Ivory Coast Ostracoda (Suborder Myodocopina)

LOUIS S. KORNICKER

SMITHSONIAN CONTRIBUTIONS TO ZOOLOGY • NUMBER 197

AUTHENTICATED
U.S. GOVERNMENT
INFORMATION
GPO

SERIAL PUBLICATIONS OF THE SMITHSONIAN INSTITUTION

The emphasis upon publications as a means of diffusing knowledge was expressed by the first Secretary of the Smithsonian Institution. In his formal plan for the Institution, Joseph Henry articulated 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 keynote of basic research has been adhered to over the years in the issuance of thousands of titles in serial publications under the Smithsonian imprint, commencing with *Smithsonian Contributions to Knowledge* in 1848 and continuing with the following active series:

Smithsonian Annals of Flight
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 History and Technology

In these series, the Institution publishes original articles and monographs dealing with the research and collections of its several museums and offices and of professional colleagues at other institutions of learning. These papers report newly acquired facts, synoptic interpretations of data, or original theory in specialized fields. These publications are distributed by mailing lists to libraries, laboratories, and other interested institutions and specialists throughout the world. Individual copies may be obtained from the Smithsonian Institution Press as long as stocks are available.

S. Dillon Ripley
Secretary
Smithsonian Institution

SMITHSONIAN CONTRIBUTIONS TO ZOOLOGY • NUMBER 197

Ivory Coast Ostracoda (Suborder Myodocopina)

Louis S. Kornicker

SMITHSONIAN INSTITUTION PRESS
City of Washington
1975

ABSTRACT

Kornicker, Louis S. Ivory Coast Ostracoda (Suborder Myodocopina). *Smithsonian Contributions to Zoology,* number 197, 46 pages, 32 figures, 1975.—This is the first record of Ostracoda in the suborder Myodocopina from the continental shelf of the Ivory Coast. Only three species were in the collections: *Cycloleberis squamiger* (Scott, 1894), *Asteropteron setiferum* Kornicker and Caraion, 1974, and *Rutiderma leloeuffi,* new species. Data are presented on the intraspecific variability of the first two species. Supplementary descriptions are presented of two additional species: *Cycloleberis galathea* Poulsen, 1965, and *Sarsiella murrayana* Scott, 1894.

Official publication date is handstamped in a limited number of initial copies and is recorded in the Institution's annual report, *Smithsonian Year.* SI PRESS NUMBER 5271. SERIES COVER DESIGN: The coral *Montastrea cavernosa* (Linnaeus).

Library of Congress Cataloging in Publication Data
Kornicker, Louis S. 1919–
Ivory Coast Ostracoda (suborder Myodocopina)
(Smithsonian contributions to zoology, no. 197)
Supt. of Docs. no.: SI 1.27:197
1. Myodocopa. 2. Crustacea—Ivory Coast. I. Title. II. Series: Smithsonian Institution. Smithsonian contributions to zoology, no. 197.
QL1.S54. no. 197 [QL444.085] 591'.08s 595'.33 74-34068

Contents

Ivory Coast Ostracoda (Suborder Myodocopina)

Louis S. Kornicker

Introduction

Thirty specimens from 18 samples collected along the Ivory Coast at depths of 10 to 80 m (Figure 1) were received from Dr. P. Le Loeuff and Dr. A. Intes of the Centre de Recherches Océanographiques, Abidjan, Ivory Coast. The collection contained three species: *Cycloleberis squamiger* (Scott, 1894), *Asteropteron setiferum* Kornicker and Caraion, 1974, and *Rutiderma leloeuffi*, new species. The first species had previously been reported from São Tomé Island, Gulf of Guinea, by Scott (1894), from off Mauritania by Klie (1943) [as *Cyclasterope lobiancoi* (G. W. Müller, 1894)], and from off Spanish Sahara and Mauritania by Kornicker and Caraion (1974); the second species had previously been reported from off Spanish Sahara and Mauritania (Kornicker and Caraion, 1974).

The relative abundance of specimens of *Cycloleberis squamiger* and *Asteropteron setiferum* permitted study of the intraspecific variability of these species. The opportunity is taken to present herein supplementary descriptions of the lectotype of *Cycloleberis squamiger* (Scott, 1894), the holotype of *Cycloleberis galathea* Poulsen, 1965, and a syntype of *Sarsiella murrayana* Scott, 1894. The latter specimen was collected from the vicinity of São Tomé Island.

ACKNOWLEDGMENTS.—I wish to thank Dr. P. Le Loeuff and Dr. A. Intes, Centre de Recherches Océanographiques, for the collection of Ostracoda upon which this study is based and for the environmental data presented in the station data herein. (Specimens deposited in the National Museum of Natural History are indicated by the abbreviation USNM. Specimens without USNM numbers were returned to the Centre de Recherches Océanographiques.) I also appreciate the loan of type material from the British Museum (Natural History), the Hamburg Zoological Museum, and the Zoological Museum of the University of Copenhagen. The shaded drawings of ostracode carapaces were prepared by Mrs. Carolyn Gast. The map of the Ivory Coast, showing station localities, and the appendage drawings were prepared by Mr. Paul Mazer. The assistance of Mr. Walter R. Brown and Miss Mary Mann, who operated the scanning electron microscope, is acknowledged. I thank Dr. Raymond B. Manning for reviewing the manuscript.

Louis S. Kornicker, Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560.

Station Data

(Water temperatures and salinities from near bottom)

Station 1, 23 November 1966; off West Vridi, 5°08′05″N, 4°09′W; 80 m; small dredge; water temperature, 19.1°C; salinity, 35.74°/oo; sandy mud with 31% oolite.
Asteropteron setiferum variety B: 1 adult ♀

Station 2, 29 September 1966; Grand Bassam; 5°06′N, 3°48′W; 40 m; small dredge; water temperature, 17.3°C; salinity, 35.65°/oo; sandy mud with 7% oolite.
Asteropteron setiferum variety B: 1 adult ♀

Station 3, 10 March 1966; Sassandra; 4°58′N, 6°W; 10 m; small dredge; water temperature, 23.9°C; salinity, 35.46°/oo; very sandy mud.
Asteropteron setiferum variety C: 1 ovigerous ♀

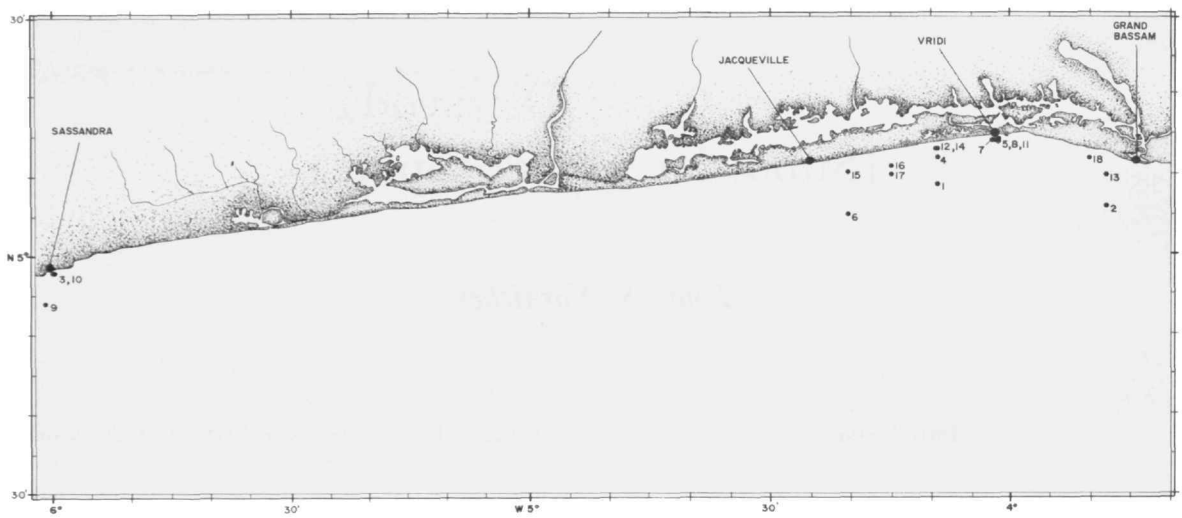


FIGURE 1.—Station locations off Ivory Coast.

Station 4, 23 November 1966; West Vridi; 5°12″N, 4°09′W; 40 m; small dredge; water temperature, 26.0°C; salinity, 35.51°/oo; slightly muddy, fine sand with 8% oolite.
Asteropteron setiferum variety A: 4 adult ♀ ♀, including 2 ovigerous

Station 5, 11 November 1966; Vridi; 5°14′N, 4°02′W; 20 m; small dredge; water temperature, 26.5°C; salinity, 34.54°/oo; medium sand.
Cycloleberis squamiger: 1 adult ♂

Station 6, 25 November 1966; East Jacqueville; 5°04′08″N, 4°20′05″W; 40 m; small dredge; water temperature, 26.1°C; salinity, 34.78°/oo; slightly muddy, fine sand.
Cycloleberis squamiger: 1 adult ♂

Station 7, 22 November 1966; Vridi; 5°14′01″N, 4°02′W; 15 m; small dredge; water temperature, 27.4°C; salinity, 34.15°/oo; fine sand.
Cycloleberis squamiger: 1 juvenile ♂

Station 8, 9 September 1966; Vridi; 5°14′N, 4°02′W; 20 m; small dredge; water temperature, 18.7°C; salinity, 35.62°/oo; medium sand.
Cycloleberis squamiger: 1 adult ♀, 1 juvenile ♂

Station 9, 10 March 1966; Sassandra; 4°54′N, 6°01′W; 22 m; small dredge; water temperature, 22.9°C; salinity, 35.50°/oo; sandy mud.
Cycloleberis squamiger: 1 adult ♀

Station 10, 10 March 1966; Sassandra; 4°58′N, 6°W; 10 m; small dredge; water temperature, 23.9°C; salinity, 35.46°/oo; very sandy mud (same locality as Station 3).
Cycloleberis squamiger: 1 ovigerous ♀, 1 juvenile ♂

Station 11, 30 September 1966; Vridi; 5°14′N, 4°02′W; 20 m; small dredge; water temperature, 17.1°C; salinity, 35.71°/oo; medium sand.
Cycloleberis squamiger: 2 adult ♀ ♀

Station 12, 23 November 1966; West Vridi; 5°13′N, 4°09′W; 40 m; small dredge; water temperature, 23.6°C; salinity, 35.46°/oo; fine sand with mud traces and with 13% oolite.
Cycloleberis squamiger: 1 adult ♀, 1 juvenile ♂
Asteropteron setiferum variety A: 1 adult ♀, 1 specimen of undetermined sex.

Station 13, 28 September 1966; Grand Bassam; 5°09′07″N, 3°48′W; 25 m; small dredge; water temperature, 18.1°C; salinity, 35.69°/oo; oolitic sandy mud with 43% oolite.
Cycloleberis squamiger: 1 adult ♀

Station 14, 23 November 1966; West Vridi; 5°13′N, 4°09′W; 20 m; small dredge; water temperature, 27.7°C; salinity, 34.07°/oo; medium sand.
Cycloleberis squamiger: 1 adult ♀

Station 15, 24 November 1966, East Jacqueville; 5°11′N, 4°15′W; 40 m; small dredge; water temperature, 24.2°C; salinity, 35.27°/oo; medium sand.
Cycloleberis squamiger: 2 ovigerous ♀ ♀, 2 juvenile ♂ ♂
Asteropteron setiferum variety A: 1 juvenile, sex undetermined

Station 16, 24 November 1966; East Jacqueville; 5°11′N, 4°15′05″W; 35 m; small dredge; water temperature, 25.6°C; salinity 35.05°/oo; medium sand.
Asteropteron setiferum variety A: 2 ovigerous ♀ ♀

Station 17, 24 November 1966; East Jacqueville; 5°09′N, 4°15′W; 50 m; small dredge; water temperature, 23.3°C; salinity, 35.34°/oo; muddy sand.
Asteropteron setiferum variety A: 1 ovigerous ♀

Station 18, 5 December 1973; off Grand Bassam, 5°12′05″N, 3°49′05″W; 20 m; Aberdeen grab of 0.1 square meter; water temperature, 28.9°C; salinity, 34.4°/oo; fine sand.
Rutiderma leloeuffi, new species: 1 adult ♀ or late instar

Suborder MYODOCOPINA Sars, 1866

This suborder is represented in the collection from the Ivory Coast by two families, Cylindroleberididae and Rutidermatidae. A supplementary description is also given herein of a member of the family Sarsiellidae.

Family CYLINDROLEBERIDIDAE Müller, 1906

The family Cylindroleberididae contains two subfamilies, Cylindroleberidinae Müller, 1906, and Cyclasteropinae Poulsen, 1965; only the latter is represented in the collections.

Subfamily CYCLASTEROPINAE Poulsen, 1965

This subfamily is represented in the collections by two genera, *Cycloleberis* and *Asteropteron*. Members of this subfamily range from about 40°N to 50°S; and they have a known depth range of 1 to 1100 m, but generally are collected in waters shallower than 100 m.

Genus *Cycloleberis* Skogsberg, 1920

The genus *Cycloleberis* is represented in the collection by one species, *C. squamiger* (Scott, 1894). The species of this genus have a latitudinal range of 41°N to 47°S and a depth ranging from intertidal to 1100 m, but usually they are collected at depths below 65 m.

Cycloleberis squamiger (Scott, 1894)

FIGURES 2–10, 11*c–h*

Asterope squamiger Scott, 1894:140, pl. 14: fig. 58; pl. 15: figs. 24, 28, 29, 31.—G. W. Müller, 1912:52 [Cypridinarum genera dubia et species dubiae].

Cyclasterope lobiancoi.—Klie, 1943:50, figs. 1–4.

Cycloleberis squamiger.—Kornicker and Caraion, 1974:47, figs. 24–31.

LECTOTYPE.—A juvenile instar in the British Museum (Natural History) (registration number 1893.4.22.1) by subsequent designation (Kornicker and Caraion, 1974).

TYPE-LOCALITY.—São Tomé Island, Gulf of Guinea.

MATERIAL.—Ivory Coast specimens: 10 adult females: USNM 143975 (sta. 15), 143979 (sta. 15), 149271 (sta. 14), 149272 (sta. 12), 149274A (sta. 11), 1 specimen (sta. 11), 149275A (sta. 10), 149276 (sta. 13), 149277 (sta. 9), 149278A (sta. 8); 2 adult males, USNM 149280 (sta. 6), 149281 (sta. 5); juvenile males: USNM 143994, 143995 (sta. 15), 149273 (sta. 12), 1 specimen (sta. 10), 1 specimen (sta. 7), 1 specimen (sta. 8). The following specimens reported from Mauritania by Kornicker and Caraion (1974) were restudied: USNM 143798, an adult male; USNM 143993, an A–1 female.

Through the courtesy of Dr. Roger Lincoln, I received from the British Museum (Natural History) a specimen (in alcohol) which had been identified by Scott (1894) as *Asterope squamiger*. In addition to the name, the label contained the words "Buccaneer, W. coast of Africa." The specimen is a complete, undissected juvenile 1.09 mm long and 0.92 mm high. It obviously is one of the two specimens reported by Scott (1894:140). Scott gave the length as 1.15 mm, so it is possible that the other specimen in the collection was slightly larger than the one at hand. The specimen dissected and illustrated by Scott (1894:140, pl. 14: figs. 56, 57; pl. 15: figs. 14, 22, 23, 26) could not be located. The specimen on hand was designated lectotype by Kornicker and Caraion (1974). I did not dissect the specimen, but managed to draw the distal parts of appendages protruding from the shell and parts of appendages visible through the shell (Figure 10). The presence of more than two bristles on the end joint of the maxilla (Scott, 1894, pl. 15: fig. 26; and Figure 10*g*, herein) indicates that this species belongs in the Cyclasteropinae. The lack of ridges on the carapace restricts the genera to which it could belong to *Cycloleberis* and *Cyclasterope*. The latter genus has not been reported from the Atlantic Ocean. Because a single species of *Cycloleberis* is abundant in shelf and bathyl waters off Spanish Sahara and Mauritania (Kornicker and Caraion, 1974) as well as off the Ivory Coast, I have assumed that it is conspecific with Scott's species, called *Cycloleberis squamiger* (Scott) here and in the paper by Kornicker and Caraion (1974).

I had borrowed, for another study (Kornicker and Caraion, 1974), three specimens in the collection of the Hamburg Zoological Museum that had been collected off Mauritania and had been

reported on by Klie (1943), who had identified them as *Cyclasterope lobiancoi* (Müller, 1894). This material consisted of the following four items:

1. One vial containing four disarticulated valves (2 lefts, 2 rights), one undissected specimen (length 3.58 mm, height 3.04 mm), a label with the number "10," and a second label stating, "*Cyclasterope lobiancoi* (G. W. Müller) Mauritanien: Muschelgrunde vor Port Etienne, 20–30 m, August 1923, fide R. Ph. Dollfuss."

2. A glass slide containing appendages labeled, in black ink, "♀ *Cyclasterope lobiancoi* (G. W. Müller) Mauritanien, Glycerine gelatine, Gliedmassen einer Körperhälfte, Port Etienne, August 1923, fide R. Ph. Dollfuss." On the label in red ink are the numbers "1" and "10a." This slide contains some appendages of a juvenile male.

3. A glass slide with appendages containing on the label, in black ink, the same information as that in black ink on the previous slide but also, in red ink, the numbers "2" and "10b." The appendages on this and the previous slide are from the same specimen.

4. A glass slide with appendages containing on the label, in black ink, "♀ *Cyclasterope lobiancoi* (G. W. Müller) Mauritanien, Glycerin gelatine, Fr. a^1, a^1, a^2, M,M, m,m, mp^1, mp^1, mp^2, mp^2, p, p, F, F, Port Etienne, August 1923, fide R. Ph. Dollfuss." On the label in red ink is the number "10c." The absence of the endopodite of the second antennae on the slide prevents determination of the sex of the specimen, but I have assumed it to be a juvenile male because of Klie's description and because the appendages are about the same size as those on slides 10 and 10b, but the presence of nine secondary claws on the furca suggests that it could be an adult female.

DESCRIPTION OF ADULT FEMALE (Figures 2–5, 6*a–i*, 7–9, 11*c–h*).—*Carapace* (Figures 2–4, 5a): Without vertical rows of posterior hairs and without small indentation in posterodorsal margin as on male; otherwise similar to that of male holotype (see Kornicker and Caraion, 1974).

Size: USNM 143975, length 3.26 mm, height 2.58 mm; USNM 143979, length 3.21 mm, height 2.63 mm; USNM 149271, length 3.80 mm, height 3.01 mm; USNM 149272, length 3.30 mm, height 2.80 mm; USNM 149274A, length 3.91 mm, height 3.16 mm; USNM 149274B, length 3.73 mm, height 2.92 mm; USNM 149275A, length 3.85 mm, height 3.13 mm; USNM 149276, length 3.53 mm, height 2.88 mm; USNM 149277, length 4.32 mm, height 3.69 mm; USNM 149278A, length 3.93 mm, height 3.14 mm. Range of length: 3.21–4.32 mm.

Micromorphology of Carapace (based on scanning electron microphotographs; Figures 3, 4): In order to determine the effect of cleaning with a sonic vibrator on the outer surface of the shell, the left valve of USNM 149278A was photographed without treatment with the sonic vibrator (Figures 3*e–i*; 4*a–c*,*g–k*) and the right valve of USNM 149278A was photographed after treatment for about 10 seconds (Figures 3*j–m*; 4*d–f*,*l*). The treatment had little effect on the appearance of the microstructure of the valves (compare Figure 3*f–i* with Figure 3*j–m*). The microstructures of the female are similar to those described for the male of the species by Kornicker and Caraion (1974) except that the posterior end of the valve of the female does not have bristles

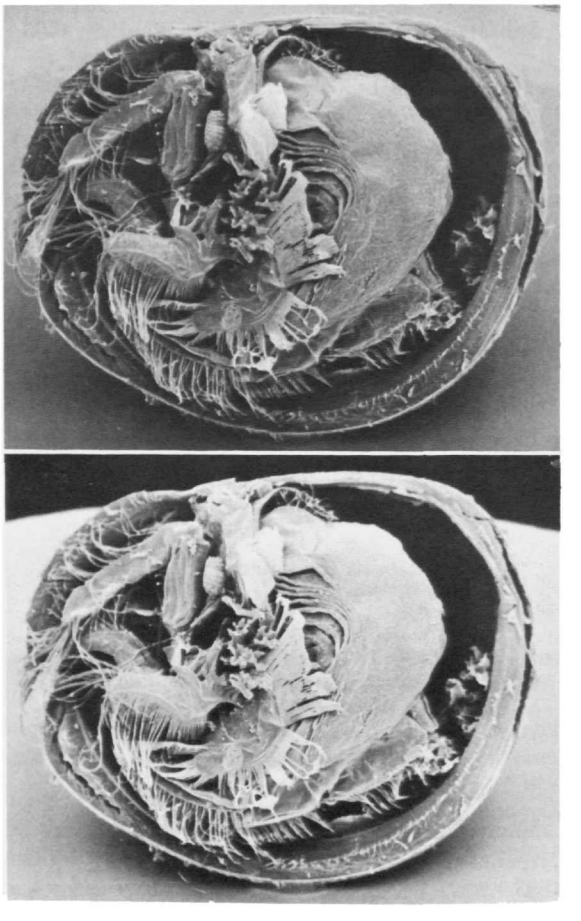


FIGURE 2.—*Cycloleberis squamiger* (Scott), adult female, length 3.93 mm, USNM 149378A: Stereo-pair of specimen with left valve removed (to be viewed with stereoscope from right side).

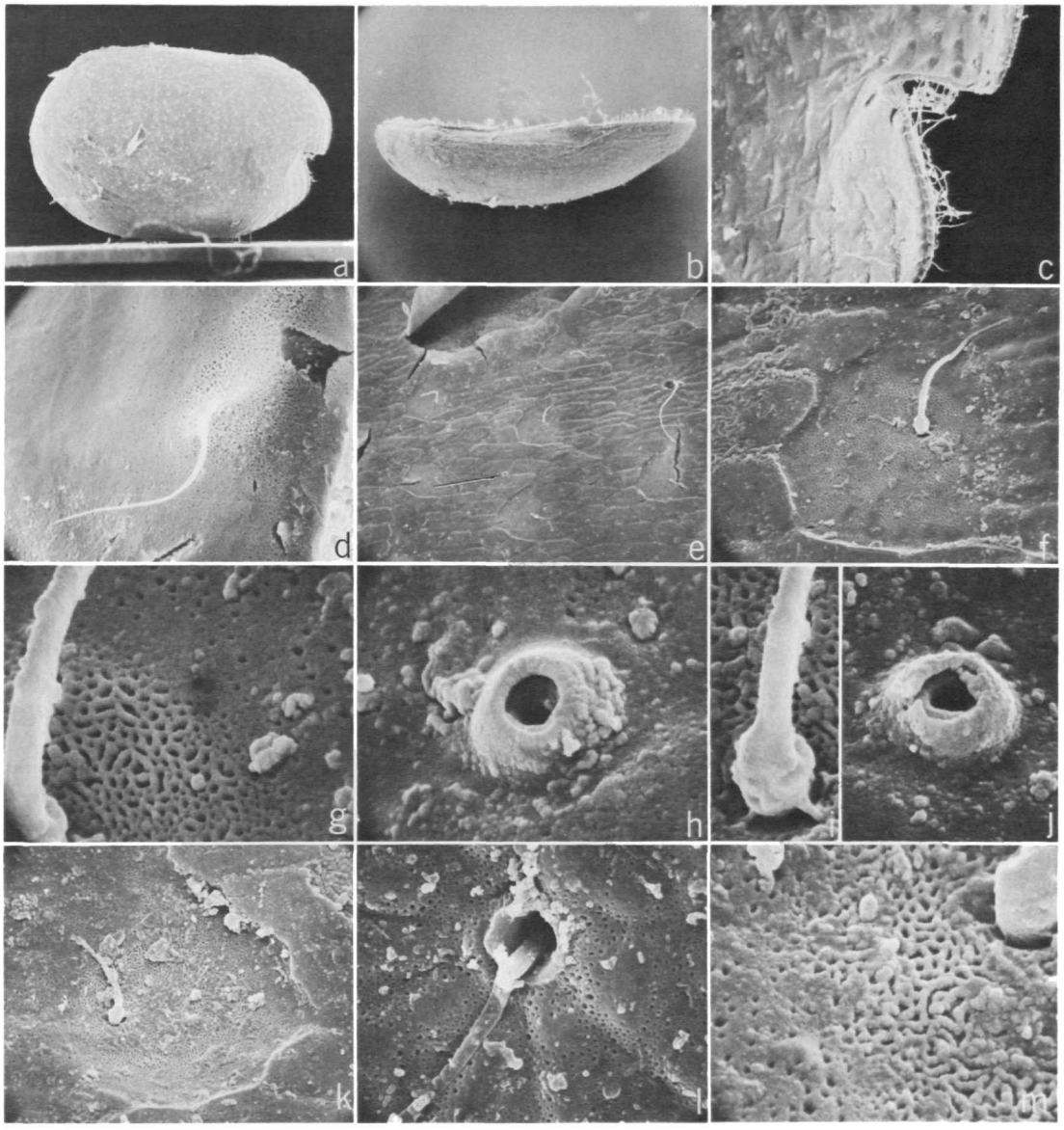


FIGURE 3.—*Cycloleberis squamiger* (Scott), right valve of adult female, length 3.26 mm, USNM 143975 (specimen not cleaned with sonic vibrator): *a*, lateral view, × 31; *b*, dorsal view, × 31; *c*, incisur, lateral view, × 125; *d*, lateral surface showing bristle and vesicular pores, × 2000. Left valve of adult female, length 3.93 mm, USNM 149278A (left valve cleaned with sonic vibrator; right valve not cleaned): *e*, lateral surface showing bristles, a pore (arrow) and polygonal markings, left valve, × 400; *f*, bristle and shallow fossae shown in *e*, × 2000; *g*, surface at base of bristle shown in *f*, × 10,000; *h*, pore shown in *e* (see arrow in *e*), × 10,000; *i*, base of bristle shown in *f*, × 10,000. Right valve, USNM 149278A: *j*, surface pore × 10,000; *k*, surface bristle and fossa, × 2000; *l*, surface bristle emerging from open pore (note vesicular appearance of valve surface), × 4000; *m*, surface at base of bristle shown in *k* (base of bristle is to upper right of *k*), × 10,000. (Photos reduced to 55 percent for publication.)

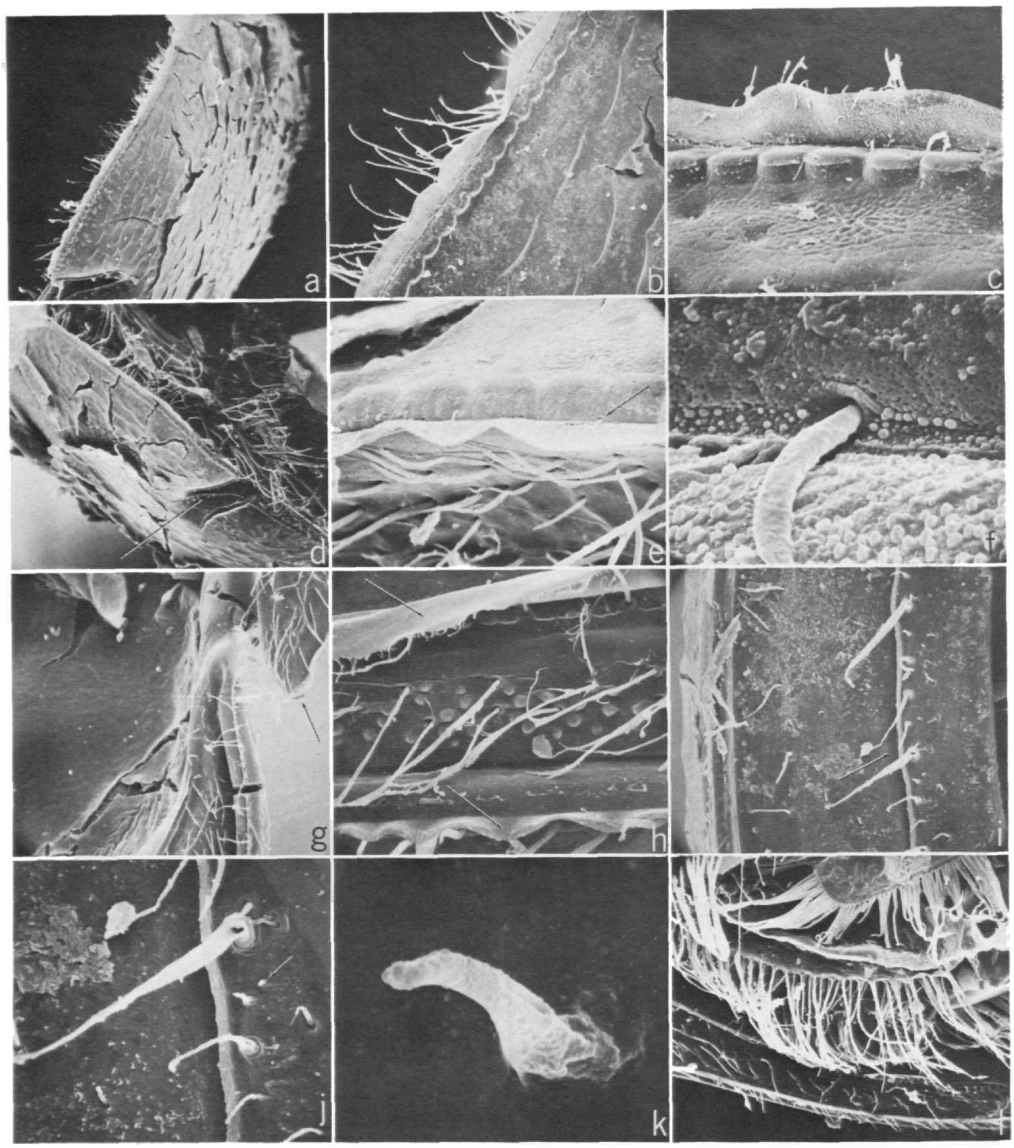


FIGURE 4.—*Cycloleberis squamiger* (Scott), left and right valves of adult female, length 3.93 mm, USNM 149278A (right valve not cleaned with sonic vibrator; left valve cleaned): *a*, anterior view of tilted left valve (note incisur at bottom), × 60; *b*, edge of valve shown in *a*, × 250; *c*, edge of valve shown in *b* viewed laterally, anterior of valve towards top, × 575; *d*, anterior view of tilted right valve (note incisur, arrow), × 52; *e*, edge of valve shown in *d* viewed medially, × 535; *f*, surface bristle near base of lamellar prolongation (for location of bristle see arrow in *e*) × 5400; *g*, incisur and tip of rostrum (arrow) of left valve, medial view, × 118; *h*, ventral margin near anterior of left valve, medial view (note lamellar prolongation of list, arrow, and also that of selvage, arrow, × 520; *i*, posterior infold of left valve, × 350; *j*, bristles and pores on list of posterior infold shown in *i* (for location see arrow in *i*), × 900; *k*, minute process on posterior list shown in *j* (for location see arrow in *j*), × 11,500; *l*, medial view of ventral margin of right valve showing position of epipodial appendage of left 5th limb (upper arrow) and left 6th limb (anterior of valve to left), × 100. (Photos reduced to 53 percent for publication.)

forming a verticle row. A scalloped border around the anterior valve margin is shown in Figure 4*a–d*. Small bristles are present along the outer edge of the scalloped border near the inner margin of the lamellar prolongation of the selvage (Figure 4*c,e,f*). The outer surface of the lamellar prolongation of the selvage is pustulose (Figure 4*c,e,f*). A fringed lamellar prolongation is present along the anteroventral list (Figure 4*g,h*) similar to that on the male (see Kornicker and Caraion, 1974). The channel formed between the list and selvage may be used for circulating water into or out of the carapace when the valves are closed, possibly during feeding. The position of the epipodial appendage of the 5th limb and the 6th limb relative to the channel is shown in Figure 4*l* and also in Figure 2. The distribution of bristles and types of bristles on the infold of the female (Figure 4*g–l*) are similar to those of the male (see Kornicker and Caraion, 1974).

First Antenna (Figure 5*b*): 1st joint with spines along ventral margin and on distal medial surface; 2nd joint with spines along ventral margin, proximally on dorsal margin, and abundant on lateral and medial surfaces; 4–6 spinous bristles of unequal length along dorsal margin; 4–7 short, slender bristles on distal lateral surface; 3rd joint with 11–19 spinous bristles along dorsal margin and 1 short, bare bristle near middle of ventral margin; 4th joint with 1 long, spinous terminal dorsal bristle and 4 or 5 spinous terminal ventral bristles (3 or 4 short, 1 long); 5th joint with convex dorsal margin; sensory bristle with 2 short proximal filaments and 12–14 long distal filaments; medial bristle on 6th joint terminal with minute plate at base. Seventh joint: a-claw curving dorsally, with rounded tip; b-bristle about 2.5 times length of a-claw, with 12 marginal filaments; c-bristle about 1.75 times length of b-bristle, with 8 marginal filaments. Eighth joint: d- and e-bristles bare, longer than b-bristle; f-bristle reflexed, about same length as b-bristle, with about 6 marginal filaments; f-bristle about same length as c-bristle, with about 11 marginal filaments; g-bristles longer than f-bristle, with about 14 filaments.

Second Antenna (Figure 5*c,d*): Protopodite with short, slender medial bristle, numerous hairs along ventral margin and medially near dorsal margin. Endopodite 3-jointed: 1st joint with 1–4 proximal bristles on or near protopodite and with 5 or 6 distal ventral bristles; 2nd joint with 0–4 distal ventral bristles; 3rd joint with long terminal bristle; all endopodite bristles bare. Exopodite: 1st joint with short terminal medial spine and groups containing 2 or 3 teeth forming rows on lateral side near dorsal margin or along dorsal margin; joints 2–8 with short spines forming row along distal margin and slender basal spines; 9th joint with short, slender lateral spine and 5 bristles—3 long, 1 medium, 1 short (dorsal); bristles on joints 2–8 and 3 long bristles on joint 9 with ventral marginal spines along proximal part; all exopodite bristles with natatory hairs.

Mandible (Figure 5*e–h*): Coxale endite with medial bristle near base; ventral branch with 6 oblique rows of spines; distal row on USNM 142795B with 3 spines with bulbous tips (foreign growth?), no bulbous tips on USNM 143795A; tip of ventral branch with 3 teeth, dorsal of these longer than others and with minute terminal teeth; ventral margin of dorsal branch with 2 short, double teeth followed by 2 short, single teeth and 4 slender, recurved teeth; the 4 short teeth with spines or teeth along posterior margins, the 4 slender, recurved teeth with spines along anterior margins; long bristle with few hairs present at tip of dorsal branch; short spines present on narrow ridge along dorsal margin of tip of dorsal branch.

Basale endite with 7 short bristles with spine-formed tips and 22 longer pectinate bristles with minute triaenid tips, longest of the pectinate bristles terminal; dorsal margin of basale with 4 short, bare bristles and 2 terminal bristles with long marginal spines; ventral margin of basale with 12 short bristles with triaenid tips and about 15 pairs of marginal spines near tip, and following these 1 slightly longer bristle and 1 very long bristle, both with long marginal spines; medial surface with 5 minute bristles with spine-formed tips near ventral margin, and long hairs forming clusters on proximal dorsal half. Exopodite reaching distal end of 1st endopodite joint, hirsute; ventral margin with bare midbristle slightly longer than exopodite, and a 2nd bristle just distal to midbristle and about one-half its length. Endopodite: ventral margin of 1st joint with 6 medium-length, slender bristles with short marginal spines and 2 long, stout bristles with long marginal


a
b
100
c
50
d
e
h
f
50
g
10
j
k
i
l

spines; ventral margin of 2nd joint with 3 slender subterminal bristles and 2 terminal bristles, all with short marginal spines; dorsal margin and medial surface of 2nd joint with abundant bristles; end joint with 3 long, bare, clawlike bristles, 1 long lateral bristle, and 2 short ventral bristles.

Maxilla (Figure 5*i,j*): Epipodite narrow, pointed, bare, about two-thirds length of basale. Protopodite of USNM 143975 with 1 short and 4 long bristles adjacent to scythe-shaped bristle, followed by group of 8 spinous bristles of various length and then 6 short, bare bristles with bases on medial side (for range of total number of protopodial bristles see Table 1); lateral side of basale with 1 short bristle; medial surface with 6–22 short, spine-tipped bristles forming row proximally near dorsal margin, 1 short, spine-tipped bristle ventral to above bristles, and 3–7 short bristles and 1 long (ventral to others) spine-tipped bristle forming row along terminal margin; distal dorsal margin with 1 long and 5–15 short, spine-tipped bristles; ventral margin with 16–18 short, bare bristles, 1 long spinous bristle (distal to others), and 1 long, bare terminal bristle, all bristles spine-tipped; dorsal margin of basale proximal to distal bristles and medial surface spinous; medial surface with long, stiff hairs proximally near middle. Exopodite minute, with 3 bristles of unequal length (Figure 5*j*). Endopodite: 1st joint with spine-tipped bare bristle near middle of dorsal margin, 1 long β-bristle with few marginal spines, and hairs on medial surface; 2nd joint with 6 bare bristles (2 long, 1 medium, 3 short), some spine-tipped, some with faint marginal spines.

Fifth Limb (Figure 5*k*): Epipodial appendage with 96 bristles, anterior and posterior bristles shorter than those in middle part. Comb (Figure 5*k*): dorsal margin hirsute, with 4–12 minute bristles; anterior margin hirsute; ventral and anterior margins with spinous bristles; lateral surface with 15 bristles: 2 slender, spinous bristles near anteroventral margin; 1 stout, spinous bristle near middle, 12 bristles with bases ventral and posterior to stout bristle (includes 1 long, spinous bristle, 5 minute, bare bristles near base of stout bristle, and 6 short, spinous bristles near ventral margin).

Sixth Limb (Figure 5*l*): Shape similar to that of male; anterodorsal corner with about 8 minute, broad medial spines; medial side of protopodite just within anterior margin with 1 small, bare bristle followed by 2 rows of spinous bristles extending to upper suture (inner row of 15 bristles short, stout; outer row of 29 bristles slightly longer and more slender); 3 somewhat longer bristles present just above upper suture; 11 spinous, slender bristles forming single row on medial surface near anterior margin between upper and lower sutures; 1 much longer, spinous medial bristle above lower suture; medial surface near anterior margin with about 27 slender, spinous bristles along anterior edge; ventral margin with about 72 short and long bristles in addition to about 20 minute bristles (the minute bristles, most short bristles, and some long bristles have bases on medial surface, remaining bristles have bases on ventral margin); extended posterior tip with 2–6 spinous bristles; 2–4 short, bare bristles in place of epipodial appendage; limb hirsute.

Seventh Limb (Figures 7, 8): Broad, distal one-third with 77 bristles, 37–40 on each side, each bristle with 3–7 bells; most rings with 2 bristles (1 on each side), some distal rings with 3 (1 or 2 on each side); terminus with opposing combs, each with about 25 teeth with pectinate margins.

Micromorphology of Seventh Limb (based on scanning electron microphotographs; Figure 7): Terminal end of each limb with 2 opposing combs; each comb with 3 types of teeth, called here A-, B- and C-teeth (Figure 8). Six A-teeth in middle of each comb curving inward; middle tooth longer than side teeth; each tooth with 2 well-developed secondary teeth near middle of each margin followed by 2 or 3 large, less well-developed teeth; tip either smooth or with minute nodular teeth and with pore (Figure 7*h,k*). Two

FIGURE 5.—*Cycloleberis squamiger* (Scott), adult female: *a*, outline of left valve, lateral view, length 3.26 mm; *b*, left 1st antenna, medial view; *c*, protopodite of left 2nd antenna, medial view; *d*, distal part of protopodite, endopodite, and 1st joint of exopodite of left 2nd antenna, medial view; *e*, left mandible, medial view (coxale endite and some medial bristles of 2nd endopodial joint not shown); *f*, coxale endite of left mandible, medial view; *g*, tip of dorsal branch of coxale endite shown in *f* (hairs on dorsal bristle not shown); *h*, exopodite of left mandible, medial view; *i*, left maxilla, medial view; *j*, detail of maxilla shown in *i* showing exopodite (arrow); *k*, comb of left 5th limb, lateral view; *l*, left 6th limb, medial view. (USNM 143975: *a–e*, *h–l*. USNM 143979: *f*, *g*. Same magnification in micrometers: *b,c,e,i,l*; *f,h,k*; *d,j*.)

or 3 B-teeth on each side of the A-teeth bearing about 6 well-developed secondary teeth proximally and about 12 smaller teeth distally along each margin; tip bearing numerous nodular teeth (Figure 7*l*); no pores observed at tips but presumed to be present. About 5 C-teeth at each end of the comb bearing proximally about 10 long secondary teeth, that together are frondlike, and distally about 12 short secondary teeth (Figure 7*d,e*).

Furca (Figure 6*a–c*): Each lamella with 3 main claws followed by 8–10 (usually 9) secondary claws; primary claws with 2 rows of teeth (1 medial, 1 lateral); both rows formed of large teeth separated by 2 or 3 minute teeth; hairs along convex margins of main claws; concavity in lamella between bases of claws 1 and 2 with greatest depth 46 to 86 percent of greatest width; [1] concavity on lamella between claws 2 and 3 with greatest depth 61 to 100 percent of greatest width; projections of lamella forming bases of claws 1–3 with medial hairs forming 2 rows; secondary claws with distal spines and midteeth along anterior and posterior margins; secondary claws 1 and 9 smaller than secondary claw 2; secondary claws decrease slightly in diameter posteriorly along lamella; secondary claws 2–4 slightly shorter than secondary claws 5–8; secondary claws 2–9 decrease slightly in diameter proximally along lamella; base of claw 4 offset very slightly inward from claw 5; short segment following lamellae with long hairs forming row; secondary claw 1 of USNM 143975 immediately adjacent to main claw 3 on left lamella but located almost the width of base of claw 3 posterior to claw 3 on right lamella.

Eyes and Rod-shaped Organ: Medial eye and rod-shaped organ similar to those on adult male (Figure 6*d*); lateral eye (Figures 6*e*, 9*a,b*) about one-half size of eye of male but with about same number of ommatidia (5 rows with about 12–14 ommatidia per row).

Upper Lip: Consisting of 2 anterior, ovate, hirsute lobes with saddle between them and 2 posterior lateral flaps (Figure 6*d*).

[1] Greatest width was obtained by measuring the distance between the bases of adjacent main claws where they join the lamella. Greatest depth was obtained by measuring the length of the longest line that could be drawn from the concave part of the lamella between adjacent claws perpendicular to a line drawn between the bases of the claws.

Posterior: Dorsum fringed with long hairs; small lobe, without hairs, present in place of dorsal process; few minute spines present on margin dorsal to small lobe.

Gill-like Processes: Broad, terminating in acute angle.

Y-*Sclerite*: Slightly arcuate with down-curving anterior tip (Figure 6*g,h*).

Genitalia and Brushlike Organ (Figure 6*f*): Genitalia ovoid; brushlike organ with 15 minute bristles adjacent to genitalia.

Eggs: USNM 143975A with 28 eggs in marsupium; USNM 143979, 22 eggs; USNM 149271, 38 eggs; 149275A, 26 eggs.

Ectozoa: Protistan attached to endopodite of left 2nd antenna (Figure 6*i*).

Supplementary Description of Adult Male (Figure 6*j*).—Specimens from Ivory Coast smaller than specimen from Mauritanian coast described by Kornicker and Caraion (1974): USNM 149280, length 3.96 mm, height 2.87 mm; USNM 149281, length 3.60 mm, height 2.41 mm. Shape of comb of 5th limb similar to that described by Kornicker and Caraion. Distribution of bristles on the 2

Figure 6.—*Cycloleberis squamiger* (Scott), adult female, USNM 143975: *a*, right lamella of furca (marginal spines and teeth of claws not shown except on claw 2); *b*, marginal teeth on middle part of anterior claw of right and left lamella of furca, right lamella to right (lateral view), left lamella to left (medial view); *c*, left lamella of furca showing spacing between claws (not all claws shown), medial view; *d*, anterior of body showing medial eye, proximal part of rod-shaped organ, anterior processes, and upper lip (note protistan on rod-shaped organ); *e*, outline of left lateral eye, anterior towards left; *f*, left genitalia and brushlike organ; *g*, sclerites in vicinity of furca, anterior to left, note Y-sclerite (arrow); *h*, Y-sclerite shown in 6*g*; *i*, protistan attached to endopodite of left 2nd antenna. Adult male, USNM 149281: *j*, outline of right valve, length 3.60 mm. A–1 female, USNM 143978, specimen from research vessel *Cornide de Saavedra*, station 14 off Mauritania (see Kornicker and Caraion, 1974, fig. 1): *k*, lateral outline, length 3.77 mm, height 3.06 mm; *l*, endopodite of left 2nd antenna, medial view; *m*, distal part of basale of maxilla (medial bristles not shown). Juvenile female, USNM 143976, specimen from research vessel *Thalassa*, station X044 off Mauritania (see Kornicker and Caraion, 1974, figure 1); *n*, lateral outline of carapace, length 2.45 mm, height 2.05 mm; *o*, protopodite of left 2nd antenna, medial view; *p*, endopodite of right 2nd antenna, lateral view; *q*, distal margin of basale of left maxilla, medial view; *r*, anterior four claws of right lamella of furca, lateral view (marginal teeth of claws not shown). (Same magnification in micrometers: *a,c–e,g,l,m,o; h,q,r; b,f,i,p.*)


a
100
b
c
50
f
g
e
d
50
h
i
k
l
m
n
p
o
q

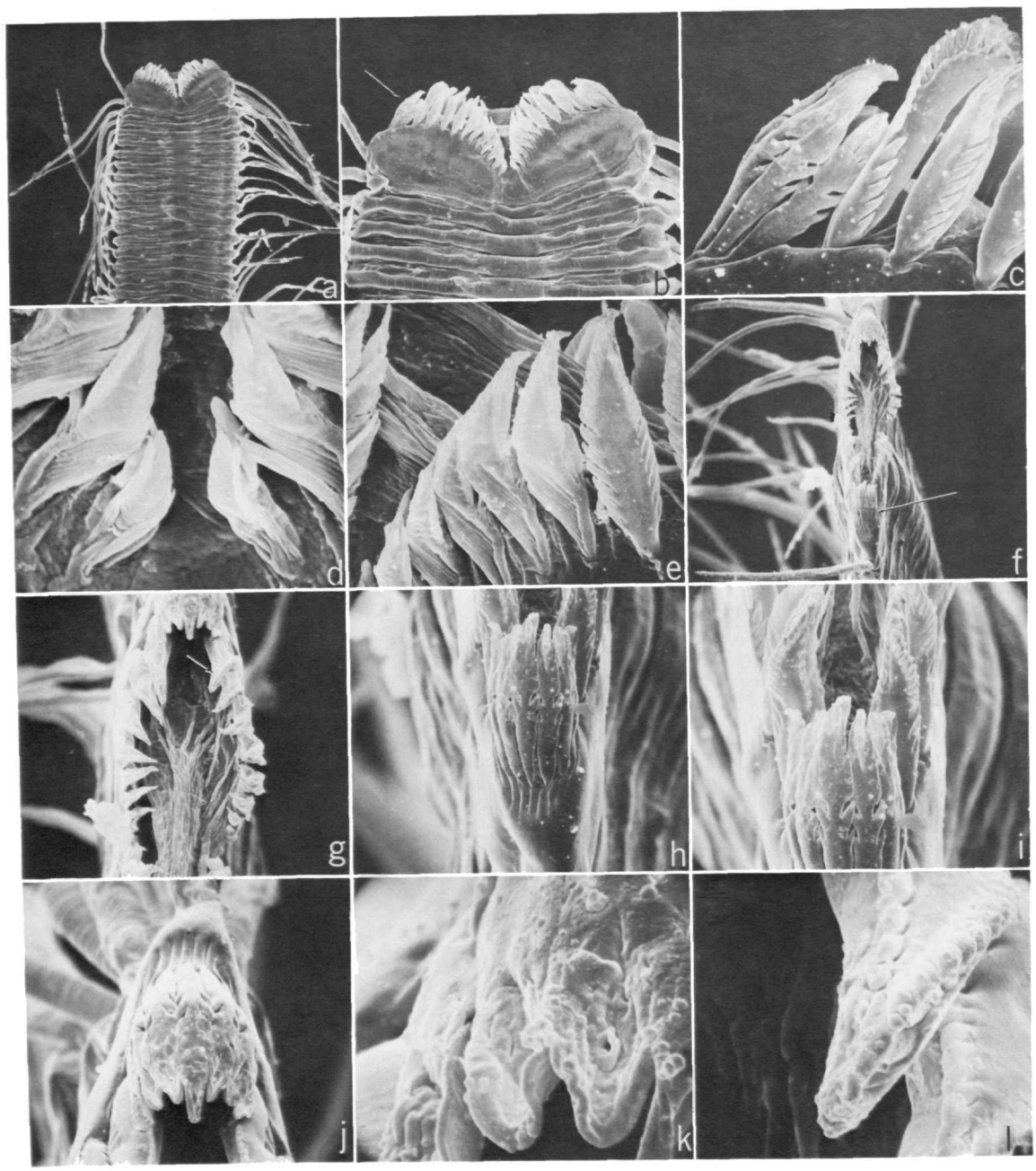


FIGURE 7.—*Cycloleberis squamiger* (Scott), adult female, USNM 149278A, 7th limb: *a*, distal part, × 200; *b*, tip of limb shown in *a*, × 500; *c*, comb bristles shown in *b* (for location see left arrow in *b*) × 2700; *d*, midbristles in *b*, × 5000; e, bristles to right of middle in *b*, × 3000; *f*, end view of limb, × 500; *g*, same, × 1230; *h*, bristles forming lower comb shown in *f* (see arrow in *f*), × 1790; *i*, same, × 2465; *j*, bristles forming upper comb shown in *f*, × 2465; *k*, bristles on left end of comb shown in *j*, note pore, × 11,000; *l*, tip of midbristles of comb (for location see arrow in *g*), × 8830. (Photos reduced to 54 percent for publication.)

Ivory Coast specimens and that on the specimen from Mauritania are compared in Table 1.

SUPPLEMENTARY DESCRIPTION OF JUVENILE MALES.—My measurements of 2 left valves of specimens from Mauritania reported on by Klie (1943): length 4.51 mm, height 3.46 mm; and length 3.96 mm, width 3.27 mm. Dimensions of Ivory Coast specimens: USNM 143995, length 2.96 mm, height 2.52 mm; USNM 149273, length 2.98 mm, height 2.41 mm; USNM 149287B, length 3.03 mm, height 2.38 mm; USNM 149273, length 2.67 mm, height 2.06 mm; USNM 149275B, length 3.44, height 2.79 mm. Appendages of Klie's specimens and an A–1 male from Mauritania reported on by Kornicker and Caraion (1974) are compared in Table 1.

DESCRIPTION OF A–1 FEMALE (Figure 6*k–m*).—Morphological characteristics of an A–1 ♀ (USNM 143993) from Mauritania reported by Kornicker and Caraion (1974) are presented in Table 1.

DESCRIPTION OF JUVENILES.—See Figures 6*n–r*, 10, 11*g,h*.

COMPARISONS.—*Cycloleberis lobiancoi* (Müller, 1894) is very close to *C. squamiger* and perhaps they should be considered conspecific. I have kept them separate because of a small difference in the armature of the 6th limbs. The single female of *C. lobiancoi* described by Kornicker (1974) bears five epipodial bristles on one 6th limb and four on the other; whereas, of the 12 6th limbs on adult females of *C. squamiger* examined herein, one had four epipodial bristles and the remaining 11 had only two or three. Additional collections of *C. lobiancoi* are needed from the vicinity of the Gulf of Naples to assess the variability of that species.

Cycloleberis galathea Poulsen, 1965, is based on a juvenile (A–1 instar) female (holotype) and a juvenile male. In describing the female 6th limb Poulsen states: "Along the anterior side of the protopodite is a row of abt. 12–14 short plumose bristles, and at the distal end of this row one longer bristle with a few shorter marginal hairs." Because the 6th limbs of *C. squamiger* contained many more bristles along the anterior margin of the protopodite, I borrowed the holotype of *C. galathea* from the Copenhagen Museum and upon examination found more anterior bristles on the protopodite of the 6th limb (Figure 12*f*) than given in Poulsen's description. The anterior margins of the protopodites of *C. galathea* and *C. squamiger* bear about the same number of bristles (compare Figures 5*l* and 12*f*). The left 1st antenna illustrated by Poulsen (1965, fig. 87b) bears six dorsal bristles on the 1st joint, a number which rarely occurs on *C. squamiger*. The left 1st antenna in the vial, however, bears only five bristles (Figure 12*a*). The right 1st antenna was not present in the vial. The endopodites of the 2nd antennae in the vial also differed somewhat from the endopodite illustrated by Poulsen (1965, fig. 87c). The 1st joint of the endopodite of the left limb bears two proximal bristles close to the protopodite and six distal bristles (Figure 12*c*); no bristles were observed on the 2nd joint; the 3rd joint bears one long terminal bristle (Figure 12*c*). The endopodite of the right limb bears three proximal and six distal bristles on the 1st joint, one distal bristle on the 2nd joint, and one long terminal bristle on the 3rd joint (Figure 12*d*). The proximal part of the 1st joint on the right limb also bears three or four strands of a foreign growth. Each strand is segmented and resembles a bristle except for being more slender and having parallel sides. Poulsen (1965, fig. 88b) illustrated the comb of the left 5th limb. The right 5th limb has the same number of dorsal bristles (Figure 12*e*).

The protopodite of the 2nd antenna of *C.*

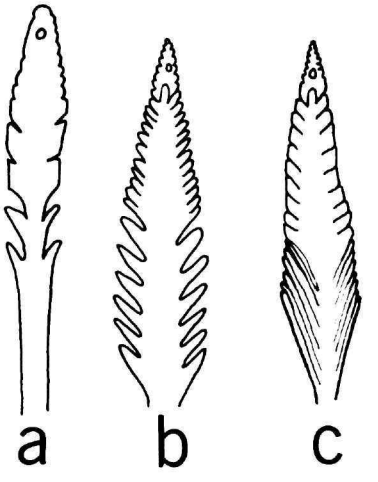


FIGURE 8.—*Cycloleberis squamiger* (Scott), adult female, USNM 149278A, comb teeth of 7th limb: *a*, typical A-tooth in middle of comb; *b*, typical B-tooth on each side of mid-bristles; *c*, typical C-tooth at each end of comb. (Note terminal pores.)

galathea has, in addition to the ventral hairs mentioned by Poulsen (1965:262), several medial hairs near the dorsal margin (Figure 12*b*). Hairs occur in that locale on both *C. squamiger* and *C. lobiancoi*. Several segmented strands of a foreign growth were observed along the dorsal margin of the protopodites of both limbs of the holotype of *C. galathea* (Figure 12*g*).

The juvenile male of *C. galathea* described by Poulsen (1965:267) is unusual in having 10 proximal bristles on the 1st joint of the endopodite of the 2nd antenna. Although I have not seen the specimen, I suggest that some of the "bristles" may actually be strands of foreign growth that strongly resemble bristles, like those on Poulsen's female. The epipodite of both the left and right maxillae of the juvenile male has a distal bristle not found on the female or on any other species in the family. If this is not a strand of a foreign growth, it may be an aberration and not a character useful for taxonomic discrimination.

Cycloleberis galathea is very similar to *C. squa-*

TABLE 1.—*Variability in appendages of* Cycloleberis squamiger
(specimen length and height, in mm, are in parentheses)

	Adult females												
	USNM 143975[a] (3.26, 2.58)		USNM 143979[a] (3.21, 2.63)		USNM 149277 (4.32, 3.69)		USNM 149271[a] (3.80, 3.01)		USNM 149274A (3.91, 3.16)	USNM 149276 (3.53, 2.88)		USNM 149272 (3.30, 2.80)	
Appendage	*Left*	*Right*	*Left*	*Right*	*Left*	*Right*	*Left*	*Right*	*Right*	*Left*	*Right*	*Left*	*Right*
First antenna (bristles)													
2nd joint: dorsal-lateral	5–4	5–4	4–5	4–5	5–7	6–7	4–7	4–6	4–7	4–6	4–5	5–5	5–4
3rd joint: dorsal-ventral	15–1	14–1	14–1	13–1	19–1	17–1	14–1	14–1	14–1	–	13–1	11–1	11–1
4th joint: dorsal-ventral	1–4	1–4	1–4	1–4	1–4	1–5	1–5	1–4	1–4	–	1–4	1–4	1–4
Sensory bristle: proximal-distal filaments	2–14	2–14	2–14	2–14	2–14	2–?	–	–	–	–	2–?	2–12	2–12
Second antenna													
Protopodite: medial hairs near dorsal margin	many	many	many	many	many	many	many	many	many	–	many	many	many
Endopodite (bristles)													
1st joint	3–6	4–5	4–5	4–6	1–5	2–6	3–6	2–6	2–6	2–6	2–6	1–5	2–5
2nd joint	2	1	1	1	4	3	0	0	2	1	0	1	0
3rd joint: proximal-terminal	0–1	0–1	0–1	0–1	0–1	0–1	0–1	0–1	0–1	0–1	0–1	0–1	0–1
Exopodite													
1st joint: lateral teeth along dorsal margin	strong	strong	strong	strong	faint	faint	faint	faint	faint	–	faint	faint	faint
9th joint: bristles	5	5	5	5	5	5	5	5	5	5	5	5	5
Maxilla													
Protopodite: bristles	18	17	18	22	–	–	–	–	–	20	19	–	–
Basale (bristles)													
Dorsal margin: proximal-distal	22–15	21–14	18–13	18–14	–	–	14–10	12–11	?–13	14–11	13–11	6–5	8–5
Ventral margin	20	20	20	20	–	–	–	–	–	20	18	13	14
Medial side: distal	8	7	7	6	–	–	6	6	–	6	5	5	4
End joint: terminal bristles	6	6	6	6	–	–	–	–	–	–	6	–	6
Fifth limb													
Comb: dorsal bristles	10	12	–	12	6	6	6	5	6	5	5	5	4
Sixth limb													
Epipodial bristles	3	2	3	3	4	3	–	2	2	2	2	3	3
Posterior end bristles	6	2	6	6	6	6	6	6	6	6	6	5	5
Seventh limb													
Bristles	77	–	–	–	–	–	–	–	–	–	–	–	–
Comb teeth	50	–	–	–	–	–	–	–	–	–	–	–	–
Furca													
Secondary claws	9	9	9	10	9	9	8	–	9	9	9	8	8
Concavity between claws 1 & 2[e]	82	46	86	73	53	46	–	–	–	60	48	61	68
Concavity between claws 2 & 3[e]	83	100	86	86	75	61	–	–	–	80	82	91	100

[a] Ovigerous females; remaining specimens not known to be adults with absolute certainty.
[b] Specimens from Mauritania reported by Kornicker and Caraion (1974).
[c] Specimens from Mauritania reported by Klie (1943), in Hamburg Zoological Museum.
[d] Terminal bristle minute.
[e] Given as greatest depth of concavity as percentage of greatest width.

miger and the two may be conspecific. Both species are recognized herein because the basale of the maxillae of both the juvenile male and female of *C. galathea* described by Poulsen (1965) bear only four distal bristles on the dorsal margin. Of the 23 specimens of *C. squamiger* studied herein, only one limb (on an adult male) contained four bristles there (Table 1); the remaining limbs had more (5–15, average 11). Additional collections of *C. galathea* are needed to determine its variability.

Moguilevsky and Ramírez (1970) considered their new species, *Cycloleberis poulseni,* to have concavities between the main furcal claws not deeper than a semicircle. However, applying the formula derived herein (see footnote, page 10) to their illustration of the left lamella (Moguilevsky and Ramírez, 1970, fig. 3), the maximum depth of the concavity between the 2nd and 3rd claws is 75 percent of the maximum width, which is much deeper than a semicircle. Their species differs from *C. squamiger* in having four short proximal filaments on the sensory bristle of the 1st antenna,

Adult males					A-1 females				A-1 males				*Range of variability*		
USNM 143798[b] (4.55, 3.10)		USNM 149280 (3.96, 2.87)		USNM 149281 (3.60, 2.41)	USNM 143993[b] (2.52, 2.08)		USNM 143978[b] (3.77, 3.06)		Klie 10c[c] (4.51, 3.46)		*Klie 10a–b*[c] (3.96, 3.27)		*Adult females*	*Adult males*	*A-1 males*
Left	*Right*	*Left*	*Right*	*Left*	*Left*	*Right*	*Left*	*Right*	*Left*	*Right*	*Left*	*Right*			
5–6	5–6	5–7	5–6	4–5	3–3	–	5–4	4–4	3–7	3–6	4–5	4–4	(4–6)–(4–7)	(4–5)–(5–7)	(3–5)–(4–7)
16–1	16–1	18–1	17–1	15–1	4–1	–	11–1	10–1	13–1	14–1	11–1	12–1	(11–19)–1	(15–18)–1	(10–14)–1
1–5	1–5	1–5	1–5	1–5	1–2	–	1–3	1–3	1–4	1–5	1–4	1–4	1–(4–5)	1–5	1–(3–5)
0	0	0	0	0	2–8	–	2–12	3–12	2–13	2–13	3–12	3–13	2–(12–14)	0	(2–3)–(12–13)
bare	bare	bare	bare	bare	many	–	many	many	–	–	–	–	many	bare	many
1–4	1–3	1–4	0–4	2–4	2–2	2–1	2–4	2–4	–	–	?–4	2–4	(1–4)–(5–6)	(0–2)–(3–4)	2–4
7	8	6	5	6	0	0	3	3	–	–	2	2	0–4	5–8	2–3
1–0	1–0	1–0	1–0	1–0	0–1	0–1	1–1[d]	1–1[d]	–	–	1–0	1–1[d]	0–1	1–0	1–(0–1)[d]
faint	faint	faint	faint	faint	faint	faint	faint	faint	faint	faint	faint	faint	faint–strong	faint	faint
5	5	5	5	5	4	4	5	5	5	5	5	5	5	5	5
18	–	16	–	–	10	–	–	–	–	15	–	18	17–22	16–18	15–18
19–13	19–12	4–6	4–4	11–12	14–10	–	18–10	17–10	24–15	25–15	13–11	10–10	(6–22)–(5–15)	(4–19)–(4–13)	(10–24)–(10–15)
16	17	13	12	12	14	–	16	17	21	22	14	15	18–20	12–17	14–22
5	5	5	5	5	3	–	5	5	6	6	5	5	4–8	5	5–6
6	6	6	–	6	6	–	5	5	–	6	5	5	6	6	5–6
7	7	4	5	4	4	–	9	7	13	11	7	7	4–12	4–7	7–13
3	3	3	–	2	2	–	3	3	3	3	2	2	2–4	2–3	2–3
3	5	5	–	4	3	–	4	4	5	5	4	3	2–6	3–5	3–5
67	68	66	–	–	34	–	73	69	95	98	65	69		66–68	65–98
64	64	56	–	–	48	–	50	60	68	68	68	64		56–64	50–64
9	9	9	9	9	8	8	8	8	9	9	8	8	8–10	9	8–9
47	52	65	52	52	33	46	46	65	93	82	73	50	46–86	47–65	50–93
72	79	67	60	68	61	83	96	81	93	96	96	90	61–100	60–79	81–96

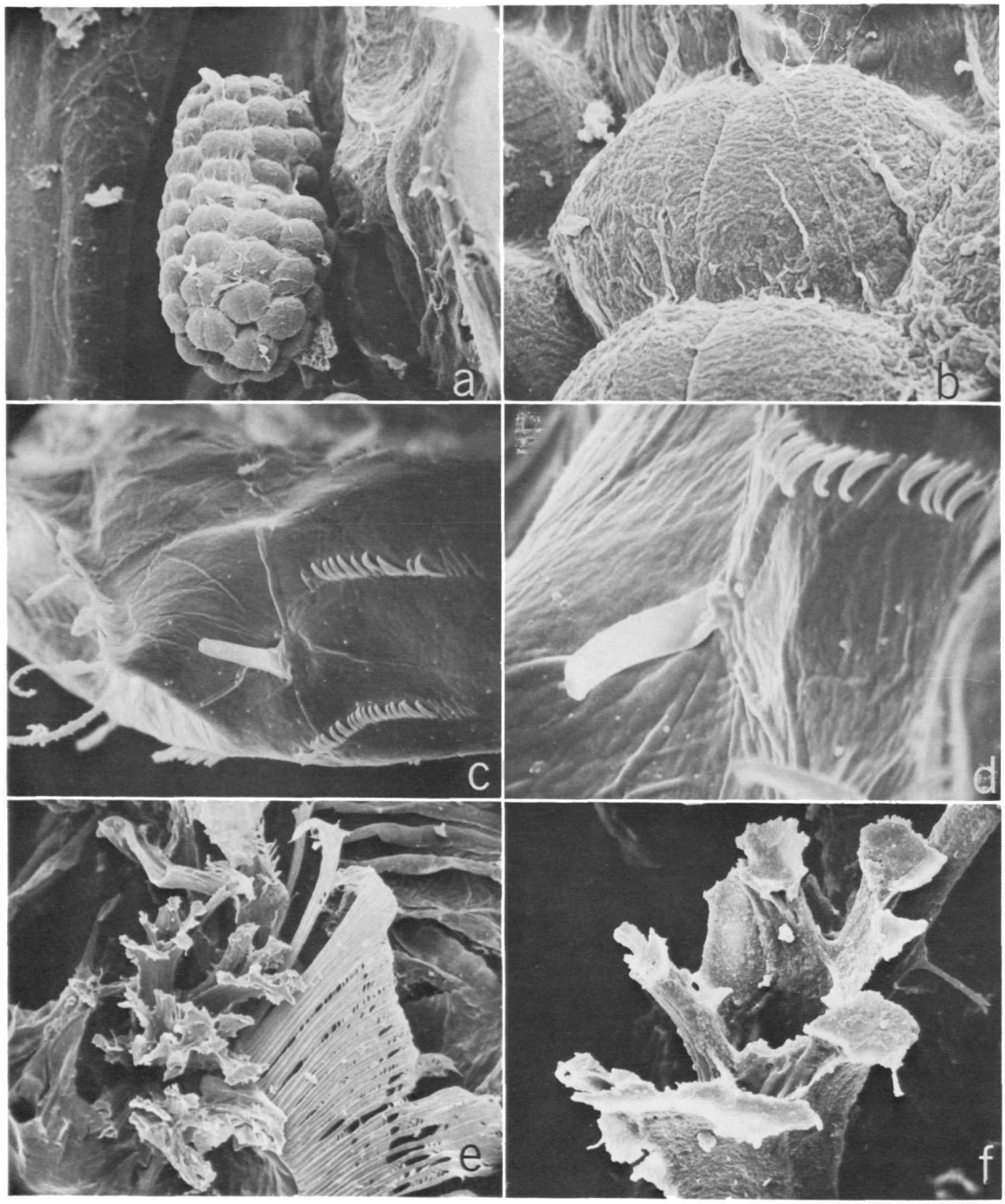


FIGURE 9.—*Cycloleberis squamiger* (Scott), adult female, USNM 149278A: *a*, left lateral eye, × 240; *b*, detail of ommatidia in *a*, × 2000; *c*, part of upper lip, × 2415; *d*, part of upper lip, × 6040; *e*, left end of central adductor muscles, anterior to left, × 125; *f*, detail of *e*, × 500. (Photos reduced to 82 percent for publication.)

more lateral bristles (10) on the 2nd joint of the 1st antenna, more recurved spines (4) following the main spine on the dorsal branch of the coxale endite of the mandible, and a larger carapace (length 5.30 mm). I was unable to obtain specimens of *C. poulseni* for comparative purposes.

Adult males have been described for only two species of *Cycloleberis*: *C. bradyi* Poulsen, 1965 (Poulsen, 1965:268), and *C. squamiger* (Scott) (Kornicker and Caraion, 1974). Both species have a large, hooklike process at the middle of the dorsal margin of the comb of the 5th limb. The process, absent on the A–1 male, probably is used by the adult male for clasping the female during copulation. The dorsal margin of the comb of *C. squamiger* has a rounded protuberance anterior to the hooklike process, but this process is absent on *C. bradyi*.

The brief description of "*Cypridina* (?) *bradyi*" De Folin, 1871, given by De Folin (1871:245) leads

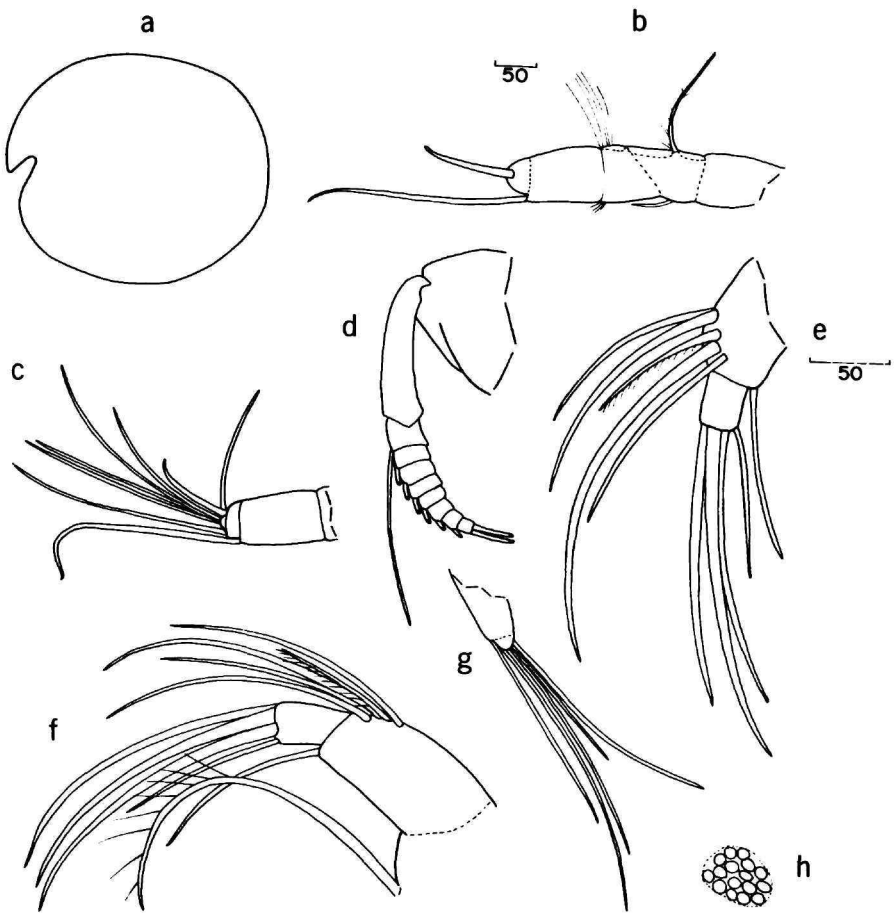


FIGURE 10.—*Cycloleberis squamiger* (Scott), lectotype, juvenile: *a*, outline of specimen, length 1.09 mm; *b*, left 1st antenna, lateral view (only a-claw of end joints shown); *c*, end of right 1st antenna, medial view; *d*, part of protopodite and exopodite of left 2nd antenna (only proximal parts of exopodial bristles shown); *e*, tip of right mandible, medial view; *f*, distal part of left mandible, lateral view; *g*, tip of left maxilla, medial view; *h*, left lateral eye, anterior to left. (Specimen not dissected; appendages drawn were either protruding from shell or visible through shell. Same magnification in micrometers: *b–d,g,h; e,f.*)

me to believe that this species may belong in the genus *Cycloleberis*, and, if so, could be a senior synonym of *Cycloleberis squamiger*. At the present state of our knowledge concerning De Folin's species, however, it seems best to leave the species where it was referred to by Müller (1912:50): "Cypridinidarum genera dubia et species dubiae."

DISTRIBUTION.—*Cycloleberis squamiger* is now known from the lagoon at São Tomé Island, Gulf of Guinea, where it was collected in a night surface tow; from the continental shelf of Spanish Sahara at a depth of 53 m; from the continental

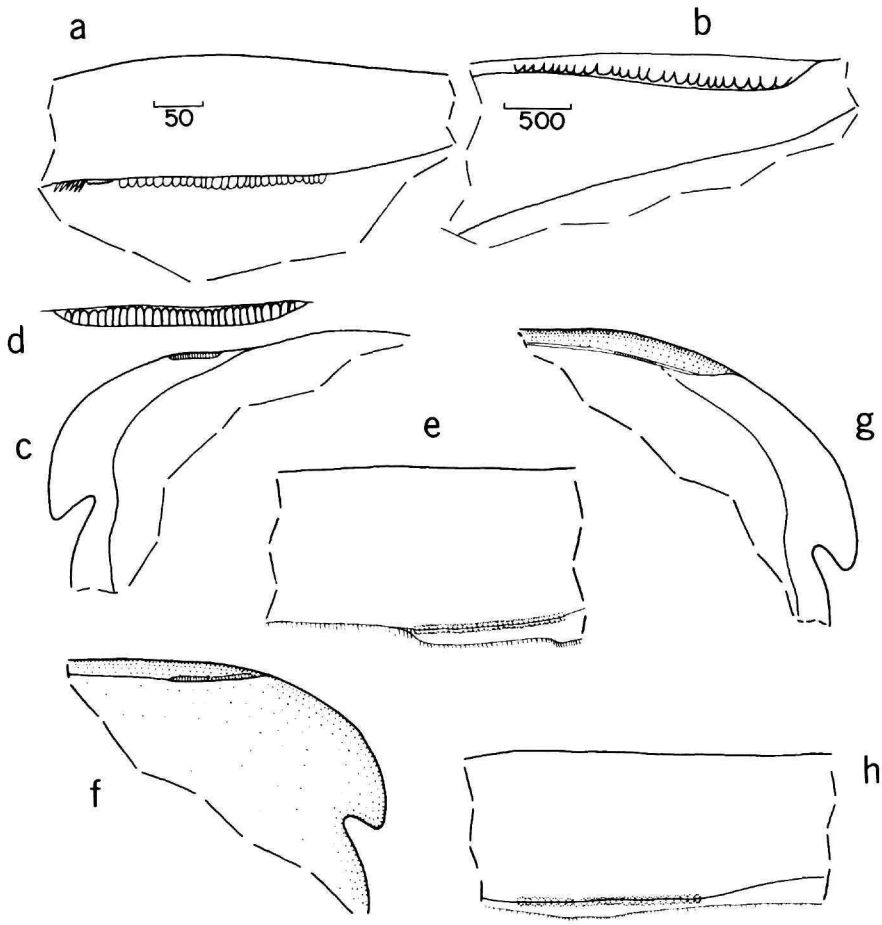


FIGURE 11.—Dentition on anterior end of dorsal margins of valves of *Cycloleberis galathea* Poulsen, holotype, A-1 female: *a*, denticles of left valve, medial view; *b*, denticles of right valve, medial view. Dentition on anterior end of dorsal margins of *Cycloleberis squamiger* (Scott): *c*, dentition of right valve on USNM 149274B, adult female, medial view; *d*, detail of dentition in *c*; *e*, dentition of left valve of USNM 143975, adult female, medial view; *f*, dentition of joint of right and left valves viewed from right, USNM 149274A, adult female, anterior of specimen towards right (left valve overlaps right along part of dorsal margin shown; row of denticles to left belongs to left valve, that to right belongs to right valve); *g*, denticles on left valve of specimen described by Klie (1943) (see section on "Material"); *h*, detail of denticles shown in *g*, medial view. (Same magnification in micrometers: *c,f,g; a,d,e,h.*)

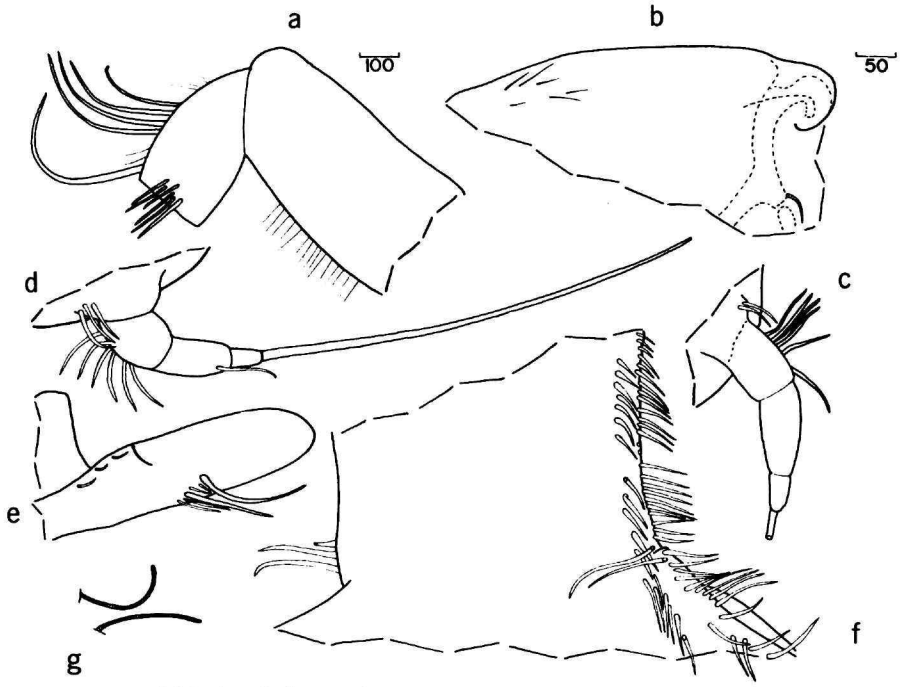


FIGURE 12.—*Cycloleberis galathea* Poulsen, holotype, A–1 female: *a*, joints 1 and 2 of left 1st antenna, lateral view; *b*, distal end of protopodite of left 2nd antenna, medial view; *c*, endopodite of left 2nd antenna, medial view; *d*, endopodite of right 2nd antenna, medial view; *e*, comb of right 5th limb (small exopodial bristles obscure, hairs and ventral bristles not shown); *f*, proximal part of left 6th limb, medial view; *g*, segmented strands of foreign growth on dorsal margin of protopodite of left 2nd antenna, medial view. (Same magnification in micrometers: *a,e; b–d,f,g.*)

slope of Mauritania at a depth of 1100 m; and from the continental shelf of the Ivory Coast at depths of 10 to 40 m.

Genus *Asteropteron* Skogsberg, 1920

This genus is represented in the collections by three varieties (A, B, and C) of *Asteropteron setiferum* Kornicker and Caraion, 1974. Members of this genus range from about 33°N to 37°S and from intertidal depths to 1100 m, but most occurrences are shallower than 100 m.

One of the criteria specified by Kornicker and Caraion (1974:75) for distinguishing *A. setiferum* from *Asteropteron nodulosum* Poulsen, 1965, was the presence of fewer coarse fossae on the carapace of the former. In the present work, specimens with many fossae are included in *A. setiferum* (varieties B and C have many fossae, whereas variety A has few). The absence of a U-shaped ridge in the posterodorsal part of the carapace of *A. setiferum* remains a criterion for distinguishing that species from *A. nodulosum*. Adults of only the female of *A. setiferum* and the male of *A. nodulosum* are known, making comparison difficult. In general, the carapaces of adult females of *A. setiferum* are smaller than carapaces on most nodose species of the genus and, also, mandibles have more bristles on the basale (Figure 14). Information is required about the adult stage of juveniles from South Africa identified by Hartmann (1974) as *Asteropteron* aff. *nodulosum* Poulsen (1965:235) and *Asteropteron* cf. *nodulosum* Poulsen (1965: 372) before they can be identified with certainty.

TABLE 2.—*Comparison of appendages of* Asteropteron setiferum *(varieties A, B, C) from the Ivory Coast arranged by USNM specimen number* (specimen length and height, in mm, are in parentheses; plus sign indicates presence of character; minus sign indicates lack of observations)

Appendage	*Variety A*						*Variety B*				*Variety C*	
	128851 (2.45, 1.84)		143996 (2.34, 1.72)		149283 (2.33, 1.73)		149282 (2.24, 1.73)		149285 (2.22, 1.89)		149284 (2.24, 1.74)	
	left	right	left	right	left	right	left	right	left	right	left	right
First antenna (bristles)												
2nd joint: dorsal-lateral	5–0	5–0	5–0	5–0	4–0	5–0	6–0	6–0	5–0	5–0	5–0	5–0
3rd joint: dorsal-ventral	3–1	3–1	3–1	3–1	3–1	3–1	3–1	2–1	3–1	3–1	3–1	3–1
4th joint: dorsal-ventral	1–3	1–3	1–3	1–3	1–3	1–3	1–3	3–2	1–3	1–2	1–3	1–3
Sensory bristle: proximal-distal filaments	2–4	3–4	3–4	3–4	2–4	3–4	2–4	2–4	2–4	2–4	–	2–4
Second antenna												
Protopodite: medial spines near dorsal margin	+	+	+	+	+	+	+	+	+	+	+	+
Endopodite (bristles)												
1st joint	9	11	9	9	12	9	14	15	9	8	8	8
2nd joint	0	0	0	0	0	0	1	0	0	0	0	0
3rd joint	1	1	1	1	1	1	1	1	1	1	1	1
Exopodite: bristles on 9th limb	5	5	5	5	5	–	5	5	5	5	–	5
Mandible (bristles)												
Basale, dorsal margin: proximal-distal	5–9	5–10	3–12	3–11	5–11	6–13	10–16	11–15	13–17	17–22	3–9	3–11
Total	14	15	15	14	16	19	26	26	30	39	12	14
Endopodite												
1st joint: ventral	3	3	3	3	3	3	3	3	3	3	4	4
2nd joint: ventral	3	3	3	3	3	3	3	2	3	3	3	3
Maxilla (bristles)												
Endites I and II: long/short	5/1–2/11	4/1–2/10	5/2–1/8	5/1–1/10	5/1–1/10	5/2–1/10	5/2–1/5	5/2–1/6	6/2–1/5	5/2–2/5	–	–
Basale (bristles)												
Dorsal margin												
Proximal	12	11	3	9	12	12	12	8	15	14	–	–
Distal, long-short	4–9	4–8	2–7	4–7	5–5	4–6	4–4	4–6	5–6	4–7	4–6	–
Medial side, distal	3	3	3	3	3	3	2	2	3	2	–	–
Ventral margin, short-long	13–1	8–1	9–1	9–1	8–1	8–1	7–1	9–1	7–1	7–1	–	–
Endopodite (bristles)												
1st joint	3	4	2	2	4	4	1	1	4	4	–	–
End joint	5	5	5	5	5	5	5	5	6	5	–	–
Exopodite (bristles)	3	3	3	3	3	3	3	2	3	3	–	–
Epipodite: hirsute	yes	–	no (?)	no (?)	yes	yes	yes	yes	–	yes	–	–
Comb of 5th limb (bristles)												
Dorsal margin: proximal-distal	?–3	8–4	6–6	8–4	6–4	3–5	3–3	3–3	–	?–5	–	–
Exopodial	8	8	–	8	7	8	–	6	–	7	–	–
Sixth limb												
Number of anterior sutures	2	2	1	2	2	2	1	1	2	2	–	–
Bristles dorsal to lower suture: outer row–inner row	21–13	19–12	–	21–11	21–11	21–12	23–9	–	23–13	24–13	–	–

TABLE 2.—Continued

Appendage	Variety A						Variety B				Variety C	
	128851 (2.45, 1.84)		143996 (2.34, 1.72)		149283 (2.33, 1.73)		149282 (2.24, 1.73)		149285 (2.22, 1.89)		149284 (2.24, 1.74)	
	left	right	left	right	left	right	left	right	left	right	left	right
Bristles between suture: outer row–inner row	4–1	4–2	–	4–1	4–2	4–1	–	–	5–1	4–1	–	–
Bristles between lowermost suture and lateral flap	7	6	6	7	4	4	1	1	4	4	–	–
Ventral bristles including those on flap	27	25	30	26	23	–	25	–	25	25	–	–
Medial dwarf bristles	28	–	28	–	42	–	28	–	–	26	–	–
Epipodial bristles	1	1	1	1	1	1	1	1	1	1	–	–
Seventh limb												
Marginal bristles	52	51	48	48	43	43	34	37	34	33	35	–
Segments with 2 bristles on one side	6	9	8	9	4	3	2	0	0	0	2	–
Comb:												
A-teeth	8	–	7	6	8	7	6	7	7	6	–	–
B-teeth	29	–	29	29	30	28	28	29	27	26	–	–
Total	37	–	36	36	38	35	34	36	34	32	–	–
Furcal claws: main–secondary	3–7	3–7	3–9	3–8	3–7	3–7	3–9	3–8	3–7	3–8	3–7	3–8
Brushlike organ (bristles)	–	4 (?)	7	5 (?)	–	–	8	–	–	–	–	–

Asteropteron setiferum Kornicker and Caraion, 1974

FIGURES 13–26

Asteropteron setiferum Kornicker and Caraion, 1974:66, figs. 37–43.

HOLOTYPE.—Number 271, a female (length 2.70 mm) in the Museum of Natural History "Grigore Antipa," Bucharest, Romania.

TYPE-LOCALITY. — *Thalassa* station X044, 20°09′06″N, 17°48′09″W, 1100 m, Mauritania.

MATERIAL.—Four adult females, USNM 128851, 143996, 149283, and 149319, from station 4; 1 adult female, USNM 149282, from station 2; 1 adult female, USNM 149284, from station 3; 1 adult female, USNM 149285, from station 1; 1 adult female from station 15; 1 adult female from station 17; 1 adult female and 1 specimen of undetermined sex from station 12; 2 adult females from station 16.

The collection from the Ivory Coast contained 13 specimens in the genus *Asteropteron*. The specimens are slightly smaller (length 2.22–2.62 mm) than the unique female of *A. setiferum* from the Mauritanian coast (length 2.70 mm). The specimens from the Ivory Coast vary considerably in carapace morphology and in the number of bristles on the dorsal margin of the mandibular basale; and, initially, I thought them to be three new species. However, because of having only a single specimen of one of the proposed new species and only two specimens of the second, and because of the variability of the third species, I found it expedient to refer all the specimens to *A. setiferum*, which if not conspecific with the Ivory Coast specimens is more closely related to them than are other species of the genus. But in order not to lose information, I have assigned the Ivory Coast specimens to three varieties: A, B, and C. The appendages of variety A are described and illustrated (Figures 13*a,b*; 15–20*a–f*). The distribution of bristles on all three varieties is given in Table 2. Carapaces of the three varieties are illustrated (Figures 13, 15–18, 21–25).

The carapace of variety A has fewer fossae than carapaces of varieties B and C. Also, the carapaces of varieties B and C bear a prominent node posterior to the middle; the node is absent or subdued on carapaces of variety A. The specimen of *A. setiferum* from Mauritania has a carapace similar to that of *A. setiferum* variety A except for being larger (2.34–2.59 mm for variety A; 2.70 mm for Mauritanian specimen).

Four of the five specimens of variety A examined bear a total of 14–19 bristles on the dorsal margin of the mandibular basale (Figure 14). The fifth specimen bears 30 or 31 bristles. The Mauritanian specimen bears 35 bristles. The two specimens of variety B in the collection bear 26–39 bristles on the dorsal margin of the mandibular basale. The single specimen of variety C in the collection bears 12 or 14 bristles.

Specimens of variety A were collected at five stations at depths of 35–50 m between Jacqueville and Vridi. Specimens of variety B were collected

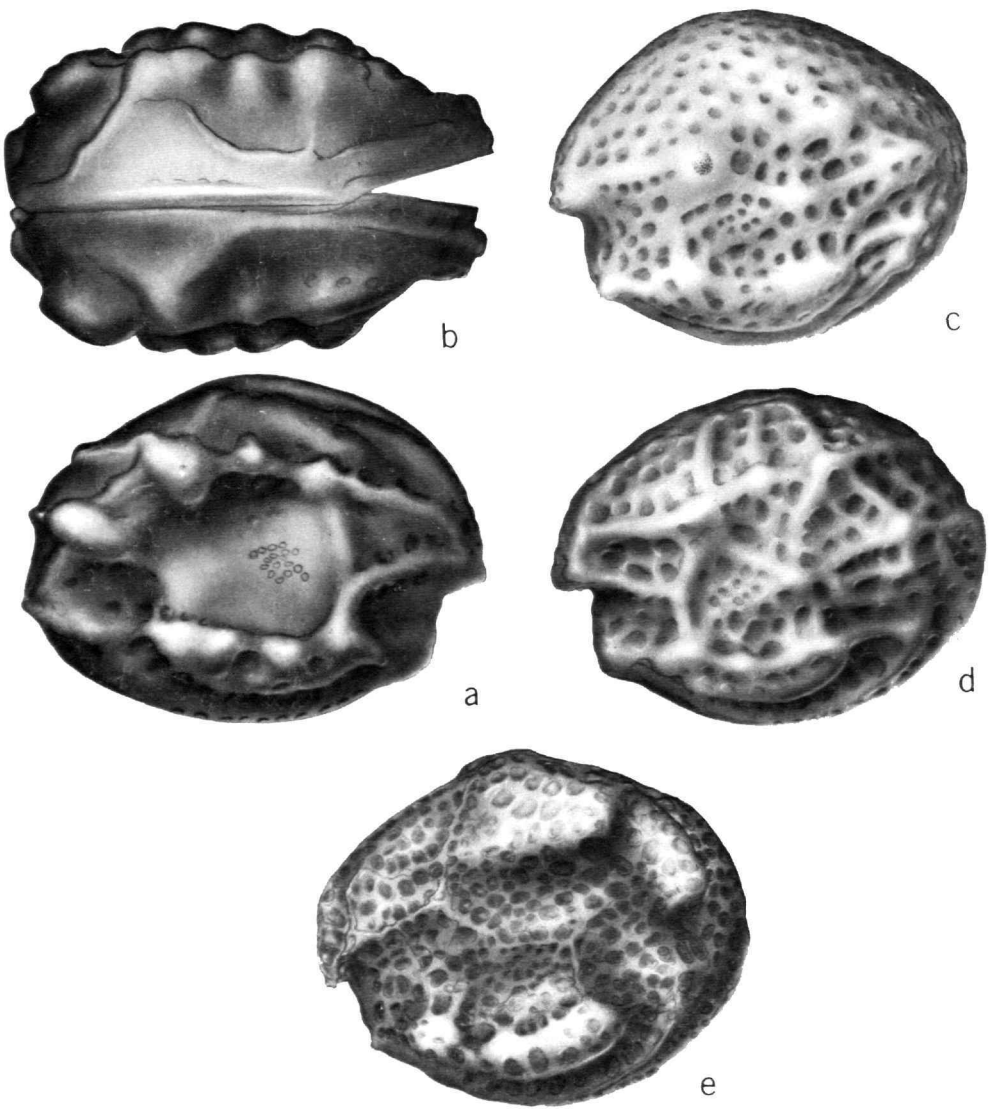


FIGURE 13.—*Asteropteron setiferum* Kornicker and Caraion, carapaces: *a, b*, lateral and dorsal views of *A. setiferum* variety A, USNM 128851; *c*, lateral view of *A. setiferum* variety B, USNM 149285; *d*, lateral view of *A. setiferum* variety B, USNM 149282; *e*, lateral view of *A. setiferum* variety C, USNM 149284.

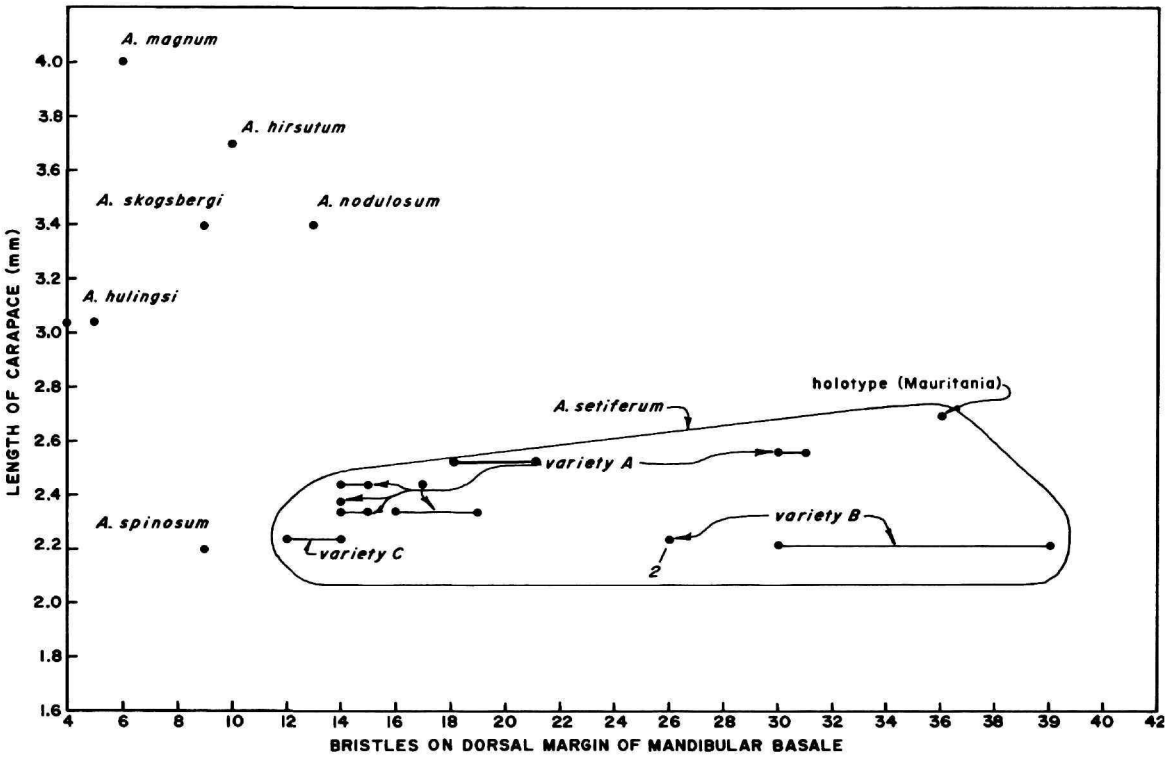


FIGURE 14.—Relationship between carapace length and number of bristles on the dorsal margin of the mandibular basale of nodose species of *Asteropteron* of which adults are known. (Datum points on each end of a horizontal line indicate left and right appendages of the same specimen.)

at two stations at depths of 40–80 m between Jacqueville and Grand Bassam, and farther from shore than the specimens of variety A. The unique specimen of variety C was collected at a station near Sassandra at a depth of 10 m.

DISTRIBUTION.—*Asteropteron setiferum* is now known from the continental shelf off Spanish Sahara at a depth of 53 m, from the continental slope off Mauritania at a depth of 1100 m, and from the continental shelf off the Ivory Coast at depths of 10–80 m.

A. setiferum variety A

FIGURES 13*a,b*; 15–20*a–f*

MATERIAL.—One ovigerous female (USNM 128851) and 3 nonovigerous adult females (USNM 143996, 149283, 149319) from station 4; 1 ovigerous female from station 17; 2 ovigerous females from station 16; 2 ovigerous and 2 nonovigerous females from station 12; 1 ovigerous female from station 15.

DESCRIPTION OF FEMALE (based mainly on USNM 128851, 143996, 149283; Figures 13*a,b*, 15–20*a–f*).—*Carapace*: Similar to that of unique specimen described by Kornicker and Caraion (1974) from off Mauritania.

Infold: Rostral infold with cluster of about 12 long and short bristles near rostral tip, row of 49 long and short bristles (29 long, 20 short) forming row parallel to anterior margin; 42 short bristles between row of bristles and anterior margin of carapace; 1 short, stout bristle dorsal to inner end of incisur; about 28 minute bristles between row of bristles and inner margin of infold; about 8 very short bristles forming row on anterodorsal infold (this row is continuation of anterior row of long and short bristles); 3 minute bristles posterior to inner end of incisur; antero-

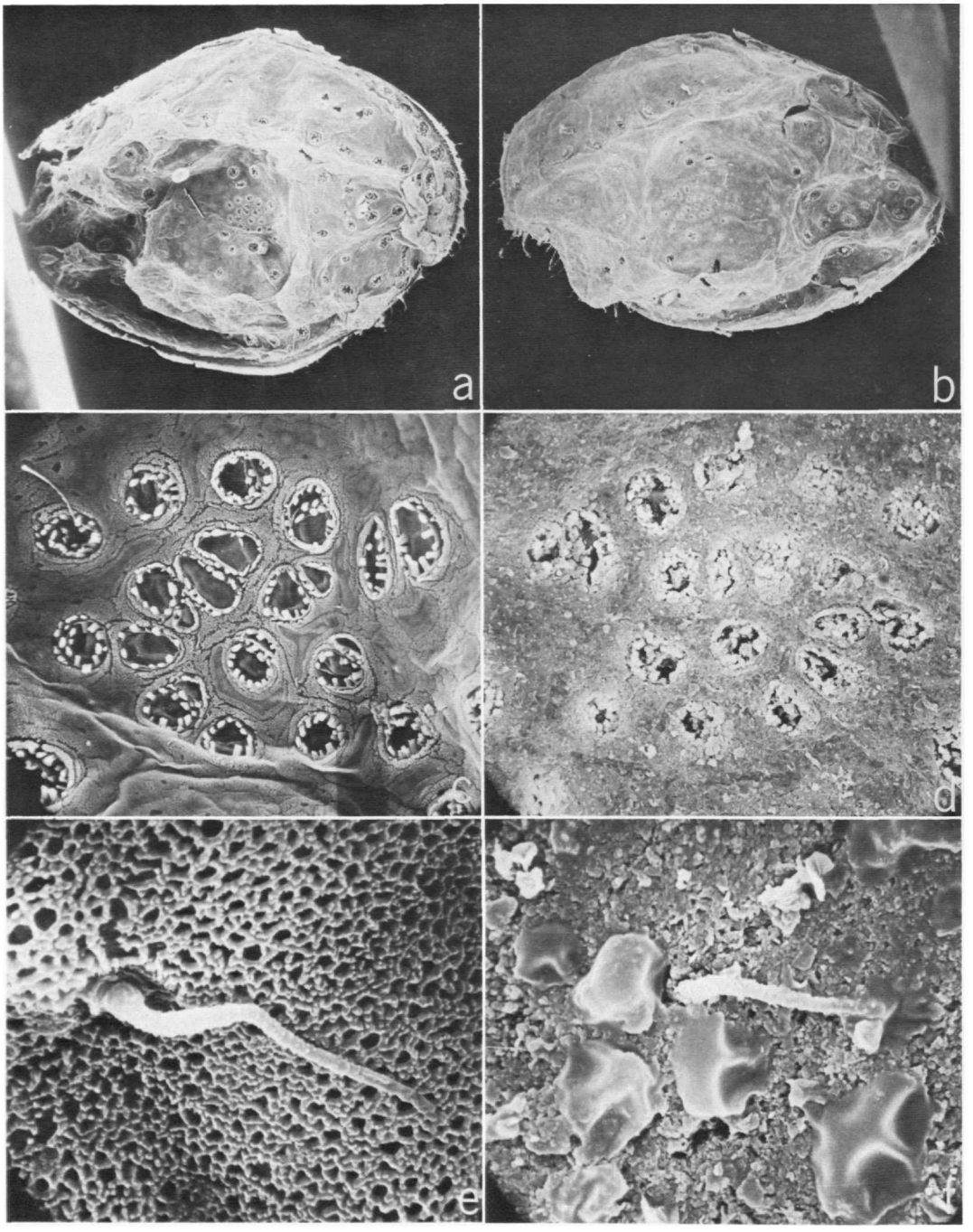


FIGURE 15.—*Asteropteron setiferum* variety A, adult female, USNM 143996, comparsion of valves treated and untreated with sonic vibrator: *a*, right valve (cleaned with sonic vibrator), × 42; *b*, left valve (not cleaned), × 42; *c*, detail, from *a*, of fossae in vicinity of central muscle scars, × 340; *d*, same, from *b*, × 340; *e*, detail, from *a*, of hair and surface textures between fossae, × 5000; *f*, same, from *b*, × 5000. (Photos reduced to 75 percent for publication.)

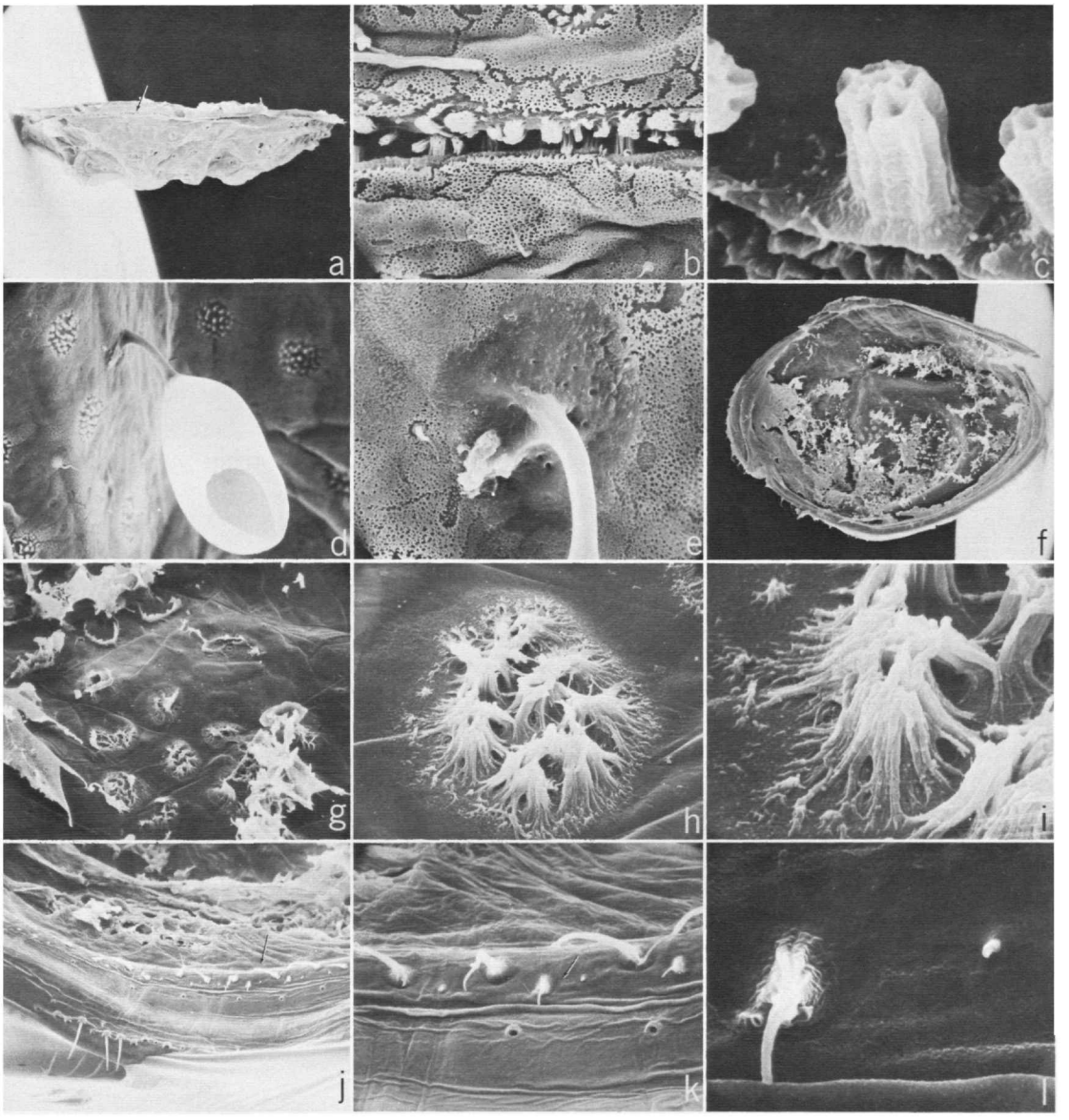
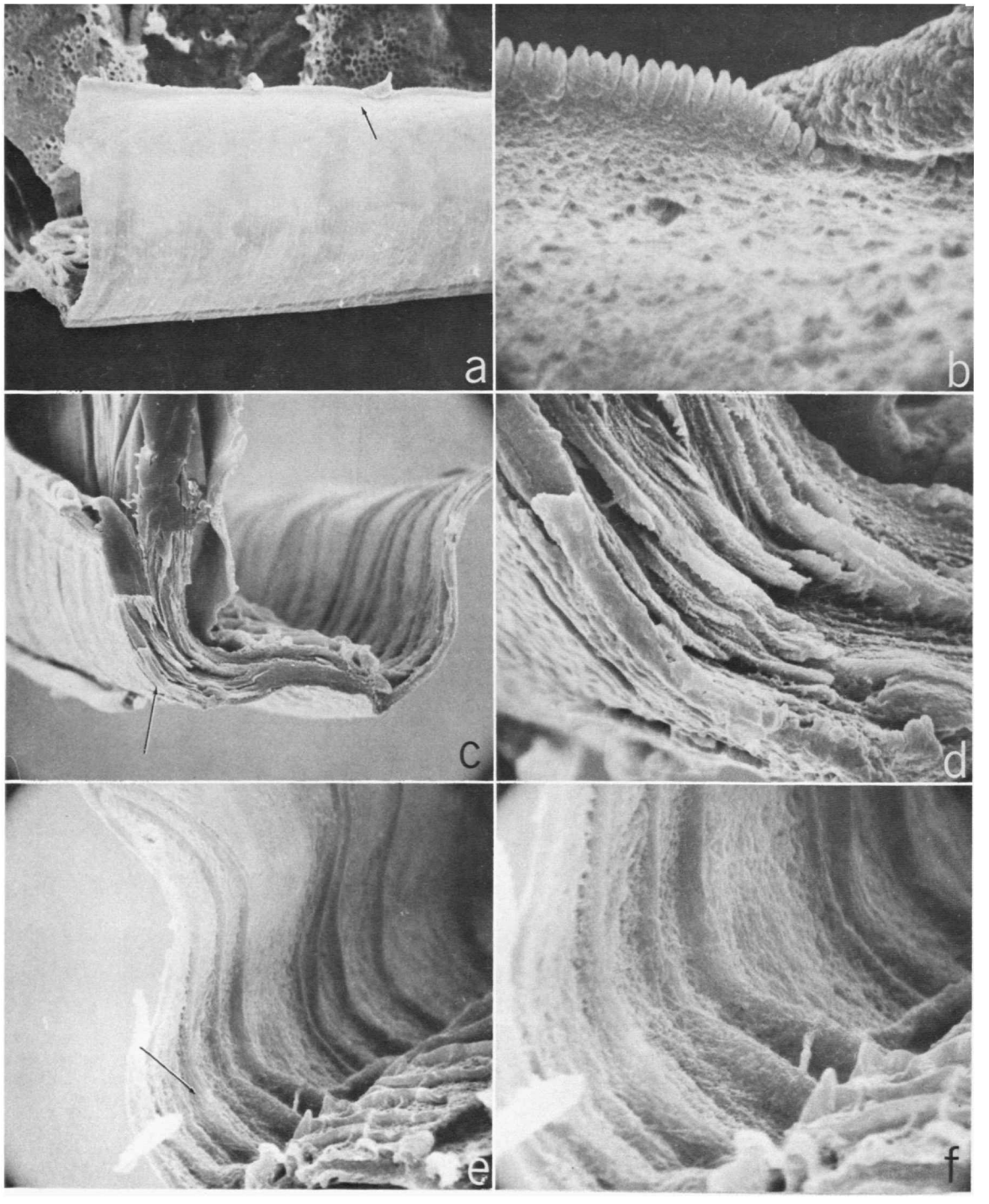


FIGURE 16.—*Asteropteron setiferum* variety A, adult female, USNM 143996, right valve and segment along dorsal margin of left valve: *a*, dorsal view (cleaned with sonic vibrator), × 42; *b*, detail, from *a*, of dorsal margin (upper half of photograph is of left valve, lower half of right valve; for location see arrow in *a*), × 1050; *c*, tubular processes along dorsal margin of right valve, × 10,000; *d*, protistan on right valve (for location see arrow on Figure 15*a*), × 525; *e*, detail, from *d*, showing base of protistan, × 1500; *f*, right valve, medial view, × 42; *g*, detail, from *f*, showing central muscle scars, × 340; *h*, detail, from *g*, showing individual scar with ends of muscle connected to it, × 2000; *i*, detail, from *h*, showing muscle fibers attached to shell, × 5000; *j*, detail, from *f*, showing posterior infold (posterior end of valve at bottom of photograph), × 300; *k*, detail, from *j*, showing list (for location see arrow in *j*; open pores probably contained bristles at one time), × 1000; *l*, detail, from *k*, showing tubular process with pore at base and minute process (for location see arrow in *k*), × 5000. (Photos reduced to 54 percent for publication.)


a
b
c
d
e
f

ventral infold with about 10 bristles forming row near middle and about 8 minute bristles or pores near outer edge; distinct list near inner margin of infold extending from below incisur to posterior end of ventral infold; ventral infold near list with 11 widely spaced, short bristles; total of 21 short bristles and 8 minute bristles or pores between list and outer edge of infold; posteroventral infold with about 15 short bristles forming row posterior to list; posterior infold with outer row of 11 short bristles and inner row of 15 short and about 19 minute bristles (bristles of inner row on broad list); 9 short bristles forming row ventral to inner row; outer margin of posterior infold (edge of valve) forming right angle near valve middle.

Central Adductor Muscle Scar: Consisting of about 21 individual ovoid scars (Figure 19*a*).

Size: USNM 128851, length 2.45 mm, height 1.84 mm; USNM 143996, length 2.34 mm, height 1.72 mm; USNM 149283, length 2.33 mm, height 1.73 mm; USNM 149319, length 2.42 mm, height 1.89 mm; specimen A from station 12, length 2.38 mm, height 1.80 mm; 2 specimens from station 16: specimen A, length 2.39 mm, height 1.87 mm, and specimen B, length 2.45 mm, height 1.86 mm; specimen B from station 12, length 2.62 mm, height 1.82 mm; specimen from station 15, length 2.53 mm, height 1.94 mm.

Micromorphology of Carapace (based on scanning electron micrographs; Figures 15–18): Kornicker and Caraion (1974) described carapace morphology of the holotype of *A. setiferum* treated with a sonic vibrator prior to freeze-drying. To assess the effect of the sonic vibrator, the right valve of USNM 143996 was vibrated and the left valve was not. The left and right valves are compared in Figure 15 (right valve, *a,c,e*; left valve, *b,d,f*). Most large fossae are visible on the untreated valve but are partly filled with a debris-like substance (compare *c* and *d* of Figure 15). The surface between large fossae, which has shallow fossae and a reticulate structure on the treated valve, is covered by an amorphous layer on the untreated valve (compare *c* and *d*, Figure 15, and *e* and *f*, Figure 15). Smooth clumps of material scattered on the surface of the unvibrated valve may be a foreign growth (Figure 15f).

The fossae and microstructure of the valve surfaces are similar to those on *A. setiferum* described previously (Kornicker and Caraion, 1974). To that description may be added that short bundles of polygonal tubes project inward along the dorsal margin of each valve (Figure 16*a–c*).

In order to determine the relationship between tubes within fossae (Figure 18*a*) and the haemocoele of the animal, the freeze-dried and gold-plated right valve of USNM 143996 was cut in two with a razor blade and the cut edges examined with the scanning electron microscope. Surprisingly, the tubes are merely surface ornamentation with no connection with the haemocoele, and they are not evident in cross sections of the shell except in the thin surface layer (Figure 18*b–f*).

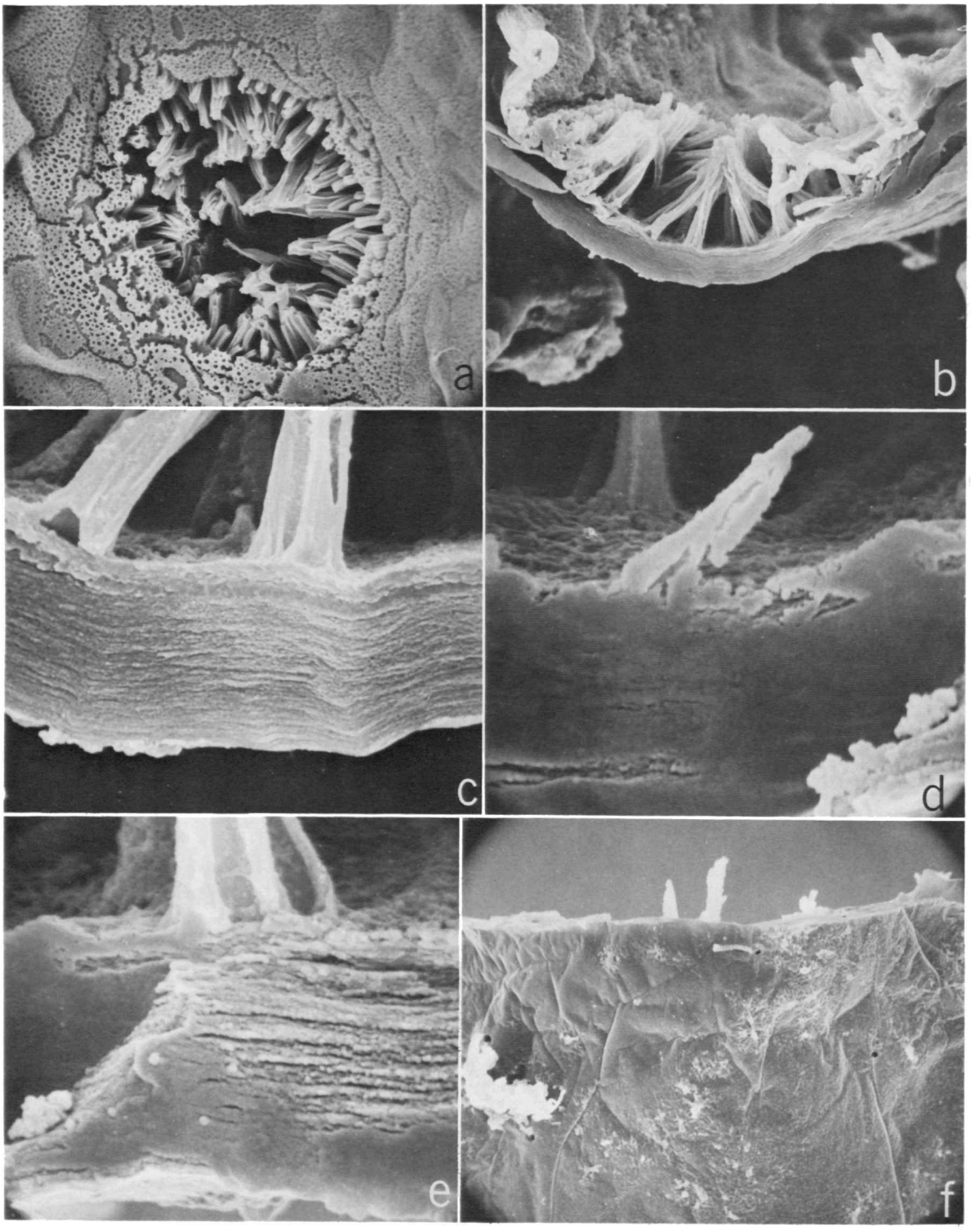
The distribution and types of bristles and pores on the infold of *A. setiferum* were described by Kornicker and Caraion (1974). Similar bristles and pores are on the specimens of *A. setiferum* variety A examined herein (Figure 16*j–l*).

Each central adductor muscle consists of several clusters of individual strands at its point of attachment with the shell (Figure 16*f–i*). The structure is quite unlike the undivided muscle of *Cylindroleberis bacescui* Kornicker and Caraion (1974, fig. 16c,e).

The lamellar prolongation along the ventral margin is faintly striate medially (Figure 17*a*) and bears minute denticulations along the margin (Figure 17*b*). The outer side bears ribs which decrease in height distally (Figure 17*e,f*). The laminated internal structure of the shell and infold along the ventral margin is shown in Figure 17*c,d*.

First Antenna (Figure 19*b*): 1st joint with long hairs on medial and lateral surfaces near ventral margin, short spines forming clusters on medial surface near distal dorsal corner, and longer spines forming clusters on medial surface near distal dorsal corner; 2nd joint with spines along ventral and proximal dorsal margins and

FIGURE 17.—*Asteropteron setiferum* Kornicker and Caraion, variety A, adult female, USNM 143996, segment of right valve sliced with razor blade: *a*, lamellar prolongation along ventral margin, medial view, × 1020; *b*, detail, from *a*, of outer margin of lamellar prolongation (for location see arrow in *a*), × 11,500; *c*, detail, from a, showing cross section of ventral margin, × 1050; *d*, detail, from *c*, showing laminated structure of shell near ventral margin (for location see arrow in *c*), × 5250; *e*, lamellar prolongation of selvage, lateral view, × 1600; *f*, detail, from *e*, showing ridges on outer surface of lamellar prolongation (for location see arrow in *e*), × 3000. (Photos reduced to 84 percent for publication.)


a
b
c
d
e
f

with 5 spinous dorsal bristles—4 proximal, 1 distal (2nd proximal bristle missing on right limb of USNM 128851); 3rd joint with 1 short ventral bristle and 3 dorsal bristles (1 near middle, 2 terminal); 4th joint with 1 long, spinous terminal bristle on dorsal margin and 3 terminal bristles on ventral margin (1 long, spinous, 2 minute, bare); sensory bristle of 5th joint with 2 or 3 short proximal filaments and 4 long terminal filaments; lateral surface of 5th joint with hairs forming row along dorsal half of terminal margin; 6th joint with short medial bristle near middle of terminal margin. Seventh joint: a-claw slightly longer than joints 5 through 8, ringed in distal part; b-bristle with 4 marginal filaments and bifurcate tip; c-bristle slightly longer than b-bristle, with 7 marginal filaments and bifurcate tip. Eighth joint: d- and e-bristles bare, about same length as c-bristle; f-bristle about same length as c-bristle, with 8 filaments including tip; g-bristle longer than others, with 9 filaments including tip.

Second Antenna (Figure 19*c,d*): Protopodite with medial bristle and numerous short spines forming rows on medial surface near dorsal margin; several short hairs present on posterior part of dorsal margin. Endopodite: 3rd joint fused with 2nd and no suture evident between them; 1st joint with 9–12 bristles; 2nd joint bare; 3rd joint with long, bare terminal bristle. Exopodite: 1st joint with short distomedial bristle; bristles on 2nd and 8th joints and 3 long bristles of 9th joint with slender spines proximally along ventral margin and with natatory hairs; 9th joint with 1 medium-length bristle and 1 short bristle with natatory hairs, in addition to 3 long bristles.

Mandible (Figure 19*e–g*): Coxale endite (Figure 19*e*): Ventral branch with 2 clusters of long hairs followed by 6 or 7 rows of stout spines; tip with 2 stout teeth (a 3rd tooth might have broken off the specimen examined); minute bristle on endite near base of ventral branch; ventral margin of dorsal branch with 4 knobs followed by short main spine with serrate posterior margin; about 15 spines forming row on lateral side of branch proximal to main spine; tip of dorsal branch with short spines forming cluster at base of terminal bristle; margin between main spine and terminal bristle serrate. Basale: endite with about 7 pectinate terminal bristles, 6 triaenid bristles, 3 dwarf bristles (distal of these longer than others), and glandular peg with about 14 pores; ventral margin of basale with 3 or 4 triaenid bristles having a pair of spines much longer than others, 2 or 3 short, spinous proximal bristles, 1 long, spinous bristle, and 3 or 4 short, spinous distal bristles; dorsal margin of basale and lateral surface near dorsal margin with total of 14–19 bristles—3–6 proximal, 9–13 distal (for total numbers of bristles on other specimens see Table 3 and Figure 14); medial surface near dorsal margin hirsute. Exopodite hirsute, slightly longer than dorsal margin of 1st endopodite joint, with 2 subterminal bristles, both with short marginal spines (proximal bristle longer than distal bristle). Endopodite: ventral margin of 1st joint with 2 long, stout proximal bristles with long marginal spines and 1 shorter bristle near middle with short marginal spines; medial surface of 2nd joint with spines forming rows in distal half; ventral margin with 3 spinous terminal bristles; dorsal margin with about 35 bristles (some of these of triaenid type); end joint with 2 short, spinous bristles on ventral corner, 1 long lateral bristle with short marginal spines, 1 straight, clawlike bristle with marginal spines on dorsal edge of terminal margin, 1 long, slightly curved, bare, clawlike bristle on ventral end of terminal margin, 1 long (longer than other clawlike bristles), slightly recurved, clawlike bristle medial to others and near middle of terminal margin.

Maxilla (Figure 19*h*): Epipodite long, slender, tapering to point, few to many hairs observed; endite I with 5–7 bristles (4 or 5 long, 1 or 2 short); endite II with 1 long, stout, hirsute bristle, 0 or 1 long, slender bristle, and 8–11 short bristles. Basale: dorsal margin with 9–12 (left limb of USNM 143996 with only 3) proximal bristles of varying length and with 5–9 short and 4 or 5 (left limb of USNM 143996 with only 2)

FIGURE 18.—*Asteropteron setiferum* Kornicker and Caraion, variety A, adult female, USNM 143996, right valve sliced with razor blade: *a*, fossa on outer surface of valve, × 1000; *b*, cross section through fossa, × 1100; *c*, detail from *b* (note that tubular processes do not continue through shell), × 5775; *d*, cross section through fossa different than that shown in *b*, × 8250; *e*, cross section through different part of fossa shown in *d*, × 8250; *f*, inner side of valve showing absence of reflection of fossa present on outer surface (cut edge of valve is towards top of photograph), × 1100. (Photos reduced to 83 percent for publication.)

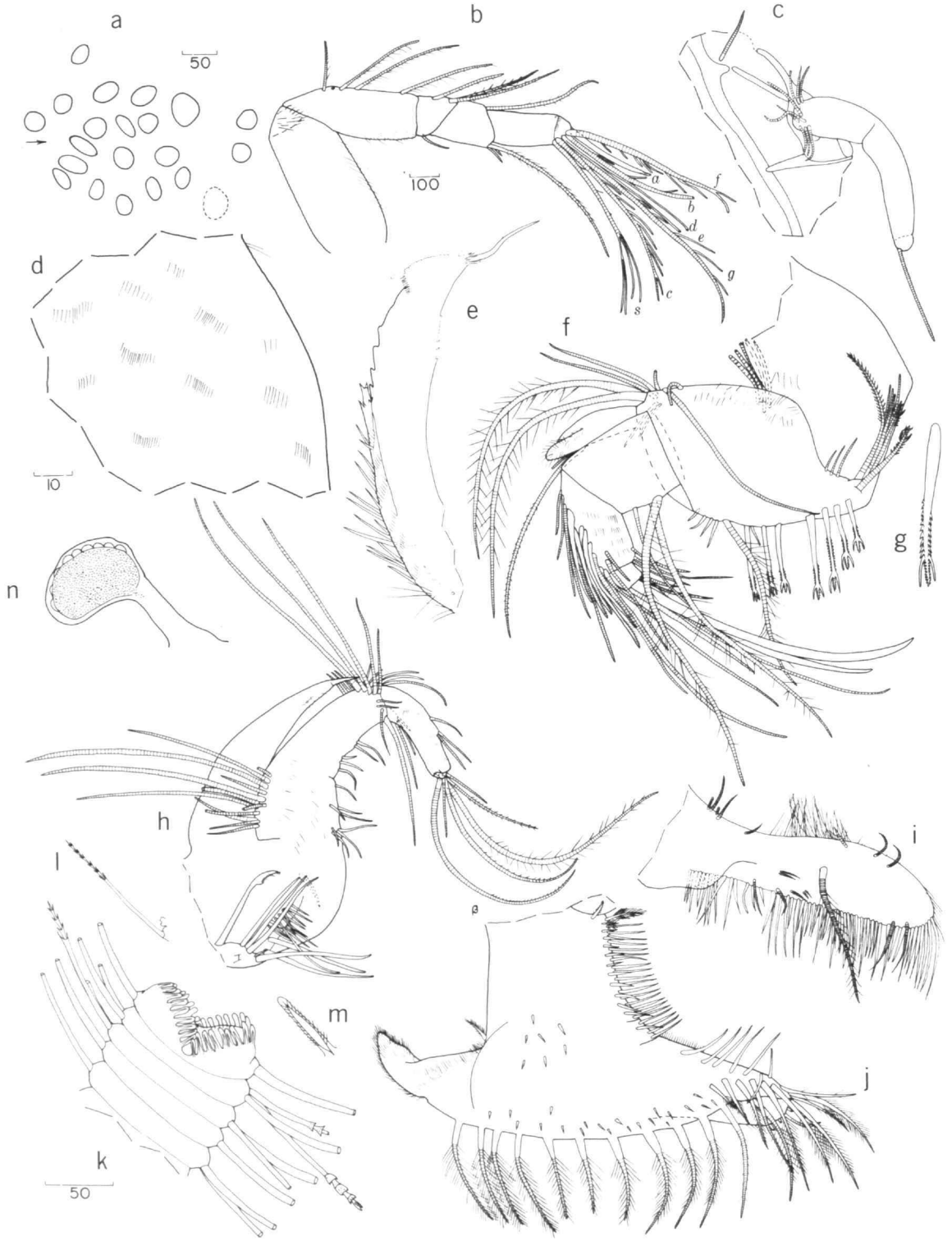

a
50
b
100
a
b
d
e
f
g
c
s
c
d
10
e
f
g
n
h
i
l
m
j
k
50

TABLE 3.—*Number of bristles on the dorsal margin of the mandibular basale of seven specimens of* A. setiferum *variety A from five stations*

Station	*Specimen*	*Left limb*	*Right limb*
4	USNM 128851	14	15
4	USNM 143996	15	14
4	USNM 149283	16	19
12	A	14	no data
15	–	21	18
16	B	17	17
17	–	31	30

long distal bristles; medial side hirsute, with 3 distal bristles; ventral margin with 8–13 short bristles and 1 long terminal bristle on lateral side at end of baleen comb. Exopodite consisting of 3 bristles (1 long, 2 short), but no definite lobe observed. Endopodite: medial side of 1st joint hirsute; dorsal margin with 2–4 short bristles; ventral margin with 1 long, spinous β-bristle; end joint with 5 spinous bristles.

Fifth Limb (Figure 19*i*): Epipodial appendage with 79 bristles. Comb: dorsal margin hirsute, with 6–12 short bristles (3–8 proximal, 3–6 distal). Lateral surface with stout, spinous exopodial bristle, a pair of short, slender bristles posterior to stout bristle, and 4 slender bristles near ventral margin posterior to stout bristle; 1 or 2 bristles on medial side with bases almost on ventral margin.

Sixth Limb (Figure 19*j*): Anterodorsal corner with short marginal spines; anterior margin with 1 or 2 sutures; margin above lower suture with medial bristles forming inner row and outer row; inner row with 9–13 short bristles with long hairs along proximal two-thirds; outer row with 19–23 longer plumose bristles (the one at suture longer than others); margin between sutures with only 1 or 2 short bristles in inner row and 4 longer bristles in outer row (the one closest to lower suture longer than others); margin below lowermost suture with row of 4–7 bristles; 10 spinous bristles on limb medial to lateral flap (these bristles could be considered to be on anterior part of ventral margin); ventral margin posterior to lateral flap with 10 spinous bristles; hirsute posterior margin tapering to rounded tip; lateral flap with 6–9 short, slender, spinous bristles; ventral bristles including those on flap total 23–30; posterior margin with 1 short, hirsute epipodial bristle; medial surface of end joint with about 28–42 minute bristles forming 2 irregular rows near ventral margin and near middle of limb.

Seventh Limb (Figure 19*k–m*): Each limb with 4 or 5 bristles; some distal segments near tip with 2 or 3 bristles on one side and with 1 or 2 on the other; each bristle with up to 7 bells. Terminus: each opposing comb with 17–19 teeth, 3 or 4 A-teeth, 14 or 15 B-teeth (see page 36 for description of teeth).

Furca (Figure 20*b,c*): Each lamella with 3 long, stout claws followed by 7–9 short secondary claws; main claws with medial and lateral teeth along concave margins; secondary claws with slender teeth along posterior margins and distal part of anterior margins; anterior margin of lamellae with slender spines; lamellae at base of main claws and between and following secondary claws with long hairs.

Rod-shaped Organ (Figure 20*a*): Broadening near middle and with rounded tip.

Eyes: Medial eye large, pigmented, bare (Figure 20*a*). Lateral eye (Figures 19*n*, 20*a*) slightly smaller than medial eye, pigmented, with about 14 ommatidia, most of these embedded in pigment and difficult to discern; each eye attached to head region by a narrow stalk.

Posterior: Hirsute; dorsal process finger-like with spinous lobe at tip (Figure 20*d*).

Upper Lip (Figure 20*e*): Consisting of 2 hirsute lobes on each side of low saddle; each lobe and saddle with 5 anterior spines; a hirsute flap posterodorsal to each lobe.

Brushlike Organ: Not observed.

Genitalia: Consisting of oval sclerotized ring.

Gill-like Structures: Well-developed.

Y-*Sclerite*: Slightly sinusoidal (Figure 20*f*).

FIGURE 19.—*Asteropteron setiferum* Kornicker and Caraion, variety A, ovigerous female, USNM 128851: *a*, central adductor muscle attachment scars on right valve, lateral view; *b*, right 1st antenna, lateral view; *c*, distal part of protopodite and endopodite of left 2nd antenna, medial view; *d*, medial surface showing spines of protopodite of left 2nd antenna, anterior towards right; *e*, coxale endite of right mandible, lateral view; *f*, right mandible, medial view (coxale endite broken off); *g*, detail of triaenid bristle in *f*; *h*, left maxilla, medial view; *i*, comb of right 5th limb, lateral view; *j*, left 6th limb, medial view; *k*, tip of 7th limb; *l*, bristle of 7th limb bearing 6 bells; *m*, detail of comb tooth from *k*. (Same magnification in micrometers: *a,c,f–j,n; e,k,l; d,m.*)

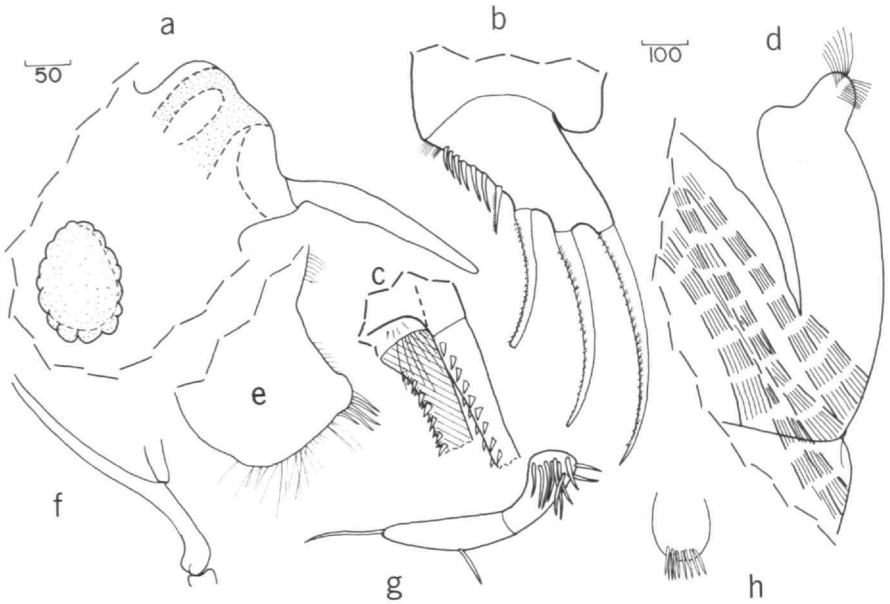


FIGURE 20.—*Asteropteron setiferum* Kornicker and Caraion, variety A, ovigerous female, USNM 128851: *a*, medial eye, rod-shaped organ, and outline of right lateral eye; *b*, right lamella of furca, lateral view; *c*, anterior claw of right and left lamella (claw of left lamella crosshatched); *d*, posterior process, anterior to left; *e*, upper lip, anterior to right; *f*, Y-sclerite of furca, anterior to left. *Asteropteron setiferum* variety B, adult female, USNM 149282: *g*, endopodite of left 2nd antenna, medial view; *h*, left brushlike organ. (Same magnification in micrometers: *b–d; a,e,f–h.*)

Eggs: USNM 128851, 12 eggs; USNM 149283, 11; specimen from station 17, 5; specimen B from station 16, 12; specimen from station 15, 13.

Ectozoa: The right valve of USNM 143996 had laterally a stemmed, vaselike protistan (Figure 16*d*). The base of its stalk appears cemented to the ostracode shell with a smooth substance that covers the microstructure of the shell (Figure 16*e*).

DISTRIBUTION.—Collected at 5 stations between Jacqueville and Vridi between depths of 35 and 50 m.

A. setiferum variety B

FIGURES 13*c,d*; 20*g,h*; 21–26

MATERIAL.—1 adult female, USNM 149282, from station 2; 1 adult female, USNM 149285, from station 1.

DESCRIPTION OF FEMALE (Figures 13*c,d*; 21–26).—Carapace with more numerous fossae than that of *A. setiferum* variety A. Left valve of USNM 149285 strongly calcified with feathery calcite under the shell layer containing fossae; right valve of that specimen and both valves of USNM 149282 translucent, light brown, without crystalline calcite. Black lateral eye of specimen visible through anterior node of carapace (Figure 13*c*).

Size: USNM 149282, length 2.24 mm, height 1.73 mm; USNM 149285, length 2.22 mm, height 1.89 mm.

Micromorphology of Carapace (based on scanning electron photographs; Figures 21–25): The right valves of both specimens assigned to *A. setiferum* variety B were studied as well as two fragments of recrystallized calcite from the left valve of USNM 149285. The fragments, which were obtained from beneath the outer layer of shell, form anastomosing patterns (Figure 23*a,b,e*). The outer surface of the recrystallized calcite bears impressions presumably of overlying fossae (Figure 23*c,d*). The underside of the recrystallized calcite is smooth on the fragment on which it was ex-

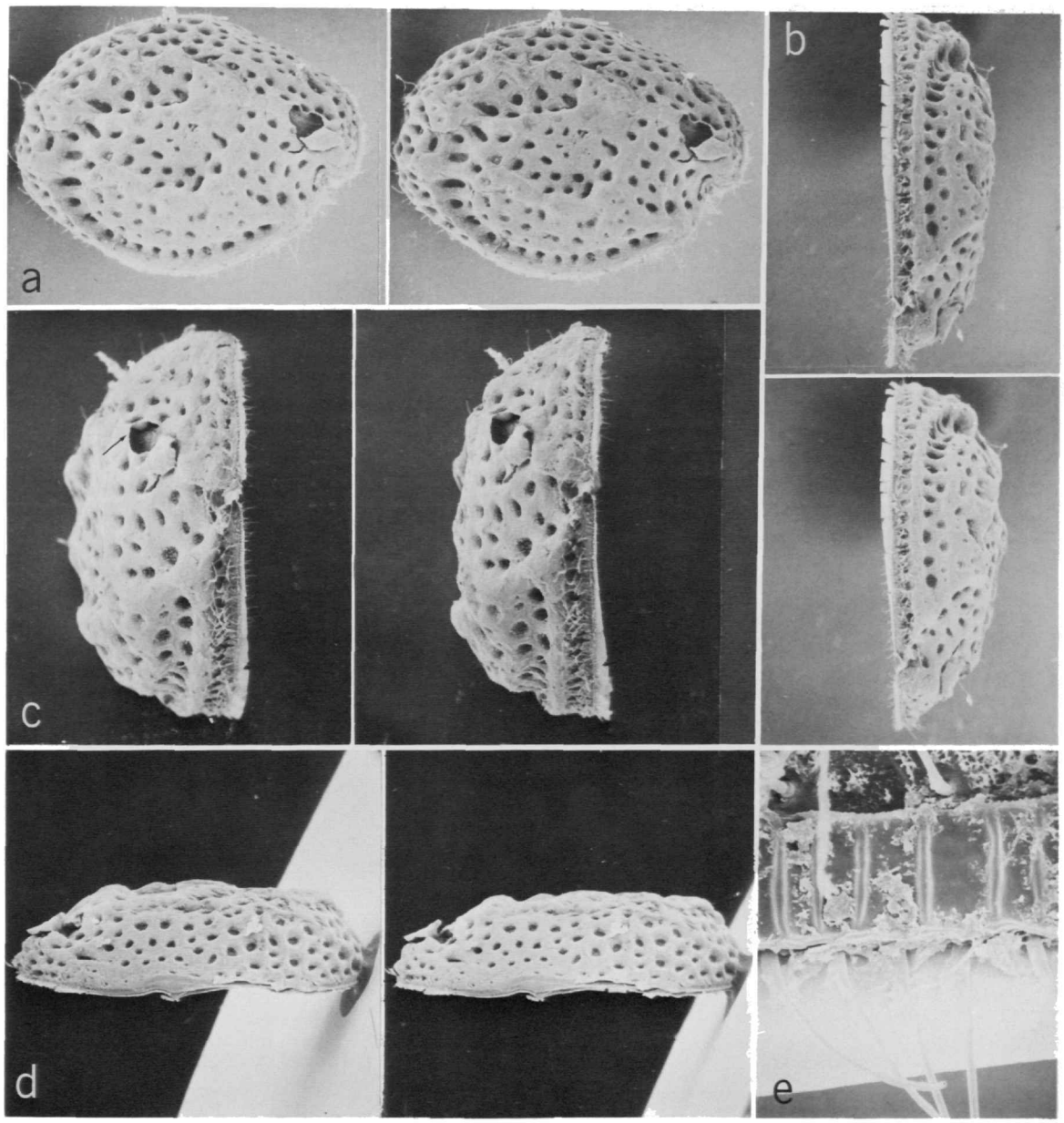


FIGURE 21.—*Asteropteron setiferum* Kornicker and Caraion, variety B, adult female, USNM 149285, right valve (cleaned in sonic vibrator): *a*, lateral view, stereo pair, × 38; *b*, ventral view, stereo pair, anterior to left, × 40; *c*, anterior view, stereo pair, × 55; *d*, dorsal view, stereo pair, anterior to left, × 38; *e*, detail, from *b*, showing ventral edge of valve (broad white band in photograph is the lamellar prolongation of the selvage), lateral view, × 1000. (Photos reduced to 70 percent for publication.)

amined (Figure 23*d*). The edge of the calcite perpendicular to the axis of the anastomosing pattern appears randomely pustulose (Figure 23*f*). The carapace of *A. setiferum* variety B contains many more punctae than that of *A. setiferum* variety A (compare Figures 21*a–d* and 24 with Figure 15*a,b*). The fossae on the carapace of USNM 149285 (Figure 22*a–c*) and some fossae on the carapace of USNM 149282 (Figure 25*j*) are of a type similar to those of variety A. However, many fossae of USNM 149282 have a polygonal network, which may represent the bases of broken processes (Figure 25*b,c,h,i*). Whereas the area of the carapace between fossae of variety A consists

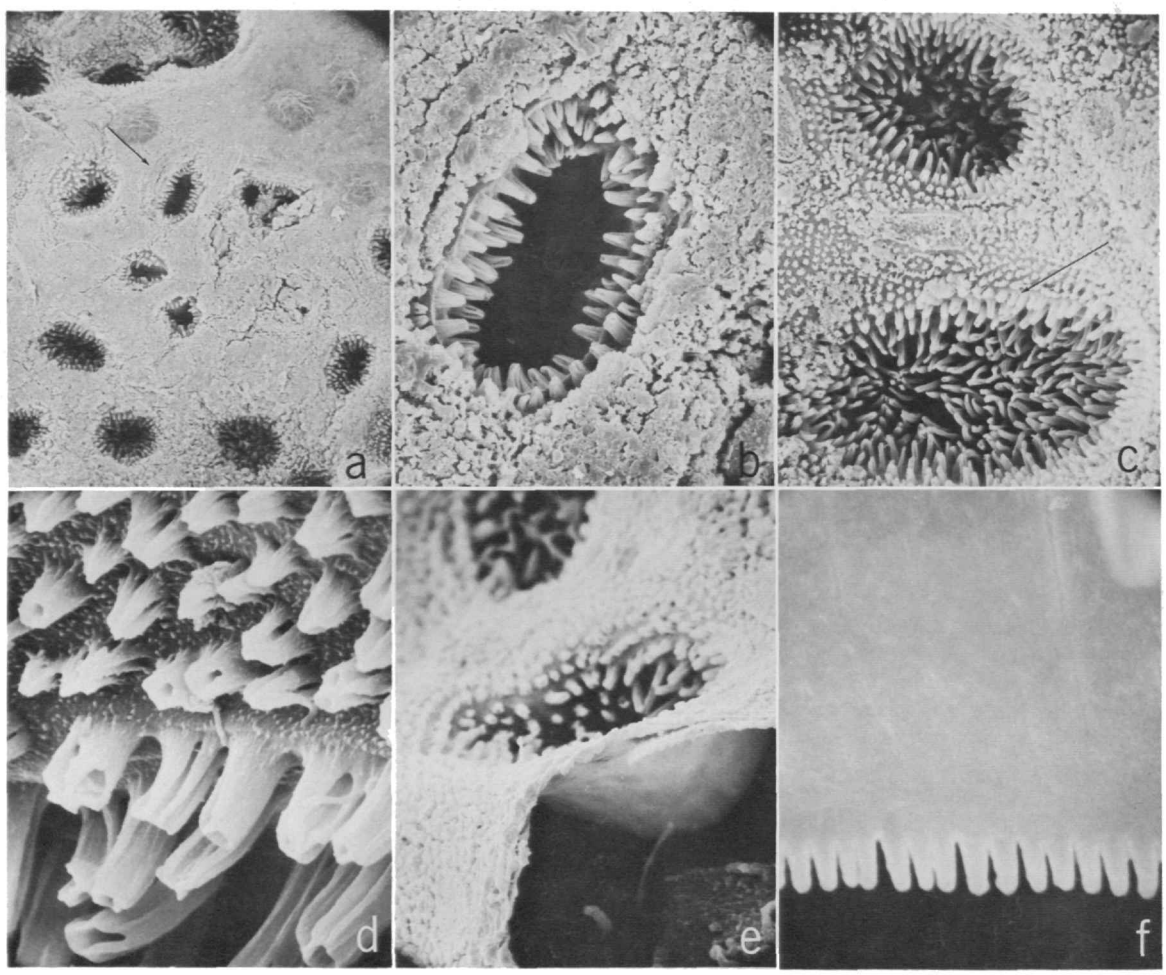


FIGURE 22.—*Asteropteron setiferum* Kornicker and Caraion, variety B, adult female, USNM 149285, right valve: *a*, fossae in vicinity of central adductor muscle attachment, anterior to right, × 190; *b*, fossa from *a* (for location see arrow in *a*), × 950; *c*, fossae near posterior end of valve, × 550; *d*, detail, from *c*, showing tubular processes along upper margin of lower fossa (for location see arrow in *c*), × 4000; e, detail, from Figure 19*c*, showing medial side of fossa through break in shell near anterior end (for location see arrow in Figure 19*c*), × 550; *f*, outer edge of lamellar prolongation along ventral margin of shell, lateral view, × 15,750. (Photos reduced to 70 percent for publication.)

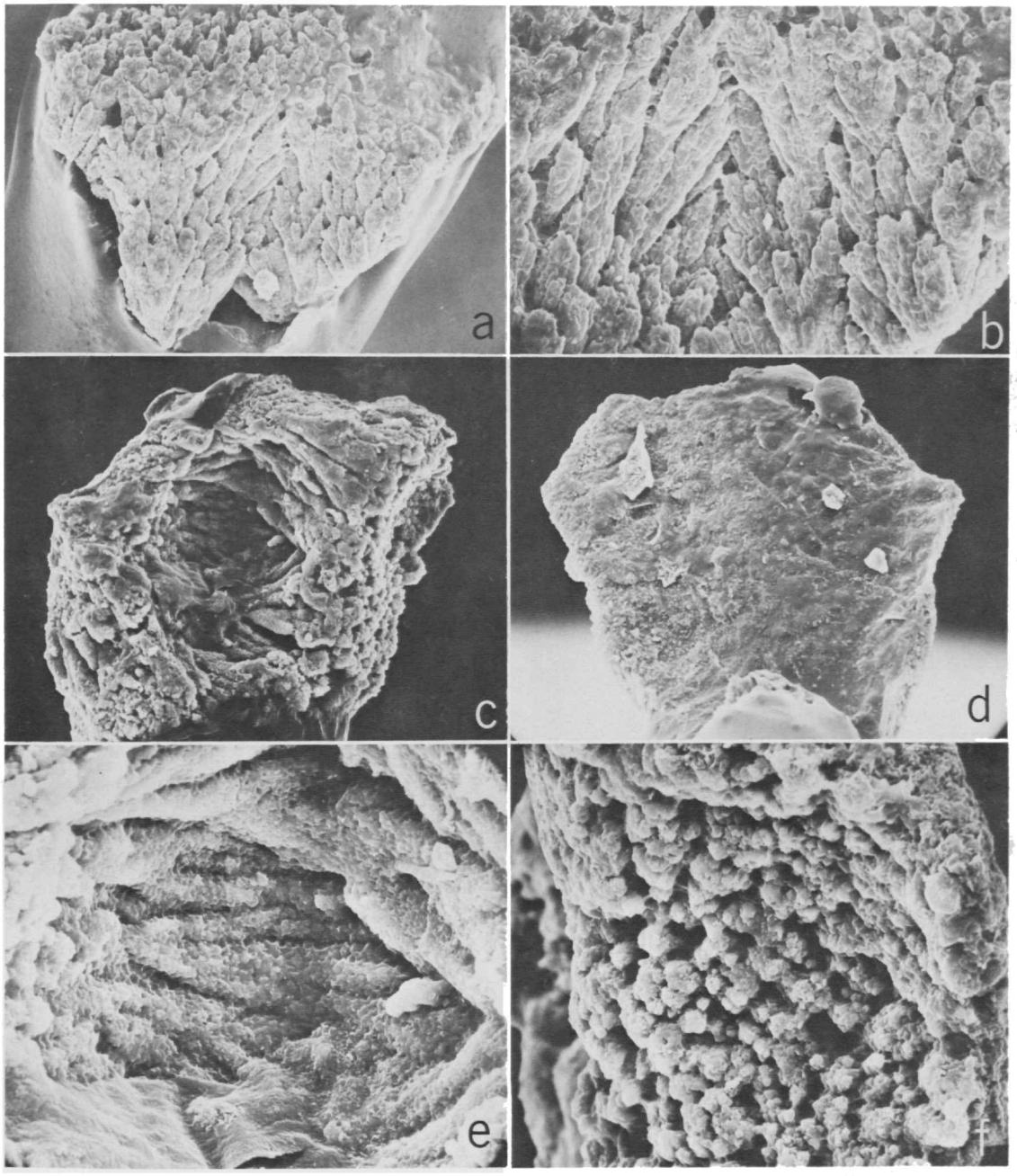


FIGURE 23.—*Asteropteron setiferum* Kornicker and Caraion, variety B, adult female, USNM 149285, two fragments of recrystallized calcite from beneath outer layer of valve: *a*, fragment showing anastomosing structure, × 440; *b*, detail of *a*, × 1000; *c*, a fragment different than that shown in *a*, with pit, × 440; *d*, smooth opposite side of fragment shown in *c*, × 440; *e*, detail of bottom of pit shown in *c* (note anastomosing structure of calcite), × 1365; *f*, right side of fragment shown in *c* (note projecting tips of anastomosing calcite), × 1365. (Photos reduced to 80 percent for publication.)

of a reticulate structure (Figure 15*e*), that area contains elongate processes on both USNM 149282 (Figure 25*d–g*) and USNM 149285 (Figure 22*c,d*). A pair of bristles and a broad lamellar prolongation of selvage are present along the ventral margin (Figure 21*e*). The distal margin of the selvage is denticulate (Figure 22*f*). Bristles and pores on the posterior infold are shown in Figure 25*k,l*.

Appendages: Similar to those of *A. setiferum* variety A, except dorsal margin of mandibular basale with more bristles than on basale of many specimens of variety A (Table 2; Figure 14). Brushlike organ consisting of small lobe with about 9 minute bristles dorsal to genitalia (Figure 20*h*). Second joint of left 2nd antenna with short bristle (Figure 20*g*); same joint of right 2nd antenna bare.

Micromorphology of Seventh Limb (based on scanning electron microphotographs; Figure 26): Terminal end of each limb with 2 opposing combs (Figure 26*a–c*); each comb with 2 types of teeth called here A- and B-teeth; 3 or 4 A-teeth (Figure 26*d*) in middle of each comb similar to those of 7th limb of *Cycloleberis squamiger* (Scott) (see Figure 7*h*); 7 or 8 B-teeth at each end of comb with well-developed secondary teeth of similar length along edge of outer segment of tooth (Figure 26*c,e*); inner segment with depression at tip containing pustulae and central pore (Figure 26*e,f*). No C-bristles similar to those of *Cycloleberis squamiger* present.

DISTRIBUTION.—Collected at a depth of 80 m off West Vridi and at a depth of 40 m off Grand Bassam.

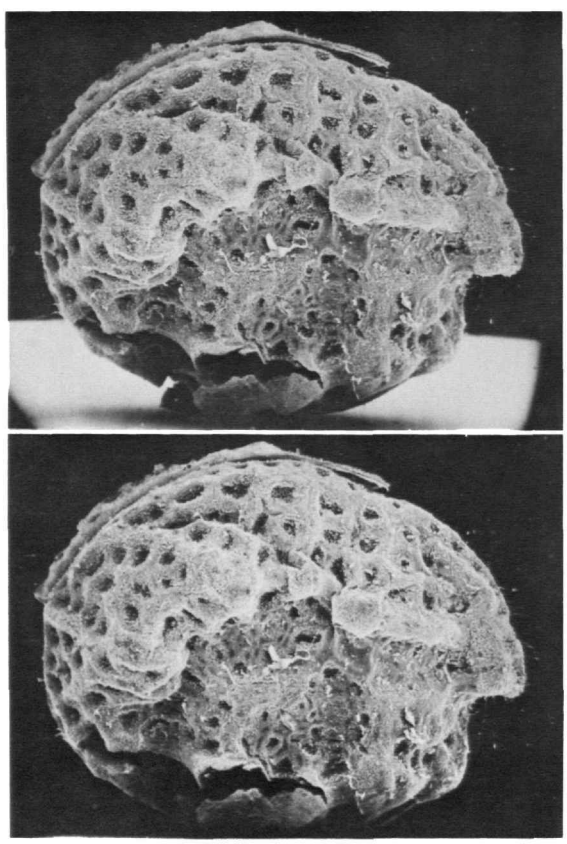


FIGURE 24.—*Asteropteron setiferum* Kornicker and Caraion, variety B, adult female, USNM 149282, stereo pair of right valve, × 45. (Photos reduced to 70 percent for publication.)

A. setiferum variety C

FIGURE 13*e*

MATERIAL.—One ovigerous female, USNM 149284, from station 3.

DESCRIPTION OF FEMALE (Figure 13*e*).—*Carapace*: With fossae more numerous than on carapace of *A. setiferum* variety A and with nodes more prominent than those on both *A. setiferum* variety A and variety B.

Appendages: Dorsal margin of mandibular basale with 12 or 14 bristles; limbs otherwise similar to those of *A. setiferum* variety A and variety B (see Table 2 and Figure 14).

DISTRIBUTION.—Collected near Sassandra at a depth of 10 m.

Family SARSIELLIDAE Brady and Norman, 1896

This family was not represented in the collection from the Ivory Coast. A supplementary description is given below of a species from São Tomé Island.

Genus *Sarsiella Norman*, 1869

This genus is widespread between latitudes 63°N and 37°05′S and in depths ranging between intertidal and 205 m.

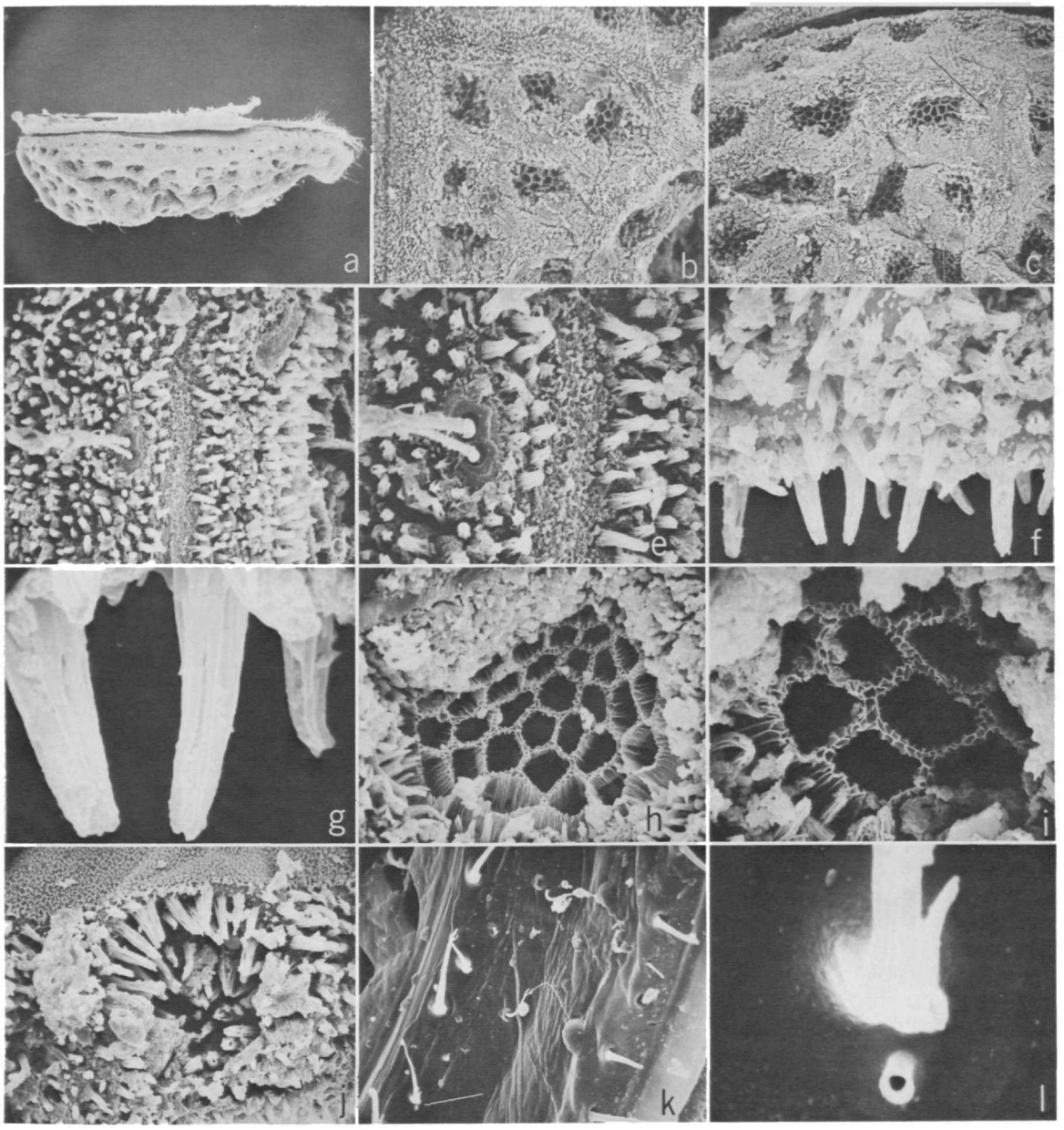


FIGURE 25.—*Asteropteron setiferum* Kornicker and Caraion, variety B, adult female, USNM 149282, right valve: *a*, dorsal view, × 45; *b*, fossae on posterior end of valve, × 200; *c*, fossae on anterodorsal part of valve, × 165; *d*, detail of *c* showing tubular process on valve surface (for location see arrow in *c*); *e*, detail of *d* (note paired bristles), × 1900; *f*, tubular processes along the margin of the dorsal fragment of left valve attached to the right valve in *a*, × 2250; *g*, detail from *f*, × 7750; *h*, fossa with polygonal structures, × 815; *i*, same, from different place on valve, × 1900; *j*, fossa near middle of right valve showing tubular processes, × 1200; *k*, part of posterior infold, anterior to right, × 825; *l*, detail, from *k*, showing tubular bristle and pore near base, both on list (for location see arrow in *k*), × 10,000. (Photos reduced to 55 percent for publication.)

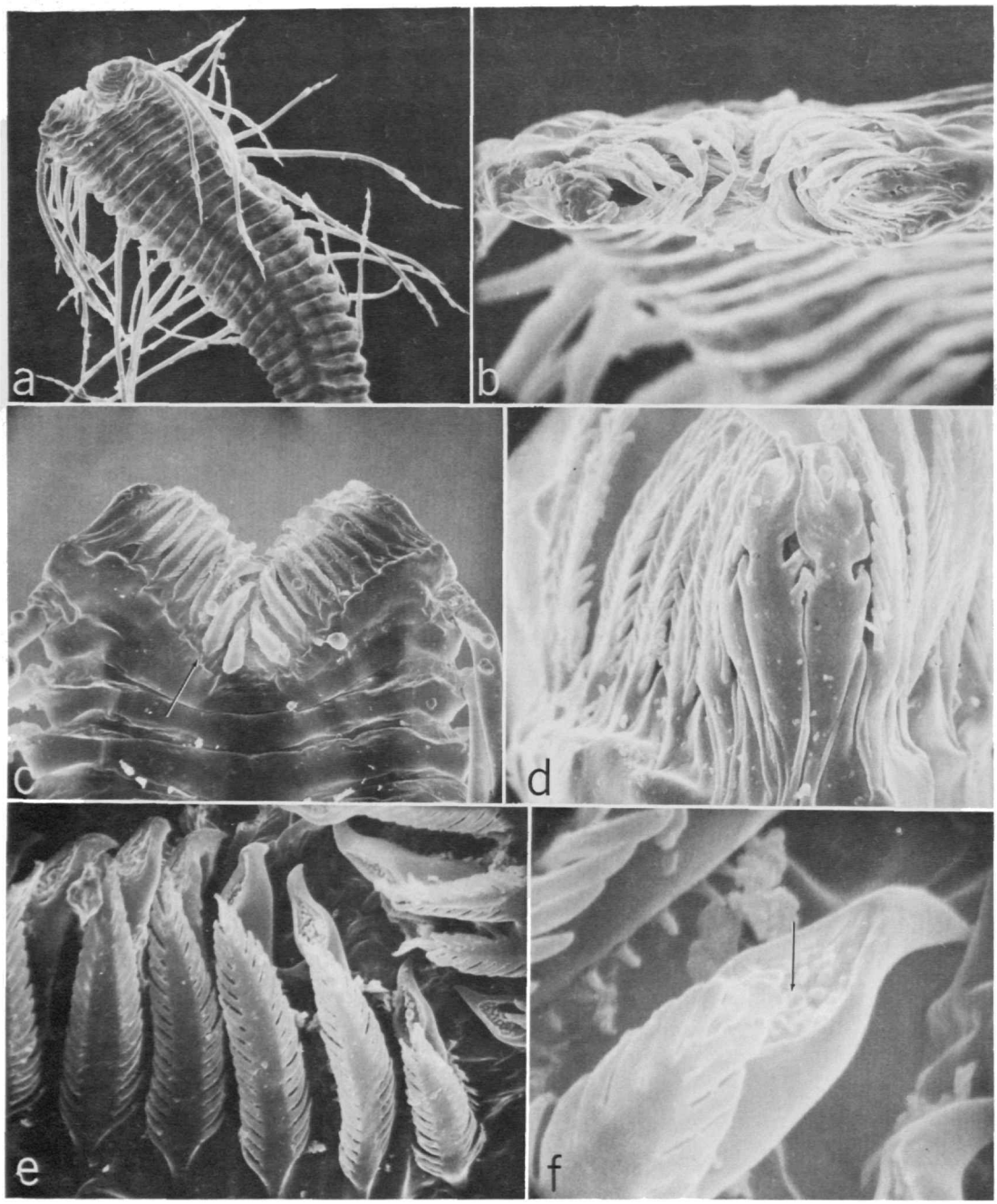


FIGURE 26.—*Asteropteron setiferum* Kornicker and Caraion, variety B, adult female, USNM 149282, 7th limb: *a*, tip of limb with bristles and opposing terminal combs, × 270; *b*, detail of *a*, looking down into terminal combs, × 1150; *c*, detail from *a* showing combs, × 900; *d*, teeth in middle of comb, × 4000; *e*, detail from *c* showing teeth at end of combs (for location see arrow in *c*), × 3100; *f*, tip of tooth near end of comb showing pore (arrow) and pustulae, × 10,000. (Photos reduced to 78 percent for publication.)

Sarsiella murrayana Scott, 1894

FIGURES 27, 28

Sarsiella Murrayana Scott, 1894:140, pl. 14: fig. 58; pl. 15: figs. 24, 28, 29. 31.
Sarsiella murrayana.—Müller, 1912:37 [key, diagnosis].

MATERIAL.—Through the courtesy of Dr. Roger Lincoln, I received from the British Museum (Natural History) the two specimens in alcohol described by T. Scott (1894) from Lagoon, São Tomé Island. Only the attached valves of the larger specimen of the two were in the vial. The smaller specimen was complete and undissected, except both 2nd antennae seem to be missing. The vial contained a label with the words "*Sarsiella murrayana*, Buccaneer, W. coast of Africa."

In his description Scott (1894:140) does not mention ribs on the carapace, nor does his illustration (pl. 14: fig. 58) show them. In a key, Müller (1912:37) used the absence of ribs on *S. murrayana* to separate that species from *S. tumida* A. Scott, 1905. Therefore, I was surprised to find on the type-specimens both an upper and lower horizontal rib. The carapace of the larger of the two specimens is reillustrated herein. Some of the appendages of the smaller specimen were partly visible through the shell, or were extending from it, so I was able to illustrate them, but details are lacking. Also, because the valves on the smaller specimen were slightly agape, I was able to draw the main features of inner side of the caudal process of both valves.

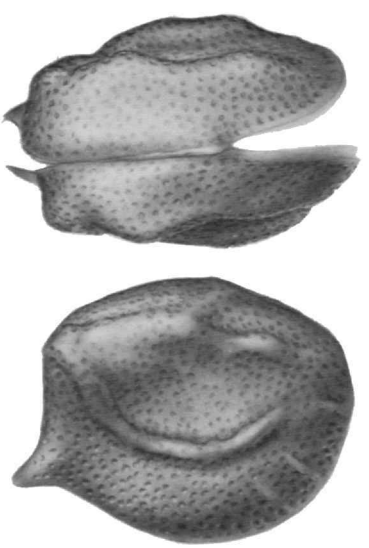


FIGURE 27.—*Sarsiella murrayana* Scott: Dorsal and lateral views of syntype; length including caudal process, 1.08 mm.

Scott (1894:140) stated that he was describing a male. It is obvious, however—because of the lack of brushlike filaments on the 5th joint of the 1st antenna that he illustrated (pl. 15: fig. 24)—that the specimen is not an adult male. The shape of the carapace suggests that the specimen is a juvenile, but study of additional specimens are necessary in order to be certain of that and to establish the sex.

SUPPLEMENTARY DESCRIPTION.—Surface of carapace punctate with upper and lower horizontal rib tending to meet at posterodorsal corner of each valve (Figure 27); anteroventral surface of each valve outside ribs with 3 very faint, low radial riblets (these visible only with valve tilted); punctae (Figure 28*c*) filled with debris so that spines, if present, not visible; no spines observed between punctae; long bristles with broad base extremely sparse on valve surface except along margins.

Infold: Caudal process of each valve of smaller specimen with 3 bristles (Figure 28*a,b*).

Size: Larger specimen: length excluding caudal process, 0.82 mm; length including caudal process, 1.08 mm; height, 0.66 mm. Smaller specimen: length, 0.56 mm; height, about 0.38 mm. Scott (1894) gave the length as 0.93 mm; presumably, this was of the larger specimen.

First Antenna (Figure 28*d*): The b-bristle of 7th joint only slightly longer than a-bristle; remaining bristles of 7th and 8th joints about same length as sensory bristle of 5th joint; no filaments observed on bristles.

Second Antenna: Missing on specimen. Endopodite unknown.

Mandible: Visible parts typical for genus (Figure 28*e*).

Maxilla: Partly visible, typical of genus (Figure 28*f*).

Seventh Limb: Not visible on specimen.

Furca (Figure 28*g,h*): Each lamella with 5 claws followed by few minute spines; claw 1 joined to lamella without suture, claws 2–5 separated from lamella by sutures; claws 1–3 with teeth forming single row along posterior margins;

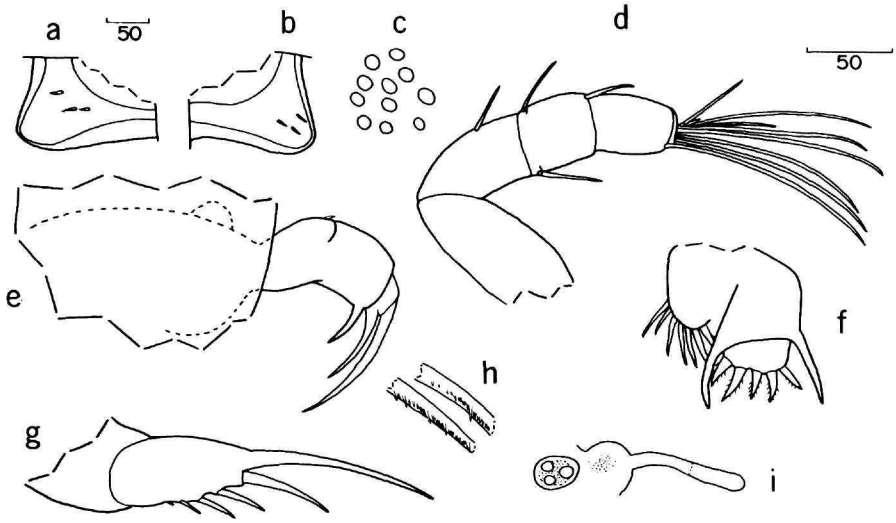


FIGURE 28.—*Sarsiella murrayana* Scott, juvenile syntype, carapace length 0.56 mm: *a*, caudal process of left valve, medial view; *b*, same, right valve; *c*, pits on shell surface; *d*, right 1st antenna, lateral view; *e*, right mandible, lateral view (not all bristles shown); *f*, right maxilla, lateral view (not all bristles shown); *g*, right lamella of furca (teeth on claws not shown); *h*, detail of teeth on claw 1 of right lamella (claw on right, lateral view) and left lamella (claw on left, medial view); *i*, right lateral eye, medial eye, and rod-shaped organ. (Same magnification in micrometers: *a–c; d–i.*)

large teeth alternate with several smaller teeth.

Lateral Eye: Each eye with 3 ommatidia (Figure 28*i*).

Medial Eye and Rod-shaped Organ: Medial eye larger than lateral eye, pigmented (Figure 28*i*). Rod-shaped organ elongate with rounded tip; suture not seen with certainty (Figure 28*i*).

Family RUTIDERMATIDAE Brady and Norman, 1896

This family contains three genera: *Rutiderma* Brady and Norman, 1896, *Alternochelata* Kornicker, 1958, and *Scleraner* Kornicker, 1975. Only *Rutiderma* is represented in the collection.

Genus *Rutiderma* Brady and Norman, 1896

This genus is represented in the collection only by *Rutiderma leloeuffi*, new species. It is widespread between latitudes 45°N and 52°56'S and in depths of 1–196 m.

Rutiderma leloeuffi, new species

FIGURES 29–32

HOLOTYPE.—USNM 149330, adult female or late instar, length 1.99 mm; both valves and some appendages in alcohol, remaining appendages on a single slide.

TYPE-LOCALITY.—Station 18, near Grand Bassam, Ivory Coast.

ETYMOLOGY.—The species is named for Dr. P. Le Loeuff.

DESCRIPTION OF FEMALE (adult or late instar; Figures 29–32).—*Carapace*: Elongate with small but distinct incisur and slightly overhanging rostrum; caudal process prominent (Figure 29).

Ornamentation: Surface with large rounded fossae; 2 longitudinal ribs on either side of central muscle scar extend from anterior of shell, where they are only slightly raised, to posterior of shell, where they are well developed and connected by a vertical rib; ventral and dorsal ridges parallel valve margins; hairs present along anterior and anteroventral margins.

Infold: Broad along anterior, anteroventral and posterior margin anterior to caudal process; infold on rostrum with 4 slender bristles forming row parallel to anterior margin of valve (Figure 30*c*); anteroventral infold with about 6 ridges, and 6 bristles forming row between ridges and edge of valve; middle part of ventral infold bare; posteroventral infold and infold of caudal process with about 16 bristles forming row (Figure 30*b,d*); only about 4 of these are on infold of caudal process.

Selvage: Broad lamellar prolongation with narrow fringe present along anterior, ventral, and posterior margins.

Central Muscle Attachment Scar: Obscure, but consisting of about 12 ovoid scars (Figure 30*a*).

Size: USNM 149330: length 1.99 mm, height 1.27 mm; height 64 percent of length.

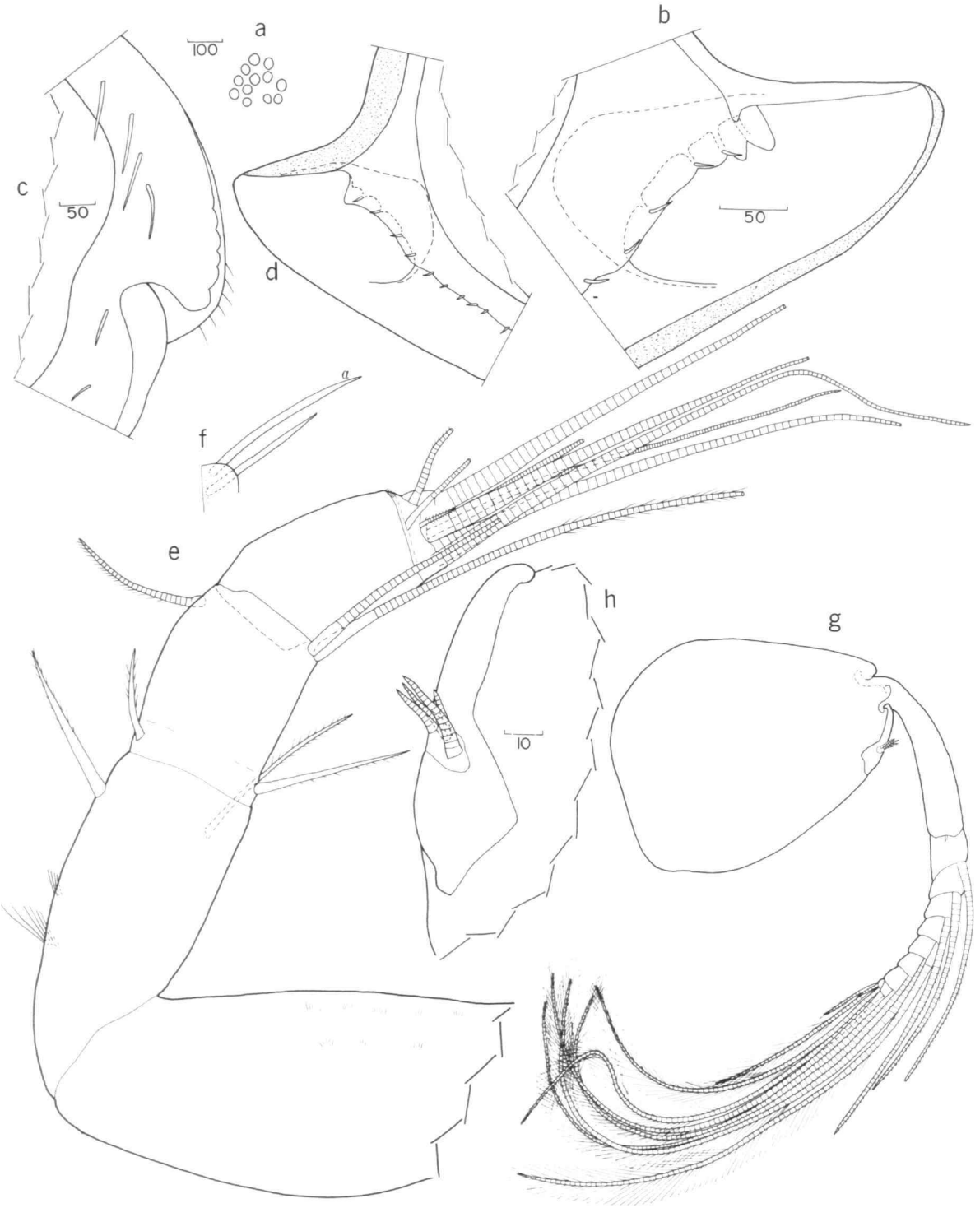
First Antenna (Figure 30*e,f*): 1st joint with spines forming clusters on medial surface near ventral margin and on lateral surface; 2nd joint with 2 bristles (1 dorsal, 1 lateral near ventral margin), both with short marginal spines; dorsal margin of joint with long hairs forming 2 clusters; 3rd joint short, fused with 4th, with 2 bristles (1 ventral, 1 dorsal), both with short marginal spines; 4th joint with 3 bristles (1 dorsal and short, 2 ventral and long), all with short marginal spines; sensory bristle of 5th joint long, bare; terminal dorsal corner of 5th or 6th joint with cluster of short spines; 6th joint short with short medial bristle with short marginal spines. Seventh joint: a-bristle about length of 5th joint, with short marginal spines; b-bristle minute, about one-fourth length of a-bristle; c-bristle bare, about same length or slightly shorter than sensory bristle. Eighth joint: d- and e-bristles bare, slightly shorter than c-bristle; f- and g-bristles bare, about same length as c-bristle.

FIGURE 29.—*Rutiderma leloeuffi*, new species, adult female or late instar, length 1.99 mm, holotype, USNM 149330, complete specimen.

Second Antenna (Figure 30*g,h*): Protopodite bare. Endopodite minute with 4 small bristles. Exopodite: 1st joint with short medial spine on distal margin; joints 2–8 with short, faint spines along dorsal and medial part of distal margins; bristle of 2nd joint reaching past 9th joint; bristles of joints 2–4 bare but with closely spaced corrugations along ventral margin except near base (tips of these bristles either broken or obscured by debris on specimen); 9th joint with 6 bristles (3 long, with natatory hairs; 1 medium, with natatory hairs; 2 short, the longer of these with hairs, the other bare); bristles of joints 5–8 with natatory hairs.

Mandible (Figure 31*a,b*): Coxale endite bifurcate with knifelike tips and secondary teeth on both prongs, long hairs near base of endite; no peg observed in valley between prongs. Basale: proximal ventral group of bristles with 1 long bristle with short marginal spines and 3 short bristles, 2 of these pectinate; 1 long and 1 short ventral bristle proximal to middle of ventral margin; dorsal margin with 1 short and 1 long bristle distal to middle, both with short marginal spines. Exopodite absent. Endopodite: 1st joint with spines forming clusters on medial surface and 3 short ventral bristles; 2nd joint with spines forming clusters on medial surface; dorsal margin with 3 proximal bristles (2 slender with short marginal spines, 1 short and stout with long, stout marginal spines); ventral margin with short subterminal bristle and stout terminal claw with proximal tooth and serrated inner margin; tip of claw strongly recurved; minute spade-shaped process with faint terminal bristle on medial side at base of claw; 3rd joint with 2 claws, outer medial claw broad with minute teeth along middle of concave margin and without distal dorsal node, inner lateral claw narrow, shorter than broad claw, with minute ventral teeth; 3 slender bristles medial to base of lateral claw; 2 short bristles near base of claw of 2nd joint.

Maxilla (Figure 31*c*): Precoxale and coxale


a
100
b
c
50
50
d
a
f
e
h
g
10

with fringed epipodial appendage; coxale with 1 distoanterior bristle with short marginal spines. Endites obscure, but endite I with 1–3 stout pectinate bristles and 3 or 4 short, slender bristles; endite II with 2 stout pectinate bristles and 2 slender spinous bristles; endite III with about 5 bristles, of which about 3 are stout pectinate. Basale with 1 slender distoanterior bristle with short marginal spines and 1 short, slender medial bristle near middle of distal margin. Exopodite short, with 3 short bristles with marginal spines. Endopodite: 1st joint with 1 α-bristle with slender marginal spines and 1 β-bristle with stout marginal spines; spines forming short rows present on medial side of joint near anterior margin; 2nd joint with 2 a-bristles with few marginal spines, 1 stout terminal claw with large marginal teeth, 1 smaller, bare claw anterior to larger claw, 1 pectinate anterior bristle, 1 posterior bristle with stout spines along both margins, and 1 short, spinous bristle medial and posterior to large claw.

Fifth Limb (Figure 32*a–d*): Epipodial appendage with 37 bristles. Endite I with 2 spinous bristles; endite II with 3 spinous bristles; endite III with 1 stout, spinous inner bristle and 3 bare outer bristles with knifelike tips. Exopodite: main tooth consisting of 4 teeth, the distal of these with 2 teeth near base and with three-pronged tip; remaining 3 teeth either single or with 1 tooth near base; 1 short bristle proximal to inner tooth and 1 short bristle on inner margin of joint; 2nd joint with large triangular tooth with 2 large teeth along inner curvature, posterior side of joint with small bristle near rounded end of triangular tooth and 2 bristles proximal to inner tooth on inner curvature of triangular tooth; 3rd joint with 3 bristles on inner lobe and 2 on outer lobe; 4th and 5th joints fused, with 4 terminal bristles.

Sixth Limb (Figure 32*e*): Two plumose bristles in place of epipodial appendage; endite I with 3 bristles (1 long with short marginal spines, 2 short with long marginal spines); endite II with 2 slender bristles with short marginal spines; endites III and IV with 2 slender bristles with short marginal spines; end joint with 7 bristles: 2 anterior bristles with short marginal spines; next 3 bristles with long proximal hairs and short distal spines; 2 posterior bristles with long hairs; lateral surface of endites III and IV hirsute.

Seventh Limb (Figure 32*f*): Terminal comb with about 8 flat teeth with minute tooth at base between bristles opposing 1 or 2 recurved pegs; each limb with 9 (possibly 10) bristles—4 in proximal group (2 on each side) and 5 (possibly 6) in terminal group (2 or 3 on each side); each bristle with 3–6 bells and distal marginal spines.

Furca (Figure 32*h*): Each lamella with 3 strong claws followed by 3 short secondary claws; long hairs present medially near bases of claws 1–3 and between and following secondary claws; claws 1–3 with equilength teeth forming lateral and medial rows along concave margins.

Eyes and Rod-shaped Organ: Lateral eyes not seen with certainty, but if present consisting of small sack with 2 minute ommatidia (Figure 32*g*); medial eye bare, elongate, unpigmented (Figure 32*g*); rod-shaped organ elongate, with short, broadened section in middle proximal to crease (or suture); tip pointed (Figure 32*g*).

Upper Lip: Small, rounded, bare (Figure 32*i*).

Posterior: Long hairs near middle of dorsal margin (Figure 32*j*).

Y-*Sclerite*: Without ventral branch; anterior end upturned; posterior end bending ventrally (Figure 32*j*).

COMPARISONS.—*Rutiderma leloeuffi*, new species, differs from *Rutiderma hartmanni* Poulsen, 1965, and *Rutiderma mortenseni* Poulsen, 1965, in having only three stout claws on the furca. It differs from *Rutiderma normani* Poulsen, 1965, in having a larger and more elongate carapace. The incisur is more distinct and the rostrum and caudal process more prominent on *Rutiderma leloeuffi*, new species, than on *Rutiderma compressa* Brady and Norman, 1896, *Rutiderma dinochelata* Kornicker, 1958, *Rutiderma gerdhartmanni* Kornicker, 1975, and *Rutiderma* species A and B (Kornicker, 1975).

DISTRIBUTION.—Collected only at the type-locality off Grand Bassam at a depth of 20 m.

FIGURE 30.—*Rutiderma leloeuffi*, new species, adult female or late instar, holotype, USNM 149330. Right valve: *a*, central adductor muscle scar, lateral view; *b*, caudal process, medial view. Left valve, medial view: *c*, rostrum; *d*, caudal process. First antenna: *e*, left limb, medial view; *f*, bristle on 6th joint and a-bristle of 7th joint of right limb, lateral view. Second antenna, medial view: *g*, left limb; *h*, endopodite and part of protopodite of right limb. (Same magnification in micrometers: *c,g; b–f.*)

FIGURE 31.—*Rutiderma leloeuffi*, new species, adult female or late instar, holotype, USNM 149330: *a*, left mandible, medial view; *b*, right mandible, medial view; *c*, maxilla (not all endite bristles shown). (Same magnification in micrometers: *a–c*.)

FIGURE 32.—*Rutiderma leloeuffi*, new species, adult female or late instar, holotype, USNM 149330: *a*, left 5th limb, anterior view; *b*, detail of *a* showing teeth on 1st exopodial joint; *c*, right 5th limb, posterior view; *d*, detail of *c* showing teeth of 2nd exopodial joint; *e*, left 6th limb, medial view; *f*, 7th limb; *g*, rod-shaped organ and medial eye, lateral eye? (dashed), protopodite of left 2nd antenna, and part of left 1st antenna; *h*, right lamella of furca; *i*, anterior of body from left side showing anterior process and simple upper lip; *j*, posterior of body (Y-sclerite crosshatched). (Same magnification in micrometers: *g–j; a,c,e,f; b,d.*)

Literature Cited

Brady, G. S., and Norman, A. M.

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, 5:621–684.

De Folin, L.

1871. Crustacés et Mollusque Noveaux de la Côte d'Afrique. Page 245 *of* volume 1 *in* L. de Folin and L. Perier, *Les fonds de la mer.*

Hartmann, Gerd

1974. Zur Kenntnis des Eulitorals der africanischen Westküste zwischen Angola und Kap der Guten Hoffnung und der afrikanischen Ostküste von Südafrica und Mocambique unter besonderer Berücksichtigung der Polychaeten und Ostracoden, part III: Die Ostracoden des Untersuchungsgebiets. *Mitteilungen aus dem Hamburgischen Zoologischen Museum und Institut,* 69:229–520, 151 plates.

Klie, Walter von

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, 89 figures.

1974. Revisions of the Cypridinacea of the Gulf of Naples (Ostracoda). *Smithsonian Contributions to Zoology,* 178:1–64, 26 figures.

1975. Antarctic Ostracoda (Myodocopina). *Smithsonian Contributions to Zoology,* 163:1–720, 432 figures, 9 plates.

Kornicker, L. S., and Francisca Caraion

1974. West African Myodocopid Ostracoda (Cylindroleberididae). *Smithsonian Contributions to Zoology,* 179:1–78, 43 figures.

Moguilevsky, A., and F. C. Ramírez

1970. *Cycloleberis poulseni* Especie Nueva (Ostracoda, Asteropidae) Crustacea Bentonico del Area de Mar del Plata, Argentina. *Physis,* 29 (79):461–471, 8 figures.

Müller, G. W.

1894. Die Ostracoden des Golfes von Neapel und der angrenzenden Meeres-Obschnitte. Volume 21 of *Fauna und Flore des Golfes von Neapel.* viii + 404 pages, 40 plates. Berlin: Verlag R. Freidlander und Sohn.

1906. Die Ostracoden der Siboga-Expedition. Volume 30 in *Siboga-Expeditie.* 40 pages, 9 plates. Leiden: E. J. Brill.

1912. Ostracoda. Volume 31 of *Das Tierreich.* xxxiii + 434 pages, 92 figures. Berlin: Verlag R. Friedlander und Sohn.

Norman, A. M.

1869. Shetland Final Dredging Report, part II: On the Crustacea, Tunicata, Polyzoa, Echinodermata, Actinozoa, Hydrozoa, and Porifera. Pages 247–342 in *Report of the Thirty-Eighth Meeting of the British Association for the Advancement of Science.*

Poulsen, E. M.

1965. Ostracoda-Myodocopa, 2: Cypridiniformes-Rutidermatidae, Sarsiellidae and Asteropidae. Volume 65 of *Dana Report.* 484 pages, 156 figures. Copenhagen: Carlsberg Foundation.

Sars, G. O.

1866[1865]. Oversigt af Norges marine Ostracoder. *Norske Vidensk Forhandlinger Videnskab-Selskabet, I Christiania Aar 1865,* 7:1–130. [Preprint, 1865.]

Scott, T.

1894. Report on Entomostraca from the Gulf of Guinea, collected by John Rattray, B. Sc. *Transactions of the Linnean Society,* Zoology, series 2, 6:1–161, 15 plates.

Skogsberg, T.

1920. Studies on Marine Ostracods, 1: Cypridinids, Halocyprids and Polycopids. *Zoologiska Bidrag fran Uppsala,* supplement, 1:1–784, 153 figures.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1975—586-379/24

Publication in Smithsonian Contributions to Zoology

Manuscripts for serial publications are accepted by the Smithsonian Institution Press, subject to substantive review, only through departments of the various Smithsonian museums. Non-Smithsonian authors should address inquiries to the appropriate department. If submission is invited, the following format requirements of the Press will govern the preparation of copy.

Copy must be typewritten, double-spaced, on one side of standard white bond paper, with 1½″ top and left margins, submitted in ribbon copy with a carbon or duplicate, and accompanied by the original artwork. Duplicate copies of all material, including illustrations, should be retained by the author. There may be several paragraphs to a page, but each page should begin with a new paragraph. Number consecutively all pages, including title page, abstract, text, literature cited, legends, and tables. The minimum length is 30 pages, including typescript and illustrations.

The *title* should be complete and clear for easy indexing by abstracting services. Taxonomic titles will carry a final line indicating the higher categories to which the taxon is referable: "(Hymenoptera: Sphecidae)." Include an *abstract* as an introductory part of the text. Identify the *author* on the first page of text with an unnumbered footnote that includes his professional mailing address. A *table of contents* is optional. An *index,* if required, may be supplied by the author when he returns page proof.

Two *headings* are used: (1) text heads (boldface in print) for major sections and chapters and (2) paragraph sideheads (caps and small caps in print) for subdivisions. Further headings may be worked out with the editor.

In *taxonomic keys,* number only the first item of each couplet; if there is only one couplet, omit the number. For easy reference, number also the taxa and their corresponding headings throughout the text; do not incorporate page references in the key.

In *synonymy,* use the short form (taxon, author, date:page) with a full reference at the end of the paper under "Literature Cited." Begin each taxon at the left margin with subsequent lines indented about three spaces. Within an entry, use a period-dash (.—) to separate each reference. Enclose with square brackets any annotation in, or at the end of, the entry. For *references within the text,* use the author-date system: "(Jones, 1910)" and "Jones (1910)." If the reference is expanded, abbreviate the data: "Jones (1910:122, pl. 20: fig. 1)."

Simple *tabulations* in the text (e.g., columns of data) may carry headings or not, but they should not contain rules. Formal *tables* must be submitted as pages separate from the text, and each table, no matter how large, should be pasted up as a single sheet of copy.

Use the *metric system* instead of, or in addition to, the English system.

Illustrations (line drawings, maps, photographs, shaded drawings) can be intermixed throughout the printed text. They will be termed *Figures* and should be numbered consecutively; however, if a group of figures is treated as a single figure, the components should be indicated by lowercase italic letters on the illustration, in the legend, and in text references: "Figure 9*b*." If illustrations (usually tone photographs) are printed separately from the text as full pages on a different stock of paper, they will be termed *Plates,* and individual components should be lettered (Plate 9*b*) but may be numbered (Plate 9: figure 2). Never combine the numbering system of text illustrations with that of plate illustrations. Submit all legends on pages separate from the text and not attached to the artwork. An instruction booklet for the preparation of illustrations is available from the Press on request.

In the *bibliography* (usually called "Literature Cited"), spell out book, journal, and article titles, using initial caps with all words except minor terms such as "and, of, the." For capitalization of titles in foreign languages, follow the national practice of each language. Underscore (for italics) book and journal titles. Use the colon-parentheses system for volume, number, and page citations: "10(2):5-9." Spell out such words as "figures," "plates," "pages."

For *free copies* of his own paper, a Smithsonian author should indicate his requirements on "Form 36" (submitted to the Press with the manuscript). A non-Smithsonian author will receive 50 free copies; order forms for quantities above this amount with instructions for payment will be supplied when page proof is forwarded.