

West African Myodocopid Ostracoda  
(Sarsiellidae, Rutidermatidae)

LOUIS S. KORNICKER  
and  
FRANCISCA ELENA CARAIÓN

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*Louis S. Kornicker*  
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## ABSTRACT

Kornicker, Louis S., and Francisca Elena Caraion. West African Myodocopid Ostracoda (Sarsiellidae, Rutidermatidae). *Smithsonian Contributions to Zoology*, number 250, 110 pages, 59 figures, 33 plates, 2 tables, 1978.—Thirteen species (10 new) in 3 genera (1 new) in the families Sarsiellidae and Rutidermatidae, collected by the research vessels *Thalassa* and *Cornide de Saavedra* in 1971 from the shelf and slope of Spanish Sahara and the Islamic Republic of Mauritania, are described and illustrated.

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# West African Myodocopid Ostracoda (Sarsiellidae, Rutidermatidae)

*Louis S. Kornicker*  
and *Francisca Elena Caraion*

## Introduction

This work reports on the shelf and slope myodocopid Ostracoda of the families Sarsiellidae and Rutidermatidae collected in bottom trawls by personnel aboard the research vessels *Thalassa* (20 stations) and *Cornide de Saavedra* (4 stations) (Figure 1). It is the third and final paper describing the ostracodes collected on the cruises. The Cyndroleberididae, Cypridinidae, and Philomedidae have already been described (Kornicker and Caraion, 1974; 1977).

The *Thalassa* collection contained 155 specimens of Sarsiellidae and the *Cornide de Saavedra* collection contained 2 specimens. Of these, 9 juveniles of *Sarsiella* could not be identified at the species level. The remaining specimens are assigned to 9 species (7 new) in 2 genera (1 new). Seven of the species were found off Mauritania; of these, 3 were also found off Spanish Sahara. Two species were found only off Spanish Sahara.

The Rutidermatidae were represented by 584 specimens from the *Thalassa* and 38 specimens from the *Cornide de Saavedra*. The specimens are assigned to 4 species (3 new) in 2 genera. Three of the species were found off Mauritania; of these, 2

were also found off Spanish Sahara. One species was found only off Spanish Sahara.

The range of latitudes from which each species was collected is shown in Figure 2, and the range of depths in Figure 3.

All specimens identified to the generic level and retained in the collection of the National Museum of Natural History, Smithsonian Institution, were assigned USNM numbers (acronym for the former United States National Museum). Those deposited in the Museum of Natural History "Grigore Antipa," Bucharest, Romania, either were assigned numbers of that museum or have bracketed USNM numbers.

Brady (1887:200) described a species of Sarsiellidae, *Parasarsiella globula* (Brady, 1887), collected off Spanish Sahara at a depth of 2333 m and off Mauritania at a depth of 932 m (Brady, 1884–1887, Kornicker, 1969b). That species was not recognized in the present collection. Brady (1869) described another species of Sarsiellidae, *Eurypylus petrosus* Brady, 1869, from the Cape Verde Islands, which is just south of the study area. That species was also not recognized in the present collection. Müller (1908:93) reported a larvae of *Sarsiella* from Simonstown, South Africa. Scott (1894) described *Sarsiella murrayana* Scott, 1894, from São Tomé Island, off Gabon. The latter species was not in the present collection.

No species of Rutidermatidae have previously been identified from the study area, but they have been collected along the west African coast south

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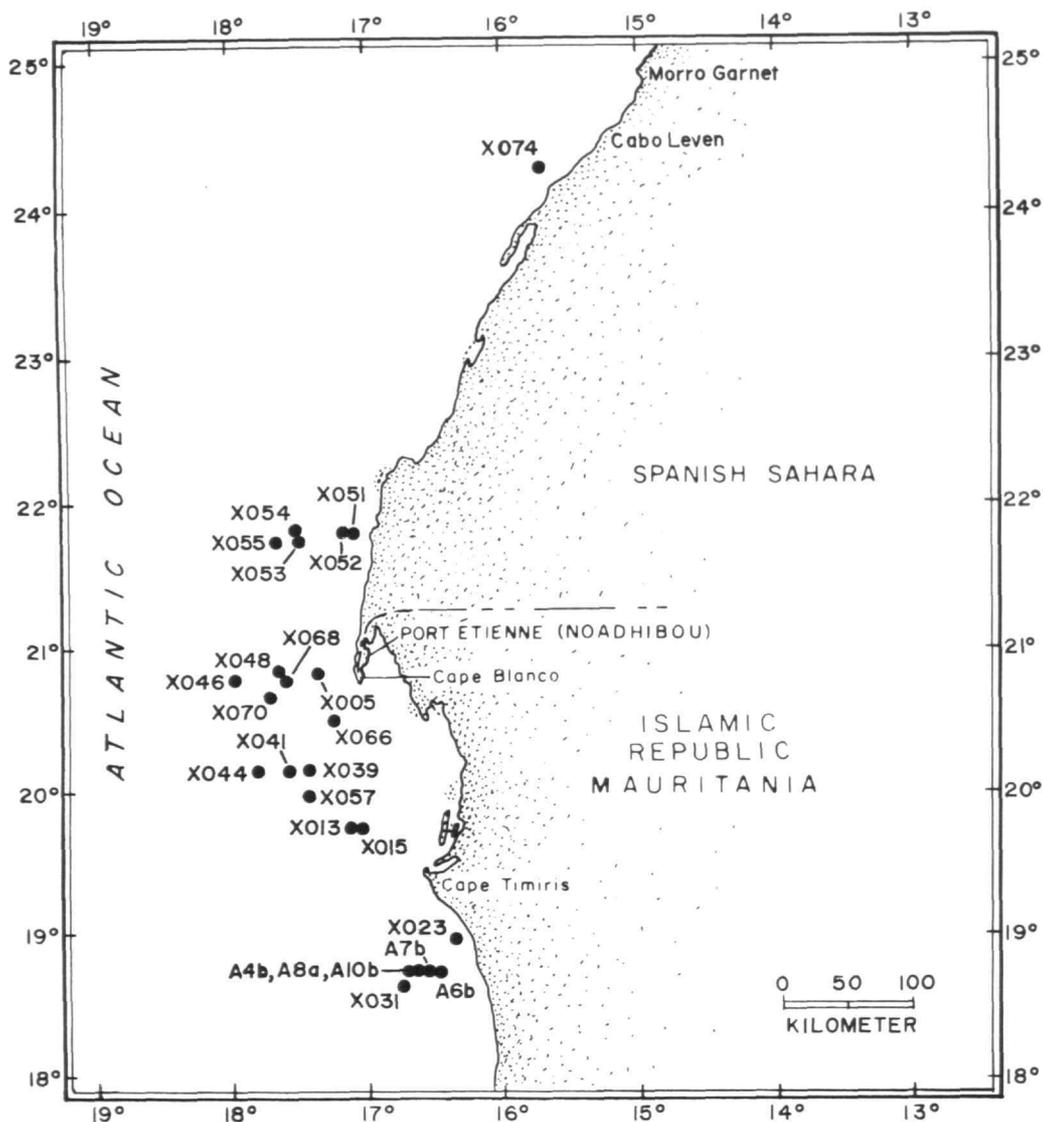


FIGURE 1.—Station map showing distribution of Sarsiellidae and Rutidermatidae taken aboard the *Thalassa* (station numbers preceded by X) and *Cornide de Saavedra* (station numbers preceded by A).

of the study area. Kornicker (1975b:40) described *Rutiderma leloeffi* Kornicker, 1975, from a specimen collected off the Ivory Coast at a depth of 20 m. That species was represented in the present collection. Klie (1940:406) identified 2 specimens collected in Lüderitz Bay, South-West Africa, at a

depth of 1–2 m, as *Rutiderma compressa* Brady and Norman, 1896; however, the specimens were not described, except for size, and their identity requires verification. Müller (1908:92) identified a single female collected from Simonstown, South Africa, as *Rutiderma compressa*. That specimen has

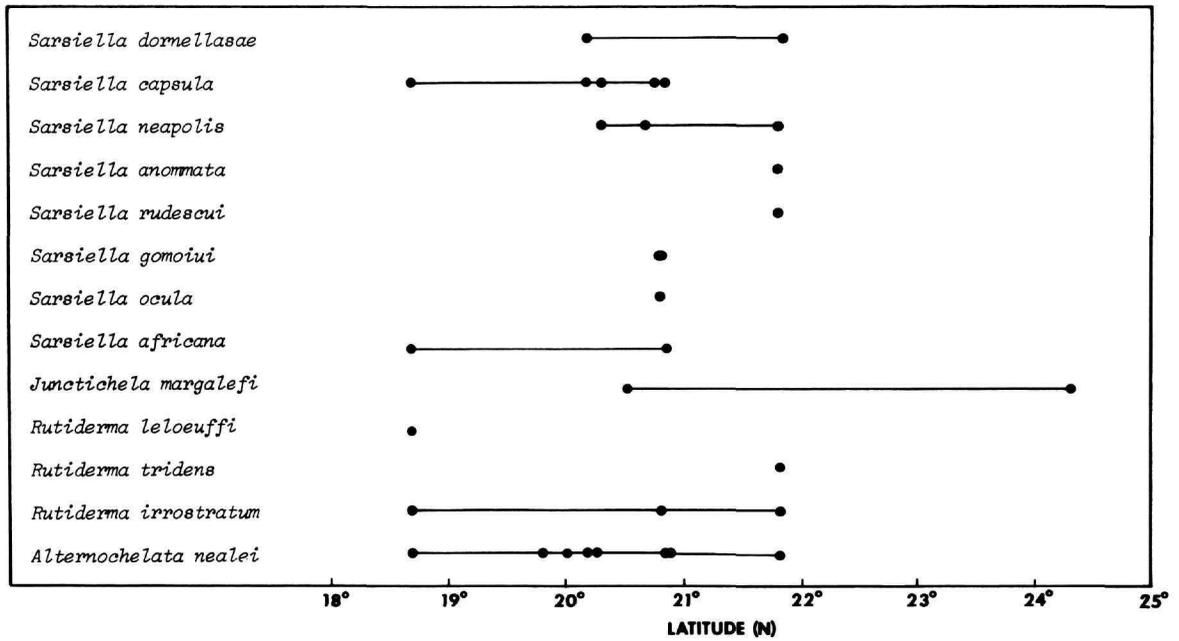


FIGURE 2.—Latitudinal distribution of species in study area.

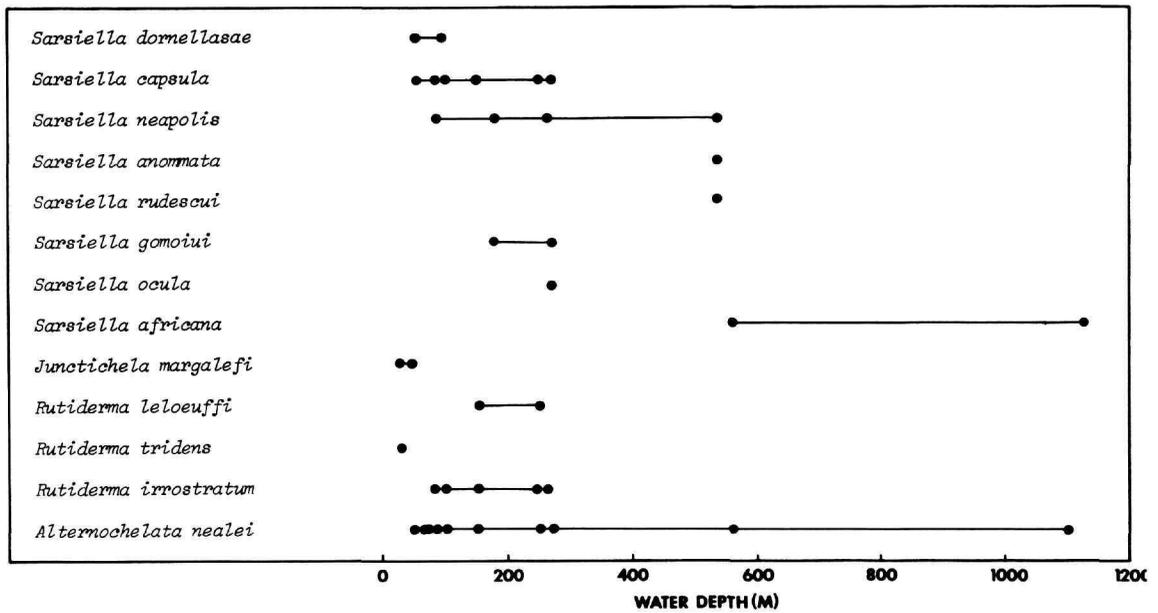


FIGURE 3.—Depth distribution of species in study area.

questionably been referred to a new species described herein from specimens in the present collection.

Two species of *Sarsiella* in the present collection have been reported from the Gulf of Naples and vicinity (Table 1): *Sarsiella capsula* Norman, 1869, and *Sarsiella neapolis* Kornicker, 1974 (see Kornicker, 1974:27, 33). The former species has also been reported from the vicinity of the Shetland Islands and Ireland (see Kornicker, 1974:27). The range of *Rutiderma leloeufti* Kornicker, 1975b, is extended herein from the Ivory Coast, where it was first described, to Mauritania. A new species, *Rutiderma tridens*, described herein from Spanish Sahara may be conspecific with a specimen from South Africa identified by Müller (1908:92) as *Rutiderma compressa* Brady and Norman, 1896.

The magnifications given for each micrograph on Plates 1–33 are those at which the micrographs were taken on the scanning-electron microscope (SEM). The percentage of reduction for publication is stated at the end of each legend.

Two specimens of *Cylindroleberididae* that were overlooked during preparation of our publication concerning that group (Kornicker and Caraion, 1974) are included in the species listed under "Station Data" herein. These are: 1 specimen of *Prionotoleberis pax* Kornicker and Caraion, 1974, from station X053; and 1 specimen of *Asteropteron setiferum* Kornicker and Caraion, 1974, from station X068.

In our paper describing the *Cylindroleberididae* of West Africa (Kornicker and Caraion, 1974) we did not obtain numbers for the specimens deposited in the Museum of Natural History "Grigore Antipa," Bucharest, Romania, in time to include them in that paper. Therefore, we assigned USNM numbers to these specimens, but enclosed these designations in brackets to differentiate them from the unbracketed designations of specimens deposited at the National Museum of Natural History, Smithsonian Institution, Washington, D.C. The equivalent "Grigore Antipa" numbers for the specimens are listed below.

Taxon	Type	USNM	"Grigore Antipa"
<i>Prionotoleberis pax</i>	holotype	139842	264
	paratype	141107	265
<i>Parasterope mauritania</i>	holotype	139860	266
	paratype	141103	267
<i>Parasterope alpha</i>	holotype	139841	268
	holotype	139844	269
<i>Cylindroleberis bacescui</i>	holotype	139845	270
<i>Asteropteron setiferum</i>	paratype	141266	271
<i>Parasterope sohni</i>	holotype	141556	272
<i>Synasterope bensoni</i>	allotype	141271	273
	holotype	141270	274
<i>Asteropella upsilon</i>	holotype	141267	275
	specimen	141265	276
<i>Parasterope thrix</i>	holotype	141261	lost

ACKNOWLEDGMENTS.—We thank Dr. Mihai Băcescu, Museum of Natural History "Grigore Antipa," for the ostracodes from the *Thalassa*, and

TABLE 1.—World distribution and depth zones of species of Sarsiellidae and Rutidermatidae discussed herein (x = reported; - = not reported; ? = questionable)

Species	Spanish Sahara	Mauritania	Ivory Coast	South Africa	Shetland Islands, Ireland	Mediterranean	Depth zone
<i>Sarsiella dornellasae</i> .....	x	x	-	-	-	-	shelf
<i>Sarsiella capsula</i> .....	-	x	-	-	x	x	shelf-bathyal
<i>Sarsiella neapolis</i> .....	x	x	-	-	-	x	shelf-bathyal
<i>Sarsiella anommata</i> .....	x	-	-	-	-	-	bathyal
<i>Sarsiella rudescui</i> .....	x	-	-	-	-	-	bathyal
<i>Sarsiella gomoiui</i> .....	-	x	-	-	-	-	shelf-bathyal
<i>Sarsiella ocula</i> .....	-	x	-	-	-	-	bathyal
<i>Sarsiella africana</i> .....	-	x	-	-	-	-	bathyal
<i>Junctichela margalefi</i> .....	-	x	-	-	-	-	shelf
<i>Rutiderma leloeufti</i> .....	-	x	x	-	-	-	shelf-bathyal
<i>Rutiderma tridens</i> .....	x	-	-	?	-	-	shelf
<i>Rutiderma irrostratum</i> .....	x	x	-	-	-	-	shelf-bathyal
<i>Alternochelata nealei</i> .....	x	x	-	-	-	-	shelf-bathyal

Dr. Ramon Margalef, Instituto de Investigaciones Pesqueras, Barcelona, for the ostracodes from the *Cornide de Saavedra*. The *Thalassa* cruise was organized and supported by the Institut Scientifique et Technique de Peche Maritime de France.

Mrs. Carolyn Gast rendered the shaded drawings of the carapaces. Mr. Paul Mazer made most of the initial camera lucida drawings of appendages and then inked the final drawings. Miss Maura McManus assisted in final preparation of the figures. Freeze-drying of specimens for photography was done in the laboratory of Mr. Roland Hower. The assistance of Mr. Walter R. Brown and Miss Mary J. Mann, who operated the scanning-electron microscope, is acknowledged. We are grateful to Dr. Mihai Băcescu and Mrs. Anne Cohen for criticizing the manuscript, and to Mrs. Barbara Spann, Smithsonian Institution Press, for editing and preparing the manuscript.

#### Station Data

Research vessel *Thalassa*, Jan and Feb 1971;  
collector: Prof. Dr. Mihai (Micael) Băcescu

- Station X005; 15 Jan; 20°52'02"N, 17°19'09"W; 61 m; muddy sand; dredge net; Islamic Republic of Mauritania.  
*Sarsiella* species indeterminate: 1 juvenile.  
*Altenochelata nealei*: 1 specimen.
- Station X013; 19 Jan; 19°46'00"N, 17°08'00"W; 61 m; mud; dredge net; Islamic Republic of Mauritania.  
*Altenochelata nealei*: 1 adult male, 1 adult female, 244 additional specimens.
- Station X015; 19 Jan; 19°45'07"N, 17°01'17"W; 70 m; mud; dredge net; Islamic Republic of Mauritania.  
*Altenochelata nealei*: 236 specimens.
- Station X023; 22 Jan; 18°59'02"N, 16°22'07"W; 14 m; sand; Băcescu dredge; Islamic Republic of Mauritania.  
*Sarsiella* species indeterminate; 1 juvenile.
- Station X031; 27 Jan; 18°40'00"N, 16°41'05"W; 560 m; Menzies trawl; Islamic Republic of Mauritania.  
*Sarsiella africana*: 2 ovigerous females, 1 adult male, 15 additional specimens, including adult females and juveniles.  
*Altenochelata nealei*: 1 specimen.
- Station X039; 28 Jan; 20°03'06"N, 17°30'11"W; 78–119 m; Gorgonacia washings; Islamic Republic of Mauritania.  
*Altenochelata nealei*: 1 specimen.
- Station X041; 29 Jan; 20°10'05"N, 17°32'09"W; 52 m; sand; Băcescu dredge; Islamic Republic of Mauritania.  
*Sarsiella capsula*: 14 specimens.  
*Sarsiella dornellasae*: 1 ovigerous female, 3 juveniles.  
*Altenochelata nealei*: 3 specimens.

- Station X044; 29 Jan; 20°09'06"N, 17°48'09"W; 1100 m; mud; Menzies trawl; Islamic Republic of Mauritania.  
*Altenochelata nealei*: 5 specimens.
- Station X046; 39 Jan; 20°49'09"N, 17°58'08"W; 1120 m; sandy mud; Menzies trawl; Islamic Republic of Mauritania.  
*Sarsiella africana*: 1 ovigerous female, 1 ovigerous female with female chonistomatid in marsupium in addition to 3 ostracod eggs, 1 adult female, 1 juvenile.  
*Sarsiella* species indeterminate: 4 juveniles
- Station X048; 29 Jan; 20°50'05"N, 17°39'00"W; 270 m; mud + sand; Băcescu dredge; Islamic Republic of Mauritania.  
*Sarsiella gomoiui*: 3 adult males, 4 ovigerous females, 3 adult females (2 containing chonistomatid egg sacs), 7 juveniles.  
*Sarsiella ocula*: 1 ovigerous female, 1 adult male, 1 juvenile female.  
*Sarsielata capsula*: 2 ovigerous females, 1 adult male, 29 unsexed specimens (no adult males).  
*Altenochelata nealei*: 1 ovigerous female.
- Station X051; 30 Jan; 21°48'01"N, 17°02'00"W; 30 m; sand; Băcescu dredge; Spanish Sahara.  
*Rutiderma tridens*: 1 A–1 male, 1 A–1? female.
- Station X052; 30 Jan; 21°47'00"N, 17°09'00"W; 53 m; sand; Rallier dredge; Spanish Sahara.  
*Sarsiella dornellasae*: 1 adult female with male and female chonistomatid copepod in marsupium.  
*Sarsiella* species indeterminate: 1 juvenile.  
*Altenochelata nealei*: 4 specimens.
- Station X053; 30 Jan; 21°47'00"N, 17°28'02"W; 260 m; sand; Rallier dredge; Spanish Sahara.  
*Sarsiella neapolis*: 2 ovigerous females, 7 juveniles.  
*Rutiderma irrostratum*: 1 ovigerous female, 1 A–1 female, 1 A–1 male, 2 juveniles.  
*Prionotoleberis pax*: 1 adult female, USNM 157131, length 1.76 mm, height 0.82 mm.
- Station X054; 30 Jan; 21°47'00"N, 17°30'06"W; 534 m; mud + sand; Rallier dredge; Spanish Sahara.  
*Sarsiella rudescui*: 2 ovigerous females.  
*Sarsiella anommata*: 1 ovigerous female, 1 A–1 female.  
*Sarsiella neapolis*: 1 A–1 male.
- Station X055; 30 Jan; 21°45'06"N, 17°39'08"W; 1045 m; Rallier dredge; Spanish Sahara.  
*Sarsiella* species indeterminate: 1 juvenile.
- Station X057; 31 Jan; 20°17'03"N, 17°36'06"W; 82 m; sand; trawl's sonde; Islamic Republic of Mauritania.  
*Sarsiella capsula*: 1 ovigerous female, 2 juveniles.  
*Sarsiella neapolis*: 1 adult male, 1 ovigerous female, 3 juveniles.  
*Sarsiella* species indeterminate: 1 juvenile.  
*Altenochelata nealei*: 1 specimen.
- Station X066; 4 Feb; West Bank Arguin; 20°32'05"N, 17°15'3"W; 40–38 m; trawl's sonde; Islamic Republic of Mauritania.  
*Junctichela margalefi*: 3 adult males, 1 adult female, 9 additional specimens.
- Station X068; 4 Feb; 20°47'06"N, 17°36'06"W; 96 m; sand and mud; Băcescu dredge; Islamic Republic of Mauritania.

- Sarsiella dornellasae*: 1 adult male, 5 ovigerous females, 2 juveniles.  
*Sarsiella capsula*: 1 juvenile.  
*Rutiderma irrostratum*: 1 specimen.  
*Alvernochelata nealei*: 77 specimens.  
*Asteropteron setiferum*: 1 specimen, USNM 157130.  
 Station X070; 5 Feb; 20°40'04"N, 17°41'01"W; 170–75 m; sand and mud from Gorgonacea washings; Islamic Republic of Mauritania.  
*Sarsiella neapolis*: 1 specimen.  
*Sarsiella gomoiui*: 1 adult female.  
 Station X074; 6 Feb; 24°17'06"N, 15°43'02"W; 25 m; coarse sand; dredge net; Islamic Republic of Mauritania.  
*Junctichela margalefi*: 1 adult male, 1 ovigerous female, 1 instar II, 1 A–1 female, 1 A–2 female, 2 juveniles.

Research vessel *Cornide de Saavedra*, Sep 1971; collector: Dr. Ramon Margalef; collected with a Van Veen grab on continental shelf of the Islamic Republic of Mauritania

- Station A6b; sample 13; 18°44'N, 16°30'W; 87 m.  
*Alvernochelata nealei*: 1 adult male, 3 ovigerous females, 10 additional specimens.  
 Station A7b; sample 14; 18°44'N, 16°23'W; 94 m.  
*Rutiderma irrostratum*: 1 specimen  
*Alvernochelata nealei*: 15 specimens.  
 Station A8a; sample 15; 18°44'N, 16°34'W; 150 m.  
*Sarsiella capsula*: 1 ovigerous female.  
*Rutiderma leloeuffi*: 1 A–1 male.  
*Rutiderma irrostratum*: 1 ovigerous female.  
*Alvernochelata nealei*: 1 specimen.  
 Station A10b; sample 16; 18°44'N, 16°34'W; 250 m.  
*Sarsiella capsula*: 1 ovigerous female.  
*Rutiderma leloeuffi*: 1 adult female.  
*Rutiderma irrostratum*: 1 specimen.  
*Alvernochelata nealei*: 2 specimens.  
 Station A4b; sample 12; 18°44'N, 16°26'W; 55 m.  
*Alvernochelata nealei*: 1 specimen.

### Zoogeography

Spanish Sahara and the Islamic Republic of Mauritania are in the subtropical biogeographic region defined by Hughes (1974:419) for the northern hemisphere as being between the 17° C and the 20° C isocrymes of sea surface temperatures during February. The 17° C isocryme intercepts the southern boundary of Morocco near its border with Spanish Sahara. The 20° C isocryme intercepts Senegal in the vicinity of Cape Verde.

All the benthic specimens collected and reported upon here and in the previous 2 reports (Kornicker and Caraion, 1974; 1977) are from near the middle of the subtropical biogeographic region. The

myodocopid ostracodes are quite diverse consisting of 17 genera and 36 species. One genus, 24 species, and 1 subspecies are endemic, but the range of many of these will probably be extended both north and south of the present study area when those relatively unknown areas are studied.

Kornicker (1974) reported 12 species in the Gulf of Naples, Italy. Of these, 7 were collected also in the present study area indicating a fairly close biotic relationship between the two areas (Simpson Index: 58). The myodocopid ostracodes in the region between the study area and the Mediterranean Sea are not well known, but it seems likely that the species present in both the study area and the Gulf of Naples will be found in the intervening region. One of the species in the study area has also been collected in the Bay of Biscay and another as far north as the Shetland Islands. The myodocopid ostracodes on the inner shelf of the Ivory Coast, which is located along the outer northern coast of the Gulf of Guinea, south of the study area, were reported on by Kornicker (1975b). The inner shelf (10–80 m depth) of the Ivory Coast contained only 3 genera and 3 species, all of which were collected also in the present study area. Thus, except for the assemblage of the Ivory Coast being depauperate, it is not unlike that of the study area (Simpson Index: 100). A single species reported by Scott (1894) from São Tomé Island, off Gabon, was not collected in the study area. The myodocopid ostracodes of South-West and South Africa are not well known, but only one of the species listed from those areas by Kornicker (1975a) was in the present collection, and that species was referred to a different species (a species not in the present collection) by Kornicker (1976a). None of the species reported by Kornicker (1976a) from southern Africa was in the present collection. This suggests that for myodocopid ostracodes, the major change in species composition along the west coast of Africa takes place between the Ivory Coast and South-West Africa. Additional collections from the west coast of Africa, both north and south of the study area, are needed to better delimit latitudinal changes in the species composition of the ostracodes.

None of the species in the study area have been reported from the Indian or Pacific Oceans, and only 1 has been reported from the west Atlantic (West Indies). Compared to other taxa, the myodo-

copid ostracodes of Spanish Sahara and Mauritania seem to be less widely distributed (for ranges of some other taxa, see Ekman, 1953:49; Briggs, 1974: 109).

**SARSIELLIDAE**

**Brady and Norman, 1896**

This family is represented in the study area by two genera: *Sarsiella* Norman, 1869, and *Junc-*

*tichela*, new genus. Two additional genera have been reported from the vicinity of western Africa: *Eurypylus* Brady, 1869, represented by *Eurypylus petrosus* Brady, 1869, collected at São Vincenti, Cape Verde Islands, and *Parasarsiella* Poulsen, 1965, represented by *Parasarsiella globula* Brady, 1887, collected off the Atlantic coast of North Africa at a depth of 932 and 2333 m.

**Key to the Genera of Sarsiellidae of West Africa**

- 1. Claws 1, 2 and 3 fused to lamella ..... *Junctichela*, new genus
- Claws 1 and 2 fused to lamella ..... *Eurypylus* Brady
- Claw 1 fused to lamella ..... 2
- 2. Furca with 5 claws ..... *Sarsiella* Norman
- Furca with more than 5 claws ..... *Parasarsiella* Poulsen

***Sarsiella* Norman, 1869**

Eight species of *Sarsiella* were collected: *S. capsula* Norman, 1869; *S. neapolis* Kornicker, 1975a; *S. anommata*, new species; *S. africana*, new species; *S. ocula*, new species; *S. dornellasae*, new species; *S. gomoiui*, new species; *S. rudescui*, new species.

**DISTRIBUTION.**—Members of *Sarsiella* are widespread between latitudes of about 63°N and 37°05'S. The previously known depth range of this genus was intertidal to about 205 m. Species in the present collection were from off Mauritania and Spanish Sahara at depths of 14–1120 m. This increases the lower limit of the known depth range.

**Key to Females of the Species of *Sarsiella* of West Africa**

- 1. Carapace with abundant small spines; endopodite of 2nd antenna with 1 or 2 terminal bristles ..... 2
- Carapace without abundant small spines or hairs; endopodite of 2nd antenna without terminal bristles (unknown for *S. murrayana*) ..... 3
- 2. Carapace with continuous concentric ridge ..... 4
- Carapace without continuous concentric ridge ..... 5
- 3. Lateral eyes present ..... 6
- Lateral eyes absent ..... *S. anommata*, new species
- 4. Carapace with 2 ridges ventral to central adductor muscle attachments ..... *S. gomoiui*, new species
- Carapace with 1 ridge ventral to central adductor muscle attachments ..... *S. neapolis* Kornicker
- 5. Carapace with numerous well developed processes ..... 7
- Carapace without numerous well developed processes ..... *S. rudescui*, new species
- 6. Carapace with upper and lower horizontal rib tending to meet at posterodorsal corner of each valve ..... *S. murrayana* Scott
- Carapace without rib meeting at posterodorsal corner ..... *S. capsula* Norman
- 7. Lateral eyes present ..... 8
- Lateral eyes absent ..... *S. africana*, new species
- 8. Endopodite of female 2nd antenna with 1 terminal bristle; length of carapace of adult female less than 1.6 mm ..... *S. dornellasae*, new species
- Endopodite of female 2nd antenna with 2 terminal bristles; length of carapace of adult female more than 1.85 mm ..... *S. ocula*, new species

*Sarsiella capsula* Norman, 1869

FIGURES 4-8; PLATES 1-4

- Sarsiella capsula* Norman, 1869:293.—Brady and Norman, 1896:677, pl. 60: figs 1-4, 18.—Kornicker, 1967:32, fig. 16, pl. 3 [redescription]; 1974:27, figs. 11-13a,b.
- Sarsiella levis* Müller, 1894:216, fig. 2, pl. 1: fig. 28, pl. 4: figs. 11, 12, 19, 20, 23, 24, 26, 32, 36, 45-47, pl. 8: figs. 2-3.
- Nematohamma obliqua* Brady and Norman, 1896:680-682, pl. 52: figs. 1-2, pl. 53: figs. 12-15.
- Sarsiella? capsula*.—Scott, 1902:475, pl. 25: figs. 27-32.
- Eusarsiella levis*.—Poulsen, 1965:44, 83, 160.
- Not *Sarsiella capsula*.—Sars. 1888:229, pl. 3: figs. 5-7, pl. 10.—Müller, 1894:214, pl. 4: figs. 4-6, 8-10, 22, 25, 27-29, 31, 33-35, 37, 48, pl. 8: figs. 6-7.—Brady, 1911:595.—Rome, 1942:8.

**HOLOTYPE.**—Unique female, on dry slide in Norman Collection at the British Museum (Natural History) (1911.11.8, M3985).

**TYPE-LOCALITY.**—In vicinity of the Shetland Islands.

**MATERIAL.**—USNM 156614, 1 ovigerous female from station A10b; USNM 156627, 1 ovigerous female from station X048; USNM 156814, 1 ovigerous female from station A8a; USNM 156815, 14 specimens from station X041; USNM 156636, 1 ovigerous female and 2 juveniles from station X057; USNM 156816, 1 juvenile from station X068; USNM 156626, 1 ovigerous female from station X048; USNM 156817, 19 specimens from station X048; 10 specimens from station X048 in Museum of Natural History "Grigore Antipa," Bucharest, Romania; USNM 156625, 1 adult male from station X048.

**DESCRIPTION OF ADULT FEMALE** (Figures 4-6;



FIGURE 4.—*Sarsiella capsula* Norman, adult female, USNM 156614, length 1.13 mm.

Plates 1, 2).—Carapace oval in lateral view with projecting posteroventral caudal process; anterior rotund without rostrum or incisor; broad alar process present in posterodorsal part of each valve appearing truncate in dorsal view.

**Ornamentation:** 6 radial anteroventral ribs extending outward from slightly depressed central area, a 7th rib extending to tip of caudal process (Figure 4); edge of alar posterodorsal process marked by rib; small shallow fossae abundant on valve surface; SEM micrographs reveal numerous digitate processes in fossae (Plate 1c-f), and also punctae on surface of valves between fossae (Plate 1c); long bristles present along anterior and ventral margins and sparsely distributed on valve surface (Plates 1a, 2a,d), some with papillae? (Plate 2e); gel-like coating not present on valves; concretions present on some valves (Plate 1a,b).

**Infold:** Minute bristle present on anterior infold (Figure 5a); infold of caudal process with 8 small bristles (Figure 5a,b; Plate 2f); bristles bear pore near middle (Plate 2b,c); a few additional smaller bristles along inner margin of infold; 2 setose bristles present just dorsal to caudal process.

**Size:** USNM 156627, length 1.13 mm, height 0.92 mm; USNM 156614, length 1.13 mm, height 0.93 mm; USNM 156626, length 1.19 mm, height 0.99 mm.

**First Antenna** (Figure 5c): 1st joint: bare. 2nd joint: 1 spinous dorsal bristle and few spines along dorsal margin. 3rd joint: fused to 4th, with 2 spinous bristles (1 ventral, 1 dorsal). 4th joint: 4 spinous bristles (1 dorsal, 3 ventral). 5th joint: sensory bristle with 3 minute filaments. 6th joint: short spinous medial bristle. 7th joint: bare a-bristle about same length as 5th joint; b-bristle bare, about one-third longer than a-bristle; c-bristle slightly longer than sensory bristle of 5th joint, with 3 minute marginal filaments. 8th joint: d- and e-bristles bare with blunt tips, slightly shorter than sensory bristle; f- and g-bristles same length as d-bristle, with 3 minute marginal filaments.

**Second Antenna:** Protopodite bare. Endopodite with 1 or 2 short proximal bristles and small terminal process (process could be considered to be 2nd joint) (Figure 5d). Exopodite: 1st joint with minute medial spine terminally; joints 2-8 with short spines forming row along distal margin; 2nd joint with bristle with about 25 slender spines

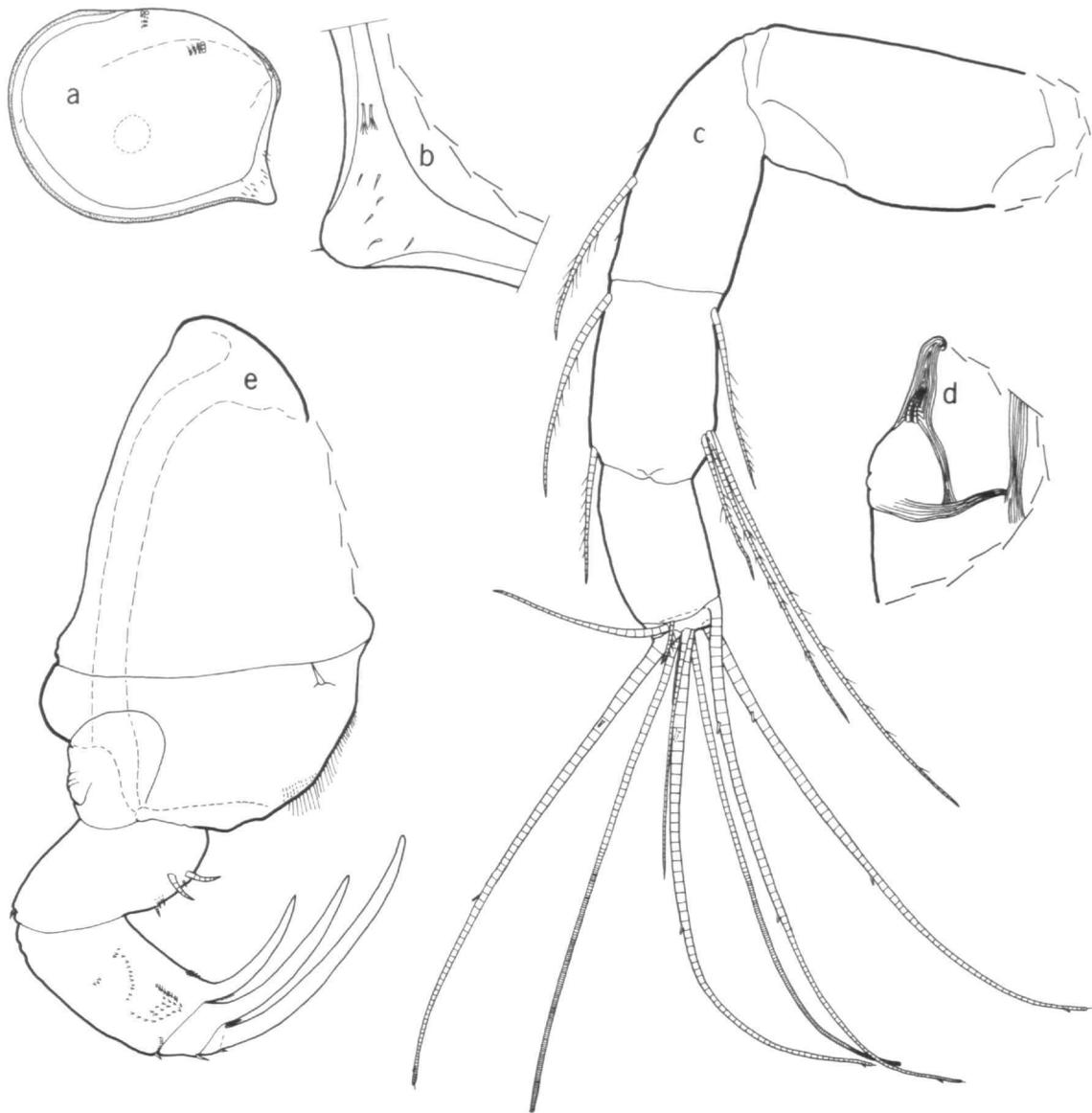


FIGURE 5.—*Sarsiella capsula* Norman, adult female, USNM 156627, length 1.13 mm: *a*, right valve showing bristles of infold, inner margin of infold, outline of central adductor muscle attachment area (dashed), and distal ends of dorsal muscles, inside view; *b*, bristles on infold of caudal process and posterior setal bristles, inside view of left valve; *c*, right 1st antenna, medial view; *d*, endopodite of right 2nd antenna, medial view; *e*, right mandible, medial view.

proximally along ventral margin and distal natatory hairs; joints 3–6 with bristles with faint, hair-like, proximal spines along ventral margin and natatory hairs; joints 7 and 8 with bristles with natatory hairs; 9th joint with 2 bristles (1 long ventral bristle with slender hairlike spines proximally along ventral margin and distal natatory hairs, and 1 short dorsal bristle with short marginal hairs).

**Mandible** (Figure 5e): Coxale with stout medial spine near ventral margin and long hairs distally along ventral margin. Basale: medial side with 2 short bristles near ventral margin; lateral side with 2 minute bristles near ventral margin; ventral margin with 2 minute bristles, proximal of these with base on medial side; dorsal margin with minute subterminal bristle. Endopodite: 1st joint with medial surface with numerous distal spines, dorsal margin with minute terminal spines con-

tinuing as row on medial surface, ventral margin with distal spines, and stout terminal claw with minute spines proximally along dorsal margin; 2nd joint with stout ventral claw and short, terminal, dorsal bristle; end joint with stout terminal claw and 3 short bristles (2 ventral, 1 dorsal).

**Maxilla** (Figure 6a): Coxale with short dorsal bristle and fringe of long hairs. 3 endites with total of 16 bristles. Basale with bristle near exopodite. Exopodite with 2 bristles, inner of these bare, about one-half length of outer spinous bristle (spines not shown on bristle in Figure 6a). Endopodite: 1st joint with few distal spines along dorsal margin,  $\alpha$ - and  $\beta$ -bristles with numerous teeth along proximal unringed part and more slender spines along ringed distal part (spines on  $\beta$ -bristle not shown in Figure 6a); end joint with 2 short  $\alpha$ -bristles, 1 short  $\gamma$ -bristle, and 5 stout pectinate end bristles, the anterior of these ringed distally.

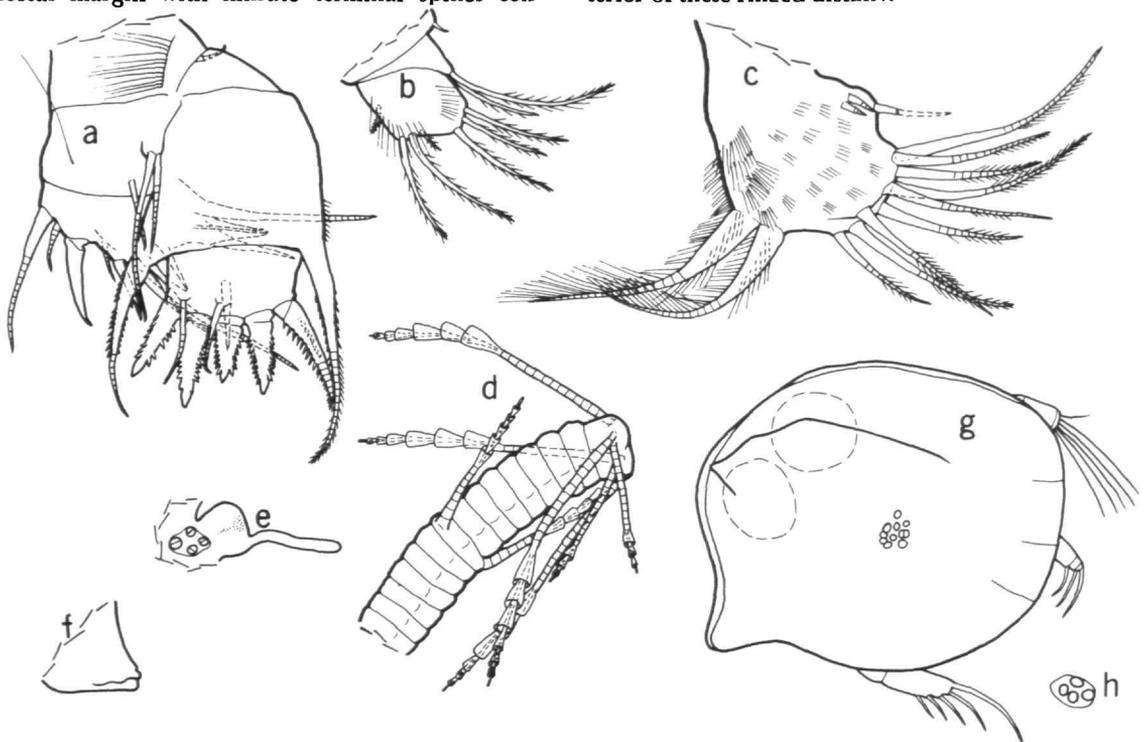


FIGURE 6.—*Sarsiella capsula* Norman, adult female, USNM 156627: a, right maxilla, lateral view; b, distal end of 5th limb; c, left 6th limb, medial view; d, distal part of 7th limb; e, right lateral eye, medial eye and rod-shaped organ; f, upper lip, anterior to right. Female, USNM 156614, length 1.17 mm: g, complete specimen showing eggs (dashed line) and central adductor muscle scars; h, right lateral eye.

*Fifth Limb* (Figure 6b): Epipodial appendage with 25 bristles. Single endite with short bare bristle. Exopodite: 1st joint with 2 spinous bristles; joints 2–5 fused, hirsute, with total of 7–8 spinous bristles. [Kornicker (1974:29) incorrectly described the fused 2nd to 5th joints of an immature female as having 9 bristles, but correctly showed 7 bristles on the illustration of the limb (1974:30, fig. 12A).]

*Sixth Limb* (Figure 6c): Single endite with 2 short medial bristles and 1 longer terminal bristle; end joint with 9–10 ventral bristles with short marginal spines, and 2 long hirsute posterior bristles; posterior one-third of medial surface and posterior margin with long hairs; anterior two-thirds of medial surface with short, slender spines forming rows; lateral surface with hairs near base of the 2 posterior bristles.

*Seventh Limb* (Figure 6d): 2 proximal bristles present (1 on each side), each with 5 bells decreasing in size distally along bristle; distal group with 6 bristles (3 on each side) comprising 2 short bristles, each with 3 bells decreasing in size distally, and 4 long bristles, each with 6 bells of which proximal 3 are much larger than distal 3; terminus without combs.

*Furca* (Figure 6g): Each lamella with 5 slender claws; claw 1 joined to lamella, claws 2–5 separated from lamella by suture; claws 1–4 with teeth along posterior margins, some of these stouter than others; claw 1 with hairs along anterior margin; long medial hairs near base of claw 1; minute spines on anterior margin of lamella; 2 or 3 minute spines on lamella following claw 5.

*Rod-shaped Organ* (Figure 6e): Elongate with rounded tip.

*Eyes*: Medial eye lightly pigmented, bare (Figure 6e); lateral eye about same size as medial eye, with light brown pigment and 4 ommatidia (Figure 6e,h).

*Upper Lip* (Figure 6f): Helmet shaped.

*Eggs*: USNM 156627 with 5 eggs in marsupium; USNM 156614 with 6 eggs (for position of eggs, see Figure 6g); USNM 156626 with 4 eggs.

**REMARKS.**—The long bristles on the terminal end of the 7th limb bear 3 large bells followed by 3 small bells. This character is useful in the identification of this species.

**SUPPLEMENTARY DESCRIPTION OF ADULT MALE** (Figures 7, 8; Plates 3, 4).—Carapace elongate with anterior rostrum and incisur (Figure 7a); posterior

truncate; alar projection with flat dorsal surface present in posterodorsal part of each valve; low rib parallel to, and just within, ventral margin.

*Ornamentation*: Surface with abundant small shallow fossae (Plate 8a–c); SEM micrographs reveal numerous digitate processes within fossae (Plate 3e,f), and also punctate on surface of valves between fossae (Plate 3d); long bristles present along anterior and ventral margins and sparsely distributed on valve surface (Plate 3b,d); gel-like coating not present on valves.

*Infold*: Minute bristle present on anterior infold (Figure 7a,b); infold of caudal process with 4 small bristles (Figure 7a,c, Plate 4c) and a few additional smaller bristles (some tubular) along inner margin of infold (Plate 4b); 2 setose bristles present just dorsal to caudal process (Plate 4d,e).

*Selvage* (Plate 4f): Selvage along rostrum with digitate margin.

*Size*: USNM 156625, length 1.21 mm, height 0.75 mm.

*First Antenna* (Figure 7d): 1st joint: few rows of minute spines on medial surface. 2nd joint: short spines forming rows on lateral surface and 1 spinous dorsal bristle. 3rd and 4th joints: fused; 3rd joint with 1 spinous dorsal bristle and 1 minute ventral bristle; 4th joint with 1 dorsal bristle with few faint spines and 2 longer ventral bristles with few faint spines; 5th joint: small, with sensory bristle with abundant slender filaments emerging from basal cup, 4 short marginal filaments, and bifurcate tip. 6th joint: short medial bristle. 7th joint: a-bristle about equal in length to 6th joint; b-bristle bare, about one and one-half times length of a-bristle, minute spine at tip; c-bristle reaching past tip of sensory bristle of 5th joint, with 4 marginal filaments and bifurcate tip. 8th joint: d- and e-bristles bare, almost as long as c-bristle (tip of e-bristle broken off on both limbs of USNM 156625); f-bristle about three-fourths length of c-bristle, with 4 marginal filaments and bifurcate tip; g-bristle almost as long as c-bristle, with 5 marginal filaments and bifurcate tip; tips of all filaments and bristles with a minute spine.

*Second Antenna*: Protopodite bare. Endopodite 3-jointed (Figure 7e): 1st joint short, with 2 small, proximal, anterior bristles; 2nd joint short with 2 short, stout, spinous, ventral bristles; 3rd joint elongate, recurved, with 2 short terminal bristles

and 3 or 4 ridges on ventral side near tip, dorsal side of 3rd joint in vicinity of curvature undulate. Exopodite: 1st joint bare; 2nd joint about twice length of 3rd; joints 2-8 with natatory bristles; joint 9 with 2 natatory bristles; all bristles with natatory hairs but without spines; basal spines absent.

*Mandible* (Figure 7f): Coxale endite consisting of stout spine; medial surface of coxale with few minute spines near ventral margin. Basale: medial surface with 4 bristles near ventral margin (3 proximal, 1 distal); lateral surface with 2 distal bristles near ventral margin; dorsal margin with 2 sub-



FIGURE 7.—*Sarsiella capsula* Norman, adult male, USNM 156625, length 1.21 mm: a, right valve, inside view; b, anterior of left valve, inside view; c, caudal process of left valve, inside view; d, left 1st antenna, medial view (only proximal part of filaments of sensory bristle shown); e, endopodite of right 2nd antenna, medial view; f, left mandible, medial view.

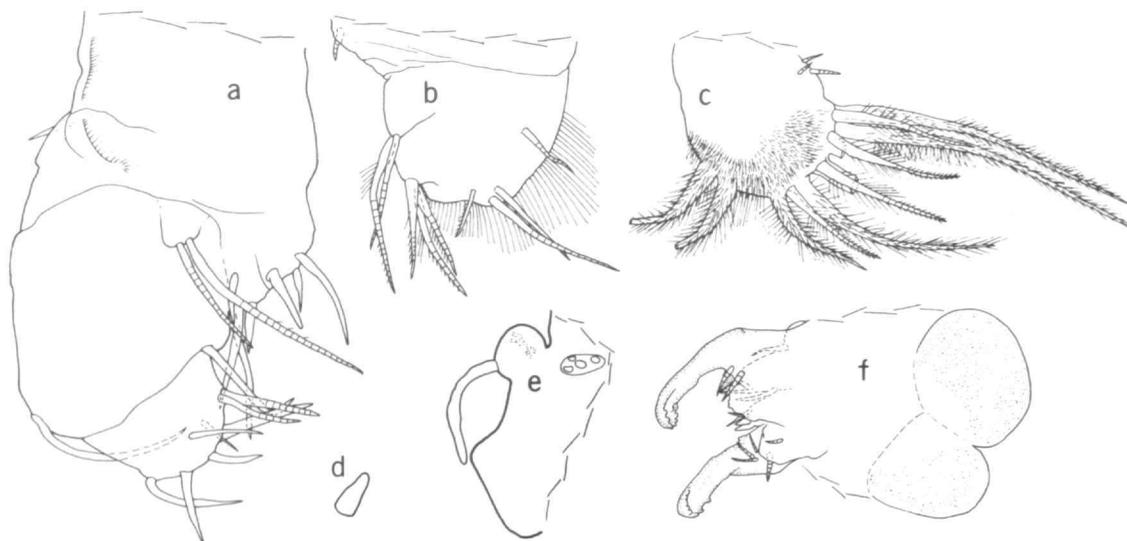


FIGURE 8.—*Sarsiella capsula* Norman, adult male, USNM 156625: *a*, maxilla, lateral view; *b*, distal end of 5th limb; *c*, left 6th limb, medial view; *d*, 7th limb; *e*, left lateral eye, medial eye, and rod-shaped organ, anterior of body, upper lip; *f*, copulatory organ showing seminal vesicles and both copulatory limbs.

terminal bristles. Exopodite consisting of hirsute process with base on lateral side of basale and distal part medial to 1st endopodial joint. Endopodite: 1st joint with dorsal margin with proximal notch and several terminal spines forming row, ventral margin with 2 terminal bristles (1 short, 1 long), medial surface hirsute on dorsal half; 2nd joint with dorsal margin with long stout midbristle, ventral margin with long stout terminal bristle with few marginal spines, medial surface with slender spines forming row along distal margin; end joint with stout terminal claw, 2 short ventral bristles, and 1 short dorsal bristle.

**Maxilla** (Figure 8*a*): Coxale with short dorsal bristle and fringe of long hairs. 3 endites with total of about 16 bristles. Exopodite with 2 bristles (inner bristle about one-half length of outer bristle). Endopodite: 1st joint with 1 slender  $\alpha$ -bristle with few faint spines, and 1 slender  $\beta$ -bristle; end joint with total of 7 or 8 bristles; limb reduced.

**Fifth Limb** (Figure 8*b*): Epipodial appendage fragmented but with more than 18 bristles. Single endite with short bare bristle. Exopodite: 1st joint with 2 spinous bristles; joints 2–5 fused, hirsute, with total of 7 bristles.

**Sixth Limb** (Figure 8*c*): Single endite with 3 short bristles; end joint with 6 lateral hirsute bristles, 4

medial bristles with long proximal hairs and short distal spines, and 2 posterior hirsute bristles; limb hirsute.

**Seventh Limb** (Figure 8*d*): Represented by a minute stump.

**Furca**: Similar to that of female.

**Rod-shaped Organ** (Figure 8*e*): Elongate with rounded tip.

**Eyes**: Medial eye lightly pigmented, bare (Figure 8*e*); lateral eye slightly smaller than medial eye, with 4 ommatidia (Figure 8*e*).

**Copulatory Organ** (Figure 8*f*): Each limb with proximal lobe with about 5 short bristles, and an elongate lobe terminating in sclerotized hook with serrate edge; 2 bristles and a small triangular process with serrate edge present proximally near inner curvature of elongate lobe.

### *Sarsiella neapolis* Kornicker, 1974

FIGURES 9, 11–14; PLATES 5–7

*Sarsiella capsula*.—Sars, 1888:229, pl. 3: figs. 5–7, pl. 10.—Müller, 1894:214, fig. 3, pl. 1: fig. 8, pl. 4: figs. 4–6, 8–10, 21, 22, 25, 27–29, 31, 33–35, 37, 48, pl. 8: figs. 6, 7, pl. 34: figs. 47, 52, 55.—Rome, 1942:8.—Poulsen, 1965:44 [discussion].—Kornicker, 1967:33 [discussion].

*Sarsiella neapolis* Kornicker, 1974:33, figs. 13*c,d*, 14, 15.

**HOLOTYPE.**—Juvenile female in collection of Zoological Museum of Berlin (ZMB) 9155, sp. No. 1, in alcohol, length including caudal process 1.37 mm.

**TYPE-LOCALITY.**—Gulf of Naples.

**MATERIAL.**—USNM 153928, 1 A-1 male from station X054; USNM 156650, 1 ovigerous female from station X053; USNM 156643, 1 adult male from station X057; USNM 156634, 1 ovigerous female from station X057; USNM 156986, 1 specimen from station X070; USNM 156987, 1 ovigerous female and 7 juveniles from station X053; USNM 156648, 1 juvenile male from station X057; 2 juveniles from station X057 in the Museum of Natural History "Grigore Antipa," Bucharest, Romania.

**DESCRIPTION OF ADULT FEMALE (Figures 9–11).**—Carapace oval in lateral view with prominent posteroventral caudal process; anterior margin rounded without rostrum or incisur.

**Ornamentation (Figure 9):** Central flat area with peripheral ridge bearing small projecting processes; the processes along posterior and ventral parts of ridge more prominent than those along anterior and dorsal parts of ridge; the 2 posterodorsal and posterior processes more prominent than others, but posteroventral process only slightly smaller than posterior process on some specimens; most of the processes continue as low radial ribs extending toward edges of valve; one of these ribs bisects caudal process; surface of valve with abundant shallow fossae; surface between fossae with densely distributed short spines covered by gelatinous substance; long bristles present along anterior and ventral margin.

**Infold:** Anterior infold with minute bristle ventral to midpoint of anterior margin; infold of caudal process with 5 or 6 bristles near middle and 1 close to inner margin of infold (arranged similarly to those illustrated by Kornicker, 1974: fig. 14h); posterior infold with 2 setose bristles near middle.

**Selvae:** Lamellar prolongation with smooth edge present along anterior, ventral, and posterior margins.

**Size (measurements include caudal process) (Figure 10):** USNM 156650, length 1.26 mm, height 1.03 mm; USNM 156634, length 1.19 mm, height 1.11 mm; USNM 156987, length 1.30 mm, height 1.10 mm.

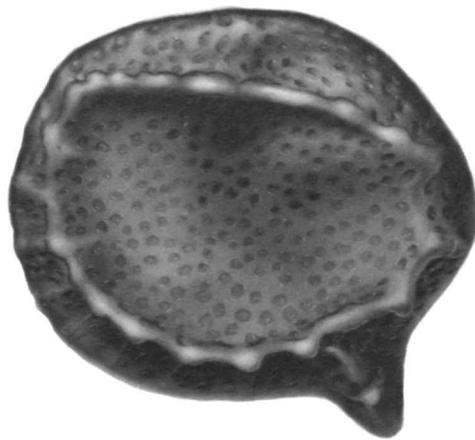


FIGURE 9.—*Sarsiella neapolis* Kornicker, adult female, USNM 156634, length 1.19 mm.

**First Antenna (Figure 11a):** 1st joint: bare. 2nd joint: 1 spinous dorsal bristle. 3rd and 4th joints: fused; 3rd joint with 2 long bristles (1 ventral, 1 dorsal); 4th joint with 3 bristles (1 dorsal, 2 ventral). 5th joint: sensory bristle with 1 short proximal filament. 6th joint: medial bristle short. 7th joint: a-bristle spinous; b-bristle bare, about one and one-half times length of a-bristle; c-bristle about same length as sensory bristle of 5th joint, with 1 short proximal filament. 8th joint: d- and e-bristles bare with blunt tips, about twice length of b-bristle; f-bristle slightly shorter than c-bristle, with 1 short proximal filament; g-bristle about same length as c-bristle, with 1 short proximal filament.

**Second Antenna:** Protopodite bare. Endopodite single jointed with 2 short proximal anterior bristles and 1 longer spinous terminal bristle (Figure 11b). Exopodite: 1st joint with minute recurved medial bristle on distal margin; bristle of 2nd joint with about 23 proximal ventral spines (spines becoming more slender distally on bristle) followed by natatory hairs; bristles of joints 2–8 with proximal ventral spines followed by natatory hairs; 9th joint with 2 bristles (dorsal of these short, bare, or with few hairs; ventral bristle long, with slender proximal spines on ventral margin followed by natatory hairs).

**Mandible (Figure 11c):** Coxale endite represented by stout spine; ventral margin of coxale with long hairs. Basale: medial side with 3 short bristles (shortest of these between and lateral to remaining

2) almost on ventral margin; ventral margin with 1 short distal bristle; lateral side with 2 short bristles near ventral margin; dorsal margin with minute midbristle and minute subterminal bristle. Endopodite: 1st joint with dorsal margin slightly undulate proximally and with terminal spines forming row extending onto medial side, ventral margin with stout terminal claw with row of minute teeth proximally along dorsal margin, medial surface

with slender spines forming pattern; 2nd joint with dorsal margin with short subterminal bristle, ventral margin with stout terminal claw; 3rd joint with stout terminal claw and 3 minute bristles (2 ventral and 1 dorsal to base of claw).

*Maxilla* (Figure 11d): Coxale with short bare bristle on anterior margin. Endites with total of 15 bristles. 1 bristle on basale near exopodite. Exopodite with 2 bristles (inner of these about one-half

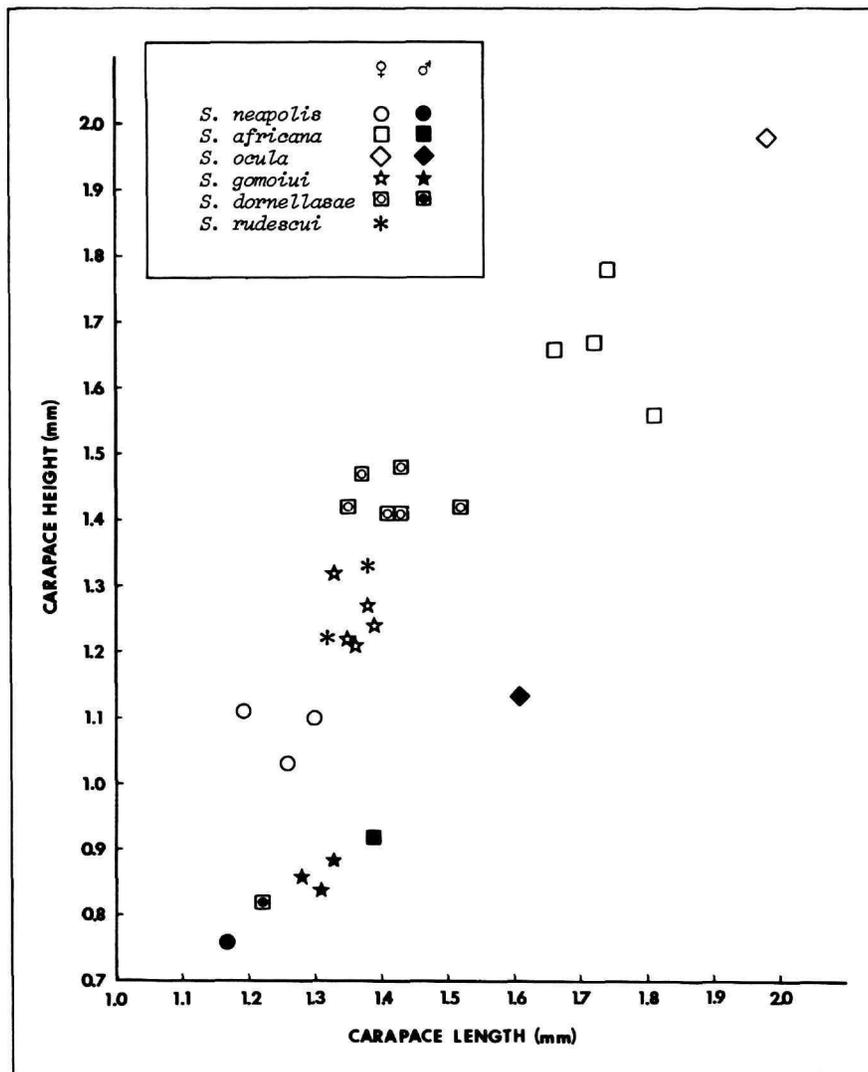


FIGURE 10.—Carapace length–height diagram of adult males and females of species of *Sarsiella* in this study having abundant surface bristles on the carapace and, also, a gelatinous coating.



FIGURE 11.—*Sarsiella neapolis* Kornicker, adult female, USNM 156650, length 1.26 mm: *a*, left 1st antenna, medial view; *b*, endopodite of right 2nd antenna, medial view; *c*, left mandible, medial view; *d*, left maxilla, medial view; *e*, distal end of 5th limb; *f*, left 6th limb, medial view; *g*, distal part of 7th limb; *h*, right lateral eye, medial eye and rod-shaped organ; *i*, left lateral eye (anterior to left); *j*, medial eye and rod-shaped organ, anterior of body, upper lip.

length of outer bristle). Endopodite: 1st joint with stout pectinate  $\alpha$ - and  $\beta$ -bristles; 2nd joint with 2 short a-bristles, 1 very small c-bristle, and 5 pectinate end bristles.

*Fifth Limb* (Figure 11e): Endite with 1 fairly long bristle. Exopodite: 1st joint with 2 spinous bristles; joints 2-5 fused, hirsute, with total of 7 spinous bristles.

*Sixth Limb* (Figure 11f): Single endite with 2 short medial bristles and 1 longer terminal bristle; end joint with 11 ventral bristles with short marginal spines and 2 longer, hirsute, posterior bristles; medial side with abundant long hairs near posterior margin and shorter hairs forming rows elsewhere.

*Seventh Limb* (Figure 11g): Each limb with 8 bristles, 6 terminally (3 on each side) and 2 proximally (1 on each side); each bristle with 2-5 bells; bells decrease in size distally along bristle; terminus consisting of 2 opposing combs, each with 5 curved teeth.

*Furca*: Each lamella with 5 claws; claw 1 joined to lamella, others separated from lamella by suture; claws 1-4 with teeth along posterior margin (some teeth longer than others); left lamella following claw 5 with 4 or 5 spines; right lamella following claw 5 with fewer and smaller spines.

*Rod-shaped Organ* (Figure 11h,j): Elongate with rounded tip.

*Eyes*: Medial eye lightly pigmented, bare (Figure 11h,j). Lateral eye about same size as medial eye, with 4 ommatidia (Figure 11h,i).

*Upper Lip* (Figure 11j): Helmet shaped.

*Genitalia*: Consisting of round sclerotized ring on each side of body in front of furca.

*Brushlike Organ*: Consisting of about 5 minute bristles on each side of body dorsal to genitalia.

*Eggs*: USNM 156650 with 3 eggs in marsupium and 4 small unextruded eggs (eggs about half the diameter of extruded eggs); USNM 156634 with 3 eggs in marsupium; USNM 156987, 4 eggs in marsupium.

**SUPPLEMENTARY DESCRIPTION OF ADULT MALE** (Figures 12, 13).—Carapace elongate with prominent rostrum and truncate posterior.

*Ornamentation* (Figure 12): Broad flat middle area of valve with peripheral rib similar to that of adult female but with more prominent postero-dorsal and posterior processes; ventral part of ridge with 5 processes; anterior part of ridge extending

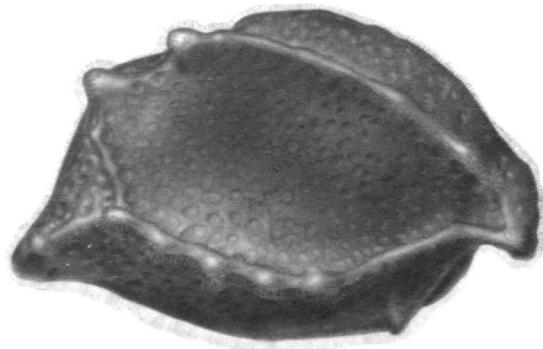


FIGURE 12.—*Sarsiella neapolis* Kornicker, adult male, USNM 156643, length 1.17 mm.

onto rostrum; posterior part of ridge ventral to prominent posterior processes subdued; surface of valve with abundant shallow fossae and spines similar to those on adult female; spines covered by gelatinous substance; long bristles present along anteroventral margin and scattered over valve surface; a long bristle present at peak of the postero-dorsal and posterior processes of peripheral ridge; short bristles present along inset ventral edge of valve.

*Size* (measurements include caudal process) (Figure 10): USNM 156643, length 1.17 mm, height 0.76 mm.

*First Antenna* (Figure 13a): 1st joint: bare. 2nd joint: 1 dorsal bristle and short spines forming rows on medial surface. 3rd and 4th joints: fused; 3rd joint with short dorsal bristle and minute ventral bristle; 4th joint with 3 bristles (2 ventral, 1 dorsal). 5th joint: minute, sensory bristle with cuplike basal part with abundant bristles and stem with 4 marginal filaments and small spines at tip. 6th joint: medial bristle short. 7th joint: a-bristle bare, about four times length of bristle of 6th joint; b-bristle bare, about one-fourth times longer than a-bristle; c-bristle extending past tip of sensory bristle of 5th limb, with 4 fairly long marginal filaments, 1 minute filament near base of distal marginal filament, and with minute spines at tip. 8th joint: d- and e-bristles slightly more than twice length of b-bristle, bare with blunt tips; f-bristle about same length as e-bristle, with 4 fairly long marginal filaments and minute spines at tip; g-bristle almost as long as c-bristle, with 4 fairly long marginal filaments and minute spines at tip.

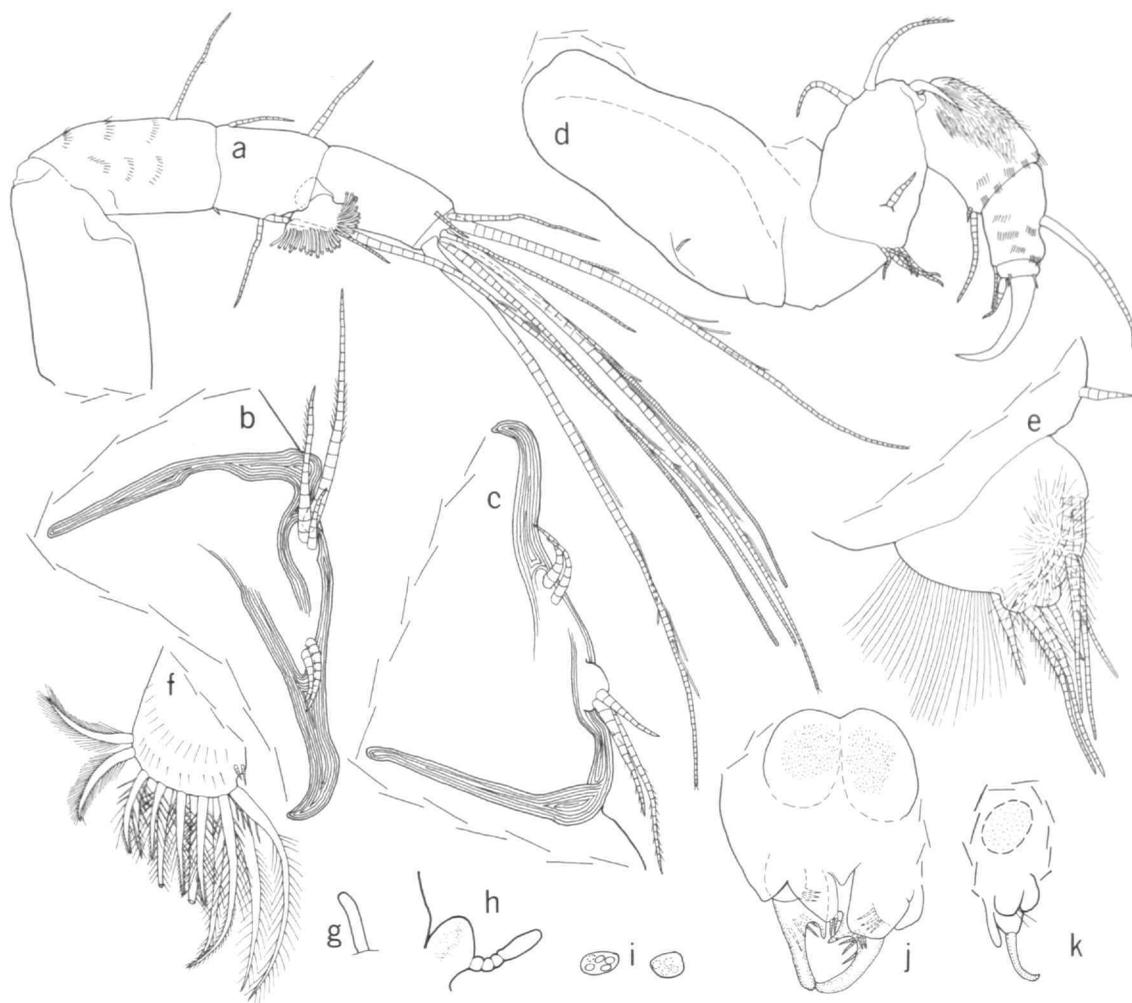


FIGURE 13.—*Sarsiella neapolis* Kornicker, adult male, USNM 156643, length 1.17 mm: *a*, left 1st antenna, medial view (only proximal part of filaments of sensory bristles shown); *b*, endopodite of right 2nd antenna, medial view (anterior down); *c*, endopodite of left 2nd antenna, medial view; *d*, left mandible, medial view; *e*, distal end of 5th limb; *f*, 6th limb; *g*, 7th limb; *h*, medial eye and rod-shaped organ; *i*, left and right lateral eyes; *j*, copulatory organ showing seminal vesicles and both copulatory limbs; *k*, right copulatory limb in situ (anterior to right).

**Second Antenna:** Protopodite bare. Endopodite single jointed or with minute 2nd joint: 1st joint with 2 short, proximal, anterior bristles; minute 2nd joint with 3 short bristles (Figure 13*b,c*). Exopodite: 1st joint with minute recurved medial bristle on distal margin; bristle of 2nd joint with few long hairs proximally on dorsal margin, then about 10 slender spines on ventral margin, followed

by natatory hairs on both margins; bristles on joints 3 and 4 with proximal natatory hairs on both margins followed by few ventral spines and, then, natatory hairs on both margins; bristles of joints 5–8 with natatory hairs but no spines; 9th joint with 2 bristles with natatory hairs (dorsal bristle very short); no basal spines.

**Mandible** (Figure 13*d*): Coxale endite consisting

of single spine; hairs absent on ventral and medial surfaces of coxale. Basale: medial side with 1 short bristle near middle and 3 short proximal bristles near ventral margin close to 2 similar bristles on ventral margin; dorsal margin with 2 fairly long bristles. Exopodite with base on lateral side of basale, and hirsute distal part medial to 1st endopodite joint. Endopodite: 1st joint with medial side with long hairs near dorsal margin and shorter hairs forming rows elsewhere, ventral margin with 2 terminal bristles (1 very short); 2nd joint with proximal notch and 1 stout midbristle on dorsal margin, 1 short slender terminal bristle on ventral margin, and spines forming rows on medial surface; 3rd joint with 1 stout terminal bristle, 1 minute dorsal bristle, and 2 ventral bristles (1 minute, 1 with bulbous base).

*Maxilla*: Limb reduced, with weak bristles. In general, similar to maxilla of adult male of *Sarsiella capsula* described herein.

*Fifth Limb* (Figure 13e): Coxale with short anterior bristle. Exopodite hirsute; 1st joint with 2 hirsute bristles; joints 2–5 fused, with total of 6 or 7 hirsute bristles.

*Sixth Limb* (Figure 13f): Single endite with 2 small bristles; ventral margin of end joint with 6 hirsute lateral bristles, 4 or 5 medial bristles with long proximal and short distal spines, and 2 hirsute posterior bristles.

*Seventh Limb* (Figure 13g): Represented by minute stump.

*Furca*: Similar to that of adult female.

*Rod-shaped Organ* (Figure 13h): Elongate with 3 proximal segments and rounded tip.

*Eyes*: Medial eye lightly pigmented, bare (Figure 13h). Lateral eye slightly smaller than medial eye, with 4 ommatidia (Figure 13i).

*Copulatory Organ* (Figure 13j,k): Each side with 2 lobes with bristles, and elongate lobe terminating in sclerotized hooklike process; dentate triangular process and several bristles present proximally on inner curvature of elongate lobe.

**DESCRIPTION OF A-1 MALE** (Figure 14; Plates 5–7).—Carapace oval in lateral view with truncate posterior and posteroventral caudal process, and without rostrum or incisur.

*Ornamentation* (Figure 14a; Plates 5–7): Peripheral ridge and radial ribs similar to those of adult

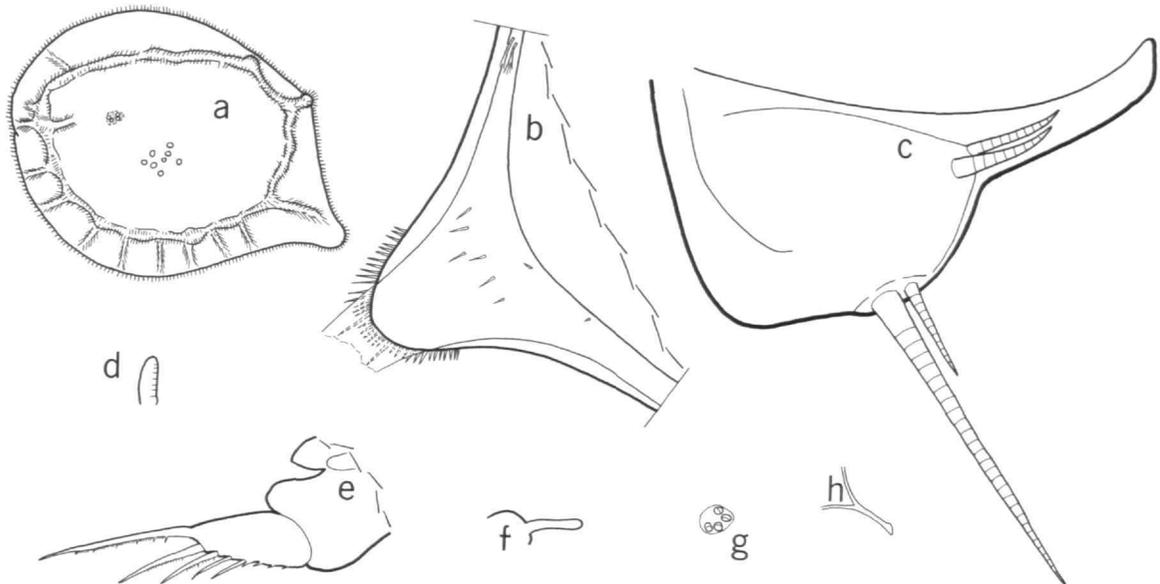


FIGURE 14.—*Sarsiella neapolis* Kornicker, A-1 male, USNM 153928, length 1.24 mm: a, complete specimen showing left lateral eye as seen through shell and central adductor muscle attachments; b, posterior end of left valve, inside view; c, endopodite of left 2nd antenna, medial view; d, left 7th limb; e, left furcal lamella; f, medial eye and rod-shaped organ; g, left lateral eye; h, left Y-sclerite (anterior to left).

female (Figure 14a; Plate 5a-c); surface with abundant shallow fossae (Plate 5a,d), SEM micrographs reveal few spines at bottom of fossae and numerous spines between fossae (Plate 5d-f) and forming ridges and ribs (Plates 5a-c, 6a); tips of spines rounded and with few minute papillae (Plate 6d); surface between spines covered with gelatinous substance forming film on drying (Plates 5d-f, 6); long bristles or hairs present along anterior and ventral margins and scattered over valve surface (Plates 5a-d, 6b).

*Infold*: Infold of caudal process with 6 bristles plus 1 near inner margin (Figure 14b); anterior infold below valve middle with 1 small bristle; posterior infold with 2 setiferous bristles dorsal to caudal process (Figure 14b).

*Central Adductor Muscles*: See Plate 7.

*Size*: USNM 153928, length including caudal process 1.24 mm, length excluding caudal process 1.14 mm, height 0.96 mm.

*Second Antenna*: Protopodite bare. Endopodite 1-jointed with 2 short anterior bristles and a long and a short terminal bristle (Figure 14c). Exopodite: 1st joint with minute, medial, recurved, terminal bristle; bristles of joints 2-8 with proximal spines along ventral margin and distal natatory hairs; 9th joint with 3 bristles (2 long with proximal ventral spines and distal natatory hairs, and 1 short, bare).

*Seventh Limb* (Figure 14d): Vestigial without bristles.

*Furca* (Figure 14e): Each lamella with 5 claws followed by 4 points; claw 1 fused to lamella, remaining claws separated from lamella by suture.

*Rod-shaped Organ* (Figure 14f): 1-jointed with rounded tip.

*Eyes*: Lateral eye with 4 ommatidia (Figure 14g); medial eye larger than lateral eye, lightly pigmented (Figure 14f).

*Y-Sclerite* (Figure 14h): Typical for family.

*Remaining Appendages*: Not examined in detail, but in general similar to those of adult female.

### *Sarsiella anommata*, new species

FIGURES 15-17; PLATE 8

**HOLOTYPE**.—USNM 141559, ovigerous female, on slides and in alcohol.

**TYPE-LOCALITY**.—Station X054.

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

**PARATYPE**.—"Grigore Antipa" 299, A-1 female from same sample as holotype.

**DISTRIBUTION**.—Collected at only the type-locality.

**DESCRIPTION OF ADULT FEMALE** (Figures 15-17a-j; Plate 8).—Carapace oval in lateral view with elongate, backward pointing, caudal process and without incisur (Figures 15, 16a).

*Ornamentation* (Figure 15): Surface of each valve punctate with upper and lower rib meeting at posterodorsal corner; 3 faint radial riblets present along anterior margin; long bristles along anterior and ventral margin and sparsely distributed on valve surface (Plate 8a,b); surface of valve with fossae containing inward pointing spines (Plate 8b-f); surface between fossae with minute pits (Plate 8b,c) and papillae (Plate 8d-f).

*Infold*: Anterior infold with minute bristle near valve midheight (Figure 16b,d); infold of caudal process with 8-10 small bristles in addition to 1 or 2 bristles at inner margin (Figure 16b,c,e); posterior infold with 2 setose bristles dorsal to caudal process (Figure 16b,c,e).

*Central Adductor Muscle Scars*: Consisting of about 11 ovoid scars.

*Selva*: Wide lamellar prolongation along anterior, ventral and posterior valve margins.

*Size*: USNM 141559, length excluding caudal

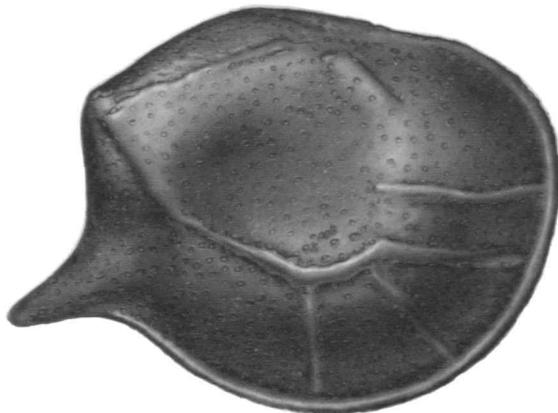


FIGURE 15.—*Sarsiella anommata*, new species, holotype, adult female, USNM 141559, length 1.40 mm.

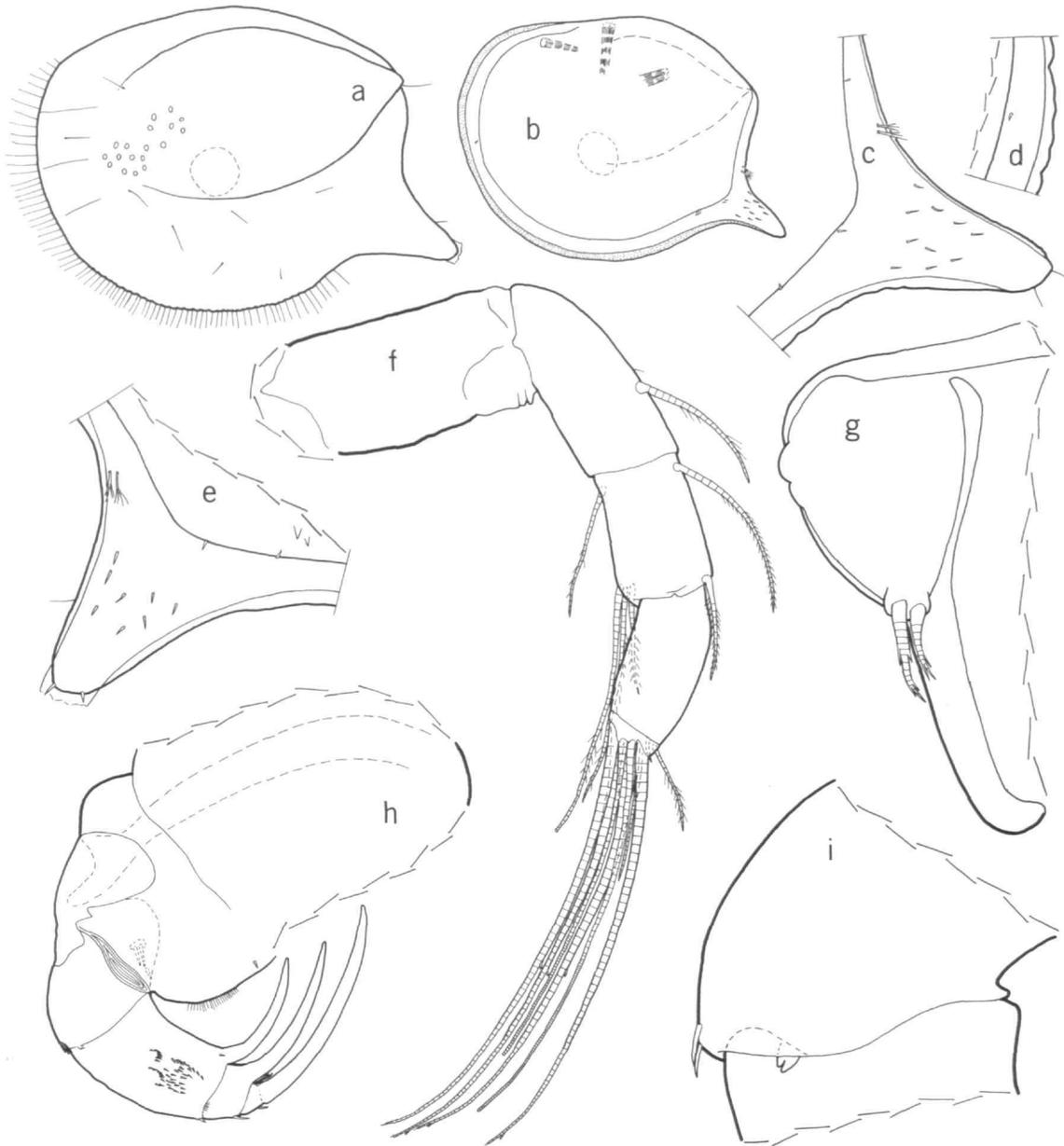


FIGURE 16.—*Sarsiella anommata*, new species, holotype, adult female, USNM 141559, length 1.40 mm: *a*, complete specimen showing area of central muscle attachments (dashed line) and a few punctae; *b*, right valve, inside view; *c*, posterior of right valve, inside view; *d*, inside view of section of anterior part of right valve showing minute bristle on infold; *e*, posterior of left valve, inside view; *f*, right 1st antenna, lateral view; *g*, endopodite of left 2nd antenna, medial view (anterior down); *h*, right mandible, medial view; *i*, distal end of basale and proximal part of 1st endopodite joint of left mandible showing position of exopodite, lateral view.

process 1.22 mm, length with caudal process 1.40 mm, height 1.06 mm.

*First Antenna* (Figure 16f): 1st joint: bare. 2nd joint: few spines along dorsal margin and 1 spinous dorsal bristle. 3rd joint: fused to 4th, with 2 spinous bristles (1 ventral, 1 dorsal). 4th joint: 4 spinous bristles (1 dorsal, 3 ventral). 5th joint: sensory bristle with 3 minute filaments (1 proximal, 1 near middle, 1 subterminal). 6th joint: small medial bristle near dorsal margin. 7th joint: a-bristle short spinous; b-bristle bare, slightly longer than a-bristle; c-bristle same length as sensory bristle of 5th joint, with 3 minute filaments (1 proximal, 1 near middle, 1 subterminal) and with small spine at tip. 8th joint: d- and e-bristles bare, slightly shorter than c-bristle; f-bristle same length as c-bristle, with 1 minute subterminal filament and small spine at tip; g-bristle same length as c-bristle, with 4 minute filaments (2 proximal, 1 near middle, 1 subterminal), and with small spine at tip.

*Second Antenna*: Protopodite bare. Endopodite 1-jointed with bare terminal protuberance and 2 anterior bristles with few marginal spines (Figure 16g). Exopodite: 1st joint with slender medial spine on distal margin; bristle of 2nd joint with few long hairs proximally on dorsal margin followed by slender spines on ventral margin and then natatory hairs on both margins; bristles of joints 2–8 with natatory hairs, some with few slender ventral spines; 9th joint with 3 bristles (1 short with short marginal spines, 2 long with natatory hairs).

*Mandible* (Figure 16h): Coxale endite consisting of minute spine; ventral margin of basale with long hairs. Basale: dorsal margin with 2 subterminal bristles; medial side near ventral margin with 3 bristles; ventral margin with 1 minute distal bristle; lateral side without bristles (absence probably aberrant; see description of A-1 female which follows). Endopodite: 1st joint with distal medial spines, row of terminal lateral spines, 1 minute terminal bristle on dorsal margin, and 1 minute medial bristle at base of bare ventral claw; 2nd joint with minute terminal bristle on dorsal margin and bare ventral claw; 3rd joint with 3 minute bristles at base of main claw (1 dorsal, 2 ventral). Exopodite represented by minute bifurcate process on lateral side a small distance from dorsal margin (Figure 16i).

*Maxilla* (Figure 17a): Precoxale and coxale with fringe of hairs along dorsal margin; coxale with short dorsal bristle. Endite I with about 5 bristles; endites II and III with total of about 9 bristles. Basale with 1 slender bristle near base of exopodite. Exopodite with 2 bristles, one of these about half length of other. Endopodite: 1st joint with pectinate  $\alpha$ - and  $\beta$ -bristles; 2nd joint with 2 a-bristles, 1 c-bristle and usual 5 b- and d-bristles.

*Fifth Limb* (Figure 17b): Single endite with 1 short bristle. Exopodite: hirsute; 1st joint with 2 spinous bristles; joints 2–5 fused; 2nd joint with 3 spinous bristles separated from joints 3–5 by space; joints 3–5 with total of 4 spinous bristles.

*Sixth Limb* (Figure 17c,d): Single endite with 3 short bristles; end joint with 10–12 spinous bristles and 2 stout, hirsute, posterior bristles.

*Seventh Limb* (Figure 17e): Proximal group with 2 bristles (1 on each side); distal group with 6 bristles (3 on each side) each with 3–6 bells, proximal 3 bells on long distal bristles longer than remaining bells; tip of limb bare, without combs.

*Furca* (Figure 17f): Each lamella with 5 slender claws followed by 2–4 minute points and hairs; claw 1 fused to lamella, remaining claws separated by suture; claws with teeth along posterior margins and hairs along anterior margins; some teeth longer than others; few spines present along anterior margin of lamellae; long hairs present on inner side of lamellae near bases of claws.

*Rod-shaped Organ* (Figure 17g): 1-jointed with rounded tip.

*Eyes*: Lateral eyes absent; medial eye small, unpigmented (Figure 17g).

*Upper Lip* (Figure 17g): Helmet-shaped projecting anteriorly, hirsute.

*Genitalia* (Figure 17i,j): Consisting of 2 oval sclerotized rings, one of these cuplike.

*Brushlike Organ* (Figure 17h): Consisting of 6 minute, slender, ringed bristles.

*Y-Sclerite* (Figure 17i): Typical for family.

*Eggs*: USNM 141559 with 3 eggs in marsupium.

**DESCRIPTION OF A-1 FEMALE** (Figure 17k).—Carapace similar to that of adult female except posterior less truncate.

*Ornamentation*: With upper and lower rib meeting in posterodorsal corner as on adult female carapace.

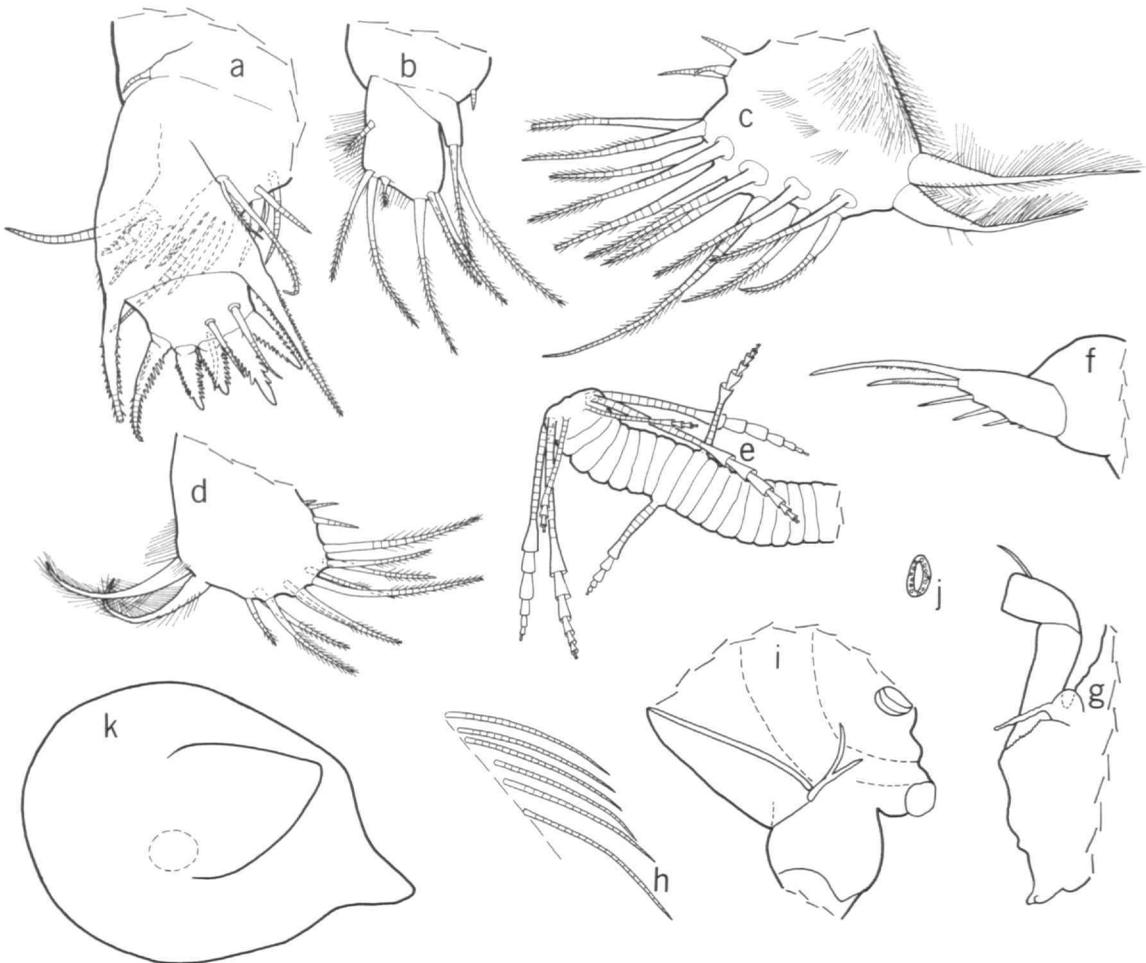


FIGURE 17.—*Sarsiella anommata*, new species, holotype, adult female, USNM 141559: *a*, maxilla, lateral view; *b*, distal end of 5th limb; *c*, *d*, 6th limbs (drawn at different magnifications); *e*, distal part of 7th limb; *f*, left lamella of furca; *g*, anterior of animal showing part of right 2nd antenna, medial eye and rod-shaped organ, upper lip; *h*, brushlike organ on right side of body, anterior to right; *i*, posterior part of body showing right genital organ, right Y-sclerite, posterior end of gut (dashed lines) terminating at anus, and proximal part of furca; *j*, left genital organ. Paratype A-1 female, "Grigore Antipa" 299, length 1.21 mm; *k*, complete specimen showing position of central adductor muscle attachments.

*Infold*: Not examined.

*Size*: "Grigore Antipa" 299, length 1.21 mm, height 0.87 mm.

*First Antenna*: Similar to that of adult female.

*Second Antenna*: Similar to that of adult female except 9th joint of exopodite with only 2 bristles (1 long, 1 short).

*Mandible*: Lateral side of basale with 2 small

bristles; limb otherwise similar to that of adult female.

*Fifth and 6th limbs*: Not examined in detail but, in general, similar to limbs of adult female.

*Seventh Limb*: Proximal group with 2 bristles (1 on each side); distal group with 4 bristles (2 on each side); bristles strongly tapering and with 2 or 3 bells.

*Furca*: Left lamella with 6 slender claws, right lamella with 5; claw 1 fused to lamella, remaining claws separated from lamella by suture; claws with teeth along posterior margin.

*Rod-shaped Organ*: 1-jointed with rounded tip.

*Eyes*: Lateral eyes absent; medial eye small unpigmented.

*Upper Lip*: Similar to that of adult female.

COMPARISONS.—Ornamentation on the carapace of *Sarsiella anommata* resembles that on the carapace of *S. murrayana* Scott, 1894. *Sarsiella anommata* differs from *S. murrayana* in having a more elongate caudal process and in lacking lateral eyes. *Sarsiella anommata* differs from *Parasarsiella globula* (Brady, 1887) in being smaller and in having fewer claws on the furca. *Sarsiella anommata* differs from *S. capsula* Norman, 1869, in having a longer caudal process and in lacking lateral eyes.

#### *Sarsiella africana*, new species

FIGURES 18-23; PLATES 9-11

HOLOTYPE.—“Grigore Antipa” 295, ovigerous female, length 1.67 mm, appendages on slide and in alcohol, carapace in alcohol.

TYPE-LOCALITY.—Station X031.

ETYMOLOGY.—The species is named after the continent.

ALLOTYPE.—USNM 153927, adult male from same station as holotype.

PARATYPES.—USNM 156612, 1 juvenile male from same sample as holotype; USNM 156613, 8 specimens, females and juveniles, including 2 without valves, from same sample as holotype; USNM 156619, 2 ovigerous females, 1 adult female, and juvenile from station X046; USNM 139847 1 adult female from same sample as holotype; USNM 156611, 1 ovigerous female from same sample as holotype; [USNM 157113], 3 specimens from same sample as holotype; [USNM 157114], 2 juveniles from same sample as holotype.

DESCRIPTION OF ADULT FEMALE (Figures 18-20; Plates 9-11).—Carapace oval in lateral view, with long posteroventral caudal process and without incisur (Figures 18, 19a; Plates 9a, 10e, 11a).

Ornamentation (Figure 18, 19d; Plates 9, 10a-d, 11): Anteroventral part of each valve with nodes forming 2 rows, each with 4 and 6 nodes (Figure

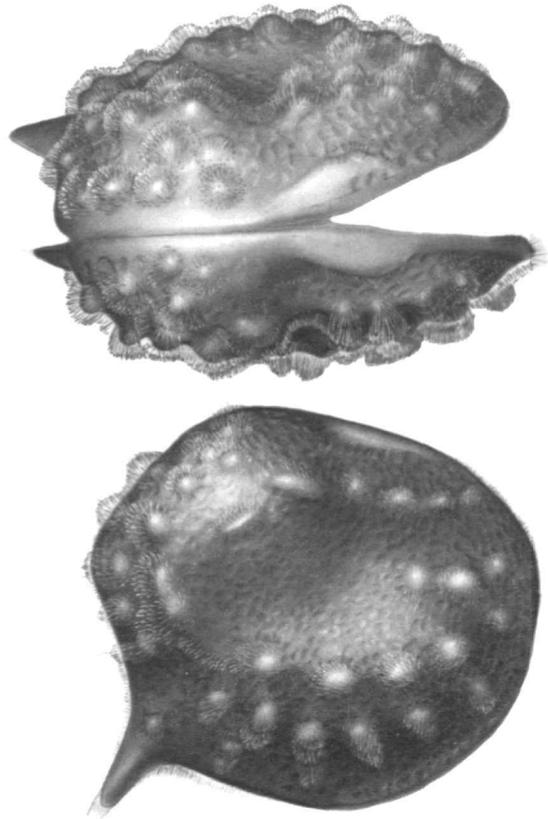


FIGURE 18.—*Sarsiella africana*, new species, holotype, adult female, “Grigore Antipa” 295, length 1.67 mm.

18; Plate 11a); dorsal part of valve with 5 or 6 nodes forming horizontal row; 4 nodes present on anterior part of valve near midheight; posterior part of valve with about 11 nodes; 2 small nodes present proximal to caudal process; total number of nodes about 33; surface of valve between nodes with shallow fossae (Figure 19d), surface of nodes and areas between nodes covered with short spines (Plates 9d-f, 10a, 11c-f); gel-like substance filling in spaces between spines (Plate 11c-f); some spines papillate (Plate 10a-d); long bristles along anterior and ventral margins and sparsely distributed over valve surface. On some specimens nodes coalesce to form horizontal, ventral and dorsal ribs.

*Infold*: Anterior infold with 1 minute bristle near inner margin at midheight (Figure 19c); in-

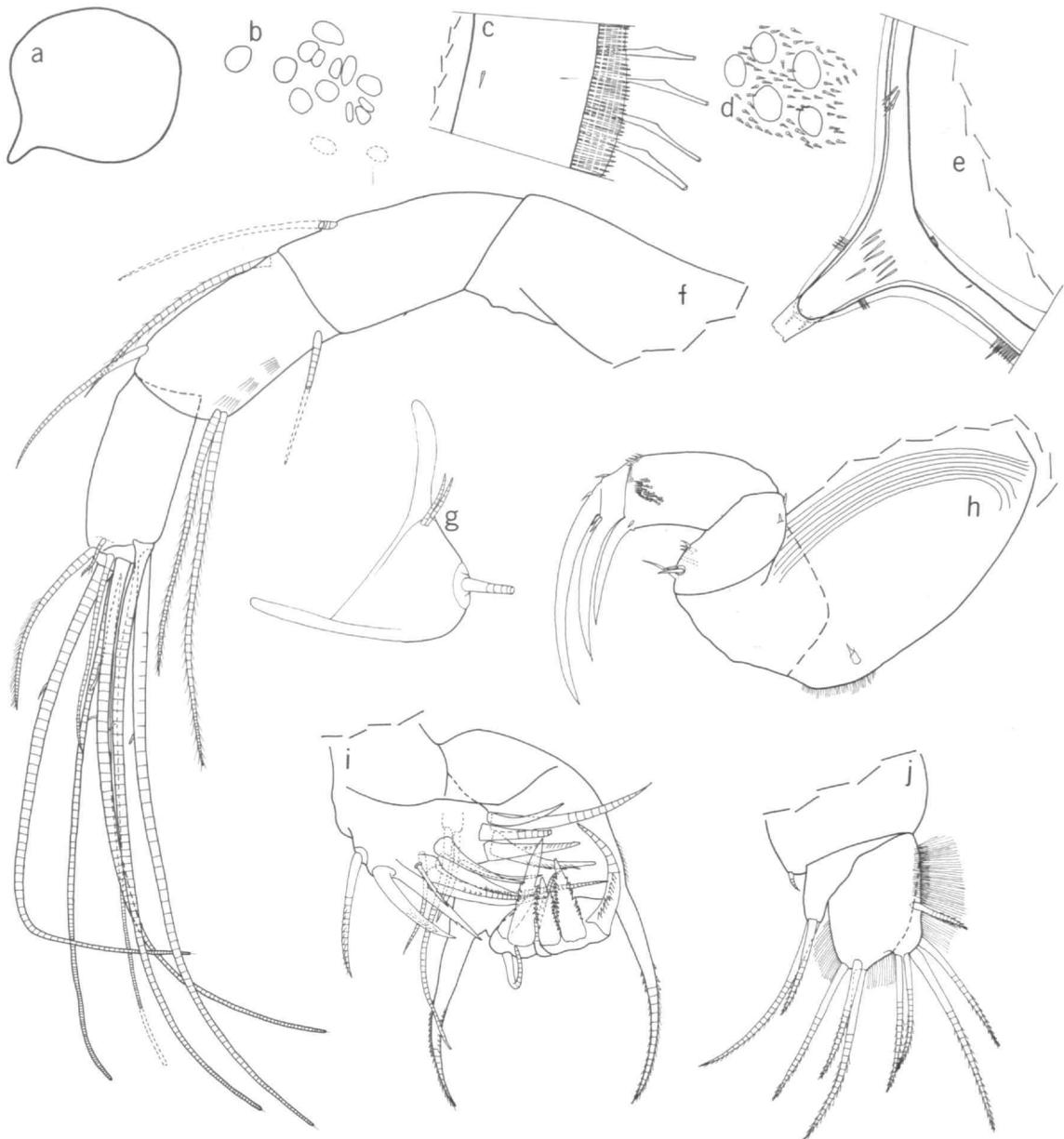


FIGURE 19.—*Sarsiella africana*, new species, paratype, adult female, USNM 139847, length 1.81 mm: *a*, outline of complete carapace; *b*, outside view of central adductor muscle attachments of left valve (anterior to left); *c*, medial view of segment of anterior part of left valve showing minute bristle on infold, and bristles along valve edge; *d*, outside view of shallow fossae and hairs on left valve; *e*, posterior of left valve, inside view; *f*, right 1st antenna, medial view; *g*, endopodite of left 2nd antenna, medial view; *h*, right mandible, medial view; *i*, left maxilla, medial view; *j*, distal end of 5th limb.

fold of caudal process with about 8 bristles in addition to 1 or 2 minute bristles along inner margin (Figure 19e; Plate 10e,f); posterior infold dorsal to caudal process with 2 setose bristles.

*Selvage*: Lamellar prolongation without fringe present along anterior, ventral, and posterior margins.

*Central Adductor Muscle Scars* (Figure 19b): Consisting of about 15 ovoid individual scars.

*Size* (Figure 10): USNM 139847, length 1.81 mm, height including caudal process 1.56 mm; holotype, "Grigore Antipa" 295, length 1.67 mm, height including caudal process 1.66 mm; USNM 156611, length 1.74 mm, height excluding caudal process 1.51 mm, height including caudal process 1.78 mm; USNM 156619a, length 1.72 mm, height excluding caudal process 1.52 mm, height including caudal process 1.67 mm.

*First Antenna* (Figure 19f): 1st joint: bare. 2nd joint: few spines along ventral and dorsal margins and 1 dorsal bristle. 3rd joint: not separated from 4th by suture, with 2 bristles (1 ventral, 1 dorsal). 4th joint: medial spines forming short rows near ventral margin and 3 bristles (2 ventral, 1 dorsal). 5th joint: sensory bristle with 1 minute proximal filament and small spine at tip. 6th joint: short, medial bristle with few spines. 7th joint: a-bristle spinous, about 4 times length of bristle of 6th joint; b-bristle bare, slightly longer than a-bristle; c-bristle about same length as sensory bristle of 5th joint, with 1 or 2 minute proximal filaments and small spine at tip. 8th joint: d- and e-bristles bare, slightly shorter than c-bristle; f- and g-bristles about same length as c-bristle, each with 1 or 2 short proximal filaments and small spine at tip.

*Second Antenna*: Protopodite bare. Endopodite 1-jointed with 2 short anterior bristles and long, spinous, terminal bristle with base on small protuberance (Figures 19g, 20g,i,j). Exopodite: 1st joint with short recurved medial spine on terminal margin; bristle of 2nd joint long, with natatory hairs but without ventral spines; bristles of joints 3-8 and 2 bristles of 9th joint (1 short, 1 long) with natatory hairs; faint short spines forming row along terminal margins of joints 2-8. Endopodite of 2nd antenna of USNM 156611 aberrant in having in addition to 2 anterior bristles, 2 terminal bristles on left limb and 3 on right.

*Mandible* (Figure 19h): Coxale endite consisting

of spine divided in half by suture; ventral margin of coxale with long hairs. Basale: ventral margin with depression near middle formed by internal muscle attachment; 6 bristles present on or near ventral margin (3 proximal and 3 distal to depression); dorsal margin with minute subterminal bristle and 1 near middle. Exopodite absent. Endopodite: medial surface of 1st joint with distal spines and minute bristle at base of main ventral claw; 2nd joint with short subterminal dorsal bristle and short bristle at base of main ventral claw; 3rd joint with minute bristle dorsal and ventral to base of terminal claw; main claw bare.

*Maxilla* (Figure 19i): Endite I with 6 bristles; endite II with about 3 bristles, 1 of these small, slender; endite III with about 5 bristles. Basale with 1 slender bristle near exopodite. Exopodite with 2 bristles, 1 of these about half length of other. Endopodite with pectinate  $\alpha$ - and  $\beta$ -bristles, 2 a-bristles, 1 c-bristle, and usual 5 end bristles.

*Fifth Limb* (Figure 19j): Single endite with 1 short bristle. Exopodite: 1st joint with 2 spinous bristles, 2nd joint with 3 spinous bristles; joints 3-5 fused, with total of 5 or 6 spinous bristles.

*Sixth limb* (Figure 20a): Single endite with 2 or 3 short bristles; end joint with 13 or 14 spinous bristles separated by short space from 2 stout, hirsute, posterior bristles.

*Seventh Limb* (Figure 20b): Each limb with 6 bristles in distal group (3 on each side) and 2 in proximal group (1 on each side), each bristle with 3-5 bells, on some bristles 2nd bell much longer than 3rd (counting from proximal end); terminus with opposing combs, each with about 8 teeth.

*Furca*: Each lamella with 5 slender claws followed by 3-5 stout spines (Figure 20c); claw 1 fused to lamella, remaining claws separated from lamella by suture; long hairs present following claws and at base of claw 1; anterior margin of lamella with faint spines; posterior margins of claws with some teeth longer and stouter than others. Furca of USNM 156619a aberrant in having 4 claws on left lamella and 3 on right (Figure 20k).

*Rod-shaped Organ* (Figure 20 d,g): 1-jointed with rounded tip.

*Eyes*: Medial eye bare, without pigment (Figure 20d,h); no lateral eyes.

*Brushlike Organ and Genitalia* (Figure 20e): Brushlike organ consisting of about 6 minute

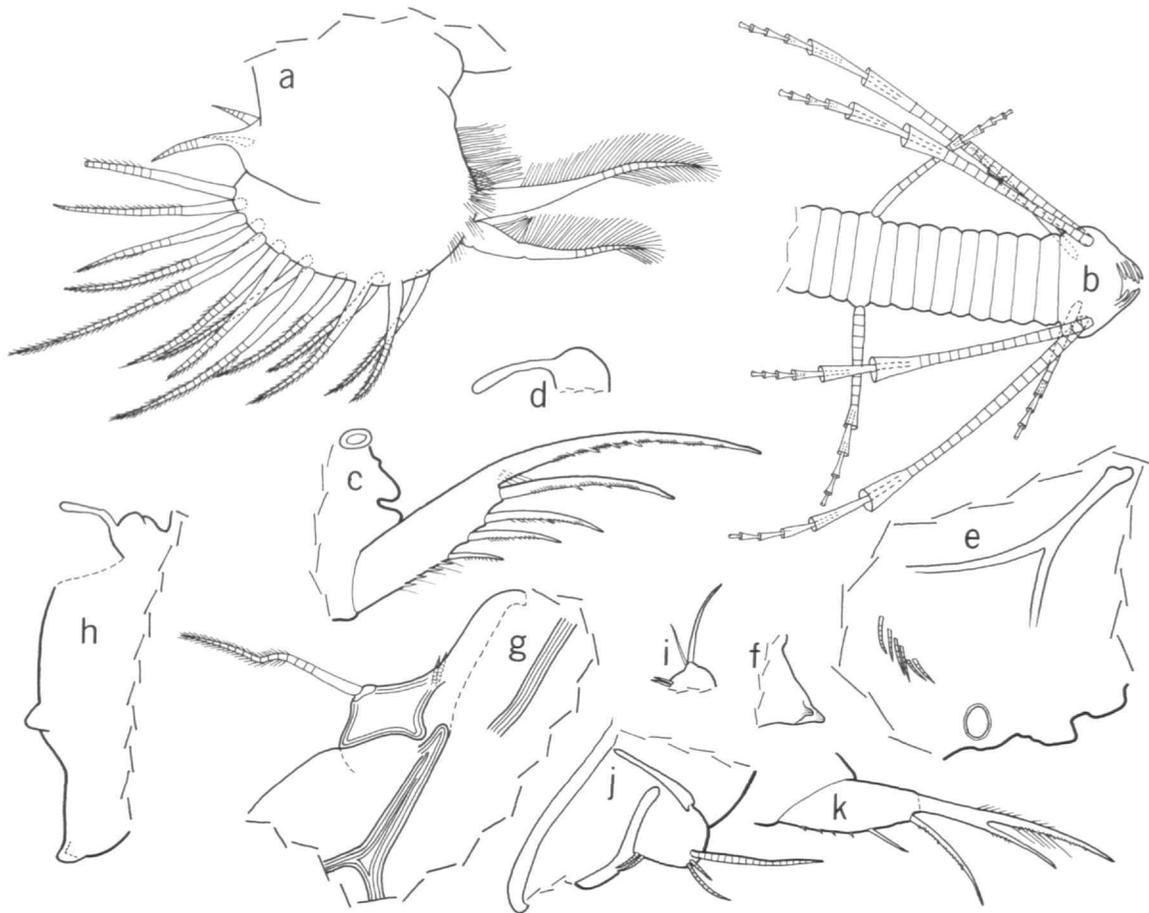


FIGURE 20.—*Sarsiella africana*, new species, paratype, adult female, USNM 139847: *a*, 6th limb; *b*, distal part of 7th limb; *c*, right furcal lamella and right genital organ; *d*, medial eye and rod-shaped organ; *e*, part of left side of body showing Y-sclerite, brushlike organ, and genital organ; *f*, upper lip (anterior to right). Holotype, adult female, "Grigore Antipa" 295, length 1.67 mm; *g*, endopodite of left 2nd antenna, lateral view; *h*, anterior of body showing medial eye and rod-shaped organ, anterior process, and upper lip. Adult female, USNM 156611, length 1.55 mm; *i*, endopodite of left 2nd antenna, medial view; *j*, endopodite of right 2nd antenna, medial view. Paratype, adult female, USNM 156619a, length 1.72 mm; *k*, aberrant right lamella of furca.

ringed bristles dorsal to oval sclerotized ring of genitalia.

*Upper Lip* (Figure 20*f,h*): Consisting of helmet-shaped lobe with 2 anterior processes.

*Y-Sclerite* (Figure 20*e*): Normal for family.

*Eggs*: USNM 156611 and USNM 156619a each with 4 eggs in marsupium and also large unextruded eggs; holotype and USNM 156619c each with 5 eggs in marsupium.

*Parasites*: USNM 156611 with female choniostomatid copepod in marsupium. Also, one of the ovigerous females assigned USNM 156619 contained female choniostomatid in marsupium.

**DESCRIPTION OF ADULT MALE** (Figures 21, 22).—Carapace elongate with prominent rostrum and caudal process.

*Ornamentation* (Figure 21): A lateral rib extending from rostrum, where it forms knob projecting

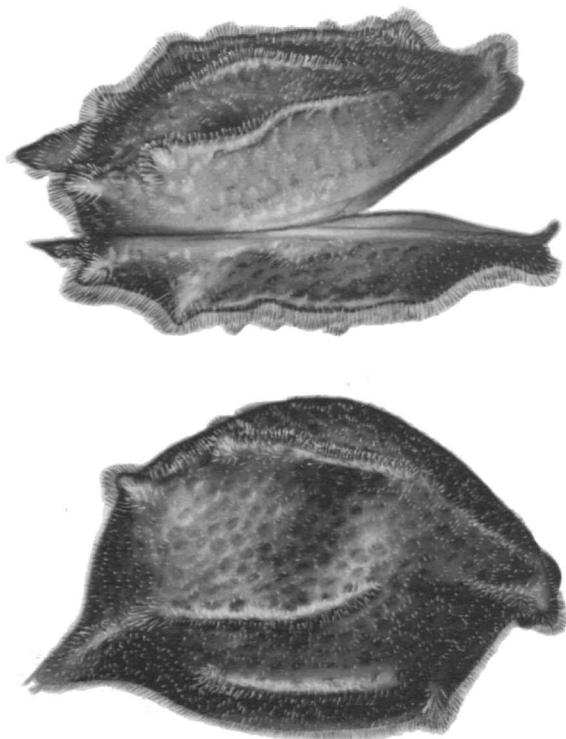


FIGURE 21.—*Sarsiella africana*, new species, allotype, adult male, USNM 153927, length 1.39 mm.

anteriorly past edge of valve, to posterodorsal part of valve where it forms 2 processes, each with 1 long bristle; a second lower rib extending from rostrum across middle of valve to point near posterior margin where it terminates in low process with 1 long bristle; a low riblet extends from the latter process onto caudal process; a third shorter rib present near ventral margin; surface of valves with low fossae; abundant short spines present between fossae and on ribs; long bristles present along anterior and ventral margins and sparsely distributed on valve surface; gelatinous substance forming coating between surface spines.

*Infold and Selvage*: Not examined in detail.

*Size* (Figure 10): USNM 153927, length including caudal process 1.39 mm, height 0.92 mm.

*First Antenna* (Figure 22a): 1st joint: bare. 2nd joint: few short spines near ventral and dorsal margins and 1 dorsal bristle. 3rd joint: not separated from 4th by suture; with 2 bristles (1 dorsal,

1 ventral). 4th joint: 3 bristles (2 ventral, 1 dorsal). 5th joint: small; sensory bristle with numerous filaments emerging from cuplike base, and stem with 4 distal marginal filaments. 6th joint: medial bristle short. 7th joint: a-bristle bare, slightly longer than combined length of joints 5–8; b-bristle bare, slightly longer than a-bristle; c-bristle slightly longer than sensory bristle of 5th joint, with 5 short filaments excluding tip. 8th joint: d- and e-bristles bare, slightly shorter than sensory bristle, with blunt tips; f-bristle slightly shorter than sensory bristle with 4 marginal filaments; g-bristle slightly longer than sensory bristle, with 4 marginal filaments.

*Second Antenna*: Protopodite bare. Endopodite 1-jointed with 2 short, anterior, proximal bristles and 3 terminal bristles on low protuberance (Figure 22b). Exopodite: 1st joint with short recurved medial bristle on terminal margin; bristle of 2nd joint long, with 7–11 long proximal hairs on dorsal margin followed by 13–18 short slender spines on ventral margin and, then, natatory hairs on both margins; bristles of joints 3 and 4 with natatory hairs and with or without few spines; bristles of joints 5–8 with natatory hairs but without spines; 9th joint with 2 bristles with natatory hairs (1 long; 1 short, dorsal); joints 2–7 with short spines forming row along distal margin, no basal spines.

*Mandible* (Figure 22c): Coxale endite consisting of weak spine; ventral margin of coxale bare. Basale: ventral margin with 2 short bristles near middle; medial surface with 4 bristles near ventral margin; dorsal margin with 2 subterminal bristles. Exopodite hirsute, with base on lateral side of basale and distal part on medial side of 1st endopodite joint. Endopodite: 1st joint hirsute on dorsal half of medial side and with 2 terminal ventral bristles (1 long, 1 minute); 2nd joint with spines forming rows on medial surface and 2 bristles (1 dorsal near middle, and 1 ventral, terminal); 3rd joint short, with stout terminal claw and 3 short bristles (1 dorsal, 2 ventral) near base of claw.

*Maxilla* (Figure 22d): Limb reduced and with weak bristles.

*Fifth Limb* (Figure 22e): Epipodial appendage with 37 bristles. Exopodite with weakly developed bristles: 1st joint with 2 bristles; joints 2–5 fused, hirsute, with total of 8 bristles.



*a*, left 1st antenna, lateral view; *b*, distal part of protopodite and endopodite of left 2nd antenna, medial view; *c*, right mandible, medial view; *d*, maxilla; *e*, distal end of 5th limb; *f*, 6th limb; *g*, left 7th limb; *h*, left lateral eye, medial eye and proximal end of rod-shaped organ; *i*, another view of left lateral eye (anterior to left), showing slightly different appearance of ommatidia than shown in *h*; *j*, right lateral eye (anterior to right).

*Sixth Limb* (Figure 22f): Single endite with 3 short bristles; end joint with 16 spinous and hirsute bristles.

*Seventh Limb* (Figure 22g): Limb represented by minute stump.

*Furca*: Similar to that of adult female.

*Rod-shaped Organ* (Figure 22h): Broken off USNM 153927.

*Eyes*: Medial eye bare with light yellow pigment (Figure 22h); lateral eyes about same size as medial eye, each with 5 light yellow ommatidia but without black pigment (Figure 22i,j).

*Copulatory Organ*: Typical for genus.

**DESCRIPTION OF JUVENILE MALE** (Figure 23).—Carapace oval in lateral view with elongate postero-ventral caudal process.

*Ornamentation* (Figure 23): Carapace with spinous nodes in general resembling those of an adult female but forming part of ribs; surface with abundant shallow fossae and short spines; gelatinous substance forming film between spines.

*Size*: USNM 156612, length with caudal process 1.44 mm, length without caudal process 1.30 mm, height 1.09 mm.

*Second Antenna*: Endopodite similar to that of adult male. Remainder of appendage not examined in detail but, in general, similar to that of adult female.

*First Antenna, Mandible, Maxilla, 5th Limb, 6th Limb, Furca, Medial Eye, and Rod-shaped Organ*: Not examined in detail but, in general, similar to those of adult female.

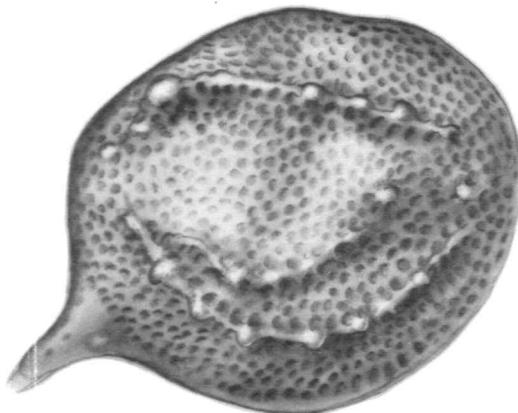


FIGURE 23.—*Sarsiella africana*, new species, paratype, juvenile male, USNM 156612, length 1.44 mm.

*Seventh Limb*: Small, similar to that of adult male.

*Lateral Eyes*: Similar to those of adult male but with ommatidia not as distinct.

### *Sarsiella ocula*, new species

FIGURES 24–26; PLATES 12–16

**HOLOTYPE**.—USNM 156624, ovigerous female in alcohol and on slides.

**TYPE-LOCALITY**.—Station X048.

**ETYMOLOGY**.—The species name from the Latin *oculus* (eye) in reference to the presence of lateral eyes on this species.

**ALLOTYPE**.—USNM 157115, adult male from same sample as holotype.

**PARATYPE**.—"Grigore Antipa" 465, juvenile female in alcohol, from same station as holotype.

**DESCRIPTION OF ADULT FEMALE** (Figures 24, 25; Plates 12–16).—Carapace oval in lateral view without incisur and with short caudal process.

*Ornamentation*: Carapace with about 23 spinous processes (Plates 12, 13a–c, 14a–c); 6 of these on low spinous horizontal rib above valve middle; a second low spinous horizontal rib below valve middle with 7 spinous processes; 2 spinous nodes present between anterior ends of horizontal ribs, and 1 spinous node present between posterior ends of horizontal ribs; 3 spinous processes forming row ventral to anterior end of lower horizontal rib; 4 spinous processes present just within posterior valve margin; 2 of these longer than others; shallow fossae abundant (Plates 12a, 13d,e); long bristles with broad base present along anterodorsal, anterior, and ventral valve margins and sparsely distributed on lateral surface of valve near margins (Plates 12a, 13b, 15a–c), some associated with spinous processes; short papillate spines abundant (Plates 13d,e 14, 15); gelatinous substance filling space between spines.

*Infold*: Infold of caudal process with 9 short bristles, 1 of these close to inner margin (Plates 16a,b,f); an additional minute bristle near inner margin just anterior to caudal process, 2 setose bristles present on posterior infold dorsal to caudal process (Plates 16c–e); 1 minute bristle near middle of anterior infold.

*Selvage* (Plate 16a,b): Wide lamellar prolonga-



FIGURE 24.—*Sarsiella ocula*, new species, holotype, adult female, USNM 156624, length 1.98 mm: *a*, posterior of left valve, inside view; *b*, right 1st antenna, medial view; *c*, endopodite of right 2nd antenna, medial view (anterior down); *d*, left mandible, medial view; *e*, left maxilla, lateral view; *f*, exopodite of 5th limb.

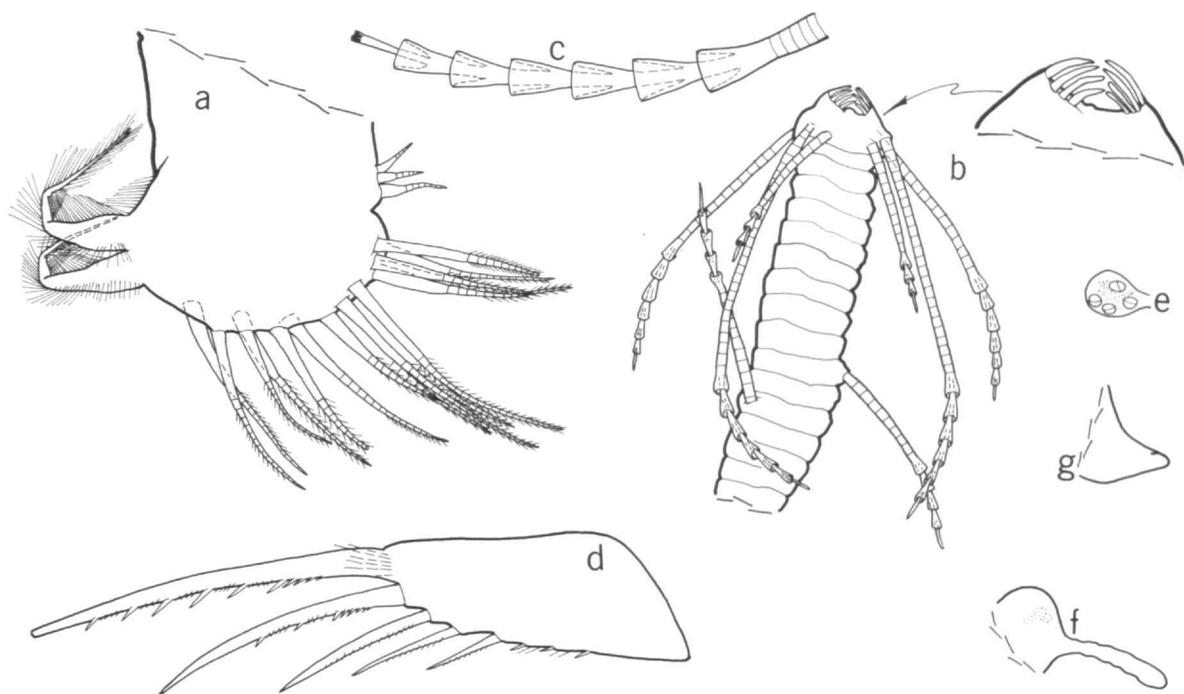


FIGURE 25.—*Sarsiella ocula*, new species, holotype, adult female, USNM 156624: *a*, 6th limb; *b*, distal part of 7th limb; *c*, detail of distal end of bristle on 7th limb; *d*, left lamella of furca; *e*, left lateral eye; *f*, medial eye and rod-shaped organ; *g*, upper lip (anterior to right).

tion with smooth outer margin present along anterior, ventral, and posterior margins.

**Central Adductor Muscle Scars:** Consisting of about 8 individual scars.

**Size** (Figure 10): USNM 156624, length 1.98 mm, height including caudal process 1.98 mm, height without caudal process 1.73 mm.

**First Antenna** (Figure 24b): 1st joint: bare. 2nd joint: 1 spinous dorsal bristle. 3rd joint: fused to 4th, with 2 bristles (1 ventral, 1 dorsal). 4th joint: 3 bristles (1 dorsal, 2 ventral). 5th joint: sensory bristle with 2 minute nodes on dorsal margin but without filaments; 6th joint: medial bristle short, spinous. 7th joint: a-bristle with marginal spines; b-bristle about one-fourth longer than a-bristle, bare; c-bristle same length as sensory bristle of 5th joint, with 2 short proximal filaments. 8th joint: d- and e-bristles slightly shorter than c-bristle, bare with blunt tips; f- and g-bristles slightly longer than d- and e-bristles, f-bristle with 1 short proximal filament, g-bristle bare; a minute spine at tip of sensory bristle, c, f, and g-bristles.

**Second Antenna:** Protopodite bare. Endopodite 1-jointed with 2 short, proximal, anterior bristles and 2 terminal bristles (1 short, 1 long) (Figure 24c). Exopodite: 1st joint with short, recurved, medial spine on distal margin; bristle of 2nd joint long, with natatory hairs; bristles of joints 2–8 with natatory hairs; 9th joint with 2 bristles (1 long with natatory hairs, 1 short with short marginal spines, or with natatory hairs).

**Mandible** (Figure 24d): Coxale endite consisting of short, stout spine. Basale: medial surface with 1 proximal and 1 distal bristle near ventral margin; ventral margin with 2 proximal bristles; lateral side with 2 distal bristles near ventral margin; dorsal margin with 2 short spinelike bristles (1 terminal, 1 distal to middle). Exopodite absent. Endopodite: 1st joint with distal lateral spines; dorsal margin with few terminal spines; ventral margin with terminal claw with short spines forming row proximally on dorsal margin; 2nd joint with few short lateral spines; dorsal margin with spinelike sub-terminal bristle; ventral margin with bare terminal

claw; claw of 3rd joint bare, with 1 dorsal and 2 ventral, short, spinelike bristles near base.

**Maxilla** (Figure 24e): Coxale with fringe of long hairs and short dorsal bristle. Endite I with 6 bristles. Endite II with 4 bristles. Endite III with 5 bristles. Basale with 1 slender bristle near base of exopodite. Exopodite with 2 bristles (1 short bare, 1 long spinous). Endopodite: 1st joint with stout pectinate  $\alpha$ - and  $\beta$ -bristles; 2nd joint with 2 short  $\alpha$ -bristles, 1 short  $\gamma$ -bristle, and 5 stout end bristles.

**Fifth Limb** (Figure 24f): Epipodial appendage with 35 bristles. Single endite with 1 short bristle. Exopodite: 1st joint with 2 bristles; joints 2–5 fused, hirsute, with total of 8–9 bristles.

**Sixth Limb** (Figure 25a): single endite with 3 bristles; end joint with 14–15 spinous ventral bristles in addition to 2 stout, hirsute posterior bristles; medial surface near posterior margin with abundant long hairs.

**Seventh Limb** (Figure 25b,c): Each limb with 8 bristles (2 in proximal group, 1 on each side, and 6 in terminal group, 3 on each side); each bristle with 3–6 or 7 bells decreasing in size distally; bristles without marginal spines; terminus with opposing combs, each with about 6 teeth.

**Furca** (Figure 25d): Each lamella with 5 claws: claw 1 fused to lamella; claws 2–4 separated from lamella by suture; claws 1 and 2 with few large and many small teeth; remaining claws with small teeth.

**Rod-shaped Organ** (Figure 25f): Broadening distally, with rounded tip.

**Eyes**: Lateral eye small with 4 ommatidia (Figure 25e); medial eye lightly pigmented, bare, almost twice diameter of lateral eye (Figure 25f).

**Upper Lip** (Figure 25g): With 2 rounded lateral lobes projecting anteriorly.

**Eggs**: USNM 156624 with 12 eggs in marsupium and smaller unextruded eggs.

**DESCRIPTION OF ADULT MALE** (Figure 26a,b).—Carapace shape and ornamentation similar to that of *S. dornellasae* (see Figure 29).

**Size** (Figure 10): USNM 157115, length 1.61 mm, height 1.13 mm.

**First Antenna**: 1st joint: bare. 2nd joint: lateral spines forming rows, and 1 dorsal bristle distal to middle of margin (bristle with short marginal spines). 3rd and 4th joints: fused; 3rd joint with dorsal bristle reaching bristle of 4th joint, and 1 minute ventral bristle; 4th joint with 1 dorsal and

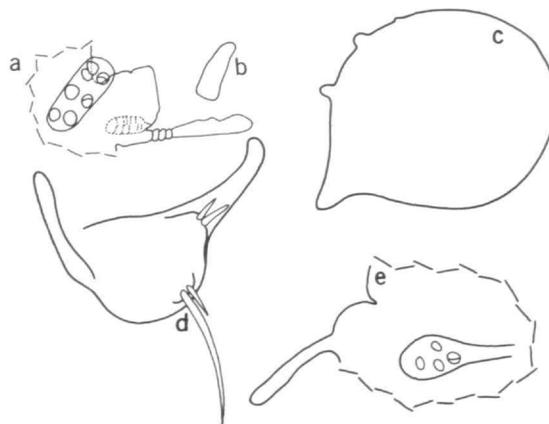


FIGURE 26.—*Sarsiella ocula*, new species, allotype, adult male, USNM 157115, length 1.61 mm: a, right lateral eye, medial eye, and rod-shaped organ; b, right 7th limb. Paratype, juvenile female (A-2? instar), "Grigore Antipa" 465, length 1.26 mm: c, outline of right valve; d, endopodite of left 2nd antenna, medial view; e, left lateral eye, medial eye, and rod-shaped organ.

2 ventral bristles. 5th joint: small, sensory bristle with cuplike proximal part with abundant filaments, and stem with 3 short marginal filaments and 2 spines at tip. 6th joint: medial bristle short. 7th joint:  $\alpha$ -bristle longer than combined length of joints 6–8;  $\beta$ -bristle bare, about one-third longer than  $\alpha$ -bristle;  $\gamma$ -bristle reaching just past sensory bristle of 5th joint, with 5 marginal filaments and 2 spines at tip. 8th joint:  $\delta$ - and  $\epsilon$ -bristles bare, with blunt tips, slightly shorter than  $\gamma$ -bristle;  $\zeta$ -bristle slightly shorter than  $\gamma$ -bristle, with 3 marginal filaments and 2 spines at tip;  $\eta$ -bristle slightly shorter than  $\gamma$ -bristle, with 5 marginal filaments and 2 spines at tip.

**Second Antenna**: Protopodite bare. Endopodite 1-jointed with 2 short proximal anterior bristles and 3 terminal bristles on low mound (endopodite similar to that of illustrated left limb of *S. dornellasae*, see Figure 30d). Exopodite: 1st joint with short terminal medial spine; bristle of 2nd joint with proximal natatory hairs on ventral and dorsal margins followed by 11 slender ventral spines, and then, natatory hairs on both margins; bristle of 3rd joint similar to that of 2nd except with only 4 slender ventral spines; bristles of joints 4–8 with natatory hairs, no spines; 9th joint with 1 long and 1 short (dorsal) bristle with natatory hairs; joints

without basal spines, but with short spines forming row along distal margin on lateral side.

**Mandible:** Similar to that of *S. dornellasae* (see Figure 30e).

**Maxilla:** Reduced, similar to that of *S. dornellasae* (see Figure 30f).

**Fifth Limb:** Similar to that of *S. dornellasae* (see Figure 30g).

**Sixth Limb:** Single endite with 3 short bristles; end joint with 16 hirsute and spinous bristles.

**Seventh Limb (Figure 26b):** Consisting of small stump.

**Furca:** Similar to that of adult female except with fewer teeth on distal two-thirds of each claw.

**Rod-shaped Organ (Figure 26a):** Elongate, with 3 proximal segments, broadening in distal half, and with rounded tip.

**Eyes:** Lateral eye with about 7 ommatidia and with light amber coloration between ommatidia (coloration similar to that of ommatidia) (Figure 26a); medial eye with light amber pigmentation, about same size as lateral eye (Figure 26a).

**Copulatory Organ:** Similar to that of *S. dornellasae* (see Figure 31e).

**Y-Sclerite:** Typical for family.

**DESCRIPTION OF JUVENILE FEMALE (A-2? instar) (Figure 26c-e).**—Carapace oval in lateral view without incisur, with caudal process and truncate posterior (Figure 26c).

**Ornamentation:** Similar to that of adult female.

**Size:** "Grigore Antipa" 465, length 1.37 mm, height including caudal process 1.26 mm, height excluding caudal process 1.21 mm.

**Second Antenna (Figure 26d):** Endopodite similar to that of adult female.

**Seventh Limb:** Each limb with 6 strongly tapering bristles (juvenile feature), 2 in proximal group, 1 on each side, and 4 in terminal group, 2 on each side, each bristle with 2 or 3 bells; terminus with opposing combs with few teeth.

**Remaining Appendages:** Similar to those of adult female, but not examined in detail.

**Rod-shaped Organ (Figure 26e):** Similar to that of adult female.

**Eyes (Figure 26e):** Lateral eye small with 4 ommatidia, with light amber pigment between ommatidia; medial eye with light amber pigment, bare, diameter greater than that of lateral eye.

**COMPARISONS.**—The female of the new species

*Sarsiella ocula* differs from that of *S. africana* in having lateral eyes. Posterior processes on both sexes of *S. ocula* are longer than those of *S. africana*. The lateral process on the rostrum of the male *S. ocula* is longer and narrower than that on the male of *S. africana*. The caudal process of *S. ocula* is usually shorter than that of *S. africana*, but not always. On the female 7th limb of *S. ocula*, the bells decrease gradually in size distally along the bristle. On the other hand, some of the long bristles on the female 7th limb of *S. africana* have disproportionately large proximal bells.

### *Sarsiella dornellasae*, new species

FIGURES 27-31

**HOLOTYPE.**—USNM 156654, ovigerous female on slides and in alcohol.

**TYPE-LOCALITY.**—Station X068.

**ETYMOLOGY.**—The species is named for Lilia Pinto de Ornellas, Porto-Alegre, Brazil.

**ALLOTYPE.**—[USNM 156653], adult male from same sample as holotype.

**PARATYPES.**—"Grigore Antipa" 468, 1 ovigerous female from station X068; USNM 157116, 3 ovigerous females and 2 juveniles from station X068;

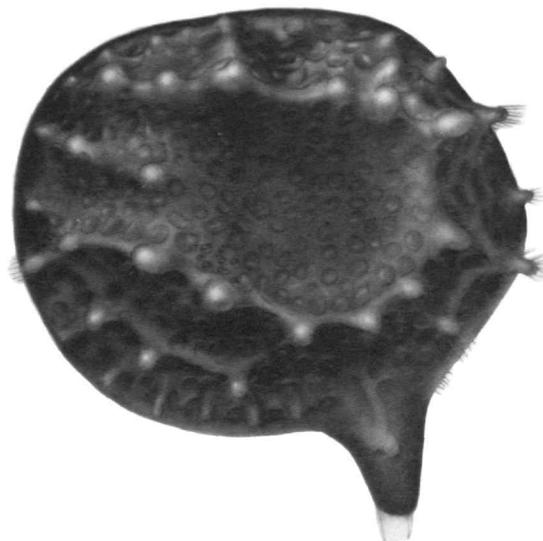


FIGURE 27.—*Sarsiella dornellasae*, new species, holotype, adult female, USNM 156654, length 1.43 mm.

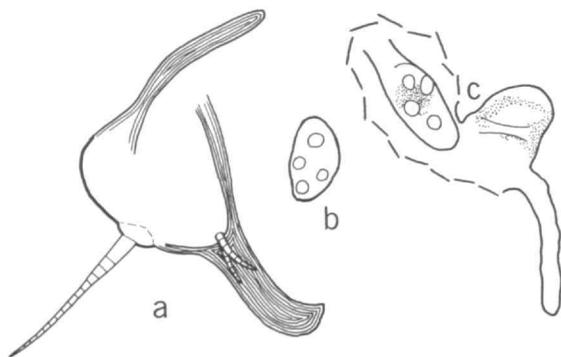


FIGURE 28.—*Sarsiella dornellasae*, new species, paratype, adult female, USNM 156685, length 1.37 mm: *a*, endopodite of left 2nd antenna, medial view; *b*, left lateral eye. Holotype, adult female, USNM 156654, length 1.43 mm: *c*, right lateral eye, medial eye, and rod-shaped organ.

USNM 156685, 1 adult female with male and female choniostomatid copepods in marsupium, from station X052; USNM 157117, 1 ovigerous female and 3 juveniles from station X041.

**DESCRIPTION OF ADULT FEMALE** (Figures 27, 28).—Carapace shape and ornamentation (Figure 27) similar to that of adult female *S. ocula*.

**Infold:** Infold of caudal process with 5–7 bristles, 1 of these close to inner margin; 1 minute bristle on inner margin of infold just anterior to caudal process; 2 setose bristles on posterior infold dorsal to caudal process; 1 small bristle near middle of anterior infold.

**Size** (Figure 10): USNM 156654, length 1.43 mm, height with caudal process 1.48 mm, height without caudal process 1.21 mm; USNM 156685, length 1.37 mm, height with caudal process 1.47 mm, height without caudal process 1.19 mm; USNM 157117, length 1.52 mm, height with caudal process 1.42 mm, height without caudal process 1.19 mm; USNM 157116a, length 1.41 mm, height with caudal process 1.41 mm, height without caudal process 1.14 mm; USNM 157116b (carapace distorted) approximate length 1.34 mm, approximate height with caudal process 1.42 mm, approximate height without caudal process 1.32 mm (not included in Figure 10); USNM 157116c, length 1.35 mm, height with caudal process 1.42 mm, height without caudal process 1.15 mm; USNM 157116d, length 1.43 mm, height with caudal process 1.41 mm, height without caudal process 1.14 mm.

**First Antenna:** Similar to that of *S. ocula* (see Figure 24b).

**Second Antenna:** Protopodite bare. Endopodite 1-jointed with 2 short proximal, anterior bristles, and 1 spinous terminal bristle (Figure 28a) (bristle about same length as longer of 2 terminal bristles on endopodite of *S. ocula*, see Figure 24c). Exopodite similar to that of adult female *S. ocula*.

**Mandible:** Coxale endite consisting of short stout spine; lateral side of coxale with long hairs forming 2 rows near ventral margin. Basale: similar to that of adult female *S. ocula* (see Figure 24d). Endopodite: similar to that of adult female *S. ocula* except minute medial spine observed near base of ventral claw of 1st joint.

**Maxilla:** Bare bristle of exopodite slightly longer than that of adult female *S. ocula*, otherwise limb similar to that of *S. ocula* (see Figure 24e).

**Fifth Limb:** Epipodial bristles not counted. Limb similar to that of adult *S. ocula* except exopodial joints 2–5 with total of 7 bristles.

**Sixth Limb:** Single endite with 2 or 3 short bristles; end joint with 11–13 spinous ventral bristles in addition to 2 stout, hirsute bristles; medial surface near posterior margin with abundant long hairs. In general, similar to 6th limb of adult female *S. ocula* (see Figure 25a).

**Seventh Limb:** Limb similar to that of adult female *S. ocula* (see Figure 25b,c).

**Furca:** Similar to that of adult female *S. ocula* (see Figure 25d).

**Rod-shaped Organ** (Figure 28c): Elongate, broadening very slightly distally, with rounded tip.

**Eyes:** Lateral eye small with 4 ommatidia; pig-

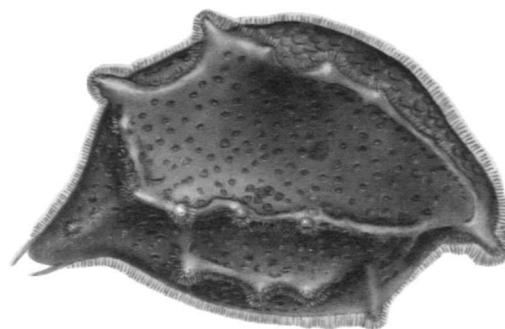


FIGURE 29.—*Sarsiella dornellasae*, new species, allotype, adult male, USNM 156653, length 1.22 mm.

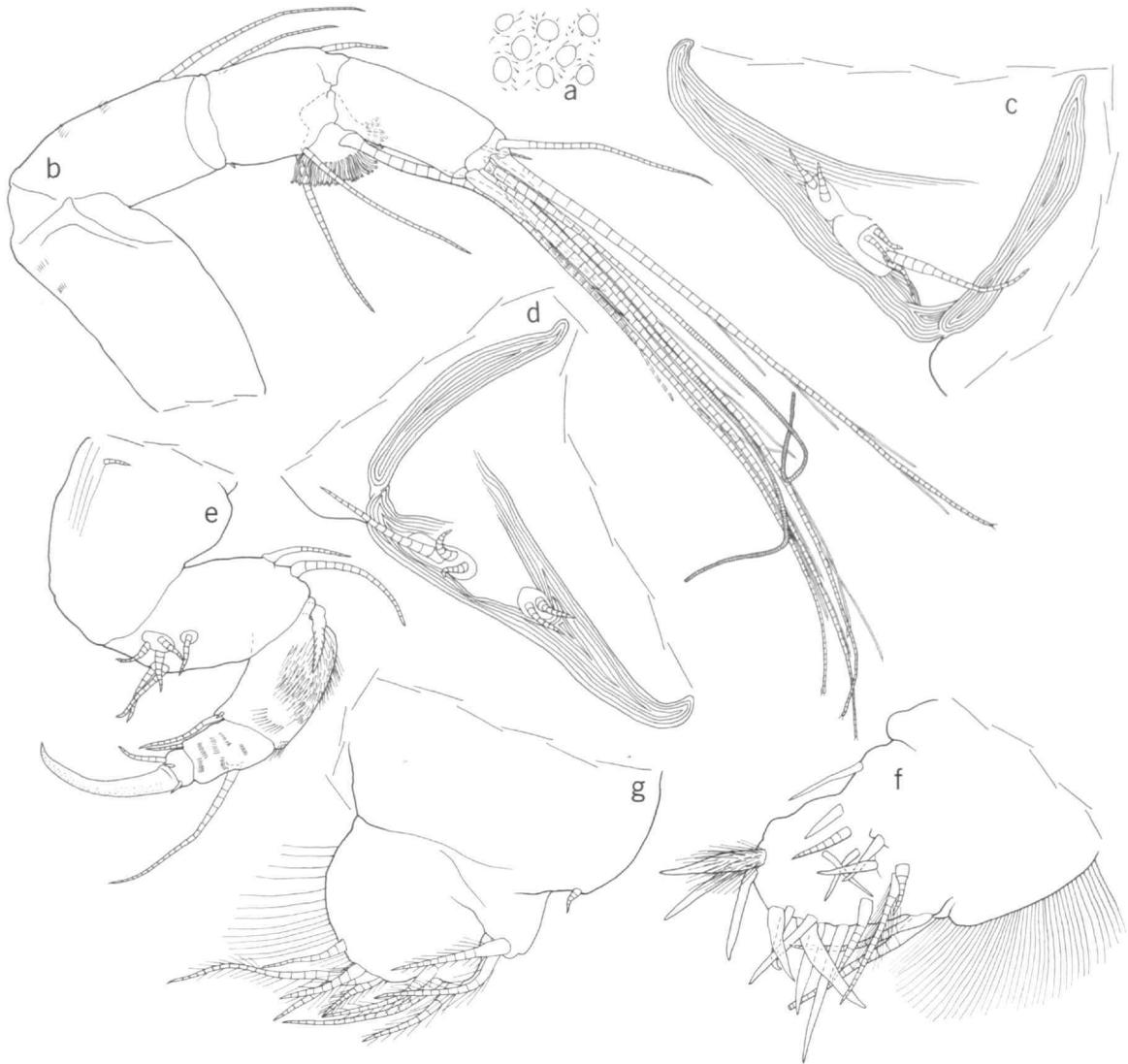


FIGURE 30.—*Sarsiella dornellasae*, new species, allotype, adult male, USNM 156653, length 1.22 mm: *a*, shallow fossae and hairs near middle of left valve, outside view; *b*, right 1st antenna, lateral view; *c*, *d*, endopodites of right and left 2nd antennae, medial view; *e*, left mandible, medial view; *f*, maxilla; *g*, distal end of 5th limb.

ment between ommatidia brown (Figure 28*b,c*). Medial eye bare, about twice size of lateral eye, with brown pigment (Figure 28*c*).

*Upper Lip*: Helmet shaped.

*Genitalia*: Consisting of oval sclerotized ring on each side of body anterior to furca.

*Eggs*: USNM 156654 with 6 eggs in marsupium;

USNM 157116a, 10 eggs in marsupium; USNM 157117, 7 eggs in marsupium.

*DESCRIPTION OF ADULT MALE* (Figures 29–31).—Carapace with prominent rostrum and caudal process (Figure 29).

*Ornamentation* (Figures 29, 30*a*): Lateral rib near dorsal margin extending from tip of rostrum,

where it projects anteriorly past anterior edge of valve, to posterodorsal part of valve, where it terminates in 2 spinous processes, each with single long bristle; a second lateral rib present just below valve middle, extending from rostrum to near posterior end of shell, and with 3 or 4 spinous processes; a third shorter rib with 3 spinous processes present near ventral margin; lateral side of caudal process with spinous process near middle; surface of valves with shallow fossae (Figure 30a); short spines abundant between fossae and on lateral ribs and processes; long bristles present along anterior and ventral margins and sparsely distributed on valve surface.

*Size* (Figure 10): USNM 156653, length 1.22 mm, height 0.82 mm.

*First Antenna* (Figure 30b): 1st joint: few spines on lateral surface. 2nd joint: few spines near dorsal margin and 1 dorsal subterminal bristle. 3rd and 4th joints: fused; 3rd joint with long dorsal and minute ventral bristle; 4th joint with 3 bristles (1 dorsal, 2 ventral). 5th joint: small, sensory bristle with cuplike proximal part with abundant filaments and stem with 3 or 4 marginal filaments. 6th joint: medial bristle short. 7th joint: a-bristle longer than combined length of joints 6–8; b-bristle bare, about one-third longer than a-bristle; c-bristle reaching past tip of sensory bristle of 5th joint, with 4 marginal filaments. 8th joint: d- and e-bristles bare, with blunt tips, slightly shorter than c-bristle; f-bristle slightly shorter than c-bristle, with 3 or 4 marginal filaments; g-bristle about same length as c-bristle, with 5 marginal filaments; minute spine at tip of sensory bristle, c-, f-, and g-bristles.

*Second Antenna*: Protopodite bare. Endopodite 1-jointed with 2 short proximal anterior bristles and 3 or 4 terminal bristles on low mound (1 of these longer than others) (Figure 30c,d). Exopodite: 1st joint with short terminal medial spine; bristle of 2nd joint with proximal natatory hairs on ventral and dorsal margins followed by 4–7 slender ventral spines and, then, natatory hairs on both margins; bristles of joints 3–8 with natatory hairs but without spines; 9th joint with 1 long and 1 short (dorsal) bristle with natatory hairs; joints without basal spines.

*Mandible* (Figure 30e): Coxale endite represented by ringed spine; ventral margin of coxale bare.

Basale: ventral margin with 2 short midbristles; medial side with 4 bristles near ventral margin; dorsal margin with 2 bristles. Exopodite hirsute with base on lateral side of basale and distal part on medial side of 1st endopodite joint. Endopodite: 1st joint with abundant hairs on dorsal half of medial side and 1 long terminal ventral bristle with minute bristle near its base; 2nd joint with spines forming rows on medial surface, 1 ventral terminal bristle, and 1 dorsal midbristle; 3rd joint short, with stout terminal claw and 3 bristles near base of claw (2 ventral, 1 dorsal).

*Maxilla* (Figure 30f): Limb reduced, with weakly developed bristles.

*Fifth Limb* (Figure 30g): Single endite with 1 short bristle. Exopodite: 1st joint with 2 bristles; remaining joints fused, with total of 8 bristles; limb weakly developed.

*Sixth Limb* (Figure 31a): Single endite with 3 short bristles; end joint with 13 hirsute and spinous bristles.

*Seventh Limb* (Figure 31b): Consisting of minute stump.

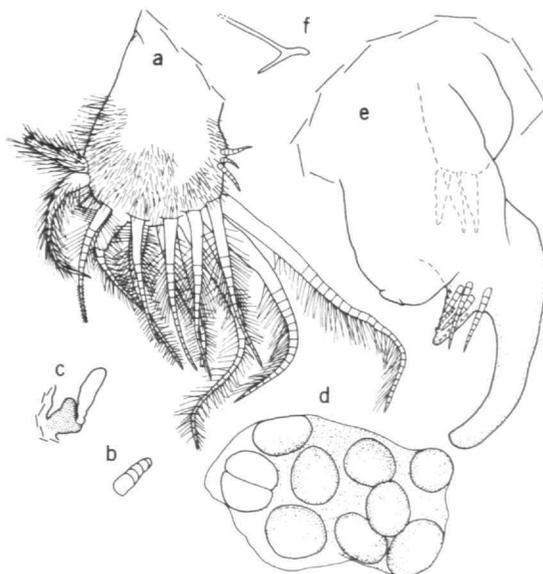


FIGURE 31.—*Sarsiella dornellasae*, new species, allotype, adult male, USNM 156653: a, 6th limb; b, right 7th limb; c, medial eye and rod-shaped organ; d, lateral eye (magnification about 5 times that of medial eye in c); e, copulatory limb; f, left Y-sclerite (anterior to left).

*Furca*: Similar to that of adult female.

*Rod-shaped Organ* (Figure 31c): Similar to that of adult female.

*Eyes*: Lateral eye with about 9 ommatidia and with dark brown pigment between ommatidia (Figure 31d); medial eye pigmented, bare, about same size as lateral eye (Figure 31c).

*Copulatory Organ* (Figure 31e): Typical for genus.

*Y-Sclerite* (Figure 31f): Typical for family.

**COMPARISONS.**—The carapace of *Sarsiella dornellasae* is very similar in shape and ornamentation to that of *S. ocula* but is smaller (Figure 10). Each endopodite of the 2nd antennae of the adult and juvenile female of *S. ocula* in the collection has 2 terminal bristles, whereas, females of *S. dornellasae* examined (4 adults and 1 juvenile) have only 1 terminal bristle. The pigment between the ommatidia in the lateral eyes of all 3 specimens of *S. ocula* in the collection (1 adult female, 1 juvenile female, 1 adult male) is light amber, about the same color as the ommatidia. The pigment is brown in lateral eyes of *S. dornellasae*.

### *Sarsiella gomoiui*, new species

FIGURES 32–38; PLATES 17–24

**HOLOTYPE.**—"Grigore Antipa" 464, adult female in alcohol, length 1.35 mm.

**TYPE-LOCALITY.**—Station X048.

**ETYMOLOGY.**—The species is named for Dr. Marian Trouian Gomoiu, Romanian Institute of Marine Research, Constanta, Romania.

**ALLOTYPE.**—USNM 156651, adult male from station X048.

**PARATYPES.**—From station X048: USNM 156687, 1 ovigerous female; USNM 156649, 1 ovigerous female; USNM 156993, 1 adult male, 2 ovigerous females, 2 adult females with chonistomatid egg sacs (valves not opened), and 7 juveniles; [USNM 156652], 1 adult male.

**ADDITIONAL MATERIAL.**—USNM 156994, adult female with caudal process missing, from station X070.

**DESCRIPTION OF ADULT FEMALE** (Figures 32–35; Plates 17–20).—Carapace oval in lateral view with prominent caudal process but without rostrum or incisur (Figure 32).

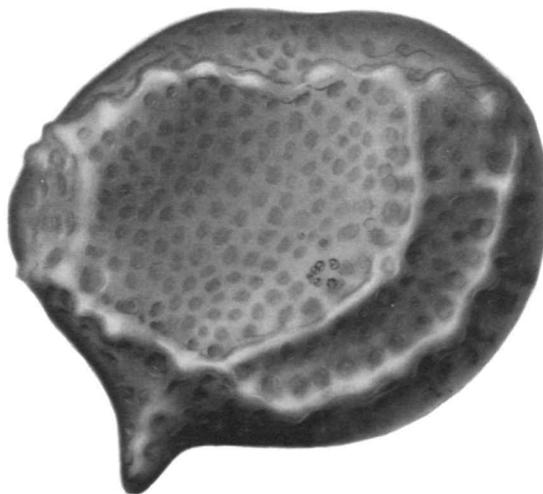


FIGURE 32.—*Sarsiella gomoiui*, new species, paratype, adult female, USNM 156649, length 1.39 mm.

**Ornamentation** (Figure 32; Plates 17–20): Each valve with flat central area with peripheral ridge (Plates 17, 18); an additional ridge lying within and parallel to anterior and ventral parts of peripheral ridge with low processes; posterodorsal and posterior processes more prominent than other processes; surface with abundant shallow fossae and minute spines between fossae (Plates 17, 18, 19a–d, f); SEM micrographs reveal marginal pustules on spines (Plate 20a,c–f); long bristles present along anterior and ventral margins and scattered over valve surfaces (Plates 17, 18, 19a,d,f, 20b); surface covered by gelatinous substance.

**Infold:** Anterior infold with single minute bristle ventral to middle of anterior margin; infold of caudal process with 5 or 6 bristles near middle (forming row or scattered) and 1 additional bristle closer to inner margin (Figure 33); ventral infold just anterior to caudal process with few minute bristles along inner margin; 2 setose bristles present dorsal to caudal process (Figure 33).

**Selvage** (Plate 19d,e): Anterior selvage with smooth margin.

**Size** (Figure 10): USNM 156649, length 1.39 mm, height including caudal process 1.23 mm, height excluding caudal process 1.18 mm. USNM 156687, length 1.33 mm, height including caudal process 1.32 mm, height excluding caudal process 1.17 mm. USNM 156993, 2 ovigerous females: length 1.38

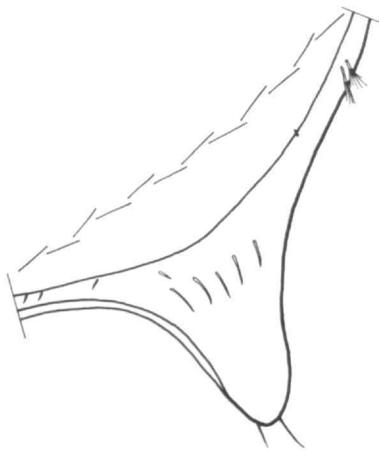


FIGURE 33.—*Sarsiella gomoitui*, new species, paratype, adult female, USNM 156687, length 1.33 mm: posterior of right valve, inside view.

mm, height including caudal process 1.27 mm; length 1.36 mm, height including caudal process 1.21 mm. Holotype, "Grigore Antipa" 464, length 1.35 mm, height including caudal process 1.27 mm.

*First Antenna* (Figure 34a): 1st joint: bare. 2nd joint: spinous dorsal bristle and few spines along dorsal and ventral margins. 3rd joint: short, fused to 4th, with 2 spinous bristles (1 dorsal, 1 ventral). 4th joint: elongate, with 3 bristles (1 dorsal, 2 ventral). 5th joint: sensory bristle with 2 minute filaments (1 proximal, 1 subterminal). 6th joint: medial bristle short with base near dorsal margin. 7th joint: a-bristle spinous; b-bristle slightly longer than a-bristle, bare; c-bristle same length as sensory bristle of 5th joint, with 3 minute marginal filaments (2 proximal, 1 subterminal). 8th joint: d- and e-bristles bare, slightly shorter than c-bristle; f- and g-bristles same length as d- and e-bristles; f-bristle with 2 minute filaments (1 proximal, 1 subterminal); g-bristle with 3 minute marginal filaments (2 proximal, 1 subterminal); minute spine at tip of sensory, c-, f-, and g-bristles.

*Second Antenna*: Protopodite bare. Endopodite 1-jointed with 2 short, proximal, anterior bristles and 1 spinous terminal bristle (Figure 34b). Exopodite: 1st joint with minute, recurved, medial bristle on distal margin; bristle of 2nd joint reaching past 9th joint, with 13 slender ventral spines proximal to middle and natatory hairs distally; bristles of joints 2–8 with natatory hairs and with-

out ventral spines; 9th joint small, with 1 long bristle with natatory hairs and 1 short bare bristle; joints 2–8 with short spines forming distal row along lateral margin; no basal spines.

*Mandible* (Figure 34c): Coxale endite consisting of sharp spine; ventral margin of coxale with long hairs. Basale: medial surface near ventral margin with 2 short bristles (1 proximal, 1 near middle); ventral margin with 2 short proximal bristles; lateral side with 2 short bristles near middle; dorsal margin with 2 minute subterminal bristles. Endopodite: 1st joint with medial spines forming pattern distal to middle; a single row of distal spines present on dorsal corner extending from medial side onto dorsal margin (unclear as to whether dorsal spines are stouter than medial spines or whether one of the dorsal spines should be considered to be a minute bristle); main claw of 1st joint with minute proximal spines along dorsal margin; 2nd joint with short, subterminal, dorsal bristle and smooth main claw; 3rd joint with 2 small bristles, 1 ventral, 1 dorsal, at base of smooth main claw. No exopodite.

*Maxilla* (Figure 34d): Coxale with short dorsal bristle. 3 endites present. Exopodite with 2 bristles. Endopodite: 1st joint with pectinate  $\alpha$ - and  $\beta$ -bristles; 2nd joint with 2 short a-bristles, 1 short c-bristle and 5 pectinate end bristles.

*Fifth Limb* (Figure 34e): Epipodial appendage with 33 bristles. Single endite with 1 short bristle. Exopodite: 1st joint with 2 spinous bristles; fused joints 2–5 hirsute, with total of 8 or 9 bristles.

*Sixth Limb* (Figure 35a): Single endite with 2 or 3 bristles; end joint with 12 spinous bristles plus 2 hirsute posterior bristles; limb hirsute along posterior margin.

*Seventh Limb* (Figure 35b): 2 bristles in proximal group (1 on each side), 6 bristles in terminal group (3 on each side), each bristle with 3–6 bells and without marginal spines, bells decrease in size gradually towards tip of bristle; terminus with opposing combs, each with 5 or 6 recurved teeth.

*Furca* (Figure 35c): Each lamella with 5 slender claws; claw 1 united to lamella; claws 2–5 separated from lamella by suture; teeth present along posterior margins of claws; several spines present on margin of lamella following claws.

*Rod-shaped Organ* (Figure 35d): Elongate, 1-jointed with rounded tip.



FIGURE 34.—*Sarsiella gomiui*, new species, paratype, adult female, USNM 156649, length 1.39 mm: *a*, left 1st antenna, medial view; *b*, endopodite of left 2nd antenna, medial view; *c*, right mandible, medial view; *d*, left maxilla, medial view; *e*, distal end of 5th limb.

*Eyes*: Lateral eye with 4 ommatidia (Figure 35e); medial eye slightly larger than lateral eye, bare, pigmented (Figure 35d).

*Upper Lip* (Figure 35d): Helmet shaped.

*Y-Sclerite* (Figure 35f): Typical for family.

*Eggs*: USNM 156649 with 7 eggs in marsupium plus smaller unextruded eggs; USNM 156687 with 6 eggs in marsupium.

*Parasites*: 2 adult females (USNM 156993) with chonistomatid egg sacs visible through ostracode shell.

**DESCRIPTION OF ADULT MALE** (Figures 36–38; Plates 21–24).—Carapace elongate with prominent rostrum and truncate posterior (Figure 36).

*Ornamentation* (Figures 36, 37a; Plates 21, 22a–e, 23c–e): Upper ridge extending from anterior of

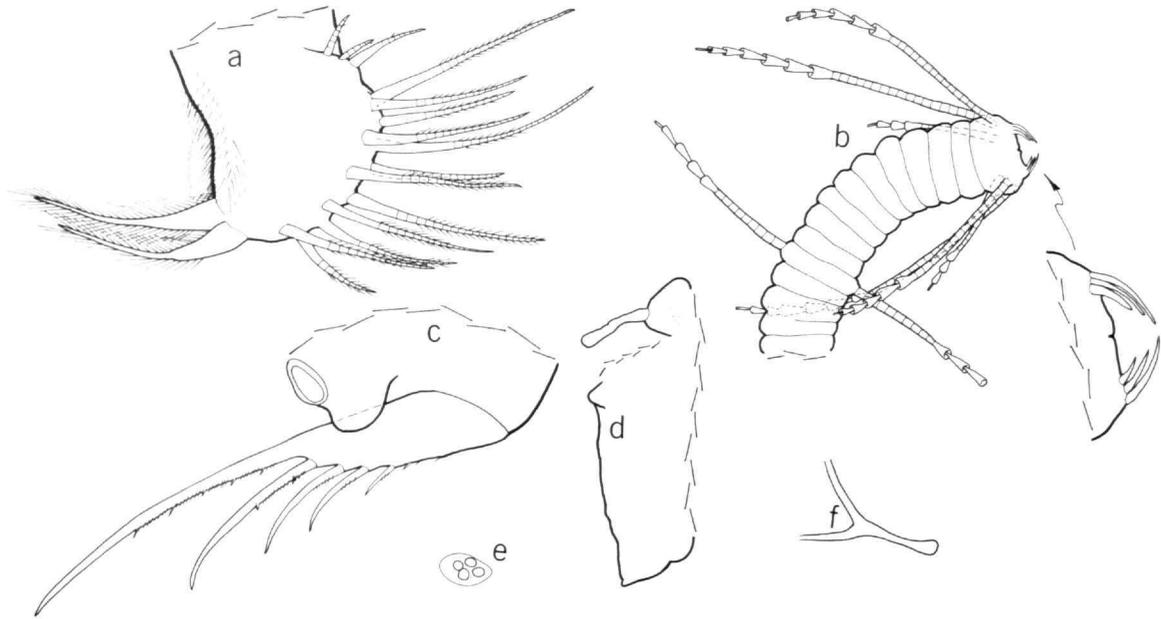


FIGURE 35.—*Sarsiella gomoiui*, new species, paratype, adult female, USNM 156649: *a*, 6th limb; *b*, distal end of 7th limb; *c*, left lamella of furca and left genital organ; *d*, anterior of body showing medial eye and rod-shaped organ, anterior process, and upper lip; *e*, left lateral eye; *f*, left Y-sclerite (anterior to left).

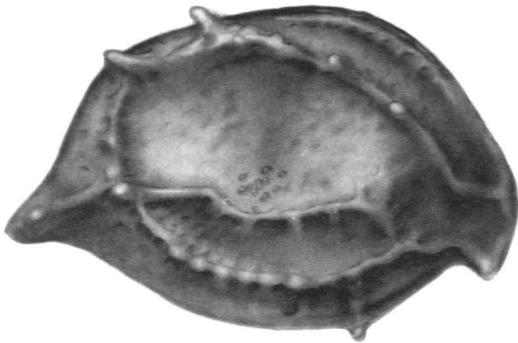


FIGURE 36.—*Sarsiella gomoiui*, new species, allotype, adult male, USNM 156651, length 1.31 mm.

rostrum to posterior part of valve and there terminating in 2 elongate processes (Plate 21); lower ridge extending from anteroventral tip of rostrum to posterior part of valve and there connecting with upper ridge at base of posterior process; a second ridge lying between central muscle attachment area and lower ridge and intersecting it anteriorly near rostrum and posteriorly near caudal process. Sur-

face with shallow fossae (Figures 36, 37*a*; Plates 21, 22*a,b*); area between fossae with abundant spines (Plate 21, 22*a,b,e*); surface of spines papillate (Plates 22*c,d*, 23*c-e*).

*Infold*: Anteroventral infold with minute bristle about half way between ventral margin of valve and ventral margin of rostrum; caudal process with 3 or 4 bristles near middle and 1 bristle closer to inner margin of infold (Figure 37*b*; Plates 22*f*, 23*b*, *f*); 2 setose bristles present on posterior infold.

*Central Adductor Muscles* (Plate 24): Consisting of about 10 ovoid individual muscles.

*Size* (Figure 10): USNM 156651, length 1.31 mm, height 0.84 mm; USNM 156652, length 1.32 mm, height 0.87 mm; USNM 156993, length 1.28 mm, height 0.86 mm.

*First Antenna* (Figure 37*c*): 1st joint: few minute, faint spines forming row on lateral and medial surfaces near dorsal margin. 2nd joint: faint spines forming rows on lateral and medial surfaces and 1 subterminal dorsal bristle. 3rd and 4th joints: fused; 3rd joint with 1 dorsal bristle and short ventral bristle; 4th joint with 3 bristles (2 ventral, 1 dorsal).

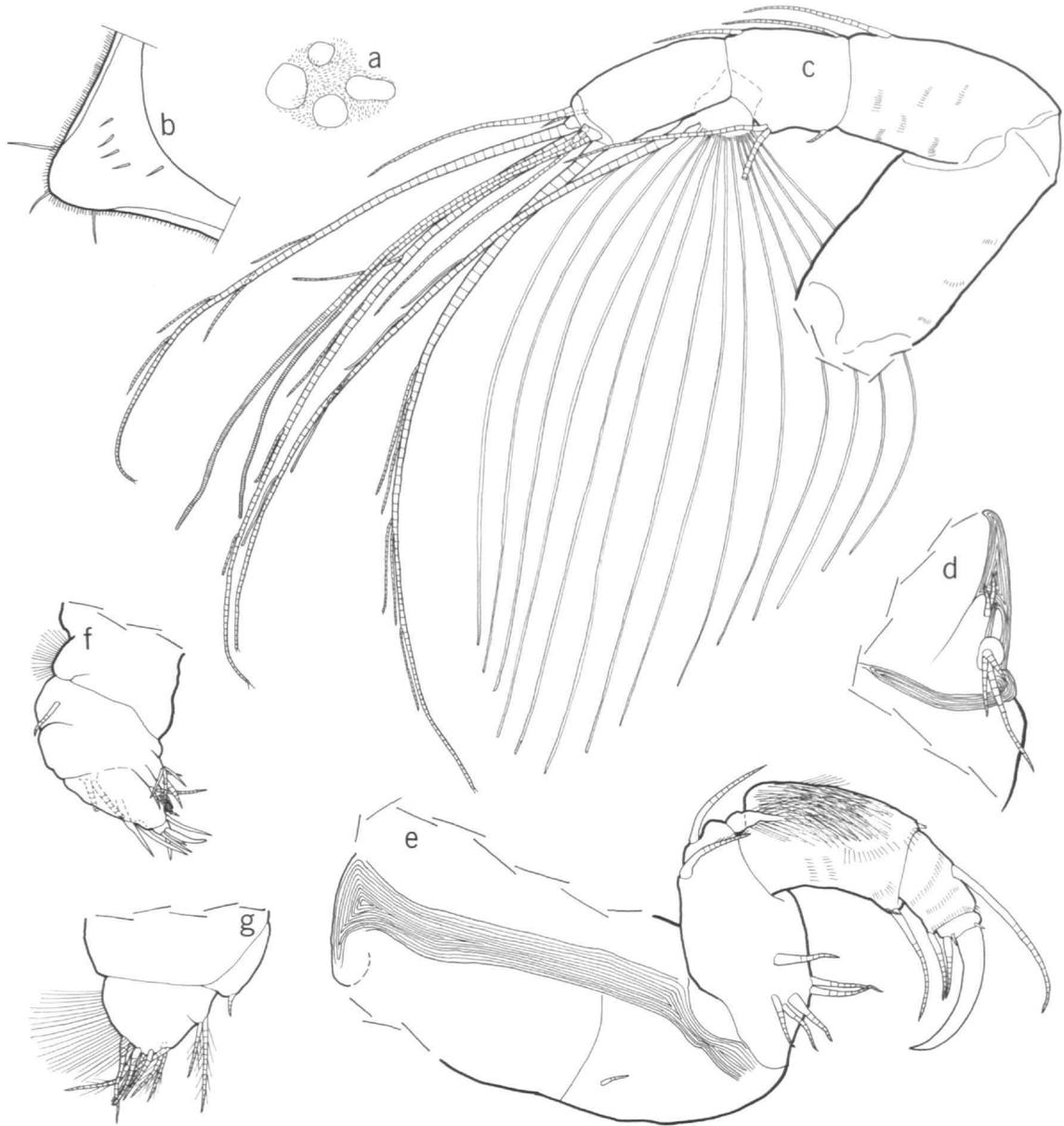


FIGURE 37.—*Sarsiella gomoiui*, new species, allotype, adult male, USNM 156651, length 1.33 mm: *a*, shallow fossae and spines near middle of right valve, outside view. Paratype, adult male, USNM 156652, length 1.32 mm: *b*, caudal process of left valve, inside view; *c*, left 1st antenna, lateral view; *d*, endopodite of left 2nd antenna, medial view; *e*, left mandible, medial view; *f*, maxilla; *g*, distal end of 5th limb.

5th joint: minute, sensory bristle with cuplike basal part with numerous filaments, and stem with 4 marginal filaments and 2 minute spines at tip. 6th joint: short medial bristle. 7th joint: a-bristle bare, longer than joints 5–8 combined; b-bristle slender, bare, about one-third longer than a-bristle; c-bristle reaching past tip of sensory bristle of 5th joint, with 5 marginal filaments and 2 minute spines at tip. 8th joint: d- and e-bristles bare with blunt tips not reaching tip of sensory bristle; f-bristle slightly longer than d-bristle, with 4 marginal filaments and 2 minute spines at tip; g-bristle reaching just past tip of sensory bristle, with 4 marginal filaments and 2 minute spines at tip.

**Second Antenna:** Protopodite bare. Endopodite 2-jointed: 1st joint with 2 small anterior, proximal bristles; 2nd joint small with 3 bristles (Figure 37d). Exopodite: 1st joint with minute, recurved, medial spine on distal margin; bristle of 2nd joint with few natatory hairs proximally on ventral margin followed by 8–10 slender ventral spines and, then, natatory hairs on both margins; bristle of joint 3 with no or 4 spines and natatory hairs; bristles of joints 4–8 with natatory hairs but no spines; 9th joint with 2 bristles with natatory hairs (dorsal of these short).

**Mandible** (Figure 37e): Coxale endite represented by slender spine with faint annulae; ventral margin of coxale without hairs or spines. Basale: medial side with 4 bristles (1 near middle, 3 proximal) all near ventral margin; ventral margin with 2 bristles near middle; dorsal margin with 2 bristles. Exopodite: 1st joint with long hairs near dorsal margin and shorter hairs and spines elsewhere; ventral margin with 2 terminal bristles (1 of these minute); 2nd joint with medial spines, 1 dorsal midbristle, and 1 ventral terminal bristle; 3rd joint with stout terminal claw and 3 bristles (2 ventral and 1 dorsal to base of claw).

**Maxilla** (Figure 37f): Precoxale and coxale with fringe of hairs dorsally; coxale with 1 dorsal bristle. 3 endites with weak bristles present. Exopodite with 2 bristles. Bristles of basale and endopodite weak, indistinct. Limb reduced.

**Fifth Limb** (Figure 37g): Single endite with 1 short bristle. Exopodite: 1st joint with 2 spinous

bristles; joints 2–5 fused, hirsute, with total of 8 bristles.

**Sixth Limb** (Figure 38a): Single endite with 2 short and 1 longer bristle. End joint with 13 ventral bristles and 2 hirsute posterior bristles (ventral bristles consisting of 6 medial bristles with long proximal and short distal spines, and 7 lateral bristles with long marginal hairs).

**Seventh Limb** (Figure 38b): Consisting of short stump.

**Furca:** Similar to that of adult female.

**Rod-shaped Organ** (Figure 38c): Elongate with rounded tip.

**Eyes:** Lateral eye with 4 ommatidia (Figure 38c, d); medial eye slightly larger than lateral eye, bare, pigmented (Figure 38c).

**Copulatory Organ:** Similar to that of adult male of *Sarsiella neapolis* Kornicker, 1974 (Figure 13j,k).

**COMPARISONS.**—The new species *Sarsiella gomoii* is very closely related to *S. neapolis* and the appendages of both species are similar. The carapace of *S. gomoii* differs from that of *S. neapolis* in having an additional ridge within the peripheral ridge common to both species. The additional ridge is sharply delimited on the 3 adult males of *S. gomoii* in the collection, and is usually easily seen on adult females, but some early instars may be difficult to separate from early instars of *S. neapolis*. The ridges on the carapace of *S. gomoii* resemble somewhat those of *S. janiceae* Kornicker,

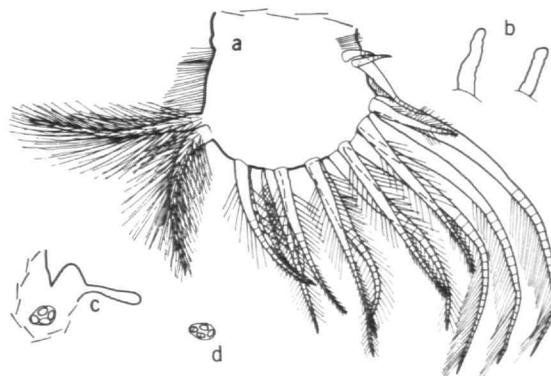


FIGURE 38.—*Sarsiella gomoii*, new species, allotype, adult male, USNM 156651: a, 6th limb; b, left and right 7th limbs; c, right lateral eye, medial eye and rod-shaped organ; d, right lateral eye.

1976*b*, but the endopodite of the female 2nd antenna of that species does not have a terminal bristle.

*Sarsiella rudescui*, new species

FIGURES 39–41; PLATES 25, 26

**HOLOTYPE.**—USNM 141558, ovigerous female on slides and in alcohol.

**TYPE-LOCALITY.**—Station X054.

**ETYMOLOGY.**—The species is named for Professor Doctor Ludwig Rudescu, Director of Section, Institute of Biology, Bucharest, Romania, member of Academy of Sciences of Romania.

**PARATYPE.**—“Grigore Antipa” 300, ovigerous female in alcohol from same sample as holotype.

**DESCRIPTION OF ADULT FEMALE** (Figures 38–41; Plates 25, 26).—Carapace oval in lateral view with elongate caudal process and without incisur; carapace swollen in posterodorsal part.

**Ornamentation** (Figure 39; Plates 25, 26*c*): Carapace with low lateral horizontal rib above valve middle meeting in posterior part of valve a convex rib that continues anteriorly below central muscle scar area (Figure 39; Plate 25*a,c,d*); anterior ends of linear dorsal rib and convex ventral rib almost reaching anterior margin of valve; 3 weak riblets extending from ventral rib towards anteroventral margin of valve; ribs and riblets formed by short

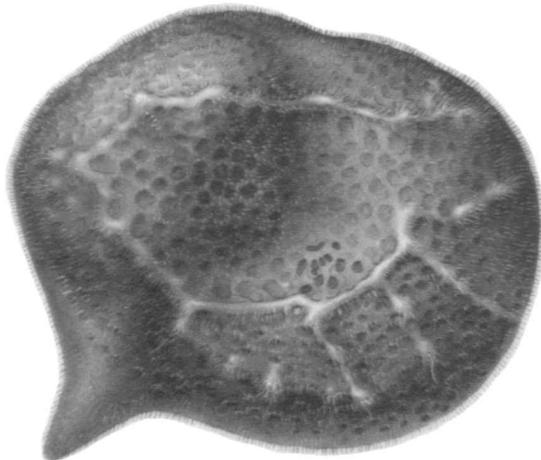


FIGURE 39.—*Sarsiella rudescui*, new species, holotype, adult female, USNM 141558, length 1.38 mm.

spines; long bristles with broad base abundant along anterior and ventral margins of valve and sparsely distributed over lateral surface (Plate 25*a,b*); shallow fossae abundant; area outside fossae with numerous short papillate spines (Plates 25*a,f*, 26*c*); gelatinous substance filling in space between spines (Plate 25*c,f*).

**Infold** (Figure 40*a,b*; Plate 26): Minute bristle present on anterior infold near inner margin (Figure 40*b*); infold of caudal process with 4 bristles forming row anterior to single bristle (Figure 40*a*; Plate 26*a,b*); 2 setose bristles present on posterior infold dorsal to caudal process (Figure 40*a*); 4 minute bristles present along inner margin of posteroventral infold.

**Selvage:** Wide lamellar prolongation with smooth outer margin present along anterior, ventral, and posterior margins.

**Central Adductor Muscle Scars** (Plate 26*d*): Consisting of about 12 individual scars.

**Size** (Figure 10): USNM 141558, length 1.38 mm, height including caudal process 1.33 mm, height excluding caudal process 1.13 mm; “Grigore Antipa” 300, length 1.32 mm, height including caudal process 1.22 mm, height excluding caudal process 1.17 mm.

**First Antenna** (Figure 40*c*): 1st joint: bare. 2nd joint: 1 spinous dorsal bristle and few faint spines on dorsal margin. 3rd joint: short, fused to 4th, with 2 spinous bristles (1 ventral, 1 dorsal). 4th joint with few faint spines on ventral margin, with 3 bristles (2 ventral, 1 dorsal). 5th joint: sensory bristle with 1 minute proximal filament. 6th joint: short medial bristle on terminal margin. 7th joint: a-bristle short, spinous, about length of 5th joint; b-bristle bare, slightly longer than a-bristle; c-bristle about same length as sensory bristle of 5th joint, with 1 minute proximal filament. 8th joint: d- and e-bristles bare, slightly shorter than c-bristles; f-bristle bare, about same length as c-bristle; g-bristle about same length as c-bristle, with 1 minute proximal filament; minute spine at tip of sensory, c-, f-, and g-bristles.

**Second Antenna:** Protopodite bare. Endopodite with 2 short anterior bristles and 1 longer terminal bristle, the latter with base on small protuberance (Figure 40*d*). Exopodite: 1st joint with short medial spine on distal margin; 2nd joint almost 3 times length of 3rd joint; bristle of 2nd joint with long

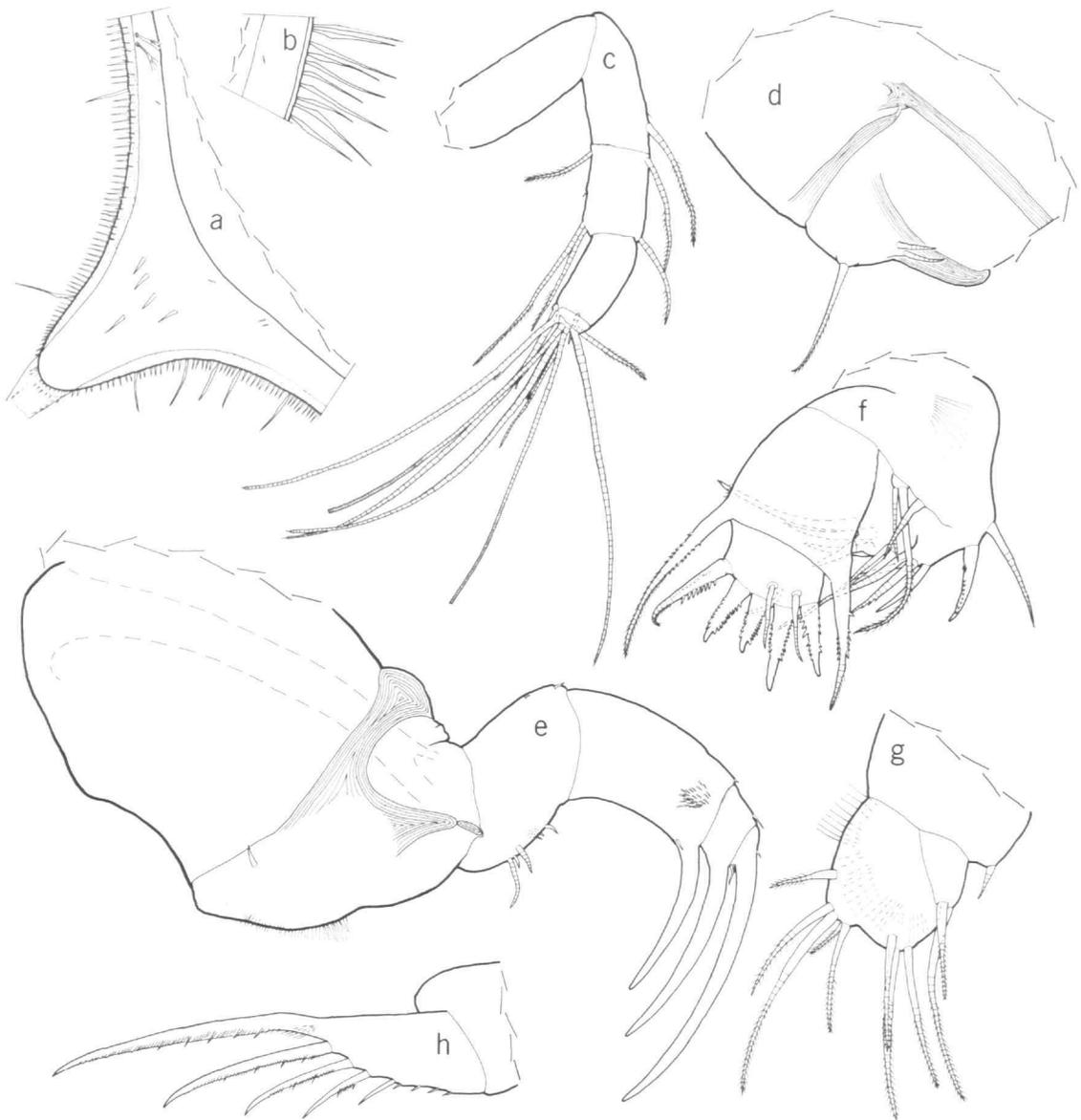


FIGURE 40.—*Sarsiella rudescui*, new species, holotype, adult female, USNM 141558, length 1.38 mm: *a*, posterior of left valve, inside view; *b*, anterior segment of left valve showing minute bristle on infold and marginal bristles; *c*, right 1st antenna, lateral view; *d*, distal part of protopodite and endopodite of left 2nd antenna, medial view; *e*, left mandible, medial view; *f*, left maxilla, lateral view (not all endite bristles shown); *g*, distal part of 5th limb; *h*, left lamella of furca.

proximal ventral spines and distal hairs; bristles of joints 2–8 with natatory hairs; 9th joint with 3 bristles (2 long with natatory hairs, 1 short with short marginal spines); joints 2–9 with lateral spines forming row along distal margin, no basal spines present.

**Mandible** (Figure 40e): Coxale: endite consisting of stout spine; ventral margin with long hairs. Basale: 6 bristles present on or near ventral margin (2 with bases on lateral side, 1 with base on medial side, 3 with base on ventral margin); dorsal margin of basale with 1 short bristle distal to middle and 1 subterminal bristle. Exopodite absent. Endopodite: 1st joint with spines on medial surface and terminally on dorsal margin; 1 minute, faint bristle present medially near base of main claw; 2nd joint with dorsal subterminal bristle and main ventral claw; 3rd joint with 3 bristles at base of main claw (1 dorsal, 2 ventral).

**Maxilla** (Figure 40f): Endite I with 5 spinous and pectinate bristles; endite II with about 6 bristles; endite III with about 4 bristles. Proto-

dite with cluster of long hairs near anterior margin. Basale with bristle near base of exopodite. Exopodite with 1 short and 1 long bristle. Endopodite: 1st joint with pectinate and spinous  $\alpha$ - and  $\beta$ -bristles;  $\beta$ -bristle with proximal tooth on anterior margin; 2nd joint with 2 a-bristles, 1 c-bristle, and usual 5 pectinate terminal bristles.

**Fifth Limb** (Figure 40g): Epipodial appendage with 33–34 bristles. Single endite with short bare bristle. Exopodite: 1st joint with 2 spinous bristles; joints 2–5 hirsute, fused; 2nd joint with 3 spinous bristles; joints 3–5 with total of 5 spinous bristles.

**Sixth Limb** (Figure 41a): Single endite with 3 bristles; end joint with 12 bristles with short marginal spines and 2 stout, hirsute posterior bristles; limb hirsute.

**Seventh Limb** (Figure 41b,c): Each limb with 2 bristles in proximal group (1 on each side) and 6 in terminal group (3 on each side) each bristle with 3–6 bells; terminus with opposing combs with 5 to 7 teeth.

**Furca** (Figure 40h): Each lamella with 5 claws

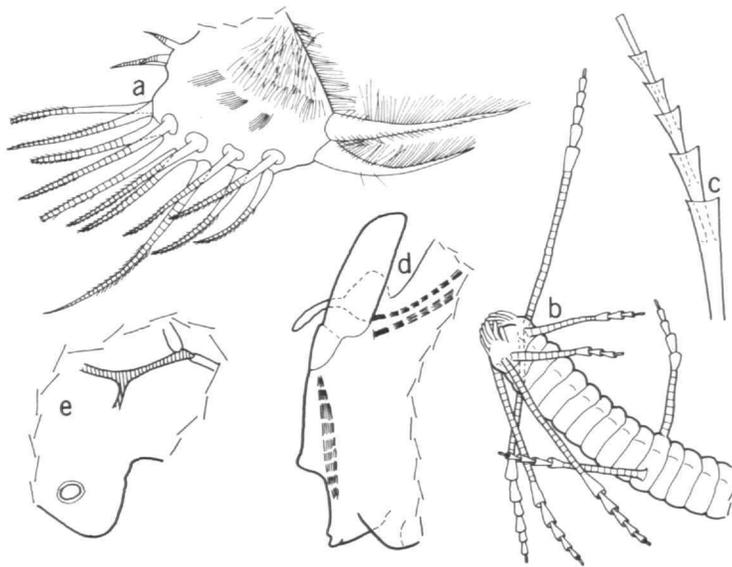


FIGURE 41.—*Sarsiella rudescui*, new species, holotype, adult female, USNM 141558: a, 6th limb; b, distal end of 7th limb; c, detail of tip of bristle of 7th limb; d, anterior of body showing 1st joint of 1st antenna, medial eye and rod-shaped organ, anterior process, and upper lip; e, section of left side of body near posterior showing Y-sclerite (pattern of vertical lines) and genital organ (anterior to left).

followed by 4 spines; claw I united to lamella, others separated from lamella by suture; claws 1-4 with teeth along posterior margins, some teeth longer and stouter than others.

*Rod-shaped organ*: Elongate, 1-jointed with rounded tip (Figure 41d); minute protuberance visible on tip when viewed under oil immersion ( $\times 100$  objective).

*Eyes*: Lateral eyes absent; medial eye bare, unpigmented (Figure 41d).

*Upper Lip* (Figure 41d): Helmet shaped.

*Genitalia* (Figure 41e): Oval sclerotized ring.

*Y-Sclerite* (Figure 41e): Typical for family.

*Eggs*: USNM 141558 with 5 eggs in marsupium and smaller unextruded eggs within body. "Grigore Antipa" 300 with 4 eggs in marsupium.

**COMPARISONS.**—In addition to the differences in shell ornamentation, the new species *Sarsiella rudescui* differs from some specimens of *S. africana* in that the 3rd bell (counted from the proximal end) of long bristles on the 7th limb is about three-fourths the length of the 2nd bell; the 3rd bell is about one-half the length of the 2nd bell on many specimens of *S. africana*. The carapace of *S. murrayana* does not have the abundant short spines present on *S. rudescui*. The carapace of *S. rudescui* does not have the 2 posterodorsal processes present on *S. neapolis*.

#### *Sarsiella* species indeterminate

**MATERIAL.**—From station X046: USNM 156646, 1 juvenile female; USNM 156647, 1 juvenile; USNM 166523, 1 juvenile male and female. USNM 157118, 1 juvenile from station X023. USNM 157119, 1 juvenile from station X005. USNM 157120, 1 juvenile from station X057. USNM 157121, 1 juvenile from station X052. USNM 157122, 1 juvenile from station X055.

### *Junctichela*, new genus

*Anscottiella* Kornicker, 1975a:607 [in part].

*Junctichela* Kornicker and McKenzie, 1976 [deliberate nomen nudum].

**TYPE-SPECIES.**—*Junctichela margalefi*, new species.

**ETYMOLOGY.**—Derived from the Latin "junctus" (= unite) and "chela" (= claw). The name refers to the furca of this genus, which bears 3 claws fused to each lamella in addition to claws separated from the lamella by a suture. Gender: feminine.

Two species, *Sarsiella similis* Scott, 1905, and *Sarsiella gracilis* Scott, 1905, both from Sri Lanka, have 3 strong claws followed by 3 weak claws. It is not known whether the strong claws are fused to the lamella. However, it is expedient to assume they are and to include them in the new genus as *Junctichela similis* and *Junctichela gracilis*.

**DISTRIBUTION.**—Mauritania, Sri Lanka.

**DIAGNOSIS.**—Carapace with shallow fossae and abundant short bristles with rounded tips; anterior with minute incisur in female and well developed incisur in male.

*First Antenna*: 7th and 8th joints with full accompaniment of bristles.

*Second Antenna*: Endopodite 1-jointed or with minute terminal mound which could represent a 2nd joint. Endopodite of male of type-species not developed as 3-jointed clasper.

*Mandible*: Without exopodite on male or female.

*Maxilla*: Exopodite with 2 bristles.

*Sixth Limb*: With single endite.

*Furca*: Each lamella with 3 stout claws joined to lamella followed by 2-3 short claws separated from lamella by suture.

**COMPARISONS.**—The new genus *Junctichela* differs from other genera in the family Sarsiellidae in having a furca with claws 1-3 joined to the lamella.

#### Key to the Species of *Junctichela*

1. Furca with 5 claws ..... *J. margalefi*, new species
- Furca with 6 claws ..... 2
2. Carapace with anterior and anteroventral radial ribs ..... *J. similis* (Scott)
- Carapace without radial ribs ..... *J. gracilis* (Scott)

*Junctichela margalefi*, new species

FIGURES 42-47; PLATE 27

**HOLOTYPE.**—"Grigore Antipa" 296, A-1 female, length 1.29 mm, height 0.97 mm, in alcohol and on slides.

**TYPE-LOCALITY.**—Station X074.

**ETYMOLOGY.**—The species is named for Dr. Ramon Margalef, Instituto de Investigaciones Pesqueras, Barcelona, Spain.

**ALLOTYPE.**—USNM 153925, adult male from same sample as holotype.

**PARATYPES.**—From station X075: USNM 141268, 1 ovigerous female; USNM 156616, 1 instar II; USNM 156617, 1 A-2 female; "Grigore Antipa" 298, 2 juveniles. *Thalassa* sample (no station number in vial) probably from off Mauritania: USNM 156618, 2 juveniles. From station X066: USNM 156630, 3 adult males; USNM 156631, 1 adult female plus 9 specimens.

**DESCRIPTION OF ADULT FEMALE** (Figures 42, 43; Plate 27).—Carapace oval in lateral view with minute incisur and small caudal process; carapace widest in posterodorsal part (Figures 42, 43a).

**Ornamentation:** Surface with ovoid shallow fos-

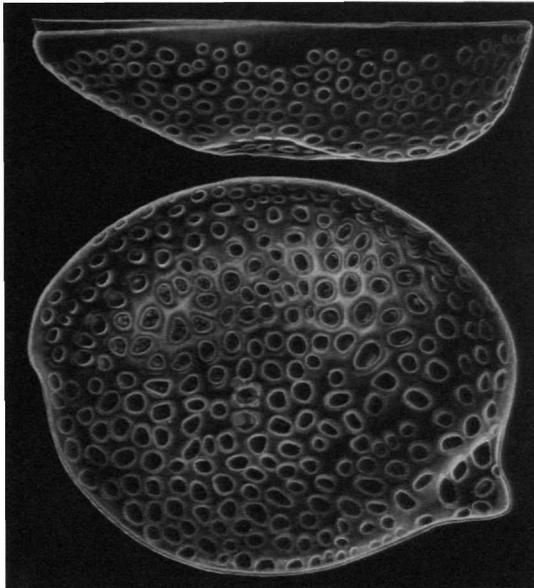


FIGURE 42.—*Junctichela margalefi*, new species, paratype, adult female, USNM 141268, length 1.56 mm.

sae (Figure 42; Plate 27a); area between fossae with abundant bristles with rounded tips (Plate 27b,c,e,f); organic matrix present between bristles; on dried specimen organic matrix tends to form film over bristles and across tops of some fossae (Plate 27d,f).

**Infold:** Anterior infold with minute bristle below incisur (Figure 43b); infold of caudal process with 8 bristles forming row in addition to several bristles along inner margin; posterior infold above caudal process with 2 setose bristles (Figure 43c,d).

**Central Adductor Muscle Attachments:** Consisting of about 13 individual ovoid attachments.

**Selvaige:** Wide lamellar prolongation present along anterior, ventral, and posterior margins.

**Size:** USNM 141268, length 1.56 mm, height 1.31 mm; USNM 156631a, length 1.54 mm, height 1.15 mm.

**First Antenna** (Figure 43e): 1st joint: lateral surface with short spines near dorsal margin. 2nd joint: 1 dorsal bristle. 3rd joint: short, fused to 4th, with 2 spinous bristles (1 ventral, 1 dorsal). 4th joint: elongate, with 3 spinous bristles (2 ventral, 1 dorsal). 5th joint: long, sensory bristle bare, terminating in minute spine. 6th joint: fused to 5th, with short spinous medial bristle. 7th joint: a-bristle spinous, almost twice length of bristle of 6th joint; b-bristle bare, longer than a-bristle; c-bristle similar to sensory bristle of 5th joint but slightly longer. 8th joint: d- and e-bristles bare, about three-fourths length of c-bristle; f- and g-bristles similar to c-bristle but slightly shorter.

**Second Antenna:** Protopodite bare. Endopodite 1-jointed with 2 minute anterior bristles and 1 spinous terminal bristle on small mound (mound could be interpreted as 2nd joint) (Figure 43f). Exopodite: 1st joint with recurved medial spine on distal margin; bristle of 2nd joint with 9 stout, widely separated, ventral spines proximally, and natatory hairs distally along both margins; bristles of joints 3-8 with ventral spines proximally and natatory hairs distally. 9th joint with 2 bristles (ventral bristle long with spines ventrally and natatory hairs distally, dorsal bristle short with short marginal spines). Joints 3-7 with minute lateral spines forming row along distal margin near base of bristle, no basal spines present.

**Mandible** (Figure 43g): Coxale consisting of stout spine; ventral margin of coxale hirsute. Basale:



FIGURE 43.—*Junctichela margalefi*, new species, paratype, adult female, USNM 141268, length 1.56 mm: *a*, complete specimen showing position of 3 eggs (dashed line); *b*, segment of anterior margin of right valve showing minute bristle of infold and minute incisur, inside view; *c*, posterior of right valve, inside view; *d*, posterior of left valve, inside view; *e*, right 1st antenna, medial view; *f*, endopodite of right 2nd antenna, medial view; *g*, left mandible, medial view; *h*, right maxilla, lateral view; *i*, distal part of 5th limb; *j*, 6th limb; *k*, distal end of 7th limb; *l*, part of left side of body showing 6th limb, Y-sclerite, genital organ (dashed line) and left lamella of furca; *m*, left and right lateral eyes; *n*, anterior of body showing medial eye and rod-shaped organ, anterior process, and upper lip; *o*, upper lip (anterior to left); *p*, part of left side of body showing Y-sclerite and brushlike organ (anterior to left).

ventral margin with 4 bristles, some with bases on medial side; lateral side near ventral margin with 2 short bristles; dorsal margin with 1 short bristle distal to middle and 1 subterminal. Exopodite absent. Endopodite: 1st joint with distal medial spines, spines along terminal dorsal corner, and main ventral claw; 2nd joint with subterminal bristle on dorsal margin and main ventral claw; end joint with minute ventral and dorsal bristle at base of main claw; tips of claws on specimen examined appearing worn.

*Maxilla* (Figure 43h): Precoxale and coxale with fringe of long hairs; coxale with short dorsal bristle. Endite I with about 5 bristles; endite II with about 4 bristles; endite III with 5 bristles. Basale with slender bristle near base of exopodite. Exopodite with 1 short bare bristle and 1 long spinous bristle. Endopodite: 1st joint with stout pectinate  $\alpha$ - and  $\beta$ -bristles; 2nd joint with 2 a-bristles, 1 c-bristle, and 5 pectinate end bristles.

*Fifth Limb* (Figure 43i): Epipodial appendage with 33–35 bristles. Single endite with 1 short bristle. Exopodite: 1st joint with 2 bristles; joints 2–5 hirsute, fused; 2nd joint with 3 bristles; fused joints 3–5 with total of 5 bristles.

*Sixth Limb* (Figure 43j,l): Single endite with 3 bristles; end joint with 13–14 spinous ventral bristles in addition to 2 stout, hirsute, posterior bristles; lateral and medial surfaces with short spines forming rows; medial surface near posterior margin with abundant long hairs.

*Seventh Limb* (Figure 43k): Each limb with 8 bristles (2 in proximal group, 1 on each side, and 6 in terminal group, 3 on each side), each bristle with 2–5 bells and without marginal spines; terminus with opposing combs, each with 5 or 6 teeth.

*Furca* (Figure 43l): Each lamella with 5 claws; claws 1–3 fused to lamella, claws 4 and 5 separated from lamella by suture; teeth present along posterior margins of claws 1–3; finer spines present along anterior margins of same claws; USNM 141268 with tips of claws broken.

*Rod-shaped Organ* (Figure 43n): Crinkled proximally, broadening distally, with rounded tip.

*Eyes*: Lateral eye small with 4 ommatidia (Figure 43m); medial eye pigmented, bare, about twice diameter of lateral eye (Figure 43n).

*Upper Lip* (Figure 43n,o): With 2 rounded processes projecting anteriorly.

*Genitalia* (Figure 43l): Visible as oval sclerotized ring.

*Brushlike Organ* (Figure 43p): Consisting of about 5 minute bristles.

*Y-Sclerite* (Figure 43p): Typical for family.

*Eggs*: USNM 141268 with 5 eggs in marsupium in addition to unextruded eggs. (See Figure 43a for position of eggs in marsupium.)

**DESCRIPTION OF ADULT MALE** (Figure 44, 45).—Carapace more elongate than that of female, with more prominent rostrum and truncate posterior (Figure 44).

*Ornamentation* (Figure 44): Similar to that of female.

*Infold*: Not examined.

*Central Adductor Muscle Attachments*: Similar to those of female.

*Size*: USNM 153925, length 1.40 mm, height 0.89 mm. USNM 156630, 3 specimens: length 1.31 mm, height 0.89 mm; length 1.33 mm, height 0.89 mm; length 1.34 mm, height 0.86 mm.

*First Antenna* (Figure 45a): 1st joint: bare. 2nd joint: spinous dorsal bristle. 3rd joint: fused to 4th, with minute ventral bristle and short, slender, dorsal bristle. 4th joint: elongate, with 3 bristles (2 ventral and 1 dorsal). 5th joint: wedged between 4th and 6th joints at ventral margin; sensory bristle of 5th joint with cuplike proximal part with abundant filaments; main stem of sensory bristle with 4 marginal filaments and bifurcate tip. 6th joint: short medial bristle. 7th joint: a-bristle spinous, about three times length of bristle of 6th joint; b-bristle bare, about same length as a-bristle; c-

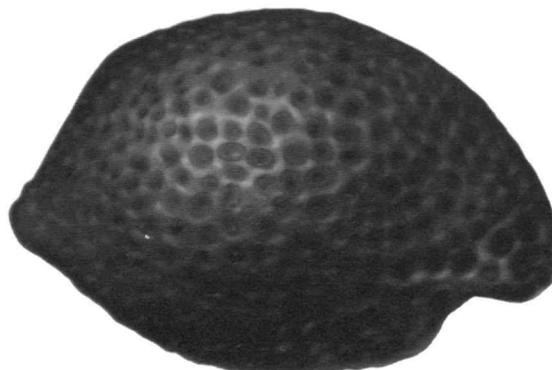


FIGURE 44.—*Junctichela margalefi*, new species, allotype, adult male, USNM 153925, length 1.40 mm.

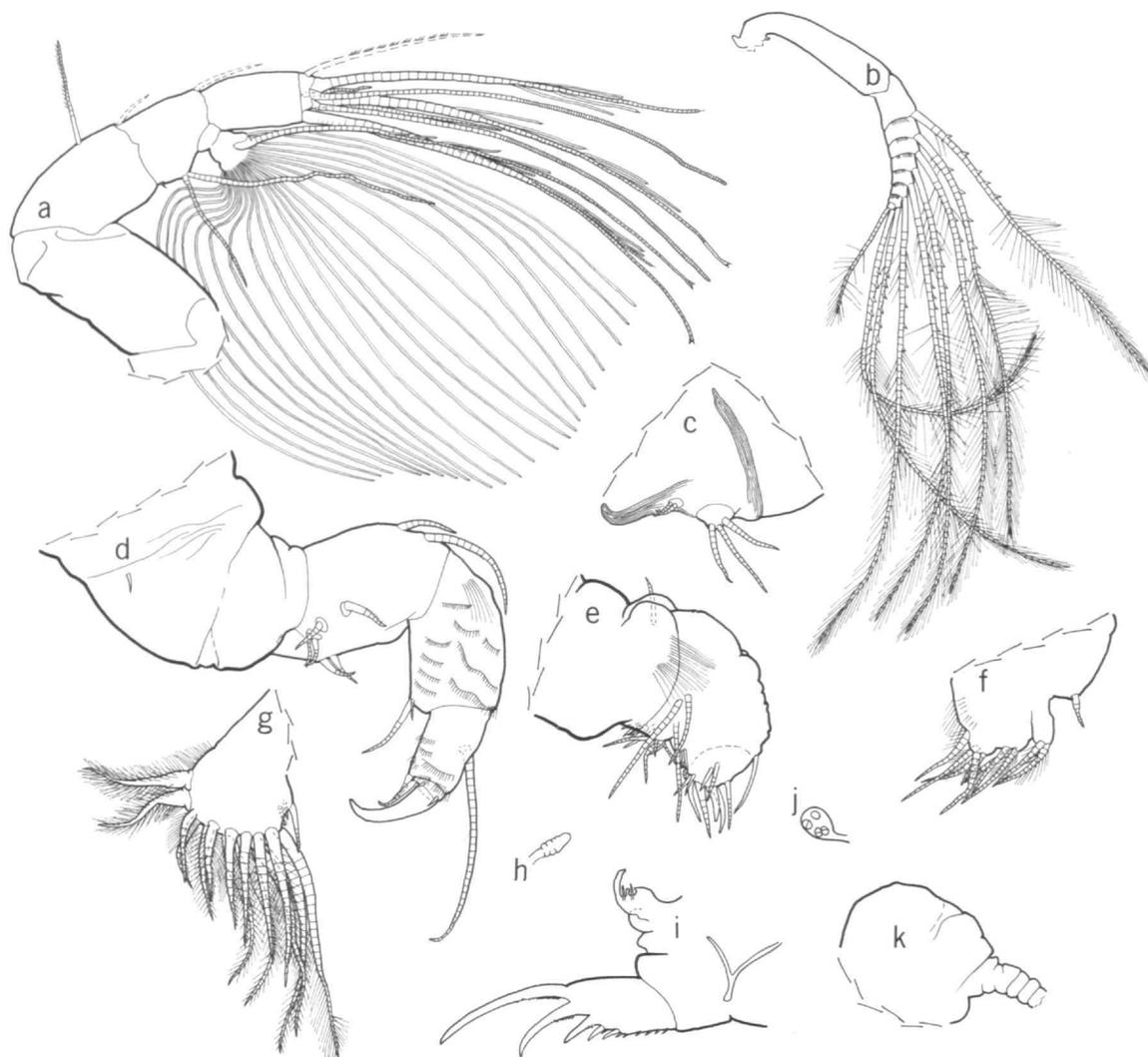


FIGURE 45.—*Junctichela margalefi*, new species, allotype, adult male, USNM 153925, length 1.40 mm: a, right 1st antenna, lateral view; b, exopodite of right 2nd antenna, lateral view; c, endopodite of right 2nd antenna, medial view; d, left mandible, medial view; e, maxilla; f, distal part of 5th limb; g, 6th limb; h, right 7th limb; i, part of left side of body showing copulatory limb, Y-sclerite, and left lamella of furca; j, right lateral eye; k, medial eye and proximal end of rod-shaped organ.

bristle with 3 or 4 marginal filaments and bifurcate tip, about same length as sensory bristle of 5th joint. 8th joint: d- and e-bristles bare, about same length as c-bristle; f-bristle with 3 marginal filaments, slightly shorter than c-bristle; g-bristle with 4 or 5 marginal filaments and bifurcate tip, about same length as c-bristle; minute spine at ends of

some filaments, and tips of sensory, c-, f-, and g-bristles.

*Second Antenna:* Protopodite bare. Endopodite 1-jointed or weakly 2-jointed, with 2 small anterior bristles and 3 spinous terminal bristles on small mound which could be considered a 2nd joint (Figure 45c). Exopodite (Figure 45b): 1st

joint with recurved medial spine on distal margin; bristle of 2nd joint with 6 stout, widely separated, stout ventral spines proximally and natatory hairs distally; bristles of joints 3–8 with proximal ventral spines, distal natatory hairs, and few hairs proximal to spines; 9th joint: 2 bristles (ventral long bristle with proximal ventral spines and distal natatory hairs; dorsal short bristle with natatory hairs); joints 2–7 with short spines forming lateral row along distal margins; no basal spines present.

*Mandible* (Figure 45d): Coxale endite represented by slender spine; ventral margin of coxale bare. Basale: medial side near ventral margin with 4 bristles; lateral side near ventral margin with 2 bristles; dorsal margin with 2 fairly long subterminal bristles. Exopodite absent. Endopodite: 1st joint with numerous slender spines on medial surface and along dorsal margin, ventral margin with 1 short bare bristle and 1 longer bristle with short marginal spines; 2nd joint with spines on medial surface, along distal edge near dorsal margin on lateral side, and at terminal end of dorsal margin, dorsal margin with long bare bristle with sharp recurved knifelike tip, ventral margin with 2 short bristles; end joint with minute dorsal and ventral bristle at base of stout, short, bare claw.

*Maxilla* (Figure 45e): Limb reduced. Endites I–III with weakly developed bristles, some with long marginal hairs. Coxale with short dorsal bristle and dorsal fringe of hairs; bristles and claws of end joint weakly developed. Exopodite represented by a long and short bristle with base on 1st endopodite joint near distal margin of basale, no lobe observed.

*Fifth Limb* (Figure 45f): Epipodial appendage with 34 bristles. Single endite with 1 short bristle. Exopodite: 1st joint with 2 hirsute bristles; joints 2–5 hirsute, fused; 2nd joint with 3 hirsute bristles; fused joints 3–5 with total of 5 hirsute bristles.

*Sixth Limb* (Figure 45g): Single endite with 3 short bristles; end joint with 13 bristles with long marginal hairs in addition to 2 hirsute posterior bristles; medial surface of limb hirsute; lateral surface with short spines forming rows except for long hairs near posterior margin.

*Seventh Limb* (Figure 45h): Represented by bare crinkled stump.

*Furca* (Figure 45i): Each lamella with 5 claws as on adult female; lamella differs from that of female

in having a small spine between 4th and 5th claws, and 5 or 6 spines following the 5th claw.

*Rod-shaped Organ* (Figure 45k): Segmented proximal part (distal end broken off specimen examined).

*Eyes* (Figure 45j,k): Lateral and medial eyes similar to those of female.

*Copulatory Organ* (Figure 45i): Consisting of 2 or 3 lobes, one of these with long sclerotized terminal hook and several bristles.

*Y-Sclerite* (Figure 45i): Similar to that of female.

DESCRIPTION OF INSTAR II (sex uncertain; Figure 46a–f): Carapace similar to that of adult female except for posterior dorsal to caudal process being truncate (Figure 47a).

*Size*: USNM 156616, length 0.82 mm, height 0.58 mm.

*First Antenna*: Similar to that of adult female except 4th joint without ventral bristles.

*Second Antenna*: Similar to that of adult female except endopodite with only 1 short anterior bristle.

*Mandible, Maxilla*: Similar to that of adult female.

*Fifth Limb*: Epipodial appendage with 30 bristles. Exopodite similar to that of adult female.

*Sixth Limb* (Figure 46b): Hirsute with 1 spinous bristle.

*Seventh Limb* (Figure 46c): Very small (observed only under oil immersion, but could not be certain that structure observed is 7th limb).

*Furca* (Figure 46d): Similar to that of adult female.

*Rod-shaped Organ* (Figure 46e), *Eyes*, and *Y-Sclerite*: Similar to those of adult female.

*Brushlike Organ*: Not present.

DESCRIPTION OF A–2 FEMALE (instar III; Figure 46g–l).—Carapace similar to that of adult female except for posterior dorsal to caudal process being truncate (Figure 46g).

*Size*: USNM 156617, length 1.08 mm, height 0.84 mm.

*First Antenna*: Similar to that of adult female except only 1 ventral bristle on 4th joint.

*Second Antenna* (Figure 46h), *Mandible, Maxilla, 5th and 6th Limbs*: Not examined in detail but similar to those of adult female.

*Seventh Limb* (Figure 46i): Long but without bristles or terminal comb teeth.

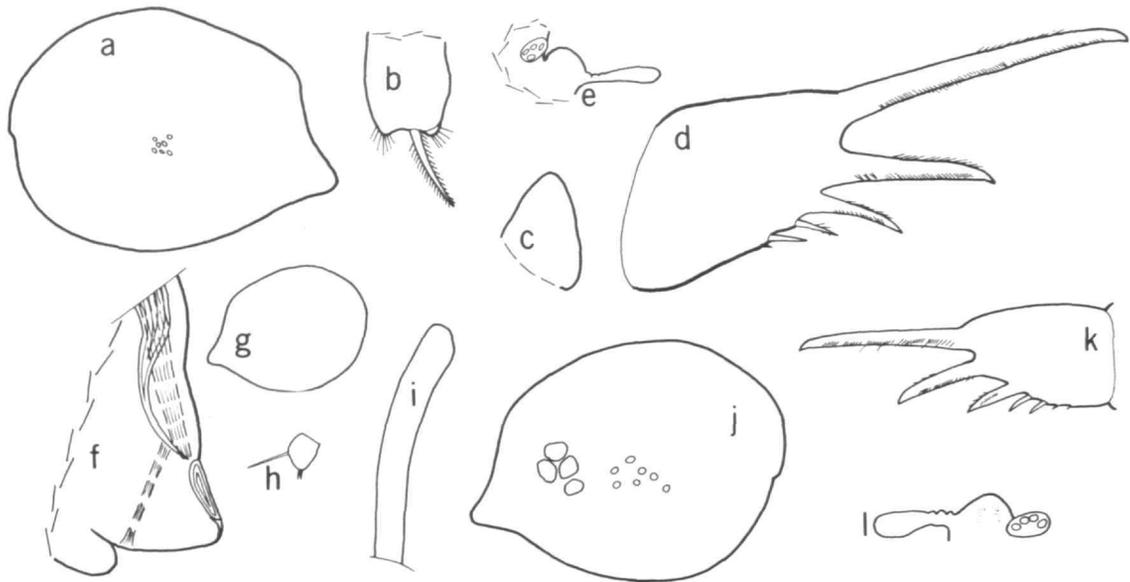


FIGURE 46.—*Junctichela margalefi*, new species, paratype, sex uncertain (instar II), USNM 156616, length 0.82 mm: *a*, complete specimen showing central adductor muscle attachments; *b*, right 6th limb, lateral view; *c*, right 7th limb (?), (anterior to right); *d*, right lamella of furca; *e*, right lateral eye, medial eye and rod-shaped organ; *f*, anterior of body showing upper lip (at lower right) and part of the musculature. Paratype, A-2 female (instar III), USNM 156617, length 1.08 mm: *g*, complete specimen; *h*, endopodite of left 2nd antenna, medial view; *i*, left 7th limb. Holotype, A-1 female (instar IV), "Grigore Antipa" 296, length 1.29 mm: *j*, complete specimen showing some fossae and central adductor muscle attachments; *k*, left lamella of furca; *l*, left lateral eye, medial eye and rod-shaped organ.

*Furca, Rod-shaped Organ, and Eyes:* Similar to those of adult female.

**DESCRIPTION OF A-1 FEMALE (instar IV; Figures 46*j-l*, 47).**—Carapace similar to that of adult female except for having truncate posterior (Figure 46*j*, 47).

*Size:* "Grigore Antipa" 296, length 1.29 mm, height 0.97 mm.

*First Antenna:* Similar to that of adult female.

*Second Antenna:* Similar to that of adult female except exopodial bristles with more ventral spines.

*Mandible, Maxilla, 5th and 6th Limbs:* Similar to those of adult female.

*Seventh Limb:* Bristles strongly tapered (juvenile character); 2 bristles in proximal group (1 on each side), 4 bristles in terminal group (2 on each side), each bristle with 2-4 bells; terminus with opposing combs.

*Furca (Figure 46*k*):* Similar to that of adult female except for having 2 spines following claw 5;

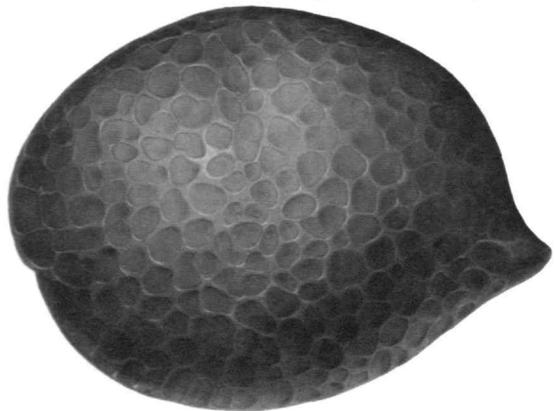


FIGURE 47.—*Junctichela margalefi*, new species, holotype, A-1 female, "Grigore Antipa" 296, length 1.29 mm.

long medial hairs forming row at base of claw I on each lamella.

*Rod-shaped Organ and Eyes* (Figure 46l): Similar to those of adult female.

**SUMMARY OF DEVELOPMENT OF FEMALE.**—Using the key to early mydocopid instars of Kornicker (1969a:3) it was determined that the collection contained instars II (A-3) to IV (A-1) in addition to the adult. Observed changes in carapace size and in the number of bristles on limbs are summarized

in Table 2. The development of *Junctichela* differs from that of *Spinacopia* (see Kornicker, 1969a:34) mainly in that the number of furcal claws remained the same during development from instar II to the adult of *Junctichela* but increased from 4 claws on instar II to 7-8 claws on the adult of *Spinacopia*. The number of furcal claws during the development from instar II to the adult of *Sarsiella zostericola* Cushman, 1906, also remains the same (Kornicker, 1967:4).

TABLE 2.—Summary of development of females of *Junctichela margalefi*

Character	Instar II*	Instar III	Instar IV	Adult
Carapace: length/height (mm) .....	0.82/0.58	1.08/0.84	1.29/0.97	1.56/1.31
1st antenna: number of ventral bristles on 4th joint .....	0	1	2	2
2nd antenna: number of short anterior bristles on endopodite .....	1	2	2	2
6th limb: number of bristles .....	1	many	many	13-14
7th limb: number of proximal bristles .....	0	0	2	2
number of terminal bristles .....	0	0	4	6
Furca: number of claws .....	5	5	5	5

\* Sex uncertain on instar II.

### RUTIDERMATIDAE Brady and Norman, 1896

This family contains three genera: *Rutiderma* Brady and Norman, 1896, *Alternochelata* Kornicker, 1958, and *Scleraner* Kornicker, 1975a. Only the first two are represented in the collections.

### *Rutiderma* Brady and Norman, 1896

This genus is represented in the collections by 3 species: *R. leloeuffi* Kornicker, 1975b, *R. tridens*, new species, and *R. irrostratum*, new species.

**DISTRIBUTION.**—Members of *Rutiderma* are widespread between latitudes of 45°N and 50°S and

#### Key to the Genera of Rutidermatidae

1. Furca with secondary caws alternating with primary claws ..... *Alternochelata* Kornicker  
Furca with secondary claws following primary claws ..... 2
2. Endopodite of female 2nd antenna with 1 joint ..... *Rutiderma* Brady and Norman  
Endopodite of female 2nd antenna with 2 joints ..... *Scleraner* Kornicker

#### Key to the Species of *Rutiderma* along the Western Coasts of Europe and Africa

1. Anterior with distinct rostrum ..... 2  
Anterior essentially without rostrum ..... *R. irrostratum*, new species
2. Horizontal ribs on both anterior and posterior halves of valves ..... 3  
Horizontal ribs absent or restricted to posterior halves of valves ..... *R. tridens*, new species
3. Each valve with overhanging rostrum and long caudal process ..... *R. leloeuffi* Kornicker  
Each valve with rostrum not overhanging and short caudal process .....  
..... *R. compressa* Brady and Norman

depths of 1 to 260 m. Species in the present collection were from off Mauritania and Spanish Sahara at depths of 30 to 260 m.

*Rutiderma leloeufti* Kornicker, 1975

FIGURE 48; PLATES 28–30

*Rutiderma leloeufti* Kornicker, 1975b:40, figs. 29–32.

**HOLOTYPE.**—USNM 149330, adult female, length 1.99 mm.

**TYPE-LOCALITY.**—Off Grand Bassam, Ivory Coast, 5°12'05"N, 3°49'05"W, 20 m.

**MATERIAL.**—USNM 156597, 1 A–1 male from station A8a; USNM 156607, an adult female from station A10b.

This species was described from a single specimen collected from a depth of 20 m off the Ivory Coast by Kornicker (1975b).

**SUPPLEMENTARY DESCRIPTION OF ADULT FEMALE.**—*Size:* USNM 156607, length 1.84 mm, height 1.41 mm. The size of this specimen, which contained large unextruded eggs, indicates that the holotype described by Kornicker (1975b) is an adult female.

**DESCRIPTION OF A–1 MALE** (Figure 48; Plates 28–30).—Except for less overhang of rostrum, carapace similar in shape to that of adult female illustrated by Kornicker (1975b: figure 29) (Figure 48a).

**Ornamentation:** Carapace with horizontal ribs and projecting caudal process (Figure 48a; Plate 28a–c,e); surface with abundant shallow fossae

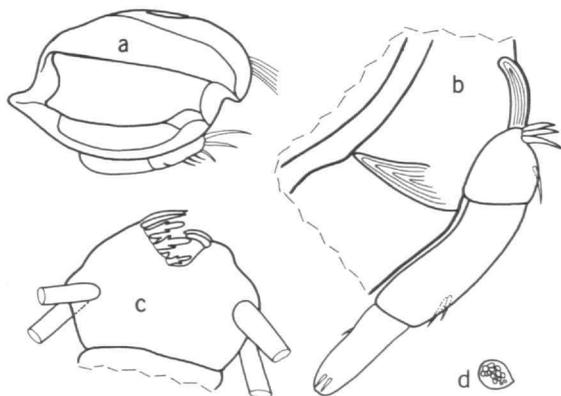


FIGURE 48.—*Rutiderma leloeufti* Kornicker, A–1 male, USNM 156597, length 1.59 mm: a, complete specimen showing ribs (diagrammatically) and projecting furca; b, endopodite of left 2nd antenna; c, tip of 7th limb; d, left lateral eye.

(Plates 28d, 29c); surface between fossae and bottom of most fossae with minute pustules (Plates 28d, 29a–d); long bristles with broad ribbed bases present along anterior margin and sparsely distributed on valve surface (Plates 28a,d,e, 29a,b,e, 30a,b).

**Infold:** Infold of rostrum with long bristles (Plate 30a,d).

**Selvae:** Lamellar prolongation of selvae at tip of caudal process with indentation exposing short bristle on valve edge (Plate 30b,c). Prolongation along lower margin of caudal process minutely serrate (Plate 28f).

**Central Adductor Muscle Scars:** Fossae in vicinity of muscle attachments with fewer pustules than fossae elsewhere, some with median row of pustules (Plate 29c,d). Muscle attachments appearing fibrous (Plate 29f).

**Size:** USNM 156597, length 1.59 mm, height 1.02 mm.

**First Antenna, Mandible, Maxilla, 5th and 6th Limbs:** Not examined in detail but morphology similar to that of adult female.

**Second Antenna:** Protopodite bare. Endopodite 3-jointed (Figure 48b): 1st joint short with 3 short proximal bristles and 1 short distal bristle; 2nd joint elongate with 2 minute ventral bristles; 3rd joint elongate with minute proximal bristle on dorsal margin and 2 minute subterminal bristles, tip of joint rounded. Exopodite: 1st joint with short medial spine on distal margin; bristle of 2nd joint reaching to about 8th joint; joints 2–7 with short spines forming row along distal margin; bristles of joints 2–8 with closely spaced spines along ventral margin; 9th joint with 4 bristles (2 about same size as bristle of 2nd joint, with closely spaced spines along ventral margin; 1 short with a few spines along ventral and dorsal margins; 1 very short with numerous spines along ventral and dorsal margins).

**Seventh Limb:** Terminal comb with 7 or 8 teeth with minute tooth between bases opposing 2 recurved teeth (Figure 48c). Each limb with 8 tapered bristles (4 terminal, 2 on each side; 4 proximal, 2 on each side); proximal bristles with 3 equal bells; terminal bristle with 4 bells, proximal bell larger than others; all bristles with distal marginal spines.

**Furca:** Each lamella with 3 strong claws followed by 3 short secondary claws (similar to furca of adult female).

*Rod-shaped Organ*: Elongate, widening near middle, tapering towards tip.

*Eyes*: Lateral eye fairly large with about 7 minute ommatidia (Figure 48d); medial eye bare, elongate, similar in size to lateral eye.

*Upper Lip*: Rounded, similar to that of adult female.

*Posterior of Body*: Long hairs present (similar to those on posterior of adult female).

### *Rutiderma irrostratum*, new species

FIGURES 49–51; PLATE 31

**HOLOTYPE**.—"Grigore Antipa" 291, female (A-1 stage), length 1.27 m, some appendages on slide, remaining appendages and carapace in alcohol.

**TYPE-LOCALITY**.—Station X053.

**ETYMOLOGY**.—The species name, derived from Latin, means "without rostrum."

**PARATYPES**.—"Grigore Antipa" 292, 2 juveniles from same sample as holotype; USNM 150106, ovigerous female from same station as holotype; USNM 152826, 1 ovigerous female from station A8a; USNM 154198, 1 A-1 male from same sample as holotype; USNM 156595, 1 specimen from station A7b; USNM 156606, 1 specimen from station A10b; USNM 156629, 1 specimen from station X068.

**DESCRIPTION OF ADULT FEMALE** (Figure 49–51a-g; Plate 31).—Carapace oval in lateral view with evenly rounded anterior, and truncate posterior with protruding caudal process (Figure 49); rostrum almost absent, a short faint line indicates lo-

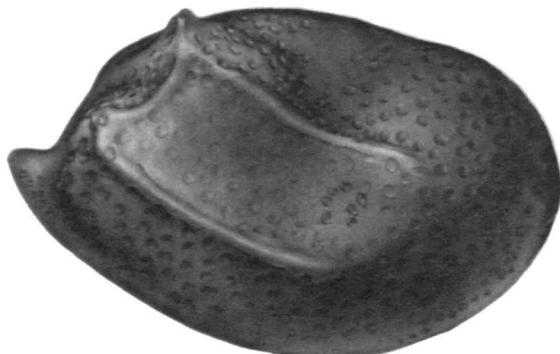


FIGURE 49.—*Rutiderma irrostratum*, new species, paratype, adult female, USNM 150106, length 1.50 mm.

cation of incisur (line visible in transmitted light); upper and lower horizontal ribs extend from just anterior to central adductor muscle attachment area to posterior part of shell; on some specimens upper rib tends to continue weakly to anterior shell margin; in dorsal view ribs of each valve parallel.

**Ornamentation**: Long bristles along anterior margin and on valve surface (Plate 31a,b,f). Surface with abundant shallow fossae (Plate 31a-d); surface between fossae and on bottom of fossae with minute pits and nodes (Plate 31c-e).

**Infold**: Broad along anterior, ventral, and posteroventral margins; anterior infold with a single bristle near or dorsal to line indicating incisur locality (Figure 50a); 8 bristles on striate anteroventral infold; middle part of ventral infold bare; posteroventral infold anterior to caudal process with 10 small bristles mostly along inner margin of infold; caudal process with 6 bristles along list (Figure 50b); posterior infold dorsal to caudal process with 1 bare bristle.

**Selvage**: Wide lamellar prolongation present along anterior, ventral, and dorsal margins; edge of prolongation along anterior margin with few marginal hairs, along anteroventral and ventral margin with abundant hairs.

**Central Muscle Attachment Scars**: Consisting of about 14 individual scars.

**Size**: USNM 152826, length 1.33 mm, height 0.94 mm; USNM 150106, length 1.50 mm, height 0.94 mm.

**First Antenna** (Figure 50c): 1st joint: bare or with few faint distal hairs on medial surface. 2nd joint: long hairs forming 3 clusters on dorsal margin, lateral spines forming row in distal dorsal corner, 1 distal dorsal bristle, and 1 short lateral bristle in distal ventral corner. 3rd joint: fused with 4th, with 2 bristles (1 ventral, 1 dorsal). 4th joint: elongate, with 3 bristles (1 dorsal, 2 ventral). 5th joint: elongate, sensory bristle bare; 6th joint: fused to 5th, with short medial bristle. 7th joint: a-bristle slightly longer than bristle of 6th joint; b-bristle represented by minute spine; c-bristle bare, slightly shorter than sensory bristle of 5th joint. 8th joint: d- and e-bristles bare with blunt tips, shorter than c-bristle; f- and g-bristles bare, slightly shorter than c-bristle; minute spine at tip of sensory, c-, f-, and g-bristles.



FIGURE 50.—*Rutiderma irrostratum*, new species, adult female, paratype, USNM 152826, length 1.33 mm: *a*, inside view of segment of anterior margin of right valve showing dashed line representing incisure line (incisure absent on species); *b*, caudal process of right valve, inside view; *c*, left 1st antenna, medial view; *d*, endopodite of left 2nd antenna, medial view; *e*, left mandible, medial view; *f*, tip of right mandible, lateral view; *g*, right maxilla, medial view; *h*, left maxilla, lateral view; *i*, distal end of right 5th limb, anterior view; *j*, endites I (top), II, and III of left 5th limb; *k*, part of right side of body showing Y-sclerite, genital organ, and right lamella of furca. Paratype, adult female, USNM 150106, length 1.50 mm; *l*, large and small eggs in marsupium (2 of each present).

*Second Antenna:* Protopodite bare. Endopodite 1-jointed with 4 anterior proximal bristles and a minute subterminal spine with base on lateral surface (Figure 50d). Exopodite: 1st joint with short medial spine on distal margin; joints 2-8 with spines forming row along distal margin; bristle of 2nd joint reaching just past 9th joint, with minute ventral spines forming 4 or 5 groups; bristles of joints 3-8 unbroken, with natatory hairs; 9th joint with 6 bristles (3 long and 1 short with natatory hairs, 2 much shorter, bare or with short hairs).

*Mandible* (Figure 50e,f): Coxale endite bifurcate with secondary teeth and long spines. Basale: ventral margin with 4 proximal bristles (1 long with short marginal spines, 2 short pectinate, and 1 minute, bare) and 2 bristles near middle (1 short with spine, 1 minute, bare); dorsal margin of basale with 3 bristles near middle forming 2 groups with 1 short bristle in proximal group and 2 in distal group. No exopodite present. Endopodite: 1st joint with 3 short ventral bristles and spines forming rows on medial surface; 2nd joint with spines forming rows on medial surface; dorsal margin with 2 proximal bristles; ventral margin with stout terminal claws with serrate inner margin and proximal tooth; 1 short ventral bristle and small medial process present near base of claw; end joint with stout dorsal claw and slender ventral claw, each with minute teeth along ventral margins, 3 short medial bristles present lateral to stout claw, and 2 short lateral bristles present ventral to base of slender claw.

*Maxilla* (Figure 50g,h): Coxale with long hairs on dorsal margin and short distoanterior bristle with short marginal spines. Endite I with 3 stout pectinate bristles and 2 or 3 slender spinous bristles; endite II with 2 stout pectinate bristles and 3 or 4 short spinous bristles; endite III with 4 stout pectinate bristles, 2 short spinous subterminal bristles, and 1 spinous proximal lateral bristle. Basale with 1 slender distoanterior bristle with short marginal spines, and 2 short distoposterior bristles. Exopodite with 2 bristles. Endopodite: 1st joint with 1  $\alpha$ -bristle with short marginal spines, 1  $\beta$ -bristle with faint marginal teeth, and distal spines on medial surface; 2nd joint with 1 stout claw with large teeth along ventral margin, 1 shorter claw without marginal teeth, 2 spinous  $\alpha$ -bristles, 1 ven-

tral posterior terminal bristle with slender teeth along both margins, and 1 medial bristle with teeth along posterior margin.

*Fifth Limb* (Figures 50i,j, 51e,f): Endite I with 2 bristles; endite II with 3 bristles; endite III with 4 bristles. Exopodite: main tooth of 1st joint consisting of a large prong with 2 distal marginal teeth and smaller elongate proximal tooth near middle of inner margin; a short bristle present near proximal tooth; outer edge of main tooth with slender proximal bristle; 2nd joint with large triangular tooth with inner edge consisting of 3 large prongs; distal of these with 2 marginal teeth on inner margin; middle prong and proximal prong with a marginal tooth on each side; base of proximal prong on anterior side of 2nd joint; 1 bristle present on inner margin proximal to proximal tooth, and 1 bristle present on posterior side near proximal prong; outer distal corner of triangular tooth of 2nd joint rounded, 3rd joint with 2 bristles on inner and outer lobes; 4th and 5th joints fused, with total of 4 spinous bristles.

*Sixth Limb* (Figure 51a): 2 plumose bristles in place of epipodial appendage. Endite I minute with 1 long bristle; endite II with 2 short spinous bristles; endite III with 2 long bristles; endite IV with 3 spinous bristles; end joint with anterior 2 bristles with short marginal spines and posterior 5 bristles plumose. (The 1st and 2nd endites could be interpreted as being only a single endite, in which case the limb would have only 3 endites).

*Seventh Limb* (Figure 51b,c,g): Each limb with 4 short proximal bristles (2 on each side), and 3 long and 2 short terminal bristles (3 on one side, 2 on other); proximal bristles with 3 small bells; short terminal bristles with 3 small bells; long terminal bristles with 6 bells of which proximal bell is much larger than others; all bristles with marginal spines; terminus bare.

*Furca* (Figure 50k): Each lamella with 3 strong claws followed by 3 secondary claws; strong claws with subequal slender spinelike teeth along posterior margin; long hairs present on lamella posterior to claws.

*Rod-shaped Organ* (Figure 51d): Elongate, 2-jointed with 1st joint widening distally; 2nd joint with tapered end bearing minute spine.

*Eyes:* Lateral eyes absent; medial eye pigmented, bare (Figure 51d).

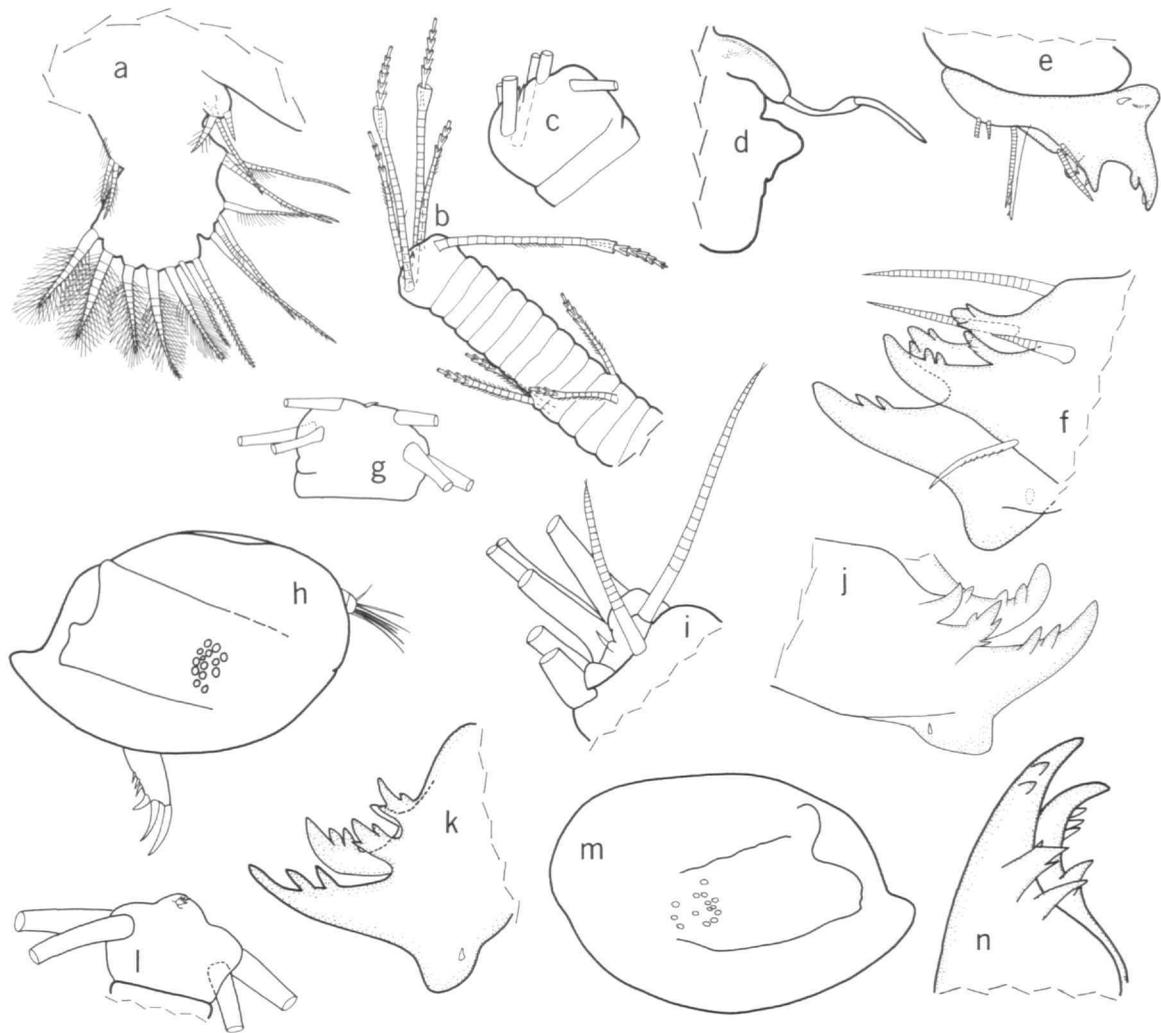


FIGURE 51.—*Rutiderma irrostratum*, new species, paratype, adult female, USNM 152826: *a*, 6th limb; *b*, distal end of 7th limb; *c*, detail of tip of 7th limb; *d*, anterior of body showing medial eye and rod-shaped organ, anterior process, and upper lip (lower right). Paratype, adult female, USNM 150106: *e*, 2nd exopodial joint of right 5th limb, posterior view; *f*, 1st and 2nd exopodial joints of left 5th limb, anterior view; *g*, tip of 7th limb. Holotype, A-1 female, "Grigore Antipa" 291, length 1.27 mm: *h*, complete specimen showing central adductor muscle scars, horizontal ribs (diagrammatically), and extruding furca and tip of right 1st antenna; *i*, tip of right 1st antenna, medial view; *j*, *k*, 1st and 2nd exopodial joints of left and right 5th limbs, posterior views (bristles not shown); *l*, tip of 7th limb. Paratype, A-1 male, USNM 154198, length 1.35 mm: *m*, complete specimen showing central adductor muscle attachment scars and horizontal ribs (diagrammatically); *n*, 1st and 2nd exopodial joints of right 5th limb, posterior view (bristles not shown).

*Upper Lip* (Figure 51d): Small, rounded, bare.  
*Posterior*: Hirsute.

*Genitalia* (Figure 50k): Consisting of oval sclerotized ring on each side of body.

*Y-Sclerite* (Figure 50k): Linear with short up-turned distal end, without ventral branch.

*Eggs*: USNM 152826 and 150106 with 4 eggs in marsupium. In 152826 3 eggs were larger than the 4th; in 150106 2 eggs were larger than the other 2 (Figure 50l).

*Gut Content*: USNM 152826 with almost complete harpacticoid copepod, a polychaete worm of Family Glyceridae (ident. M. H. Pettibone), a freeliving nematode of the order Desmoscolecida (ident. D. H. Hope), and spines possibly belonging to a polychaete.

**DESCRIPTION OF A-1 FEMALE** (Figure 51h-l).—Carapace similar to that of adult female except smaller (Figure 51h): holotype, "Grigore Antipa" 291, length 1.27 mm, height 0.83 mm.

*First Antenna* (Figure 51i): Same as 1st antenna of adult female.

*Second Antenna*: Protopodite and endopodite similar to that of adult female except endopodite with only 3 anterior bristles. Exopodite: bristles shorter than those on limb of adult female and without natatory hairs; bristles of joints 2-8 with minute teeth along ventral margin; 9th joint with 5 bristles, all with either minute marginal spines or teeth; 1st joint with medial terminal spine; joints 2-8 with minute spines forming row near terminal margin.

*Mandible, Maxilla, 6th Limb*: Not examined in detail, but same type as on adult female.

*Fifth Limb* (Figure 51j,k): Epipodial appendage with 34-35 bristles. Exopodite similar to that of adult female.

*Seventh Limb* (Figure 51l): Proximal and terminal groups each with 4 tapered bristles; proximal bristles short, with 2-3 equal terminal bells and marginal spines; terminal bristles longer than proximal bristles, with 4 terminal bells (proximal bell longer than others) and marginal spines; terminal with few spines.

*Furca, Rod-shaped Organ, and Eyes*: Similar to those of adult female.

**DESCRIPTION OF A-1 MALE** (Figure 51m,n).—Carapace similar to that of A-1 female but slightly

larger (Figure 51m): USNM 154198, length 1.35 mm, height 0.89 mm.

*First Antenna*: Same as limb of A-1 female.

*Second Antenna*: Protopodite and exopodite similar to those of A-1 female. Endopodite 3-jointed: 1st joint short with 4 ventral bristles (3 proximal, 1 distal); 2nd joint elongate with 2 short distoventral bristles; 3rd joint elongate with 1 minute bristle near middle of dorsal margin and 2 short terminal bristles.

*Mandible, Maxilla, 6th Limb*: Not examined in detail but of same general type as on adult female.

*Fifth Limb* (Figure 51n): Epipodial appendage with 33 bristles. Exopodite similar to that of adult female.

*Seventh Limb*: Proximal bristles with 2 bells, limb otherwise same as that of A-1 female.

*Furca*: Similar to that of adult female.

*Lateral eye*: Not seen with certainty; faint globe with what could be minute ommatidia observed.

**COMPARISONS**.—The main tooth of the 1st exopodite joint of the 5th limb of females and advanced juveniles of previously described species consist of 3 or 4 large prongs and a proximal peg. The main tooth of the new species *Rutiderma irrostratum* bears only 1 large prong with 3 marginal teeth. The b-bristle of the 7th joint of the 1st antenna is minute, much smaller than that bristle on previously described species. The tip of the 7th limb of *R. irrostratum* is either bare or has a few minute spines, unlike the tip of the limb of other species which bears 2 opposing combs with well-developed teeth. In addition, the rostrum is totally lacking on *R. irrostratum* and in its place is a minute line. The degree of development of the rostrum of previously described species varies, but none is without a rostrum. The above differences may warrant future inclusion of this species in a new subgenus of *Rutiderma*.

### *Rutiderma tridens*, new species

FIGURES 52-55; PLATES 32, 33

?*Rutiderma compressa*.—Müller, 1908:92, pl. 7: figs. 1-13.

**HOLOTYPE**.—USNM 152829, A-1 male, in alcohol and on slides.

**TYPE-LOCALITY**.—Station X051.

**ETYMOLOGY**.—The specific name is from the

Latin "tri" (= three) plus dens (= tooth) in reference to the 3 teeth on the infold of the caudal process of the A-1 male.

PARATYPE.—"Grigore Antipa" 469, 1 juvenile female (A-1 instar?) from same sample as holotype.

DESCRIPTION OF A-1 MALE (Figures 52-54; Plates 32, 33).—Carapace oval in lateral view, with small caudal process and distinct incisur forming right angle; 2 weakly developed lateral ribs present in posterior half of each valve (Figure 52).

*Ornamentation*: Surface with shallow round fossae (Plate 32*a,b,d,e*); anterodorsal, anterior and ventral margin with numerous hairs, most with broad base (Plate 32*a,b*); short and long hairs sparsely distributed over valve surface (Plates 32*b,d,f*, 33*a-c*); low nodes present along ventral margin and edge of rostrum; surface between fossae with pits (Plate 33*c,d*).

*Infold*: Rostral infold with 5 long bristles forming row paralleling anterodorsal margin; anteroventral infold with 7 bristles and 5 ribs paralleling margin; ventral infold bare; posteroventral infold anterior to caudal process with about 9 short bristles; infold of caudal process with "pocket"; anterior margin of pocket with 3 teeth along dorsal part and 3 or 4 bristles forming row ventral to teeth (Figure 53*a*); 2 or 3 minute bristles present between anterior margin of pocket and inner margin of infold (Figure 53*a*).

*Selvage* (Plate 32*c*): Wide lamellar prolongation with fringed margin present along anterodorsal, anterior, ventral, and posterior valve margins.

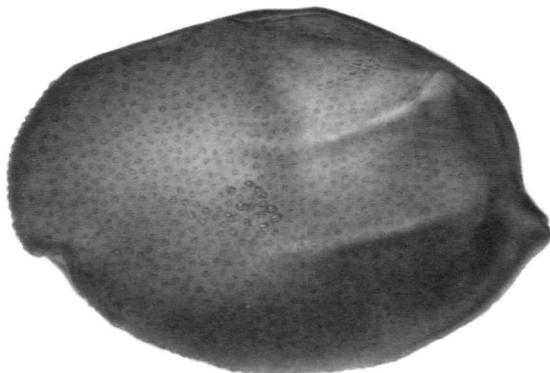


FIGURE 52.—*Rutiderna tridens*, new species, holotype, A-1 male, USNM 152829, length 1.32 mm.

*Central Adductor Muscle Scars*: Consisting of about 12-15 individual ovoid scars.

*Size*: USNM 152829, length 1.32 mm, height 0.88 mm.

*First Antenna* (Figure 52*b-d*): First joint: bare. 2nd joint: 1 spinous lateral bristle near ventral margin, 1 spinous dorsal bristle, spines forming row on lateral surface in distodorsal corner, and 2 clusters of long spines proximally on dorsal margin (spines form short row extending onto medial surface). 3rd joint: fused to 4th with, 2 short spinous bristles (1 ventral, 1 dorsal). 4th joint: 3 spinous bristles (2 ventral, 1 dorsal). 5th joint: sensory bristle bare with 2 short proximal filaments; row of short lateral spines present near base of sensory bristle. 6th joint: medial bristle short with few marginal spines. 7th joint: a-bristle spinous, about same length as bristle of 6th joint; b-bristle represented by minute bristle with broad base; c-bristle bare, same length as sensory bristle. 8th joint: d- and e-bristles bare with blunt tips, slightly shorter than c-bristle; f-bristle with 1 or 2 short proximal filaments, about same length as d-bristle; g-bristle about same length as c-bristle, with 1 short proximal filament; a minute spine at tips of sensory, c-, f-, and g-bristles.

*Second Antenna*: Protopodite bare. Endopodite 3-jointed (Figure 53*e*): 1st joint short with 4 short bristles; 2nd joint elongate with 3 short distal bristles; end joint elongate with 2 short terminal bristles. Exopodite: 1st joint with short medial bristle on terminal margin; bristles of joints 2-8 short, with abundant small teeth ventrally along distal three-fourths; 9th joint with 5 short bristles, length of bristles decreasing dorsally, the 2 ventrally located bristles of 9th joint with ventral teeth distally, other bristles with few dorsal and ventral spines or bare; joints 2-8 with short spines forming row along distal margin, no basal spines.

*Mandible* (Figure 53*f*): Coxale endite bifurcate with stout distal teeth and proximal hairs. Basale: medial surface with 6 proximal bristles (2 long with short marginal spines, 2 short pectinate, 2 short bare); lateral surface with 1 short bristle opposite distal bristle of medial surface; dorsal margin with 2 bristles near middle. Endopodite: 1st joint with medial spines and 3 or 4 short ventral bristles; 2nd joint with medial spines; dorsal margin with 3 spinous proximal bristles; ventral mar-



FIGURE 53.—*Rutiderma tridens*, new species, holotype, A-1 male, USNM 152829, length 1.32 mm: *a*, caudal process of left valve, inside view; *b* left 1st antenna, medial view; *c*, right 1st antenna, lateral view; *d*, detail of tip of left 1st antenna, medial view; *e*, endopodite of right 2nd antenna, medial view; *f*, left mandible, medial view.

gin with short subterminal bristle and terminal claw; small bristle with stout base present medial to terminal claw; ventral margin of claw with minute node distally (node smaller on left limb); dorsal margin with proximal toothlike process, large teeth along broad proximal two-thirds, and minute teeth along slender recurved distal part; 3rd joint with large terminal claw with few teeth along ventral margin, 3 short slender medial bristles, 2 slender lateral bristles, and 1 slender lateral claw ventral to main claw.

*Maxilla* (Figure 54a): 3 endites present, each with stout pectinate bristles and slender spinous bristles. Coxale with 1 short dorsal bristle. Basale with 2 spinous marginal bristles, ventral of these near exopodite. Exopodite represented by 2 short spinous bristles. Endopodite: 1st joint with 1  $\alpha$ - and 1  $\beta$ -bristle; end joint with 2 claws, 1 about half size of other, and 4 bristles.

*Fifth Limb* (Figure 54b,c): Epipodial appendage with 36 bristles, 3 endites present. Exopodite: main tooth of 1st joint with 4 prongs (proximal 2 bare, distal 2 with marginal teeth); short bristle present proximal to proximal prong; slightly longer bristle present near middle of distal margin; 2nd joint with large squarish tooth with 3 stout prongs along inner margin; posterior side of joint with short slender bristle in outer distal corner of tooth and 2 bristles near proximal prong (bristle closest to prong pectinate, other bristle spinous); 3rd joint with 3 bristles on inner lobe and 2 on outer lobe; fused 4th and 5th joints with total of 5 bristles.

*Sixth Limb* (Figure 54d): Endite I with long spinous terminal bristle and 2 short spinous medial bristles; endite II with 2 terminal bristles; endite III with 1 or 2 terminal bristles; endite IV with 1 terminal bristle; end joint with 6 bristles (2 anterior with short marginal spines; 2 middle with long proximal hairs and short distal spines, 2 posterior with long hairs); 2 spinous bristles present in place of epipodial appendage; long hairs on lateral sides of endites I and II and on medial side near epipodial bristles.

*Seventh Limb* (Figure 54e): Proximal group with 3 or 4 tapered bristles (1 and 2 on each side), each bristle with 1 bell and distal marginal spines; distal group with 4 tapered bristles (2 on each side), each bristle with 3 or 4 bells and distal marginal

spines; terminus with comb of 8 alate teeth opposite 2 recurved, spinous teeth.

*Furca* (Figure 54f): Each lamella with 3 stout claws followed by 3 secondary claws; claws 1 and 2 with short and long teeth forming lateral and medial row along posterior margins and few hairs along anterior margins; long medial hairs present proximally on claws 1 and 2; claw 3 with few medial teeth near posterior margin; long hairs present on lamella following claw 6; right lamella with few long anterior hairs near base of claw 1.

*Rod-shaped Organ* (Figure 54g): Elongate, single jointed, broadening near middle with tapered tip.

*Eyes* (Figure 54g): Lateral eye about same size as medial eye, with about 7 small ommatidia; medial eye tapering distally, with small amount of pigmentation, bare.

*Upper Lip* (Figure 54g): Rounded lobe.

*Posterior of Body* (Figure 54h): Segment dorsal to furca hirsute.

*Y-Sclerite* (Figure 54h): Broad, indistinct.

**DESCRIPTION OF JUVENILE FEMALE (A-1 Instar?; Figure 55).**—Outline of carapace similar to that of A-1 male (Figure 55a); lateral ribs absent on specimen examined.

*Ornamentation*: Similar to that of A-1 male.

*Infold*: Rostral infold with 3-5 long bristles forming row paralleling anterodorsal margin (Figure 55b,c); anteroventral infold with 5 bristles and 6 ribs paralleling margin; ventral infold bare; posteroventral infold anterior to caudal process with 8-10 short bristles; infold of caudal process with "pocket"; anterior margin of pocket with 2 teeth along dorsal part, 1 short bristle between teeth, 3 bristles forming row ventral to teeth (Figure 55b,c); anterior margin of pocket of right valve with indistinct flat process near base of ventral tooth (Figure 55b); on left valve a similar process near base of dorsal tooth (Figure 55c).

*Selvage, Central Adductor Muscle Scars*: Similar to those of A-1 male.

*Size*: "Grigore Antipa" 469, length 1.24 mm, height 0.87 mm.

*First Antenna*: Similar to that of A-1 male except without minute proximal filaments on f-bristle.

*Second Antenna*: Protopodite and exopodite similar to those of A-1 male. Endopodite 1-jointed with 3 proximal anterior bristles (Figure 55d).

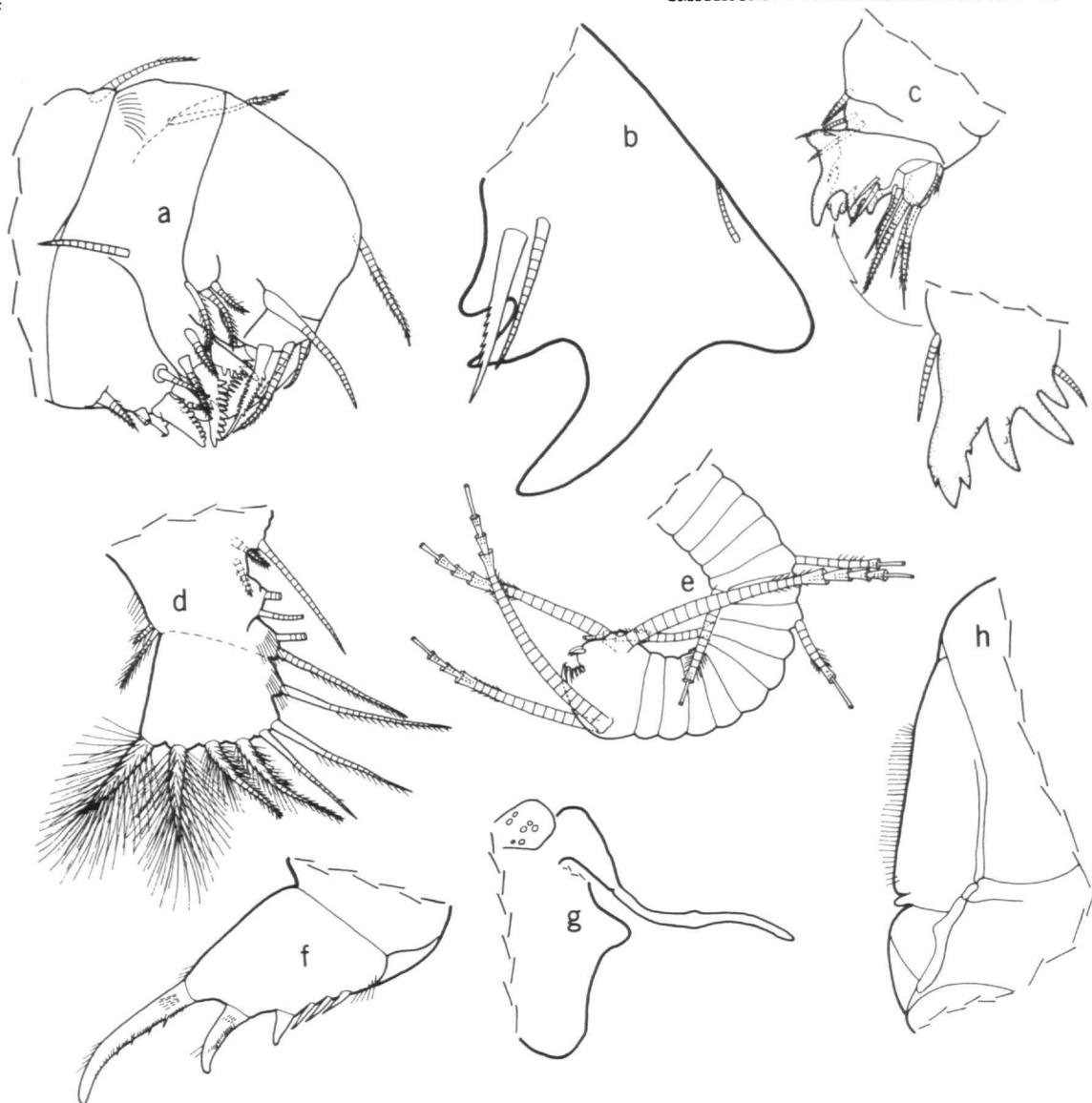


FIGURE 54.—*Rutiderma tridens*, new species, holotype, A-1 male, USNM 152829: *a*, right maxilla, lateral view; *b*, 2nd exopodial joint of right 5th limb, posterior view; *c*, distal part of left 5th limb, posterior view; *d*, 6th limb; *e*, distal part of 7th limb; *f*, left lamella of furca; *g*, anterior of body showing right lateral eye, medial eye and rod-shaped organ, anterior process, and upper lip (lower right); *h*, posterior of body showing Y-sclerite (anterior to right).

*Mandible, Maxilla, 5th Limb, 6th Limb*: Similar to those of A-1 male.

*Seventh Limb*: Proximal group with 4 tapered bristles (2 on each side), each bristle with 1 bell and distal marginal spines; distal group with 4 tapered bristles (2 on each side), each bristle with

3 bells and distal marginal spines; terminus with comb of about 5 alate teeth opposite 2 recurved spinous teeth.

*Furca* (Figure 55a), *Rod-Shaped Organ* (Figure 55e), *Upper Lip* (Figure 55e), *Posterior of Body*: Similar to those of A-1 male.

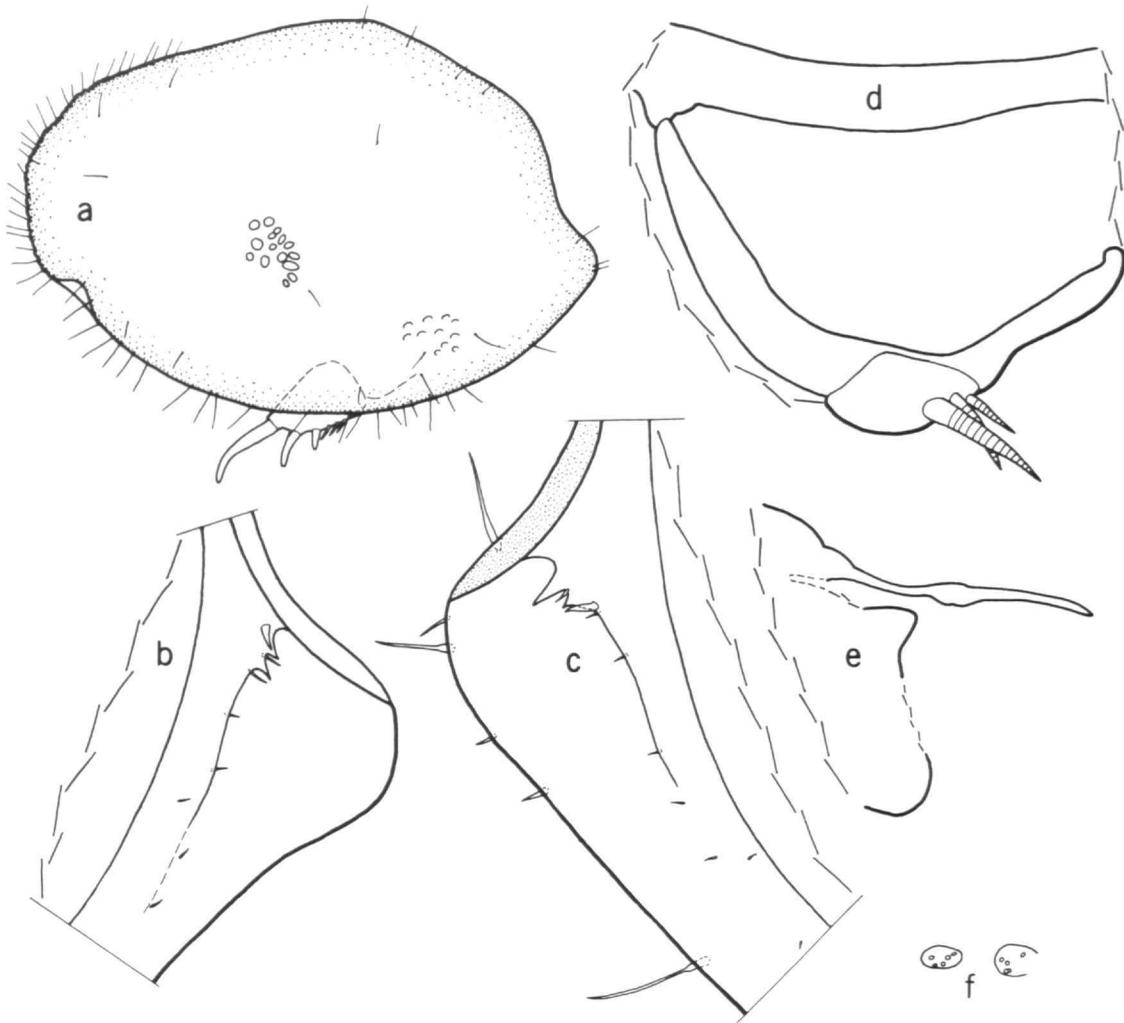


FIGURE 55.—*Rutiderma tridens*, new species, paratype juvenile female (A-1 instar?), "Grigore Antipa" 469, length 1.24 mm: *a*, complete specimen showing central adductor muscle attachment scars and protruding furca; *b*, *c*, caudal process of right and left valves, inside views; *d*, endopodite of left 2nd antenna, medial view; *e*, anterior of body showing medial eye and rod-shaped organ, anterior process, and upper lip (lower right); *f*, right and left lateral eyes.

*Eyes*: Lateral eye about one-half size of medial eye, with 5 small ommatidia (Figure 55*f*); medial eye tapering distally, with light amber pigmentation, bare (Figure 55*e*).

*COMPARISONS*.—The new species *Rutiderma tridens*, differs from *R. compressa* Brady and Norman, 1896, in not having anterodorsal and ventral ribs and riblets on the surfaces of the valves. The carapace of *R. tridens* resembles that of the female

of *R. compressa* from South Africa illustrated by Müller (1908: pl. 7:1). Müller's specimen has been put into the synonymy of *R. tridens* with a question, because the 1st antenna illustrated by Müller (1908: pl. 7:2) does not show a lateral bristle on the 2nd joint, but this could be because the illustration is a medial view of the limb. The 1st, 3rd and 4th endites of the 6th limb illustrated by Müller (1908: pl. 7:12) have a different number

of bristles than do the same endites of the two specimens of *R. tridens* described herein, but this could be the result of intraspecific variability. *Rutiderma tridens* is easily separated from *R. leloeuffi* by the absence of ribs on the anterior half of the valves, and by having a smaller caudal process. Klie (1940:406) did not describe the specimens from Lüderitz Bay, South-West Africa, that he identified as *R. compressa* Brady and Norman; their identification should be verified. The carapace of *R. tridens* differs from that of *R. mollita* Darby, 1965, in having the caudal process projecting past the

posterior end of the shell (see Darby, 1965: pl. 15: fig. 1).

#### *Altenochelata* Kornicker, 1958

This genus is represented in the collection by one species, *A. nealei*, new species.

**DISTRIBUTION.**—The only previously known member of this genus is *A. polychelata* Kornicker, 1958, which was described from the Great Bahama Bank at depths of 1–5 m. The species in the present collection, *A. nealei*, was collected off Mauritania at depths of 52–1100 m.

#### Key to the Species of *Altenochelata*

- Carapace without distinct caudal process; each lamella of furca with main claws 1, 2, 3, 5 . . . . .  
 . . . . . *A. nealei*, new species  
 Carapace with distinct caudal process; each lamella of furca with main claws, 1, 2, 4, 6 . . . . .  
 . . . . . *A. polychelata* Kornicker

#### *Altenochelata nealei*, new species

FIGURES 56–59

**HOLOTYPE.**—“Grigore Antipa” 293, female with large unextruded eggs, length 1.18 mm, left valve and some appendages in alcohol, remaining appendages on 2 slides; right valve gold-plated.

**TYPE-LOCALITY.**—Station X013.

**ALLOTYPE.**—“Grigore Antipa” 294, adult male, length 1.27 mm; left valve and some appendages in alcohol, remaining appendages on slide; left valve gold-plated, in 2 parts; from same sample as holotype.

**ETYMOLOGY.**—The species is named for Dr. John W. Neale.

**PARATYPES.**—USNM 154199, 1 ovigerous female from station X048; USNM 156591, 1 specimen from station A4b; USNM 156592, 13 specimens including 3 ovigerous females from station A6b; USNM 156593, 15 specimens from station A7b; USNM 156594, 1 specimen from station A8a; USNM 156596, 1 adult male from station A6b; USNM 156608, 2 specimens from station A10b; USNM 156620, 62 specimens from station X013; “Grigore Antipa” 461, 38 specimens from station X013; USNM 156621, 236 specimens from station X015; USNM 156622, 136 specimens from station X013; USNM 156628, 77 specimens from station X068; USNM 156633, 3 specimens from station X041; USNM 156637, 1 specimen from station

X057; USNM 156638, 4 specimens from station X052; USNM 156639, 5 specimens from station X044; USNM 156640, 1 specimen from station X039; USNM 156641, 1 specimen from station X031 USNM 156642, 1 specimen from station X005.

**DESCRIPTION OF FEMALE (Figures 56–58).**—Carapace oval in lateral view with greatest height near middle of dorsal margin and greatest posterior extension near middle of posterior margin (Figures 56, 57a); rostrum rounded anteriorly and projecting ventrally only slightly over shallow but distinct incisure; posterior evenly rounded, without projecting caudal process.

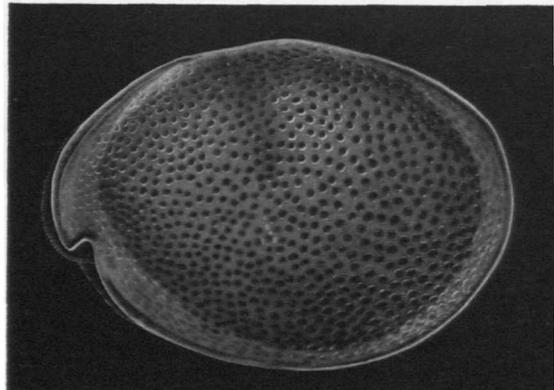


FIGURE 56.—*Altenochelata nealei*, new species, holotype, adult female, “Grigore Antipa” 293, length 1.18 mm

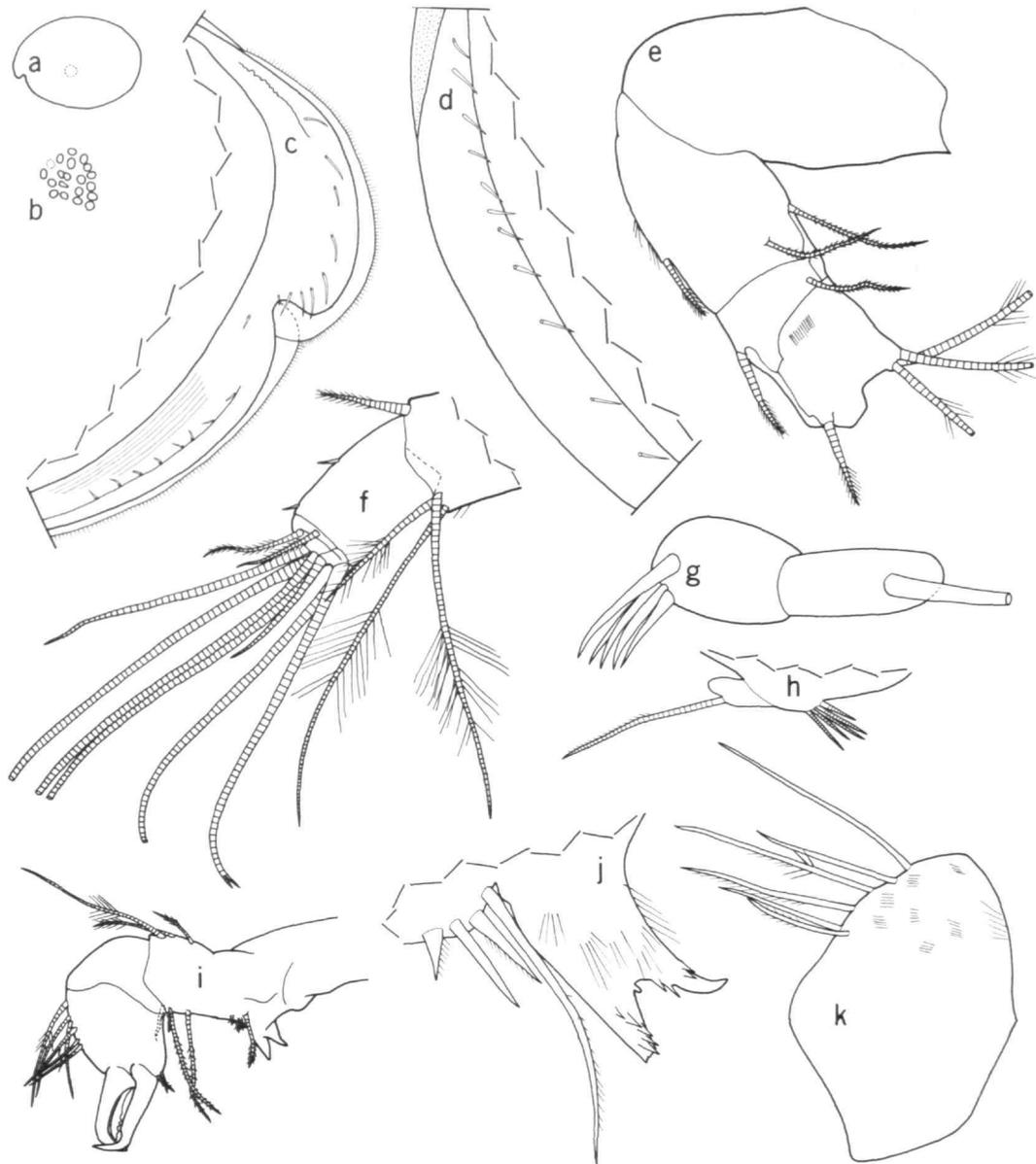


FIGURE 57.—*Alternochela nealei*, new species, holotype, adult female, "Grigore Antipa" 293, length 1.18 mm: *a*, complete specimen showing position of central adductor muscle attachments (dashed); *b*, central adductor muscle attachment scars of left valve, outside view (anterior to left); *c*, anterior of left valve, inside view; *d*, posterior of left valve, inside view; *e*, joints 1-4 of left 1st antenna, lateral view; *f*, distal part, of right 1st antenna medial view; *g*, endopodite of left 2nd antenna, medial view; *h*, endopodite of right 2nd antenna, lateral view; *i*, mandible; *j*, coxale endite and proximal bristles on ventral margin of basale of left mandible, lateral view; *k*, 2nd endopodial joint of right mandible showing dorsal bristles, medial view (distal end of joint towards lower left).

**Ornamentation:** Surface with large round fossae within weak reticulations (Figure 56); no ribs; lateral surface, anterior, ventral, and posterior margins with long and short hairs broadening near base.

**Infold (Figure 57c, d):** Broad along anterior, ventral, and posteroventral margins; infold on rostrum with 7 feathered bristles forming row paralleling anterior margin (Figure 56 c); 1 long bristle at middle of upper margin of incisur, and 1 short bristle at inner end of incisur; broad part of anteroventral infold with 6 parallel ridges proximal to thin list bearing 8 bristles; 1 bristle present on infold between ridges and incisur; middle part of ventral infold bare; posteroventral and posterior infold with row formed of 10 or 11 clusters consisting of single or paired bristles (Figure 57d).

**Selvage (Figure 56, 57c):** Fringed lamellar prolongation present along anterior, ventral, and posterior margins.

**Central Muscle Attachment Scars (Figure 57b):** Consisting of about 20 individual scars.

**Size:** "Grigore Antipa" 293, length 1.18 mm, height 0.85 mm; USNM 156592, 3 specimens: length 1.20 mm, height 0.83 mm; length 1.21 mm, height 0.86 mm; length 1.25 mm, height 0.88 mm.

**First Antenna (Figure 57e, f):** 1st joint: long hairs on medial surface and short spines along ventral margin. 2nd joint: 3 bristles with faint marginal spines (1 lateral, 1 ventral, 1 dorsal); spines forming clusters along dorsal margin, on medial surface near dorsal and ventral margins, and near distal end of lateral surface. 3rd joint: short with 2 spinous bristles (1 ventral, 1 dorsal); spines forming clusters along dorsal margin and on medial surface near dorsal margin; lateral side of 3rd joint about twice length of medial side. 4th joint: distinctly separated by suture from 3rd joint, with 4 spinous bristles (3 ventral, 1 dorsal; ventral bristles with long and short spines, dorsal bristle with short spines); spines forming clusters along ventral and dorsal margins and on lateral surface near ventral margin. 5th joint: spines forming clusters along dorsal margin and on lateral surface at distal margin; sensory filament with 1 short proximal filament (not shown in Figure 57f) and bifurcate tip (not shown in Figure 57f); 6th joint: very short; medial bristle short with marginal spines. 7th joint: a-bristle about same length as bristle on 6th

joint, with short marginal spines; b-bristle bare, about one-third longer than a-bristle; c-bristle with 1 short proximal filament (not shown in Figure 57f) and bifurcate tip, same length as sensory bristle of 5th joint. 8th joint: d- and e-bristles bare with fused base and blunt tips, same length as c-bristle; f-bristle without proximal filament but with bifurcate tip (not shown in Figure 57f), slightly shorter than c-bristle; g-bristle with 1 short proximal filament (not shown in Figure 57f) and bifurcate tip (not shown in Figure 57f), same length as c-bristle.

**Second Antenna:** Protopodite bare. Endopodite 2-jointed (Figure 57g, h): 1st joint with 5 small bare bristles; 2nd joint elongate with rounded tip and long subterminal bristle with short marginal spines. Exopodite: 1st joint with short medial spine on distal margin; joints 2-8 with short spines forming row along distal margin; bristle of 2nd joint bare, reaching 9th joint; bristles of joints 3-5 bare with pointed tips; bristles of joints 6-8 and 4 long bristles of 9th joint broken, with natatory hairs on stumps; 9th joint, in addition to 4 long broken bristles, with 3 short spinous bristles at dorsal corner.

**Mandible (Figures 57i-k, 57a-d):** Coxale endite bifurcate, with secondary teeth and long spines; minute peg present in valley between main spines (Figure 57j). Basale: proximal ventral group with 1 long bristle with short marginal spines and 3 short bristles, 2 of these pectinate; 2 equal length bristles with marginal spines present on ventral margin distal to middle; dorsal margin with short mid-bristle with short marginal spines and 2 subterminal bristles, shorter of these with short marginal spines, other with long proximal and short distal spines. Exopodite absent. Endopodite (Figures 57a, d, 58a-d): 1st joint with 2 short ventral bristles and spines forming rows on medial surface; 2nd joint with spines forming rows on medial surface; dorsal margin with 5 or 6 bristles (4 in vicinity of middle, 1 or 2 proximal to middle (Figure 57i, k)); ventral margin with stout terminal claw with serrated inner margin, but without proximal inner tooth (Figure 58a, b); tip of claw distal to serrations fingerlike (Figure 58d); 2 small ventral bristles and small spade-shaped sclerotized medial process present near base of claw (Figure 58b); 3rd joint with 2 large claws (Figure 58a): inner claw with



FIGURE 58.—*Alternochelata nealei*, new species, holotype, adult female, "Grigore Antipa" 293: a, distal end of mandible (not all bristles shown); b, distal end of right mandible showing 2nd and 3rd endopodial joints of right mandible, medial view, (distal end of claws of 3rd joint not shown); c, claws of 3rd endopodial joint of right mandible, medial view; d, tip of claw of 3rd endopodial joint of left mandible, lateral view; e, exopodite and endite III of left maxilla, lateral view; f, distal end of left 5th limb, posterior view; g, distal end of right 5th limb, anterior view; h, upper lip and esophagus (dashed line, anterior to right); i, posterior of body with 2 posterior claws of right lamella of furca at bottom; j, 6th limb; k, distal part of 7th limb; l, medial eye and rod-shaped organ; m, right lamella or furca.

large distal and small proximal teeth along ventral margin: outer claw with minute teeth along ventral margin and without distodorsal node; lateral surface with 2 short bristles with long marginal hairs present ventral to bases of claws; 3 short bristles present medial to bases of claws.

*Maxilla* (Figure 58e): Precoxale and coxale with fringed epipodial appendage; coxale with 1 distoanterior bristle with short marginal spines. Endite I with 5 stout pectinate bristles and 2 slender bristles with long proximal and short distal spines; endite II with 2 stout pectinate bristles and 2 slender spinous bristles; endite III with 3 stout pectinate bristles (not all shown in Figure 58e), 1 or 2 slender spinous bristles, and 1 proximal lateral bristle with short spines. Basale with 1 slender distoanterior bristle with short marginal spines, 1 distoposterior bristle near exopodite, and 1 short spinous bristle near middle of medial margin (the latter 2 bristles could be on 1st endopodite joint). Exopodite short with 3 bristles (Figure 58e). Endopodite: 1st joint with 1  $\alpha$ - and 1  $\beta$ -bristle, both with short marginal spines; dorsal margin of joint with short spines; 2nd joint with 2 stout pectinate clawlike bristles, 2  $\alpha$ -bristles with short marginal spines, and 3 terminal bristles, some pectinate.

*Fifth Limb* (Figure 58f,g): Epipodial appendage with 47 bristles. Endite I with 2 spinous bristles and short triangular process; endite II with 3 spinous bristles and short triangular process; endite III with about 4 spinous and pectinate bristles and short triangular process. Exopodite: first joint with main tooth consisting of 3 large prongs, proximal of these with 1 small marginal tooth, middle prong with 3 marginal teeth, distal prong with 2 marginal teeth; small node may be present near proximal prong; short bristle present near node; middle of anterior margin of joint with 1 spinous bristle; inner end of joint anterior to main tooth forming sclerotized triangular tooth. Second joint with large triangular tooth with 3 prongs, each prong with 2 marginal teeth; outer edge of triangular tooth with small hirsute bristle near rounded end; posterior side of joint with 1 proximal bristle near inner margin and distal to this, a pair of bristles; 3rd joint with 3 bristles on inner lobe and 2 on outer lobe, the latter hirsute; 4th and 5th joint fused, with 3 or 4 terminal bristles.

*Sixth Limb* (Figure 58j): 2 plumose bristles in

place of epipodial appendage; endite I with 3 short spinous bristles (2 stout with long spines, 1 slender with short spines); endite II with 3 bristles, 2 long, 1 short, all with long proximal and short distal spines; endite III with 3 bristles, middle bristle longer than others, all with long proximal and short distal spines; 4th endite with 2 long bristles with long proximal and short distal spines; end joint with anterior part with 3 slender ventral bristles with long proximal and short distal spines, and posterior part with 4 stout plumose bristles separated by marginal indentations; lateral and medial surfaces of endites II to IV and end joint hirsute.

*Seventh Limb* (Figure 58k): Terminal comb with about 11 alate teeth with small teeth near bases opposing 2 bare recurved pegs; each limb with 10 bristles, 4 in proximal group (2 on each side), and 6 in terminal group (3 on each side); each bristle with 2 to 5 bells and distal marginal spines.

*Furca* (Figure 58m): Each lamella with 3 strong main claws followed by 1 short secondary claw, 1 short main claw, and 5 short secondary claws; long hairs present medially at bases of main claws and following secondary claws; claw 1 with teeth forming medial and lateral row; other main claws with teeth forming 1 or 2 rows; secondary claws between main claws 3 and 5 with spines forming row along each margin; posterior 5 secondary claws with few marginal spines.

*Rod-shaped Organ*: Elongate, 1-jointed with widened middle section; faint spines present on broad middle section and proximal half of elongate distal section, tip rounded (Figure 58l).

*Eyes*: Lateral eyes absent; medial eye pigmented, bare (Figure 58l).

*Upper Lip* (Figure 58h): Small, rounded.

*Posterior* (Figure 58i): Clusters of long hairs present near middle of dorsal margin.

*Y-Sclerite*: Linear with short upturned distal end, without ventral branch.

*Eggs*: "Grigore Antipa" 293, with 2 or 3 large unextruded eggs.

**DESCRIPTION OF ADULT MALE** (Figure 59).—Carapace more elongate than that of female (Figure 59a); lower margin of rostrum forming almost right angle with anterior margin of valve to form incisur more open than that of female carapace.

*Ornamentation*: Surface fossae similar to those of

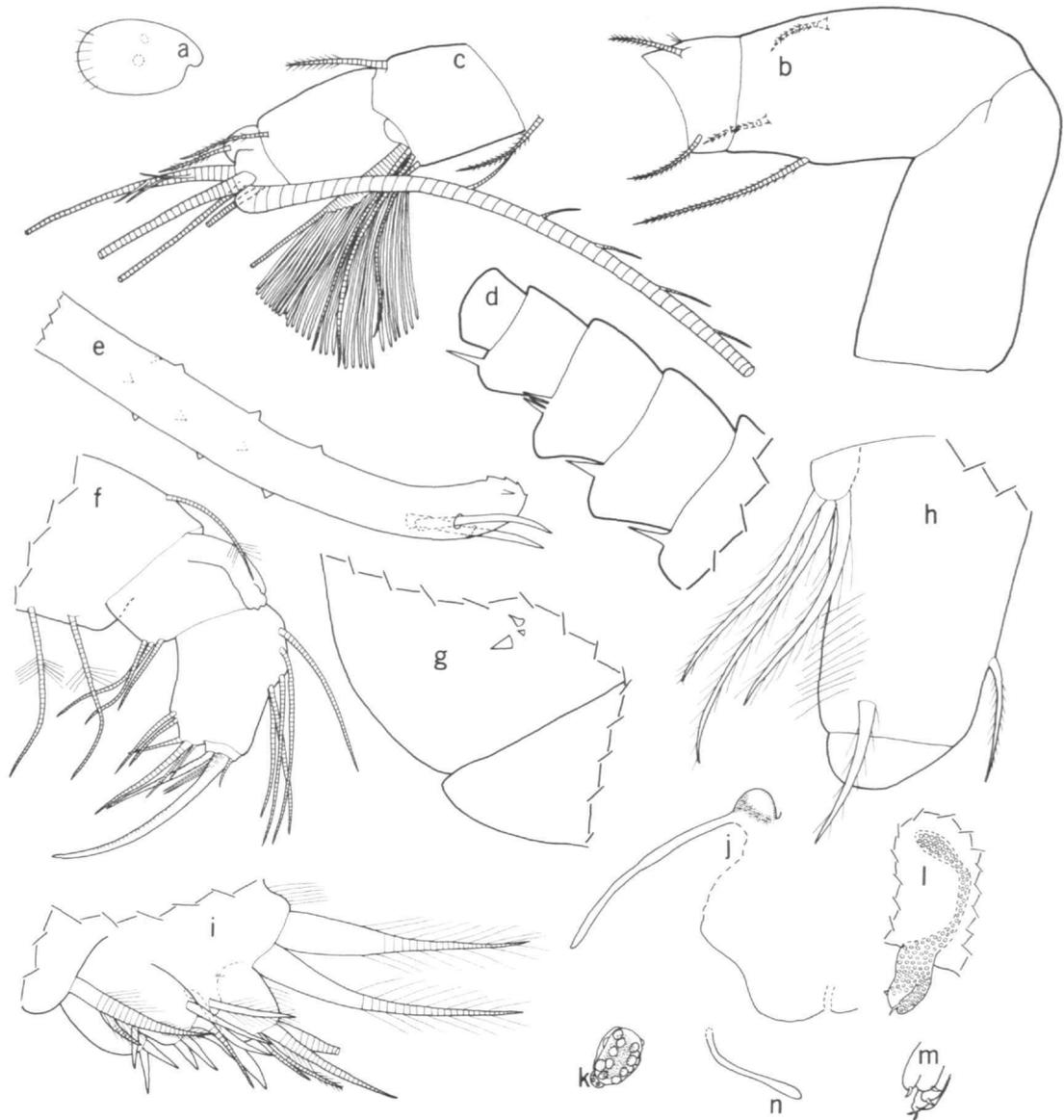


FIGURE 59.—*Alternochelata nealei*, new species, allotype, adult male, "Grigore Antipa" 294, length 1.27 mm: *a*, complete specimen showing position of central adductor muscle attachments and lateral eye (dotted circles); *b*, *c*, proximal and distal ends of 1st antenna (not all spines shown on bristles); *d*, joints 5-9 of exopodite of right 2nd antenna showing basal spines, lateral view; *e*, distal three-fourths of 3rd joint of endopodite of left 2nd antenna, medial view; *f*, distal end of mandible; *g*, parts of coxale and basale of right mandible showing coxale endite, medial view; *h*, right maxilla showing exopodite and endopodite, lateral view (not all endopodial bristles shown); *i*, distal end of 5th limb, short bristles on endite III not shown; *j*, anterior of body showing medial eye and rod-shaped organ, upper lip (lower left) and esophagus (dashed double line); *k*, left lateral eye; *l*, *m*, copulatory organ; *n*, Y-sclerite (anterior to left).

female; long hairs present along anterior, ventral, and posterior margins, and on posterior valve surface.

*Infold, Selvage, Central Muscle Attachment Scars:* Similar to those of female.

*Size:* USNM 149317, length 1.27 mm, height 1.00 mm; USNM 156596, length 1.38 mm, height 0.81 mm.

*First Antenna* (Figure 59b,c): 1st joint: spines forming clusters on distal part of medial surface. 2nd joint: abundant clusters of spines on medial and lateral surfaces, joint otherwise similar to that of female. 3rd joint: spines forming 3 clusters across middle of ventral margin, limb otherwise similar to that of female. 4th joint: distinctly separated from 3rd, with 5 bristles (4 ventral, some with long proximal and short distal spines, 1 dorsal with long proximal and short distal spines); ventral and dorsal margins, medial surface, and dorsal part of lateral surface with spines forming clusters. 5th joint: small, triangular, inset between ventral parts of 4th and 6th joints; sensory bristle with broad proximal part almost reaching distal end of 6th limb and bearing about 33 filaments and stout terminal bristle with bifurcate tip. 6th joint: short spinous lateral bristle near dorsal margin reaching past end of limb. 7th joint: a-bristle slightly shorter than bristle of 6th joint and with short marginal spines; b-bristle stout, about 3 times length of a-bristle, with 3 short filaments near middle; c-bristle long, reflexed, with 12 marginal filaments. 8th joint: d- and e-bristles bare, longer than b-bristle; f-bristle similar to c-bristle but shorter, with 8 marginal filaments (f-bristle not shown in Figure 59c); g-bristle slightly longer than d-bristle, with 1–2 marginal filaments and bifurcate tip.

*Second Antenna:* Protopodite bare. Endopodite 3-jointed; 1st joint with 6 small bristles (5 proximal, 1 distal); 2nd joint elongate with 2 long ventral bristles just proximal to middle; 3rd joint elongate, reflexed with 2 short subterminal bristles (Figure 59e); central part of 3rd joint with 10–13 small toothlike processes. Exopodite (Figure 59d): 1st joint with short medial spine on terminal margin and numerous spines forming clusters distally; 2nd joint short; 3rd joint about 3 times length of 2nd; joints 4–9 smaller than 2nd joint; joints 2–8 with spines forming row along distal margin and 1–3 (usually 1) small basal spine at

base of bristle; bristle of 2nd joint bare, pointed, reaching 8th joint; bristles of joints 3–8 with natatory hairs and pointed tip; 9th joint with 6 bristles (4 long pointed, with natatory hairs, 2 very short with marginal spines); 9th joint without lateral spine.

*Mandible* (Figure 59f,g).—Coxale endite represented by small triangular process (Figure 59g); 2 smaller processes present adjacent to endite (Figure 59g). Basale: medial side near ventral margin with 6 proximal spinous bristles (2 long, 1 medium, 3 short), and 2 long spinous bristles distal to middle; dorsal margin with 1 short spinous midbristle and 2 longer spinous subterminal bristles (not all shown in Figure 59f); medial surface and dorsal margin with spines forming clusters. Exopodite appears fused to lateral side of 1st endopodite joint at dorsal margin and is full length of joint. Endopodite: 1st joint with 3 spinous ventral bristles and numerous medial spines forming short rows; 2nd joint with spines forming short rows on medial surface; dorsal margin with 7 spinous bristles (not all shown in Figure 59f); ventral margin with bristles forming 2 distal groups: proximal group with 2 bristles, distal group 4 spinous bristles; 3rd joint with 2 lateral claws with spines along ventral margin (inner claw about two-thirds length of outer claw), and 5 shorter spinous medial bristles (all bristles not shown in Figure 59f).

*Maxilla* (Figure 59h): Precoxale and coxale with fringed epipodial appendage; coxale with 1 stout distoanterior (dorsal) bristle with long marginal spines. Endite I with 1 proximal ventral bristle and 5 terminal bristles; endite II with about 6 terminal bristles; endite III with about 7 terminal bristles. Basale with 1 distoanterior (dorsal) bristle and 1 short medial bristle near middle of distal margin (this could be on proximal part of endite III). Exopodite short with 3 subequal spinous bristles (Figure 59h). Endopodite: 1st joint hirsute with 1  $\alpha$ - and 1  $\beta$ -bristle; 2nd joint with 8 bristles (2 slightly longer than others and stouter).

*Fifth Limb* (Figure 59i): Epipodial appendage with 48 bristles. Endite I with 2 short bristles; endite II with 2 or 3 short spinous bristles; endite III with 1 stout bristle with long proximal hairs and short distal spines, and 3 or 4 short slender bristles with short marginal spines. Exopodite: 1st joint with 1 short proximal bristle and 2 or 3 un-

segmented terminal bristles; 2nd joint with 6 bristles; 3rd joint with 2 bristles (1 of these unsegmented with marginal spines, other segmented) on inner lobe and 2 long stout hirsute bristles on outer lobe; 4th and 5th joint fused, with 4 bristles; outer lobe of 3rd joint and joints 4 and 5 hirsute.

*Sixth Limb:* Similar to that of female except only 2 bristles on endite I, both with long spines; endite IV of one limb with 1 single bristle and 1 double bristle with fused proximal part.

*Seventh Limb:* Terminal comb with 11–13 alate teeth with small teeth near bases opposing 2 short pegs (1 of these may have marginal spines); each limb with 8 bristles (4 in both proximal and terminal groups, 2 on each side); each bristle with 1–3 bells and distal marginal spines.

*Furca:* Similar to that of female.

*Rod-shaped Organ:* Longer than that of female and not as wide in middle part (Figure 59j); marginal spines not observed with magnification of  $\times 200$ ; tip rounded as on that of female.

*Eyes:* Lateral eyes well developed with about 14 ommatidia (Figure 59k); medial eye pigmented,

bare, smaller than lateral eye (Figure 59j).

*Upper Lip* (Figure 59j): Similar to that of female.

*Posterior:* Bare.

*Copulatory Organ* (Figure 59l,m): Each limb consisting of 2 short lobes with 1 or 2 small bristles.

*Y-Sclerite* (Figure 59n): Without ventral branch.

COMPARISONS.—The new species, *A. nealei*, differs from *A. polychelata* Kornicker, 1958, in not having a distinct caudal process on the carapace. Also, the main claws of the furca are claws 1–3, 5 on *A. nealei*, and claws 1, 2, 4, 6 on *A. polychelata*.

REMARKS.—The females of many species of the family Philomedidae eat or break off the tips of many bristles on the exopodites of the 2nd antennae after mating (see "Discussion" in Kornicker, 1975a:76). Without these bristles, they are no longer capable of swimming to the surface to mate. The adult female of many specimens of the new species, *A. nealei*, had broken bristles on the exopodite of the 2nd antenna. Previously, this has been reported only in the Philomedidae.

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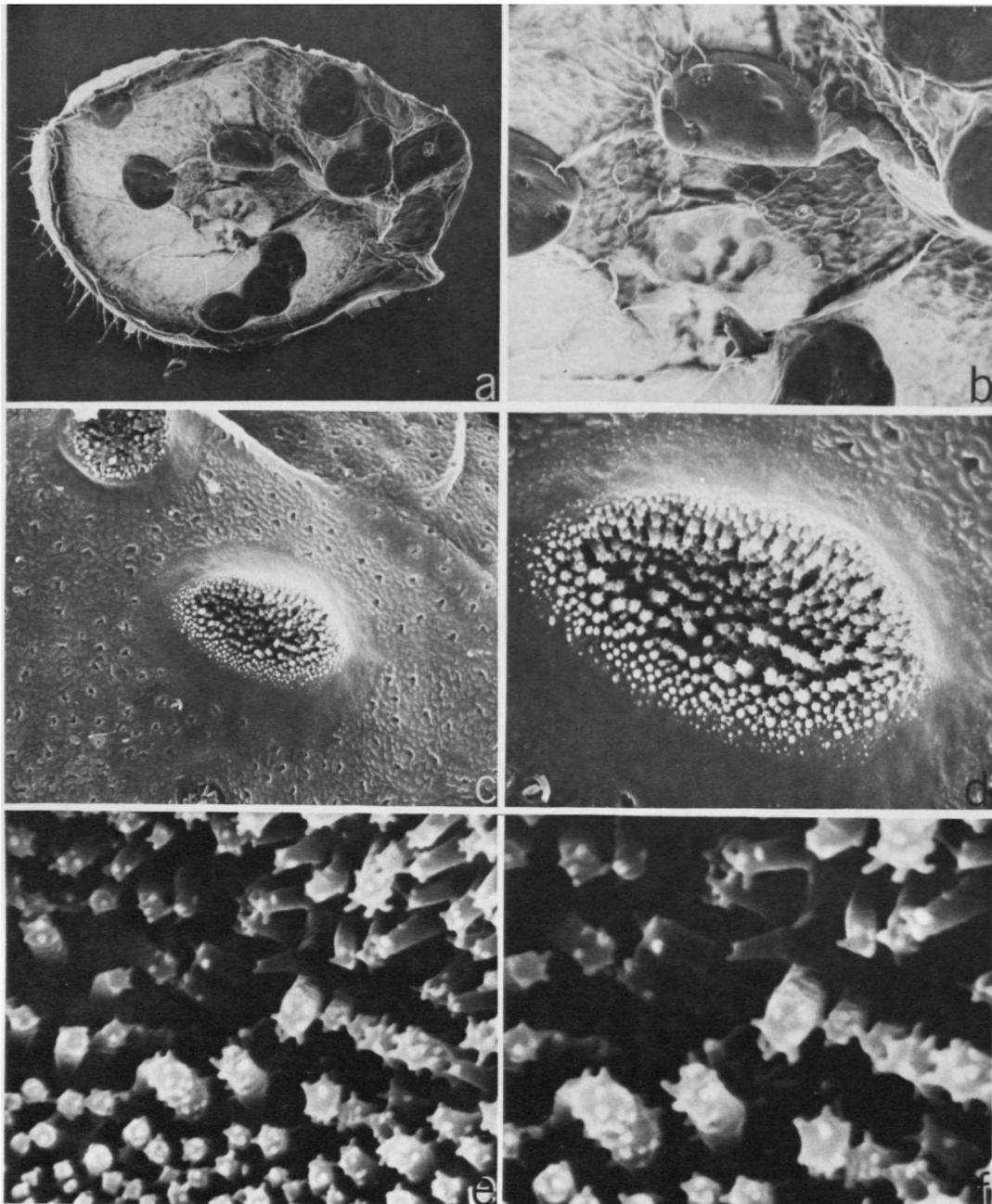


PLATE 1.—*Sarsiella capsula* Norman, adult female, USNM 156627, length 1.13 mm, left valve (distorted), lateral view: *a*, complete valve, dark oval areas are concretions,  $\times 90$ ; *b*, concretions in *a*,  $\times 210$ ; *c*, fossae and pits in upper concretion in *b*,  $\times 1500$ ; *d*, fossa in middle of *c*,  $\times 3700$ ; *e*, digitate processes in fossa in *d*,  $\times 10,500$ ; *f*, detail of *e*,  $\times 15,000$ . (Micrographs reduced to 77%.)

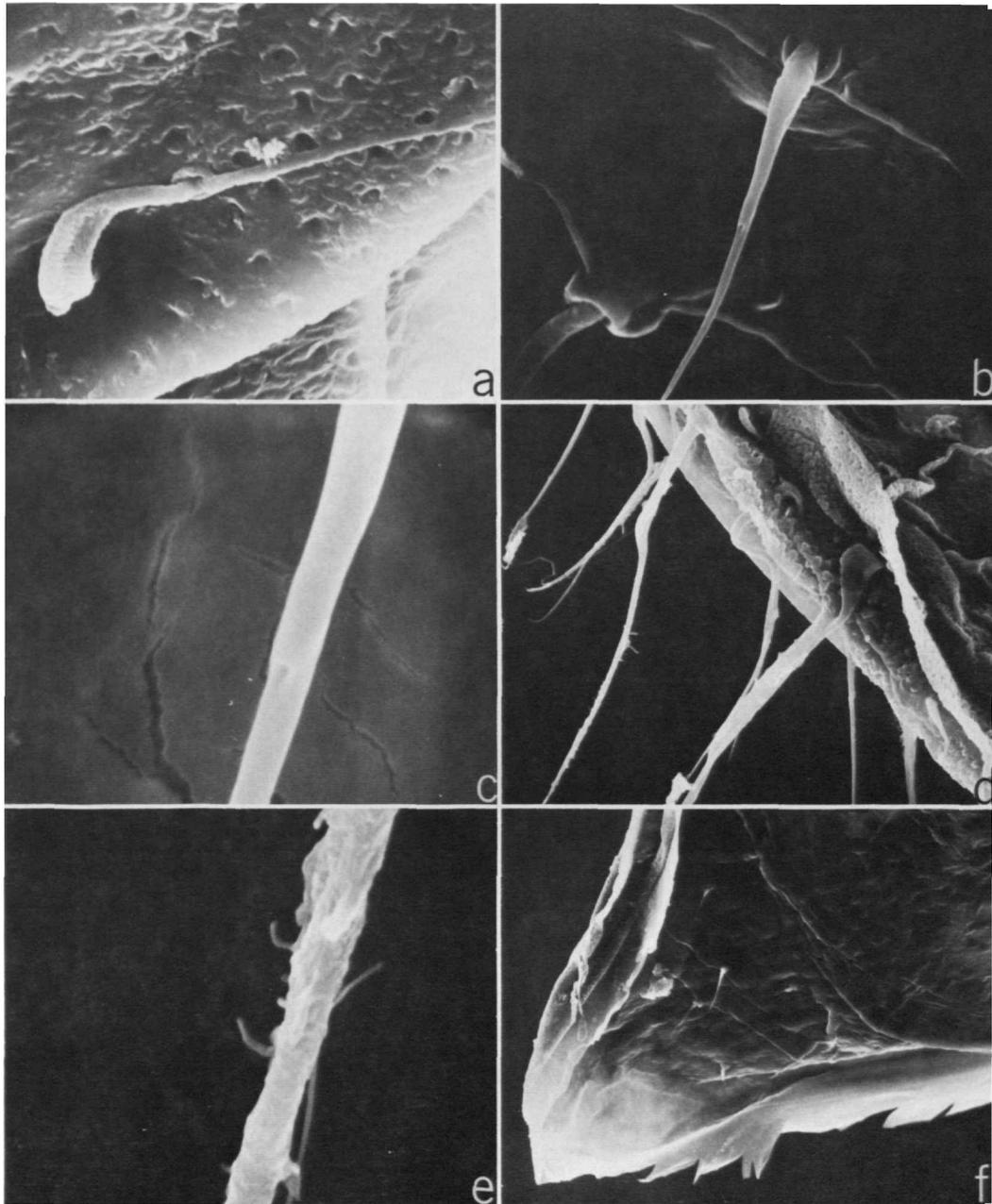


PLATE 2.—*Sarsiella capsula* Norman, adult female, USNM 156627, length 1.13 mm, left valve: *a*, long bristle and pits in concretion near caudal process, lateral view,  $\times 4100$ ; *b*, bristle on infold of caudal process shown in *f*,  $\times 4400$ ; *c*, middle part of bristle in *b* showing pore,  $\times 15,000$ ; *d*, bristles along anteroventral margin, from Plate 1*a*,  $\times 1100$ ; *e*, papillae on bristle in *d* (may be foreign growth),  $\times 10,500$ ; *f*, caudal process, medial view,  $\times 500$ . (Micrographs reduced to 76%.)

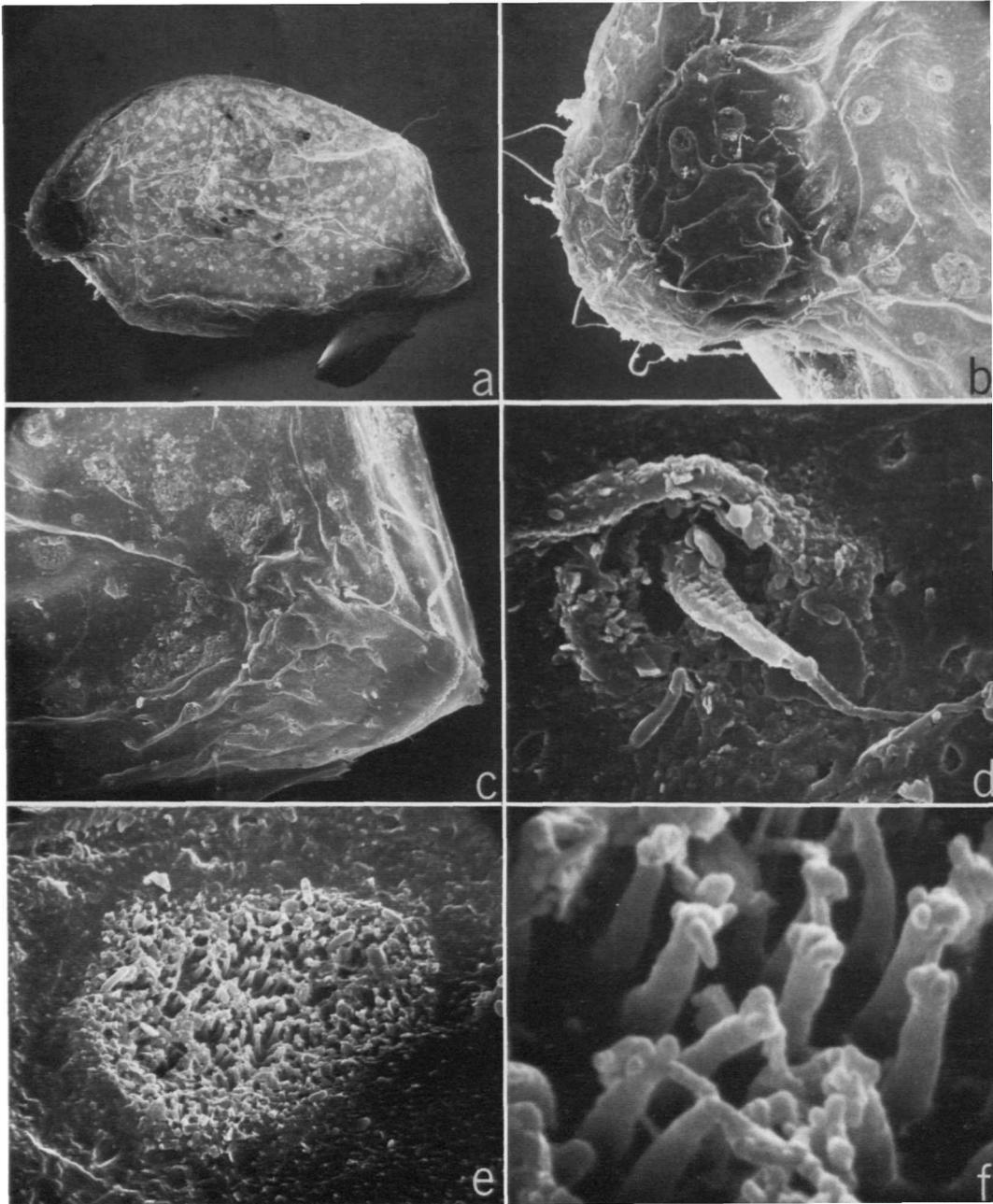


PLATE 3.—*Sarsiella capsula* Norman, adult male, USNM 156625, length 1.21 mm, left valve, slightly distorted, lateral view: *a*, complete valve, dark oval near rostrum is concretion, small dark spots near middle represent position of some of the central adductor muscles,  $\times 75$ ; *b*, rostrum from *a*,  $\times 400$ ; *c*, caudal process from *a*,  $\times 400$ ; *d*, long bristle and surface pits near valve middle,  $\times 7500$ ; *e*, fossa,  $\times 3800$ ; *f*, digitate processes in fossae in *e*,  $\times 20,000$ . (Micrographs reduced to 77%.)



PLATE 4.—*Sarsiella capsula* Norman, adult male, USNM 156625, length 1.21 mm, left valve (slightly distorted), medial view: *a*, complete valve,  $\times 75$ ; *b*, 2 bristles on inner margin of infold of caudal process,  $\times 6200$ ; *c*, bristle near middle of caudal process,  $\times 6200$ ; *d*, 2 setose bristles on infold dorsal to caudal process,  $\times 2200$ ; *e*, distal end of bristles in *d*,  $\times 10,000$ ; *f*, lamellar prolongation of selvage along edge of rostrum,  $\times 10,000$ . (Micrographs reduced to 77%.)

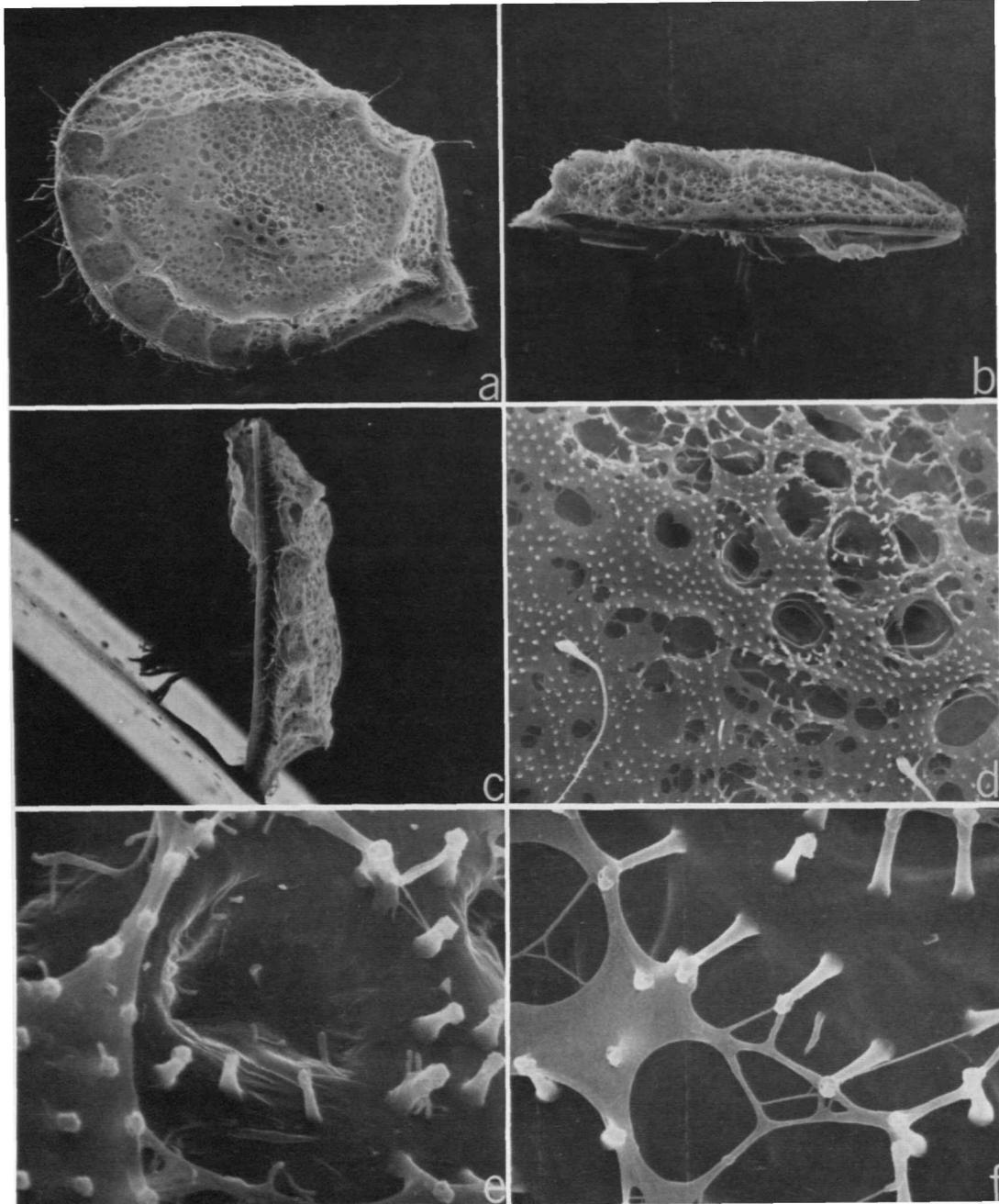


PLATE 5.—*Sarsiella neapolis* Kornicker, A-1 male, USNM 153928, length 1.24 mm, left valve, lateral view: *a*, complete valve,  $\times 75$ ; *b*, dorsal view,  $\times 85$ ; *c*, anterior view,  $\times 85$ ; *d*, fossae, long bristle, and spines projecting through gelatinous substance coating valve, from near middle of *a*,  $\times 410$ ; *e*, fossae and spines in *d*,  $\times 2150$ ; *f*, spines and gelatinous substance (dried), from upper right of *d*,  $\times 2100$ . (Micrographs reduced to 77%.)

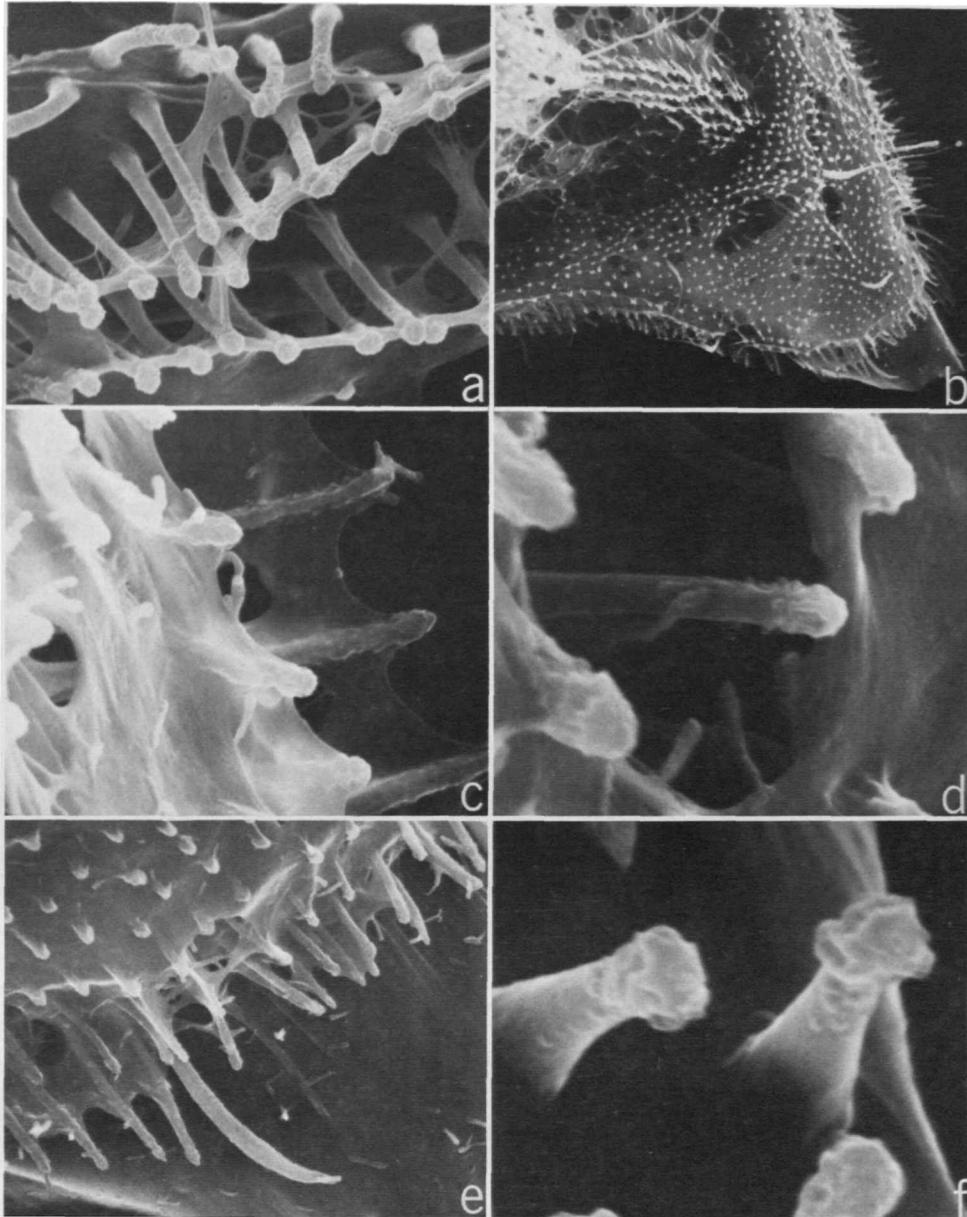


PLATE 6.—*Sarsiella neapolis* Kornicker, A-1 male, USNM 153928, length 1.24 mm, left valve, lateral view: *a*, spines along upper rib in Plate 5*a*,  $\times 2150$ ; *b*, caudal process, from Plate 5*a*,  $\times 420$ ; *c*, spines and gelatinous substance along posterior margin of caudal process, from *b*,  $\times 4000$ ; *d*, spine projecting through gelatinous substance,  $\times 8000$ ; *e*, tip of caudal process, from *b*,  $\times 3000$ ; *f*, short spines in Plate 5*e*, gelatinous substance (dried) coating tips,  $\times 10,500$ . (Micrographs reduced to 75%.)

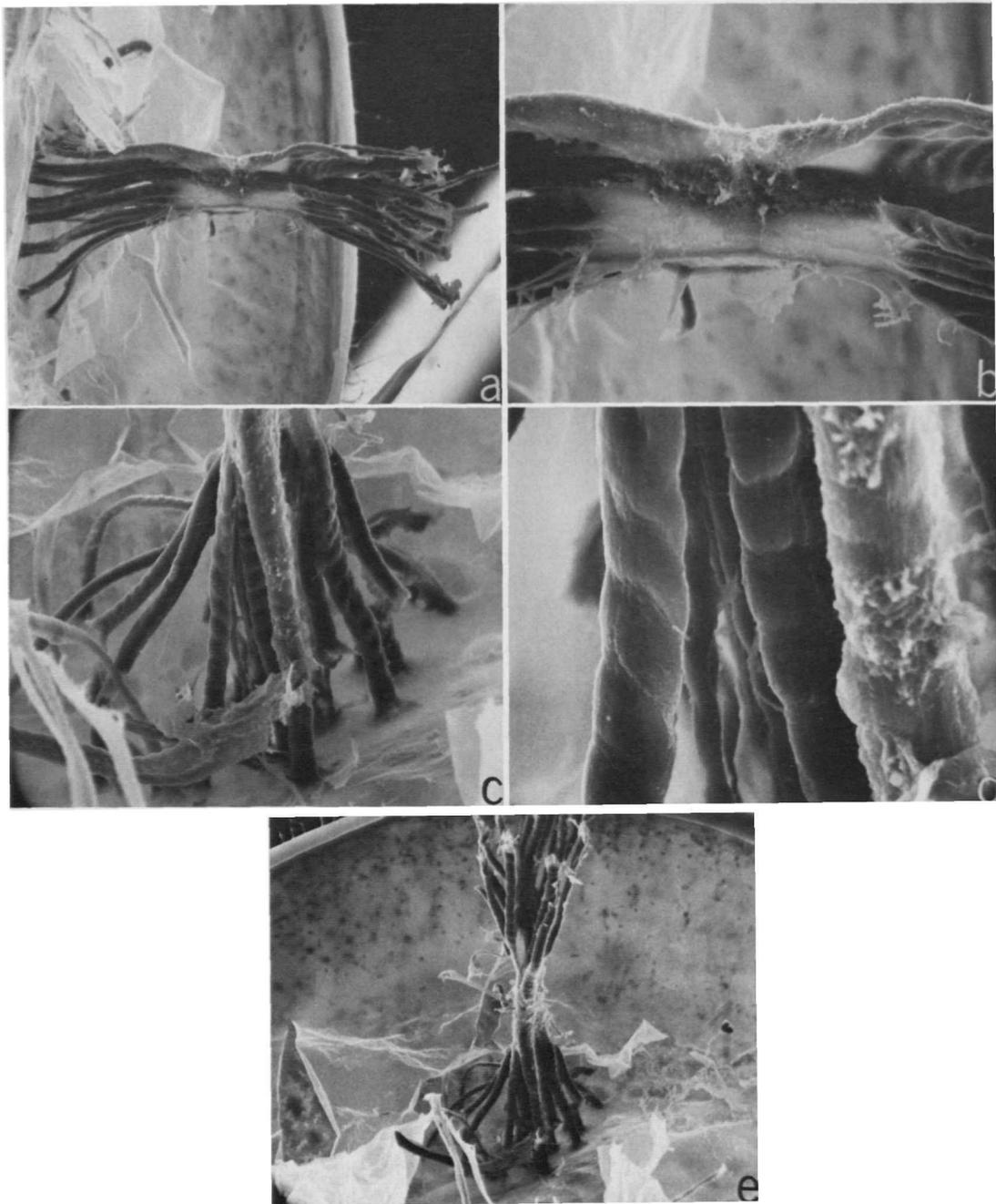


PLATE 7.—*Sarsiella neapolis* Kornicker, A-1 male, USNM 153928, length 1.24 mm, left valve, central adductor muscles: *a*, posterior view of muscles,  $\times 200$ ; *b*, middle part of muscle bundle, from *a*,  $\times 500$ ; *c*, muscles attached to left valve, dorsal oblique view,  $\times 500$ ; *d*, detail from *c*,  $\times 1900$ ; *e*, dorsal oblique view of muscle bundle,  $\times 185$ . (Micrographs reduced to 78%.)

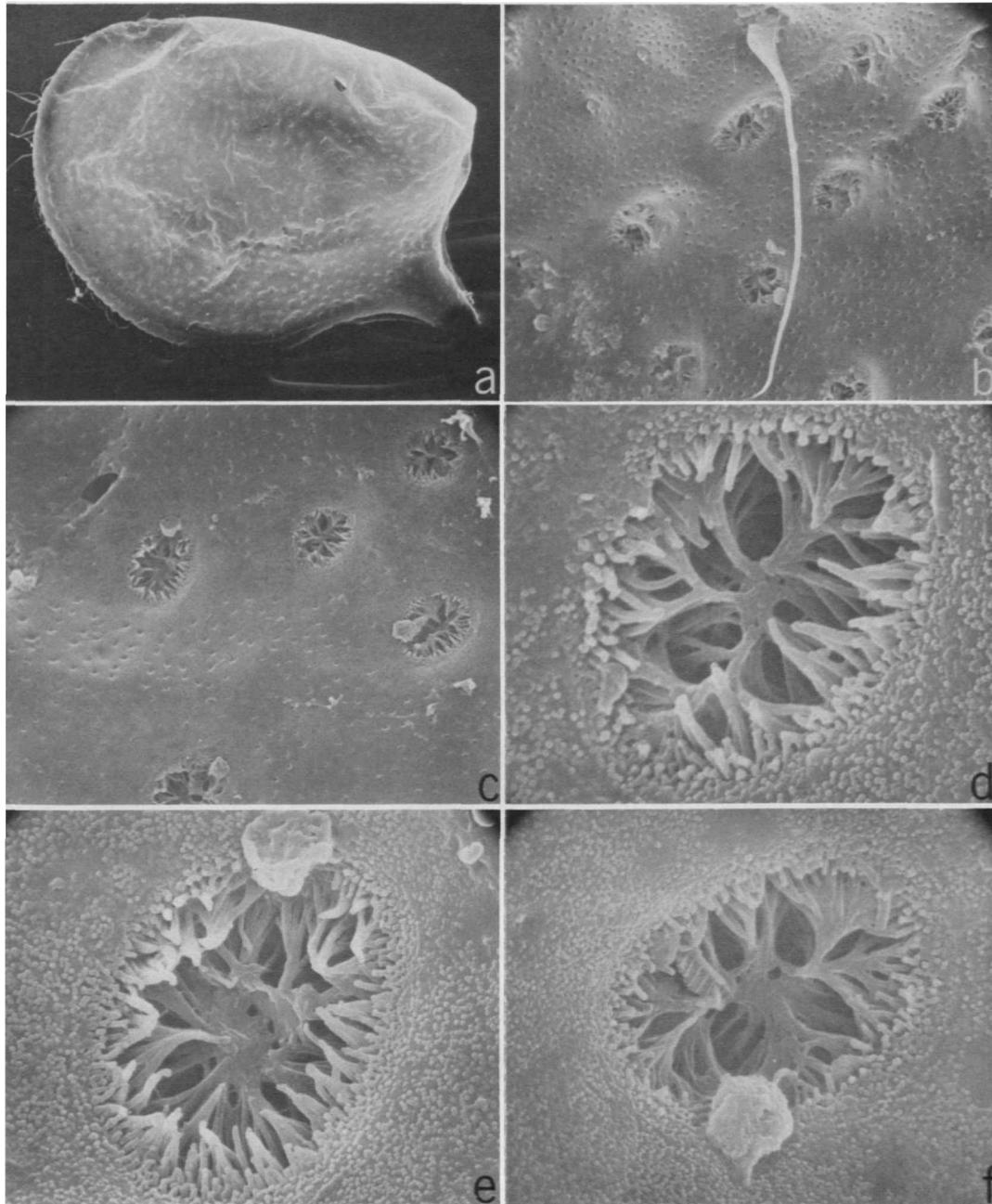


PLATE 8.—*Sarsiella anommata*, new species, holotype, adult female, USNM 141559, length 1.40 mm, left valve, lateral view: *a*, complete valve, dorsal margin folded back,  $\times 75$ ; *b*, bristle, fossae and minute pits on anteroventral part of valve,  $\times 870$ ; *c*, fossae and pits near middle of valve,  $\times 1000$ ; *d*, *e*, fossae in *c*,  $\times 4400$ ; *f*, fossa near middle of valve, from *a*,  $\times 4400$ . (Micrographs reduced to 77%.)

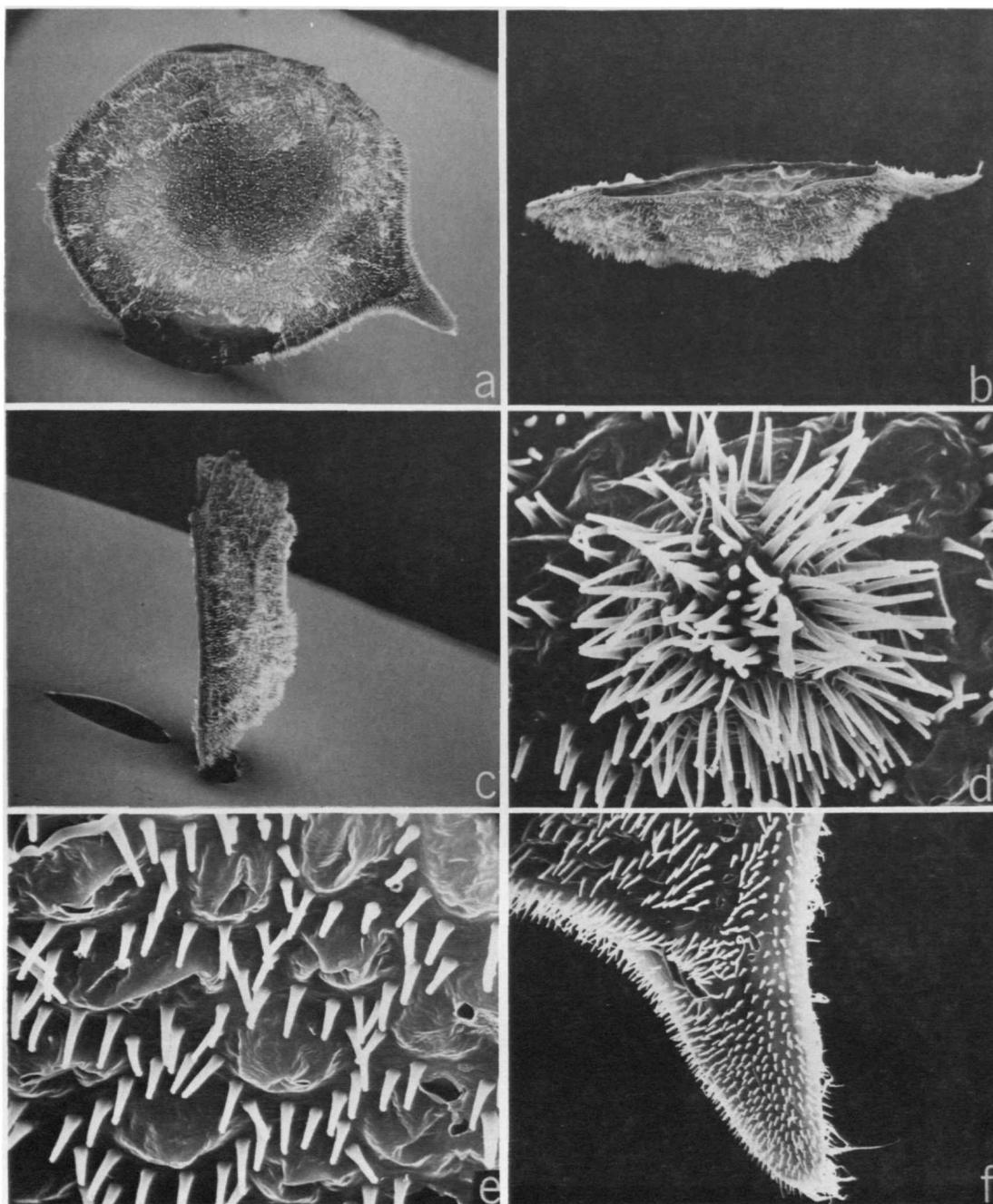


PLATE 9.—*Sarsiella africana*, new species, holotype, adult female, "Grigore Antipa" 295, length 1.67 mm, left valve, outside view: *a* complete valve,  $\times 44$ ; *b*, dorsal view,  $\times 50$ ; *c*, anterior view,  $\times 44$ ; *d*, hirsute process on valve,  $\times 500$ ; *e*, hairs near valve middle,  $\times 500$ ; *f*, caudal process,  $\times 200$ . (Micrographs reduced to 78%.)

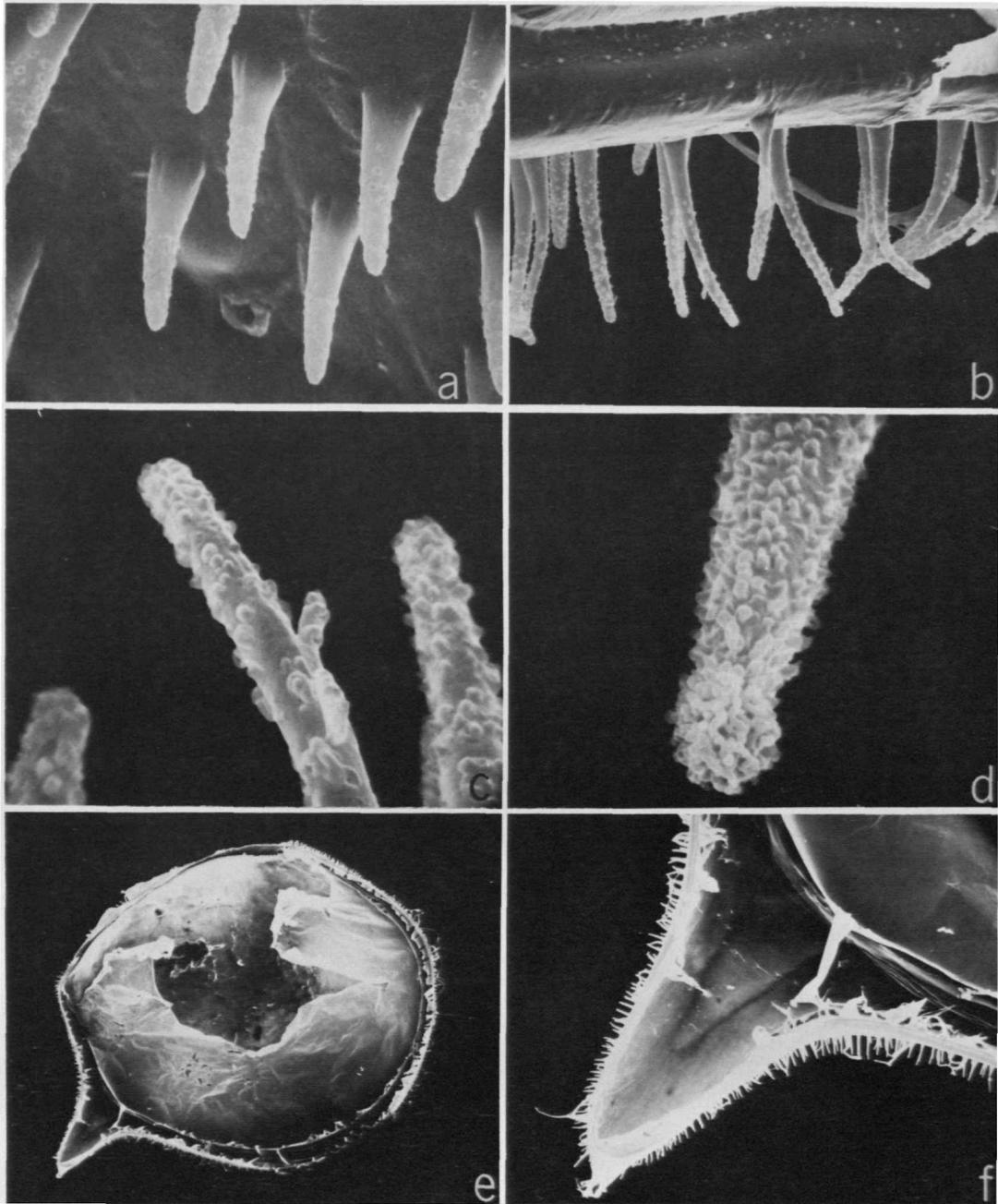


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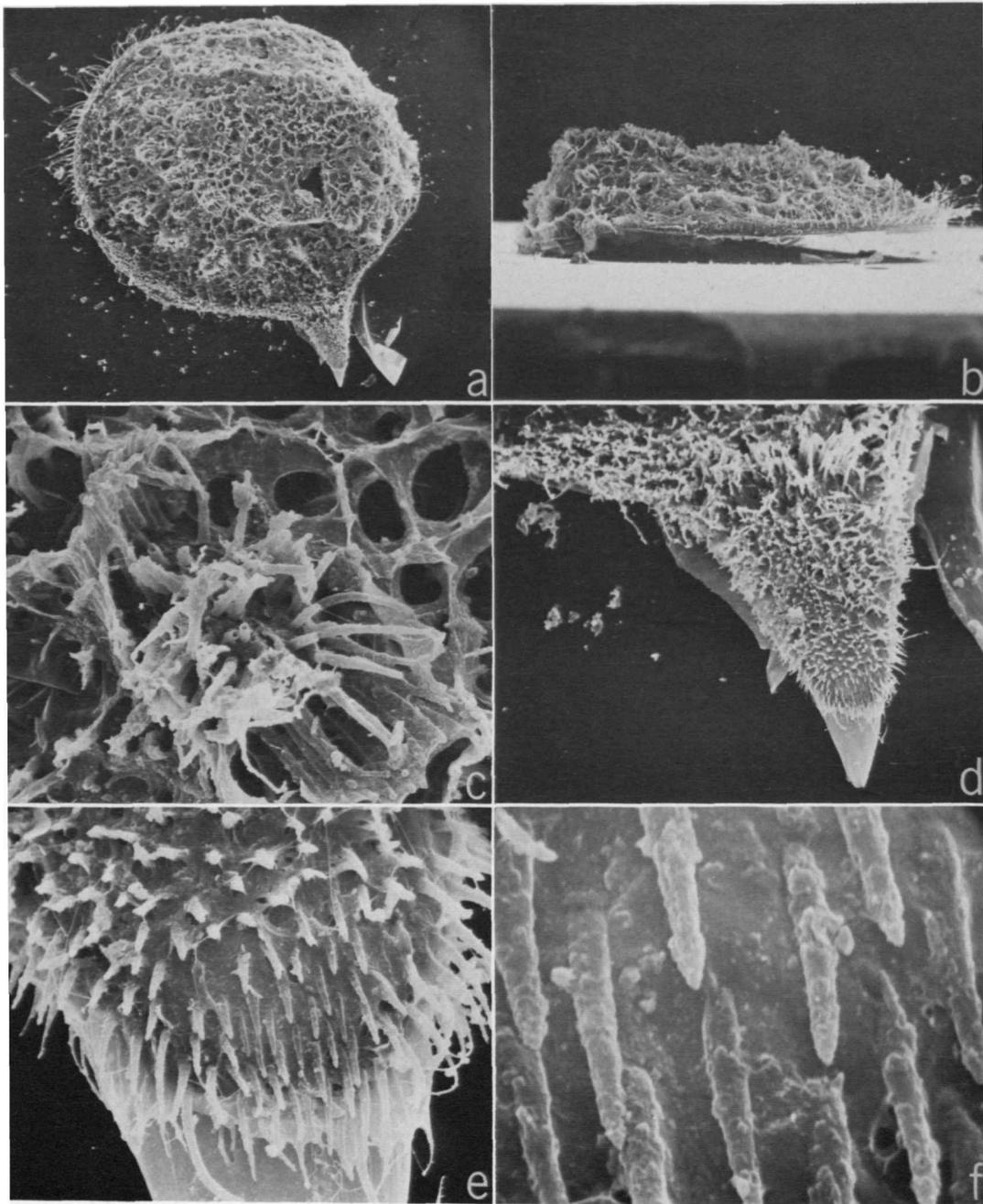


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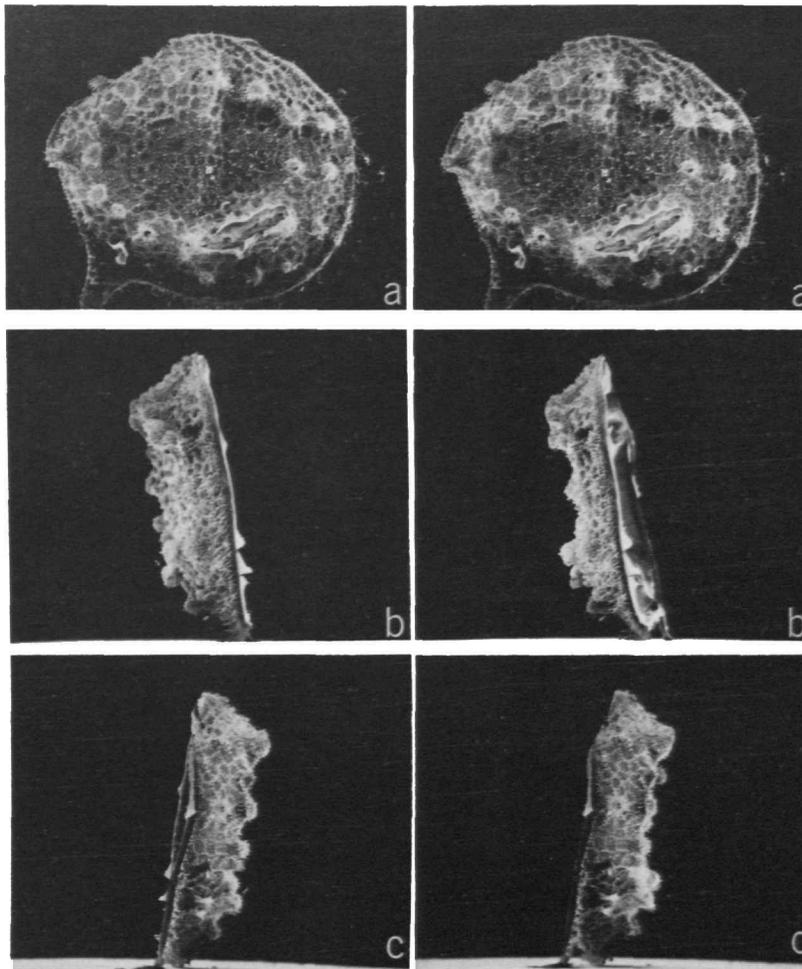


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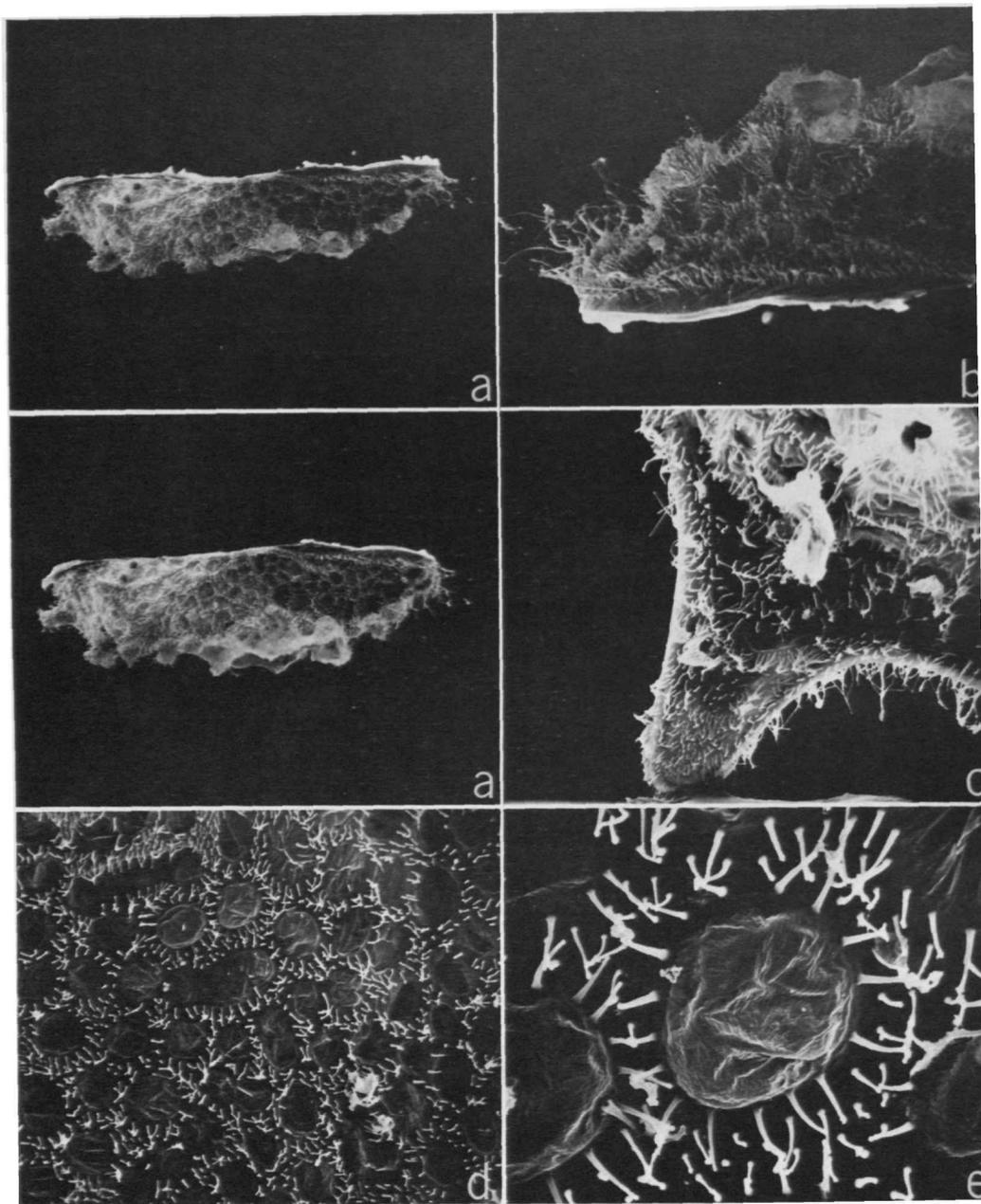


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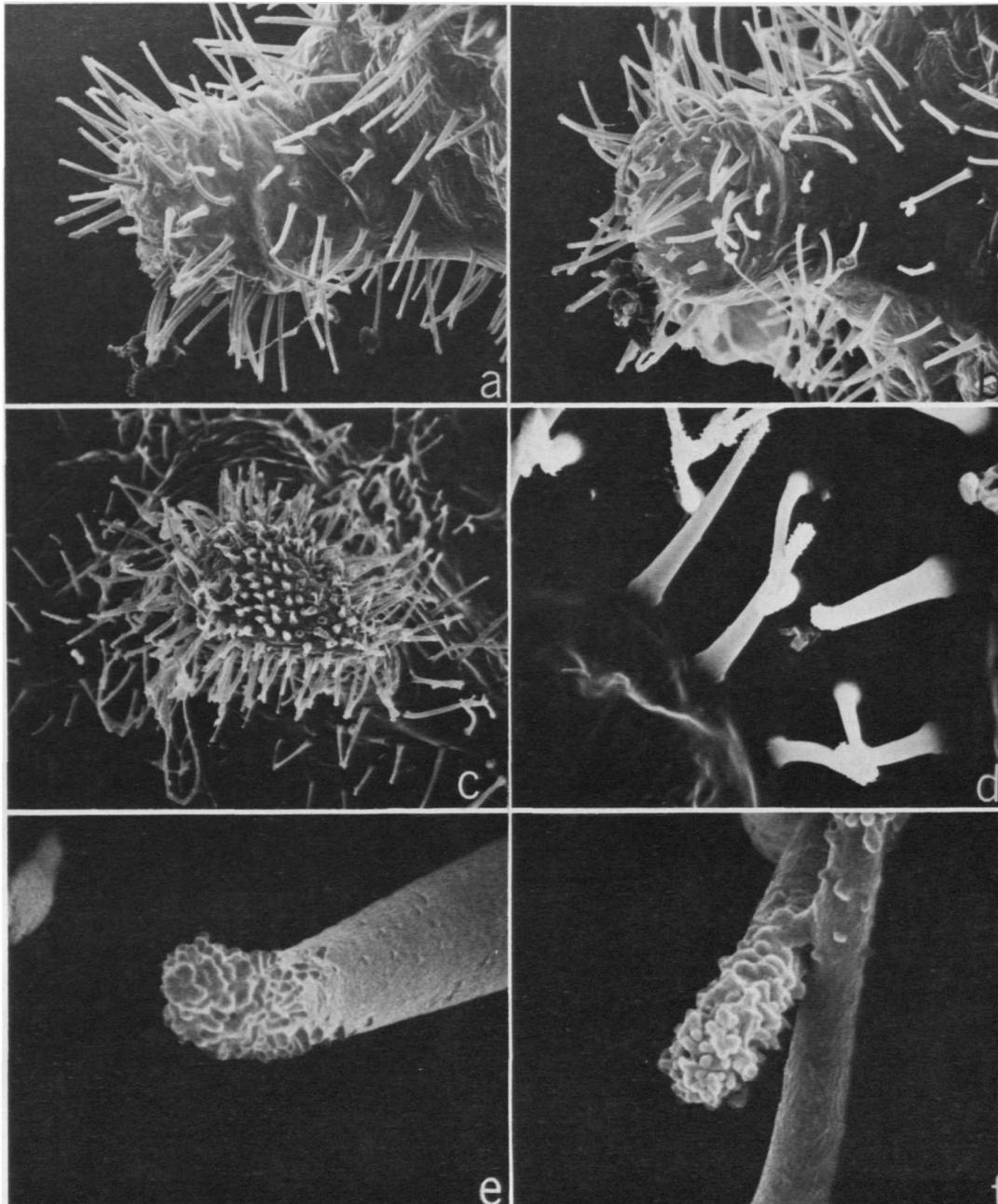


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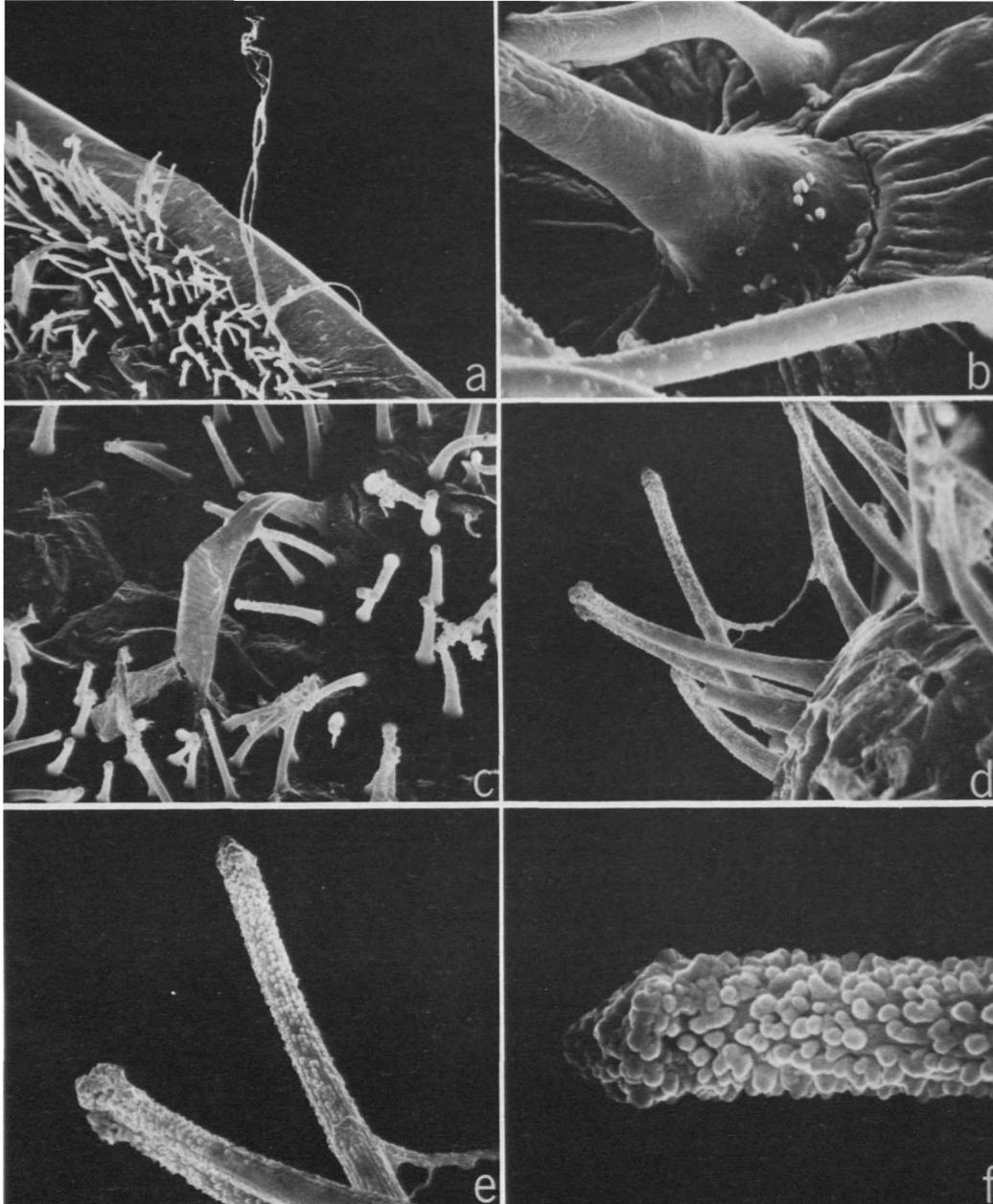


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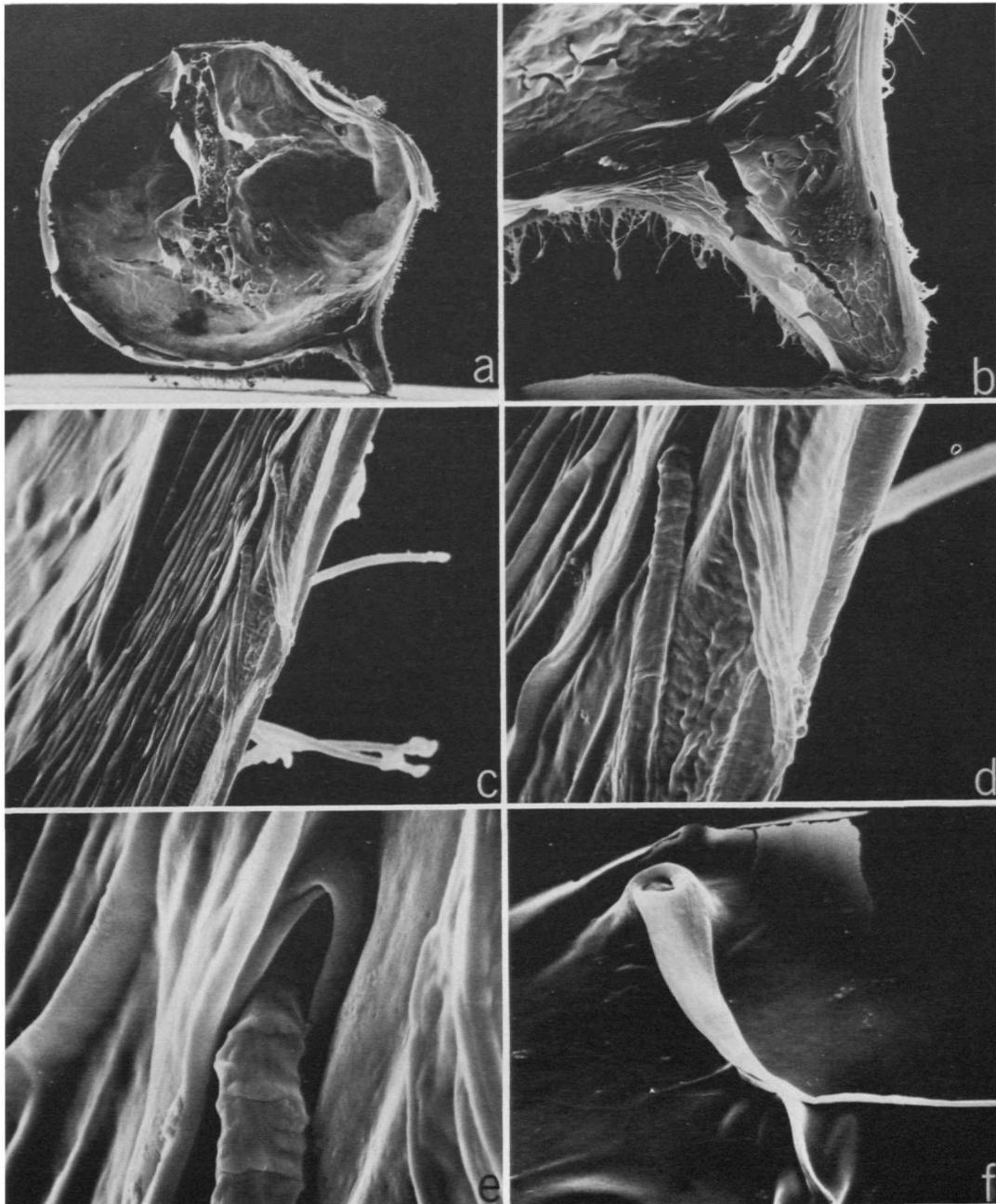


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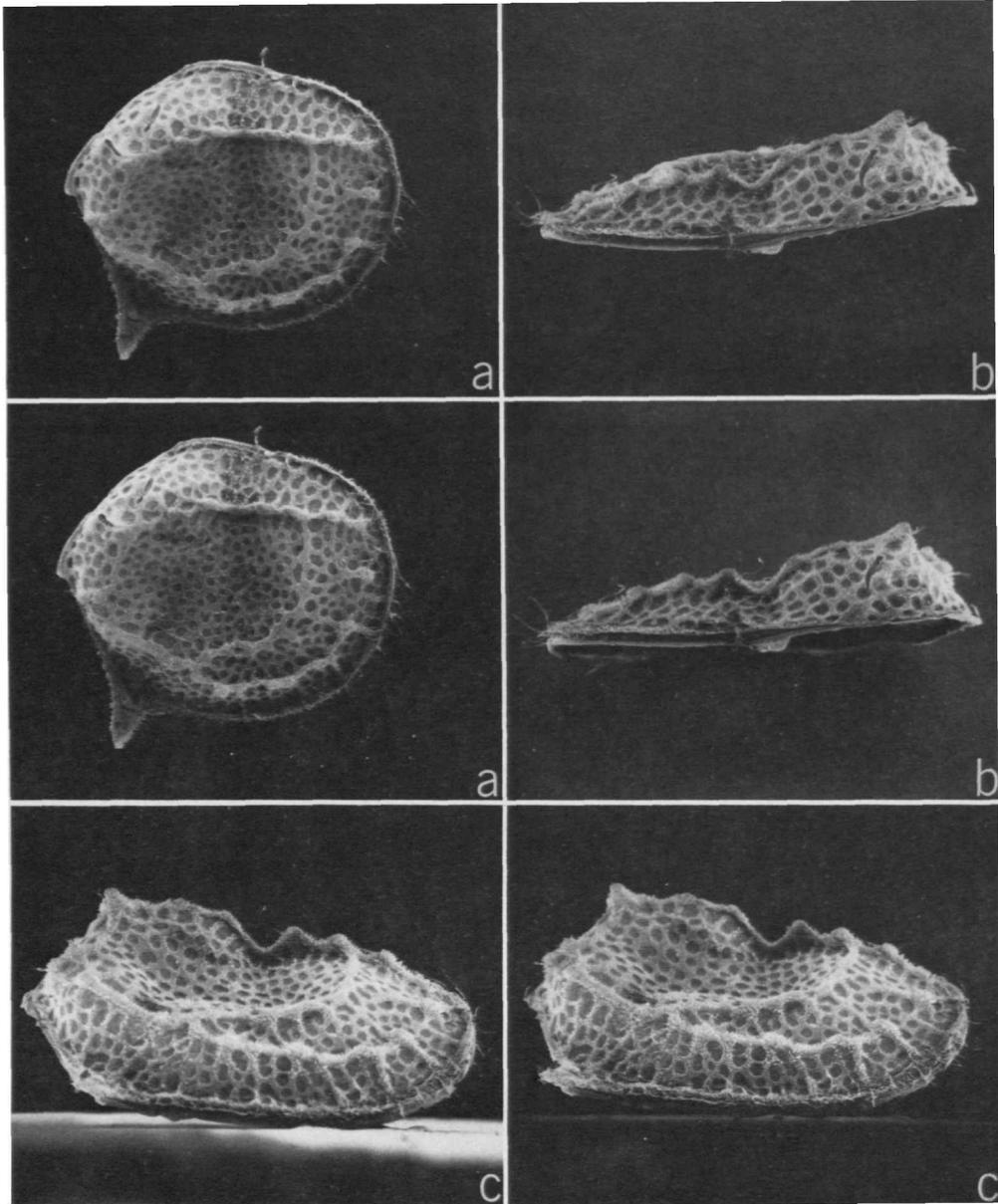


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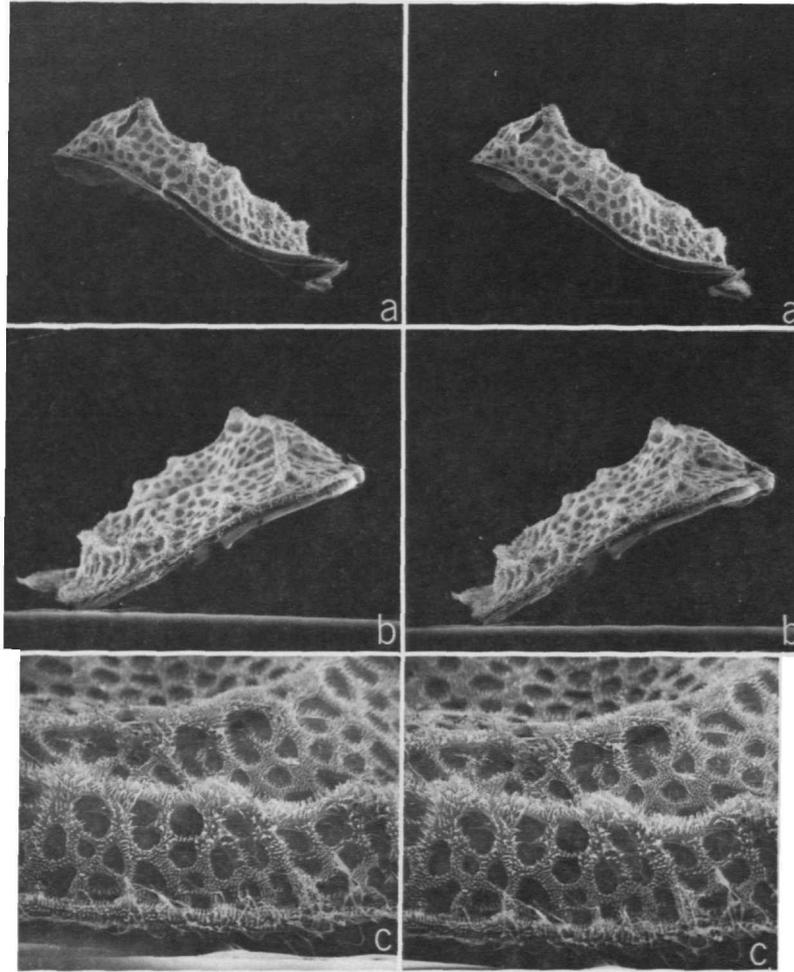


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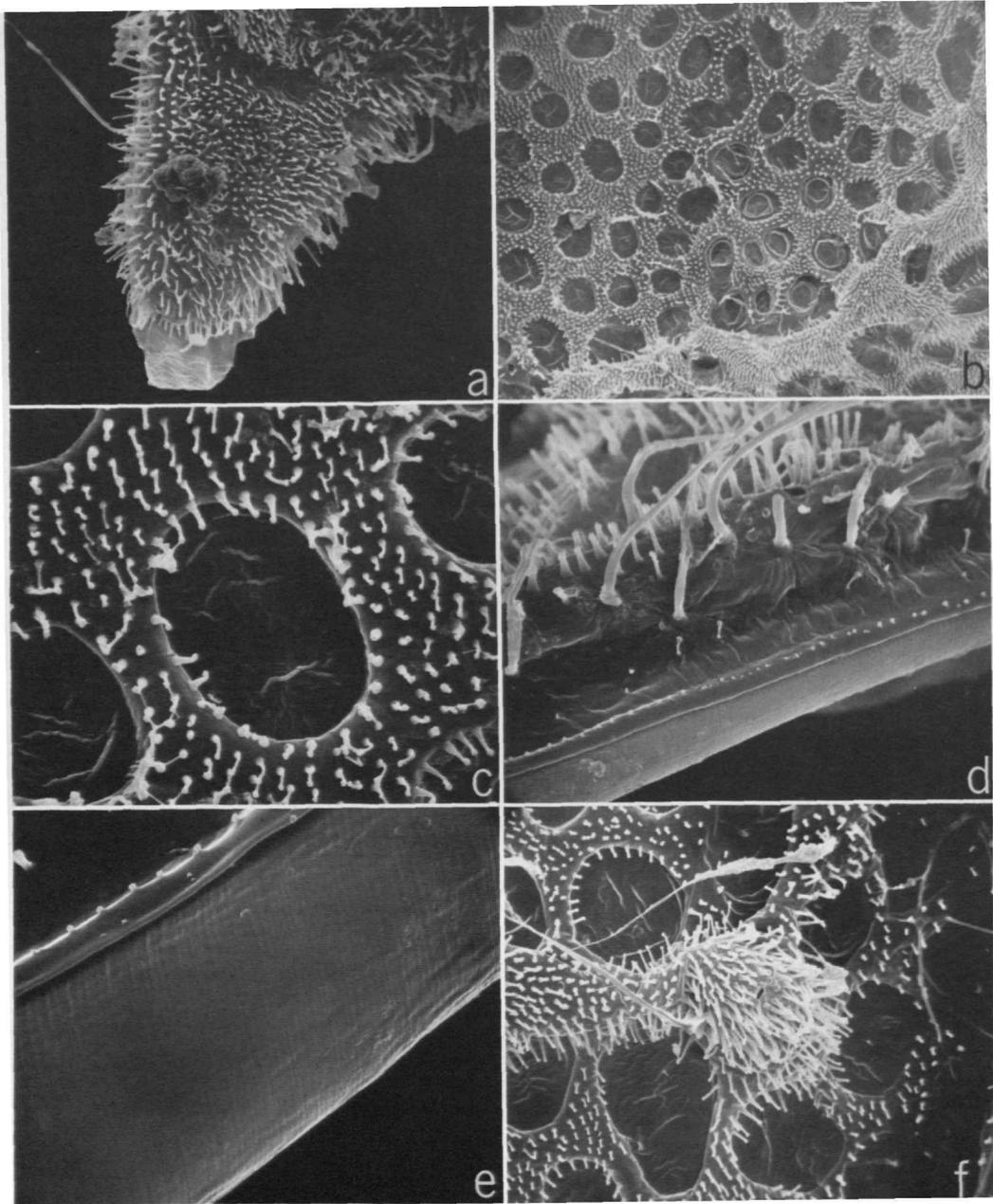


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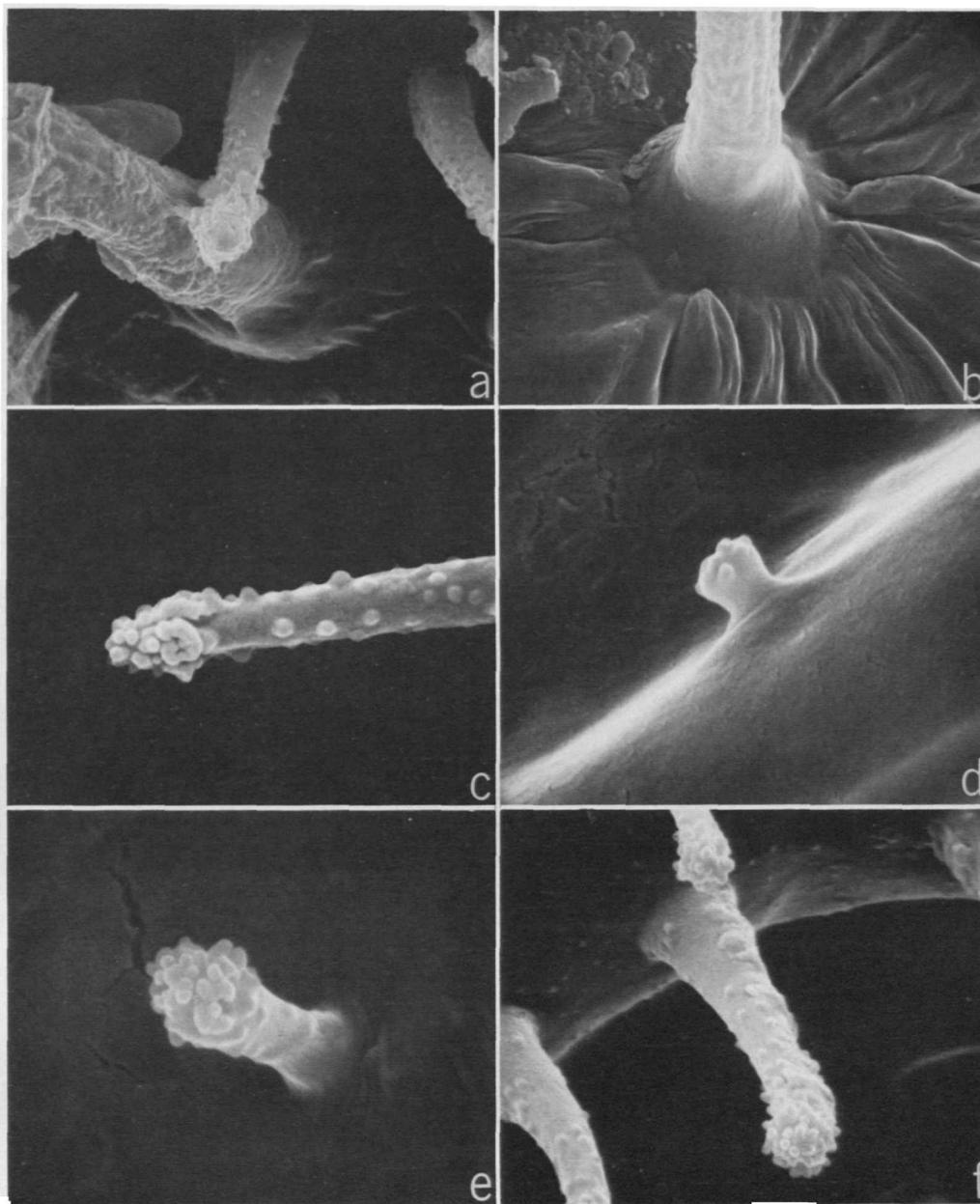


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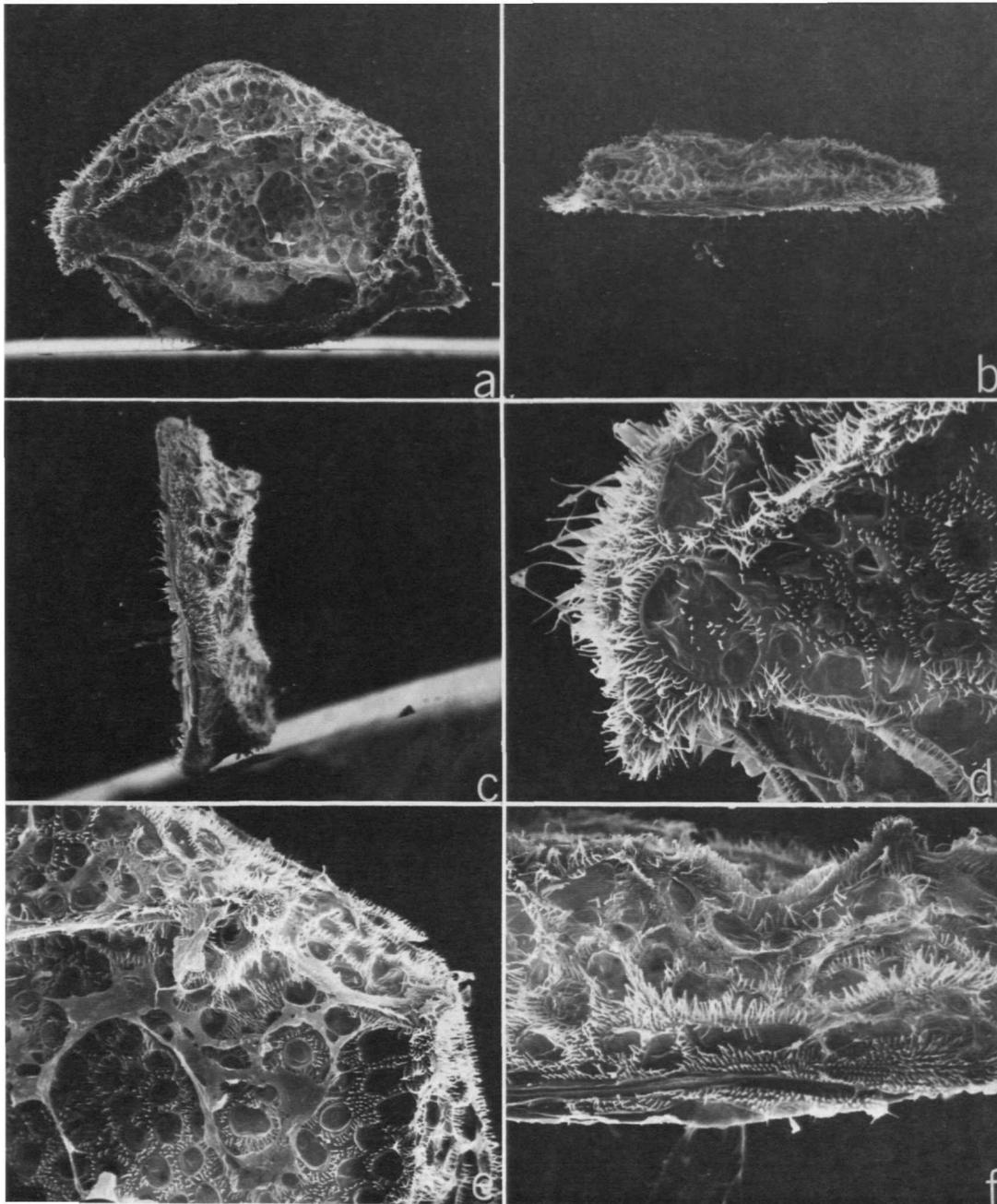


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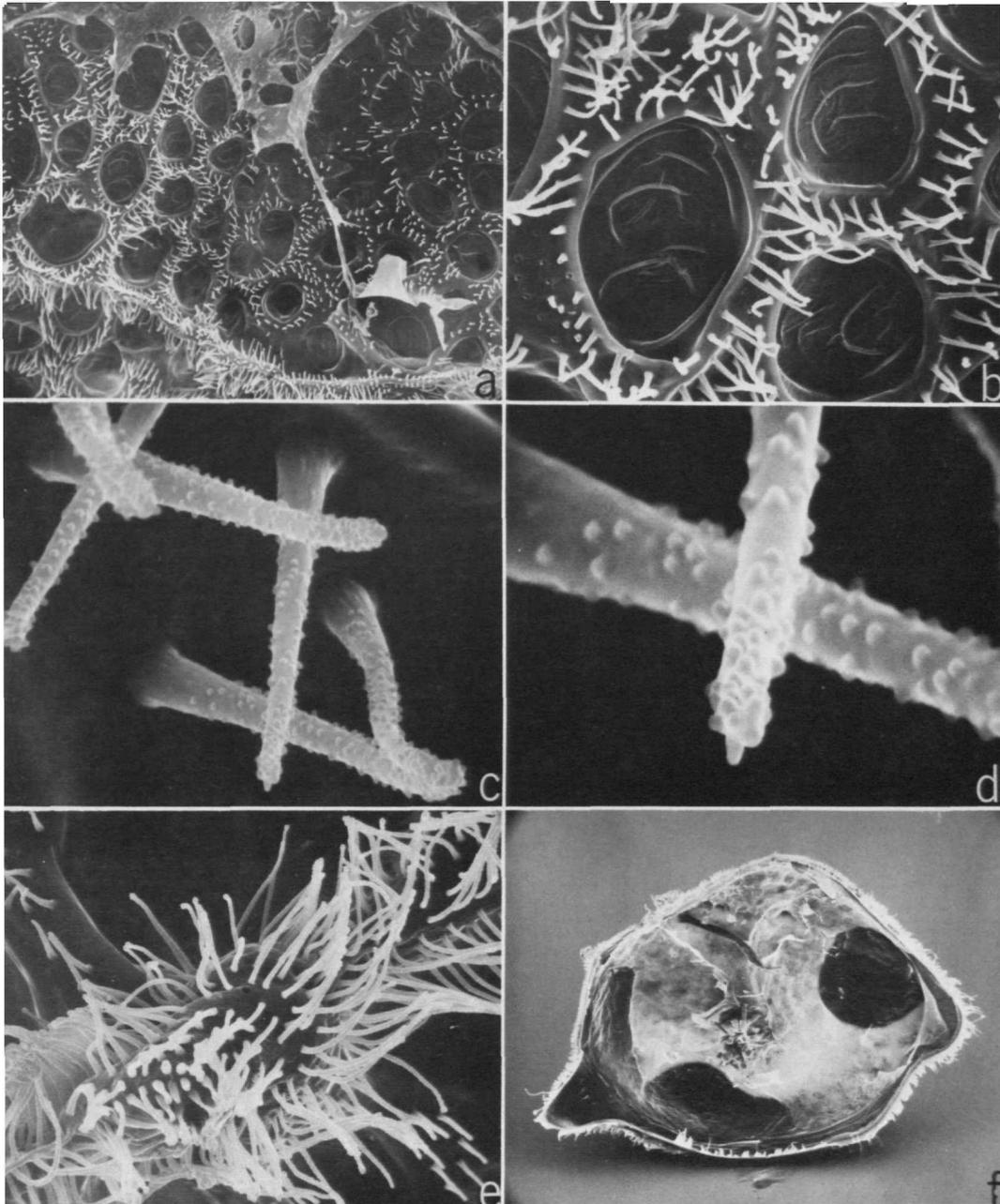


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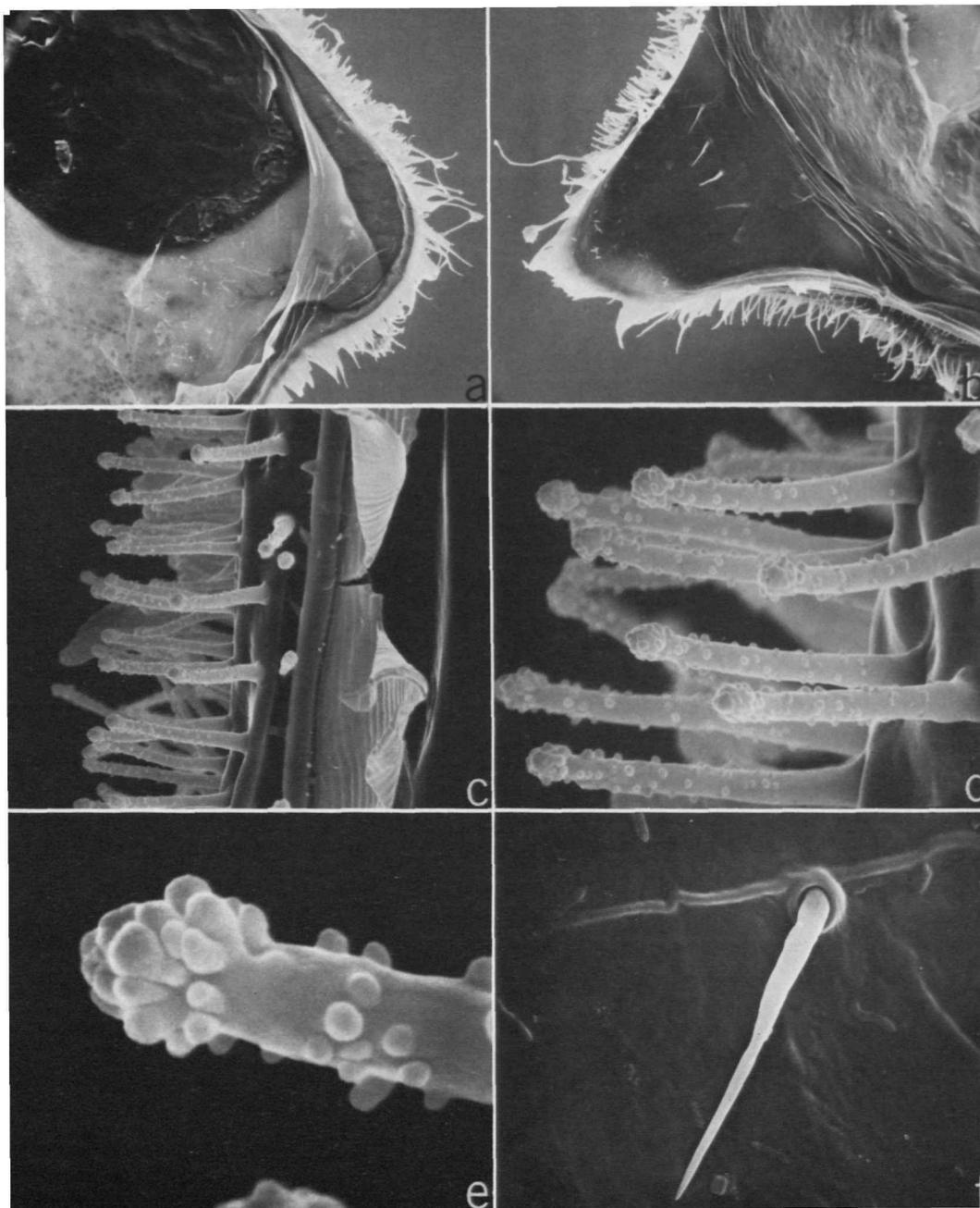


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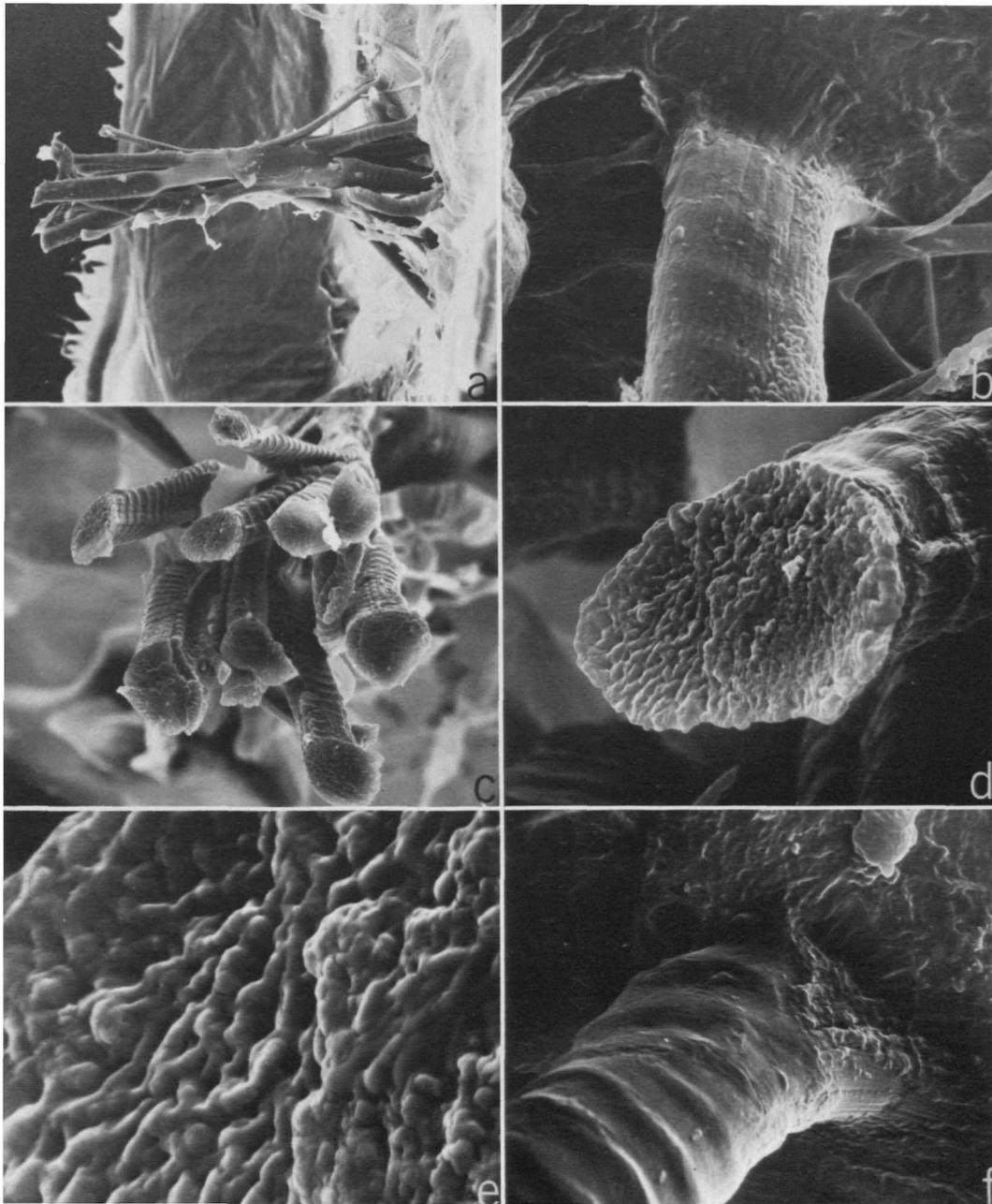


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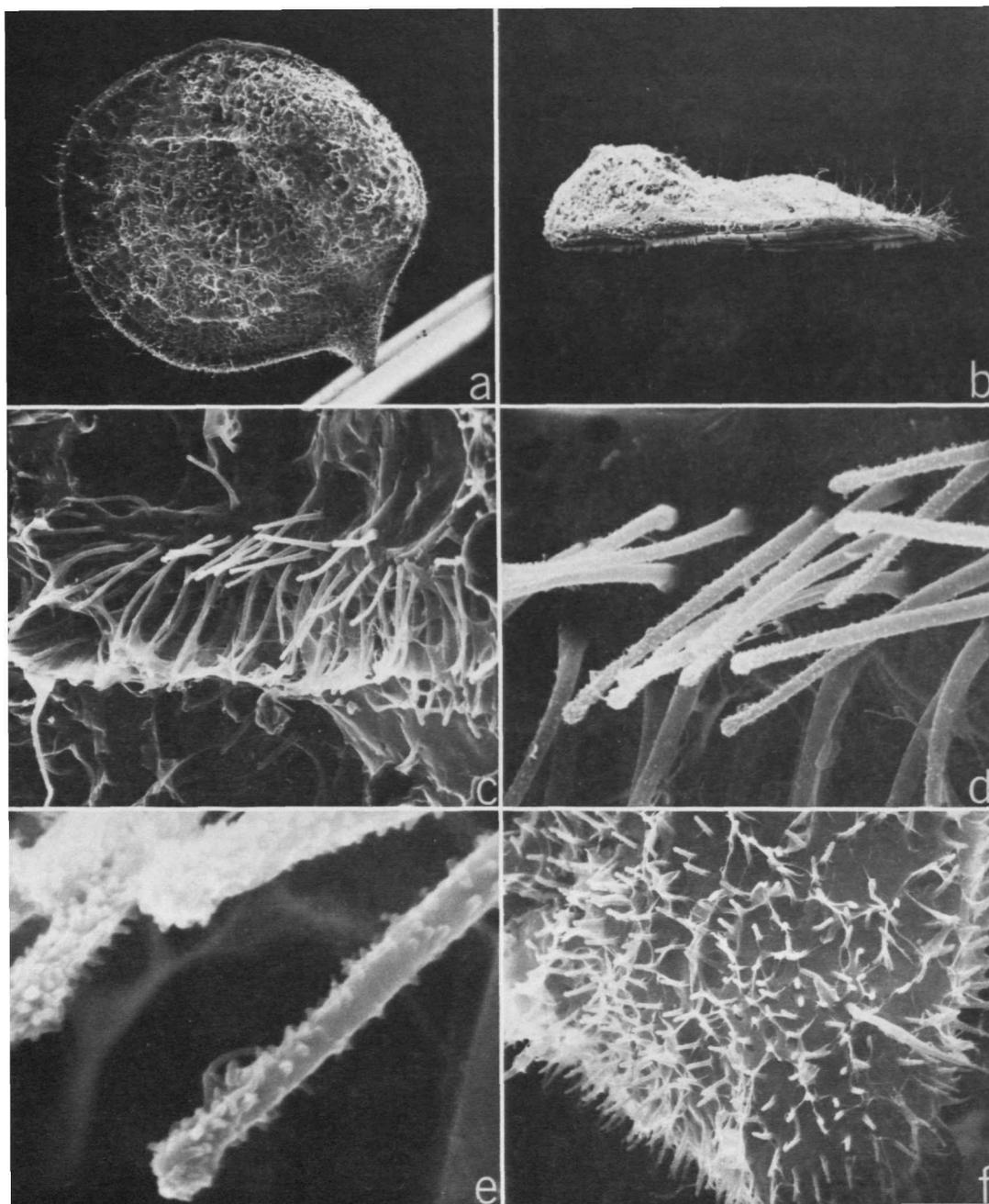


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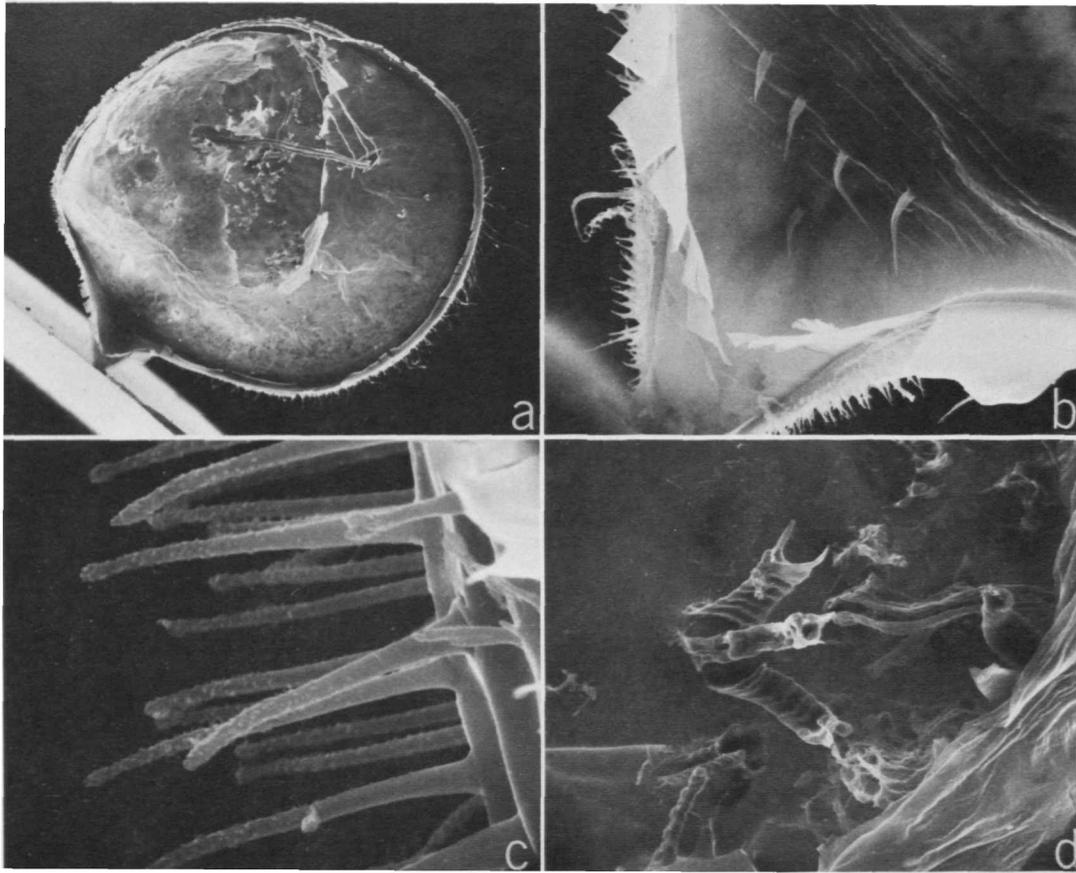


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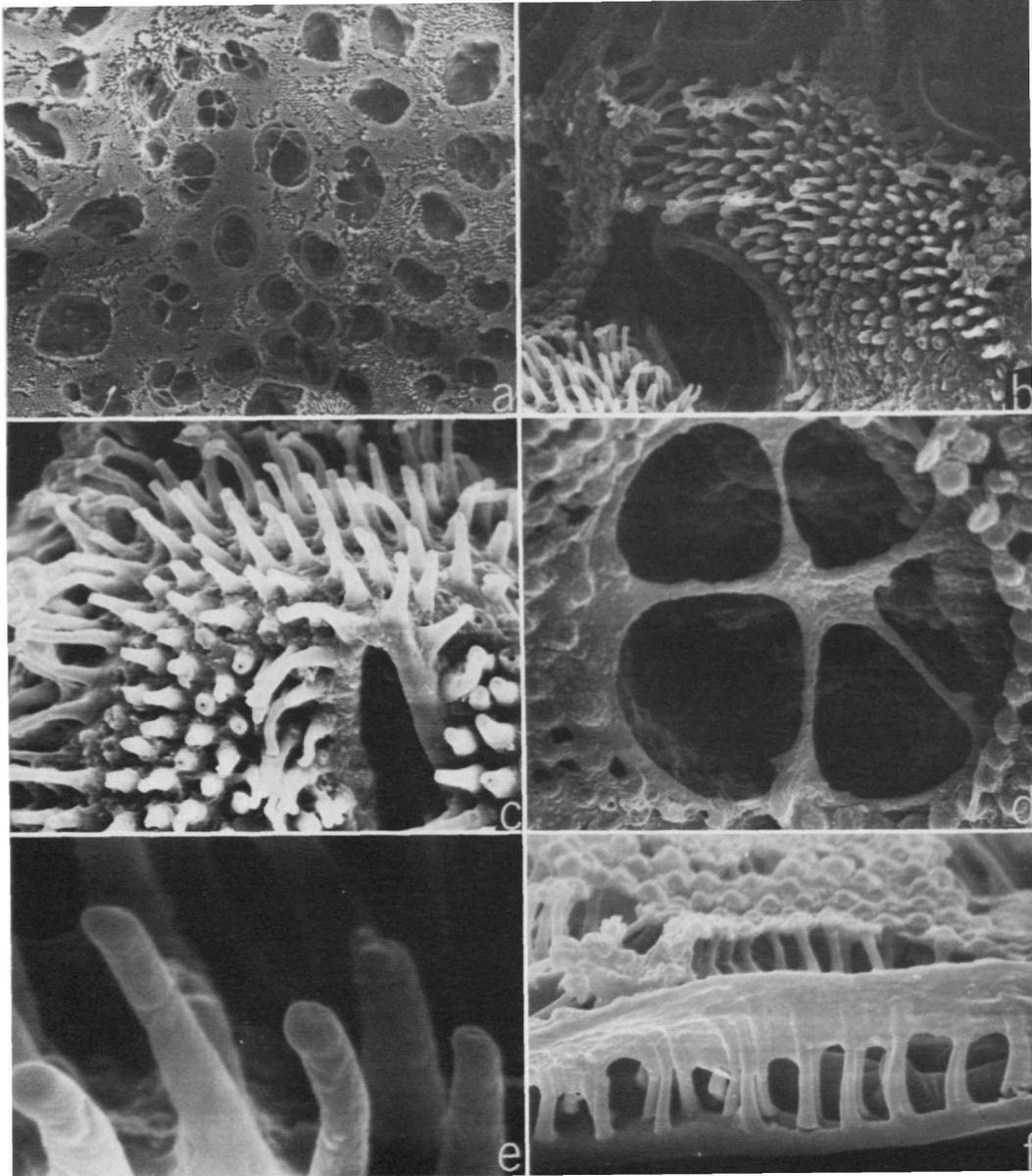


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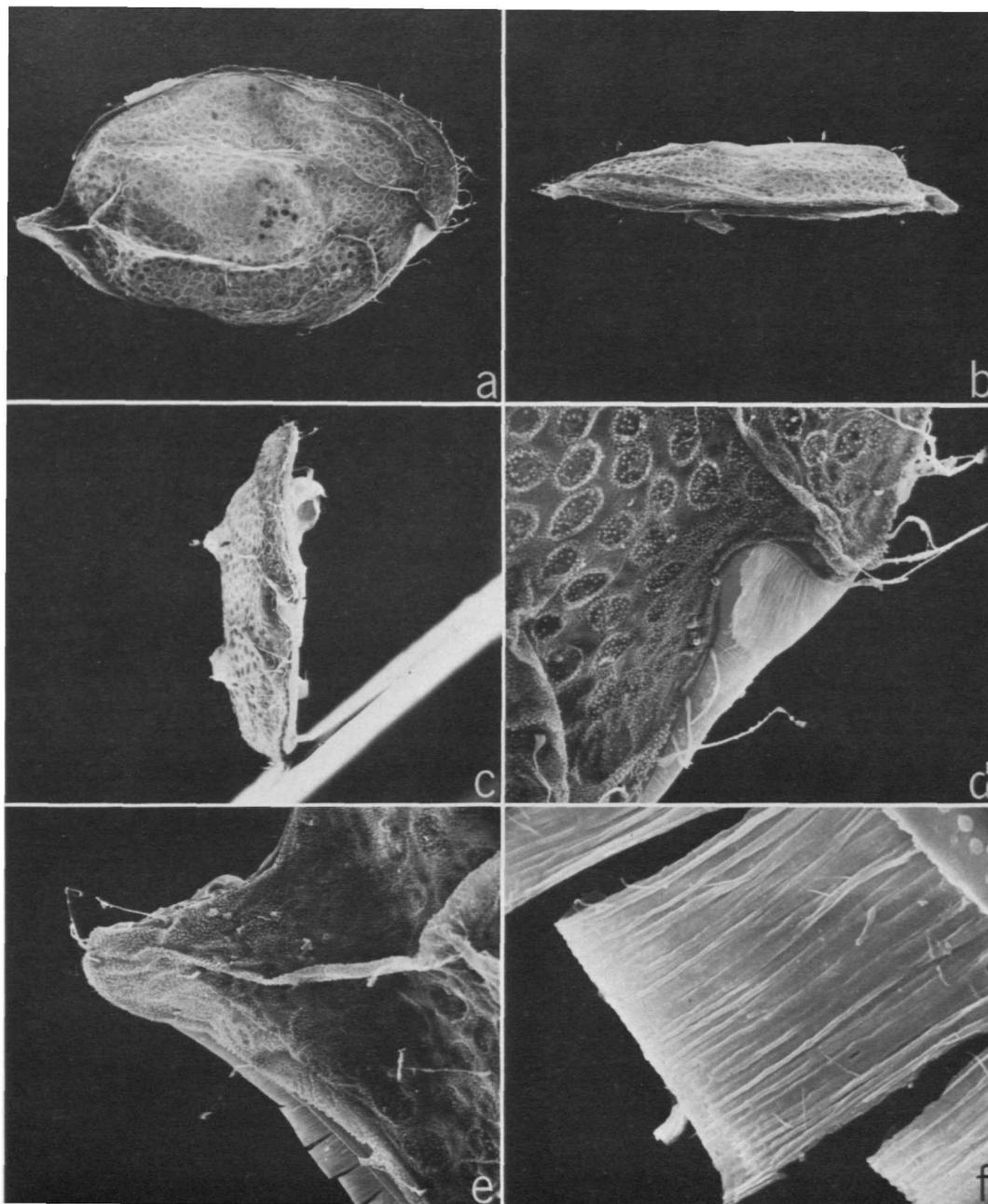


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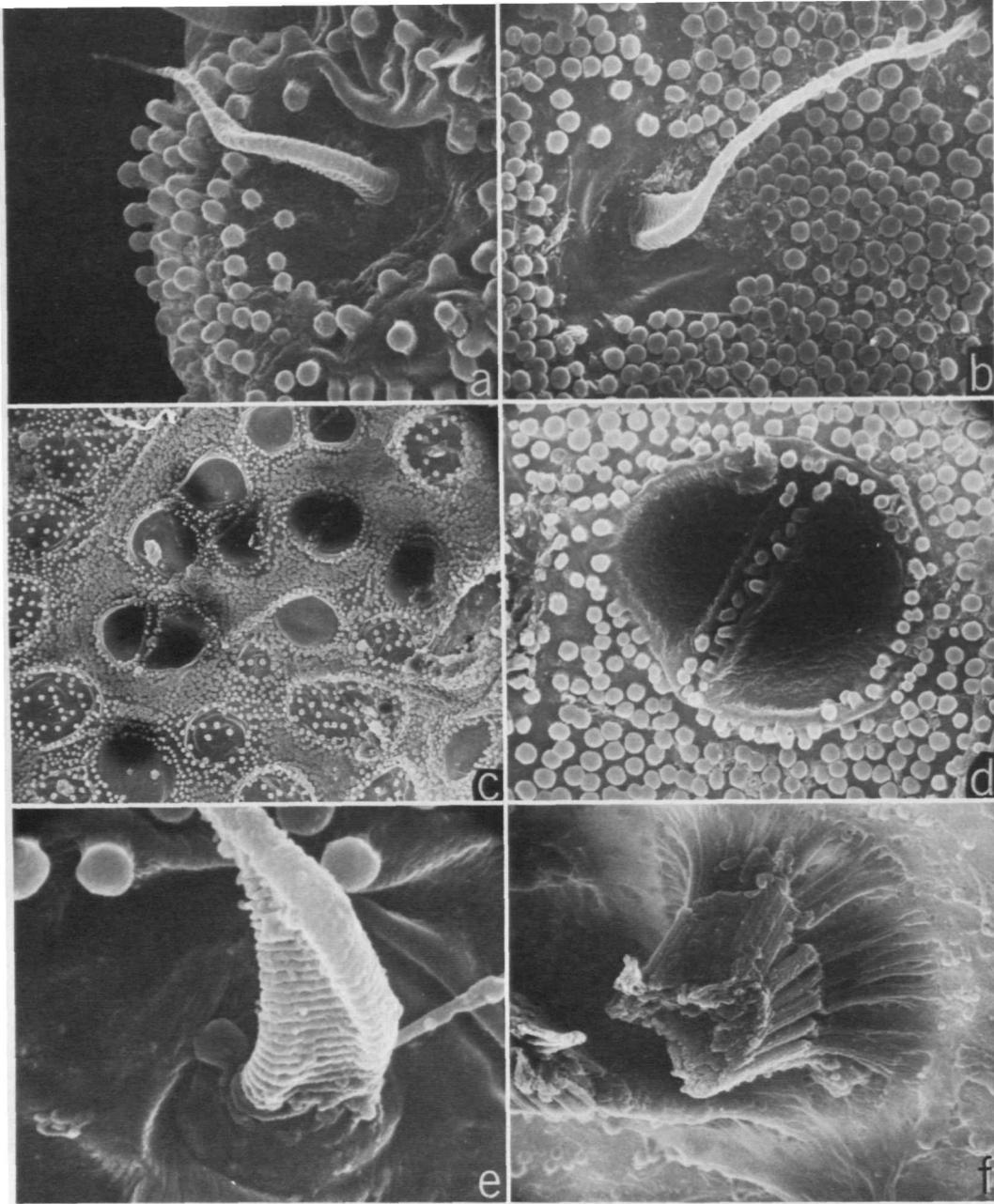


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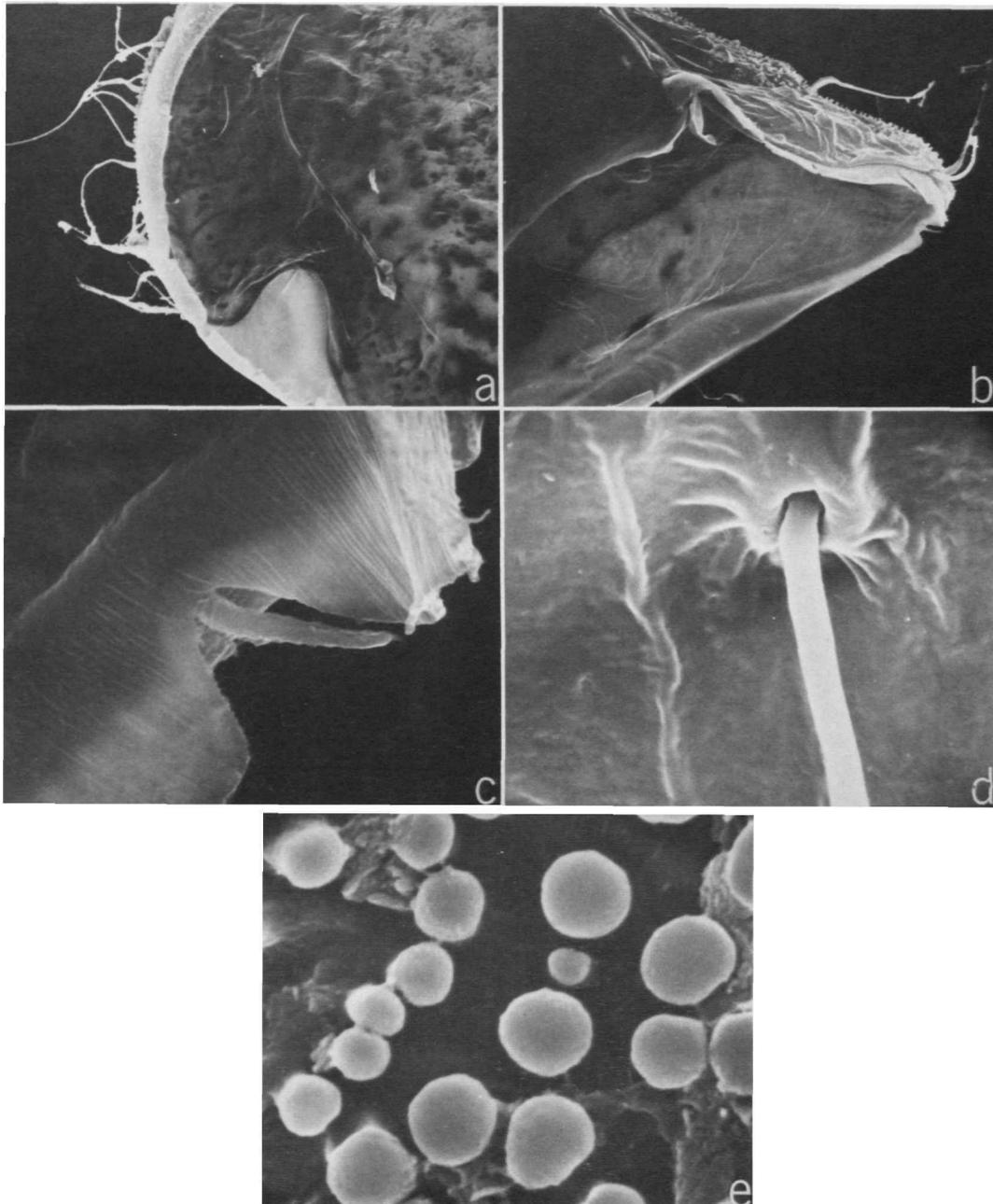


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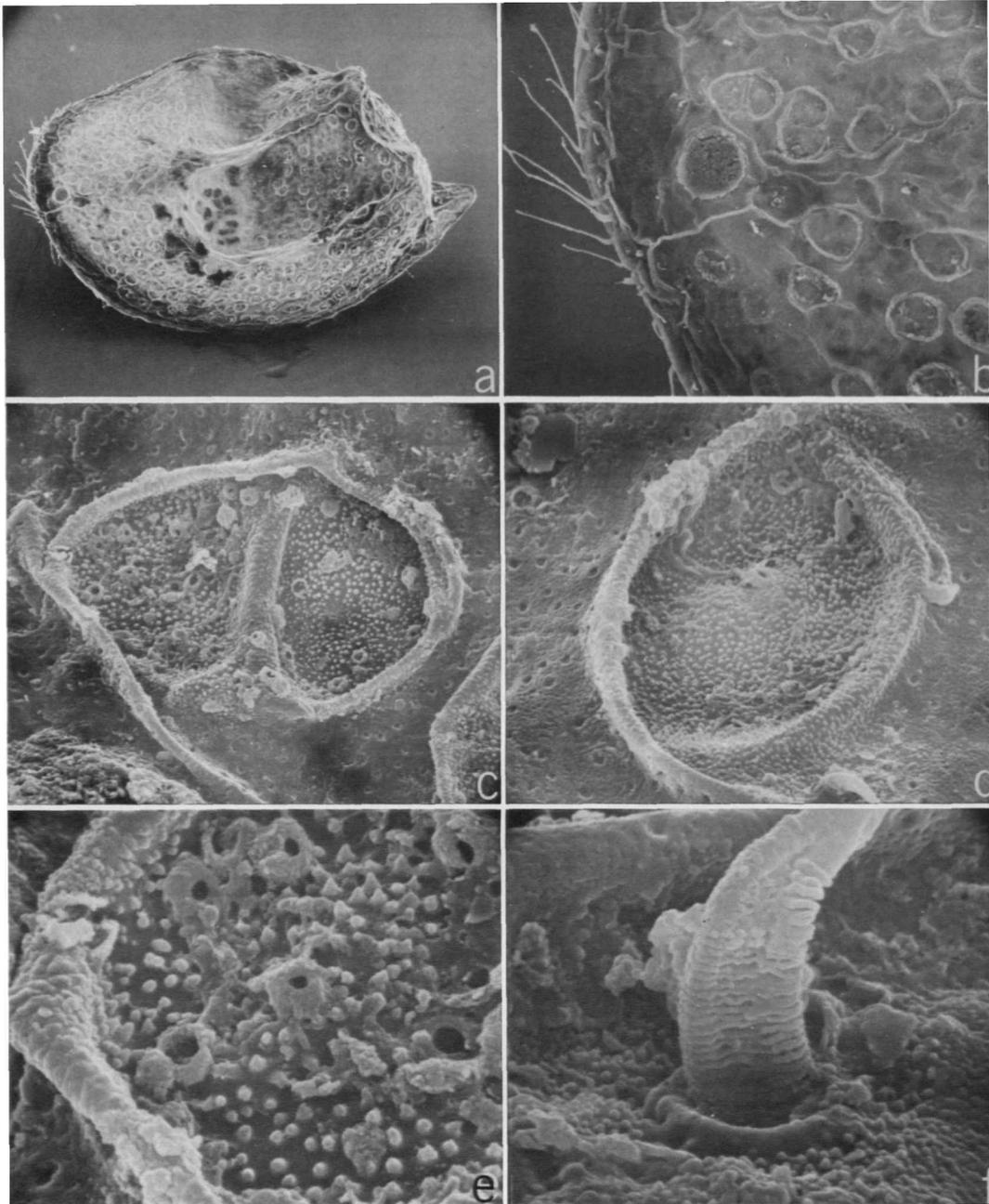


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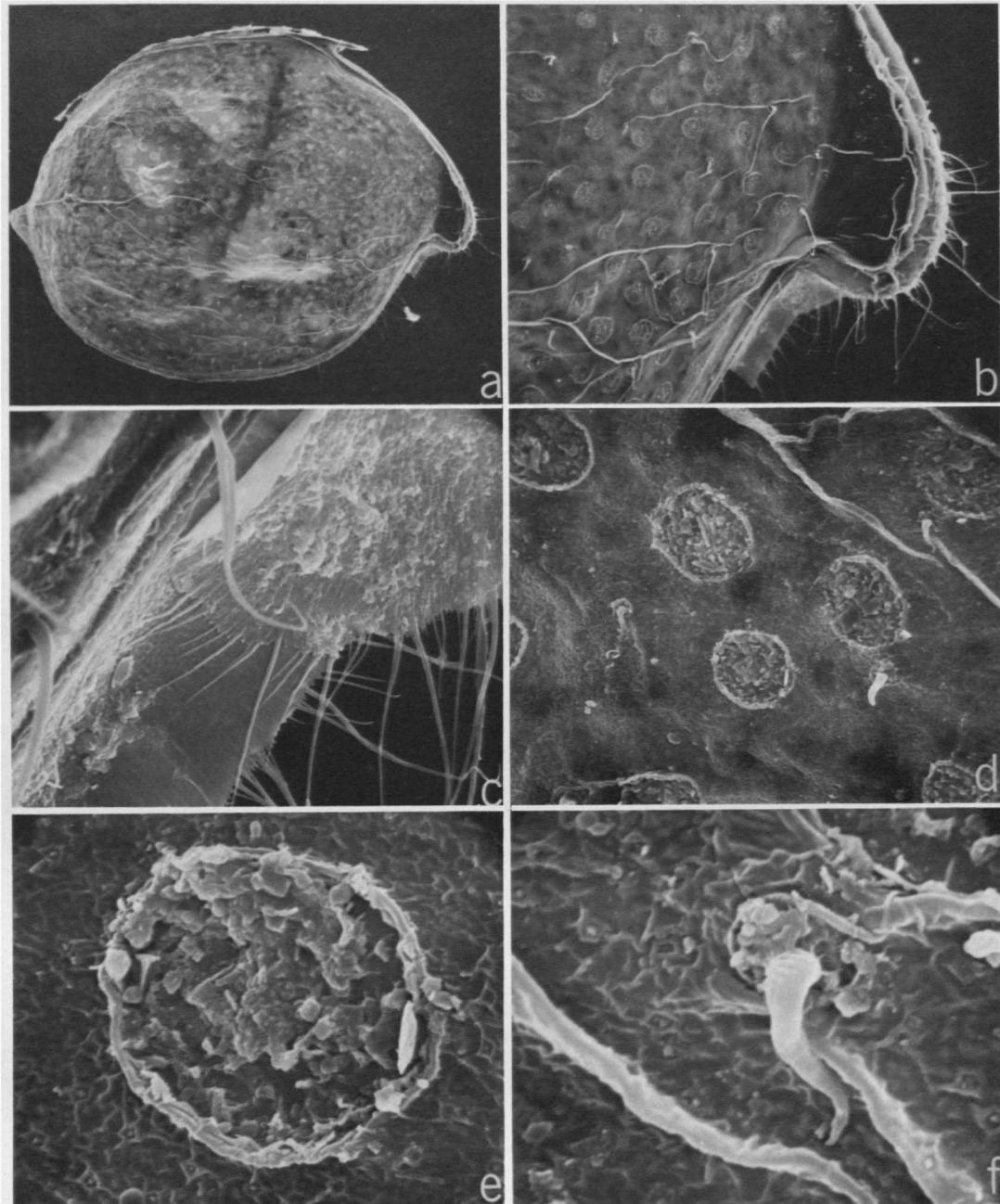


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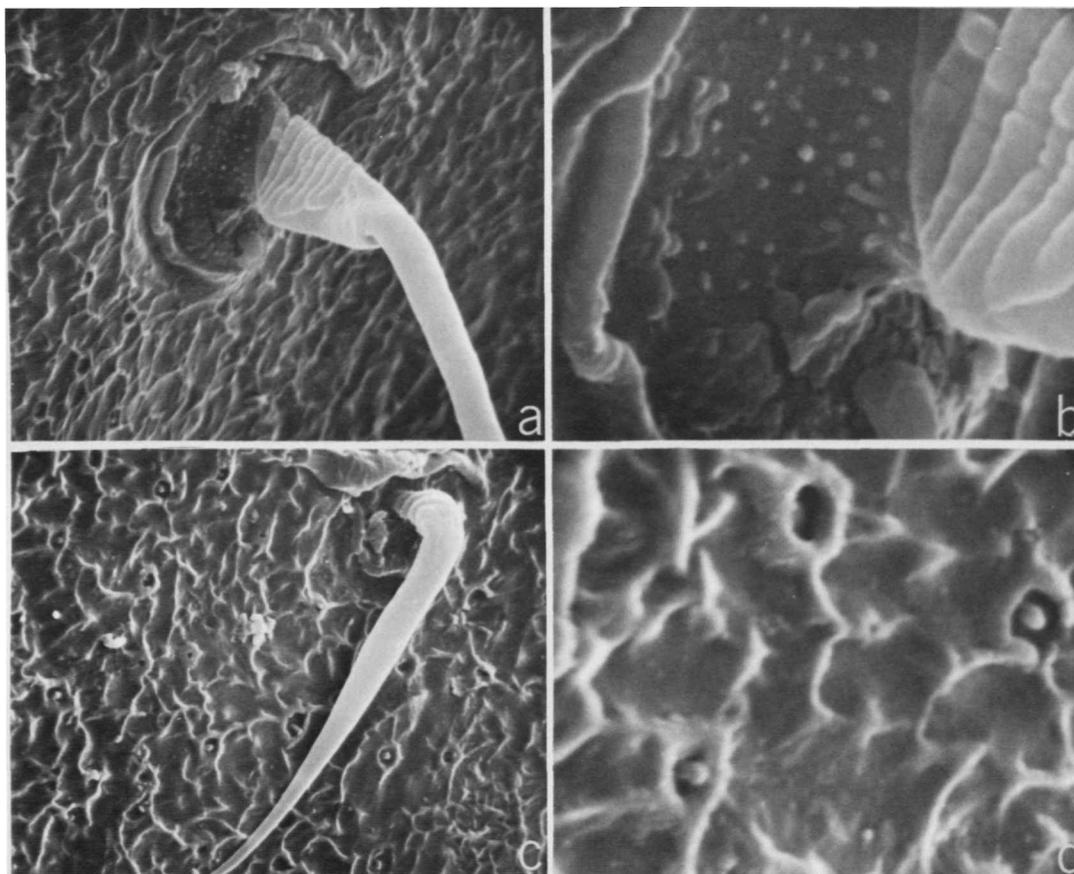


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*tridens*, *Rutiderma*, 3 (figs. 2, 3), 4, 5, 54, 60-66 (figs. 52-55), 107 (pl. 32), 108 (pl. 33)  
*upsilon*, *Asteropella*, 4  
*zostericola*, *Sarsiella*, 54





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