

West African Myodocopid Ostracoda
(Cypridinidae, Philomedidae)

LOUIS S. KORNICKER
and
FRANCISCA ELENA CARAION

SMITHSONIAN CONTRIBUTIONS TO ZOOLOGY • NUMBER 241

SERIES PUBLICATIONS OF THE SMITHSONIAN INSTITUTION

Emphasis upon publication as a means of "diffusing knowledge" was expressed by the first Secretary of the Smithsonian. In his formal plan for the Institution, Joseph Henry outlined a program that included the following statement: "It is proposed to publish a series of reports, giving an account of the new discoveries in science, and of the changes made from year to year in all branches of knowledge." This theme of basic research has been adhered to through the years by thousands of titles issued in series publications under the Smithsonian imprint, commencing with *Smithsonian Contributions to Knowledge* in 1848 and continuing with the following active series:

Smithsonian Contributions to Anthropology
Smithsonian Contributions to Astrophysics
Smithsonian Contributions to Botany
Smithsonian Contributions to the Earth Sciences
Smithsonian Contributions to Paleobiology
Smithsonian Contributions to Zoology
Smithsonian Studies in Air and Space
Smithsonian Studies in History and Technology

In these series, the Institution publishes small papers and full-scale monographs that report the research and collections of its various museums and bureaux or of professional colleagues in the world of science and scholarship. The publications are distributed by mailing lists to libraries, universities, and similar institutions throughout the world.

Papers or monographs submitted for series publication are received by the Smithsonian Institution Press, subject to its own review for format and style, only through departments of the various Smithsonian museums or bureaux, where the manuscripts are given substantive review. Press requirements for manuscript and art preparation are outlined on the inside back cover.

S. Dillon Ripley
Secretary
Smithsonian Institution

SMITHSONIAN CONTRIBUTIONS TO ZOOLOGY • NUMBER 241

West African Myodocopid Ostracoda
(Cypridinidae, Philomedidae)

Louis S. Kornicker
and Francisca Elena Caraión



SMITHSONIAN INSTITUTION PRESS

City of Washington

1977

ABSTRACT

Kornicker, Louis S., and Francisca Elena Caraion. West African Myodocopid Ostracoda (Cypridinidae, Philomedidae). *Smithsonian Contributions to Zoology*, number 241, 100 pages, 52 figures, 28 plates, 1 table, 1977.—Eleven species, including 5 new species and 1 new subspecies, in 6 genera in the families Cypridinidae and Philomedidae, 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.

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

Library of Congress Cataloging in Publication Data

Kornicker, Louis S. 1919—

West African myodocopid Ostracoda (Cypridinidae, Philomedidae)

(Smithsonian contributions to zoology ; no. 241)

Bibliography: p.

Includes index.

1. Philomedidae. 2. Paradoria. 3. Crustacea—Spanish Sahara. 4. Crustacea—Mauritania. I. Caraion, Francisca Elena, joint author. II. Title. III. Series: Smithsonian Institution. Smithsonian contributions to zoology ; no. 241.

QL1.S54 no. 241 [QL444.085] 591'.08s [595'.33] 76-17590

Contents

	<i>Page</i>
Introduction	1
Acknowledgments	3
Station Data	4
CYPRIDINIDAE Baird, 1850	5
CYPRIDININAE Baird, 1850	5
<i>Paradoloria</i> Poulsen, 1962	5
? <i>Paradoloria</i> species indeterminate	5
PHILOMEDIDAE Müller, 1908	6
Key to the Subfamilies of Philomedidae	6
PHILOMEDINAE Müller, 1908	6
Microstructures	7
Key to the Genera of Philomedinae	8
<i>Philomedes</i> Lilljeborg, 1853	8
Key to the Species of <i>Philomedes</i> of West Africa	9
Key to Adult Females of the Species of <i>Philomedes</i>	9
<i>Philomedes bonneti</i> , new species	9
<i>Philomedes tetradens</i> , new species	15
<i>Euphilomedes</i> Poulsen, 1962	19
Key to the Species and Subspecies of <i>Euphilomedes</i> of West Africa	19
<i>Euphilomedes asper</i> (Müller, 1894)	20
<i>Euphilomedes sinister</i> Kornicker, 1974	23
Key to the Subspecies of <i>Euphilomedes sinister</i>	23
<i>Euphilomedes sinister sinister</i> Kornicker, 1974, new status	24
<i>Euphilomedes sinister pentathrix</i> , new subspecies	24
<i>Euphilomedes schornikovi</i> , new species	27
<i>Tetragonodon</i> Brady and Norman, 1896	32
<i>Tetragonodon ctenorynchus</i> (Brady, 1887)	32
<i>Scleroconcha</i> Skogsberg, 1920	40
<i>Scleroconcha folinii</i> (Brady, 1871)	40
PSEUDOPHILOMEDINAE Kornicker, 1967	46
Key to the Genera of Pseudophilomedinae	46
<i>Pseudophilomedes</i> Müller, 1893	46
Microstructures	47
Sexual Dimorphism	47
Ontogeny	48
Key to Adult Females of the Species of <i>Pseudophilomedes</i>	48
<i>Pseudophilomedes angulatus</i> Müller, 1894	49
<i>Pseudophilomedes thalassa</i> , new species	56
<i>Pseudophilomedes tetrathrix</i> , new species	64
<i>Pseudophilomedes foveolatus</i> Müller, 1894	68
Table 1: World distribution and depth zones of Philomedidae	68
Literature Cited	69
Plates	71
Index	99

West African Myodocopid Ostracoda (Cypridinidae, Philomedidae)

Louis S. Kornicker
and *Francisca Elena Caraion*

Introduction

This work reports on the shelf and slope myodocopid Ostracoda of the families Cypridinidae and Philomedidae collected in bottom trawls by personnel aboard the research vessels *Thalassa* (12 stations) and *Cornide de Saavedra* (2 stations) in the vicinity of Spanish Sahara (4 stations) and Mauritania (10 stations) (Figure 1). It is the second of three papers describing the ostracodes collected on the cruises. The *Cylindroleberididae* have already been described (Kornicker and Caraion, 1974); the third part, which is in preparation, will describe the families *Rutidermatidae* and *Sarsiellidae*.

The *Thalassa* collection contained 57 specimens and the *Cornide de Saavedra* collection contained 19 specimens of Philomedidae. Of these, two juveniles could not be identified at the genus level. The remaining specimens are referred to 10 species in five genera. Ten of the species were found off Mauritania, of which two were also found off Spanish Sahara. One species was found only off Spanish Sahara. The Cypridinidae were represented in the collection by only two juveniles, both are referred questionably to the genus *Paradoloria*. The two specimens were found off Mauritania, each vessel collecting one. 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, Washington, D.C. were assigned USNM numbers (former United States National Museum). Those deposited in the Museum of Natural History "Grigore Antipa," Bucharest, Romania, were assigned either numbers of that museum or USNM numbers; the latter are enclosed by brackets in the text. Magnifications shown in legends of Plates 1-28 are those used in taking SEM micrographs. These were reduced for publication; reduction is given at end of each legend.

The only Philomedidae previously identified from the study area are *Scleroconcha folinii* (Brady, 1871), *Tetragonodon ctenorynchus* Brady, 1887, *T. erinaceus* Brady and Norman, 1896, *Paramekodon inflatus* Brady and Norman, 1896. *Streptoleberis favosa*, Brady and Norman, 1896, and *S. rectirostris* Brady and Norman, 1896. Müller (1912:51) correctly referred to "Cypridinidarum genera dubia et species dubiae" three of the species: *Tetragonodon erinaceus*, *Streptoleberis favosa*, and *S. rectirostris*. The three species could not be recognized with certainty among the specimens in the present collection and therefore are left in the category to which they were referred by Müller. *Paramekodon inflatus* was not represented in the collection. Specimens of *Tetragonodon ctenorynchus* and *Scleroconcha folinii* were present in the collection and are

Louis S. Kornicker, Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560. Francisca Elena Caraion, Institute of Biological Sciences, Splaiul Independentei 296, Bucharest, Romania.

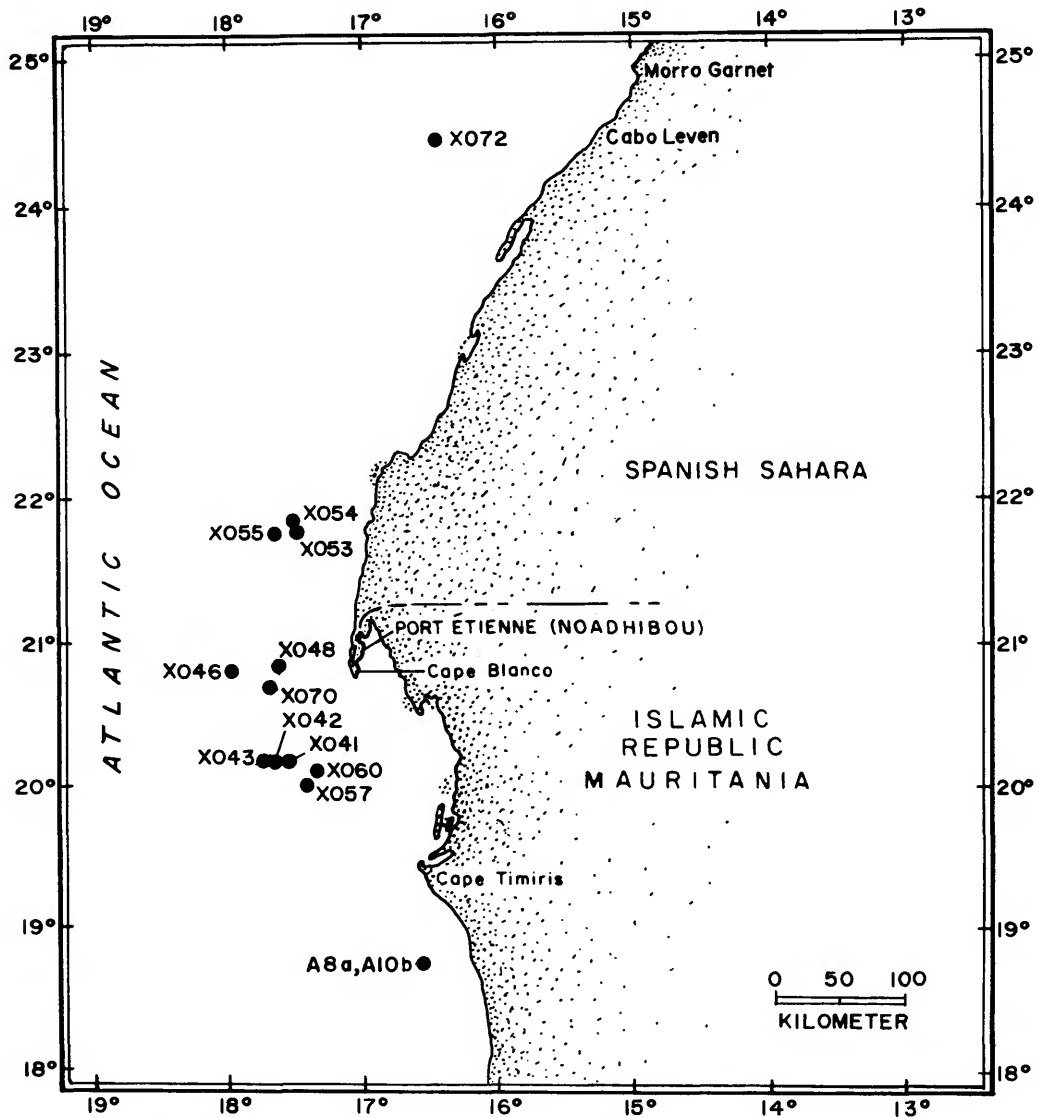


FIGURE 1.—Map showing locations of stations containing ostracodes reported upon herein. (*Thalassa* station numbers preceded by "X" and *Cornide de Saavedra* station numbers preceded by "A.")

redescribed herein. Two species in the family that have been reported from southern Africa but were not in the study area are *Euphilomedes africanus* (Klie, 1940) and *E. kornickeri* Hartmann, 1974. A species in the family that has been reported off Morocco but was not found in the study area is

Philomedes macandrei (Baird, 1848) (Kornicker, 1969b).

Only one species of Cypridinidae has previously been reported from the study area, *Cypridina* (?) *bradyi* de Folin, 1870. That species was referred to "Cypridarum genera dubia et species dubiae," by

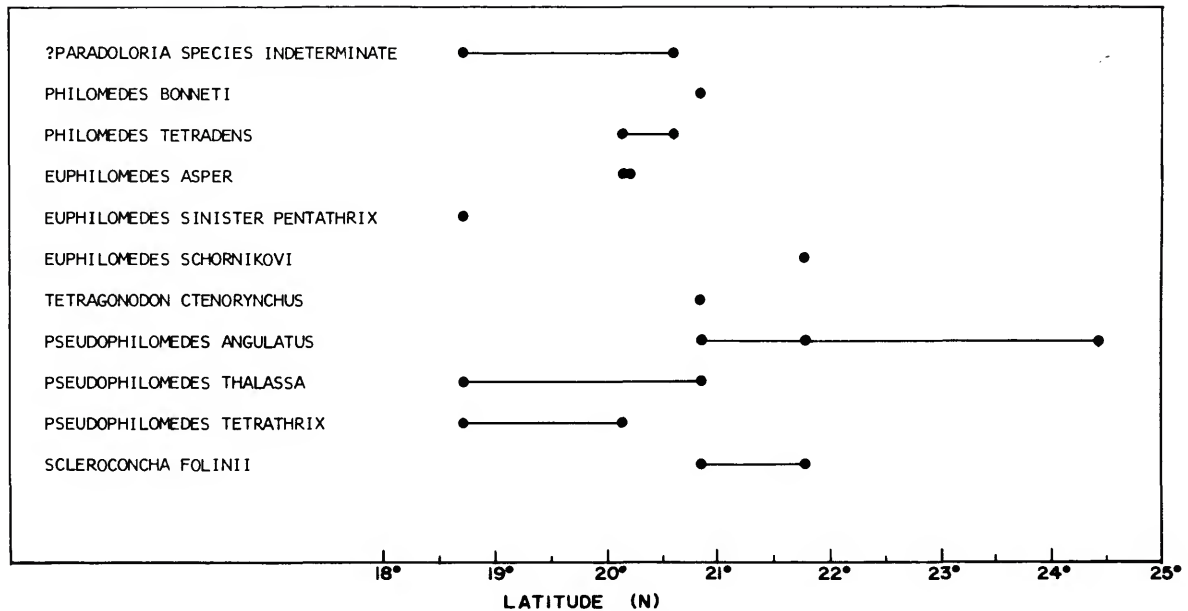


FIGURE 2.—Latitudinal distribution of species in study area.

Müller (1912:50). Kornicker (1975b:17) believed the species to belong in the family Cyndroleberididae but concurred with Müller. Species of Cypridinidae that have been reported from southern Africa are "*Cypridina*" *nobilis* Cleve, 1905, *Azgyocypridina africanus* (Stebbing, 1901), *Paradoloria dorsoserrata* (Müller, 1908), *P. vanhoeffeni* (Müller, 1908), *P. capensis* (Cleve, 1905), *Paravargula arborea* (Müller, 1908) and *Skogsbergia caudata* (Cleve, 1905). The two specimens, both juveniles, of Cypridinidae in the present collection have been referred to *?Paradoloria* species indeterminate.

Four species in the present collection have been reported from other regions: *Euphilomedes asper* (Müller, 1894), *Pseudophilomedes angulatus* Müller, 1894, *Scleroconcha folinii* (Brady, 1871), and *Tetragonodon ctenorynchus* (Brady, 1887) (Table 1, p. 68). The last species has been reported from the coast of Africa north of the study area. The other species have been reported from the Mediterranean Sea. *Scleroconcha folinii* has also been reported from the Atlantic coast of Europe as far north as the Bay of Biscay. The species *Euphilomedes sinister* Kornicker, 1974, has been divided herein into two

subspecies, one off Mauritania and the other both in the Mediterranean and in the Atlantic in the vicinity of Europe as far north as Plymouth, England. Adult males of the genera *Tetragonodon* and *Pseudophilomedes* are described herein for the first time.

ACKNOWLEDGMENTS.—We thank Dr. Mihai Băcescu, Museum of Natural History "Grigore Antipa," for the ostracodes from the *Thalassa*, and Dr. Ramon Margalef, Instituto de Investigaciones Pesqueras, Barcelona, for the ostracodes from the *Cornide de Saavedra*. Mrs. Carolyn Gast rendered the shaded drawings of 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 figures. Freeze-drying of specimens for photography was done in the laboratory of Mr. Roland Hower. The assistance of Walter R. Brown and Miss Mary J. Mann, who operated the scanning-electron microscope, is acknowledged. The *Thalassa* cruise was organized and supported by the Institut Scientifique et Technique de Peche Maritime de France. We are grateful to Dr. Mihai Băcescu and Mrs. Anne Cohen for criticizing the manuscript.

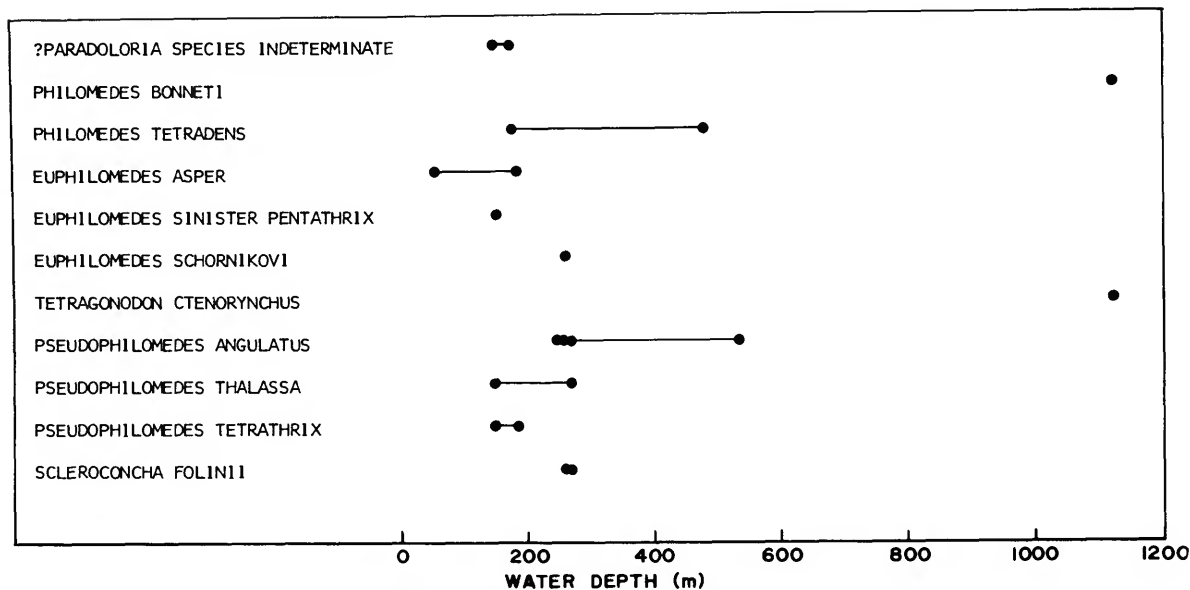


FIGURE 3.—Depth distribution of species in study area.

Station Data

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

Station X041; 29 Jan; 20°10'05"N, 17°32'09"W; 52 m; sand; Băcescu dredge; Islamic Republic of Mauritania.

Euphilomedes asper: 1 ♀ (adult or A-1 instar).

Station X042; 29 Jan; 20°10'00"N, 17°39'00"W; 187 m; mud, sand; Băcescu dredge; Islamic Republic of Mauritania.

Euphilomedes asper: 1 female (adult or A-1 instar).

Pseudophilomedes tetrathrix, new species: 1 ovigerous ♀.

Station X043; 29 Jan; 20°09'08"N, 17°43'01"W; 480 m; mud; Menzies trawl; Islamic Republic of Mauritania.

Philomedes tetradens, new species: 2 adult ♀, 1 juvenile ♀.

Station X046; 29 Jan; 20°49'09"N, 17°58'08"W; 1120 m; sandy mud; Menzies trawl; Islamic Republic of Mauritania.

Tetragonodon ctenorynchus: 4 ovigerous ♀, 1 adult ♂, 10 adult ♀ and juveniles.

Philomedes bonneti, new species: 1 ovigerous ♀, 1 adult ♂.

Station X048; 29 Jan; 20°50'05"N, 17°39'00"W; 270 m; mud + sand; Băcescu dredge; Islamic Republic of Mauritania.

Pseudophilomedes angulatus: 1 adult ♀, 1 A-1 ♂, 1 juvenile.

Pseudophilomedes thalassa, new species: 4 ovigerous ♀, 2 adult ♀, 1 adult ♂, 1 A-1 ♂, 3 additional specimens.

Scleroconcha folinii: 1 ovigerous ♀, 1 adult ♀, 9 juveniles.

Station X053; 30 Jan; 21°47'00"N, 17°28'02"W; 260 m; sand; Rullier dredge; Spanish Sahara.

Pseudophilomedes angulatus: 1 A-1 ♂.

Scleroconcha folinii: 1 specimen.

Euphilomedes schornikovi: 1 A-1 ♂, 1 instar III ♀.

Station X054; 30 Jan; 21°47'00"N, 17°30'06"W; 534 m; mud + sand; Rullier dredge; Spanish Sahara.

Pseudophilomedes angulatus: 1 adult ♂, 1 A-1 ♂, 1 A-1 ♀.

Station X055; 30 Jan; 21°45'06"N, 17°39'08"W; 1045 m; Rullier dredge; Spanish Sahara.

Philomedidae genus indeterminate: 1 early instar.

Station X070; 5 Feb; 20°40'04"N, 17°41'01"W; 170-175 m; sand and mud from Gorgonacea washings; Islamic Republic of Mauritania.

?*Paradoloria* species indeterminate: 1 instar I.

Philomedes tetradens, new species: 1 adult ♀.

Station X072; 6 Feb; 24°27'09"N, 16°26'00"W; 286-227 m; sandy mud; Băcescu dredge.

Pseudophilomedes angulatus: 1 A-1 ♂, 1 adult ♂.

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

Station A8a, sample 15; 18°44'N, 16°34'W; 150 m.

?*Paradoloria* species indeterminate: 1 instar III.

Pseudophilomedes tetrathrix new species: 2 ovigerous ♀, 2 adult ♀, 1 A-1 ♂.

Pseudophilomedes thalassa, new species: 1 adult ♂.

Station A10b, sample 16; 18°44'N, 16°34'W; 250 m.

Euphilomedes sinister pentathrix (new subspecies): 1 ovigerous ♀, 1 adult ♀, 1 A-1 ♂.

CYPRIDINIDAE Baird, 1850

The family Cypridinidae contains two subfamilies, Cypridininae Baird, 1850, and Azygocypridininae Kornicker, 1970. Only the former is represented in the study area.

CYPRIDININAE Baird, 1850

Only two juveniles in this subfamily were collected. Both are referred questionably to *Paradoloria* because at their early stage of development they cannot be separated with certainty from the closely related genus *Skogsbergia* Poulsen, 1962.

Paradoloria Poulsen, 1962

Because both specimens collected are very early instars they were left in open nomenclature as *?Paradoloria* species indeterminate.

DISTRIBUTION.—Members of this genus have been reported mostly from the Indo-West-Pacific area, but three species live in the vicinity of southern

Africa: *P. vanhoeffeni* (Müller, 1908), *P. capensis* (Cleve, 1905), and *P. dorsoserrata* (Müller, 1908).

?Paradoloria species indeterminate

FIGURES 4, 5

MATERIAL.—USNM 152828, single instar I, from *Thalassa* station X070; USNM 152827, single instar III, from *Cornide de Saavedra* station A8a.

DISTRIBUTION.—This taxon was collected only off Mauritania at depths of 150–175 m.

DISCUSSION.—A small process with 3 spines on the posterior of the body of both specimens in the collection has not previously been described on species of either *Skogsbergia* or *Paradoloria*, and should permit the juveniles to be coupled with adult specimens in future collections from the study area.

DESCRIPTION OF INSTAR I (Figure 4).—Carapace with prominent rostrum and narrow caudal process (Figure 4a).

Size: USNM 152828, length 0.94 mm, height 0.64 mm.

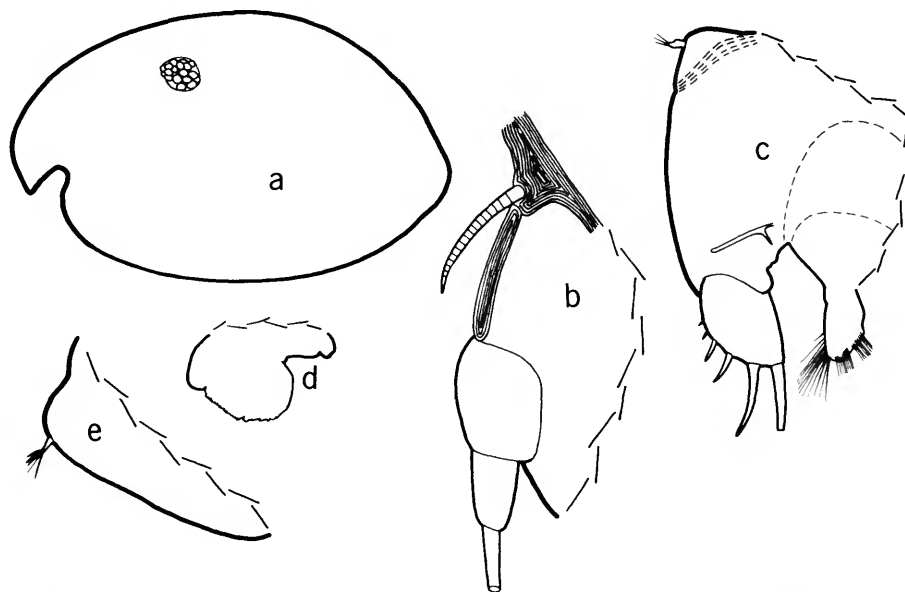


FIGURE 4.—*Paradoloria* species indeterminate, instar I, USNM 152828, length 0.94 mm: a, complete specimen showing lateral eye; b, endopodite and medial bristle on protopodite of right 2nd antenna, medial view; c, posterior of body showing right furcal lamella, right 6th limb, right sclerite, and posterior process with 3 spines; d, lateral view of upper lip, anterior to right; e, posterior process showing 3 spines and 2 hairs.

Second Antenna (Figure 4b): Protopodite with medial bristle. Endopodite 2-jointed: 1st joint bare, 2nd joint elongate with terminal bristle.

Sixth Limb: Hirsute, without bristles (Figure 4c).

Seventh Limb: Absent.

Furca (Figure 4c): Each lamella with 4 stout claws followed by 2 minute incipient claws; all claws separated from lamella by suture.

Lateral Eye: Well developed (Figure 4a).

Upper Lip: Undivided anterior part, divided posterior part (Figure 4d).

Posterior of Body: Small process present with 3 spines (Figure 4c,e).

DESCRIPTION OF INSTAR III (Figure 5).—Carapace with caudal process better developed than on Instar 1 (Figure 5a).

Size: USNM 152827, length 1.31 mm, height 0.64 mm.

Second Antenna: Endopodite 2-jointed (Figure 5b): 1 bristle on 1st joint; terminal bristle on 2nd joint.

Sixth Limb: Well developed with numerous bristles.

Seventh Limb: Present but without bristles (Figure 5c).

Furca (Figure 5d): Each lamella with 8 claws, all separated from lamella by suture; claw 4 shorter and more slender than claw 5.

Lateral Eye: Well developed (Figure 5e).

Rod-shaped Organ: Short with terminal node (Figure 5e).

Upper Lip: Undivided anterior part and divided posterior part with small lateral posterior lobe on each side (Figure 5e).

Posterior of Body: Small process present with 3 spines (Figure 5f,g).

PHILOMEDIDAE Müller, 1908

The Philomedidae contain two subfamilies: Philomedinae Müller, 1908, and Pseudophilomedinae

Kornicker, 1967. Both are represented in the study area.

PHILOMEDINAE Müller, 1908

This subfamily is represented in the collections by four genera: *Philomedes* Lilljeborg, 1853; *Euphilomedes* Poulsen, 1962, *Scleroconcha* Skogsberg, 1920, and *Tetragonodon* Brady and Norman, 1896. The other members of the subfamily are: *Anarthron* Kornicker, 1975; *Igene* Kornicker, 1975; and *Paraphilomedes* Poulsen, 1962.

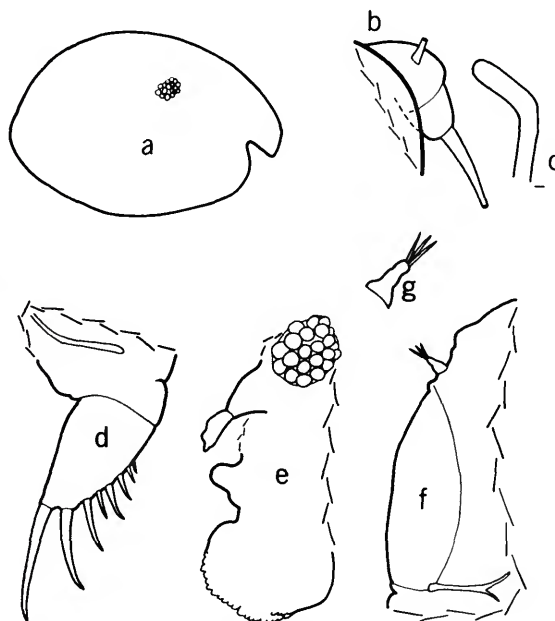


FIGURE 5.—*Paradoloria* species indeterminate, instar III, USNM 152827, length 1.31 mm: a, complete specimen showing lateral eye; b, endopodite of 2nd antenna; c, 7th limb; d, left lamella of furca and left Y-sclerite; e, anterior of body showing left lateral eye, medial eye and rod-shaped organ, anterior process, and upper lip; f, posterior of body showing posterior process with 3 spines; g, posterior process.

Key to the Subfamilies of Philomedidae

- Rod-shaped organ with numerous joints; 2nd exopodite joint of 5th limb of female and juvenile male with fanglike prolongation PSEUDOPHILOMEDINAE
 Rod shaped organ with few or numerous joints; 2nd exopodite joint of 5th limb of female and juvenile male not fanglike (2nd joint of *Euphilomedes ferox* Poulsen, 1962, resembles those in Pseudophilomedinae, but rod-shaped organ without numerous joints PHILOMEDINAE

MICROSTRUCTURES

The microstructures described below are concerned only with the collected species.

NORMAL PORES.—*Philomedes*: Only pores with bristles were observed on the surface of the carapace of *P. bonneti* (Plates 1b–f, 2b) and *P. tetradens* (Plate 5a–c). Some of the pores of *P. bonneti* bearing long bristles have a low circular rim lying just within the outer edge of the pore structure (Plate 1e–f).

Euphilomedes: Only simple pores with short bristles were observed on *E. sinister pentathrix* (Plates 8b–f, 9b), and with long bristles on *E. asper* (Plate 6f).

Tetragonodon: *T. ctenorhynchus* bears simple pores with bristles and without bristles (Plate 10e). The latter have a peripheral rim and are in the middle of pustules (Plate 11a,b).

Scleroconcha: *S. folinii* has simple rimmed pores bearing long bristles (Plate 15e), and smaller pores without bristles (Plates 15e,f, 16a). The latter are separated by a small space from a surrounding rim (Plate 15f); the rim around some pores forms a wall having the appearance of a pustule (Plate 16a). The rim around pores could be a remnant of a pustule-like wall.

ORNAMENTATION.—*Philomedes*: *P. bonneti* bears small shallow fossae (Plate 1b). *P. bonneti* has a small projection on the lower corner of the rostrum (Plate 1c,d), whereas, *P. tetradens* has a much longer projection in the same place (Plate 5a,b). The surface of *P. tetradens* bears minute papillae (Plate 5c).

Euphilomedes: *E. asper* has shallow flat-bottomed fossae with a raised peripheral rim (Plate 6d,e); the surface of both the bottom of fossae and the area between fossae bear minute papillae (Plate 6e). *E. sinister pentathrix* has polygonal muri (Plates 7–9), an upper and lower posterior process on the left valve (Plates 7e,f, 8d–f), and peculiar closely packed ribbed structures, evident mostly on the posterior part of the shell (Plates 8d–f, 9). The latter may be formed after death of the animal.

Tetragonodon: *T. ctenorhynchus* has a finely papillate surface visible clearly only at magnifications of about 15,000 (Plate 11a,b).

Scleroconcha: *S. folinii* bears horizontal ribs (Plate 15a–c), distinct flat-bottomed, shallow fossae (Plate 15d), and minute pustulae and rimmed pores (Plates 15e,f, 16a).

BRISTLES.—*Philomedes*: Both *P. bonneti* and *P. tetradens* bear long bristles with broad crenulate bases (Plates 1d–f, 2b, 3a,b, 5a,b), but they are sparsely distributed. Short stout bristles were observed on *P. tetradens* (Plate 5c); these may also be on *P. bonneti*.

Euphilomedes: Long bristles with broad crenulate bases are present on *E. asper* (Plate 6f). *E. sinister pentathrix* bears short bristles with bulbous tips (Plate 8c).

Tetragonodon: *T. ctenorhynchus* bears both short bristles and long bristles with broad crenulate bases (Plate 10b–f). The crenulations on the broad base of the long bristles are discontinuous and bear minute papillae (Plate 10f). These differ from the continuous and non-papillate surface of bristles of *Philomedes* (Plate 1f).

Scleroconcha: *S. folinii* bears long bristles with broad crenulate bases (Plate 15e). Bristles along the outer edge of the caudal process have abundant short marginal hairs (Plate 18b,c).

INFOLD.—*Philomedes*: *P. bonneti* bears long spinous bristles on the rostral infold (Plate 3a), short spinous double bristles parallel to the anteroventral margin (Plate 3b), and short bristles forming groups along the inner margin of the infold of the caudal process (Plate 2e). The latter bristles on *P. tetradens* are tubular and have open ends (Plate 5d). The bristles in that position on *P. bonneti* are also probably tubular. Parallel ribs are present along the anteroventral infold of *P. bonneti* (Plate 3b).

Tetragonodon: *T. ctenorhynchus* bears spinous bristles on the rostral infold (Plate 12a). That species also has ribs paralleling the anteroventral margin (Plate 12b). The bristle on the anteroventral infold below the incisur appears to have a pore near its middle (Plate 12c). A truncate bristle on the list of the caudal process is shown in Plate 12d.

Scleroconcha: *S. folinii* bears spinous bristles on the rostral infold (Plate 16e,f), and a spinous bristle at the inner end of the incisur (Plate 16d). Bristles on the list of the caudal process appear to have open ends (Plate 17e,f).

SELVAGE.—*Philomedes*: The lamellar prolongation of the selvage along the rostrum of *P. bonneti* bears lateral ribs and a terminal fringe (Plate 1d). The prolongation is divided in the vicinity of the incisur, with the rostral prolongation overlapping the prolongation along the lower edge of the in-

cisur (Plate 1c). A similar lamellar prolongation is present along the rostrum of *P. tetradens* (Plate 5a).

Euphilomedes: The segmented lamellar prolongation along the rostrum of *E. asper* is fringed and overlaps the prolongation along the lower margin of the incisur (Plate 6b). The prolongation along the rostrum of *E. sinister pentathrix* is also segmented (Plate 7d).

Tetragonodon: The lamellar prolongation along the lower margin of the rostrum of *T. ctenorhynchus* is very narrow (Plate 11d).

Scleroconcha: The lamellar prolongation along the lower margin of the rostrum of *S. folinii* is broad and overlaps the prolongation along the lower margin of the incisur (Plates 15c, 16c). The prolongation along the ventral margin of the valve is fringed and bears minute spines along the lateral surface (Plate 19).

SHELL MUSCLES.—*Tetragonodon*: The central adductor muscles of *T. ctenorhynchus* have a segmented appearance and fine lineations running parallel to the strands (Plate 12f).

Scleroconcha: The central adductor muscles of *S. folinii* also have a segmented appearance (Plate 18d,e), and flare where they attach to the valve (Plate 18f).

SEVENTH LIMB.—This was examined only on the male *Philomedes bonneti* (Plate 4). The comb teeth bear alar projections along each margin, and each tooth has a terminal pore (Plate 4b-d). The processes opposite the comb have smooth sides, and each process bears a terminal pore (Plate 4e,f).

LIPS AND MOUTH.—This was examined only on

the female *Tetragonodon ctenorhynchus* (Plates 13, 14a,d-f). The upper lip projects anteriorly (Plate 13a). It is broad at the posterior end near the mouth, tapering anteriorly to a blunt point (Plate 13b). The tip bears several tubelike processes (Plate 13c,d). In ventral view the lower lip is separated from the upper lip by a narrow crescent-like mouth (Plates 13b, 14d). In that view the lower lip is roughly oval in shape (Plate 14d), and bears slender hairs forming rows parallel to the mouth (Plate 14e). Shorter hairs forming rows are present on the lower lip near the lateral corners of the mouth (Plate 14f).

ANTERIOR PROCESS OF BODY.—This was examined only on *Tetragonodon ctenorhynchus* (Plates 13e, 14b,c). A single smooth, button-like process is present between the upper lip and the bases of the 1st antennae (Plate 13e). The process is without pores (Plate 14b,c).

Philomedes Lilljeborg, 1853

Two species of *Philomedes* were collected: *P. bonneti*, new species, and *P. tetradens*, new species. The only other species of the genus previously collected off west Africa is *P. macandrei* Baird, 1848, which was reported from the west coast of Morocco by Brady and Norman (1896:662).

The two new species of *Philomedes* (*P. bonneti* and *P. tetradens*) from the west coast of Africa bring to six the number of species in this genus having 6 or more elongate pegs opposite the comb of the 7th limb. The other species are *P. lilljeborgii* (Sars, 1865), a northern species found north of latitude

Key to the Genera of Philomedinae

1. Carapace of female with horizontal ribs (absent or reduced on male); rod-shaped organ long with 0-17 sutures 2
Carapace without horizontal ribs; rod-shaped organ short conical or long cylindrical with not more than 1 suture near middle 3
2. Rod-shaped organ with 9-17 sutures *Scleroconcha*
Rod-shaped organ with wrinkles or few sutures *Anarthron*
3. Rod-shaped organ conelike *Igene*
Rod-shaped organ cylindrical 4
4. Carapace with hornlike process near dorsal margin of right valve *Paraphilomedes*
Carapace without hornlike process on right valve 5
5. Rod-shaped organ shorter than 1st joint of 1st antenna or absent *Tetragonodon*
Rod-shaped organ longer than 1st joint of 1st antenna 6
6. Furca with secondary claws between primary claws *Euphilomedes*
Furca without secondary claws, or with secondary claws following primary claws *Philomedes*

50°N (Poulsen, 1962:358); *P. curvata* Poulsen, 1962, from the West Indies (Poulsen, 1962:355); *P. orbicularis* Brady, 1907, from the Continental subregion of Antarctica (Kornicker, 1975a:245), and *P. subantarctica* Kornicker, 1975, from east of Argentina between latitudes of 40°–55°S (Kornicker, 1975a:235).

DISTRIBUTION.—Members of this genus are widespread ranging from the Arctic to Antarctic in the Atlantic Ocean at depths of intertidal to 3382 m (Kornicker, 1975:229). Species in the present collection were from off Mauritania at depths of 170–1120 m.

Philomedes bonneti, new species

FIGURES 6–10; PLATES 1–4

HOLOTYPE.—“Gigore Antipa” 288, ovigerous female, length 1.99 mm, right valve and some appendages in alcohol, remaining appendages on 2 slides; right valve gold-plated.

TYPE-LOCALITY.—Station X046.

ETYMOLOGY.—The species is named for Dr. Marc Bonnet, leader of the expedition aboard *Thalassa*.

ALLOTYPE.—“Gigore Antipa” 289, adult male, length 2.15 mm, from same station as holotype.

DESCRIPTION OF FEMALE (Figures 6–8; Plates

1–4).—Carapace not calcified, with slightly convex dorsal margin, evenly rounded anterodorsal and posterodorsal corners, almost straight anterior and posterior margins except for small caudal process (Figures 6, 7a–d; Plates 1–3); ventral margin convex with small swelling near anterior end; distal margin of rostrum straight with minute protuberance on posterior corner (Figures 6, 7a; Plate 1c,d); incisur broad with rounded inner end (Figures 6, 7a).

Ornamentation (Figure 7e; Plates 1b–f): Surface smooth with widely scattered bristles with broad base and shorter bristles without broad base; bristles form row along ventral margin and caudal process; edge of caudal process with 6–10 minute digitations (Figure 7c; Plate 2b,c,f).

Infold (Figure 7a,c,d; Plates 2d–f, 3): Broad along anterior and ventral margins and narrow along posterior margin dorsal to caudal process; infold on rostrum with 26 bristles, mostly spinous with bifurcate tips; 1 small bristle present on infold posterior to inner end of incisur; anteroventral part of infold with about 15 striae and 17 spinous bristles; infold along ventral margin bare; list paralleling inner margin of posteroventral and posterior infold with about 43 small bristles in groups of 1 to 6 bristles; “pocket” present in infold of caudal process; anterior margin of pocket with 5 or 6

Key to the Species of *Philomedes* of West Africa

1. Rostrum with prominent hornlike process on each valve *P. macandrei*
Rostrum without hornlike process 2
2. Outer edge of caudal process with 6–10 minute digitations, dorsal margin of mandibular basale with 5 bristles, end joint of 6th limb with 24–25 bristles *P. bonneti*, new species
Outer edge of caudal process with 4 fairly large teeth, dorsal margin of mandibular basale with 6 bristles, end joint of 6th limb with 34–41 bristles *P. tetradens*, new species

Key to Adult Females of the Species of *Philomedes*

(Having 6 or more elongate pegs opposite comb of 7th limb)

1. Outer edge of caudal process with minute digitations or teeth 2
Outer edge of caudal process smooth, without teeth 3
2. Outer edge of caudal process with 6–10 minute digitations, dorsal margin of mandibular basale with 5 bristles, end joint of 6th limb with 24–25 bristles *P. bonneti*, new species
Outer edge of caudal process with 4 fairly large teeth, dorsal margin of mandibular basale with 6 bristles, end joint of 6th limb with 34–41 bristles *P. tetradens*, new species
3. 7th limb with 10–11 bristles *P. liljeborgii* Sars
7th limb with more than 17 bristles 4
4. 2nd joint of endopodite of 2nd antenna with 2 bristles *P. curvata* Poulsen
2nd joint of endopodite of 2nd antenna with 3 bristles *P. orbicularis* Brady
2nd joint of endopodite of 2nd antenna with 5 bristles *P. subantarctica* Kornicker

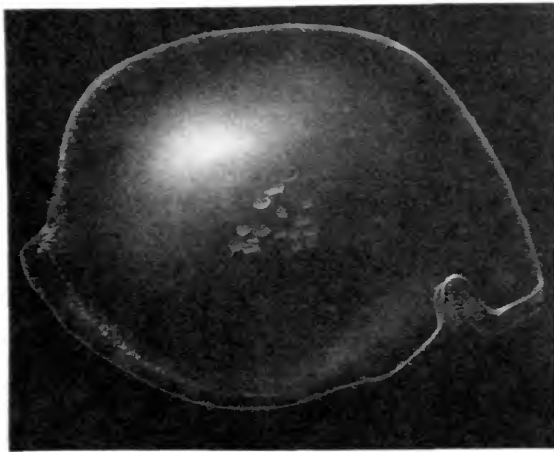


FIGURE 6.—*Philomedes bonneti*, new species, female, "Grigore Antipa" 288, holotype, complete specimen, length 1.99 mm.

small bristles; outer edge of caudal process with 3 minute bristles; posteroventral infold anterior to caudal process with 2 or 3 bristles near middle.

Selvage (Figure 7a; Plates 1a,c,d, 2d, 3): Lamellar prolongation striate, fringed; anteroventral prolongation with additional long hairs with bases on lateral side.

Central Muscle Attachment Scars: Consisting of about 15 individual oval scars (Figure 6).

Size: Holotype, length 1.99 mm, height 1.43 mm.

First Antenna (Figure 7f-h): 1st joint: medial hairs and spines. 2nd joint: short spines forming 7 or 8 rows on lateral surface near dorsal margin, and short row of stouter spines forming single row on lateral surface near terminal dorsal corner (Figure 7h); 3 bristles (1 ventral, 1 dorsal, 1 lateral), each with long middle and short distal spines. 3rd joint: 1 ventral bristle with short marginal spines and 3 dorsal bristles (2 long with long middle and short distal spines, 1 short with short marginal spines). 4th joint: 1 dorsal bristle with long middle and short distal spines, and 4 ventral bristles (2 long, 1 medium, 1 short), all with long middle and short distal spines. 5th joint: sensory bristle with 5 short proximal filaments and 5 short terminal filaments including stem. 6th joint: medial bristle about two-thirds length of a-bristle, with long middle and short distal spines. 7th joint: a-bristle with long middle and short distal spines; b-bristle about twice length of a-bristle, with 1 short proximal filament and 3 short terminal filaments; c-bristle about

same length as sensory bristle of 5th joint, with 3-5 short proximal filaments and 5 short terminal filaments including tip. 8th joint: d- and e-bristles bare, about same length as c-bristle; f-bristle about same length as c-bristle, with 4 short proximal filaments and 4 short terminal filaments including stem; g-bristle about same length as c-bristle, with 3 short proximal filaments and 5 short terminal filaments including stem.

Second Antenna (Figure 7i): Protopodite bare. Endopodite 2-jointed: 1st joint with 5 short, bare, proximal bristles, and 1 short distal bristle with few short hairs; 2nd joint with 1 recurved bare terminal bristle and 3 ventral bristles (proximal of these long, with long middle and short distal spines; middle bristle short with short marginal spines; distal bristle with few long middle spines and short distal spines). Exopodite: 1st joint with short medial spine; joints 2-8 with short spines forming row near terminal margin and short basal spines increasing in length on distal joints; basal spine on joint 8 one-half to three-fourths length of ventral margin of 9th joint; bristle of joint 2 reaching well past 9th joint and with 2 minute ventral spines near middle of bristle; bristles of joints 3-5 bare, slightly longer than bristle of 2nd joint; bristles of joints 6-8 and 4 long bristles of 9th joint broken, with natatory hairs near tip of stump; 9th joint with 2 unbroken, short, dorsal bristles with long middle and short distal hairs, and 1 unbroken, very short bare dorsal bristle; 9th joint without lateral spine.

Mandible (Figure 7j): Coxale endite bifurcate, spinous, with minute bristle near base. Basale: medial side with 6 proximal bristles near ventral margin (3 unringed, pectinate, 3 ringed, with long middle and short distal spines); lateral side with 5 bristles forming row near ventral margin, each with long middle and short distal spines; ventral margin with 3 distal bristles with long middle and short distal spines; dorsal margin with 3 bristles in addition to 2 terminal bristles, all with long middle spines, some with very short distal spines or without distal spines. Exopodite and endopodite similar to those of *Philomedes lilljeborgii* (Sars, 1865) (see Skogsberg, 1920: fig. 11).

Maxilla (Figure 8a-c): Similar to that of *P. lilljeborgii* (see Skogsberg, 1920:408). Distal margin of basale with 4 bristles of which 2 form pair near anterior corner.

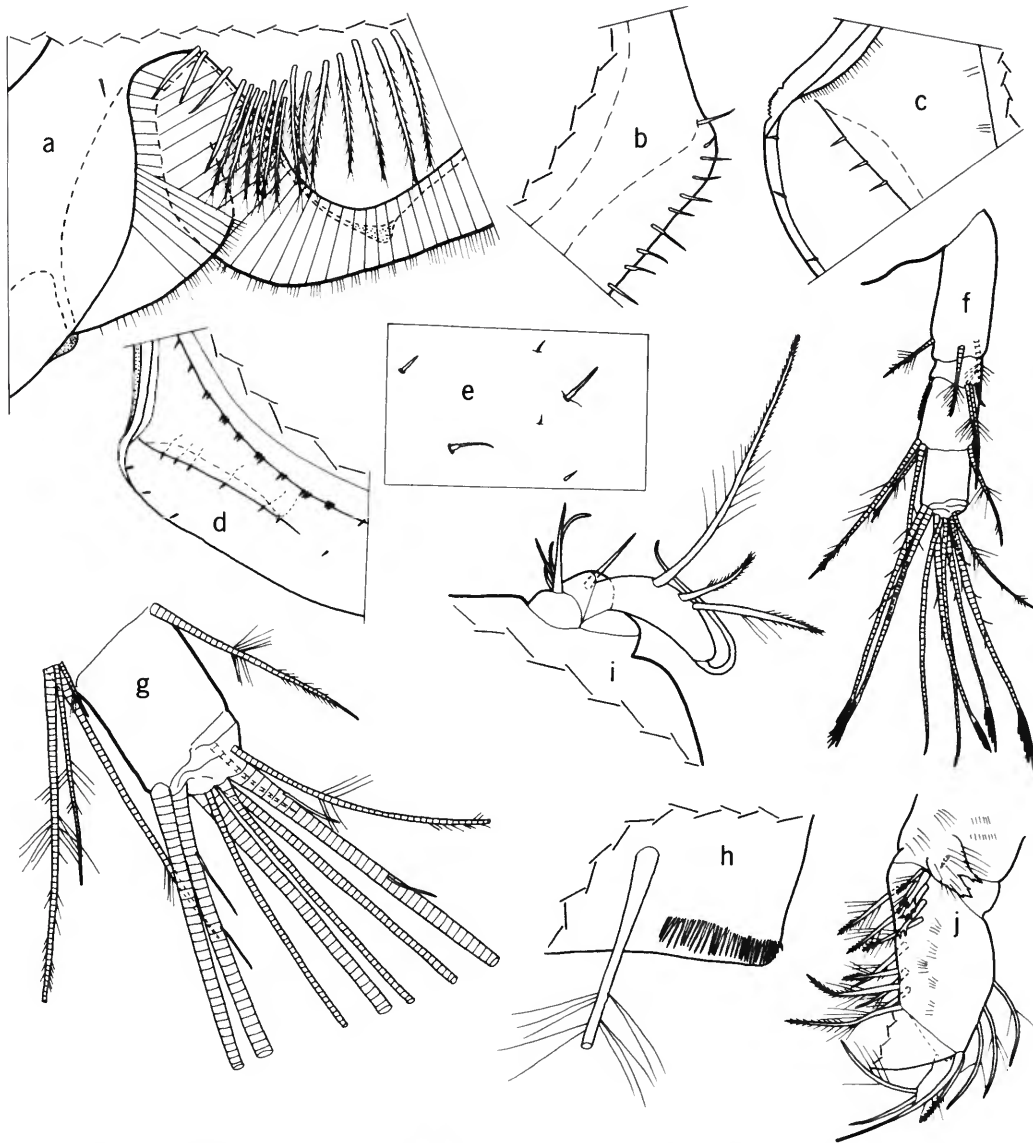


FIGURE 7.—*Philomedes bonneti*, new species, female, "Grigore Antipa" 288, holotype, length 1.99 mm: a, incisur and part of rostrum of left valve, medial view, anterior to right; b, caudal process of left valve, lateral view; c, part of caudal process of left valve, medial view; d, caudal process of left valve, medial view; e, hairs on outside surface of valve; f, right 1st antenna, lateral view; g, tip of 1st antenna shown in f; h, anterodorsal corner of 2nd joint of right 1st antenna, lateral view; i, endopodite of left 2nd antenna, medial view; j, coxale, basale, and exopodite of left mandible, medial view.

Fifth Limb: Similar to that of *Philomedes globosa* (Liljeborg, 1853) [= *Philomedes brenda* (Baird, 1850), Sylvester-Bradley, 1950] (see Skogsberg, 1920:

388) and *P. lilljeborgii* (see Skogsberg, 1920:407, fig. 12).

Sixth Limb (Figure 8d): Similar to that of *P.*

globosa (see Skogsberg, 1920:390); limbs of holotype with 24 or 25 bristles on end joint.

Seventh Limb (Figure 8e): Similar to that of *P. lilljeborgii* (see Skogsberg, 1920:407, 408, figs. 13, 14), except with only 4 proximal bristles, 2 on each side.

Furca: Similar to that of *P. lilljeborgii* (see Skogsberg, 1920:409, fig. 15).

Rod-shaped Organ: Elongate, 1-jointed with rounded tip (Figure 8f).

Eyes: Medial eye bare, eye of holotype without black pigment (Figure 8f); lateral eye weak, diffi-

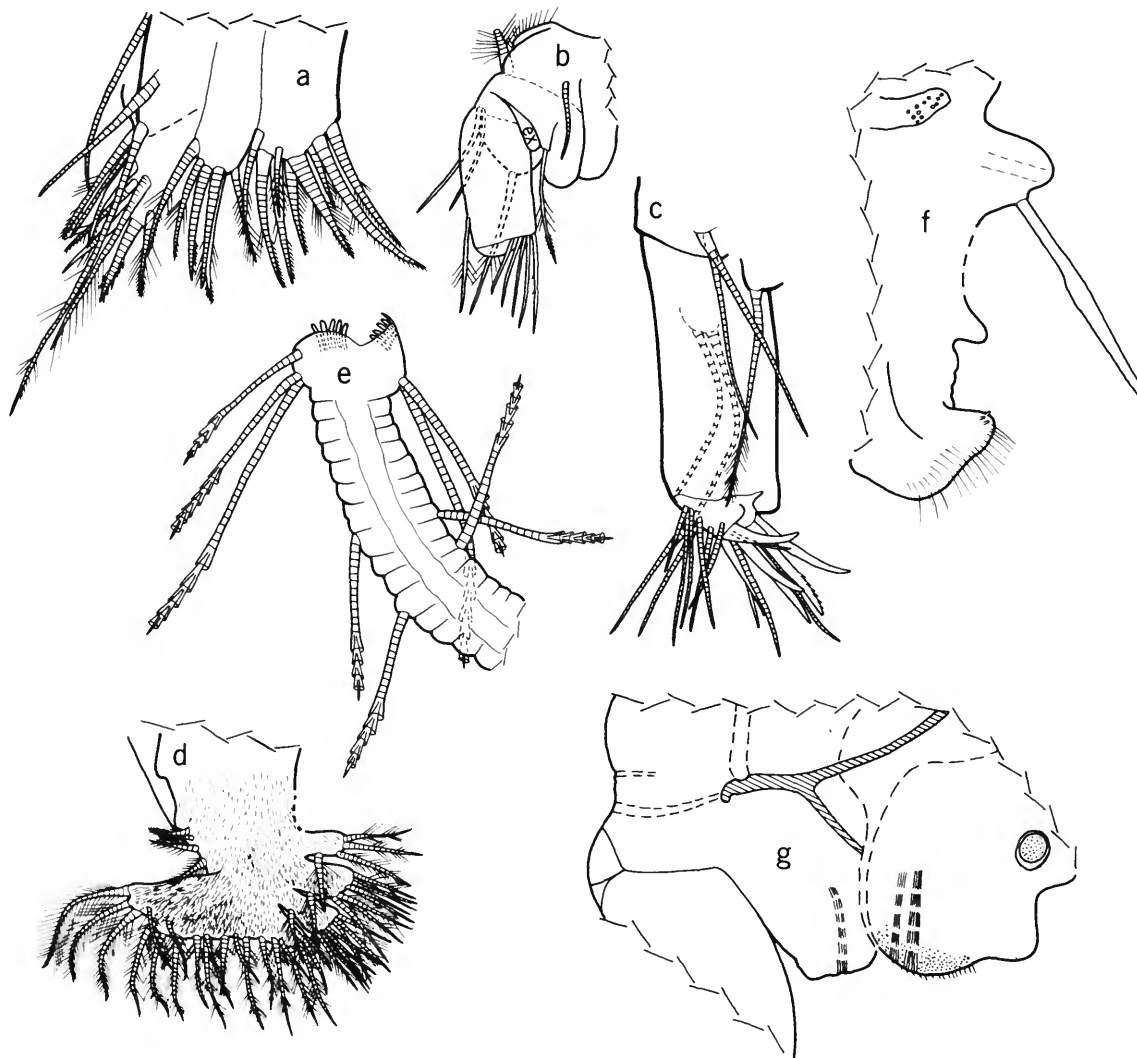


FIGURE 8.—*Philomedes bonneti*, new species, female, "Grigore Antipa" 288, holotype: a, endites of maxilla; b, left maxilla, lateral view, (terminal endite bristles, the 3 bristles of exopodite, and bristles of 2nd endopodite joint not shown); c, sketch of distal part maxilla; d, left 6th limb, medial view; e, 7th limb; f, anterior of body showing right lateral eye, medial eye and rodshaped organ, anterior process, and upper lip; g, posterior of body showing Y-sclerite, right genital organ, and anal track and opening.

cult to see, with numerous minute oval bodies (cells?) (Figure 8f).

Upper Lip: Helmet-shaped, hirsute, with several anterior processes (Figure 8f).

Anterior and Posterior of Body: Rounded knob present between medial eye and upper lip (Figure 8f). Posterior of body just dorsal to furca hirsute.

Y-Sclerite: Normal for genus (Figure 8g).

Genitalia: Small oval structure anterior to anus (Figure 8g).

Eggs: Holotype with 8 eggs in marsupium.

DESCRIPTION OF MALE (Figures 9, 10; Plate 4).—Carapace slightly longer than that of female but not as high (Figure 9); incisur more open than that of female; protuberances on posterior corner of rostrum and along anteroventral margin absent.

Ornamentation: Similar to that of female carapace except with more long bristles with broad bases present near posterior of each valve.

Infold: Similar to that of female.

Size: Allotype, length 2.15 mm, height 1.16 mm.

First Antenna (Figure 10a): 1st joint: bare. 2nd joint: spines forming rows near distal dorsal and ventral margins and near terminal margin of medial surface; lateral surface with long hairs forming rows distally; 3 bristles (1 ventral with long middle and short distal spines; 1 dorsal and 1 medial, both with only short marginal spines). 3rd joint: short spines forming rows on medial surface and 4 bristles (3 dorsal, 1 very short, with short marginal spines, 2 longer with long middle and short distal spines; and 1 ventral with long middle and short distal spines, the base of this bristle actually on medial side of terminal margin). 4th joint: 5

bristles (1 dorsal with long middle and short distal spines, and 4 ventral bristles with bases on medial surface; outer and inner bristles shorter than middle bristles and with long middle and short distal spines; long middle bristles with only short marginal spines). 5th joint: minute, triangular; sensory bristle with abundant filaments along broad proximal part and 5 terminal filaments. 6th joint: medial bristle with base near dorsal margin and with long middle and short distal spines. 7th joint: a-bristle about same length as bristle of 6th joint, with short marginal spines; b-bristle less than twice length of a-bristle, with 3 marginal and 4 terminal filaments including stem; c-bristle extremely long, with 12 or 13 marginal filaments. 8th joint: d- and e-bristles bare with blunt tips; d-bristle about 3 times length of a-bristle; e-bristle about 4 times length of a-bristle; f-bristle same length as c-bristle, with 12 marginal filaments; g-bristle slightly longer than b-bristle, with 3 marginal and 5 terminal filaments including stem.

Second Antenna: Protopodite bare. Endopodite 3-jointed (Figure 10b,c): 1st joint with 5 short, bare, proximal bristles and 1 short spinous distal bristle; 2nd joint elongate with 3 spinous bristles at middle of ventral margin; 3rd joint elongate, reflexed on 2nd, with 2 small subterminal bristles and tip with about 5 toothed ridges. Exopodite: 1st joint with short medial spine; 2nd joint with spines forming row along distal margin and bare ventral bristle reaching 5th joint; 3rd joint longer than 2nd, with spines forming row along distal margin; bristles of joints 3–8 and long bristles of 9th joint with natatory hairs; joints 3–8 with basal spines increasing in length on distal joints; basal spine on joint 8 about one-half length of joint 9; joint 9 and its bristles obscure on appendage examined.

Mandible (Figure 10d,e): Coxale endite small, bifurcate, with minute bristle near base (Figure 10d). Basale: medial side with 5 proximal bristles (3 non-annulate, 2 annulate), all with slender marginal spines (not pectinate); medial side near middle with 1 slender bristle with long middle and short distal spines; lateral side with 4 bristles forming row almost on ventral margin, all with long middle and short distal spines; ventral margin with 2 distal bristles with long middle and short distal spines; dorsal margin with 3 bristles in addition to 2 terminal bristles, all with long middle spines, lateral bristle of terminal pair about same

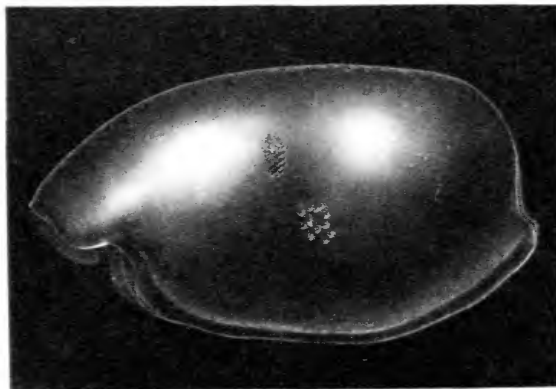


FIGURE 9.—*Philomedes bonneti*, new species, male, "Grigore Antipa" 289, allotype, complete specimen, length 2.15 mm.

length as exopodite; medial surface of basale spinous. Exopodite similar to that of female except

both bristles with only short marginal spines. Endopodite similar to that of female, except proximal



FIGURE 10.—*Philomedes bonneti*, new species, adult male, "Grigore Antipa" 289, allotype: *a*, left 1st antenna, medial view; *b*, *c*, proximal and distal parts of endopodite of right 2nd antenna, medial view; *d*, coxale endite of left mandible; *e*, distal part of right mandible, medial view; *f*, exopodial bristles of 5th limb; *g*, right lateral eye, medial eye and proximal part of rod-shaped organ; *h*, anterior part of upper lip and anterior process; *i*, copulatory appendages.

group of bristles on dorsal margin of 2nd joint with only 4 bristles, and bristles in distal group with only short marginal spines.

Maxilla: Appendage slightly smaller than that of female; distribution of bristles also similar except that most are hirsute.

Fifth Limb (Figure 10f): Similar to that of *Philomedes globosa* (Liljeborg, 1853) described by Skogsberg (1920:391, fig. 15).

Sixth Limb: Endite I with 1 medial and 2 terminal bristles; endite II with 1 medial and 3 terminal bristles; endites III and IV with 1 medial and 8 terminal bristles; end joint with 18 bristles; 3 hirsute epipodial bristles present; most bristles on appendage with long hairs either proximal or all along margin except near tip.

Seventh Limb, Rod-shaped Organ, Upper Lip (Figure 10h), *Anterior, Posterior, Y-Sclerite*: Similar to that of female.

Furca: Similar to that of female except with only 9 claws.

Eyes: Medial eye similar to that of female (Figure 10g); lateral eye larger than medial eye, with about 29 ommatidia (Figure 10g).

Heart: Well-developed, tapering slightly towards posterior.

Copulatory Organ: Elongate with 2 or 3 lobes at tip (Figure 10i).

COMPARISONS.—The female of the new species, *P. bonneti*, closely resembles the female of *Philomedes lilljeborgii* (Sars, 1865) described by Skogsberg (1920:402), but differs from that species as follows: posterior edge of caudal process with minute digitations; dorsal margin of mandibular basale with 5 instead of 6 or 7 bristles; 7th limb with 9 instead of 10 or 11 bristles.

Philomedes tetradens, new species

FIGURES 11–13; PLATE 5

HOLOTYPE.—USNM 150289, 1 adult female, length 2.16 mm; in alcohol and on slides.

TYPE-LOCALITY.—Station X043.

ETYMOLOGY.—The specific name is from the Latin *tetra* (four) and *dens* (tooth), in reference to the 4 teeth on the margin of the caudal process of the carapace.

PARATYPES.—“Grigore Antipa” 297, 1 juvenile female from station X043; USNM 156598, 1 adult

female from station X043; USNM 156600, 1 adult female from station X070.

DESCRIPTION OF ADULT FEMALE (Figures 11, 12a,b, d–h, 13; Plate 5).—Carapace not calcified, with slightly convex dorsal margin, evenly rounded anterodorsal and posterodorsal corners, rounded anterior and posterior margins except for small caudal process (Figures 11, 12a,b,d,e; Plate 5a,b); ventral margin convex with small swelling near anterior end; distal margin of rostrum straight with protuberance on posterior corner (Figure 12a,d; Plate 5a,b); incisur broad with rounded inner end (Figures 11, 12d); distal end of caudal process with 4 or 5 teeth, upper tooth medial to valve edge.

Ornamentation: Surface smooth with widely scattered bristles with broad basal parts and shorter bristles without broad bases (Plate 5a–c); slender bristles form row along ventral margin and caudal process.

Infold: Broad along anterior and ventral margins and narrow along posterior margin dorsal to caudal process; infold on rostrum with 23 bristles, mostly spinous with bifurcate tip (Figure 12d); 1 small bristle present on infold posterior to inner end of incisur; anteroventral part of infold with about 11 striae and 13–15 short bristles; infold along ventral margin bare; list paralleling inner margin of posteroventral and posterior infold with about 67 minute bristles in groups of 1 to 6 bristles (Figure 12b,e; Plate 5d); “pocket” present in infold of caudal process; anterior margin of pocket with 6–8 small bristles (Figure 12b,e); outer edge of caudal process with 5 short bristles (Figure 12b,e).

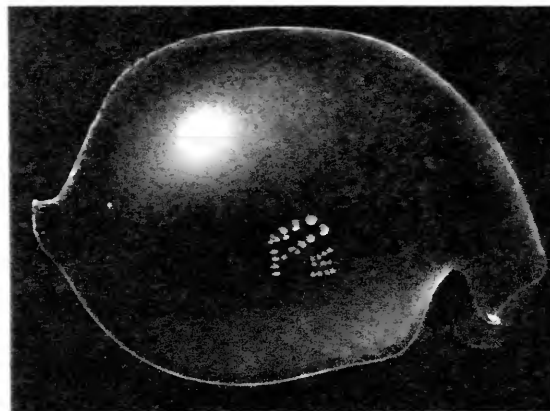


FIGURE 11.—*Philomedes tetradens*, new species, female, USNM 156598, paratype, complete specimen, length 2.20 mm.



FIGURE 12.—*Philomedes tetradens*, new species, female, USNM 156600, paratype, length about 2.2 mm: *a*, rostrum of right valve showing lateral process and lamellar prolongation of selvage, medial view; *b*, caudal process of right valve, medial view. A-1 female instar, "Grigore Antipa" 297, paratype: *c*, tip of caudal process of right valve, lateral view. Female, USNM 150289, holotype: *d*, incisur and part of rostrum of left valve, medial view; *e*, caudal process of left valve, medial view; *f*, left 1st antenna, medial view; *g*, endopodite of right 2nd antenna, medial view; *h*, right mandible, medial view.

Selvage: Lamellar prolongation striate, fringed (Figures 11, 12a,d; Plate 5a).

Central Muscle Attachment Scars: Consisting of about 15 individual oval scars, and 3 elongate scars that may consist of 3 or 4 fused oval scars (Figure 11).

Size: USNM 150289, length 2.16 mm, height 1.46 mm; USNM 156598 length 2.20 mm, height 1.49 mm; USNM 156600, valve torn, length about 2.2 mm.

First Antenna (Figure 12f): 1st joint: cluster of lateral spines in distodorsal corner. 2nd joint: long spines forming 7 rows along dorsal margin, a single row proximally on medial surface, and a single row on lateral surface in distodorsal corner; 3 bristles (1 dorsal, bare or with short marginal spines, 1 ventral and 1 lateral, each with long spines near middle). 3rd joint: 4 bristles (1 ventral, 3 dorsal). 4th joint: 5 bristles (1 dorsal, 4 ventral). 5th joint: sensory bristle with 5 short marginal filaments and 4 short terminal filaments including tip. 6th joint: medial bristle about two-thirds length of a-bristle. 7th joint: a-bristle with long middle and short distal spines; b-bristle longer than a-bristle, with 0 or 1 marginal filaments and 3 or 4 short terminal filaments including stem; c-bristle about same length as sensory bristle of 5th joint, with 3–5 marginal filaments and 5 terminal filaments including stem. 8th joint: d- and e-bristles bare, about same length as c-bristle; f-bristle about same length as c-bristle, with 4 marginal filaments and 4–5 terminal filaments including stem; g-bristle about same length as c-bristle, with 3 marginal filaments and 5 terminal filaments including stem.

Second Antenna: Protopodite bare. Endopodite 2-jointed (Figure 12g): 1st joint with 5 short, bare, proximal bristles, and 1 short distal bristle with few short hairs; 2nd joint with 1 recurved bare terminal bristle and 4 ventral bristles (proximal of these long, with long middle and short distal spines; remaining bristles short with short marginal spines). Exopodite: 1st joint with short medial spine; joints 2–8 with short spines forming row near terminal margin and short basal spines increasing in length on distal joints; basal spine on joint 8 one-half to three-fourths length of ventral margin of 9th joint; bristle of joint 2 reaching well past 9th joint and with 2 minute ventral spines near middle of bristle; bristles of joints 3–5 bare, slightly longer than bristle of 2nd joint; bristles of

joints 6–8 and 4 long bristles of 9th joint with natatory hairs; 9th joint with 2 short, dorsal bristles with long middle and short distal hairs, and 1 very short bare dorsal bristle; 9th joint without lateral spine. No natatory bristles broken on adult females USNM 150289 and 156598.

Mandible (Figure 12h): Coxale endite bifurcate, spinous, with minute bristle near base. Basale: medial side with 6 proximal bristles near ventral margin (3 unringed, pectinate; 3 ringed, with long middle and short distal spines); lateral side with 5 bristles near ventral margin (proximal 1 or 2 of these have bases on ventral margin); distal ventral margin with 2 bristles, all with long middle and short distal spines; dorsal margin with 4 bristles in addition to 2 terminal bristles; medial surface with long hairs forming rows on ventral half. Exopodite hirsute with 2 subterminal bristles (proximal bristle longer than distal bristle, with long middle spines and short distal spines; distal bristle with few long middle spines). Endopodite: 1st joint with 4 ventral bristles and few short spines along dorsal margin; 2nd joint with 2 groups of 6 bristles each on dorsal margin and 2 groups of 3 distal bristles each on ventral margin (1 of the bristles considered here to be in anterior group actually between the groups), medial surface of 2nd joint spinous; end joint with 3 claws and 3 bristles.

Maxilla (Figure 13a): Precoxale with epipodial fringe along dorsal margin. Coxale with stout plumose dorsal bristle. Endite I with 10 bristles; endite II with about 5 bristles; endite III with about 10 bristles. Basale: ventral margin with 2 long bristles (1 medial, 1 lateral), medial side with 3 short slender bristles near dorsal margin. Exopodite: 3 bristles (2 long, 1 short). Endopodite: 1st joint spinous, with 1 spinous α -bristle and 4 β -bristles, some with short marginal spines; end joint with 3 pectinate clawlike bristles in addition to about 8 slender ringed bristles.

Fifth Limb (Figure 13b): Epipodial appendage with 56 bristles. Exopodite: 1st joint with 1 short stout spinous bristle in outer distal corner, anterior bristles obscure on limb examined, main tooth with 3 pectinate teeth and proximal bare peg, anterior part of distal tooth with 2 large prongs, spinous bristle present proximal to peg; 2nd joint with large squarish tooth with 2 digitate teeth on inner margin, posterior side with proximal bristle (bristle not reaching tip of middle of 3 distal bris-

gles), and usual group of 3 distal bristles (middle bristle much longer than bristle on each side); 3rd joint with 2 bristles on outer lobe and 3 on inner lobe; 4th and 5th joints fused, with 6 spinous bristles.

Sixth Limb (Figure 13c): Epipodial appendage consisting of 4 or 5 hirsute bristles; endite I with 2 medial and 1 terminal bristle; endite II with 1 medial and 3 terminal bristles; endites III and IV

with 1 medial and 8 terminal bristles; end joint with 34–41 bristles.

Seventh Limb (Figure 13d): Proximal group with 4 bristles (2 on each side); terminal group with 5 bristles (2 on comb side, 3 on peg side); each bristle with up to 7 bells and distal marginal spines; terminus with comb of about 12 teeth opposite 6 or 7 pegs.

Furca: Each lamella with 10 claws similar to furca

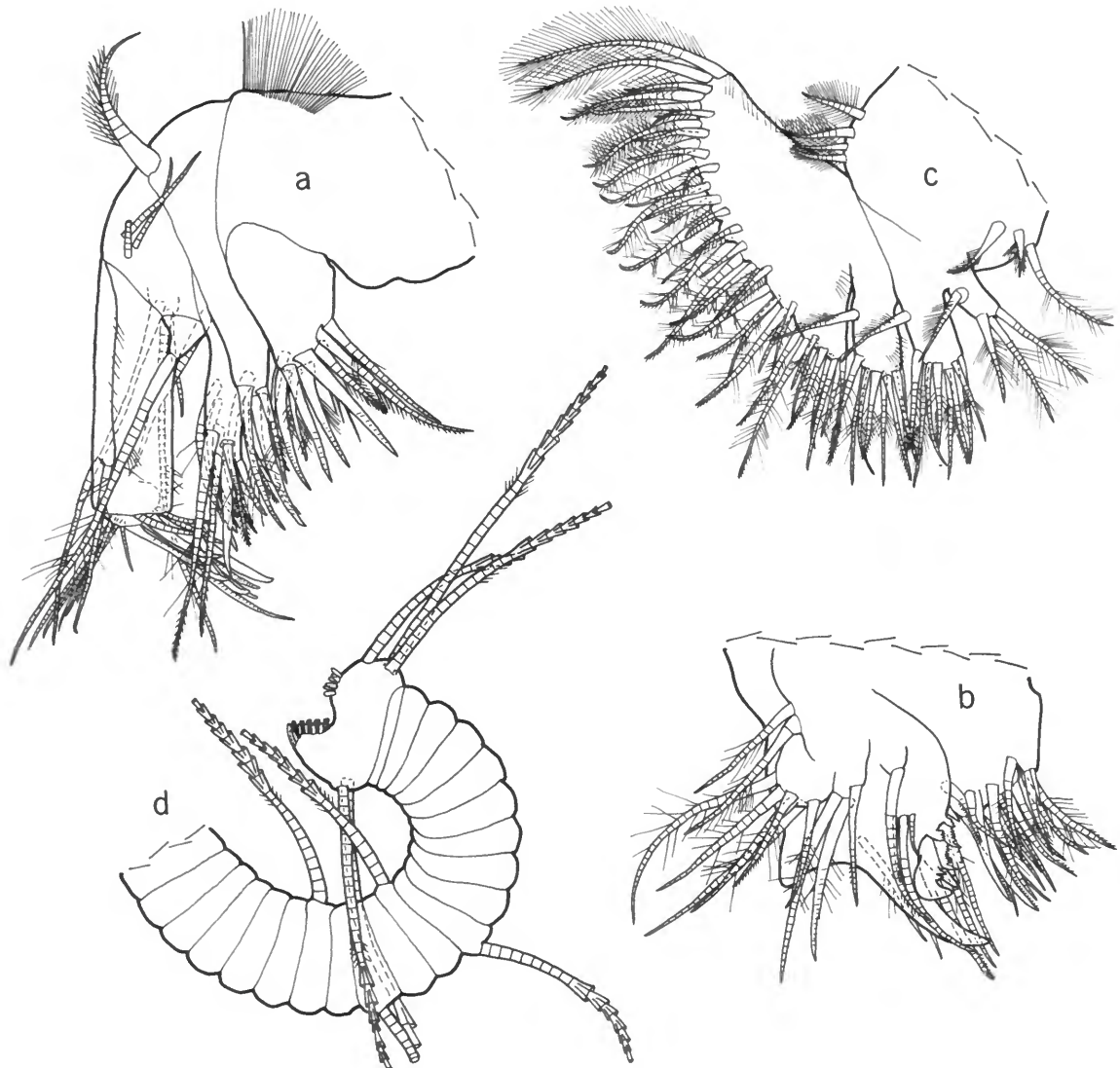


FIGURE 13.—*Philomedes tetradens*, new species, female, USNM 150289, holotype: a, right maxilla, medial view; b, tip of left 5th limb, posterior view; c, left 6th limb, medial view; d, 7th limb.

of *P. lilljeborgii* (see Skogsberg, 1920:409, fig. 15).

Rod-shaped Organ: Elongate, 1- or 2-jointed with rounded tip.

Eyes: Medial eye bare; lateral eye not observed.

Upper Lip: Helmet-shaped, hirsute, with anterior processes.

Anterior and Posterior of Body: Rounded knob present between medial eye and upper lip. Posterior of body just dorsal to furca hirsute.

Y-Sclerite: Typical for genus.

Genitalia: Small oval structure anterior to anus.

DESCRIPTION OF A-1 FEMALE.—Carapace similar to that of adult female, except edge of caudal process with 5 teeth (Figure 12c).

Size: "Grigore Antipa" 297, length 1.88 mm, height 1.22 mm.

First Antenna: Not examined in detail but in general similar to that of adult female.

Second Antenna: 2nd endopodial joint with 1 long and 2 short ventral bristles and 1 recurved terminal bristle; bristles of exopodite short, bare; remaining part of limb not examined in detail.

Mandible: Dorsal margin of basale with 5 bristles, remaining part of limb not examined in detail but in general similar to those of adult female.

Fifth and 6th Limbs: Not examined in detail but in general similar to those of adult female.

Seventh Limb: Each limb with 4 proximal and 5 distal bristles; each bristle tapering distally (a juvenile character); terminus not examined in detail but in general similar to that of adult female.

Furca: Each lamella with 9 claws, otherwise similar to lamellae of adult female.

Rod-shaped Organ, Eyes, Upper Lip, Anterior and Posterior of Body: Not examined in detail, but similar in general to those of adult female.

COMPARISONS.—The new species *P. tetradens* differs from *P. bonneti* in having 4 or 5 teeth on the outer edge of the caudal process rather than the more numerous (6–10) much smaller digitations on

the edge of the caudal process of *P. bonneti*. The protuberance on the posterior corner of the rostrum on the carapace of *P. tetradens* is much longer than that of *P. bonneti*. The dorsal margin of the basale of the mandible of *P. tetradens* bears 6 bristles compared to 5 on *P. bonneti*. The end joint of the 6th limb of *P. tetradens* bears more bristles than that of *P. bonneti*. Comparisons of some characters of adult females of *P. tetradens*, *P. bonneti*, and *P. lilljeborgii* are as follows:

	<i>tetradens</i>	<i>bonneti</i>	<i>lilljeborgii</i>
Carapace length of female (mm)	2.16–2.20	1.99	2.15–2.6
Edge of caudal process	4–5 teeth	6–10 minute digitations	smooth
Protuberance on posterior margin of rostrum	large	small	small
Number of bristles on 2nd joint of endopodite of 2nd antenna	5	4(always?)	5
Number of bristles on dorsal margin of basale of mandible	6	5	6–7
Number of bristles on end joint of 6th limb	34–41	24–25	28–33
Number of bristles on 7th limb	9	9	10–11

***Euphilomedes* Poulsen, 1962**

Three species of *Euphilomedes* were collected: *E. asper* (Müller, 1894), *E. sinister pentathrix*, new subspecies, and *E. schornikovi*, new species. A supplementary description is also given of *E. sinister sinister* based on specimens collected in Plymouth Sound, England, by Dr. Eric Robinson. The other species of *Euphilomedes* previously collected off

Key to the Species and Subspecies of *Euphilomedes* of West Africa

1. Left valve with posterodorsal spine *E. sinister pentathrix*, new subspecies
- Left valve without posterodorsal spine 2
2. Each lamella of furca with 6 claws *E. schornikovi*, new species
- Each lamella with 10 or 11 claws 3
3. Posterior margin rounded *E. africanus*
- Posterior margin truncate 4
4. Furcal claw 6 a primary claw *E. kornickeri*
- Furcal claw 6 a secondary claw *E. asper*

west Africa are: *E. africanus* Klie, 1940, and *E. kornickeri* Hartmann, 1974.

DISTRIBUTION.—This genus is widely distributed between the latitudes 63°N and 46°S, mostly inhabiting shallow water. Males are often collected in plankton. Species in the present collection were from Spanish Sahara and Mauritania at depths of 52–260 m.

***Euphilomedes asper* (Müller, 1894)**

FIGURES 14–16; PLATE 6

Philomedes aspera Müller, 1894:210, pl. 3: figs. 3, 17, 21, pl. 8: fig. 1; 1912:26, 27 [key, diagnosis].

Philomedes joveolata.—Brady and Norman, 1896:659, pl. 56: figs. 4, 5 [not Müller, 1894].

Ph. (Ph.) aspera (Müller).—Skogsberg, 1920:351.

Euphilomedes aspera (Müller).—Poulsen, 1962:362, 363 [key].

Euphilomedes asper (Müller).—Kornicker, 1967:18, figs. 9, 10, 11a–d, 12 [supplementary description]; 1974:14, fig. 5 [supplementary description].

LECTOTYPE.—Adult male in the Zoological Museum of Berlin (ZMB 9152: 1).

TYPE-LOCALITY.—Gulf of Naples, Italy.

MATERIAL.—USNM 154193, 1 female from *Thalassa* station X042; USNM 156632, 1 female from *Thalassa* station X041.

SUPPLEMENTARY DESCRIPTION OF FEMALE (Adult or A–1 instar).—Carapace with broad rostrum and incisur and truncate posterior (Figures 14, 15a; Plate 6a–c).

Ornamentation: Surface with shallow round fossae and sparsely distributed long hairs (Plate 6).

Infold: Rostral infold with 9 long bristles forming row parallel to valve edge; small bristle present on infold just behind and below incisur; anteroventral infold with 7 bristles along list; list



FIGURE 14.—*Euphilomedes asper* (Müller), female, USNM 154193, complete specimen, length 1.30 mm.

along posterior half of ventral infold and on posterior infold with about 30 short bristles; infold of caudal process posterior to list with 3 short bristles.

Selvage: Wide lamellar prolongation with fringed margin present along anterior, anterodorsal, and ventral margins; prolongation divided at inner end of incisur (Figure 14; Plate 6b).

Size: USNM 156632, length 1.44 mm, height 0.90 mm; USNM 154193, length 1.30 mm, height 0.77 mm.

First Antenna (Figure 15d): 1st joint: bare. 2nd joint: lateral and medial spines and 3 bristles (1 dorsal, 1 ventral, 1 lateral). 3rd joint: short with few short lateral and medial spines and 3 bristles (2 dorsal, 1 ventral with base on medial side). 4th joint: 6 bristles (2 dorsal and subterminal, 4 ventral and terminal). 5th joint: sensory bristle with 6 short proximal filaments and 3 distal filaments (excluding stem with bifurcate tip), 1 long and 2 short; medial bristle with few long proximal spines. 7th joint: a-bristle longer than bristle of 6th joint, with short marginal spines; b-bristle almost twice length of a-bristle, with 4 short marginal filaments excluding stem with bifurcate tip; c-bristle same length as sensory bristle of 5th joint, with 5 short proximal filaments and 3 distal filaments (1 long, 2 short, excluding stem with bifurcate tip). 8th joint: d- and e-bristles bare, only slightly longer than b-bristle; f- and g-bristles similar to c-bristle but with only 3 short proximal filaments.

Second Antenna: Protopodite bare. Endopodite 2-jointed (Figure 15e): 1st joint with 6 short bare bristles; 2nd joint longer than 1st with 1 long ventral midbristle with long proximal and short distal bristles, and 1 shorter bare terminal bristle. Exopodite: 1st joint with minute medial bristle on distal margin; bristle of 2nd joint reaching past 3rd joint, with short slender proximal marginal spines; bristles of joints 2–8 with spines similar to those on bristle of 2nd joint; 9th joint with 7 bristles (2 long with proximal ventral spines and also some spines along dorsal margin, 1 medium bristle with proximal, ventral, and dorsal spines, 4 shorter bristles, dorsal on joint, bare or with ventral spines); all exopodite bristles without natatory hairs; joints 2–8 with spines forming row along distal margin and small basal spines.

Mandible (Figure 15f): Coxale endite spinous, bifurcate, with minute bristle near base. Basale: medial surface spinous, with 5 proximal bristles

(2 pectinate, 3 spinous), and 2 longer spinous bristles with bases almost on ventral margin; ventral

margin with 5 spinous bristles; dorsal margin with 1 bristle distal to middle and 2 terminal bristles.



FIGURE 15.—*Euphilomedes asper* (Müller), female, USNM 156632, length 1.44 mm: *a*, outline of whole specimen; *b*, anterior of body showing medial eye and rod-shaped organ, anterior process and upper lip; *c*, left lateral eye. Female, USNM 154193, length 1.30 mm: *d*, left 1st antenna, lateral view; *e*, endopodite of right 2nd antenna, medial view; *f*, left mandible, medial view.

Exopodite hirsute, reaching just past middle of 1st endopodite joint, with 2 subterminal bristles. Endopodite: 1st joint with medial spines and 4 ventral bristles (1 short, 3 long); 2nd joint with proximal medial spines, 4 bristles on ventral margin forming 2 distal groups (proximal group with 1 bristle, distal group with 3), dorsal margin with 8 bristles (5 long, 3 short); end joint with 3 claws and 4 bristles.

Maxilla: Precoxale and coxale with fringe of hairs along dorsal margins; coxale with spinous

dorsal bristle. Endite I with 11 or 12 bristles; endite II with 7 bristles; endite III with 7 distal bristles and 1 proximal lateral bristle. Basale with 3 bristles on distal margin (1 dorsal, 2 ventral). Exopodite forming short lobe with 3 bristles (2 long, 1 short). Endopodite: 1st joint with hairs along dorsal margin, 1 spinous α -bristle and 3 β -bristles; end joint with about 4 a-bristles, 2 b-bristles (outer bristle slender spinous, inner bristle clawlike with stout spines along both margins), 2 slender c-bristles, and 3 d-bristles (inner bristles



FIGURE 16.—*Euphilomedes asper* (Müller), female, USNM 154193: *a*, tip of right 5th limb, anterior view; *b*, tip of left 5th limb, anterior view; *c*, left 6th limb, medial view; *d*, 7th limb; *e*, right lamella of furca and right genital organ; *f*, anterior of body showing medial eye and rod-shaped organ, anterior process, and upper lip, and 3 protistans attached to medial eye; *g*, right and left lateral eyes; *h*, left view of body near furca showing sclerite system, brushlike organ and left genital organ; *i*, protistan attached to protopodite of 2nd antenna.

slender with marginal spines, outer 2 bristles clawlike with stout spines along both margins).

Fifth Limb (Figure 16a,b): Epipodial appendage with 49 bristles. Endite I with 6 spinous bristles; endite II with 9 spinous bristles; endite III with about 10 spinous or pectinate bristles. Exopodite: 1st joint with main tooth with 4 constituent pectinate teeth followed by short stout bristle, triangular tooth in front of main tooth not reaching past main tooth, with smaller tooth near inner proximal end, anterior side of joint with 2 spinous bristles near middle of distal margin, outer end with small lobe with 1 small bristle; 2nd joint with large squarish tooth with 2 or 3 small teeth along inner margin, 1 minute bristle on posterior side of outer corner, long posterior c-bristle and 3 posterior d-bristles; 3rd joint with 3 spinous bristles on inner lobe and 2 spinous bristles on outer lobe; 4th and 5th joints fused, with total of 7 spinous bristles.

Sixth Limb (Figure 16c): Endite I with 3 spinous bristles (1 long, 2 short); endite II with 1 proximal and 3 terminal spinous bristles; endites III and IV each with 1 proximal and 7 terminal spinous bristles; end joint hirsute, with 15 bristles (6 of posterior 7 bristles hirsute, other bristles of end joint with long proximal and short distal spines); 3 hirsute bristles present in place of epipodial appendage.

Seventh Limb (Figure 16d): Proximal group with 4 bristles (2 on each side); distal group with 6 bristles (3 on each side); bristles with 2-6 bells and distal marginal spines; terminus with comb of 10 or 11 teeth opposing 2 pegs.

Furca (Figure 16e): Each lamella with 10 claws: claws 1, 2, 4 primary, remaining claws secondary; claw 3 about same length as claw 5; claw 1 with teeth along posterior lateral margin and larger medial teeth; claws 2-5 (and possibly others) with teeth along posterior margins; lamella at base of claws and following claws hirsute.

Rod-shaped Organ (Figures 15b, 16f): Elongate with 1 suture in middle and pointed tip.

Eyes: Medial eye pigmented, bare (Figures 15b, 16f); lateral eye smaller than medial eye, with 3 or 4 ommatidia (Figures 15c, 16g).

Upper Lip (Figures 15b, 16f): Projecting anteriorly with small processes at tip, hirsute.

Genitalia and Brushlike Organ: Genitalia represented by yellowish opaque ovoid mass (Figure 16e,h); brushlike organ consisting of about 7 minute bristles on each side of specimen near genitalia (Figure 16h).

Epizoa: Stemmed protozoans with ball-like tips present on medial eye and protopodite of right 2nd antenna (Figure 16f,i). Slender segmented filaments also present on some appendages.

MATURITY OF SPECIMENS IN COLLECTION.—One of the specimens contained a single egg wedged between the ventral margins of the valves of the carapace. It was not possible to determine whether the egg belonged to the specimen or had been washed in from outside. Genitalia were present on the specimen indicating it to be an adult female; however, none of the bristles of the exopodite of the 2nd antenna were long or bore natatory hairs like those usually found on adult females. For these reasons, the maturity of the specimen is in doubt. The second specimen in the collections is also without natatory bristles on the 2nd antenna. Prior collections reported upon by Müller (1894:210), Brady and Norman (1896:659), and Kornicker (1974:14) did not contain adult females.

Euphilomedes sinister Kornicker, 1974

A new subspecies *Euphilomedes sinister pentathrix* is proposed herein because it has 4 ventral bristles on the 2nd joint of the female 2nd antenna compared to only 1 on specimens from the Gulf of Naples and Plymouth Sound. To test the hypothesis that the west African and European populations comprise two subspecies, it will be necessary to examine the variability in the number of bristles on the 2nd joint of the female 2nd antenna when more specimens become available for study. The specimens of Brady, 1868, Brady and Norman, 1896, Fage, 1934, and Caraion, 1959, have been retained in the synonymy of *E. sinister sinister* because they were collected in the vicinity of Europe, although

Key to the Subspecies of *Euphilomedes sinister*

Second endopodial joint of 2nd antenna of adult female with 4 ventral bristles	<i>E. s. pentathrix</i>
Second endopodial joint with 1 ventral bristle	<i>E. s. sinister</i>

the number of bristles on the 2nd joint of the endopodite of the female 2nd antenna of those specimens is unknown. It will be necessary to reexamine the specimens in order to verify the subspecies to which they belong.

***Euphilomedes sinister sinister* Kornicker, 1974,
new status**

Philomedes longicornis.—Norman, 1861:280 [part] [not Liljeborg, 1853:176].

Philomedes interpuncta.—Brady, 1868:463, pl. 33: figs. 10–13, pl. 41: fig. 3; 1871:293, pl. 26: figs. 1–5; 1872:60, pl. 1: fig. 5.—Müller, 1894:210, pl. 3: figs. 5–14, 16, 19, 20, 23–28, 32, 37–44.—Brady and Norman, 1896:656, pl. 56: figs. 6–10, pl. 57.—Fage, 1934:249, figs. 1–2.—Caraion, 1959:266, fig. 1. [Not Baird, 1850:257.]

Euphilomedes sinister sinister Kornicker, 1974:17, figs. 6, 7.

HOLOTYPE.—A female without eggs, Zoological Station of Naples, length 1.24 mm.

TYPE-LOCALITY.—Benta Palumma, station B27, 90 m, Gulf of Naples, Italy.

MATERIAL.—USNM 151189a,b, 2 adult females collected at a depth of 5.5 m in June 1974 in Plymouth Sound, England, by Dr. Eric Robinson. These were examined for comparative purposes.

SUPPLEMENTARY DESCRIPTION OF ADULT FEMALE.—Carapace larger than the holotype: USNM 151189a, length 1.37 mm, height 0.93 mm; USNM 151189b (dry measurement), length 1.45 mm, height 0.95 mm.

Endopodite of 2nd Antenna: Same as that described by Kornicker (1974:19; fig. 6i).

REMARKS.—Kornicker (1974:17) did not include specimens identified by Norman (1861:280, pl. 14: fig. 11) from Plymouth Sound in the synonymy of *E. sinister*. Because Robinson's collection shows that the species is present in Plymouth Sound, it is probable that some of Norman's specimens belong to this species. The specimen illustrated by Norman (1861, pl. 14, fig. 11) has a spine on the right valve and therefore has not been included in the above synonymy.

***Euphilomedes sinister pentathrix*, new subspecies**

FIGURES 17, 18; PLATES 7–9

HOLOTYPE.—USNM 152831, ovigerous female, in alcohol and on slides.

TYPE-LOCALITY.—Station A10b, Cornide de Saa-

vedra.

ETYMOLOGY.—The specific name, from the Greek *penta* (five) and *thrix* (hair), refers to the number of bristles on the 2nd joint of the endopodite of the 2nd antenna of the adult female.

PARATYPES.—USNM 152834, 1 adult female from same sample as holotype; USNM 152832, 1 A–1 male from same sample as holotype.

DESCRIPTION OF ADULT FEMALE.—Carapace similar in shape to that of *E. sinister sinister*; posterior end of left valve with dorsal and ventral spines (Figure 17a,b; Plates 7a,e,f, 8d–f); right valve without spines.

Ornamentation: Surface with polygonal reticulations (Figure 17a; Plates 7–9); inferior tip of rostrum with stout protuberance (Figure 17a; Plate 7a,d); long and short bristles present along margins and scattered over valve surface (Plates 7a,e, 8b–f, 9).

Infold: Infold behind rostrum with 18–20 bristles; 1 bristle present at inner end of incisur; anteroventral infold with 9 short bristles; posteroventral infold with about 28 bristles along inner margin, and 4 or 5 small bristles between inner margin of infold and valve margin (Figure 17b).

Selvage: Wide lamellar prolongation with marginal fringe present along anterior, ventral, and posterior margins (Plate 7a); prolongation divided at inner end of incisur (Plate 7d).

Size: USNM 152831, length 1.42 mm, height 0.94 mm; USNM 152834, length 1.40 mm, height 0.93 mm.

First Antenna (Figure 17c): Joints 1 and 2 with spines on lateral and medial surfaces; joints 3 and 4 may have spines on medial surface (not observed clearly). 2nd joint: 3 bristles (1 ventral, 1 dorsal, 1 lateral). 3rd joint: 3 bristles (1 ventral, 2 dorsal). 4th joint: 6 bristles (4 ventral, 2 dorsal). 5th joint: sensory bristles with 4 or 5 short marginal filaments, 3 longer subproximal filaments, and bifurcate tip. 6th joint: 1 slender medial bristle. 7th joint: a-bristle about same length as bristle of 6th joint, with few long marginal spines; b-bristle slightly shorter than sensory bristle of 5th joint, with short marginal filaments and bifurcate tip; c-bristle same length as sensory bristle, with 5 short marginal filaments, 3 longer subterminal filaments, and bifurcate tip. 8th joint: d- and e-bristles bare, same length as sensory bristle; f- and g-bristles same length as sensory bristle, with 4 short marginal fila-



FIGURE 17.—*Euphilomedes sinister pentathrix*, new subspecies, female, USNM 152831, holotype, length 1.42 mm: a, whole carapace showing some surface reticulations and outline of egg; b, posterior end of left valve, medial view; c, left 1st antenna, lateral view; d, endopodite of left 2nd antenna, medial view; e, right mandible, medial view.

ments, 2 longer subterminal filaments, and bifurcate tip.

Second Antenna: Protopodite with clusters of spines on ventral and dorsal margins, and on lateral and medial surfaces (Figure 17d); spines along dorsal margin longer than those along ventral margin. Endopodite 2-jointed (Figure 17d): 1st joint with 5 proximal and 1 distal bristle; ventral margin of 2nd joint with 1 long spinous proximal bristle and 3 shorter spinous bristles distal to middle; 1 bare bristle about one-half length of 2nd

joint present terminally. Exopodite: 1st joint with small medial terminal spine; terminal margins of joints 2–8 with comb of short spines; bristle of 2nd joint with short slender hairs along middle part of ventral margin; bristles of joints 3–5 bare; bristles of joints 6–8 longer than those of joints 2–5, with natatory hairs; joint 9 with 7 bristles (4 long, 1 medium, and 1 short, all with natatory hairs, 1 very short with short hairs or bare; the latter 3 bristles located distodorsally on joint).

Mandible (Figure 17e): Coxale endite with bi-

furcate tip, secondary teeth, and cluster of spines. Basale: medial surface hirsute, with 6 short bristles in proximal group near ventral margin (2 or 3 stout pectinate, 2 or 3 slender spinous); ventral margin with 7 spinous bristles; dorsal margin with 1 midbristle and 2 terminal bristles. Exopodite hirsute, about three-fourths length of 1st endopodite joint, with 2 spinous ventral bristles. Endopodite:

1st joint with 4 ventral, terminal bristles (3 long, 1 short); 2nd joint with 2 clusters of distal bristles on ventral margin (3 in proximal group, 4 in distal group), dorsal margin with 2 groups of bristles (5 in proximal group, 8 in distal group near middle of margin); end joint with 3 claws, all with minute marginal teeth along ventral margin, and 4 bristles; 1st and 2nd endopodite joints with spines forming

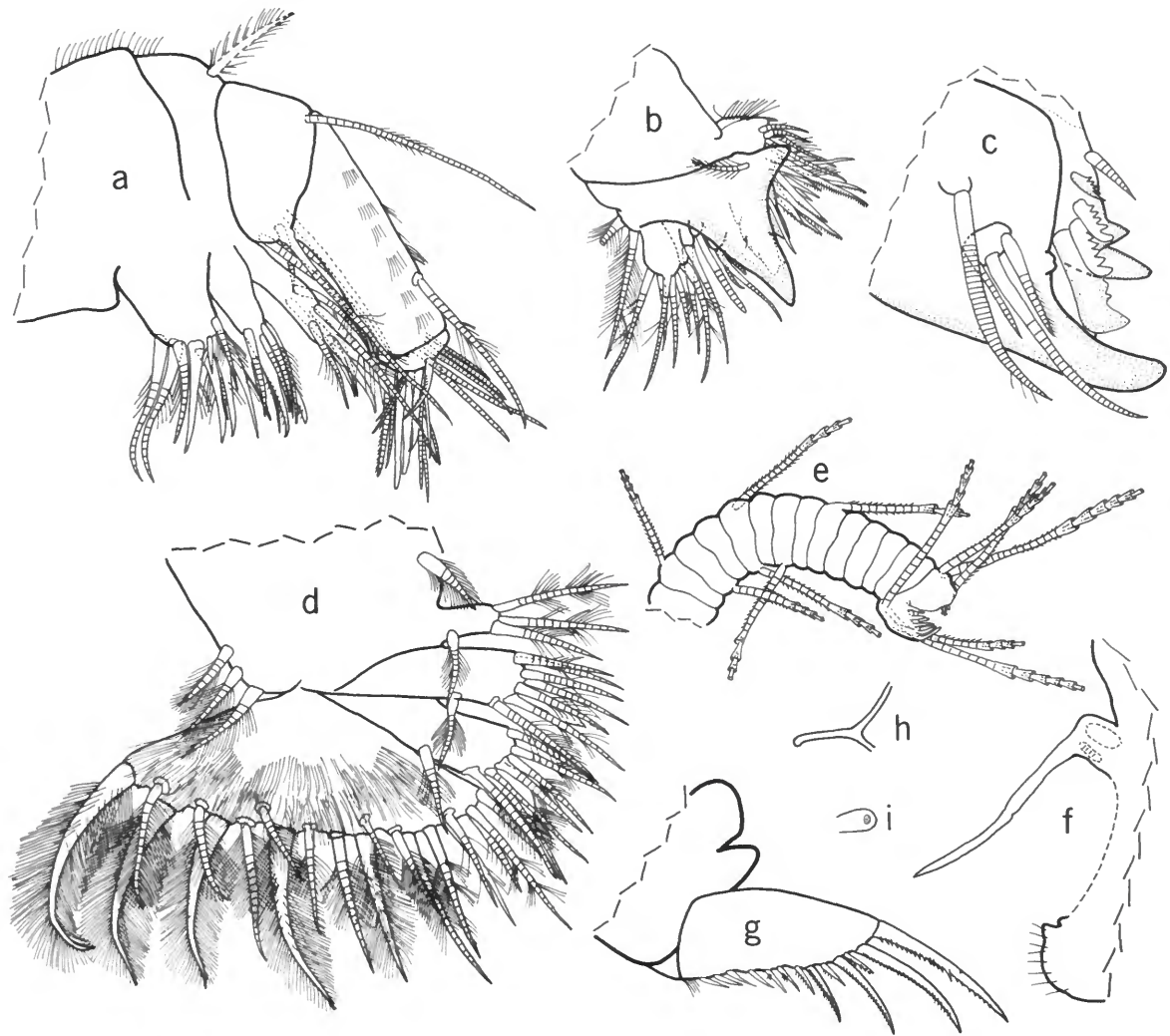


FIGURE 18.—*Euphilomedes sinister pentathrix*, new subspecies, female, USNM 152831, holotype: a, left maxilla, medial view; b, tip of right 5th limb, anterior view; c, tip of left 5th limb, posterior view; d, left 6th limb, medial view; e, 7th limb; f, anterior of body showing medial eye and rod-shaped organ, and upper lip; g, right lamella of furca, lateral view; h, right Y-sclerite. Female, USNM 152834, paratype: i, right lateral eye?

clusters on medial surfaces.

Maxilla (Figure 18a): Precoxale and coxale with fringe of hairs along anterior (dorsal) margins; coxale with spinous anterior bristle. Endite I with 9 or 10 bristles; endite II with 8 bristles; endite III with about 10 bristles. Basale with 3 long distal bristles. Exopodite with 3 bristles (2 long, 1 short). Endopodite: 1st joint spinous, with 1 α -bristle with wreath of long marginal spines, and 5 β -bristles; end joint with total of about 12 bristles, some pectinate.

Fifth Limb (Figure 18b,c): Epipodial appendage with 44 bristles. Endite I with about 6 bristles, endite II with about 8 bristles; endite III with about 10 bristles. Exopodite: 1st joint with distal margin without midbristles, outer distal corner with lobe bearing spines and 2 short spinous bristles, main tooth consisting of 4 pectinate teeth followed by short spinous bristle, tooth in front of main tooth bilobed; 2nd joint with anterior side with slender spinous bristle near outer corner, posterior side with distal group of 3 bristles (2 short, 1 long) and long proximal bristle, middle of inner margin of large triangular tooth with minute node; 3rd joint with 3 bristles on inner lobe and 2 hirsute bristles on outer lobe; 4th and 5th joints fused, with total of 6 bristles.

Sixth Limb (Figure 18d): Endite I fragmented, 1 short proximal bristle on remaining part; endite II with 1 proximal and 3 terminal bristles; endites III and IV with 1 proximal and 7 terminal bristles; end joint with 20 bristles; 3 hirsute epipodial bristles present.

Seventh Limb (Figure 18e): Proximal group with 6 bristles (3 on each side) and terminal group with 6 bristles (3 on each side), each bristle with 3–5 bells and distal marginal spines; terminal comb with about 15 teeth; 2 pegs present opposite comb, inner of these spinous and about twice as long as outer peg.

Furca (Figure 18g): Each lamella with 13 claws: claws 1, 2, 4, 6 primary, remaining claws secondary; claw 1 with large tooth in middle of medial side and teeth along lateral and medial sides of posterior margin; remaining claws also with teeth along posterior margin; hairs present at base of claws and following claws.

Rod-shaped Organ: Elongate, 1- or 2-jointed, with tapering tip (Figure 18f).

Eyes: Medial eye bare (Figure 18f); lateral eye

minute with 1 ommatidium (Figure 18i).

Upper Lip: Rounded, hirsute, with anterior projection (Figure 18f).

Y-Sclerite: Typical for family (Figure 18h).

Eggs: USNM 152831 with 1 egg in marsupium.

COMPARISONS.—The new subspecies, *E. sinister pentathrix*, differs from *E. sinister sinister* in having 5 instead of 2 bristles on the 2nd joint of the endopodite of the 2nd antenna of the adult female.

Euphilomedes schornikovi, new species

FIGURES 19–22

HOLOTYPE.—USNM 156644, 1 A–1 male, on slides and in alcohol.

TYPE-LOCALITY.—*Thalassa* station X053.

ETYMOLOGY.—The species is named after Professor E. I. Schornikov, Hydrobiological Laboratory, Institute of Marine Biology of the Far Eastern Scientific Center of the Academy of Science, Vladivostok, USSR.

MATERIAL.—“Grigore Antipa” 462, paratype, instar III female, from same station as holotype.

DESCRIPTION OF A–1 MALE (Figures 19–21).—Carapace with elongate rostrum and projecting caudal process (Figures 19, 20a,b); valve edge cutting diagonally across outer ventral corner of rostrum (Figure 20b).

Ornamentation: Surface with shallow fossae and scattered short and long bristles (Figure 19).

Infold: Rostral infold with 4–6 bristles (Figure 20b); infold just below incisor with 1 short bristle (Figure 20b); anteroventral infold with about 6 ridges but no bristles; ventral infold without bristles; posteroventral infold including caudal process with 7 bristles near inner margin of infold (Figure 20a); caudal process with “pocket” with 5 spinous bristles along upper part of inner edge (Figure 20a); outer edge of caudal process with 3 minute bristles (Figure 20a).

Selvage: Wide lamellar prolongation with marginal fringe present along anterior, ventral, and posterior margins; prolongation divided at inner end of incisor (Figure 20b).

Central Muscle Attachment Scars: Consisting of elongate and oval individual scars (Figures 19, 20c).

Size: USNM 156644, length 0.96 mm, height 0.60 mm.

First Antenna (Figure 20d): 1st joint: bare. 2nd joint: 1 dorsal and 1 ventral bristle, spines on



FIGURE 19.—*Euphilomedes schornikovi*, new species, A-1 male, USNM 156644, holotype, complete specimen, length 0.96 mm.

medial surface near ventral margin and on lateral surface near terminal end. 3rd joint: 3 bristles (1 ventral, 2 dorsal). 4th joint: 4 bristles (2 ventral, 2 dorsal), and with few spines on medial surface near ventral margin; 5th joint: sensory bristle with about 6 short marginal filaments and tip consisting of 4 longer filaments. 6th joint: medial bristle about same length as 5th joint, with marginal spines. 7th joint: a-bristle about one-third longer than bristle of 6th joint; b-bristle slightly longer than twice length of a-bristle, with 1 short filament near middle and 3 terminal filaments; c-bristle slightly longer than b-bristles, with 5 marginal filaments and 1 short and 3 longer filaments at tip. 8th joint: d- and e-bristles bare, same length as c-bristle; f-bristle about same length as c-bristle, with 2 marginal filaments and 1 short and 3 long terminal filaments; g-bristle about same length as f-bristle, with 2 marginal filaments and 4 terminal filaments (1 short, 3 long).

Second Antenna: Protopodite bare. Endopodite 3-jointed (Figure 20e): 1st joint short with 2 minute bristles; 2nd joint elongate with 3 ventral bristles; 3rd joint elongate with 1 proximal ventral bristle and 2 short terminal bristles. Exopodite: 1st joint with minute medial bristle on terminal margin; joints 2-8 with fairly long distal spines forming row; joints 3 or 4 to 7 or 8 with small basal spine; bristles of joints 2-8 short with stout ventral spines; 9th joint with 3 bristles, all short (Figure 20f) (longer of these ventral and with few stout ventral spines, remaining 2 with more slender ventral spines).

Mandible (Figures 20g, 21a): Coxale endite bifurcate, without basal bristle. Basale: spinous medial side with 4 short proximal bristles near ventral margin and 1 at middle of ventral margin; ventral margin with 1 or 2 distal bristles; lateral side with

2 bristles near ventral margin; dorsal margin with 1 bristle distal to middle and 2 terminal. Exopodite hirsute, reaching middle of dorsal margin of 1st endopodite joint, with 2 terminal bristles. Endopodite: 1st joint with ventral bristles (2 long, 1 short); 2nd joint with 4 distal bristles on ventral margin forming 2 groups, each with 2 bristles; middle of dorsal margin with 7 bristles forming 2 groups (2 bristles in proximal group, 5 in distal group); medial side of joint with spines forming row near proximal group of bristles on dorsal margin; 3rd joint with 3 bristles and 3 claws (2 long with ventral spines, and 1 short, dorsal).

Maxilla (Figure 21b-d): Coxale with spinous dorsal bristle. Endites I and II each with about 6 bristles; endite III with 1 proximal and 7 terminal bristles. Basale with 2 long bristles on distal ventral margin. Exopodite short with 3 bristles (2 long, 1 short). Endopodite: 1st joint with 1 α -bristle with long proximal spines and 2 β -bristles; end joint with 3 a-bristles with long hairs near middle, 2 b-bristles (outer bristle with long proximal hairs and short distal spines, inner bristle clawlike, bare), 2 short slender c-bristles, and 3 stout d-bristles (Figure 21c,d).

Fifth Limb (Figure 21e,f): Epipodial appendage with 42 bristles. 3 endites with numerous bristles. Exopodite: 1st joint with main tooth obscured on specimen examined but consisting of about 4 teeth, distal margin with 2 anterior bristles, posterior bristles obscure on specimen examined, outer distal corner with hirsute lobe with spinous bristle; 2nd joint with large squarish tooth with 2 low nodes on inner edge; 3rd joint with 2 short hirsute bristles on outer lobe and 3 bristles on inner lobe (2 much longer than bristles on outer lobe); 4th and 5th joints fused, with total of 5 bristles.

Sixth Limb (Figure 21g): 1 hirsute bristle in place of epipodial appendage; endite I with 3 bristles; endite II with 3 terminal bristles; endite III with 7 terminal bristles; endite IV with 5 terminal bristles; end joint not projecting posteriorly, with 8 marginal bristles (posterior 2 bristles hirsute, remaining bristles and those of endites with long proximal hairs and short distal spines); surface of limb hirsute.

Seventh Limb (Figure 21h): No proximal bristles; distal group with 4 tapered bristles, each with 3 bells and distal marginal spines; terminus with comb of 5 teeth opposing 2 pegs.

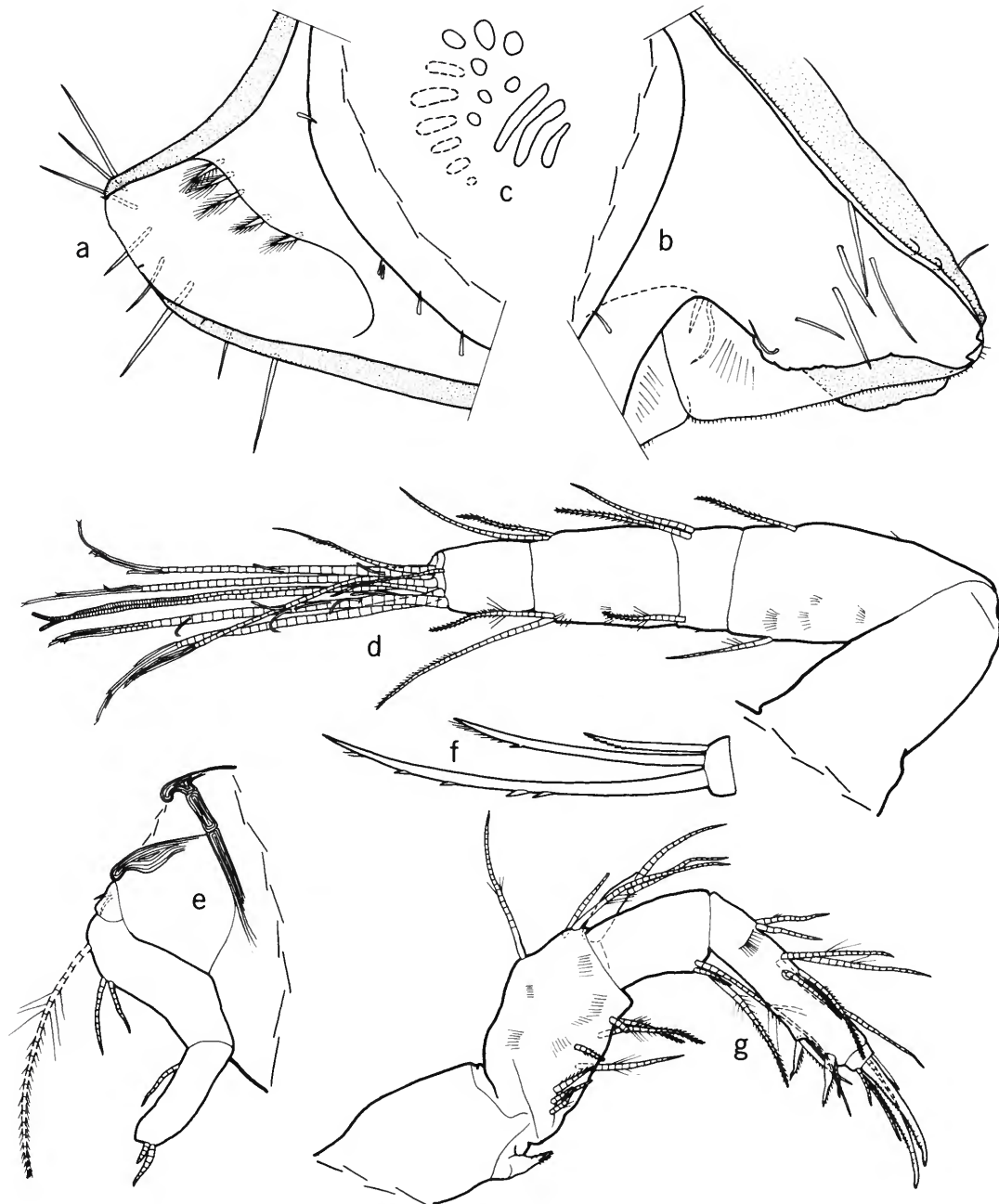


FIGURE 20.—*Euphilomedes schornikovi*, new species, A-I male, USNM 156644, holotype, length 0.96 mm: a, caudal process of left valve, medial view; b, rostrum and incisor of left valve, medial view; c, central adductor muscle scars of right valve, lateral view; d, right 1st antenna, medial view; e, endopodite of right 2nd antenna, medial view; f, 9th joint of exopodite of right 2nd antenna, lateral view; g, left mandible, medial view.



FIGURE 21.—*Euphilomedes schornikovi*, new species, A-1 male, USNM 156644, holotype: *a*, right mandible, medial view; *b*, right maxilla, lateral view; *c*, end joint of endopodite of left maxilla, lateral view; *d*, end joint of endopodite of right maxilla, lateral view; *e*, distal end of right 5th limb; *f*, distal end of left 5th limb, posterior view; *g*, 6th limb; *h*, tip of 7th limb; *i*, left lamella of furca and claw 1 of right lamella, and Y-sclerite; *j*, anterior of body showing medial eye and rod-shaped organ and upper lip; *k*, rod-shaped organ under cover slip, dorsal view.

Furca (Figure 21i): Each lamella with 6 claws: claws 1, 2, 4 primary; claws 3, 5, 6 secondary; claw 1 with teeth forming lateral and medial row along posterior margin with largest tooth medially and distally; remaining claws with teeth along posterior margins; hairs present near base of claw 1 and following claw 6.

Rod-shaped Organ (Figure 21j,k) Elongate, weak suture present proximal to middle, tip pointed; part distal to middle with wide and narrow sections but without sutures.

Eyes: Medial eye not well-defined, bare (Figure 21j); sac with many minute yellow cells in vicinity where lateral eye generally occurs may be lateral eye.

Upper Lip: Helmet-shaped with anterior process (Figure 21i).

Y-Sclerite: Type usually present in family (Figure 21i).

Genitalia: Not observed.

DESCRIPTION OF INSTAR III FEMALE (Figure 22).—Carapace similar in shape and ornamentation to that of A-1 male (Figure 22a). Infold not examined.

Size: "Grigore Antipa" 462, length 0.90 mm, height 0.45 mm.

First Antenna: Not examined in detail, but similar to that of A-1 male.

Second. Antenna: Protopodite bare. Endopodite 2-jointed (Figure 22b,c): 1st joint with 1 short bristle; 2nd joint elongate with 1 or 2 ventral bristles (1 long with long proximal and short distal spines, other bristle when present short), and 1 spinous terminal bristle. Exopodite: distal margin of 1st joint with well developed medial bristle, about one-

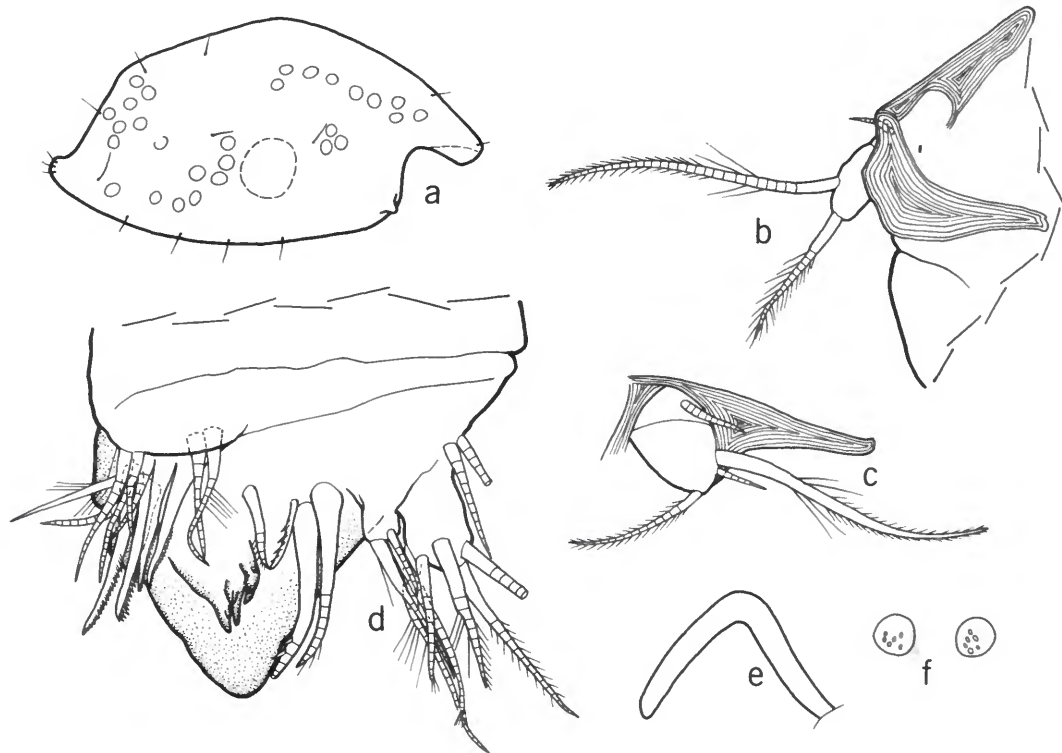


FIGURE 22.—*Euphilomedes schornikovi*, new species, instar III female, "Grigore Antipa" 462, paratype, length 0.90 mm: a, right valve with some of fossae indicated and area of central adductor muscles scars outlined by dashes; b, endopodite of right 2nd antenna, medial view; c, endopodite of left 2nd antenna, medial view; d, distal end of 5th limb, posterior view; e, 7th limb; f, lateral eyes.

fourth length of 2nd joint; bristles of joints 2 to 8 short, with stout ventral spines; 9th joint with 3 bristles (1 bristle same length as joints 4 to 9 combined, with 4 stout ventral spines; remaining bristles very short with short, slender, marginal spines); joints 2–8 with spines forming terminal row; small basal spines on some joints.

Mandible, Maxilla: Not examined in detail but similar to those of A–1 male.

Fifth Limb (Figure 22d): Epipodial appendage with 36 bristles. 3 narrow endites with total of about 15 bristles. Exopodite: 1st joint with main tooth with 3 teeth bearing small secondary teeth, short stout pectinate spine proximal to main tooth; 2nd joint with large square tooth, posterior side with group of 3 bristles (2 long, 1 short and pectinate); 3rd joint with inner lobe with 3 bristles, outer lobe with 2; 4th and 5th joints fused, with total of 5 bristles.

Sixth Limb: Not examined in detail but similar to that of A–1 male.

Seventh Limb: Elongate, without bristles or terminal comb (Figure 22e).

Furca, Rod-shaped Organ, Medial Eye: Similar to those of A–1 male.

Lateral Eye: Round sac with about 6 minute yellowish cells present on each side may be lateral eyes (Figure 22f).

COMPARISONS:—The new species *E. schornikovi* has in common with two other species (*Philomedes paucichelata* Kornicker, 1958, and *Tetragonodon rhabdion* (Kornicker, 1970) the presence of only 6 claws on the furca with the 3rd claw being smaller than the 4th. The three species should probably be referred to a new genus. *E. schornikovi* differs from *P. paucichelata* in having 2 bristles instead of 1 on the 2nd joint of the 1st antenna, and in having a long terminal bristle on the 2nd joint of the endopodite of the female 2nd antenna. (The terminal ends of the endopodites of several specimens of *Philomedes paucichelata* from Charlotte Harbor, Florida, examined by the senior author were either bare or bore a minute bristle.) *E. schornikovi* differs from *T. rhabdion* in having a well developed rod-shaped organ and a long terminal bristle on the 2nd joint of the endopodite of the female 2nd antenna. Some species of *Pseudophilomedes* also have only 6 furcal claws, but the 2nd exopodial joint of the female 5th limb of members of that genus is prolonged, not short as on *E. schornikovi*.

Tetragonodon Brady and Norman, 1896

One species of *Tetragonodon* was collected, *T. ctenorynchus* (Brady, 1887), which is the type-species of the genus. The male of the species is described for the first time. The male of the genus was previously unknown. Of particular interest is the fact that the sensory bristle of the male 1st antenna bears proximal filaments in a cup not unlike that on the sensory bristle of males in the family Sarsellidae.

DISTRIBUTION.—Only three species of the genus are known. One species lives along the western coast of Africa and Europe between latitudes 20°41'N and 38°38'N at depths of 636–2995 m; a second species lives in the Gulf of Mexico at a depth of 1000–1200 m, and a third lives in the Peru-Chile Trench at a depth of 991–1015 m. Empty valves have been collected at shallower depths (7–152 m) in the Atlantic Ocean off Puerto Rico and in Colon Harbor, Panama. Specimens of *T. ctenorynchus* in the present collection are from off the northern end of the Islamic Republic of Mauritania at a depth of 1120 m. A possible fourth species from the west coast of Morocco, *Tetragonodon erinaceus* Brady and Norman, 1896, was correctly referred by Müller (1912:51) to “Cypridinidarum genera dubia et species dubiae.”

Tetragonodon ctenorynchus (Brady, 1887)

FIGURES 23–29; PLATES 10–14

Bradycinetus Stenorynchus Brady, 1886:166 [nomen nudum].

Bradycinetus ctenorynchus Brady, 1887:199.

Tetragonodon ctenorynchus (Brady).—Brady and Norman, 1896:667, pl. 58, figs. 1–8.—Sylvester-Bradley, 1961:400, fig. 322:5.—Kornicker, 1968:450–452 [discussion].

Philomedes ctenorhynchus (Brady).—Müller, 1912:33.

[?] *Tetragonodon ctenorhynchus* (Brady).—Bold, 1966:44, pl. 1, fig. 1.

HOLOTYPE.—Not designated.

SYNTYPE LOCALITY.—West Atlantic between 20°41'N and 38°38'N at depths of 636–2995 m (see Kornicker, 1968:452, table 1).

MATERIAL.—[USNM 142387], 1 adult female, USNM 150278, 1 adult female, USNM 150105, 3 adult females, all from *Thalassa* station X046; USNM 150102, 1 adult male from *Thalassa* station X046; USNM 150103, 9 adult females and juveniles from *Thalassa* station X046.

SUPPLEMENTARY DESCRIPTION OF FEMALE (Figures

23–26; Plates 10–14).—Carapace with straight hinge but with convex dorsal outline in lateral view (Figure 23, 24a,b); rostrum beaklike, pointed with lateral fold (Figure 24a,c; Plate 11c,d); posterior with distinct caudal process (Figures 23, 24a; Plate 11c,e); ventral margin of carapace strongly convex; greatest height of valve in front of middle.

Ornamentation: Surface with shallow punctae (Figures 23, 24k; Plate 10d); punctae not distinct on decalcified valves; surface with short and long hairs (Figure 24d); 2 small bristles at inner end of incisur (Figure 24c).

Infold: Broad in area of rostrum and caudal process, narrower elsewhere (Figure 24a); infold behind rostrum with 4 long spinous bristles forming row (Figure 24a,c; Plate 12a), infold immediately ventral to rostrum with 1 small bristle (Figure 24c; Plate 12c); infold in front of caudal process with 6 flat spinous bristles near top of list and 2 small bristles ventral to these near inner margin of infold, the latter 2 bristles with truncate tips (Figure 24a; Plates 11c,e, 12d); anteroventral infold with 5 ridges paralleling valve margin (Plate 12b).

Selvage: Wide fringed lamellar prolongation present along anterior, ventral, and posterior margin of each valve; prolongation divided at inner end of incisur (Plate 11d).

Central Muscle Attachment Scars: Consisting of about 40 widely dispersed individual ovoid scars forming about 7 horizontal rows, the upper 3 or 4 of these being slightly convex and containing more individual scars than the lower 3 (Figures 23, 24e). Muscles striate (Plate 12f).

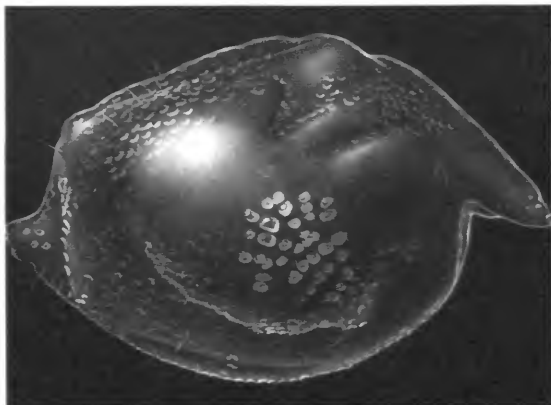


FIGURE 23.—*Tetragonodon ctenorynchus* (Brady), female, USNM 150278, complete specimen, length 1.69 mm.

Size: [USNM 142387], length 1.89 mm, height 1.00 mm; USNM 150278, length 1.69 mm, height 1.03 mm.

First Antenna (Figure 24f,l): 1st joint: lateral spines near dorsal margin. 2nd joint: cluster of spines at middle of dorsal margin and on lateral side in distodorsal corner, and 1 subterminal dorsal bristle with long spines near middle and short spines distally. 3rd joint: short with cluster of spines on ventral margin, and with 1 ventral bristle with long mid-spines and short distal spines, and 2 dorsal bristles with long mid-spines and short distal spines. 4th joint: more than twice length of 3rd joint, with spines forming clusters along ventral margin, 2 or 3 bristles (1 or 2 ventral, 1 dorsal), all bristles with long mid-spines and short distal spines. 5th joint: sensory bristle with 2 short proximal filaments, 1 slightly longer filament near middle, and 4 long terminal filaments including stem. 6th joint: not separated from 5th by visible suture, with short spinous medial bristle. 7th joint: a-bristle about one-third longer than bristle of 6th joint, with short marginal spines; b-bristle slender, more than twice length of a-bristle, with 1 short proximal and 3 longer terminal filaments including stem; c-bristle slightly longer than b-bristle, with 3 short proximal filaments, one short subterminal filament, and 2 long terminal filaments, including stem. 8th joint: d- and e-bristles slightly longer than c-bristle, bare with blunt tips; f- and g-bristles with 2 short proximal filaments, 1 short subterminal filament, and 2 long terminal filaments, including stem.

Second Antenna (Figure 24g–j): Protopodite bare. Endopodite 2-jointed (Figure 24h,i): 1st joint short with 1 short bristle; 2nd joint elongate with squarish tip and 1 long terminal bristle with long proximal and short distal marginal spines. Exopodite: 1st joint elongate, distal margin with short recurved spine with blunt (open?) tip (Figure 24j); joints 2 to 7 or 8 with spines along dorsal margins; bristles on joints 2–9 without spines or natatory hairs (Figure 24g); 9th joint with 3 bristles (1 short 2 long; long bristles slightly shorter than bristle of 8th joint).

Mandible (Figure 25a): Coxale endite spinous with strong teeth at tip; dorsal half of coxale with long hairs on lateral surface. Basale: dorsal margin with 1 short bristle near middle and 2 subterminal bristles, outer of these about three-fourths length of inner bristle; ventral margin with 1 subterminal

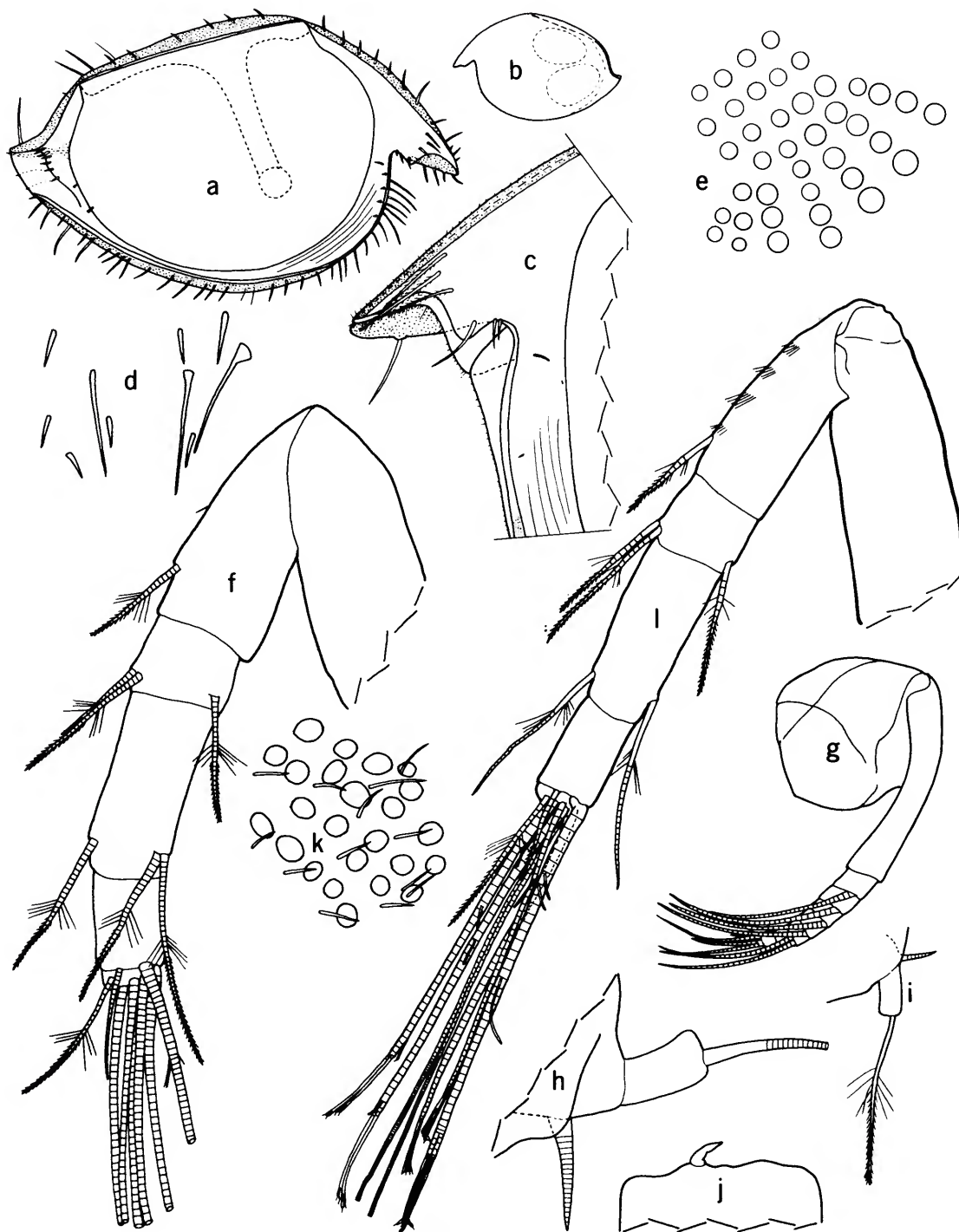


FIGURE 24.—*Tetragonodon ctenorynchus* (Brady), female, [USNM 142387], length 1.89 mm: *a*, left valve, medial view; *b*, whole specimen showing 2 eggs; *c*, incisur and rostrum of right valve, medial view; *d*, bristles on outer surface of valve; *e*, ends of central adductor muscles projecting through left side of body anterior to left; *f*, right 1st antenna, medial view; *g*, sketch of 2nd antenna, endopodite not shown; *h*, endopodite of right 2nd antenna, medial view; *i*, endopodite of left 2nd antenna, medial view; *j*, recurved spine on tip of 1st joint of exopodite of left 2nd antenna, medial view. Female, USNM 150278, length 1.69 mm: *k*, fossae and bristles on outer surface of left valve anterior to middle. Female, USNM 105105: *l*, right 1st antenna, medial view.

bristle; lateral surface spinous, with 3 or 4 bristles forming row distal to middle of joint (bases of bristles almost on ventral margin); medial surface spinous, with 5 short bristles near ventral margin (4 proximal, 1 near middle). Exopodite with hirsute tip reaching past middle of dorsal margin of 1st endopodite joint, with 2 subterminal bristles (inner of these with long spines near middle and short spines distally; outer bristle slightly shorter than inner bristle and with only short marginal spines). Endopodite: 1st joint with 3 spinous terminal bristles (2 long, 1 short); 2nd joint with 3 short ventral bristles (1 subterminal, 2 terminal) and 7 dorsal bristles (2 proximal, 5 near middle); medial surface of joint with spines forming clusters; end joint with 2 subequal claws with a few teeth proximally and near middle of ventral margin, 1 short spinelike bristle at dorsal corner, and 3 bristles.

Maxilla (Figure 25c-f): Precoxale with dorsal fringe of hair. Coxale with long hirsute anterior bristle (Figure 25c). 1st endite with 6 spinous bristles; 2nd endite with about 8 spinous bristles; 3rd endite with about 8 spinous terminal bristles and 1 short proximal bristle. Basale with 3 bristles along distal margin (the inner of these on slender lobe). Exopodite with 1 short and 2 long bristles. Endopodite: 1st joint with 1 α -bristle and 2 β -bristles (Figure 25c,d); 2nd joint with 3 a-, 2 b-, 2 c-, and 3 d-bristles (Figure 25d-f).

Fifth Limb (Figures 25b,g-i, 26a-c): Epipodial appendage with 46 bristles. 1st endite with 2 bristles; 2nd and 3rd endites with about 6 bristles. Exopodite: 1st joint with main tooth consisting of 4 constituent teeth (proximal of these peglike, remaining teeth with marginal teeth) (Figure 25b,g,i), 1 short stout, spinous bristle present proximal to peglike tooth, anterior side with 2 slender bristles near

middle of distal margin and 1 short slender bristle on outer corner (Figure 25h); 2nd joint consisting of large squarish tooth, posterior side with group of 3 bristles (1 long, 2 short) and proximally to them, 1 stout bristle; 3rd joint with 2 bristles on outer lobe and 3 on inner lobe; 4th and 5th joints fused, hirsute with 4 spinous bristles.

Sixth Limb (Figure 26d): 1st endite with 3 short spinous bristles (1 terminal, 2 medial); 2nd endite with 3 spinous terminal bristles; 3rd endite with 6 spinous terminal bristles; 4th endite with 5 spinous terminal bristles; end joint with 8 bristles (6 spinous, 2 hirsute, the latter located on posterior edge); end joint not produced posteriorly; 1 short spinous bristle in place of epipodial appendage; limb hirsute.

Seventh Limb (Figure 26e,f): 6 bristles in terminal group (3 on each side), 4 bristles in proximal group (2 on each side), all bristles with 2-6 bells and marginal spines distally; terminus consisting of comb with 8 or 9 alate teeth opposed by 4 pegs.

Furca (Figure 26g,i): Each lamella with 9 or 10 claws, each separated from lamella by suture; claws decreasing in length posteriorly along lamella; claw 1 with row of minute teeth along lateral side and few large teeth on medial surface; remaining claws with small teeth along posterior margin; proximal teeth larger than distal teeth; hairs present on lamella between claws.

Eyes and Rod-shaped Organ: Absent.

Lips: Upper lip with 4 small processes at tip, (lower lip with spines) (Figure 26h-j; Plates 12e, 13, 14a).

Anterior and Posterior of Body: Anterior with button-like process (Plate 14b,c). Posterior bare.

Y-Sclerite: Without ventral branch (Figure 26k).

Genitalia: Represented by sclerotized round ring (Figure 26k).

Eggs: [USNM 142387] with 4 large eggs in brood chamber. USNM 150105, 3 specimens, one with 4 eggs and two with 5.

DESCRIPTION OF ADULT MALE (Figures 27-29).—Carapace similar to that of female except rostrum and caudal process broader (Figures 27, 28a,b).

Ornamentation: Surface similar to that of female carapace; hairs on caudal process longer than those on female (Figure 28b).

Infold: Similar to infold of female, except only 5 flat spinous bristles on list of caudal process on specimen examined.



FIGURE 25.—*Tetragonodon ctenorynchus* (Brady), female, USNM 105105: *a*, right mandible, medial view; *b*, main tooth and large tooth of 2nd exopodite joint of right 5th limb, anterior view. Female, [USNM 142387]: *c*, left maxilla, lateral view (terminal bristles of endites and distal bristles of endopodite not shown); *d*, lateral view of left maxilla showing β -bristles of 1st endopodial joint and α -bristles of end joint; *e*, medial view of end joint of right maxilla showing *b*-, *c*-, and *d*-bristles of end joint. Female, USNM 150278: *g*, tip of right 5th limb, posterior view; *h*, tip of right 5th limb, anterior view; *i*, main tooth on 1st exopodite joint of right 5th limb.

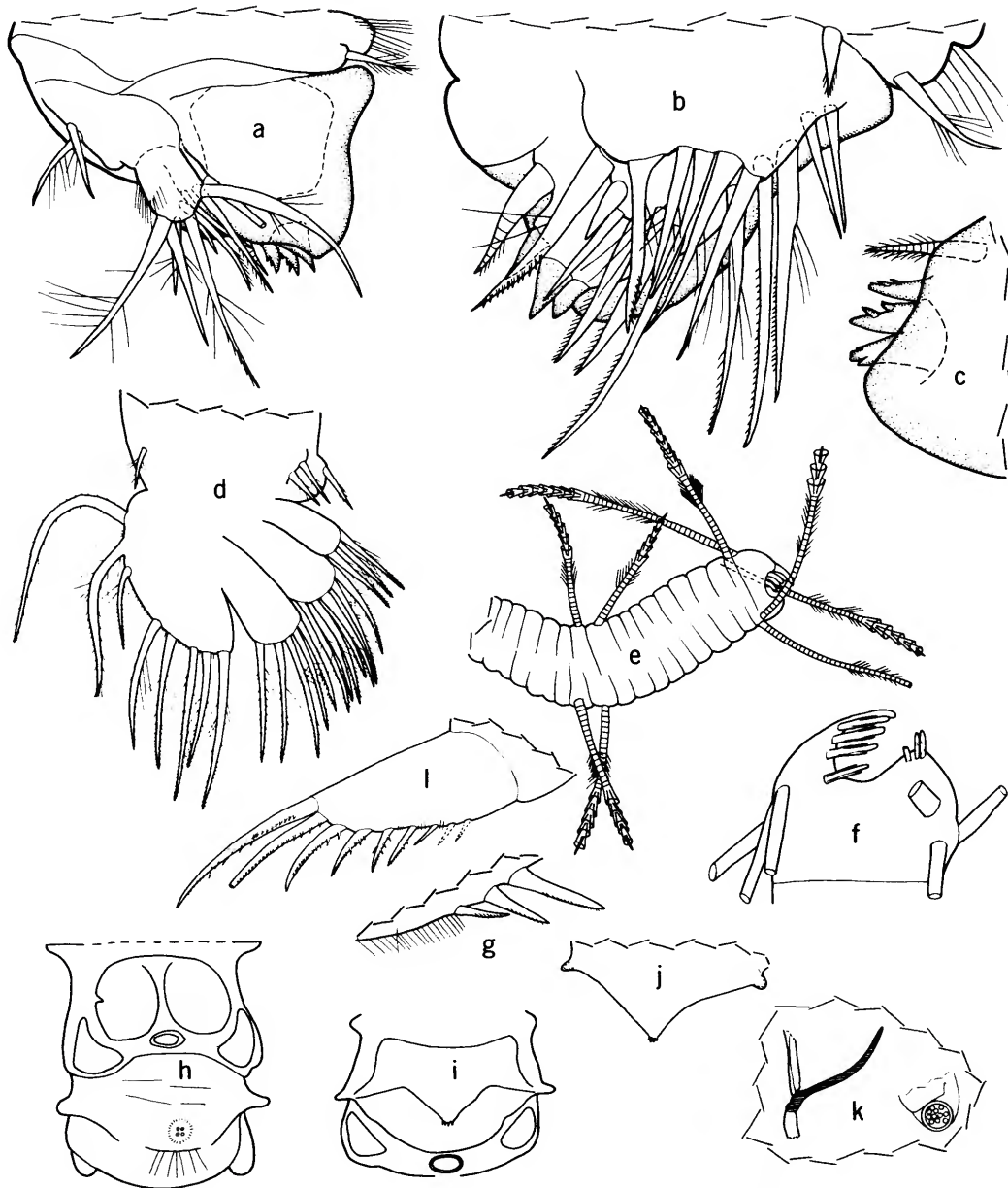


FIGURE 26.—*Tetragonodon ctenorynchus* (Brady), female, [USNM 142387]: *a*, tip of left 5th limb, posterior view; *b*, tip of right 5th limb, anterior view; *c*, main tooth and tip of large tooth of 2nd exopodial joint of left 5th limb, posterior view; *d*, right 6th limb, medial view; *e*, 7th limb; *f*, tip of 7th limb; *g*, claws 8, 9, and 10 of right lamella of furca; *h*, anterior view of body with appendages removed, medial eye and rod-shaped organ not shown; *i*, ventral view of anterior part of body with appendages removed; *j*, ventral view of upper lip, from *i*; *k*, right part of body near furca showing Y-sclerite and right genital organ. Female USNM 150278: *l*, left lamella of furca, lateral view.

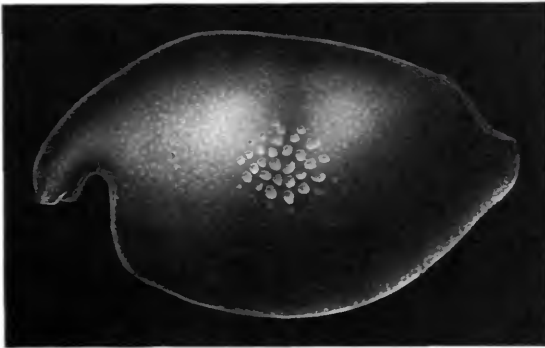


FIGURE 27.—*Tetragonodon ctenorynchus* (Brady), adult male, USNM 150102, whole specimen, length 1.50 mm.

Selvage: Similar to selvage of female.

Size: USNM 150102, length 1.50 mm, height 0.91 mm.

First Antenna (Figure 28c,d): 1st joint: bare. 2nd joint: 1 subterminal dorsal bristle, and long hairs on medial surface. 3rd joint: short with 1 ventral and 2 dorsal bristles. 4th joint: twice length of 3rd joint, with 2 proximal ventral bristles and 1 subterminal dorsal bristle. 5th joint wedged ventrally between 4th and 6th joints, sensory bristle with abundant filaments on bulbous proximal part, stem of sensory bristle posterior to proximal bulb with 4 distal filaments and bifurcate tip. 6th joint: long, narrow, with medial bristle about same length as joint. 7th joint: a-bristle about same length as bristle of 6th joint, with few long proximal spines; b-bristle, about one and one-half times the length of a-bristle, with 4 marginal filaments; c-bristle very long with 11 marginal filaments. 8th joint: d- and e-bristles bare, reaching past sensory bristle of 5th joint; f-bristle very long, similar to c-bristle but with 10 marginal filaments; g-bristle slightly longer than c- and d-bristles, with 4 marginal filaments and bifurcate tip.

Second Antenna: Protopodite bare. Endopodite 3-jointed (Figure 28e): 1st joint short with 4 bristles (1 longer than others); 2nd joint elongate with 2 long ventral bristles near middle; 3rd joint elongate, reflexed on 2nd, with 2 short subterminal bristles and knifelike tip. Exopodite: 1st joint without distomedial spine; joints 2–8 with spines along dorsal margin; bristle on 2nd joint reaching well past end of limb, with natatory hairs, without ventral spines; 2nd joint only slightly longer than 3rd, and 3rd joint only slightly longer

than 4th; bristles of joints 3–8 long, with natatory hairs, without ventral spines; 9th joint with 3 bristles (2 long with natatory hairs; 1 dorsal, short, bare), 2 slender spines on distal dorsal corner.

Mandible (Figure 28f): Coxale bare, without endite. Basale: medial surface spinous with 4 short proximal bristles on sclerotized ridge near proximal ventral corner, one short bristle with short marginal spines near middle of ventral margin, and 1 subterminal bristle with long proximal and short distal spines (base of bristle almost on ventral margin); ventral margin with 3 long bristles near middle with long proximal and short distal spines; dorsal margin with 2 long subterminal bristles. Exopodite hirsute, about three-fourths length of 1st endopodite joint, with 2 bare terminal bristles. Endopodite: 1st joint with medial surface spinous, ventral margin with 3 terminal bristles; 2nd joint with ventral margin with 3 subterminal bristles forming groups of 1 and 2 bristles each; dorsal margin with 7 bristles (2 proximal to middle, 5 near middle); medial surface spinous; end joint with 3 claws (dorsal of these very short), and 3 short slender bristles.

Maxilla (Figure 29a,b): Limb reduced; precoxale and coxale with dorsal fringe of hairs; coxale with short dorsal bristle with long hairs. 1st endite with 5 weak bristles; 2nd endite with 6 weak bristles; 3rd endite with 1 short proximal bristle and 7 weak distal bristles. Basale hirsute with 3 bristles along distal margin. Exopodite with 1 short and 2 long bristles. Endopodite: 1st joint hirsute with 1 bare α -bristle and 2 bare β -bristles; 2nd joint with 8 bristles.

Fifth Limb (Figure 29c): Limb weakly developed; epopodial appendages with 53 bristles; 1st and 2nd endites each with 1 small bristle; 3rd endite with 6 or 7 weak bristles; exopodite with 11 bristles.

Sixth Limb (Figure 29d): Endite I without distinct lobe, with 2 short bristles; endite II forming lobe with 3 long bristles; endite III longer than endite II, with 7 bristles (5 hirsute, 2 with short spines); endite IV with 5 bristles (3 hirsute, 2 with long proximal and short distal spines); end joint not produced posteriorly, with 9 or 10 bristles (posterior 2 of these hirsute, stouter and longer than others); limb hirsute; epipodial bristle not observed (limbs somewhat fragmented in that area on specimen examined).

Seventh Limb (Figure 29e): 4 short bristles in

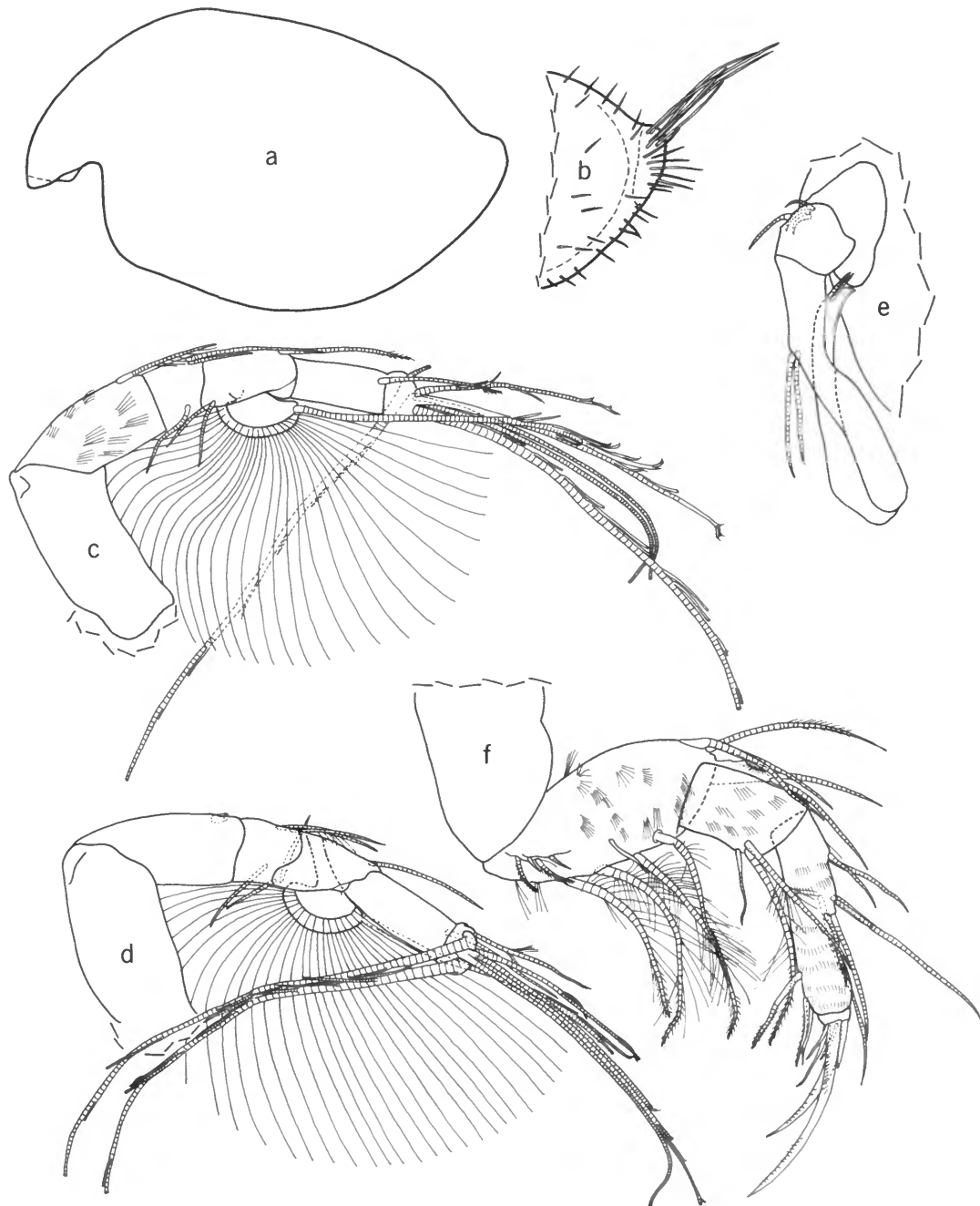


FIGURE 28.—*Tetragonodon ctenorynchus* (Brady), adult male, USNM 150102, length 1.50 mm: *a*, outline of whole specimen; *b*, hairs on posterior end of left valve; *c*, left 1st antenna, medial view; *d*, right 1st antenna, lateral view; *e*, endopodite of right 2nd antenna, medial view; *f*, left mandible, medial view.



FIGURE 29.—*Tetragonodon ctenorynchus* (Brady), adult male, USNM 150102: *a*, maxilla, ?right lateral; *b*, tip of maxilla, ?left medial; *c*, distal end of 5th limb; *d*, 6th limb; *e*, 7th limb; *f*, right lamella of furca, right copulatory organ and testes; *g*, anterior part of body showing hirsute upper lip; *h*, right Y-sclerite, anterior to right.

proximal group (2 on each side), each with 3 or 4 bells; 4 bristles in distal group (2 on each side), each with 6 or 7 bells and marginal spines distally; terminus consisting of comb with 7 spinous or alate teeth opposed by 2 pegs.

Furca (Figure 29*f*): Each lamella with 9 claws, each separated from lamella by suture; claws decreasing in length posteriorly along lamella, more slender than those of female furca; all claws with teeth along posterior margin, proximal teeth larger than distal teeth; claw 1 without large medial teeth present on female claw; posterior 5 claws with teeth also along ventral margins.

Eyes and Rod-shaped Organ: Absent.

Upper Lip: Projecting anteriorly, small processes present on female not observed (Figure 29*g*).

Posterior of Body: Bare.

Y-Sclerite: Small ventral branch distally (Figure 29*h*).

Genitalia: Copulatory organ with sclerotized terminal hook (Figure 29*f*).

Scleroconcha Skogsberg, 1920

Only one species of *Scleroconcha* was collected, *S. folinii* (Brady, 1971). The specimens provided an opportunity to give a supplementary description of the species.

DISTRIBUTION.—The genus is widespread between the latitudes 50°N and 78°S at depths of intertidal to about 1226 m. Species in the present collection were from off Spanish Sahara and the Islamic Republic of Mauritania, at depths of 260–270 m.

Scleroconcha folinii (Brady, 1871)

FIGURES 30–33; PLATES 15–19

Philomedes folinii Brady, 1871:294, pl. 27.

Philomedes Folini Brady.—Brady, 1872:60, pl. 5: fig. 3; 1879:213; 1886:164–166 [list].—Brady and Norman, 1896:662, pl. 51: figs. 9, 10, pl. 56: figs. 11, 12.

Philomedes folini Brady.—Brady, 1880:160.—Müller, 1912:26 [key], 30 [diagnosis].—Klie, 1943:49.—Kornicker, 1969b, table 1.

Philomedes Folinii Brady.—Sars, 1888[1887]:220, pl. 3: figs. 3, 4, pl. 9.—Müller, 1894:209.—Brady and Norman, 1896:760.

Philomedes (Scleroconcha) Folini Brady.—Skogsberg, 1920:366, 367, 380.

Scleroconcha folini (Brady).—Poulsen, 1962:359 [locality map].

TYPE SPECIMENS.—Centre D'Etudes et de Recherche Scientifiques, Biarritz, France.

TYPE-LOCALITY.—Bay of Biscay.

MATERIAL.—USNM 141545, 1 ovigerous female from station X048; USNM 152830, 1 adult female and 6 juveniles from station X048; 3 juveniles from station X048 deposited in Museum of Natural History "Grigore Antipa"; USNM 156635, 1 specimen from station X053.

DISTRIBUTION.—Bay of Biscay, water depth 64–128 m (Brady and Norman, 1896:664); Messina, 20–38 m (Sars, 1888[1887]:227); Gulf of Naples (Müller, 1894:209); off west coast of Morocco, 33°30'20"N, 8°24'30"W, 55 m (Klie, 1943:49); off Islamic Republic of Mauritania, 260–270 m (herein); off Spanish Sahara, 22°57'N, 17°31'W, 930 m, and 23°00'N, 17°30'W, 932 m (see Kornicker, 1969b, table 1).

SUPPLEMENTARY DESCRIPTION OF FEMALE.—Carapace with prominent rostrum, shallow incisur, and projecting posteroventral caudal process; greatest height in front of middle, greatest length below middle (Figure 30).

Ornamentation (Figure 30; Plates 15–16a): Surface with 5 longitudinal ribs (Figure 30): dorsal

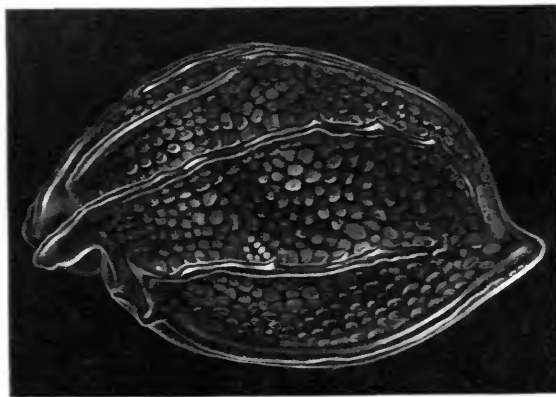


FIGURE 30.—*Scleroconcha folinii* (Brady), female, USNM 141545, whole specimen, length 2.56 mm.

rib just within dorsal margin and parallel to it, with anterior end on rostrum and posterior end just ventral to posterodorsal corner of valve; ventral rib just within ventral margin and parallel to it, with anterior end at small anteroventral process and posterior end on caudal process; main lateral rib dorsal to valve middle and convex, with anterior end on rostral process and posterior end just anterior to caudal process; short anterodorsal rib with anterior end at rostrum and posterior end intersecting with dorsal rib at peak of dorsal margin; linear rib below central adductor muscles with anterior end at short vertical rib near small anteroventral process and posterior end on low broad node just anterior to posterior end of main convex rib; lateral process on rostrum extending past anterior end of rostrum; narrow rib extending ventrally from inner end of incisur to point just below incisur, where it forms minute process extending to anteroventral margin of valve and then continues posteriorly to meet anteroventral process at ventral end of short vertical rib; the narrow rib combines with the short vertical rib to form a small U-shaped rib. Surface of valve with shallow fossae (Figure 30; Plate 15a–d), minute rimmed pores (Plates 15e,f, 16a) and scattered bristles emerging from rimmed open pores (Plate 15e); hairs along outer edge of caudal process with short marginal hairs (Plate 18b,c).

Infold: Infold on rostrum with 14 spinous bristles (Plate 16b,c,e); small bristle present below inner end of incisur (Plate 16d) followed by space and then 8 short spinous bristles forming row on anteroventral list (Plate 17a,b); anteroventral infold with about 10 striations (Plate 17a); ventral infold bare; posteroventral and posterior list with numerous bristles in groups of up to 6 bristles; (Figure 31a; Plates 17c, 18a); flap with 4–8 bristles present between posterior list and posterior edge of valve (Figure 31a; Plate 17c), some of these bristles may be tubular with terminal opening (Plate 17e,f); 1 bristle present between flap and valve edge, close to valve edge; inner end of incisur with spinous pair of bristles medial to lamellar prolongation of selvage (Plate 16c,d).

Selvage: Striate lamellar prolongation with short fringe present; prolongation discontinuous in area of incisur (Figure 30; Plates 15c, 16c,d); outer surface of prolongation with short hairs (Plate 19).

Central Muscle Attachment Scars: Consisting of

about 11 ovoid individual scars. Muscles shown in Plate 18*d-f*. All scars not shown in Figure 30.

Size: USNM 141545, separated left valve, length 2.56 mm, height 1.64 mm; USNM 152830, undis-



FIGURE 31.—*Scleroconcha folinii* (Brady), female, USNM 141545, length 2.56 mm: *a*, caudal process of right valve, medial view; *b*, left 1st antenna, medial view; *c*, endopodite of right 2nd antenna, medial view; *d*, tip of right 5th limb, anterior view.

sected specimen, length 2.64 mm, height 1.64 mm. Brady and Norman (1896:663) gave the length of the female as 2.6 mm, height 1.7 mm; Sars (1888[1887]:221) gave the length of the female as 2.42 mm.

First Antenna (Figure 31b): 1st joint: few short spines forming distal rows on medial and lateral surfaces near dorsal margin. 2nd joint: long proximal spines on medial surface near dorsal margin, short spines forming row on medial surface near middle of dorsal margin, short spines along ventral margin, short spines on lateral surface at distal end, and 3 spinous bristles (1 ventral, 1 dorsal, and 1 lateral). 3rd joint: short with 3 spinous bristles (1 ventral, 2 dorsal). 4th joint: few short spines along ventral margin and 5 spinous bristles (3 ventral, 2 dorsal). 5th joint: elongate with sensory bristle with 7 short proximal filaments and 4 short marginal filaments near tip. 6th joint: minute with medial bristle with few long proximal spines and short distal spines. 7th joint: a-bristle similar to bristle on 6th joint but slightly longer; b-bristle about one and one-half times length of a-bristle, with 5 short marginal filaments; c-bristle longer than b-bristle, about same length as sensory bristle of 5th joint, with 9 marginal filaments (5 proximal, 4 distal). 8th joint: d- and e-bristles bare, about same length as c-bristle; f- and g-bristles about same length as c-bristle, with 10 short marginal filaments (6 proximal, 4 distal).

Second Antenna: Protopodite bare. Endopodite 2-jointed (Figure 31c): 1st joint short with 6 short spinous bristles (5 proximal, 1 distal); 2nd joint long with 2 bristles (proximal bristle spinous, about 5 times length of 2nd joint; terminal bristle short, about twice width of 2nd joint). Exopodite: 1st joint with short medial terminal spine; bristles of joints 2-4 relatively short, bare; bristles of joints 5-8 long, unbroken, with natatory hairs; 9th joint with 7 bristles (1 short with short marginal spines, 4 long with natatory hairs, 2 medium with natatory hairs); joints 3-8 with short basal spines; joints 2-8 with short spines forming row along distal margin. (The absence of natatory hairs on the bristles of exopodial joints 2-4 supports the findings of Skogsberg (1920:367) and not the illustration of Sars (1888[1887], pl. 9: fig. 3) which shows these bristles to have natatory hairs.)

Mandible (Figure 32a): Coxale endite bifurcate, spinous, with minute bristle near base. Basale:

medial surface with long hairs and 6 bristles (5 proximal, 3 pectinate and 2 spinous; and 1 near middle); ventral margin with 7 spinous bristles (base of proximal 5 of these on lateral surface); dorsal margin with 3 spinous bristles (1 subterminal, 2 terminal). Exopodite hirsute, reaching past middle of dorsal margin of 1st endopodial joint, with 2 spinous subterminal bristles. Endopodite: 1st joint with ventral margin with 3 spinous terminal bristles, dorsal margin with short spines on distal corner; 2nd joint with dorsal margin with 4 spinous proximal bristles, 6 longer spinous bristles near middle, and 1 short triaenid medial bristle between proximal and middle groups, ventral margin with 2 distal groups of bristles, each with 3 spinous bristles, medial surface and ventral margin with spines forming clusters; end joint with 3 claws and 4 bristles, all claws with faint minute teeth proximally or near middle of ventral margin.

Maxilla (Figure 32b): Coxale with 1 stout plumose dorsal bristle; both precoxale and coxale with transparent fringed epipodite dorsally. 1st endite with 11 distal bristles; 2nd endite with about 6 distal bristles; 3rd endite with about 7 distal bristles. Basale with 1 proximal bristle near margin of 3rd endite and 3 distal bristles (one of these very short). Exopodite with 3 bristles (one of these very short). Endopodite: 1st joint with 1 α -bristle with long proximal and short distal spines and 4 β -bristles; end joint with 3 clawlike, pectinate bristles, remaining bristles of end joint difficult to study on mounted specimen.

Fifth Limb (Figures 31d, 32c): Epipodial appendage with 53-57 bristles, Endite I with 6 bristles; endite II with 7 bristles; endite III with 10 bristles. Exopodite: 1st joint with anterior side with 2 bristles near middle and 1 short bristle on small lobe near outer margin, main tooth consisting of 4 constituent pectinate teeth, anterior part of main tooth smooth and triangular, 1 bristle with short marginal spines present proximal to teeth of main tooth; 2nd joint with posterior side with long proximal d-bristle with few spines and group of 3 a- and b-bristles (middle long bristle with few marginal teeth, bare inner bristle about two-thirds length of middle bristle, outer bristle only about one-fourth length of middle bristle), presence or absence of d-bristle on anterior side could not be determined on specimen examined, inner curvature of large tooth with small pointed tooth; 3rd joint

with 2 spinous bristles on outer lobe and 3 bristles on inner lobe (2 spinous, 1 with minute teeth); 4th joint with 6 spinous bristles.

Sixth Limb (Figure 33a): 3 hirsute bristles in place of epipodial appendage; endites I and II with 3 spinous bristles; endite II with few spines and



FIGURE 32.—*Scleroconcha folinii* (Brady), female USNM 141545: *a*, right mandible, medial view; *b*, left maxilla, lateral view; *c*, tip of left 5th limb, posterior view; *d*, right side of body showing part of Y-sclerite, genitalia, and brushlike organ, anterior to right; *e*, right Y-sclerite.

hairs on lateral surface; endite III with 8 spinous bristles; endite IV with 7 spinous bristles; end joint moderately prolonged posteriorly, with 23-25 spinous and plumose bristles; endites III and IV

and end joint with clusters of long hairs on lateral and medial surfaces.

Seventh Limb (Figure 33*b,c*): Each limb with 10 bristles (4 proximal, 2 on each side; and 6 distal, 3



FIGURE 33.—*Scleroconcha folinii* (Brady), female, USNM 141545: a, 6th limb; b, tip of 7th limb; c, 7th limb; d, anterior of body showing lateral eye, medial eye and rod-shaped organ, anterior process and upper lip; e, distal end of left lamella of furca, lateral view (marginal teeth not shown). Specimen identified by Klie (see page 46); f, left lamella of furca, lateral view.

on each side), each bristle with 2-5 bells, tip of bristles bell-like, about one-half diameter of proximal bells, bristles with marginal spines except proximally; terminal comb with 12 teeth with few or many long spines; 1 smooth recurved peg opposite comb (Figure 33b).

Furca (Figure 33e,f): Each lamella with 13 claws decreasing in length posteriorly on lamella, but claws 6-13 sufficiently smaller than claws 1-5 to prevent considering decrease to be gradual; claw 3 more slender than claw 4; claws 1-4, possibly others, with teeth forming lateral and medial row along posterior margin; claws 5-13 with small teeth along anterior margins; anterior teeth closer to size of posterior teeth on smaller claws; hairs present on claws 1 and 2 near lamella, on lamella near base of claws, and on lamella following claws.

Rod-shaped Organ (Figure 33d): Elongate with about 9 short segments in middle part; tip pointed, with 1 or more hairs projecting anteriorly from tip.

Eyes: Medial eye represented by a widening on the proximal end of the rod-shaped organ, unpigmented (Figure 33d). Lateral eye small with 2 ommatidia (Figure 33d).

Upper Lip (Figure 33d): Projecting anteriorly, hirsute with glandular processes at tip; large single rounded process present between rod-shaped organ and lip (Figure 33d).

Posterior of Body: Hairs present along lower part.

Y-Sclerite: Typical for genus (Figure 32d,e).

Genitalia: Consisting of small sclerotized oval (Figure 32d).

Brushlike Organ: Consisting of 7 minute bristles dorsal to genitalia and between anterior fork of Y-shaped sclerite (Figure 32d).

Eggs: USNM 141545 with 6 eggs.

DISCUSSION OF SPECIMENS FROM OFF MOROCCO REPORTED BY KLIE (1943:49).—Through the courtesy of Dr. Gerd Hartmann the senior author received from the Hamburg Zoological Museum 2 specimens in alcohol that had been identified by Klie (1943) as *Philomedes folini* Brady. The vial contained a complete specimen (length 2.07 mm, height 1.49 mm), 1 smaller distorted empty shell (length 1.55 mm, height 0.99 mm), and a label

stating, "*Philomedes folini* Brady, Weskuste von Marokko: — Vanneau — Stat. LVI 33°30'20"N, 8°24'30"W, Tiefe 55 m, 24 Juni 1924." The left lamella of the furca, which was protruding out of the shell of the larger specimen, is illustrated in Figure 33f. The endopodite of the 2nd antenna of that specimen was sufficiently visible through the shell to determine that the specimen is a female. The presence of only 11 furcal claws on the furca and the small size of the carapace indicate it to be a juvenile. The length of the 3rd furcal claw is somewhat shorter relative to the 4th claw than that on the furca of the adult female described herein, but the similarity of the distribution of the ribs on the carapace of Klie's specimen and on the adult female described here leads us to concur with Klie's identification.

PSEUDOPHILOMEDINAE Kornicker, 1967

This subfamily contains two genera: *Paramekodon* Brady and Norman, 1896, and *Pseudophilomedes* Müller, 1893. Brady and Norman (1896:670) reported *Paramekodon inflatus* in samples collected off Spanish Sahara, at a depth of 1435 m, but no specimens are in the present collection, possibly because the maximum sampling depth was 1120 m, and only three samples were collected below 1000 m. Members of the genus *Pseudophilomedes* are reported herein for the first time from the west coast of Africa. The adult male of members of this subfamily was previously unknown. Adult males of two species of *Pseudophilomedes* are described herein.

Pseudophilomedes Müller, 1893

Three species of *Pseudophilomedes* were collected: *P. angulatus* Müller, 1894, *P. tetrathrix*, new species, and *P. thalassa*, new species. A supplementary description is given of the lectotype of *P. foveolatus* Müller from the Gulf of Naples. The additional species in the genus is *P. ferulanus* Kornicker, 1958.

DISTRIBUTION.—Members of *Pseudophilomedes*

Key to the Genera of Pseudophilomedinae

Seventh joint of 1st antenna with b-bristle	<i>Pseudophilomedes</i>
Seventh joint of 1st antenna without b-bristle	<i>Paramekodon</i>

have previously been reported from the Gulf of Naples (Müller, 1894), the Great Bahama Bank (Kornicker, 1958), the Atlantic shelf off Georgia (Darby, 1965), and the Atlantic shelf off North Carolina (Kornicker, 1967), at a depth range of 6–160 m. Species in the present collection were from off Mauritania and Spanish Sahara at depths of 150–534 m.

MICROSTRUCTURES

NORMAL PORES.—All the species observed have simple pores with bristles (hairs): female *P. angulatus* (Plate 21a), *P. thalassa* (Plate 24f), *P. tetrathrix* (Plate 28c). The hair-pores of the A-1 male of *P. angulatus* have crescent-like ribs forming a discontinuous rim around the bristle (Plate 22d–f). Minute pustules containing a simple hairless pore at the middle are present between fossae on *P. angulatus* (Plates 21d, 22d,e) and *P. tetrathrix* (Plates 27e, 28a,c). The pustules circumscribe the edge of fossae on *P. tetrathrix* (Plate 28e,f). Small pustules with a central pore that are either surrounded by a rim or are without rims are on bottom of fossae on *P. angulatus* (Plate 21c,d) and *P. tetrathrix* (Plate 28d,e). Minute fossae on *P. tetrathrix* have in the middle of their flat bottoms a small pustule with a central pore.

ORNAMENTATION.—The female *P. angulatus* bears well developed ribs (Plate 20a,c). Ribs are weakly developed on the female *P. tetrathrix*; on the micrograph of the specimen examined ribs appear only on the rostrum (Plate 26d). The female *P. thalassa* bears small posterior nodes (Plate 24d). Nodes are also present on the male *P. angulatus* (Figure 37), but they did not appear on micrographs of the specimen examined. Large oval fossae with flat bottoms are present on *P. angulatus* (Plates 20e,f, 21c, 22), and *P. tetrathrix* (Plates 26d,f, 27b,c, 28e). Oval fossae also are present in the area of the adductor muscles and may represent places of muscle attachment of *P. angulatus* (Plate 20f) and *P. tetrathrix* (Plates 27a, 28a). The bottom of these fossae differs from those in other parts of the valve in having very few pores (Plate 28b). Minute fossae between the larger fossae discussed above form clusters on *P. tetrathrix* (Plate 27d–f). On the bottom of the fossae in the area of the central adductor muscles, minute papillae are visible at magnifications of about 15,000 (Plate 28b).

BRISTLES.—Long and short bristles, broadening near base are present on *P. angulatus* (Plates 20e, 21a, 22d–f), *P. thalassa* (Plate 24f), and *P. tetrathrix* (Plates 26d–f, 27a,b, 28c). Crenulations on the base of the long bristles are less pronounced than those observed on bristles of members of the Philomedinae.

SELVAGE.—The lamellar prolongation of the selvage is fringed along the rostrum and lower margin of the incisur, and the former overlaps the latter in the incisur area of the female *P. angulatus* (Plate 20e) and *P. tetrathrix* (Plate 26e).

INFOLD.—Bristles on the rostral infold of the male *P. angulatus* have marginal spines (Plate 23b). Setose bristles are present on the posterior end of the list on the caudal process of the male *P. angulatus* (Plate 23c,d).

SEXUAL DIMORPHISM

The adult males are known for only two species: *P. thalassa* and *P. angulatus*. The carapaces of males are smaller than those of females. The rostrum of the male *P. thalassa* overhangs the incisur, whereas, the incisur of the female forms a right angle. The carapace of the male *P. angulatus* does not have the prominent horizontal ribs present on the carapace of the female.

FIRST ANTENNA.—The male limb differs from that of the female primarily in having a small 5th joint wedged ventrally between the 4th and 6th joints, a sensory bristle (on 5th joint) with abundant long proximal filaments, very long c- and f-bristles.

SECOND ANTENNA.—The protopodite and exopodite are similar to those of female; the male endopodite is 3-jointed with the 3rd joint reflexed on the 2nd; the female endopodite consists of only 1 short joint.

MANDIBLE.—The male limb differs from that of the female primarily in having a short bristle in place of the large bifurcate coxale endite present on the female.

MAXILLA.—The male limb much smaller than that of the female and weakly developed.

FIFTH LIMB.—Male limb weakly developed and without strong teeth on the 1st and 2nd exopodial joints.

SIXTH LIMB.—No sexual dimorphism except endite bristles of male limb with thinner and more abundant marginal hairs.

SEVENTH LIMB.—Females with 6 bristles in distal group and 4 in proximal group. Males with only 4 bristles in distal group and none or 1 in proximal group for *P. thalassa* and 2 in proximal group for *P. angulatus*. Terminus of female limb with opposing combs. Terminus of male *P. angulatus* similar to that of female, but terminus of male *P. thalassa* without combs.

FURCA.—Males and females with same number of furcal claws.

ROD-SHAPED ORGAN, MEDIAL EYE, AND UPPER LIP.—No sexual dimorphism.

LATERAL EYE.—Lateral eye of female *P. thalassa* small with 3–5 ommatidia; lateral eye of male large with 19 ommatidia. Lateral eye of female *P. angulatus* not observed; that of male minute with 2 ommatidia.

BRUSHLIKE ORGAN.—About 5 bristles observed near the female genitalia of *P. angulatus*, but not on males and females of other species.

GENITALIA.—Female with small sclerotized ring; male copulatory organ consisting of elongate lobes with bristles and sclerotized hook.

ONTOGENY

The A-1 males of *P. angulatus*, *P. thalassa*, and *P. tetrathrix*, and the A-1 female of *P. angulatus* were examined. Except for being smaller, the outline and ornamentation of the carapace and the distribution of infold bristles are similar to those of the adult female.

FIRST ANTENNA.—Not examined in detail but in general similar to that of the adult female.

SECOND ANTENNA.—Protopodite and exopodite are similar to those of the adult female; A-1 female endopodite similar to that of the adult female; A-1 male endopodite 3-jointed, but the 3rd joint not

reflexed on the 2nd as on the adult male; also, 3rd joint without terminal ridges.

MANDIBLE, MAXILLA, 5TH AND 6TH LIMBS.—Except for A-1 female of *P. angulatus*, these limbs were not examined in detail, but in general are similar to those of the adult female.

SEVENTH LIMB.—Bristles strongly tapered and having 4 bristles in distal group in both sexes. The A-1 female of *P. angulatus* has 4 bristles in the proximal group. The A-1 male of *P. angulatus* has either no bristles or 2 to 3 bristles in the proximal group (2 specimens without proximal bristles, 1 specimen with 2, and 1 specimen with 3). The A-1 male of *P. tetrathrix* (1 specimen) is without proximal bristles. The A-1 male of *P. thalassa* (1 specimen) has 1 proximal bristle. The adult females of the 3 species studied have parallel sided bristles (6 in the distal group and 4 in the proximal group). Adult males of *P. thalassa* and *P. angulatus* have 4 distal bristles. The adult male of *P. thalassa* is without bristles or has 1 bristle in the proximal group (1 specimen with no bristles, 1 specimen with 1 bristle); the adult male of *P. angulatus* has 2 bristles in the proximal group (1 specimen). The terminus of the A-1 male of *P. thalassa* is bare like that of the adult male; the terminae of the A-1 males of *P. tetrathrix* and *P. angulatus* have opposing combs similar to those of the adults, but with fewer teeth.

FURCA.—Number and distribution of claws are similar to those of furca of adult.

ROD-SHAPED ORGAN, MEDIAL EYE, AND UPPER LIP.—Similar to organs of adult.

LATERAL EYE.—A-1 male of *P. thalassa* well-developed with 16 ommatidia; adult male of that species also with well developed eye, but with 19 ommatidia. The lateral eyes of the A-1 male of *P. tetrathrix* are small and unpigmented, each with

Key to Adult Females of the Species of *Pseudophilomedes*

- | | |
|---|------------------------------------|
| 1. Furca with 8–10 claws | 2 |
| Furca with 6 (rarely 7) claws | 3 |
| 2. End joint of maxilla with stout fingerlike bristle; rostral infold with 4 bristles; one of the 7th limbs with at least 6 proximal bristles | <i>P. ferulanus</i> |
| End joint of maxilla without fingerlike bristle; rostral infold with 9–10 bristles; 7th limbs with 4 proximal bristles | <i>P. thalassa</i> , new species |
| 3. 6th limb with 3 endites | <i>P. joveolatus</i> |
| 6th limb with 4 endites | 4 |
| 4. Carapace with prominent horizontal ribs; carapace length 1.23–1.59 mm | <i>P. angulatus</i> |
| Carapace without prominent horizontal ribs (some with subdued ribs); carapace length 0.93–1.17 mm | <i>P. tetrathrix</i> , new species |

about 12 minute ommatidia; the adult male *P. tetrathrix* is unknown. Lateral eyes were not observed with certainty on either the A-1 female, A-1 male, or the adult female of *P. angulatus*. The adult male of *P. angulatus* has small lateral eyes, each with 2 ommatidia.

GENITALIA.—Copulatory organ of A-1 male weakly developed, consisting of 2 lobes, one of them with few bristles.

Pseudophilomedes angulatus Müller, 1894

FIGURES 34-40; PLATES 21-23

Pseudophilomedes angulata Müller, 1894:212, pl. 3: figs. 50, 52, pl. 4: fig. 3.

HOLOTYPE.—Not selected by Müller; present locality of syntypes, if extant, unknown.

TYPE-LOCALITY.—Gulf of Naples, Italy.

MATERIAL.—USNM 154192, 1 adult female with unextruded eggs from station X048; [USNM 156679], 1 juvenile from station X048; USNM 156682, 1 A-1 male from station X048 (valves torn); USNM 156674, 1 adult male from station X054; USNM 156683, 1 A-1 female from station X054; USNM 150101, 1 A-1 male from station X054; USNM 156645, 1 juvenile male from station X053; USNM 154191, 1 A-1 male from station X072.

DESCRIPTION OF ADULT FEMALE (Figures 34, 36; Plates 20, 21).—Carapace larger and with more strongly developed ribs than the carapace of *P. tetrathrix* (Figure 34; Plate 20a-d); well-developed rostrum overhanging incisur; caudal process small.

Ornamentation: Each valve with horizontal rib

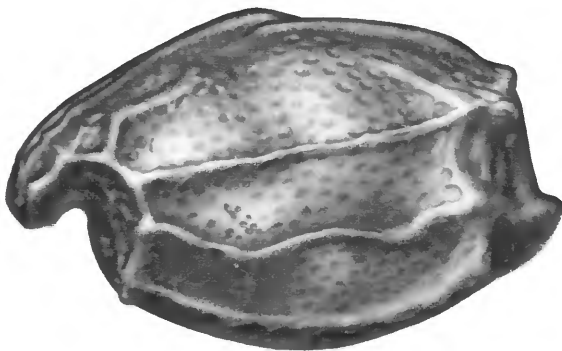


FIGURE 34.—*Pseudophilomedes angulatus* Müller, female, USNM 154192, whole specimen, length 1.59 mm.

(just within and parallel to ventral margin) and 2 horizontal midribs (1 above and 1 below valve middle (Figure 34; Plate 20a-d) anterior end of the 3 ribs connected anteriorly by vertical ridge whose upper end continues onto rostrum (Plate 20e); less strongly developed ribs present along dorsal margin of valves; surface with well-developed fossae (Plates 20e,f, 21a); single hairs forming row along valve edges and scattered over valve surface (Plates 20d,e, 21a); minute pores present on bottom of fossae (Plate 21c,d) and between fossae (Plate 21a,b).

Infold: Broad in area of rostrum and caudal process, narrower elsewhere; infold behind rostrum with 4 spinous bristles forming row parallel to edge of rostrum; infold immediately ventral to rostrum with 1 short bristle; infold in front of caudal process with 5 spinous bristles near top of list; antero-ventral infold with about 3 ridges paralleling valve margin.

Selvage: Wide fringed lamellar prolongation present along anterior, ventral and posterior margins of each valve; prolongation divided at inner corner of incisur (Plate 20e).

Central Muscle Attachment Scars: Consisting of numerous small ovoid scars (Figure 34); fossae in vicinity of muscle attachments smaller than fossae elsewhere (Plate 20f).

Size: USNM 154192, length 1.59 mm, height 0.81 mm (Figure 35). Müller (1912:34) gave the length of a female from the Gulf of Naples as 1.23 mm.

First Antenna: 1st joint: bare. 2nd joint: spines forming rows along ventral and dorsal margins and on medial surface, with 1 bare dorsal bristle reaching just past distal margin of 3rd joint. 3rd joint: 2 bristles (1 ventral, 1 dorsal), both with short marginal spines and reaching past distal margin of 4th joint. 4th joint: 4 bristles (3 ventral, outer of these with few long proximal spines and reaching past 8th joint, middle bristle with few long proximal spines and short spines distally and reaching past distal margin of 5th joint, inner bristle with short marginal spines and not reaching distal margin of 5th joint; and 1 dorsal with long proximal and short distal spines and just reaching distal margin of 5th joint). 5th joint: sensory bristle with 6 marginal filaments and bifurcate tip. 6th joint: medial bristle short, with short marginal spines. 7th joint: a-bristle little more than twice length of bristle of 6th joint, with few short marginal spines; b-bristle slightly longer than a-bristle; c-bristle same

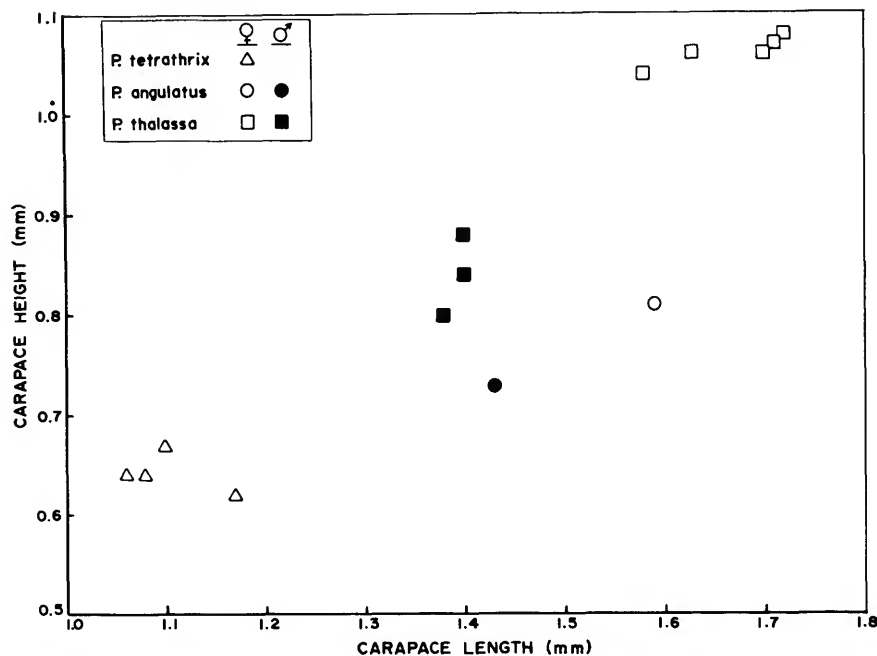


FIGURE 35.—Comparison of relationship between carapace length and height of adult males and females of *Pseudophilomedes angulatus*, *P. thalassa*, new species, and *P. tetratrix*, new species. Only specimens in present collection are included in graph.

length as sensory bristle of 5th joint, with 5 marginal filaments and bifurcate tip. 8th joint: d- and e- bristles bare, about same length as c-bristle; f- and g- bristles about same length as c-bristle, with 5 marginal filaments and bifurcate tip.

Second Antenna: Protopodite bare. Endopodite single jointed with short bare proximal anterior bristle and 1 longer terminal bristle with few long proximal spines and short distal spines. Exopodite: terminal margin of 1st joint with short recurved medial bristle; distal margins of joints 2-8 with spines forming row; bristle of 2nd joint just reaching past distal end of 9th joint, with about 13 stout ventral spines followed by slender hairlike spines; bristles of joints 3-8 relatively short, with stout ventral spines except near knifelike tip, no natatory hairs; 9th joint with 3 short bristles (ventral bristle longer with stout ventral spines; middle bristle only slightly shorter than ventral bristle, with short marginal spines; dorsal bristle very short, bare).

Mandible: Coxale endite with bifurcate spinous tip; minute process present between base of

branches forming tip. Basale: dorsal margin with 1 subterminal bristle about one and one-half times width of joint, with few marginal spines, and 2 terminal bristles reaching past distal end of 1st endopodite joint (lateral bristle bare; medial bristle with few long proximal spines and short distal spines); medial surface spinous with 1 short bristle (with short marginal spines) near middle of ventral margin; 1 long distal bristle with long proximal and short distal spines present near ventral margin but with base on medial surface; 2 minute bristles present on ventral margin distal to middle. Exopodite spinous, not reaching middle of dorsal margin of 1st endopodite joint, with 2 terminal bristles (lateral bristle reaching past distal end of 1st endopodite joint, with long proximal and short distal spines; medial bristle shorter, with short marginal spines). Endopodite: 1st joint with 2 ventral bristles (medial bristle reaching just past tip of limb, with long proximal and short distal spines; lateral bristle not reaching tip of limb, with short marginal spines), medial surface spinous distally; 2nd joint with medial surface with spines

forming about 7 rows, dorsal margin with 4 bristles (1 proximal, 3 near middle bare or with short marginal spines), ventral margin with 1 subterminal bristle and 2 shorter terminal bristles; end joint with 1 long claw, 1 long spinous lateral bristle reaching well past middle of claw, 1 short claw (with ventral hairs proximally) with base on medial edge of joint near middle, and 2 short spinous bristles, 1 ventral and 1 dorsal to short claw.

Maxilla: Precoxale and coxale with dorsal fringe of hairs; coxale with short hirsute dorsal bristle. Endite I with 2 spinous bristles and 3 stout terminal pectinate bristles; endite II with 2 stout terminal pectinate bristles and 2 shorter slender bristles; endite III about half length of endites I and II, with 3 bristles (2 short, 1 long). Exopodite consisting of 3 bristles on lateral side of 1st endopodite joint near basale. Basale hirsute with 2 bristles on distal margin (1 ventral, 1 lateral near dorsal margin). Endopodite: 1st joint with 1 short spinous subterminal dorsal bristle and 1 longer, spinous, terminal bristle near middle of dorsal margin; end joint with 3 slender tapered ringed bristles (Figure 36a).

Fifth Limb: Same as that of female *P. tetrathrix*.

Sixth Limb: Endite I with 3 spinous bristles (1 longer than others); endite II with 1 long bristle with long proximal and short distal spines, or additional shorter distal bristle with short spines; endite III with 5 spinous bristles; endite IV with 4 spinous bristles; end joint with 7 bristles (posterior 2 of these hirsute, remaining with long proximal and short distal spines); 1 short bristle with short marginal spines present in place of epipodial appendage; surface of appendage hirsute.

Seventh Limb: 6 bristles in distal group (3 on each side), 4 bristles in proximal group (2 on each side, each bristle with 2-6 bells and distal marginal spines; terminus consisting of opposing combs, about 5 spinous teeth on 1 comb, opposing comb with about 10 teeth (3-4 alate flat-tipped teeth on each side of 3 longer teeth with rounded tips).

Furca (Figure 36b): Each lamella with 6-7 claws: claw 4 much stouter and longer than claw 3; claw 1 with relatively small medial tooth near middle, teeth along posterior margin, and few hairs along anterior margin; remaining claws with teeth along posterior margin; claws 5-6, or 5-7 with few anterior teeth or spines. Anterior margin of lamella with few spines; lamella following claws with hairs.

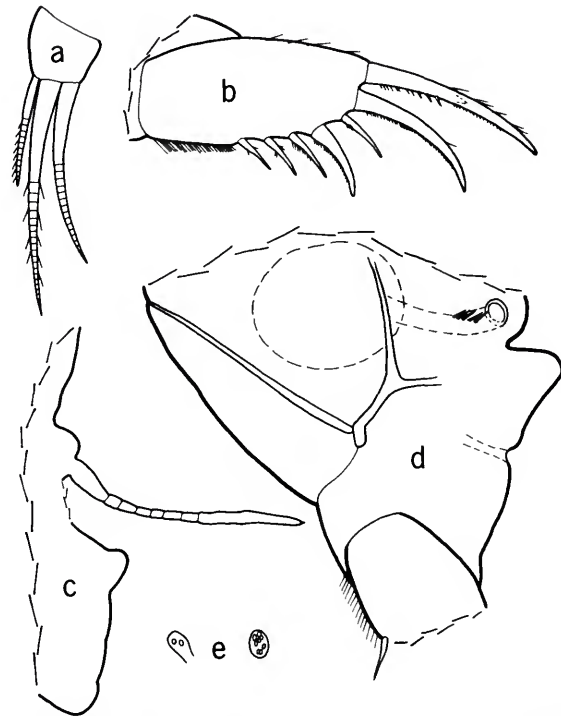


FIGURE 36.—*Pseudophilomedes angulatus* Müller, female, USNM 154192: a, bristles on end joint of left maxilla, lateral view; b, right lamella of furca, lateral view; c, anterior of body showing medial eye and rod-shaped organ, anterior process, and upper lip; d, posterior of body above furca showing Y-sclerite, genitalia, and brushlike organ; e, left and right lateral eyes.

Rod-shaped Organ: Elongate, about 6 segments in middle part; tip rounded with minute spine (Figure 36c).

Eyes: Lateral eye minute (Figure 36e), but not observed with certainty; medial eye bare, unpigmented (Figure 36c).

Upper Lip: Helmet-shaped (Figure 36c).

Y-Sclerite: Normal for family (Figure 36d).

Genitalia and Brushlike Organ (Figure 36d): Genitalia consisting of small sclerotized ring on each side; brushlike organ consisting of about 5 small bristles near genitalia.

Eggs: USNM 154192 with about 5 large unextruded eggs.

DESCRIPTION OF ADULT MALE (Figures 37-39).—Carapace with straight hinge line, overhanging rostrum and projecting caudal process (Figure 37).

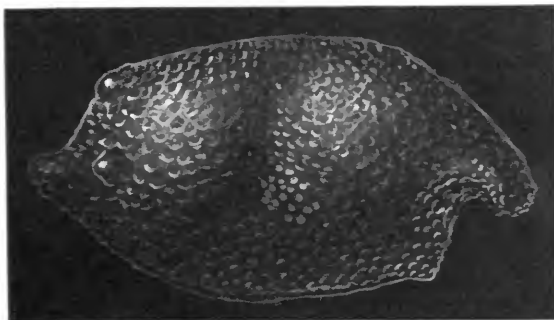


FIGURE 37.—*Pseudophilomedes angulatus* Müller, adult male, USNM 156674, whole specimen, length 1.43 mm.

Ornamentation: Distinct shallow fossae abundant on valve surface (Figure 37); narrow ridge projecting laterally along ventral margin of rostrum and extending slightly onto anterior part of valve posterior to rostrum; posterodorsal part of valve with low node; long bristles present along outer margin and sparsely distributed on lateral surface, some with as many as 4 strands, usually 1 or 2.

Infold: Infold behind rostrum with 4 or 5 spinous bristles; infold of caudal process with 5 spinous bristles near top of list.

Central Muscle Attachment Scars: Consisting of about 20 individual scars (Figure 37).

Size: USNM 156674, length 1.43 mm, height 0.73 mm, height 51 percent of length (Figure 35).

First Antenna (Figure 38a): 1st joint: bare. 2nd joint: 1 dorsal bristle with long marginal spines. 3rd joint: short with 1 dorsal bristle with long marginal spines and 1 ventral bristle with few short marginal spines. 4th joint about twice length of 3rd, with 1 dorsal bristle with long marginal spines. 5th joint: small, triangular, wedged between 4th and 6th joints ventrally; sensory bristle with bulbous base with abundant long filaments and long stem with 1 long proximal filament, 3 short distal filaments, and bifurcate tip. 6th joint: medial bristle about same length as 5th joint. 7th joint: a-bristle reaching just past tip of bristle of 6th joint; b-bristle about 50 percent longer than a-bristle, with 2 long proximal filaments, 1 shorter distal filament, and bifurcate tip; c-bristle very long with about 9 marginal filaments. 8th joint: d- and e-bristles bare, of equal length, reaching just past tip of sensory bristle of 5th joint; f-bristle similar to c-bristle; g-bristle same length as d- and e-bristles,

with 5 short marginal filaments and bifurcate tip. (Limb illustrated has 1st joint bent upward so that lateral side is shown instead of medial.)

Second Antenna: Protopodite bare. Endopodite 3-jointed (Figure 38b): 1st joint short with 2 short proximal, anterior bristles; 2nd joint with 1 bristle proximal to middle; 3rd joint reflexed on 2nd, with 2 short subterminal bristles and ridged tip. Exopodite (Figure 38c): 1st joint with small, medial, terminal bristle; bristles of joints 2–8 with natatory hairs but without spines; 9th joint with 4 bristles (2 long with natatory hairs, 2 short with short hairs or bare); joints 2–8 with short spines forming row along terminal margin.

Mandible (Figure 38d): Coxale endite represented by small spine. Basale: medial surface spinous, with 1 short proximal bristle, and 1 short bristle nearer middle, both near ventral margin; ventral margin with 3 long bristles with long marginal spines; dorsal margin with 1 bristle distal to middle and 2 terminal bristles. Exopodite about one-third length of 1st endopodite joint, with 2 long terminal bristles. Endopodite: medial surface of 1st joint with spines forming rows; ventral margin with 2 long, subterminal bristles with long proximal and short distal marginal spines, and 1 short bristle; 2nd joint with medial and lateral surfaces with spines forming rows; dorsal margin with bristles forming 2 groups proximal to middle (1 bristle in proximal group, 3 in distal group); ventral margin with 3 short subterminal bristles; end joint with 1 long claw with proximal spines along ventral margin, 1 spinous bristle reaching past middle of claw, 1 short ventral bristle with spines along ventral margin, 1 short medial bristle, and 1 short clawlike medial bristle ventral to and longer than short medial bristle.

Maxilla (Figure 38e): Limb weakly developed, reduced. Precoxale and coxale with fringe of long hairs dorsally; coxale with short dorsal bristle. Endite I with 4 broad flat transparent terminal bristles with rounded tips; endite II with 5 broad transparent terminal bristles; endite III obscure with 1 or 2 bristles (these could be interpreted as being on endite II). Exopodite consisting of 2 long and 1 short ringed, spinous bristles with bases on 1st endopodite joint near proximal margin. Basale hirsute, with 2 or 3 bristles along distal margin. Endopodite: 1st joint with long hairs on dorsal margin and 2 transparent terminal bristles (1

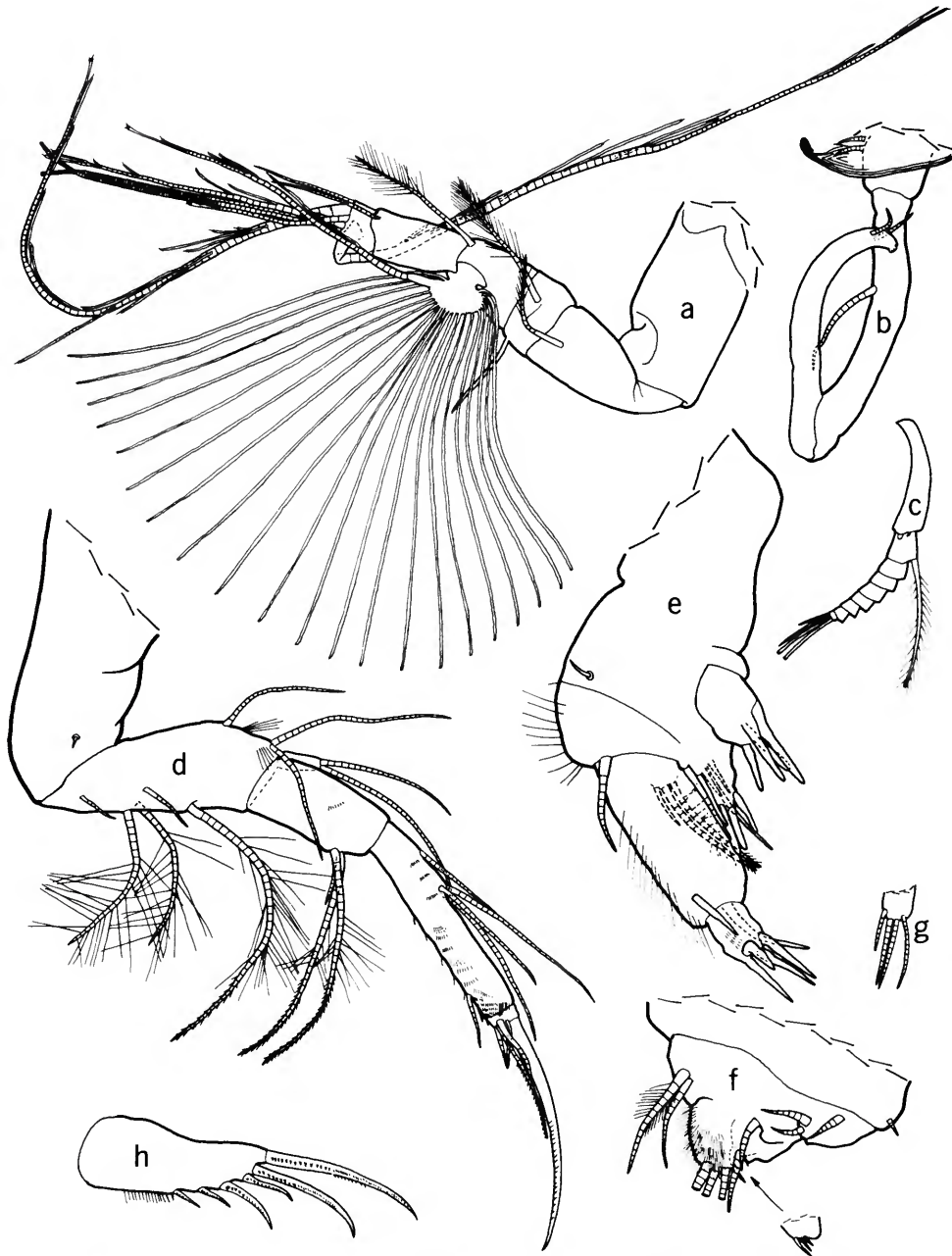


FIGURE 38.—*Pseudophilomedes angulatus* Müller, adult male, USNM 156674: *a*, right 1st antenna, lateral view of twisted 1st joint, medial view of remaining joints; *b*, endopodite of right 2nd antenna, medial view; *c*, exopodite of left 2nd antenna, medial view (bristles of joints 2-8 not shown); *d*, left mandible, medial view; *e*, maxilla; *f*, tip of 5th limb; *g*, bristles on tip of 5th limb opposite limb shown in *f*; *h*, right lamella of furca, lateral view.

dorsal, 1 ventral); end joint with 4 transparent bristles.

Fifth Limb (Figure 38f,g): Epipodial appendage with 48 bristles. Single endite present with 1 short bristle. Exopodite: 1st joint with 3 proximal ringed bristles and 4 weak, finger-formed distal teeth; 2nd joint with 3 terminal, weak, finger-formed teeth; 3rd joint with inner lobe with 1 ringed bristle, outer lobe with 2 longer bristles with long proximal hairs; 4th and 5th joints fused, hirsute, with 4 ringed terminal bristles with short marginal spines.

Sixth Limb (Figure 39a): Endite I with 3 short bristles; endite II with 1 or 2 short bristles (1 with long marginal hairs, other, if present, with short spines); endite III with 3 long hirsute bristles and 2 shorter bristles with short marginal spines; endite IV with 2 hirsute bristles (1 long, 1 short) and 2 short bristles with short marginal spines; end joint with 5 short anterior bristles with long proximal

hairs and short distal spines and 2 long hirsute posterior bristles; limb hirsute; 1 short bristle in place of epipodial appendage.

Seventh Limb (Figure 39b): 4 bristles in distal group (2 on each side), 2 bristles in proximal group (1 on each side), each bristle with 4-6 bells and few distal marginal spines; terminus consisting of opposing combs, about 8 spinous teeth on one comb and 3 on other.

Furca (Figure 38h): Each lamella with 6 claws all separated from lamella by a suture; claw 4 stouter and longer than claw 3; claw 5 shorter than claw 3; all claws with distal teeth smaller than proximal teeth; claw 1 without large tooth present on female.

Rod-shaped Organ (Figure 39c): Elongate with about 11 short segments in the proximal two-thirds; tip rounded but with minute cleft in middle.

Eyes: Medial eye bare (Figure 39c); lateral eye

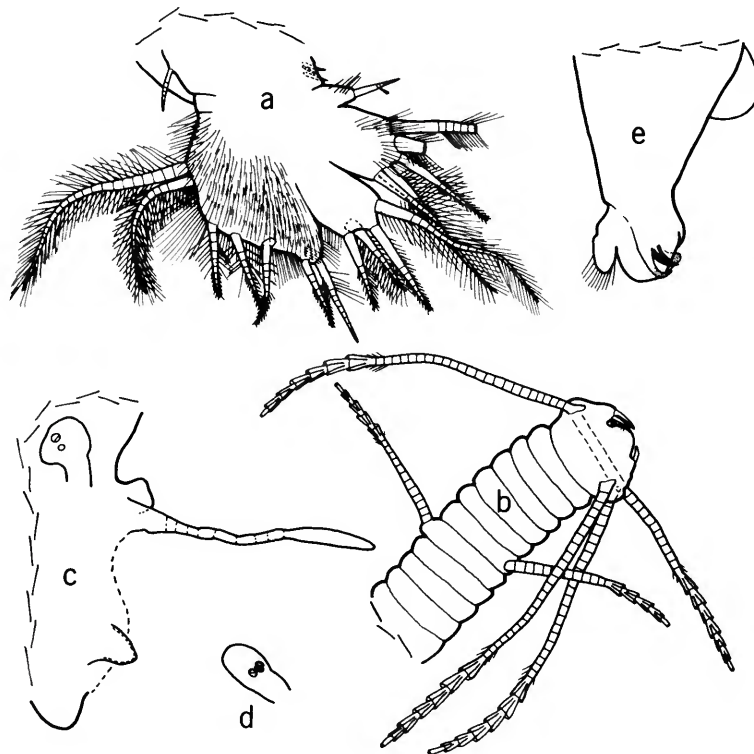


FIGURE 39.—*Pseudophilomedes angulatus* Müller, adult male, USNM 156674: a, 6th limb; b, 7th limb; c, anterior of body showing lateral eye, medial eye and rod-shaped organ, anterior process, and upper lip; d, left lateral eye; e, right copulatory organ.

small with 2 ommatidia (1 of these divided) (Figure 39c, d).

Upper Lip: Helmet-shaped (Figure 39c).

Copulatory Organ: Elongate with 2 or 3 terminal lobes, 1 hirsute and 1 with sclerotized hook (Figure 39e).

DESCRIPTION OF A-1 MALE (Figure 40a-c; Plates 22, 23).—Carapace resembles that of adult female but horizontal ribs subdued on some specimens; surface with shallow fossae (Plate 22c), minute pores (Plate 22d), and long bristles (Plate 22c-f).

Infold (Plate 23): Rostral infold with 4 spinous bristles; infold of caudal process with 5 spinous bristles forming row at top of list; 1 short bristle on anteroventral infold below incisur.

Size: USNM 150101, length 1.30 mm, height 0.81 mm, height 62 percent of length; USNM 156645, length 1.36 mm, height 0.75 mm, height 55 percent of length; USNM 154191, length 1.32 mm, height 0.79 mm, height 60 percent of length.

First Antenna: Not examined in detail but similar to that of adult female.

Second Antenna: Endopodite 3-jointed (Figure 40b): 1st joint with 2 short anterior bristles; 2nd joint elongate with 2 ventral bristles, longer of these

with few short spines; 3rd joint elongate with 2 short terminal bristles. Exopodite: bristles short without natatory hairs; bristles on joints 2-8 and ventral bristle of 9th joint with ventral spines; 9th joint with 3 bristles.

Mandible, Maxilla, 5th and 6th Limbs: Not examined in detail, but, in general, similar to limbs of female.

Seventh Limb: 4 bristles in distal group (2 on each side); USNM 156645 and 154191 without proximal bristles; USNM 150101 with 3 bristles in proximal group (2 on 1 side, 1 on other); USNM 156682 with 2 proximal bristles (1 on each side); all bristles tapering distally; terminus with opposing combs with 5 alate teeth in one comb and 2 spinous teeth in other.

Furca: Each lamella with 6 claws; similar to that of adult female.

Rod-shaped Organ: Similar to that of adult male.

Eyes: Lateral eye not observed with certainty (if present, small, not pigmented); medial eye similar to that of adult male and female.

Copulatory Organ: Weakly developed (Figure 40c).

DESCRIPTION OF A-1 FEMALE (Figure 40d-g).—

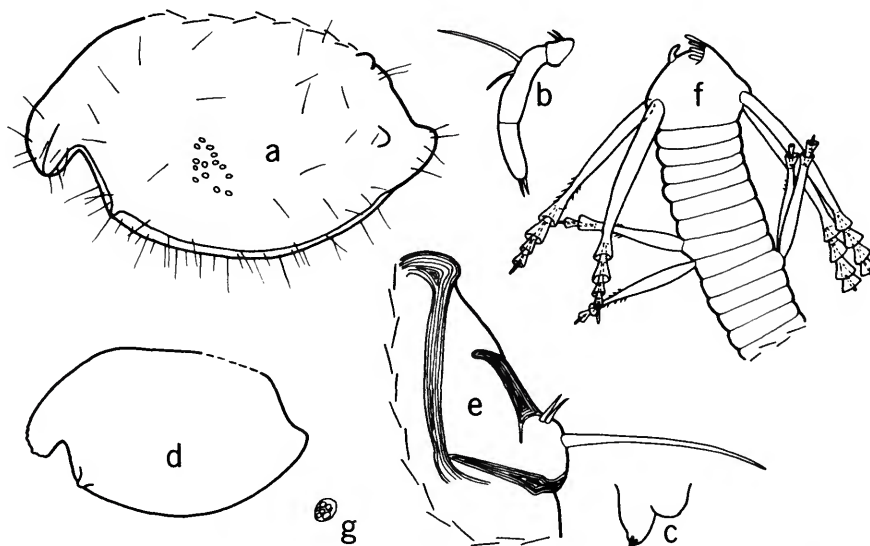


FIGURE 40.—*Pseudophilomedes angulatus* Müller, A-1 male, USNM 150101, length 1.30 mm: a, outline of left valve showing some central adductor muscle scars, lateral ribs not shown; b, endopodite of right 2nd antenna, medial view. A-1 male, USNM 156645, length 1.36 mm: c, left copulatory organ. A-1 female, USNM 156683, length 1.36 mm: d, outline of left valve, lateral ribs not shown; e, endopodite of left 2nd antenna, medial view; f, 7th limb; g, right lateral eye (not observed with certainty).

Carapace similar in outline and ornamentation to that of A-1 male (Figure 40d).

Infold: Same as that of A-1 male.

Size: USNM 156683, length 1.36 mm, height 0.79 mm, height 58 percent of length.

First Antenna: Not examined in detail but similar to that of adult female.

Second Antenna: Endopodite 1-jointed with 2 short proximal anterior bristles and 1 long terminal bristle (Figure 40e). Exopodite similar to that of A-1 male.

Mandible, Maxilla, 5th and 6th Limbs: Not examined in detail but, in general, similar to those of adult female.

Seventh Limb (Figure 40f): 4 tapered bristles in distal group, 2 on each side; each bristle with 4 bells; 4 tapered bristles in proximal group, 2 on each side, each bristle with 2 bells; terminus with opposing combs with 7 teeth in one and 2 in other.

Furca: Each lamella with 6 claws; similar to that of adult female.

Rod-shaped Organ: Similar to that of adult female.

Eyes: Lateral eye not observed with certainty, if present, minute, unpigmented (Figure 40g); medial eye similar to that of adult female.

REMARKS.—Müller (1894:212) did not describe or illustrate the 7th limb of females *P. angulatus* collected in the Gulf of Naples. He did, however, list differences between *P. angulatus* and *P. foveolatus*. Because he did not state that the 7th limb of those species differed, it may be assumed that they were similar. The 7th limb of *P. foveolatus* illustrated by Müller (1894, pl. 3: fig. 47) bears 2 proximal bristles. The 7th limb of the adult female *P. angulatus* from west Africa bears 4 proximal filaments. Until the variability of this character is better known in both the west African and Gulf of Naples' populations, it is not possible to conclude that the populations differ in the number of proximal bristles on the 7th limb. A certain amount of variability of this character is suggested by the range of 0 to 3 proximal bristles found on the 7th limb of 4 A-1 males from west Africa described herein. The length of the only adult female in the present collection is 1.59 mm, longer than the length of the female (1.23 mm) described by Müller (1894:212) from the Gulf of Naples.

The adult female and juveniles of both sexes of *P. angulatus* have horizontal ribs on the carapace

that are absent on the adult male. This raises doubt as to whether the male has been correctly identified. The 6 claws on the caudal furca of the male indicate that it could not be *P. thalassa* which has 8 furcal claws. The only species of *Pseudophilomedes* with 6 claws on the furca collected in the area are *P. angulatus* and *P. tetrathrix*. The male was assigned to *P. angulatus* rather than *P. tetrathrix* because it is larger than the adult female of *P. tetrathrix*, but smaller than the adult female of *P. angulatus*, and because of its small lateral eye, which contained only 2 ommatidia. The lateral eyes on the A-1 male of *P. tetrathrix* contained many more ommatidia, whereas lateral eyes were not observed on the A-1 male of *P. angulatus*. The relative size was used as a character for referring the male to *P. angulatus* rather than *P. tetrathrix* because the adult male of *P. thalassa* is smaller than the adult female, and in that species both sexes are almost certainly identified correctly.

Pseudophilomedes thalassa, new species

FIGURES 41-48; PLATES 24, 25

HOLOTYPE.—"Grigore Antipa" 290, adult female, length 1.68 mm, appendages and valves in alcohol.

TYPE-LOCALITY.—*Thalassa* station X048.

ETYMOLOGY.—The species named for the research vessel *Thalassa*.

ALLOTYPE.—USNM 154190, adult male from station X072.

PARATYPES.—USNM 150104, 154188, 154189, 156-602, 4 ovigerous females from station X048; USNM 156609, adult female from station X048; USNM 156-605, 1 adult male from station A8a; USNM 156678, 3 specimens from station X048; USNM 156680, 1 adult male from station X048; USNM 156681, 1 A-1 male from station X048.

DESCRIPTION OF FEMALE (Figures 41-44; Plates 24, 25).—Carapace with straight hinge line, greatest height in front of middle, incisur forming right angle, small caudal process (Figures 41, 42; Plate 24b-d).

Ornamentation: Surface with shallow fossae, (Plate 24e,f), single hairs forming row along edges of valves and scattered over valve surface (Plate 24b,f); minute nodes present in posterodorsal part of each valve (Figures 41, 42; Plate 24a,d).

Infold: Broad in area of rostrum and caudal

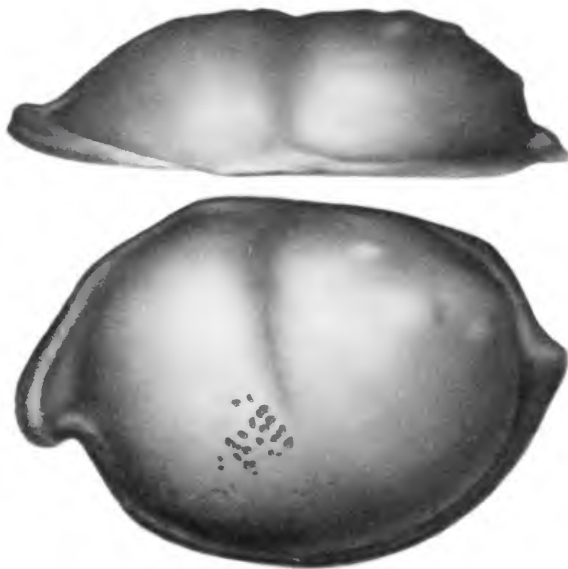


FIGURE 41.—*Pseudophilomedes thalassa*, new species, female, USNM 154188, paratype, whole specimen, length 1.58 mm, and dorsal view of right valve.



FIGURE 42.—*Pseudophilomedes thalassa*, new species, female, USNM 150104, paratype, whole specimen, length 1.63 mm.

process, narrower elsewhere (Plate 25a-c); infold behind rostrum with 9 or 10 long spinous bristles forming row parallel to edge of rostrum (Figure 43a, Plate 25b); infold immediately ventral to rostrum with 1 short bristle; infold in front of caudal process with 6 spinous bristles near top of list (Figure 43b); anteroventral infold with about 3 ridges paralleling valve margin (Plate 25a).

Selvae: Wide fringed lamellar prolongation

present along anterior, ventral, and posterior margin of each valve (Plates 24c, 25b); prolongation divided at inner corner of incisur.

Central Muscle Attachment Scars: Consisting of about 35 widely dispersed individual ovoid scars (Figures 41, 42; Plate 25d).

Size: USNM 150104, length 1.63 mm, height 1.06 mm; height 65 percent of length; USNM 154188, length 1.58 mm, height 1.04 mm; height 66 percent of length; USNM 154189, length 1.72 mm, height 1.08 mm, height 63 percent of length; USNM 156602, length 1.70 mm, height 1.06 mm, height 62 percent of length; USNM 156609, length 1.71 mm, height 1.07 mm, height 63 percent of length; holotype, length 1.68 mm, height 1.04 mm, height 62 percent of length (Figure 35).

First Antenna (Figure 43c): 2nd joint: 1 dorsal bristle with short marginal spines, short spines along dorsal margin, and long proximal hairs on medial surface near ventral margin. 3rd joint: 2 bristles with short marginal spines, each about twice length of bristle on 1st joint. 4th joint: 1 dorsal bristle (with short marginal spines) almost reaching distal end of 6th joint, and 2 ventral bristles (with medium length proximal spines and short distal spines) reaching well past end of stem. 5th joint: long, with sensory bristle with 2 short proximal filaments, 1 short distal filament, and bifurcate tip. 6th joint: short, medial bristle short, with short marginal spines. 7th joint: a-bristle 2 to 3 times length of bristle of 6th joint, with short marginal spines; b-bristle 3 to 4 times length of bristle of 6th joint, with bifurcate tip; c-bristle about same length as sensory bristle, with 4 short marginal filaments and bifurcate tip. 8th joint: d- and e-bristles bare with truncate tip; length about same as sensory bristle; f-bristle with 3 proximal marginal filaments, 1 double distal filament, and bifurcate tip; g-bristle with 1 proximal filament, 1 distal filament, and bifurcate tip; f- and g-bristles about same size as sensory bristle.

Second Antenna: Protopodite bare. Endopodite single-jointed, with 2 short bare proximal anterior bristles and 1 longer terminal bristle with long proximal and short distal spines (Figure 43d,e). Exopodite: terminal margin of 1st joint with 1 short recurved medial spine; distal margins of joints 2-8 with faint spines forming row; bristle of 2nd joint very long, about one and one-half times length of stem joints 1-9, with 18 stout proximal

spines along ventral margin and natatory hairs distally; bristles of joints 3-8 with distal natatory hairs and stout proximal spines along ventral

margin; 9th joint with 3 bristles (ventral bristles long, with stout, proximal, ventral spines and distal natatory hairs; middle bristle shorter, with slender,



FIGURE 43.—*Pseudophilomedes thalassa*, new species, female, USNM 150104, paratype, length 1.63 mm: a, rostrum of left valve, medial view; b, caudal process of left valve, medial view; c, right 1st antenna, medial view; d, endopodite of right 2nd antenna, medial view; e, endopodite of left 2nd antenna, medial view; f, right mandible, medial view; g, coxale and basale and endites of left maxilla, medial view; h, basale and endopodite of left maxilla, lateral view; i, right maxilla, lateral view; j, tip of endopodite of right maxilla, lateral view, from i; k, anterior of body showing left lateral eye, medial eye and rod-shaped organ, and upper lip; l, rod-shaped organ, dorsal view under cover slip.

proximal, ventral spines and distal natatory hairs; dorsal bristle short with very short marginal hairs or spines).

Mandible (Figure 43f): Coxale endite with bifurcate tip, each with strong terminal spine or tooth and smaller marginal spines (distal prong with 5 marginal spines; proximal prong with about 25 marginal spines, some very small). Basale: dorsal margin with 3 bristles (1 distal to middle, 2 terminal); medial surface near ventral margin with 2 or 3 short spinous bristles and 1 longer spinous terminal bristle. Exopodite spinous, with 2 terminal bristles, outer bristle slightly shorter than inner. Endopodite: 1st joint with 3 ventral bristles (inner medial bristle with long proximal and short distal spines, remaining bristles shorter and with short marginal spines); 2nd joint with ventral and medial spines, dorsal margin with 1 proximal bristle and 4 near middle, ventral margin with 3 subterminal bristles (1 proximal, 2 distal); end joint with 1 long claw with base on lateral side of joint edge, 1 short claw with base on medial edge of joint near ventral margin, 1 minute claw with base on medial edge of joint near dorsal margin, and 3 annulate bristles, longest of these lateral and just reaching past middle of long claw.

Maxilla (Figure 43g-j): Precoxale and coxale with dorsal fringe of hairs; coxale with long hirsute dorsal bristle. Endite I with 1 long spinous bristle, 1 short spinous proximal bristle, and 3 short stout pectinate terminal bristles; endite II with 2 short stout pectinate terminal bristles and 2 short slender proximal spinous bristles; endite III about half length of endite II, with 2 short slender proximal bristles and 2 longer spinous terminal bristles. Exopodite consisting of short lobe with 3 bristles (2 long, 1 short) with short marginal spines. Basale hirsute with 3 slender bristles along distal margin. Endopodite: 1st joint with 1 slender distal bristle on anterior margin and 1 longer, stouter, spinous terminal bristle; end joint with 5 bristles (3 short, 2 long; inner of long bristles shorter but slightly stouter than outer bristle, both with marginal spines).

Fifth Limb (Figure 44a-f): Single endite present with 1 short bristle. Exopodite: 1st joint with large proximal tooth consisting of 3 prongs and 3 or 4 bristles, large distal tooth consisting of 4 prongs, and a single short bristle distal to endite bristle present on anterior side of 1st joint (possibly 2nd endite?);

2nd joint with large fanglike tooth (inner edge of fanglike tooth with single short distal tooth) followed by tooth with 3 large prongs and 1 short prong and by proximal tooth with 3 prongs, posterior side of 2nd joint with 2 bristles (1 short slender, 1 long, stout); 3rd joint with 2 slender bristles on outer lobe and 1 on inner lobe; 4th and 5th joints fused, with 4 bristles.

Sixth Limb (Figure 44k,l): Endite I with 3 spinous bristles (1 long, 2 short); endite II with 1 long spinous bristle; endite III with 5 spinous bristles; endite IV with 4 spinous bristles; end joint with 9 bristles, posterior 2 of these hirsute, remaining spinous; 1 bristle with short faint marginal spines present in place of epipodial appendage; surface of appendage hirsute.

Seventh Limb (Figure 44m,n): 6 bristles in distal group (3 on each side), 4 bristles in proximal group (2 on each side), each bristle with 3-7 bells and few marginal distal spines; terminus consisting of opposing combs with faint teeth without marginal spines, about 9 or 10 on one comb, about 3 or 4 on other.

Furca (Figure 44o,p): Each lamella with 8 or 9 claws (usually 8); claw 4 much stouter and about the same length or longer than claw 3; posterior 4 or 5 claws secondary; claw 1 with large medial tooth near middle and smaller teeth proximally on lateral and medial sides; claws 2 and 4 with small teeth forming medial and lateral rows near concave margin; claw 3 with few faint teeth; claws 5-8 or 5-9 with faint spines along anterior and posterior margins; claws 1 and 2 with faint distal hairs along anterior margins; margin of lamella following claws with 1-4 short spines.

Rod-shaped Organ: Elongate, about 7 short segments in middle part; tip rounded with short terminal spine (Figure 43k,l).

Eyes: Medial eye bare (Figure 43k); lateral eye small with reddish pigment in preserved material, with 3-5 yellow ommatidia (Figure 43k).

Upper Lip: Helmet-shaped (Figure 43k).

Eggs: USNM 150104 with 12 eggs in marsupium; USNM 154188 with 3 eggs.; USNM 154189 with 4 eggs; USNM 156602 with 10 eggs.

Parasites: Holotype with 1 cyproniscid isopod in marsupium; USNM 156609 with 2 cyproniscid isopods and 1 clutch of isopod eggs in marsupium of ostracode.

DESCRIPTION OF ADULT MALE (Figures 45-47).—Carapace with straight hinge line, large overhanging

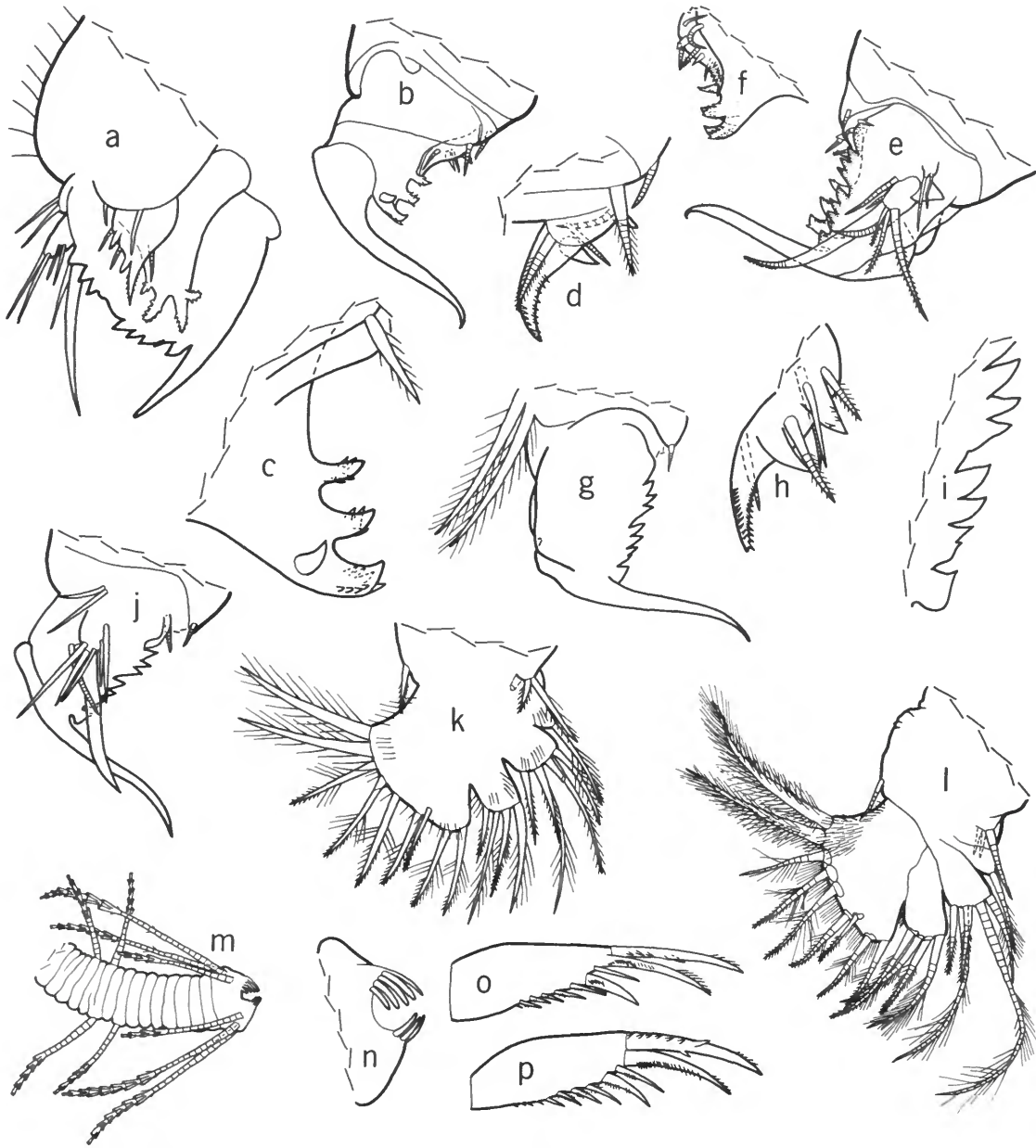


FIGURE 44.—*Pseudophilomedes thalassa*, new species, female, USNM 150104, paratype: *a*, tip of left 5th limb, anterior view, not under cover slip; *b*, tip of left 5th limb, anterior view; *c*, detail of distal lobe of 1st exopodial joint, from *b*; *d*, detail of endite bristle and proximal tooth of 1st exopodial joint, from *b*; *e*, tip of right 5th limb, posterior view; *f*, proximal and distal teeth of 1st exopodial joint, from *e*; *g*, tip of left 5th limb, posterior view; *h*, proximal tooth of left 5th limb, posterior view; *i*, detail of teeth along inner margin of large tooth of 2nd exopodial joint, from *g*; *j*, tip of left 5th limb, posterior view; *k*, right 6th limb, medial view; *l*, left 6th limb, lateral view; *m*, 7th limb; *n*, detail of tip of 7th limb, from *m*; *o*, right lamella of furca, lateral view; *p*, left lamella of furca, medial view.

rostrum, broad open incisur, and projecting caudal process (Figures 45, 46, 47a); anterior margin of rostrum with rim and with minute processes.

Ornamentation: Carapace with shallow punctae on well-preserved specimens (Figure 45); posterior of valve with few small nodes (Figure 45); long double hairs present on posterior part of valve; long hairs present along anterior and ventral margin.

Infold: Infold behind rostrum with 8 long bristles forming row parallel to edge of rostrum; infold immediately ventral to incisur with 1 short bristle; infold in front of caudal process with 6 spinous bristles near top of list.

Selvae: Wide fringed lamellar prolongation along anterior, ventral, and posterior margins.

Size: USNM 154190, length 1.38 mm, height 0.80

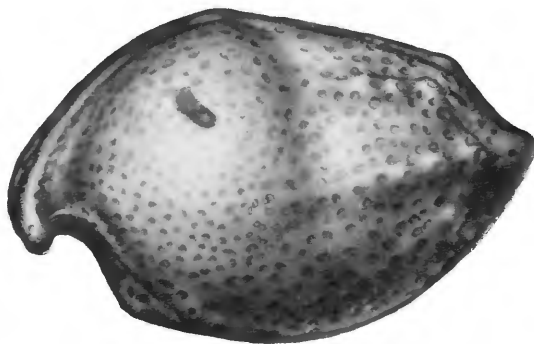


FIGURE 45.—*Pseudophilomedes thalassa*, new species, adult male, USNM 156605, paratype, whole valve with punctae visible, length 1.40 mm.



FIGURE 46.—*Pseudophilomedes thalassa*, new species, adult male, USNM 154190, allotype, whole valve without visible punctae, length 1.38 mm.

mm, height 58 percent of length; USNM 156605, length 1.40 mm, height 0.84 mm, height 60 percent of length; USNM 156680, length 1.40 mm, height 0.88 mm, height 63 percent length (Figure 35).

First Antenna (Figure 47b): 1st joint: bare. 2nd joint: short dorsal bristle with short marginal spines. 3rd joint: short, with 1 dorsal bristle and 1 shorter ventral bristle, both with short marginal spines. 4th joint: long dorsal bristle with short marginal spines. 5th joint: small, triangular, wedged ventrally between 4th and 6th joints; sensory bristle of 5th joint with bulbous base with abundant long filaments and long stem with 4 marginal filaments. 6th joint with medial bristle reaching well past 8th joint. 7th joint: a-bristle almost twice length of bristle of 6th joint; b-bristle almost twice length of a-bristle, with 2 long filaments near middle, and bifurcate tip; c-bristle very long, stout, with 9 short filaments on broken bristle of examined specimen. 8th joint: d- and e-bristles bare, of equal length, reaching well past tip of sensory bristle of 5th joint; f-bristle similar to c-bristle, also broken on specimen examined, with 10 short marginal filaments on stump; g-bristle same length as d- and e-bristles, with 7 marginal filaments and bifurcate tip.

Second Antenna: Protopodite bare. Endopodite 3-jointed (Figure 47c): 1st joint short, with 1 or 2 short proximal anterior bristles; 2nd joint elongate, with 1 bristle proximal to middle; 3rd joint reflexed on 2nd, with 2 short subterminal bristles and ridged tip. Exopodite: 1st joint bare; bristles of joints 2-8 with natatory hairs but without spines; 9th joint with 4 bristles (2 long with natatory hairs, 2 short with short hairs); joints 2-8 with short spines forming row along terminal margin; 9th joint with few spines forming medial row on distal margin; joints 2-9 with minute spine on dorsal corner.

Mandible (Figure 47d): Coxale endite represented by small spine; lateral side of coxale with few spines forming short rows. Basale: medial side with 1 short proximal bristle and 1 short bristle just distal to middle, both closer to ventral margin than to dorsal margin; ventral margin with 1 medium length proximal bristle and 1 long stout distal bristle, both with long proximal and short distal spines; dorsal margin with 1 bristle distal to middle and 2 terminal bristles. Exopodite about one-third length of 1st endopodite joint, with 2 long terminal bristles. Endopodite: medial surface of 1st joint

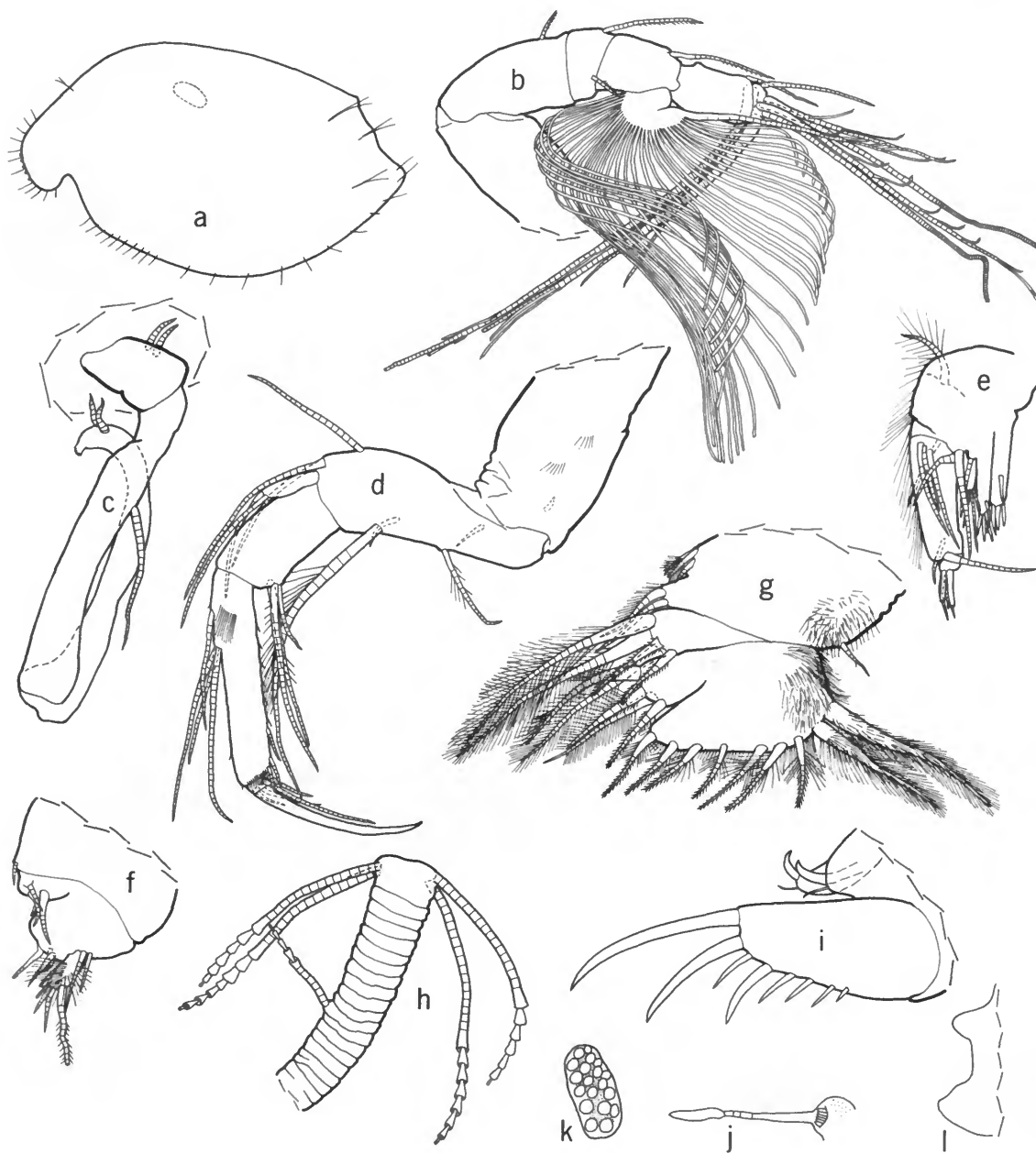


FIGURE 47.—*Pseudophilomedes thalassa*, new species, adult male, USNM 154190, allotype, length 1.38 mm: *a*, outline of whole specimen showing position of lateral eye; *b*, left 1st antenna, medial view; *c*, endopodite of left 2nd antenna, medial view; *d*, left mandible, lateral view; *e*, left maxilla, lateral view, all endite bristles not shown; *f*, tip of 5th limb; *g*, 6th limb; *h*, 7th limb; *i*, left lamella of furca and copulatory organ, lateral view; *j*, medial eye and rod-shaped organ; *k*, left lateral eye, anterior to left; *l*, anterior process and upper lip, lateral view.

with spines forming rows; ventral margin with 3 terminal bristles (2 long and 1 short), all with marginal spines; 2nd joint with medial and lateral surfaces with spines forming rows, dorsal margin with bristles forming 2 groups proximal to middle (1 bristle in proximal group, 3 in distal group), ventral margin with 3 short subterminal bristles; end joint with 1 long claw with faint spines along ventral margin, 1 bristle reaching past middle of claw, 1 short ventral bristle, 1 short medial bristle, and 1 short clawlike medial bristle dorsal to and shorter than short medial bristle.

Maxilla (Figure 47e): Limb weakly developed, reduced. Precoxale and coxale with fringe of long hairs dorsally; coxale with short, stout, hirsute dorsal bristle. Endite I with 5 bristles; endite II with 4 bristles; endite III short, with 1 proximal and 3 terminal bristles. Exopodite consisting of 3 bristles with bases on 1st endopodite joint near basale. Basale hirsute with 3 bristles along distal margin (2 lateral, 1 medial). Endopodite: 1st joint with hairs on dorsal margin and 2 terminal bristles (1 ventral, 1 dorsal); end joint with 5 bristles.

Fifth Limb (Figure 47f): Epipodial appendage with 48 bristles. Single endite present with 1 short bristle. Exopodite: 1st joint with 3 proximal ringed bristles and 2 small distal finger-formed bristles; 2nd joint with 2 bristles; inner lobe of 3rd joint with 1 bristle, outer lobe with 2 bristles; fused 4th plus 5th joints hirsute, elongate, with 4 bristles.

Sixth Limb (Figure 47g): Endite I with 3 short hirsute bristles; endite II with 2 hirsute bristles; endite III with 3 long hirsute bristles and 2 shorter bristles with short marginal spines; endite IV with 2 hirsute bristles and 2 shorter bristles with marginal spines; end joint with 7 or 8 anterior bristles with long proximal hairs and short distal spines, and 2 long hirsute posterior bristles; limb hirsute; 1 short bristle with short marginal spines present in place of epipodial appendage.

Seventh Limb (Figure 47h): 4 bristles in distal group (2 on each side); USNM 154190 with 1 bristle in proximal group, USNM 156605 without proximal bristle; each bristle with 4-7 bells; terminus bare without combs.

Furca (Figure 47i): Each lamella with 7 or 8 claws; claw 4 much stouter and longer than claw 3; posterior 3 or 4 claws secondary; claw 1 with proximal teeth slightly larger than distal teeth, no large tooth near middle as on claw 1 of female;

all claws with lateral and medial row of teeth along posterior margins.

Rod-shaped Organ (Figure 47j): Elongate, with 3 to 5 short segments in middle part; distal end broad, tapering to rounded tip with few terminal spines.

Eyes: Medial eye bare, lightly pigmented (Figure 47j); lateral eye larger than medial eye, with about 19 ommatidia (Figure 47k).

Upper Lip: Helmet-shaped (Figure 47l).

Copulatory Organ: Tip with elongate sclerotized hook and lobe with bristle (Figure 47i).

DESCRIPTION OF A-1 MALE (Figure 48).—Carapace similar in outline to that of adult female (Figure 48a). Surface punctae not visible on examined specimen.

Infold: Rostral infold with 9 spinous bristles; infold of caudal process with 5 spinous bristles forming row at top of list; anteroventral infold with 1 short bristle below incisor.

Size: USNM 156681, length 1.24 mm, height 0.77 mm, height 62 percent of length.

First Antenna: Not examined in detail but similar to that of adult female.

Second Antenna: Endopodite 3-jointed (Figure

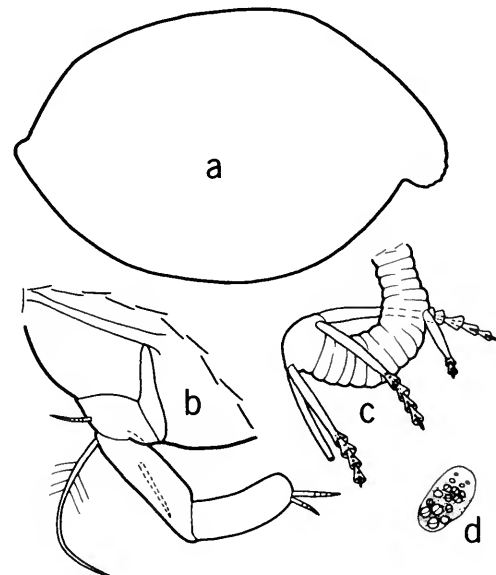


FIGURE 48.—*Pseudophilomedes thalassa*, new species, USNM 156681, A-1 male, paratype, length 1.24 mm: a, outline of whole specimen; b, endopodite of right 2nd antenna, medial view; c, 7th limb; d, right lateral eye, anterior to right.

48*b*): 1st joint short with 1 short anterior bristle; 2nd joint elongate with 2 long bristles, longer of these with long proximal spines; 3rd joint elongate with 2 short terminal bristles. Exopodite: bristles of joints 2–8 with few proximal hairs on dorsal margin, stout proximal spines along ventral margin, and natatory hairs distally; bristles long, similar to those of adult female; 9th joint with 3 bristles (2 long with proximal ventral spines and distal natatory hairs, 1 short with few hairs).

Mandible, Maxilla, 5th and 6th Limbs: Not examined in detail but, in general, similar to limbs of adult female.

Seventh Limb (Figure 48*c*): 4 tapered bristles in distal group, each with 4–5 bells; 1 tapered proximal bristle with 2 bells; terminus bare, without combs.

Furca: Each lamella with 8 claws similar to those of adult female except claw 3 shorter than claw 4.

Rod-shaped Organ: Similar to that of adult female.

Eyes: Lateral eyes well developed, with reddish brown pigment and about 16 ommatidia, larger of these ventrally located in eye sac (Figure 48*d*); medial eye similar to that of adult male and female.

Copulatory Organ: Not observed.

COMPARISONS.—The new species *P. thalassa* differs from other species of *Pseudophilomedes* in having more bristles (8–10) on the rostral infold. Other species have only 4–5 bristles on the rostral infold. Each lamella of the adult female furca of *P. thalassa* bears 8 or 9 claws, whereas the lamellae of *P. tetrathrix*, new species, *P. angulatus* Müller, and *P. foveolatus* Müller, bear only 6 or 7. The carapace of *P. thalassa* resembles in outline that of *Paramekodon inflatus* Brady and Norman, 1896. It differs from that species in having 8–10 bristles on the rostral infold instead of only 4 (see Kornicker, 1968:462, for supplementary description of *Paramekodon inflatus*).

Pseudophilomedes tetrathrix, new species

FIGURES 49–51; PLATES 26–28

HOLOTYPE.—USNM 156603, ovigerous female, length 1.10 mm, appendages on slides and in alcohol.

TYPE-LOCALITY.—*Cornide de Saavedra* station A8a, sample 15.

ETYMOLOGY.—The specific name *tetrathrix* from

the Greek *tetra* (four) and *thrix* (hair) refers to the 4 proximal bristles on the 7th limb of the adult female.

PARATYPES.—USNM 156604, 156676, 2 adult females from same sample as holotype; “Grigore Antipa” 463, 1 ovigerous female from station X042; USNM 156677, 1 A–1 male from same sample as holotype.

DESCRIPTION OF ADULT FEMALE (Figures 49, 50; Plates 26–28).—Carapace with straight hinge line, greatest height at middle, small caudal process, overhanging rostrum (Figure 49).

Ornamentation: Surface with shallow fossae (Figure 49; Plates 26*a–d,f*, 27*a,b*, 28*a,e*); single hairs forming row along edges of valves and scattered over valve surface (Plates 26, 27*a,b*, 28*c*); 2 low horizontal ribs present (1 above and 1 below central muscle attachment scars) (Figure 49), ribs not visible on all specimens; minute round fossae with pore in middle form clusters between larger fossae (Plate 27*d–f*); minute pustules with central pore present between and on floor of fossae (Plates 27*b*, 28).

Infold: Broad in area of rostrum and caudal process, narrower elsewhere; infold behind rostrum with 4 long spinous bristles forming row parallel to edge of rostrum (Figure 50*a*); infold immediately ventral to incisur with 1 short bristle; infold in front of caudal process with 5 spinous bristles near top of list (Figure 50*b*).

Selvage: Wide fringed lamellar prolongation present along anterior, ventral and posterior margins of each valve; prolongation divided at inner corner of incisur (Plate 26*d,e*).

Central Muscle Attachment Scars: Consisting of about 18 widely dispersed individual ovoid scars (Figure 49; Plates 26*a*, 27*a*).

Size: USNM 156603, length 1.10 mm, height 0.67

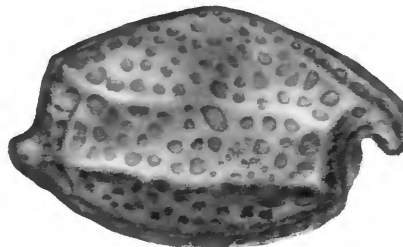


FIGURE 49.—*Pseudophilomedes tetrathrix*, new species, female, USNM 156604, paratype, whole specimen, length 1.06 mm.

mm; USNM 156604, length 1.06 mm, height 0.64 mm; "Grigore Antipa" 463, length 1.17 mm, height 0.62 mm; USNM 156676, length 1.08 mm, height 0.64 mm (Figure 35).

First Antenna (Figure 50c): 2nd joint: spines along ventral and dorsal margin and with 1 dorsal bristle. 3rd joint: 2 bristles (1 ventral, 1 dorsal). 4th joint: 3 bristles (2 ventral, 1 dorsal). 5th joint: sensory bristle with 2 proximal and 2 distal filaments. 6th joint: minute, medial bristle short. 7th joint: a-bristle about twice length of bristles of 6th joint; b-bristle slightly longer than a-bristle, with bifurcate tip; c-bristle about same length as sensory bristle of 5th joint, with 4 marginal filaments and bifurcate tip. 8th joint: d- and e-bristles bare, length about same as c-bristle; f- and g-bristles about same length as c-bristle, with 5 marginal filaments and bifurcate tip.

Second Antenna (Figure 50d): Protopodite: bare. Endopodite single-jointed with 1 short bare proximal anterior bristle and 1 longer terminal bristle with short marginal spines. Exopodite: terminal margin of 1st joint with short recurved medial spine; distal margins of joints 2–8 with spines forming row; bristle of 2nd joint reaching just past 9th joint, with about 10 stout marginal spines becoming more slender towards tip of bristle, followed by slender hairlike spines near tip; bristles of joints 3–8 relatively short, with stout ventral spines and knifelike tip, no natatory hairs; 9th joint with 2 short bristles, longer of these with stout ventral spines, other with short marginal spines.

Mandible (Figure 50e): Coxale endite with bifurcate spinous tip. Basale: dorsal margin with 3 bristles (1 distal to middle, 2 terminal); medial surface spinous, with 2 short bristles (1 proximal, 1 near middle), both with short marginal spines; 1 long distal bristle with long proximal and short distal spines present near ventral margin, but with base on medial side; 2 minute bristles present on ventral margin distal to middle. Exopodite spinous with 2 terminal bristles, outer bristle slightly shorter than inner. Endopodite: 1st joint with 3 ventral bristles (1 of these very small), medial surface of joint spinous distally; 2nd joint with medial surface with few spines, dorsal margin with 1 proximal bristle and 3 near middle, ventral margin with 3 subterminal bristles; end joint with 1 long claw, 1 long lateral bristle reaching past

middle of claw, 1 short claw with base on medial edge of joint near middle, and 2 short bristles (1 ventral and 1 dorsal to short claw).

Maxilla (Figure 50f): Precoxale and coxale with dorsal fringe of hairs; coxale with hirsute dorsal bristle. Endite I with 5 bristles including 3 short, stout, pectinate, terminal bristles; endite II with 4 bristles including 2 short, stout, pectinate, terminal bristles; endite III about half length of endites I and II, with 3 bristles (2 short and 1 long). Exopodite consisting of 3 bristles on lateral side of 1st endopodite joint near basale. Basale hirsute with 2–3 slender bristles along distal margin (1 or 2 ventral, 1 lateral near dorsal margin). Endopodite: 1st joint with 1 long, stout, spinous, terminal bristle on anterior margin; end joint with 3 bristles (2 long, 1 short; inner of long bristles shorter but slightly stouter than outer bristle, both with marginal spines).

Fifth Limb (Figure 50g): Single endite present with 1 short bristle. Exopodite: 1st joint with large proximal tooth with 3 prongs and 2 bristles, large distal tooth consisting of 4 prongs, and 1 short proximal bristle; 2nd joint with large fanglike tooth, inner edge of fanglike tooth with single short distal tooth followed by 2 3-pronged teeth, posterior side of joint with 2 bristles (1 short, 1 long); 3rd joint with 2 hirsute bristles on outer lobe and 1 bare bristle on inner lobe; 4th and 5th joints fused, hirsute, with 4 spinous bristles.

Sixth Limb (Figure 50h): Endite I with 3 short hirsute bristles; endite II with 2 longer bristles (1 with short marginal spines, other with long proximal hairs); endite III with 5 bristles with short or long spines; endite IV with 4 bristles with short or long spines; end joint with 7 bristles (posterior 2 hirsute, remaining bristles with long proximal and short distal spines); 1 short bristle in place of epipodial appendage.

Seventh Limb (Figure 50i): 6 bristles in distal group (3 on each side), 4 bristles in proximal group (2 on each side), each bristle with 3–6 bells and few distal marginal spines; terminus consisting of opposing combs, one comb with 5 alate teeth, other with 3 spinous teeth.

Furca (Figure 50j): Each lamella with 6 claws; claw 4 much stouter and slightly longer than claw 3; claw 1 with large tooth medially near middle and about 9 stout teeth proximally along posterior margin, these increasing in length distally along

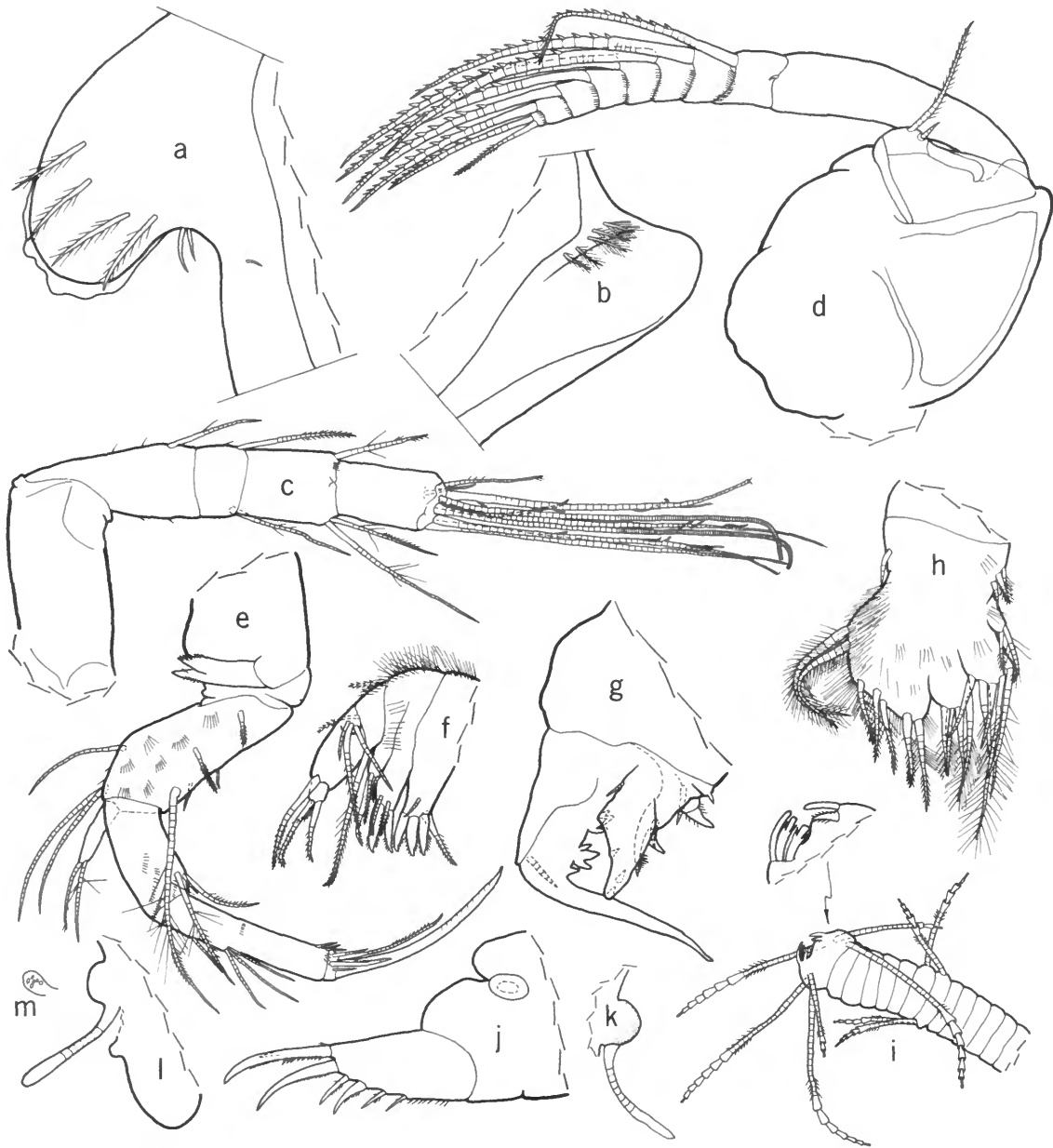


FIGURE 50.—*Pseudophilomedes tetratrix*, new species, female, USNM 156603, holotype, length 1.10 mm: *a*, incisur and rostrum of right valve, medial view; *b*, caudal process of right valve, medial view; *c*, right 1st antenna, lateral view; *d*, right 2nd antenna, medial view; *e*, right mandible, medial view; *f*, left maxilla, lateral view; *g*, tip of 5th limb; *h*, 6th limb; *i*, 7th limb; *j*, left lamella of furca and genitalia, lateral view; *k*, medial eye and rod-shaped organ. Female, USNM 156604, paratype, length 1.06 mm: *l*, anterior of body showing medial eye and rod-shaped organ, anterior process and upper lip; *m*, left lateral eye.

margin and followed by thinner teeth; claws 2 and 4 with slender teeth along posterior margin; claws 3, 5, and 6 with a few proximal, slender teeth along anterior margin and more teeth along posterior margin; hairs on margin of lamella posterior to claws.

Rod-shaped Organ: Elongate, about 6 short segments in middle part; tip rounded, possibly with minute terminal spine (Figure 50k,l).

Eyes: Medial eye bare, with reddish pigment (Figure 50k,l); lateral eye small with 4–6 minute yellow ommatidia (Figure 50m).

Upper Lip: Helmet-shaped (Figure 50l).

Eggs: USNM 156603 with 6 eggs; USNM 156604 with 3 eggs; USNM 156675 with 1 egg.

DESCRIPTION OF A-1 MALE (Figure 51).—Carapace similar in outline to that of adult female (Figure 51a); surface with distinct shallow fossae, some larger than others.

Infold: Rostral infold with 4 spinous bristles; infold of caudal process with 4–5 spinous bristles forming row at top of list; anteroventral infold with 1 short bristle below incisur.

Size: USNM 156677, length 0.93 mm, height 0.51 mm.

First Antenna: Not examined in detail but similar to that of adult female.

Second Antenna: Endopodite 3-jointed (Figure

51b): 1st joint short with 2 short anterior bristles; 2nd joint elongate with 2 bare ventral bristles; 3rd joint elongate with 2 short terminal bristles. Exopodite: bristle of 2nd joint just reaching past 9th joint, with few slender ventral spines; bristles of joints 3–8 not more than about one-third longer than bristle of 2nd joint, with stout ventral spines, no natatory hairs; 9th joint with 3 bristles, all shorter than bristle of 2nd joint, ventral of these with stout ventral spines, middle bristle with few slender spines or bare, dorsal bristle very short, bare.

Mandible, Maxilla, 5th Limb: Not examined in detail but, in general, similar to limbs of female.

Sixth Limb: Same as that of adult female except end joint with 6 bristles, posterior 2 hirsute, others spinous.

Seventh Limb (Figure 51c): 4 bristles in distal group (2 on each side), each bristle with 4 bells; no proximal bristles; terminus with opposing combs with 3 alate teeth in one, and 1 spinous tooth in other.

Furca: Each lamella with 6 claws similar to those of adult female.

Rod-shaped Organ: Similar to that of adult female.

Eyes: Lateral eyes small, unpigmented, with about 12 minute yellowish ommatidia (Figure 51d);

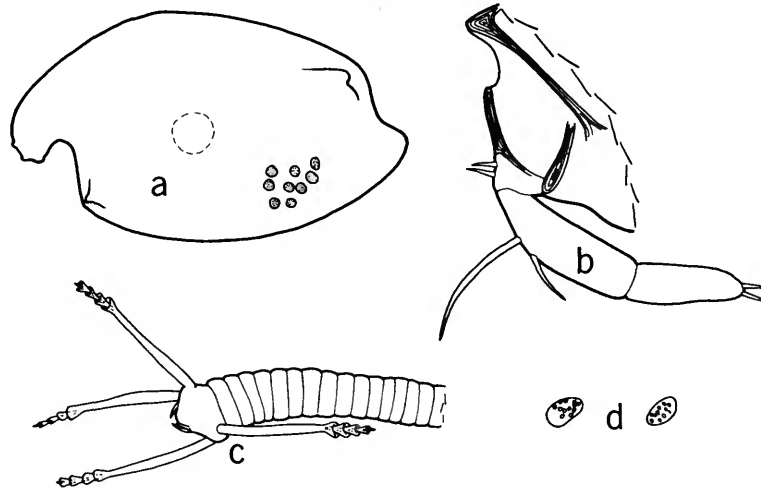


FIGURE 51.—*Pseudophilomedes tetratrix*, new species, A-1 male, USNM 156677, length 0.93 mm: a, outline of whole specimen showing position of muscle scar and some fossae; b, endopodite of right 2nd antenna, medial view; c, 7th limb; d, left and right lateral eyes.

medial eye similar to that of adult male and female.

Copulatory Organ: Not observed.

COMPARISONS.—The new species *P. tetratrix* differs from *P. foveolatus* in having 4 instead of 3 endites on the 6th limb, and 4 instead of 2 proximal bristles on the 7th limb of the adult female. *P. tetratrix* differs from *P. angulatus* in not having prominent horizontal ribs on the carapace and in being smaller. *P. tetratrix* differs from *P. thalassa* in having 4 instead of 9–10 bristles on the rostral infold and in being much smaller.

***Pseudophilomedes foveolatus* Müller, 1894**

FIGURE 52

Pseudophilomedes foveolata Müller, 1894:212, pl. 3: figs. 34–35, 45–49, 51, 53–54, pl. 4: figs. 1, 2, 7, pl. 34: fig. 49, pg. 60: fig. 6, pg. 79: fig. 6.—1912:34, figs. 6, 1, 11.

Pseudophilomedes foveolatus Müller.—Sylvester-Bradley, 1961:Q399, fig. 322.2.—Kornicker, 1967:13, figs. 7, 8; 1974:21, figs. 8–10.

LECTOTYPE.—Female, instar III, ZMB 9154:1, Zoological Museum of Berlin. Subsequent designa-

tion (Kornicker, 1974:21).

TYPE-LOCALITY.—Bay of Naples, Italy.

MATERIAL.—Lectotype.

DISTRIBUTION.—Gulf of Naples.

DISCUSSION.—Kornicker (1967:13) described the lectotype but did not mention or illustrate the 7th limb. Examination of the 7th limb revealed that it was without bristles. According to the "Key to Early Myodocopid Instars" (Kornicker, 1969a:3) this identifies the specimen as the 3rd stage instar.

SUPPLEMENTARY DESCRIPTION OF LECTOTYPE.—*Seventh Limb*: Elongate without bristles or terminal comb (Figure 52).



FIGURE 52.—*Pseudophilomedes foveolatus* Müller, lectotype, instar III: 7th limb.

TABLE 1.—World distribution and depth zones of species of Philomedidae discussed herein

Species	Spanish Sahara	Mauritania	Morocco	Mediterranean	Atlantic coast of Europe	Depth zone
<i>Philomedes bonneti</i>	—	x	—	—	—	bathyal
<i>Philomedes tetrads</i>	—	x	—	—	—	shelf-bathyal
<i>Euphilomedes asper</i>	—	x	—	x	—	bathyal
<i>Euphilomedes sinister pentatrix</i>	—	x	—	—	—	shelf
<i>Euphilomedes schornikovi</i>	x	—	—	—	—	bathyal
<i>Tetragonodon ctenorynchus</i>	x	x	x	—	x	bathyal-abyssal
<i>Pseudophilomedes angulatus</i>	x	x	—	x	—	shelf-bathyal
<i>Pseudophilomedes thalassa</i>	—	x	—	—	—	shelf-bathyal
<i>Pseudophilomedes tetratrix</i>	—	x	—	—	—	shelf
<i>Scleroconcha folinii</i>	x	x	—	x	x	shelf-bathyal

x Reported

— Not reported

Literature Cited

- Baird, W.
 1848. Note on the Genus *Cypridina*, M. Edwards; with a Description of Two New Species. *Annals and Magazine of Natural History*, series 2, 1:21-25, plates 6, 7.
 1850a. *The Natural History of the British Entomostraca*. 364 pages, 36 plates. London: Printed for the Ray Society.
 1850b. Descriptions of a New Crustacean. *Proceedings of the Zoological Society of London*, 18:102.
 1850c. Descriptions of Several New Species of Entomostraca. *Proceedings of the Zoological Society of London*, 18:254-257.
- Bold, W. A. van den
 1966. Ostracoda from Colon Harbour, Panama. *Caribbean Journal of Science*, 6(1-2):43-64, 4 plates, 1 figure.
- Brady, G. S.
 1868. A Monograph of the Recent British Ostracoda. *Transactions of the Linnean Society of London*, 26(2):353-495.
 1871. A Review of the Cypridinidae of the European Seas, with Description of a New Species. *Proceedings of the Scientific Meetings of the Zoological Society of London for the Year 1871*, 19:289-296.
 1872. Sur les Cypridinidae de Cap-Breton et sur ceux des mers d'Europe. Pages 53-61 in volume 1 of A. G. L. de Folin and L. Périer, *Les Fonds de la mer*. Paris.
 1880. Report on the Ostracoda Dredged by H.M.S. *Challenger* During the Years 1873-1876. Part 3 in volume 1 of *Report on the Scientific Results of the Voyage of H.M.S. Challenger: Zoology*. 184 pages, 44 plates. London.
 1886? Les Crustacés-Ostracodes des expéditions du Travailleur et du Talisman de 1881 à 1883. Pages 164-175 in part 3 in volume 4 of A. G. L. de Folin and L. Périer, *Les Fonds de la mer*. Paris.
 1887. Les ostracodes nouveaux des explorations du Travailleur et du Talisman. Pages 194-200 in part 3 in volume 4 of A. G. L. de Folin and L. Périer, *Les Fonds de la mer*. Plates 12, 14, 15 [plate 12 may not have been published.]
 1907. Ostracoda. Chapter 5 in volume 3 (Crustacea) of *Reports of National Antarctic Expedition of the SS Discovery, 1901-1904: Natural History*. Pages 1-9. London.
- Brady, G. S., and A. M. Norman
 1896. A Monograph of the Marine and Fresh Water Ostracoda of the North Atlantic and of North-Western Europe. *The Scientific Transactions of the Royal Dublin Society*, series 2, 5:621-746, plates 50-68.
- Caraion, E. C.
 1959. Ostracode noi în Marea Neagră (Apele Bosforice). *Comunicările Academiei Republicii Populare Romine*, 9(3):265-273, figures 1-4.
- Cleve, P. T.
 1905. The Plankton of the South African Seas. *Marine Investigations in South Africa*, 4:133-137.
- Darby, D. G.
 1965. Ecology and Taxonomy of Ostracoda in the Vicinity of Sapelo Island, Georgia. Report number 2 in R. V. Kesling, editor, *Four Reports of Ostracod Investigations*. 77 pages, 11 figures, 33 plates. Ann Arbor: University of Michigan.
- de Folin, A. G. L.
 1870. Crustacés. Pages 245-246 in Chapter 16 (Crustaces et mollusque nouveaux de la côte d'Afrique) in volume 1 of A. G. L. de Folin and L. Périer, *Les Fonds de la mer*. Paris: Savy, Libraire-Éditeur.
- Fage, Louis
 1934. La Phase pélagique des ostracodes benthiques littoraux. *Annales des Sciences Naturelles*, series 10, 17:249-261, figures 1-4.
- Hartmann, Gerd
 1974. Die Ostracoden des Untersuchungsgebiets. Part 3 in Zur Kenntnis des Eulitorals der afrikanischen Westküste zwischen Angol und Kap der Guten Hoffnung und der Afrikanischen Ostküste von Südafrika und Mocambique unter besondere Berücksichtigung der Polychaeten und Ostracoden. *Mitteilungen aus dem Hamburgischen Zoologischen Museum und Institut*, 69:229-520, figures 1-151.
- Klie, Walter
 1940. Beiträge zur Fauna des Eulitorals von Deutsch-Südwest-Africa, 11: Ostracoden von der Küste Deutsch-Südwest-Afrikas. *Kieler Meeresforschungen*, 3:403-448, 91 figures.
 1943. Ostracoden aus Marokko und Mauritanien. *Zoologischer Anzeiger*, 143(3/4):49-62, 20 figures.
- Kornicker, Louis S.
 1958. Ecology and Taxonomy of Recent Marine Ostracodes in the Bimini Area, Great Bahama Bank. *Publications of the Institute of Marine Science*, 5:194-300.
 1967. The Myodocopid Ostracod Families Philomedidae and Pseudophilomedidae. *Proceedings of the United States National Museum*, 121(3580):1-35, 12 figures, 1 plate, 2 tables.
 1968. Bathyal Myodocopid Ostracoda from the North-eastern Gulf of Mexico. *Proceedings of the Biological Society of Washington*, 81:439-472.
 1969a. Morphology, Ontogeny, and Intraspecific Variation of *Spinacopia*, a New Genus of Myodocopid Ostracod

- (Sarsiellidae). *Smithsonian Contributions to Zoology*, 8:1-50, 26 figures, 6 plates.
- 1969b. Station Data on Ostracoda Collected by the "Travailleur" and "Talisman" (1881-1883). *Crustaceana*, 16(1):111-112, tables 1, 2.
1970. Ostracoda (Myodocopina) from the Peru-Chile Trench and the Antarctic Ocean. *Smithsonian Contributions to Zoology*, 32:1-42, 25 figures.
1974. Revision of the Cypridinacea of the Gulf of Naples (Ostracoda). *Smithsonian Contributions to Zoology*, 178:1-64, 26 figures.
- 1975a. Antarctic Ostracoda (Myodocopina). *Smithsonian Contributions to Zoology*, 163:1-720, 432 figures, 9 plates.
- 1975b. Ivory Coast Ostracoda (Suborder Myodocopina). *Smithsonian Contributions to Zoology*, 197:1-46, 32 figures.
- Kornicker, L. S., and Francisca Elena Caraiou
1974. West African Mydocopid Ostracoda (Cylindroleberididae). *Smithsonian Contributions to Zoology*, 179:1-78, 43 figures.
- Liljeborg [Lilljeborg], Wilh.
1853. Ostracoda. Pages 92-130 in *De Crustaceis ex ordinibus tribus: Cladocera, Ostracoda et Copepoda in Scania occurrentibus*. Lund.
- Müller, G. W.
1893. Über Lebensweise und Entwicklungsgeschichte der Ostracoden. *Sitzungsberichte der Königlich-Preussische Akademie der Wissenschaften*, 23:355-381.
1894. Die Ostracoden des Golfes von Neapel und der angrenzenden Meeres-Abschnitte. *Fauna und Flora des Golfes von Neapel*, 21: 404 pages, 40 plates.
1908. Die Ostracoden. Part 2 of volume 10 in *Deutsche Südpolar-Expedition 1901-1903*, 178 pages, 12 plates. Berlin.
1912. Ostracoda. *Das Tierreich*. 31: 434 pages, 92 figures.
- Norman, A. M.
1861. Contributions to British Carcinology, I: Characters of Undescribed Podophthalmia and Entomostraca. *Annals and Magazine of Natural History*, Series 3, 8:273-281, plates 13, 14.
- Poulsen, E. M.
1962. Ostracoda-Myodocopa, 1: Cypridiniformes-Cypridinae. *Dana Reports*, 57:1-414, 181 figures.
- Sars, G. O.
1866. Oversigt af Norges marine Ostracoder. *Forhandlinger Videnskabs-Selskabet i Christiania*, 7:1-130. [Preprint: 1865.]
1888. Nye Bidrag til Kundskaben om Middelhavets Invertebratfauna. *Archiv for Mathematik og Naturvidenskab*, 12:173-324, plates 1-20. Kristiania. [Preprint: 1887:1-152, plates 1-20].
- Skogsberg, T.
1920. Cypridinids, Halocyprids and Polycopids. Part 1 in volume 1 (studies on Marine Ostracods) of Supplement to *Zoologiska Bidrag från Uppsala*. 784 pages, 153 figures.
- Stebbing, T. R.
1901. Giant Ostracoda: Old and New. *Knowledge*, 24:100.
- Sylvester-Bradley, P. C.
1950. The Identity of the Ostracod *Philomedes brenda* (Baird). *Annals and Magazine of Natural History*, Series 12, 3:777.
1961. Myodocopida. Pages Q387-Q406 in volume 3(Q) of R. C. Moore, ed., *Treatise on Invertebrate Paleontology*. Lawrence, Kansas: Geological Society of America and University of Kansas Press.

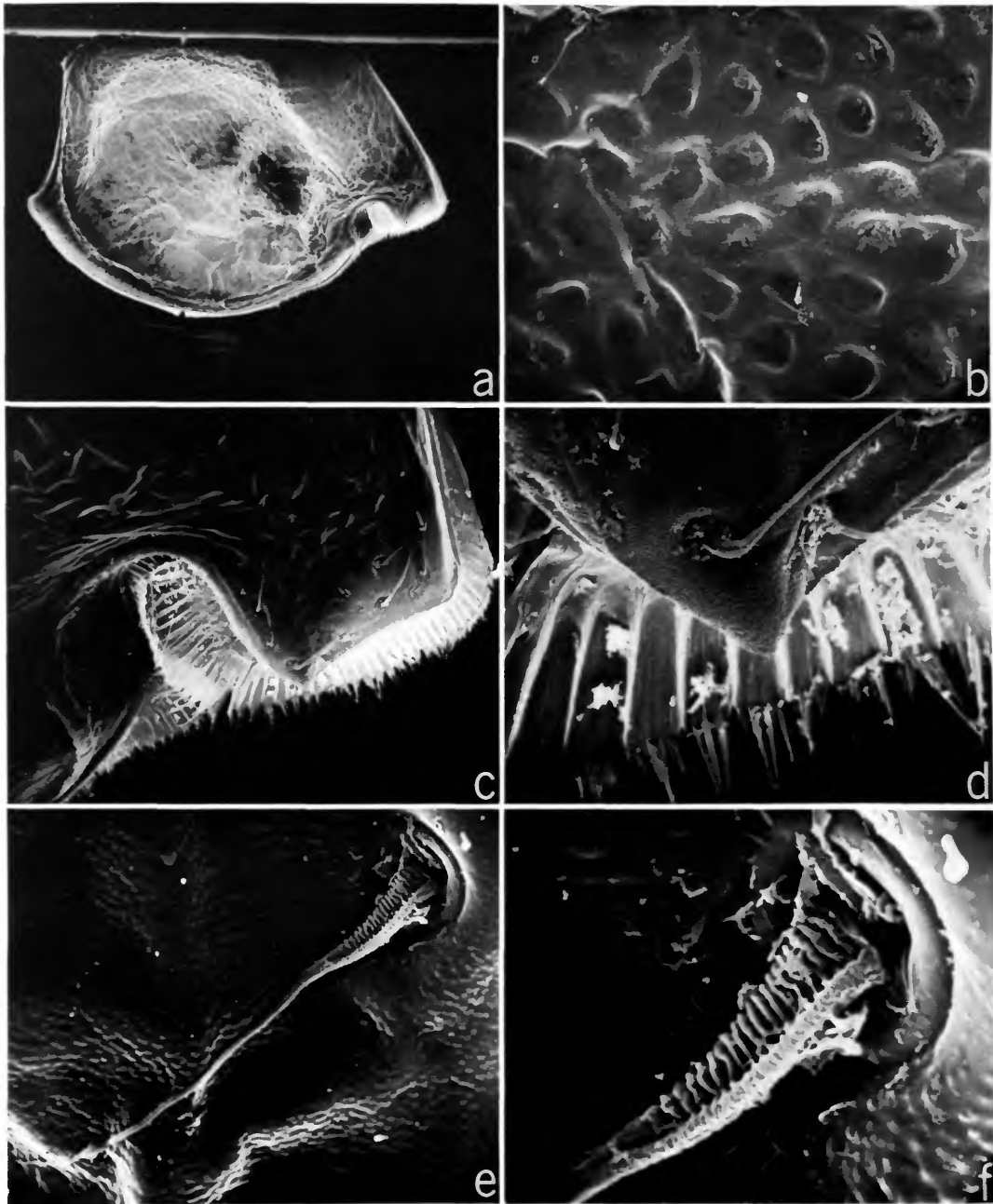


PLATE 1.—*Philomedes bonneti*, new species, female, "Grigore Antipa" 288, holotype, outside views of right valve: *a*, complete valve, dorsal margin flattened, $\times 45$; *b*, shallow fossae near middle of *a*, $\times 400$; *c*, rostrum and incisur, $\times 200$; *d*, inferior corner of rostrum showing process at tip, $\times 900$; *e*, bristle near anteroventral margin of valve, $\times 2800$; *f*, base of bristle shown in *e*, $\times 7000$. (Photos reduced to 76%.)

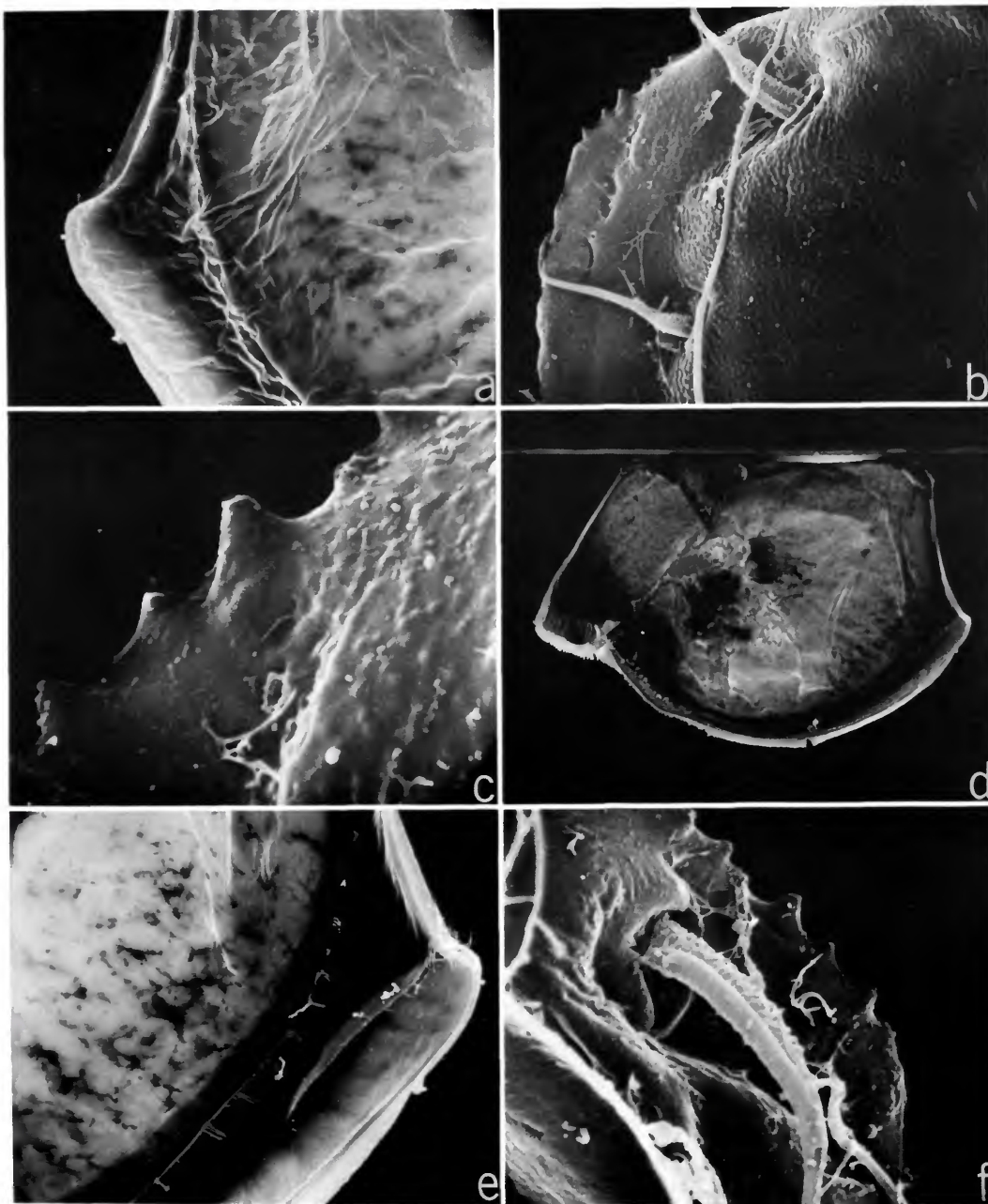


PLATE 2.—*Philomedes bonneti*, new species, female, "Grigore Antipa" 288, holotype, right valve: *a*, posterior of valve showing caudal process, lateral view, $\times 185$; *b*, posterodorsal margin of caudal process in *a* showing digitation, $\times 2000$; *c*, digitations shown in *b*, $\times 10,000$; *d*, complete valve, dorsal margin flattened, inside view, $\times 47$; *e*, posterior of *e* showing caudal process, $\times 95$; *f*, digitations and medial bristle on posterodorsal margin of caudal process, from *e*, $\times 4700$. (Photos reduced to 75%.)

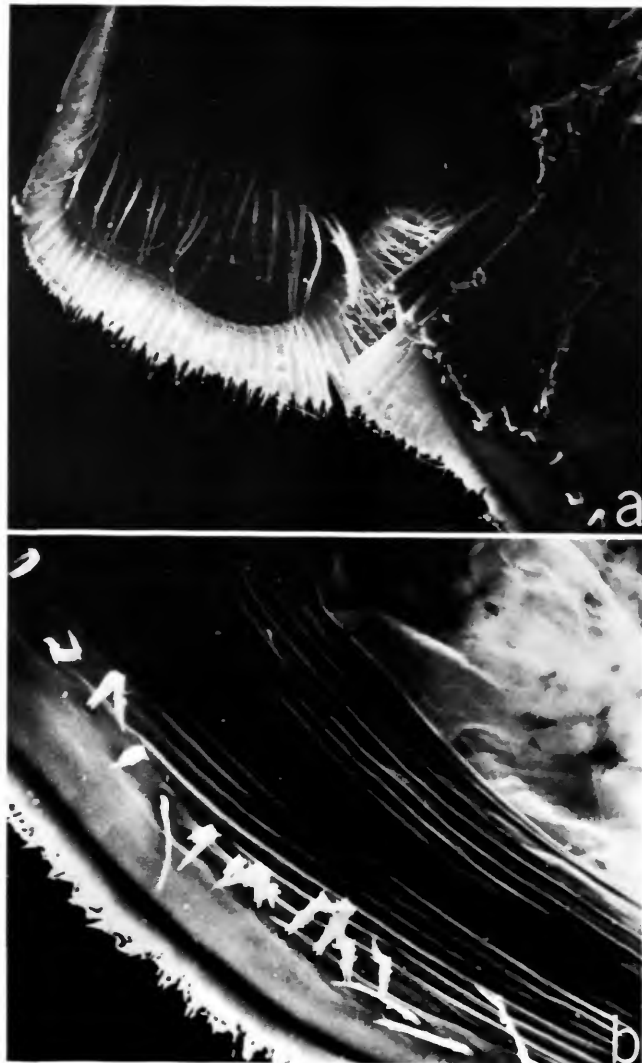


PLATE 3.—*Philomedes bonneti*, new species, female, "Grigore Antipa" 288, holotype, inside views of right valve: *a*, rostrum, $\times 200$; *b*, anteroventral infold, $\times 400$. (Photos reduced to 77%.)

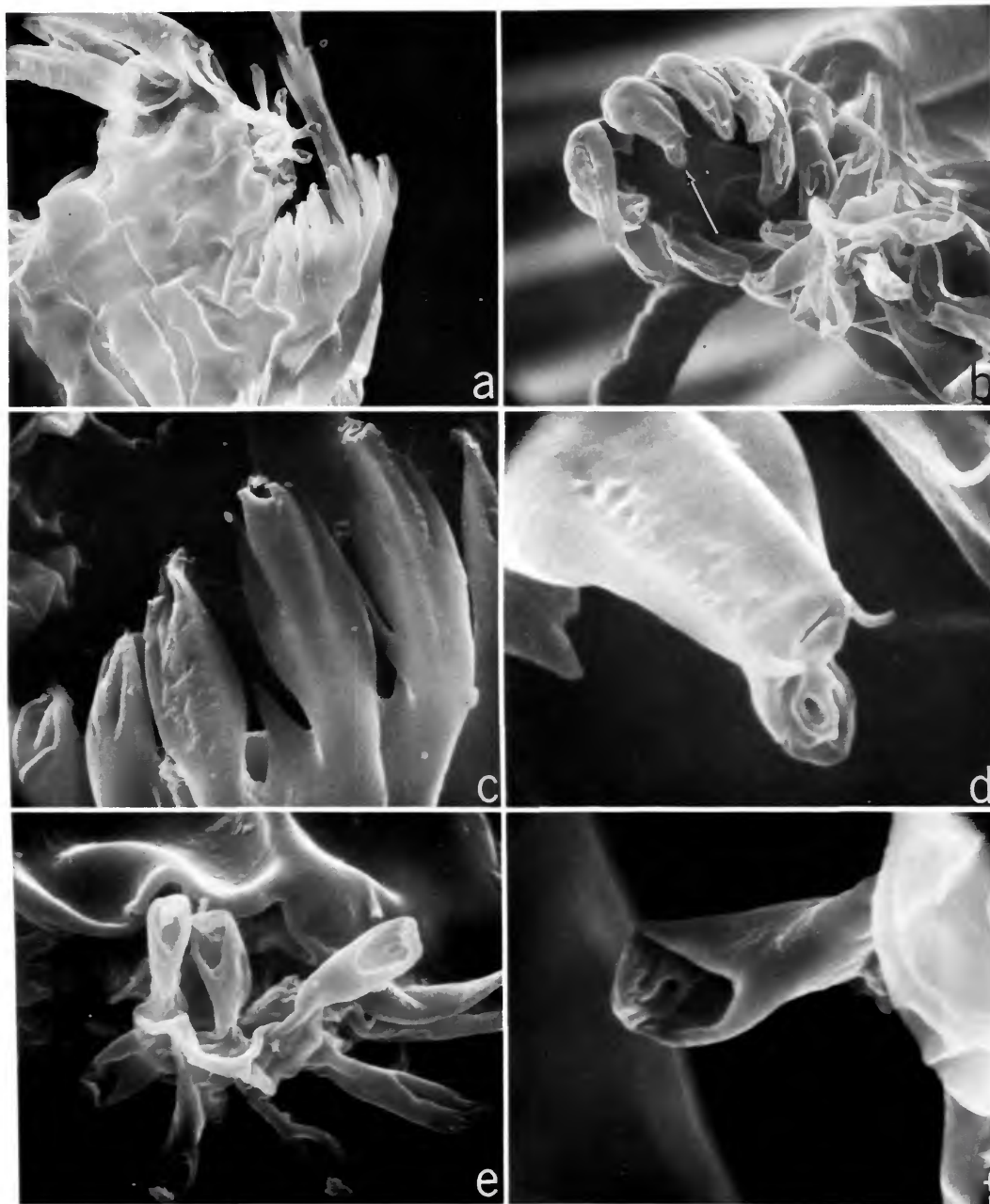


PLATE 4.—*Philomedes bonneti*, new species male, "Grigore Antipa" 289, allotype, tip of 7th limb: *a*, lateral view of terminus, comb on right of tip, pegs on upper left, $\times 1400$; *b*, end view of terminus, comb on left of tip, pegs on right, $\times 3400$; *c*, comb teeth, from *a*, $\times 6500$; *d*, tip of comb tooth showing terminal pore, from *b* (see arrow in *b*), $\times 17,000$; *e*, pegs, from *a* (note pore at tips of lower pegs), $\times 7500$; *f*, detail of tip of peg showing pore, $\times 10,000$. (Photos reduced to 74%.)

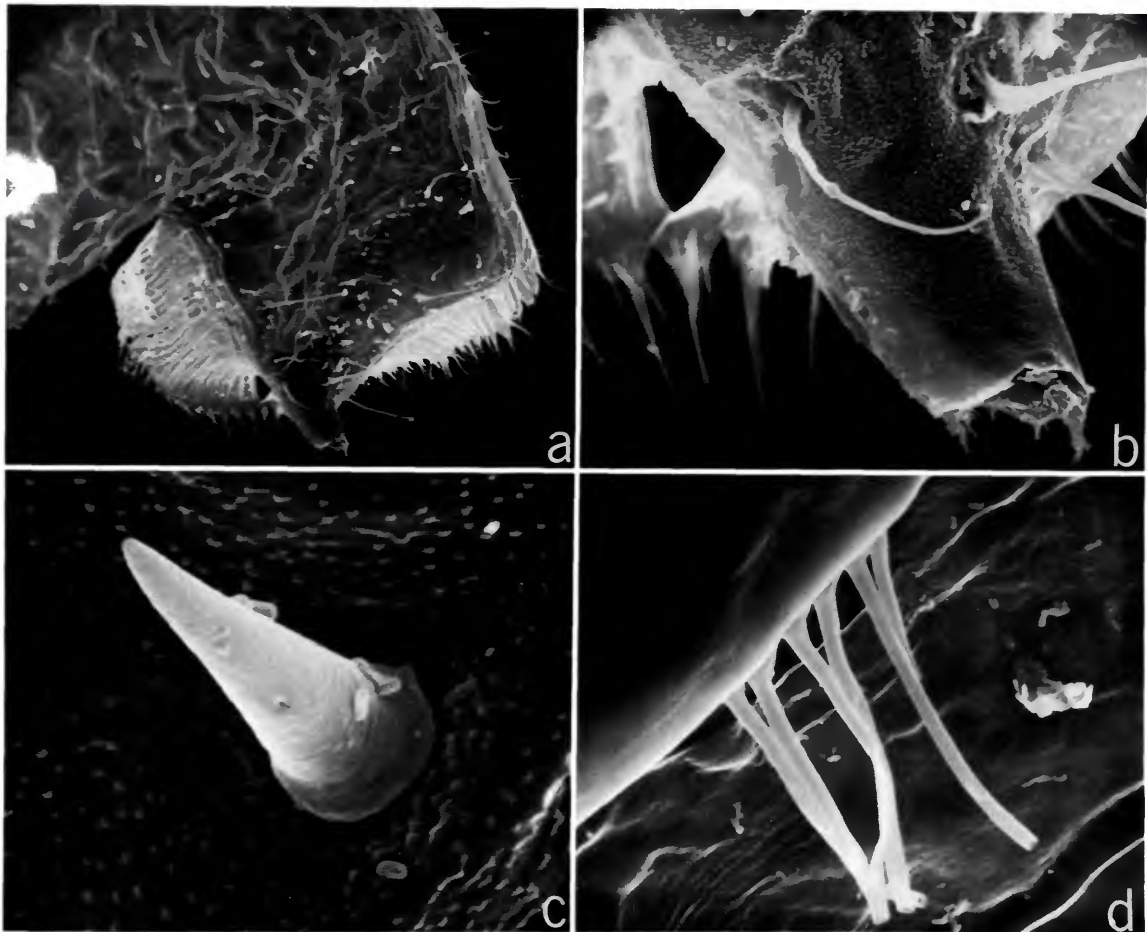


PLATE 5.—*Philomedes tetradens*, new species, female, USNM 150289, holotype, right valve: *a*, rostrum showing lateral process (valve margin below incisur folded under on specimen photographed), $\times 220$; *b*, process of rostrum, $\times 1000$; *c*, short bristle on outer surface of carapace, $\times 5000$; *d*, bristles along inner margin of posterior infold (note open ends), $\times 2600$. (Photos reduced to 82%.)

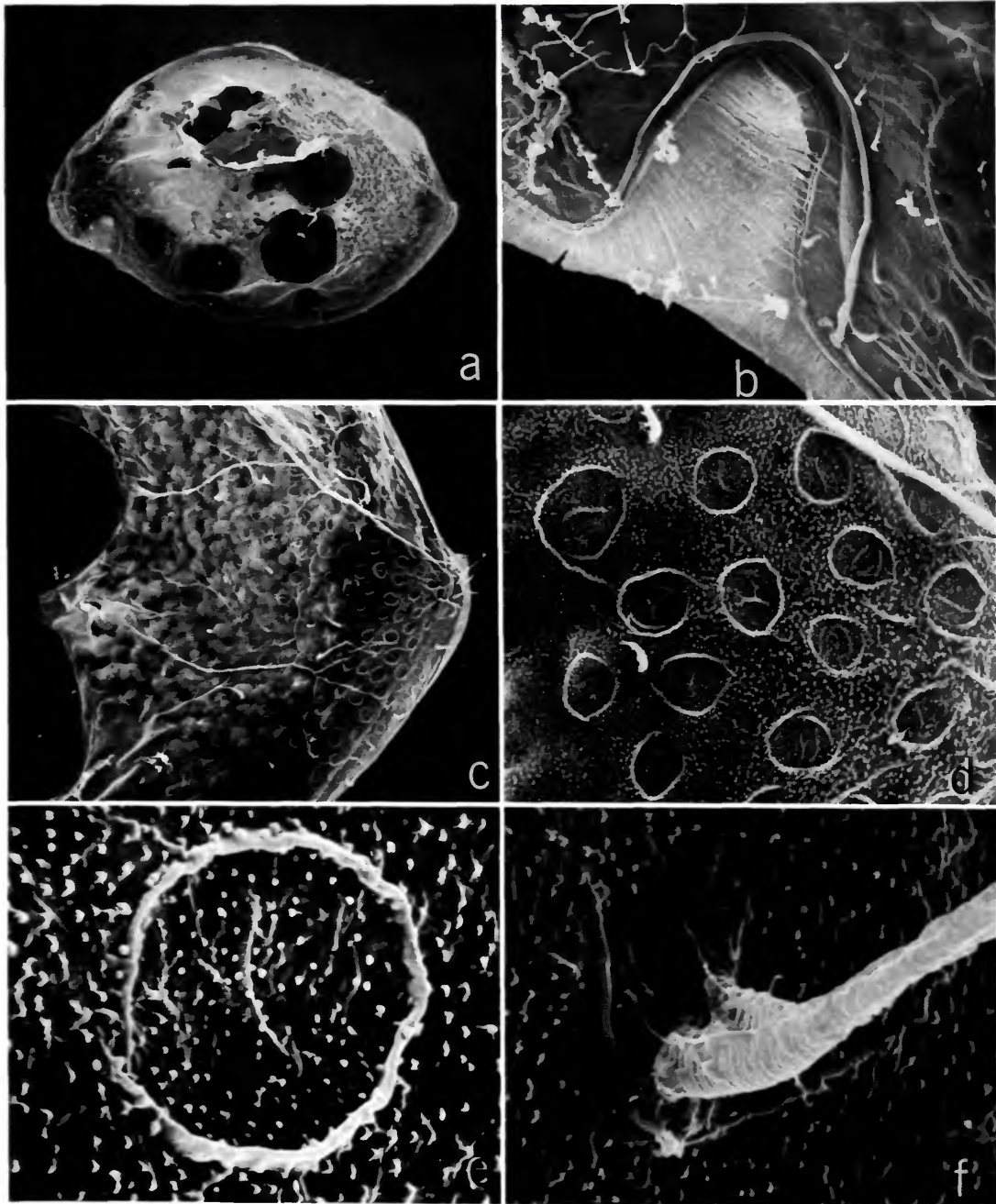


PLATE 6.—*Euphilomedes asper* (Müller), female, USNM 156632, left valve, outside views: a, complete valve, $\times 65$; b, rostrum and incisur, $\times 400$; c, truncate posterior of valve, $\times 200$; d, fossae with peripheral rim, from c, $\times 1000$; e, individual fossae, from d, $\times 5000$; f, base of bristle on valve outer surface, $\times 5000$. (Photos reduced to 77%.)

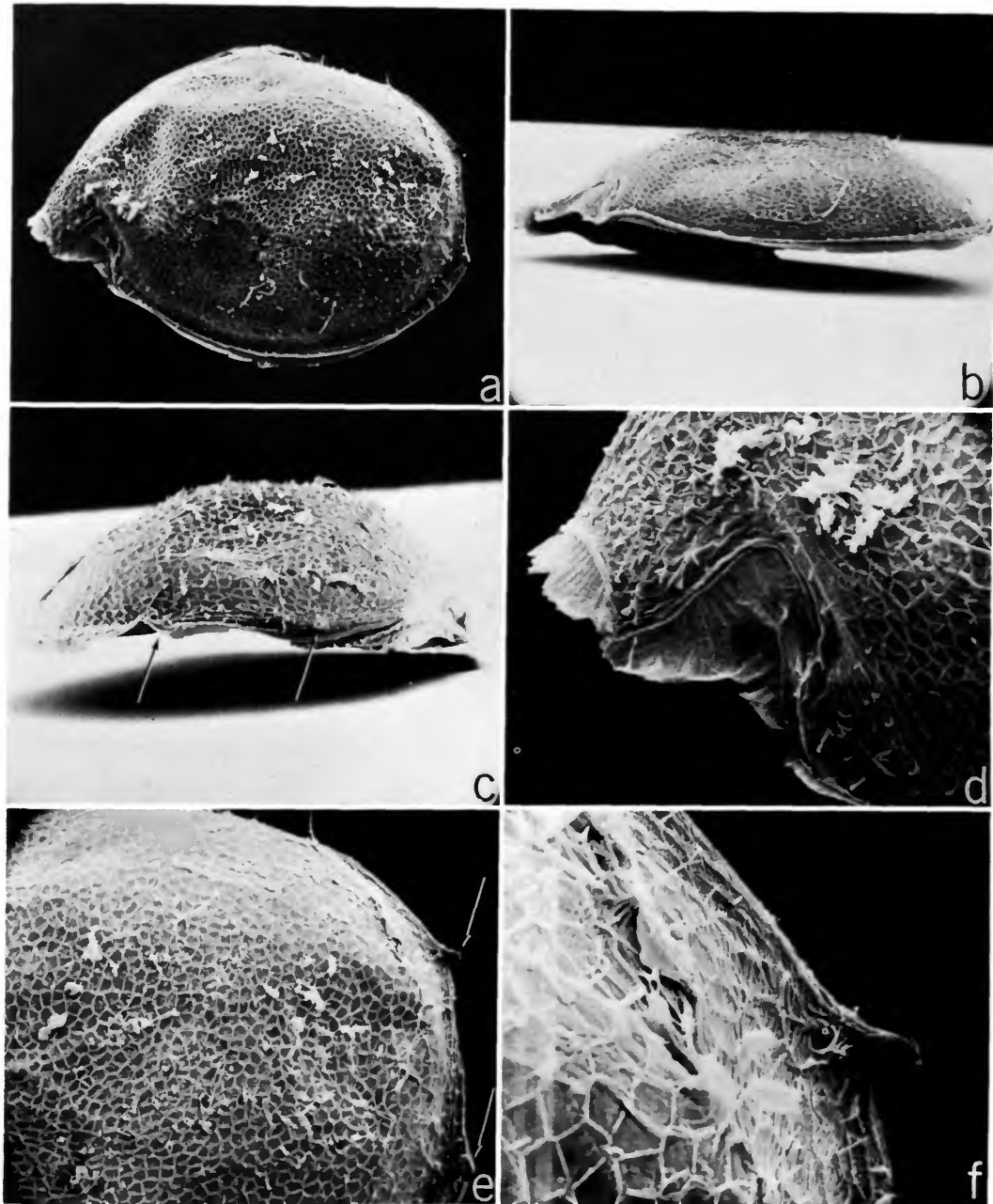


PLATE 7.—*Euphilomedes sinister pentathrix*, new subspecies, female, USNM 152831, holotype, left valve, outside views: *a*, complete valve, $\times 70$; *b*, ventral view, anterior to left, $\times 80$; *c*, posterior view, venter to left (arrows point to lower and upper posterior processes), $\times 100$; *d*, rostrum and incisur, $\times 230$; *e*, posterior (arrows point to upper and lower processes, lower process bent outward during freeze-drying), $\times 135$; *f*, upper process, from *e*, $\times 500$. (Photos reduced to 75%.)

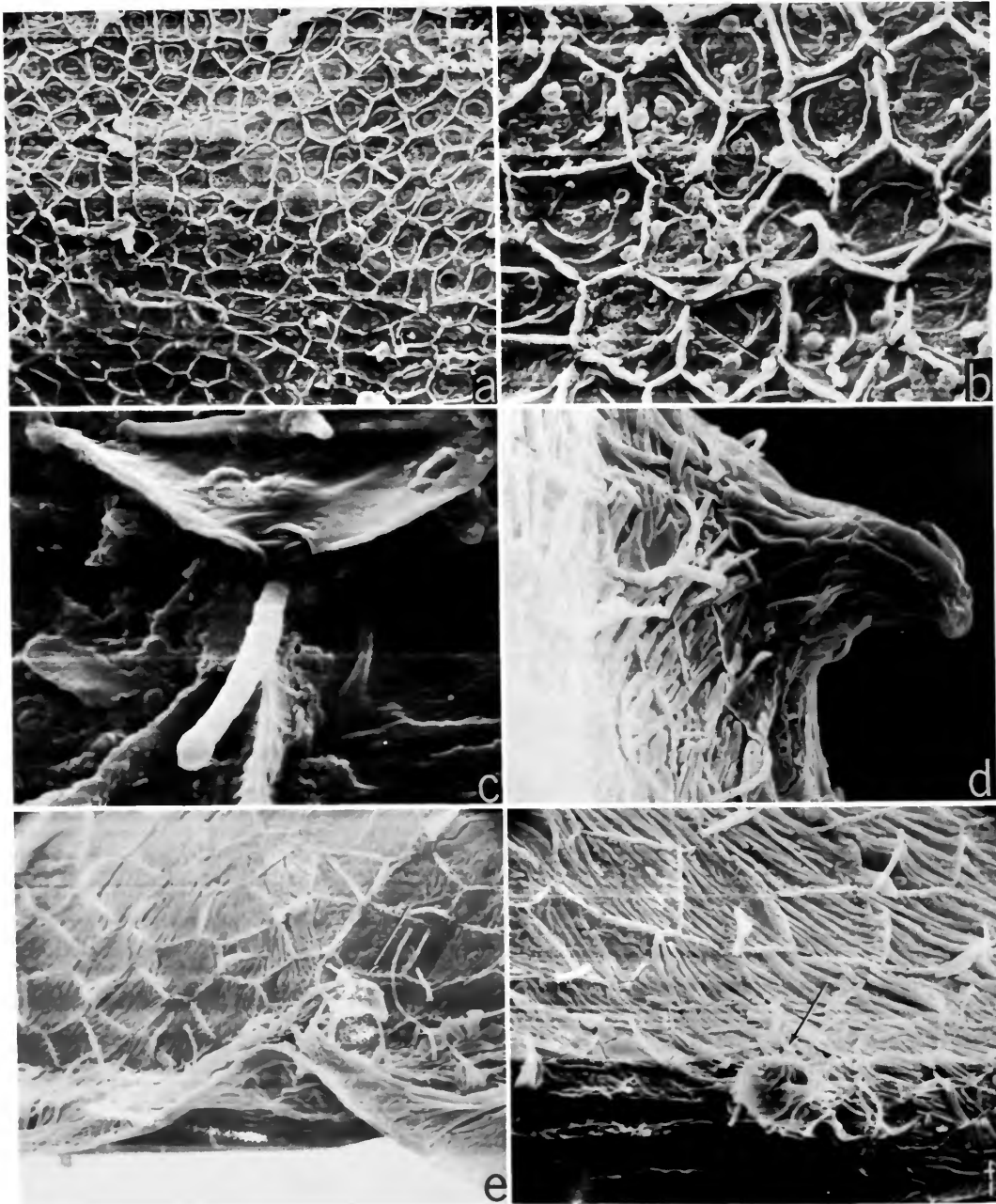


PLATE 8.—*Euphilomedes sinister pentathrix*, new subspecies, female, USNM 152831, holotype, left valve, outside views: *a*, reticulate surface near central adductor muscle scars, from Plate 7*a*, $\times 375$; *b*, reticulate surface from near middle of Plate 7*a*, $\times 1150$; *c*, bristle in lower left of *b* (see arrow in *b*), $\times 5775$; *d*, upper posterior process, from Plate 7*f*, $\times 1680$; *e*, posterior view of lower posterior process (arrow), from Plate 7*c*, $\times 750$; *f*, posterior view of upper posterior process (arrow), from Plate 7*c*, $\times 1100$. (Photos reduced to 75%.)

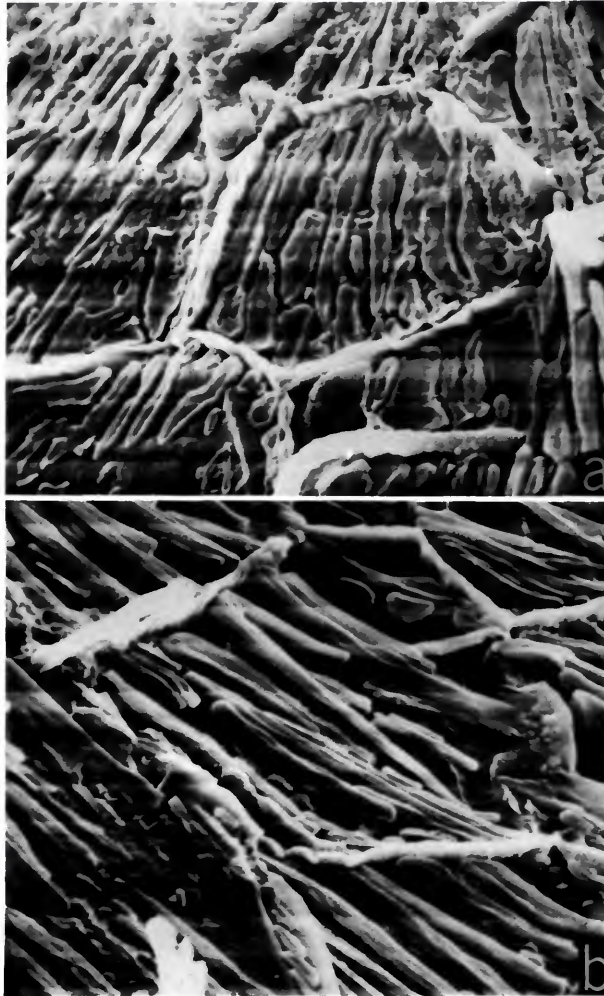


PLATE 9.—*Euphilomedes sinister pentathrix*, new subspecies, female, USNM 152831, holotype, left valve, outside views: *a*, detail of surface near lower posterior process, from Plate 8*e*, $\times 3000$; *b*, detail of surface near upper posterior process, from Plate 8*f*, $\times 3000$. (Photos reduced to 80%.)

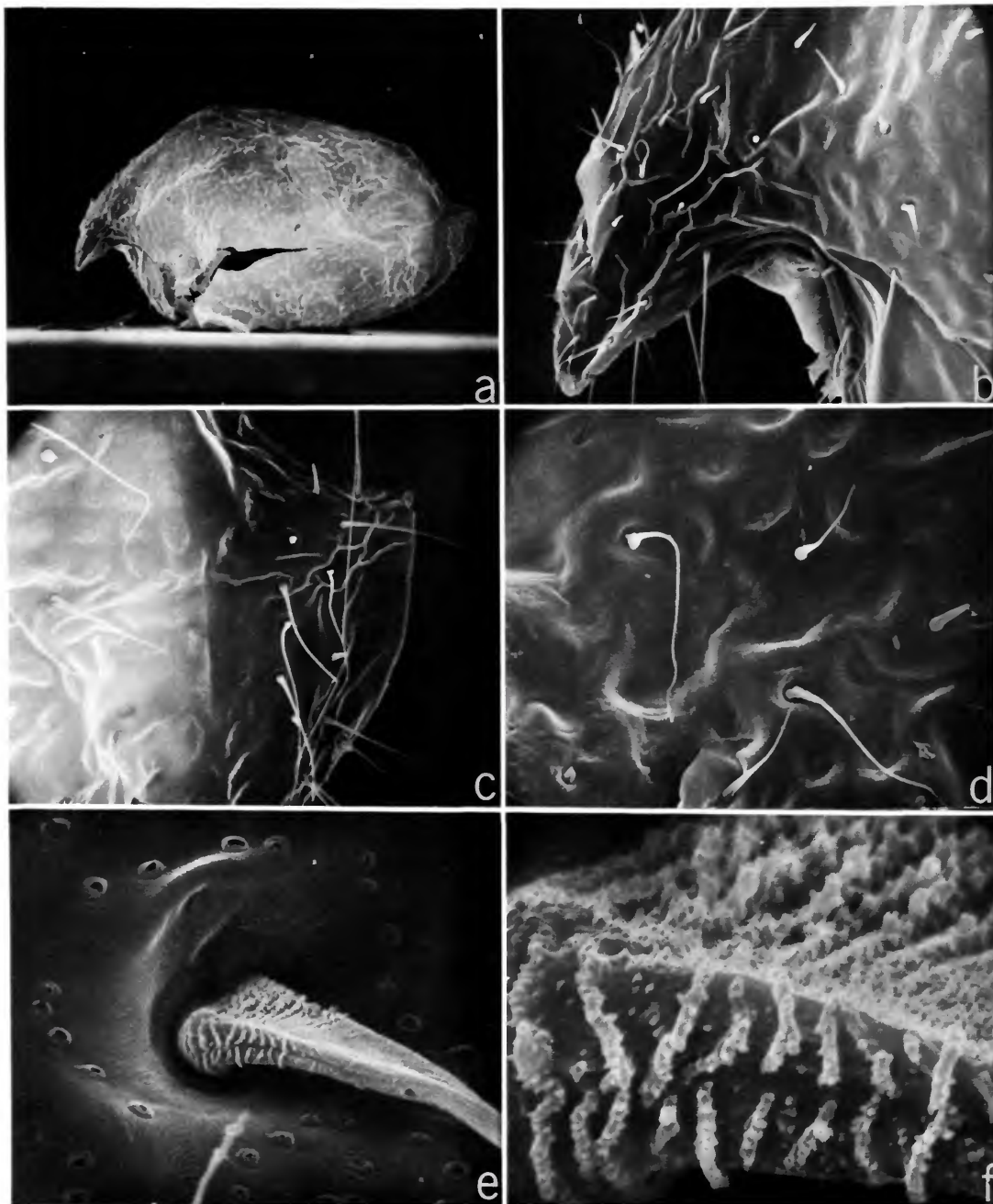


PLATE 10.—*Tetragonodon ctenorynchus* (Brady), female, [USNM 142387], left valve, outside views: *a*, complete valve, $\times 50$; *b*, rostrum and incisur, $\times 250$; *c*, caudal process, $\times 250$; *d*, surface hairs, from just ventral to posterior end of horizontal crack in *a*, $\times 400$; *e*, base of bristle in *d*, $\times 3000$; *f*, surface of base of bristle in *e*, $\times 15,000$. (Photos reduced to 77%.)

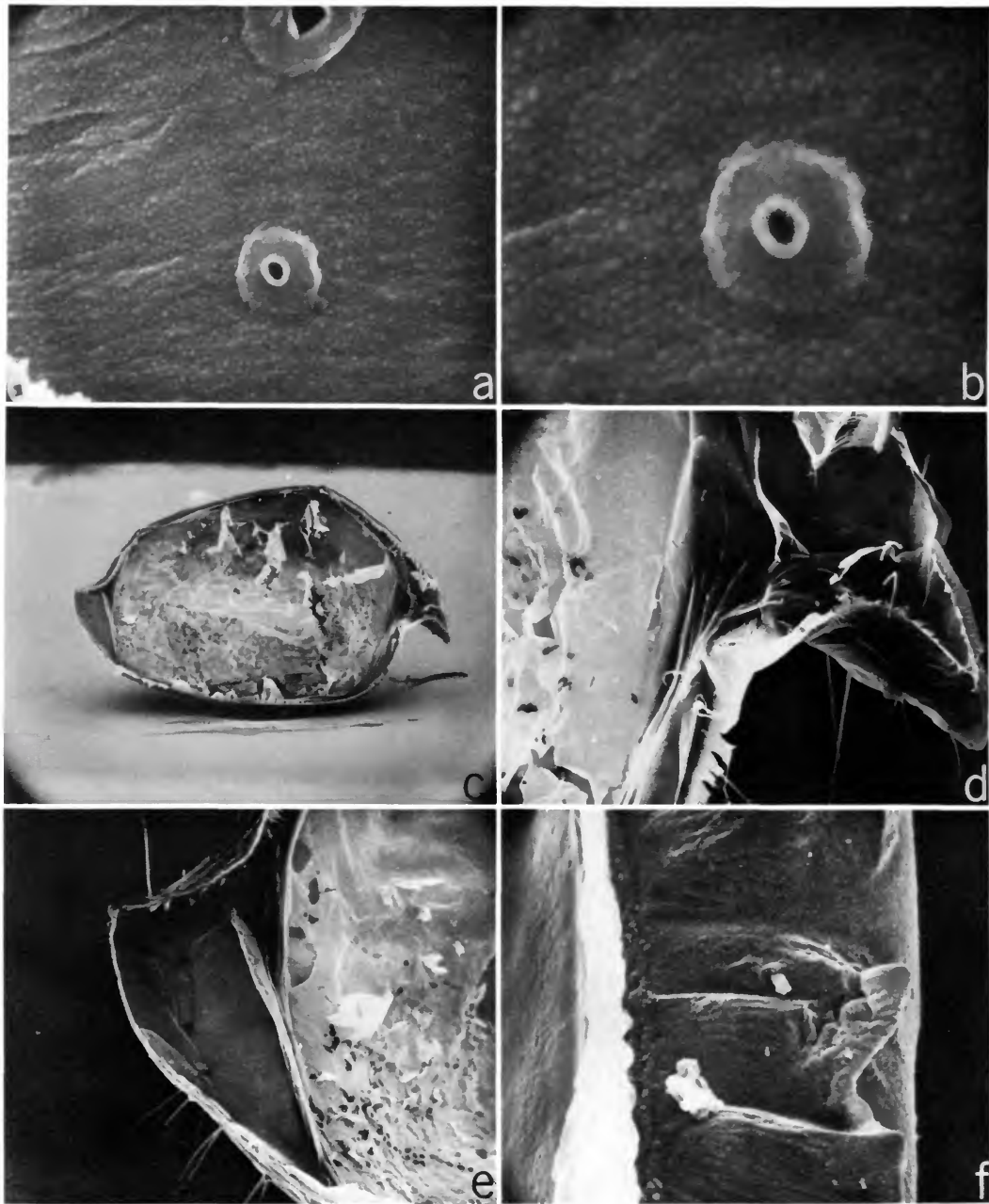


PLATE 11.—*Tetragonodon ctenorhynchus* (Brady), female. [USNM 142387], left valve: *a*, surface pores, from Plate 10e, $\times 15,000$; *b*, detail of pore in *a*, $\times 30,000$; *c*, complete valve, inside view, $\times 40$; *d*, rostrum and incisur, from *c*, $\times 250$; *e*, caudal process from *c*, $\times 200$; *f*, anterior margin of rostrum, from *d*, $\times 6500$. (Photos reduced to 77%.)

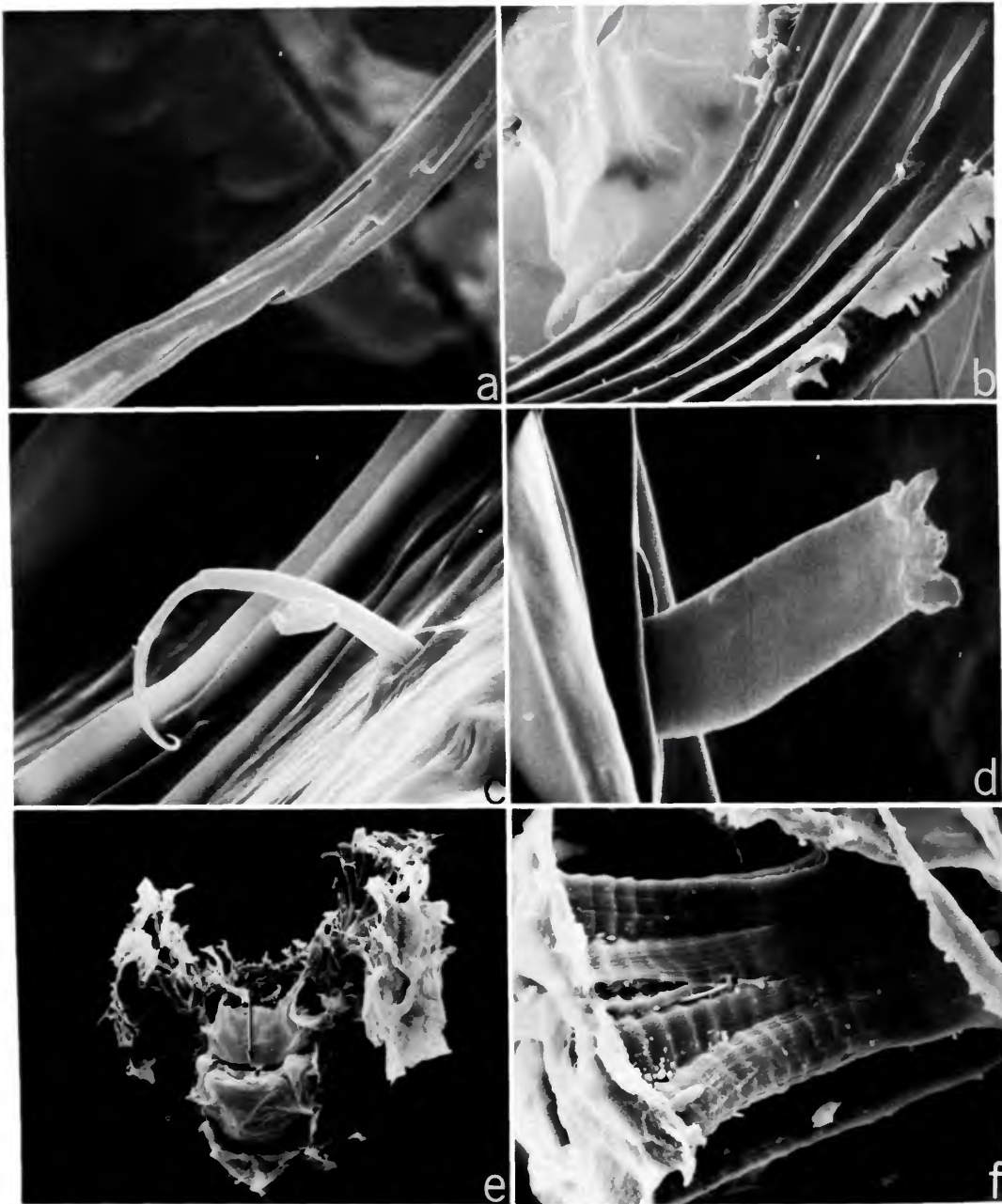


PLATE 12.—*Tetragonodon ctenorynchus* (Brady), female, [USNM 142387]: *a*, section of bristle on infold of rostrum of left valve, $\times 7500$; *b*, lamellar prolongation of selvage and ridges of infold along anteroventral margin of left valve, $\times 750$; *c*, bristle on anteroventral infold just below incisur, from Plate 11*d*, $\times 300$; *d*, one of the 2 truncate bristles on list of infold of caudal process of left valve, $\times 7500$; *e*, ventral view of upper and lower lip, and central adductor muscles detached from valves (arrow points to mouth), $\times 85$; *f*, detail of muscle ends on left of *e*, $\times 625$. (Photos reduced to 77%.)

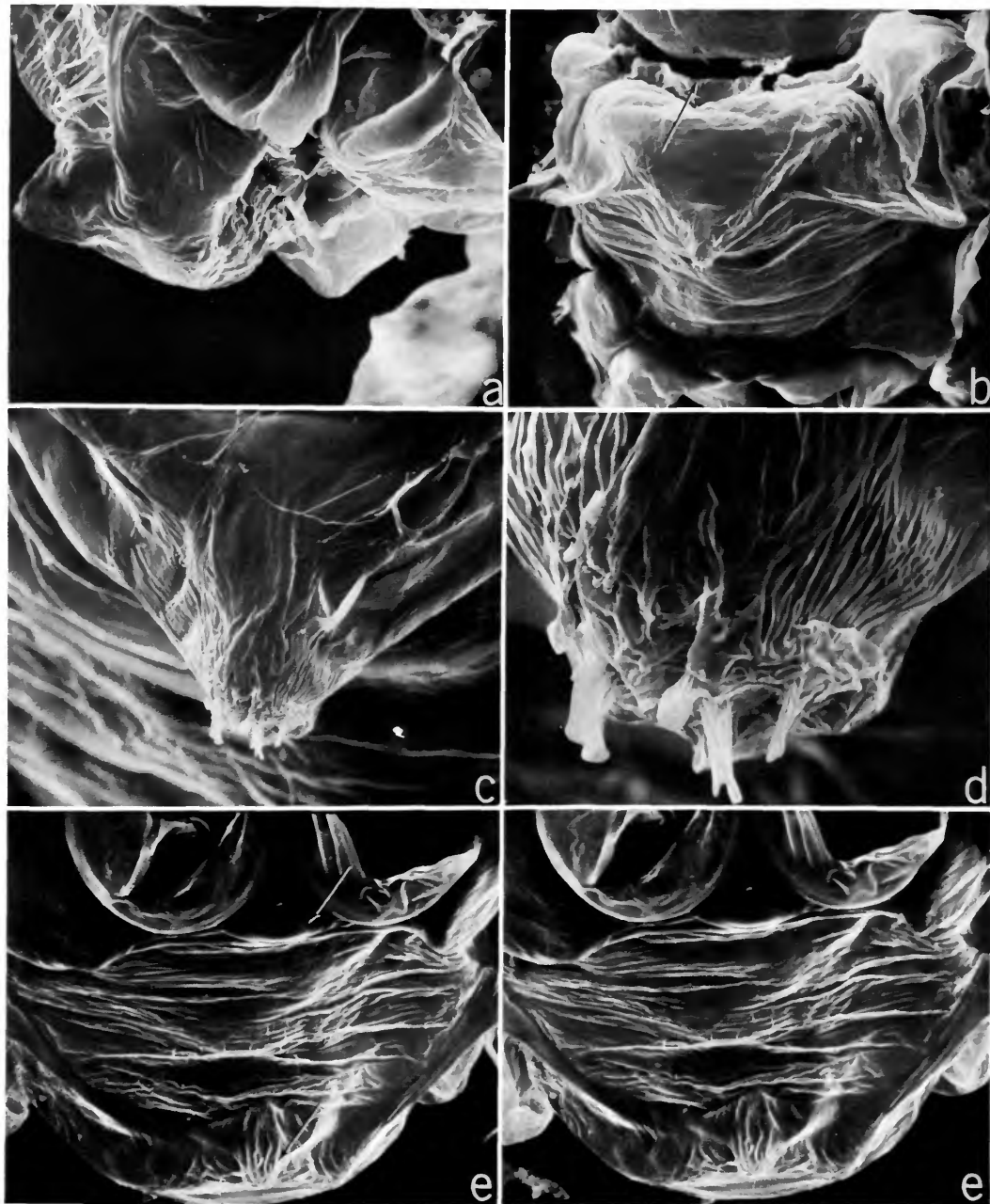


PLATE 13.—*Tetragonodon ctenorynchus* (Brady), female, [USNM 142387], upper lip: *a*, lateral view, anterior to left, $\times 400$; *b*, ventral view, anterior to bottom, also showing mouth and part of lower lip (arrow points to mouth), $\times 300$; *c*, ventral view of tip of upper lip showing anterior process, from *b*, $\times 1500$; *d*, detail of processes at tip of lip shown in *c*, $\times 5000$; *e*, stereo pair showing anterior view of anterior of body (lower arrow points to anterior tip of upper lip, upper arrow points to button-like anterior process between upper lip and 1st antennae). $\times 400$. (Photos reduced to 77%.)

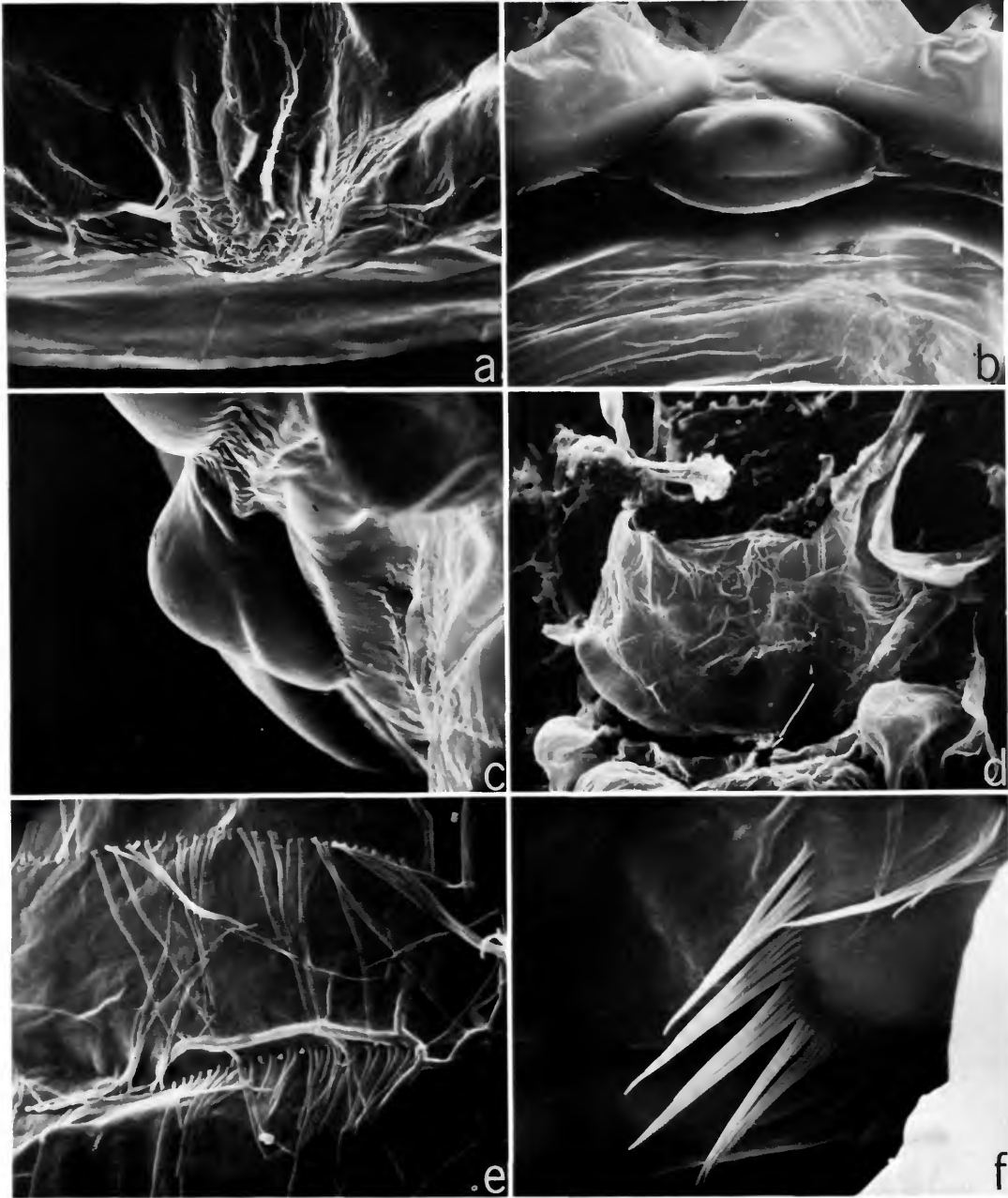


PLATE 14.—*Tetragonodon ctenorynchus* (Brady), female, [USNM 142387]: *a*, anterior view, slightly oblique, of tip of upper lip, from Plate 13*e*, $\times 2000$; *b*, anterior view, slightly oblique, of button-like anterior process, from Plate 13*e*, $\times 2000$; *c*, left lateral view of anterior process, $\times 2000$; *d*, ventral view of lower lip and mouth (arrow), from Plate 12*e*, $\times 300$; *e*, hairs near middle of lower lip, from *d*, $\times 3000$; *f*, hairs on lower lip near right side of mouth, from *d*, $\times 3400$. (Photos reduced to 75%.)

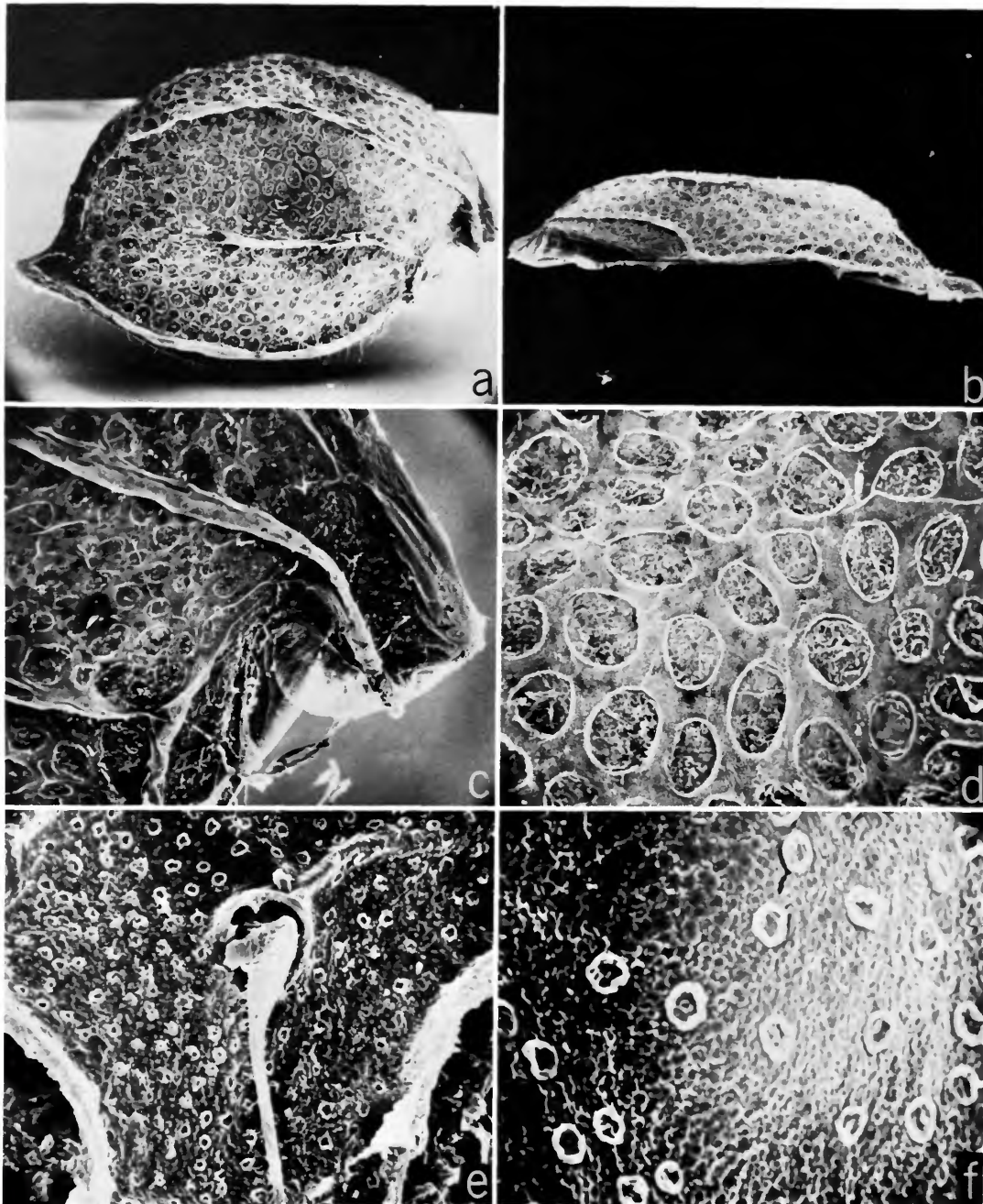


PLATE 15.—*Scleroconcha folinii* (Brady), female, USNM 141545, right valve, outside views: *a*, complete valve, length 2.56 mm, $\times 45$; *b*, dorsal view, anterior to left, $\times 45$; *c*, rostrum and incisur, $\times 120$; *d*, fossae near middle of *a*, $\times 200$; *e*, bristle near middle of *d*, $\times 2000$; *f*, rimmed pores from floor of fossae on lower right of *d*, $\times 6000$. (Photos reduced to 77%.)

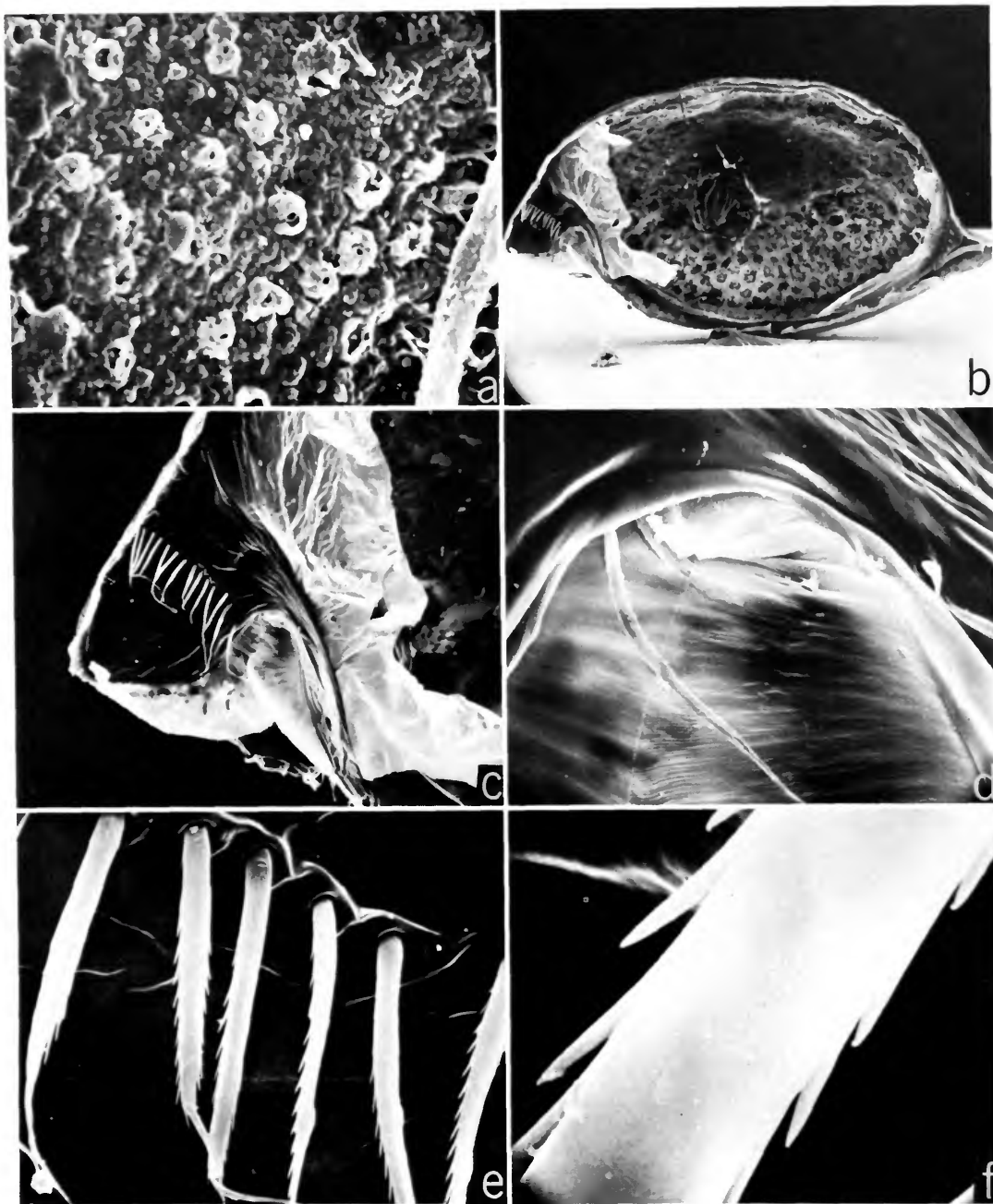


PLATE 16.—*Scleroconcha folinii* (Brady), female, USNM 141545, right valve: *a*, rimmed pores on surface between fossae on outer surface of valve, $\times 6000$; *b*, inside view of complete valve, $\times 45$; *c*, rostrum and incisor, inside view, $\times 130$; *d*, inner end of incisor, from *c*, $\times 1000$; *e*, bristles on infold of rostrum, from *c*, $\times 1000$; *f*, detail of bristle in *e*, $\times 7500$. (Photos reduced to 76%.)

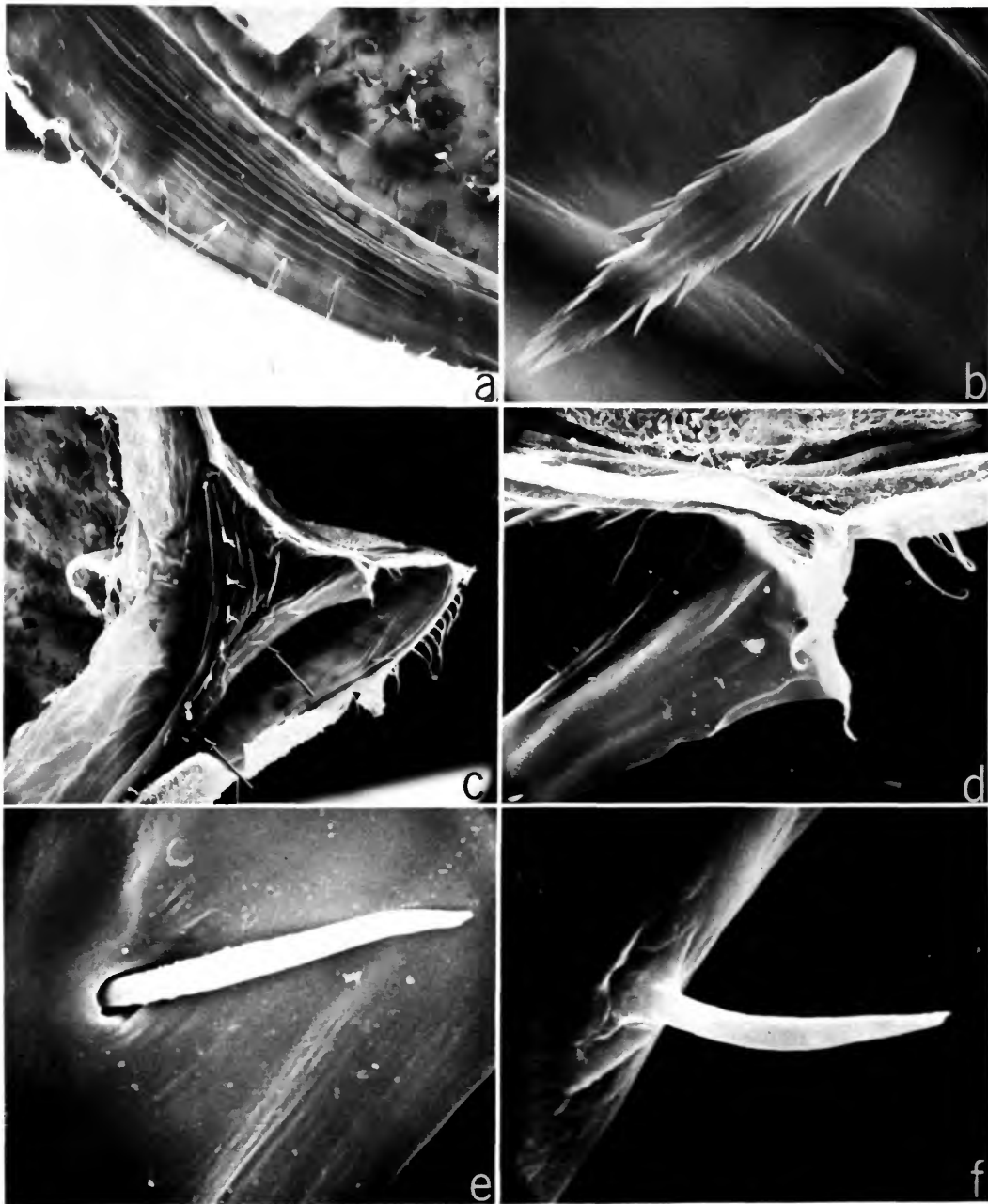


PLATE 17.—*Scleroconcha folinii* (Brady), female, USNM 141545, right valve, inside views: *a*, anteroventral margin, $\times 270$; *b*, infold bristle from *a*, $\times 2650$; *c*, caudal process, $\times 200$; *d*, junction between edge of valve and dorsal end of list flap, from *c*, $\times 1000$; *e*, *f*, bristles on list of caudal process (see arrows in *c*), $\times 5000$. (Photos reduced to 77%.)

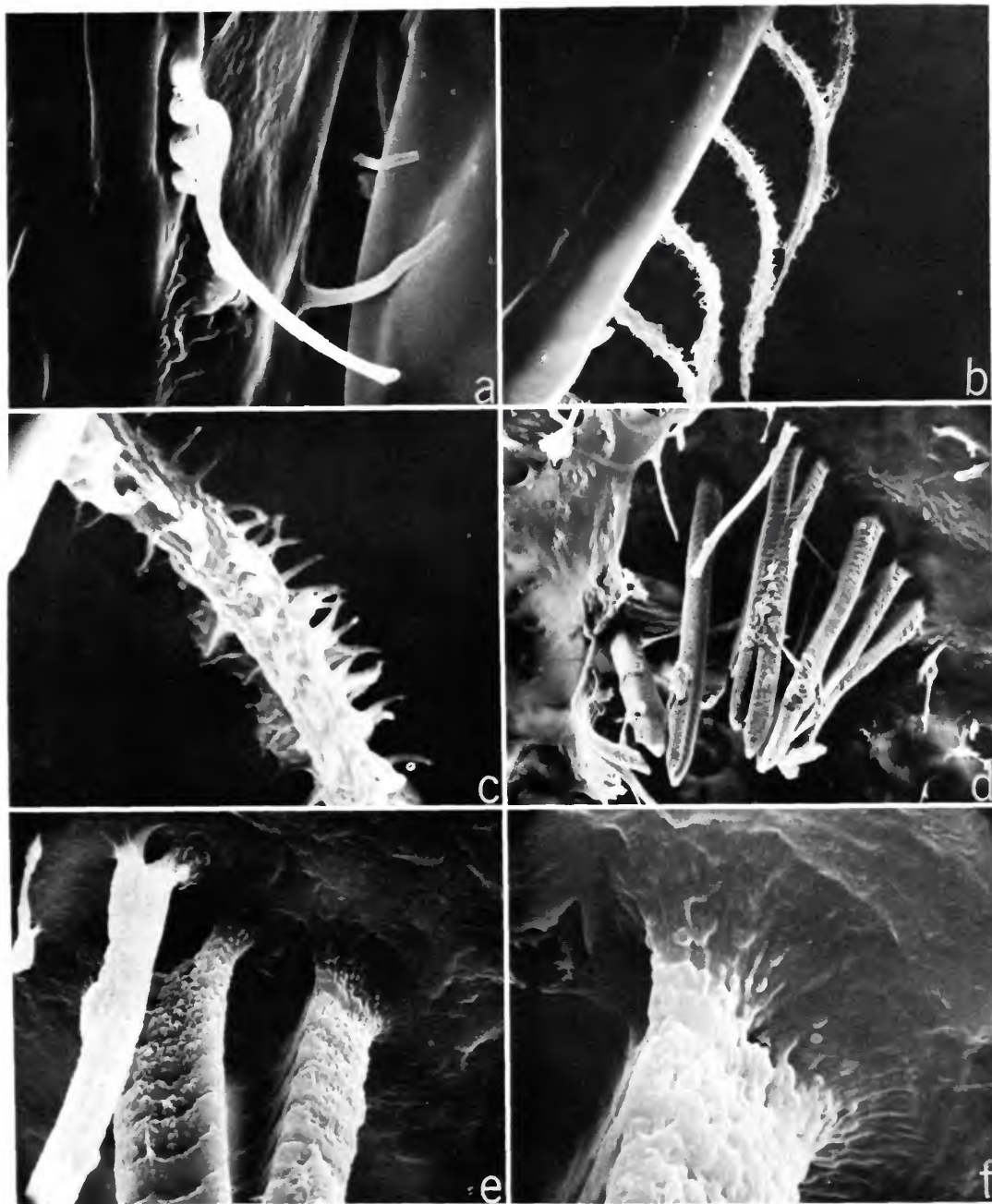


PLATE 18.—*Scleroconcha folinii* (Brady), female, USNM 141545, right valve, inside views: a, group of 4 bristles on inner margin of infold of caudal process, from Plate 17c, $\times 3000$; b, bristles on outer edge of valve of caudal process, from Plate 17c, $\times 2000$; c, detail of bristle in b, $\times 10,000$; d, distal end of central adductor muscles, from Plate 16b, $\times 340$; e, ends of muscles near top of d, $\times 1700$; f, end of right muscle in e, $\times 750$. (Photos reduced to 76%.)

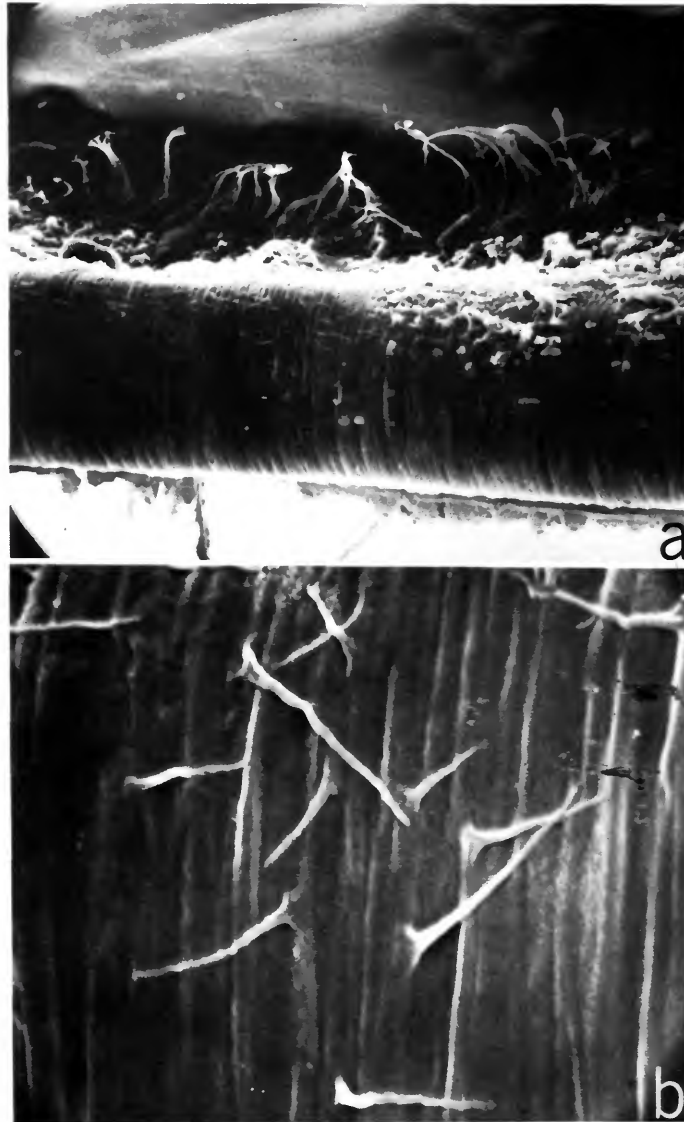


PLATE 19.—*Scleroconcha jolinii* (Brady), female, USNM 141545, right valve: *a*, outer surface of lamellar prolongation of selvage along ventral margin just posterior to middle, from Plate 16*b*, $\times 750$; *b*, hairs on outer surface of lamellar prolongation shown in *a*, $\times 7500$. (Photos reduced to 83%.)

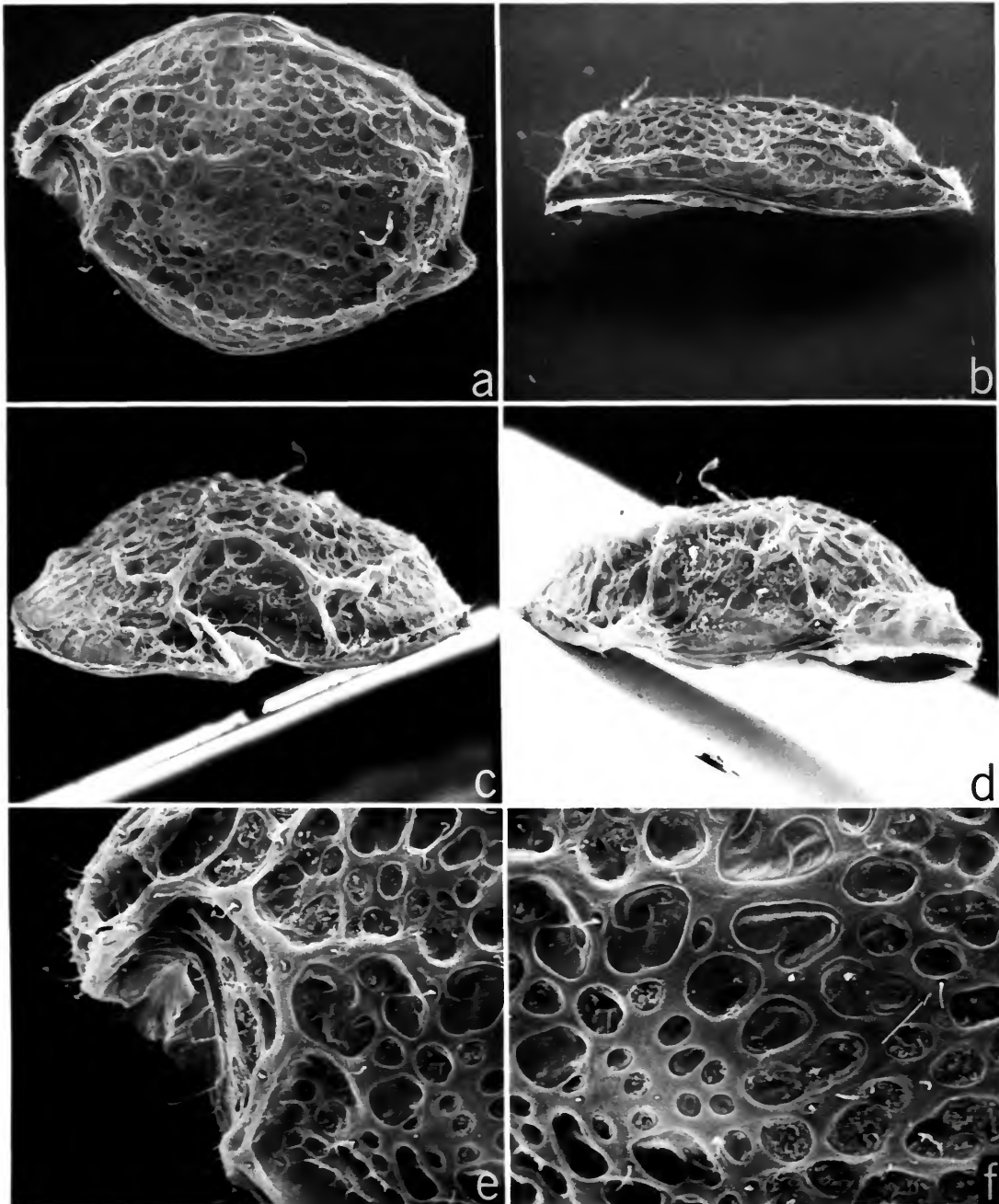


PLATE 20.—*Pseudophilomedes angulatus* Müller, female, USNM 154192, left valve, outside views: *a*, complete valve, length 1.59 mm, $\times 70$; *b*, dorsal view, anterior to right, $\times 70$; *c*, anterior view, venter to right, $\times 100$; *d*, posterior view, venter to left, $\times 100$; *e*, rostrum and incisor, from *a*, $\times 175$; *f*, fossae and bristles in vicinity of central muscles attachment area, from *a*, $\times 220$. (Photos reduced to 76%.)

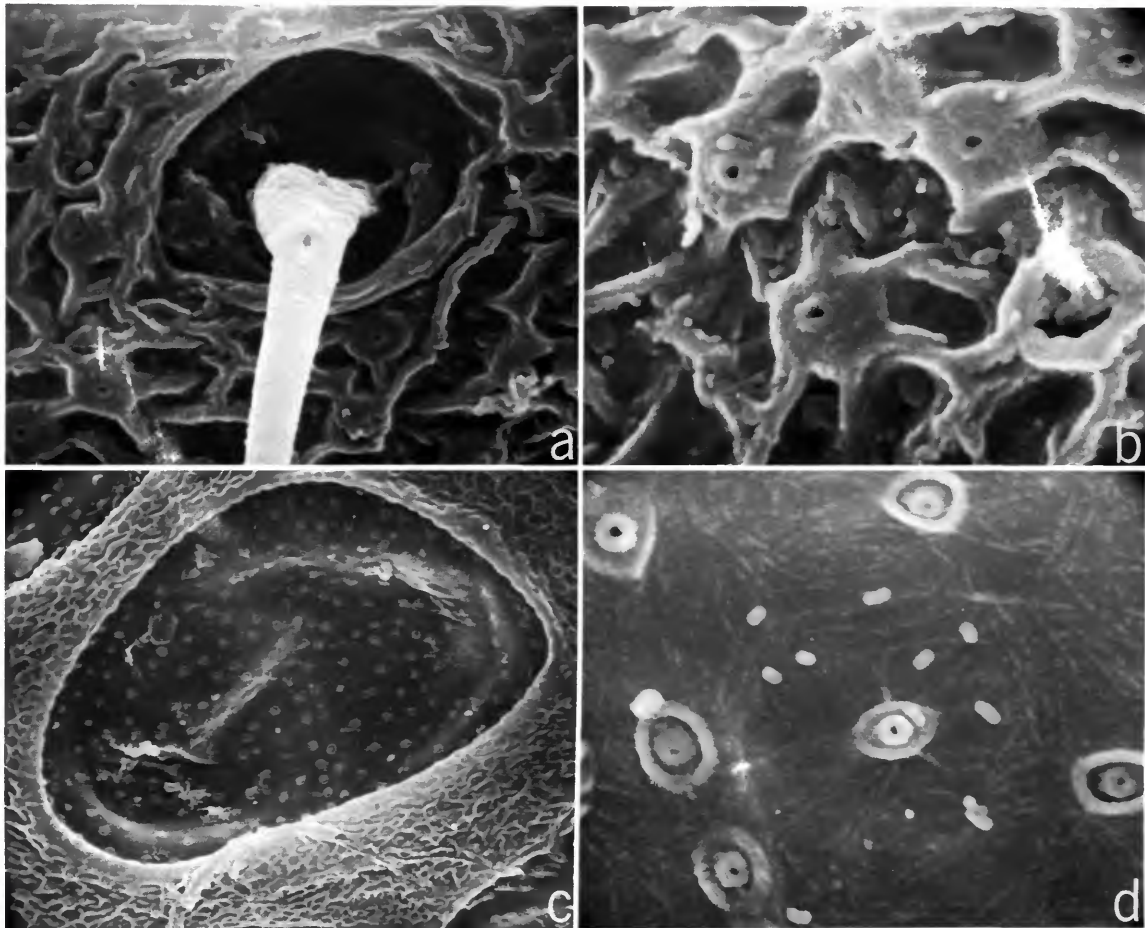


PLATE 21.—*Pseudophilomedes angulatus* Müller, female, USNM 154192, left valve, outside views: *a*, fossae with bristle (see arrow in Plate 20*f*), $\times 5000$; *b*, surface pores in *a*, $\times 10,000$; *c*, detail of fossae, from Plate 20*f*, $\times 1260$; *d*, rimmed pores at bottom of fossae in *c*, $\times 10,000$. (Photos reduced to 82%.)

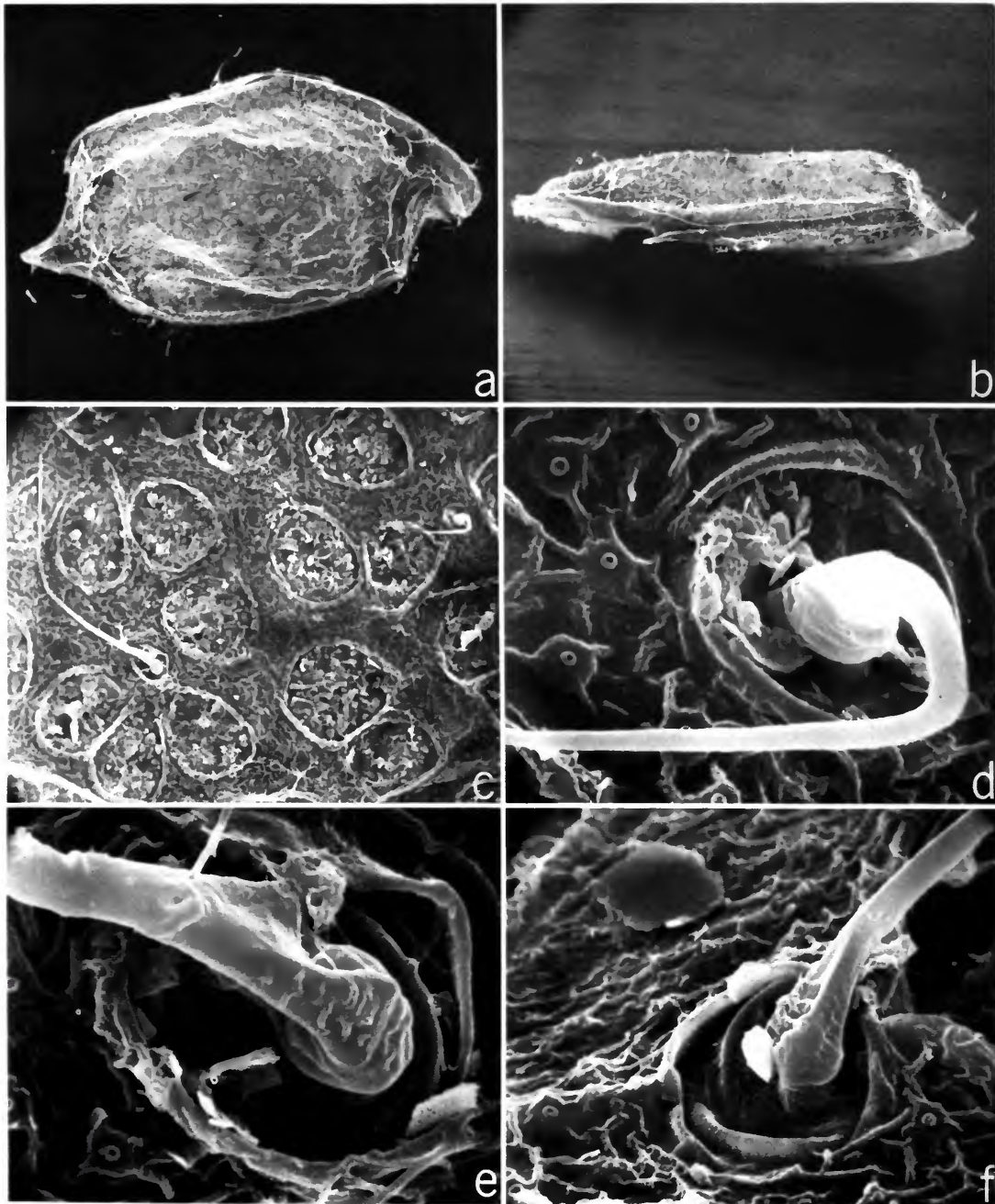


PLATE 22.—*Pseudophilomedes angulatus* Müller, A-1 male, USNM 150101, right valve, outside views: *a*, complete valve, length 1.30 mm, $\times 77$; *b*, dorsal view, anterior to left, $\times 70$; *c*, fossae and bristles near middle of *a*, $\times 675$; *d*, bristle to upper right of *c*, $\times 7000$; *e*, base of bristle to left of middle of *c*, $\times 7000$; *f*, base of bristle near dorsal margin of valve, $\times 5000$. (Photos reduced to 76%.)

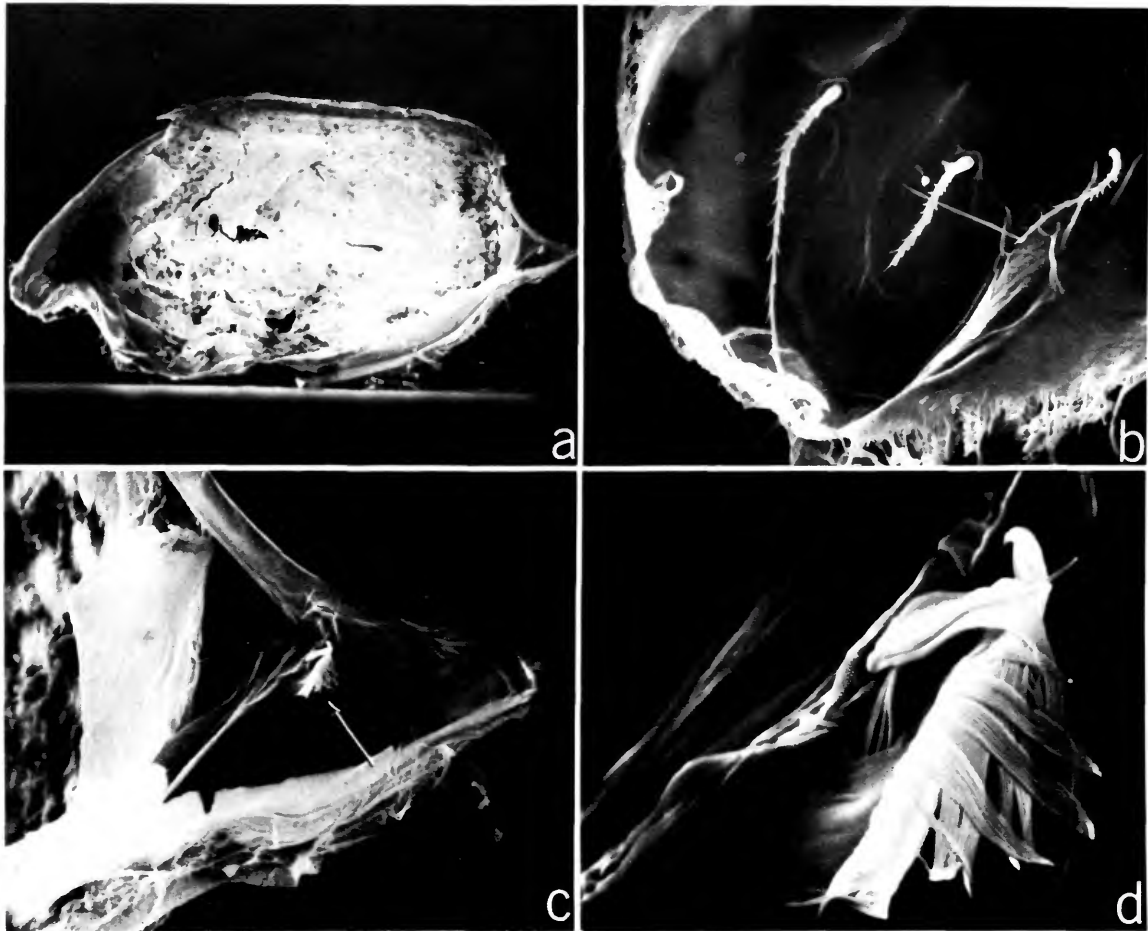


PLATE 23.—*Pseudophilomedes angulatus*, A-1 male, USNM 150101, right valve, inside views: *a*, complete valve, $\times 75$; *b*, rostrum, $\times 750$; *c*, caudal process, $\times 500$; *d*, detail of two setose bristles on list of caudal process (see arrow in *c*), $\times 3200$. (Photos reduced to 82%.)

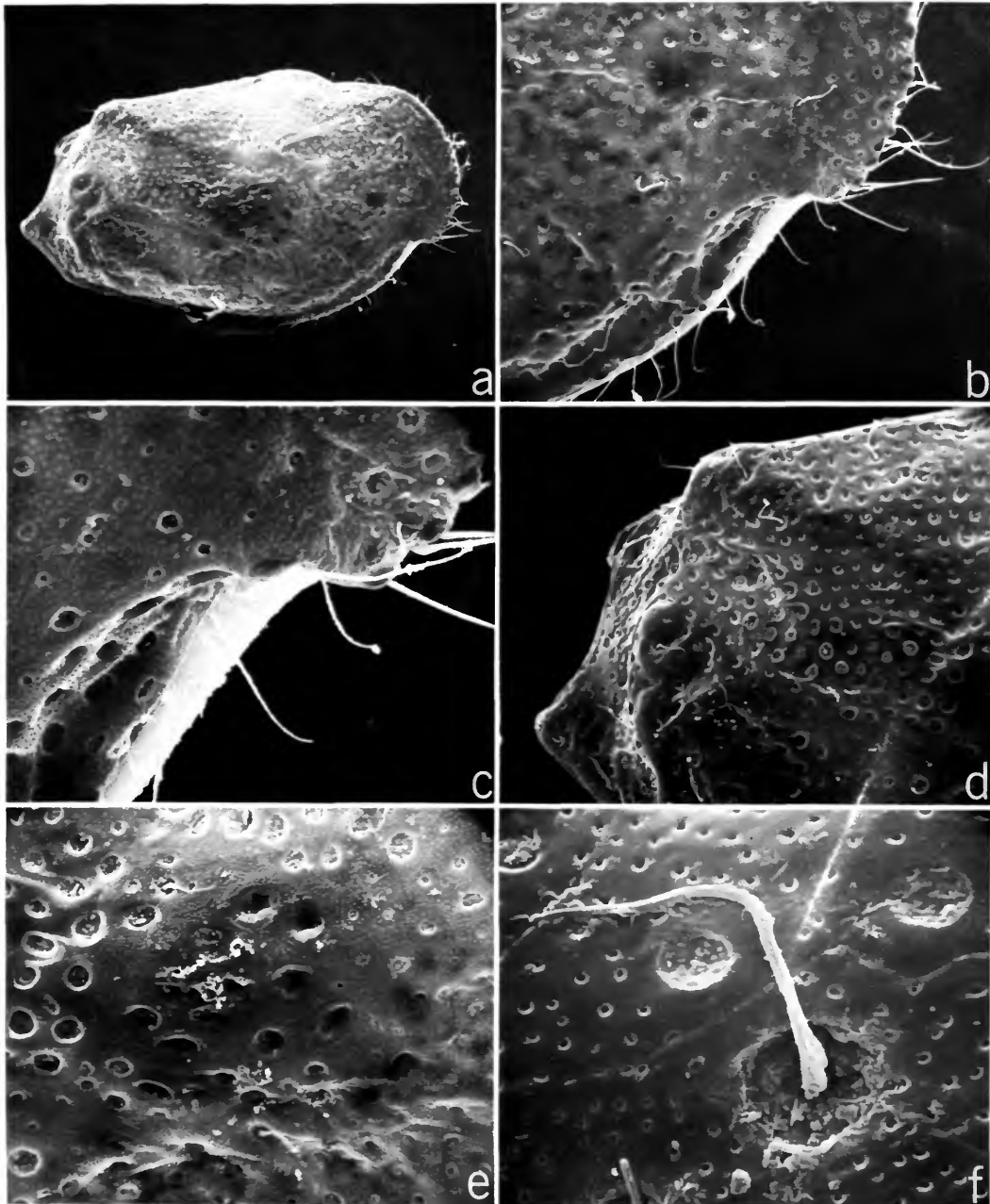


PLATE 24.—*Pseudophilomedes thalassa*, new species, female, USNM 150104, paratype, right valve, outside views: *a*, complete valve, posterior half of dorsal margin folded back slightly, $\times 80$; *b*, rostrum and incisor, $\times 210$; *c*, detail of incisor shown in *b*, $\times 525$; *d*, posterior showing caudal process and surface nodes; *e*, fossae and bristles in vicinity of central adductor muscle attachments, from *a*, $\times 210$; *f*, fossae with bristle, $\times 2100$. (Photos reduced to 75%.)

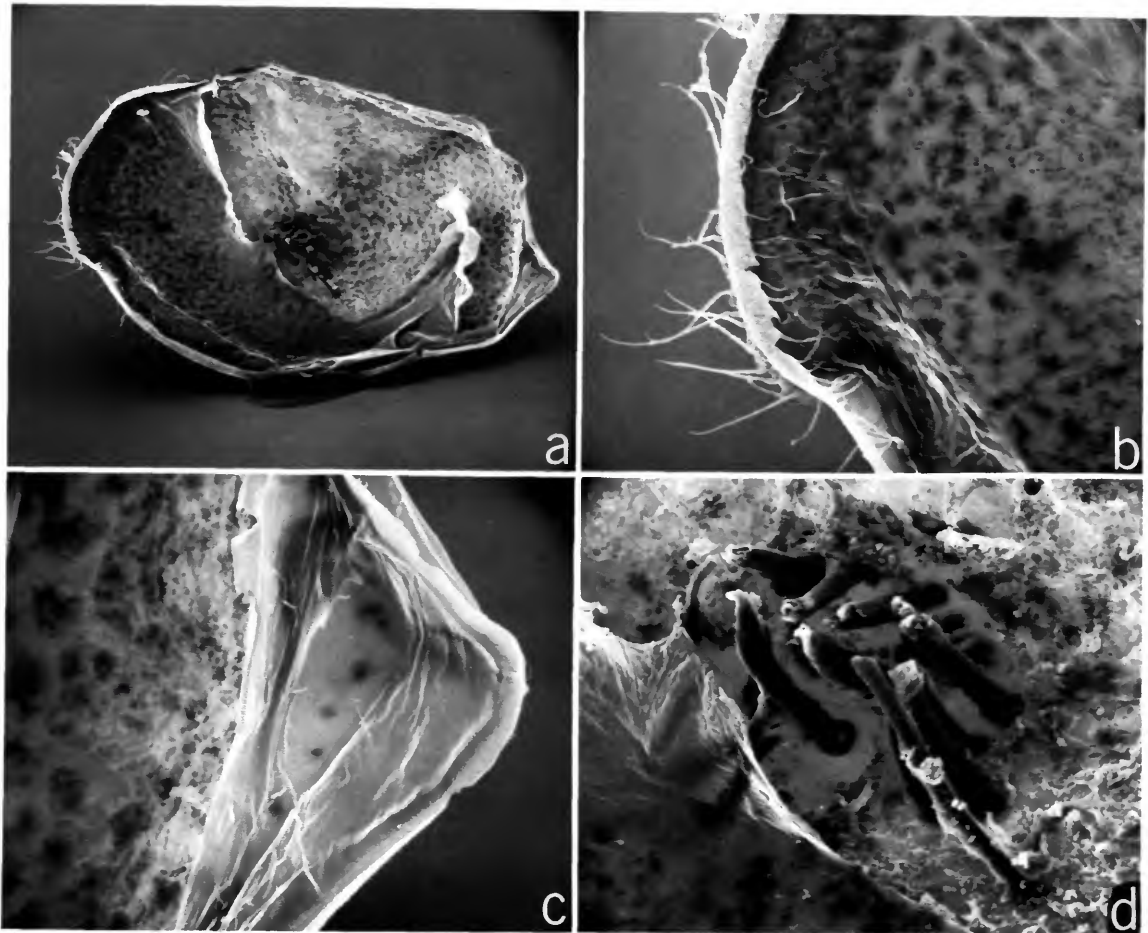


PLATE 25.—*Pseudophilomedes thalassa*, new species, female USNM 150104, paratype, right valve, inside views: a, complete valve, $\times 80$; b, rostrum and incisor, $\times 260$; c, caudal process, $\times 500$; d, ends of central adductor muscles, from a, $\times 370$. (Photos reduced to 82%.)

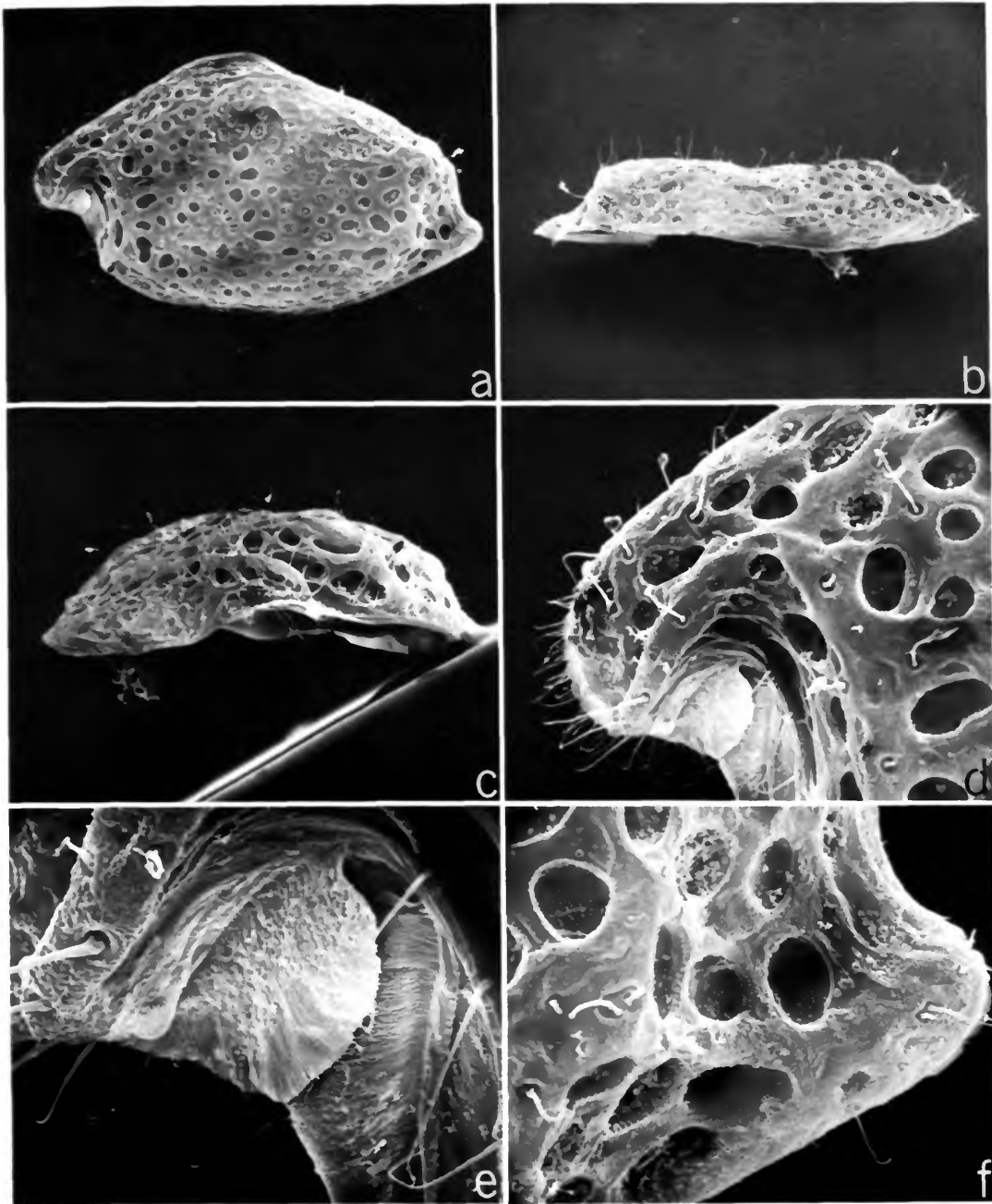


PLATE 26.—*Pseudophilomedes tetrathrix*, new species, female, USNM 156603, holotype, left valve, outside views: *a*, complete valve (posterior half of dorsal margin folded back slightly), $\times 90$; *b*, dorsal view, anterior to right, $\times 85$; *c*, anterior view, venter to right, $\times 225$; *d*, rostrum and incisur, from *a*, $\times 300$; *e*, incisur showing lamellar prolongation of selvage, from *c*, $\times 785$; *f*, caudal process, from *a*, $\times 440$. (Photos reduced to 76%.)

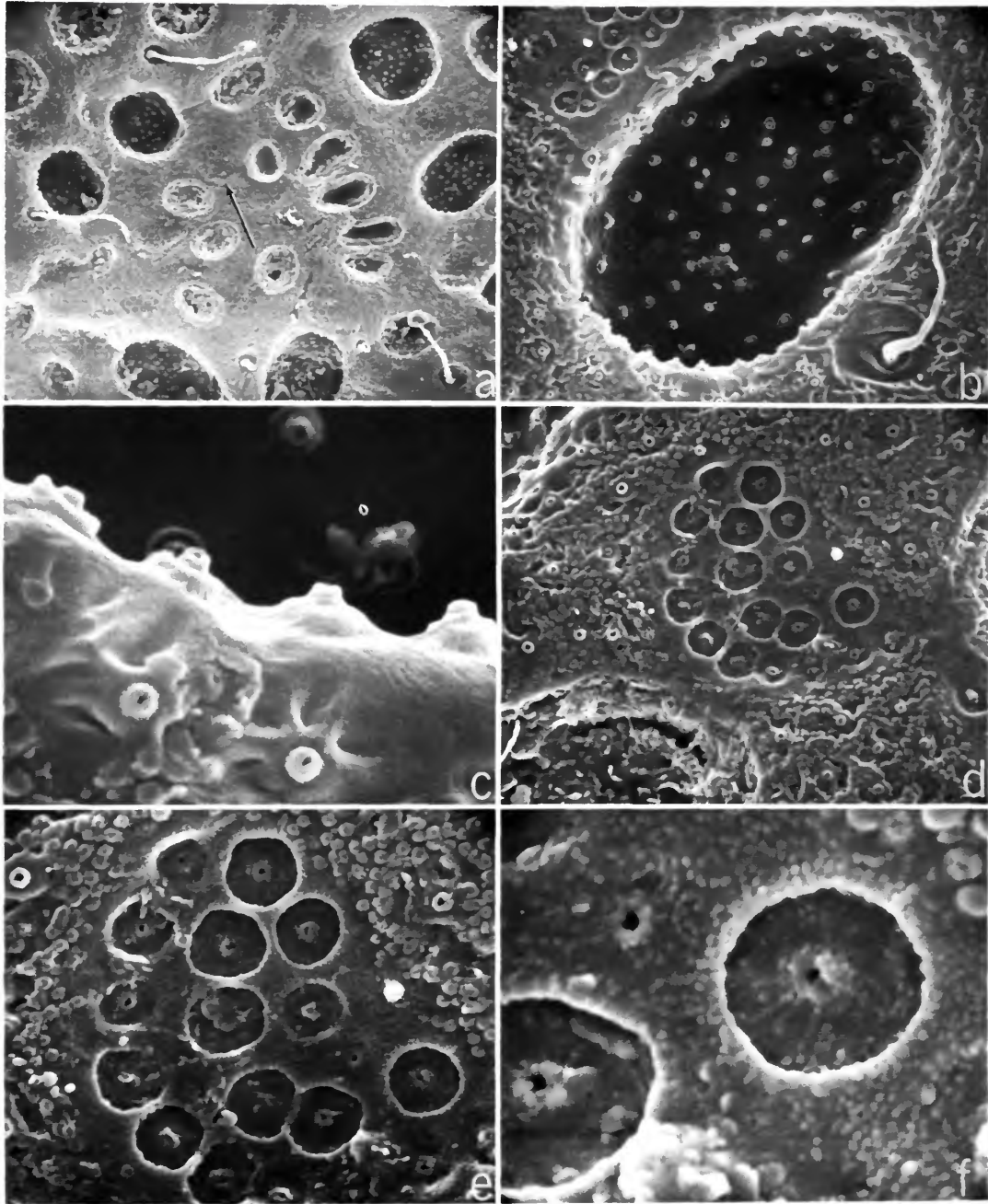


PLATE 27.—*Pseudophilomedes tetratrix*, new species, female, USNM 156603, holotype, left valve, outside views: *a*, fossae just posterior to central adductor muscle scar area, from Plate 26*a*, $\times 500$; *b*, fossa and bristle on right of *a*, $\times 2000$; *c*, lower edge of fossa in *b*, $\times 10,500$; *d*, group of pores between fossae (see arrow in *a*), $\times 3000$; *e*, pores in *d*, $\times 5000$; *f*, detail of pores in *e*, $\times 15,000$. (Photos reduced to 76%.)

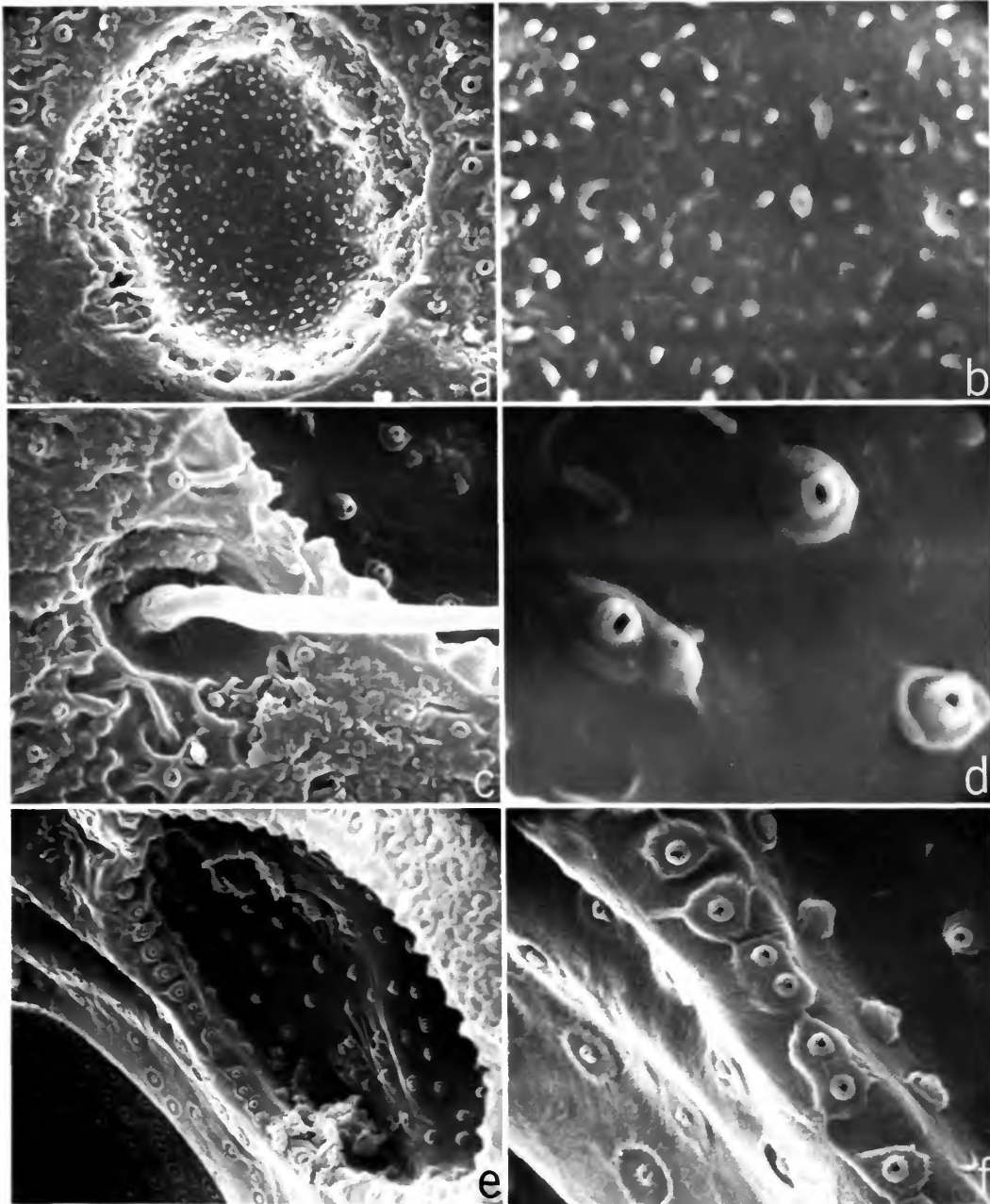


PLATE 28.—*Pseudophilomedes tetratrix*, new species, female, USNM 156603, holotype, left valve, outside views: *a*, fossa in muscle scar area, from Plate 26*a*, $\times 4620$; *b*, pores and pustules in bottom of fossa shown in *a*, $\times 15,000$; *c*, bristle and part of fossa near top of Plate 26*a*, $\times 5000$; *d*, pores at bottom of fossa shown in *c*, $\times 15,000$; *e*, fossae posterior to incisur (note pores forming row around inner edge of fossa), from Plate 26*d*, $\times 2300$; *f*, detail from *e*, showing pores around inner edge of fossa, $\times 7100$. (Photos reduced to 75%.)

Index

(New species, subspecies, and principal accounts are noted in italics)

- africanus*, *Azygocypridina*, 3
Euphilomedes, 2, 19, 20
Anarthron, 6, 8
angulata, *Pseudophilomedes*, 49
angulatus, *Pseudophilomedes*, 3, 4 (fig. 3), 46–48, 49–56 (figs. 34–40), 64, 68 (tab. 1), 90–93 (pls. 20–23)
arborea, *Paravargula*, 3
asper, *Euphilomedes*, 3, 4 (fig. 3), 7, 8, 19, 20–23 (figs. 14–16), 68 (tab. 1), 76 (pl. 6)
aspera, *Euphilomedes*, 20
Philomedes, 20
Azygocypridina africanus, 3
Azygocypridininae, 5

bonneti, *Philomedes*, 4 (fig. 3), 7, 8, 9–15 (figs. 6–10), 13 (fig. 9), 14 (fig. 10), 15, 19, 68 (tab. 1), 71–74 (pls. 1–4)
Bradycinetus ctenorhynchus, 32
Stenorhynchus, 32
bradyi, *Cypridina* (?), 2
brenda, *Philomedes*, 11

capensis, *Paradoloria*, 3, 5
caudata, *Skogsbergia*, 3
ctenorhynchus, *Bradycinetus*, 32
Philomedes, 32
Tetragonodon, 1, 3, 4 (fig. 3), 7, 8, 32–40 (figs. 23–29), 68 (tab. 1), 80–84 (pls. 10–14)
 [?] *Tetragonodon*, 32
curvata, *Philomedes*, 9
Cypridina (?) *bradyi*, 2
nobilis, 3
Cypridinidae, 5
Cypridininae, 5

dorsoserrata, *Paradoloria*, 3, 5

erinaceus, *Tetragonodon*, 1, 32
Euphilomedes, 6–8, 19 (key), 20
africanus, 2, 19, 20
asper, 3, 4, (fig. 3), 7, 8, 19, 20–23 (figs. 14–16), 68 (tab. 1), 76 (pl. 6)
aspera, 20
ferox, 6
kornickeri, 2, 19, 20
schornikovi, 4 (fig. 3), 19, 20, 27–32 (figs. 19–22), 68 (tab. 1)
sinister, 3, 23 (key), 24
sinister pentathrix, 4 (fig. 3), 7, 8, 19, 20, 22, 24–27 (figs. 17, 18), 68 (tab. 1), 77–79 (pls. 7–9)
sinister sinister, 19, 23, 24, 26

favosa, *Streptoleberis*, 1

ferox, *Euphilomedes*, 6
ferulanus, *Pseudophilomedes*, 46, 48
Folini, *Philomedes* (*Scleroconcha*), 41
folini, *Philomedes*, 41, 46
Scleroconcha, 41
folinii, *Philomedes*, 40
Scleroconcha, 1, 3, 4 (fig. 3), 7, 8, 40–46 (figs. 30–33), 68 (tab. 1), 85–89 (pls. 16–19)
foveolata, *Philomedes*, 19
Pseudophilomedes, 68
foveolatus, *Pseudophilomedes*, 46, 48, 56, 68 (fig. 52)

globosa, *Philomedes*, 11, 12, 15

Igene, 6, 8
inflatus, *Paramekodon*, 1, 46, 64
interpuncta, *Philomedes*, 23

kornickeri, *Euphilomedes*, 2, 19

lilljeborgii, *Philomedes*, 8–12, 15, 19
longicornis, *Philomedes*, 23

macandrei, *Philomedes*, 2, 8, 9

nobilis, *Cypridina*, 3

orbicularis, *Philomedes*, 9

Paradoloria, 1, 5 (fig. 4)
capensis, 3, 5
dorsoserrata, 3, 5
vanhoeffeni, 3, 5
 ?*Paradoloria* species indeterminate, 3, 4 (fig. 3), 5 (fig. 4), 6 (fig. 5)
Paramekodon, 46
inflatus, 1, 46, 64
Paraphilomedes, 6, 8
Paravargula arborea, 3
paucichelata, *Philomedes*, 32
pentathrix, *Euphilomedes sinister*, 4 (fig. 3), 7, 8, 19, 20, 22, 24–27 (figs. 17, 18), 68 (tab. 1), 77–79 (pls. 7–9)
Philomedes, 6–8, 9 (key)
aspera, 19
bonneti, 4 (fig. 3), 7, 8, 9–15 (figs. 6–10), 19, 68 (tab. 1), 71–74 (pls. 1–4)
brenda, 11
ctenorhynchus, 32
curvata, 9
folini, 41, 46
Folini, 41

- folinii*, 40
Folini, 41
foveolata, 19
globosa, 11, 12, 15
interpuncta, 23
lilljeborgii, 8–12, 15, 19
longicornis, 24
macandrei, 2, 8, 9
orbicularis, 9
paucichelata, 32
(Scleroconcha) *Folini*, 41
subantarctica, 9
tetradens, 4 (fig. 3), 7–9, 15–19 (figs. 11–13), 68 (tab. 1), 75 (pl. 5)
Philomedidae, 6 (key)
Philomedinae, 6, 8 (key)
Pseudophilomedes, 3, 46, 48 (key), 64
angulata, 49
angulatus, 3, 4 (fig. 3), 46–48, 49–56 (figs. 34–40), 64, 68 (tab. 1), 90–93 (pls. 20–23)
ferulanus, 46, 48
foveolata, 68
foveolatus, 46, 48, 56, 68 (fig. 52)
tetrathrix, 4 (fig. 3), 46–49, 50 (fig. 35), 51, 56, 64–68 (figs. 49–51, tab. 1), 96–98 (pls. 26–28)
thalassa, 4 (fig. 3), 46–48, 50 (fig. 35), 56–64 (figs. 41–48), 68 (tab. 1), 94 (pl. 24), 95 (pl. 25)
Pseudophilomedinae, 6, 46 (key)
rectirostris, *Streptoleberis*, 1
rhabdion, *Tetragonodon*, 32
schornikovi, *Euphilomedes*, 4 (fig. 3), 19, 20, 27–32 (figs. 19–22), 68 (tab. 1)
- Scleroconcha, 6–8, 40
folini, 41
folinii, 1, 3, 4 (fig. 3), 7, 8, 40–46 (figs. 30–33), 68 (tab. 1), 85–89 (pls. 15–19)
(Scleroconcha) *Folini*, *Philomedes*, 41
sinister, *Euphilomedes*, 3, 23 (key), 24
sinister, *Euphilomedes sinister*, 19, 23, 24, 27
sinister pentathrix, *Euphilomedes*, 4 (fig. 3), 7, 8, 19, 20, 22, 24–27 (figs. 17, 18), 68 (tab. 1), 77–79 (pls. 7–9)
sinister sinister, *Euphilomedes*, 19, 23, 24, 27
Skogsbergia, 5
Skogsbergia caudata, 3
species indeterminate, ?*Paradoloria*, 3, 4 (fig. 3), 5 (fig. 4), 6 (fig. 5)
Stenorynchus, *Bradycinetus*, 32
Streptoleberis favosa, 1
rectirostris, 1
subantarctica, *Philomedes*, 9
tetrathrix, *Pseudophilomedes*, 4 (fig. 3), 46–49, 50 (fig. 35), 51, 56, 64–68 (figs. 49–51, tab. 1), 96–98 (pls. 26–28)
thalassa, *Pseudophilomedes*, 4 (fig. 3), 46–48, 50 (fig. 35), 56–64 (figs. 41–48), 68 (tab. 1), 94 (pl. 24), 95 (pl. 25)
tetradens, *Philomedes*, 4 (fig. 3), 7–9, 15–19 (figs. 11–13), 68 (tab. 1), 75 (pl. 5)
Tetragonodon, 3, 6–8, 32
ctenorynchus, 1, 3, 4 (fig. 3), 7, 8, 32–40 (figs. 23–29), 68 (tab. 1), 80–84 (pls. 10–14)
erinaceus, 1, 32
rhabdion, 32
[?] *Tetragonodon ctenorhynchus*, 32
vanhoeffeni, *Paradoloria*, 3, 5

REQUIREMENTS FOR SMITHSONIAN SERIES PUBLICATION

Manuscripts intended for series publication receive substantive review within their originating Smithsonian museums or offices and are submitted to the Smithsonian Institution Press with approval of the appropriate museum authority on Form SI-36. Requests for special treatment—use of color, foldouts, casebound covers, etc.—require, on the same form, the added approval of designated committees or museum directors.

Review of manuscripts and art by the Press for requirements of series format and style, completeness and clarity of copy, and arrangement of all material, as outlined below, will govern, within the judgment of the Press, acceptance or rejection of the manuscripts and art.

Copy must be typewritten, double-spaced, on one side of standard white bond paper, with 1¼" margins, submitted as ribbon copy (not carbon or xerox), in loose sheets (not stapled or bound), and accompanied by original art. Minimum acceptable length is 30 pages.

Front matter (preceding the text) should include: **title page** with only title and author and no other information, **abstract page** with author/title/series/etc., following the established format, **table of contents** with indents reflecting the heads and structure of the paper.

First page of text should carry the title and author at the top of the page and an unnumbered footnote at the bottom consisting of author's name and professional mailing address.

Center heads of whatever level should be typed with initial caps of major words, with extra space above and below the head, but with no other preparation (such as all caps or underline). Run-in paragraph heads should use period/dashes or colons as necessary.

Tabulations within text (lists of data, often in parallel columns) can be typed on the text page where they occur, but they should not contain rules or formal, numbered table heads.

Formal tables (numbered, with table heads, boxheads, stubs, rules) should be submitted as camera copy, but the author must contact the series section of the Press for editorial attention and preparation assistance before final typing of this matter.

Taxonomic keys in natural history papers should use the joined-couplet form in the zoology and paleobiology series and the multi-level indent form in the botany series. If cross-referencing is required between key and text, do not include page references within the key, but number the keyed-out taxa with their corresponding heads in the text.

Synonymy in the zoology and paleobiology series must use the short form (taxon, author, year:page), with a full reference at the end of the paper under "Literature Cited." For the botany series, the long form (taxon, author, abbreviated journal or book title, volume, page, year, with no reference in the "Literature Cited") is optional.

Footnotes, when few in number, whether annotative or bibliographic, should be typed at the bottom of the text page on which the reference occurs. Extensive notes must appear at the end of the text in a notes section. If bibliographic footnotes are required, use the short form (author/brief title/page) with the full reference in the bibliography.

Text-reference system (author/year/page within the text, with the full reference in a "Literature Cited" at the end of the text) must be used in place of bibliographic footnotes in all scientific series and is strongly recommended in the history and technology series: "(Jones, 1910:122)" or ". . . Jones (1910:122)."

Bibliography, depending upon use, is termed "References," "Selected References," or "Literature Cited." Spell out book, journal, and article titles, using initial caps in all major words. For capitalization of titles in foreign languages, follow the national practice of each language. Underline (for italics) book and journal titles. Use the colon-parentheses system for volume/number/page citations: "10(2):5-9." For alignment and arrangement of elements, follow the format of the series for which the manuscript is intended.

Legends for illustrations must not be attached to the art nor included within the text but must be submitted at the end of the manuscript—with as many legends typed, double-spaced, to a page as convenient.

Illustrations must not be included within the manuscript but must be submitted separately as original art (not copies). All illustrations (photographs, line drawings, maps, etc.) can be intermixed throughout the printed text. They should be termed **Figures** and should be numbered consecutively. If several "figures" are treated as components of a single larger figure, they should be designated by lowercase italic letters (underlined in copy) on the illustration, in the legend, and in text references: "Figure 9_a." If illustrations are intended to be printed separately on coated stock following the text, they should be termed **Plates** and any components should be lettered as in figures: "Plate 9_b." Keys to any symbols within an illustration should appear on the art and not in the legend.

A few points of style: (1) Do not use periods after such abbreviations as "mm, ft, yds, USNM, NNE, AM, BC." (2) Use hyphens in spelled-out fractions: "two-thirds." (3) Spell out numbers "one" through "nine" in expository text, but use numerals in all other cases if possible. (4) Use the metric system of measurement, where possible, instead of the English system. (5) Use the decimal system, where possible, in place of fractions. (6) Use day/month/year sequence for dates: "9 April 1976." (7) For months in tabular listings or data sections, use three-letter abbreviations with no periods: "Jan, Mar, Jun," etc.

Arrange and paginate sequentially EVERY sheet of manuscript—including ALL front matter and ALL legends, etc., at the back of the text—in the following order: (1) title page, (2) abstract, (3) table of contents, (4) foreword and/or preface, (5) text, (6) appendixes, (7) notes, (8) glossary, (9) bibliography, (10) index, (11) legends.

