

Metapolycope, a New Genus of
Bathyal Ostracoda from the Atlantic
(Suborder Cladocopina)

LOUIS S. KORNICKER
and
F. P. C. M. VAN MORKHOVEN

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SMITHSONIAN CONTRIBUTIONS TO ZOOLOGY • NUMBER 225

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SMITHSONIAN INSTITUTION PRESS

City of Washington

1976

ABSTRACT

Kornicker, Louis S., and F. P. C. M. van Morkhoven. *Metapolycope*, a New Genus of Bathyal Ostracoda from the Atlantic (Suborder Cladocopina). *Smithsonian Contributions to Zoology*, number 225, 29 pages, 24 figures, 1976.—*Metapolycope*, a new genus of Ostracoda, in the suborder Cladocopina, is described from 5 samples collected in the Atlantic Ocean by personnel aboard the *Atlantis II* and *Ingolf* at depths of 587–2191 m. Two new species, *M. hartmanni* and *M. microthrix*, are described and illustrated. The ontogeny and sexual dimorphism of *M. hartmanni* are discussed, and a key is given for identifying instars. Keys are also given for identifying genera of the Polycopidae, and species of *Metapolycope*.

OFFICIAL PUBLICATION DATE is handstamped in a limited number of initial copies and is recorded in the Institution's annual report, *Smithsonian Year*. SI PRESS NUMBER 6158. SERIES COVER DESIGN: The coral *Montastrea cavernosa* (Linnaeus).

Library of Congress Cataloging in Publication Data

Kornicker, Louis S. 1919–

Metapolycope, a new genus of bathyal Ostracoda from the Atlantic (suborder, Cladocopina) (Smithsonian contributions to zoology : 225)

Bibliography: p.

Supt. of Docs. no.: SI 1.27:225

I. *Metapolycope*. 2. *Metapolycope hartmanni*. 3. *Metapolycope microthrix*. 4. Crustacea—South Atlantic Ocean. I. van Morkhoven, F. P. C. M., joint author. II. Title. III. Series: Smithsonian Institution. Smithsonian contributions to zoology : no. 225.

QL1.S54 no. 225 [QL444.085] 591'.08s [595'.33]

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Introduction

Collections of deep-sea ostracodes, obtained by personnel of the Woods Hole Marine Biological Laboratory while aboard the *Atlantis II* in 1967 and 1968, and Danish personnel aboard the *Ingolf* in 1896, contained a new genus of Cladocopina in samples from four localities in the South Atlantic (Figure 1) and one in the North Atlantic near Iceland. Only three genera have been previously described in the suborder Cladocopina. The new genus is particularly interesting because the male 1st antenna bears a sensory process similar in appearance to processes reported previously only on specimens in the order Podocopa, and bristles with discs (sensory or for clasping female?) similar to those reported previously only on specimens in the suborder Myodocopina (Family Cypridinidae).

ACKNOWLEDGMENTS.—We thank personnel of the Woods Hole Marine Biological Laboratory and *Ingolf* personnel for the samples upon which this study was based, and Dr. Gerd Hartmann, University of Hamburg, for identifying for us the species upon which the polycopeid muscle scars he had illustrated in a publication (1966:130, fig. 74a–g) were based. The assistance of Walter R. Brown and Miss Mary J. Mann, Smithsonian Institution,

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who operated the scanning-electron microscope is acknowledged. The specimens, prior to photographing by the SEM, were freeze-dried in the laboratory of R. Hower, Smithsonian Institution. Photographs with transmitted light were taken by V. Kranz, Smithsonian Institution. The manuscript was kindly reviewed by our colleague, Dr. I. G. Sohn. We thank Mary Frances Bell of the

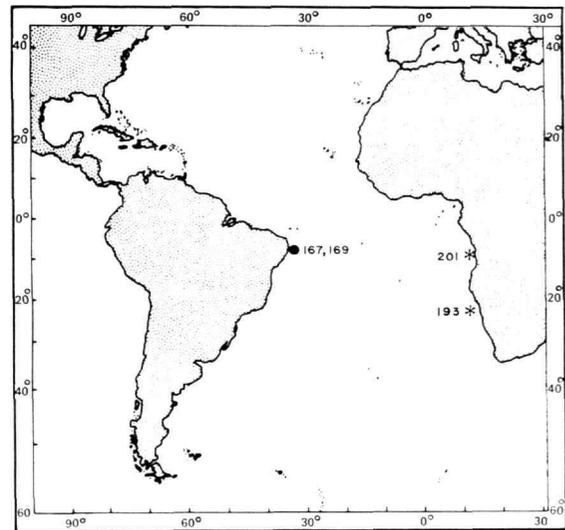


FIGURE 1.—Locality map of South Atlantic stations and species (black dot = *Metapolycope hartmanni*; stars = *Metapolycope microthrix*).

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Station Data

Research Vessel *Atlantis II*

(Cruise 31, Dakar, Senegal to Recife, Brazil,
2 February 1967–23 February 1967)

Station 167; 20 February; 07°58'0"S, 34°17'0"W to 07°50'0"S, ?
(final longitude not given in cruise report, but presumably close to initial longitude); 943–1007 m.

Metapolycope hartmanni, new species: 5 complete specimens + 1 right valve.

Station 169; 21 February; 08°03'0"S, 34°23'0"W to 08°02'0"S, 34°25'0"W; 587 m.

Metapolycope hartmanni, new species: 9 specimens.

(Cruise 42, Walvis Bay, South West Africa, to Luanda, Angola, 15 May 1968–23 May 1968)

Station 193; 17 May; 22°56'S, 12°18'E; 2094–2191 m; epibenthic trawl.

Metapolycope microthrix, new species: 1 specimen.

Station 201; 23 May; 9°25'S, 11°35'E to 9°05'S, 12°17'E; 1964–2031 m; epibenthic trawl.

Metapolycope microthrix, new species: 1 specimen.

Research Vessel *Ingolf*

(Danish Ingolf–Expedition, 1895–1896,
North Atlantic)

Station 90; 24 June 1896; 64°45'N, 29°06'W; 1068 m; bottom temperature 4.4°C; Denmark Strait between Greenland and Iceland.

Metapolycope species: 1 left valve.

Family POLYCOPIDAE Sars, 1866

Kozur (1974:853) proposed the subfamily Pokornyopsinae Kozur, 1974, in the Polycopidae, for *Thaumatocypris feifeli* Triebel, 1941; *Thaumatocypris bettenstaedti* Bartenstein, 1949; *Polycope?* sp., *Thaumatocypris?* sp. Oertli, 1972; and *Polycope?* sp., D. Oertli, only figures 37, 38. Kornicker and Sohn (1976) referred the first two species to the family Thaumatocyprididae.

The present authors recognize only one subfamily in the Polycopidae—the Polycopinae Sars, 1866.

Subfamily POLYCOPINAE Sars, 1866

This subfamily contains 4 genera: *Polycope* Sars, 1866; *Polycopsis* Sars, 1923; *Parapolycope* Klie, 1936, and *Metapolycope*, new genus.

Metapolycope, new genus

TYPE-SPECIES.—*Metapolycope hartmanni*, new species.

ETYMOLOGY.—From the Greek *Meta* (= near) + *polycope*. Gender: Feminine.

DISTRIBUTION.—Atlantic between depths of 587–2191 m.

DIAGNOSIS.—Carapace reticulate with central adductor muscle scars consisting of central ovoid scar and 7 additional scars forming half of rosette with convex part of rosette oriented posteriad; an 8th slender crescentic muscle scar, less visible than others, present anterior to lowermost scar; hinge straight, simple without teeth, located along posterodorsal margin.

First antenna: With 5 distinct joints; 1st joint of male with elongate, lateral, sensory process; 2nd joint of both sexes with 2 large processes, each with terminal bristle; 4th joint of adult female with 1 dorsal and 2 ventral bristles; 4th joint of adult male with 1 dorsal and 4 ventral bristles (2 bristles of usual type and 2 with 7–8 minute discs).

Key to Genera of the Polycopinae

1. Dorsal margin of 2nd joint of 1st antenna with 1 or 2 large processes, each with terminal bristle 2
- Dorsal margin of 2nd joint of 1st antenna without large processes 3
2. Central adductor muscle scars composed of 3 ovoid individual scars (always?); 1st antenna with 6 joints *Polycopsis* Sars, 1923
- Central adductor muscle scars composed of 9 individual scars forming one-half of a rosette; 1st antenna with 5 joints *Metapolycope*, new genus
3. Furca of female with 3 claws on left lamella and 4 on right *Parapolycope* Klie, 1936
- Furca of female with minimum of 4 claws on each lamella *Polycope* Sars, 1866

Mandible: Ventral margin of basale with 4 spinous bristles (always?).

Maxilla: Dorsal margin of basale with large proximal hump.

Furca: Each lamella with 7 slightly curved claws.

DESCRIPTION.—Carapace reticulate; in lateral view, anteroventral margin of each valve of *M. hartmanni* distinctly serrate; anteroventral margin of *M. microthrix* with subdued serrations on left valve, and almost no serrations on right valve; serrations formed by edges of reticulations; central adductor muscle scar composed of 8 individual scars forming half of a rosette around small central scar.

First antenna: Limb with 5 joints; except for 3rd joint, bristles present on all joints; 1st joint of adult male with 2 large dorsal processes, each with terminal bristle; 4th joint of adult male with 2 ventral bristles with 7–8 minute discs.

Second antenna: Endopodite 3-jointed, each joint with bristles; 3rd joint of adult male with sclerotized hooklike clasper.

Mandible: Coxale endite with large inner and outer tooth with several small teeth between them; basale with 4 spinous ventral bristles; exopodite with 2 spinous bristles; end joint of endopodite with spinous ventral bristle and clawlike dorsal bristle.

Maxilla: Dorsal margin of basale with large proximal hump to which a stout muscle is attached internally.

Fifth limb: Typical for family (Figures 4g, 11g, 19e).

Furca: Each lamella with 7 slightly curved claws followed by unpaired bristle.

Posterior of body: 5th segment with cluster of long hairs.

COMPARISONS.—Large processes on the dorsal margin of the 2nd joint of the 1st antenna have been reported only on *Metapolycope*, new genus, and *Polycopsis* Müller, 1894. The 1st antenna of *Metapolycope* bears 5 joints compared to 6 on *Polycopsis*. Adult males are known for only *Polycopsis*

compressa (Müller, 1894) and *Metapolycope hartmanni*, new species. Unlike *Metapolycope*, the adult male of *Polycopsis* does not have a 1st antenna with a sensory process on the 1st joint and 2 bristles with minute discs on the 4th joint (see Müller, 1894, pl. 7: figs. 34, 35). The central adductor muscle scars of *Metapolycope* consist of 8 elongate scars forming half of a rosette around a small central scar. The muscle scar of *Polycopsis serrata* Müller, 1894, consists of 3 ovoid scars (Müller, 1894, pl. 8: fig. 22). The muscle scar is not well defined on the specimen of *P. compressa* illustrated by Sars (1923, pl. 17: fig. 2), but it seems to be composed of 3 ovoid scars similar to those of *P. serrata*. On the other hand, photographs of valves of *P. compressa* illustrated by Barbeito-González (1971, pl. 44: figs. 1, 2) suggest a rosette arrangement not unlike that of *Metapolycope*; however, the scars in the photographs are not clearly visible. Through the courtesy of Dr. Gerd Hartmann, we received from the Hamburg Zoological Museum a dissected specimen of *P. compressa* (number 37325) from Banyuls. The right valve was missing from the vial. Unfortunately, the left valve contained only a remnant of a single adductor muscle; however, markings on the valve when viewed with transmitted light suggest that additional muscles may have been attached to form a rosette pattern. The rosette is convex toward the ventral margin, not the posterior margin as in *Metapolycope*. Additional study is required to determine the number and arrangement of muscle scars on *P. compressa*. By study of the 1st antenna of the specimen from Banyuls we are able to confirm that it has 6 joints arranged similar to those of the 1st antenna of *P. compressa* illustrated by Sars (1923, pl. 17: fig. 2a).

Metapolycope hartmanni, new species

FIGURES 2–14, 20a,b

HOLOTYPE.—USNM 151164, adult female.

Key to Species of *Metapolycope*

- Ventral margin of left valve with 14–16 minute teeth; unpaired bristle posterior to furca about one-half length of posterior claw of furca *M. microthrix*, new species
 Ventral margin of left valve without teeth; unpaired bristle posterior to furca about same length as posterior claw of furca *M. hartmanni*, new species

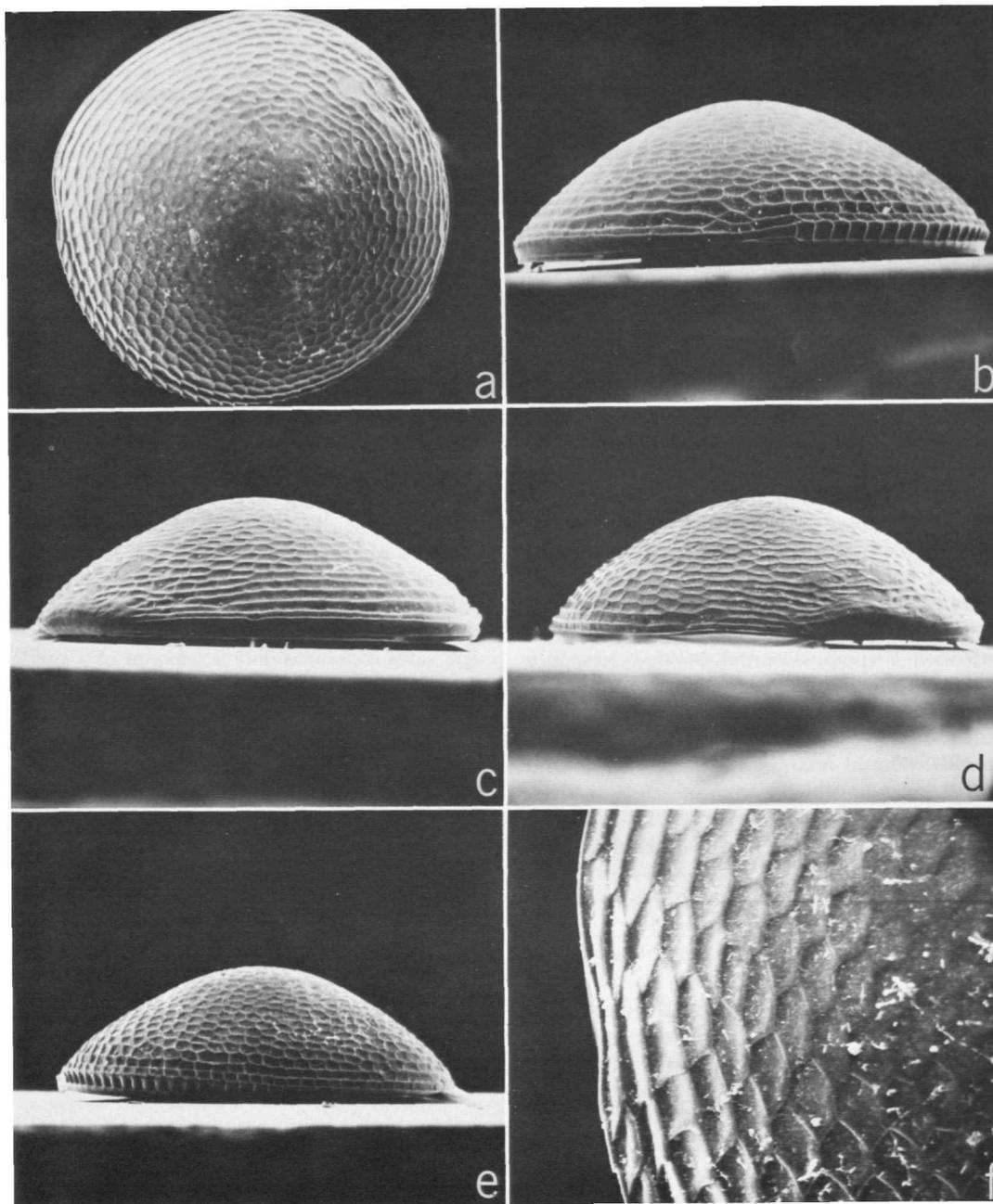


FIGURE 2.—*Metapolycope hartmanni*, USNM 151164, holotype, adult female, length 1.00 mm, views of left valve: *a*, complete valve, anterior to left, $\times 83$; *b*, anterior view, venter to right, $\times 100$; *c*, dorsal view, anterior to right, $\times 94$; *d*, posterior view, venter to left, $\times 94$; *e*, ventral view, anterior to left, $\times 83$; *f*, detail from *a* showing slight anterior concavity, $\times 290$. (Micrographs reduced to 76.5% for publication.)

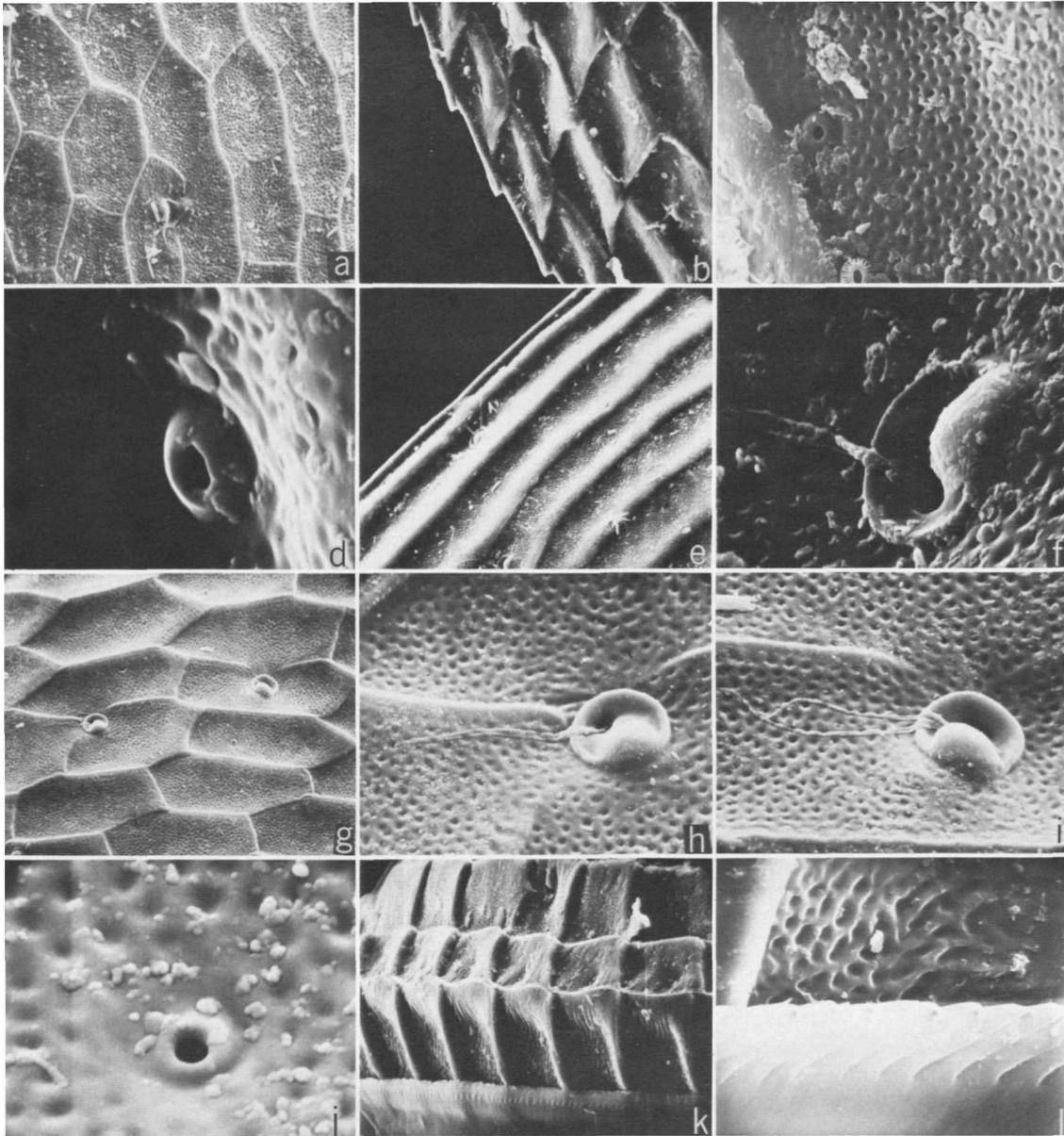


FIGURE 3.—*Metapolycope hartmanni*, USNM 151164, holotype, adult female, length 1.00 mm, outside views of left valve: *a*, surface of posterodorsal part of valve, from Figure 2*a*, $\times 770$; *b*, anteroventral margin, from Figure 2*a*, $\times 725$; *c*, detail showing pore to right of middle of *b*, (note coccolith), $\times 5000$; *d*, pore in lower left of *b*, $\times 10,000$; *e*, anteroventral margin, from Figure 2*a*, $\times 725$; *f*, pore and double bristle in lower left of *e*, $\times 6000$; *g*, surface dorsal to middle of valve shown in Figure 2*a*, $\times 770$; *h*, *i*, details of pores and bristles in *g*, $\times 3085$; *j*, detail of open pore in *g*, $\times 10,000$; *k*, detail of anteroventral valve margin showing lamellar prolongation of selvage in Figure 2*e*; *l*, detail of anteroventral margin of valve showing fringed edge of lamellar prolongation, from Figure 2*b*, $\times 3400$. (Micrographs reduced to 53.5% for publication.)



FIGURE 4.—*Metapolycope hartmanni*, USNM 151164, holotype, adult female, length 1.00 mm: a, left valve, inside view showing central adductor muscle scars and some pores; b, 1st antenna; c, bristles of head region, proximal part of left antenna without bristles (1-3), propodite of left 2nd antenna; d, endopodite of 2nd antenna; e, mandible; f, maxilla; g, 5th limb; h, bristles of head region, anterior to left; i, bristles of head region and anterior of body showing upper lip; j, furca (only left lamella shown) and posterior showing segmentation.

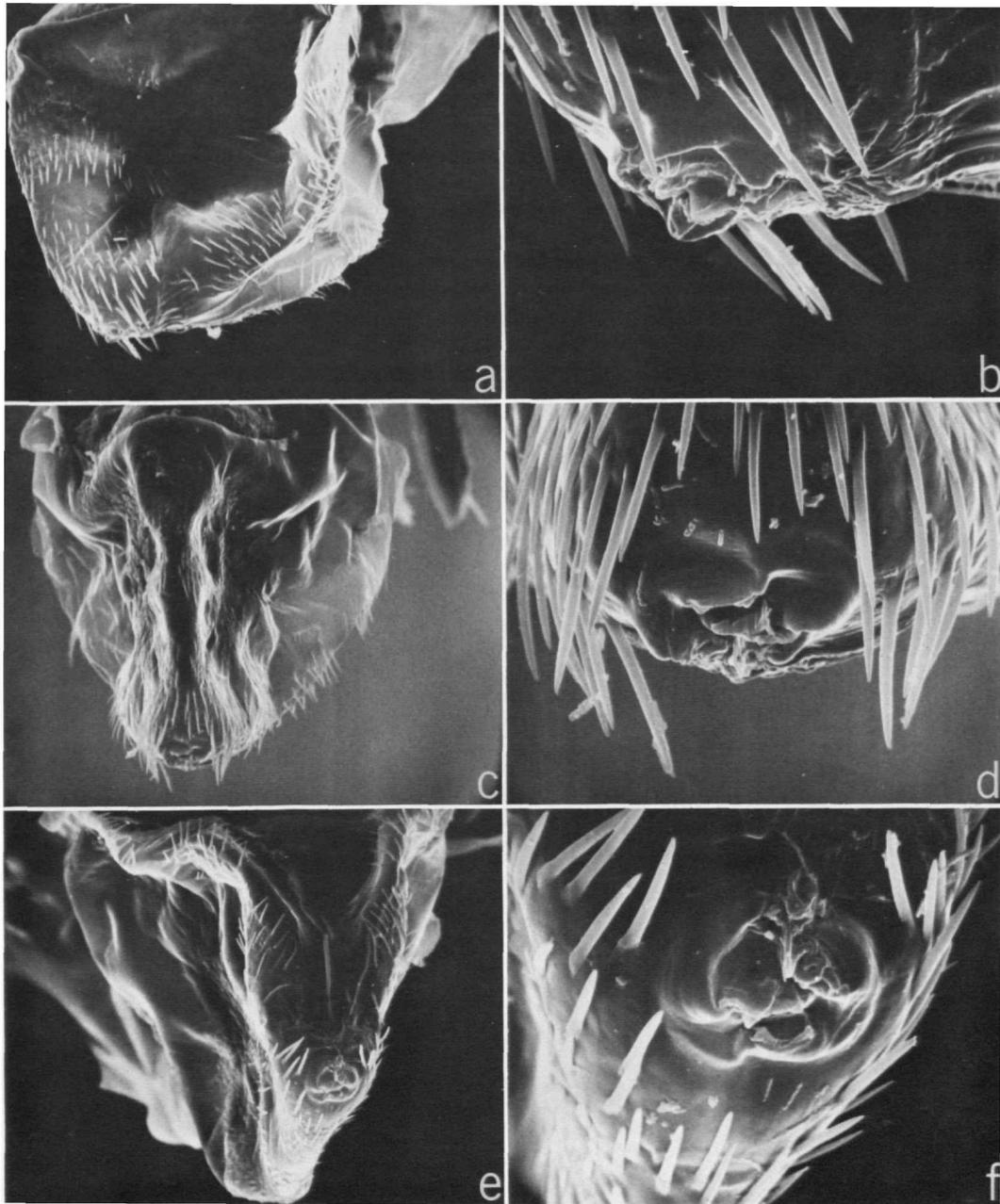


FIGURE 5.—*Metapolycope hartmanni*, USNM 151164, holotype, adult female, upper lip: *a*, lateral view from left, anterior to left, $\times 625$; *b*, anteroventral corner of lip, from *a*, $\times 2700$; *c*, anterior view, $\times 625$; *d*, detail of lower part of *c*, $\times 2900$; *e*, ventral view, anterior of lip toward bottom of picture, $\times 625$; *f*, detail of lower part of *e*, $\times 2900$. (Micrographs reduced to 76% for publication.)

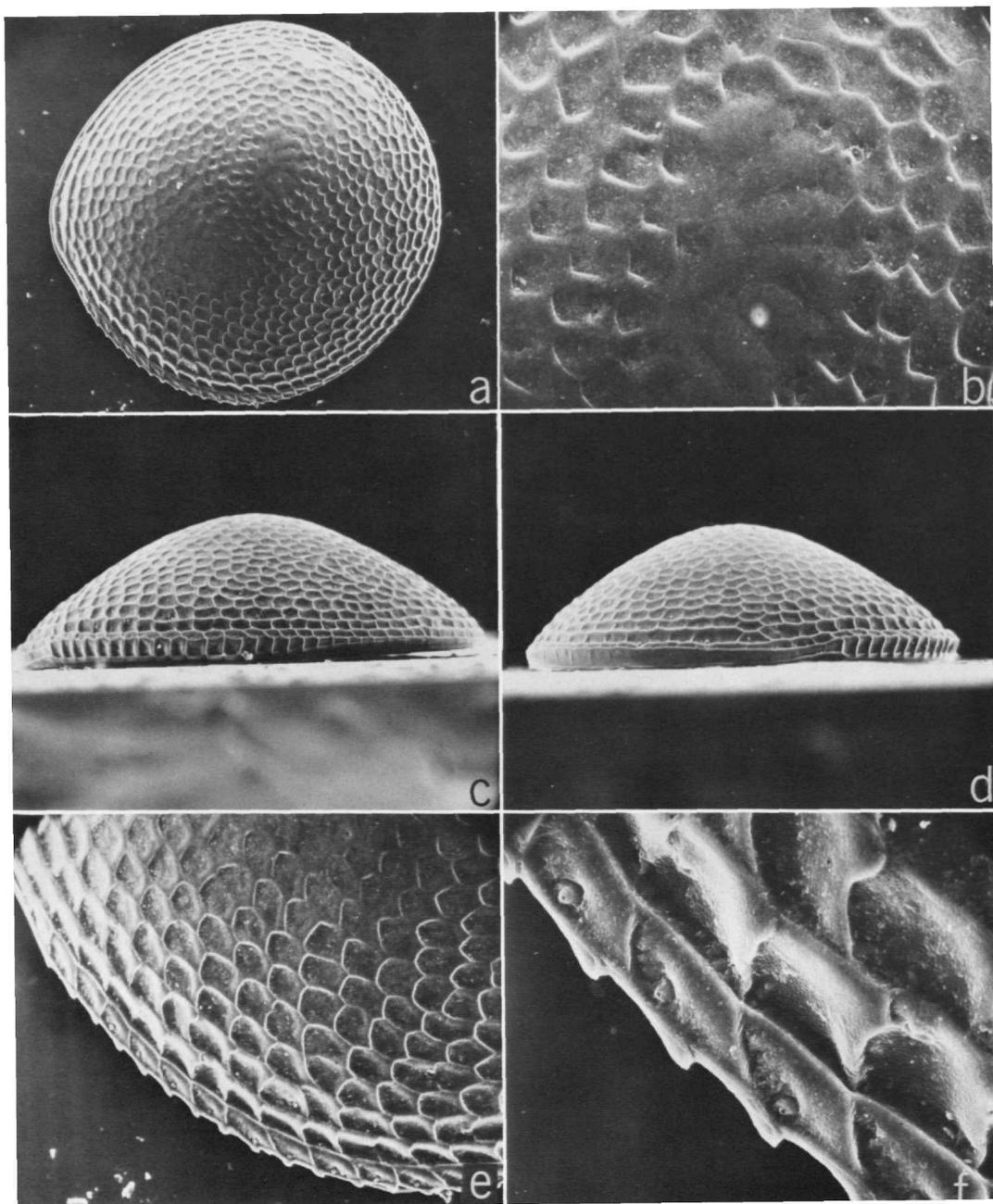


FIGURE 6.—*Metapolycope hartmanni*, USNM 151163, allotype, adult male, length 0.91 mm, outside views of left valve: *a*, complete valve, anterior to left, $\times 86$; *b*, detail of central muscle scar area in *a*, $\times 340$; *c*, ventral view, anterior to left, $\times 100$; *d*, anterior view, venter to right, $\times 100$; *e*, anteroventral margin, from *a*, $\times 200$; *f*, detail from *e*, $\times 750$. (Micrographs reduced to 77% for publication.)

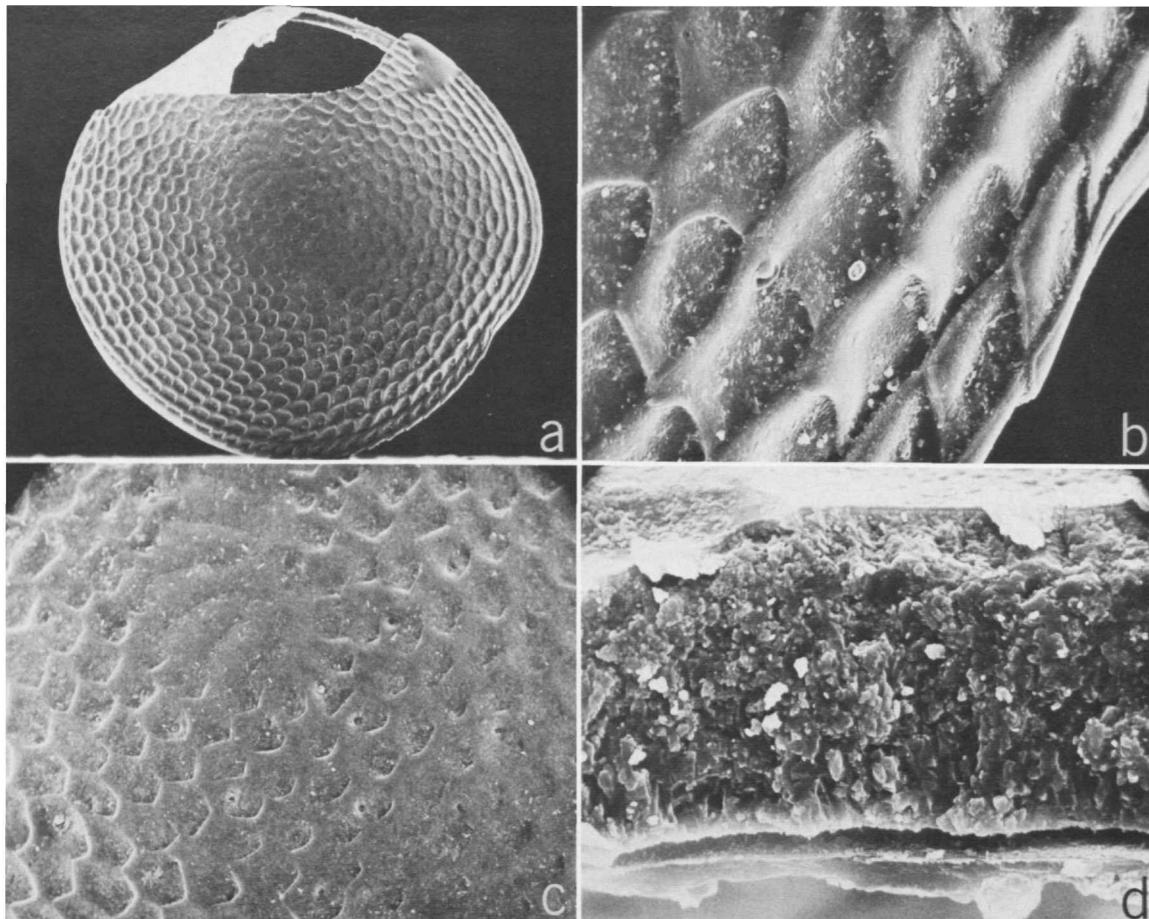


FIGURE 7.—*Metapolycope hartmanni*, USNM 152857, paratype, adult male, length 0.94 mm, outside views of right valve: *a*, complete valve, anterior to right, $\times 90$; *b*, anteroventral margin, from *a*, $\times 640$; *c*, central muscle scar area, from *a*, $\times 260$; *d*, cross section of shell, from broken edge in *a*, outside of shell toward top of picture, $\times 2520$. (Micrographs reduced to 81.5% for publication.)

TYPE-LOCALITY.—*Atlantis II*, cruise 31, station 167.

ETYMOLOGY.—The species is named for Dr. Gerd Hartmann, who has done much work on the Cladocopa.

ALLOTYPE.—USNM 151163, adult male.

PARATYPES.—USNM 152857, 1 adult male; USNM 152858, 1 A-1 male; USNM 152859, 1 adult female; USNM 152860, 1 adult male; USNM 152861, 1 adult male; USNM 152862, 7 juveniles; USNM 152864, 1 right valve (φ ?).

LOCALITIES.—USNM 151163, 152859, 152860,

152861; 152864 from type-locality; USNM 152857, 152858, 152862, from *Atlantis II*, cruise 31, station 169A.

DISTRIBUTION.—Western part of South Atlantic at depths of 587–1007 m.

DESCRIPTION OF ADULT FEMALE (Figures 2–5, 20*a*).—Except for slight anterior concavity, carapace round in lateral view (Figures 2*a,f*, 4*a*); each valve more-or-less evenly rounded in anterior view (Figure 2*b*), posterior view (Figure 2*d*), dorsal view (Figure 2*c*), and in ventral view (Figure 2*e*); carapace widest in middle.

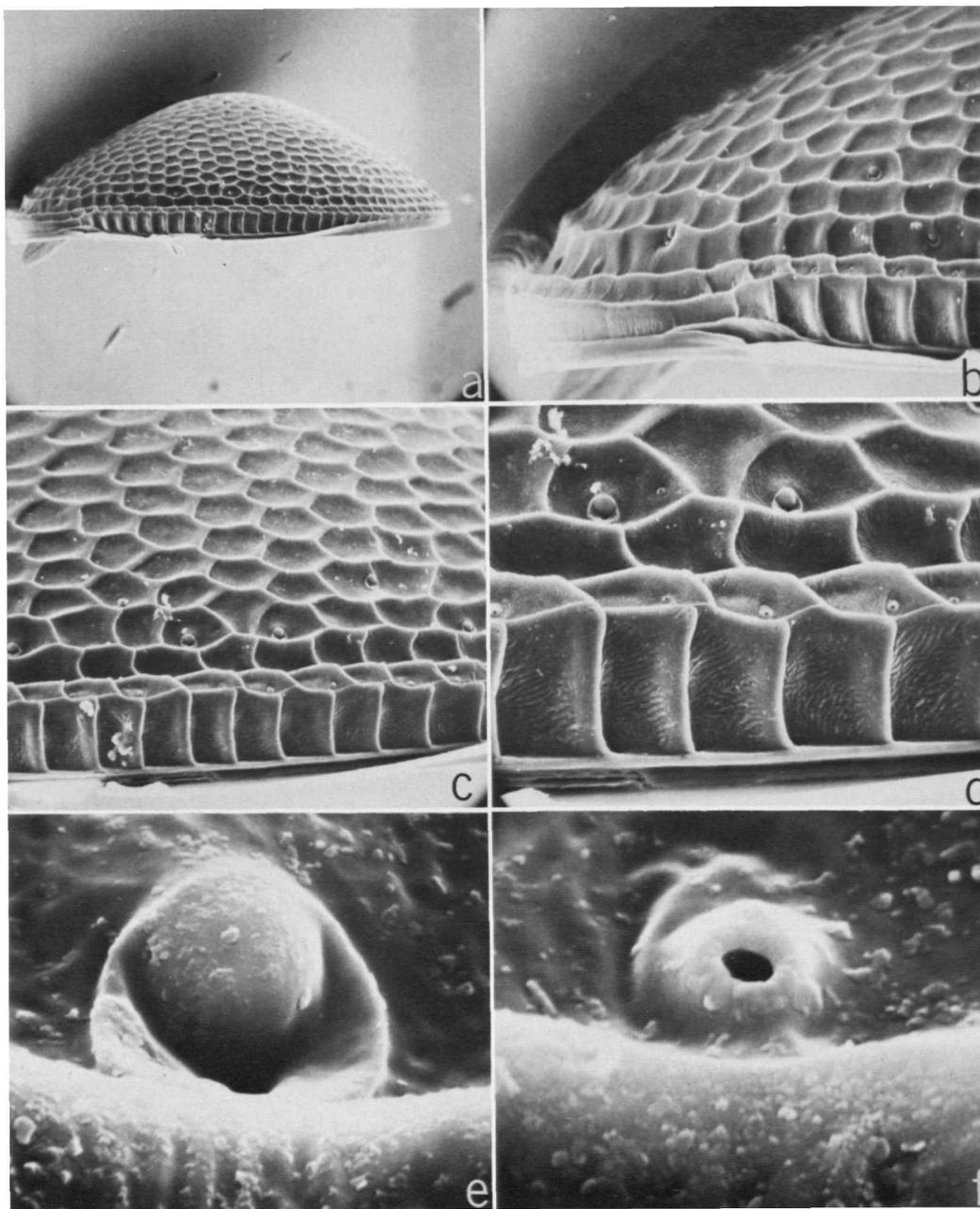


FIGURE 8.—*Metapolycope hartmanni*, USNM 152857, paratype, adult male, length 0.94 mm, ventral views of left valve: *a*, complete valve, anterior to left, $\times 105$; *b*, anterior end, from *a*, $\times 320$; *c*, middle of ventral margin, from *a*, $\times 320$; *d*, detail of *c*, $\times 655$; *e*, detail of noded pore in *d*, $\times 6550$; *f*, detail of pore without node in *d*, $\times 9100$. (Micrographs reduced to 76.5% for publication.)

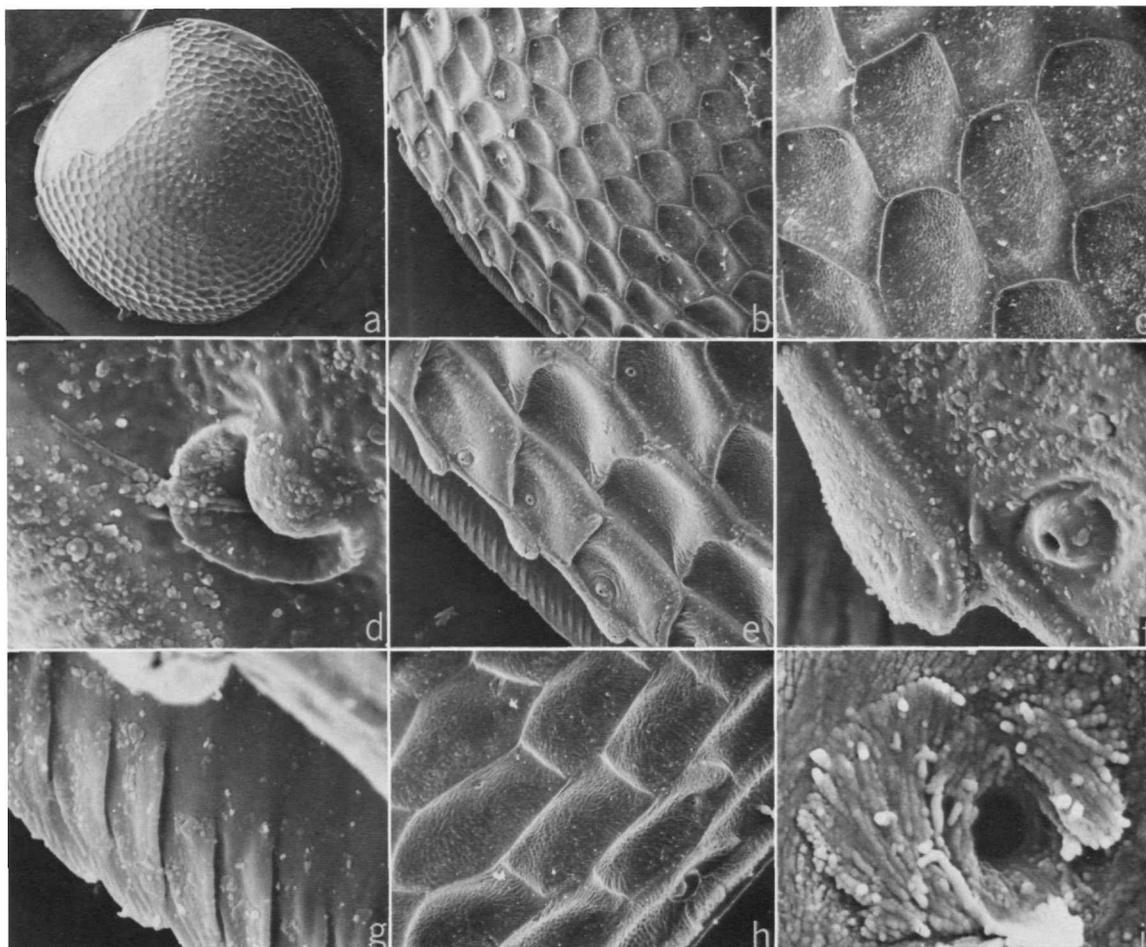


FIGURE 9.—*Metapolycope hartmanni*, USNM 152857, paratype, adult male, length 0.94 mm, lateral views of left valve: *a*, complete valve, anterior to left, $\times 85$; *b*, anteroventral margin, from *a*, $\times 350$; *c*, detail of reticulations in *b*, $\times 940$; *d*, noded pore near valve margin, from *b*, $\times 5200$; *e*, detail of anteroventral margin, from *a* (lower part of *b*), $\times 940$; *f*, pore near valve edge, from *e*, $\times 9375$; *g*, lamellar prolongation of selvage, from *e*, $\times 5250$; *h*, posteroventral margin, from *a*, $\times 940$; *i*, under side of piece of shell that peeled off dorsal part of valve shown in *a*, $\times 10,500$. (Micrographs reduced to 55% for publication.)

Ornamentation: Carapace reticulate except in middle part of valve, in area of central adductor muscle scars (Figure 2*a*); 3 or 4 continuous more-or-less straight ridges present just within valve edge on anterodorsal margin; in vicinity of anterior concavity the ridges become discontinuous forming short segments (Figures 2*a,b,e,f*, 3*b,j*); lower end of each segment with oblique or vertical ridge forming reticulations along anteroventral

margin and giving valve serrate appearance in lateral view (Figures 2*a*, 3*b*); reticulations absent along concavity in anterior margin, and the anterodorsal and posterior margins (Figures 2*b-d*, *f*, 3*e*).

Pores: 2 types of pores present: small open pores without bristles (Figure 3*c-e,g,i*), and noded open pores containing 1 or 2 bristles (Figure 3*a*, *e-i*).

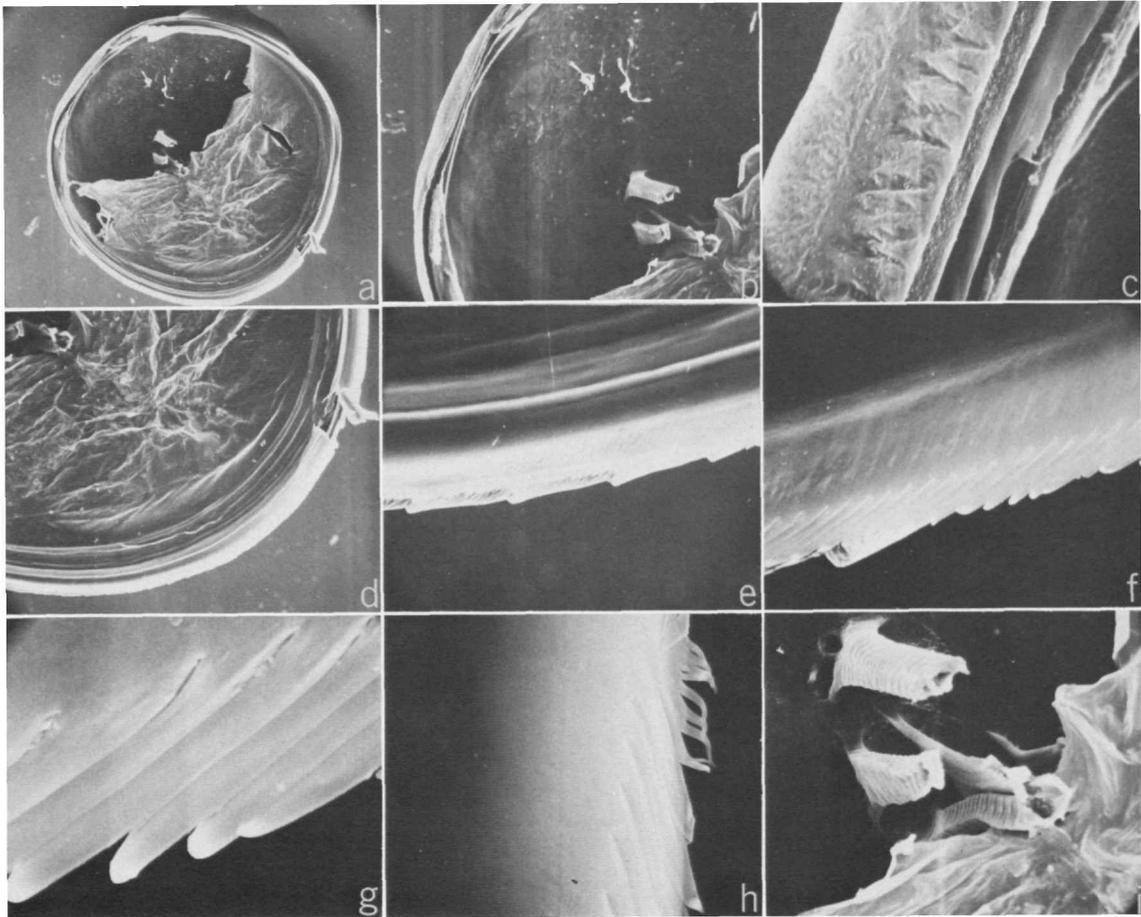


FIGURE 10.—*Metapolycope hartmanni*, USNM 152857, paratype, adult male, length 0.94 mm, inside views of left valve: *a*, complete valve, anterior to right, $\times 87$; *b*, posterodorsal margin showing straight hinge line, $\times 185$; *c*, detail of hinge area shown in *b* (triangular markings could be an artifact resulting from freeze-drying operation), $\times 1850$; *d*, anteroventral margin, $\times 175$; *e*, detail from bottom of *d* showing lamellar prolongation of selvage, $\times 825$; *f*, detail from *e*, $\times 2540$; *g*, edge of lamellar prolongation of selvage, from *f*, $\times 10,000$; *h*, lamellar prolongation of selvage on anterior margin just below middle, from *a*, $\times 5500$; *i*, attached ends of some central adductor muscles, from *a*, $\times 460$. (Micrographs reduced to 54.5% for publication.)

Selvage: Outer edge of lamellar prolongation of selvage along ventral margin of valve fringed (Figure 3*k*, *l*).

Central adductor muscle scar (Figure 4*a*): Consisting of central ovoid scar and 7 additional scars forming half of a rosette with convex part of rosette oriented posteriad; an 8th slender crescentic

muscle scar, less visible than others, present anterior to lowermost scar.

Infold: Wide infold present except along hinge area.

Hinge: Short, straight; position of soft parts suggests that hinge has posterodorsal position when living animal swims.



FIGURE 11.—*Metapolycope hartmanni*, USNM 151163, allotype, adult male, length 0.91 mm: a, outline of left valve from outside showing central adductor muscle scars, anterior to left; b, left 1st antenna, lateral view; c, protopodite and exopodite of 2nd antenna; d, endopodite of 2nd antenna; e, mandible; f, maxilla; g, 5th limb; h, furca, only right lamella shown; i, furca (only left lamella shown) and copulatory apparatus; j, tip of copulatory organ shown in i. USNM 152857, paratype, adult male: k, furca (only right lamella shown) and posterior showing segmentation; l, spinous bristles of head region, anterior to right.

Size: USNM 151164, length 1.00 mm, height 0.96 mm; USNM 152859, length 1.07 mm, height 1.00 mm.

First antenna (Figure 4a,b): Limb with 5 distinct joints; 1st joint short spinous, with long dorsal bristle with long proximal and short distal spines; 2nd joint long, spinous, with distal spinous ventral bristle, and 2 dorsal processes, each with spinous bristle; 3rd joint very short, bare; 4th joint elongate with 3 short distal bristles, 2 ventral, 1 dorsal; 5th joint short with 5 long bristles having rings and long spines proximally.

Second antenna: Protopodite triangular (Figure 4c) with cluster of long hairs distal to middle of dorsal margin and extending onto medial and lateral sides; medial surface of protopodite with closely spaced spines forming 2 rows proximal to endopodite. Exopodite 9-jointed; 1st joint with spines along ventral margin; joints 1-8 with long bristles having rings on proximal part; ringed section with proximal spines and distal natatory hairs; 9th joint with 3 bristles: 1 long similar to bristles on other joints, 1 medium with proximal spines but no natatory hairs, and 1 short with short marginal spines; joints 2-8 with short spines forming row along distal margin. Endopodite 3-jointed (Figure 4d): 1st joint long with 1 spinous terminal bristle on ventral margin; 2nd joint with 1 ventral bristle with long proximal and short distal spines, and 5 long terminal bristles with proximal rings and spines; 3rd joint with 4 long bristles with proximal widely spaced spines; bristles of endopodite without closely spaced long natatory hairs present on exopodite; suture between 2nd and 3rd joints not well defined.

Mandible (Figure 4e): Coxale endite with large weak inner tooth with fringed margins and large strong outer tooth with smooth margins; 2 short teeth and 1 short spine present between inner and outer teeth; distal half of posterior margin of endite knurled. Basale with 4 spinous ventral bristles and 1 short, spinous, distal, dorsal bristle. Exopodite with 2 spinous bristles. Endopodite 2-jointed: medial surface of 1st joint hirsute; ventral margin with 3 spinous bristles, 2 proximal, 1 distal; dorsal margin with 3 spinous bristles, 1 proximal, 2 distal; end joint with 2 bristles with long proximal and short distal spines; dorsal bristle of end joint clawlike.

Maxilla (Figure 4f): Suture separating precox-

ale and coxale not well defined; both joints with total of 10 or more bristles. Basale: ventral margin with 3 spinous bristles; dorsal margin with large proximal hump to which is attached internally a muscle extending into exopodite. Exopodite 1-jointed with 9 bristles, most with spines near middle. Endopodite 3-jointed: 1st joint with 2 long spinous bristles; 2nd joint with 4 terminal ventral bristles and 1 dorsal bristle (dorsal bristle missing on both limbs of USNM 151164 but represented by hole); end joint with 4 bristles.

Fifth limb (Figure 4g): Epipodial appendage with 16 hirsute bristles; coxale hirsute, with 10 bristles; basale with 9 bristles (3 medial bristles not shown in Figure 4g); exopodite without hairs, with 4 terminal bristles; endopodite larger than exopodite, hirsute, with 6 terminal bristles. (Interpretation of which distal lobe is the exopodite and which the endopodite is based on the description of *Polycope setifera* Skogsberg, 1920, in which he stated (p. 769) that the exopodite of the fifth limb is bare and the endopodite hirsute; additional study is necessary to verify this interpretation.)

Furca (Figure 4j): Each lamella with 7 slightly curved claws; claws decreasing in length proximally along lamella; each claw with minute spines on lateral surface proximal to long spines along posterior margin, and few short hairs along anterior margin; posterior spines longer on shorter claws and decrease in length distally along claw; except between claws 6 and 7, a triangular process present anterior to claw 1, between all claws, and following claw 7; processes bear short terminal spines; lateral side of each lamella with short spines forming 4 rows near anterior margin; each row of spines parallel to ventral margin of lamella; unpaired bristle with short spines along anterior margin present posterior to claw 7 and about same length as claw.

Upper lip: Helmet shaped, spinous, with indication of glandular openings in anteroventral corner (Figures 4i, 5).

Head region: 2 spinous bristles present in head region posterior to attachment of 1st antennae (Figure 4c,i,h); long hairs forming cluster present posterior to bristles.

Posterior of body (Figure 4j): With 7-8 (only 5 distinct) transverse segments with short spines forming row near distal margin of each segment; 5th segment from furca with cluster of very long

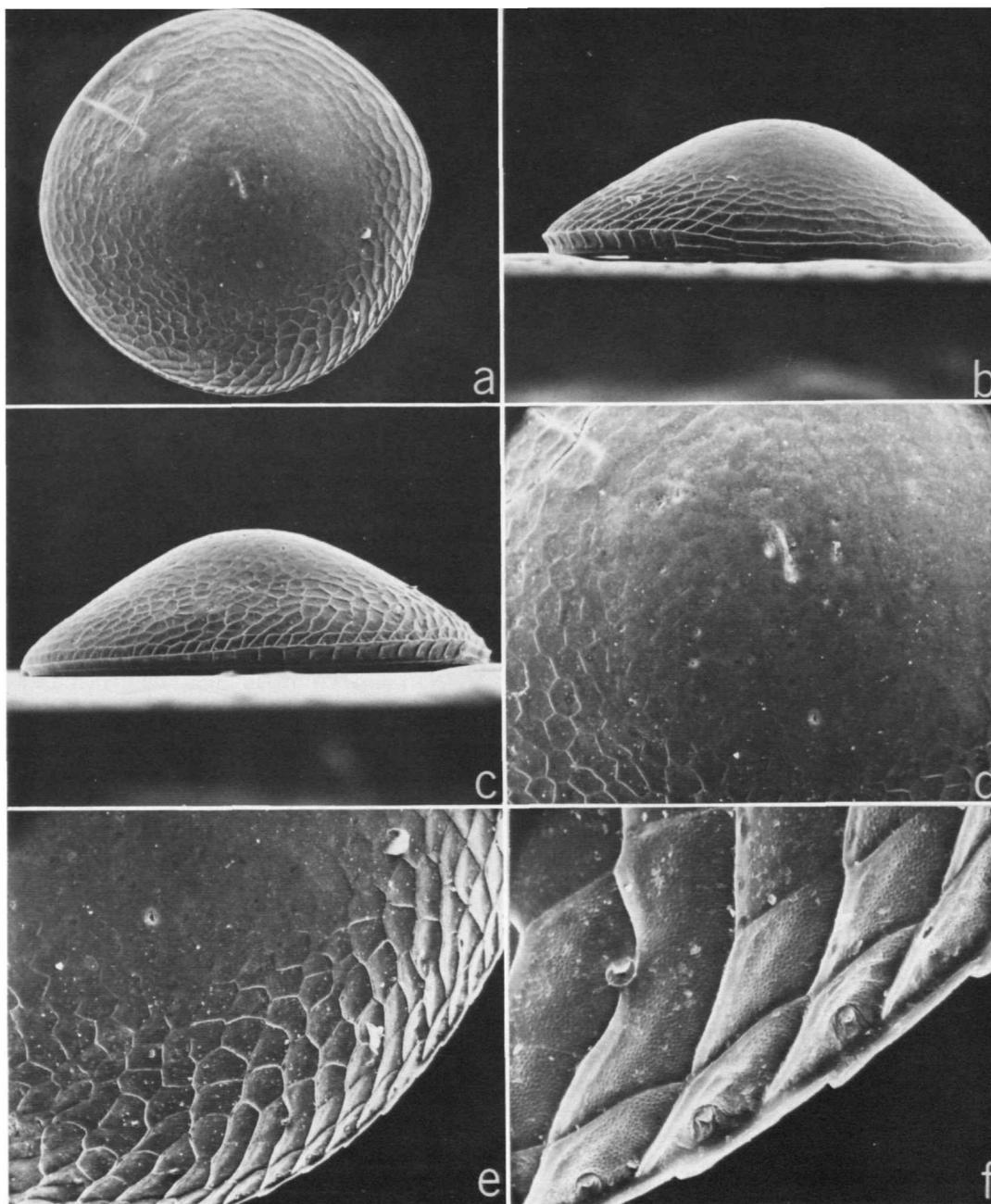


FIGURE 12.—*Metapolycope hartmanni*, USNM 152858, paratype, A-1 male, length 0.93 mm, outside views of right valve: *a*, complete valve, anterior to right, $\times 86$; *b*, anterior view, venter to left, $\times 105$; *c*, ventral view, anterior to right, $\times 105$; *d*, adductor muscle scar area, from middle of *a*, $\times 200$; *e*, anteroventral margin, from *a*, $\times 200$; *f*, detail of *e* showing pores, $\times 750$. (Micrographs reduced to 77% for publication.)

hairs or spines on posterior corner. (Posterior segments appear to be surface features similar to those on thaumatocyprids, and are not true segments such as those on platycopids.)

DESCRIPTION OF ADULT MALE (Figures 6–11, 14*b*, 20*b*).—Reticulations of carapace more evident than on female, especially in vicinity of central adductor muscle scar, which appears slightly raised in SEM photographs (Figure 6*b*); carapace otherwise similar to that of female (Figures 6–10, 11*a*).

Size: Slightly smaller than female; USNM 151163, length 0.91 mm, height 0.92 mm; USNM 152860, length 0.92 mm, height 0.87 mm; USNM 152861, length 0.97 mm, height 0.95 mm; USNM 152857, length 0.94 mm, height 0.89 mm.

First antenna (Figure 11*b*): Lateral side of 1st joint with elongate sensory process; proximal edge of tip of process folded over proximal part giving appearance that sensory process is 2-jointed; except for sensory process, 1st joint, and also 2nd and 3rd joints, similar to those of female; 4th joint with 1 spinous dorsal bristle and 4 ventral bristles, 2 with marginal spines and 2 with 7–8 minute discs; end joint with 4 long bristles with rings and widely spaced spines proximally. (The end joint could be interpreted as consisting of 2 minute joints, each with 2 bristles.)

Second antenna: Protopodite and exopodite similar to those of female (Figure 11*b*). Endopodite 3-jointed (Figure 11*d*): 1st joint with short spines along ventral margin and 2 distal bristles (inner of these with bulbous base); 2nd joint with 1 long and 2 short bristles near ventral margin and 6 dorsal and terminal bristles with widely spaced spines proximally; 3rd joint with sclerotized hook-shaped clasping organ and about 4 bristles with widely spaced spines proximally.

Mandible: Similar to that of female (Figure 11*e*).

Maxilla (Figure 11*f*): Precoxale and coxale with total of 16–17 bristles. Basale, exopodite, and endopodite similar to those on female maxilla.

Fifth limb (Figure 11*g*): Epipodial appendage with about 15 hirsute bristles; coxale hirsute with 11 bristles; basale with 9 bristles (3 medial bristles not shown in Figure 11*g*); exopodite and endopodite similar to those on female 5th limb.

Furca (Figure 11*h,i,k*), **upper lip**, **head region** (Figure 11*l*), **posterior of body** (Figure 11*k*): Similar to those of female.

Copulatory organ: Consisting of inner setigerous, elongate, pointed, bristlelike process and outer elongate, curved process with sclerotized pointed process at tip (Figure 11*i,j*).

DESCRIPTION OF A-1 MALE (Figures 12, 13, 14*a*).—Carapace similar to that of adult male. **Size:** USNM 152858, length 0.93 mm, height 0.89 mm.

First antenna: Similar to that of adult male except 4th joint with 2 sausage-shaped bristles in place of bristles with discs (Figures 13*a*, 14*a*), and 5th joint with 5 long bristles.

Second antenna: Protopodite (Figure 13*a*) and exopodite similar to those of adult male; endopodite 3-jointed: 1st joint with few hairs along ventral margin and 2 spinous terminal, ventral bristles; 2nd joint with 1 spinous, terminal, ventral bristle and 6 terminal dorsal bristles; 3rd joint with 4 terminal bristles.

Mandible, maxilla, 5th limb, upper lip, head region, posterior of body: Similar to those of adult male and female.

Furca: Similar to that of adult male except with only 6 claws.

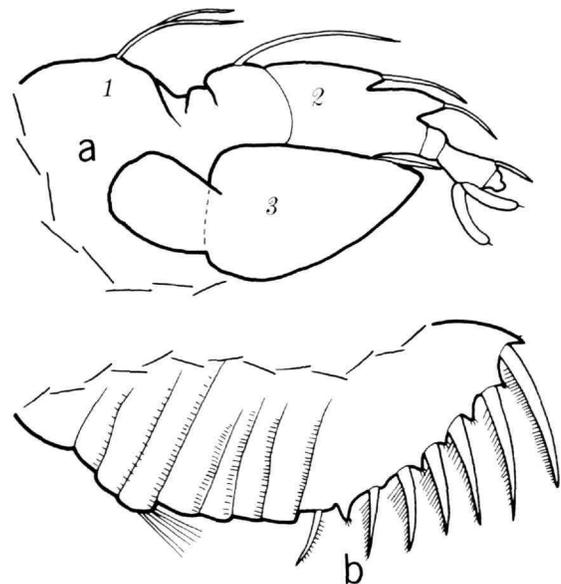


FIGURE 13.—*Metapolycope hartmanni*, USNM 152858, paratype, A-1 male: a, bristles of head region (1), right 1st antenna (2), protopodite of right 2nd antenna (3); b, furca (only right lamella shown) and posterior showing segmentation.

Copulatory organ: None present.

Note concerning sex: USNM 152858 is considered to be an A-1 male because of the 2 sausage-shaped bristles on the 4th joint of the 1st antenna, which are interpreted to be the forerunner of bristles with discs that appear on the adult male. Because USNM 152858 is about the same size as the adult males, and because not even a vestigial copulatory organ was observed on the specimen, the interpretation of the specimen as a male is considered tentative.

DESCRIPTION OF A-2 FEMALE.—Carapace similar to that of adult female except smaller. Size: USNM 152862A, length 0.86 mm, height 0.79 mm; USNM 152862B, length 0.85 mm, height 0.81 mm.

First and 2nd antennae: Similar to those of adult female and with same number of bristles on each joint.

Mandible, maxilla, 5th limb, upper lip, head region, posterior of body: Not examined in detail, but similar to those of adult female.

Furca: Each lamella with only 5 claws, otherwise similar to lamellae of adult female.

DESCRIPTION OF A-2 MALE.—Carapace similar to that of A-1 male except smaller. Size: USNM 152862C, length 0.84 mm, height 0.81 mm; USNM 152862D, length 0.83 mm, height 0.81 mm.

First antenna: 1st, 2nd, 3rd, and 5th joints similar to those of A-1 male; 4th joint with 1 spinous dorsal bristle and 3 short ventral bristles.

Mandible, maxilla, 5th limb, upper lip, head region, posterior of body: Not examined in detail but similar to those of A-1 male.

Furca: Each lamella with only 5 claws, otherwise similar to lamellae of A-1 male.

Copulatory organ: Not observed.

SEXUAL DIMORPHISM.—The carapace of the male is slightly smaller than that of the female, and the ornamentation is more distinct, especially in the central part of each valve, near the central adductor muscle attachments. The 4th joint of the 1st antenna of the male bears more bristles than on the female, as follows:

Developmental stage	Female	Male
A-2	2	3
A-1	no data	4 (2 sausage-shaped)
Adult	2	4 (2 with discs)

The 5th joint of the 1st antenna bears 5 bristles

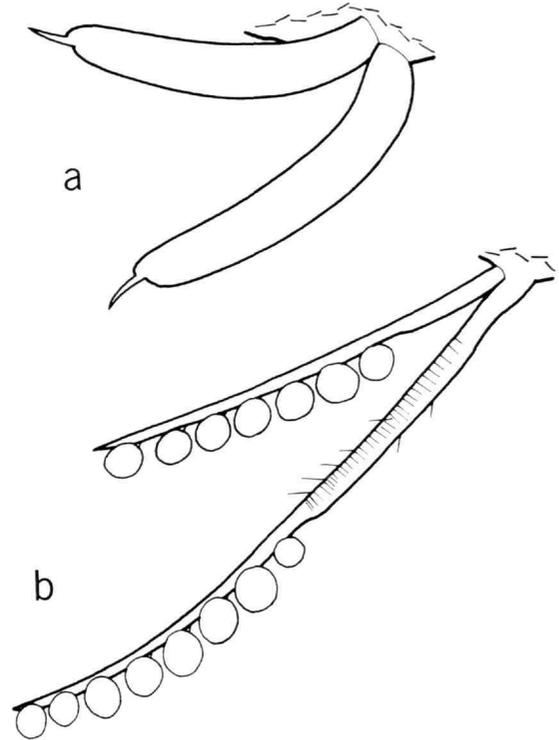


FIGURE 14.—Ontogenetic development of sensory bristles on 4th joint of 1st antennae of males, *Metapolycope hartmanni*: a, USNM 152858, paratype, A-1 male; b, USNM 151163, allotype, adult male.

on the adult female but only 4 on the adult male. The same number of bristles (5) is present on the 5th joint of the A-2 instar of both sexes.

The 1st joint of the endopodite of the 2nd antenna of the adult male bears short spines along the ventral margin; the female has hairs in this location. Also, the female has only 1 bristle on the 1st joint, whereas, the male has 2. The 2nd joint of the adult male bears 3 ventral and 6 terminal bristles, whereas, this joint of the adult female bears only 1 ventral and 5 terminal bristles. The 3rd joint of the adult male bears a sclerotized, hooklike clasper that is absent on the female.

ONTOGENY.—All appendages are present on the A-2 instar, which is the youngest stage in the collection. The mandible, maxilla, and 5th limb, although not examined in detail at each stage, ap-

pear just as well developed in the A-2 instar as in the adult for both sexes. The number of furcal claws increases by one at each stage of development, from 5 on the A-2 instar to 7 on the adult. The female 1st and 2nd antennae are as fully developed in the A-2 instar as in the adult. The 1st antenna of the A-2 male bears 3 short ventral bristles on the 4th joint. The number increases to 4 on the A-1 instar, and 2 of these are sausage shaped. The 2 sausage-shaped bristles develop into bristles with small discs on the adult. The 5th joint of the 1st antenna of the A-2 male instar bears 5 long bristles. The number decreases to 4 on the A-1 male and on the adult male. The male copulatory organ was observed only on the adult.

KEY TO DEVELOPMENTAL STAGES

Each lamella with 5 claws	A-2 instar
Each lamella with 6 claws	A-1 instar
Each lamella with 7 claws	Adult

Metapolycope microthrix, new species

FIGURES 15-19, 20c,d

HOLOTYPE.—USNM 150291, 1 adult female.

TYPE-LOCALITY.—*Atlantis II*, cruise 42, station 193.

ETYMOLOGY.—The specific name from the Greek *mikros* (= small, little) and *thrix* (= hair), in reference to the length of the unpaired bristle posterior to the furca of this species.

PARATYPE.—USNM 152863, 1 adult female, from *Atlantis II*, cruise 42, station 201.

DISTRIBUTION.—Eastern part of the South Atlantic at depths of 1964-2191 m.

DESCRIPTION OF ADULT FEMALE (Figures 15-19, 20c,d).—Carapace round in lateral view; anterior margin straight, not concave as in *M. hartmanni* (Figures 15a, 18a,b); each valve evenly rounded in anterior (Figure 17b), posterior, dorsal, and ventral views (Figure 17c). Left valve with 14-16 minute teeth along ventral margin outside of lamellar prolongation of selvage (Figure 18c,d); teeth absent on right valve; carapace widest in middle.

ORNAMENTATION.—Carapace reticulate except in middle part of valve, in area of central adductor muscle scars (Figure 15a); reticulations more elongate than those on valves of *M. hartmanni*, and

bordered by narrow, raised ridge (Figures 15, 16); serrations along anteroventral margin more subdued than on *M. hartmanni*, and better defined on left valve than on right.

Pores (Figures 16e,f, 17a), selvage, central adductor muscle scar (Figures 18a,b 19a,b), infold, hinge: Similar to those of *M. hartmanni*.

Size: USNM 150291, length 0.86 mm, height 0.83 mm; USNM 152863, length 0.95 mm, height 0.89 mm.

First antenna (Figures 18e,f, 19c,g), 2nd antenna (Figures 18g, 19d), mandible (Figures 18h, 19e), maxilla (Figures 18i, 19f), 5th limb (Figures 18j, 19h), furca (Figure 18k) upper lip (Figure 18m), head region (Figure 18l), posterior (Figure 18k): Similar to those of *M. hartmanni*.

Unpaired bristle posterior to furca: Length of bristle about half length of posterior claw of furca (Figures 18k, 20c,d).

COMPARISONS.—The carapace of *M. microthrix* differs from that of *M. hartmanni* in lacking a concavity on the anterior margin, in reticulations being elongate, in having reticulations bordered by a narrow raised ridge, and in having 14-16 minute teeth along the ventral margin of the left valve. The unpaired bristle posterior to the furca of *M. hartmanni* is about the same length as the posterior furcal claw, whereas, on *M. microthrix*, it is about one-half the length of the posterior furcal claw (Figure 20).

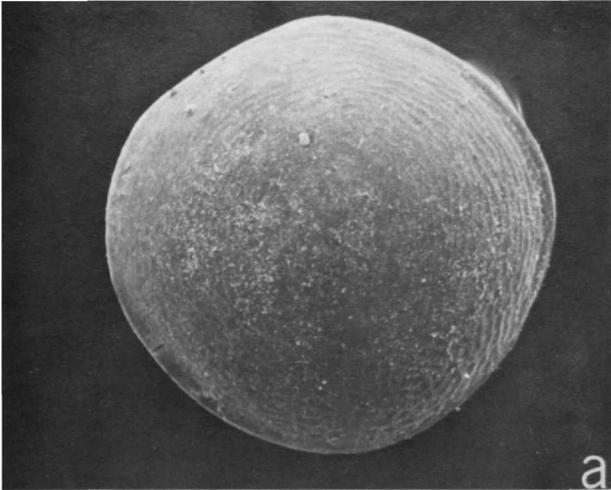
Metapolycope species

FIGURES 21-24

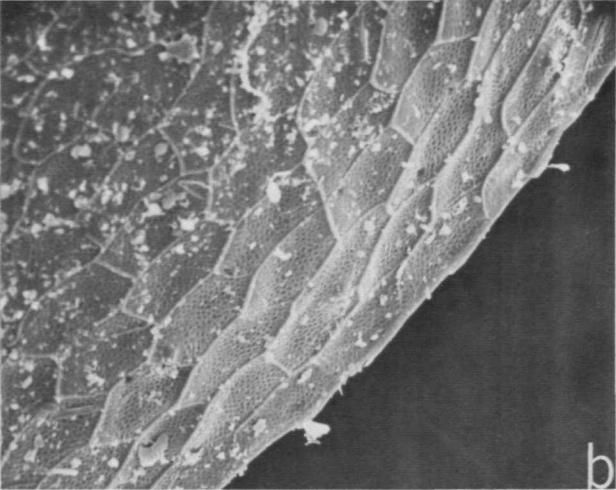
MATERIAL.—A single left valve from a small bag of washed residue collected by the Danish *Ingolf* expedition, station 90. Unfortunately, the specimen was lost after completion of this paper.

Associated organisms: The sample of washed residue from which the single left valve of *Metapolycope* species was obtained consisted of about 95% Recent pelagic foraminifers plus some podo-

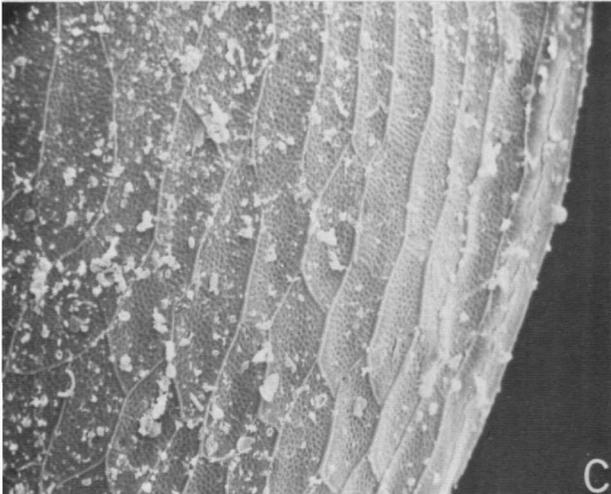
FIGURE 15.—*Metapolycope microthrix*, USNM 150291, holotype, adult female, length 0.86 mm, lateral views of right valve: a, complete valve, anterior to right, $\times 85$; b, anteroventral margin, from a, $\times 500$; c, anterior margin, from a, $\times 500$; d, anterodorsal margin, from a, $\times 350$; e, ventral margin, from a, $\times 500$; f, posterior margin, from a $\times 500$. (Micrographs reduced to 88% for publication.)



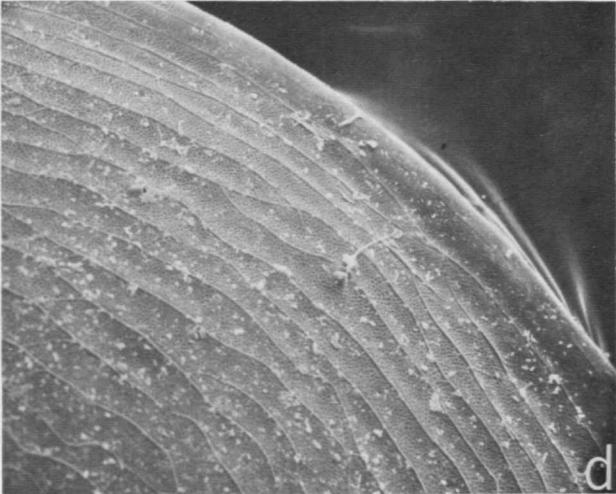
a



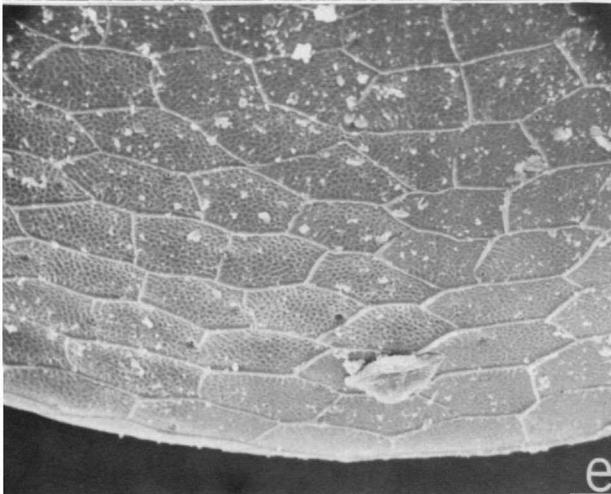
b



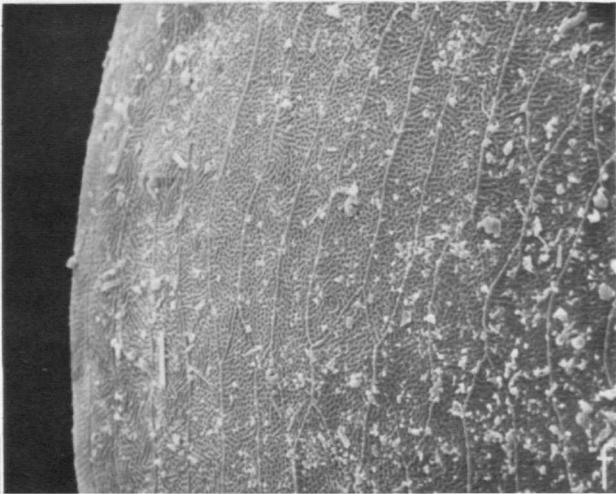
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d



e



f

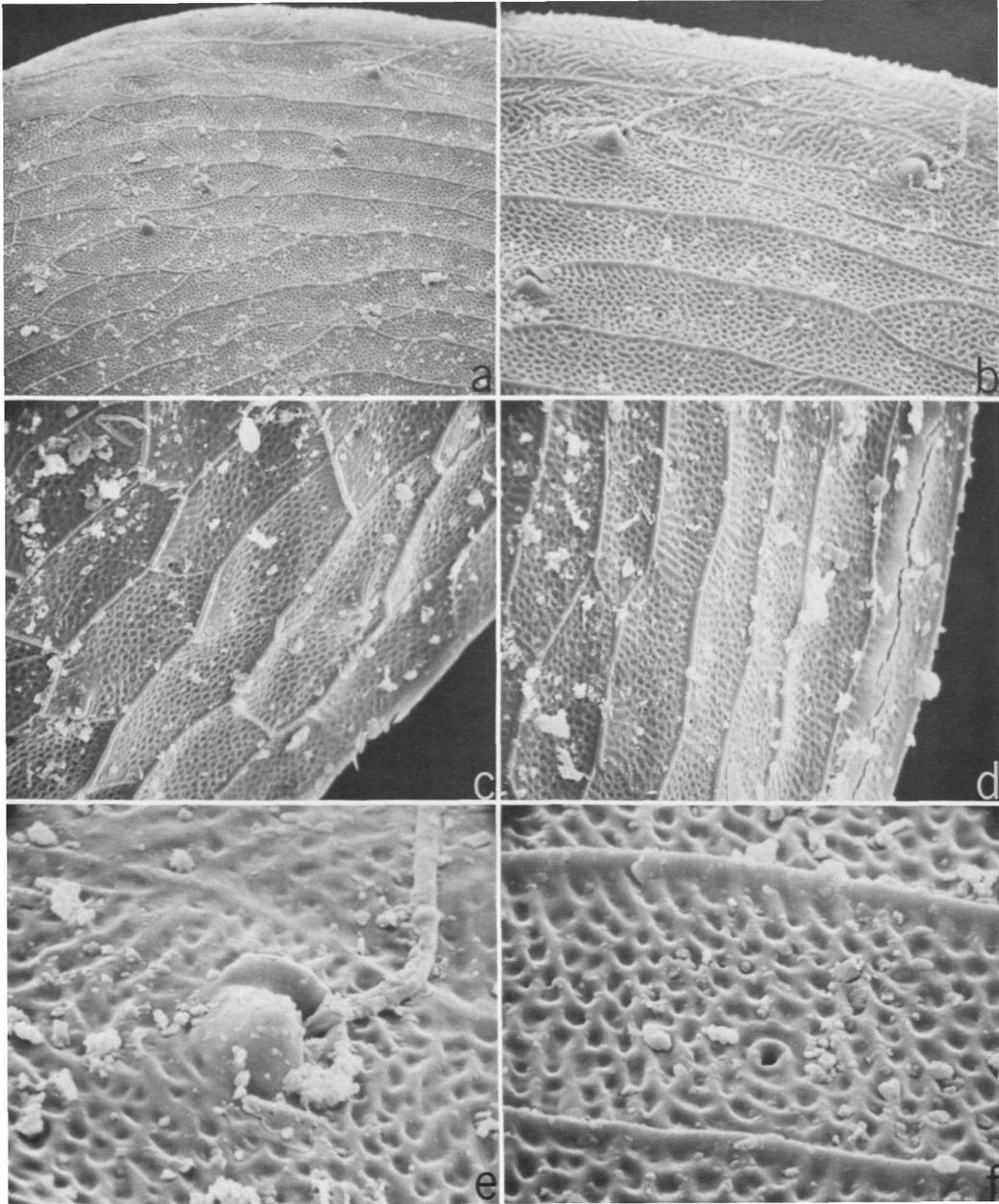


FIGURE 16.—*Metapolycope microthrix*, USNM 150291, holotype, adult female, length 0.86 mm, lateral views of right valve: *a*, dorsal margin from Figure 15*a*, $\times 500$; *b*, detail from right of *a* showing pores and ridges, $\times 1000$; *c*, detail of anteroventral margin from Figure 15*b*, $\times 1000$; *d*, detail of anterior margin from Figure 15*c*, $\times 1000$; *e*, noded pore with double bristle, from *b*, $\times 4000$; *f*, detail of open pore and valve surface near middle of *b*, $\times 4000$. (Micrographs reduced to 75% for publication.)

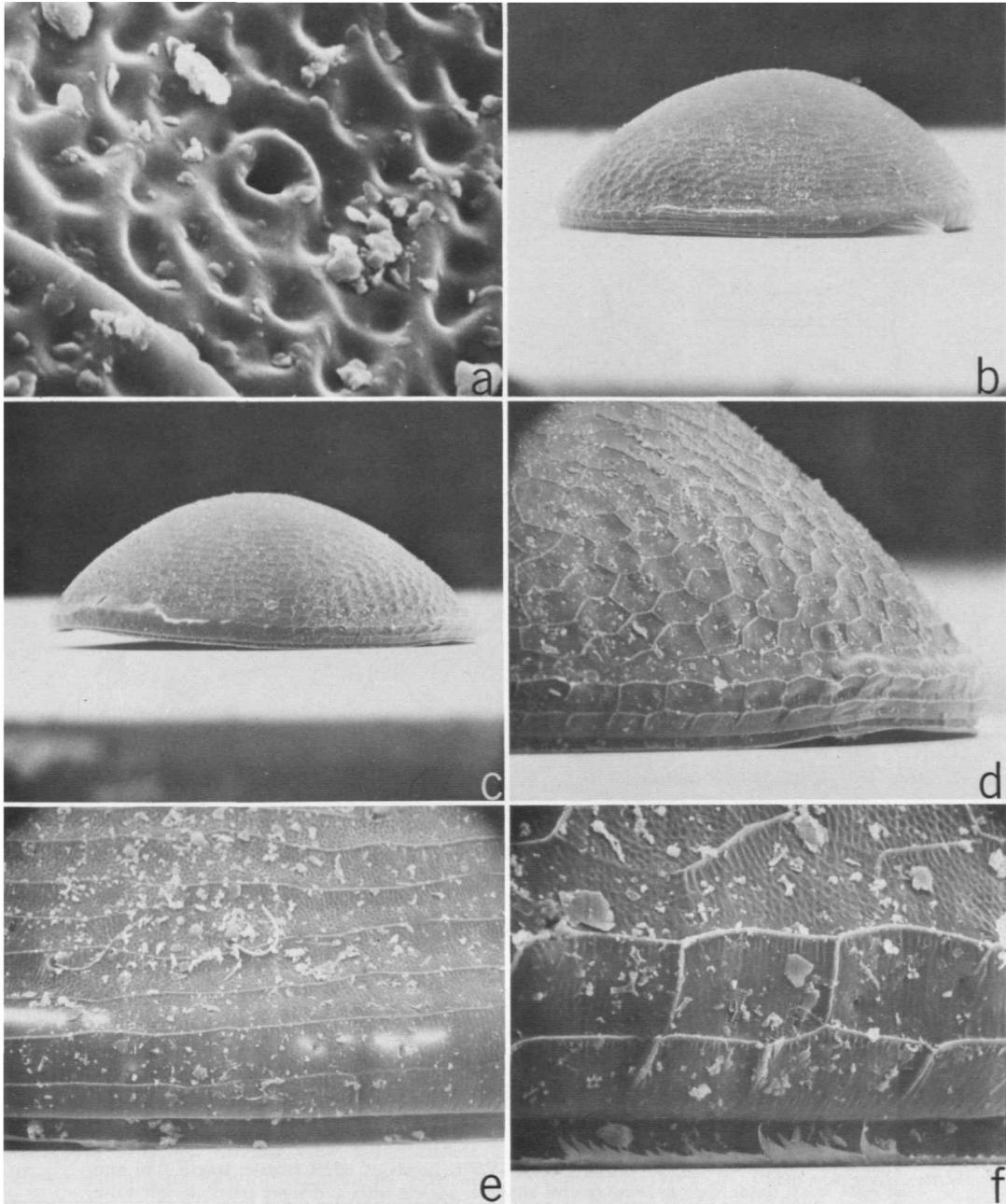


FIGURE 17.—*Metapolycope microthrix*, USNM 150291, holotype, length 0.86 mm, outside view of right valve: *a*, open pore from Figure 16*f*, $\times 8700$; *b*, anterior view, venter to left, $\times 100$; *c*, ventral view, anterior to right, $\times 100$; *d*, anteroventral margin, from *c*, $\times 210$; *e*, detail of anterior margin, from middle of *b*, $\times 500$; *f*, detail of anteroventral margin, from *d*, $\times 1000$. (Micrographs reduced to 76% for publication.)

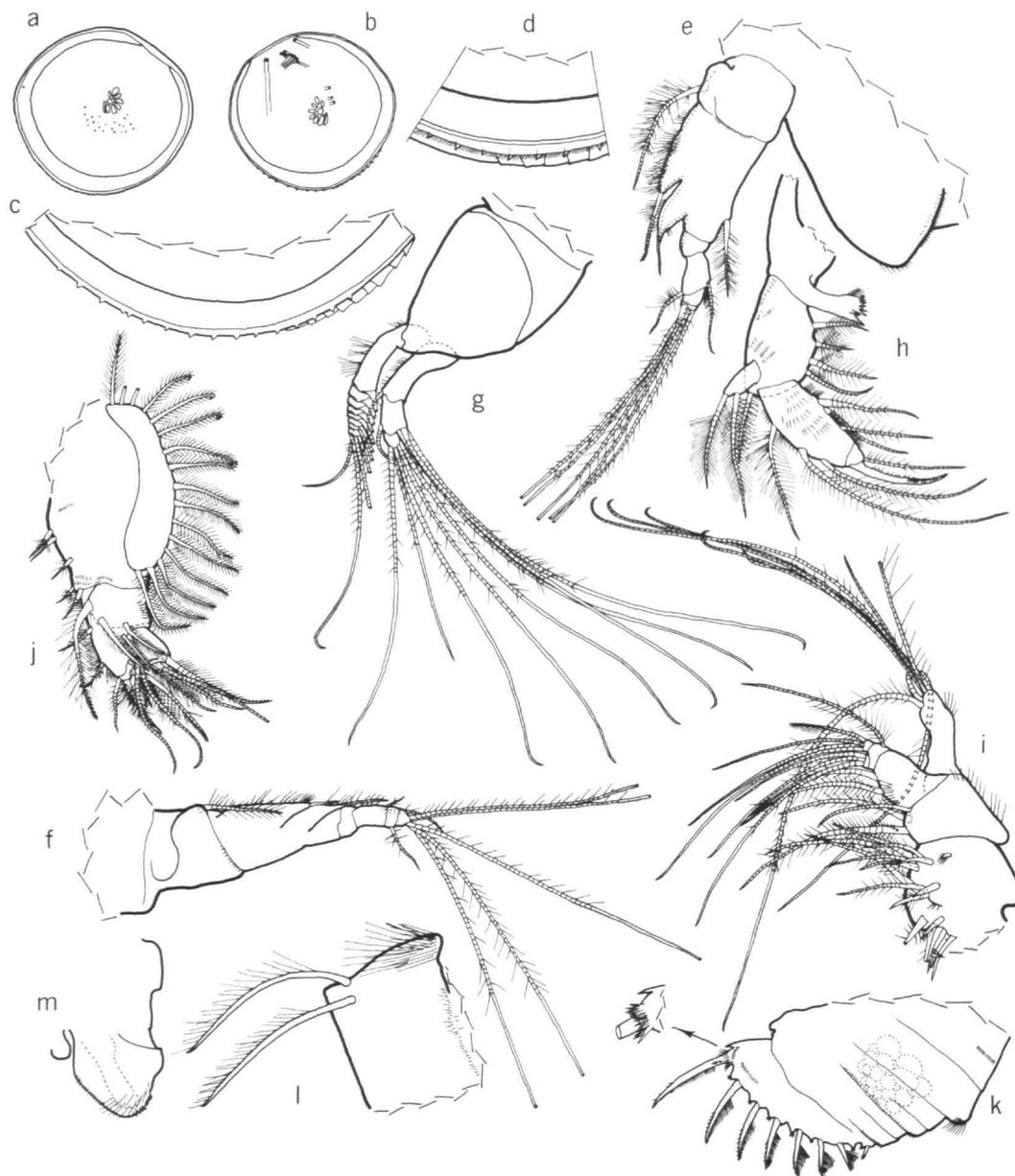


FIGURE 18.—*Metapolycope microthrix*, USNM 150291, holotype, adult female, length 0.86 mm: a, right valve, inside view showing central adductor muscle scars and some pores; b, left valve, inside view showing central adductor muscle scars and dorsal muscle scars with fragments of attached muscle; c, ventral margin of left valve, inside view; d, segment of ventral margin of left valve, inside view; e, 1st antenna and anterior of body showing upper lip; f, other 1st antenna; g, 2nd antenna; h, mandible; i, maxilla; j, 5th limb; k, furca (only left lamella shown), posterior of body showing segmentation, and small eggs within posterior part of body; l, spinous bristles of head region, anterior to left; m, upper lip, anterior to right.

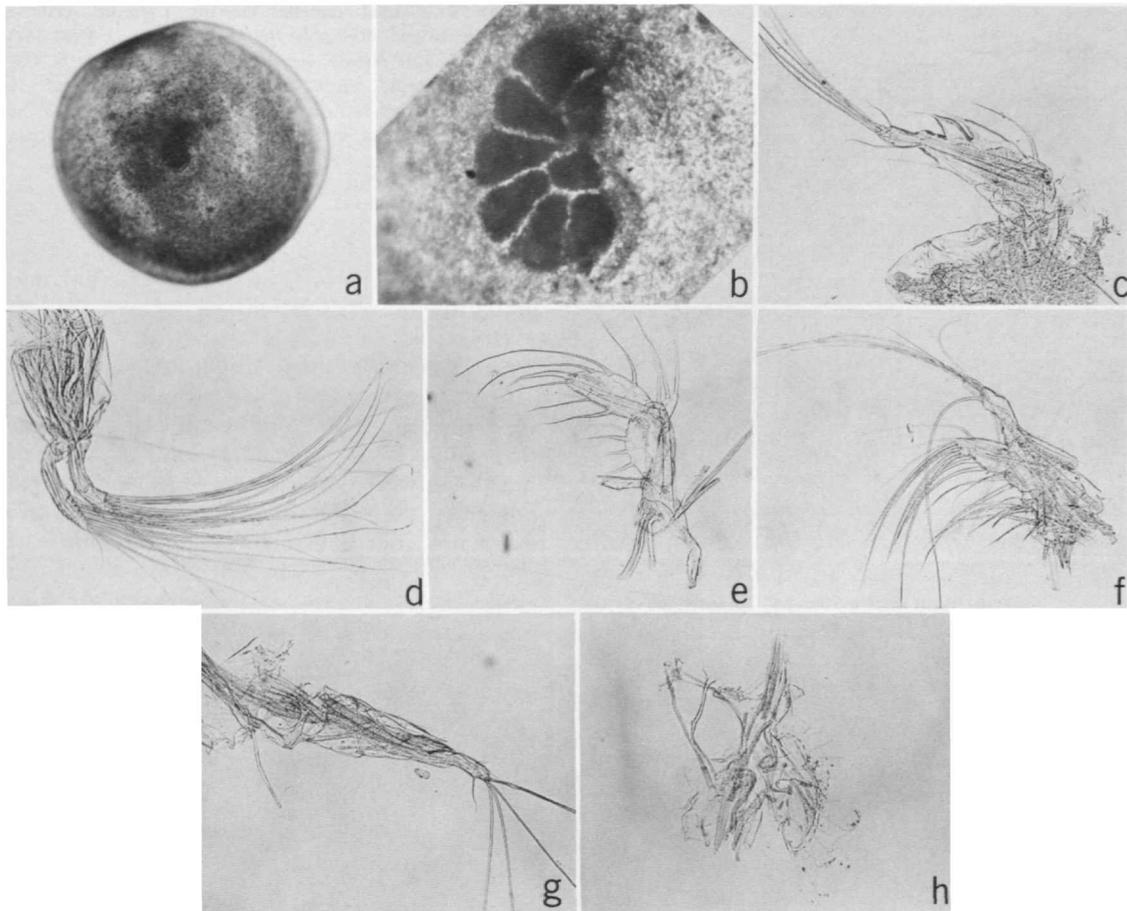


FIGURE 19.—*Metapolycope microthrix*, USNM 150291, holotype, length 0.86 mm, photographs with transmitted light of right valve and appendages: a, complete valve; b, central adductor muscle attachment scars, from a; c, 1st antenna; d, 2nd antenna; e, mandible, f, maxilla; g, 1st antenna; h, epipodial appendage of 5th limb.

copid ostracod valves without soft-parts of genera including *Krithe*, *Bairdia*, *Argilloecia*, *Echinocythereis*, and *Henryhowella*.

DISTRIBUTION.—West of Iceland at depth of 1068 m.

DESCRIPTION OF LEFT VALVE.—Round in lateral view (Figures 21a, 22a); in end view valve widest just above midheight (Figure 22d, e), in ventral and dorsal views valve widest near midlength (Figure 22b, c); anterior edge of specimen broken (Figure 22e) so that presence or absence of anterior concavity not known.

Ornamentation: Reticulate with walls of reticu-

lations having less relief near valve middle; 2 or 3 ribs without cross-ridges that form reticulations present just within anterodorsal and dorsal margins (Figure 22a, c, e, f); cross-ridges between outer 2 ribs along anteroventral margin slightly oblique giving valve slightly serrate appearance in lateral view (Figures 22a, 23a, b, f).

Pores: 2 types of pores present: small open pores (Figure 23d) and noded open pores (Figures 23d, 24d).

Central adductor muscle scar (Figures 21, 22a): Consisting of central ovoid scar and 7 additional scars forming half of a rosette with convex part of

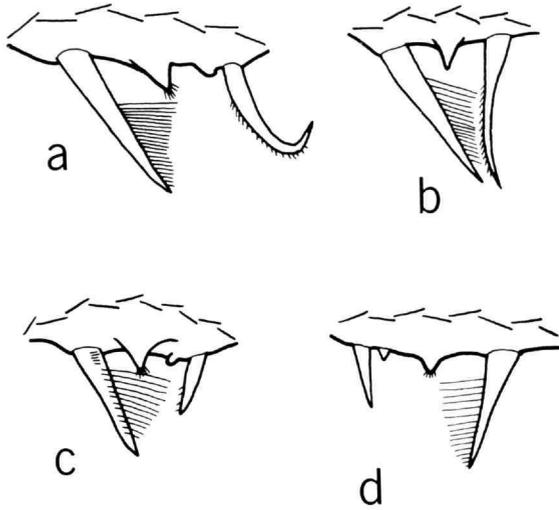


FIGURE 20.—Caudal lamella showing posterior claw and unpaired bristle, *Metapolycope hartmanni*: a, USNM 151164, holotype, adult female, left lamella, lateral view; b, USNM 151163, allotype, adult male, left lamella, lateral view. *Metapolycope microthrix*: c, USNM 150291, holotype, adult female, left lamella, lateral view; d, USNM 152863, paratype, adult female, right lamella, lateral view.

graphs (Figure 21a-c), but visible in SEM micrograph (Figure 21d).

Hinge: Edge broken in hinge area.

Size: Length 0.57 mm, height 0.54 mm.

COMPARISONS.—The single left valve of *Metapolycope* species in the present collection is smaller than adults of *M. microthrix* and *M. hartmanni*, but the valve could be from a juvenile. The reticulations on the valve are of the type present on *M. hartmanni*, not like those on *M. microthrix*; the reticulations on *M. hartmanni* form about 35 more-or-less concentric rows compared to only about 24 on the left valve of *Metapolycope* species.

rosette oriented posteriad; an 8th slender crescentic muscle scar present anterior to lowermost scar; 8th scar not visible in transmitted light photo-

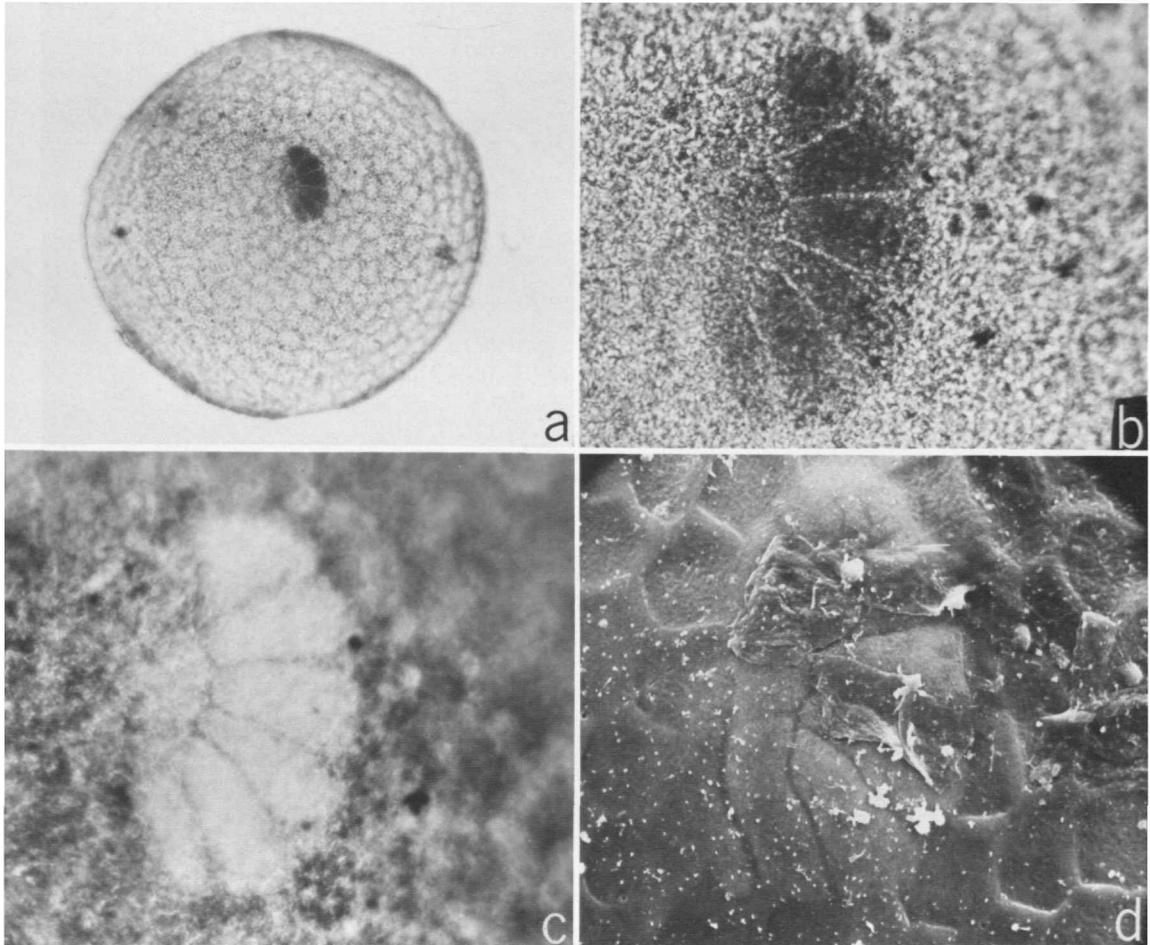


FIGURE 21.—*Metapolycope* species, left valve, length 0.57 mm, outside views: *a*, complete valve, anterior to left, transmitted light photograph; *b*, detail of central adductor muscle scar pattern shown in *a*; *c*, same as *b* but photographed with dark field condenser; *d*, scanning-electron microscope picture of muscle scar (debris partly covers upper part of scar), $\times 735$. (Micrographs reduced to 82% for publication.)

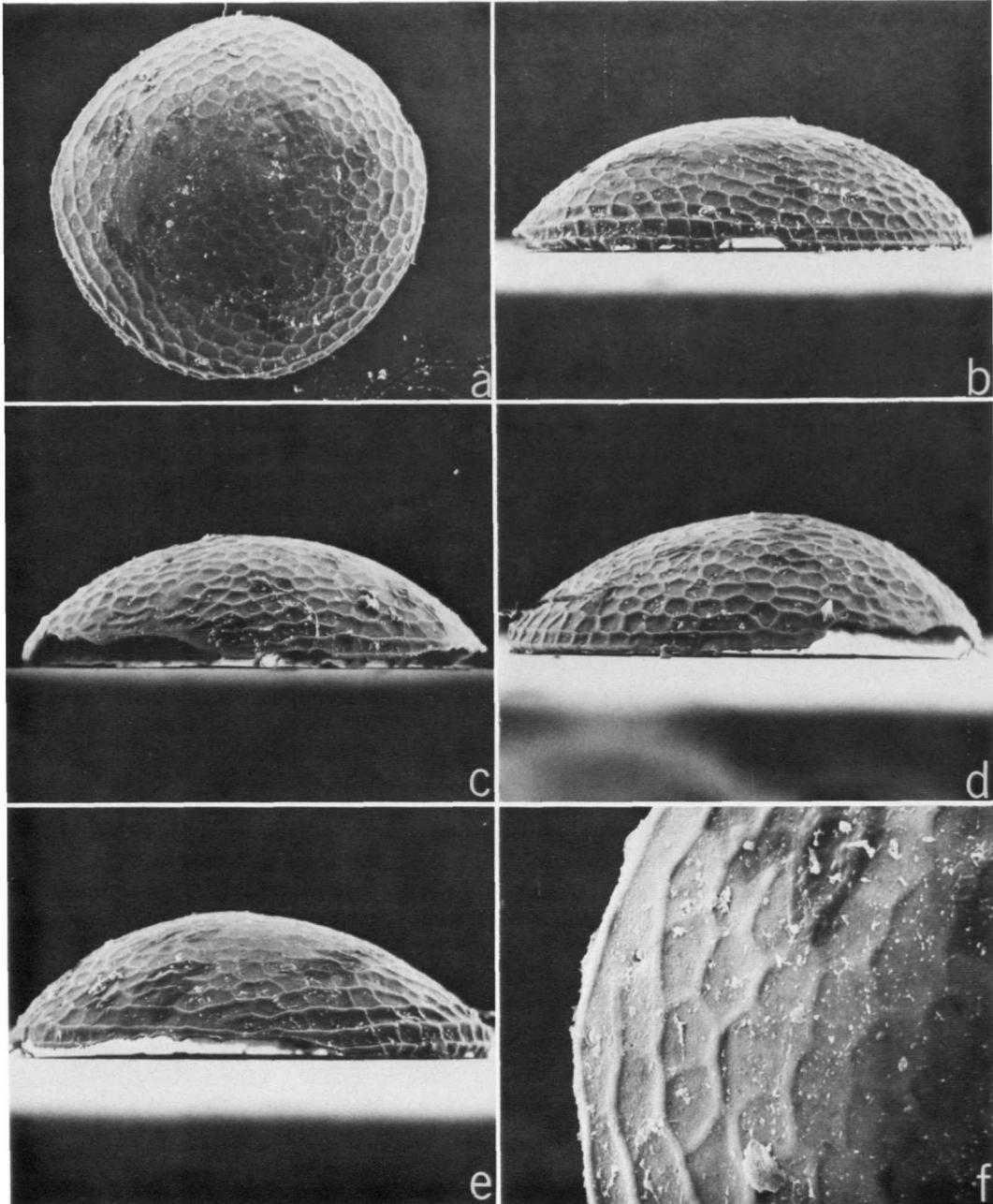


FIGURE 22.—*Metapolycope* species, left valve, outside views, SEM pictures: *a*, complete valve, anterior to left, $\times 140$; *b*, ventral view, $\times 175$; *c*, dorsal view, $\times 175$; *d*, posterior view, venter to left, $\times 190$; *e*, anterior view, venter to right, $\times 190$; *f*, anterior margin of valve, from *a*, $\times 500$. (Micrographs reduced to 78% for publication.)

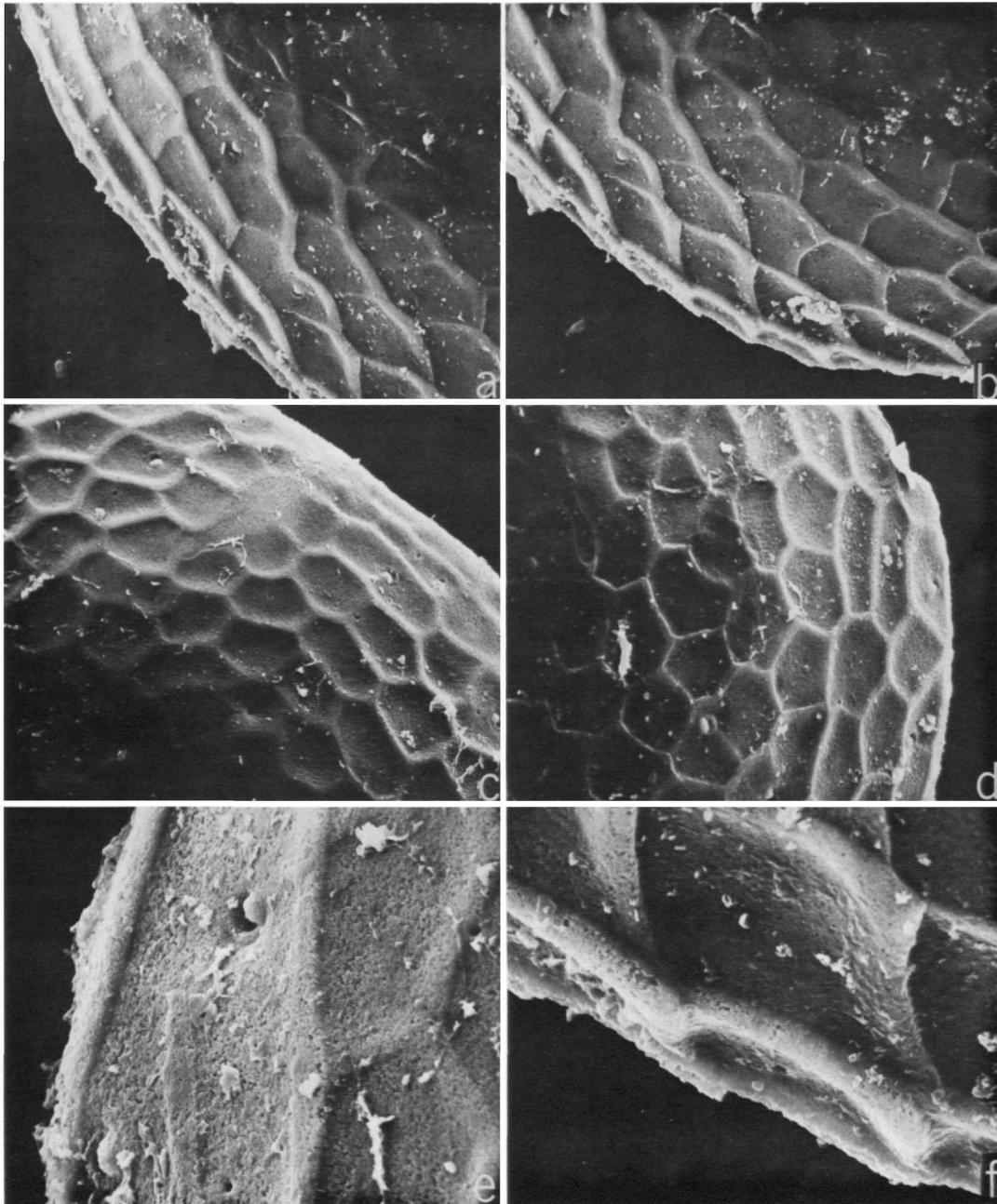


FIGURE 23.—*Metapolycope* species, left valve, outside views: *a*, anteroventral margin, from Figure 22*a*, $\times 500$; *b*, anteroventral and part of ventral margin posterior to *a*, from Figure 22*a*, $\times 500$; *c*, posterodorsal margin, from Figure 22*a*, $\times 500$; *d*, posterior margin, from Figure 22*a*, $\times 500$; *e*, anterior margin showing simple and noded pores, from Figure 22*f*, $\times 1700$; *f*, serrate valve edge from *b*, $\times 1950$. (Micrographs reduced to 77% for publication.)

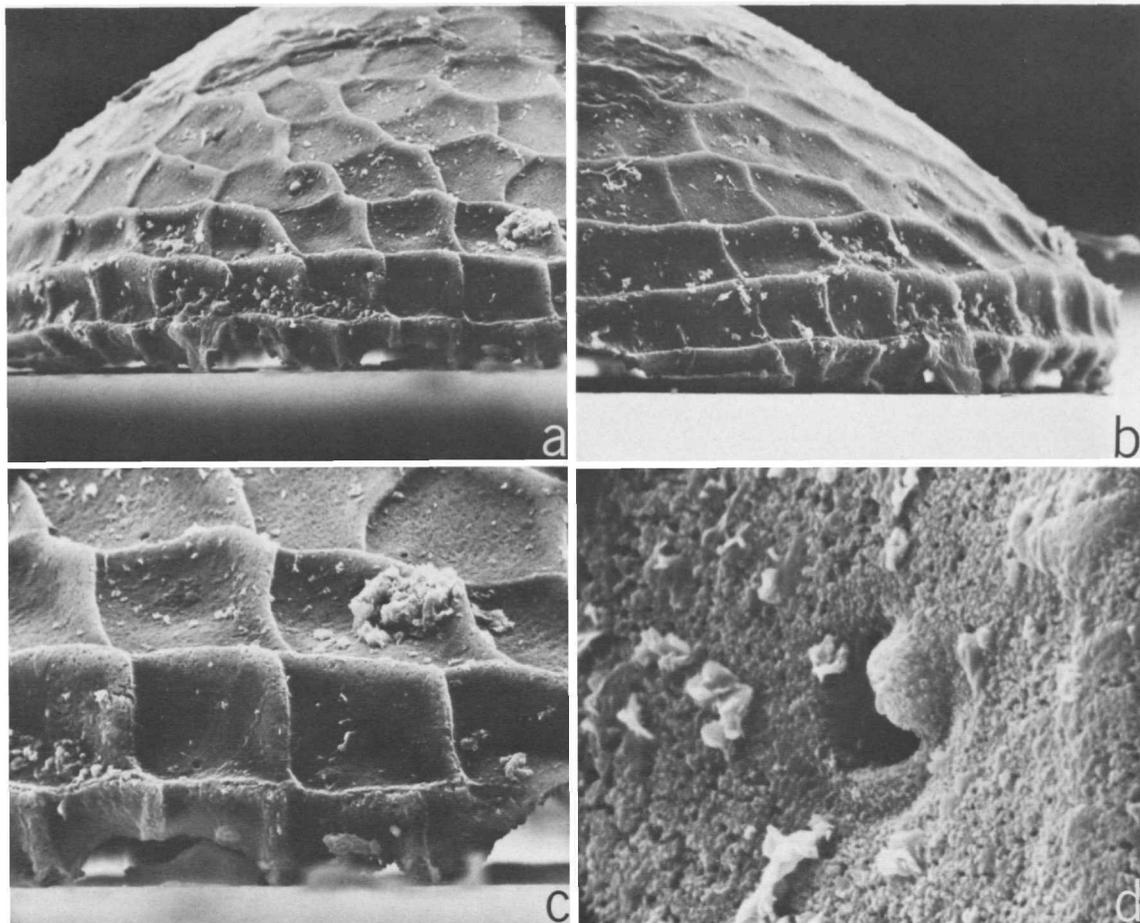


FIGURE 24.—*Metapolycope* species, left valve, outside views: *a*, ventral view of margin near anterior end, from Figure 22*b* $\times 500$; *b*, anterior view of ventral end of valve, from Figure 22*e*, $\times 500$; *c*, reticulations on ventral margin near anterior of valve, from *a*, $\times 1000$; *d*, noded pore from Figure 23*e*, $\times 5000$. (Micrographs reduced to 82% for publication.)

Literature Cited

- Barbeito-González, P. J.
1971. Die Ostracoden des Küstenbereiches von Naxos (Griechenland) und ihre Lebensbereiche. *Mitteilungen Hamburgischen Zoologischen Museum und Institut*, 67:255-326, figures 1-47.
- Brady, G. S., and D. Robertson
1869. Notes of a Week's Dredging in the West of Ireland. *The Annals and Magazine of Natural History*, 3 (4):353-374, plates 18-22.
- Hartmann, Gerd
1966. Ostracoda. *Klassen und Ordnungen des Tierreichs*, 2 (IV), part 1:1-216, figures 1-121.
- Kornicker, L. S., and I. G. Sohn
1976. Phylogeny, Ontogeny, and Morphology of Living and Fossil Thaumatoocyprididae (Myodocopa, Ostracoda). *Smithsonian Contributions to Zoology*, 219, 93 figures.
- Kozur, Heinz
1974. Eine neue Gattung der Familie Polycopidae (Cladocopida, Ostracoda). *Zoologische Geologische Wissenschaften*, Berlin, 2 (7):853-855.
- Müller, G. W.
1894. Die Ostracoden des Golfes von Neapel und der Angrenzenden Meeres-Abschnitte. Volume 21 of *Fauna und Flora des Golfes von Neapel*. viii + 404 pages, 40 plates. Berlin: Verlag von R. Friedlander & Sohn.
1912. Ostracoda. Volume 31 in *Das Tierreich*. xxxii + 434 pages, 92 figures. Berlin: Verlag R. Friedlander & Sohn.
- Sars, G. O.
1923. An Account of the Crustacea of Norway with Short Descriptions and Figures of All the Species. *Ostracoda*, 9 (3-4):33-72, plates 17-32.

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