Myodocopid Ostracoda from Southern Africa

LOUIS S. KORNICKER

SMITHSONIAN CONTRIBUTIONS TO ZOOLOGY • NUMBER 214

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ABSTRACT

Kornicker, Louis S. Myodocopid Ostracoda from Southern Africa. *Smithsonian Contributions to Zoology,* number 214, 39 pages, 24 figures, 1976.—Ostracoda from Lüderitz Bay, South-West Africa, identified by Klie (1940) as *Asterope grimaldi* Skogsberg, 1920, and *Asterope muelleri* Skogsberg, 1920, were restudied and referred to three new species: *Cylindroleberis kliei, Parasterope beta,* and *Parasterope kappa.* The new species are described and illustrated. *Paradoloria dorsoserrata* (Müller, 1908), the type-species of the genus *Paradoloria,* is redescribed from syntypes from off the coast of South Africa. The identification by Klie (1940) of *Paradoloria dorsoserrata* in Lüderitz Bay is tentatively confirmed. It is concluded that ostracodes from the vicinity of Japan identified by Poulsen (1962) as *Paradoloria dorsoserrata* were correctly referred by Hanai (1974) to *Paradoloria pellucida* (Kajiyama, 1912).

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Introduction

Skogsberg (1920:510) reported *Asterope grimaldi* Skogsberg, 1920 (= *Cylindroleberis grimaldi*), from the Mediterranean Sea near Monaco. Later, Klie (1940:409) reported it from Redfort Bay and Lüderitz Bay, South-West Africa. Its absence from the coast of Mauritania (Kornicker and Caraion, 1974) suggested a disjunct distribution of the species—the Mediterranean Sea and South-West Africa. For this reason, it seemed advisable to reexamine Klie's specimens. These were obtained from the Hamburg Zoological Museum and are described herein as *Cylindroleberis kliei,* new species.

Skogsberg (1920:483) reported *Asterope muelleri* Skogsberg, 1920 (= *Parasterope muelleri*), from the English Channel and the Mediterranean Sea. It has since been reported from many localities including the Bahamas (Kornicker, 1958:239), the West Indies (Poulsen, 1965:370), and off Mauritania (Kornicker and Caraion, 1974:8). Klie (1940:409) reported the species from Lüderitz Bay, South-West Africa. Klie's identification was questioned by Poulsen (1965:370), Kornicker (1974:36), and Kornicker and Caraion (1974:8). Because of this, the specimens identified by Klie were obtained from the Hamburg Zoological Museum and restudied. Most were found to be very closely related to *Parasterope muelleri* Skogsberg, but sufficient differences were detected to refer them to *Parasterope beta,* new species. Three specimens in the same vial as the specimens identified as *A. muelleri* by Klie (= *Parasterope beta*) are described herein as *Parasterope kappa,* new species.

Müller (1908) described *Paradoloria dorsoserrata* (as *Cypridina dorsoserrata*) from Simonstown, South Africa, and Klie (1940) reported the species from Lüderitz Bay, South-West Africa. Poulsen (1962) reported it from off Misaki, Japan, but Hanai (1974:119) referred Poulsen's specimens to *Paradoloria pellucida* (Kajiyama, 1912). Examination of syntypes of *P. dorsoserrata* described below leads me to concur with Hanai. I also examined a juvenile (described below) from Lüderitz Bay in the collection reported on by Klie (1940), and tentatively agree that *P. dorsoserrata* was present in the bay. Hanai (1974:119) designated *P. dorsoserrata* the type-species of *Paradoloria.*

ACKNOWLEDGMENTS.—I thank Dr. Gerd Hartmann, Hamburg Zoological Institute and Museum, for sending specimens reported on by Klie (1940), and Dr. H.-E. Gruner, Berlin Zoological Museum, for sending syntypes of *Paradoloria dorsoserrata* (Müller, 1908). Criticisms of the manuscript by Dr. Thomas E. Bowman and Ms. Maura McManus are appreciated. Preliminary camera lucida drawings of appendages were made by Mr. Paul Mazer, who also inked the final drawings. The assistance of Mr. Walter R. Brown and Ms. Mary J. Mann, who operated the scanning electron microscope, is acknowledged with thanks.

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CYLINDROLEBERIDIDAE Müller, 1906

CYLINDROLEBERIDINAE Müller, 1906

Cylindroleberis Brady, 1868

A vial containing 46 specimens identified by W. Klie as *Asterope grimaldi* Skogsberg was received from the Hamburg Zoological Museum. These had been collected in Lüderitz Bay in February, 1938, by Dr. v. Levetzow. Klie (1940) had reported 50 specimens from Lüderitz Bay and 1 specimen from Redfort Bay. This indicates that the specimens I studied represent the bulk of the collection. All the specimens in the vial are referred to *Cylindroleberis kliei*, new species.

The new species brings to two the number of species of *Cylindroleberis* reported from the west coast of Africa.

Key to Species of *Cylindroleberis*

(along the western coast of Africa)

Dorsal margin of mandibular basale with 1 midbristle ..... ***C. bacescui*** Kornicker and Caraion, 1974
Dorsal margin of mandibular basale with 3–4 midbristles ..... ***C. kliei,*** new species

Cylindroleberis kliei, new species

FIGURES 1–5

Asterope grimaldi Skogsberg.—Klie, 1940:409.

Cylindroleberis grimaldi (Skogsberg, 1920).—Hartmann and Schröder, 1974a:35,36,41,46,50,70,76,77; 1974b:232; 1975:360, table 4.

HOLOTYPE.—Klie specimen number 1, ovigerous female, length 1.78 mm, Hamburg Zoological Museum. Appendages on 2 slides and in alcohol; valves in alcohol.

TYPE-LOCALITY.—Lüderitz Bay, South-West Africa.

ETYMOLOGY.—The species is named for Dr. Walter Klie.

ALLOTYPE.—Klie specimen number 2, adult male, length 1.95 mm, Hamburg Zoological Museum; from type-locality. Appendages on 2 slides and in alcohol; valves in alcohol.

PARATYPES.—44 specimens, including ovigerous females and juvenile males and females; Hamburg Zoological Museum.

DISTRIBUTION.—In addition to the type-locality, Hartmann and Shröder (1975:360, table 4) reported the species as *Cylindroleberis grimaldi* (Skogsberg, 1920) sensu Klie, 1940, from Langabaan, Velddrift, Kometji, False Bay, and Knysna, Union of South Africa. I have not seen those specimens.

Material: Through Dr. Gerd Hartmann, I received from the Hamburg Zoological Museum a vial containing 46 specimens and 2 labels: "09." and "*Asterope grimaldi* Skogsberg, D.S.W. Africa: Lüderitz Bucht, February 1938. Coll. v. Levetzow." All species have been referred herein to *Cylindroleberis kliei,* new species. I have labeled the holotype "Klie speciemen number 1" and the allotype "Klie specimen number 2."

DESCRIPTION OF FEMALE (Figures 1–3).—Carapace elongate with slightly convex dorsal and ventral margins (Figure 1*a*); anterior margin evenly rounded with slitlike incisur below valve middle; posterior almost evenly rounded; surface smooth.

Infold: Infold behind rostrum with about 5 bristles along list near incisur, about 7 bristles forming row ventral to list near inner end of incisur, and about 50 long bristles and many small bristles dorsal to list; about 35 long bristles and about 29 small bristles on broad anteroventral infold ventral to incisur; about 40 bristles forming row 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 list with about 27 broad transparent bristles with tubes at their bases and about 57 slender bristles, generally 2 but sometimes 3 or 4 bristles between each pair of transparent bristles (Figure 1*b*); 28 bristles present in ventral part of posterior infold between broad posterior list and valve edge; 2 additional bristles present in dorsal corner of posterior infold posterior to broad list; middle of posterior infold with 5 processes, each process with several pores posterior to base.

Size: Holotype, Klie specimen number 1, length 1.78 mm, height 0.98 mm. Four ovigerous females:

FIGURE 1.—*Cylindroleberis kliei*, new species, Klie specimen number 1, holotype, ovigerous female, length 1.78 mm: *a*, complete specimen showing position of lateral eye and eggs; *b*, posterior infold of left valve, medial view; *c*, left 1st antenna, lateral view; *d*, endopodite of right 2nd antenna, medial view; *e*, part of protopodite of right 2nd antenna showing stump of medial bristle, medial view. (Same magnification in micrometers: *b,c; d,e.*)

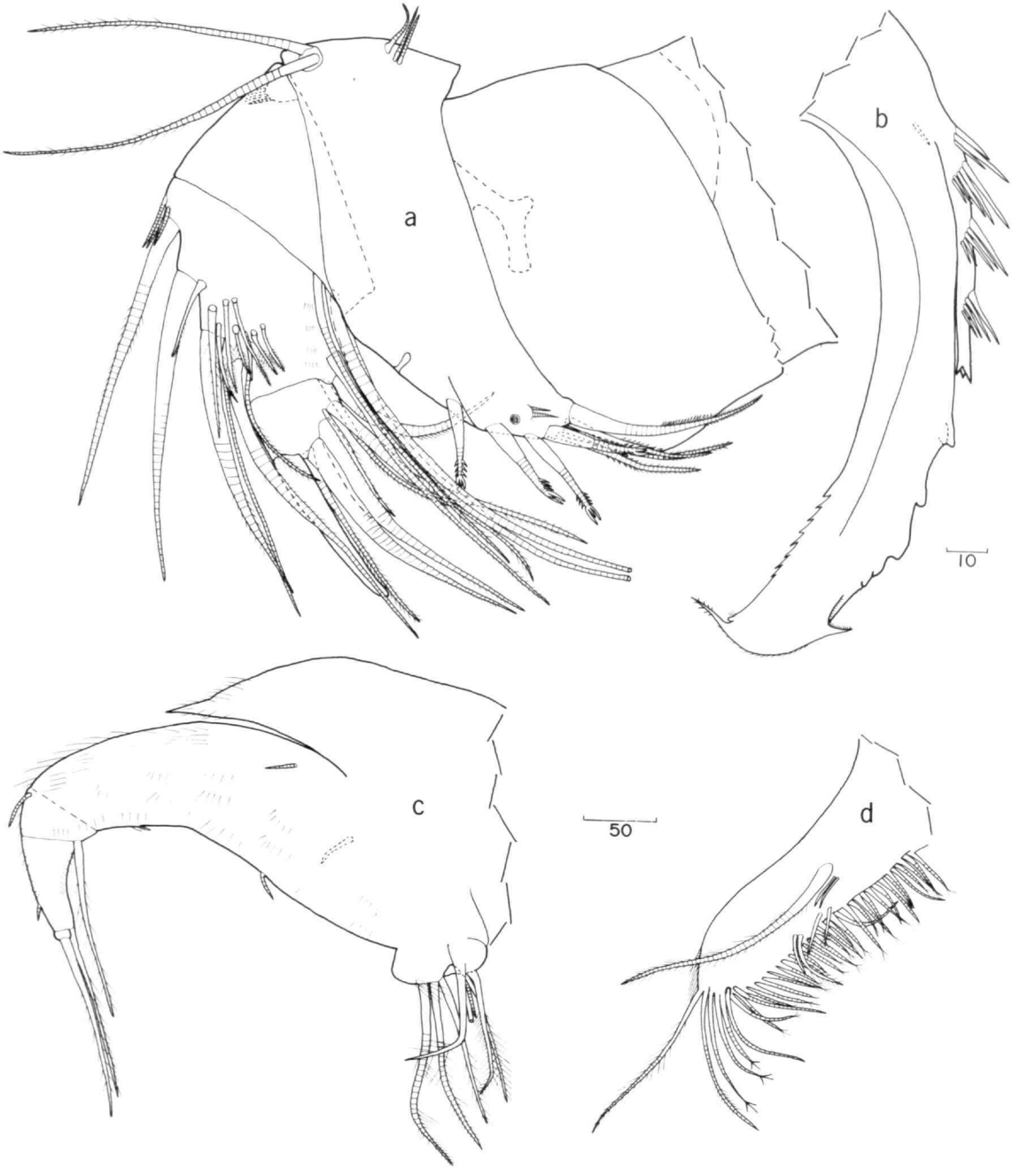

FIGURE 2.—*Cylindroleberis kliei*, new species, Klie specimen number 1, holotype (continued): *a*, right mandible without coxale endite, medial view; *b*, coxale endite of right mandible, lateral view (distal bristle on dorsal margin of dorsal branch broken); *c*, right maxilla, medial view; *d*, comb of left 5th limb, lateral view. (Same magnification in micrometers: *a,c,d*.)

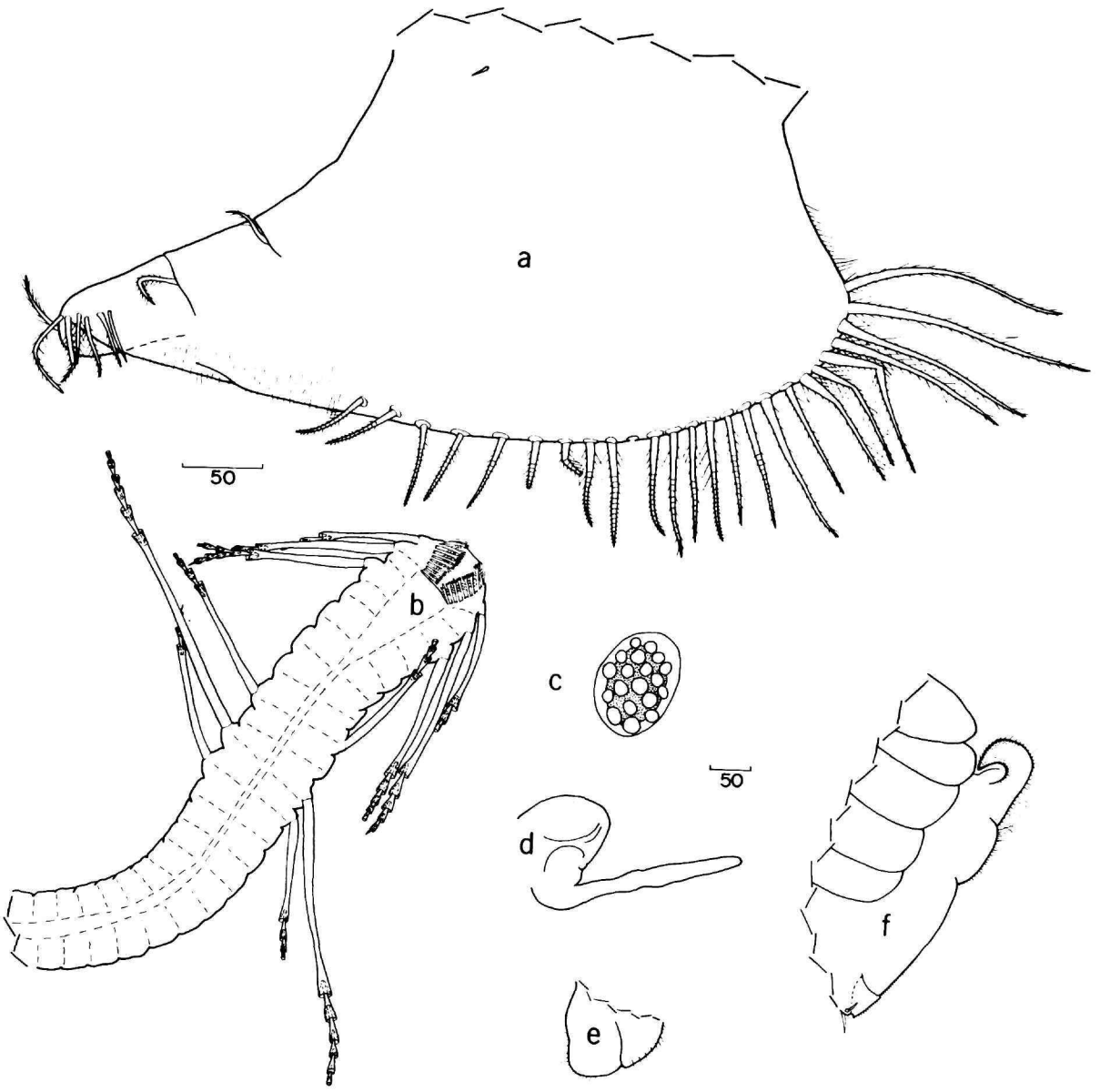

FIGURE 3.—*Cylindroleberis kliei*, new species, Klie specimen number 1, holotype (continued): *a*, right 6th limb, medial view; *b*, 7th limb; *c*, left lateral eye; *d*, medial eye and rod-shaped organ; *e*, upper lip, anterior to left; *f*, posterior of body showing tips of 5th of the gill-like structures, the dorsum, and the posterior furcal claws. (Same magnification in micrometers: *a,b; c–f.*)

length 1.74 mm, height 0.89 mm; length 1.73 mm, height 0.84 mm; length 1.72 mm, height 0.84 mm; length 1.72 mm, height 0.88 mm.

First antenna (Figure 1*c*): 1st joint with long hairs on medial and lateral surfaces; 2nd joint with short spinous lateral bristle and long stout subterminal dorsal bristle on widest part of joint; lateral surface with spines forming rows proximally near dorsal margin; medial surface also with rows of spines; 3rd joint with minute ventral bristle and 6 long spinous dorsal bristles (5th and 6th bristles adjacent to each other, remaining bristles isolated); 3rd plus 4th joints quadrate, separated by indistinct suture; distal margin of 4th joint only slightly curved; ventral margin spinous and with 2 bristles (medial of these reaching middle of 6th joint; lateral bristle almost reaching end of stem); dorsal margin with spinous terminal bristle; 5th joint: sensory bristle with 1 short proximal filament and 6 long terminal filaments; lateral surface with short spines forming row on distal dorsal corner; 6th joint with 1 long spinous medial bristle; lateral surface with short spines forming row near middle and along distal margin. Seventh joint: a-claw short with a few minute teeth distally along ventral margin; b-bristle stout with 3 marginal and 2 terminal filaments including tip; c-bristle reaching past sensory bristle, with 3 marginal filaments and bifurcate tip. Eighth joint: d-bristle represented by minute spine; e-bristle bare, about two-thirds length of c-bristle, slightly shorter than b-bristle; f-bristle bent dorsally, with 4 spinous marginal filaments and bifurcate tip (part of bristle distal to the 4 marginal filaments with marginal spines); g-bristle similar to c-bristle.

Second antenna: Protopodite with spines along dorsal margin, on lateral surface near dorsal margin and on distal half of medial surface; distal medial bristle on protopodite minute or absent (Figure 1*e*). Endopodite 3-jointed but with suture between 1st and 2nd joints indicated only by division in weakly sclerotized exoskeleton (Figure 1*d*); terminal bristle longer than stem, reaching to about 5th joint of exopodite. Exopodite: joints 2–8 with short spines forming row along distal margin; bristle of 2nd joint reaching just past 9th joint, with short spines forming dense row along ventral margin; bristles of joints 3–8 with spines along proximal ventral margin and with natatory hairs; 9th joint with 2 long stout bristles with proximal ventral spines and natatory hairs, 2 short bristles with short marginal spines, and stout lateral spine about seven-eighths length of 9th joint; joints 3–8 with basal spines (spine on 8th joint about one-half length of 9th joint, spines on other joints smaller).

Mandible (Figure 2*a,b*): Coxale endite: ventral branch with spines forming 4 oblique rows, and with 3 minute teeth at tip (Figure 2*b*); minute bristle present near base of ventral branch; ventral margin of dorsal branch with double node followed by 2 single prominent nodes and 1 or 2 low nodes and short main spine; posterior margin of main spine and margin of branch between spine and tip of branch with minute spines; exact locality of base of dorsal terminal bristle difficult to ascertain on specimen examined. Basale: endite with usual 4 pectinate end bristles, short glandular peg, 2 short dwarf bristles, and 3 triaenid bristles with 3 or 4 pairs of marginal spines excluding terminal pair; ventral margin of basale near base of endite and proximal to U-shaped depression with 1 triaenid bristle with about 3 pairs of marginal spines excluding terminal pair; dorsal margin of basale with 3 or 4 short midbristles with bases on medial surface of basale, and 2 spinous terminal bristles (these also with bases on medial surface of basale); lateral surface of basale with numerous spines forming rows. Exopodite: very small, about one-fourth length of dorsal margin of 1st endopodite joint, hirsute, with 2 short terminal bristles. Endopodite: 1st joint with 3 stout spinous ventral bristles; ventral margin of 2nd joint with 3 spinous terminal bristles; dorsal margin with 1 short proximal bristle and stout spinous a-, b-, c-, and d-bristles; no lateral bristle between b- and c-bristles; 1 short spinous medial cleaning bristle present just distal to base of b-bristle; 2 oblique rows of 3 and 5 medial cleaning bristles between b- and d-bristles; 1 long spinous medial bristle present just distal to base of d-bristle; 1 long spinous lateral bristle present between c- and d-bristles; medial surface of 2nd joint with few rows of short spines; end joint with straight dorsal claw and 5 bristles (3 long, stout; 1 long, slender, and 1 short, slender).

Maxilla (Figure 2*c*): Epipodial appendage hirsute with tip reaching middle of dorsal margin of basale; endite I with 4 bristles, 3 long, 1 short;

endite II with 3 long bristles. Basale hirsute with hairs on medial surface and dorsal margin; medial surface with 1 proximal and 1 distal bristle, the latter almost on dorsal margin; ventral margin with 1 short proximal bristle, 1 short distal bristle, and 1 long spinous terminal bristle; lateral surface with 1 short proximal bristle. Endopodite: 1st joint with 1 short dorsal bristle and 1 long beta-bristle with faint marginal spines; end joint with 1 long spinous bristle extending just past beta-bristle.

Fifth limb: Epipodial appendage with about 75 spinous bristles; comb with 2 short lateral bristles ventral to base of stout exopodial bristle; 2 pairs of lateral bristles present near middle of ventral margin of comb; 2 ventral bristles near distal end of comb with bases more proximally located on comb than bases of remaining ventral bristles.

Sixth limb (Figure 3*a*): Medial surface with minute bristle in anterodorsal corner more than usual distance from anterior margin; anterior margin with 1 upper and 1 lower bristle, both with marginal spines; anteroventral corner with 6 spinous bristles plus 1 spinous bristle on lateral flap; posteroventral margin with 25 spinous bristles; medial surface, anterior, ventral, and posterior margins hirsute.

Seventh limb (Figure 3*b*): Proximal and distal groups each with 6 bristles (3 + 3), each with 3 to 5 bells; terminus consisting of opposing combs, each with about 20 spinous teeth.

Furca (Figure 3*f*): Each lamella with 9 claws; posterior claw bent backward, most claws with teeth along posterior margins and slender spines along anterior margins; a few distal teeth along posterior margins longer than others; short spines present along lamella following claws.

Rod-shaped organ (Figure 3*d*): Elongate, slightly broader in middle, tip rounded.

Eyes: Medial eye bare, pigmented (Figure 3*d*); lateral eye pigmented, about same size as medial eye, with about 20 ommatidia (Figure 3*c*).

Posterior: Dorsum spinous forming small broad projecting process; posterior with long hairs (Figure 3*f*).

Upper lip (Figure 3*e*): Consisting of 2 hirsute lobes and hirsute lateral flap on each side; no spines observed.

Genitalia: Genitalia and brush organ not observed.

Eggs: Holotype, Klie specimen number 1, with 13 eggs in marsupium.

DESCRIPTION OF ADULT MALE (Figures 4, 5).—Carapace differing from that of female in being larger, having a sloping dorsal margin, and hairs forming a verticle row near posterior margin (Figure 4*a*).

Infold: Not examined.

Central muscle scars: Consisting of about 12 individual ovoid scars (Figure 4*b*).

Size: Allotype, Klie specimen number 2, length 1.95 mm, height 1.03 mm.

First antenna (Figure 4*c*): First joint with long hairs on medial surface near ventral margin; 2nd joint with 1 spinous lateral bristle, 1 spinous distal bristle on dorsal margin, and short spines forming rows on medial and lateral surfaces; 3rd joint with minute ventral bristle and 6 spinous dorsal bristles (5th and 6th bristles adjacent to each other, remaining bristles isolated; proximal bristle separated from second bristle by long space); 4th joint distinctly separated from 3rd, with 1 spinous bristle near middle of dorsal margin and 2 short, slender, terminal bristles on ventral margin; 5th joint short, not reaching dorsal margin of limb, with stout sensory bristle with abundant filaments (approximately 6 filaments at tip stouter than others); long 6th joint with spinous medial bristle near dorsal margin. Seventh joint: short a-claw with distal teeth along ventral margin; b-bristle with 5 marginal filaments; long c-bristle with 25 marginal filaments. Eighth joint: d-bristle absent; e-bristle bare, about three-fourths length of b-bristle; long f-bristle with 25 marginal filaments; g-bristle with 6 marginal filaments.

Second antenna: Protopodite with minute distomedial bristle (Figure 4*e*), but without spines present on protopodite of female. Endopodite 3-jointed (Figure 4*d*): 1st joint elongate, bare; 2nd joint with 3 distal bristles on ventral margin near minute protuberance; proximal bristle of recurved 3rd joint with straight proximal part terminating in small node; tip of 3rd joint with 10 serrations. Exopodite (Figure 4*f*): 1st joint with hairs on lateral side near distal end; joints 2 to 8 with minute basal spine and long hairs forming row near inner edge of distal margin; bristle of 2nd joint reaching well past 9th joint and with natatory hairs, no spines; bristles of joints 3–8 without spines, but with natatory hairs; joint 9 with 2 long

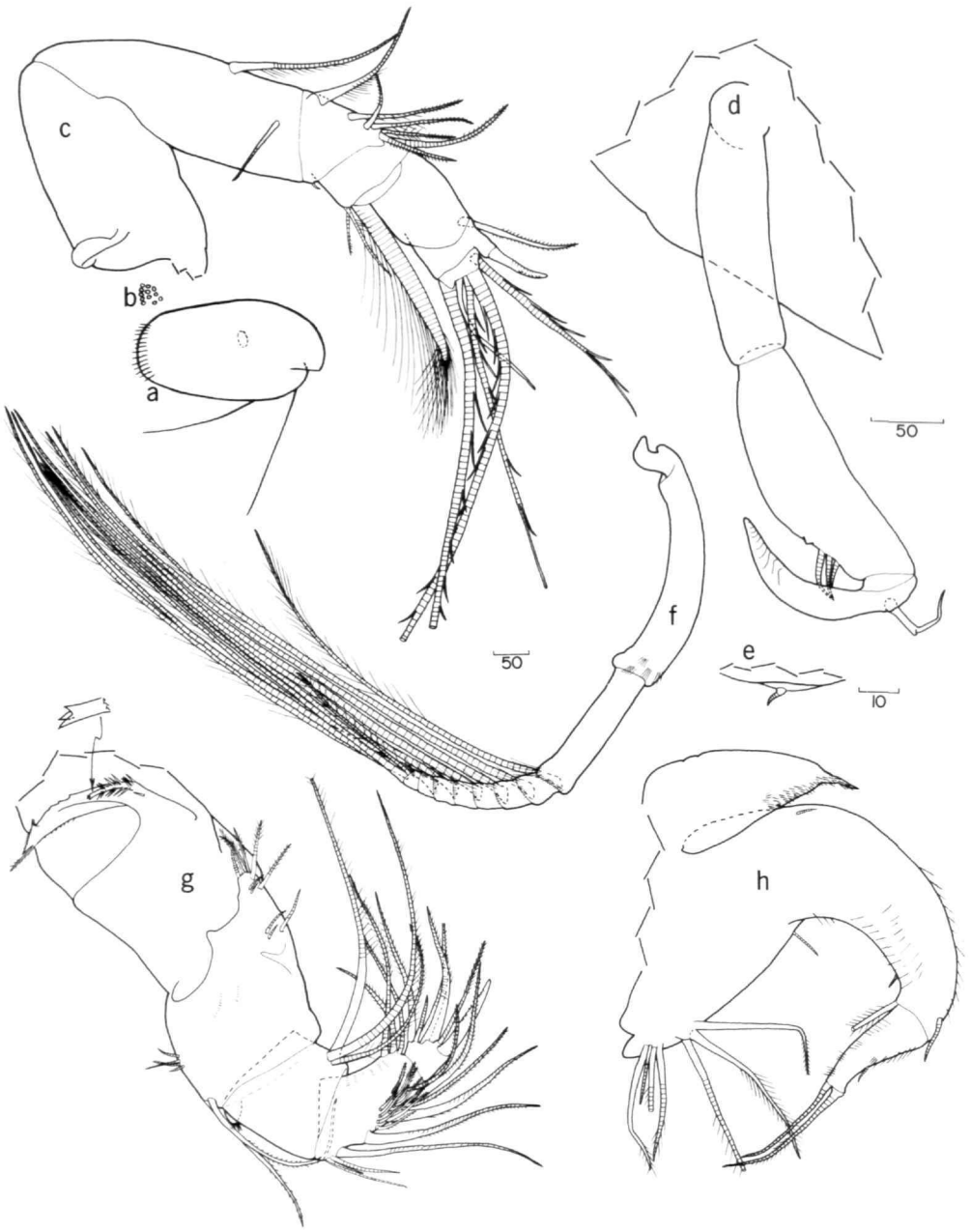

FIGURE 4.—*Cylindroleberis kliei*, new species, Klie specimen number 2, allotype, adult male, length 1.95 mm: *a*, complete specimen showing position of lateral eye and 2 long bristles on 1st antenna emerging from carapace, lateral view; *b*, sketch of central muscle scars of right valve, lateral view; *c*, right 1st antenna, lateral view (only proximal parts of c- and g-bristles shown); *d*, endopodite of right 2nd antenna, medial view; *e*, medial bristle on protopodite of right 2nd antenna, medial view; *f*, exopodite of right 2nd antenna, lateral view; *g*, right mandible, medial view; *h*, left maxilla, medial view. (Same magnification in micrometers: *c,f,g; d,h.*)

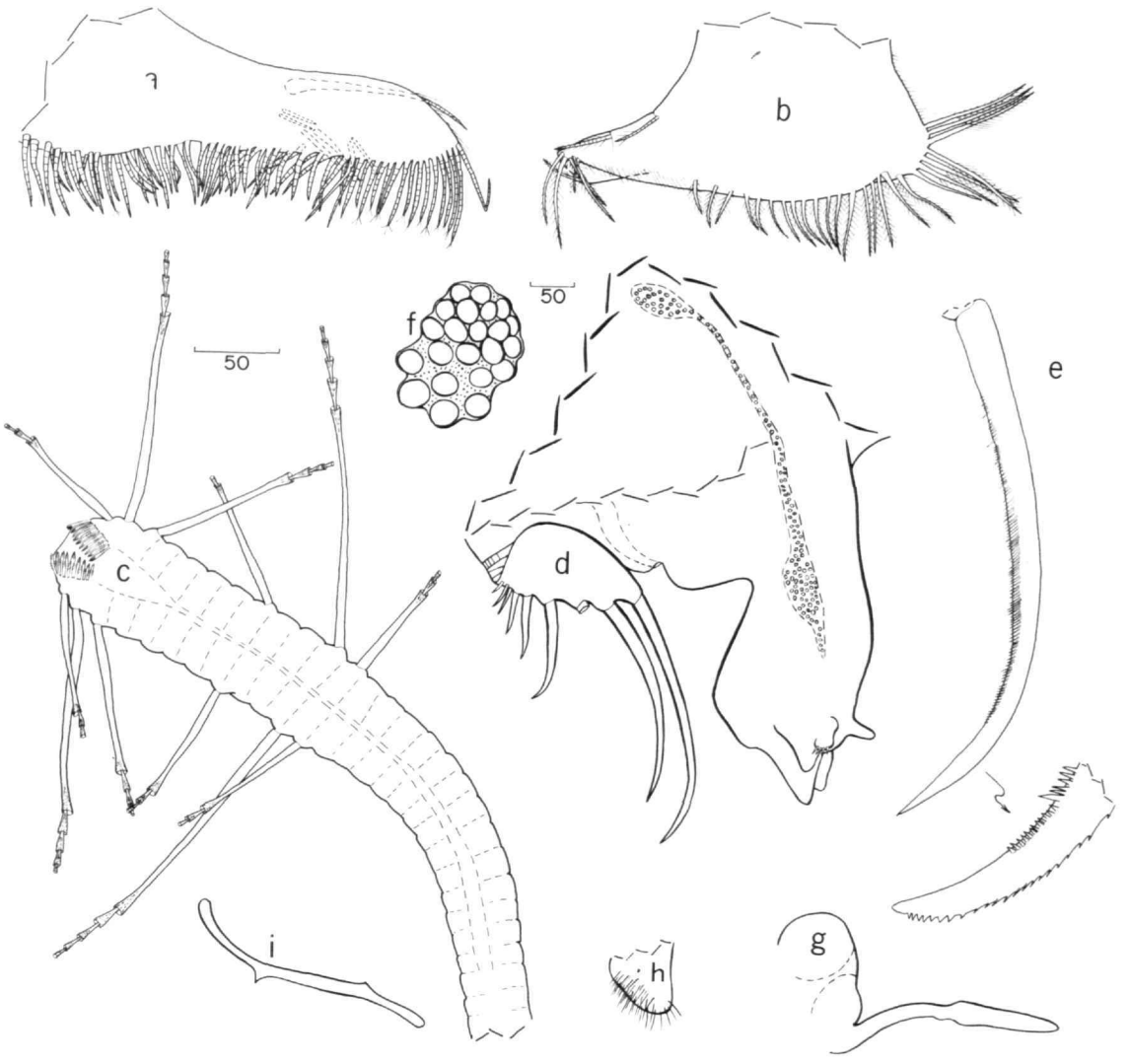

FIGURE 5.—*Cylindroleberis kliei*, new species, Klie specimen number 2, allotype (continued): *a*, comb of left 5th limb, medial view; *b*, right 6th limb, medial view; *c*, 7th limb; *d*, right furcal lamellae and copulatory organ, lateral view, anterior to right; *e*, main furcal claw; *f*, left lateral eye, anterior to left; *g*, medial eye and rod-shaped organ; *h*, left lobe of upper lip, anterior to right; *i*, left Y-sclerite of furcal region, anterior to left. (Same magnification in micrometers: *a,c,e; b,d,f–i.*)

and 1 medium bristle, all with natatory hairs; lateral spine not observed on 9th joint.

Mandible (Figure 4*g*): Dorsal bristle near tip of dorsal branch of coxale endite with base set back from tip of branch (this was not seen clearly on female holotype), endite otherwise similar to that of female. Basale: 4 spinous end bristles of endite weakly developed; 2 triaenid bristles of endite also weakly developed but with more pairs of marginal spines (about 23) than on bristles of

female; endite with 2 dwarf bristles and weakly developed glandular process; ventral margin of basale proximal to U-shaped depression with 1 weakly developed triaenid bristle near base of endite with about 20 pairs of marginal spines; dorsal margin of basale with 4 short midbristles and 2 spinous terminal bristles. Exopodite similar to that of female. Endopodite: 1st joint and ventral margin of 2nd joint similar to that of female; dorsal margin of 2nd joint with 3 short proximal bristles and stout spinous a-, b-, c-, and d-bristles; 4 cleaning bristles forming oblique row on medial side between b- and c-bristles; 6 cleaning bristles forming oblique row on medial side starting near base of c-bristle; 1 long lateral bristle present between c-, and d-bristles; 1 long medial bristle present just distal to base of d-bristle; end joint similar to that of female.

Maxilla (Figure 4*h*), *5th limb* (Figure 5*a*): Similar to that of female.

Sixth limb (Figure 5*b*): Anteroventral corner with 5 spinous bristles plus 1 spinous bristle on lateral flap; limb otherwise similar to that of female.

Seventh limb (Figure 5*c*): Similar to that of female, except bristles with 2 to 5 bells.

Furca (Figure 5*d,e*) *rod-shaped organ* (Figure 5*g*): Similar to that of female.

Eyes: Medial eye similar to that of female (Figure 5*g*); lateral eye about one-third larger than that of female, with 21 ommatidia (Figure 5*f*).

Posterior, upper lip (Figure 5*h*): Similar to that of female.

Copulatory appendage: Elongate, paired, with triangular-shaped tip and few minute bristles (Figure 5*d*).

Y-*sclerite:* With slight curvature and small projection proximally on ventral margin and distally on dorsal margin (Figure 5*i*).

Parasites: Allotype with 1 choniostomatid copepodite inside carapace.

Comparisons: Only two other species of *Cylindroleberis* have as many as 3 midbristles on the dorsal margin of the mandibular basale: *Cylindroleberis verrucosa* (Poulsen, 1965:440), and *Cylindroleberis thailandica* (Poulsen, 1965:444). The new species, *C. kliei,* differs from both species in having more bristles on the posterior infold between the list and edge of valve, and in having processes on the posterior infold. The carapace of *C. kliei* also differs from that of *C. verrucosa* in not having teeth along the lower margin of the incisur.

Parasterope Poulsen, 1965

Two vials containing 78 specimens identified as *Asterope muelleri* Skogsberg by W. Klie were received from the Hamburg Zoological Museum. These had been collected in Lüderitz Bay in February, 1938, by Dr. v. Levetzow. Klie (1940) had reported 97 specimens of *A. muelleri* from that locality. This indicates that the specimens I studied represent the bulk of the collection. I divided the specimens into three groups: one group consists of 48 specimens of *Parasterope beta,* new species; a second group consists of 3 specimens of *Parasterope kappa,* new species; and a third group consists of 27 specimens, mostly juveniles, of *Parasterope* species indeterminate. All specimens were returned to the Hamburg Zoological Museum.

The two new species bring the number of spe-

Key to Species of *Parasterope*

(along the western coast of Africa having adult females with tumid carapace in lateral view)

1. Ventral margin of mandibular basale with 1 short bare bristle proximal to U-shaped depression ..... ***P. kappa,*** new species
   Ventral margin of mandibular basale with 1 triaenid bristle proximal to U-shaped depression, or without bristle in this position 2
2. Carapace of adult female not longer than 1.41 mm; lateral eye of adult female with about 17 ommatidia; dorsal margin of mandibular basale of adult male without midbristle ..... ***P. muelleri*** (Skogsberg, 1920)
   Carapace of adult female 1.67 mm long (based on 1 specimen); lateral eye of adult female with 13–14 ommatidia; male unknown ..... ***P. alpha*** Kornicker and Caraion, 1974
   Carapace of adult female 1.47–1.60 mm; lateral eye of adult female with about 18 ommatidia; dorsal margin of adult male with midbristle ..... ***P. beta,*** new species

cies of *Parasterope* reported from the western coast of Africa to 7. Of the 7, only 4 have adult females with tumid (pear-shaped) carapaces in lateral view. Because the new species are easily distinguishable from the nontumid species on shape of carapace, the key above is just for tumid species.

Parasterope beta, new species

FIGURES 6–9

Asterope muelleri Skogsberg, 1920.—Klie, 1940 [part]:409, figs. 7–10.

Cylindroleberis (Parasterope) muelleri (Skogsberg, 1920).—Hartmann and Schröder, 1974a:70,76,77; 1974b:234.

Cylindroleberis muelleri (Skogsberg, 1920).—Hartmann and Schröder, 1975:360, table 4.

HOLOTYPE.—Klie specimen number 3, ovigerous female, length 1.47 mm; most appendages on 2 slides, some appendages and carapace in alcohol; Hamburg Zoological Museum, number 07.

TYPE-LOCALITY.—Lüderitz Bay, South-West Africa.

ETYMOLOGY.—The specific name from the second letter of the Greek alphabet.

PARATYPES.—46 specimens, including 5 complete carapaces without soft parts (includes 2 adult males), and a left and right valve. Of these, 5 are ovigerous females and 6 are ?females containing in their brood chambers copepode parasites or their ovisacs, and 3 are whole adult males.

ALLOTYPE.—Klie specimen number 8, adult male, length 1.69 mm.

MATERIAL.—Through the courtesy of Dr. Gerd Hartmann, I received on loan from the Hamburg Zoological Museum 2 vials. One vial contained 3 labels, "♀," "07," "*Asterope mülleri* Skogsberg, D.S.W. Africa: Lüderitz Bucht, February 1938. Coll. v. Levetzow." The second vial contained 2 labels, "08," "♂, *Asterope mülleri* Skogsberg, D.S.W. Africa: Lüderitz Bucht, February 1938. Coll. v. Levetzow." The first vial contained 42 specimens of *P. beta*, 3 specimens of *P. kappa*, new species, and 27 specimens of *Parasterope*, species indeterminate (many juveniles). The second vial contained 6 adult males (including 2 carapaces without soft parts) of *P. beta*.

DESCRIPTION OF FEMALE (Figures 6–8).—Carapace tumid in lateral view (Figure 6*a*).

Infold: Infold behind rostrum with 4 bristles along list, about 7 bristles between list and incisur, and about 35 bristles anterior and dorsal to list; 8 small bristles forming row along anterodorsal infold; about 38 bristles on broad anteroventral infold; 31 bristles along ventral infold to point opposite lowermost hyaline flaplike bristle on posterior list. List beginning near inner margin of anterior part of infold, continuing along ventral margin and then onto posterior infold where it broadens; posterior list with 31 broad transparent flaplike bristles and 31–32 small bristles between flaplike bristles, generally 1 or 2 small bristles between each pair of flaplike bristles (4 pairs of flaplike bristles without small bristles between them; 21 pairs of flaplike bristles with 1 small bristle between them; 5 pairs of flaplike bristles with 2 small bristles between them); 17 bristles between broad posterior list and posterior margin of valve, all bristles being confined to ventral half of posterior infold.

Selvage: Very faint lamellar prolongation with hairlike fringe present along lower margin of incisur.

Central muscle scars: Consisting of about 9 individual ovoid scars (Figure 6*b*).

Size (Figure 7): Klie specimen number 3, length 1.47 mm, height 1.04 mm. Five ovigerous females (not dissected): length 1.51 mm, height 1.07 mm; length 1.53 mm, height 1.08 mm; length 1.56 mm, height 1.10 mm; length 1.57 mm, height 1.10 mm; length 1.57 mm, height 1.08 mm. Six ?females with copepod parasites of copepod ovisacs in brood chamber (it is possible that some of these could be A-1 males; specimens not dissected): length 1.60 mm, height 1.09 mm; length 1.56 mm, height 1.07 mm; length 1.50 mm, height 1.06 mm; length 1.55 mm, height 1.06 mm; length 1.58 mm, height 1.11 mm; length 1.51 mm, height 1.07 mm.

First antenna (Figure 6*c*): 1st and 2nd joints with spines on lateral and medial surfaces; 2nd joint with long spinous dorsal bristle and short spinous lateral bristle; 3rd joint with small ventral bristle and 6 long spinous dorsal bristles (5th and 6th bristles adjacent to each other, remaining bristles isolated), 3rd plus 4th joints quadrate, separated by distinct suture; 4th joint with distinctly concave distal margin and 3 bristles, 1 long spinous dorsal bristle and 2 slender spinous ventral bristles (longer of these reaching distal end of 6th joint, shorter reaching middle of 6th joint);

FIGURE 6.—*Parasterope beta*, new species, Klie specimen number 3, holotype, ovigerous female, length 1.47 mm: *a*, complete specimen showing position of lateral eye, central muscle scar, and eggs; *b*, sketch of central muscle scars of left valve, lateral view; *c*, left 1st antenna, medial view; *d*, right 2nd antenna, medial view; *e*, left mandible, medial view (distal bristle on dorsal margin of dorsal branch of coxale endite broken). (Same magnification in micrometers: *c*,*d*.)

ventral margin of 4th joint with spines forming 2 rows extending onto lateral surface; sensory bristle of 5th joint long with 6 terminal filaments; dorsal margin of 5th joint with short spines forming row along distal part; medial bristle of 6th joint with short marginal spines. Seventh joint: a-claw about same length as bristle of 6th joint, with minute teeth along dorsal margin; b-bristle shorter than sensory bristle of 5th joint, with 5 filaments including tip of bristle; c-bristle reaching past sensory bristle, with 5 marginal filaments excluding tip. Eighth joint: d-bristle minute with blunt tip; e-

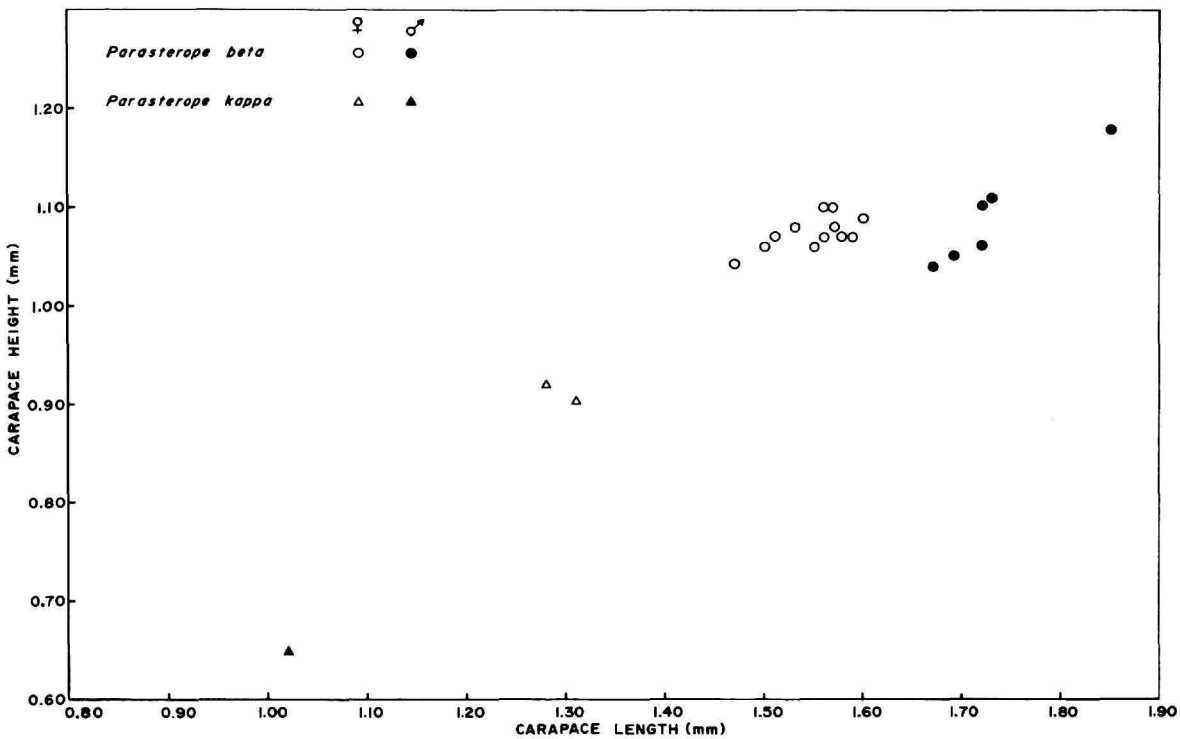

FIGURE 7.—Comparison of relationship between shell length and height of adult males and females of *Parasterope beta*, new species and *Parasterope kappa*, new species.

bristle bare, almost reaching tip of sensory bristle; f-bristle bent dorsally, with 5 marginal filaments excluding tip; g-bristle broken on both limbs of specimen examined, 3 marginal filaments on remaining part of one of the limbs.

Second antenna (Figure 6*d*): Protopodite with small distal medial spine; medial surface with spines along dorsal and ventral margins and all over surface, but more densely distributed on dorsal half; lateral surface with fine spines near ventral and dorsal margins. Endopodite 3-jointed with well-defined sutures separating joints; terminal bristle about twice length of stem. Exopodite: 2nd joint with spines forming crescent on medial side; right limb aberrant in having only 8 joints, left limb with 9; bristle of 2nd joint reaching past stem, with spines along ventral margin; bristles of joints 3–8 of left limb and 3–7 of right limb with natatory hairs; bristles of joints 3–5 with marginal spines along part of ventral margin; 9th joint of left limb with stout lateral spine about half length of joint and 4 bristles (2 long with natatory hairs, 2 short with short marginal spines); 8th joint of right limb with 2 small lateral spines and 3 bristles (2 long with natatory hairs, 1 short with short marginal spines); joints 2–8 on left limb and 2–7 on right limb with short spines forming row along distal margin; joints 3–8 on left limb and 3–7 on right limb with small basal spines; basal spine on next-to-last joint about one-third length of last joint.

Mandible (Figure 6*e*): Coxale endite: small slender bristle present near base of ventral branch; ventral branch with 5 oblique rows of spines; tip of ventral branch with 3 minute teeth; ventral margin of dorsal branch with 3 prominent nodes followed by 2 low nodes and small main spine; margin between main spine and tip of branch with equal-lengthed spines; last spine slightly stouter but same length as others; bristle on dor-

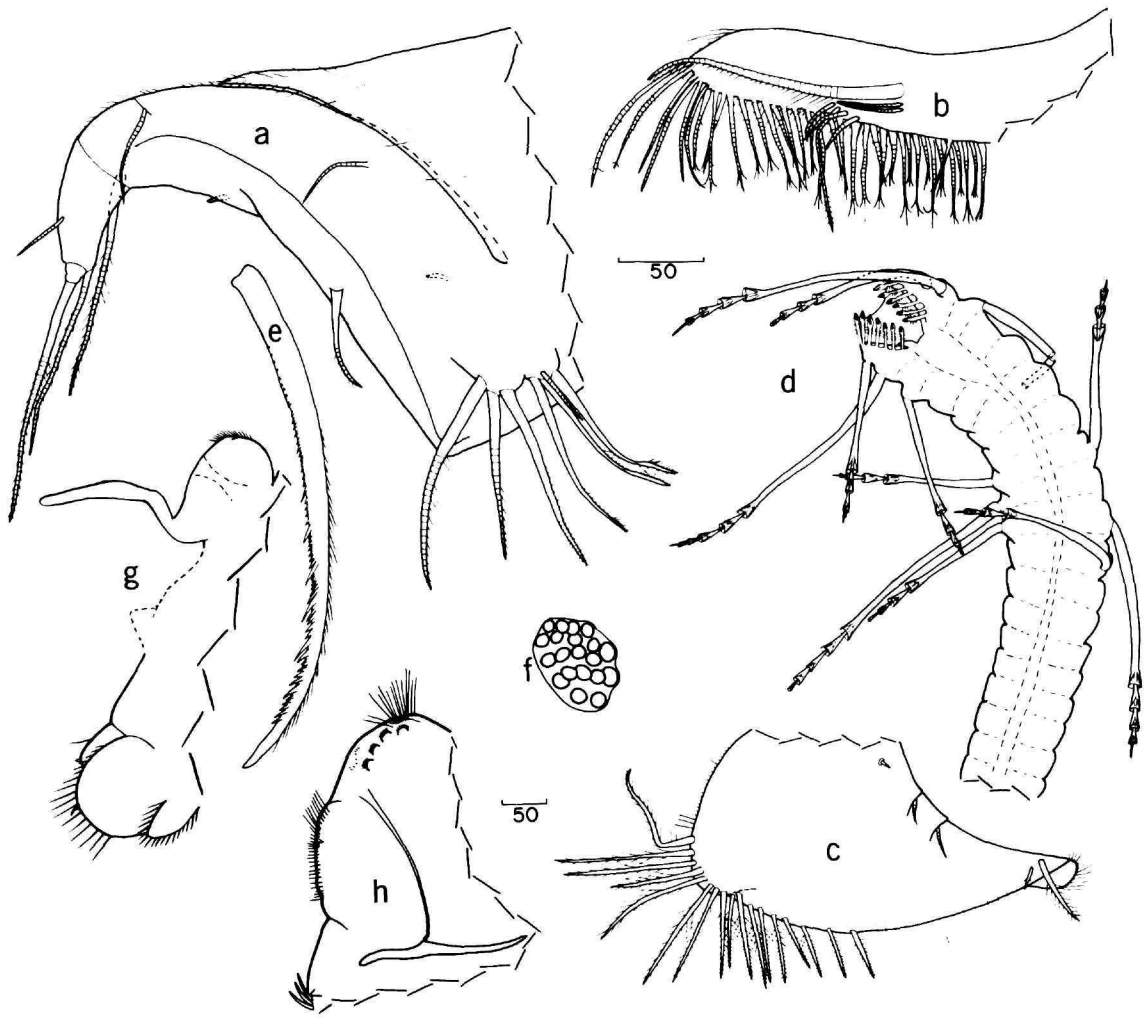

FIGURE 8.—*Parasterope beta*, new species, Klie specimen number 3, holotype, ovigerous female (continued): *a*, right maxilla, medial view; *b*, comb of left 5th limb, lateral view; *c*, left 6th limb, medial view; *d*, 7th limb; *e*, main furcal claw; *f*, lateral eye under cover slip; g, anterior of body showing medial eye and rod-shaped organ and upper lip; *h*, posterior of body showing dorsum with lateral crescents, posterior claws of furca, and right Y-sclerite. (Same magnification in micrometers: *a,b,d,e; c,h.*)

sal margin of dorsal branch broken off on specimen examined but with base some distance from tip of branch. Basale: endite with usual 4 pectinate end bristles, 1 long dwarf bristle (about same length as triaenid bristles), elongate glandular peg, and 3 triaenid bristles with 3 or 4 pairs of marginal spines excluding terminal pair; 1 triaenid bristle with 3 pairs of marginal spines excluding terminal pair present on ventral margin of basale proximal to U-shaped depression; dorsal margin of basale with 2 stout spinous terminal bristles; medial and lateral surfaces with long

spines forming clusters. Endopodite: 1st joint with 3 long stout spinous ventral bristles; ventral margin of 2nd joint with 3 spinous terminal bristles; dorsal margin of 2nd joint with 1 short proximal bristle and stout spinous a-, b-, c-, and d-bristles; c-bristle slightly stouter than d-bristle and much stouter than a- and b-bristles; 1 long spinous lateral bristle between b- and c-bristles and c- and d-bristles; 2 rows of 2 or 3 and 5 or 6 cleaning bristles on medial surface between b- and d-bristles; 1 long spinous medial bristle at base of d-bristle; medial surface of 2nd joint with spines forming short rows; end joint with dorsal claw with spines along ventral margin and 5 bristles, 4 long, 1 short. Exopodite hirsute, just reaching distal margin of 1st endopodite joint, with 2 short subterminal bristles.

Maxilla (Figure 8*a*): Epipodial appendage hirsute with pointed tip reaching past middle of dorsal margin of basale; endite I with 4 bristles, 3 long, 1 short; endite II with 3 long bristles. Basale hirsute on medial and lateral surfaces and along dorsal margin; medial surface with 2 bare bristles, both near dorsal margin (proximal bristle about three-fourths length of distal bristle); ventral margin with 1 proximal bristle (about same length as distal medial bristle), 1 short distal bristle, and 1 long spinous terminal bristle. Endopodite: 1st joint with 1 short dorsal bristle and 1 long spinous beta-bristle; end joint with long spinous terminal bristle (beta-bristle about three-fourths length of terminal bristle).

Fifth limb: Epipodial appendage with 67 bristles; comb with 2 short slender bristles ventral to base of stout exopodial bristle and 2 pairs of bristles near middle of ventral margin of comb (Figure 8*b*).

Sixth limb (Figure 8*c*): Medial surface with minute bristle in anterodorsal corner; anterior margin with 1 upper and 1 lower bristle; anteroventral corner with 2 bristles (short bristle with few marginal spines and less than one-half length of longer spinous bristle); lateral flap without bristles; posteroventral margin with 17 spinous bristles; lateral and medial surfaces hirsute.

Seventh limb (Figure 8*d*): Proximal and distal groups each with 6 bristles, 3 on each side; each bristle with 3 or 4 bells. Terminus consisting of opposing combs, each with about 12 spinous teeth.

Furca: Each lamella with 9 claws; posterior 2 or 3 claws bristlelike (Figure 8*e,h*).

Rod-shaped organ: Elongate with rounded tip (Figure 8*g*).

Eyes: Medial eye with hairs on dorsal part (Figure 8*g*); lateral eye about same size as medial eye, with about 18 ommatidia, appears dark brown when viewed through shell (Figure 8*f*). Eyes similar to those of male.

Posterior (Figure 8*h*): Dorsum forming evenly rounded right angle; 4 or 5 minute sclerotized lateral crescents fringed with short spines present on each side of dorsum; rounded corner or dorsum with long hairs on each side.

Upper lip (Figure 8*g*): Upper lip consisting of 2 hirsute lobes and hirsute lateral flap on each side; 1 anterior spine on saddle between lobes; 1 or 2 spines may be on each lobe, but not seen with certainty.

Y-sclerite: Almost straight with small projection distally on dorsal margin (Figure 8*h*).

Eggs: Klie specimen number 3 with 7 eggs in marsupium.

Parasites: 6 undissected ?females contained within their carapaces copepod parasites or copepod ovisacs.

Description of Adult Male (Figures 7, 9).—Carapace differing from that of the female in not being tumid, in having the posterior half of the dorsal margin sloping downward, and in having hairs forming a verticle row near the posterior margin (Figure 9*a*); anterior margin of rostrum more broadly rounded than that of female.

Infold: Not examined.

Size (Figure 7): Allotype, Klie specimen number 8, length 1.72 mm, height 1.06 mm. Other specimens: length 1.67 mm, height 1.04 mm; length 1.68 mm, height 1.05 mm; length 1.72 mm, height 1.10 mm; length 1.73 mm, height 1.12 mm; length 1.85 mm, height 1.18 mm.

First antenna (Figure 9*b*): Medial and lateral surfaces of 1st joint without spines; 2nd joint with spines on medial and lateral surfaces, 1 long spinous dorsal bristle and 1 short spinous lateral bristle; 3rd joint with small ventral bristle and 6 long spinous dorsal bristles (3rd and 4th bristles and 5th and 6th bristles adjacent to each other; space between 1st and 2nd bristles); 4th joint with slightly convex distal margin on lateral side and concave distal margin on medial side; dorsal margin with 1 long stout bristle with short marginal

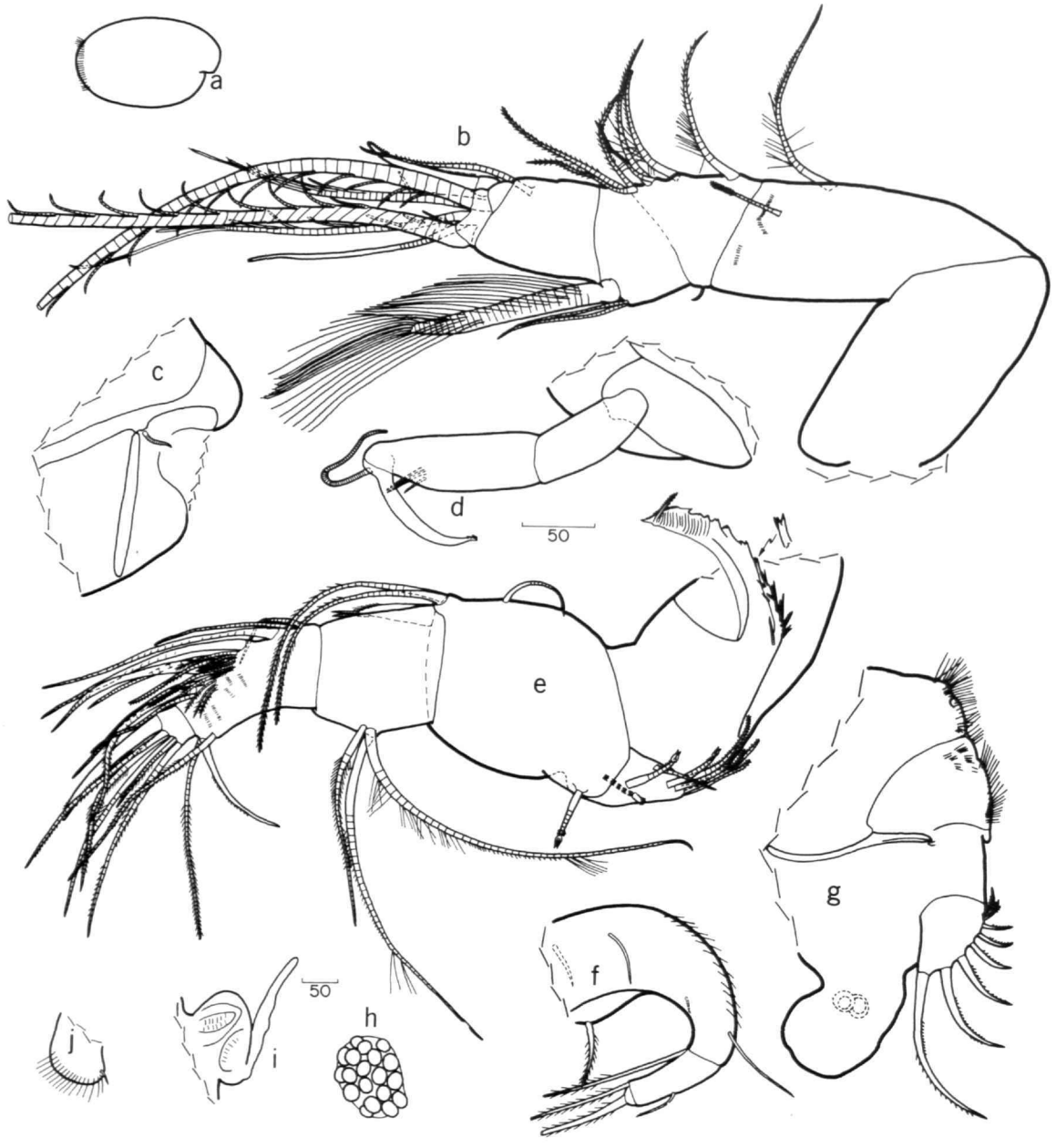

FIGURE 9.—*Parasterope beta*, new species, Klie specimen number 8, allotype, adult male, length 1.75 mm: *a*, complete specimen, lateral view; *b*, left 1st antenna, lateral view (only proximal parts of c- and g-bristles shown); *c*, medial bristle on protopodite of left 2nd antenna, medial view; *d*, endopodite of left 2nd antenna, medial view; *e*, right mandible, medial view; *f*, left maxilla, medial view (endites not shown); *g*, posterior of body showing dorsum, left furcal lamella, copulatory appendage, and left Y-sclerite; *h*, right lateral eye; *i*, medial eye and rod-shaped organ; *j*, right lobe of upper lip (anterior to right). (Same magnification in micrometers: *b–f; g–j*.)

spines; ventral margin with short spines forming clusters and 2 slender terminal bristles; stout hirsute sensory bristle of 5th joint wedged between ventral corners of 4th and 6th joints; medial bristle of 6th joint with short marginal spines. Seventh joint: a-claw about same length as bristle of 6th joint, with minute teeth along dorsal margin; b-bristle extending past sensory bristle of 5th joint, with 5 filaments excluding tip; c-bristle very long with 33 marginal filaments. Eighth joint: d-bristle absent; e-bristle bare, about same length as b-bristle; f-bristle not bent dorsally, with 8 marginal filaments excluding tip; g-bristle about same length as c-bristle, with 29 marginal filaments.

Second antenna: Protopodite with small distal medial bristle but without spines on medial or lateral surfaces (Figure 9*c*). Endopodite 3-jointed (Figure 9*d*): 1st joint elongate without bristles; 2nd joint longer than 1st, with 2 or 3 short distal bristles; 3rd joint reflexed with proximal bristle; tip of joint with 2 teeth and short hairs forming row. Exopodite: 1st joint with short spines forming few clusters proximally along dorsal margin and longer spines or hairs forming few rows near ventral margin on lateral surface; 2nd joint elongate, about one-half length of 1st joint; joints 2–8 with spines forming row along distal margins and long hairs forming row on dorsal margin; joints 4–8 with minute basal spines; basal spine on next-to-last joint about one-eighth length of last joint; 9th joint with short lateral spine; 9th joint with 1 medium and 3 long bristles; bristles on joints 2–8 and all bristles of 9th joint with natatory hairs but without marginal spines.

Mandible (Figure 9*e*): Coxale more elongate than that of female, otherwise similar; basale more elongate than that of female and with 1 midbristle on dorsal margin, otherwise similar. Exopodite excluding bristles about two-thirds length of 1st endopodite joint. Endopodite; 1st joint similar to that of female; dorsal margin of 2nd joint with 2 proximal bristles and stout spinous a-, b-, c-, and d-bristles; c-bristle slightly stouter than other 3 bristles; 1 long spinous lateral bristle between b- and c-bristles and c- and d-bristles; 2 rows of 5–6 cleaning bristles on medial surface between b- and c-bristles; 1 long spinous medial bristle at base of d-bristle; medial surface of 2nd joint with spines forming short rows; bristles of end joint similar to those of females.

Maxilla (Figure 9*f*), *5th limb, 6th limb, 7th limb, rod-shaped organ* (Figure 9*i*); *upper lip* (Figure 9*j*): Similar to those of female.

Furca (Figure 9*g*): Each lamella with 8 claws; posterior 2 claws bristle-like; concave margin of claw 1 on right lamella with very faint, minute teeth; concave margin of claw 1 on left lamella smooth, or with only few faint, minute teeth.

Eyes: Medial eye bare (Figure 9*i*); lateral eye about same size as medial eye, with about 19 ommatidia, appears dark brown when viewed through shell (Figure 9*h*). Eye similar to those of female.

Posterior: Dorsum rounded, spinous, without sclerotized lateral crescents observed on female.

Copulatory organ: Consisting of large rounded lobe.

Y-*sclerite:* Similar to that of female (Figure 9*g*).

Sexual dimorphism: In addition to usual differences, the dorsal margin of the mandibular basale of the male bears 1 midbristle absent on the female. The posterior of the female bears 4–5 sclerotized lateral crescents absent on the male. The furca of the female bears 9 claws, whereas, that of the male bears only 8. The presence of a midbristle on the dorsal margin of the mandibular basale of males and its absence on females has been previously noted on *Parasterope quadrata* (Brady, 1898) and *Homasterope maccaini* Kornicker, 1975 (Kornicker, 1975).

Comparisons: The specimens upon which the new species, *Parasterope beta,* is based had been identified by Klie (1940) as *Asterope muelleri* Skogsberg, 1920 (= *Parasterope muelleri*), a species very close to the new species. The main difference between them is that the dorsal margin of the mandibular basale of the adult male of *P. beta* bares a midbristle which is absent on *P. muelleri.* The maximum reported carapace length of adult females of *P. muelleri* is 1.41 mm, whereas, the range of the length of carapaces of adult females of *P. beta* is 1.47–1.60 mm. The new species is also closely related to *Parasterope alpha* Kornicker and Caraion, 1975, which was described from a single adult female from the continental shelf off the Islamic Republic of Mauritania. The species are separated mainly by the number of ommatidia in the lateral eyes: 13–14 for *P. alpha* and 18–19 for *P. beta.* Also, the distal bristle on the dorsal mar-

gin of the basale of the maxilla of *P. beta* is longer than that bristle of *P. alpha*. When the male of *P. alpha* becomes known, the relationship between *P. alpha* and *P. beta* should be reassessed.

Parasterope kappa, new species

FIGURES 7, 10, 11

Asterope muelleri Skogsberg 1920.—Klie, 1940:409 [part].

HOLOTYPE.—Klie specimen number 5, ovigerous female, length 1.28 mm; most appendages on 1 slide; some appendages and carapace in alcohol; Hamburg Zoological Museum, number 07.

TYPE-LOCALITY.—Lüderitz Bay, South-West Africa.

ETYMOLOGY.—The specific name from the tenth letter of the Greek alphabet.

PARATYPES.—1 ovigerous female, Klie specimen number 6.

ALLOTYPE.—Klie specimen number 7, adult male, length 1.02 mm.

MATERIAL.—Through the courtesy of Dr. Gerd Hartmann, I received on loan from the Hamburg Zoological Museum a vial containing 3 labels, "♀," "07," "Asterope mülleri Skogsberg, D.S.W. Africa: Lüderitz Bucht, February 1938. Coll. v. Levetzow." The vial contained 42 specimens of *P. beta*, new species, 3 specimens of *P. kappa*, new species, and 27 specimens of *Parasterope*, species indeterminate (many juveniles).

DESCRIPTION OF FEMALE (Figures 7, 10, 11*a-e*).—Carapace tumid in lateral view (Figures 10*a*, 11*a*).

Infold: Infold behind rostrum with 5 bristles along list (2 distal, 3 proximal), 8 bristles forming row parallel to incisur between list and incisur, 9 short proximal bristles between list and incisur, and about 20 medium bristles and 18 minute bristles anterior and dorsal to list; about 16 additional short bristles forming row along anterodorsal infold; about 21 medium bristles and 18 minute bristles on broad anteroventral infold; 23 bristles along ventral infold to point opposite lowermost hyaline flaplike bristle on posterior list. List beginning near inner margin of anterior part of infold, continuing along ventral margin and then onto posterior infold where it broadens; posterior list with 22–24 broad transparent flaplike bristles and about 37 small bristles between flaplike bristles, generally 1 or 2 small bristles between each pair of flaplike bristles; 15–17 bristles between broad posterior list and posterior margin of valve, all bristles being confined to ventral half of posterior infold.

Selvage: Lamellar prolongation not observed along lower margin of incisur.

Central muscle scars (Figures 10*b*, 11*a*): Consisting of about 10 individual ovoid scars.

Size: Klie specimen number 5, length 1.28 mm, height 0.92 mm; Klie specimen number 6, length 1.31 mm, height 0.90 mm (Figure 7).

First antenna (Figure 10*c*): 1st and 2nd joints with spines on lateral and medial surfaces; 2nd joint with long spinous dorsal bristle and short spinous lateral bristle; 3rd joint with small ventral bristle and 6 long spinous dorsal bristles (3rd and 4th as well as 5th and 6th bristles adjacent to each other, remaining bristles isolated), 3rd plus 4th joints quadrate, separated by distinct suture; 4th joint with distinctly concave distal margin and 3 bristles, 1 long spinous dorsal bristle and 2 slender spinous ventral bristles (longer of these just about reaching base of distal margin of 5th joint, shorter bristle not quite reaching distal margin of 5th joint); spines not observed on 4th joint; sensory bristle of 5th joint with 6 terminal filaments; dorsal margin of 5th joint without spines; medial bristle of 6th joint with short marginal spines. Seventh joint: a-claw about same length as bristle of 6th joint, with minute teeth along middle of dorsal margin; b-bristle shorter than sensory bristle of 5th joint, with 5 filaments including tip of bristle; c-bristle reaching past sensory bristle of 5th limb, with 5 marginal filaments excluding tip. Eighth joint: d-bristle minute with pointed tip; e-bristle bare, almost reaching tip of sensory bristle of 5th limb; f-bristle bent dorsally, with broken tip, 4 marginal filaments on remaining part; g-bristle reaching tip of sensory bristle of 5th limb, with 5 marginal filaments excluding tip.

Second antenna (Figure 10*d*): Protopodite with small distal medial bristle; medial surface with spines on dorsal half; dorsal margin with spines; ventral margin with hairs. Endopodite 3-jointed with well-defined sutures separating joints; terminal bristle above twice length of stem. Exopodite: 1st joint with long hairs forming medial row near distal margin; joints 2–8 with short spines forming row along distal margins; bristle of 2nd

FIGURE 10.—*Parasterope kappa*, new species, Klie specimen number 5, holotype, ovigerous female, length 1.28 mm: *a*, complete specimen, lateral view; *b*, sketch of central muscle scars of right valve, lateral view; *c*, left 1st antenna, lateral view; *d*, distal part of protopodite and endopodite of left 2nd antenna, medial view; *e*, left mandible, medial view; *f*, tip of ventral branch of coxale endite of left mandible, medial view; *g*, left maxilla, medial view; *h*, right 6th limb, medial view; *i*, 7th limb; *j*, medial eye and rod-shaped organ; *k*, right lateral eye, anterior to right; *l*, left lobe of upper lip, anterior to left. (Same magnification in micrometers: *c–e,g–i; j,k.*)

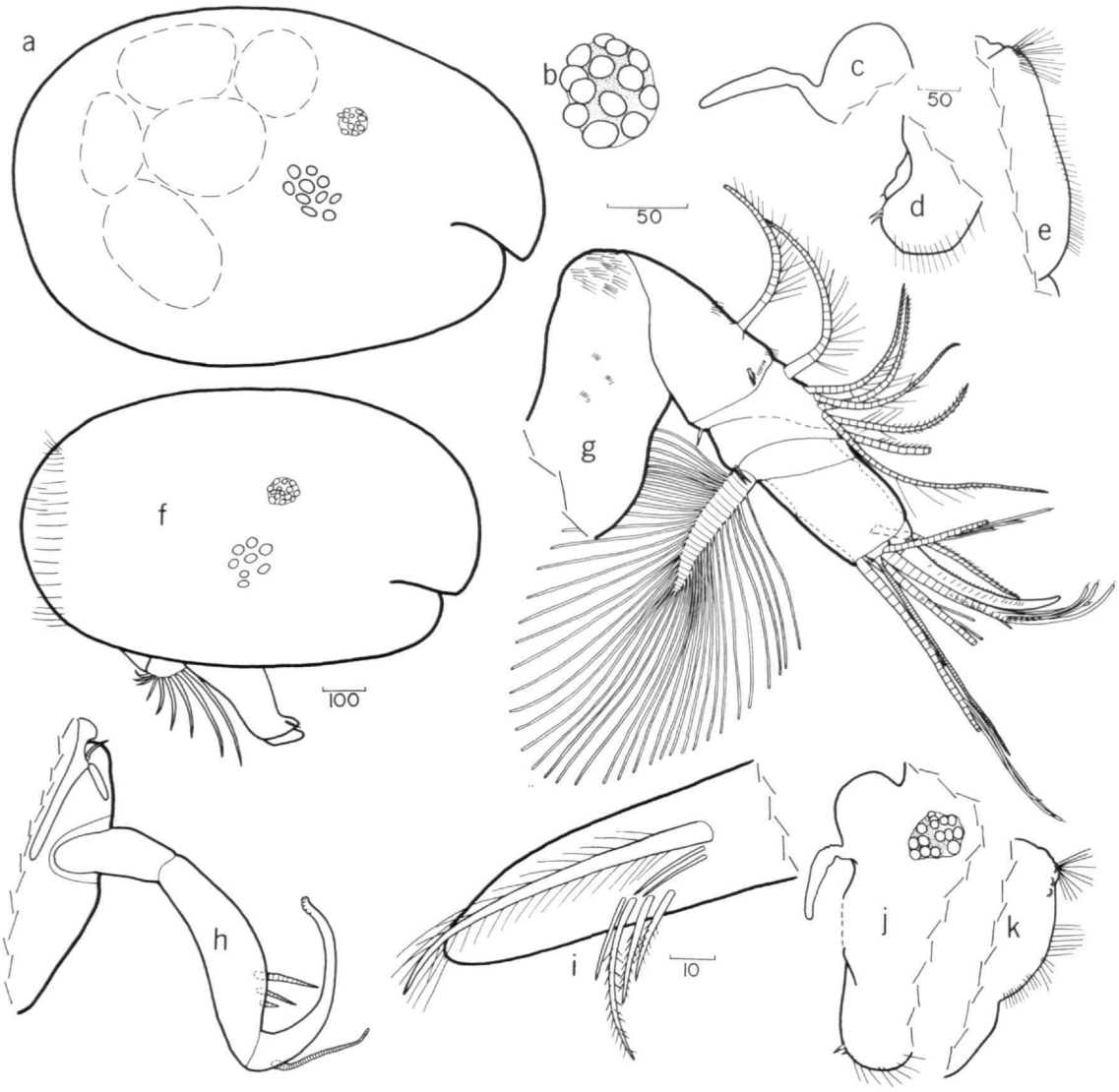

FIGURE 11.—*Parasterope kappa*, new species, Klie specimen number 6, ovigerous female, paratype, length 1.31 mm: *a*, complete specimen showing lateral eye, central muscle scars, and eggs, lateral view; *b*, left lateral eye, anterior to left; *c*, medial eye and rod-shaped organ; *d*, upper lip viewed from left; *e*, posterior of body showing dorsum. Klie specimen number 7, allotype, adult male, length 1.02 mm: *f*, complete specimen showing lateral eye, central muscle scars, and copulatory organ, lateral view; *g*, right 1st antenna, lateral view; *h*, distal part of protopodite and endopodite of left 2nd antenna, medial view; *i*, comb of left 5th limb, lateral view; *j*, anterior of body showing lateral eye, medial eye and rod-shaped organ, and upper lip; *k*, posterior of body showing dorsum with lateral crescents. (Same magnification in micrometers: *b,g,h; c–e,j,k*.)

joint reaching past stem, with spines along ventral margin; bristles of joints 3–8 with natatory hairs and with faint spines along ventral margins; 9th joint with lateral spine about three-fourths length of joint, and 4 bristles (2 long with natatory hairs, 2 short with short marginal spines); small basal spines present on joints 3–8.

Mandible (Figure 10*e,f*): Coxale endite: small slender bristle present near base of ventral branch; ventral branch with 3–4 oblique rows of spines; tip of ventral branch with about 5 slender spines (Figure 10*f*); ventral margin of dorsal branch with 3 low nodes followed by undulating margin; main spine minute; margin between main spine and tip of branch with short spines; bristle on dorsal margin of dorsal branch broken off on specimen examined but with base some distance from tip of branch. Basale: endite with usual 4 pectinate end bristles, 1 fairly long dwarf bristle (shorter than triaenid bristle), and 3 triaenid bristles with 3 pairs of marginal spines excluding terminal pair, glandular peg not observed; ventral margin of basale proximal to U-shaped depression with 1 minute bristle with distal part more slender than proximal part; dorsal margin of basale with 2 long stout spinous terminal bristles; medial surface of joint with spines forming short rows (spines mostly on dorsal half); lateral surface not observed. Exopodite hirsute, about three-fourths length of dorsal margin of 1st endopodite joint, with 2 short subterminal bristles. Endopodite: 1st joint with 3 long stout spinous ventral bristles; ventral margin of 2nd joint with 3 spinous terminal bristles; dorsal margin of 2nd joint with 1 short proximal bristle and stout spinous a-, b-, c-, and d-bristles; c- and d-bristles slightly stouter than a- and b-bristles; 1 long slender spinous lateral bristle present between b- and c-bristles and c- and d-bristles; 3 cleaning bristles forming oblique row near base of b-bristles; 6 longer cleaning bristles forming oblique row near base of c-bristle; 1 long spinous medial bristle present just distal to base of d-bristle; medial surface of 2nd joint with spines forming short rows; end joint with dorsal claw with ventral spines and 5 spinous bristles, 4 long, 1 short.

Maxilla (Figure 10*g*): Epipodial appendage hirsute with pointed tip reaching to about middle of dorsal margin of basale; endite I with 4 bristles, 3 long, 1 short; endite II with 3 long bristles. Basale hirsute on medial surface and along dorsal margin; medial surface with 2 bare bristles, both near dorsal margin (proximal bristle about three-fourths length of distal bristle); lateral surface with short proximal bristle; ventral margin with 1 proximal bristle (about same length as distal medial bristle), and 1 long spinous terminal bristle. Endopodite: 1st joint with 1 short dorsal bristle and 1 long spinous beta-bristle; end joint with long spinous terminal bristle (beta-bristle about three-fourths length of terminal bristle).

Fifth limb: Epipodial appendage with 59 bristles; comb with 2 short slender bristles ventral to base of stout exopodial bristle and 2 pairs of bristles near middle of ventral margin of comb.

Sixth limb (Figure 10*h*): Medial surface with minute bristle in anterodorsal corner (obscured on right limb); anterior margin with 1 upper and 1 lower bristle, the latter about one-half length of former; anterodorsal corner with 2 spinous bristles, proximal of these about one-half length of other; lateral flap without bristles; posteroventral margin with 13–14 spinous bristles; medial surface hirsute.

Seventh limb (Figure 10*i*): Proximal and distal groups with 6 bristles, 3 on each side; each bristle with 2 to 4 bells. Terminus consisting of opposing combs, each with about 12 opposing teeth.

Furca: Each lamella with 9 claws; posterior 3 claws bristle-like; claws 1 and 2 with hairs along convex margins; teeth along concave margins of claws 1–3 consisting of 4 or 5 short teeth forming row between longer teeth.

Rod-shaped organ: Elongate with rounded tip (Figures 10*j*, 11*c*).

Eyes: Lateral eye smaller than medial eye, with about 13 ommatidia (Figures 10*k*, 11*b*); hairs not observed on medial eye (Figures 10*j*, 11*c*).

Posterior (Figure 11*e*): Dorsum forming evenly rounded margin with long hairs; sclerotized crescents such as those on male not observed.

Upper lip (Figures 10*l*, 11*d*): Upper lip consisting of 2 hirsute lobes, each with 2 anterior spines; lateral hirsute flaps present on each side of lobes.

Y-*sclerite:* Similar to that on male of *P. beta.*

Eggs: Klie specimen number 6 with 7 eggs in marsupium (Figure 11*a*).

DESCRIPTION OF ADULT MALE (Figures 7, 11*f–k*).—Carapace differing from that of female in not

being tumid, in having anterior margin of rostrum more broadly rounded, and in having long hairs forming verticle row near the posterior margin (Figure 11*f*).

Infold: Not examined.

Size (Figure 7): Allotype, Klie specimen number 7, length 1.02 mm, height 0.65 mm.

First antenna (Figure 11*g*): 1st and 2nd joints with spines forming rows on lateral and medial surfaces; 2nd joint with 1 long spinous dorsal bristle and 1 short spinous lateral bristle; 3rd joint with small ventral bristle and 6 long spinous dorsal bristles (4th and 5th bristles adjacent to each other; short space between 1st and 2nd bristles); 4th joint with concave distal margins on both lateral and medial sides; dorsal margin of 4th joint with 1 long stout bristle with short marginal spines; ventral margin with 2 short bristles about one-half length of ventral margin of 4th joint; stout hirsute sensory bristle of 5th joint wedged between ventral corners of 4th and 6th joints; medial bristle of 6th joint with short marginal spines; sclerotized ventral margin of 6th joint with break in sclerotization near middle of joint (possibly indicating separation between 5th and 6th joints); sclerotized dorsal margin with slight thinning opposite break in sclerotization of ventral margin. Seventh joint: a-claw about same length as bristle of 6th joint, with minute teeth along dorsal margin; b-bristle extending past a-claw, with 5 filaments excluding tip; c-bristle broken, with only 7 short filaments on remaining part, but base about same thickness as c-bristle on female indicating bristle may not be long like on males in most other species of genus. Eighth joint: d-bristle absent; e-bristle bare, about same length as b-bristle; f-bristle broken, bent dorsally, with 3 filaments on remaining part; g-bristle broken, but base about same thickness as g-bristle of female indicating that bristle may not be long like on males of most species in the genus.

Second antenna (Figure 11*h*): Protopodite with small distal bristle but without spines on medial or lateral surfaces. Endopodite 3-jointed: 1st joint elongate without bristles; 2nd joint longer than 1st with 3 short distal bristles (bristles decreasing in length distally along joint); 3rd joint with proximal bristle and 6 terminal ridges. Exopodite broken on both limbs; remaining part of exopodite of right limb with 6 joints; 2nd joint only slightly longer than 3rd joint; bristle of 2nd joint with spines along ventral margin; bristles of joints 3–6 with natatory hairs, and spines along ventral margins; joints 2–6 with short spines forming row along distal margins; basal spines not seen with certainty.

Mandible: Coxale endite: small slender branch present near base of ventral branch; ventral branch with 4 oblique rows of spines; tip of ventral branch with 4 slender spines; ventral margin of dorsal branch with 1 pair of rounded nodes followed by 5 acuminate nodes decreasing in height distally along branch; tip of branch similar to that of female except main spine more prominent; bristle on dorsal margin of dorsal branch broken off but with base some distance from tip of branch. Basale: endite with usual 4 pectinate end bristles, 1 long dwarf bristle (about same length as adjacent triaenid bristle), 3 triaenid bristles with 3–4 pairs of marginal spines excluding terminal pair, and with small glandular peg; ventral margin of basale proximal to U-shaped depression with 1 minute bristle with distal part more slender than proximal part; dorsal margin of basale with 2 long spinous terminal bristles; medial surface of basale with spines mostly on dorsal half. Exopodite and 1st endopodite joint similar to those of female mandible. Ventral margin of 2nd endopodial joint with 3 long spinous terminal bristles; dorsal margin with 1 short and 1 medium proximal bristle, otherwise similar to that of female mandible.

Maxilla: Right maxilla of specimen examined with short slender bristle midway between proximal and terminal bristles on ventral margin of basale, otherwise similar to that of female. Left maxilla similar to that of female.

Fifth limb (Figure 11*i*): Similar to that of female.

Sixth limb: Similar to that of female except both limbs with 13 posteroventral bristles.

Seventh limb, furca, rod-shaped organ (Figure 11*j*), *Y-sclerite, upper lip* (Figure 11*d*): Similar to that of female.

Eyes: Lateral eye same size as that of female, with 14 ommatidia (Figure 11*j*); medial eye similar to that of female except hairs observed on dorsal margin (Figure 11*j*).

Posterior: Similar to that of female except with 3 small lateral sclerotized crescents with short spines (Figure 11*k*).

Copulatory organ: Consisting of long L-shaped lobes, each with short bristle near tip (Figure 11*f*).

Sexual dimorphism: The 2nd joint on the exopodite of the 2nd antenna of the adult male of *P. kappa* is only slightly longer than the 3rd joint. On adult males of most species of *Parasterope* the 2nd joint is considerably longer than the 3rd. Unfortunately, the c- and g-bristles of the 1st antennae of the only male *P. kappa* in the collection are broken, but their slender bases suggest that they may not be extremely long like on adult males of most other species of *Parasterope*.

Comparisons: The combination of a short bare bristle on the ventral margin of the mandibular basale proximal to the U-shaped depression, the small size of the carapace, and the number of ommatidia in the lateral eyes of the male and female (13–14) distinguishes *P. kappa* from other species in the genus.

CYPRIDINIDAE Baird, 1850

CYPRIDININAE Baird, 1850

Paradoloria Poulsen, 1962

Three species in the vicinity of South Africa and South-West Africa have been referred to the genus *Paradoloria* (Poulsen, 1962:147–149): *P. dorsoserrata* (Müller, 1908), *P. vanhoeffeni* (Müller, 1908), and *P. capensis* (Cleve, 1905). The description of *P. capensis* is inadequate to refer it to *Paradoloria* with certainty (Poulsen, 1962:147; Kornicker, 1975:141).

Paradoloria dorsoserrata (G. W. Müller, 1908)

FIGURES 12–24

Cypridina dorsoserrata G. W. Müller, 1908:83–84, pl. 4: figs. 1–3, 5–10; 1912:10[key], 11.—Klie, 1940:406.

Cypridina (Vargula) dorsoserrata G. W. Müller.—Skogsberg, 1920:247 [by implication].

Paradoloria dorsoserrata (G. W. Müller).—Poulsen, 1962 [part]:147.—Hanai, 1974:119.—Hartmann and Schröder, 1975:360, table 4.

Cypridina (Paradoloria) dorsoserrata G. W. Müller.—Hartmann and Schröder, 1974a:70.

Not *Paradoloria dorsoserrata* (G. W. Müller).—Poulsen, 1962: 149–152, fig. 76.

HOLOTYPE.—None selected. Syntypes—109 specimens in the Berlin Zoological Museum, catalog number 19097.

TYPE-LOCALITY.—Simonstown, Union of South Africa, 35°15′S, 19°45′E, bottom sample.

DISTRIBUTION.—In addition to the type-locality, the species has been reported from Langebaan, Veiddrift, and Kometje, Union of South Africa, by Hartmann and Schröder (1975:360, table 4), and from Lüderitz Bay, South-West Africa, by Klie (1940:406) and Hartmann and Schröder (1975:360, table 4).

MATERIAL.—Through the courtesy of Dr. H. -E. Gruner, I received from the Berlin Zoological Museum a vial containing 2 labels, "Gaussexp. 166–Simonst.," and "Types, Kat. Nr. 19097, Species *Cypridina dorsoserrata* G. W. Müller, 1908, Fundort Simonstown, South Africa, Biotop 35°15′S, 19°45′E, bottom sample, gesammelt von 1.VII. 1903, Dat. Deutsche Südpolar Exp., determiniert von G. W. Müller." The vial contained 109 specimens and 1 larval clam. I dissected 2 adult females designated herein "Müller female specimen number 1 and number 2," and 1 adult male designated herein "Müller male specimen number 1," and partly dissected 1 adult male designated herein "Müller male specimen number 2" and 1 female designated "Müller female specimen number 5." Also partly dissected were 1 A–1 male and 1 A–2 ?male. All specimens were returned to the Berlin Zoological Museum.

I received from the Hamburg Zoological Museum through Dr. Gerd Hartmann a vial containing 3 labels: "♀"; "07"; "*Asterope mülleri* Skogsberg, D. S. W. Africa: Lüderitz Bucht, February 1938. Coll. v. Levetzow." The vial contained in

Key to Species of *Paradoloria*

(in the vicinity of South-West Africa and South Africa)

1.	2nd claw of furca not separated from lamella by suture	***P. vanhoeffeni*** (Müller 1908)
	2nd claw of furca separated from lamella by suture	2
2.	Carapace length less than 2.2 mm	***P. dorsoserrata*** (Müller 1908)
	Carapace length more than 2.6 mm	***P. capensis*** (Cleve, 1905)

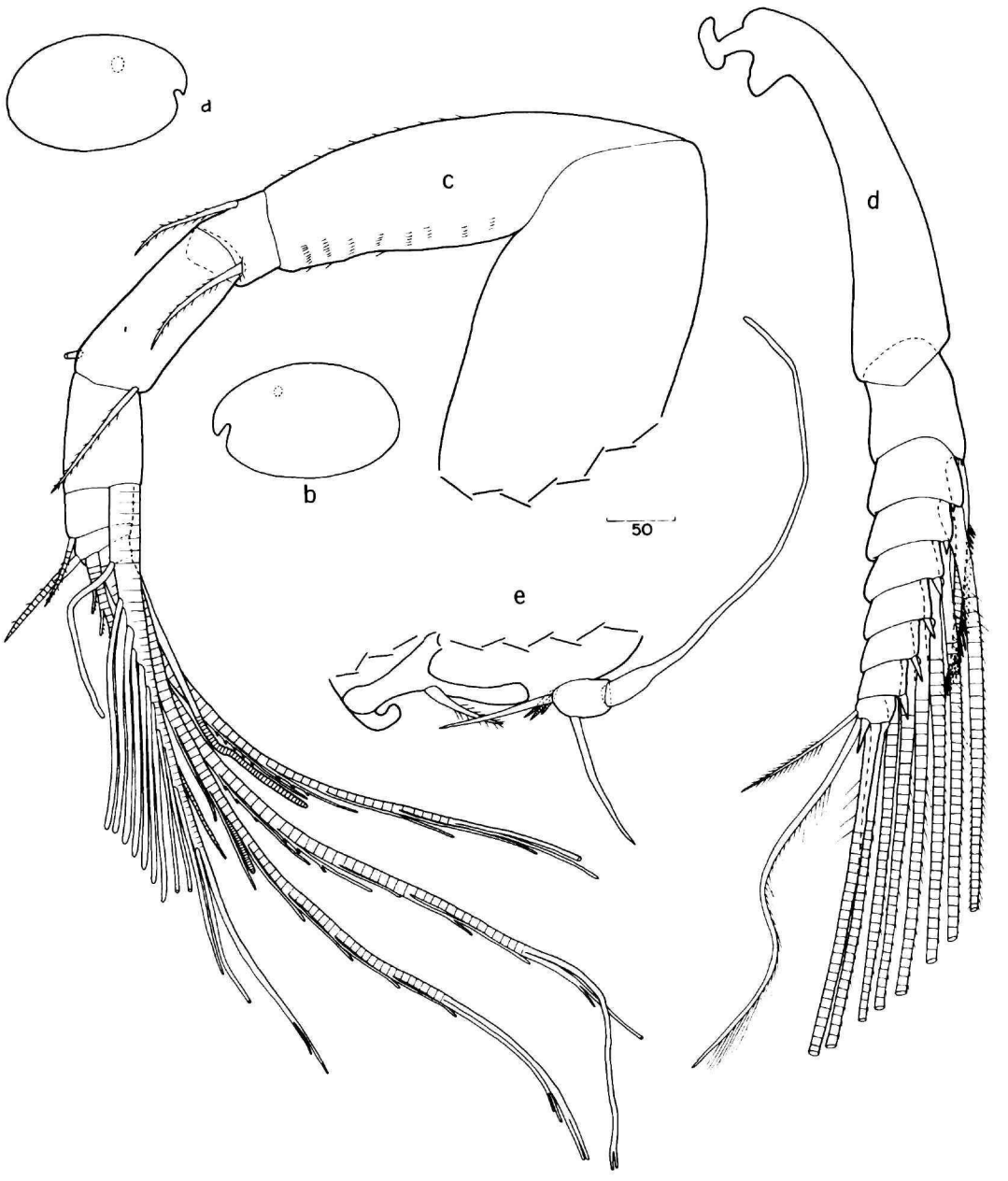

FIGURE 12.—*Paradoloria dorsoserrata* (Müller), Müller female specimen number 1, adult female with 1 female choniostomatid copepod and 15 copepod egg clones within carapace, syntype, length 1.99 mm: *a*, specimen showing outline of lateral eye. Müller female specimen number 2, adult female with large unextruded eggs, syntype, length 2.02 mm: *b*, complete specimen showing outline of lateral eye: *c*, left 1st antenna, lateral view; *d*, exopodite of right second antenna, lateral view; *e*, distal part of protopodite and endopodite of right 2nd antenna, medial view. (Same magnification in micrometers: *c–e*.)

addition to 72 cylindroleberids, 1 juvenile cypridinid, which I have identified as *Paradoloria dorsoserrata*. The specimen was returned to the Hamburg Zoological Museum.

DESCRIPTION OF FEMALE (Figures 12, 13*a–f*, 14–17).—Carapace smooth, oval in lateral view with caudal process hardly differentiatable from smooth curvature of posterior valve outline; incisur small (Figures 12*a,b*, 13*a*).

Infold (Figure 13*a–f*): Broad in area of rostrum and caudal process, narrower elsewhere; infold behind rostrum with about 32 long bristles and several minute bristles; 2 long bristles present at inner edge of upper margin of incisur; 1 short bristle on infold posterior to inner end of incisur; anteroventral infold with about 50 closely spaced bristles forming row; posterior edge of list along anterior margin of infold of caudal process with about 25 minute processes or bristles (Figure 13*c–e*); outer edge of infold of caudal process with about 18 pores (Figure 13*c,f*).

Selvage: Lamella prolongation with smooth outer margin present along anterior and ventral margins (Figure 13*a,b*).

Size: Müller female specimen number 1, length 1.99 mm, height 1.27 mm; Müller female specimen number 2, length 2.02 mm, height 1.23 mm; Müller female specimen number 5, length 2.01 mm, height 1.22 mm (not dissected). Müller (1908:84) gave the length as 2 mm.

First antenna (Figure 12*c*): 1st joint bare; 2nd joint with spines along ventral and dorsal margins and on lateral surface; 3rd and 4th joints each with 2 spinous bristles, 1 ventral, 1 dorsal; sensory bristle on 5th joint with 12 long marginal filaments and bifurcate tip; medial bristle of 6th joint short, spinous. Seventh joint: a-bristle short spinous; b-bristle slightly shorter than d-bristle, with 4 denticulate proximal filaments; c-bristle broken with about 5 marginal filaments, some pectinate, on remaining part. Eighth joint: d- and e-bristles bare, about half length of sensory bristle; f- and g-bristles longer than sensory bristle, with about 7 marginal filaments, some pectinate, and bifurcate tip (number of filaments on bristles of end joints not accurately determined on specimen examined).

Second antenna (Figure 12*d,e*): Protopodite with spinous medial bristle (Figure 12*e*). Endopodite 2-jointed (no indication of a 3rd joint) (Figure 12*e*): 1st joint with 2 long bristles with few marginal spines and 3 short bristles; 2nd joint elongate with long bare terminal filament. Exopodite (Figure 12*d*): bristle of 2nd joint not reaching end of exopodite; bristle with about 33 ventral spines and a few faint dorsal spines; 9th joint with 4 bristles, 2 long, 1 medium, 1 short (short bristle with short marginal spines, others with long natatory hairs); bristles of joints 2–8 with natatory hairs, no spines; joints 3–8 with basal spines increasing in length on distal joints; joints 2–8 with faint triangular spines forming row along distal margin.

Mandible (Figure 14*a*): Coxale endite spinous with short peg present between 2 stout terminal spines; minute bristle present at base of endite. Basale: ventral margin with 3 a-bristles (medial), 1 short b-bristle (lateral near a-bristles), 1–2 c-bristles (1 short c-bristle on left limb, 1 short and 1 medium on right), and 2 spinous d-bristles; dorsal margin with 1 spinous bristle near middle and 2 terminal; medial surface with long hairs. Exopodite hirsute, almost reaching end of 1st endopodite joint, with 2 spinous bristles. Endopodite: 1st joint with 4 spinous ventral bristles, 2 long, 2 short; dorsal margin of 2nd joint with about 13 short bristles and 7 longer bristles; ventral margin of 2nd joint with 2 single short slender bristles and terminal group with 2 slender equilength bristles; end joint with 3 claws and 4 bristles; each claw with few teeth along concave margin.

Maxilla (Figure 14*b*): Similar to maxilla of male.

Fifth limb (Figure 15): Epipodial appendage with 52 bristles; protopodite with undulate anterior process and single anterior spinous bristle inward from it (bristle could be on 1st exopodite joint); 1st exopodite joint with 3 anterior bristles forming group and main tooth with proximal peg and 6 pectinate teeth; 1 spinous bristle proximal to peg; 2nd joint with 1 spinous proximal posterior bristle, 4 pectinate a-bristles, and 6 pectinate b-bristles; inner lobe of 3rd joint with 3 bristles; outer lobe with 2 bristles; 4th and 5th joints fused, separated by hirsute process; 4th joint with 3 bristles, 5th joint with 2.

Sixth limb (Figure 16*a*): Epipodial appendage represented by 4 bare bristles; endite I with 4 bristles, 2 medial, 2 terminal; endite II with 5 bristles, 3 medial, 2 terminal; endite III with 5 bris-

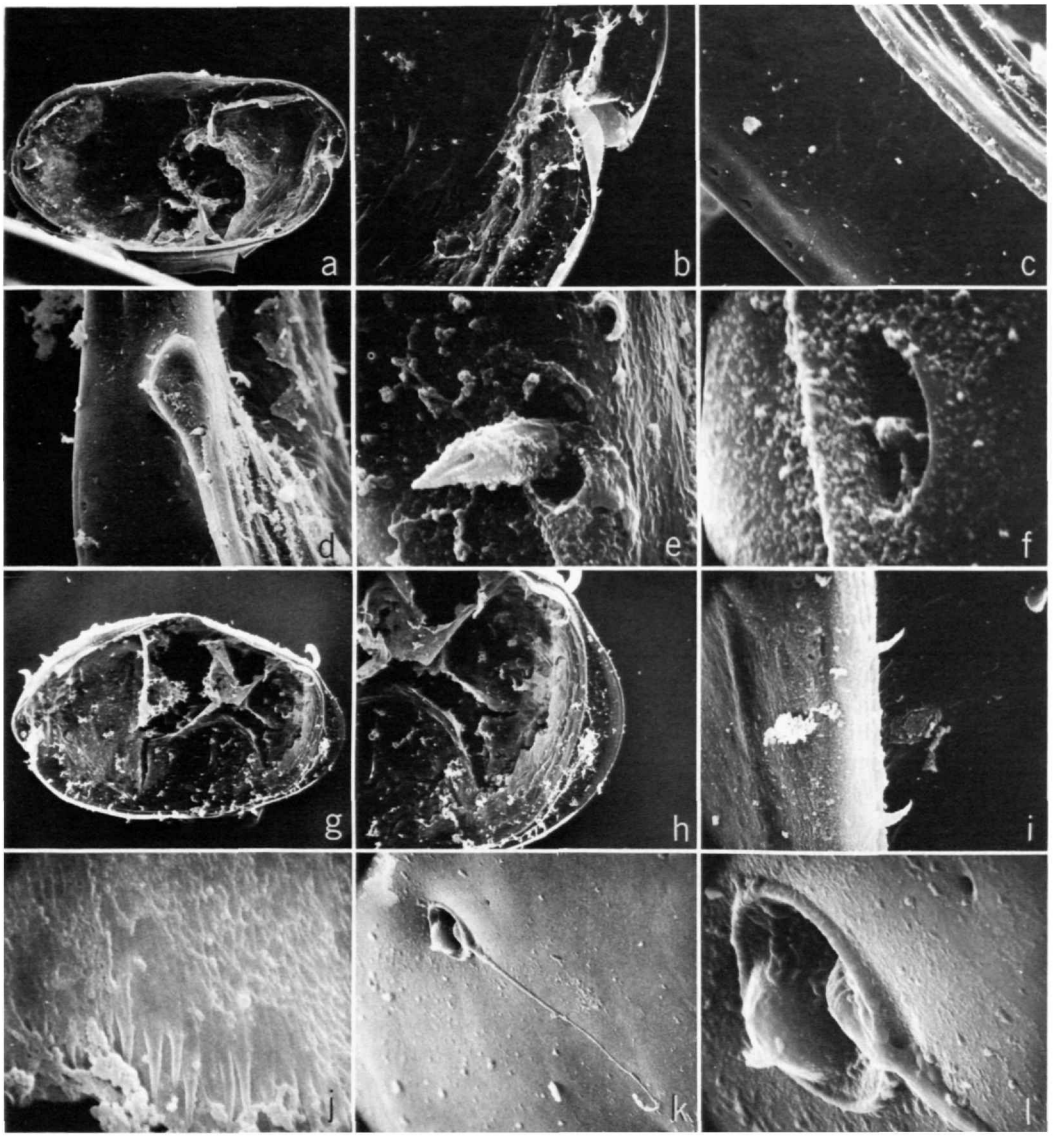

FIGURE 13.—*Paradoloria dorsoserrata* (Müller), Müller female specimen number 2, adult female, syntype, length 2.02 mm, left valve, medial view: *a*, complete valve, anterior to right × 50; *b*, anterior end showing lamellar prolongation of selvage in vicinity of incisur, × 200; *c*, part of infold of caudal process, × 1000; *d*, dorsal end of caudal process showing knob on end of list that fits into socket on right valve, × 1000; *e*, detail of *d* showing bristle on list shown × 10,000; *f*, detail of *d* showing pore near posterior edge of valve, × 15,000. Müller male specimen number 1, adult male, syntype, length 2.05 mm, right valve: *g*, complete valve, medial view, anterior to left, × 50; *h*, caudal process, medial view, × 100; *i*, detail of *h* showing 2 bristles on list of caudal process, × 2500; *j*, fringed outer edge of lamellar prolongation along upper edge of incisur, medial view, × 16,000; *k*, noded pore and bristle on lateral side of valve, note minute simple satellite pore to upper right of noded pore, × 3000; *l*, detail of *k* showing noded pore and satellite pore, × 12,000. (Photos reduced to 50% for publication.)

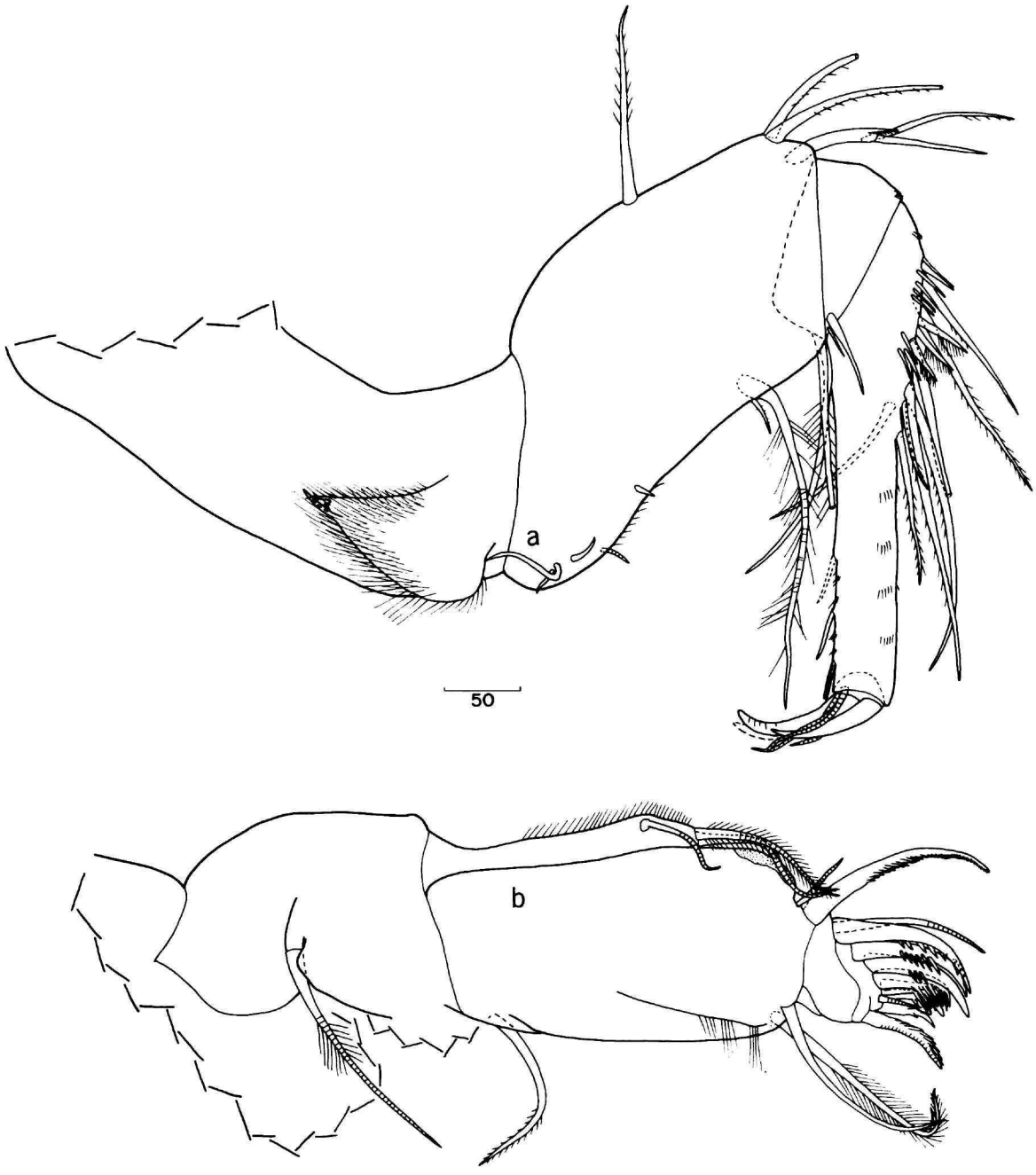

FIGURE 14.—*Paradoloria dorsoserrata* (Müller), Müller female specimen number 2 (continued): *a*, left mandible, medial view; *b*, right maxilla, medial view.

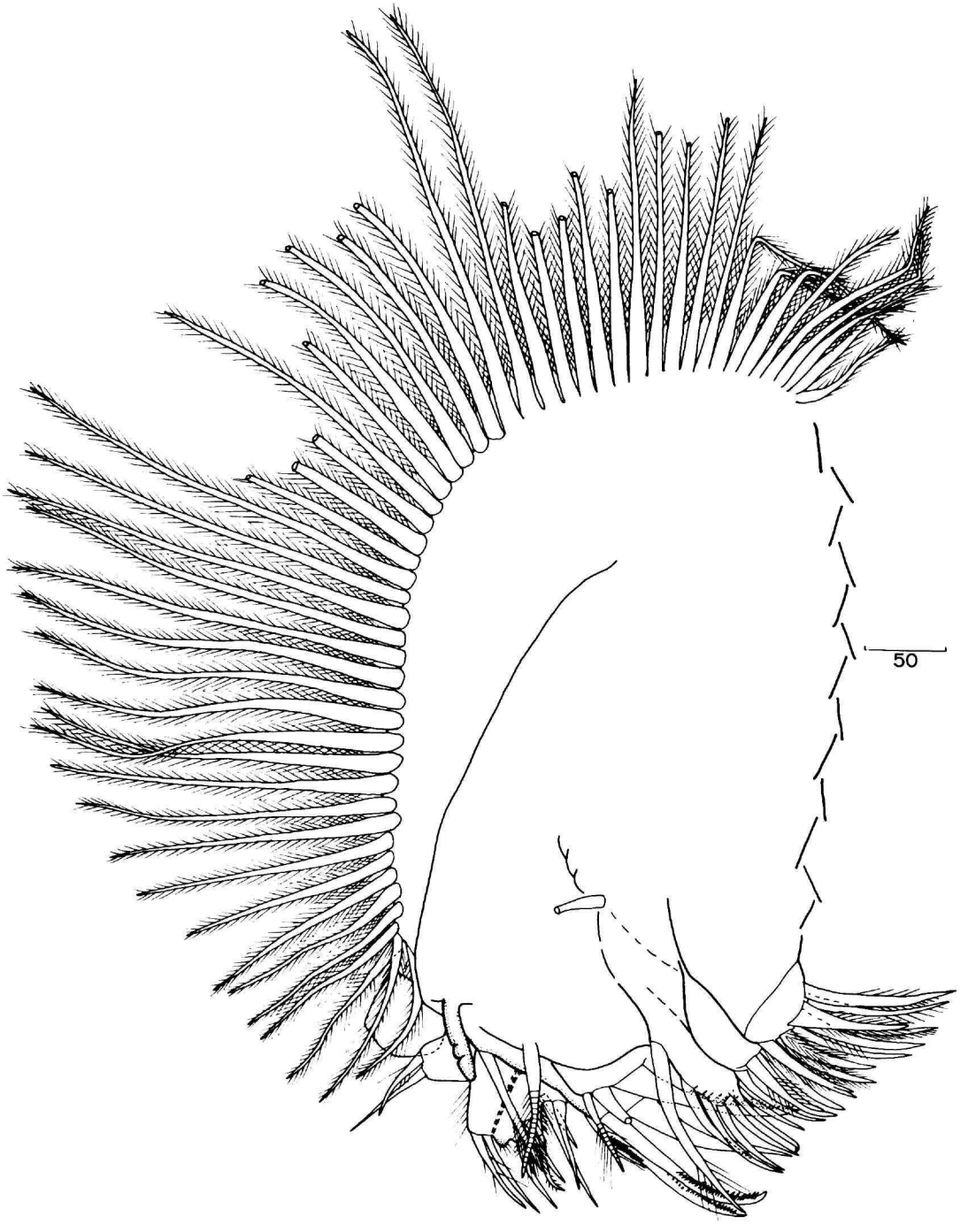

FIGURE 15.—*Paradoloria dorsoserrata* (Müller), Müller female specimen number 2 (continued): 5th limb.

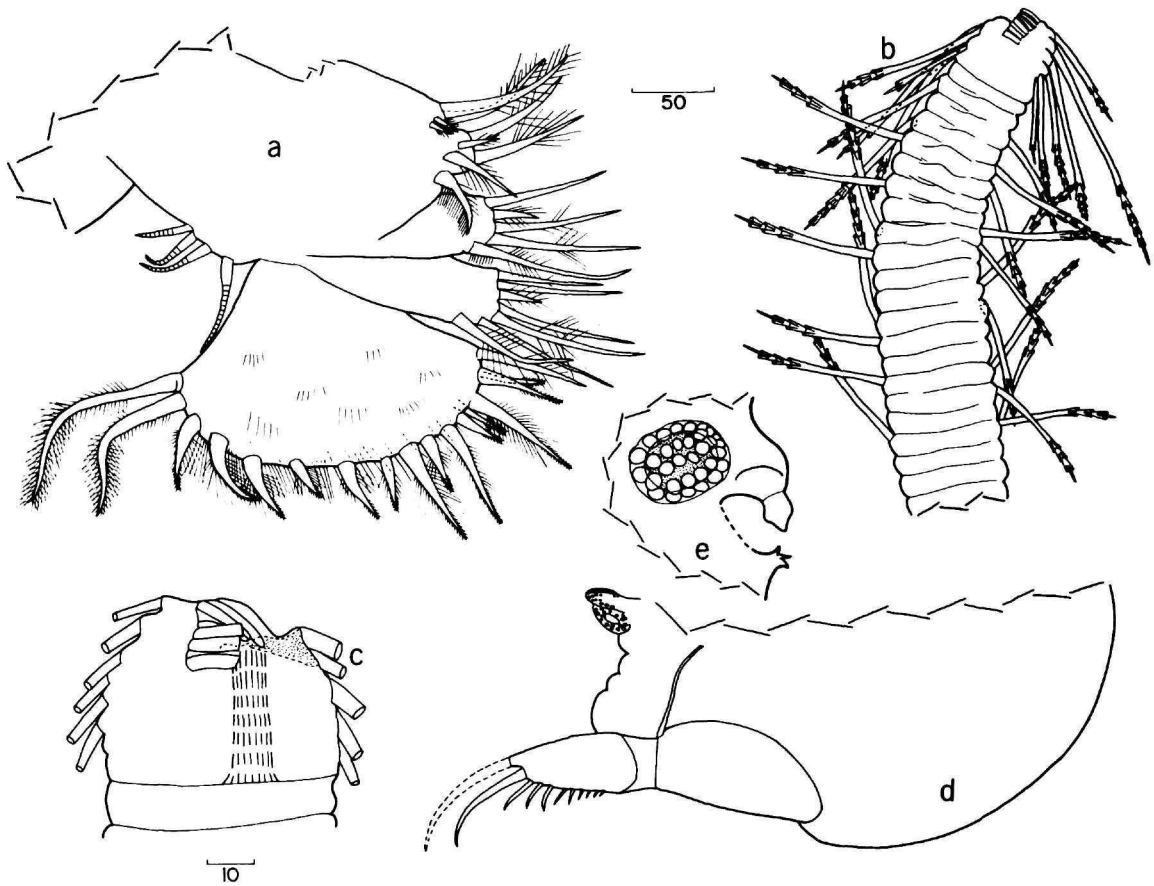

FIGURE 16.—*Paradoloria dorsoserrata* (Müller), Müller female specimen number 2 (continued): *a*, left 6th limb, medial view; *b*, 7th limb; *c*, tip of opposing 7th limb; *d*, posterior of body showing left lamella of furca and genitalia; *e*, anterior part of body showing right lateral eye, medial eye, rod-shaped organ, and 3-pronged anterior process. (Same magnification in micrometers: *a,b*.)

tles, 1 medial, 4 terminal; endite IV with 7 bristles, 1 medial, 6 terminal; end joint with 14–17 bristles.

Seventh limb (Figure 16*b,c*): Limb with 35 bristles, each with 3–5 bells. Terminal comb with 4 flat-tipped teeth on each side of 3 or 4 round-tipped teeth; jaw opposite comb bare.

Furca (Figure 16*d*): Each lamella with 11 claws, all separated from lamella by a suture; claws decrease in length posteriorly along the lamella; claw 4 slightly more slender at base than claw 5 and slightly longer; all claws with teeth forming row along concave posterior margins; claw 1 with medial teeth forming row.

Rod-shaped organ and eyes (Figure 16*e*): Rod-shaped organ short, tapering to point; medial eye lightly pigmented, bare; lateral eye pigmented, larger than medial eye, with about 33 ommatidia.

Upper lip: Consisting of unpaired anterior lobe and 2 pairs of low posterior lobes, all lobes with glandular openings.

Posterior (Figure 16*d*): Evenly rounded without large serrations present on male.

Anterior (Figure 16*e*): 2- or 3-pronged anterior process present.

Genitalia (Figures 16*d*, 17): Consisting of 2 paired lobes (one of the lobes interpreted herein to be a spermatophore).

Eggs: Müller specimen number 2 with rosette

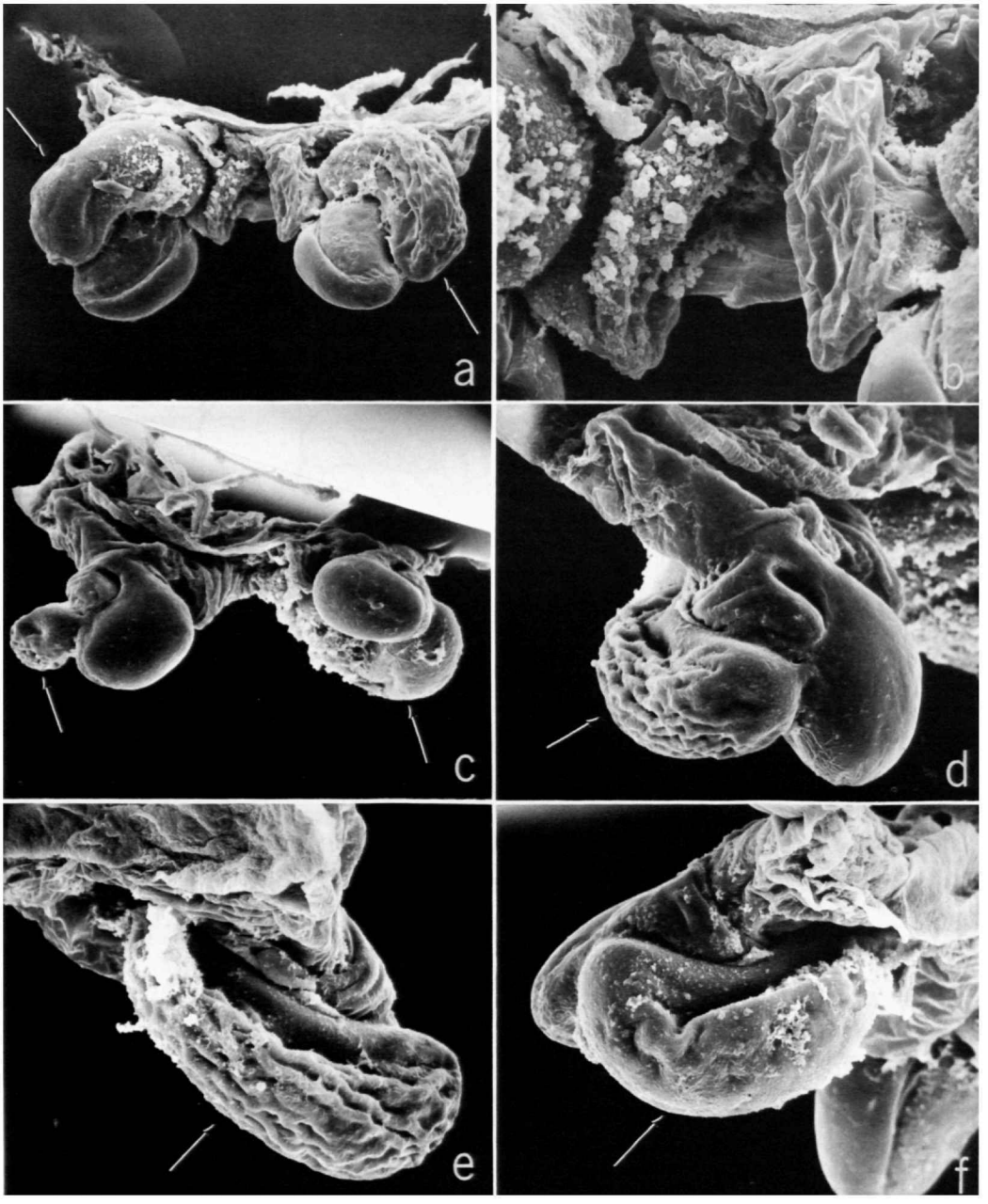

FIGURE 17.—*Paradoloria dorsoserrata* (Müller), Müller female specimen number 2 (continued), genitalia: *a*, anterior? view, spermatophores? indicated by arrows, × 300; *b*, detail of middle part of *a*, × 900; *c*, posterior? view, spermatophore? indicated by arrows, × 300; *d*, detail of left side of *c*, orientation slightly different than in *c*, spermatophore? indicated by arrow, × 625; *e*, detail of spermatophore? (arrow) on left of *d*, oriented differently than on *d*, × 625; *f*, spermatophore? (arrow) on right side of *c*, × 550. (Photos reduced 75% for publication.)

of 9 unextruded large eggs on each side of body (18 total).

Parasites: Müller specimen number 1 with 1 female copepod and 15 copepod egg clones within posterodorsal part of carapace.

DESCRIPTION OF MALE (Figures 13*g–k*, 18–22).—Carapace similar in shape to that of female except for caudal process being slightly more prominent (Figures 13*g*, 18*a*).

Infold (Figure 13*h,i*): Infold behind rostrum similar to that of female except only 24 bristles counted; posterior edge of list of posterior infold minutely uneven, otherwise similar to that of female (Figure 13*i*).

Selvage: Outer edge of lamellar prolongation along upper edge of incisur minutely serrate (Figure 13*j*).

Central muscle scars: Consisting of 10–12 ovoid or elongate individual scars (Figure 18*b,c*).

Pores: Outer surface of carapace with 2 types of pores: 1, a rimmed pore containing a bristle and off-center node (Figure 13*k,l*), and 2, a simple pore without bristle or rim and much smaller than the rimmed pore (Figure 13*k,l*).

Size: Müller male specimen number 1, length 2.05 mm, height 1.32 mm; specimen number 2, length 2.05 mm, height 1.31 mm; 2 undissected specimens: length 2.06 mm, height 1.35 mm; length 2.02 mm, height 1.31 mm.

First antenna (Figure 18*d*): Joints 1–6 similar to those of female. Seventh joint: a-bristle about same length as bristle of 6th joint; b-bristle with proximal process having bulbous base, large disc near middle, and small triangular process between disc and pointed tip of process; main part of b-bristle with long filament near middle having spine followed by 3 small discs at tip; a similar filament present near tip of b-bristle and extending well past tip (unusual); 2 short filaments present on b-bristle near base of distal long filament; c-bristle with stout proximal process similar to that on b-bristle, but with disc almost twice diameter of disc on b-bristle; remaining part of c-bristle with 2 filaments (1 near middle, 1 subterminal) having small proximal spines followed by 3 small discs; short marginal filaments also present between middle of c-bristle and its bifurcate tip. Eighth joint: d- and e-bristles bare, about one-half length of b-bristle; f- and g-bristles about same length as c-bristle, with about 9 marginal filaments (some pectinate) and bifurcate tip.

Second antenna (Figure 18*e,f*): Similar to that of female; ventral margin of bristle on 2nd joint of exopodite with 27 spines.

Mandible (Figure 19*a*): Similar to that of female.

Maxilla (Figure 19*b*): Endite I with about 11 spinous bristles; endite II with about 9 bristles; endite III with 1 proximal bristle and about 6 terminal bristles. Precoxale and coxale with hirsute transparent dorsal epipodial appendage; coxale with long slender dorsal bristle with long hairs restricted to proximal part and short spines distally; basale with 1 long slender bristle on dorsal margin near border with endopodite and 1 shorter bristle near inner margin and also at border with endopodite; exopodite long with 3 bristles (see illustration of maxilla of female). Endopodite: 1st joint spinous, especially along dorsal (anterior) margin, with 2 alpha-bristles (1 with long hairs, 1 with short spines) and 3 beta-bristles (1 long pectinate, 2 short bare, or with few faint marginal spines); end joint with 4 a-bristles (each with minute teeth along posterior margins), 3 strongly pectinate b-bristles; 3 c-bristles (2 strongly pectinate, 1 short with few small teeth), and 3 strongly pectinate d-bristles.

Fifth limb (Figure 20*b*): Similar to that of female; 3 endites with 3–6 bristles.

Sixth limb (Figure 20*c*): Epipodial appendage represented by 3 or 4 bare bristles; endites similar to those of female 6th limb; end joint with 14–18 spinous and hirsute bristles.

Seventh limb (Figure 20*d,e*): Each limb with 34 or 35 bristles, each with 3–5 (rarely 1) bells. Terminal comb similar to that of female; jaw opposite comb with small spinous process (not observed on female).

Furca (Figures 20*f*, 21*g-l*): Similar to that of female.

Rod-shaped organ and eyes: Rod-shaped organ and medial eye similar to those of female (Figures 18*g*, 21*a,j*). Lateral eye about one-third larger than that of female, with about same number of ommatidia (Figures 18*g*, 21*a,k*).

Upper lip (Figures 18g, 22*a-h*): Similar to that of female. The SEM photographs show a 3rd lobe containing 1 glandular opening in addition to the 2 paired lobes visible with the light microscope (Figure 22*c,d,f*), and also, the closely spaced hairs

FIGURE 18.—*Paradoloria dorsoserrata* (Müller), Müller male specimen number 1, syntype, length 2.05 mm: *a*, complete specimen showing outline of lateral eye; *b*, sketch of central adductor muscle scars of left valve, lateral view; *c*, sketch of central adductor muscle scars of right valve, lateral view; *d*, left 1st antenna, medial view; *e*, endopodite of right 2nd antenna, medial view; *f*, exopodite of right 2nd antenna, lateral view (bristles not shown); *g*, anterior of body showing outline of right lateral eye, medial eye and rod-shaped organ, bifurcate anterior process, and upper lip. (Same magnification in micrometers: *d,g; e,f.*)

FIGURE 19.—*Paradoloria dorsoserrata* (Müller), Müller male specimen number 1 (continued): *a*, right mandible, medial view; *b*, right maxilla, lateral view.

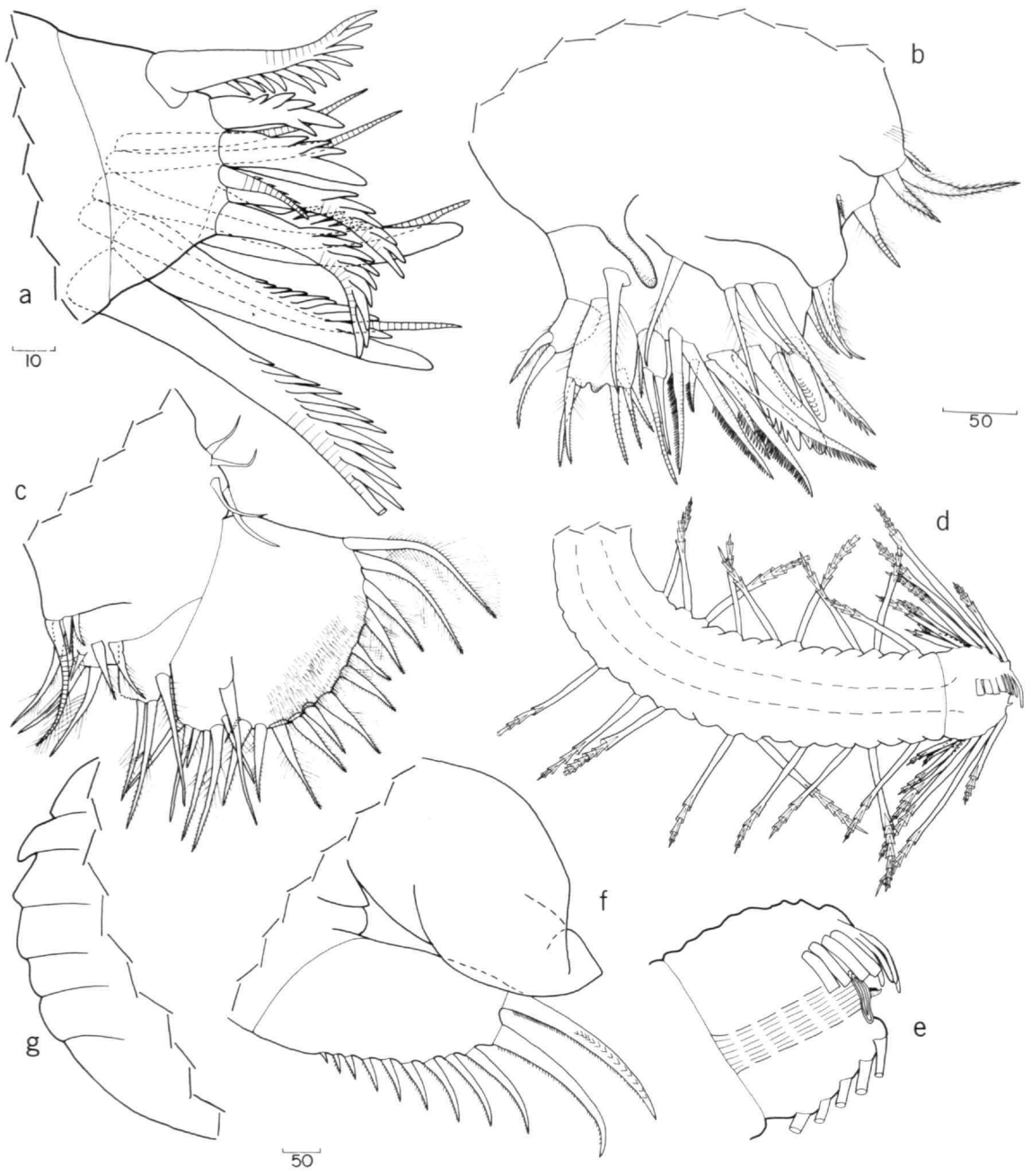

FIGURE 20.—*Paradoloria dorsoserrata* (Müller), Müller male specimen number 1 (continued): *a*, end joint of left maxilla, medial view; *b*, distal part of right 5th limb, anterior view; *c*, left 6th limb, medial view; *d*, 7th limb; *e*, detail of tip of 7th limb shown in *d*; *f*, right furcal lamella and outline of copulatory organ; *g*, posterior margin of body, anterior to right. (Same magnification in micrometers: *a,e*; *b–d*; *f,g*.)

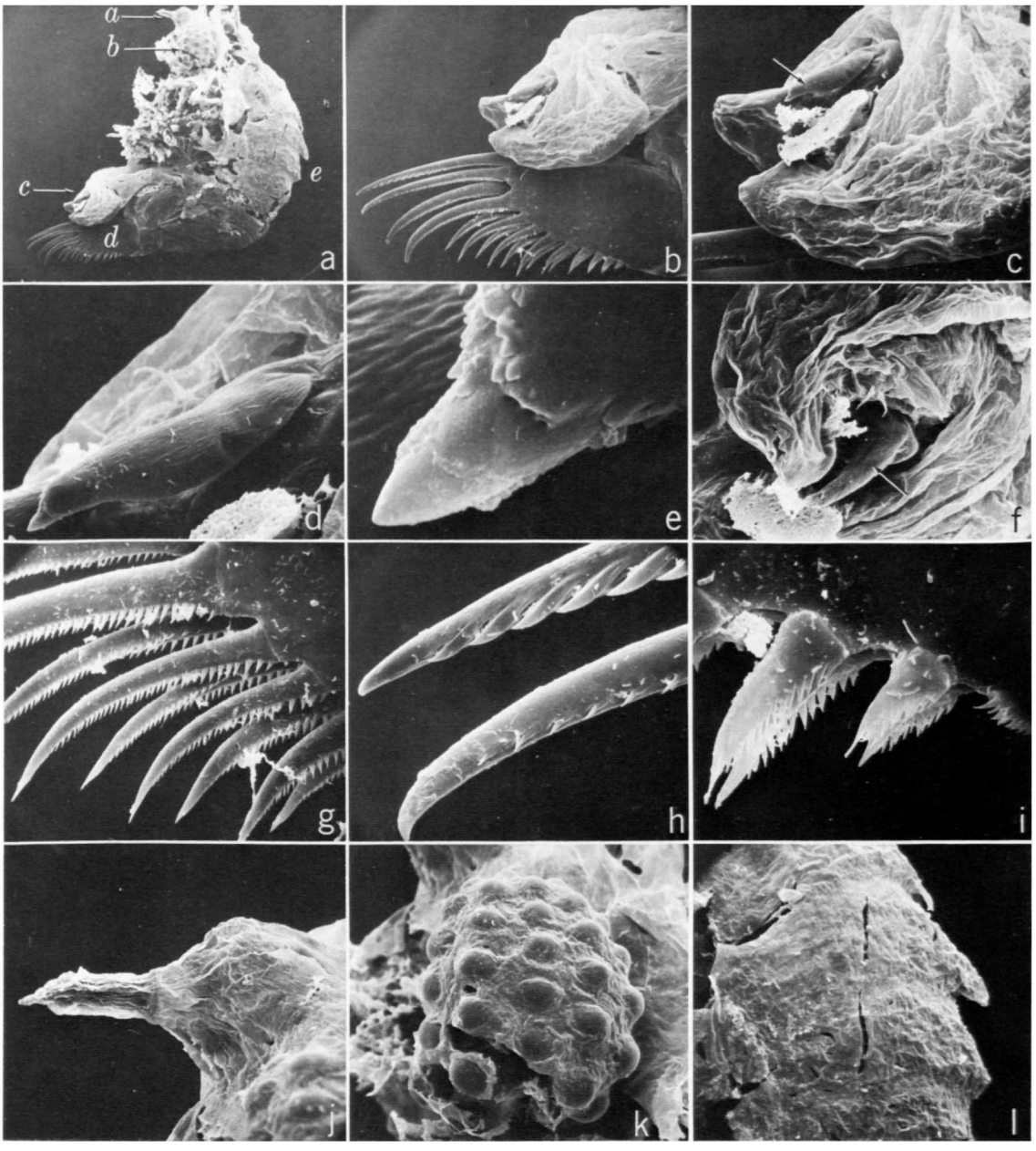

FIGURE 21.—*Paradoloria dorsoserrata* (Müller), Müller male specimen number 1 (continued): *a*, part of body showing medial eye and rod-shaped organ (a), lateral eye (*b*), copulatory organ (c), furca (d), and serrate posterior margin of body (e), × 50; *b*, copulatory organ and furca, × 150; *c*, copulatory organ (white object near middle is debris), × 360; *d*, detail from *c* showing penis? (see arrow in *c*), × 1100; *e*, detail from *d* showing tip of penis?, note 3 pores near middle of photograph, × 8400; *f*, tip of copulatory organ viewed from anterior and above showing penis? (arrow), × 360; *g*, anterior claws of furca, × 550; *h*, medial view of tip of claw 1 of right lamella (above), and lateral view of claw 1 of left lamella (below), × 1100; *i*, posterior 2 claws of left and right lamella, note teeth on margin of left lamella following claws (to right of claws on photograph), × 1700; *j*, medial eye and rod-shaped organ, × 400; *k*, left lateral eye, anterior toward left, × 300; *l*, serrate posterior margin of body, anterior toward left, × 210. (Photos reduced to 54% for publication.)

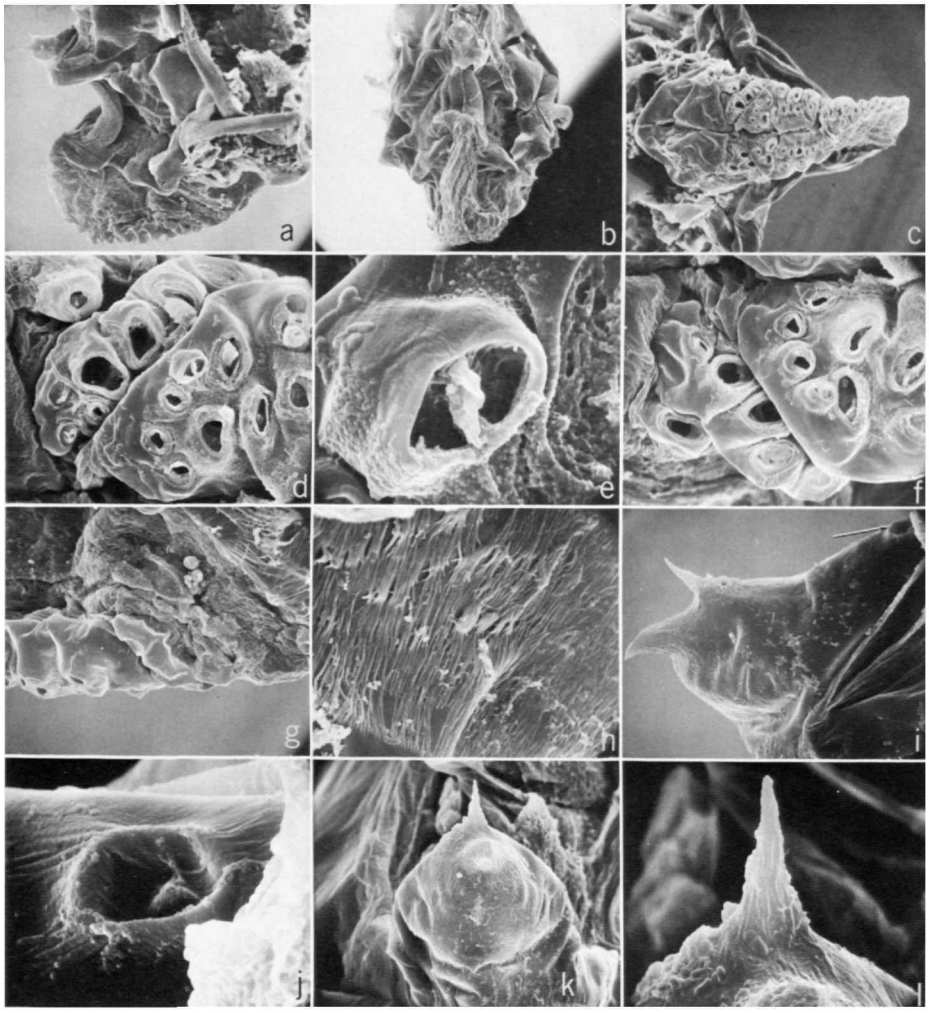

FIGURE 22.—*Paradoloria dorsoserrata* (Müller), Müller male specimen number 2, (continued): *a*, bifurcate anterior process and upper lip, lateral view, × 230; *b*, same anterior view, × 230; *c*, upper lip, ventral view, anterior to right, × 280; *d*, detail from *c* showing posterior openings of right segment, × 1250; *e*, detail from *d* showing glandular opening, × 7000; *f*, detail of *c* showing posterior openings of left segment, × 1250; *g*, detail from *a* showing transition between part of upper lip with glandular openings (toward left) and globose posterior part, note difference in surface texture, × 750; *h*, hirsute surface of posterior globose part of upper lip, × 2000; *i*, detail from *a* showing bifurcate anterior process, × 1150; *j*, detail from *i* (see arrow) showing pit above anterior process, × 6000; *k*, anterior view of bifurcate anterior process, × 1150; *l*, detail from *k* showing upper spine of anterior process, × 4000. (Photos reduced to 44½% for publication.)

on the lobe posterior to the glandular lobes (Figure 22*g,i*).

Posterior (Figures 20*g*, 21*a,l*, 23*f*): Margin serrate with some serrations tapering to point; on some specimens serrations longer than on others (compare Figure 20*g* with Figure 23*f*).

Anterior (Figures 18*g*, 22*a,i,k,l*): 2-pronged process present. (The SEM photographs revealed a pit above the anterior process (Figure 22*j*.)

Genitalia (Figures 20*f*, 21*a–f*): Each copulatory limb consisting of short triangular lobe with 2 minute bristles and inner lobe with elongate process with pointed toothlike tip (Figure 21*a–f*); toothlike tip with minute teeth and 3 pores (Figure 21*e*).

Parasites: Müller male specimen number 2 with 1 female copepod in posterodorsal part of shell.

DESCRIPTION OF A-1 MALE, MÜLLER SPECIMEN NUMBER 3 (Figure 23*c–e*).—Carapace in lateral view similar to that of adult female (Figure 23*c*); length 1.71 mm, height 1.11 mm.

Second antenna: Similar to that of adult male except fewer short bristles on 1st joint of endopodite.

Seventh limb: With 27 tapered bristles and single peg opposite comb.

Furca: Similar to that of adult male except with only 10 claws.

Genitalia (Figure 23*e*): Weakly developed as large anterior and small posterior lobe; anterior lobe with 3 short bristles.

Lateral eye: Well developed.

Posterior: Margin very weakly undulate (Figure 23*d*).

DESCRIPTION OF A-2 ?MALE, MÜLLER SPECIMEN NUMBER 4 (Figure 23*a,b*).—Carapace in lateral view similar to that of adult female (Figure 23*a*); length 1.32 mm, height 0.87 mm.

Second antenna: Similar to that of A-1 male, but endopodite may not have bristles on 1st joint.

Sixth limb: Well developed with many bristles.

Seventh limb: With 11 tapered bristles and single peg opposite comb.

Furca: Aberrant on specimen examined; left lamellar with 8 claws, claw 6 longer than others; right lamella also with 8 claws, but claw 2 shorter than claw 3, and a long claw with base on inner side of lamellar present proximal to claw 3.

Genitalia: Not developed.

Lateral eye: Well developed.

Posterior: Margin smooth (Figure 23*b*).

Note: Specimen examined assumed to be a male because of the presence on the 7th limb of a peg opposite the comb.

DESCRIPTION OF A JUVENILE ?MALE, KLIE SPECIMEN FROM LÜDERITZ BAY, (see "Material," page

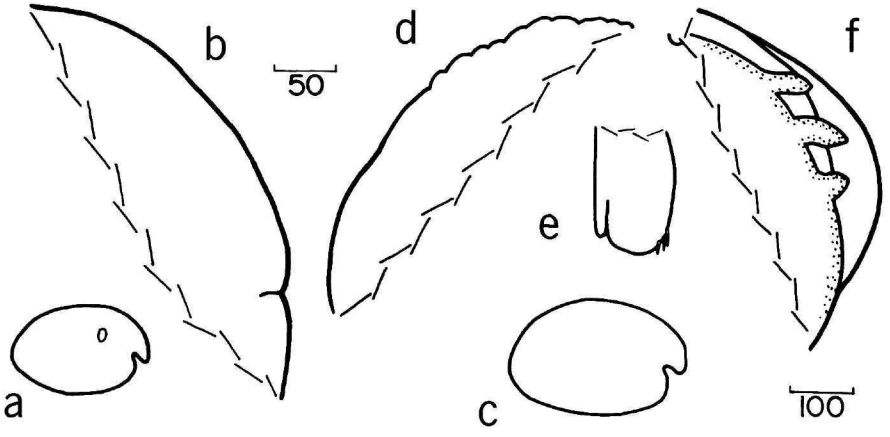

FIGURE 23.—*Paradoloria dorsoserrata* (Müller), Müller specimen number 4, A-2 ?male, syntype, length 1.32 mm: *a*, complete specimen showing outline of lateral eye; *b*, posterior of body, anterior to left. Müller specimen number 3, A-1 male, syntype, length 1.71 mm: *c*, outline of complete specimen; *d*, posterior of body, anterior to right; *e*, right copulatory organ, anterior to right. Müller male specimen number 2, adult male, syntype, length 2.05 mm: *f*, posterior of animal (stippled) shown inside the shell. (Same magnification in micrometers: *b,d*.)

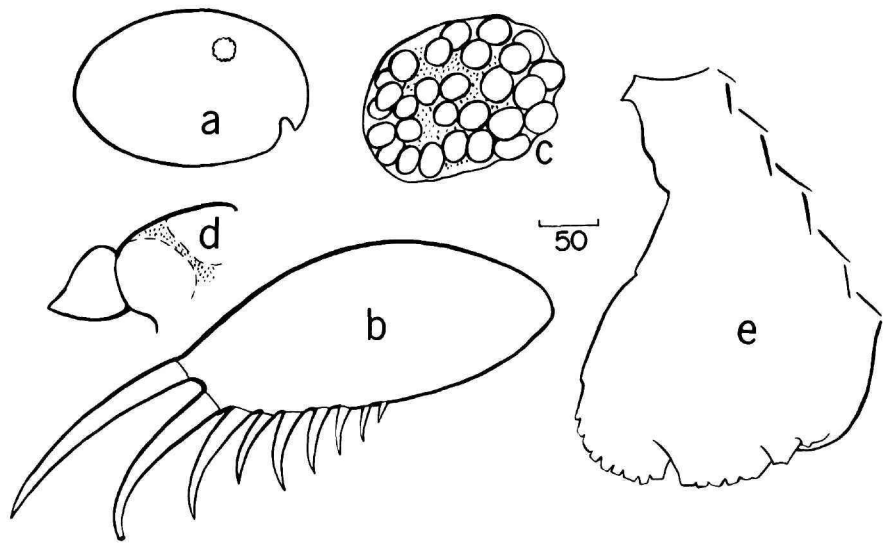

FIGURE 24.—*Paradoloria dorsoserrata* (Müller), Klie specimen number 4, juvenile ?male, length 1.50 mm: *a*, complete specimen showing outline of right lateral eye; *b*, left furcal lamella; *c*, left lateral eye, anterior toward left; *d*, medial eye and rod-shaped organ; *e*, upper lip, anterior to left. (Same magnification in micrometers: *b,d,e*.)

23) (Figure 24).—Carapace similar to that of A-1 male described above (Figure 24a); length 1.50 mm, height 1.01 mm.

Second antenna: Similar to that of adult male but with only 2 long bristles and 1 short bristle on 1st endopodite joint.

Seventh limb: Each limb with 11 tapered bristles and a single peg with small teeth on inner margin opposite comb.

Furca (Figure 24*b*): Similar to that of adult male but with only 9 claws and claw 3 shorter than claw 4.

Genitalia: Absent.

Medial eye and rod-shaped organ (Figure 24*d*): Similar to that of adult male.

Lateral eye: Well developed (Figure 24*c*).

Posterior: Margin very weakly undulate.

Upper lip (Figure 24*e*): Similar to that of adult male.

Remarks: The presence of a peg opposite the comb of the 7th limb suggests that the specimen is a male, but no copulatory organ was observed. The 7th limb contained about the same number of bristles present on the A–2 ?male described above, but that specimen had a smaller carapace. I have tentatively identified the specimen as *P. dorsoserrata;* however, it will be necessary to examine adult males and females of specimens identified by Klie as *P. dorsoserrata* in order to verify his identification.

SEXUAL DIMORPHISM.—In addition to usual dimorphic characters such as diflerences in the 1st antennae, the following differences were observed.

Carapace: Caudal process of male carapace slightly more prominent than that of female.

Seventh limb: Terminal jaw bare on female, with spinous process on male.

Posterior: Smooth on female, serrate on male.

Lateral eye: Slightly larger on male.

REMARKS CONCERNING SPECIMENS FROM JAPAN REFERRED TO *P. dorsoserrata* BY POULSEN (1962).—Because of differences in the endopodite of the 2nd antenna, number of furcal claws, and the posterior margin of the body of the male, I concur with Hanai (1974) that the Japanese and South African forms are not conspecific. The Japanese forms were correctly referred by Hanai (1974:119) to *Paradoloria pellucida* (Kajiyama, 1912).

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