THE COMMON MARINE ISOPOD CRUSTACEA OF PUERTO RICO

A Handbook for Marine Biologists

by

ROBERT J. MENZIES
and
PETER W. GLYNN

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104. Robert J. Menzies & Peter W. Glynn

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„Wij kunnen niet allen metselaar zijn:
er moeten er ook zijn die de steenen aandragen"

STUDIES ON THE FAUNA OF CURAÇAO AND OTHER CARIBBEAN ISLANDS: No. 104.

THE COMMON MARINE ISOPOD CRUSTACEA OF PUERTO RICO

A HANDBOOK FOR MARINE BIOLOGISTS

by

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(Duke University, Durham, North Carolina)

and

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(Institute of Marine Biology, University of Puerto Rico, Mayagüez)

PREFACE

This treatment of the common marine isopod crustaceans of Puerto Rico is the second in a planned series of handbooks on marine isopods from various parts of the world. The first handbook (MENZIES & FRANKENBERG, 1966) dealt with the shelf fauna of the state of Georgia, U.S.A. Like the Georgia handbook this one is intended for graduate and undergraduate students who need a reference to a species encountered in their studies. The professional taxonomist will find the handbook of limited use only, because detailed synonymies are lacking and no concerted effort has been made to exhaust all nomenclatural problems. The illustrations are original, prepared from Puerto Rican specimens, and are not just copies from earlier works. Descriptions of previously known species are deliberately limited to diagnostic features in order that the text could be kept at minimal size. In contrast, new species are fully described and illustrated in considerable detail.

Present adresses: MENZIES, Dept. Oceanogr. Florida State Univ., Tallahassee. GLYNN, Smiths. Trop. Res. Inst., Balboa, Canal Zone.

This handbook departs a little from the style of the Georgia paper in that separate keys are given to various subgroups of higher taxa.

The collections on which this study is based come from a one month's collecting trip made by the senior author in the summer of 1966.

This trip was sponsored by the University of Puerto Rico through the cooperation of Dr. MÁXIMO CERAME VIVAS and Dr. GUSTAVO CANDELAS, Chairman, Department of Biology. Assistance in the field, which involved SCUBA diving, was given by Mr. and Mrs. HERBERT AUSTIN, graduate students of Dr. CERAME VIVAS. Added collecting assistance was provided by the junior author and Mr. FRANCISCO FERNÁNDEZ IRIZARRY of the Institute of Marine Biology, Mayagüez, Puerto Rico and by Mr. PETER CASTRO of the Department of Zoology, University of Hawaii. Aid in the field was also given by Dr. and Mrs. ERIC MATTHEWS. More than two years of collections of isopods associated with coral reefs in Puerto Rico were contributed by the junior author. The algae were identified by Dr. LUIS R. ALMODÓVAR of the Institute of Marine Biology, Mayagüez.

Support for the dissection, illustration, and identification of specimens was provided by the Smithsonian Institution, Museum of Natural History. This support included space and museum facilities and allowed the writers access to type materials, an excellent library, and the stimulating atmosphere of colleagues at the museum. In particular we thank Dr. I. E. WALLEN for arranging for this support. We further appreciate the technical assistance provided by Dr. LOUIS S. KORNICKER and Dr. J. LAURENS BARNARD. Opportunity to discuss technical problems with Dr. THOMAS E. BOWMAN and Dr. RAYMOND MANNING and to receive their comments on this work while it was in progress and in manuscript stage has allowed us to make several technical improvements.

This work represents a joint contribution from the Duke University Marine Laboratory, Beaufort, North Carolina, the Zoology Department, Duke University, Durham, North Carolina and the Institute of Marine Biology, University of Puerto Rico, Mayagüez and the Department of Biology at the Río Piedras campus.

Aspects of this work in the form of equipment and collections were supported by NSF grant No. GA-5220 and NSF grant No. GB-888 awarded to MENZIES and GLYNN, respectively.

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INTRODUCTION

The collecting sites from which isopods were obtained are located around the island (see p. 84). Concentrated collecting at several depths was done in the San Juan area at Boca de Cangrejos and at La Parguera where the Institute of Marine Biology is located.

Many collections were made by washing a substrate sample in a bucket of formalin sea water soon after collection. Motile animals such as isopods fall to the bottom of the bucket. Substrate samples taken with SCUBA techniques were carefully placed in a plankton net and transferred to a surface vessel without loss of specimens en route. The substrate was broken up to obtain the burrowers and discarded and the remaining liquid filtered through a No. 00 mesh plankton net. The filtrate was preserved in 70% ethanol and the isopods were removed later with the aid of a binocular dissecting microscope and placed in vials in 70% ethanol. Isopods kept in formalin lose carbonate and are not easily identified. In all cases care was taken not to contaminate the environment with discarded formalin sea water.

Dissections were carried out under the dissecting microscope with the specimens immersed in glycerol. Parts teased off with "minuten" insect pins were transferred to a drop of glycerol on a microscope slide and provided with a cover slip.

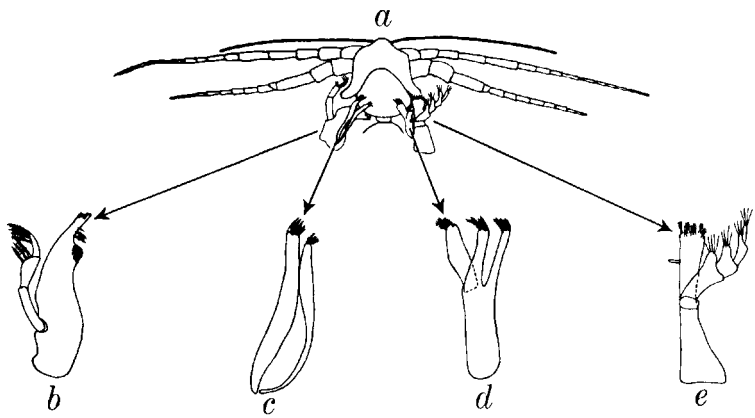
Illustrations were prepared with the aid of a Leitz microprojector unit and verified by inspection at higher magnification.

Body measurements given are of the greatest length, exclusive of antennae and uropods, and greatest width.

Types and uniques have been deposited in the collections of the United States National Museum where they are provided with a catalog number (USNM Cat. No.). A reference collection of identified species has been deposited in the collections of the Institute of Marine Biology at Mayagüez.

PREVIOUSLY KNOWN PUERTO RICAN SPECIES

Previous studies on the marine isopod fauna of Puerto Rico are indeed scarce. We have been able to find only the work of MOORE (1902) entitled "Report on Porto Rican Isopoda" in which 13 species



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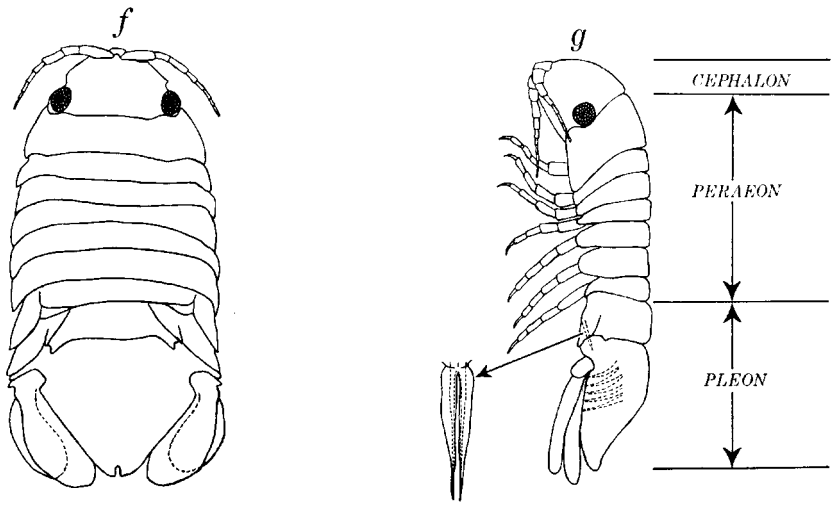
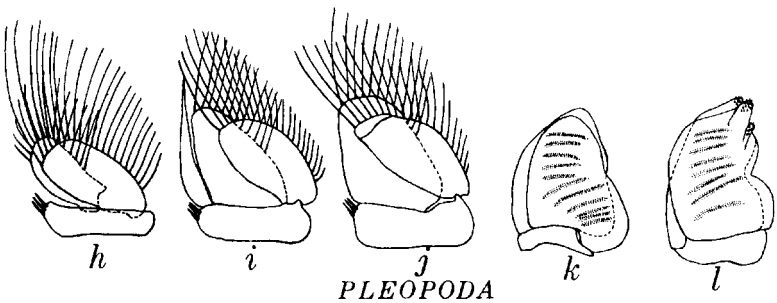


DORSAL AND LATERAL ASPECT



PLEOPODA

are listed and described. The majority of the Puerto Rican species have been described from islands other than Puerto Rico in the West Indies in a variety of small papers. Most of these are listed in the References section. Whether or not there exists species of marine isopods indigenous to Puerto Rico can not be determined today because the fauna of the West Indies is generally so poorly known.

The 13 known marine species in MOORE's (1902) list have undergone five subsequent changes in nomenclature. His list, with the changed nomenclature immediately after each species, follows:
Cirolana mayana Ives*
Cirolana parva Hansen*
Cirolana obtruncata Richardson
Branchuropus littoralis Moore* = *Eurydice littoralis* (Moore)
Corallana tricornis Hansen* = *Excorallana tricornis* (Hansen)
Alcirona hirsuta Moore* = *Alcirona insularis* Hansen
Nalicora rapax Moore
Aega ecarinata Richardson
Rocinela signata Schiödte & Meinert*
Anilocra laticauda Milne Edwards*
Cilicea caudata Ives* = *Paracerceis caudata* (Say)
Dynamene perforata Moore* = *Dynamenella perforata* (Moore)
Cleantis planicauda Benedict

The nine species marked with asterisks were represented in the collections reported on here. Three of the five species which were not in our collections came from deep water between 25 and 310 fathoms and were not expected to occur in shallow water. The absence of *Cleantis planicauda* Benedict from our collections is inexplicable.

FIGURE 1. ISOPOD MORPHOLOGY. – Schematic sketch of a sphaeromid isopod (male). (a) *view of anterior of cephalon.* Enlarged views of (b) right mandible showing the cutting edge or incisor, a setal row, the grinding surface or molar and the palp, (c) first maxilla, (d) second maxilla, and (e) maxilliped showing a coupling seta and the palp. *Dorsal* (f) and *lateral* (g) views indicate the three major body divisions: *cephalon*, containing antennae, mouth and mouth parts, and the eyes; *peraeon*, comprising seven segments, each of which bears a pair of peraeopods; *pleon*, made up partially of six fused segments of which the largest is the terminal pleotelson. The peni are illustrated in greater detail. The first through the fifth right hand members of the pairs of pleopoda are shown in (h) through (l), respectively. A male stylet (appendix masculinum) is shown along the medial margin of the endopod in the second pleopod. The exopods of pleopods four and five are fleshy with pleated, respiratory folds, characteristic of the hemibranchiate condition.

Anatomy and Nomenclature

The isopod crustacean (Figure 1, a–l) has three major body divisions: the *cephalon* or head with mouth parts, eyes and antennae, the *peraeon* consisting of seven generally articulated somites (somites 2–8 of thorax) each bearing a pair of appendages called *peraeopods* or legs, and the *pleon* or abdomen which bears five pairs of natatory and respiratory appendages, the *pleopods*, and a terminal pair of appendages called *uropods*. The telson is usually fused with one or more pleonal somites to form the *pleotelson*.

The *cephalon* bears the first and second pair of antennae: Ant^1 and Ant^2. The first antenna is often shorter than the second and carries a flagellum bearing aesthetascs or sensory bristles. The mandible (Md) consists of a triarticulate palp, a toothed incisor, a toothed lacinia mobilis (left mandible), a setal row and a molar process.

The first maxilla, Mx^1 consists of two rami or lobes. The second maxilla, Mx^2 has an inner lobe and a bilobed outer ramus. The rami of the maxillae bear apical setae. Differences in number, size and shape of the rami of the maxillae identify certain genera. The apical setae increase in number with growth and are of limited taxonomic utility.

The maxilliped (Mxp) consists of an endite with a basically 5 – articulate palp (often reduced to 4 or 3) and an exopod of various shape called the epipod or exite. The maxilliped, embryologically a leg, has been incorporated into the *cephalon*. This is indicated by the presence of an occipital suture laterally on the *cephalon* and a dorsal occipital groove.

The *peraeopods* (P^1–P^7) have seven articles, the first (1) is the *coxal plate* or *epimeron* which is variously fused to the peraeonal somite. The *unguis* or claw is attached terminally to the seventh article or *dactyl*. Following the practice of Barnard (1920) these articles are numbered 1–7 from the body to the most distal article.

The five pairs of *pleopods* (Plp^1–Plp^5) are usually biramous, jointed or unjointed. The uropods are modified pleopods attached to the sixth pleonal somite. A seventh segment when present is identified as the *telson*. Pleopoda often bear plumose marginal setae (PMS).

Male isopods have a pair of openings or swellings on the ventral

surface of the seventh peraeonal somite called *genital apophyses* or *penes*; sometimes these are elongated and separated or fused. The male second pleopodal endopod bears a separate medial lobe called the *appendix masculinum* or male stylet. In asellote isopods the first and second pleopoda are modified as sperm transfer organs and an appendix masculinum is lacking. The pleopoda of many species bear natatory setae called here plumose marginal setae or simply PMS.

Female isopods usually bear paired brood plates or oostegites attached medially to the coxal plates of the anterior peraeopods.

List of potential Gulf and Caribbean marine Species

Not less than 91 species of marine isopods have been recorded from the Gulf and Caribbean region between Florida and Brazil inclusive of Bermuda. Some of these are deep water species and would not be expected to be found in the shallow waters of Puerto Rico.

The following list has been compiled mainly from Richardson (1905) plus a few scattered references such as Boone (1921), Pearse (1932), Bowman & Díaz Ungria (1957), and Menzies (1957).

This listing is given here mainly to indicate to the student that other species might be expected to occur in Puerto Rico.

1.	*Anthelura affinis* Richardson	Bermudas
*2.	*Calathura crenulata* Richardson	Yucatán and Bahamas
3.	*Paranthura infundibulata* Richardson	Bermudas
4.	*Paranthura verrillii* Richardson	Bermudas
5.	*Colanthura tenuis* Richardson	Bermudas
*6.	*Cirolana sphaeromiformis* Hansen	West Indies
*7.	*Cirolana mayana* Ives	Puerto Rico and Yucatán
8.	*Cirolana minuta* Hansen	West Indies
9.	*Cirolana gracilis* Hansen	West Indies
10.	*Cirolana albida* Richardson	Sugarloaf Key, Florida
11.	*Cirolana obtruncata* Richardson	Puerto Rico and Jamaica
*12.	*Cirolana parva* Hansen	West Indies, Florida and Gulf of México
13.	*Conilera cylindracea* (Montagu)	Cedar Keys, Florida
14.	*Eurydice spinigera* Hansen	West Indies
15.	*Eurydice convexa* Richardson	Florida
*16.	*Branchuropus littoralis* Moore	Puerto Rico
17.	*Bathynomus giganteus* Milne Edwards	West Indies and Gulf of México
*18.	*Colopisthus parvus* Richardson	Bermudas
*19.	*Excorallana tricornis* (Hansen)	Puerto Rico, Gulf of México and Florida

20.	*Excorallana sexticornis* (Richardson)	Florida
21.	*Excorallana quadricornis* (Hansen)	West Indies
22.	*Excorallana subtilis* (Hansen)	West Indies
23.	*Excorallana antillensis* (Hansen)	West Indies
24.	*Excorallana fissicauda* (Hansen)	West Indies
25.	*Excorallana oculata* (Hansen)	West Indies
26.	*Excorallana warmingii* (Hansen)	Yucatán
27.	*Alcirona krebsii* Hansen	West Indies
*28.	*Alcirona hirsuta* Moore	Virgin Islands
29.	*Nalicora rapax* Moore	Puerto Rico, Gulf of México, and Florida
30.	*Aega antillensis* Schiödte & Meinert	West Indies
31.	*Aega ecarinata* Richardson	Puerto Rico, Bahamas, and Florida
32.	*Aega tenuipes* Schiödte & Meinert	Cuba
33.	*Aega dentata* Schiödte & Meinert	Cuba
34.	*Aega incisa* Schiödte & Meinert	Florida
35.	*Aega gracilipes* Hansen	Gulf of México
36.	*Rocinela insularis* Schiödte & Meinert	Florida Keys, West Indies and Gulf of México
37.	*Rocinela dumerilii* (Lucas)	Cuba
38.	*Rocinela cubensis* Richardson	Cuba
*39.	*Rocinela signata* Schiödte & Meinert	Puerto Rico, Florida and Gulf of México
40.	*Aegathoa linguifrons* Richardson	Trinidad
41.	*Aegathoa oculata* (Say)	West Indies, Florida
42.	*Nerocila acuminata* Schiödte & Meinert	Bermudas, Florida and Gulf of México
*43.	*Anilocra laticauda* Milne Edwards	West Indies and Florida
44.	*Olencira praegustator* (Latrobe)	Florida
45.	*Ceratothoa impressa* (Say)	Brazil to New Jersey
46.	*Meinertia deplanata* (Bovallius)	West Indies
47.	*Agarna carinata* Schiödte & Meinert	West Indies
48.	*Cymothoa excisa* Perty	Massachusetts to Rio de Janeiro
49.	*Cymothoa caraibica* Bovallius	West Indies
50.	*Cymothoa oestrum* (Linnaeus)	Caribbean
*51.	*Lironeca redmanni* Leach	Cuba and Brazil
52.	*Lironeca orinoco* Bowman & Ungria	Venezuela
53.	*Irona nana* Schiödte & Meinert	Caribbean
*54.	*Limnoria tripunctata* Menzies	West Indies to Boston, Massachusetts
*55.	*Limnoria platycauda* Menzies	West Indies
*56.	*Limnoria pfefferi* Stebbing	West Indies
57.	*Limnoria simulata* Menzies	West Indies
*58.	*Paralimnoria andrewsi* (Calman)	West Indies
59.	*Sphaeroma destructor* Richardson	Florida
60.	*Sphaeroma quadridentatum* Say	Florida
*61.	*Exosphaeroma yucatanum* (Richardson)	Yucatán
62.	*Exosphaeroma faxoni* Richardson	Florida
63.	*Exosphaeroma crenulatum* Richardson	Bermudas

*64.	*Exosphaeroma nuttingi* Boone	Barbados
*65.	*Dynamene perforata* Moore	Puerto Rico
*66.	*Dynamene moorei* Richardson	Puerto Rico
67.	*Dynamene angulata* Richardson	Florida
68.	*Cilicaea linguicauda* Richardson	Yucatán
*69.	*Cilicaea caudata* (Say)	Puerto Rico
70.	*Arcturus caribbaeus* Richardson	Caribbean
71.	*Arcturus floridanus* Richardson	Florida
72.	*Idothea baltica* (Pallas)	Bermuda, Brazil
*73.	*Erichsonella filiformis* (Say)	Bahamas
74.	*Erichsonella floridana* Benedict	Key West, Florida
75.	*Cleantis planicauda* Richardson	Puerto Rico
*76.	*Stenetrium serratum* Hansen	West Indies
*77.	*Stenetrium occidentale* Hansen	West Indies
78.	*Stenetrium stebbingi* Richardson	West Indies
79.	*Stenetrium antillense* Hansen	West Indies
*80.	*Carpias bermudensis* Richardson	Bermudas
*81.	*Janira minuta* Richardson	Bermudas
*82.	*Jaeropsis rathbunae* Richardson	Bermudas
83.	*Eurycope caribbea* Benedict	West Indies
84.	*Grapsicepon edwardsii* Giard & Bonnier	Sargasso Sea
85.	*Pseudione curtata* Richardson	Key West
*86.	*Stegias clibanarii* Richardson	Bermudas
87.	*Probopyrus alphei* Richardson	North Carolina and Brazil
88.	*Probopyrus latreuticola* (Gissler)	North Carolina and Bahamas
89.	*Bopyrina abbreviata* Richardson	Bermudas and Florida
90.	*Bopyrina urocaridis* Richardson	Florida
91.	*Bopyrina thorii* Richardson	Florida

Those 27 marked with asterisks were encountered in this study. Some are apparently synonyms of other species as suggested by us in this report. Some have been transferred to other genera. They are listed here as they were reported in the literature.

List of Isopods collected

BOPYROIDEA

1. *Pseudione* sp.
2. *Stegias clibanarii* Richardson

VALVIFERA

3. *Erichsonella filiformis tropicalis*, n. ssp.
4. *Astacilla cymodocea*, n. sp.

GNATHIOIDEA

5. *Gnathia puertoricensis*, n. sp.

ANTHUROIDEA

6. *Mesanthura decorata*, n. sp.
7. *Mesanthura paucidens*, n. sp.
8. *Apanthura signata*, n. sp.
9. *Apanthuroides millae*, n. gen., n. sp.
10. *Pendanthura tanaiformis*, n. gen., n. sp.
11. *Accalathura crenulata* (Richardson)

CIROLANID-TYPE: CIROLANOIDEA

12. *Cirolana sphaeromiformis* Hansen
13. *Cirolana parva* Hansen
14. *Cirolana mayana* Ives
15. *Eurydice littoralis* (Moore)
16. *Colopisthus parvus* Richardson
17. *Excorallana tricornis* (Hansen)

18. *Alcirona insularis* Hansen
19. *Rocinela signata* Schiödte and Meinert
20. *Anilocra laticauda* Milne Edwards
21. *Lironeca redmanni* Leach

LIMNORIID-TYPE: CIROLANOIDEA

22. *Limnoria* (*L.*) *pfefferi* Stebbing
23. *Limnoria* (*L.*) *platycauda* Menzies
24. *Limnoria* (*L.*) *tripunctata* Menzies
25. *Paralimnoria andrewsi* (Calman)

SPHAEROMID-TYPE: CIROLANOIDEA

26. *Paracerceis caudata* (Say)
27. *Paracerceis nuttingi* (Boone)
28. *Sphaeroma walkeri* Stebbing
29. *Geocerceis barbarae*, n. gen., n. sp.
30. *Dynamenella perforata* (Moore)
31. *Dynamenella quadripunctata*, n. sp.
32. *Dynamenella acutitelson*, n. sp.
33. *Dynamenella dianae* (Menzies)
34. (?) *Dynamenella barnardi*, n. sp.
35. (?) *Exosphaeroma alba*, n. sp.
36. (?) *Exosphaeroma productatelson*, n. sp.

ASELLOTA

37. *Stenetrium occidentale* Hansen
38. *Stenetrium serratum* Hansen
39. *Stenetrium minocule*, n. sp.
40. *Antias milleri*, n. sp.
41. *Jaeropsis rathbunae* Richardson
42. *Bagatus stylodactylus* Nobili
43. *Bagatus bermudensis* (Richardson)
44. *Bagatus serricaudus*, n. sp.

SYNOPSIS OF CONTENTS

The foregoing list of species which are reported on in this study suggests that our knowledge of the isopod fauna was far from complete. Thus three genera are described as new, and 14 species or 32 percent of the fauna in the collections represent hitherto unknown and undescribed species. This summary of new forms, however, does not tell the full story because we have found it necessary to make a number of important changes regarding previously described species.

Nine species were transferred from one genus to another;

Dynamenopsis dianae Menzies	to *Dynamenella*
Dynamene moorei Richardson	to *Dynamenella*
Exosphaeroma nuttingi Boone	to *Paracerceis*
Exosphaeroma yucatanum (Richardson)	to *Paracerceis*
Clianella elegans Boone	to *Dynamenella*
Janira minuta Richardson	to *Bagatus*
Carpias bermudensis Richardson	to *Bagatus*
Munna "B" Monod	to *Antias*
Janira algicola Miller	to *Bagatus*

At least ten formerly described species are made synonyms of other known species as follows:

Rocinela aries Schiödte & Meinert – synonym of *Rocinela signata* Schiödte & Meinert

Dynamene moorei Richardson – synonym of *Dynamenella perforata* (Moore)

Exosphaeroma yucatanum (Richardson) – synonym of *Paracerceis caudata* (Say)

Janira nana Stebbing – synonym of *Bagatus stylodactylus* Nobili

Janira algicola Miller – synonym of *Bagatus stylodactylus* Nobili

Stenetrium medipacificum Miller – synonym of *Stenetrium occidentale* Hansen

Stenetrium antillense Hansen – synonym of *Stenetrium occidentale* Hansen

Stenetrium gilbertense Nordenstam – synonym of *Stenetrium occidentale* Hansen

Stenetrium chiltoni Stebbing – synonym of *Stenetrium serratum* Hansen

Janira minuta Richardson – synonym of *Bagatus bermudensis* Richardson

Our somewhat revised treatment of the Flabellifera or Cirolanoidea is consistent with recommendations made by earlier workers. Here we have utilized the recommendations and have evolved a somewhat new scheme. This presentation is one of convenience which may have to be changed by later workers.

SYSTEMATICS

KEY TO THE MAJOR CATEGORIES (AUCT. SUBORDERS) OF THE MARINE ISOPODA IN PUERTO RICO

1a. Parasitic on Crustacea, female larger than male and modified to fit site parasitized on the host . . . . . BOPYROIDEA
1b. Free living or parasitic on fish but not parasitic on Crustacea 2

2a. With only five pairs of peraeopods, with two pairs of maxillipeds . . . . . GNATHIOIDEA
2b. With six or seven pairs of peraeopods and only one pair of maxillipeds 3

3a. Body tubular, elongate, more than five times as long as wide, uropoda lateral or flexed over pleotelson . . . ANTHUROIDEA
3b. Body dorso-ventrally flattened, less than four times as long as wide 4

4a. Uropoda inflexed under pleon to cover pleopods . . VALVIFERA
4b. Uropoda terminal or lateral or even lacking but not inflexed under the pleon to cover the pleopods. 5

5a. All five pairs of pleopoda similar in size. . . . . . CIROLANOIDEA (= Flabellifera)
5b. First, second or third pleopoda smaller than or unlike the lamelliform succeeding pairs. . . . . ASELLOIDEA

Suborder BOPYROIDEA

The isopods belonging to this suborder are highly specialized parasites on Crustacea including the Isopoda themselves. The female has lost the ability to swim and accordingly the pleopods have lost their natatory setae. The female is usually modified to fit the site that it parasitizes and the male is usually small, less modified than the female and attached loosely to the female in her brood pouch under the abdomen, etc. The antennae are reduced to only a few joints in both sexes. The larvae are free-living and minute, less than a millimeter in length. Sex may or may not be determined by the host.

The piercing mouth parts of the female indicate a true parasitism.

No concerted effort was made by the writers to collect parasitic forms and because of this our report is deficient in parasitic species. Many more may be expected to occur in Puerto Rico. We found two species attached to a single hermit crab, *Clibanarius tricolor*.

Genus **Pseudione** Kossmann, 1881

Type-species: *Pseudione callianassae* Kossmann, 1881.

Diagnosis: Female with body oval, somewhat asymmetrical. Segments of abdomen distinct. Epimera well defined, not contiguous. Lateral parts of abdominal segments lamellar, more or less projecting. Terminal segment of abdomen small, with sides not lamellarly produced. Incubatory plates meet in median ventral line, concealing incubatory pouch and eggs; first pair with distal segment usually produced in a lobe. All seven pairs of legs present. Pleopoda well developed, double branched. Uropoda simple, consisting of a pair of lanceolate lamellae. Male with segments of thorax and abdomen distinct. Pleopoda present as five pairs of small rudimentary sac-like bodies, a pair for each of the first five segments. Uropoda wanting. Branchial parasites. (after RICHARDSON, 1905, p. 522).

1 **Pseudione** sp.

(Fig. 2 A–B)

This species was collected from under the carapace (dorsal side) of the hermit crab *Clibanarius tricolor* (Gibbes) at Sta. XII-6. The specimens appear to meet the characteristics for the genus as given by RICHARDSON (1905) in that the pleopoda of the female are biramous, and lanceolate simple uropoda are present. The cephalon of the female, however, is deeply immersed in the first peraeonal somite thus resembling *Bopyro* Pearse (1932). Because only one specimen of each sex was available and because the specimens were so greatly injured, we prefer not to attempt a positive determination. Accordingly we have assigned this species to the genus that it seems to best fit. The species is probably new, being unlike any of the species that have been previously described.

The female was 1.4 mm in length and 1.0 mm in width and gravid. The male was 0.5 mm in length and 0.2 mm in width.

Genus **Stegias** Richardson, 1904

Type-species: *Stegias clibanarii* Richardson, 1904.

Diagnosis: Body of female with sixth segment of thorax not greatly longer than any of the others. All six segments of abdomen distinct; lateral parts or pleural lamellae not developed. First three pairs of pleopods triramous; last two pairs biramous. Uropoda consist of a pair of elongated lamellae, without a conical process between the two. (after RICHARDSON, 1905, p. 535).

2 **Stegias clibanarii** Richardson, 1904

(Fig. 3 A–D)

References: RICHARDSON, 1905, p. 535–537. PEARSE, 1932, p. 4–5.

Diagnosis: Cephalon deeply set in peraeon and partly fused to first peraeonal somite. Peraeon with seven somites; second, third and fourth narrower by one half of the length of each of the following three; fifth widest. Pleon with six distinct somites, all pleopoda except the last triramous, last biramous.

Measurements: Female, length 1 mm, width 1.0 mm; male, length 0.7 mm, width 0.2 mm.

Type-locality: Bermuda; attached to *Clibanarius tricolor* RICHARDSON, 1905, p. 537.

Distribution: Found in Puerto Rico at Sta. XII-6 on the dorsum of the abdomen of the hermit crab, *Clibanarius tricolor* (Gibbes). This hermit crab was also parasitized by *Pseudione* sp.

This species agrees in most details with the description given by RICHARDSON. We find the last pair of pleopoda biramous instead of triramous, and the last somite of the pleon shows a bilobed "telson" dorsally at midline. The male, unknown to RICHARDSON, was subsequently described by PEARSE (1932). We found the male in the brood pouch of the female and it agrees more or less with the decription given by PEARSE (op. cit.); however, the terminal rami of

the last pleonal somite show five setae on the lateral margin of each instead of three.

We have noted the long, conspicuous, serrated seta attached to the fifth peraeopod.

It is highly probable that the genus *Stegias* Thompson and *Stegophryxus* Richardson are synonyms. This is suggested by the fact that the pleonal somites of the male are indistinct (or just hard to see) and the fact that our specimen (female) had the last pleopod biramous instead of triramous.

Suborder VALVIFERA

Isopods belonging to this suborder have the uropoda attached ventrolaterally to cover the pleopoda as opercula. The first antenna is usually stout, pauciarticulate and with a club-shaped, uni-articulate flagellum. Valviferans show considerable diversity in form and habitat. The best known species belong to *Idotea*, a genus which lives among seaweeds. Only two representatives of this suborder were found, *Erichsonella* and *Astacilla*, both of which were obtained from sea grasses.

KEY TO TWO SPECIES OF VALVIFERA

1a. Fourth somite of peraeon more than twice as long as wide. . . . . *Astacilla cymodocea*, n. sp.

1b. Fourth somite of peraeon wider than long. . . . . *Erichsonella filiformis tropicalis*, n. ssp.

Family IDOTHEIDAE

The family Idotheidae contains genera having all peraeopods more or less similar and not divided into an anterior series of four pairs of peraeopods and different posterior series of three pairs of peraeopods.

Genera are distinguished from each other by the number of somites comprising the pleon and the number of articulations to the flagellum of the second antennae.

Genus **Erichsonella** Richardson, 1901

Type-species: *Erichsonella filiformis* (Say), 1818.

Distinguished by the clavate, single article comprising the flagellum of the second antennae. The peraeonal somites are of similar length. The peraeopods are more or less similar to each other and the pleotelson consists of a single segment; sometimes with indications of a partly coalesced anterior segment.

Richardson incorrectly attributes the name of this genus to Benedict.

3 **Erichsonella filiformis tropicalis,** n. ssp.

(Fig. 4 C)

Reference: RICHARDSON, 1905, p. 401–403.

Diagnosis: Trifid lobe on dorsum of cephalon, high, extending over frontal margin. Posterior medial part of cephalon smooth at dorsum and lacking lobes. Lateral borders of peraeonal somites 3–4 bifid. Dorsum of pleotelson without tubercle near anterior end.

Measurements: Illustrated male, length 4.8 mm, width 1.0 mm.

Type-locality: Puerto Rico, Sta. XII-8, one male, from the turtle grass *Thalassia testudinum*, USNM Cat. No. 119342.
Distribution: Known only from Puerto Rico.

Affinities: Closely related to *Erichsonella filiformis* (Say) and differing from that species in the characteristics mentioned in the diagnosis. It is much narrower. The differences mentioned are not so great as one might be led to suspect from the illustration and are of degree rather than kind. It seems probable that intergrades will be found and for this reason we have called it a subspecies.

Genus **Astacilla** Cordiner, 1795

Type species: *Oniscus longicornis* Sowerby, G. O. Sars, 1899.

Diagnosis: Valvifera with narrow cylindrical body. Uropoda biramous, last three pair of peraeopods adapted for clinging. First four pair of peraeopods bent forward over mouth, delicate and adapted for

filtering water. Fourth somite of peraeon much longer than wide. Second antenna much longer than the minute 4-articulate first antenna, and provided with triarticulate claw-bearing flagellum. (Adapted from G. O. SARS op. cit.).

The incomplete separation of the 4th and 5th peraeonites is perhaps distinctive. Otherwise, the following species is in every respect a member of *Astacilla*.

4 Astacilla cymodocea, n. sp.

(Fig. 5 A–H)

Diagnosis: Dorsum of body smooth, without spines or tubercles. First peraeonal somite incompletely fused to cephalon. Second and third somites short, subequal in length and with straight lateral margins. Fourth peraeonal somite three times as long as wide, sides parallel. Fifth peraeonal somite as long as wide and incompletely fused with fourth. Sixth and seventh peraeonal somites subequal in length. Pleotelson elongate, with lateral indications of a partly fused somite. Apex of pleotelson truncate. Color in life bright green.
Measurements: Female holotype, length 6.0 mm, width 0.5 mm, length second antenna 3.5 mm.

Type-locality: Puerto Rico, Sta.'s XII-9 and XII-10, two female specimens, found on the manatee grass *Cymodocea*, USNM Cat. No. 119341.
Distribution: Known only from type-locality.

Affinities: This species appears to be closely related to *Astacilla bacilus* BARNARD (1920, pp. 386–388) from South Africa; however, because BARNARD (op. cit.) did not provide illustrations this conclusion is based only on his description. It differs, however, in the partial fusion of the fourth and fifth peraeonal somites and in having only one partial rather than two pleonal somites in front of the pleotelson.
Supplementary descriptive notes: General body form attenuate, around nine times as long as wide. Cephalon longer than wide, frons slightly concave at margin, with small median triangulate projection. Eyes lateral, much longer than wide. First peraeonal somite partly fused to cephalon, one-fourth as long as cephalon. Second peraeonal somite about as long as first, sides square. Third

peraeonal somite as long as second. Fourth peraeonal somite slightly longer than cephalon and first three peraeonal somites together, sides subparallel. Fifth peraeonal somite partly fused to fourth, slightly longer than wide, sides subparallel. Sixth peraeonal somite one-third the length of fifth, anterior one-half with angulate lateral projections. Seventh peraeonal somite as long as sixth. Ant^2 exceeds one-half the length of body, with apical claw, flagellum triarticulate. Ant^1 not much longer than first two peduncular articles of Ant^2. Md with grinding molar and no palp. Mxp with palp pentarticulate and longer than endite. Mx^1 bilobed. Mx^2 trilobed. P^1 articles expanded like Mxp, last article with setae instead of claw. P^1–P^4 delicate and setiferous, P^5–P^7 short, adapted to clinging. Pleopods biramous with PMS. Uropods inflexed under pleotelson. Exopod two-jointed, endopod one-jointed with two terminal setae. Green in color.

Suborder GNATHIOIDEA (auct. Gnathiidea)

Isopods belonging to this suborder have only five pairs of peraeopods in the male; the first is incorporated into a cephalothorax as mouth parts (called the pylopod) and the seventh pair is missing. The mandibles are highly modified as pincers projecting from the front of the head. The abdomen or pleon has seven segments with the last segment constituting a telson. Anteriorly a reduced seventh peraeonal segment joins the abdomen with the peraeon.

The female is minute and quite unlike the male in appearance. The mouth parts are modified into a piercing and sucking apparatus. There is only one pair of maxillipeds and hence no pylopod. The peraeon has seven somites and six pairs of peraeopods even though the first is partly incorporated into the cephalon. These animals would not belong in the Isopoda were it not for the fact that the major differences are in sexual dimorphism. The young and the females demonstrate their true isopodan affinities. Both sexes, however, have a separated telson. The characteristics and anatomy of the Gnathioidea have been described in great detail by MONOD (1926).

Genus **Gnathia** Leach, 1814

Type-species: Not known to us, presumably *Gnathia termitoides* Leach, 1813, MONOD, 1926, p. 521, a synonym of *Gnathia maxillaris* (Montague).

This genus was represented by one species which appears to be new. The genus has all of the characteristics of the Suborder and is distinguished from other genera in the Gnathioidea by having eyes, a bi- or tri-articulate pylopod, a frons without a medial projection which is as long as or longer than the mandibulae.

5 **Gnathia puertoricensis,** n. sp.

(Fig. 6 A–G, Fig. 7 C–D)

Diagnosis: *Gnathia* with cephalon smooth, without pronounced spines or tuberculations. Frons straight, not deeply concave, with three teeth or projections, medial projection apically blunt and provided with two stout setae. Inner edges of mandibles with small teeth of similar shape.

Measurements: Holotype male, length 3.0 mm, width 0.7 mm; allotype female, length 1.8 mm, width 0.2 mm. Sta. VII-15, types only.

Type-locality: Puerto Rico, Sta. VII-15, one male and two females, USNM Cat. No. 119343.

Distribution: In Puerto Rico specimens were also found at Sta. VII-9, three females; Sta. XII-2, two females; Sta. XII-5, two females.

Affinities: The trifid frons allies this species to *Gnathia tridens* MENZIES & BARNARD (1959, pp. 29–30) from California but the frons is not produced in this new species and the cephalon is smooth rather than roughly tuberculate. In frons structure the species is quite similar to *Gnathia illepide* MONOD (1926, pp. 475–480) from the Mediterranean. Our species, however, has a short longitudinal ridge on the cephalon which is lacking in *G. illepide*.

Supplementary descriptive notes: General body form about four times as long as wide, body smooth, tuberculations minute. Cephalon slightly longer than wide, frons trifid but with margin otherwise straight, not produced at angle between the mandibulae. Eyes present, black multifacetted, located at lateral border

which is straight rather than convex. Third peraeonal somite (first free) slightly shorter than fourth, lateral areas project slightly forward. Fourth peraeonal somite slightly longer than third, posterolateral borders evenly rounded. Fifth to seventh somites incompletely fused together, seventh four times the length of fifth. Ant^1 with eight articles, first slightly shorter than second, third article three times the length of second and longer than all others. Ant^2 with 12 articles, first and second subequal, third twice the length of second, fourth twice the length of third, flagellum as long as fourth and composed of 8 articles with subsimilar low teeth. Mxp with four articles to palp. Pylopod with minute apical article to palp. Peraeopods sparsely provided with tubercles. Propod of P^7 with stout, two-pointed seta near proximal end on inferior margin. Pleopods normal for genus, provided with PMS. Uropods not projecting beyond apex of telson.

Suborder ANTHUROIDEA

To this suborder belongs a diversified group of genera. The diversity is so very great that it is extremely difficult to characterize the suborder. The genera within the suborder are easily distinguished from one another. All are similar in having a telson with the uropodal exopoda usually flexed over the telson. All are elongate and generally well over five times as long as wide. Most have the first peraeopods greatly swollen, subchelate and much more massive than the other peraeopods. Statocysts are often present on the telson either paired or singly. The somites of the peraeon are longer than wide (except for the seventh somite in certain genera). BARNARD (1925) revised the Anthuroidea (then called Anthuridae) into two basic sections; those with piercing and sucking mouth parts (section A, here called the Paranthuridae) and those with chewing or normal mouth parts (section B, here called Anthuridae *sens. str.*) The late Dr. KEPPEL BARNARD (op. cit.) working with a 10 powered hand lens produced the fundamental treatise on the anthurid isopods that elicits our strong admiration for his care and accuracy.

KEY TO PUERTO RICAN ANTHUROIDEA

1a. Mouth parts converge as piercing and sucking appendages. Statocyst medial . . . . *Accalathura crenulata* (Richardson)

1b. Mouth parts short, normal with toothed incisive processes to mandible. Statocysts paired when present 2

2a. Pleonal somites completely fused dorsally 3

2b. Pleonal somites completely separate or indicated at least laterally and partly on dorsum 4

3a. Pleon as long as or longer than sixth peraeonal somite. . . 5

3b. Pleon short, almost obscure dorsally, much shorter than sixth peraeonal somite . . . *Pendanthura tanaiformis*, n. gen., n. sp.

4a. First three pleonal somites completely separated dorsally, only a lateral incision separates fourth from the fifth . . . . . *Apanthura signata*, n. sp.

4b. All pleonal somites fused along midline but separated laterally . . . . . *Apanthuroides millae*, n. gen., n. sp.

5a. Chromatophores of pleon arranged segmentally or in transverse bands . . . . . *Mesanthura paucidens*, n. sp.

5b. Chromatophores of pleon arranged longitudinally in two pairs . . . . . *Mesanthura decorata*, n. sp.

Family ANTHURIDAE sens. str.

Genera belonging to this family have normal mouth parts, paired statocysts (when present at all), the unguis of claw of P^1 is long. P^2 and P^3 are seldom subchelate and similar to P^1 and the telson is often splayed and indurated. (after BARNARD, 1925).

BARNARD (1925) lists 17 genera belonging to the family. The Puerto Rico collections contained four genera in this family, two of which appear to be new.

Genus **Mesanthura** Barnard, 1914

Type-species: *Mesanthura catenula* (Stimpson), 1855, as the first species listed by BARNARD in his list of species belonging to the genus.

Diagnosis: Eyes present, peraeon without dorsal pits. Pleon short, sutures absent or extremely obscure. Telson not indurated, dorsally

smooth, convex or nearly flat. Ant^1 with flagellum brush-like in male, 2-jointed in female. Ant^2 with flagellum 2–4 jointed. Md with third palpal joint as long or longer than first, with comb of setae. Mxp 5-jointed, the narrow waist-like third (second free) joint being very characteristic. P^1 with palm of sixth joint distally excavate, unguis long. P^2 and P^3 with sixth joint cylindrical. P^4–P^7 with fifth joint underriding sixth. Plp^1 not indurated. Uropods not indurated; exopod apically notched, folding down over telson. Oostegites four pairs (after Barnard, 1925).

The species belonging to this genus are all characterized by pigment patterns which are distinctive for each species.

6 **Mesanthura decorata,** n. sp.

(Fig. 8 A–I)

Diagnosis: *Mesanthura* with dorsum of cephalon almost completely covered by pigment, central pigment free area lacking. Peraeonal somites 1–6 and pleon with a central area free of pigment; somite seven without pigment-enclosed central area. Telson not fully covered by pigment, anterior and posterior quarters free of pigment. Posterior border of pleotelson with two tufts of setae on either side of midline.

Measurements: Holotype male, length 6.0 mm, width 0.3 mm.

Type-locality: Puerto Rico, Sta. VII-9, holotype. USNM Cat. No. 119347.

Distribution: In Puerto Rico at Sta. VII–18, 13 specimens; Sta. VIII-1, one male, one female; Sta. XII-2, one female; Sta. XII-5, 4 specimens.

Affinities: This species is close to *Mesanthura pulchra* Barnard 1914 from St. Thomas and St. John in the West Indies. It differs rather markedly in not having the telson fully pigmented and in not having a central non-pigmented area on the dorsum of the cephalon. Also the seventh peraeonal somite is not fully pigmented but only partly so.

Supplementary descriptive notes: General body form elongate, about 20 times as long as wide. Cephalon slightly longer than wide, almost fully covered with pigment. Frons of cephalon with pronounced median lobe at margin. Eyes large, separated from each other by the diameter of two eyes. First peraeonal somite longer than cephalon, with central pigment-free area. Second to sixth pe-

raeonal somites as long as first, subequal in length, each with a central pigment-free area. Seventh peraeonal somite shorter than sixth, with bilobed pigment splotch meeting at midline. Pleon equals the length of the sixth peraeonal somite, with central pigment-free area and more pigment in posterior half than in anterior half. Telson equals the length of pleon, pigmented in middle part but not at ends. Ant^1 brush-like in male, pauciarticulate in female. Ant^2 of male clavate with three flagellar articles. Mouth parts normal. Mxp with six articles inclusive of minute apical one. P^1 subchelate with slight projection at base of palm and a fringe of simple setae on inner margin. Other peraeopods ambulatory. P^7 with two stout setae at distal margin of propodus. Plp^1 with outer ramus much wider than inner operculiform ramus. Plp^2 of male with stylus having blunt end. Uropods with little pigmentation, exopod much shorter than telson and endopod extending beyond posterior margin of telson.

7 **Mesanthura paucidens,** n. sp.

(Fig. 9 A–G)

Diagnosis: *Mesanthura* with transverse band of pigment behind eyes, but located in anterior part of cephalon. Pigment of peraeonal somites consists of a ring of pigment with a central area having added pigment variously arranged. Pigmentation of pleon arranged in five transverse rows which are all connected laterally. Telson pigmented. Uropoda scarcely pigmented. Frontal margin of cephalon with medial margin scarcely produced and more pointed than rounded. Apex of telson with a pair of long single setae on either side of two small medial setae.

Measurements: Holotype female, length 3.5 mm, width 0.2 mm.

Type-locality: Puerto Rico, Sta. VIII-3, female holotype. USNM Cat. No. 119348.

Distribution: In Puerto Rico at Sta. VIII-5, one juvenile, Sta. VII-15, 3 specimens.

Affinities: This species resembles *M. hieroglyphica* Miller & Menzies, 1952, from which it differs in having fewer setae at the apex of the telson and in having full circles of pigment on the peraeonal somites instead of a variety of pigment patterns on various somites. Both species show the transverse rows of pigment on the pleon.

Supplementary descriptive notes: General body form elongate, about 17 times as long as wide. Cephalon only slightly shorter than first peraeonal somite. Frons of cephalon slightly pointed in a wide angle. Eyes lateral, separated from each other by four eye diameters. First three peraeonal somites subequal in length, each with a ring of pigment with a central pigment-free area. Fourth to sixth peraeonal somites subequal in length and each one-third longer and slightly wider than the first somite. Seventh peraeonal somite one-third shorter than sixth. Pleon as long as seventh peraeonal somite, with five transverse rows of pigment which are connected laterally. Ant^1 slightly shorter than Ant^2, flagellum with three articles, last article minute in female. Ant^2 with flagellum of five articles in female. Mouth parts typical for genus, chewing. P^1 of female with crenulate palm. Other peraeopods ambulatory, P^7 with three stout setae at distal end of inferior margin. Pleopods typical of genus. Uropods with endopod just reaching to posterior margin of pleotelson.

Genus **Apanthura** Stebbing, 1900

Type-species: *Apanthura sandalensis* Stebbing, 1900.

Diagnosis: Eyes usually present. Peraeonal segments not pitted. Pleon with sutures distinct. Telson not indurated, rather thin, dorsally smooth and convex. Ant^1 with flagellum of one joint or obscurely 2–3 jointed, or occasionally brush-like in male. Ant^2 with flagellum rudimentary. Md with third palpal joint shorter than or subequal to first, sometimes with only an apical tuft. Mxp five-jointed. P^1 usually with a tooth on palm near base, unguis typically long. P^2 and P^3 with sixth joint somewhat ovate. P^4–P^7 with fifth joint underriding sixth. Plp^1 not indurated. Uropods not indurated, exopod folding over telson. Oostegites four pairs. (after BARNARD, 1925).

This genus contains several species. None had been known previously from the Caribbean.

8 **Apanthura signata,** n. sp.

(Fig. 10 A–G)

Diagnosis: *Apanthura* with eyes minute (female). Body pigmented. Statocysts paired. Proximal fourth of telson densely pigmented.

Apex of telson with medial tuft of long setae, dorsum near apex with a long, simple seta on either side of apical tuft. Gnathopod with small palmar tooth; margin is minutely crenulate.

Measurements: Holotype female, length 4.5 mm, width 0.4 mm.

Type-locality: Puerto Rico at Sta. VII-15, three specimens. USNM Cat. No. 119344.

Distribution: Collected in Puerto Rico additionally at Sta. VII-8, several specimens and at Sta. VII-18, one specimen.

Affinities: This species apparently is close to *Apanthura magnifica* Menzies & Frankenberg (1966) from which it differs in having pigmentation. The gnathopod lacks the large palmar tooth present in *A. magnifica*.

Supplementary descriptive notes: General body form elongate, 11 times as long as wide. Cephalon slightly longer than wide, with short, rounded, medial margin. Eyes minute and separated from each other by five eye diameters. First peraeonal somite longer than cephalon, narrower than second peraeonal somite. Second peraeonal somite as long as first and third. Fourth, fifth and sixth peraeonal somites similar in length and width. Seventh peraeonal somite shorter and narrower than sixth. Pleon with four distinct somites; fourth laterally incised indicating partial fusion of segments five and six. Ant^1 shorter than Ant^2, with five articles in female. Ant^2 with flagellum of three articles. Mxp with five articles, other mouth parts normal for genus. P^1 subchelate, with crenulate inferior margin on palm. Other peraeopods ambulatory, P^7 with one stout seta at inferior distal margin. Plp^1 with operculiform outer ramus. Uropodal endopod extends considerably beyond posterior margin of pleotelson.

Genus **Apanthuroides,** new genus

Type-species: *Apanthuroides millae*, n. sp.

Diagnosis: Eyes present. Peraeonal somites not pitted. Pleon with sutures indicating five incomplete somites visible laterally. Telson indurated. Statocysts paired. Ant^1 brush-like (in male). Ant^2 with three flagellar articles (in male). Md with third palpal joint shorter than first and with setae at apex. Mxp five-jointed. P^1 not subchelate, unguis short. P^4–P^7 with fifth joint not underriding sixth.

Plp^1 with exopod operculiform. Exopod of uropod not folding over telson. Md with toothed incisor.

Affinities: This genus seems close to *Apanthura* Stebbing. The main difference is the lack of complete dorsal segmentation to the pleon and the absence of subchelate gnathopods. The Mxp while having the same number of articles differs in having the terminal article large and equal in length to the first free article. The genus also is similar to *Haliophasma* Haswell from which it differs in not having the uropodal exopods folded over the telson and in the lack of a subchelate P^1 and in having one more article to the Mxp.

9 **Apanthuroides millae,** n. gen., n. sp.

(Fig. 11 A–G)

Diagnosis: Cephalon convex at anterior, posterior and lateral borders. Eyes (male) large, separated by less than one eye diameter. First and second peraeonal somites with opposed middorsal grooves. Second peraeonal somite longest, third to fifth somites subequal in length, sixth shorter than fifth, seventh one-half the length of sixth. First and fifth pleonal somites longer than the subequal second to fourth somites. Apex of telson rounded, lateral margin with minute teeth. Uropodal endopod just reaching apex of telson. Telson provided with midlongitudinal ridge.

Measurements: Holotype male, length 3.0 mm, width 0.2 mm. Sta. VII-15.

Type-locality: Puerto Rico, Sta. VII-15, two males. USNM Cat. No. 119345.
Distribution: Known only from type-locality.

Affinities: Superficially this species resembles *Apanthura magnifica* (Menzies & Frankenberg, 1966).

Supplementary descriptive notes: General body form attenuate, about 15 times as long as wide. Cephalon with convex frontal, posterior and lateral margins. Frons slightly projecting, rounded. Eyes large, separated from each other by diameter of one eye. First peraeonal somite shorter than second, lateral borders convex. Second peraeonal somite longer and wider than first. Third peraeonal somite narrower and shorter than second. Fourth and

fifth about equal in length to third. Sixth peraeonal somite shorter than fifth. Seventh peraeonal somite one-half the length of sixth. Pleon with lateral incisions of five somites, first and last longest. Apex of telson evenly rounded. Statocysts paired. Telson dorsally carinate. Ant^1 with brush-like flagellum (male). Ant^2 shorter than Ant^1, flagellum triarticulate. Md with toothed incisor, palp triarticulate, last article shorter than first, apically setiferous. Mxp with five articles, last and first free articles subequal in length. P^1 not chelate, appearing much like other peraeopods. P^4–P^7 with fifth article not underriding sixth. Plp^1 large and operculate, Plp^2–Plp^5 covered by Plp^1. Uropods with exopod short and not flexed over telson; endopod reaching apex of telson.

Genus **Pendanthura,** new genus

Type-species: *Pendanthura tanaiformis*, n. sp.

Diagnosis: Anthuridae with triarticulate Mxp bearing an endite. P^1 subchelate, unguis short, palmar inner surface with a tooth near proximal end, P^2 and P^3 similar to P^1. P^5–P^7 with fifth article underriding sixth. Ant^1 and Ant^2 pauciarticulate. Pleon very short with neither dorsal nor lateral incisions indicating segmentation. Statocysts paired. Telson indurated. Plp^1 operculate. Mandibular palp reduced to two setae.

Affinities: Although the species keys out to *Xenanthura* in BARNARD's (1925) key it is not closely related to this genus because of its single, short pleonal somite, excessively long indurated telson, and paired statocysts. The loss of the mandibular palp does resemble the condition in *Xenanthura*, but this is where the similarities cease. The Mxp of *Xenanthura* has one more article; the telson is equal to the length of the last two pleonal somites; the uropoda are longer than the telson. In *Pendanthura* the telson is four times longer than the pleon; the uropoda are not longer than the telson and the Mxp has one and not two free articles.

This species looks superficially like a tanaid crustacean. The pleon can be seen to be composed of 5–6 somites in ventral view where incisions are present at either side of the exopod of Plp^1.

10 Pendanthura tanaiformis, n. sp.

(Fig. 12 A–I)

Diagnosis: *Pendanthura* with spine-like rostral process at midline of anterior margin of cephalon. Eyes small, separated from each other by seven eye diameters. Apex of telson crenulate and convex, provided with a few setae. Uropodal exopod not strongly arching over telson, border crenulate. Flagellum of Ant^1 with only two articles and a possible inner ramus of one article. Body densely pigmented. Peraeonal somites with two dorsal setae.
Measurements: Holotype female, length 2.8 mm, width 0.4 mm.

Type-locality: Puerto Rico, Sta. XI-3, holotype and four female paratypes. USNM Cat. No. 119346.
Distribution: In Puerto Rico at Sta. VII-15, two specimens; Sta. VII-18, two specimens; Sta. VIII-1, three specimens, one gravid. Males were not found.

Affinities: Not known or suspected.
Supplementary descriptive notes: General body form shorter than usual for anthurids, only seven times as long as wide. Cephalon subquadrate, frons with stout, medial, spine-like process. Eyes minute, separated by seven eye diameters. First peraeonal somite longer than cephalon, sides sub-parallel. Second peraeonal somite one-half the length of first, sides converge posteriorly. Third peraeonal somite subquadrate and shorter than second, fourth and fifth longer than third. Sixth peraeonal somite shorter than fifth. Seventh peraeonal somite one-half the length of fifth. Pleon consists of a short unsegmented piece which is almost concealed by seventh peraeonal somite. Telson indurated, with two statocysts. Md with toothed incisor, palp lacking. Mx with setiferous apex. Mxp with one free article or a total of three articles. P^1 subchelate, margins short, palm with proximal tooth. P^4–P^7 with fifth article underriding sixth. Plp^1 operculiform, covering other pleopods. Uropods with exopod shorter than telson, border crenulate; endopod as long as telson.

Family PARANTHURIDAE, new family

The family has the characteristics of BARNARD's (1925) section B. Mouthparts modified for piercing and sucking (the incisive process

of the Md is pointed and not flattened with teeth, and the Mx is a long, pointed stylet bearing barbs). Statocysts usually absent but when present are unpaired. The unguis of P^1 is short. P^2 and P^3 are similar to P^1, being subchelate but smaller. The telson is usually neither splayed nor indurated. (modified after BARNARD, 1925). Type-genus *Paranthura* Bate & Westwood.

One genus, *Accalathura* Barnard, was represented in the collections.

Genus **Accalathura** Barnard, 1925

Type-species: *Accalathura crenulata* (Richardson), 1901.

Mxp 4-jointed. Telson longer than pleon, with single statocyst. P^1 with palm straight but with a large basal tooth, unguis short. P^4–P^7 with fifth joint cylindrical and not underriding the sixth. Pleon with sutures distinct. Uropodal endopod distinctly narrower than peduncle. (after BARNARD, 1925).

BARNARD's 4-jointed Mxp is probably an error. Our specimens were compared with RICHARDSON's type in the U.S. National Museum and appear to be conspecific. These have only two free maxillipedal articles or a total of three joints to the Mxp. It is identical with BARNARD's (op. cit.) illustration.

11 **Accalathura crenulata** (Richardson), 1901

(Fig. 13 A–H)

References: *Calathura crenulata* Richardson, 1905. *Accalathura crenulata* (Richardson) Barnard, 1925.

Diagnosis: *Accalathura* with indurated telson showing three or more longitudinal carinae, apex rounded. Uropodal endopod strap-shaped, not lanceolate and not pointed. Postero-lateral angles of seventh peraeonal somite produced backwards to partly embrace first pleonal somite. Apex of pleotelson appears rounded but is pointed, crenulate, showing three smaller setae at midline between two stout longer setae. Eyes present and situated at antero-lateral angles of cephalon.

Measurements: Female, length 14 mm, width 1.0 mm.

Type-locality: Between Nassau and Andros Island, Bahamas (RICHARDSON, 1905).

Distribution: Tropical Atlantic, Bahamas to Yucatán (RICHARDSON, 1905), Brazil, West Indies, Cape Verde Islands (BARNARD, 1925). These specimens are the first record from Puerto Rico. Specimens were found in Puerto Rico at Sta. VII-13, one female, and Sta. VII-18, eleven specimens.

Affinities: This species, according to BARNARD (op. cit.), is closely related to *Accalathura gigas* (Whitelegge) from New South Wales, Australia.

Suborder CIROLANOIDEA = Flabellifera *sens. str.*

This suborder includes species that most persons think isopods should look like. Actually this group or suborder includes such a diversified assemblage that it can be split, but not easily so, into several sub-categories. None of these differ from each other as much as the other suborders differ and hence the elevation of any one to subordinal rank is probably not warranted.

The families included within the Cirolanoidea are the Cirolanidae, Excorallanidae, Corallanidae, Aegidae, Cymothoidae, Limnoriidae and the Sphaeromidae. (Although etymologically correct, the family name Sphaeromatidae is not employed here because of the almost universal acceptance of Sphaeromidae). RICHARDSON (1905) included the Gnathiidae, the Anthuridae and the Serolidae (MENZIES, 1962a) also in this group. These have since been elevated to subordinal rank and as we have seen here the Anthuridae has been split into two families of equal rank.

It should be realized that the "final" word on flabelliferan classification has not yet been obtained. It is probable that the Sphaeromidae and the Limnoriidae should be separated within this suborder as higher taxa of coordinate rank leaving a cirolanid type to represent the remaining families. This we do in the following, but without assigning a taxon to the groups. We distinguish the cirolanid-type, a sphaeromid-type and a limnoriid-type of Cirolanoidea.

CIROLANID-TYPE: Body not capable of enrollment into a ball. Uropoda lateral, flattened and fan-like; both rami movable and separated from peduncle. Pleopoda attached to generally separated abdominal somites and are visible in lateral view, not being enclosed in a vaulted pleotelson. Cephalon articulates with first peraeonal somite

or is partly immersed in it. – Comprised in Puerto Rico of the families Cirolanidae, Excorallanidae, Aegidae and Cymothoidae.
LIMNORIID-TYPE: Body capable of enrollment but not into a compact ball. Uropoda lateral and tubular, both rami separated from peduncle. Pleonal somites separated and pleopoda visible in lateral view. Cephalon globular, retractable under the margin of the first peraeonal somite. – Comprises the family Limnoriidae.
SPHAEROMID-TYPE: Body capable of complete enrollment into a ball. Uropoda lateral with only the outer ramus free and movable, inner ramus fused solidly to peduncle. Pleopoda attached to a single, wide, middle piece of the pleon (composed of the nearly complete fusions of at least three somites) and are enclosed within the vaulted pleotelson. Cephalon articulates with first peraeonal somite and does not ride under this somite. – Comprised in Puerto Rico of only the family Sphaeromidae.

CIROLANID-TYPE: CIROLANOIDEA

The characteristics given above distinguish this group of Cirolanoidea. In addition this type has a flattened molar process and not an expanded, truncate, grinding molar but this characteristic shows a progressive loss as the parasitic mode increases.

KEY TO THE CIROLANID-TYPE SPECIES OF CIROLANOIDEA (FLABELLIFERA sens. str.)

1a. Posterior margin of pleon smooth, devoid of spines or plumose setae (fish parasites) 2
1b. Posterior margin of pleotelson with spines, plumose setae, teeth or all three of these 4

2a. Frons of cephalon pointed, eyes occupy all but center of cephalon. Dorsum of pleotelson with chromatophores arranged in shape of an inverted "W" . . . . . *Rocinela signata* Schiödte & Meinert
2b. Frons straight or blunt, eyes small, lateral. Chromatophores do not form design on dorsum of pleotelson. 3

3a. Uropoda extend beyond posterior margin of pleotelson . . . . . *Lironeca redmanni* (Leach)

3b. Uropoda shorter than pleotelson . . . . . *Anilocra laticauda* Milne Edwards

4a. Pleon (inclusive of pleotelson) with 5–6 obvious somites. . . 6

4b. Pleon (inclusive of pleotelson) with not more than four somites visible in dorsal view 5

5a. Dactyl of first peraeopod with a comb-like arrangement of teeth on inferior margin. Dorsum of pleotelson with hairs . . . . . *Alcirona insularis* Hansen

5b. Dactyl of first peraeopod without a comb of spines. Dorsum of pleotelson with pronounced longitudinal carina . . . . . *Colopisthus parvus* Richardson

6a. Lateral borders of pleotelson near apex deeply incised, incision with fringe of stout hairs on setae . . . . . *Excorallana tricornis* (Hansen)

6b. Lateral borders of pleotelson entire, without deep incisions . 7

7a. Cephalon anterior border evenly rounded. . . . . *Eurydice littoralis* (Moore)

7b. Cephalon pointed at midline of anterior border 8

8a. Second antennae extend beyond posterior margin of second peraeonal somite 9

8b. Second antennae very short, just extending to posterior margin of first peraeonal somite. . . . . *Cirolana sphaeromiformis* Hansen

9a. Posterior margin of pleotelson with about eight stout, two-pointed setae . . . . . *Cirolana parva* Hansen

9b. Posterior margin of pleotelson without stout, two-pointed setae, margin crenulate and provided only with plumose setae. . . . . *Cirolana mayana* Ives

Family Cirolanidae

This family includes those Cirolanoidea which have an expanded and flattened saw-toothed molar process and a maxillipedal palp

with five ovate articles. The pleotelson and uropoda are provided with stout, two-pointed setae or plumose setae, or both. The majority of the species are free-living predaceous or meat-eating scavengers. Some species burrow in the sand, others are planktonic, still others are benthonic under rock and rubble. Species of Cirolanidae have been known to attack swimmers and draw blood. It is probable that the animals secrete or inject an anticoagulant because bleeding is profuse and of long duration (pers. obs.). The bite is not especially painful and the possibility of a narcotic being produced and injected by Cirolanidae should also be examined by those having access to living specimens.

Genus **Cirolana** Leach, 1818

Type-species: *Cirolana cranchii* Leach, 1818.

Cirolanid-type Cirolanoidea with Ant^1 with basal article of peduncle not extended straight in front at right angle to second article. Peduncle of Ant^2 composed of five articles. Plp^1 and Plp^2 similar to each other. Peduncle of uropoda with inner angle strongly produced. (modified after RICHARDSON, 1905, p. 82).

12 **Cirolana sphaeromiformis** Hansen, 1890

(Fig. 14 A–B)

Reference: RICHARDSON, 1905, p. 84–86.

Diagnosis: Body about two and one-half times as long as wide. Cephalon narrow, with eyes located at sharp antero-lateral angles, front with anterior margins angulate, apex pointed. Pleon with five distinct somites plus pleotelson. Dorsum of pleotelson with mid longitudinal carina, apex of pleotelson with two stout setae separated by three crenulations. Exopod of uropod shorter than endopod and not extending to posterior margin of pleotelson. Measurements: Illustrated male, length 2.5 mm, width 1.0 mm.

Type-locality: St. Thomas, West Indies (RICHARDSON, 1905, op. cit.).
Distribution: Probably a pantropical cosmopolite but this is the first record of the species from Puerto Rico. The senior author has seen specimens of this species from Honolulu, Hawaii and from Bermuda. In Puerto Rico this species was collected

at Sta. VII-3, five specimens; Sta. VII-4, four specimens; Sta. VII-18, one specimen; Sta. VIII-3, one specimen; Sta. VIII-5, twelve specimens.

Affinities: Superficially this species resembles *Colopisthus parvus* in the size and shape of the head. These two are easily separated by color with *C. sphaeromiformis* cream or rusty brown and *C. parvus* dark, due to pigmentation. The fundamental difference lies in the greater number of pleonal somites in this species. This species either does not belong to *Hansenolana* Stebbing, 1900, or if it does then *Hansenolana* is a synonym of *Cirolana*. We have not seen STEBBING's (1900) reference. NIERSTRASZ (1931) places it in *Paracirolana* Nierstrasz, also a genus of uncertain validity.

13 **Cirolana parva** Hansen, 1890

(Fig. 14 C–D)

Reference: RICHARDSON, 1905, p. 111–114.
Synonyms: *Cirolana diminuta* MENZIES, 1962, p. 343–344.

Diagnosis: Body about two and one-half times as long as wide. Cephalon about as wide as long, front evenly rounded with only a minute medial knob. Pleon with five distinct somites inclusive of pleotelson showing in dorsal view. First somite of pleon mostly concealed by last peraeonal somite. Dorsum of pleotelson smooth, without longitudinal carinae. Uropoda with both rami reaching to end of pleotelson. Apex of pleotelson with about eight stout, two-pointed setae between crenulations. Rami of uropoda provided with stout, two-pointed setae, apex of each ramus with bifid spines enclosing a tuft of long, simple setae.
Measurements: Illustrated male, length 5.0 mm, width 2.0 mm.

Type-locality: St. Thomas, West Indies (first locality listed).
Distribution: RICHARDSON (1905) records the species from the Caribbean and Gulf of Mexico including Cedar Keys, Florida. The species has also been recorded from Georgia (MENZIES & FRANKENBERG, 1966) and from San Quintín Bay and México as *Cirolana diminuta*, MENZIES (1962 b). BARNARD (1936) cites occurrences in the Andaman Islands, Ceylon, Samoa, Mozambique, and possibly also in Chilka Lake, India. The senior author has seen specimens from the Hawaiian Islands.

In Puerto Rico specimens were found at Sta. XII-1, one specimen; Sta. XII-2, four specimens; Sta. XII-6, one specimen; Sta. VII-8, fifty-nine specimens; Sta. VII-9, two specimens; Sta. VII-13, eight specimens; Sta. VII-15, twenty-nine specimens; Sta. VIII-3, thirty-three specimens; Sta. VII-4, three specimens; Sta.

VIII-5, seven specimens; Sta. X-2, thirty-eight specimens; Sta. XI-2, one specimen; several specimens at each of Sta.'s VII-18, VIII-4 and XI-3. It constitutes one of the most widely distributed and abundant species on the island.

Affinities: The small variations in pleotelson shape noted by MENZIES (op. cit.) when he described *C. diminuta* do not seem adequate to keep that species separated from *C. parva* Hansen.

14 **Cirolana mayana** Ives, 1891

(Fig. 15 A–D)

Reference: RICHARDSON, 1905, p. 87–90.

Diagnosis: *Cirolana* with body two and one-half times as long as wide. Front of cephalon evenly rounded, except for short median lobe. Pleon with six distinct somites inclusive of pleotelson. Apex of pleotelson evenly rounded, lacking stout, two-pointed setae, margin crenulate with short, plumose setae between crenulations. Uropodal exopod shorter than endopod; endopod does not quite reach to posterior border of pleotelson; endopod shows a pronounced spine or tooth half way up its outer margin which breaks the lateral contour of that margin. Cephalon with limited pigment; third and fourth peraeonal somites pigmented heavily, making the animal appear banded.

Measurements: Illustrated female, length 2.0 mm, width 0.8 mm.

Type-locality: Port of Silam, Yucatán (IVES, 1891).

Distribution: Probably a pantropical cosmopolite. RICHARDSON (1905) records it from various places in the Caribbean including Puerto Rico as well as from Lower California, México. In Puerto Rico we found this species at Sta. VII-15, one female.

Affinities: This species appears to be closely allied to *Cirolana minuta* Hansen, but until the pleotelsonal apex armature is known for that species it seems best to keep them distinct. This species does not have stout, two-pointed setae at the apex of the pleotelson as MOORE's (1901) illustrations suggest.

Genus **Eurydice** Leach, 1815

Type-species: *Eurydice pulchra* Leach, 1815.

Peduncle of Ant^2 composed of four articles. Ant^1 with basal articles of peduncle extended in front at right angles to remaining part

of antenna. Abdomen with all six segments distinct. Plp^1 and Plp^2 subequal in structure, both branches submembranaceous, posterior margin furnished with very long, plumose setae. Peduncle of uropoda with inner posterior angle very little produced. (after RICHARDSON, 1905, p. 123).

MENZIES & FRANKENBERG (1966) placed *Branchuropus* Moore as a synonym of *Eurydice* Leach. They did not have access to MOORE's specimens and hence made a presumptive judgement. Our study of MOORE's type has allowed us to confirm this transfer.

15 **Eurydice littoralis** (Moore), 1901

(Fig. 4 A–B)

References: RICHARDSON, 1905, p. 128–130 as *Branchuropus littoralis* Moore. *Eurydice branchuropus* MENZIES & BARNARD, 1959, p. 32–33. *Eurydice littoralis* MENZIES & FRANKENBERG, 1966, p. 49.

Diagnosis: *Eurydice* with four stout setae at apex between which are plumose setae that are not longer than the stout setae. Chromatophores evenly distributed to give body a light to dark brown color.

Measurements: Illustrated male, length 5.0 mm, width 1.5 mm.

Type-locality: Puerto Rico (MOORE, 1902).
Distribution: Georgia, U.S.A. to Mona Island, Puerto Rico (Sta. VI-2). Planktonic but neritic, often caught with dip-net at night lights.

Affinities: Here it has been possible to compare MOORE's types with these specimens. We have concluded that they are conspecific and equal to this species. Comparison of *Eurydice branchuropus* Menzies & Barnard 1959, leads us to the conclusion that this species is a synonym of *Eurydice littoralis* (Moore).

Genus **Colopisthus** Richardson, 1902

Type-species: *Colopisthus parvus* Richardson, 1902.

Cirolanid-type Cirolanoidea with cephalon transversely elongate, eyes located at antero-lateral angles, frons triangulate. Ant^1 about as long as cephalon is wide. Ant^2 longer than first and extending only to middle of lateral margin of first peraeonal somite. Pleon with only

four somites, first concealed by seventh peraeonal somite. Pleotelson with pronounced longitudinal carina at midline. (modified from RICHARDSON, 1905, p. 133).

Study of RICHARDSON's type in the U.S. National Museum showed that she failed to notice all of the pleonal somites which she considered consolidated into one short segment. Furthermore, RICHARDSON did not show the angulate frons which characterizes the only known species of this genus. We have illustrated various appendages to aid subsequent workers in the identification of this species.

16 **Colopisthus parvus** Richardson, 1902

(Figs. 16 A–C, 17 A–D)

Reference: RICHARDSON, 1905, p. 137.

Diagnosis: *Colopisthus* with antero-lateral margin of first peraeonal somite crenulate. Uropoda extending slightly beyond posterior margin of pleotelson, exopod slightly shorter than endopod. Apex of pleotelson crenulate and provided with two short, two-pointed setae on either side of two simple setae at midline. Uropodal exopod with two and endopod with three stout, two-pointed setae, distal margins crenulate.

Measurements: Illustrated female, length 2.0 mm, width 0.6 mm.

Type-locality: Castle Harbor, Bermuda (RICHARDSON, op. cit.).

Distribution: Puerto Rico to Bermuda. Probably widely distributed in Caribbean. Found in Puerto Rico at Sta. III-1, seven specimens; Sta. XII-1, five specimens.

Affinities: Superficially this species looks a great deal like *Cirolana sphaeromiformis* from which it is distinguished by its pigmentation and by the fewer number of pleonal somites. It is the only known species in its genus.

Family EXCORALLANIDAE

Cirolanid-type Cirolanoidea with apical tooth (incisor) of Md very long, lacinia lacking and molar absent. Middle articles of maxillipedal palp narrow and elongate, much longer than wide, not ovoid. Apex of outer lobe of Mx^1 furnished with single, stout, recurved seta. (modified after RICHARDSON, 1905, p. 138).

Genus **Excorallana** Stebbing, 1904

This is the only genus known to belong to the family and hence the familial and generic diagnostic characters are the same. In practice it is possible to split the genus into two groups. To group "A" belong those species with the eyes separated from one another, at the midline and the pleotelson with a paired, deep, lateral incision. To group "B" belong those species with medially contiguous eyes and the lateral margins of the pleotelson entire and not incised. (It should be noted that *Exocorallana* is an incorrect spelling of Stebbing's *Excorallana*).

17 **Excorallana tricornis** (Hansen), 1890

(Fig. 7 A–B)

References: Richardson, 1905, p. 139–141; Lemos de Castro, 1964, p. 3–5.

Diagnosis: *Excorallana* of group A with body elongate, about four times as long as wide. Cephalon of mature male with two stout tubercles just in front of eyes and a pronounced upturned rostral process. Dorsum of pleotelson with a pair of elongate setiferous areas. Lateral incisions of pleotelson fringed with hairs. Eyes not contiguous at midline. Body smooth, not tuberculate.
Measurements: Illustrated male, length 8.0 mm, width 2.5 mm.

Type-locality: St. Thomas and St. Croix, West Indies, and *Reialejo, Mellem-Amerika* (Hansen 1890, p. 379–381).
Distribution: Caribbean and Gulf of Mexico (Richardson, op. cit.). Found in Puerto Rico at Sta. VII-1, on gills of ray *Aetobatus narinari*, 97 specimens; Sta. VII-5 on gill of the ray *Dasyatis americana*, 18 specimens; and Sta. X-2, on squirrel fish, two young specimens.

Affinities: This species is perhaps close to *E. mexicana* Richardson from which it differs in lacking a tuberculated body.

Family Corallanidae Hansen

Cirolanid-type Cirolanoidea with articles of maxillipedal palp ovate, the penultimate articles not narrow and much longer than wide. Mandibles with molar absent, teeth of incisor not greatly elon-

gated. Exite of first maxilla with two stout, apical setae. (modified after RICHARDSON, 1905, p. 156–157).

The genus *Tridentella*, which was assigned to this family by RICHARDSON (op. cit.), probably does not belong to this family because of its enlarged molar process. It probably belongs to *Excirolana* Richardson. The genus *Nalicora* Moore probably belongs to the family Excorallanidae because of the elongated articles to the palp of the maxilliped.

Genus **Alcirona** Hansen, 1890

Type-species: *Alcirona krebsii* Hansen, 1890.

Diagnosis: Corallanidae with the first pair of antennae having a peduncle of two articles. Molar absent from mandibles. (modified after RICHARDSON, 1905).

18 **Alcirona insularis** Hansen, 1890

(Figs. 18 A–D, 19 A–C)

References: RICHARDSON, 1905, p. 159–161; NORDENSTAM, 1946, p. 10 (places *hirsuta* Moore a synonym of *insularis*).

Diagnosis: *Alcirona* with posterior part of body hirsute, especially the pleotelson which is densely covered with golden-brown hairs. Uropodal exopod slightly shorter than endopod, exopod with eight stout, two-pointed setae, endopod with nine such setae, both rami with long plumose setae. Apex of pleotelson with six stout, two-pointed setae between each of which is a plumose seta. Frons of cephalon evenly rounded. Dactyl of female and dactyl and propod of male provided each with a comb of teeth on inferior margin.

Measurements: One young female, length 2.5 mm, width 1.2 mm; one male, length 5.0 mm, width 2.0 mm.

Type-locality: St. Thomas, West Indies.
Distribution: In Puerto Rico found at Sta. VII-15, one female, and Sta. VII-16, one male.

Affinities: Because the two sexes show differing degrees of hirsutness but are otherwise the same, we have considered the male and female (above) as belonging to the single species. This may well be

incorrect, but it is not a problem that can be solved with only two specimens of different sex from two different samples. Study on a large series is required. Preferably specimens should be cultured and various growth stages compared.

We have examined a specimen of *Alcirona krebsii* Hansen determined by HARRIET RICHARDSON, USNM Cat. No. 44279, "Fish Hawk" collections at Mayagüez, Puerto Rico, from deep water. This specimen showed hair tufts on peraeonal somites 2–7 inclusive, and showed six distinct pleonal somites as illustrated by HANSEN for *krebsii*, but the peraeonal and pleonal somites were strongly tuberculate at the margins and the dorsum of the pleotelson was only sparsely tuberculate. This we believe belongs perhaps to another yet undescribed species. We believe HANSEN confused two species in his description of *A. krebsii* because he illustrates (vide RICHARDSON, 1905, fig. 137) a male specimen with five pleonal somites showing in dorsal view and a female (RICHARDSON's op. cit., fig. 139, p. 159) with six somites showing in dorsal view. MOORE (op. cit.) illustrates a specimen with four somites to the pleon and with an apparently tuberculate peraeon and transverse setae tufts on peraeonal somites 3–7; presumably this is the real *Alcirona hirsuta* Moore. Our specimens differ in lacking tuberculations and in having transverse marginal setae absent from the female or present on the male only on the last peraeonal somite. We hope these comments will stimulate the added study that is required.

Family AEGIDAE

Cirolanid-type Cirolanoidea with peduncle of Ant^1 and Ant^2 well defined. Apex of pleotelson with plumose setae. P^1–P^3 with dactyls modified into large recurved claws; other peraeopods ambulatory, with dactyls normal. Distal article of palp of Mxp with stout, recurved spines. Pleopoda with marginal, plumose setae. (modified after RICHARDSON, 1905, p. 166).

Genus **Rocinela** Leach, 1818

Type-species: *Rocinela danmoniensis* Leach, 1818.

Diagnosis: Aegidae with Mxp consisting of three articles (palp of two articles). Pleon not much narrower than peraeon. P^1–P^3 with inferior margin of propodus expanded and armed with stout, recurved setae or hooks. (modified after RICHARDSON, 1905, p. 190).

19 **Rocinela signata** Schiödte & Meinert, 1879

(Fig. 20 E–G)

Reference: RICHARDSON, 1905, p. 209–210.
Synonyms: *Rocinela aries* Schiödte & Meinert, RICHARDSON, 1905, p. 210–211; MENZIES 1962b, p. 345, fig. 5.

Diagnosis: *Rocinela* with eyes not contiguous. Flagellum of Ant^2 with 10–11 articles. Body lacks tubercles on dorsum. Pleotelson with semilunar bands of pigment. Propodus of prehensile legs armed with one spine and not three.
Measurements: Illustrated female, length 12 mm, width 5.5 mm.

Type-locality: Several localities in West Indies and Caribbean.
Distribution: Probably a pantropical species, already found at various places in the Caribbean and Gulf of México and Pacific at Mazatlán, Magdalena Bay, México (MENZIES, 1962b). In Puerto Rico at Sta. VII-5, eight specimens, gill slits of sting ray (*Dasyatis americana*), juvenile; Sta. VII-16, two specimens, gills of nurse shark (*Ginglymostoma cirratum*); Sta. VII-17, seven specimens, gills of nurse shark.

Affinities: The union of *R. signata* with *R. aries* was made possible by the finding of color patterns of both species in a single sample in Puerto Rico. The specimens with the *R. signata* color pattern were found to have the stout seta or spine on the propodus of the prehensile legs and hence this union of species seems quite reasonable.

Family CYMOTHOIDAE

Cirolanid-type Cirolanoidea with no clear distinction between flagellum and peduncle of antennae. Pleopods without plumose setae. All seven pairs of peraeopods with dactyls modified as large recurved hooks. Maxillipedal palp of two articles, last article armed with stout spines or hooks. (modified after RICHARDSON, 1905, p. 214).

Genus **Anilocra** Leach, 1818

Type-species: Probably *Anilocra mediterranea* Leach, 1818 = *A. physodes* (L.).

Diagnosis: Cephalon scarcely immersed in first peraeonal somite. Peraeonal epimera do not reach the posterior angle of their somites or just barely reach this angle. Peraeopods increase in length from front to rear. (modified after Richardson, 1905, p. 226).

20 **Anilocra laticauda** Milne Edwards, 1840

(Fig. 20 A–D)

Reference: Richardson (1905, p. 227–228).

Diagnosis: *Anilocra* with frons of cephalon truncated medially. Uropoda shorter than pleotelson with both rami of similar length, inner ramus wider than outer ramus (after Richardson, 1905).
Measurements: Illustrated female, length 34 mm, width 12 mm.

Type-locality: *La mer des Antilles.*
Distribution: Atlantic-Maryland, U.S.A. to Straits of Magellan, and in Caribbean. Not known from the Pacific. In Puerto Rico this species was collected at Sta. X-1 on a squirrel fish.

Affinities: Separated from the Pacific twin species *A. plebeia* Schiödte & Meinert by having the rami of the uropoda subequal in length and not having the uropodal exopod longer than the endopod; also the frons of the cephalon is blunt instead of pointed.

Genus **Lironeca** Leach, 1818

Type-species: *Lironeca redmanni* Leach, 1818.

Diagnosis: Cymothoid-type Cirolanoidea with body suboval, more or less twisted. Head almost always deeply immersed. Ant[1] widely separated at the base, rather compressed. Anterior margin of first thoracic segment widely sinuated in the middle, more or less sinuated or incised at the antero-lateral angles. Abdomen little immersed, continuous with thorax, not narrower than thorax. (after Richardson, 1905, p. 256).

One species belonging to *Lironeca* was in the Puerto Rico collections. This species appears to be the type-species.

21 Lironeca redmanni Leach, 1818

(Fig. 4 D–G)

Reference: RICHARDSON, 1905, p. 261–263.

Diagnosis: Uropoda much longer than pleotelson, inner ramus narrow, obtuse, and much shorter than outer ramus. Coxal plates of last two peraeonal somites not longer than the somites. Pleon not immersed in peraeon, sides of first somite reach lateral border. (modified after RICHARDSON, 1905).

Measurements: Illustrated female, length 26 mm.

Type-locality: Jamaica, Antilles.

Distribution: Cuba, Jamaica, Brazil (RICHARDSON, op. cit.). Found in Puerto Rico at Sta. VII-2, two specimens, parasitic on *Scomberomorus maculatus*.

LIMNORIID-TYPE: CIROLANOIDEA

The characteristics separating this group of Cirolanoidea from the cirolanid and sphaeromid types were given on p. 35. These are repeated here to characterize the single family Limnoriidae.

Family LIMNORIIDAE

Body capable of enrollment but not into a compact ball. Uropoda lateral and tubular, not flattened and fan like, both rami separated from peduncle. Pleonal somites separated and pleopoda visible in lateral view. Cephalon globular, retractable under the margin of the first peraeonal somite. This family comprises two genera, *Limnoria* and *Paralimnoria*. In the former genus only the exopod of the uropod is minute and provided with an apical claw; it is much shorter than the endopod. In *Paralimnoria* the exopod and endopod are similar in shape and both provided with an apical claw.

Genus **Limnoria** Leach, 1813

Type-species: *Limnoria lignorum* (Rathke), 1799.

Diagnosis: Limnoriidae with uropodal exopod minute and provided with an apical claw; endopod long and apically devoid of a claw. (after MENZIES, 1957).

22 **Limnoria (Limnoria) pfefferi** Stebbing, 1905

(Fig. 21 E)

Reference: MENZIES, 1957, p. 135–137.

Diagnosis: *Limnoria* (*Limnoria*) with flagellum of Ant^2 with four articles. Epipod of Mxp just reaching articulation of first article of palp endopod; epipod clavate, widest near distal end, about two and one-half times as long as wide. Md palp with three articles. Fifth somite of pleon dorsally with median longitudinal "V"-shaped carina. Dorsal surface of posterior edge of pleotelson lacks spike-like bristles; lateral crests devoid of tubercles. Lacinoid setae of right Md short, with five apical denticles. (after MENZIES, op. cit.).
Measurements: Illustrated female, length 3.6 mm, width, 1.0 mm.

Type-locality: Minikoi Atoll (STEBBING, 1905, p. 715).
Distribution: Probably pantropical. This is the first record from the Caribbean. Found in Puerto Rico at Sta. VII-6, over 50 specimens; Sta. XI-3, five specimens.

23 **Limnoria (Limnoria) platycauda** Menzies, 1957

(Fig. 21 F)

Reference: MENZIES, 1957, p. 139–141.

Diagnosis: *Limnoria* (*Limnoria*) with flagellum of Ant^2 with five articles. Epipod of Mxp reaching nearly to articulation between first and second articles of palp; epipod semi-spatulate, narrowest at distal end, about three times as long as wide. Md palp with three articles. Fifth somite of pleon dorsally with obscure median longitudinal ridge. Pleotelson lacking ridges or carinae. Lateral crests with conspicuous tubercles. Lacinoid seta of right mandible elongated, abruptly bent at distal end which bears a cup-shaped, serrated apex. (after MENZIES, op. cit.).
Measurements: Illustrated male, length 2.3 mm, width 0.5 mm.

Type-locality: Curaçao, Dutch West Indies.
Distribution: Puerto Rico and Curaçao (MENZIES, op. cit.). In Puerto Rico specimens were found at Sta. VII-15 from a mangrove root.

24 **Limnoria (Limnoria) tripunctata** Menzies, 1951

(Fig. 21 C–D)

Reference: MENZIES, 1957, p. 137–139.

Diagnosis: *Limnoria* (*Limnoria*) with flagellum of Ant^2 with five articles. Epipod of Mxp triangulate, two and one-half times as long as wide, just reaching articulation of palp with endopod. Md palp with three articles. Dorsal surface of fifth somite of pleon medially with two anteriorly located elevated nodes and a single posteriorly elevated area; central part depressed. Pleotelson medially with one anteriorly located tubercle followed by a pair of tubercles, each of which is followed by a longitudinal carina. Dorsal surface of posterior margin of telson tuberculate, spike-like bristles lacking. Lateral crests conspicuously tuberculate. Lacinoid seta of right Md abruptly curved distally, bearing two prominent, flattened, apically-spinulate projections. (MENZIES, op. cit.).

Type-locality: Pacific Ocean – San Diego, California, U.S.A.
Distribution: Probably pantropical. Recorded from Atlantic and Pacific Coasts of North America, Caribbean (MENZIES, 1957) and found in Hawaii and the Mediterranean (senior author notes). Found in Puerto Rico at Sta. XII-4, three specimens.

Affinities: This species is perhaps a synonym of *Limnoria tuberculata* Sowinski from the Black Sea (KUSSAKIN, pers. com). This species shows some variation in enhanced tuberculation that has been recognized by the senior author in populations from Boston, Massachusetts, and Plymouth, England also. There is a suspicion that this variation, if indeed it is a variation, represents a hybrid with *Limnoria lignorum* (Rathke). This problem is being studied further with plans to interbreed specimens from the Black Sea with specimens from North Carolina and elsewhere.

Genus **Paralimnoria** Menzies, 1957

Type-species: *Paralimnoria andrewsi* (Calman), 1910.

Diagnosis: Limnoriidae with both rami of uropods subequal in length and provided with apical claw. Otherwise quite similar to wood-boring *Limnoria* (sens. str.). (after MENZIES, 1957).

25 **Paralimnoria andrewsi** (Calman) 1910

(Fig. 21 A–B)

Reference: MENZIES, 1957, p. 148–151.

Diagnosis: See characteristics of the genus above. There is only one species known for this genus. The species has three formae or variants. The specimen illustrated here belongs to forma *typica* which has the paired carinae of the pleotelson absent or reduced.
Measurements: Illustrated female, length 2.7 mm, width 0.8 mm.

Type-locality: Forma *typica* was taken from the Indian Ocean at Christmas Island (CALMAN, 1910).
Distribution: Probably a pantropical cosmopolite. Indian Ocean, Caribbean (MENZIES & ROBINSON, 1960), Hawaiian Islands, Japan (MENZIES, op. cit.). In Puerto Rico this species was found at Sta. XII-4, over 100 specimens found with *Limnoria* (*L.*) *tripunctata* Menzies.

SPHAEROMID-TYPE: CIROLANOIDEA

Sphaeromid-type Cirolanoidea have three unifying characteristics. (see also p. 35). First, the pleon and pleotelson combine functionally to form a vault in which the pleopods are enclosed. Thus the pleopods are not visible in lateral view. Second, the various somites of the peraeon and the pleon act together to permit complete enrollment into a ball or partial enrollment. Third, the cephalon does not underride the first peraeonal somite; instead it articulates to the first peraeonal somite. In sphaeromid isopods the fertilized eggs are often withdrawn into invaginated pockets of the ventral body wall and are not out free in the marsupium as is the case for most Isopoda.

HANSEN (1905) divided the Sphaeromidae into three groups based on the structure of the pleopoda. He included *Limnoria* among the Spaeromidae but this genus was removed from that family by MENZIES (1957). He divided his subfamily Sphaerominae into three groups.

Hemibranchiatae: Plp^4 and Plp^5 have the endopods thick, of fleshy aspect, with deep, essentially transverse folds, the exopods submembranaceous and rather pellucid, two-jointed; both rami of both pairs without plumose marginal setae; exopod of Plp^4 has the

subapical squamiferous protuberance on the lower surface very high. Plp^3 has both rami closely set with long plumose setae, at least on distal margin. Endopod of Plp^1 at least rather broad, scarcely ever half again as long as broad. (after HANSEN, 1905).

Eubranchiatae: Plp^4 and Plp^5 have both rami subsimilar, with deep, essentially transverse folds, often of fleshy aspect, without plumose marginal setae; exopod of Plp^5 generally distinctly two-jointed, with subapical, squamiferous protuberance on the lower surface very high. Plp^3 has both rami closely set with long plumose setae at least on their distal margin. Endopod of Plp^1 at least rather broad, scarcely over half as long again as broad. End of abdomen at least emarginate, generally with a notch or slit terminating in a foramen. (after HANSEN, 1905).

Platybranchiatae: Plp^4 and Plp^5 have both rami completely without transverse folds, and their exopods are unjointed; endopod of Plp^4 at most with a few short, terminal, plumose setae, exopod of same pair rarely with numerous long, marginal, plumose setae (*Tecticeps*), in most genera both rami without plumose setae; both rami of Plp^5 without plumose, marginal setae, and the exopod has the squamiferous protuberances slightly in relief, and in rare cases without spines or even wanting. Plp^3 has sometimes plumose, marginal setae on both rami as Plp^2, sometimes with endopod nearly naked or with both rami naked. Endopod of Plp^1 rarely broad, most frequently narrow (end of abdomen sometimes with a rounded notch, often truncate, rounded or acute).

Of these three major groups of Sphaeromid-type Cirolanidae only the Hemibranchiatae and the Eubranchiatae were encountered in the collections from Puerto Rico. Since the outstanding analytical study of HANSEN (op. cit.), the number of described genera and species in the Sphaeromidae has increased greatly but without the requisite synthesis of characteristics and classification. Today the classification of the genera of the sphaeromid isopods is in chaos and a synthesis is needed by someone having access to the type-species. This paper is not the appropriate place for such a study even were the study possible at this time, which it is not. The best we have been able to do is to assign species to what appear to be appropriate genera and illustrate as many significant characteristics as possible

with the hope our work may be used in the future to provide corrected assignments of the species.

A culturing of the young to their adult stages with detailed descriptions of the changes in morphology as sexual maturity is reached could do much to simplify our understanding of the sphaeromids. It will be of interest to see whether an eubranchiate passes through a hemibranchiate and platybranchiate stage in early life history and vice versa. It is possible, however, that the young emerge from the parent brood pouch in one of the three stages and remain at that stage through life. We do not today have the answer to these questions which are so vital to the classification of sphaeromids.

In the collections from Puerto Rico the sphaeromid-type was represented by 11 species according to HANSEN's classification as follows:

Hemibranchiatae – *Sphaeroma* (1 species)
Exosphaeroma (?*Pseudosphaeroma*) (2 species)

Eubranchiatae – *Dynamenella* (5 species)
Paracerceis (2 species)
Geocerceis (1 species)

KEY TO THE SPECIES OF SPHAEROMID-TYPE CIROLANOIDEA

1. Hemibranchiate genera 10
2. Eubranchiate genera 3

3a. Inner one-third of endopod of Plp^1 indurated and hence unlike outer ramus . . . . . .(?)*Dynamenella barnardi*, n. sp.
3b. Inner one-third of endopod of Plp^1 not indurated but instead appearing much like the outer ramus 4

4a. Exopod of Plp^3 unjointed. Dorsum of pleotelson with greatly elevated central area. Exopod of male uropod tubular and longer than pleon. . . . . *Geocerceis barbarae*, n. gen., n. sp.
4b. Exopod of Plp^3 two jointed. Dorsum of pleotelson without greatly elevated central area. Exopod of male uropod not longer than pleotelson 5

5a. Rami of adult male uropoda with exopod and endopod dissimilar in length, with exopod tubular and longer than endopod. Apex of female and young male uropoda truncated . . . 6

5b. Rami of adult male uropoda similar in length and flattened. Apex of female and young male uropoda more pointed than truncated. 7

6a. Apex of pleotelson of male with a spine at proximal medial margin of foramen . . . . . *Paracerceis nuttingi* (Boone)

6b. Apex of pleotelson of mature male with two spines at proximal, medial margin of foramen. . . . . *Paracerceis caudata* (Say)

7a. Adult male with penes elongate, much longer than wide, and pointed. 8

7b. Adult male with penes short, blunt at apex and not much longer than width of both penes . . . . . *Dynamenella acutitelson*, n. sp.

8a. Dorsum of pleotelson covered with minute, evenly dispersed tubercles . . . . . *Dynamenella perforata* (Moore)

8b. Dorsum of pleotelson with a few stout tubercles or carinae 9

9a. Dorsum of pleotelson with eight tubercles (male) and four tubercles (female) centrally . . . . . *Dynamenella quadripunctata*, n. sp.

9b. Dorsum of pleotelson with two pairs of longitudinal carinae centrally arranged. . . . . *Dynamenella dianae* (Menzies)

10a. Exopod of uropod with around nine sharp teeth on outer margin, dorsum of pleotelson with a pair of larger conspicuous tubercles arranged in longitudinal rows. Male penes minute . . . . . *Sphaeroma walkeri* Stebbing

10b. Exopod of uropod with crenulate lateral margin, dorsum of pleotelson smooth, devoid of tubercles. 11

11a. Stylus of male Plp^2 with apex enlarged. Sexes very similar, with apex of pleotelson having a slight median emargination . . . . . *Exosphaeroma alba*, n. sp.

11b. Stylus of male Plp^2 without enlargement at apex. Sexes similar, without emargination at apex of pleotelson . . . . . *Exosphaeroma productatelson*, n. sp.

Genus **Paracerceis** Hansen, 1905

Type-species: *Paracerceis caudata* (Say), 1818.

Diagnosis: Eubranchiate sphaeromids with notched pleotelson in male, with a pair (or a single denticle) in the notch. Male without any medial process on sixth thoracic segment; female with abdominal notch semicircular, mouth parts strongly metamorphosed. Exopod of Plp^3 with an articulation rather near the end. Exopod of uropod about as large or much larger than endopod; head of normal size. (compiled from HANSEN's, op. cit., key in which the genus is described; the parentheses are ours, indicating deviations from the diagnosis in specimens seen by us).

26 **Paracerceis caudata** (Say), 1818

(Fig. 22 A–F)

Synonym: *Exosphaeroma yucatanum* (Richardson), 1901.
References: HANSEN, 1905; RICHARDSON, 1905; MENZIES & FRANKENBERG, 1966.

Diagnosis: *Paracerceis* with two spines in abdominal foramen of male at midline and not just one. Female uropoda truncated, not reaching apex of pleotelson with three swellings. Dorsum of male pleotelson with medial, bilobed swelling and a pair of lateral tubercles or lobes.

Measurements: Illustrated male, length 6.0 mm, width 2.7 mm; illustrated male, length 6.0 mm (var. *brevipes*); illustrated female, length 3.0 mm, width 1.5 mm.

Distribution: This species has been reported from New Jersey, U.S.A., to Yucatán and from Bermuda (RICHARDSON, 1905, p. 314). It was found in Puerto Rico at Sta. VII-9, 3 males, 14 females, and two young females; Sta. VII-15, 12 females; Sta. XII-5, two females; Sta. XII-8, two females, two young females; Sta. XII-7, one male. The variation *brevipes* was found at Sta. VII-11, four males, six females.

Affinities: This species may be distinguished from *Paracerceis nuttingi* (Boone), which also occurs in the Caribbean, by the two spines instead of one at the abdominal notch.

Variation: Ten specimens of a variant having the lateral projections of the abdominal notch reduced and each lacking a medial tooth were noticed in our sample; all four males were alike in this respect. The females were not distinguishable from *P. caudata* (Say).

This variant, which we have called *brevipes*, may or may not represent an ecotype.

The type of the species *Exosphaeroma yucatanum* (Richardson, 1901) was compared with females of *Paracerceis caudata* and found to be conspecific.

27 **Paracerceis nuttingi** (Boone), 1921

(Fig. 23 D–F)

Synonym: *Exosphaeroma nuttingi* Boone, 1921, p. 97–98, figs. 1–2.

Diagnosis: *Paracerceis* with a single median spine in abdominal notch in immature male. Either side of incipient notch in female provided with sharp, small teeth or crenulations. Female exopod of uropod slightly shorter than endopod; female dorsum smooth, without three lobes.

Measurements: Illustrated immature male, length 5.0 mm, width 2.5 mm; female, length 2.5 mm, width 1.5 mm. (both from Sta. VII–9).

Type-locality: Barbados, among the spines of sea urchins. (Boone, op. cit.).
Distribution: Barbados (Boone, 1921). Found in Puerto Rico at Sta. VII-9, 14 specimens; Sta. VII-14, three specimens; Sta. XII-10, one specimen.

Remarks: The incipient male pleotelson, which shows through the exoskeleton, is characteristic of the immature male. This species appears to be closely related to *Paracerceis sculpta* (Holmes) from San Diego, California (Richardson, 1905), but this relationship can not be firmly determined until mature males have been found and have been compared with west coast specimens. We saw no mature male specimens.

Genus **Sphaeroma** Bosc, 1801

Type-species: *Oniscus serratus* Fabricius, 1787.

Diagnosis: Hemibranchiate sphaeromids without terminal notch to pleotelson, which is rounded or somewhat produced. Mxp with lobes of fourth to sixth joints low or rudimentary. Md normal, with obtuse, generally toothed incisor. Sides of pleon not expanded below lateral margin of peraeon. (after Hansen, 1905).

28 Sphaeroma walkeri Stebbing, 1905

(Fig. 23 C)

Reference: Loyola e Silva, 1960, p. 41–52; Pillai, 1955, p. 132–133.

Diagnosis: *Sphaeroma* with exopod of uropod lanceolate and laterally provided with sharp teeth, margins of endopod smooth, dorsum with three stout tubercles. Dorsum of pleotelson tuberculate, medial longitudinal pair consists of around seven tubercles, bi-laterally in a row, there are several added lateral tubercles; pleotelsonal apex crenulate. Pleon with four tubercles in transverse row. Peraeonal somites five to seven with transverse row of stout tubercles at posterior margin of each somite. First pleonal somite with a medially produced, semilunate flange.

Measurements: Illustrated female, length 8.0 mm.

Type-locality: Ceylon (?), not known to us (Stebbing, 1905).

Distribution: Probably a pantropical cosmopolite. Rio de Janeiro, Brazil (Loyola e Silva, 1960), Ceylon (Stebbing, op. cit.), India (Barnard, 1936, Pillai, 1961), Red Sea (Monod, 1933), South Africa (Barnard, 1920), Australia (Baker, 1928).

This is the first record of the species from the West Indies. In Puerto Rico it was found at Sta. I-1, 13 specimens.

Genus **Geocerceis,** n. gen.

Type-species: *Geocerceis barbarae*, n. gen., n. sp.

Diagnosis: Eubranchiate sphaeromid with exopod of Plp^3 unjointed; exopod of Plp^5 two-jointed. Sexes dimorphic in pleon but not in mouthparts. Endopod and exopod of uropoda similar in length in female. Exopod greatly elongate, club-shaped, tubular, and endopod much reduced in male. Pleon with sutures going to lateral borders of pleon, not ending on pleotelson. Frontal lamina expanded forward in male, not in female. P^1 similar to P^7 but a little shorter, not prehensile. Basal joint of Ant^1 of the usual shape, not expanded in a free plate. Both male and female without pair of long processes from sixth thoracic segment. Apex of pleotelson with simple notch, not expanded into tube and without foramen, transverse or otherwise.

This genus has a strong superficial resemblance to species of *Cy-*

modopsis BAKER (1926, p. 264–268) which genus, however, belongs to the Hemibranchiata.

Cilicaea beddardi STEBBING (1905, p. 40–42, pl. 10A) from Ceylon looks similar in many details, but the sculpturing of the pleotelson and pleon differs considerably. Our species can not belong to *Cilicaea* because it is a eubranchiate and not a hemibranchiate like *Cilicaea*. It is for this reason we have described this genus as new. If HANSEN's system of classification (based on the pleopods) is in error, then this genus may later become a synonym of *Cymodopsis* Baker.

29 Geocerceis barbarae, n. gen., n. sp.

(Figs. 24 A–M, 25 D–G)

Diagnosis: Eubranchiate sphaeromid, with exopod of Plp^3 unjointed. Stylus of male Plp^2 located at distal inner margin of endopod and hence projecting beyond that ramus. Lobes of Mxp palp strongly produced. Md normal with teeth on incisor and normal molar process. Measurements: Holotype female, length 2.5 mm, width 1.2 mm; allotype male, length 3.3 mm, width 1.0 mm. Holotype from Sta. VII-15, allotype from Sta. VII-9.

Type-locality: Puerto Rico at Sta. VII, USNM Cat. No. 119349.
Distribution: Known only from Puerto Rico at above locality, at Sta. VII-18, three specimens; Sta. VII-9, ten specimens; Sta. VII-15, nine specimens.

Supplementary Descriptive Notes: General body form ovate. Cephalon wider than long. Frons sinuate, eyes situated at postero-lateral angles. First peraeonal somite as long as cephalon and three times the length of second. Second to sixth peraeonal somites about equal in length. Seventh peraeonal somite less than one-fourth the length of sixth peraeonal somite. Incisions of pleon reach lateral margins. Pleotelson dorsally with high bilobed elevation in both sexes and apically incised. Ant^1 flagellum with six articles; Ant^2 flagellum with seven articles. Md normal, incisor with four teeth, lacinia with three teeth, setal row with four setae. Mxp with middle three articles having strongly produced lobes. Mx^1 outer ramus with nine setae at apex, inner ramus with five setae. Mx^2 inner lobe with five setae, outer lobe with four setae to outer ramus, inner ramus with six apical setae. P^1 shorter than others, P^7 with two

stout setae on inferior border of propodus. Plp^1 with rami unjointed, exopod with 18 PMS, endopod with 9 PMS. Plp^2 with unjointed rami, exopod with 19 PMS, endopod with 9 PMS. Plp^3 with unjointed rami, exopod with 26 PMS, endopod with 12 PMS. Plp^4 and Plp^5 fleshy with transverse folds, lacking PMS; exopod of fifth two-jointed. Uropods with inner and outer ramus subequal and ovate (female), outer ramus long and tubular, inner ramus almost obsolete (male).

Genus **Dynamenella** Hansen, 1905

Type-species: *Dynamenella perforata* (Moore) 1901, Hansen, 1905.
Synonyms: *Dynamenopsis* Baker, 1908; *Clianella* Boone, 1923.

Diagnosis: Eubranchiate sphaeromid with basal joints to Ant^1 not expanded in a free plate. Uropodal exopod always at least one-half as long as endopod. Pleon of both sexes rather similar in aspect, without real process (on dorsum of last somite of pleon); abdomen with notch which is semicircular or oblong in female, in male narrow in distal part, while proximal part constitutes a transverse foramen; uropod subsimilar in both sexes, with the rami lamellar. Mouth parts similar in both sexes, male with appendix masculina on endopod of Plp^2. (modified after HANSEN, 1905, parentheses ours).

HANSEN (op. cit.) assigned *Dynamenella* to the Eubranchiatae having the exopod of Plp^3 unjointed. Our reexamination of topotypes and the holotype in the USNM suggests strongly that it belongs to the Eubranchiatae, but the exopod of Plp^3 is two-jointed in these specimens.

The genus *Dynamenopsis* Baker is based upon the error in HANSEN's diagnosis of *Dynamenella*. It was formerly thought to be distinguished from *Dynamenella* in having a two-jointed exopod to Plp^3. We consider therefore that *Dynamenopsis* is a synonym of *Dynamenella*.

This brings up the problem of what to do with species formerly assigned to *Dynamenella* which have an unjointed exopod to Plp^3.

MENZIES (1962a) has a serious typographical error in his diagnosis of *Dynamenopsis* in the Eubranchiatae sections where the word three should replace the word four when referring to jointed exopods.

The folds of Plp^4 and Plp^5 are exceptionally difficult to distinguish

when the pleopoda are examined under high power in transmitted light. They should be examined and the folding determined under moderate power with reflected light to assure proper assignment to eu- or hemibranchiate divisions.

Study of the types of *Clianella elegans* Boone in the USNM shows that this species belongs to *Dynamenella*. This species appears to be so close to the illustrations given by LOYOLA E SILVA for his *Dynamenella antonii* Loyola e Silva, 1960, that we suspect these two may be conspecific.

30 **Dynamenella perforata** (Moore), 1901

(Figs. 26 A–H, 27 A–L)

References: MOORE, 1901, p. 173–174; RICHARDSON, 1905, p. 303.
Synonym: *Dynamene moorei* RICHARDSON, 1905, p. 303.

Diagnosis: *Dynamenella* with apex of pleotelson of male with deep T-shaped emargination on transverse foramen with lateral borders joined at midline. Uropoda expanded and fan-like, rami with margins crenulate, exopod exceeds posterior border of pleotelson. Dorsum of pleotelson evenly and minutely tuberculate. First pleonal somite shows only at lateral border of seventh peraeonal somite. Pleonal sutures not extending to lateral margin of pleon and instead, meet above uropodal insertions on pleotelson. Female pleotelson minutely tuberculate, uropodal rami not as expanded as in male, apex of pleotelson rounded, not emarginate. Pleonal sutures as in male. Mature male penes elongate, pointed, fused at base.
Measurements: Illustrated male, length 3.2 mm, width 1.5 mm; female, length 2.6 mm, width 1.0 mm.

Type-locality: Culebra Island, Puerto Rico (MOORE, 1902).
Distribution: Puerto Rico to Bermuda. Found in Puerto Rico at Sta. VII-15, one male, one female, twenty-two young; Sta. VII-18, seven females; Sta. VIII-5, one male, one female. All specimens collected from under the chiton *Acanthopleura granulata*.

Affinities: One of us (GLYNN, MS) has cultured this species to maturity. Females have been compared with the types of *Dynamene moorei* Richardson from Bermuda and found to be conspecific with *D. perforata*. There is probably a collecting error for this species be-

cause we have not found it among mangrove roots as stated by MOORE and RICHARDSON.

Supplementary descriptive notes: General body form of topotype male, slightly more than two times as long as wide, color yellowish with black chromatophores. Cephalon wider than long. Frons with median "rostrum", not meeting frontal lamina. Eyes lateral, black, with ocelli. First peraeonal somite longer than second and shorter than cephalon. Second peraeonal somite about half the length of first. Third to sixth peraeonal somites equal to second in length. Seventh peraeonal somite slightly longer than sixth. Ant^1 about as long as cephalon is wide, flagellum with 10 articles. Ant^2 one-third longer than first, flagellum with 11 articles. Md with tri-articulate palp, incisor with four teeth, lacinia with four teeth, setal row with several setae. Mxp, Mx^1 and Mx^2 similar in both sexes, normal, as illustrated. Peraeopods increase in length from anterior to posterior. Plp^1 exopod unjointed with 22 PMS setae which are longer than exopod; endopod longer than wide, narrower than exopod, unjointed with 18 PMS setae which are longer than endopod. Plp^2 rami unjointed, exopod with 23 PMS, endopod with 14 PMS. Plp^3 two-jointed, exopod with 25 PMS, endopod with 13 PMS. Plp^4 with both rami unjointed, no PMS. Plp^5 with exopod two-jointed, no PMS.

31 **Dynamenella quadripunctata,** n. sp.

(Fig. 28 A–N)

Diagnosis: *Dynamenella* with deep-set, semicordate, transverse foramen at apex of pleotelson in male with postero-lateral borders conjoined medially. Uropoda extending to apex of pleotelson, rami crenulate at margins. Penes long and pointed. Dorsum of pleotelson centrally with four stout tubercles arranged in square, two smaller tubercles on either side of these; pleon with two stout tubercles, one on either side of midline, stylus of male Plp^2 straight, not tapering to a fine spinulate point. Apex of female pleotelson medially incised, somewhat pointed. Incisions of pleotelson of male and female similar.

Measurements: Male holotype, length 2.5 mm, width 1.0 mm; allotype of gravid female, length 2.5 mm, width 1.0 mm. Sta. IV-1.

Type-locality: Puerto Rico, Sta. IV-1, holotype and allotypes, one male, 22 females and nine young paratypes, USNM Cat. No. 119350.
Distribution: Known only from type-locality. Found in Puerto Rico additionally at Sta. III-1, three specimens; Sta. VIII-3, four specimens; Sta. VIII-1, six specimens; Sta. XI-3, two specimens.

Affinities: This species resembles *D. perforata* Moore in general aspect and most details of the pleopoda and mouth parts. It differs in not having the dorsum of the pleotelson minutely but densely tuberculate and in having the pleotelson more pointed with the foramen of the male less transverse. The male stylus of Plp^2 does not taper to a fine point and the uropoda are shorter.
Supplementary descriptive notes: General body form two and one-half times as long as wide (color purple to dark brown). Cephalon wider than long, eyes situated at postero-lateral angles. First peraeonal somite longer than second. Peraeonal somites two to six similar in length. Seventh peraeonal somite longer than sixth and with projecting, wavy posterior margin. Ant^1 with flagellum of eight articles, Ant^2 with flagellum of 11 articles. Md palp triarticulate; last article one-third shorter than middle one, with eight comb-setae, middle article with two stout setae at distal end, first article as long as second. Incisor with four teeth, lacinia with three teeth, molar well developed. Mx^1 exite with 10 teeth, endite with 4–5 setae. Mx^2 inner lobe with five setae, outer each lobe with four comb-setae, three very large. P^1 with inferior margin of dactyls tuberculate. Other peraeopods longer than first. Plp^1 rami unjointed, exopod with 20 PMS, endopod with 14 PMS. Plp^2 rami unjointed, exopod with 22 PMS, endopod with 12 PMS. Plp^3 with exopod two-jointed, with 19 PMS, endopod with 11 PMS. Plp^4 fleshy with folds, without PMS, rami unjointed. Plp^5 fleshy with folds, exopod two-jointed, neither ramus with PMS.

32 **Dynamenella acutitelson,** n. sp.

(Figs. 29 A–M, 30 A–C)

Diagnosis: *Dynamenella* with sutures of pleon confined to dorsum of pleotelson, as in *D. perforata,* not reaching lateral margin. Sexes quite similar in pleotelson and mouth parts. Apex of pleotelson pointed but ventrally sulcate when viewed from below or behind. Dorsum

of pleotelson centrally with two pairs of elevated, minutely tuberculate swellings; first pair globular, posterior pair elongated longitudinally. Peraeon with transverse ridges on somites 4–6 (var. *typica*) or devoid of ridges, even and minutely tuberculate (var. *glabrothorax*). Penes small, rami not much longer than wide, apex blunt; stylus of male Plp^2 curves outward and then inward, apex blunt.

Measurements: Holotype male, length 3.5 mm, width 2.0 mm; allotype, length 2.3 mm, width 1.0 mm. Sta. I-1 (*typica*). Illustrated var. *glabrothorax*, length 3.0 mm, width 1.5 mm. Sta. XII-3.

Type-locality: Puerto Rico at Sta. I-1, one male, 10 females, three juveniles. USNM Cat. No. 119351.

Distribution: Known only from Puerto Rico, from type locality and Sta. III-1, one male and one female. The variety *glabrothorax* was found at Sta. XII-3, one male, two females and eight young.

Supplementary descriptive notes (these apply to var. *typica*): General body form slightly less than twice as long as wide. Cephalon wider than long, eyes at postero-lateral angles. First peraeonal somite not so long as second. Second peraeonal somite as long as third, dorsum of both smooth. Fourth to sixth peraeonal somites similar in length and with a transverse ridge which is separated at midline by a medial piece of the remaining ridge. Sixth peraeonal somite with transverse ridge, seventh peraeonal somite with mid-dorsal, tuberculate swelling near posterior margin having a pair of smaller tubercles on either side of it. Ant^1 flagellum with 7–8 articles, Ant^2 flagellum with seven articles, both Ant of similar length. Md lacinia with three, incisor with four teeth which are brown in color, setal row with five setae. Mxp with one coupling hook, second, third, and fourth articles of palp expanded, lobed as is typical for genus, endite narrow with seven apical setae. Mx^1 outer ramus with nine, inner ramus four apical setae; Mx^2 outer ramus with four; inner ramus with four setae on outer lobe, inner lobe with 10 setae. P^1 shorter than others, dactyl with inferior margin smooth. Other peraeopods similar to P^1. Plp^1 unjointed, exopod with 29 PMS, endopod with 13 PMS. Plp^2 unjointed, with 29 PMS, endopod with 16 PMS. Plp^3 with exopod two-jointed with 29 PMS, endopod with 13 PMS; Plp^4 fleshy with folds on both rami, no PMS; Plp^5 endopod two-jointed, both rami fleshy with folds, no PMS.

The following notes apply to var. *glabrothorax*.

This variant is almost equal to *acutitelson* var. *typica* except that the peraeonal somites are smooth dorsally, lacking transverse ridges, but provided with minute tuberculations. The sculpture of the dorsum of the pleotelson, the male penes, and the appendix masculina are identical in the two. Perhaps the two are distinctly different species. More specimens are required to determine the range of variation. The uropoda of *typica* seem to project farther beyond the margin of the pleotelson than they do in *glabrothorax* and have the margin of the endopod more rounded. Plp^1 and Plp^2 normal. Plp^3 exopod two-jointed. Plp^4 and Plp^5 with deep folds, fleshy.

33 **Dynamenella dianae** (Menzies), 1962

(Fig. 23 A–B)

Reference: *Dynamenopsis dianae* MENZIES, 1962b, p. 341.

Diagnosis: Exopod and endopod (of uropod) of the mature male large, with heavy, decidedly crenulate margins. Body bearing dorsally a unique sculpturing as follows: Seventh peraeonal somite broadening medially with a central depression along its upturned thin and expanded outer upper margin; pleotelson cephalad of the cordate foramen with a pair of stout (elongated) tubercles which converge toward the midline as the sides of a triangle; seventh peraeonal somite with pair of conspicuous "eye-like" yellowish (internal) "bodies" on either side of midline; a median (elongate) tubercle occurring anterior to foramen (of pleotelson). Uropoda of female smaller than male, apex of pleotelson with a slight reduced depression. Sculpturing on dorsum of female consists of only a single swelling medially. (after MENZIES, 1962b).

Measurements: Illustrated male, length 3.4 mm, width 1.7 mm.

Type-locality: San Quintín Bay, Lower California, México (MENZIES, op. cit.).
Distribution: This is the first record of this species from the Caribbean. It was found in Puerto Rico at Sta. V-1, one male, two females; Sta. V-2.

Remarks: The two pairs of elongate tubercles described by MENZIES are really more like carinae, while the tubercle in front of the foramen of the pleotelson is also a carina.

34 (?)**Dynamenella barnardi,** n. sp.

(Fig. 31 A–J)

Reference: *Dynamenella kraussi* Barnard, 1914, which is perhaps a synonym.

Diagnosis: *Dynamenella* with exopod of Plp^1 indurated at interior one third, indurated piece triangulate and sulcate so that exopod fits into lateral margin of indurated part. Exopod of Plp^3 unjointed. Penes moderately short, about four times as long as wide at base, bases not fused. Exopod of male Plp^2 much smaller than endopod, male stylus not exceeding length of endopod. Both rami of Plp^4 and Plp^5 fleshy and with folds, exopod of Plp^5 two-jointed. Male and female pleotelsons similar, pointed, with small, semilunate, medial emargination.

Measurements: Holotype male, length 4.5 mm, width 2.0 mm; allotype female, length 3.7 mm, width 1.7 mm. Sta. XII-1, plus seven males, seven females and eight young paratypes.

Type-locality: Puerto Rico at Sta. XII-1, USNM Cat. No. 119352.
Distribution: Known only from Puerto Rico. One young specimen was also collected at Sta. XII-2.

Affinities: This species is very close to *Dynamenella kraussi* Barnard, 1914, p. 415–417. The pleonal sutures of the two differ markedly in that those of our new species show the first suture sweeping forward to meet the exposed part of the first pleonal somite instead of going toward the midline of the body. Pleonite 3 does not reach close to the lateral border of the pleon and instead is confined to the dorsum of the pleotelson. This species probably should be removed from *Dynamenella*. The species *Dynamenella eatoni* (Miers) is also similar to this species.

Additional descriptive notes: General body form with sides subparallel; body and pleotelson smooth, lacking tubercles or other ornamentation, color in alcohol lavender. Cephalon slightly wider than long. Frons with short medial bump, eyes located at posterolateral angles. First peraeonal somite slightly longer than second. Second to sixth somites subequal in length, seventh peraeonal somite about twice the length of sixth. Ant^1 one half the length of Ant^2, flagellum with 10 articles. Ant^2 flagellum with 14 articles. Md incisor with four teeth, brown in color, palp triarticulate, molar typical.

Mxp palp articles three, four and five with produced lobes, endite with one coupling hook. Mx^1 outer ramus with 10 apical setae, inner ramus with four apical setae. Mx^2 outer and inner lobes of outer ramus with four setae, inner lobe with 10 setae at apex. P^1 similar to other peraeopods, all short and stout, inferior margin of dactyl with row of squarish scales. Plp^1 with both rami unjointed, exopod with 20 PMS, endopod triangulate and with indurated medial quarter with 24 PMS. Plp^2 with both rami unjointed, exopod, with 31 PMS, one-half the size of endopod with 25 PMS. Plp^3 with both rami longer than wide, unjointed, exopod with 18 PMS and endopod with 35 PMS. Plp^4 and Plp^5 fleshy with folds, exopod of Plp^5 two-jointed, no PMS. Uropods with exopod slightly shorter than endopod which barely reaches to posterior margin of pleotelson.

Genus **Exosphaeroma** Stebbing, 1900

Two species were found which do not meet either the hemibranchiate or the platybranchiate character. The rami of Plp^4 and Plp^5 are fleshy and the blood sinuses are arranged transversely, giving the impression of folds or channels. Under low magnification no folds are seen. The exopod of Plp^3 is unjointed. The exopod of Plp^4 is two-jointed. In both species the male penes are long and tapering and in both the male stylus of Plp^2 is scarcely longer than the endopod and curved at its apex toward the lateral. These animals accordingly probably belong to the same genus. Possibly they could be placed with *Exosphaeroma* from which they deviate, however, in lacking folds on one ramus of Plp^4 and Plp^5 and in having the exopod of Plp^3 unjointed. The lobes of Mxp palp are long, Md normal in both sexes and the sexes not dimorphic. The type of *Exosphaeroma*, *Exosphaeroma gigas*, has short penes.

Loyola e Silva (1960) placed *Exosphaeroma rhombofrontale* Giambiagi in *Pseudosphaeroma* Chilton (1909). Giambiagi's species has an unjointed exopod to Plp^3 and no folds on the posterior pleopoda but the legs have natatory setae and the lobes of the Mxp palp scarcely developed. The genus *Pseudosphaeroma* was originally placed in the Eubranchiatae of Hansen by Chilton. Later it was

transferred to the Hemibranchiatae by MONOD (1931). LOYOLA E SILVA (op. cit.) also placed two apparent (to judge from illustrations) eubranchiate sphaeromids, which have the exopod of the third pleopod two-jointed, into the genus *Pseudosphaeroma*. These were his two species *Pseudosphaeroma mourei* and *P. jakobii*. These two species, while agreeing with *Pseudosphaeroma* in having unjointed exopods on Plp^3, are considerably different from the type of that genus in having almost platybranchiate posterior pleopods, and hence should not be placed in *Pseudosphaeroma*. We have tentatively placed the two species encountered in this study in *Exosphaeroma* realizing that this placement is incorrect but probably less incorrect than assigning them to *Pseudosphaeroma* as defined by CHILTON (1909).

35 (?)**Exosphaeroma alba,** n. sp.

(Figs. 32 A–N, 25 A–C)

Diagnosis: (?)*Exosphaeroma* with two-jointed exopod to Plp^4. Male and female with notch at end of pointed pleotelson. Uropoda with rami of similar length, reaching to or slightly beyond apex of pleotelson. Penes long and pointed, not fused at base. Apex of stylus of male Plp^2 swollen at base. Body and pleotelson smooth, devoid of tuberculations or other ornamentation. Flagellum of Ant^1 with seven articles, of Ant^2 with 11 articles.

Measurements: Holotype male, length 2.0 mm, width 1.0 mm; allotype, length 2.3 mm, width 0.6 mm. Sta. VIII-5.

Type-locality: Puerto Rico, Sta. VIII-5 (plus 60 added paratypes). USNM Cat. No. 119353.

Distribution: Also in Puerto Rico at Sta. VI-1, six specimens; Sta. VII-3, seven specimens; Sta. VIII-4, three specimens; Sta. VII-18, ten specimens; Sta. VIII-3, two specimens; Sta. XI-1, four specimens.

Affinities: This species is somewhat similar to the female of *Dynamenella perforata* (Moore) but is distinguished by its pleopods which lack the folds of that species. The *chromata* variant was found at Sta. XI-2 (103 specimens).

Supplementary descriptive notes: General body form elongate or ovoid. Cephalon with eyes at postero-lateral angles. First

peraeonal somite twice the length of second. Second to seventh peraeonal somites subequal in length. First pleonal somite about as long as seventh peraeonal somite, lateral margins continuous with peraeon. Sutures located over pleotelson and not reaching lateral margins. Ant^1 about as long as cephalon is wide, slightly shorter than Ant^2. Ant^2 slightly longer than Ant^1. Md palp triarticulate, first and second articles subequal in length, last article two-thirds the length of second, second with five marginal setae, last with eight marginal setae, lacinia not brown in color at apex, with three teeth, incisor with four teeth, apex dark brown, setal row with three setae. Mxp typical of genus with produced lobes, one coupling hook on endite. Mx^1 with nine setae on outer, four on inner ramus. Mx^2 outer and inner lobes each with four apical setae, inner ramus with five apical setae. P^1 shorter than others. Plp^1 with both rami unjointed, exopod with 18 PMS, endopod with 14 PMS. Plp^2 with both rami unjointed, exopod with 21 PMS, endopod with 14 PMS. Plp^3 unjointed, exopod with 22 PMS, endopod with 12 PMS. Plp^4 with exopod partially two-jointed, both rami lack PMS and are somewhat submembranaceous. Plp^5 with rami unjointed, submembranaceous without PMS. Uropods with rami long, exopod shortest, both reaching the apex of pleotelson.

The species occurs in an apparent variant which we have called *chromata*. This variant is proportionally longer than *alba* and bears many more chromatophores (Fig. 25, A–C), otherwise the two were indistinguishable.

36 (?)**Exosphaeroma productatelson,** n. sp.

(Fig. 33 A–J)

Diagnosis: (?)*Exosphaeroma* with produced lobes to Mxp palp. Exopod of Plp^3 unjointed. Dorsum of pleotelson and body smooth and devoid of ornamentation, tubercles, etc., apex of pleotelson without notch in either sex. Incisions of pleon not reaching to lateral margin. Penes elongate and pointed, fused at base. Male stylus of Plp^2 not much longer than endopod and slightly curved laterally; apex unarmed and not swollen. Uropoda reaching to apex of pleotelson, exopod slightly shorter than endopod, margin crenulate.

Measurements: Male holotype, length 2.5 mm, width 1.0 mm; female allotype, length 1.5 mm, width 0.7 mm. Sta. II-1.

Type-locality: Puerto Rico, Sta. II-1, types and 328 added paratype specimens. USNM Cat. No. 119354.
Distribution: Known only from Puerto Rico. Found in Puerto Rico additionally at Sta. IV-1, three specimens; Sta. VIII-4, eight specimens; Sta. VIII-5, four specimens.

Affinities: This species resembles *Exosphaeroma diminutum* Menzies & Frankenberg from Georgia, but its crenulate uropoda set it apart. In this latter feature the species appears much like *Exosphaeroma crenulatum* Richardson from Bermuda except that the types (not RICHARDSON's description or illustrations) show the apex of the pleotelson to be medially emarginate. This is not the case with our specimens.

Suborder ASELLOTA

This suborder contains a large number of genera whose species are usually minute in size. It is a most difficult suborder to characterize due to the great diversity of the genera.

The Asellota may be divided into three major divisions which were called subtribes by MENZIES (1962a, p. 27) because he identified the Asellota as a tribe. As that author stated, however, his nomenclature for the higher taxa was one of convenience for that paper and did not imply a stabilized nomenclature. In this paper the Asellota are treated as a suborder. The subdivisions of the Asellota then become superfamilies. As was implied through his work, the major categories of the Isopoda require redefinition and realignment. This cannot be done here. Here the three major divisions of the Asellota will simply be called groups.

Group 1. Stenetriioidea (with one family Stenetriidae, and one genus, *Stenetrium*).

Group 2. Aselloidea (with one family Asellidae mainly represented in fresh water and one or more genera).

Group 3. Paraselloidea (with many to few families depending on one's view of the Asellota).

KEY TO EIGHT SPECIES OF ASELLOTA

1a. Pleon consists of three somites inclusive of pleotelson 2
1b. Pleon consists of one or two somites inclusive of pleotelson. . 4

2a. Eyes with four pigmented ocelli each . . . . . *Stenetrium minocule*, n. sp.
2b. Eyes with many ocelli. 3

3a. Lateral border of pleotelson each with one spine-like serration . . . . . *Stenetrium occidentale* Hansen
3b. Lateral border of pleotelson with 5–7 serrations or spines . . . . . *Stenetrium serratum* Hansen

4a. Uropoda with rami minute, shorter than peduncle, no dorsally visible coxal plates . . . . . *Jaeropsis rathbunae* Richardson
4b. Uropoda with obvious rami usually longer than peduncle . . 5

5a. Eyes on short, immovable stalks at lateral borders of cephalon . . . . . *Antias milleri*, n. sp.
5b. Eyes dorsal or bulging, near lateral border but not on stalks . 6

6a. Lateral borders of pleotelson minutely serrated; uropoda shorter than pleotelson. . . . . *Bagatus serricaudus*, n. sp.
6b. Lateral borders of pleotelson without minute serrations, uropoda as long as or longer than pleotelson 7

7a. Body speckled with chromatophores; gnathopod of male with 3–4 teeth on upper margin of carpus, dactyls bilobed on inferior margin. Propod much shorter than carpus . . . . . *Bagatus bermudensis* (Richardson)
7b. Body colorless. Gnathopod of male with two teeth on upper margin of carpus, dactyl without lobes, propod as long as carpus . . . . . *Bagatus stylodactylus* Nobili

Group STENETRIIOIDEA

(with characteristics of family below)

Family STENETRIIDAE

Asellote isopods with three somites to the pleon inclusive of pleotelson. Dactyls of peraeopods with two claws. Male Plp^1 fused at base with two small, plate-like rami; Plp^2 not much larger than Plp^1 and conjoin functionally with Plp^1 laterally, inner ramus with sperm transfer organ. Male Plp^3 with outer ramus biarticulate and broad, forming an operculum concealing the remaining pleopoda. Uropoda biramous, insertion terminal, anus terminal and outside of branchial chamber. Frontal lamina of cephalon quite evident between Ant^1. Antennal scale attached to peduncle of Ant^2. Ant^1 short with pauciarticulate flagellum, Ant^2 long with multiarticulate flagellum.

Genus **Stenetrium** Haswell, 1881

Type-species: *Stenetrium armatum* Haswell, ref. HANSEN, 1905.

Diagnosis: Because the family contains a single genus the generic diagnosis is the same as that given for the family (RICHARDSON, 1905, p. 440). The species have been reviewed by HANSEN (1905).

P^1, which are modified into subchelate gnathopods, are very dimorphic sexually. Various growth stages of the gnathopods are encountered in collections of these animals. Unfortunately the mature male gnathopod has been used to distinguish the various species without good knowledge of the variation of this appendage during development. The animals should be cultivated in the laboratory and changes during development determined so that the utility of the male gnathopod in distinguishing species can be determined. This has not yet been done. We suspect that several species have been described based upon growth variation in the gnathopod of the male.

37 **Stenetrium occidentale** Hansen, 1905

(Figs. 34 A–E, 35 A–F, 36 D)

Reference: RICHARDSON, 1905, p. 441–444.

Diagnosis: *Stenetrium* with acute antero-lateral and acute pre-antennular spines at front of cephalon, lateral margin entire. Pleotelson longer than wide with a pronounced spine anterior to uropoda at lateral margin. Eyes large, multifaceted, separated medially by less than three eye diameters (long axis). Frontal process of cephalon slightly emarginate. Apex of endopod of male Plp^2 with expanded cup bearing circle of sharp setae and a lateral spiniferous knob. Uropoda shorter than pleotelson, outer ramus shorter than inner ramus.

Measurements: Illustrated male, length 4.0 mm, width 0.8 mm; length of Ant^2 3.9 mm, flagellum 2.4 mm. Sta. VII-8.

Type-locality: St. Thomas, West Indies (RICHARDSON, op. cit.).
Distribution: West Indies. This is the first record of the species from Puerto Rico. In Puerto Rico it was found at Sta. VII-8, 96 specimens; Sta. VII-9, one male with mature gnathopod, one young; Sta. VII-13, five specimens; Sta. VII-14, one young; Sta. VII-15, ten specimens. It is possible that this species is a pantropical cosmopolite.

Remarks: The mature male gnathopod of the specimen from Sta. VII-9 is shown in Fig. 36 D. This gnathopod is so close to that given by HANSEN (vide RICHARDSON, 1905, p. 442, fig. 498) that it is reasonably certain that our specimens belong to *S. occidentale*. Gnathopods belonging to less mature males show a progressive rounding of the inner distal projection of the carpus and the presence of an added spine on the inferior margin of the propodus, Fig. 35 A; in other characteristics the specimens are the same and probably belong to the same species. This observation suggests further the probability that Richardson's *Stenetrium stebbingi* RICHARDSON (1905, p. 444–446) from Bermuda as well as *Stenetrium antillense* Hansen are conspecific with *Stenetrium occidentale* Hansen. It is probable also that *Stenetrium gilbertense* NORDENSTAM (1946, p. 23–26) from the Gilbert Islands (based on female specimens) and that *Stenetrium medipacificum* MILLER (1941, p. 308–311) from Hawaii are equal to *S. occidentale* Hansen.

We have been able to examine specimens of RICHARDSON's *S. stebbingi* from the collections of the USNM and conclude that it is conspecific with the specimens described here. The differences reported by various authors we believe to be growth stages.

38 **Stenetrium serratum** Hansen, 1905

(Fig. 37 A–C)

Reference: RICHARDSON, 1905, p. 440–441.

Diagnosis: *Stenetrium* with pronounced, acute, antero-lateral and acute, preantennular spines. Lateral margin of cephalon with a small spine. Pleotelson not much longer than wide; each lateral border with six to seven teeth. Eyes large and multifaceted, separated medially by four eye diameters (long axis). Frontal process slightly emarginate. Apex of endopod of male Plp^2 with long setae and apparently without a lateral spiniferous knob (vide illustration G of HANSEN in: RICHARDSON, 1905, p. 442, fig. 498 g). Uropoda shorter than pleotelson, outer ramus shorter than inner ramus.
Measurements: Illustrated female, length 2.7 mm, width 0.6 mm (Ant^2 missing).

Type-locality: St. Thomas, West Indies (RICHARDSON, op. cit.).
Distribution: Found also in Puerto Rico at Sta. VII-15, one female.

Affinities: This species is easily distinguished from *S. occidentale* Hansen by the multi-toothed, lateral margins of the pleotelson. It is probably conspecific with *S. chiltoni* Stebbing (NORDENSTAM, 1946) from Ceylon (STEBBING, 1905), Amirante Islands (STEBBING, 1910) and the Ellice and Gilbert Islands in the South Pacific (NORDENSTAM, op. cit.). If this is so, then the species may be expected to be a pantropical cosmopolite.

39 **Stenetrium minocule,** n. sp.

(Fig. 38 A–E)

Diagnosis: *Stenetrium* with a single pair of spines or teeth at lateral margin of pleotelson in front of uropoda. Ant^2 as long as body. Eyes reduced to a few ocelli, cephalon with antero-lateral and preantennular teeth reduced to blunt lobes, lateral borders convex,

entire, without teeth. Uropoda only one half the length of pleotelson. Measurements: Holotype female, length 3.7 mm, width 0.6 mm; length Ant^1 3.7 mm, length flagellum 2.7 mm.

Type-locality: Puerto Rico, Sta. VII-15, female holotype, USNM Cat. No. 118355.
Distribution: Known only from Puerto Rico.

Affinities: The reduced eyes set this species apart from other species in the genus.
Added descriptive notes: General body form about six times longer than wide; colorless. Cephalon slightly wider than long, without sharp antero-lateral spines or sharp preantennular spines, lateral border without spines. Frons slightly concave. Eyes minute, consist of four pigmented ocelli, separated from each other dorsally by five eye diameters. First peraeonal somite as long as second with sharp, antero-lateral angles. Second peraeonal somite as long as third with pointed, antero-lateral angles. Third peraeonal somite as long as second with blunt antero-lateral angles. Fourth peraeonal somite one half as long as third. Fifth peraeonal somite equal to length of fourth. Sixth peraeonal somite much longer than fifth. Seventh peraeonal somite equal in length to sixth. Ant^1 about as long as width of head. Ant^2 as long as body, flagellum with about 76 articles. Mouth parts normal for genus. P^1 of female with dactyl having sharp setae along inferior margin, dactyl as long as distal border of propodus, this border with three large teeth and a stout seta or spine at outer angle. Other peraeopods ambulatory. Pleopods normal for genus. Male pleopods not observed. Uropods half the length of pleotelson, outer ramus shorter than inner ramus.

Group PARASELLOIDEA

Diagnosis: Asellota with only two or less than two somites comprising pleotelson. When two present they consist of a short anterior one and a shield-shaped pleotelson. Male Plp^1 fused medially to form sympod which couples laterally and functionally to male Plp^2. Other pleopoda smaller and covered by Plp^1 and Plp^2. Female with only four pairs of pleopoda, Plp^1 lacking; Plp^2 completely fused to form operculum covering remaining pleopoda.

This family contains few or many genera depending on how one splits the genera into natural groups. MENZIES (1962a) prefers many families; whereas WOLFF (1962) prefers few. Our state of knowledge today is such that one choice is about as good as another. Following the multifamily concept, three families were found in Puerto Rico, viz. ANTIASIDAE, JAEROPSIDAE and JANIRIDAE.

Family ANTIASIDAE

Diagnosis: Articles of Mxp palp all narrow, similar in width and at least one half the width of endite. Dactyl of P^7 with two short claws, not three. Md molar process normal, expanded, apically with grinding edge. All peraeonal somites of similar width and similar length, none twice as long as wide. Uropoda with peduncle, generally biramous. Peraeopods, except for gnathopod (P^1), of similar structure. (modified from MENZIES, 1962a).

Genus **Antias** Richardson, 1906

Type-species: *Antias charcoti* Richardson, 1906.

Diagnosis: Generally the same as for Family except that the species of this genus lack a rostrum. In the companion genus *Kuphomunna* Barnard, 1914, a rostrum (really the upper lip) is present that exceeds the length of the cephalon (MENZIES, 1962a).

40 **Antias milleri,** n. sp.

(Fig. 39 A–F)

Diagnosis: *Antias* with large biramous uropoda. Frons of cephalon convex. First peraeonal somite shorter than second. Pleotelson devoid of stout setae laterally or dorsally.

Measurements: Holotype female, length 1.0 mm, width 0.5 mm.

Type-locality: Sta. VII-11, four females. USNM Cat. No. 119356. In Puerto Rico the species was found additionally at Sta. VII-8, one female; Sta. VII-9, one female; Sta. VII-12, one specimen. Males were not found. The pleopoda of the male should be described by some student having access to more material.

Distribution: Possibly occurs in Bermuda where a species of this genus was

reported by Dr. MILTON A. MILLER (MENZIES, 1962a); MONOD's (1933) species *Munna "B"* from Suez is probably also this species.

Affinities: This species appears to be related to *Antias mawsoni* Hale in having stout uropoda with the outer ramus the longest. It differs markedly, however, in having the frons of the cephalon convex and produced and not concave.

Supplementary descriptive notes: General body form ovate, about two times as long as wide. Frons excavate, evenly but slightly concave, devoid of stout, two-pointed setae or spines. Rostrum lacking. Eyes with minute preocular lobes, eyelobes project beyond lateral margin of cephalon, about as long as wide. First peraeonal somite shorter than cephalon or second peraeonal somite. Second peraeonal somite twice as long as first. Third peraeonal somite subequal in length to second. Fourth peraeonal somite slightly shorter than third. Fifth, sixth and seventh peraeonal somites all subequal in length and each shorter than fourth, each with a pronounced coxal plate visible in dorsal view. Coxal plates each with a stout seta at antero-lateral angle. Ant^1 one third the length of Ant^2, flagellum with three articles, last article more than twice the length of second, first and second subequal in length. Ant^2 equals the length of the body exclusive of pleotelson, flagellum with about ten articles. Md palp triarticulate. Mxp normal for genus, with two coupling hooks. Mx^1 outer ramus with nine apical setae, inner ramus with four apical setae. Mx^2 having both lobes of outer ramus with two apical setae; inner lobe with four apical setae. P^1 slightly subchelate, dactyl one-half the length of propod. Other peraeopods with dactyl one-third the length of elongate propod. P^7 with four stout, two-pointed setae at inferior margin. Plp^1–Plp^5 normal for genus. Uropods as long as or longer than pleotelson, rami longer than peduncle with many long, stout, two-pointed setae, exopod longer than endopod.

Family JAEROPSIDAE

Paraselloidea with only two somites to pleon. Ant^1 and Ant^2 short. Length of Ant^2 less than width of cephalon. Cephalon with articulated rostrum at frontal border. Uropoda biramous, peduncle squarish or ovate, inner and outer ramus minute, often scarcely discernible. Md

without molar. Mxp palp much narrower than endite. Ant^2 without antennal scale. Contains one genus, *Jaeropsis*, with the characteristics of the family.

Genus **Jaeropsis** Koehler, 1885

Type-species: *Jaeropsis curvicornis* (Nicolet), 1849.

Diagnosis: As per family diagnosis above.

41 **Jaeropsis rathbunae** Richardson, 1902

(Fig. 36 A–C)

Reference: Richardson, 1905, p. 478–479.

Diagnosis: *Jaeropsis* with claw on medial postero-lateral angle of uropod, peduncle prominent. Rostrum evenly rounded and provided with fringe of entire scales. Apex of pleotelson bluntly pointed between uropods.

Measurements: Illustrated female, length 1.5 mm, width 0.4 mm.

Type-locality: Bermuda (Richardson, 1905).

Distribution: Bermuda (Richardson, 1905). This is the first record of the species from the Caribbean. In Puerto Rico the species was found at Sta. VII-9, one female; Sta. VII-8, two females.

It is highly probable that *Jaeropsis curvicornis* (Nicolet) reported by Stebbing 1910 (*non* Nicolet) from Ceylon is equal to this species. There are no discernible differences and hence this species is probably a pantropical cosmopolite.

Family Janiridae

Diagnosis: Paraselloidea with two somites to pleon. Ant^1 short, Ant^2 long, longer than width of cephalon. Cephalon without articulated rostrum. Md molar process well developed, expanded and truncate. Uropoda biramous, peduncle long, rami as long as peduncle. Ant scale present on Ant^2. Posterior peraeopods ambulatory with three claws or ungui. Mxp palp with first three articles expanded, over one half as wide as endite and much wider than last two articles. (modified after Menzies, 1962a).

We have deliberately restricted the familial diagnosis by adding the triunguiculate character of the hinder peraeopods.

Genus **Bagatus** Nobili, 1907

Type-species: *Bagatus stylodactylus* Nobili, 1907 (p. 418–419, pl. 11, fig. 11); type by original designation.
Synonym: *Carpias* Richardson, 1902 (p. 294–295).

Diagnosis: Janiridae with carpus of P^1 in mature male greatly swollen, dactyl reduced, propodus as long as carpal inner margin. P^1 as long or longer (when stretched) than body. Male Plp^1 without lateral expansions or lateral projections near apex. Other characteristics distinguishing this genus from certain other genera of the Janiridae are simply lacking.

The genera *Janiropsis, Janira* and *Bagatus* are indistinguishable from each other except for the characteristics of the male gnathopod. We have united *Carpias* with *Bagatus* because the apex of the male Plp^1 in *Carpias bermudensis* is identical to that reported here for *Bagatus* from Puerto Rico. The difference appears to be in the degree of maturity of the male gnathopod. As with the various species of *Stenetrium* and their presumed synonyms, someone should cultivate these animals and determine the range of postembryonal growth variation. The species differ from each other mainly in the structure of the male gnathopod, the relative lengths of the uropoda, the spines or serrations on the lateral margin of the pleotelson, and the pigmentation of the body.

42 **Bagatus stylodactylus** Nobili, 1907

(Figs. 40 A–F, 41 A–G)

References: Nobili, 1907, p. 418 (*Bagatus*); Nordenstam, 1946, p. 16–18 (*Bagatus*); Richardson, 1905, p. 452–454 (*Carpias*); Miller, 1941 (*Janira*).

Diagnosis: *Bagatus* with uropoda longer than pleotelson. Body not pigmented. Gnathopod with two wide spines or teeth at distal margin of carpus. Inferior margin of propodus smooth, without teeth and not greatly inflated. Apex of male Plp^1 with sharp, posterolateral angles which recurve somewhat medially. Lateral margins of

pleotelson without teeth or spines, but with some simple setae. Eyes large and red in life.

Measurements: Illustrated male, length 2.5 mm, width 1.0 mm; length Ant^2 2.5 mm, length flagellum 1.5 mm.

Type-locality: Mangareva, Gambier Islands, Polynesia (NOBILI, 1907).
Distribution: South Pacific, Polynesia and also including the Gilbert Islands, Melanesia (NORDENSTAM, op. cit.). It probably occurs in Hawaii (MILLER, 1941, *Janira algicola*). *Janira nana* Stebbing, 1905, is a *Bagatus*. It is probably also a synonym of *B. stylodactylus* (Nobili) and hence is probably a pantropical cosmopolite. In Puerto Rico it was found at Sta. VII-8, three specimens; Sta. VII-9, 29 specimens; Sta. VII-11, six specimens; Sta. VII-12, three specimens; Sta. VII-15, six males, 11 females; Sta. VII-18, six specimens; Sta. VIII-3, one female; Sta. XII-7, three specimens.

Affinities: The apex of the male Plp^1, as well as the two huge spines on the carpus of the male gnathopod, distinguish this species from others.

43 **Bagatus bermudensis** (Richardson), 1902

(Fig. 42 A–D)

Synonyms: *Carpias bermudensis* RICHARDSON, 1902, p. 294–295; RICHARDSON, 1905, p. 452–454. *Janira minuta* RICHARDSON, 1902, p. 297; 1905, p. 471–472; VANHÖFFEN, 1914.

Diagnosis: *Bagatus* with uropoda longer than pleon inclusive of pleotelson. Body speckled with chromatophores, lateral border of pleotelson rounded, entire, lacking spines or teeth. Male gnathopod with three teeth at superior (distal) margin of carpus, outer tooth longest, propod with one obtuse tooth on inferior margin changing to two teeth in fully mature male. Apex of male Plp^1 rami with swollen, medially recurved tips. Eyes black in life.

Measurements: Illustrated male, length 1.6 mm, width 0.4 mm; illustrated female, length 1.5 mm, width 0.5 mm.

Type-locality: Bermuda (RICHARDSON, 1902).
Distribution: Found in Puerto Rico at Sta. VII-14, one male, four females; south of Azores and Cape Verde Islands (VANHÖFFEN, 1914, as *Janira minuta*).

Affinities: Distinguished from *B. stylodactylus* Nobili by the three teeth on the superior margin of the carpus of the young male as well as in the mature male.

Our specimens were compared with RICHARDSON's types of *Car-*

pias bermudensis and found conspecific. We have also seen the female types of *Janira minuta* Richardson and believe they too are conspecific with *Bagatus bermudensis* (Richardson).

44 **Bagatus serricaudus,** n. sp.

(Fig. 43 A–D)

Diagnosis: *Bagatus* with uropoda shorter than pleotelson, lateral margins of pleotelson spinulate. Superior margin of carpus with three large teeth, first two subequal in size. Inferior margin of propodus entire, smooth. Apex of male sympod of Plp^1 with acute, recurved apex bearing an abrupt angle anteriorly. Eyes black in life. Measurements: Holotype male, length 1.6 mm, width 0.4 mm; allotype female, length 1.5 mm, width 0.5 mm.

Type-locality: Puerto Rico, Sta. VII-15, two males and four females; Sta. XII-7, two specimens, USNM Cat. No. 119357.
Distribution: Known only from type-locality.

Affinities: Distinguishable from other species by its serrated pleotelson, short uropoda and tri-toothed carpus of gnathopod.

SPECIES INDETERMINATE

The collection contained the usual amount of indeterminate specimens. These are given in the following list to their closest determination.

1. Corallanidae juvenile. Sta. VII-18, specimen had six pairs of peraeopods only.
2. *Dynamenella*, possibly *acutitelson*. Sta. VIII-2, specimen crushed.
3. Oniscoidean isopod, possibly belonging to genus *Trichoniscus*, uropoda missing. Sta. VII-15, three specimens.
4. (?) *Lironeca* young. Sta. VII-7, over 70 specimens.
5. (?) *Bagatus* young. Sta. VIII-5, one specimen, black eyes.

STATION LIST

STA. NO.

I Wagner's Shipyard, San Juan Bay.

Sample No. 1, 24 August 1966; intertidal, shore line cobbles covered by alga *Ulva*. FW (formalin washings); P. Glynn. – *Sphaeroma walkeri, Dynamenella acutitelson* var. *typica*.

II Dorado Beach, 15 miles west of San Juan.

Sample No. 1, 23 August 1966; intertidal, shore line rocks covered with algae, FW; P. Glynn. – *Exosphaeroma productatelson*.

III Cueva del Indio, 2 miles east of Arecibo.

Sample No. 1, 24 August 1966; intertidal, rocks and algae, FW; P. Glynn. – *Colopisthus parvus, Dynamenella quadripunctata, D. acutitelson* var. *typica*.

IV Crashboat Landing, Aguadilla.

Sample No. 1, 24 August 1966; intertidal algae, *Laurencia papillosa* dominant, FW; P. Glynn. – *Dynamenella quadripunctata, Exosphaeroma productatelson*.

V Mayagüez sea wall, north end of Mayagüez Bay.

Sample No. 1, 18 January 1966; under *Chiton tuberculatus* and in dead barnacle shells, under rocks; P. Glynn. – *Dynamenella dianae*.

Sample No. 2, 5 August 1966; rocks with algae, FW; P. Glynn and R. Menzies. – *Dynamenella dianae*.

VI Mona Island.

Sample 1, west of Punta Caigo o no Caigo, 21 March 1966; intertidal rocks, under *Chiton tuberculatus*; P. Glynn. – *Exosphaeroma alba*.

Sample No. 2, nite light, 10 May 1966; R/V Shimada (Nuclear Center) 40–50 ft. water, Sardinera Anchorage; sea calm, moonless night, 20.00–23.00 hrs.; R. W. Davis. – *Eurydice littoralis littoralis*.

VII Vicinity of La Parguera; collected by P. Glynn unless stated otherwise.

Sample No. 1, 28 May 1965; gills of *Aetobatus narinari*. – *Excorallana tricornis*.

Sample No. 2, Cayo Májimo, 13 November 1965; 30 ft. depth, host *Scomberomorus maculatus*. – *Lironeca redmanni*.

Sample No. 3, Turrumote Reef, March 15 and 18, 1966; under coral rubble in splash zone and also under *Chiton tuberculatus*. – *Exosphaeroma alba, Cirolana sphaeromiformis*.

Sample No. 4, Turrumote Reef, 29 March 1966; coral rubble over coarse sand, shore line, wave-splashed rocks, isopods found on undersides of coral rubble. – *Cirolana sphaeromiformis, Cirolana parva*.

Sample No. 5, fishing, 10 November 1965; from body and external gill of

Dasyatis americana (female sting ray with wing spread of about 4 ft.); J. Ramsey. – *Excorallana tricornis, Rocinela signata.*

Sample No. 6, log piling (palm), 9 June 1966; imbedded in muddy bottom in front of Magueyes Island. – *Limnoria pfefferi.*

Sample No. 7, Institute of Marine Biology dock, nite light, 23 July 1966; water calm, depth about 7 ft. (maximum), dip net; R. Menzies and H. Austin. – *Lironeca*(?).

Sample No. 8, Májimo Reef, 23 July 1966; *Porites* and *Millepora* clumps, subtidal, 5 ft., aqualung samples in net; FW, H. Austin. – *Apanthura signata, Cirolana parva, Stenetrium occidentale, Antias milleri, Jaeropsis rathbunae, Bagatus stylodactylus.*

Sample No. 9, Májimo Reef, 23 July 1966; dead *Acropora*, 5 ft., aqualung sample in net; FW; H. Austin. – *Gnathia puertoricensis, Mesanthura decorata, Cirolana parva, Paracerceis caudata, Paracerceis nuttingi, Geocerceis barbarae, Stenetrium occidentale, Antias milleri, Jaeropsis rathbunae, Bagatus stylodactylus.*

Sample No. 10, Májimo Reef, 23 July 1966; mangrove roots covered with sponges, 1–2 ft., FW; R. Menzies. – No isopods collected.

Sample No. 11, Májimo Reef, 23 July 1966; echinoids, holothurians and *Halimeda* in net, 5 ft., FW; R. Menzies and H. Austin. – *Antias milleri, Bagatus stylodactylus, Paracerceis caudata* var. *brevipes.*

Sample No. 12, Májimo Reef, 23 July 1966; sand and *Thalassia* in net, 5 ft.; H. Austin and R. Menzies. – *Antias milleri, Bagatus stylodactylus.*

Sample No. 13, Májimo Reef, 23 July 1966; various gorgonians; FW, 5 ft.; H. Austin and R. Menzies. – *Accalathura crenulata, Cirolana parva, Stenetrium occidentale.*

Sample No. 14, Májimo Reef, 23 July 1966; various sponges, 5 ft.; FW; H. Austin and R. Menzies. – *Paracerceis nuttingi, Stenetrium occidentale, Bagatus bermudensis.*

Sample No. 15, Laurel Reef, 6 August 1966; coral rubble covered with algae in exposed intertidal zone, and from corals and algae on leeward side of reef in 10 ft.; FW; P. Glynn and R. Menzies. – *Gnathia puertoricensis, Mesanthura paucidens, Apanthura signata, Apanthuroides millae, Pendanthura tanaiformis, Cirolana parva, Cirolana mayana, Alcirona insularis, Limnoria platycauda, Paracerceis caudata, Geocerceis barbarae, Dynamenella perforata, Stenetrium occidentale, Stenetrium serratum, Stenetrium minocule, Bagatus stylodactylus, Bagatus serricaudis, Trichoniscus*(?).

Sample No. 16, 16 August 1966; gills of nurse shark; J. S. Ramsey. – *Alcirona insularis, Rocinela signata.*

Sample No. 17, 7 September 1966; gills of nurse shark. – *Rocinela signata.*

Sample No. 18, Turrumote Reef, 7 September 1966; coral rubble in intertidal zone, FW. – *Mesanthura decorata, Apanthura signata, Pendanthura tanaiformis, Accalathura crenulata, Cirolana sphaeromiformis, Cirolana parva, Geocerceis barbarae, Dynamenella perforata, Exosphaeroma alba, Bagatus stylodactylus,* Corallanidae, juv.

Sample No. 19, Punta Peñones, 22 September 1966; rocky, limestone wave-washed shore and sandy bottom with *Thalassia.* – No isopods collected.

VIII Vicinity of Punta Brea; collected by P. Glynn.

Sample No. 1, 10 miles east of La Parguera, 13 September 1966; base of limestone cliff, protected shore, 1½ ft., FW of bare boulders embedded in sand. – *Mesanthura decorata, Pendanthura tanaiformis, Dynamenella quadripunctata.*

Sample No. 2, September 13, 1966; limestone platform sloping into sea, coarse-grained sand, exposed stone, mid-intertidal zone, FW of *Laurencia papillosa* and *Centroceros clavulatum.* – *Dynamenella acutitelson*(?).

Sample No. 3, September 13, 1966; medium-sized boulders on sand-pebble floor, semiprotected shore, FW algae-coated rocks, dominant alga *Laurencia papillosa.* – *Mesanthura paucidens, Cirolana sphaeromiformis, Cirolana parva, Dynamenella quadripunctata, Exosphaeroma alba, Bagatus stylodactylus.*

Sample No. 4, September 13, 1966; bare limestone ledge, sandy bottom, 1½ ft., protected shore, FW bare boulders. – *Cirolana parva, Exosphaeroma alba, Exosphaeroma productatelson.*

Sample No. 5, 13 September 1966; large boulders on sandy bottom, protected shore in the intertidal zone; FW algae-coated rocks, dominant alga *Laurencia papillosa.* – *Mesanthura paucidens, Cirolana sphaeromiformis, Cirolana parva, Dynamenella perforata, Exosphaeroma productatelson, Exosphaeroma alba, Bagatus*(?).

IX Cayo Morillo, entrance to Jobos Harbor.

Sample No. 1, 22 December 1965; R/V Carite, under *Chiton tuberculatus*, coral rubble shore line, protected coast; P. Glynn. – No isopods collected.

X Vicinity of Las Croabas.

Sample No. 1, 10 September 1962; ectoparasite on squirrel-fish; Eric Matthews. – *Anilocra laticauda*(?).

Sample No. 2, 25 October 1964; L. E. Paraliticci. – *Cirolana parva, Excorallana tricornis.*

XI Vicinity of Punta Maldonado; collected by P. Glynn, P. Castro and F. Fernández.

Sample No. 1, 13 March 1966, under *Chiton marmoratus* washed by waves and submerged. – *Exosphaeroma alba.*

Sample No. 2, 31 March 1966; in algae and under *Chiton marmoratus* washed by waves and submerged. – *Cirolana parva, Exosphaeroma alba* var. *chromata.*

Sample No. 3, 23 August 1966; algae FW, dominant alga *Digenia simplex.* – *Pendanthura tanaiformis, Cirolana parva, Limnoria pfefferi, Dynamenella quadripunctata.*

XII Vicinity of Boca de Cangrejos, San Juan; collected by R. Menzies.

Sample No. 1, 19 July 1966, brown algae (*Sargassum* dominant) on exposed rocky coast. – *Cirolana parva, Colopisthus parvus, Dynamenella barnardi.*

Sample No. 2, 19 July 1966; alga-encrusted rock from tide pool in spray

zone, exposed rocky coast. – *Gnathia puertoricensis, Mesanthura decorata, Cirolana parva, Dynamenella barnardi.*
Sample No. 3, 19 July 1966; red algae, exposed rocky coast. – *Dynamenella acutitelson* var. *glabrothorax.*
Sample No. 4, 20 July 1966; wood in water, protected bay, rock and sand beach. – *Limnoria tripunctata, Paralimnoria andrewsi.*
Sample No. 5, 20 July 1966; protected rock and sand beach, rock FW. – *Gnathia puertoricensis, Mesanthura decorata, Paracerceis caudata.*
Sample No. 6, 21 July 1966; sponges, ascidians, etc. on submerged mangrove roots, FW. – *Pseudione* sp., *Stegias clibanarii, Cirolana parva.* Two parasitic species from the hermit crab *Clibanarius tricolor.*
Sample No. 7, 21 July 1966; various gorgonians, about 5 ft., FW. – *Paracerceis caudata, Bagatus stylodactylus, Bagatus serricaudus.*
Sample No. 8, 21 July 1966; protected sand cove, 5 ft., *Thalassia* community, FW. – *Paracerceis caudata, Erichsonella filiformis tropicalis.*
Sample No. 9, 21 July 1966; protected sand cove, *Cymodocea* grass, FW. – *Astacilla cymodocea.*
Sample No. 10, 25 July 1966; duplicate of Sample No. 9, Sta. XII. – *Astacilla cymodocea, Paracerceis nuttingi.*

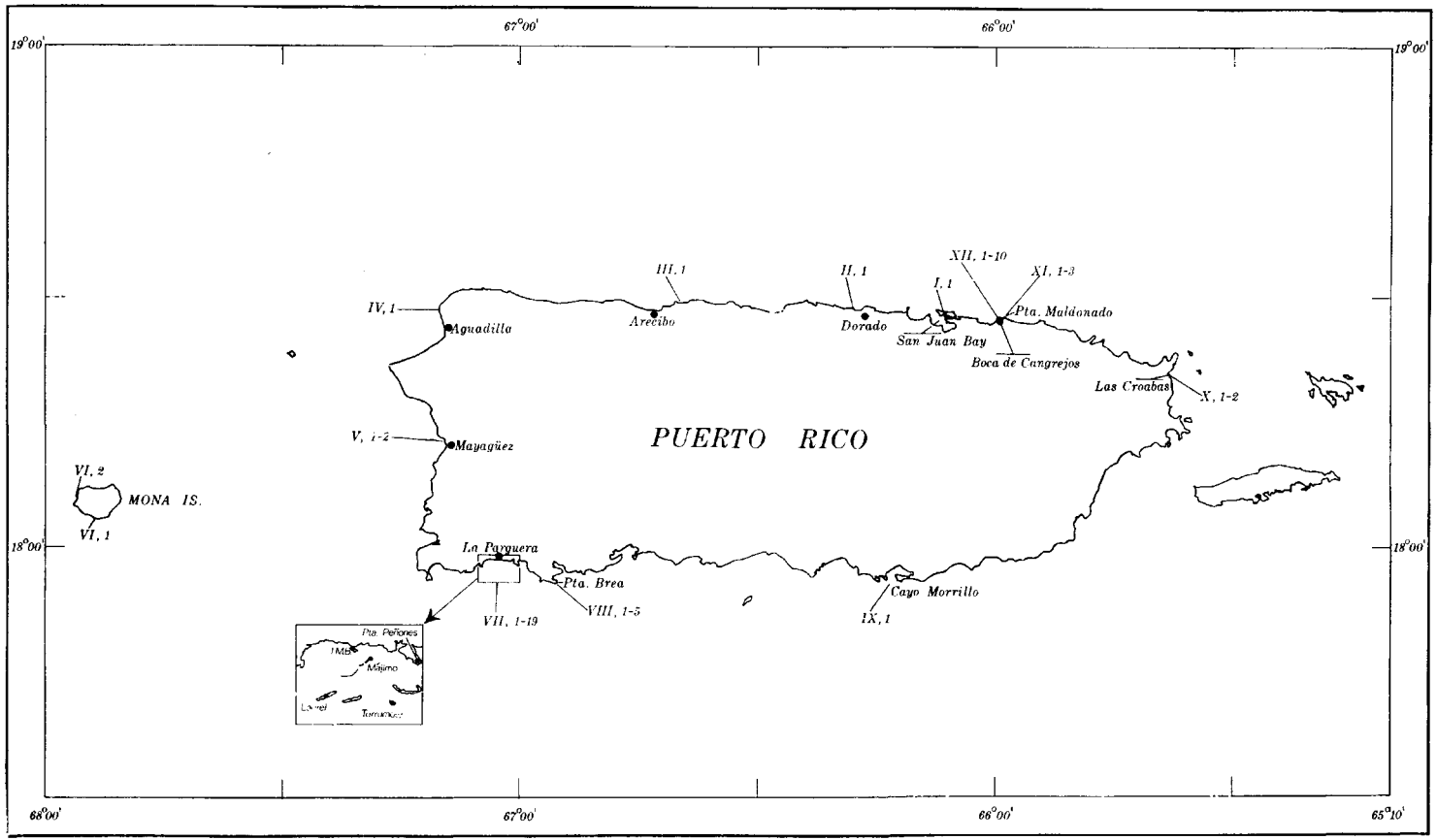
Isopods were not found, although they were searched for, in tide pools in the spray zone at Boca de Cangrejos. Additionally none were found at the sand beaches of San Juan or Mayagüez. – Interstitial collections were not made.

DISTRIBUTION AND ECOLOGY

Three facets of distribution should be considered; these are distribution within Puerto Rico, distribution within the Caribbean, and distribution elsewhere in the world ocean. We have assembled sufficient collections to describe the distribution within Puerto Rico and have enough data to give a preliminary indication of the relationships between the Puerto Rican fauna and fauna elsewhere, but we lack essential data regarding the fauna of other Caribbean islands and therefore must omit this interesting subject.

As a result of our small study the marine isopod fauna of Puerto Rico is now known better than that of any other Caribbean island. Even the faunas of the Gulf of Mexico and the Florida Keys are now less known as a unit than the Puerto Rican fauna by a factor of ten or more.

Certain general impressions may be worthwhile to examine in some detail. As a whole Puerto Rico may be divided into the northern and southern shores. The northern shores are characterized intertidally as ancient, cemented, sand dune environments and the



COLLECTING LOCALITIES on map of Puerto Rico and surrounding islands; collecting localities (Roman numerals) and stations (Arabic numerals). An insert of La Parguera and environs shows in greater detail localities visited in that area.

southern shore as active, off-shore coral reefs. Between these extremes are mangrove stands and exposed beaches. The vertical extent of the intertidal zone is much restricted due to the limited tidal range. Seasonally the range in atmospheric and marine temperatures is limited and low but the temperature *per se* is high. High temperature with accompanying desiccation and almost constant solar radiation combine to make the upper ranges of the intertidal belt inhospitable and frequented by few species of marine organisms. In contrast the subtidal region is rich and flourishing.

Forty-four species were represented in the collections. Fourteen were described as new. One of the fourteen species was known previously outside of Puerto Rico, but the remainder of the new ones provides no information today on their distribution elsewhere. Possibly some of these are endemics.

Fourteen of the species or 32 percent were also represented in Bermuda, giving the known isopod fauna a strong relationship to Bermuda.

Only six of the species (14 percent) were found also along the coastal Atlantic of North America. Nine percent also extended to Brazil and the coastal part of South America.

Fourteen species (32 percent) were found in the Atlantic and the Pacific and are believed to be represented in both oceans, and 23 percent are suspected to be PANTROPICAL in distribution.

Four species of the 44 here considered or 9 percent are represented by Pacific "twin" species.

These data may be summarized as follows:

	Percentage Affinity to Puerto Rico
Puerto Rican fauna not known elsewhere	29½
Caribbean – Gulf of Mexico	the highest? (data lacking)
North Atlantic coastal	14
South Atlantic coastal	7
Both North & South Atlantic coastal	3
Pacific-Atlantic	32
Pantropical (known or suspected)	23
Bermuda	32
Pacific "Twin" species	9

In conclusion it may be safely stated that, excluding Gulf and Caribbean relationships and endemics, the Puerto Rican fauna shows its greatest relationships to the Bermudian fauna, and to the Pacific and Pantropical fauna. Affinities with the North American continental fauna and that of the South American continent are low. Perhaps, however, these provisional conclusions will be altered when our knowledge of the isopods in these regions becomes better known.

Ecology

The 44 species of isopods reported in this study illustrate well the broad range of environmental conditions to which this group has adapted. Also, the great numbers of individuals collected within certain species indicate the relative abundance of the shallow water isopod fauna in Puerto Rico. Isopods are small in size and tend to live in secretive places; because of this, the novice collector may fail to gain a fair appreciation of the common occurrence of this group. In addition, many isopod species are very selective in living habits and can be collected successfully from only a specific habitat niche, for example in association with a particular species of alga or at certain vertical levels on the shore. For these reasons we have chosen to examine the various species treated in this account in relation to their preferred abodes. We do this to acquaint the reader with possible future collecting sites.

In general rocky shores washed by the breaking surf provide ecologic conditions favorable to numerous forms. A total of fifteen species was more or less restricted to this environment. Some of these species were found on the cemented dune and beach rock formations on the north coast of the islands as well as on the coral rubble shores of coral reefs, namely, *Gnathia puertoricensis*, *Mesanthura decorata*, *Mesanthura paucidens*, *Pendanthura tanaiformis* and *Cirolana sphaeromiformis*. Isopods found only on rocky shores were *Colopisthus parvus*, *Dynamenella quadripunctata*, *Dynamenella barnardi* and *Exosphaeroma productatelson*. Many of the animals were collected from the thalli of algae, and *Dynamenella quadripunctata* was frequently found on the red algae *Digenia simplex*, *Laurencia papillosa* and *L. obtusa*. *Mesanthura paucidens* was commonly associated with *Laurencia papillosa*.

The following species were collected only on the shore of coral reefs: *Apanthura signata, Apanthuroides millae, Accalathura crenulata, Cirolana mayana, Stenetrium serratum* and *Stenetrium minocule.* Especially good collections were obtained from the dense algal mat growing attached to large boulders of dead *Acropora palmata.* The undersurface of coral rubble imbedded in sand in ankle-deep water was the preferred abode of *Cirolana sphaeromiformis.* The greatest number of species taken from the same habitat was ten, from coral rubble in the intertidal zone at Turrumote Reef (Sta. VII-18).

Although only limited collecting was carried out subtidally, it is apparent that some species occur more commonly in slightly deeper water. In the intertidal belt *Bagatus stylodactylus* and *Bagatus serricaudus* were found on coral rubble, but also ranged to a depth of at least 5 ft. where both were obtained from a formalin wash of gorgonians. *Bagatus stylodactylus* was found living in turtle grass (*Thalassia*) and in algae in deeper water. Isopods which seemed to be mainly subtidal in their distribution were: *Paracerceis caudata* var. *brevipes, Paracerceis nuttingi, Geocerceis barbarae, Stenetrium occidentale, Antias milleri, Jaeropsis rathbunae* and *Bagatus bermudensis.*

Most of these forms were obtained from coral rubble and from a diverse assortment of living organisms with which they were associated, including algae, sea grasses, sponges and gorgonians. Three additional species which were collected below the tide line on marine plants were *Erichsonella filiformis tropicalis* from turtle grass, *Astacilla cymodocea* from manatee grass, and *Alcirona insularis* from the red alga *Ceramium nitens.* The rich collections obtained from this alga in deeper water indicate that it probably provides shelter for a host of subtidal species.

Wood infesting isopods were represented by four species in Puerto Rico as follows: *Limnoria pfefferi, L. platycauda, L. tripunctata* and *Paralimnoria andrewsi. Limnoria pfefferi* occurs by the thousands in palm pilings around La Parguera and is partly responsible for much of the marine damage in that area. One specimen of *Limnoria platycauda* was found on an underwater root of the red mangrove (*Rhizophora mangle*), and *Limnoria tripunctata* and *Paralimnoria andrewsi* were found on submerged pieces of wood. *Cirolana parva,* one of the most wide ranging or eurytopic species encountered, was

also collected from mangrove roots in addition to shallow and deeper water stations on rocky shores and coral reefs.

Hundreds of individuals of *Eurydice littoralis littoralis* were attracted to a night light at Mona Island. This collecting technique often attracts isopods that can not be found during the day.

The polluted San Juan and Mayagüez Bays yielded three sphaeromids: *Sphaeroma walkeri* and *Dynamenella acutitelson* were obtained from formalin washings of algae-coated cobbles along the shore. It should be noted that *D. acutitelson* was also collected from algae on an unprotected rocky shore. *Dynamenopsis dianae* occurred abundantly at the Mayagüez breakwater. At this locality it was found under stones, in dead barnacle shells and occasionally under the chiton *Chiton tuberculatus*.

Investigations on the association of sphaeromid isopods with chitons in Puerto Rico (GLYNN, MS) have revealed five distinct species partnerships. *Dynamenella perforata* can frequently be found in the ctenidial groove of the chiton *Acanthopleura granulata* and occasionally with *Chiton tuberculatus*. *Exosphaeroma alba* occurs on boulders embedded in sand and also at times under *C. tuberculatus*. *Exosphaeroma alba* var. *chromata* has been collected from Pt. Maldonado on the north coast only, and at this locality in association with *Chiton marmoratus* exclusively. Apparently these isopods are facultative commensals, and in the case of *D. perforata* preliminary observations indicate that the plant material not ingested by the chiton in its feeding is actually picked up and consumed by the isopods.

Parasitic isopods, collected only incidentally, were represented by six species. One specimen of the common shallow water hermit crab *Clibanarius tricolor* was infected with *Pseudione* sp. in the branchial cavity and with *Stegias clibanarii* on the abdomen. Earlier observations have revealed a high incidence of infection of shore hermits by parasitic isopods. Elasmobranchs caught around La Parguera very often had isopod parasites. Numerous individuals of *Excorallana tricornis* have been collected from the gill slits and from around the mouth of the two rays *Dasyatis* and *Aetobatus*. *Rocinela signata* was usually found in the external gill chamber of the nurse shark. Among bony fish hosts *Anilocra laticauda* was collected from a squirrel fish and *Lironeca redmanni* from *Scomberomorus*.

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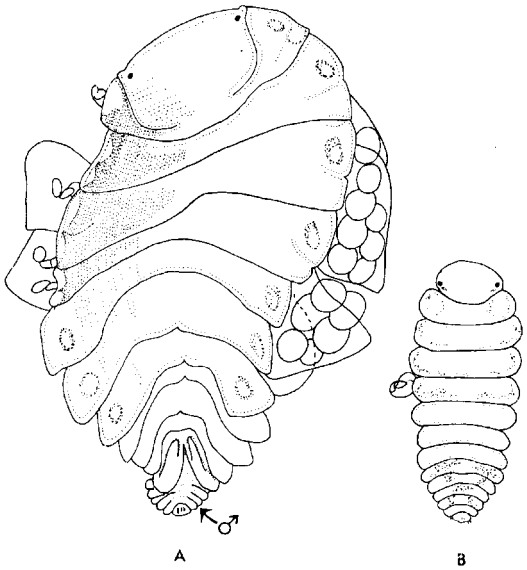

FIGURE 2. *Pseudione* sp. A. female, length 1.4 mm, with attached male; B. detached male, length 0.5 mm.

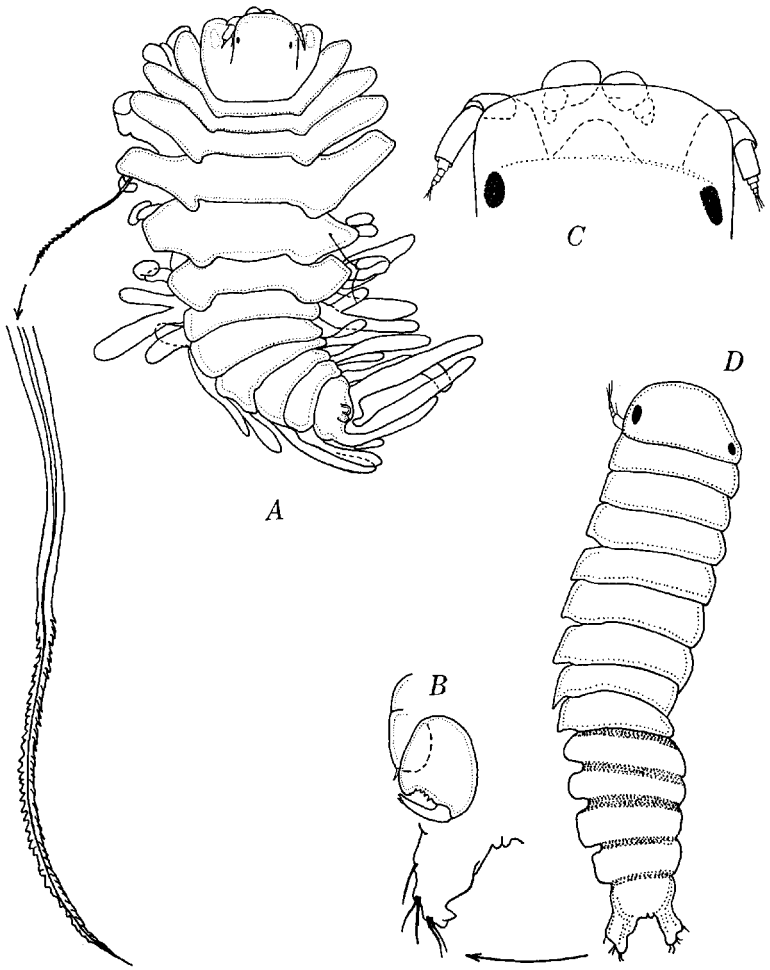

FIGURE 3. *Stegias clibanarii* Richardson. A. female, length 1 mm, arrow points to enlarged view of seta; B. gnathopod; C. anterior margin of cephalon; D. male, length 0.7 mm, arrow points to enlarged view of left branch of telson. Illustrations A, B, and C of female, and D of male.

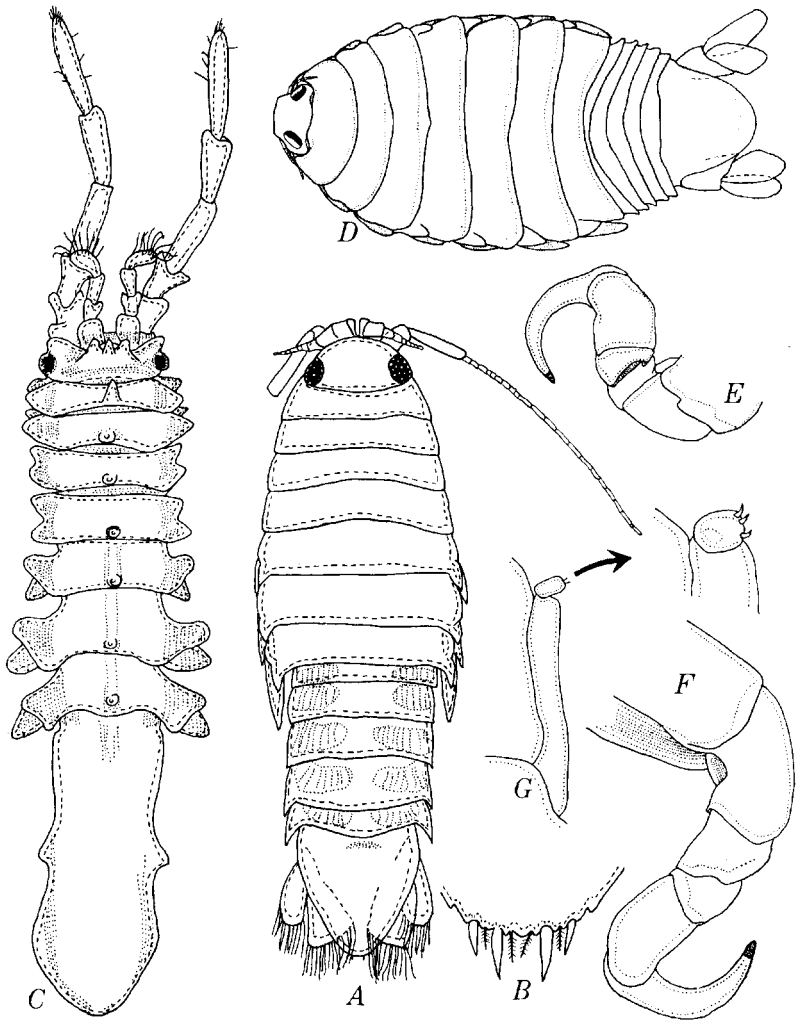

FIGURE 4. *Eurydice littoralis* (Moore). A. male topotype, length 5.0 mm; B. posterior border of telson. – *Erichsonella filiformis tropicalis* new subspecies. C. male holotype, length 4.8 mm. – *Lironeca redmanni* Leach. D. female, length 26 mm; E. P^1; F. P^7; G. apical articles Mx^2, arrow points to enlarged tip.

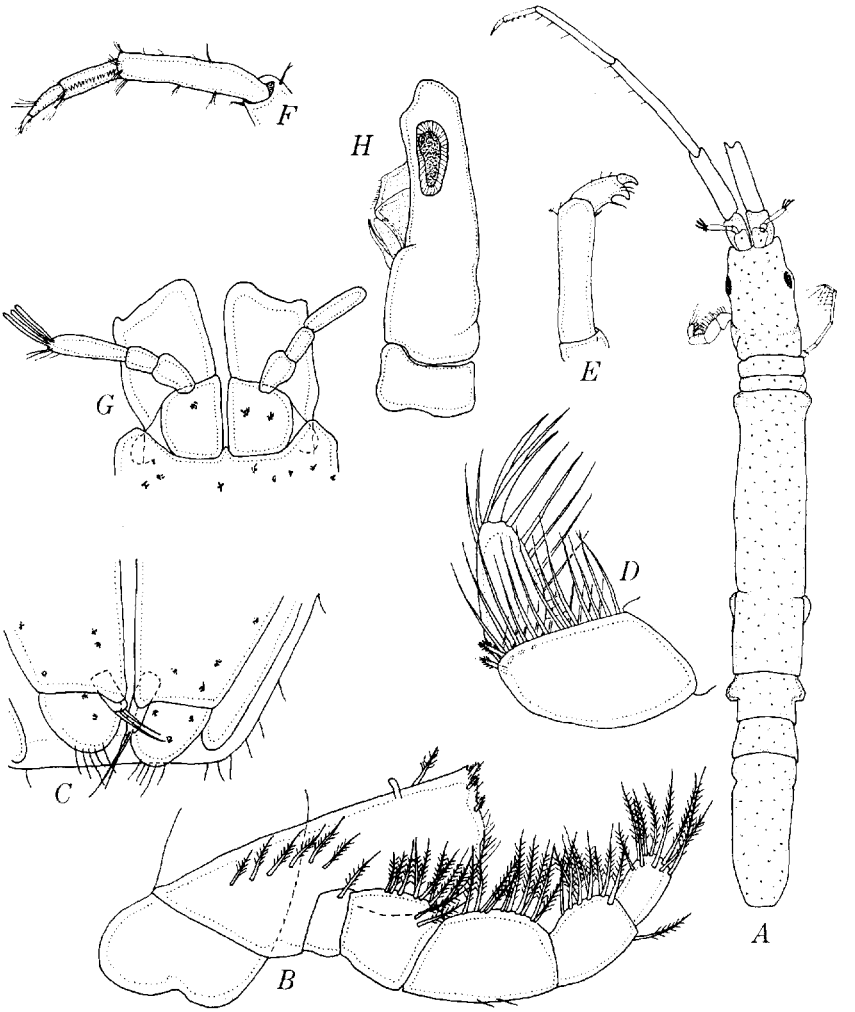

FIGURE 5. *Astacilla cymodocea*, new species. A. female holotype, length including Ant^2 6.0 mm; B. Mxp; C. ventral view of posterior border of pleotelson; D. apical articles P^1; E. apical articles P^7; F. apical articles Ant^2; G. anterior border of cephalon, Ant^1 and basal articles Ant^2; H. cephalon, lateral view.

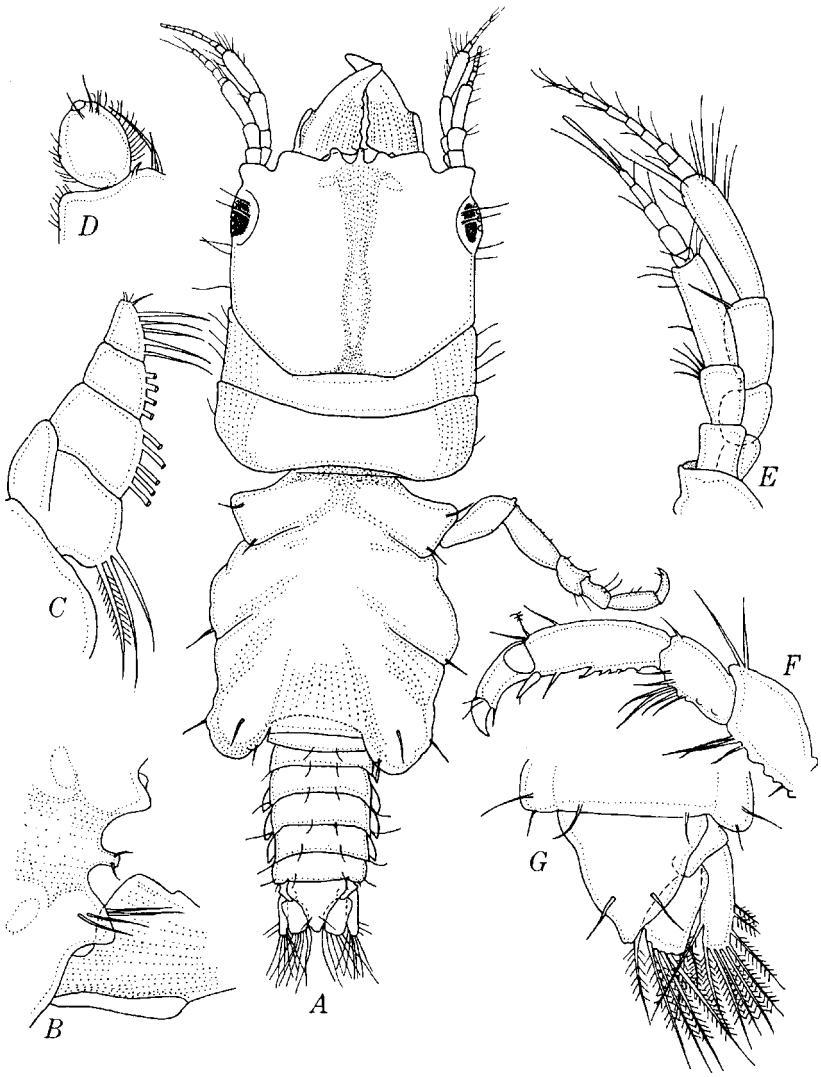

FIGURE 6. *Gnathia puertoricensis*, new species. A. male holotype, length 3.0 mm; B. anterior border of cephalon; C. Mx^1; D. apical articles Mx^2 (pylopod); E. Ant^1 and Ant^2; F. P^3; G. telson.

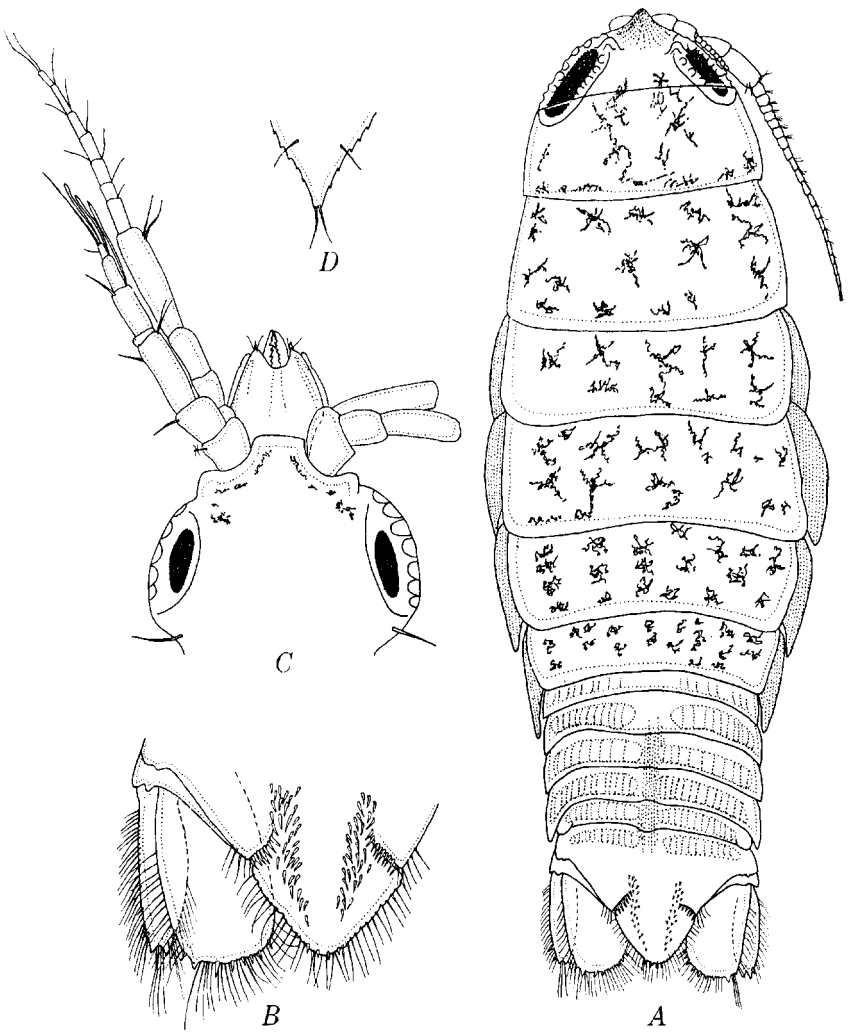

FIGURE 7. *Excorallana tricornis* (Hansen). A. male, length 8.0 mm; B. telson and uropods. – *Gnathia puertoricensis*, new species. C. cephalon and Ant, female allotype, length of entire animal 1.8 mm; D. apex of telson.

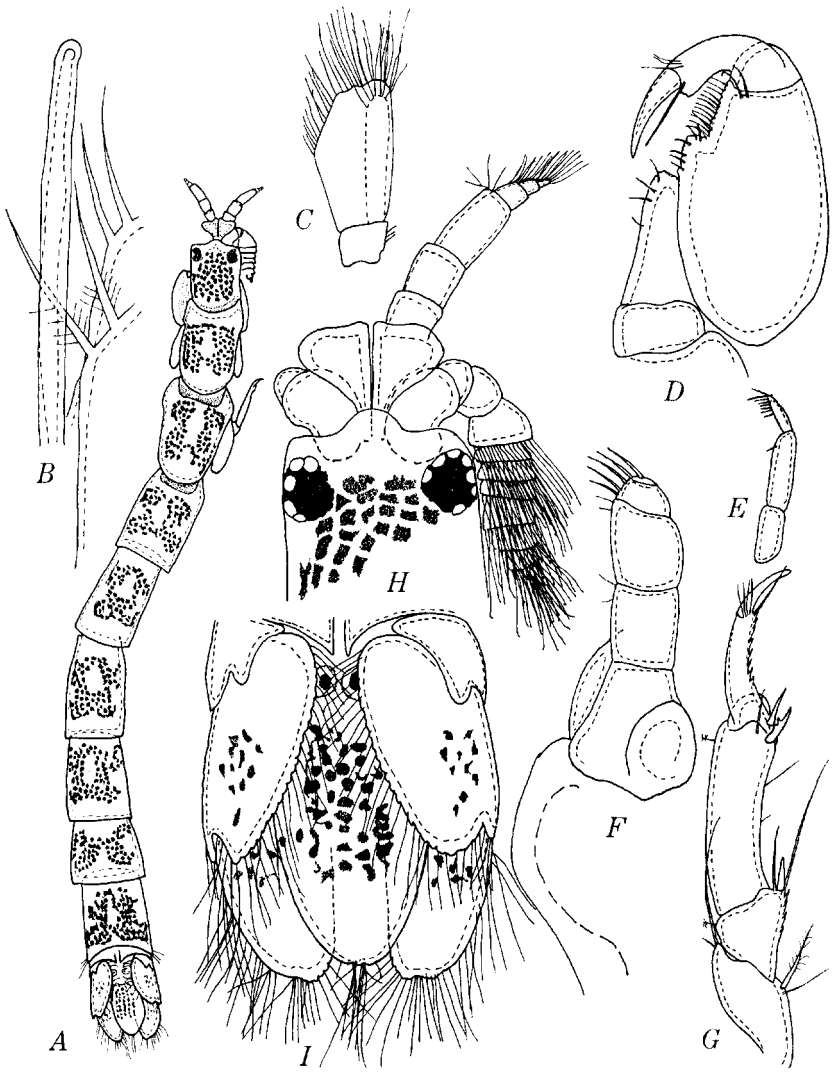

FIGURE 8. *Mesanthura decorata*, new species. A. male holotype, length 6.0 mm; B. medial view Plp^2; C. Plp^1; D. apical articles P^1; E. Md palp; F. lateral view Mxp in place on cephalon; G. apical articles P^7; H. cephalon and Ant; I. telson and uropoda.

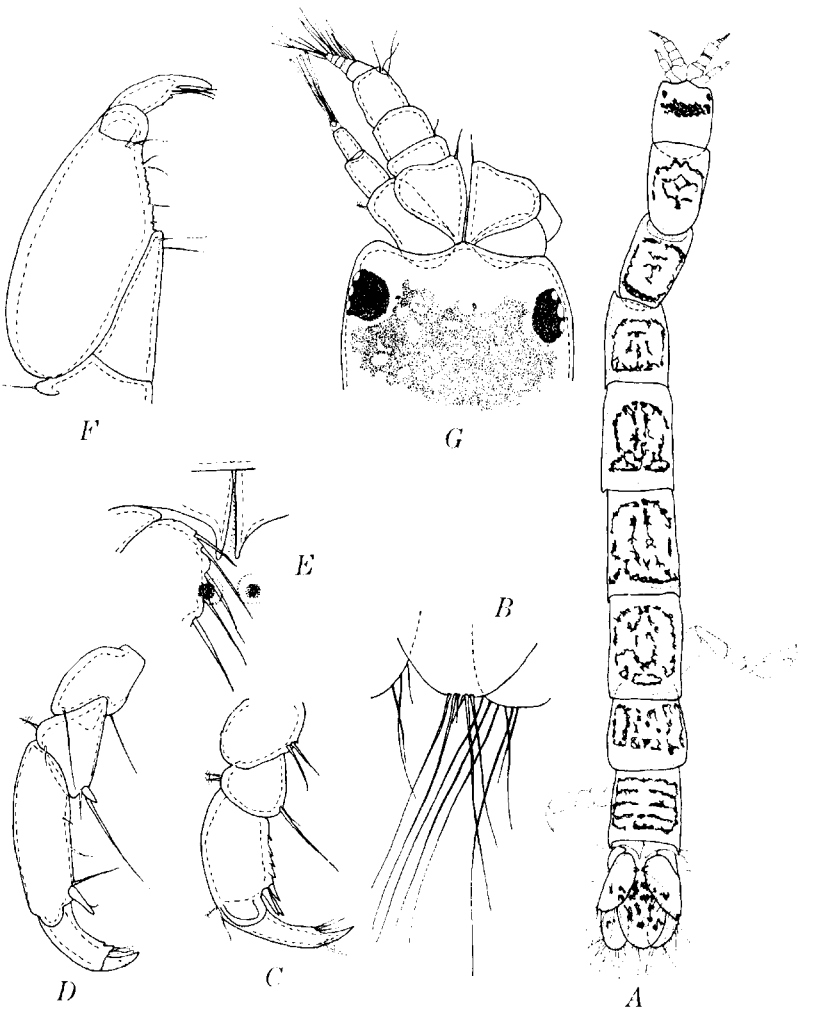

FIGURE 9. *Mesanthura paucidens*, new species. A. female holotype, length 3.5 mm; B. terminal view of telson and uropods; C. P^7; D. P^6; E. dorsal view of telson showing statocysts; F. apical articles P^1; G. cephalon and Ant.

FIGURE 10. *Apanthura signata*, new species. A. female holotype, length 4.5 mm; B. posterior border of telson; C. Mxp; D. Md palp; E. cephalon and Ant; F. P^1; G. P^7.

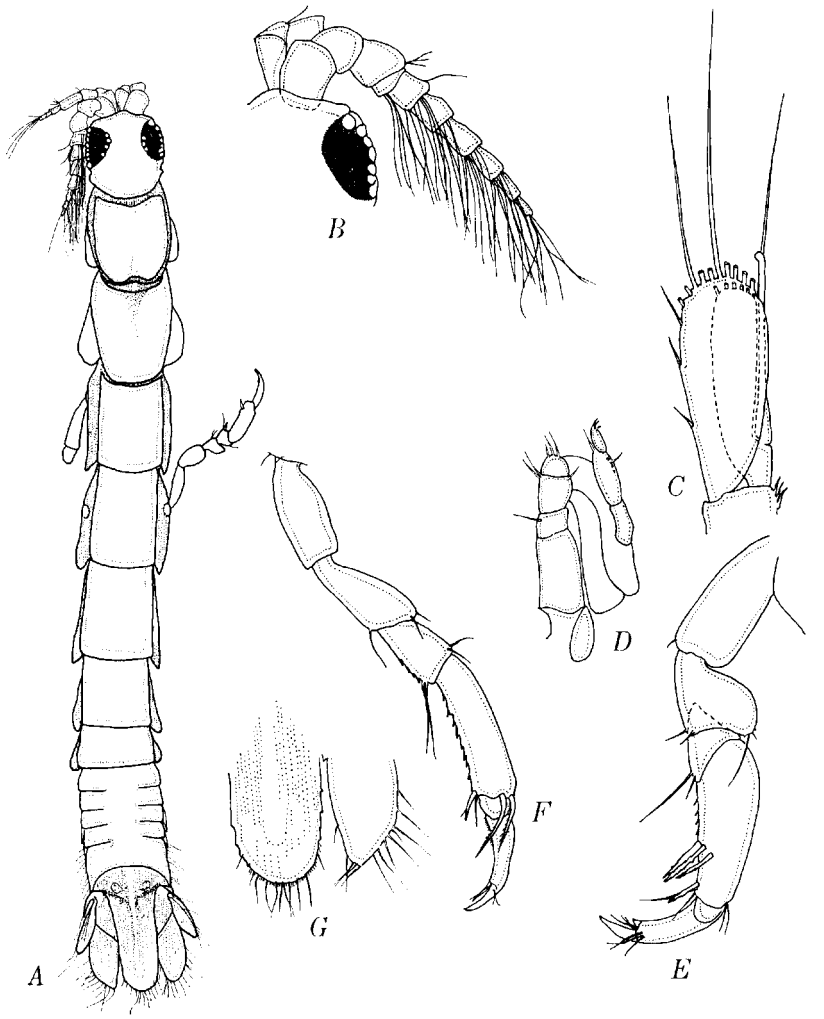

FIGURE 11. *Apanthuroides millae*, new genus, new species. A. male holotype, length 3.0 mm; B. right margin of cephalon and Ant^1; C. Plp^2; D. left mouth parts in place; E. P^1; F. P^7; G. posterior border of telson and uropod.

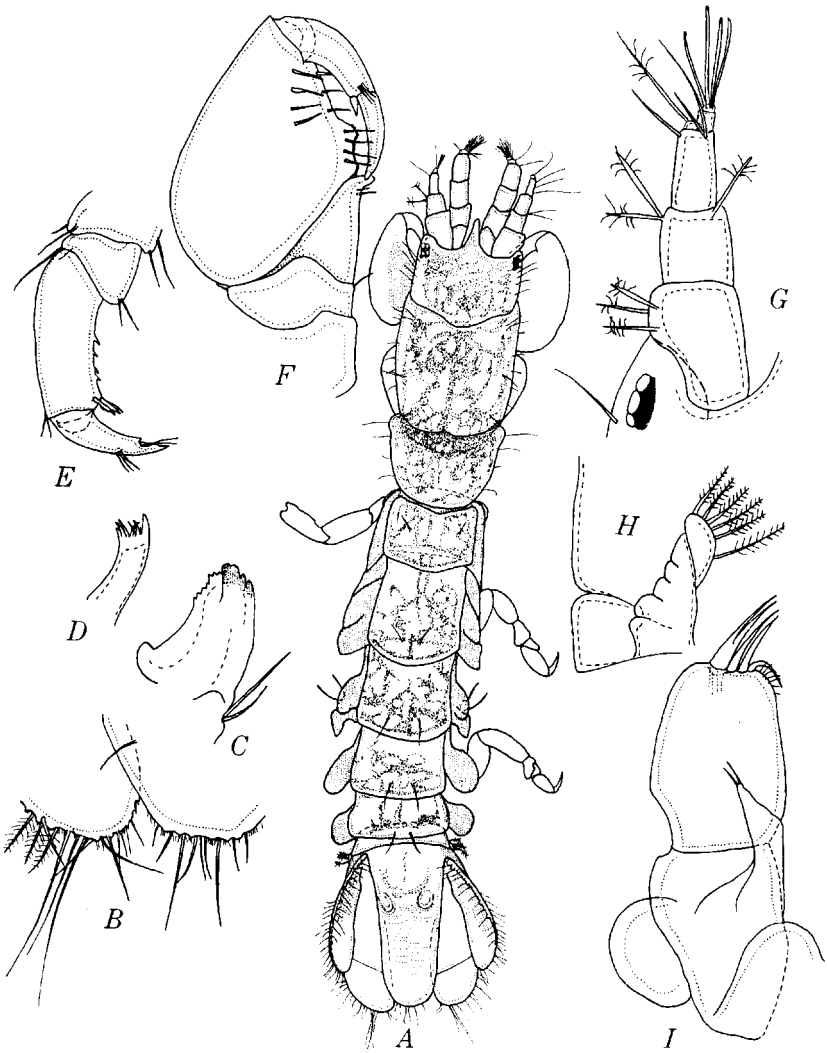

FIGURE 12. *Pendanthura tanaiformis*, new genus, new species. A. female holotype, length 2.8 mm; B. posterior border of telson and uropod; C. Md; D. Mx; E. apical articles P^7; F. P^1; G. cephalon and Ant^1, left side; H. ventral view of pleon, right side; I. Mxp.

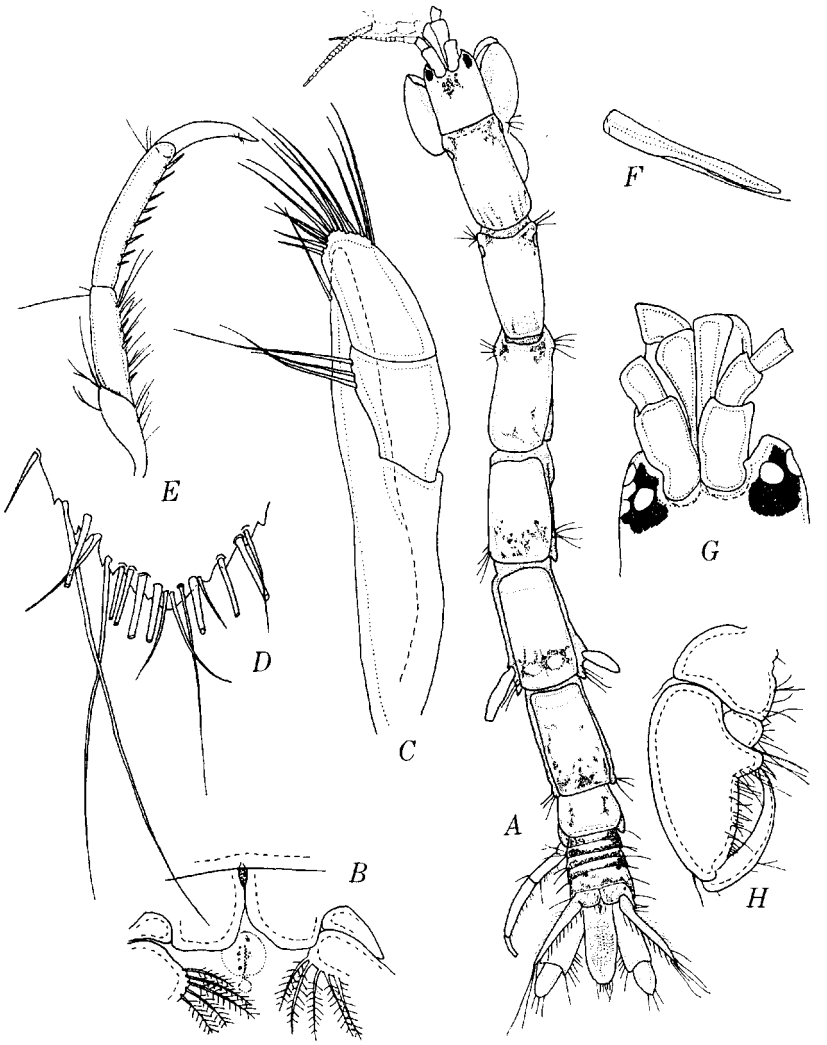

FIGURE 13. *Accalathura crenulata* (Richardson). A. female, length 14 mm; B. dorsal view of pleon showing statocyst; C. Mxp; D. posterior border of telson; E. P^7; F. two-pointed bristle from P^7; G. cephalon and basal articles Ant; H. apical articles P^1.

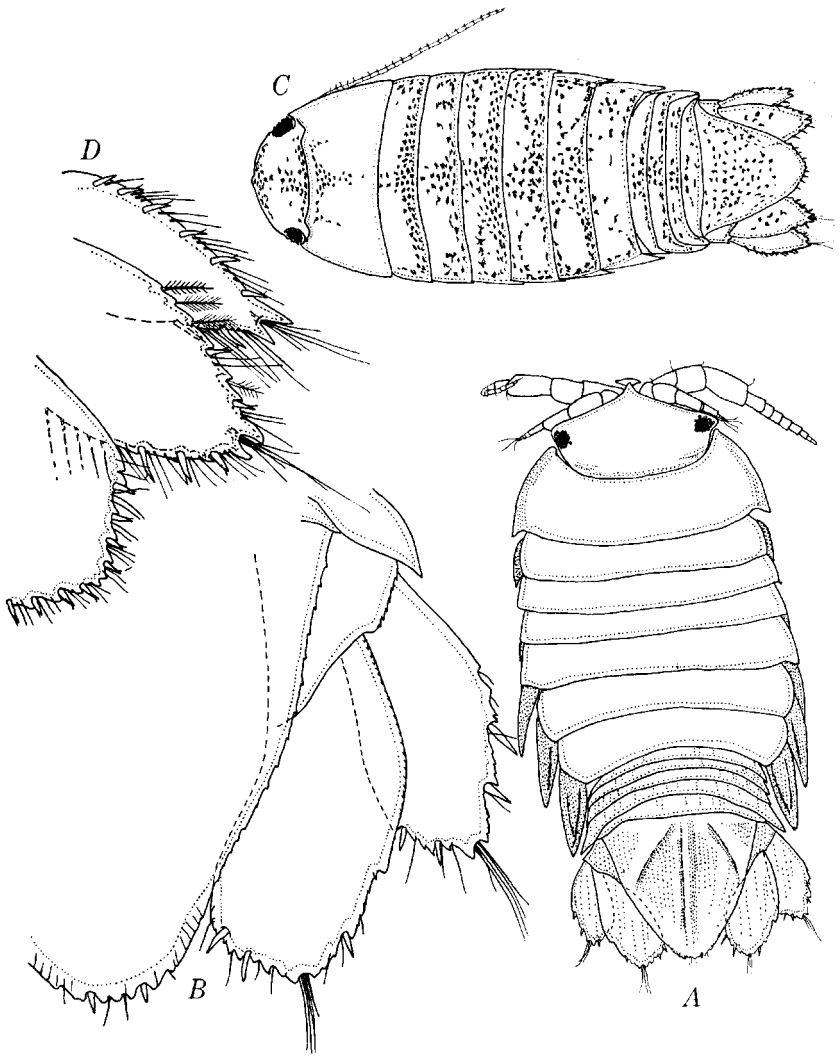

FIGURE 14. *Cirolana sphaeromiformis* Hansen. A. male, length 2.5 mm; B. posterior border of telson and uropods. – *Cirolana parva* Hansen. C. male, length 5.0 mm; D. posterior border of telson and uropods.

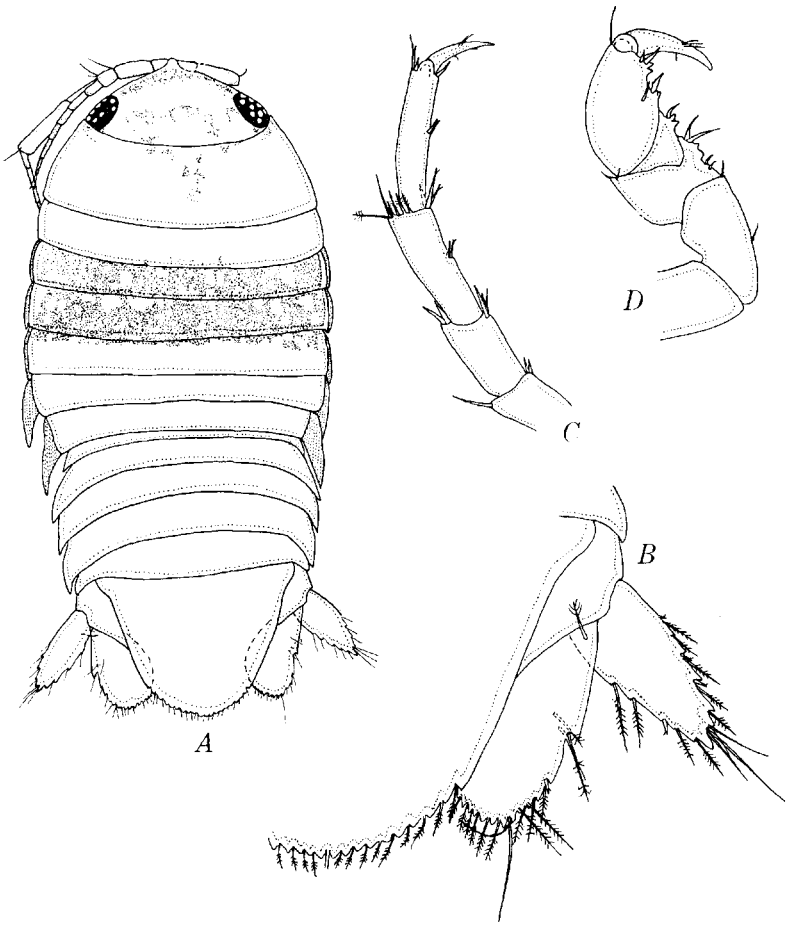

FIGURE 15. *Cirolana mayana* Ives. A. young female, length 2.0 mm; B. posterior border of telson and uropods; C. P^7; D. P^1.

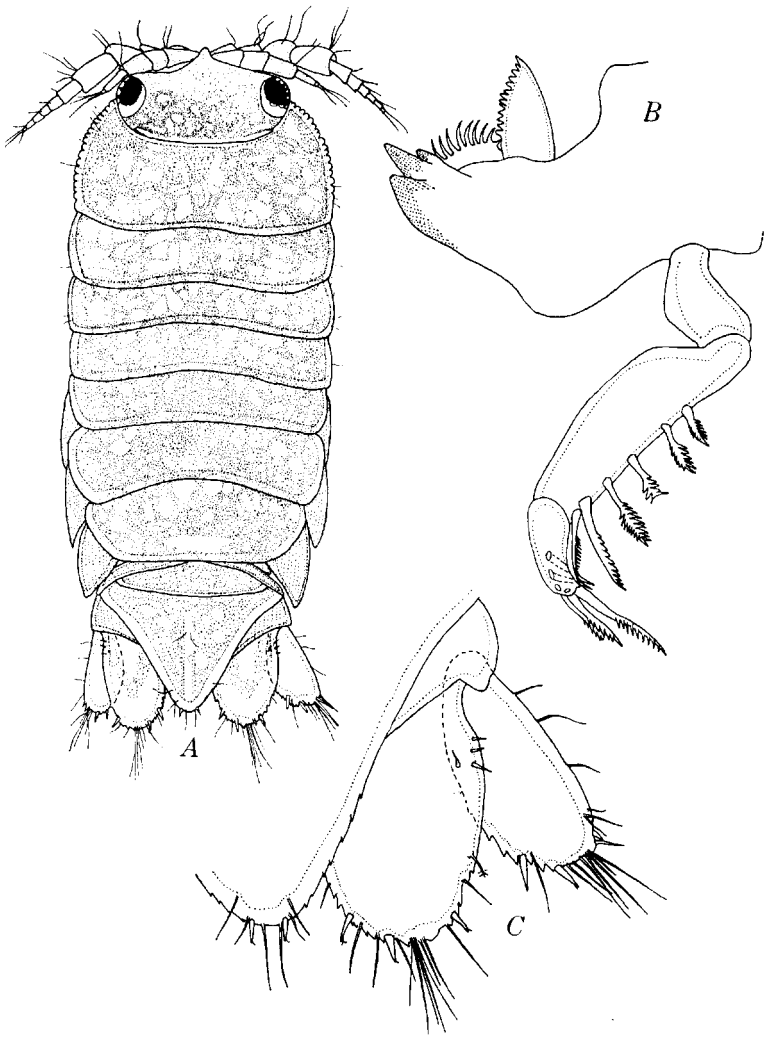

FIGURE 16. *Colopisthus parvus* Richardson. A. female, length 2.0 mm; B. Md; C. posterior border of telson and uropods.

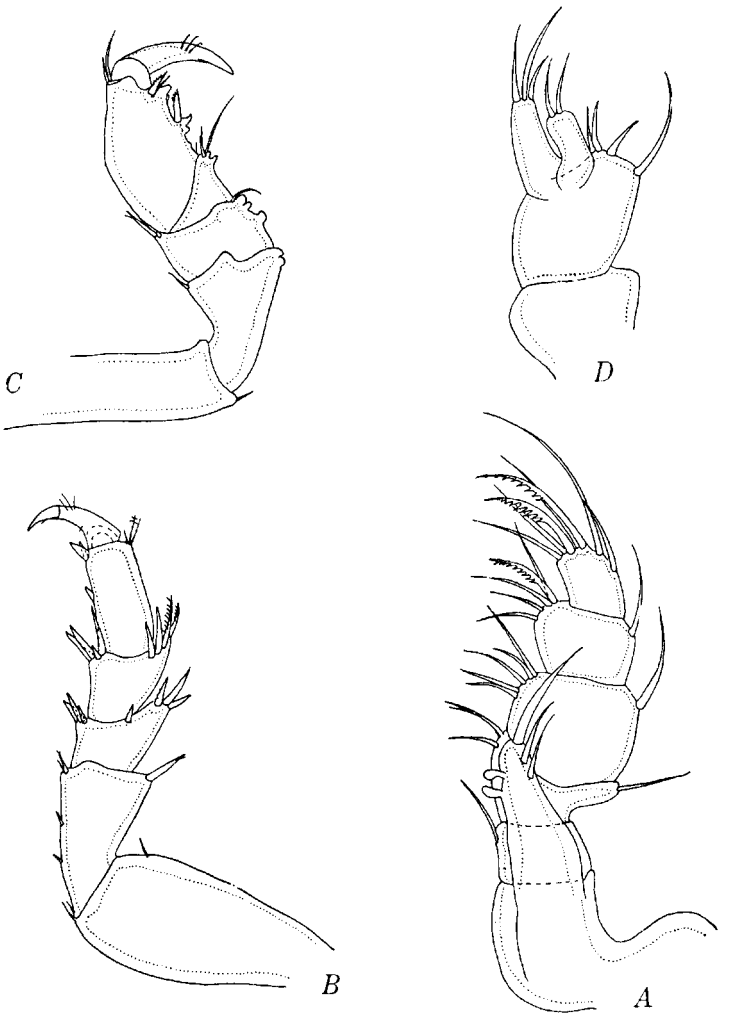

FIGURE 17. *Colopisthus parvus* Richardson. Female appendages, A. Mxp; B. P^7; C. P^1; D. Mx^2.

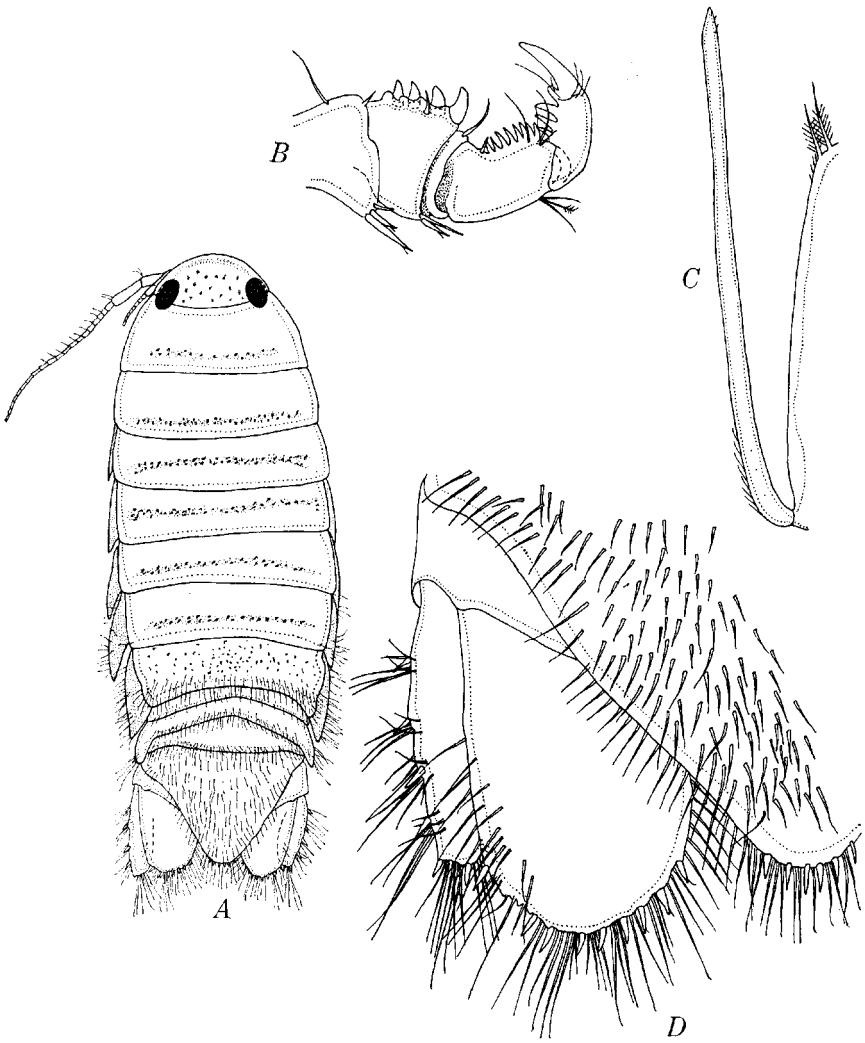

FIGURE 18. *Alcirona insularis* Hansen. A. male, length 5.0 mm; B. P^1; C. medial margin Plp^2; D. posterior border of telson and uropods.

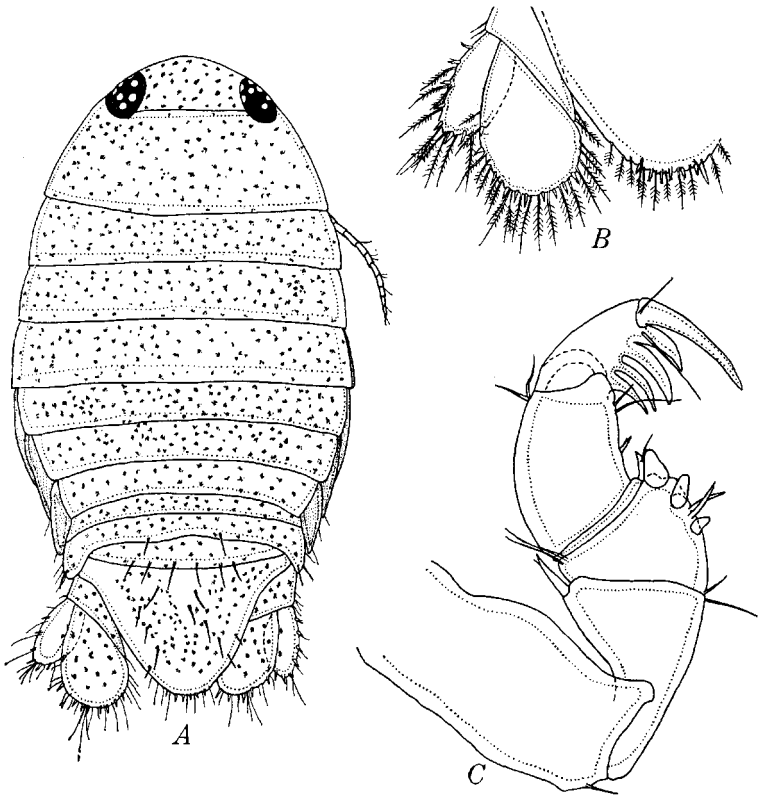

FIGURE 19. *Alcirona insularis* Hansen. A. female, length 2.5 mm; B. posterior border of telson and uropods; C. P1.

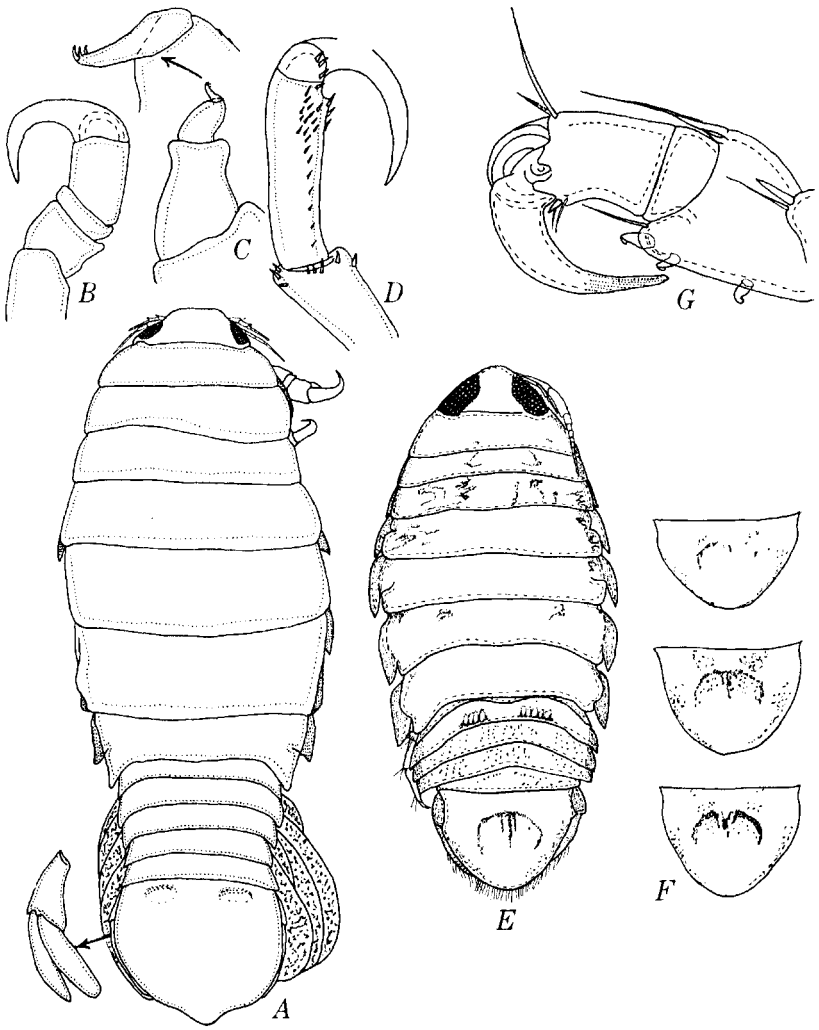

FIGURE 20. *Anilocra laticauda* Milne Edwards. A. female, length 34 mm; B. P^1; C. Mxp; D. P^7. – *Rocinela signata* Schiödte & Meinert. E. female, length 1.2 cm; F. different pigmentation patterns on telson; G. apical articles P^1.

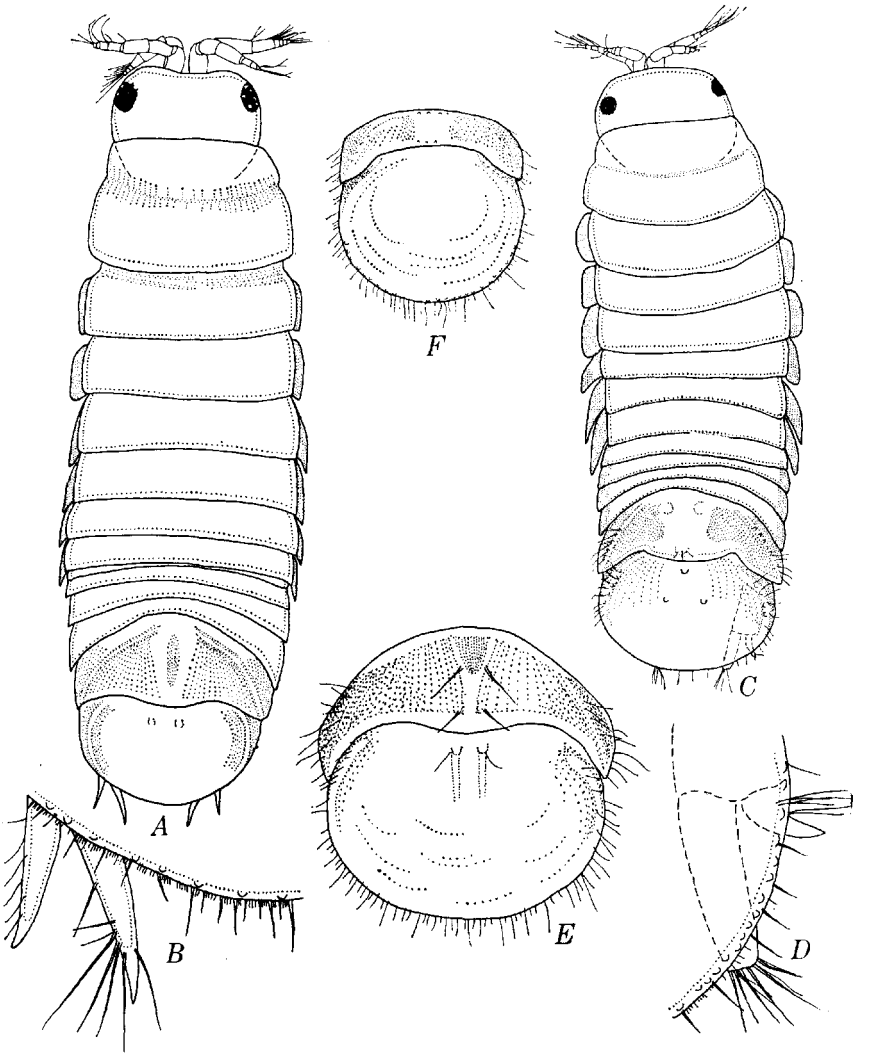

FIGURE 21. *Paralimnoria andrewsi* (Calman). A. female, length 2.7 mm; B. left posterior border of pleotelson. – *Limnoria* (*Limnoria*) *tripunctata* Menzies. C. female, length 2.0 mm; D. right posterior border of pleotelson. – *Limnoria* (*Limnoria*) *pfefferi* Stebbing. E. pleotelson of female, length 3.6 mm. – *Limnoria* (*Limnoria*) *platycauda* Menzies. F. pleotelson of male, length 2.3 mm.

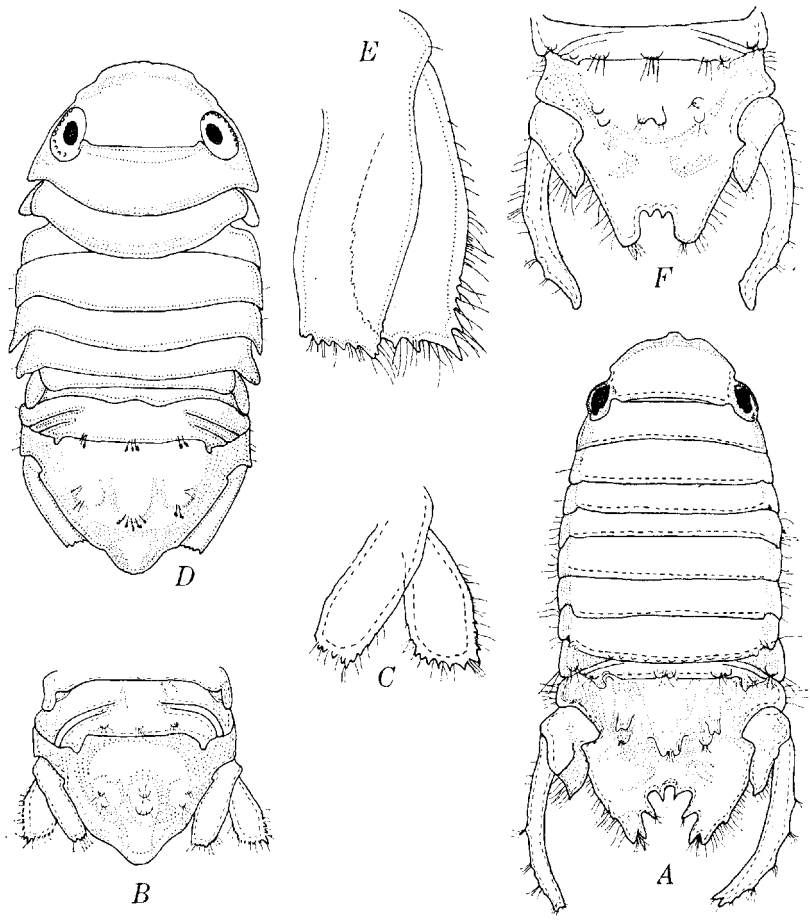

FIGURE 22. *Paracerceis caudata* (Say). A. male, length 6.0 mm; B. pleotelson, female, length of entire specimen 3.0 mm; C. uropods, same female as B.; D. female, length 4.0 mm; E. uropods, same female as D. – *Paracerceis caudata* var. *brevipes*, new variety. F. pleotelson, male, length 6.0 mm.

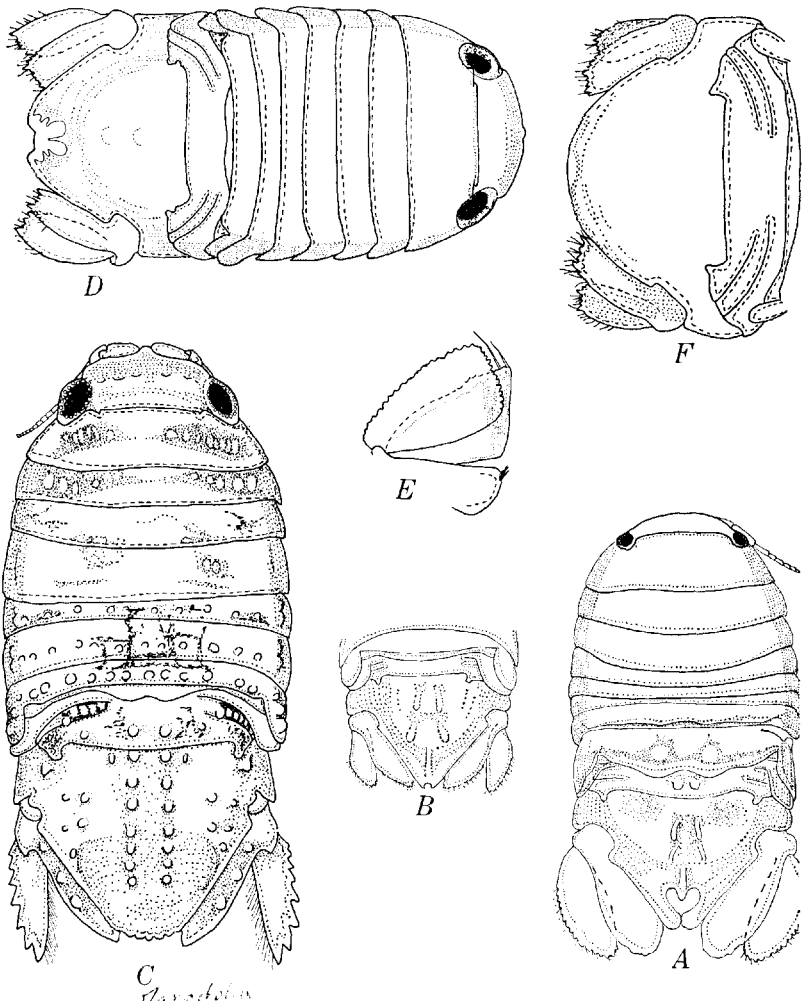

FIGURE 23. ~~*Dynamenella dianae*~~ (Menzies). A. male, length 3.4 mm; B. pleotelson, female, length of entire specimen 2.5 mm. – *Sphaeroma walkeri* Stebbing. C. female, length 8.0 mm. – *Paracerceis nuttingi* (Boone). D. immature male, length 5.0 mm; E. Plp^2; F. pleotelson of female, length of entire animal 2.5 mm.

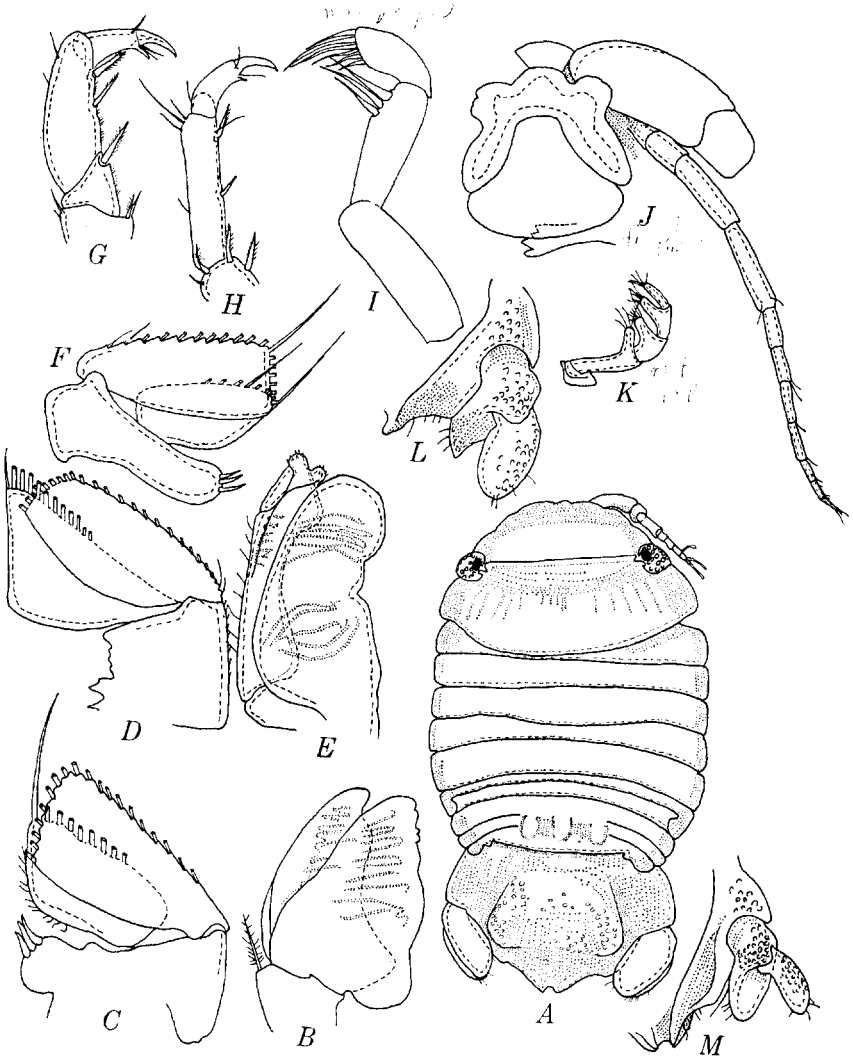

FIGURE 24. *Geocerceis barbarae*, new genus, new species. A. female holotype, length 2.5 mm; B. Plp^4; C. Plp^2; D. Plp^3; E. Plp^5; F. Plp^1; G. apical articles P^1; H. apical articles P^7; I. Md palp; J. frontal lamina; K. Mxp palp; L. ventral view of pleotelson and uropods, left side; M. ventral view of pleotelson and uropods, left side. Illustration L of a paratype specimen, all others of the holotype.

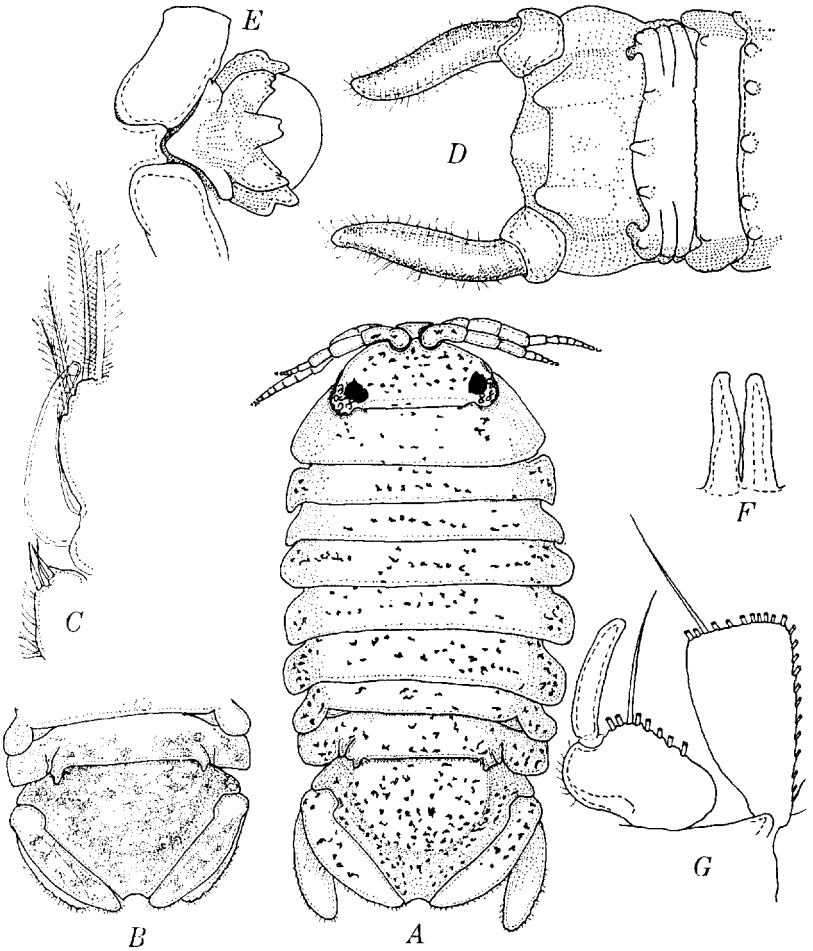

FIGURE 25. (?) *Exosphaeroma alba* var. *chromata*, new species, new variety. A. male holotype, length 2.6 mm; B. pleotelson, female allotype, length of entire specimen 2.3 mm; C. medial edge Plp^2 of holotype. – *Geocerceis barbarae*, new genus, new species. D. pleotelson of male allotype, length of entire specimen 3.3 mm; E. frontal lamina; F. penes; G. Plp^2; (E–G, male).

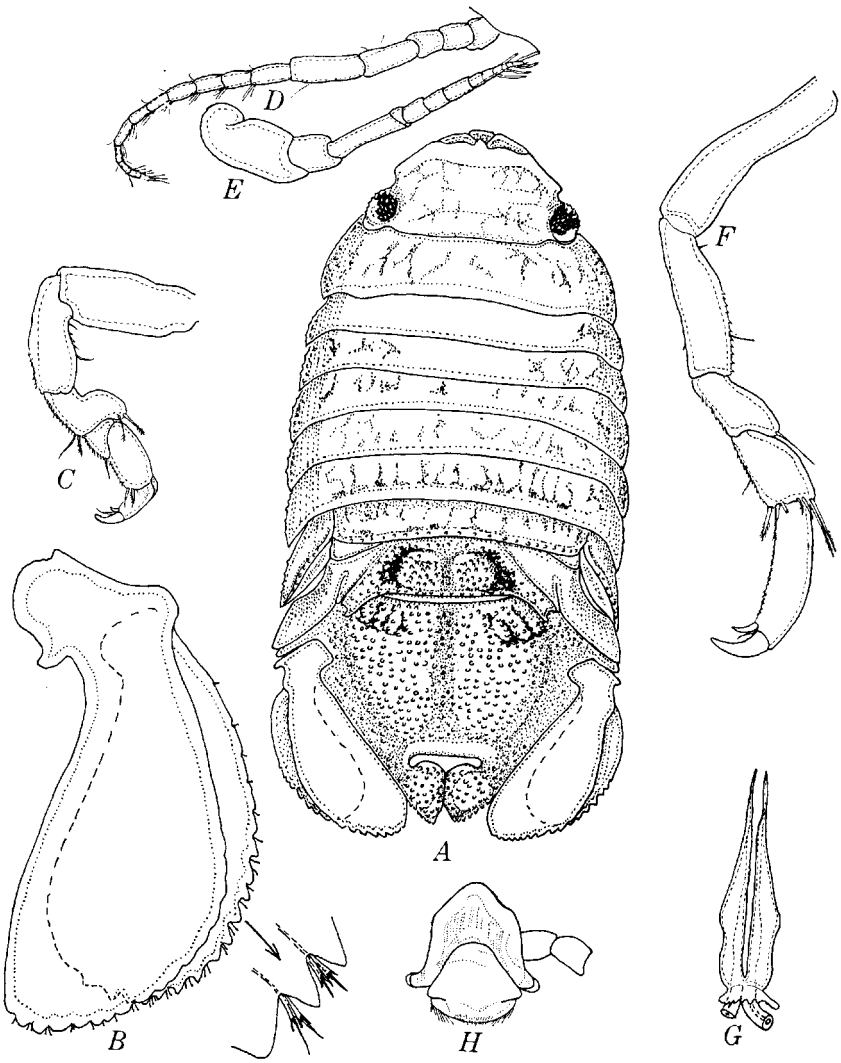

FIGURE 26. *Dynamenella perforata* (Moore). A. male topotype, length 3.2 mm; B. uropods; C. P^1; D. Ant^2; E. Ant^1; F. P^7; G. penes; H. frontal lamina.

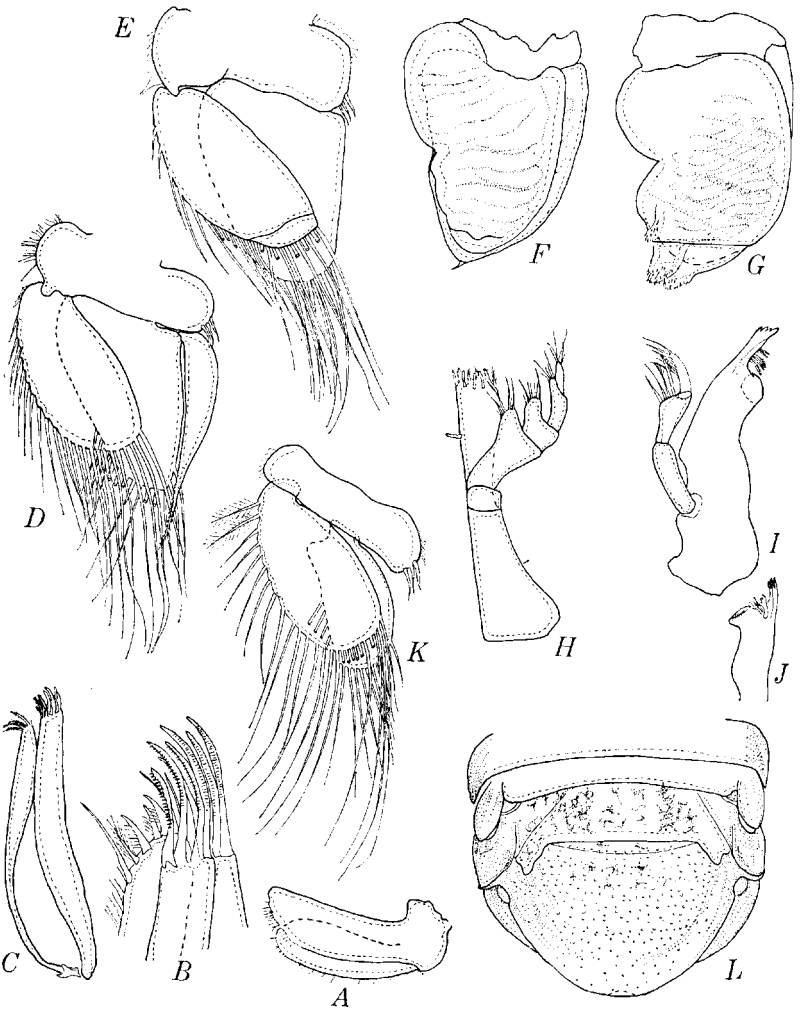

FIGURE 27. *Dynamenella perforata* (Moore). A. uropod; B. Mx^2; C. Mx^1; D. Plp^2; E. Plp^3; F. Plp^4; G. Plp^5; H. Mxp; I. Md; J. Md; K. Plp^1; L. pleotelson, female. Illustrations A and L belong to female topotype, length of entire specimen 2.6 mm; illustrations B to K belong to male topotype, length 3.2 mm.

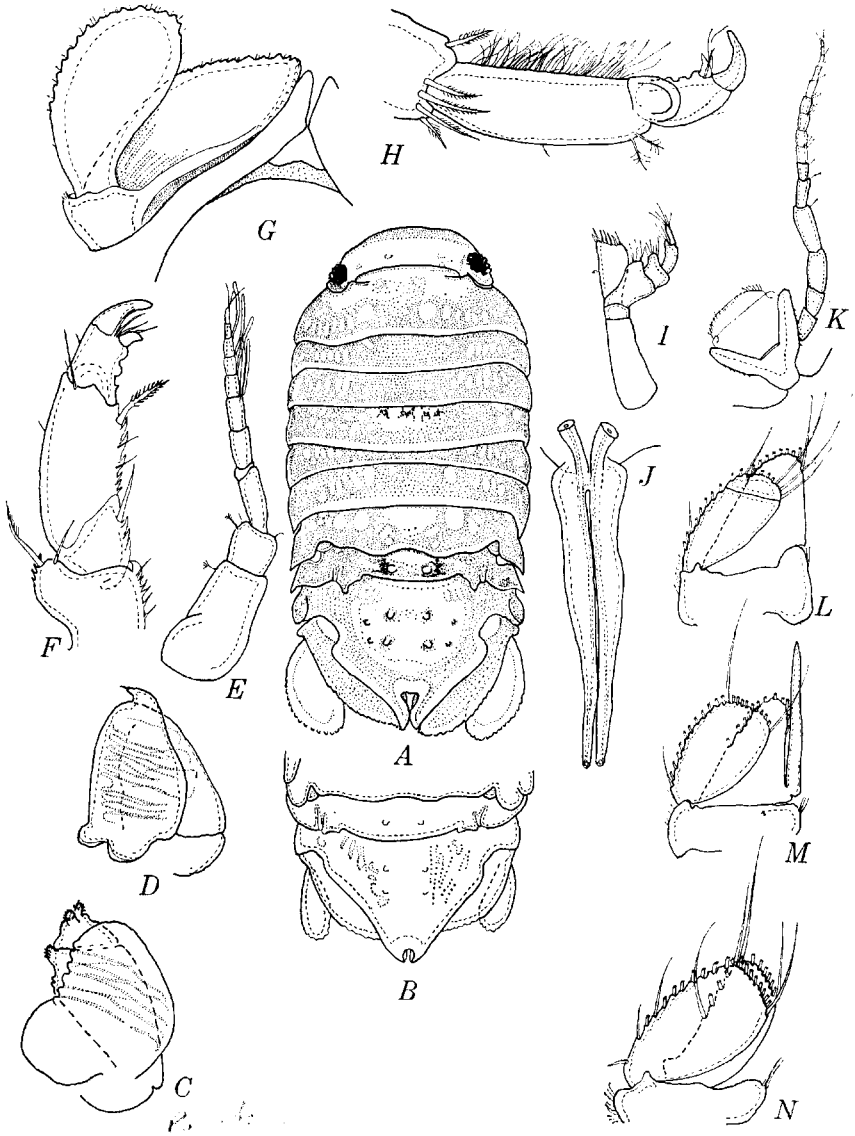

FIGURE 28. *Dynamenella quadripunctata*, new species. A. male holotype, length 2.5 mm; B. pleotelson, female allotype, length of entire animal 2.5 mm; C. Plp^{5}; D. Plp^{4}; E. Ant^{1}; F. apical articles P^{1}; G. ventral view of pleotelson; H. apical articles P^{7}; I. Mxp; J. penes; K. frontal lamina and Ant^{2}; L. Plp^{3}; M. Plp^{2}; N. Plp^{1}; all illustrations of holotype except B.

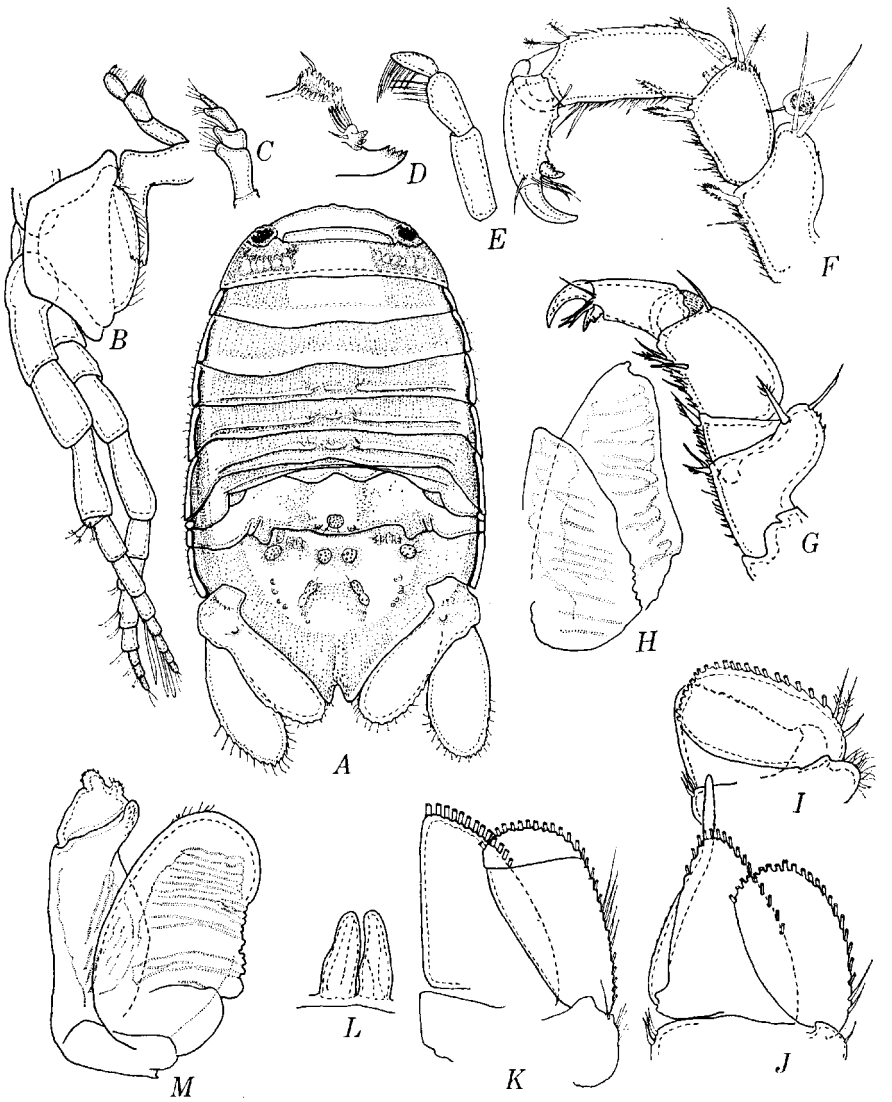

FIGURE 29. *Dynamenella acutitelson* var. *typica*, new species. A. male holotype, length 3.5 mm; B. frontal lamina, Ant^1, Ant^2 and Md; C. Mxp palp; D. Md, inner view; E. Md palp; F. P^7; G. P^1; H. Plp^4; I. Plp^1; J. Plp^2; K. Plp^3; L. penes; M. Plp^5.

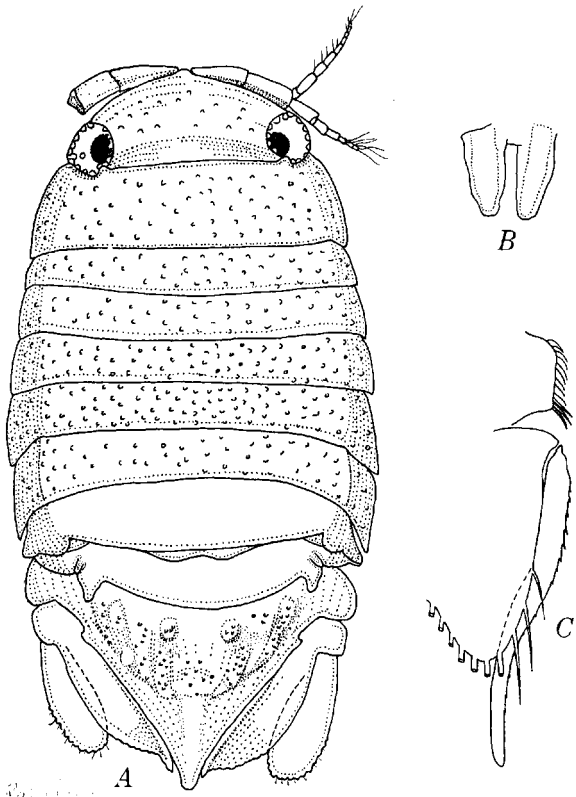

FIGURE 30. *Dynamenella acutitelson* var. *glabrothorax*, new species, new variety. A female holotype, length 3.0 mm; B. penes; C. medial margin Plp^2; illustrations B and C belong to male, length 3.0 mm.

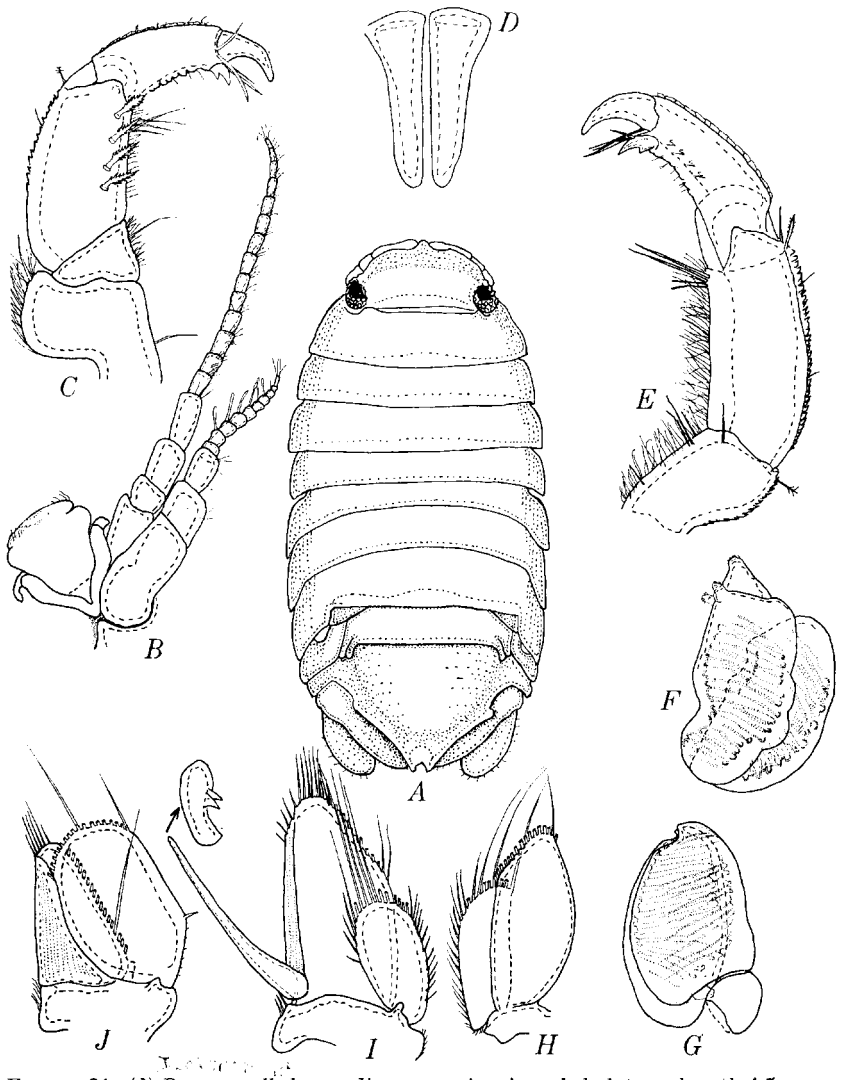

FIGURE 31. (?) *Dynamenella barnardi*, new species. A. male holotype, length 4.5 mm; B. frontal lamina and Ant^1 and Ant^2; C. apical articles P^1; D. penes; E. apical articles P^7; F. Plp^5; G. Plp^4; H. Plp^3; I. Plp^2; J. Plp^1 (note indurated endopod).

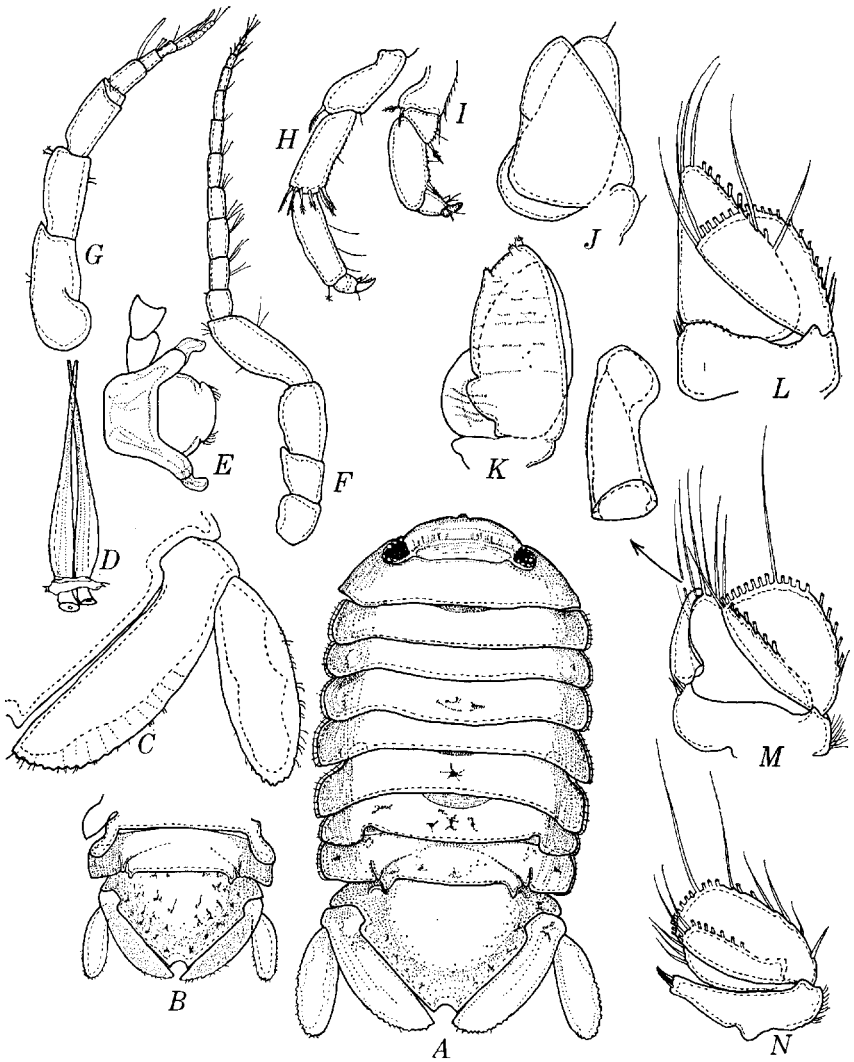

FIGURE 32. (?) *Exosphaeroma alba*, new species. A. male holotype, length 2.0 mm; B. pleotelson, female allotype, length of entire specimen 1.5 mm; C. uropods; D. penes; E. frontal lamina; F. Ant^2; G. Ant^1; H. apical articles P^7; I. apical articles P^1; J. Plp^4; K. Plp^5; L. Plp^3; M. Plp^2, arrow points to enlarged tip of stylet; N. Plp^1; all illustrations of holotype except B.

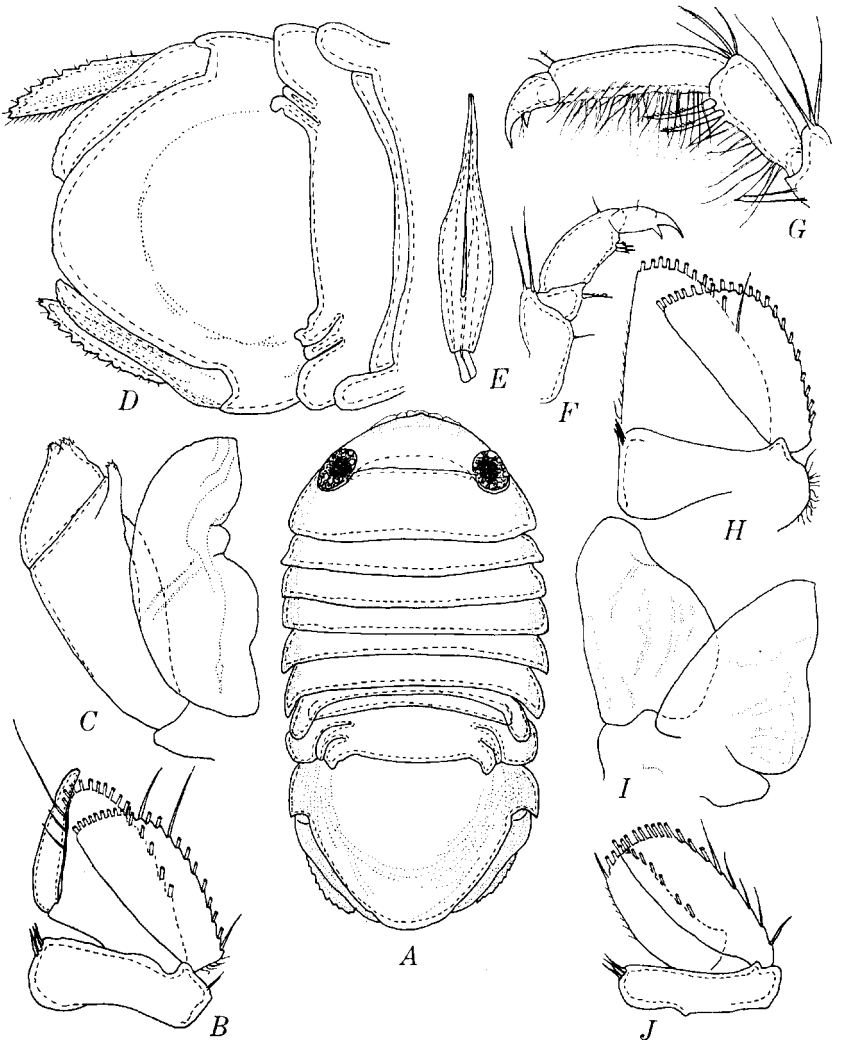

FIGURE 33. (?) *Exosphaeroma productatelson*, new species. A. male holotype, length 2.5 mm; B. Plp^2; C. Plp^5; D. pleotelson of male; E. penes; F. P^1; G. P^7; H. Plp^3; I. Plp^4; J. Plp^1; illustrations B, D and E belong to a paratype specimen, remainder of illustrations belong to a female allotype.

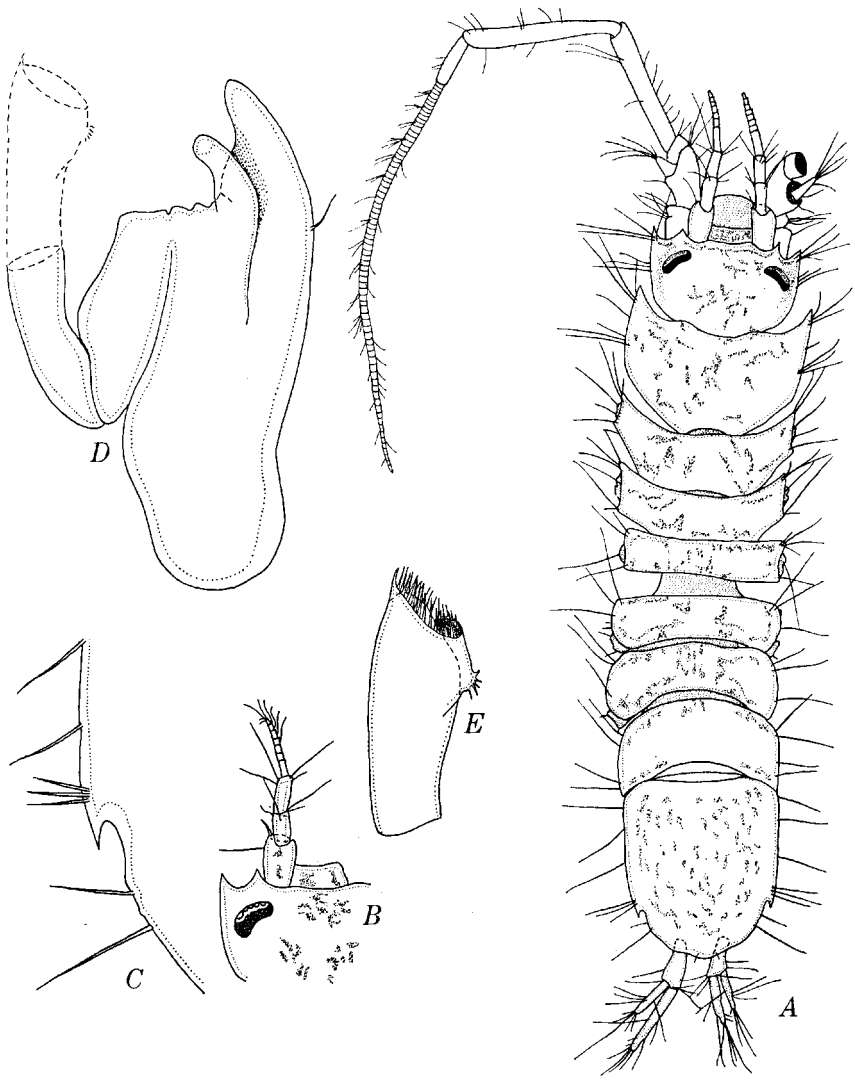

FIGURE 34. *Stenetrium occidentale* Hansen. A. male holotype, length 4.0 mm; B. latero-frontal margin of cephalon and Ant^1; C. lateral margin of pleotelson; D. Plp^2; E. apex of stylus; illustrations A, B and C of holotype, D and E of male paratype.

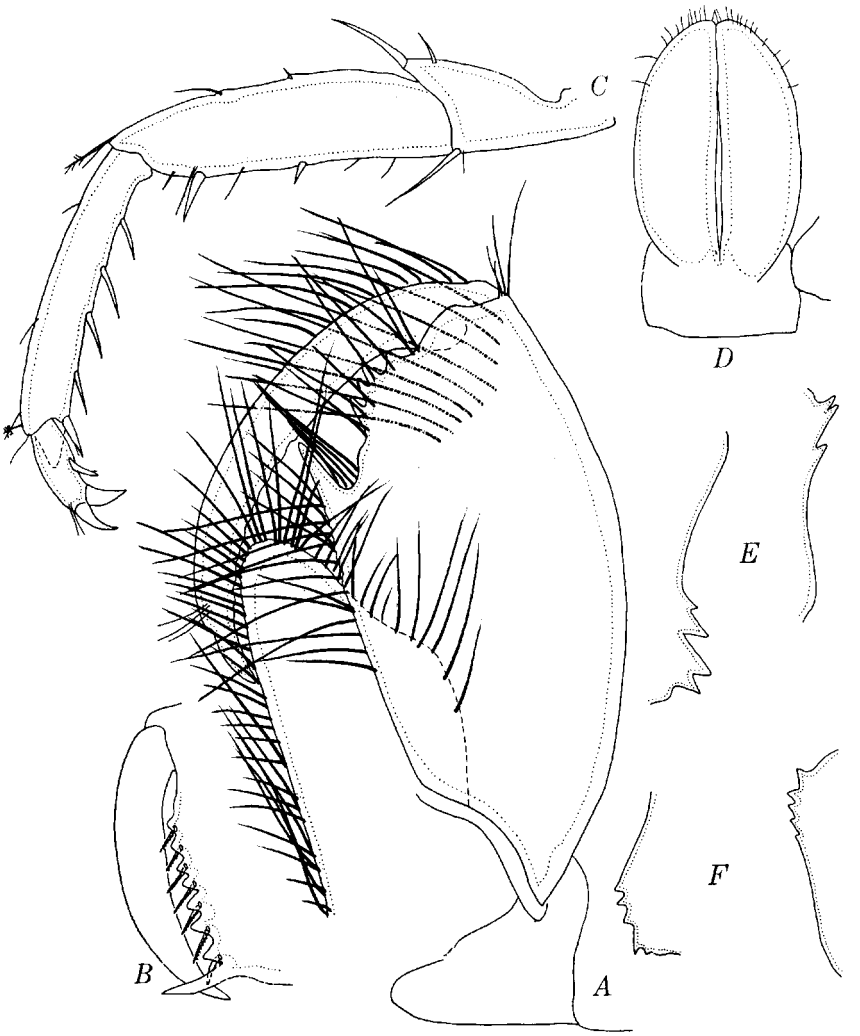

FIGURE 35. *Stenetrium occidentale* Hansen. A. P^1, male; B. P^1, female; C. P^7; D. Plp^1; E. inner margins of the left and the right carpus of male holotype, USNM Cat. No. 24877; F. inner margins of the left and the right carpus of the male cotype; C and D from male.

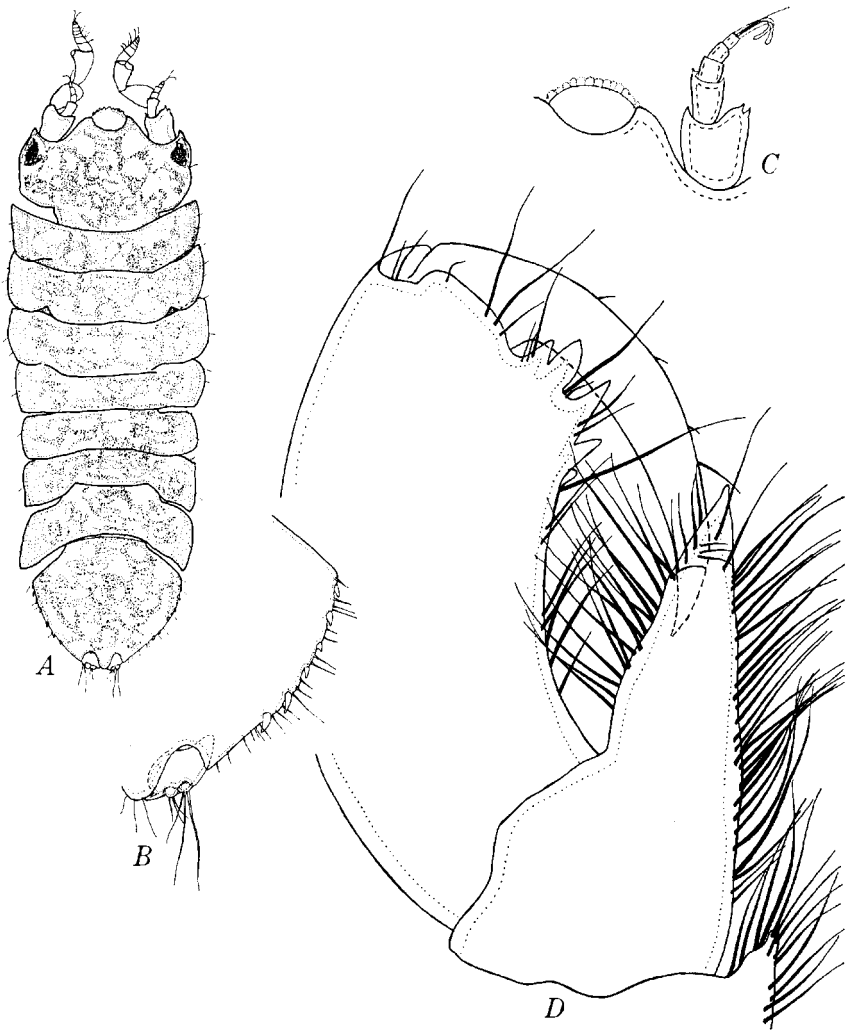

FIGURE 36. *Jaeropsis rathbunae* Richardson. A. female, length 1.5 mm; B. posterior border of telson showing uropods; C. anterior border of cephalon and Ant[1]. – *Stenetrium occidentale* Hansen, D. mature gnathopod.

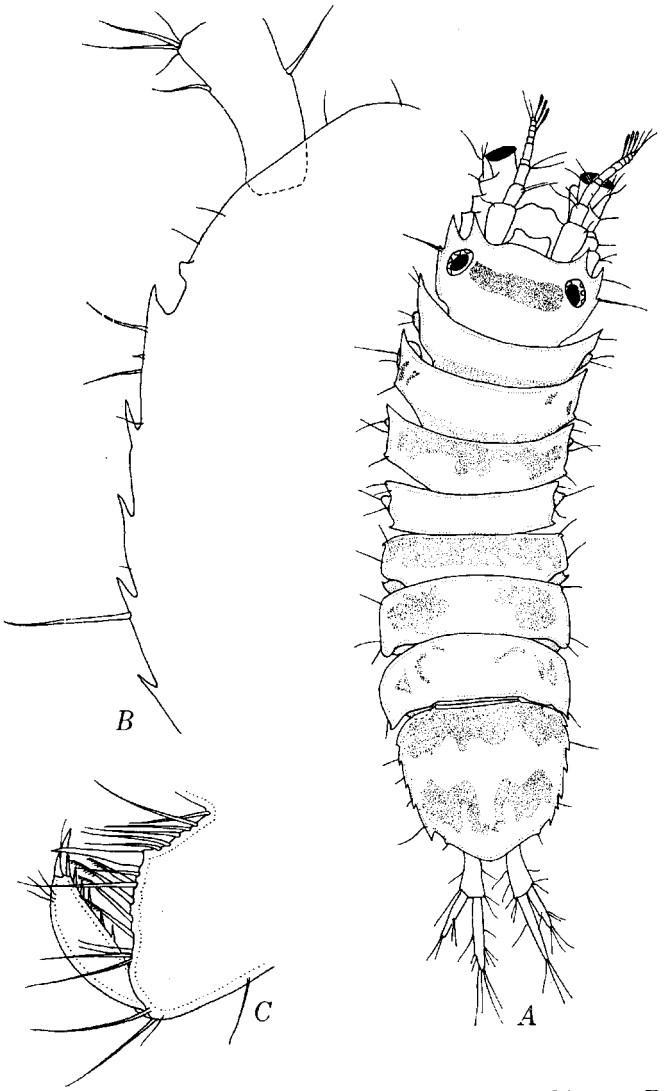

FIGURE 37. *Stenetrium serratum* Hansen. A. female, length 2.7 mm; B. latero-posterior border of pleotelson; C. gnathopod.

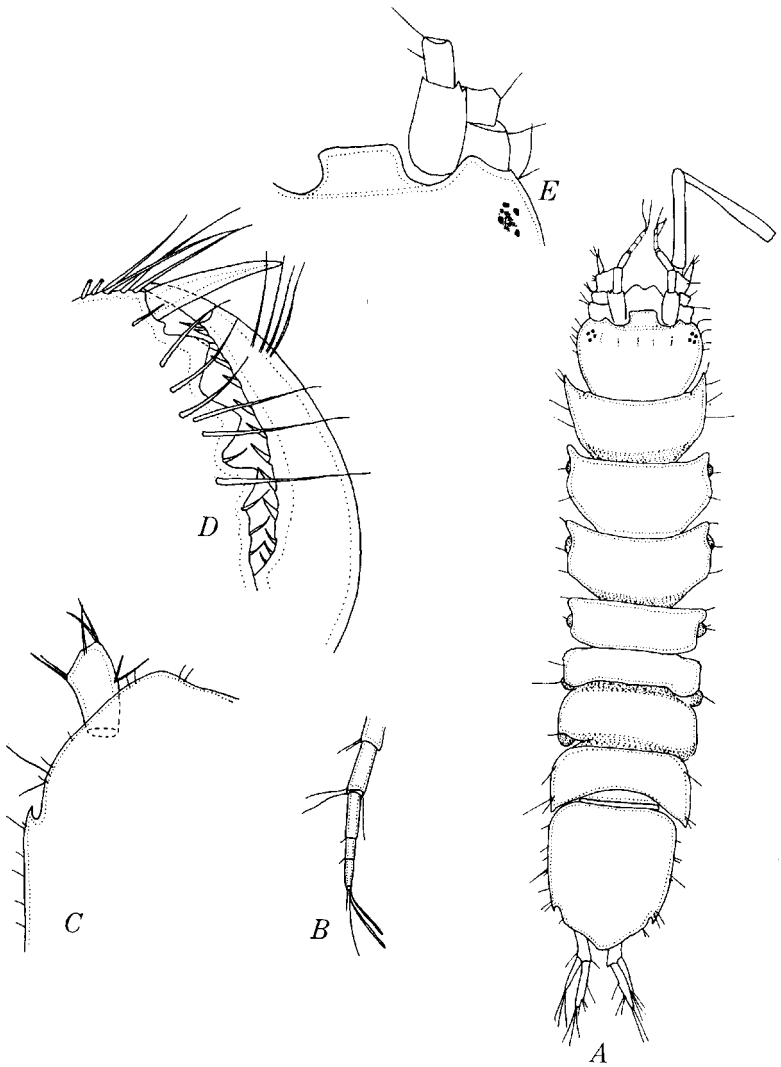

FIGURE 38. *Stenetrium minocule*, new species. A. female holotype, length 3.7 mm; B. apical articles Ant^1; C. lateral border of pleotelson; D. gnathopod; E. anterior margin of cephalon and basal articles Ant^1 and Ant^2.

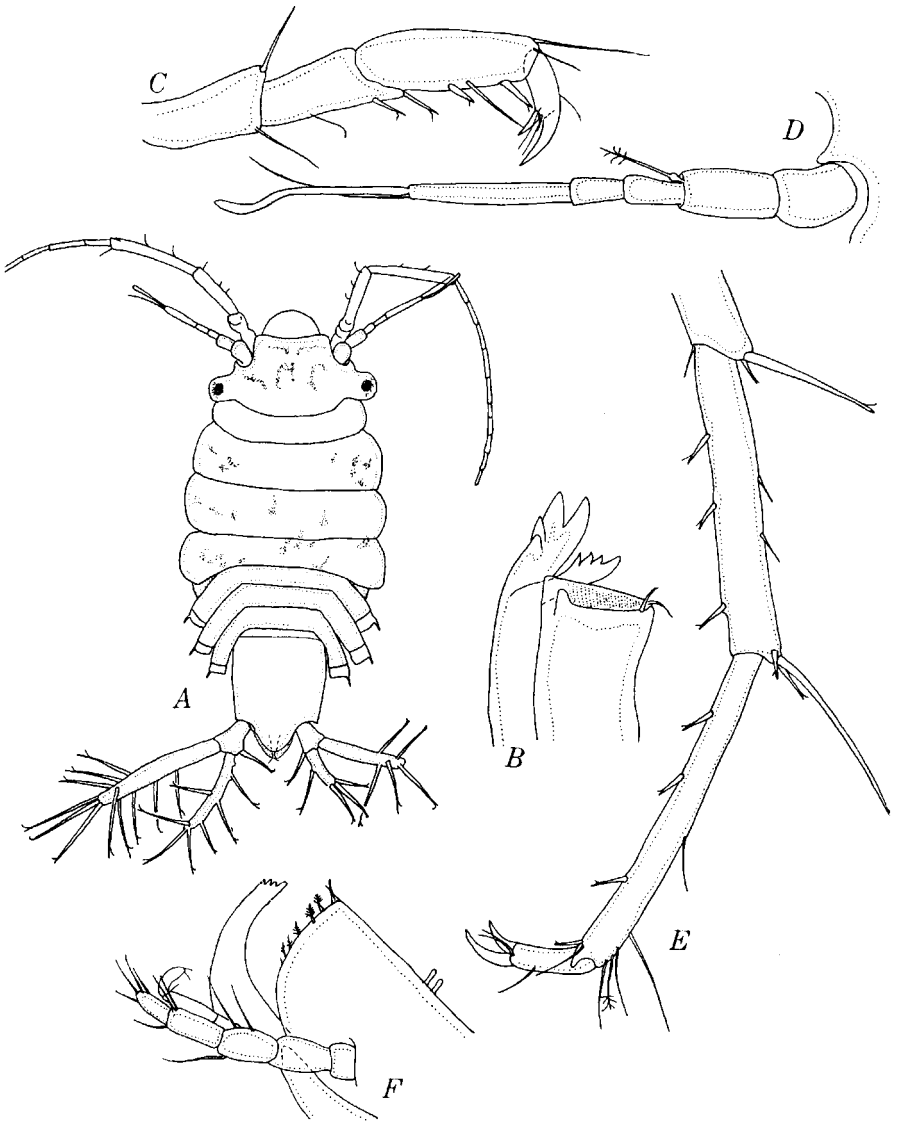

FIGURE 39. *Antias milleri*, new species. A. female holotype, length 1.0 mm; B. left Md; C. P^1; D. Ant^1; E. P^6; F. right Mxp and Md.

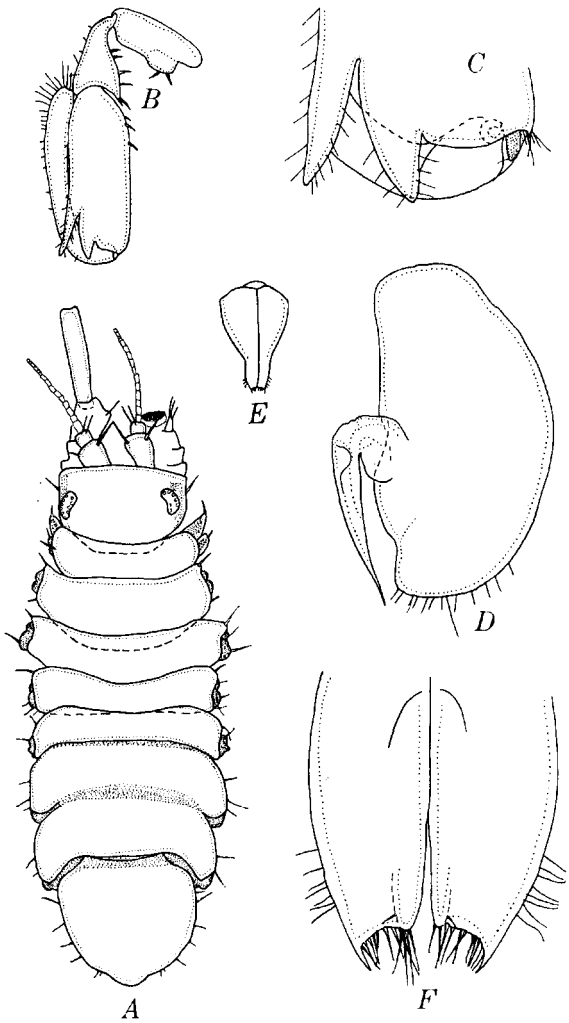

FIGURE 40. *Bagatus stylodactylus* Nobili. A. male, length 2.5 mm; B. gnathopod, same scale as A; C. enlarged view of margin of propodus from B; D. Plp^2; E. Plp^1; F. enlarged view Plp^1.

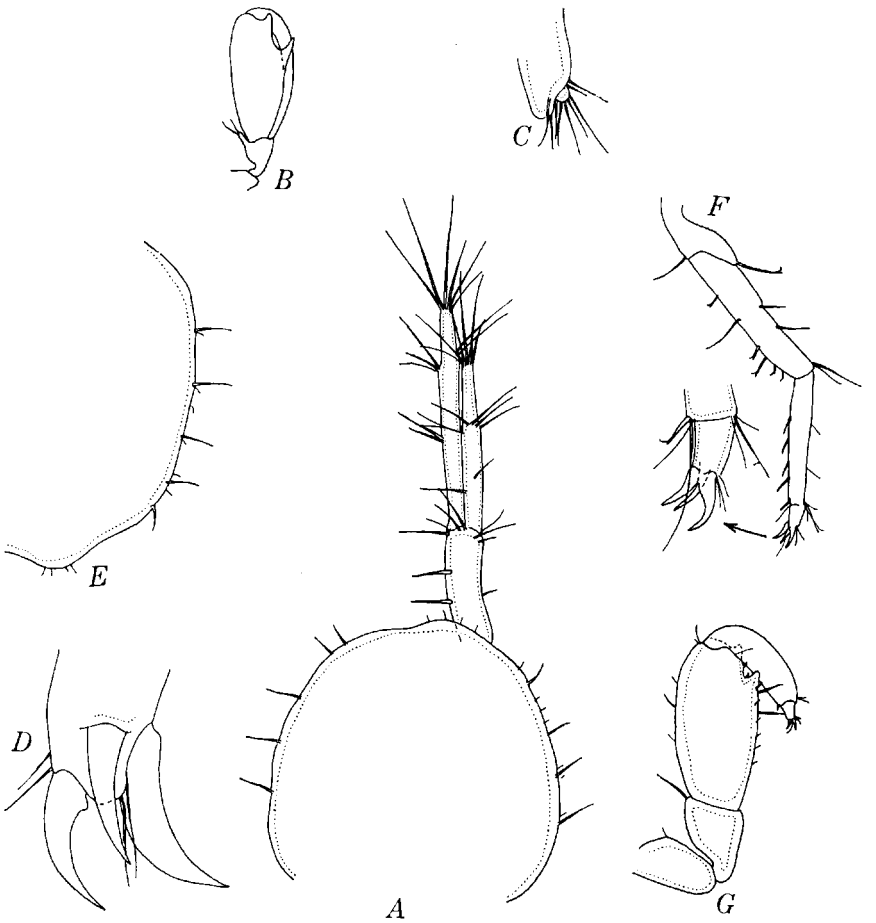

FIGURE 41. *Bagatus stylodactylus* Nobili. A. pleotelson, male; B. gnathopod; C. apex of dactyl of gnathopod; D. apex of dactyl P^7; E. lateral border of pleotelson, female; F. P^7 and dactyl, female; G. immature male gnathopod showing dactyl with claws.

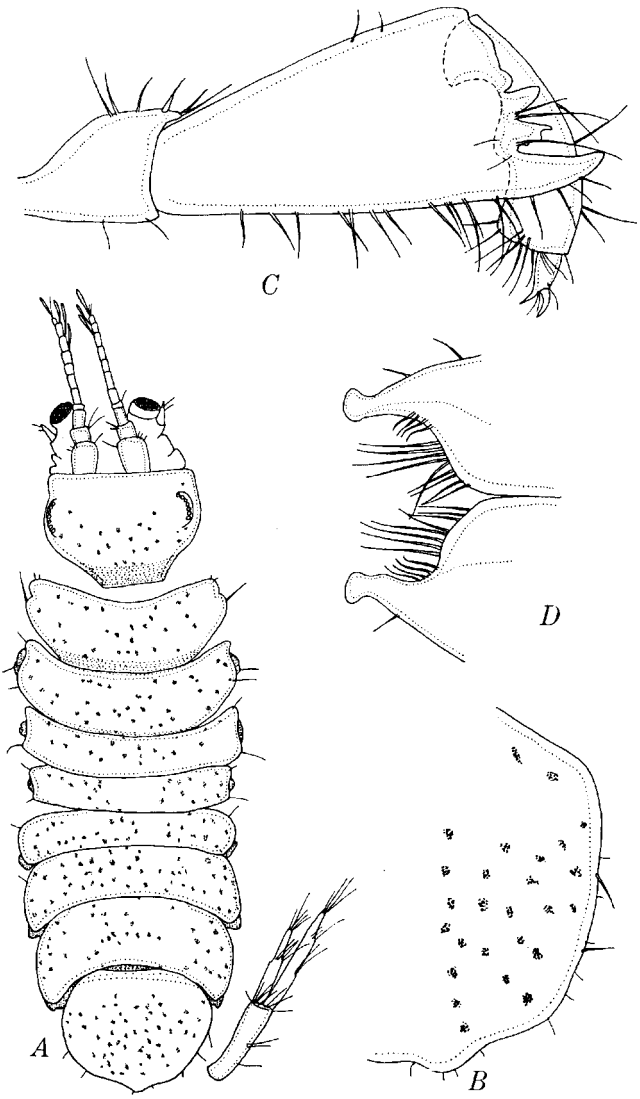

FIGURE 42. *Bagatus bermudensis* (Richardson). A. female, length 1.5 mm; B. pleotelson; C. dactyl; D. apex Plp[1], male.

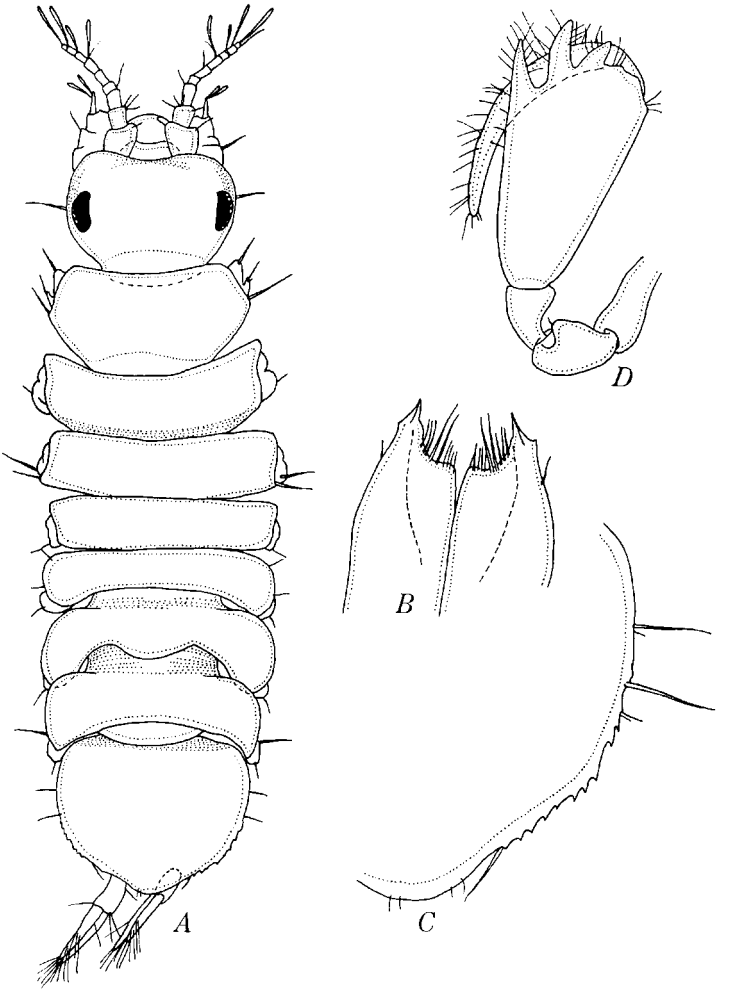

FIGURE 43. *Bagatus serricaudus*, new species. A. male, length 1.6 mm; B. Plp[1]; C. latero-posterior border of pleotelson; D. gnathopod.