

A Restudy of the Ostracode Genus
Pleoschisma Brady, 1890
(Myodocopina)

LOUIS S. KORNICKER

SERIES PUBLICATIONS OF THE SMITHSONIAN INSTITUTION

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

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

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

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

S. Dillon Ripley
Secretary
Smithsonian Institution

SMITHSONIAN CONTRIBUTIONS TO ZOOLOGY • NUMBER 332

A Restudy of the Ostracode Genus
Pleoschisma Brady, 1890
(Myodocopina)

Louis S. Kornicker



SMITHSONIAN INSTITUTION PRESS

City of Washington

1981

ABSTRACT

Kornicker, Louis S. A Restudy of the Ostracode Genus *Pleoschisma* Brady, 1890 (Myodocopina). *Smithsonian Contributions to Zoology*, number 332, 16 pages, 5 figures, 1981.—Supplementary descriptions and illustrations are given of *Pleoschisma moroides* Brady, 1890, the type-species of *Pleoschisma* Brady, 1890, based on both type material and a specimen more recently collected from near the type-locality. It is concluded that *Pleoschisma* is a valid genus, and two additional species (*Philomedes agilis* Thomson, 1879, and *Euphilomedes ferox* Poulsen, 1962) are referred to it. *Pleoschisma reticulata* Brady, 1890, is referred to "Genus and Species Indeterminate." *Pleoschisma robusta* Brady, 1890, which Brady (1897:94) referred to *Sarsiella robusta*, is referred to *Ancohenia robusta* (new combination), and the specimen is redescribed and illustrated from type material.

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

Library of Congress Cataloging in Publication Data

Kornicker, Louis S. 1919-

A restudy of the Ostracode genus *Pleoschisma* Brady, 1890 (Myodocopina)
(Smithsonian contributions to zoology ; no. 332)

Bibliography: p.

1. *Pleoschisma*—Classification. 2. Crustacea—Classification. I. Title. II. Series: Smithsonian Institution. Smithsonian contributions to zoology ; no. 332.

QL1.S54 no. 332 [QL444.O85] 591s [595.3'3] 80-607813

Contents

	<i>Page</i>
Introduction	1
Acknowledgments	1
PHILOMEDIDAE Müller, 1906	2
PHILOMEDINAE Müller, 1906	2
Key to the Genera of Philomedinae	2
<i>Pleoschisma</i> Brady, 1890	2
Key to the Species of <i>Pleoschisma</i>	3
<i>Pleoschisma moroides</i> Brady, 1890	3
Genus and Species Indeterminate	11
SARSIELLIDAE Brady and Norman, 1896	11
SARSIELLINAE Brady and Norman, 1896	11
<i>Ancohenia</i> Kornicker, 1976	11
Key to the Species of <i>Ancohenia</i>	12
<i>Ancohenia robusta</i> (Brady, 1890), new combination	12
Literature Cited	16

A Restudy of the Ostracode Genus *Pleoschisma* Brady, 1890 (Myodocopina)

Louis S. Kornicker

Introduction

G. S. Brady (1890:513) proposed the new genus *Pleoschisma* for three new species collected in the South Seas: *P. robusta*, *P. moroides*, *P. reticulata*, and described and illustrated a carapace of each species. He later (Brady, 1897) described and illustrated some appendages of the male and female of *P. moroides*, and referred *P. robusta* to the genus *Sarsiella*, as *Sarsiella robusta*. Sylvester-Bradley (1961:Q399) designated *Pleoschisma moroides* as the type-species of the genus *Pleoschisma*.

As part of an effort, initiated by a Committee on Recent Ostracoda established at a symposium held in Naples, Italy, in 1963, to redescribe type-species of poorly known genera, I obtained from the Hancock Museum, Newcastle-upon-Tyne, specimens of *Pleoschisma moroides* in the Brady Collection. That material was supplemented by a single A-I male of the species from the alcohol collection of the National Museum of Natural History. The specimen had been collected in 1978 from the same area as the syntypes.

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

I conclude that *Pleoschisma* is a valid genus and assign to it, in addition to *Pleoschisma moroides*, *Philomedes agilis* Thomson (1879:257) as *Pleoschisma agilis* (Thomson), and *Euphilomedes ferox* Poulsen (1962:391) as *Pleoschisma ferox* (Poulsen).

I also obtained from the Brady Collection the holotype (a unique specimen) of *Pleoschisma reticulata*, which I have referred herein to "Genus and Species Indeterminate," and specimens of *Sarsiella robusta*, most of which I have referred herein to the genus *Ancohenia*, as *Ancohenia robusta* (Brady), new combination.

ACKNOWLEDGMENTS.—I thank Dr. Albert G. Long and Dr. K. G. McKenzie for supplying specimens from the Brady Collection at the Hancock Museum, Newcastle-upon-Tyne, and Mr. C. A. Child for a specimen he collected in the Fiji Islands. Most initial drawings of appendages of the specimen collected by Mr. Child were made by Mrs. Kathryn Brown. Final inking of appendages was done under the supervision of Mr. Jack Schroeder. I especially thank Mrs. Carolyn Bartlett Gast for the shaded renderings of carapaces and Mrs. Anne Cohen for reviewing the manuscript.

PHILOMEDIDAE Müller, 1906

PHILOMEDINAE Müller, 1906

Key to the Genera of Philomedinae

1. Endopodite of female 2nd antenna with single joint **Paraphilomedes**
Endopodite of female 2nd antenna with 2 joints 2
2. Carapace of female with 2 or more horizontal ribs (absent or reduced on adult male) 3
Carapace without horizontal ribs 4
3. Bellonci organ with about 15 sutures **Scleroconcha**
Bellonci organ with wrinkles or few sutures **Anarthron**
4. Furca with secondary claws between primary claws 5
Furca without secondary claws, or with secondary claws following primary claws 6
5. Fifth limb: 1st exopodial joint with 1 or 2 fanglike teeth, 2nd exopodial joint with fanglike tooth with 2 large teeth on inner margin **Pleoschisma**
Fifth limb: 1st exopodial joint without fanglike tooth, tooth of 2nd exopodial joint without 2 large teeth on inner margin **Euphilomedes**
6. Bellonci organ very long **Philomedes**
Bellonci organ very short **Igene**

***Pleoschisma* Brady, 1890**

TYPE-SPECIES.—*Pleoschisma moroides* Brady, by subsequent designation (Sylvester-Bradley, 1961: Q399).

DIAGNOSIS OF GENUS.—Carapace of females generally with very shallow incisure; incisure of adult male also fairly shallow. Known species without projecting caudal process. Valve surface without ribs or large processes, or horns.

Second Antenna: Endopodite of adult female 2-jointed.

Mandible: End joint with only 1 or 2 stout clawlike bristles in addition to other bristles.

Fifth Limb: With 3 endites. Exopodite: 1st joint with 1 or 2 elongate fanglike teeth bearing additional teeth along the inner margin; 2nd joint with elongate fanglike tooth with 2 well-developed teeth along its inner margin; the latter teeth bearing smaller secondary teeth along their inner margins.

Sixth Limb: With 4 endites; end joint projecting posteriorly.

Seventh Limb: Terminus consisting of comb teeth opposite either 1 or 2 pegs, or large spine with small blunt tooth (*P. ferox*).

Furca: All claws separated from lamella by sutures. Claws 1, 2, 4 stout primary claws; claw 3 and claws following primary claw 4 very small secondary claws.

Bellonci Organ: Elongate, broadening in middle part, then tapering to thin pointed tip; either without sutures or with 1 or 2 weak sutures.

DISCUSSION.—I consider the morphology of the teeth of the 1st and 2nd exopodial joints of the adult female 5th limb as a synapomorphic character state showing the close relationship of species in the genus *Pleoschisma*. A similarity of the tooth of the 2nd exopodial joint of *Pleoschisma* with that of the genera *Pseudophilomedes* and *Parmekodon*, both genera in the subfamily Pseudophilomedinae, is considered to be the result of parallelism or convergence.

Three of the species Poulsen (1962:362) included in his "agilis-group" are referred herein to

Pleoschisma: *P. moroides*, *P. agilis*, and *P. ferox*. Five of the species he referred to the *agilis*-group are not referred to *Pleoschisma*: *Euphilomedes asper* (Müller, 1894:210); *E. bradyi* Poulsen (1962:385); *E. sordida* (Müller, 1890:237); *E. fonsecensis* (Hartmann, 1959:197), and *E. debilis* (Brady, 1902:186). The fifth limbs of the females of most of these species have not been described in published literature. The presence of more than 3 stout claws on the furcae of *E. fonsecensis* and *E. debilis* makes it unlikely that either species belongs in *Pleoschisma*. I have examined a specimen (USNM 158329) that I believe to be the female *E. bradyi* from Bab el Mandeb, and found it to have a very simple 5th limb without the stout triangular tooth forming the 2nd exopodial joint present on both *Euphilomedes* and *Pleoschisma*. Although I leave it

for the present in the genus *Euphilomedes*, the species probably should be proposed as a new genus. Müller (1890) did not describe or illustrate the 5th limb of *E. sordida*, but it was described and illustrated by Hiruta (1976:591). The 5th limb is typical of *Euphilomedes*, and, therefore, I have not referred *E. sordida* to *Pleoschisma*. The female 5th limb of *Euphilomedes asper* is also typical of *Euphilomedes* (see Kornicker and Caraion, 1977:22, fig. 16a,b).

Juday (1907:145) referred males collected off the west coast of California to a new species *Pleoschisma oblonga* Juday. Poulsen (1962:359) referred the species to *Euphilomedes* as *E. oblonga* (Juday). I have examined a female (USNM 158178) of the species from Monterey Bay, California, and find it to have a 5th limb typical of *Euphilomedes* and therefore concur with Poulsen.

Key to the Species of *Pleoschisma*

1. Exopodite of female (also juvenile male) 5th limb with 2 large fanglike teeth on 1st joint ***P. ferox***
 Exopodite of female (also juvenile male) 5th limb with 1 large fanglike tooth on 1st joint 2
2. Incisur of female and juvenile male valves negligible (see Figure 1 for outline of A-1 male, and Brady, 1890: pl. I: fig. 23, for outline of ?female) ***P. moroides***
 Incisur of female and juvenile male fairly well developed (see Thomson, 1879, fig. C.3, for outline of female, and Kornicker, 1975:29, fig. 182a, for outline of A-1 male) ***P. agilis***

Pleoschisma moroides Brady, 1890

FIGURES 1-3

Pleoschisma moroides Brady, 1890:514, pl. 1: figs. 23, 24.—1897:92, pl. XVII: figs. 1-11.

Philomedes moroides.—Müller, 1912:26, 29.

Euphilomedes moroides.—Poulsen, 1962:339, 362, 363, 388.

Euphilomedes agilis.—Poulsen, 1962:338, fig. 170 [questionable].

HOLOTYPE.—None selected. Syntypes at the Hancock Museum, Newcastle-upon-Tyne.

SYNTYPE-LOCALITY.—New Caledonia, Fiji Islands.

MATERIAL.—At my request, Mr. Albert G.

Long, the Hancock Museum, Newcastle-upon-Tyne, sent me four slides of *Pleoschisma moroides* Brady, from the Brady Collection. For reference purposes I have numbered these slides 1-4. All the slides have partly dried out, and structures are generally obscure.

Slide 1: This slide contains the appendages of an adult male and adult female. The slide bears 3 labels: (1) a small label on which is printed "Hancock Museum New Castle-on-Tyne"; (2) a label on the left side of the slide containing the handwritten information, "*Pleoschisma moroides*. G. W. Brady. types"; (3) a label on the right side of the slide containing the handwritten information,

"Vuna Point, Taviuni, Fiji. Shore sand & lowwater pools, H.B.B." (a small pink disc of paper has been glued to the label).

Slide 2: This slide contains the appendages of an adult female and A-1 male. The labels on this slide are identical to those on slide 1 including the pink paper disc.

Slide 3: This slide contains the appendages of an adult female. In addition to the printed label, "Hancock Museum, Newcastle-on-Tyne," the slide bears a label on the left side with handwritten information, "*Pleoschisma moroides*, Cape Bon Louis, New Caledonia." The handwriting on the slide appears to be the same as that on slides 1 and 2.

Slide 4: This slide contains 2 partly fragmented valves. The labels are the same as those on slides 1 and 2 with the following exceptions: the left label states "shell only," the word "types" is not present, and a pink paper disc is not present.

I had previously (1976) received from Mr. Long a slide containing dry shells of ostracodes and labeled "8, Off Cape Bon Louis, New Caledonia, 4 fathoms, weedy." Mr. Long stated that this slide contained, according to "Brady's MS book," a specimen of *Pleoschisma moroides*. One specimen on the slide could be *Pleoschisma moroides* (this specimen is located in the square immediately above the "a" in "fathoms" written along the bottom of the slide. The specimen is complete, except the furca, which is protruding from the carapace, has its claws missing. Without study of the appendages of this specimen, I am unable to refer it to *P. moroides*. I infer from Mr. Long's letter that the collection may have been made in June, 1864, or possibly that date refers to Brady's notation in note book.

I had also received in 1976 from Dr. K. G. McKenzie, a slide he had made from Brady's material at the Hancock Museum containing a dry ostracode. The slide is labeled "*Pleoschisma moroides* Brady, 1890, Type. Loc.: Levuka, Fiji. K.G.M. July, 1967, B474." The complete specimen is in good condition, brown, and resembles the specimen illustrated by Brady (1890: pl. I:

figs. 23, 24), and has roughly the same dimensions as that specimen.

In addition to the above type material, I examined 1 A-1 male (USNM 158028) collected by C. A. Child, 30 Jul 1978, from sta 171, 17°40'20"S, 177°06'40"E, fringing reef on north, or leeward, side (drop off) of Mana Island, Mananutha Group, Viti Levu, Fiji, depth 1 m.

REMARKS CONCERNING TYPE MATERIAL.—Brady did not select a holotype. His type material was collected from 4 localities in the Fiji Islands and 1 locality in New Caledonia. The Fiji material I examined is represented by 4 specimens on 3 slides from Vuna Point, Taveuni Island, and 1 complete dry specimen from Levuka; no material was available from the other 2 Fiji localities. The New Caledonia material is represented by 1 slide containing the appendages of a female, and a slide containing 1 complete dry specimen (I cannot refer the later species to *Pleoschisma moroides* because it occurs in a slide with many other species and may not have been a specimen identified by Brady). The slide from New Caledonia is labeled "Cape Bon Louis, New Caledonia," whereas Brady (1890:514) states "Port of Noumea" as the locality. I am unable to find "Cape Bon Louis" on available maps, but do find a town of St. Louis located near Noumea and, therefore, have assumed that the slide contains type material; if it is not type material, it is material from near the type-locality.

METHODS.—Because the type material available for study is in poor condition, I started the study by describing and illustrating an A-1 male recently collected in the Fiji Islands. This was the only specimen of the species in a small collection from the Fiji Islands at the National Museum of Natural History. Brady's slide from New Caledonia contained appendages of an adult female, and the description of the adult female is made primarily from that specimen. One of Brady's slides from Vuna Point, Fiji Islands, contained the appendages of an adult male and an adult female. The description of the adult male is based on the appendages on that slide. The female appendages were compared with those of the

specimen from New Caledonia, and differences noted in the description. Unfortunately, the appendages of the female from Vuna Point are poorly preserved. The absence of good detail of the endopodite of the 2nd antenna and the 5th limbs on the Vuna Point specimen does not permit certain conclusion that the Vuna Point and New Caledonian females are conspecific. A second slide made by Brady of Vuna Point material contained the appendages of an adult female and an A-1 male. Although the appendages are not in good condition, I was able to verify to my satisfaction that the A-1 male from Vuna Point is conspecific with the newly collected A-1 male described herein. The appendages of the female on this slide are also in poor condition. A third slide of Brady's contained 2 partly fragmented valves of a Vuna Point specimen. The reticulate microstructures of the valves are (Figure 3a) similar to those on the carapace of the newly collected A-1 male described herein (Figure 1).

DESCRIPTION OF A-1 MALE (Figures 1, 2, 3t).—Slight rostrum formed by lateral projection of valve extending anteriorly past edge of valve (Figures 1, 2a); edge of valve with no projection in vicinity of rostrum and without incisur (Figure 2a); posterodorsal margin of valve tending to be linear; anterodorsal and ventral margins of valve evenly curved; slight corner of posterodorsal margin represents posterior end of linear hinge.

Ornamentation (Figures 1, 2a,b): Surface of valves strongly reticulate except in vicinity of central adductor muscle attachments where ridges enclose oval areas; each reticulation containing within it smaller reticulations formed by ridges thinner than that forming the main reticulation (see detail on Figure 1). Surface and margins of valve with widely scattered long bristles (Figure 2a,b).

Infold (Figure 2a,b): Infold broad along anterior, ventral, and posterior margins; anterodorsal infold with 6 bristles (Figure 2a); posteroventral infold with stout list in middle paralleling inner edge of infold (Figure 2b); 8 to 12 short bristles forming row just anterior to posteroventral list or on list; 9 or 10 bristles present along inner edge

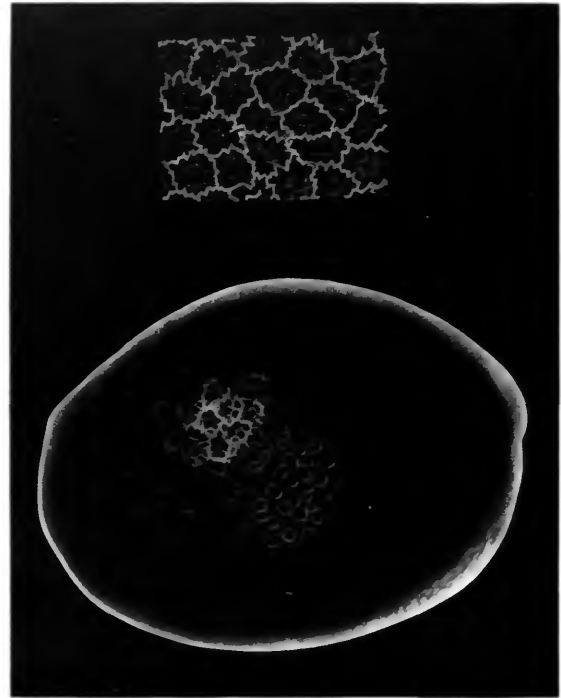


FIGURE 1.—*Pleoschisma moroides* Brady, A-1 male, USNM 158028, length 0.96 mm, right view of complete specimen and detail of reticulate surface.

of posteroventral infold; 3 bristles present on short ridge just ventral to posterodorsal corner of valve (observed only on right valve, but left valve torn in this region); anteroventral infold with 1 bristle near middle; ventral infold with 2 anterior bristles close to narrow list near outer edge of infold.

Selvage: Selvage with fairly narrow lamellar prolongation with long marginal fringe present along anterodorsal, anterior and ventral margins of valves.

Size: USNM 158028, length 0.96 mm, height 0.72 mm.

First Antenna (Figure 2c): 1st joint with few small medial spines forming rows. 2nd joint with 3 bristles (1 ventral, 1 dorsal, 1 lateral), and with medial and dorsal spines. 3rd joint short, with 2 bristles (1 ventral, 1 dorsal). 4th joint with 4 bristles (1 dorsal, 3 ventral). 5th joint about same length as 4th, with medial and lateral spines in



FIGURE 2.—*Pleoschisma moroides* Brady, A-1 male, USNM 158028: *a*, rostrum of right valve, inside view; *b*, posteroventral end of right valve, inside view; *c*, left 1st antenna, medial view; *d*, left 2nd antenna, medial view; *e*, left mandible, medial view; *f*, tip of right mandible showing 3 spines on 2nd endopodial joint, lateral view (all bristles of end joint not shown); *g*, left maxilla, lateral view; *h*, 5th limb (epipodial appendage not shown); *i*, right 6th limb, medial view; *j*, 7th limb; *k*, left furcal lamella, lateral view; *l*, right lateral eye, medial eye and bellonci organ.

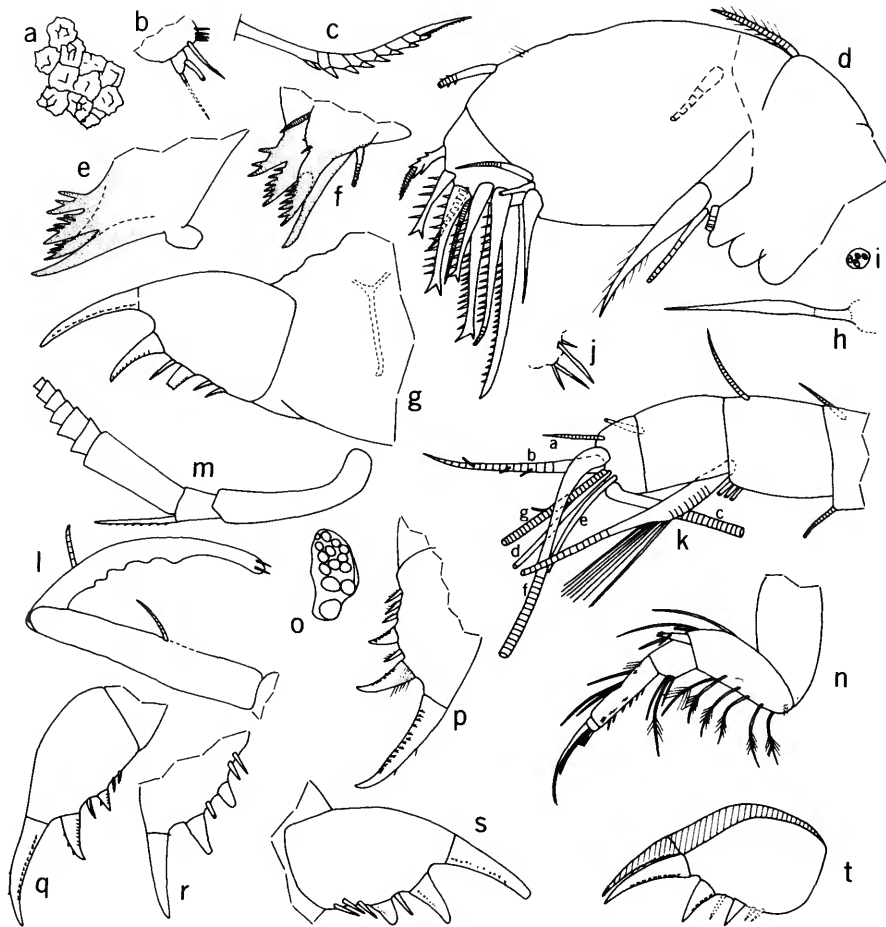


FIGURE 3.—*Pleoschisma moroides* Brady, type-slides: *a*, detail of reticulations of valve on slide 4, sex and maturity unknown. *b-i*, slide 3, adult female: *b*, endopodite of left 2nd antenna, medial view; *c*, bristle of 5th exopodial joint of right 2nd antenna, medial view; *d*, left maxilla, lateral view (endite bristles not shown); *e*, tip of right 5th limb showing teeth of 2nd exopodial joint and distal tooth of 1st exopodial joint, posterior view; *f*, tip of left 5th limb showing 1st and 2nd exopodial joints, anterior view; *g*, right lamella of furca, medial view, and left Y-sclerite, lateral view; *h*, distal part of medial eye and bellonci organ; *i*, lateral eye. *j-r*, slide 1: *j*, part of endopodite of left 2nd antenna of adult female, medial view; *k*, distal end of left 2nd antenna of adult male, lateral view; *l*, endopodite of left 2nd antenna of adult male, lateral view; *m*, exopodite of 2nd antenna of adult male (only bristle of 2nd joint shown); *n*, left mandible of adult male, lateral view; *o*, lateral eye of adult male; *p-r*, lateral views of left and right lamellae of furca of either adult male or female (teeth of claws not shown on *r*). *s*, *t*, slide 2: *s*, lamella of furca of adult female; *t*, furcal lamella of A-1 male (only claw 1 of right lamella shown).

vicinity of distal dorsal corner; sensory bristle with 4 or 5 short proximal filaments and 2 long distal marginal filaments. 6th joint minute, with small medial bristle. 7th joint: a-bristle slightly longer than bristle of 6th joint; b-bristle about twice length of a-bristle, with 1 proximal and 2 distal marginal filaments; c-bristle with about 6 short proximal filaments and 2 longer distal marginal filaments (tip of c-bristle broken off on illustrated limb). 8th joint: d- and e-bristles long, bare with blunt tips (tips broken off on illustrated limb); f-bristle with 1 distal marginal filament and bifurcate tip; g-bristle longer than f-bristle, with 2 short proximal filaments, 1 longer distal filament, and bifurcate tip. c-, d-, e-, g-bristles all about same length as sensory bristle of 5th joint.

Second Antenna (Figure 2d): Protopodite bare. Endopodite 3-jointed: 1st joint short, with 5 bristles (4 proximal, 1 near middle); 2nd joint elongate with 3 ventral bristles near middle; 3rd joint elongate with 2 small subterminal bristles and 1 small dorsal bristle near middle. Exopodite: long 1st joint with minute tubelike medial bristle on distal margin; bristles of joints 2-8 relatively short, all with stout ventral spines; 9th joint with 6 bristles (2 of these minute; 2 of the longer bristles with ventral spines); joints 2-8 with basal spines (spines on joints 3-5 stouter than spines on other joints); joints 2-8 with minute spines forming row along distal margin.

Mandible (Figure 2e,f): Coxale endite bifurcate, pectinate distally, long hairs proximally, basal bristle not observed. Basale: medial surface spinous, with 4 proximal bristles (2 pectinate, unringed, 2 ringed) near ventral margin, and 1 bristle near middle of ventral margin; ventral margin with 1 distal bristle; lateral side spinous, with 4 bristles near ventral margin; dorsal margin with 3 bristles (1 near middle, 2 distal). Exopodite about same length as dorsal margin of 1st endopodial joint, hirsute distally, with 2 subterminal bristles. 1st endopodial joint with medial spines and 3 ventral bristles. 2nd endopodial joint with proximal medial spines and dorsal hairs, 3 dorsal bristles near middle of margin, 1 subterminal bristle on ventral margin, and 3 small spinelike

unringed lateral bristles on distal margin (Figure 2f). End joint with 1 stout claw, 1 long slender bristle ringed distally, 3 short ringed medial bristles, and 1 minute unringed spinelike bristle located dorsal to the 3 short bristles.

Maxilla (Figure 2g): 3 endites present, each with spinous and pectinate bristles. Coxale with short, stout, hirsute bristle. Basale with 2 long bristles (1 dorsal, 1 ventral). Exopodite well developed, with 3 bristles (2 long, spinous; 1 short, hirsute). 1st endopodial joint very broad, with 1 proximal bristle near basale, 1 spinous alpha-bristle, 2 or 3 beta-bristles with few short marginal spines; joint with hairs near dorsal margin. 2nd endopodial joint with 2 or 3 slender, ringed a-bristles with short marginal spines, 2 pectinate c-bristles with slender ringed tips, and total of 5 pectinate b- and d-bristles (of these, anterior b-bristle with slender ringed tip).

Fifth Limb (Figure 2h): Epipodial appendage with 50 bristles. Endite I with 4 bristles; endite II with 5 bristles; endite III with about 6 bristles. Exopodite: 1st joint consisting of long curved tooth with small proximal and distal secondary tooth; a short bristle present near base of tooth; 2nd joint with long fanglike tooth with 2 additional teeth along inner margin, each additional tooth with a small secondary tooth; 3 bristles present on limb proximal to teeth; inner lobe of 3rd joint with 2 bristles with short marginal spines, outer lobe with 2 hirsute bristles; combined 4th plus 5th joints with total of 4 spinous bristles.

Sixth Limb (Figure 2i): Endite I with 3 spinous bristles (2 medial, 1 terminal); endite II with 3 or 4 spinous bristles; endite III with 6 spinous bristles; endite IV with 4 or 5 spinous bristles. End joint projecting posteriorly, with 13 or 14 spinous or hirsute bristles. 2 or 3 bristles with long proximal hairs present in place of epipodial appendage.

Seventh Limb (Figure 2j): 4 bristles in proximal group (2 on each side) and 5 in terminal group (2 or 3 on each side); each bristle with up to 6 bells and marginal spines; bristles tapering distally (a juvenile character). Terminus consisting

of comb of about 8 teeth opposite 1 or 2 small pegs.

Furca (Figures 2k, 3t): Each lamella with 6 claws; claws 1, 2, 4 stout primary claws; claws 3, 5, 6 small secondary claws; all claws with teeth along posterior margin; lamella following claws with hairs; medial hairs present near base of claw 1.

Bellonci Organ (Figure 2l): Elongate with proximal suture followed by broad section tapering to pointed tip; minute fine hairs present on distal part.

Eyes (Figure 2l): Medial eye with brown pigment, bare. Lateral eye slightly larger than medial eye, with brown pigment and about 7 minute scattered ommatidia, some divided by suture.

Posterior of Body (Figure 2k): Middle part with spines.

DESCRIPTION OF CARAPACES OF TYPE MATERIAL.—One of Brady's slides from Vuna Point, Fiji Islands (slide 4 herein), contains the flattened valves of a specimen of unknown sex and maturity. Surface reticulations (Figure 3a) are similar to those of the A-1 male described herein (Figure 1). A dry complete specimen from Levuka, Fiji Islands, on a slide prepared from Brady's material by Dr. K. G. McKenzie, resembles the specimen illustrated by Brady (1890, pl. I: figs. 23, 24). It has circular bosses and is brown as mentioned by Brady (1890:92), but also contains numerous minute reticulations, such as those present on the flattened valves (Figure 3a), and on the newly collected A-1 male (Figure 1).

DESCRIPTION OF APPENDAGES OF ADULT FEMALE (Figure 3b-i, p-r, s).—*First Antenna*: Similar to that of A-1 male illustrated herein.

Second Antenna (Figure 3b, c, j): Protopodite bare. Endopodite 2-jointed (Figure 3b, part only on 3j): 1st joint with 5 bristles (4 short, 1 long); 2nd joint with 2 bristles (1 subterminal, 1 terminal). Exopodite: long 1st joint with minute medial bristle on distal margin; bristle of short 2nd joint reaching 7th joint, with slender ventral spines; bristles of joints 3-5 short, with stout ventral spines except on last segment on which ventral spines are slender (Figure 3c); bristles of joints 6-

8 with long bristles with very faint natatory hairs but no ventral spines; short 9th joint with 4 bristles (3 long, 1 fairly long), all with very faint natatory hairs, no ventral spines; joints 3-8 short, with basal spines (basal spine of 2nd joint about half length of 4th joint, basal spine of 8th joint about same length as 9th joint).

Mandible: Limb similar to that of A-1 male illustrated herein with following exceptions: basale with 5 lateral bristles near ventral margin; 2nd endopodial joint of limbs on slide 3 with bristles along middle of dorsal margin forming 3 groups (1 bristle in proximal and distal groups, 3 bristles in middle group); 2nd endopodial joints of limbs on slide 1 with 2 or 3 bristles forming single dorsal group on right limb, left limb obscure.

Maxilla (Figure 3d): In general similar to that of A-1 male illustrated herein. One of the exopodial bristles very stout.

Fifth Limb (Figure 3e, f): 1st exopodial joint with elongate tooth with 4-6 stout teeth along inner margin. 2nd exopodial joint with elongate tooth with 2 large teeth along inner margin (distal of these with 4 or 5 stout teeth along inner margin, proximal of these with 2 stout teeth along inner margin). Remaining part of limb not examined in detail but, in general, similar to that of A-1 male illustrated herein.

Sixth Limb: Endite I with 3 bristles; endite II with 3 bristles; endite III with 6 bristles; endite IV with 6 bristles. End joint with 12 bristles. 2 small bristles in place of epipodial appendage.

Seventh Limb: Absent on slide 3, obscure and fragmented on slide 1.

Furca (Figure 3g): All claws separated from lamella by suture; each lamella with 2 stout claws followed by 1 small secondary claw, then 1 stout claw, and 2 or 3 small secondary claws; all claws with small teeth along posterior margins.

Bellonci Organ (Figure 3h): Broadening in middle part, then tapering to finely pointed tip; suture may be present just proximal to broad middle part.

Eyes: Lateral eyes small, each with 4 divided

ommatidia (Figure 3i). Medial eye fragmented, distal end shown as dashed line in Figure 3h).

Y-Sclerite (Figure 3g): Similar to that of A-1 male.

DESCRIPTION OF APPENDAGES OF ADULT MALE (Figure 3k-o,p-r).—*First Antenna* (Figure 3k): 1st joint without bristles. 2nd joint with 3 bristles (1 ventral, 1 dorsal, 1 lateral); 3rd joint short with 2 bristles (1 dorsal, 1 ventral). 4th joint long, with 4 bristles (1 dorsal, 3 ventral). Sensory bristle of minute 5th joint with numerous filaments at distal end of proximal broadened part (distal end of stem broken off appendage examined). 6th joint with short medial bristle near dorsal margin. 7th joint: a-bristle short; b-bristle about 3 times length of a-bristle, with several short filaments (exact number difficult to ascertain on 2 appendages examined); c-bristles very long, with numerous short filaments (filaments not shown on illustrated limb). 8th joint: d- and e-bristles bare with blunt tips; f-bristle similar to c-bristle; g-bristle stout, with short filaments (distal part broken off on 2 appendages examined).

Second Antenna (Figure 3l,m): Protopodite bare. Endopodite 3-jointed: short 1st joint obscure; 2nd joint elongate, but exact number of bristles near middle obscure; 3rd joint elongate, reflexed on 2nd joint, with 1 proximal bristle on ventral margin, and undulate dorsal margin; tip obscure, but may have 2 minute bristles. Exopodite: 1st and 3rd joints elongate, remaining joints short; 2nd joint with short bristle with ventral spines; bristles of joints 3-8 long with natatory hairs, no ventral spines; 9th joint with 4 stout bristles; basal spines, if present, minute (could not see them on poorly preserved appendages examined).

Mandible (only right limb present on slide 1) (Figure 3n): Coxale endite not observed with certainty. Basale: medial surface with 3 short faint bristles near ventral margin (2 proximal, 1 near middle); lateral surface with 5 bristles near or on ventral margin (these are longer than those on female and have wreaths of long hairs near middle); ventral margin with long distal bristle with wreaths of long hairs near middle; dorsal

margin with 3 bare bristles (1 near middle, 2 terminal). Exopodite similar to that of female. 1st endopodial joint with 3 fairly long bristles (the longest of these with wreaths of long hairs near middle). 2nd endopodial joint: dorsal margin with proximal spines and 3 bristles forming 2 groups (1 bristle in proximal group, 2 in distal group); ventral margin with spines forming 5 rows proximal to short distal bristle (these spines not present on mandible of adult female or A-1 male); medial and lateral surfaces of joints with spines forming rows. End joint with 1 long stout claw, 1 long bristle, and 3 short medial bristles; minute unringed bristle similar to that on limb of A-1 male illustrated herein may be present medial to long claw, but could not be observed with certainty.

Maxilla: Obscure on slide 1.

Fifth Limb: Obscure on slide 1, but 1st and 2nd exopodial joints without large teeth like those of female.

Sixth Limb: Obscure on slide 1, but in general similar to that of female.

Seventh Limb: Limbs obscure on slide 1, but proximal group seems to consist of 3 bristles (1 on one side, 2 on other), and distal group consists of 5 bristles (2 on one side, 3 on other; one of the distal bristles twice length of other bristles and with about 7 bells). Terminus with comb of few teeth on one side, opposite side obscure.

Furca (Figure 3p-r): Similar to that of adult female.

Bellonci Organ: Not visible on slide 1.

Eyes (Figure 3o): Well developed, about 4 times length of lateral eye, with about 13 ommatidia (3 of these much larger than others).

REMARKS.—The above description is based on the poorly preserved appendages on slides in the Brady Collection. Poulsen (1962:388) described on adult male from New Caledonia that he identified as *Euphilomedes agilis* Brady, but which I have questionably referred to *Pleoschisma moroides* herein. The mandible of Poulsen's specimen differs from the one described herein in having a 2nd claw on the end joint, and in some additional characters. My decision to refer Poulsen's speci-

men to *P. moroides* is based to some degree on its having been collected in one of the type-localities of *P. moroides*. Also, the carapace of Poulsen's specimen contained several bristles at the upper end of the posterior infold. Similar bristles are present on the A-1 male of *P. moroides* from Fiji described herein, but are not present on the adult male of *Euphilomedes agilis* from New Zealand described by Kornicker (1975:294). Additional study of new material from New Caledonia, the Fiji Islands, and New Zealand is necessary to clarify the relationships of populations of *Pleoschisma* living in the three areas.

REMARKS CONCERNING DESCRIPTIONS AND ILLUSTRATIONS OF APPENDAGES OF *Pleoschisma moroides* BY BRADY (1897:92, pl. XVII: figs. 1-11).—Only major differences between Brady's illustrations and what my study revealed are discussed here.

Male First Antenna (Brady, 1897, pl. XVII: Fig. 1): Brady shows filaments along the margin of the broad proximal part of the sensory bristle of the 5th joint. I could detect filaments only at the distal end of the broad proximal part (Figure 3k).

Male Second Antenna (Brady, 1897, pl. XVII: figs. 2,5): I did not see striations on the protopodite. The endopodites I examined were in such poor condition that I could not verify the number of bristles on the 1st and 2nd joints.

Female Second Antenna (Brady, 1897, pl. XVII: figs. 3,4): Although the illustrated exopodite is that of an adult female, the endopodite more closely resembles that of a juvenile male. I examined all specimens on Brady's slides and could find no females with an endopodite of this type. None of the adult or juvenile males on the slides have exopodites like that illustrated by Brady. Brady's figure 4 supposedly is a detail of the bristle of the 2nd exopodial joint. On the specimens I examined the bristle of the 2nd joint of the female exopodite has slender spines, whereas stout spines such as those shown by Brady are present on the bristles of joints 3-5.

Male Mandible (Brady, 1897, pl. XVII: fig. 7): The mandible I examined has an exopodite similar to that of the female.

Furca (Brady, 1897, pl. XVII: fig. 10): All claws are separated from lamella by suture on all specimens I examined.

Seventh Limb (Brady, 1897, pl. XVII: fig. 9): The terminus I examined contained the usual type comb on one side, but the other side was obscure on Brady's slide. The newly collected A-1 male I examined has 1 or 2 small pegs opposite the comb.

Genus and Species Indeterminate

Pleoschisma reticulata Brady, 1890:514, pl. IV: figs. 11, 12.—Müller, 1912:52 [referred species to "Cyprindinidarum genera dubia et species dubiae"].

HOLOTYPE.—Dry complete specimen, appendages unknown, length 0.52 mm. Unique specimen.

TYPE-LOCALITY.—Unknown, but probably South Seas.

MATERIAL.—Holotype. I received from Dr. K. G. McKenzie a specimen that he had obtained from the Hancock Museum, Newcastle-upon-Tyne, and had remounted. The present slide is labeled "*Pleoschisma reticulata* Brady, 1890, Holotype, Loc: unknown, B475, K.G.M. July, 1967."

SUPPLEMENTARY DESCRIPTION OF HOLOTYPE.—Specimen white, about same size as that given by Brady; reticulations not visible with dissecting microscope using 4X objectives; otherwise similar to specimen illustrated by Brady (1890: pl. IV: figs. 11, 12).

REMARKS.—Without knowledge of the appendages it is not possible to refer this specimen with certainty to a particular genus. The small size suggests that it is a juvenile. It will be necessary to soften the holotype and to examine the appendages to identify the species, for without knowledge of the type-locality it is not possible to study topotypes. The specimen may prove to be an early instar of *Pleoschisma moroides*. For the specific name to be in the same gender as the genus, the species should be *Pleoschisma reticulatum*.

SARSIELLIDAE Brady and Norman, 1896

SARSIELLINAE Brady and Norman, 1896

Ancohenia Kornicker, 1976

TYPE-SPECIES.—*Ancohenia hawaiiensis* Kornicker, 1976, monotypy.

Key to the Species of *Ancohenia*

Adult Males

- 7th limb with 2 proximal bristles **A. robusta**
 7th limb without proximal bristles **A. hawaiiensis**

***Ancohenia robusta* (Brady, 1890), new combination**

FIGURES 4, 5

- Pleoschisma robusta* Brady, 1890:513 [probably only part], pl. IV: figs. 13, 14 (?).
Sarsiella robusta.—Brady, 1897:94, pl. XVII: figs. 14, 15.—Müller, 1912:42.
Eusarsiella robusta.—Poulsen, 1965:83.

HOLOTYPE.—None selected. Syntypes at the Hancock Museum, Newcastle upon Tyne. Syn-type-locality: Vuna Point, Taveuni, Fiji; low-tide pools.

MATERIAL.—At my request, Mr. Albert G. Long, the Hancock Museum, Newcastle-upon-Tyne, sent me three glass slides of *Pleoschisma robusta* Brady from the Brady Collection. For reference purposes I have numbered these slides 1–3. The slides have partly dried out, and structures are generally obscure.

Slide 1: This slide contains most of the appendages of an adult male and 2 fragments of a valve. The slide bears 2 labels: 1, a small label on which is printed "Hancock Museum, Newcastle-on-Tyne"; 2, a label on the left side containing the handwritten information, "*Sarsiella* ♂, *Cypridina* (with 3 lines through it crossing out the name), *Pleoschisma robusta* n. sp. Vuna Point, Fiji." The handwriting appears to be the same, but the words "*Sarsiella*" and "Fiji" are darker than the other words on the label.

Slide 2: This contains a few appendages of an adult male and some appendages of 2 females (developmental stage uncertain). The appendages on this slide are in much poorer condition than those on slide 1, but all are from specimens in the subfamily Sarsiellinae. In addition to the printed label "Hancock Museum, Newcastle-on-Tyne," this slide bears 2 handwritten labels: (1) label on right states "Vuna Point, Fiji" and con-

tains a pink paper disc glued to the label; (2) label on left states "♂ & ♀, *Sarsiella*, *Pleoschisma robusta*, G.S.B., types." The handwriting appears to be the same but the word "*Sarsiella*" is darker than the other words on the labels.

Slide 3: This slide, which has a only part of the cover slip remaining, bears the fragments of valves in very poor condition. The labels have the same information as on slide 2, including the pink disc, with the following exceptions: (1) the word "*Sarsiella*" is not present, and (2) the words "shell only" appear on the left label.

In addition to the above glass slides, I had received from Dr. K. G. McKenzie in 1976 two cardboard slides he had prepared from Brady's material at the Hancock Museum. Each slide contains one closed dry carapace (although they may contain appendages, they are not evident). Each slide is labeled "*Pleoschisma robusta* Brady, 1890. Loc: Vuna Point, Taviuni, Fiji, K.G.M. July 1967." One of the slides also contains the number "B473" and the word "syntype." The other slide contains within brackets the words "non *robusta*." In my opinion, the "syntype" is a male in the subfamily Sarsiellinae, whereas the specimen marked "non *robusta*" belongs in the subfamily Philomedinae and probably in the genus *Pleoschisma*.

METHODS.—The appendages on slide 1 are in much better condition than those on slide 2, and all appear to belong to the same specimen, an adult male. Therefore, the appendages on slide 1 were used herein to describe the species. The label on slide 1 does not state that the specimen is part of the type-series, but it is from the type-locality. The appendages of the adult male on slide 2, which is labeled "type," are mostly in poor condition, but the mandible and 1st and 2nd antenna are sufficiently similar to those on slide 1 to conclude that the adult males on each slide are

conspecific. Endopodites of female 2nd antennae on slide 2 are obscure but appear to be similar to those of the female *Ancohenia hawaiiensis* (Kornicker, 1976: fig. 8d). This suggests that male and females on slide 2 are probably conspecific.

The fragments of shell on slide 3 bear pits similar to those on the carapace on the slide prepared by K. G. McKenzie, which is labeled "syntype," and in my opinion is a male in the Sarsiellinae. Pits are commonly present on species in diverse ostracode families, so it is not possible to conclude with certainty that the dry specimen is conspecific with the males on slides 1 and 2, but I think it likely and therefore have illustrated the dry specimen in Figure 4.

DESCRIPTION OF ADULT MALE (Figures 4, 5).—Carapace with distinct but shallow sinus (Figures 4, 5a) and truncate posterior; dorsal margin arched but fairly linear in posterior half; ventral margin evenly convex (Figure 4). (Although a small caudal process is shown in Figure 4, its presence is uncertain because this area is covered by debris on the specimen.)

Ornamentation: Surface with distinct, closely spaced, round fossae. Long bristles abundant along free margins and sparsely distributed on valve surface (Figure 5a).

Size: Dry specimen on slide B473, length 0.96 mm, height 0.76 mm.



FIGURE 4.—*Ancohenia robusta* (Brady), slide B473, adult male, length 0.96 mm, complete specimen, anterior to right.

First Antenna (Figure 5b): 1st joint without bristles. 2nd with 1 distal dorsal bristle. 3rd and 4th joints fused; short 3rd joint with single dorsal bristle; long 4th joint with 2 bristles (1 ventral, 1 dorsal). 5th joint small, wedged ventrally between 4th and 6th joints, bristle with stout cuplike proximal part with numerous filaments and stout, long, bare stem. 6th joint long, with 1 short medial bristle. 7th joint; a-bristle small; b-bristle about same length as a-bristle but with broad proximal part; c-bristle long, with 2 small proximal filaments. 8th joint: d- and e-bristles bare, with blunt tips; d-bristle shorter and narrower than e-bristle; f-bristle and g-bristle long, clawlike proximally but bristle-like with rings distally (tip of f-bristle missing on appendage illustrated), each bristle with short proximal filament.

Second Antenna (Figure 5c): Protopodite bare. Endopodite 3-jointed: 1st joint short, with 2 proximal anterior bristles; 2nd joint elongate with 2 long proximal bristles; 3rd joint elongate, reflexed on 2nd joint, with broad rounded tip with transverse ridges and 2 minute bristles. Exopodite: 1st joint elongate, remaining joints short, decreasing in size distally, 9th joint minute, with 2 bristles, 1 short, 1 fairly long with natatory hairs; joints 2–8 with long natatory bristles, some with small slender ventral spines in addition to hairs.

Mandible (Figure 5d): Coxale endite not observed. Basale: ventral margin fragmented but with 1 small proximal bristle remaining (2 long bristles like those present on the ventral margin of the basale of *Ancohenia hawaiiensis* illustrated in Kornicker (1976, fig. 12h) may have been present on the mandible of *A. robusta* illustrated herein, but are now missing); medial surface of limb with 2 small faint bristles in proximal ventral corner; dorsal margin with 2 short bristles (1 near middle, 1 subterminal). Exopodite not observed. Endopodite: 1st joint with stout terminal claw and 2 small bristles; 2nd joint with stout ventral claw and 1 dorsal midbristle; 3rd joint with long stout claw and 2 bristles (1 ventral, 1 dorsal).

Maxilla: Not observed.

Fifth Limb: Exopodite reduced with few weak bristles.

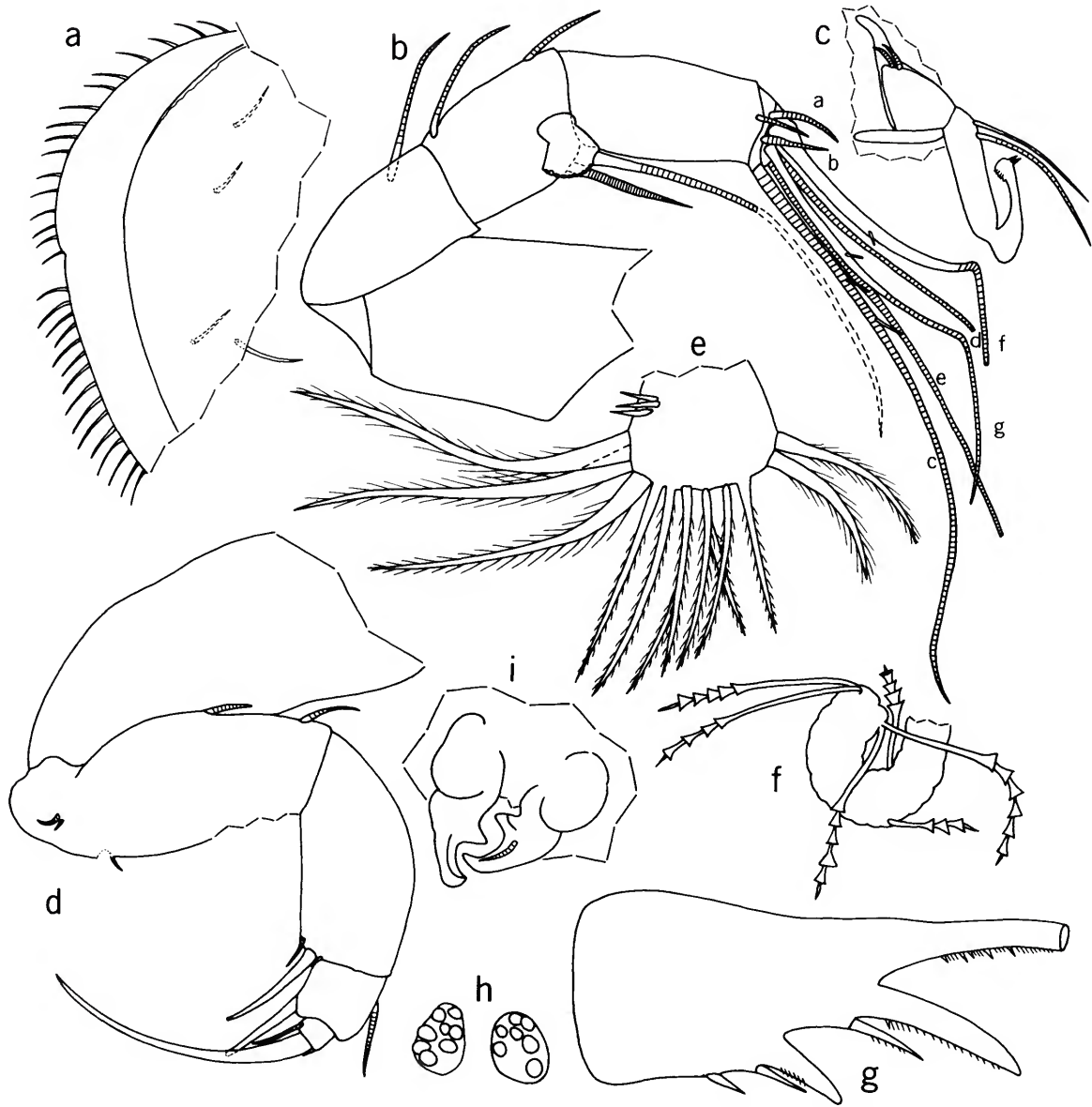


FIGURE 5.—*Ancohenia robusta* (Brady), slide 1, adult male: *a*, anterior of right valve, inside view; *b*, left 1st antenna, medial view; *c*, endopodite of left 2nd antenna, medial view; *d*, left mandible, medial view; *e*, 6th limb; *f*, 7th limb; *g*, left lamella of furca, medial view; *h*, lateral eyes; *i*, copulatory organ (not all bristles shown).

Sixth Limb (Figure 5e): Single endite with 3 small bristles. End joint with 3 very long spinous anterior bristles followed by about 7 slender spinose bristles and then 2 long, hirsute, posterior bristles.

Seventh Limb (Figure 5f): Limb with 4 terminal bristles (2 on each side) and 2 proximal bristles (1 on each side); each bristle with up to 6 bells. Terminus with central depression but without teeth.

Furca (Figure 5g): Each limb with primary claws 1, 2, and 4 fused to lamella, and secondary claws 3, 5, and 6 separated from lamella by suture. Most claws with teeth along posterior margins.

Bellonci Organ: Not observed.

Eyes: Medial eye not observed. Lateral eyes fairly large, each with 7 or 8 ommatidia (Figure 5h).

Copulatory Organ (Figure 5i): Consisting of a lobe on each side of body, each terminating in sclerotized hook. (Only 1 bristle shown on illustrated organ, but others that may be present obscure on organ examined.)

REMARKS.—The appendages of the male *A. robusta* are, in general, quite similar to those of *A. hawaiiensis* (Kornicker, 1976:11, figs. 12,13). Some of the differences may result from obscurity of the preserved appendages of *A. robusta* available for study. The nonobservance of an exopodite on the mandible of *A. robusta* may be an example of this. A real difference is the presence of 2 proximal bristles on the 7th limb of *A. robusta*; these are absent on *A. hawaiiensis*. The latter difference, unless it should prove to be the result of intraspecific variability, may be useful in identification.

Literature Cited

- Brady, G. S.
 1890. On Ostracoda Collected by H. G. Brady, Esq., LL.D., F.R.S., in the South Sea Islands. *Transactions of the Royal Society of Edinburgh*, 35(part 2, number 14):489-525.
 1897. A Supplementary Report on the Crustaceans of the Group Myodocopa Obtained during the *Challenger* Expeditions with Notes on Other New or Imperfectly Known Species. *Transactions of the Zoological Society of London*, 14(part 3, number 7):85-100.
 1902. On New or Imperfectly Known Ostracoda, Chiefly from a Collection in the Zoological Museum, Copenhagen. *Transactions of the Zoological Society of London*, 16(part 4, number 1):179-210.
- Brady, G. S., and A. M. Norman
 1896. A Monograph of the Marine and Fresh Water Ostracoda of the North Atlantic and of Northwestern Europe. *Scientific Transactions of the Royal Dublin Society*, series 2, 5:621-684.
- Hartmann, Gerd
 1959. Zur Kenntnis der lotischen Lebensbereiche der pazifischen Küste von El Salvador unter besonderer Berücksichtigung seiner Ostracodenfauna. *Kieler Meeresforschungen*, 15(2):187-241.
- Hiruta, S.
 1976. *Euphilomedes nipponica* n. sp. from Hokkaido, with a Redescription of *E. sordida* (G. W. Müller) (Ostracoda; Myodocopina). *Journal of the Faculty of Science, Hokkaido University*, series VI, Zoology, 20(3):579-599.
- Juday, Chauncy
 1907. Ostracoda of the San Diego Region, II: Littoral Forms. *University of California Publications in Zoology*, 3(9):135-156.
- Kornicker, L. S.
 1975. Antarctic Ostracoda (Myodocopina). *Smithsonian Contributions to Zoology*, 163 [in two parts]: 720 pages, 432 figures, 9 plates.
 1976. Benthic Marine Cypridinacea from Hawaii (Ostracoda). *Smithsonian Contributions to Zoology*, 231:1-24, figures 1-19.
- Kornicker, L. S., and F. E. Caraion
 1977. West African Myodocopid Ostracoda (Cypridini-
 dae, Philomedidae). *Smithsonian Contributions to Zoology*, 241: 100 pages, 51 figures, 28 plates.
- Müller, G. W.
 1890. Neue Cypridiniden. *Zoologische Jahrbuecher*, 5:211-252.
 1894. Die Ostracoden des Golfes von Neapel und der angrenzenden Meeres-Abschnitte. In *Fauna und Flora des Golfes von Neapel*, 21: 404 pages, 40 plates.
 1906. Die Ostracoden der Siboga-Expedition. In *Siboga-Expedition*, 30: 40 pages, 9 plates. Leiden: E. J. Brill.
 1912. Ostracoda. In *Das Tierreich*, 31: 434 pages, 92 figures.
- Poulsen, E. M.
 1962. Ostracoda-Myodocopa, 1: Cypridiniformes-Cypridinidae. In *Dana Report*, 57: 414 pages, 181 figures. Copenhagen: Carlsberg Foundation.
 1965. Ostracoda-Myodocopa, 2: Cypridiniformes-Rutidermatidae, Sarsiellidae and Asteropidae. In *Dana Report*, 65:1-484, 156 figures. Copenhagen: Carlsberg Foundation.
- Sylvester-Bradley, P. C.
 1961. Myodocopida. In R. C. Moore, editor, *Treatise on Invertebrate Paleontology*, 3 (Q):387-406. Lawrence, Kansas: Geological Society of America and University of Kansas Press.
- Thomson, G. M.
 1879. On the New Zealand Entomostraca. *Transactions and Proceedings of the New Zealand Institute*, 11:251-263, plate 11.

REQUIREMENTS FOR SMITHSONIAN SERIES PUBLICATION

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

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

Copy must be typewritten, double-spaced, on one side of standard white bond paper, with 1 $\frac{1}{4}$ " margins, submitted as ribbon copy (not carbon or xerox), in loose sheets (not stapled or bound), and accompanied by original art. Minimum acceptable length is 30 pages.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

