.

Sixth limb: Anterior margin without bristle at lower suture, but with 6 or 7 bristles above upper suture.

Seventh limb: With 12 or 13 bristles.

Lateral eyes: Absent.

DESCRIPTION OF FEMALE.—Carapace oval in lateral view with incisur well below valve middle (Figure 270*a*).

Infold (Figure 271): Infold behind rostrum with 40 to 50 bristles between list and outer margin; about 11 bristles on rostral list; about 14 bristles between list and incisur; infold below incisur with about 40 bristles; about 25 to 35 bristles on infold along ventral margin; list present starting near inner margin of anterior part of infold below incisur, extending along ventral infold, and continuing on posterior infold where it broadens; posterior list with about 35 broad transparent bristles and about 20 small bristles, not more than 1 small bristle between adjacent transparent bristles; 1 bristle present between broad posterior list and posterior margin of valve near dorsal end of list.

Selvage: Lamellar prolongation with fringe of hairs present along lower margin of incisur.

Size: USNM 137259, length 2.01 mm, height 1.48 mm (Figure 254).

First antenna (Figure 270*b*): Medial and lateral surfaces of 1st joint with spines forming clusters; 2nd joint with spines forming clusters on proximal part of dorsal margin, few faint spines on ventral margin, 1 long bristle on dorsal margin with long proximal and short distal marginal spines, and 1 short distal spinous lateral bristle near dorsal margin; ventral margin of 3rd joint with 1 short bare bristle; dorsal margin with 6 bristles in 5 groups of 1, 1, 1, 1, 2 bristles, medial bristle of distal pair with short marginal spines, others with long proximal and short distal spines; 3rd plus 4th joints longer than wide; medial proximal margin of 3rd joint concave, lateral margin linear; distal margin of 4th joint slightly concave, distinct; dorsal margin

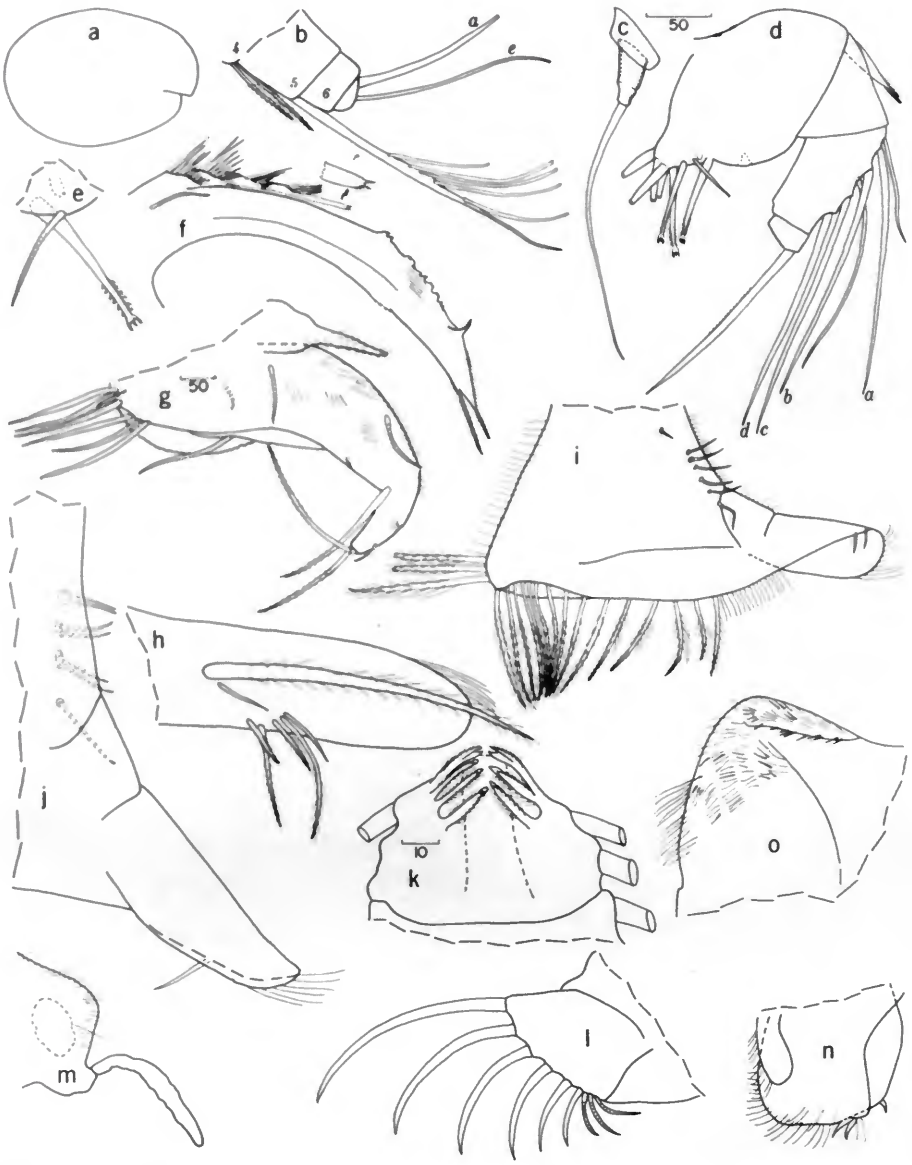

Figure 270.—*Parasterope styx*, female, USNM 137259, length 2.01 mm, carapace: *a*, complete specimen, lateral view. Right 1st antenna, lateral view: *b*, tip of limb (not all bristles shown). Right 2nd antenna, medial view: *c*, endopodite. Mandible: *d*, left limb, medial view (not all bristles shown); *e*, dwarf bristle and triaenid bristle of basale endite on right limb, medial view; *f*, coxale endite on left limb, medial view. Maxilla: *g*, left limb, medial view. Fifth limb: *h*, exopodial bristles on comb of right limb, lateral view. Sixth limb: *i*, left limb, medial view; *j*, anterior of right limb, lateral view. Seventh limb: *k*, tip. Furca: *l*, left lamella (marginal teeth of claws not shown). Anterior: *m*, medial eye and rod-shaped organ; *n*, upper lip. Posterior: *o*, spinous posterodorsal corner, anterior to right. (Same magnification in microns: *c-f,h,j; g,i,l-o.*)

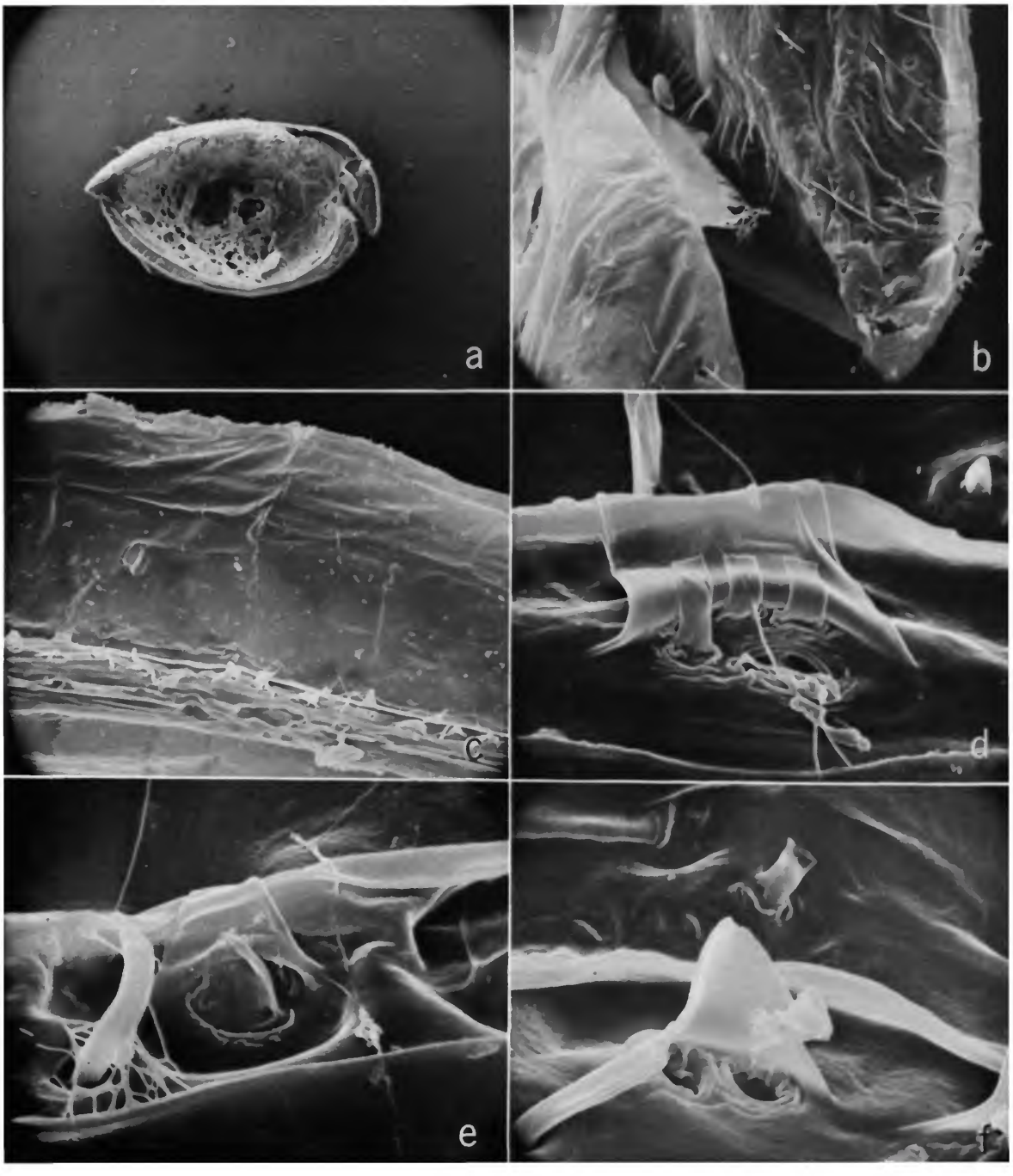

FIGURE 271.—*Parasterope styx*, female, USNM 137259, medial view: *a*, complete valve, × 28; *b*, anterior rostrum and incisur, × 280; *c*, posterior, × 500 (ventral to left); *d-f*, pores and transparent flaplike bristles, × 5000 (ventral to left, posterior to top).

of 4th joint with 1 long bristle with long marginal spines; ventral margin with 2 spinous bristles (longer of these reaching past distal end of 6th joint, other reaching to middle of ventral margin of 6th joint); sensory bristle of 5th joint with 6 filaments (proximal filament more slender than others); lateral surface of both 2nd and 5th joints with spines forming short row parallel to distal edge and near dorsal margin; medial bristle of 6th joint spinous, almost reaching end of sensory bristle of 5th joint. Seventh joint: a-claw with short spines along middle of dorsal margin; b-bristle broken but with 3 spinous marginal filaments on remaining part; c-bristle with 6 filaments including tip. Eighth joint: d-bristle absent or minute; e-bristle bare, almost reaching tip of sensory bristle; f-bristle bent at right angle to stem, broken on specimen, but with 2 marginal filaments on remaining part; g-bristle with 6 filaments including tip, some with marginal spines.

Second antenna (Figure 270*c*): Protopodite with small medial bristle and spines along dorsal margin and dorsal part of medial surface. Endopodite 3-jointed; suture separating 2nd and 3rd joints indistinct on right limb of holotype, fairly distinct on left limb; terminal filament of 3rd joint about 4 times length of stem. Exopodite: 1st joint with cluster of long distal hairs on inner margin; bristle of 2nd joint reaching past 9th joint and with numerous narrow spines along ventral margin and fewer spines along dorsal margin; bristles of joints 3 to 8 with natatory hairs; 9th joint of right limb with 4 bristles, 2 long with natatory hairs, 2 short bare or with short marginal spines; 9th joint of left limb of holotype with 2 long bristles with natatory hairs and 1 short bristle with short marginal spines; joints 3 to 8 with short basal spines, joint 9 with short lateral spine; comb of short spines present along distal margins of joints 2 to 8.

Mandible (Figure 270*d-f*): Ventral branch of coxale endite with 4 oblique rows of spines, and 2 slender spines and few hairs at tip; ventral margin of dorsal branch with about 6 pairs of weakly developed teeth and small main spine; dorsal bristle with short marginal hairs; small bristle present at basis of endite. Basale endite with glandular peg, 4 terminal bristles, 3 triaenid bristles with 6 to 8 pairs of marginal spines excluding terminal pair, and 1 dwarf bristle about two-thirds length of triaenid bristle. Basale: ventral margin with U-shaped sclerotized area: dorsal margin with 2 faint rows of short spines on proximal part and 2 long spinous terminal bristles. Exopodite with hirsute tip and 2 short terminal bristles not quite reaching end of 1st endopodite joint. Endopodite: 1st joint with 3 long spinous ventral bristles; dorsal margin of 2nd joint with single spinous proximal bristle about half length of a-bristle, and spinous a-, b-, c-, and d-bristles; medial surface spinous with 1 or 2 short bristles between b- and c-bristles, 3 to 5 spinous cleaning bristles forming oblique row between c- and d-bristles, 1 long spinous bristle distal to base of d-bristle; lateral surface with 1 long spinous bristle between b- and c-bristles and between c- and d-bristles; ventral margin of 2nd joint with 3 long spinous terminal bristles; end joint with long dorsal claw with minute teeth along middle of inner margin and 5 long spinous bristles.

Maxilla (Figure 270*g*): Epipodite elongate hirsute; proximal endite with 4 spinous bristles, 3 long, 1 short; distal endite with 3 spinous bristles, middle bristle shorter than others. Basale hirsute; medial surface with 1 proximal bristle near base of epipodite; dorsal margin with 1 distal bristle; lateral surface with 1 short proximal bristle; ventral margin with 1 long proximal bristle, 1 short distal bristle and 1 long spinous terminal bristle. Endopodite: 1st joint with clusters of spines, short anterior bristle and long spinous 6-bristle; end joint with long spinous terminal bristle.

Fifth limb: Epipodial appendage with 72 bristles. Dorsal margin of comb bare except for hairs present at distal end. Exopodite: stout plumose bristle reaching past end of comb; 1 slender bristle near basis of main bristle; 5 bristles near ventral margin (Figure 270*h*).

Sixth limb (Figure 270*i,j*): Anteroventral corner with 1 minute medial bristle; anterior margin without bristle at lower suture, but with 6 or 7 medial bristles above upper suture; anteroventral corner with 1 or 2 bristles; posteroventral margin with 15 or 16 bristles; medial and lateral surfaces and margins of limb hirsute.

Seventh limb: One limb with 12 bristles, 6 in proximal group (2 + 4) and 6 in distal group (3 + 3); other limb with 13 bristles, 8 in proximal group (4 + 4) and 5 in distal group (2 + 3); each bristle with 2 to 4 bells; opposing combs of

terminus each with 7 or 8 teeth; teeth bifurcate consisting of spinous outer part and smooth tipped inner part (Figure 270*k*).

Furca (Figure 270*l*): Each lamella with 9 claws including 3 posterior secondary bristlelike annulate claws. Primary claws with long and short teeth along posterior margins, some also with thin hairs along anterior margins.

Posterior (Figure 270*o*): Posterior forming right angle, spinous.

Rod-shaped organ and eyes (Figure 270*m*): Rod-shaped organ 1-jointed with rounded tip. Medial eye hirsute with reddish brown central part in preserved specimen. Lateral eyes not present.

Upper lip (Figure 270*n*): Lip consisting of two hirsute lobes with linear ventral margin, each lobe with 2 spines; segment between lobes with 1 anterior spine; hirsute flap present on each side of mouth.

Eggs: USNM 137259 with 9 well-developed eggs and larvae.

COMPARISONS.—The new species differs from previously described *Parasterope* in having more than 2 anterior bristles on the 6th limb. The absence of lateral eyes is uncommon in the genus. The dwarf bristle on the basale endite of the mandible of *P. styx* is unusually long.

DISTRIBUTION.—This species was collected only at the type-locality, on the crest of the west rise of the Peru-Chile Trench, at a depth of 4303 m (Figure 255).

73. *Parasterope prolixa*, new species

FIGURES 272, 273

HOLOTYPE.—USNM 139104, gravid ♀, length 1.30 mm, carapace and some appendages in alcohol, remaining appendages on slides.

TYPE-LOCALITY.—*Hero* Cruise 69–5, station 48.

ETYMOLOGY.—The specific name is derived from the Latin "prolixus" [= stretched out long] in reference to the unusually long dwarf bristle on the basale endite of the mandible.

PARATYPES.—USNM 139106, 1 gravid ♀; USNM 139107, 1 gravid ♀, (not dissected); USNM 139108, 2 adult ♀♀ without eggs, 17 juveniles; USNM 139109, 1 juvenile ♂, length 1.02 mm, height 0.66 mm; USNM 139140, 1 adult ♂; USNM 139114, 1 adult ♀, 1 juvenile. USNM 139106–139108 from same sample as holotype; USNM 139109 from *Hero* Cruise 69–5, station 49; USNM 139140, 139114 from *Hero* Cruise 69–5, station 45.

DIAGNOSIS OF ADULT FEMALE.—Carapace tumid in lateral view; 4 or 5 bristles present in lower half of posterior infold between broad list and valve margin; carapace length 1.29–1.35 mm.

Mandible: Medial surface of basale with few spines forming rows; dorsal margin without spines or midbristle.

Maxilla: Dorsal margin of basale hirsute and with long distal bristle.

Sixth limb: Posteroventral margin with 14 or 15 spinous bristles.

Seventh limb: With 12 bristles.

Lateral eyes: With about 16 ommatidia.

DESCRIPTION OF FEMALE (Figure 272). Carapace tumid, small, greatest height behind valve middle; incisur short, placed below valve middle; ventral and posterior margins rounded; surface smooth, minute punctae visible under high magnification (Figure 272*a*).

Infold (Figure 272*s-u*): Infold behind rostrum with 29 bristles (list faint if present); list present starting near inner margin of anterior part of infold, extending along ventral infold and continuing on posterior infold where it broadens; anteroventral infold below incisur with 15–18 bristles; 6–9 bristles forming row between list and ventral margin of valve; posterior broad list with about 21 or 22 broad transparent bristles and about 14 bristles, about 1 bristle between each transparent bristle; 4 or 5 bristles present in lower half of posterior infold between broad posterior list and margin of valve.

Selvage: Short lamellar prolongation with long fringe observed on posterodorsal part of right valve above broad posterior list.

Muscle scars: Central muscle scars consisting of about 13 individual scars.

Size (Figure 254): USNM 139104, length 1.30 mm, height 0.89 mm; USNM 139106, length, 1.29 mm, height 0.87 mm; USNM 139107, length 1.32 mm, height 0.90 mm; USNM 139114, length 1.35 mm, height 0.96 mm.

First antenna (Figure 272*b,c*): Medial and lateral surfaces of 1st and 2nd joints spinous; 2nd joint with long dorsal bristle with long spines along anterior margin and short spines distally, and short lateral bristle with short marginal spines; few clus-

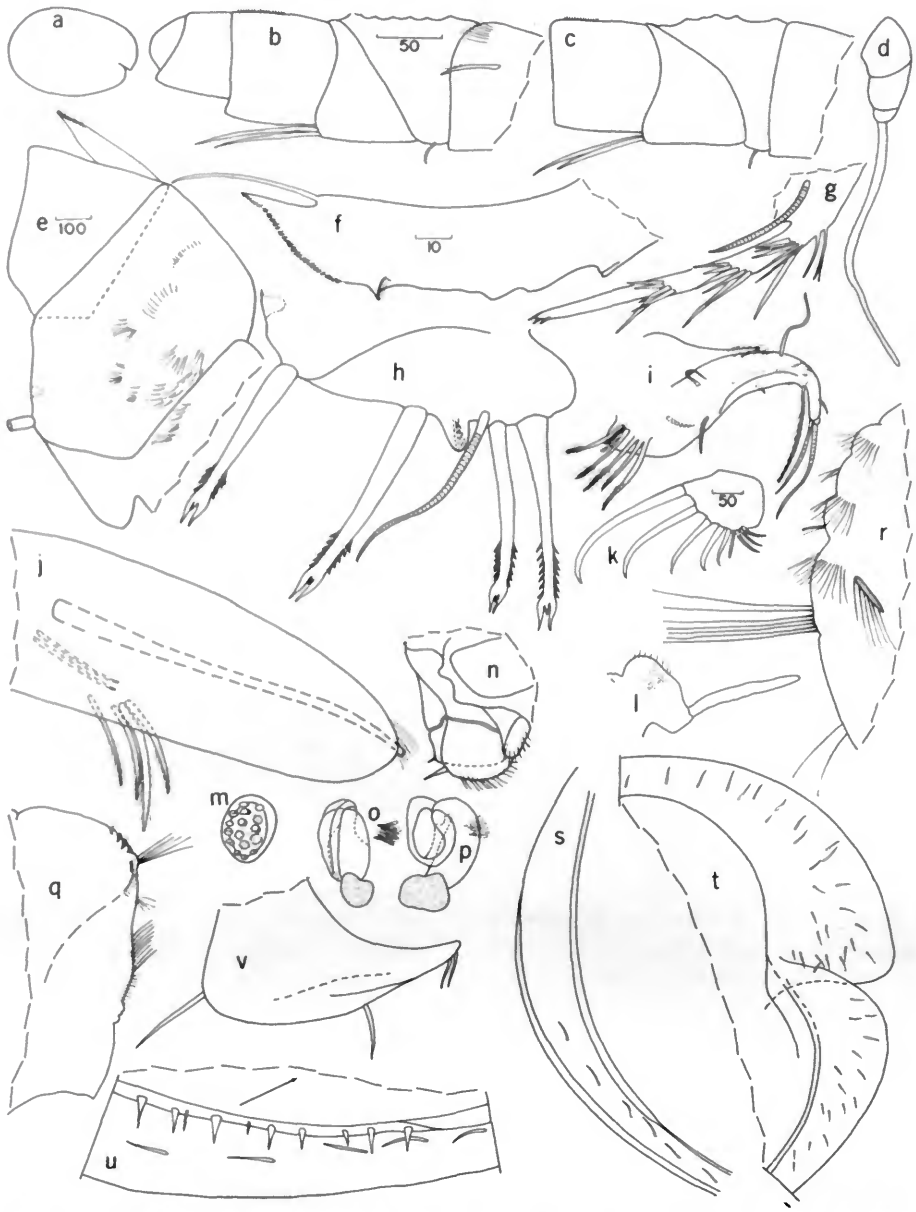

FIGURE 272.—*Parasterope prolixa*, female, USNM 139104, length 1.30 mm, carapace: *a*, complete specimen, lateral view. First antenna: *b*, distal end of left limb, lateral view (not all bristles shown); *c*, joints 2–5 of right limb, medial view (not all bristles shown). Right 2nd antenna: *d*, endopodite, medial view. Mandible: *e*, basale and exopodite of right limb, medial view (not all bristles shown); *f*, tip of dorsal branch of coxale endite on left limb, medial view; *g*, dorsal branch and proximal bristle on coxale endite of left limb, medial view; *h*, basale endite of right limb, medial view. Maxilla: *i*, left limb, medial view. Fifth limb: *j*, exopodial bristles on left limb, medial view. Furca: *k*, left lamella. Anterior: *l*, medial eye and rod-shaped organ; *m*, left lateral eye; *n*, upper lip. Posterior: *o*, genitalia and brushlike organ, lateral view of right organ; *p*, genitalia and brushlike organ, medial view of left organ; *q*, posterior margin; *r*, detail of "*q*." Female, USNM 139106, length 1.29 mm, left valve, medial view: *s*, posterior; *t*, anterior; *u*, posteroventral infold; *v*, right 6th limb (only posterior and anterior bristles along anteroventral margin shown). (Same magnification in microns: *i,k-n,r-t; b,c,o,p,u; d,e; f-h,j,q*.)

ters of spines present along ventral and dorsal margins of joint; 3rd joint with short bare ventral bristle and 6 long spinous dorsal bristles; all dorsal bristles slightly shorter than dorsal bristle of 2nd joint; proximal dorsal bristle of 3rd joint stouter than bristle of 2nd joint and remaining bristles of 3rd joint; distinct suture separating 3rd and 4th joints; 4th joint with 1 long dorsal bristle with short marginal spines and 2 short ventral bristles with short marginal spines; both ventral bristles reaching past distal margin of 5th joint; sensory bristle of 5th joint with 6 terminal filaments; distal dorsal margin of 5th joint with minute spines forming row; medial bristle of 6th joint with short marginal spines. Seventh joint: a-claw with faint spines along ventral margin of tip; b-bristle longer than a-claw and with 5 filaments including tip; c-bristle with 6 filaments including tip. Eighth joint: d-bristle not present; e-bristle bare, slightly shorter than b-bristle; f-bristle at right angle to stem, with 5 filaments including tip; g-bristle with 6 filaments including tip.

Second antenna (Figure 272*d*): Protopodite with small medial bristle; many slender spines present along anterior margin and anterior half of medial surface; single row of minute spines on posterior half of medial surface near endopodite; posterior margin bare. Endopodite 3-jointed, joints well defined; 3rd joint with terminal bristle more than twice length of stem. Exopodite: bristle on 2nd joint reaching past 9th joint and with slender ventral spines; bristles of joints 3 to 8 with natatory hairs; joints 2 to 8 with short spines forming row along distal margin; dorsal margin of 1st joint with long hairs forming distal cluster; 9th joint with lateral spines and 4 bristles, 2 long with natatory hairs, 2 short with short marginal spines; bristles of joints 3 to 8 with marginal spines proximal along ventral margin; joints 2 to 8 with basal spines, spines becoming longer on distal joints.

Mandible (Figure 272*e-h*): Coxale: minute bristle present at base of endite; ventral branch of endite with 3 rows of oblique spines and 3 or 4 small spines at tip; dorsal branch with proximal pair of angular nodes, 2 low rounded distal nodes and small main spine; margin between main spine and tip of dorsal branch with bare space followed by spines; bristle of dorsal margin bare, extending past tip of branch. Basale: endite with usual 4 pectinate end bristles, 3 triaenid bristles bearing 5 to 7 pairs of spines excluding terminal pair, elongate glandular peg and single dwarf bristle about four-fifths length of adjacent triaenid bristles; ventral margin of basale near endite with triaenid bristle with 4 or 5 pairs of marginal spines excluding terminal pair; U-shaped process present on margin distal to base of bristle; dorsal margin of basale bare except for 2 long spinous terminal bristles; medial surface of basale with few spines forming rows. Exopodite almost reaching distal end of 1st joint of endopodite and with 2 short spinous bristles. Endopodite: 1st joint with 3 long ventral bristles, shortest of these with short marginal spines, remaining 2 with short proximal spines and long spines near middle; ventral margin of 2nd joint with 3 long terminal bristles with short marginal spines; dorsal margin with 1 short bare proximal bristle and stout spinous a-, b-, c-, and d-bristles; 1 long spinous lateral bristle present between b- and c-bristles and c- and d-bristles; 2 medial rows of spinous cleaning bristles present between b- and c-bristles, proximal group with 3 bristles, distal group with 6; 1 long spinous medial bristle present near base of d-bristle; medial surface with few spines forming rows; end joint with dorsal claw and 5 bristles, 1 short spinous, 4 long spinous or bare.

Maxilla (Figure 272*i*): Epipodial appendage hirsute; endite I with 3 long and 1 short bristle; endite II with 3 long bristles; basale with 1 proximal medial bristle below base of epipodial appendage, 1 proximal lateral bristle, 1 long spinous distal bristle on dorsal margin; ventral margin with 2 short bristles, 1 proximal, 1 distal, and 1 long spinous terminal bristle; dorsal margin hirsute. Endopodite: 1st joint with 1 short bare distal bristle on anterior margin and 1 long 6-bristle with marginal spines; end joint with long spinous terminal bristle.

Fifth limb (Figure 272*j*): Dorsal margin of comb bare except at terminal end; 2 slender bristles present at base of stout spinous exopodial bristles; 4 additional lateral bristles present near ventral margin of comb.

Sixth limb (Figure 272*v*): Medial surface with minute bristle in anterodorsal corner; anterior margin with 1 upper and 1 lower bristle; anteroventral corner and lateral flap with total of 3 spinous bristles; posteroventral margin with 14 or 15 spinous bristles; medial and lateral surfaces hirsute.

Seventh limb: Proximal and distal groups each with 6 bristles (3 + 3); each bristle with 3 or 4 bells; terminus consisting of opposing combs, each with 10 or 11 teeth.

Furca (Figure 272*k*): Each lamella with 9 claws, posterior 3 or 4 claws annulate, bristlelike; main claws with teeth along posterior margins and hairs along anterior margins; secondary claws with spines along both margins.

Rod-shaped organ: Elongate with rounded tip (Figure 272*l*).

Eyes (Figure 272*l,m*): Medial eye with dorsal hairs, pigmented; lateral eye about same size as medial eye, pigmented, with about 16 ommatidia.

Upper lip (Figure 272*n*): Lip lobate with lateral flaps; anterior spines on each lobe and between lobes; lobes and flap hirsute.

Posterior (Figure 272*q,r*): Posterior spinous; dorsum forming right angle; spinous lateral bar present.

Genitalia: Oval sclerotized process on each side (Figure 272*o,p*).

Brushlike organ: Organ with 8 minute bristles (Figure 272*o,p*).

Eggs: USNM 139104 with 6 and USNM 139106 with 5 well-developed eggs with lateral and medial eyes visible.

Description of Adult Male (Figure 273).—Carapace with greatest height near middle and long hairs near posterior (Figure 273*a*). Size: USNM 139140, length 1.28 mm, height 0.87 mm (Figure 254).

First antenna (Figure 273*b*): 1st joint bare; 2nd joint with spines along ventral margin and on medial surface near ventral margin, and 1 dorsal and 1 lateral bristle; 3rd joint with 1 short ventral bristle and 6 long spinous dorsal bristles; 4th joint with 1 long dorsal bristle with short marginal spines and 2 short ventral bristles with short faint marginal spines; stem of plumose sensory bristle on 5th limb extending past tip of a-claw on 7th limb; medial bristle of 6th joint with short marginal spines. Seventh joint: a-claw slender, with faint teeth along ventral margin near tip; b-bristle longer than a-claw, with 6 filaments including tip (proximal filament hirsute); c-bristle longer and stouter than other bristles on 7th and 8th joints and with 16 filaments including tip. Eighth joint: d-bristle not present; e-bristle bare, about same length as b-bristle; f-bristle at right angle to stem and with 8 filaments including tip; g-bristle about three-fourths length of c-bristle and with 10 filaments including tip.

Second antenna (Figure 273*c*): Protopodite with small medial bristle and with minute spines forming few clusters near middle. Endopodite 3-jointed: 1st joint elongate bare, 2nd joint elongate with 3 short distal bristles on ventral margin; 3rd joint elongate, reflexed on 2nd, with long proximal filament and pointed serrated tip. Exopodite: bristle on 2nd joint about twice length of 3rd to 9th joints and with natatory hairs; 2nd joint shorter than usual for genus, equal in length to combined lengths of joints 3 and 4; small basal spines on

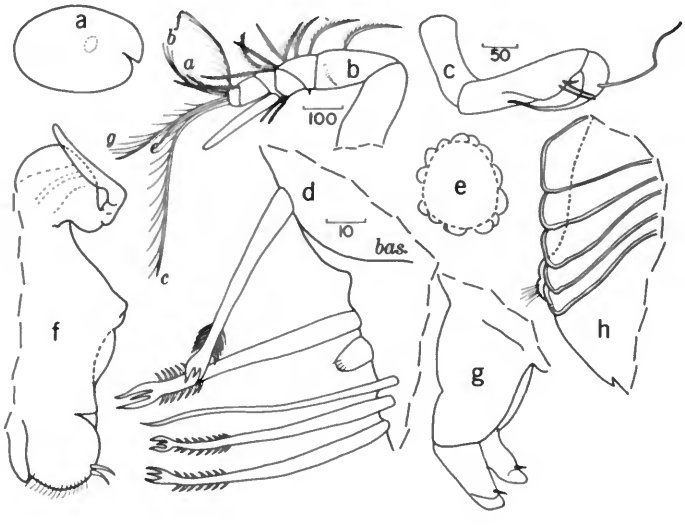

Figure 273.—*Parasterope prolixa*, male, USNM 139140, length 1.28 mm: *a*, complete specimen showing outline of eye position, lateral view; *b*, right 1st antenna, medial view (filaments on sensory bristle not shown); *c*, endopodite on left 2nd antenna, lateral view; *d*, part of basale and basale endite on right mandible, medial view; *e*, outline of right lateral eye; *f*, anterior with medial eye and rod-shaped organ and upper lip; *g*, copulatory limb, right lateral view (not under cover slip); *h*, posterior and gill-like structures, anterior to right. (Same magnification in microns: *c,e-h*.)

joints 4 to 8, lateral spine on joint 9; 9th joint with 4 bristles, 2 long, 1 medium, 1 short, all with natatory hairs; joints 3 to 8 with short spines forming row along distal margins and long hairs forming row on distal dorsal margin; right exopodite on USNM 139113 aberrant in having only 8 exopodite joints, last joint (possibly fused 8th and 9th joints) with 4 long and 1 short bristle.

Mandible (Figure 273*d*): Minute bristle present at base of coxale endite (endite broken off on only limb examined). Basale: endite with usual 4 pectinate end bristles, 3 triaenid bristles with 7 or 8 pairs of marginal spines excluding terminal pair, elongate glandular peg and single dwarf bristle as long as adjacent triaenid bristles; 4th triaenid bristle with 5 marginal spines excluding terminal pair present on ventral margin of basale near bases of endite; dorsal margin of basale bare except for 2 long spinous terminal bristles; medial surface of basale bare. Exopodite similar to that on mandible of female. Endopodite: 1st joint with 3 long spinous ventral bristles (right limb of USNM 139113 aberrant, having only 2 bristles and one of these only partly emergent); ventral margin of 2nd endopodite joint with 3 terminal bristles on left limb, 2 on right; ventral margin of joint with 2 proximal bristles, otherwise joint armed similarly to that of female; end joint armed similarly to that of female.

Maxilla: Similar to that on female.

Fifth limb: Epipodial appendage with 61 bristles; bristles and hairs on comb similar to those on comb of female.

Sixth limb (not removed): Similar to that of female but with 15 or 16 spinous bristles on posteroventral margin.

Seventh limb: Similar to that on female.

Furca: Each lamella with 8 claws, posterior 2 claws annulate, bristlelike; claw 1 with hairs along anterior convex margin but without teeth along posterior concave margin; claws 2 to 4 with teeth along posterior margin and few hairs along anterior margin; claws 5 to 8 bare.

Rod-shaped organ and medial eyes, and upper lip: Similar to that on female (Figure 273*f*).

Lateral eye: Pigmented with ommatidia about twice diameter of lateral eyes on female (Figure 273*e*).

Posterior: Similar to that on female (Figure 273*h*).

Genitalia: Copulatory organs elongate with triangular tips and 1 or more distal bristles (Figure 273*g*).

COMPARISONS.—*Parasterope prolixa* resembles *P. obesa* Poulsen, 1965 (p. 364), and *P. styx* in having an extremely long dwarf bristle on the basale endite of the mandible. The new species differs from *P. obesa* in having hairs and a much longer distal bristle on the dorsal margin of the basale of the maxilla, spines on the protopodite of the 2nd antenna, longer combined 3rd and 4th joint on the 1st antenna, and 2 slender bristles beneath the major exopodite bristle on the 5th limb. The new species differs from *P. crinita* in not having hairs and spines along the dorsal margin of the mandibular basale. The large lateral eye distinguishes *P. prolixa* from *P. styx*, *P. micrommata*, and *P. anommata*.

DISTRIBUTION.—This species was collected in the western part of the Strait of Magellan at a depth of 21–40 m (Figure 255).

Parasterope Species Indeterminate

MATERIAL.—USNM 128145, 1 juvenile ♀, length 1.56 mm, height 1.16 mm; USNM 128144, 1 N–1 ♂, length 1.41 mm, height 0.96 mm; USNM 128502, 1 juvenile ♀, length 1.37 mm, height 0.95 mm; USNM 128281, 1 adult ♀ without eggs (mandibles lost), length 1.31 mm, height 0.86 mm; USNM 137091, 1 juvenile ♂ (large lateral eyes, short distal bristle on dorsal margin of maxilla basale) length 1.17 mm, height 0.86 mm; USNM 137250, juvenile ♀, instar III, length 1.09 mm, height 0.78 mm (♀ choniostomatid in brood chamber); USNM 137455, 1 juvenile ♂, length 1.18 mm, height 0.88 mm, + 1 juvenile.

USNM 128144, 128145 from *Eltanin* Cruise 9, station 740; USNM 128502 from *Eltanin* Cruise 6, station 453; USNM 128281 from *Eltanin* Cruise 20, station 91; USNM 137091 from *Vema* Cruise 18, station V–18–12; USNM 137250 from *Vema* Cruise 15, station V–15–131; USNM 137455 from *Vema* Cruise 17, station V–17–69.

DISTRIBUTION.—The distribution of this taxon is shown in Figure 255.

Synasterope Poulsen, 1965

TYPE-SPECIES.—*Synasterope implumis* Poulsen, 1965, designated herein.

Synasterope is represented by eight species in the study area: *S. brachythrix*, new species; *S. dimorpha* (Hartmann, 1965); *S. duplex*, new species; *S. mystax*, new species; *S. empoulseni*, new species; *S. polythrix*, new species; *S. arnaudi*, new species; *S. bassana* Poulsen, 1965.

DIAGNOSIS OF GENUS.—Carapace elongate with subparallel ventral and dorsal margins and slitlike incisur on female; lateral surface smooth without ornamentation.

First antenna: Sensory bristle of 5th joint with 6 terminal filaments; d-bristle of 8th joint absent or minute.

Mandible: Exopodite reaching past middle of dorsal margin of 1st endopodite joint except on *S. mystax*; without long lateral bristle between b- and c-bristles of 2nd endopodite joint.

Seventh limb: Each limb with 10–22 bristles.

REMARKS CONCERNING PLACEMENT OF *Synasterope mystax*.—Poulsen (1965:401) gives as one of the characters defining *Synasterope*, "The exopodite of the mandible is longer than half the length of the 1st endopodite joint." On *S. mystax* the mandibular exopodite on the female is about half, and on the male less than half the length of the 1st endopodite joint. The female is referred to *Synasterope* rather than to *Cylindroleberis* herein because it does not have a short proximal filament on the sensory bristle on the 5th joint of the 1st antenna. The male could not be separated on that basis, and it is possible that, if the male and female prove not to be conspecific, the male should be referred to *Cylindroleberis*.

DISTRIBUTION.—The genus *Synasterope* is widespread. The northernmost latitude at which it has been collected is about 30°N. The southernmost locality is in the Weddell Sea, Antarctica (Figure 253). The genus has been collected at depths of about 1–4450 m. Adult males have been collected at the water's surface.

Key to Species

(Includes only species south of 35°S)

1. Lateral eyes present 2
   Lateral eyes absent 3
2. 2 or 3 midbristles on dorsal margin of mandibular basale ..... 76. *S. empoulseni*
   Without midbristle on dorsal margin of mandibular basale ..... 75. *S. bassana*
3. Ventral margin of basale of maxilla with 1 proximal bristle 4
   Ventral margin of basale of maxilla with 5 proximal bristles 5
4. Seventh limb with 19–21 bristles ..... 79. *S. mystax*
   Seventh limb with 12 bristles 6
5. Seventh limb with 18–22 bristles ..... 78. *S. polythrix*
   Seventh limb with 12 bristles ..... 77. *S. duplex*
6. e-bristle on 8th joint of 1st antenna about same length or shorter than a-claw of 7th joint; medial bristle on protopodite of 2nd antenna absent ..... 80. *S. brachythrix*
   e-bristle on 1st antenna longer than a-claw; medial bristle on protopodite of 2nd antenna present 7
7. Length of ventral margin of 6th joint of 1st antenna of female less than 60 percent length of distance between base of sensory bristle and base of proximal filament on sensory bristle; 8 processes on posterior infold of carapace ..... 74. *S. dimorpha*
   Length of ventral margin of 6th joint of 1st antenna of female more than 70 percent of distance between base of sensory bristle and base of proximal filament on sensory bristle; 4 or 5 processes on posterior infold of carapace ..... 81. *S. arnaudi*

74. *Synasterope dimorpha* (Hartmann)

FIGURES 274, 276

Cylindroleberis dimorpha Hartmann, 1965:321, figs. 23–32.

HOLOTYPE AND PARATYPES.—Hamburg Zoological Museum, nos. K 27 289, K 27 292, K 27 305 (Hartmann, 1965:321).

TYPE-LOCALITY.—Hartmann station 108, 136 m water depth, 73°58.5′W, 40°53.5′S, near Cabo Quedal, S. Chile (Hartmann in Hartmann-Schröder and Hartmann, 1965:321).

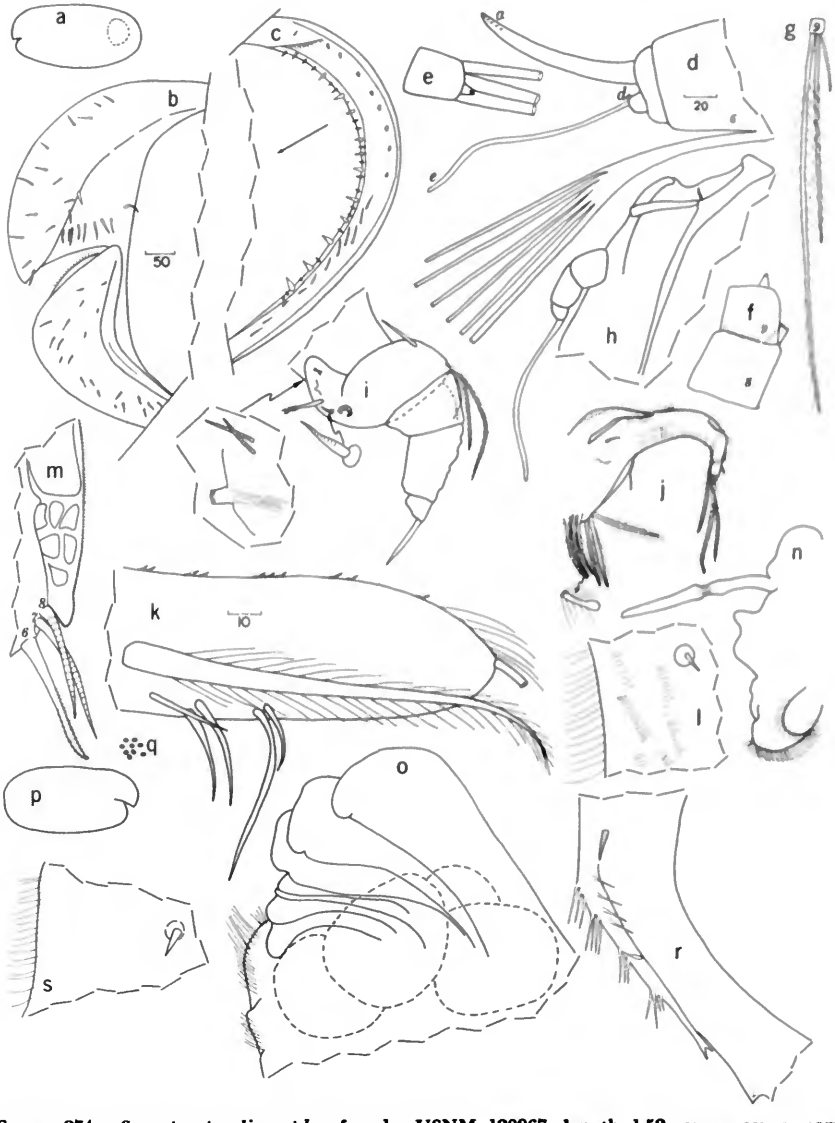

FIGURE 274.—*Synasterope dimorpha*, female, USNM 128967, length 1.52, carapace: *a*, complete specimen, position of egg indicated, lateral view. Right valve, medial view: *b*, anterior; *c*, posterior. First antenna: *d*, tip of limb (all bristles and ends of filaments on sensory bristles not shown). Second antenna: *e*, 9th joint on exopodite of left limb, lateral view; *f*, joints 8–9 on right limb, lateral view; *g*, bristles on 9th joint of right limb, medial view; *h*, endopodite and part of protopodite of right limb, medial view. Mandible: *i*, left limb, medial view (not all bristles shown). Maxilla: *j*, left limb, medial view. Right 5th limb: *k*, comb, lateral view. Right 6th limb: *l*, minute bristle in anterodorsal corner, medial view. Furca: *m*, proximal 3 claws on left lamella. Anterior: *n*, medial eye and rod-shaped organ, anterior process, upper lip. Posterior: *o*, dorsal process and gill-like structures, outlines of unextruded eggs, anterior toward lower right. Female, USNM 128968, length 1.57 mm: *p*, complete specimen, lateral view; *q*, sketch of central muscle attachments on right valve, lateral view. Female, K 27 305, Hamburg Zoological Museum, length 1.63 mm: *r*, ventral branch and proximal bristle on coxale endite of right mandible, medial view; *s*, minute bristle in anterodorsal corner of right 6th limb, medial view. (Same magnification in microns: *b,c,g,i,j,n,o; e,f,k-m,r*.)

OTHER LOCALITIES.—Hartmann stations 93, 94, 106, 110 (Hartmann in Hartmann-Schröeder and Hartmann, 1965:324). *Vema* Cruise 17, stations V-17-12, V-17-13.

MATERIAL.—At my request, Dr. Gerd Hartmann forwarded from the Hamburg Zoological Museum specimens of *Cylindroleberis dimorpha* for my examination. These consisted of 2 vials, K 27 292 and K 27 305. I removed 1 gravid ♀ from the latter vial and dissected it. The valves and some appendages of this specimen in alcohol and 1 slide of mounted appendages were returned to the Hamburg museum. The supplementary description presented herein is based mainly on specimens from *Vema* cruise 17, station V-17-12. These were described by me prior to my study of Hartmann's specimens, when I thought they represented a new species. The specimens from V-17-12 are as follows: USNM 128967, 1 gravid ♀; USNM 128968, 1 gravid ♀; USNM 128969, 1 adult ♀; USNM 128970, 1 adult ♂; USNM 128971, 1 N-1 ♂. The labels in the vials from the Hamburg Zoological Museum contained the following information: "27 292, *Asterope dimorpha* n. sp., ♂ ♂ Station 108, Mar Chile I"; "27 305, *Asterope dimorpha* n. sp., Stat. 93, Mar Chile I, (VI, 60)." An additional specimen, USNM 137258, a juvenile ♂, length 1.80 mm, height 0.80 mm, which was collected on *Vema* Cruise 17, station V-17-13, is questionably referred to this species.

DIAGNOSIS OF ADULT FEMALE.—Carapace elongate with evenly rounded posterior; 8 processes and 9 bristles present on posterior infold between broad flap-bearing list and valve margin.

First antenna: Length of ventral margin of 6th joint less than 60 percent length of distance between base of sensory bristle and base of proximal filament on sensory bristle; e-bristle longer than a-claw and slightly shorter than b-bristle.

Second antenna: Protopodite with medial bristle.

Mandible: Dorsal margin of basale with backward-pointing midbristle.

Maxilla: Ventral margin of basale with 1 short proximal bristle and 1 long terminal bristle; dorsal margin with 1 short distal bristle.

Sixth limb: Posteroventral margin with 10–18 bristles.

Seventh limb: With 12 bristles.

Lateral eyes: Absent.

SUPPLEMENTARY DESCRIPTION OF FEMALE (Figure 274).—Carapace elongate with slitlike incisur near or below valve middle and evenly rounded posterior (Figure 274*a,p,q*).

Infold (Figure 274*b,c*): Infold between list and anterodorsal margin of rostrum with 15–21 bristles; list and area below list with about 12 bristles; about 25 bristles present on infold below incisur to point on ventral margin where single row of bristles start; infold on ventral margin with about 17 bristles; posterior ridge with about 12 to 16 flaplike bristles, each separated by 1 or 2 small bristles; about 9 bristles forming row between ventral part of posterior ridge and posteroventral valve margin; 8 processes present between posterior ridge and posterior valve margin.

Size (Figure 275): USNM 128967, length 1.52 mm, height 0.71 mm; height as percent of length 46.7; USNM 128968, length 1.57 mm, height 0.74 mm, height as percent of length 47.4; USNM 128969 (not dissected), length 1.61 mm; height 0.75 mm, height as percent of length 46.5. Specimen from K 27 305, gravid ♀, length 1.63 mm, height 0.75 mm. Hartmann (in Hartmann-Schröeder and Hartmann, 1965:324) gives dimensions of females as length 1.50–1.90 mm, height 0.75–1.00 mm.

First antenna (Figure 274*d*): 1st joint with spines forming clusters on dorsal surface; 2nd joint with short spines forming clusters, 1 short spinous lateral bristle, and 1 long spinous dorsal bristle; 3rd joint weakly separated from 4th, with short ventral bristle and 6 spinous dorsal bristles; 4th joint with 1 long spinous dorsal bristle and 2 spinous ventral bristles; longer of 2 ventral bristles about twice length of shorter bristle and reaching past 8th joint; sensory bristle of 5th joint short, stout, with 6 terminal filaments, no proximal filament; distomedial bristle of 6th joint spinous, reaching past end of a-claw of 7th joint. Seventh joint: a-claw with few faint teeth near tip; b-bristle with 3 marginal filaments and bifurcate tip; c-bristle with 7 filaments including stem. Eighth joint: d-bristle consisting of minute nub; e-bristle bare, slightly shorter than b-bristle; f-bristle bent and with 5 filaments including stem, some with marginal spines; g-bristle with 6 filaments including stem.

Second antenna (Figure 274*e-h*): Protopodite with minute distomedial bristle, and with spines forming rows on dorsal half of medial margin. En-

dopodite 3-jointed, 3rd joint with long terminal filament. Exopodite: 1st joint with dorsal hairs and without distomedial spine; bristle of 2nd joint reaching 8th or 9th joint and with abundant slender spines along ventral margin; joints 2 to 8 with slender spines along distal margin but without basal spines; 9th joint with 3 bristles and lateral spine; bristles of joints 3 to 8 and 2 long bristles of 9th joint with natatory hairs; short bristle of 9th joint with short marginal spines; bristles of joints 3 to 5 with few marginal spines.

Endopodite of specimen from Hartmann sample K 27 305 similar to that described above. (Numerous filaments illustrated by Hartmann—in Hartmann-Schröeder and Hartmann, 1965:322, fig. 28—are foreign organisms and not bristles.)

Mandible (Figure 274*i,r*): Coxale with short spines on medial surface; (coxale endite broken off on 2 specimens examined). Basale endite with 4 spinous end bristles, 2 dwarf bristles, 2 or 3 triaenid bristles with 3 to 5 pairs of marginal spines excluding terminal pair, and a glandular peg with serrated tip; 1 small bare medial bristle present on basale near base of endite and near U-shaped sclerotized process. Dorsal margin of basale with spinous backward-pointing midbristle and 2 longer spinous subterminal bristles. Exopodite about three-fourths length of dorsal margin of 1st endopodite joint; tip with 2 short bristles. Endopodite: 1st joint with 3 long spinous bristles. Dorsal margin of 2nd joint with 2 short proximal bristles, and stout spinous a-, b-, c-, and d-bristles; 1 short spinous bristle present medially between a- and b-bristles; 1 short spinous bristle present medially near base of b-bristle or between b- and c-bristles; 4 or 5 short spinous cleaning bristles forming oblique row present medially near base of c-bristle; no lateral bristle between b- and c-bristles; 1 long spinous lateral bristle present between c- and d-bristles; 1 long spinous medial bristle present slightly distal to base of d-bristle; ventral margin of 2nd joint with 3 long spinous terminal bristles; medial surface of joint with few spines forming clusters. End joint with short straight dorsal claw (bare or with 2 or 3 minute spines near middle of ventral margin), 1 short spinous medial bristle, 1 long spinous lateral bristle reaching past end of dorsal claw, and 3 stout spinous clawlike bristles.

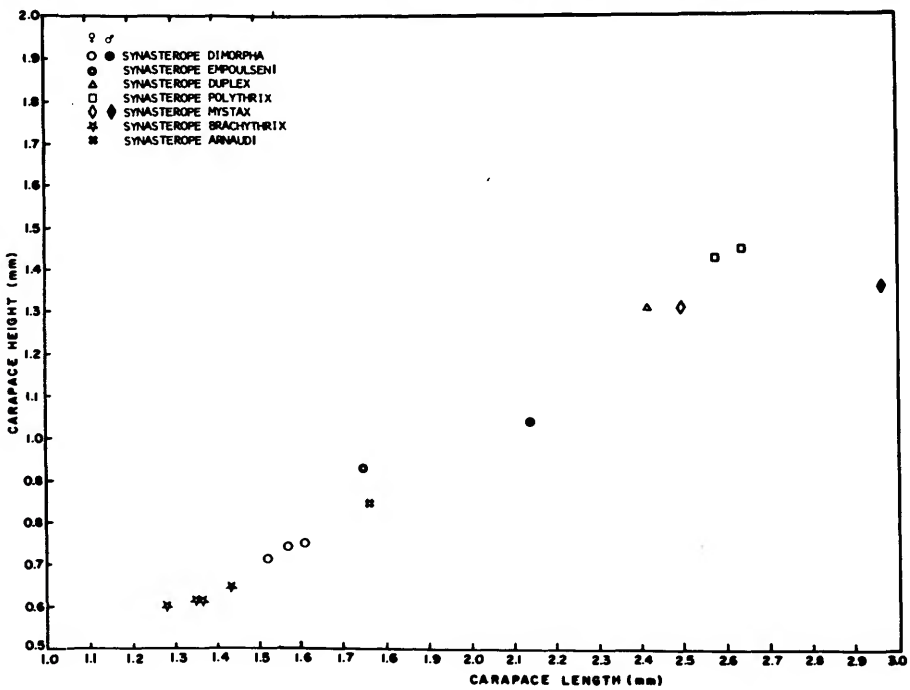

FIGURE 275.—Comparison of relationship between shell length and height of adults of *Synasterope*.

Coxale endite of specimen from K 27 305 with small bristle at base; ventral branch with spines forming 4 oblique rows (Figure 274*r*), tip of branch with 2 teeth; dorsal branch with 4 or 5 teeth along ventral margin.

Maxilla (Figure 274*j*): Epipodial appendage hirsute with elongate tip. Endite I with 3 long and 1 short bristles (tips of long bristles appear to have ball-like encrustation); endite II with 3 long bristles, all endite bristles with long marginal spines. Basale: spinous, medial side with 1 short bristle near base of epipodite; lateral surface with 1 short proximal bristle; dorsal margin with 1 short distal bristle; ventral margin with 1 short proximal bristle and 1 long spinous terminal bristle. First endopodite joint: spinous, dorsal margin with 1 short distal bristle; ventral margin with 1 long spinous 6-bristle. Second endopodite joint with 1 long spinous bristle slightly longer than 6-bristle.

Fifth limb (Figure 274*k*): Epipodial appendage with 68 bristles; dorsal margin of comb with minute spines; distal end with usual long hairs; 1 small bristle present ventral to base of long spinous bristle; 4 or 5 additional bristles present near ventral margin.

Sixth limb (Figure 274*l,s*): Anterior margin with 1 upper and 1 lower bristle; anterior tip with 5 bristles plus 1 on lateral flap; posteroventral margin with 10 to 18 bristles; anterior, anteroventral, and posterior margins, lateral sole, and medial surface hirsute; 1 minute proximal medial bristle present.

Seventh limb: Proximal and distal groups each with 6 bristles, 3 on each side; each bristle with 2 to 4 bells; opposing terminal combs each with 7 or 8 spinous teeth.

Rod-shaped organ and eyes (Figure 274*n*): Rod-shaped organ elongate, 1-jointed or weakly 2-jointed, tip rounded. Medial eye bare, lateral eyes absent.

Furca (Figure 274*m*): USNM 128967 with 9 claws on right lamella and 8 on left; posterior 2 claws bristlelike; secondary claws with long and short teeth along concave margin and slender spines along convex margin; short spinous process present on corner of lamella posterior to last secondary claw.

Upper lip (Figure 274*n*): Lip consisting of 2 hirsute lobes without spines; some hairs have broader bases and are longer than others; small hirsute flap posterior to upper lip present on each side of mouth.

Posterior (Figure 274*o*): Posterior without thumblike process.

Eggs: USNM 128967 with 1 egg in brood chamber and 4 in ovaries; USNM 128968 with 8 eggs in brood chamber. Specimen from K 27 305 with 9 eggs in brood chamber.

Parasites: USNM 128967 with abundant long segmented filaments.

SUPPLEMENTARY DESCRIPTION OF ADULT MALE (Figure 276*a-i*).—Carapace much longer than that of female and with irregular dorsal margin (Figure 276*a,b*). Size: USNM 128970, length 2.14 mm, height 1.04 mm, height as percent of length 48.6 (Figure 275). Hartmann (1965:324) gave length of male as 2.14 mm, height as 0.88 mm.

First antenna: 1st joint bare; 2nd joint with spines forming clusters on medial surface, 1 lateral bristle and 1 long spinous dorsal bristle; 3rd joint distinctly separated from 4th, with 1 short ventral bristle and 6 long spinous dorsal bristles; 4th joint with 1 long dorsal bristle with short marginal spines and 2 short slender ventral bristles; longer of 2 ventral bristles about twice length of shorter bristle and reaching 6th joint; sensory bristle of short 5th joint long and densely covered with long thin filaments; distal bristle of 6th limb on dorsal margin, spinous and reaching past a-claw of 7th joint; no suture observed between 6th and 7th joints. Seventh joint: a-claw with numerous short surface spines; b-bristle with 4 marginal filaments in addition to stem; c-bristle long, stout, with 33 marginal filaments. Eighth joint: no d-bristle; e-bristle bare, shorter than b-bristle; f-bristle long, stout, with 28 marginal filaments; g-bristle with 9 marginal filaments.

Second antenna (Figure 276*c*): Protopodite with short medial bristle and without spines. Endopodite 3-jointed; 1st joint bare; 2nd joint with 3 short ventral bristles distal to middle; 3rd joint reflexed, with 1 proximal bristle and distal ridges along inner margin. Exopodite: joints 2 to 9 with broad basal spines; bristles of joints 2 to 9 with natatory hairs; 9th joint with 4 bristles; joints 2 to 8 with clusters of long distal hairs on dorsal margin.

Mandible (Figure 276*d*): Coxale endite with small bristle at base; ventral branch with spines forming 4 oblique rows, tip of branch with 2 teeth;

dorsal branch with about 5 teeth along ventral margin and short main spine; distal bristle on dorsal margin of dorsal branch hirsute. Basale: endite with 4 spinous end bristles, 2 dwarf bristles, 3 triaenid bristles with about 6 pairs of stout distal marginal spines and numerous slender proximal spines, and small glandular peg; 1 small bare medial bristle present on basale near base of endite and near U-shaped sclerotized process; dorsal margin of basale with 1 spinous backward-pointing midbristle and 2 longer spinous subterminal bristles. Exopodite about one-half length of dorsal margin of 1st endopodite joint; tip hirsute and with 2 short bristles. Endopodite: 1st joint with 3 long spinous ventral bristles. Dorsal margin of 2nd joint with 3 proximal bristles of varying length, and stout spinous a-, b-, c-, and d-bristles; 1 short spinous bristle present medially between a- and d-bristles; 2 small spinous bristles present medially between b- and c-bristles; no lateral bristle between b- and c-bristles; 6 short spinous cleaning bristles forming oblique row present medially near base of c-bristle; 1 long spinous lateral bristle present between c- and d-bristles; 1 long spinous medial bristle present slightly distal to base of d-bristle. Ventral margin of 2nd joint with 3 or 4 long spinous terminal bristles; medial surface of joint with few spines forming clusters. End joint with fairly straight dorsal claw with minute spines near middle, 2 short slender spinous ventral bristles, and 3 stout spinous bristles.

Maxilla: Distribution of bristles similar to that on female maxilla (Figure 276*f*).

Fifth limb (Figure 276*e*): Epipodial appendage with 75 bristles; dorsal margin of comb with minute spines; distal end of comb with usual long hairs; 1 small bristle present ventral to base of long spinous exopodial bristle; 4 additional slender bristles present near ventral margin.

Sixth limb: Anterior margin with 1 upper and 1 lower bristle; anterior tip with 6 spinous bristles plus 1 on lateral flap; posteroventral margin with

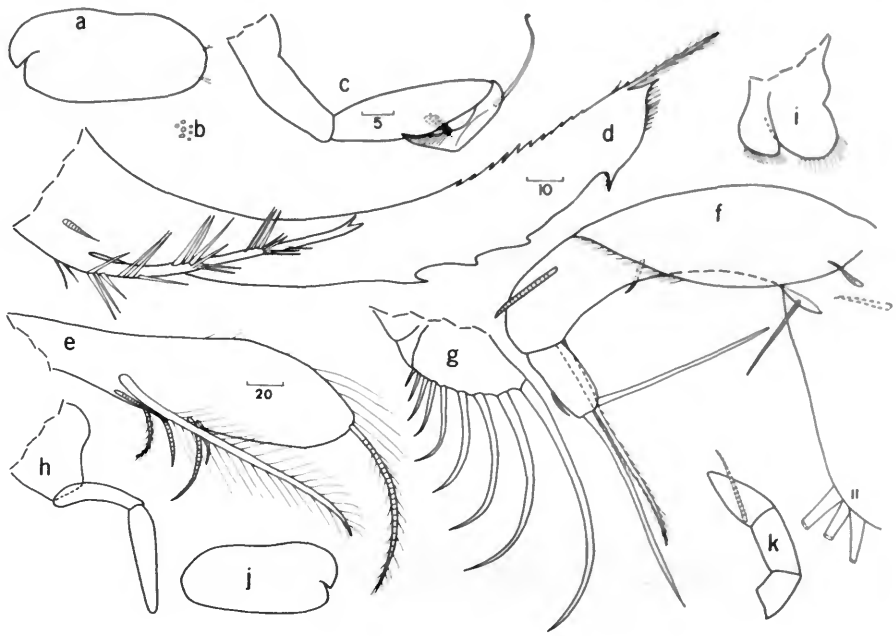

FIGURE 276.—*Synasterope dimorpha*, male, USNM 128970, length 2.14 mm: *a*, complete specimen, lateral view; *b*, sketch of central muscle attachments on left valve, lateral view; *c*, endopodite of right 2nd antenna, medial view; *d*, ventral branch and proximal bristles on right mandible, medial view; *e*, comb on right 5th limb, lateral view; *f*, right maxilla, medial view; *g*, right lamella of furca (teeth and hairs on claws not shown); *h*, medial eye and rod-shaped organ; *i*, upper lip. N–1 male, USNM 128971, length 1.69 mm: *j*, outline of complete carapace, lateral view; *k*, endopodite of right 2nd antenna, medial view. (Same magnification in microns: *c,g-i,k*.)

24 bristles; medial side of anterodorsal corner with 2 minute bristles; limb hirsute as on female 6th limb.

Seventh limb: Proximal and distal groups each with 6 bristles, 3 on each side; each bristle with 2 to 4 bells; opposing terminal combs with 7 spinous teeth.

Rod-shaped organ and eyes (Figure 276*h*): Rod-shaped organ 2-jointed, 2nd joint broadening proximally and rounded terminally. Medial eye bare; lateral eyes absent.

Furca: Similar to furca of female (Figure 276*g*).

Upper lip (Figure 276*i*): Lip consisting of 2 hirsute lobes without spines; small hirsute flap present on each side of mouth.

Posterior: Similar to that of female.

DESCRIPTION OF N–1 MALE (Figure 276*j,k*).—Carapace similar in shape to that of adult male (Figure 276*j*).

Size: USNM 128970, length 1.69 mm, height 0.78 mm, length as percent of height 46.2.

Appendages: In general similar to those of adult female with exception of endopodite of 2nd antenna which bears 1 proximal bristle on the 3rd joint (Figure 276*k*).

COMPARISONS.—In the key to the genus given by Poulsen (1965:402), *S. dimorpha* keys out to *S. quadrata* (= *S. empoulseni* herein). It differs from that species in having no lateral eyes, only 1 bristle in middle of dorsal margin of mandibular basale, and 6 bristles instead of 4 on the dorsal margin of the 3rd joint of the 1st antenna. This species is smaller than *S. duplex* and *S. polythrix*, described herein, and *S.* species A, *S.* species B, described by Kornicker (1970*a*:37, 39), and the height of the shell is less than 50 percent its length for *S. dimorpha* and more than 50 percent for the other 4 species.

DISTRIBUTION.—This species was collected along the west coast of Chile at depths of 70–2563 m (Figure 252).

75. *Synasterope bassana* Poulsen

Synasterope bassana Poulsen, 1965:402, figs. 133, 134.

HOLOTYPE.—Not designated.

SYNTYPE-LOCALITY.—Bass Strait, Southeast Australia, 38°12′S, 149°40′E, 180 m.

MATERIAL.—None examined.

DIAGNOSIS OF FEMALE.—Carapace with dorsal margin only slightly arched, ventral margin almost linear; posterior infold with 15–20 bristles between ridge and posterior shell margin, carapace length 1.93–1.95 mm.

Second antenna: Protopodite with medial bristle and about 10 spines along dorsal margin. Endopodite short, conical, weakly 2-jointed.

Maxilla: Distal endite with 3 long and 3 short bristles; dorsal margin without fringe of hairs with short proximal lateral bristle, short middle and shorter distal bristle.

Sixth limb: Posterior two-thirds of end joint with about 12 bristles.

Seventh limb: Each limb with 12 bristles.

Posterior: Dorsal processs short, with squarish tip, hirsute.

Lateral eyes: Small with 10–12 ommatidia.

DISTRIBUTION.—Collected only at type-locality (Figure 252).

76. *Synasterope empoulseni*, new species

Synasterope quadrata Brady.—Poulsen, 1965:406, fig. 135.
Not *Asterope quadrata* Brady, 1898:432, pl. 45: figs. 17–21 [= *Parasterope quadrata* (Brady)].

HOLOTYPE.—♀ described by Poulsen (1965:407–410) and illustrated (fig. 135), length 1.73 mm, Universitets Zoologiske Museum, Copenhagen.

TYPE-LOCALITY.—Halfmoon Bay, Stewart Island, N. Z., 10–15 m.

ADDITIONAL SPECIMENS.—1 juvenile from Three Kings Island, New Zealand (Poulsen, 1965:406). I consider this identification questionable.

MATERIAL.—None examined.

Poulsen (1965) considered two specimens from the vicinity of New Zealand to be conspecific with *Asterope quadrata* Brady, and presented a supplementary description of the species based mainly on a specimen from Halfmoon Bay, New Zealand. Poulsen (p. 410) states:

> When is it borne in mind that Brady's description only is concerned with the outline of the shell, the furca and the endopodite of the juvenile male 2nd antenna, the validity of the identification can of course be doubted, it is in fact based only on the similarity in the form of the shell and in the structure of the furca, as well as on the fact that Brady's males and the present females are from the same region, New Zealand.

I have presented herein (p. 409) a supplementary description of *Asterope quadrata* Brady based on Brady's specimens, and have assigned that species to the genus *Parasterope*. The specimens assigned to Brady's species by Poulsen are not conspecific with *P. quadrata*, and I have named the species to which they belong, *Synasterope empoulseni*. I have not, however, seen Poulsen's specimens, nor have specimens of the species appeared in the present collections. I do not consider the juvenile from Three Kings, New Zealand, as a paratype because of the difficulty of being certain of the identification of early instars of Cylindroleberidinae.

DIAGNOSIS OF FEMALE.—(Possibly a juvenile.) Carapace elongate with subparallel ventral and dorsal margins; posterior infold without long bristles on list or between list and posterior margin of carapace; carapace length 1.73 mm.

First antenna: Dorsal margin of 3rd joint with only 4 bristles (possibly juvenile character).

Second antenna: Protopodite without medial bristle; endopodite weakly 3-jointed, not tapering as in *S. bassana* Poulsen, 1965.

Mandible: Dorsal margin of basale with 2 or 3 bristles near middle; exopodite reaching just past middle of 1st endopodite joint.

Maxilla: Proximal endite with 4 bristles, 3 long, 1 short; distal endite with 3 long bristles; dorsal margin of basale with 1 short proximal and 1 short midbristle; ventral margin of basale with 2 short bristles near middle and 1 long terminal bristle; terminal bristles of endopodite joints bare.

Sixth limb: End joint with 2 anterior and 20 posteroventral bristles.

Seventh limb: Each limb with only 4 distal (possibly juvenile character) and 6 proximal bristles.

Lateral eyes: Small with about 15 ommatidia.

COMPARISONS.—*Synasterope empoulsenia* differs from previously described species in the genus in having 2 or 3 midbristles on the dorsal margin of the mandibular basale. The presence of fewer than 6 dorsal bristles on the 3rd joint of the 1st antenna is a characteristic of members of *Homasterope*, new genus, herein, but it is possible that the known specimens of *S. empoulsenia* are juveniles.

DISTRIBUTION.—This species has been collected at Stewart Island and Three Kings Island, New Zealand, at depths of 12–110 m (Figure 252).

77. *Synasterope duplex*, new species

FIGURES 277–279

HOLOTYPE.—USNM 126137, adult ♀ or juvenile, length 2.42 mm. Valves and some appendages in alcohol, remaining appendages on slides.

TYPE-LOCALITY.—USGCG *Glacier*, Cruise 2, station 0022, Weddell Sea.

ETYMOLOGY.—The specific name is derived from the Greek "duplex" [= double, two] and refers to the 2 bristles on the endopodite of the 2nd antenna.

MATERIAL.—Holotype.

DIAGNOSIS.—Carapace elongate with evenly rounded posterior; posterior infold with few minute pores near valve edge and 15 bristles forming row between list and valve margin; carapace length about 2.42 mm.

First antenna: e-bristle shorter than b-bristle and slightly longer than a-claw.

Second antenna: Protopodite with medial bristle; 2nd endopodial joint with short subterminal bristle (possibly aberrant).

Mandible: Dorsal margin of basale with 1 short midbristle; basale endite with 2 dwarf bristles.

Maxilla: Ventral margin of basale with 5 short proximal bristles, 1 short distal bristle, and 1 long terminal bristle; dorsal margin with 1 short proximal and 1 short distal bristle.

Sixth limb: Posteroventral margin of end joint with 19 bristles.

Seventh limb: With 12 bristles.

Lateral eyes: Absent.

DESCRIPTION.—Carapace elongate with slitlike incisur below valve middle and evenly rounded posterior (Figure 277*a*).

Infold (Figures 277*b*,*c*; 279): Infold between list and anterodorsal margin of rostrum with about 50 bristles; list and area below list with about 16 bristles; about 44 bristles present on infold below incisur to point on ventral margin where single row of bristles start; infold of ventral margin with about 27 bristles forming single row; posterior ridge with about 24 flaplike bristles, each separated by 1, rarely 2, minute bristles; 15 bristles forming row between posterior list and posterior valve margin, bristles unevenly spaced; few minute pores present on posterior infold near valve edge.

Size (Figure 275): Holotype length 2.42 mm, height 1.31 mm, height as percent of length 54.

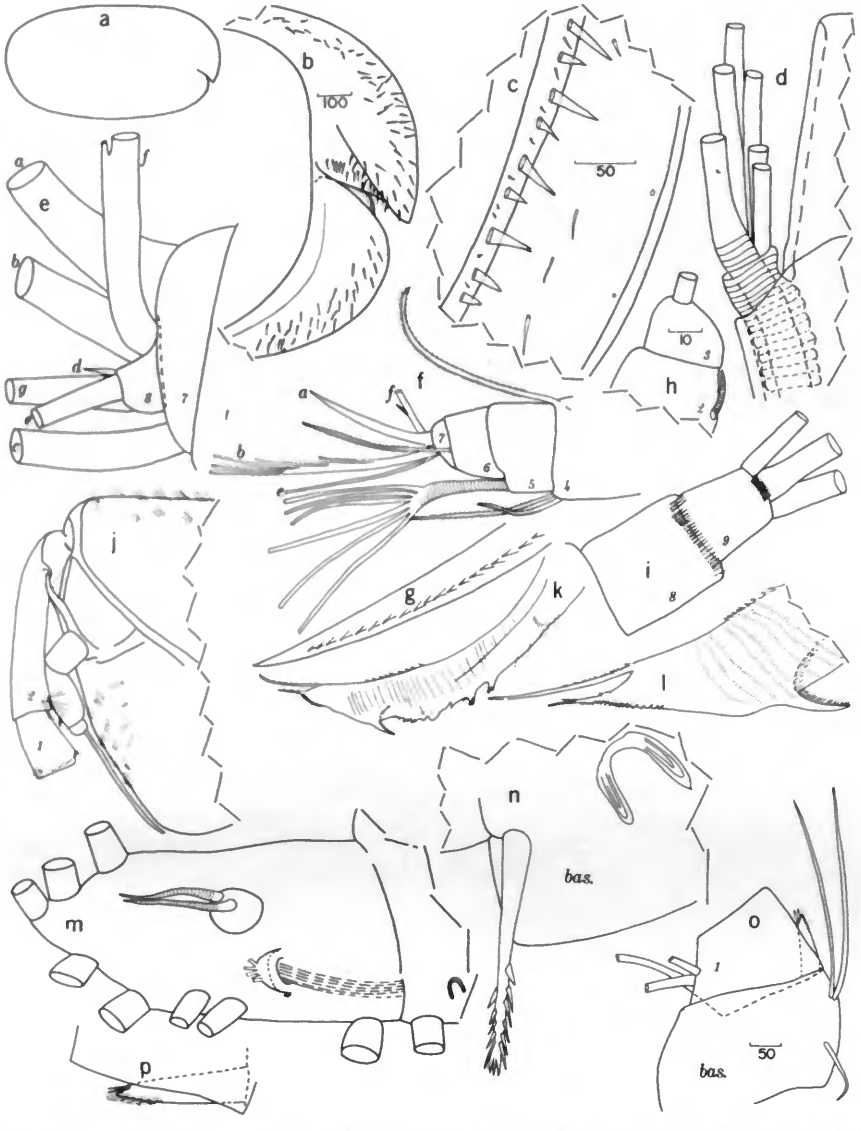

Figure 277.—*Synasterope duplex*, female, USNM 126137, length 2.42 mm, carapace: *a*, complete specimen, lateral view; *b*, anterior of left valve, medial view; *c*, section of posteroventral infold of right valve, medial view. First antenna: *d*, aberrant sensory bristle on 5th joint of left limb, lateral view; *e*, joints 7–8 on left limb, lateral view; *f*, tip of right limb, medial view; *g*, tip of a-claw on left limb, lateral view. Second antenna: *h*, tip of endopodite on left limb, lateral view; *i*, tip of exopodite on left limb, lateral view (bristle on 8th joint not shown); *j*, endopodite and part of protopodite and exopodite on right limb, medial view. Mandible: *k*, dorsal branch of coxale endite on right limb, lateral view; *l*, tip of coxale endite shown in "*k*"; *m*, basale endite of left limb, medial view (only stumps of bristles shown, 5 triaenid bristles along lower margin); *n*, detail of U-shaped sclerotized process and triaenid bristle on basale of left limb, medial view; *o*, basale, exopodite, and 1st endopodial joint of right limb, medial view; *p*, exopodite on left limb, medial view. (Same magnification in microns: *b,f,j; c,k,p; d,e,g,h,i,l-n.*)

First antenna (Figure 277*d-g*): 1st joint with spines forming clusters abundant on posterior or dorsal surface; 2nd joint with abundant spine clusters, 1 short spinous distolateral bristle, and 1 long dorsal bristle with long stiff marginal spines proximally and short spines distally; 3rd joint with 1 short ventral bristle and 6 spinous dorsal bristles; 3rd joint only weakly separated from 4th; 4th joint with spines forming clusters along ventral margin, 1 long spinous dorsal bristle, and 2 spinous ventral bristles; longer of 2 ventral bristles about twice length of shorter bristle and reaching past 8th joint; clusters of short spines present along dorsal margins of 5th and 6 joints; sensory bristle of 5th joint short, stout, with 6 terminal filaments, no proximal filament; distomedial bristle of 6th joint spinous, almost reaching tip of a-claw of 7th joint. Seventh joint: a-claw with faint lateral and medial teeth forming row parallel to, and inward from, ventral margin; b-bristle with 3 marginal filaments and bifurcate tip, proximal filaments with marginal spines (bristle only about one-third longer than a-claw); c-bristle incomplete on each limb but with 6 marginal filaments on portion remaining. Eighth joint: d-bristle minute; e-bristle bare, shorter than b-bristle; f-bristle with 5 spinous marginal filaments and bifurcate tip; g-bristle of each limb incomplete, but with 5 marginal filaments on remaining part.

Second antenna (Figure 277*h-j*): Protopodite with minute distomedial bristle; slender spines forming clusters abundant on medial and lateral surfaces and anterior and posterior margins. Endopodite distinctly 3-jointed; 1st joint bare; 2nd joint with short subterminal bristle (possibly aberrant); 3rd joint with long terminal bristle reaching 7th joint of exopodite. Exopodite: 1st joint without distomedial spine, but with long hairs forming subterminal cluster on dorsal margin; bristle of 2nd joint reaching past 9th joint and with abundant slender hairs on ventral margin; joints 2 to 9 with short spines forming row along distal margin, but without basal spines; bristles of joints 3 to 8 with natatory hairs, a few also with sparse marginal spines; joint 9 with 3 bristles, 2 long with natatory hairs, 1 short with short marginal spines.

Left mandible (Figures 277*m,n,p*; 278*a*): Coxale endite remained in mouth when mandible removed from body and is obscure; some spines on ventral branch bifurcate at tip. Basale endite with 4 spinous end bristles, 2 dwarf bristles, 4 triaenid bristles with 7 to 15 pairs of spines, and glandular peg with minute fingerlike processes; a 5th triaenid bristle present on basale near base of endite; large proximal spine and 5 pairs of smaller spines present on this bristle; U-shaped sclerotized process present near base of bristle. Dorsal margin of basale with short spinous midbristle and 2 longer spinous subterminal bristles; ventral margin of basale hirsute. Exopodite about three-fourths length of dorsal margin of 1st endopodite joint; tip hirsute and with 2 short bristles. Endopodite: 1st joint with 3 long spinous bristles. Dorsal margin of 2nd endopodite joint with 2 proximal bristles, 1 short, 1 long, both with short marginal spines, and stout spinous a-, b-, c-, and d-bristles; short spinous bristle present medially near base of a-bristle; short spinous bristle present medially between a- and b-bristle, but closer to b-bristle; 2 short spinous bristles present medially between b- and c-bristles; 1 short spinous medial bristle and 1 long spinous lateral bristle present between c- and d-bristles; 1 long spinous bristle present medially distal to d-bristle; ventral margin of 2nd endopodite joint with 3 long spinous terminal bristles; medial surface of joint with spines forming clusters. End joint with dorsal claw having minute spines near middle of ventral margin, 1 short spinous medial bristle, 1 long spinous lateral bristle reaching past end of dorsal claw, and 3 stout clawlike bristles, ventral of these with abundant spines, other 2 with sparse spines.

Right mandible (Figures 277*k,l,o*; 278*b*): Distal part of ventral branch of coxale endite broken off during dissection or obscure; minute bristle present near base of ventral branch; ventral margin of dorsal branch with several slender spines followed by 2 pairs of pointed teeth and 2 rounded teeth; margin serrate between distal rounded tooth and main spine; main spine with small spines along concave margin; tip of branch bristlelike and spinous; spinous dorsal bristle extending past branch tip; small spines present on ventral margin near tip and on dorsal margin opposite main spine; medial surface of coxale with numerous spines forming clusters. Basale endite with 4 end bristles and 3 triaenid bristles, otherwise similar to that of left mandible; triaenid bristle on basale with 7 pairs of spines and without proximal spine. Bristles on basale, 1st

endopodite joint, ventral margin of 2nd endopodite joint, and end joint similar to those on left mandible. Exopodite similar to that on left mandible but length only 62 percent length of 1st endopodite joint. Bristles on dorsal margin of 2nd endopodite joint: a-, b-, c-, d-bristles same as on left mandible; both spinous proximal bristles short and bases not separated by sclerotized area as on left mandible; 1 short spinous bristle present between a- and b-bristles; 3 short spinous bristles present

FIGURE 278.—*Synasterope duplex*, ?female, USNM 126137, mandible: *a*, 2nd endopodial joint on left limb, medial view; *b*, same on right limb, medial view. Maxilla: *c*, right limb, medial view; *e*, epipodial process on left limb, medial view. Fifth limb: *d*, comb on right limb, medial view. Sixth limb: *f*, right limb, medial view. Furca: *g*, right lamella, lateral view (all claws not shown); *h*, detail of "*g*." Anterior: *i*, medial eye and rod-shaped organ; *j*, upper lip, anterior to right; *k*, detail of upper lip from left, anterior to left. Posterior: *l*, posterior with rounded dorsum, anterior to right. (Same magnification in microns: *a,b,d,e; c,f,g,i,j,l; h,k*.)

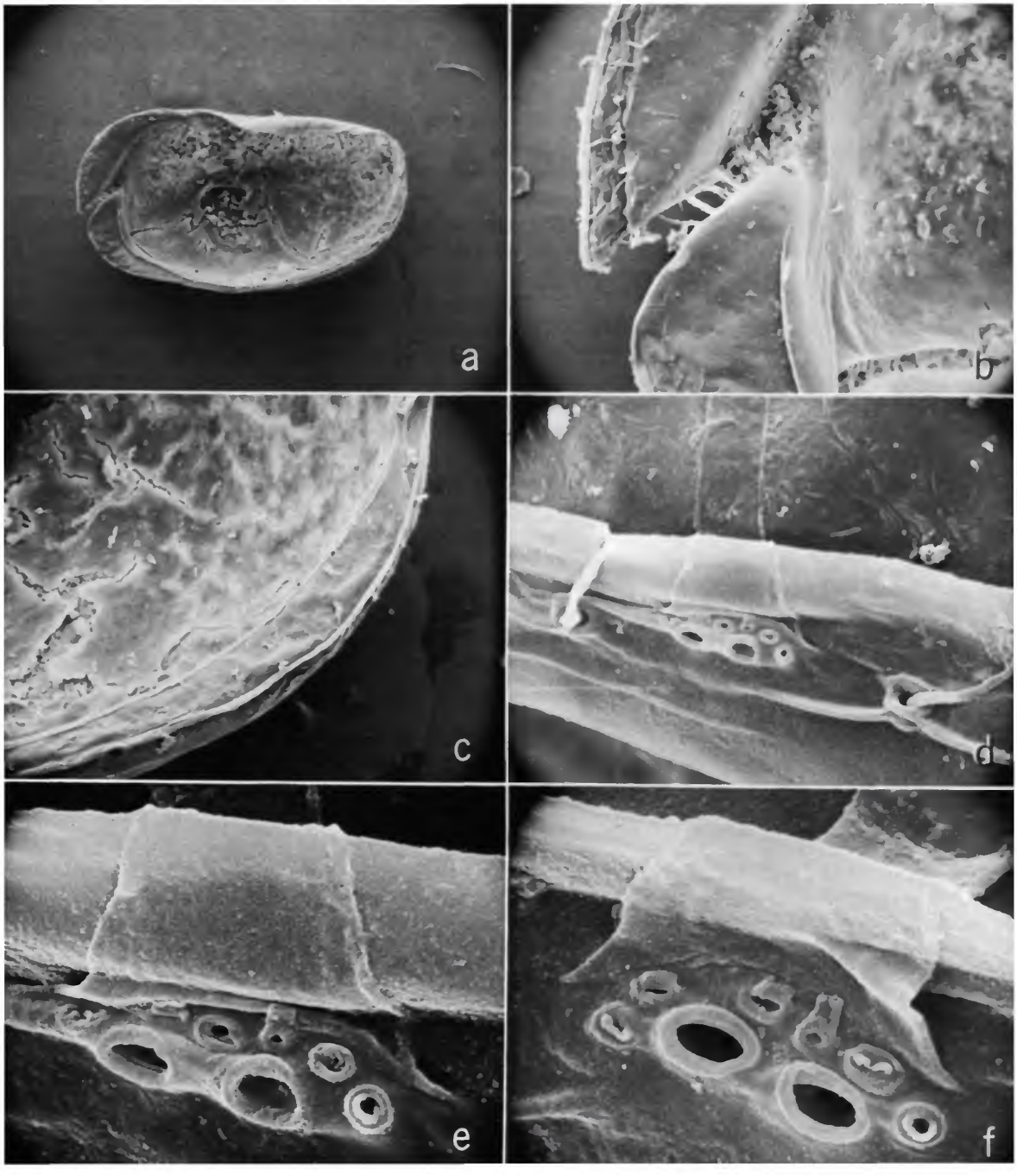

FIGURE 279.—*Synasterope duplex*, female, USNM 126137, right valve, medial view: *a*, valve, × 28; *b*, anterior, note spines on vestment, × 140; *c*, posteroventral margin, × 115; *d*, detail of posteroventral list, × 2150; *e*, detail of pores in "*d*," × 5400; *f*, pores at base of another flaplike bristle on posteroventral list, × 5400.

medially between b- and c-bristles; 7 spinous cleaning bristles forming medial row between c- and d-bristles; 1 long spinous bristle present between c- and d-bristles; 1 long medial bristle present distal to base of d-bristle; medial surface of joint with spines forming clusters.

Maxilla (Figure 278*c,e*): Epipodial appendage short, hirsute with prolonged tip. Endite I with 3 long bristles and 1 short bristle; endite II with 3 long bristles (proximal bristle shorter than others). Dorsal margin of basale hirsute with short proximal and distal bristles, both bare; ventral margin with 5 short bare proximal bristles, 1 short distal bristle, and 1 long spinous terminal bristle; medial surface hirsute. Endopodite: 1st joint with short bare dorsal bristle and long 6-bristle with faint spines, medial surface of joint with hairs forming clusters; end joint with spinous terminal bristle slightly longer than 6-bristle.

Fifth limb (Figure 278*d*): Epipodial appendage with about 59 bristles. Distal margin of comb with long hairs; lateral surface with long spinous bristle; 2 small bristles present ventral to base of long bristle; 4 or 5 additional bristles present near ventral margin.

Sixth limb: Anterior margin with 1 upper and 1 lower bristle, latter bristle with long marginal spines; anterior tip with 4 small bristles; posteroventral margin with 19 bristles (bristles 1–11, 14 with long proximal and short distal spines; bristles 12, 13, 15–19 with long spines or hairs from their bases to tips); lateral sole, anterior, anteroventral and posterior margins, and medial surface hirsute (Figure 278*f*).

Seventh limb: Proximal and distal groups each with 6 bristles, 3 on each side; each bristle with 2–4 bells; opposing terminal combs each with 8 or 9 spinous teeth.

Furca (Figure 278*g,h*): Each lamella with 9 claws of which posterior 2 are bristlelike secondary claws; primary claws with long and short spines along concave margin and slender spines along convex anterior margin; short spinous process present on corner of furca posterior to last secondary claw.

Rod-shaped organ and eyes (Figure 278*i*): Rod-shaped organ 1-jointed or weakly 2-jointed, elongate with rounded tip. Medial eye with hairs along upper surface. Lateral eyes absent.

Upper lip (Figure 278*j,k*): Lip consisting of 2 hirsute lobes with 2 pairs of minute spines on upper anterior margin; small hirsute flap posterior to upper lip present on each side of mouth. (As often happens in specimens of Cylindroleberidinae, a coxale endite of one of the mandibles remained in the mouth of the specimen after the mandible was removed from the body; it is visible on the slide on which the mouth is mounted.)

Posterior: Posterior hirsute with broadly rounded dorsal process (Figure 278*l*).

Parasites: Holotype with ♂ and ♀ isopod (Cyproniscidae) and 26 minute isopod eggs; 11 additional eggs present in marsupium of ♀ isopod.

Sex and maturity of holotype: The male copulatory organs of the Cylindroleberidinae are usually well defined. They could not be discerned on the holotype of *S. duplex*. Unfortunately, the female genitalia in this group are not well defined, and they could not be identified with certainty on the present specimen. The endopodite of the 2nd antenna is usually useful in identifying sex of Cylindroleberidinae, but the endopodite on the holotype of *S. duplex* is not typical of that on either the male or female Cylindroleberidinae. Previously described females of the subfamily have only 1 bristle, which is usually terminal on a short end joint. The present specimen has in addition to a terminal bristle on a short 3rd joint, a small bristle on the 2nd joint. Juvenile males in the subfamily have 1 to 3 bristles on the 2nd joint of the endopodite, but the bristle on the 3rd joint is not terminal, and the joint is elongate. The bristles of the 7th limb on the holotype of *S. duplex* are not strongly tapered, indicating that it is either a late instar or an adult. I am inclined to consider the holotype a female, either an adult or later instar. It is, of course, not an adult male, which is easily identified by many characters, but the possibility that it may be a juvenile male cannot be ruled out.

COMPARISONS.—This species is larger than previously described members of the genus. In the key to the genus given by Poulsen (1965:402), this species keys out to *S. quadrata* (= *S. empoulseni* herein), but it differs from that species in having no lateral eye, a shorter stem on the sensory appendage of the 1st antenna, only 1 bristle on the dorsal margin of the mandibular basale, and in many other characters. Only three other species of the genus have been reported without lateral eyes, *Synasterope* species A and species B, both were described by Kornicker (1970a), and *S. dimorpha*

(Hartman). *S.* species A differs from *S. duplex* in having a shorter exopodite on the mandible; *S.* species B differs from *S. duplex* in having only 1 dwarf bristle on the basale endite of the mandible. The triaenid bristles of the basale endite of the mandible of *S. duplex* have more pairs of spines (up to 15) than previously described species of the genus.

DISTRIBUTION.—This species was collected only at the type-locality, the Weddell Sea at a depth of 378 m (Figure 252).

78. *Synasterope polythrix*, new species

FIGURE 280

HOLOTYPE.—USNM 128509, adult ♀, length 2.58 mm. Valves and some appendages in alcohol, remaining appendages on slides.

TYPE-LOCALITY.—*Eltanin* Cruise 4, station 112.

ETYMOLOGY.—The specific name "polythrix" is derived from the Greek "polys" [= many] and "thrix" [= hair] and refers to the many bristles on the 7th limb of the species.

PARATYPES.—USNM 128510, adult ♀ from same station as holotype.

DIAGNOSIS OF ADULT FEMALE.—Carapace elongate with evenly rounded posterior; posterior infold with 4 or 5 small pores or processes, and 20–26 bristles forming row between broad list and valve margin; carapace length 2.58–2.64 mm.

First antenna: e-bristle shorter than b-bristle and longer than a-claw.

Second antenna: Protopodite with medial bristle.

Mandible: Basale with 1 short midbristle.

Maxilla: Ventral margin of basale with 5 short proximal bristles, 1 short distal bristle, and 1 long terminal bristle; dorsal margin with 1 short proximal and 1 short distal bristle.

Sixth limb: Posteroventral margin of end joint with 15–20 bristles.

Seventh limb: With 18–21 bristles.

Lateral eyes: Absent.

DESCRIPTION OF FEMALE.—Carapace elongate similar to that of *S. duplex* (Figure 280*a*).

Infold (Figure 280*b*): Infold between list near ventral margin of rostrum and anterior juncture of attached margin with about 95 bristles; rostral list and area below list with about 22 bristles; about 57 bristles (excluding minute bristles) present on infold below incisur to point on ventral margin where single row of bristles start; infold of ventral margin with about 36 bristles forming single row; posterior ridge with about 32 flaplike bristles, each separated by 1, rarely 2, minute bristles; 20 to 26 bristles forming row between posterior ridge and posterior valve margin, bristles unevenly spaced; 4 or 5 distinct small pores (these pores may have small processes in them) present near middle of posterior infold close to valve edge.

Size (Figure 275): USNM 128509, length 2.58 mm, height 1.43 mm, height as percent of length 55.4; USNM 128510, length 2.64 mm, height 1.45 mm, height as percent of length 54.9 (the valve of this specimen was torn, so measurement is approximate, but probably nearly right).

First antenna (Figure 280*c*): joints 1 to 3 with spinosity and distribution of bristles similar to that of *S. duplex*. Fourth joint with spines forming clusters along ventral margin, 1 long spinous dorsal bristle and 2 spinous ventral bristles; longer of 2 ventral bristles reaching just past end of limb; shorter of 2 bristles about two-thirds length of longer bristle; clusters of short spines present along dorsal margin of 5th joint and on 6th joint; sensory bristle of 5th joint short stout, with 6 terminal filaments, no proximal filament; distomedial bristle of 6th joint spinous, reaching just past a-claw of 7th joint. Seventh joint: a-claw with faint lateral and medial teeth forming row parallel to, and inward from ventral margin; b-bristle with 3 marginal filaments and bifurcate tip, all filaments with marginal spines; c-bristle with 7 marginal filaments excluding tip. Eighth joint: d-bristle minute; e-bristle bare, shorter than b-bristle; f-bristle with 5 spinous marginal filaments plus single tip; g-bristle with 6 marginal filaments plus single tip.

Second antenna (Figure 280*d,l,m*): Protopodite similar to that of *S. duplex*. Endopodite 3-jointed (suture between 2nd and 3rd joints not present on USNM 128509, but quite evident on USNM 128510); 1st and 2nd joints bare; 3rd joint with terminal bristle reaching to about 5th joint of exopodite. Exopodite: 1st joint without distomedial spine, but with long hairs forming subterminal cluster; bristle of 2nd joint reaching 9th joint and with abundant hairs becoming shorter distally along both margins; joints 2 to 9 with short spines forming row along distal margin but without basal

FIGURE 280.—*Synasterope polythrix*, female, USNM 128509, length 2.58 mm, carapace: *a*, complete specimen, lateral view; *b*, posterodorsal corner of right valve, medial view. Left 1st antenna: *c*, tip of limb, lateral view. Left 2nd antenna: *d*, endopodite, part of protopodite and exopodite, medial view. Mandible: *e*, coxale endite on left limb, medial view; *f*, detail of "*e*." Maxilla: *g*, proximal bristles on ventral margin of basale on left limb, medial view; *h*, same on right limb, medial view. Seventh limb: *i*, distal part of limb bearing bristles. Furca: *j*, posterior claws on left lamella, anterior to left. Anterior: *k*, medial eye and rod-shaped organ. Female, USNM 128510, length 2.64 mm, 2nd antenna: *l*, endopodite on left limb, medial view; *m*, endopodite on right limb, medial view. Mandible: *n*, tip of dorsal branch of coxale endite on left limb, medial view. Maxilla: *o*, proximal bristles on ventral margin of basale on left limb, medial view; *p*, same on right limb, medial view. Right 5th limb: *q*, exopodial bristles on comb, lateral view. Left 6th limb: *r*, minute bristle in anterodorsal corner, medial view. Anterior: *s*, rod-shaped organ; *t*, upper lip. Posterior: *u*, genitalia and brushlike organ; *v*, spinous posterior margin, anterior to left. (Same magnification in microns: *f,q,r; c,i-m,s-v; e,o,p; g,h,n*.)

spines; bristles of joints 3 to 8 with natatory hairs; 9th joint with 3 bristles, 2 long with natatory hairs, 1 short with short marginal spines.

Mandible (Figure 280*e,f,n*): Coxale endite: minute bristle present near base of ventral branch; ventral branch with spines forming 4 rows, many spines with bifurcate tip; tip of branch with 3 small teeth; ventral margin of dorsal branch with several slender spines followed by 1 single stout spine, a pair of pointed spines and then a pair of rounded teeth; serrated margin present between rounded teeth and main spines; tip of branch bristlelike and spinous; single spine present on margin between tip and main spines; spinous dorsal bristle extending past branch tip; dorsal margin of dorsal branch serrate opposite main spine; medial surface of coxale with numerous spines forming clusters. Basale endite with 4 spinous end bristles, 2 dwarf bristles, 4 triaenid bristles with 9 to 16 pairs of spines, and a glandular peg with minute fingerlike processes; a 5th triaenid bristle with only 3 pairs of spines present on basale near base of endite; U-shaped sclerotized process present near base of bristle. Dorsal margin of basale with short spinous midbristle, 2 longer spinous subterminal bristles, and short spines forming clusters; the latter also present on lateral surface; ventral margin of basale with hairs forming few proximal clusters. Endopodite and exopodite similar to those on *S. duplex*.

Maxilla (Figure 280*g,h,o,p*): Similar to that of *S. duplex*. Group of 5 proximal bristles on ventral margin of basale with bases close together on some appendages and on others with anterior 1 or 2 of group slightly separated from others.

Fifth limb (Figure 280*q*): Epipodial appendage with 69 to 72 bristles. Distal margin of comb with long hairs; lateral surface with long spinous bristle; 1 small bristle present ventral to base of long bristle; 4 additional bristles present near ventral margin.

Sixth limb (Figure 280*r*): Outline similar to that of same limb on *S. duplex*. Anterior margin with 1 upper and 1 lower bristle (right limb of USNM 128510 may have 2 lower bristles, but debris on limb obscured bristles); lateral flap with 4 small bristles on anterior margin; posteroventral margin with 15 to 20 bristles (USNM 128509 with 15 bristles on left limb and 22 on right); medial surface with minute bristle in anterodorsal corner.

Seventh limb (Figure 280*i*): Opposing terminal combs with 9 spinous teeth; each limb with 18 to 21 bristles (USNM 128509 with 21 on each limb; USNM 128510 with 18 on one limb, 19 on other), about half the number on each side; bristles not distinctly divided into proximal and distal groups; each bristle with 2 to 4 bells.

Furca (Figure 280*j*): Each lamella with 9 claws similar to those on *S. duplex*.

Rod-shaped organ and eyes (Figure 280*k,s*): Rod-shaped organ elongate 1-jointed or weakly 2-jointed. Medial eye with hairs on upper surface. Lateral eyes absent.

Upper lip (Figure 280*t*): Lip consisting of 2 hirsute lobes with 2 anterior spines; 2 small spines also present on anterior margin of segment between and above lips; small hirsute flap present on each side of mouth.

Posterior (Figure 280*v*): Posterior hirsute with broadly rounded dorsum.

Brushlike organ (Figure 280*u*): Organ consisting of small lobe with about 9 minute bristles near genitalia.

REMARKS.—Specimens described above did not have eggs, but because of the presence of sclerotized genital structures, USNM 128509 and 128510 are assumed to be adult.

COMPARISONS.—All previously described species in the genus have at most 12 bristles on the 7th limb; these are usually in 2 groups, with 6 bristles in the proximal group and 4 to 6 in the distal group. The 7th limbs of *S. polythrix*, bear 18 to 22 bristles, which are not divided into proximal and distal groups.

DISTRIBUTION.—This species was collected only at the type-locality, in the Drake Passage at a depth of about 4008 m (Figure 252).

79. *Synasterope mystax*, new species

FIGURES 281, 282

HOLOTYPE.—USNM 128614, adult ♀, length 2.50 mm. Valves and some appendages in alcohol, remaining appendages on slides.

TYPE-LOCALITY.—*Vema* Cruise 14, station V–14–25.

ETYMOLOGY.—The specific name is derived from the Greek "mystax" [= upper lip, hair upon it].

ALLOTYPE.—USNM 137110, adult ♂ from *Vema* Cruise 17, station V–17–56.

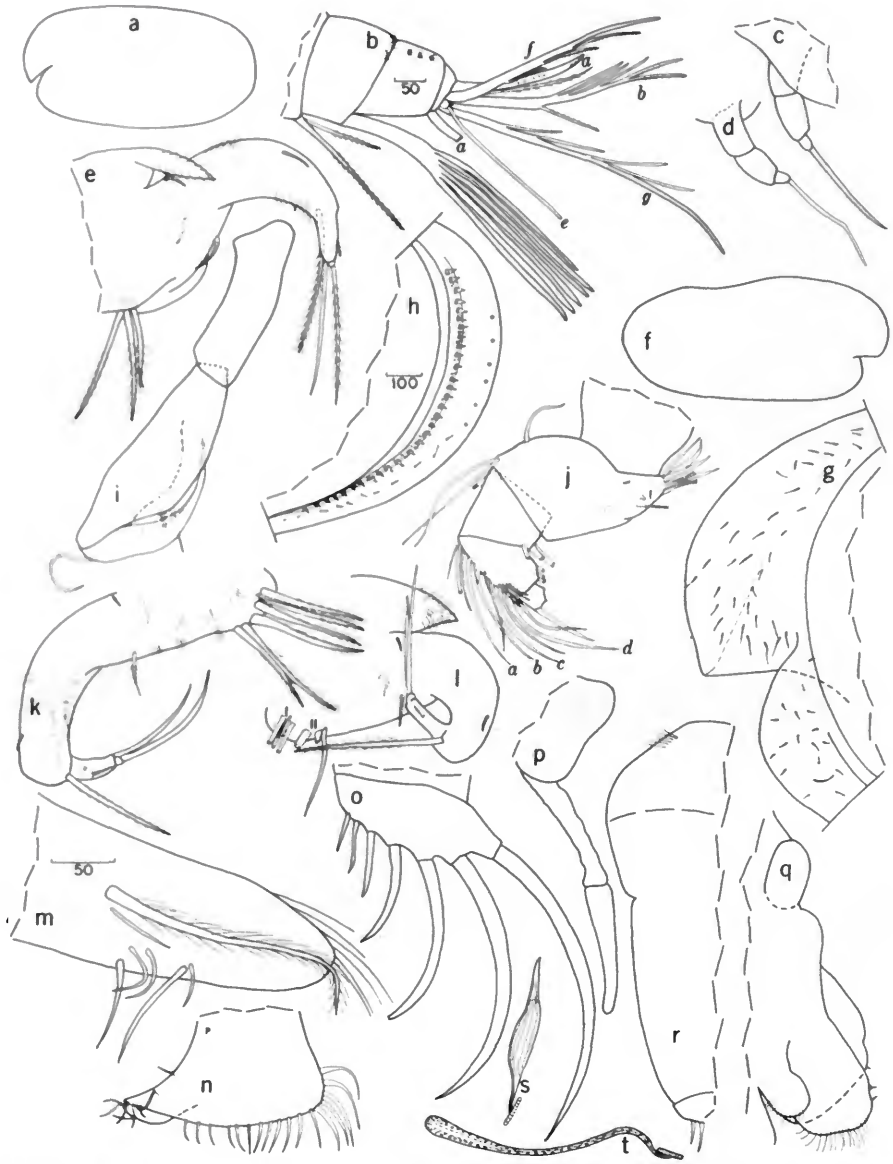

FIGURE 281.—*Synasterope mystax*, female, USNM 128614, length 2.50 mm: *a*, complete specimen, lateral view; *b*, tip of right 1st antenna, lateral view; *c*, endopodite of left 2nd antenna, lateral view; *d*, endopodite of right 2nd antenna, medial view; *e*, left maxilla, medial view. Male, USNM 137110, length 2.97 mm, carapace: *f*, complete specimen, lateral view. Right valve, medial view: *g*, anterior; *h*, posterior. Left 2nd antenna: *i*, endopodite, medial view. Mandible: *j*, right limb, medial view (all bristles not shown). Maxilla: *k*, right limb, medial view; *l*, left limb, medial view. Right 5th limb: *m*, comb, lateral view. Right 6th limb: *n*, medial view (marginal spines on bristles not shown). Furca: *o*, right lamella (teeth on claws not shown). Anterior: *p*, medial eye and rod-shaped organ; *q*, upper lip. Posterior: *r*, posterior margin with posterior 2 claws of right lamella. ?Epizoa or egg case: *s*, specimen attached to c-bristle on 1st antenna; *t*, specimen attached to f-bristle of same limb as "*s*." (Same magnification in microns: *b-e,i,k,l,o-r; g,h,j,n,s,t*.)

DIAGNOSIS OF ADULT FEMALE.—Carapace elongate with evenly rounded posterior margin; carapace length about 2.50 mm.

First antenna: e-bristle longer than a-claw and shorter than b-bristle.

Second antenna: Protopodite with medial bristle.

Mandible: Dorsal margin of basale with 1 backward-pointing midbristle.

Maxilla: Ventral margin of basale with medium length proximal bristle, 1 short distal bristle, and 1 long terminal bristle; dorsal margin with 1 short proximal and 1 short distal bristle.

Sixth limb: Posteroventral margin of end joint with 17 bristles.

Seventh limb: With 19–21 bristles.

Lateral eyes: Absent.

DESCRIPTION OF ADULT MALE (Figure 281*f-t*).—Carapace elongate; posterior half of dorsal margin lower than ventral half (Figure 281*f*).

Ornamentation: Surface appearing smooth, but minute pores present.

Infold (Figure 281*g,h*): About 35 bristles present scattered over infold of rostrum dorsal to list; total of about 9 bristles on list and between list and dorsal margin of incisur; about 14 bristles present on anteroventral infold ventral to incisur; single row of about 25 bristles present along ventral infold to point opposite 1st hyaline spine on posterior list; list paralleling posterior margin with about 31 hyaline spines; about 14 bristles present between hyaline spines, not more than 1 bristle between 2 spines; 6 minute processes present between list and posterior valve margin; about 11 bristles forming row on infold ventral to processes.

Selvage: Fringed lamellar prolongation present along lower margin of infold; prolongation with smooth margin present along ventral margin.

Size (Figure 275): USNM 137110, length 2.97 mm, height 1.37 mm; height 46 percent of length.

First antenna: 1st joint bare; 2nd joint with spines forming clusters on medial surface, and 1 dorsal bristle with long proximal and short distal marginal spines; lateral surface of 2nd joint and medial surface of 3rd joint with few minute spines forming rows; 3rd joint with 6 spinous dorsal bristles and 1 minute bare ventral bristle; 4th joint with 1 long dorsal bristle with short marginal spines and 2 short ventral bristles, longer of these with short marginal spines, other bare; stout stem of sensory bristle of 5th joint about one and a half times length of distance from distal end of 5th joint to end of limb; medial bristle of 6th joint with short marginal spines. Seventh joint: a-claw with numerous minute teeth; tip of b-bristle missing, stump with 5 marginal filaments; tip of c-bristle missing, stump very long with 28 filaments. Eighth joint: d-bristles not present; e-bristle bare, short, slender (tip missing on both limbs of USNM 137110); tip of f-bristles missing, remaining stump very long with 25 marginal filaments; g-bristle with 9 marginal filaments.

Second antenna (Figure 281*i*): Protopodite with short slender medial bristle; margins of protopodite bare. Endopodite 3-jointed: 1st joint bare; 2nd joint with 3 bare distal ventral bristles; 3rd joint reflexed on 2nd and with bare ventral bristle and pointed tip with 16 ridges. Exopodite: joints 2 to 8 with long hairs forming cluster on distal dorsal margin; joints 2 and 3 with minute spines forming row along distal margin; all bristles with natatory hairs; joint 9 with 3 long bristles (on both limbs of USNM 137110, a bristle is present within the exopodite, which apparently would have added a 4th bristle to the 9th joint if it had emerged); no basal spines.

Mandible (Figure 281*j*): Coxale with 1 small bristle at basis of endite; ventral branch of endite with spines forming 4 or 5 oblique rows; tip obscure but with several small backward-pointing spines; dorsal branch of endite missing on limb examined. Basale: endite with 4 spinous terminal bristles, 3 triaenid bristles with 13 to 18 marginal spines (proximal spines minute, faint), 1 dwarf bristle and glandular peg, and 1 additional dwarf bristle on endite near basis; dorsal margin of basale with 1 backward-pointing midbristle with short marginal spines and 2 long terminal bristles; medial surface of basale with few short rows of minute spines. Exopodite reaching about one-third distance up dorsal margin of 1st endopodite joint, with hirsute tip and 2 short subterminal bristles. Endopodite: 1st joint with 3 long spinous ventral bristles; medial surface of 2nd joint with spines forming clusters; ventral margin with 3 long spinous terminal bristles; dorsal margin with 3 spinous proximal bristles (middle of these quite long), and stout spinous a-, b-, c-, and d-bristles; 1 short spinous medial bristle present at margin between a- and b-bristles; 2 spinous medial bristles (1 short, 1 long) present at margin between b- and

c-bristles; 5 spinous medial cleaning bristles forming oblique row between c- and d-bristles; 1 long spinous medial bristle present near margin distal to d-bristle; lateral side with 1 long spinous bristle near margin between c- and d-bristles; no lateral bristle present between b- and c-bristles; 3rd joint with pointed dorsal claw and 5 bristles.

Maxilla (Figure 281*k,l*): Epipodial appendage short hirsute. Endite I with 1 short and 3 long spinous bristles; endite II with 3 long spinous bristles, distal bristle shorter than others. Dorsal margin of basale with few hairs, and with 1 short proximal and 1 short distal bristle; ventral margin with medium proximal bristle with few marginal spines, 1 short bare distal bristle, and 1 long spinous terminal bristle; lateral surface with 1 proximal bristle. Endopodite: 1st joint with short bare dorsal bristle and long bare 6-bristle; end joint with bare terminal bristle slightly longer than 6-bristle.

Fifth limb (Figure 281*m*): Epipodial appendage with 70 bristles. Distal margin of comb with long hairs; lateral surface with long spinous exopodial bristle; 1 short slender bristle present ventral to base of exopodial bristle; 4 or 5 additional bristles near ventral margin.

Sixth limb (Figure 281*n*): Anterodorsal corner with minute bristle on medial surface; anterior margin with 1 upper and 1 lower bristle; anterior tip with 4 spinous bristles, lateral flap with 2; posteroventral margin with 17 bristles (bristles 1 to 10 with long proximal and short distal spines, remaining bristles with long spines or hairs); surfaces and margins of limb hirsute.

Seventh limb: Limb with 19 to 21 bristles, each with 2 to 4 bells; bristles not distinctly separated into proximal and distal groups, but 6 to 8 bristles close to tip (3 or 4 on each side) and remaining bristles more proximal; terminus consisting of opposing combs of spinous teeth, spines fairly long.

Rod-shaped organ and eyes (Figure 281*p*): Rod-shaped organ 2-jointed with rounded tip; medial eye bare, lateral eyes absent.

Furca (Figure 281*o*): Right lamella of USNM 137110 with 7 claws, left lamella with 8; each claw with small teeth along concave margins, teeth uniform in size; minute spines also along distal part of convex margin.

Upper lip: Lip consisting of 2 hirsute lobes, each with 2 minute anterior spines; central segment also with spine; hirsute flap present on each side of mouth.

Copulatory organ: Organ not well defined.

Posterior (Figure 281*r*): Posterior broadly rounded dorsally with few hairs on upper part; 7 gills extending past posterior margin on each side.

Epizoa (Figure 281*s,t*): 2 elongate saclike forms of unknown affinity attached to the long f- and c-bristles of right 1st antenna of USNM 137110.

Description of Adult Female (Figures 281*a-e*,

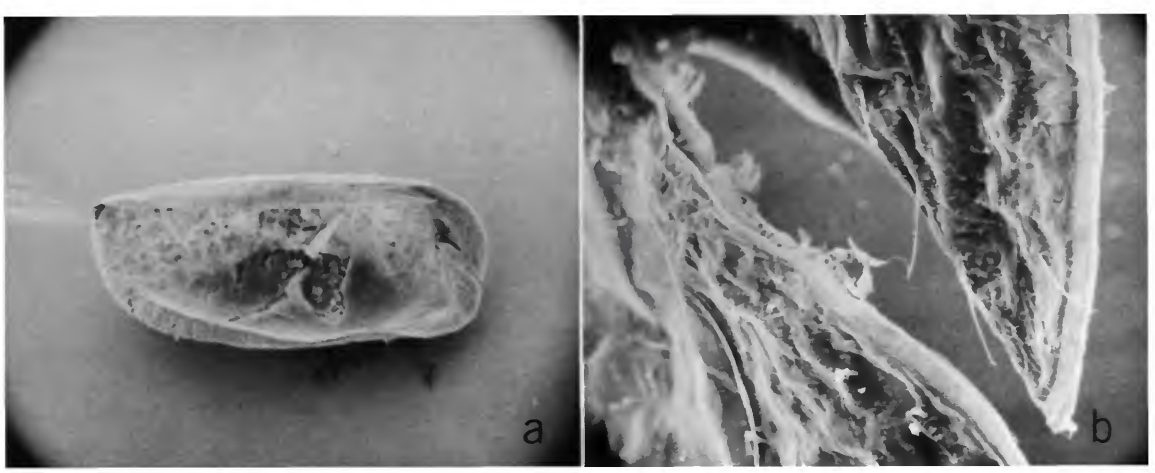

Figure 282.—*Synasterope mystax*, female, USNM 128614, left valve, medial view: *a*, complete valve, × 30; *b*, anterior, × 290.

282).—Carapace elongate with smooth outer surface (Figure 281*a*).

Infold (Figure 281*a*): About 30 long bristles scattered over infold of rostrum dorsal to list; total of about 10 bristles on list and between list and dorsal margin of incisur; about 30 bristles on anteroventral infold below incisur; single row of about 25 bristles along ventral infold to point opposite 1st hyaline spine on posterior list; list paralleling posterior margin with about 28 hyaline spines; about 25 short bristles present between spines, 1, rarely 2, bristles between 2 spines; about 12 bristles forming row on ventral half of posterior infold; posterior processes not observed (possibly obscure).

Selvage: Similar to that on male carapace.

Size (Figure 275): USNM 128614, length 2.50 mm, height 1.32 mm; height 53 percent of length.

First antenna (Figure 281*b*): 1st and 2nd joints spinous; 2nd joint with 1 dorsal bristle with long proximal and short distal spines; 3rd joint with short bare ventral bristle and 6 spinous dorsal bristles; 4th joint with long dorsal bristle with short marginal spines and 2 dorsal bristles with short marginal spines; 5th joint with short spines forming 2 medial rows near distal dorsal corner and sensory bristle with 6 terminal filaments; 6th joint with spines on medial surface and lateral bristle with short marginal spines. Seventh joint: a-claw with minute teeth; b-bristle with proximal ventral spinous filament, 3 dorsal filaments and bifurcate tip (proximal ventral bristle on right limb only); c-bristle broken, with 4 filaments on remaining part. Eighth joint: d-bristle represented by minute process; e-bristle bare, longer than a-claw; f-bristle with broken tip, 3 dorsal spinous filaments on remaining part; g-bristle with 4 or 5 marginal filaments excluding tip.

Second antenna (Figure 281*c,d*): Protopodite with short slender medial bristle; anterior or dorsal margin with few short spines forming clusters. Endopodite 3-jointed, 3rd joint with long terminal bristle. Exopodite: 1st joint with long hairs on ventral margin near distal end; 2nd to 8th joints with short slender spines forming row along distal margin; 9th joint with 7 minute lateral teeth along distal margin and 4 bristles, 2 long with natatory hairs, 2 short bare or with few short spines; bristle of 2nd joint reaching 8th joint and with numerous short spines along ventral margin; bristles on joints 2 to 8 with natatory hairs.

Mandible: Coxale endite missing on USNM 128614. Basale: endite with 4 spinous terminal bristles, 4 triaenid bristles with 5 to 10 marginal spines excluding terminal pair, glandular peg and 2 dwarf bristles, and 1 additional dwarf bristle on endite near basis; dorsal margin of basale with 1 backward-pointing midbristle with short marginal spines and 2 long terminal bristles. Exopodite reaching about one-half distance up dorsal margin of 1st endopodite joint, with hirsute tip and 2 short subterminal bristles. Endopodite: 1st joint with 3 long spinous ventral bristles; medial surface of 2nd joint with short spines forming clusters; ventral margin with 3 long spinous terminal bristles; dorsal margin with 1 spinous proximal bristle and stout spinous a-, b-, c- and d-bristles; 1 short spinous bristle between a- and b-bristles; 2 spinous medial bristles at margin between b- and c-bristles; 5 spinous medial bristles forming oblique row between b- and c-bristles; 1 long spinous bristle near margin distal to d-bristle; lateral side with 1 long spinous bristle near margin; no lateral bristle between b- and c-bristles; 3rd joint with pointed dorsal claw and 5 bristles.

Maxilla: Similar to that of male except faint hairs observed on terminal bristle of end joint of endopodite (Figure 281*e*).

Fifth limb: Similar to that of male.

Sixth limb: Similar to that of male except with 22 or 23 posteroventral bristles on end joint.

Seventh limb: Similar to that on male; opposing terminal combs with 13 spinous teeth.

Rod-shaped organ, medial and lateral eyes, upper lip, posterior: Similar to those on male.

Furca: Each lamella with 9 claws; long and short slender teeth present along concave margins of claws 1 to 7, slender spines along convex margins.

REMARKS.—The female and male described herein were not found together in any sample, so it is possible that they are not conspecific. They are combined because of the similarity of the maxilla and 7th limb. Differences in basale endite of the mandible and number of claws on the caudal furca are attributed to individual variation or sexual dimorphism. The female (USNM 128614) is considered mature because of the presence of well-developed genitalia.

COMPARISONS.—The new species differs from *S. polythrix* and *S. duplex* in having only 1 proximal bristle on the ventral margin of the basale of the maxilla. It differs from *S. dimorpha, S. duplex,* and *Synasterope* species A and B described by Kornicker (1970a:37, 39) in having more than 12 bristles on the 7th limb.

DISTRIBUTION.—This species has been collected in the Scotia Sea at depth of about 2747–4006 m (Figure 252).

80. *Synasterope brachythrix*, new species

FIGURE 283

HOLOTYPE.—USNM 139116, adult ♀, some appendages on slides, remaining appendages and valves in alcohol.

TYPE-LOCALITY.—*Hero* Cruise 69–5, station 57.

ETYMOLOGY.—Specific name is derived from the Greek "brachys" [= short] combined with "thrix" [= hair] in reference to the short e-bristle on the 8th joint of the first antenna of the female.

PARATYPES.—USNM 139118, 139119, 139142, 3 adult ♀♀; USNM 139143, 18 specimens including adult ♀♀ without eggs and juveniles; USNM 139144, 2 specimens. USNM 139142, 139143 from same sample as holotype; USNM 139118, 139144 from same cruise, station 210; USNM 139119 from same cruise, station 201.

DIAGNOSIS OF ADULT FEMALE.—Carapace elongate with evenly rounded posterior margin; posterior infold with 5 or 6 processes and 6 small bristles between broad list and valve margin.

First antenna: e-bristle slightly shorter than a-claw.

Second antenna: Protopodite without medial bristle.

Mandible: Dorsal margin of basale with backward-pointing midbristle.

Maxilla: Ventral margin of basale with 1 short proximal bristle, 1 short distal bristle, and 1 long terminal bristle; dorsal margin with 1 short distal bristle.

Sixth limb: Posteroventral margin with 16 or 17 bristles.

Seventh limb: With 12 bristles.

Lateral eyes: Absent.

DESCRIPTION OF FEMALE (Figure 283).—Carapace elongate with extremely narrow incisur below valve middle; posterior and anterior evenly rounded, ventral and dorsal margins linear (Figure 283*a*).

Infold (Figure 283*b-d*): Infold between list and anterodorsal margin of rostrum with about 67 bristles; list and area below list with about 10 bristles; about 27–35 bristles present on infold below incisur to point on ventral margin where single row of bristles begin; infold on ventral margin with about 6 bristles; posterior ridge with 9 flaplike bristles and 6 small bristles (not more than 2 small bristles between adjacent flaplike bristles); 6 small bristles forming row between ventral part of posterior ridge and posteroventral valve margin of right valve, none on left (2 specimens examined); 5 or 6 processes present between posterior ridge and posterior valve margin; 30 to 42 distinct pores present on ridge between posterior processes and posterior valve margin.

Size (Figure 275): USNM 139116, length 1.35 mm, height 0.61 mm, height as percent of length 45.2; USNM 139118, length 1.44 mm, height 0.64 mm, height as percent of length 44.4; USNM 139119, length 1.29 mm, height 0.60 mm, height as percent of length 46.5; USNM 139142, length 1.36 mm, height 0.61 mm, height at percent of length 44.9.

First antenna (Figure 283*e*): Joints 1 to 7 similar to those on adult ♀ of *Synasterope dimorpha*; Eighth joint: no d-bristle; bare e-bristle slightly shorter than a-claw of 7th joint; f- and g-bristles similar to those on *S. dimorpha*.

Second antenna (Figure 283*f,g*): Protopodite with short spines forming rows on dorsal half of medial surface and without distomedial bristles. Endopodite 3-jointed but without distinct suture between 2nd and 3rd joints; terminal bristle reaching 5th joint of exopodite. Exopodite: 1st joint with dorsal hairs and without distomedial bristle; bristle of 2nd joint reaching distal end of 9th joint and with abundant slender spines along ventral margin; joints 2 to 8 with slender spines forming row along distal margins; joints 3 to 8 with basal spines; 9th joint with large lateral spine about same length as 9th joint; 9th joint with 3 bristles, 1 long with natatory spines, 2 short with short marginal spines; bristles of joints 3 to 8 with marginal spines along proximal ventral margin.

Mandible (Figure 283*h*): Coxale endite with small bristle at base; ventral branch with spines

forming 4 or 5 oblique rows, tip of branch with 3 teeth; dorsal branch with 4 teeth along ventral margin; bristle on distal end of dorsal margin hirsute. Basale endite with 4 spinous end bristles, 2 dwarf bristles, 2 triaenid bristles with 4 or 5 pairs of marginal spines excluding terminal pair, and glandular peg; 1 minute bare medial bristle present on basale near base of endite and near U-shaped sclerotized process. Dorsal margin of basale with bare backward-pointing midbristle and 2 longer spinous subterminal bristles. Exopodite about three-fourths length of dorsal margin of 1st endopodite joint; tip with 2 short bristles. Endopodite: 1st joint with 3 long spinous ventral bristles. Dorsal margin of 2nd joint with 2 short proximal bristles and stout spinous, a-, b-, c-, and d-bristles; 1 short spinous bristle present medially between b- and c-bristles; 3 short spinous cleaning bristles forming oblique row near base of c-bristle; 1 long spinous medial bristle slightly distal to base of d-bristle; no lateral bristle between b- and c-bristles; 1 long spinous lateral bristle between c- and d-bristles; ventral margin of 2nd joint with 3 long spinous terminal bristles; medial surface with few spines forming rows; end joint similar to that of *S. dimorpha*.

Maxilla: Similar to that on *S. dimorpha* except small bristle observed on distal ventral margin of basale.

Fifth limb: Similar to that on *S. dimorpha*.

Sixth limb: Anterior margin with 1 upper and 1 lower bristle; anterior tip with 4 bristles; posteroventral margin with 16 or 17 bristles; 1 minute medial bristle present in proximal anterior corner; anterior, anteroventral and posterior margin, lateral sole, and medial surface hirsute.

Seventh limb: Proximal and distal groups each with 6 bristles, 3 on each side, each bristle with 1 to 3 bells; opposing terminal combs with about 11 spinous teeth.

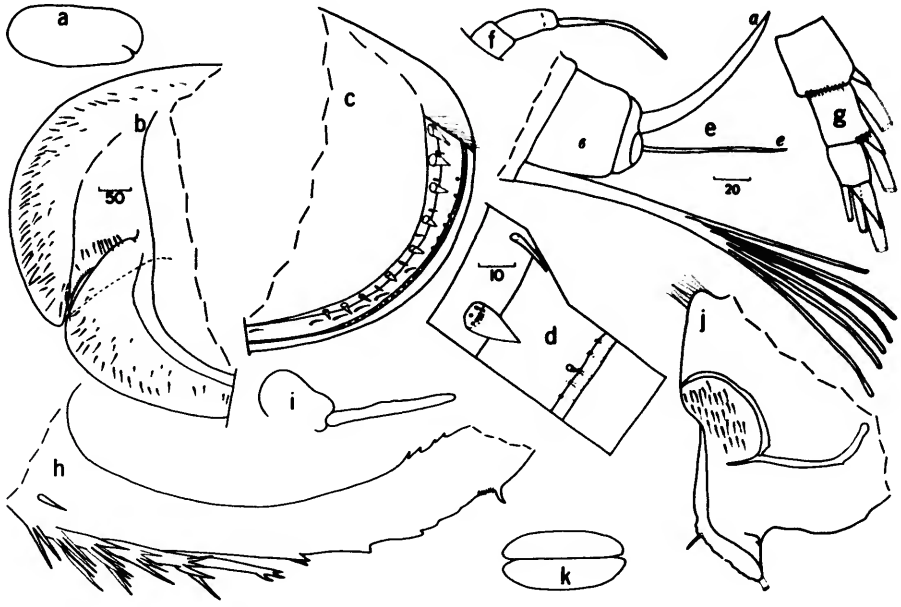

FIGURE 283.—*Synasterope brachythrix*, female, USNM 139118, length 1.44 mm, carapace: *a*, complete specimen, lateral view. Right valve, medial view; *b*, anterior; *c*, posterior; *d*, detail of "*c*." Left 1st antenna: *e*, tip, lateral view (not all bristles shown). Right 2nd antenna, lateral view: *f*, endopodite; *g*, exopodial joints 7–9 (only proximal stumps of bristles shown); *h*, coxale endite of right mandible, medial view; *i*, medial eye and rod-shaped organ; *j*, posterior of body and anterior and posterior claws of right lamella of furca. Female, USNM 139142: *k*, complete specimen, length 1.36 mm, dorsal view, anterior to right. (Same magnification in microns: *b,c,i,j; d,g,h; e,f*.)

Rod-shaped organ and eyes (Figure 283*i*): Rod-shaped organ elongate, 1-jointed with rounded tip. Medial eye bare, lateral eyes absent.

Furca: Similar to that on *S. dimorpha*. USNM 139118 with 8 claws on each lamella.

Posterior (Figure 283*j*): Dorsal corner with low rounded process with long hairs.

Genitalia: Genitalia well developed on USNM 139116, 139118, the former with small unextruded eggs.

Upper lip: Similar to that on *S. dimorpha*.

COMPARISONS.—This new species differs from *S. duplex* and *S. polythrix* in having only 1 proximal bristle on the ventral margin of the basale of the maxilla. It differs from previously described members of the genus in having an e-bristle on the 8th joint of the female first antenna slightly shorter than the a-claw on the 7th joint. *S. brachythrix* differs from *S. dimorpha* in having more bristles on the infold of the rostrum, basal spines on the exopodite of the 2nd antenna, and no medial bristle on the protopodite of the 2nd antenna; also, the 9th joint of the exopodite of the 2nd antenna of *S. dimorpha* bears 2 long and 1 short bristles, whereas, this joint on *S. brachythrix* bears 1 long and 2 short bristles.

REMARKS.—A juvenile ♂ (USNM 139141) collected in the same sample as the holotype has been identified herein as *Synasterope* species indeterminate because it bears a long e-bristle on the 1st antenna, and because the trunk of the sensory bristle on the 1st antenna is much shorter than that on the female of *S. brachythrix*.

DISTRIBUTION.—This species was collected near the western end of the Strait of Magellan at depths of 78–425 m (Figure 252).

81. *Synasterope arnaudi*, new species

FIGURE 284

HOLOTYPE.—USNM 139858, adult ♀, some appendages on slides, remaining appendages and valves in alcohol.

TYPE-LOCALITY.—Kerguelen Islands, station Ker–D74.

ETYMOLOGY.—The new species is named after its collector, Dr. Patrick M. Arnaud.

PARATYPES.—USNM 141100, 1 ♂ (N–1); 1 juvenile returned to Dr. P. M. Arnaud, length 1.14 mm, height 0.59 mm (not dissected). Paratypes from same sample as holotype.

DIAGNOSIS OF ADULT FEMALE.—Carapace elongate with posterior evenly rounded; posterior infold with 4 or 5 processes, 5 or 6 bristles forming row between ventral part of broad list and valve margin, and 1 bristle in dorsal corner; carapace length about 1.75 mm.

First antenna: Ventral margin of 6th joint more than 70 percent of distance between base of sensory bristle and base of proximal filament on sensory filament; e-bristle slightly shorter than b-bristle, and longer than a-claw.

Second antenna: Protopodite with medial bristle.

Mandible: Dorsal margin of basale with backward-pointing midbristle.

Maxilla: Ventral margin of basale with 1 short proximal bristle, 1 short distal bristle, and 1 long terminal bristle; dorsal margin with 1 short distal bristle.

Sixth limb: Posteroventral margin with 19 bristles.

Seventh limb: With 12 bristles.

Lateral eyes: Absent.

DESCRIPTION OF FEMALE.—Carapace elongate with narrow incisur below valve middle; posterior and anterior evenly rounded, ventral and dorsal margins linear, parallel (Figure 284*a*, *b*).

Infold: Infold between list and anterodorsal margin of rostrum with about 42 bristles; list and area below list with about 11 bristles; about 28 long bristles and 12 minute bristles present on infold below incisur to point on ventral margin where single row of bristles begin; infold on ventral margin with about 22 bristles to point opposite 1st hyaline bristle on posterior infold; posterior ridge with about 20 flaplike bristles and 18 bristles, generally only 1 bristle between adjacent flaplike bristles; 5 or 6 bristles forming row present between ventral part of posterior ridge and posteroventral valve margin; a single bristle present in dorsal corner of posterior infold; 4 or 5 processes present betweeen posterior ridge and posterior valve margin.

Size: USNM 139858, length 1.75 mm, height 0.85 mm (Figure 275).

First antenna (Figure 284*c*): Joints 1 to 4 similar to those on *S. dimorpha*; sensory bristle differing from that on *S. dimorpha* in having shorter and stouter stem; distomedial bristle of 6th joint spi-

nous, reaching tip of a-claw of 7th joint. Seventh limb: a-claw with few faint teeth near tip; b-bristle with 3 marginal filaments and bifurcate tip; c-bristle with 7 filaments including tip. Eighth joint: d-bristle consisting of minute nub; e-bristle bare, only slightly shorter than b-bristle and longer than a-claw; f-bristle bent and with 5 filaments including stem, some with marginal spines; g-bristle with 7 filaments including stem.

Second antenna (Figure 284*d*): Protopodite with minute distomedial bristle, and with spines forming rows on medial surface and along dorsal margin. Endopodite 3-jointed, 3rd joint with long terminal filament. Exopodite: 1st joint with dorsal hairs forming clusters and with faint distomedial spine; bristle of 2nd joint just reaching 8th joint and with abundant slender spines along ventral margin; joints 2 to 8 with short spines forming row along distal margins but without basal spines; 9th joint with 3 bristles and short lateral spine with serrate tip; bristles of joints 3 to 8 and 2 long bristles of 9th joint with natatory hairs; short bristle of 9th joint with short marginal spines; bristles of joints 3 to 5 with few faint marginal spines along ventral margin.

Mandible: Coxale endite broken off both limbs of USNM 139858; coxale with spines forming rows on medial surface. Basale endite with 4 spinous end bristles, 1 or 2 dwarf bristles, 3 triaenid bristles with 2 to 5 pairs of marginal spines excluding terminal pair, and a glandular peg with digitate tip; 1 small bare medial bristle present on basale near base of endite and near U-shaped sclerotized process. Dorsal margin of basale with backward-pointing midbristle and 2 long spinous subterminal bristles. Exopodite about three-fourths length of dorsal margin of 1st endopodite joint and with 2 small spinous subterminal bristles. Endopodite: 1st joint with 3 long spinous ventral bristles; dorsal margin of 2nd joint with 1 short spinous proximal bristle and stout spinous a-, b-, c-, and d-bristles; 1 small spinous bristle present medially between b- and c-bristles (and on right limb of USNM 139858 also between a- and b-bristles); 4 short spinous cleaning bristles forming oblique row near base of c-bristle; no lateral bristle betweeen b- and c-bristles; 1 long spinous lateral bristle present between c- and d-bristles; 1 long spinous medial bristle present just distal to base of d-bristle; ventral margin of 2nd joint with 3 long spinous terminal bristles; medial surface of joint with faint spines forming clusters; end joint with short straight dorsal claw with few faint teeth near middle and at tip, 1 short spinous medial bristle, and 4 stout spinous bristles.

Maxilla: Similar to that of *S. dimorpha* except short distal ventral bristle observed on basale (a bristle is probably also present in that locality on *S. dimorpha* but could not be seen).

Fifth limb (Figure 284*e*): Epipodial appendages with about 63 bristles; comb with 1 short slender bristle ventral to base of stout exopodial bristle

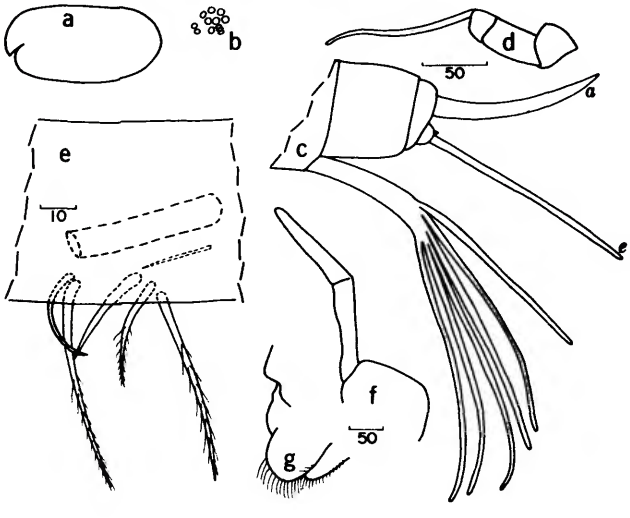

FIGURE 284.—*Synasterope arnaudi*, female, USNM 139858, length 1.75 mm: *a*, complete specimen, lateral view; *b*, sketch of central muscle attachments on left valve, lateral view; *c*, tip of right 1st antenna, lateral view (not all bristles shown); *d*, endopodite of left 2nd antenna, medial view; *e*, exopodial bristles of left 5th limb, medial view; *f*, medial eye and rod-shaped organ; *g*, upper lip. (Same magnification in microns: *c,d; f,g*.)

and 5 additional bristles present near ventral margin (the most proximal of these almost on ventral margin).

Sixth limb: Anterior margin with 1 upper and 1 lower bristle (upper bristle missing on left limb of USNM 139858); anterior tip with 4 bristles plus 1 on lateral flap; posteroventral margin with 19 bristles; hairs present on anteroventral and posterior margins, lateral sole, medial surface, and lateral surface near posteroventral margin.

Seventh limb: Proximal and distal group each with 6 bristles, 3 on each side, each with 1 to 3 bells; opposing terminal combs each with 10 spinous teeth.

Rod-shaped organ and eyes (Figure 284*f*): Rod-shaped organ elongate, 1- or 2-jointed with rounded tip. Medial eye bare, lateral eyes absent.

Furca: Each lamella with 8 claws, posterior claw oriented posteriad.

Genitalia: Well developed, rounded, sclerotized.

Posterior: Dorsal corner with low rounded process with long hairs.

Upper lip (Figure 284*g*): Consisting of 2 hirsute lobes without spines and with lateral flap on each side of mouth.

DESCRIPTION OF N–1 MALE.—Carapace similar in shape to that of female but larger. Size: USNM 139861, length 1.84 mm, height 0.97 mm.

Lateral eyes: Absent.

COMPARISONS.—Some differences between *S. arnaudi* and *S. dimorpha* are listed below:

	S. arnaudi	*S. dimorpha*
Number of processes on posterior infold	4–5	8
Length of ventral margin of 6th joint of 1st antenna as percent of distance between base and proximal filament on sensory bristle of 5th joint	74	57

DISTRIBUTION.—This species was collected from the Bay of Morbihan, Kerguelen Islands, at a depth of 50 m (Figure 252).

Synasterope Species Indeterminate

USNM 128607, 1 N–1 ♂ with both 7th limbs missing, length 2.48 mm, height 1.51 mm, from *Eltanin* Cruise 4, station 102; USNM 127523, 1 juvenile ♀, length 1.74 mm, height 0.89 mm, from *Eltanin* Cruise 11, station 939; USNM 128616, 1 ♀ (N–1 instar or adult), length 2.25 mm, height 1.14 mm, from *Vema* Cruise 14, station V–14–25; USNM 139141, 1 juvenile ♂, length 1.23 mm, height 0.63 mm, from *Hero* Cruise 69–5, station 57.

The distribution of specimens assigned to this category is shown in Figure 252.

Skogsbergiella, new genus

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

ETYMOLOGY.—The new genus is named after Dr. Tage Skogsberg. Gender: feminine.

REMARKS.—This species was included by Poulsen (1965) in his genus *Philippiella* (see "Remarks" under *Empoulsenia*).

The genus *Skogsbergiella* contains 6 species, all of which live in the study area: *S. spinifera* (Skogsberg, 1920); *S. macrothrix*, new species; *S. skogsbergi* (Kornicker, 1971); *S. scotti*, new species; *S. plocus*, new species; *S. pax*, new species.

DIAGNOSIS OF THE GENUS.—Carapace elongate, smooth, with slitlike incisur; infold of right valve only with linear ridge between list and posterior valve margin; on left valve ridge almost coinciding with valve margin; 4–6 processes present between posterior list and posterior valve margin.

First antenna: 3rd joint with 6 dorsal bristles; sensory bristle of 6th joint of female with 1 short proximal and 6 long terminal bristles, except *S. macrothrix* on which proximal bristle may be long or short and on some species is close to terminal bristles (this species as conceived herein may contain more than one species); d- and e-bristles of 8th joint well developed, d-bristle shorter than e-bristle.

Second antenna: Endopodite 3-jointed in both sexes, 3rd joint reflexed on adult male.

Mandible: Basale of female with spines and 4–19 bristles along the dorsal margin in addition to terminal pair; dorsal margin of 1st endopodite joint of female only with about 3 short stout terminal spines; 2nd endopodite joint with long lateral bristle between b- and c-bristles. Exopodite about half length of dorsal margin of 1st endopodite joint.

Maxilla: Basale with 1 proximal bristle on ventral margin and 1–5 distal bristles on dorsal margin.

Sixth limb: Anterior margin with 1 upper and 1 lower bristle; posteroventral margin with 12–29 bristles.

Seventh limb: Each limb with 12–25 bristles.

DISTRIBUTION.—Members of the genus *Skogsbergiella* have not been reported from outside the present study area. The northernmost latitude from which the genus has been collected is 38°13′S. The southernmost locality is in the Weddell Sea (Figure 285). The known depth range of the genus is 6 to 3431 m, but it was only collected once below 2000 m, and twice between 1000 m and 2000 m.

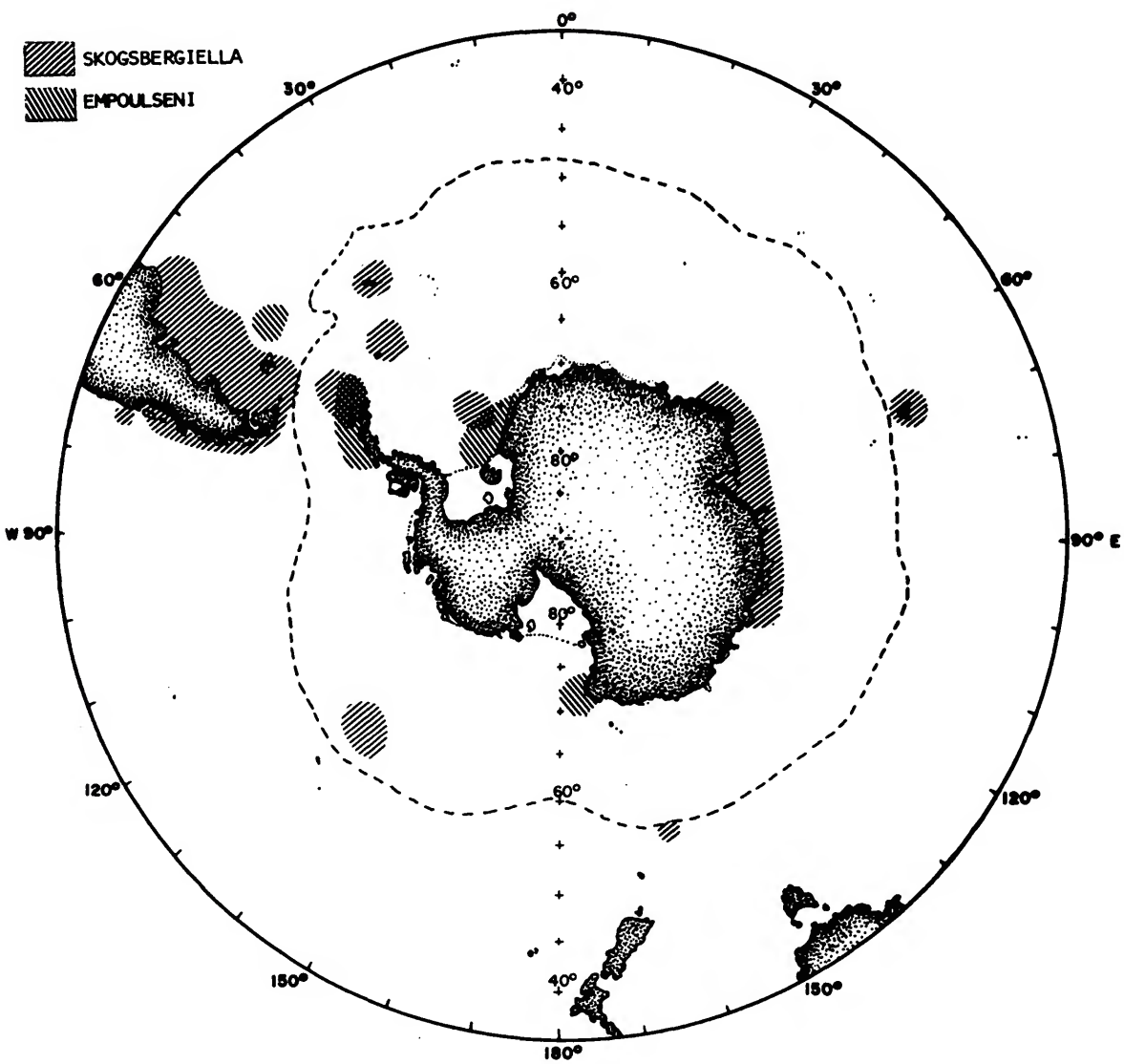

FIGURE 285.—Distribution map.

Key to Species

1. Carapace longer than 3.4 mm ..... 83. *S. skogsbergi*
   Carapace shorter than 3.0 2
2. Lateral eyes absent in adults and late instars ..... 87. *S. pax*
   Lateral eyes present in adults and late instars 3
3. Dorsal margin of mandibular basale with 6 or 7 bristles excluding terminal pair, dorsal margin of basale of maxilla with 3 or 4 distal bristles, 7th limb with 12 bristles ..... 86. *S. plocus*
   Dorsal margin of mandibular basale with 10–19 bristles excluding terminal pair, dorsal margin of basale of maxilla with 1 distal bristle, 7th limb with 17–25 bristles 4
4. Lateral eye with 19–23 ommatidia ..... 84. *S. scotti*
   Lateral eye with less than 10 ommatidia 5
5. Carapace longer than 2.5 mm; proximal bristle on sensory bristle of 1st antenna short and located some distance from terminal filaments ..... 82. *S. spinifera*
   Carapace equal to or shorter than 2.5 mm; proximal bristle on sensory bristle of 1st antenna similar to that on *S. spinifera*, or much longer, and on some specimens located close to terminal filaments ..... 85. *S. macrothrix*

82. *Skogsbergiella spinifera* (Skogsberg)

FIGURES 286, 287

Asterope spinifera Skogsberg, 1920:466, 476, figs. 86–87.
Not *Cylindroleberis spinifera* (Skogsberg).—Hartmann, 1965: 41 [*C.* cf. *spinifera*, p. 324; = *Skogsbergiella macrothrix* herein].
Philippiella spinifera (Skogsberg).—Poulsen, 1965:344.—Kornicker, 1971:209, figs. 29, 30.

HOLOTYPE.—Swedish State Museum (Riksmuseum), Stockholm (see Skogsberg, 1920:483).

TYPE-LOCALITY.—South Georgia, S.A.E. Station 34, off mouth of Cumberland Bay, 54°11′S, 54°18′W.

MATERIAL.—USNM 125824, juvenile ♂ (N–1); USNM 125828, female with 1 valve missing; USNM 126125, gravid ♀; USNM 127277, gravid female; USNM 127278, adult female without eggs; USNM 128286, juvenile; USNM 128287, 2 juveniles; USNM 128854, 1 N–1 ♂; USNM 128856, 1 gravid ♀, 1 juvenile.

USNM 125824 from *Eltanin* Cruise 12, station 1078; USNM 125828 from *Eltanin* Cruise 6, station 418; USNM 126125 from *Eltanin* Cruise 6, station 410; USNM 127277, 127278 from *Eltanin* Cruise 6, station 416; USNM 128286, 128287 from *Eltanin* Cruise 6, station 344; USNM 128854 from *Vema* Cruise 17, station V–17–97; USNM 128856 from *Vema* Cruise 17, station V–17–43.

DIAGNOSIS OF FEMALE.—Carapace with curved ventral and dorsal margins; posterior infold with 6 or 7 faint processes between list and posterior margin of shell; carapace length 2.55–2.65 mm, height 1.59–1.79 mm.

First antenna: Proximal filament on sensory bristle short and some distance from terminal filament.

Mandible: Dorsal margin of basale with 10–15 short bristles and numerous spines.

Maxilla: Dorsal margin of basale with 1 proximal and 1 distal bristle, both short; ventral margin of basale with short proximal bristle, minute distal

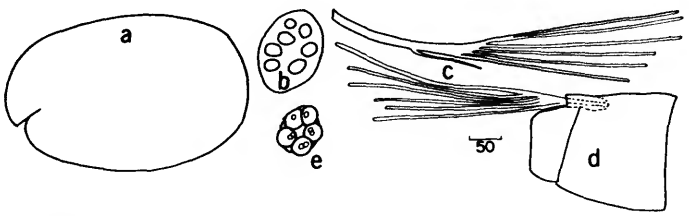

FIGURE 286.—*Skogsbergiella spinifera*, female, USNM 128856, length 2.55 mm: *a*, complete specimen, lateral view; *b*, central muscle attachments on right valve, lateral view; *c*, aberrant sensory bristle on 5th joint of right 1st antenna, lateral view; *d*, sensory bristle on left 1st antenna, medial view; *e*, left lateral eye. (Same magnification in microns: *b-e*.)

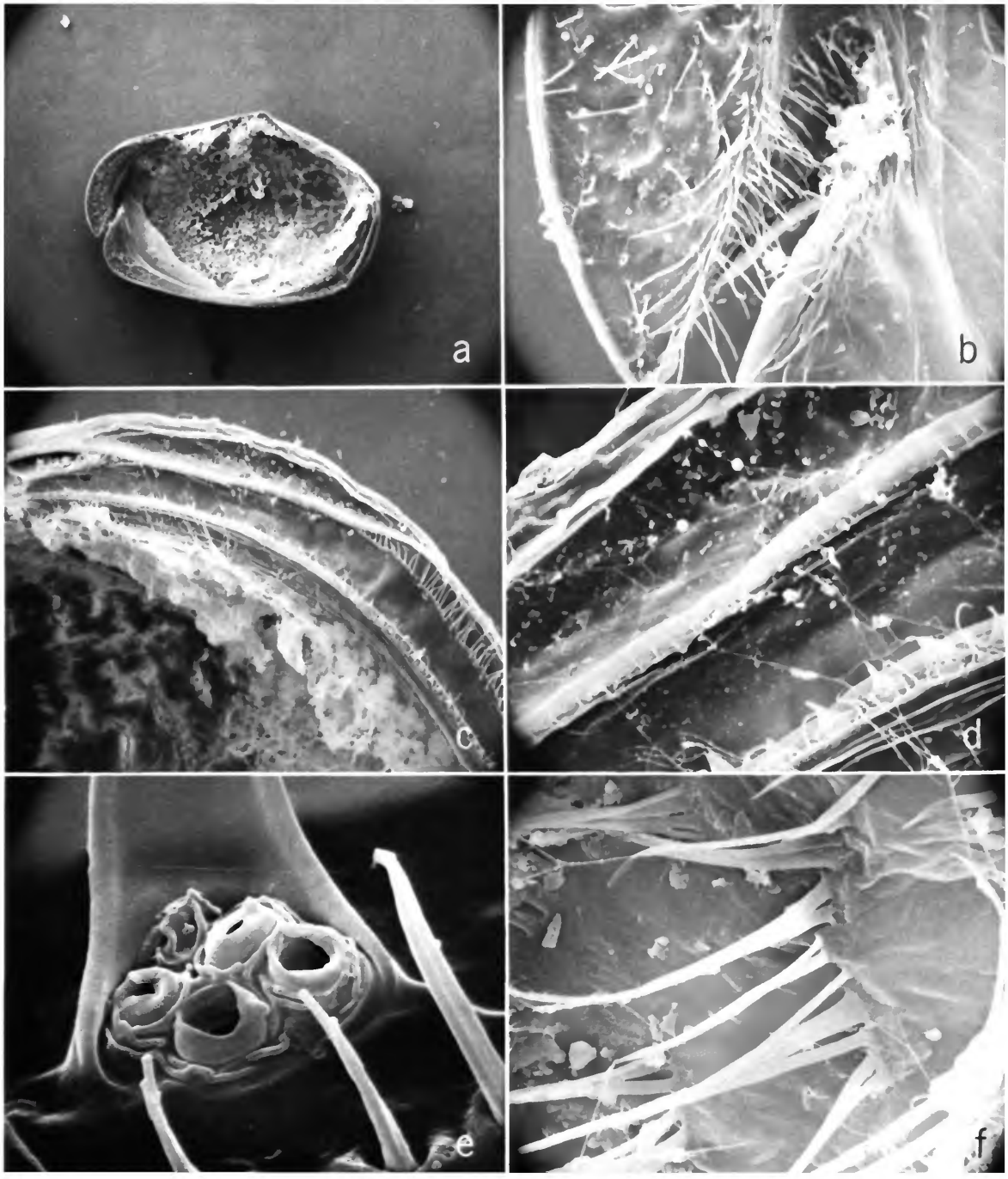

FIGURE 287.—*Skogsbergiella spinifera*, female, USNM 127277, right valve, medial view: *a*, complete valve, × 24; *b*, anterior, × 240; *c*, posterior, ventral margin to right × 120; *d*, detail of "*c*," ventral margin to lower right, × 500; *e*, detail of base of pores at base of flaplike bristles on posterior list, × 6000; *f*, detail of hairs on anterodorsal part of vestment proximal to inner margin of infold, × 2400.

bristle and long spinous terminal bristle.

Sixth limb: End joint with 5 or 6 anterior bristles and 23–28 posteroventral bristles.

Seventh limb: Each limb with 17–20 bristles.

Lateral eye: Small with 5 or 6 ommatidia.

Posterior: Dorsum consisting of thumblike spinous process.

SUPPLEMENTARY DESCRIPTION OF FEMALE (Figures 286, 287).—Carapace dimensions (Figure 288): USNM 126125, length 2.58 mm, height 1.59 mm; USNM 127277, length 2.60 mm, height 1.74 mm; USNM 127278, length 2.65 mm, height 1.79 mm; USNM 128856, length 2.55 mm, height 1.73 mm.

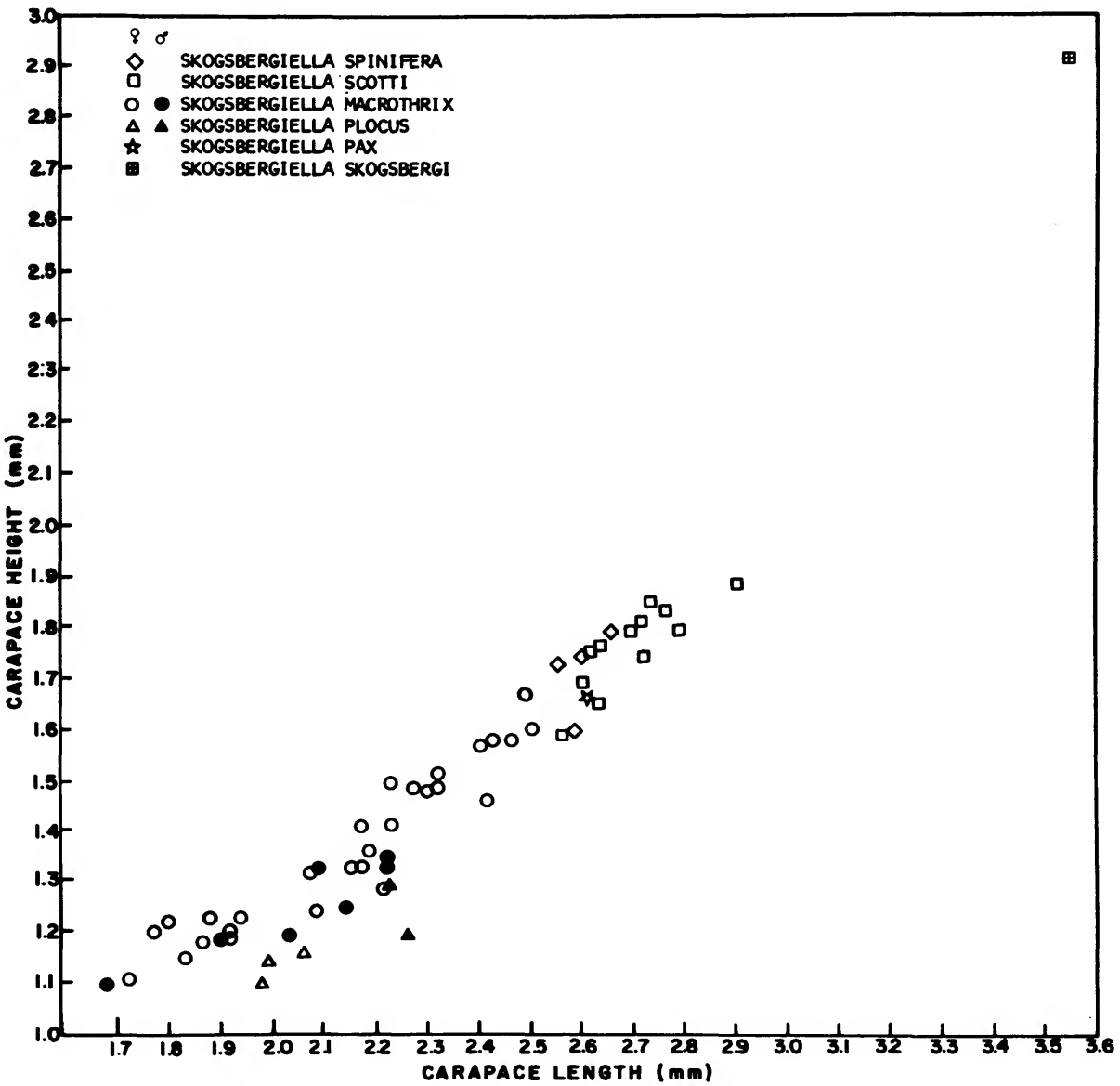

FIGURE 288.—Comparison of relationship between shell length and height of adults of *Skogsbergiella*.

Eggs: USNM 126125, 10 eggs; USNM 127277, 15 eggs; USNM 128856, 9 eggs.

SUPPLEMENTARY DESCRIPTION OF JUVENILES.—Carapace dimensions: USNM 125824, N–1 ♂, length 2.20 mm, height 1.45 mm; USNM 128854, N–1 ♂, length 2.42 mm, height 1.51 mm; USNM 128286, length 2.32 mm, height 1.41.

REMARKS ON SPECIMENS IDENTIFIED BY LOFTHOUSE (1967:143) AS *Philippiella spinifera* (Skogsberg) FROM FIVE LOCALITIES.—

1. Enderby Land: Through Dr. K. G. McKenzie I received from the British Museum (Natural History) 1 specimen with valves and some appendages in alcohol and remaining appendages on a slide. The label on the slide is as follows: "98 *Philippiella spinifera* (Skogsberg), St. 39, 300 m, TML B.A.N.Z.A.R.E., 7.1.30, from 1966.7.20.50." The labels in the vial are more-or-less similar. I did not open the vial, but a rough measurement made through the glass side of the vial indicates that the specimen is the one referred to by Lofthouse as "a mature female of 3.68 mm." This specimen, a gravid ♀, probably represents a new species of *Skogsbergiella*, but because of its condition I am not formally proposing it as such. The vial contains a well-developed lateral eye with numerous ommatidia (roughly 20 estimated using low power magnification and looking through glass of vial). The 3rd joint of the 1st antenna bears on the dorsal margin 7 or 8 bristles (previously described species in the genus bear only 6). The dorsal margin of the basale of the mandible bears about 14 short bristles. The dorsal margin of the basale of the maxilla bears 8 bristles, many more than on other species of *Skogsbergiella*. In the present paper I have listed the specimen under *Skogsbergiella* species indeterminate.

2. Kerguelen Islands: Also received from the British Museum (Natural History) were two slides, one with appendages, the other with disarticulated valves under a cover slip. Both slides bear the following label, "98 *Philippiella spinifera* (Skogsberg, St. 64, 2.3.30, 91 m OTL, Kerguelen, B.A.N.Z.A.R.E. 1966. 7.20.56." The measurements of the carapace are as follows: right valve length 2.71 mm, height 1.71 mm; left valve length 2.69 mm, height 1.72 mm. The specimen is an adult ♀. The well-developed pigmented lateral eye with about 20 ommatidia indicates that the specimen is not conspecific with *P. spinifera*, which bears only 5–9 ommatidia. The lateral eye resembles that of *S. scotti* described herein, which bears about 23 ommatidia. The dorsal margin of the basale of the mandible on the Kerguelen specimen bears only 6–8 bristles, which is lower than the number present on *S. scotti* (14–19). Therefore, this specimen has been listed as *Skogsbergiella* species indeterminate herein. The posterior infold of the right valve bears a ridge not present in the left valve and the number of bristles in the anteroventral row in front of the ridge is about 46. Both 7th limbs on the slide are fragmented.

3. MacRobertson Land: Through Mr. David C. Lee, I received from the South Australian Museum one vial bearing two valves and a label, "DRL 107 16/2/31 219 m" and one slide bearing appendages. The label on the slide reads: "*Philippiella spinifera*, B.A.N.Z.A.R.E., D.R.L., 16/2/31, 219 m, Stn. 107." The valves are about 3.3 mm long and have a posterior ridge on the infold of the right valve indicating that the specimen belongs in *Skogsbergiella*. The dorsal margin of the mandibular basale of the right limb bears 14 short bristles, the left limb 13. Lateral eyes are not visible on the slide. Because of the large carapace I question its identification as *P. spinifera* and consider it *Skogsbergiella* species indeterminate herein.

4. Crozet Islands (Possession Island): Also received from the South Australian Museum was a vial containing 4 complete specimens, fragments of 2 specimens and the label, "Res. 155." These ostracodes had been identified, presumably by Lofthouse, as *Philippiella spinifera*. Two of the complete specimens are early juveniles, which I did not dissect; I consider them Cylindrolebridinae genus indeterminate herein. I dissected the remaining complete specimens. The largest of these, which I have labeled "specimen number 1," belongs to *Skogsbergiella*. Large lateral eyes with 18 ommatidia indicate that it is not *Skogsbergiella spinifera*. The specimen differs from known species of *Skogsbergiella* in having no bristles (only spines) on the dorsal margin of the mandibular basale. The specimen has well-developed genitalia and may be an adult ♀; its dimensions are as follows: length 2.64 mm, height 1.53 mm. The 2 fragmented specimens belong to the same species as specimen number 1. I consider these 3 specimens to be *Skogsbergiella* species indeterminate herein.

The remaining complete specimen is a N–1

male, which I have labeled "specimen number 2." The presence of a short proximal filament on the sensory bristle of the 2nd antenna as well as other characters indicates that it belongs in the genus *Diasterope*. Kornicker (in Bowman and Kornicker, 1967:16), however, found that *Parasterope pollex* Kornicker, 1967, has a *Diasterope*-type sensory bristle on the N–1 male. Therefore, it is possible that the specimen is a *Parasterope*. Nevertheless, I consider it *Diasterope* species indeterminate herein. The dimensions of the carapace are length 1.46 mm, height 1.03 mm. The specimen has no mid-bristles on the dorsal margin of the mandibular basale and no bristles on the dorsal margin of the basale of the maxilla.

According to Patricia M. Thomas (written com., 1971), Residue 155 was collected on the B.A.N.Z. Antarctic Research Expedition, "(Col. 317) Crozet Is (Possession I) 21.11.29, Swamp." This sample is probably from an unnumbered station between stations 2 and 3, *Discovery* Cruise 1, which is located in the vicinity of Possession Island, but the collecting date was 2–3 November 1929 (see Johnston, 1937.

5. Maquarie Island: I have not had the opportunity to examine this material, but in view of the previous identifications of this species by Lofthouse being at variance with my own, I have referred the Macquarie Island specimens to *Skogsbergiella* species indeterminate.

Distribution.—This species was collected from South Georgia, South Shetland Islands, the shelf between King George and Elephant Islands, Bransfield and English Straits, South Orkney Islands, Strait of Magellan, Argentine shelf, Burdwood Bank, and the Chilean shelf. The depth range is about 70 m to 663 m (Figure 289).

83. *Skogsbergiella skogsbergi* (Kornicker)

Philippiella skogsbergi Kornicker, 1971:211, fig. 31.

Holotype.—USNM 125488, gravid ♀, length 3.55 mm.

Type-Locality.—Vicinity of Greenwich Island, South Shetland Islands, 62°25′48″S, 59°37′, 274 m.

Material Examined.—See Kornicker (1971).

Diagnosis of Female.—Carapace similar in shape to that of *S. spinifera*, length 3.55 mm, height 2.19 mm (Figure 288); bristles on posteroventral infold sparse.

First antenna: Length of longer of 2 ventral bristles on 4th joint 100 percent length of ventral margin of 5th joint.

Mandible: Dorsal margin of basale with 9 or 10 short bristles.

Maxilla: Dorsal margin of basale with 1 short proximal and 1 distal bristle.

Seventh limb: Limb with 25 bristles.

Lateral eye: Eye with about 16 ommatidia.

Distribution.—Collected only at type-locality (Figure 289).

84. *Skogsbergiella scotti*, new species

Figures 290, 292

Asterope australis Brady.—Scott, 1912:586, pl. 13: fig. 18.
Philippiella spinifera? Skogsberg.—Kornicker, 1971:214.

Holotype.—USNM 127398, gravid ♀, length 2.90 mm. Valves and some appendages in alcohol, remaining appendages on slides.

Type-Locality.—Arthur harbor, Anvers Island, Palmer station AH4–20.

Etymology.—This species is named after Dr. Thomas Scott.

Paratypes.—USNM 125820, gravid ♀; USNM 127400, 1 adult ♀, 1 juvenile; USNM 127403, gravid ♀; USNM 127404, 7 adult ♀♀, 13 juveniles; USNM 127405, 16 gravid ♀♀; USNM 127399, gravid ♀; USNM 127401, 1 gravid ♀; USNM 127402, 2 adult ♀♀; USNM 125820 from *Eltanin* Cruise 12, station 1082; USNM 127403–127405 from same sample as holotype; USNM 127399, 127400 from Palmer station AH4–25; USNM 127401, 127402 from Palmer station AH 4–30.

Additional Specimens.—USNM 139855, 1 gravid ♀ from Kerguelen Island, station D70A; USNM 139856, 1 adult ♀ from same station returned to Dr. P. M. Arnaud.

Diagnosis of Adult Female.—Posterior infold with 6–9 broad pores or processes and 46 bristles between broad list and valve margin.

First antenna: Length of longer of 2 ventral bristles on 4th joint 75–80 percent length of ventral margin of 5th joint.

Mandible: Dorsal margin of basale with 10–19 short bristles.

Maxilla: Dorsal margin of basale with 1 short proximal and 1 short distal bristle.

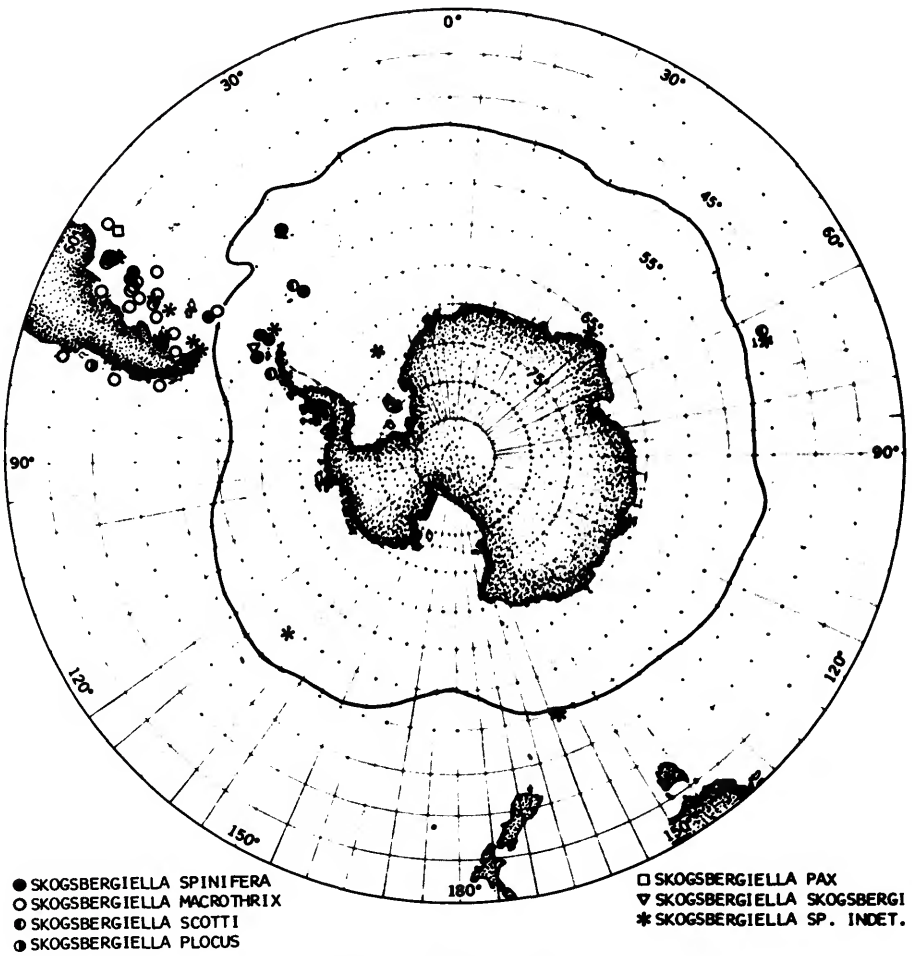

FIGURE 289.—Distribution map.

Seventh limb: With 17–25 bristles.

Lateral eyes: With 19–23 ommatidia and black pigment.

DESCRIPTION OF FEMALE.—Shape of carapace similar to that of *S. spinifera* (Figure 290 *a*, *b*, *m*).

Infold (Figures 290*n*, 291, 292): 46 long bristles forming outer row along posteroventral infold with counting starting opposite lowermost hyaline spine of list; posterior list with 30 to 49 hyaline spines; 6 to 9 broad pores present betweeen spine bearing list and posterior edge of shell; narrow linear ridge present on infold of right valve between spine bearing list and posterior edge of shell; about 20 small bristles present anterior to linear ridge.

Size (Figure 288): Length of measured specimens ranged from 2.55 to 2.90 mm, height from 1.57 to 1.89 mm. Measurements are as follows: USNM 125820, length 2.61 mm, height 1.75 mm; USNM 127403, length 2.63 mm, height 1.76 mm. USNM 127405, 4 gravid specimens (not dissected): length 2.73 mm, height 1.84 mm; length 2.60 mm, height 1.69 mm; length 2.76 mm, height 1.83 mm; length 2.78 mm, height 1.78 mm. USNM 127399, length 2.72 mm, height 1.74 mm; USNM 127400, length 2.69 mm, height 1.79 mm; USNM 127401, length 2.71 mm, height 1.81 mm; USNM 139855, length 2.61 mm, height 1.65 mm; USNM 139856, length 2.55 mm, height 1.57 mm; USNM 127398, length 2.90 mm, height 1.89 mm.

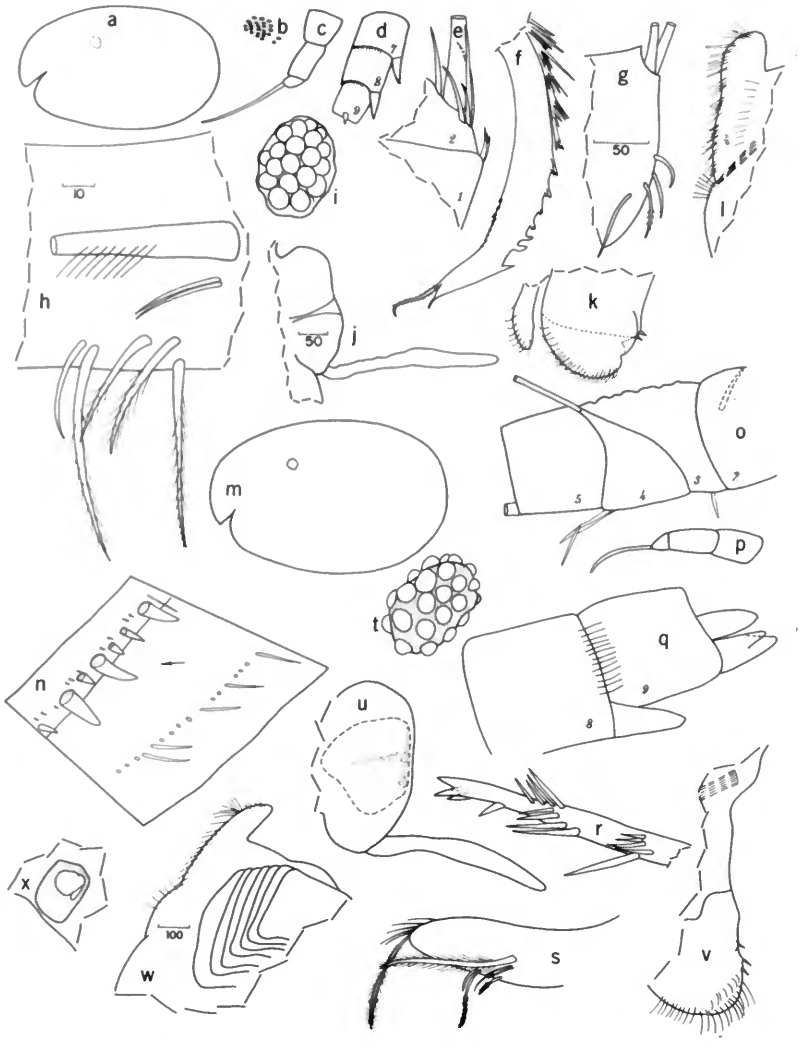

FIGURE 290.—*Skogsbergiella scotti*, female, USNM 139855, length 2.61 mm, carapace: *a*, complete specimen, lateral view; *b*, sketch of central muscle attachments on left valve, lateral view. Second antenna: *c*, endopodite on left limb, medial view; *d*, exopodial joints 7–8 on right limb, lateral view (bristles not shown). Mandible: *e*, part of 1st and 2nd endopodial joints of right mandible, medial view; *f*, coxale endite; *g*, dorsal margin of basale on right limb, medial view. Left 5th limb: *h*, exopodial bristles, lateral view. Anterior: *i*, right lateral eye; *j*, medial eye and rod-shaped organ; *k*, upper lip, anterior to right. Posterior: *l*, spinous dorsal process, anterior to right. Female, USNM 127398, length 2.90 mm, carapace: *m*, complete specimen showing position of lateral eye, lateral view; *n*, detail of posteroventral infold on right valve, medial view. Right 1st antenna: *o*, joints 2–5, medial view (not all bristles shown). Left 2nd antenna: *p*, endopodite, lateral view; *q*, exopodial joints 8–9, lateral view (bristles not shown). Left mandible: *r*, tip of ventral branch of coxale endite, medial view. Left 5th limb: *s*, exopodial bristles, lateral view. Anterior: *t*, right lateral eye; *u*, medial eye and rod-shaped organ; *v*, upper lip. Posterior: *w*, dorsal process and ends of gill-like structures; *x*, left genitalia on left side, anterior to left. (Same magnification in microns: *p,s-v; c,i-l,o,x; d-g,n; q,r*.)

First antenna (Figure 290*o*): First joint spinous; 2nd joint spinous with long spinous dorsal bristle and short spinous lateral bristle; combined 3rd plus 4th joints longer than wide; 3rd joint with 6 spinous dorsal bristles and 1 small ventral bristle; 4th joint with concave distal margin, 1 long spinous dorsal bristle, and 2 short ventral terminal bristles; longer of 2 ventral bristles of 4th joint about 75–80 percent length of ventral margin of 5th joint; 3rd and 4th joints with few clusters of short spines; sensory bristle of 5th joint with 1 short proximal and 6 terminal filaments; 6th joint with long spinous medial bristle. Seventh joint: a-claw with or without minute spines on concave margin; b-bristle with 6 spinous filaments including tip; c-bristle with 8 filaments including tip. Eighth joint: d- and e-bristles longer than a-claw; d-bristle slightly shorter and more slender than e-bristle; f-bristle at right angles to stem and with 6 spinous filaments including tip; g-bristle same as c-bristle.

Second antenna (Figure 290*c,e,p,q*): Protopodite: medial surface with spines forming clusters, spines longer near dorsal margin than near ventral margin; long spines present along dorsal margin, shorter more slender spines present along ventral margin; usual short medial bristle present. Endopodite 3-jointed with terminal bristle shorter than length of stem. Exopodite: 9th joint with 4 bristles; joints 2–8 with short spines forming row along distal margin; joints 3 or 4 to 8 with basal spines; 9th joint with 1 single or double lateral spine (Figure 290*q*).

(The ventral margin of the protopodite of the 2nd antenna on the specimen of *S. scotti* from *Eltanin* station 1082 bears broad spines similar to those on the protopodite of *S. spinifera*. The specimens of *S. scotti* from Arthur Harbor have in this position only slender spines. This difference in spinosity is tentatively considered herein to be the result of intraspecific variability.)

Mandible: Coxale endite similar to that of *S. spinifera* (Figures 290*f,r*); 1 slender bristle present near basis of endite. Basale: endite with usual 4 spinous end bristles and 4 triaenid bristles, each with 12 to 16 pairs of spines proximal to the distal pair; 1 additional triaenid bristle with 9 pairs of spines present on endite proximal to glandular peg; proximal dwarf bristle of endite shorter than distal bristle, both dwarf bristles fairly long; ventral margin of basale with 1 triaenid bristle with 5 pairs of spines proximal to distal pair; dorsal margin with 10–19 short bristles, clusters of short spines, and 2 long spinous terminal bristles (Figure 290*g*). Endopodite (Figure 290*e*): 1st joint with 3 long spinous ventral bristles and 3–5 stout terminal dorsal spines; dorsal margin of 2nd joint with 3 or 4 proximal bristles and stout spinous a- to d-bristles; medial surface with numerous cleaning bristles; end joint similar to that of *S. spinifera*. The number of short bristles on the dorsal margin of the basale of 5 specimens is listed below:

Specimen	*Left limb*	*Right limb*
USNM 125820	-	14
USNM 127398	19	18
USNM 127403	15	16
USNM 139855 (aberrant?)	5	4
USNM 139856	10	-

Maxilla: First endite with 3 long and 1 short bristles; 2nd endite with 3 long bristles. Tip of epipodial appendage hirsute. Basale: spinous, dorsal margin short, with 1 spinous proximal bristle and 1 short bare distal bristle; ventral margin with 1 short proximal bristle with few faint spines, 1 very short bare distal bristle, and 1 long stout spinous terminal bristle. Endopodite: anterior margin of 1st joint with short bare distal bristle, posterior margin with long spinous terminal bristles; end joint with long spinous terminal bristle.

Fifth limb (Figure 290*h,s*): Epipodial appendage with 86 to 88 bristles; 2 short slender bristles present near base of spinous exopodite bristle, and 2 pairs of bristles present close to ventral margin of comb; exopodite bristle extending slightly past end of comb.

Sixth limb: Anterior margin with upper and lower bristle; anteroventral corner with 3 to 5 spinous bristles and 2 to 4 small bristles on lateral flap; posteroventral margin with 21–29 spinous bristles; minute medial bristle present near proximal anterior corner; limb hirsute.

Seventh limb: Each comb with approximately 16 to 18 spinous teeth; each limb with 17 to 25 bristles, each with 2 to 5 bells. The distribution of bristles on 7th limbs of 7 specimens is listed below (limbs A and B refer to opposing limbs on same specimen):

Specimen	*Limb A*	*Limb B*
USNM 127398	24	–
USNM 127399	25	–
USNM 127400	22	22
USNM 127401	20	–
USNM 127403	23	–
USNM 125820	?16 (frag.)	–
USNM 139855	17	18

Furca: Each lamella with 10 claws, last claw weak, oriented posteriad.

Rod-shaped organ (Figure 290*j,u*): Elongate 1-jointed, slightly widening near middle, rounded tip.

Posterior (Figure 290*l,w*): Posterior margin with spines and thumblike spinous dorsal process.

Eyes (Figure 290*i,j,t,u*): Medial eye large, pigmented, without hairs; lateral eye large with 19–23 ommatidia in lateral view and black pigment, maximum length of lateral eye about 50 to 76 percent maximum length of medial eye.

Upper lip (Figure 290*k,v*): Consisting of 2 hirsute lobes, each with 3 anterior spines; lateral hirsute flap present on each side of mouth.

Genitalia: See Figure 290*x*.

Eggs: USNM 127398 with 21 eggs in brood chamber; USNM 125820, 24 eggs; USNM 127398, 21 eggs; USNM 127403, 18 eggs; USNM 127399, 17 eggs; USNM 127401, 18 eggs; USNM 139855, 11 eggs.

Parasites: USNM 139856 with 1 ♀ choniostomatid and 3 copepodite choniostomatids. These were put into the collection of the NMNH.

REMARKS.—Kornicker (1971) referred to *Philippiella spinifera?* a specimen from Scotia Bay, South Orkney Islands, which had been identified as *Asterope australis* Brady by Scott (1912:586). The large lateral eyes on the specimen indicate that it is more closely related to *S. scotti* than it is to *S. spinifera* and it is placed in the synonymy of *S. scotti* herein. The specimen bears broad spines on the ventral margin of the protopodites of the 2nd antenna similar to those on the specimen of *S. scotti* collected at *Eltanin* station 1082. The Scotia Bay specimen was collected in deeper water (595 m) than at *Eltanin* station 1082 (298–302 m) or at Palmer stations AH4–20, 25, 30 (6.1–9.1 m) where other specimens of the species were collected. It also contained fewer eggs in its brood chamber (11) than specimens from other areas (17–24). The length of the longest ventral bristle on the 4th joint of the 1st antenna on the Scotia Bay specimen is 100 percent of the length of the ventral margin of the 5th joint compared to 75–80 percent for specimens from other areas.

The specimens from Kerguelen Island (station D70A) have been referred to *S. scotti*, although they differ from specimens from the type-locality (Arthur Harbor, Anvers Island) in having 39 or 40 instead of 46 long bristles forming a row on posteroventral infold of carapace with count starting opposite the lowermost hyaline spine, and only 4 or 5 instead of 6–9 broad pores or processes present between the spine-bearing list and the posterior edge of the shell. The 6th limb differs in having 5 instead of 3 or 4 bristles at the anteroventral corner, 2 instead of 3 or 4 bristles on the

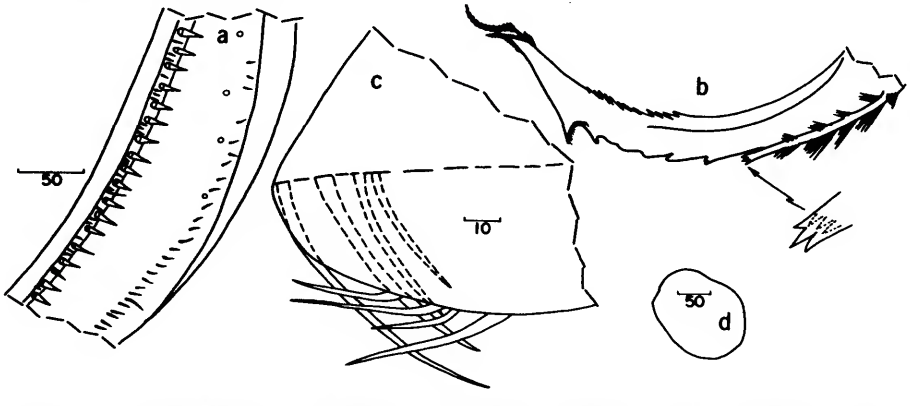

FIGURE 291.—*Skogsbergiella scotti*, female, USNM 127403: *a*, detail of posterior infold on right valve, medial view: *b*, coxale endite on mandible; *c*, anterior tip of left 6th limb, lateral view; *d*, outline of right lateral eye. (Same magnification in microns: *a,b*.)

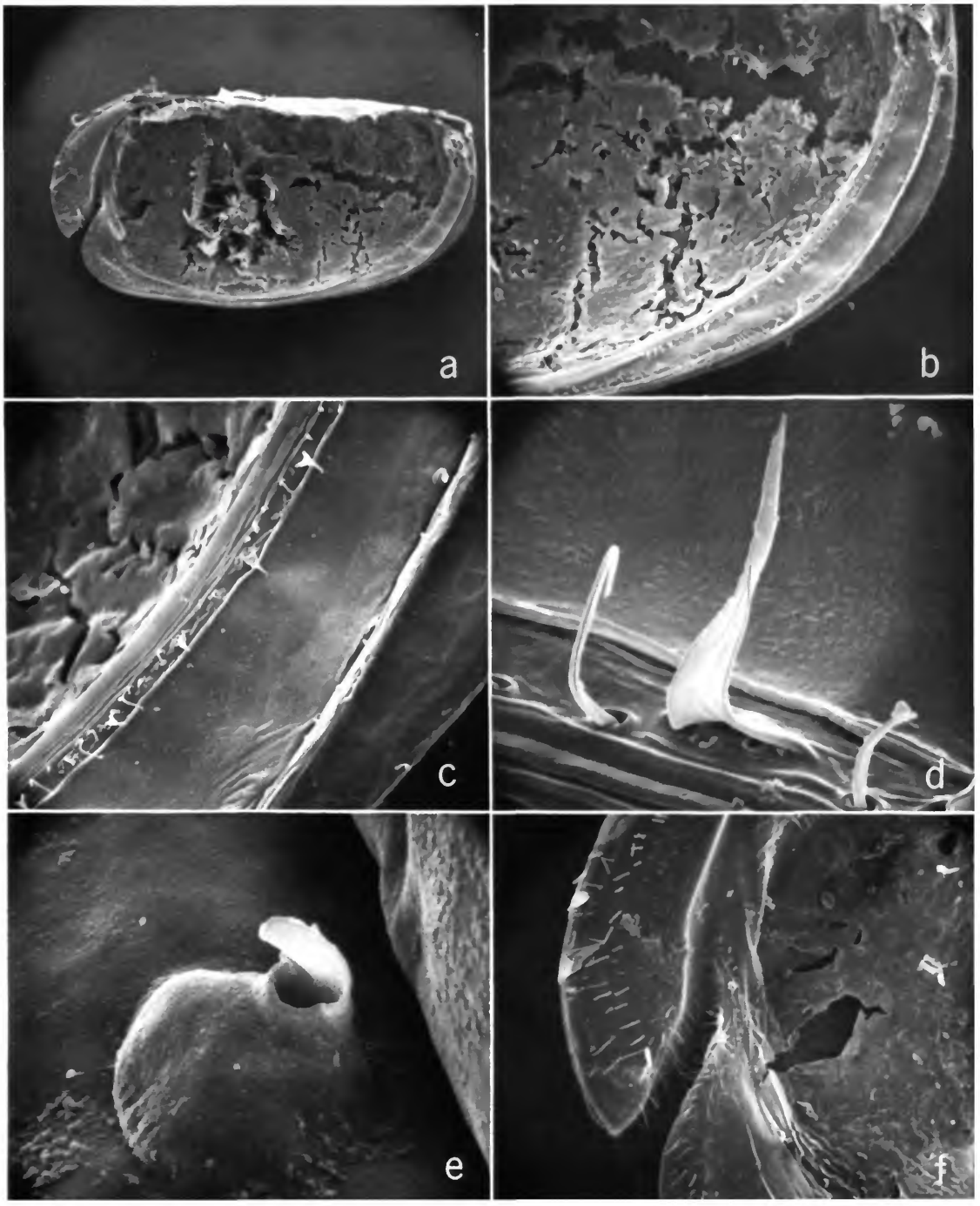

FIGURE 292.—*Skogsbergiella scotti*, female, USNM 139855: *a*, right valve, medial view, × 35; *b*, detail of posterior, × 87; *c*, detail of list and ridge in "*b*," × 350; *d*, detail of list (anterior toward bottom of picture), × 2150; *e*, detail of posterior process on posterior infold, × 6500; *f*, detail of anterior, × 115.

lateral flap, and 21–23 instead of 26–29 postero-ventral bristles. The 7th limbs differ in having 17 or 18 instead of 20–25 bristles. The lateral eyes contain only 19 instead of 23 ommatidia and have a greatest length about 76 percent instead of 50–65 percent the greatest length of the medial eye.

COMPARISONS.—*S. scotti* is closely related to *S. spinifera* (Skogsberg, 1920) and *S. skogsbergi* (Kornicker, 1971). *Skogsbergiella scotti* differs from *S. spinifera* mainly by the number of ommatidia and pigmentation of the lateral eye. The lateral eye of *S. scotti* is large with 19–23 ommatidia and black pigment between ommatidia; the lateral eye of *S. spinifera* is small with less than 10 ommatidia and no black pigment between them. The maximum diameter of the lateral eye of *S. scotti* is half to three-quarters of the maximum diameter of the medial eye compared to about one-quarter to one-third for *S. spinifera*. *S. scotti* is separated from *S. skogsbergi* mainly on size of carapace. The length of the carapace of *S. scotti* is 2.55–2.90 mm compared to 3.55 mm for the carapace of *S. skogsbergi*. Some observed difference in the 3 species are listed below:

	S. scotti	*S. skogsbergi*	*S. spinifera*
Carapace length, mm	2.55–2.90	3.55	2.55–2.65
Abundance of bristles in outer row on postero-ventral infold	sparse	sparse	dense
First antenna, length of longer of 2 ventral bristles on 4th joint as percent length of 5th joint	75–80	100	50–80
Seventh limb, number of bristles	17–25	25	17–20
Lateral eye, approximate number of ommatidia	19–23	ca. 16	5–9
Lateral eye with black pigment (P), without black pigment (W)	P	P	W

DISTRIBUTION.—This species has been collected in the Palmer Archipelago, Kerguelen Island, and in the Scotia Sea. The depth range is about 6 to 300 m (Figure 289).

85. *Skogsbergiella macrothrix*, new species

FIGURES 293–298

Cylindroleberis cf. *spinifera* Skogsberg.—Hartmann, 1965:324 [*C. spinifera*, p. 41].

HOLOTYPE.—USNM 128044, gravid ♀, length 2.43 mm. Valves and some appendages in alcohol, remaining appendages on slides.

TYPE-LOCALITY.—*Eltanin* Cruise 6, station 340.

ETYMOLOGY.—Specific name "macrothrix" is derived from the Greek "makros" [= long] and "thrix" [= hair] and refers to the great length of the proximal filament on the sensory bristle of the 1st antenna.

PARATYPES.—USNM 128045, USNM 128047, 2 juveniles, from same sample as holotype.

ADDITIONAL SPECIMENS.—USNM 138035, 1 N–1 ♂; USNM 128686, 1 gravid ♀; USNM 128689, 1 gravid ♀; USNM 128692, 4 gravid ♀♀, 22 juveniles; USNM 128853, 1 adult ♀; USNM 128857, 2 gravid ♀♀; USNM 135049, gravid ♀; USNM 137069, 4 gravid and 3 adult ♀♀ without eggs; USNM 136161, gravid ♀; USNM 137059, gravid ♀; USNM 137060, gravid ♀, USNM 137061, 2 gravid ♀♀, 4 adult ♀♀ without eggs, 8 juveniles; USNM 137062, 2 gravid ♀♀, 2 adult ♀♀ without eggs, 4 juveniles; USNM 137064, 1 adult ♂; USNM 137063, 14 gravid ♀♀, 7 adult ♀♀ without eggs; USNM 137066, 17 juveniles; USNM 137068, 8 juveniles; USNM 137067, 2 gravid ♀♀, 2 adult ♀♀ without eggs; USNM 137070, 1 adult ♂, 1 adult ♀ without eggs, 4 juveniles; USNM 137071, 2 gravid females, 3 juveniles; USNM 137072, 3 adult ♂♂, 3 gravid ♀♀, 1 adult ♀ without eggs, 13 juveniles; USNM 137074, 1 gravid ♀; USNM 137075, 1 gravid ♀, 3 adult ♀♀ without eggs; USNM 137079, 2 juvenile ♀♀; USNM 137077, 1 gravid ♀, 1 adult ♀ without eggs, 2 juveniles, length 1.82 mm, height 1.11 mm, length 1.28 mm, height 0.81 mm; USNM 137080, 1 gravid ♀, 7 adult ♀♀ without eggs, 21 juveniles; USNM 137081, 1 adult ♀; USNM 137082, 7 adult ♂♂; USNM 137085, 3 gravid ♀♀, 2 adult ♀♀ without eggs, 1 juvenile; USNM 137086, 1 gravid ♀, 7 adult ♀♀ without eggs; USNM 137089, 1 adult ♂; USNM 137090, 2 juveniles, dimensions of 1, length 1.55 mm, height 1.00 mm; USNM 137095, 1 gravid ♀; USNM 137096, 1 gravid ♀, 1 adult ♀ without eggs, 1 adult ♂, 9 juveniles; USNM 137101, 1 adult ♂; USNM 137106, 1 gravid ♀, 2 juveniles; USNM 137108, 1 adult ♂; USNM 138039, 1 adult ♀; USNM 138040, 4 adult ♀♀ without eggs, 2 juveniles.

USNM 138035 from same sample as holotype; USNM 128686, 128689, 128692, from *Vema* Cruise

FIGURE 293.—*Skogsbergiella macrothrix*, female, USNM 128044, length 2.43 mm, carapace: *a*, complete specimen, lateral view; *b*, sketch of central muscle attachments on right valve, lateral view. Right valve, medial view: *c*, posterior; *d*, detail of "*c*." Right 1st antenna, lateral view: *e*, tip (not all bristles shown); *f*, bristles on ventral margin of 4th joint. Right mandible, medial view: *g*, coxale and basale; *h*, terminal spines on dorsal margin of 1st endopodite joint. Maxilla: *i*, right limb, medial view. Left 5th limb: *j*, exopodial bristles, lateral view. Sixth limb: *k*, left limb, medial view; *l*, lateral flap on anteroventral margin of right limb, lateral view; *m*, minute bristles in anteroventral corner of right limb, lateral view. Anterior: *n*, left lateral eye; *o*, medial eye and rod-shaped organ, upper lip, proximal joints of right 1st antenna. Posterior: *p*, left genitalia and brushlike organ, anterior to left; *q*, spinous posterior margin, anterior to right. (Same magnification in microns: *c,k,o; d,f,p; e,i,n,q; g,h,j,l*.)

17, station V–17–75; USNM 128853 from *Vema* Cruise 17, station V–17–97; USNM 128857 from *Vema* Cruise 18, station V–18–16; USNM 135049 from *Vema* Cruise 17, station V–17–21B; USNM 137069 from *Vema* Cruise 17, station V–17–90; USNM 136161 from *Vema* Cruise 18, station V–18–27; USNM 137059, 137060, 137061 from *Vema* Cruise 17, station V–17–76; USNM 137062 from *Vema* Cruise 17, station V–17–88; USNM 137063, 137064, 137066, 137068 from *Vema* Cruise 17, station V–17–89A; USNM 137067 from *Vema* Cruise 17, station V–17–89; USNM 137070 from *Vema* Cruise 17, station V–17–86; USNM 137071 from *Vema* Cruise 17, station V–17–99; USNM 137072 from *Vema* Cruise 17, station V–17–101; USNM 137074, 137075 from *Vema* Cruise 17, station V–17–74; USNM 137079 from *Vema* Cruise 17, station V–17–67; USNM 137077 from *Vema* Cruise 17, station V–17–68; USNM 137080–137082 from *Vema* Cruise 17, station V–17–14. USNM 137085 from *Vema* Cruise 18, station V–18–13; USNM 137086 from *Vema* Cruise 18, station V–18–18; USNM 137089, 137090 from *Vema* Cruise 18, station V–18–12; USNM 137095, 137096 from *Vema* Cruise 14, station V–14–6; USNM 137101 from *Vema* Cruise 15, station V–15–102; USNM 137106 from *Vema* Cruise 14, station V–14–2; USNM 137108 from *Vema* Cruise 14, station V–14–5; USNM 138039, 138040 from *Eltanin* Cruise 6, station 363 (station data on this station obviously incorrect and not used herein).

Diagnosis of Adult Female.—Posterior infold with 4 broad pores or processes and 75 bristles between list and valve margin; carapace length 1.72–2.50 mm.

First antenna: Sensory bristle variable, generally proximal filament long, but short on some specimens; proximal filament on many specimens terminal.

Mandible: Dorsal margin of basale with 12 short bristles.

Maxilla: Dorsal margin with 1 short proximal and 1 short distal bristle.

Seventh limb: With 19 or 20 bristles.

Lateral eye: With 2–6 ommatidia.

Description of Female (Figures 293, 294*a-l*, 295–297).—Carapace elongate, dorsal and ventral margins slightly curved (Figures 293*a,b*; 294*a,h*).

Infold (Figures 293*c,d*; 295–297): Distribution of bristles similar to that of *S. spinifera;* 75 long bristles forming outer row along posteroventral infold with counting starting opposite lowermost hyaline spine of list; 4 broad pores present between spine bearing list and posterior edge of shell; posterior list with 34 hyaline spines; about 37 long bristles on list (1 or 2 between each hyaline spine); also on list about 130 minute bristles anterior to row of hyaline spines; narrow linear ridge present on infold of right valve between spine-bearing list and posterior edge of shell; about 30 small bristles present anterior to linear ridge of right valve and posterior margin of left valve.

Size (Figure 288): USNM 128044, length 2.43 mm, height 1.58 mm; USNM 128689, length 1.92 mm, height 1.20 mm; USNM 128692 (2 gravid ♀♀ not dissected) length 1.87 mm, height 1.18 mm, length 1.92 mm, height 1.19 mm; USNM 128686, length 2.23 mm, height 1.50 mm; USNM 128853, length 2.41 mm, height 1.46 mm; USNM 128857, 2 specimens, length 2.50 mm, height 1.60 mm, length 2.49 mm, height 1.66 mm (latter specimen not dissected); USNM 135049, length 1.88 mm, height 1.22 mm; USNM 137069, 2 specimens, length 1.77 mm, height 1.20 mm, length 1.80 mm, height 1.22 mm; USNM 136161, length 2.40 mm, height 1.57 mm; USNM 137059, length 2.21 mm, height 1.28 mm; USNM 137060, length 2.07 mm, height 1.32 mm; USNM 137062, length 2.15 mm, height 1.33 mm; USNM 137063, 3 specimens, length 2.23 mm, height 1.41 mm, length 2.32 mm, height 1.49 mm, length 2.17 mm, height 1.41 mm; USNM 137071, length 2.46 mm, height 1.58 mm (not dissected); USNM 137074, length 1.83 mm, height 1.15 mm; USNM 137077, length 2.09 mm, height 1.24 mm; USNM 137080, length 1.72 mm, height 1.24 mm; USNM 137080, length 1.72 mm, height 1.11 mm; USNM 137081, length 1.94 mm, height 1.23 mm; USNM 137085, length 2.32 mm, height 1.52 mm; USNM 137086, length 2.19 mm, height 1.36 mm; USNM 137095, length 2.30 mm, height 1.48 mm; USNM 137106, length 2.27 mm, height 1.49 mm; USNM 138039, length 2.40 mm, height 1.54 mm.

First antenna (Figures 293*e,f;* 294*b,i,j,n,o*): Medial surface of 1st joint with abundant spines, lateral surface with spines forming clusters on dorsal half; 2nd joint with numerous clusters of spines, 1 long dorsal bristle with long proximal and short distal spines, and 1 short lateral bristle with short marginal spines; proximal and distal margins of

3rd joint fairly well defined; dorsal margin of joint with 6 bristles, the 2 distal bristles paired, remaining bristles single, 1st, 2nd, and 4th bristles with long proximal and short distal spines, remaining bristles with only short spines; ventral margin with 1 short bare bristle; dorsal margin of 4th joint with 1 long bristle with short spines; longest of 2 ventral bristles about 82 percent of length of 5th joint; distal margin of joint well defined; clusters of spines present on ventral margin; sensory bristle

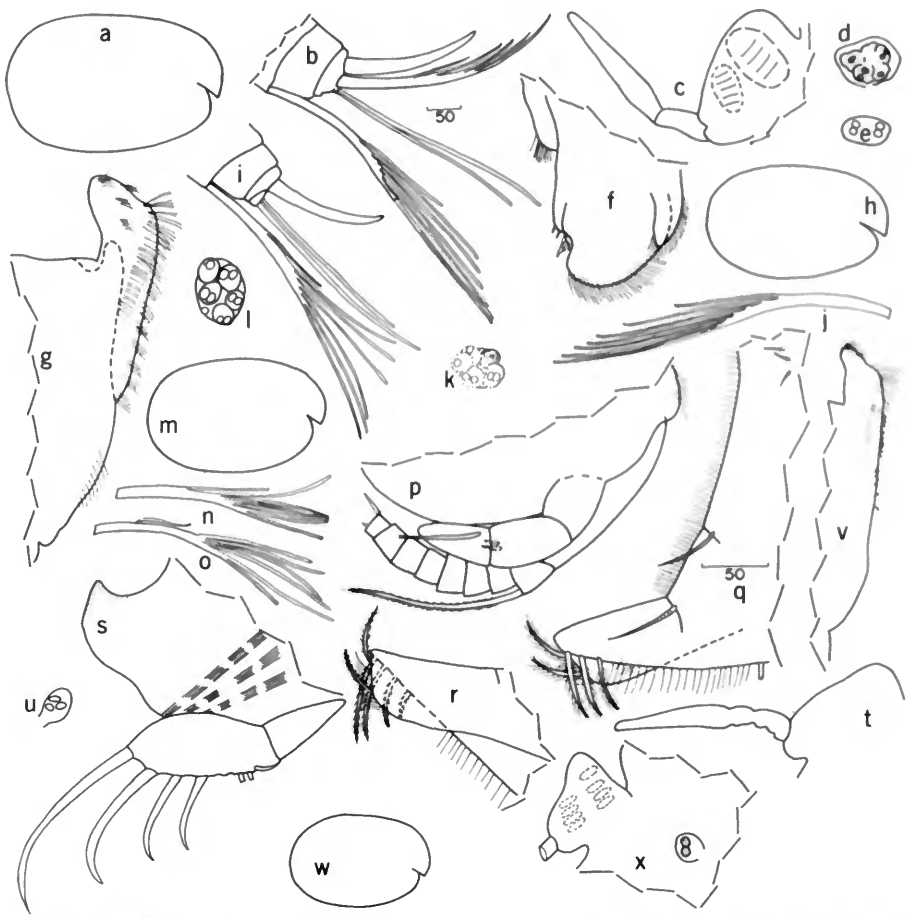

FIGURE 294.—*Skogsbergiella macrothrix*, female, USNM 128686, length 2.23 mm: *a*, complete specimen, lateral view; *b*, tip of right 1st antenna, lateral view (not all bristles shown); *c*, medial eye and rod-shaped organ; *d*, right lateral eye; *e*, left lateral eye; *f*, upper lip; *g*, dorsal process, anterior to left. Female, USNM 128689, length 1.92 mm: *h*, complete specimen, lateral view; *i*, tip of left 1st antenna, lateral view. Female, USNM 128853, length 2.41 mm: *j*, sensory bristle on 5th joint of left 1st antenna, lateral view; *k*, left lateral eye. Female, USNM 138039: *l*, right lateral eye. N–1 male, USNM 129045, length 1.86 mm: *m*, complete specimen, lateral view; *n*, sensory bristle on 5th joint of right 1st antenna, lateral view; *o*, same on left 1st antenna, medial view; *p*, endopodite, exopodite, part of protopodite of left 2nd antenna (not all exopodial bristles shown); *q*, anterior of right 6th limb, medial view; *r*, anteroventral tip of left 6th limb, lateral view; *s*, left lamella of furca (some bristles missing and broken); *t*, medial eye and rod-shaped organ; *u*, lateral eye; *v*, posterior with dorsal process, anterior to left. N–2 female, USNM 128047, length 1.45 mm: *w*, complete specimen, lateral view; *x*, left lateral eye, medial eye and stump of rod-shaped organ. (Same magnification in microns: *b-g*, *i-l*, *m-p*, *s-z*; *q-r*.)

of 5th joint with 7 terminal filaments, proximal of these more slender than others; 6th joint with long medial bristle with short marginal spines. Seventh joint: a-claw with faint teeth observed on lateral surface; b-bristle broken on both limbs of holotype; c-bristle broken but with 7 filaments on remaining part. Eighth joint d- and e-bristles bare, both bristles long, tip of e-bristle broken, d-bristle more slender than e-bristle and at least three-fourths its length, d-bristle about one and one-half times length of a-claw; f-bristle bent dorsally, with 6 hirsute filaments including tip of bristle; g-bristle broken but with 6 marginal filaments on remaining part.

Second antenna: Protopodite: medial surface with small bristle, numerous clusters of slender spines on dorsal part and shorter, stouter spines along ventral margin; lateral surface bare except for slender spines along dorsal margin and short spines along ventral margin. Endopodite 3-jointed, with long terminal bristle. Exopodite: 1st joint with 2 clusters of long hairs on dorsal margin near distal end; joints 2 to 8 with short spines along distal margins; joints 4 to 8 with basal spines; joint 9 with lateral spine; bristle of 2nd joint reaching past 9th joint and with slender spines along ventral and dorsal margins; bristles of joints 3 to 7 with natatory hairs, bristles on remaining joints missing from holotype. USNM 128853 with natatory hairs on exopodial bristles of joint 8, and 2 long bristles of joint 9; 9th joint also with 2 small bristles.

Mandible (Figure 293*g,h*): Coxale with small bristle at base of endite; ventral branch of endite with 5 rows of spines; tip with 2 large ventral teeth with 1 smaller dorsal tooth and 2 minute teeth between them; ventral margin of dorsal branch with 6 teeth proximal to main spine; proximal tooth consisting of 3 small pointed teeth, following 4 teeth rounded, tooth just proximal to main spines resembling main spine; main spine recurved near extended hirsute tip; margin between main spine and tip with short hairs; long dorsal spine with marginal hairs and hairs near base; serrations present on dorsal margin proximal to dorsal spine. Basale: endite with usual 4 spinous end bristles, 2 dwarf bristles, a glandular opening on short peg, and 4 triaenid bristles with 10 to 18 pairs of spines excluding terminal pair; distal paired spines longer than those proximal; additional triaenid bristle with only 6 paired marginal spines present on ventral margin of basale near endite and proximal to U-shaped sclerotized process; medial and lateral surfaces with slender spines forming clusters near dorsal margin; dorsal margin of basale with 12 short bare bristles, clusters of slender spines and 2 long stout terminal bristles with short marginal spines. Exopodite reaching about middle of 1st endopodite joint, with 2 short bristles on hirsute tip. Endopodite: ventral margin of 1st joint with 3 stout bristles, 2 with long proximal and short distal spines, 1 with only short spines; dorsal margin with 3 stout terminal spines; dorsal margin of 2nd joint with 2 short proximal bristles, stout a-, b-, c-, d-bristles, all with marginal spines; medial side near dorsal margin with 1 short spinous bristle near base of a-bristle, 2 short spinous bristles between a- and b-bristles, 1 short spinous bristle near base of b-bristle, 2 short spinous bristles between b- and c-bristles, 2 oblique rows of 4 bristles between b- and c-bristles; oblique row of 4 spinous bristles between c- and d-bristles; 1 long spinous bristle distal to base of d-bristles; lateral surface near dorsal margin with 2 long spinous bristles, 1 between bases of b- and c-bristles, and 1 between bases of c- and d-bristles; medial surface of joint with clusters of short spines; ventral margin with 3 long spinous terminal bristles. End joint with stout dorsal claw and 5 spinous bristles.

Maxilla (Figure 293*i*): Epipodial appendage short, triangular, hirsute. Proximal endite with 1 short bare bristle and 3 long bristles with distal marginal spines; distal endite with 3 spinous bristles, middle bristle slightly shorter than others. Basale extremely hirsute with 6 bristles: 1 short spinous proximal bristle on medial surface near base of epipodite, 1 short bare bristle near middle of dorsal margin, 1 short proximal bristle on ventral margin, 1 short proximal bristle on lateral surface near proximal bristle on ventral margin, 1 very short bristle near middle of ventral margin, and 1 long spinous terminal bristle on ventral margin. First endopodite joint with 1 short anterior bristle and 1 long spinous 6-bristle; end joint with spinous terminal bristle about same length as 6-bristle.

Fifth limb (Figure 293*j*): Epipodial appendage with about 85 plumose bristles; dorsal margin of comb bare except near tip; plumose exopodite bristle reaching past end of comb; lateral surface of comb with 1 or 2 short slender bristles near

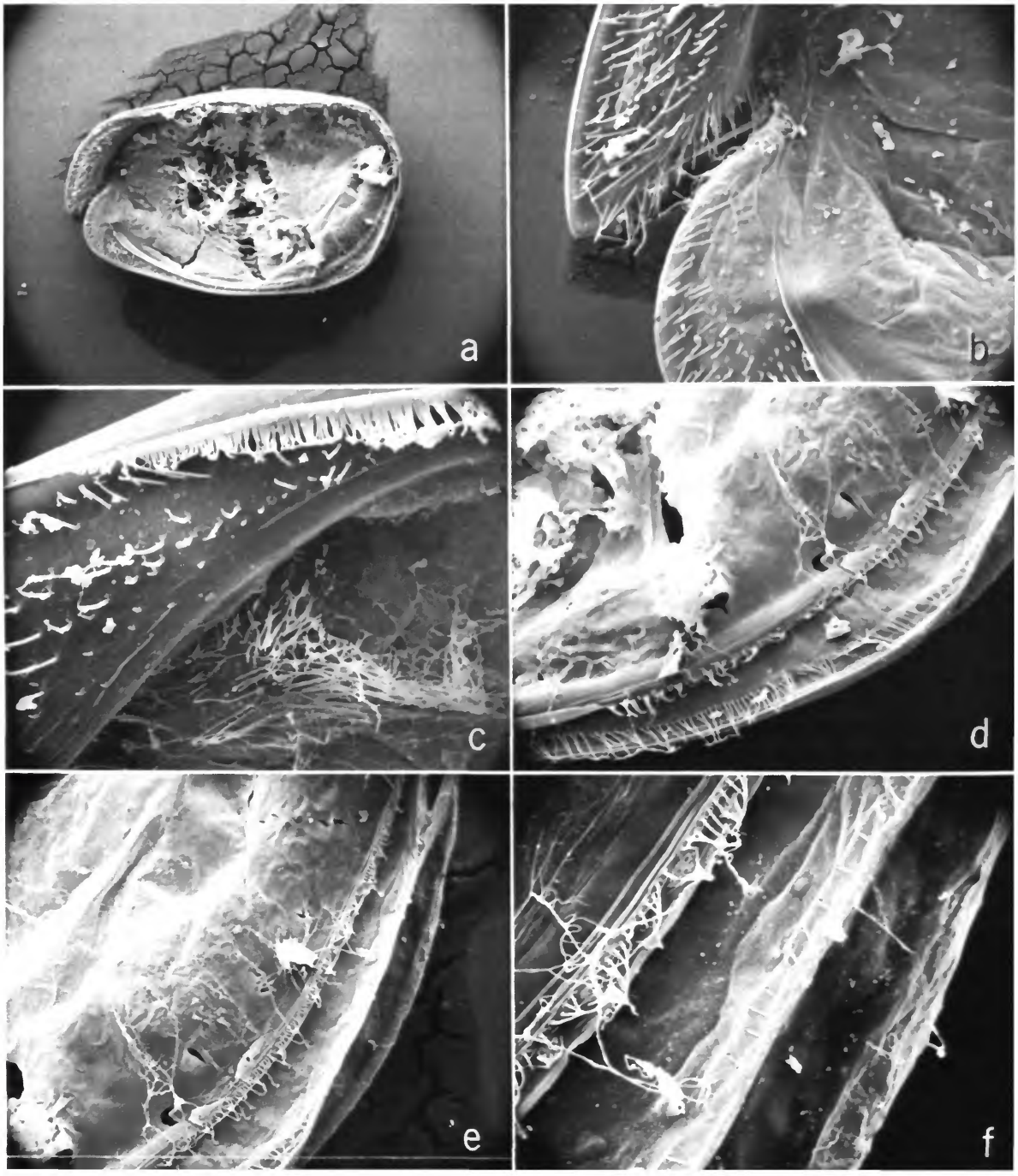

FIGURE 295.—*Skogsbergiella macrothrix*, female, USNM 128044, right valve, medial view: *a*, complete valve, × 28; *b*, anterior, × 140; *c*, anterodorsal corner, × 280; *d*, posteroventral corner, × 141; *e*, posterior margin, ventral half, × 141; *f*, detail of "e," × 5000.

base of exopodite bristle and 3 short bristles and 1 long bristle near ventral margin.

Sixth limb (Figure 293*k,m*): Anterior margin hirsute and with 1 upper and 1 lower bristle; anterior corner including flap with 4 or 5 spinous bristles; posteroventral margin with 24 or 25 spinous bristles; medial surface with 2 minute bristles in anterodorsal corner; medial and lateral surfaces with spines forming rows or clusters; anterior and posterior margins hirsute.

Seventh limb: Each limb with 19 or 20 bristles in roughly 2 groups, each group separated from each other by 2 to 5 rings without bristles; proximal group with 10 or 11 bristles, 5 or 6 on each side; distal group with 8 bristles, 4 on each side; in distal group, distal 4 bristles (2 on each side) on terminus, remaining 4 bristles (2 on each side) on proximal 2 rings, each bristle with 3 to 5 bells; opposing terminal combs with about 19 teeth.

Furca: Each lamella with 10 claws; small posterior claw oriented posteriad.

Rod-shaped organ and eyes (Figures 293*n,o*; 294*c-e,k,l*): Rod-shaped organ weakly 2-jointed,

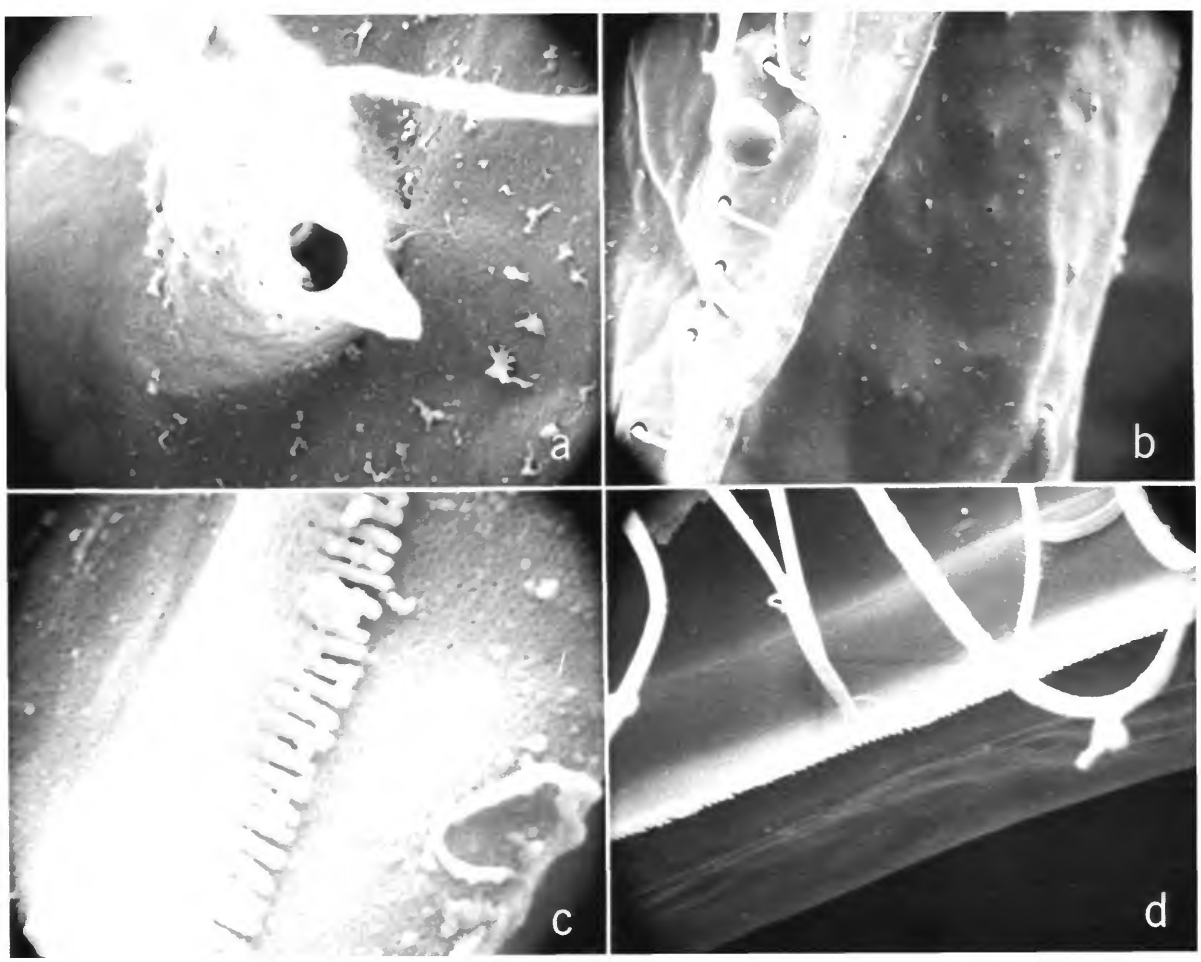

FIGURE 296.—*Skogsbergiella macrothrix*, female, USNM 128044, right valve, medial view: *a*, detail of posterior process visible in Figure 295*f*, × 7000; *b*, detail of selvage on linear ridge visible in Figure 295*f*, × 1400; *c*, detail of selvage in "*b*," × 4000; *d*, selvage ventral margin, × 2900.

with rounded tip; medial eye large with surface spines; lateral eye of holotype minute with 2 or 3 small ommatidia, about one-third maximum length of medial eye. Lateral eyes of other specimens with up to 6 ommatidia and as large as one-half maximum length of medial eye.

Upper lip: Lip consisting of left and right hirsute lobes, each with 2 anterior spines; lateral hirsute flap present (Figures 293*o*,294*f*).

Posterior: Short broad spinous dorsal processs present. Seven "gills" on each side (Figures 293*p*,*q*; 294*g*).

Genitalia and brushlike organ (Figure 293*p*): Represented by sclerotized ring on each side. Brushlike organ consisting of 8 minute bristles near genitalia.

Eggs: USNM 128044, 2; USNM 128686, 12; USNM 128689, 6; USNM 128857, 21; USNM 135049, 10; USNM 137069, 8, 9; USNM 136161, 14; USNM 137059, 9; USNM 137060, 11; USNM 137062, 8; USNM 137063, 9, 12; USNM 137074, 6; USNM 137077, 10; USNM 137080, 8; USNM 137085, 7; USNM 137086, 12; USNM 137095, 17; USNM 137106, 13.

Parasites: Choniostomatids in USNM 128853 (♀, ♂, 1 ovisac), USNM 128044 (1 ♀), USNM

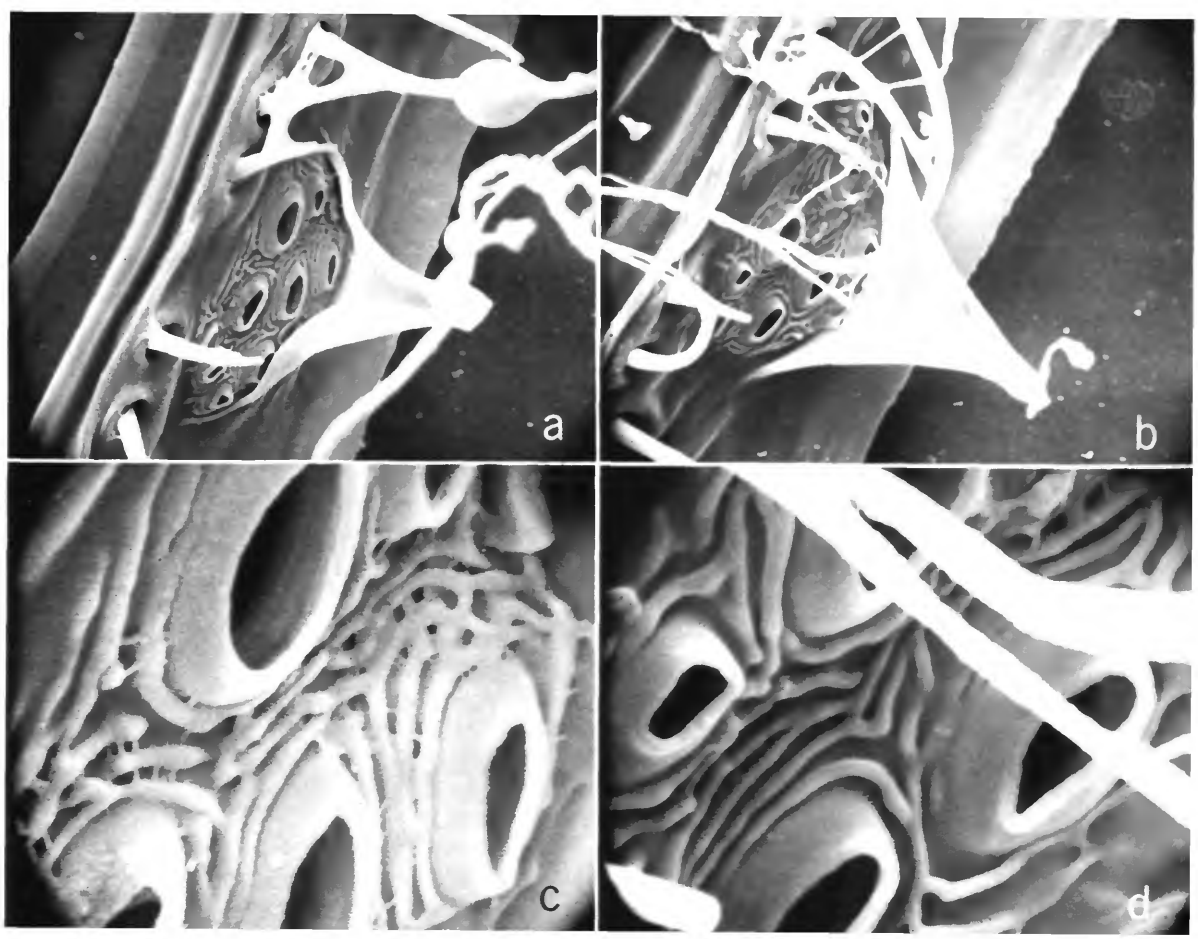

FIGURE 297.—*Skogsbergiella macrothrix*, female, USNM 128044, right valve, medial view: *a*, pores and flaplike bristle, × 2800 (bulb on slender bristle is artifact); *b*, pores and flaplike bristle, × 2900; *c*, detail of pores in "*a*," × 14,000; *d*, detail of pores in "*b*," × 14,000.

137081 (♀, 6 ovisacs), USNM 138039 (♀, 8 ovisacs). Segmented filamentous protistans attached to valves and some appendages.

DESCRIPTION OF ADULT MALE (Figure 298).—Carapace with posterior half of dorsal margin strongly tapering (Figure 298*a*). Usual row of long hairs present near posterior margin.

Ornamentation: Surface appearing smooth, but minute pores present.

Infold (Figure 298*b*): About 40 long bristles scattered over infold of rostrum dorsal to list; list with about 8 long bristles; about 20 bristles forming 2 or 3 rows between list and incisur; about 24 minute bristles along dorsal margin anterior to anterior juncture of dorsal ligament; 7 small bristles posterior to inner end of incisur; about 200 bristles below incisur and on anteroventral infold; single row of about 30 bristles present along ventral infold to point opposite 1st hyaline spine on posterior list; list paralleling posterior margin with about 35 hyaline spines posterior to about 136 minute bristles; 3 minute processes on right valve and 4 on left forming row between list and posterior shell margin; about 100 long bristles forming outer row along posteroventral infold with counting starting opposite lowermost hyaline spine of list (about 78 bristles on right valve and 48 on left valve present between lowermost hyaline spine on list and lowermost process in area between list and posterior valve margin); posterior selvage lies anterior to posterior edge of right valve forming "ridge" typical of *Skogsbergiella*.

Selvage: Fringed lamellar prolongation present along lower margin of infold.

Size (Figure 288): USNM 137064, length 2.22 mm, height 1.35 mm; USNM 137070, 2 specimens not dissected, length 2.09 mm, height 1.32 mm, length 2.14 mm, height 1.25 mm; USNM 137072 (not dissected) length 2.22 mm, height 1.33 mm; USNM 137082, length 1.68 mm, height 1.10 mm; USNM 137089, length 2.17 mm, height 1.33 mm; USNM 137101, length 2.03 mm, height 1.19 mm; USNM 137108, length 1.90 mm, height 1.18 mm.

First antenna (Figure 298*c*): 1st joint bare; 2nd joint with spines on medial and lateral surfaces, 1 dorsal bristle and 1 lateral bristle, both with marginal spines; 3rd joint with 6 spinous dorsal bristles and 1 short recurved bare ventral bristle; 4th joint with 1 long dorsal bristle with short marginal spines and 2 short ventral bristles; stout stem of sensory bristle of 5th joint more than twice length of 5th to 8th joints inclusive and with numerous filaments; medial bristle of 6th joint with short marginal spines. Seventh joint: a-claw with numerous minute teeth visible under oil immersion; b-bristle with 4 marginal filaments (2 proximal filaments with marginal spines); c-bristle long with 19 marginal filaments. Eighth joint: d- and e-bristles bare, e-bristle slightly stouter and longer than d-bristle, about same length as d-bristle; f-bristle only slightly longer than e-bristle and with 10 marginal filaments; g-bristle slightly longer than f-bristle and with 10 filaments.

Second antenna (Figure 298*d*): Protopodite with short slender medial bristle; margins of protopodite bare. Endopodite 3-jointed: 1st joint bare; 2nd joint with 2 or 3 bare proximal ventral bristles; 3rd joint reflexed on 2nd and with bare proximal ventral bristle and pointed tip with 8 or 9 ridges. Exopodite: joints 2 to 8 with long hairs forming a cluster on distal dorsal margin and minute spines forming row along distal margin; bristles on joints 2 to 8 and 4 bristles of 9th joint all with natatory hairs, dorsal bristle of 9th joint much shorter than others; joints 5 to 8 with short basal spines; 9th joint with short lateral spine.

Mandible (Figure 298*e,f*): Coxale with 1 small bristle at basis of endite; ventral margin of dorsal branch of coxale endite with 6 angular and rounded teeth and short main spine; dorsal bristle proximal to tip of endite with small marginal spines; bristle at tip of endite hirsute; ventral branch of endite with spine forming oblique rows and tip consisting of 3 minute backward-pointing spines. Basale: endite with 4 terminal spinous bristles, 3 triaenid bristles with about 6 to 14 pairs of marginal spines excluding terminal pair, 2 dwarf bristles and glandular peg; 1 triaenid bristle with 3 or 4 pairs of marginal spines excluding terminal pair present on basale near endite; dorsal margin of basale with 2 long terminal bristles with short marginal spines and 4 midbristles on left limb and 3 on right. Exopodite about one-third to one-half length of dorsal margin of 1st endopodite joint, with hirsute tip and 2 short bare subterminal bristles. Endopodite: 1st joint with 3 long ventral spinous bristles; medial surface of 2nd joint with spines forming clusters; ventral margin with 3 long spinous terminal bristles; dorsal margin with 3 fairly long proximal bristles and stout spinous a-,

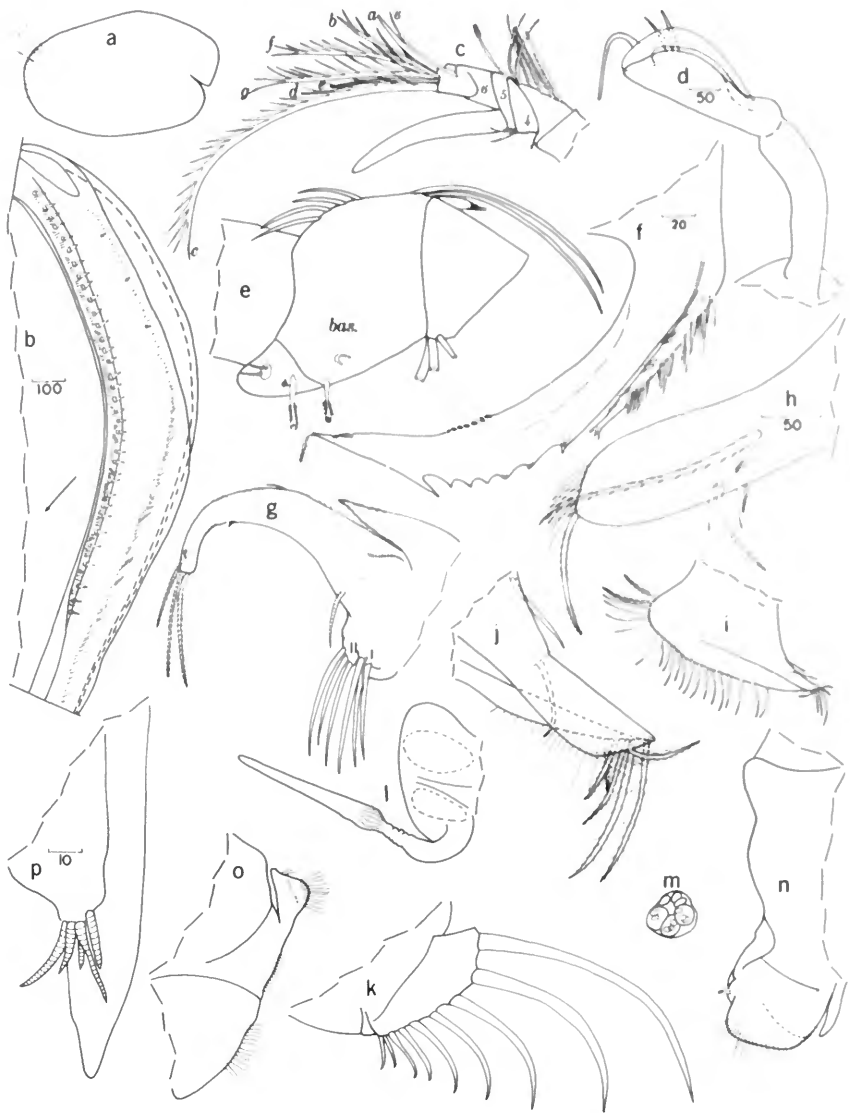

FIGURE 298.—*Skogsbergiella macrothrix*, male, USNM 137064, length 2.22 mm, carapace: *a*, complete specimen, lateral view; *b*, posterior of right valve, medial view. Left 1st antenna: *c*, distal end, medial view (filaments on sensory bristle not shown). Right 2nd antenna: *d*, endopodite, medial view. Mandible: *e*, basale and exopodite of left limb, medial view; *f*, coxale endite of right limb, medial view. Maxilla: *g*, right limb, medial view. Left 5th limb: *h*, comb, lateral view. Sixth limb: *i*, left limb, medial view (marginal spines not shown on most bristles); *j*, anterodorsal corner of right limb, lateral view. Furca: *k*, right lamella (teeth on claws not shown). Anterior: *l*, medial eye and rod-shaped organ; *m*, left lateral eye; *n*, upper lip. Posterior: *o*, dorsal process, anterior to left; *p*, right copulatory organ, anterior to left. (Same magnification in microns: *b,c,i; d,e,g,j-o*.)

b-, c-, and d-bristles; 1 short spinous bristle present between b- and c-bristles; 1 long lateral bristle present between b- and c-bristles; 3 rows of 3, 3, 5 bristles present medially between b- and c-bristles; 1 long lateral bristle present between c- and d-bristles; 1 long spinous medial bristle present near base of d-bristle; 3rd joint with pointed dorsal claw with minute teeth near middle and at tip, and 5 bristles.

Maxilla (Figure 298*g*): Epipodial appendage short hirsute. Endite I with 1 short and 3 long spinous bristles; endite II with 3 long spinous bristles. Basale hirsute; medial surface with 1 bristle near dorsal margin; dorsal margin with 1 short midbristle; lateral surface with 1 short proximal bristle; ventral margin with fairly long proximal bristle, very short distal bristle, and long spinous terminal bristle. Endopodite: 1st joint with short bristle near middle of dorsal margin and long spinous 6-bristle; end joint with spinous bristle about same length as 6-bristle.

Fifth limb (Figure 298*h*): Epipodial appendage with 77 bristles. Lateral side of comb with long stout spinous exopodial bristle, 2 slender bristles near base of bristle and 4 bristles near ventral margin.

Sixth limb (Figure 298*i,j*): Anterior margin with upper and lower bristle; minute medial bristle present in anterodorsal corner; anteroventral corner and flap with total of 6 bristles; posteroventral margin with 18 to 21 bristles; medial and lateral surfaces and anterior and posterior margins of limb hirsute.

Seventh limb: Each limb with 18 bristles, each with 3 to 5 bells; opposing terminal combs each with about 16 spinous teeth.

Furca (Figure 298*k*): Each lamella with 9 claws; claws decreasing in curvature posteriorly along lamella; teeth along concave margins of claws 2 to 4 much stronger than those on claw 1; each claw with lateral and medial teeth forming rows along ventral margin and few hairs distally along dorsal margin; claws decreasing in length proximally along lamella.

Medial eye and rod-shaped organ (Figure 298*l*): Medial eye large, bare; rod-shaped organ wrinkled proximally, widening near middle and tapering to rounded tip, faintly striate near middle.

Lateral eye (Figure 298*m*): Eye small, about one-half diameter of medial eye (long axis) with 3 or 4 large spheres containing 1 or 2 ommatidia.

Posterior (Figure 298*o*): Dorsal process thumb-like, with spines forming rows; "gills" just reaching dorsal process.

Upper lip (Figure 298*n*): Lip consisting of 2 lobes, each with 2 small spines on upper part of anterior margin.

Copulatory organ (Figure 298*p*): Organ not well defined, with proximal lobe bearing 5 bristles.

Gut content: USNM 137064 with fine material filling gut and anal canal, but no organisms recognizable under oil immersion.

Description of N–1 Juvenile Male (Figure 294*m-v*).—Carapace similar to adult female (Figure 294*m*).

Size: USNM 128045, length 1.86 mm, height 1.21 mm.

First antenna: Similar to that of adult female except for sensory filament of 5th joint, which differs in having 1 proximal and 6 terminal filaments, proximal filament of right limb long, that of left limb short (Figure 294*n,o*).

Second antenna (Figure 294*p*); Protopodite and exopodite similar to that of adult female (4 bristles on 9th joint); endopodite 3-jointed with 2 small bristles on 2nd joint and 1 long proximal bristle on 3rd joint.

Mandible: Similar to that of adult female except dorsal margin of basale with only 6 to 9 short bristles, and dorsal margin of 2nd endopodite joint of right limb with 3 proximal bristles, left limb with only 2. Maxilla similar to that of adult female.

Fifth limb: With 77 bristles on epipodial appendage, limb otherwise similar to that of adult female.

Sixth limb (Figure 294*q,r*): Similar to female except 6 bristles present on anterior corner of right limb (including lateral flap), 5 on left; posteroventral margin with 23 bristles; medial surface of right limb with 3 dwarf bristles in anterodorsal corner (this corner of left limb obscure).

Seventh limb: Similar to that of adult female except each limb with 17 bristles, and each bristle with 2 to 4 bells; bristles tapering distally.

Furca: 9 claws on each lamella (Figure 294*s*).

Rod-shaped organ: Unjointed (Figure 294*t*).

Medial eye and upper lip: Similar to those on adult female (Figure 294*t*).

Lateral eye: Small with 3 ommatidia (Figure 294*u*).

Posterior: Dorsal process relatively longer than that on female (Figure 294*v*).

Copulatory organ: Foot-shaped, ill defined.

Parasites: Some appendages with segmented filamentous protistans attached.

DESCRIPTION OF N–2 FEMALE (Figure 294*w,x*).—Carapace similar to that of adult female (Figure 294*w*).

Size: USNM 128047, length 1.45 mm, height 0.99.

First antenna: Sensory bristle of 5th joint with 1 short proximal and 6 long terminal filaments, limb otherwise similar to that of adult female.

Second antenna: Similar to that of adult female, but only 3 bristles on 9th joint of exopodite.

Mandible: Dorsal margin of basale with only 4 short bristles among spines, triaenid bristles with fewer paired spines, limb otherwise similar to that of adult female.

Maxilla and fifth limbs: In general, similar to those of adult female.

Sixth and seventh limbs: Not examined in detail but, in general, similar to those on N–1 male described above.

Furca: Each lamella with 8 claws.

Rod-shaped organ, medial eye, upper lip: Similar to those of N–1 male described above (Figure 294*x*).

Lateral eye: Small with 2 ommatidia (Figure 294*x*).

SEXUAL DIMORPHISM.—Males in the genus *Skogsbergiella* are rare, USNM 137064 being the first collected. It was obtained in a sample with 46 other specimens of *S. macrothrix* (14 gravid females, 7 adult females without eggs in marsupia, 25 juveniles). Three of the females were dissected prior to concluding that only one species was present. The posterior of all specimens were examined externally to insure that they belonged to *Skogsbergiella* (all had ridge on posterior infold of right valve). In addition to usually sexual dimorphisms common in the family, the mandible of the male *S. macrothrix* differed from that of the female in not having spines and numerous small bristles along the dorsal margin of the basale and in not having 3 stout terminal spines on the dorsal margin of the 1st endopodite joint. A juvenile male examined had a mandible similar to that of the female.

REMARKS CONCERNING SPECIMEN FROM CHILEAN SLOPE (260 m) IDENTIFIED AS *Cylindroleberis* cf. *spinifera* Skogsberg, 1920, BY HARTMANN (1965: 324).—Through Dr. Hartmann, I received from the Zoological Museum in Hamburg the specimen he had identified as *Cylindroleberis* cf. *spinifera*. The vial containing the dissected specimen (a gravid female) contained two labels, "27283" and "*Asterope* cf. *spinifera* Sko. Mar Chile I, Station 96." The vial contained the right valve plus appendages and eggs (I could find only one of the 1st antennae). The right valve measures 2.01 mm in length and 1.37 mm in height. The lateral eye has 6 ommatidia. The proximal filament on the sensory bristle of the 1st antenna reaches just beyond the base of the 4th filament from the proximal end. The 7th limbs have 14 or 15 bristles, 8 terminal (4+4) and 6 or 7 proximal (3 or 4+3). Because of the small size of the specimen I have included it in *Skogsbergiella macrothrix*.

COMPARISONS.—This new species, *S. macrothrix*, was established initially for specimens similar to *S. spinifera* except for having 7 long terminal filaments and no short proximal filament. As additional specimens were examined from other localities, it was observed that the proximal filament did not always have a terminal position; on some specimens, it was in the same position as the short proximal filament on *S. spinifera*, and on a few specimens, the proximal filament was long on one limb and short on the other. The range of the lengths of the carapaces of specimens referred to *S. macrothrix* is greater than found in other species of the family; this suggests that I may have included more than 1 species under the name *S. macrothrix*. Because of the great variability in the length and position of the proximal filament, I was not always able to separate *S. spinifera* from *S. macrothrix* using that character. None of the specimens with a long proximal filament on at least 1 limb have a carapace longer than 2.5 mm, and therefore that measurement is used herein to distinguish the two species. All specimens longer than 2.5 mm have short proximal filaments and were assigned to *S. spinifera*. Further work is necessary in order to better understand the relationships between specimens assigned to both species.

DISTRIBUTION.—This species has been collected from the Argentine shelf and slope, Chilean shelf

and slope (Figure 289). The depth range is about 70 to 1173 m.

86. *Skogsbergiella plocus*, new species

FIGURES 299–302

HOLOTYPE.—USNM 136077, gravid ♀, length 2.06 mm; valves and some appendages in alcohol, remaining appendages on slides.

TYPE-LOCALITY.—*Vema* Cruise 17, station V–17–12.

ETYMOLOGY.—The specific name is derived from the Greek "plokos" [= lock of hair, braid, curl] and refers to the cluster of long bristles on the dorsal margin of the mandibular basale.

PARATYPES.—USNM 136081, 1 adult ♂; USNM 136082, 1 adult ♂, 1 adult ♀ without egg (not dissected); USNM 136083, 1 adult ♀ without eggs. Paratypes from same sample as holotype.

DIAGNOSIS OF ADULT FEMALE.—Posterior infold with 4 broad pores or processes and about 42–66 bristles between broad list and valve margin; Carapace length 1.97–2.06 mm.

First antenna: Sensory bristle with 1 short proximal and 6 long terminal filaments; longer of ventral bristles of 4th joint about same length as ventral margin of 5th joint.

Mandible: Dorsal margin of basale with 6 or 7 bristles (2 of these quite long) and 2 long terminal bristles.

Maxilla: Dorsal margin of basale with 1 proximal bristle, 1 near middle, and 3 or 4 distal.

Seventh limb: With 12 bristles.

Lateral eye: Large, with 19 ommatidia.

DESCRIPTION OF FEMALE (Figures 299; 300*a,b*).—Carapace elongate with evenly rounded posterior; incisur below middle of anterior margin (Figure 299*a*).

Infold (Figure 299*b-e*): About 46 long bristles and numerous minute bristles on rostrum above list; list with about 13 bristles; 5 bristles present forming row between list and incisur; 4 minute bristles present posterior to inner end of incisur; about 53 bristles present below incisur and on anteroventral infold; row of 34 bristles present along ventral infold to point opposite 1st hyaline spine on posterior list; list paralleling posterior margin with 29 hyaline spines posterior to a row of about 140 minute bristles; about 40 additional fairly long bristles present between hyaline spines and posterior to minute bristles of posterior list; 4 short faint processes present forming row between list and posterior shell margin; about 42 bristles on left valve and 66 on right valve present between lowermost hyaline spine and lowermost process in area between list and posterior shell margin.

Size (Figure 288): USNM 136077, length 2.06 mm, height 1.16 mm; USNM 136082, length 1.99 mm, height 1.14 mm; USNM 136083, length 1.97 mm, height 1.10 mm.

First antenna (Figure 299*f,g*): 1st and 2nd joints spinous; 2nd joint with 1 long spinous dorsal bristle and short spinous lateral bristle; 3rd and 4th joints quadrate; 3rd joint with 6 or 7 spinous dorsal bristles and 1 small ventral bristle; 4th joint with concave distal margin, 1 long spinous dorsal bristle and 2 short ventral bristles; longer of ventral bristles about same length as ventral margin of 5th joint; 4th joint with few spines along ventral margin; sensory bristle of 5th joint with 1 short proximal and 6 long terminal filaments; 6th joint with long spinous medial bristle. Seventh joint: a-claw with minute spines forming row on medial and lateral surfaces; b-claw with 6 spinous filaments including tip; c-bristle with 7 filaments including tip. Eighth joint: d- and e-bristles more than twice length of a-claw; d-bristle more narrow and slightly shorter than e-bristle; f-bristle at angle to stem and with 6 spinous filaments including tip; g-bristle similar to c-bristle.

Second antenna (Figure 299*h*): Protopodite: long spines present along dorsal margin, short triangular teeth (spines) present along ventral margin; medial surface with spines forming clusters in dorsal half; short medial bristle present. Endopodite 3-jointed with terminal bristle longer than stem. Exopodite: 9th joint with 4 bristles; joints 2 to 8 with short spines forming row along distal margin; joints 4–8 with basal spines; 9th joint with lateral spine.

Mandible (Figure 299*i-k*): Coxale endite: ventral branch with spines forming 4 rows; tip with 4 small teeth; dorsal branch broken; 1 slender bristle present near base of endite; medial surface of coxale spinous. Basale: endite with spinous end bristles, 6 triaenid bristles with 4–6 pairs of spines proximal to distal pair, 2 dwarf bristles and glandular peg; ventral margin of basale with 1 triaenid bristle with 3 pairs of spines proximal to distal

FIGURE 299.—*Skogsbergiella plocus*, female, USNM 136077, length 2.06 mm, carapace: *a*, complete specimen, lateral view; *b*, posterior of right valve, medial view; *c*, posterior of left valve, medial view; *d*, detail of list in "*c*"; *e*, anterior of left valve, medial view. Right 1st antenna, medial view: *f*, distal part (all bristles not shown); *g*, bristles on dorsal margin of 3rd joint. Right 2nd antenna: *h*, endopodite, medial view. Mandible: *i*, spines on basale of 1st endopodial joint and proximal dorsal bristle on 2nd endopodial joints of right limb, medial view; *j*, bristles on dorsal margin of basale on left limb, medial view; *k*, ventral branch of coxale endite on left limb, lateral view. Maxilla: *l*, right limb, medial view. Right 5th limb: *m*, comb on left limb, medial view. Sixth limb: *n*, right limb, medial view. Anterior: *o*, left lateral eye, anterior to left. (Same magnification in microns: *b,c,e,f,l,o; d,g,h; i,k; j,m*.)

pair; dorsal margin with 6 or 7 spinous bristles (2 of these quite long), short spines, and 2 long spinous terminal bristles; lateral surface of basale with abundant spines forming clusters. Endopodite: 1st joint with 3 long spinous ventral bristles and 3 stout terminal dorsal spines; dorsal margin of 2nd joint with 2–4 small proximal bristles and stout spinous a- to d-bristles; medial surface with proximal row of 2 or 3 cleaning bristles, middle row of 3–5 and distal row of 6 or 7; 1 long spinous bristle near d-bristle; short spines forming clusters present on medial surface; lateral surface with long spinous bristle between b- and c-bristles and c- and d-bristles; ventral margin with 3 long spinous terminal bristles. End joint with 1 claw and 5 bristles.

Maxilla (Figure 299*l*): 1st endite with 4 bristles, 3 long, 1 short; 2nd endite with 3 long bristles. Tip of epipodial appendage hirsute. Basale spinous: dorsal margin with 1 long proximal bristle, 1 fairly long bristle near middle, and 3 or 4 short distal bristles; ventral margin with 1 proximal bristle, 1 short bristle near middle, and 1 long spinous terminal bristle; lateral side with short proximal bristle. Endopodite: anterior margin of 1st joint with short bare distal bristle; posterior margin with 1 long spinous terminal bristle; end joint with long spinous terminal bristle.

Fifth limb (Figure 299*m*): Exopodite bristle extending slightly past end of comb; 2 slender bristles present near base of exopodite bristle and 2 pairs of bristles present close to ventral margin of comb. Epipodial appendage with 79 bristles.

Sixth limb (Figure 299*n*): Anterior margin with upper and lower bristle; anteroventral corner with 2 short spinous bristles plus 2 on lateral flap; posteroventral margin with 12 spinous bristles; limb hirsute.

Seventh limb: Each limb with 12 bristles, 6 proximal (3 + 3) and 6 terminal (3 + 3), each bristle with 3 to 5 bells; opposing terminal combs with 16 spinous teeth.

Furca: Each lamella with 10 claws, last claw weak, oriented posteriad.

Rod-shaped organ (Figure 300*a*): Elongate, 2-jointed with rounded tip.

Posterior (Figure 300*b*): Thumblike spinous dorsal process present.

Eyes: Medial eye large pigmented, hirsute dorsally; lateral eye large, slightly smaller than medial eye, pigmented with 19 ommatidia (Figure 299*o*).

Upper lip (Figure 300*a*): Consisting of 2 hirsute lobes, each with 1 anterior spine; lateral hirsute flap present on each side of mouth.

Eggs: USNM 136077 with 14 eggs in brood chamber.

Description of Adult Male (Figures 300*c-n*, 301, 302).—Posterior half of dorsal margin sloping posteriorly (Figure 300*c,d*); usual row of hairs near posterior margin.

Ornamentation: Surface appearing smooth but minute pores visible under high magnification.

Infold (Figures 300*e*, 301, 302): Number and distribution of bristles and hyaline spines similar to those on infold of female; 5 faint processes present between list and posterior edge of valve on left valve and between list and raised posterior ridge on right valve.

Size (Figure 288): USNM 136081, length 2.26 mm, height 1.19 mm; USNM 136082, length 2.33 mm, height 1.29 mm.

First antenna (Figure 300*f*): Distal part of medial surface of 1st joint with long hairs; 2nd joint with spines forming clusters on medial surface and 2 spinous bristles, 1 dorsal, 1 lateral; 3rd joint with short ventral bristle and 6 spinous dorsal bristles; 4th joint with 1 long dorsal bristle with short marginal spines and 2 short ventral bristles; sensory bristle of 5th joint less than twice length of 5th to 8th joints and with abundant filaments; 6th joint with long medial bristle with short marginal spines. Seventh joint: c-claw on small pedestal and with marginal spines forming 2 rows; b-bristle with 6 filaments including tip; c-bristle very long with 35 filaments. Eighth joint; d- and e-bristles bare, slightly shorter than b-bristle; d-bristle longer and stouter than e-bristle (usually opposite, possibly an aberrant specimen); f-bristle very long with about 33 filaments; g-bristle longer than b-bristle and with 10 filaments including tip.

Second antenna (Figure 300*g*): Protopodite with short slender medial bristle; margins of protopodite bare. Endopodite 3-jointed: 1st joint bare; 2nd joint with 3 or 4 bare ventral bristles near middle; 3rd joint reflexed on 2nd joint with 1 bare proximal ventral bristle and pointed tip with about 10 ridges. Exopodite: 1st and 2nd joints elongate with spines forming clusters along ventral margin; joints 2 to 8 with short spines along distal margin; bristles on joints 2 to 8 and 3 bristles of

joint 9 with natatory hairs; dorsal bristle of 9th joint much shorter than others.

Mandible (Figure 300*h-j*): Coxale spinous with 1 small bristle at basis of endite; ventral margin of dorsal branch with 6 angular and rounded teeth and short main spine; ventral branch of endite with spines forming 4 oblique rows and tip with 5 minute spines or teeth. Basale: endite with 4 terminal spinous bristles, 2 dwarf bristles, 5 or 6 triaenid bristles with 5 to 7 pairs of marginal spines excluding terminal pair, and short glandular peg; ventral margin of basale with additional triaenid bristle with 4 pairs of marginal spines proximal to U-shaped process; dorsal margin with 4 long slender midbristles and 2 long spinous terminal bristles. Exopodite about one-third length of dorsal margin of 1st endopodite joint, with hirsute tip and 2 short bare subterminal bristles. Endopo-

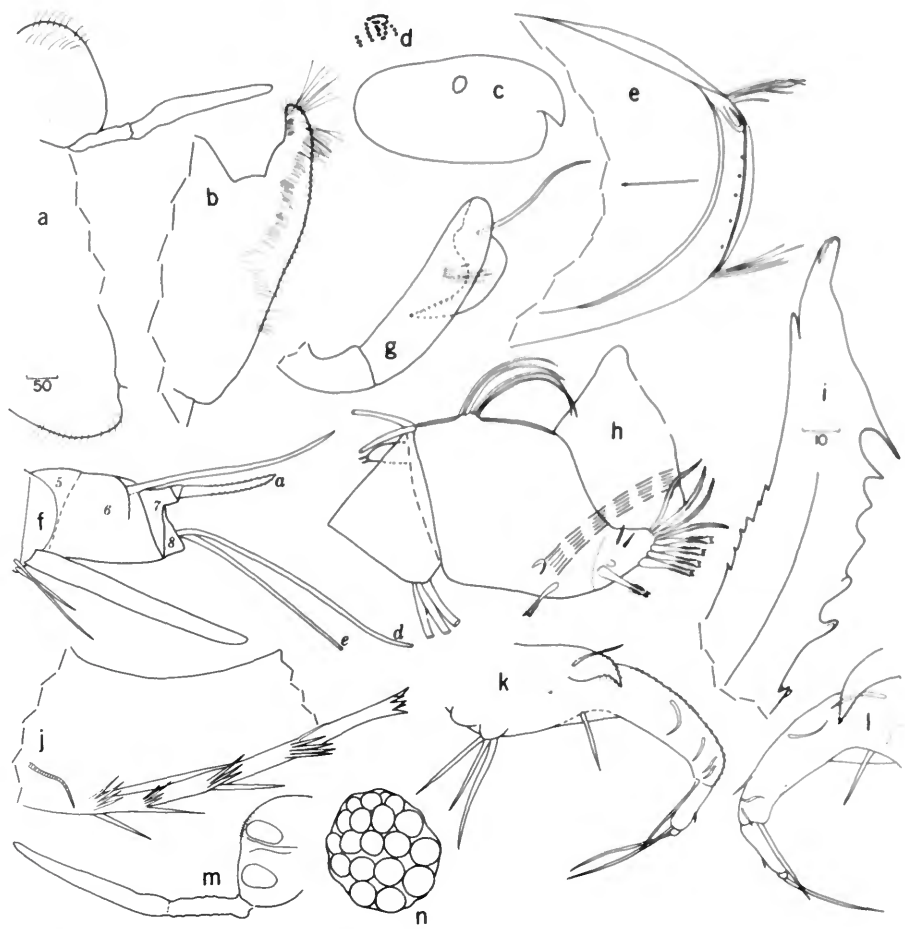

FIGURE 300.—*Skogsbergiella plocus*, female, USNM 136077, anterior: *a*, medial eye and rod-shaped organ, upper lip. Posterior: *b*, dorsal process. Male, USNM 136081, length 2.26 mm, carapace: *c*, complete specimen showing position of lateral eye, lateral view; *d*, sketch of central muscle scars on right valve; *e*, posterior of right valve, medial view. Right 1st antenna: *f*, distal part, lateral view (not all bristles or filaments shown). Right 2nd antenna: *g*, endopodite, medial view. Left mandible, medial view: *h*, basale and exopodite; *i*, distal end of dorsal branch of coxale endite; *j*, ventral branch and proximal bristle of coxale endite. Maxilla: *k*, left limb, medial view; *l*, right limb, medial view. Anterior: *m*, medial eye and rod-shaped organ; *n*, right lateral eye, anterior to right. (Same magnification in microns: *a,b,f-h,k-n; i,j.*)

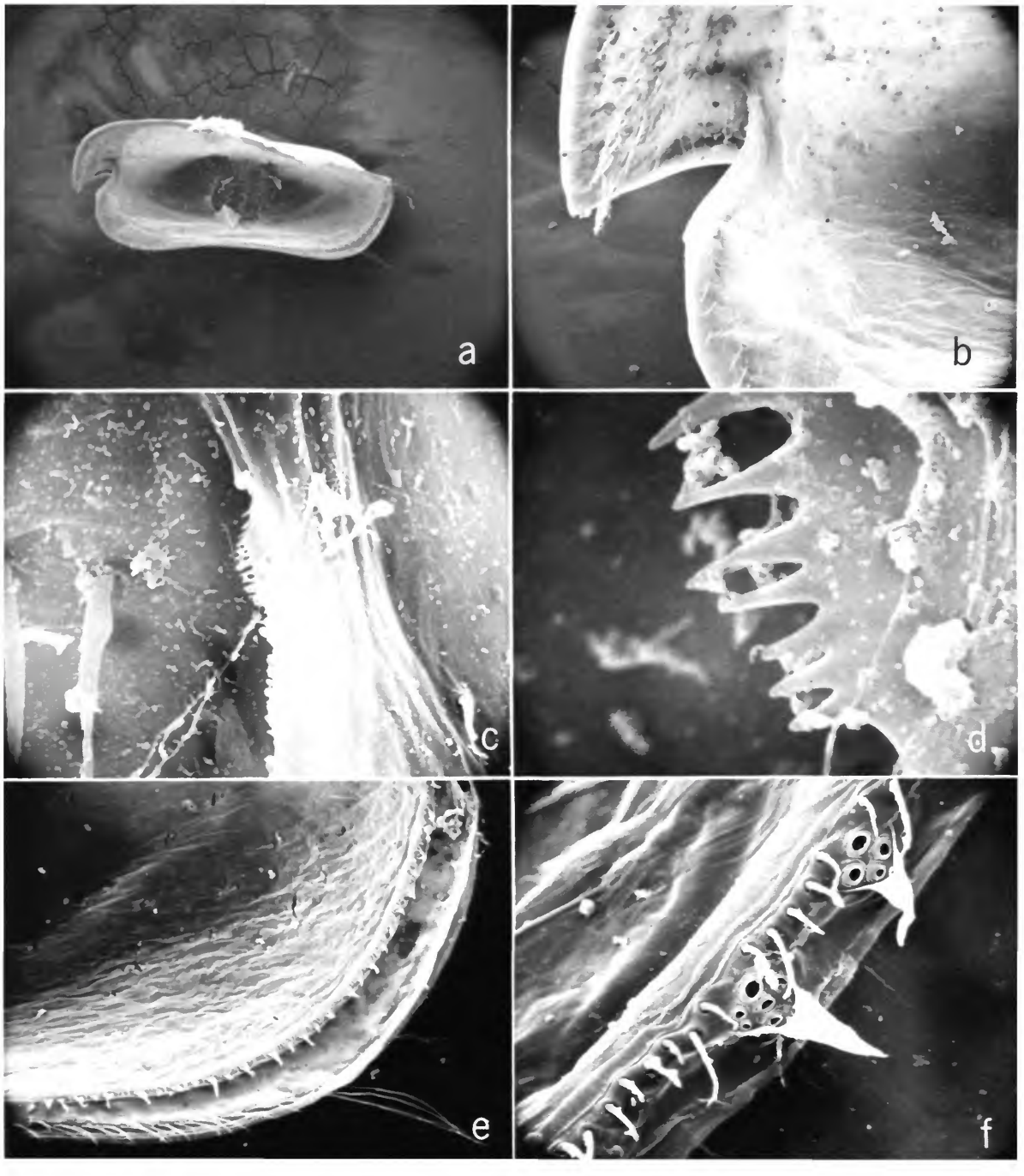

FIGURE 301.—*Skogsbergiella plocus*, male, USNM 136081, right valve, medial view: *a*, complete valve, × 27.5; *b*, anterior, × 144; *c*, lamella prolongation in incisur, × 1440; *d*, detail of lamella prolongation in "*c*," × 14,400; *e*, posteroventral margin, × 144; *f*, detail of "*e*," × 1440.

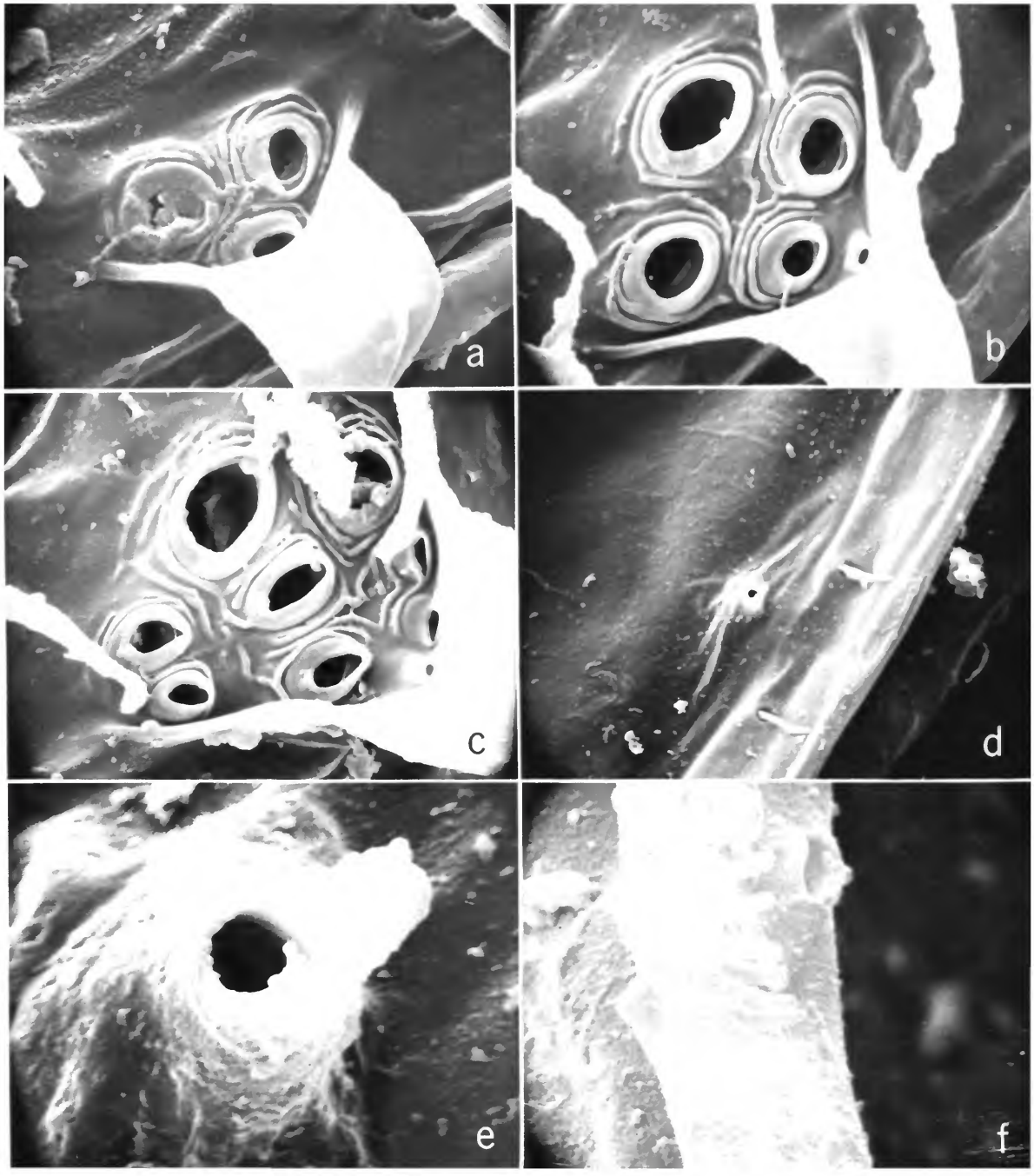

FIGURE 302.—*Skogsbergiella plocus*, male, USNM 136081, right valve, medial view: *a-c*, details of pores at base of flaplike bristles on posterior list, × 7250; *d*, posteroventral margin showing process between list and shell margin, × 1440; *e*, detail of process in "*d*," × 14,400; *f*, detail of selvage in "*d*," × 14,400.

dite: 1st joint with 3 long spinous ventral bristles; dorsal margin bare (no terminal spines); medial surface of 2nd joint with spines forming rows; ventral margin with 3 long spinous terminal bristles; dorsal margin with 3 proximal bristles reaching almost to middle of a-bristle, and stout spinous a-, b-, c-, and d-bristles; long spinous lateral bristle present between b- and c-bristle and c- and d-bristle; 3 rows consisting of 2 or 3, 5 or 6, 6 or 7 (total 13–16), medial cleaning bristles present between a- and d-bristles; additional long spinous medial bristle present near base of d-bristle; end joint with dorsal claw with ventral teeth, 3 stout and 2 slender bristles, all with marginal spines.

Maxilla (Figure 300*k,l*): Similar to that of female with following exceptions: dorsal margin of basale with 3 distal bristles on both appendages; terminal bristle missing on 1st endopodite joint of right limb only.

Fifth limb: Epipodial appendage with 76 bristles; exopodite bristles and comb similar to those on female.

Sixth limb: Similar to that of female with following exceptions: right limb with 3 spinous bristles on anteroventral corner in addition to the 2 on lateral flap, and 17 posteroventral bristles; left limb with 15 posteroventral bristles; minute medial bristle present in anterodorsal corner.

Seventh limb: Each limb with 12 bristles, 6 proximal, 6 terminal, 3 on each side in both groups; each bristle with 3 to 5 bells; opposing terminal combs with about 12 spinous teeth.

Furca: Each lamella with 9 claws, last claw not oriented posteriad as on female.

Rod-shaped organ (Figure 300*m*): Elongate, 2-jointed, with minute protuberance at tip.

Posterior and upper lip: Similar to those on female.

Eyes: Medial eye similar to that on female (Figure 300*m*); lateral eye slightly larger than medial eye and also lateral eye of female, with 19 ommatidia (individual ommatidia larger than those in eye of female) (Figure 300*n*).

Sexual dimorphism: Like the female, the posterior infold of the right valve bears a linear ridge between the list and posterior edge of the valve, but unlike the female, the dorsal margin of the mandibular basale does not bear terminal spines. The dorsal margin of the mandibular basale of the male bears 4 long midbristles, whereas, the female in this location bears 6 or 7 bristles, some of which are short. Other differences between the sexes are those usually found in members of the subfamily.

COMPARISONS.—The new species, *S. plocus*, differs from other species of *Skogsbergiella* in having fewer bristles on the dorsal margin of the mandibular basale, some of which are quite long. The 7th limb bears only 12 bristles, whereas, previously described species of *Skogsbergiella* bear 17 to 25 bristles. It's carapace is smaller than those of previously described species in the genus except *S. macrothrix*. The dorsal margin of the basale of the maxilla of *S. plocus* bears 5 or 6 bristles compared to 2 for *S. macrothrix*, *S. spinifera*, and *S. scotti*.

DISTRIBUTION.—Collected only at the type-locality on shelf west of Chile at a depth of 112 m (Figure 289).

87. *Skogsbergiella pax*, new species

FIGURES 303–305

HOLOTYPE.—USNM 137098, gravid ♀, length 2.61 mm. Valves and some appendages in alcohol, remaining appendages on slide.

TYPE-LOCALITY.—*Eltanin* Cruise 15, station V–15–131.

ETYMOLOGY.—Specific name is derived from the Latin "pax" [= peace, tranquility, rest].

PARATYPES.—USNM 137100, adult ♀ with valves separated from body in sample I received, USNM 137099, 1 N–1 ♂ instar; USNM 136585, 1 juvenile ♀; USNM 137251, 1 juvenile ♀; USNM 137252, 2 juveniles. Paratypes from same sample as holotype.

DIAGNOSIS OF ADULT FEMALE.—Posterior infold with 5 minute processes and numerous bristles between broad list and valve margin. Length 2.61 mm.

First antenna: Sensory bristle with 7 terminal filaments, proximal of these shorter and more slender than remainder.

Mandible: Dorsal margin of basale with 12 short bristles.

Maxilla: Dorsal margin of basale with 1 short proximal and 1 short distal bristle.

Seventh limb: With 19 or 20 bristles.

Lateral eye: Absent.

DESCRIPTION OF FEMALE.—Carapace with shape similar to that of *S. macrothrix* (Figure 303*a*).

Infold: Similar to that on *S. macrothrix* but with 5 posterior processes on left valve and 6 on right (Figures 303*b,c*; 304; 305).

Size: USNM 137098, length 2.61 mm, height 1.66 mm (Figure 288).

First antenna (Figure 303*d*): Sensory bristle of each limb with 7 terminal filaments, proximal of these shorter and more slender than remainder; limb similar to that of *S. macrothrix*.

Second antenna: Similar to that of *S. macrothrix*.

Mandible: Second endopodite joint: dorsal margin with 4 short bare proximal bristles, stout a-, b-, c-, and d-bristles, all with marginal spines; 3 or 4 short spinous bristles between a- and b-bristles; 2 oblique rows of 7 and 8 cleaning bristles present between b- and d- bristles; 1 long spinous medial bristle present near base of d-bristle; 1 long spinous lateral bristle present between b- and c-bristles and c- and d-bristles; remainder of limb similar to that of *S. macrothrix*. (Dorsal branch of coxale endite broken on both limbs of holotype.)

Maxilla: Similar to that of *S. macrothrix*.

Fifth limb: Epipodial appendage with 87 bristles, otherwise limb similar to that of *S. macrothrix*.

Sixth limb: left limb of holotype with 26 posteroventral bristles and 2 minute medial bristles in anterodorsal corner; right limb with 28 posteroventral bristles and 1 minute medial bristle in anterodorsal corner; anteroventral corner with 3 spinous bristles, lateral flap with 2 spinous slender marginal bristles; limb otherwise similar to that on *S. macrothrix*.

Seventh limb, furca, rod-shaped organ and medial eye (Figure 303*e*), *posterior, upper lip*: Similar to those on *S. macrothrix*.

Lateral eye: Absent.

Eggs: USNM 137098 with 21 eggs.

Epizoa: Ovoid organism attached to bristle of 8th joint of exopodite on left 2nd antenna of holotype (Figure 303*g*).

Description of N–1 Male.—Carapace similar in shape to adult female.

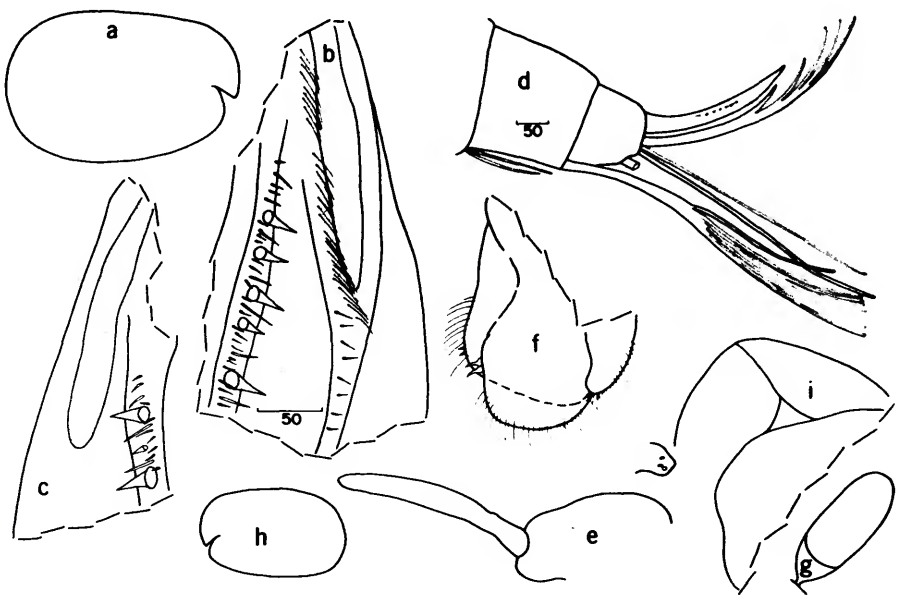

Figure 303.—*Skogsbergiella pax*, female, USNM 137098, length 2.61 mm, carapace: *a*, outline of left valve, medial view; *b*, posterodorsal corner of right valve with socket, medial view; *c*, posterodorsal corner of left valve showing elongate tooth. Right 1st antenna: *d*, distal end, lateral view (not all bristles shown). Anterior: *e*, medial eye and rod-shaped organ; *f*, upper lip. Epizoa: *g*, object attached to bristle on 8th joint of left 2nd antenna. Juvenile female, USNM 136585, length 1.55 mm: *h*, complete specimen, lateral view; *i*, right lateral eye, joints 1–2 of right 1st antenna, and posterior end of protopodite of right 2nd antenna. (Same magnification in microns: *b,c; d-f,i*.)

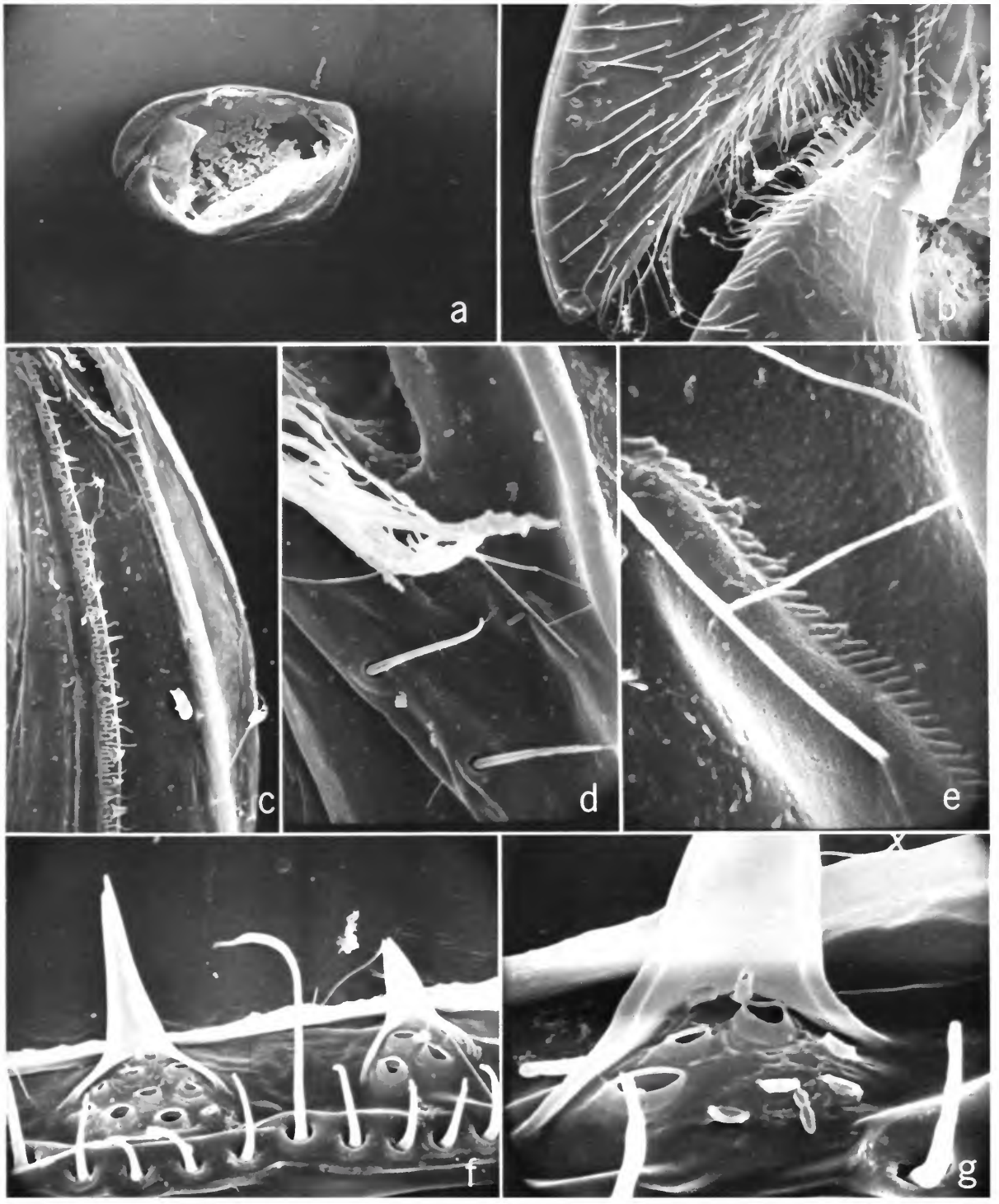

FIGURE 304.—*Skogsbergiella pax*, female, USNM 137098, right valve, medial view: *a*, complete valve, × 20; *b*, anterior part, × 200; *c*, posterior near middle, × 200; *d*, detail near top of "*c*," × 2000; *e*, detail of selvage on ridge between posterior end of valve and list on "*d*," × 10,000; *f*, detail of pores at base of transparent flaplike bristles on posterior list, × 2000; *g*, detail of pores at base of another transparent flaplike bristle on posterior list, × 2000.

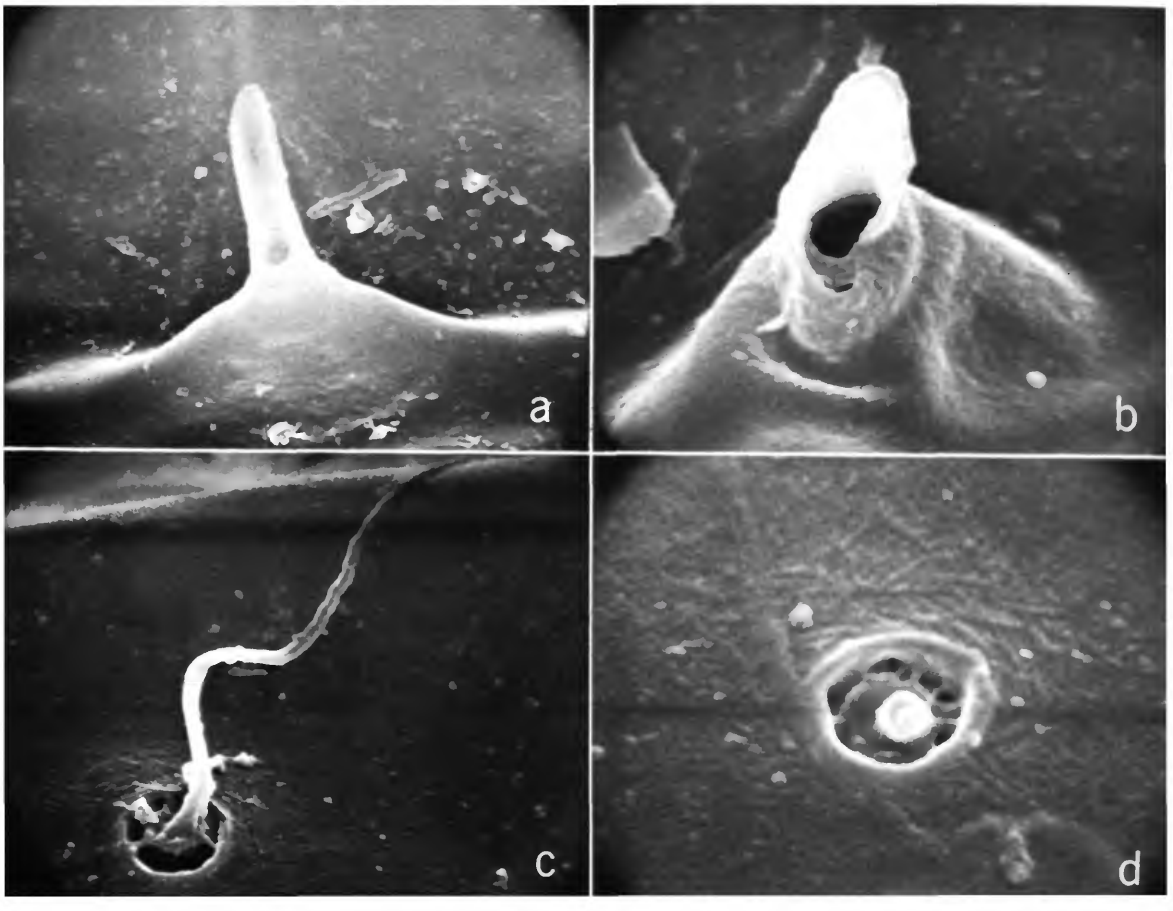

FIGURE 305.—*Skogsbergiella pax*, female, USNM 13098, right valve, medial view (post margin toward top): *a*, posterior process, × 5000; *b*, another posterior process, × 10,000; *c*, bristles and pores between posterior ridge and posterior edge of valve, × 10,000; *d*, pore and stump of bristle between posterior ridge and posterior edge of valve, × 20,000.

Size: USNM 137099, length 2.01 mm, height 1.29 mm.

First antenna: Similar to that on adult female.

Lateral eye: Absent.

DESCRIPTION OF JUVENILE FEMALE (N–2 instar?).—Shape similar to that of adult female (Figure 303*h*).

Size: USNM 136585, length 1.55 mm, height 0.91 mm; USNM 137251, length 1.49 mm, height 0.92 mm.

First antenna: Sensory bristle of 5th limb with 6 sensory filaments, all terminal; proximal filament absent.

Lateral eye: Minute (Figure 303*i*).

COMPARISONS.—This new species, *S. pax*, is very similar to *S. macrothrix* except for lacking lateral eyes in adults and later instars.

DISTRIBUTION.—Collected only at type-locality on the slope east of Argentina at a depth of 1475 m (Figure 289).

Skogsbergiella Species Indeterminate

MATERIAL.—USNM 126214, 1 juvenile ♂, length 1.95 mm, height 1.41 mm, from *Glacier* Cruise 2,

station 0022, Epibenthic sled; USNM 125818, 1 juvenile ♀, length only 2.35 mm, from *Eltanin* Cruise 12, station 1003; USNM 127509, 1 juvenile ♀, length 1.22 mm, height 0.91 mm, from *Eltanin* Cruise 14, station 1248; USNM 128608, 1 juvenile ♀, length 1.53 mm, height 0.92 mm + 1 juvenile, both from *Eltanin* Cruise 6, station 350; USNM 136169, 1 gravid ♀, 18 eggs in marsupium, length 2.95 mm, height 2.05 mm (specimen obscured by crystals); USNM 137084, 1 N-1 ♂ + 1 juvenile, from *Vema* Cruise 17, station V-17-47; USNM 137103, 1 ♀, length 1.90 mm, height 1.16 mm, from *Vema* Cruise 15, station V-15-91; USNM 137104, 1 juvenile ♂, length 2.32 mm, height 1.37 mm, from *Vema* Cruise 18, station V-18-14; USNM 137105, 1 juvenile, length 1.25 mm, height 0.74 mm, from *Vema* Cruise 16, station V-16-39; USNM 137107, 1 juvenile N-1 ♂, length only 1.64 mm (1 ♀ choniostomatid within carapace), from *Vema* Cruise 14, station V-14-14; USNM 137254, 1 juvenile ♀, length 1.80 mm, height 1.24 mm, from *Vema* Cruise 17, station V-17-51; USNM 137255, 1 juvenile ♀, length 1.39 mm, height 0.87 mm, from *Vema* Cruise 17, station V-17-78; USNM 137257, 1 juvenile ♀, length 1.31 mm, height 0.80 mm, from *Vema* Cruise 17, station V-17-77; USNM 137262, 1 juvenile ♂, length 1.47 mm, height 0.92 mm, + 4 juveniles all from *Vema* Cruise 16, station V-16-37; 1 adult ♀, right valve length 2.71 mm, height 1.71 mm, left valve length 2.69 mm, height 1.72 mm, from *Discovery* Cruise 1, station 64 (identified as *Philippiella spinifera* by Lofthouse, 1967); 1 gravid ♀, from *Discovery* Cruise 1, station 39 (identified as *Philippiella spinifera* by Lofthouse, 1967; I confirm the length of the specimen given by Lofthouse as 3.68 mm).

DISTRIBUTION.—The distribution of specimens assigned to this category is shown in Figure 289.

Empoulsenia, new genus

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

ETYMOLOGY.—The new genus is named after Dr. E. M. Poulsen. Gender: feminine.

REMARKS.—Poulsen (1965:344) established a new genus *Philippiella* to contain two species described by Skogsberg (1920), *Asterope spinifera* and *Asterope quinquesetae*. Each of these species is referred to a different genus (both new) herein. Because the name *Philippiella* is preoccupied (see Kornicker, 1971:205), Dr. Poulsen (written comm., 1970) suggested that I make the necessary change. Because Dr. Poulsen did not designate a type-species when he established *Philippiella*, the genus is technically not valid. Rather than validate the genus by designating a type-species and then proposing a new name for the genus, which I intended to subdivide, I have considered it simpler to allow the genus *Philippiella* established by Poulsen to remain invalid.

DIAGNOSIS OF GENUS.—Carapace elongate, smooth, with slitlike incisur; 5–8 processes present on posterior infold between list and posterior edge of valve.

First antenna: 3rd joint with 6 dorsal bristles; sensory bristle of 6th joint of female with 1 short proximal and 6 long terminal filaments; d- and e-bristles of eighth joint well developed, d-bristle shorter than e-bristle.

Second antenna: Endopodite 3-jointed in both sexes, 3rd joint reflexed on adult male.

Mandible: Basale with 3–5 midbristles on dorsal margin. Exopodite one-third to one-half length of dorsal margin of 1st endopodite joint. Second joint of endopodite with long lateral bristle between b- and c-bristles.

Key to Species

1. Anterior margin of 6th limb with 1 bristle ..... 88. *E. quinquesetae*
   Anterior margin of 6th limb with 2 bristles on at least 1 limb and usually on both limbs 2
2. Carapace longer than 3.2 mm 3
   Carapace shorter than 2.7 mm ..... 89. *E. pentathrix*
3. 7th limb with more than 25 bristles ..... 90. *E. antarctica*
   7th limb with fewer than 20 bristles ..... 91. *E. weddellensis*

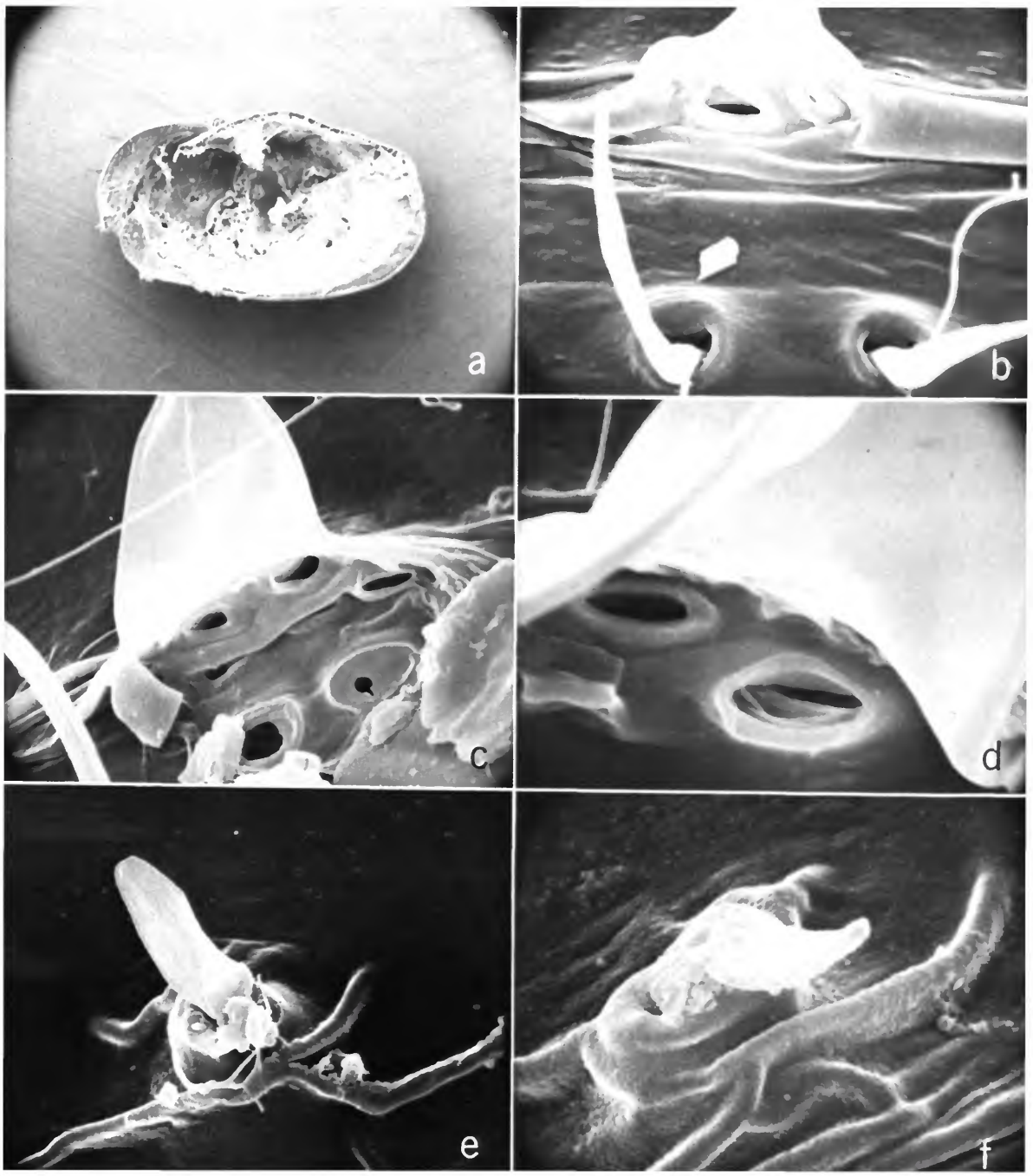

FIGURE 306.—*Empoulsenia quinquesetae*, female, USNM 128955, right valve, medial view: *a*, complete valve, × 23; *b,c*, posterior list, × 4750; *d*, pores at base of flaplike bristles on posterior list, × 9500; *e*, process posterior to list, × 4750; *f*, posterior process, × 9500.

Maxilla: Basale with 4–7 proximal bristles on ventral margin and 3 distal bristles on dorsal margin. End joint of endopodite with 1 long bristle.

Sixth limb: Anterior margin with 1 bristle (upper bristle) on *E. quinquesetae*, and 2 bristles on remaining species (*E. pentathrix* occasionally with only 1 bristle on one limb). End joint with 19–29 posteroventral bristles.

Seventh joint: Each limb with 16 to 30 bristles.

DISTRIBUTION.—Members of the genus *Empoulsenia* are restricted to the Antarctic and Subantarctic. The northernmost latitude at which specimens were collected is 49°50′S. The southernmost locality is in the Weddell Sea (Figure 285). The known depth range of the genus is 40 to 1212 m, but it is seldom collected shallower than 200 m.

88. *Empoulsenia quinquesetae* (Skogsberg)

FIGURE 306

Asterope quinquesetae Skogsberg, 1920:470, figs. 84, 85.
Philippiella quinquesetae (Skogsberg).—Poulsen, 1965:344.—Kornicker, 1971:214, fig. 32.
Not *Philippiella quinquesetae* (Skogsberg).—Lofthouse, 1967: 143.

HOLOTYPE.—Swedish State Museum (Riksmuseum), Stockholm (see Skogsberg, 1920:476).

TYPE-LOCALITY.—South Georgia, S.A.E. Station 34, off mouth of Cumberland Bay, 54°11′S, 36°18′W.

MATERIAL.—USNM 128955, gravid ♀ + 1 juvenile, both from *Vema* Cruise 14, station V–14–21.

DIAGNOSIS OF FEMALE.—Carapace with curving ventral and dorsal margins; posterior infold with 6 or 7 processes between list and posterior shell margin; carapace length 2.90–3.1 mm, height 1.68–1.77 mm.

Mandible: Dorsal margin of basale with 5 mid-bristles forming row.

Maxilla: Dorsal margin of basale with 1 short proximal bristle and 3 short distal bristles; ventral margin with 4–7 proximal bristles.

Sixth limb: Anterior margin with 1 upper bristle and no lower bristle; end joint with 5 or 6 anterior bristles and 22–24 posteroventral bristles.

Seventh limb: Each limb with 22–26 bristles.

Lateral eye: Each eye with 9 or 10 ommatidia.

SUPPLEMENTARY DESCRIPTION OF FEMALE.—Infold: see Figure 306. Size: USNM 128955, length 2.90 mm, height 1.68 mm (Figure 307). Eggs: USNM 128955 with 13 eggs.

REMARKS CONCERNING SPECIMEN FROM SOUTH OF KERGUELEN ISLAND IDENTIFIED AS *Philippiella quinquesetae* BY LOFTHOUSE (1967:143).—Through Dr. K. G. McKenzie, I received the Kerguelen specimen from the British Museum (Natural History). The articulated carapace and 10 eggs are in a small vial with the following labels: "*Philippiella quinquesetae* (Skogsberg) S. of Kerguelen (Crozet) Sta. 47, 7.2.30 BANZARE, 1966. 7.20.55," "DRL 7–2–30, 150 m," and "1966.7.20.55." Appendages are on a slide labeled "98 *Philippiella quinquesetae* B.A.N.Z.A.R.E. St. 47, 150 m, 7–2–50, DRL [?] from 1966. 7.20.55." As noted by Lofthouse, the specimen is somewhat smaller than specimens of *P. quinquesetae* described by Skogsberg (2.95–3.1 mm). My measurement of the length of the articulated carapace from Kerguelen is 2.55 mm (Lofthouse gave the length as 2.48 mm). The bristles and processes on the posterior infold of the carapace, although somewhat obscure, appear similar to those described by Skogsberg. The 1st and 2nd antennae, mandible, 5th and 6th limbs, caudal furca, and lateral eye are also similar to those described by Skogsberg (1920) and Kornicker (1971). On the other hand, the maxilla is quite different. The ventral margin of the basale of one of the maxillae on the Kerguelen specimen bears 10 bristles, and the other bears at least 6. Skogsberg reported 4 to 7 ventral bristles. The dorsal margins of the basale of both limbs of the Kerguelen specimen bear 5 bristles, whereas, Skogsberg reports only 3. The 7th limbs of the Kerguelen specimen bear only 15–18 bristles compared to 22–26 for those reported by Skogsberg, but it is possible that some bristles are missing. The difference between the number of bristles on the basale of the maxilla described by Skogsberg and that on the Kerguelen specimen raises sufficient doubt to question the correctness of the identification by Lofthouse, although it might prove to belong to a distinct population of that species. In the present paper I do not consider the Kerguelen specimen to be conspecific with *E. quinquesetae*. The specimen has been listed as *Empoulsenia* species indeterminate herein.

DISTRIBUTION.—This species has been collected only in the South Georgia district at bathyal depths (327–281 m) (Figure 308).

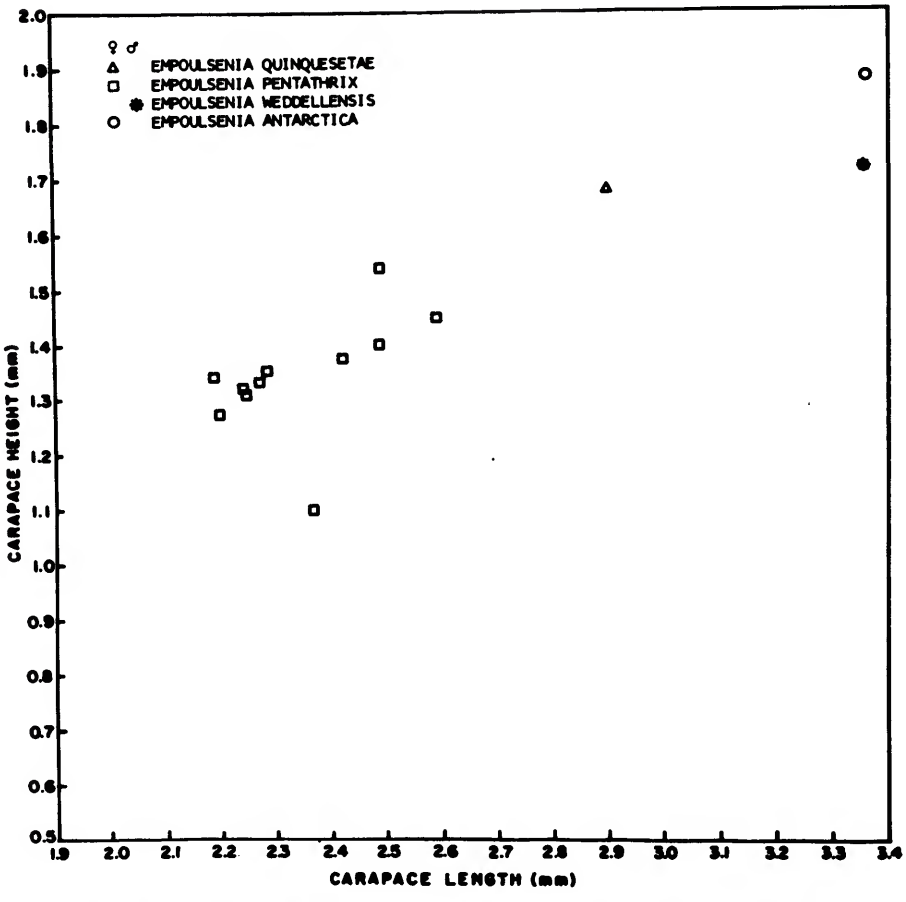

FIGURE 307.—Comparison of relationship between shell length and height of adults of *Empoulsenia*.

89. *Empoulsenia pentathrix* (Kornicker)

FIGURES 309–313

Philippiella pentathrix Kornicker, 1971, figs. 26–28.

HOLOTYPE.—USNM 125483, gravid ♀.

TYPE-LOCALITY.—Greenwich Island, South Shetland Islands, Antarctica.

MATERIAL.—USNM 125496, gravid ♀; USNM 125842, gravid ♀; USNM 125843, juvenile ♂, stage III, length 1.42 mm, height 0.84 mm; USNM 125971, N–1 ♀, length 2.08 mm, height 1.10 mm; USNM 125978, juvenile ♂, instar ?IV, length 1.89 mm, height 1.02 mm; USNM 128959, gravid ♀ + 1 juvenile; USNM 136581, gravid ♀; USNM 137109, adult ♀; USNM 137253, adult or late instar with distorted shell, length 2.09 mm, height 1.22 mm; USNM 137256, juvenile ♀, length 1.30 mm, height 0.73 mm; USNM 138162, 1 gravid ♀; USNM 138651, 1 gravid ♀.

USNM 125496 from *Eltanin* Cruise 12, station 1082; USNM 125842, 125843 from *Eastwind* station 004 A; USNM 125971 from Deep Freeze II, USS *Staten Island*, station 17; USNM 125978 from Deep Freeze IV, USS *Edisto*, station 14, sample TD–2; USNM 128959 from *Vema* Cruise 17, station V–17–53; USNM 136581 from *Eltanin* Cruise 32, station 1996; USNM 137109 from *Vema* Cruise 17, station V–17–66; USNM 137253 from *Vema* Cruise 17, V–17–46; USNM 137256 from *Vema* Cruise 17, V–17–59; USNM 138162 from Chilean Antarctic Expedition XXIV, *Yelcho* station 70–39;

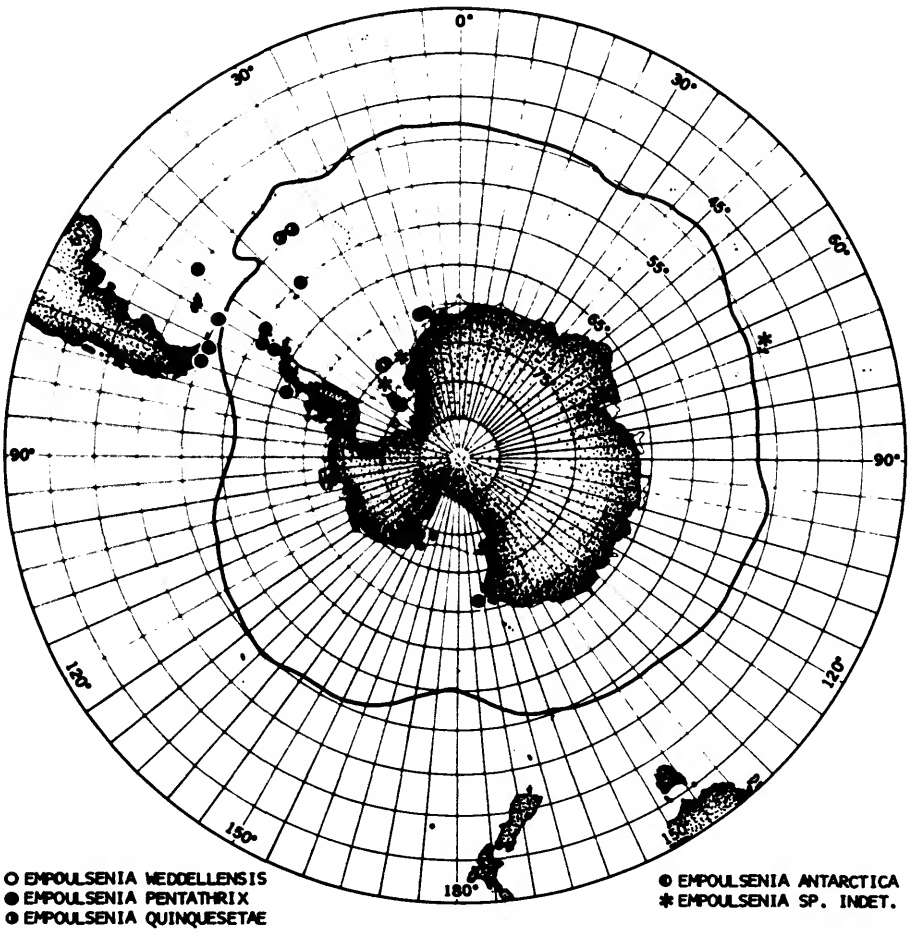

FIGURE 308.—Distribution map.

USNM 138165 from Chilean Antarctic Expedition XXIII, *Hero* station 69–42.

In addition, the following specimens collected on Chilean Antarctic Expeditions were identified and returned to the Instituto Central de Biología, Chile: XXIV, *Hero* station 70–39, 1 gravid ♀; XXIII, *Hero* station 70–40, 1 gravid ♀, 4 adult ♀ ♀ without eggs; XXIII, *Hero* station 69–42, 3 gravid ♀ ♀, 3 adult ♀ ♀ without eggs; XXIII, *Hero* station 69–47, 1 gravid ♀, 1 juvenile; XXIII, *Hero* station 69–37, 1 adult ♀ without eggs; XXII, *Yelcho* station 57, 1 N–1 ♀, length 2.11 mm, height 1.14 mm.

DIAGNOSIS OF FEMALE.—Carapace with curving ventral and dorsal margins; posterior infold with 5 short processes between list and posterior shell margin; carapace length 2.19–2.49 mm, height 1.24–1.45 mm.

Mandible: Dorsal margin of basale with 5 short bristles forming row.

Maxilla: Similar to that of *E. quinquesetae*.

Sixth limb: Anterior margin with 1 upper and 1 lower bristle; end joint with 5 anterior bristles including 2 on lateral sole, and 20 or 21 postero-ventral bristles.

Seventh limb: Each limb with 18 bristles.

Lateral eyes: Small with 3 ommatidia.

Posterior: Similar to that on *E. quinquesetae*.

SUPPLEMENTARY DESCRIPTION OF ADULT FEMALE.—Infold: see Figures 309*a-c*, 310.

Size (Figure 307): USNM 125496, length 2.25 mm, height 1.31 mm; USNM 125842, length 2.20

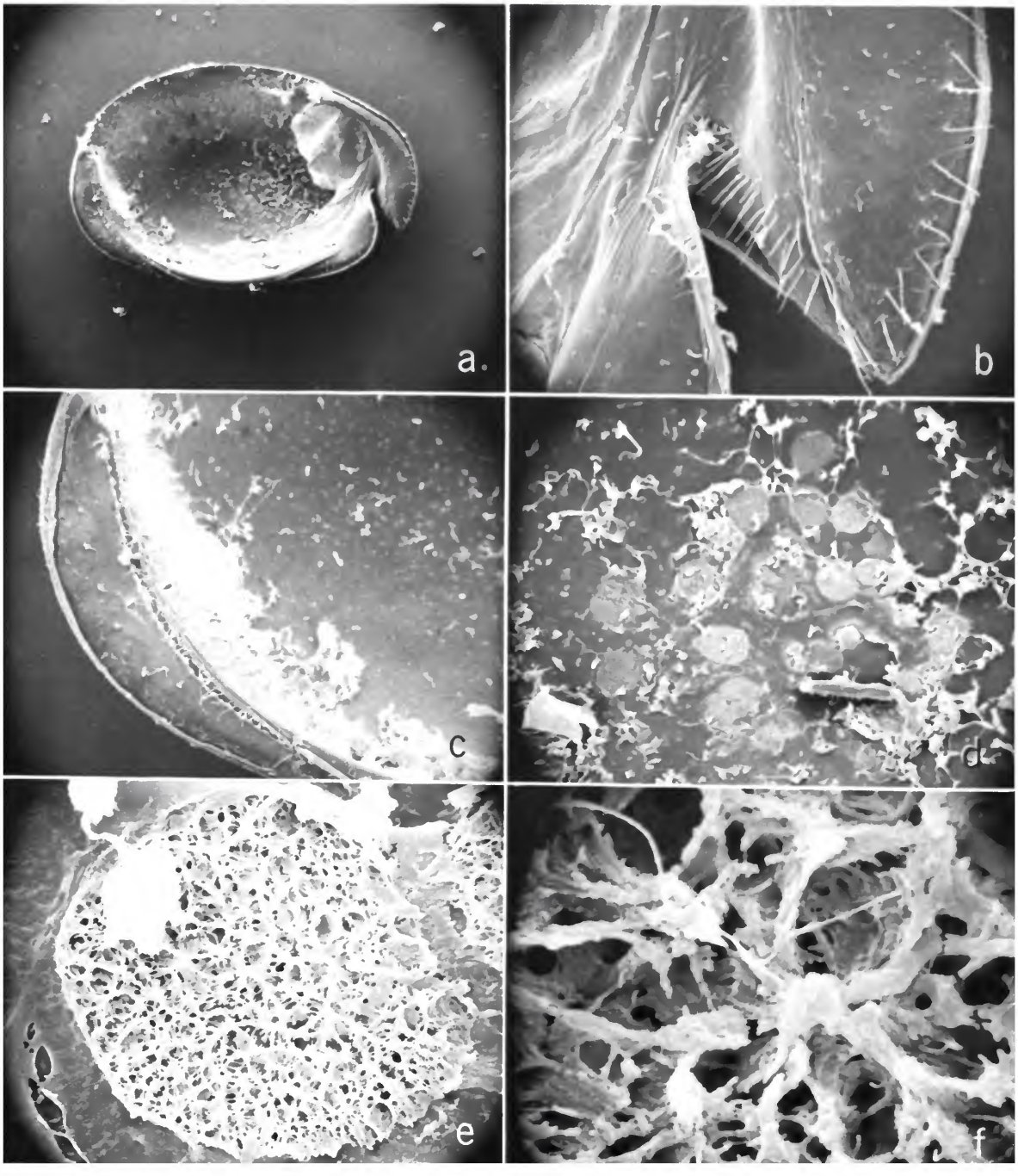

FIGURE 309.—*Empoulsenia pentathrix*, female, USNM 136581, left valve, medial view: *a*, complete valve, × 31; *b*, rostrum and incisur, × 220; *c*, posteroventral part of valve, × 110; *d*, central muscle attachments, × 210; *e*, detail of one of the attachments shown in "*d*," × 2100; *f*, detail of "*e*," × 10,500.

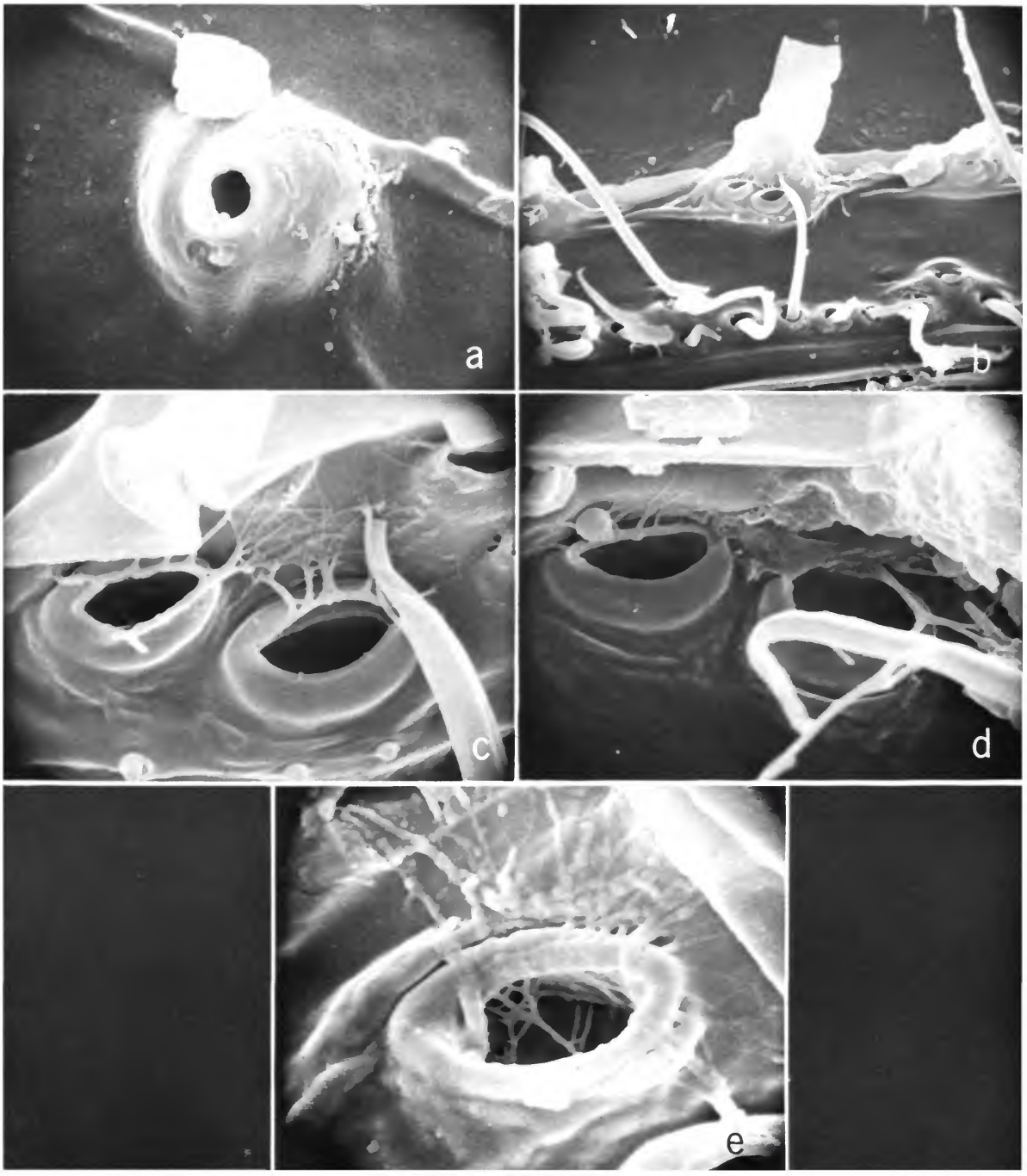

FIGURE 310.—*Empoulsenia pentathrix*, female, USNM 136581, left valve, medial view: *a*, posterior process, × 5500; *b*, bristles and pores on list, × 2100; *c*, detail of pores in "*b*," × 11,000; *d*, detail of additional pores at base of transparent bristle, × 10,500; *e*, detail of additional pores, × 21,000.

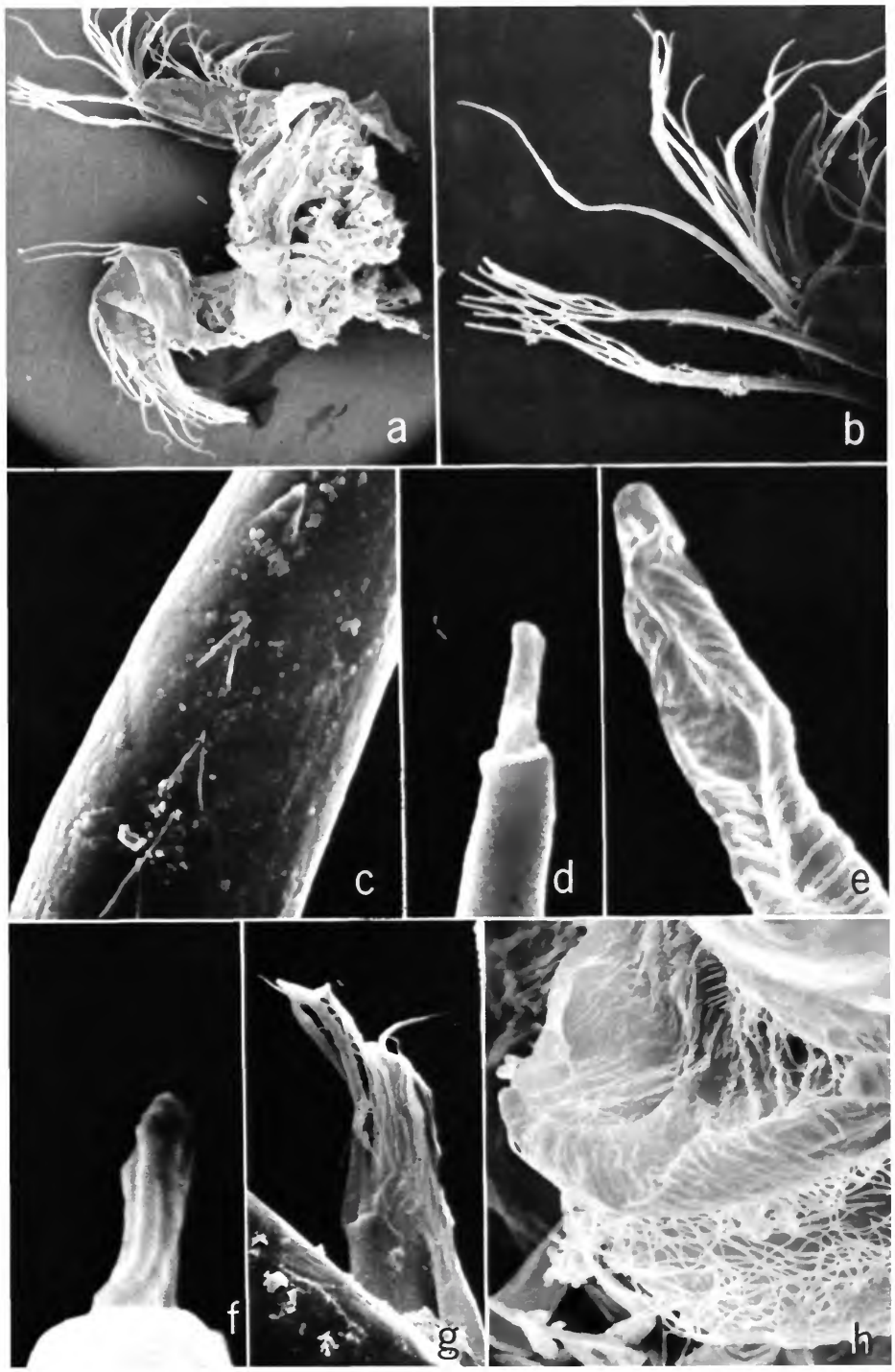

FIGURE 311.—*Empoulsenia pentathrix*, female, USNM 138651, appendages: *a*, anterior showing 1st antenna and right mandible, × 67; *b*, tip of 1st antenna, × 175; *c*, part of a-claw, 7th joint, left 1st antenna, × 5000; *d*, tip of c-bristle, 7th joint, left 1st antenna, × 10,000; *e*, tip of d-bristle, 8th joint, left 1st antenna, × 10,000; *f*, tip of sensory bristle, 5th joint, left 1st antenna, × 20,000; *g*, exopodite, right mandible, × 15,000; *h*, detail of upper lip shown in "*a*," × 5000.

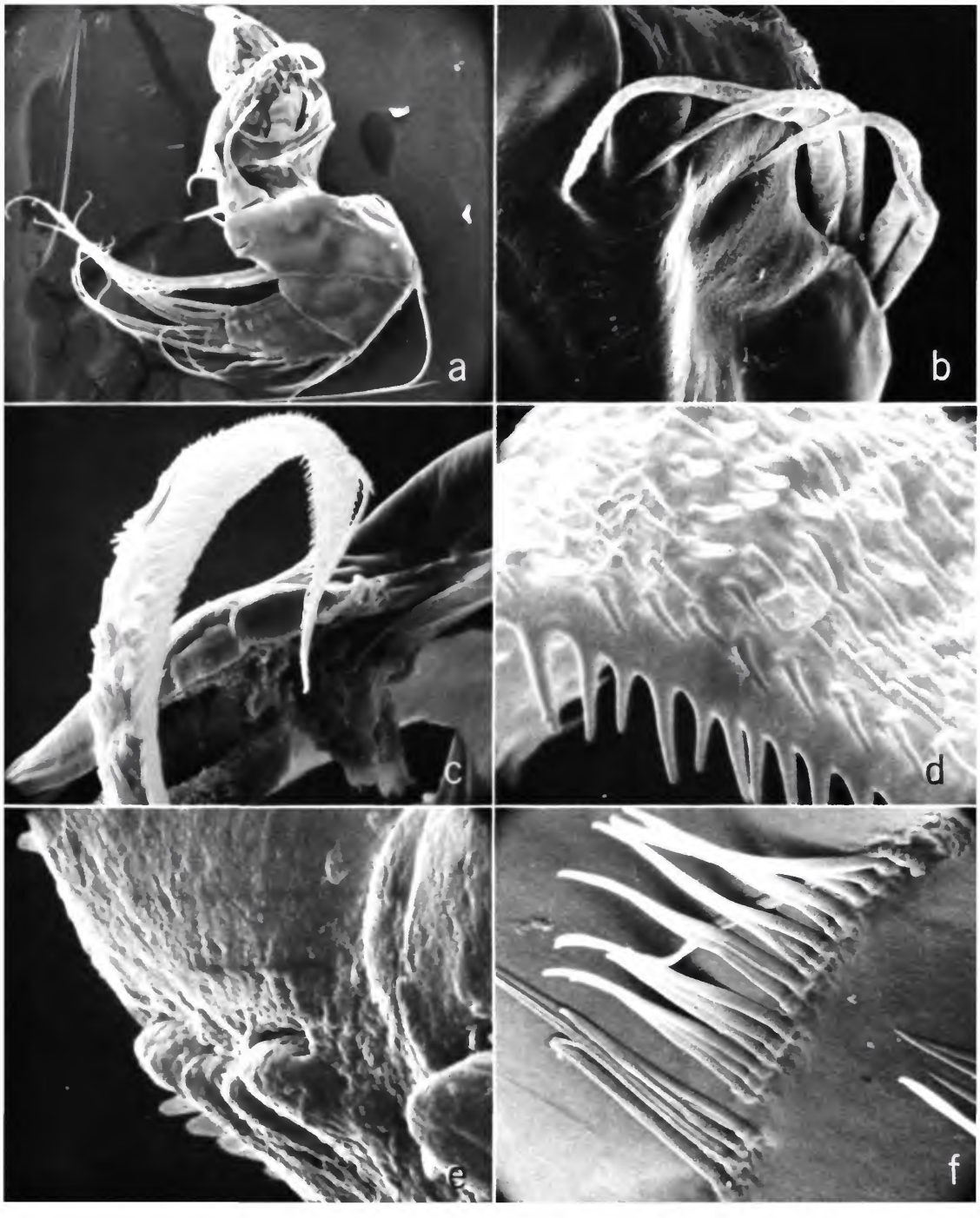

FIGURE 312.—*Empoulsenia pentathrix*, female, USNM 138651, left mandible, medial view: *a*, complete appendage, × 134; *b*, midbristles on dorsal margin of basale, × 1250; *c*, coxale endite, × 1000; *d*, detail of endite in "*c*," × 10,000; *e*, detail of protuberances on proximal ventral margin of coxale endite shown in "*c*," × 10,000; *f*, detail of spines on medial surface of 2nd endopodite joint, × 5000.

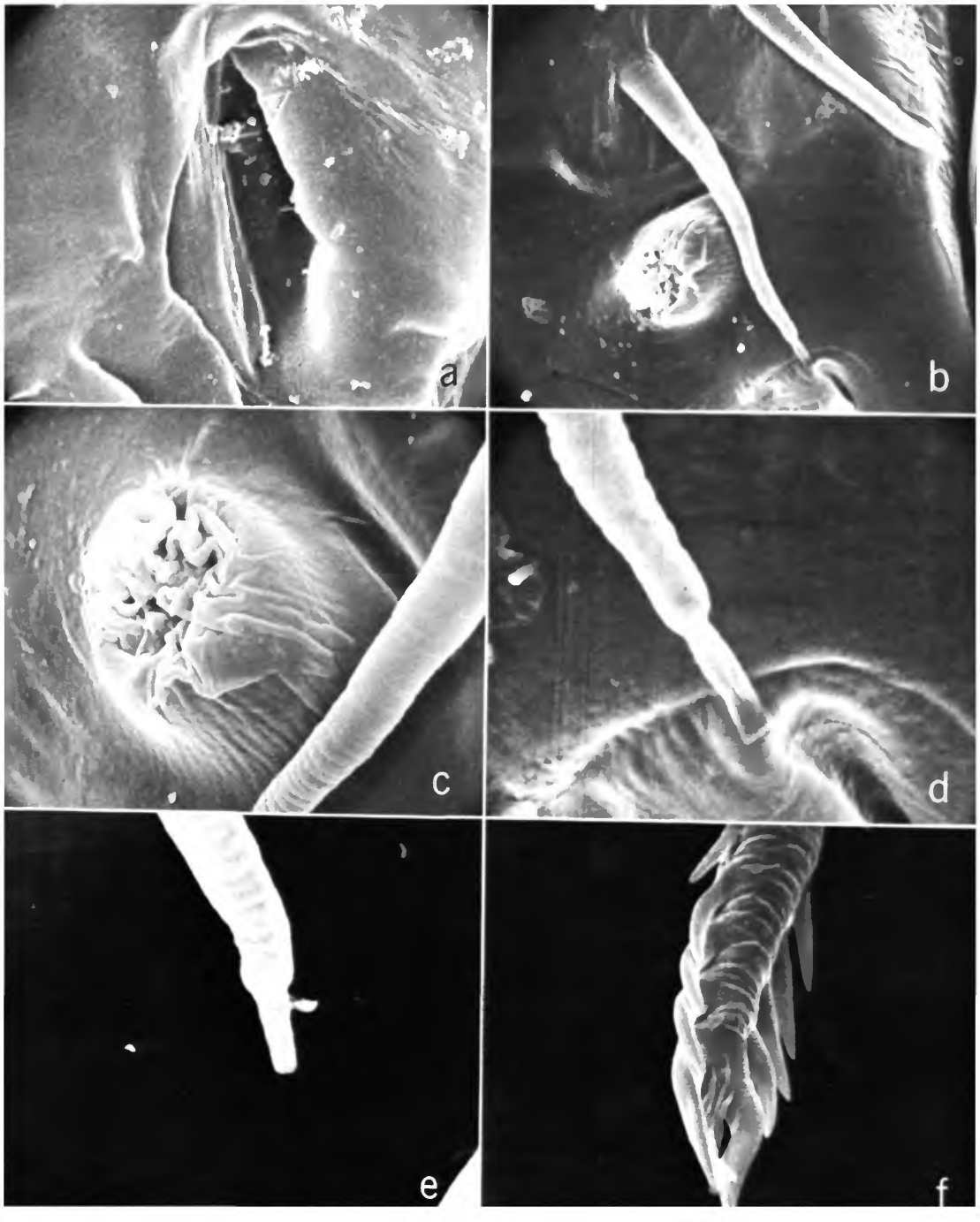

FIGURE 313.—*Empoulsenia pentathrix*, female, USNM 138651, basale of left mandible, medial view: *a*, U-shaped depression on ventral margin, × 2400; *b*, glandular process and dwarf bristles on basale endite, × 2500; *c*, detail of glandular process in "*b*," × 6000; *d*,*e*, detail of tips of dwarf bristles in "*b*," × 10,000; *f*, tip of triaenid bristle in ventral margin of basale, × 4000.

mm, height 1.27 mm; USNM 128959, length 2.49 mm, height 1.40 mm; USNM 136581, length 2.49 mm, height 1.45 mm; USNM 138162, length 2.37 mm, height 1.41 mm; USNM 138651, length 2.42 mm, height 1.38 mm; gravid ♀ from *Hero* station 70–40, length 2.19 mm, height 1.34 mm; adult ♀ without eggs from *Hero* station 70–40, length 2.29 mm, height 1.35 mm; gravid ♀ from *Hero* station 69–47, length 2.28 mm, height 1.33 mm; adult ♀ without eggs from *Hero* station 69–37, length 2.24 mm, height 1.32 mm.

Central muscle attachments: See Figure 309*d,e*.

Number of eggs in marsupium: USNM 125842, 8; USNM 128959, 10; USNM 136581, 1; USNM 138162, 4; USNM 138651, 8; specimen from *Hero* station 70–40, 9 eggs; specimen from *Hero* station 69–47, 11 eggs.

DISTRIBUTION.—This species was collected in the Subantarctic and Antarctic regions of the American and Pacific Quadrants at shelf to bathyal depths (40–1511 m) (Figure 308).

90. *Empoulsenia antarctica*, new species

FIGURES 314–317

HOLOTYPE.—USNM 126124, gravid ♀, length 3.37 mm. Valves and some appendages in alcohol, remaining appendages on slides.

TYPE-LOCALITY.—*Eltanin* Cruise 6, station 410.

MATERIAL.—Holotype.

DIAGNOSIS.—Posterior infold with 8 short processes between list and valve margin; carapace length about 3.37 mm, height 1.89 mm.

Mandible: Dorsal margin of basale with 3 or 4 short bristles.

Maxilla: Dorsal margin of basale with 1 proximal and 3 distal bristles; ventral margin with 5 proximal bristles, 1 distal and 1 terminal bristle.

Sixth limb: Anterior margin with 1 upper and 1 lower bristle on at least one limb; end joint with 5 anterior bristles and 29 posteroventral bristles.

Seventh limb: With 30 bristles.

Lateral eye: Small with 3 ommatidia.

DESCRIPTION OF FEMALE.—Carapace oval in lateral view with rostrum and incisur of usual type for genus (Figure 314*a*).

Ornamentation: Surface appearing smooth, but pores visible at magnification of about × 200 (Figure 314*f*).

Infold (Figures 314*c-e*, 316, 317): About 21 bristles forming row just within and parallel to anterodorsal margin above incisur; about 32 short bristles present between row of 21 bristles and list; numerous bristles present on list above incisur and between list and incisur; about 72 bristles present below incisur and on anteroventral infold; single row of 28 bristles present along ventral infold to point opposite 1st hyaline flat bristle on posterior list; list paralleling posterior margin with 42 hyaline bristles posterior to about 96 long and short slender bristles; 8 short processes forming row between list and posterior shell margin; about 23 long bristles present between lowermost hyaline bristle and lowermost process in area between list and posterior shell margin.

Selvage: Lamellar prolongation with long marginal hairs present along lower margin of incisur of each valve.

Muscle scars: Central muscle scars obscure but consisting of about 32 individual scars (Figure 314*b*).

Pore canals: Radial pore canals numerous, ending in minute pores or spines along posterior margin. Normal pore canals visible under high magnification (around × 200), consisting of 2 sizes: smaller size appearing gray in transmitted light; larger size looking like short blunt-tipped spines when both inner and outer surfaces of shell are visible.

Size (Figure 307): Holotype (USNM 126124) length 3.37 mm, height 1.89 mm.

First antenna: General morphology typical for genus: 1st and 2nd joint with short spines forming clusters; 2nd joint with long spinous subterminal dorsal bristle and short spinous lateral bristle near distal margin; 3rd joint with short ventral bristle and 6 long spinous dorsal bristles; distal margin of 4th joint moderately concave; dorsal margin with 1 long spinous bristle; ventral margin with few short spines and 2 spinous terminal bristles, longer of 2 slightly longer than ventral margin of 5th joint, shorter of 2 bristles slightly shorter than ventral margin; sensory bristle of 5th joint with 1 short proximal and 6 long terminal filaments; proximal filament not quite reaching bases of terminal filaments; medial bristle of 6th joint spinous, longer than a-claw. Seventh joint: a-claw smooth; b-bristle with short spinous proximal filament and 4 longer spinous distal filaments; c-bristle with 6

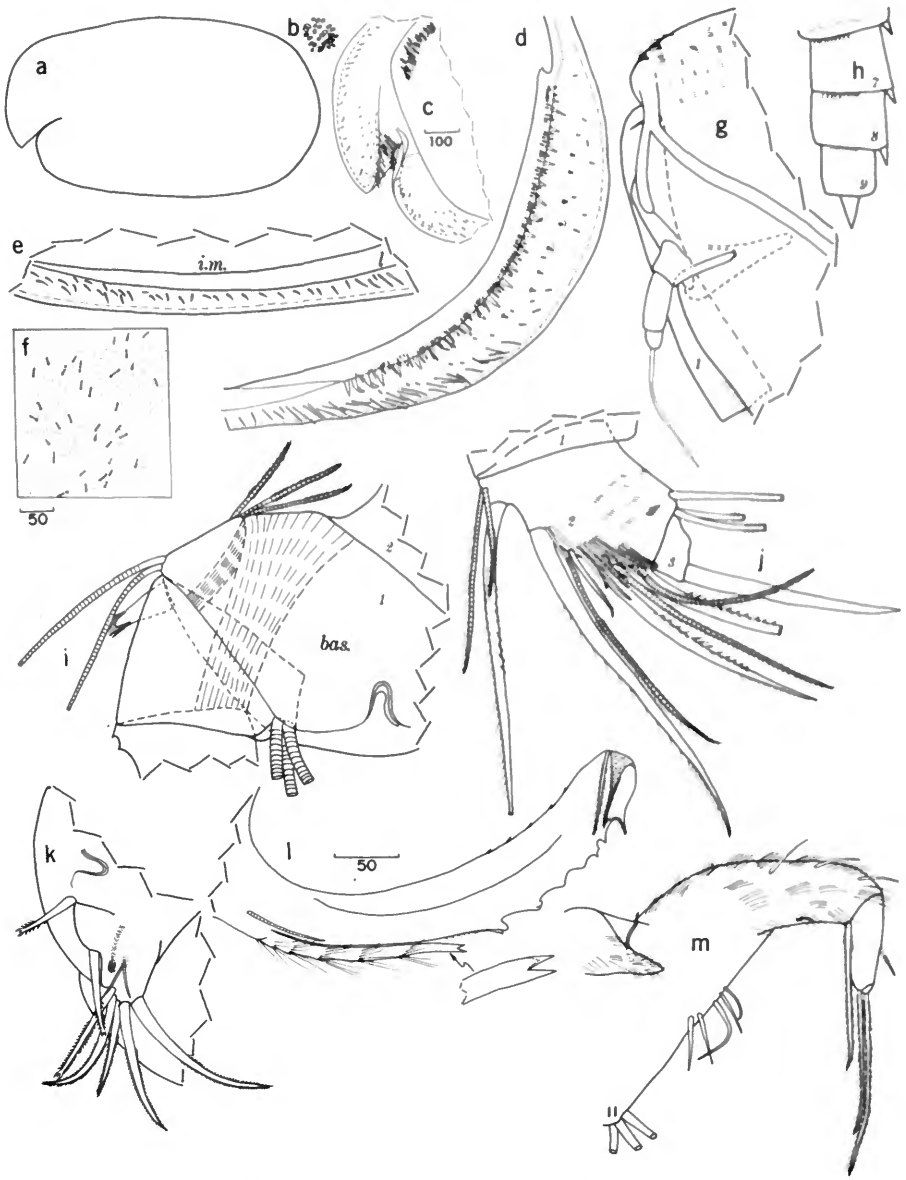

FIGURE 314.—*Empoulsenia antarctica*, female, USNM 126124, length 3.37 mm, carapace: *a*, complete specimen, lateral view; *b*, sketch of central muscle attachments on left valve, lateral view. Right valve, medial view: *c*, anterior; *d*, posterior margin; *e*, part of ventral margin. Left valve, lateral view: *f*, detail of shell near middle showing pores. Right 2nd antenna: *g*, endopodite and parts of protopodite and exopodite, medial view; *h*, joints 7–9 of exopodite, lateral view. Right mandible, medial view: *i*, basale and exopodite; *j*, endopodial joints 2–3 (not all bristles on 3rd joint shown); *k*, basale endite; *l*, coxale endite. Maxilla: *m*, left limb, medial view. (Same magnification in microns: *c,e; d,h,l; f,g,i-k,m*.)

marginal filaments and bifurcate tip. Eighth joint: d- and e-bristles bare, d-bristle somewhat shorter and more slender than e-bristle; f-bristle reflexed, with 5 spinous marginal filaments; g-bristle with 5 marginal filaments and bifurcate tip.

Second antenna (Figure 314*g,h*): Protopodite with short medial bristle; short spines forming clusters on anteromedial surface; slender spines on anterior part of dorsal margin and near middle of ventral margin. Endopodite distinctly 3-jointed, 2nd joint almost twice length of 1st; bristle of end joint only slightly longer than stem. Exopodite: distal margins of joints 2 to 8 with comb of short spines; basal spines on joints 4 to 8, lateral spine on joint 9; bristle of 2nd joint same length as joints 2 to 9, inclusive, and with hairs along ventral margin; bristles of joints 3 to 8 with natatory hairs; a few minute spines observed on bristle of 4th joint; 9th joint with 2 long bristles with natatory hairs, 1 medium bristle with short marginal spines, and 1 short bristle.

Mandible (Figure 314*i-l*): Coxale endite with short slender bristle near basis of ventral branch; ventral branch with 6 oblique rows of spines and 2 or 3 stout spines at tip; ventral margin of dorsal branch with 2 rounded pairs of teeth followed by 2 rounded teeth and 2 pointed teeth; main spine small with spines along posterior margin; spine at tip of dorsal branch with minute marginal spines. Basale endite with 4 dentate terminal bristles, 1 triaenid bristle with 17 pairs of teeth, and 1 triaenid bristle with 4 or 5 pairs of teeth. Two dwarf bristles and small glandular opening present near base of endite; U-shaped margin depression and 1 short triaenid bristle with 4 or 5 pairs of teeth present on basale proximal to endite. Dorsal margin of basale with 3 spinous midbristles on right limb of holotype, 4 on left, and 2 long spinous terminal bristles. Exopodite about one-half length of dorsal margin of 1st endopodite joint, with hirsute tip and 2 short subterminal bristles. Endopodite: 1st joint with 3 long, spinous, terminal bristles; dorsal margin of 2nd endopodite joint with 2 spinous proximal bristles, 4 stout spinous a-, b-, c-, and d-bristles; a long spinous bristle placed laterally between b- and c-bristles, and between c- and d-bristles; 2 short spinous medial bristles present near base of b-bristle; 1 long spinous medial bristle present on margin distal to base of d-bristle; about 11 additional medial bristles in 2 oblique rows of about 7 and 4 bristles present between b- and c-bristles; medial surface of 2nd joint with short

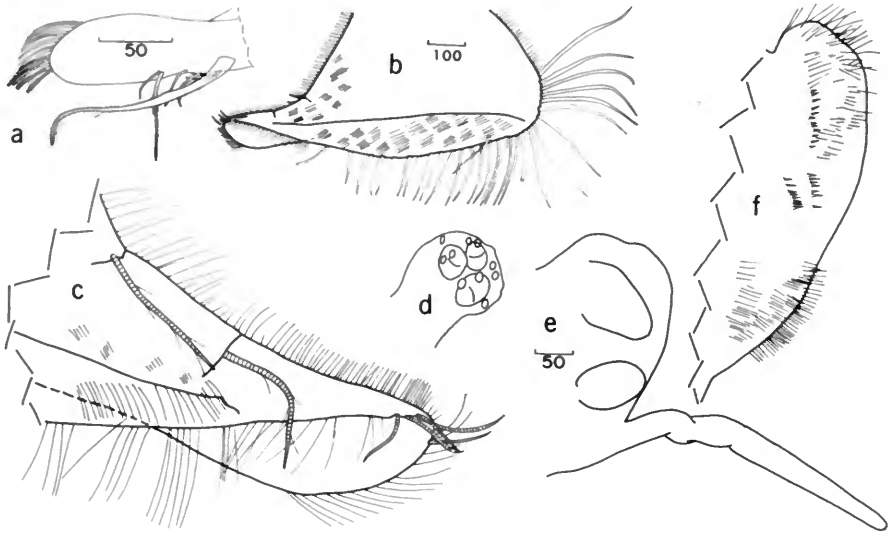

FIGURE 315.—*Empoulsenia antarctica*, female, USNM 126124: *a*, comb of left 5th limb, lateral view; *b*, right 6th limb, medial view (marginal spines on bristles not shown); *c*, anterior of left 6th limb, medial view; *d*, right lateral eye; *e*, medial eye and rod-shaped organ; *f*, posterior. (Same magnification in microns: *a,c; d-f*.)

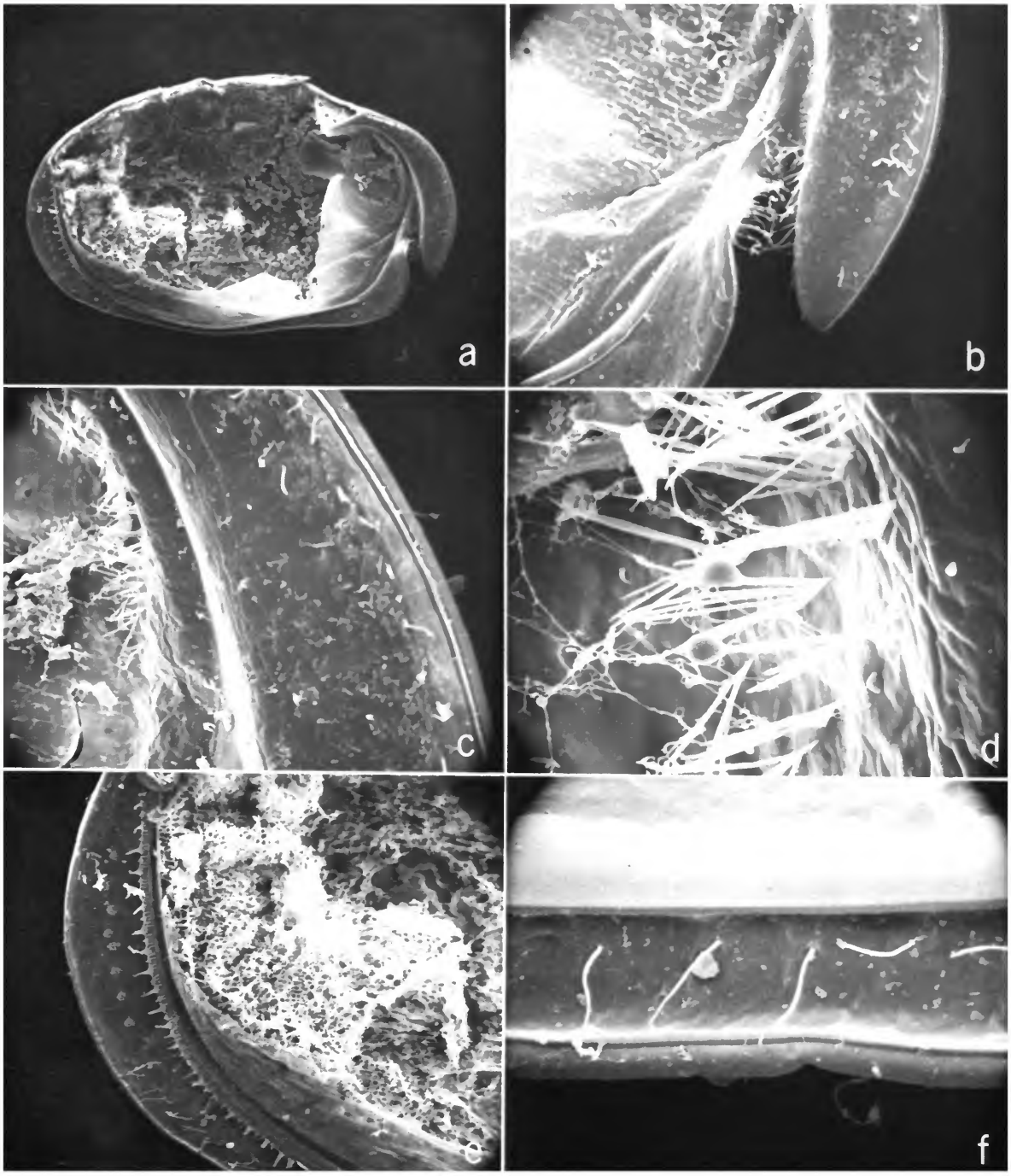

FIGURE 316.—*Empoulsenia antarctica*, female, USNM 126124, left valve, medial view: *a*, complete valve, × 25; *b*, anterior, × 100; *c*, anterodorsal corner, × 200; *d*, detail of vestment hairs in "*c*," × 1000; *e*, posterior, × 71; *f*, midventral margin, × 660.

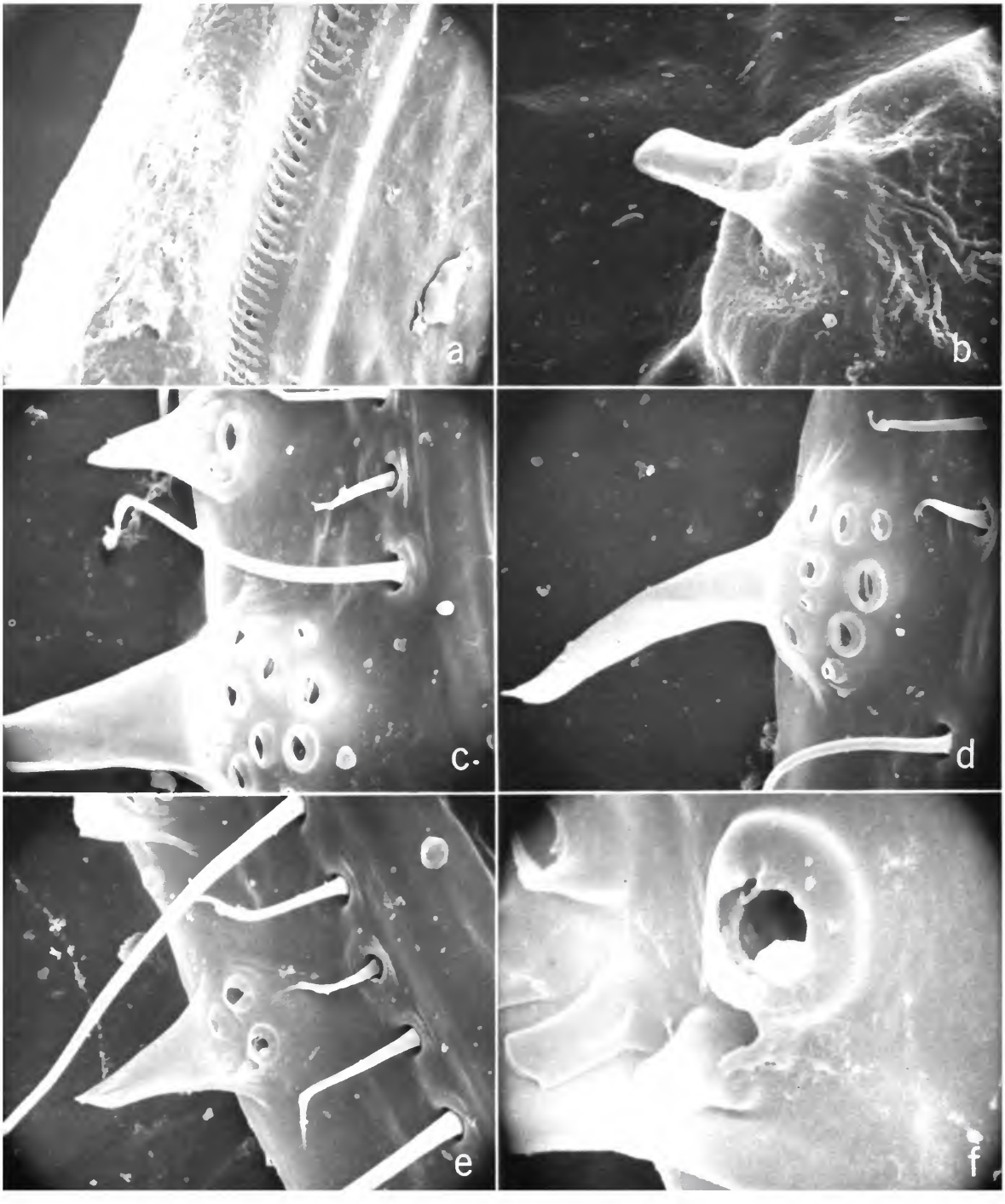

FIGURE 317.—*Empoulsenia antarctica*, female, USNM 126124, left valve, medial view: *a*, selvage along dorsal half of posterior margin, × 6500; *b*, detail of posterior process, × 5000; *c-e*, pores and flaplike bristles along posterior list, × 2000; *f*, detail of tube in "*e*," × 10,000.

spines forming clusters. Third joint of endopodite with bare dorsal claw and 5 spinous bristles.

Maxilla (Figure 314*m*): Proximal endite with 3 long bristles and 1 short bristle; distal endite with 3 long bristles. Epipodial appendage and basale hirsute; dorsal margin of basale with 1 proximal and 3 distal bristles, all bare; ventral margin with 5 proximal and 1 distal bristles, all bare, and 1 long spinous terminal bristle. Endopodite: 1st joint with short spinous bristle on anterior margin; 6-bristle also spinous and about twice length of joint; bristle of end joint spinous and longer than 6-bristle.

Fifth limb: Epipodial appendage with 72 bristles; spinous exopodite bristle reaching past end of comb; 2 slender bristles present ventral to base of this bristle, and 4 bristles present on ventral margin distal to base (Figure 315*a*).

Sixth limb (Figure 315*b,c*): Anterior margin of right limb of holotype with only upper bristle, left limb with both upper and lower bristle; anteroventral corner with 5 spinous bristles; posteroventral margin with 29 spinous bristles; margin of anteroventral flap, anteroventral margin, posterior margin, medial surface of limb hirsute; anterior margin slightly concave, posteroventral corner rounded.

Seventh limb: Each limb with 30 bristles armed with 2 to 4 bells; terminal combs each with 16 or 17 spinous teeth.

Furca: Each lamella with 7 claws followed by 2 short bristles oriented posteriad; all claws with lateral and medial row of teeth along concave margin; claws 1 to 6 with slender spines along convex margin; short spines present on margin of furca posterior to bristles.

Medial eye and rod-shaped organ (Figure 315*d*): Medial eye large, smooth; rod-shaped organ elongate, tapering slightly to rounded tip.

Lateral eye (Figure 315*d*): Eye small, about one-half diameter of medial eye, with about 3 large divided ommatidia and numerous small yellowish globules. (Ommatidia obscured by brownish pigment of eye.)

Posterior: Thumblike process present on posterior above furca; posterior hirsute and with short spines forming clusters (Figure 315*f*).

Eggs: Holotype with 18 eggs in brood chamber.

COMPARISONS.—This species is closely related to *E. pentathrix* and *E. quinquesetae*. It is larger than these species and has fewer midbristles on the dorsal margin of the mandibular basale. *Empoulsenia pentathrix* has both an upper and lower bristle on the anterior margin of the 6th limb, whereas *E. quinquesetae* has only an upper bristle. The unique specimen of *E. antarctica* has an upper and lower bristle on one limb and only an upper bristle on the other, but with only one specimen it is not possible to determine the variability of this character in the species. A comparison of the three species follows:

	E. pentathrix	*E. quinquesetae*	*E. antarctica*
Carapace length, mm	2.20–2.49	2.88–3.1	3.37
Infold of carapace			
Number of hyaline spines on posterior list	20	32–35	42
Number of short processes between list and posterior margin of shell	5	6–7	8
Number of bristles in row paralleling anterodorsal margin of rostrum	44	?	16
Number of long bristles between lowermost hyaline spine and lowermost process in the area between list and posterior margin of shell	16	37	23
Number of midbristles on dorsal margin of basale of mandible	5	5	3–4
Number of bristles on anterior margin of 6th limb	2	1	1–2
Number of posteroventral bristles on 6th limb	20–21	22–24	29
Number of bristles on 7th limb	18	22–26	30

DISTRIBUTION.—This species was collected at only one locality in the Scotia subregion of Antarctica at 220–240 m (Figure 308).

91. *Empoulsenia weddellensis*, new species

FIGURES 318–323

HOLOTYPE.—USNM 126206, adult ♂, length 3.36 mm. Right valve and some appendages in alcohol, remaining appendages on slides; left valve gold-plated, dry.

TYPE-LOCALITY.—USCGC *Glacier* Cruise 1, station 0001, International Weddell Sea Oceanographic Expedition, epibenthic sled sample, Weddell Sea.

FIGURE 318.—*Empoulsenia weddellensis*, male, USNM 126206, length 3.36 mm, carapace: *a*, complete specimen showing central muscle scars, lateral view; *b*, anterior of left valve, medial view; *c*, posterior of right valve, medial view. Right 1st antenna: *d*, distal part, lateral view. Second antenna: *e*, part of protopodite showing medial bristle, and proximal part of exopodite on right limb, medial view; *f*, endopodite on right limb, medial view; *g*, tip of endopodite on left limb, lateral view; *h*, part of exopodial joints 1 and 2 on left limb, lateral view. Mandible: *i*, coxale endite of right limb, lateral view; *j*, dwarf bristles, glandular peg, and triaenid bristle on basale endite of left limb, medial view; *k*, basale and exopodite on right limb, medial view; *l*, 2nd endopodial joint on right limb, medial view. Maxilla: *m*, right limb, medial view. (Same magnification in microns: *b,d; c,e-g,k,m; h,i,l.*)

PARATYPES.—USNM 126205, juvenile ♂; USNM 126207, juvenile ♀; USNM 126208, juvenile ♀, length 1.82 mm, height 0.99 mm; USNM 126209, 59 juveniles; USNM 126210, 24 juveniles. All paratypes from same station as holotype; USNM 126205–126207, 126210 from same sample as holotype; USNM 126208, 126209 from anchor dredge sample.

DIAGNOSIS OF ADULT MALE.—Posterior infold with 5 short processes between broad list and valve margin; carapace length 3.36 mm, height 1.72 mm.

Mandible: Dorsal margin of basale with 3 or 4 midbristles.

Maxilla: Dorsal margin of basale with 1 proximal and 3 distal bristles; ventral margin with 6 proximal bristles.

Sixth limb: Anterior margin with 1 upper and 1 lower bristle; end joint with 6 bristles, posteroventral margin with 19 bristles.

Seventh limb: With 16 or 17 bristles.

Lateral eye: Small with 3 ommatidia.

DESCRIPTION OF ADULT MALE (Figures 318–321).—Carapace elongate with posterior half of dorsal margin strongly tapering (Figure 318*a*); usual row of hairs present near posterior margin.

Ornamentation: Surface appearing smooth, but minute pores visible at magnification of × 100.

Infold (Figures 318*b,c*; 320; 321): About 24 bristles forming irregular row just within and parallel to anterodorsal margin above incisur; about 13 short bristles present between row of 24 bristles and list; list with about 6 bristles; 7 bristles present forming row between list and incisur; about 5 minute bristles present posterior to upper edge of lower margin of incisur; about 41 bristles present below incisur and on anteroventral infold; single row of 29 bristles present along ventral infold to point opposite 1st hyaline spine on posterior list; list paralleling posterior margin with 34 or 35 hyaline spines posterior to about 160 minute bristles; 5 short processes forming row between list and posterior shell margin; about 12 bristles on right valve and 8 on left valve present between lowermost hyaline spine and lowermost process in area between list and posterior shell margin; 21 minute bristles forming row anterior to anterior juncture on dorsal margin.

Size (Figure 307): Holotype (USNM 126206) length 3.36 mm, height 1.72 mm.

First antenna (Figure 318*d*): 1st joint bare; 2nd joint with spines on medial and lateral surfaces, 1 dorsal bristle and 1 lateral bristle, both with marginal spines, 3rd joint with 6 long spinous dorsal bristles and 1 short recurved bare ventral bristle; 4th joint with 1 long dorsal bristle with short marginal spines and 2 short ventral bristles (bristles bare or with short faint marginal spines); stem of sensory bristle of 5th joint almost twice length of 5th to 8th joints and with usual filaments; medial bristle of 6th joint with short marginal spines. Seventh joint: a-claw short with numerous minute teeth visible under oil immersion; b-bristle with 4 marginal filaments; c-bristle very long with 36 filaments. Eighth joint: d- and e-bristles bare, e-bristle slightly stouter and longer than d-bristle; f-bristle very long, with 34 filaments; g-bristle longer than b-bristle and with 6 marginal filaments.

Second antenna (Figure 318*e-h*): Protopodite with short slender medial bristle; margins of protopodite bare. Endopodite 3-jointed: 1st joint bare; 2nd joint with 3 bare ventral bristles near middle; 3rd joint reflexed on 2nd joint with 1 bare, medium, proximal, ventral bristle and pointed tip with 5 or 6 ridges. Exopodite: 1st joint elongate with spines forming clusters along ventral and distal lateral margin; 2nd joint elongate with spines forming clusters along ventral margin; joints 3 to 7 with 2 clusters of spines along ventral margins; joints 2 to 8 with long hairs forming a cluster on distal dorsal corner, and comb of minute spines along distal margins; bristles on joints 2 to 8 and 4 bristles of 9th joint all with natatory hairs, 1 bristle of 9th joint much shorter than others.

Mandible (Figure 318*i-l*): Coxale with 1 small bristle at basis of endite; ventral margin of dorsal branch of coxale endite with 6 or 7 angular and rounded teeth and short main spine; dorsal bristle proximal to tip of endite with small marginal spines; ventral branch of coxale endite with spines forming 5 oblique rows and a pointed tip with 2 backward-pointing spines. Basale: endite with 4 terminal spinous bristles, 2 triaenid bristles with about 9 to 19 pairs of marginal spines, 2 dwarf bristles and glandular peg; 3rd weakly triaenid bristle with 3 or 4 pairs of marginal spines present on basale near base of endite; dorsal margin of basale with 2 long terminal bristles with short marginal spines and 4 spinous midbristles on right limb and 3 on left. Exopodite about one-third length of dorsal margin of 1st endopodite joint,

with hirsute tip and 2 short bare subterminal bristles. Endopodite: 1st joint with 3 long spinous ventral bristles; medial and lateral surfaces of 2nd endopodite joint with short spines forming clusters; ventral margin with 3 long spinous terminal bristles; dorsal margin with 2 spinous proximal bristles and stout spinous a-, b-, c-, and d-bristles; long spinous lateral bristle present between b- and c-bristles; 2 rows consisting of 5 and 7 spinous bristles present medially between b- and c-bristles; 1 long spinous lateral bristle present between c- and d-bristles; 1 long spinous bristle present medial to base of d-bristle; 3rd joint with short pointed dorsal claw with minute teeth near middle, 3 long

FIGURE 319.—*Empoulsenia weddellensis*, male, USNM 126206, right 5th limb: *a*, exopodial bristles on comb, lateral view. Right 6th limb: *b*, complete limb, medial view (bristles on anteroventral tip not shown); *c*, detail of minute bristle in anterodorsal corner of "*b*"; *d*, bristles on anteroventral tip shown in "*b*." Left 6th limb: *e*, anterior part, medial view. Furca: *f*, posterior claws on left lamella, lateral view; *g*, posterior claws on right lamella, lateral view. Anterior: *h*, medial eye and rod-shaped organ; *i*, right lateral eye. Posterior: *j*, copulatory limbs and claws 1 and 2 on left lamella of furca; *k*, left copulatory limb, anterior to left; *l*, dorsal process on posterior margin and tips of 3 gill-like structures; *m*, parts of 4 gill-like structures. Upper lip; *n*, lip showing both anterior lobes and right lateral lobe. (Same magnification in microns: *a,c-f,k; g-j, l-n.*)

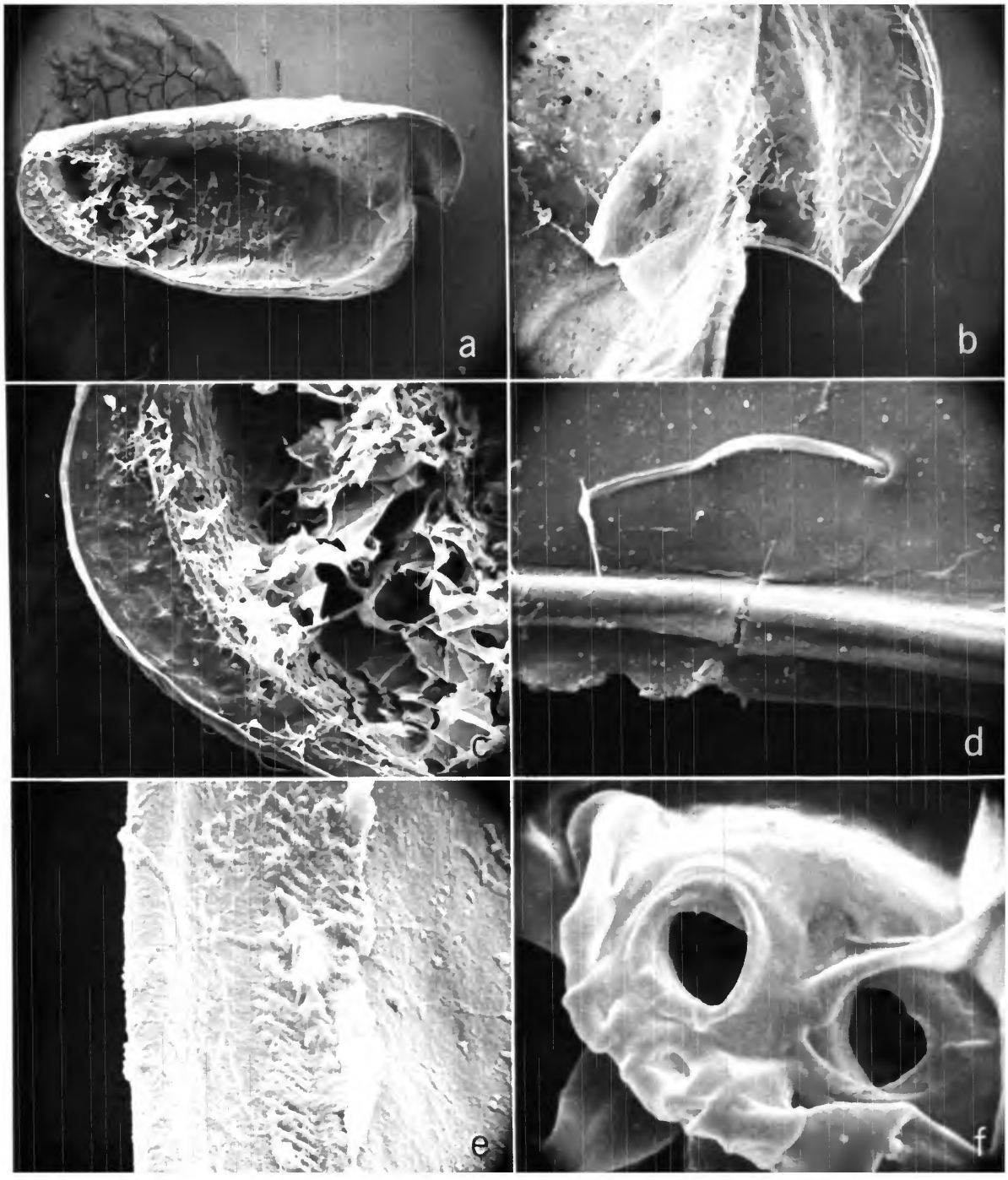

FIGURE 320.—*Empoulsenia weddellensis*, male, USNM 126206, left valve, medial view: *a*, complete valve, × 26; *b*, anterior, × 100; *c*, posterior, × 100; *d*, ventral margin, just anterior to middle, × 1300; *e*, middle of posterior margin, × 6500; *f*, pores at base of flaplike bristle on posterior list, × 10,000.

spinous clawlike bristles, and 2 slender spinous bristles.

Maxilla (Figure 318*m*): Epipodial appendage short, hirsute. Endite I with 1 short and 3 long spinous bristles; endite II with 3 long spinous bristles. Basale: hirsute; dorsal margin with 1 proximal (base medial) and 3 distal bristles, all bare; 1 short proximal bristle present near ventral margin; ventral margin with 6 bare proximal bristles, 1 short bare bristle near middle, and 1 long spinous terminal bristle. Endopodite: 1st joint with 1 short bare dorsal midbristle and 1 long spinous 6-bristle; end joint with spinous bristle slightly longer than 6-bristle.

Fifth limb (Figure 319*a*): Epipodial appendage with 68 bristles. Comb with 1 long stout spinous exopodial bristle and about 6 slender bristles near ventral margin.

Sixth limb (Figure 319*b-e*): Anterior margin with upper and lower bristles; minute medial bristle present in proximal anterior corner; anteroventral corner and flap with total of 6 bristles; posteroventral margin with 19 bristles on right limb (left limb fragmented); medial and lateral

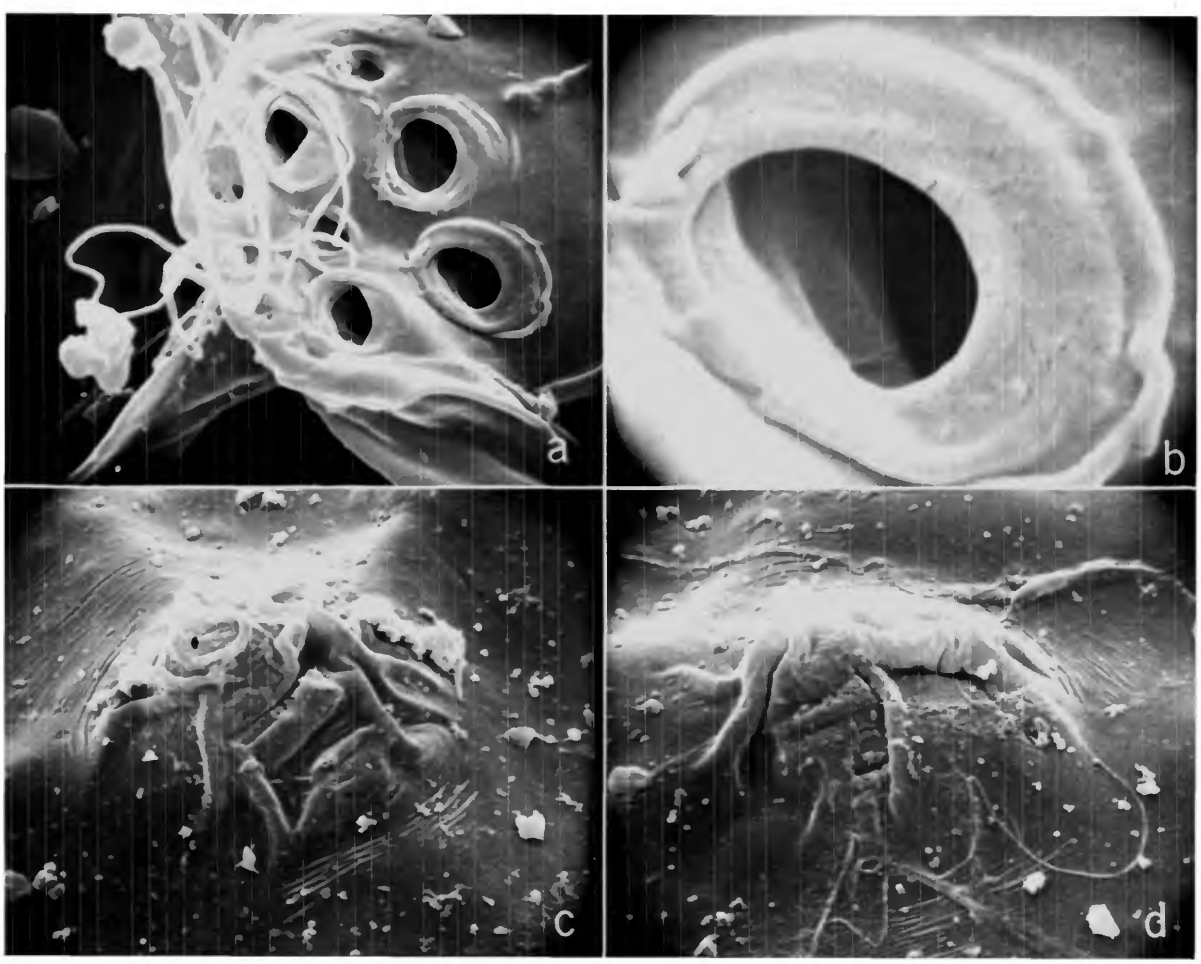

FIGURE 321.—*Empoulsenia weddellensis*, male, USNM 126206, left valve, medial view: *a*, pores at base of flaplike bristle on posterior list, × 5000; *b*, detail of pore (lower right) in "*a*," × 20,000; *c,d*, detail of posterior process in Figure 320*c*, × 2500.

surfaces and anterior and posterior margins of limb hirsute.

Seventh limb: Right limb with 16 bristles, left limb with 17, each bristle with 2 or 3 bells; opposing terminal combs each with 12 or 13 spinous teeth.

Furca (Figure 319*f,g*): Left lamella with 6 curved claws followed by 1 straight claw and 1 bristle with its tip pointing dorsally. Right lamella with 5 curved claws followed by 3 straight claws of which last 2 are weak and have their bases laterally on lamella. Claw 7 much weaker than claw 6 on both lamella; all claws separated from lamellae by sutures; main claws decrease in length proximally along lamella.

Medial eye and rod-shaped organ (Figure 319*h*): Medial eye large, bare; rod-shaped organ wrinkled proximally, widening near middle and tapering to rounded tip, possibly 2-jointed, faintly striate near middle.

Lateral eye (Figure 319*i*): Eye small, only about one-fourth size of medial eye, with about 3 ommatidia.

Posterior (Figure 319*l,m*): Dorsal process thumb-like with short and long spines; 7 gills present on each side, each with small lobe on distoventral corner.

Lips (Figure 319*n*): Upper lip consisting of hirsute left and right lobe on low central part, each lobe with 2 small spines. An additional hirsute flap present posterior to upper lip and on each side or behind esophagous.

Copulatory organ (Figure 319*j,k*): Organ not well defined, separated from anterior part of furca by transparent lobe; each limb foot-shaped with transparent process at "heel"; lobe with 2 small bristles observed near middle of anterior margin of left limb.

Description of Juvenile (N–1) Male (Figure 322).—Carapace elongate with posterior half of dorsal margin only slightly tapered (Figure 322*a*); hairs in row found on posterior part of shell of adult male not present on juvenile.

Infold (Figure 322*b*): About 32 bristles forming irregular row just within and parallel to anterodorsal margin above incisur; about 32 short bristles present between row of 32 bristles and list; list with about 11 bristles; 13 bristles present between list and incisur: about 60 bristles present below incisur and on anteroventral infold; single row of 27 bristles present along ventral infold to point opposite 1st hyaline spine of posterior list; list paralleling posterior margin with 36 or 37 hyaline spines posterior to about 155 long and short bristles; 5 short processes forming row between list and posterior shell margin; about 12 bristles (4 long) on left valve and 15 (4 long) on right valve present between lowermost hyaline spine and lowermost process in area between list and posterior shell margin; about 23 minute bristles forming row along inner margin of infold anterior to hingement of dorsal margin.

Size: USNM 126205, length 2.64 mm, height 1.44 mm.

First antenna (Figure 322*c*): Joints 1 to 4 similar to those of *E. antarctica*; sensory filament of 5th joint with proximal filament reaching halfway to bases of 6 terminal filaments; medial bristle of 6th limb spinous, longer than a-claw. Seventh joint: a-claw with minute teeth; b-bristle with short proximal filament and 4 long spinous distal filaments; c-bristle with about 8 short proximal filaments similar to those of f-bristle, and about 7 longer filaments. Eighth joint: d- and e-bristles bare, d-bristle slightly shorter and more slender than e-bristle; f-bristle reflexed, with 12 short proximal filaments, and about 5 distal filaments; g-bristle with 6 marginal filaments and bifurcate tip.

Second antenna (Figure 322*d*): Protopodite with short medial bristle and spines distributed similarly to those on the protopodite of *E. antarctica*. Endopodite 3-jointed; 1st and 2nd joints bare; 3rd joint with proximal dorsal bristle, pointed tip, and reaching 6th to 9th joint of exopodite. Exopodite: distal margins of joints 2 to 8 with comb of short spines; joints 2 to 8 with 1 or 2 minute basal spines; joint 9 with short stout lateral spine; bristle of joint 2 reaching past 9th joint and with short slender spines; bristles of joints 3 to 8 with natatory hairs; 9th joint with 4 bristles, 2 long and 1 medium with natatory hairs, 1 short with short marginal spines.

Mandible (Figure 322*e,f*): Coxale endite similar to that of adult male, also basale endite, except 10 and 15 to 17 pairs of marginal spines present on the 2 triaenid bristles; triaenid bristle on basale with 3 pairs of marginal spines; dorsal margin of basale with 4 spinous midbristles and 2 long spinous terminal bristles; slender spines forming clusters present on lateral surface on dorsal margin.

Exopodite similar to that on male but slightly longer, about 40 percent of length of dorsal margin of 1st endopodite joint. Endopodite: 1st joint with usual 3 ventral bristles; 2nd endopodite joint with clusters of short spines on medial surface and 3 stout spinous terminal bristles on ventral margin; dorsal margin with 1 short spinous proximal bristle and stout spinous a-, b-, c-, and d-bristles; 1 short spinous bristle present between a- and b-bristles; 1 long spinous lateral bristle, slightly shorter than b-bristle, present between b- and c-bristles; 2 rows with 4 and 5 short spinous cleaning bristles present medially between b- and c-bristles; 1 long spinous lateral bristle present between c- and d-bristles; 1 long spinous bristle present medially distal to base of d-bristle; 3rd joint similar to that of adult male.

Maxilla: Similar to that of adult male.

Fifth limb: Epipodial appendage with 34 bristles, appendage otherwise similar to that of adult male.

Sixth limb: Anterior margin with upper and lower bristles: minute medial bristle present in proximal anterior corner; anteroventral corner with 4 bristles; posteroventral margin of left limb with 18 bristles (right limb fragmented); limb margins and surfaces hirsute.

Seventh limb: Each limb with 17 bristles, each bristle with 2 or 3 bells; opposing terminal combs similar to those of adult male.

Furca: Right lamella with 6 curved claws, claw 6 about half length of claw 5; left lamella with 6 curved claws followed by 1 small bristle, claw 6 about three-fourths length of claw 5; all claws separated from lamellae by sutures; main claws decrease in length proximally along lamella.

Medial eye and rod-shaped organ (Figure 322*g*), *lateral eye* (Figure 322*h*): Similar to those of adult male.

Lips: Similar to adult male except with only 1 anterior spine on each lob (Figure 322*i*).

Copulatory organ: Not well defined, but similar to lobes of adult, except reduced.

Description of Juvenile (N–1) Female (Figure 323).—Carapace similar to that of juvenile male except posterior end more broadly rounded and without tapering of posterodorsal shell margin (Figure 323*a*).

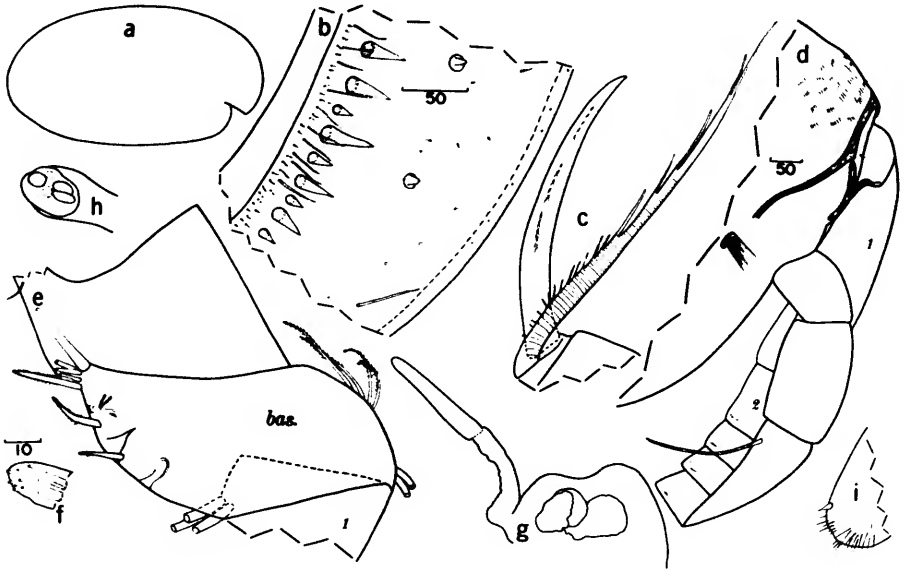

Figure 322.—*Empoulsenia weddellensis*, N–1 male, USNM 126205, length 2.74 mm, carapace: *a*, complete specimen, lateral view; *b*, posteroventral corner of right valve, medial view. Appendages: *c*, c- and f-bristles on right 1st antenna, medial view; *d*, endopodite and parts of protopodite and exopodite of left 2nd antenna, medial view; *e*, proximal bristle on coxale endite and basale of left mandible, medial view; *f*, detail of glandular peg shown in "*e*." Anterior: *g*, medial eye and rod-shaped organ; *h*, right lateral eye; *i*, anterior part of left lobe of upper lip, anterior to left. (Same magnification in microns: *b,c; d,e,g,h*.)

Infold: About 35 bristles forming irregular row just within and parallel to anterodorsal margin above incisur; about 68 short bristles present between row of 35 bristles and list; list with about 16 bristles; about 17 bristles between list and incisur; about 24 minute bristles forming row along inner margin of infold anterior to hingement of dorsal margin; about 79 bristles below incisur and on anteroventral infold; single row of 39 bristles present along ventral infold to point opposite 1st hyaline spine of posterior list; dorsal end of posterior list obscure or torn on both valves of specimen examined, but remaining segment of right valve with 32 hyaline spines posterior to 187 long and short bristles; 5 short processes forming row between list and posterior shell margin; about 24

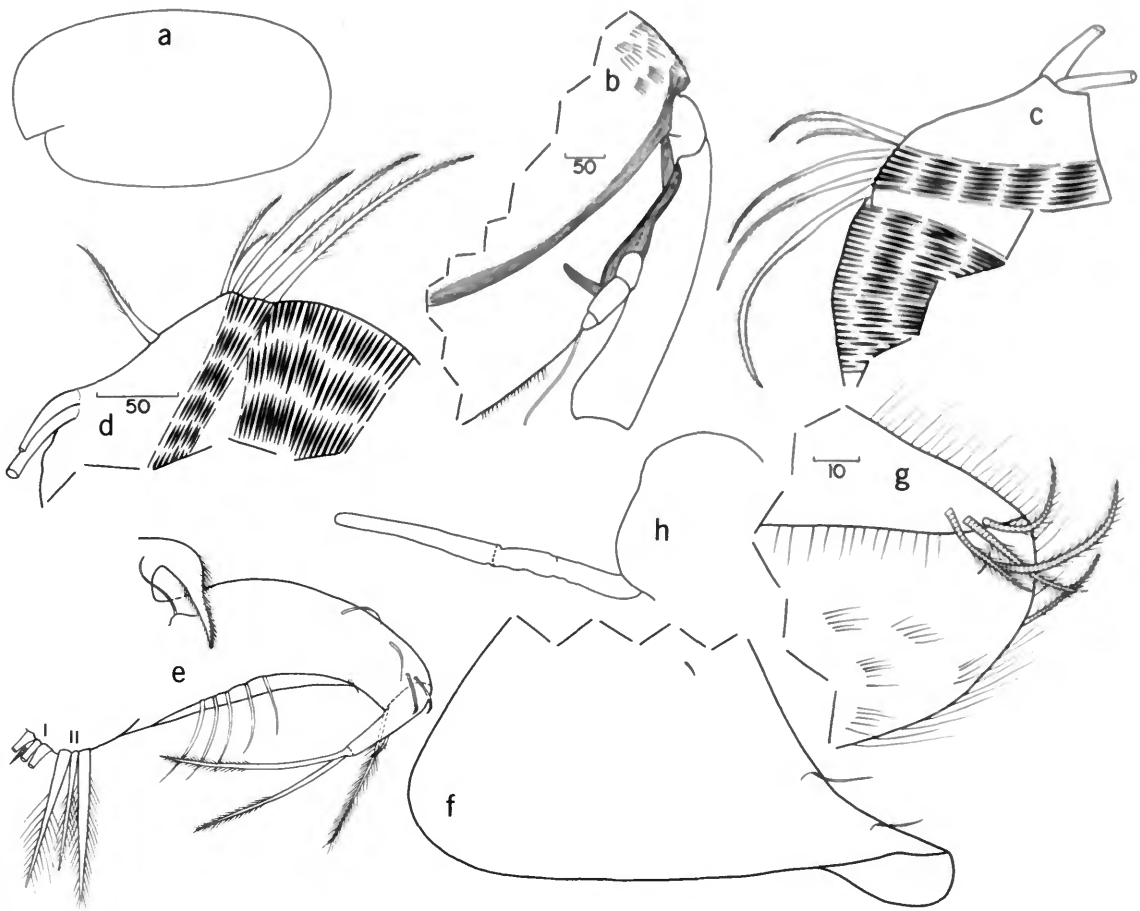

FIGURE 323.—*Empoulsenia weddellensis*, juvenile (N–1) female, USNM 126207, length 2.63 mm: *a*, complete specimen, lateral view; *b*, endopodite and parts of protopodite and exopodite on left 2nd antenna, medial view; *c*, dorsal margin of basale on left mandible, medial view; *d*, same, right mandible, medial view; *e*, left maxilla, medial view; *f*, left 6th limb, medial view (ventral and anteroventral bristles not shown); *g*, detail of "*f*" showing anteroventral bristles; *h*, medial eye and rod-shaped organ. (Same magnification in microns: *b,e,f,h; c,d.*)

bristles (14 long) on right valve and 16 (9 long) on left valve between lowermost hyaline spine and lowermost process in area between list and posterior shell margin.

Size: USNM 126207, length 2.63 mm, height 1.50 mm.

First antenna: Joints 1 to 3 similar to those on juvenile male; longer ventral bristle of 4th joint about same length as ventral margin of 5th joint, shorter ventral bristle slightly shorter than margin; proximal filament on sensory bristle of 5th joint reaching slightly more than half way to base of 6 terminal filaments; a-claw of 7th joint with minute teeth near middle; bristles of joints 7 and 8 similar to those on juvenile male, except short proximal filaments not present on c- and f-bristles.

Second antenna (Figure 323*b*): Endopodite 3-jointed with terminal bristle of 3rd joint reaching 2nd joint and longer than stem; protopodite and exopodite similar to those on juvenile male, except no marginal spines observed on short bristle of 9th joint, and the medium bristle of that joint not as long.

Left mandible (Figure 323*c*): Coxale endite broken off but small bristle present at base; basale endite and also basale similar to those of juvenile male except 5 spinous midbristles present on dorsal margin. Endopodite: 1st joint and ventral margin of 2nd joint similar to juvenile male; dorsal margin with two short spinous proximal bristles and stout spinous a-, b-, c-, and d-bristles; 1 short spinous medial bristle near base of b-bristle; 1 long spinous lateral bristle present between b- and c-bristles and c- and d-bristles; 2 rows with 5 and 8 spinous cleaning bristles present medially between b- and d-bristles; 1 long spinous medial bristle present distal to base of d-bristle; end joint similar to that of juvenile male.

Right mandible (Figure 323*d*): Dorsal margin of basale with 1 short spinous bristle between 5 midbristles and 2 terminal bristles; dorsal margin of 2nd endopodite joint without short medial bristle near base of b-bristle; cleaning bristles of 2nd joint consisting of 2 rows with 5 and 7 bristles, space present between 2nd and 3rd bristles of 1st row; limb otherwise similar to left mandible.

Maxilla (Figure 323*e*): Dorsal margin of basale with 4 distal bristles; ventral margin with proximal 6 bristles on right limb, but only 5 on left. Short bristle on dorsal or anterior margin of 1st endopodite joint spinous. Limb otherwise similar to that of juvenile male.

Fifth limb: Epipodial appendage with 69–72 bristles, otherwise similar to juvenile and adult males.

Sixth limb (Figure 323*f,g*): Anterior margin with upper and lower bristles; anteroventral corner with 4 bristles plus 1 on margin of flap; posteroventral margin with 19 bristles on right limb and 18 on left; minute medial bristle present in proximal anterior corner; limb hirsute.

Seventh limb: Each limb with 17 bristles, each bristle with 3 or 4 bells; opposing terminal combs with 16 or 17 spinous teeth.

Furca: Right lamella with 9 claws: claws 1 to 6 curved, claws 7 to 9 straight, claws 8 and 9 bristlelike. Left lamella similar to right except bristlelike claws recurved posteriorly.

Medial eye and rod-shaped organ (Figure 323*h*), *lateral eye, posterior*: Similar to that of adult and juvenile males.

Upper lip: Similar to adult and juvenile males except with 3 spines on each lobe.

REMARKS.—The only adult specimen of *E. weddellensis* in the collection is an adult male. Species previously described in the genus *Empoulsenia* are based on adult females. To have a basis for comparing the adult male with previously described females, a juvenile male and female of *E. weddellensis* were examined, both specimens being in the N–1 stage of development. Characters which are fairly similar in both sexes and in the N–1 and adult males are as follows:

	Adult male	*Juvenile male*	*Juvenile female*
Carapace: number of short processes between the posterior list and shell margin	5	5	5
Sixth limb: number of bristles on the posteroventral margin	19	18	18–19
Sixth limb: number of bristles on anterior margin	2	2	2
Seventh limb: number of bristles	16–17	17	17

COMPARISONS.—This species may be separated from previously described species of *Empoulsenia* by the following morphological differences (*E. weddellensis*, adult male; others, adult females):

	E. pentathrix	*E. quinquesetae*	*E. antarctica*	*E. weddellensis*
Carapace length, mm	2.20–2.49	2.88–3.1	3.37	3.36
Number of short processes between posterior list and valve margin	5	6–7	8	5
Number of bristles on posteroventral margin of 6th limb	20–21	22–24	29	19
Number of bristles on anterior margin of 6th limb	2	1	1–2	2
Number of bristles on 7th limb	18	22–26	30	16–17

DISTRIBUTION.—This species was collected only in the Weddell Sea at a depth of 650 m (Figure 308).

Empoulsenia Species Indeterminate

MATERIAL.—USNM 126126, 1 juvenile ♂, length 1.79 mm, height 0.98 mm, from *Eltanin* Cruise 6, station 410; USNM 126211, 1 juvenile ♂, length 2.41 mm, height 1.39 mm, from *Glacier* Cruise 2, station 0009, anchor dredge; USNM 126212, 1 juvenile ♂, length 2.41 mm, height 1.33 mm, from *Glacier* Cruise 2, station 0002, anchor dredge; USNM 126213, 1 juvenile ♀, length 1.98 mm, height 1.14 mm, *Glacier* Cruise 2, station 0008, anchor dredge; USNM 127279, 1 juvenile, length 2.21 mm, height 1.21 mm, from *Eltanin* Cruise 6, station 412; USNM 127280, 2 juveniles from *Eltanin* Cruise 6, station 412; 1 gravid ♀ with 10 eggs in marsupium, length 2.55 mm, *Discovery* Cruise 1, station 47 (identified as *Philippiella quinquesetae* by Lofthouse, 1967).

DISTRIBUTION.—The distribution of specimens assigned to this category is shown in Figure 308.

Homasterope, new genus

TYPE-SPECIES.—*Asterope curta* Skogsberg, 1920: 498, figs. 93, 94.

ETYMOLOGY.—The prefix "Hom" from the Greek "homos" [= same, uniform, like, similar] refers to the similarity of the sensory bristles on the 5th joints of the 1st antennae on males and females. Gender: feminine.

This new genus contains four species: *H. curta* (Skogsberg, 1920); *H. glacialis* (Müller, 1908); *H. maccaini*, new species; and *H. micra*, new species.

Poulsen (1965:362) included *Asterope curta* Skogsberg in his new genus *Parasterope*. In the diagnosis of *Parasterope*, Poulsen (1965:362) states concerning the sensory bristle on the 5th joint of the first antenna: "The bristle has in the female only the six long terminal filaments; in the males is along most of the stem a dense clothing of long, hair-like filaments, and about 6 stouter filaments are placed near the tip." Poulsen may have overlooked Skogsberg's statement (1920:501) that the sensory bristle of the male *A. curta* is of the same type as that of the female. A female-type sensory bristle is also present on the male *A. glacialis* (Müller, 1908, pl. 8: fig. 15) and on the male *H. maccaini* described herein. Because these three species differ in this important character from other species which have been referred to genera of Cylindroleberidinae, it is considered expedient to establish a new genus to include them.

DIAGNOSIS OF GENUS.—This genus is based on the presence of a female-type sensory bristle on the fifth joint of the male 1st antenna. The females of the new genus have fewer than 6 bristles along the dorsal margin of the 3rd joint of the 1st antennae, which is encountered rarely among other genera in the subfamily.

Carapace: Male and female carapace short and less than 2 mm long in four known species. Posterior infold without processes between list and posterior edge of valve; posterior list with numerous transparent bristles; number of bristles between list and posterior edge of valve varies considerably in different species.

First antenna: Dorsal margin of 3rd joint with 5 bristles on female and 4 or 5 on male; sensory bristle on 5th joint with only 6 terminal filaments on both male and female; d-bristle missing.

Second antenna: Protopodite with small medial bristle. Endopodite of female 3-jointed with terminal filament longer than stem; endopodite of male 3-jointed: 1st joint bare; 2nd joint with 3 distal ventral bristles; 3rd joint reflexed with fairly

long proximal bristle and ridges along tip. Exopodite: no basal spines except for lateral spine on 9th joint; 9th joint with 3 bristles.

Mandible: Ventral branch of coxale endite with 2 or 3 stout teeth at tip (known only for *H. maccaini*). Basale endite with glandular peg, 4 terminal bristles, 1 or 2 dwarf bristles and 3 or 4 triaenid bristles; latter bristles with only 2 to 5 pairs of marginal spines excluding terminal pair. Basale: dorsal margin of female without midbristles; dorsal margin of male bare or with 1 midbristle; medial surface of female with clusters of spines. Exopodite with hirsute tip and 2 short spinous bristles reaching proximal end of 1st endopodite joint. Endopodite: 2nd joint with long lateral bristle between b- and c-bristles on dorsal margin and relatively few (4–7) medial cleaning bristles.

Maxilla and fifth limb: Similar to those of *Parasterope*.

Sixth limb: Anterior margin with 1 upper bristle and 1 or 2 lower bristles (2 lower bristles present on at least 1 limb); anteroventral corner with 2 or 3 bristles; posteroventral margin with 16 to 20 bristles.

Seventh limb: Each limb with 14 to 18 bristles; terminus with 2 opposing combs, each with 5 to 9 teeth.

Furca: Each lamella with 7 to 9 claws.

Posterior: Posterior spinous with rounded dorsum.

Lateral eyes: Lateral eyes of female and male well developed, with about 20 ommatidia; eyes of male larger than those of female.

Rod-shaped organ: Organ 1-jointed with rounded tip.

COMPARISONS.—This new genus *Homasterope* is closely related to the genus *Parasterope* and is separated from it because of having a female-type sensory bristle on the 1st antenna of the male. Females may be identified by having fewer than the 6 bristles present on the dorsal margin of the 1st antenna. An exception is *Parasterope pollex* Kornicker, 1967, which also only has 4 or 5 bristles on the 3rd joint of the 1st antenna. Females of that species can be separated from those of *Homasterope* by having a thumblike dorsum.

DISTRIBUTION.—Species of the genus *Homasterope* have been collected only in the study area. The northernmost latitude specimens have been collected is 43°30′S off the Pacific Coast of Chile. The southernmost locality is at Gauss Station, 65°S, 90°E. The known depth range is 6 to 385 m (Figure 241).

Key to Species

1. Carapace length less than 1.4 mm 2
   Carapace length greater than 1.5 mm 3
2. Each lamella of furca with 7 claws ..... 93. *H. glacialis*
   Each lamella of furca with 9 claws ..... 95. *H. micra*
3. Posterior infold with more than 50 bristles ..... 92. *H. curta*
   Posterior infold with less than 20 bristles ..... 94. *H. maccaini*

92. *Homasterope curta* (Skogsberg)

Asterope curta Skogsberg, 1920:467, 498, figs. 93, 94.
Parasterope curta (Skogsberg).—Poulsen, 1965:363 [key].

HOLOTYPE.—According to Skogsberg (1920:504) the type-specimen is on slides in the Swedish State Museum.

TYPE-LOCALITY.—South Georgia, S.A.E. Station 25, 54°22′S, 36°27′W, depth 24–52 m, gray clay with scattered algae (Skogsberg, 1920:503).

MATERIAL EXAMINED.—None.

DIAGNOSIS.—Posterior section of infold of carapace with about 80 bristles between list bearing broad transparent bristles and posterior margin of valve. Length of female carapace 1.70–1.80 mm; length of male carapace 1.60–1.61 mm.

Seventh limb: With 14–18 bristles.

Furca: With 8 claws on each lamella.

DISTRIBUTION.—Collected only in the vicinity of South Georgia at depths of 12 m to 52 m (Figure 242).

93. *Homasterope glacialis* (Müller)

Cylindroleberis ovalis Müller, 1908:93, pl. 8: figs. 11–15; pl. 9: figs. 17, 18.

Asterope glacialis (Müller).—Müller, 1912:47 [new name].—Skogsberg, 1920:440, 467, 503.

HOLOTYPE.—Adult ♂, unique specimen.

TYPE-LOCALITY.—Gauss station, Antarctica.

MATERIAL EXAMINED.—None.

DIAGNOSIS OF ADULT MALE.—Carapace oval, length 1.35 mm.

Seventh limb: With 14 bristles.

Furca: With 7 claws.

DISTRIBUTION.—Collected only at type-locality (Figure 242).

94. *Homasterope maccaini*, new species

FIGURES 324–329

HOLOTYPE.—USNM 127383, gravid ♀, length 1.72 mm, height 1.31 mm. Valves and some appendages in alcohol, remaining appendages on slides.

TYPE-LOCALITY.—Palmer Station, station AH–70, submarine cliff, Arthur Harbor, Anvers Island.

ETYMOLOGY.—The species is named after Dr. John C. McCain.

PARATYPES.—USNM 127382, gravid ♀; USNM 127384, adult ♂; USNM 127385, gravid ♀, USNM 127386, gravid ♀; USNM 127387, 25 gravid ♀♀; USNM 127388, 11 adult ♀♀ without eggs in brood chambers; USNM 127389, 18 juveniles; USNM 127390, 5 adult ♂♂; USNM 127391, 1 adult ♂; USNM 127392, 1 gravid ♀; USNM 127393, 33 gravid ♀♀, 16 adult ♀♀, without eggs in brood chamber, 3 adult ♂♂, 10 juveniles; USNM 127394, 1 gravid ♀; USNM 127395, 1 adult ♂; USNM 127396, 2 specimens, 1 gravid ♀, 1 juvenile; USNM 127397, 1 adult ♂; USNM 138019, 1 adult ♀; USNM 138020, 1 gravid ♀ + 1 undissected specimen.

USNM 12782 from same sample as holotype; USNM 127384–USNM 127391 from station AH4–30; USNM 127392, USNM 127393 from station AH4–20; USNM 127394 from station AH4–80; USNM 127395 from station AH4–25; USNM 127396 from station AH4–50; USNM 127397 from station AH4–45; USNM 138019, 138020 from *Hero* Cruise 720, station 448.

ADDITIONAL SPECIMENS.—As a result of my request to the Royal Scottish Museum, Edinburg, for a loan of specimens from Gough Island identified by T. Scott (1912) as *Asterope oculata* Brady, I received ten complete specimens in alcohol in a vial with three labels: (1) "*Asterope oculata* Brady, S. Orkneys, June 1903, Scotia collection," (2) "1921–143–1146," and (3) "Royal Scottish Museum, Edinburg, *Asterope oculata* G.S. Brady, Scotia coll. Req. No. 1921–143–1146, Gough Island." In answer to my letter to A. Rodger Waterston, the Royal Scottish Museum, pointing out the discrepancy in locality data on labels 1 and 3, he kindly informed me (in litt, 1972) that the earlier label (label 1) should be regarded as that borne by the specimens prior to registration. He further stated that no specific locality data are given in the register and that he had added Gough Island to the label from Scott's paper. The ten specimens in the vial all appear to be *H. maccaini*, new species. I dissected a gravid ♀ and returned all specimens and the mounted appendages to the Royal Scottish Museum. Scott (1912) did not report *A. oculata* from the South Orkneys. The locality and month and year (day not given) on the label coincide with that given by Scott (1912:586) for *Asterope australis* Brady; however, the specimens identified by Scott as *Asterope australis* Brady have been referred herein to *Skogsbergiella scotti*. I have not indicated the occurrence of *H. maccaini* in the South Orkneys on species locality maps herein.

DIAGNOSIS.—Posterior infold with 1–6 bristles between broad list and valve margin. Length of female carapace 1.72–1.84 mm; length of male carapace 1.66–1.75 mm.

Seventh limb: With 14–18 bristles.

Furca: Female with 9 claws on each lamella, male with 8.

DESCRIPTION OF FEMALE (Figures 324, 325, 327, 328).—Carapace tumid, small, greatest height behind valve middle; incisur short, placed well below valve middle; ventral and posterior margins rounded (Figure 324*a,f*); surface smooth, minute punctae visible under high magnification.

Infold (Figures 324*c,d,g*; 325): Infold behind rostrum with about 35 bristles near outer margin and about 19 bristles in vicinity of incisur; infold below incisur with about 32 bristles; about 16 bristles present along ventral part of infold; 1 to 5 bristles between posteroventral margin of valve

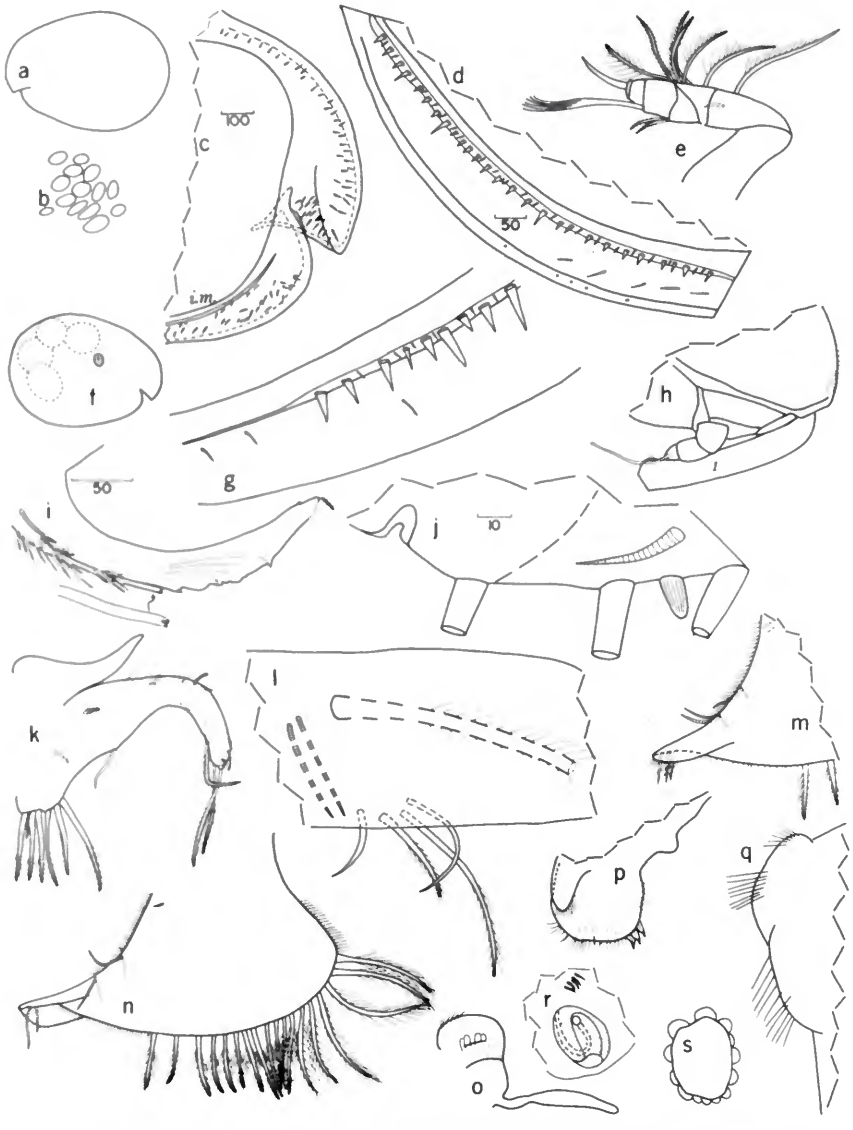

FIGURE 324.—*Homasterope maccaini*, female, USNM 127382, length 1.83 mm, carapace: *a*, complete specimen, lateral view. Left valve, medial view: *b*, central muscle attachments; *c*, anterior; *d*, posteroventral corner. Second antenna: *e*, right limb, medial view (not all bristles on joints 6–8 shown). Female, USNM 127283, length 1.72 mm, carapace: *f*, complete carapace showing positions of lateral eye and eggs; *g*, posteroventral corner of right valve, medial view. Left 2nd antenna: *h*, endopodite and parts of protopodite and exopodite, medial view. Right mandible, medial view: *i*, coxale endite; *j*, dwarf bristle, glandular peg and 2 stumps of triaenid bristles on basale endite, U-shaped depression and stump of triaenid bristle on basale. Maxilla: *k*, left limb, medial view. Left 5th limb: *l*, exopodial bristles, medial view. Sixth limb: *m*, anterior of left limb, lateral view; *n*, right limb, medial view. Anterior: *o*, medial eye and rod-shaped organ; *p*, upper lip, anterior to right. Posterior: *r*, right genitalia and brushlike organ. Lateral eye: *s*, right eye (ommatidia within outline not shown). (Same magnification in microns: *b,c,e; d,h,k,m-s; g,i; j,l*.)

and broad list near inner margin of infold (South Orkney specimen also with 1 bristle in dorsal half of posterior infold); list present starting near inner margin of anterior part of infold below incisur, extending along ventral infold, and continuing on posterior infold where it broadens; posterior list with 26 to 31 broad transparent bristles and 22 to 26 small bristles; generally 1 small bristle present between broad bristles.

Selvage: Small lamellar prolongation with fringe of hairs present along lower margin of incisur.

Muscle scars: Central muscle scars consisting of about 14 individual scars below valve middle (Figure 324*b*).

Size (Figure 326): USNM 127382, length 1.83 mm, height 1.35 mm; USNM 127383, length 1.72 mm, height 1.31 mm; USNM 127385, length 1.83 mm, height 1.37 mm; USNM 127386, length 1.81 mm, height 1.33 mm; USNM 127392, length 1.84 mm, height 1.32 mm; USNM 127394 (not dissected), length 1.79 mm, height 1.29 mm; USNM 127396 (not dissected), length 1.75 mm, height 1.37 mm; USNM 138019, length 1.80 mm, height 1.35 mm; USNM 138020, length 1.74 mm, height 1.25 mm; *Scotia* specimen from the South Orkneys, length 1.78 mm, height 1.29 mm.

First antenna: Medial and lateral surfaces of 1st joint with short spines forming clusters; 2nd joint with spines forming clusters on medial and lateral surfaces and along dorsal and ventral margins, 1 long spinous bristle distal to middle of dorsal margin and 1 short spinous lateral bristle; ventral margin of 3rd joint with 1 short bare bristle and short spines, dorsal margin with 5 long spinous bristles; 3rd plus 4th joints quadrate; proximal margin of 3rd joint and distal margin of 4th joint concave; lateral suture between 3rd and 4th joints indistinct, medial suture distinct; dorsal margin of 4th joint with 1 long spinous bristle, ventral margin with 2 slender spinous bristles reaching past end of 5th joint; sensory bristle of 5th joint with 6 long terminal filaments; minute spines forming row on distal half of dorsal margin of 5th joint; medial bristle of 6th joint spinous, reaching past a-claw of 7th joint. Seventh joint: a-claw with short spines along middle of dorsal margin; b-bristle with 5 filaments including tip; c-bristle with 6 filaments including tip. Eighth joint: no d-bristle; e-bristle bare, about same length as b-bristle; f-bristle bent at angle to stem, with 5 filaments including tip; g-bristle with 6 filaments including tip.

(First antenna of USNM 127382 aberrant with only 4 bristles on dorsal margin of 3rd joint of left limb and 3 bristles on right limb; no bristle on dorsal margin of 4th joint of right limb.)

Second antenna (Figures 324*e,h*; 327): Protopodite with small medial bristle, and spines along dorsal margin. Endopodite 3-jointed with terminal filament longer than stem. Exopodite: 1st joint with clusters of long distal spines on inner margin; bristle of 2nd joint reaching past end of 9th joint and with numerous narrow spines along ventral margin; bristles of joints 3 to 8 with natatory hairs; a few proximal spines on ventral margin of bristle of 3rd joint; 9th joint with 3 bristles, 2 long with natatory hairs, 1 short with short marginal spines; comb of short spines present along distal margins of joints 2 to 8; lateral spine on 9th joint, basal spines not present on other joints.

Mandible (Figure 324*i,j*): Ventral branch of coxale endite with 4 rows of spines and 2 or 3 stout teeth at tip; ventral margin of dorsal branch with 4 or 5 weakly developed rounded teeth and small main spine; bristle with marginal spines present at tip of dorsal branch; bristle present near basis of coxale endite. Basale endite with elongate glandular peg, 4 terminal bristles, 3 triaenid bristles with 3 to 5 pairs of marginal spines excluding terminal pair, and 1 or 2 dwarf bristles (2nd dwarf bristle, when present, is less than half length of other bristle). Basale: 1 triaenid bristle with 2 or 3 pairs of marginal spines present on ventral margin near basis of endite proximal to U-shaped sclerotized area (on some limbs this bristle is on endite); dorsal margin with 2 long spinous terminal bristles; medial surface with clusters of spines. Exopodite with hirsute tip and 2 short spinous bristles reaching end of 1st endopodite joint. Endopodite: 1st joint with 3 long spinous ventral bristles; dorsal margin of 2nd joint with single proximal bristle about half length of a-bristle, spinous a-, b-, c-, and d-bristles, 1 or 2 short medial bristles, 1 long lateral bristle present between b- and c-bristles, both with short marginal spines, 4 or 5 spinous medial cleaning bristles near basis of c-bristle, 1 long spinous lateral bristle between c- and d-bristles, and 1 long spinous medial bristle distal to basis of d-bristle; ventral margin with 3 long spinous terminal bristles; 2nd joint with clusters of spines on

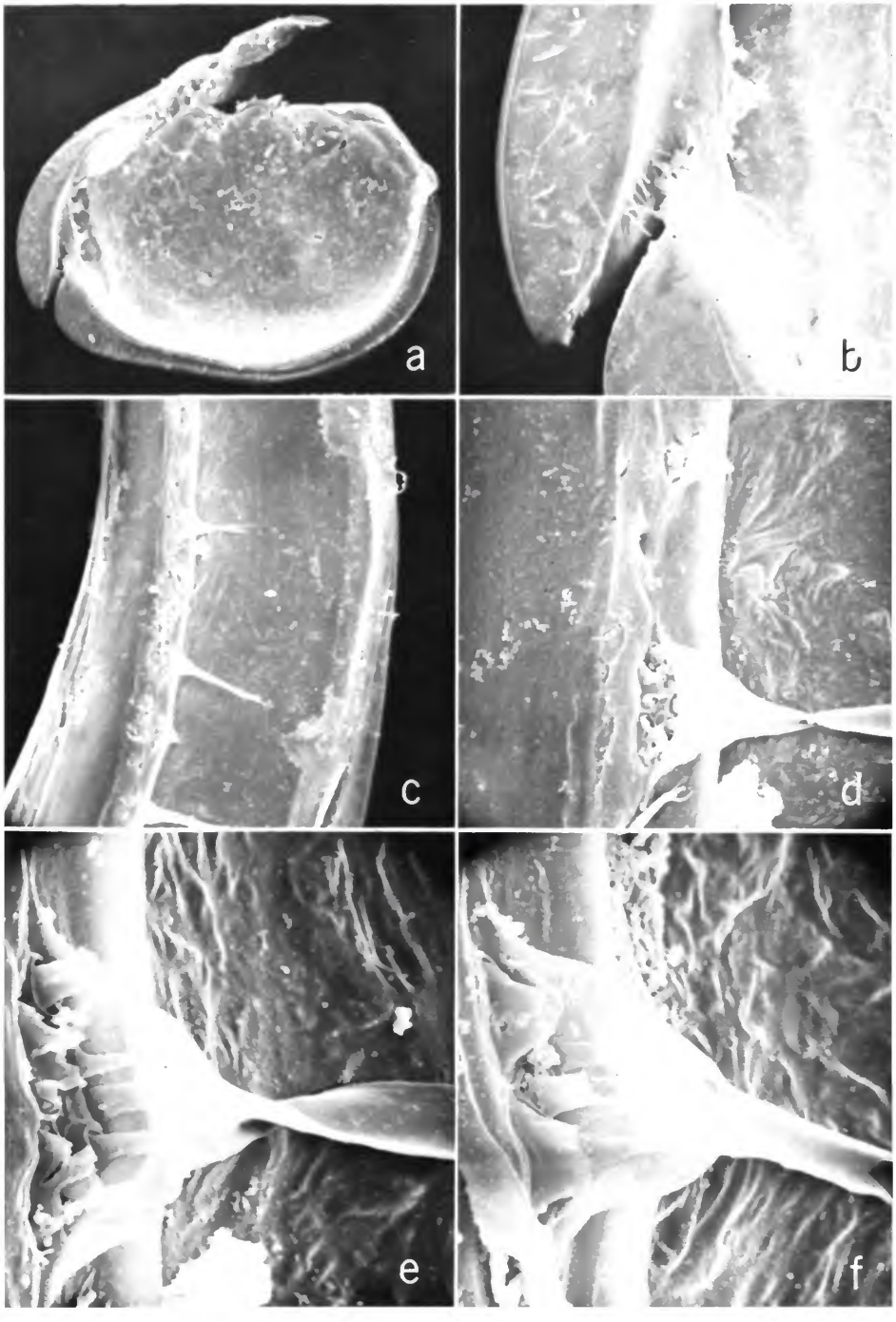

FIGURE 325.—*Homasterope maccaini*, female, USNM 138019, right valve, medial view: *a*, complete valve, × 47; *b*, anterior, × 190; *c*, detail of posterior, posterior of valve toward top of picture, × 460; *d*, detail from "*c*," × 1850; *e*, detail from "*d*," × 5000; *f*, detail of tubes at base of middle transparent bristle shown in "*c*," × 5000.

medial surface; end joint with 5 spinous bristles and long dorsal claw with minute teeth along middle of inner margin.

Maxilla (Figure 324*k*): Epipodite elongate bare or hirsute; proximal endite with 4 bristles, 3 long, 1 short; distal endite with 3 long bristles. Basale: dorsal margin with fringe of hairs and short distal bristle; 1 spinous proximal bristle on medial surface, and 1 short proximal bristle on lateral surface; ventral margin with 1 medium bare bristle near middle, a small distal bristle and a long spinous terminal bristle. Endopodite: 1st joint with short anterior distal bristle and 1 long spinous 6-bristle, and a few clusters of spines on surface; end joint with long spinous terminal bristle.

Fifth limb: Dorsal margin of comb bare, hairs present at distal end. Exopodite: main hirsute bristle reaching past end of comb; 2 slender bristles present near basis of main bristle; 4 bristles present near ventral margin (Figure 324*l*).

Sixth limb (Figure 324*m,n*): Anterior margin with 1 upper bristle and 1 or 2 lower bristles; anteroventral corner with 2 or 3 bristles; posteroventral margin with 16 to 20 bristles; minute bristle present in upper anterior corner of medial side; medial and lateral surfaces hirsute. Distribution of bristles on limbs of three specimens is as follows:

	USNM 127382		*USNM 127383*		*USNM 127385*
	left	*right*	*left*	*right*	*left*
Anterior					
upper	1	1	1	1	1
lower	2	1	2	1	2
Anteroventral	3	2	3	2	–
Posteroventral	17	20	16	18	–

Seventh limb: Each limb with 14 to 18 bristles: 6 or 7 bristles in distal group, 10 or 11 in proximal group, each bristle with 2 to 4 bells. Terminus with 2 opposing combs, each with about 7 spinous teeth. (Some limbs with bristles not distinctly divided into distal and proximal groupings.) Distribution of bristles on three specimens is as follows (A and B refer to opposing limbs):

	USNM 127382		*USNM 127383*		*USNM 127385*	
	A	*B*	*A*	*B*	*A*	*B*
Distal bristles	7	6	6	6	6	6
Proximal bristles	11	11	10	11	8	9
Total	18	17	16	17	14	15

Furca: Each lamella with 9 claws: 6 primary with 2 rows of teeth along concave margin, 3 secondary, bristlelike. Claws 1 and 2 with distal hairs along convex margin. Claws 1 to 3 with pointed tips and curved, claws 4 to 6 almost straight. Long slender teeth present at intervals among the more numerous short teeth on claws 1 to 3.

Lateral eyes (Figure 324*s*): Eyes large, pigmented, with about 20 ommatidia.

Medial eye and rod-shaped organ (Figure 324*o*): Medial eye about same size as lateral eye, pigmented, with few short hairs along top. Rod-shaped organ elongate, 1-jointed with rounded tip, broadest near middle.

Upper lip (Figure 324*p*): Lip consisting of 2 hirsute lobes with 3 broad anterior spines; lateral hirsute flap on each side of mouth. A single rounded knob present on anterior between upper lip and medial eye.

Posterior: Posterior with long spines; dorsum rounded, spinous.

Genitalia and brushlike organ (Figure 324*r*): Genitalia ovoid with curved tube visible leading from small opening. Brushlike organ consisting of about 5 minute bristles dorsal to genitalia.

Eggs: USNM 127382 and USNM 127385 with 7 eggs in brood chamber, USNM 127383 with 8, USNM 127386 with 11, USNM 127392 with 6, USNM 138020 with 9, South Orkney specimen with 11.

Description of Male (Figure 329).—Carapace with greatest height near middle; ventral margin fairly linear, dorsal margin arched (Figure 329*a*); surface finely punctate as on carapace of female; fine hairs present in vertical row near posterior; central muscle scars located more posteriorly on carapace than on female.

Infold: In general, similar to that of female but with fewer bristles on infold of rostrum; some bristles on infold of rostrum and below incisur longer than those of female.

Size (Figure 326): USNM 127384, length 1.75 mm, height 1.21 mm; USNM 127391, length 1.73 mm, height 1.22 mm. USNM 127390 (5 specimens not dissected): length 1.71 mm, height 1.20 mm; length 1.70 mm, height 1.24 mm; length 1.69 mm, height 1.15 mm; length 1.71 mm, height 1.22 mm; length 1.71 mm, height 1.21 mm. USNM 127395 (not dissected), length 1.71 mm, height 1.21 mm;

USNM 127397 (not dissected), length 1.66 mm, height 1.19 mm.

First antenna: Limb larger than that of female; 1st joint without spines; 2nd joint with about 6 clusters of minute spines along ventral margin and with 2 bristles as on female; 3rd joint with short ventral bristle and 4 or 5 dorsal bristles; 3rd and 4th joints more elongate than on female; proximal margin of 3rd joint straight; distal margin of 4th joint straight laterally, slightly concave medially; 4th joint with 3 bristles as on female; 5th joint with maximum length about half length that of female, and with ventral margin about half length that of dorsal margin; sensory bristle of 5th joint and bristle on 6th joint similar to those of female. Seventh joint: a-claw shorter than that on female; b-bristle with 6 filaments including tip; long c-bristle with 19 marginal filaments (tip broken). Eighth joint: no d-bristle; e-bristle bare, about half length of b-bristle; long f-bristle with 18 filaments including tip; g-bristle with 9 filaments including tip.

Second antenna (Figure 329*b,c*): Protopodite with bare margins and small medial bristle. Endopodite 3-jointed: 1st joint bare; 2nd joint with 3 short distal ventral bristles; 3rd joint reflexed with fairly long proximal bristle, tip of joint with several ridges. Exopodite: all bristles with natatory

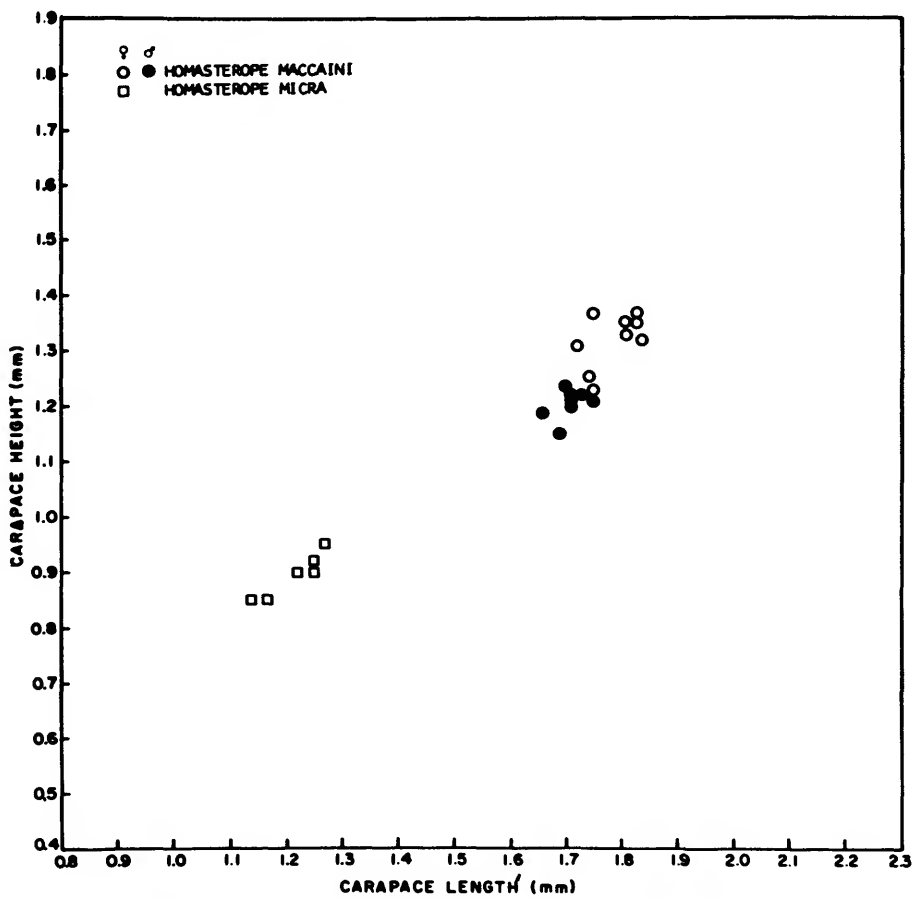

FIGURE 326.—Comparison of relationship between shell length and height of adults of *Homasterope*.

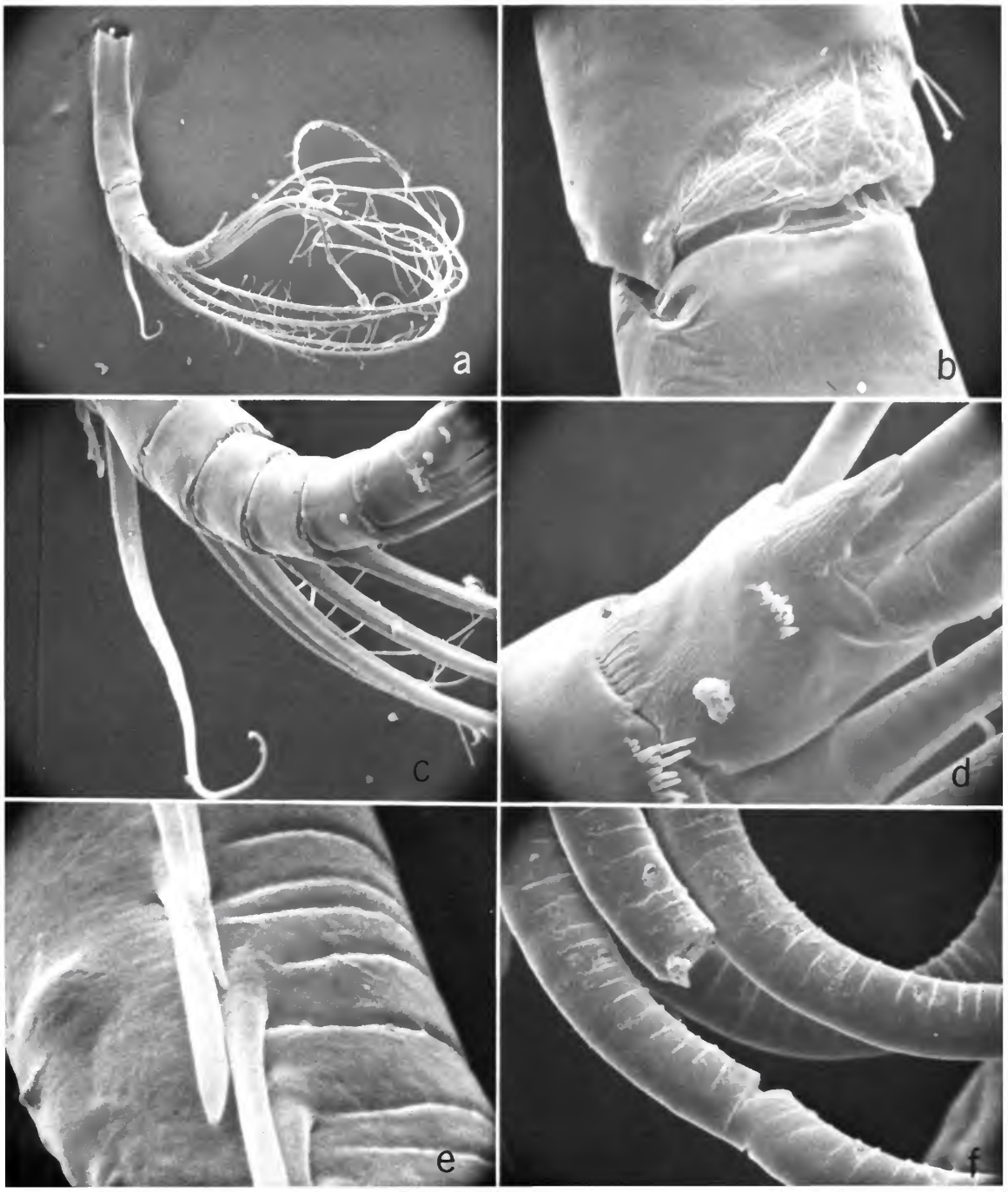

FIGURE 327.—*Homasterope maccaini*, female, USNM 127392, exopodite of left 2nd antenna, lateral view: *a*, joints 1–9, × 135; *b*, detail of distal part of 1st joint and proximal part of 2nd joint, × 200; *c*, detail of joints 3–9, × 500; *d*, detail of joints 8–9, × 2000; *e*, detail of bristle on 2nd joint, × 10,000; *f*, detail of bristles on joints 4–7, × 1000.

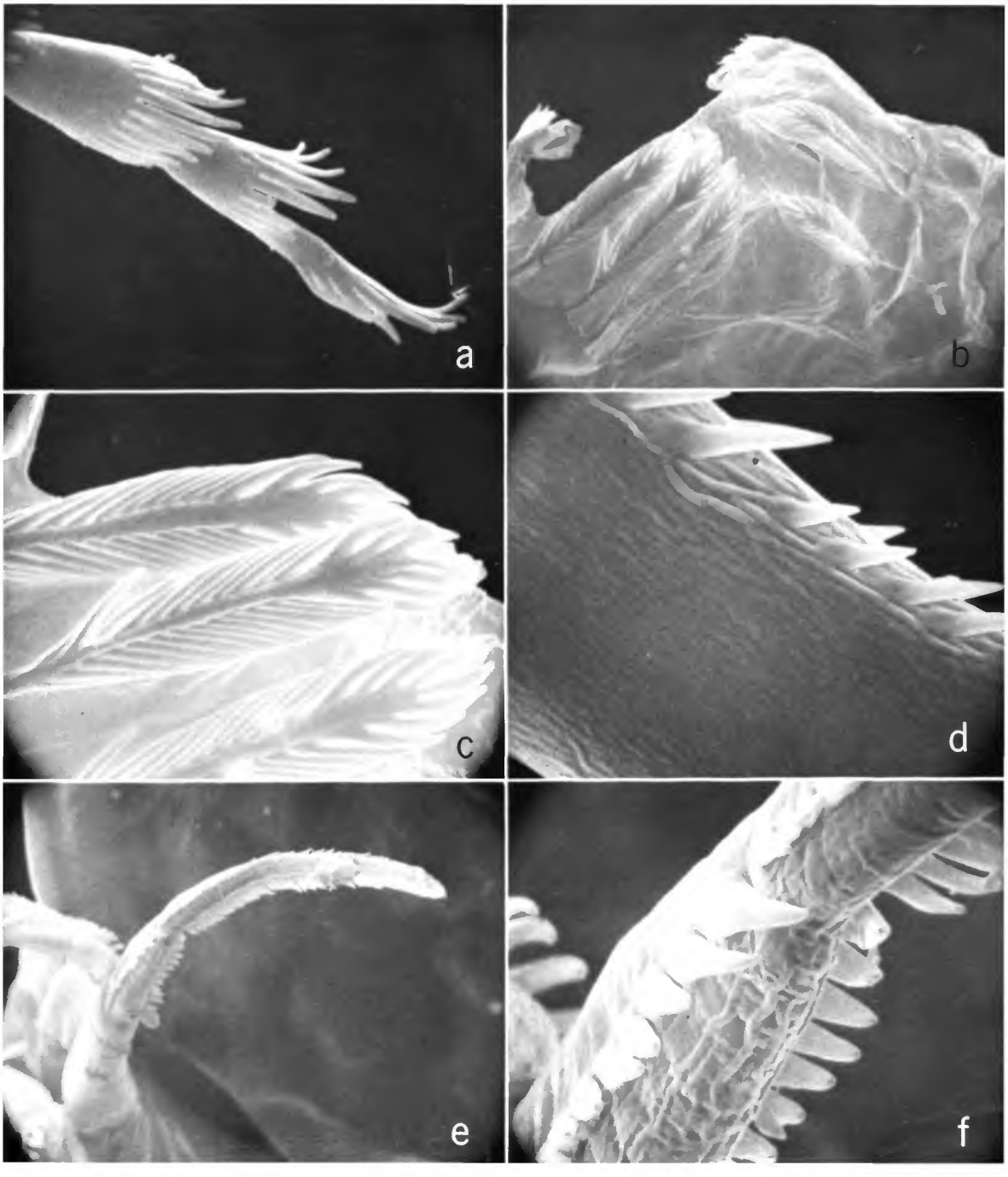

FIGURE 328.—*Homasterope maccaini*, female, USNM 127392, 7th limb: *a*, tip of bristle, × 5000; *b*, terminal combs, × 2000; *c*, detail of comb teeth in "*b*," × 5000. Furca: *d*, detail of teeth on 3rd claw of furca, × 5000. Mandible: *e*, end bristles on basale endite, × 1300; *f*, proximal part of end bristle shown in "*e*," × 6500.

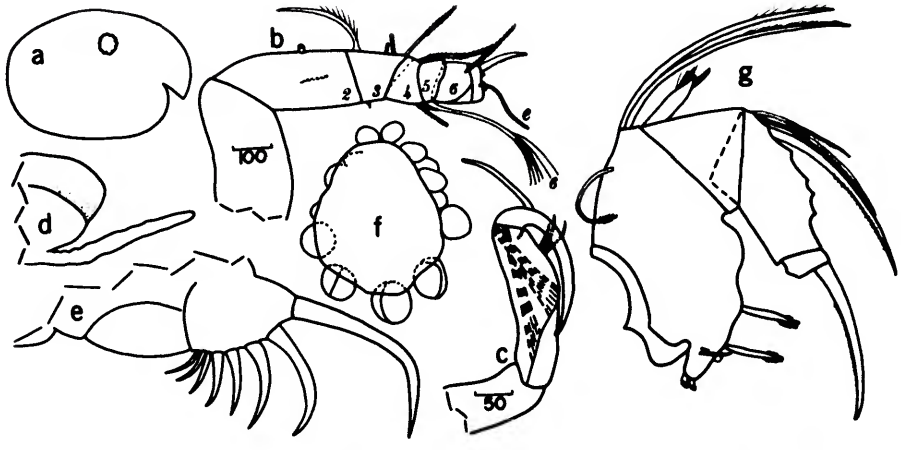

FIGURE 329.—*Homasterope maccaini*, male, USNM 127384, length 1.75 mm: *a*, complete specimen, lateral view; *b*, left 2nd antenna, medial view (a-claw twisted, not all bristles of joints 7–8 shown); *c*, endopodite of left 2nd antenna, lateral view; *d*, medial eye and rod-shaped organ; *e*, right lamella of furca; *f*, lateral eye (ommatidia within outline not shown). Male, USNM 127391: *g*, left mandible, medial view (not all bristles shown). (Same magnification in microns: *c-g*.)

hairs; bristle of 2nd joint very long, longer than combined joints 1 to 9; 9th joint with 3 bristles and small lateral spine with minute spines along distal margin.

Mandible (Figure 329*g*): Differs from that of female in having 1 midbristle on dorsal margin of basale and 2 proximal bristles on dorsal margin of 2nd endopodite joint.

Maxilla: Same as that of female.

Sixth limb: Similar to that of female; 2 lower anterior bristles observed on right limb of USNM 127384.

Seventh limb: Same as that of female.

Furca: (Figure 329*e*): Each lamella with 8 claws: 6 primary, 2 secondary, bristlelike; claws 1 to 3 more strongly curved than those on furca of female.

Lateral eye (Figure 329*f*): Eyes of male similar to those of female but larger.

Medial eye and rod-shaped organ (Figure 329*d*): Same as on female.

COMPARISONS.—This species is closely related to *Homasterope curta* (Skogsberg), which was described by Skogsberg (1920:498) from specimens collected in the vicinity of South Georgia. The infold of the carapace of *H. curta* has about 80 bristles forming a row between the list and posterior shell margin (see Skogsberg, 1920:499, fig. 93–5). The infold in this position on *H. maccaini* bears only 1 to 5 bristles, and these are generally restricted to the ventral part.

This new species is also closely related to *Homasterope glacialis* (Müller, 1912:47), which was described by Müller (1908:93) from specimens collected at "Gauss Station," Antarctica. Only the adult male was described. This is smaller than the male *H. maccaini*, length 1.35 mm, compared to 1.66–1.75 mm, and has only 7 claws on the furca instead of 8 as on *H. maccaini*.

DISTRIBUTION.—This species was collected only in the Scotia subregion of Antarctica at shelf depths (6–24 m) (Figure 242).

95. *Homasterope micra*, new species

FIGURES 330, 331

HOLOTYPE.—USNM 136071, gravid ♀, length 1.14 mm, one valve and some appendages in alcohol, remaining appendages and one valve on slides.

TYPE-LOCALITY.—*Vema* Cruise 17, station V-17-12.

ETYMOLOGY.—The specific name is derived from the Greek "mikros" [= small, little] in reference to the small size of the carapace of the new species.

PARATYPES.—USNM 136072, 136073, 2 adult ♀ ♀; USNM 136074, 1 gravid ♀ (not dissected); USNM 136075, 1 adult ♀ with unextruded eggs; USNM 136076, 1 adult ♀ without eggs. Paratypes from same sample as holotype.

DIAGNOSIS OF ADULT FEMALE.—Posterior infold with 25–29 bristles between broad list and valve margin; carapace length 1.14–1.27 mm.

Seventh limb: With 12 bristles.

Furca: Each lamella with 9 claws.

DESCRIPTION OF FEMALE.—Carapace tumid, small, greatest height behind middle (Figure 330*a*); incisur below middle of anterior margin; surface smooth, minute pores visible under high magnification.

Infold (Figures 330*b-d*; 331): Rostrum with about 31 bristles plus about 13 bristles in area of incisur; infold below incisur with about 25 bristles; about 19 bristles present along ventral part of infold; 25–29 bristles present between posteroventral margin of valve and broad list near inner margin of infold; broad posteroventral list with about 21 broad transparent bristles and about 14 minute bristles; generally not more than 1 small bristle between broad bristles.

Selvage: Small lamellar prolongation present along lower margin of incisur (Figure 331*c*).

Muscle scars: Central muscle scars consisting of about 15 individual scars.

Size (Figure 326): USNM 136071, length 1.14 mm, height 0.85 mm; USNM 136072, length 1.25 mm, height 0.90 mm; USNM 136073, length 1.17 mm, height 0.85 mm; USNM 136074, length 1.22 mm, height 0.90 mm; USNM 136075, length 1.25 mm, height 0.92 mm; USNM 136076, length 1.27 mm, height 0.95 mm.

First antenna (Figure 330*e*): Medial and lateral surfaces of 1st joint with long spines forming clusters; 2nd joint with spines forming clusters on lateral and medial surfaces and along ventral and dorsal margins, and 2 spinous bristles (lateral bristle short, dorsal bristle long); ventral margin of 3rd joint with 1 short bare bristle, dorsal margin with 5 long spinous bristles; 3rd plus 4th joints quadrate; distal margin of 4th joint concave; lateral suture betweeen 3rd and 4th joints indistinct, medial suture distinct; dorsal margin of 4th joint with long bristle with short marginal spines; ventral margin with few spines and 2 slender spinous bristles, longest of these reaching distal end of 5th joint; sensory bristle of 5th joint with 6 long terminal bristles; minute spines on lateral side of distal half of dorsal margin of 5th joint; medial bristle of 6th joint spinous reaching past a-claw of 7th joint. Seventh joint: a-claw with short spines along proximal part of dorsal margin; b-bristle with 5 filaments including tip; c-bristle with 6 filaments including tip. Eighth joint: d-bristle absent or represented by minute pore or process; e-bristle bare, almost same length as b-bristle; f-bristle bent at right angle to stem, with 5 filaments including tip; g-bristle with 6 filaments including tip.

Second antenna (Figure 330*f,g*): Protopodite with short medial bristle, long spines along dorsal margin and both long spines and short stout teeth along ventral margin. Endopodite 3-jointed with terminal filament longer than stem. Exopodite: 1st joint with clusters of long spines present distally on inner margin; bristle of 2nd joint reaching past end of 9th joint and with numerous spines along ventral margin; bristles of joints 3 to 8 with natatory hairs, and short spines along ventral margin; 9th joint with 3 bristles, 2 long with natatory hairs, 1 short with short marginal hairs; lateral spine present on 9th joint, basal spines absent on other joints.

Mandible (Figure 330*h,i*): Coxale hirsute; ventral branch of coxale endite with 4 rows of spines, and about 4 slender spines at tip; bristle present near base of ventral branch (dorsal branch broken). Basale endite with elongate glandular peg, 4 terminal bristles, 3 triaenid bristles with 5 or 6 pairs of marginal spines excluding terminal pair, 1 fairly long dwarf bristle. Basale: 1 triaenid bristle with 3 pairs of marginal spines present on ventral margin proximal to U-shaped sclerotized area; dorsal margin with 2 long spinous terminal bristles; medial surface and dorsal part of lateral surface with clusters of long spines. Exopodite with hirsute tip and 2 short spinous bristles reaching end of 1st endopodite joint. Endopodite: 1st joint with 3 long spinous ventral bristles; dorsal margin of 2nd joint with single proximal bristle about one-third length of a-bristle, spinous a-, b-, c-, and d-bristles, 2 short medial bristles and 1 long lateral bristle between b- and c-bristles, 4 spinous medial cleaning bristles near basis of c-bristle, 1 long spinous lateral bristle between c- and d-bristles, 1 long spinous medial bristle distal to basis of d-bristle; ventral margin with 3 long spinous terminal

FIGURE 330.—*Homasterope micra*, female, USNM 136071, length 1.14 mm, carapace: *a*, complete specimen, lateral view; *b*, anterior of right valve, medial view; *c*, posterior of right valve, medial view; *d*, detail of "*c*." Right 1st antenna: *e*, distal part, lateral view (not all bristles or marginal spines shown). Second antenna: *f*, spines on protopodite and 1st exopodial joint of left limb, lateral view; *g*, endopodite on right limb, medial view. Left mandible, medial view: *h*, basale, exopodite, and endopodite (not all bristles shown); *i*, ventral branch and proximal bristles on coxale endite. Maxilla: *j*, right limb, lateral view; *k*, left limb, lateral view. Right 5th limb: *l*, comb, lateral view. Sixth limb: *m*, right limb, medial view (marginal spines of bristles not shown). Furca: *n*, left lamella. Anterior: *o*, medial eye and rod-shaped organ, dorsal view; *p*, upper lip. Posterior: *q*, posterior margin with 2 posterior furcal claws at bottom. Lateral eye: *r*, left eye. Female, USNM 136072, length 1.25 mm: *s*, anterior showing medial eye and rod-shaped organ; upper lip, dashed outline of left lateral eye. (Same magnification in microns: *b,c,e,m,n,p-s; d,o; h,j,k; g,i,l.*)

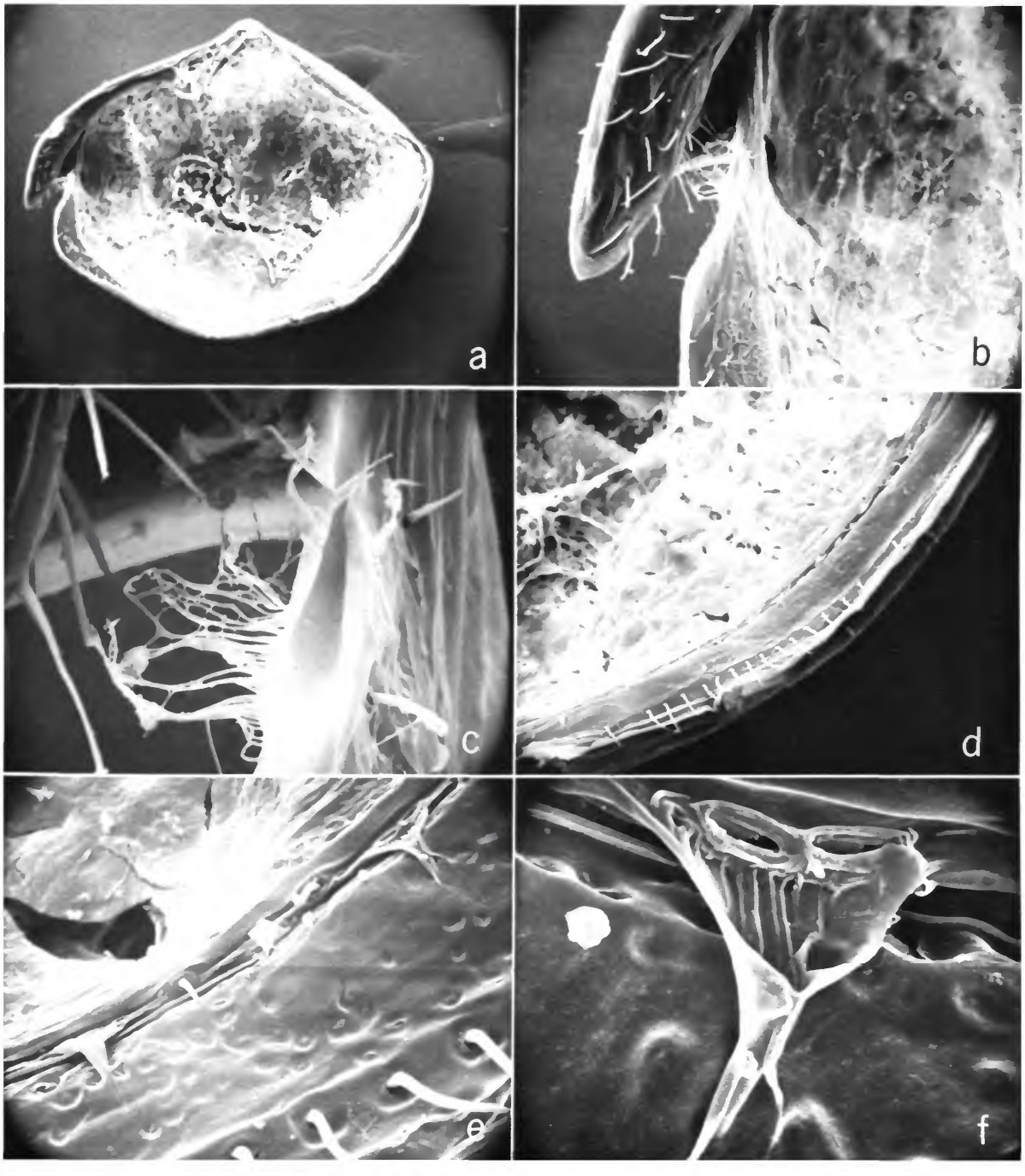

FIGURE 331.—*Homasterope micra*, female, USNM 136071, right valve, medial view: *a*, complete valve (distorted), × 71; *b*, anterior, × 294; *c*, lamella prolongation of incisur, × 1475; *d*, posteroventral end of valve, × 294; *e*, detail of "*d*," × 1470; *f*, flaplike bristle of posterior list showing two dorsal pores (specimen tilted to photograph), × 5310.

bristles; clusters of spines present on medial surface of joint; end joint with 5 spinous bristles and long dorsal claw with minute teeth along middle of inner margin.

Maxilla (Figure 330*j,k*): Epipodite elongate hirsute; proximal endite with 4 bristles; 3 long, 1 short; distal endite with 3 long bristles. Basale with fringe of long hairs on dorsal margin, 1 medial proximal bristle, 1 short proximal lateral bristle, 3 ventral bristles (1 proximal, 1 short distal, 1 long spinous terminal). Endopodite: 1st joint with short anterior distal bristles and 1 long 6-bristle; end joint with long terminal bristle.

Fifth limb (Figure 330*l*): Dorsal margin of comb bare, hairs present at distal end. Exopodite: main hirsute bristle reaching past end of comb; 2 slender bristles present near basis of main bristle; 4 bristles present near ventral margin.

Sixth limb (Figure 330*m*): Anterior margin with 1 upper and 1 lower bristle; anteroventral corner with 2 bristles plus 1 on lateral flap; posteroventral margin with 12–15 bristles; minute bristle present in upper anterior corner of medial side; medial and lateral surfaces hirsute.

Seventh limb: Each limb with 12 bristles, 6 in proximal group (3 on each side), 6 in terminal group (3 on each side), each bristle with 2 to 4 bells. Terminus with opposing combs, each with about 9 spinous teeth.

Furca (Figure 330*n*): Each lamella with 9 claws, 6 primary, 3 secondary. Claws 1 and 2 with distal hairs along convex margin; primary claws with long and short teeth along concave margin.

Posterior (Figure 330*q*): Posterior with long spines; dorsum rounded, spinous.

Lateral eyes (Figure 330*r*): Eyes fairly small, about half diameter of medial eye, with about 10 or 11 ommatidia.

Medial eye and rod-shaped organ (Figure 330*o,s*): Medial eye pigmented, with dorsal hairs. Rod-shaped organ 1-jointed, elongate with rounded tip, broadening near middle.

Upper lip (Figure 330*s*): Lip consisting of 2 hirsute lobes, each with anterior spine; lateral hirsute flap present on each side of mouth.

Eggs: USNM 136071 with 5 eggs in brood chamber, additional eggs unextruded.

Parasites: USNM 136075 with 1 choniostomatid copepodite.

REMARKS.—To be certain that this species is correctly referred to the genus *Homasterope*, it would be necessary to have adult males. In their absence, the presence of only 5 bristles on the dorsal margin of the 3rd joint of the female has been considered sufficient evidence to place the species in *Homasterope* rather than *Parasterope*, to which it should be assigned if the male should prove to have a sensory bristle on the 5th joint of the 2nd antenna developed differently than that on the female.

COMPARISONS.—The new species, *H. micra*, is smaller than both *H. curta* and *H. maccaini*. It also differs in having 25–29 bristles on the infold between the broad list and posterior valve margin; in this area *H. curta* bears about 80 bristles and *H. maccaini* only 1–5 bristles. The lateral eye of *H. micra* contains only 10 ommatidia compared to 20 in the lateral eye of *H. maccaini*. Only the male of *H. glacialis* is known. It differs from *H. micra* in having 7 instead of 9 claws on the caudal furca. The 7th limb of *H. micra* bears only 6 bristles in the proximal group, whereas, other species referred to this genus have at least 8 bristles in that group.

DISTRIBUTION.—This species was collected only at the type-locality in the Subantarctic-to-35°S region west of Chile at 112 m (Figure 242).

Bathyleberis, new genus

TYPE-SPECIES.—*Bathyleberis grossmani*, described herein.

ETYMOLOGY.—The generic name "Bathyleberis" is derived from the Greek "Bathyal" [= deep] and "leberis" [= sloughed skin]. Gender: feminine.

This new genus contains three new species described herein, *B. grossmani*, *B. oculata*, and *B. monothrix*; males are unknown.

DIAGNOSIS OF GENUS.—Carapace: Carapace elongate without ornamentation; list on posterior infold with hyaline spines and bristles between them; infold between list and posterior valve margin with or without bristles and processes.

First antenna: Sensory bristle with 7 long terminal filaments on *B. grossmani* and 1 short proximal and 6 long terminal filaments on *B. monothrix* and *B. oculata*; d-bristle about one-half length of e-bristle on *B. grossmani*, about three-fourths length on *B. monothrix*, and about one-fifth on

B. oculata; d-bristles tapering, with marginal spines on some species.

Second antenna: Medial and lateral surfaces of protopodite spinous or bare.

Mandible: Tip of ventral branch of coxale endite with 3 teeth. Dorsal margin of basale with 1–4 midbristles and terminal pair. Exopodite reaching about middle of dorsal margin of 1st endopodite joint and with 2 short bristles on hirsute tip. Dorsal margin of 2nd endopodite joint with long lateral bristle between b- and c- bristles.

Sixth limb: Anterior margin of limb of *B. grossmani* with 6 or 7 bristles; anterior margin of limb of *B. monothrix* with only 1 (on upper suture); anterior margin of limb of *B. oculata* with 2 bristles.

Seventh limb: *B. grossmani* with 6 proximal and 6 distal bristles and terminal combs with 9 teeth; *B. monothrix* with 8 proximal and 6 distal bristles and terminal combs with 14–17 teeth; *B. oculata* with 6 proximal and 6 distal bristles and terminal combs with 20 or 21 teeth.

Furca: Limb normal for subfamily.

Eyes: Medial eye well developed with or without hairs. Lateral eyes absent on *B. grossmani* and *B. monothrix*, well developed on *B. oculata*.

COMPARISONS.—The only previously described genera in the subfamily with a well-developed d-bristle on the 1st antenna are *Dolasterope, Empoulsenia, Skogsbergiella,* and *Archasterope*. On these four genera the d-bristle is a filament with almost parallel sides from the base to the tip, which is either rounded and bears a minute spine, or is blunt. The d-bristle on the 1st antenna of *Bathyleberis* tapers from the base to the tip and may bear faint marginal spines. *B. grossmani* also differs from species of *Archasterope, Empoulsenia,* and *Skogsbergiella* in having 6 or 7 bristles on the anterior margin of the 6th limb.

DISTRIBUTION.—*Bathyleberis* is represented in the study area in the Atlantic and Pacific Oceans and in the vicinity of New Zealand. The northernmost latitude at which it was collected is 41°S; the southernmost latitude was 61°S (Figure 241). Species in the genus were collected at water depths of 71 to 4303 m.

Key to Species

1. Sensory bristle of 1st antenna with 7 long terminal filaments, anterior margin of 6th limb with 6 or 7 bristles ..... 96. *B. grossmani*
   Sensory bristle of 1st antenna with 1 short proximal and 6 long terminal filaments, anterior margin of 6th limb with 1 or 2 bristles 2
2. Lateral eye absent or, if present, without ommatidia, anterior margin of 6th limb with 1 bristle; dorsal margin of mandibular basale with 1 midbristle ..... 97. *B. monothrix*
   Lateral eye well developed with about 18 ommatidia; anterior margin of 6th limb with upper and lower bristle; dorsal margin of mandibular basale with 3 or 4 midbristles .. 98. *B. oculata*

96. *Bathyleberis grossmani*, new species

FIGURES 332, 334, 335

HOLOTYPE.—USNM 127281, gravid ♀, length 2.51 mm. Valves and some appendages in alcohol, remaining appendages on slides.

TYPE-LOCALITY.—*Eltanin* Cruise 4, station 129.

ETYMOLOGY.—The species is named for Dr. Stuart Grossman.

PARATYPE.—USNM 127282, adult ♀, and USNM 138027, 1 gravid ♀, from same sample as holotype.

ADDITIONAL SPECIMENS.—USNM 127502, juvenile ♀, length 2.07 mm, height 1.13 mm; USNM 127503, 2 juveniles; USNM 137260, 1 juvenile ♂, length 2.35 mm, height 1.29 mm; USNM 137261, 1 juvenile ♀, length only 1.69 mm; USNM 137263, 1 juvenile ♀, length 1.75 mm, height 0.93 mm. USNM 127502, 127503 from *Eltanin* Cruise 14, station 1248; USNM 137260, 137261, 137263 from *Vema* Cruise 17, station V–17–6.

DIAGNOSIS OF ADULT FEMALE.—Posterior infold with 6–8 minute bristles between broad list and valve margin; carapace length 2.51–2.63 mm.

First antenna: Sensory bristle with 7 long terminal filaments; d-bristle about one-half length e-bristle.

Mandible: Dorsal margin of basale with 1 midbristle.

Sixth limb: Anterior margin with 6 or 7 bristles.

Seventh limb: Each limb with 12 bristles.

FIGURE 332.—*Bathyleberis grossmani*, female, USNM 127281, length 2.51 mm, carapace: *a*, complete specimen, lateral view; *b*, posterior of right valve, medial view; *c*, posteroventral corner of left valve, medial view; *d*, anterior of left valve, medial view. Right first antenna: *e*, distal part, lateral view. Second antenna: *f*, endopodite and parts of protopodite and exopodite of right limb, medial view; *g*, exopodial joints 8–9 on left limb, lateral view. Right mandible, medial view: *h*, basale, exopodite, endopodite (not all bristles shown); *i*, dwarf bristles, glandular peg, stumps of 4 endbristles and 3 triaenid bristles; *j*, ventral branch and proximal bristle of coxale endite; *k*, tip of dorsal branch of coxale endite. Maxilla: *l*, left limb, medial view. Right 5th limb: *m*, comb, lateral view. Sixth limb: *n*, right limb, medial view; *o*, anterior of left limb, lateral view. Seventh limb: *p*, tip. Furca: *q*, right lamella. Anterior: *r*, medial eye and rod-shaped organ, joints 1–2 of left 1st antenna; *s*, upper lip. Posterior: *t*, right genitalia and brushlike organ; *u*, posterior margin with broad dorsum. (Same magnification in microns: *b-d,h,n,q,r; e,f,l,o,s-u; g,i,p; k,m.*)

Lateral eyes: Absent.

DESCRIPTION OF FEMALE (Figure 332).—Carapace elongate with evenly rounded anterior with slit-like incisur; posterior infold with widest part well below and extending beyond middle of posterior margin; surface smooth (Figure 332*a*).

Infold (Figure 332*b-d*): Numerous small and medium bristles present on anterior infold above and below incisur; ventral infold with single row of about 18 bristles; list paralleling posterior margin with about 20 hyaline spines and about the same number of bristles of which only a few, about 4, being fairly long; no more than 2 bristles present between hyaline spines; 6 to 8 minute bristles present between spine bearing list and posterior margin of shell.

Size (Figure 333): Holotype (USNM 127281) length 2.51 mm, height about 1.42 mm; USNM 127282, length only 2.61 mm; USNM 138027, length 2.63 mm, height 1.47 mm.

First antenna (Figure 332*e*): 1st joint with clusters of spines on dorsal part of lateral surface and on medial surface; 2nd joint with numerous clusters of spines, 1 long dorsal bristle with long spines proximally and short spines distally, and 1 shorter lateral bristle with short marginal spines; proximal and distal sutures of 3rd joint well defined; dorsal margin of joint with 2 single proximal bristles and 2 pairs of distal bristles, all bristles with long proximal spines; short ventral margin of joint with 1 short bare bristle; lateral surface of joint with few rows of short spines on ventral part; distal margin of 4th joint not well defined; short dorsal margin of joint with 1 long bristle with short marginal spines; ventral margin with 2 spinous terminal bristles, longer bristle of 2 reaching past end of stem, shorter bristle reaching just past distal end of 5th joint; lateral surface of 4th joint with spines forming clusters on ventral part; sensory bristle of 5th joint with long stem and 7 long terminal filaments, the proximal filament of these thinner than distal filaments; lateral surface of joint with row of short spines along dorsal part of distal margin; suture separating 5th and 6th joints well defined on medial side, less well defined, but distinct, on lateral side; 6th joint with long spinous bristle. Seventh joint: a-claw with minute teeth in both lateral and medial surfaces; b-bristle about one-third longer than a-claw and with 1 proximal and 4 distal filaments including tip of bristle, proximal 3 of the 5 filaments with minute marginal spines; c-bristle with 7 marginal filaments, distal filaments longer than proximal filaments. Eighth joint: d-bristle tapered, with faint marginal spines, about one-half length of e-bristle; e-bristle slightly longer than a-claw; f-bristle broken but with 4 spinous filaments on remaining stump of examined specimen; g-bristle also broken but with 5 spinous marginal filaments on remaining stump.

Second antenna (Figure 332*f,g*): Protopodite: Medial surface with usual bristle and numerous spines forming clusters, spines thin, hairlike, on dorsal part of surface and stout on ventral part; dorsal margin with numerous hairlike spines; anterior part of ventral margin with stout spines, all tapering to pointed tip; lateral surface with numerous spines forming clusters on anterior part. Endopodite 3-jointed with long terminal bristle. Exopodite: 2 clusters of long hairs present on dorsal margin of 1st joint near distal end; distal ventral corner of 1st joint with several small slender spines; 2 small clusters of spines present along ventral margin of 2nd joint; joints 2 to 8 with small spines forming row along distal margin on lateral side and on ventral and dorsal corners; lateral spine with digitate tip present on distal margin of 9th joint; basal spines absent; bristle of 2nd joint reaching 9th joint and with spines along ventral margin; bristles of joints 2 to 8 and 2 stout bristles of 9th joint with natatory hairs; a few small spines present along middle of ventral margin of bristle on 3rd joint; 9th joint with 3 bristles, dorsal bristle slender and with short marginal spines.

Mandible (Figure 332*h-k*): Coxale with small bristle at base of endite; ventral branch of endite with 5 or 6 rows of spines and with 3 teeth at tip, 2 ventral teeth longer than single dorsal tooth; dorsal branch with 6 or 7 rounded or recurved knobs on ventral margin and large main spine (tip of branch broken off on both limbs of holotype). Basale: endite with 4 spinous end bristles, 2 dwarf bristles, a glandular opening on short peg, and 3 triaenid bristles with 19 to 27 pairs of marginal spines, distal spines larger than those proximal; ventral margin of basale with U-shaped sclerotized area; lateral surface with many minute spines near ventral margin; dorsal margin of basale with 1 bristle near middle and 2 terminal, and clusters of short spines. Endopodite: ventral margin of 1st joint with 3 stout spinous bristles; dorsal

margin of 2nd joint with stout a-, b-, c-, d-bristles (all with some short marginal spines), 2 or 3 spinous proximal bristles (distal of these quite long), 1 short spinous bristle between a- and b-bristles; 2 short spinous medial bristles and 1 long spinous lateral bristle between b- and c-bristles (lateral bristle only slightly shorter than b-bristle), oblique row of 5 or 6 spinous medial bristles between c- and d-bristles, 1 long spinous lateral bristle between c- and d-bristles, 1 long spinous medial bristle distal to base of d-bristle; ventral margin of 2nd joint with 3 stout spinous terminal bristles; medial surface of 2nd joint with numerous spines forming clusters; end joint with stout dorsal claw, 2 claw-like bristles, and 3 bristles, all bristles and claws with marginal spines. Exopodite reaching about middle of dorsal margin of 1st endopodite joint, with 2 short bristles on hirsute tip.

Maxilla (Figure 332*l*): Epipodite short, triangular, hirsute. Proximal endite with 1 short bare bristle and 3 long bristles with distal spines; distal endite with 3 spinous bristles, middle bristle shorter than others. Basale extremely hirsute with 1 or 2 bare proximal bristles on medial surface near base of epipodite, 2 or 3 bare bristles on dorsal margin (1 or 2 near middle and 1 distally), 1 fairly long proximal bristle, 1 short distal bristle (both bare) and 1 long plumose terminal bristle on ventral margin, 1 short proximal bristle on lateral surface; first endopodite joint with 1 short

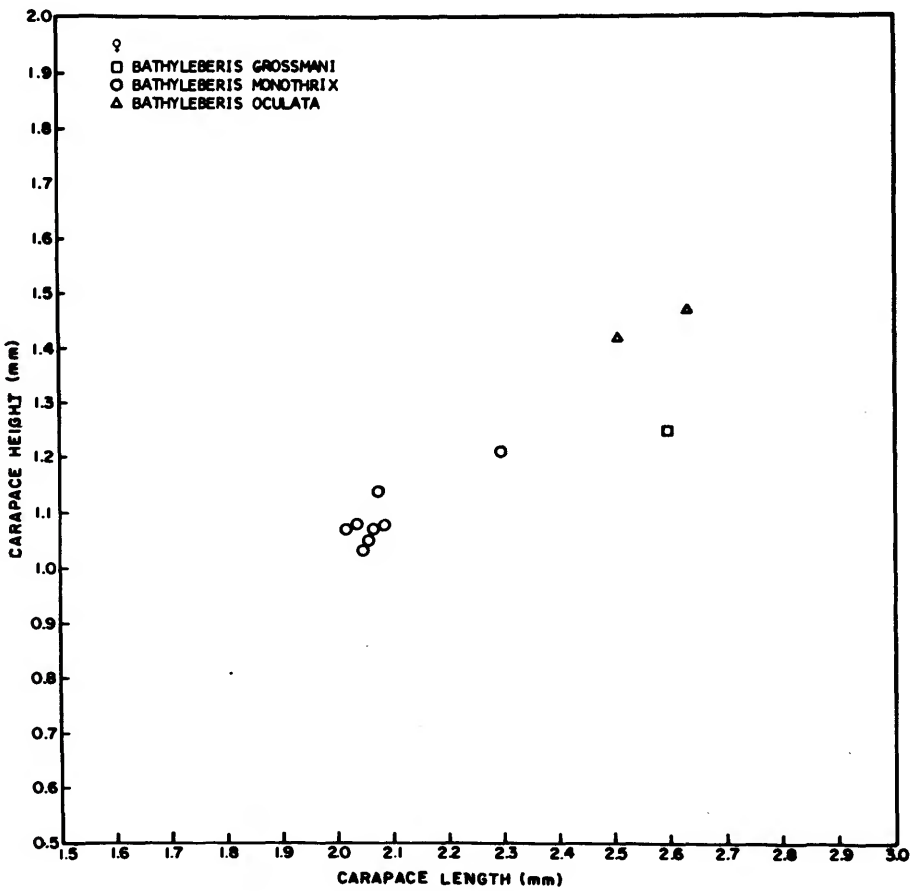

FIGURE 333.—Comparison of relationship between shell length and height of adults of *Bathyleberis*.

bare anterior bristle and long 6-bristle with marginal spines; end joint with spinous terminal bristle slightly longer than 6-bristle.

Fifth limb (Figure 332*m*): Epipodial appendage with about 69 plumose bristles; dorsal margin of comb bare; plumose exopodite bristle reaching past end of comb; lateral surface of comb with 1 short slender bare bristle near base of exopodite bristle and 3 short and 1 long bristle near ventral margin.

Sixth limb (Figure 332*n,o*): Anterior margin hirsute and with 6 or 7 bare bristles; anterior corner with 3 or 4 spinous bristles; ventral margin with 14 to 17 spinous bristles, posterior of these separated from others by space; medial surface with minute bristle in anterodorsal part; medial and lateral surfaces, anterior ventral and posterior margins hirsute.

Seventh limb (Figure 332*p*): Each limb with 12 bristles, 6 proximal, 6 distal; each bristle with 2 to 5 bells; some bristles with a few marginal spines, but most bare; opposing terminal combs with about 9 spinous teeth.

Furca (Figure 332*q*): Each lamella with 9 claws; primary claws with minute teeth along concave margin and thin hairs on convex margin; base of 2 posterior bristlelike claws located dorsal to ventral margin of lamella.

Rod-shaped organ and eyes (Figure 332*r*): Rod-shaped organ weakly 2-jointed, elongate, with rounded tip. Medial eye hirsute without pigmentation. Lateral eyes absent.

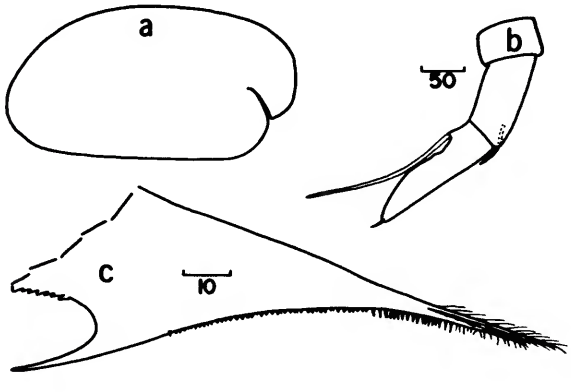

FIGURE 334.—*Bathyleberis grossmani*, N–1 male, USNM 137260, length 2.35 mm: *a*, complete specimen, lateral view; *b*, endopodite of left 2nd antenna, medial view; *c*, tip of dorsal branch of coxale endite on left mandible, medial view.

Upper lip (Figure 332*s*): Lip consisting of left and right hirsute lobes with hirsute lateral flap partly covering posterior part of each lobe. (Part of coxale endite of mandibles of both specimens remained in esophagus when mandibles were removed from specimen.)

Posterior (Figure 332*u*): Short broad spinous dorsal process present.

Genitalia and brushlike organ (Figure 332*t*): Genitalia on each side represented by sclerotized ring. Brushlike organ consisting of 7 minute bristles present dorsal to genitalia.

Eggs: 1 egg present in marsupium of USNM 127281, but as 1 valve was torn, additional eggs could have been lost; USNM 138027 with about 12 eggs (not dissected).

DESCRIPTION OF N–1 MALE INSTAR (Figures 334, 335).—Posterodorsal margin of valve more acuminate than on valve of adult female (Figure 334*a*); contact of valves along posterodorsal margins depressed.

Infold: See Figure 335.

Size: USNM 137260, length 2.35 mm, height 1.29 mm.

First antenna: Longer of 2 ventral bristles of 4th joint almost reaching end of stem, shorter bristle not quite reaching distal end of 5th joint; c-bristle broken but with 12 marginal filaments on remaining part; f-bristle at right angle to stem, broken but with 9 marginal filaments on remaining part; sensory bristle of 5th joint on right limb with 7 terminal filaments; sensory bristle on left limb with 1 proximal and 7 terminal filaments, proximal bristle about same length as terminal filaments but more slender. Limb otherwise similar to that of adult female.

Second antenna (Figure 334*b*): Protopodite similar to that on adult female. Endopodite 3-jointed: 1st joint bare; 2nd joint with 1 or 2 short distal ventral bristles; 3rd joint with long proximal dorsal bristle and 1 small terminal bristle. Exopodite: distal margin of 1st joint with minute medial process; 7th and 8th joints with several minute basal spines; 9th joint with digitate lateral spine; bristle of 2nd joint reaching just past 9th joint and with long hairs along both margins (ventral hairs stouter than faint dorsal hairs). Limb otherwise similar to that of adult female.

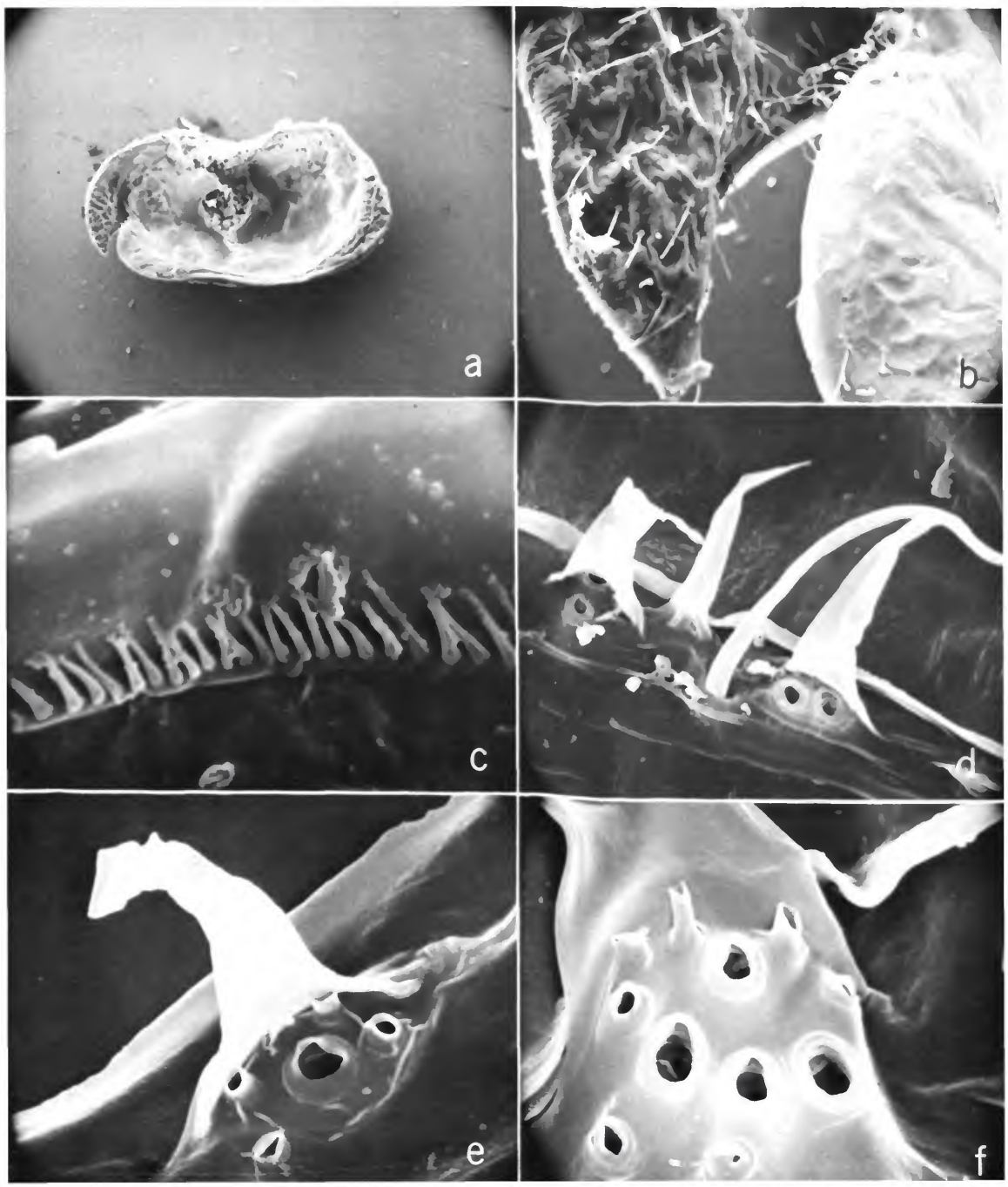

FIGURE 335.—*Bathyleberis grossmani*, N–1 male, USNM 137260, right valve, medial view: *a*, complete valve, × 28; *b*, rostrum and incisur, × 280; *c*, selvage along posterior edge of valve, × 10,000; *d*, part of posterior list, × 2000; *e,f*, detail of pores and flaplike bristle on posterior list (specimen on list oriented with ventral to right and posterior to top), × 5000.

Mandible: Tip of dorsal branch of coxale endite with acute tip; hirsute bristle present near tip of ventral margin (Figure 334*c*); limb otherwise similar to that of adult female.

Maxilla and fifth limb: Similar to those on adult female.

Sixth limb: Ventral margin with 19 bristles; limb otherwise similar to that on adult female.

Seventh limb: Each limb with 12 bristles as on female, 6 proximal, 6 terminal; some bristles strongly tapering, others with parallel sides; each bristle with 1 to 4 bells; opposing terminal combs with 7 or 8 spinous teeth.

Furca: Each limb with 8 claws, otherwise similar to that on adult female.

Rod-shaped organ, eyes, upper lip, posterior: Similar to those on adult female.

DISTRIBUTION.—This species was collected in the Subantarctic-to-35°S region west of Chile and in the American and Pacific Quadrants of the Antarctic region at abyssal depths (3431–4303 m) (Figure 242).

97. *Bathyleberis monothrix*, new species

FIGURES 336–339

HOLOTYPE.—USNM 128688, gravid ♀, length 2.08 mm. Valves and some appendages in alcohol, remaining appendages on slides.

TYPE-LOCALITY.—*Vema* Cruise 17, station V–17–75.

ETYMOLOGY.—The specific name is derived from the Greek "mono" [= one] and "thrix [= hair] and refers to the presence of only 1 bristle on the anterior margin of the 6th limb.

PARATYPE.—USNM 128691, adult ♀ without eggs; USNM 128693, 10 gravid ♀♀; USNM 128694, 6 adult ♀♀ without eggs, 28 juveniles. Paratypes from same sample as holotype.

ADDITIONAL SPECIMENS.—USNM 137073, 1 gravid ♀; USNM 137076, 9 adult ♀♀ without eggs + 4 juveniles; USNM 137092, 1 gravid ♀; USNM 137078, 1 juvenile ♀, length 1.71 mm, height 1.06 mm. USNM 137073, 137076 from *Vema* Cruise 17, station V–17–74; USNM 137092 from *Vema* Cruise 18, station V–18–9; USNM 137078, from *Vema* Cruise 17, station V–17–67.

DIAGNOSIS OF ADULT FEMALE.—Posterior infold with 40–56 bristles and 4 or 5 short processes between broad list and valve margin; carapace length 2.02–2.30 mm.

First antenna: Sensory bristle with 1 short proximal and 6 long terminal filaments; d-bristle three-fourths length e-bristle.

Mandible: Dorsal margin of basale with 1 backward-pointing midbristle.

Sixth limb: Anterior margin with 1 bristle on upper suture, and without bristle on lower suture.

Seventh limb: Each limb with 14 bristles.

Lateral eyes: Absent.

DESCRIPTION OF FEMALE (male unknown).—Carapace elongate with evenly rounded anterior and posterior and with slitlike incisur (Figure 336*a,q*); surface smooth; widest part of posterior infold not extending beyond middle of posterior margin.

Infold (Figures 336*b,c;* 337): Infold dorsal to list on rostrum with 27 long and numerous short bristles; infold on rostral list and between list and incisur with 19 long bristles; anterior infold below incisur with about 20 long bristles; ventral infold with single row of about 18 bristles; list paralleling posterior margin with about 19 hyaline spines and about 70 bristles, mostly short, forming row anterior to row of hyaline spines; 2 to 5 bristles present between hyaline spines; about 40 to 56 bristles (ventral 12 longer than others) present between list and posterior valves margin; 4 or 5 processes present between list and posterior row of bristles.

Size (Figure 333): Holotype (USNM 128688) length 2.08 mm, height 1.14 mm; USNM 128691, length 2.30 mm, height 1.21 mm. USNM 128693 (4 specimens not dissected), length 2.05 mm, height 1.03 mm; length 2.06 mm, height 1.05 mm; length 2.07 mm, height 1.07 mm; length 2.04 mm, height 1.08 mm; USNM 137073, length 2.09 mm, height 1.08 mm; USNM 137092, length 2.02 mm, height 1.07 mm.

First antenna (Figure 336*d*): 1st joint with clusters of spines on posterior part of lateral surface and on medial surface; 2nd joint with numerous clusters of spines, 1 long subterminal dorsal bristle with long proximal and short distal spines, and 1 short spinous lateral bristle near dorsal margin; proximal and distal sutures of 3rd joint well defined; dorsal margin of joint with 2 single proximal bristles and 2 pairs of distal bristles, all bristles with long proximal spines; short ventral margin of joint with 1 short bare bristle; lateral surface with short spines forming cluster near ventral

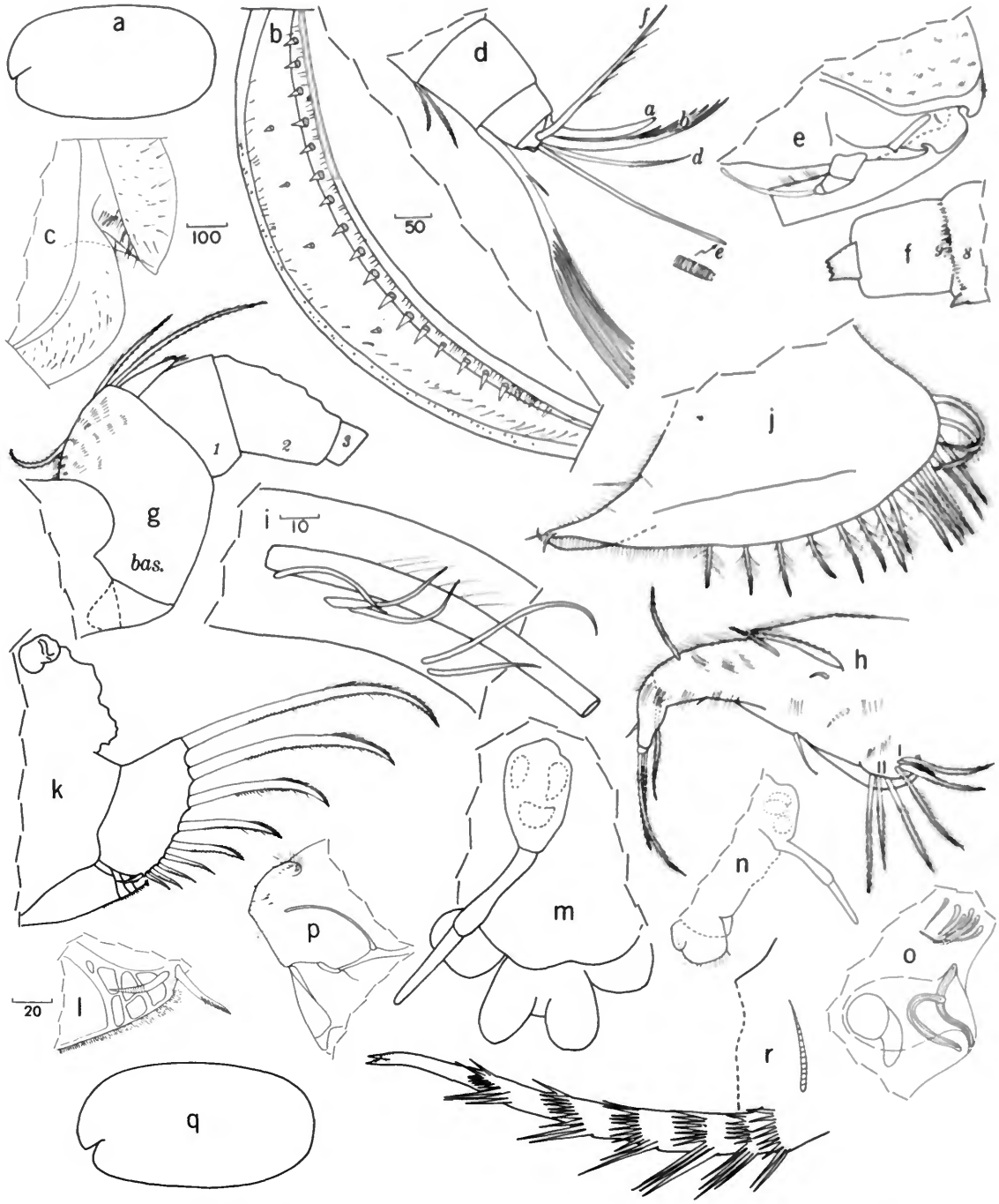

FIGURE 336.—*Bathyleberis monothrix*, female, USNM 128688, length 2.08 mm, carapace: *a*, complete specimen, lateral view. Left valve, medial view: *b*, posterior; *c*, anterior. Left 1st antenna: *d*, tip (not all bristles shown). Second antenna: *e*, endopodite and parts of protopodite and exopodite, medial view; *f*, exopodial joints 8 and 9 on right limb, lateral view (bristles not shown). Right mandible: *g*, basale, exopodite, and endopodite (not all bristles shown). Maxilla: *h*, right limb, medial view. Right 5th limb: *i*, exopodial bristles, lateral view. Sixth limb: *j*, right limb, medial view. Posterior: *k*, right furcal lamella and genitalia; *l*, detail of posterior 2 bristles shown in "*k*." Anterior: *m*, dorsal view showing medial eye and rod-shaped organ and upper lip (not under cover slip); *n*, same, lateral view. Posterior: *o*, right genitalia and brushlike organ; *p*, spinous posterior margin and 2 posterior claws of right furcal lamella at bottom. Female, USNM 128691, length 2.30 mm: *q*, complete specimen, lateral view; *r*, ventral branch and proximal bristle on coxale endite of left mandible, medial view. (Same magnification in microns: *b,d-h,j,k,m,n,p; i,o,r*.)

margin; distal margin of 4th joint well defined on medial side; ventral margin with 2 spinous terminal bristles, longer bristle of 2 reaching past end of 5th joint; dorsal margin of joint with 1 long bristle with short marginal spines; lateral surface with short spines forming clusters along ventral margin; sensory bristle of 5th joint with 1 short proximal and 6 long terminal bristles; 6th joint with 1 long spinous medial bristle. Seventh joint: a-claw with minute teeth forming groups on medial and lateral surfaces; b-bristle about a third longer than a-claw and with 5 filaments including tip of bristle; c-bristle with 7 filaments including tip. Eighth joint: d-bristle tapering (bristlelike) with short marginal spines on distal third, about three-fourths length of e-bristle; e-bristle with parallel sides and blunt tip (filamentlike), about same length as b-bristle; f-bristle with 6 filaments including tip; g-bristle with 6 marginal filaments and bifurcate tip.

Second antenna (Figure 336*e,f*): Protopodite: medial bristle small; medial and lateral surfaces with clusters of spines on dorsal half; long spines forming cluster on dorsal margin, ventral margin bare. Endopodite 3-jointed with long terminal bristle. Exopodite: 2 clusters of long hairs present on dorsal margin of 1st joint near distal end; few short spines present on distal margin of 1st joint; minute spines present on ventral margin of 2nd joint; joints 2 to 8 with small spines forming row along distal margins; joints 3 to 6 with 2 or 3 minute basal spines; joints 6 to 8 with small basal spine; joint 9 with lateral spine with digitate tip; bristle of 2nd joint reaching 9th joint and with slender spines along ventral margin and stout proximal teeth along dorsal margin; bristles of joints 2 to 8 and 2 long bristles of joint 9 with natatory hairs; bristles on joints 3 to 8 with small spines along proximal part of ventral margin; 9th joint with 2 long ventral and 2 short dorsal bristles; latter bristles with short marginal spines.

Mandible (Figures 336*g,r;* 338*d-f;* 339*d*): Ventral branch of coxale endite with spines forming 6 rows; tip of branch with 3 stout teeth; small bristle present near base of ventral branch; (dorsal branch remained in esophagus of both specimens examined). Basale: endite with 4 end bristles, 2 dwarf bristles, a glandular opening on short peg, and 2 triaenid bristles with 3 to 14 pairs of marginal spines; ventral margin of basale with U-shaped sclerotized area; dorsal margin with 1 backward-pointing spinous bristle near middle and 2 terminal bristles, and clusters of short spines. Exopodite reaching past middle of dorsal margin of 1st endopodite joint and with 2 short terminal bristles on hirsute tip. Endopodite: ventral margin of 1st joint with 3 stout bristles; dorsal margin of 2nd joint with stout a-, b-, c-, d-bristles (all with marginal spines; a-bristle more slender than others), 2 short spinous proximal bristles (longer of these almost one-half length of a-bristle). 2 short spinous bristles between a- and b-bristles, 1 long lateral bristle and oblique row of 4 short spinous medial bristles between b- and c-bristles, 1 long lateral bristle and oblique row of 6 short spinous medial bristles between c- and d-bristles, 1 long medial bristle distal to base of d-bristle; ventral margin of 2nd joint with 3 stout spinous terminal bristles; medial surface of 2nd joint with numerous spines forming clusters; end joint with stout dorsal claw with minute lateral teeth along middle of ventral margin and tip of dorsal margin, 2 clawlike bristles, and 3 more slender bristles, all bristles with marginal spines.

Maxilla (Figures 336*h*, 339*d*): Epipodite short, triangular, hirsute. Proximal endite with 4 spinous bristles, 3 long, 1 short; distal endite with 3 spinous bristles, middle bristle shorter than others. Basale extremely hirsute with 7 bristles: 1 medial bristle near base of epipodite, 1 lateral bristle between epipodite and endites, 2 spinous bristles near or on dorsal margin, 1 proximal bristle on ventral margin, 1 near middle of ventral margin, and 1 long spinous terminal ventral bristle. Endopodite: 1st joint with 1 short bare anterior bristle and 1 long spinous 6-bristle; end joint with spinous terminal bristle longer than 6-bristle.

Fifth limb (Figure 336*i*): Epipodial appendage with 72–75 bristles; plumose exopodite bristle reaching past end of comb; lateral surface of comb with 1 slender bare bristle near base of exopodite bristle and 3 short bristles and 1 long bristle near ventral margin.

Sixth limb (Figure 336*j*): Anterior margin hirsute and with 2 distinct sutures; upper suture with 1 bristle, lower suture without bristle; anterior corner with 3 or 4 bristles; ventral margin with 16–18 spinous bristles; medial surface with

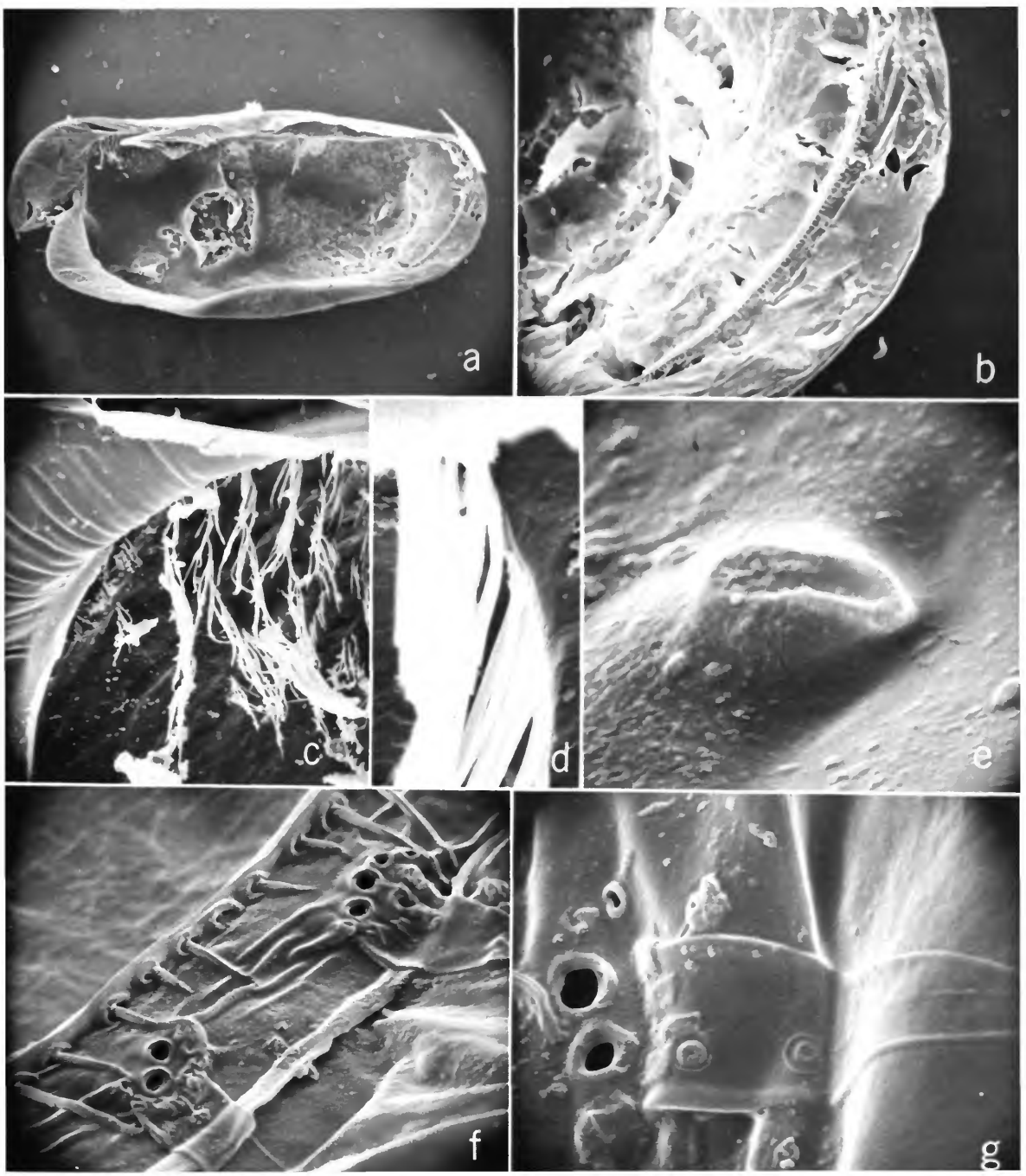

FIGURE 337.—*Bathyleberis monothrix*, female, USNM 137073, right valve, medial view: *a*, complete valve, × 50; *b*, posteroventral infold, × 2000; *c*, detail of hairs on anterodorsal vestment, × 5000; *d*, detail of single row of hairs shown in "*b*," × 5000; *e*, posterior process between posteroventral list and edge of valve, × 200; *f*, posteroventral list, × 2000; *g*, detail of "*f*," × 5000.

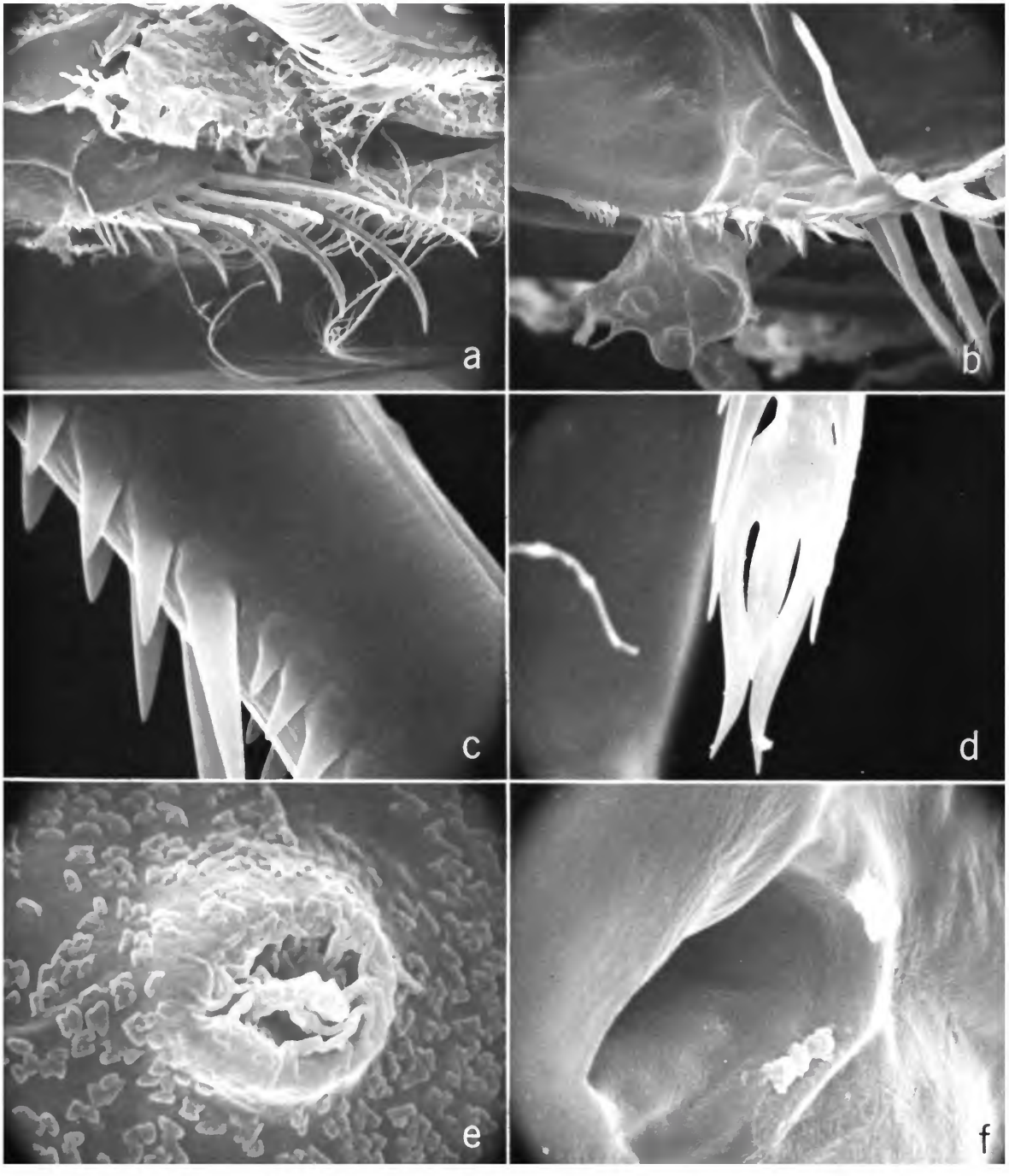

FIGURE 338.—*Bathyleberis monothrix*, female, USNM 137073, appendages: *a*, furca, × 175; *b*, posterior bristles and spines of furca, × 900; *c*, detail of furcal claw #3 of left lamella in "*a*," × 5000; *d*, tip of triaenid bristle on basale endite of mandible, × 9000; *e*, glandular process on basale endite of mandible (small objects probably bacteria), × 6500; *f*, U-shaped sclerotized depression on basale endite of mandible, × 4000.

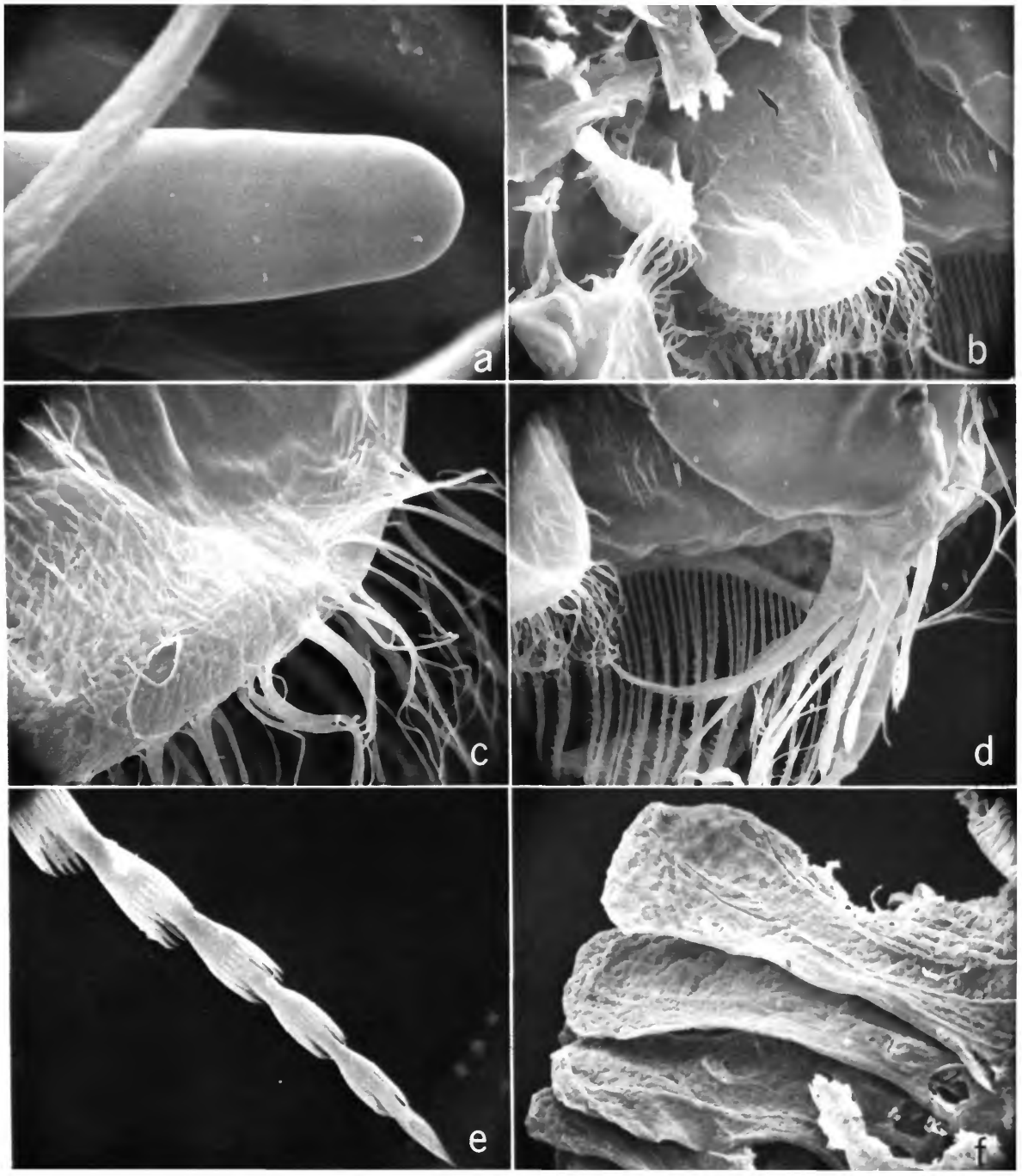

FIGURE 339.—*Bathyleberis monothrix*, female, USNM 137073, appendages: *a*, tip of rod-shaped organ, × 2000; *b*, upper lip, lateral view, anterior toward right, × 400; *c*, detail of anterior corner of upper lip in "*b*," × 2000; *d*, lateral view showing upper lip, basale endite of mandible, and in background, the maxilla, × 400; *e*, bristle on 7th limb, × 2000; *f*, detail of gill-like structures, lateral view, × 190.

minute bristle in anterodorsal part; medial and lateral surfaces, posterior and anteroventral margins hirsute.

Seventh limb (Figure 339*e*): Each limb with 14 bristles, 8 proximal, 4 on each side, and 6 distal, 3 on each side; each bristle with 3 to 5 bells and without marginal spines; opposing terminal combs with 14–17 spinous teeth.

Furca (Figures 336*k,l;* 338*a-c*): Each lamella with 10 claws, last claw bristlelike, pointing back; most claws with lateral and medial row of minute long and short teeth along posterior concave margin and hairs along anterior convex margin; spines present on margin following claws.

Rod-shaped organ and eyes (Figures 336*m,n;* 339*a*): Rod-shaped organ weakly 2-jointed, elongate, with rounded tip. Medial eye bare; lateral eyes absent.

Upper lip (Figures 336*m,n;* 339*b-d*): Lip consisting of unpaired middle part with left and right hirsute lobes, and with hirsute lateral flaps partly covering posterior part of each lobe.

Posterior (Figure 336*p*): Posterior angular with part above angle terminating in rounded thumblike process, extremely spinous.

Genitalia and brushlike organ (Figure 336*o*): Genitalia on each side with obscure sclerotized structures. Brushlike organ consisting of 8 minute bristles present dorsal to and slightly in front of genitalia.

Eggs: USNM 128688 with 8 eggs in marsupium; 1 specimen of USNM 128693 with 3 eggs; USNM 137073 with 11 eggs; USNM 137092 with 12.

Population structure: Sample from station V–17–75 with 12 gravid ♀♀, 6 adult ♀♀ without eggs in the marsupium, and 28 juveniles.

Epizoa: USNM 137073 with numerous segmented filaments inside shell.

Comparisons.—The new species differs from *B. grossmani* in many characters. For example, the sensory bristle on the 1st antenna of *B. grossmani* bears 7 terminal filaments, whereas, that bristle bears 1 short proximal and 6 long terminal filaments on *B. monothrix*. The d-bristle of *B. grossmani* is about one-half the length of the e-bristle compared to three-fourths the length on *B. monothrix*. The anterior margin of the 6th limb of the new species bears only 1 bristle compared to 6 or 7 on *B. grossmani*.

Distribution.—This species was collected at four stations in the Subantarctic-to-35°S region east of Argentina at shelf to bathyl depths (71–601 m) (Figure 242).

98. *Bathyleberis oculata*, new species

Figures 340, 341

Holotype.—USNM 128845, gravid ♀, length 2.60 mm. Valves and appendages in alcohol, remaining appendages on slides.

Type-Locality.—*Vema* Cruise 18, V–18–113, Cook Strait, New Zealand.

Etymology.—The specific name is derived from the Latin "oculatus" [= having eyes] and refers to the large lateral eyes on this species.

Paratype.—USNM 128846, 1 juvenile ♀ (N–1) from same sample as holotype.

Diagnosis of Adult Female.—Posterior infold with about 56 bristles and 4 small processes between broad list and valve margin; carapace length about 2.60 mm.

First antenna: Sensory bristle with 1 short proximal bristle and 6 long terminal filaments; d-bristle about one-fifth length of e-bristle.

Mandible: Dorsal margin of mandibular basale with 3 or 4 midbristles.

Sixth limb: Anterior margin with 1 upper and 1 lower bristle.

Seventh limb: Each limb with 12 bristles.

Lateral eye: With about 18 ommatidia.

Description of Female (male unknown).—Carapace elongate with evenly rounded anterior and posterior and with slitlike incisur (Figure 340*a,b*); surface smooth.

Infold (Figures 340*c,d;* 341): Infold dorsal to list on rostrum with 42 long bristles forming row just within and parallel to anterodorsal margin of valve; about 24 small bristles present on anterodorsal infold following row of long bristles; numerous short bristles present between row of long bristles and rostral list; infold on rostral list and between list and incisur with about 19 long bristles; anterior infold below incisur with about 18 long bristles and numerous shorter bristles; ventral infold with single row of about 52 short bristles; list paralleling posteroventral margin with about 19–21 hyaline spines and about 100 bristles, mostly short, forming row anterior to row of hyaline spines; 1 to 9 bristles present between hyaline spines; about 42

FIGURE 340.—*Bathyleberis oculata*, female, USNM 128845, length 2.60 mm, carapace: *a*, complete specimen, lateral view; *b*, sketch of central muscle attachments on left valve, lateral view. Right valve, medial view: *c*, anterior; *d*, posterior. Left 1st antenna: *e*, tip, lateral view (all bristles not shown). Left 2nd antenna: *f*, exopodial joints 7–9, lateral view (bristles not shown); *g*, endopodite and parts of protopodite and exopodite, medial view. Right mandible, medial view: *h*, coxale endite (dorsal bristle on dorsal branch broken); *i*, basale, exopodite on 1st endopodial joint (not all bristles shown). Maxilla: *j*, right limb, medial view. Right 5th limb: *k*, comb, lateral view. Sixth limb: *l*, right limb, medial view; *m*, anteroventral tip of left limb, lateral view; *n*, minute bristle in anterodorsal corner of left limb, lateral view. Posterior: *o*, left lamella of furca; *p*, posterior 2 claws on right furcal lamella, anterior to right; *q*, posterior margin with dorsum. Anterior: *r*, medial eye and rod-shaped organ, left lateral eye; *s*, upper lip. N–1 female, USNM 128846, length 2.05 mm: *t*, filament attached to appendage. (Same magnification in microns: *c,d,l,o,q-s; g,i,j,t; h,k,m.*)

long bristles present between posteroventral part of list (starting opposite 1st hyaline spine) and posteroventral valve margin; about 14 short bristles present between posterior part of list and posterior valve margin; 4 small processes present between list and posterior row of bristles.

Size (Figure 333): Holotype (USNM 128845) length 2.60 mm, height 1.25 mm.

First antenna (Figure 340*e*): Clusters of short spines present on 1st and 2nd joints; 2nd joint with 1 long subterminal bristle with long proximal and short distal spines, and 1 short spinous lateral bristle near distal margin; proximal and distal sutures of 3rd joint well defined; dorsal margin of joint with 2 single proximal bristles and 2 pairs of distal bristles, all bristles with long proximal spines; short ventral margin of joint with 1 short bare bristle; lateral surface with minute spines forming several rows on ventral half; distal margin of 4th joint well defined; ventral margin with 2 spinous ventral bristles, longer bristle of 2 reaching tip of limb (8th joint), shorter bristle reaching distal end of 6th joint; dorsal margin of joint with 1 long bristle with short marginal spines; lateral surface with short spines forming clusters along ventral margin; sensory bristle of 5th joint with 1 short proximal and 6 long terminal filaments; 6th joint with 1 long spinous medial bristle. Seventh joint: a-claw with acute tip, bare; b-bristle about a third longer than a-claw and with 5 filaments including tip of bristle; c-bristle broken but with 6 marginal filaments on remaining part. Eighth joint: d-bristle tapering (bristlelike), about one-fifth length of e-bristle; e-bristle with parallel sides and blunt tip, about same length as b-bristle; f-bristle with 5 or 6 spinous filaments including tip; g-bristle with 6 marginal filaments and bifurcate tip, some filaments with spines.

Second antenna (Figure 340*f,g*): Protopodite with small medial bristle and few minute spines forming clusters on anterior margin. Endopodite 3-jointed with long terminal bristle. Exopodite: joints 2 to 8 with small spines along dorsal margins; joints 3 and 4 with 2 or 3 minute basal spines; joints 4 to 8 with 1 stout basal spine; joint 9 with lateral spine and 4 bristles, 2 long (ventral) with natatory hairs and 2 short (dorsal) with short marginal spines; bristle of 2nd joint reaching past 9th joint and with slender spines along ventral margin and stouter spines along dorsal margin; bristles of joints 3 to 8 with natatory hairs and with small spines along proximal part of ventral margin.

Mandible (Figure 340*h,i*): Ventral branch of coxale endite with spines forming 5 rows; tip of branch with 3 stout teeth, 2 ventral teeth longer than dorsal tooth; small bristle present near base of ventral branch; ventral margin of dorsal branch with 2 proximal pairs of pointed teeth followed by 3 or 4 rounded teeth and short main spine; terminal bristle of dorsal branch short, spinelike; bristle of dorsal margin long spinous. Basale: endite with 4 end bristles, 2 unequal dwarf bristles, a glandular opening on short peg with serrate margin, and 3 triaenid bristles with 5 or 6 pairs of marginal spines not counting terminal pair; additional triaenid bristle with 3 or 4 pairs of spines present on ventral margin of basale near base of endite; dorsal margin with 3 or 4 spinous midbristles and 2 long spinous terminal bristles; surface of joint without short spines. Exopodite reaching past middle of dorsal margin of 1st endopodite joint and with 2 small terminal bristles and hirsute tip. Endopodite: ventral margin of 1st joint with 3 stout bristles, all with marginal spines; dorsal margin of 2nd joint with stout a-, b-, c-, d-bristles (all with marginal spines), 2 proximal bristles (1 short, 1 long stout—only slightly shorter than a-bristle), oblique row of 5 or 6 short spinous medial bristles (triaenid type), 1 fairly long lateral bristle between b- and c-bristles, oblique row of 4 or 5 short spinous medial bristles (triaenid type) and 1 long lateral bristle between c- and d-bristles, 1 long spinous medial bristle distal to base of d-bristle; ventral margin of 2nd joint with 3 stout spinous terminal bristles; medial surface of 2nd joint with numerous spines forming clusters; end joint with stout bare dorsal claw, 4 stout spinous bristles, and 1 short slender spinous bristle.

Maxilla (Figure 340*j*): Epipodite short, triangular, hirsute. Proximal endite with 4 spinous bristles, 3 long, 1 short; distal endite with 3 spinous bristles. Basale hirsute with 6 bristles: 1 lateral bristle near base of endite; 1 proximal and 1 distal bristle on dorsal margin; 2 proximal, 1 distal bristle, and 1 long spinous terminal bristle on ventral margin. Endopodite: 1st joint with 1 short bare anterior bristle and 1 long spinous 6-bristle; end joint with spinous terminal bristle longer than 6-bristle.

Fifth limb (Figure 340*k*): Epipodial appendage

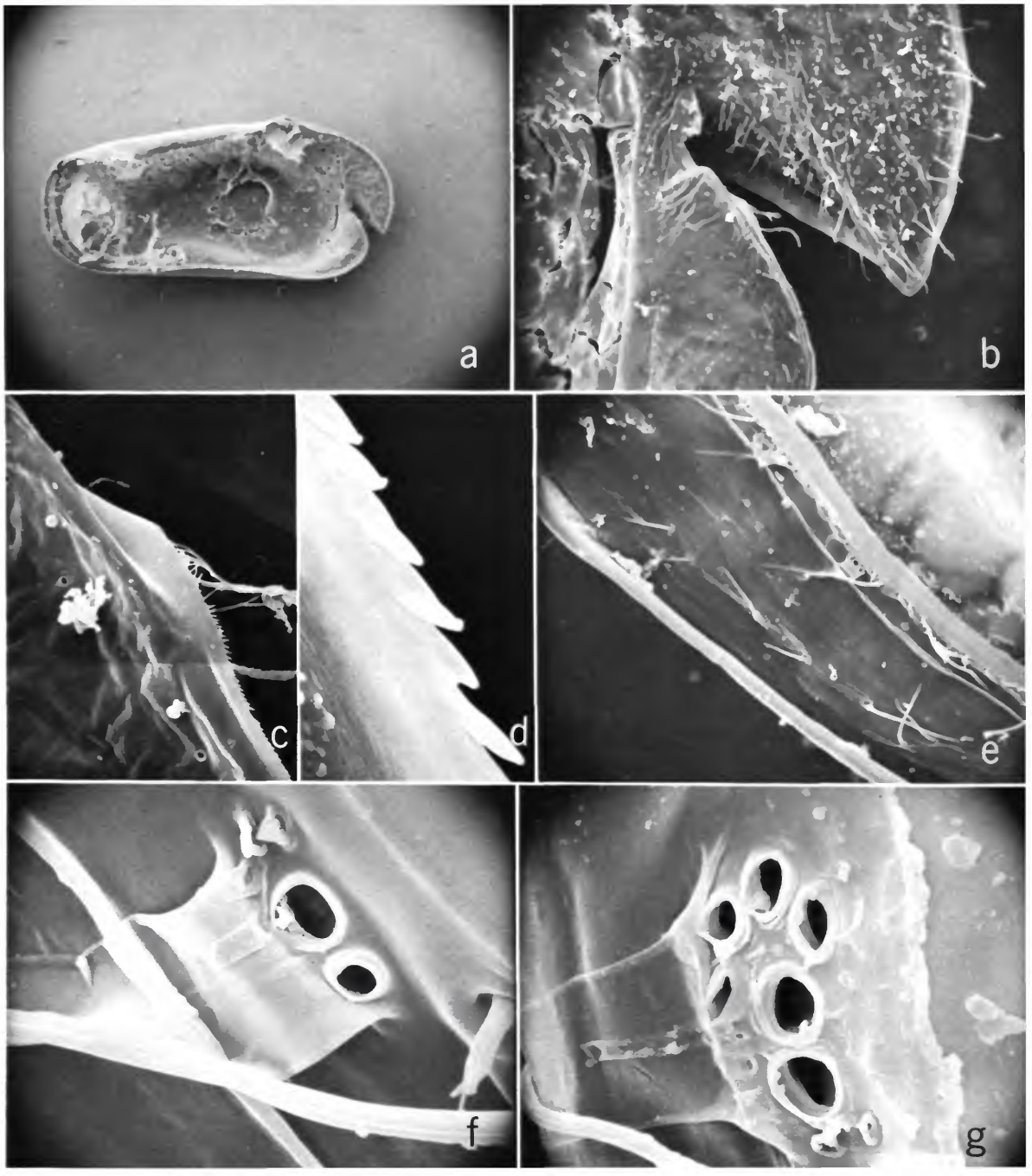

FIGURE 341.—*Bathyleberis oculata*, female, USNM 128845, left valve, medial view: *a*, complete valve, × 30; *b*, anterior, × 200; *c*, lamellar prolongation on inner margin of infold, × 1000; *d*, serrations on lamellar prolongation on section below that shown in "*c*," × 10,000; *e*, posteroventral infold, × 15,000; *f,g*, details of pores at base of transparent bristles on posteroventral list shown in "*e*," × 5000.

with 76 bristles; plumose exopodite bristle reaching past end of comb; lateral surface of comb with 2 slender bare bristles near base of exopodite bristle and 3 short and 1 long bristle near ventral margin.

Sixth limb (Figure 340*l-n*): Anterior margin hirsute and with 2 distinct sutures, each with 1 bristle; anterior corner with 5 bristles; ventral margin with 24 or 25 spinous bristles; medial surface with dwarf bristle in anterodorsal part; medial and lateral surfaces, posterior and anterior parts of ventral margin hirsute.

Seventh limb: Each limb with 12 bristles, 6 proximal, 3 on each side, and 6 distal, 3 on each side; each bristle with 3 or 4 bells and without marginal spines; opposing terminal combs with 20 or 21 spinous teeth.

Furca (Figure 340*o,p*): Each lamella with 9 claws, last claw bristlelike, pointing back on right lamella of holotype but not on left; most claws with lateral and medial row of minute long and short teeth along posterior margin and hairs along anterior margin; spines present on margin following claws.

Rod-shaped organ and eyes (Figure 340*r*): Rod-shaped organ weakly 2-jointed, elongate, with rounded tip. Medial eye bare; lateral eye with about 18 ommatidia in lateral view, about same size as medial eye.

Upper lip (Figure 340*s*): Lip consisting of unpaired middle part with left and right hirsute lobes, each with single anterior spine; lateral flap present posterior to each lobe.

Posterior (Figure 340*q*): Spinous thumblike posterior process bent forward, with rounded tip.

Genitalia and brushlike organ: Genitalia obscure, but with oval sclerotized structures. Brushlike organ not observed.

Eggs: USNM 128845 with 23 eggs in marsupium.

Epizoa: Numerous long slender segmented threads attached to external surfaces of appendages of USNM 128845.

Description of N–1 Female (Figure 340*t*).—Carapace size: USNM 128846, length 2.05 mm, height 1.04 mm.

Epizoa: Similar to those on adult female (Figure 340*t*).

Comparisons.—The new species differs from previously described species of the genus in many ways. For example, the carapace is more elongate, the d-bristle of the 1st antenna is much shorter, and the anterior margin of the 6th limb bears 2 bristles.

Distribution.—This species was collected only at one station in Cook Strait, New Zealand, at a depth of 117 m (Figure 242).

Cylindroleberidinae Genus Indeterminate

Material.—1 juvenile, length 1.56 mm, height 0.90 mm, from *Eltanin* Cruise 12, station 997; 1 juvenile from *Eltanin* Cruise 6, station 418; 1 juvenile, length 1.65 mm, height 0.94 mm from *Eltanin* Cruise 19, station 1474; 1 juvenile ♀, length 1.75 mm, height 0.96 mm from *Eltanin* Cruise 16, station 1418; 1 specimen from *Discovery* Cruise 1, station 61; 1 juvenile ♂, length 1.66 mm, height 1.22 mm from *Vema* Cruise 17, station V–17–18; 1 adult ♂, length only 4.5 mm (appendages missing) from *Vema* Cruise 17, station V–17–52; 1 carapace without appendages from *Vema* Cruise 17, station V–17–25; 6 specimens from *Discovery* Cruise 1, station 317, residue 155; 2 specimens from *Discovery* Cruise 1, station 107.

It is appropriate to include here a juvenile ♂ identified by Müller (1908:94) as *Cylindroleberis* sp. I have not examined that specimen, which was collected at "Gaussstation." Jan. 22, 1903. Also included here is a specimen identified by Hartmann (1965:324) as *Cylindroleberis* species from Chile (station 93, 39°58′S, 73°44′48″W, 84 m). I have not examined that specimen.

I also refer to Cylindroleberidinae genus indeterminate specimens from Gough Island identified as *Asterope oculata* Brady by Scott (1912) (see discussions on pages 526 and 683).

CYCLASTEROPINAE Poulsen, 1965

This subfamily is represented by three genera in the study area: *Asteropella* Poulsen, 1965; *Asteropteron* Skogsberg, 1920; and *Cycloleberis* Skogsberg, 1920. The three remaining genera in the subfamily which have not been collected in the area are *Microasteropteron* Poulsen, 1965; *Cyclasterope* Brady, 1897; and *Actinoseta* Kornicker, 1958.

Diagnosis of Subfamily.—Shell generally ovoid in lateral view, either smooth—*Cycloleberis, Cycla-*

sterope—or ornamented—*Asteropteron, Asteropella, Microasteropteron, Actinoseta.*

First antenna: 2nd joint with 2–10 (generally 4 or 5) dorsal bristles and 0–11 lateral bristles; 3rd joint with 2–14 dorsal bristles and 1 ventral bristle; 4th joint with 1 or 2 dorsal bristles and 1–5 ventral bristles; sensory bristle of female with 0–9 short filaments and 4–10 long terminal bristles (an exception is *Microasteropteron* on which the sensory bristle is bare); sensory bristle of male with numerous slender filaments; d- or e-bristle of 8th joint missing on *Microasteropteron* and possibly *Actinoseta,* but both bristles well developed in remaining genera.

Second antenna: Protopodite with medial bristle. Endopodite of female of *Microasteropteron* 1-jointed with several bristles, on remaining genera 3-jointed with 0–10 bristles on joints 1 and 2, and a single terminal bristle on joint 3 (an exception is *Cyclasterope bisetosa* Poulsen, 1965, which bears 1 long and 1 short bristle on 3rd joint). Endopodite of male 3-jointed with 0–10 bristles on joints 1 and 2, and 1 or 2 bristles on reflexed 3rd joint.

Mandible: Bristles on exopodite much longer than those on the Cylindroleberidinae. Endopodite: 1st joint with 3–14 ventral bristles; 2nd joint with 0–8 ventral and 10–70 dorsal bristles; end joint with 5 or 6 bristles—3 of these stout clawlike.

Maxilla: Proximal endite with 2–19 bristles, distal endite with 3–25 bristles; dorsal margin of basale with numerous bristles; terminal joint of endopodite with 4–6 bristles.

Sixth limb: Limb with posteroventral corner projecting posteriorly; anterior and ventral margins with numerous bristles.

Seventh joint: Each limb with 6 to more than 200 bristles; terminus consisting of opposing combs with 14–80 teeth.

Furca: Each lamella with 6 to 10 or 12 claws; on *Cyclasterope,* bristlelike secondary claws present proximal and between bases of primary claws; on *Microasteropteron,* bristlelike secondary claws not present; on remaining genera, bristlelike secondary claws follow primary claws.

Rod-shaped organ: Elongate, 1-jointed or weakly segmented.

Eyes: Lateral eyes absent or very well developed. Medial eye well developed.

Posterior: Posterior spinous; *Cycloleberis* without dorsum, or with low bulge; remaining genera with thumblike dorsum (morphology of posterior of *Actinoseta* unknown).

MICROSTRUCTURE.—*Asteropella* species A: A simple hair pore with a rim is shown in Figure 346*d*. Details of the rows of septate structures forming the central rib are shown in Figures 346*e,f*. This peripheral ridge around the margin of this species also appears to have the same peculiar structure.

Asteropteron hulingsi: A detail of one of the fossae is shown in Figure 350*b*, and the reticulate structure on the surface of carapace is shown in Figure 350*d*. A surface bristle with marginal hairs and its pore is shown in Figure 350*f*. The pore is partly obscured by debris. Fossae with tubes in

Key to Genera

(Adapted from Poulsen's (1965:174) key)

1. Surface of carapace imbricate, or with ribs, ridges or lobate processes 2
   Surface of carapace smooth 4
2. Carapace with longitudinal midrib ..... *Asteropella*
   Carapace without longitudinal midrib 3
3. Carapace with ridges or lobate processes 5
   Carapace without ridges or lobate processes (with imbricate or pustulose surface) ... *Actinoseta*
4. Furcal lamella with bristlelike secondary claws following primary claws ..... *Cycloleberis*
   Furcal lamella with bristlelike secondary claws proximal to and between some primary claws ..... *Cyclasterope*
5. Gills rudimentary. Second antenna: 9th joint of exopodite with 1 bristle, endopodite on female limb 1-jointed ..... *Microasteropteron*
   Gills well developed. Second antenna: 9th joint of exopodite with 3 or more bristles, endopodite on female limb 3-jointed ..... *Asteropteron*

middle part and lathlike processes around margin were observed on holotype when using compound microscope with transmitted light (Figure 348*e,f*), but were not observed in juvenile examined with scanning electron microscope.

DISTRIBUTION.—Members of the subfamily Cyclasteropinae have not been collected in Antarctic or Subantarctic regions. The northernmost latitude at which members have been collected is about 40°N; the southernmost latitude, about 50°S in the vicinity of New Zealand. The known depth range is 1 to 100 m.

Asteropella Poulsen, 1965

TYPE-SPECIES.—*Asteropella mortenseni* Poulsen, 1965, designated herein.

The genus *Asteropella* is represented in the study area by *A. rotundicostata* (Hartmann, 1965) and *Asteropella* species A (described herein).

DIAGNOSIS OF GENUS.—Carapace oval in lateral view with shallow incisur; lateral surface with prominent ridge just within outer edge of valve and horizontal rib near valve middle.

First antenna: Sensory bristle of 5th joint bifurcate, each branch with bifurcate tips.

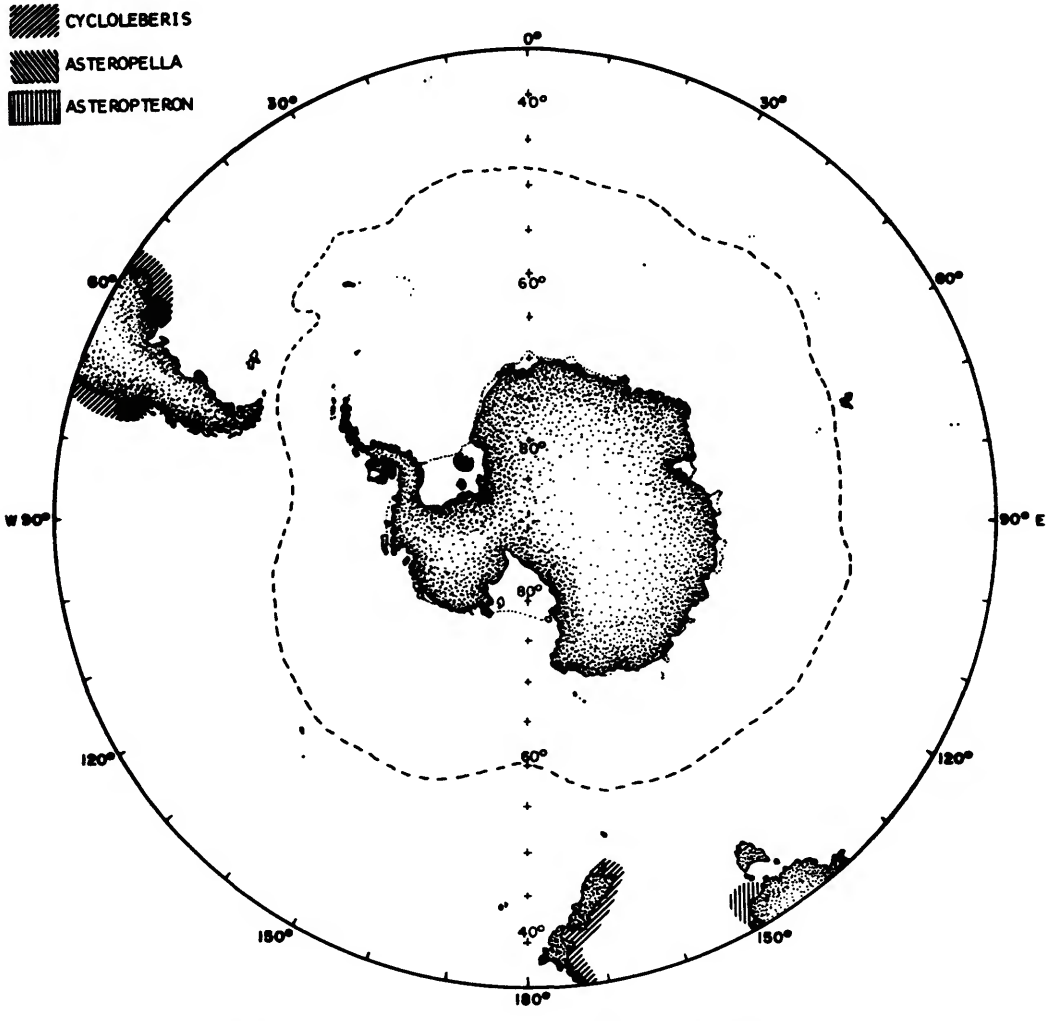

FIGURE 342.—Distribution map of *Cycloleberis*, *Asteropella*, and *Asteropteron*.

Furca: Each lamella with 3 stout claws followed by 3 to 5 secondary claws; posterior secondary claw displaced laterally on lamella and slightly longer than remaining secondary claws.

DISTRIBUTION.—Species of the genus *Asteropella* have been collected in the Atlantic and Pacific Oceans in the vicinity of North and South America. The genus is not found in Antarctic waters.

The northernmost locality at which *Asteropella* has been collected in the Pacific Ocean is Scammon Lagoon, Baja California, Mexico, at 27°35′N–28°15′N, and in the Atlantic Ocean in the Bahamas, at 25°45′N. The southernmost locality is Bahia Inglés, North Chile, 41°48′S, 74°22′W in the Pacific Ocean, and 40°32′S, 60°19′W in the Atlantic Ocean, but a species *Asteropella agassizii* (F. Müller, 1870), which may belong to this genus, was collected off south Brazil (Figure 342). Members of the genus have been reported from intertidal depths to 57 m.

Key to Species

(Includes only species south of 35°S)

Lateral ridge within valve margin continuous.....100. *Asteropella* species A
Lateral ridge within valve margin forming clockwise spiral.....99. *A. rotundicostata*

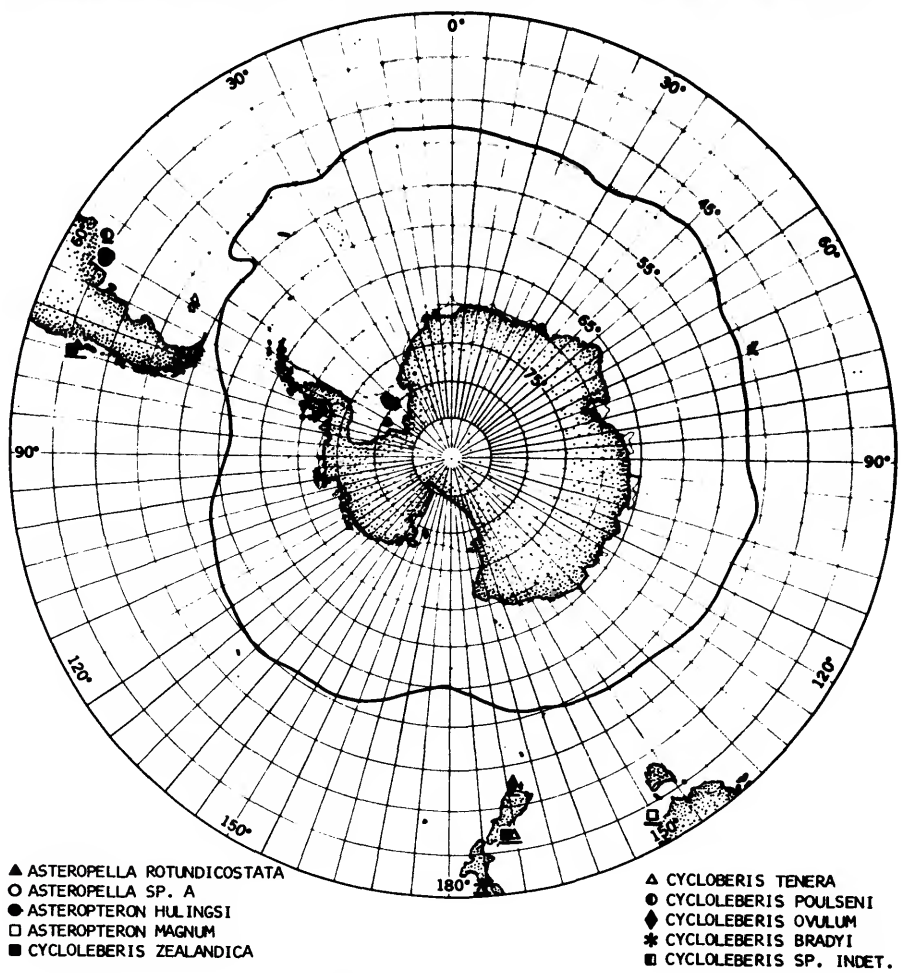

FIGURE 343.—Distribution map.

99. *Asteropella rotundicostata* (Hartmann)

Cycloleberis rotundicostata Hartmann, 1965:326, fig. 35.

HOLOTYPE.—♀, length 1.88 mm, Hamburg Zoological Museum, no. K27 282, unique specimen.

TYPE-LOCALITY.—Bahia Inglés off Chiloë, 41°48′S, 75°53′W, 12 m.

MATERIAL.—None examined.

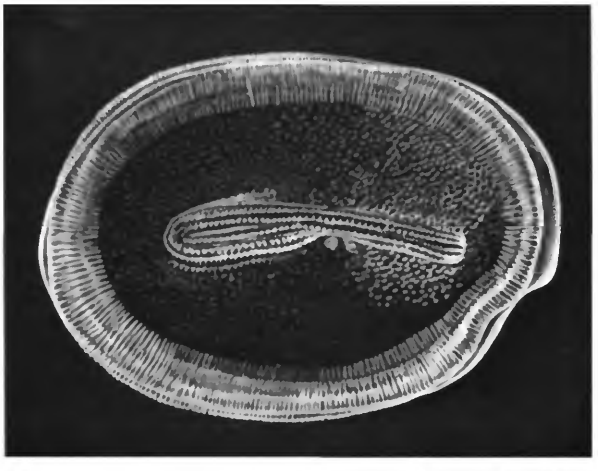

FIGURE 344.—*Asteropella* species A, female, USNM 134809, length 1.78 mm.

DIAGNOSIS OF FEMALE.—Carapace length 1.88 mm, height 1.43 mm.

Ornamentation: Concentric ridge within valve margin discontinuous, forming spirallike design.

DISTRIBUTION.—Known only from type-locality (Figure 343).

100. *Asteropella* species A

FIGURES 344–346

MATERIAL.—USNM 134809, length 1.78 mm, appendages missing, from *Vema* Cruise 17, station V-17-71; USNM 134810, 1 juvenile left valve and part of right, length 1.13 mm, height 0.84 mm, appendages missing, from *Vema* Cruise 17, station V-17-70.

The two specimens on hand had been dissected by Dr. Hulings and each was on a glass slide in a drop of glycerine surrounded by a plastic ring. Unfortunately, I could find no appendages on the slides. The slide with the larger of the two carapaces (USNM 134809) also contained the posterior part of the body of an ostracode sans furca. The body contained several large eggs showing that it was from an adult female. This suggests that

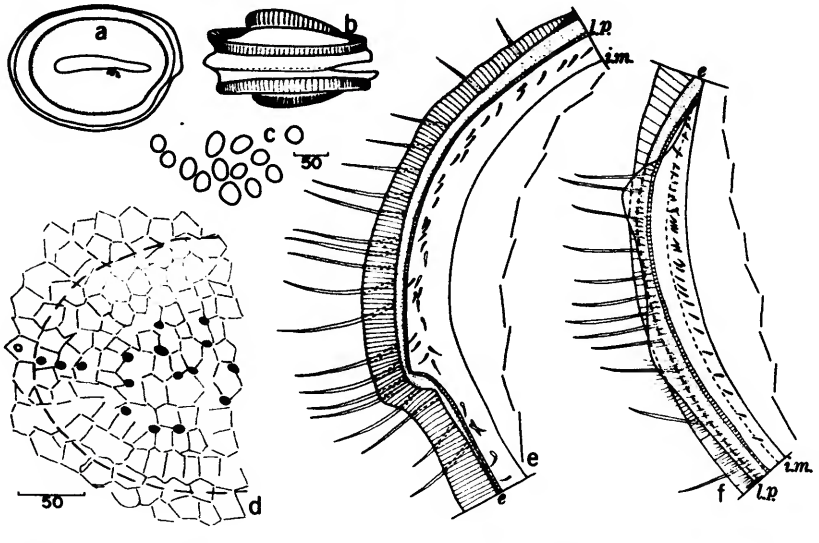

FIGURE 345.—*Asteropella* species A, female, USNM 134809, length 1.78 mm, carapace: *a*, complete specimen, lateral view, anterior to right; *b*, dorsal view, anterior to right; *c*, central muscle scars on left valve, medial view; *d*, reticulations and pores on posterior end of central rib, medial view; *e*, anterior of right valve, medial view; *f*, posterior of left valve, medial view. (Same magnification in microns: *c-f*.)

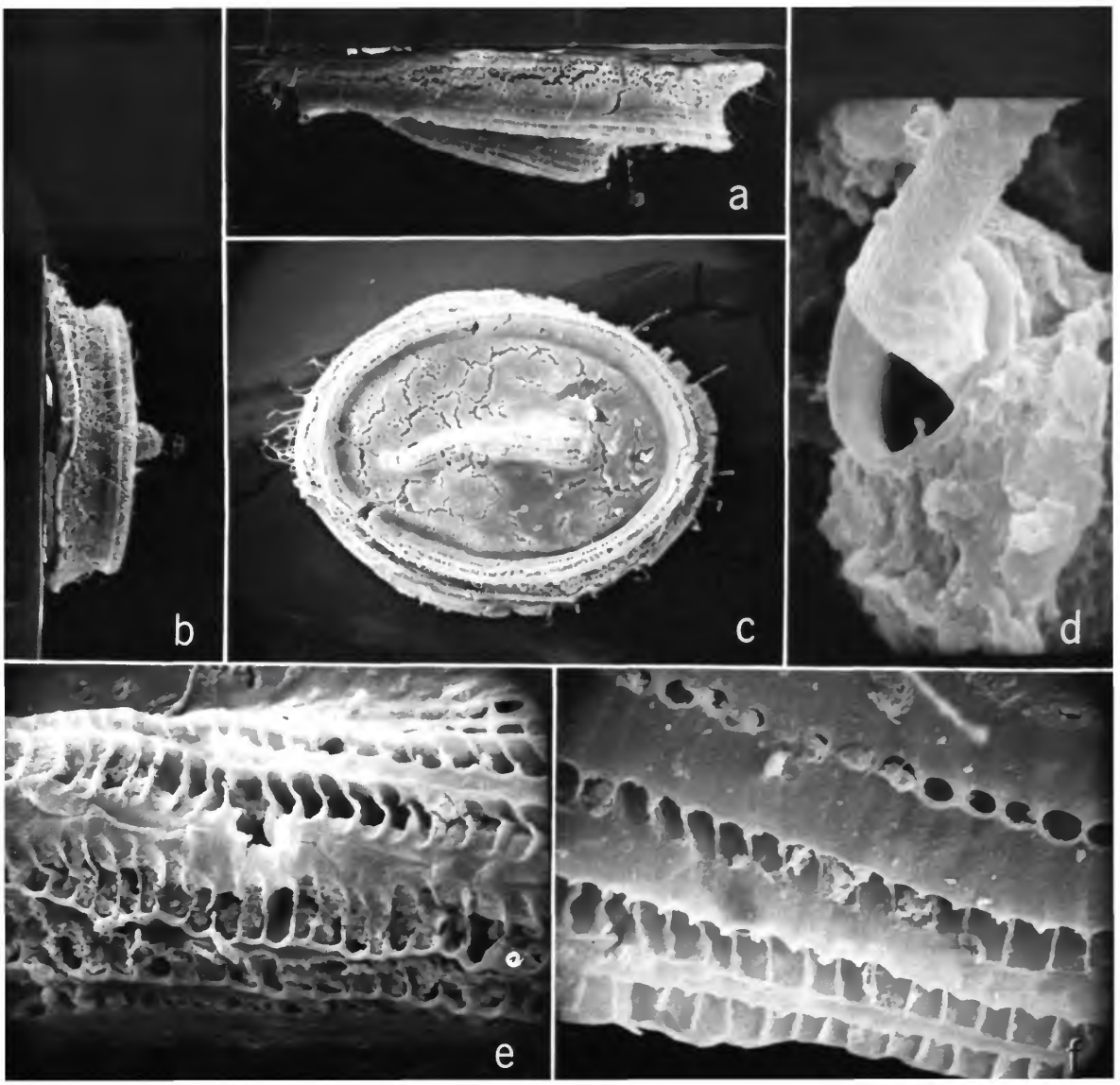

FIGURE 346.—*Asteropella* species A, female, USNM 134809, left valve: *a*, dorsal view, × 60; *b*, anterior view, × 54; *c*, lateral view, × 51; *d*, pore with hair, × 1025; *e*, midrib, lateral view, × 525; *f*, midrib, dorsal view, × 600.

USNM 134809 is the carapace of an adult female.

DIAGNOSIS OF FEMALE (?).—Carapace length 1.78 mm; narrow continuous ridge present within and parallel to margin of valve; longitudinal ridge not intersecting concentric ridge.

DESCRIPTION OF FEMALE (?).—Carapace oval in lateral view except for small incisur; left valve slightly overlapping right along dorsal margin (Figures 344; 345*a,b;* 346).

Ornamentation (Figures 345*d,* 346): Wide oval ridge paralleling valve edge, slightly indented along anterior part below incisur; longitudinal ridge in mid part of valve above central muscle attachments not connecting with oval ridge at either end; ridges appearing to be formed of polygonal rods; minute polygons also visible on lateral surface of valves.

Infold (Figure 345*e,f*): Infold between incisur and anterior juncture on dorsal margin with about 30 bristles on each valve; infold below incisur with 3 to 5 bristles; list present along ventral margin closer to inner margin of infold than to valve edge; 2 bristles present on list near middle of ventral margin; posteroventral and posterior infold with about 40 bristles, some longer than others.

Selvage: Narrow striated ridge present within and parallel to anterior, ventral, and posterior margins of valve; wide striated lamellar prolongation continuous across incisur; edges of prolongation smooth except along ventral margin where fringe is present.

Muscle scars: Central muscle scars consisting of about 12 individual scars (Figure 345*c*).

Size: USNM 134809, length 1.78 mm, height 1.31 mm.

COMPARISONS.—The smooth rounded posterior part of the concentric ridge distinguishes *Asteropella* species A from *Asteropella monambon* (Kornicker, 1958), *Asteropella mortenseni* Poulsen, 1965, and *Asteropella punctata* Poulsen, 1965. The continuity of the concentric ridge of *Asteropella* species A distinguishes the species from *Asteropella agassizii* (F. Müller, 1870), and *Asteropella rotundicostata* (Hartmann, 1965). The carapace of *Asteropella* species A closely resembles that of a juvenile identified as *Cyclasterope* sp. by Hartmann (1959:203) from the Pacific coast of El Salvador. On that specimen, however, the middle ridge intercepts the outer concentric ridge slightly above the incisur, and the concentric ridge is indented at that point, whereas, the middle ridge and the concentric ridge do not intersect on *Asteropella* species A and the concentric ridge is only slightly indented below the incisur. The outer concentric ridge and inner longitudinal ridge have considerably more relief than those features on *Asteropella scammonensis* McKenzie, 1965. McKenzie (1965:60) places *Cyclasterope* sp. (Hartmann, 1959) in the synonymy of *A. scammonensis.*

DISTRIBUTION.—This species was collected at two localities in the Subantarctic-to-35°S region east of Argentina at depths of 44–57 m (Figure 343).

Asteropteron Skogsberg, 1920

TYPE-SPECIES.—*Asterope fusca* Müller, 1890.

The genus *Asteropteron* is represented in the study area by two species, *A. magnum* Poulsen, 1965, and *A. hulingsi,* new species.

DIAGNOSIS OF GENUS.—Carapace highly ornamented with smooth or rugose concentric ridge; anteriorly, with wide rounded incisur and overhanging rostrum; surface with large rounded punctae.

First antenna: Sensory bristle of 5th joint of female with 1–9 proximal and 4 or 5 distal filaments.

Second antenna: Endopodite 3-jointed in both sexes.

Furca: Each lamella with 3 (rarely 4, 5) main claws followed by 4–8 secondary claws.

DISTRIBUTION.—Species of *Asteropteron* are widespread but are not present within the Antarctic Convergence. The northernmost latitude at which members of the genus have been collected is about 33°N. The southernmost locality is southeast of Australia, at 37°05′S, 150°05′E (Figure 342). The known depth range of the genus is 4 to 100 m.

Key to Species

(Includes only species south of 35°S)

Carapace with vertical ridge anterior to central muscle scars.....101. *A. magnum*
Carapace without vertical ridge anterior to central muscle scars.....102. *A. hulingsi*

101. *Asteropteron magnum* Poulsen, 1965

Asteropteron magnum Poulsen, 1965:178, figs. 57–60.

HOLOTYPE.—♀ with eggs in ovaries; carapace length 4.0 mm.

TYPE-LOCALITY.—Off Disaster Bay, southeast Australia, 65–90 m.

MATERIAL.—None examined.

DIAGNOSIS OF FEMALE WITH EGGS IN OVARIES.—Inner ridge on carapace passing vertically slightly anterior to central adductor muscle. Carapace length 4.0–4.1 mm.

First antenna: Dorsal margin of 3rd joint with 2 bristles.

Second antenna: 1st endopodite joint with 3 bristles. Joints of exopodite with basal spines.

Maxilla: Proximal group on dorsal margin of basale with 7 bristles; dorsal margin of 1st endopodite joint with 1 bristle.

Lateral eyes: Absent.

DISTRIBUTION.—Collected only off southeast Australia at depths of 65 to 100 m (sand, mud bottom) (Figure 343).

102. *Asteropteron hulingsi*, new species

FIGURES 347–350

HOLOTYPE.—USNM 128680, ♀ probably late instar, length 3.04 mm; valves and some appendages in alcohol, remaining appendages on slides.

TYPE-LOCALITY.—*Vema* Cruise 17, station V–17–71.

ETYMOLOGY.—The species is named for Dr. Neil C. Hulings.

PARATYPES.—USNM 128682, 1 late instar same stage as holotype; USNM 128685, 17 juveniles younger than holotype. Paratypes from same sample as holotype.

DIAGNOSIS OF FEMALE (probably late instar).—Ridge along dorsal margin with 4 nodes; ridge along posterior margin with 1 node; ventral ridge with 3 nodes.

First antenna: Dorsal margin of 3rd joint with 3 bristles.

Second antenna: 1st endopodite joint without bristles. Joints of exopodite without basal spines.

Maxilla: Dorsal margin of basale with 1 proximal bristle and 5 or 6 distal bristles; dorsal margin of 1st endopodite joint with 2 or 3 bristles.

Lateral eyes: Pigmented, with about 10 ommatidia.

DESCRIPTION OF FEMALE (late instar, male unknown) (Figures 347–349).—Carapace highly ornate with small incisur and rostrum; single lateral process hiding rostrum in lateral view; process continuing as ridge along dorsal, posterior, and ventral margins; ridge along dorsal margin with 4 nodes, posterior node of 4 longer than others and projecting back; 1 backward-pointing node present near middle of posterior part of ridge; ventral ridge with 3 nodes, anterior node short, middle node about twice length of anterior node, posterior node about same length as anterior node; 1 single process present projecting anteroventrally past valve margin; surface of carapace with numerous coarse punctae (Figures 347; 348*a,b,e,f*; 349).

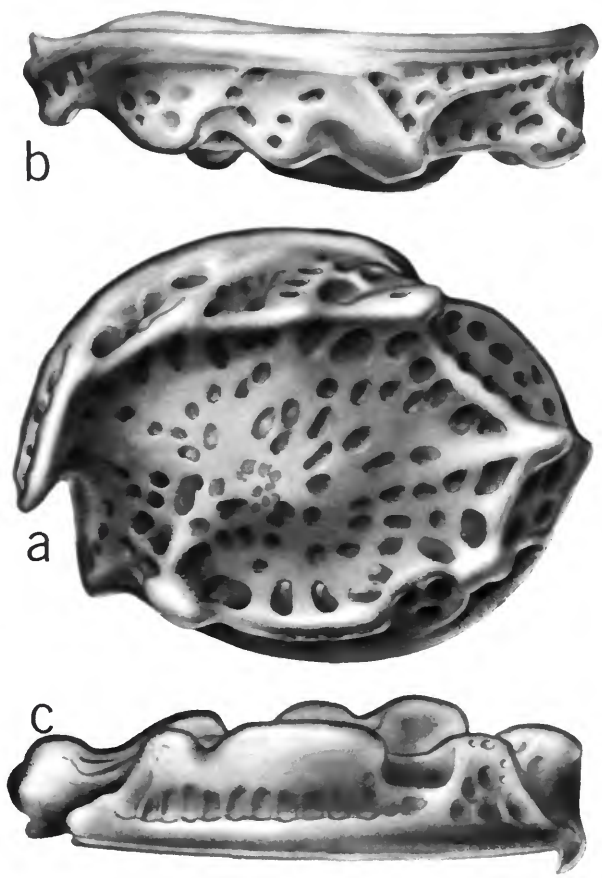

FIGURE 347.—*Asteropteron hulingsi*, late female instar, USNM 128680, length 3.04 mm, left valve: *a*, lateral view; *b*, dorsal view; *c*, ventral view.

Infold (Figure 348*c,d*): Rostral infold with row of about 20 long single bristles and numerous short bristles; 4 or 5 short bristles present posterior to inner end of incisur; anteroventral infold with 12 minute bristles forming row just inward from selvage; distinct list present near inner margin of infold extending from below incisur to posterior end of ventral infold; 4 small bristles forming row in middle of anteroventral infold; 8 bristles present just ventral to list on ventral infold; about 23 short bristles forming row on posteroventral infold just inward from selvage; numerous short and long bristles present in a broad strip on posteroventral infold just within inner margin of infold.

Selvage: Striate lamellar prolongation present along anterior, ventral, and posterior margins; fringe on edge of prolongation along posterior margin.

Size: USNM 128680, length 3.04 mm, height 2.28 mm; USNM 128682 (not dissected), length 3.17 mm, height 2.44 mm.

First antenna: 1st joint with long hairs on ventral part of lateral and medial surfaces; 2nd joint with long hairs or spines forming clusters on ventral and distal parts of medial surface and on ventral margin, 1 short proximal lateral bristle with short marginal spines, 1 short proximal and 3 or 4 long distal bristles on dorsal margin (proximal short bristle with short marginal spines, long bristles with long marginal spines); ventral margin of 3rd joint short and with short spinous bristle; dorsal margin about 3 times length of ventral margin and with 1 proximal and 2 terminal bristles, all with long proximal marginal spines; 6 or 7 short spines forming row present at middle of distal margin of lateral side of joint; 4th joint with 2 terminal bristles (1 long, 1 very short) on ventral margin, and 1 long terminal bristle on dorsal margin, all long bristles on joint spinous; sensory bristle of 5th joint with 4 short proximal and 4 long terminal bristles; medial bristle of 6th joint short, reaching just past end of 7th and 8th joints. Seventh joint: a-claw long bare; b-bristle with 9 filaments including tip; c-bristle with 10 filaments including tip; 8th joint: d- and e-bristles bare, about same length as b-bristle; f-bristle with 8 filaments including tip; g-bristle with 6 filaments including tip; short spines forming row along middle of terminal margins of lateral side of 6th and 7th joints.

Second antenna (Figure 348*g-i*): Protopodite with short spinous distomedial bristle and few long hairs along ventral and dorsal margins. Endopodite 3-jointed: 1st joint with broad proximal half which may be incipient 4th joint; joint without bristles but with minute papillae on distoventral part; 2nd joint elongate, bare except for scattered papillae; 3rd joint short with long subterminal bristle. Exopodite: bristle of 2nd joint reaching past end of joint and with short stout marginal spines and natatory hairs; 9th joint with 4 bristles; bristles of joints 3 to 8 with natatory hairs, some also with marginal spines; distal margin of medial surface of 1st joint with short spine (Figure 348*g*); joints without basal spines.

Mandible (Figure 348*j,k*): Coxale endite: ventral branch with 3 or 4 rows of proximal hairs, and spines forming 7 oblique rows; dorsal spines in each oblique row shorter than ventral spines; tip of branch with 3 small teeth; minute bristle present on endite near base of ventral branch; ventral margin of dorsal branch with 4 or 5 rounded knobs between main spine and tip of ventral branch; main spine with serrate margin; about 7 long spines present along lateral side of proximal margin of main spine; tip of dorsal branch with many long spines or hairs (tip appears to consist only of single hirsute bristle, but it is possible that base of bristle is actually dorsal to tip of branch which is obscured by numerous hairs at tip); margin between main spine and tip serrate; serrations also present on ventral margin. Basale: endite with 6 or 7 pectinate end bristles, 1 longer than others, and 6 triaenid bristles; 1 pair of spines on triaenid bristles extremely long (Figure 348*j*); endite with 5 dwarf bristles, distal of these about twice length of others; ventral margin of basale with 5 proximal triaenid bristles and 1 long spinous bristle distal to middle of margin, and 4 to 6 small bristles (some with bases on lateral surface); dorsal margin with 1 short proximal bristle, 2 long stout spinous terminal bristles and 2 or 3 very small spinous bristles just proximal to them (the 3 or 4 short bristles having bases on lateral surface of joint); medial surface of joint with numerous long slender hairs forming clusters near dorsal margin. Exopodite hirsute, slightly longer than dorsal margin of 1st endopodite joint, with 2 spinous subterminal bristles, proximal bristle slightly longer than distal bristle. Endopodite of left limb of USNM 128680: ventral margin of 1st joint with 5

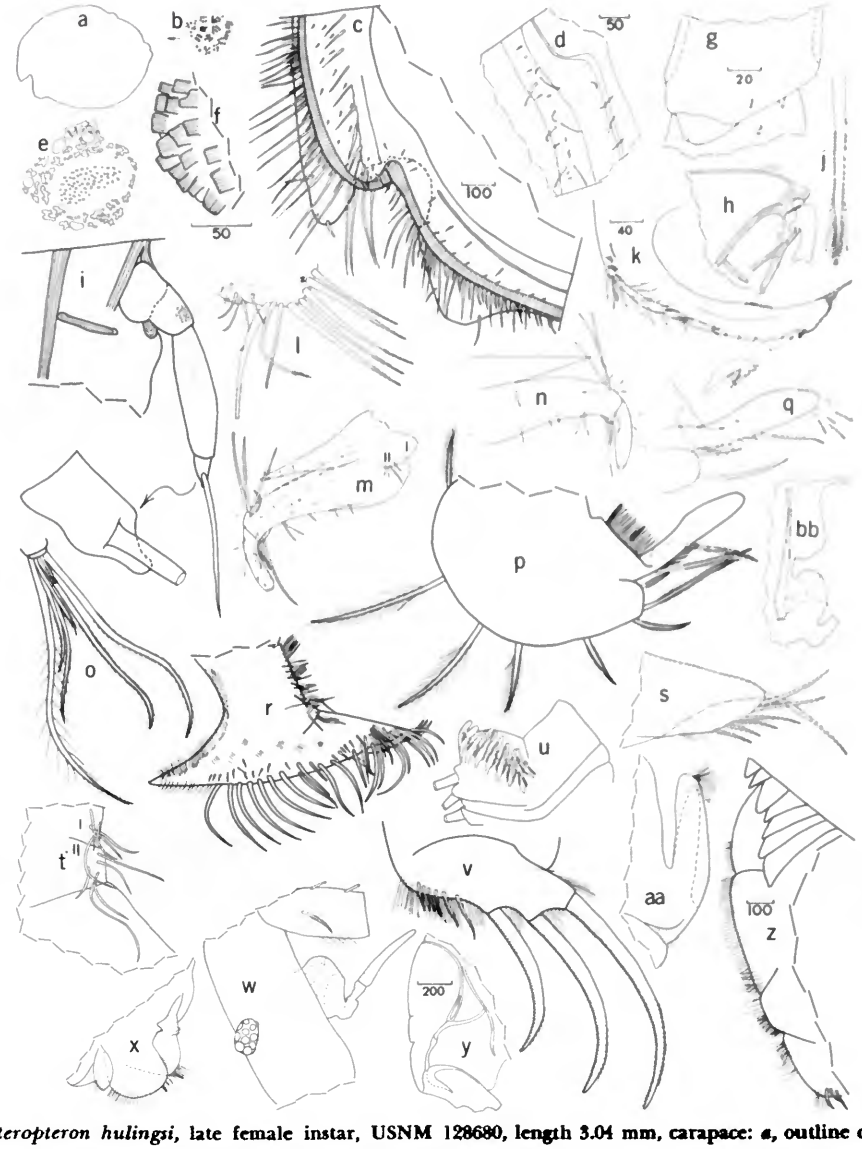

FIGURE 348.—*Asteropteron hulingsi*, late female instar, USNM 128680, length 3.04 mm, carapace: *a*, outline of complete specimen, anterior to left, lateral view; *b*, position of minute pores in vicinity of central muscle scars on left valve, lateral view; *c*, anterior of right valve, medial view; *d*, detail along posterior infold on right valve, medial view; *e*, detail of surface texture on right valve near anterior, medial view; *f*, detail of pit on outer surface of right valve, medial view. Left 2nd antenna, medial view: *g*, detail showing small spine on terminal margin of 1st exopodial joint; *h*, part of protopodite and 1st exopodial joint; *i*, endopodite. Right mandible, medial view: *j*, tip of triaenid bristle on ventral margin of basale; *k*, coxale endite. Maxilla: *l*, endites I and II on right maxilla, medial view; *m*, right limb, medial view (not all endite bristles shown); *n*, left limb, medial view (not all bristles shown); *o*, end-joint of right limb, medial view. Fifth limb: *p*, left limb (not all bristles shown); *q*, tip of right limb, lateral view. Sixth limb: *r*, left limb, medial view; *s*, bristles on lateral sole of right limb, lateral view; *t*, detail of bristles on anterior of limb shown in "*r*." Seventh limb: *u*, tip. Furca: *v*, right lamella. Anterior: *w*, right lateral eye, 1st and 2nd joint of right 1st antenna, medial eye and rod-shaped organ; *x*, upper lip. Posterior: *y*, posterior showing sclerites and furca (claws of furca not shown); *z*, posterior margin showing spines, tips of gill like structures and proximal three claws on right furcal lamella; *aa*, dorsal process; *bb*, medial eye showing attached muscle. (Same magnification in microns: *c,h,m,n,p-r,v-x,aa; d,e,i,o; g,j,u; k,l,s,t; y, bb.*)

slender and 2 stout spinous bristles; medial surface of 2nd joint with long hairs forming clusters; ventral margin of joint with 3 spinous terminal bristles; dorsal margin with about 27 bristles, some of these bare or with short marginal spines, others pectinate or of triaenid type; end joint with 2 short spinous bristles on ventral corner and 3 extremely long clawlike terminal bristles (ventral of these longer and stouter than others). Endopodite of right limb of USNM 128680: this limb aberrant, having only about 10 bristles on dorsal margin of 2nd joint; on 1st joint, one of stout ventral bristles did not molt properly and is inside the limb (where embedded bristle reaches surface, segmented filaments—protistans?—abound); large protuberance present at distal corner of dorsal margin of 1st endopodite joint; end joint with 1 short ventral bristle, 3 clawlike bristles, and 2 lateral spinous slender bristles (claws only about three-fourths length of claws on left limb).

Maxilla (Figure 348*l-o*): Epipodite long, tapering to point distally, with numerous short spines forming clusters; endite I with 5 long bristles with spines near tip; endite II with 6 medium to long bristles and 4 short distal bristles (Figure 348*l*). Basale: dorsal margin with 1 short proximal bristle and 5 or 6 distal bristles (3 long plus 2 or 3 short); ventral margin with 3 short bristles along middle, 1 pair of short distal bristles, and 1 medial and 1 lateral terminal bristles; exopodite (?) consisting of short lateral flap present at end of ventral margin; 3 short spinous bristles present on lateral surface near exopodite; numerous short spines forming clusters present on joint. Endopodite: 1st joint spinous, with 2 or 3 short dorsal bristles and long spinous 6-bristle; end joint with 6 spinous bristles.

Fifth limb (Figure 348*p,q*): Epipodial appendage with 86–88 bristles. Comb: dorsal margin slightly convex distally and with long hairs on terminal end; lateral surface with long hairs and 2 minute proximal bristles near dorsal margin; lateral surface near ventral margin with stout exopodial bristle reaching end of comb and more slender and longer bristle proximal to it; about 6 small bristles present on or near ventral margin between exopodial and proximal bristles.

Sixth limb (Figure 348*r-t*): Anterior margin with 2 sutures: margin above upper suture with 19 spinous bristles; medial surface above suture just in from anterior margin with 11 short spinous bristles; anterior margin between sutures bare; medial surface between sutures with 5 spinous bristles; bristle just above each suture longer than others; anterior margin and medial surface below lower suture without bristles. Lateral anteroventral flap (sole) with 6 slender spinous bristles. Ventral margin with about 17 stout spinous bristles; medial surface near ventral margin with about 12 minute spinous bristles in posterior half and about 20 minute-to-stout spinous bristles in anterior half. Posterior tip and posterior margin with abundant long hairs; medial surface with short spines forming clusters on posterior half and long hairs forming clusters on anterior half; anterior margin with long hairs; lateral surface with hairs along ventral margin and spines forming clusters in anterior half of limb.

Seventh limb: Each limb with 62–65 bristles, 29 to 35 on each side; 2 bristles, 1 on each side, present on almost all distal rings; section of limb bearing bristles broader than proximal part; each bristle with up to 9 bells. Terminus: each opposing comb with about 16 teeth; 4 middle teeth in each comb with 2 digitations on each side near middle and rounded tip; 6 teeth to each side of the 4 middle teeth with 4 or 5 minute proximal spines present on each side, and also with a tapering spinous lateral part (Figure 348*u*); end of limb within combs reaching past tips of most comb teeth.

Furca (Figure 348*v,y*): Each lamella with 3 long

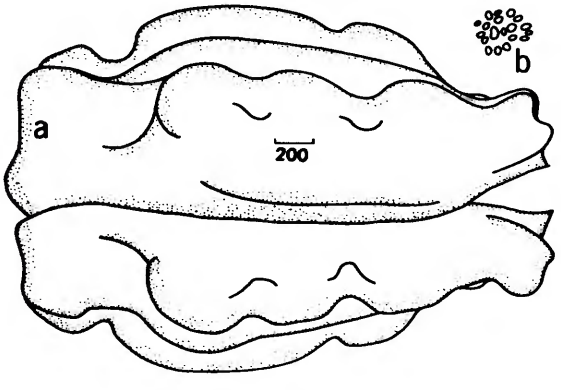

FIGURE 349.—*Asteropteron hulingsi*, late female instar, USNM 128682, length 3.17 mm, carapace: *a*, dorsal view, anterior to right; *b*, sketch of central muscle scars on left valve, lateral view.

slender curved main claws and 5 or 6 secondary claws; main claws with medial and lateral teeth along concave margin; convex margins of main claws with hairs along distal part; secondary claws with teeth or hairs along margins; anterior and ventral margins of lamellae hirsute; anterior margin also with few minute spines.

Rod-shaped organ (Figure 348*w*): Rod-shaped organ broadening near middle and indistinctly segmented; tip rounded bare.

Eyes (Figure 348*w,bb*): Medial eye large pigmented bare; lateral eye pigmented, about half diameter of medial eye and with about 10 ommatidia.

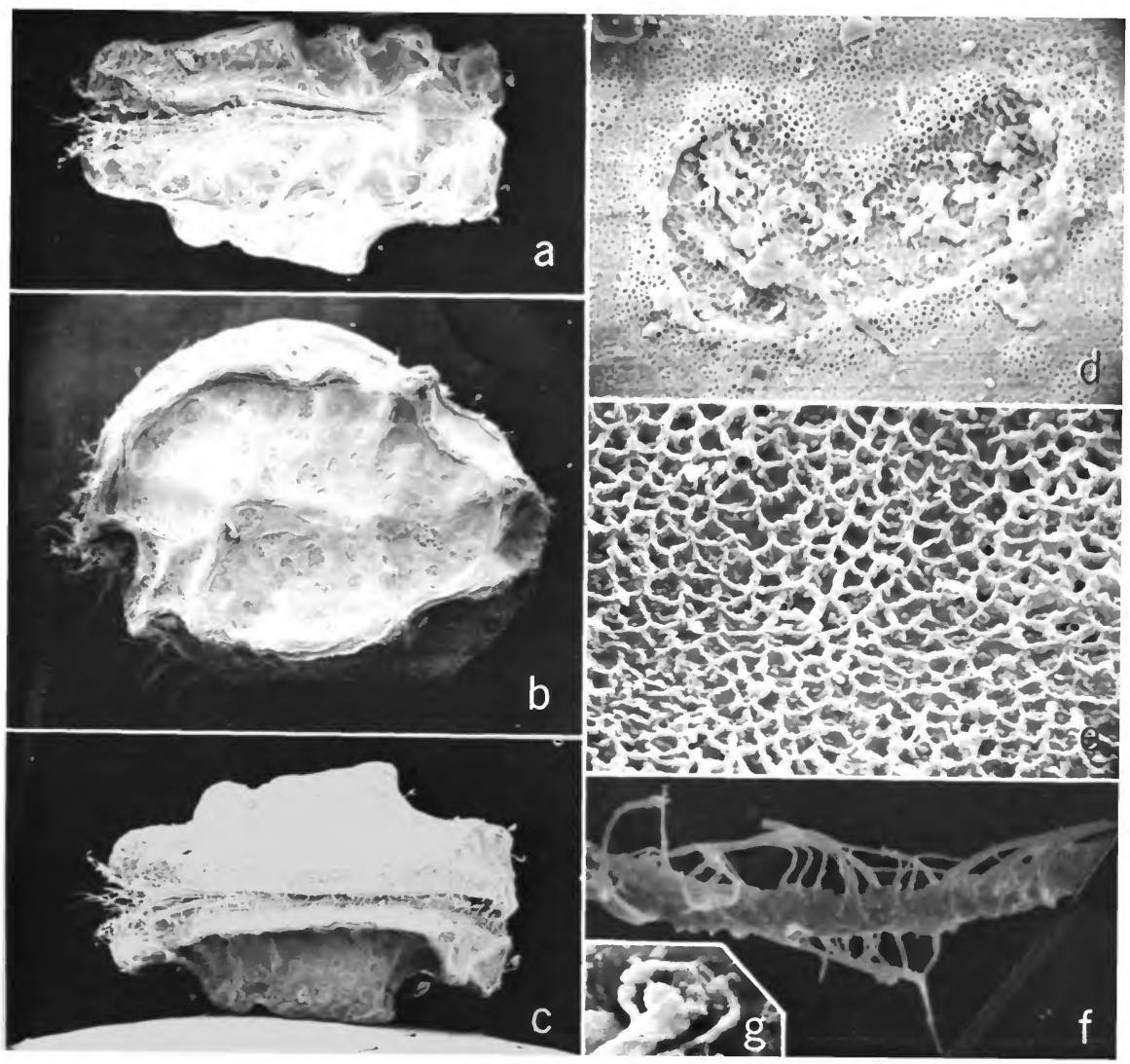

FIGURE 350.—*Asteropteron hulingsi*, juvenile, USNM 128685, complete specimen: *a*, dorsal view, × 69; *b*, lateral view, × 75; *c*, ventral view, × 66; *d*, detail of pit, × 1500; *e*, detail of reticulations in "*d*," × 7125; *f*, detail of surface bristles, × 8125; *g*, detail of pore with surface bristle, × 1250.

Posterior (Figure 348z,aa): Posterior hirsute; dorsal process long fingerlike with spines.

Upper lip (Figure 348x): Lip consisting of rounded anterior part with broad-based spines along anteroventral surface, and on each side, 1 large rounded hirsute lobe with about 4 broad-based spines on anteroventral surface; 1 flat hirsute flap present on each side of mouth.

COMPARISONS.—The carapace of the new species, *A. hulingsi,* does not have a vertical ridge anterior to the central muscle scars such as the ridge on the carapace of *A. magnum* Poulsen, 1965, nor does it have the curved spines present on *A. spinosum* Poulsen, 1965. The dorsal ridge on the carapace of *A. hulingsi* contains more nodes than does the ridge on the carapace of *A. hirsutum* Poulsen, 1965, and does not have the spinous anterior bristles for which the latter species is named. The ventral ridge on the carapace of *A. thailandicum* Poulsen, 1965, bears more nodes than does the ventral ridge on the carapace of *A. hulingsi.* The shape of the ridges on the new species is considerably different than that of *A. nodulosum* Poulsen, 1965. The carapaces of *A. skogsbergi* Poulsen, 1965, and the new species bear a strong resemblance; however, the appendages differ. For example; the 1st joint of the endopodite on the 2nd antenna of the new species is bare, whereas, that of *A. skogsbergi* bears numerous bristles on juveniles as well as adults; the distributions of bristles on the maxillae and 6th limbs of both species also have considerable differences. *Asteropteron liguriae* (Granata, 1915) is not well known, but the carapace illustrated by Granata (1915:30, fig. 5) does not have large nodes on the ventral ridge such as those present on *A. hulingsi.* The carapace of the new species bears no resemblance to that of *Asteropteron fuscum* (Müller, 1890). Only the male of *Asteropteron oculitristis* Darby, 1965, is known. It differs from the female of *A. hulingsi* in having fewer bristles on the 7th limb and fewer secondary claws on the furca. The carapace of *A. oculitristis* bears a distinct rib extending from the ventral margin of the rostrum to the anteroventral margin of the valve. This crescentlike rib is absent on *A. hulingsi.*

DISTRIBUTION.—This species was collected at only one locality in the Subantarctic-to-35°S region east of Argentina at a depth of 44 m (Figure 343).

Cycloleberis Skogsberg, 1920

TYPE-SPECIES.—*Cylindroleberis lobiancoi* G. W. Müller, 1894:220, pl. 4: figs. 40, 42; pl. 5: figs. 2,3, 26,32,34,40.

Six species of this genus have been reported in the study area: *C. zealandica* (Baird, 1850); *C. orbicularis* (Brady, 1897); *C. tenera* (Brady, 1898); *C. ovulum* (Brady, 1898); *C. poulseni* Moguilevsky and Ramirez, 1970; and *C. bradyi* Poulsen, 1965.

DIAGNOSIS OF GENUS.—Carapace usually oval with incisur continuous at inner end.

First joint: Dorsal margin of 2nd joint with 3 to 6 bristles; lateral margin of 1st joint with numerous (up to 11) bristles; dorsal margin of 3rd joint with as many as 17 bristles.

Second antenna: Endopodite of female with as many as 21 bristles on 1st joint and 20 on 2nd joint. Endopodite of adult male prehensile with numerous (as many as 10) bristles on 2nd joint.

Maxilla: End joint of endopodite with 5 or 6 bristles.

Fifth limb: Dorsal margin of comb with 3 to 13 short bristles.

Sixth limb: Numerous bristles present along anterior margin.

Furca: Each lamella with 3 or 4 main claws followed by 6 to 10 slender bristles; on some species a slender bristle present between 3rd and 4th main claws.

REMARKS.—Four of the species in the study area are inadequately described (*C. zealandica, C. orbicularis, C. ovulum, C. tenera*). No new material was collected, and I reexamined only a syntype of *C. zealandica.* Therefore, I have not attempted a key to the species in the study area.

DISTRIBUTION.—The genus *Cycloleberis* is widespread, having been reported from the Atlantic, Pacific, and Indian Oceans, and the Mediterranean Sea. In the study area species of the genus live along both the east and west coasts of South America and in the vicinity of New Zealand. The genus also occurs just outside the study area in the vicinity of Australia and the tip of South Africa. The northern limit of the range of the genus is 40°50′N in the Mediterranean Sea. The southern limit of its range is 47°S, in the vicinity of Stewart Island, New Zealand (Figure 342). The genus has been collected on the bottom only in shallow water,

from intertidal rock pools down to depths of 65 m. Specimens have occasionally been collected in nets at or near the water's surface.

103. *Cycloleberis bradyi* Poulsen

Cycloleberis bradyi Poulsen, 1965:268, figs. 90–94.
Cycloberis bradyi Poulsen.—Eagar, 1971:61 [generic name misspelled].

HOLOTYPE.—Mature ♂, carapace length 7.1 mm.

TYPE-LOCALITY.—Colville Channel, New Zealand (about 36°30′S, 175°30′S), water depth 65 m, sand and ooze bottom.

MATERIAL.—None examined.

DIAGNOSIS OF ADULT MALE (from Poulsen, 1965).—Ventral and dorsal margins evenly arched with slight truncation at posterodorsal corner; surface with minute punctae. Carapace length 7.1 mm.

First antenna: 2nd joint with 6 dorsal and 11 lateral bristles; 3rd joint elongate, with 10 dorsal and 1 ventral bristle; 4th joint with 1 dorsal and 5 ventral bristles; sensory bristle with abundant thin marginal filaments and 12 stouter terminal filaments.

Second antenna: Endopodite prehensile, 3-jointed: 1st joint with 11 or 12 bristles, 6 or 7 proximal, 5 marginal and distal; 2nd joint with about 20 bristles.

Mandible: Dorsal margin of basale with 16 bristles; ventral margin with 3 long distal bristles in addition to numerous shorter bristles; ventral margin of 1st endopodite joint with 7 bristles.

Maxilla: Ventral margin of basale with about 23 bristles in addition to terminal bristle; dorsal margin and distal sides of basale with 12 bristles; end joint with 6 bristles; exopodite represented by 3 fairly long bristles.

Seventh limb: Teeth of comb with marginal spines and knobbed tip.

Furca: Lamella with 3 stout main claws followed by 8 or 9 bristles; indentations between main claws less than semicircular in outline.

DIAGNOSIS OF JUVENILE FEMALE (from Poulsen, 1965).—Carapace more ovoid in lateral outline than that of male. Carapace length 4.8 mm.

First antenna: 2nd joint with 6 dorsal and 7 lateral bristles; 3rd joint with 13 or 14 dorsal bristles and 1 ventral bristle; 4th joint with 1 dorsal and 5 ventral bristles; sensory bristle of 5th joint with 2 short proximal and 10 long terminal filaments.

Second antenna: Endopodite 3-jointed: 1st joint with 21 bristles, 14 proximal, 7 marginal and distal; 2nd joint with 7 marginal bristles.

Mandible: In general, similar to that of adult male.

Maxilla: Ventral margin of basale with about 30 bristles in addition to long terminal bristle; dorsal margin and distal sides of basale with about 28 bristles; end joint with 5 bristles; exopodite represented by 3 fairly long bristles.

Seventh limb: Teeth on comb similar to those on comb of male limb.

Furca: Similar to that of adult male except no more than 8 bristles observed following main claws.

DISTRIBUTION.—This species has been recorded from three localities: Colville Channel, New Zealand (36°30′S, 175°30′E); *Galathea* station 541, Moreton Bay, Brisbane, East Australia (27°25′S, 153°25′E); and *Galathea* station 544, Coral Sea, northeast of Australia (29°57′S, 153°22′E) (Figure 343). The known depth range of the species is 50 to 65 m.

104. *Cycloleberis poulseni* Moguilevsky and Ramirez

Cycloleberis poulseni Moguilevsky and Ramirez, 1970:461–471, pls. 1–3.

HOLOTYPE.—Not designated.

TYPE-LOCALITY.—Mar del Plata, Argentina.

MATERIAL.—None examined.

DIAGNOSIS OF FEMALE.—Carapace oval, somewhat flattened along dorsal margin. Carapace length 5.30 mm, height 4.20 mm.

First antenna: 2nd joint with 6 dorsal and 10 lateral bristles; 3rd joint with 14 dorsal bristles and 1 ventral bristle; 4th joint with 1 dorsal and 4 ventral bristles; sensory bristle of 5th joint with 4 short proximal and 10 long terminal filaments.

Second antenna: Endopodite 3-jointed: 2nd joint with 1 bristle; end joint with 2 terminal bristles, 1 long, 1 short (always?).

Furca: Lamella with 3 main claws followed by 8 bristles; indentations between main claws deeper than semicircle.

DISTRIBUTION.—All specimens collected from Mar del Plata, Argentina, 37°56′24″S and 38°05′00″S – 57°25′50″W and 57°32′00″W (Figure 343). Depth range of the species is 10 to 20 m.

105. *Cycloleberis ovulum* (Brady)

Cyclasterope ovulum Brady, 1898:432, figs. 24–30.—Müller, 1912:48 [key].—Skogsberg, 1920:439 [discussion].
Cycloleberis ovulum Brady.—Skogsberg, 1920:442.—Poulsen, 1965:245 [key], 282 [discussion].
Cycloberis ovulum Brady.—Eagar, 1971:61 [genus misspelled].

HOLOTYPE.—Not designated, possibly a unique specimen, a ♀. A specimen is in the collections of the Hancock Museum, Newcastle-upon-Tyne.

TYPE-LOCALITY.—Rock pools on Stewart Island, New Zealand.

MATERIAL.—None examined.

The original description of this species may be inadequate for its recognition. The carapace size of the female described by Brady suggests that it is mature.

DIAGNOSIS OF FEMALE.—Carapace oval, length 8.8 mm, height 6.6 mm.

Second antenna: Endopodite: 1st joint with about 9 hairs; 2nd joint with about 3 hairs; 3rd joint with 1 long terminal bristle.

Seventh limb: Teeth of comb corrugated with tip formed by small spine and an overhanging knobbed process.

Furca: Lamella with 3 strong main claws followed by 9 spinous bristles. Indentations between main claws shallow.

DISTRIBUTION.—Collected only at the type-locality (Figure 343).

106. *Cycloleberis zealandica* (Baird)

FIGURE 351

Cypridina zealandica Baird, 1850b:102, pl. 17: figs. 11–13.—Skogsberg, 1920:439.
Cypridina zealanica Baird, 1850c:257, pl. 17: figs. 11–13; 1852:58.
Cyclasterope? zealandica (Baird).—Brady, 1898:433.—Müller, 1912:48 [key], 49.—Eagar, 1971:61 [listed].
Cycloleberis? zealandica (Baird).—Skogsberg, 1920:442; Poulsen, 1965:245 [key], 281 [discussion].
Cyclasterope? tenera Brady, 1898:433, pl. 46: figs. 27–29.—Müller, 1912:52 [genera dubia and species dubia].—Skogsberg, 1920:439.—Poulsen, 1965:281 [discussion].—Eagar, 1971:61 [listed].
Cycloleberis? tenera Brady.—Skogsberg, 1920:442.
Azygocypridina zealanica (Baird) [part].—Eagar, 1971:60 [only Eagar's *Cypridina zealanica* included here].
Cycloberis? tenera (Brady).—Eagar, 1971:61 [genus misspelled].

HOLOTYPE.—Not designated. Two syntype specimens are in the British Museum (Natural History), no. 1966.6.16.6 (one with valves intact, other with valves disarticulated).

SYNTYPE-LOCALITY.—New Zealand (more specific locality unknown). The collection was made by Rev. R. Taylor of Waimate, New Zealand, who sent two specimens to the British Museum (Natural History), without locality data (Baird, 1850: 102). Waimate, N. Z., is near the southeast coast of South Island, about 44°20′S, 171°E.

MATERIAL EXAMINED.—Two disarticulated valves (length 6 mm, height 5 mm) and a dried fragment of the anterior part of the body of a syntype were sent to me from the British Museum (Natural History) through Mr. G. M. Bennell. The valves and fragment were received in a small cardboard box bearing the label, "*Cypridina zealandica* Baird, Proc. Zool. Soc. 1850, 1966.6.66.6." Mr. G. M. Bennell had previously sent photographs of the muscle scar of the right valve of this specimen.

REMARKS.—The dry fragment bears a mandible with numerous bristles along the ventral margin of the basale, similar to that illustrated for *Cycloleberis galathea* Poulsen, 1965, by Poulsen (1965: 261, fig. 87f). The central muscle scars (Figure 351) form a faint spiral pattern similar to that illustrated for *Cyclasterope fascigera* Brady, 1902, by Skogsberg (1920:543, fig. 106–3). For these reasons I do not concur with Eagar (1970:60) who, without stating a reason, referred the species to *Azygocypridina*.

The description of the dried specimens studied by Baird is insufficient for identification, because it is concerned only with the outer characters of

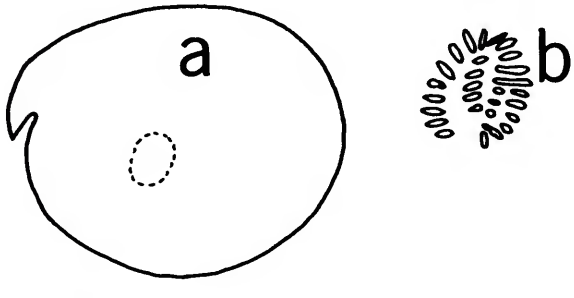

FIGURE 351.—*Cycloleberis zealandica*, syntype, no. 1966.6.16.6, British Museum (Natural History), length 6 mm: *a*, left valve, lateral view; *b*, sketch of central muscle scars.

the carapace. The carapace length of about 6 mm and striate appearance of the valve surface may be of some use in its recognition. The oval lateral outline of the carapace suggests that specimens illustrated by Baird is a female. Because a whole specimen from the type-series is still extant in the collections of the British Museum (Natural History), it may still be possible for the species to be adequately described.

Brady (1898:433) referred specimens collected in Lyttelton Harbor, New Zealand, to this species. He stated that he was describing a male and female, but I agree with Poulsen (1965:281) that the latter was actually a juvenile male.

Brady (1898:433) also described a new species, *Cyclasterope tenera,* from Lyttelton Harbor. I agree with Poulsen (1965:281) that this is an early instar and is possibly conspecific with the specimens from the same locality which Brady referred to *Cyclasterope zealandica* Baird. I consider it possible that *C. ovulum* Brady may be an adult female of *C. zealandica.*

Diagnosis of ?Female (based on Baird's description).—Carapace oval with striate surface; carapace length of dry specimen about 6 mm.

Diagnosis of Adult Male (based on Brady's description).—Carapace truncate at posterodorsal corner, length 6.25 mm, height 4.5 mm.

Second antenna: Endopodite 3-jointed: 2nd joint with about 7 setae.

Diagnosis of Juvenile Male (probably N–1 stage) (based on Brady's description).—Carapace oval, length 5 mm, height 4 mm.

Second antenna: Endopodite 3-jointed: 2nd joint with about 7 setae.

Seventh limb: Teeth of terminal comb with marginal spines and bulbous tips.

Furca: Lamella with 3 strong claws followed by 10 bristles; indentations between main claws shallow.

Distribution.—The type-locality is recorded only as New Zealand. Specimens collected by Brady and considered herein to be questionable *C. zealandica,* are from Lyttelton Harbor, New Zealand, at depths of 2 to 9 meters (Figure 343).

Cycloleberis Species Indeterminate

Cycloleberis cf. *orbicularis* (Brady, 1897).—Hartmann, 1965: 326.

Material.—None examined.

Remarks.—Hartmann collected only larvae.

Distribution.—Puerto Ingles, off Chiloe, 41°48′S, 73°53′W, water depth 12 m. The type-locality for *Cycloleberis orbicularis* (Brady) is in the vicinity of Valparaiso (ca. 33°S, 71°40′W). Hartmann's locality is shown in Figure 343.

SARSIELLIDAE Brady and Norman, 1896

Only four genera in the family Sarsiellidae were collected in the study area: *Sarsiella* Norman, 1869; *Cymbicopia* new genus, *Spinacopia* Kornicker, 1969a; and *Adelta,* new genus. The genera not collected are *Anscottiella,* new name; *Parasarsiella* Poulsen, 1965; and *Chelicopia* Kornicker, 1958.

Diagnosis of the Family.—Anterior of carapace generally rounded in lateral view without incisur or with very shallow incisur; incisur generally deeper in males; carapace of males often more elongate and sometimes considerably smaller than carapace of females; surface ornamentation varied, but generally similar in males and females of same species; caudal process usually present, but varying in degree of development; posterior infold with 2 or more brushlike bristles dorsal to caudal process, or on dorsal part of caudal process; surface with few hairs or abundant hairs of several types; hairs generally abundant around free margins; single small bristle present on anterior infold near middle of valve margin.

First antenna: 3rd and 4th joints fused without suture separating them; sensory bristle of 5th joint on female limb bare or with 2 or 3 short filaments; sensory bristle of 5th joint on male limb with numerous filaments; b-bristle may be missing on 7th joint of *Chelicopia;* d- and e-bristles on 8th joint bare and about the same length except in *Adelta* on which the d-bristle is missing.

Second antenna: Endopodite of female either 1- or 2-jointed: 1-jointed endopodites with 1 or 2 anterior proximal bristles, and on some species also 2 posterior proximal bristles, or 1 terminal bristle; 2-jointed endopodites with 2 or 3 anterior proximal bristles on 1st joint and 1 (rarely 2) terminal bristle on small 2nd joint. Endopodite of male limb 1-jointed with several bristles, or 3-jointed with 3rd joint reflexed on 2nd.

Mandible: Endopodite on female limb with terminal claw on each joint; endopodite on male limb with terminal claw only on 3rd joint.

Maxilla: Exopodite with 2 or 3 bristles. Endopodite on female limb 2-jointed with 2 stout terminal α- and 6-bristles on 1st joint, and 5 stout bristles along terminal margin of 2nd joint; endopodite on male limb reduced with weakly developed bristles.

Fifth limb: Single endite present with 1 bristle; sclerotized teeth such as those on Philomedidae, Rutidermatidae, or Cypridinidae, not present.

Sixth limb: Each limb with 1 to 4 endites; end joint narrow with 6 to 14 bristles.

Seventh limb: Limb of male on some species reduced, bare and without end combs, on other species male limb similar to limb on female except with fewer teeth in terminal combs; some species without terminal combs on both sexes; total number of bristles 6 to 21.

Furca: In *Sarsiella*, *Parasarsiella*, and *Adelta* claws not separated into primary and secondary types, only claw 1 united to furca, claws decreasing in length posteriorly along lamella; *Sarsiella* and *Adelta* with 5 claws, *Parasarsiella* with 7. *Chelicopia* with primary claws 1, 2, and 4 united to lamella, secondary claw 3 shorter than claw 4, 3 or 4 secondary claws following primary claw 4. *Spinacopia* with only claw 1 united to lamella; each lamella with 7 to 9 claws, claw 3 shorter than claw 4, occasionally claw 5 shorter than claw 6. *Anscottiella* with 4 to 8 claws; female with claws 1 and 2 united with lamella; male with claws 1 to 3 united with lamella; claws 3 to 8 or 4 to 8 considerably shorter than 2nd claw. *Cymbicopia* with 4 to 8 claws; claws 1 and 2 continuous with lamella, except for female of *C. hispida* on which only claw 1 is united to lamella; on *C. zealandica* and *C. hispida*, claw 3 (a secondary claw) smaller than primary claw 4.

Rod-shaped organ: Elongate on some species, short conical in others, generally 1-jointed or weakly ringed or divided into several joints.

Eyes: Medial eye well developed, pigmented. Lateral eyes absent in *Spinacopia*, generally present but reduced in other genera; male *Sarsiella crispata* with 12–16 ommatidia, male *Sarsiella georgiana* with 10 ommatidia, but remaining species with fewer than 8; on some species, lateral eye of male with more ommatidia than eye of female, but remaining species with male eyes with same number of ommatidia of same size as those of female or larger.

DISTRIBUTION.—The northernmost latitude from which members of the family have been collected is about 63°N, the southernmost latitude 73°29′ in the Weddell Sea. The known depth range is intertidal to 4758 m. The only genus in the family collected in Antarctica and the Subantarctic is *Spinacopia*.

Key to Genera

1. Bristles on carapace with ball-like or cuplike tips ..... ***Cymbicopia***
   Bristles on carapace without ball-like or cuplike tips 2
2. Furca with only claw 1 united to lamella 3
   Furca with more than 1 claw united to lamella 4
3. Furca with 5 claws 5
   Furca with more than 5 claws 6
4. Claw 4 of furca united to lamella ..... ***Chelicopia***
   Claw 4 of furca not united to lamella ..... ***Anscottiella***
5. First antenna with d-bristle on 8th joint ..... ***Sarsiella***
   First antenna without d-bristle on 8th joint ..... ***Adelta***
6. Claw 3 of furca shorter and more slender than claw 4 ..... ***Spinacopia***
   Claw 3 of furca longer and stouter than claw 4 ..... ***Parasarsiella***

Sarsiella Norman, 1869

TYPE-SPECIES.—*Sarsiella capsula* Norman, 1869, by monotypy.

Two species of this genus have been collected in the study area; *S. magna* (Poulsen, 1965), and *S. lunata*, new species.

DIAGNOSIS OF THE GENUS.—Carapace of female without prominent rostrum.

First antenna: 8th joint with d- and e-bristles.

Second antenna: Endopodite on female limb 1-jointed; endopodite on male limb either 1- or 3-jointed.

Mandible: Female limb without exopodite.

Sixth limb: Limb with only 1 distinct endite.

Seventh limb: Male limb generally bare.

Lateral eyes: Eyes present in both sexes.

Furca: Each lamella with 5 claws, claw 1 united with lamella, remaining claws separated from lamella by suture; claws decreasing in length and stoutness proximally along lamella.

MICROSTRUCTURE.—Both male and female *S. lunata* have on the carapace bristles with a broad base emerging from a simple pore (Figures 335*c*,

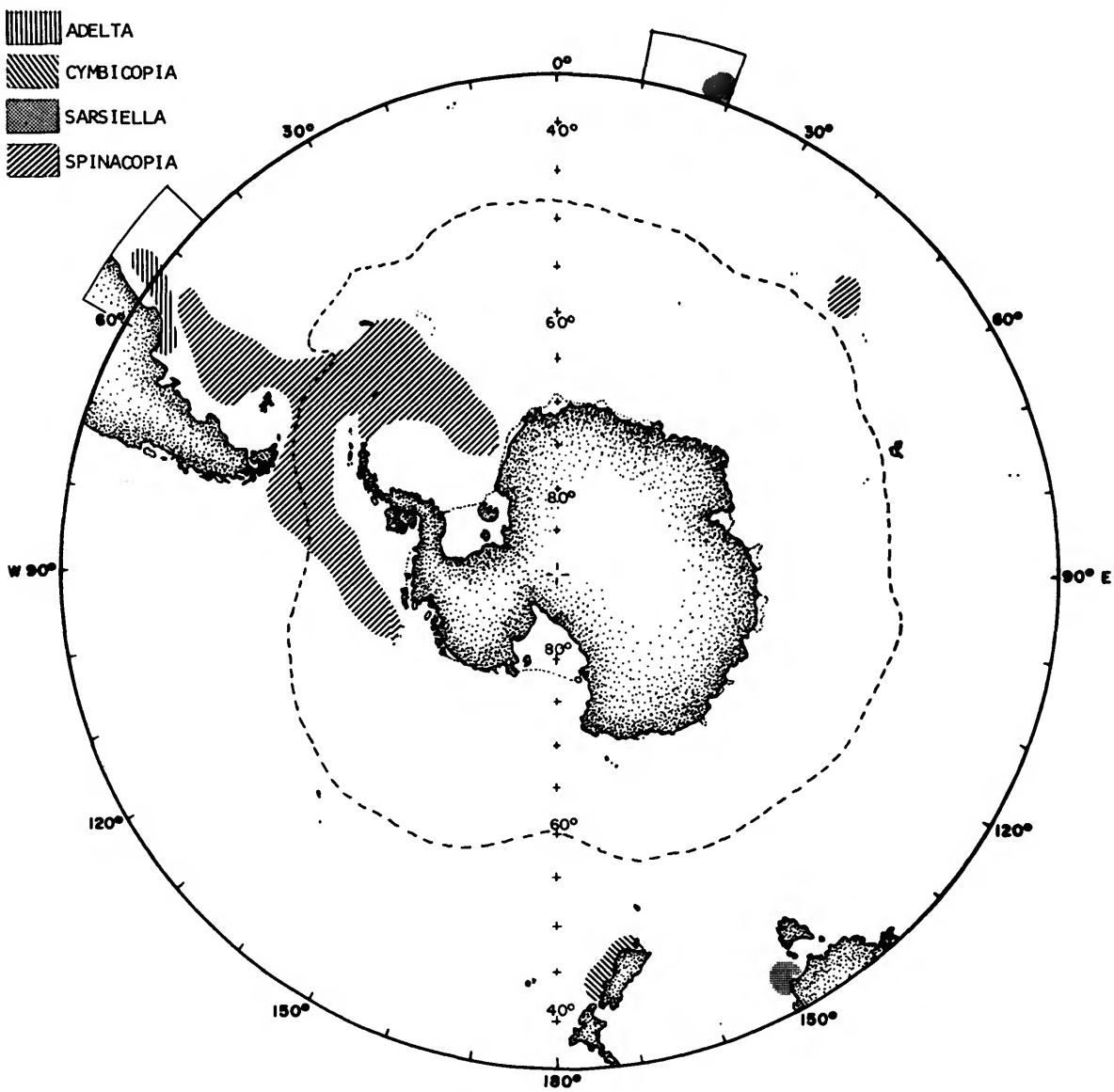

FIGURE 352.—Distribution map.

358*e*). Papillate fossae are present on carapaces of both sexes (Figures 335*b,d,e*; 358*b-d*). Small punctae occur on surfaces between fossae (Figures 355*f*, 358*f*). On the female the punctae contain minute pores (Figure 355*f*).

DISTRIBUTION.—The northernmost latitude from which members of the genus have been collected is about 63°N, the southernmost latitude is 37°05′S off southeast Australia (Figure 352). Species of the genus were not collected in the Antarctic or Subantarctic regions. The known depth range of this genus is intertidal to about 205 m.

Key to Species

(Includes only those species south of 33°S)

Carapace without longitudinal ribs ..... 107. *S. magna*
Carapace with longitudinal ribs ..... 108. *S. lunata*

107. *Sarsiella magna* (Poulsen)

Eusarsiella magna Poulsen, 1965:89, figs. 25, 26.

HOLOTYPE.—A gravid female with 10 embryos, 2.2 mm long, unique specimen deposited in the Universitets Zoologiske Museum, Copenhagen.

TYPE-LOCALITY.—Off southeast Australia, 37°05′S, 150°05′E, 70–100 m.

MATERIAL.—None examined.

DIAGNOSIS.—Carapace oval in lateral view, without incisur and with posteroventral caudal process. Ornamentation: prominent posterodorsal lateral bulge with wavy sclerotized margin; wavy ridge present just inside anterior half of dorsal margin. Carapace length about 2.2 mm.

Second antenna: Endopodite with minute terminal bristle.

Seventh limb: Proximal group with 15 bristles (7 + 8), distal group with 6 bristles (3 + 3); terminal combs with total of 20 teeth.

DISTRIBUTION.—Collected only at type-locality (Figure 360).

108. *Sarsiella lunata*, new species

FIGURES 353–359

HOLOTYPE.—USNM 137688, ♀ length 1.27 mm, appendages on slides; left valve in alcohol, right valve gold-plated on dry slide.

TYPE-LOCALITY.—*Vema* Cruise 14, station V-14-34.

ETYMOLOGY.—The specific name is derived from the Latin "lunatus" [= shaped like a crescent moon] in reference to the crescentlike rows of spines on the medial surface of the 1st endopodite joint of the mandible on the female.

ALLOTYPE.—USNM 137689, adult ♂ from same sample as holotype.

PARATYPES.—USNM 137690, 2 juveniles: 1 N-1 ♂ length 1.19 mm, height 0.94 mm; 1 undissected juvenile length 0.98 mm, height 0.86 mm; both specimens from same sample as holotype.

DIAGNOSIS OF FEMALE.—Carapace oval in lateral view with minute incisur and projecting caudal processs. Ornamentation: major ornamentation consisting of 2 longitudinal ribs meeting in posterodorsal corner of valve. Carapace length about 1.27 mm.

Second antenna: Endopodite 1-jointed or weakly 2-jointed, with 2 short proximal bristles and 1 long terminal bristle.

Mandible: Medial surface of 1st endopodial joint with groups of spines forming crescent-shaped row.

Seventh limb: Proximal group with 2 bristles, distal group with 6.

DESCRIPTION OF FEMALE (Figures 353–355).—Carapace oval in lateral view with minute incisur and projecting caudal process (Figures 353, 354*a*).

Ornamentation (Figures 353, 355): Major ornamentation consisting of 2 longitudinal ridges meeting in posterodorsal corner of valve; 1 short anterior longitudinal ridge present between major ridges in region of incisur; minor ridges branching from major ridges vary somewhat on different specimens. Surface with large punctae. Bristles sparse except along anterior and ventral margins.

Muscle scars: Central muscle scars obscure but

consisting of about 13 individual ovoid scars (Figure 354*b*).

Infold (Figure 354*c,d*): Infold below incisur with minute bristle near inner margin; infold of caudal process with 2 plumose bristles on dorsal part and 5 bristles on medial surface (posterior of these longer than others); several minute bristles present along inner margin of posterior infold.

Selvage: Lamellar prolongation with smooth margin present along anterior, ventral, and posterior margins.

Size: USNM 137688 (holotype), length 1.27 mm, height 1.01 mm.

First antenna: 1st joint bare; 2nd joint with spines along ventral margin, and 1 bristle on distal dorsal margin; 3rd and 4th joints fused; 3rd joint short, with long spinous dorsal bristle reaching middle of 5th joint and spinous ventral bristle reaching past end of limb; 4th joint with 1 dorsal terminal bristle with few marginal spines (bristle reaching middle of 5th joint) and 2 very long ventral bristles with 1 long proximal spine and distal short marginal spines; sensory bristle of 5th joint with 2 minute filaments (bristle about same length as long bristles on 7th and 8th joints); short medial bristle of 6th joint with few short marginal spines. Seventh joint: a-bristle with few marginal spines (bristle less than one-half length sensory bristle of 5th limb); bare b-bristle longer but more slender than a-bristle; c-bristle long with 1 minute marginal filament. Eighth joint: bare d- and e-bristles slightly shorter than c-bristle; f-bristle with 3 minute marginal filaments; g-bristle bare. (Marginal filaments on long bristles of 7th and 8th joints extremely small and exact number uncertain.)

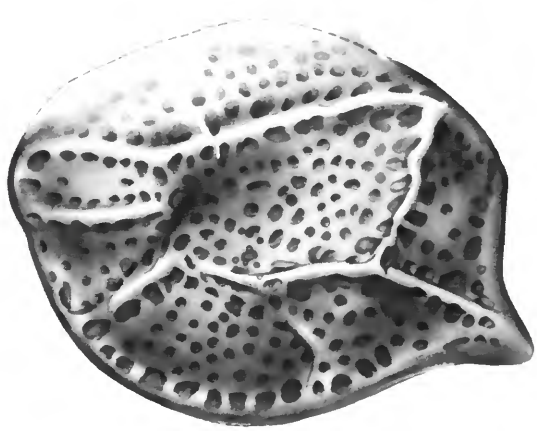

FIGURE 353.—*Sarstella lunata*, female, USNM 137688, length 1.27 mm, left valve (distorted and torn along anterodorsal margin).

Second antenna (Figure 354*e*): Protopodite bare, without medial bristle. Endopodite 1-jointed or weakly 2-jointed with 2 short, bare proximal, bristles and 1 long, spinous, terminal bristle. Exopodite: 1st joint with small recurved medial terminal bristle; bristles of joints 3 to 8 with natatory hairs; bristle of 2nd joint reaching well past end of limb and with slender spines proximally along ventral margin and natatory hairs distally; 9th joint with 2 long bristles with natatory hairs and 1 medium bare bristle; joints 2 to 8 with short spines forming row along terminal margin.

Mandible (Figure 354*f,g*): Coxale with spines along ventral margin and small pronged endite on medial side near ventral margin. Basale: dorsal margin with 2 small subterminal bristles with marginal spines; ventral margin with 6 short bristles, most with spines. No exopodite present. Endopodite: 1st joint with cluster of terminal spines on dorsal margin, 2 medial spines at base of main claw (main claw with short spines forming proximal row on dorsal margin) medial surface of joint with row of minute terminal spines near dorsal margin and 3 groups of spines near middle, distal 2 of these roughly crescent-shaped; 2nd joint with minute subterminal spine on dorsal margin and main claw on ventral margin; 3rd joint with 2 small bristles at base of main claw.

Maxilla (Figure 354*h*): Coxale with short anterior bristle and hirsute epipodial appendage. Endites 1 to 3 with about 6 bristles, some pectinate. Endopodite: 1st joint with spinous α- and 6-bristles and spines along anterior margin; 2nd joint with 2 a-bristles, 1 c-bristle, and usual 5 pectinate terminal bristles. Exopodite with 1 long and 1 shorter bare bristle.

Fifth limb (Figure 354*i*): Epipodial appendage with about 33 bristles; single endite present with 1 bristle. Exopodite: 1st joint with 2 spinous bristles; 2nd joint with 3 bristles, 2 long spinous, 1 minute; 3rd to 5th joints separated from 2nd joint only by indentation in distal margin and with 1 proximal and 2 terminal bristles.

Sixth limb (Figure 354*j*): Endite 1 with 1 short

FIGURE 354.—*Sarsiella lunata*, female, USNM 137688, length 1.27 mm, carapace: *a*, complete specimen, lateral view (not all ornamentation shown). Right valve: *b*, central muscle scars, lateral view; *c*, anterior, medial view; *d*, caudal process, medial view. Right 2nd antenna: *e*, endopodite, medial view. Right mandible, medial view: *f*, complete limb; *g*, 1st endopodial joint. Maxilla: *h*, left limb, lateral view. Right 5th limb: *i*, complete limb, lateral view. Left 6th limb: *j*, complete limb, medial view. Seventh limb: *k*, tip; *l*, same on opposing limb. Right lamella of Furca: *m*, claw 5 and following small spines, lateral view; *n*, claws 1 and 2, medial view. Anterior: *o*, medial eye and rod-shaped organ; *p*, right lateral eye. (Same magnification in microns: *b-d,f,n-p; g,k,l,m; h-j*.)

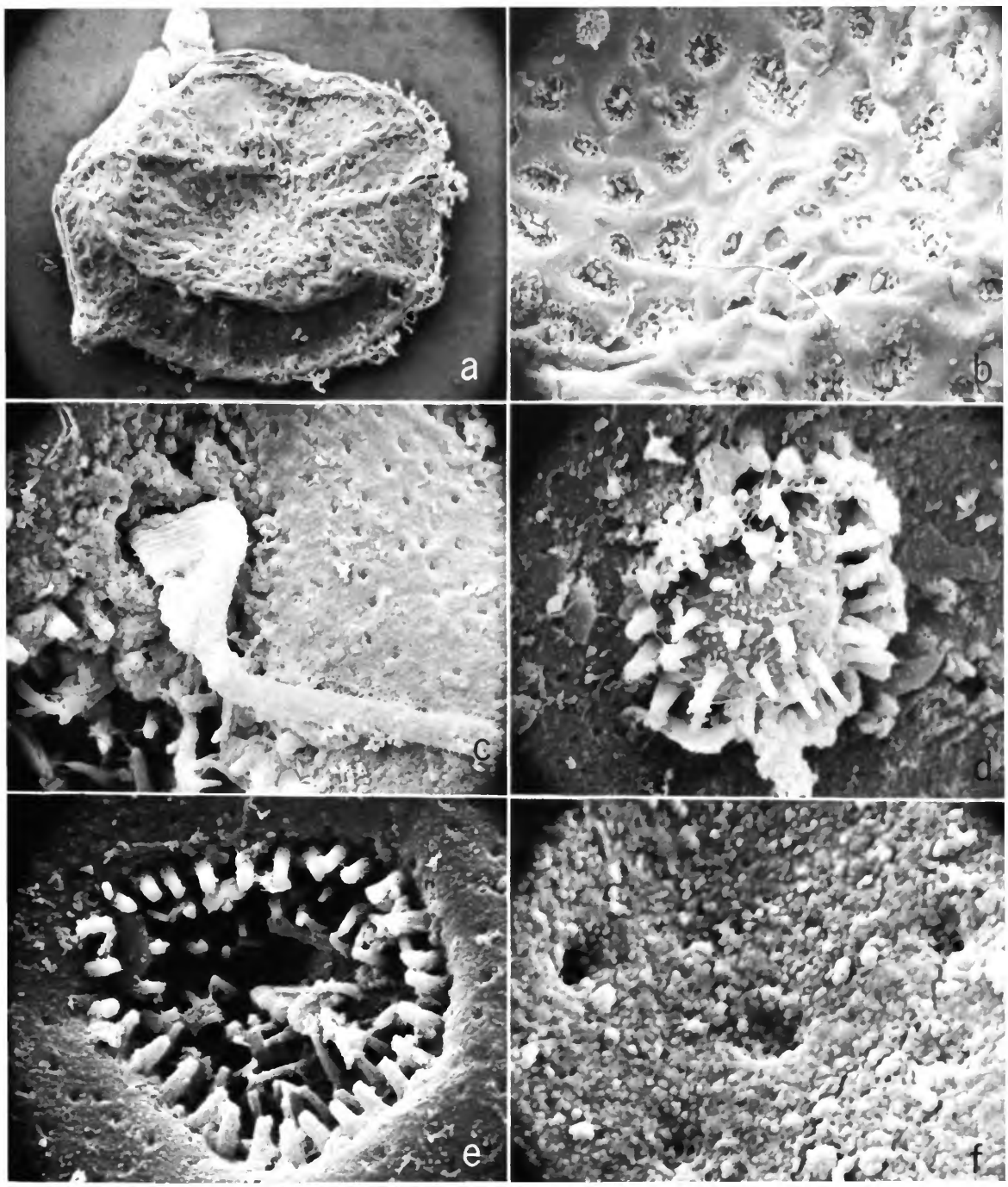

FIGURE 355.—*Sarsiella lunata*, female, USNM 137688, right valve, lateral view: *a*, complete valve, × 70; *b*, punctae in area of central muscle scars, × 280; *c*, base of hair, × 280; *d,e*, detail of two punctae, × 2800; *f*, detail of small punctae in area between larger punctae (note pores in punctae), × 14,000.

terminal bristle and 2 shorter medial bristles, all with short marginal spines; end joint with 2 hirsute posterior bristles and 9 or 10 bristles with short marginal spines; medial surface and posterior margin of end joint with long hairs, lateral surface with few spines forming clusters.

Seventh limb (Figure 354*k,l*): Proximal group with 2 bristles (1 + 1), distal group of USNM 137688 with 6 bristles on 1 limb (3 + 3) and 4 on the other (2 + 2), each bristle with 4 to 6 bells and no distal marginal spines; terminus with opposing combs, each with about 5 teeth (some teeth on 1 comb quite short).

Furca (Figure 354*m,n*): Each lamella with 5 claws followed by several small spines; claw 1 continuous with lamella, others separated from lamella by suture; claws 1 and 2 with teeth forming lateral and medial row along concave posterior margin and hairs along convex anterior margin; remaining claws with few teeth along posterior margins; medial hairs present at base of claws and following claw 5.

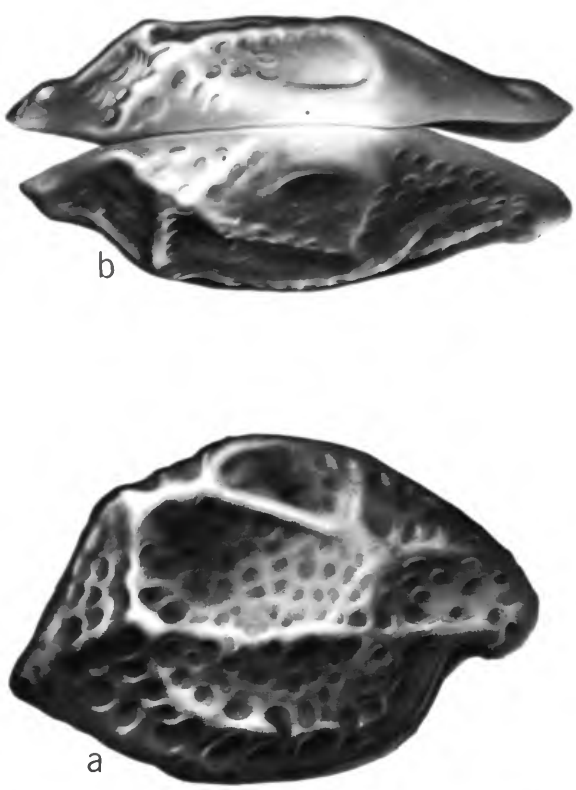

FIGURE 356.—*Sarsiella lunata*, male, USNM 137689, length 1.13 mm, carapace: *a*, lateral view; *b*, dorsal view, anterior to right.

Eyes and rod-shaped organ (Figure 354*o,p*): Minute lateral eyes with about 6 ommatidia; medial eye larger than lateral eye; rod-shaped organ 1-jointed, elongate, broadening distally with crinkly margin and rounded tip.

Posterior: Small spines forming clusters on lateral and medial surfaces of vestment proximal to furca visible at high magnification (× 1000—oil immersion).

Brushlike organ: Not observed.

Gut content: USNM 137688 with copepods in gut.

AGE OF HOLOTYPE.—The holotype did not contain eggs or spermatophores and may be a juvenile. The lack of strongly tapering bristles on the 7th limb indicates that it could not be younger than the N–1 stage. The fact that the carapace is longer than that of the adult male leads me to believe that the holotype is probably an adult, but the possibility of it being an N–1 instar cannot be ruled out.

DESCRIPTION OF ADULT MALE (Figures 356–357*a-m*; 358).—Carapace with projecting rostrum and truncate posterior (Figures 356, 357*a*).

Ornamentation (Figure 358): Differing from that on female in having midridge continuing across middle of carapace and intersecting lower ridge near posterior of carapace. Punctae similar to those on female.

Infold (Figure 357*b*): Infold below incisur with minute bristle near inner margin; infold of caudal process of left valve with 2 plumose bristles in dorsal part and 3 bristles on medial surface; infold of caudal process of right valve with only 1 plumose bristle and 2 medial bristles. Several minute bristles present along inner margin of posterior infold.

Selvage: Similar to that of female.

Size: USNM 137689, length 1.13 mm, height 0.77 mm.

First antenna: 1st joint bare; 2nd joint with 1 dorsal bristle with few long proximal spines, and short spines forming clusters on medial and lateral surfaces; 3rd joint with 1 dorsal bristle and no ventral bristle, not separated from 4th joint by suture; 4th joint with very short dorsal bristle with short marginal spines and longer ventral

bristle; 5th joint small, triangular, with usual filamentous sensory bristle; stout bristle on distal part of cup of sensory bristle with 3 distal marginal filaments and bifurcate tip; 6th joint with short medial bristle. Seventh joint: a-bristle less than one-half length of sensory bristle of 5th joint; b-bristle slender, about three-fourths length of sensory bristle (no filaments observed); c-bristle as

FIGURE 357.—*Sarsiella lunata*, male, USNM 137689, length 1.13 mm, carapace: *a*, outline of complete specimen, lateral view; *b*, caudal process on left valve, medial view. Right 2nd antenna: *c*, endopodite, medial view. Mandible: *d*, right limb, medial view. Maxilla: *e*, right limb, lateral view. Fifth limb: *f*, distal part. Left 6th limb: *g*, complete limb, lateral view. Seventh limb: *h*, right limb, lateral view. Anterior: *i*, right lateral eye, medial eye and rod-shaped organ. Copulatory limbs: *j*, posterior view showing both limbs, central penis and seminal vesicles; *k*, tip of right limb, medial view; *l*, tip of left limb, medial view; *m*, tip of right limb, lateral view. N–1 male, USNM 137690, length 1.19 mm: *n*, outline of complete specimen, lateral view; *o*, endopodite and parts of protopodite of right 2nd antenna, medial view; *p*, left 7th limb; *q*, anterior showing light lateral eye, medial eye and rod-shaped organ, upper lip. (Same magnification in microns: *b,o; c,e,g; d,h-j, p,q; f,k-m.*)

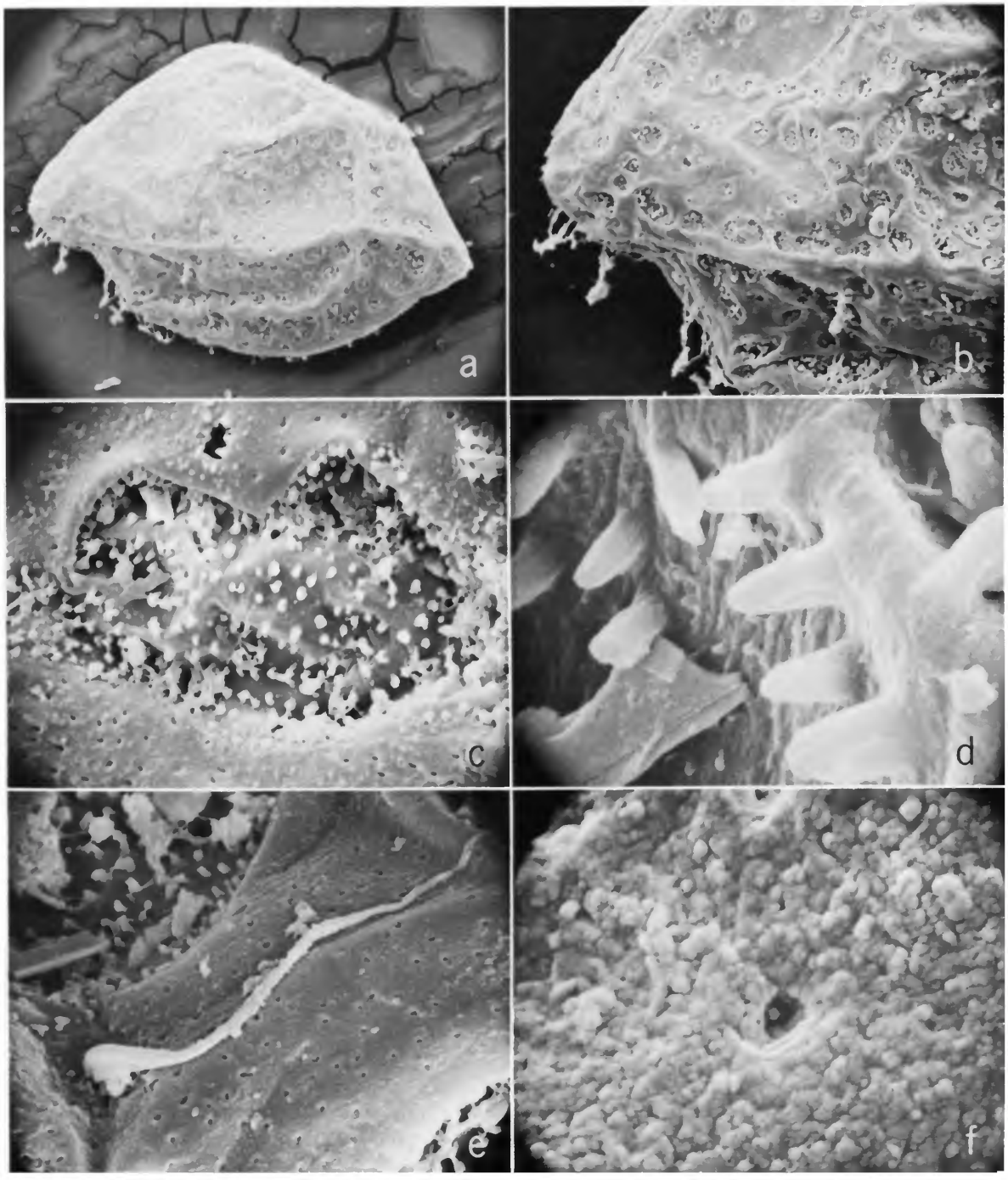

FIGURE 358.—*Sarsiella lunata*, male, USNM 137689, left valve, lateral view: *a*, complete valve, × 80; *b*, rostrum and incisur, × 160; *c*, detail of large pit, × 1500; *d*, spines in pit shown in "*c*," × 10,000; *e*, detail of surface and hair, × 1650; *f*, surface near middle of "*e*," × 15,000.

long as sensory bristle and with 4 distal marginal filaments and bifurcate tip. Eighth joint: d- and e-bristles bare, slightly shorter than c-bristle; f- and g-bristles same length as c-bristle and with 5 distal filaments.

Second antenna (Figure 357*c*): Protopodite bare and without medial bristle. Endopodite 3-jointed: 1st joint with 2 small bare anterior bristles and spines forming rows; 2nd joint elongate with 3 proximal ventral bristles (1 long, 2 short); 3rd joint obscure on right limb of USNM 137689 (left limb missing), but with 1 (possibly 2) short stout terminal bristle. Exopodite: distal margin of 1st joint with small recurved medial spine; 9th joint with 2 bristles, 1 long with proximal ventral spines and distal natatory hairs, 1 short with short marginal spines; bristles of remaining joints with natatory hairs, some also with proximal ventral spines; joints 2 to 8 with short spines forming row along distal margins.

Mandible (Figure 357*d*): Ventral margin of coxale bare; small coxale endite present. Basale: dorsal margin with 3 subterminal bristles, 1 medium, 2 short; ventral margin with total of 6 bristles, 4 proximal and medial, 2 marginal and slightly distal to these. Exopodite with bristle and hirsute process. Endopodite: 1st joint with hairs forming clusters on medial surface, spines on distal dorsal corner, and 3 terminal ventral bristles (1 minute bristle, 1 short bristle with short marginal spines, 1 plumose bristle almost reaching tip of claw of end joint and with long hairs along middle part); 2nd joint with 1 stout bristle on proximal dorsal margin (base on bend in margin) and 1 long terminal bristle on ventral margin, and spines forming 2 distal rows on medial surface; end joint with minute mediodorsal bristle, stout terminal claw and 2 short ventral bristles.

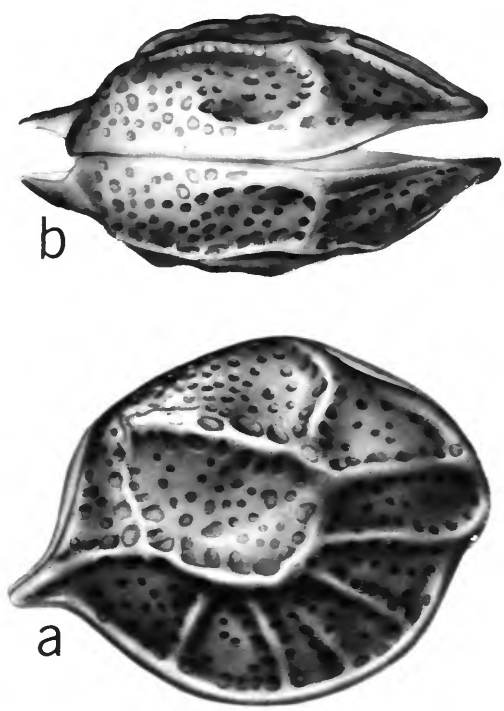

FIGURE 359.—*Sarsiella lunata*, N–1 male, USNM 137690, length 1.19 mm, carapace: *a*, lateral view; *b*, dorsal view, anterior to right.

Maxilla (Figure 357*e*): Limb smaller than on female, bristles weakly developed. Precoxale and coxale with fringe of long hairs; anterior margin of coxale with short bare bristle; exopodite with 2 long bristles. Endopodite with 1 α-bristle; remaining endopodite bristles obscure.

Fifth limb (Figure 357*f*): Limb smaller than that on female and with shorter bristles on exopodite. Epipodial appendage with about 28 bristles. Endite I with 1 short bare bristle. Exopodite: 1st joint with 2 long bristles; 2nd joint with 3 long bristles; 3rd to 5th joints with about 6 long bristles.

Sixth limb (Figure 357g): Endite I with 2 short bristles, 1 medial, 1 terminal; end joint with 13 bristles (3 medial bristles with long proximal and short distal marginal spines, remaining bristles hirsute); end joint with few clusters of short spines laterally, and long hairs medially and along posterior margin.

Seventh limb (Figure 357*h*): Limb small bare.

Furca: Distribution and number of bristles similar to those on female furca; spines present along anterior margin of each lamella proximal to claw 1; hairs not observed along anterior margins of claws 1 and 2; claw 1 slightly more curved than same claw on female; teeth along concave margins of claws 1 and 2 similar to those on same claws of female except distal tooth of each group of teeth only slightly longer than other teeth in group.

Eyes and rod-shaped organ (Figure 357*i*): Lateral eye same size as that on female, with 4 ommatidia. Medial eye and rod-shaped organ similar to those on female.

Upper lip: Small, helmet-shaped.

Copulatory organ (Figure 357*j-m*): Penis small, between complex clasping organs hanging down at each side. Each clasper consisting of 3 lobes; proximal lobe with 3 short bristles; distal lobe with 2 slender distal bristles (proximal bristle observed on only right lobe of USNM 137689); main lobe terminating in sclerotized hook and triangular tooth with serrations on proximal margin; short stout bristle present on anterior margin proximal to triangular tooth; 2 groups of bristles with 2 bristles in each group laterally on main lobe proximal to triangular tooth.

Parasites: USNM 137689 with 1 ♀ choniostomatid inside carapace.

Description of N–1 ♂ (Figures 357*n-q*, 359).—Carapace in lateral view intermediate between adult ♂ and ♀; ornamentation similar to that on female carapace (Figures 357*n*, 359). Size USNM 137690, length 1.19 mm, height 0.94 mm.

Second antenna (Figure 357*o*): Exopodite similar to that on adult female except only 2 bristles

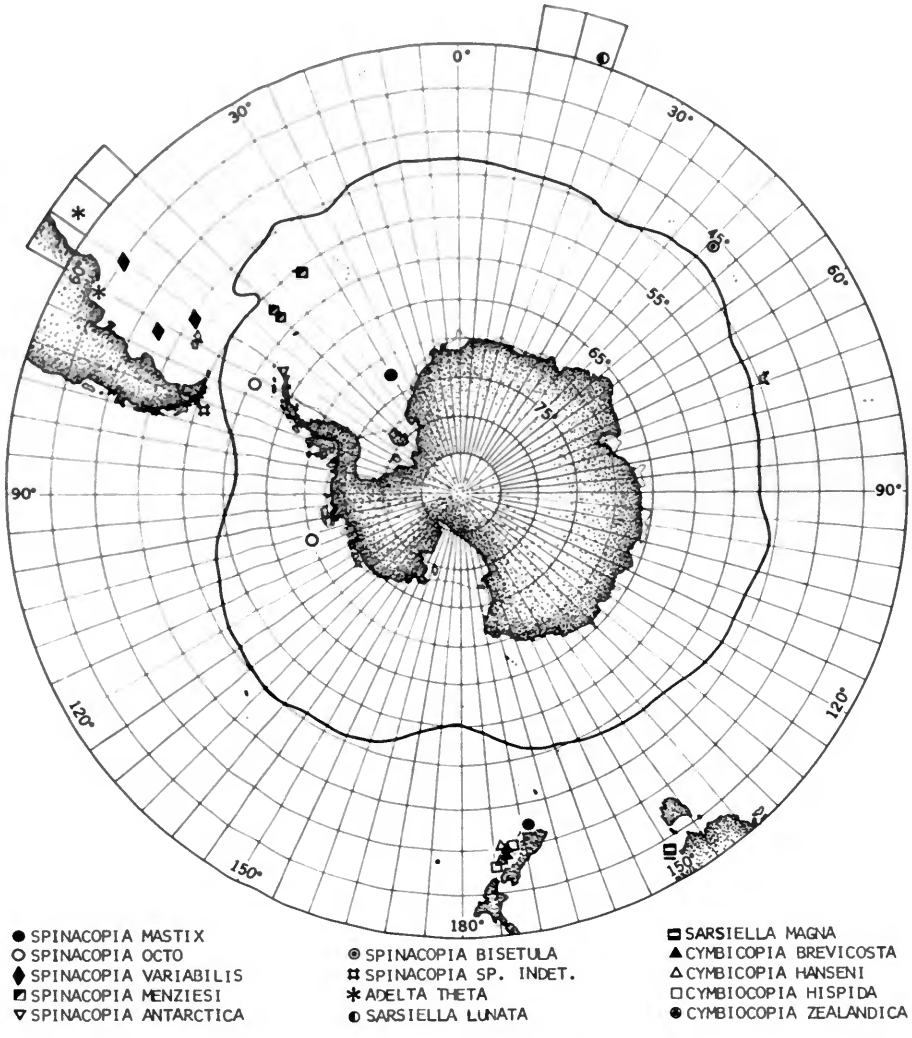

Figure 360.—Distribution map.

(1 short, 1 long) on 9th joint. Endopodite 3-jointed: 1st joint with 2 short anterior bristles; 2nd joint with 2 proximal ventral bristles, 1 quite long, 1 short; 3rd joint with 2 fairly long terminal bristles.

First antenna, furca, lateral eye, medial eye, rod-shaped organ: Similar to those on adult ♀ (Figure 357*q*).

Seventh limb: See Figure 357*p*.

Remaining appendages: Not examined in detail, but generally similar to those on adult female.

Gut content: Two small crustaceans observed in gut.

COMPARISONS.—The ornamentation on the carapace of the new species resembles that of *Sarsiella capsula* Norman, 1869. The two species may be readily separated by the endopodite of the 2nd antenna on the female, which on *S. lunata* bears a long terminal bristle that is absent on *S. capsula*. The 2nd joint of the endopodite on the 2nd antenna of the adult male of *S. lunata* bears a long bristle not present on the adult male of *S. capsula*.

DISTRIBUTION.—This species was collected at only one locality in the African Quadrant just outside the study area at a depth of 179 m (Figure 360).

Spinacopia Kornicker, 1969

TYPE-SPECIES.—*Spinacopia sandersi* Kornicker, 1969a:8.

This genus is represented in the study area by six species: *S. menziesi* Kornicker, 1969a; *S. variabilis* Kornicker, 1969a; *S. bisetula* Kornicker, 1969a; *S. antarctica* Kornicker, 1970; *S. octo* Kornicker, 1970; and *S. mastix*, new species.

DIAGNOSIS OF THE GENUS.—Carapace oval in lateral view with greatest height near middle in female and posterior to middle in male; shallow incisur present in male. Infold in front of caudal process with 4 or 5 stout spinous bristles forming row.

Second antenna: Endopodite of female 2-jointed with 2 or 3 bristles on 1st joint and 1 (rarely 2) on 2nd joint. Endopodite of adult male 3-jointed, reflexed with 2 or 3 bristles on 1st joint, 3 on 2nd joint, and 2 on 3rd joint.

Mandible: Female with small coxale endite with bifurcate tip, male with endite. Exopodite prominent on both male and female, with bristle reaching one-fourth to one-third length of 1st endopodite joint.

Sixth limb: 3 or 4 endites present: 1st endite with 1–4 bristles; 2nd endite with 2–4 bristles; 3rd endite with 3 or 4 bristles; 4th endite with 3–5 bristles; end joint with 2–5 anterior bristles, 1–3 middle bristles, and 1–3 hirsute posterior bristles.

Seventh limb: Well developed in both male and female; proximal group with 4 to 10 bristles; distal group with 6 bristles; terminus with opposing combs; each comb with 7 to 12 teeth in female and 2 or 3 in male.

Furca: Each lamella with 7 to 9 claws; claw 3 shorter than claw 4 (on some specimens claws 3 and 5 shorter than following claw); claw 1 continuous with lamella.

Eyes: Lateral eyes absent, medial eye large.

Rod-shaped organ: 1- or 2-jointed with rounded or tapering tip.

Brushlike organ: Consisting of 7 or 8 minute bristles above genitalia of female.

DISCUSSION OF HAIRS ON THE CARAPACE OF *Spinacopia*.—The hairlike processes on the outer surface of ostracod carapaces are commonly called "hairs," "setae," "bristles." In this discussion they are termed hairs. In an attempt to find additional characters to use in indentifying the various species of *Spinacopia*, holotypes and paratypes of previously described species of the genus and those described herein were restudied by light and scanning electron microscopes and the hairs on their carapaces classified. It was possible to classify the hairs into 8 types, which are designated herein as a-, b-, c-, d-, e-, f-, g-, h-hairs. The distribution of hair types on each species is illustrated in Figure 361. The distinguishing characteristics of these hairs are listed below:

a-hairs: These hairs vary in length, but the longest is usually much longer than other types of hairs (Figures 363*b*, 367*b*). They are usually abundant along the anterior and ventral margins and are distributed sparsely over lateral surfaces. Each hair is characterized by having a "node" near its base. The node is often completely or partly ringed, and may be either symmetrical or asymmetrical. These a-hairs are present on all species of *Spinacopia* examined. They have been reported previously on species in the genus *Sarsiella* (Kornicker, 1967:11, fig. 4b) and may be present on all species in the Sarsiellidae.

b-hairs: These are of short-to-medium length, tapering at a more-or-less constant angle from base

to tip, and consist of several unnamed subtypes. They could be subdivided roughly into slender and stout hairs. The slender hairs seem more flexible than the stout ones. Minute stout hairs are spinelike. They are present on all species of *Spinacopia* examined, but the relative abundance of the various subtypes vary from species to species. Minute spinelike b-bristles frequently occur around the periphery of surface pits—pointing toward the center of the pits. These are numerous on the abundantly pitted carapaces of *S. sandersi*. Slender b-hairs are absent on *S. antarctica* and *S. variabilis* which bear a short stout variety. Rather long slender b-hairs are present on *S. menziesi* (Figure 363*c-e*); and *S. bisetula* (Figure 367*c-e*). The species, *S. octo* (Figure 371*a-d*), *S. torus*, *S. antarctica*, *S. variabilis* bear only short b-hairs. Some b-hairs on *S. octo* are papillate (Figure 371*d,e*).

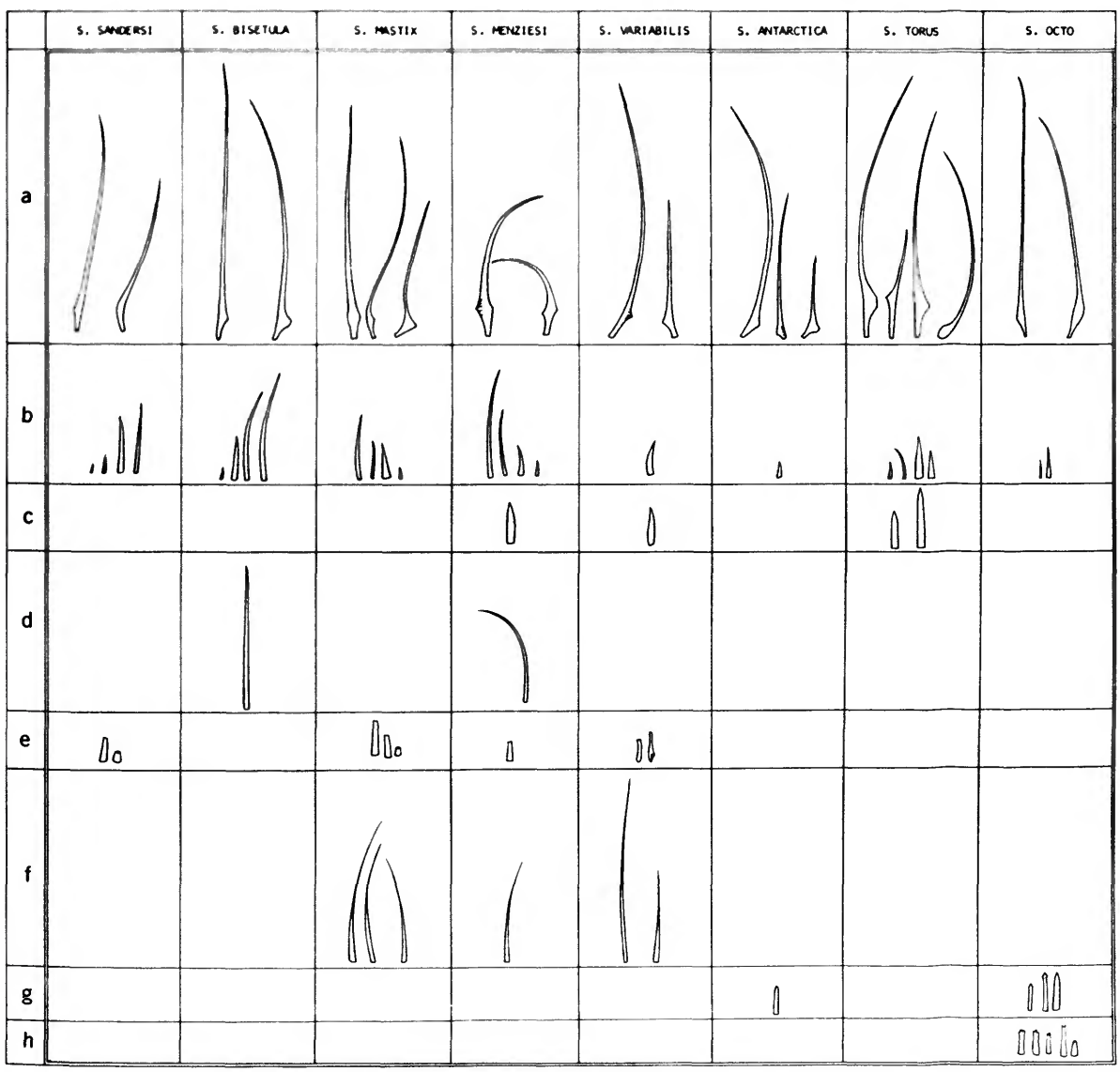

FIGURE 361.—Distribution of hairs on the carapace of species of *Spinacopia*.

c-hairs: These hairs resemble stout b-hairs but differ because the hairs taper at a greater angle distally than proximally. They are usually short and are relatively sparse on *S. menziesi*, but abundant on *S. variabilis* (Figure 365*c,d*) and *S. torus*. On *S. torus* c-hairs, abundant on the lateral surface of each valve, tend to blend into stout b-hairs near the valve margins. On *S. menziesi* the angle at which the c-hairs taper increases gradually, whereas, on *S. torus*, the taper angle increases suddenly so that the proximal part of the bristle tapers at one constant angle and the distal part at another. At the magnifications the carapaces were examined with the light microscope (× 400) a decision as to whether hairs are c-hairs or stout b-hairs was sometimes subjective.

d-hairs: These hairs are essentially long b-hairs in that they taper at a constant angle. They are separated from b-hairs in this classification, because they generally occur in clusters or form linear rows radially oriented on the anterior and ventral parts of each valve. d-hairs were recognized on *S. menziesi* (Figure 363*b*) and *S. bisetula* (Figure 367*d*).

e-hairs: These hairs have truncated tips and are merely broken hairs. They were observed on the margins and lateral surfaces of *S. menziesi* (Figure 363*e*), *S. variabilis* (Figure 365c,*f*), *S. sandersi*, *S. mastix* (Figure 375*b-d*), and *S. octo* (Figure 371*e*). The possibility of being broken does not seem restricted to any given hair type.

f-hairs: The hairs are similar in length to d-hairs, occurring in the same localities as the d-hairs, but have a greater taper angle in the proximal part compared with the distal part. The tips of the hairs are drawn out and whiplike. These hairs are abundant on the posterodorsal bulge of the carapace and form linear radial rows on the ventral and anterior part of the valve of *S. variabilis* (Figure 365*d*), *S. mastix* (Figure 375*b*), and *S. menziesi*. On *S. menziesi* the decision as to whether bristles should be classified as the d- or f-type was difficult, whereas on *S. variabilis* and *S. mastix* hairs are drawn out to a degree that made the decision easy.

g-hairs: These are short almost parallel-sided hairs with a short tapered tip. g-hairs are restricted to two species, *S. antarctica* and *S. octo*. They are especially abundant in the vicinity of the valve margins. On *S. octo*, some g-hairs are slightly constricted and others bulbous near the tip (Figures 370*d-g*) and some are papillose (Figure 370*f*).

h-hairs: These are short hairs with digitate tips. They are present only on *S. octo* where they form loose clusters on lateral surfaces of the carapace.

MICROSTRUCTURE.—Peculiar papillae (branched and unbranched) not visible under the light microscope were observed with the scanning electron microscope on the surface of carapaces. Branched and unbranched papillae are present on *S. menziesi* (Figure 363*f*), *S. octo* (Figure 371*c*), and apparently *S. mastix* (Figure 375*e*). Unbranched papillae are present on *S. bisetula* (Figure 367*f*) and *S. variabilis* (Figure 365*f*).

Key to Species

BASED ON ADULT FEMALES

(Includes only species present south of 35°S)

1. Carapace longer than 2.50 mm 2
   Carapace shorter than 2.50 mm 3
2. Carapace with abundant short hairs with parallel sides and pointed or digitate tips ..... 113. ***S. octo***
   Carapace without short parallel-sided hairs with pointed and digitate tips ..... 109. ***S. menziesi***
3. Carapace longer than 2.2 mm and with clifflike ventral margin on posterodorsal bulge ..... 114. ***S. mastix***
   Carapace shorter than 2.2 mm and with gradual slope on ventral margin of posterodorsal bulge 4
4. Carapace with series of lateral ridges and nodes ..... 110. ***S. antarctica***
   Carapace without lateral ridges and nodes 5
5. Ventral margin of posterodorsal bulge with long hairs forming row ..... 112. ***S. bisetula***
   Hairs along ventral margin of posterodorsal bulge not longer than those on remainder of bulge ..... 111. ***S. variabilis***

Fossae are well developed on *S. bisetula* (Figure 367*b-d*) and bear on their margins inward-pointing b-hairs or spines.

Central muscle attachments on the carapace were seen more clearly with the scanning electron microscope than with the light microscope and suggest that the distribution of muscle scars might prove useful in discriminating between species of *Spinacopia*. Both *S. bisetula* (Figure 367*a*) and *S. octo* (Figure 370*b*) have a group of 3 touching individual scars in a central position among the scars, but they are oriented differently on both species. In addition, *S. octo* has 4 touching scars not present on *S. bisetula*. No scars touch on *S. variabilis* (Figure 365*c*), and *S. mastix* (Figure 375*c*) has 4 elongate centrally located scars. The muscle scars from the SEM photographs are compared in Figure 366.

Distribution.—*Spinacopia* is the only genus in the Sarsiellidae with representatives living within the Antarctic Convergence (Figure 352). Its northern limit in the Atlantic Ocean is 32°19′24″N, in the Pacific Ocean 8°13′S, in the Indian Ocean 45°00′S. The southern limit of its range is 73°29′S in the Weddell Sea. Species of the genus are generally restricted to deeper water—known depth range 135–4758 m. Species with larger carapaces are present in deep water.

109. *Spinacopia menziesi* Kornicker

Figures 362, 363

Spinacopia menziesi Kornicker, 1969a:9, figs. 3, 4; pls. 1c, 3a-c.

Holotype.—USNM 122086, ♀ with unextruded eggs, length 2.75 mm.

Type-Locality.—*Vema* Cruise 14, station V-14-24, 56°37′S, 34°48′W.

Material.—USNM 138150, 1 adult ♀ with unextruded eggs from *Eltanin* Cruise 7, station 475; USNM 127267, 127268, 12770, 3 ?N-1 females with small unextruded eggs from *Eltanin* Cruise 7, station 480.

Remarks.—The original description of *S. menziesi* was based on a unique female. Although the specimens in the present collection have been included in that species, they differ from the holotype in some characters attributed herein to intraspecific variation. The closeness of the collecting site of the present specimens to the type-locality and the similarity in size and kinds of bristles on the lateral surface of their carapaces to that of the holotype weighed heavily in the identification. The adult female in the present collection differs from the holotype in having 2 ventral bristles on the 4th joint of the 1st antenna and 9 claws on each lamella on the furca, both the 3rd and 5th claws being smaller than the following claws. A study of ?N-1 instars in the present collection suggests that both the number of ventral bristles on the 4th joint and number and distribution of claws on the furca are somewhat variable.

Diagnosis of Female.—Carapace large, length 2.70 to 2.75 mm; anterior margin of rostrum and posterodorsal bulge of valve broadly rounded; surface of valve hirsute but without additional ornamentation; without hairs with digitate or strongly tapering tips.

First antenna: Fourth joint with 2 or 3 ventral bristles.

Second antenna: Endopodite 2-jointed; 1st joint with 3 short bare bristles; 2nd joint with 1 long spinous bristle.

Seventh limb: Each limb with 13 to 16 bristles, 12 terminal, 7 to 10 proximal.

Furca: Each lamella with 8 or 9 claws (rarely 7); claw 3, or claws 3 and 5, shorter than following claws.

Supplementary Description of Hairs on Carapace of Holotype.—a-hairs present around ventral, anterior, and posterior margins, also scattered sparsely on lateral surfaces; b-hairs (several different sizes) densely distributed along margins and on lateral surfaces; c-hairs sparsely distributed (rare) on lateral surfaces; d-hairs forming 5 or 6 roughly linear rows radially oriented on anterior lateral surfaces, also present along anterodorsal, dorsal, and posterior margins; e-hairs scattered along anterior, ventral, and dorsal margins and on lateral surfaces; some f-hairs mixed among d-hairs.

Supplementary Description of Adult Female (based on USNM 138150).—Infold in front of caudal process of right valve with 4 stout spinous bristles forming row dorsal to 3 smaller bristles; left valve with 3 stout bristles dorsal to 4 smaller bristles; carapace otherwise similar to that of holotype (Figures 362*h*, 363). Size: length 2.70 mm, height 2.26 mm (Figure 364).

First antenna: Similar to that of holotype except for having only 2 ventral bristles on 4th joint.

Second antenna: Similar to that of holotype.

Mandible, maxilla, fifth and sixth limbs: Not examined in detail.

Seventh limb: Left limb with 14 bristles, 8 proximal (4 + 4) and 6 terminal (3 + 3); right limb with 13 bristles, 7 proximal (5 + 2) and 6 terminal (3 + 3).

Furca: Both lamellae with 9 claws; claws 3 and 5 smaller than claws 4 and 6 respectively.

Eyes and rod-shaped organ: Similar to those on holotype.

Eggs: 7 large unextruded eggs.

DESCRIPTION OF ?N–1 FEMALE (Figure 362*a-g*).—Carapace typical for genus with small incisur and caudal process; posterodorsal bulge modest (Figure 362*a,b,f*).

Ornamentation: Surface with low rim present within and parallel to valve edge. Short tapered hairs abundant on valve surface; long hairs abundant on posterodorsal bulge and forming linear row in radial pattern on anterior and ventral part of each valve.

Infold (Figure 362*d*): Infold below shallow incisur with usual minute bristles near inner margin; infold anterior to caudal process with 5 large spinous bristles above and 4 small bristles below; small bristles present along inner margin of infold in front of caudal process.

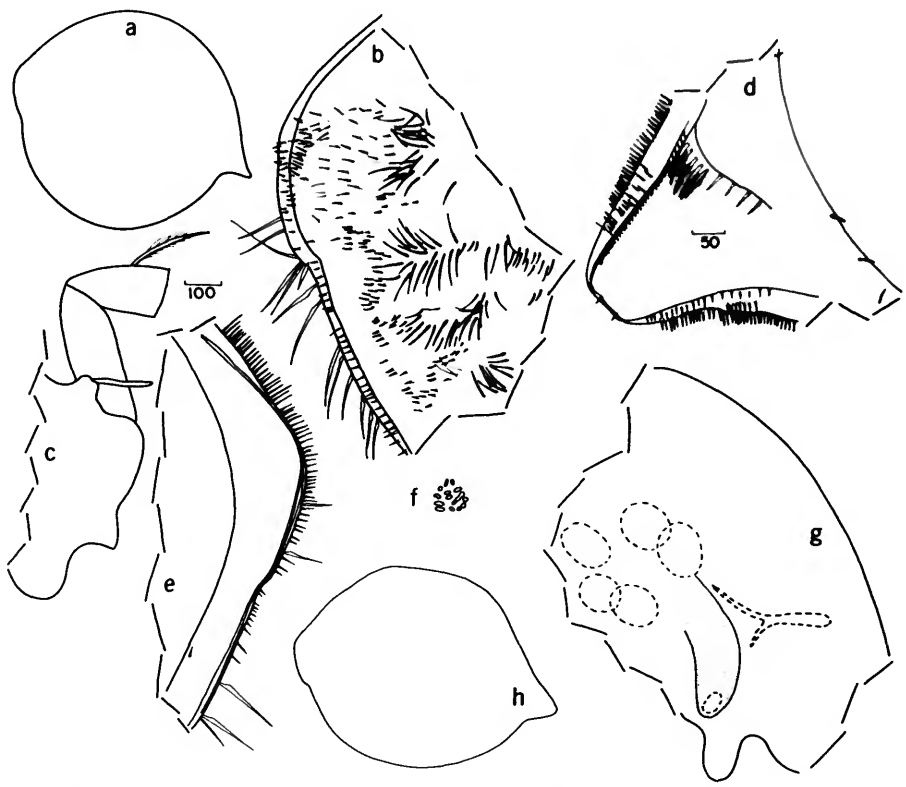

FIGURE 362.—*Spinacopia menziesi*, N–1 female, USNM 127267, length 2.19 mm, carapace: *a*, outline of complete specimen, lateral view; *b*, anterior of right valve, lateral view (not all hairs shown). Anterior of body: *c*, anterior showing medial eye and rod-shaped organ, anterior process, upper lip, and joints 1 and 2 of the left 1st antenna. N–1 female, USNM 127268, length 2.49 mm, left valve: *d*, caudal process, medial view; *e*, anterior. N–1 female, USNM 127270, length 2.47 mm: *f*, sketch of central muscle scars on right valve, lateral view; *g*, posterior of body showing genitalia, small unextruded eggs, and sclerite. Female, USNM 138150, length 2.70 mm: *h*, outline of complete specimen, lateral view. (Same magnification in microns: *b,c,e,g*.)

Size: The dimensions of three specimens are tabulated below (small unextruded eggs present in all specimens):

Specimen	*Length* (mm)	*Height* (mm)
USNM 127267	2.49	2.19
USNM 127268	2.49	2.15
USNM 127270	2.47	2.15

First antenna: Similar to adult female except with 2 or 3 ventral bristles on 4th joint. (The f- and g-bristles of 8th joint bear 2 to 5 spines. (These are also present on holotype, USNM 122086, but were overlooked in original description.) Number of ventral bristles on 4th joint of three specimens is tabulated below:

Specimen	*Left limb*	*Right limb*
USNM 127267	2	2
USNM 127268	3	2
USNM 127270	2	2

Second antenna: Similar to adult female. Short spines forming row on distal margins of joints 2 to 8 (also present on holotype, but very faint on joints 6 to 8).

Mandible: Left limb USNM 127267 similar to adult female. Right limb aberrant in having only 3 bristles in distal group on ventral margin of basale (1 long marginal, 2 short lateral).

Maxilla: Similar to adult female.

Fifth limb: Similar to adult female except for number of bristles on 4th + 5th joints. Endite of left limb of USNM 127270 bears 2 bristles; endite of right limb and endites of 5th limbs of remaining two species bear usual single bristle. Number of bristles on 4th + 5th joints of 5th limbs of three specimens is tabulated below:

Specimen	*Left limb*	*Right limb*
USNM 127267	6	4
USNM 127268	5	5
USNM 127270	5	5

Sixth limb: Distribution of bristles on two specimens is tabulated below (the 2 lines for each specimen represent opposing limbs):

Specimen	*Endites*				*End joint*		
	I	*II*	*III*	*IV*	*anterior*	*middle*	*posterior*
USNM 127267	3	4	6	5	5	2	3
	3	4	6	4	5	2	2
USNM 127268	3	3	4	3	3	1	2
	3	2	4	3	4	1	?

Seventh limb: Distal group with 6 bristles, proximal group with 6 to 8 (usually 6); each bristle with 3 to 5 bells and distal marginal spines. Terminus with about 12 teeth in opposing combs. Distribution of bristles in proximal and distal groups on three specimens is tabulated below (the two lines for each specimen represent opposing limbs):

Specimen	*Proximal group*	*Distal group*
USNM 127267	8	6
	8	6
USNM 127268	6	5
	7	6
USNM 127270	8	6
	7	6

Furca: Both lamellae of USNM 127267 and left lamella of USNM 127268 and USNM 127270 with both 3rd an 5th claws smaller than the 4th and 6th claws, respectively; right lamella of USNM 127268 and USNM 127270 with 3rd claw smaller than 4th; both lamellae of USNM 127267 and right lamella of USNM 127268 with 9 claws; right lamella of USNM 127268 with 7 claws; both lamellae of USNM 127270 with 8 claws; type of claws and lamellae normal for genus. Distribution of claws on three specimens is tabulated below:

Specimen	*Number of claws*	*Short claws*
USNM 127267		
left	9	3rd, 5th
right	9	3rd, 5th
USNM 127268		
left	7	3rd
right	9	3rd, 5th
USNM 127270		
left	8	3rd
right	8	3rd, 5th

Genitalia: Elongate with genital pore well defined (Figure 362*g*). No spermatophores present. Brushlike organ not observed.

Upper lip: Lip helmet-shaped with few hairs (Figure 362*c*).

Eyes: Lateral eyes absent, medial eye present (Figure 362*c*).

Rod-shaped organ: Elongate, 1-jointed with rounded or digitate tip (Figure 362*c*).

Eggs: USNM 127267, 127268, and 127270 (Figure 362*g*) with small unextruded eggs.

DISTRIBUTION.—This species was collected at three localities in Antarctica in the Scotia subregion at depths of 2818–3500 m (Figure 360).

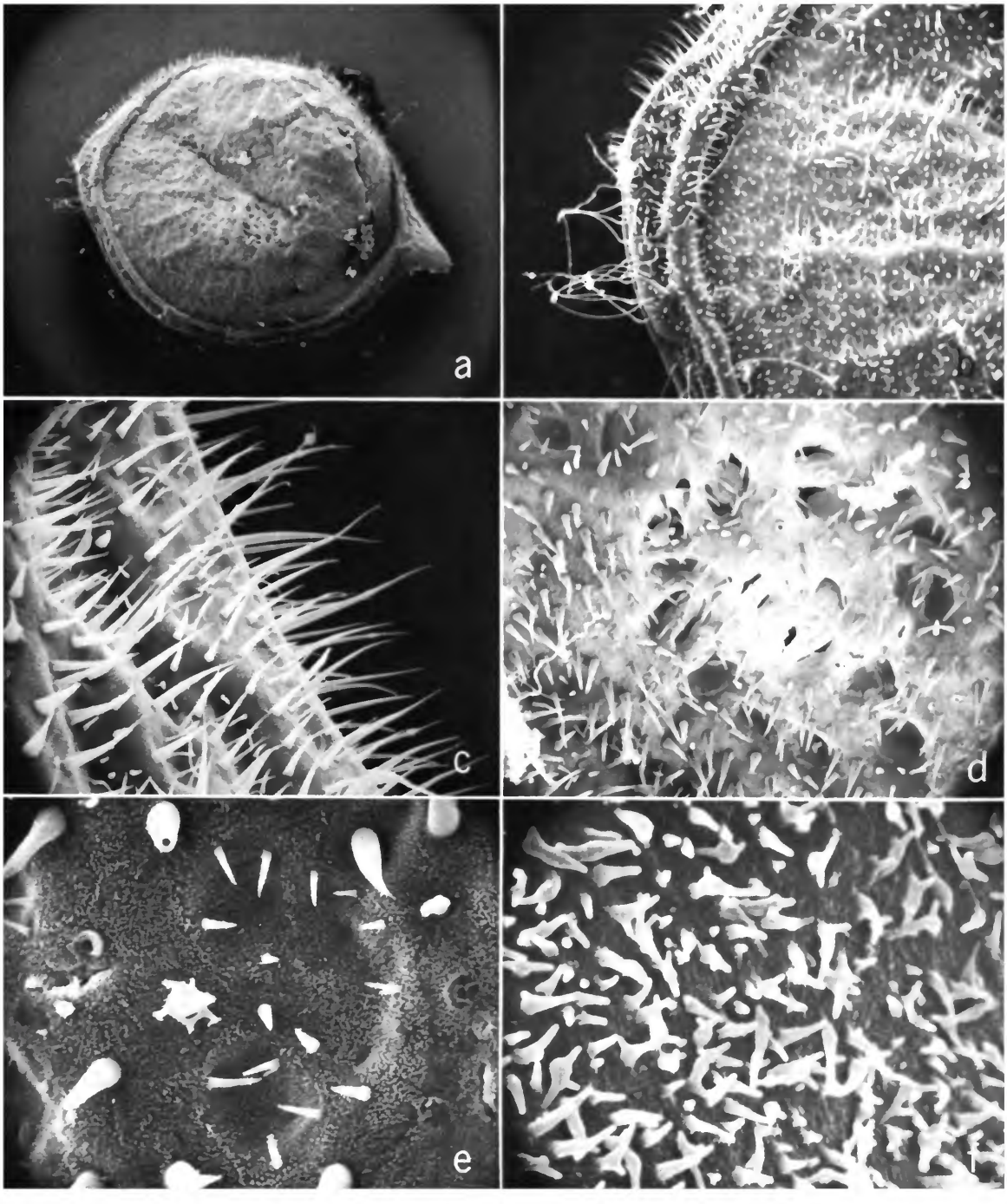

FIGURE 363.—*Spinacopia menziesi*, female, USNM 138150, length 2.70 mm, left valve, lateral view: *a*, complete valve, × 32; *b*, anterior, × 1000; *c*, posterior, dorsal to caudal process, × 500; *d*, central muscle scar area, × 300; *e*, hairs anterior to muscle scars, × 1000; *f*, surface in "*e*," × 10,000.

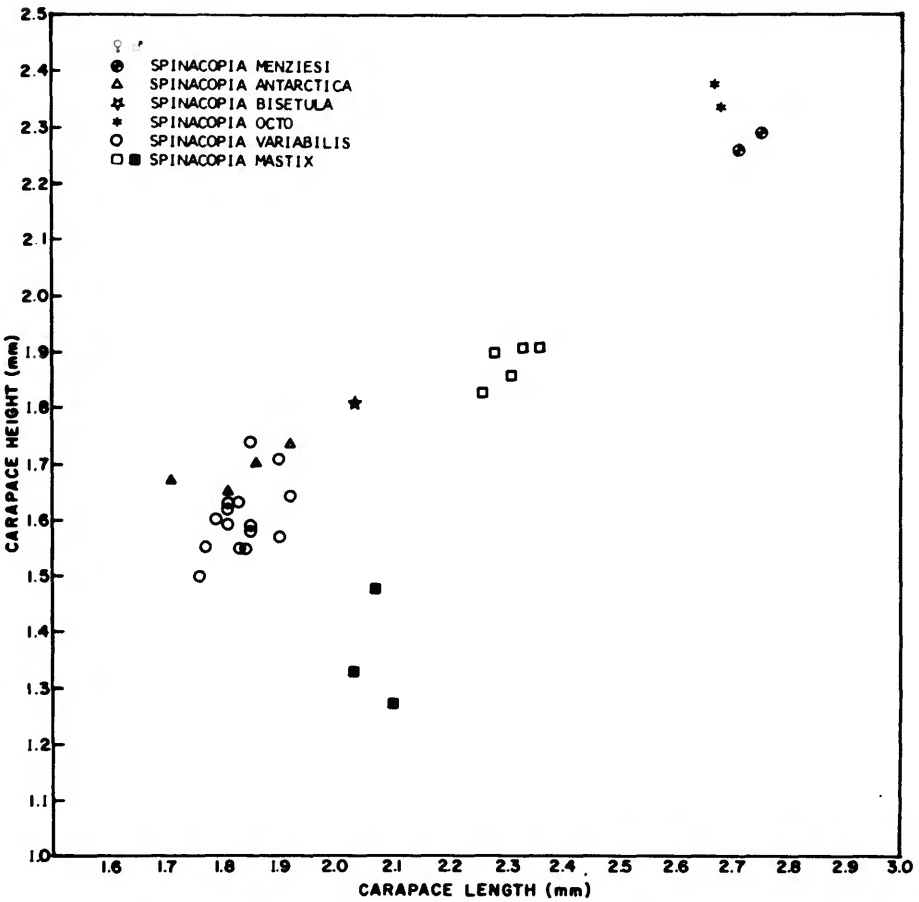

FIGURE 364.—Comparison of relationship between shell length and height of adults of *Spinacopia*.

110. *Spinacopia antarctica* Kornicker

Spinacopia antarctica Kornicker, 1970:20, figs. 11–14.

HOLOTYPE.—USNM 123340, adult ♀, length 1.92 mm.

TYPE-LOCALITY.—*Eltanin* Cruise 12, station 1003, 62°41′S, 54°43′W, 210–220 m.

MATERIAL.—Reexamined paratype.

DIAGNOSIS OF FEMALE.—Carapace length 1.71 to 1.92 mm (Figure 364); lateral surface with numerous irregular nodes and short spines.

Second antenna: Endopodite 2-jointed: 1st joint with 2 or 3 short bristles; 2nd joint with 2 bristles (?always), 1 short, 1 long.

Seventh limb: Each limb with 11 bristles, 6 in terminal group, 5 in proximal group.

Furca: Each lamella with 7 or 8 claws, claw 3 shorter than claw 4.

SUPPLEMENTARY DESCRIPTION OF HAIRS ON CARAPACE OF PARATYPE (USNM 123342).—a-hairs abundant along ventral and anterior margins, sparsely distributed on lateral surfaces, absent on dorsal and posterior margins; short stout b-hairs equal in length extremely abundant over lateral surfaces; these hairs, except for their linear margins when viewed laterally, resemble c-hairs; g-hairs densely distributed along margins; on lateral surfaces, g-hairs, abundant near margins, appear to be replaced by b-hairs inward from margins; nodes and internodes on lateral surfaces of each valve evenly covered with b-bristles.

DISTRIBUTION.—Known only from type-locality (Figure 360).

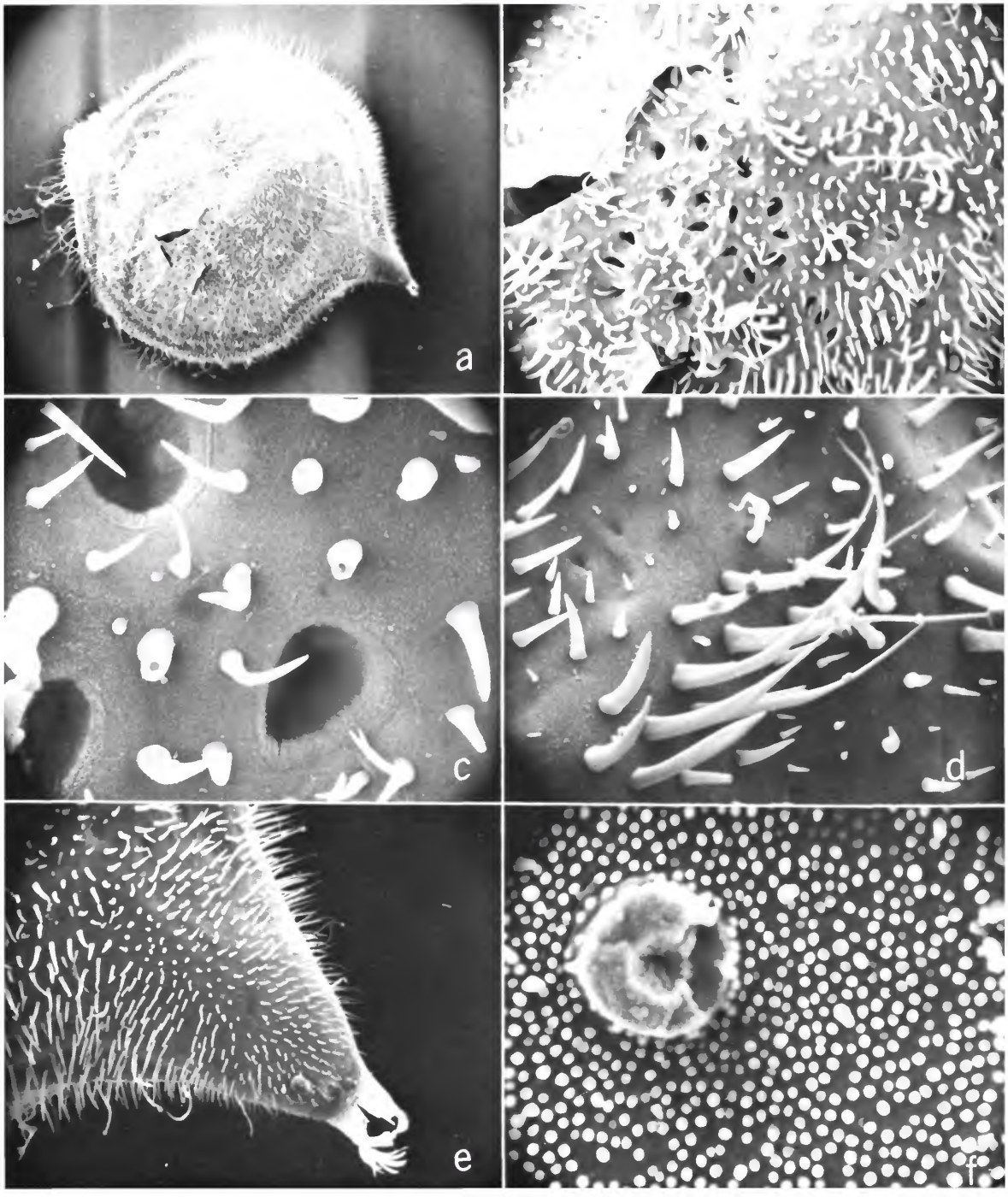

FIGURE 365.—*Spinacopia variabilis*, female, USNM 127525, left valve, lateral view: *a*, complete valve, × 40; *b*, vicinity of central adductor muscle attachments, × 170; *c*, detail of "*b*," × 1200; *d*, surface hairs, × 600; *e*, caudal process, × 240; *f*, detail of surface of "*e*," × 15,000.

111. *Spinacopia variabilis* Kornicker

FIGURE 365

Spinacopia variabilis Kornicker, 1969a:13, figs. 5–9, pls. 1d, 3*e,f*.

HOLOTYPE.—USNM 122191, gravid ♀, length 1.92.

TYPE-LOCALITY.—*Vema* Cruise 15, station V–15–131, 40°14.6′S, 55°24.7′W.

MATERIAL.—USNM 127524, 1 adult ♀ without eggs or attached spermatophores; USNM 127525, 1 adult ♀ without eggs but with attached spermatophores; USNM 127533, 1 adult ♀ with attached spermatophores; USNM 127534, 1 N–1 ♂, USNM 128615, 2 gravid ♀♀ + 3 specimens. USNM 127534 and 127525 from *Eltanin* Cruise 7, station 558; USNM 127533, 27534 from same cruise, station 557; USNM 128615 from *Vema* Cruise 15, station V–15–131 (type-locality).

DIAGNOSIS OF FEMALE.—Carapace length 1.77 mm to 1.92 mm (Figure 364); ventral margin of posterodorsal bulge evenly rounded; surface of valves hirsute but otherwise unornamented (Figure 365); surface hairs with digitate and strongly tapered tips absent.

Second antenna: Endopodite 2-jointed; 1st joint with 2 to 4 (generally 3) short bristles; 2nd joint with 1 or 2 (generally 1) long bristles. Seventh limb with 10 to 17 bristles, 4 in terminal group, 4 to 7 (usually 4 to 6) in proximal group.

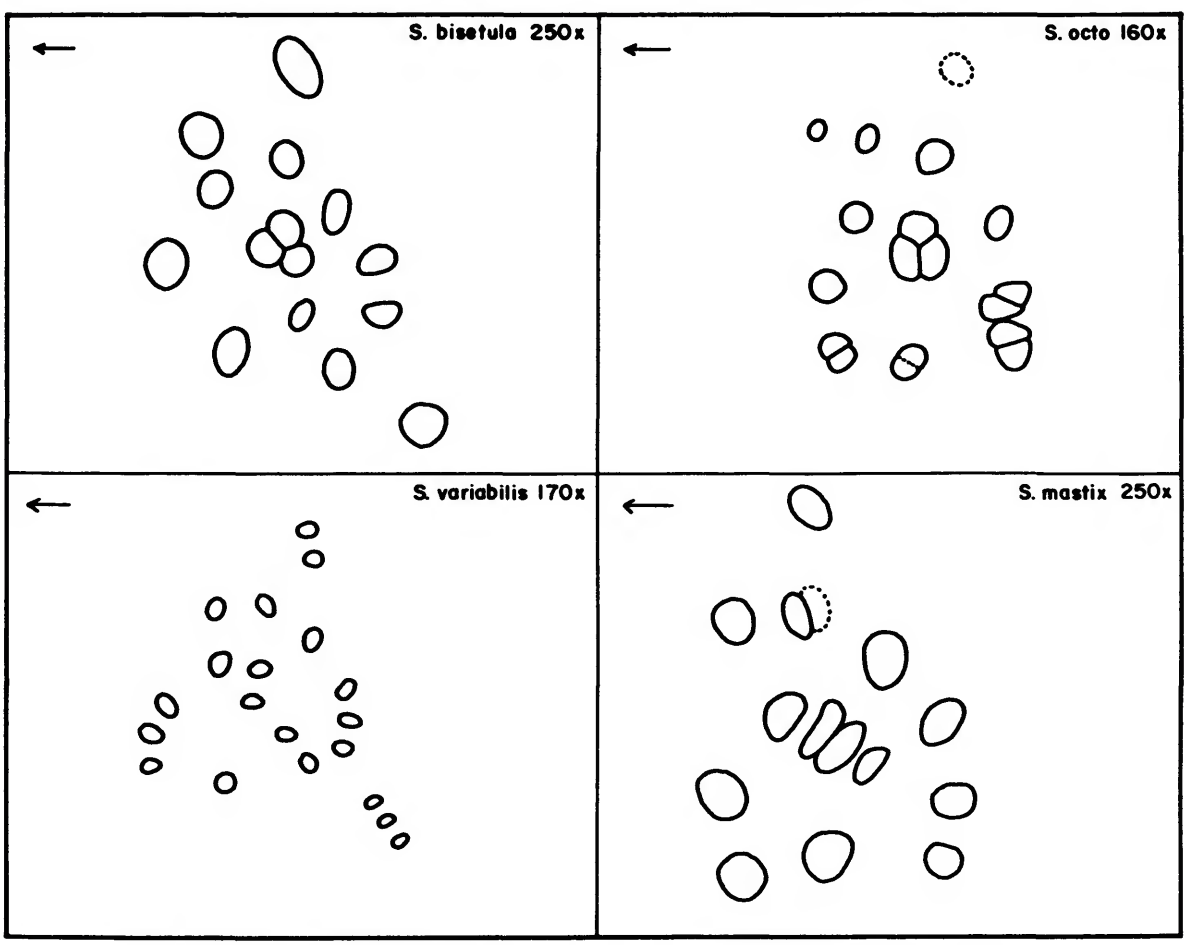

FIGURE 366.—Central muscle scars on *Spinacopia bisetula, S. octo, S. variabilis, S. mastix* (obtained from SEM photographs).

Furca: Each lamella with 7 to 9 claws (usually 8), claw 3 or both claws 3 and 5 shorter than following claw.

SUPPLEMENTARY DESCRIPTION OF ADULT FEMALE.—Carapace of paratype (USNM 122547) with a-hairs abundant around all margins and sparsely distributed on lateral surfaces; b-hairs distributed along ventral and anterior margins; c- and f-hairs abundant along margins and on lateral surfaces; f-hairs forming roughly linear rows radially oriented on anterior and ventral lateral surface and extremely abundant on posterodorsal bulge; e-hairs sparse around margins. Central muscle scars and surface details of USNM 127525 are illustrated in Figure 365. Size: USNM 127524, length 1.85 mm, height 1.59 mm; USNM 127525, length 1.81 mm, height 1.63 mm; USNM 127533, length 1.77 mm, height 1.55 mm (Figure 364).

Gut content: USNM 127524 with adult ♂ podocopid ostracod *Paracytherois?* species indeterminate. Carapace of podocopid brittle but appendages without protoplasm.

REMARKS.—The furca of USNM 127524 has 7 claws on the left lamella and 8 on the right; both lamellae with the 3rd claw smaller than the 4th. The left lamella of USNM 127525 bears 8 claws with the 3rd claw smaller than the 4th, whereas, the right lamella bears 9 claws and both the 3rd and 5th claws are small. Although neither specimen has eggs inside the ovaries or in the brood chamber, the appendages are well developed and USNM 127525 bears spermatophores over the genital pores indicating that the specimens are adult.

SUPPLEMENTARY DESCRIPTION OF N–1 MALE (USNM 127534).—Carapace length 1.79 mm, height 1.34 mm (shell somewhat distorted).

Second antenna: Similar to that illustrated by Kornicker (1969a:21, fig. 9c).

Lateral eye: Absent.

DISTRIBUTION.—This species was collected at four stations in the American Quadrant, two in the Subantarctic region at depths of 700 m and 850 m, and two in the Subantarctic-to-35°S region at depths of 135 mm and 1475 m (Figure 360).

112. *Spinacopia bisetula* Kornicker

FIGURE 367

Spinacopia bisetula Kornicker, 1969a:21, fig. 10, pls. 3d, 6.

HOLOTYPE.—USNM 122545, gravid ♀, length 2.03 mm.

TYPE-LOCALITY.—*Vema* Cruise 16, station V-16-15, 45°00'S, 45°46'E, 1622 m.

MATERIAL.—Reexamined holotype.

DIAGNOSIS OF FEMALE.—Carapace length 2.03 mm (Figure 364); posterodorsal bulge with ridge-like ventral margin outlined by long hairs forming horizontal row; without hairs with digitate and strongly tapering tips.

Second antenna: Endopodite 2-jointed: 1st joint with 2 short bristles; 2nd joint with 1 long spinous bristle.

Seventh limb: Each limb with 10 bristles, 6 bristles in terminal group, 4 in proximal group.

Furca: Each lamella with 8 claws, claw 3 shorter than claw 4.

SUPPLEMENTARY DESCRIPTION OF CARAPACE OF FEMALE (Figures 361,367).—a-hairs abundant along anterior and ventral margins and sparsely distributed along dorsal and posterior margins and lateral surfaces; minute b-hairs distributed rather abundantly over lateral surfaces, some around peripheries of faint pits; short stout b-hairs also scattered over lateral surfaces; long and short slender b-hairs present along anterior and posterior margins and scattered over lateral surfaces and along ventral margin of posterodorsal bulge; rather long b-hairs, which could be considered d-hairs, present in clusters of only 3 to 5 hairs each on lateral surfaces near anteroventral margins and scattered over lateral surfaces; these also present along ventral margin of posterodorsal bulge. Central muscle scars are illustrated in Figure 367*c* and compared with other species in Figure 366.

DISTRIBUTION.—Collected only at type-locality (Figure 360).

113. *Spinacopia octo* Kornicker

FIGURES 368–371

Spinacopia octo Kornicker, 1970a:24, figs. 15–17.

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

TYPE-LOCALITY.—*Eltanin* Cruise 11, station 931, Antarctic Ocean 70°11'S, 106°38'–106°26'W, bottom depth 3495 m.

MATERIAL.—USNM 127271, USNM 127273, 2

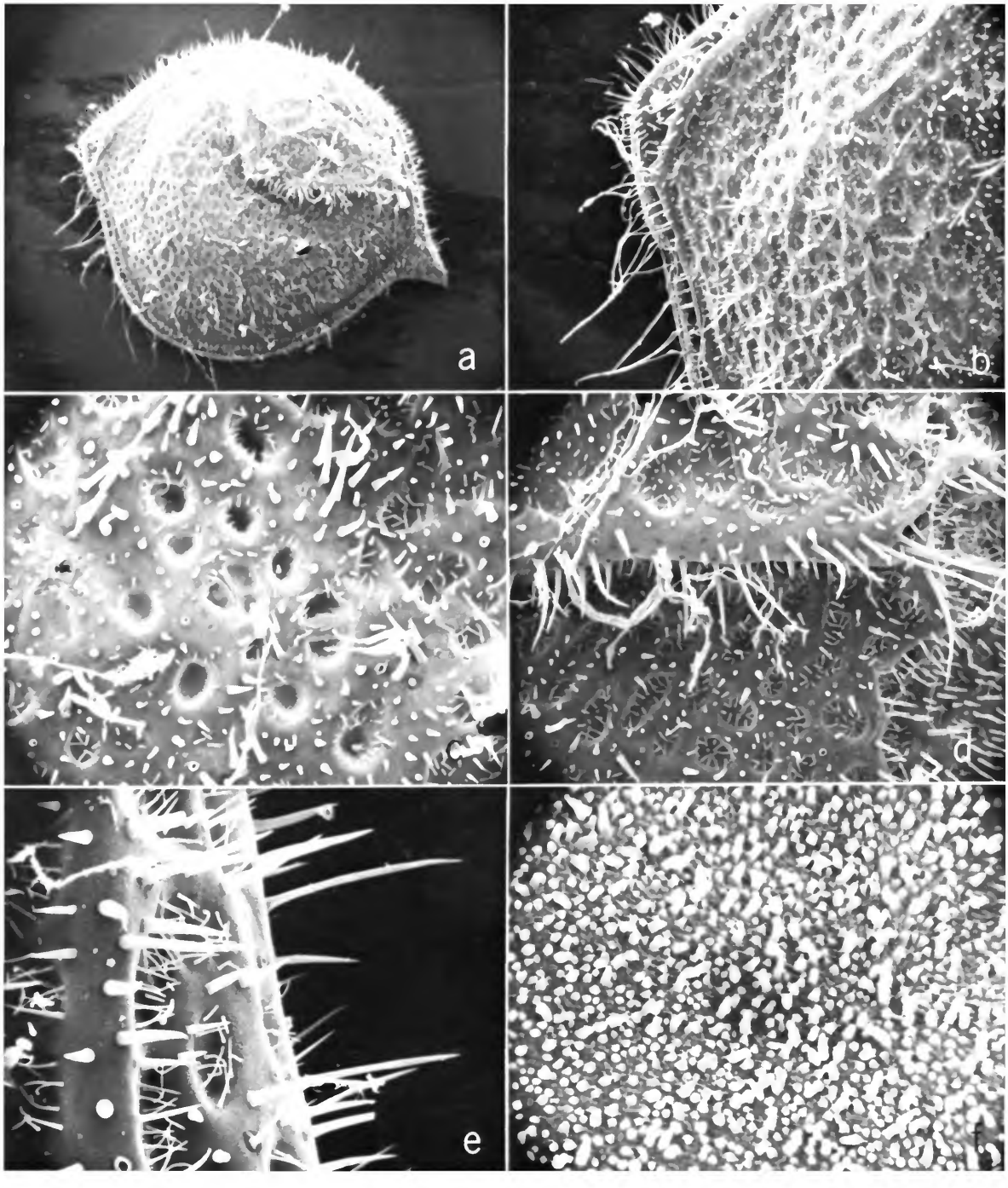

FIGURE 367.—*Spinacopia bisetula*, female, USNM 122545, left valve, lateral view: *a*, complete valve, × 40; *b*, anterior, × 100; *c*, central muscle scars, × 250; *d*, ventral margin of postero-dorsal bulge, × 200; *e*, posterior margin, dorsal to caudal process, × 500; *f*, detail of valve surface, × 10,000.

gravid ♀ ♀; USNM 127274, 1 juvenile, length 2.20 mm, height 1.71 mm (not dissected); USNM 138028, 1 juvenile. USNM 127273, 127271 from *Eltanin* Cruise 4, station 127; USNM 127271, 138028 from same cruise, station 129. Holotype reexamined.

DIAGNOSIS OF FEMALE.—Carapace length 2.67–2.68 mm; surface with short spines, many parallel sided except at pointed tips; some tips slightly inflated and digitate.

My description of this species (1970) was based upon two juvenile males. The specific name "octo" referred to ornamentation on the carapaces of both specimens vaguely resembling a figure 8; however, it was stated in the description (p. 26) that the depressions forming the ornamentation could have been an artifact formed after death of the animal. Adult females in the present collection do not have the depressions. The female of the species is described below.

DESCRIPTION OF ADULT FEMALE (Figures 368–371).—Carapace oval in lateral view with shallow incisur and short caudal process; posterdorsal area of carapace inflated (Figure 368, 369*a*).

Ornamentation: Surface with short spines, many with parallel sides except at pointed or bulbous tips; bulbous tips either pointed or digitate distally; some spines with parallel sides and pointed tips broaden subterminally; long bristles with expanded area near base present along margins and scattered over lateral surface of carapace (Figures 369*d,r*; 370, 371).

FIGURE 368.—*Spinacopia octo*, female, USNM 127277, length 2.67 mm, carapace, lateral view.

Infold: Infold below incisur with minute bristle near inner margin; infold anterior to caudal process with 5 stout spinous bristles forming row; 3 or 4 small bristles forming row ventral to larger bristles.

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

Muscle scars: Central scars consisting of about 9 individual scars (Figures 366; 369*b,c*; 370*b,c*).

Size: USNM 127271, length 2.67 mm, height 2.38 mm; USNM 127273, length 2.68 mm, height 2.34 mm (Figure 364).

First antenna: Dorsal bristle of 2nd joint with long spines near middle and short spines distally; short spines forming clusters along dorsal and ventral margins of 2nd joint; 3rd and 4th joints not separated by suture; both dorsal and ventral bristles of 3rd joint spinous; dorsal margin of 4th joint with spines near middle and distal; ventral margin of 4th joint with 1 or 2 spinous bristles; sensory bristle of 5th joint with 1 short filament; 6th joint without medial bristle. Seventh joint: a-bristle spinous, about one-half length of sensory bristle of 5th joint; b-bristle about same length as a-bristle, with 1 short filament near middle; c-bristle long, stout, with 2 short filaments near middle. Eighth joint: f-bristle long stout, with 1 short filament near middle; d- and e-bristles bare, longer than b-bristle; f- and g-bristles long with 1 or 2 short filaments.

Second antenna (Figure 369*e,f*): Protopodite bare. Endopodite 2-jointed: 1st joint with 3 short bare bristles; 2nd joint with 1 (rarely 2) long, subterminal, spinous bristle. Exopodite: joints 2 to 8 with short spines forming row along distal margin; small recurved medial spine present on distal margin of 1st joint; long bristles of 2nd to 9th joints with few natatory hairs; 9th joint with 2 bristles, 1 long with few natatory hairs, 1 short spinous.

Mandible (Figure 369*g-i*): Ventral margin of coxale spinous; coxale endite with single knifelike tip, short spines on base, and long spines forming cluster near base. Basale: dorsal margin with 1 spine near middle and 1 subterminal; ventral margin with total of 8 or 9 bristles forming roughly 3 groups: 1 medial and 1 lateral spine present in proximal group, 1 medial spine and 1 lateral bristle present in middle group, 1 long medial bristle and 3 or 4 short lateral bristles in distal group; U-shaped glandular opening present on lateral side

FIGURE 369.—*Spinacopia octo*, female, USNM 127271, length 2.67 mm, carapace: *a*, complete specimen, lateral view; *b*, sketch of central muscle scars on left valve, lateral view; *c*, same, right valve; *d*, detail of hairs on right valve near middle (not all hairs shown). Second antenna: *e*, endopodite of left limb, medial view; *f*, endopodite and part of protopodite and exopodite on right limb, lateral view. Left mandible, medial view: *g*, coxale endite; *h*, basale; *i*, exopodite. Maxilla: *j*, right limb, lateral view; *k*, c-bristle on 2nd endopodial joint of left limb, medial view. Sixth limb: *l*, right limb, lateral view. Furca: *m*, right lamella. Anterior: *n*, medial eye and rod-shaped organ; *o*, anterior showing medial eye and rod-shaped organ, upper lip, dashed line indicates food ball in mouth. Posterior: *p*, posterior margin showing spines and internal muscles and sclerites; *q*, spermatophore on right genitalia. Female, USNM 127273, length 2.68 mm: *r*, detail of hairs on posteroventral surface of left valve (not all hairs shown); *s*, spermatophore and brushlike bristles on left side, anterior to left. (Same magnification in microns: *e,f,j,l,n-q,s*; *g-i*, *k,r*.)

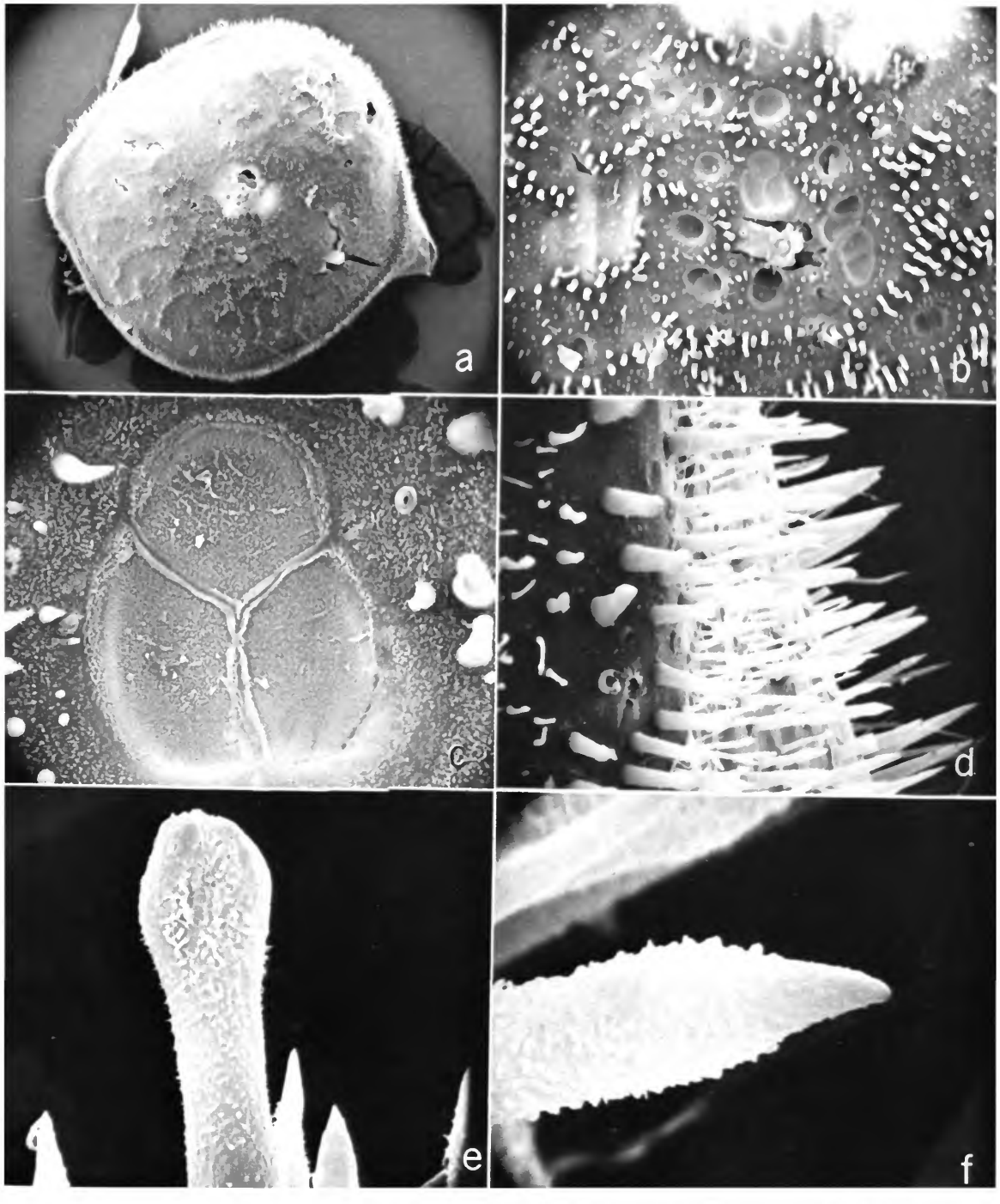

FIGURE 370.—*Spinacopia octo*, female, USNM 127273, left valve, lateral view: *a*, complete valve, × 30; *b*, area of central muscle scars, × 160; *c*, detail of scars in middle of "*b*," × 875; *d*, dorsal side of caudal process, × 600; *e*, tip of hair in dorsal part of valve, × 3000; *f*, detail of tip of hair in "*d*," × 7000.

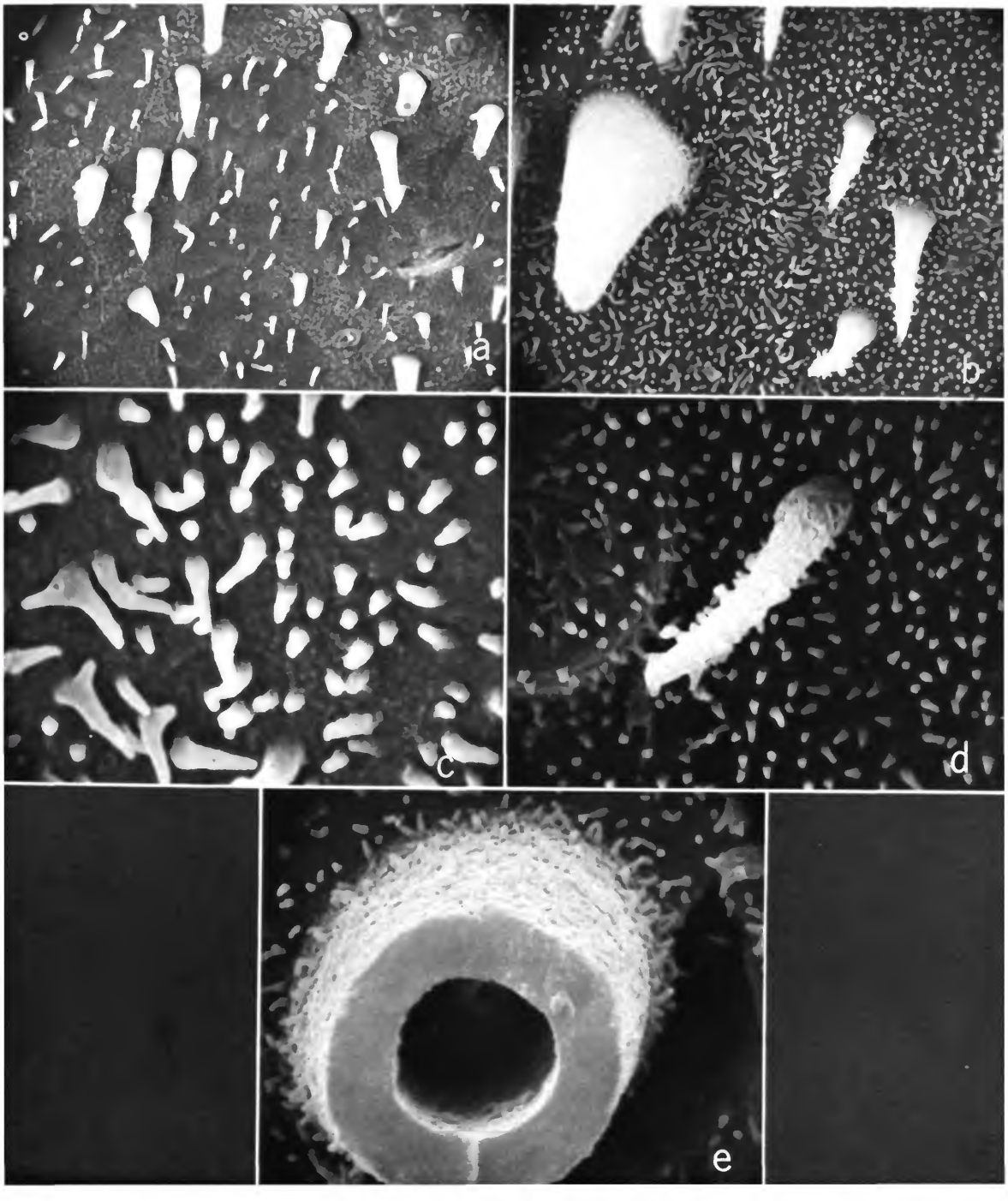

FIGURE 371.—*Spinacopia octo*, female, USNM 127273, left valve, lateral view: *a*, hairs on lateral surface, × 600; *b*, detail from near middle of "*a*," × 3000; *c*, detail from near middle of "*b*," × 15,000; *d*, hair similar to those in lower right of "*b*," × 8000; *e*, broken hair, × 8000.

near long bristle of distal group. Exopodite with blunt tip and spinous bristle reaching between one-fifth and one-sixth length of dorsal margin of 1st endopodite joint. Endopodite: 1st joint with several short terminal spines on dorsal margin, 1 or 2 medial spines near base of ventral claw, and minute spines forming rows on medial surface near distal end and along terminal margin; 2nd joint with 1 spine distal to middle of dorsal margin and 1 lateral spine near base of main ventral claw; 3rd joint with 1 dorsal and 2 longer ventral spines near base of main claw.

Maxilla (Figure 369*j,k*): Protopodite with 1 spinous anterior bristle; basale with 1 bristle with few spines near exopodite; exopodite with 3 bristles. Endopodite: 1st joint with spinous α- and β-bristles; 2nd joint with 2 spinous a-bristles, 1 short spinous c-bristle and 5 spinous terminal bristles.

Fifth limb: Epipodial appendages with 44 bristles; single endite with 1 bare bristle. Exopodite: 1st joint with 3 bristles, all with spines, longest bristle more spinous than others; 2nd joint with 5 spinous terminal bristles and 1 spinous proximal bristle; 3rd joint with 3 spinous bristles on inner lobe and 1 long spinous bristle on outer lobe; 4th + 5th joints with 5 bristles, all with spines; joints of exopodite hirsute.

Sixth limb (Figure 369*l*): Lateral surface of limb, posterior margin, and proximal medial surface of end joint hirsute. Endites well defined. Right limb of holotype with 4 endites, left limb aberrant in having only 3; 1st endite with bare bristles; bristles on remaining endites and anterior and middle bristles of end joint spinous, posterior bristles of end joint plumose. Distribution of bristles on USNM 127271 is as follows:

Limb	*Endites*				*End joint*		
	I	*II*	*III*	*IV*	*anterior*	*middle*	*posterior*
Left	3	–	3	4	4	2	2
Right	5	3	4	5	3	2	2

Seventh limb: Proximal group with 4 or 5 bristles, 2 or 3 on each side; distal group with 6 bristles, 3 on each side; each bristle with 2 to 4 bells and with marginal spines distally; terminus with opposing combs, each with about 6 teeth.

Furca: Left lamella of USNM 127271 and both lamellae of USNM 127273 normal with 8 claws, only claw 1 united to lamella and claw 3 smaller than claw 4. Right lamella of USNM 127271 aberrant with 9 claws, both claws 3 and 4 smaller than claw 5 (Figure 369*m*).

Eyes: Lateral eyes absent. Medial eye normal for genus (Figure 369*n,o*).

Rod-shaped organ: 1-jointed, elongate (Figure 369*n,o*).

Genitalia and brushlike organ: Genitalia of USNM 127271 tear-drop shaped with oval opening near bottom (Figure 369*q*); genitalia of USNM 127273 with oval spermatophore attached on each side (Figure 369*s*). Brushlike organ consisting of about 7 or 8 minute bristles posterior to and above genitalia.

Upper lip: Lip helmet shaped (Figure 369*o*).

Posterior: See Figure 369*p*.

Eggs: USNM 127271 and USNM 127273 with 7 eggs in brood chambers (maximum egg length 0.44 mm).

Comparisons.—The adult female carapace bears the same type of hairs as the carapaces of the juvenile males previously described. These parallel-sided hairs with either pointed or digitate tips distinguish *S. octo* from other species of the genus.

Supplementary Description of Hairs on Carapace of Holotype (Figure 361).—a-hairs distributed sparsely along margins and on lateral surfaces; short slender b-hairs sparsely distributed around margins and on lateral surfaces; g-hairs abundant in vicinity of margins and sparsely distributed on lateral surfaces; h-hairs scattered and forming loose clusters on lateral surfaces; some g-hairs pinched slightly below tips.

Distribution.—This species has been collected at three localities in Antarctica at depths of 3495 to 4758 m (Figure 360).

114. *Spinacopia mastix*, new species

Figures 372–376

Holotype.—USNM 126104, gravid ♀, length 2.31 mm. Valves and some appendages in alcohol, remaining appendages on slides.

Type-Locality.—Cruise 2, USCGC *Glacier*, station 0022, Weddell Sea.

Etymology.—The specific name is derived from the Greek "mastix" [= whip] and refers to the slender whiplike hairs on the lateral surface of each valve.

Paratypes.—USNM 126103, gravid ♀; USNM

126127, gravid ♀; USNM 126128, gravid ♀; USNM 126129, 11 gravid ♀♀; USNM 126130, 18 adult ♀♀; USNM 126131, 55 juveniles; USNM 126132, 1 adult ♂; USNM 126133, 126134, 126135, 3 adult ♂♂. Paratypes were in same epibenthic sled sample as holotype.

ADDITIONAL SPECIMENS.—USNM 126138, 1 adult ♂, from type-locality collected in an anchor dredge.

DIAGNOSIS OF ADULT FEMALE.—Carapace length 2.31 mm; ventral margin of posterodorsal bulge clifflike; surface with whiplike hairs.

DESCRIPTION OF FEMALE (Figures 372–375).—Carapace oval in lateral view with greatest height near middle; anterior produced in area of rostrum and with small incisur; posterior with short caudal process ventral to valve middle; carapace widest posterodorsally. Adult females with posterodorsal part of carapace forming large bulge; ventral margin of bulge clifflike, dropping almost perpendicular to carapace below bulge; hairs along ventral margin of bulge and hairs on remaining part of bulge about same length; bulge on juvenile carapaces much smaller and closer to dorsal margin of valve (Figures 372; 373*a,b,f,g*).

Ornamentation (Figures 372; 373*f,g*; 375): Surface pitted (pits more easily seen on juveniles because adult carapaces usually obscure because of debris). a-hairs abundant along anterior and ventral margins and scattered on lateral surfaces; short slender b-hairs abundant along margins; short stout b-hairs abundant on lateral surfaces; f-hairs present along posterior margin and forming linear rows radially arranged along anterior and ventral margins, also abundant on posterodorsal bulge; e-hairs numerous along margins.

Infold (Figure 373*c,h-j*): Infold ventral to incisur with minute bristle near inner margin; list anterior to caudal process with 5 (rarely 6) stout spinous bristles dorsally and 3 or 4 smaller spinous bristles ventrally; small bristles present along 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 extend-

FIGURE 372.—*Spinacopia mastix*, female, USNM 126104, length 2.31 mm, carapace.

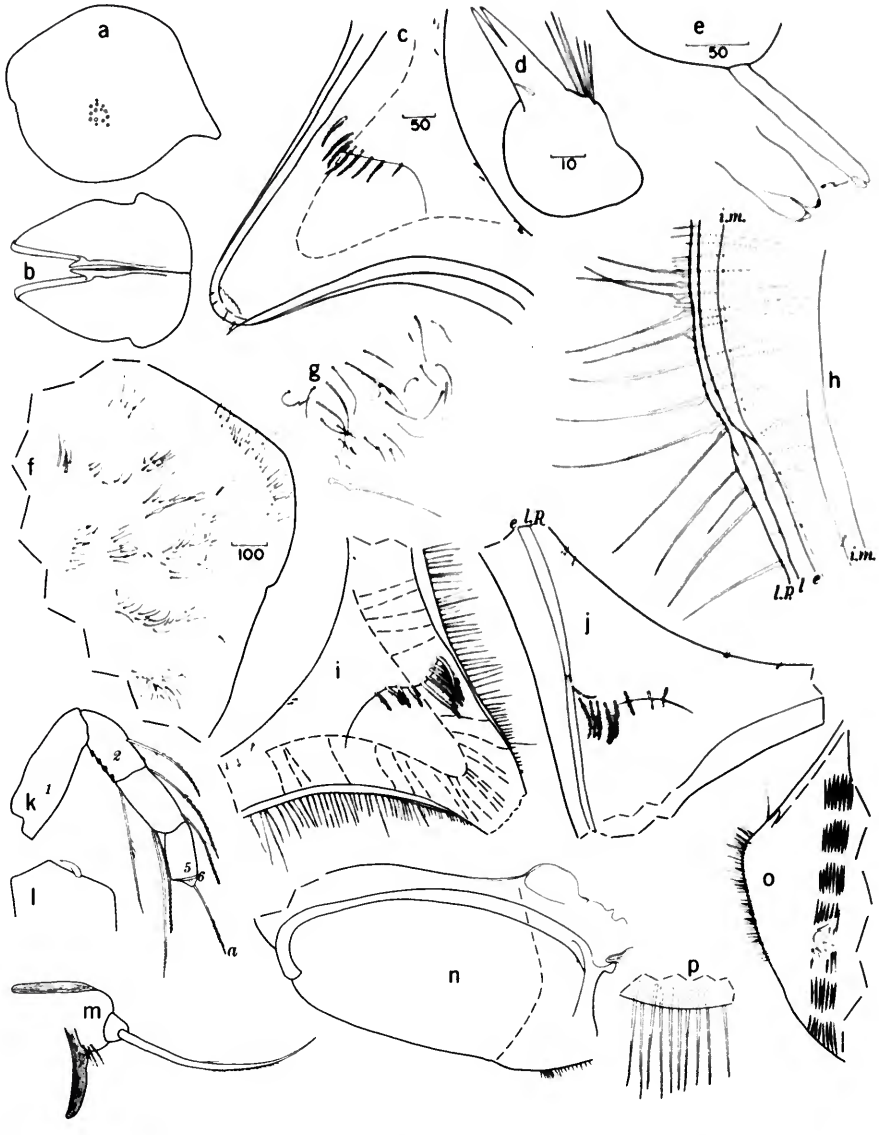

FIGURE 373.—*Spinacopia mastix*, female, USNM 126127, length 2.28 mm, carapace: *a*, lateral outline of specimen showing central muscle scars; *b*, dorsal view of same, anterior to left. Female, USNM 126103, length 2.36 mm: *c*, caudal process on left valve, medial view; *d*, coxale endite on right mandible, medial view; *e*, medial eye and rod-shaped organ. Female, USNM 126104, length 2.31 mm, right valve: *f*, anterior showing surface hairs, lateral view; *g*, detail of hairs near muscle scars, lateral view; *h*, incisur, medial view; *i*, caudal process, medial view. Left valve: *j*, caudal process, medial view. Right 1st antenna: *k*, complete limb, lateral view (not all bristles shown). Right 2nd antenna: *l*, spine on distal end of 1st joint, medial view; *m*, endopodite, medial view. Right mandible: *n*, precoxale and proximal part of coxale, lateral view; *o*, coxale endite, medial view, ventral to left. Left mandible: *p*, spines along ventral margin of coxale, medial view, anterior to right. (Same magnification in microns: *f,k; c,g-j,m,n; e,l,o; d,p.*)

ing backward from caudal process in juveniles, but lacking on most adults (tip of caudal process of holotype broken).

Size (Figure 364): USNM 126103, gravid ♀, length 2.36 mm, height 1.91 mm; USNM 126104, gravid ♀, length 2.31 mm, height 1.86 mm; USNM 126127, gravid ♀, length 2.28 mm, height 1.90 mm, width 1.71 mm; USNM 126128, length 2.33 mm, height 1.91 mm (not dissected); USNM 126132, ♀ with unextruded eggs, length 2.26 mm, height 1.83 mm.

First antenna (Figure 373*k*): Dorsal bristle of 2nd joint with few long spines; clusters of spines sparse on dorsal margin of 2nd joint and numerous on ventral margin; 3rd and 4th joint not separated by suture; both dorsal and ventral bristle of 3rd joint with few marginal spines; dorsal bristle of 4th joint with faint spines; ventral margin of 4th joint with 2 or 3 bristles (3 bristles observed only on left antenna of USNM 126103); sensory bristle of 5th joint with 2 short filaments; 6th joint with or without 1 small medial bristle. Seventh joint: a-bristle with faint spines and about one-half length of sensory bristle of 5th joint; b-bristle slightly shorter than a-bristle, with 1 short filament near middle; c-bristle about same length of sensory bristle, with 3 short filaments. Eighth joint: d- and e-bristles bare, slightly shorter than f-bristle; f- and g-bristles about same length as c-bristle, and with 2 short filaments.

Second antenna (Figure 373*l,m*): Protopodite bare, without medial bristle. Endopodite 2-jointed: 1st joint with 3 short bare bristles, 2nd joint with 1 long spinous terminal bristle (2nd shorter bristle rarely present). Exopodite: distal margin of 1st joint with short recurved medial spine; ventral margin of bristle of 2nd joint with few slender hairs; bristles of joints 3 to 8 with sparse natatory hairs; 9th joint with 2 bristles, 1 long with sparse natatory hairs, 1 short with short marginal spines; joints 3 to 8 with short spines forming row along distal margin.

Mandible (Figures 373*n-p*; 374*a-c*): Ventral margin of coxale spinous; coxale endite with bifurcate tip, small bristle and long spines near base. Basale: dorsal margin with 1 spine near middle and 2 subterminally; ventral margin with total of 8 bristles and spines, 3 in proximal group, 5 in distal group: proximal group with 2 short medial spines and 1 longer marginal bristle; distal group with 1 medial spine, 1 long medial bristle, and 3 short lateral bristles; U-shaped glandular opening present on lateral side between proximal and distal groups. Exopodite with elongate blunt tip, ventral bristle reaching about one-fifth length of dorsal margin of 1st endopodite joint. Endopodite: 1st joint with several short terminal spines on dorsal margin, 1 or 2 medial spines near base of main ventral claw and minute spines forming 2 distal rows on medial surface; 2nd joint with 2 spines slightly distal to middle of dorsal margin and 1 small lateral spine near base of main ventral claw; 3rd joint with 1 dorsal and 2 longer ventral spines near base of main claw.

Maxilla (Figure 374*d*): Coxale with short anterior bristle; basale with 1 bristle near exopodite; exopodite with 3 bare bristles; 1st and 3rd endites with 6 bristles; 2nd endite with 5 bristles; 1st endopodite joint with spinous α- and 6-bristles; 2nd endopodite joint with 2 spinous a-bristles, 1 bare c-bristle, and usual 5 pectinate terminal bristles; distal inner margin of posterior terminal bristle with closely spaced teeth forming row.

Fifth limb (Figure 374*e*): Epipodial appendage with 44 plumose bristles; single endite with 1 bare bristle; 1st joint of exopodite with 3 bristles, shortest bristle bare, others sparsely spinous; 2nd joint with 5 spinous terminal bristles and 1 short bare proximal bristle; 3rd joint with 3 bristles on inner lobe and 1 long bare bristle on outer lobe; 4th + 5th joints with 5 bristles; joints of exopodite hirsute.

Sixth limb (Figure 374*f,g*): Lateral surface of limb, posterior margin and proximal medial surface of end joint hirsute. Four endites well defined: 1st endite with 3 or 4 bare bristles; posterior 2 or 3 bristles of end joint plumose, most remaining bristles of endites and end joints with marginal spines. Distribution of bristles on 2 specimens is as follows:

Specimen	*Endites*				*End joint*		
	I	*II*	*III*	*IV*	*anterior*	*middle*	*posterior*
USNM 126103							
left	4	3	3	4	3	2	3
right	4	2	4	3	5	2	2
USNM 126104							
left	3	3	4	3	5	2	2
right	3	4	4	4	4	3	2

Seventh limb: Proximal group with 5 to 7 bristles; distal group with 6 bristles, 3 on each side;

FIGURE 374.—*Spinacopia mastix*, female, USNM 126104, length 2.31 mm, left mandible: *a*, basale, exopodite, endopodite, medial view; *b*, detail of exopodite in "*a*." Right mandible: *c*, bristles on ventral margin of basale, lateral view. Maxilla: *d*, left limb, lateral view. Fifth limb: *e*, left limb, medial view. Sixth limb: *f*, left limb, medial view; *g*, right limb, medial view. Furca: *h*, left lamella; *i*, right lamella. Anterior: *j*, medial eye and rod-shaped organ; *k*, upper lip and part of right mandible showing position of coxale endite relative to the mouth. Genitalia: *l*, left spermatophore and brushlike organ, anterior to left. (Same magnification in microns: *a,d,f-i, k,m; c,e,j,l; b.*)

each bristle with 2 to 5 bells and with marginal spines distally; terminus with opposing combs, each with 7 to 11 teeth.

Furca (Figure 374*h,i*): Each lamella with 8 claws: claw 1 continuous with lamella, remaining claws separated from lamella by suture; claw 3 shorter than claw 4, all claws slender and with pointed tip; most claws with teeth forming row along posterior margin and short hairs along anterior margin; few minute teeth present following posterior claw; anterior margin of lamella with 2–9 or 3–9 short spines; hairs present at base of claw 1. (Left lamella of holotype aberrant in having 9 claws with both 3rd and 5th claws shorter than following claw.)

Eyes (Figure 374*j*): Lateral eyes absent. Medial eye normal for genus.

Rod-shaped organ (Figure 374*j*): 1-jointed, elongate with digitate tip (tip of rod-shaped organ of USNM 126103 bifurcate).

Genitalia and brushlike organ (Figure 374*l*): Genitalia with oval spermatophore attached on each side. Brushlike organ consisting of about 10 minute ringed bristles present posterior to and above genitalia.

Posterior: Posterior margin above furca with clusters of long hairs.

Upper lip: Lip helmet shaped with few hairs (Figure 374*k*).

Eggs: Holotype with 5 eggs in brood chamber; USNM 126103 with 4 eggs, both specimens with additional unextruded eggs within body.

Description of Male (Figure 376).—Carapace more elongate than female, with prominent rostrum and caudal process (Figure 376*a*); carapace highest anterior to middle; posterodorsal area slightly inflated, but without clifflike ventral margin of female; ornamentation and distribution of bristles on infold similar to that on female.

Size (Figure 364): USNM 126133, shell broken and not measured; USNM 126134, length 2.07 mm, height 1.48 mm; USNM 126135, length 2.10 mm, height 1.27 mm (specimen not dissected); USNM 126138, length 2.03 mm, height 1.33 mm.

First antenna (Figure 376*b*): Lateral and medial surfaces of 1st and 2nd joints and ventral margin of 2nd joint with spines; 2nd joint with dorsal bristle with long proximal and short distal spines; 3rd joint not separated from 4th by suture and with 2 long bristles, 1 ventral, 1 dorsal; 4th joint with 3 bristles, 2 ventral, 1 dorsal; 5th joint small and placed ventrally between 4th and 6th joints; sensory bristle of 5th joint with 4 marginal filaments; numerous filaments present on basal cup of sensory bristle; 6th joint with short medial bristle with cluster of short spines near base. Seventh joint: a-bristle with distal marginal spines; b-bristle with 2 filaments; c-bristle with 6 filaments. Eighth joint: d- and e-bristles bare, longer than b-bristle; f-bristle with 5 marginal filaments and bifurcate tip; g-bristle with 6 marginal filaments.

Second antenna (Figure 376*c*): Protopodite bare. Endopodite 3-jointed: 1st joint with 3 short bare bristles and clusters of surface hairs; 2nd joint with 3 proximal bristles longer than joint; 3rd joint recurved with 2 short subterminal bristles and about 14 distal ridges. Exopodite: 1st joint with short recurved medial spine on distal margin; joints 2 to 8 with short spines along distal margins; bristles on joints 2 to 8 with sparse natatory hairs; joint 9 with 1 long bristle with sparse natatory hairs and 1 short bristle with short marginal spines.

Mandible (Figure 376*d-g*): Coxale endite present consisting of 2 unringed spinelike bristles with bases on small process; ventral margin of coxale with linear clusters of spines. Basale: dorsal margin with 3 bristles; ventral margin with 1 long and 7 short bristles; exopodite longer than on female, bristle reaching about one-half length of 1st endopodite joint. Endopodite: 1st joint with clusters of surface spines and 1 long and 2 short subterminal ventral bristles; 2nd joint with clusters of surface spines, 2 long midbristles on dorsal margin, 1 medial bristle on distal margin; 2 long bristles on ventral end of distal margin; 3rd joint with short a-bristle, stout clawlike b-bristle with clusters of short spines on medial and lateral surfaces, short clawlike c-bristles with teeth along ventral margin, and long d-bristle; dorsal margin of 1st endopodite joint indented in region of exopodite.

Maxilla: Appendage reduced; 3 endites present, each with 5 or 6 hirsute bristles; exopodite with 3 bristles; surface of appendage with numerous spines forming clusters; no clawlike bristles present, most bristles hirsute, some with short marginal spines.

Fifth limb (Figure 376*h*): Appendage about one-half size of that of female. Epipodial appendage

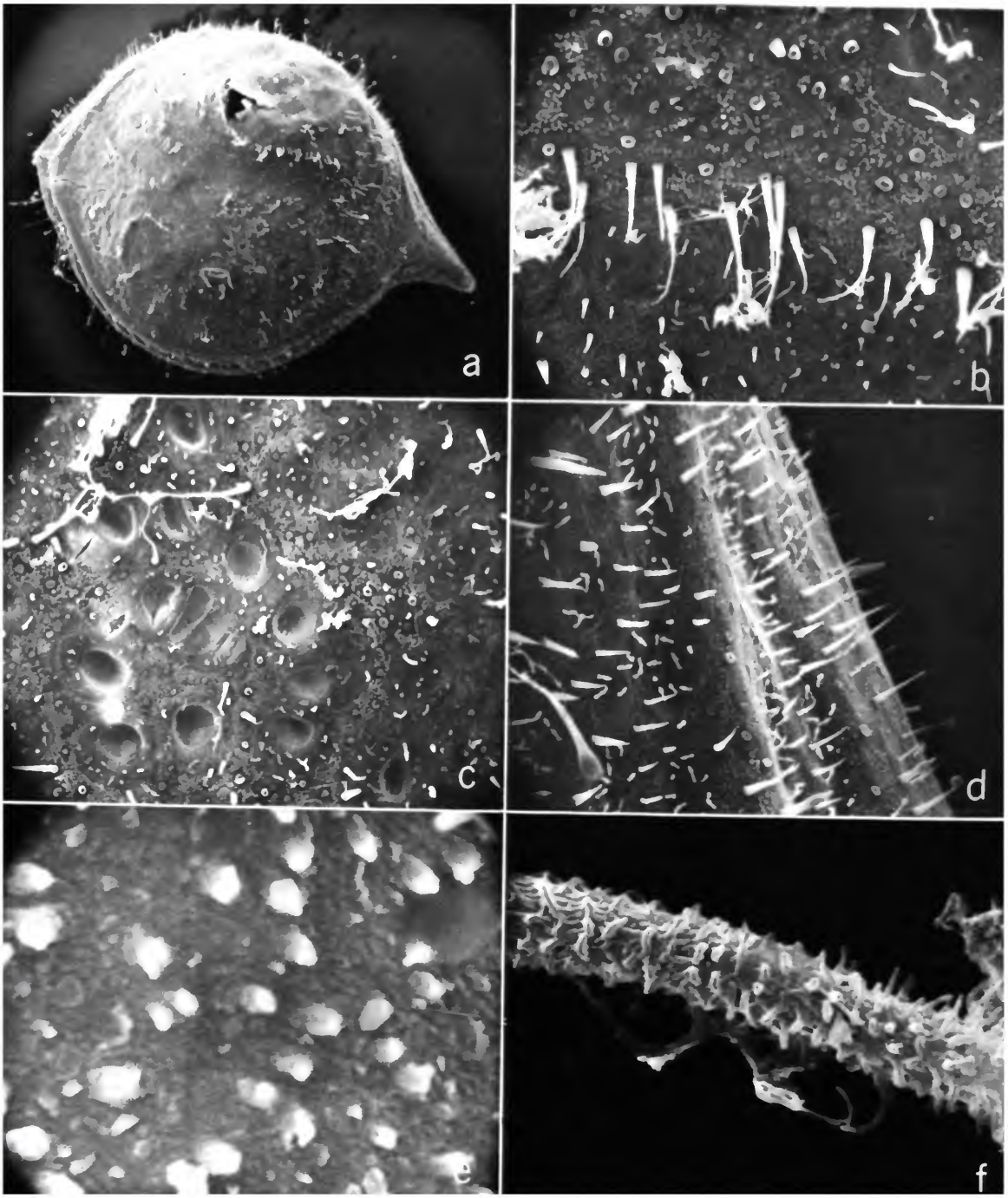

FIGURE 375.—*Spinacopia mastix*, female, USNM 126103, left valve, lateral view (many surface bristles broken): *a*, complete valve, × 40; *b*, central part of ventral margin of posterodorsal bulge, × 5000; *c*, central muscle scar area, × 250; *d*, posterior margin, dorsal to caudal process, × 500; *e*, detail of surface, × 15,000; *f*, surface of long hair, anterior to central, muscle scars in "*a*," × 10,000.

with 48 bristles; single endite with 1 hirsute bristle. Endopodite: 1st joint with 3 hirsute bristles; 2nd joint with 4 spinous bristles; inner lobe of 3rd joint with 4 spinous bristles, outer lobe with 1 long spinous bristle; 4th + 5th joints with 4 spinous bristles and surface hairs.

Sixth limb (Figure 376*i*): Appendage slightly larger than that of female. Bristles generally more hirsute than those on female. Four endites well defined. Distribution of bristles on 6th limb of USNM 126133 is as follows:

Limb	*Endites*				*End joint*		
	I	*II*	*III*	*IV*	*anterior*	*middle*	*posterior*
left	3	3	4	3	5	2	2
right	4	3	4	3	5	3	2

Seventh limb: Proximal group with 3 or 4 bristles; distal group with 4 bristles, 2 on each side; each bristle with 2 or 3 bells and distal marginal spines; opposing combs with 3 or 4 teeth.

Furca: USNM 126133 with 7 claws on each lamella; claw 1 continuous with lamella, remaining claws separated from lamella by suture; claws decreasing in length posteriorly along lamella; claw 3 longer and stouter than claw 4; all claws with teeth along posterior margin. USNM 126134 with 8 claws on each lamella, claw 3 shorter and more slender than claw 4. (Furca of latter specimen probably has more common distribution of claws.)

Eyes: Lateral eyes absent. Medial eye normal for genus (Figure 376*j*).

Rod-shaped organ: 1-jointed, elongate with rounded tip (Figure 376*j*).

Posterior: Posterior margin above furca with clusters of hairs.

Copulatory organ (Figure 376*k*): Seminal vesicle bilobed; penis small, between complex clasping organs hanging down at each side; each clasper consisting of 3 lobes, each with 5–8 bristles; main lobs terminating in sclerotized hook and triangular tooth proximally; ridges and minute projections present on triangular tooth; 6 bristles present on proximal part of sclerotized hook, 3 of these on sclerotized base; outer lobe with 5 terminal bristles and minute spines proximal to bristles; inner lobe with 2 terminal bristles and about 6 slender proximal bristles (latter bristles similar in appearance to bristles of brushlike organ on female).

Sexual dimorphism: The mandible of the male *S. mastix* bears a coxale endite consisting of either a bifurcate process, or 2 short stout bristles on a low mound, located slightly more posterior on the coxale than the process on the female. Such a process has not previously been reported on a male of the family Sarsiellidae. The only other *Spinacopia* from which the adult male is known is *S. sandersi* Kornicker, 1969. Reexamination of the allotype of that species, USNM 122558, revealed a single pronged process on the coxale in the general area of the coxale endite of *S. mastix* but slightly more dorsally (dorsal to the main muscle). Apparently, *Spinacopia* differs from other genera in the Sarsiellidae in possessing this process. The coxale of the male of *S. mastix* also bears clusters of long hairs or spines along the ventral margin. This was not observed on the male of *S. sandersi*, nor have they been previously reported on any other males of the Sarsiellidae.

As in other genera of Sarsiellidae, bristles on the 6th limbs of the males of *Spinacopia* bear longer hairs than do bristles on the same limb of the females.

Population Structure.—The sample collected in an epibenthic sled from station 0022 contained 33 adult females and 3 adult males. Eggs were visible in the brood chamber of almost half (15) of the adult females. In addition to adults, the sample contained 56 juveniles. Another adult male was collected at the same station in an anchor dredge.

Comparisons.—Adult females of this species are slightly larger than *S. torus* Kornicker, 1969, but the shape of their carapaces are similar. They can be separated by differences in the hairs on the carapace. Many hairs on *S. mastix* are slender, tapering to a thin lash; whereas, most hairs on *S. torus* are stout and taper to a broad tip.

Some adult females of *S. mastix* have artificial depressions in the posterodorsal bulge resembling those on specimens of *S. octo* described by Kornicker (1969a). Many hairs on the carapace of *S. octo* have sides that are almost parallel except near the tip and resemble the shape of an obelisk; some hairs are short with digitate tips. The obelisk-shaped hairs are especially common along the margins of the caudal process.

The shape of the carapace of *S. mastix* is also similar to that of *S. bisetula*, but on the carapace of *S. mastix* the hairs on the ventral margin and on the broad surface of the posterodorsal bulge are

FIGURE 376.—*Spinacopia mastix*, male, USNM 126134, length 2.07 mm, carapace: *a*, outline of specimen, lateral view. Male, USNM 126133, right 1st antenna: *b*, complete limb (bristles on 8th joint not shown). Right 2nd antenna: *c*, endopodite, lateral view. Right mandible, medial view: *d*, basale, exopodite, endopodite; *e*, coxale; *f*, exopodite. Left mandible, medial view: *g*, coxale endite. Left 5th limb: *h*, distal part, anterior view. Right 6th limb: *i*, complete limb, medial view. Anterior: *j*, medial eye and rod-shaped organ. Copulatory limbs: *k*, left limb, medial view; *l*, same, lateral view. (Same magnification in microns: *b,d,i; c,e-h,j-l.*)

the same length, whereas on *S. bisetula* the hairs along the ventral margin of the bulge are much longer than those on its broad surface.

The ventral margin of the posterodorsal bulge on each valve of adult females of *S. sandersi* Kornicker, 1969a, *S. menziesi* Kornicker, 1969a, and *S. variabilis* Kornicker, 1969a, slopes gradually to that part of the valve below the bulge; it is not clifflike as on *S. mastix*.

The only male *Spinacopia* described prior to *S. mastix* is that of the smaller *S. sandersi* Kornicker, 1969a. The 1st joint of the endopodite of the 2nd antenna of *S. mastix* bears 3 bristles compared to 2 on *S. sandersi*. The 4th endite of the 6th limb of *S. mastix* is distinct, whereas it is separated from the end joint by only a narrow gap on *S. sandersi*. The copulatory organ of *S. mastix* bears more bristles than that of *S. sandersi*.

DISTRIBUTION.—This species was collected only at the type-locality in the Weddell Sea at a depth of 3035 m (Figure 360).

Spinacopia Species Indeterminate

MATERIAL.—USNM 138031, 1 ♀, length 1.99 mm, height 1.64 mm, from *Eltanin* Cruise 5, station 322.

DISTRIBUTION.—The distribution of this category is shown in Figure 360.

Anscottiella, new name

Scottiella Poulsen, 1965:64.

TYPE-SPECIES.—*Scotiella crispata* (Scott, 1905), monotypy.

I notified Dr. Poulsen that the name *Scottiella* is preoccupied and that a new name would be required. He suggested (written comm., 1970) that I should propose the new name. I follow Dr. Poulsen in naming the genus after Andrew Scott.

In addition to *Scotiella crispata*, the only species referred to the genus by Poulsen (1965), I include in *Anscottiella*, the species *Muelleriella setifera* Poulsen, 1965:62. I also consider it possible that *Sarsiella similis* Scott, 1905, and *Sarsiella gracilis* Scott, 1905, two species referred to *Muelleriella* by Poulsen (1965:58), should be referred to *Anscottiella*, and do so herein; however, the species are not sufficiently known for the referral to be made with certainty.

Members of this genus have not been collected in the study area.

DIAGNOSIS OF THE GENUS.—Carapace of female without incisur or with minute notch; caudal process short; surface punctae with or without low ridges. Carapace of male with projecting rostrum.

First antenna: 7th and 8th joints with full complement of bristles.

Second antenna: Endopodite on female limb 1-jointed: *A. setifera* with 4 proximal bristles, 2 anterior, 2 posterior; *A. crispata* with 2 anterior proximal bristles on reduced joint. Endopodite on male limb reduced to 1 or 2 small teeth, joint reduced or absent (male known only for *A. crispata*).

Mandible: Exopodite absent.

Maxilla: Exopodite with 3 bristles.

Fifth limb: Typical for family.

Sixth limb: Limb with 2 or 3 small endites, each with 1 or 2 bristles; end joint of female limb with 2 plumose posterior bristles and 9 or 10 bare bristles; end joint of male limb with all bristles spinous.

Seventh limb: Male limb bare, reduced. Female limb with 6 distal bristles (3 on each side) and 2 to 4 proximal bristles (1 or 2 on each side); terminus with opposing combs, each with 2 or 3 teeth.

Furca: Female limb of *A. crispata* with claws 1 and 2 stout, united with lamella; claws 3 and 4 small and separated from lamella. Male limb with claws 1 to 3 united to lamella, claw 4 separated from lamella, with claws 3 and 4 much smaller than claws 1 and 2. Female limb of *A. setifera* with claws 1 and 2 united to lamella and claws 3 to 7 or 8 separated from lamella and smaller than claws 1 and 2. Female limbs of *A. gracilis* and *A. similis* with 3 stout claws followed by 3 small claws. (It is probable that some or all primary claws of these two species are united to the lamella, but this cannot be ascertained from either description or illustrations of Scott, 1905, which show all claws separated from lamella; accuracy of Scott's illustrations of furcae of these species is suspect because he shows all claws of *S. crispata* separated from lamella, whereas, Poulsen, 1965, found claws 1 and 2 united to lamellae on specimens he referred to that species.)

Lateral eyes: Small in female, more ommatidia in male.

Rod-shaped organ: Elongate, but shorter on *A. crispata* than on *A. setifera*, tip rounded; on *A. crispata* distal part of organ weakly ringed.

COMPARISONS.—Members of the genus *Anscottiella* differ from species of *Cymbicopia* in being without a long terminal bristle on the endopodite of the 2nd antenna on the female limb. The carapace of members of *Cymbicopia* bear some bristles with bulbous or cuplike tips, which presumably are not present on members of *Anscottiella*, but this cannot be stated with certainty until species referred to *Anscottiella* are better known. The furcal lamellae of *Anscottiella* differ from those on *Sarsiella*, *Adelta*, and *Parasarsiella* in having more than 1 claw united with the lamella, and from those on *Spinacopia* and *Chelicopia* in being without secondary claws between primary claws.

DISTRIBUTION.—Members of the genus *Anscottiella* have been collected in the vicinity of Ceylon, Thailand, and Singapore. The known depth range is from 2 m to about 189 m.

Key to Species

1.	Furca with 4 claws	*A. crispata*
	Furca with 6 or more claws	2
2.	Furca with 7 or 8 claws	*A. setifera*
	Furca with 6 claws	3
3.	Carapace with lateral ribs	*A. similis*
	Carapace without lateral ribs	*A. gracilis*

Cymbicopia, new genus

Muelleriella Poulsen, 1965:57 [part].

TYPE-SPECIES.—*Sarsiella hanseni* Brady, 1898.

ETYMOLOGY.—The generic name "Cymbicopia" is derived from the Latin "cymba" [= cup, bowl, boat] and "copia" [= abundance] in reference to the abundant bristles with cup-shaped tips on the carapace of the type-species.

This new genus contains the following species: *C. hanseni*, *C. hispida* (Brady, 1898), *C. zealandica* (Poulsen, 1965), and *C. brevicosta*, new species.

DIAGNOSIS OF GENUS.—Carapace with numerous bristles, some forming ridges; bristles of all types but also including those with bulblike or cuplike tips. Rostrum of ♀ prominent on *C. hispida* and *C. zealandica* but not on other species; caudal process short on *C. hanseni*, but elongate on other species. Usual sexual dimorphism.

First antenna: 3rd and 4th joints with long ventral bristles on female and long dorsal bristles on male.

Second antenna: Endopodite of female with 1 or 2 small proximal bristles and long terminal bristle; distinctly 2-jointed or with 2nd joint consisting of small bulge fused to 1st joint (in latter case, endopodite could be considered 1-jointed). Endopodite of ♂ 3-jointed, prehensile.

Mandible: ♀ exopodite either absent or minute.

Maxilla and 5th limbs: Usual type.

Sixth limb: 3 endites present; end joint with 7 to 14 bristles.

Seventh limb: ♀ limb with 8 bristles, 6 terminal, 2 proximal, and opposing terminal combs, each with 4 to 8 plain or alate teeth. Male limb of *C. hispida* short and without bristles or terminal combs, of *C. brevicosta* elongate with 4 terminal bristles and bare terminus, of *C. hanseni* similar to that of *C. brevicosta* but with 1 proximal bristle. Male of *C. zealandica* unknown, but 7th limb probably similar to that of *C. hispida*.

Furca: Claws 1 and 2 continuous with lamella, remaining claws separated from lamella by suture except for female of *C. hispida* on which only claw 1 is continuous with lamella; *C. hanseni* and *C. brevicosta* with claws 3–7 or 4–7 decreasing in length posteriorly along lamella (*C. hanseni* with 4 claws, *C. brevicosta* with 6 or 7), *C. zealandica* and *C. hispida* with claw 4 (a main claw) longer and stouter than claw 3, and claws 5–7 or 5–8 decreasing in length posteriorly along lamella.

Eyes: Lateral eyes small with 2 groups of ommatidia.

Rod-shaped organ: 1-jointed, broadening distally, with crinkled margins.

MICROSTRUCTURE.—The carapaces of species of *Cymbicopia* are coated by an amorphous substance

that seems to fill spaces between bristles and in some instances cover them. This substance is transparent when observed on a whole mount or a section (Figure 386). It may be epicuticle and is so called in the descriptions below. The substance seems to shrink during the freeze-drying process used in preparing specimens for the scanning electron microscope. The relationship of the dried epicuticle to bristles is clearly shown in Figure 383*f* (*C. hanseni*), Figure 394*e,f* (*C. hispida*), and Figure 397*d* (*C. brevicosta*).

Bristles with bulbous tips are present on *C. hanseni* (Figure 381*d-f*), *C. hispida* (Figures 392*c,d*; 394*c*), and *C. brevicosta* (Figure 400*c*). The tips of bristles on *C. hispida* are less bulbous than those on *C. hanseni* and *C. brevicosta*. The bulbous tips tend to collapse forming cuplike tips, especially those on *C. hanseni*. Some bristles on *C. hispida* have papillae (Figures 393*b*, 394*c*). Unlike most bristles, the bristles with bulbous tips do not appear to emerge from pores in the shell (Figures 384; 385*b-d*; 393*c,d*; 394*e*). The jagged tear in the base of the bristle on *C. hispida* shown in Figure 392*e* is probably not a pore. The bristles form the ridges which ornament the species (Figures 381*d,e*; 394*d*; 397*b,d*; 400*b,d*). On *C. hanseni* short bristles with bulbous or collapsed tips occur between ridges (Figure 381*d*).

On a specimen of *C. hanseni* about to molt, the bristles with bulbous or collapsed tips were erect on the old carapace (Figure 381) and lying down on the new carapace (Figure 382).

Bristles with branching tips (Figure 383*b*) and also bristles with a ribbed broad base (Figure 382*c,d*) were observed on *C. hanseni*. Some bristles on *C. hispida* (Figure 394) and *C. brevicosta* (Figure 397*c*) have tapering tips. Flat, triangular bristles occur near the base of the ridges on *C. hanseni* (Figure 381*d*).

REMARKS.—Poulsen (1965:58) included *Cymbicopia zealandica* in a new genus, *Muelleriella*, along with *M. setifera* Poulsen, 1965, *M. similis* (Scott, 1905), and *M. gracilis* (Scott,1905). He also stated that possibly *C. hanseni* and *C. hispida* should be included in his new genus. I notified Dr. Poulsen that *Muelleriella* was preoccupied and that a new name would be required. He suggested (written comm., 1970) that I should propose the new name. In view of *Muelleriella* not being a valid genus in that Poulsen did not designate a type-species, and in that I do not include either *M. setifera*, *M. similis*, or *M. gracilis* in my new genus *Cymbicopia*, I find it expedient to ignore *Muelleriella* at this time.

DISTRIBUTION.—Members of the genus *Cymbicopia* have been collected only in bays and harbors of New Zealand at depths of 15 m or less (Figure 352).

Key to Species

1. Carapace with prominent posterodorsal process, female carapace with prominent rostrum.....3
   Carapace without posterodorsal process, female carapace without prominent rostrum.....2
2. Midrib of carapace extending posteriorly past middle of carapace; furca with 4 (rarely 5) claws on each lamella.....116. *C. hanseni*
   Midrib of carapace not reaching posteriorly past middle of carapace; furca with 6 or 7 (rarely 5) claws on each lamella.....118. *C. brevicosta*
3. Carapace of female shorter than 1.20 mm.....117. *C. hispida*
   Carapace of female longer than 1.35 mm.....115. *C. zealandica*

115. *Cymbicopia zealandica* (Poulsen)

Muelleriella zealandica Poulsen, 1965:58, figs. 15, 16.—Eagar, 1971:61.

HOLOTYPE.—A gravid ♀ with 8 embryos, length 1.44 mm.

TYPE-LOCALITY.—Halfmoon Bay, Stewart Island, New Zealand, 10–15 m, sand bottom.

MATERIAL.—None examined.

DIAGNOSIS.—Carapace with distinct rostrum and shallow incisur, length of adult females 1.40–1.45 mm. Ornamentation: posterodorsal bulge with triangular process on posterodorsal corner of bulge. Infold on caudal process with 3 spinous bristles in anterodorsal corner.

Furca: Claws 1, 2, 4 stout and with rounded tips; claws 1 and 2 united with lamella, remaining claws separated from lamella by suture.

REMARKS.—*Cymbicopia zealandica* is closely related to *C. hispida* (Brady) and may eventually be referred to it.

DISTRIBUTION.—Collected only at type-locality (Figure 360).

116. *Cymbicopia hanseni* (Brady)

FIGURES 377–386

Sarsiella hanseni Brady, 1898:438, pl. 45: figs. 1–12.—Hansen, 1905:356.—Müller, 1912:36 [key], 40.
Muelleriella hanseni (Brady).—Poulsen, 1965:57, 58.
Muelleriella? hanseni (Brady).—Eagar, 1971:61 [listed].

HOLOTYPE.—None designated.

SYNTYPE-LOCALITY.—Lyttelton Harbor, N.Z., dredged in 1–5 fathoms (Brady, 1898).

MATERIAL.—In a vial containing 120 specimens of *Scleroconcha flexilis* from Lyttelton Harbor, New Zealand, I found 23 specimens of *C. hanseni*. This material was among that received from Dr. K. G. McKenzie and is part of the Brady collection of the Hancock Museum. The specimens include 1 adult ♂, 5 gravid ♀♀, 2 adult ♀♀ without eggs, and 15 juveniles.

(After I had returned this material to the British Museum (Natural History), I studied a collection from Akaroa Harbor, N. Z., now in the Universitets Zoologiske Museum, Copenhagen, and identified a new species described herein as *Cymbicopia brevicosta*. This species superficially resembles *C. hanseni*. It is possible that some specimens belonging to the new species were included in the 23 specimens I identified as *C. hanseni* in the collection from the British Museum.)

A single specimen of *C. hanseni*, a juvenile N–1 ♂, length 0.88 mm, height 0.60 mm, was present in a vial labeled *Sarsiella hispida* Brady in the collection of Universitets Zoologiske Museum, Copenhagen, Denmark. This vial is discussed in more detail under "Material" in the description of *Cymbicopia brevicosta*. Specimens in the vial are from Akaroa Harbor, N. Z.

In another vial received on loan from the Universitets Zoologiske Museum, which contains two labels—"*Philomedes flexilis* Brady, orig. spec. Lyttelton Harb., 1–5 fm." and "TYPE"—I found 21 specimens of *Cymbicopia hanseni*, including 2 adult ♂♂, 4 adult ♀♀ without eggs and 15 juveniles. One ♂ (USNM 135041), 1 ♀ (USNM 135042) and 1 juvenile (USNM 135046) have been placed in the collections of the National Museum of Natural History, the remaining specimens have been returned to Copenhagen.

DIAGNOSIS OF ADULT FEMALE.—Carapace length 0.98–1.08 mm; midrib extending posteriorly beyond central muscle scar area.

Furca: Each lamella with 4 claws (rarely 5); claws 1 and 2 continuous with lamella, remaining 2 or 3 claws separated from lamella by suture; claws decreasing in length posteriorly along lamella.

SUPPLEMENTARY DESCRIPTION OF FEMALE (Figures 377–378; 379*a–i*; 385).—Carapace oval in lateral view with small incisur above middle of anterior margin and with posteroventral caudal process (incisur evident in lateral view, but not reflected by indentation of valve edge).

Ornamentation (Figures 377, 385): Carapace with ridges and various types of bristles. Configuration of main ridges M-shaped, with lower leg of "m" extended downward and recurved so that extension fits midway between upper and middle legs of "m," oriented so that top of "m" faces anterior. Additional short radial ridges extend venteriad and posteriad from lower longitudinal ridge. Relief of ridges caused primarily by rows of bristles rather than by shell material. Bristles forming ridges have expanded tips, some bulbous but most cuplike. (Whether or not cuplike tips are formed by depression of tops of bulbous tips after death of animal is not known. It is also possible that live animals are capable of changing configuration of tips.) Many additional bristle-types present on shell: short flaplike bristles were observed below ventral ridge; bristles terminating in 1 to 3

FIGURE 377.—*Cymbicopia hanseni*, female, USNM 135042, carapace, × 60.

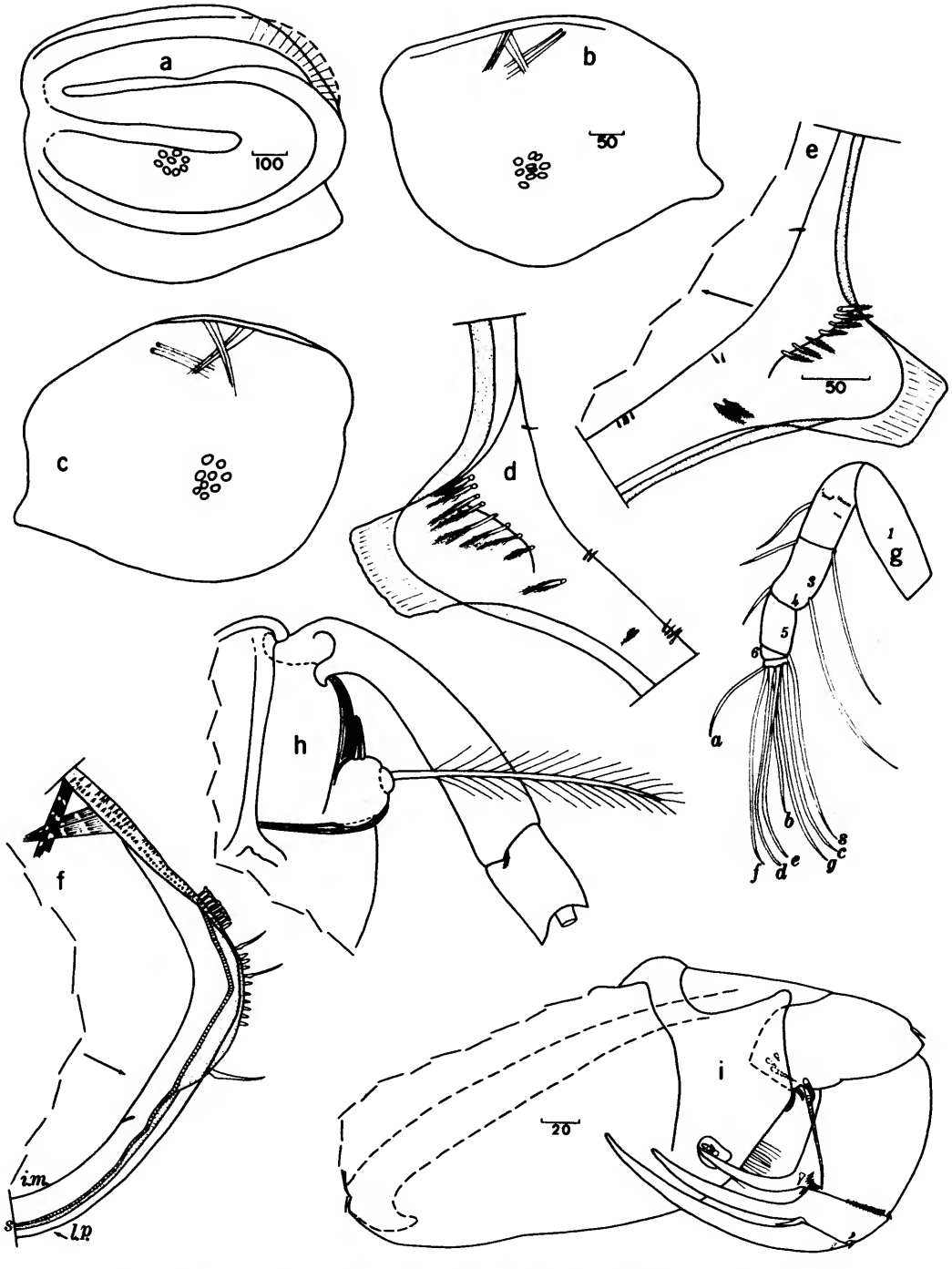

FIGURE 378.—*Cymbicopia hanseni*, female with 1 egg, B505, length 0.98 mm: *a*, complete specimen, lateral view. Female with 5 eggs, B505, length 1.06 mm, carapace: *b*, right valve showing central and dorsal muscle attachments, medial view; *c*, same on left valve. Caudal process, medial view: *d*, left valve; *e*, right valve. Anterior: *f*, left valve showing small incisur and position of anterior dorsal muscles. Left 1st antenna: *g*, complete limb, lateral view. Left 2nd antenna: *h*, endopodite, part of protopodite and exopodite, medial view. Mandible: *i*, left limb, medial view. (Same magnification in microns: *b,c,f,g; h,i; d,e.*)

FIGURE 379.—*Cymbicopia hanseni*, female with 5 eggs, B505, length 0.98 mm: *a*, left maxilla, lateral view (only part of endite I shown); *b*, distal part of 5th limb (marginal spines not shown on all bristles); *c*, right 6th limb, medial view; *d*, part of left 6th limb, medial view (marginal spines not shown on bristles); *e*, right lamella of furca and internal sclerite; *f*, medial eye and rod-shaped organ; *g*, left lateral eye; *h*, left genitalia; *i*, anterior showing left lateral eye, part of right 1st and 2nd antennae, medial eye and rod-shaped organ, anterior process, upper lip, and right mandible. Male, B505, length 1.04 mm, carapace: *j*, complete specimen, lateral view showing left furcal lamella and copulatory limb. Left valve, medial view: *k*, bristles along middorsal margin; *l*, caudal process. Right valve, medial view: *m*, caudal process; *n*, anterior. Right 1st antenna: *o*, complete limb, lateral view (not all bristles or filaments shown). Second antenna: *p*, endopodite on left limb, medial view; *q*, 3rd joint of endopodite on right limb, lateral view. (Same magnification in microns: *a-d,f,p; e,g-i,o; l-n.*)

branches are scattered on valve surface; long stout bristles with broad ribbed process near their bases scattered on valve surface and present along anterior and ventral margins, many of these bear marginal spines; short bristles with rounded tips present along anterior, ventral, posterior, and dorsal margins except along anterodorsal margin where short cup-tipped bristles dominate; short pointed spines also present along anterodorsal margin between cup-tipped bristles and shell edge. Short cup-tipped bristles on carapace between ridges form groups with about 7 or 8 bristles. Transparent substance observed between cup-shaped bristle similar to that observed between the bristles of *Cymbicopia hispida*. (Bristles similar to those on adult female are illustrated for juveniles in Figures 381, 386.)

(Microtome sections of a female show that cup-

FIGURE 380.—*Cymbicopia hanseni*, male, B505, length 1.04 mm: *a*, right mandible, medial view; *b*, right maxilla, lateral view; *c*, distal part of right 5th limb, medial view; *d*, right 6th limb, medial view; *e*, right 7th limb; *f*, posterior showing right lamella of furca, internal sclerites, right and left (cross-hatched) copulatory limbs: *g*, lateral eye; *h*, body from right with right 2nd antenna removed, dashed oval outlines heart (most bristles not shown on appendages); *i*, copulatory limbs and penis, anterior view; *j*, right clasping organ, medial view; *k*, copulatory limbs, posterior view. (Same magnification in microns: *a,e,f,h; g,j; i,k; c,d.*)

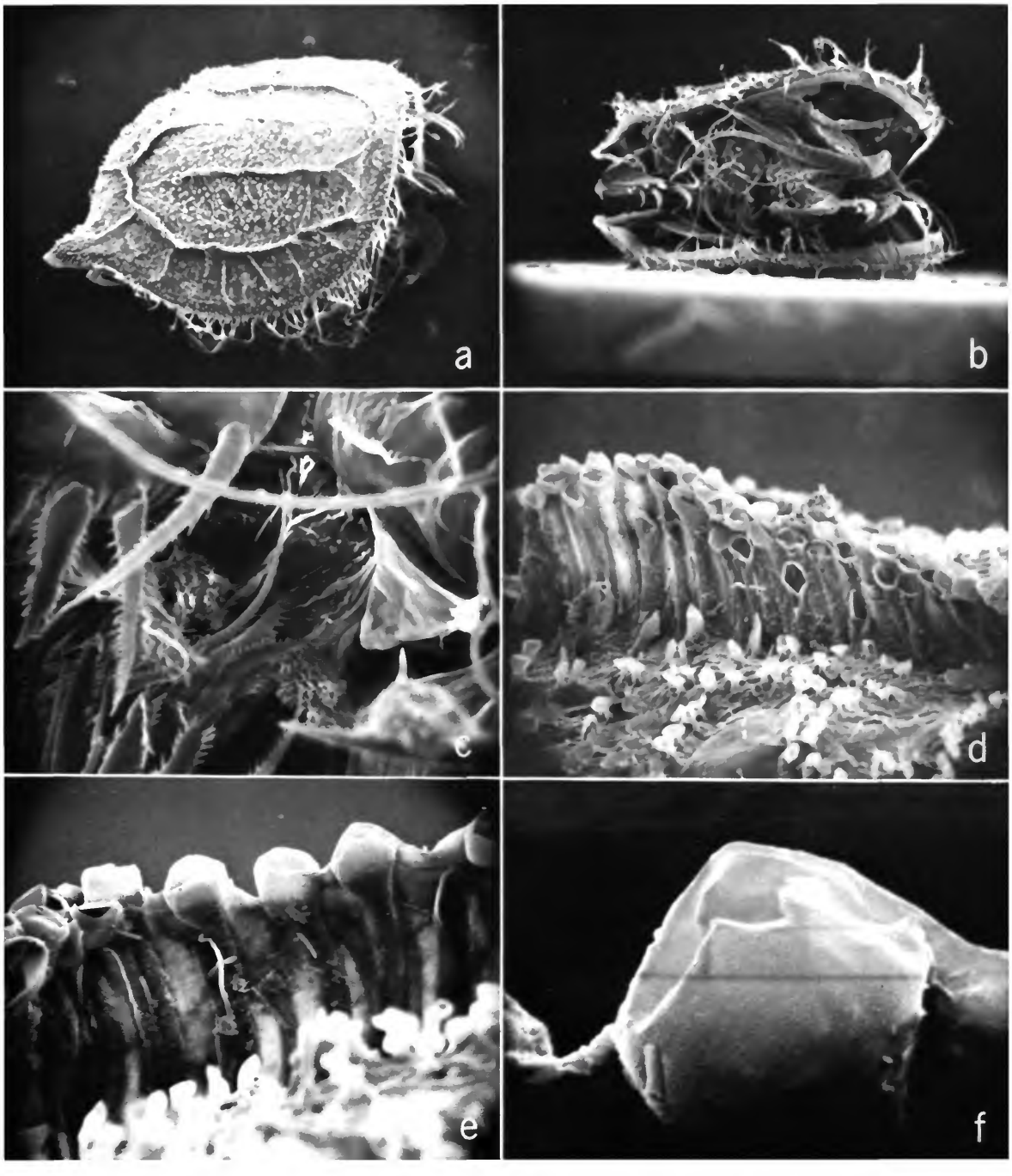

FIGURE 381.—*Cymbicopia hanseni*, juvenile, B505, length 0.86 mm, height 0.65 mm: *a*, complete specimen, × 100; *b*, ventral view, × 100; *c*, ventral view mouth area, × 10,000; *d*, middle ridge, ventral view, × 1000; *e*, posterior ridge, ventral view, × 2000; *f*, detail of bristle top in "*e*," × 10,000.

tipped and bulbous bristles are hollow—Figure 385. Their bases appear closed, without an opening, although in some a slight pit seemed present near middle of upper surface of the base, and a membrane or thread seemed to be present inside bristles, but these could not be seen with certainty. Bristles appear continuous with epicuticle of shell and do not stain with mallory's triple stain.)

Muscle scars (Figure 378*b,f*): Central muscle scars obscure but consisting of about 10 ovoid individual scars. Attachments of anterior head-region muscles and furcal muscles are closer to dorsal valve edge than posterior head-region muscles, which also are posterior to the first 2 muscles.

Infold: Infold below incisur with minute bristle near inner margin; list in front of caudal process with 7 or 8 spinous bristles forming row; continuation of row with 1 to 3 spinous bristles present ventral to spinous bristles of list and separated from them by space; minute bristles present along inner margin of infold of caudal process (Figure 378*d,e*).

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

Size of gravid specimens (Figure 387): Dissected specimen (5 eggs), length 1.06 mm, height 0.83 mm; dissected specimen (1 egg), length 0.98 mm, height 0.82 mm; 2 undissected specimens, length 1.08 mm, height 0.83 mm; length 1.00 mm, height 0.87; adult without eggs, length 1.05 mm, height 0.82 mm.

First antenna (Figure 378*g*): Dorsal bristle on 2nd joint with long proximal, short distal spines; clusters of short spines present on lateral surface of joint; 3rd and 4th joints not separated by suture; dorsal bristle of 3rd joint with short distal marginal spines, ventral bristle very long and with long proximal and short distal spines; dorsal bristle of 4th joint reaching about two-thirds length of dorsal margin of 5th joint, ventral bristle very long with hairs along anterior margin; sensory bristle of 5th joint with 2 or 3 short filaments; 6th joint without medial bristle. Seventh joint: a-bristle about three-fourths length of sensory bristle of 5th joint, with long marginal hairs becoming shorter distally; b-bristle slightly longer than a-bristle; c-bristle with 2 or 3 short filaments and about same length as sensory bristle. Eighth joint: d- and e-bristles bare, about same length as c-bristle; f- and g-bristles about same length as c-bristle, with 1 or 2 short filaments; bristles of 7th and 8th joints, with exceptions of d- and e-bristles, with several short hairs on tips.

Second antenna (Figure 378*h*): Protopodite bare, without medial bristle. Endopodite 2-jointed: 1st joint with 2 small bare anterior bristles; 2nd joint small with 1 long spinous terminal bristle. Exopodite: distal margin of 1st joint with short recurved medial spine with short hairs; bristles of joints 2 to 8 with natatory hairs; 9th joint small with 1 short bristle with short marginal spines and 1 long bristle with natatory hairs.

Mandible (Figure 378*i*): Ventral margin of coxale with long hairs; small coxale endite present with spine near base. Basale: dorsal margin with small subterminal spines; ventral margin with total of 7 spines and bristles, 3 proximal on medial side, 2 distal (1 long, 1 short), and 2 near middle on lateral side. Exopodite not present. Endopodite: 1st joint with several short terminal spines on dorsal margin, 2 medial spines near base of main ventral claw and minute spines forming row along distal medial margin; 2nd joint with 1 or 2 minute subterminal spines on dorsal margin, 1 small medial spine near dorsal distal corner and large ventral claw; 3rd joint with 1 faint medial spine near dorsal end of base of main claw and 2 small spines near ventral margin (I could not be certain that latter 2 small spines are not actually on 2nd joint.)

Maxilla (Figure 379*a*): Anterior margin of coxale with short bare bristle; protopodite with transparent filmlike process; 3 endites present, each with about 5 or 6 bristles. Endopodite; 1st joint with spinous α- and 6-bristles and spines forming clusters along anterior margin and inner surface; 2nd endopodite joint with 2 a-bristles, 1 c-bristle, and usual 5 pectinate terminal bristles. Exopodite with 1 long and 2 short bristles.

Fifth limb (Figure 379*b*): Epipodial appendage with 32 plumose bristles; single endite present with 1 short bare bristle. Exopodite: 1st joint with 2 bristles, 1 short, 1 long, both with short marginal spines; 2nd joint with 2 spinous bristles; 3rd joint with 1 spinous bristle on outer lobe and 2 on inner lobe; 4th + 5th joints with 2 bristles.

Sixth limb (Figure 379*c,d*): 3 endites present but separation between 3rd endite and end joint marked by only slight dip in margin; 1st endite

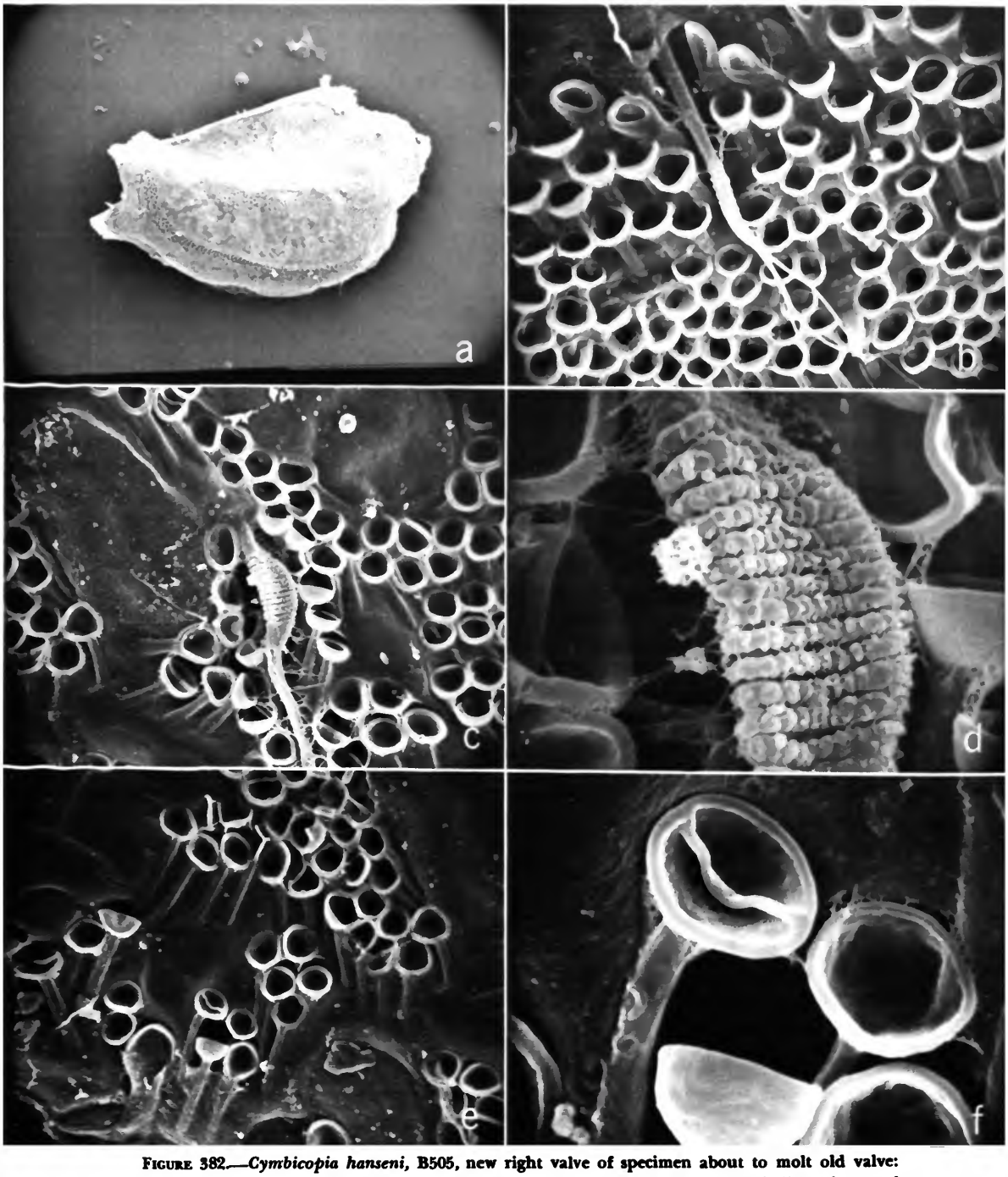

FIGURE 382.—*Cymbicopia hanseni*, B505, new right valve of specimen about to molt old valve: *a*, distorted valve, lateral view, anterior to right, × 100; *b*, bristles between middle and ventral ridge, × 2000; *c*, bristles near ventral ridge, × 2000; *d*, detail of bristles in "*c*," × 10,000; *e*, same general area in "*c*," × 2000; *f*, detail of "*c*," × 8000.

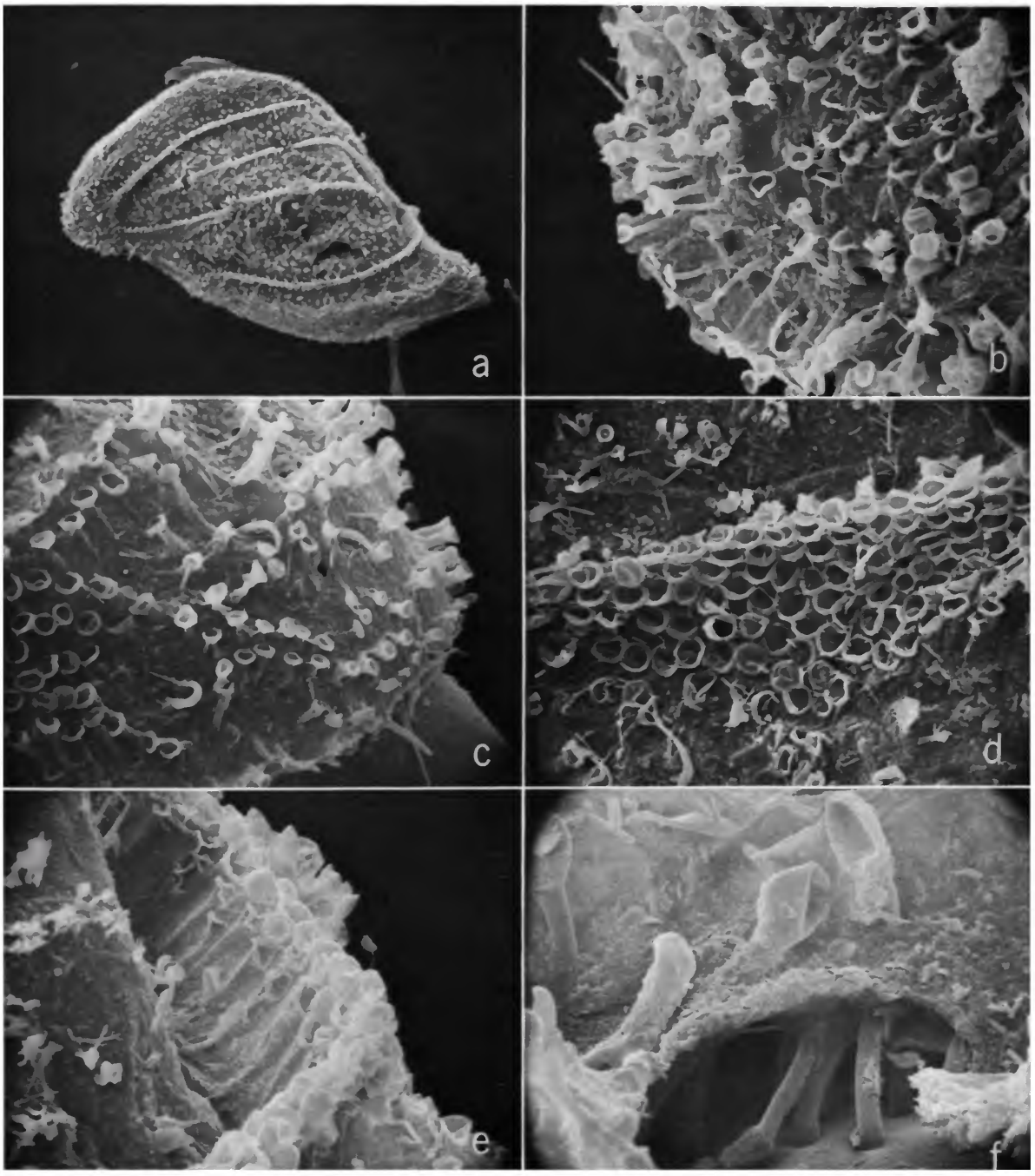

FIGURE 383.—*Cymbicopia hanseni*, male, USNM 135041, left valve (distorted): *a*, complete valve, anterior to left, posterodorsal end folded under, × 94; *b*, tip of rostrum, × 960; *c*, caudal process, × 906; *d*, anterior end of longitudinal ridge dorsal to central muscle scars, × 906; *e*, posterior curvature of longitudinal ridge below center muscle scars, × 960; *f*, bristles showing through hole in epicuticle near middle of valve, × 2563.

with 3 bristles, 2nd endite with 2, 3rd endite with 3; end joint with 3 or 4 bristles in anterior group, 3 bristles in middle group and 2 plumose bristles in posterior group; limb hirsute.

Seventh limb: Proximal group with 2 bristles (1 + 1), distal group with 6 bristles (3 + 3), each bristle with 3 to 6 bells and without distal marginal spines; terminus with opposing combs, each with about 6 teeth.

Furca (Figure 379*e*): Each lamella with 4 claws (rarely 5): claws 1 and 2 continuous with lamella, remaining 2 or 3 claws separated from lamella by suture; claws decrease in length posteriorly along lamella, all claws slender curved, with pointed tips; claws 1, 2, 3, with few strong teeth along concave margin, all claws with abundant slender hairs along convex margin; long hairs present at bases of claws 1, 2, and 3.

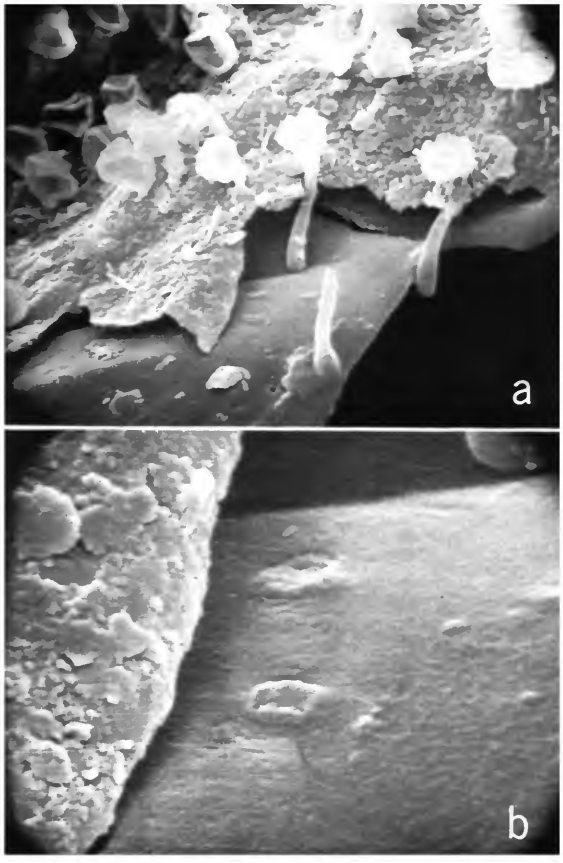

FIGURE 384.—*Cymbicopia hanseni*, male, USNM 135041, left valve: *a*, opening in epicuticle in lower right of valve shown in Figure 383*a*, × 2563; *b*, detail of base area shown in "*a*," × 13,125.

Eyes (Figure 379*f,g,i*): Lateral eyes with 2 pairs of small ommatidia; medial eye about twice diameter of lateral eye, pigmented.

Rod-shaped organ (Figure 379*f,i*): 1-joint, elongate, broadening distally, with crinkly margin and rounded tip.

Posterior: No spines or hairs observed.

Upper lip (Figure 379*i*): Helmet shaped, triangular process present between lip and rod-shaped organ.

Eggs: Dissected specimen with 5 eggs, second specimen with 1 questionable egg. Two unopened specimens have 4 or 5 eggs as determined by estimating number through carapace.

SUPPLEMENTARY DESCRIPTION OF ADULT MALE (Figures 379*j-q*, 380, 383, 384).—*Carapace* about same length as that of females but more elongate, with broader incisur and sloping posterodorsal margin (Figure 379*j*).

Ornamentation (Figure 383, 384): Ridges and bristles similar to those on carapace of female, except cup-shaped bristles present around all margins where short bristles with rounded tips are present on female carapace. Transparent substance present between bristles.

Infold (Figure 379*l-n*): Infold below incisur with minute bristle near inner margin; list in front of caudal process with 9 spinous bristles forming row; minute bristles present along margin of infold of caudal process.

Size (Figure 387): Length 1.04 mm, height 0.61 mm. Specimens from Copenhagen: length 0.99, height 0.58 mm (USNM 135041); length 0.98 mm, height 0.60 mm.

First antenna (Figure 379*o*): 2nd joint with 1 dorsal bristle and few spines forming clusters on lateral surface; 3rd and 4th joints not separated by suture; 3rd joint with 1 dorsal bristle, without ventral bristle; 4th joint with 1 long dorsal bristle, ventral bristle not observed: 5th joint small, triangular with usually filamentous sensory bristle; stout single bristle on distal part of cup of sensory bristle with about 3 short filaments and bifurcate tip; 6th joint without medial bristle. Seventh joint: a-bristle about three-fourths length of stout bristle of sensory bristle; b-bristle almost as long as sensory bristle and with about 3 filaments; c-bristle as long

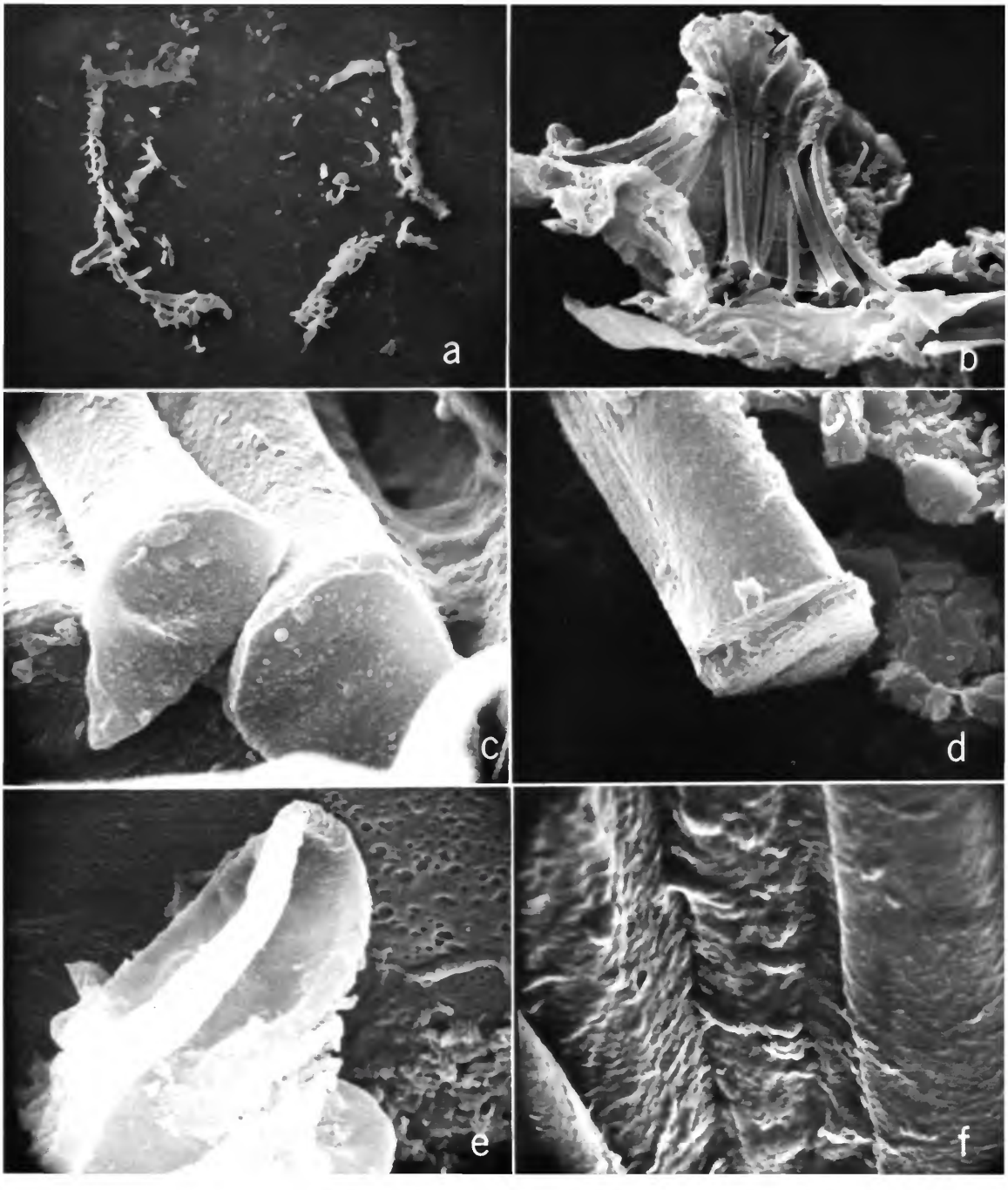

FIGURE 385.—*Cymbicopia hanseni*, thin section of complete female carapace: *a*, section mounted for SEM photography, × 110; *b*, cluster of bristles on lower left of "*a*," × 800; *c*, bases of bristles in "*b*," × 8000; *d*, detail of base of bristle, × 8000; *e*, tip of bristle in "*a*," × 8500; *f*, detail of surface of epicuticle, × 12,500.

as sensory bristle and with about 5 marginal filaments. Eighth joint: d- and e-bristles bare, about same length as c-bristle; f- and g-bristles same length as c-bristle with about 5 filaments; limb not as long as that of adult ♀.

Second antenna (Figure 379*p,q*): Protopodite bare, without medial bristle. Endopodite 3-jointed: 1st joint with 2 small bare anterior bristles, and hairs forming rows; 2nd joint elongate with 2 stout proximal bristles; 3rd joint elongate, reflexed, with 2 small terminal bristles and distal ridges. Exopodite: distal margin of 1st joint with short recurved medial spine; bristles of joints 2 to 8 and long bristle of 9th joint with natatory hairs; short bristle on 9th joint with short marginal spines.

Mandible (Figure 380*a*): Ventral margin of coxale bare; small coxale endite present. Basale: dorsal margin with 2 subterminal bristles; ventral margin with total of 7 bristles, 3 proximal and medial, 2 distal (1 long and 1 short) and 2 slightly

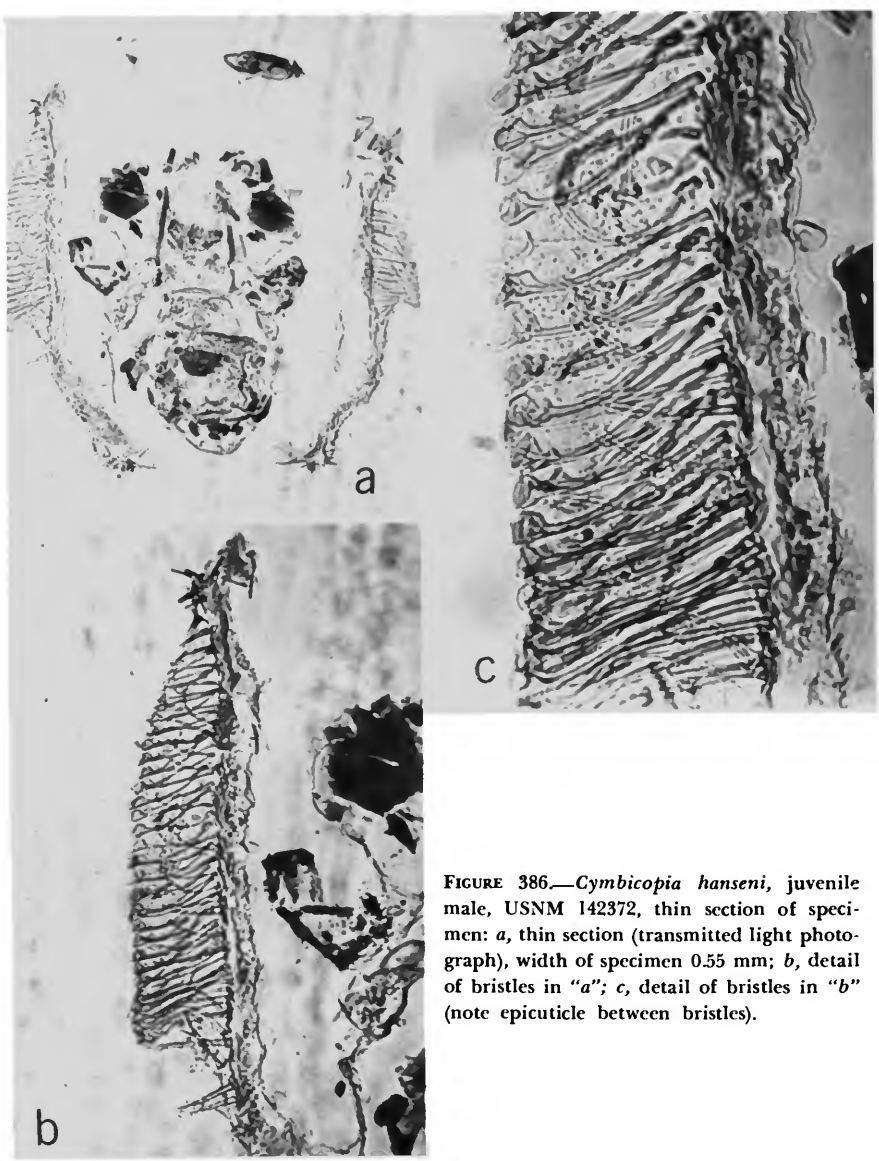

FIGURE 386.—*Cymbicopia hanseni*, juvenile male, USNM 142372, thin section of specimen: *a*, thin section (transmitted light photograph), width of specimen 0.55 mm; *b*, detail of bristles in "*a*"; *c*, detail of bristles in "*b*" (note epicuticle between bristles).

proximal to these with bases on lateral side. Exopodite not present. Endopodite: 1st joint with slender spines forming row on terminal margin on medial side and dorsal corner; ventral margin with 1 plumose bristle and 2 short bristles; 2nd joint with spines forming row along distal medial margin, 2 bare dorsal bristles and 2 bare ventral bristles; end joint with 1 long bare ventral bristle, 1 short medial bristle, and 1 long terminal claw with minute teeth along ventral margin.

Maxilla (Figure 380*b*): Limb smaller than on female, bristles weakly developed; anterior margin of coxale with short bare bristle; exopodite with 1 long and 2 short bristles; bristles of endites and endopodite obscure; most joints with long hairs forming rows.

Fifth limb (Figure 380*c*): Epipodial appendage with 26 plumose bristles; single endite present with short bare bristle. Exopodite: 1st joint with 2 bristles; 2nd joint with 2 bristles; 3rd joint with 2 bristles on outer lobe and 1 on inner lobe; 4th + 5th joints with 2 bristles; all bristles bare or with few short marginal spines: 4th and 5th joints without hair.

Sixth limb (Figure 380*d*): Limb hirsute, with 3 endites: 1st endite with 3 bristles, 2nd endite with 2 bristles, 3rd endite with 3 bristles. End joint with 3 bristles in anterior group, 2 bristles in middle group, and 2 long plumose bristles in posterior group. (Wide separation of 1st and 2nd endites suggests possibility that an endite without bristles is present between them.) Limb differs from that of female in having more plumose type bristles.

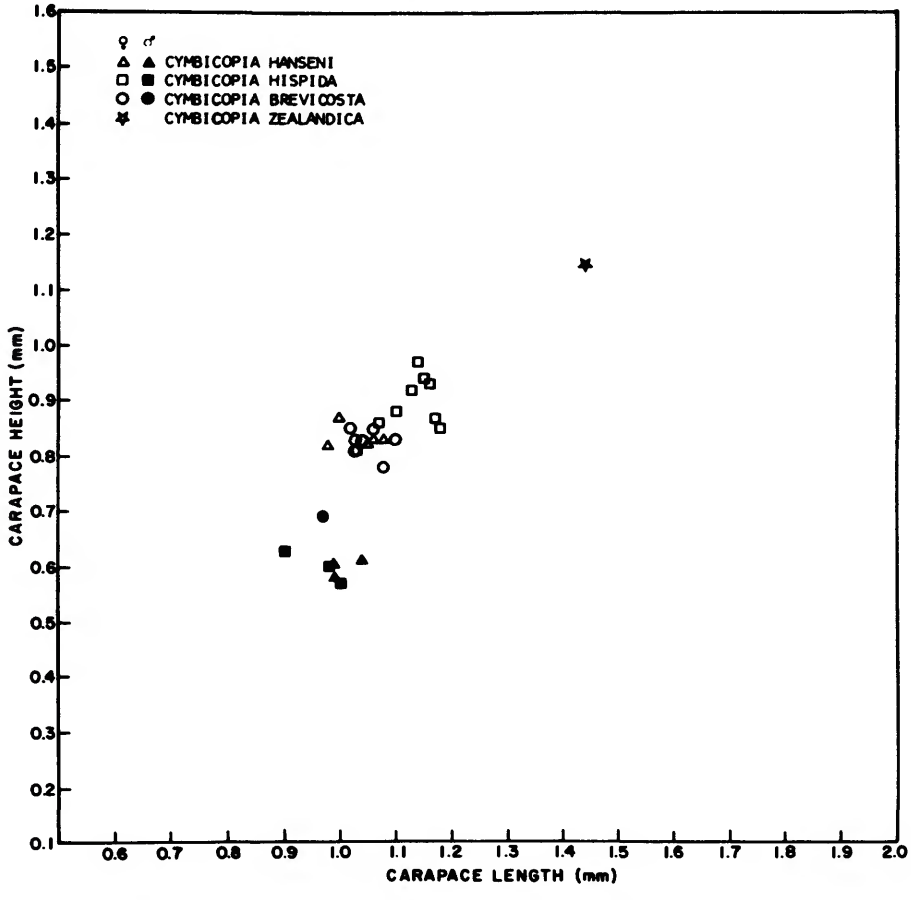

FIGURE 387.—Comparison of relationship between shell length and height of adults of *Cymbicopia*.

Seventh limb (Figure 380*e*): Proximal group with 1 short bristle with 2 bells, terminal group with 4 bristles (2 + 2), each bristle with 5 or 6 bells; terminus without teeth or combs and bristles without marginal spines.

Furca (Figure 380*f*): Distribution and number of claws similar to that on each lamella of female (three specimens examined had 4 claws on each lamella).

Eyes (Figure 380*g*): Lateral eye slightly larger than that of female, with 2 pairs of small ommatidia; medial eye similar to that of female.

Rod-shaped organ: Similar to that on female.

Upper lip: Lip similar to that of female; anterior process between lip and medial eye rounded.

Copulatory organ (Figure 380*i-k*): Penis small, between complex clasping organs hanging down at each side; each clasper consisting of 3 lobes: proximal lobe with small spines forming rows but without bristles, distal lobe with 2 proximal and 2 distal bristles; main lobe terminating in sclerotized hook (inner margin with 4 bristles) and triangular tooth. Single small bare lobe present posterior to bases of clasping organs.

REMARKS ON JUVENILES AND MOLTING.—Juveniles also have a transparent substance between bristles as on adults. Two smaller juveniles in the collection, a male (length 0.72 mm, height 0.54 mm) and a specimen whose sex was not determined (length 0.76 mm, height 0.57 mm), have 4 furcal claws similar to those on the adults. One specimen in the collection was in the process of molting when collected. The new shell is visible inside the old. The cup-tipped bristles forming the ridges and in other places on the carapace are lying flat on the new shell (Figure 382) and standing perpendicular to the shell's surface on the old outer shell; a similar phenomenon was noted on bristles of a molting specimen of *C. hispida*.

DISTRIBUTION.—This species was collected in Lyttelton Harbor and Akaroa Harbor, at a depth of 1–12 m (Figure 360).

117. *Cymbicopia hispida* (Brady)

FIGURES 388–394

Sarsiella hispida Brady, 1898:439, pl. 45: figs. 13, 14.—Hansen, 1905:356 [Hansen describes parasite].—Müller, 1912:51 [Müller considered the species "Cypridinidarum genera dubia et species dubiae"].

Muelleriella hispida Brady.—Poulsen, 1965:57, 58.—Eagar, 1971, p. 61 [listed].

LECTOTYPE.—Female, carapace length 1.13 mm, valves and some appendages in alcohol, remaining appendages on slide. Designated herein and deposited in the Universitets Zoologiske Museum, Copenhagen, Denmark.

TYPE-LOCALITY.—Akaroa Harbor, N. Z., dredged in 6 fathoms (Brady, 1898).

MATERIAL.—In a vial containing 120 specimens of *Scleroconcha flexilis* and 23 specimens of *Cymbicopia hanseni* from Lyttelton Harbor, N. Z., I found 5 specimens of *Sarsiella hispida*. This material was among that received on loan from Dr. K. G. McKenzie and is part of the Brady collection of the Hancock Museum. The specimens include 2 adult ♂♂, 1 juvenile ♂, 1 juvenile ♀ (length 0.83, height 0.74), 1 juvenile (lost). One of the adult males and the juvenile ♀ are described herein.

At my request for loan of specimens of *Sarsiella hispida* Brady in the collection of the Universitets Zoologiske Museum, Copenhagen, Denmark, Dr. Torben Wolff kindly forwarded a vial containing a label stating, "*Sarsiella hispida* Brady, TYPE, Akaroa Harbour, N.Z., 12 m–8–1897. H. Suter." Of the 12 specimens in the vial, only 1 has the outline of the specimen of *S. hispida* figured by Brady (1897, pl. 45: figs. 13, 14). As Dr. Wolff suggested that I select lectotypes from the material he forwarded, I have designated the single specimen (a female) as the lectotype and have described it herein. The remaining specimens in the vial have been assigned to *Cymbicopia hanseni* and *Cymbicopia brevicosta*.

I also received from the Universitets Zoologiske Museum a vial containing the following label in pencil, "*Philomedes flexilis* Brady, orig. spec., Lyttelton Harb., 1–5 fm," and a small label in ink, "TYPE." In addition to other species, this vial contained 4 specimens of *Cymbicopia hispida* (1 adult ♂, 1 juvenile ♂, 2 juveniles of undetermined sex). One of the juveniles has been put into the collections of the National Museum of Natural History, USNM 135040, the remaining specimens were returned in alcohol to Copenhagen.

The Universitets Zoologiske Museum, Copenhagen, forwarded a vial with 49 ostracodes and a label stating that the specimens are *Sarsiella hispida*

Brady from Lyttelton Harbor, N.Z., 1–5 fm, identified by Hansen in 1904. The vial contained 48 specimens of *Cymbicopia hispida* and 1 specimen of *Cymbicopia brevicosta*. Among the 48 specimens of *C. hispida* are 25 gravid ♀♀, 3 adult ♀♀ with choniostomatid parasites, and 20 juveniles and ♀♀ without eggs. Some of the gravid ♀♀ may contain choniostomatids but none were visible by examination through the shell. The 3 specimens that had contained parasites were retained at the National Museum of Natural History and given the USNM numbers, 136078, 136079, 136080; the 3 parasites and remaining ostracode specimens were returned to Copenhagen.

Diagnosis of Adult Female.—Carapace length 1.03–1.18 mm. Ornamentation consisting of 2 midribs; upper rib terminating posteriorly in prominent knob.

Furca: Each lamella with 7 or 8 claws, usually 8; claw 1 continuous with lamella, remaining claws separated from lamella by suture; claw 3 shorter and narrower than claw 4; all claws slender with pointed tips.

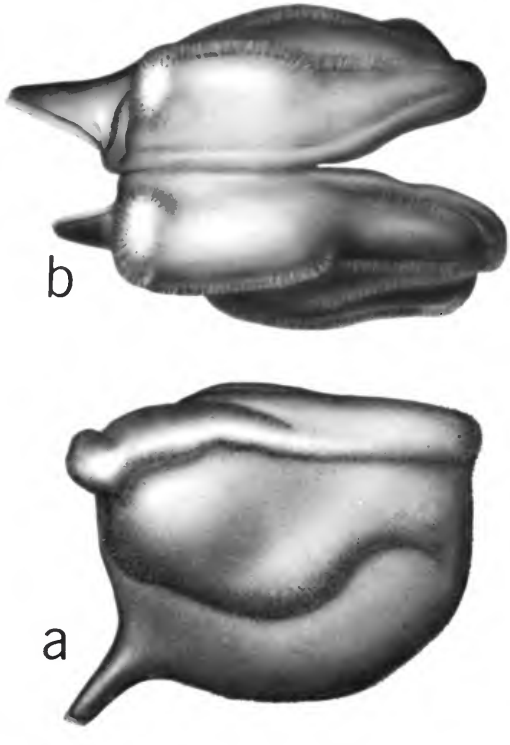

Figure 388.—*Cymbicopia hispida*, female lectotype, length 1.13 mm, complete carapace: *a*, right valve, lateral view; *b*, dorsal view, anterior to right.

Remarks Concerning Lectotype.—Brady (1898: 439) gave the length of the carapace as 1.5 mm. The carapace of the lectotype is only 1.13 mm long. It does not have eggs either in the marsupium or within the body, but the presence of spermatophores suggests that the specimen is an adult ♀. Unfortunately, the left 1st antenna, 2nd antenna, and mandible are missing from the lectotype, and also claws 1, 2, 7 of the left lamella of the furca. The presence of so many specimens in the vial belonging to species other than *S. hispida* makes me suspect that the specimens in the vial may not be part of the type-series examined by Brady, but this would be difficult to document. At this time, it seems appropriate to select a lectotype from the material at hand. It is of interest that the parasitic copepod *Sphaeronellopsis littoralis*, described by Hansen (1905:354) in specimens of *Sarsiella hispida* from Akaroa Harbor and Lyttelton Harbor, N. Z., was also present in the lectotype. Hansen (p. 357) found this parasite host specific; this is supporting evidence that the lectotype belongs to the same species recognized by Hansen as *S. hispida*.

Description of Female (Figures 388, 389, 390*k*, 392, 393).—Carapace with short rostrum with rounded anterior margin and shallow but distinct incisur; dorsal and ventral margin of each valve rounded, but anterior part of dorsal margin more or less linear; caudal process elongate (Figures 388, 389*a*).

Ornamentation (Figures 388, 392, 393): Prominent posterodorsal knob present, which continues to anterior margin near incisur in form of low horizontal ridge; second horizontal ridge present, intersecting anterior margin below incisur and continuing posteriorly, ventral to adductor muscle attachments, then curving upward near posterior margin of valve and intersecting posterodorsal knob. Bristles with bulbous tips forming ridges and on posterodorsal knob; similar, but shorter, bristles densely covering valve surface; long spinous bristles with broad processes near base scattered over valve surface; bristles fairly closely spaced along anterior and ventral margins; short stout tapering bristles with blunt tips present along anterior margin of rostrum; similar short tapered bristles with and without blunt tips present along remaining margins of each valve, bare round-

FIGURE 389.—*Cymbicopia hispida*, female lectotype, length 1.13 mm, carapace: *a*, outline of complete specimen, lateral view; *b*, anterior of left valve, medial view; *c*, caudal process on right valve, medial view; *d*, caudal process on left valve, medial view. Appendages: *e*, 2nd antenna, endopodite and part of protopodite and exopodite of right limb, medial view; *f*, right mandible, medial view; *g*, left maxilla, posterior view; *h*, 5th limb; *i*, left 6th limb, lateral view; *j*, tip of 7th limb; *k*, right lamella of furca and internal sclerites; *l*, detail of tips of claws 1,2,4 of lamella shown in "*k*"; *m*, Right lateral eye. *n*, Medial eye and rod-shaped organ, upper lip; *o*, Genitalia and left brushlike organ. (Same magnification in microns: *b-d,k-n; f-i,o; e,j*.)

ed areas bordered by short bristles present on valve surface. Transparent substance observed filling spaces between bristles.

Central muscle scars: Scars obscure but consisting of about 12 ovoid, individual scars.

Infold (Figure 389*b-d*): Infold below incisur with minute bristle near inner margin; list in front of caudal process with 2 spinous bristles; infold of caudal process with 5 or 6 bare bristles; numerous minute bristles present along inner margin of infold of caudal process.

Selvage: Broad lamellar prolongation with smooth outer margin present along anterior, ventral, and posterior margins of both valves; prolongation partly divided in vicinity of incisur.

Size (Figure 387): Lectotype, length 1.13 mm, height 0.92 mm, height 81 percent of length (including caudal process). USNM 136078, length 1.03 mm, height 0.81 mm; USNM 136079, length 1.14 mm, height 0.97 mm; USNM 136080, length 1.18 mm, height 0.85 mm; 5 gravid ♀♀: length 1.10 mm, height 0.88 mm; length 1.17 mm, height 0.87 mm; length 1.16 mm, height 0.93 mm; length 1.07 mm, height 0.86 mm; length 1.15 mm, height 0.94 mm.

First antenna: 1st joint bare; 2nd joint spinous with 1 dorsal bristle distal to middle; 3rd joint short with 2 spinous bristles, dorsal bristle reaching past end of 4th joint, ventral bristle about twice length of 3rd + 4th joints; 3rd and 4th joints fused; 4th joint spinous with 2 long terminal, spinous, ventral bristles and 1 dorsal bristle just reaching end of 5th joint; 2nd, 4th, and 5th joints with long spines along ventral and dorsal margins; sensory bristle of 5th joint as long as long bristles of 7th and 8th joints and with 2 short filaments; no medial bristle on 6th joint. Seventh joint: a-bristle with short marginal spines, more than one-half length of sensory bristle of 5th limb; b-bristle bare, about three-fourths length of sensory bristle; c-bristle long with 3 short marginal filaments. Eighth joint: d- and e-bristles bare almost as long as c-bristle; f-bristles with 2 short marginal filaments, slightly shorter than d-bristle; g-bristle long with 3 short marginal filaments.

Second antenna (Figure 389*e*): Protopodite bare, without medial bristle. Endopodite 2-jointed: 1st joint spinous with 1 short bare bristle; 2nd joint with 0 or 1 short bare bristle and 1 long bristle with fairly long marginal hairs. Exopodite: 1st joint with groups of long hairs along ventral margin and short terminal medial spine; bristle of 2nd joint longer than joints 1 to 9 of exopodite and with few marginal spines proximally and natatory hairs along distal two-thirds; bristles of joints 2 to 8 with natatory hairs; 9th joint with 2 bristles, 1 long with natatory hairs, 1 short with short marginal spines; joints 2 to 8 with short spines forming row along distal margin.

Mandible (Figures 389*f*, 390*k*): Ventral margins of coxale with long hairs; coxale endite consisting of bifurcate process with minute adjacent bristle. Basale: dorsal margin with 1 minute midbristle and 2 minute subterminal bristles; ventral margin with total of 8 bristles, 3 in proximal group, 4 in distal group; long bristle in distal group with short distal marginal spines. Exopodite minute. Endopodite: 1st joint with short spines forming 2 rows on distal medial surface and 1 short medial spine at base of main claw; 2nd joint with 1 or 2 minute spines or bristles subterminally on dorsal margin and ventral main claw; end joint with 3 minute spines at base of main claw, 2 ventral, 1 dorsal.

Maxilla (Figure 389*g*): 3 endites present, each with 5 or 6 bristles; anterior margin of coxale with small spinous bristle. Endopodite: 1st joint with spines along anterior margin, α- and 6-bristles with 7 to 10 proximal spines and smaller distal spines; 2nd joint with 2 spinous a-bristles, 1 spinous c-bristle and usual 5 pectinate terminal bristles. Exopodite with 1 long and 2 shorter bristles (long bristle with spines, shorter bristles obscure, but appear to be bare).

Fifth limb (Figure 389*h*): Epipodial appendage with 35 plumose bristles; single endite present with 1 short bristle with faint marginal spines. Exopodite: 1st joint with 1 bristle (2nd bristle was probably lost during dissection); 2nd joint with 3 terminal bristles and 1 short proximal bristle (proximal bristle located near inner lobe of 3rd joint); 3rd joint with 2 bristles on inner lobe and 1 on outer lobe; 4th + 5th joints with 3 bristles; limb hirsute.

Sixth limb (Figure 389*i*): 3 endites present: 1st endite with 2 or 3 short bristles; 2nd endite with 2 bristles; 3rd endite with 4 bristles; end joint with 10 bristles consisting of 2 posterior plumose bristles, about 4 bristles in anterior group and 4 distributed along middle part of margin with bases on lateral side; limb hirsute.

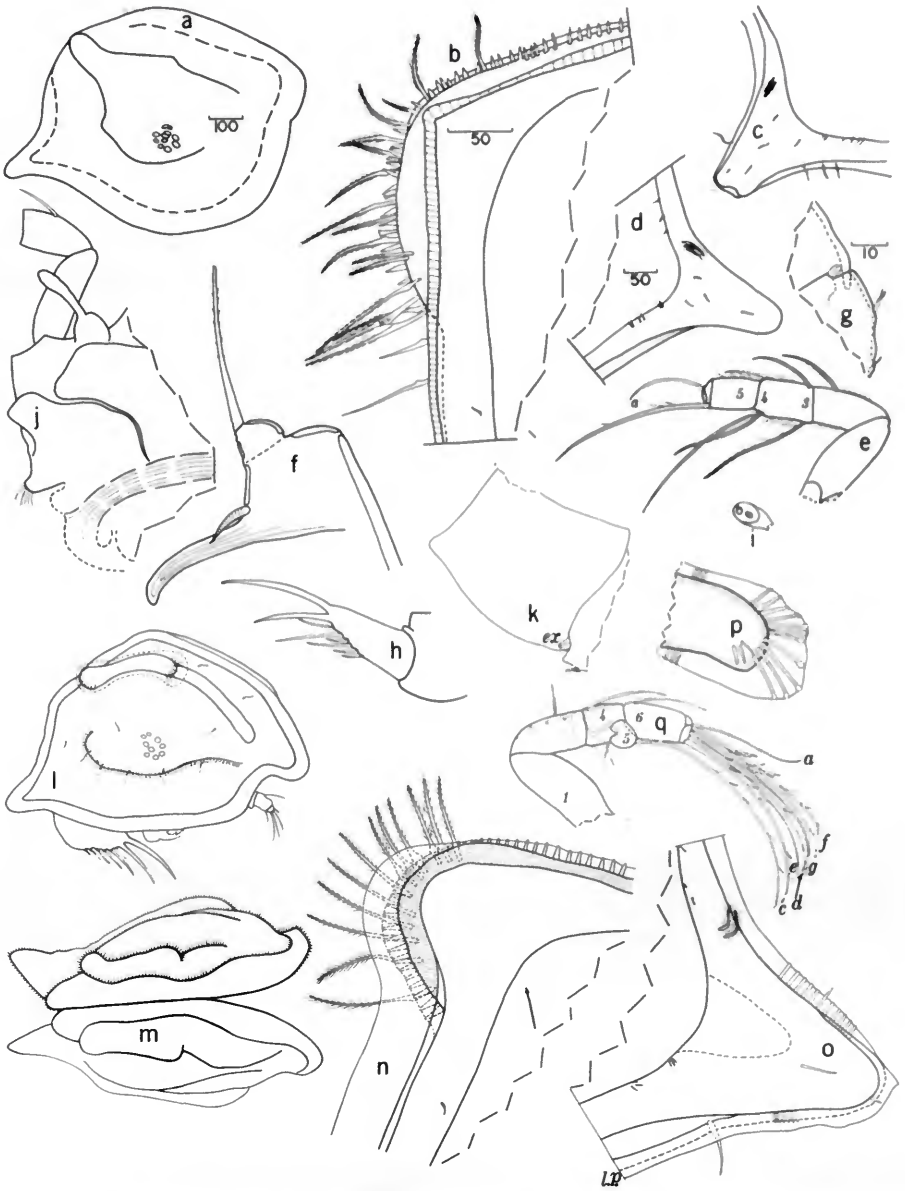

FIGURE 390.—*Cymbicopia hispida*, juvenile female, B505, length 0.83 m, carapace: *a*, right valve, lateral view showing outline of new valve (dashed); *b*, anterior of old right valve, medial view; *c*, caudal process on left valve (new and old valve together), medial view; *d*, caudal process on right valve (new and old valves together), medial view. Appendages: *e*, left 1st antenna, lateral view; *f*, endopodite on left 2nd antenna, medial view; *g*, exopodite and spines on dorsal margin of left mandible, lateral view; *h*, left lamella of furca (marginal teeth not shown); *i*, right lateral eye; *j*, anterior showing part of right 1st antenna, medial eye and rod-shaped organ, upper lip and esophagus. Female, USNM 136078, length 1.03 mm: *k*, exopodite on right mandible, lateral view. Male, B505, length 1.0 mm, carapace: *l*, complete specimen, lateral view: *m*, same, dorsal view, valves partly open (appendages not shown). Right valve: *n*, anterior medial view; *o*, caudal process, medial view; *p*, anterior end of posterodorsal protuberance (not all bristles shown). Left 1st antenna: *q*, complete limb, medial view (not all filaments shown on sensory bristles). (Same magnification in microns: *a,l,m; b,n-p; d,e,h-j,q*.)

Seventh limb (Figure 389*j*): Proximal group with 2 bristles (1 + 1), terminal group with 6 bristles (3 + 3), each with 4 to 6 bells and no distal spines; terminus with closely spaced opposing combs, each with 4 bare teeth.

Furca (Figure 389*k,l*): Each lamella with 7 or 8 claws, usually 8; claw 1 continuous with lamella, remaining claws separated from lamella by suture; claw 3 shorter and more narrow than claw 4; all claws slender with pointed tips; each claw with stout spines along posterior margin and slender spines along anterior margin; long hairs present on lamellae near bases of claws and following claws; spines present along anterior margin of each lamella. Distribution of claws on 8 specimens is listed below:

Number of furcal claws		*Remarks*
left lamella	*right lamella*	
8	7	lectotype
8	8	USNM 136079
8	8	
8	8	
8	8	USNM 136080
8	8	
8	7	4th claw shorter than 3rd, both 3rd and 4th claws shorter and more slender than 5th
7	7	

Eyes: Minute lateral eyes with 2 ommatidia (Figure 389*m*); medial eye about twice diameter of lateral eye, pigmented (Figure 389*n*).

Rod-shaped organ (Figure 389*n*): 1-jointed, elongate, broadening distally with crinkly margin and rounded tip.

Posterior: Long hairs forming clusters along posterior margin.

Upper lip: Lip helmet shaped, triangular process present between lip and rod-shaped organ.

Genitalia and brushlike organ (Figure 389*o*): Genitalia with triangular spermatophores: 5 minute ringed bristles present proximal to genitalia.

Eggs: Three females with 6, 7, 7, eggs in brood chamber.

Parasites: The parasitic copepod, *Sphaeronellopsis littoralis* Hansen, 1904, present in 4 adult ♀♀: lectotype with 1 ♀; USNM 136078 with 1 ♀ + 4 copepod egg sacs; USNM 136079 with 1 ♀ + 3 copepod egg sacs; USNM 136080 with 1 ♀ + 6 copepod egg sacs.

Description of Juvenile Female (specimen in process of molting so that new shell and appendages are visible within older shell and appendages) (Figure 390*a-j*).—Carapace similar in shape to adult (Figure 390*a*).

Ornamentation: Similar to that on carapace of lectotype. (Bristles on inner carapace of molting specimen lying flat and oriented with long axes parallel to orientation of ridges.) Transparent material observed between bristles of outer shell but not between bristles of inner shell.

Muscle scars: Similar to those on lectotype.

Infold (Figure 390*b-d*): Distribution of bristles similar to those on lectotype, but only 4 or 5 bare bristles on infold of caudal process.

Size: Complete specimen, length 0.83 mm, height 0.74 mm, height 89 percent of length.

First antenna (Figure 390*e*): 1st, 2nd, and 3rd joints similar to those of adult female; 4th joint with 2 long ventral bristles and 1 shorter dorsal bristle; sensory bristle of 5th joint with 3 short filaments; dorsal margin of 5th joint spinous; 6th joint without bristle. Seventh joint: a-bristle fairly long, bare or with very faint marginal spines; b-bristle about same length as a-bristle and with at least 1 short marginal filament; c-bristle about same length as sensory bristle of 5th joint and with 2 short marginal filaments. Eighth joint: d- and e-bristles bare, almost as long as c-bristle; f-bristles broken near middle; g-bristle similar to c-bristle, with 3 marginal filaments.

Second antenna (Figure 390*f*): Protopodite and exopodite similar to that of adult female. Endopodite 2-jointed but without suture between joints; 1st joint with 1 short proximal bristle; 2nd joint with long spinous terminal bristle.

Mandible: Same as that of adult female (Figure 390*g*).

Seventh limb: Proximal group with 2 bristles (1 + 1); terminal group with 4 bristles (2 + 2); each bristle tapering distally, with 2 to 4 bells; terminus with minute opposing combs much smaller than those of adult female.

Furca (Figure 390*h*): Each lamella with 8 claws; claws 1 and 2 continuous with lamella, remaining claws separated from lamella by suture; claw 3 shorter and more slender than claw 4; claw 5 shorter and more slender than claw 6; spines and hairs of claws and lamellae similar to those of adult female.

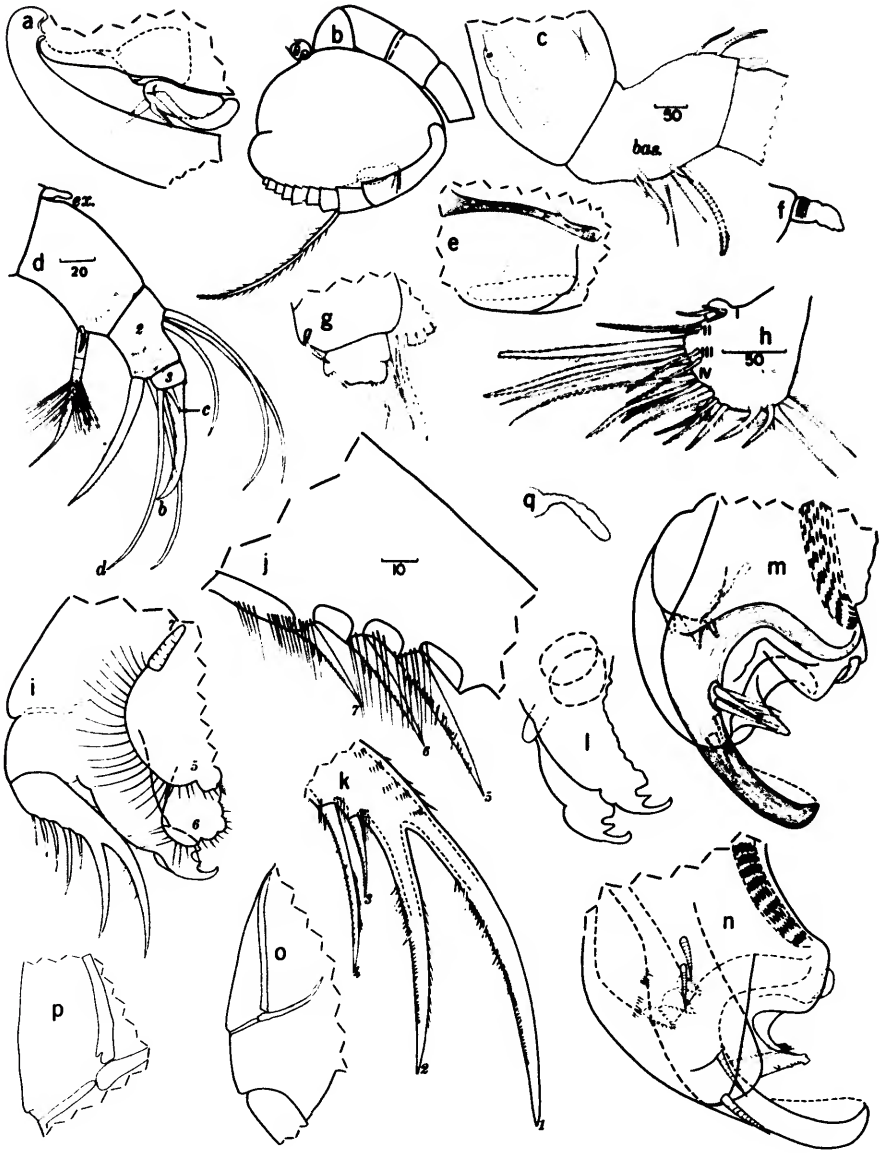

FIGURE 391.—*Cymbicopia hispida*, male, B505, length 1.0 mm, left 2nd antenna: *a*, endopodite, part of protopodite and exopodite, lateral view; *b*, complete limb without most exopodial bristles, also right lateral eye and joints of right 1st antenna. Left mandible: *c*, coxale, basale, and exopodite, medial view; *d*, exopodite, medial view. Right mandible: *e*, part of coxale showing endite, lateral view; *f*, exopodite, lateral view. Fifth limb: *g*, distal part. Sixth limb: *h*, right limb, medial view (not under cover slip). Posterior: *i*, right lamella of furca, 5th, 6th, and 7th limbs, right copulatory organ; *j*, posterior 3 claws on left lamella of furca, medial view; *k*, claws 1–4 of right lamella, lateral view; *l*, copulatory apparatus; *m*, tip of right clasping organ, lateral view; *n*, tip of left clasping organ, medial view; *o*, posterior showing position of internal sclerites, anterior to right; *p*, detail of "*o*." Anterior: *q*, medial eye and rod-shaped organ. (Same magnification in microns: *a,c,e,g,k,p; b,i,l,o,q; f,j,m,n.*)

Eyes, rod-shaped organ, upper lip: Similar to those of adult female (Figure 390*i,j*).

DESCRIPTION OF ADULT MALE (Figures 390*l-q*, 391, 394).—Carapace with greatest height near or anterior to middle; anterior margin with large rostrum overhanging broad incisur; ventral margin fairly flat in lateral view (Figure 390*l,m*).

Ornamentation (Figures 390*p*, 394): Longitudinal ridges present dorsal and ventral to central muscle scar area; upper ridge divided into prominent posterior part and less prominent anterior part; posterior end of posterior part forming rounded knob; anterior end of posterior part forming knob less prominent than on posterior end; raised rim present along or just within valve edge. Bristles: long bristles broadening near base, sparsely distributed on valve surfaces, 5 present on or near lower longitudinal ridge; similar bristles but with marginal spines, present along anterior margin of rostrum, incisur, and ventral margin of each valve; anterior knob of posterior part of upper ridge with long bristles with bulbous ends; all ridges and surface of valves with abundant short tapering bristles which taper more abruptly at tip (obelisk-shaped); short and long bristles with bulbous tips embedded in transparent substance; bases of all bristles originate at interface between transparent substance and opaque part of shell (see discussion following description of species).

Infold (Figure 390 *n,o*): Infold below incisur with minute bristle near inner margin; list in front of caudal process with 2 stout spinous bristles; 1 medium bristle present between list and tip of process; minute bristles present along inner margin of infold of caudal process.

Selvage: Broad lamellar prolongation with smooth outer margin present along anterior, ventral, and posterior margins of both valves.

Size (Figure 387): Dissected specimen length 0.90 mm, height 0.63 mm. Undissected specimen (shell distorted, measurements approximate) length 1.0 mm, height 0.57 mm. Copenhagen ♂, length 0.98 mm, height 0.60 mm.

First antenna (Figure 390*q*): 2nd joint with spines forming clusters on medial side near dorsal margin and fairly short spinous dorsal bristle; 3rd and 4th joints not separated by suture; 3rd joint with long bare dorsal bristle and minute ventral bristle; 4th joint with long bare dorsal bristle and short faint ventral bristle; 5th joint consisting of small area betweeen ventral parts of 4th and 6th joints; sensory bristle of 5th joint with abundant filaments and 1 stout anterior bristle with 5 short marginal filaments and bifurcate tip; 6th joint with minute medial bristle. Seventh joint: a-bristle with faint marginal spines and about half length of sensory bristle of 5th joint; b-bristle longer than a-bristle and with about 3 marginal filaments and bifurcate tip; c-bristle long stout with 5 marginal filaments and bifurcate tip. Eighth joint: d- and e-bristles bare, almost as long as c-bristles; f- and g-bristles with about 5 marginal filaments and bifurcate tip, both bristles about same length as c-bristle.

Second antenna (Figure 391*a,b*): Protopodite bare and without medial bristle. Endopodite 3-jointed: 1st joint with 1 short ringed bristle with slender tip; 2nd joint with 3 short stout bristles; 3rd joint reflexed on 2nd joint with 2 small terminal bristles. Exopodite: distal margin of 1st joint with small recurved medial spine; bristles of joints 2 to 8 with natatory hairs; 9th joint small, with 2 bristles, 1 long with natatory hairs, 1 short.

Mandible (Figure 391*c-f*): Ventral margin of coxale without spines or hairs; coxale endite small (bifurcate at tip on right limb and consisting of 4 small processes on left limb of specimen examined). Basale: dorsal margin with 2 groups of subterminal bristles, 2 in distal group, 1 in proximal group; ventral margin with total of 7 bristles, 3 in proximal group and 4 in distal group; long bristle in distal group plumose distally. Exopodite small with indentation near middle and faintly digitate at tip (no bristle observed). Endopodite: 1st joint with distal clusters of spines on medial surface and 1 small and 1 long stout subterminal bristles on ventral margin (small bristle with short marginal spines, long bristle with long hairs near middle); 2nd joint with 3 long bare bristles near middle of ventral margin and 2 terminal bristles on ventral margin; ventral surface of terminal bristles with abundant fine hairs distally, other bristles bare; 2nd joint with spines forming clusters distally on medial and lateral sides; 3rd joint with minute faint a-bristle; long stout clawlike b-bristle with teeth forming rows on medial surface; short c-bristle with ventral teeth; and 1 long bare d-bristle.

Maxilla: Limb not observed, probably minute.

Fifth limb (Figure 391*g*): Epipodial appendages with 28 bristles. Single endite present with 1 bare bristle. Exopodite: 1st joint with 2 bristles; 2nd

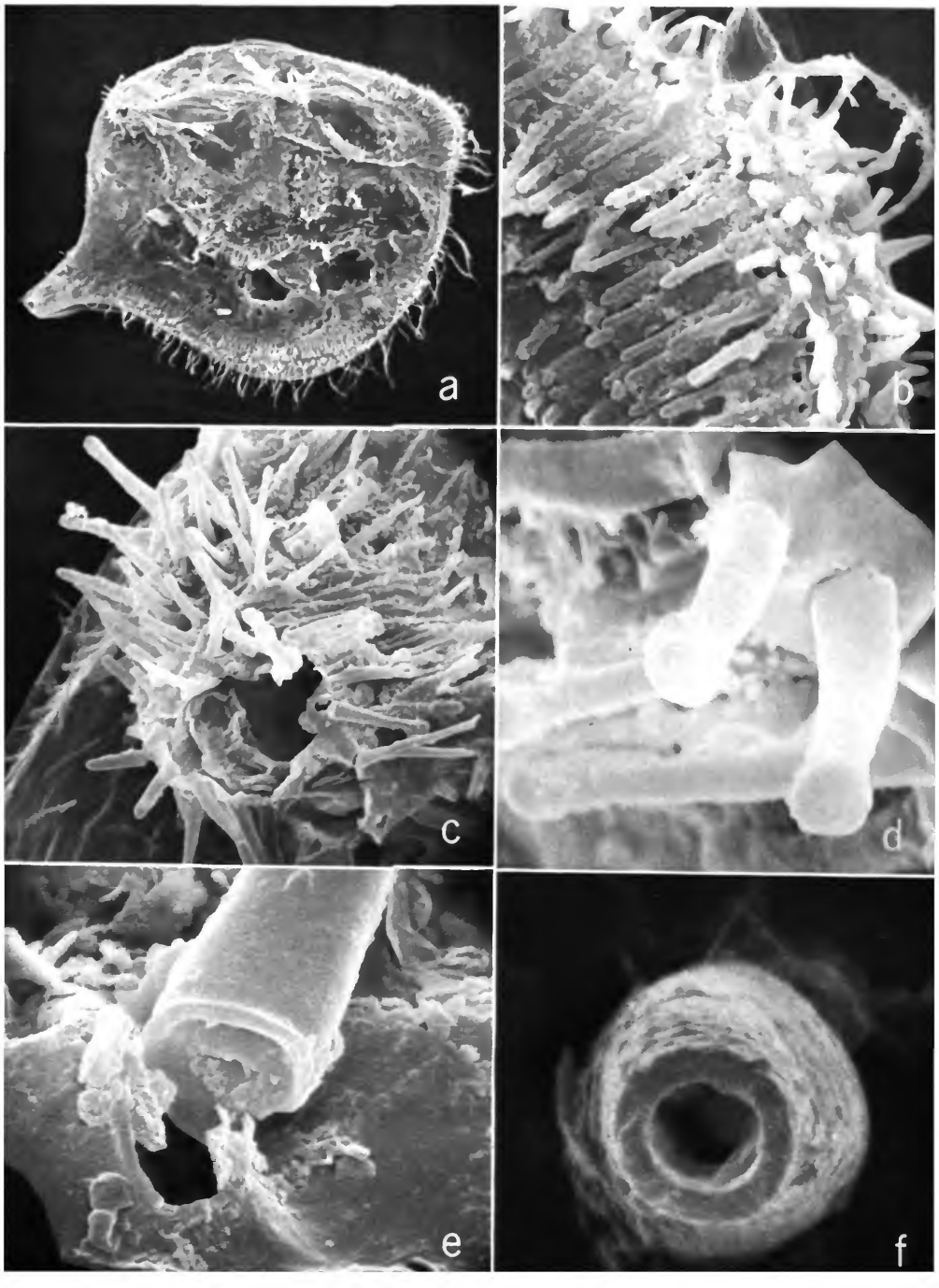

FIGURE 392.—*Cymbicopia hispida*, female, B505, Lyttelton Harbor, right valve, lateral view: *a*, complete valve, × 94; *b*, margin of rostrum, × 940; *c*, posterodorsal knob, × 940; *d*, detail of posterodorsal knob in "*c*," × 4688; *e*, base of bristle, × 11,750; *f*, stump of a broken bristle, × 18,750.

joint with several faint bristles, some with marginal hairs; inner lobe of 3rd joint with 1 long bare bristle, inner lobe with 1 short bristle; 2 long bare bristles on limb are interpreted as being on 4th + 5th joints; hairs present on 4th + 5th joints.

Sixth limb (Figure 391*h*): Limb extremely hirsute; endite I with 2 short medial and 1 longer terminal bristles, all with short marginal spines; endite II with 1 short medial and 1 long terminal bristle, both with short marginal spines; endite III with 2 long slender medial bristles with short marginal spines and 3 long plumose terminal bristles; endite IV with 1 medial slender bristle with wreaths of proximal hairs, and 2 longer plumose terminal bristles; end joint with 8 bristles, 4 with long wreaths of proximal hairs and short distal spines, remaining bristles plumose.

Seventh limb: Limb very short and without bristles or terminal teeth.

Furca (Figure 391*i-k*): Each lamella with 7 claws; claws 1 and 2 continuous with lamella, remaining claws separated from lamella by suture; claw 3 shorter and more slender than claw 4; abundant faint medial hairs present near base of claws and posterior to claws; long and short teeth forming row, present along concave margins of claws; hairs present along convex margins of claws

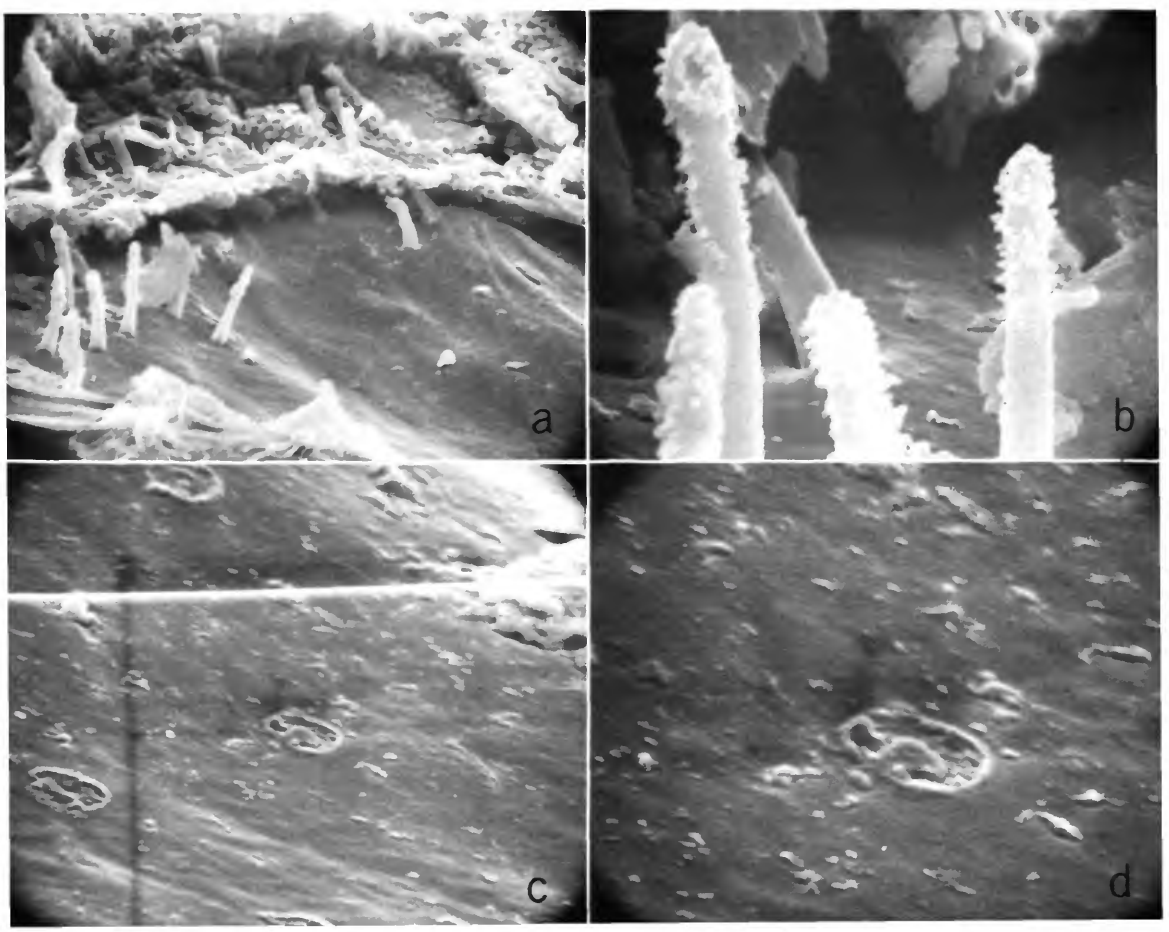

FIGURE 393.—*Cymbicopia hispida*, female, B505, right valve, lateral view: *a*, detail of antero-ventral area where "epicuticle" is not present, × 1875; *b*, detail in "*a*," × 5625; *c*, detail in "*a*," × 9375; *d*, detail in "*c*," × 18,750.

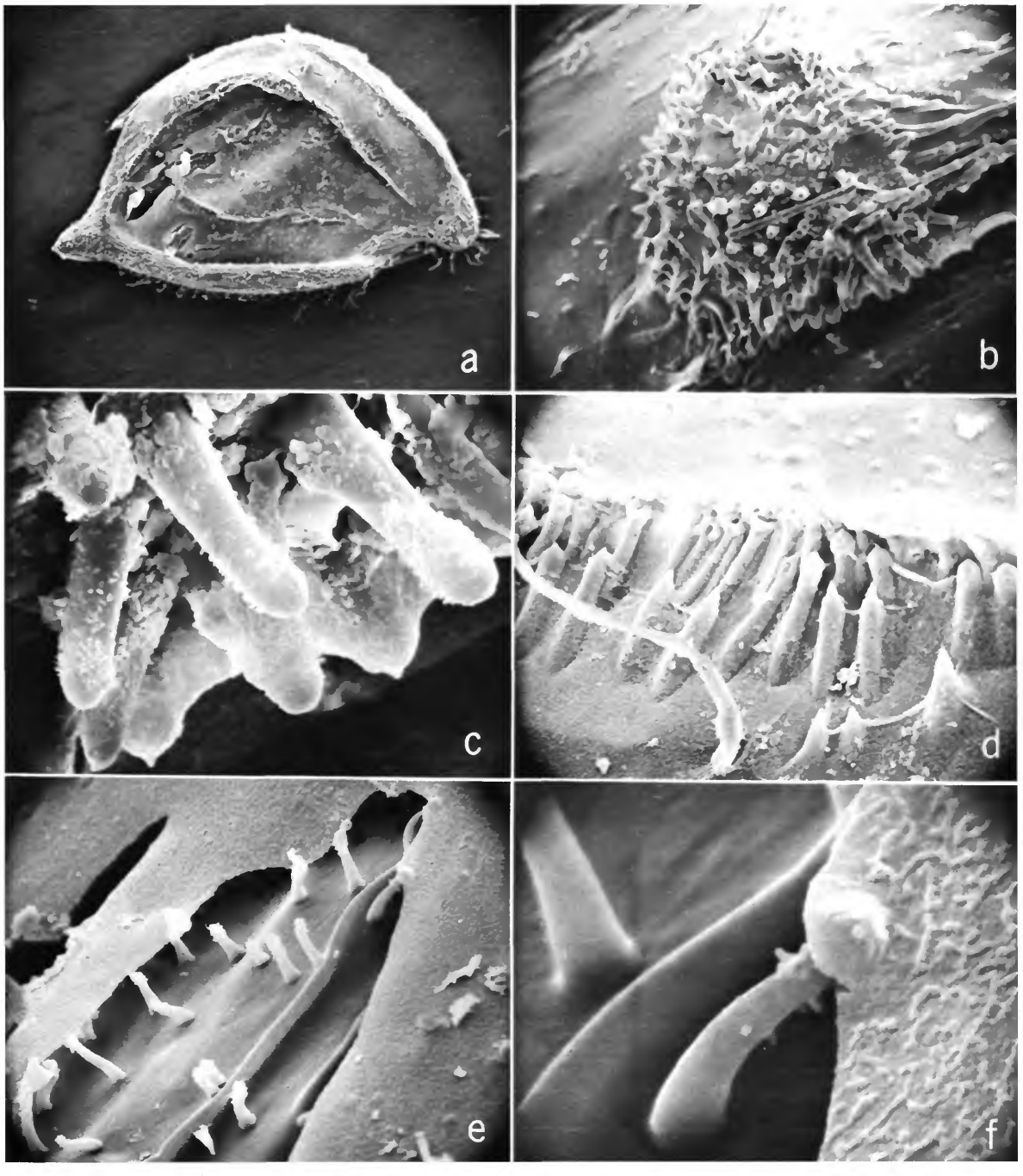

FIGURE 394.—*Cymbicopia hispida*, male, dissected specimen, B505, Lyttelton Harbor, right valve, lateral view: *a*, complete valve, × 100; *b*, posterodorsal knob, × 1000; *c*, bristles on ventral part of knob in "*b*," × 10,000; *d*, detail of ridge, about × 4000; *e*, lower chipped area, × 3000; *f*, detail in "e," × 15,000.

2 and 4; short spines present along anterior margin of lamella proximal to claw 1. (Both adult males and the N–1 male in the Hancock Museum collection have same distribution of claws on furca.)

Eyes: Lateral eyes small, each with 2 amber-colored divided ommatidia (Figure 391*b*); medial eye about twice diameter of lateral eye (Figure 391*q*).

Rod-shaped organ: 1-jointed, crinkled in proximal part, expanding in diameter distally with broadly rounded tip (Figure 391*q*).

Posterior: Posterodorsal surface with short spines forming clusters (Figure 391*o*).

Copulatory organ (Figure 391 *l-n*): Penis small between complex clasping organs which hang down at each side; each clasper consisting of 3 lobes: proximal (middle) lobe with 3 short stout spines pectinate on both margins; medial lobe with 2 small proximal and 2 small distal bristles; main lobe terminating in sclerotized hook and triangular tooth with several papillae, inner margin of hook with 4 bristles on sclerotized base, 1 minute stout bristle present on margin near proximal part of sclerotized horseshoe-shaped process of which hook is distal part, faint hyaline process present along inner concave margin of hook.

Sexual dimorphism: In addition to the usual differences betweeen sexes, both the 1st and 2nd claws on the male furca are united with the lamella, whereas, only the 1st is united on the adult female furca. Unlike the 7th limb of the male of *C. hanseni* and *C. brevicosta*, the 7th limb of the male *C. hispida* is short and bare.

DISTRIBUTION.—This species was collected in Lyttelton and Akaroa Harbors, New Zealand, at depths of 1–12 m (Figure 360).

118. *Cymbicopia brevicosta*, new species

FIGURES 395–400

HOLOTYPE.—Gravid ♀ with 2 eggs, length 1.06 mm, appendages on slide, valves and some appendages in alcohol. Deposited in Universitets Zoologiske Museum, Copenhagen, Denmark.

TYPE-LOCALITY.—Akaroa Harbor, N.Z., 12 m water depth.

ETYMOLOGY.—The specific name is derived from the Latin "brevis" [= short] and "costa" [= rib, side, ridge] in reference to the short lateral mid-ridge which characterizes the carapace of the species.

ALLOTYPE.—Adult ♂, length 0.97 mm, appendages on slide, valves and remaining appendages in alcohol. Deposited with holotype. Allotype from same locality as holotype.

PARATYPES.—Three gravid ♀♀, 2 adult ♀♀ without eggs, 2 empty carapaces. One gravid ♀ is placed in the collections of the National Museum of Natural History, Smithsonian Institution (USNM 135039), remaining paratypes deposited with holotype. Paratypes from same sample as holotype.

ADDITIONAL SPECIMENS.—One adult ♀ without eggs, length 1.03 mm, height 0.81 mm, from Lyttelton Harbor, N.Z.

MATERIAL.—At my request, Dr. Torben Wolff forwarded specimens of *Sarsiella hispida* from the Brady collection in the Universitets Zoologiske Museum, Copenhagen, Denmark. This consisted of 1 vial containing 12 specimens and 2 labels, one in ink stating, "*Sarsiella hispida* Brady, TYPE, Akaroa Harbour, N.Z., 12 m–8–1897. H. Suter,"

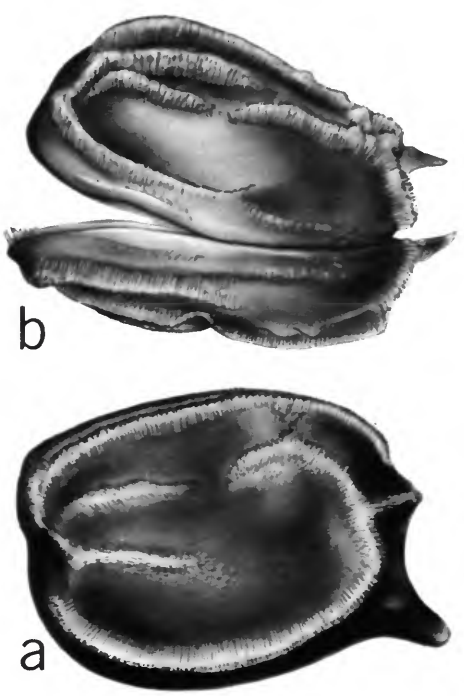

FIGURE 395.—*Cymbicopia brevicosta*, female, USNM 135039, carapace, × 60: *a*, lateral view; *b*, dorsal view with valves slightly open.

and one in pencil stating, "*Sarsiella hispida* Brady, spec. orig. Akaroa Harb. 6 fm. 8. 97, H. Suter." According to Brady (1898:429) Mr. H. Suter collected the specimens he described from Akaroa Harbor. The vial contained three species which I have identified herein as *Sarsiella* (= *Cymbicopia*) *hanseni* (1 specimen), *Sarsiella* (=*Cymbicopia*) *hispida* (1 specimen), and *Cymbicopia brevicosta*, new species (9 specimens).

At my request for loan of specimens of *Sarsiella hispida* studied by Hansen (1905), I received from Dr. Wolff a vial containing 48 specimens of *Sarsiella* (= *Cymbicopia*) *hispida* and 1 specimen I identified as *C. brevicosta*. The material is from Lyttelton Harbor, N.Z., 1–5 fm.

Diagnosis of Adult Female.—Carapace length 1.02–1.10 mm. Ornamentation similar to that on *C. hanseni* except midrib not extending posteriorly beyond central muscle scar area.

Furca: Each limb with 6 or 7 claws (rarely 5); claws 1 and 2 continuous with lamella, remaining claws separated from lamella by suture; claws generally decreasing in length posteriorly along lamella.

Description of Female (Figures 395–398).—Carapace oval in lateral view with minute incisur and elongate caudal process (Figures 395, 398*a*).

Ornamentation (Figures 396, 397): Ridges actually consisting of rows of bristles rather than thickening of shell; ventral ridge roughly U-shaped; dorsal ridge with anterior end just below incisur, extending past posterodorsal valve margin; anterior middle part of each valve with 2 short horizonal ridges, dorsal of these lying between anterior end of U-shaped ridge and anterior end of dorsal ridge; lower short horizontal ridge (name of species derived from this ridge) not extending past central muscle scars. Bristles with bulbous tips forming ridges, and scattered over lateral surface of valves; long slender bristles broadening near base, present along anterior and ventral margins of valve and scattered over lateral surface; short slender bris-

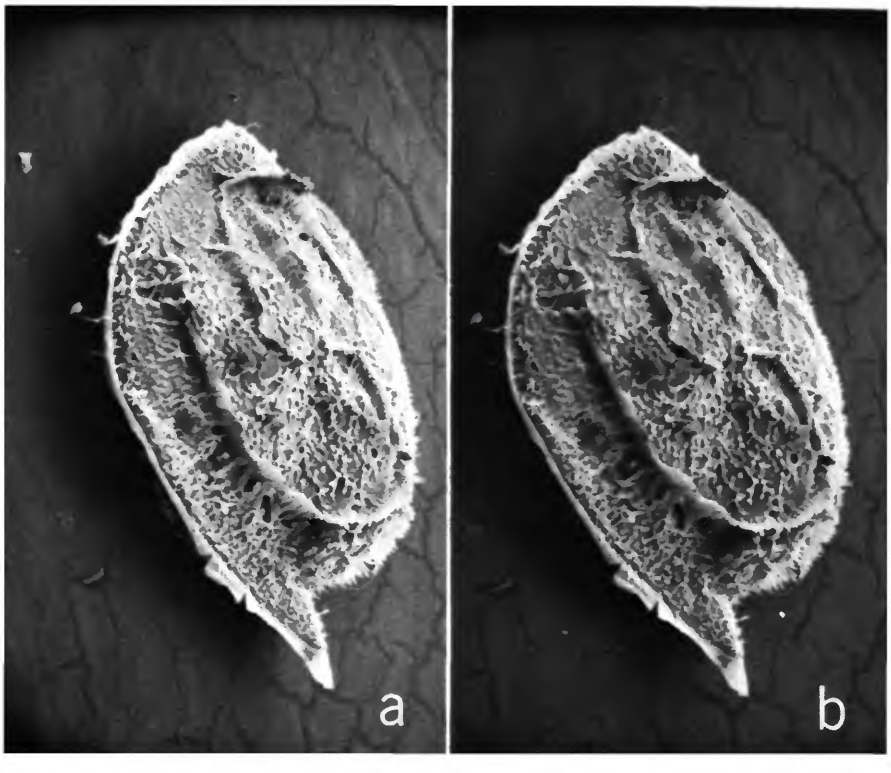

Figure 396.—*Cymbicopia brevicosta*, female, holotype, sterioscan of left valve, × 75.

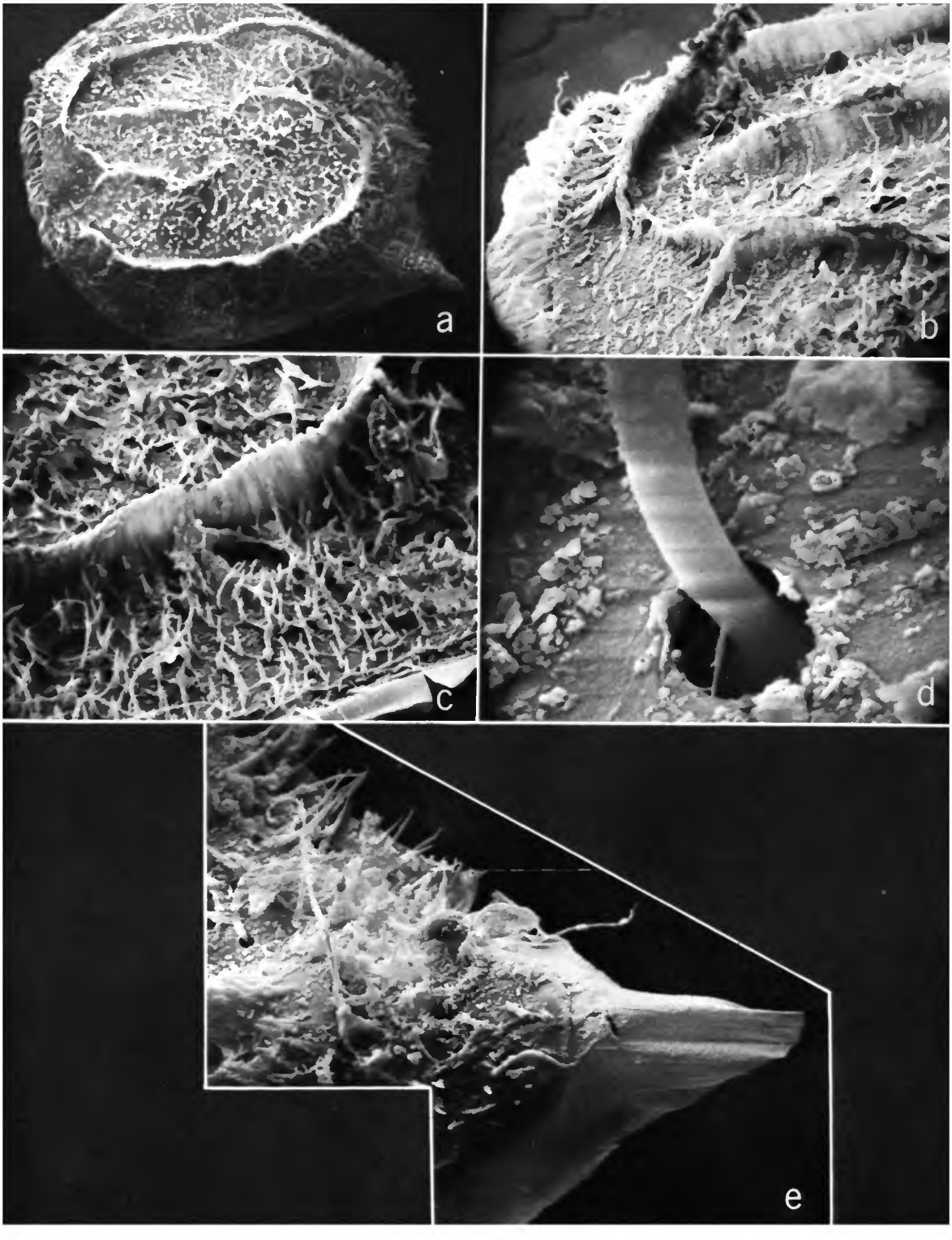

FIGURE 397.—*Cymbicopia brevicosta*, female, holotype, left valve, lateral view: *a*, complete valve, × 94; *b*, detail anterior upper ridge, × 300; *c*, detail posterior part lower ridge, × 300; *d*, bristle coming through epicuticle (detail of "*e*"), × 7500; *e*, collage of caudal process, × 738.

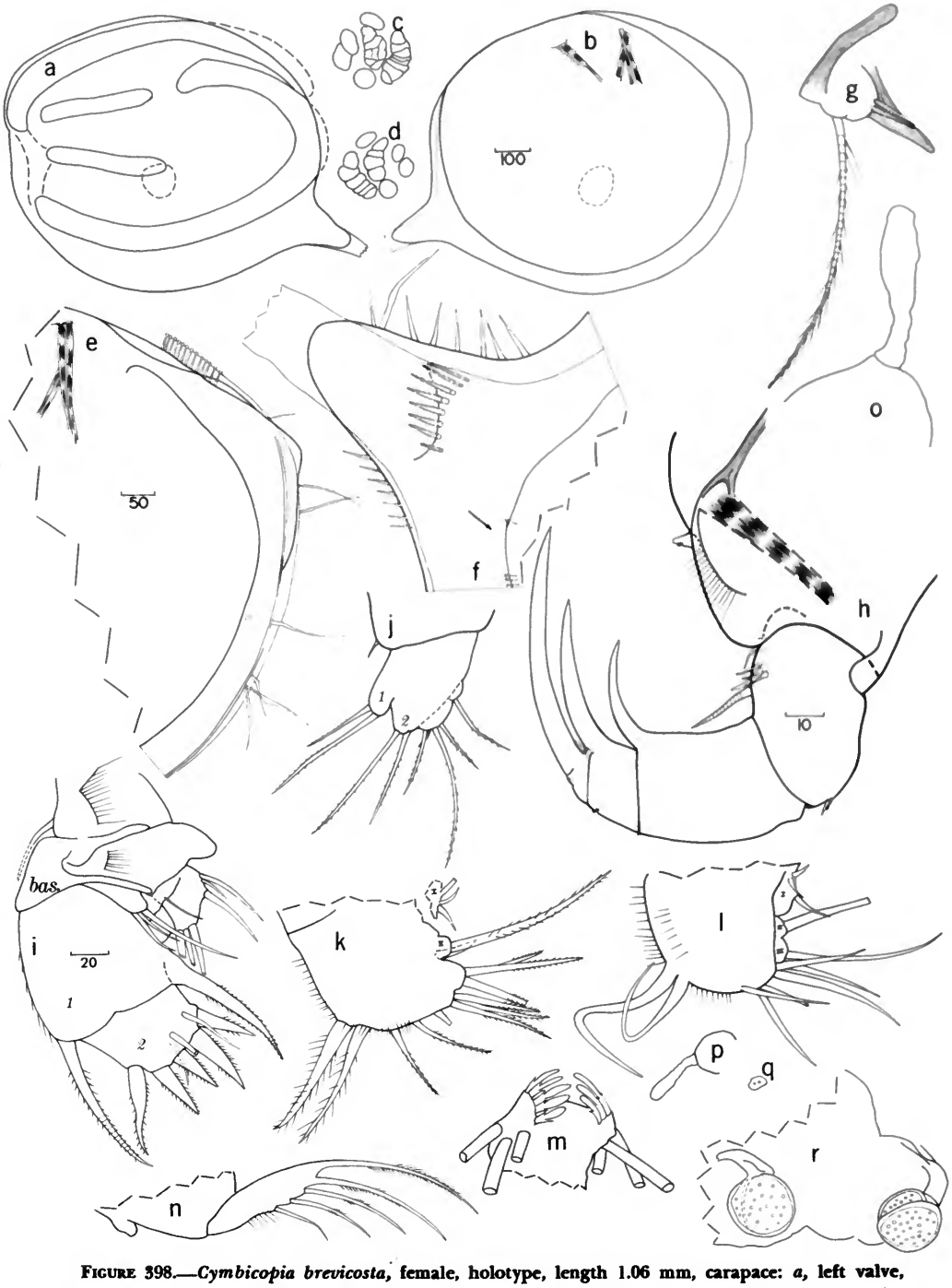

FIGURE 398.—*Cymbicopia brevicosta*, female, holotype, length 1.06 mm, carapace: *a*, left valve, lateral view; *b*, same, medial view showing attachments of dorsal muscles; *c*, central muscles scars in left valve, lateral view; *d*, same on right valve; *e*, anterior of left valve, medial view; *f*, caudal process of left valve, medial view. Left 2nd antenna: *g*, endopodite, medial view. Mandible: *h*, right limb, lateral view. Maxilla: *i*, left limb, lateral view. Fifth limb: *j*, distal part. Sixth limb: *k*, right limb, lateral view; *l*, left limb, medial view. Seventh limb: *m*, tip. Furca: *n*, right lamella. Anterior: *o*, medial eye and rod-shaped organ, dorsal view; *p*, same, lateral view; *q*, lateral eye. Genitalia: *r*, spermatophores. (Same magnification in microns: *b,f; c-e,n,p,q; g,i-m,o,r.*)

tles also abundant along margins and on lateral surface. Transparent substance present between bristles as on *C. hanseni* and *C. hispida*.

Muscle scars (Figure 398*b-d*): Central muscle scars obscure but consisting of 2 crescent-shaped scars, 1 posterior and 1 central, and 4 ovoid scars (2 anterior, 1 ventral, and 1 dorsal).

Infold: (Figure 398*e,f*): Infold below incisur with minute bristle near inner margin; list in front of caudal process with 8 spinous bristles forming row; minute bristles present along inner margin of infold of caudal process.

Selvage: Same as on *C. hanseni*.

Size of adult females (Figure 387): Holotype (gravid), length 1.06 mm, height 0.85 mm. Paratypes: length 1.02 mm, height 0.85 mm; length 1.04 mm, height 0.83 mm; length 1.08 mm, height 0.78 mm (gravid); length 1.03 mm, height 0.83 mm (gravid); length 1.10 mm, height 0.83 mm (gravid).

First antenna: 2nd joint with spines forming clusters on lateral surface, dorsal and ventral margins; spinous bristle present just distal to middle of dorsal margin; 3rd joint short and only partly fused to 4th joint; 3rd joint with bare dorsal bristle reaching 5th joint and long spinous ventral bristle reaching past end of limb; 4th joint with spines forming clusters along ventral and dorsal margins and 2 spinous terminal bristles, 1 dorsal reaching past middle of 5th joint, 1 ventral reaching past end of limb; 5th joint with spines along dorsal margin; sensory bristle of 5th joint as long as long bristles of 7th and 8th joints and with 3 short marginal spines; no medial bristle on 6th joint. Seventh joint: a-bristle bare, less than one-half length sensory bristle 5th joint; b-bristle longer than a-bristle and with 3 short marginal spines and bifurcate tip; c-bristle long with 3 short marginal filaments and bifurcate tip. Eighth joint: d- and e-bristles bare, almost as long as c-bristle; f- and g-bristles similar to c-bristle.

Second antenna (Figure 398*g*): Protopodite bare and without medial bristle. Endopodite weakly 2-jointed, with 2 short bare proximal bristles on 1st joint and 1 long spinous terminal bristle on 2nd joint. Exopodite: 1st joint with hairs along ventral margin and small recurved medial spine; bristles of joints 2 to 8 with natatory hairs; joints 2–8 with short spines forming row along terminal margins; 9th joint small with 2 bristles, 1 long with natatory hairs, 1 short, bare.

Mandible (Figure 398*h*): Ventral margin of coxale with long hairs; small coxale endite present with small spine near base. Basale: dorsal margin with 2 small subterminal spines; ventral margin with total of 7 or 8 spines and bristles, 3 proximal on medial side, 2 distal (1 long, 1 short), and 2 or 3 near middle on lateral side. Exopodite represented by minute process. Endopodite: 1st joint with several short terminal spines on dorsal margin, 1 or 2 medial spines near base of main claw and minute spines forming row along distal medial margin; 2nd joint with 2 minute subterminal spines on dorsal margin, 1 small medial spine near distal dorsal corner and 1 small lateral spine near base of large ventral claw; 3rd joint with 2 spines near ventral margin of large main claw and 1 faint medial spine near dorsal margin of claw.

Maxilla (Figure 398*i*): Anterior margin of coxale with short bristle; protopodite with transparent process; 3 endites present, each with 5 or 6 bristles. Endopodite: 1st joint with spinous α- and 6-bristles and spines forming clusters along anterior margin; 2nd joint with 2 a-bristles, 1 c-bristle, and usual 5 pectinate terminal bristles. Exopodite with 1 long and 2 short bare bristles.

Fifth limb (Figure 398*j*): Epipodial appendage with 30 plumose bristles; single endite present with 1 short bristle. Exopodite: 1st joint with 2 bristles, both with short marginal spines; 2nd joint with 2 spinous bristles; 3rd joint with 2 spinous bristles on inner lobe and 1 on outer lobe; 4th + 5th joints with 2 spinous bristles (inner lobe of 3rd joint fused to 4th and 5th joints); limb hirsute.

Sixth limb (Figure 398*k,l*): 3 endites present, but separation between 3rd endite and end joint marked only by small sclerotized area and slight dip in margin; 1st endite with 3 short bristles; 2nd endite with 1 or 2 bristles with short marginal spines; 3rd endite with 2 or 3 bristles with short marginal spines; end joint with 7 or 8 bristles consisting of 2 plumose posterior bristles, 2 or 3 anterior bristles and 2 or 3 bristles in middle group, anterior and middle bristles with short marginal spines; limb hirsute.

Seventh limb (Figure 398*m*): Proximal group with 2 bristles (1 + 1), distal group with 6 bristles (3 + 3), each bristle with 2 to 6 bells and no distal marginal spines; terminus with opposing combs, each with 7 or 8 alate teeth.

Furca (Figure 398*n*): Each lamella with 5 to 7

slender claws (6 specimens examined bear 7 claws on left lamella and 5 or 6 on right); claws 1 and 2 continuous with lamella, remaining claws separated from lamella by suture; claws usually decreasing in length posteriorly along lamella, but claw 5 shorter than claw 6 on right lamella on one of specimens examined; all claws slender, with pointed tips; most claws with teeth along posterior margin, hairs along anterior margin and medial hairs at base and on lamella following claws. Distribution of claws on six specimens is listed below.

Number of furcal claws		*Remarks*
left lamella	*right lamella*	
7	5	holotype
7	6	claw 5 of left lamella shorter than claw 6 (specimen parasitized by nematodes)
7	6	
7	6	
7	6	
7	6	

Eyes: Minute lateral eyes with 2 ommatidia present (Figure 398*q*); medial eye 2 or 3 times diameter of lateral eye, pigmented (Figure 398*o*).

Rod-shaped organ: 1-jointed, elongate, broadening distally with crinkly margin and rounded tip (Figure 398*o*).

Posterior: No spines or hairs observed.

Upper lip: Lip helmet shaped, triangular process present between lip and rod-shaped organ.

Genitalia: Spermatophores present on holotype (Figure 398*r*).

Eggs: Holotype with 2 eggs, remaining 3 gravid ♀♀ with 4, 4, 5 eggs.

Parasites: One adult ♀ without eggs from Akaroa Harbor, with numerous encysted nematodes in protopodite of 2nd antenna and uncoiled nematodes within valves.

Gut content: Gut of holotype with two sacks containing elongate weakly connected pellets consisting of material having the appearance of sedimentary debris. No recognizable fragments of organisms were observed in the gut.

Description of Adult Male.—Carapace slightly smaller than that of female, more elongate, with broader incisur and shorter caudal process (Figure 399*a,b*).

Ornamentation (Figure 400): Ridges and bristles

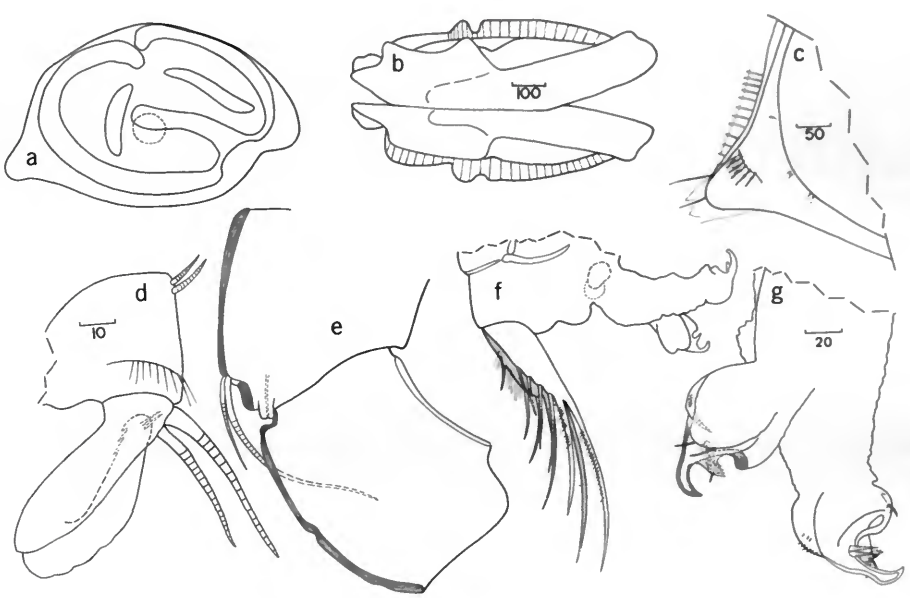

Figure 399.—*Cymbicopia brevicosta*, male, length 0.97 mm, carapace: *a*, complete specimen, lateral view; *b*, same, dorsal view, anterior to right; *c*, caudal process on left valve, medial view. Appendages: *d*, endopodite on left 2nd antenna, medial view; *e*, left mandible, basale, exopodite, and 1st endopodial joint (not all bristles shown), lateral view; *f*, furca and copulatory apparatus; *g*, detail of copulatory apparatus shown in "*f*." (Same magnification in microns: *c,f*; *d,e*.)

similar to those on carapace of female, except short vertical ridge formed by bristles present posterior to adductor muscles. Transparent substance present between bristles.

Infold (Figure 399*c*): Infold below incisur with minute bristle near inner margin; list in front of caudal process with 6 spinous bristles forming row; minute bristles present along margin of infold of caudal process.

Size (Figure 387): Length 0.97 mm, height 0.69 mm.

First and second antennae (Figure 399*d*): Similar to those of *C. hanseni*.

Mandible (Figure 399*e*): Limb similar to that of male *C. hanseni* except minute exopodite observed (possibly overlooked on *C. hanseni*) and 3 bare dorsal bristles instead of 2 present on 2nd joint of endopodite.

Maxilla: Not examined.

Fifth limb: Epipodial appendage with 32 or 33 bristles, otherwise similar to that of male *C. hanseni*.

Sixth limb: Same as that on male of *C. hanseni*.

Seventh limb: Each limb with 4 terminal bristles with 4 to 6 bells; terminus similar to that of male *C. hanseni*.

Furca (Figure 399*f*): Right lamella with 6 claws, left with 5; claws 1 and 2 continuous with lamella,

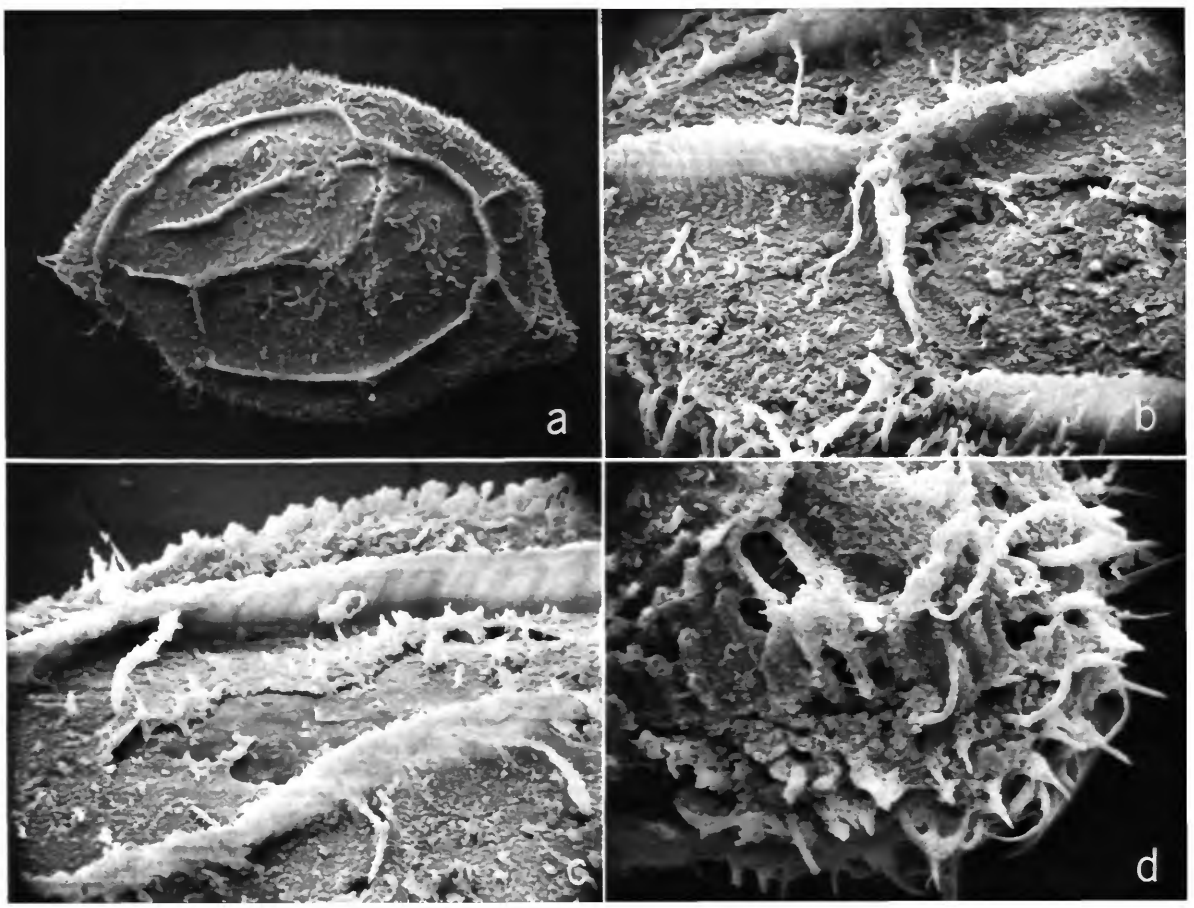

FIGURE 400.—*Cymbicopia brevicosta*, male, left valve, lateral view: *a*, complete valve, × 188; *b*, anterior end longitudinal ridge above central muscle scars, × 463; *c*, anterior part of dorsal ridge and ridge ventral to dorsal ridge, × 463; *d*, caudal process, × 906.

remaining claws separated from lamella by suture.

Eyes: Lateral eyes not observed; medial eye same as on *C. hanseni*.

Rod-shaped organ, upper lip, posterior: Same as on *C. hanseni*.

Copulatory organ (Figure 399*f,g*): Main lobe terminating in sclerotized hook and triangular tooth with total of 4 bristles (2 pairs) on inner margin of hook; triangular tooth bearing about 5 minute processes; 2 lobes present bearing few spines and bristles.

COMPARISONS.—The carapace of the new species superficially resembles that of *C. hanseni*. The ornamentation differs mainly in having a shorter midridge. On *C. brevicosta* this ridge usually does not reach past the adductor muscle area, whereas, on *C. hanseni* this ridge extends well past the adductor muscle area. A vertical rib is present posterior to the adductor muscle area on the male *C. brevicosta* but not on *C. hanseni*. In both species the ribs are formed by bristles and not by a thickening of shell material. On *C. hanseni*, however, the tips of the bristles on preserved specimens are mainly cup-shaped, whereas the tips are bulbous on *C. brevicosta*. On carapaces of adult specimens, the caudal process on *C. brevicosta* is much longer than that on *C. hanseni*. The appendages on both species are quite similar except for the number of claws on the furca. The furca of *C. brevicosta* bears 6 or 7 claws (rarely 5) on each lamella, whereas, the furca of *C. hanseni* bears 4 claws (rarely 5) on each lamella.

DISTRIBUTION.—This species was collected in Akaroa and Lyttelton Harbors, New Zealand, at depths of 1.8 to 11 m (Figure 360).

Adelta, new genus

TYPE-SPECIES.—*Adelta theta* Kornicker, described herein.

ETYMOLOGY.—The generic name "Adelta" is derived from the Greek "a-" [= not, without] and the Greek letter "delta" in reference to the absence of d-bristle on the 1st antenna of specimens of this genus. Gender: neuter.

This new genus contains one species, *A. theta*, but it is possible that some species previously assigned to *Sarsiella* belong here.

DIAGNOSIS OF GENUS.—Carapace with minute incisur; infold of caudal process with numerous spinous bristles forming row similar to that on members of *Spinacopia* and *Cymbicopia*.

First antenna: 8th joint without d-bristle. (It is uncertain whether the d-bristle and not e-bristle is the missing bristle, but because d-bristle and not e-bristle is missing or reduced on some species of Cylindroleberidinae, it is assumed the same bristle is missing in the present case.)

Second antenna: Endopodite of *A. theta* 2-jointed with 1 or 2 short bare bristles on 1st joint and long spinous terminal bristle on 2nd joint.

Mandible: Small exopodite on mandible. (This differs from exopodite on some species in *Spinacopia* and *Cymbicopia* in being situated farther from dorsal margin.)

Sixth limb: With 3 endites.

Furca: Each lamella with 5 claws of which only 1st not separated from lamella by suture.

MICROSTRUCTURE.—The valves of USNM 154811 have opaque and translucent area when viewed in transmitted light. The scanning electron microscope revealed that the opaque areas contain cauliflower-like bundles of opaque material (?calcite) (Figure 404*e*), whereas the translucent areas are relatively free of these bundles. Clear oval areas in the broad middle part of the oblique anterior-posterior ridge present near the middle of the valve are free of bundles (Figures 404*b,d*); in other parts of the shell the bundles form ovals (Figure 404*c*). The bundles may have formed after death of the animal by precipitation of calcium carbonate (see Sohn and Kornicker, 1969).

COMPARISONS.—*Sarsiella* is the only genus in the Sarsiellidae bearing 5 furcal claws of which none is secondary, and in which only claw 1 is not separated from the lamella by a suture. This new genus differs from *Sarsiella* mainly in having no d-bristle on the 1st antenna but also in having an exopodite on the mandible and numerous spinous bristles on the infold of the caudal process of the carapace. The distribution and number of furcal claws as well as the absence of the d-bristle on the 1st antenna distinguishes *Adelta* from other genera in the Sarsiellidae.

DISTRIBUTION.—The only species known in this genus was collected in the Atlantic Ocean on the Uruguayan and Chilean shelves at a depth of 15 m at two stations (33°49′30″S and 39°′21S) (Figure 352).

119. *Adelta theta*, new species

FIGURES 401–404

HOLOTYPE.—USNM 134811, adult ♀, length 0.96 mm. One valve in alcohol, other valve gold-plated, on dry slide; furca and posterior in alcohol, other appendages on slide.

TYPE-LOCALITY.—*Vema* Cruise 17, station V–17–72.

ETYMOLOGY.—The specific name is derived from the Greek letter "theta" because ridges on the carapace resemble that letter.

PARATYPE.—USNM 134812, 1 gravid ♀ with 3 eggs in brood chamber. Left mandible, 1st and 2nd antennae on slide, valves and remaining appendages in alcohol. Paratype from *Vema* Cruise 18, station V–18–39.

DIAGNOSIS.—Same as for genus.

DESCRIPTION OF ADULT FEMALE.—Carapace oval in lateral view with small posteroventral caudal process; anterior incisur indicated by minute indentation; adult females with posterodorsal part of carapace inflated (Figures 401, 402*a*).

Ornamentation (Figures 402*b*, 404): Oval ridge present within margin of each valve; oblique ridge extending from anterior part of oval ridge below indentation of incisur, through adductor muscle attachment area to posteroventral part of ridge near caudal process; ridges resembling Greek letter theta. Oblique ridge broadening in area of adductor muscle scar attachments and bearing about 13 flat oval areas that do not seem related to ends of individual muscle attachments; similar oval areas, but much smaller, present over remaining part of shell; area between ovals on broadened part of ridge and most of remaining shell with minute pustules which, under magnification of × 17,000, resemble cauliflower heads. Anterior and ventral margins with long hairs broadening near base; valve surface almost devoid of hairs.

Infold (Figure 402*c-e*): Infold below minute incisur with small bristle; list in front of caudal process with 9 spinous bristles forming upper row on list and 2 smaller spinous bristles on lower part of list; several minute bristles present near inner margin of posterior infold; infold at tip of caudal process with faint crescent bearing several minute teeth; 4 small spines present on terminal margin of caudal process.

Selvage: Lamellar prolongation with smooth outer margin present along anterior, ventral, and posterior margins.

Size: USNM 134811, length 0.96 mm, height 0.82 mm; USNM 134812, length 1.07 mm, height 0.86 mm.

First antenna (Figures 402*f*, 403*i*): 1st joint with clusters of spines on medial and lateral surfaces; 2nd joint with 1 dorsal midbristle with short marginal spines, and spines forming clusters on medial surface and dorsal margin; 3rd and 4th joints not separated by suture; 3rd joint with 2 bristles, with short marginal spines, 1 ventral, 1 dorsal; 4th joint with spines along ventral and dorsal margins and 2 bristles with short marginal spines, 1 dorsal, 1 ventral, ventral bristle about twice length of dorsal; sensory bristle of 5th joint without filaments; medial bristle of 6th joint short, reaching tip of limb. Seventh joint: a-bristle with faint marginal spines, and one-half length of sensory bristle of 5th joint; b-bristle longer than a-bristle but shorter than sensory bristle; c-bristle about same length as sensory bristle, bare. Eighth joint: d-bristle absent; e-bristle bare and slightly shorter than c-bristle; f- and g-bristles same length as c-bristle, both with 1 or 2 minute filaments. (It is uncertain whether d- or e-bristle is absent. Because the d-bristle in some

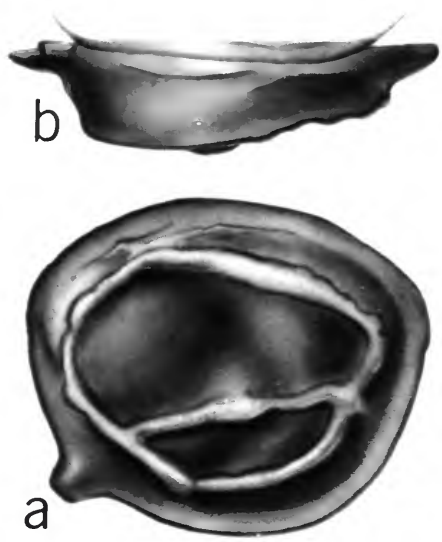

FIGURE 401.—*Adelta theta*, female, USNM 134812, length 1.07 mm, carapace: *a*, lateral view; *b*, dorsal view, anterior to right.

genera of Cylindroleberidinae is absent or reduced. it is assumed that the d-bristle is absent in present case.)

Second antenna (Figures 402*g*, 403*j*): Protopodite with few spines near anterior (dorsal) margin, and without medial bristle. Endopodite 2-jointed: 1st joint with 1 or 2 short bare bristles, 2nd joint with 1 long spinous terminal bristle. Exopodite: 1st

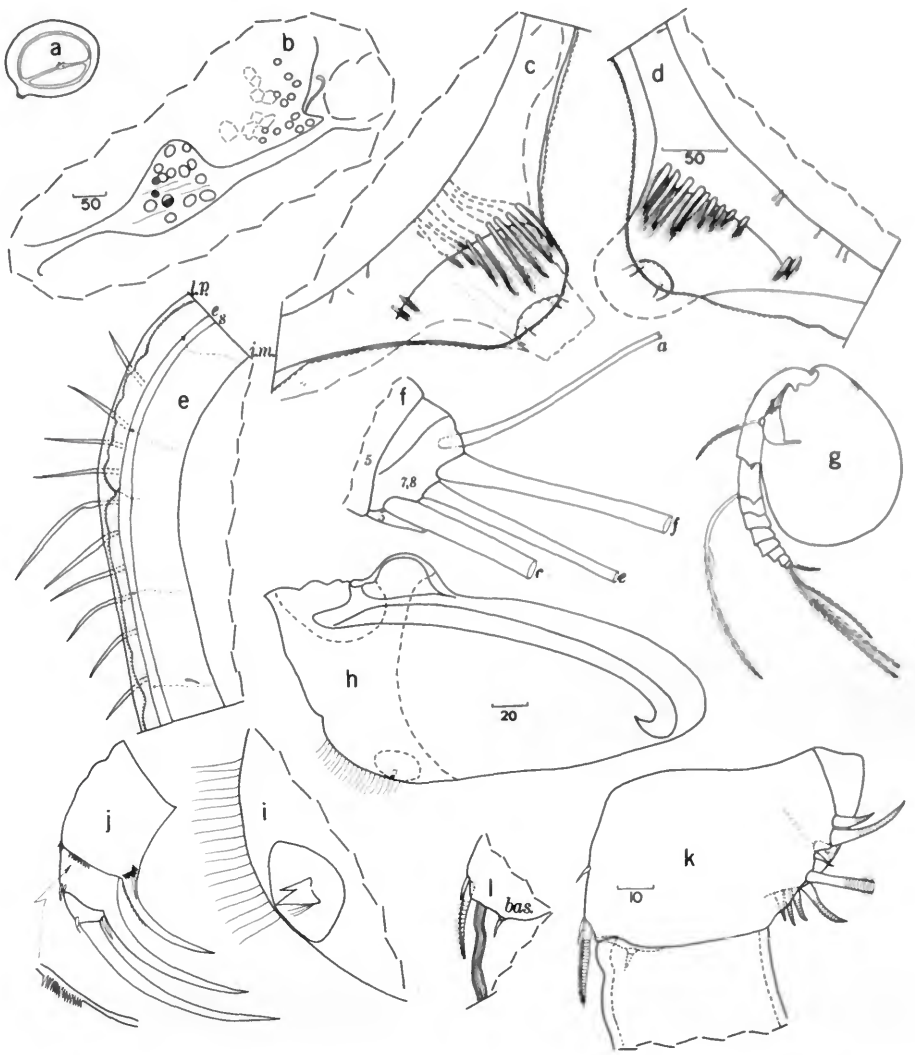

FIGURE 402.—*Adelta theta*, female, USNM 134811, length 0.96 mm, carapace: *a*, complete specimen, lateral view; *b*, detail of right valve showing midridge with central muscle scars (center) and few pits above ridge, lateral view; *c*, caudal process on right valve, medial view; *d*, caudal process on left valve, medial view; *e*, anterior of right valve, medial view. Right 1st antenna: *f*, tip, lateral view (not all bristles shown). Right 2nd antenna: *g*, complete limb (not all bristles shown). Mandible: *h*, coxale on left limb, lateral view; *i*, coxale endite on right limb, medial view; *j*, endopodite on right limb, medial view; *k*, part of basale and exopodite on left limb, lateral view; *l*, basale on right limb, medial view. (Same magnification in microns: *b,g; c-e; h,j; k,l.*)

joint with long spines or hairs along ventral margin and lateral side, and short recurved medial spine on terminal margin; bristle of 2nd to 8th joints long, with natatory hairs; 9th joint with 3 bristles, 1 long with natatory hairs, 2 shorter with short marginal spines; joints 2 to 8 with short spines forming row along distal margin.

Mandible (Figures 402*h-l*, 403*k*): Ventral mar-

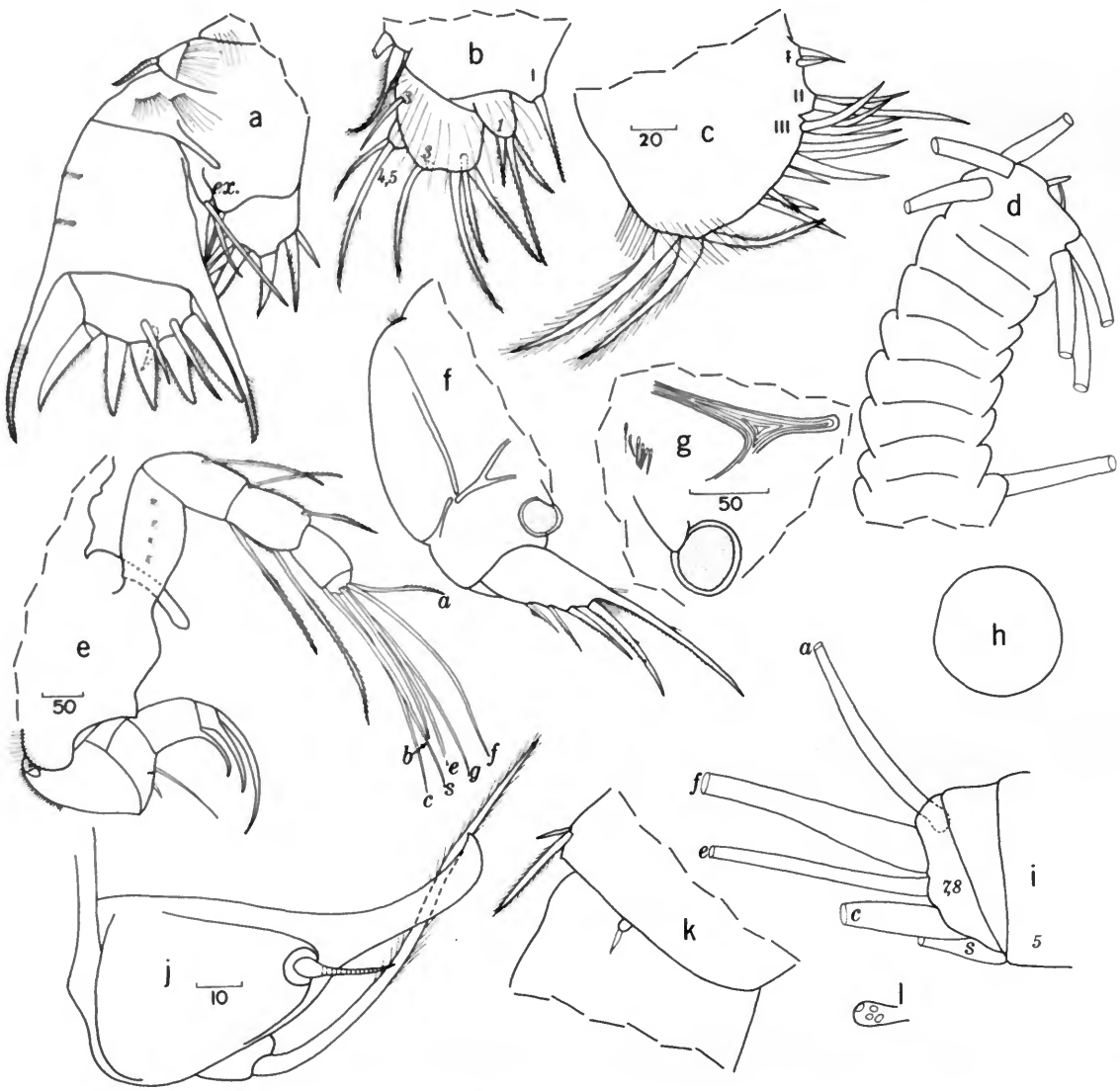

FIGURE 403.—*Adelta theta*, female, USNM 134811, length 0.96: *a*, left maxilla, lateral view; *b*, distal part of left 5th limb, medial view; *c*, left 6th limb, medial view; *d*, distal part of 7th limb; *e*, anterior showing right 1st antenna, medial eye and rod-shaped organ, anterior process, upper lip, left mandible; *f*, posterior showing right lamella of furca, spermatophore, and internal sclerites; *g*, genitalia, brushlike organ, and internal sclerite on left side, anterior to left; *h*, outline of unextruded egg. Female, USNM 134812, length 1.07 mm: *i*, tip of left 1st antenna, lateral view (not all bristles shown); *j*, endopodite of left 2nd antenna, medial view; *k*, distal end of basale on left mandible showing exopodite, lateral view; *l*, right lateral eye. (Same magnification in microns: *a-c; d,i-k; e,f,h,l*.)

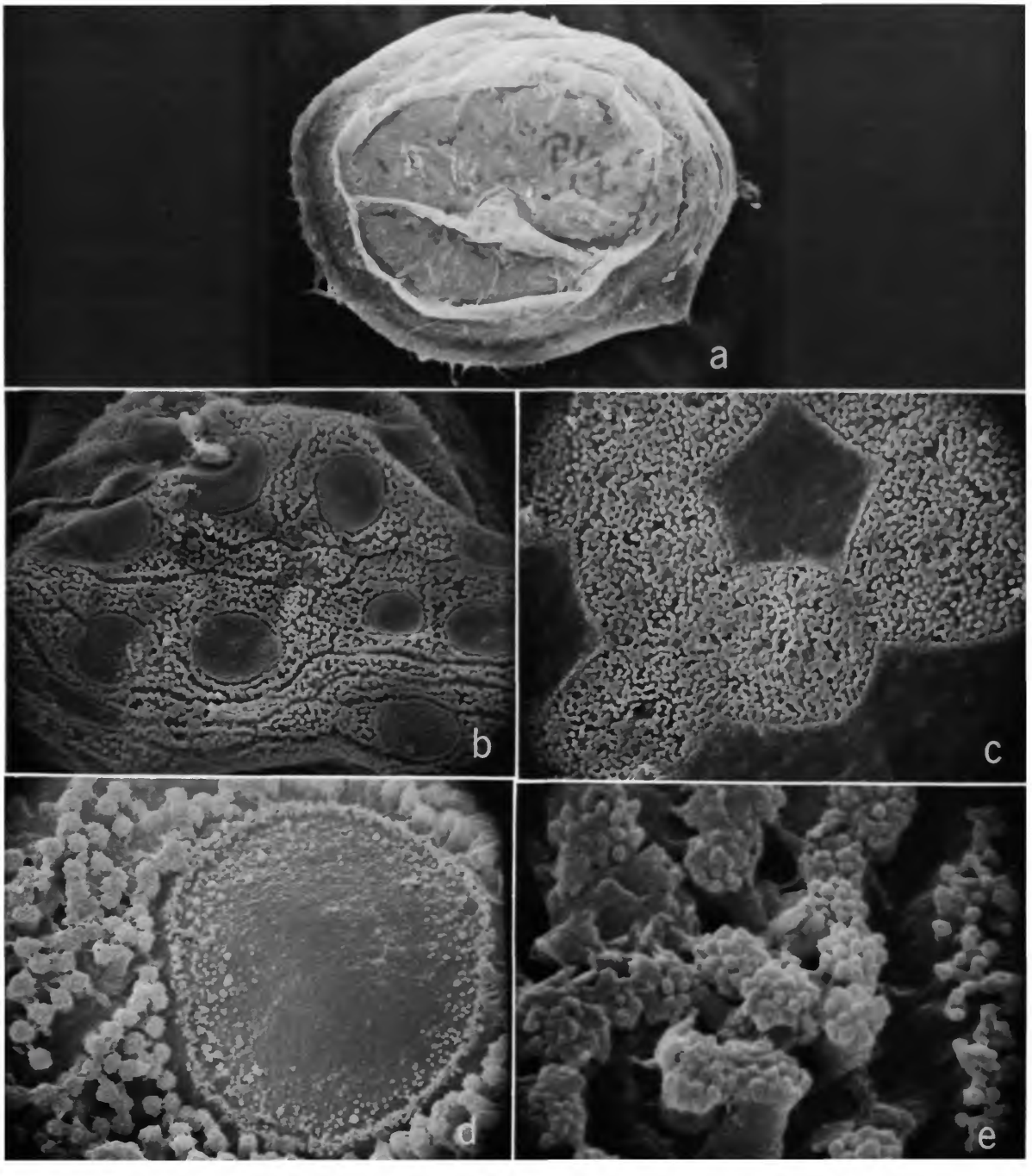

FIGURE 404.—*Adelta theta*, female, USNM 134811, left valve, lateral view: *a*, complete valve, × 100; *b*, central muscle scars, × 1000; *c*, detail of ?recrystallization in posterodorsal part of valve within peripheral ridge, × 2000; *d*, muscle scar shown in "*b*," × 5000; *e*, ?crystal clusters shown in "*d*," × 21,250.

gin of coxale with long hairs; coxale endite with bifurcate tip and spines near base (small bristle near base not observed with certainty). Basale: dorsal margin undulate proximally, with 1 short spine near middle, 1 short spine and 1 bristle with short marginal spines subterminal; ventral margin with U-shaped glandular opening and total of 7 or 8 bristles and spines, long midbristle with short marginal spines. Endopodite: 1st joint with several short terminal spines on dorsal margin, comb of short medial spines on terminal margin, and fan of medial spines near base of main ventral claw; 1 stout medial spine present near base of main claw; main claw with short proximal spines along anterior convex margin; 2nd joint with 2 terminal spines on dorsal margin; end joint with 1 dorsal and 2 ventral spines near base of main claw. Exopodite: consists of small lateral process with terminal bristle on terminal margin of basale near dorsal margin.

Maxilla (Figure 403*a*): Coxale with short anterior bristle with short marginal spines. Three endites present: 1st with about 6 bristles, 2nd with about 3 or 4 bristles, 3rd with about 7 bristles. One bristle present on ?basale proximal to 1st endite, near tip of exopodite; exopodite with 2 bristles. Endopodite: 1st joint with spinous α- and 6-bristles; 2nd joint with 2 a-bristles, 1 c-bristle, and usual 5 pectinate terminal bristles.

Fifth limb (Figure 403*b*): Epipodial appendage with 32 to 34 plumose bristles; single endite with 1 fairly long bristle with short marginal spines; 1st and 2nd joints of exopodite with 3 bristles with short marginal spines; 3rd joint with 2 bristles on inner lobe (1 long with short marginal spines and 1 minute and bare), and 1 bristle on outer lobe; joints 4 + 5 with 2 bristles with short marginal spines; joints of exopodite hirsute.

Sixth limb (Figure 403*c*): Lateral and medial surfaces of limb and distal posterior margin hirsute. Three endites present: 1st and 2nd endites with 2 bristles; 3rd endite with 4 bristles; end joint with 3 anterior bristles, 3 middle bristles and 3 posterior bristles (2 hirsute, 1 with short marginal spines); 3rd endite not clearly delimited from end joint.

Seventh limb (Figure 403*d*): Limb with 8 bristles, 2 in proximal group (1 + 1), 6 in terminal group (3 + 3); each bristle with 2 to 5 bells and without marginal spines; terminus with opposing combs, only 1 tooth in each comb.

Furca (Figure 403*f*): Each lamella with 5 claws: claw 1 continuous with lamella, remaining claws separated from lamella by suture; all claws decreasing in length posteriorly along lamella; long hairs present at base of claw 1 on right lamella; each claw with fine teeth along posterior margin; claws 1 and 2 with few hairs along convex margin.

Eyes: Lateral eyes small with 4 ommatidia (Figure 403*l*). Medial eye normal for family (Figure 403*e*).

Rod-shaped organ (Figure 403*e*): 1-jointed, elongate with rounded tip.

Genitalia and brushlike organ (Figure 403*g*): Genitalia with oval spermatophore attached on each side. Brushlike organ consisting of several minute ringed bristles present dorsal to genitalia.

Posterior: Posterior margin without hairs except near dorsal corner.

Upper lip: Lip helmet shaped with hairs.

Eggs: 4 or 5 large unextruded eggs present in holotype. Paratype with 3 eggs in brood chamber and about 4 unextruded (Figure 403*h*).

DISTRIBUTION.—This species was collected at two localities on the shelf east of Argentina; one station is outside the study area. Both collections were at a depth of 15 m (Figure 360).

RUTIDERMATIDAE Brady and Norman, 1896

The family Rutidermatidae contains three genera: *Rutiderma* Brady and Norman, 1896; *Alternochelata* Kornicker, 1958, *Scleraner*, new genus. Only *Rutiderma* and *Scleraner* have been collected in the study area.

DIAGNOSIS OF FAMILY.—Carapace oval in lateral view with male more elongate than female; surface punctate or smooth; prominent ribbing absent on *Alternochelata* and *Scleraner*, present on most species of *Rutiderma*; caudal process present on some species, absent on others; rostrum generally rounded anteriorly, incisur minute on some species and forming small indentation creating overhanging rostrum in others; rostrum of male more prominent than that on female; carapace small, length 1.0 mm to 1.75 mm.

First antenna: Ventral bristle on 5th joint of female limb either bare or with 2 short proximal

filaments and bifurcate tip; ventral bristle on 5th joint of adult male limb, stout with numerous long filaments; d- and e-bristles of 8th joint bare, about same length; c-bristle of 7th joint and f-bristle of 8th joint on male limb long and with numerous short filaments.

Second antenna: Endopodite of female limb with 1 joint in *Rutiderma*, 2 joints in *Alternochelata* and *Scleraner*; endopodite of male limb 3-jointed with 3rd joint reflexed on 2nd.

Mandible: Endopodite on female limb with opposing stout terminal chelae on 1st and 2nd joints; endopodite on male limb without opposing chelae. Exopodite well developed on male limb, but stout or rudimentary on female limb.

Maxilla: Limb short stout with 3 endites; limb reduced in males.

Fifth limb: Morphology in general similar to 5th limb of Philomedinae.

Sixth limb: Limb with 4 distinct endites; end joint narrow without posteroventral extension, and with 6 to 8 bristles.

Seventh limb: Seventh limb with 4 to 10 bristles; terminus with opposing combs, one comb on some species with fewer teeth than other.

Furca: *Rutiderma* with 3 or 4 stout claws followed by 2 or 3 secondary claws; *Scleraner* (1 species) with 4 stout claws followed by 5 secondary claws; *Alternochelata* (1 species) with secondary claws alternating with stout claws.

Rod-shaped organ: Organ elongate, 1 or 2 jointed with rounded or pointed tip.

Lateral eyes: Present on all known species, but reduced in some; on some species lateral eyes on male (14–30 ommatidia) better developed than on female (5 ommatidia).

Medial eye: Large pigmented.

DISTRIBUTION.—Members of the family Rutidermatidae are widespread. The northernmost latitude from which it has been reported is about 45°N, the southernmost latitude 50°16′42″S. It has not been collected in waters of the Antarctic. The known depth range is 1 to 240 m.

Key to Genera

1. Endopodite of female 2nd antenna with 1 joint, carapace generally with prominent ribbing.... ..... *Rutiderma*
   Endopodite of female with 2 joints, carapace generally without prominent ribbing 2
2. Furca with secondary claws following primary claws..... *Scleraner*
   Furca with secondary claws between primary claws.....*Alternochelata*

Rutiderma Brady and Norman, 1896

TYPE-SPECIES.—*Rutiderma compressa* Brady and Norman, 1896.

This genus is represented in the area south of 35°S by *R. gerdhartmanni*, new species, and two species designated herein as *Rutiderma* species A and *Rutiderma* species B. A new species *R. ovata* from about 31°S is also described herein. Müller (1908:92) reported a specimen of *R. compressa* from just outside the study area, Simonston, South Africa, at about 34°S.

DIAGNOSIS OF GENUS.—Carapace general highly ornamented with longitudinal ribs and marginal radial riblets.

Second antenna: Endopodite of female 1-jointed with 3 or 4 short anterior bristles.

Mandible: Dorsal margin of 1st endopodite joint of mandible with 3 or 4 bristles.

Furca: Each lamella with 6 claws, 3 or 4 main claws followed by 2 or 3 secondary claws.

MICROSTRUCTURE.—Carapace: *Rutiderma gerdhartmanni* with long bristles with broad basal parts (Figure 409*f*), and shorter bristles (Figure 409*c,d,f*). Both types of bristles with marginal papillae, and emerging from simple pores in middle of low oval platforms (Figure 409*f*). Long bristles on *R. ovata* with no visible papillae (Figure 420*a,c*).

Large oval fossae with flat bottoms containing minute papillae present on *R. gerdhartmanni* (Figure 409*a-e*). Smaller 2nd order fossae with crinkled bottoms present in area between large fossae (Figure 409*c,d,f*). Minute punctae abundant in area between fossae (Figure 409*f*). Large oval fossae also present on carapace on *R. ovata*, but papillae not observed at their bottoms (Figures 414*d*; 417*a,b*; 420*f*). Minute punctae present in area between

fossae, but 2nd order fossae absent (Figures 417*b*, 420*f*).

Striate lamellar prolongation with marginal hairs present in incisur areas of *R. gerdhartmanni* (Figure 409*b*) and *R. ovata* (Figure 414*a*). Lateral view of lamellar prolongation along ventral margin of *R. ovata* shows numerous threads similar to those on members of Philomedidae (Figure 414*f*).

Anteroventral infold ventral to incisur of *R. ovata* with branching bristle (Figure 414*c*); bristles on infold of rostrum with marginal spines (Figure 414*b*).

Appendages: Each branch of bifurcate tip on sensory bristle on 5th joint of 1st antenna of female *R. ovata* terminates in cylindrical processes about one-third diameter of branch (Figure 424*e*). Tips of filaments on c-bristle of 7th joints of 1st antenna similar to above, but in addition, bear proximal spine (Figure 424*f,g*).

Protopodite of 2nd antenna of adult male *R. ovata* triangular, with muscles emerging medially near proximal margin (Figure 421*a*). Basal spines of exopodial joints cylindrical (Figure 421*b*), similar in shape to spines along ventral margin of bristle on 2nd exopodial joint (Figure 421*c*). Ridges at tip of 3rd joint of endopodite with serrate margins (Figure 421*d-f*).

Exopodite on the mandible of the adult male of *R. ovata* bears 1 minute spine near tip and 2 short bristles near middle—the latter had not been observed with light microscope—(Figure 422*c*). Medial surfaces of basale and endopodite (Figure 422*e*) much more spinous than lateral surfaces (Figure 422*b*). Medial side of terminal claw on end joint of exopodite with spines forming row near ventral margin (Figure 422*f*). Minute serrations along inner margin of large claw on end joint of exopodite of mandible of adult female *R. ovata* visible in Figure 417*e*.

Pore similar to those observed on tips of comb teeth on 7th limbs of Cypridininae and Philomedidae not observed on comb teeth of male *R. ovata* (Figure 423*d,e*). Bells on bristles of 7th limb (Figure 423*f*) similar to those of other members of Myodocopina.

Rod-shaped organ of *R. ovata* bears long blunt spine at tip (Figure 424*c,d*). Teeth along ventral margins of furcal claws on adult *R. ovata* long and slender (Figure 423*a,b*). Secondary claws with similar teeth along both ventral and dorsal margins, and less curved than primary claws (Figure 423*c*). Primary claws with long hairs forming clusters on rounded anterior surfaces (Figure 423*a,b*).

Upper lip of adult female *R. ovata* rounded, with few short spines forming clusters on posterior part (Figure 417*d*). Grouping of appendages in vicinity of upper lip visible in Figure 417*f*.

Tip of copulatory limb of adult male *R. ovata* with few short bristles and numerous hairs (Figure 424*a*). One cluster of these hairs appears to be on minute process (Figure 424*b*).

DISTRIBUTION.—This genus is widespread. The northernmost point at which it has been collected is the Bay of Biscay, France, at about 45°N. Its southernmost range is extended herein to 52°56′S near the tip of Chile in the Pacific Ocean (Figure 405). The depth range is 1–196 m.

Key to Species

(Includes only species collected south of 35°S, except for *R. ovata*, which was collected at 31°S)

1. Carapace posterior with projecting caudal process 2
   Carapace without projecting caudal process ..... 121. *R. ovata*
2. Anterior end of longitudinal ribs reaching middle of valve 3
   Longitudinal ribs extending full length of valves ..... 122. *Rutiderma* species A
3. Anterior part of end joint of 6th limb projecting ventrally considerable distance ..... 120. *R. gerdhartmanni*
   Anterior part of end joint of 6th limb projecting only slightly ..... 123. *Rutiderma* species B

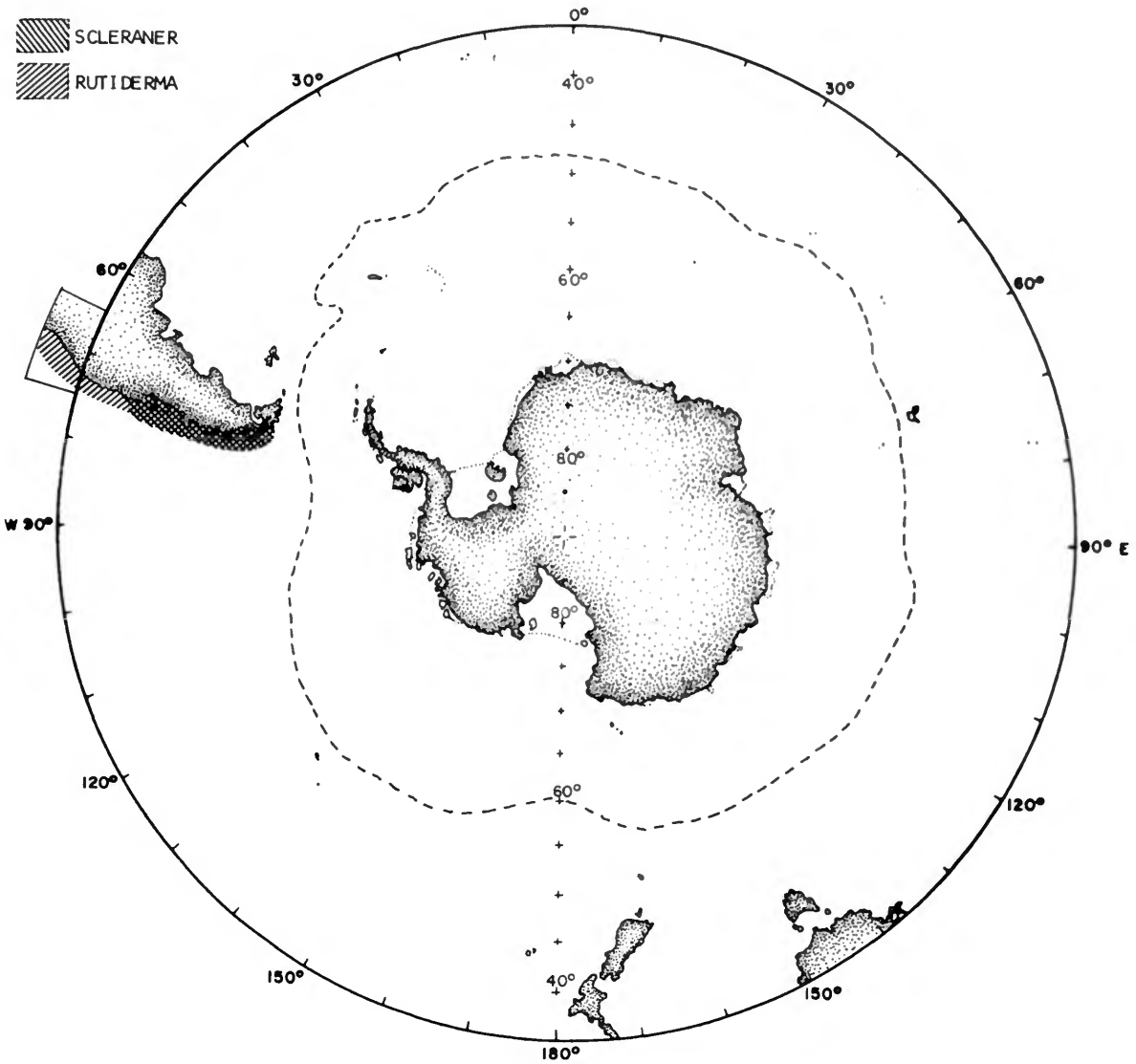

FIGURE 405.—Distribution map of *Rutiderma* and *Scleraner*.

120. *Rutiderma gerdhartmanni*, new species

FIGURES 406, 408–410

Rutiderma compressa Brady and Norman.—Hartmann 1965: 328 [part].

HOLOTYPE.—Gravid ♀ labeled "Holotype," length 1.38 mm, valves and some appendages in alcohol, remaining appendages on slide, Hamburg Zoological Museum No. 27297. (No. 27297 includes all specimens from Chile identified by G. Hartmann as *Rutiderma compressa*.)

TYPE-LOCALITY.—Bahia Ingles, Chile, 41°48′S, 75°53′W, 12 m.

PARATYPES.—1 gravid ♀; 1 ♀ without left valve and furca; 1 adult ♂, 3 disarticulated valves, 2 left, 1 right. Paratypes from same locality as holotype.

MATERIAL.—Through Dr. Gerd Hartmann, I re-received, from the Zoological Museum Hamburg,

specimens from the coast of Chile that Dr. Hartmann (1965:328) had identified as *Rutiderma compressa*. The material was received in alcohol in a vial containing a label bearing the number "27297" and a second label stating, "*Rutiderma* cf. *compressa*, Bahia Inglés, Chiloe (III.60)." The vial contained 4 complete specimens (2 gravid ♀♀, 1 adult ♂, 1 N–1 ♂), 1 ♀ with left valve, 7th limbs and furca removed, 4 disarticulated valves (3 left, 2 right), and numerous appendages. Appendages in the vial include the following: 3 caudal lamellae (all with 3 strong claws followed by 3 weak claws); 1 body anterior with 1st antennae, medial eye and rod-shaped process (both antennae bear 1 lateral bristle on the 1st joint and 2 dorsal bristles on the third joint, lateral eye either absent or reduced); 2 connected 6th limbs attached to one 7th limb, and the epipodial part of a 5th limb (7th limb and 6th limbs similar to those described herein under *R. gerdhartmanni* with following exceptions concerning the 6th limb: endite I of both limbs with 1 terminal and 2 shorter medial bristles; endite II of right limb with only 3 bristles; endite III of both limbs with only 2 bristles); a right and left separated 1st antenna (both with 1 lateral bristle on the 2nd joint and 2 dorsal bristles on the 3rd joint); 4 female-type 5th limbs (one of these with complete epipodial appendages bearing 46 bristles); one 7th limb similar to that on *R. gerdhartmanni*; 2 right 2nd antennae similar to that described for adult ♀ of *R. gerdhartmanni* (exopodite separate on one of these); 1 right 2nd antenna with 2-jointed endopodite with 4 bristles on 1st joint and short terminal bristle on short 2nd joint; 4 eggs; one 7th limb differing from *R. gerdhartmanni* in having only 3 proximal bristles; 2 female-type maxillae; 3 female-type mandibles (one of these with pronounced tooth on dorsal margin near tip of claw on 3rd joint); proximal part of 1 female-type mandible; 1 maxilla attached to central adductor muscles; 2 attached 6th limbs similar to that on the female *R. gerdhartmanni* described herein except for having 3 bristles on endite I on both limbs and 2 bristles on endite III of the left limb only.

I have referred all complete specimens (except the N–1 ♂), the one specimen with left valve and some appendages removed, and all disarticulated valves except 2 to a new species, *R. gerdhartmanni*. The remaining 2 valves (a left and right valve which obviously came from the same specimen) I have referred to *Rutiderma* species A (described herein). The N–1 ♂ has also been referred to *Rutiderma* species A. The loose appendages in the vial apparently are from 2 or 3 specimens of *R. gerdhartmanni* and 1 specimen of *Rutiderma* species A; as it is not possible to assign these to either species with certainty, they have been returned labeled *Rutiderma* spp. A left valve of one of the specimens dissected by Hartmann has been gold-plated for photographic purposes. All specimens have been returned to the Hamburg Zoological Museum.

It is possible to assume that one of the 3 left valves and one of the caudal lamellae loose in the vial are from the partly dissected specimen. The remaining 2 left and 2 right valves are from 2 completely dissected specimens. Because 2 pairs of 1st antennae and 6th limbs are present in the vial, it is possible to assume that they are from the 2 completely dissected specimens represented by the valves. Likewise, at least one of the 2 right 2nd antennae, one of the 3 mandibles, and two of the three 5th limbs in the vial must come from one of the 2 specimens, and one of the 2nd antennae, two of the mandibles and two of the fifth limbs from the other. As the 4 valves are considered herein to belong to two different species, an inference can be drawn concerning the morphology of the appendages of both species where the loose appendages are similar; for example, all 3 loose caudal laminae have 3 strong claws followed by 3 weak claws, therefore, it can be inferred that both species have the same distribution of claws on the furca. This inference has been used in the description of *Rutiderma* species A in this paper.

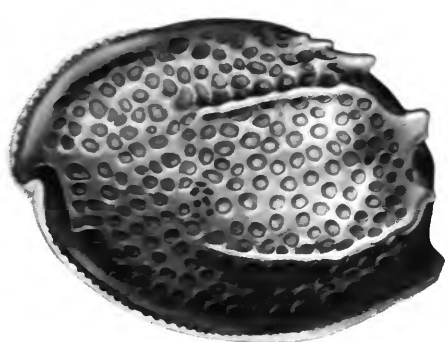

FIGURE 406.—*Rutiderma gerdhartmanni*, female, 27297, Hamburg Zoological Museum, left valve.

DIAGNOSIS OF FEMALE.—Carapace with small incisur and projecting caudal process; lateral surface with 2 longitudinal ribs connecting posteriorly and terminating anteriorly in region of central muscle scars; carapace length 1.35–1.39.

First antenna: 2nd joint with 2 bristles, 1 dorsal, 1 lateral; 3rd joint with 2 dorsal bristles, and 1 ventral bristle.

Second antenna: Endopodite 1-jointed with 4 short bristles.

Sixth limb: End joint with anterior projecting part with 3 bristles and posterior part with 4 plumose bristles.

Seventh limb: Each limb with 10 bristles, 4 proximal, 6 terminal.

Furca: Each lamella with 3 strong claws followed by 3 weak claws.

Lateral eye: Small with 5 minute ommatidia.

DESCRIPTION OF FEMALE (Figures 406, 408, 409).—Carapace with well defined but small incisur forming right angle with lower margin of rostrum; posterior with projecting caudal process (Figures 406; 408*a*,*c*); carapace with greatest height just posterior to middle; preserved specimen weakly calcified.

Ornamentation (Figures 408*b*, 409): Lateral surface with both large and minute punctae and 2 longitudinal ribs connecting posteriorly; both ribs terminating anteriorly in region of central muscle scars; vertical posterior section of ribs with dorsal and ventral projections; section between projections concave posteriorly; 2 small protuberances present along posterodorsal margin of each valve, ventral of these larger than more dorsally located

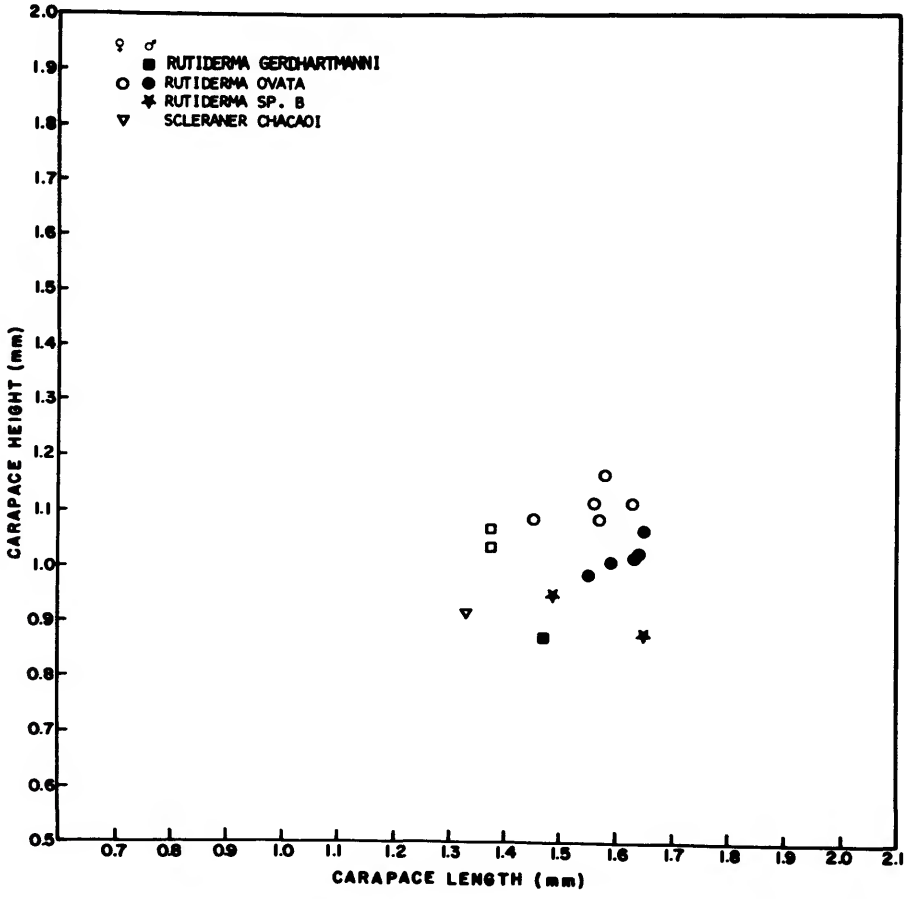

FIGURE 407.—Comparison between shell length and height of adults of *Rutiderma* and *Scleraner*.

protuberance; small ridge present posterior to incisur; surface with scattered hairs; anterior and ventral margins with numerous long hairs broadening near base.

Infold: Infold broad along anterior and ventral margins; infold on rostrum with 13 bristles forming row parallel to anterior margin, and 2 smaller bristles near inner margin of incisur; broad part of anteroventral infold with about 7 parallel striations and 11 bristles; central part of ventral infold bare; list extending along posteroventral infold onto caudal process with 15–20 bristles forming row; 2nd row of about 4 minute bristles present on caudal process anterior to list; 1 bristle present on caudal process posterior to upper end of list; 2 or 3 minute bristles present on posterior infold dorsal to caudal process.

Selvage: Broad prolongation present along anterior and ventral margin, narrower prolongation along posterior margin; margins of prolongation

FIGURE 408.—*Rutiderma gerdhartmanni*, female (specimen no. 4), length 1.36 mm, right valve, lateral view: *a*, complete valve, showing position of muscle scars and some ornamentation; *b*, detail of surface. Female, holotype, length 1.38 mm: *c*, outline of complete specimen showing location of eggs: *d*, distal part of left 5th limb, anterior view; *e*, detail of 2nd exopodial joint on left 5th limb, posterior view; *f*, left 6th limb, medial view; *g*, endites I and II of right 6th limb, lateral view; *h*, tip of 7th limb (bristles not shown); *i*, anterior showing left lateral eye, medial eye and rod shaped organ, anterior process, upper lip; *j*, right lateral eye; *k*, posterior margin showing spines and attached protistan. (Same magnification in microns: *b,i,j,k; d,e.*)

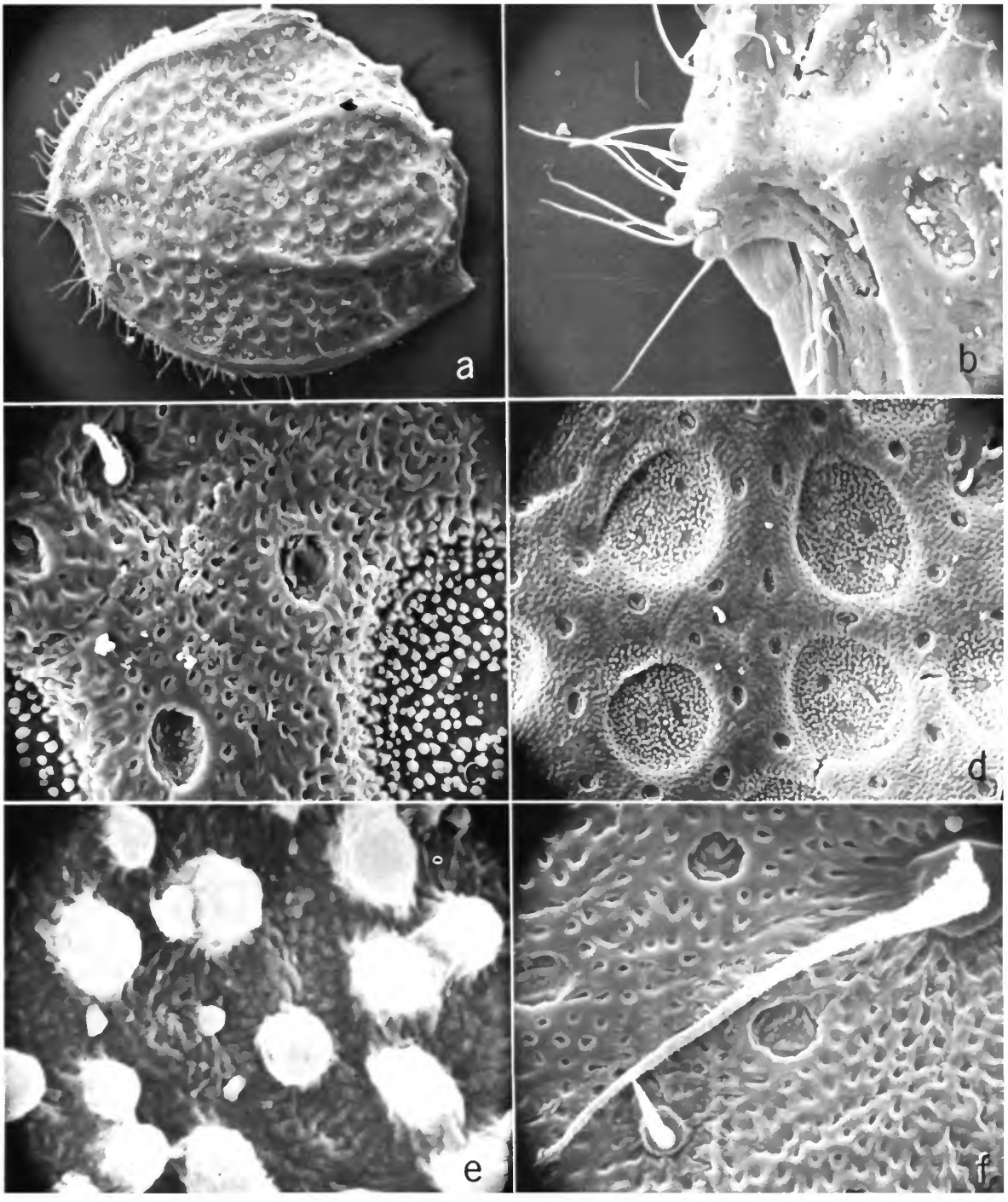

FIGURE 409.—*Rutiderma gerdhartmanni,* female (specimen no. 4), left valve, lateral view: *a,* complete valve, × 65; *b,* anterior, × 300; *c,* detail near middle of "*d,*" × 2000; *d,* detail of surface, × 575; *e,* papillae in large punctae, × 15,000; *f,* bristle and surface between large punctae, × 2000.

along anterior and ventral margins with fringe; posteroventral part of prolongation near caudal processs without fringe; lamellar prolongation divided at incisur; separation in prolongation present just ventral to posterior tip of caudal process.

Size (Figure 407): Specimens dissected by Hartmann: left valve, length 1.36 mm, height 1.06 mm; right valve, length, 1.35 mm, height 1.03 mm; left valve length, 1.39 mm, height 1.02 mm. Holotype, length 1.38 mm, height 1.03 mm. One gravid ♀, length 1.38 mm, height 1.06 mm.

First antenna: 1st joint with short spines forming clusters along dorsal margin and on medial and lateral surfaces; 2nd joint with 2 bristles with short marginal spines, 1 dorsal, 1 lateral; faint spines forming row near dorsal margin on proximal medial surface and on proximal and distal lateral surfaces; 3rd joint with 3 bristles with short marginal spines, 1 ventral, 2 dorsal; 4th joint fused with 3rd, and with 3 bristles with short marginal spines, 2 long ventral, 1 very short dorsal; sensory bristle of 5th joint with 2 short proximal filaments and bifurcate tip; row of faint hairs present on 5th joint near base of bristle; medial bristle of 6th joint short with short marginal spines. Seventh joint: a-bristle short with short marginal spines; b-bristle about 3 times length of a-bristle (no filaments observed); c-bristle reaching tip of sensory bristle of 5th joint and with bifurcate tip. Eighth joint: bare d- and e-bristles with fused base and with blunt tips reaching tip of c-bristle; f-bristle slightly shorter than c-bristle, with bifurcate tip; g-bristle with 1 proximal filament and bifurcate tip reaching tip of c-bristle; tips of bifurcate bristles on joints 5–8 with recurved terminal spine.

Second antenna: Protopodite bare. Endopodite 1-jointed with 4 short bristles. Exopodite: 1st joint with short medial terminal bristle; bristles on joints 2 to 5 with short spines along ventral margins (spines becoming shorter distally along margin); bristles of joints 6 to 8 with natatory hairs; 9th joint with 6 bristles, 4 long with natatory hairs, 2 very short, bare or with few faint hairs; short spines forming row along distal margins of joints 3 to 8; cluster of small spines present on proximal lateral side of 3rd joint.

Mandible: Coxale endite bifurcate with few stout spines, hairs near base. Basale: proximal ventral group with 1 long bristle with short marginal spines and 3 short bristles (2 of these pectinate, but one almost twice diameter of other); 2 bristles (1 short, 1 long) with short marginal spines present near middle of ventral margin; dorsal margin with 3 bristles with short marginal spines, 1 near middle, 2 almost terminal. Exopodite absent. Endopodite: 1st joint with 2 short ventral bristles and spines forming clusters on medial surface; 2nd joint with numerous spines forming clusters on medial surface; dorsal margin with 3 short proximal bristles; ventral margin with stout terminal claw with serrated inner margin with proximal tooth; 2 small ventral bristles and small spinous medial process present near base of claw; 2 short bristles with short marginal spines present dorsal to base of claw (these may be on 3rd joint); 3rd joint with large claw with faint serrations along ventral margin (no tooth present on dorsal margin of claw); 2nd smaller lateral claw with spines along inner margin and 3 short medial bristles present ventral to base of large claw.

Maxilla: Endite I with 3 stout pectinate bristles and 3 spinous bristles; endite II with 2 stout pectinate bristles and 3 spinous bristles; endite III with 3 stout pectinate bristles, 2 spinous distal bristles and 1 long slender proximal bristle with few marginal spines. Coxale with hirsute epipodial appendage and distal anterior bristle with short marginal spines. Basale with 1 distal anterior bristle with short marginal spines and 1 shorter distal posterior bristle, and 1 short bristle near middle of medial margin. Exopodite short with 2 terminal bristles, inner bristle with short marginal spines, about one-half length of outer bristle. Endopodite: 1st joint with 1 α- and 1 β-bristle, both with short marginal spines; distal anterior margin of joint with few spines forming clusters; 2nd joint with 2 broad stout pectinate clawlike bristles, 2 pectinate bristles, and bristles with short marginal spines.

Fifth limb (Figure 408*d,e*): Endite I with 4 short spinous bristles; endite II with spines forming clusters and 4 spinous bristles; endite III with 7 spinous or pectinate bristles, distal of these long with fairly long proximal hairs (3 on 1 side, 6 on other). Exopodite: main tooth of 1st joint consisting of 4 teeth (proximal of these bare, middle 2 teeth with 3 prongs, distal tooth with 6 prongs); 1 short stout bristle with few marginal spines present just proximal to bare tooth; anterior side of 1st joint with long spinous bristle on distal margin proximal to main tooth. Second joint with large

triangular tooth with 2 smaller bare teeth along inner curvature; 1 long spinous bristle present on distal margin proximal to smaller teeth; posterior side with 2 bristles near small tooth and minute bristle near outer corner of large tooth. Outer lobe of 3rd joint with 2 bristles with fairly long thin marginal hairs; inner lobe of 3rd joint with 3 bristles; 4th joint fused with 5th, both with total of 3 or 4 spinous bristles; surfaces of exopodial joints without spines or hairs. Epipodial appendage fragmented on specimen examined, but with at least 35 hirsute bristles.

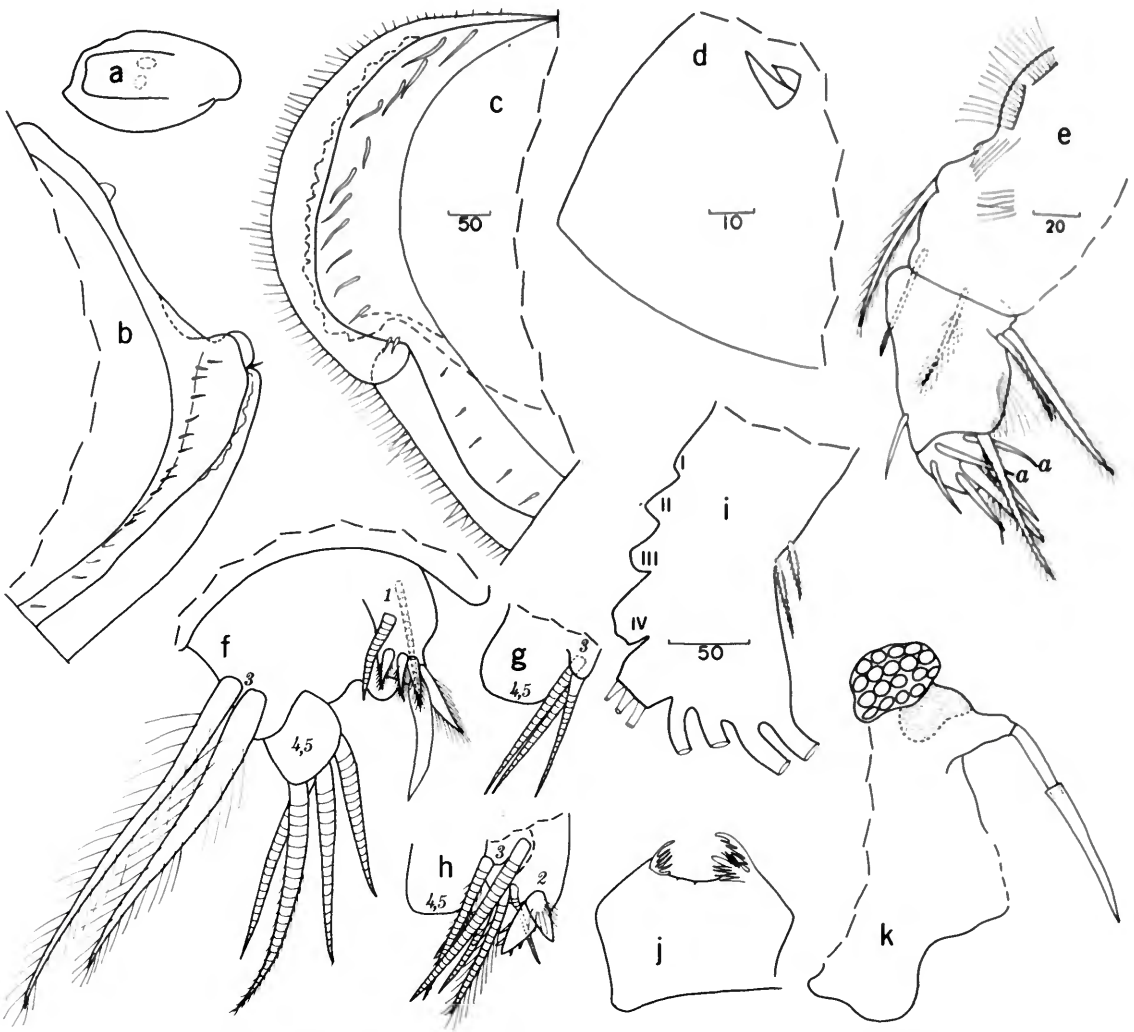

FIGURE 410.—*Rutiderma gerdhartmanni*, male, length 1.48 mm, carapace: *a*, complete specimen showing location of central muscle scars and lateral eye. Right valve, medial view: *b*, posterior; *c*, anterior. Right mandible: *d*, coxale endite, medial view. Maxilla: *e*, left limb, lateral view (endites not shown). Left 5th limb, medial view: *f*, distal end (inner lobe of 3rd joint not shown); *g*, inner lobe of 3rd exopodial joint; *h*, 2nd exopodial joint and inner lobe of 3rd joint. Sixth limb: *i*, left limb (not all bristles shown). Seventh limb: *j*, tip (not all bristles shown). Anterior: *k*, right lateral eye, medial eye and rod-shaped organ, upper lip. (Same magnification in microns: *b,c,k; d,f-h*.)

Sixth limb (Figure 408*f,g*): 2 spinous bristles in place of epipodial appendage; endite I with 2 or 3 bristles; endite II with 2 bristles; endite III with 3 bristles; endite IV with 3 bristles; end joint with anterior projecting part with 3 bristles and posterior part with 4 plumose bristles; lateral surface and posterior margin of limb with long hairs forming clusters.

Seventh limb (Figure 408*h*): Terminal comb with about 5 stout teeth, each with 3 prongs and small teeth near bases opposing 2 teeth with broad marginal spines; each limb with 10 bristles, 4 in proximal group (2 on each side) and 6 in terminal group (3 on each side); each bristle with 2 to 6 bells and distal marginal spines.

Furca: Each lamella with 3 strong claws followed by 3 weak claws; furca similar to that of *R. ovata* described herein.

Eyes and rod-shaped organ (Figure 408*i,j*): Lateral eye small with 5 minute ommatidia; medial eye pigmented with prolonged anterior part; rod-shaped organ elongate with 2 sutures proximally and near middle; middle only slightly wider than proximal part, tip pointed.

Upper lip (Figure 408*i*): Lip small rounded with few hairs posteriorly.

Anterior and posterior: Anterior with single rounded process below medial eye (Figure 408*i*). Posterior hirsute with few spines also along posterodorsal margin (Figure 408*k*).

Eggs: Two gravid females with 4 eggs in brood chamber, one of these also with unextruded eggs.

Parasites (Figure 408*k*): Stalked protistan with buttonlike tip fairly common on appendages and attached to body.

Description of Adult Male (Figure 410).—Carapace with less height than adult female but with similar ornamentation (Figure 410*a*); valves more weakly calcified than those on female.

Infold (Figure 410*b,c*): Infold on rostrum with 12 to 16 bristles and 2 small bristles near inner margin of rostrum; anteroventral infold with 9 or 10 short bristles; central part of ventral infold bare; list extending along posteroventral infold onto caudal process with 17 minute bristles; 1 bristle present on caudal process posterior to upper end of list.

Selvage: Similar to that on adult female.

Size: Length 1.48 mm, height 0.88 mm (Figure 407).

First antenna: 1st joint with short spines forming rows on medial surface near ventral margin; 2nd joint with long hairs forming rows on medial surface and proximal part of ventral margin; dorsal margin with few proximal spines and short bristle (with short marginal spines) distal to middle; lateral surface of 2nd joint with short distal bristle with short marginal spines; 3rd joint short, separated from 4th joint by suture (suture more distinct on medial side), and with 3 short bristles (2 dorsal, 1 ventral) with short marginal spines; 4th joint with hairs forming rows on distal half of medial surface and ventral margin; ventral margin with 3 terminal bristles with short marginal spines (inner bristle just reaching end of limb, outer bristles much longer); dorsal margin with short subterminal bristle with short marginal spines; 5th joint ventral, wedged between 4th and 6th joints; stout part of sensory bristle almost reaching distal end of 6th joint and bearing stout bristle and about 20 filaments; stout bristle reaching well past end of limb, and with 1 short proximal filament, few spines forming group near middle, and bifurcate tip; each end of bifurcated tip of sensory bristle with small bent processs and subterminal ventral spine; 6th joint with long hairs forming few clusters on medial surface and along ventral margin; distal margin with short medial bristle on ventral corner (bristle with short marginal spines and reaching past end of limb). Seventh joint: a-bristle similar to bristle on 6th joint; b-bristle stout proximally, about 3 times length of a-bristle, with 2 short proximal filaments and spines forming cluster about three-fourths distance from proximal end of bristle (bristle becoming narrower at location of spines); tip of b-bristle with bent process and minute subterminal ventral spine; c-bristle extremely long, broken on both appendages examined, but with 9 short filaments on remaining stump (tip of filaments with bent tip and fairly long subterminal spine). Eighth joint: d- and e-bristles bare and with suaged tips; f-bristle similar to c-bristle (broken on both appendages of specimen examined); g-bristle same length as d-bristle and with 1 short proximal filament (end of bristle with bent tip and subterminal spine).

Second antenna: Limb similar to that on male of *R. ovata*.

Mandible (Figure 410*d*): Coxale with 2 distal minute medial processes representing endite.

Basale similar to that on male of *R. ovata,* but short marginal spines observed on all medial bristles. Hirsute exopodite reaching halfway up 1st endopodite joint. Endopodite similar to that on male *R. ovata.*

Maxilla (Figure 410*e*): Precoxale and coxale with fringed epipodial appendage; coxale with stout plumose anterodorsal bristle; basale with 2 bristles along distal margin, 1 hirsute, 1 with short marginal spines. Exopodite with 2 spinous bristles. Endopodite: 1st joint with slender bare α-bristle and stout plumose 6-bristle; 2nd joint spinous with 2 a-bristles and 5 terminal bristles. Endite I with 6 spinous bristles, remaining 2 endites obscure.

Fifth limb (Figure 410*f-h*): Endite I with 3 bristles, endite II with 3–5 bristles, endite III with 6 or 7 bristles. Exopodite: 1st joint with anterior and posterior bristles and 6 broad bristles, longest of these bare, others hirsute; 2nd joint with about 6 bristles; inner lobe of 3rd joint with about 3 bristles, outer lobe with 2 hirsute bristles; joints 4 + 5 hirsute, fused, with 4 bristles. Epipodial appendage with 41 hirsute bristles.

Sixth limb (Figure 410*i*): Endite I with 3 bristles; endite III with 2 or 3 bristles; lateral and medial surfaces and posterior margin of limb hirsute. Limb otherwise similar to that of adult ♀.

Seventh limb (Figure 410*j*): Terminus with comb of 3 teeth with broad marginal spines opposing 2 similar teeth; each limb with 8 bristles, 4 terminal (2 on each side) and 4 proximal (2 on each side), each bristle with 3 to 5 bells and distal marginal spines.

Furca: Similar to that on male *R. ovata.*

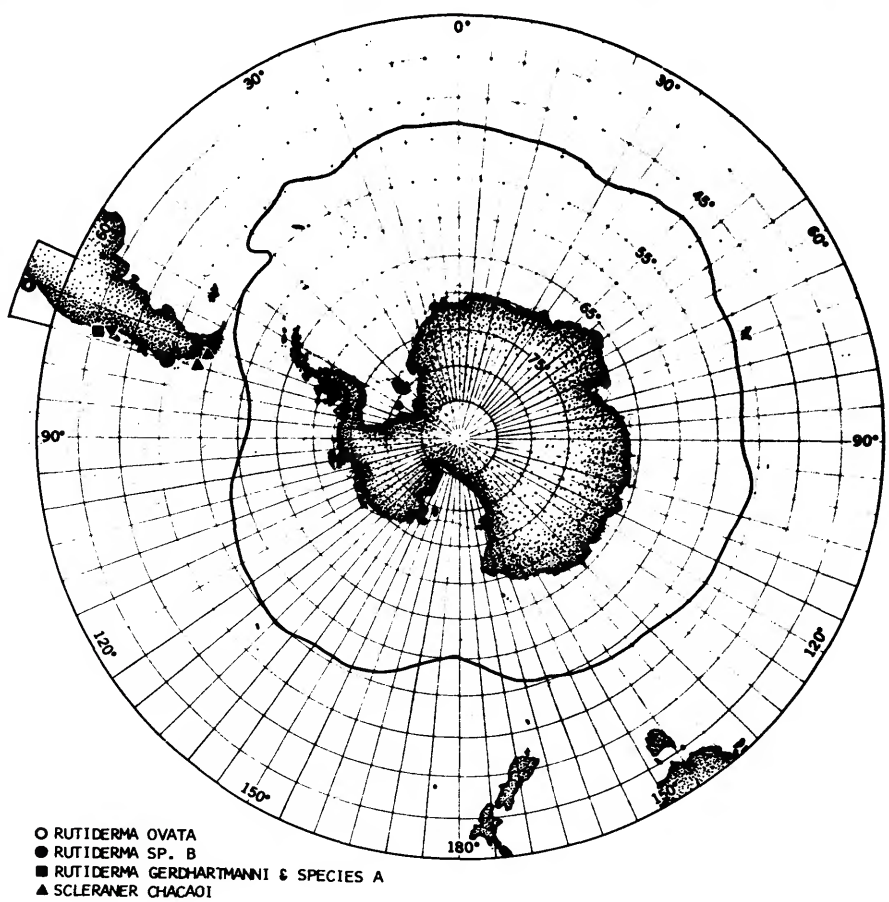

FIGURE 411.—Distribution map of species of *Rutiderma* and *Scleraner.*

Medial eye and rod-shaped organ (Figure 410*k*): Medial eye similar to that on adult female. Rod-shaped organ with suture and broadening near middle.

Lateral eye (Figure 410*k*): Eye large pigmented with about 19 ommatidia.

Upper lip: Similar to that on female (Figure 410*k*).

Posterior: Posterior without hairs or spines.

Copulatory organ: Not observed under high magnification, but similar type to that on adult male of *R. ovata*.

COMPARISONS.—The specimens identified by Hartmann as *R. compressa* have been assigned to a new species primarily because of the 6th limb on which the anterior part of the end joint forms a projecting process bearing 3 bristles. The 6th limb of *R. compressa* was not described in the original description by Brady and Norman (1896), but was illustrated by Müller (1908) from a specimen collected near South Africa. His figure shows the anterior part of the end joint of the 6th limb to be only very slightly separated from the posterior part. I have not examined either the specimens described by Brady and Norman or that described by Müller, and it is possible that they do not belong to the same species; however, both Brady and Norman and Müller illustrated the first antenna of a female. These illustrations show the lack of a lateral bristle on the 2nd joint and only 1 dorsal bristle on the 3rd joint. The 1st antenna of *R. gerdhartmanni* bears a lateral bristle on the 2nd joint and 2 dorsal bristles on the 3rd joint. I do not, however, rely strongly on those differences in the 1st antennae, because bristles may have been overlooked by Brady and Norman and Müller, or they may have described and illustrated 2nd antennae from juveniles. The carapace illustrated by Brady and Norman bears numerous riblets between the anterodorsal rib and the anterodorsal shell margin. These are not present on *R. gerdhartmanni*. The length of the carapace of the female *R. gerdhartmanni* is in the order of 1.35 mm to 1.39 mm; the length of *R. compressa* given by Brady and Norman (1896:674) was 1.5 mm; the length of the specimen identified as *R. compressa* by Müller was given by him as 1.6 mm (1908:92).

DISTRIBUTION.—This species was collected in Bahia Inglés, Chile, which is in the Antarctic-to-35°S region, at a depth of 12 m (Figure 411).

121. *Rutiderma ovata*, new species

FIGURES 412–424

HOLOTYPE.—USNM 137683, gravid ♀, some appendages and valves in alcohol, remaining appendages on slide.

TYPE-LOCALITY.—*Eltanin* Cruise 3, station 71, sample 71–26.

ETYMOLOGY.—Specific name is derived from the Latin "ovatus" [= egg-shaped] in reference to the rounded posteroventral margin of the carapace.

ALLOTYPE.—USNM 137685, adult ♂, from same sample as holotype.

PARATYPES.—USNM 137682, N–1 ♂, from *Eltanin* Cruise 3, station 75, sample 75–19. USNM 137684, 4 gravid ♀♀, USNM 137687, 4 adult ♂♂, and USNM 137686, about 1000 specimens at various stages of maturity, all from same sample as holotype; USNM 139857, 1 ♀ from same sample as holotype.

REMARKS CONCERNING STATION DATA OF SAMPLE CONTAINING PARATYPE USNM 137682.—The sample from *Eltanin* Cruise 3, station 75, was collected in a Phleger corer, according to the label in the sample and also the cruise data. Because *Rutiderma* has not been reported previously at the great depth at which this sample was collected (1932–3142 m), I asked Dr. R. S. Houbrick of the Smithsonian Oceanographic Center for information concerning other taxa present in the sample. He informed me (pers. comm., January 1972) that the sample contained abundant cypris larvae and euphausids. Because it seems unlikely that a large number of organisms would be collected in a Phleger corer, I believe that data concerning this sample have been erroneously reported. Therefore, I have not used the depth information or this sample in this paper.

In this study the new species was first encountered in a sample from *Eltanin* station 75. That sample contained only 1 specimen, a N–1 stage juvenile male. Because the family had not been represented in prior samples, the juvenile was described and illustrated in detail. Then about a thousand specimens, including adult males and females, were found in a sample from *Eltanin* station 71. Because of the comprehensive description of the juvenile, the adult female and male are compared with the juvenile, and illustrations of the

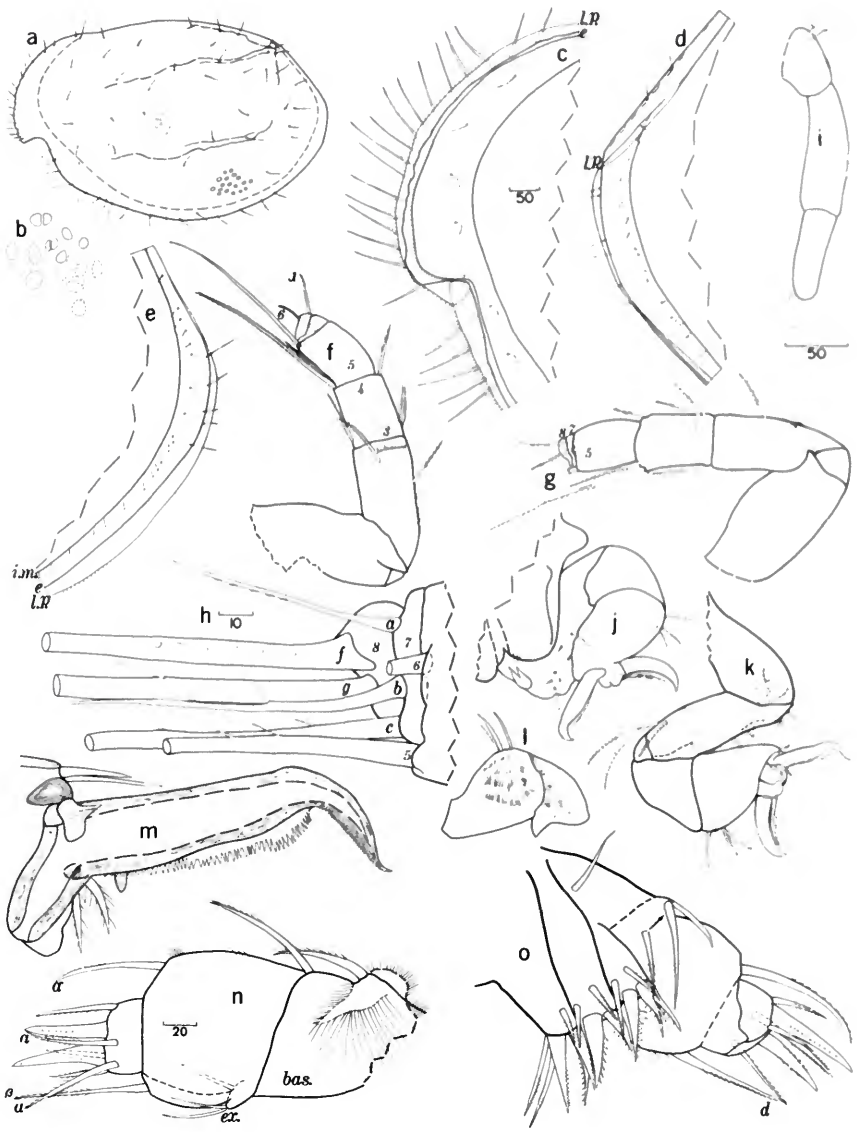

FIGURE 412.—*Rutiderma ovata*, N–1 male, USNM 137682, length 1.11 mm, carapace: *a*, complete specimen showing position of central muscle scars and some ornamentation; *b*, central muscle scars on left valve, lateral view; *c*, anterior of right valve, medial view; *d*, posterior of left valve, medial view; *e*, posterior of right valve, medial view. First antenna: *f*, left limb, lateral view (not all bristles shown); *g*, right limb, medial view (not all bristles shown); *h*, tip of right limb, medial view (d- and e-bristles not shown). Right 2nd antenna: *i*, endopodite, medial view. Mandible: *j*, left mandible and upper lip in place (details of mandible generalized); *k*, left mandible, lateral view; *l*, 1st and 2nd endopodial joints of right mandible showing medial spines, medial view; *m*, detail of right mandible, medial view. Maxilla: *n*, left limb, lateral view (endites not shown); *o*, right limb, medial view (one of exopodial bristles broken off and offset in mount; endites folded on mount so that they point dorsally). (Same magnification in microns: *b-g,j-l; n,o.*)

adults are presented only where considered necessary.

DIAGNOSIS OF FEMALE.—Carapace with distinct incisur and truncate posterior without projecting caudal process; lateral surface with 2 weak longitudinal ribs; carapace length about 1.11 mm.

First antenna: 2nd joint with 2 bristles, 1 lateral, 1 dorsal.

Second antenna: Endopodite 1-jointed with 4 short bristles.

Sixth limb: End joint with 3 anterior bristles and 4 plumose posterior bristles; ventral margin of end joint with groove between anterior and posterior bristles.

Seventh limb: Each limb with 10 bristles, 4 proximal, 6 terminal.

Furca: Each lamella with 3 strong claws followed by 3 weak claws.

Lateral eye: Small with about 5 ommatidia.

DESCRIPTION OF N–1 MALE (Figures 412–414).—Carapace oval in lateral view with greatest height near middle of dorsal margin and greatest posterior extension near middle of posterior margin (Figure 412*a*); rostrum rounded anteriorly and projecting to form distinct incisur; ventral margin of rostrum forming right angle at incisur; posterodorsal margin truncate, but posterior without distinct caudal process; preserved specimen very weakly calcified.

Ornamentation (Figure 414*d-f*): Lateral surface with distinct but small punctae and 2 weak longitudinal ridges; upper ridge ending posteriorly, forming corner with low relief; lateral surface, anterior and ventral margins with long hairs broadening near base.

Infold (Figures 412*c-e*, 414*a-c*): Infold fairly broad, especially along anterior and anteroventral margins; infold on rostrum with 4 feathered bristles forming row paralleling anterior margin and 1 shorter bristle near incisur; broad part of anteroventral infold weakly striate with 5 branched bristles; central part of ventral infold bare; posteroventral and posterior infold with about 30 bristles forming row.

Selvage (Figure 414*f*): Fairly broad lamellar prolongation present along anterior, ventral, and posterior margins; margin of lamellar prolongation along anterior, ventral, and truncate part of posterior margin with fringe; posteroventral part of lamellar prolongation without fringe; lamellar prolongation divided at incisur.

Central muscle scars (Figure 412*b*): Scars poorly defined but consisting of about 16 individual scars.

Size: USNM 137682 length 1.11 mm, height 1.03 mm, height 93 percent of length.

First antenna (Figure 412*f-h*): 1st joint with short spines forming clusters on medial surface; 2nd joint with dorsal and lateral bristle with short marginal spines; joint with long proximal spines along dorsal margin, and short spines forming lateral row near dorsal half of distal margin; 3rd joint fused with 4th and with 3 bristles, 2 dorsal, 1 ventral, latter bristle with short marginal spines; 4th joint with 3 bristles, 1 dorsal, 2 ventral, all with short faint marginal spines; sensory bristle of 5th joint with 2 short proximal filaments and bifurcate tip; row of faint hairs present on 5th joint near base of bristle; medial bristle of 6th joint short, with short marginal spines. Seventh joint: a-bristle short with faint marginal spines; b-bristle about twice length of a-bristle and with 2 short marginal filaments; c-bristle reaching tip of sensory bristle of 5th limb, with 3 short marginal filaments. Eighth joint: d- and e-bristles bare, filamentlike, about same length as c-bristle; f-bristle with 4 short proximal filaments; g-bristle with 1 short filament; f-bristle slightly shorter than c-bristle; g-bristle about same length as c-bristle; d- and e-bristles with blunt tips; remaining bristles of eighth joint, c-bristle of 7th joint and sensory bristle of 5th joint with bifurcate tip, each tip with terminal spine.

Second antenna (Figure 412*i*): Protopodite bare. Endopodite 3-jointed reaching 4th joint of exopodite: 1st joint with 4 short ventral bristles, 3 proximal, 1 distal; 2nd joint with 2 short ventral bristles; 3rd joint with 2 short terminal bristles. Exopodite: 1st joint with short medial terminal bristle; short spines forming row along distal margins of joints 3 to 8; all bristles without natatory hairs; bristle of 2nd joint reaching 8th joint; bristles of joints 2 to 9 with closely spaced small spines forming row along distal ventral margins; joints 9 with 5 bristles (dorsal medial bristle very short); tips of long bristles terminating in minute hook.

Mandible (Figures 412*j-m*, 413*a*): Coxale endite bifurcate with few stout spines and hairs near base. Basale: proximal ventral group of bristles with 1 long bristle on margin and 3 bristles with bases on lateral surface near margin (2 of these stout pectinate); 3 additional bristles present on or near

FIGURE 413.—*Rutiderma ovata*, N–1 male, USNM 137682, length 1.11 mm: *a*, proximal ventral group of bristles on basale of right mandible, medial view; b, distal part of left 5th limb, anterior view; *c*, distal part of right 5th limb, posterior view; *d*, right 6th limb, medial view; *e*, tip of 7th limb; *f*, posterior showing marginal spines and internal sclerites; *g*, right lateral eye; *h*, anterior showing left lateral eye, medial eye and rod-shaped organ, anterior process; *i*, left lamella of furca; *j*, posterior showing copulatory organs, anal tract (dashed) and internal sclerites; *k*, outline of stomach with sketch of contents. (Same magnification in microns: *d,f-k; c,e.*)

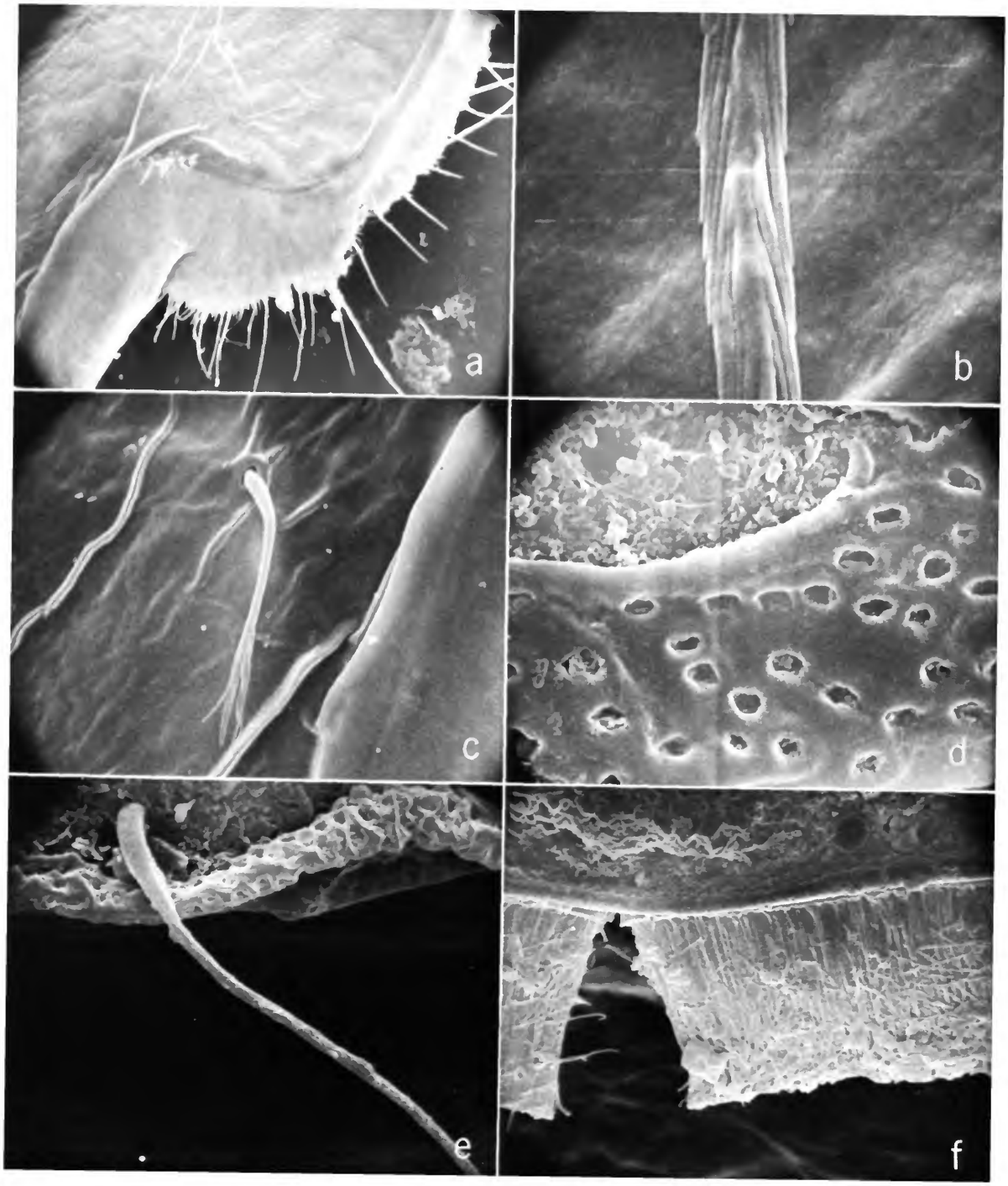

FIGURE 414.—*Rutiderma ovata*, N-1 male, USNM 137682, left valve: *a*, incisur and lower part of rostrum, medial view, × 500; *b*, detail of medial bristle on rostral infold, × 10,000; *c*, bristle on anteroventral infold below incisur, medial view, × 2000; *d*, detail of lateral surface of valve, × 5000; *e*, bristle on lateral valve surface, × 2000; *f*, lateral view, lamellar prolongation of selvage along ventral margin, × 2000.

ventral margin; dorsal margin with 3 spinous bristles, 1 near middle, 2 distally. Exopodite absent. Endopodite: 1st joint with 2 slender ventral bristles and spines forming clusters on medial surface; 2nd joint with numerous spines forming clusters on medial surface; dorsal margin with 3 proximal bristles; ventral margin with stout terminal claw with serrated inner margin with proximal tooth; small spinous medial process present at base of claw; 2 small bristles present on ventral and dorsal side of claw base (2 on dorsal side may be on 3rd joint); 3rd joint with large claw with spines along inner margin (no tooth present on dorsal margin of claw), 2nd smaller claw also with spines along inner margin, and 3 short slender bristles.

Maxilla (Figure 412*n,o*): Endite I with 3 stout pectinate bristles and 3 spinous bristles; endite II with 2 stout pectinate bristles and 3 spinous bristles; endite III with 3 stout pectinate bristles, 3 spinous distal bristles, and 1 bare proximal bristle. Coxale with hirsute epipodial appendage and spinous distal anterior bristle. Basale with spinous distal anterior and distal posterior bristle. Exopodite short with 2 terminal bristles (bristles bare or with few marginal spines). Endopodite: 1st joint with 1 α- and 1 6-bristle, both with short marginal spines (6-bristle slightly longer than α-bristle); spines present along anterior margin of joint; 2nd joint with 1 or 2 spinous a-bristles, 3 pectinate bristles (posterior of these smaller than others), and 2 spinous bristles.

Fifth limb (Figure 413*b,c*): Endite I with 3 spinous bristles, one of these very short; endite II with 4 spinous or pectinate bristles; endite III lobate with 6 bristles: 2 proximal bristles with short marginal spines; 2 pectinate bristles in middle, and 1 long and 1 minute distal bristle (long bristle with 7 or 8 extremely long proximal hairs). Exopodite: main tooth of 1st joint consisting of 4 teeth, proximal of these bare, others with secondary teeth; short stout spinous bristle present proximal to bare tooth; anterior side of 1st joint with long bristle near distal margin. Second joint with large triangular tooth with 2 small bare triangular teeth along inner curvature; anterior side of joint with 2 bristles proximal to distal small triangular tooth, and with small bristle present near outer corner of large tooth; outer lobe of 3rd joint with 2 bristles with fine marginal hairs; inner lobe of 3rd joint with 3 bristles; 4th joint fused with 5th, both with total of 4 spinous bristles; (additional bristle present on exopodite, but whether it is on 1st joint proximal to bare tooth or on inner lobe of 3rd joint could not be determined); surfaces of exopodite joints bare. Epipodial appendage with 43 hirsute bristles.

Sixth limb (Figure 413*d*): 1st endite with 3 bristles, 1 long with short faint marginal spines, 2 short (medial) with longer marginal spines; 2nd endite with 1 bristle with short marginal spines; 3rd endite with 2 or 3 bristles with short marginal spines; 4th endite with 3 bristles with short marginal spines; end joint with 6 bristles on ventral margin (4 posterior stout plumose, 2 anterior slender and with short marginal spines); surface of end joint and posterior margin with few spines forming clusters; 2 bristles present in place of epipodial appendage.

Seventh limb: Terminal comb with about 5 stout teeth on one side opposing 2 stout teeth with smaller teeth on each side (obscure on slide) (Figure 413*e*); each limb with 8 bristles, 4 in proximal group (2 on each side) and 4 in terminal group (2 on each side); each bristle with 2 to 5 bells and distal marginal spines; USNM 137682 with some bristles strongly tapering, a juvenile character.

Furca (Figure 413*i*): Each lamella with 3 strong claws followed by 3 weak claws; claws with spines forming lateral and medial rows along posterior margins; hairs present on lamellae at base of claws and following claws and along anterior margins of main claws; spines on claw 1 forming small

FIGURE 415.—*Rutiderma ovata*, female, USNM 137686, length 1.52 mm, carapace.

groups with distal spines in group being longer than proximal spines.

Eyes and rod-shaped organ (Figure 413*h*): Lateral eye slightly smaller than medial eye, with 6 or 7 small amber translucent ?ommatidia, otherwise quite transparent. Medial eye with internal black pigmented area. Rod-shaped organ elongate, widening markedly near middle, with 3 sutures, 2 proximal, 1 near middle.

Upper lip: Helmet shaped with few hairs posteriorly.

Anterior and posterior: Anterior with single rounded process immediately below medial eye. Posterior hirsute, with few spines along posterodorsal margin (Figure 413*j*).

Copulatory organ: Consisting of 2 small lobes (Figure 413*j*).

Gut content: Gut with annelid spines and at least 2 genera of nematodes (Figure 413*k*).

Description of Adult Female (Figures 415–417).—Carapace similar in shape to that of N–1 male (Figures 415, 416*a*). Infold behind rostrum of USNM 137683 with 4 bristles on left valve and 5 on right; bristles on posterior infold similar to those on N–1 male. Most specimens weakly calcified.

Ornamentation (Figure 417*a-c*): All carapaces with upper and lower horizontal ribs which vary in relief from specimen to specimen; most specimens without radial riblets, but some with 1 faint radial riblet extending ventrally from near posterior end of lower rib; rare specimens with faint radial riblets extending anteroventrally along anterior part of lower rib; some rare specimens also with 1 faint radial riblet extending from posterior end of upper rib to posterodorsal margin of carapace; some specimens with faint vertical rib connecting posterior ends of upper and lower horizontal ribs. Surface of carapace with punctae and hairs as on N–1 male.

Size (Figure 407): USNM 137683, length 1.58 mm, height 1.17 mm, height 74 percent of length. USNM 137684, 4 specimens: length 1.45 mm, height 1.09 mm, height 75 percent of length; length

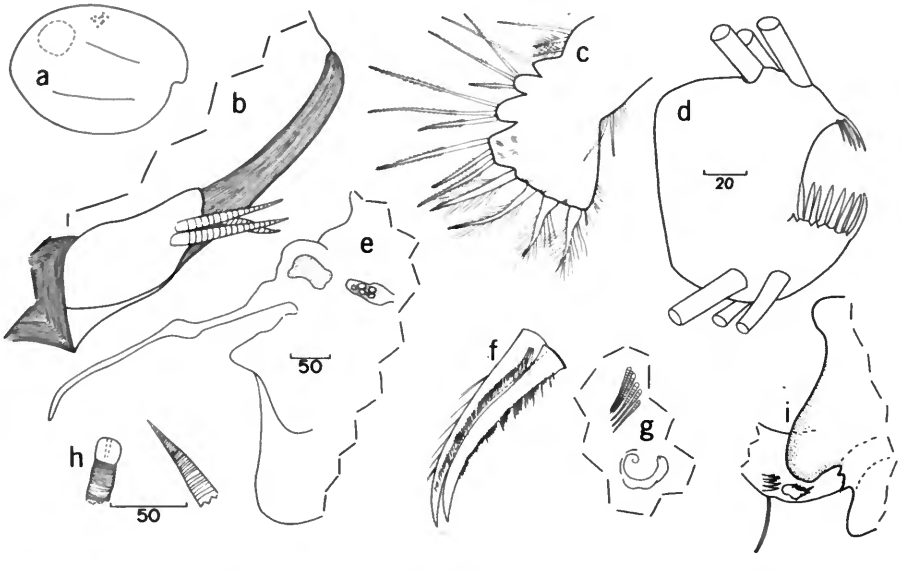

Figure 416.—*Rutiderma ovata*, female, USNM 137683, length 1.58 mm: *a*, complete specimen showing location of 1 egg, lateral view; *b*, endopodite of left 2nd antenna, medial view; *c*, left 6th limb, lateral view; *d*, tip of 7th limb; *e*, anterior showing left lateral eye, medial eye and rod-shaped organ, anterior process, and upper lip; *f*, claw 1 of left lamella, medial view, and right lamella, lateral view, anterior to left; *g*, left genitalia and brushlike organ, anterior to left; *h*, opposite ends of nematode in gut of ostracode. Female, USNM 137686: *i*, anterior showing relative positions of upper lip, esophagus, and coxale endite of right mandible. (Same magnification in microns: *c,e-g; h,i*.)

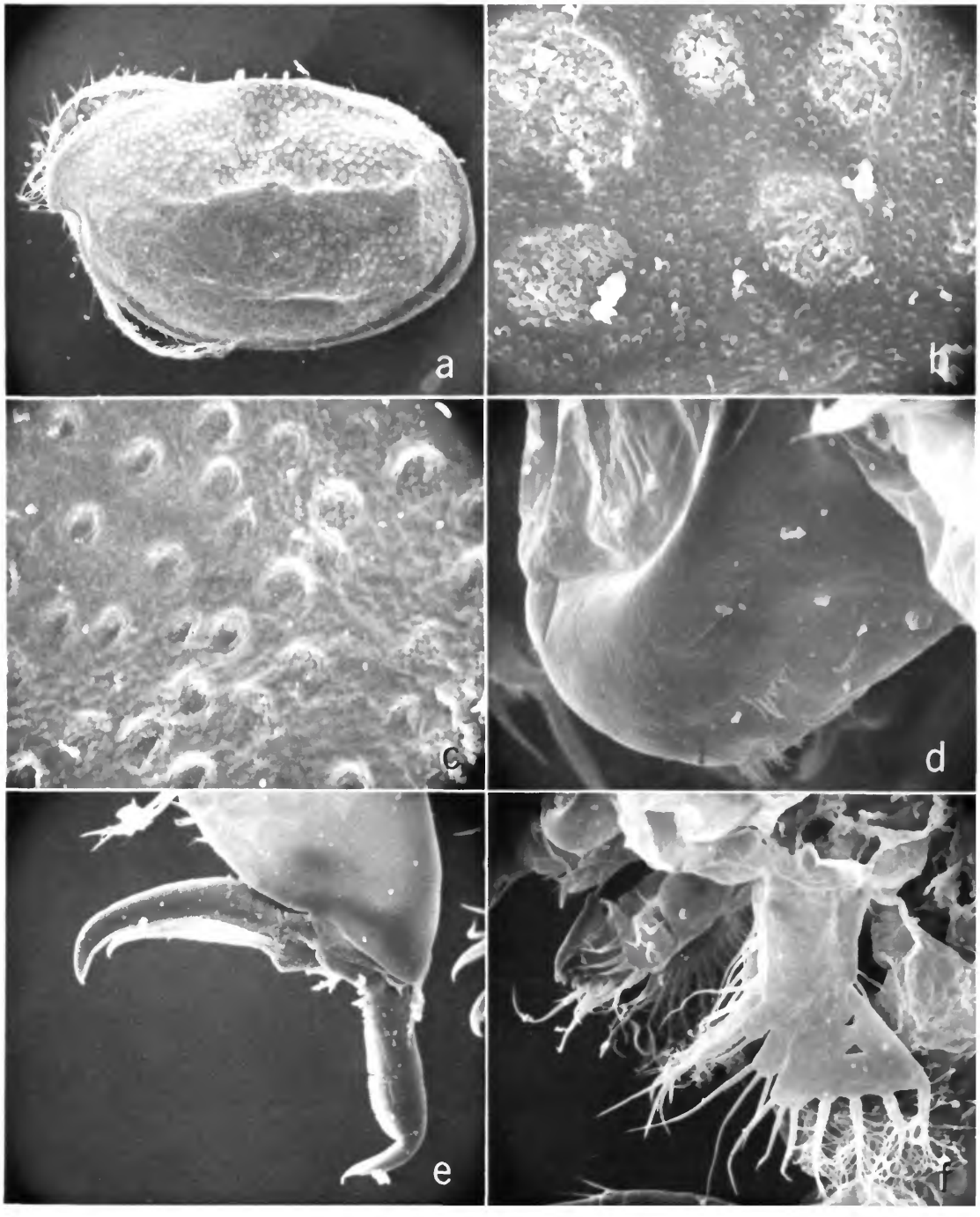

FIGURE 417.—*Rutiderma ovata*, female, USNM 139857: *a*, complete carapace, animal removed, × 57; *b*, detail of shell, × 1150; *c*, detail of shell between punctae, × 5750; *d*, upper lip, anterior to left, × 10,000; *e*, tip of right mandible, anterior to left, medial view, × 380; *f*, limbs in mouth region (upper lip to upper left), × 190.

1.63 mm, height 1.12 mm, height 69 percent of length; length 1.57 mm, height 1.09 mm, height 69 percent of length; length 1.56 mm, height 1.12 mm, height 72 percent of length.

First antenna: Joints 1–6 similar to those on N–1 male except 1st joint with short spines on medial surface and longer spines on lateral surface, 3 bristles of 3rd joint with short marginal spines, shorter of 2 ventral bristles on 4th joint reaches well beyond 8th joint. Seventh joint: a-bristle short with faint marginal spines; b-bristle bare, about twice length of a-bristle; c-bristle same length as sensory bristle, with bifurcate tip. Eighth joint: bare d- and e-bristles same length as c-bristle; f-bristle almost same length as c-bristle, with bifurcate tip; f-bristle same length as c-bristle, with 1 short proximal filament and bifurcate tip (short proximal filament with pointed tip).

Second antenna (Figure 416*b*): Protopodite bare. Endopodite 1-jointed with 4 short bristles. Exopodite: 1st joint with short medial terminal bristle; short spines forming row along distal margins of joints 2 to 8; bristles of joints 6 to 8 with natatory hairs; bristle on 2nd joint reaching 9th joint; bristles on joints 2 to 5 with short spines along ventral margins (spines forming groups and becoming shorter distally along bristles); 9th joint with 6 bristles, 4 long with natatory hairs, 2 very short, bare or with faint hairs.

Mandible (Figure 417*e,f*), *maxilla; fifth limb*: Similar to those on N–1 male.

Sixth limb (Figure 416*c*): Endites similar to that of N–1 male. End joint with 7 bristles on ventral margin: 3 anterior bristles with short marginal spines; 4 posterior bristles plumose (3 anterior bristles separated by groove from posterior 4 suggesting formation of 5th endite).

Seventh limb (Figure 416*d*): Terminal comb with about 13 teeth with minute teeth near bases opposing about 9 slender recurved teeth; each limb with 10 bristles, 4 in proximal group (2 on each side), 6 in distal group (3 on each side); each bristle with 3 to 6 bells and distal marginal spines.

Lateral eye (Figure 416*e*): Eye about one-third size of eye of N–1 male, pigmented, with about 5 small ommatidia.

Furca (Figure 416*f*) *and upper lip* (Figures 416*e,i*; 417*d*): Similar to those on N–1 male.

Medial eye and rod-shaped organ (Figure 416*e*): Medial eye pigmented; rod-shaped organ 1-jointed broadening near middle.

Posterior: Margin hirsute but without spines on dorsal part.

Genitalia and brushlike organ (Figure 416*g*): Genitalia consisting of minute sclerotized oval process. Brushlike organ consisting of about 6 minute bristles dorsal to genitalia.

Eggs: USNM 137683 with 2 eggs; USNM 137684, 3 specimens with 3, 3, and 4 eggs.

Gut content: The gut content of 2 gravid females were examined; they contained nematodes (Figure 416*h*), crustacean fragments, annelid spines, and sedimentary particles.

Description of Adult Male (Figures 418–424).—Carapace more narrow anteriorly in lateral view than carapace of adult female or juvenile male, however, ornamentation similar (Figures 418, 419 *a,b*). Infold behind rostrum on USNM 137685 with 6 bristles, otherwise infold similar to that of female.

Size (Figure 407): USNM 137685, length 1.55 mm, height 0.99 mm, height 64 percent of length. USNM 137687, 4 specimens: length 1.59 mm, height 1.01 mm, height 64 percent of length; length 1.64 mm, height 1.03 mm, height 63 percent of length; length 1.63 mm, height 1.02 mm, height 63 percent of length; length 1.65 mm, height 1.07 mm, height 65 percent of length.

First antenna (Figure 424*c,e-g*): 1st joint with few short spines forming clusters on medial surface; medial surface of 2nd joint with numerous long spines forming clusters on proximal half and 2 clusters of long hairs near proximal ventral mar-

Figure 418.—*Rutiderma ovata*, male, USNM 137687, length 1.59 mm, carapace.

FIGURE 419.—*Rutiderma ovata*, male, USNM 137685, length 1.55 mm, carapace: *a*, anterior of left valve showing bristles (dashed) on infold, lateral view (exterior bristles not shown); *b*, central muscle scars on left valve, lateral view. Left 2nd antenna: *c*, endopodite and part of protopodite, medial view. Right mandible, medial view: *d*, complete limb; *e*, distal end (not all marginal spines on bristles shown); *f*, part of coxale and basale. Maxilla: *g*, left limb, lateral view; *h*, exopodite on right limb, lateral view. Fifth limb: *i*, distal part; *j*, bristles on 1st exopodial joint on limb shown in "*i*"; *k*, bristles on 2nd exopodial joint of limb shown in "*i*"; *l*, detail of exopodial joints 3–5 on limb shown in "*i*." Sixth limb: *m*, left limb, medial view. Furca: *n*, right lamella. Anterior: *o*, medial eye and rod-shaped organ, upper lip; *p*, left lateral eye. Posterior: *q*, right copulatory limb and posterior claw on furca. (Same magnification in microns: *a-d,g,m-q; e,f,j-l.*)

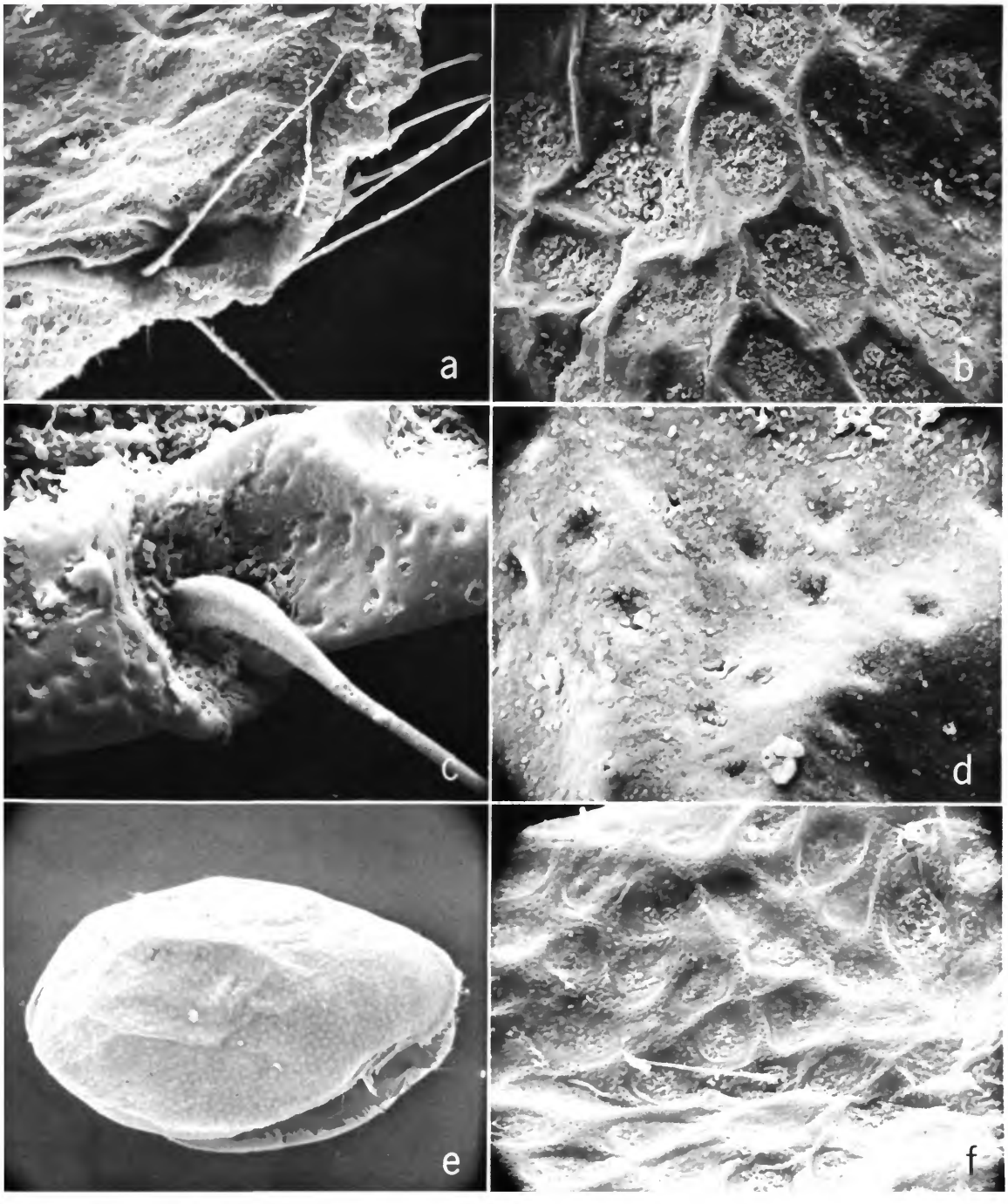

FIGURE 420.—*Rutiderma ovata*, male, USNM 137685, right valve, lateral view: *a*, rostral area, × 720; *b*, detail of surface, × 720; *c*, detail of bristle, × 7200; *d*, detail of pits, × 7200. Male, USNM 139846, carapace, lateral view; *e*, complete valve, × 58; *f*, detail of surface, × 600.

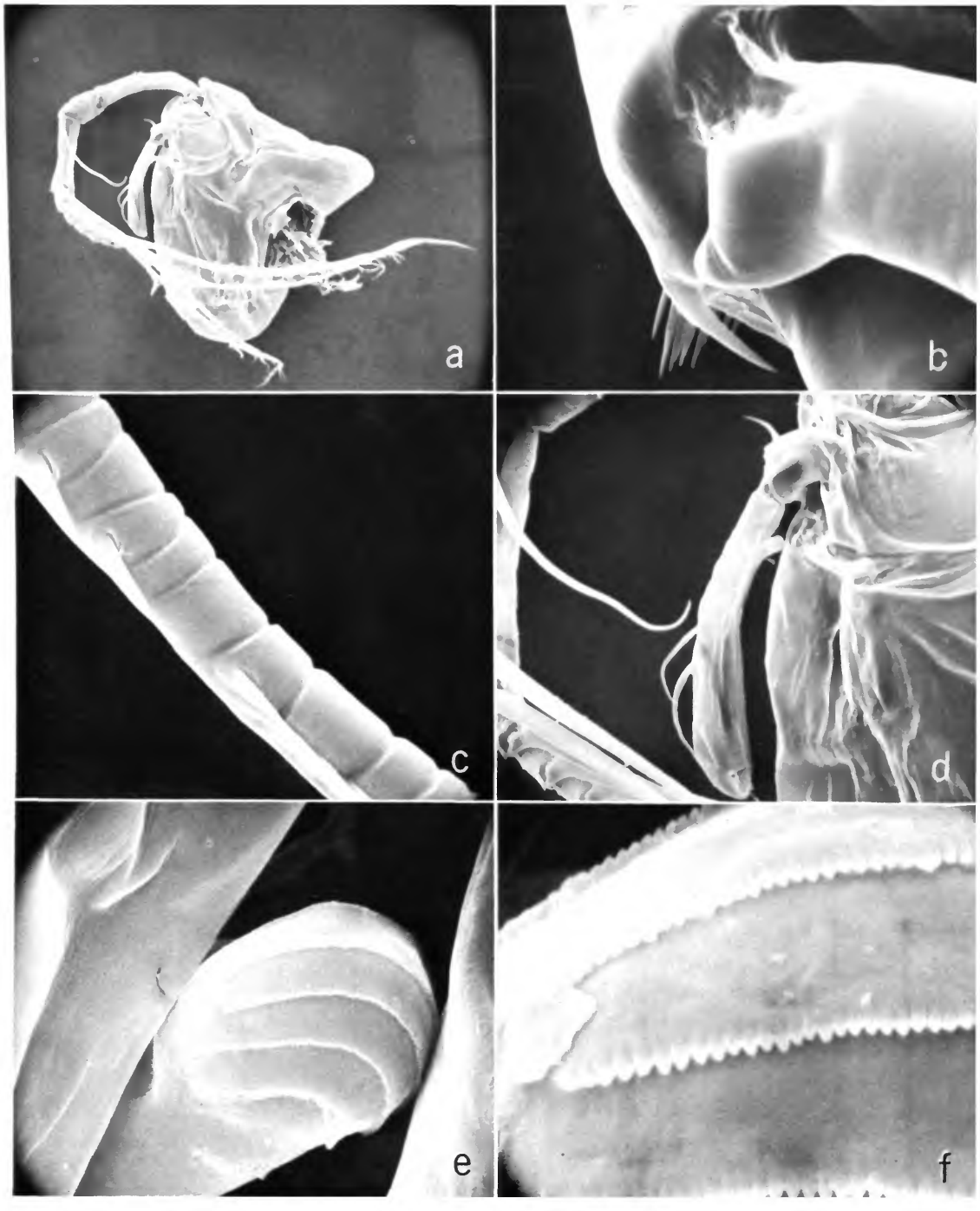

FIGURE 421.—*Rutiderma ovata*, male, USNM 139846, right 2nd antenna, medial view: *a*, complete limb, × 90; *b*, spines near base of bristle on 4th exopodial joint in "*a*," × 2800; *c*, bristle on 2nd joint of exopodite in "*a*," × 3400; *d*, endopodite in "*a*," × 290; *e*, tip of endopodite in "*d*," × 4300; *f*, detail of "*e*," × 15,000.

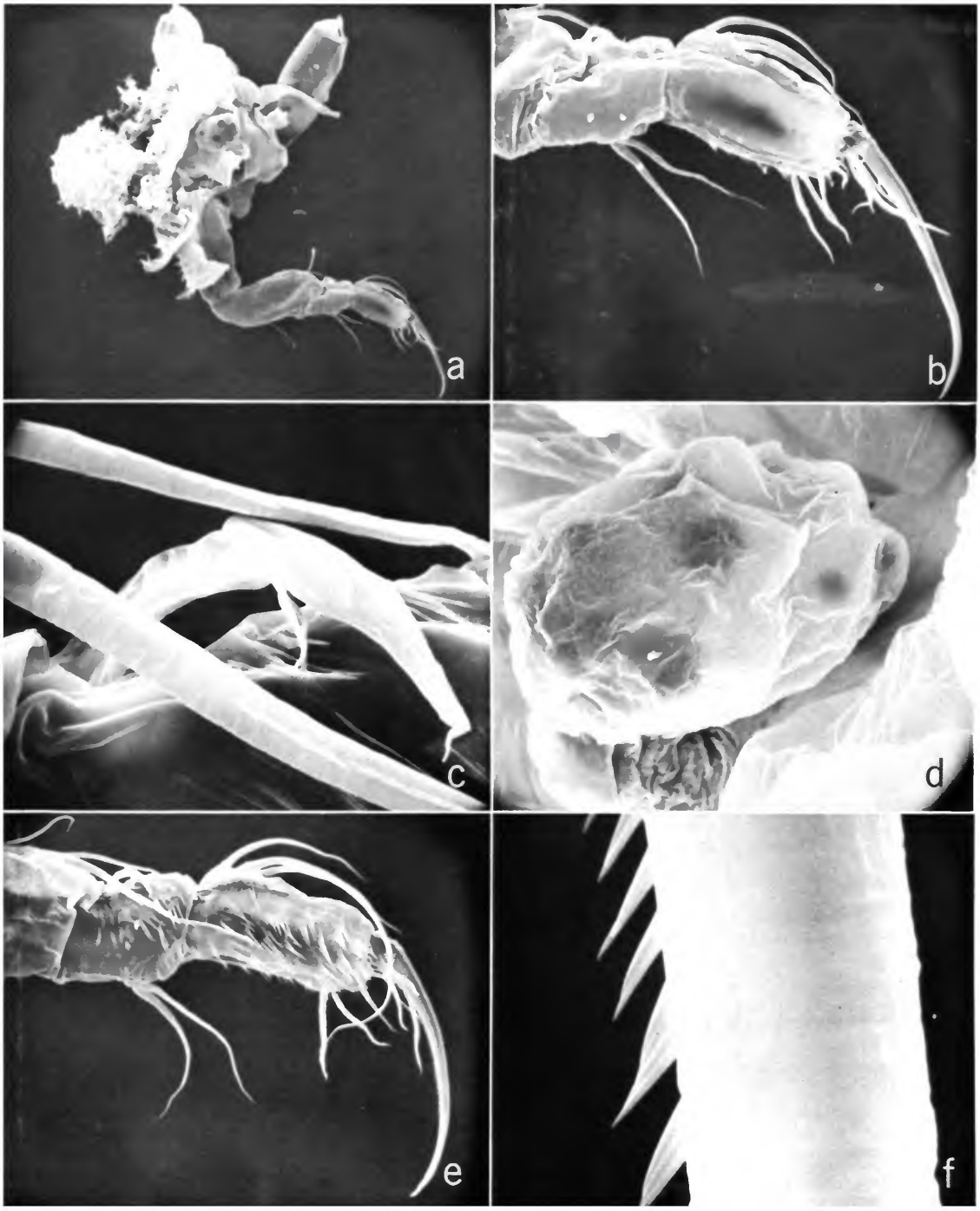

FIGURE 422.—*Rutiderma ovata,* male, USNM 139846: *a,* anterior of animal with many appendages removed, × 90; *b,* distal part of right mandible in "*a,*" lateral view, × 280; *c,* exopodite left mandible, × 2400; *d,* lateral eye in "*a,*" × 750; *e,* left mandible, distal part, medial view, × 280; *f,* detail of terminal claw in "*e,*" × 7000.

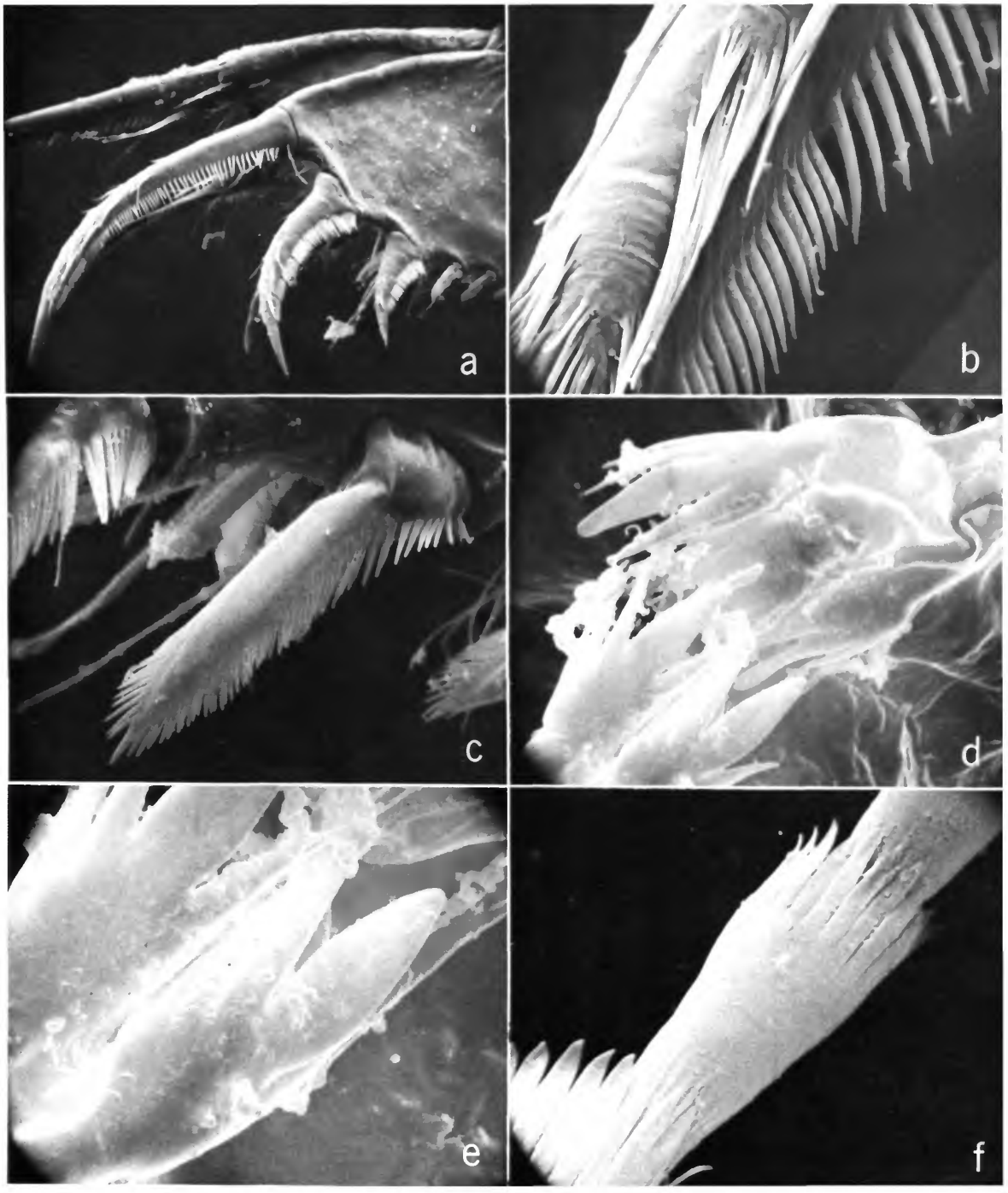

FIGURE 423.—*Rutiderma ovata*, male, USNM 137687: *a*, furca, × 290; *b*, detail claw 2, × 2900; *c*, detail claw 5, × 2900; *d*, tip of 7th limb, × 4600; *e*, detail of "*d*," × 9200; *f*, bristle of 7th limb, × 7000.

gin; dorsal margin of 2nd joint with few proximal spines and short midbristle with few short marginal spines; lateral surface of joint with numerous spines forming clusters and 1 short distal bristle with short marginal spines; 3rd joint short, separated from 4th joint by distinct suture, with 3 short bristles (2 short dorsal bristles with few short marginal spines, 1 longer ventral bristle with numerous short marginal spines); medial surface of 4th joint with long spines forming clusters on distal half; dorsal margin with 1 subterminal bristle with few short marginal spines; ventral margin with 3 bristles with short marginal spines (inner bristle not quite reaching end of limb, outer 2 bristles reaching well past limb end); 5th joint ventral, wedged between 4th and 6th; stout proximal part of sensory bristle reaching distal margin of 6th joint and bearing 1 stout bristle and about 23 thin filaments (stout bristle reaching well past end of limb and with 1 short proximal filament and bifurcate tip); medial surface of 6th joint with spines forming 4 clusters near middle; distal margin with short medial bristle on ventral corner (bristle with short marginal spines and reaching past end of limb). Seventh joint: a-bristle about same size as bristle of 6th joint and with short marginal spines; b-bristle stout proximally, about 3 times length of a-bristle, with 2 short proximal filaments; c-bristle extremely long, with 12 marginal filaments. Eighth joint: d- and e-bristles bare, reaching slightly past tip of sensory bristle of 5th joint; f-bristle about same length as c-bristle, with 10 short marginal filaments; g-bristle reaching tip of d-bristle, with 1 short proximal filament.

Second antenna (Figures 419*c*, 421): Protopodite bare. Endopodite 3-jointed: 1st joint with 5 ventral bristles, 4 proximal, 1 distal; 2nd joint elongate with 2 ventral midbristles with short marginal spines; 3rd joint elongate reflexed, with 1 proximal and 2 subterminal bristles; tip of joint with about 5 ridges. Exopodite: 1st joint elongate with medial spine on distal margin and numerous clusters of spines (spines longer on lateral side than on medial side); 2nd joint short with bristle reaching 5th or 6th joint (bristle with short spines along ventral margin forming groups with spines being shorter in distal groups); 3rd joint elongate, joints 4–9 short; bristles on joints 3 to 8 with natatory hairs; 9th joint with 5 bristles, 4 long with natatory hairs, 1 very short, bare; distal margin of joints 2 to 8 with spines forming groups; joints 3 to 8 with short basal spine.

Mandible (Figures 419*d-f*, 422): Coxale with 2 minute medial processes near distal ventral corner representing endite. Basale: dorsal margin with 3 bristles with short marginal spines; medial side with 6 bristles near ventral margin, 3 long and 3 short, near ventral margin, long bristles with at least few marginal spines; medial surface with numerous spines forming clusters. Hirsute exopodite reaching halfway up dorsal margin of 1st endopodite joint, with minute truncated spine at tip. Endopodite: ventral margin of 1st joint with 2 long bristles with short marginal spines; medial surfaces of 1st and 2nd joints with numerous spines forming clusters; dorsal margin of 2nd joint with 3 proximal bristles with short marginal spines; ventral margin of 2nd joint with 6 distal bristles with short marginal spines; end joint with long claw with spines along ventral margin and 5 bristles, all with short marginal spines.

Maxilla (Figure 419*g,h*): Precoxale and coxale with fringed epipodial appendages; coxale and basale with stout plumose anterodorsal bristle; basale also with bristle near exopodite; exopodite with 2 hirsute bristles. Endopodite: 1st joint with 1 spinous α-bristle and 1 longer plumose 6-bristle; end joint with 7 spinous bristles (longest of these much broader than others). Endites I and II with 5 spinous terminal bristles; endite III with 5 terminal and 1 proximal bristle.

Fifth limb (Figure 419*i-l*): 1st endite with 2 bristles, 2nd endite with 4 bristles; endite 3 with 5 bristles (1 of these quite long with long proximal spines). Exopodite: 1st joint with anterior and posterior bristle and 4 broad unringed paddlelike bristles (some hirsute); 2nd joint with 6 bristles; inner lobe of 3rd joint with 3 bristles, outer lobe with 2 hirsute bristles; hirsute 4th plus 5th joints fused and with 4 bristles, all with faint short marginal spines.

Sixth limb (Figure 419*m*): 1 or 2 hirsute bristles in place of epipodial appendage; endite I with 1 terminal and 2 hirsute medial bristles; endite II with 1 slender terminal bristle; endite III with 2 slender terminal bristles; endite IV with 3 terminal bristles with marginal spines. End joint consisting of 2 parts: posterior part with 4 broad bristles (posterior 2 of these hirsute to tip, anterior 2 hirsute proximally and with short marginal

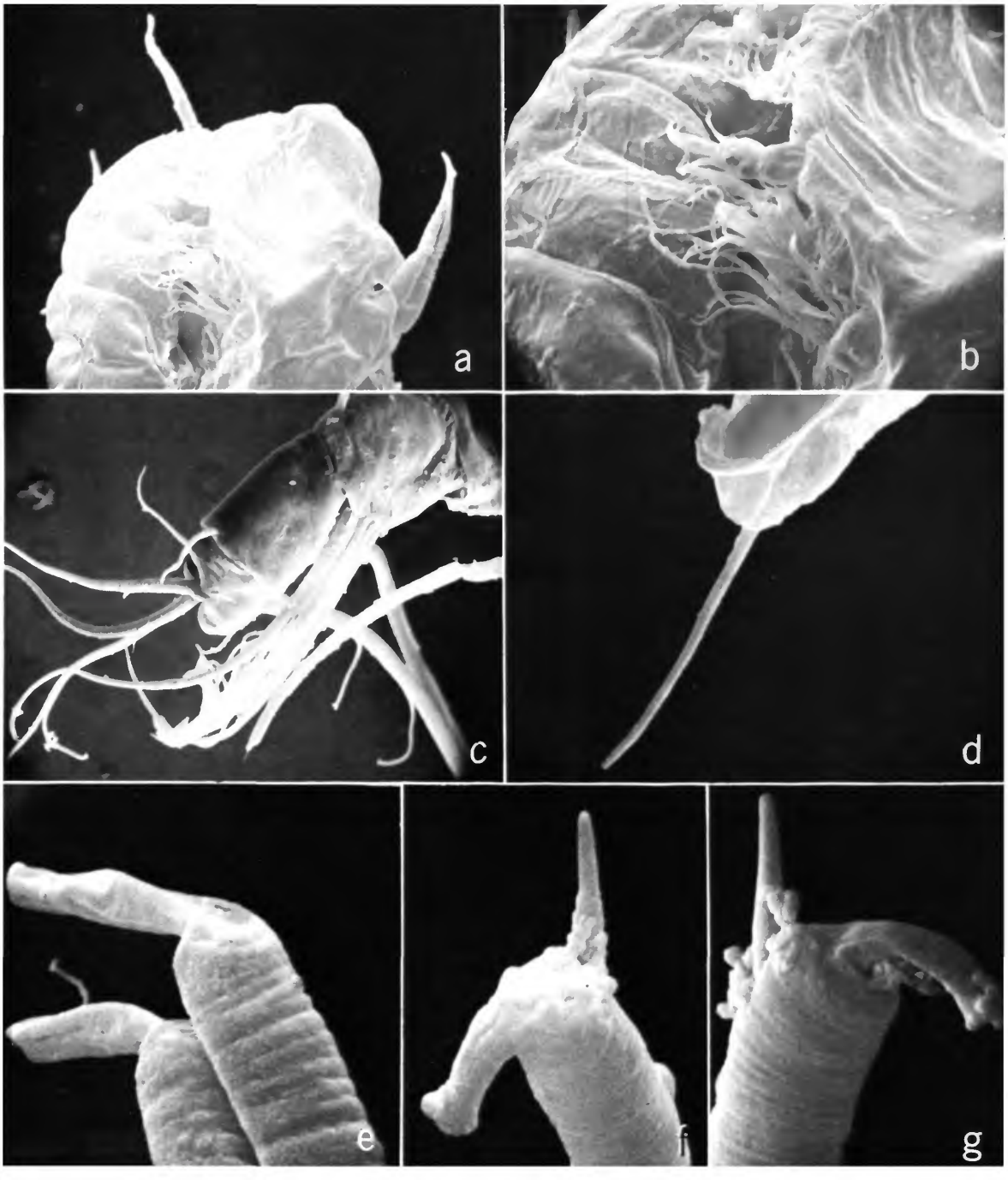

FIGURE 424.—*Rutiderma ovata*, male, USNM 137687: *a*, tip of clasping organ of copulatory organ, × 1400; *b*, detail of "*a*," × 2900; *c*, tip of 1st antenna and rod-shaped organ, × 290; *d*, tip of rod-shaped organ in "*c*," × 2700; *e*, tip of sensory bristle of 5th joint of 1st antenna shown in "*c*," × 14,000; *f,g*, tips of filaments on c-bristle of 7th joint shown in "*c*," × 14,000.

spines distally), anterior part with 3 slender bristles with short marginal spines; end joint with hairs forming clusters on medial and lateral surfaces. (6th limb of ♂ similar to that of ♀ except anterior part of end joint more distinctly separated from posterior part.)

Seventh limb (Figure 423*d-f*): Similar to that on adult female except with only 4 bristles in distal group, 2 on each side, and with 3 to 5 bells on bristles.

Furca (Figures 419*n*, 423*a-c*): Similar to that of female and N–1 male except spines on claw 1 not divided into small groups, but decreasing in length distally along claw.

Medial eye and rod-shaped organ (Figures 419*o*; 424*c,d*): Similar to that on adult female.

Lateral eye (Figures 419*p*; 422*a,d*): Eye well developed, pigmented with about 14 ommatidia.

Copulatory organ: Elongate with hook and few bristles at tip (Figures 419*q*, 424 *a*).

Posterior: Posterior without hairs or spines.

Gut content: The gut of each of 4 adult males was examined: one specimen contained a few oillike globules, the 2nd contained a whole (partly digested) copepod or amphipod, the 3rd contained a segmented worm and particulate matter within a sleeve, the fourth contained a sleeve with particulate matter and an empty transpartnt globular brownish organism with a minute sclerotized "orange" process at one end. The male gut is more slender than that of the female and contained less food.

Copulatory organ: Elongate with hook and few bristles at tip.

Comparisons.—Because of the absence of a projecting posteroventral caudal process, the carapace of the new species resembles that of *Rutiderma rotunda* Poulsen, 1965. The incisur of *R. ovata* is much more developed than that of *R. rotunda*, also the latter has 6 proximal bristles on the 7th limb compared to 4 on *R. ovata*. The furca of *R. ovata* bears 6 claws compared to 5 for *R. rotunda*. *R. californica* McKenzie, 1965 (p. 66), which may be a synonym of *R. rotunda*, also has 6 proximal bristles on the 7th limb and the carapace is more ornate than that of *R. ovata*.

In addition to differences in shape of the carapace, *R. rostrata* Juday, 1907 (p. 147), differs from *R. ovata* in having 4 strong claws on the furca. *R. compressa* Brady and Norman, 1896 (p. 673), has a carapace with a projecting posteroventral caudal process, which is absent on *R. ovata*.

Distribution.—This species was collected off the west coast of Chile outside the study area at 31°05′S at a depth of 192–176 m (Figure 411).

122. *Rutiderma* species A

Figure 425

Rutiderma compressa Brady and Norman.—Hartmann, 1965: 328 [part].

Material.—Disarticulated valves of one specimen; 1 N–1 ♂, length 1.36 mm, height 0.92 mm (not dissected). See discussion in "Material" section in description of *Rutiderma gerdhartmanni* herein.

Locality.—Bahia Inglés, Chile, 41°48′S, 75° 53′W, 12 m.

Remarks.—Appendages of the disarticulated valves were included by G. Hartmann in a vial with those of two other specimens he had also identified as *R. compressa*. The valves are described briefly herein and for reference purposes the species is identified as *Rutiderma* species A. The description is necessary to document that it should not be referred to *R. compressa*. As discussed under "Material" section of *R. gerdhartmanni*, even though appendages of two different species had been mixed, it is possible to infer morphology of some of the appendages of *Rutiderma* species A. The N–1 male was not dissected and is inferred to be the same species as the disarticulated valves on the basis of carapace ornamentation.

Diagnosis of N–1 Male.—Carapace with small incisur and projecting caudal process; 2 longitudinal ribs extending full length of valves, and a dorsal and ventral ridge paralleling margins; several riblets connecting longitudinal ribs; carapace length about 1.33 mm.

First antenna: 2nd joint with 2 bristles, 1 lateral, 1 dorsal; 3rd joint with 3 bristles, 1 ventral, 2 dorsal.

Second antenna: Endopodite 3-jointed.

Sixth limb: End joint with 3 bristles on anterior projecting process and 4 plumose posterior bristles.

Seventh limb: Each limb with 10 bristles, 4 proximal, 6 distal.

Furca: Each lamella with 3 strong claws followed by 3 weak claws.

Description (based on specimen dissected by G.

Hartmann).—Carapace with well defined but small incisur (Figure 425*a*); posterior with projecting caudal process; preserved specimen weakly calcified.

Ornamentation: Lateral surface with small punctae and 2 longitudinal ribs extending full length of valve and additional ventral and dorsal ribs paralleling ventral and dorsal margins, respectively; several riblets connecting longitudinal ribs.

Infold (Figure 425*d,e*): Infold on rostrum with 10 to 12 bristles forming row paralleling anterior margin and 2 smaller bristles near inner margin of incisur; broad part of anteroventral infold with 12 bristles forming row; central part of infold bare; list extending along posteroventral infold onto caudal process with 21 or 22 bristles; 1 bristle present on caudal process posterior to dorsal end of list; 1 or 2 bristles present on posterior infold dorsal to caudal process.

Selvage: Similar to that on *R. gerdhartmanni;* bristle present in space separating lamellar prolongation at tip of caudal process.

Muscle scars: See Figure 425*b,c*.

Size: Right valve, length 1.33 mm, height 0.93 mm.

First antenna: Bristles on 1st to 4th joints similar to those on *R. gerdhartmanni.*

Mandible: Ventral margin of basale with several bristles.

Sixth limb: Epipodial appendage with 2 bristles; endite I with 3 bristles; number of bristles on endites II and III not precisely known, but with not more than 3 nor less than 2; endite IV with 3 bristles; end joint similar to that on 6th limb of *R. gerdhartmanni.*

Furca: Similar to that of *R. gerdhartmanni.*

REMARKS.—The sex and stage of development of the specimen described above is not known; it is not an adult male. The N–1 male also considered here to be *Rutiderma* species A has a 3-jointed endopodite on the 2nd antenna, a 7th limb with 4 proximal and 6 terminal bristles, and a furca similar to that of *R. gerdhartmanni* (observations made through valves under transmitted light).

COMPARISONS.—*Rutiderma* species A differs from

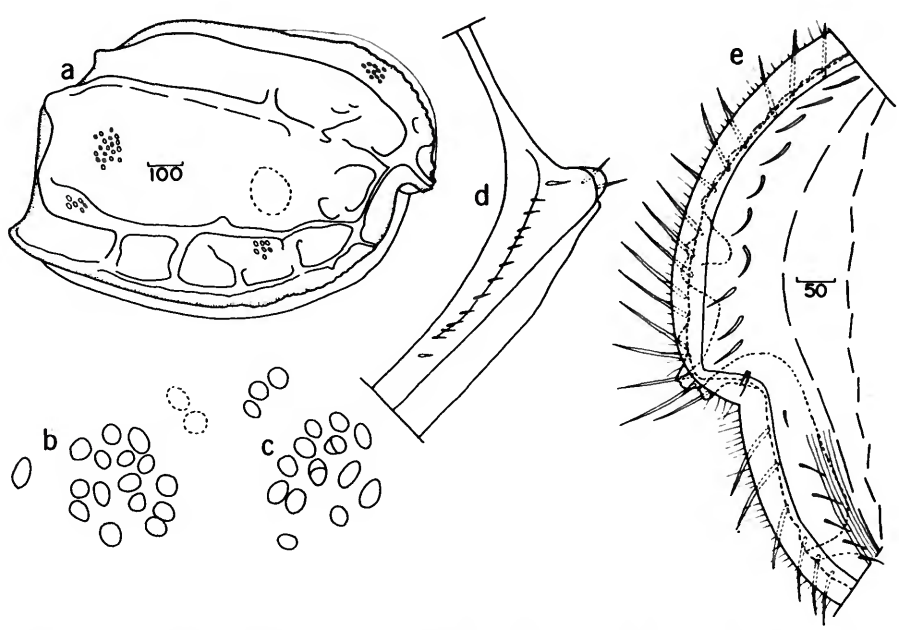

FIGURE 425.—*Rutiderma* species A, N–1 male, length 1.33 mm, carapace: *a*, right valve, lateral view; *b*, central muscle scars on left valve, lateral view; *c*, central muscle scars on right valve, lateral view; *d*, caudal process on right valve, medial view; *e*, anterior of right valve, medial view. (Same magnification in microns: *b-e*.)

R. gerdhartmanni in having longitudinal ribs extending the full length of the valves. The surface of the carapace also has fewer large punctae than the carapace of *R. gerdhartmanni*. Ornamentation of the carapace of *Rutiderma* species A resembles that on *R. dinochelata* Kornicker, 1958, and *R. judayi* McKenzie, 1965, but on those species the 4th furcal claw is much stronger than the 5th. The carapace of *Rutiderma* species A is more ornate than that of *R. gerdhartmanni* and, therefore, more closely resembles that of *R. compressa*. It differs from that species in having more bristles on the 2nd and 3rd joints of the 1st antenna and in having the anterior 3 bristles on the end joint of the 6th limb on a projecting process.

DISTRIBUTION.—This species was collected only in Bahia Inglés, Chile, which is in the Subantarctic-to-35°S region, at a depth of 12 m (Figure 411).

123. *Rutiderma* species B

FIGURES 426, 427

MATERIAL.—USNM 138022, 1 adult ♂, from *Eltanin* Cruise 11, station 958; USNM 138667, 1 adult ♂, from *Hero* Cruise 69–5, station 207.

DIAGNOSIS OF ADULT MALE.—Carapace with rostrum projecting to form distinct incisur and with projecting caudal process; posterior half of carapace with 2 horizontal ribs connected by vertical rib at their posterior ends; infold on rostrum with 11–14 bristles forming row paralleling anterior margin; carapace length 1.48–1.65 mm.

Sixth limb: End joint with 3 anterior bristles and 4 plumose posterior bristles; anterior of end joint projecting only slightly, or not at all.

Seventh limb: Each limb with 8 bristles, 4 proximally and 4 distally.

Furca: Each lamella with 6 claws: claws 1 to 3 stout; claw 4 much smaller than claw 3 but longer and stouter than claws 5 and 6.

Lateral eye: Well developed with about 16 ommatidia.

DESCRIPTION OF ADULT MALE.—Carapace elongate with greatest height near middle of dorsal margin (Figures 426*a*, 427*a*); rostrum rounded anteriorly and projecting to form distinct incisur; ventral margin of rostrum forming right angle at incisur; posterior margin with distinct caudal process (Figure 426*d*); specimen weakly calcified.

Ornamentation: Lateral surface with distinct but shallow punctae; posterior half of carapace with 2 longitudinal ridges connected by vertical rib posteriorly; lateral surface, anterior and ventral margins with long hairs, some broadening near base.

Infold (Figure 426*b,c,e,f*): Infold broad especially along anterior, anteroventral, and posterior margins; infold on rostrum with 11 to 14 bristles forming row paralleling anterior margin, and 2 short bristles near incisur; broad anteroventral infold with 9 short bristles; central part of infold bare; posteroventral and posterior infold with 20 bristles.

Selvage: Similar to that on carapace of male *R. ovata*.

Size (Figure 407): USNM 138022, length 1.65 mm, height 0.89 mm; USNM 138667, length 1.48 mm, height 0.94 mm.

First antenna (Figure 426*g*): First joint bare; lateral surface of 2nd joint with short spines forming proximal clusters, long hairs forming distal clusters and 1 distal bristle with short marginal spines; proximal medial surface with clusters of long hairs; dorsal margin with 1 bristle with short marginal spines; 3rd joint short, separated from 4th joint by distinct suture; 3rd joint with 3 bristles, 2 dorsal, 1 ventral; 4th joint with spines on medial surface and 4 bristles, 3 ventral, 1 dorsal; stout part of sensory bristle of 5th limb with about 20 filaments and 1 stout terminal bristle with short proximal filament and bifurcate tip; 6th joint with cluster of 4 minute spines on medial surface, and short dorsal terminal bristle. Bristles on 7th and 8th joints similar to those on male of *R. ovata*. Seventh joint with medial pore.

Second antenna: Similar to that on male *R. ovata*. Protopodite shown in Figure 427*h*).

Mandible (Figures 426*h*, 427*e,g*): Coxale with endite consisting of 2 short broad spines near middle. Basale with 5 bristles on medial side and 3 dorsal bristles. Exopodite hirsute, reaching about halfway up dorsal margin of 1st endopodite joint. Endopodite similar to that on mandible of male *R. ovata*.

Maxilla: Coxale with stout plumose anteroventral bristle; basale with 1 anterodorsal and 1 medial bristle, both with long proximal hairs; exopodite short with 2 hirsute bristle; endite I with 1 terminal and 1 proximal bristles; endites II and III not differentiable, with total of 7 bristles,

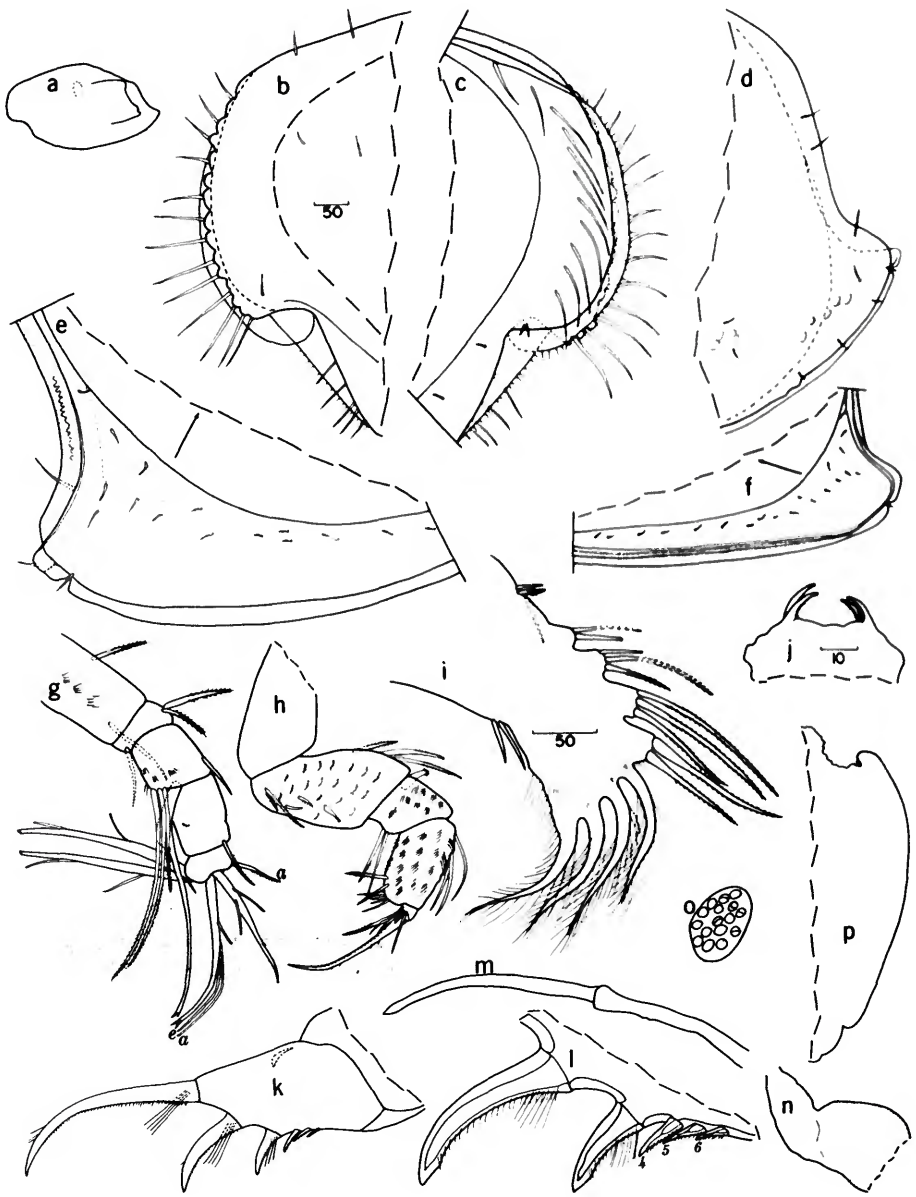

FIGURE 426.—*Rutiderma* species B, male, USNM 138022, length 1.65 mm, carapace: *a*, complete specimen showing position of lateral eye (dotted); *b*, anterior of right valve, medial view; *c*, anterior of left valve, medial view; *d*, posterior of left valve, lateral view; *e*, caudal process of left valve, medial view; *f*, caudal process of right valve, medial view. Appendages: *g*, distal part of left 1st antenna, medial view; *h*, left mandible, medial view; *i*, left 6th limb, lateral view; *j*, tip of 7th limb; k, left furcal lamella; *l*, claws 2–6 of left furcal lamella; *m*, rod-shaped organ; *n*, medial eye; *o*, left lateral eye; *p*, posterior margin of body, anterior to left. (Same magnification in microns: *b-d,f-h,k,o,p; e,i,l-n*.)

all with spines or hirsute. Endopodite: 1st joint with 1 slender α-bristle and 1 stout plumose β-bristle; end joint with 7 spinous bristles, longest of these much broader than others.

Fifth limb (Figure 427*b*): Epipodial appendage with 41–45 bristles; 1st endite with 2 short bristles; endite II with 4 or 5 short bristles; endite III with 6–8 bristles. Exopodite: 1st and 2nd joints with several annulate, broad transparent bristles; inner lobe of 3rd joint with 3 bristles, outer lobe with 2 hirsute bristles; hirsute 4th plus 5th joints fused and with 4 bristles.

Sixth limb of USNM 138022 (Figure 426*i*): 2 bristles in place of epipodial appendage; endite I with 3 bristles; endite II with 2 bristles; endites III and IV each with 3 bristles. End joint: anterior part only slightly projecting ventrally and with 2 slender spinous bristles; posterior part with 4 broad plumose bristles.

Sixth limb of USNM 138667 (Figure 427*c,d*): 2 hirsute bristles present in place of epipodial appendage; endite I with 3 short bristles; endites II and III with 2 bristles; endite IV with 3 bristles. End joint with 3 slender anterior bristles with short marginal spines and 4 posterior hirsute bristles (posterior 2 of these hirsute to tip, anterior 2 with short marginal spines distally); anterior part of end joint bearing 3 slender bristles not projecting outward from posterior part on right limb and only slightly projecting on left limb.

Seventh limb (Figure 426*j*): Each limb with 8 bristles, 4 in distal group (2 + 2), 4 in proximal group (2 + 2), each bristle with 3 to 6 terminal bells and distal marginal spines; terminus with comb of 2 spinous teeth opposing comb with 3 spinous teeth.

Furca (Figure 426*k,l*): Each lamella with 6 claws: claws 1 to 3 long stout; claw 4 much smaller than

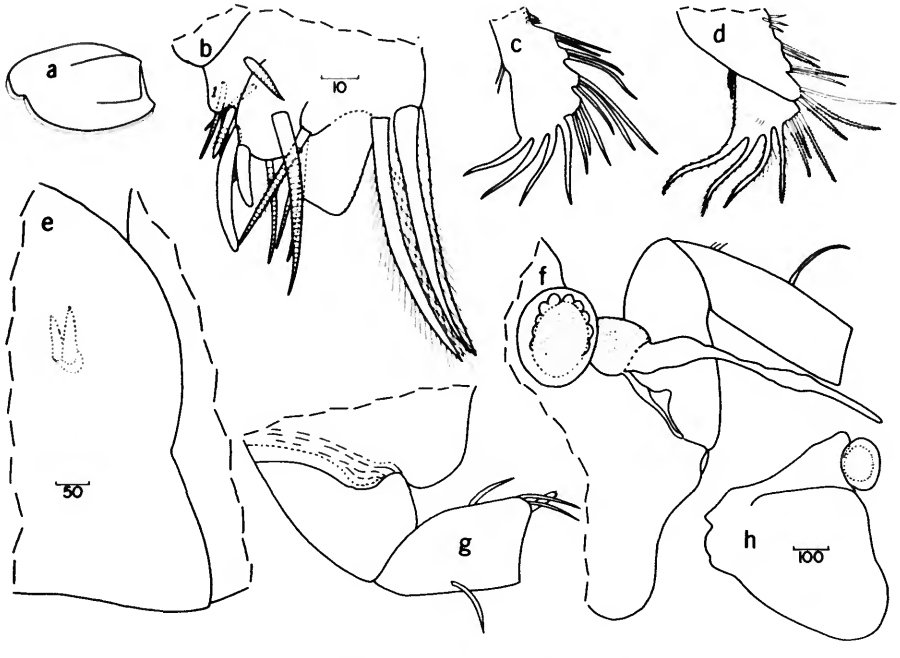

FIGURE 427.—*Rutiderma* species B, male, USNM 138667, length 1.48 mm: *a*, complete carapace, lateral view; *b*, distal part of left 5th limb, anterior view (4 bristles on joints 4–5 not shown); *c*, left 6th limb, medial view; *d*, right 6th limb, lateral view; *e*, coxale endite on right mandible, lateral view; *f*, anterior showing right lateral eye, medial eye and rod-shaped organ, upper lip, joints 1–2 of left 1st antenna; *g*, upper lip, esophagus (dashed) and coxale, basale, exopodite of left mandible; *h*, left lateral eye and protopodite of left 2nd antenna, anterior to left. (Same magnification in microns: *c-g*.)

claw 3 but longer and stouter than claws 5 and 6. (Because of similarity in internal structure of claws 4 to 6, I consider claw 4 a secondary claw.)

Medial eye and rod-shaped organ (Figures 426*m,n*; 427*f*): Medial eye pigmented with produced anterior. Rod-shaped organ of USNM 138022 elongate with suture near broad middle and with tapering tip; rod-shaped organ of USNM 138022 without suture and with rounded tip.

Lateral eye (Figures 426*o*, 427*f,h*): Eye well developed, pigmented with about 16 ommatidia.

Posterior (Figure 426*p*): Posterior bare or with few spines.

REMARKS.—The end joint of the 6th limb of USNM 138022 bears only 6 bristles compared to 7 on the 6th limb of USNM 138667. This suggests that the two specimens may not be conspecific, but because they were collected in the same geographic area, and because the small number of specimens does not allow study of intraspecific variation, both specimens are included in the same species herein.

It is possible that *Rutiderma* species B should be included in *R. gerdhartmanni*, and if the specimens (2 males) had been collected in the same sample as females of *R. gerdhartmanni*, I would have done so. I have not because the anterior part of the end joint of the 6th limb of all the specimens of *R. gerdhartmanni* examined projects ventrally a considerable distance from the posterior part of the joint, whereas, in both males referred to *Rutiderma* species B, the projection is slight in one or both limbs. Future collections of female specimens of *Rutiderma* along the western coast of Chile in the region *Rutiderma* species B was collected should resolve the problem.

COMPARISONS.—The infold of the rostrum of *Rutiderma* species B bears more bristles (11 to 14) than that of *R. rostrata* (4 bristles). The anterior part of the end joint of the 6th limb does not project ventrally as far as the end joints of *R. gerdhartmanni* and *Rutiderma* species A. The adult male of *R. hartmanni* Poulsen, 1965, is unknown, but the juvenile male described by Poulsen (1965: 34) differs from *Rutiderma* species B in having 4 main claws on the furca and a different distribution of bristles on the infold of the caudal process. The furca of *R. judayai* McKenzie, 1965, differs from that of *Rutiderma* species B in having a 4th claw almost as long as the 3rd claw.

DISTRIBUTION.—This species was collected at two localities in the Magellanic subregion of the Subantarctic region at depths of about 1–96 m (Figure 411).

Scleraner, new genus

TYPE-SPECIES.—*Rutiderma* (*Rutiderma*) *chacaoi* Hartmann, 1965.

ETYMOLOGY.—The generic name is derived from an approximate Greek translation of Dr. Gerd Hartmann's name; gender: masculine.

This new genus is monotypic; only the female is known.

DIAGNOSIS OF GENUS.—Carapace of type-species without lateral ribs or projecting caudal process.

First antenna, mandible, 6th and 7th limbs, upper lip: Similar to those on *Alternochelata*.

Second antenna: Protopodite and exopodite similar to *Rutiderma* and *Alternochelata;* endopodite 2-jointed (type-species with 5 bristles on 1st joint and 2 on 2nd, 1 ventral, 1 terminal).

Fifth limb: 2 large teeth present on inner corner of anterior side of 1st exopodite joint of type-species.

Furca: Each lamella with more than 6 claws and without secondary short claws betweeen primary long claws.

COMPARISONS.—This new genus differs from *Rutiderma* in having 2 joints on the endopodite of the 2nd antenna, and from *Alternochelata* in absence of secondary claws between primary claws on the furca. The type-species bears a ventral bristle on the 2nd joint of the endopodite of the 2nd antenna.

DISTRIBUTION.—The only known species of this genus lives along the Pacific Coast of Chile. The northernmost locality is 42°24′S, 72°57′W; the southernmost locality is 50°16′42″S, 74°48′28″W (Figure 405). The known depth range is 30–240 m.

124. *Scleraner chacaoi* (Hartmann)

FIGURE 428

Rutiderma (*Rutiderma*) *chacaoi* Hartmann, 1965:328, figs. 36–44.

HOLOTYPE.—♀ with valves and appendages in alcohol, Hamburg Zoological Museum, no. K 27 302.

TYPE-LOCALITY.—Gulf of Corcovado, Canal of Chacao, South Chile.

PARATYPE.—1 juvenile ♀, partly dissected, valves and appendages in alcohol, Hamburg Zoological Museum, no. K 27 302; from same locality as holotype.

MATERIAL.—Through Dr. Gerd Hartmann, I received from the Hamburg Zoological Museum two specimens from the coast of Chile that Dr. Hartmann (1965:328) had described as *Rutiderma* (*Rutiderma*) *chacaoi*. The material was received in alcohol in a vial containing a label bearing the number '27 302" and a second label stating, "*Rutiderma chacaoi* n. sp. *typus* and Larve; Mar Chile I Stat. 99." The vial contained 1 juvenile with left valve and furca removed, a loose left valve and a left and right furcal lamella of the juvenile. The vial also contained the dissected holotype consisting of a left and right valve, 2 first antennae, 2 second antennae, 2 mandibles, 2 maxillae, 1 fifth limb, 1 sixth limb, 2 seventh limbs, rod-shaped organ and medial eye, 2 furcal lamellae. All material was returned to the Hamburg Zoological Museum, but the holotype and paratype were placed in separate vials. During my examination I removed a left 2nd antenna from the juvenile; it is now loose in the vial containing the other parts of the specimen.

As noted above, the label in the vial from the Hamburg Zoological Museum containing the types bears the station number 99. This station number does not appear in the station list given by Hartmann-Schroeder and Hartmann (1965:8–10, 17–26). However, two specimens of *Rutiderma chacaoi* are listed as being present in "Station X 1." Therefore, I have assumed that Station X 1 and Station 99 are different numbers given to the same sample locality.

Dr. Hartmann (1965) considered the holotype to be an adult female and the juvenile to be in the penultimate stage of development. Although the males are not known, the endopodite of the 2nd antenna of males in other members of the family does not have a long terminal bristle on the 2nd joint; therefore, I have concluded that both specimens are female. No eggs were present in the vial I received from the Hamburg Zoological Museum, nor are they mentioned by Hartmann (1965). The presence of natatory hairs on bristles of the exopodite of the 2nd antenna confirms that the holotype is an adult female. The absence of natatory hairs on the bristles of the exopodite of the 2nd antenna of the 2nd specimen confirms that it is a juvenile.

ADDITIONAL SPECIMENS.—USNM 138659, 1 N–1 ♂, length 1.12 mm, height 0.80 mm; USNM 138661, 1 ♀, length 1.27 mm, height 0.89 mm; USNM 138664, 7 juveniles; USNM 138668, 1 juvenile ♀, length 1.19 mm, height 0.84 mm, + 2 juveniles. USNM 138659, 138661, 138664 from *Hero* Cruise 69–5, station 48; USNM 138668 from *Hero* Cruise 69–5, station 206.

DIAGNOSIS.—Same as for genus.

SUPPLEMENTARY DESCRIPTION OF FEMALE HOLOTYPE (Figure 428*b-r*).—Carapace with overhanging rostrum and truncate posterior without projecting caudal process. Carapace with greatest height near middle.

Ornamentation (Figure 428*b*): Valves without ribs; surfaces with oval or weakly hexagonal punctae bordered by small papillae, and with scattered hairs; anterior and ventral margins with numerous long hairs, some with broad base.

Infold (Figure 428*c,d*): Infold broad along anterior and ventral margins; infold on rostrum with 11 long bristles forming row paralleling anterior margin and 2 shorter bristles near inner margin of incisur; broad part of anteroventral infold with about 7 parallel striations and 11 bristles; central part of infold bare; list extending along posteroventral infold onto truncated caudal process with about 13 short bristles; 3 short bristles present between list and posterior margin of valve.

Selvage: Broad prolongation present along anterior, ventral, and posterior margins; margins of prolongation along anterior and anteroventral margins with fringe; posteroventral and posterior selvage without fringe; lamellar prolongation divided at incisur, but not at tip of caudal process.

Size (Figure 407): Hartmann (1965:330) gives length as 1.30–1.40 mm, height 0.90–1.00 mm. My measurements of the separated valves are as follows: left valve, length 1.32 mm, height 0.94 mm; right valve, length 1.31 mm, height 0.89 mm.

First antenna: 1st joint with few spines on medial and lateral surfaces; 2nd joint with 3 bristles, 1 lateral, 1 ventral, 1 dorsal; spines forming clusters present along proximal dorsal margin, ventral margin and medial surface; 3rd joint with 3 bristles, 1 dorsal, 2 ventral; 4th joint separated from 3rd by

FIGURE 428.—*Scleraner chacaoi*, juvenile female, length 1.19 mm, carapace: *a*, complete specimen, lateral view. Adult female, holotype, length 1.31 mm, left valve: *b*, detail of ornamentation, lateral view; *c*, anterior, medial view; *d*, posterior, medial view. Right 2nd antenna: *e*, endopodite and part of protopodite and exopodite (exopodial bristles not shown). Mandible: *f*, distal part of right limb, lateral view; *g*, left limb, medial view. Maxilla: *h*, left limb, medial view. *i*, right limb, lateral view; *j*, exopodite on right limb, lateral view. Fifth limb: *k*, right limb, posterior view; *l*, distal part of right limb, anterior view; *m*, endites on right limb, posterior view. Sixth limb: *n*, right limb, medial view. Seventh limb: *o*, distal part; *p*, tip of limb shown in "*o*." Furca: *q*, right lamella. Anterior: *r*, medial eye and rod-shaped organ. Female, USNM 138661, length 1.27 mm, lateral eyes: *s*, right eye; *t*, left eye. N–1 male, USNM 138659, length 1.12 mm: *u*, outline of complete carapace, lateral view; *v*, endopodite of right 2nd antenna, medial view; *w*, right lateral eye. (Same magnification in microns: *b-h,n-t,w; k-m*.)

suture and with 3 bristles, 1 dorsal (short, bare) and 2 ventral (long, spinous); ventral margin of joint with spines forming clusters; sensory bristle of 5th joint with 2 short proximal filaments and bifurcate tip; medial bristle of 6th joint short with short marginal spines. Seventh joint: a-bristle similar to bristle on 6th joint; b-bristle about twice length of a-bristle and with minute bent process at tip; c-bristle about same length as sensory bristle on fifth joint and with bifurcate tip. Eighth joint: d- and e-bristles subequal in length, longest of these same length as c-bristle and with suaged tips; f-bristle shorter than c-bristle and with bifurcate tip; g-bristle with 2 short proximal filaments and with bifurcate tip reaching tip of c-bristle.

Second antenna (Figure 428*e*): Protopodite bare. Endopodite 2 jointed; 1st joint with short ventral bristles, 4 proximal, 1 distal; 2nd joint with 2 long bristles, 1 ventral, 1 terminal. Exopodite: bristle on joints 2 to 5 with short spines along ventral margin (spines becoming shorter along margin); bristles on joints 6 to 8 with natatory hairs; 9th joint with 6 bristles, 4 long with natatory hairs, 2 very short, bare or with few short spines; short spines forming row along distal margins of joints 2 to 8.

Mandible (Figure 428*f,g*): Coxale endite bifurcate with few stout spines, hairs near base. Basale: ventral margin with 1 or 2 medium spinous bristles and 2 short pectinate bristles proximal, 2 short bristles near middle, and 1 long spinous distal bristle; dorsal margin with 2 bristles (1 short proximal, 1 medium-to-long distal. Exopodite absent. Endopodite: 1st joint with 3 short ventral bristles (1 of these on medial margin of joint); clusters of short spines present near distodorsal corner of joint; dorsal margin of 2nd joint with 7 bristles (5 long, 2 short) near middle and 2 or 3 stout spines proximal to bristles; medial surface with spines forming clusters near dorsal margin; ventral margin with short bare distal bristle; tip of 2nd joint with stout claw with teeth along inner margin and 1 minute medial bristle; end joint with stout terminal claw, 2 short lateral and 2 short medial bristles, and 1 short stout claw with coarse serrations along inner distal margin.

Maxilla (Figure 428*h-j*): Endite I with 4 stout pectinate bristles and 3 spinous and bare bristles; endite II with 2 stout pectinate bristles and 1 bare bristle; endite III with 2 stout pectinate bristles and 2 bare bristles. Coxale with hirsute epipodial appendage and 1 distoanterior bristle. Basale with 2 or 3 bristles along distal margin. Exopodite with 3 terminal bristles, 1 of these much longer than others. Endopodite: 1st joint with 1 α- and 6-bristle; end joint with 2 stout pectinate bristles and several bristles with short marginal spines.

Fifth limb (Figure 428*k-m*): Endite I with 3 bristles; endite II with 4 bristles; endite III with 5 bristles, one of these with fairly long hairs proximally and short spines distally. Exopodite: main tooth of 1st joint consisting of 4 teeth, proximal 2 of these bare, remaining 2 with secondary teeth; 1 short stout bristle present just proximal to smallest bare tooth; posterior side of joint with 1 long bristle proximal to inner lobe of 3rd joint; anterior side of 1st joint with 2 bristles near middle of distal margin and 2 stout teeth on inner distal corner just anterior to distal two teeth of main tooth. Second joint with large triangular tooth with 2 smaller teeth along inner margin, distal of these with secondary tooth; anterior side of joint with spinous bristle proximal to outer corner of large tooth. Outer lobe of 3rd joint with 2 spinous bristles, inner lobe with 3 bristles; 4th joint fused with 5th, both with total of 8 bristles (it is possible that some of these are on posterior sides of 1st or 2nd joints). Epipodial appendage fragmented but of type similar to those on members of family.

Sixth limb (Figure 428*n*): Endites I, II, III, and IV each with 3 bristles; end joint with 8 bristles (posterior 4 hirsute); 2 bristles present in place of epipodial appendage; posterior margin of limb hirsute.

Seventh limb (Figure 428*o,p*): Terminal comb with about 7 broad faint teeth opposing about 2 teeth with broad marginal spines; each limb with 8 bristles, 2 in proximal group (1 on each side) and 6 in terminal group (3 on each side); each bristle with 5 or 6 bells and distal marginal spines.

Furca (Figure 428*q*): Each lamella with 4 strong claws followed by 5 weak claws; claws 1 to 3 with teeth along ventral margin, claws 4 to 9 without teeth; anterior margin of lamella with few spines proximal to claw 1; hairs present on margin following claw 9 and at bases of claws.

Eyes and rod-shaped organ (Figure 428*r-t*): Lateral eyes not observed on holotype, but on USNM 138661, lateral eye small with 5 minute ommatidia; medial eye pigmented with somewhat prolonged anterior. Rod-shaped organ elongate, slightly wider

in proximal part, with 1 proximal suture and 2 weak sutures that could be wrinkles; tip of organ rounded.

DESCRIPTION OF JUVENILE FEMALE.—Carapace similar in shape to that of adult female (Figure 428*a*). Size: left valve, length 1.19 mm, height 0.83 mm.

First antenna: Distribution of bristles similar to that of adult, except possibly only 1 ventral bristle on 3rd joint.

Second antenna: Similar to that of adult except without natatory setae on bristles of exopodite, and terminal bristle on 2nd joint of endopodite shorter than ventral bristle.

Mandible, maxilla: Not examined in detail but similar to those of adult.

Sixth limb: Not removed but 9 bristles observed on end joint of left limb (1 more than on adult).

Seventh limb: Each limb with same distribution of bristles as on adult.

Furca: Each lamella with 4 strong claws followed by weak claws.

Eyes: Lateral eyes not observed; medial eye similar to that on adult.

Rod-shaped organ: Elongate with 1 suture near middle and rounded tip.

DESCRIPTION OF JUVENILE MALE (USNM 138659).—Carapace similar in shape to that of adult female (Figure 428*u*). Size: length 1.12 mm, height 0.80 mm.

First antenna: Distribution of bristles similar to those of adult except for absence of ventral bristle on 1st joint and presence of only 1 ventral bristle on 3rd joint.

Second antenna: Endopodite 3-jointed but without suture between 2nd and 3rd joints (could be considered 2-jointed) (Figure 428*v*); 1st joint with 4 bristles, 3 proximal, 1 distal; 2nd joint with 2 ventral bristles; 3rd joint with 1 long dorsal bristle and 1 short terminal bristle. Protopodite and exopodite of 2nd antenna similar to that on adult female except 9th exopodite joint with only 5 bristles, also 1st joint with short terminal medial spine.

Mandible, maxilla: Not examined in detail but similar to those of adult.

Sixth limb: Not removed but with 9 bristles on end joint.

Seventh limb: With only 6 bristles, 2 in proximal group (1 on each side) and 4 in terminal group (2 on each side).

Furca: Each lamella with 4 strong claws followed by 3 weak claws.

Lateral eyes and rod-shaped organ: Lateral eyes small with about 5 minute ommatidia (Figure 428*w*); medial eye similar to that on adult; rod-shaped organ elongate with 2 weak sutures near middle and tapering tip.

DISTRIBUTION.—Collected only at type-locality (Figure 411).

Indeterminate Taxa

125. *Cypridina glacialis* Brady

Cypridina glacialis Brady, 1907:3, 2 figs.

HOLOTYPE.—Unique specimen, female, carapace length 5 mm.

TYPE-LOCALITY.—Hut point, Winter Quarters, McMurdo Sound, 11 November 1902.

MATERIAL.—None examined.

REMARKS.—I requested from Dr. K. G. McKenzie, British Museum (Natural History), loan of the unique holotype of *Cypridina glacialis* and received from him a vial containing a label, "*Cypridina glacialis* 1907–7–2–34, Discovery Exp. 90" and a smaller vial containing a label, "W.Q. Oct. 02, D Net Hut Point from sponges." The smaller vial contained another vial with two ostracodes. Without opening the vial it was possible to determine that both specimens belonged to the genus *Philomedes* and were much smaller than *C. glacialis*; therefore, the vial was returned unopened to the British Museum (Natural History). In further correspondence with Dr. McKenzie, he informed me that *C. glacialis* is not represented in the collections of the British Museum (Natural History). The location of this species is not shown on the species distribution maps herein.

DISTRIBUTION.—Collected only at the type-locality.

126. *Cypridina thielei* Chapman

Cypridina thielei Chapman, 1906:28, pl. 9.—Müller, 1912:16.

HOLOTYPE.—Not designated.

TYPE-LOCALITY.—Hobson's Bay, Port Phillip,

about 1 mile from shore, Melbourne, Australia (about 38°S, 114°E), water depth 7.3 m.

MATERIAL.—None examined.

REMARKS.—The species is not described in sufficient detail to be able to place it in the proper genus. Specimens are luminescent. Chapman (1906: 28) stated that luminescent ostracodes discussed by Shepherd (1894:131) from Brighton Beach, Port Phillip, probably belong to *C. theilei*.

DISTRIBUTION.—Port Phillip, Australia.

127. *Philomedes laevipes* Daday

Philomedes laevipes Daday, 1908:12, figs. 13, 14.—Kornicker, 1971:185, fig. 13 [supplementary description, discussion].

HOLOTYPE.—Not designated.

TYPE-LOCALITY.—Near Booth Island.

MATERIAL.—None examined.

REMARKS.—Müller (1912) referred this species to *Philomedes orbicularis* Brady with a question mark. Skogsberg (1920:418) suggested that *P. laevipes* is a larva of *P. charcoti* Daday. Kornicker (1971) reexamined some of the material studied by Daday, present in the Muséum National d'Histoire Naturelle, Paris, and concluded that the specimens Daday described are juveniles and that they could not belong to *P. charcoti*. He referred them to "species dubia."

128. *Cypris violacea* Nicolet

Cypris violacea Nicolet, 1849:294.
Cypris caerulea Nicolet, 1854, pl. 4: fig. 6b.
Cypridina (?) *caerulea* Nicolet.—Brady, 1880:152.
Cypris coerulea Nicolet.—Müller, 1912:51 [listed under the title "Cypridinidarum genera dubia et species dubiae"].

HOLOTYPE.—Not designated.

TYPE-LOCALITY.—Chile (Marine).

MATERIAL.—None examined.

REMARKS.—Nicolet (1849:294) described this species but did not indicate whether his specimens were illustrated. In the Atlas of illustrations to the descriptions, he (1854) lists the species name of one of his illustrations as *Cypris caerulea*, a name that does not appear in the text. The name *C. violacea* does not appear in the Atlas. Because both names refer to a color, I have assumed that they probably refer to the same species. Müller (1912) made a similar assumption. The shape of the specimen suggests that it might belong in Philomedidae.

DISTRIBUTION.—Nicolet indicates that the species is from the marine of Chile.

129. *Cypris bimaculata* Nicolet

Cypris bimaculata Nicolet, 1849:294; 1854, pl. 4: figs. 6, 6a.—Müller, 1912:50 [listed under the title "Cypridinidarum genera dubia et species dubiae"].—Skogsberg, 1920:440, 441, 443 [lists species as probably belonging to genus *Asterope*].
Cypridina (?) *bimaculata* (Nicolet).—Brady, 1880:152.

HOLOTYPE.—Not designated.

TYPE-LOCALITY.—Coast of Chile.

MATERIAL.—None examined.

DISTRIBUTION.—Nicolet (1849) mentions only marine of Chile as locality.

130. *Asterope oculata* Brady sensu Scott

Asterope oculata Brady.—Scott, 1912:586, pl. 13: figs. 20, 21. [Not *Asterope oculata* Brady, 1902:179, pl. 21: figs. 6–13. =*Synasterope oculata* (Brady) by Poulsen (1965:413).]

LOCALITY.—Gough Island, Scotia station 461, 40°20′S, 9°56′30″W, 22 April 1904.

REMARKS.—Scott (1912) gave only the length of a specimen and illustrated the furca and carapace, criteria inadequate for identification of the species or genus.

I agree with Skogsberg (1920:527), who referred to the specimens identified by Scott from Gough Island stating, "This cannot possibly be included as a synonym [of *A. oculata* Brady]."

MATERIAL.—I have been unable to locate the specimens from Gough Island identified by Scott. In response to my request to the Royal Scottish Museum, Edinburgh, for loan of the specimens from Gough Island, I received 10 specimens labeled *A. oculata* Brady, South Orkney Island; these have been identified herein as *Homasterope maccaini*. I also received a vial with an articulated carapace containing 6 eggs but no appendages, which I did not try to identify (dimensions of the distorted specimen are length 1.72 mm, height 1.25 mm) and a label, "*Asterope oculata* Brady, Stat. A, Scotia coll., 3 April 1904," plus two undecipherable words. On 3 April 1904, the *Scotia* was far from Gough Island, at 56°55′S, 10°00′W (Wilton et al.,

1908). In lateral outline, the specimen is tumid, similar to the specimen illustrated by Scott.

The Y-sclerite

Rome (1969) showed that the "furcal attachment" (a sclerite on each side of the animal near the furca and serving for muscle attachments and as a pivot for furcal movement) varies from species to species in podocopid ostracodes and is useful in taxonomic descrimination. Myodocopid ostracodes have a similar sclerite on each side of the body near the furca. Because of the shape of the sclerite in some families, I am using the name Y-sclerite. During this study I routinely drew the outline of the Y-sclerite for many species in order to determine their variability and possible usefulness for identifying taxa and assessing phylogenetic relationships.

Almost all my illustrations of the Y-sclerite are from animals observed in lateral view and not compressed by a cover slip. Because the Y-sclerite

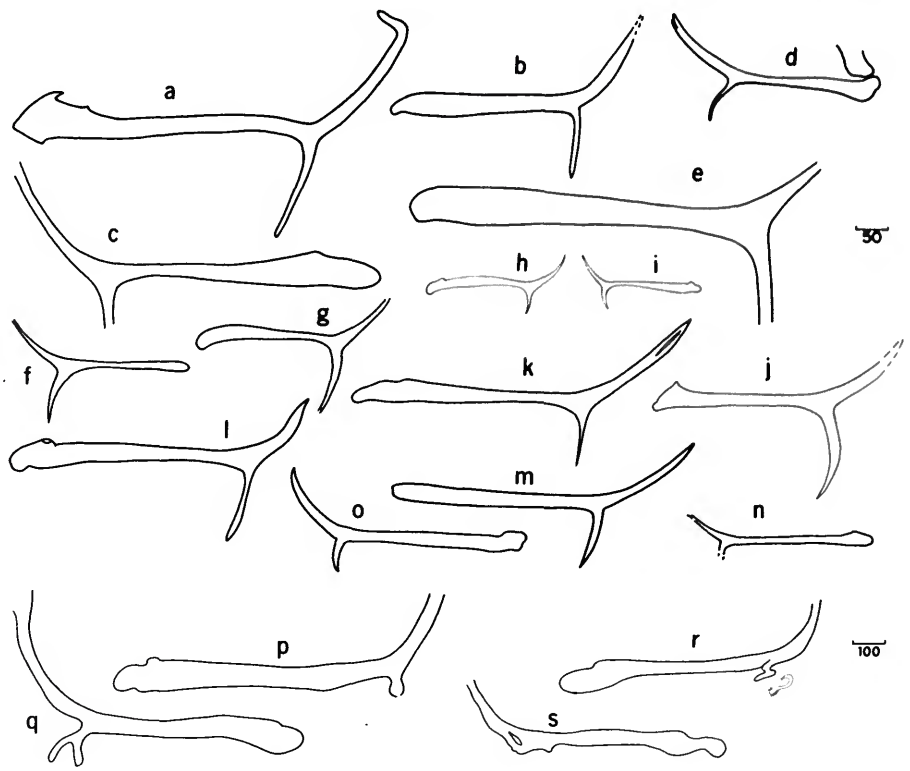

FIGURE 429.—Outline of the furcal sclerites in family Cypridinidae (R = right sclerite, L = left sclerite): *a, Doloria levinsoni,* female, USNM 127283 (R); *b, D. septenaria,* female, USNM 128143 (R); *c, D. isaacsi,* ovigerous female, species K (L); *d, D. isaacsi,* juvenile under cover slip, station 39 (L); *e, D. mawsoni,* adult female, station 83, specimen 1 (R); *f, Hadacypridina bruuni,* juvenile male, USNM 128610 (L); *g, Metavargula iota,* adult female, USNM 137472 (R); *h, Siphonostra hallex,* female, USNM 137264 (R); *i, S. hallex,* male, USNM 137265 (L); *j, Vargula hamata,* male, USNM 127971 (R); *k, V. hamata, ovigerous* female, USNM 127526 (R); *l, V. sutura,* female, USNM 127506 (R); *m, V. antarctica,* ovigerous female, USNM 127961 (L); *n, V. dentata,* male, USNM 127969 (L); *o, Rugosidoloria serrata,* gravid female, USNM 136586 (L); *p, Isocypridina quatuorsetae,* ovigerous female, USNM 136174 (R); *q, I. quatuorsetae,* ovigerous female, USNM 136174 (L); *r, I. quatuorsetae,* N–1 male, USNM 136175 (R); *s, I. quatuorsetae,* N–1 male, USNM 136175 (L). (Magnification *a-o,* × 20; *p-s,* × 10.)

is not parallel to the median plane of the animal, my illustrations generally give slightly oblique views of the sclerite, and changes in position or obesity of the animal slightly change the appearance of the sclerite. Also, extremities of the sclerite are obscure on some specimens. A more careful study, perhaps using potassium hydroxide to remove protoplasm, should produce more accurate illustrations.

Because of the general similarity in shape of the Y-sclerite and the furcal attachment of Podocopa, I have used part of the terminology of Rome. The anterior end is branched forming a "dorsal branch" and "ventral branch." The posterior end of the furcal attachment was termed the "*Extremite articulaire*" by Rome. The Y-sclerite in the Cypridinacea contains two posterior features, a "dorsal socket" and a "ventral socket" (see Figure 430*c*). Between the dorsal socket, which is generally anterior to the ventral socket, and the crotch of the anterior branches is the "middle segment." On some species the ventral socket is actually on the posterior tip of the sclerite.

The Y-sclerites of Cylindroleberididae (Figure 431) differ considerably from those of Cypridinidae (Figure 429), Philomedidae (Figure 430), Sarsiellidae, and Rutidermatidae (Figure 432) in the absence of a ventral branch and in having the dorsal socket at a considerable distance from the posterior end of the sclerite. The ventral branch

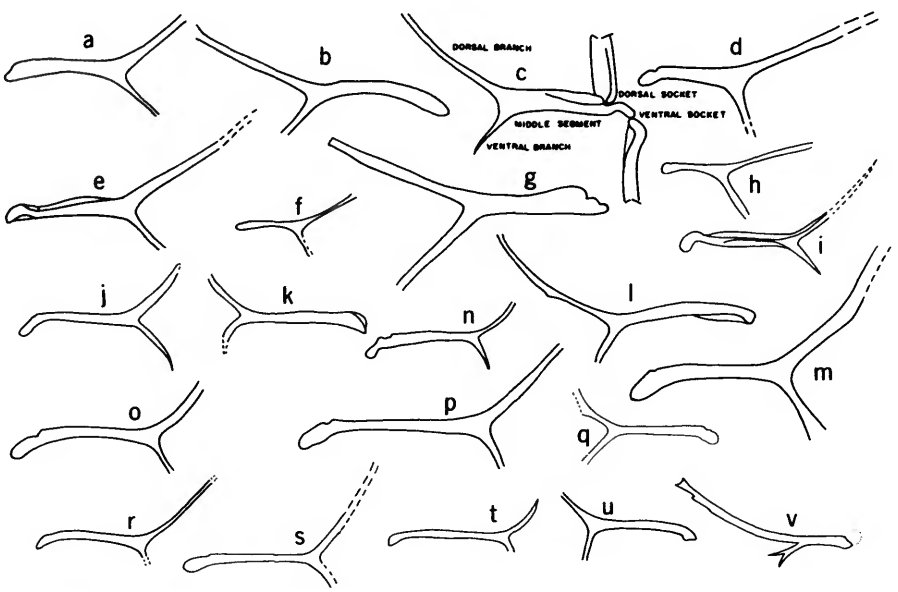

FIGURE 430.—Outline of furcal sclerites in family Philomedidae (R = right sclerite, L = left sclerite): *a, Philomedes orbicularis,* ovigerous female, USNM 138160 (R); *b, P. orbicularis,* female, USNM 138160 (L); *c, P. subantarctica,* adult male, USNM 128040 (L); *d, P. subantarctica,* ovigerous female, USNM 127977 (R); *e, P. subantarctica,* adult male, USNM 128042 (R); *f, P. minys,* ovigerous female, USNM 128209 (R); *g, P. ramus,* adult female, USNM 135107 (L); *h, P. cubitum,* female, USNM 138656 (R); *i, P. agilis,* male, USNM 128283 (R); *j, P. agilis,* N–1 male, USNM 128280 (R); *k, P. agilis,* N–1 male, USNM 128280 (L); *l, Scleroconcha arcuata,* male, USNM 128848 (L); *m, S. arcuata,* female, USNM 128849 (R); *n, S. flexilis,* male, B505 (R); *o, S. flexilis,* female, B505, specimen z (R); *p, S. frons,* N–1 male, USNM 128503 (R); *q, S. wolffi,* ovigerous female, Akaroa Hbr., specimen 1 (R); *r, Anarthron reticulata,* female, specimen 1 (R); *s, A. dithrix,* adult female, USNM 128858 (R); *t, A. dithrix,* male, USNM 136932 (R); *u, A. evexum,* ovigerous female, USNM 136939 (L); *v, Igene walleni,* adult female, USNM 127517 (L). (Magnification × 20.)

of the Y-sclerite in most species of Cypridinidae (excluding the Azygocypridininae) forms an angle of about 90° or less with the middle segment (an exception is *Doloria mawsoni*); whereas, in most species of Philomedidae, Sarsiellidae, and Rutidermatidae this angle is more than 90°. The Y-sclerite of the Philomedidae, Sarsiellidae, and Rutidermatidae are similar.

In the Cypridinidae, the Y-sclerite of the subfamily Azygocypridininae differs from that in the subfamily Cypridininae in having a shorter and more variable ventral branch.

It does not appear that the Y-sclerite will be useful in discriminating genera, but differences in the details of the sclerite might be useful for identifying species; for example, the Y-sclerite on *Doloria levinsoni* (Figure 429*a*) is the only one with a backward-pointing hook on the tip of the dorsal branch. Differences between illustrations of the Y-sclerites of males and females and juveniles

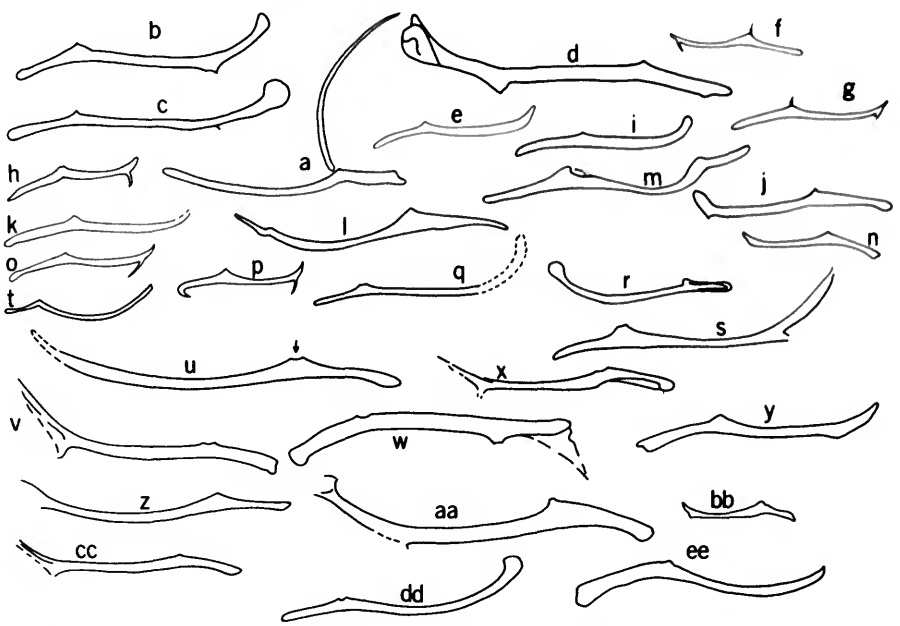

FIGURE 431.—Outline of furcal sclerites in family Cylindroleberididae (R = right sclerite, L = left sclerite): *a, Archasterope bulla,* ovigerous female, USNM 128964 (L); *b, Diasterope grisea,* ovigerous female, B501 (R); *c, D. grisea,* ovigerous female, B501 (R); *d, D. grisea,* male, specimen z, B501 (R); *e, Parasterope longiseta,* ovigerous female, USNM 136132 (R); *f, P. quadrata,* N–1 female, B501 (L); *g, P. quadrata,* N–1 male, B501 (R); *h, P. crinita,* female, USNM 128278 (R); *i, P. anommata,* ovigerous female, USNM 137087 (L); *j, P. anommata,* adult female, USNM 128046 (L); *k, P. anommata,* male, USNM 137088 (R); *l, P. styx,* ovigerous female, USNM 137259 (L); *m, P. styx,* ovigerous female, USNM 137259 (R); *n, P. prolixa,* ovigerous female, USNM 139104 (R); *o, P. prolixa,* ovigerous female, USNM 139104 (L); *p, P. prolixa,* adult male, USNM 139113 (R); *q, Synasterope dimorpha,* adult male, USNM 128970 (R); *r, S. dimorpha,* ovigerous female, USNM 128967 (L); *s, S. mystax,* adult male, USNM 137110 (R); *t, S. bachythrix,* adult female, USNM 139118 (R); *u, Skogsbergiella scotti,* ovigerous female, USNM 127398 (L); *v, S. macrothrix,* adult male, USNM 137064 (L); *w, S. macrothrix,* female, USNM 128044 (R); *x, S. macrothrix,* N–1 male, USNM 128045 (L); *y, S. plocus,* adult male, USNM 136081 (R); *z, S. plocus,* ovigerous female, USNM 136077 (L); *aa, S. pax,* ovigerous female, USNM 137098 (L); *bb, Homasterope micra,* ovigerous female, USNM 136071 (R); *cc, Bathyleberis grossmani,* juvenile male, USNM 137260 (R); *dd, B. monothrix,* ovigerous female, USNM 128688 (L); *ee, Asteropteron hulingsi,* female, USNM 128680 (R). (Magnification × 20.)

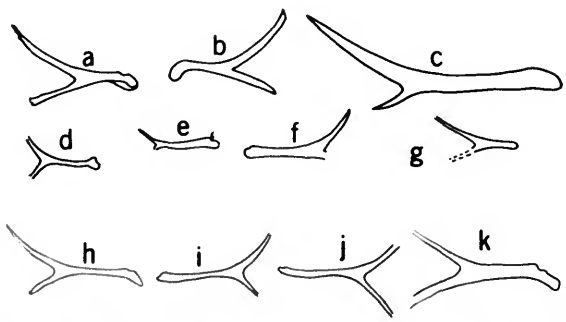

FIGURE 432.—Outline of furcal sclerites in families Sarsiellidae and Rutidermatidae (R = right sclerite, L = left sclerite). Sarsiellidae: *a, Sarsiella lunata,* female, USNM 137688 (L); *b, S. lunata,* female, USNM 137688 (R); *c, Spinacopia octo,* ovigerous female, USNM 127271 (L); *d, Cymbicopia hanseni,* male, B505 (L); *e, C. hispida,* female, B505 (L); *f, C. hispida,* female, lectotype (R); *g, Adelta theta,* adult female, USNM 134811 (L). Rutidermatidae: *h, Rutiderma ovata,* N-1 male, USNM 137682 (L); *i, R. ovata,* male, USNM 137685 (R); *j, R. ovata,* male, USNM 137685 (R) (orientation of specimen slightly different than in "i"); *k, R. ovata,* ovigerous female, USNM 137683 (L).

belonging to the same species are sufficiently small to have resulted from slightly different orientations and the extent to which the sclerite is obscured in the prepared specimen.

Postadult Molting

Elofsen (1941, 1969:161–164) reviewed the evidence concerning postadult molting of ostracodes and stated that the conclusion of Müller (1926:422) that molts do not occur in ostracodes that have reached maturity is probably correct, but he pointed out that "no proof has been produced that not a single case of such molts exist." Hoff (1943) observed two kinds of females in the entocytherid ostracode *Entocythere riojai* Hoff, 1943; one type which copulated but did not bear eggs, and a second type that bore eggs but did not copulate. Each type had characteristic differences in their shells and appendages. He concluded (p. 281) that "The only adequate explanation for the two kinds of females seems to be that a molt occurs between the time of copulation and the time of development of the eggs within the ovary." Rioja (1943) observed that the presence of two types of females is extensive among entocytherid species and considered the first type (copulating female) to be a juvenile. Dr. Horton H. Hobbs (pers. comm., 1972) also considers only the egg-bearing female of entocytherids to be adult.

Poulsen (1962:34) concluded that mature females of *Gigantocypris agassizi* Müller, 1895, in his collection fell into two, or possibly three, groups having carapace lengths of 23–27 mm, 30–32 mm, and 34 mm. He measured 11 specimens in the first group, 3 in the second, and 1 in the third. Embryos were present in specimens of the first and second groups. Poulsen (p. 34) interpreted this as follows, "This may either mean that the females after having propagated, moult again, and then propagate a second time, or that some of them do not propagate after the moulting preceding the size 23–27 mm., but only after still another moulting, and then at the larger size, 30–34 mm." Both interpretations call for postadult molting. Poulsen (1962: 68, Table 8) considered the mature females of *Gigantocypris muelleri* Poulsen, 1962, to fall into two size groups. He measured 20 specimens in the first group and 2 in the second. Postadult molting was not proposed for males in the two species.

I reexamined the data of Poulsen to determine whether it could be shown conclusively by using statistics that postadult molting had taken place. It seems logical to assume that if the adults of a species include 2 or 3 size groups, each representing a different molt or instar, then the dispersion of carapace lengths when the groups are combined should be greater than the variation in carapace lengths of the N–1 instars of the same sex, which comprise only a single group. Assuming that the data were normally distributed, I employed the variance or F ratio (see Wallis and Roberts, 1960: 426) to measure dispersion differences and found that the adult females of *G. agassizi* almost had a significantly different dispersion at the 0.1 level than juvenile females. Adult females of *G. muelleri* were not significantly different from the juvenile females. The data suggest that Poulsen may be correct in stating that *G. agassizi* undergoes postadult molting, but it is inconclusive.

Kornicker (in Bowman and Kornicker, 1967:16) reported three specimens, considered to be juvenile males of *Parasterope pollex* Kornicker, 1967, that were larger than the N–1 male instars and had a sensory bristle with numerous filaments (adult character) on the 5th joint of the 1st antenna, but

did not have other adult characters. The carapace lengths of five N–1 male instars ranged from 1.38 mm to 1.43 mm; the lengths of eight adult males ranged from 1.50 mm to 1.63 mm; lengths of the three partly developed males were 1.56 mm, 1.70 mm, 1.72 mm (range: 1.56 mm to 1.72 mm). The data are too few for statistical evaluation, but because two of the three partly developed males have carapace lengths outside the range of the adult males, it is probably correct to assume that, in general, partly developed males are larger than fully developed males.

In the above paper I attributed the large partly developed males to a delay in sexual maturity and not to postadult molting. In a later paper (Kornicker, 1969:36) I suggested that the partly developed males may be similar to "second form" males of crayfish, which have some juvenile characters and alternate with "first form" fully developed males. In later discussions with Dr. Fenner A. Chace and Dr. Horton H. Hobbs I learned that the second form males of crayfish are essentially similar to the N–1 instar, except for size. Because the partly formed males of *P. pollex* have characters not present in the N–1 instars, it seems unlikely that they can be considered second form males.

The best positive evidence to prove postadult molting would be to find an adult in the process of molting. It is not uncommon to find juveniles with the new appendages visible within the old. In the present study I found no adults in that state. In some crustaceans molting is delayed if females are ovigerous (Passano, 1964:482). Therefore, it is possible that the examination of ovigerous ostracodes for signs of molting might be fruitless. The examination of adult males, and females that have released their larvae, might be more rewarding. In the crab genus *Carcinus*, the adult female does not molt, whereas, the adult male molts 3 to 4 times (Austin B. Williams, pers. comm., 1972); therefore, if it should be proved that postadult molting occurs in any particular sex of an ostracode, it cannot be assumed that it occurs in the other sex.

In summary, no evidence is on hand to show conclusively that postadult molting occurs in the Ostracoda. Sufficient work has been done, however, to conclude that if postadult molting does occur, it is rare.

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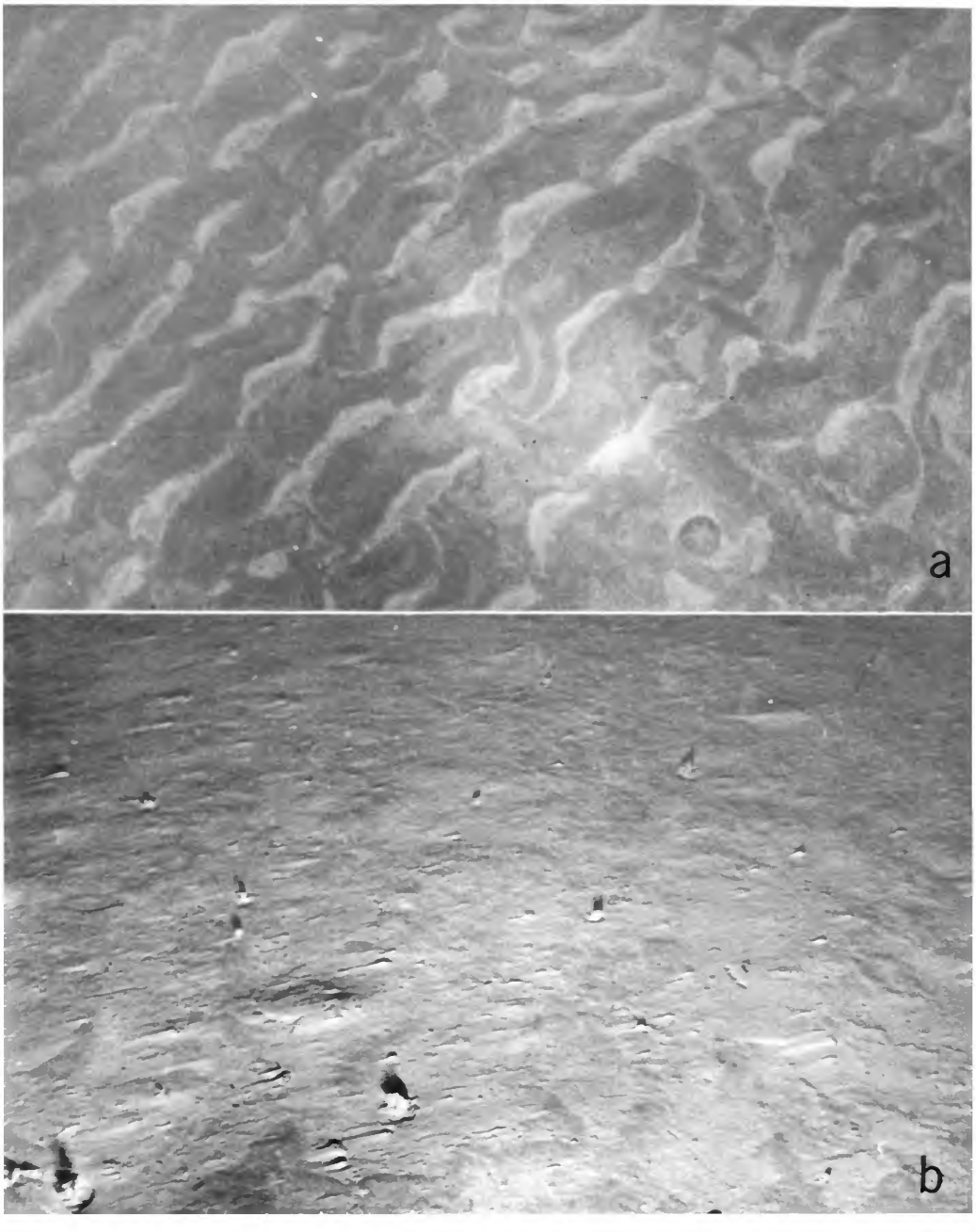

PLATE 1.—Bottom photographs: *a, Eltanin* Cruise 4, Camera station 2, frame 6, 16 July 1972, 55°52′S, 61°35′W, depth 4060 m, Scotia Sea, bottom with current ripples, foraminifers in troughs of ripples, echinoid in lower right, near biological station 102; *b, Eltanin* Cruise 4, Camera station 3, frame 22, 20 July 1962, 56°03′S, 60°48′W, depth 4108.8 m, Drake Passage, light gray foraminiferal sand bottom with pebbles and rocks showing current scour around them, near biological station 112. (Width of photographs at base represents about 1 m.)

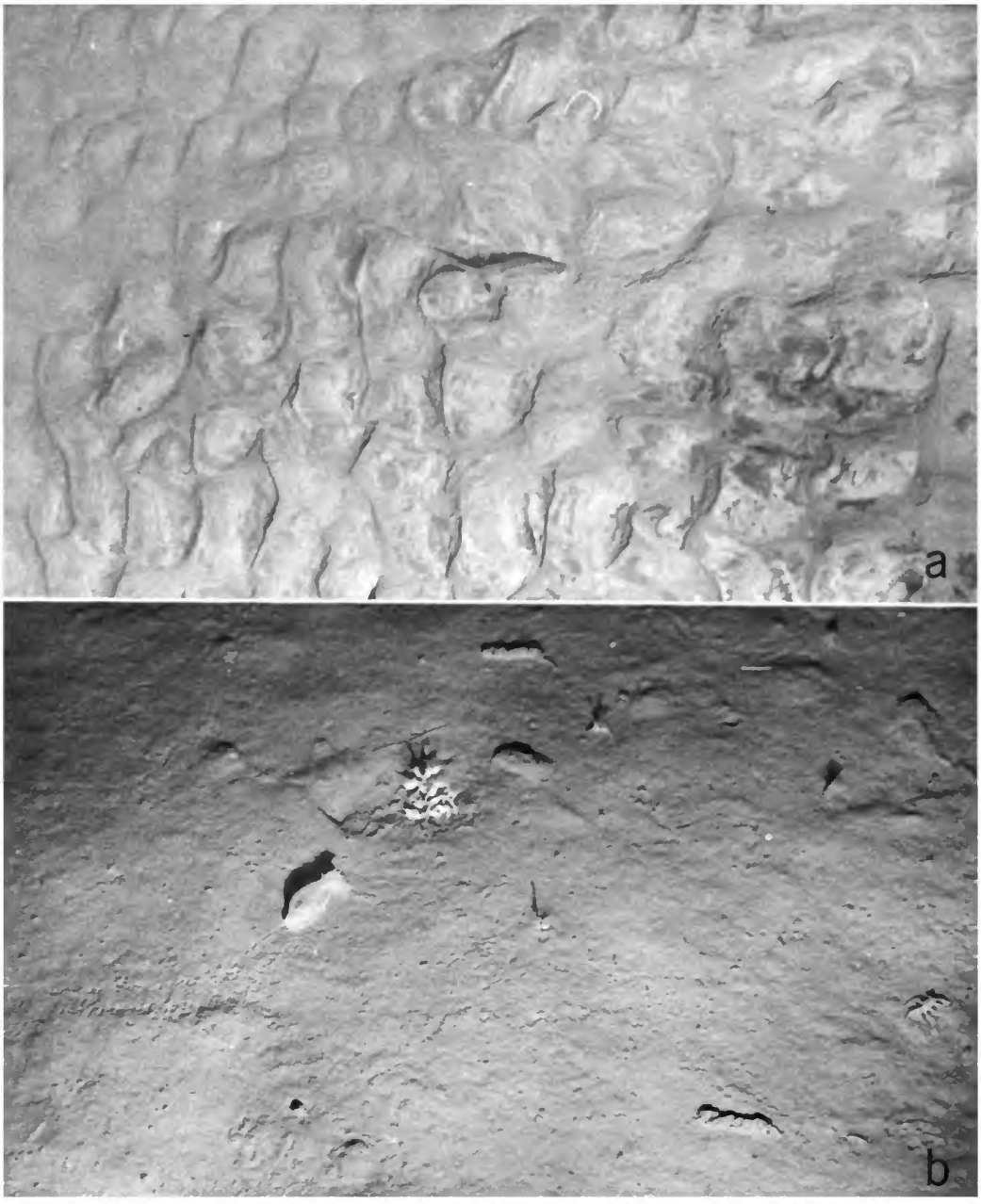

PLATE 2.—Bottom photographs: *a, Eltanin* Cruise 4, Camera station 4, 55°59′S, 61°43′W, depth 4133 m, Drake Passage, rippled sand with elasipod holothuroid, near biological station 112; *b, Eltanin* Cruise 4, Camera station 8, frame 21, 2 August 1962, 61°41′S, 61°10′W, depth 4773 m, southern Drake Passage, light brown clayey silt bottom with holothuroid ophiuroids, fecal strands and scalpellid barnacles (see Newman and Ross, 1971, pl. Ib), near biological station 127. (Width of photographs at base represents about 1 m.)

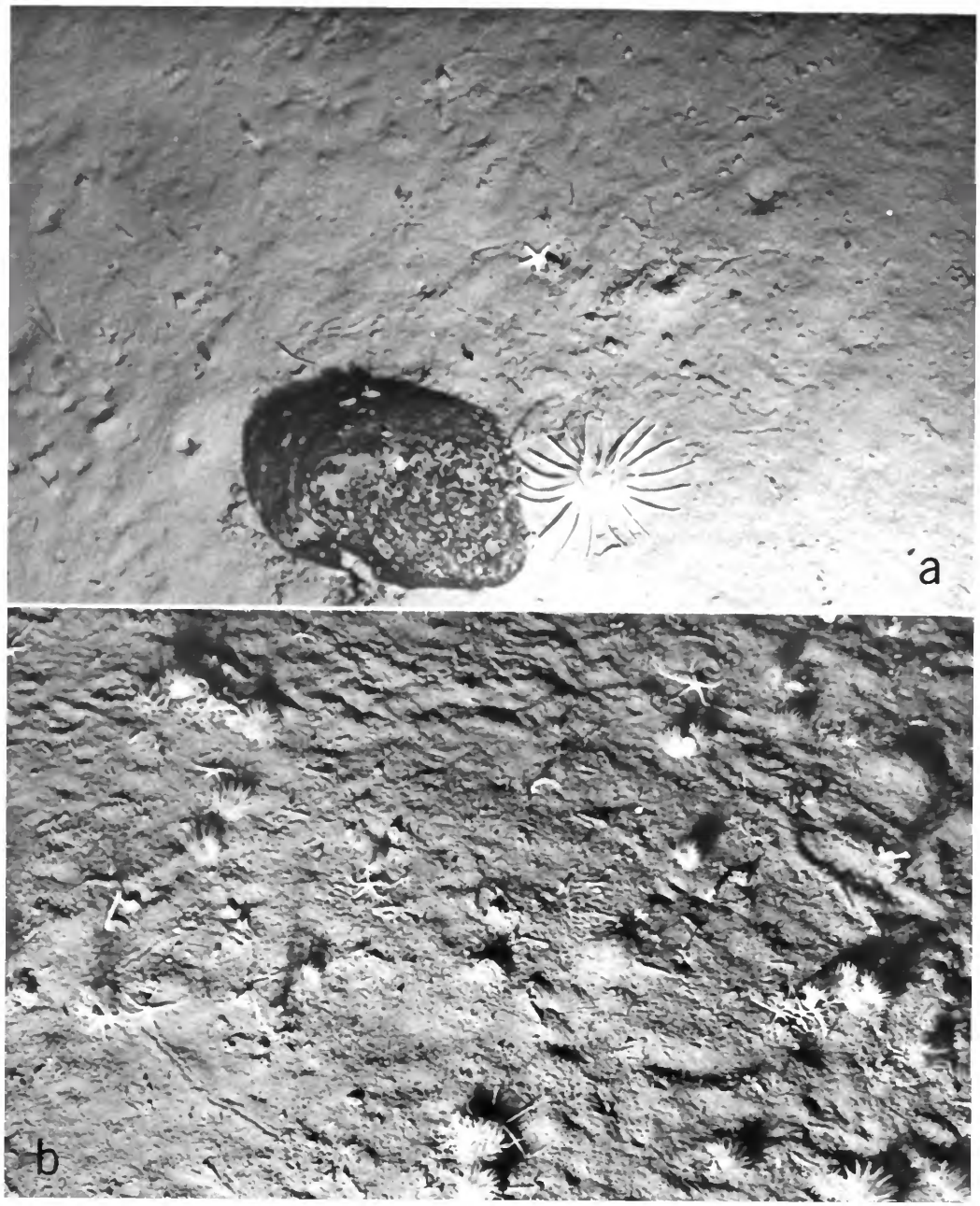

PLATE 3.—Bottom photographs: *a, Eltanin* Cruise 4, Camera station 9, frame 6, 2 August 1962, 61°49′S, 61°23′W, depth 3227 m, southern Drake Passage, fine silt bottom with boulders, anemone, asteroid, ophiuroid, holothuroid trails and burrows, near biological station 129; *b, Eltanin* Cruise 6, Camera station 2, frame 9, 3 December 1962, 53°05′S, 59°32′30″W, depth 640 m, station between Burdwood Bank and the Falkland Islands east of Straits of Magellan, dark gray medium sand bottom with abundant ophiuroids and anemones, near biological station 340. (Width of photographs at base represents about 1 m.)

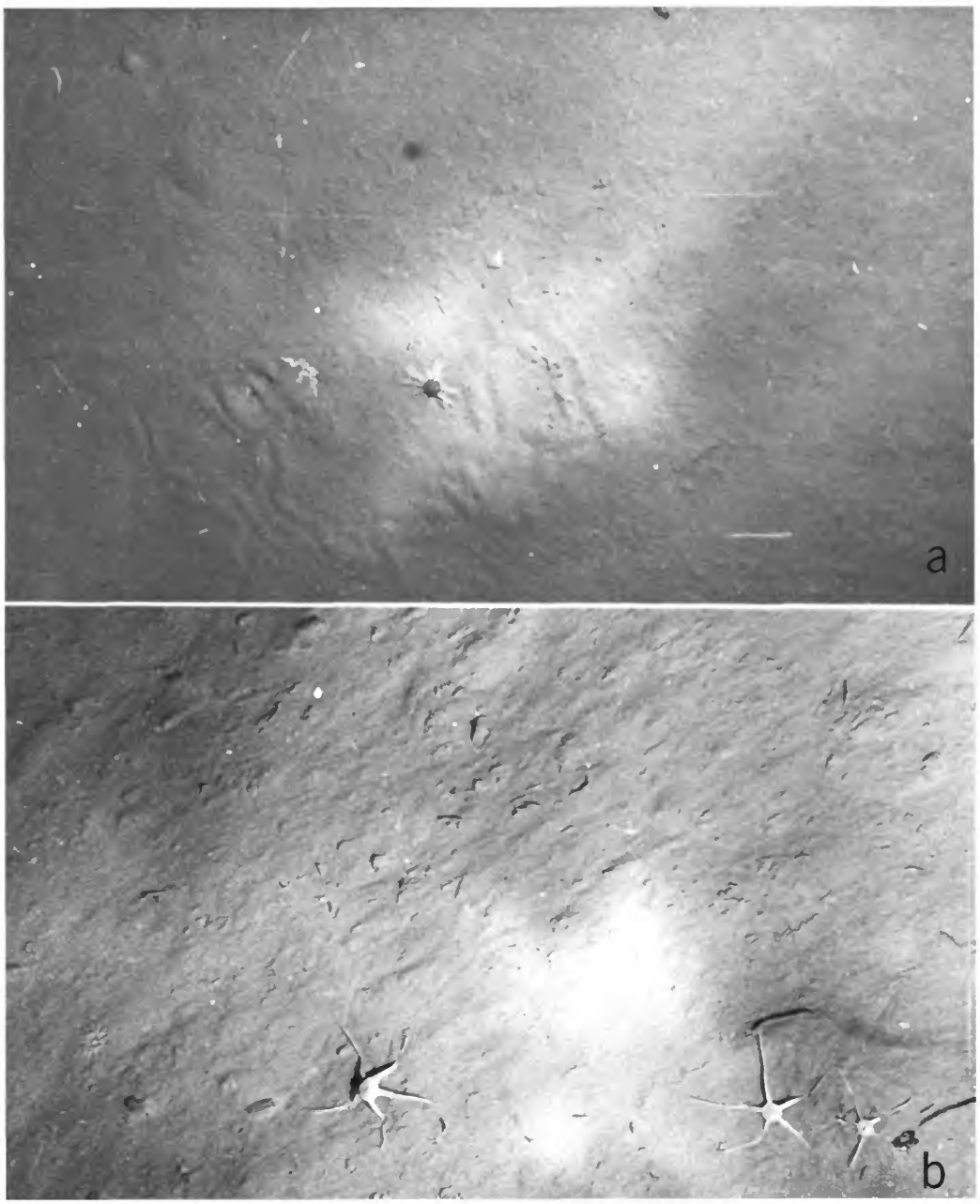

PLATE 4.—Bottom photographs: *a, Eltanin* Cruise 6, Camera station 9, frame 7, 29 December 1962, 58°49′30″S, 56°00′W, depth 3134.6 m, Scotia Sea, mud bottom with trails, echinoids, and ophiuroids, near biological station 394; *b, Eltanin* Cruise 6, Camera station 12, frame 14, 1 January 1963, 62°03′S, 56°03′W, depth 1280 m, West Scotia Basin, olive-gray foraminiferal sandy silt bottom with ophiuroids, worms, and anemones, near biological station 412. (Width of photographs at base represents about 1 m.)

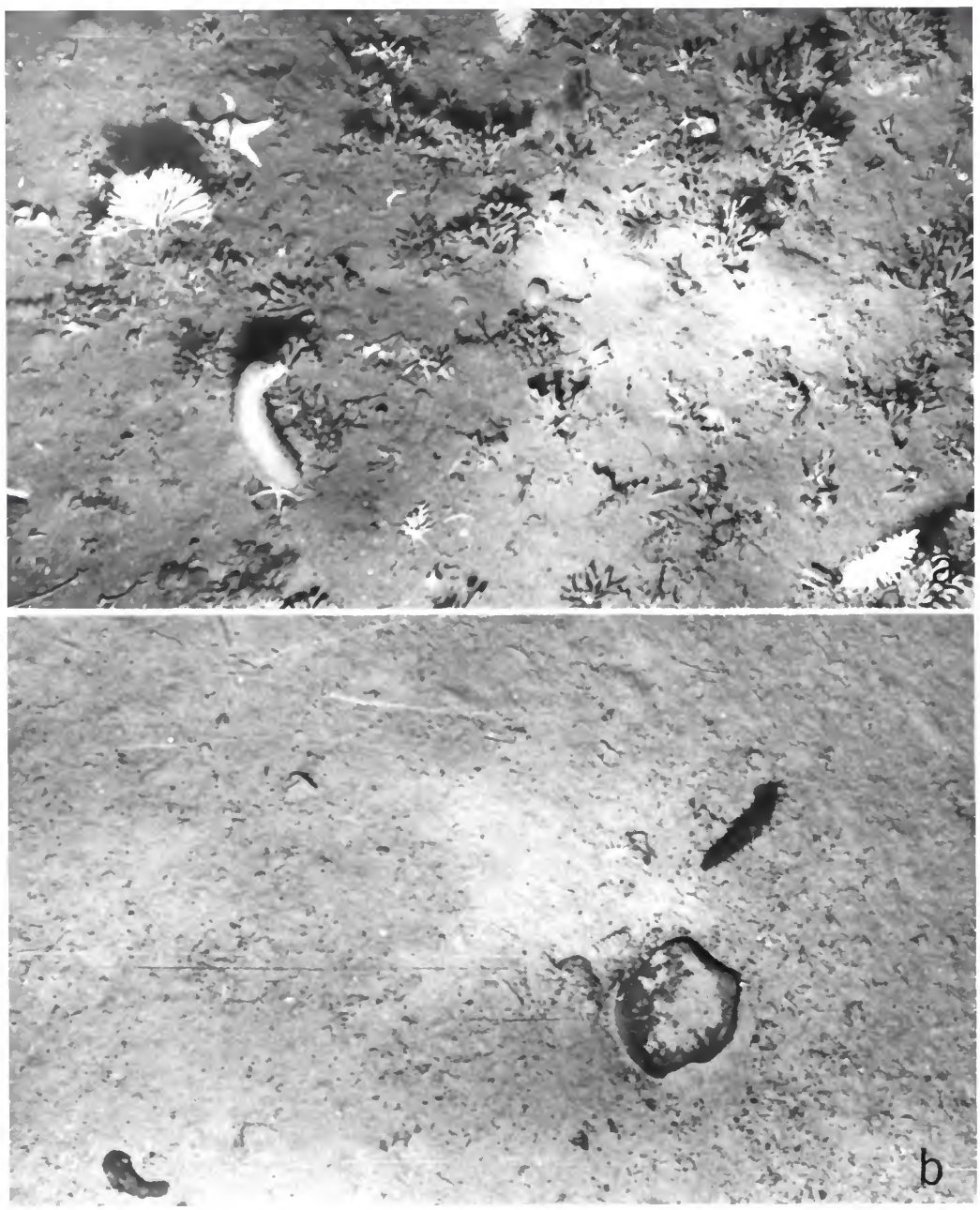

PLATE 5.—Bottom photographs: *a, Eltanin* Cruise 6, Camera station 13, frame 8, 2 January 1963, 62°38′S, 56°14′W, depth 438.9 m, Bransfield Strait, olive-gray sandy silt bottom with sponges, ophiuroids, holothuroid, asteroid, polychaete worms, near biological station 416; *b, Eltanin* Cruise 7, Camera station 5, frame 6, 14 February 1963, 57°09′S, 44°59′W, depth 3525.6 m, east center of West Scotia Basin, yellowish olive-gray diatomaceous sandy silt bottom with cobbles and small manganese nodules, holothuroids, and polychaetes, near biological station 476. (Width of photographs at base represents about 1 m.)

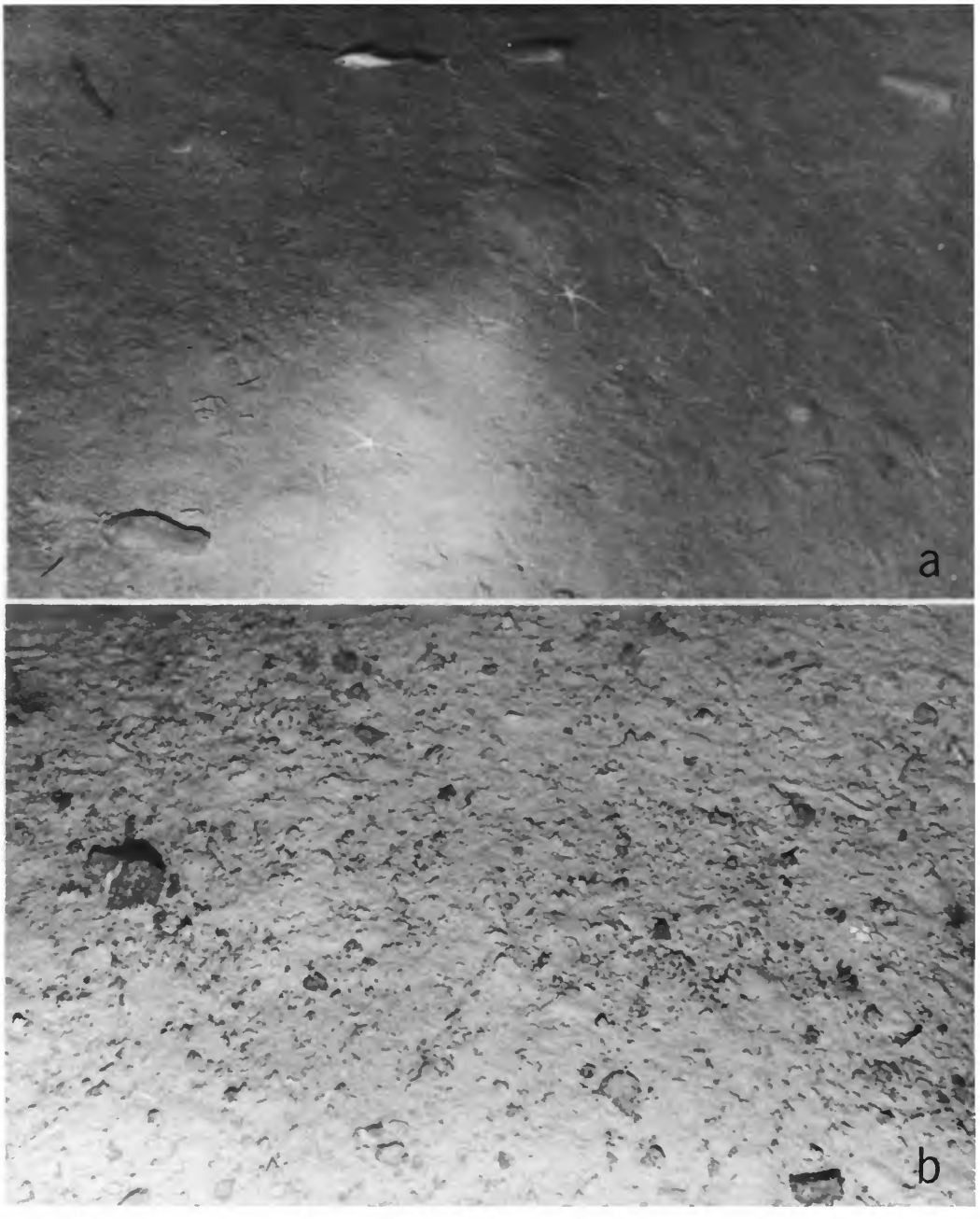

PLATE 6.—Bottom photographs: *a, Eltanin* Cruise 7, Camera station 6, frame 5, 16 February 1963, 58°45′S, 44°50′W, depth 2414 m, east center of West Scotia Basin, mud bottom with holothuroids, ophiuroids, fish, worm tubes, fecal strands, anemones, near biological station 480; *b, Eltanin* Cruise 11, Camera station 13, frame 1, 22 January 1964, 70°25′S, 99°30′W, depth 3621 m, on southern flank of Bellingshausen Basin, pale yellowish-brown, calcareous, sandy, clayey silt bottom with pebbles, boulders, and manganese nodules, trails and fecal strands, near biological station 939. (Width of photographs at base represents about 1 m.)

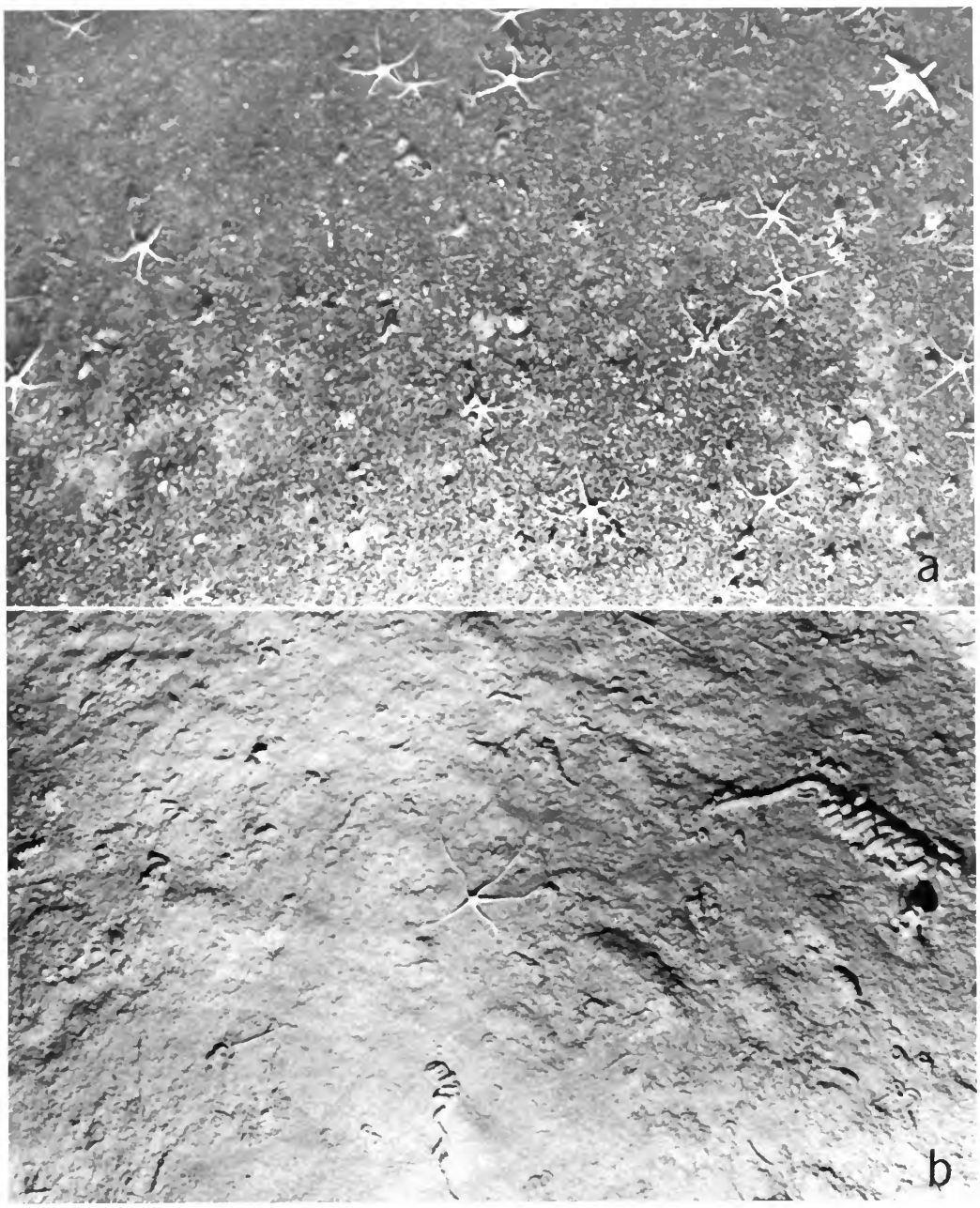

PLATE 7.—Bottom photographs: *a, Eltanin* Cruise 12, Camera station 1, frame 4, 14 March 1964, 61°24′S, 56°41′W, depth 658 m, north of Bransfield Strait, glacial, marine, dark greenish-gray pebbly sand bottom with pebbles and numerous ophiuroids and one asteroid, near biological station 997; *b, Eltanin* Cruise 14, Camera station 4, frame 10, 11 August 1964, 58°03′S, 160°12′6″W, depth 4096 m, Albatross Cordillera, South Pacific, mud bottom with ophiuroid and fecal strands, near biological station 1209. (Width of photographs at base represents about 1 m).

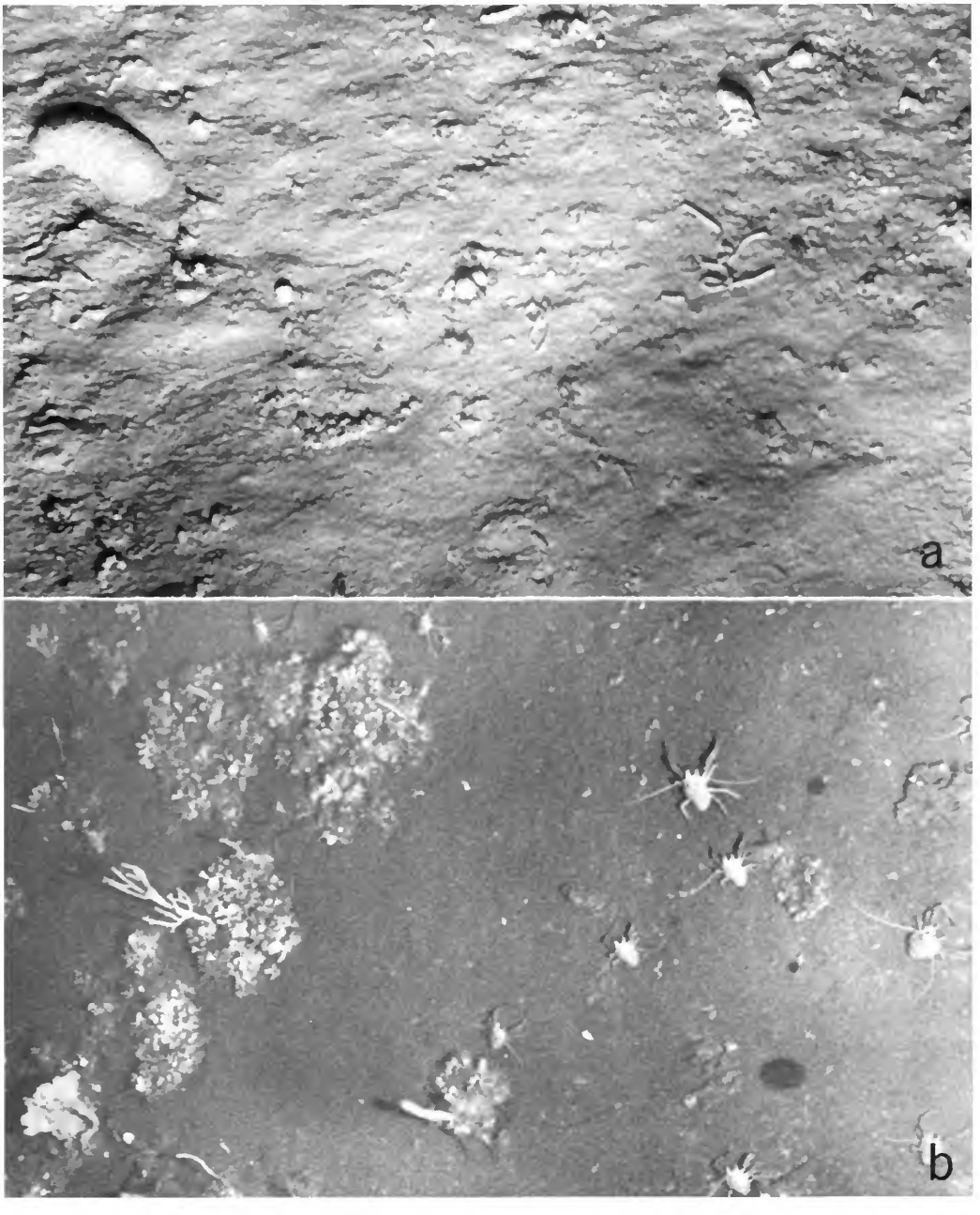

PLATE 8.—Bottom photographs: *a, Eltanin* Cruise 19, Camera station 9, frame 5, 24 July 1965, 59°54′S and 110°09′W to 59°54′S and 110°09′W, depth 5047 m, South Pacific, silty mud with fecal matter, holothuroids, trails, near biological station 1474; *b, Eltanin* Cruise 21, Camera station 1, frame 10, 22 November 1965, 33°03′S, 71°47′W, depth 155.4 m, shelf west of Chile, mud bottom with galatheids, gorgonians, coralline, and red algae, near biological station 194. (Width of photographs at base represents about 1 m.)

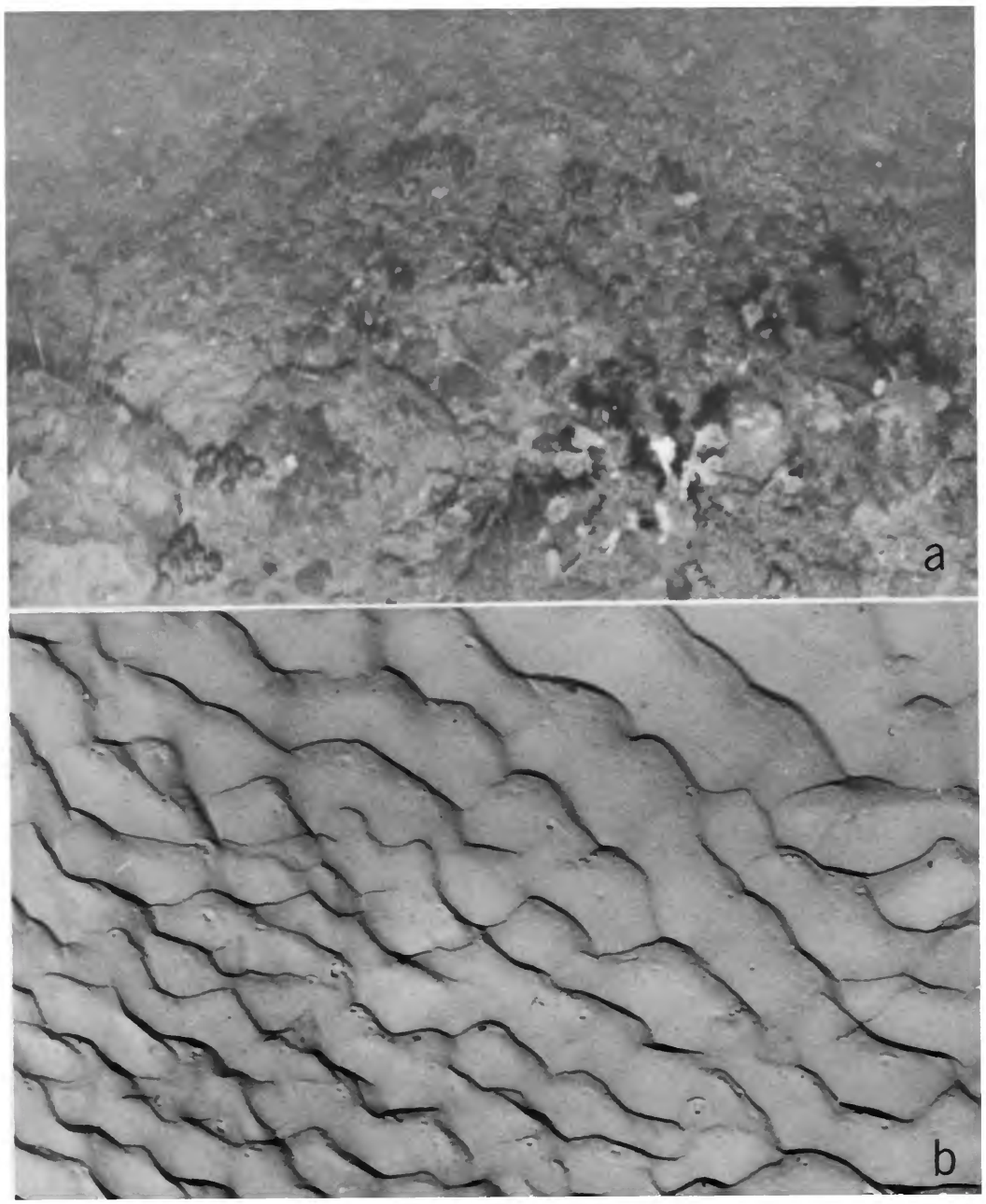

PLATE 9.—Bottom photographs: *a, Eltanin* Cruise 22, Camera station 31, frame 7, 14 March 1966, 55°19′S and 53°20′W to 55°17′S and 53°27′W, depth 126.2 m, Burdwood Bank, boulder bottom with sponges, gorgonians, pennatulids, worm tubes, near biological station 1596; *b, Eltanin* Cruise 27, Camera station 28, frame 8, 23 February 1967, 40°20′S, 147°50′E, depth 988–965.5 m, Tasman Plateau, bottom with current ripples indicating current moving northwest to southeast, near biological station 1981. (Width of photographs at base represents about 1 m.)

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