



ARTHUR G. HUMES
and JAN H. STOCK

*A Revision of the
Family Lichomolgidae
Kossmann, 1877,
Cyclopoid Copepods
Mainly Associated with
Marine Invertebrates*

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ABSTRACT

Humes, Arthur G., and Jan H. Stock. A Revision of the Family Lichomolgidae Kossmann, 1877, Cyclopoid Copepods Mainly Associated with Marine Invertebrates. *Smithsonian Contributions to Zoology*, number 127, 368 pages, 190 figures, 1973.—The poecilostome family Lichomolgidae has been divided into five families (Humes and Stock, 1972): Sabelliphilidae Gurney, 1927; Lichomolgidae Kossmann, 1877; Urocopiidae Humes and Stock, 1972; Pseudanthessiidae Humes and Stock, 1972; and Rhynchomolgidae Humes and Stock, 1972. These families form the superfamily Lichomolgoidea Humes and Stock, 1972. In the present work 76 genera are characterized, including 324 species (37 new). Previously known species are recorded from 73 new hosts. In addition to illustrations of the new taxa, selected figures of each genus not represented by new species have been reproduced. Keys are provided for the families, genera, and species where possible. For each species the geographical distribution and hosts, where known, are indicated.

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NEW SPECIES

Family Sabelliphilidae

Herrmannella bullata
Myxomolgus proximus
Serpuliphilus tenax
Serpuliphilus duplus

Family Lichomolgidae

Acanthomolgus astrictus
Acanthomolgus bilobipes
Acanthomolgus hales
Acanthomolgus plantei
Amarda cultrata
Amarda compta
Andrianellus exsertidens
Ascetomolgus plicatus
Ascidioxynus floridanus
Ascidioxynus bermudensis
Colobomolgus laboutei
Contomolgus lokobeensis
Debruma clavelinae
Doridicola astrophyticus

Family Lichomolgidae (continued)

Doridicola ptilosarci
Macrochiron echinicum
Meringomolgus facetus
Meringomolgus devotus
Meringomolgus hamatus
Metaxymolgus antheliae
Metaxymolgus chlamydis
Metaxymolgus cinctus
Metaxymolgus claudus
Metaxymolgus inflatiseta
Panjakus hydriophorae
Panjakus platygyrae
Paraduridicola sinulariae
Rakotoa proteus
Stellicola illgi
Telestacicola angoti
Xenomolgus varius
Zamolgas tridens
Zamolgas acanthodes

SPECIES REDESCRIBED

Family Sabelliphilidae

Herrmannella columbiae (Thompson, 1897)
Herrmannella panopeae (Illg, 1949)
Herrmannella saxidomi (Illg, 1949)
Herrmannella tivelae (Illg, 1949)
Lichomolgidium sardum Kossmann, 1877
Lichomolgidium cynthiae (Brian, 1924)
Modiolicola insignis Aurivillius, 1882
Modiolicola gracilis C. B. Wilson, 1935

Family Sabelliphilidae (continued)

Modiolicola inermis Canu, 1892
Modiolicola maximus (Thompson, 1893)
Myxomolgus myxocolae (Bocquet and Stock, 1958)

Family Lichomolgidae

Ascidioxynus jamaicensis (C. B. Wilson, 1921)
Macrochiron sargassi C. O. Sars, 1916

Family Pseudanthessiidae

Kombia angulata Humes, 1962

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and Jan H. Stock

A Revision of the Family Lichomolgidae Kossmann, 1877, Cyclopoid Copepods Mainly Associated with Marine Invertebrates

Introduction

A variety of genera of poecilostome copepods has been ascribed to the family Lichomolgidae since its establishment by Kossmann in 1877. A few of these genera, such as *Anthessius* Della Valle, 1880 (= *Pseudomolgus* G. O. Sars, 1916), *Synaptiphilus* Canu and Cuénot, 1892, *Cholidya* Farran, 1914, *Myicola* Wright, 1885, and *Rhinomolgus* G. O. Sars, 1918, have been removed from the Lichomolgidae by later authors because of their obvious nonlichomolgid characters.

In recent years our knowledge of these copepods has expanded considerably. From 1853 (the year of establishment of the first lichomolgid genus, *Doridicola*) to 1899, there were 13 genera described. From 1900 to 1947 only 7 new genera were proposed. From 1948 to 1971 24 new genera were created, and we recently added 32 new genera (Humes and Stock, 1972). In this revision 76 genera are recognized. These contain 324 species, 37 of which are new.

Lichomolgid copepods, although well known as common associates of marine invertebrates in northern Europe and the Mediterranean Sea, appear to be particularly abundant on a wide variety

of invertebrate hosts in tropical areas. Intensive collections in warm regions have thus far been few in number. Thompson and Scott (1903) recorded 283 species of copepods of all kinds from the Ceylon Pearl Banks (Herdman, 1904, p. 57), among them 19 lichomolgids (including 16 new species). Humes (1970c) and his coworkers reported 191 copepods (mostly cyclopoids) associated with marine invertebrates in the vicinity of Nosy Bé, Madagascar. Of these more than 100 were lichomolgids, the majority of them new. Other reports by Stock (1967a, 1967b, 1968) in the Red Sea area and by Stock, Humes, and Gooding (1963a) in the West Indies suggest the richness of this tropical fauna. More than seventy years ago I. C. Thompson (1900) was well aware of the diversity and abundance of copepod associates when he wrote (p. 140) ". . . it is evident that Sponges, Coelenterates, Echinoderms, Worms, Molluscs, Nudibranchs, and Ascidians will all richly reward careful search; for judging from past results, they are the hosts of many highly organized species of Copepoda, each specially adapted to its particular host and that alone."

Various proposals have been made for supra-generic division of the Lichomolgidae. Kossmann (1877) divided the family into the group Lichomolgini, characterized by a lack of deformation in the female, and including *Sabelliphilus* M. Sars, 1862, *Lichomolgus* Thorell, 1859, and his new gen-

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era *Stellicola*, *Lichomolgidium*, *Lecanurius*, and *Boholia*, and the group Ergasilini, with the thorax of the female deformed by the ovaries, and including his new genus *Paclabius*. Such a division seems artificial, since deformation of the body frequently occurs in associated or parasitic copepods, especially in the females, where it is the expression of parasitic adaptation rather than a fundamental morphological feature.

Gurney (1927) divided the Lichomolgidae into two subfamilies, the Sabelliphilinae, with the endopod of leg 4 composed of three segments, and the Lichomolginae, with that endopod 2-segmented, 1-segmented, or absent. Sewell (1949) adopted Gurney's division of the family. That division appears to reflect two evolutionary branches, and it has served as the starting point for our revision.

In view of the greatly increased information which we now have, we feel that the copepods included in the broad family Lichomolgidae show more than two evolutionary lines, and that these relationships can best be expressed by a division of the old family Lichomolgidae into five families. One of these, the family Sabelliphilidae, corresponds largely to Gurney's Sabelliphilinae, but the definition has been expanded to include not only those with a 3-segmented endopod in leg 4 but also those with one or more of the endopods of legs 1-4 being 2-segmented in a series from anterior to posterior. The family Lichomolgidae is retained, but in a restricted sense, for those with the endopod of leg 4 having fewer than three segments or being absent (with the endopods of legs 1-3 not reduced, except in leg 3 in *Ravahina* and in legs 1-3 in *Amarda*), and with a free segment in leg 5. The family Pseudanthessiidae shows a strong reduction in the endopod of leg 4 (1-segmented or absent, with this reduction in certain genera being carried forward into the more anterior legs) and lacks a free segment in leg 5. The family Urocopiidae accommodates the genus *Urocopia*, with the endopod of leg 4 composed of three segments but with leg 5 lacking a free segment. The family Rhynchomolgidae contains the genus *Rhynchomolgus*, with legs 1-4 showing very strong reduction from posterior to anterior, with leg 5 in the female lacking a free segment, and with strong sexual dimorphism both in body form and in the appendages (in the

male the mandible, maxilliped, leg 4, and leg 5 being absent).

Specimens that are deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C., are listed under the catalog numbers of the former United States National Museum (USNM).

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Definition of Terms and Scope of the Work

The brief generic descriptions that follow include only those characters considered to be especially diagnostic; thus, they serve to distinguish the genera one from another. The descriptive statements apply to both sexes unless otherwise specified.

For descriptive purposes three terms have been used to refer to the aspect of the body: (1) cyclopidiform, where the aspect is that of a generalized unmodified cyclopoid (as in *Paranthessius* and many *Lichomolgus*); (2) modified, where the form is basically cyclopoid but is elongated and slender (as in *Octopicola*), unusually broadened (as in *Aspidomolgus*), or otherwise departs from the generalized form (as in *Gelastomolgus*); and (3) transformed, where the body, especially in the female,

is swollen, vermiform, or otherwise changed, often with loss of external segmentation (as in *Rhynchomolgus*).

Although there are intergrading species for which the application of these terms might be difficult, the three categories are useful in a general way.

The following abbreviations are used: A₁, first antenna; A₂, second antenna; L, labrum; MD, mandible; MX₂, second maxilla; MXPD, maxilliped; P₁₋₅, legs 1-5; EXP, exopod; and ENP, endopod. In the spinal and setal formulas the Roman numerals indicate spines, the Arabic numerals setae.

In the list of species under each genus the hosts with which the copepods are associated are given in all cases where they are known. The geographical distribution of the species has been in some cases noted in a general way in the interest of brevity.

For each genus where new forms are not herein described, selected figures of a known species have been reproduced in order to illustrate certain characters and to facilitate generic determination.

Every effort has been made to include for each species all significant synonyms, all references containing new descriptive or interpretive material, and all references to hosts and geographical localities. In certain cases where species names have been used only as citations from previously recorded authors the names have not been entered in order to shorten the lists.

Comparative External Anatomy of the Five Families of Lichomolgoidea

In the majority of genera the body retains the general cyclopidiform facies. In certain genera, however, the body is modified or transformed. The Sabelliphilidae and Lichomolgidae contain several modified genera and a few which are moderately transformed (*Synapticola*, *Amarda*, *Paraphiloconcha*, *Ravahina*). In certain cases, only the female is modified or transformed, the male being cyclopidiform (*Lichomolgides*, *Epimolgus*). *Urocopia*, the only known genus of the Urocopiidae, is cyclopidiform. In the Pseudanthessiidae there is a strong tendency toward modification or transformation, with only the genus *Pseudanthessius* having a cyclopidiform facies. *Rhynchomolgus*, the only known genus of the Rhynchomolgidae, is highly transformed.

Most species have a characteristic size range in both sexes. A few, however, exist in two size forms (*Caribulus sculptus*, *Meomicola amplexans*).

Generally, females are larger than males, though in a few cases males are larger (*Indomolgus brevisetosus*, *Rhynchomolgus corallophilus*, *Temnomolgus eurynotus*).

Sexual dimorphism is most usual in the first and second antennae, the maxillipeds, leg 1, leg 5, and the genital segment. Sexual differences, however, may appear in other structures; for example, in the rostrum (*Acanthomolgus varirostratus*, *Paramolgus insectus*), in the segmentation of the first and second antennae (*Rhynchomolgus corallophilus*), in the second maxilla (*Meringomolgus*), and in the caudal ramus (*Rhynchomolgus corallophilus*). Suckers occur on the second antenna of the male in a few species (*Aspidomolgus stoichactinus*, *Herrmannella poculifera*). One species, *Stellicola femineus*, is unique in that the male has a maxilliped much like that of the female, without the long claw characteristic of the male.

Several pairs of species, each pair associated with one host genus, are remarkably similar in their external anatomy and may be regarded as sibling species (*Paramolgus politus* and *P. simulans*, *Paramolgus constrictus* and *P. insectus*, and *Plesiomolgus conjunctus* and *P. organicus*).

The genital segment varies greatly in form in the female, less so in the male. In *Calypsarion* there is a remarkable modification of this segment in the female, where there is a ventral keel. The genital segment in the male of this genus lacks a keel, but a keel is present on the first postgenital segment. In *Schedomolgus lobophorus*, while the genital segment in both sexes is ordinary, there is a ventral lobe on the first postgenital segment in the female and on the second postgenital segment in the male.

The number of postgenital segments is, in almost all genera, three in the female and four in the male. In *Synstellicola* and in one species of *Pseudanthessius* the number is two in the female and three in the male (*P. deficiens*). (This is probably true also for *P. dubius*, where there are two postgenital segments in the female, but the male is unknown.)

The caudal ramus, though variable in size and proportions, has six setae. The setae, especially the two median terminal ones, are usually very

long, but may be very short as in *Ravahina tumida*. In *Diogenella* the two median terminal setae are vestigial.

One species (*Thamnomolgus robustus*) is unique in having a pair of ocelliform sclerotized areas on the ventral surface of the cephalosome in the male posterior to the bases of the maxillipeds.

The usual pattern (referred to below as lichomolgoidiform) for the armature of legs 1-4 is as follows (the Roman numerals indicating spines, the Arabic numerals setae):

P ₁	coxa	0-1	basis	1-0	exp	I-0; I-1; III,I,4
					enp	0-1; 0-1; I,5
P ₂	coxa	0-1	basis	1-0	exp	I-0; I-1; III,I,5
					enp	0-1; 0-2; I,II,3
P ₃	coxa	0-1	basis	1-0	exp	I-0; I-1; III,I,5
					enp	0-1; 0-2; I,II,2
P ₄	coxa	0-1	basis	1-0	exp	I-0; I-1; II,I,5 or III,I,5
					enp	variable

Deviations from this arrangement are described in the text below.

Host Specificity

Approximately three-fourths of the genera in the five families contain at present relatively few species (less than five). Only 18 genera have five or more species. The ten largest genera are *Pseudanthessius* (34 species), *Metaxymolgus* (23), *Scambicornus* (21), *Lichomolgus* (17), *Herrmannella* (16), *Doridicola* (14), *Acanthomolgus* (13), *Stellicola* (10), *Kelleria* (9), and *Macrochiron* (9). Thirty genera are monotypic. Observations on the relative sizes of the genera have little significance, however, since it is apparent that our present knowledge of these families is very limited. Large numbers of new forms remain to be described. In the collections of the present authors are numerous new species that await study.

In the Sabelliphilidae the 18 genera are associated with particular groups of hosts, with no adventitious associations with other host groups. (The only exception is *Scambicornus armoricanus* Bocquet, Stock, and Kleeton, 1963, from a polychaete rather than from a holothurian like other members of the genus. As mentioned in the text below, however, this species probably belongs to a new genus rather than to *Scambicornus*.) The associations of copepod genera and host groups in this family are as follows:

with Antipatharia: *Thamnomolgus*
 with Actiniaria: *Paranthessius*
 with Polychaeta: *Myzomolgus*, *Sabelliphilus*, *Serpuliphilus*
 with Bivalvia: *Herrmannella*, *Modiolicola*
 with Holothuroidea: *Calypsarion*, *Calypsina*, *Caribulus*, *Diogenella*, *Diogenidium*, *Lecanurius*, *Lichothuria*, *Scambicornus* (except *S. armoricanus*), *Synapticola*
 with Ascidiacea: *Henicoxiphium*, *Lichomolgidium*

In the Lichomolgidae 42 genera are associated with definite host groups, as follows:

with Scyphozoa: *Paramacrochiron*, *Pseudomacrochiron*, *Sevellochiron*
 with Actiniaria: *Aspidomolgus*
 with Octocorallia: *Acanthomolgus*, *Anisomolgus*, *Ascetomolgus*, *Colobomolgus*, *Contomolgus*, *Meringomolgus*, *Paradoricola*, *Paredromolgus*, *Pennatulicola*, *Plesiomolgus*, *Telestacicola*, *Zamolgus*
 with Madreporaria: *Amarda*, *Anchimolgus*, *Andrianellus*, *Haplomolgus*, *Monomolgus*, *Odontomolgus*, *Panjakus*, *Prionomolgus*, *Rakotoa*, *Ravahina*, *Schedomolgus*, *Spaniomolgus*, *Xenomolgus*
 with Polychaeta: *Acaenomolgus*, *Nasomolgus*
 with Bivalvia: *Gelastomolgus*, *Paraphiloconcha*, *Philoconcha*
 with Gastropoda: *Epimolgus*
 with Cephalopoda: *Octopicola*
 with Asteroidea: *Astericola*, *Stellicola*, *Synstellicola*
 with Ascidiacea: *Ascidioxynus*, *Debruma*, *Lichomolgides*

On the other hand, several genera in the Lichomolgidae contain species associated with more than one host group or are free-living:

with Mollusca and Ascidiacea: *Lichomolgus*
 with Algae, Hydrozoa, Echinoidea, Ascidiacea: *Macrochiron*
 with Alcyonacea, Zoanthidea, Actiniaria, Opisthobranchia: *Metaxymolgus*
 with Ascidiacea, Algae, Holothuroidea: *Zygomolgus*
 with Algae, free-living: *Lichomolgella*
 with Crinoidea, free-living, in burrows: *Kelleria*
 with Zoanthidea, Actiniaria: *Indomolgus*
 with Octocorallia, Actiniaria: *Paramolgus*
 with Octocorallia, Actiniaria, Nudibranchia, Crinoidea: *Doridicola*

Except for the genus *Pseudanthessius* the genera of the Pseudanthessiidae are restricted in their host groups as follows:

with Zoanthidea: *Temnomolgus*
 with Madreporaria: *Kombia*
 with Echinoidea: *Meomicola*
 with Ascidiacea: *Heteranthessius*
 with Turbellaria, Rhynchocoela, Polychaeta, Crinoidea, Asteroidea, Ophiuroidea, Echinoidea: *Pseudanthessius*

In certain cases a single-host species may have more than one species of copepod of one genus associated with it. These species are sometimes

strikingly similar and yet morphologically distinct. The alcyonacean *Tubipora musica*, for example, has two closely related copepod associates, *Plesiomolgus conjunctus* and *P. organicus* (Humes and Ho, 1967a). Another example is the polychaete *Sabellastarte magnifica* which has four species of copepods associated with it, *Nasomolgus firmus*, *N. leptus*, *N. parvulus*, and *N. rudis* (Humes and Ho, 1967c). The first three of these copepods have been recovered together from a single host. Presumably the three species occupy different microhabitats on the host.

Phylogenetic Relationships of the Five Families of Lichomolgoidea

Any interpretation of possible interrelationships of the five poecilostome families considered here is destined to be speculative. With the recent demonstration that intensive search in a small area can uncover many new forms (as at Nosy Bé, Madagascar), it is clear that the assemblage of copepods in the Lichomolgoidea is far from complete. Almost nothing is known about the developmental stages of the described species.

Of all the poecilostome families the Oncaeidae seem to approach most closely the sabelliphilid and lichomolgid types. The oncaeid segmentation and armature of legs 1–5 resemble closely those of the sabelliphilids. There are, however, important features by which the Oncaeidae differ from the five families under consideration. Chief among these are the nonprehensile nature of the second antenna, the form of the mandible, and the presence of a clawed maxilliped in both sexes.

Thorell (1859) referred his new genus *Lichomolgus* to the Ergasilidae, and later (1860) to the Sapphirinidae. The sabelliphilids and lichomolgids appear to be rather far removed, however, from the Ergasilidae, which have a very prehensile second antenna (especially in the female), lack a maxilliped in the female, and have a different segmentation and armature of legs 1–4. They are also very different from the Sapphirinidae, which have a pair of corneal lenses.

The Sabelliphilidae apparently are the most generalized and primitive of the five families. Their legs 1–4 usually have 3-segmented rami, and their bodies are generally not transformed. In several genera there is a reduction in segmentation of the

endopods (*Calypsarion*, *Calypsina*, *Caribulus*, *Lichothuria*, *Synapticola*), such reduction being from anterior to posterior in the series of legs. In one genus (*Synapticola*) there is a slight transformation of the body.

The Lichomolgidae (in the definition used here) may be derived from the sabelliphilid stem. There is a reduction of the endopod of leg 4 to two segments, one segment, or none. In a few genera the body is modified or transformed, the greatest reduction and transformation being seen in *Amarda* and *Ravahina*.

The Pseudanthessiidae may be derived from the lichomolgid stem. Here there is a strong tendency toward reduction of the endopods (and in certain cases the exopods also) of legs 1-4 from posterior to anterior. Their bodies are often modified or transformed. Leg 5 lacks the free segment present in the sabelliphilids and lichomolgids.

The Rhynchomolgidae apparently have evolved from the pseudanthessiid stem. There is a very strong reduction of the legs and the body is highly transformed. Again there is no free segment in leg 5.

The relationships of the Urocopiidae are more obscure. (The family contains only *Urocopia singularis* G.O. Sars, 1917, of which only the female is known.) Here there is no reduction in legs 1-4 and the body is cyclopiform, yet there is no free segment in leg 5. Possibly the family evolved from the early pseudanthessiid stem, losing the free segment of leg 5 but retaining the sabelliphilid nature of leg 4.

The phylogenetic tree presented in Figure 1 is intended only to suggest possible relationships within the Lichomolgoidea.

Superfamily LICHOMOLGOIDEA Humes and Stock, 1972

First antenna usually 7-segmented. Second antenna either 4-segmented or 3-segmented by a fusion of the last two segments. Mandible simple, without terminal elements, but often attenuated into a slender lash. Maxilliped present in both sexes, prehensile in the male.

Legs 1-4 typically with 3-segmented exopods and endopods, but these frequently reduced or some-

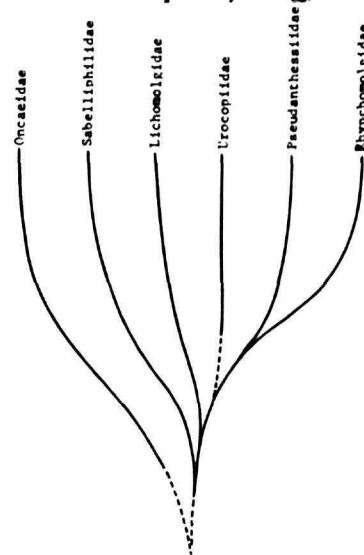


FIGURE 1.—Possible relationships within the Lichomolgoidea.

Key to Families of the Superfamily Lichomolgoidea

1. Exopods of legs 1 and 2 in the female 2-segmented, in the male 1-segmented **Rhynchomolgidae**
Exopods of legs 1 and 2 in the female 3-segmented, in the male at least 2-segmented 2
2. Leg 5 without a free segment 3
Leg 5 with a free segment (except a short papilla in *Synapticola*) 4
3. Leg 4 endopod 3-segmented **Urocopiidae**
Leg 4 endopod 1-segmented, reduced to a small knob, or absent. **Pseudanthessiidae**
4. Leg 4 endopod 2-segmented, 1-segmented, reduced to a small knob, or absent; legs 1-3 endopods 3-segmented (except in *Amarda* and *Ravahina*); the reduction in the endopods occurring in a posterior to anterior series **Lichomolgidae**
Legs 1-4 endopods 3-segmented in most genera; if leg 4 endopod 2-segmented, then legs 1-3 endopods also 2-segmented; the reduction of the endopods occurring in an anterior to posterior series **Sabelliphilidae**

times absent. Leg 5 with at most a single free segment, in some cases lacking a free segment entirely; armature usually consisting of three elements, two of them on the free segment if present.

Usually associated with marine invertebrates, in some cases evidently parasitic, with the body form modified or transformed.

REMARKS.—The superfamily name as originally proposed by Humes and Stock (1972) inadvertently contained an extra syllable. The name is here corrected to Lichomolgoidea, its intended form.

Family SABELLIPHILIDAE Gurney, 1927

Subfamily SABELLIPHILINAE Gurney, 1927

Legs 1–4 with 3-segmented rami in most genera. Certain genera with 2-segmented endopods, especially in the male, the reduction occurring in an anterior to posterior series as in males of *Scambicornus*. Leg 5 present in both sexes and with a free segment, except in *Synapticola* where in both sexes it is reduced to a short papilla and in *Thamnomolgus* where in the male it is reduced to a small lobe fused with the body.

Key to Genera of the Family Sabelliphilidae

1. Second antenna 3-segmented 2
 Second antenna 4-segmented 3
2. Legs 1–4 with exopods and endopods 3-segmented in both sexes; leg 5 with a free segment *Henicoxiphium*
 Legs 1–4 with 3-segmented exopods and 2-segmented endopods in both sexes; leg 5 without a free segment *Synapticola*
3. Second antenna with one claw on third segment and three or four claws on fourth segment 4
 Second antenna with claws not present on both of these segments 5
4. Rostrum bifid; second antenna with first two segments enlarged, second segment with a toothed crest and fourth segment with four claws *Sabelliphilus*
 Rostrum not bifid; second antenna with first two segments not enlarged; second segment without a toothed crest and fourth segment with three claws *Myzomolgus*
5. Second antenna with one claw on third segment, fourth segment without claws 6
 Second antenna with 1–3 terminal claws, but without a claw on third segment 11
6. Ventral keel on genital segment of female and on first postgenital segment of male; endopods of legs 1–4 in both sexes 2-segmented *Calypsarion*
 Without a ventral keel on genital segment of female or on first postgenital segment of male; endopods of legs 1–4 not entirely 2-segmented in both sexes 7
7. Body much elongated with broad triangular cephalosome; legs 1–4 with all exopods and endopods 3-segmented in both sexes; leg 4 endopod with formula 0–1; 0–1; I,I,I,I; egg sacs very long with nearly linear eggs *Lecanurius*
 Body not unusually elongated and cephalosome not broadened; legs 1–4 with 3-segmented exopods, but endopods sometimes 2-segmented; leg 4 endopod with formula other than in *Lecanurius*; egg sacs not unusually long and eggs not linearly arranged 8
8. Legs 1–4 in both sexes with rami 3-segmented except legs 1–3 with endopods 2-segmented; rostrum a slender beak; endopod of leg 4 with the formula 0–0; 0–0; I,III,I *Calypsina*
 Legs 1–4 in female with 3-segmented rami, but in male some endopods 2-segmented; rostrum rounded or weakly developed; endopod of leg 4 with formula other than in *Calypsina* 9
9. Mandible with a large spinelike element on base; leg 4 with endopod in female 0–1; 0–1; II,I, in male 0–1; II,I,I *Lichothuria*
 Mandible without a large spinelike element on base; leg 4 with endopod having formula unlike *Lichothuria* 10
10. Legs 1–4 with 3-segmented rami, except in the male where legs 1–2 have 2-segmented endopods and legs 3–4 have 3-segmented endopods; leg 4 with endopod in both sexes with formula 0–1; 0–1; I,I,II *Scambicornus*
 Legs 1–4 with 3-segmented rami, except in male where all endopods are 2-segmented; leg 4 with endopod in female 0–1; 0–1; I,I,II and in male 0–1; I,II,I,I *Caribulus*
11. Second antenna with one terminal claw 12
 Second antenna with more than one terminal claw 15

- | | |
|---|-----------------------|
| 12. Caudal ramus with two median terminal setae vestigial | <i>Diogenella</i> |
| Caudal ramus with two median terminal setae normally developed | 13 |
| 13. Third segment of leg 3 endopod with four elements; leg 5 in female with a free segment,
in male with the segment fused with body | <i>Thamnomolgus</i> |
| Third segment of leg 3 endopod with five elements; leg 5 in both sexes with a free
segment | 14 |
| 14. Terminal lash on second maxilla much shorter than adjacent seta | <i>Diogenidium</i> |
| Terminal lash on second maxilla longer than adjacent seta | <i>Herrmannella</i> |
| 15. Second antenna with two terminal claws | 16 |
| Second antenna with three terminal claws | 17 |
| 16. Second maxilla lacking an auxiliary lash; maxilliped in female 2-segmented with blunt tip
..... | <i>Lichomolgidium</i> |
| Second maxilla with an auxiliary lash; maxilliped in female 3-segmented and prehensile
..... | <i>Serpuliphilus</i> |
| 17. Leg 4 endopod with formula 0-1;0-2;III; leg 3 endopod with 0-1;0-2;I,II,2 | <i>Paranthesisius</i> |
| Leg 4 endopod with formula 0-1;0-1;II; leg 3 endopod with 0-1;0-1;II,II,2 or I,III,2 | <i>Modiolicola</i> |

Genus *Calypsarion* Humes and Ho, 1969

DIAGNOSIS.—Body modified, elongated, and slender. Urosome in the female 5-segmented; in the male 6-segmented. A ventral keel on the genital segment of the female and on the first postgenital segment of the male. Caudal ramus with six setae. Rostrum rounded. First antenna 7-segmented, in the female with the formula 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male with the same setation but without aesthetes. Second antenna 4-segmented, the last segment set off laterally; formula 1, 1, 3 + one large claw, and 7.

Labrum with two widely diverging lobes. Mandible with the base having a few small spiniform processes on the convex edge, the blade with its convex side finely spinulose (not a single row of spinules as in related genera). Paragnath a small hairy lobe. First maxilla with two or three elements and a small knob. Second maxilla of the usual lichomolgid type. Maxilliped of the female 3-segmented with a pointed tip; in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1-4 in both sexes with 3-segmented exopods and 2-segmented endopods. Legs 3 and 4 exopods

Key to Species of the Genus *Calypsarion*

FEMALES

1. First maxilla with one terminal seta; distal spine on posterior surface of second segment of second maxilla club-shaped and spinulose *C. leprum*
First maxilla with two terminal setae; distal spine on posterior surface of second segment of second maxilla attenuated and laterally barbed 2
2. Genital segment in dorsal view with more or less rounded lateral margins *C. carinatum*
Genital segment in dorsal view expanded laterally in anterior third and slender in posterior two-thirds *C. sentosum*

MALES

1. Inner margin of second segment of maxilliped greatly produced to form a long lobe crowned with obtuse spines and two setae *C. sentosum*
Inner margin of second segment of maxilliped not produced 2
2. First maxilla with one terminal seta; distal spine on posterior surface of second segment of second maxilla club-shaped and spinulose; inner surface of second segment of maxilliped with one row of obtuse spines and two setae *C. leprum*
First maxilla with two terminal setae; distal spine on posterior surface of second segment of second maxilla attenuated and laterally spinulose; inner surface of second segment of maxilliped with 2-3 rows of conical spines and two setae *C. carinatum*

with the third segment having II,I,5. Leg 4 endopod with the formula 0-1;I,III,I,1 or 0-1;I,III,I. Leg 1 endopod with the same formula in both sexes. Leg 5 with the free segment bearing two setae. Leg 6 in the female represented by the two setae and the process near the area of attachment of each egg sac (without these setae in *C. leprum*); in the male by the ventral posterolateral flap on the genital segment bearing two setae.

Other features as in the species below.

Endoparasitic in holothurians.

TYPE-SPECIES.—*Calypsarion carinatum* (Stock).

Calypsarion carinatum (Stock, 1968)

Scambicornus carinatus Stock, 1968, pp. 92-94, figs. 1-3 [from the holothurian *Stichopus monotuberculatus* (Quoy and Gaimard), Dahlak Archipelago, Ethiopia].

Calypsarion leprum Humes and Ho, 1969

FIGURE 2

Calypsarion leprum Humes and Ho, 1969b, pp. 878-880, figs. 1-29 [from the holothurians *Actinopyga miliaris*

(Quoy and Gaimard), *Actinopyga lecanora* (Jaeger), and *Actinopyga mauritiana* (Quoy and Gaimard), Nosy Bé and vicinity, northwestern Madagascar].

Calypsarion sentosum Humes and Ho, 1969

Calypsarion sentosum Humes and Ho, 1969b, pp. 880-889, figs. 30-56 [from the holothurian *Bohadschia marmorata* Jaeger, Nosy Bé, Madagascar].

Genus *Calypsina* Humes and Stock, 1972

DIAGNOSIS.—Body cyclopiform. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six setae. Rostrum a pointed beak. First antenna 7-segmented, in the female with the armature 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented, the fourth segment set off laterally; formula 1, 1, 3 + one large claw, and 6, the last segment bearing only setae.

Mandible resembling that of *Scambicornus*. First maxilla with three elements. Second maxilla of the usual lichomolgid type. Maxilliped in the female 3-segmented with a pointed tip; in the male

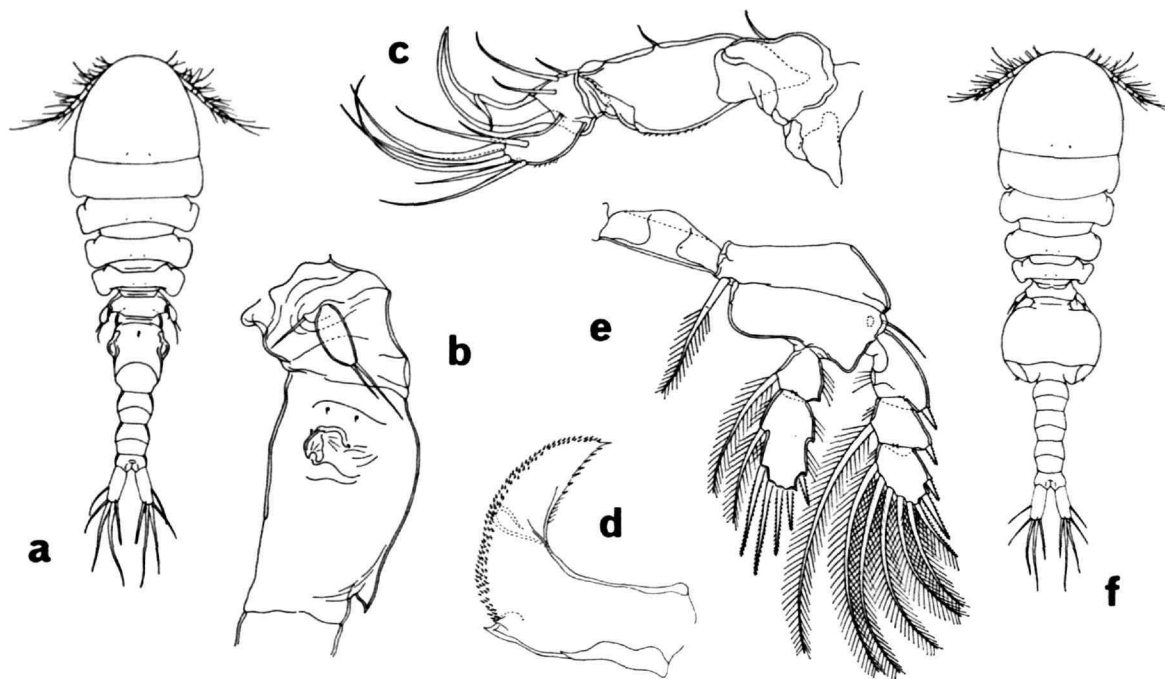


FIGURE 2.—*Calypsarion leprum* Humes and Ho. Female: a, dorsal; b, anterior part of urosome; c, second antenna; d, mandible; e, leg 4 and intercoxal plate. Male: f, dorsal. (From Humes and Ho, 1969b, figs. 1, 3, 9, 10, 20, 23.) Length of female 1.22 mm, of male 1.39 mm.

4-segmented (assuming that the proximal part of the claw represents a fourth segment).

In both sexes legs 1-3 with 3-segmented exopods and 2-segmented endopods, and leg 4 with both rami 3-segmented. Leg 4 exopod with the third segment having II,I,5. Leg 1 endopod 0-1;I,5,1, without sexual dimorphism in the male. Leg 2 endopod 0-1;I,II,3,1. Leg 3 endopod 0-1;I,III,2,1. Leg 4 endopod 0-0;0-0;I,III,I. Leg 5 in both sexes with a free segment bearing two terminal elements.

Other features as in the species below.

Associated with holothurians.

TYPE-SPECIES.—*Calypsina changeuxi* (Stock and Kleeton).

ETYMOLOGY.—The name is a diminutive form of *καλυψω*, a nymph who concealed Ulysses. Gender feminine.

***Calypsina changeuxi* (Stock and Kleeton, 1963)**

FIGURE 3

Preherrmannella changeuxi Stock and Kleeton, 1963a, pp. 697-701, figs. 9-11 [from esophagus of the holothurian

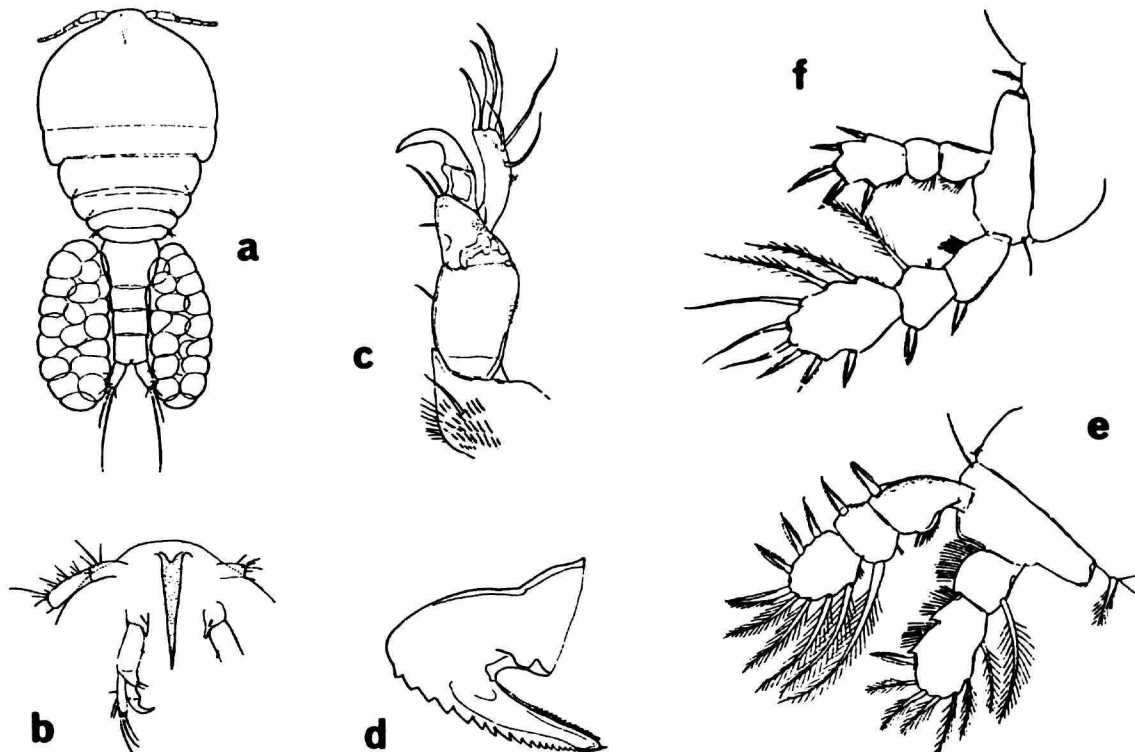


FIGURE 3.—*Calypsina changeuxi* (Stock and Kleeton). Female: a, dorsal; b, rostrum; c, second antenna; d, mandible; e, leg 1; f, leg 4. (From Stock and Kleeton, 1963a, figs. 9a,c,d,g, 10a,d.) Length of female 0.77 mm, of male 0.60 mm.

Holothuria tubulosa Gmelin, Banyuls, Mediterranean coast of France].

"Copépode poecilostome".—Changeux, 1961, p. 55, footnotes pp. 109, 110, 111 [from *Holothuria tubulosa* and *Holothuria stellati* Della Chiaje, Banyuls].

Scambicornus changeuxi.—Humes, 1967a, p. 144; 1969f, p. 92.

FEMALE.—A paratypic female was studied in lactic acid without dissection. Its length is 0.80 mm and its greatest width 0.30 mm. The genital segment is $112 \times 104 \mu$ in dorsal view, broadest in its anterior third and tapering posteriorly to 78μ near the posterior end of the segment. The areas of attachment of the egg sacs are located in the anterior half of the segment.

The rostral beak is about 75μ long.

The caudal ramus is $58 \times 26 \mu$. The two long median terminal setae are 180μ (inner) and 83μ (outer). All the setae are naked.

Genus *Caribulus* Humes and Stock, 1972

DIAGNOSIS.—Body cyclopiform. Urosome in the female 5-segmented, in the male 6-segmented.

Caudal ramus with six setae. Rostrum broadly rounded. First antenna 7-segmented, in both sexes with the armature 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented with the formula 1, 1, 3 + one large claw, and 7, with some of the terminal setae jointed.

Labrum deeply incised medially. Mandible with its base merging at an angle with a broad attenuated blade, serrated along the convex side and with spinules along the concave side. Paragnath a small hairy lobe. First maxilla with four elements. Second maxilla of the usual lichomolgid type. Maxilliped in the female 3-segmented with a pointed tip; in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1-4 in the female with 3-segmented rami. Leg 4 exopod in both sexes with third segment having II, I, 5. Leg 4 endopod in the female with the formula 0-1; 0-1; I, II, II. Legs 1-4 in the male with 3-segmented exopods with their armature as in the female; but these legs with 2-segmented

endopods, the second and third segments having fused, the formula for leg 4 endopod being 0-1; I, II, II, 1. Leg 1 endopod in the male with 0-1; I, I, 5, the next to the outermost element on the second segment being a barbed spine instead of a seta as in the female. Leg 5 with a free segment bearing two terminal elements. Leg 6 represented in the female by the two setae near the genital openings; in the male by a ventral posterolateral flap on the genital segment bearing two setae.

Other features as in the species below.

Associated with holothurians.

TYPE-SPECIES.—*Caribulus sculptus* (Humes).

ETYMOLOGY.—The name is a diminutive form of *Carib*, alluding to the wide distribution of the genus in the Caribbean Sea. Gender masculine.

Caribulus sculptus (Humes, 1969)

FIGURE 4

Scambicornus sculptus Humes, 1969f, pp. 81-93, figs. 37-78 [from the holothurians *Isostichopus badionotus* (Selenka), Barbados, Puerto Rico, Jamaica, Bahamas; *Ludwigothuria*

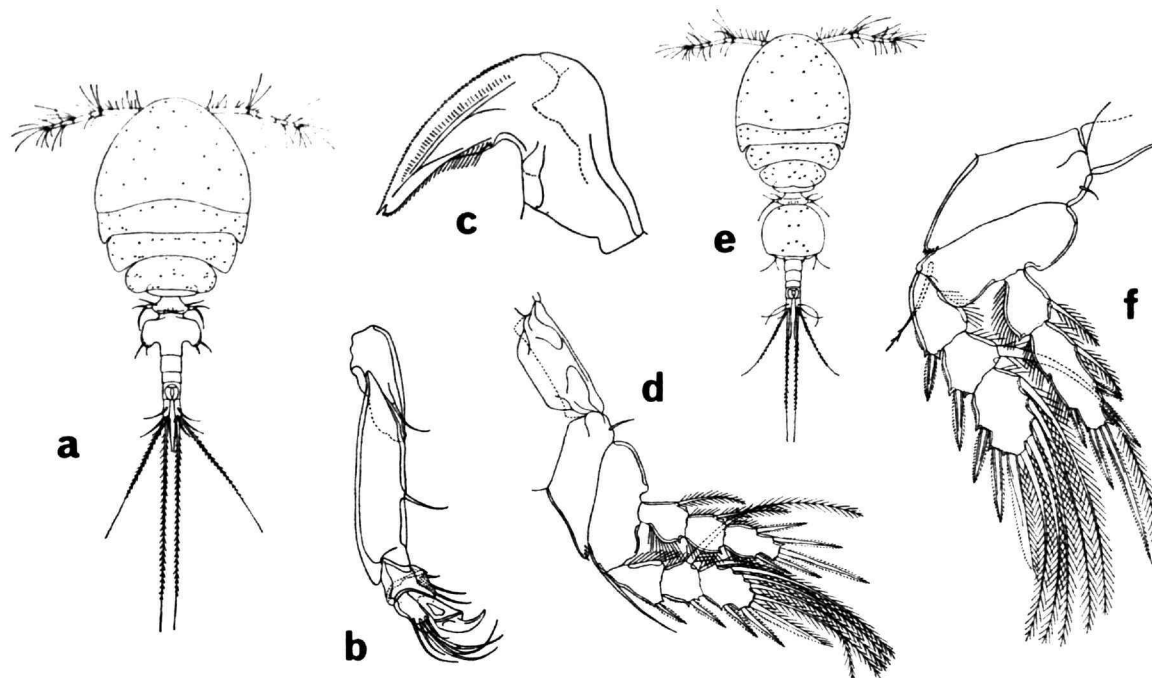


FIGURE 4.—*Caribulus sculptus* (Humes). Female: a, dorsal; b, second antenna; c, mandible; d, leg 4 and intercoxal plate. Male: e, dorsal; f, leg 4. (From Humes, 1969f, figs. 37, 49, 52, 63, 65, 76.) Length of female 1.18 mm, of male 0.98 mm.

mexicana (Ludwig), Bahamas, Jamaica, Curaçao, Bonaire; *Actinopyga agassizii* (Selenka), Bahamas, Jamaica; and *Ludwigothuria grisea* (Selenka), Jamaica, Bonaire].

Caribulus sp.

Scambicornus sp.—Humes, 1969f, pp. 93, 94, figs. 79–83 [from the holothurians *Isostichopus badionotus*, Bahamas, Barbados, Jamaica; *Ludwigothuria mexicana*, Bahamas, Jamaica, Curaçao; and *Actinopyga agassizii*, Bahamas, Jamaica].

REMARKS.—The female is unknown.

Genus *Diogenella* Stock, 1968

DIAGNOSIS.—Body elongated, more or less modified. Urosome in the female 5-segmented; in the male 6-segmented. Caudal ramus with six setae, the two median terminal setae vestigial and the lateral seta displaced proximally. Rostrum broadly triangular or elongated linguiform. First antenna 7-segmented, the formula for the armature being 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and

7 + 1 aesthete, with one seta on the second segment long and ciliated. Second antenna 4-segmented, with the formula 1, 1, 4, and 1 terminal claw + 5 small elements.

Labrum with the two lobes widely separated by a shallow indentation. Mandible with the base tapering into an attenuated pectinate blade. Paragnath a small hairy lobe. First maxilla with two elements. Second maxilla of the usual lichomolgoid type. Maxilliped in the female 3-segmented with the setae much reduced; in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1–4 with 3-segmented rami. Armature of the usual lichomolgoidiform pattern. Leg 4 exopod with the third segment having II, I, 5. Leg 4 endopod with the formula 0–1; 0–1; II. Leg 1 endopod with the same formula in both sexes. Leg 5 with a free segment bearing two unequal terminal elements. Leg 6 represented by two setae near the genital openings.

Key to Species of the Genus *Diogenella*

KNOWN FEMALES

1. Caudal ramus with ciliated inner and outer terminal setae; first segment of second antenna with spinules; second maxilla with terminal and auxiliary lash (seta) slender and nearly of equal length 2
Caudal ramus with inner terminal seta having only a few minute barbules and outer terminal seta naked; first segment of second antenna without spinules; second maxilla with auxiliary lash (seta) stout and about half as long as terminal lash *D. deichmannae*
2. Genital segment not tapered posteriorly, but of approximately same width throughout, with areas of attachment of egg sacs near middle of segment; genital and first two postgenital segments each with a posteroventral transverse row of small spines *D. seticauda*
Genital segment broadest anteriorly and tapered posteriorly, with areas of attachment of egg sacs in anterior part of segment; genital and first two postgenital segments without such rows of spines *D. spinicauda*

MALES

1. Caudal ramus with ciliated inner and outer terminal setae; first segment of second antenna with spinules; second maxilla with terminal and auxiliary lash (seta) slender and nearly equal in length 2
Caudal ramus with inner terminal seta having only a few minute barbules and outer terminal seta naked; first segment of second antenna without spinules; auxiliary lash (seta) of second maxilla stout and about half as long as terminal lash 3
2. First three postgenital segments each with a posteroventral transverse row of small spines *D. seticauda*
First three postgenital segments without such rows of spines *D. spinicauda*
3. Rostrum linguiform and slender; ratio of greatest length to width of caudal ramus about 2:1 *D. deichmannae*
Rostrum broad and subtriangular; ratio of greatest length to width of caudal ramus about 3.6:1. *D. impar*

Other features as in the species below.

Lives in holothurians.

TYPE-SPECIES.—*Diogenella spinicauda* Stock.

REMARKS.—The female of *D. impar* is unknown. The following keys are from Humes and Ho (1970a).

Diogenella spinicauda Stock, 1968

FIGURE 5

Diogenella spinicauda Stock, 1968, pp. 97, 98, figs. 7, 8 [from the holothurian *Holothuria mexicana* Ludwig, Curaçao].—Humes and Ho, 1970a, pp. 15–21, figs. 1–27 [from the holothurians *Ludwigothuria* (= *Holothuria*) *mexicana* (Ludwig), Bahamas, Puerto Rico, Jamaica; and *Actinopyga agassizii* (Selenka), Bahamas, Jamaica].

Diogenella deichmannae Humes and Ho, 1970

Diogenella deichmannae Humes and Ho, 1970a, pp. 25–31, figs. 51–73 [from the holothurian *Brandtothuria arenicola* (Semper), Barbados].

Diogenella impar Humes and Ho, 1970

Diogenella impar Humes and Ho, 1970a, pp. 31–35, figs. 74–87 [from *Brandtothuria arenicola* (Semper), Barbados].

REMARKS.—The female is unknown.

Diogenella seticauda Stock, 1968

Diogenella seticauda Stock, 1968, pp. 98, 99, figs. 9, 10 [from the holothurians *Halodeima surinamensis* (Ludwig) and *Holothuria impatiens* (Forsk.)], Puerto Rico].—Humes and Ho, 1970a, pp. 21–25, figs. 28–50 [from the holothurians *Semperothuria* (= *Halodeima*) *surinamensis* (Ludwig) and *Brandtothuria arenicola* (Semper), mixed at the time of collection, Puerto Rico].

Genus *Diogenidium* Edwards, 1891

DIAGNOSIS.—Body cyclopiform, but elongated and somewhat modified. Urosome in the female 5-segmented; in the male 6-segmented. Caudal ramus with six setae. Rostrum a pointed beak (except broadly rounded in *D. spinulosum*). First antenna

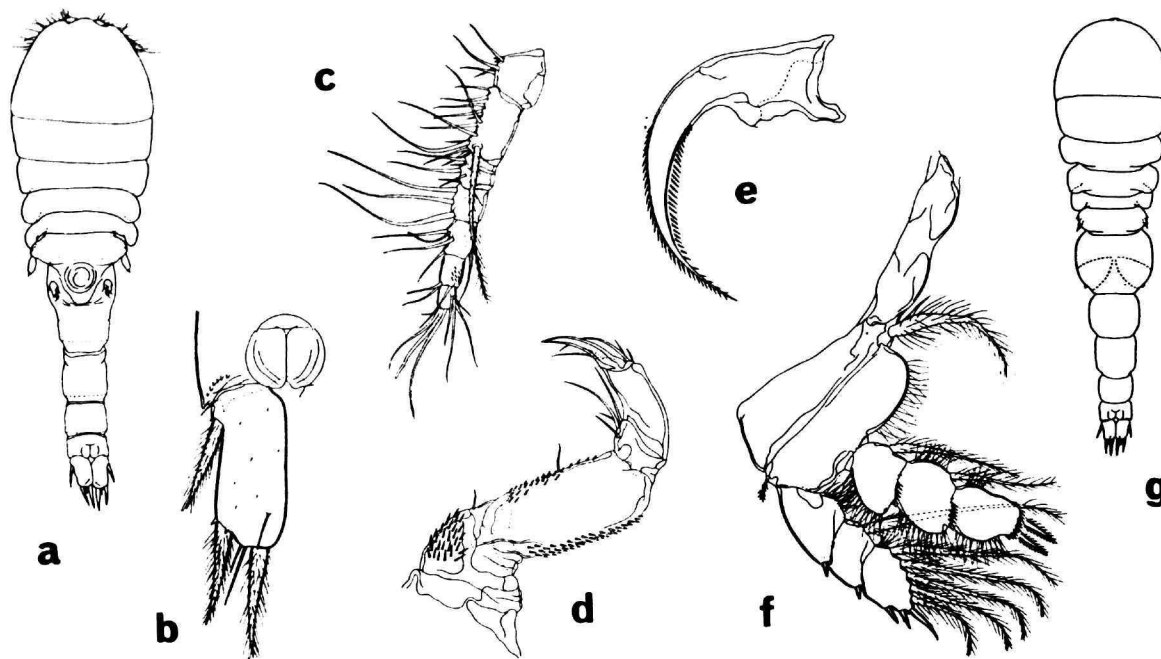


FIGURE 5.—*Diogenella spinicauda* Stock. Female: a, dorsal; b, caudal ramus; c, first antenna; d, second antenna; e, mandible; f, leg 4 and intercoxal plate. Male: g, dorsal. (From Humes and Ho, 1970a, figs. 1, 6, 9, 10, 11, 19, 22.) Length of female 1.62 mm, of male 1.59 mm.

7-segmented, in both sexes with the armature 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented, with the formula 1, 1, 4, and one terminal claw + six setiform elements.

Labrum with two small widely separated lobes and without a median incision. Mandible with the basal region beyond the indentation having on its concave side a row of slender spinules and on its convex side a crest of stouter spinules, both rows continuing on the long slender lash. Paragnath a small hairy lobe. First maxilla with three elements. Second maxilla of the usual lichomolgoid form, but with the main lash much shorter than the auxiliary lash. Maxilliped in the female 3-

segmented, in the male 4-segmented (assuming the proximal part of the claw to be a fourth segment).

Legs 1-4 with 3-segmented rami. Armature lichomolgoidiform in pattern. Leg 4 exopod with the third segment having II, I, 5. Leg 4 endopod with the formula 0-1; 0-1; II. Leg 1 endopod with the same formula in both sexes. Leg 5 with a free segment bearing two terminal elements. Leg 6 represented by the setae (1 or 2 in the female, 2 in the male) near the genital openings.

Other features as in the species below.

Lives in holothurians.

TYPE-SPECIES.—*Diogenidium nasutum* Edwards.

REMARKS.—The female of *D. tectum* is unknown.

Key to Species of the Genus *Diogenidium*

1. Rostrum without a pointed beak; second and third segments of rami of legs 1-4 with small spines on posterior surface *D. spinulosum*
 Rostrum with a pointed beak; without such spines on rami of legs 1-4 2
2. Second segment of second antenna without fine ornamentation *D. deforme*
 Second segment of second antenna with outer spinules 3
3. Longest terminal seta on caudal ramus shorter than ramus; armature of last segment of exopod of leg 2 usually II, I, 5 but sometimes III, I, 5 *D. nasutum*
 Longest terminal seta on caudal ramus about twice the length of ramus; armature of last segment of exopod of leg 2 always III, I, 5 (female unknown) *D. tectum*

Diogenidium nasutum Edwards, 1891

FIGURE 6

Diogenidium nasutum Edwards, 1891a, pp. 87-91, pl. 4, figs. 12-19 [from the body cavity of the holothurian *Muelleria* (= *Actinopyga*) *agassizii* Selenka, Bahamas]; 1891b, pp. 15-19, pl. 4, figs. 12-19 [from the body cavity of the holothurian *Muelleria* (= *Actinopyga*) *agassizii* Selenka, Bahamas].—Stock, 1968, pp. 100, 101, figs. 11, 12 [from the body cavity of the holothurian *Holothuria mexicana* (Ludwig), Puerto Rico, Curaçao].—Humes and Ho, 1971, pp. 172-177, figs. 1-24 [from *Actinopyga agassizii* (Selenka), Bahamas; *Ludwigothuria mexicana* (Ludwig), Puerto Rico, Jamaica; and *Ludwigothuria grisea* (Selenka), Jamaica].

Diogenidium deforme Stock, 1968

Diogenidium deforme Stock, 1968, pp. 102-104, figs. 15, 16 [from the holothurian *Holothuria glaberrima* Selenka, Puerto Rico].—Humes and Ho, 1971, pp. 182-188, figs. 48-72 [from the holothurians *Brandtothuria arenicola* (Semper), Barbados; and *Ludwigothuria mexicana* (Ludwig), Puerto Rico, Bahamas].

Diogenidium spinulosum Stock, 1968

Diogenidium spinulosum Stock, 1968, pp. 101, 102, figs. 13, 14 [from the holothurian *Isostichopus badionotus* (Selenka), Puerto Rico].—Humes and Ho, 1971, pp. 177-182, figs. 25-47 [from *Isostichopus badionotus* (Selenka), Puerto Rico, Jamaica].

Diogenidium tectum Humes and Ho, 1971

Diogenidium tectum Humes and Ho, 1971, pp. 188-189, figs. 73-86 [from the holothurian *Actinopyga agassizii* (Selenka), Jamaica, Bahamas].

REMARKS.—The female is unknown.

Genus *Henicoxiphium* Illg and Humes, 1971

DIAGNOSIS.—Body cyclopiform, elongated. Urosome in the female 5-segmented; in the male 6-segmented. Caudal ramus with six short setae. Rostrum rounded posteroventrally. First antenna 7-segmented, in the female with the armature 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7

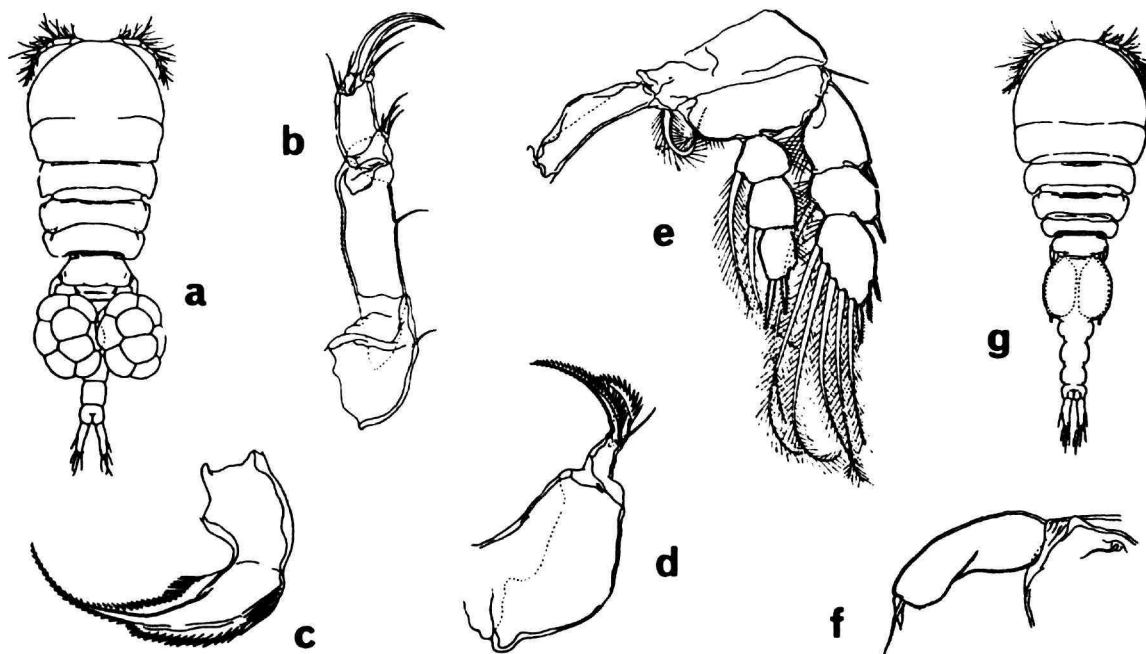


FIGURE 6.—*Diogenidium nasutum* Edwards. Female: a, dorsal; b, second antenna; c, mandible; d, second maxilla; e, leg 4 and intercoxal plate; f, leg 5. Male: g, dorsal. (From Humes and Ho, 1971, figs. 1, 7, 8, 10, 16–18.) Length of female 1.58 mm, of male 1.49 mm.

+ 1 aesthete; in the male with 4, 13 + 1 aesthete, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 3-segmented, with the formula 1, 1, 3 + terminally one claw, one clawlike element, and five small setiform elements.

Labrum with two widely separated lobes. Mandible without a basal indentation; lash with a row of spinules on the concave side and numerous spinules on the convex side. Paragnath a small lobe. First maxilla with three elements. Second maxilla of the lichomolgid type. Maxilliped in the female 3-segmented, with vestigial setae and rounded tip; in the male 4-segmented (considering the proximal part of the claw to represent a fourth segment).

Legs 1–4 with 3-segmented rami. Armature of the basic lichomolgidiiform type. Leg 4 exopod with the third segment having II,I,5. Leg 4 endopod with the formula 0–1;0–1;I. Leg 1 endopod with the same formula in both sexes. Leg 5 with a

free segment bearing two unequal terminal elements. Leg 6 represented in both sexes by two setae near the genital openings.

Associated with ascidians.

TYPE-SPECIES.—*Henicoxiphium redactum* Illg and Humes.

Henicoxiphium redactum Illg and Humes, 1971

FIGURE 7

Henicoxiphium redactum Illg and Humes, 1971, pp. 570–577, figs. 1–26 [from the ascidian *Styela plicata* (Lesueur), Florida, North Carolina].

Genus *Herrmannella* Canu, 1891

DIAGNOSIS.—Body cyclopiform. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six setae. Rostrum rounded or beaked. First antenna 7-segmented, with the for-

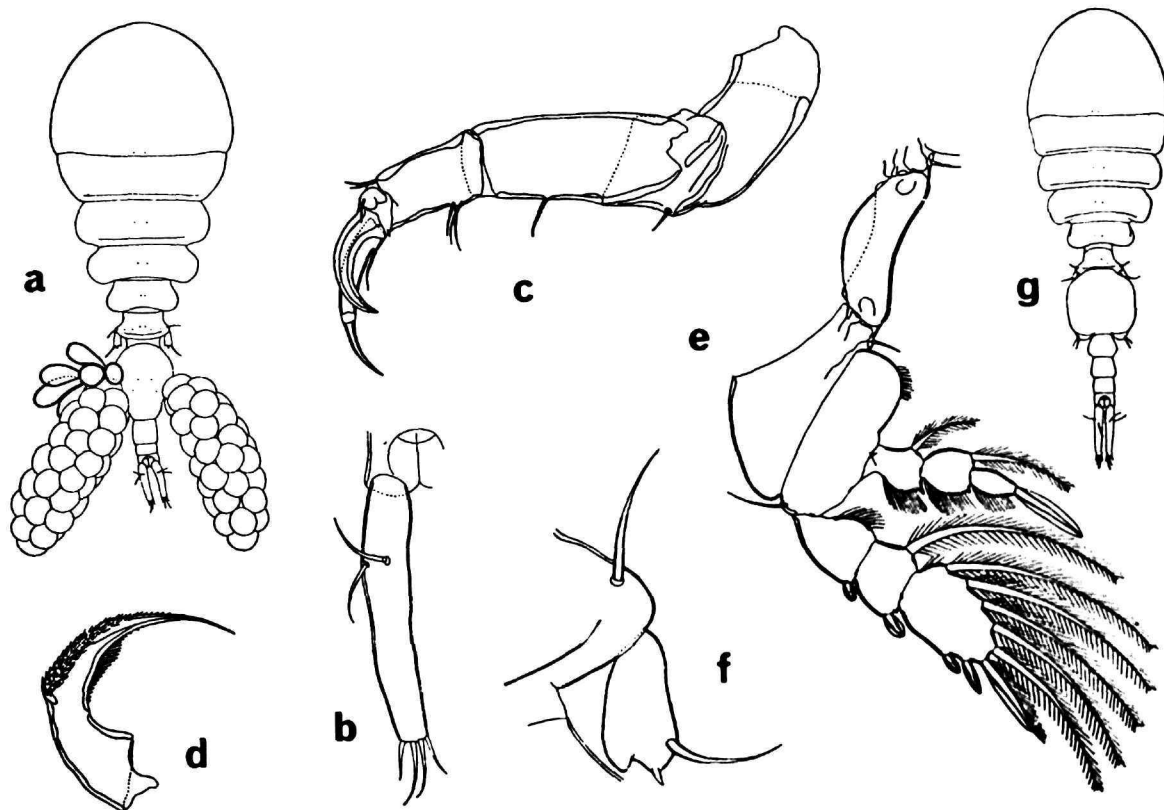


FIGURE 7.—*Henicoxiphium redactum* Illg and Humes. Female: a, dorsal; b, caudal ramus; c, second antenna; d, mandible; e, leg 4 and intercoxal plate; f, leg 5. Male: g, dorsal. (From Illg and Humes, 1971, figs. 1, 5, 9, 11, 18–20.) Length of female 1.14 mm, of male 0.90 mm.

mula 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented, with the armature 1, 1, 3, and 1 terminal claw + several setae.

Labrum with the two lobes separated by a shallow indentation. Mandible slender, the region beyond the weak indentation pectinate; lash long. Paragnath a small hairy lobe. First maxilla with three elements. Second maxilla of the lichomolgid type, with the terminal lash much longer than the auxiliary elements. Maxilliped in the female 3-segmented; in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1–4 with 3-segmented rami. Armature having the usual lichomolgidiform pattern. Leg 4 exopod with the third segment having II,I,5. Leg 4 endopod with the formula 0–1;0–1;II (except 0–1;0–1;I,II in *H. panopeae*). Leg 1 endopod with the same armature in both sexes, as far as known. Leg 5 with a free segment bearing two terminal elements. Leg 6 in the female represented by one or two setae and in the male by two setae near the genital openings.

Other features as in the species described below. Associated with bivalve mollusks.

TYPE-SPECIES.—*Herrmannella rostrata* Canu.

REMARKS.—*Herrmannella parva* is omitted from the following keys because of its uncertain position. The males of *H. perplexa* and *H. valida* are unknown.

Key to Species of the Genus *Herrmannella*

FEMALES

1. Endopod of leg 4 with the formula 0-1;0-1;I,II *H. panopeae*
Endopod of leg 4 with the formula 0-1;0-1;II 2
2. Caudal rami much shorter than anal segment and only slightly longer than wide *H. valida*
Caudal rami distinctly longer than anal segment, clearly longer than wide 3
3. Rostrum rounded or with a bubble-like rounded tip 4
Rostrum beaked 8
4. Rostrum with a bubble-like rounded tip *H. bullata*
Rostrum broadly rounded 5
5. Caudal ramus with the ratio 6:1 *H. perplexa*
Caudal ramus with the ratio 3.4-4:1 6
6. Free segment of leg 5 with a pronounced proximal inner expansion *H. inflatipes*
Free segment of leg 5 without a proximal inner expansion 7
7. Prosoma not tumid; caudal ramus 135 x 34 μ (4:1); free segment of leg 5, 52 x 19 μ
H. protothacae
Prosoma tumid in nearly all specimens; caudal ramus 102 x 30 μ (3.4:1); free segment
of leg 5, 43 x 16 μ *H. mesodesmatis*
8. First four segments of first antenna greatly swollen in relation to last three segments;
anal segment with a pair of crescentic ventral rows of spinules *H. columbiae*
First four segments of first antenna only slightly swollen (as in *H. saxidomi*) or not
swollen; anal segment without a pair of crescentic rows of spinules 9
9. Two median terminal setae on caudal ramus very short, much shorter than the ramus;
caudal ramus very elongated, a little longer than last three postgenital segments
together *H. barneae*
One or both median terminal setae on caudal ramus elongated; caudal ramus not longer
than last three postgenital segments together 10
10. Third exopod segment of leg 4 with three outer spines and one terminal spine 11
Third exopod segment of leg 4 with two outer spines and one terminal spine 12
11. Third exopod segment of leg 4 with formula III,I,4; first antenna without a plumose seta
..... *H. dissidens*
Third exopod segment of leg 4 with formula III,I,5; first antenna with a plumose seta
..... *H. caribaea*
12. Second segment of second antenna slender, twice or more than twice as long as wide
(length measured along the inner margin of the segment) 13
Second segment of second antenna robust ($1\frac{1}{4}$ to $1\frac{1}{2}$ times as long as wide) 14
13. Endopod segments 1-3 of leg 4 without lateral spiniform processes *H. saxidomi*
Endopod segments 1-3 of leg 4 with distinct lateral spiniform processes *H. tivelae*
14. Lateral side of endopod segment 3 of leg 4 with two spiniform processes; lateral spiniform
processes on endopod segments 1 and 2 of legs 1-4 long *H. pecteni*
Lateral side of endopod segment 3 of leg 4 with one, sometimes hardly discernible, spini-
form process; lateral spiniform processes on endopod segments 1 and 2 of legs 1-4
short 15
15. Rostrum (in lateral view) hook-shaped, recurved; lateral spiniform process on endopod
segment 3 in leg 4 vestigial *H. haploceras*
Rostrum (in lateral view) straight, not recurved; lateral spiniform process on endopod
segment 3 in leg 4 distinct *H. rostrata*

KNOWN MALES

1. Endopod of leg 4 with the formula 0-1;0-1;I,II *H. panopeae*
Endopod of leg 4 with the formula 0-1;0-1;II 2
2. Rostrum rounded or with a bubble-like rounded tip 3
Rostrum beaked 6
3. Rostrum with a bubble-like rounded tip *H. bullata*
Rostrum broadly rounded 4
4. Body length 0.85 mm; claw of maxilliped 130 μ long *H. inflatipes*
Body length at least 1.38 mm; claw of maxilliped at least 150 μ 5

5. Body length 1.44 mm; claw of maxilliped 172 μ ; subterminal element of leg 5, 15 μ , spiniform *H. protothacae*
 Body length 1.38 mm; claw of maxilliped 150 μ ; subterminal element of leg 5, 10 μ , setiform *H. mesodesmatis*
6. First four segments of first antenna greatly swollen in relation to last three segments; anal segment with a pair of crescentic ventral rows of spinules *H. columbiae*
 First four segments of first antenna only slightly swollen (as in *H. saxidomi*) or not swollen; anal segment without a pair of crescentic rows of spinules 7
7. Two median terminal setae on caudal ramus very short *H. barneae*
 One or both median terminal setae on caudal ramus of usual elongated form 8
8. Third exopod segment of leg 4 with three outer spines and one terminal spine 9
 Third exopod segment of leg 4 with two outer spines and one terminal spine 10
9. Third exopod segment of leg 4 with formula III,I,4; first antenna without a plumose seta *H. dissidens*
 Third exopod segment of leg 4 with formula III,I,5; first antenna with a plumose seta *H. caribaea*
 *H. tiwelae*
10. Second segment of first antenna shorter than fourth 11
 Second segment of first antenna not shorter than fourth 11
11. Second segment of maxilliped with one of two setae modified (stout with a slender recurved tip) *H. saxidomi*
 Second segment of maxilliped with both setae unmodified 12
12. Rostrum in lateral view a strongly recurved hook; terminal armature on fourth segment of second antenna reduced (one claw and a small clawlike seta) *H. haploceras*
 Rostrum flat, not strongly recurved; terminal armature on fourth segment of second antenna normal (one claw and several setae) 13
13. Outer spiniform processes on endopods of legs 1-4 strongly developed *H. pecteni*
 Outer spiniform processes on endopods of legs 1-4 weakly developed *H. rostrata*

Herrmannella rostrata Canu, 1891

Herrmannella rostrata Canu, 1891a, pp. 479, 480 [from the bivalve *Macra stultorum* Linnaeus, Pointe aux Oies, Wimereux, France]; 1891b, p. 436 [from the bivalve *Pecten opercularis* Linnaeus, Boulogne coast of France]; 1892, pp. 236, 237, pl. 24, figs. 1-13 [from the bivalves *Macra stultorum*, *Cardium edule* Linnaeus, and *Pecten opercularis*, Boulogne coast of France]; 1894a, p. 3; 1899, p. 73.—T. Scott, 1894b, p. 259; 1905, pp. 206, 207 [from *Cardium edule*, Scotland]; 1906, p. 354 [from *Cardium edule*, Scotland].—Pelseneer, 1929, p. 43 [from *Tapes pullaster* (Montagu), Channel coast of France].—Fraser, 1932, p. 279 [from *Cardium edule*, Morecambe Bay, Lancashire, England].—Atkins, 1934, p. 674 [from *Cardium edule*, Plymouth, England].

Lichomolgus agilis.—T. Scott, 1892, pp. 266, 267 [from *Cardium edule*, Morecambe Bay, Lancashire, England, and Cramond Island, Firth of Forth, Scotland; nomen nudum].—T. Scott and A. Scott, 1892a, pp. 201-203, pl. 15, figs. 1-14 [from *Cardium edule*, Firth of Forth, Scotland, and Morecambe Bay, Lancashire, England].—Herdman, 1893, p. 83.—Thompson, 1893, pp. 207, 208, pl. 25, figs. 4, 8d [from *Cardium edule*, Liverpool Bay, England].

Paranthesius rostratus.—Monod and Dollfus, 1932a, pp. 147, 148 [from *Macra corallina* (Linnaeus) (= *Macra stultorum* Linnaeus), *Chlamys* (*Aequipecten*) *opercularis* (Linnaeus), *Cardium edule* Linnaeus, and *Tapes pullaster* (Montagu)].—Leigh-Sharpe, 1933, p. 113 [from the testis of *Cardium edule*, Plymouth, England]; 1935, pp. 47, 48 [from the gonad of *Cardium edule*, the mantle cavity of *Chlamys*

(*Aequipecten*) *opercularis*, and the gonad of *Paphia pullastra* (Montagu), England].—Fouque and Franc, 1953, pp. 24, 25 [from the ascidian *Ascidia mentula* Müller, northern France].—Marine Biological Association, 1957, p. 176.—Stock, 1959a, pp. 44, 45 [from the bivalve *Tapes decussatus* Linnaeus, Gulf of Naples, Italy].—Stock and de Vos, 1960, p. 206 [from *Cardium edule*, The Netherlands].—Bruce, Colman, and Jones, 1963, p. 128 [from *Cardium edule*, Port Erin, England].—Jepsen, 1965, pp. 284, 294, 297, 304 [from *Cardium edule*, Germany].—Crothers, 1966, p. 52 [from *Cardium edule*, Wales].

Paranthesius (*Herrmannella*) *rostratus*.—Bocquet and Stock, 1959a, pp. 241-243, figs. 1, 2 [from the bivalves *Cardium edule*, *Solen marginatus* Don., *Ensis siliqua* (Linnaeus), *Spisula solida* (Linnaeus), *Lutraria lutraria* (Linnaeus), *Meretrix chione* (Linnaeus), and *Tapes pullastra* (Montagu), Channel coast of France; and from *Macoma balthica* (Linnaeus) and *Spisula subtruncata* (da Costa), The Netherlands]; 1963, p. 296.—Stock, 1964a, p. 67 [from the bivalve *Venerupis pullastra* (Montagu), The Netherlands].
Paranthesius rostratus.—Green, 1968, pp. 324, 325.

Herrmannella barneae (Pelseneer, 1929)

Ischnurella barneae Pelseneer, 1929, pp. 40, 41, fig. 4 [from the bivalve *Pholas* (*Barnea*) *candida*, Wimereux, France].
Ischnurella.—Rancurel, 1954, pp. 855, 856, fig. 11b.

Paranthesius barneae.—Bocquet and Stock, 1958b, pp. 604-609, fig. 1 [from the mantle cavity of the bivalves *Barnea candida* (Linnaeus), Langue de Chien, Ambleteuse-sur-

Mer (Pas-de-Calais), France; and *Pholas dactylus* Linnaeus, Brest, and Longues (coast of Calvados), France].—Gotto, 1962, p. 102.—Glaçon, 1971, p. 23 (unnumbered). *Paranthessius* (*Herrmannella*) *barneae*.—Bocquet and Stock, 1959a, pp. 248, 249 [from the mantle cavity of *Ostrea edulis* Linnaeus, Baie de la Forêt (ouest de Concarneau), France].

Herrmannella bullata, new species

FIGURES 8–10

TYPE MATERIAL.—119 ♀♀, 67 ♂♂, and 37 copepodids from 12 bivalves, *Chlamys hastata hericia* (Gould), in 36 fathoms, Flat Point, San Juan Islands, Washington, 48°31'06" N, 122°55'07" W, 3 July 1950, collected by M. Dunn. USNM 187867. Holotype ♀, allotype, and 178 paratypes (114 ♀♀, 64 ♂♂), along with the copepodids, are deposited in the United States National Museum (USNM), Washington, D. C., the remaining paratypes (dissected) in the collection of A. G. Humes (AGH).

OTHER MATERIAL EXAMINED.—From *Chlamys hastata hericia*: 53 ♀♀, 50 ♂♂, and 33 copepodids, in 20–30 fathoms, "potato patch," San Juan Islands, Washington, 48°35'30" N, 122°51' W, 26 June 1952, collected by P. L. Illg, fairly general infestation; and 69 ♀♀, 97 ♂♂, and 81 copepodids from 32 hosts, in 105 fathoms, President Channel, San Juan Islands, Washington, 5 August 1950, collected by P. L. Illg. USNM 187867.

From *Chlamys rubida* (Hinds): 4 ♀♀, 1 ♂, in 20–30 fathoms, "potato patch," San Juan Islands, Washington, 48°35'30" N, 122°51' W, 26 June 1952, collected by P. L. Illg. Very sparse infestation.

FEMALE.—The body (Figure 8a) has the prosome not unusually broadened or thickened. The length is 1.25 mm (1.07–1.38 mm) and the greatest width 0.50 mm (0.46–0.56 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1.47:1. The ratio of the length of the prosome to that of the urosome is 1.39:1. The segment of leg 1 is separated from the cephalosome by a transverse dorsal furrow. The epimeral areas of the pedigerous segments are rounded except for that of leg 4, which is slightly truncated.

The segment of leg 5 (Figure 8b) is 78 x 132 μ . Between this segment and the genital segment

there is no ventral intersegmental sclerite. The genital segment is 176 x 169 μ , slightly lobate laterally in its broadened anterior two-thirds, narrowed in its posterior third. The areas of attachment of the egg sacs are located dorsolaterally near the middle of the segment. Each area (Figure 8c) bears two naked setae, 11 μ and 20 μ , and a small spinous process. The three postgenital segments are 70 x 79 μ , 55 x 70 μ , and 83 x 67 μ , from anterior to posterior. The genital and each of the postgenital segments bear posteriorly a dorsal and ventral row of minute spinules.

The caudal ramus (Figure 8d) is elongated, 114 x 26 μ , or 4.38 times longer than wide. The outer lateral seta is 65 μ , the dorsal seta 68 μ , the outermost terminal seta 81 μ , the innermost terminal seta 77 μ , and the two long median terminal setae 300 μ (outer) and 400 μ (inner), both inserted between dorsal (unornamented) and ventral (with a group of small spinules) flaps. All the setae are naked. A few surficial hairs occur on the ramus.

The body surface has minute hairs (sensilla) as in Figure 8a.

The egg sac (Figure 8a) is elongated, 900 x 220 μ , in the specimen drawn, but in one female shorter, 625 x 230 μ . The sacs reach to the ends of the longest ramal setae and contain many eggs about 65 μ in diameter.

The rostrum (Figure 8e) has a round, bubble-like posteroventral tip.

The first antenna (Figure 8f) is 380 μ long. The lengths of its seven segments (measured along their posterior nonsetiferous margins) are 18 (52 μ along the anterior margin), 120, 44, 55, 55, 35, and 19 μ respectively. The formula for the armature is 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All the setae are naked.

The second antenna (Figure 8g) has a small seta on each of the first two segments and three setae on the third segment. The fourth segment is 65 μ along the outer edge, 33 μ along the inner edge, and 40 μ in greatest width, bearing a terminal claw 68 μ along its axis, two clawlike, bent setae, and four small setiform elements. All the setae are naked.

The labrum (Figure 9a) has two, widely divergent, slender lobes ornamented with minute spinules.

The mandible (Figure 9b) is slender and armed as in other species of the genus. The paragnath

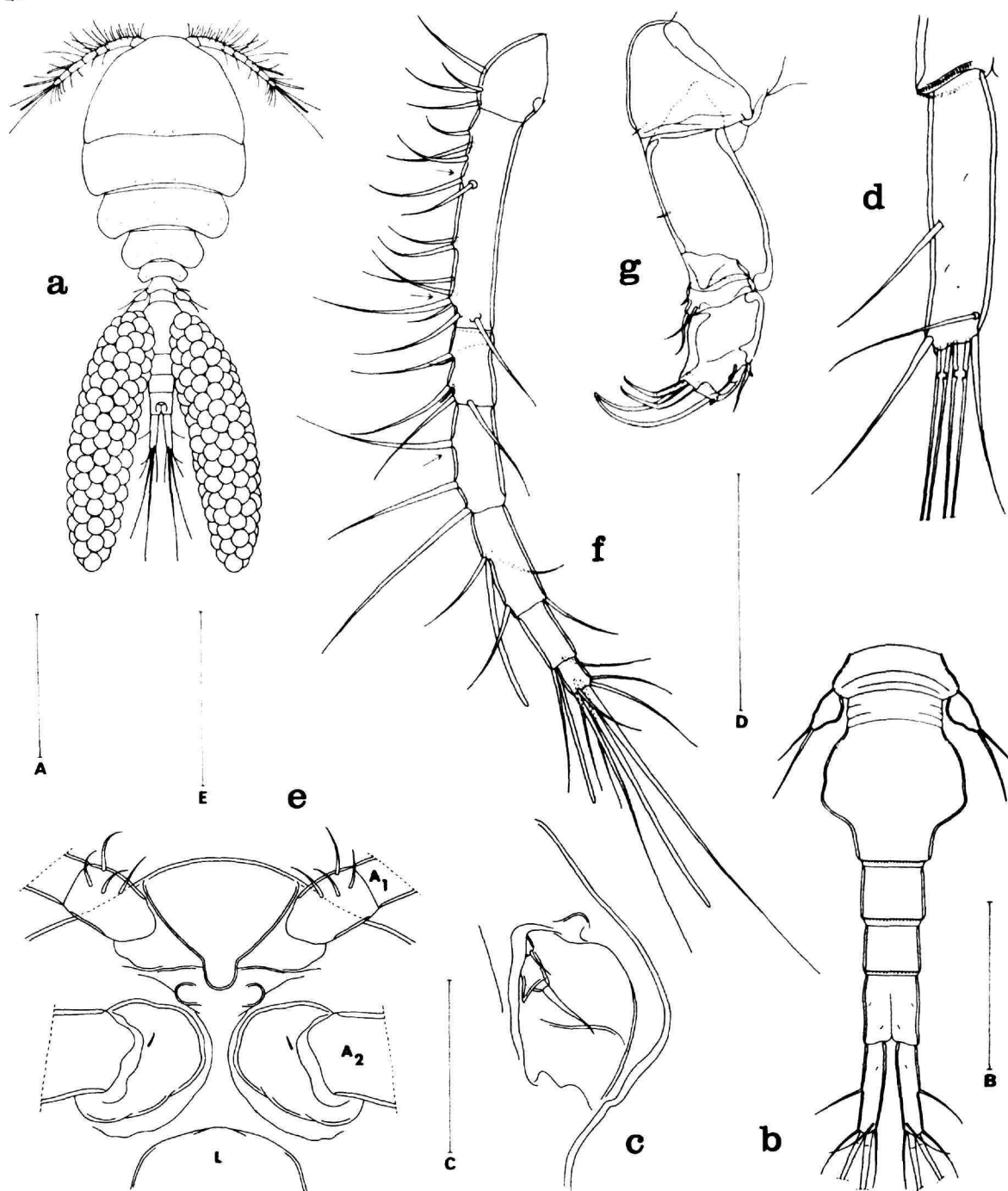


FIGURE 8.—*Herrmannella bullata*, new species. Female: a, dorsal (A); b, urosome, ventral (B); c, area of attachment of egg sac, dorsal (C); d, caudal ramus, dorsal (D); e, rostrum, ventral (E); f, first antenna, with arrows indicating positions of additional aesthetes in male, dorsal (E); g, second antenna, posterior (E). Scale: A, 0.5 mm; B, 0.2 mm; C, 0.05 mm; D, E, 0.1 mm.

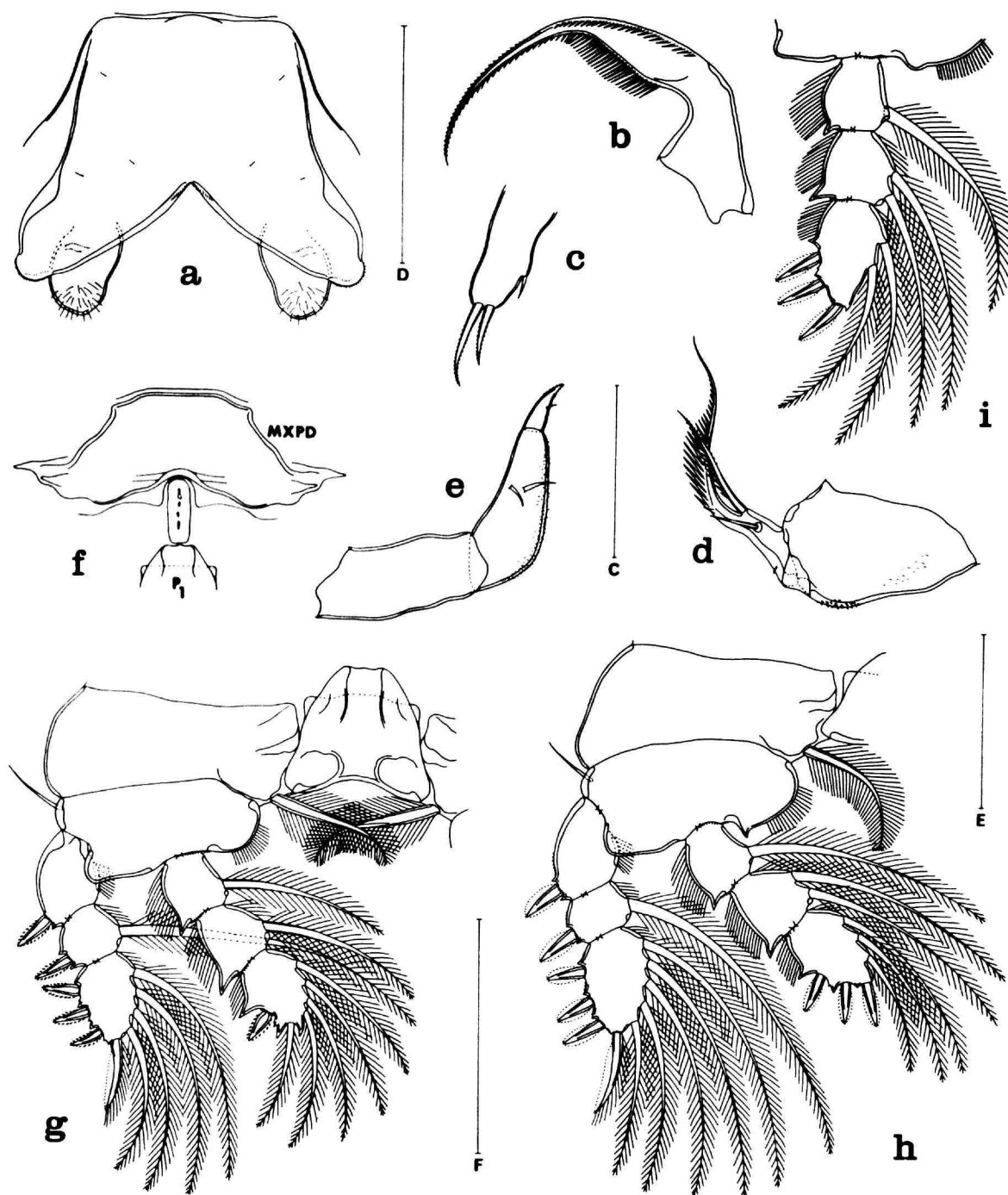


FIGURE 9.—*Herrmannella bullata*, new species. Female: *a*, labrum and paragnaths, ventral (D); *b*, mandible, anterior (C); *c*, first maxilla, anterior (C); *d*, second maxilla, posterior (D); *e*, maxilliped, antero-inner (D); *f*, area between maxillipeds and first pair of legs, ventral (F); *g*, leg 1 and intercoxal plate, anterior (E); *h*, leg 2, anterior (E); *i*, endopod of leg 3, anterior (E). Scale: C, 0.05 mm; D, E, 0.1 mm; F, 0.2 mm.

(Figure 9a) is a small hairy lobe. The first maxilla (Figure 9c) bears three elements. The second maxilla (Figure 9d) has patches of small spinules on the first segment. The second segment has a small outer (ventral) setule, a naked surficial posterior seta, and an inner (dorsal) distal barbed spine, and it terminates in a lash with slender spines along one edge. The maxilliped (Figure 9e) is slender. The first segment is unornamented. The second segment bears two naked setae and has a finely spinulose postero-outer surface. The third segment carries a small setule and terminates in a finely barbed spiniform process.

The area between the maxillipeds and the first pair of legs (Figure 9f) is slightly protuberant. A well-defined line connects the bases of the maxillipeds.

Legs 1-4 (Figures 9g-i, 10a) have the segmentation and armature as usual for the genus. In all four legs the inner coxal seta is long and plumose and the inner margin of the basis has a row of hairs. The exopod of leg 4 has the formula I-0;I-1;II,I,5. The endopod of leg 4 (Figure 10a) has the second and third segments weakly separated; in some specimens without a break in the sclerotization of the wall, in others with a slight break on the inner side, but in all specimens at the intersegmental junction there is a row of small spinules and a trace of an intersegmental joint. The two terminal fringed endopod spines are 44 μ (outer) and 53 μ (inner).

Leg 5 (Figure 10b) has a relatively small unornamented free segment 52 x 29 μ in greatest dimensions. The two terminal setae are 55 μ and 94 μ , both with extremely short barbules. The adjacent seta on the body is 35 μ and naked.

Leg 6 is represented by the two setae on the area of attachment of each egg sac (Figure 8c).

The color in life corresponds to the color of the sex of the scallop host: yellow-orange-red copepods in male scallops which are bright orange, and white copepods in female scallops which are milky white. (These color notes are from a letter from P.L. Illg to AGH dated 6 March 1970.)

MALE.—The body (Figure 10c) resembles that of the female. The length is 0.97 mm (0.91–1.02 mm) and the greatest width 0.35 mm (0.35–0.37 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome

is 1.57:1. The ratio of the length of the prosome to that of the urosome is 1.40:1.

The segment of leg 5 (Figure 10d) is 34 x 78 μ . There is no ventral intersegmental sclerite. The genital segment is 143 x 133 μ . The four post-genital segments are 57 x 75 μ , 57 x 65 μ , 44 x 54 μ , and 61 x 50 μ from anterior to posterior, posteriorly with dorsal and ventral spinules as in the female.

The caudal ramus is like that of the female, but smaller, 86 x 22 μ , or 3.91 times longer than wide.

The body surface has small hairs (sensilla) as in the female.

The rostrum is like that of the female.

The first antenna resembles that of the female, but three aesthetes are added (at points indicated by arrows in Figure 8f), so that the formula is 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete.

The second antenna, labrum, mandible, paragnath, first maxilla, and second maxilla are like those of the female. The maxilliped (Figure 10e) is slender. The unornamented first segment has a distinct inner bulge. The second segment bears a row of spinules and two setae, one slender, the other swollen proximally as in Figure 10f. The third segment is unarmed. The claw is 133 μ along its axis, partially divided about midway, with a small terminal lamella and two very unequal proximal setae.

The ventral area between the maxillipeds and the first pair of legs resembles that of the female.

Leg 1 resembles that of the female, except that the inner coxal seta is only partially plumose, the distal part having small barbs as in Figure 10g. Leg 2 resembles that of the female, except for longer spiniform processes on the last segment of the endopod (Figure 10h). Legs 3 and 4 are like those of the female.

Leg 5 (Figure 10i) has a small unornamented free segment, 29 x 13 μ ; the two terminal setae are 39 μ and 73 μ . The adjacent seta on the body is 29 μ .

Leg 6 (Figure 10j) is a posteroventral flap on the genital segment bearing two naked setae 29 μ and 39 μ and two minute spiniform processes.

The spermatophore (Figure 10k), attached to the female in pairs, is 83 x 43 μ , not including the neck.

The color in life resembles that of the female.

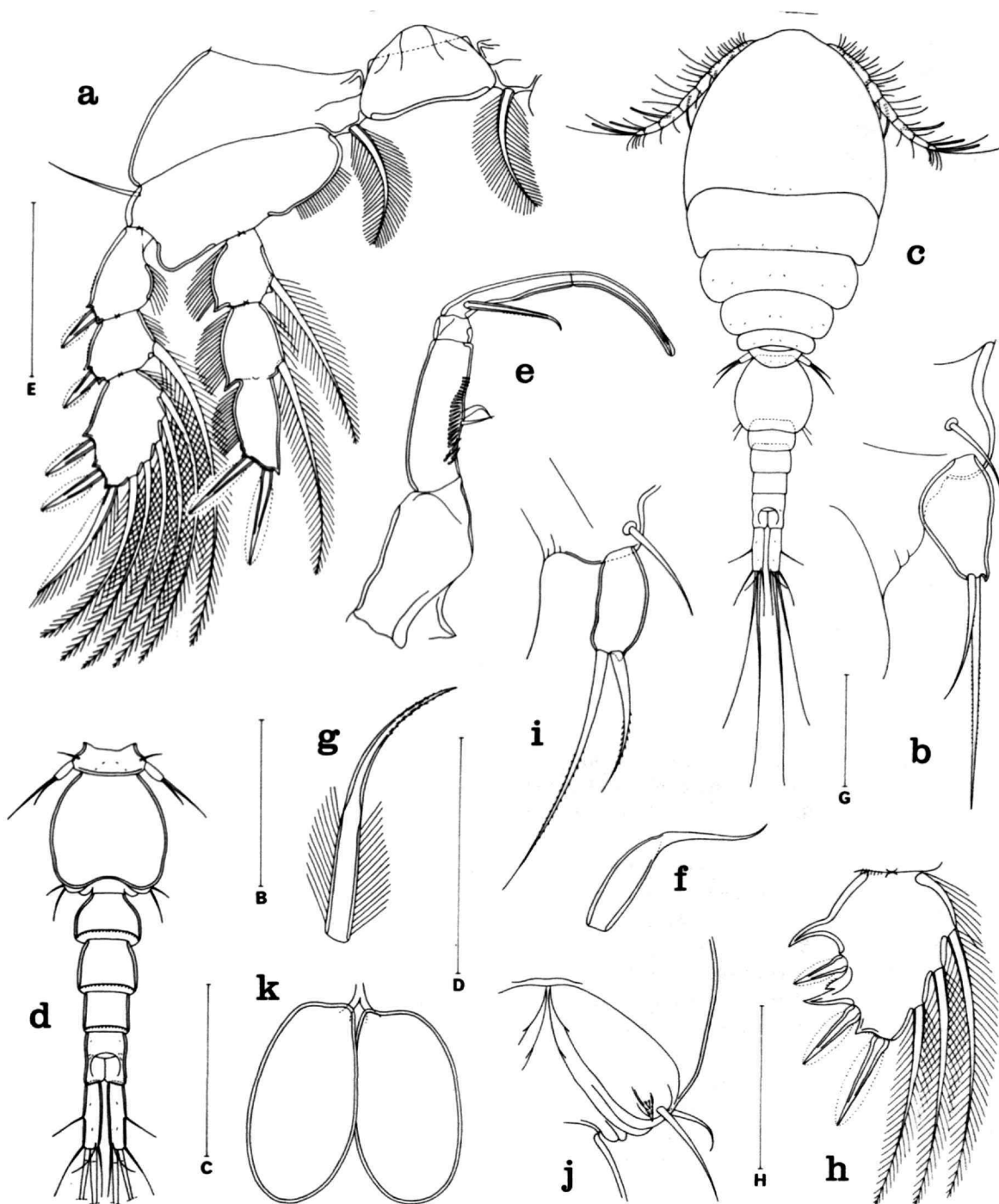


FIGURE 10.—*Herrmannella bullata*, new species. Female: *a*, leg 4 and intercoxal plate, anterior (E); *b*, leg 5, dorsal (D). Male: *c*, dorsal (G); *d*, urosome, dorsal (B); *e*, maxilliped, inner (E); *f*, swollen seta on second segment of maxilliped, outer (H); *g*, inner coxal seta of leg 1, anterior (C); *h*, third segment of endopod of leg 2, anterior (C); *i*, leg 5, dorsal (C); *j*, leg 6, ventral (D); *k*, spermatophores, attached to female, dorsal (D). Scale: B, C, 0.2 mm; G, 0.05 mm; D, E, 0.1 mm; H, 0.02 mm.

ETYMOLOGY.—The specific name *bullata* (Latin, swollen like a bubble) alludes to the bubble-like tip on the rostrum.

REMARKS.—*Herrmannella bullata* is unique among the known species of the genus in the form of its rostrum. The sexual dimorphism in leg 1 (with a half-plumose, half-spinose inner coxal seta in the male) occurs in no other species in the genus so far as known.

Herrmannella caribaea (Humes, 1970)

Paranthessius caribaeus Humes, 1970a, pp. 615–621, figs. 26–51 [from the bivalves *Chama sinuosa* Broderip, Barbados, Jamaica, Puerto Rico; and *Pseudochama radians* Lamarck, Jamaica].

Herrmannella columbiae (Thompson, 1897)

FIGURES 11–14

Pseudolichomolgus columbiae Thompson, 1897a, pp. 87–89, pl. 8, figs. 1–10 [in tow-net, Puget Sound].

Paranthessius columbiae.—Illg, 1949, pp. 402–413, figs. 33, 34 [from the bivalves *Schizothaerus nuttalli* (Conrad) and *Protothaca tenerrima* (Carpenter), California].

MATERIAL EXAMINED.—213 ♀♀, 115 ♂♂, and 154 copepodids from the mantle cavity of the bivalve *Schizothaerus* (= *Tresus*) *capax* Gould, Garison Bay, San Juan Island, Washington, 7 April 1962, collected by Jack Pearce. (*Herrmannella panopeae* also in this collection.)

FEMALE.—The body (Figure 11a,b) is elongated, with the cephalosome flattened dorsally in lateral view. The length is 1.90 mm (1.73–2.14 mm) and the greatest width 0.61 mm (0.58–0.64 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1.68:1. The ratio of the length of the prosome to that of the urosome is 1.43:1.

The segment of leg 5 (Figure 11c) is 120 x 352 μ . There is no ventral intersegmental sclerite between that segment and the genital segment. The genital segment is 335 μ long, a little broader in its anterior half (290 μ) than in its posterior half (218 μ), the two halves separated dorsally by a transverse line. The areas of attachment of the egg sacs are located laterally on the anterior half. Each area (Figure 11d) bears a single naked seta, 21 μ . The three postgenital segments are 174 x

190 μ , 153 x 161 μ , and 130 x 121 μ from anterior to posterior. The anal segment has a pair of crescentic rows of spinules anteriorly placed on the ventral surface (Figure 11e) and carries a row of minute spinules on the posteroventral margin on both sides.

The caudal ramus (Figure 11e) is 164 x 34 μ in greatest dimensions, or 4.8 times longer than wide. The outer lateral seta is 62 μ and finely barbed, the dorsal seta 33 μ and naked, the outermost terminal seta 78 μ and finely barbed, the innermost terminal seta 65 μ and naked, and the two long median terminal setae 240 μ (outer) and 500 μ (inner), both naked and inserted dorsally over a small ventral flap ornamented with a few spinules.

The body surface has a few hairs (sensilla) as in Figure 11a.

The egg sac (Figure 11a) is elongated, 1180 x 290 μ , reaches nearly to the ends of the longest ramal setae, and contains many eggs about 65 μ in diameter.

The rostrum (Figure 11f) has a long, pointed beak arising from a base with lateral, slightly knobbed expansions.

The first antenna (Figure 11g) is 411 μ long. The lengths of its seven segments (measured along their posterior nonsetiferous margins) are: 33 (75 μ along the anterior margin), 75, 37, 63, 61, 56, and 44 μ respectively. The formula for the armature is 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All the setae are naked except one on segment 5, one on segment 6, and four on the last segment which are haired.

The second antenna (Figure 11h) has one seta on the first segment, one seta and an outer row of small spinules on the second segment, and three setae on the third segment. The fourth segment is 59 μ along its outer edge, 37 μ along its inner edge, and 24 μ wide, with a claw 58 μ along its axis, two bent setae, and four other setae. All the setae are naked.

The labrum (Figure 12a) has two, widely divergent, posteroventral lobes.

The mandible (Figure 12b) is slender and bipectinate. The paragnath (Figure 12a) is a small lobe with a few hairs. The first maxilla (Figure 12c) has three elements. The second maxilla is as shown in Figure 12d. The maxilliped (Figure 12e) is unusually small and 3-segmented. The first

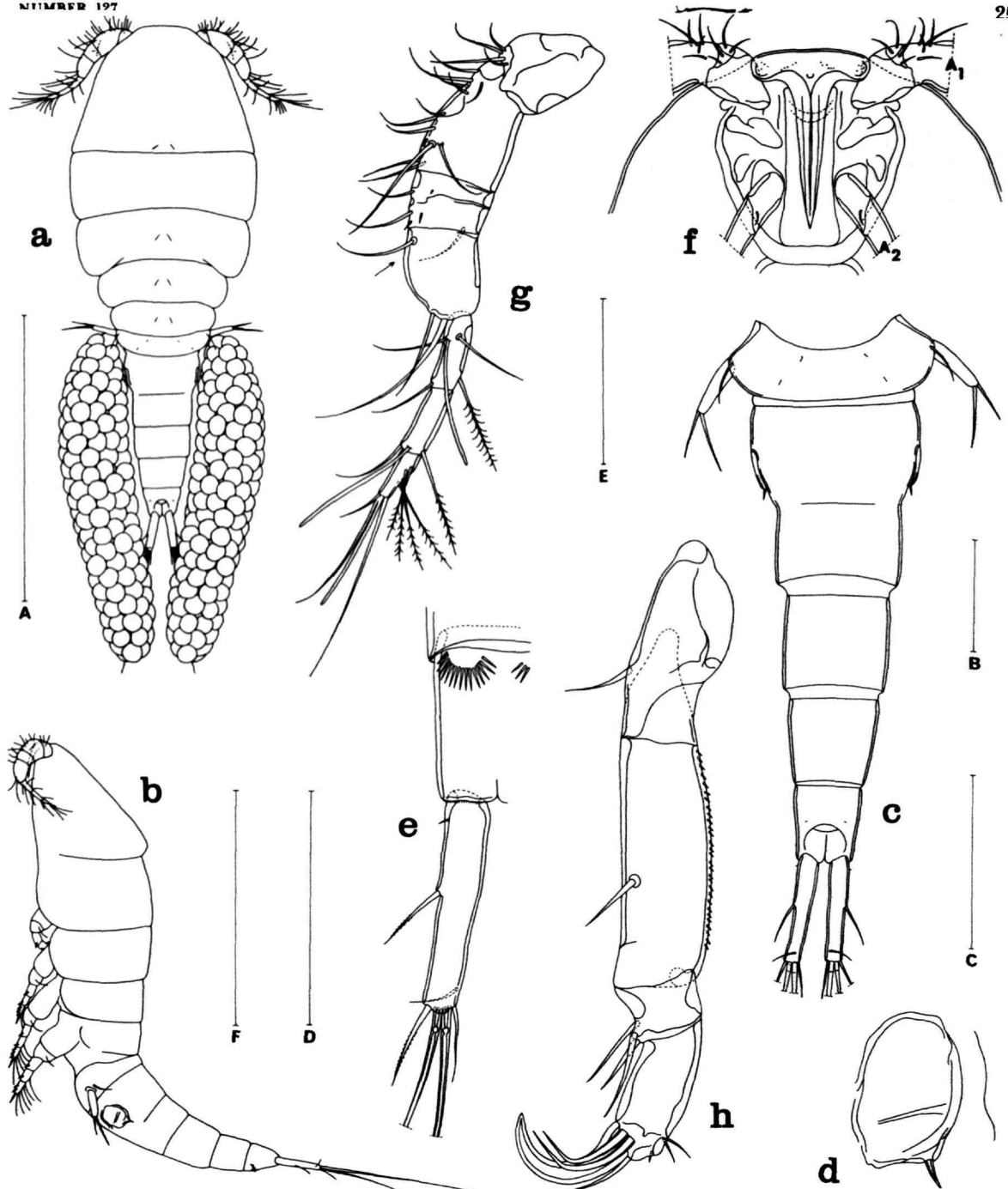


FIGURE 11.—*Herrmannella columbiae* (Thompson). Female: a, dorsal (A); b, lateral (A); c, urosome, dorsal (B); d, area of attachment of egg sac, lateral (C); e, caudal ramus and part of anal segment, ventral (D); f, rostrum, ventral (E); g, first antenna, with arrow indicating position of additional aesthete in male, ventral (D); h, second antenna, posterior (F). Scale: A, 1.0 mm; B, D, E, 0.2 mm; C, F, 0.1 mm.

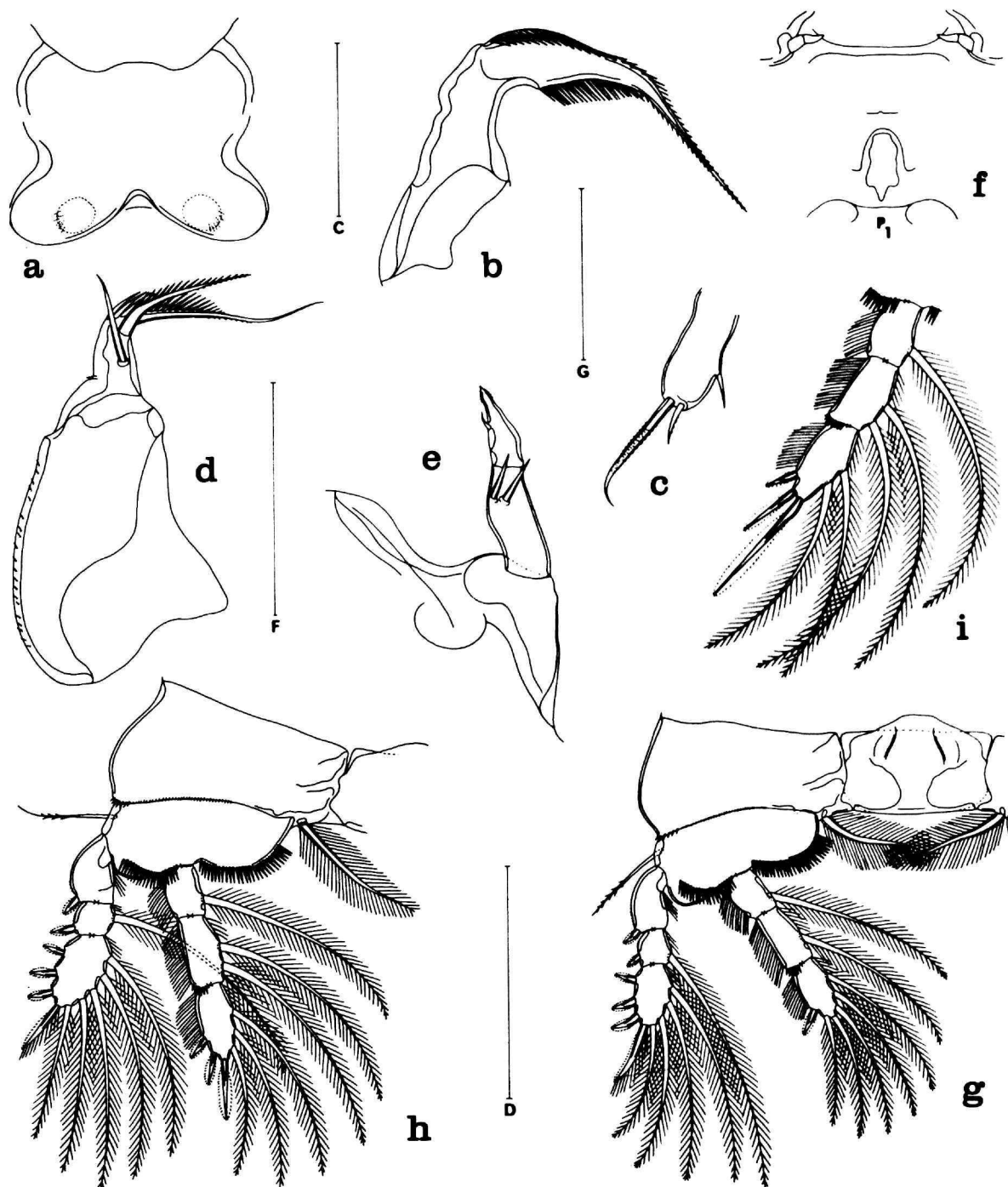


FIGURE 12.—*Herrmannella columbiae* (Thompson). Female: *a*, labrum, with paragnaths indicated by broken lines, ventral (c); *b*, mandible, posterior (c); *c*, first maxilla, anterior (c); *d*, second maxilla, posterior (F); *e*, maxilliped, antero-inner (G); *f*, area between maxillipeds and first pair of legs, ventral (D); *g*, leg 1 and intercoxal plate, anterior (D); *h*, leg 2, anterior (D); *i*, endopod of leg 3, anterior (D). Scale: c, F, 0.1 mm; D, 0.2 mm; G, 0.05 mm.

segment is broadly joined with the body and unarmed. The second segment is slender with two setae. The third segment bears a small setule and has an attenuated, finely barbed tip.

The ventral area between the maxillipeds and the first pair of legs (Figure 12f) is not protuberant. A sclerotized bar connects the bases of the maxillipeds.

Legs 1-4 (Figures 12g-i, 13a) are segmented and armed as in other species of the genus. In all four legs the inner coxal seta is long and plumose. In legs 1-3 the inner margin of the basis has a row of slender spines, but in leg 4 this margin has a row of hairs. In legs 1-3 the anterior surface of the basis between the rami has a similar row of long slender spines, but in leg 4 these are reduced to a few small spinules. In all four legs the first and second endopod segments are without outer distal spiniform processes, and the second segment has a distal outer group of spinules. The two terminal fringed spines of the fourth endopod are 73 μ (outer) and 140 μ (inner); there is a row of slender spinules on the segment near their insertions.

Leg 5 (Figure 13b) has a moderately slender free segment, 92 x 28 μ in greatest dimensions (ratio of 3.29:1), that is unornamented except for a row of minute spinules near the insertions of the two terminal naked elements which are 78 μ and 99 μ . The adjacent seta on the body is about 60 μ and naked.

Leg 6 is represented by the single seta on the area of attachment of each egg sac (Figure 11d).

The color in life is unknown.

MALE.—The body (Figure 13c) is slender. The length is 1.82 mm (1.62-1.93 mm) and the greatest width is 0.48 mm (0.45-0.50 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1.75:1. The ratio of the length of the prosome to that of the urosome is 1.06:1.

The segment of leg 5 (Figure 13d) is 52 x 177 μ . There is no ventral intersegmental sclerite. The genital segment is 220 x 243 μ . The four postgenital segments are 122 x 156 μ , 117 x 139 μ , 104 x 122 μ , and 107 x 101 μ from anterior to posterior. The anal segment has ventral spinules as in the female.

The caudal ramus is similar to that of the female, 166 x 36 μ , with the ratio of 4.6:1.

The body surface has hairs as in the female.

The rostrum (Figure 13e) shows sexual dimorphism in the presence of two long spiniform processes extending posteroventrally from the lateral margins of the basal area.

The first antenna is similar to that of the female but has an additional aesthete on the fourth segment (at the location indicated by the arrow in Figure 11g), so that the formula is 4, 13, 3, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete.

The second antenna resembles that of the female but there are prominent additional spinules along the inner side of the second segment (Figure 13f).

The labrum, mandible, paragnath, first maxilla, and second maxilla are like those of the female. The maxilliped (Figure 13g) is 4-segmented, assuming that the proximal part of the claw represents a fourth segment. The first segment is short and broad, unarmed except for an inner knob. The second segment inwardly has a slender seta, a modified seta with a stout base and slender tip (Figure 13h), and two rows of spinules. The third segment is small, obscure, and unarmed. The claw is 230 μ along its axis, weakly divided about midway, with a small terminal lamella, and with two very unequal proximal setae.

The ventral area between the maxillipeds and the first pair of legs (Figure 13i) has a sclerotization slightly different from that in the female.

Legs 1-4 are segmented as in the female, with the spinal and setal formula as in that sex. The intercoxal plate of leg 1 (Figure 14a) is wider and shorter than in the female (as in the following three legs also). The coxa and basis of all four legs are ornamented as in the female, except that in leg 4 the anterior surface of the basis between the rami bears a row of long slender spines as in the previous legs (not reduced as in the female). The exopods of legs 1-4 are ornamented as in the female. The endopod of leg 1 (Figure 14b) has the first segment with a distal outer group of spinules, the second segment with a distal outer spiniform process and a reduced group of spinules, and the third segment with an outer spiniform process near the insertion of the spine and a few terminal spinules and small spinous processes. The endopod of leg 2 (Figure 14c) lacks distal outer spinules on the first segment, bears an outer spini-

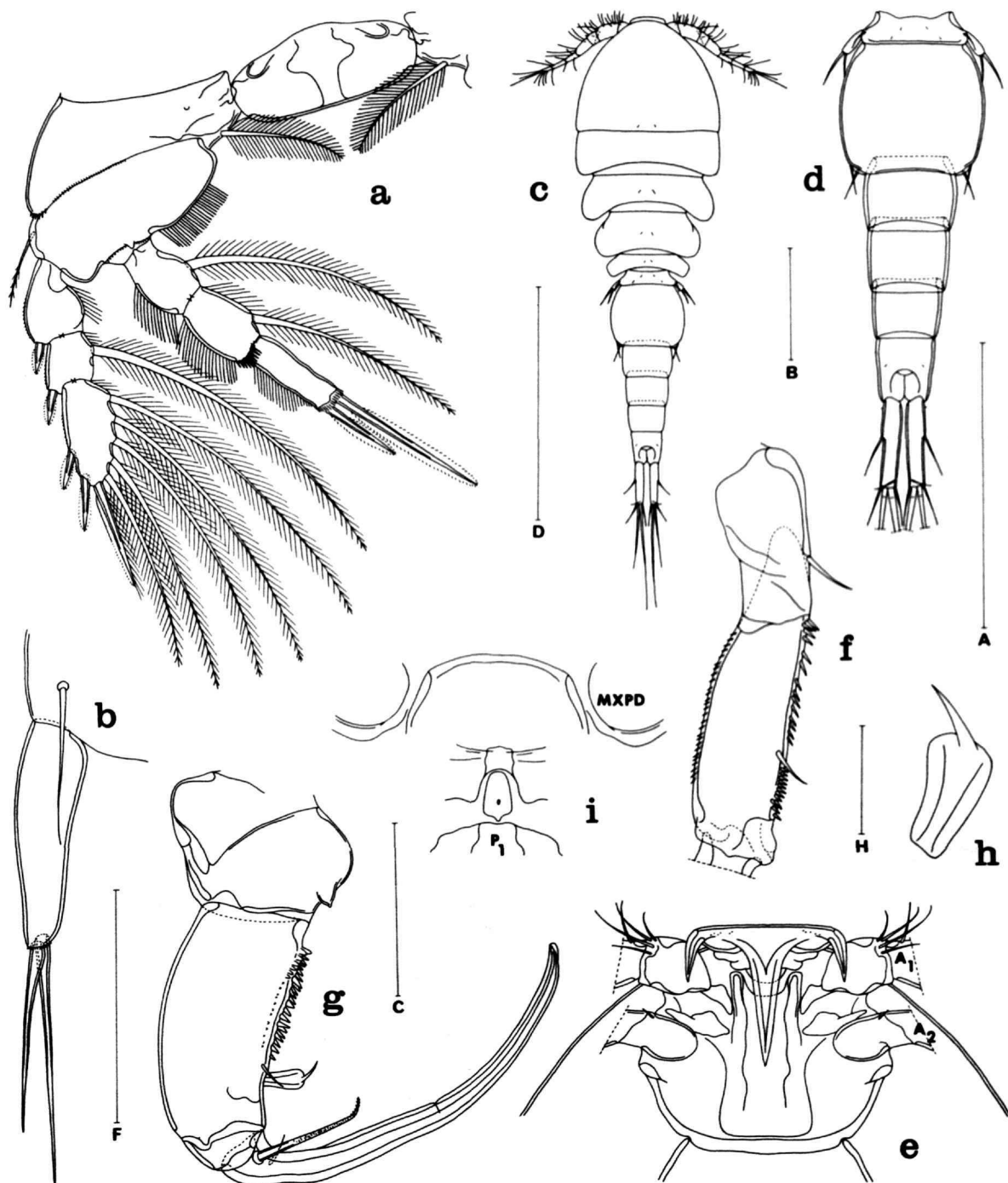


FIGURE 13.—*Herrmannella columbiae* (Thompson). Female: a, leg 4 and intercoxal plate, anterior (D); b, leg 5, dorsal (F). Male: c, dorsal (A); d, urosome, dorsal (B); e, rostrum, ventral (D); f, first and second segments of second antenna, posterior (F); g, maxilliped, posterior (C); h, modified seta on second segment of maxilliped, posterior (H); i, area between maxillipeds and first pair of legs, ventral (D). Scale: A, 1.0 mm; B, D, 0.2 mm; C, F, 0.1 mm; H, 0.02 mm.

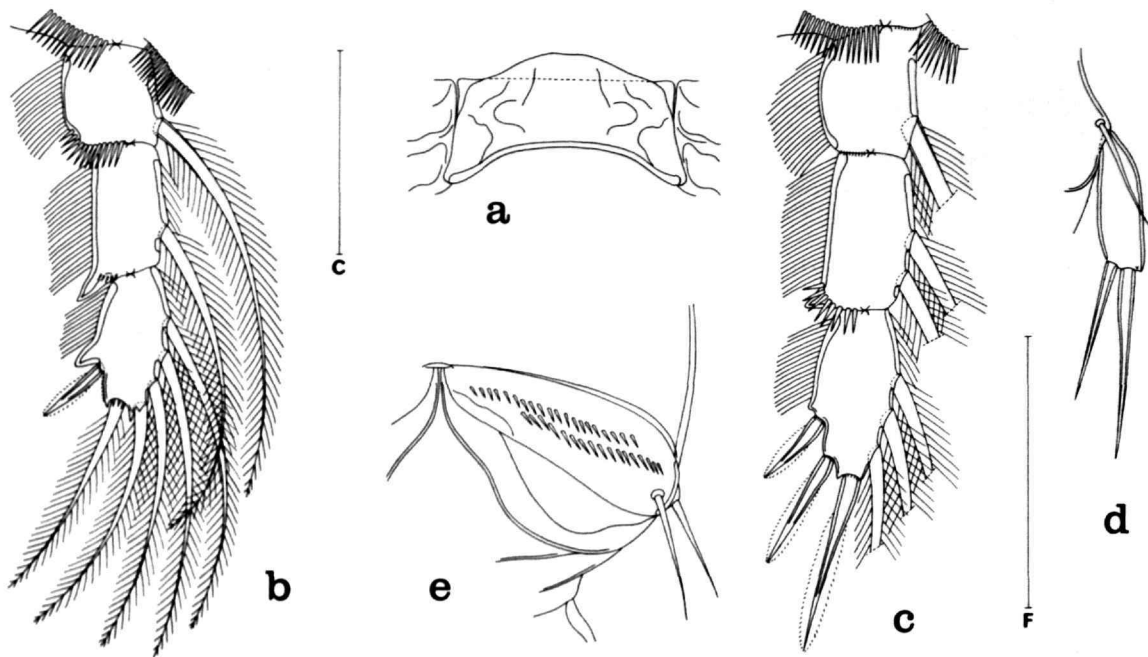


FIGURE 14.—*Herrmannella columbiae* (Thompson). Male: a, intercoxal plate of leg 1, anterior (c); b, endopod of leg 1 anterior (f); c, endopod of leg 2, anterior (f); d, leg 5, dorsal (f); e, leg 6, ventral (c). Scale: c, f, 0.1 mm.

form process on the second segment, but has only a trace of an outer spiniform process on the third segment. The endopod of leg 3 is like that of leg 2. The endopod of leg 4 is also similar to that of leg 2, but the outer spiniform process on the second segment is smaller, and this process is absent on the third segment.

Leg 5 (Figure 14d) has an unornamented free segment, $48 \times 16 \mu$. The two terminal elements are 44μ and 66μ , and the adjacent seta on the body is 44μ .

Leg 6 (Figure 14e) is a posteroventral flap on the genital segment bearing two naked setae, 44μ and 56μ , and ornamented with two parallel rows of spinules. In five specimens the anterior row had an average number of 22 spinules (20–25) and the posterior row averaged 15 (12–19).

The spermatophore was not observed.

The color in life is unknown.

REMARKS.—Several similar features suggest a close relationship between *H. columbiae* and *H. saxidomi* (Illg). Among such features in the female are the single seta on the area of attachment of the egg sac, the enlarged four proximal seg-

ments of the first antenna, the reduction in size of the maxilliped, the general ornamentation of legs 1–4, and the appearance of leg 5. In the male the similarities include the modified seta on the second segment of the maxilliped, details of the ornamentation of the endopods of legs 1 and 2, and the two rows of spinules associated with leg 6.

Herrmannella dissidens (Humes, 1970)

Paranthesius dissidens Humes, 1970a, pp. 605–613, figs. 1–25 [from the bivalves *Chama sinuosa*, Barbados, Jamaica, and Puerto Rico; and *Pseudochama radians*, Jamaica and Puerto Rico].

Herrmannella haploceras (Bocquet and Stock, 1959)

Paranthesius (*Herrmannella*) *haploceras* Bocquet and Stock, 1959a, pp. 246–248, fig. 5 [from the bivalve *Cardium crassum* Gmelin, "La Vieille," Baie de Morlaix, Roscoff; Luc-sur-Mer, Normandy, France].

Paranthesius colmani Reddiah, 1960, pp. 440–443, fig. 1 [from the bivalve *Laevicardium crassum* (Gmelin), Port Erin, Isle of Man, England].—Bruce, Colman, and Jones, 1963, p. 128 [from *Laevicardium crassum*, Port Erin].

***Herrmannella inflatipes* (Humes and Cressey, 1958)**

Modiolicola inflatipes Humes and Cressey, 1958a, pp. 936–938, figs. 101–126 [from the bivalve *Mytilus perna* Linnaeus, Pointe Noire, Moyen Congo, West Africa].—Cheng, 1967, pp. 315, 343.

***Herrmannella mesodesmatis* (Humes, 1967)**

Paranthessius mesodesmatis Humes, 1967b, pp. 6–9, figs. 34–43 [from the bivalve *Mesodesma donacium* Lamarck, Valparaiso, Chile].

***Herrmannella panopeae* (Illg, 1949)**

FIGURES 15–16

Paranthessius panopeae Illg, 1949, pp. 413–417, figs. 35a–g, 36a–g, [from the bivalve *Panope generosa* Gould, California].—Stout, 1970, p. 68 [from *Tresus* (= *Schizothaerus*) *nuttalli*, California].

The descriptive notes given below (and the accompanying figures) are based upon the study of a freshly dissected male and female from a new bivalve host, *Clinocardium nuttalli* (Conrad), at Mitchell Bay, San Juan Island, Washington (USNM 90700, collected by G. Comita, 7 August 1949, P. L. Illg, det.). An examination of the holotype ♀ (USNM 85343) and the allotype (USNM 85344), both dissected and mounted on slides, and three paratypes (1 ♀, 2 ♂♂), sent by Dr. Paul L. Illg, showed a close similarity in the observable features with the specimens from *Clinocardium*. Features identical with Illg's original description are omitted from the following partial characterization. Additional specimens (35 ♀♀, 2 ♂♂, sent to us by P. L. Illg) from the bivalve *Schizothaerus capax* Gould at Garrison Bay, San Juan Island, Washington, a second new host, have been studied.

FEMALE.—The length of the body (not including the setae on the caudal rami) is 1.77 mm and the greatest width is 0.51 mm, based on a specimen in lactic acid. The segment of leg 5 (Figure 15a) is 90 x 180 μ . The genital segment is 260 x 187 μ , slightly expanded in its anterior two-thirds. The areas of attachment of the egg sacs are located dorsolaterally near the middle of the segment. Each area (Figure 15b) bears a naked seta 21 μ long, a small process, and a hyaline spot (the site

of a seta now lost?). The three postgenital segments are 107 x 118 μ , 91 x 100 μ , and 96 x 83 μ from anterior to posterior. The posteroventral margin of the anal segment is unornamented.

The caudal ramus (Figure 15a) is 190 x 27 μ (the width taken just in front of the outer lateral seta) with the ratio 7:1. All six setae are naked. The ventral flap near the insertions of the two long median terminal setae has a smooth margin.

The first antenna is 330 μ long. The lengths of the seven segments (measured along their posterior nonsetiferous margins) are 17 (44 μ along the anterior margin), 72, 33, 55, 45, 42, and 39 μ respectively. The formula is 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete.

The second antenna (Figure 15c) has an inner seta on the first segment, an inner seta and a row of outer spinules on the second segment, and three inner setae and a row of minute spinules on the third segment. The fourth segment bears a stout claw, 57 μ along its axis, two slightly spiniform setae, and four small hyaline elements.

The labrum, mandible (Figure 15d), and paragnath are much like those of *H. protothacae* (Humes). The first maxilla (Figure 15e) has three elements. The slender maxilliped (Figure 15f) has two setae on the second segment. The third segment bears two setae and has an attenuated, spiniform, finely barbed tip.

Legs 1–4 resemble closely those of *H. protothacae* and have the same spinal and setal formula. The spines on the last segment of the endopod of leg 2 (Figure 15g) are 28, 35, and 54 μ from outer to inner; these spines in leg 3 have proportionally similar lengths. Leg 4 (Figure 15h) has three fringed spines on the last segment of the endopod, their lengths from outer to inner being 43, 54, and 82 μ , and the greatest length of the segment 70 μ .

Leg 5 (Figure 15i) has a free segment, 49 x 37 μ , ornamented with a few spinules at its outer (anterior) distal corner. Of the two naked terminal elements, one is hyaline and 54 μ and the other is spiniform and 138 μ . The naked seta adjacent to the free segment is 55 μ .

MALE.—The length of the body (without the ramal setae) is 1.46 mm and the greatest width 0.40 mm, based on a specimen in lactic acid. The segment of leg 5 (Figure 16a) is 65 x 117 μ . The genital segment is 221 x 178 μ . The four post-

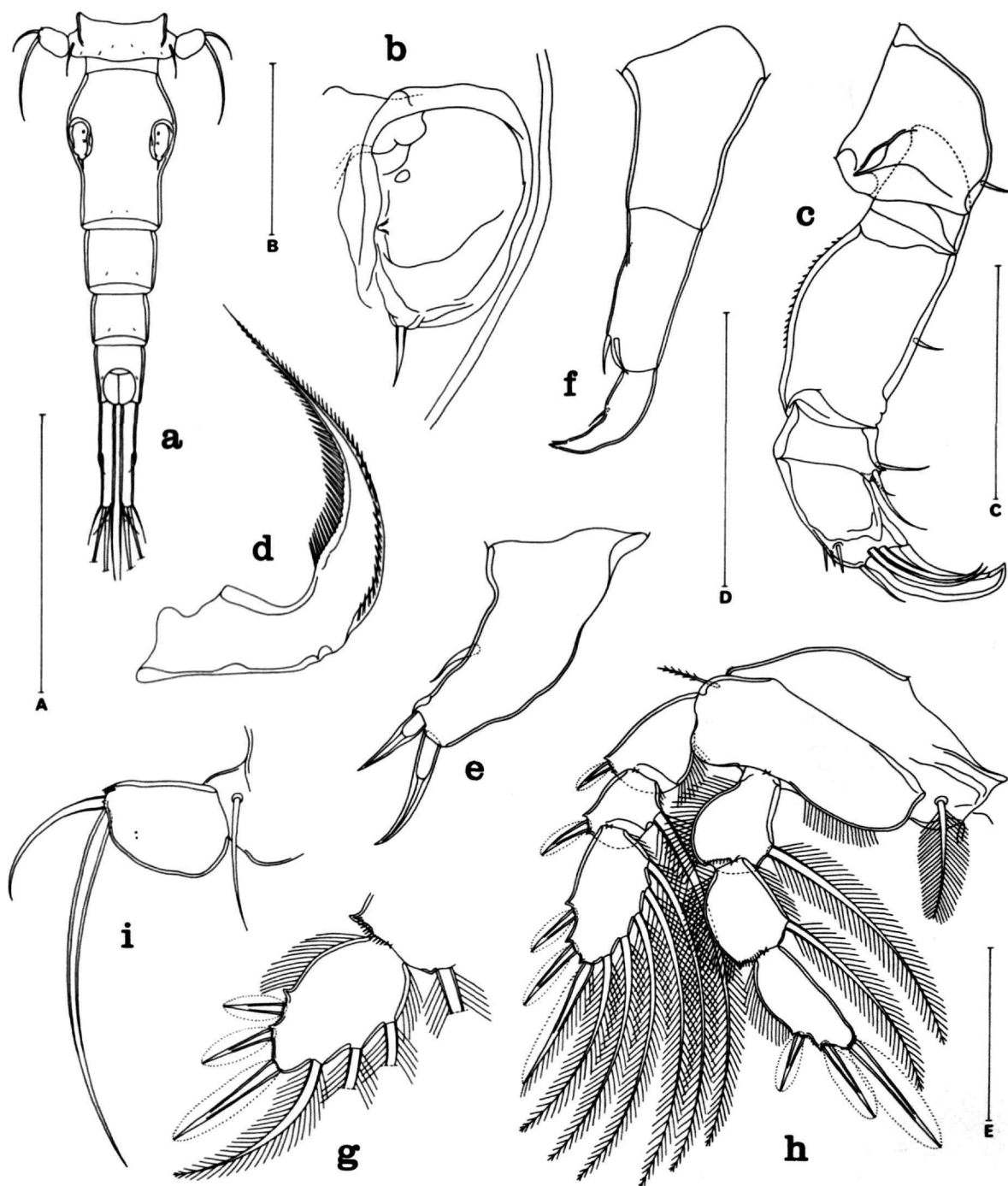


FIGURE 15.—*Herrmanella panopeae* (Illg). Female: *a*, urosome, dorsal (A); *b*, area of attachment of egg sac, dorsal (B); *c*, second antenna, posterior (C); *d*, mandible, anterior (D); *e*, first maxilla, anterior (E); *f*, maxilliped, antero-inner (F); *g*, third segment of endopod of leg 2, anterior (G); *h*, leg 4, anterior (H); *i*, leg 5, dorsal (I). Scale: A, 0.5 mm; B, D, 0.05 mm; C, E, 0.1 mm.

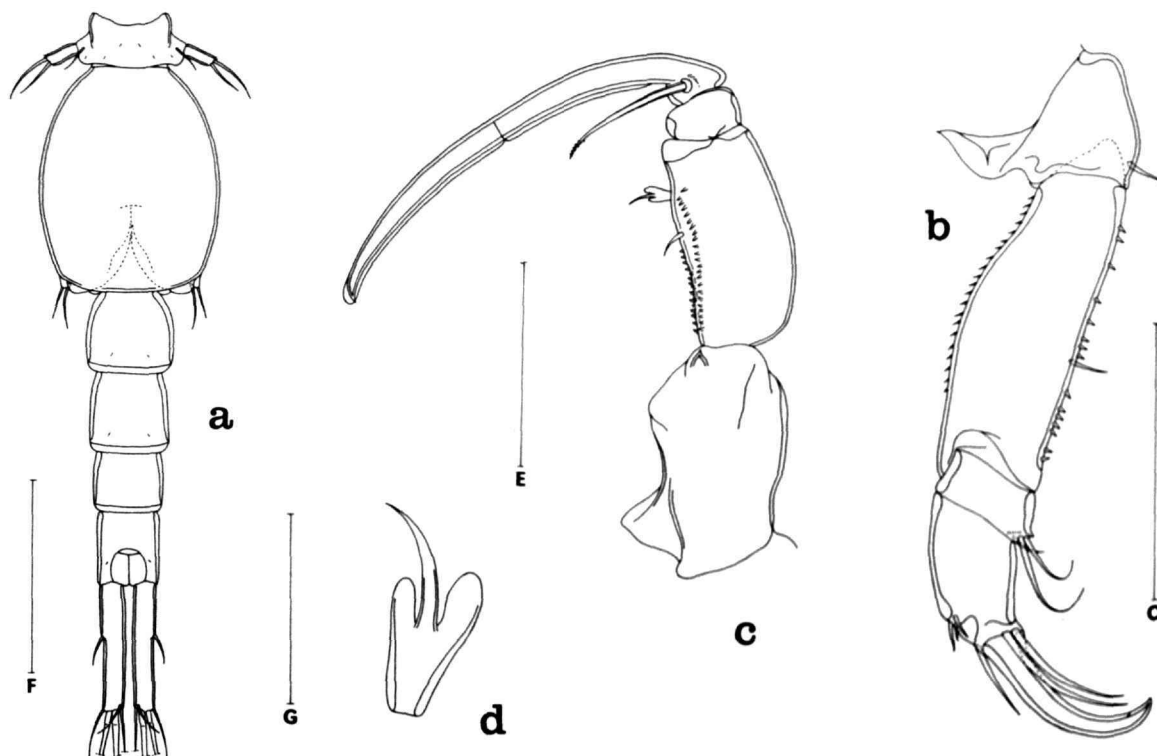


FIGURE 16.—*Herrmannella panopeae* (Illg). Male: a, urosome, dorsal (F); b, second antenna, posterior (c); c, maxilliped, posterior (E); d, modified seta on second segment of maxilliped, posterior (G). Scale: c, E, 0.1 mm; F, 0.2 mm; G, 0.02 mm.

genital segments are $81 \times 96 \mu$, $83 \times 83 \mu$, $60 \times 73 \mu$, and $78 \times 60 \mu$ from anterior to posterior.

The caudal ramus is like that of the female, but smaller, $140 \times 24 \mu$.

The formula for the armature of the first antenna is 4, 13, 6, $3 + 1$ aesthete, $4 + 1$ aesthete, $2 + 1$ aesthete, and $7 + 1$ aesthete, one aesthete having been added on the fourth segment, but none on the second.

The second antenna (Figure 16b) is more slender than in the female, the second segment bears short spines along its inner surface, and the terminal claw is 62μ along its axis.

The maxilliped (Figure 16c) has on the inner surface of the second segment two rows of spinules and two naked setae, one of them modified (Figure 16d) with a swollen base. The claw is 211μ along its axis including the small terminal lamella.

The last segment of the endopod of leg 1 has the same formula as in the female. The second segment of the endopod of legs 1–3 shows an enlarged outer distal spinous process, as described by Illg. Leg 4 is like that of the female.

Leg 5 (Figure 16a) has a rectangular free segment, $33 \times 11 \mu$. Its two terminal naked elements are 39μ and 50μ .

Leg 6 (Figure 16a) bears a row of spinules as described by Illg and two naked setae, 22μ and 34μ .

REMARKS.—Although *H. panopeae* differs from all other species of *Herrmannella* in having three spines instead of two on the third segment of the fourth endopod, its other features conform to the generic concept. Perhaps the future discovery of similarly armed species will indicate generic separation, but for the present it seems best to place *H. panopeae* within *Herrmannella*.

***Herrmannella parva* Norman and T. Scott, 1905**

Herrmannella parva Norman and T. Scott, 1905, pp. 299, 300 [from Plymouth Sound, England]; 1906, pp. 199, 200, pl. 13, fig. 15, pl. 15, figs. 7-10, pl. 16, fig. 12, pl. 19, fig. 5 [from Plymouth, England].—G. O. Sars, 1918, pp. 176, 177, pl. 99 [from Norway].

Herrmannella parva.—Marine Biological Association, 1957, p. 176.

Paranthessius parvus.—Illg, 1949, p. 401.

Paranthessius ? parvus.—Stock and Kleeton, 1963b, pp. 259, 260, fig. 8 [from the gorgonian *Eunicella stricta* (Bert.), Banyuls, Mediterranean coast of France].

REMARKS.—The position of this species in *Herrmannella* is questionable. The terminal armature of the second antenna, with three setiform claws, sets it apart from other species in the genus.

***Herrmannella pecteni* (Sowinski, 1884)**

Lichomolgus pecteni Sowinski, 1884, pp. 249-253, pl. 7, figs. 35, 36 [from *Pecten sulcatus* Born (= *Chlamys glaber* (Linnaeus) var. *sulcatus* Born), Black Sea]; 1904, p. 94.

Herrmannella rostrata.—Canu, 1891b, p. 436 [part; from *Pecten opercularis* Linnaeus, Boulogne coast of France; see Bocquet and Stock, 1959a, p. 245].

Herrmannella rostrata.—Canu, 1892, pp. 236, 237, pl. 24, figs. 1-13 [part; from *Pecten opercularis*, Boulogne coast of France; see Bocquet and Stock, 1959a, p. 245].

Herrmannella pectini.—Stock, 1969, p. 221.

Pseudolichomolgus pectinis.—Pesta, 1909, pp. 263-265, pl. 2, figs. 8-10, pl. 3, figs. 11-16 [from *Pecten glaber* (Linnaeus), Barcola Canal, near Trieste, Italy].

Pestalichomolgus.—Wilson, 1932, p. 587 [new name for *Pseudolichomolgus* Pesta, 1909].

Paranthessius pectinis.—Monod and Dollfus, 1932a, p. 148 [from *Pecten glaber*].—Illg, 1949, p. 401.—Bruce, Colman, and Jones, 1963, p. 128 [from *Chlamys opercularis*, *Chlamys tigerina* (Müller), and *Pecten maximus* (Linnaeus), Isle of Man, England].

Paranthessius rostratus.—Leigh-Sharpe, 1935, p. 47 [part; from *Pecten opercularis*, England].

Paranthessius (Herrmannella) pectinis.—Bocquet and Stock, 1957a, p. 427; 1959a, pp. 243-246, figs. 3, 4 [from *Pecten tigerinus* Müller forma *obsoletus* (Penn.), *Pecten opercularis*, *Pecten varius* (Linnaeus), and *Anomia ephippium* Linnaeus, northwestern France].

Lichomolgus pectini.—Stock, 1969, p. 220.

***Herrmannella saxidomi* (Illg, 1949)**

FIGURES 17-19

Paranthessius saxidomi Illg, 1949, pp. 420-423, fig. 37a-h [from *Saxidomus nuttalli* Conrad, California].

MATERIAL EXAMINED.—We have studied the holotype ♀ (USNM 85341) and the allotype (USNM

85342), both dissected and mounted on slides. In addition, Dr. Paul L. Illg has generously provided us with a paratype of each sex. These have been dissected and form the basis for the following redescription and figures.

FEMALE.—The length of the body in lactic acid, not including the setae on the caudal rami, is 1.71 mm; the greatest width is 0.66 mm. The prosome (Figure 17a) is moderately broad. The urosome in this specimen was damaged and thus could not be drawn entirely. The genital segment (Figure 17b) is 260 x 203 μ in greatest dimensions. The areas of attachment of the egg sacs are situated laterally in the wide anterior part of the segment. Each area (Figure 17c) bears a single naked seta, 24 μ . The three postgenital segments are 133 x 126 μ , 101 x 109 μ , and 99 x 83 μ from anterior to posterior.

The caudal ramus (Figure 17d) is 140 μ long, 27 μ in greatest width proximally, and 19 μ in least width distally. The ratio of the length to the greatest width is 5.2:1. All the setae are naked.

The rostrum (Figure 17e) has a long slender beak.

The seven segments of the first antenna (Figure 17f), with the first four segments a little swollen as in *H. columbiae*, have the following lengths (measured along their posterior nonsetiferous margins): 28 (63 μ along the anterior margin), 62, 28, 54, 36, 32, and 23 μ respectively. The formula for the armature is 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All the setae are naked.

The second antenna (Figure 17g) has a row of spinules along the outer margin of the second segment. The fourth segment, 48 μ along its outer edge, 30 μ along its inner edge, and 23 μ wide, bears terminally a claw, 50 μ along its axis, and five setae, two of them very small.

The labrum (Figure 17h) has two divergent posteroventral lobes. Its ventral surface is ornamented with refractile bosses.

The mandible (Figure 17i) is slender. The paragnath (Figure 17j) is a small lobe with hairs. The first maxilla (Figure 17j) bears three elements. The second maxilla (Figure 17k) has refractile bosses on the outer surface of the first segment. The lash on the second segment bears a row of long slender spines. The dorsal (inner) seta is strongly barbed. The maxilliped (Figure

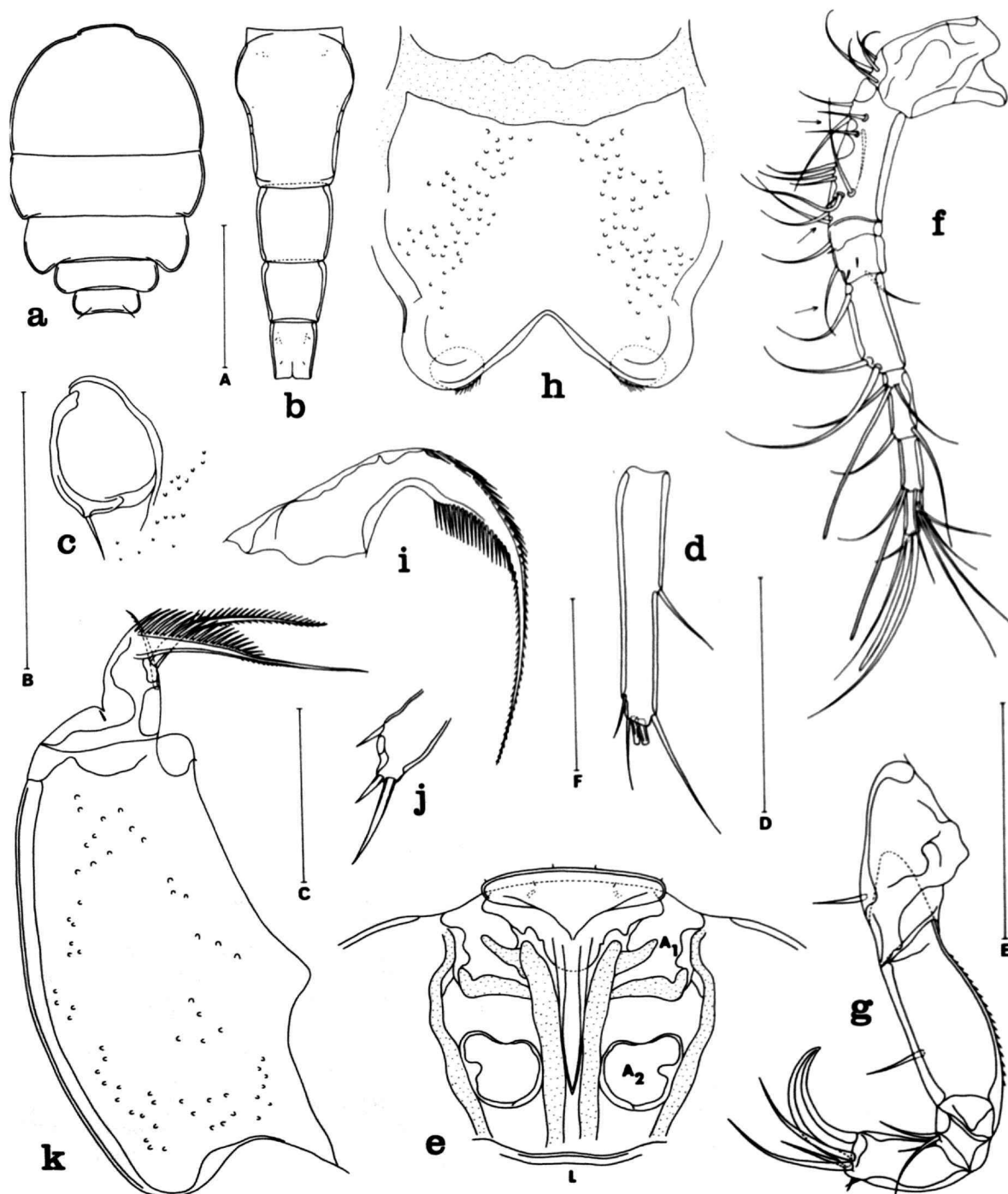


FIGURE 17.—*Herrmannella saxidomi* (Illg.). Paratype female: a, prosome, dorsal (A); b, genital and postgenital segments, ventral (B); c, area of attachment of egg sac, lateral (C); d, caudal ramus, dislodged from anal segment, dorsal (D); e, rostrum, ventral (E); f, first antenna, with arrows indicating positions of additional aesthetes in male, ventral (F); g, second antenna, posterior (G); h, labrum and paragnaths, ventral (H); i, mandible, anterior (I); j, first maxilla, anterior (J); k, second maxilla, outer (K). Scale: A, B, 0.5 mm; C, E, 0.1 mm; D, 0.2 mm; F, 0.05 mm.

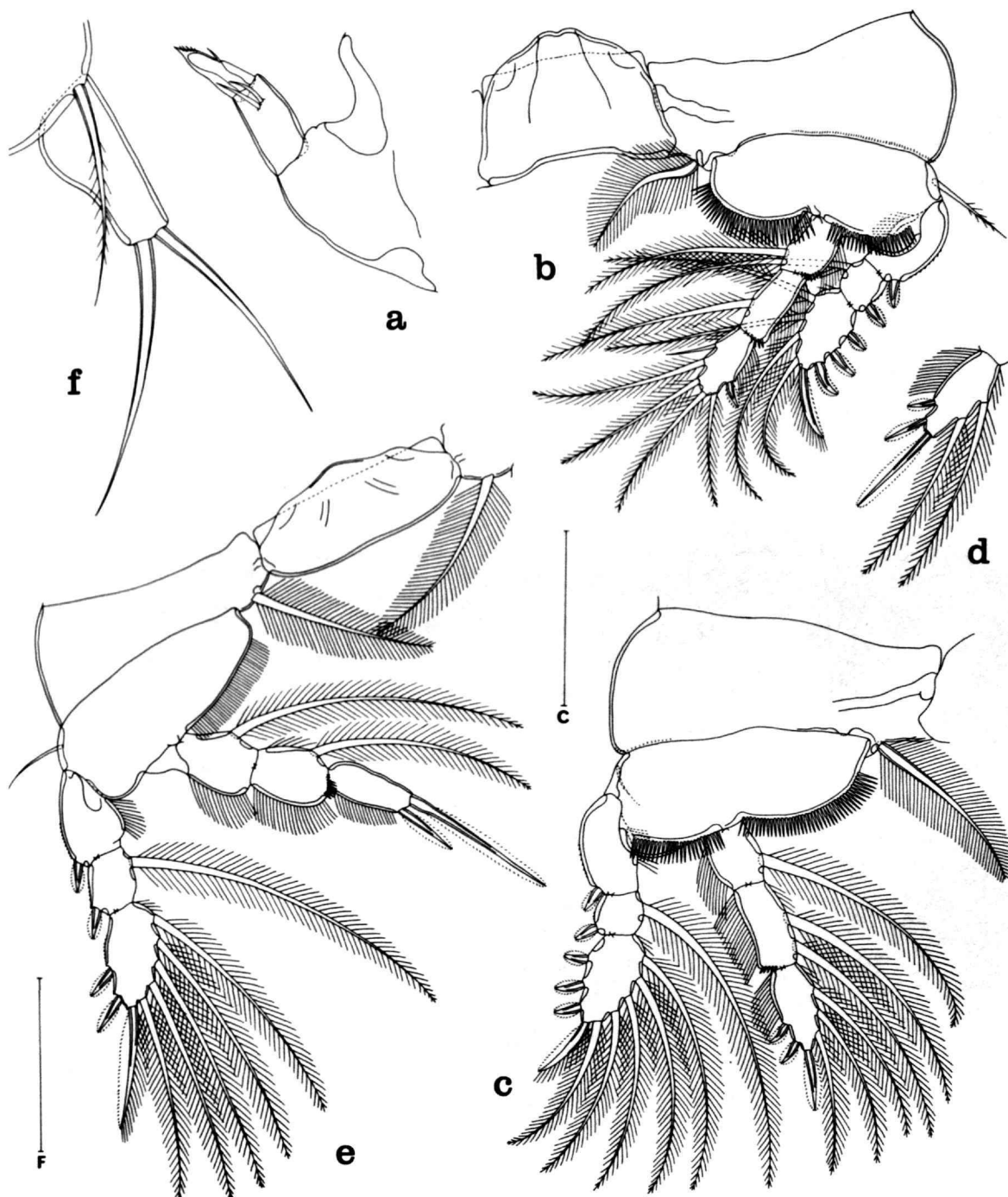


FIGURE 18.—*Herrmannella saxidomi* (Illg.). Paratype female: a, maxilliped, antero-inner (f); b, leg 1 and intercoxal plate, anterior (c); c, leg 2, anterior (c); d, third segment of endopod of leg 3, anterior (c); e, leg 4 and intercoxal plate, anterior (c); f, leg 5, dorsal (f). Scale: c, 0.1 mm; f, 0.05 mm.

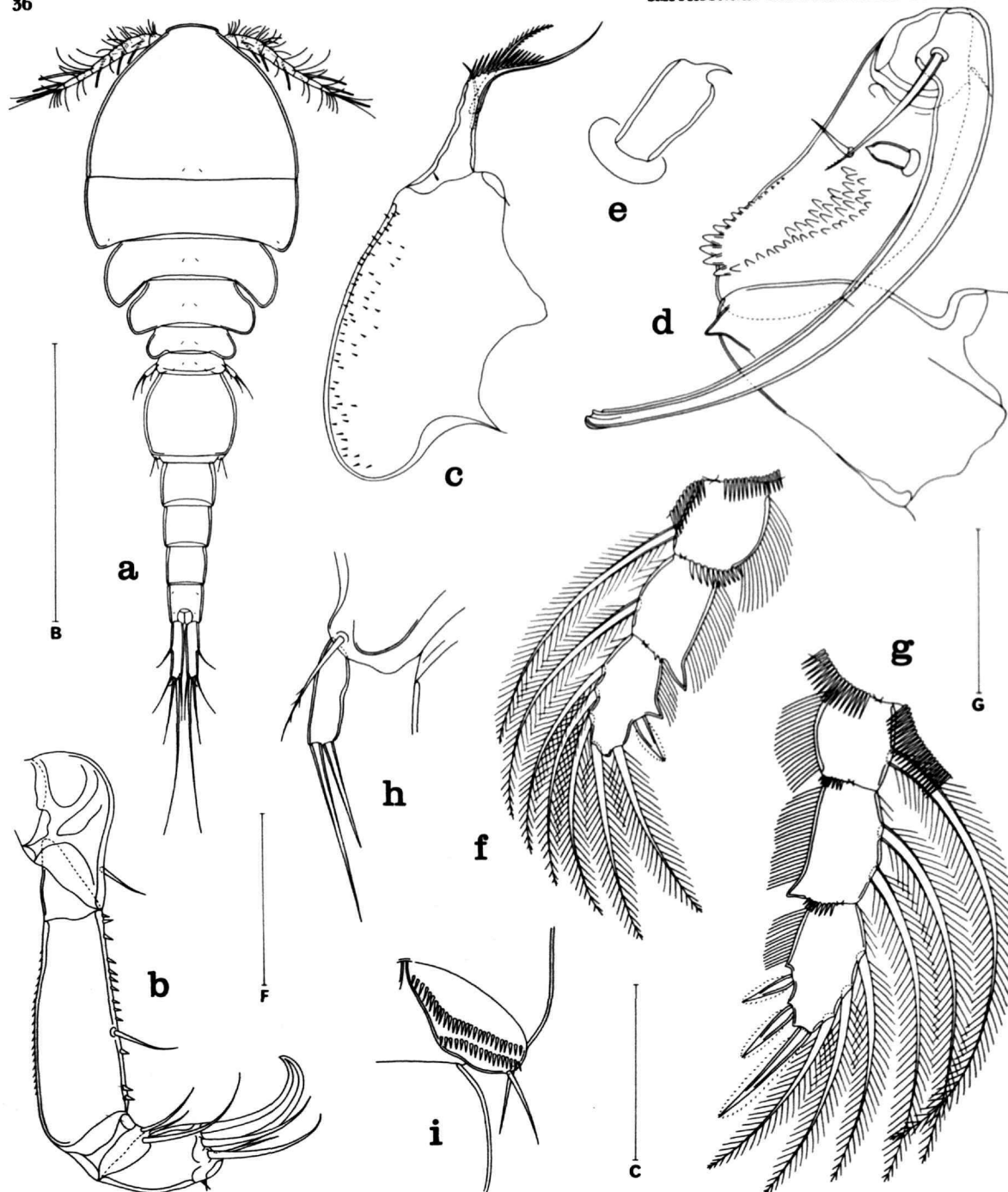


FIGURE 19.—*Herrmannella saxidomi* (Illg). Paratype male: a, dorsal (B); b, second antenna, posterior (F); c, second maxilla, outer (F); d, maxilliped, inner (F); e, modified seta on second segment of maxilliped, inner (C); f, endopod of leg 1, anterior (F); g, endopod of leg 2, anterior (F); h, leg 5, dorsal (F); i, leg 6, ventral (C). Scale: a, 0.5 mm; c, 0.1 mm; f, 0.05 mm; g, 0.2 mm.

18a), greatly reduced in size, has a large first segment. The second segment bears two setae. The third segment bears a small seta and has an attenuated tip with spinules.

Legs 1-4 (Figure 18b-e) have the same spinal and setal formula as in other species in the genus (for example, *H. protothacae* Humes). The inner margin of the basis is ornamented with a row of spinules in legs 1-3, but with hairs in leg 4. A row of spinules is present on the lobe of the basis between the rami, but this row is absent in leg 4. The short naked seta on the third segment of the endopod of leg 1 in Figure 18b, present on both endopods of the paratype dissected, is considered to be an abnormality. The last segment of the endopod of leg 4 is $46 \times 21 \mu$ in greatest dimensions, with the two terminal fringed spines 37μ (outer) and 90μ (inner). The distal outer margin of the second segment of the endopod of legs 1-4 lacks a spiniform process.

Leg 5 (Figure 18f) has an unornamented free segment 47μ long, 20μ wide at the proximal expanded area, and 14μ wide distally. The two naked terminal setae are 75μ (inner) and 62μ (outer). The adjacent seta on the body is 55μ and feathered.

Leg 6 is probably represented by the seta near the attachment of each egg sac.

The color in life is unknown.

MALE.—The body (Figure 19a) resembles in general form that of the female. The length (without the ramal setae) in lactic acid is 1.10 mm and the greatest width 0.35 mm. The ratio of the length to the width of the prosome is 1.53:1. The ratio of the length of the prosome to that of the urosome is 1:1.

The genital segment is $164 \times 161 \mu$. The four postgenital segments are $83 \times 99 \mu$, $79 \times 90 \mu$, $70 \times 77 \mu$, and $65 \times 65 \mu$ from anterior to posterior.

The caudal ramus resembles that of the female, but is somewhat shorter, $96 \times 23 \mu$, with the ratio 4.2:1.

The rostrum is similar to that of the female.

The first antenna is like that in the female, but three aesthetes are added (Figure 19a), so that the formula is 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete.

The second antenna (Figure 19b) resembles that of the female, but the second segment bears small spines along its inner margin.

The labrum has two posteroventral lobes much like those of the female. The ventral surface of the labrum lacks the refractile bosses seen in the opposite sex.

The mandible, paragnath, and first maxilla resemble those of the female. The second maxilla (Figure 19c) is much like that of the female, but the first segment is ornamented with spinules, and the second segment is not indented as it is in the female. The maxilliped (Figure 19d) has a spiniform process on the distal inner (ventral) area of the first segment. The second segment bears stout spinules, arranged as illustrated in the figure, and two setae, one slender, the other highly modified (Figure 19e), stout, with a slender recurved tip. The third segment is small. The claw is 156μ along its axis, is weakly divided about midway, and bears proximally the usual two very unequal setae.

Legs 1-4 have the same spinal and setal formula as in the female. The endopods differ from those of the female chiefly in having a spiniform process on the outer distal area of the second segment. Such a process is most pronounced in leg 1 (Figure 19f), a little less so in leg 2 (Figure 19g), and still smaller in legs 3 and 4. The exopods are like those of the female.

The unornamented free segment of leg 5 (Figure 19h) is $31 \times 9 \mu$.

Leg 6 (Figure 19i) is a posteroventral flap on the genital segment bearing two naked setae, 28μ and 39μ , and ornamented with two oblique rows of spinules (27 in the anterior row, 18 in the posterior row).

The color in life is unknown.

Herrmannella tivelae (Illg, 1949)

FIGURES 20, 21

Paranthessius tivelae Illg, 1949, pp. 417-420, figs. 35h-j, 36h-m [from the bivalve *Tivela stultorum* (Mawe), California].

MATERIAL EXAMINED.—We have studied the dissections of the holotype (USNM 85346) and the allotype (USNM 85345). The following redescription of the female is based on a paratype (from

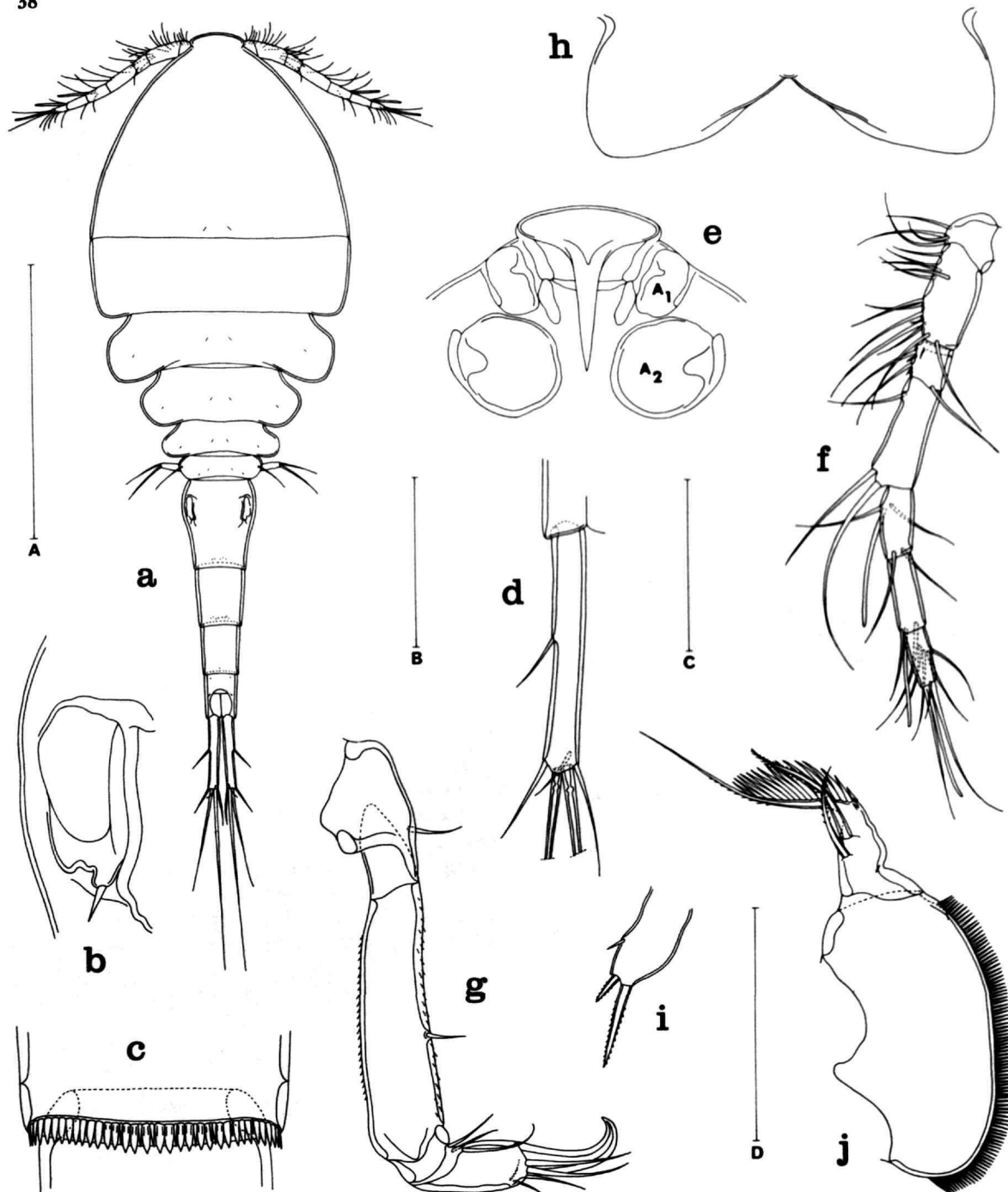


FIGURE 20.—*Herrmannella tiwelae* (Illg). Paratypic female: a, dorsal (A); b, area of attachment of egg sac, dorsal (B); c, posteroventral border of first postgenital segment, ventral (B); d, caudal ramus, ventral (C); e, rostrum, ventral (C); f, first antenna, dorsal (C); g, second antenna, posterior (D); h, labrum, ventral (B); i, first maxilla, anterior (B); j, second maxilla, posterior (B). Scale: A, 0.5 mm; B, 0.05 mm; C, D, 0.1 mm.

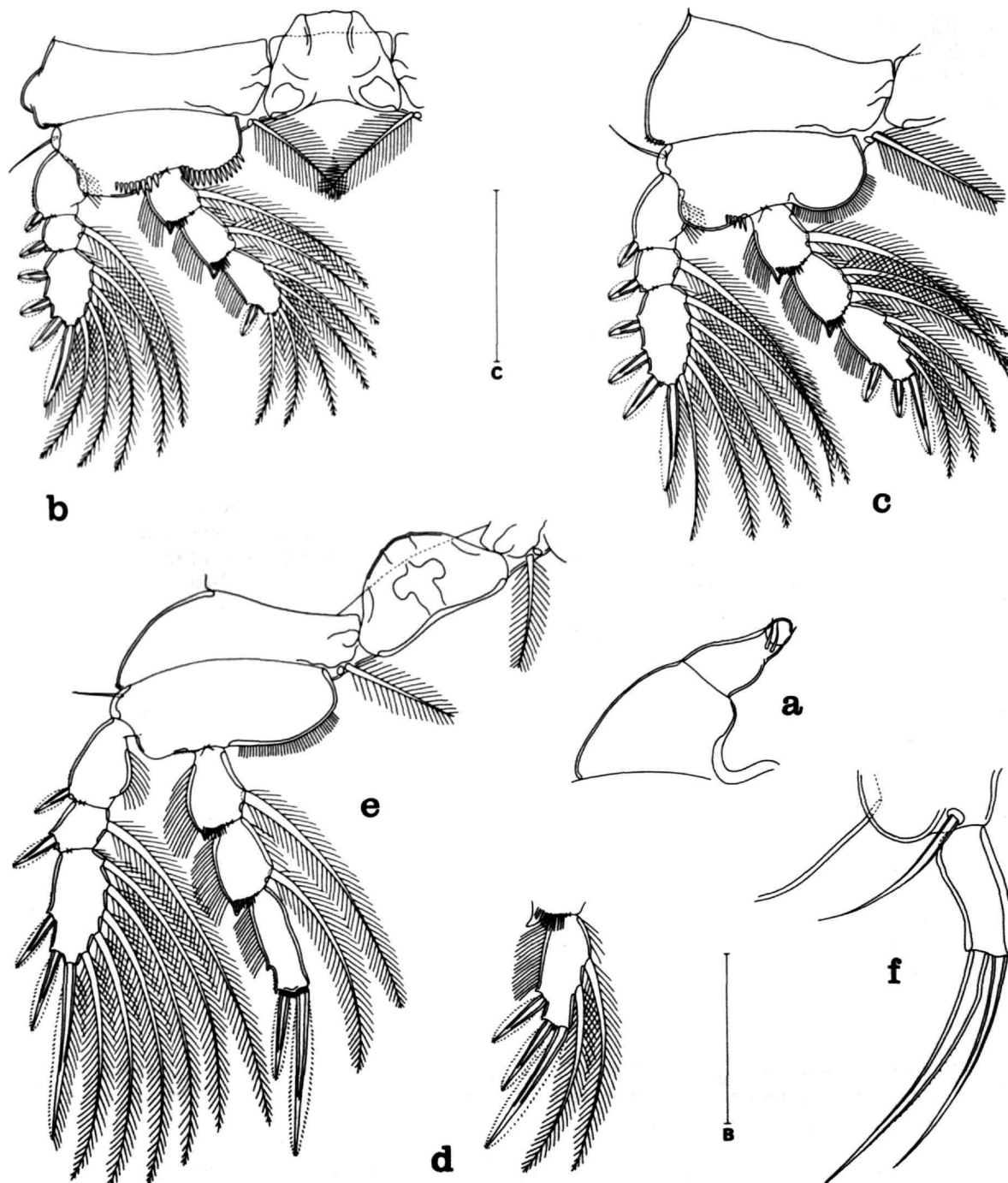


FIGURE 21.—*Herrmannella tivelae* (Illg.). Paratype female: a, maxilliped, posterior (x); b, leg 1 and intercoxal plate, anterior (x); c, leg 2, anterior (x); d, third segment of endopod of leg 3, anterior (x); e, leg 4 and intercoxal plate, anterior (x); f, leg 5, dorsal (x). Scale: a, 0.05 mm; c, 0.1 mm.

the bivalve *Tivela stultorum* Mawe, La Selva Beach, California, 13 July 1943) sent to us by Dr. Paul L. Illg.

FEMALE.—The length of the body (Figure 20a) in lactic acid, excluding the setae on the caudal rami, is 1.29 mm and the greatest width is 0.45 mm. The prosome is only moderately broad, the ratio of the length to the width being 1.63:1. The ratio of the length of the prosome to that of the urosome is 1.26:1.

The genital segment is $174 \times 138 \mu$. The areas of attachment of the egg sacs are located dorso-laterally on the widest part of the segment. Each area (Figure 20b) has a single naked seta 12μ . The three postgenital segments are $104 \times 78 \mu$, $96 \times 63 \mu$, and $81 \times 55 \mu$ from anterior to posterior. The posteroventral borders of the genital segment and the first two postgenital segments bear a row of hyaline spinules (Figure 20c), each about 11μ long, but the posteroventral border of the anal segment is smooth.

The caudal ramus (Figure 20d) is $143 \times 18 \mu$ in greatest dimensions, the ratio of the length to the width being 7.9:1. The two long median terminal setae are 154μ (outer) and 328μ (inner). All six setae are naked.

The rostrum (Figure 20e) has a pointed beak.

The first antenna (Figure 20f) is notable in having the second segment shorter than the fourth. The lengths of the seven segments (measured along their posterior nonsetiferous margins) are: 8 (30 μ along the anterior margin), 46, 26, 55, 35, 42, and 33 μ respectively. The formula for the armature is the same as in *H. saxidomi*. All the setae are naked.

The second antenna (Figure 20g) has small spinules along both outer and inner margins of the second segment. The fourth segment, 48 μ along its outer edge, 25 μ along its inner edge, and 21 μ wide, bears a terminal claw 38 μ along its axis and five setae.

The labrum (Figure 20h), weakly sclerotized and lacking the refractile bosses seen in *H. saxidomi*, has two very divergent posteroventral lobes with hyaline margins.

The mandible and paragnath are the same as in *H. saxidomi*. The first maxilla (Figure 20i) has three elements. The second maxilla (Figure 20j) has a row of long spinules along the convex (ventral) border of the first segment. The maxilliped

(Figure 21a) resembles that of *H. saxidomi*, but the last segment is small and globose rather than attenuated and is smooth except for one minute seta.

Legs 1-4 (Figure 21b-e) have the same spinal and setal formula as in *H. saxidomi* and other species of the genus. The coxa of leg 1 has an outer and slightly posterior protuberance. The coxa of leg 4 has sparser ciliation on the inner seta than in legs 1-3. The inner margin of the basis of leg 1 has a row of broad spinules, but in legs 2-4 these spinules are replaced by hairlike spinules. On the lobe of the basis between the rami in legs 1-3 there are a few stout spinules. In leg 4 such spinules are absent, and instead there is a row of minute spines. The outer distal area of the first and second segments of the endopods of all four legs has a spinous process and an adjacent row of spinules [these being much more slender and hairlike on the second segment of the endopod of leg 3 (Figure 21d) and on the endopod of leg 4 (Figure 21e)]. The last segment of the endopod of leg 4 is $61 \times 20 \mu$ in greatest dimensions and has two small outer spiniform processes. The two terminal fringed spines are 52 μ (outer) and 94 μ (inner).

Leg 5 (Figure 21f) has an unornamented free segment 39 μ long, 17 μ wide proximally and 13 μ wide distally. The two terminal elements are 76 μ (inner) and 68 μ (outer).

Leg 6 is represented by the seta near the attachment of each egg sac.

The color in life is unknown.

Herrmannella valida G. O. Sars, 1918

Herrmannella valida G. O. Sars, 1918, pp. 175, 176, pl. 98 [from Norway].

REMARKS.—The male is unknown.

Genus *Lecanurius* Kossmann, 1877

DIAGNOSIS.—Body modified, elongated, cephalosome broad and triangular. Urosome in the female 5-segmented; in the male 6-segmented. Caudal ramus with six moderately short setae. Rostrum not well defined posteroventrally. First antenna 7-segmented, in both sexes with the formula 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented, with the formula 1, 1, 3 + one large claw, and 7.

Labrum incised medially. Mandible with the base not indented but having distally on its convex edge a blunt process and on its concave side a pointed process; blade bipectinate. Paragnath a small lobe with spinules. First maxilla with four elements. Second maxilla with a short lash about as long as the adjacent seta. Maxilliped in the female 3-segmented with a pointed tip; in the male 4-segmented (taking the proximal part of the claw as a fourth segment).

Legs 1-4 in the female with 3-segmented rami. Leg 4 exopod with the third segment having II,I,5. Leg 4 endopod with the formula 0-1;0-1;I,I,1,1,1. Legs 1-3 in the male having the same formula as

in the female but showing sexual dimorphism in other respects (the endopods of legs 1 and 2 being 2-segmented). Leg 5 in both sexes with a free segment bearing two setae. Leg 6 in the female represented by the two setae near the area of attachment of each egg sac, in the male by the ventral posterolateral flap on the genital segment bearing two setae.

Other features as in the species below.

Lives inside holothurians.

TYPE-SPECIES.—*Lecanurius intestinalis* Kossmann.

REMARKS.—A key to the females has not been prepared because the female of *L. intestinalis* is unknown.

Key to Species of the Genus *Lecanurius*

MALES

Average body length 1.97 mm; cephalosome laterally indented; claw of maxilliped with one pointed prominence	<i>L. kossmannianus</i>
Average body length 1.46 mm; cephalosome approximately semicircular in outline, not indented; claw of maxilliped with two blunt protuberances	<i>L. intestinalis</i>

Lecanurius intestinalis Kossmann, 1877

Lecanurius intestinalis Kossmann, 1877, pp. 20-22, pl. 5, fig. 1 [from the intestine of the holothurian *Muelleria lecanora* Jaeger, Bohol, Philippine Islands].—Changeux, 1961, p. 55.

REMARKS.—The female is unknown.

Lecanurius kossmannianus Humes, 1968

FIGURE 22

Lecanurius kossmannianus Humes, 1968a, pp. 181-190, figs. 1-32 [from the holothurians *Actinopyga lecanora* (Jaeger) and *Actinopyga miliaris* (Quoy and Gaimard), region of Nosy Bé, Madagascar].

Lecanurius sp.

Lecanurius sp., copepodid.—Humes, 1968a, p. 190 [from the holothurian *Synapta maculata* (Chamisso and Eysenhardt), Ambariobe, near Nosy Bé, Madagascar].

REMARKS.—This form has been omitted from the key because of its immaturity.

Genus *Lichomolgidium* Kossmann, 1877

DIAGNOSIS.—Body cyclopiform. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six setae. Rostrum linguiform.

First antenna 7-segmented, in the female with the formula 3, 10, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 6 + 1 aesthete. Second antenna 4-segmented, with the armature 1, 1, 4, and II + 5, the two terminal claws being slender and setiform.

Mandible with the basal area tapering to a broad, fringed blade. First maxilla with three elements. Second maxilla of the usual lichomolgid type except that it lacks the auxiliary lash. Maxilliped in the female 2-segmented with a blunt tip; in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1-4 with 3-segmented rami. Leg 4 exopod with the third segment having II,I,5. Leg 4 endopod with 0-1;0-1;II. Formula for the armature of the typical lichomolgidiform type and similar in both sexes. Leg 5 with a free segment bearing two terminal elements.

Other features as in the species below.

Associated with ascidians.

TYPE-SPECIES.—*Lichomolgidium sardum* Kossmann.

REMARKS.—The genus *Lichomolgidium*, in its present conception, is characterized chiefly by the 3-segmented endopod of leg 4, armed with two elements on its distal segment, and by the absence of an auxiliary lash on the second maxilla.

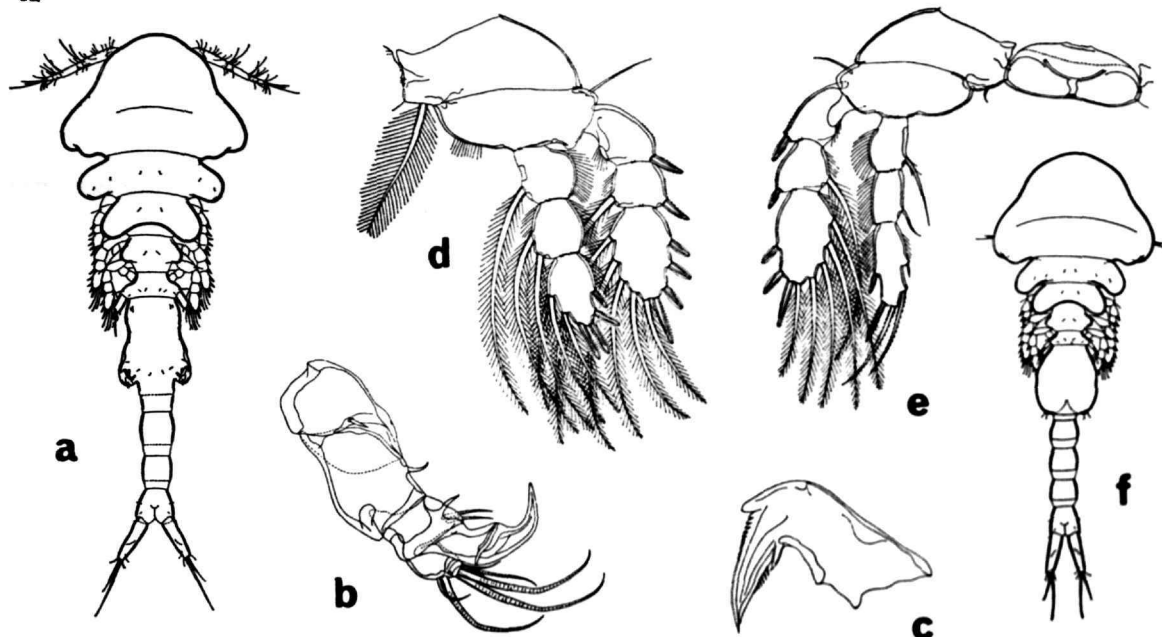


FIGURE 22.—*Lecanurius kossmannianus* Humes. Female: a, dorsal; b, second antenna; c, mandible; d, leg 3; e, leg 4 and intercoxal plate. Male: f, dorsal. (From Humes, 1968a, figs. 1, 9, 11, 20, 22, 24.) Length of female 2.64 mm, of male 1.97 mm.

Key to Species of the Genus *Lichomolgidium*

FEMALES

- Terminal spiniform processes on leg 1 endopod rather strongly developed; leg 4 endopod with the third segment not much tapered or constricted; leg 5 with the free segment $63 \times 45 \mu$ *L. sardum*
- Terminal spiniform processes on leg 1 endopod weakly developed; leg 4 endopod with the third segment constricted and tapered distally; leg 5 with the free segment $68 \times 40 \mu$... *L. cynthiae*

Lichomolgidium sardum Kossmann, 1877

FIGURE 23

Lichomolgidium sardum Kossmann, 1877, pp. 19, 20, pl. 4, fig. 3 [from the ascidian *Cynthia* (=Pyura) *microcosmus* (Savigny), Mediterranean Sea].—Carus, 1885, p. 351.

Although the genus *Lichomolgidium* was described and illustrated in a very superficial way by Kossmann,¹ the host, the locality, and the available

¹ Kossmann (1877, p. 19) himself admitted the "incompleteness" of his description: "Leider kann ich nur eine sehr unvollkommene Darstellung geben, weil ich nur ein Exemplar in la Maddalena selbst unter schwierigen Umständen untersuchen konnte."

descriptive notes indicated in the original publication give us a clue as to which copepod was described as *Lichomolgidium sardum*.

The host was called *Cynthia microcosmus* by Kossmann, a tunicate now known as *Pyura microcosmus* (Savigny, 1816) or as *P. savignyi* (Philippi, 1843). We have examined material from this host from the Mediterranean and the Atlantic as well as from the closely related *Halocynthia papillosa* (Linnaeus, 1758) from the Mediterranean. The copepods from these different hosts and different localities agree with the original description in the more essential details: general structure of the legs (with a 3-segmented endopod in leg 4) and finely

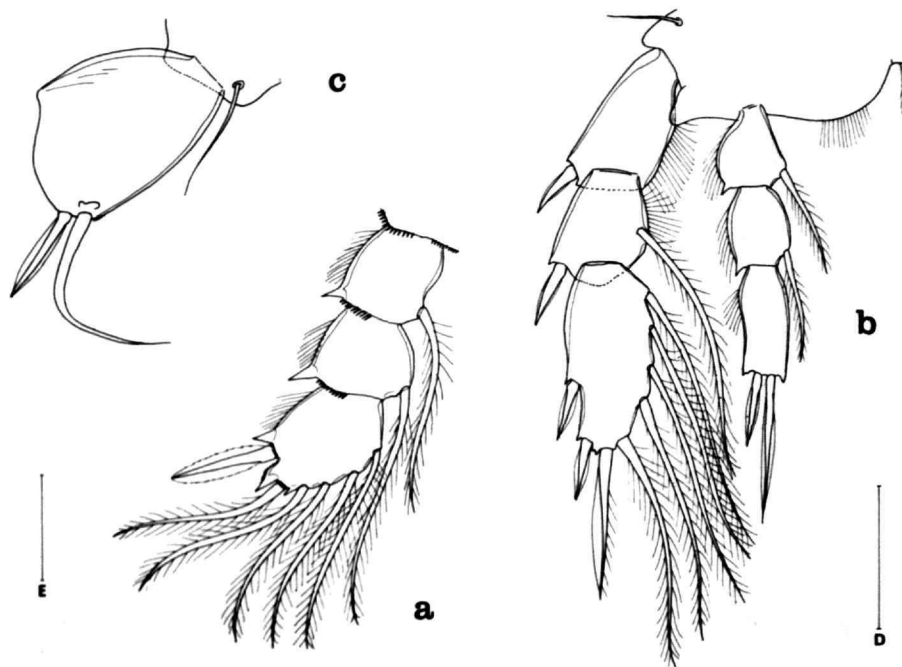


FIGURE 23.—*Lichomolgidium sardum* Kossmann. Female: a, endopod of leg 1 (e); b, leg 4 (e); c, leg 5 (d). Scale: d, e, 0.05 mm.

toothed mandibular blade.² We have ventured, therefore, to consider the correspondence in host and general morphology a sufficient basis to identify our material as *L. sardum* Kossmann.

It appears that *L. sardum* is very similar to a copepod described from the Atlantic Ocean under the name of *Herrmannella cynthiae* Brian (1924; see also Gotto, 1961b). We are in doubt whether the Atlantic material is conspecific with the Mediterranean samples, since a few minor differences exist. The differences are so slight that, although we treat here the Atlantic material as a different species, more detailed studies based on more material from different localities and different hosts are necessary to determine whether the differences found are constant or due to intraspecific variation.

MATERIAL EXAMINED.—1 ♀, 1 ♂, and 1 copepodid from *Pyura microcosmus* (Savigny), at the pier, depth about 10 m, Banyuls, France, 8 August 1962; 4 ♀♀, 4 ♂♂, and 5 copepodids from *Halocyn-*

thia papillosa (Linnaeus), at the pier, depth about 10 m, Banyuls, France, 11 August 1961, both collections made by JHS.

REMARKS.—The material from the Mediterranean mentioned above is so similar to the Atlantic specimens that it suffices to mention the differences. Only three appendages show minor differences, viz., legs 1–3. In the remaining appendages no differences whatsoever have been observed.

Leg 1 differs from the corresponding appendage of *L. cynthiae* in having the spiniform processes on the endopod more strongly developed (Figure 23a). This is especially distinct in the terminal spiniform process. The endopod of leg 4 (Figure 23b) is shorter than in *L. cynthiae*. The distal endopod segment is more cylindrical, less tapered, and less constricted in the middle. The terminal endopod spines are shorter (69 μ and 35 μ , against 75 μ and 50 μ in *L. cynthiae*).

The free segment of leg 5 in the female (Figure 23c) is wider than in *L. cynthiae* (63 x 45 μ , against 68 x 40 μ in *L. cynthiae*).

²It appears to us that Kossmann actually described not the mandible but the lash of the second maxilla.

The body length of *L. sardum* ranges from 1.26–1.42 mm for females and from 0.93–0.97 mm for males.

***Lichomolgidium cynthiae* (Brian, 1924)**

FIGURES 24, 25

Hermannella cynthiae Brian, 1924, pp. 5–7, figs. 1–4 [from ascidians (?*Cynthia*), Mauritania].

Parantheissius cynthiae.—Gotto, 1961b, pp. 88–91, fig. 2a–1 [from the pharynx of the ascidian *Styela clava* Herdman (= *S. mammiculata* Carlisle), Plymouth, England].

MATERIAL EXAMINED.—1 ♀, 1 ♂ from *Pyura microcosmus*, Roscoff, France, 1961 (gift of C. Monniot); 2 copepodids from *Pyura* sp., dredged in about 25 m, Chateau du Taureau, Baie de Morlaix, France, 23 August 1954, collected by JHS.

FEMALE.—The length of the body is 1.51 mm. The general shape has been illustrated adequately by Gotto (1961b, fig. 2a). [Only minor additions to Gotto's description and illustrations of the appendages are necessary. The mandible and first maxilla, not mentioned in his paper, are described here, and the sexual dimorphism found in the male is treated.]

The ventral surfaces of urosomal segments 2–4 are armed at their posterior margins with a row of small cuticular spinules (Figure 24a). Still smaller spinules are present on the posterior margin of the fifth urosomal segment (anal). The caudal rami are as described by Gotto.

The rostrum (Figure 24b) is elongated and tongue-shaped.

The first antenna (Figure 24b) is 7-segmented. The armature of the segments is as follows: 3, 9 + 1 spinule, 3 + 3 spinules, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 6 + 1 aesthete. The second antenna (Figure 24c) agrees with Gotto's account.

The mandible (Figure 24d) has a broad basal portion tapering gradually into a medium-long lash, armed on both sides with a hyaline, finely denticulated fringe. The fringe on the lateral (concave) side of the lash is very transparent and hardly visible by normal light microscopy; it shows up very clearly, however, by the use of phase contrast.

The first maxilla (Figure 24d) is a tapering lobe, armed with one terminal and one subterminal spine and with a short lateral seta. The second maxilla (Figure 24e) is remarkable in that it lacks an auxiliary lash. Thus, the second segment is

armed only with a subbasal smooth spine and a medium-long apical lash, which has a hyaline, sharply toothed medial margin and a smooth lateral margin.

The maxilliped (Figure 24f) shows up differently in different positions. It is 2-segmented, with the distal segment bearing two setae and having a finely spinulose tip.

Legs 1–4 are as illustrated in Figures 24g, 25a–c. The exopod of leg 3 is similar to that of leg 2. The third segment of the exopod of leg 4 has the armature II, I, 5. The formula of the endopod of leg 4 is 0–1; 0–1; II, the two terminal spines being 75 and 50 μ in length.

Leg 5 (Figure 25d) has an ovate free segment 68 μ long and 40 μ in greatest width, medially produced into an obtuse projection.

Leg 6 is represented by the two short, wide spinules near the genital openings.

MALE.—The length of the body is 1.06 mm. The only male appendages that show marked sexual dimorphism are the maxilliped and leg 5. The maxilliped (Figure 25e) has two large proximal segments, the second of which is armed with two spines and ornamented with numerous small cuticular spinules. The third segment is small and unarmed. The fourth segment is probably represented by the proximal part of the long, strongly recurved terminal claw with a short basal setule.

Leg 5 (Figure 25f) is not widened as in the female. Its median margin has a shallow notch. Distally the segment bears a flat short spine and a long seta.

Genus *Lichothuria* Stock, 1968

DIAGNOSIS.—Body modified, elongated and slender. Urosome in the female 5-segmented; in the male 6-segmented. Caudal ramus with six setae. Rostrum weakly developed. First antenna 7-segmented, in both sexes the formula being 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented, with the armature 1, 1, 3 + one claw, and 6 (three of these setae being jointed and clawlike).

Labrum with a shallow posteroventral indentation. Mandible composed of a basal part and a distal bipectinate blade at the junction of which on the convex side there is a large spinelike element. Paragnath a small hairy lobe. First maxilla

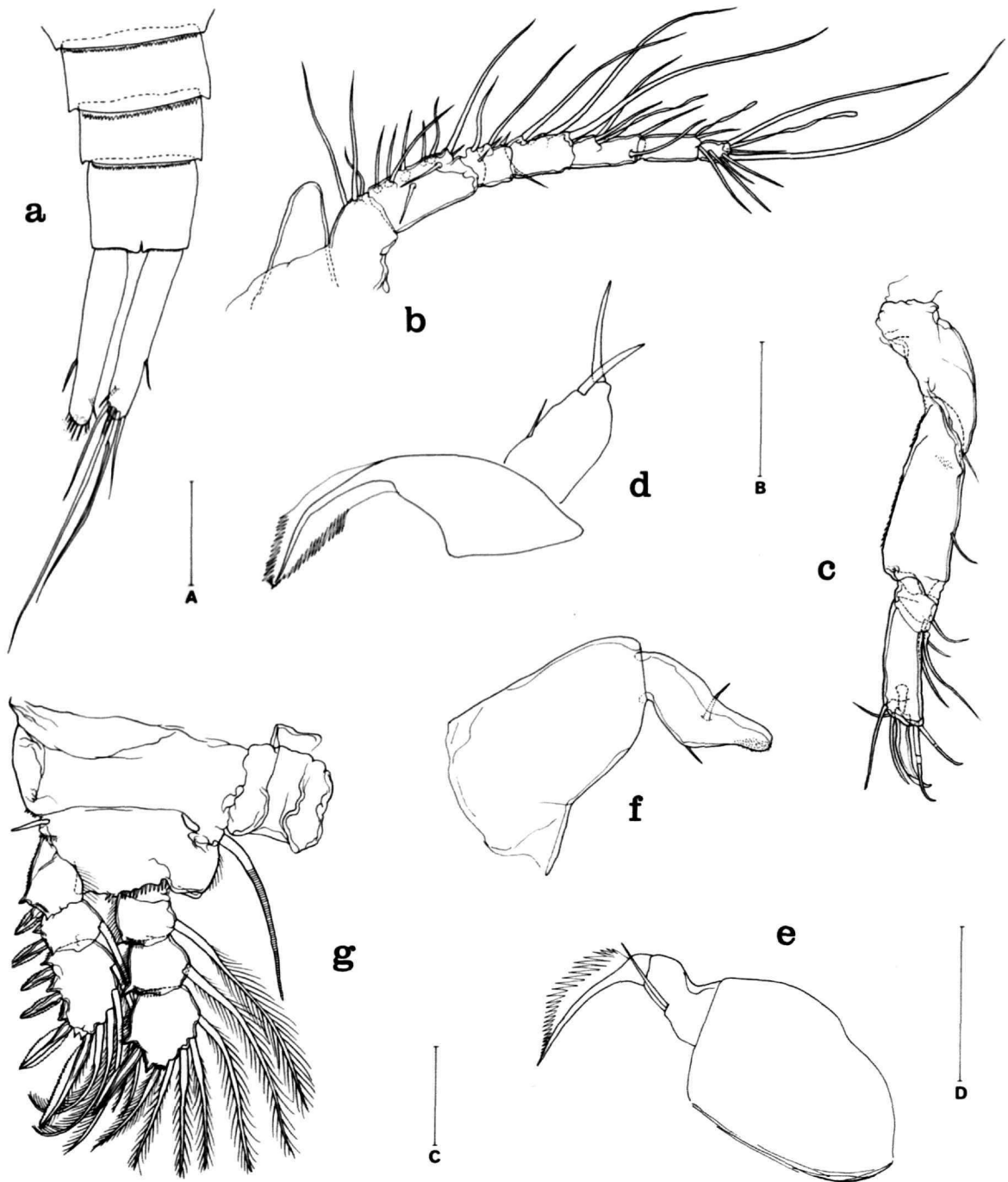


FIGURE 24.—*Lichomolgidium cynthiae* (Brian). Female: a, three posterior urosomal segments and caudal rami, ventral (A); b, first antenna and rostrum (B); c, second antenna (B); d, mandible and first maxilla (B); e, second maxilla (D); f, maxilliped (D); g, leg 1 and intercoxal plate (B). Scale: A, B, 0.1 mm; C, 0.02 mm; D, 0.05 mm.

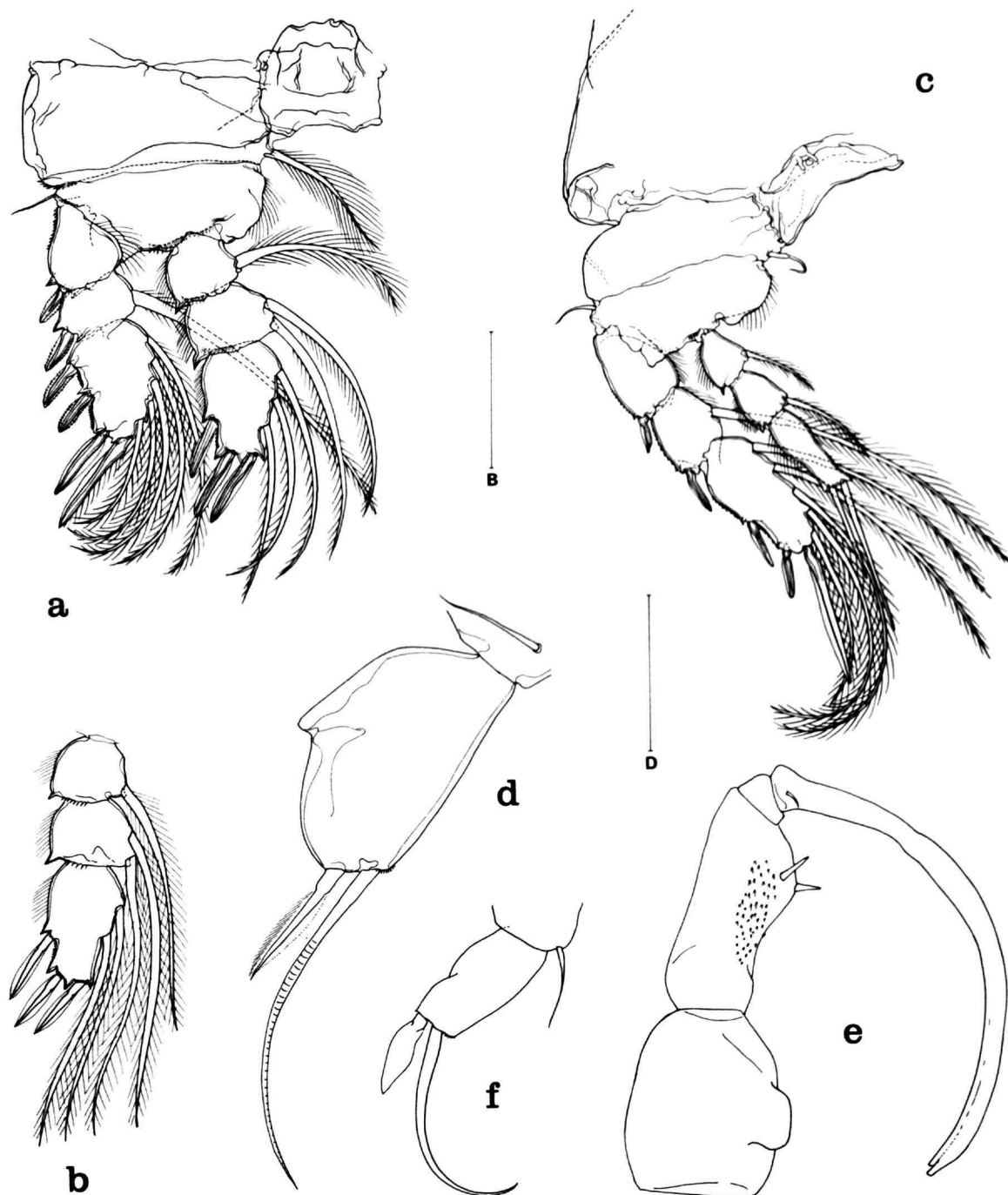


FIGURE 25.—*Lichomolgidium cynthiae* (Brian). Female: a, leg 2 and intercoxal plate (B); b, endopod of leg 3 (B); c, leg 4 and intercoxal plate (B); d, leg 5 (D). Male: e, maxilliped (D); f, leg 5 (D). Scale: B, 0.1 mm; D, 0.05 mm.

with two setae. Second maxilla of the usual lichomolgoid type. Maxilliped of the female 3-segmented with a pointed tip; in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1-4 in the female with 3-segmented rami; in the male with 3-segmented exopods but 2-segmented endopods. Leg 4 endopods in the female with the formula 0-1;0-1;II,1; in the male with 0-1;II,1,1. Leg 1 endopod with the same formula in both sexes. Leg 5 in both sexes with a free segment bearing two elements. Leg 6 represented in the female by the two setae and the spiniform process near the area of attachment of each egg sac; in the male by the ventral posterolateral flap on the genital segment bearing two setae.

Other features as in the species below.

Endoparasitic in holothurians.

TYPE-SPECIES.—*Lichothuria mandibularis* Stock.

Lichothuria mandibularis Stock, 1968

FIGURE 26

Lichothuria mandibularis Stock, 1968, pp. 95-96, figs. 4-6 [from the holothurian *Halodeima atra* (Jaeger), Eilat, Gulf of Aqaba, Israel].—Humes and Ho, 1969b, pp. 889-894, figs. 57-82 [from the holothurians *Holothuria scabra* Jaeger, *Holothuria* aff. *fuscopunctata* Semper, *Argiodia nobilis* (Selenka), and *Ludwigothuria* (= *Halodeima*) *atra* (Jaeger), region of Nosy Bé, Madagascar].

Genus *Modiolicola* Aurivillius, 1882

DIAGNOSIS.—Body cyclopiform. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six setae. Rostrum rounded posteroventrally. First antenna 7-segmented, with the armature 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete (or 3 + 2 aes-

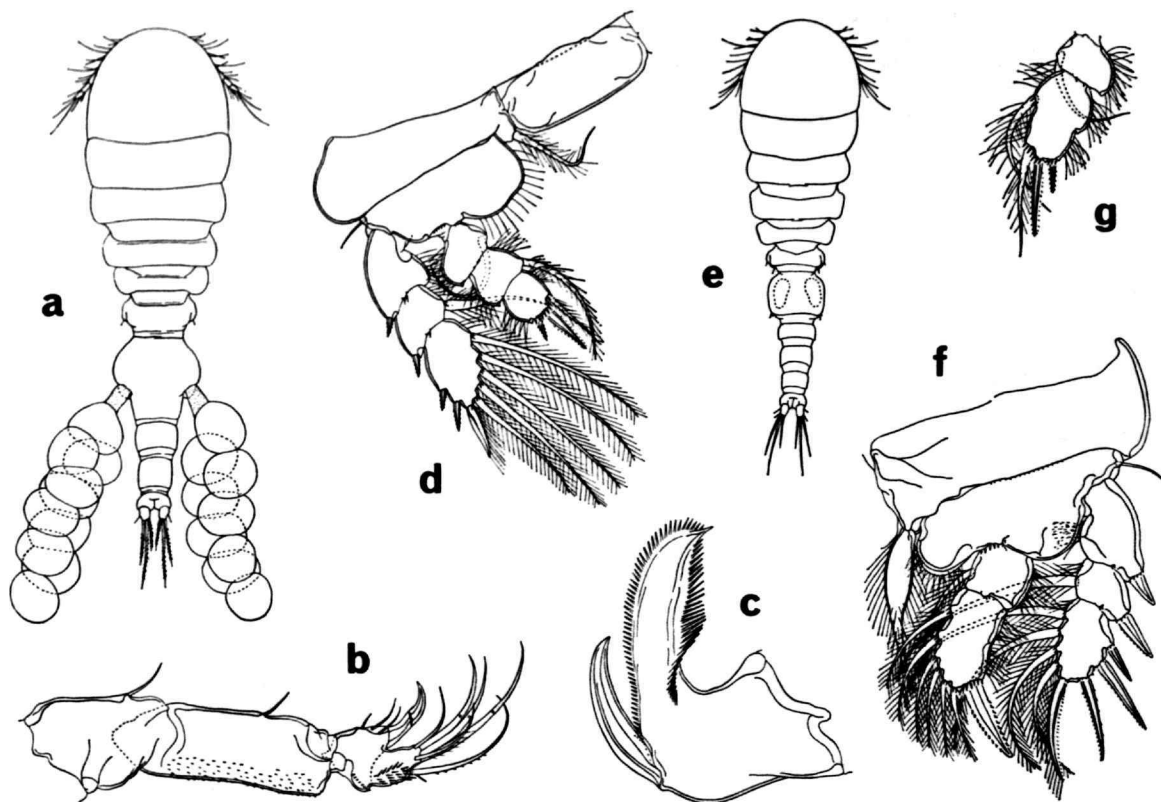


FIGURE 26.—*Lichothuria mandibularis* Stock. Female: a, dorsal; b, second antenna; c, mandible; d, leg 4 and intercoxal plate. Male: e, dorsal; f, leg 1; g, endopod of leg 4. (From Humes and Ho, 1969b, figs. 57, 63, 64, 73, 75, 78, 81.) Length of female 1.61 mm, of male 1.32 mm.

thetes), 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented, with the formula 1, 1, 3, and three terminal claws + four setae.

Labrum incised medially. Mandible with a slender base which, distal to the slight indentation, has on its concave side a row of long spinules and on its convex side a row of spinules; lash long and pectinate. Paragnath a small hairy lobe. First maxilla with four elements. Second maxilla of the usual lichomolgid type, but the auxiliary lash short and naked. Maxilliped in the female 3-segmented, the third segment small, the setae vestigial; in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1-4 with 3-segmented rami. Leg 3 endopod with the third segment having II,II,2 or I,III,2. Leg 4 exopod with the third segment having II,I,5. Leg 4 endopod with the formula 0-1;0-1;II. Leg 5 with a free segment bearing two terminal elements. Leg 6 represented by two setae near the genital openings.

Other features as in the species below.

Associated with bivalve mollusks.

TYPE-SPECIES.—*Modiolicola insignis* Aurivillius.

REMARKS.—Detailed information on which to construct a key for the males is not available, but in general the following key to females will serve for males also, allowing for somewhat smaller body sizes.

Key to Species of the Genus *Modiolicola*

FEMALES

1. Second antenna slender with very short setae (easily overlooked) on one or both of first and second segments 2
 Second antenna robust with conspicuous setae on both first and second segments 3
2. Caudal ramus 2.58:1; spinules on concave side of base of mandible of one thickness, but longest at either end of row *M. insignis*
 Caudal ramus 4.2:1; spinules on concave side of base of mandible of two thicknesses, proximal group slender, distal group stout *M. gracilis*
3. Caudal ramus distinctly less than 9:1 4
 Caudal ramus clearly more than 9:1 5
4. Caudal ramus 5:1; body length 1.45-1.48 mm *M. bifidus*
 Caudal ramus 6:1; body length 0.83 mm *M. trabalis*
5. Body length 1.90 mm; concave side of base of mandible with about 19 spinules of two sizes; caudal ramus 11.9:1 *M. inermis*
 Body length 2.40 mm; concave side of base of mandible with 9-11 spinules of one size; caudal ramus 11:1 *M. maximus*

Modiolicola insignis Aurivillius, 1882

FIGURE 27

Modiolicola insignis Aurivillius, 1882a, pp. 40-44, pl. 6, figs. 1-10 [from the gill lamellae of the bivalve *Modiola vulgaris* Linnaeus, Gullmarsfjord, Bohuslän, Sweden]; 1882b, pp. 43-48, pl. 13, figs. 1-8 [from the bivalves *Modiola vulgaris* and *Mytilus edulis* Linnaeus, Bohuslän]; 1883, pp. 10-14, pl. 2, figs. 1-10 [from *Modiola vulgaris*, Gullmarsfjorden, Bohuslän, pp. 39-44, pl. 4, figs. 1-8 [from *Modiola vulgaris* and *Mytilus edulis*, Bohuslän].—Canu, 1891a, p. 482 [from the bivalve *Modiola modiolus*, between Le Varne and Le Colbart, northern France]; 1892, pp. 238-240, pl. 24, figs. 14-26 [from *Modiola modiolus*, between Le Varne and Le Colbart, in the middle of the straits at Pas-de-Calais, France]; 1899, p. 73.—T. Scott, 1893, pp. 207-209, pl. 4, figs. 13-24 [from the bivalve *Mytilus modiolus*, Scotland]; 1894b, p. 233; 1905, p. 207 [from *Mytilus modiolus* (= *Modiola modiolus*), Scotland]; 1906, p. 354 [from *Mytilus*

modiolus, Firth of Forth, Scotland].—Herdman, 1896, pp. 42, 44 [in washings of dredged material, Port Erin, England].—A. Scott, 1896a, p. 153 [from *Mytilus modiolus*, England]; 1896b, p. 78 [from *Mytilus modiolus*, Liverpool Bay, England].—G. O. Sars, 1918, pp. 173, 174, pl. 97 [from *Modiola modiolus*, Norway].—Monod and Dollfus, 1932a, p. 152 [from *Modiolus modiolus* (Linnaeus), *Mytilus edulis* Linnaeus, and *Mytilus galloprovincialis* Lamarck].—Stock and de Vos, 1960, p. 206 [from *Mytilus edulis*, The Netherlands].—Bresciani and Lutzen, 1962, p. 377.—Bruce, Colman, and Jones, 1963, p. 128 [from *Modiolus modiolus*, Isle of Man, England].—Porumb and Andriescu, 1964, pp. 94, 95, figs. 1-19 [from *Mytilus galloprovincialis* Lamarck, Black Sea].—Stock, 1964a, p. 67.

Modiolicola insignis.—T. Scott, 1894b, p. 259.

Modiocola insignis.—Marcus, 1970, p. 10.

Lichomolgus insignis.—Raffaele and Monticelli, 1885, pp. 302-307, figs. 13-16 [from the bivalve *Mytilus galloprovincialis* Lamarck, Naples, Italy].

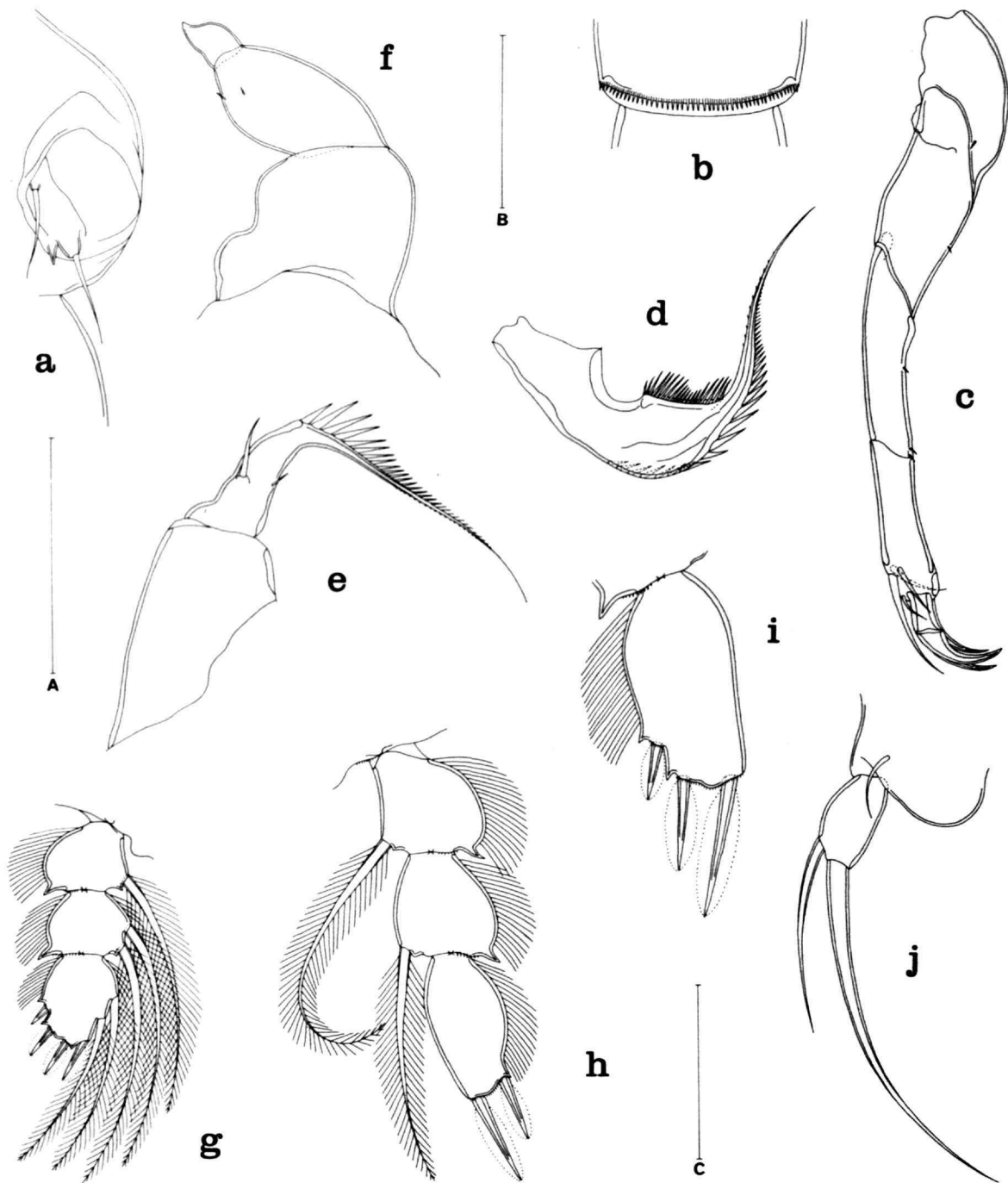


FIGURE 27.—*Modiolicola insignis* Aurivillius. Female: *a*, area of attachment of egg sac, dorso-lateral (A); *b*, posterior border of first postgenital segment, ventral (A); *c*, second antenna, anterior (inner) (A); *d*, mandible, anterior (B); *e*, second maxilla, posterior (B); *f*, maxilliped, inner (B); *g*, endopod of leg 3, anterior (C); *h*, endopod of leg 4, anterior (A); *i*, abnormal third segment of endopod of leg 4, anterior (B); *j*, leg 5, dorsal (B). Scale: A, C, 0.1 mm; B, 0.05 mm.

The descriptions and figures of this species given by Canu (1892) and Sars (1918) are reliable in most respects. There are, however, a few details which need correction or addition. In the brief notes below we attempt to provide this information. Our observations and drawings are based on a single female from *Modiolus barbatus*. No males were available to us at the time of the study.

MATERIAL EXAMINED.—From *Modiolus barbatus* (Linnaeus): 2 ♀♀, 1 copepodid, Pte. du Binde, Rade de Brest, France, 30 September 1955; 2 ♀♀, Pte. du Binde, Rade de Brest, 26 March 1956, collected by JHS.

FEMALE.—The dimensions of the body (without the ramal setae) are 1.56 x 0.49 mm (measurements of a single specimen in lactic acid). The area of attachment of each egg sac (Figure 27a) bears two long slender setae, 36 μ and 38 μ , with a spiniform process between them. The posteroventral edges of the genital segment and the first two postgenital segments bear a fringe of small spines (as in Figure 27b).

The caudal ramus is 62 x 24 μ in greatest dimensions, or 2.58:1.

The lengths of the seven first antennal segments are 17 (39 μ measured along the anterior edge), 78, 22, 41, 48, 40, and 21 μ respectively.

The second antenna (Figure 27c) has the usual armature, contrary to the figures of both Canu and Sars. The single seta on the first and second segments and the three setae on the third segment are extremely small (approximately 2.5 μ long), and visible only with very high magnification (oil immersion objective). The fourth segment bears three jointed claws, the longest 44 μ along its axis, and four setae. The segment is 67 μ along its outer edge, 56 μ along its inner edge, and 16 μ wide at the middle.

The mandible (Figure 27d) has the row of spinules on its concave side, at either end, composed of spinules longer and stouter than in the middle of the row.

The second maxilla (Figure 27e) has on the second segment a very small setule near the outer (ventral) margin, a superficial posterior naked seta, and a small naked seta on the inner margin (rather difficult to see in some cases). The lash is of the usual type.

The maxilliped (Figure 27f) is 3-segmented, with two minute setae on the second segment.

The four spines on the last segment of the endopod of leg 3 (Figure 27g) are 13, 20, 22, and 38 μ from outer to inner. The endopod of leg 4 is shown in Figure 27h. The right endopod in this female had, abnormally, three spines (Figure 27i) instead of two.

Leg 5 (Figure 27j) has an unornamented free segment (25 x 15 μ) bearing two unequal naked terminal elements (52 μ and 99 μ).

REMARKS.—*M. insignis* may be recognized by the rows of small spines on the posteroventral borders of the postgenital segments (segments 1, 2 in the female, 1–3 in the male) and by the reduction of the armature of the second antenna. The mandible is distinctive in the nature of the spinules on the concave margin.

Modiolicola bifidus Tanaka, 1961

Modiolicola bifidus Tanaka, 1961, pp. 266–269, pl. 32, figs. 6–11, pl. 33, figs. 1–12, pl. 34, figs. 1–9, pl. 35, figs. 1–10 [from the mantle cavity of the bivalve *Paphia*, Sasebo Bay, Japan; misspelled as *Modiloicola*.]

Modiolicola bifida.—Kô, 1969a, p. 5; 1969b, pp. 83, 84, 86, 90, 91 [from *Tapes japonica*, Sasebo Bay, Japan].

Paranthesius sp. ?—Kô, Murakami, and Daidu, 1962, pp. 114, 116 [from the bivalves *Tapes japonica* Deshayes and *Macatra sulcataria* Reeve, Japan].

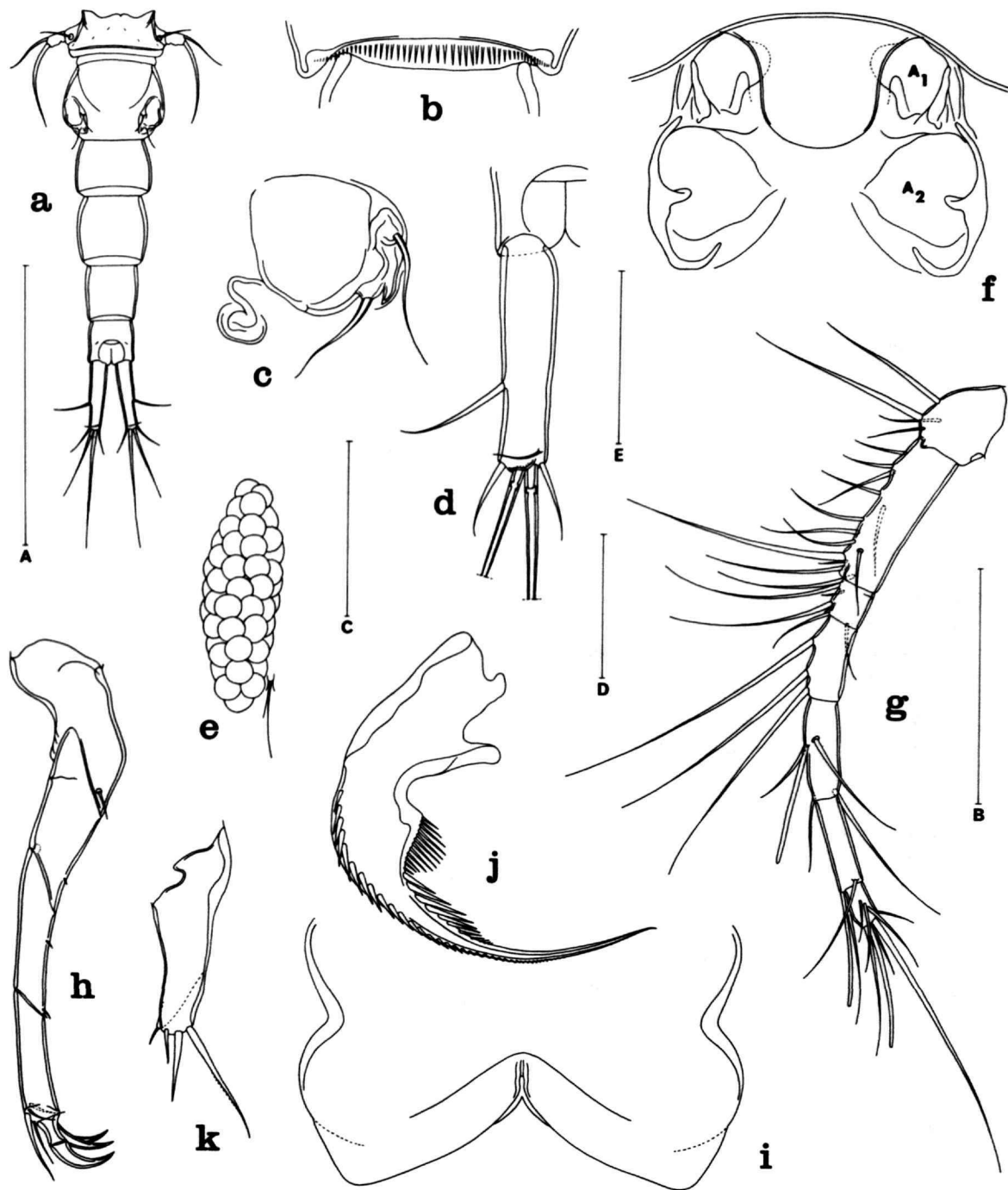
Modiolicola gracilis C. B. Wilson, 1935

FIGURES 28–30

Modiolicola gracilis C. B. Wilson, 1935, pp. 781–782, pl. 25, figs. 8–12 [from the gill filaments of the bivalve *Mytilus californianus* Conrad, Elkhorn Slough, Monterey Bay, California; host erroneously reported by Wilson as *Mytilus edulis* Linnaeus, but see below].—MacGinitie and MacGinitie, 1949, p. 257.—Ricketts and Calvin, 1952, p. 205.

MATERIAL EXAMINED (all from *Mytilus californianus* Conrad).—19 ♀♀, 2 ♂♂, Hopkins Marine Station, Pacific Grove, California, 7 November 1942, collected by P. L. Illg; 3 ♀♀, 2 ♂♂, Bodega Bay, California, 23 January 1944, collected by K. A. Hok; 5 ♀♀, 2 ♂♂, two miles north of Montara, San Mateo County, California, 25 October 1942, collected by P. L. Illg.

Although Wilson's type specimens were reported from *Mytilus edulis*, this represents an error in labeling; the correct host is *Mytilus californianus*, fide P. L. Illg.



length, dorsal (b); f, rostrum, ventral (c); g, first antenna, ventral (c); h, second antenna, anterior (inner) (c); i, labrum, ventral (c); j, mandible, posterior (e); k, first maxilla, anterior (e). Scale: A, D, 0.5 mm; B, C, 0.1 mm; E, 0.05 mm.

The male of this species is here described for the first time.

FEMALE.—The average size is 1.47 x 0.52 mm, based on five females in lactic acid. The form of the body is like that in Wilson's figure 8 of plate 25. The segment of leg 5 (Figure 28a) is 104 x 174 μ . The genital segment is distinctly bipartite, the anterior part 120 x 174 μ , the posterior part 101 x 130 μ . The three postgenital segments are 112 x 109 μ , 101 x 86 μ , and 68 x 78 μ from anterior to posterior. The posteroventral borders of the genital segment (posterior part) and of the first two postgenital segments bear a row of fairly strong spines (Figure 28b) somewhat resembling those in *M. insignis*. The anal segment has a posteroventral row of very small spinules on each side. The areas of attachment of the egg sacs are situated dorso-laterally and posteriorly on the anterior section of the genital segment. Each area (Figure 28c) bears two long setae with a small spiniform process between them.

The caudal ramus (Figure 28d) is 130 x 31 μ . The outer lateral seta is 59 μ , the dorsal seta 23 μ , the outermost terminal seta 43 μ , and the innermost terminal seta 40 μ . The two long median terminal setae are 120 μ (outer) and 250 μ (inner), both inserted between very short and unornamented dorsal and ventral flaps.

The egg sac (Figure 28e) is elongated, 750–790 x 264 μ , reaches a little beyond the caudal rami, and contains many eggs each about 85 μ in diameter.

The rostrum (Figure 28f) is broadly rounded posteroventrally.

The first antenna (Figure 28g) is 312 μ long. The lengths of the seven segments (measured along their posterior nonsetiferous margins) are 18 (51 μ along the anterior margin), 86, 22, 31, 50, 48, and 24 μ respectively. The formula for the armature is the same as in *M. maximus*. All the setae are naked.

The second antenna (Figure 28h) resembles in its general form that of *M. insignis*. The setae on the first three segments are short; the seta on the first segment is 19 μ and the one on the second segment is 4.5 μ ; and the three setae on the third segment are 6, 8, and 4 μ . The fourth segment, which is 66 μ along its outer edge, 56 μ along its inner edge, and 17 μ wide, bears three claws (the

largest 40 μ along its axis) and four setae. All the elements are naked.

The labrum (Figure 28i) has two broad posteroventral lobes.

The mandible (Figure 28j) is similar in many ways to that of *M. insignis*, but the spinules on the concave edge, though similarly ranged in two groups according to length, are of two sizes—the proximal group slender, the distal group stout. The paragnath is a small lobe with hairs as in other species in the genus. The first maxilla (Figure 28k) has four elements, the longest very finely barbed along one edge. The second maxilla (Figure 29a) resembles that of *M. insignis*. The maxilliped (Figure 29b) has the second segment more elongated than in *M. insignis*, with apparently only one small seta on this segment instead of two as in that species.

The ventral area between the maxillipeds and the first pair of legs is slightly protuberant.

Legs 1–4 (Figures 29c–f) have the same segmentation and armature as in *M. maximus*, *M. inermis*, and *M. insignis*. (The formula given by Wilson erroneously includes both spiniform processes and articulated spines.) The four spines on the last segment of the endopod of leg 3 are 19, 32, 50, and 58 μ from outer to inner. The inner seta on the coxa of leg 4 is only 22 μ and naked, instead of long and feathered as in legs 1–3. The two spines on the last segment of the endopod are 38 μ and 77 μ .

Leg 5 (Figure 29g) has an unornamented free segment 34 x 19 μ , armed terminally with a large seta, 140 μ , bearing a narrow fringe along one edge and with a more slender, delicately feathered seta, 72 μ . The adjacent seta on the body is 55 μ and lightly feathered.

Leg 6 is probably represented by the two setae near the attachment of each egg sac (Figure 28c).

MALE.—The size is 1.08 x 0.34 mm, based on two males in lactic acid. The body (Figure 30a) is similar in general form to that of the female. The ratio of the length to the width of the prosome is 1.64:1. The ratio of the length of the prosome to that of the urosome is 1.07:1.

The segment of leg 5 is 60 x 143 μ . The genital segment is 190 x 213 μ . The four postgenital segments are 75 x 120 μ , 81 x 91 μ , 75 x 74 μ , and 64 x 67 μ from anterior to posterior, ornamented as in the female.

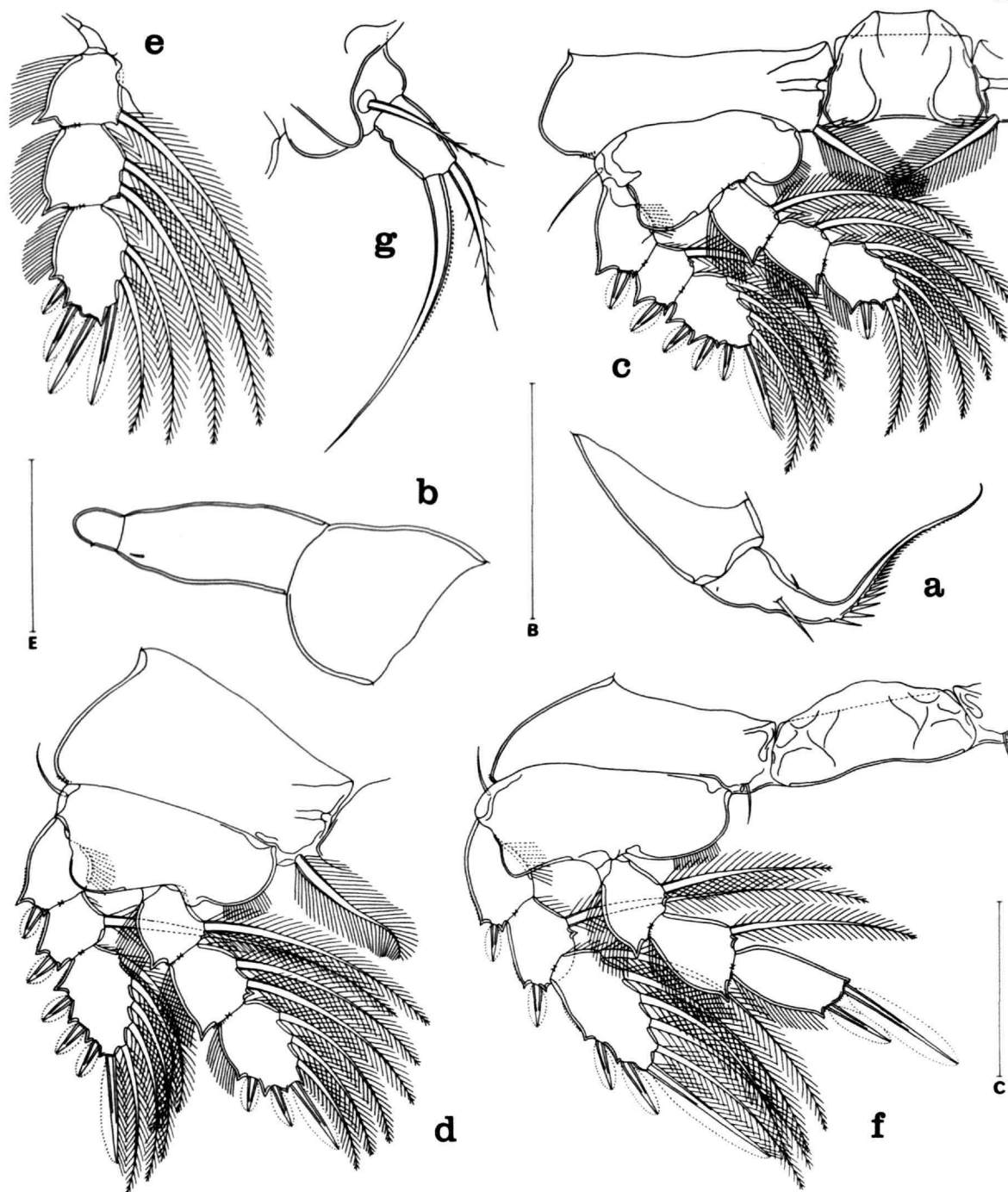


FIGURE 29.—*Modiolicola gracilis* C. B. Wilson. Female: *a*, second maxilla, posterior (B); *b*, maxilliped, inner (E); *c*, leg 1 and intercoxal plate, anterior (C); *d*, leg 2, anterior (C); *e*, endopod of leg 3, anterior (C); *f*, leg 4 and intercoxal plate, anterior (C); *g*, leg 5, dorsal (B). Scale: B, C, 0.1 mm; E, 0.05 mm.

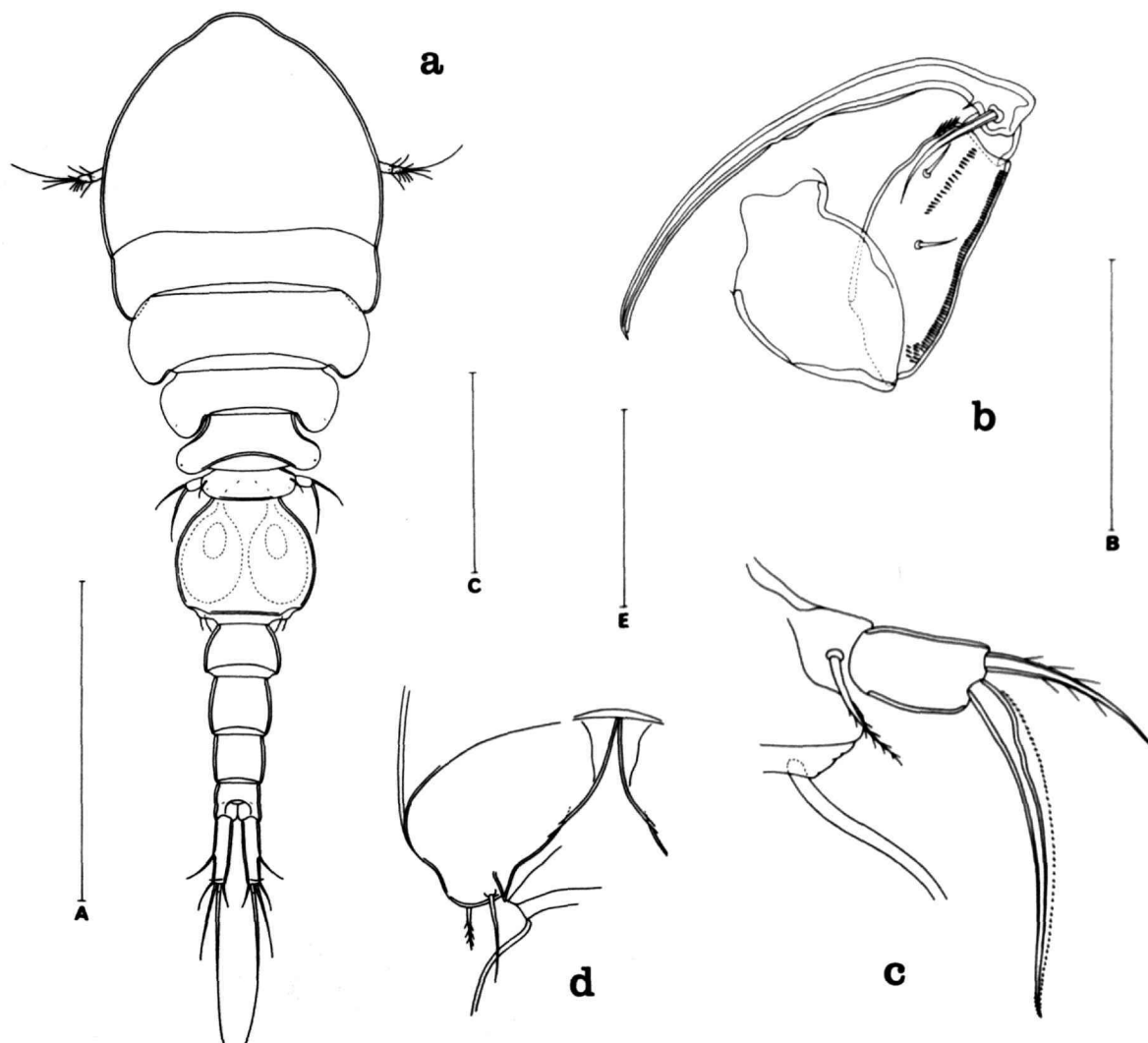


FIGURE 30.—*Modiolicola gracilis* C. B. Wilson. Male: *a*, dorsal (A); *b*, maxilliped, inner (B); *c*, leg 5, dorsal (E); *d*, leg 6, ventral (C). Scale: A, 0.5 mm; B, C, 0.1 mm; E, 0.05 mm.

The caudal ramus is similar to that of the female, but smaller, $106 \times 29 \mu$.

The rostrum resembles that of the female.

The first antenna is similar to that of the female, but two aesthetes are added on the second segment and one on the fourth segment, so that the formula is 4, $13 + 2$ aesthetes, 6, $3 + 1$ aesthete, $4 + 1$ aesthete, $2 + 1$ aesthete, and $7 + 1$ aesthete.

The second antenna, labrum, mandible, paragnath, first maxilla, and second maxilla are like those in the female.

The maxilliped (Figure 30*b*) has two setae and three rows of spinules on the second segment. The claw is 164μ along its axis and bears proximally two very unequal setae.

The ventral area between the maxillipeds and the first pair of legs is similar to that in the female.

Legs 1-4 are like those of the female, with no observed sexual dimorphism in armature or ornamentation.

Leg 5 (Figure 30c) has an unornamented free segment ($32 \times 18 \mu$) with the larger terminal seta (83μ) having a conspicuous fringe and the smaller terminal seta measuring 52μ .

Leg 6 (Figure 30d) is a posteroventral flap on the genital segment having a plumose seta (23μ), a naked seta (42μ), and a spiniform process.

The spermatophore was not observed.

REMARKS.—This species seems to be more closely related to *M. insignis* than to other species of *Modiolicola*. This affinity is indicated by similari-

ties in the second antenna, the division of the genital segment in the female, and the mandible.

Modiolicola inermis Canu, 1892

FIGURE 31

Modiolicola inermis Canu, 1892, pp. 240, 241, fig. 19 [from the bivalve *Pecten opercularis* Linnaeus, Channel coast of France]; 1894a, pp. 10-14 [from the bivalves *Pecten maximus* Linnaeus and *Pecten opercularis* Linnaeus, Channel coast of France; specimens from *Pecten maximus* probably are *Modiolicola maximus*; see Reddiah and Williamson, 1959, and below]; 1899, p. 74.—T. Scott, 1905, p. 207.—Monod and Dollfus, 1932a, pp. 152, 153 [from *Chlamys (Aequipecten) opercularis* (Linnaeus) and *Pecten maxi-*

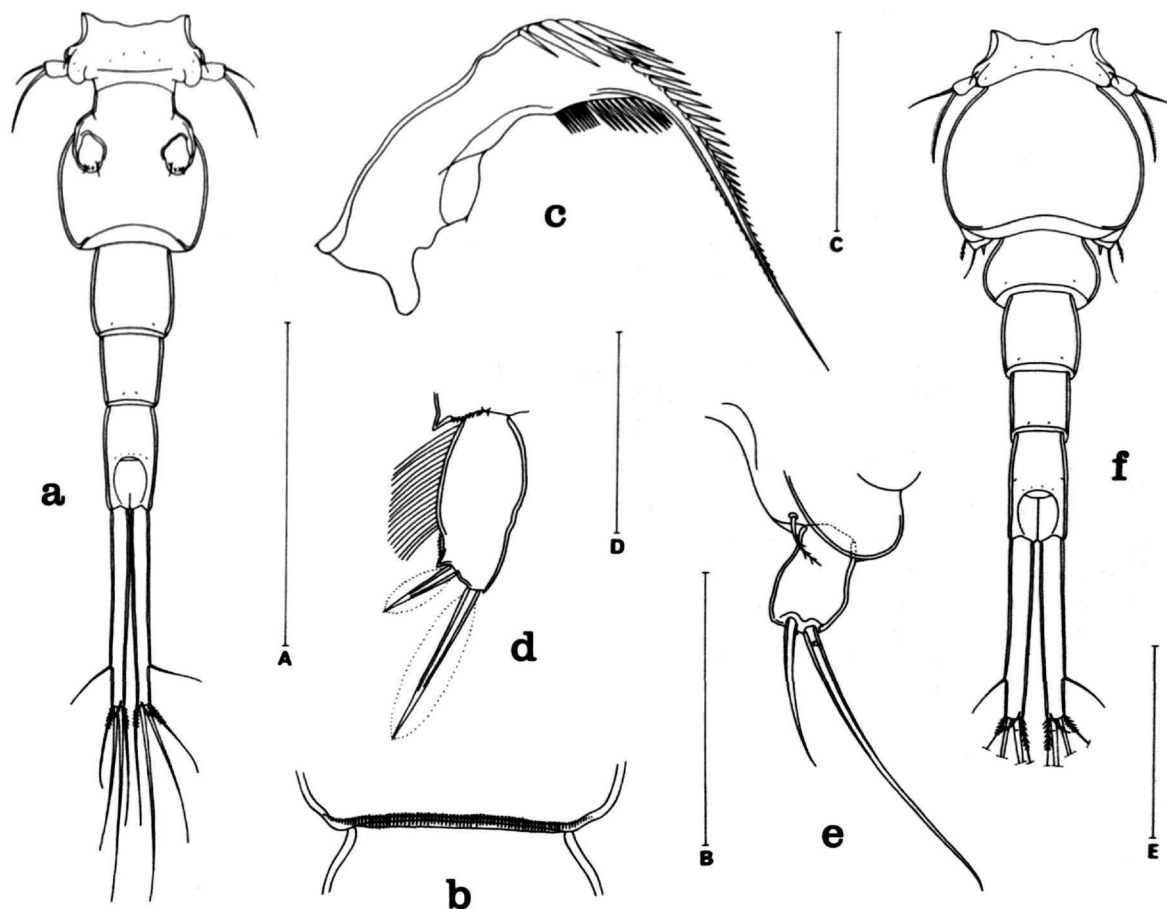


FIGURE 31.—*Modiolicola inermis* Canu. Female: a, urosome, dorsal (A); b, posterior border of first postgenital segment, ventral (B); c, mandible, posterior (C); d, third segment of endopod of leg 4, anterior (D); e, leg 5, dorsal (E). Male: f, urosome, dorsal (E). Scale: A, 0.5 mm; B, D, 0.1 mm; C, 0.05 mm; E, 0.2 mm.

- mus* (Linnaeus)].—Leigh-Sharpe, 1935, pp. 47, 48 [from the mantle cavity of *Chlamys (Aequipecten) opercularis* and *Pecten maximus*, England; specimens from *Pecten maximus* probably are *Modiolicola maximus*, see below].—Reddiah and Williamson, 1959, pp. 691–696, figs. 1a–f, 2a–l [from the bivalve *Chlamys opercularis*, Isle of Man, England].—Gotto, 1962, p. 103.—Bruce, Colman, and Jones, 1963, p. 128 [from *Chlamys opercularis*, Isle of Man, England].
- "*Lichomolgide nouveau*."—Canu, 1891b, p. 436 [from *Pecten opercularis*, Boulogne-sur-Mer, France].
- ?*Lichomolgus maximus*.—T. Scott, 1897a, p. 154 [from *Pecten opercularis*, Loch Gair, off Inveraray, Upper Loch Fyne, Scotland].
- Herrmannella maxima*.—Norman and T. Scott, 1906, p. 199 [from *Pecten opercularis*, England].
- Herrmannella maxima*.—T. Scott, 1906, p. 354 [from *Pecten opercularis*, Inchkeith, Firth of Forth, Scotland].
- Paranthesius (Modiolicola) inermis*.—Bocquet and Stock, 1957a, p. 427.
- Paranthesius inermis*.—Stock, 1960c, pp. 247, 248 [from *Pecten opercularis* forma *audouini* Payr., Banyuls, Mediterranean coast of France].

MATERIAL EXAMINED.—10 ♀♀, 1 ♂ from *Pecten opercularis* Linnaeus, in ± 20 m, Cochons Noirs, northwest of La Vieille, near Roscoff, France, 27 July 1954; and 1 ♀, 1 copepodid from the same host, in ± 20 m, Cochons Noirs, northwest of Le Cerf, near Roscoff, 27 July 1954; both collections made by JHS.

Our specimens agree well with the description and figures of Reddiah and Williamson (1959). We offer here a few notes on selected features, chiefly those differentiating this species from *M. maximus*.

FEMALE.—The dimensions of one female are 1.90 x 0.65 mm (in lactic acid). The segment of leg 5 (Figure 31a) is 104 x 195 μ . The genital segment is 234 x 224 μ in dorsal view, broadest near the middle of the segment instead of posteriorly as in *M. maximus*. The three postgenital segments are 135 x 121 μ , 107 x 94 μ , and 153 x 82 μ from anterior to posterior. The posteroventral borders of the genital segment and the first two postgenital segments bear a fringe of slender spinules (Figure 31b) much as in *M. maximus*.

The caudal ramus is 297 x 25 μ .

The mandible (Figure 31c) has about 19 long spinules of two sizes on the concave side instead of about 10 or 11 of one size as in *M. maximus*.

The three spines on the last segment of the endopod of leg 2 are 20, 24, and 45 μ (instead of 26, 26, and 62 μ as in *M. maximus*); the four spines

on the last segment of the endopod of leg 3 are 23, 28, 51, and 66 μ (instead of 32, 39, 73, and 86 μ); and the two spines on the last segment of the endopod of leg 4 (Figure 31d) are 37.5 μ and 78 μ (instead of 45 μ and 101 μ).

The free segment of leg 5 (Figure 31e) is 40 x 25 μ . The two terminal elements are 50 μ and 105 μ , more unequal than in *M. maximus* where they are 81 μ and 112 μ .

MALE.—The dimensions of one male are 1.30 x 0.43 mm. The segment of leg 5 is 50 x 121 μ (Figure 31f). The genital segment is 160 x 200 μ . The four postgenital segments are 73 x 122 μ , 88 x 81 μ , 70 x 65 μ , and 96 x 60 μ from anterior to posterior.

The caudal ramus is 195 x 23 μ .

The first antenna has the same arrangement of aesthetes as in *M. maximus*.

The claw of the maxilliped is 177 μ along its axis.

The two elements on leg 5 are 44 μ and 69 μ .

REMARKS.—Although *M. inermis* and *M. maximus* have many similarities, they may be readily distinguished by careful study (which may necessitate dissection in order to see the mandible). The chief points of difference are mentioned under *M. maximus* below.

Modiolicola maximus (Thompson, 1893)

FIGURES 32–34

Lichomolgus maximus Thompson, 1893, pp. 208–210, pl. 25 [from the bivalve *Pecten maximus* Linnaeus, Port Erin Bay, England].—Herdman, 1894, p. 24; 1896, p. 50.—T. Scott, 1897a, p. 154 [from *Pecten opercularis*, Scotland].—d-Arcy Thompson, 1901, p. 47.

Modiolicola inermis.—Canu, 1894a, pp. 10–14. [See above under *M. inermis*.]

Modiolicola maxima.—Reddiah and Williamson, 1959, pp. 696–699, figs. 1g–h, 2m–x [from *Pecten maximus*, Port Erin, England].—Gotto, 1962, p. 103; 1966, p. 194.—Bruce, Colman, and Jones, 1963, p. 128 [from *Pecten maximus*, Isle of Man, England].

Herrmannella maxima.—T. Scott, 1905, p. 206 [from *Pecten maximus* and *Pecten opercularis*, Scotland; specimens from *Pecten opercularis* probably are *Modiolicola inermis*, see above].

Herrmannella maxima.—Farran, 1913, p. 6 [from *Pecten maximus*, Ballynakill Harbour, Ireland].—Williams, 1954, p. 73 [from *Pecten maximus*, Strangford Lough, Ireland].—Marine Biological Association, 1957, p. 176.

The brief redescriptions below, based entirely on specimens from *Pecten maximus*, supplement previous descriptions of this species by Canu (1891a, 1892) and by Reddiah and Williamson (1959). Figures of the entire animal have been omitted, since they have been adequately supplied by the latter authors.

MATERIAL EXAMINED.—From *Pecten maximus* (Linnaeus): 5 ♀♀, 3 ♂♂, Baie de la Forêt, west of Concarneau, France, 2 November 1955; 1 ♀, Pte. du Binde, Rade de Brest, France, 27 March 1956; and 5 ♀♀, 2 ♂♂ from two hosts, in \pm 25 m, Chateau du Taureau, Baie de Morlaix, Bretagne, France, 18 September 1969; all collections made by JHS.

From *Pecten opercularis* forma *audouini* Payr.: 1 ♀, in 50–95 m, trawled between Banyuls and Cerbère, 9 October 1959, collected by JHS.

FEMALE.—The dimensions of the body in two specimens measured in lactic acid are 2.40 x 0.80 mm and 2.24 x 0.77 mm. The segment of leg 5 (Figure 32a) is 117 x 226 μ . The genital segment is 270 x 315 μ . The three postgenital segments are 177 x 172 μ , 140 x 115 μ , and 198 x 101 μ from anterior to posterior. The posteroventral borders of the genital segment and of the first two postgenital segments bear a row of fine spinules resembling a fringe (Figure 32b,c). The anal segment bears a posteroventral row of minute spinules on each side. The areas of attachment of the egg sacs are situated dorsolaterally in the anterior half of the genital segment. Each area (Figure 32d) bears two setae, one 20 μ and naked and the other 36 μ and lightly feathered, with a spiniform process between them.

The caudal ramus (Figure 32e) is 390 x 35 μ , or about 11 times longer than wide. The setae are naked except for the feathered dorsal seta and the innermost and outermost terminal setae which are bilaterally haired proximally. The two long median terminal setae are inserted between dorsal (unornamented) and ventral (with a marginal row of minute spinules) flaps.

The elongated egg sac (Figure 32f) is 968 x 335 μ , reaches nearly to the end of the caudal ramus, and contains many eggs about 91 μ in diameter.

The rostrum (Figure 32g) is broadly rounded posteroventrally.

The first antenna (Figure 32h) is 465 μ long. The lengths of the seven segments (measured along

the posterior nonsetiferous margins) are 29 (72 μ along the anterior margin), 145, 41, 74, 61, 42, and 30 μ respectively. The formula for the armature is 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All the setae are naked except one on the fifth, one on the sixth, and four on the seventh segment which are feathered.

The second antenna (Figure 32i) has on the fourth segment two unequal claws 69 μ and 39 μ along their axes, a bent clawlike element, and four setae. The fourth segment is 88 μ along its outer edge, 52 μ along its inner edge, and 44 μ wide. All the elements of the appendage are naked except the terminal bent clawlike element which has a few minute distal barbs.

The labrum (Figure 32g) has two posteroventral lobes.

The mandible is shown in Figure 33a. The paragnath is a small lobe with a few hairs and a knoblike tip (see Figure 34e of the male). The first maxilla (Figure 33b) has four elements. The second maxilla (Figure 33c) has on the second segment an extremely small setule near the outer (ventral) margin, a surficial posterior naked seta, and a naked seta on the inner margin (this seta being delicate and sometimes broken off). The terminal lash has a row of graduated spinules. The maxilliped (Figure 33d) has three segments, the third very small. The first segment is unarmed. The expanded second segment bears two small naked setae and a row of slender spinules. The minute third segment bears only a very small terminal hyaline setule.

The ventral area between the maxillipeds and the first pair of legs (Figure 33e) is only slightly protuberant.

Legs 1–4 (Figures 33f–h, 34a) have the same armature as described by Reddiah and Williamson (1959).

Leg 5 (Figure 34b) has an unornamented free segment, 52 x 32 μ . The two naked terminal elements are 81 μ and 112 μ . The adjacent seta on the body is 25 μ and feathered.

Leg 6 is probably represented by the two small setae near the attachment of each egg sac (Figure 32d).

MALE.—The dimensions of the body in two specimens in lactic acid are 1.62 x 0.47 mm and 1.66 x 0.52 mm. The segment of leg 5 (Figure

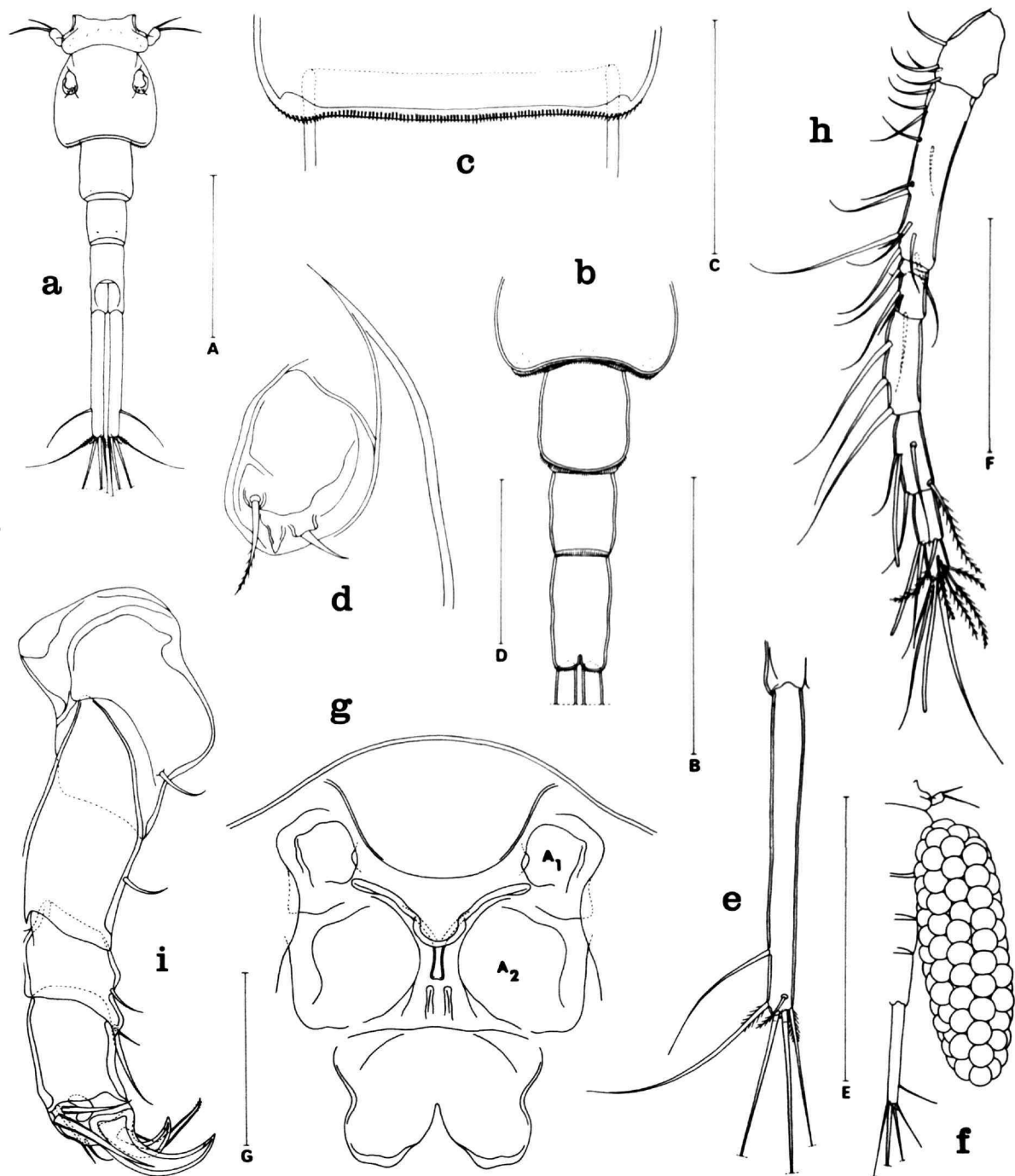


FIGURE 32.—*Modiolicola maximus* (Thompson). Female: a, urosome, dorsal (A); b, posterior part of genital segment and postgenital segments, ventral (B); c, posterior border of first postgenital segment, ventral (C); d, area of attachment of egg sac, dorsal (D); e, caudal ramus, dorsal (E); f, egg sac with side of urosome, dorsal (F); g, rostrum and labrum, ventral (F); h, first antenna, ventral (F); i, second antenna, anterior (inner) (C). Scale: A, B, 0.5 mm; C, C, 0.1 mm; D, F, 0.2 mm; E, 1.0 mm.

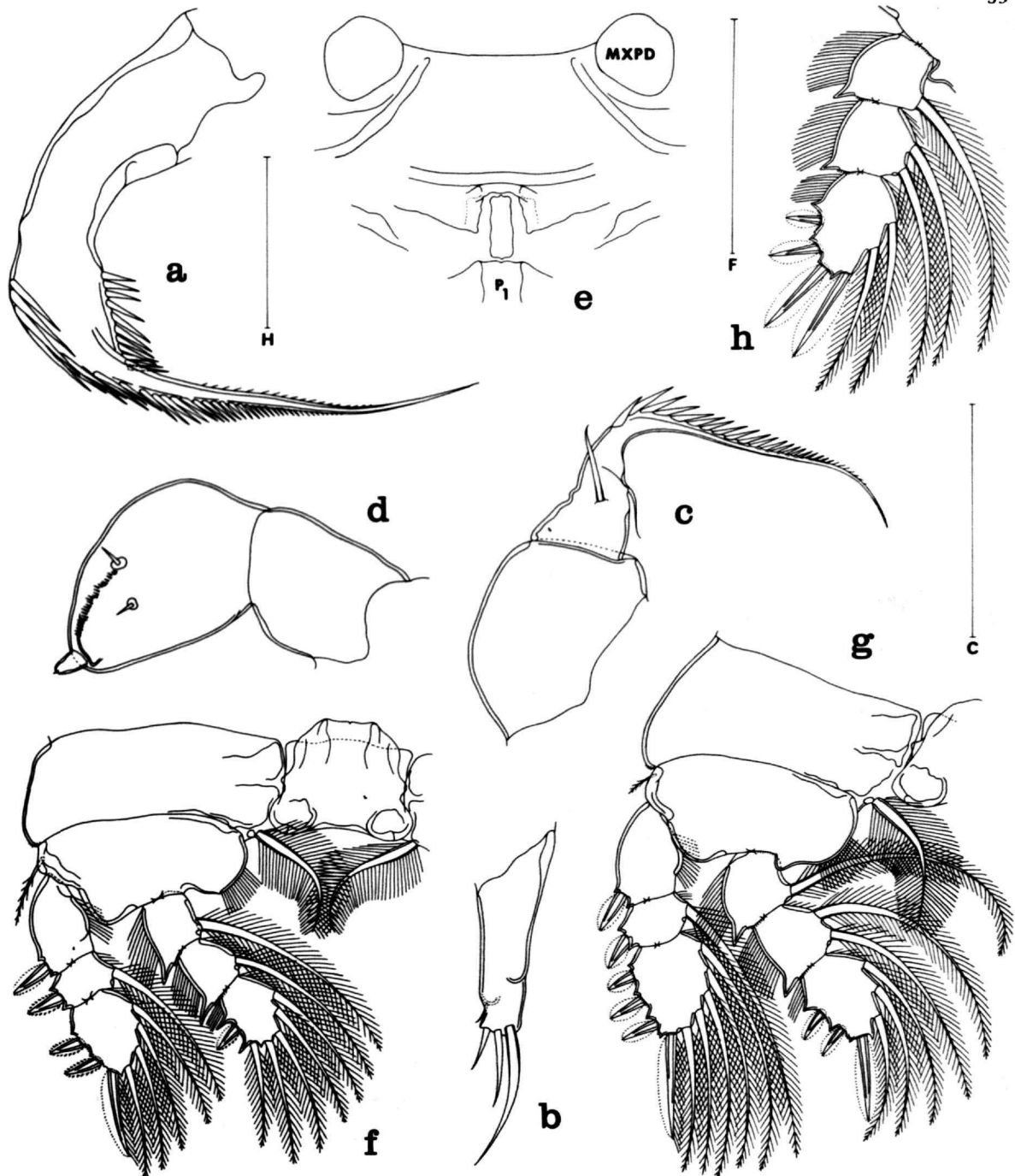


FIGURE 33.—*Modiolicola maximus* (Thompson). Female: *a*, mandible, posterior (H); *b*, first maxilla, anterior (H); *c*, second maxilla, posterior (C); *d*, maxilliped, inner (C); *e*, area between maxillipeds and first pair of legs, ventral (F); *f*, leg 1 and intercoxal plate, anterior (F); *g*, leg 2, anterior (F); *h*, endopod of leg 3, anterior (F). Scale: C, 0.1 mm; F, 0.2 mm; H, 0.05 mm.

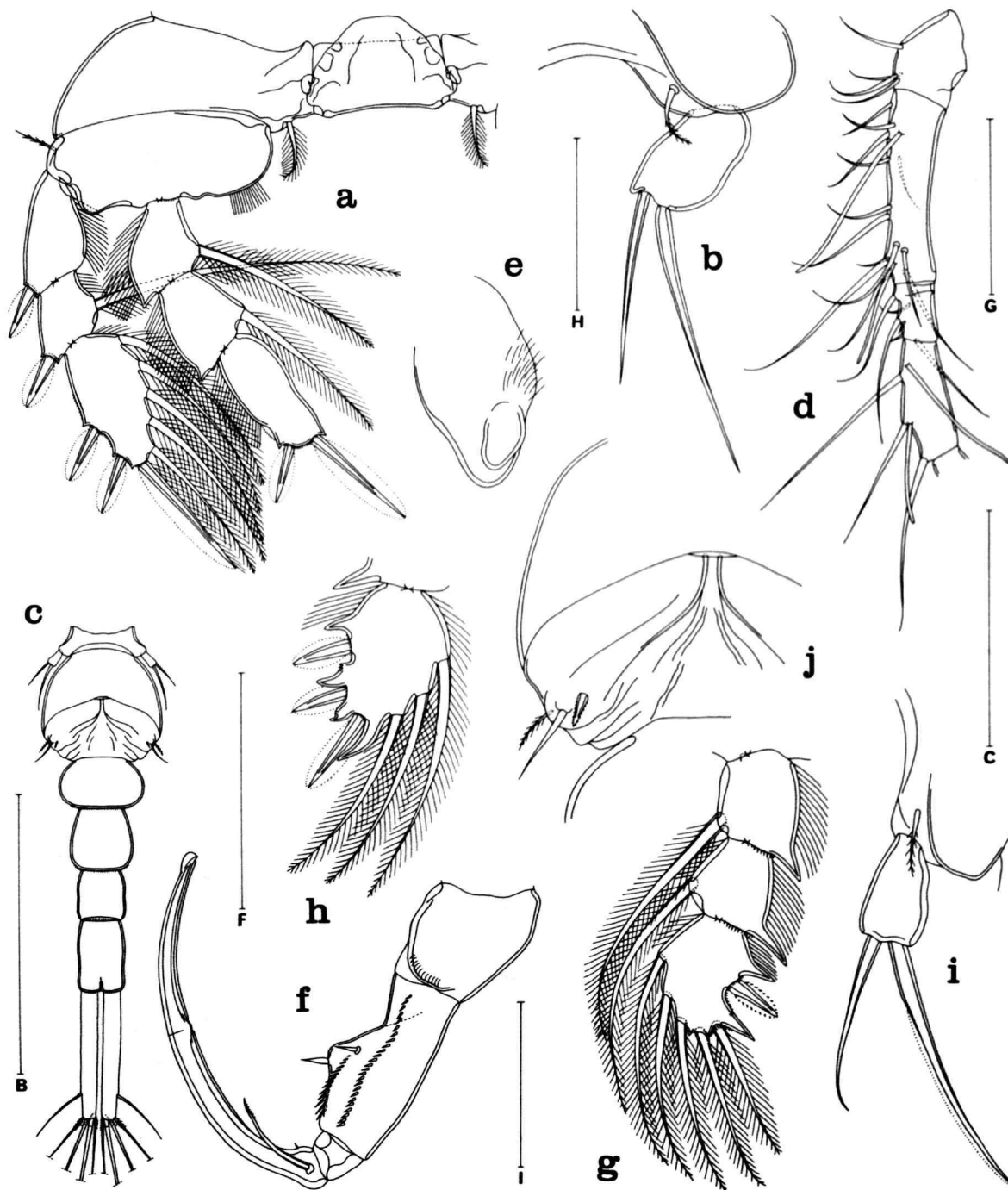


FIGURE 34.—*Modiolicola maximus* (Thompson). Female: a, leg 4 and intercoxal plate, anterior (F); b, leg 5, dorsal (C). Male: c, urosome, ventral (B); d, segments 1-4 of first antenna, ventral (C); e, paragnath, ventral (I); f, maxilliped, inner (C); g, endopod of leg 1, anterior (C); h, third segment of endopod of leg 2, anterior (C); i, leg 5 dorsal (H); j, leg 6, ventral (C). Scale: B, 0.5 mm; C, 0.1 mm; F, 0.2 mm; H, 0.05 mm; I, 0.4 mm.

34c) is $52 \times 143 \mu$. The genital segment is $180 \times 216 \mu$. The four postgenital segments are $91 \times 156 \mu$, $112 \times 106 \mu$, $83 \times 82 \mu$, and $123 \times 75 \mu$ from anterior to posterior and are ornamented as in the female.

The caudal ramus is similar to that of the female, but smaller, $93 \times 11 \mu$.

The rostrum is like that of the female.

The first antenna resembles that of the female, but two aesthetes are added on the second segment and two on the third segment (Figure 34d), so that the formula is 4, 13 + 2 aesthetes, 6, 3 + 2 aesthetes, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete.

The second antenna, labrum, mandible, paragnath (Figure 34e), first maxilla, and second maxilla are like those in the female. The maxilliped (Figure 34f) has a row of weak striations on the first segment. The second segment bears two naked setae and two rows of spinules. The claw is 206μ along its axis, indistinctly divided midway, and armed with two very unequal proximal setae.

The ventral area between the maxillipeds and the first pair of legs is like that of the female.

Leg 1 resembles that of the female except that the two spinous processes at either side of the spine on the last segment of the endopod (Figure 34g) are relatively longer. Leg 2 shows slight sexual dimorphism in the nature of the spiniform processes on the last segment of the endopod (Figure 34h) but otherwise resembles that of the female. Legs 3 and 4 are like those of the female.

Leg 5 (Figure 34i) has an unornamented free segment that is $31 \times 18 \mu$ in greatest dimensions. The shorter terminal naked element is 52μ and the longer element, fringed along the outer side, is 75μ . The adjacent seta is 18μ and feathered.

Leg 6 (Figure 34j) is a posteroventral flap on the genital segment bearing a plumose seta, 30μ , a naked seta, 45μ , and a finely barbed spine, 19μ .

The spermatophore was not observed.

REMARKS.—*M. maximus* may be distinguished from *M. inermis*, with which it appears to be closely related, by the shape of the genital segment in the female, the relative lengths of the two terminal setae in leg 5 of the female, the size and number of spinules on the concave edge of the base of the mandible, and the size of the body.

Modiolicola trabalis Humes, 1959

Modiolicola trabalis Humes, 1959, pp. 315–319, figs. 250–268 [from the bivalve *Arca decussata* Sowerby, Nosy Bé, Madagascar].

Genus *Myxomolgus* Humes and Stock, 1972

DIAGNOSIS.—Body cyclopiform. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six setae. Rostrum elongated and triangular. First antenna 7-segmented in the female, with the armature 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; one of the elements on the first segment and two on the second segment enlarged to form stout denticulated spines. Second antenna 4-segmented, the formula being 1, 1, 3 + one claw, and 4 + three claws.

Labrum deeply indented medially. Mandible with the blade at nearly a right angle to the base and provided along its outer side with spinules and on its inner side with lamellate teeth. First maxilla with two or three elements. Second maxilla of the usual lichomolgid type, with the auxiliary lash about as long as the lash itself. Maxilliped in the female 3-segmented, the third segment forming a short recurved claw; in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1–4 with 3-segmented rami. Leg 4 exopod with the third segment II, I, 4 or II, I, 5. Leg 4 endopod with the formula 0–1; 0–1; II. Armature of the lichomolgidiiform type, with the formula similar in both sexes. Strong sexual dimorphism in leg 2 endopod. Leg 5 with a free segment armed with two elements. Leg 6 in the female represented by a seta and a spine near the genital openings; in the male by a ventral posterolateral flap on the genital segment bearing two elements.

Other features as in the species below.

Associated with polychaete annelids.

TYPE-SPECIES.—*Myxomolgus myxicolae* (Bocquet and Stock).

ETYMOLOGY.—The name is derived from the Greek words *μύξα* (mucus) and *μόλγος*. It alludes to the fact that both known species of this genus live in the mucous tube of the annelid rather than on the host itself. Gender masculine.

REMARKS.—The genus is closely related to *Dio-genidium*, *Herrmannella*, and *Paranthesius* but it differs from these by the following characters: (1)

segments 1 and 2 of the first antenna have strong flat spines; (2) segments 3 and 4 of the second antenna have one and three claws respectively; (3)

the blade of the mandible is medially strongly toothed; and (4) the fifth leg has a strong basal swelling.

Key to Species of the Genus *Myxomolgus*

FEMALES

Third segment of exopod of leg 4 with II,I,4; weak cuticular teeth on the urosome; free segment of leg 5 $108 \times 49 \mu$	<i>M. myxicolae</i>
Third segment of exopod of leg 4 with II,I,5; strong cuticular teeth on the urosome; free segment of leg 5 $70 \times 43 \mu$	<i>M. proximus</i>

Myxomolgus myxicolae (Bocquet and Stock, 1958)

FIGURE 35

Paranthessius myxicolae Bocquet and Stock, 1958a, pp. 244-253, figs. 1-4 [from the mucous tubes of the polychaete *Myxicola infundibulum* (Rénier), Penpoull, Finistère, France].—Bocquet, Stock, and Kleeton, 1963, pp. 31-32 [between the layers of the mucous tube of *Myxicola infundibulum*, Roscoff, France, and Plymouth, England].

Myxomolgus proximus, new species

FIGURES 36-38

MATERIAL EXAMINED.—1 ♀ (holotype) embedded between the mucous layers of the tube of the polychaete *Myxicola aesthetica* (Claparède), intertidal in crevices of rocks, Locquirec, Finistère, France, 3 November 1955, collected by JHS. The holotype is preserved in the Zoölogisch Museum, Amsterdam (ZMA Co.102.218).

FEMALE.—The body (Figure 36a) is slender. The total length is 1.16 mm, without the ramal setae. The first pedigerous segment is separated only by a faint line from the cephalosome. The urosome

consists of five segments: the fifth pedigerous segment, the genital segment, and three postgenital segments. Urosomal segments 2-4 are ventrally provided at their posterior margins with 5-7 strong sclerotized teeth (Figure 36b), stronger than those of *M. myxicolae* (Figure 35a). The anal segment bears ventrally, at its posterior margin, a row of minute spinules on each side.

The caudal ramus (Figure 36b) is $68 \times 27 \mu$, distinctly longer than the anal segment. The lateral seta is implanted slightly proximal to the middle of the ramus. The four terminal setae are smooth, the central two being very long.

The rostrum (Figure 36d) is elongated and triangular. Supporting structures, as in *M. myxicolae*, have not been observed in the single specimen available, but this point needs verification.

The first antenna (Figure 36c) is very similar to that of *M. myxicolae*, both in segmentation and in armature. The fifth segment in the new species is slightly more slender than in *M. myxicolae*. The second antenna (Figure 36e) is constructed as in *M. myxicolae*, viz., with four segments, armed with 1 seta, 1 seta, 3 seta + 1 claw, and 4 setae + 3

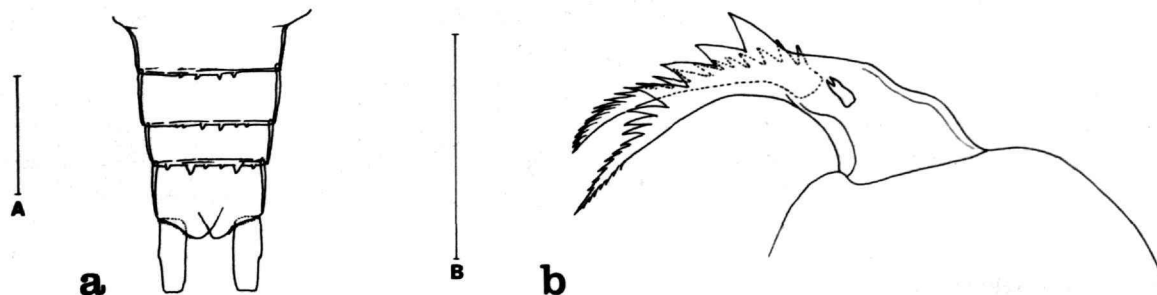


FIGURE 35.—*Myxomolgus myxicolae* (Bocquet and Stock). Female: a, distal part of urosome and caudal rami (setae omitted), ventral (A); b, terminal portion of second maxilla (B). Scale: A, 0.1 mm; B, 0.05 mm.

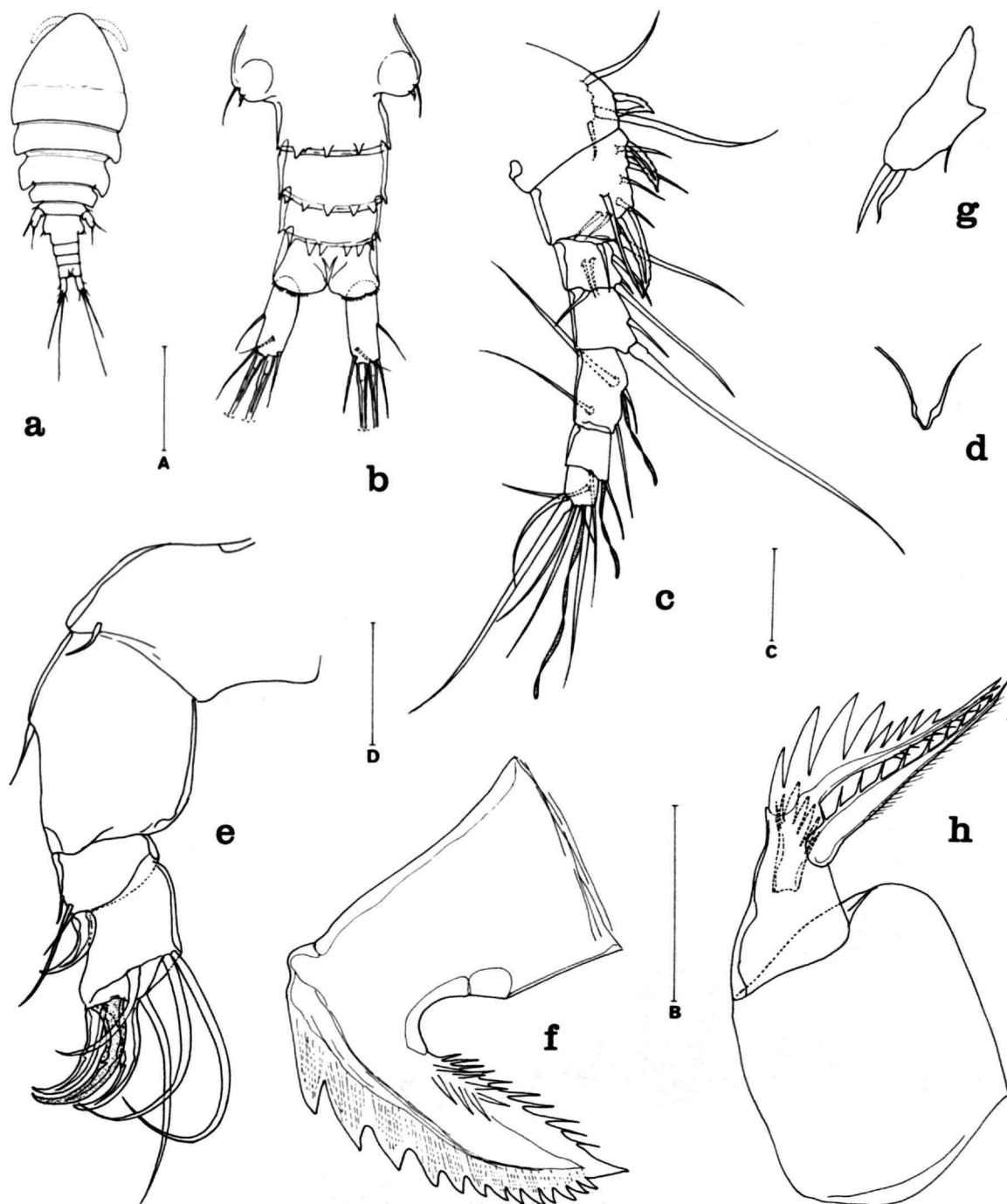


FIGURE 36.—*Myxomolgus proximus*, new species. Female: *a*, entire animal, dorsal (total length 1.16 mm); *b*, urosome, ventral (*A*); *c*, first antenna (*C*); *d*, rostrum (*C*); *e*, second antenna (*D*); *f*, mandible (*B*); *g*, first maxilla (*D*); *h*, second maxilla (*B*). Scale: *A*, 0.1 mm; *B*, *C*, *D*, 0.05 mm.

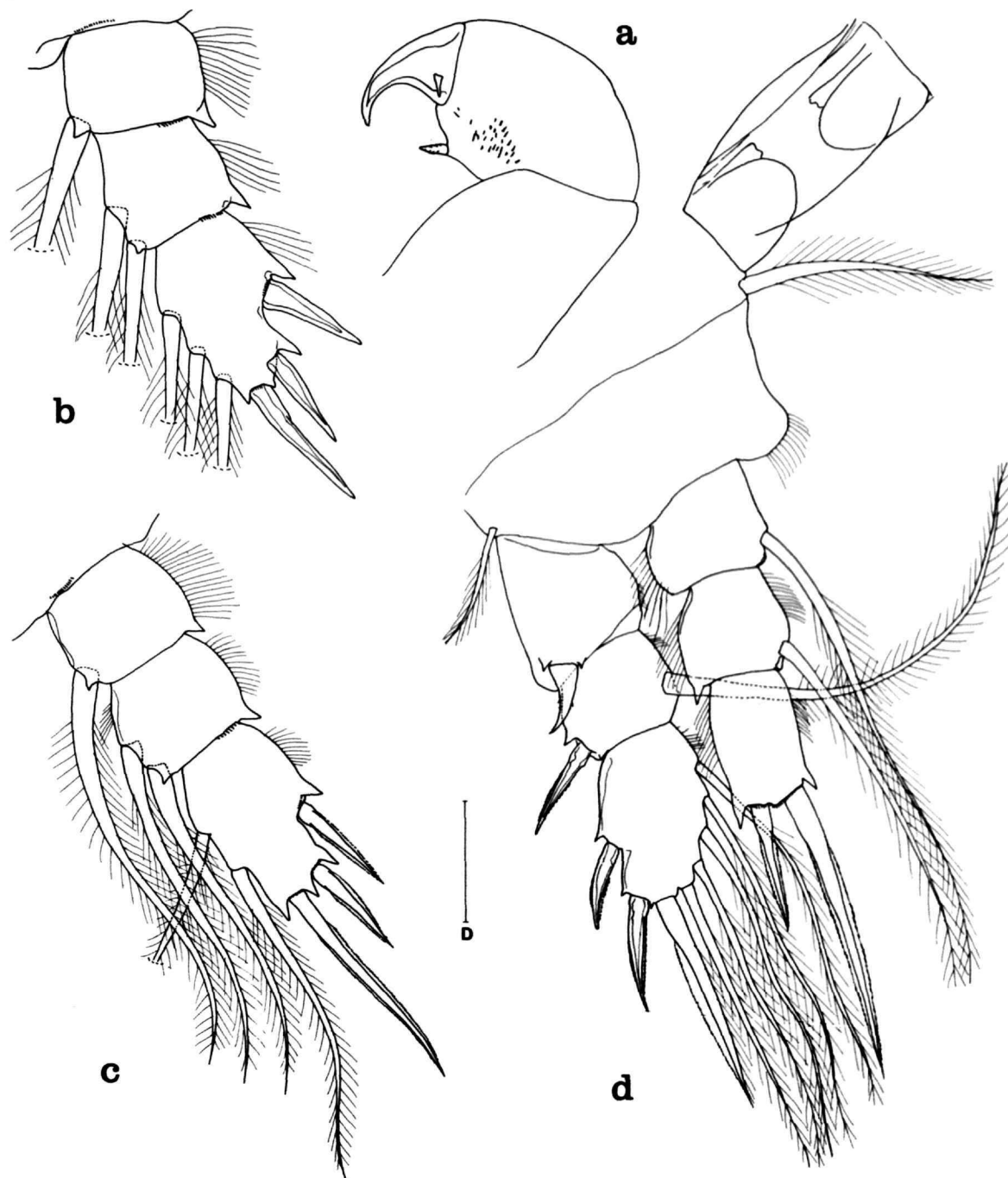


FIGURE 37.—*Myxomolgus proximus*, new species. Female: a, maxilliped; b, endopod of leg 2; c, endopod of leg 3; d, leg 4 and intercoxal plate. Scale: d, 0.05 mm, applies to all drawings.

claws respectively. In *M. proximus* the fourth segment is about as long as wide, whereas in *M. myxicolae* it is much longer than wide. On the other hand, the terminal claws in *M. proximus* are longer than the fourth segment, but in *M. myxicolae* shorter than that segment.

The mandible (Figure 36f) is very similar to that of the type-species. The first maxilla (Figure 36g) bears three elements, among them a small medial setule not observed in *M. myxicolae*.

The second maxilla (Figure 36h) differs in several respects from that of *M. myxicolae*. The distal lash is armed with elongatedly triangular teeth (less elongate in *M. myxicolae*); the most proximal tooth is shorter than the second tooth (longer in *M. myxicolae*). A curiously toothed bladeliike spine arises near the base of the auxiliary lash; it bears five strong teeth on one side and three smaller teeth on the other. [In the original description of *M. myxicolae* a structure homologous to this is not mentioned, but re-examination of the type ma-

terial has revealed its presence (Figure 35b); it is much smaller than in *M. proximus*, and instead of being toothed it is bicuspidate.] The maxilliped (Figure 37a) corresponds rather closely with that of *M. myxicolae*.

Legs 1-4 (Figures 37b-d, 38a) show two distinguishing characters: the spiniform processes on the outer side of the endopod (in particular in legs 1-3) are more strongly developed in *M. proximus*; and the chaetotaxis formula of the exopod of leg 4 is different in the two species—I-0;I-1;II,I,5 in *M. proximus* and I-0;I-1;II,I,4 in *M. myxicolae*.³

The free segment of leg 5 (Figure 38b) is 70 μ long and, at a level just below the shortest distal spine, 43 μ wide; this segment is thus shorter, and much less slender than the corresponding segment

³In the original description of *M. myxicolae* (Bocquet and Stock, 1958a) the chaetotaxis formula of a somewhat abnormal female was used for leg 1. Instead of I-0;I-1;II,I,3 for the exopod, one usually finds I-0;I-1;II,I,4, as has been corrected by Bocquet, Stock, and Kleeton (1963, p. 31).

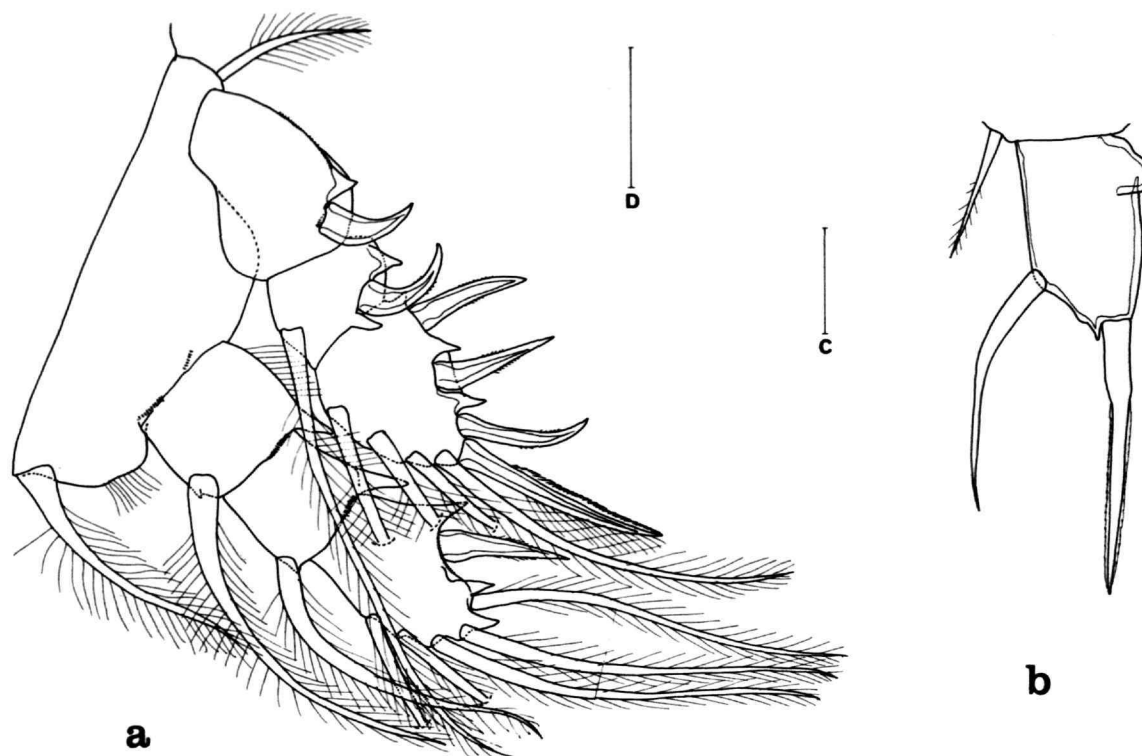


FIGURE 38.—*Myxomolgus proximus*, new species. Female: a, leg 1 (d); b, leg 5 (c). Scale: c, d, 0.05 mm.

in *M. myxicolae* (108 x 49 μ). The two distal elements in *M. proximus* are 108 μ and 95 μ long, in *M. myxicolae* 135 μ and 97 μ . This means that these two distal elements are more unequal in length in *M. myxicolae* than in *M. proximus*.

Leg 6 (Figure 36b) is represented by a seta and a very short spine near the genital openings.

The male is unknown.

REMARKS.—This new species is closely related to *M. myxicolae*, and the hosts of these two copepods are closely related tubicolous polychaetes, *Myxicola infundibulum* and *Myxicola aesthetica*. The main differences between the two copepod species are as follows: stronger cuticular teeth on the urosome in *M. proximus*; the less slender fourth segment and the longer terminal claws in the second antenna of *M. proximus*; the length of the teeth and the structure of the proximal bladelike spine on the second maxilla; the length of the spiniform processes in legs 1–3; the different armature of the third exopod segment in leg 4; and the length-to-width ratio in leg 5.

In our opinion these differences warrant the creation of a new species for the present material, although there is little doubt that the two species of *Myxomolgus* are closely related. The proposed specific name *proximus* (Latin, closely akin) alludes to this fact.

Genus *Paranthessius* Claus, 1889

DIAGNOSIS.—Body cyclopiform. Urosome in the female 5-segmented; in the male 6-segmented. Caudal ramus with six setae. Rostrum linguiform. First antenna 7-segmented. Second antenna 4-segmented, with the formula 1, 1, 3, and three terminal claws + several setae.

Labrum incised medially. Mandible slender with the basal region beyond the small indentation having on the concave side a row of spinules and on the convex side an area with a few spinules followed by a serrated fringe; lash long. First maxilla with three elements. Second maxilla of the lichomolgid type but the lash and the two auxiliary elements about equal in length, forming a tripartite tip. Maxilliped in the female 3-segmented; in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1–4 with 3-segmented rami. Armature lichomolgidiform in pattern. Leg 4 exopod with

the third segment II, I, 5. Leg 4 endopod with the formula 0–1; 0–2; III. Leg 1 endopod in the male with the third segment having I, I, 4 instead of I, 5 as in the female. Leg 5 with a free segment bearing two terminal elements.

Other features as in the species below.

Associated with actinurians.

TYPE-SPECIES.—*Paranthessius anemoniae* Claus.

Paranthessius anemoniae Claus, 1889

FIGURE 39

Paranthessius anemoniae Claus, 1889, p. 17, pl. 4, figs. 8–15 [from the actinurian *Anemonia* sp., Trieste, Italy].—Voigt, 1892, p. 35.—Canu, 1894b, p. 137 [from Isles Chaussy, northern France]; 1898, pp. 413–415, pl. 10, figs. 1–8 [from Isles Chaussy, France].—Gadeau de Kerville, 1898, p. 436.—Graeffe, 1900, p. 41 [from *Anemonia sulcata* (Pennant), Trieste, Italy].—De Zulueta, 1912, pp. 12, 50.—Illg, 1949, p. 397.—Bocquet and Stock, 1959b, pp. 44–53, figs. 1–5 [from the actinurian *Anemonia sulcata* (Pennant), Channel coast of France].—Bouligand, 1966, p. 269.

REMARKS.—This species is unusual among lichomolgidiform copepods in having two inner setae (instead of one seta) on the second segment of the fourth endopod.

Genus *Sabelliphilus* M. Sars, 1862

DIAGNOSIS.—Body cyclopiform, elongated. Urosome in the female 5-segmented; in the male 6-segmented. Caudal ramus with six setae. Rostrum bifid. First antenna 7-segmented, the first two segments enlarged. Second antenna 4-segmented, with a toothed crest on the second segment, the formula being 1, 1, one claw + 2 small setae, and four terminal claws + several small setae.

Labrum incised medially. Mandible with area beyond the indentation having fine spinules on the concave side and coarse spinules along the convex side, both rows continuing on the long lash. Paragnath a small hairy lobe. First maxilla with three elements. Second maxilla of the usual lichomolgid type. Maxilliped in the female 3-segmented with a pointed tip; in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1–4 with 3-segmented rami. Armature of the basic lichomolgidiform type. Leg 4 exopod with the third segment having II, I, 5. Leg 4 endopod

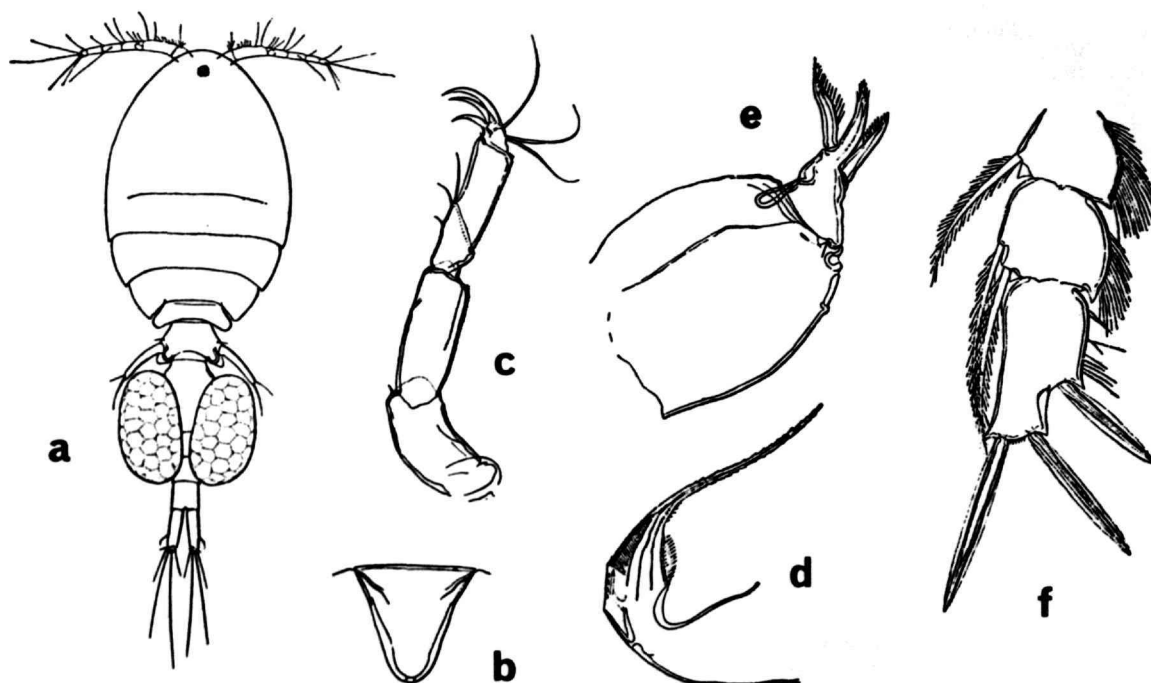


FIGURE 39.—*Paranthessius anemoniae* Claus. Female: a, dorsal; b, rostrum; c, second antenna; d, mandible; e, second maxilla; f, endopod of leg 4. (From Bocquet and Stock, 1959b, figs. 1a,c, 2b, 3a,c, 5c.) Length of female 1.5–1.6 mm, of male 0.95–1 mm.

with the formula 0–1;0–1;II. Leg 1 endopod of the male with the third segment having I,I,4 instead of I,5 as in the female. Leg 5 with a free segment bearing two terminal elements. Leg 6 represented

by the two setae near the genital openings.

Other features as in the species below.

Associated with polychaete annelids.

TYPE-SPECIES.—*Sabelliphilus elongatus* M. Sars.

Key to Species of the Genus *Sabelliphilus*

FEMALES

Body length 1.56–1.87 mm; two teeth of rostrum separated basally; crest on second segment of second antenna with 4–10 spines (average 6); middle endopod segment of legs 1–4 with one dentiform process *S. elongatus*

Body length averaging 0.90 mm (up to 1.17 mm); two teeth of rostrum with bases contiguous; crest on second segment of second antenna with 1–4 spines (average 2); middle endopod segment of legs 1–4 with two dentiform processes *S. sarsi*

MALES

Body length 0.8–0.9 mm; first two postgenital segments with posteroventral denticulations *S. elongatus*

Body length 0.60–0.90 mm; first two postgenital segments with posteroventral borders smooth *S. sarsi*

Sabelliphilus elongatus M. Sars, 1862

Sabelliphilus elongatus M. Sars, 1862, pp. 139, 140 [from the polychaete *Sabella sarsii* Krøyer (= *Sabella pavonina* Savigny), Norway].—De Saint-Joseph, 1894, p. 266.—McIntosh, 1905, p. 86.—G. O. Sars, 1918, pp. 188, 189, pl. 107 [from Norway].—Lang, 1949, pp. 9, 10, figs. 12–15 (on the gills of *Sabella pavonia* Savigny, Rödberget, Sweden).—Rullier and Cornet, 1951, p. 48.—Bocquet, 1953, pp. 283–286.—Gotto, 1954a, p. 133 [from *Sabella pavonina*, Ringhaddy Sound, Strangford Lough, County Down, Northern Ireland]; 1960a, pp. 619–628, fig. 1, pl. 1 [from *Sabella pavonina*, Ireland]; 1961a, p. 266; 1966, p. 194.—Bocquet and Stock, 1957a, p. 427; 1958a, p. 243 [from the plume of *Spirographis spallanzanii* Viviani and *Sabella pavonina* Savigny, Penpoull, Finistère, France]; 1963, p. 295; 1964, pp. 157–180, figs. 2, 4, 6, 9–22, 32, 37, 39, 46, 48–52, 58–67 [from the plume of *Sabella pavonina*, *Spirographis spallanzanii*, and *Spirographis spallanzanii* var. *brevispira* De Quatrefages (= *Sabella pavonina* var. *bicolorata* Hornell), Channel coast of France; also from *Sabella* and *Spirographis* at Banyuls, southern France].—Stock, 1960c, p. 248 [from the plume of the polychaete *Spirographis spallanzanii*, Banyuls, Mediterranean coast of France].—Bresciani and Lützen, 1962, p. 377.—Bocquet, Stock, and Kleeton, 1963, p. 21.—Carton, 1966b, p. 816.—Crothers, 1966, p. 52 [from the branchiae of *Sabella*, Wales].—Glaçon, 1971, p. 23 (unnumbered).

Sabelliphilus sarsii.—Kossmann, 1877, pp. 16, 17, pl. 3, fig. 2 [from *Sabella*, La Spezia, Italy].—Canu, 1891b, pp. 436, 437 [from *Sabella pavonina*, Boulogne-sur-Mer, France].—Thompson, 1893, p. 210, pl. 25, fig. 5 [from *Sabella*, Puffin Island, Liverpool Bay, England; synonym, *Lichomolgus sabellae*, p. 210].

Sabelliphilus sarsii Claparède var. *massiliensis* Gourret, 1889, pp. 475–477, pl. 34, figs. 1–6 [from the plume of *Spirographis spallanzanii*, Gulf of Marseille, France].

Sabelliphilus sarsii.—Canu, 1892, pp. 234, 235 [from *Sabella pavonina*, Roches Bernard, Boulogne coast of France].—T. Scott, 1897b, p. 196 [from *Sabella*, Clyde, Scotland]; 1897c, p. 256 [from *Sabella*, Firth of Forth, Scotland]; 1905, p. 203 [from the plume of *Sabella*, Scotland]; 1906, p. 335 [from the plume of *Sabella* sp. (? *S. pavonina*), St. Monans, Firth of Forth, Scotland].

Sabelliphilus sarsii var. *branchialis* (Della Valle).—Rioja, 1935, pp. 239–244, figs. 1–16 [from the plume of *Sabella pavonina*, Bay of Pontevedra, near Marin, northwestern Spain].

Lichomolgus sabellae Thompson, 1888a, pp. 32–33 [from *Sabella*, Beaumaris, England]; 1888b, pp. 68, 69, pl. 2, figs. 1–9 [from *Sabella*, Liverpool Bay, England]; in Herdman, 1888, p. 56 [from *Sabella penicillus*, Liverpool Bay, England]; 1889, p. 182.—Herdman, 1890, p. 65.—De Saint-Joseph, 1894, p. 266.

non *Bispiraphilus tenax* De Saint-Joseph, 1894, p. 292 [= *Gastrodelphys*].

REMARKS.—This species always lives on the branchial crown of the polychaete host.

Sabelliphilus sarsi Claparède, 1870

FIGURE 40

Sabelliphilus sarsii Claparède, 1870, pp. 10–18, pl. 7, figs. 1–8 [from the polychaete *Spirographis spallanzanii* Viviani, Naples, Italy].—Claus, 1876, pp. 161–165, pl. 10 [from *Spirographis spallanzanii*, Naples, Italy]; 1889, pp. 14–15, pl. 1, figs. 8–10 [from *Spirographis spallanzanii*, Trieste, Italy].—Stossich, 1880, p. 251 [on the skin of *Spirographis spallanzanii*, Trieste, Italy].—Aurivillius, 1883, p. 9.—Carus, 1885, p. 352.—De Saint-Joseph, 1894, p. 266.—Graeffe, 1900, p. 41 [from *Spirographis spallanzanii*, Trieste, Italy].

Sabelliphilus sarsii var. *branchialis*.—Carus, 1885, p. 352.

Sabelliphilus sarsii.—T. Scott, 1894b, p. 258.—McIntosh, 1905, p. 86.—Bocquet, 1953, pp. 283–286.—Bocquet and Stock, 1957a, p. 427; 1958a, p. 243 [from the body of *Spirographis spallanzanii*, Penpoull, Finistère, France]; 1963, p. 295; 1964, pp. 157–180, figs. 1, 3, 5, 7, 8, 23–36, 38, 40–45, 47, 53–57, 68, 69 [from the body of *Spirographis spallanzanii*, Penpoull, northern France, and Banyuls, Mediterranean coast of France].—Bocquet, Stock, and Kleeton, 1963, p. 21.—Bouligand, 1966, p. 302.—Carton, 1966a, pp. 427–442, figs. 1, 2, tables 1, 2 [from *Spirographis spallanzanii*, *Sabella pavonina*, and *Spirographis spallanzanii* var. *brevispira*, Channel coast of France, and from *Spirographis spallanzanii* var. *bicolorata*, Plymouth, England]; 1966b, pp. 807 et seq.; 1967, pp. 387 et seq.; 1968a, pp. 123 et seq.; 1968b, pp. 269 et seq.; 1968c, pp. 545 et seq.

Lichomolgus sarsii.—Della Valle, 1880a, pp. 87–97, pl. 5, figs. 1–26 [from *Spirographis spallanzanii*, Naples, Italy]; 1880b, pp. 110–118, pl. 1, figs. 1–26 [from *Spirographis spallanzanii*, Naples, Italy].—Lo Bianco, 1888, p. 405 [from *Spirographis spallanzanii*, Naples, Italy].

Lichomolgus sarsii var. *branchialis* Della Valle, 1880a, p. 97 [from *Spirographis spallanzanii*, Naples, Italy]; 1880b, p. 117 [from *Spirographis spallanzanii*, Naples, Italy].

Lichomolgus (Sabelliphilus) sarsii.—Raffaele and Monticelli, 1885, p. 307.

REMARKS.—This species always lives on the body of the polychaete host.

Genus *Scambicornus* Heegaard, 1944

DIAGNOSIS.—Body cyclopiform. Urosome in the female 5-segmented; in the male 6-segmented. Caudal ramus with six setae. Rostrum broadly rounded or not well defined posteroventrally. First antenna 7-segmented, the formula in the female being 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male with a similar formula or in *S. lobulatus* with an additional small aesthete on the second segment. Second antenna 4-segmented, the fourth segment offset; formula 1,

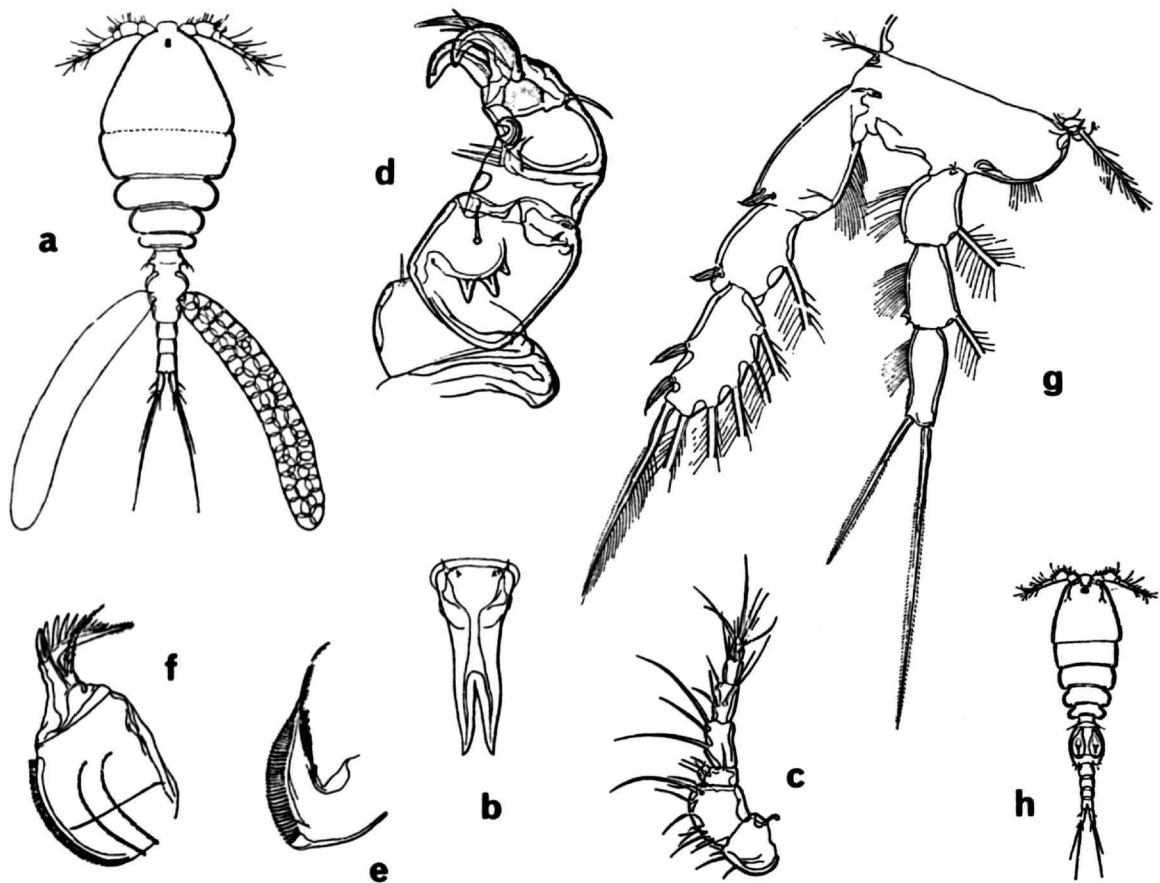


FIGURE 40.—*Sabelliphilus sarsi* Claparède. Female: *a*, dorsal; *b*, rostrum; *c*, first antenna; *d*, second antenna (a fourth terminal claw is hidden); *e*, mandible; *f*, second maxilla; *g*, leg 4. Male: *h*, dorsal. (From Bocquet and Stock, 1964, figs. 1, 3, 5, 7, 35, 38, 44, 47.) Length of female 0.90–1.17 mm, of male 0.60–0.68 mm.

1, 3 + one large claw, and 7, with all the terminal elements being slender setae.

Labrum deeply incised medially. Paragnath a small hairy lobe. First maxilla with four elements. Second maxilla of the usual lichomolgid type. Maxilliped in the female 3-segmented with a pointed tip; in the male 4-segmented (if the proximal part of the claw is considered as the fourth segment).

Legs 1–4 in the female with both rami 3-segmented. Leg 4 exopod with the third segment having II,I,5. Leg 4 endopod with the formula 0–1;0–1;I,II,II. Legs 1 and 2 in the male with 3-segmented exopods and 2-segmented endopods; legs 3 and 4 with both rami 3-segmented. (In

S. armoricanus the endopods of legs 1–4 in the male are 3-segmented; see below.) Distal segment of leg 1 endopod of the male with I,5,1 (though the outermost seta on leg 1 endopod may be partly feathered and partly barbed as in *S. lobulatus*); spines on the distal endopod segments of male legs 2 and 3 strongly modified. Leg 5 with a free segment bearing two terminal setae. Leg 6 in the female represented by the two setae and the process near the genital openings, in the male by a ventral posterolateral flap on the genital segment bearing two setae.

Other features as in the species below.

Associated mostly with holothurians so far as known.

TYPE-SPECIES.—*Scambicornus hamatus* Heegaard.

REMARKS.—The species *Scambicornus armoricanus* is omitted from the following key because the female is unknown. We have thought it im-

practical to prepare a key to the males of *Scambicornus*, since in seven species the males are unknown and in several others the males are not described in sufficient detail.

Key to Species of the Genus *Scambicornus*

KNOWN FEMALES

1. Leg 5 bell-shaped, much wider distally than proximally; genital segment with a pair of dorsolateral toothlike protuberances *S. campanulipes*
 Leg 5 subrectangular, not much wider distally than proximally; genital segment lacking a pair of toothlike protuberances 2
2. Caudal ramus elongated, at least 4:1 3
 Caudal ramus not more than 3:1 8
3. Claw on third segment of second antenna slender and setiform; fourth segment of second antenna elongated 4
 Claw on third segment of second antenna stout and unguiform; fourth segment of second antenna short and almost quadrate 5
4. Caudal ramus 4:1 *S. finmarchicus*
 Caudal ramus 12:1 *S. tenuicaudis*
5. Caudal ramus between 4.5:1 and 5.5:1 6
 Caudal ramus 7:1 *S. petiti*
6. Genital segment in dorsal view widest near middle, with sides smooth, not indented *S. prehensilis*
 Genital segment in dorsal view widest posterior to middle, with sides indented 7
7. Body length 1.16 mm; ratio of length to width of prosome about 1.3:1; caudal ramus about 5:1 *S. serendibicus*
 Body length 1.23 mm; ratio of length to width of prosome about 1.18:1; caudal ramus 5.45:1 *S. idoneus*
8. Genital area with two short spiniform elements *S. tuberosus*
 Genital area with two slender setae 9
9. Second antenna with claw on third segment rather slender and not strongly unguiform; fourth segment of this appendage not offset 10
 Second antenna with claw on third segment stout and distinctly prehensile; fourth segment offset 11
10. Caudal ramus about 1:1 *S. brevicauda*
 Caudal ramus 2.5:1 *S. propinquus*
11. Genital segment in dorsal view markedly expanded laterally, with a short slender posterior part 12
 Genital segment in dorsal view not much expanded laterally with gently rounded sides 17
12. Expanded sides of genital segment near genital openings rounded *S. hamatus*
 Expanded sides of genital segment near genital openings angular 13
13. Body length 1.3–1.44 mm 14
 Body length 0.6–1.18 mm 16
14. Mandible with a small terminal lash *S. adduensis*
 Mandible without a terminal lash 15
15. Genital segment in dorsal view with sides tapering posteriorly; caudal ramus 2.9:1; free segment of leg 5, 1.9:1 *S. lobulatus*
 Genital segment in dorsal view with sides rounded; caudal ramus 2.5:1; free segment of leg 5, 2.1:1 *S. subgrandis*
16. Caudal ramus 2.7:1 *S. modestus*
 Caudal ramus 1.67:1 *S. subtilis*
17. Second antenna with fourth segment elongated, ratio about 3.8–4.0:1 18
 Second antenna with fourth segment short, nearly quadrate 19
18. Caudal ramus 1.5:1; free segment of leg 5 about 2.25:1 *S. nicobaricus*
 Caudal ramus 1.19:1; free segment of leg 5 with ratio of 1.65:1 *S. poculiferus*
19. Caudal ramus 2:1; body length 1.1 mm *S. robustus*
 Caudal ramus 1.6:1; body length 0.6 mm *S. brachysetosus*

Scambicornus hamatus Heegaard, 1944

FIGURE 41

Scambicornus hamatus Heegaard, 1944, pp. 360-366, figs. 1-10 [from the tentacles of the holothurian *Thyonidium alexandri* Fisher, in 400 m, Okinose, Sagami Sea, Japan].—Changeux, 1961, p. 55.—Stock, 1964b, pp. 183-191, figs. 1-3.—Humes, 1967a, p. 144; 1969f, p. 92.

Scambicornus adduensis (Sewell, 1949)

Preherrmannella adduensis Sewell, 1949, pp. 85-89, figs. 20a-g, 21a-i [in weed-washings, Addu Atoll, Maldivé Archipelago, and Nankauri Harbor, Nicobar Islands].
Scambicornus adduensis.—Humes, 1967a, pp. 144-145; 1969f, p. 92.

REMARKS.—The male is unknown.

Scambicornus armoricanus (Bocquet, Stock, and Kleeton, 1963)

Preherrmannella armoricana Bocquet, Stock, and Kleeton, 1963, pp. 32-37, figs. 6-9 [from the polychaete *Polynnia nebulosa* (Mont.), Roscoff, northern France].

REMARKS.—The female is unknown. It is probable that this species belongs to a new genus. Legs 1-4 of the male have 3-segmented endopods, a situation unlike any other *Scambicornus*. The fact that this species is associated with a polychaete instead of with a holothurian suggests that it is different from *Scambicornus*. Clarification of the position of this species, however, must await the discovery of the female.

Scambicornus brachysetosus Reddiah, 1968

Scambicornus brachysetosus Reddiah, 1968c, pp. 126-131, figs. 1, 2 [from the holothurian *Holothuria atra* Jaeger, Kilakarai, Ramnad District, Madras State, India].

Scambicornus brevicauda (Sewell, 1949)

Preherrmannella brevicauda Sewell, 1949, pp. 82-85, fig. 19a-o [in weed-washings, Addu Atoll, Maldivé Archipelago].—Ummerkutty, 1968, p. 314 [in weed-washings, Gulf of Mannar, India].

Scambicornus brevicauda.—Humes, 1967a, p. 144; 1969f, p. 92.

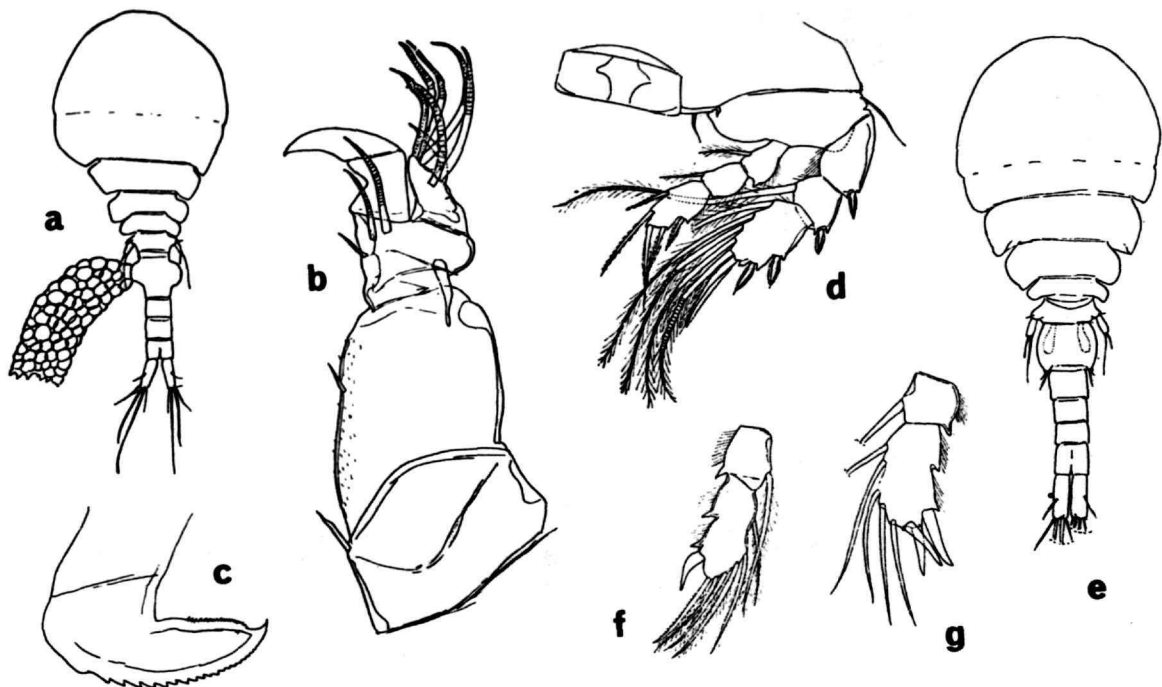


FIGURE 41.—*Scambicornus hamatus* Heegaard. Female: a, dorsal; b, second antenna; c, mandible; d, leg 4. Male: e, dorsal; f, endopod of leg 1; g, endopod of leg 2. (From Stock, 1964b, figs. 1a,c,e, 2a, 3d-f.) Length of female 1.13 mm, of male 0.97 mm.

***Scambicornus campanulipes* (Humes and Cressey, 1961)**

Preherrmannella campanulipes Humes and Cressey, 1961a, pp. 45-49, figs. 75-92 [from the holothurians *Actinopyga mauritiana* (Quoy and Gaimard), *Actinopyga echinites* (Jaeger), *Actinopyga* sp., and *Halodeima atra* (Jaeger), and from the echinoid *Diadema setosum* (Leske), region of Nosy Bé, Madagascar].

Scambicornus campanulipes.—Humes, 1967a, pp. 148-150, figs. 36-41 [from the holothurians *Actinopyga lecanora* (Jaeger), *Actinopyga mauritiana*, *Actinopyga miliaris* (Quoy and Gaimard), and *Actinopyga echinites*, region of Nosy Bé, Madagascar]; 1969f, p. 92.

***Scambicornus finmarchicus* (T. Scott, 1903)**

Herrmannella finmarchica T. Scott, 1903b, pp. 28-30, pl. 4, figs. 14-19 [from Bög Fjord, East Finmark].

Herrmannella finmarchica.—G. O. Sars, 1918, pp. 179, 180, pl. 101 [from Norway].

Scambicornus finmarchicus.—Humes, 1967a, p. 144; 1969f, p. 92.

***Scambicornus idoneus* (Humes and Cressey, 1961)**

Preherrmannella idonea Humes and Cressey, 1961a, pp. 26-34, figs. 1-27 [from the holothurians *Halodeima atra* (Jaeger), *Actinopyga echinites* (Jaeger), and *Holothuria leucospilota* (Brandt), and from the echinoid *Diadema setosum* (Leske), region of Nosy Bé, Madagascar].

Scambicornus idoneus.—Humes, 1967a, p. 150, figs. 42-48 [from the holothurians *Ludwigothuria* (= *Halodeima*) *atra* (Jaeger), *Argiodia nobilis* (Selenka), and *Holothuria scabra* Jaeger, region of Nosy Bé, Madagascar]; 1969f, p. 92.

NEW HOST.—2 ♀♀, 1 ♂ from 15 specimens of *Holothuria edulis* (Lesson), in 2 m, Ambariobe, near Nosy Bé, Madagascar, 25 May 1967, collected by AGH.

***Scambicornus lobulatus* Humes, 1967**

Scambicornus lobulatus Humes, 1967a, pp. 136-148, figs. 1-25 [from the body surface of the holothurian *Bohadschia graeffei* (Semper), region of Nosy Bé, Madagascar].

***Scambicornus modestus* (Humes and Cressey, 1961)**

Preherrmannella modesta Humes and Cressey, 1961a, pp. 39-43, figs. 56-74 [from the holothurians *Stichopus monotuberculatus* (Quoy and Gaimard), *Stichopus chloronotus* Brandt, *Stichopus variegatus* Semper, *Holothuria pardalis* Selenka, and *Bohadschia drachi* Cherbonnier, region of Nosy Bé, Madagascar].

Scambicornus modestus.—Humes, 1967a, pp. 152-154, figs. 61-66 [from the holothurians *Stichopus chloronotus*, from either *Microthele difficilis* (Semper) or *Urodemas ehrenbergi* Selenka, and *Brandtothuria impatiens* (Forskål), region of Nosy Bé, Madagascar]; 1969f, p. 92.

***Scambicornus nicobaricus* (Sewell, 1949)**

Preherrmannella nicobarica Sewell, 1949, pp. 89-91, fig. 22a-g [in weed-washings, Nankauri Harbor, Nicobar Islands].

Scambicornus nicobaricus.—Humes, 1967a, p. 144; 1969f, p. 92.

REMARKS.—The male is unknown.

***Scambicornus petiti* (Stock and Kleeton, 1963)**

Preherrmannella petiti Stock and Kleeton, 1963a, pp. 690-696, figs. 5-8 [from the holothurian *Stichopus regalis* (Cuvier), Banyuls, Mediterranean coast of France, and Cape Creus, Spain].

Scambicornus petiti.—Humes, 1967a, p. 144; 1969f, p. 92.

***Scambicornus poculiferus* (Humes and Cressey, 1961)**

Preherrmannella poculifera Humes and Cressey, 1961a, pp. 57-62, figs. 129-157 [from the holothurian *Synapta maculata* (Chamisso and Eysenhardt), Nosy Bé, Madagascar].

Scambicornus poculiferus.—Humes, 1967a, pp. 150-152, figs. 49-60 [from *Synapta maculata*, region of Nosy Bé, Madagascar]; 1969f, p. 92.

***Scambicornus prehensilis* (G. O. Sars, 1918)**

Herrmannella prehensilis G. O. Sars, 1918, p. 178, pl. 100 [from Norway].—Heegaard, 1944, pp. 361-363, fig. 11 (after G. O. Sars, 1918).

Scambicornus prehensilis.—Humes, 1967a, p. 144; 1969f, p. 92.

REMARKS.—The male is unknown.

***Scambicornus propinquus* (Nicholls, 1944)**

Paranthessius propinquus Nicholls, 1944, pp. 53-54, figs. 23-24 [from South Australia].

Scambicornus propinquus.—Humes, 1967a, p. 144; 1969f, p. 92.

REMARKS.—The male is unknown.

***Scambicornus robustus* (Thompson and A. Scott, 1903)**

Herrmannella robusta Thompson and A. Scott, 1903, p. 282, pl. 17, figs. 1-8 [from washings of invertebrates, Ceylon].

Lichomolgus robustus.—Stock, 1957, p. 382.

Macrochiron robustus.—Stock, 1957, p. 382.

Scambicornus robustus.—Humes, 1967a, p. 144; 1969f, p. 92.

REMARKS.—The male is unknown.

Scambicornus serendibicus (Thompson and A. Scott, 1903)

Hermannella serendibica Thompson and A. Scott, 1903, pp. 282–283, pl. 17, figs. 9–11 [in washings of sponges, Gulf of Mannar, Ceylon].

Scambicornus serendibicus.—Humes, 1967a, p. 144; 1969f, p. 92.

Preherrmannella serendibica.—Ummerkutty, 1968, p. 314 [in weed washings, Gulf of Mannar].

REMARKS.—The male is unknown.

Scambicornus subgrandis (Humes and Cressey, 1961)

Preherrmannella subgrandis Humes and Cressey, 1961a, pp. 53–57, figs. 110–128 [from the holothurian *Holothuria rugosa* Ludwig, region of Nosy Bé, Madagascar].

Scambicornus subgrandis.—Humes, 1967a, p. 144; 1969f, p. 92.

Scambicornus subtilis (Humes and Cressey, 1961)

Preherrmannella subtilis Humes and Cressey, 1961a, pp. 49–53, figs. 93–109 [from the holothurians *Halodeima edulis* (Lesson), *Opheodesoma grisea* (Semper), and *Holothuria curiosa* Ludwig, Nosy Bé, Madagascar].

Scambicornus subtilis.—Humes, 1967a, p. 144; 1969f, p. 92.

Scambicornus tenuicaudis (G. O. Sars, 1918)

Hermannella tenuicaudis G. O. Sars, 1918, pp. 180, 181, pl. 102 [from Norway].

Scambicornus tenuicaudis.—Humes, 1967a, p. 144; 1969f, p. 92.

REMARKS.—The male is unknown.

Scambicornus tuberatus (Humes and Cressey, 1961)

Preherrmannella tuberosa Humes and Cressey, 1961a, pp. 34–39, figs. 28–55 [from the holothurians *Bohadschia* sp., *Bohadschia koellikeri* (Semper), *Thelenota ananas*

(Jaeger), *Opheodesoma grisea* (Semper), and *Bohadschia cousteauxi* Cherbonnier, region of Nosy Bé, Madagascar].

Scambicornus tuberatus.—Humes, 1967a, p. 154, figs. 67–73 [from the holothurian *Bohadschia marmorata* Jaeger, region of Nosy Bé, Madagascar]; 1969f, p. 92.

NEW HOST.—3 ♀♀, 2 ♂♂, and 1 copepodid from a single specimen of *Bohadschia vitiensis* (Semper), in 17 m, in pass between Nosy Komba and Nosy Bé, Madagascar, 10 August 1967, collected by AGH.

Genus *Serpuliphilus* Humes and Stock, 1972

DIAGNOSIS.—Body cyclopiform. Urosome in the female 5-segmented; in the male 6-segmented. Caudal ramus with six setae. Rostrum broadly rounded. First antenna 7-segmented, slender. Second antenna 4-segmented, with two strong claws on the fourth segment.

Mandible having on its convex side a serrated fringe and on its concave side a row of spinules; tapering gradually into a relatively short lash. First maxilla with three elements. Second maxilla of the usual lichomolgid type. Maxilliped in the female 3-segmented and prehensile, but the last segment very long and clawlike; in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1–4 with 3-segmented rami. Armature lichomolgidiform in pattern. Leg 4 exopod with the third segment having II, I, 5. Leg 4 endopod with the formula 0–1; 0–1; II. Leg 1 endopod with the same formula in both sexes. Leg 5 with a free segment bearing two terminal elements. Leg 6 represented by two setae near the genital openings.

Other features as in the species described below. Associated with serpulid polychaetes.

TYPE-SPECIES.—*Serpuliphilus tenax*, new species.

ETYMOLOGY.—The generic name is compounded from Serpulidae and φιλος, loving. Gender masculine.

REMARKS.—It is not possible to construct a key for the males of *Serpuliphilus*, since the male of *S. duplus* is unknown.

Key to Species of the Genus *Serpuliphilus*

- Caudal ramus about 1.5 times as long as wide; maxilliped with a long slender claw, resembling that of a male *S. tenax*
 Caudal ramus about 4 times as long as wide; maxilliped reduced with a short terminal claw *S. duplus*

Serpuliphilus tenax, new species

FIGURES 42, 43, 44a

MATERIAL EXAMINED.—All from the gills of the sedentary polychaete *Spirobranchus giganteus* (Pallas): *Curaçao*: 22 ♀♀, 36 ♂♂, and 19 copepodids (including ♀ holotype and allotype) from eight polychaetes, depth 1–2 m, Piscadera Bay, 10 October 1958, deposited in ZMA (Co.102.274A), collected by JHS; 9 ♀♀, 7 ♂♂, and 12 copepodids from one polychaete, depth 2 m, same locality, 14 October 1958, collected by JHS.

Bonaire: 21 ♀♀, 48 ♂♂, and 1 copepodid, depth 0–1 m, pier of Kralendijk, 28 December 1958, collected by JHS.

Puerto Rico: 2 ♂♂ from one polychaete, in 1.8 m, on edge of lee side of Margarita Reef, near La Parguera, 8 August 1959; 13 ♂♂ from 9 polychaetes, Terremoto Reef, southeast of Magüeyes Island, near La Parguera, 9 August 1959; 20 ♀♀, 39 ♂♂ from 14 polychaetes, Laurel Reef, south of Magüeyes Island, 13 August 1959. All collected by AGH and R. U. Gooding (RUG).

Jamaica: 1 ♀, 1 ♂, and 4 copepodids from three polychaetes, in 15 m, southeastern corner of Maiden Cay, off Kingston Harbor, 6 September 1959; 1 ♀, 6 ♂♂, and 1 copepodid from 3 polychaetes, Rackham's Cay, off Kingston Harbor, 7 September 1959. Collected by AGH and RUG.

Barbados: More than 50 specimens from 20 polychaetes, depth 90–180 cm, off Six Men's Bay, St. Peter, 30 June 1959; 7 ♀♀, 6 ♂♂ from five polychaetes, 120–180 cm, reef off St. James Church, St. James, 30 June 1959; 9 ♀♀, 4 ♂♂, on wreck, Carlisle Bay, 6 July 1959. Collected by AGH and RUG.

Bahamas: 23 ♀♀, 6 ♂♂, and 3 copepodids, on wreck, three miles south of South Bimini, 8 June 1959; 5 ♀♀, 8 ♂♂, and 4 copepodids from one polychaete, west of southern end of Alec Bay, Bimini Lagoon, 9 June 1959. Collected by AGH and RUG.

The description and figures are based on a single female and a single male from Curaçao, except for Figure 44a, which was made from a Puerto Rican specimen. The polychaetes from Curaçao and Bonaire were identified by Dr. E. Wesenberg-Lund, those from Puerto Rico, Jamaica, Barbados, and the Bahamas by Dr. Marian E. Pettibone.

FEMALE.—The body form (Figure 42a) is that of a generalized *Herrmannella*. The size, not including the setae on the caudal rami, is 0.85 mm (0.81–0.87 mm) x 0.39 mm (0.37–0.40 mm), based on five specimens.

The first pedigerous segment is fairly clearly demarcated from the cephalic segment. It has the same width as the cephalic segment; pedigerous segments 2 and 3 diminish regularly, but slightly, in width; segment 4 is suddenly much narrower, and segment 5 narrower again. The genital segment (Figure 42b) has a larger diameter than the fifth pedigerous segment, its greatest width being reached at the level of two roughly triangular lateral expansions that carry the genital openings on their posterior margin. The genital segment carries one spinelike seta and a flexible setule near the sexual openings. The egg sacs (Figure 42a) are elongate, reach to the tip of the setae on the caudal rami, and contain rather numerous eggs in multiserial arrangement. The size of the egg sac is 586 μ (515–612 μ) x 121 μ (113–137 μ). A spermatophore found attached to the genital segment measured 98 x 47 μ .

The total number of urosomal segments is five. The anal segment does not carry spinules. The caudal ramus (Figure 42b) is 24 x 18 μ to 32 x 23 μ , thus about 1.5 times as long as wide; its lateral seta arises near the middle of the outer margin. The lateral seta, the four terminal setae, and the dorsal seta are smooth and not transformed.

The rostral fold (Figure 43f) is a flat, rounded lobe, not accompanied by auxiliary structures.

The first antenna (Figure 42c) is composed of seven distinctly articulated segments. The third segment bears a trace of a subdivision, but is certainly not subdivided into two articulated units. The segments bear 4, 14, 5, 3, 4, 2, and 7 setae respectively; in addition, each of segments 5–7 bears an aesthete.

The second antenna (Figure 42d) is very stout. It consists of the usual four segments, but the third segment is reduced to a narrow, triangular wedge carrying three normal setae and a longer seta with a flattened tip. The fourth segment is armed with three lateral setae, one long outer terminal seta, one very short and one long inner terminal seta, and two unusually powerful, curved claws.

The mandible (Figure 42e) has the median edge of the lappet finely serrated, the lateral edge armed

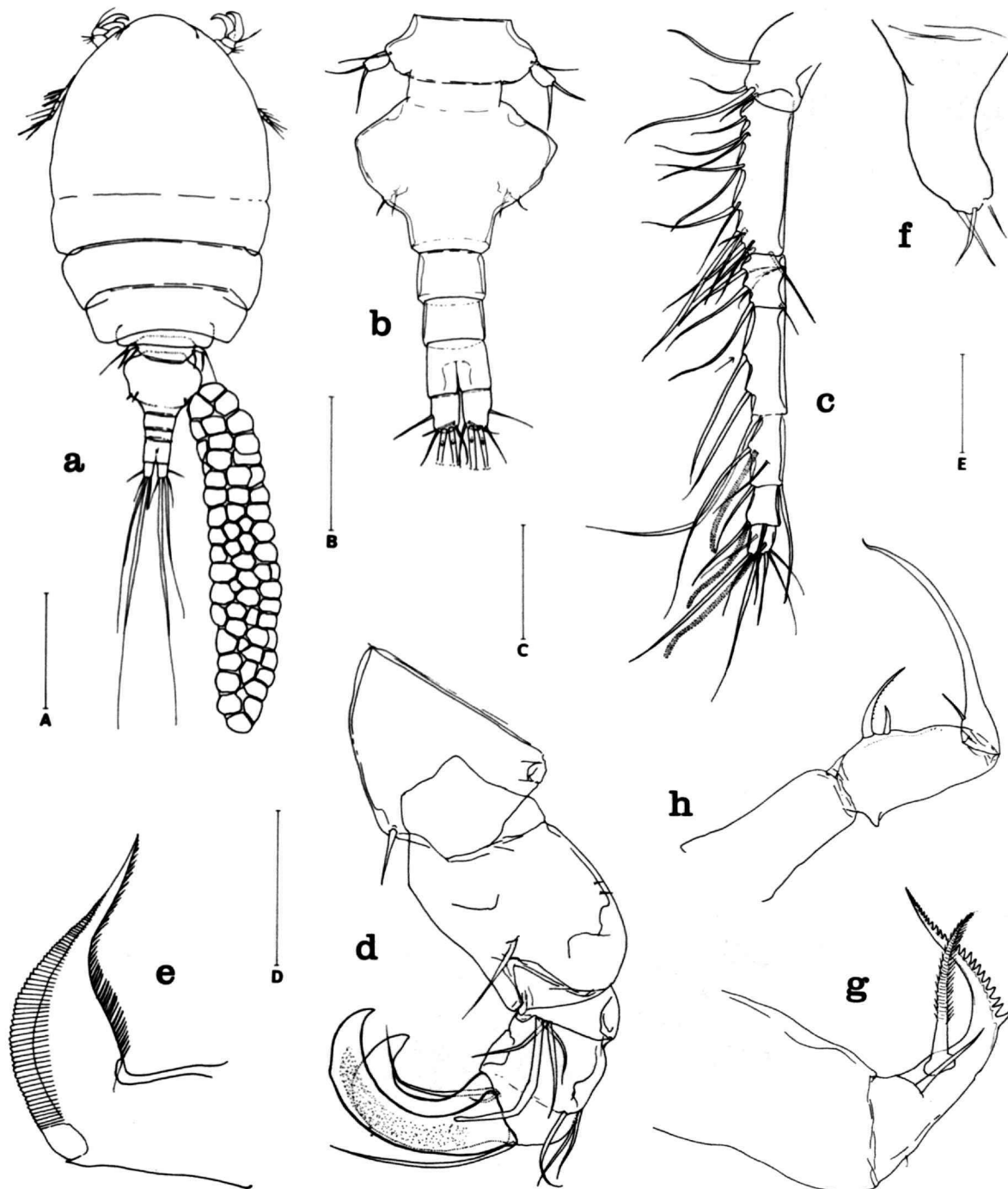


FIGURE 42.—*Serpuliphilus tenax*, new species. Female: *a*, dorsal (A); *b*, urosome, ventral (B); *c*, first antenna, with an arrow indicating the position of an additional aesthete in the male (C); *d*, second antenna (D); *e*, mandible (E); *f*, first maxilla (E); *g*, second maxilla (E); *h*, maxilliped (D). Scale: A, 0.2 mm; B, 0.1 mm; C, D, 0.05 mm; E, 0.02 mm.

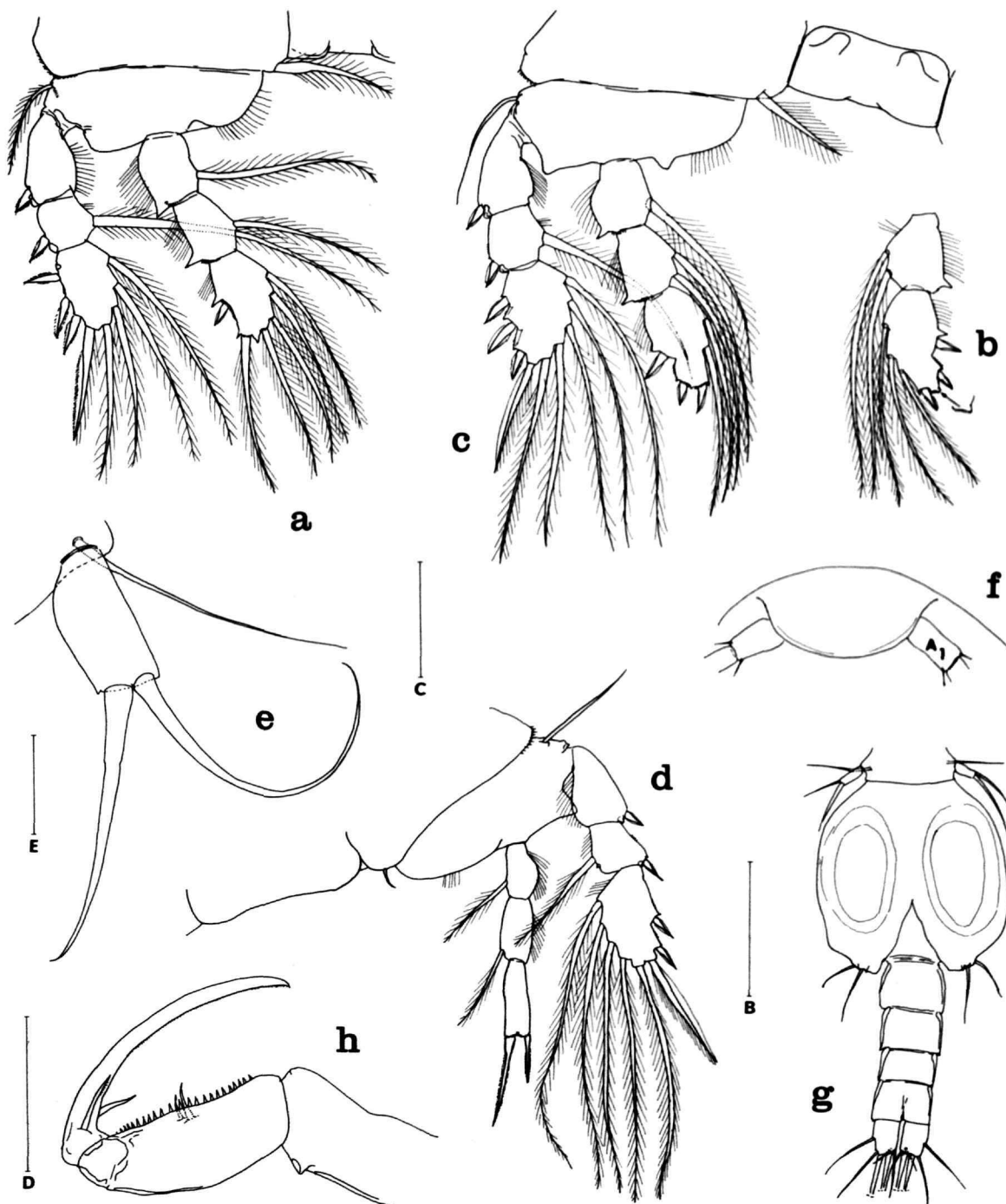


FIGURE 43.—*Serpuliphilus tenax*, new species. Female: *a*, leg 1 (*C*); *b*, second and third segments of endopod of leg 2 (*C*); *c*, leg 3 and intercoxal plate (*C*); *d*, leg 4 (*C*); *e*, leg 5 (*E*); *f*, rostrum, ventral (*B*). Male: *g*, urosome, ventral (*B*); *h*, maxilliped (*D*). Scale: *B*, 0.1 mm; *C*, *D*, 0.05 mm; *E*, 0.02 mm.

with long, fine spinules. The apical lash is relatively short.

The first maxilla (Figure 42f) is a simple lobe armed with three short terminal setae.

The second maxilla (Figure 42g) bears two articulated elements: a smooth spine and, more distally, a large, feathered, annulated seta. The terminal lash bears numerous regular serrations on its median edge.

The maxilliped (Figure 42h) has attained an unusual development for this family and this sex. It is a slender, prehensile organ consisting of a smooth basal segment, a tapering second segment, and a slender claw. The second segment bears a conical projection on the outer side and two large spines and a row of minute spinules on the inner side.

Legs 1-4 (Figures 43a-d) are biramous, each ramus being 3-segmented. The spinal and setal formula of the rami is as follows:

P₁ exp 1-0; 1-1; III,1,4
 enp 0-1; 0-1; 1,5
 P₂ exp 1-0; 1-1; III,1,5
 enp 0-1; 0-2; I,II,3
 P₃ exp 1-0; 1-1; III,1,5
 enp 0-1; 0-2; I,II,2
 P₄ exp 1-0; 1-1; II,1,5
 enp 0-1; 0-1; II

The endopod of leg 4 is slender and weak compared to the exopod.

The fifth leg (Figure 43e) consists of a single segment 19 x 11 μ . The two terminal setae are smooth.

MALE.—The size (based on five specimens) is 0.76 mm (0.74-0.79 mm) x 0.29 mm (0.29-0.31 mm). Apart from the configuration of the urosome, of the first antenna, and of the maxilliped, there are no structural differences between the two sexes. The genital segment is of the normal, roughly circular shape (Figure 43g); four urosomal segments follow after the genital segment, against three in the female. The first antenna is armed and constructed as in the female, but has an extra aesthete on segment 4, implanted near the most proximal seta. The male maxilliped (Figure 43h) has a stronger claw, which is armed, moreover, with two basal setae; the spinules in the row on segment 2 are larger than in the female. A very slight sexual difference exists in the second antenna

where the terminal seta is as long as the claw in the male, but shorter than the claw in the female.

COLOR.—In the Curaçao specimens the body is clear as glass, the eye is red, the intestine is ivory-colored. The two egg sacs are white with a slightly pinkish hue. Other females, from the Bahamas, have brown or white reproductive organs and a brown gut. A female from Puerto Rico was colorless except for a bright red eye and a very slight rose tint on the thoracic appendages and the genital segment.

ANOMALOUS STRUCTURE.—A female specimen collected at Terremoto Reef, Puerto Rico, shows a curious anomaly. On the exopod of the first leg (Figure 44a) one of the setae is replaced by an additional small segment which carries two short, plumose terminal setae. The corresponding leg on the other side of the body is normally built.

AFFINITIES.—Within the Sabelliphilidae, the present species stands well isolated by the presence of two strong claws on segment 4 of the second antenna, whereas segment 3 of the second antenna is devoid of claws. Also, the great development of the female maxilliped is a most remarkable feature of this new species.

ETYMOLOGY.—The specific name *tenax* (Latin, tenacious) alludes to the strong development of the antennal and maxillipedal claws.

Serpuliphilus duplus, new species

FIGURES 44b-j, 45

MATERIAL EXAMINED.—From the gills of the sedentary polychaete *Pomatostegus stellatus* (Abildg.): Curaçao: ovigerous ♀, the holotype (ZMA Co.102.274), from a polychaete fixed on a coral in about 2 m depth, Santa Martha Bay, 12 October 1958, collected by JHS. Puerto Rico: 1 ♀ from five polychaetes, depth about 0.5 m, landing at Magüeyes Island, off La Parguera, 4 February 1963, collected by JHS.

FEMALE (holotype).—The body (Figure 44b) is fairly slender; the first pedigerous segment is vaguely separated from the cephalic segment. The size, not including the setae on the caudal rami, is 0.76 x 0.31 mm. The metasome segments diminish regularly in width. The genital segment has a characteristic shape (Figure 44c); the total number of urosomal segments is five; the anal segment is

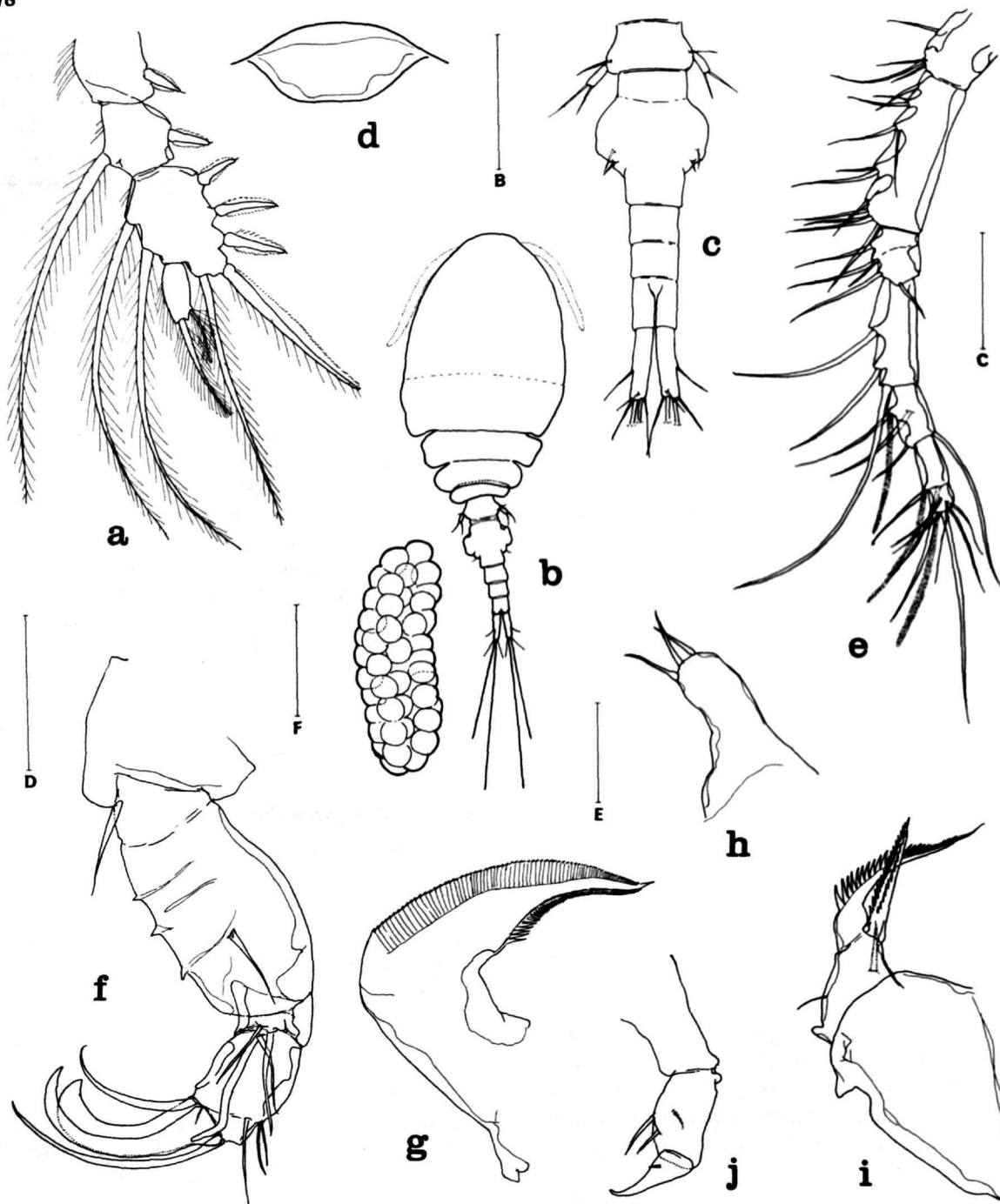


FIGURE 44.—*Serpuliphilus tenax*, new species. Female: *a*, abnormal exopod of leg 1 in a specimen from Puerto Rico (*n*). *Serpuliphilus duplus*, new species. Female: *b*, dorsal, with egg sac (*F*); *c*, urosome, ventral (*B*); *d*, rostrum, ventral (*B*); *e*, first antenna (*C*); *f*, second antenna (*D*); *g*, mandible (*E*); *h*, first maxilla (*E*); *i*, second maxilla (*E*); *j*, maxilliped (*D*). Scale: *B*, 0.1 mm; *C*, *D*, 0.05 mm; *E*, 0.02 mm; *F*, 0.2 mm.

smooth. Two setae arise near each genital opening. The egg sacs are elongated elliptical in outline, measure $451 \times 129 \mu$, and contain numerous eggs. The caudal ramus (Figure 44c) is $58 \times 14 \mu$, thus about four times as long as wide, much longer than the anal segment (40μ). The lateral seta arises somewhat distally to the middle of the outer margin of the ramus. All setae are smooth and not transformed.

The rostral fold (Figure 44d) is a weakly chitinized, broad lobe, not beak-shaped or bifid as in many other sabelliphilid species.

The first antenna (Figure 44e) is composed of seven distinct segments; the third segment, however, bears a trace of a subdivision which is not a functional articulation. The number of setae on the segments is 4, 12, 5, 3, 4, 2, and 7 respectively. Moreover, each of segments 5-7 carries an aesthete.

The second antenna (Figure 44f) roughly resembles that of *S. tenax*. The second segment bears one seta and three chitinous wrinkles or folds. The third segment is small, rectangular, and carries three normal setae and a longer, flattened seta. The fourth segment has three lateral setae and a termi-

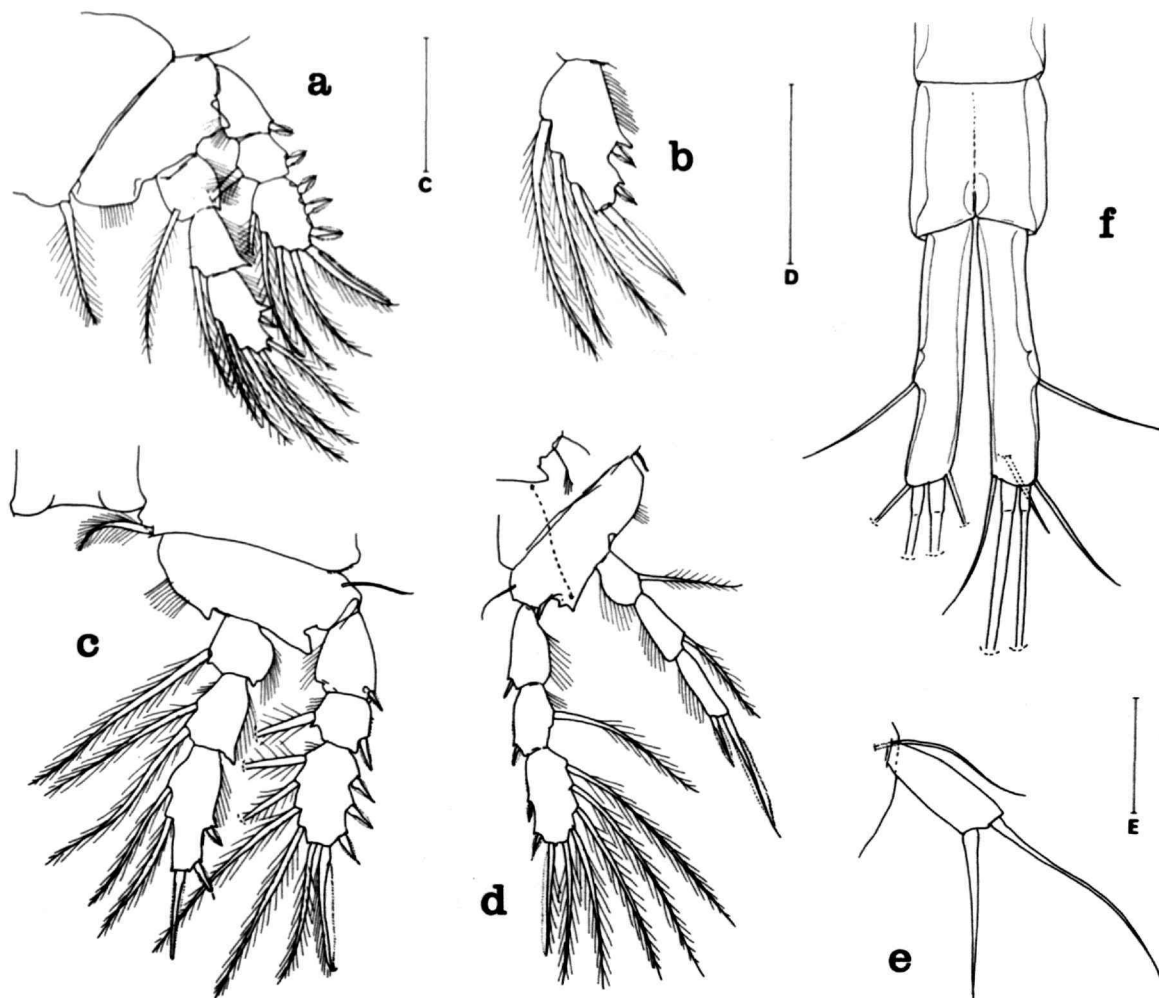


FIGURE 45.—*Serpuliphilus duplus*, new species. Female: a, leg 1 (c); b, third segment of endopod of leg 2 (d); c, leg 3 (c); d, leg 4, with detail of basis on opposite side of body (c); e, leg 5 (e); f, caudal ramus in a specimen from Puerto Rico (c). Scale: c, d, 0.05 mm; e, 0.02 mm.

nal armature consisting of one long outer seta, one long and one very short inner seta, and one robust and one feebler claw.

The mandible (Figure 44g) and first maxilla (Figure 44h) resemble those of *S. tenax*. The second maxilla (Figure 44i) bears two projections: one on the anterior distal corner of the first segment and one on the adjacent corner of the second segment. A setule arises near the projection on the second segment. The terminal lash is armed with regular, slender teeth.

The maxilliped (Figure 44j) consists of two segments and a terminal claw. The second segment bears two spines and a row of spinules; the claw bears one short spine. The entire appendage is in a more reduced condition than in *S. tenax*.

The spine and setal formula of legs 1-4 (Figure 45a-d) is identical with that of *S. tenax*. There exist, however, certain differences in proportions, which are most clearly visible in the greater elongation of the third segment and in the much longer terminal spine on this segment in *S. duplus*.

The fifth leg (Figure 45e) is similar to that of *S. tenax*, the free segment being $20 \times 8 \mu$.

The female from Puerto Rico is slightly longer than the Curaçao specimen, viz., 998μ . It has much slenderer caudal rami (Figure 45f), $83 \times 14 \mu$, whereas the anal segment is 50μ long. In its other characters, however, it resembles fully the Curaçao specimen.

MALE.—Unknown.

COLOR.—The body is colorless; the eye is bright red; the gut is pink; the two egg sacs are salmon-pink.

AFFINITIES.—Like *S. tenax*, the present species is chiefly characterized by the presence of two strong claws on the fourth segment of the second antenna. It differs from *tenax*, however, in a number of characters, the most readily visible being the more reduced female maxilliped, the much greater elongation of the caudal rami, and the greater development of the terminal spine of the third endopod segments.

ETYMOLOGY.—The specific name *duplus* (Latin, the double number) refers to the presence of two terminal claws on the second antenna.

Genus *Synapticola* Voigt, 1892

DIAGNOSIS.—Body transformed, elongated. Urosome in the female 5-segmented; in the male

6-segmented. Caudal ramus with three setae. Rostrum not developed. First antenna 7-segmented. Second antenna 3-segmented, terminally with a claw and a seta.

Labrum a thin plate notched in the middle. Mandible sickle-shaped and with the convex side of the broad blade having fine teeth; tip of the blade with a curved and rounded thickening. First maxilla with three elements. Second maxilla of the usual lichomolgid form. Maxilliped in the female 3-segmented and with a pointed tip; in the male 4-segmented (assuming the proximal part of the claw to be a fourth segment).

Legs 1-4 in both sexes with 3-segmented exopods and 2-segmented endopods. Leg 5 in both sexes a short papilla bearing two setae, with a third seta nearby.

Endoparasitic in holothurians.

TYPE-SPECIES.—*Synapticola teres* Voigt.

Synapticola teres Voigt, 1892

FIGURE 46

Synapticola teres Voigt, 1892, pp. 32-40, pl. 5, figs. 1-25 [from the body cavity of the holothurian *Synapta kefersteini* Selenka, Amboina].—Changeux, 1960, p. 55.

REMARKS.—Voigt's description, based on two females and three males, is far from complete. *S.*

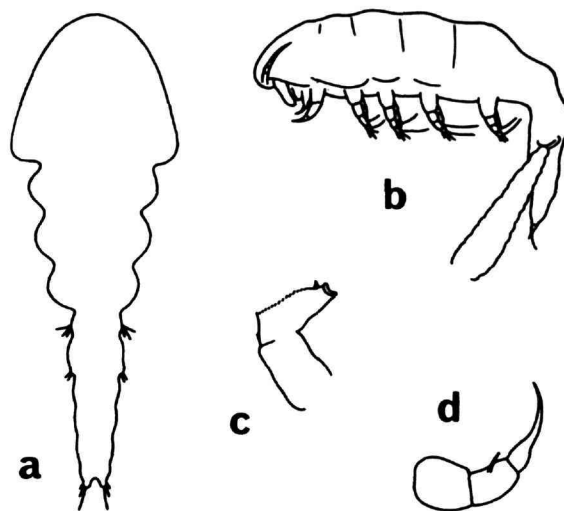


FIGURE 46.—*Synapticola teres* Voigt. Female: a, outline of body, dorsal; b, lateral; c, mandible; d, maxilliped. (Redrawn after Voigt, 1892, pl. 5, figs. 6, 11 (part), 15, 22.) Length of female 3 mm, of male 1.5 mm.

teres has not been found since, and the genus remains monotypic. Hence, the characterization of the genus is at present deficient and its completion must await the finding of new specimens. On the basis of Voigt's information, however, we consider it to be a valid genus.

Genus *Thamnomolgus* Humes, 1969

DIAGNOSIS.—Body cyclopiform. Urosome 5-segmented in the female, 6-segmented in the male. Caudal ramus with six relatively short setae. Rostrum with a broadly truncated posteroventral margin. First antenna 7-segmented, the armature in the female being 3, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male three aesthetes added, so that the formula is 3, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented, with the formula 0, 1, 3, 1 + a minute setuliform element, there being one terminal claw.

Labrum subquadrate, its posteroventral margin only slightly indented and without the usual deep median cleft. Mandible a simple blade without a proximal constriction. Paragnath a hairy lobe. First maxilla with two setae. Second maxilla 2-segmented, the small second segment with a slender blade corresponding to the lash seen in related genera. Maxilliped in the female 3-segmented; in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1–4 with 3-segmented rami and with the same formula for the armature in both sexes. Leg 3 endopod with the formula 0–1;0–2;II,2. Leg 4 endopod with 0–1;0–1;II. Strong sexual dimorphism on the third segment of leg 1 endopod. Leg 5 in the female with a free segment bearing two terminal setae; in the male this segment reduced to a small lobe fused with the body but bearing two terminal setae. Leg 6 in the female represented by a single small seta near the area of attachment of each egg sac, in the male by a posteroventral flap on the genital segment extended as a subconical process bearing two small setae.

Other features as in the species below.

Associated primarily with antipatharians.

TYPE-SPECIES.—*Thamnomolgus robustus* Humes.

Thamnomolgus robustus Humes, 1969

FIGURE 47

Thamnomolgus robustus Humes, 1969b, pp. 19–28, figs. 64–97 [from the antipatharians *Antipathes myriophylla* Pallas, *Antipathes* sp. cf. *spinescens* Gray, *Antipathes abies* (Linnaeus), and *Antipathes ericoides* Pallas, region of Nosy Bé, northwestern Madagascar].

NEW RECORD.—1 ♂ from the gorgonian *Acanthogorgia aspera* Pourtalès, in 24 m, north of Ankazoberavina, near Nosy Bé, Madagascar, 13°27.6' S, 47°58.2' E, 25 August 1967, collected by AGH. This specimen, which occurred along with 390 adults and copepodids of *Acanthomolgus astrictus*, probably is an accidental rather than a regular associate of the gorgonian.

Sabelliphilidae Insufficiently Described or of Uncertain Position

Doridicola antheae Ridley, 1879

Doridicola antheae Ridley, 1879, p. 458 [from the tentacles of the actinarian *Anthea cereus*, var., in a pool at low water, Ilfrecombe, North Devon, England].

Lichomolgus antheae.—De Zulueta, 1912, p. 11. [*Anemonia sulcata* (Pennant) = *Anthea cereus*.]

REMARKS.—Ridley's species may be *Paranthesius anemoniae* Claus, 1889. The male is unknown.

Herrmannella dubia G. O. Sars, 1921

Herrmannella dubia G. O. Sars, 1921, pp. 110, 111, pl. 73, fig. 1 [from Norway].

REMARKS.—Similar in some ways to *Paranthesius anemoniae*. Probably belongs to *Paranthesius* according to Sewell, 1949, p. 81. The female is unknown.

Paclabius tumidus Kossmann, 1877

Paclabius tumidus Kossmann, 1877, pp. 23, 24, pl. 6, figs. 1–10 [from the pericardium of the bivalve *Tridacna*, Bohol, Philippine Islands; belongs in Lichomolgidae according to unpublished work of H. E. H.].—Aurivillius, 1883, p. 3.

Paranthesius sp.

Paranthesius sp.—Kô, 1961, pp. 130, 131, 138, fig. 1c [from the bivalves *Mactra sulcata* Reeve and *Tapes japonica* Deshayes, Japan].

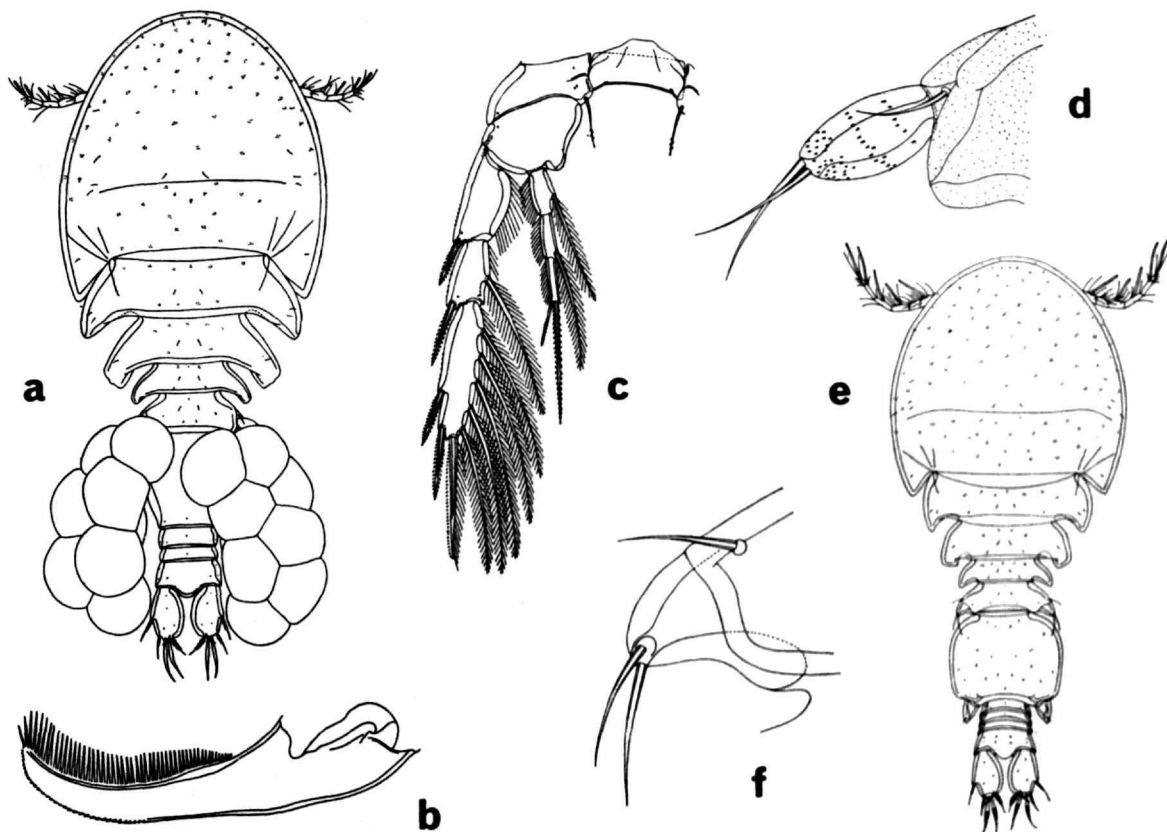


FIGURE 47.—*Thamnomolgus robustus* Humes. Female: a, dorsal; b, mandible; c, leg 4 and intercoxal plate; d, leg 5. Male: e, dorsal; f, leg 5. (From Humes, 1969b, figs. 64, 74, 83–85, 96.) Length of female 1.21 mm, of male 1.05 mm.

***Sabelliphilus* (?) *bispirae* McIntosh, 1905**

Sabelliphilus (?) *bispirae* McIntosh, 1905, pp. 86–91, pl. 9, figs. 51–56 [from the polychaete *Bispira volutacornis* Montagu, South Africa].—Barnard, 1955, p. 233, fig. 5a–c [from the polychaete *Bispira volutacornis*, Cape, South Africa].

***Sabelliphilus leuckarti* Kossmann, 1877**

Sabelliphilus leuckarti Kossmann, 1877, pp. 17, 18, pl. 2, figs. 2, 3 [from the polychaete *Sabella*, Massaua, Red Sea].

Family LICHOMOLGIDAE Kossmann, 1877

Sapphirinidae Thorell, 1860, p. 64.—Brady, 1880, p. 39.—Carus, 1885, p. 350 (Section b, Lichomolgina).
Lichomolgidae Kossmann, 1877, p. 10.—Canu, 1891a, p. 477.—G. O. Sars, 1917a, pp. 149, 150.
Lichomolgiden Claus, 1889, pp. 1, 19.
Lichomolginae Gurney, 1927, p. 463.—Sewell, 1949, p. 91.

Legs 1–4 usually with all rami 3-segmented except the endopod of leg 4 which is 1- or 2-segmented. Reduction occurs in a posterior to anterior series, as in *Rakotoa* with a vestigial leg 4 endopod, *Ravahina* with endopods of legs 3 and 4 vestigial, and *Amarda* with endopods of the first two legs 2- or 3-segmented, endopods of legs 3 and 4 absent (in this genus leg 3 exopod is 2-segmented and leg 4 exopod is absent). Leg 5 present in both sexes and with a free segment (in a few genera—for example, *Octopicola*—not clearly delimited from the body).

REMARKS.—Two genera, *Philoconcha* and *Paraphiloconcha*, have been omitted from the following key due to lack of information in the existing descriptions.

Key to the Described Genera of the Family Lichomolgidae

1. Second antenna 3-segmented 2
 Second antenna 4-segmented 11
2. Legs 1 and 2 with 3-segmented exopods and 2- or 3-segmented endopods; leg 3 with 2-segmented exopod, endopod absent; leg 4 absent *Amarda*
 Legs 1-3 with 3-segmented rami; leg 4 with 3-segmented exopod and 1- or 2-segmented endopod 3
3. Rostrum with slender, needle-like process; claws on second antenna pectinate *Macrochiron*
 Rostrum rounded, triangular, or broadly truncated but lacking a needle-like process; claws on second antenna not pectinate 4
4. Leg 4 with endopod 1-segmented 5
 Leg 4 with endopod 2-segmented 6
5. With broad shield-shaped prosome; second antenna with two terminal claws; leg 4 with endopod armed with II,I *Aspidomolgus*
 Prosome not unusually broad; second antenna with one terminal claw; leg 4 with endopod armed with II *Sewellocchiron*
6. Second antenna with two or three terminal claws *Astericola*
 Second antenna with one terminal claw 7
7. Leg 4 with endopod having formula 0-1;II 8
 Leg 4 with endopod not thus armed 9
8. Mandible with basal area distal to indentation having on its convex side four slender digitiform processes; first segment of first antenna with four setae *Schedomolgus*
 Mandible with basal area distal to indentation having on its convex side a large hyaline expansion; first segment of first antenna with one seta *Spaniomolgus*
9. Leg 4 with endopod having formula 0-1;I; mandible with basal area distal to constriction having on its concave side two lobes with serrated margins *Prionomolgus*
 Leg 4 with endopod having more than one element on second segment; mandible with basal area distal to constriction having on its concave side a row of spinules 10
10. Urosome in female 5-segmented, in male 6-segmented but with segment of leg 5 fused with genital segment; basis of leg 4 laterally elongated *Stellicola*
 Urosome in female 4-segmented, in male 5-segmented (though in both sexes there may be a slight indication of division of anal segment); basis of leg 4 not laterally elongated *Synstellicola*
11. Legs 1-4 with rami 3-segmented except for endopod of leg 4 or endopods of both legs 3 and 4 which are vestigial and represented only by a small unarmed knob 12
 Legs 1-4 with all rami 3-segmented except endopod of leg 4 which is either 1- or 2-segmented 13
12. Only leg 4 with vestigial endopod; legs 1-4 with inner coxal seta; second maxilla with long digitiform process on first segment *Rakotoa*
 Both legs 3 and 4 with vestigial endopod; legs 1-4 lacking inner coxal seta; second maxilla without a long process on first segment *Ravahina*
13. Leg 4 with endopod 1-segmented 14
 Leg 4 with endopod 2-segmented 20
14. Fourth segment of second antenna with four terminal claws; leg 5 a minute lobe; body elongated with slender prosome. *Octopicola*
 Fourth segment of second antenna with less than four terminal claws; leg 5 with a distinct free segment; body cyclopiform, prosome not unusually slender 15
15. Endopod of leg 4 unarmed *Haplomolgus*
 Endopod of leg 4 armed 16
16. Second antenna with a claw on third segment in addition to either one or two terminal claws 17
 Second antenna without a claw on third segment 18
17. Second antenna with one terminal claw; leg 4 with endopod having two spines *Lichomolgella*
 Second antenna with two terminal claws; leg 4 with endopod having two spines and a seta *Kelleria*
18. Leg 4 with endopod armed with two spines and a seta *Telestacicola*
 Leg 4 with endopod armed with only two spines 19

19. Leg 4 with endopod in female almost as long as exopod in male, much shorter than exopod; second antenna with one terminal claw *Paramacrochiron*
 Leg 4 with endopod in both sexes much shorter than exopod; second antenna with two terminal claws (except one clawlike spine in *P. fucicolum*) *Pseudomacrochiron*
20. Leg 4 with second segment of endopod bearing only one element 21
 Leg 4 with second segment of endopod bearing more than one element 24
21. Second antenna with one terminal claw 22
 Second antenna with three terminal claws 23
22. Leg 4 with endopod having formula 0-1;I; second maxilla with long digitiform process on first segment *Andrianellus*
 Leg 4 with endopod having formula 0-0;I; second maxilla without such a process on first segment *Monomolgus*
23. Body modified with prosome in female pointed anteriorly; leg 4 with endopod having formula 0-1;I; mandible a broad blade abruptly attenuated distally; third exopod segments of legs 1-4 with only three spines *Gelastomolgus*
 Body cyclopiform with prosome in female rounded anteriorly; leg 4 with endopod having formula 0-1;I; mandible with broad base and slender attenuated blade; third exopod segments of legs 1-4 with four spines *Debruma*
24. Leg 4 with second segment of endopod bearing more than two elements 25
 Leg 4 with second segment of endopod bearing two elements 26
25. Leg 4 with endopod having formula 0-1;II,1; mandible with slender base merging into long attenuated lash; leg 4 with third exopod segment having armature II,1,5 *Ascidioxymus*
 Leg 4 with endopod having formula 0-1;II,3, or 0-1;II,2, or 0-1;I,3; mandible with large basal area indented; leg 4 with third exopod segment having armature III,1,4, or III,1,5, or I,1,1,5 *Indomolgus*
26. Leg 4 with endopod having first segment unarmed *Xenomolgus*
 Leg 4 with endopod having an inner element on first segment 27
27. Labrum with a pair of prominent, ventrally directed anterolateral setae; leg 4 with endopod having formula 0-1;2; maxilliped in female slender, with greatly elongated third segment *Nasomolgus*
 Labrum without such setae; leg 4 with endopod having different formula; maxilliped in female not elongated 28
28. Leg 4 with endopod having formula 0-1;1,I *Anisomolgus*
 Leg 4 with endopod having different formula 29
29. Leg 4 with endopod having formula 0-I;II 30
 Leg 4 with endopod having formula 0-1;II 31
30. Second antenna with one terminal claw; second maxilla in male with large proximally directed seta *Meringomolgus*
 Second antenna with two terminal claws; second maxilla in male without such a seta *Acanthomolgus*
31. Second antenna with one claw on third segment and three or four terminal claws 32
 Second antenna without claw on third segment but with 1-4 terminal claws 34
32. Second antenna with three terminal claws; mandible with toothlike process on convex edge *Acaenomolgus*
 Second antenna with four terminal claws; mandible without toothlike process on convex edge 33
33. Female with prosome strongly inflated, and with a median ventrally produced postoral structure terminating in two small hooks *Lichomolgides*
 Female with prosome not inflated and without such a hooked structure *Zygomolgus*
34. Second antenna terminally with one claw and one clawlike spine *Epimolgus*
 Second antenna terminally with different armature 35
35. Mandible of simple type, with slender base merging gradually into long, attenuated lash *Lichomolgus*
 Mandible of more complex type, with large base often indented on convex side and variously ornamented; lash variable, very short to long 36
36. Second antenna with one terminal claw 37
 Second antenna with two terminal claws (or in *Doridicola fishelsoni* with one claw and one long spine) 43

37. Mandible with a scalelike area on convex side of base..... 38
 Mandible without a scalelike area but with digitiform processes or tooth on convex side..... 40
38. Mandible with lash reduced, and represented only by a small pointed process.....
Colobomolgus..... 39
 Mandible with a long pectinate lash..... 39
39. Leg 4 with third exopod segment II,I,5..... *Paramolgus*
 Leg 4 with third exopod segment III,I,5..... *Paradoidicola*
40. Mandible with convex side of base bearing a proximally directed tooth..... *Odontomolgus*
 Mandible with convex side of base bearing one or more small digitiform lobes..... 41
41. Second maxilla with a large digitiform process on first segment..... *Panjakus*
 Second maxilla without such a process..... 42
42. Mandible with convex side of base bearing two small digitiform lobes; leg 4 with third exopod segment II,I,5..... *Anchimolgus*
 Mandible with convex side of base having a roughened area followed by a digitiform process; leg 4 with third exopod segment III,I,5..... *Zamolgus*
43. Mandible with very short lash..... 44
 Mandible with long lash..... 45
44. Mandible with convex side of base having a scalelike area with spinules; lash of second maxilla not "folded"; leg 4 with third exopod segment III,I,5..... *Contomolgus*
 Mandible with convex side of base having a large hyaline area without spinules; lash of second maxilla "folded"; leg 4 with third exopod segment II,I,5..... *Ascetomolgus*
45. Mandible with convex side of base bearing a tooth..... 46
 Mandible with convex side of base bearing a scalelike area with spinules..... 47
46. Tooth on mandible proximally directed; leg 4 with third exopod segment II,I,5..... *Plesiomolgus*
 Tooth on mandible distally directed; leg 4 with third exopod segment III,I,5..... *Paredromolgus*
47. Mandible with basal area beyond indentation densely spinose; free segment of leg 5 with distal inner process..... *Pennatulicola*
 Mandible with basal area beyond indentation with a row of spinules on concave side and scalelike area with row of spinules followed by a serrated fringe on convex side; free segment of leg 5 without a distal inner process..... 48
48. Leg 4 with third exopod segment II,I,5..... *Metaxymolgus*
 Leg 4 with third exopod segment III,I,5..... *Doridicola*

Genus *Acaenomolgus* Humes and Stock, 1972

DIAGNOSIS.—Body cyclopiform, elongated, except the female of *A. protulae* where the prosome is inflated. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six setae. Rostrum rectangular or linguiform. First antenna 7-segmented. Second antenna 4-segmented, slender, with the formula 1, 1, 2 or 3 + one articulated claw, and several setae + three articulated claws (in *A. protulae* two of the setae are clawlike, making five apparent claws in all).

Mandible with the base lacking a pronounced indentation and the spinules usually seen on the concave side but having a distally directed toothlike process on the convex edge; distal part of the mandible an attenuated blade set at an angle to the base and with marginal serrulations or denticulations. First maxilla with two or three elements. Second maxilla of the usual lichomolgid type. Maxilliped in the female 3-segmented with a

pointed tip, in the male 4-segmented (considering the proximal part of the claw to represent a fourth segment).

Legs 1-4 with 3-segmented rami except for leg 4 endopod which is 2-segmented. Leg 4 exopod with the third segment having II,I,5. Leg 4 endopod with the formula 0-1,II, the seta being feathered. Leg 1 endopod with the same formula in both sexes in *A. protulae* (male unknown in *A. serpulae*). Leg 5 with a free segment bearing two terminal elements. Egg sacs long, reaching well beyond the caudal rami.

Other features as in the species below.

Associated with polychaete annelids.

TYPE SPECIES.—*Acaenomolgus protulae* (Stock).

ETYMOLOGY.—The name is a combination of the Greek words *ακαυνα* (a thorn), alluding to the toothlike process on the mandible, and *μολγος* (a sac made of leather), being part of the name of the type-genus, *Lichomolgus*. Gender masculine.

Key to Species of the Genus *Acaenomolgus*

FEMALES

- Prosoma inflated; second antenna terminally with three articulated claws and two clawlike setae; leg 4 endopod as long as the exopod..... *A. protulae*
 Prosoma not inflated; second antenna terminally with three claws and three setae; leg 4 endopod distinctly shorter than the exopod..... *A. serpulae*

Acaenomolgus protulae (Stock, 1959)

FIGURE 48

?*Lichomolgus* (*Epimolgus*) *protulae* Stock, 1959b, pp. 70-74, figs. 7, 8 [from the plume of the polychaete *Protula intestinum* (Lamarck), Gulf of Naples, Italy].

Lichomolgus sp. (cf. *protulae* Stock).—Stock, 1960c, p. 246 [copepodids; from the plume of *Protula tubularia* (Mont.), Banyuls, Mediterranean coast of France].

Lichomolgus protulae.—Gotto, 1961a, pp. 265-267 [from the branchial filaments of the polychaete *Protula tubularia*, Strangford Lough, northern Ireland]; 1962, p. 104; 1966, p. 194.

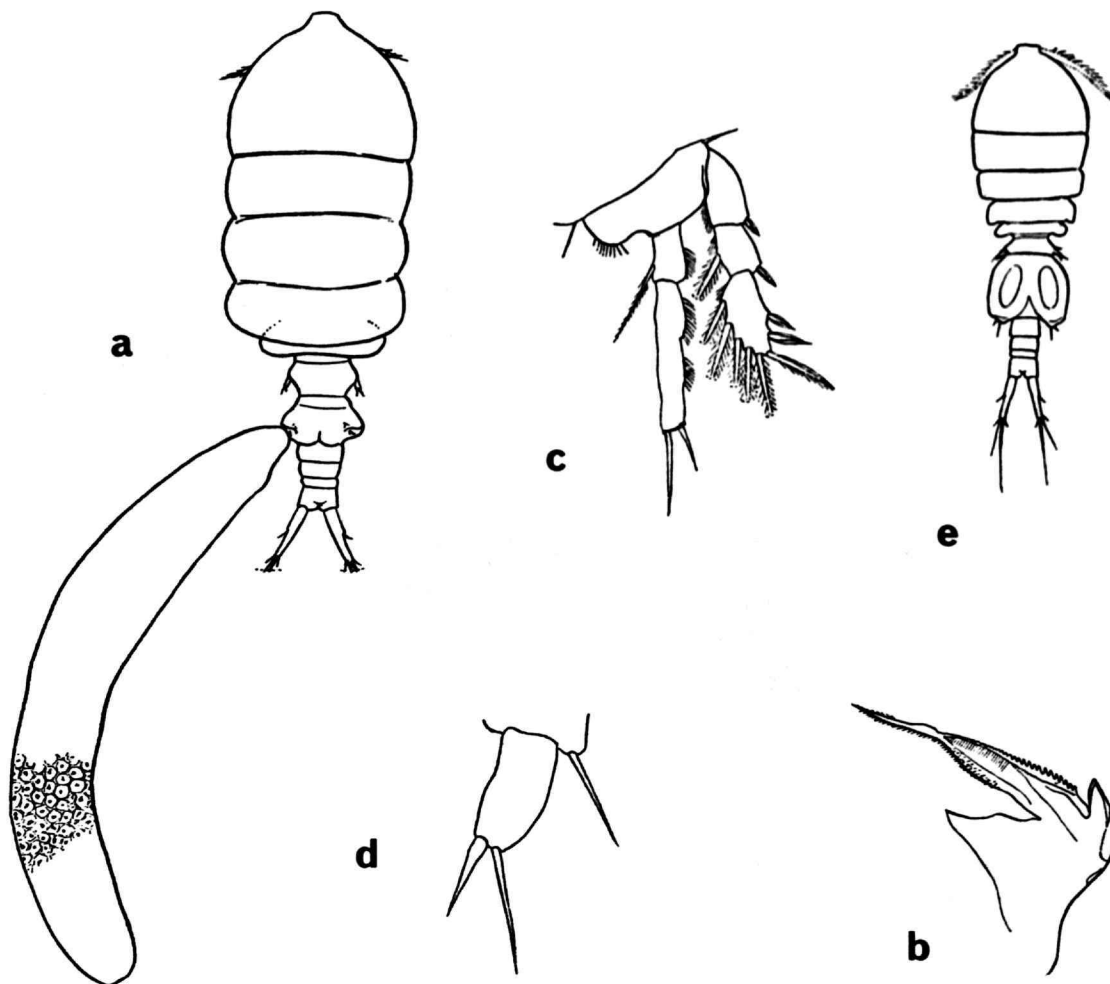


FIGURE 48.—*Acaenomolgus protulae* (Stock). Female: a, dorsal; b, mandible; c, leg 4; d, leg 5. Male: e, dorsal. (From Stock, 1959b, figs. 7b,c,h, 8a,b.) Length of female 1.5-2.0 mm, of male 1.0-1.4 mm.

Acaenomolgus serpulae (Stock, 1960)

Lichomolgus serpulae Stock, 1960c, pp. 242-246, figs. 13, 14 [from the plume of the polychaete *Serpula vermicularis* Linnaeus, between Cerbère and Banyuls, Mediterranean coast of France].—Gotto, 1961a, p. 267.

REMARKS.—The male is unknown.

Genus *Acanthomolgus* Humes and Stock, 1972

DIAGNOSIS.—Body cyclopiform. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six setae. Rostrum rounded posteroventrally. First antenna 7-segmented, in the female with the formula 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male with 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented with the armature 1, 1, 3, 11 + several small elements (usually five), there being two terminal claws, often long.

Labrum with the two lobes separated by a deep cleft. Mandible with the basal area distal to the indentation, having on its convex side a scalelike area with spinules followed by a serrated fringe and on its concave side a row of spinules; lash long. Paragnath a small hairy lobe. First maxilla

with four elements (except three in *A. varirostratus* and *A. bilobipes*). Second maxilla of the usual lichomolgid type. Maxilliped of the female 3-segmented, with a pointed tip; in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1-4 with 3-segmented rami except for leg 4 endopod which is 2-segmented. Leg 4 exopod with third segment II, I, 5. Leg 4 endopod with the formula 0-I; II, the first segment bearing a spine rather than a seta. Armature similar in both sexes except for leg 1 endopod in the male where the last segment is I, I, 4 instead of I, 5 as in the female. Leg 5 with a free segment bearing two terminal elements. Leg 6 in the female represented by the two setae and the process near the area of attachment of each egg sac, in the male by a posteroventral flap on the genital segment bearing two setae.

Other features as in the species below.

Associated with octocorals.

TYPE-SPECIES.—*Acanthomolgus exilipes* (Humes and Ho).

ETYMOLOGY.—The name is formed from the Greek words *ακανθα* (a spine), referring to the spine on the first segment of leg 4 endopod, and *μολγος*.

Key to Species of the Genus *Acanthomolgus*

FEMALES

1. Free segment of leg 5 with inner margin bilobed *A. bilobipes*
Free segment of leg 5 not bilobed, either straight or with a proximal inner expansion or toothlike process 2
2. Two setae on second segment of maxilliped about equal in length 3
One of the two setae on second segment of maxilliped much longer than the other, at least 2:1 6
3. Two long median terminal setae on caudal ramus naked; free segment of leg 5 with a prominent inner basal pointed expansion directed distally *A. cuneipes*
Two long median terminal setae on caudal ramus with long spinules; free segment of leg 5 with a small inner basal rounded expansion 4
4. Sides of expanded part of genital segment subparallel rather than rounded; mandible with small blunt process on basal area near serrated fringe *A. exilipes*
Sides of expanded part of genital segment rounded; mandible without such a process 5
5. Second segment of leg 4 endopod with inner hairs *A. gentilis*
Second segment of leg 4 endopod with small inner spinules *A. fuscisetiger*
6. Inner margin of basis of leg 4 with a row of hairs; rostrum sexually dimorphic; two long median terminal setae on caudal ramus naked *A. varirostratus*
Inner margin of basis of leg 4 smooth; rostrum alike in both sexes; two long median terminal setae on caudal ramus with lateral spinules (sometimes sparse and minute) 7
7. Free segment of leg 5 with an inner proximal distally directed process separated sharply from the more distal margin of the segment 8
Free segment of leg 5 with at most a rounded inner expansion not sharply set off from the rest of the margin 10

8. Genital segment broadest anterior to middle; free segment of leg 5 shorter than genital segment *A. verseveldti*
- Genital segment broadest posterior to middle; free segment of leg 5 as long as genital segment 9
9. Second segment of first antenna six times longer than third; first segment of leg 1 exopod with spine unusually long (twice the length of the spine on second segment) *A. longispinifer*
- Second segment of first antenna four times longer than third; first segment of leg 1 exopod with spine about as long as that on second segment *A. astrictus*
10. Two long median terminal setae on caudal ramus with a few minute spinules visible only under high magnification 11
- Two long median terminal setae on caudal ramus with many long spinules 12
11. Distalmost element on third segment of second antenna a naked spine; second segment of leg 4 endopod with inner margin smooth; free segment of leg 5 about five times longer than wide *A. hales*
- Distalmost element on third segment of second antenna minute ($2\ \mu$) and hyaline; second segment of leg 4 endopod with inner margin having small spinules; free segment of leg 5 about two times longer than wide *A. plantei*
12. Maxilliped with two terminal elements of about equal length and highly divergent, and one seta on second segment about twice the length of the other; second segment of leg 4 endopod with a few hairs on inner margin *A. hians*
- Maxilliped with two terminal elements unequal and not conspicuously divergent, and one seta on second segment about four times the length of the other; second segment of leg 4 endopod with a smooth inner margin *A. telestophilus*

MALES

1. Two long median terminal setae on caudal ramus naked 2
- Two long median terminal setae on caudal ramus with spinules, either long or very short and visible only under high magnification 3
2. Rostrum with a minute median posteroventral knob; free segment of leg 5, $33 \times 9\ \mu$ *A. varirostratus*
- Rostrum rounded as in female; free segment of leg 5, $51 \times 8\ \mu$ *A. cuneipes*
3. Two long median terminal setae on caudal ramus with a few very short spinules visible only under high magnification 4
- Two long median terminal setae on caudal ramus with long lateral spinules 5
4. Second segment of second antenna with smooth inner surface (no sexual dimorphism); two claws on this appendage relatively short and stout, the longer claw distinctly shorter than the greatest length of the fourth segment *A. hales*
- Second segment of second antenna with small spines on inner surface; two claws on this appendage relatively long and slender, the longer almost as long as the greatest length of the fourth segment *A. plantei*
5. One of the two setae on the second segment of the maxilliped terminating in several pointed spiniform elements *A. fissisetiger*
- Both setae on the second segment of the maxilliped attenuated (but one seta obtuse in *A. verseveldti*) 6
6. First segment of leg 1 exopod with spine unusually long (twice the length of the spine on the second segment) *A. longispinifer*
- First segment of leg 1 exopod with spine about as long as that on second segment 7
7. Second segment of leg 4 endopod with smooth inner margin 8
- Second segment of leg 4 endopod with hairs or small spinules on inner margin 10
8. Setae on first and second segments of second antenna fringed on one side *A. bilobipes*
- Setae on first and second segments of second antenna smooth 9
9. One of the three elements on third segment of second antenna angularly bent; two terminal claws on this appendage distinctly shorter than the fourth segment *A. telestophilus*
- All three elements on third segment of second antenna straight; two terminal claws on this appendage nearly as long as fourth segment *A. astrictus*
10. Two claws on second antenna about as long as fourth segment 11
- Two claws on second antenna distinctly shorter than fourth segment 12

11. Mandible with a small blunt process on basal area near serrated fringe..... *A. exilipes*
Mandible without such a process on basal area near serrated fringe..... *A. gentilis*
12. Third segment of leg 1 endopod with outer spine recurved and process between the two
spines blunt *A. verseveldti*
Third segment of leg 1 endopod with outer spine straight and process between the two
spines pointed *A. hians*

Acanthomolgus exilipes (Humes and Ho, 1968)

Lichomolgus exilipes Humes and Ho, 1968b, pp. 7–10, figs. 32–55 [from the alcyonaccans *Dendronephthya mucronata* (Pütter), *Dendronephthya regia* Verseveldt, *Dendronephthya stocki* Verseveldt, and *Dendronephthya koellikeri* Kükenthal, region of Nosy Bé, northwestern Madagascar].

NEW RECORDS (all from Madagascar, collected by AGH).—From *Dendronephthya mucronata*: 1 ♀, from single colony, in 3 m, Antsmantsara, Nosy Bé, 9 June 1967; several specimens, from four colonies, in 10 m, Rocher du N.E., Nosy Bé, 19 August 1967; many specimens, from two colonies, in 10 m, Rocher du N.E., Nosy Bé, 19 August 1967; many specimens, from single colony, in 25 m, north of Ankazoberavina, near Nosy Bé, 13°27.6' S, 47°58.2' E, 24 August 1967; and several specimens, from single colony, in 24 m, north of Ankazoberavina, near Nosy Bé, 13°27.6' S, 47°58.2' E, 25 August 1967.

From *Dendronephthya regia*: 78 ♀♀, 96 ♂♂, and 24 copepodids from single colony, in trawl, 26–23 m, near Nosy Bé, 13°15'50" S, 48°08'35" E, 29 August 1967.

From *Dendronephthya stocki*: many specimens, from single colony, in 25 m, north of Ankazoberavina, near Nosy Bé, 13°27.6' S, 47°58.2' E, 24 August 1967.

From *Dendronephthya* sp.: many specimens, from part of single colony, in 27 m, Banc des Frères, Isles Mitsio, near Nosy Bé, 12°58' S, 48°28' E, 17 August 1967.

NEW HOSTS.—From *Dendronephthya speciosa* Kükenthal: 2 ♀♀, from single colony, in 17 m, near black buoy, north of Pte. Ambarionaomby, Nosy Komba, near Nosy Bé, Madagascar, 5 August 1967; 1 ♀, 5 ♂♂, and 2 copepodids, from single colony, in 24 m, north of Ankazoberavina, near Nosy Bé, 13°27.6' S, 47°58.2' E, 25 August 1967; both collections by AGH.

From *Stereonephthya cordylophora* Verseveldt: many specimens, from single colony, in 24 m, north of Ankazoberavina, near Nosy Bé, Madagascar, 13°27.6' S, 48°58.2' E, 25 August 1967.

Acanthomolgus astrictus, new species

FIGURES 49–52

TYPE MATERIAL.—384 ♀♀, 302 ♂♂, and 48 copepodids from one colony of a gorgonian, *Acanthogorgia aspera* Pourtalès, in 23 m, Tany Kely, a small island south of Nosy Bé, Madagascar, 30 July 1967, collected by AGH. Holotype ♀, allotype, and 580 paratypes (330 ♀♀, 250 ♂♂) deposited in USNM; 60 paratypes (30 ♀♀, 30 ♂♂) in ZMA; and the remaining paratypes in the collection of AGH.

OTHER MATERIAL EXAMINED (all from *Acanthogorgia aspera*).—290 ♀♀, 109 ♂♂, and 22 copepodids from single colony, in 20 m, Banc de Cinq Mètres, west of Nosy Bé, 6 August 1967; and 150 ♀♀, 140 ♂♂, and 100 copepodids from single colony, in 24 m, north of Ankazoberavina, 13°27.6' S, 47°58.2' E, west of Nosy Bé, 25 August 1967. All collected by AGH.

FEMALE.—The body (Figure 49a) resembles in general form that of *A. cuneipes* (Humes and Ho). The length is 0.89 mm (0.80–0.99 mm) and the greatest width 0.44 mm (0.41–0.46 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1.65:1. The ratio of the length of the prosome to that of the urosome is 2.75:1. The body is rather weakly sclerotized.

The segment of leg 5 (Figure 49b) is 75 x 125 μ. Between this segment and the genital segment there is a very short ventral intersegmental sclerite (Figure 49c). The genital segment is as wide as long, 114 x 114 μ, in dorsal view with rounded lateral margins which abruptly join a short posterior region with parallel sides. The areas of attachment of the egg sacs are located dorsolaterally near the middle of the segment. Each area (Figure 49d) bears two naked spiniform setae, 9 μ and 13 μ in length, and a small spiniform process. The three postgenital segments are 32 x 67 μ, 23 x 66 μ, and 26 x 65 μ from anterior to posterior.

The caudal ramus (Figure 49e) is shorter than wide, 24 x 27.5 μ in greatest dimensions. The outer

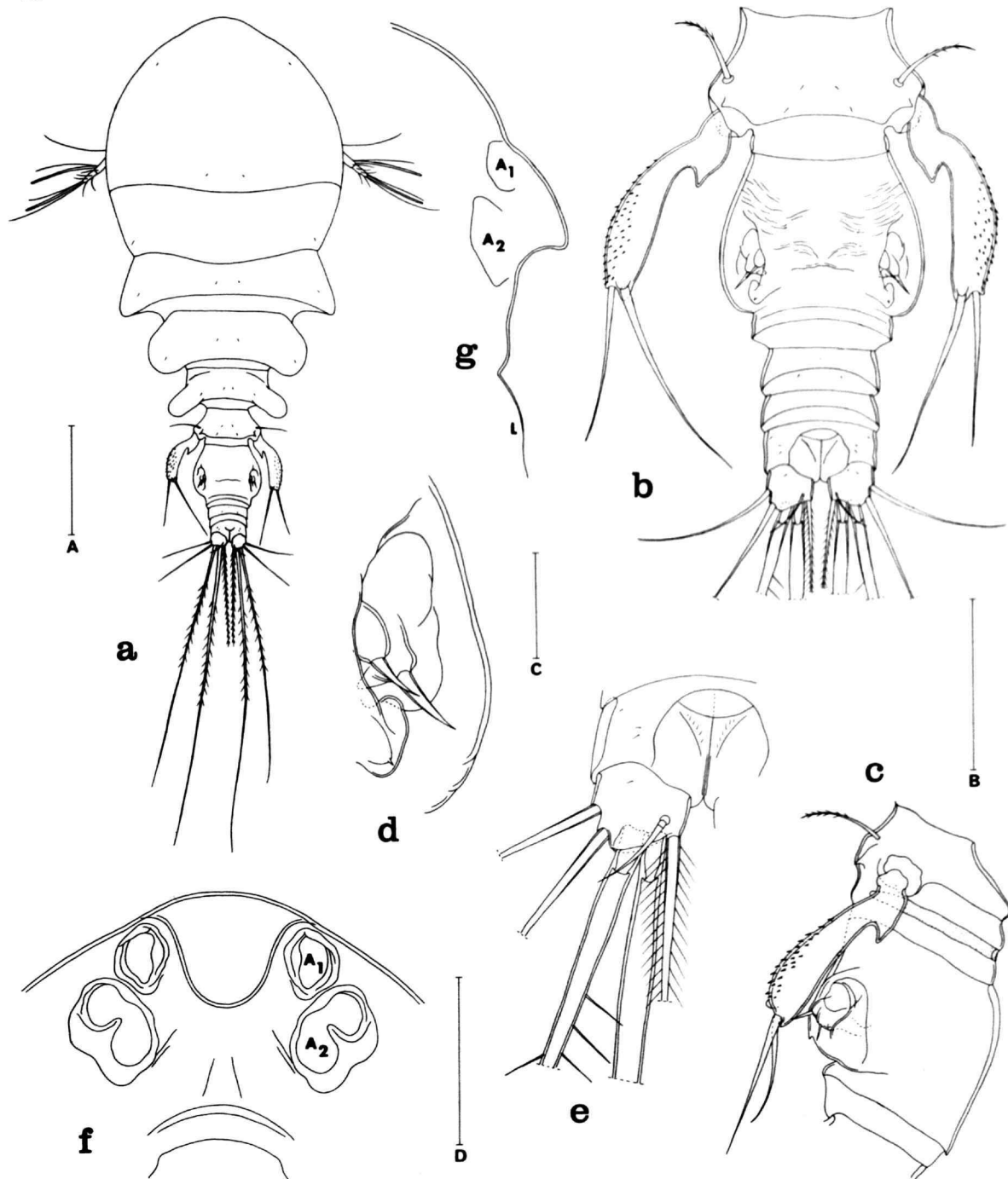


FIGURE 49.—*Acanthomolgus astrictus*, new species. Female: *a*, dorsal (A); *b*, urosome, dorsal (B); segment of leg 5 and genital segment, lateral (C); *d*, area of attachment of egg sac, dorsal (D); *e*, caudal ramus, dorsal (D); *f*, rostrum, ventral (B); *g*, rostrum, lateral (B). Scale: A, 0.2 mm; B, 0.1 mm; C, 0.02 mm; D, 0.05 mm.

lateral seta is 96 μ , the dorsal seta 25 μ , and the outermost terminal seta 122 μ , all three of them naked. The innermost distal seta is 195 μ with lateral hairs, and the two long median terminal setae 440 μ (outer) and 570 μ (inner), both inserted between dorsal (unornamented) and ventral (with a marginal row of minute spinules) flaps and both with prominent coarse lateral spinules in their proximal halves.

The fine ornamentation of the body consists of a few hairs (sensilla). The anal segment has a row of minute spinules along its posteroventral margin on both sides.

The egg sacs are elongated, reaching far beyond the caudal rami and resembling those of *A. cuneipes*. In nearly all ovigerous females, however, the sacs were broken. The only complete sac seen measured 475 x 200 μ , with each of the many eggs about 49 μ in diameter.

The rostrum (Figure 49f) in ventral view is broadly rounded posteroventrally, and in lateral view (Figure 49g) projects ventrally.

The first antenna (Figure 50a) is about 400 μ long. The lengths of the seven segments (measured along their posterior nonsetiferous margins) are 31 (65 μ along the anterior margin), 112, 28, 57, 60, 43, and 31 μ respectively. The formula for the armature is 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All the setae are naked.

The second antenna (Figure 50b) is 4-segmented and rather slender. Each of the first two segments bears an inner seta, and the inner margin of the second segment has a few minute hyaline spinules. The third segment bears three setae. The moderately elongated fourth segment, 79 μ along its outer edge, 50 μ along its inner edge, and 21 μ wide, bears two unequal terminal claws, the slender claw 57 μ along its axis, the stout claw 53 μ , and five setae. All the setae are naked.

The labrum (Figure 50c) has two broad posteroventral lobes.

The mandible (Figure 50d) resembles that of *A. longispinifer* (Humes and Ho) but the scale-like protrusion on the convex side distal to the basal constriction is rounded rather than pointed. The paragnath (Figure 50c) is a small hairy lobe. The first maxilla (Figure 50e) bears four setae. The second maxilla (Figure 50f) resembles that of *A. fissisetiger* (Humes and Ho). The maxilliped (Fig-

ure 50g) has groups of spinules on its first segment. The second segment bears two setae somewhat unequal in length. The third segment has a small naked seta and two nearly equal terminal elements, widely divergent as in *A. hians* (Humes and Ho).

The area between the maxillipeds and the first pair of legs (Figure 50h) is not protuberant; a fine sclerotized line connects the bases of the maxillipeds.

Legs 1-4 (Figure 51a-d) have the same segmentation and formula for the armature as in *A. varirostratus* (Humes and Ho) and all other species in the genus. The inner seta on the coxa of leg 4 is naked and minute, only 6 μ long. The setae on the third segment of each exopod have distally somewhat longer hairs along the inner side than on the outer side. Leg 3 is similar to leg 2 except for the formula of the third segment of the endopod (Figure 51c). The endopod of leg 4 (Figure 51d) is 113 μ long (without the spinous processes), a little shorter than the exopod, which is 156 μ . The first segment of the endopod is 37 x 26 μ (including the terminal spinous processes) and bears an inner distal spine that is 27 μ and very finely barbed. The second segment is 80 μ long (including the processes), 22 μ in greatest proximal width, and 15.5 μ in least distal width. Its two unequal terminal spines are 28 μ (outer, finely barbed) and 67 μ (inner, with spinulose fringes). The outer margins of both segments are haired, their inner margins naked, and the second segment has a row of minute spinules near the insertions of the terminal spines.

Leg 5 (Figure 51e) has an elongated free segment 112 x 26 μ in greatest dimensions and of peculiar form. Proximally the segment is constricted (width here 13 μ), the region proximal to the constriction with a distomedially directed beaklike process. Distal to the constriction the segment is rather broadened with a curved outer margin but fairly straight inner margin. The outer terminal seta is 88 μ and naked. The inner terminal seta is 120 μ and naked, and arises between two small lobes. The seta on the body near the insertion of the segment is 50 μ and lightly feathered. The free segment is ornamented outwardly on both dorsal and ventral surfaces with small flattened spines.

Leg 6 is represented by the two setae near the attachment of each egg sac (Figure 49d).

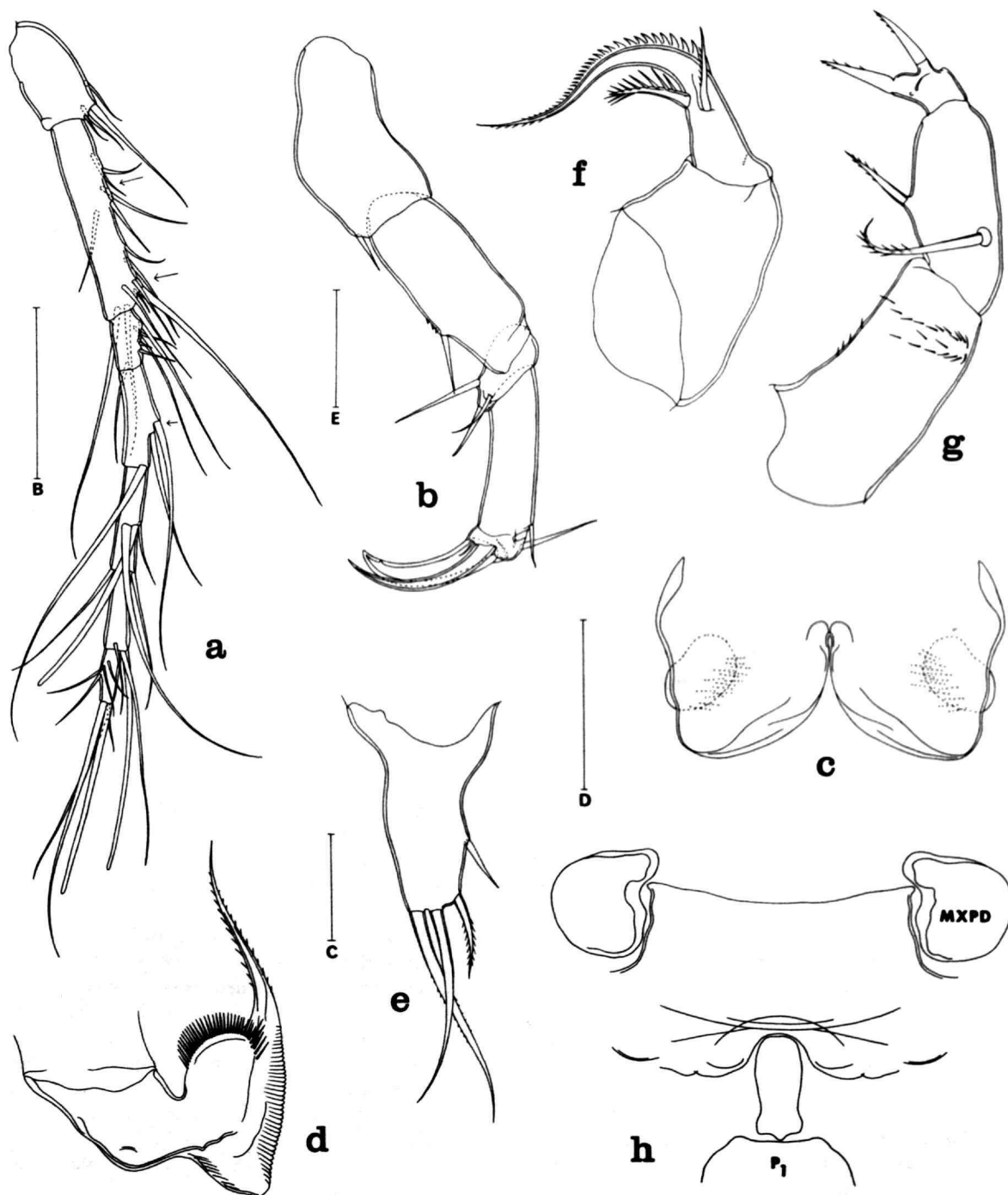


FIGURE 50.—*Acanthomolgus astrictus*, new species. Female: *a*, first antenna, with arrows indicating positions of additional aesthetes in male, ventral (B); *b*, second antenna, postero-inner (E); *c*, labrum and paragnaths, ventral (D); *d*, mandible, posterior (D); *e*, first maxilla, posterior (C); *f*, second maxilla, posterior (D); *g*, maxilliped, postero-inner (D); *h*, area between maxillipeds and first pair of legs, ventral (E). Scale: B, 0.1 mm; C, 0.02 mm; D, E, 0.05 mm.

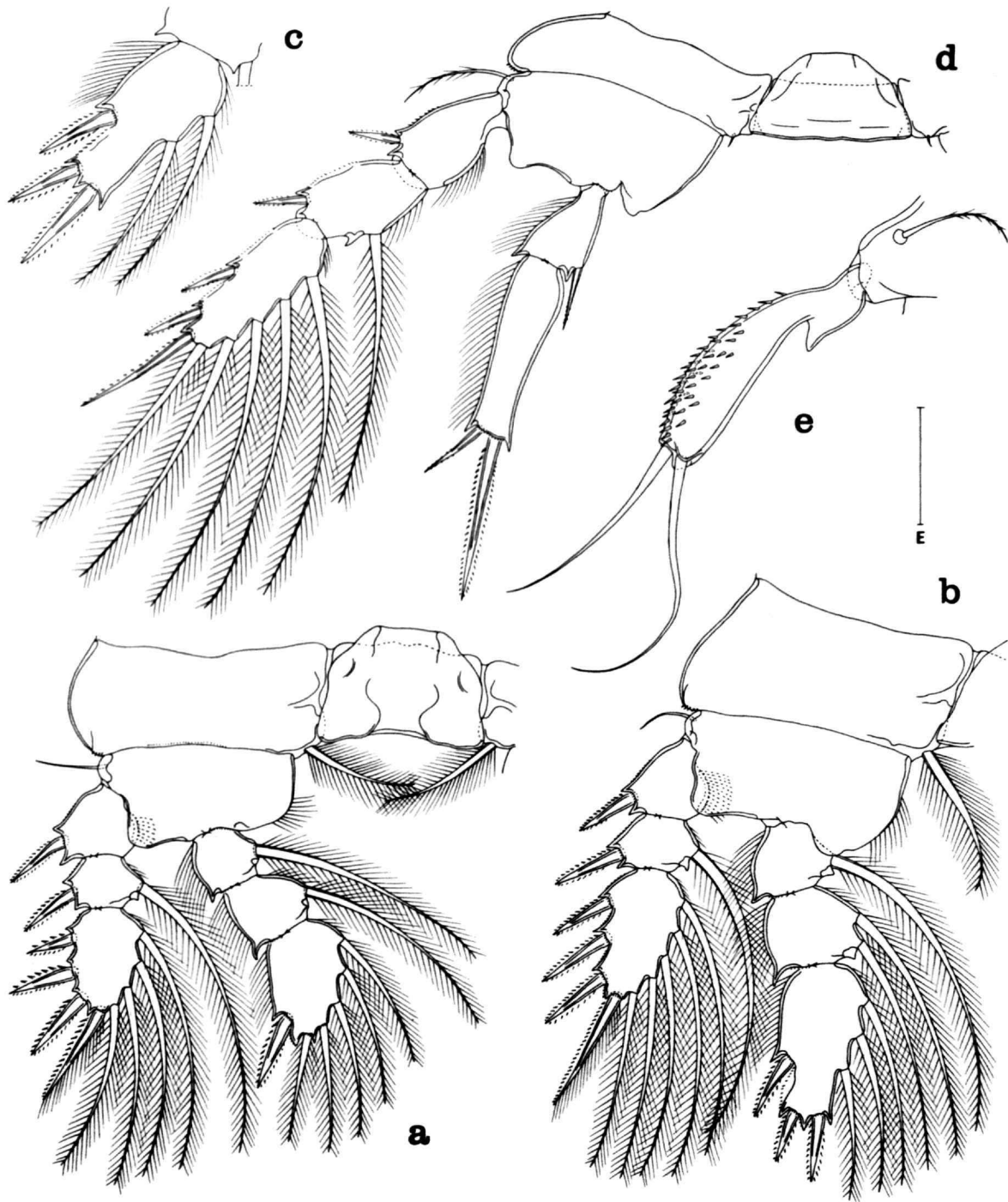


FIGURE 51.—*Acanthomologus astrictus*, new species. Female: a, leg 1 and intercoxal plate, anterior; b, leg 2, anterior; c, third segment of endopod of leg 3, anterior; d, leg 4 and intercoxal plate, anterior; e, leg 5, dorsal. Scale: E, 0.05 mm, applies to all drawings.

The color in life in transmitted light is slightly reddish (because of red globules within), the eye red, the egg sacs light reddish brown or gray. (The reddish color imitates the dark red color of the host gorgonian).

MALE.—The body (Figure 52a) resembles in general aspect that of the female. The length is 0.72 mm (0.67–0.78 mm) and the greatest width 0.27 mm (0.25–0.31 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1.54:1. The ratio of the length of the prosome to that of the urosome is 1.67:1.

The segment of leg 5 (Figure 52b) is 39 x 70 μ . There is no ventral intersegmental sclerite between this segment and the genital segment. The genital segment is about as long as wide, 153 x 151 μ , in dorsal view with its lateral borders rounded. The four postgenital segments are 23 x 44 μ , 18 x 44 μ , 11 x 43 μ , and 16 x 44 μ from anterior to posterior.

The caudal ramus resembles that of the female, but is smaller, 19 x 20 μ .

The fine ornamentation of the body is like that of the female.

The rostrum is similar to that of the female. The first antenna (Figure 52a) also is like that of the female but has three additional aesthetes (their positions indicated by arrows in Figure 50a), so that the formula is 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. The second antenna (Figure 52c) resembles that of the female, but the minute spinules on the inner edge of the second segment are more numerous and the stouter of the two claws is relatively less stout than in that sex.

The labrum, mandible, paragnath, first maxilla, and second maxilla resemble those of the female. The maxilliped (Figure 52d) is slender and 4-segmented (assuming that the proximal part of the claw represents a fourth segment). In general form it resembles that of *A. hians* (Humes and Ho). The claw is 159 μ along its axis (including the terminal lamella). One of the two unequal slender setae on the second segment is very finely barbed.

The area between the maxillipeds and the first pair of legs is like that of the female.

Legs 1–4 are segmented as in the female and have the same spinal and setal formula except for the last segment of the endopod of leg 1 (Figure 52e) where the formula is I, I, 4. Between the two conspicuously barbed spines on this segment there

is a recurved process minutely spinulose along its outer edge. Legs 2 and 3 are similar to those in the female. The endopod of leg 4 (Figure 52f) has slightly different proportions and the inner spine on the first segment is relatively longer than in the opposite sex. The first segment is 27 x 19 μ (including the terminal spinous processes) and its spine is 31 μ . The second segment is 52 μ long (including the processes), 15.5 μ in greatest width, and 11.5 μ in least width. The outer terminal spine is 22 μ , the inner 53 μ .

Leg 5 (Figure 52g) has a slender subrectangular free segment, 41 x 9 μ , ornamented with fewer and smaller outer spinules than in the female, and bearing two terminal naked setae 57 μ (outer) and 23 μ (inner).

Leg 6 (Figure 52h) consists of the usual postero-ventral flap on the genital segment bearing two naked setae, 39 μ and 52 μ .

The spermatophore (Figure 52i), attached to the female in pairs, is 133 x 73 μ (not including the neck).

The color in life resembles that of the female, but tends to be less reddish.

ETYMOLOGY.—The specific name *astrictus* (Latin, bound closely or drawn together) alludes to the proximal constriction of leg 5 in the female.

COMPARISON WITH RELATED SPECIES.—One of the chief characters of the genus *Acanthomolgus* is the possession of the formula 0–I;II on the endopod of leg 4. In seven species the inner margin of leg 5 in the female is not deeply indented proximally and the inner process, if present, is broadly rounded rather than toothlike (*A. exilipes*, *A. gentilis*, *A. fissisetiger*, and *A. varirostratus*, all described as *Lichomolgus* by Humes and Ho, 1968b; and *A. hians*, *A. telestophilus*, and *A. verseveldti*, all described as *Lichomolgus* by Humes and Ho, 1968d).

The two remaining species, *A. cuneipes* (Humes and Ho) and *A. longispinifer* (Humes and Ho), have an inner proximal toothlike process on the free segment of leg 5 in the female, a feature which suggests affinity with *A. astrictus*. In the female of *A. astrictus*, however, the shape of the free segment of leg 5, with its proximal constriction and distal expansion, is unlike that in those two species. *A. cuneipes* further differs from the new species in the absence of lateral spinules on the two long median terminal setae on the caudal ramus and

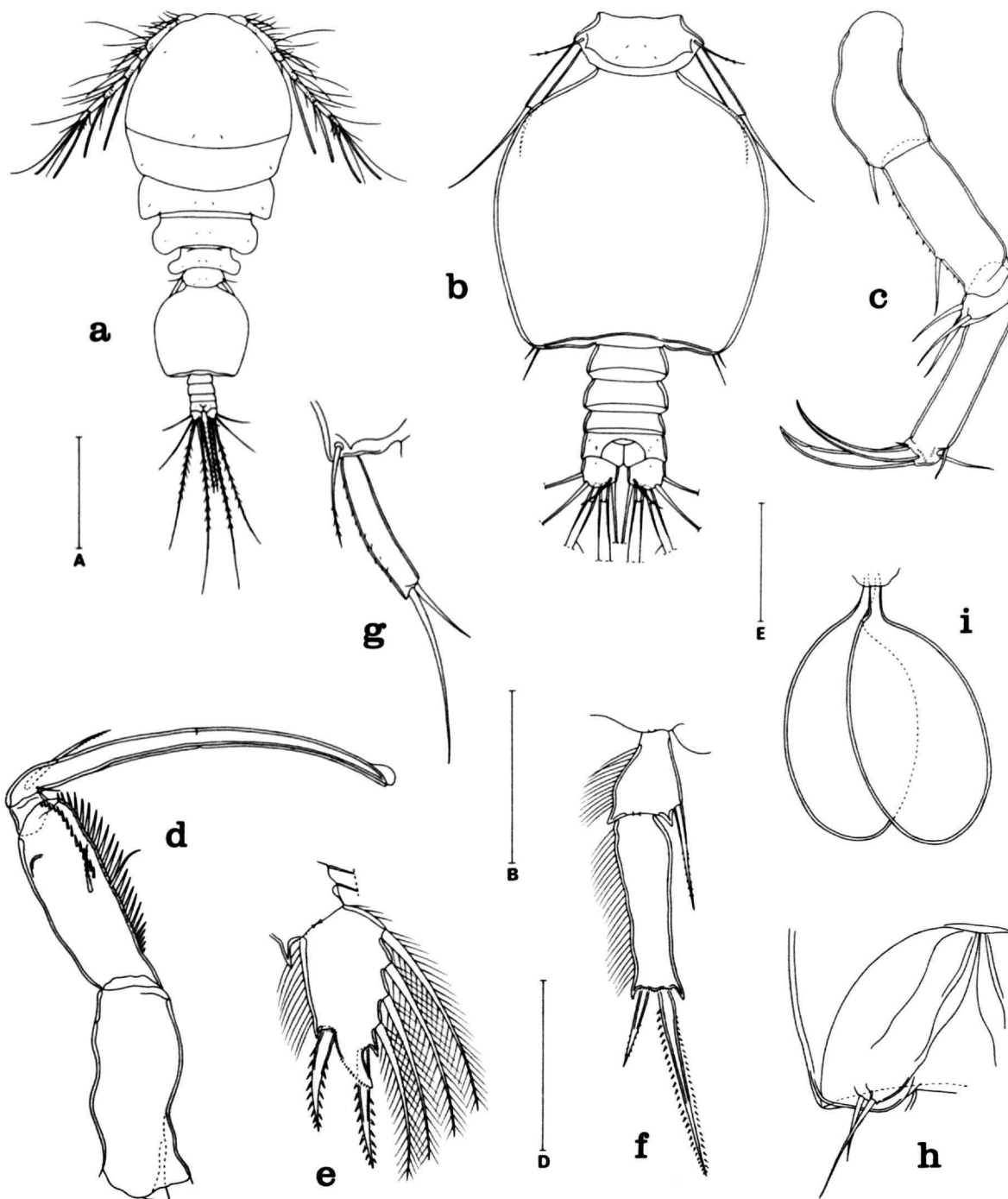


FIGURE 52.—*Acanthomolgus astrictus*, new species. Male: a, dorsal (A); b, urosome, dorsal (B); c, second antenna, postero-inner (E); d, maxilliped, outer (E); e, third segment of endopod of leg 1, anterior (D); f, endopod of leg 4, anterior (D); g, leg 5, dorsal (D); h, leg 6, ventral (E); i, spermatophore, attached to female, dorsal (E). Scale: A, 0.2 mm; B, 0.1 mm; D, E, 0.05 mm.

in the 4 or 5 central teeth on the lash of the second maxilla being stouter than the other teeth; and *A. longispinifer* differs in the outer spine on the first segment of the exopod of leg 1 being unusually long.

***Acanthomolgus bilobipes*, new species**

FIGURES 53-55

TYPE MATERIAL.—11 ♀♀, 26 ♂♂ from a gorgonian, *Antillogorgia acerosa* (Pallas), in 3 m, Lime Cay, near Kingston, Jamaica, 30 August 1959, collected by AGH and RUG. Holotype ♀, allotype, and 31 paratypes (8 ♀♀, 23 ♂♂) deposited in USNM, the remaining paratypes (dissected) in the collection of AGH.

OTHER MATERIAL EXAMINED.—From *Antillogorgia acerosa*: 9 ♀♀, 4 ♂♂, in 7 m, Oistin's Bay, Christchurch, Barbados, 15 July 1959. From *Antillogorgia elastica* Bieschowsky: 7 ♀♀, 2 ♂♂, in 4 m, lee side of Terremoto Reef (Cayo Terremoto), southeast of La Parguera, southwestern Puerto Rico, 6 August 1959; and 10 ♀♀, 3 ♂♂, in 3 m, Terremoto Reef, 9 August 1959. All collected by AGH and RUG.

All of the gorgonians had basket stars, *Astrophyton muricatum* Lamarck, entwined about them. *Acanthomolgus bilobipes* is believed to be associated with the gorgonian rather than with the basket star, since it always occurred in washings of gorgonians and basket stars together, never in washings of basket stars alone. Unfortunately, gorgonians without basket stars were not examined in the field. *Doridicola astrophyticus*, described elsewhere in this work, is apparently an associate of basket stars, since it was found in washings of these echinoderms living apart from gorgonians.

FEMALE.—The body (Figure 53a) has a moderately slender prosome. The length (without the setae on the caudal rami) is 0.94 mm (0.86–0.98 mm) and the greatest width 0.45 mm (0.41–0.47 mm) based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1.54:1. The ratio of the length of the prosome to that of the urosome is 2.41:1. The segment of leg 1 is set off dorsally from the cephalosome by a transverse furrow. The epimeral areas of the pedigerous segments are as indicated in the figure.

The segment of leg 5 (Figure 53b) is 64 x 122 μ . There is no ventral intersegmental sclerite between

this segment and the genital segment. The genital segment is 114 x 140 μ in greatest dimensions, in dorsal view of characteristic form (with slight wings at the maximum width terminating in a small knob). The areas of attachment of the egg sac are located dorsolaterally near the middle of the segment. Each area (Figure 53c) bears two long naked setae, 28 μ . The three postgenital segments are 39 x 75 μ , 32 x 69 μ , and 30 x 68 μ from anterior to posterior.

The caudal ramus (Figure 53d) is 23 x 28 μ , wider than long. The outer lateral seta is 68 μ and naked. The dorsal seta is 30 μ and naked. The outermost terminal seta is 91 μ with proximal inner spinules. The innermost terminal seta is 133 μ with bilateral spinules. The two long median terminal setae are 345 μ (outer) and 480 μ (inner), both with spinules and inserted between dorsal (unornamented) and ventral (with a row of spinules) flaps.

The body surface has a few hairs (sensilla) as shown in Figure 53a,b.

The egg sac is unknown.

The rostrum (Figure 53e) has a broadly rounded posteroventral margin.

The first antenna (Figure 53f) is slender and 356 μ long. The lengths of its seven segments (measured along their posterior nonsetiferous margins) are 24 (60 μ along the anterior margin), 99, 22, 50, 50, 41, and 34 μ respectively. The armature is 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All the setae are naked.

The second antenna (Figure 53g) has a small seta and a few minute spinules on both first and second segments. The third segment has three setae. The fourth segment, 67 μ along its outer edge, 40 μ along its inner edge, and 22 μ wide, has terminally two somewhat unequal claws, the stouter one 35 μ along its axis, the more slender one 33 μ , and five slender setae. All the setae are naked.

The labrum (Figure 53h) has two posteroventral lobes.

The mandible (Figure 53i) resembles that in other species of the genus. The paragnath, indicated by broken lines in Figure 53c, is a small hairy lobe. The first maxilla (Figure 53j) has three elements. The second maxilla (Figure 53k) has the usual form for the genus. The maxilliped (Figure 54a) has a few spinules on the first segment. The second segment has two unequal setae. The third segment

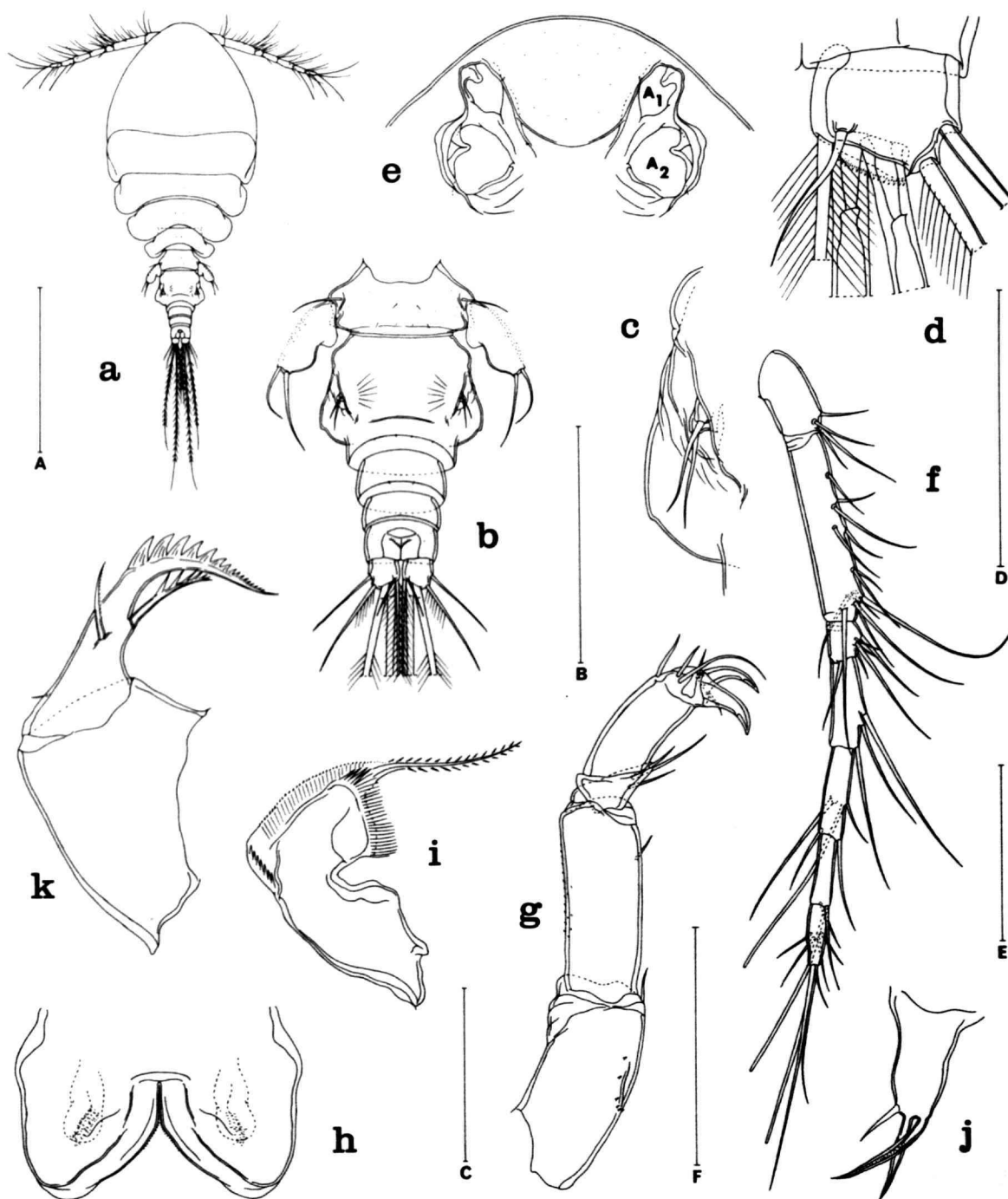


FIGURE 53.—*Acanthomolgus bilobipes*, new species. Female: *a*, dorsal (A); *b*, urosome, dorsal (B); *c*, area of attachment of egg sac, dorsal (C); *d*, caudal ramus, dorsal (D); *e*, rostrum, ventral (B); *f*, first antenna, dorsal (E); *g*, second antenna, anterior (F); *h*, labrum, with paragnaths indicated by broken lines, ventral (C); *i*, mandible, posterior (C); *j*, first maxilla, posterior (C); *k*, second maxilla, posterior (C). Scale: A, 0.5 mm; B, 0.2 mm; C, D, 0.05 mm; E, F, 0.1 mm.

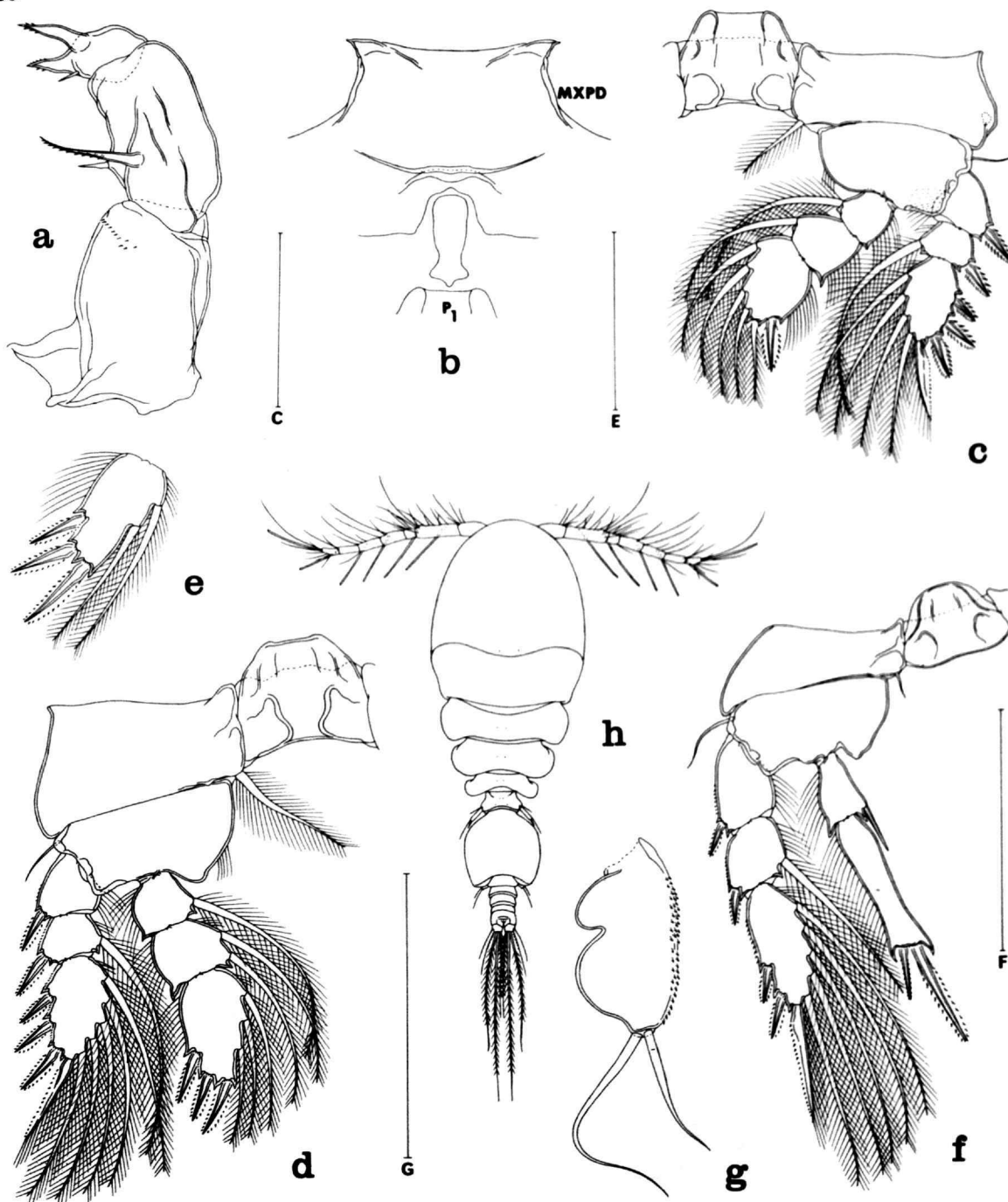


FIGURE 54.—*Acanthomolgus bilobipes*, new species. Female: a, maxilliped, posterior (c); b, area between maxillipeds and first pair of legs, ventral (E); c, leg 1 and intercoxal plate, anterior (E); d, leg 2 and intercoxal plate, anterior (E); e, third segment of endopod of leg 3, anterior (E); f, leg 4 and intercoxal plate, anterior (E); g, free segment of leg 5, inner (F). Male: h, dorsal (c). Scale: c, 0.05 mm; E, F, 0.1 mm; c, 0.5 mm.

has a barbed spine and a small setule and terminates in a barbed spiniform process.

The ventral area between the maxillipeds and the first pair of legs (Figure 54b) is not protuberant. A line connects the bases of the maxillipeds.

Legs 1-4 (Figures 54c-f) are segmented and armed as in other species of the genus. Leg 1 (Figure 54c) has a small posterior protrusion on the outer side of the coxa. The inner coxal seta in legs 1-3 is long and plumose, but in leg 4 it is short ($14\ \mu$) and naked. The inner margin of the basis of legs 1-3 is haired, but in leg 4 it is smooth. The exopod of leg 4 (Figure 54f) is $156\ \mu$ long. The first segment of the endopod is $36 \times 24\ \mu$ (not including the spiniform processes), with the inner distal spine $27\ \mu$ and naked. The second segment is $91\ \mu$ long (with the processes) and $15\ \mu$ in least width near the middle; the two terminal fringed spines are $33\ \mu$ (outer) and $63\ \mu$ (inner). Both segments have the outer margins haired.

Leg 5 (Figure 54g) has a free segment, $83 \times 43\ \mu$, its outer surface finely spinulose, its inner margin bilobed. The two naked terminal setae are $57\ \mu$ and $95\ \mu$.

Leg 6 is represented by the two setae near the attachment of each egg sac (Figure 53c).

The color in life in transmitted light is translucent to very light tan, the eye red.

MALE.—The body (Figure 54h) has a prosome more slender than in the female. The length (excluding the ramal setae) is $0.76\ \text{mm}$ (0.72 – $0.79\ \text{mm}$) and the greatest width $0.28\ \text{mm}$ (0.26 – $0.30\ \text{mm}$), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is $1.81:1$. The ratio of the length of the prosome to that of the urosome is $1.93:1$.

The segment of leg 5 (Figure 55a) is $33 \times 76\ \mu$. There is no ventral intersegmental sclerite. The genital segment is $135 \times 135\ \mu$. The four post-genital segments are $23 \times 52\ \mu$, $20 \times 50\ \mu$, $14 \times 48\ \mu$, and $20 \times 50\ \mu$ from anterior to posterior.

The caudal ramus is similar to that of the female.

The body surface is ornamented with hairs as in the female.

The rostrum is like that of the female.

The first antenna resembles that of the female but has three additional aesthetes (Figure 54h), two on the second segment and one on the fourth seg-

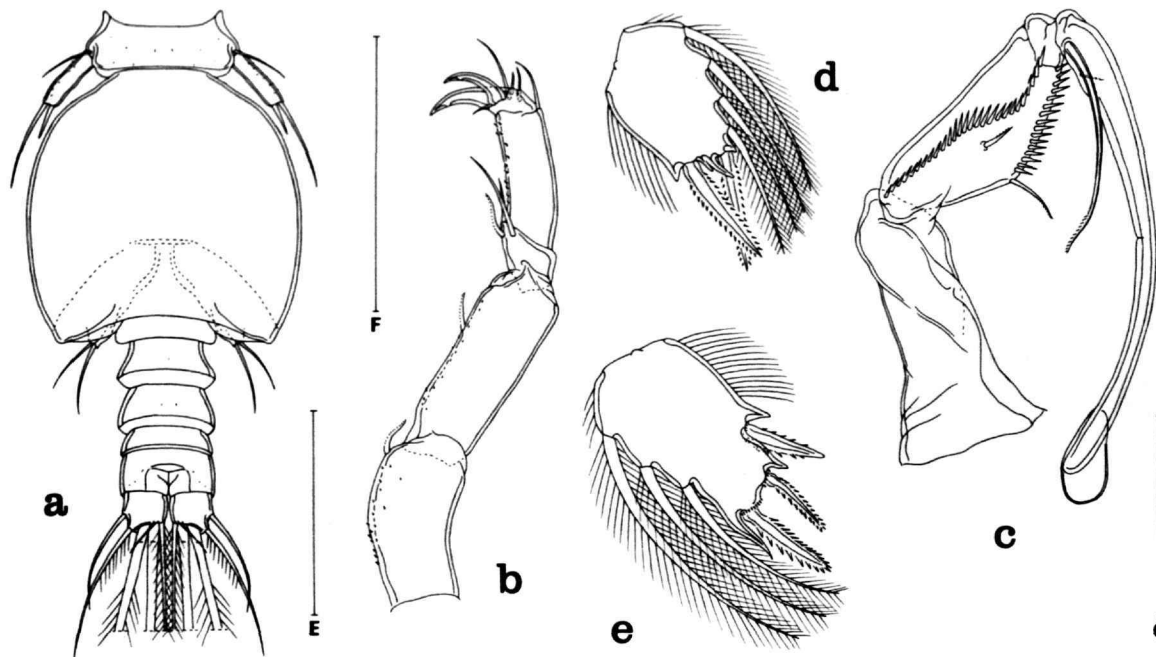


FIGURE 55.—*Acanthomolgus bilobipes*, new species. Male: a, urosome, dorsal (E); b, second antenna, posterior (F); c, maxilliped, outer (F); d, third segment of endopod of leg 1, anterior (c); e, third segment of endopod of leg 2, anterior (c). Scale: c, $0.05\ \text{mm}$; E, F, $0.1\ \text{mm}$.

ment, so that the formula is 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. The second antenna (Figure 55b) is much like that of the female, but the setae on the first and second segments and one on the third segment are finely pectinate, and segments 1, 2, and 4 have minute spinules on their inner surfaces.

The labrum, mandible, paragnath, first maxilla, and second maxilla are like those of the female. The maxilliped (Figure 55c) has an unarmed first segment. The second segment has two setae and two rows of spines. The third segment is unarmed. The claw is 185 μ along its axis, with an unusually large terminal lamella, weakly divided midway, and with two very unequal proximal setae.

The ventral area between the maxillipeds and the first pair of legs is like that in the female.

Legs 1-4 are segmented as in the female. Leg 1 is armed as in the female except for the last segment of the endopod (Figure 55d) which has the formula I,I,4. Leg 2 is similar to that of the female but the last segment of the endopod (Figure 55e) has the middle spine weaker than the other two and the inner spinous process much longer. Legs 3 and 4 are like those of the female.

Leg 5 (Figure 55a) has a slender free segment, 33 x 8 μ , not bilobed as in the female. The two terminal elements are 14 μ and 44 μ . The outer surface of the free segment has only a few spinules.

Leg 6 (Figure 55a) is a posteroventral flap on the genital segment bearing two slender naked setae 25 μ and 36 μ .

The spermatophore is unknown.

The color in life is like that of the female.

ETYMOLOGY.—The specific name *bilobipes* (from the Latin *bis*, twice; *lobus*, a lobe; and *pes*, a foot) alludes to the bilobed inner margin of the free segment of leg 5 in the female.

REMARKS.—*Acanthomolgus bilobipes* may be separated from all other members of the genus by the bilobed inner margin of the free segment of leg 5 in the female and by the unusually large terminal lamella on the claw of the male maxilliped.

***Acanthomolgus cuneipes* (Humes and Ho, 1968)**

Lichomolgus cuneipes Humes and Ho, 1968b, pp. 17-20, figs. 84-96 [from the alcyonacean *Stereonephthya acaulis* Verseveldt, Nosy Bé, Madagascar].

NEW HOST.—Several specimens from six colonies of *Dendronephthya mucronata* (Pütter), in 1 m, off Ampombilava, Nosy Bé, 26 September 1964, collected by AGH.

***Acanthomolgus fissisetiger* (Humes and Ho, 1968)**

Lichomolgus fissisetiger Humes and Ho, 1968b, pp. 14-17, figs. 70-83 [from the alcyonaceans *Stereonephthya acaulis* Verseveldt, *Stereonephthya papyracea* Kükenthal, and *Lemnalia elegans* (May), region of Nosy Bé, Madagascar; Dr. Verseveldt recently changed the host identification of *Stereonephthya papyracea* to *S. acaulis* Verseveldt].

NEW RECORD.—22 ♀♀, 42 ♂♂, and 44 copepodids from three colonies of *Stereonephthya acaulis*, in 15 m, Banc du Touareg, near Nosy Bé, Madagascar, 1 September 1967, collected by AGH.

NEW HOST.—8 ♀♀, 5 ♂♂, and 8 copepodids from the alcyonacean *Lemnalia humesi* Verseveldt, in 10 m, Pte. Lokobe, Nosy Bé, Madagascar, 18 July 1967, collected by AGH.

***Acanthomolgus gentilis* (Humes and Ho, 1968)**

Lichomolgus gentilis Humes and Ho, 1968b, pp. 11-14, figs. 56-69 [from the alcyonaceans *Dendronephthya mucronata* (Pütter), *Dendronephthya koellikeri* Kükenthal, *Dendronephthya stocki* Verseveldt, *Stereonephthya acaulis* Verseveldt, and *Stereonephthya papyracea* Kükenthal, region of Nosy Bé, Madagascar; Dr. Verseveldt recently changed the host identification of *Stereonephthya papyracea* to *S. acaulis* Verseveldt].

NEW RECORDS (all from Madagascar, collected by AGH).—From *Dendronephthya mucronata*: 3 ♀♀, 6 ♂♂, and 13 copepodids, from single colony, in 3 m, Antsamantsara, Nosy Bé, 9 June 1967; 22 ♀♀, 23 ♂♂, and 14 copepodids, from single colony, in 4 m, Antsamantsara, Nosy Bé, 9 June 1967; many specimens, from two colonies, in 10 m, Rocher du N.E., Nosy Bé, 19 August 1967; and several specimens, from single colony, in 24 m, north of Ankazoberavina, near Nosy Bé, 13°27.6' S, 47°58.2' E, 25 August 1967.

From *Dendronephthya* sp.: many specimens, from part of single colony, in 27 m, Banc des Frères, Isles Mitsio, near Nosy Bé, 12°58' S, 48°28' E, 17 August 1967.

From *Stereonephthya acaulis*: 43 ♀♀, 31 ♂♂, and 76 copepodids, from single colony, in 4 m, Antsamantsara, Nosy Bé, 9 June 1967; 6 ♀♀, 12 ♂♂, and 7 copepodids, from single colony, in 2

m, Ambatoloaka, Nosy Bé, 23 June 1967; 12 ♀♀, 24 ♂♂, and 27 copepodids, from single colony, in 8 m, Pte. Lokobe, Nosy Bé, 25 July 1967; and 26 ♀♀, 38 ♂♂, and 45 copepodids, from single colony, in 17 m, near black buoy, north of Pte. Ambarionaomby, Nosy Komba, near Nosy Bé, 5 August 1967.

NEW ALCYONACEAN HOSTS (all from Madagascar, collected by AGH).—From *Umbellulifera striata* (Thompson and Henderson): 2 ♀♀, 4 ♂♂, from four colonies, in 17 m, in pass at Pte. Lokobe, Nosy Bé, 25 August 1967.

From *Dendronephthya lokobeensis* Verseveldt: 3 ♀♀, 6 ♂♂, from single colony, in 4 m, Antsamantsara, Nosy Bé, 9 June 1967.

From *Dendronephthya speciosa* Kükenthal: 3 ♀♀, 10 ♂♂, and 1 copepodid, from single colony, in 22 m, Tany Kely, near Nosy Bé, 17 June 1967; 20 ♀♀, 19 ♂♂, and 4 copepodids, from single colony, in 17 m, near black buoy, north of Pte. Ambarionaomby, Nosy Komba, near Nosy Bé, 5 August 1967.

From *Stereonephthya cordylophora* Verseveldt: many specimens, from single colony, in 24 m, north of Ankazoberavina, near Nosy Bé, 12°27.6' S, 47°58.2' E, 25 August 1967.

Acanthomolgus hales, new species

FIGURES 56-58

TYPE MATERIAL.—404 ♀♀, 581 ♂♂, and 646 copepodids from single colony of the gorgonian *Solenocaulon tortuosum* Gray, on sand in 15 m, in pass between Nosy Komba and Nosy Bé, northwestern Madagascar, 13 April 1966, collected by R. Plante. Holotype ♀, allotype, and 730 paratypes (280 ♀♀, 450 ♂♂) deposited in USNM; 200 paratypes (100 ♀♀, 100 ♂♂) in ZMA; and the remaining paratypes and copepodids in the collection of AGH.

OTHER MATERIAL EXAMINED (all from *Solenocaulon tortuosum*).—214 ♀♀, 55 ♂♂, and 61 copepodids from single colony, in 15 m, in pass at Pte. Lokobe, Nosy Bé, 13 June 1967; and 42 ♀♀, 29 ♂♂, and 46 copepodids from four colonies, in 18 m, in pass at Pte. Lokobe, Nosy Bé, 3 July 1967. All collected by AGH.

FEMALE.—The body (Figure 56a) has a moderately expanded prosome. The length is 0.81 mm

(0.75–0.84 mm) and the greatest width 0.38 mm (0.34–0.39 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1.39:1. The ratio of the length of the prosome to that of the urosome is 1.79:1.

The segment of leg 5 (Figure 56b) is 60 x 112 μ. Between that segment and the genital segment there is a well-developed ventral intersegmental sclerite. The genital segment is 138 x 120 μ, a little longer than wide and not greatly expanded, with two pairs of hyaline lateral membranes. The areas of attachment of the egg sacs are situated dorsolaterally near the middle of the segment. Each area (Figure 56c) bears two small naked spiniform elements, 7 μ and 9 μ in length, with a pointed process between them. Medial to the larger element the cuticular fold is produced as a small thornlike prominence. The three postgenital segments are 35 x 58 μ, 31 x 56 μ, and 36 x 55 μ from anterior to posterior.

The caudal ramus (Figure 56d) is a little longer than wide, 33 x 25 μ. The outer lateral seta is 59 μ and the outermost terminal seta is 67 μ, both naked. The dorsal seta is 32 μ and very lightly feathered. The innermost terminal seta is 135 μ with its inner margin haired proximally and with a few minute spinules distally. The two long median terminal setae are 273 μ (outer) and 330 μ (inner), both with a few widely spaced minute inner spinules and both inserted between dorsal (unornamented) and ventral (with a marginal row of spinules) flaps.

The body surface is ornamented with a few hairs (sensilla) as shown in Figure 56a,b. The posteroventral margin of the anal segment bears a row of spinules on both sides.

The egg sac (Figure 56a) is elongated, oval, 300 x 140 μ, reaches beyond the caudal rami, and contains many eggs about 40 μ in diameter.

The rostrum (Figure 56a) is broadly rounded posteroventrally.

The first antenna (Figure 56f) is 284 μ long. The lengths of the seven segments (measured along their posterior nonsetiferous margins) are 25 (51 μ along the anterior margin), 85, 18, 37, 39, 28, and 26 μ respectively. The formula for the armature is 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All the setae are naked.

The second antenna (Figure 56g) is 4-segmented. Each of the first two segments bears a naked seta.

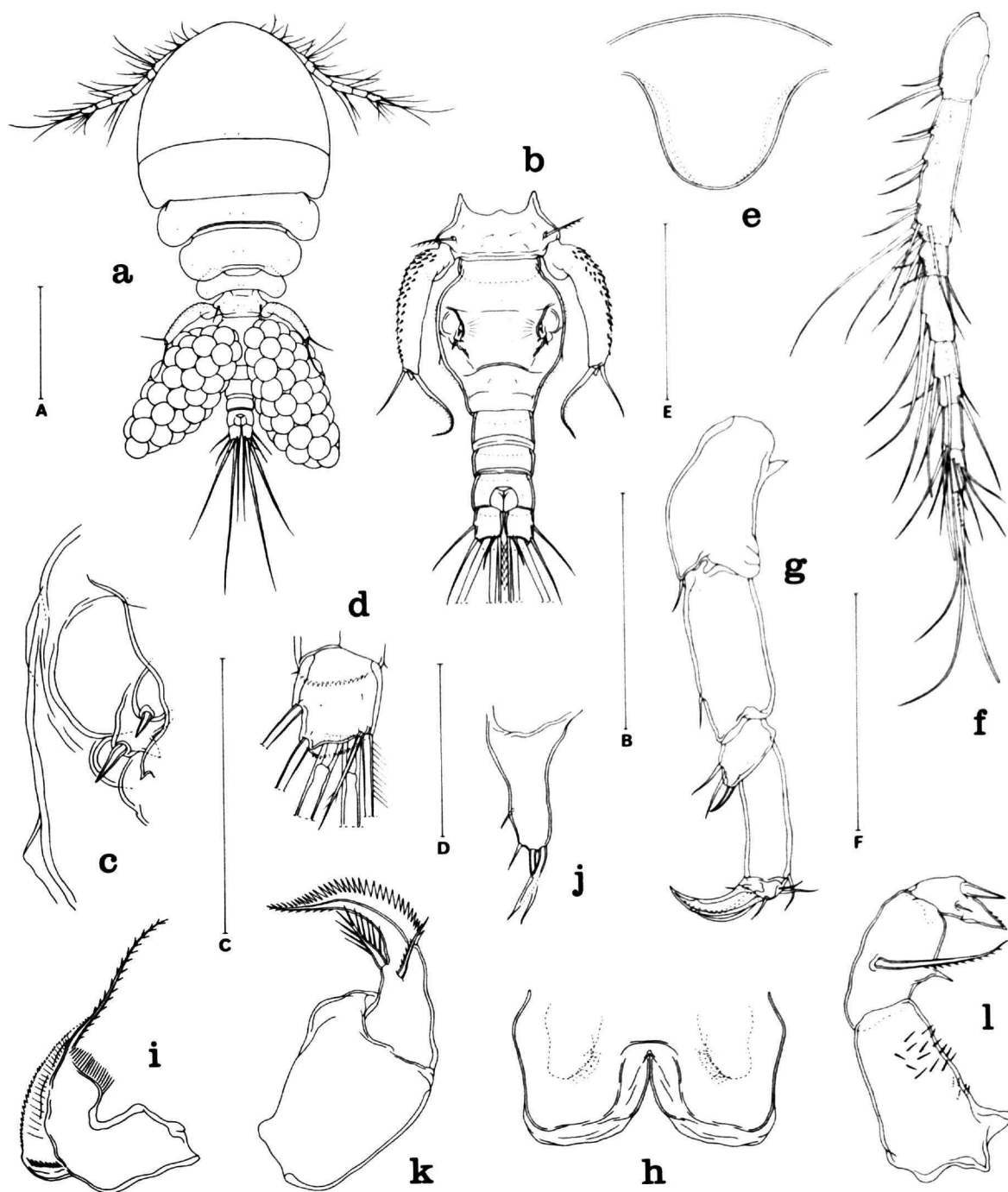


FIGURE 56.—*Acanthomolgus hales*, new species. Female: *a*, dorsal (A); *b*, urosome, dorsal (B); *c*, area of attachment of egg sac, dorsal (C); *d*, caudal ramus, dorsal (D); *e*, rostrum, ventral (E); *f*, first antenna, ventral (F); *g*, second antenna, anterior (F); *h*, labrum, with paragnaths indicated by broken lines, ventral (D); *i*, mandible, posterior (D); *j*, first maxilla, anterior (D); *k*, second maxilla, posterior (D); *l*, maxilliped, postero-inner (D). Scale: A, B, 0.2 mm; C, D, 0.05 mm; E, F, 0.1 mm.

The third segment bears a naked spine and two naked setae. The last segment, 75 μ along its outer edge, 47 μ along its inner edge, and 20 μ wide, bears two terminal unequal claws. The stouter claw is 43 μ along its axis and the more slender claw 32 μ . Near the insertions of the claws are five small hyaline elements.

The labrum (Figure 56h) has two broad postero-ventral lobes.

The mandible (Figure 56i), paragnath (Figure 56h), first maxilla (Figure 56j), and second maxilla (Figure 56k) resemble those of *A. exilipes* (Humes and Ho). The maxilliped (Figure 56l) has two very unequal setae on the second segment, the longer seta barbed along one edge, the shorter seta naked. The last segment bears a naked spine, a small naked setule, and an incompletely articulated spini-form process with minute barbules along one edge. The first segment is ornamented with slender spinules.

The ventral area between the maxillipeds and the first pair of legs (Figure 57a) is not protuberant. A sclerotized line connects the bases of the maxillipeds.

Legs 1-4 (Figure 57b-e) have the same spine and setal formula as in other species of the genus. The inner coxal element of leg 4 is reduced to a small naked setule 5 μ long. The inner margin of the basis of leg 4 is smooth instead of having a row of hairs as in legs 1-3. The outer exopod spines of leg 1 have relatively small numbers of barbs on their proximal edges. The inner margins of the second and third segments of legs 1-3 lack hairs. The exopod of leg 4 is 146 μ . The endopod of leg 4 has outer hairs on both segments. The first segment is 30 x 27 μ (not including the spinous processes) and its inner distal naked spine is 32 μ . The second segment is 70 μ long (including the terminal spiniform processes), 25 μ in greatest width proximally, and 20 μ in least width distally; the outer terminal fringed spine is 21 μ , the inner spine is 53 μ , inwardly fringed but outwardly barbed.

Leg 5 (Figure 57f) has an elongated free segment 120 x 23 μ (the width taken at the middle); the width at the proximal inner expansion is 32 μ . The outer surface of the segment bears short, broad spines. The two terminal setae are 57 μ and naked and 78 μ with a narrow unilateral fringe. The seta

on the body near the free segment is 33 μ and lightly feathered.

Leg 6 is probably represented by the two spini-form elements near the area of attachment of the egg sacs (Figure 56c).

The color in life in transmitted light is opaque, the eye red, the egg sacs grayish black.

MALE.—The body (Figure 57g) is more slender than in the female. The length is 0.64 mm (0.58–0.67 mm) and the greatest width is 0.25 mm (0.24–0.25 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1.65:1. The ratio of the length of the prosome to that of the urosome is 1.59:1.

The segment of leg 5 (Figure 57h) is 32 x 57 μ . There is no ventral intersegmental sclerite. The genital segment is 138 x 122 μ . The four postgenital segments are 19 x 40 μ , 19 x 39 μ , 13 x 37 μ , and 21 x 39 μ from anterior to posterior.

The caudal ramus is like that of the female, but smaller, 23 x 19 μ .

The surface of the body is ornamented with hairs as in the female.

The rostrum is similar to that of the female.

The first antenna is segmented and armed as in the female but has three additional aesthetes as in *A. strictus*. The second antenna is the same as in the female, without sexual dimorphism.

The labrum, mandible, paragnath, first maxilla, and second maxilla are like those of the female. The maxilliped (Figure 57i) resembles in general form that of *A. varirostratus* (Humes and Ho) but the claw is shorter, 108 μ along its axis (including the terminal lamella), and more strongly recurved.

The ventral area between the maxillipeds and the first pair of legs is like that of the female.

Legs 1-4 are segmented and armed as in the female except for the last segment of the endopod of leg 1 (Figure 58a) which has I,I,4 instead of I,5 as in the opposite sex. On the last segment of the endopod of leg 2 (Figure 58b) the three spines from outer to inner are 17.5, 15.5, and 22 μ (in the female 17, 14, and 22 μ) and more strongly barbed than in the opposite sex; and on the last segment of the endopod of leg 3 (Figure 58c) the spines are 20, 20, and 24 μ (in the female 21, 18, and 26 μ) and also are more strongly barbed. The endopod of leg 4 (Figure 58d) has a slightly more slender second segment than in the female. The dimensions of this endopod are as follows: first segment 22 x

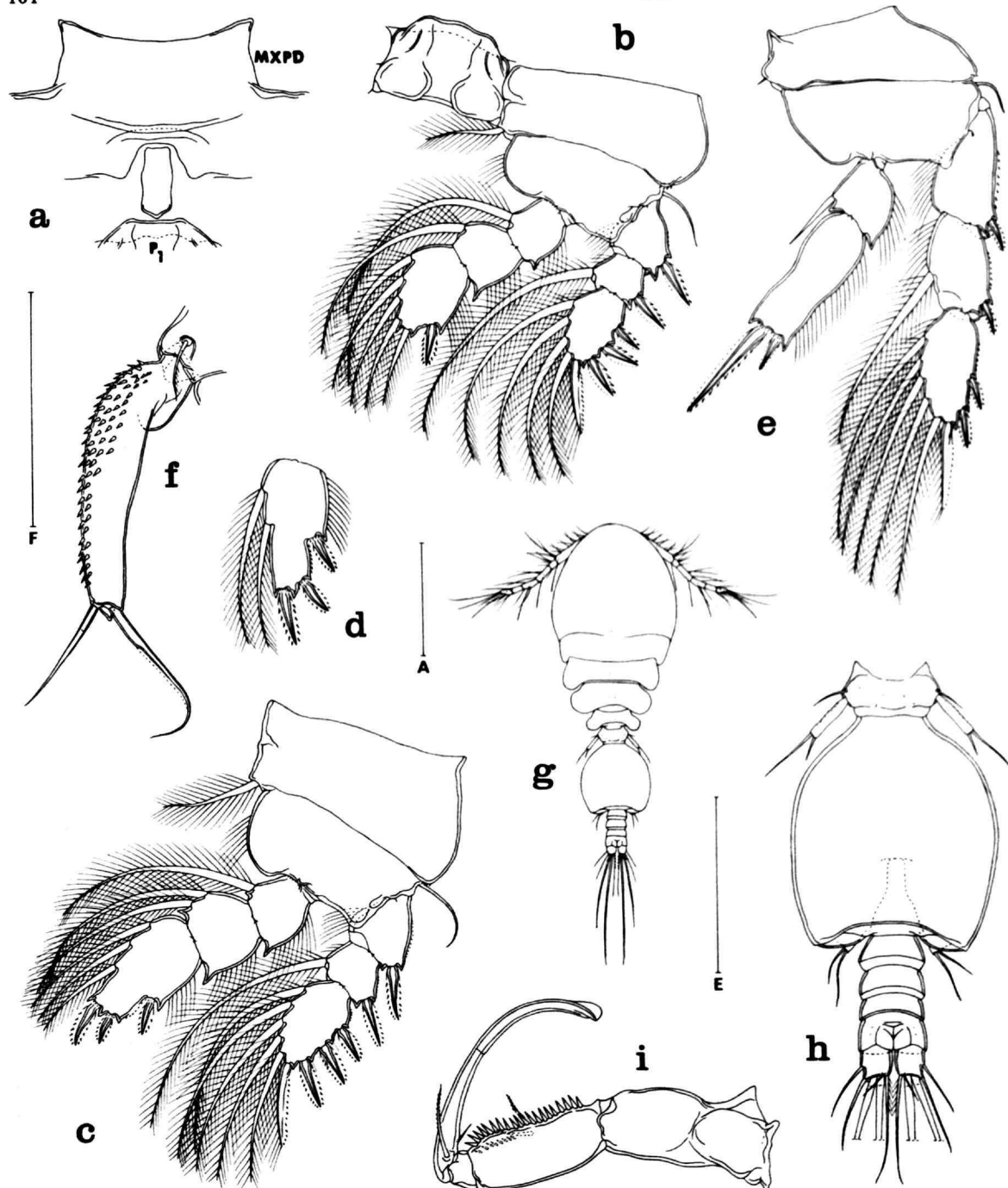


FIGURE 57.—*Acanthomoigus hales*, new species. Female: *a*, area between maxillipeds and first pair of legs, ventral (F); *b*, leg 1 and intercoxal plate, anterior (F); *c*, leg 2, anterior (F); *d*, third segment of endopod of leg 3, anterior (F); *e*, leg 4, anterior (F); *f*, leg 5, dorsal (F). Male: *g*, dorsal (A); *h*, urosome, dorsal (E); *i*, maxilliped, postero-inner (F). Scale: A, 0.2 mm; E, F, 0.1 mm.

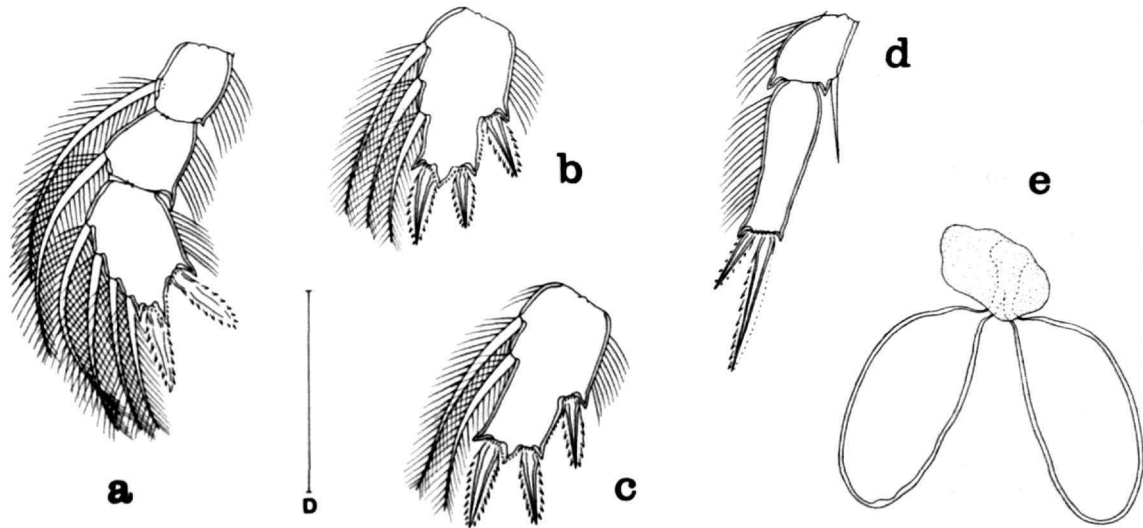


FIGURE 58.—*Acanthomolgus hales*, new species. Male: a, endopod of leg 1, anterior (v); b, third segment of endopod of leg 2, anterior (v); c, third segment of endopod of leg 3, anterior (v); d, endopod of leg 4, anterior (v); e, spermatophores, attached to female, dorsal (v). Scale: D, 0.05 mm; E, 0.1 mm.

17.5 μ (without the spiniform processes) and its spine 24 μ ; second segment 46 μ long (including the terminal spiniform processes), 14 μ in greatest width proximally, and 11 μ in least width distally; the outer terminal spine is 18 μ , the inner spine 42 μ .

Leg 5 (Figure 57h) has an elongated, slender free segment, 30 x 7.5 μ , without a proximal expansion. The outer surface bears a few small spinules and the two terminal elements are 14 μ and 39 μ .

Leg 6 (Figure 57h) consists of a posteroventral flap on the genital segment bearing two naked setae, 21 μ and 30 μ .

The spermatophore (Figure 58e), attached to the female in pairs, is oval, 104 x 55 μ (without the neck).

The color in life in transmitted light resembles that of the female.

ETYMOLOGY.—The specific name *hales* (Greek $\alpha\lambda\eta\varsigma$, in abundance) alludes to the great numbers of this copepod (more than 1,600 specimens) found on a single host colony (type collection).

REMARKS.—By the nature of the ornamentation on the two long median setae on the caudal ramus, *A. hales* may be distinguished from eight species

that have long spinules on these setae—*A. exilipes* (Humes and Ho), *A. fissisetiger* (Humes and Ho), *A. gentilis* (Humes and Ho), *A. hians* (Humes and Ho), *A. longispinifer* (Humes and Ho), *A. telestophilus* (Humes and Ho), *A. verseveldti* (Humes and Ho), and *A. astrictus* and *A. bilobipes*, described above—and from two species that have these setae naked—*A. cuneipes* (Humes and Ho) and *A. varirostratus* (Humes and Ho). Extremely high magnification is needed in order to determine whether these setae are naked. There are, however, other characters more easily seen by which the last two species may be separated from *A. hales*. *A. cuneipes* differs from the new species by the claws on the second antenna being shorter than the greater length of the fourth segment and in having a wedgelike inner expansion on leg 5 in the female. *A. varirostratus* is unlike *A. hales* in showing sexual dimorphism in the rostrum and in having hairs on the inner margin of the basis of leg 4.

Acanthomolgus hians (Humes and Ho, 1968)

Lichomolgus hians Humes and Ho, 1968d, pp. 719–725, figs. 90–108 [from the alcyonacean *Siphonogorgia pichoni* Verseveldt, region of Nosy Bé, Madagascar; host originally reported as *Siphonogorgia pendula* Studer].

NEW RECORDS (species mixed with *Acanthomolgus longispinifer* and all from *Siphonogorgia pichoni*, collected by AGH).—1,266 ♀♀, 713 ♂♂, and 260 copepodids, in 17 m, near black buoy between Pte. Ambarionaomby, Nosy Komba, and Pte. de Tafondro, Nosy Bé, Madagascar, 5 August 1967; 491 ♀♀, 199 ♂♂, and 46 copepodids, in 25 m, Tany Kely, a small island south of Nosy Bé, Madagascar, 14 August 1967.

Acanthomolgus longispinifer (Humes and Ho, 1968)

Lichomolgus longispinifer Humes and Ho, 1968d, pp. 713–719, figs. 69–89 [from the alcyonacean *Siphonogorgia pichoni* Verseveldt, Nosy Bé, Madagascar; host originally reported as *Siphonogorgia pendula* Studer].

NEW RECORDS (species mixed with *Acanthomolgus hians* and all from *Siphonogorgia pichoni*, collected by AGH).—1,266 ♀♀, 713 ♂♂, and 260 copepodids, in 17 m, near black buoy between Pte. Ambarionaomby, Nosy Komba, and Pte. de Tafondro, Nosy Bé, Madagascar, 5 August 1967; 491 ♀♀, 199 ♂♂, and 46 copepodids, in 25 m, Tany Kely, a small island south of Nosy Bé, Madagascar, 14 August 1967.

Acanthomolgus plantei, new species

FIGURES 59–61

TYPE MATERIAL.—418 ♀♀, 401 ♂♂, and 219 copepodids from a single colony of the alcyonacean *Umbellulifera striata* (Thompson and Henderson), in 47 m, 13°29' S, 48°06' E, southwest of Nosy Bé, Madagascar, 24 July 1967, collected by R. Plante. Holotype ♀, allotype, and 770 paratypes (390 ♀♀, 380 ♂♂) deposited in USNM, the remaining paratypes and the copepodids in the collection of AGH.

OTHER MATERIAL EXAMINED (all from *Umbellulifera striata*).—75 ♀♀, 31 ♂♂, and 9 copepodids from single colony, in 17 m, pass at Pte. Lokobe, Nosy Bé, 23 August 1967; 1 ♀, 3 ♂♂ from single colony, in 17 m, pass at Pte. Lokobe, 23 August 1967; 4 ♀♀, 22 copepodids from four colonies, in 17 m, pass at Pte. Lokobe, 25 August 1967; and 97 ♀♀, 32 ♂♂, and 9 copepodids from two colonies, in 17 m, pass at Pte. Lokobe, 27 August 1967. All collected by AGH.

FEMALE.—The body (Figure 59a) has a moderately broad prosome. The length is 0.91 mm (0.81–0.99 mm) and the greatest width 0.43 mm (0.42–0.45 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1.44:1. The ratio of the length of the prosome to that of the urosome is 2.48:1.

The segment of leg 5 (Figure 59b) is 78 x 127 μ . There is no clearly identifiable ventral intersegmental sclerite between this segment and the genital segment. The genital segment is 109 x 117 μ , slightly wider than long, its anterior three-fourths with rounded lateral margins in dorsal view. The areas of attachment of the egg sacs are located dorsolaterally at about the middle of the segment. Each area (Figure 59c) bears two naked setae, 6 μ and 10 μ , with a small pointed process between them. The cuticular fold medial to the larger seta is enlarged to form a beaklike process, much larger than in *A. hales*. The three postgenital segments are 33 x 72 μ , 26 x 68 μ , and 33 x 67 μ from anterior to posterior.

The caudal ramus (Figure 59d) is only a little longer than wide, 26 x 24 μ . The dorsal seta is 22 μ , the outer lateral seta 35 μ , the outermost terminal seta 44 μ , and the innermost terminal seta 88 μ , all of them naked. The two long median terminal setae are 166 μ (outer) and 255 μ (inner), both with extremely short lateral spinules and both inserted between dorsal (unornamented) and ventral (with a marginal row of spinules) flaps.

The body surface is ornamented with hairs (sensilla) as indicated in Figure 59a,b. The posteroventral margin of the anal segment bears a row of spinules on both sides.

The egg sac (Figure 59a) is elongated oval, 418 x 176 μ , reaches far beyond the caudal rami, and contains many eggs 50 μ in diameter. (Egg sacs transferred from 70 percent ethyl alcohol to lactic acid disintegrated slowly, releasing the individual eggs.)

The rostrum resembles that of *A. hales*.

The first antenna (Figure 59e) is 312 μ long. The lengths of the seven segments (measured along their posterior nonsetiferous margins) are 26 (55 μ along the anterior margin), 94, 20, 36, 46, 35, and 26 μ respectively. The formula for the armature is the same as in *A. hales*. All the setae are naked.

The second antenna (Figure 59f) is 4-segmented. The first two segments are relatively short and ro-

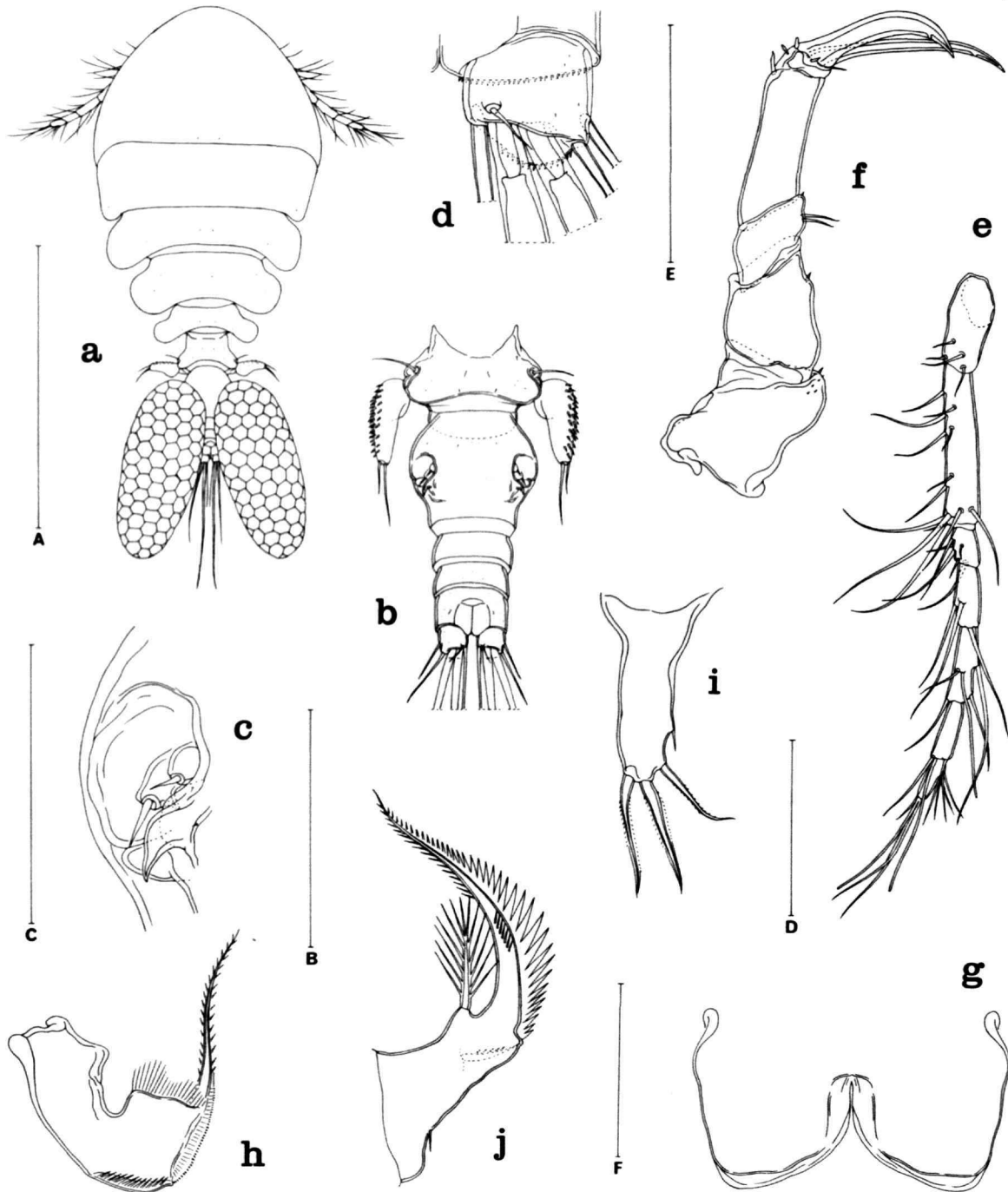


FIGURE 59.—*Acanthomolgus plantei*, new species. Female: a, dorsal (A); b, urosome, dorsal (B); c, area of attachment of egg sac, dorsal (C); d, caudal ramus, dorsal (C); e, first antenna, anterodorsal (E); f, second antenna, anterior (E); g, labrum, ventral (F); h, mandible, posterior (F); i, first maxilla, anterior (C); j, terminal segment of second maxilla, anterior (C). Scale: A, 0.5 mm; B, 0.02 mm; C, F, 0.05 mm; D, E, 0.1 mm.

bust, and their setae are very short; the first segment is ornamented with a few small spines near the seta. The third segment bears two setae and a vestige of a spiniform element which is hyaline and only 2 μ long. The fourth segment is 90 μ along the outer edge, 58 μ along the inner edge, and 22.5 μ wide, bearing two long unequal terminal claws, the stouter claw 70 μ along its axis, the more slender claw 89 μ . Near the insertion of the claws are five small hyaline elements as in *A. hales*.

The labrum (Figure 59g) has two broad postero-ventral lobes, less truncated than in *A. hales*.

The mandible (Figure 59h) is similar to that of *A. varirostratus* (Humes and Ho). The paragnath is like that of *A. hales*. The first maxilla (Figure 59i) resembles that of *A. exilipes* (Humes and Ho). The second maxilla also is much like that of *A. exilipes*, but the spinules on the inner distal spine are longer (Figure 59j). The maxilliped (Figure 60a) resembles that of *A. hales* but is a little more elongated.

The ventral area between the maxillipeds and the first pair of legs is like that in *A. hales*.

Legs 1-4 (Figure 60b-e) have the same spinal and setal formula as in other species of the genus. The inner coxal element of leg 4 is reduced to a small naked setule 6 μ long. The inner margin of the basis of leg 4 is smooth instead of bearing a row of hairs as in legs 1-3. The exopod of leg 4 is 136 μ long. The endopod of leg 4 has hairs along the outer margins of both segments and a few short spinules on the inner margin of the second segment. The first segment is 36 x 28 μ (not including the processes) and its inner distal spine is 44 μ and finely barbed. The second segment is 68 μ long (including the terminal spiniform processes), 25 μ in greatest width proximally, and 16.5 μ in least width distally; the outer spine is 28 μ , the inner spine 55 μ , both barbed.

Leg 5 (Figure 60f) has a free segment about twice as long as wide in greatest dimensions. The length is 79 μ and the greatest width at the proximal inner expansion is 37 μ . The outer surface of the segment bears relatively long spines. The two terminal elements are 39 μ and naked, and 66 μ with a unilateral fringe. The seta on the body near the insertion of the free segment is 34 μ and naked.

Leg 6 is probably represented by the two setae

near the areas of attachment of the egg sacs (Figure 59c).

The color in life in transmitted light is opaque, the eye red, the egg sacs gray.

MALE.—The body (Figure 60g) is more slender than in the female. The length is 0.79 mm (0.72-0.86 mm) and the greatest width 0.28 mm (0.26-0.30 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1.78:1. The ratio of the length of the prosome to that of the urosome is 1.73:1.

The segment of leg 5 (Figure 60h) is 39 x 70 μ . There is no ventral intersegmental sclerite. The genital segment is longer than wide, 162 x 138 μ . The four postgenital segments are 28 x 53 μ , 21 x 51 μ , 14 x 50 μ , and 23 x 51 μ from anterior to posterior.

The caudal ramus is similar to that of the female, but smaller, 23 x 21 μ .

The surface of the body is ornamented with hairs as in the female.

The rostrum is like that of the female.

The first antenna has the same armature as in the male of *A. strictus* but with three additional aesthetes. The second antenna (Figure 60i) shows sexual dimorphism. The setae on the first two segments are longer than in the female and both segments bear a few short spines. The spiniform element on the third segment is well formed (12 μ long) and has a few minute barbules on one edge. The fourth segment is 88 μ along the outer edge, 63 μ along the inner edge, and 23 μ wide. The terminal claws are 59 μ and 76 μ .

The labrum (Figure 60j) has a form slightly different from that in the female.

The mandible, paragnath, first maxilla, and second maxilla are like those in the female. The maxilliped (Figure 61a) resembles that of *A. hales*. The claw is 172 μ along its axis and has on its proximal area a few striations in addition to the two unequal setae.

The ventral area between the maxillipeds and the first pair of legs is like that of the female.

Legs 1-4 are like those of the female, except for the last segment of the endopod of leg 1 (Figure 61b), which is I,I,4. Slight sexual dimorphism occurs on the last segment of the endopod of leg 2 (Figure 61c) where the three spines from outer to inner are 19, 26, and 26 μ (in the female 20, 15, and 20 μ); and on the last segment of the endopod

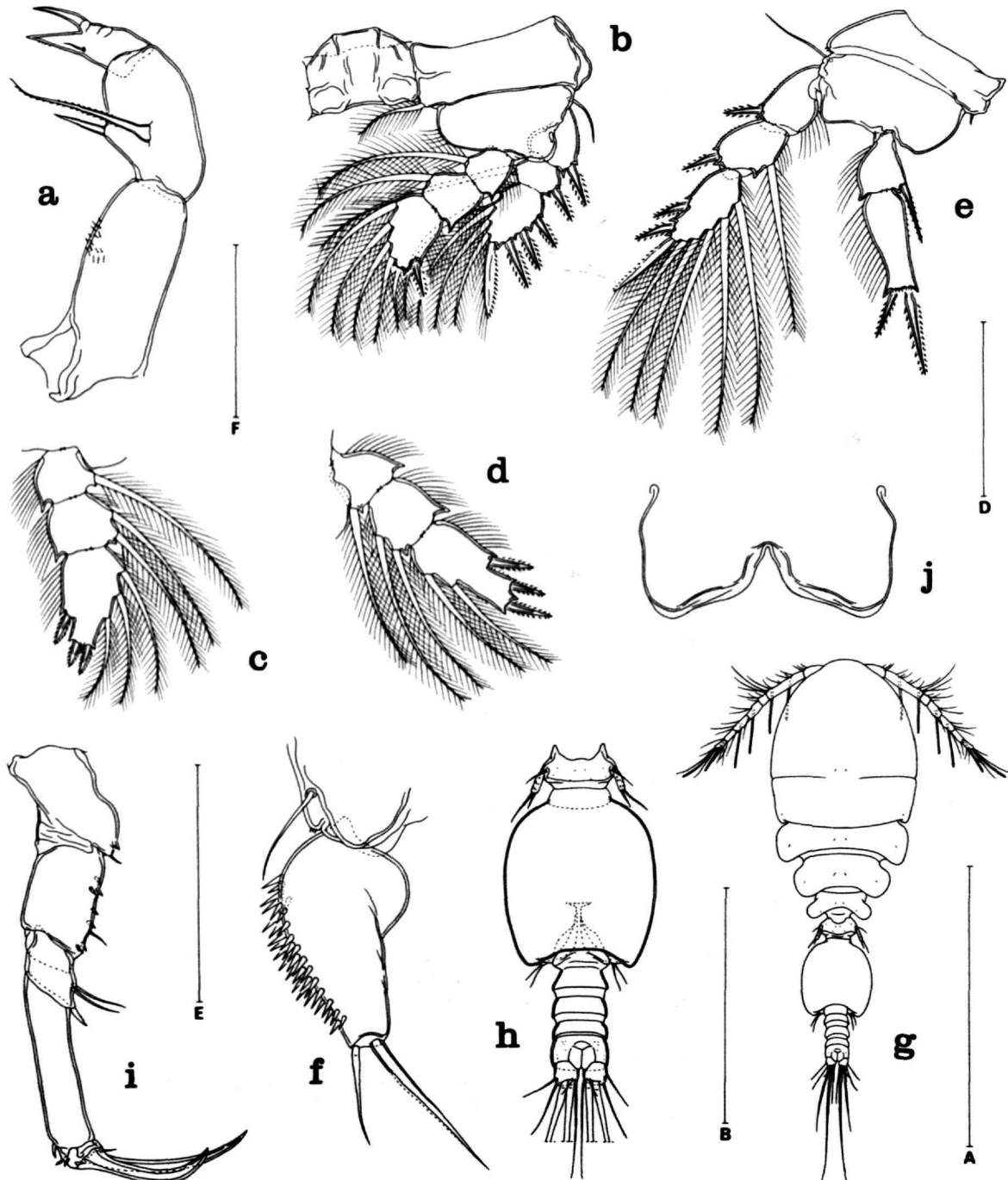


FIGURE 60.—*Acanthomolgus plantei*, new species. Female: a, maxilliped, postero-inner (F); b, leg 1 and intercoxal plate, anterior (D); c, endopod of leg 2, anterior (D); d, endopod of leg 3, anterior (D); e, leg 4, anterior (D); f, leg 5, dorsal (F). Male: g, dorsal (A); h, urosome, dorsal (B); i, second antenna, anterior (E); j, labrum, ventral (F). Scale: A, 0.5 mm; B, 0.2 mm; D, E, 0.1 mm; F, 0.05 mm.

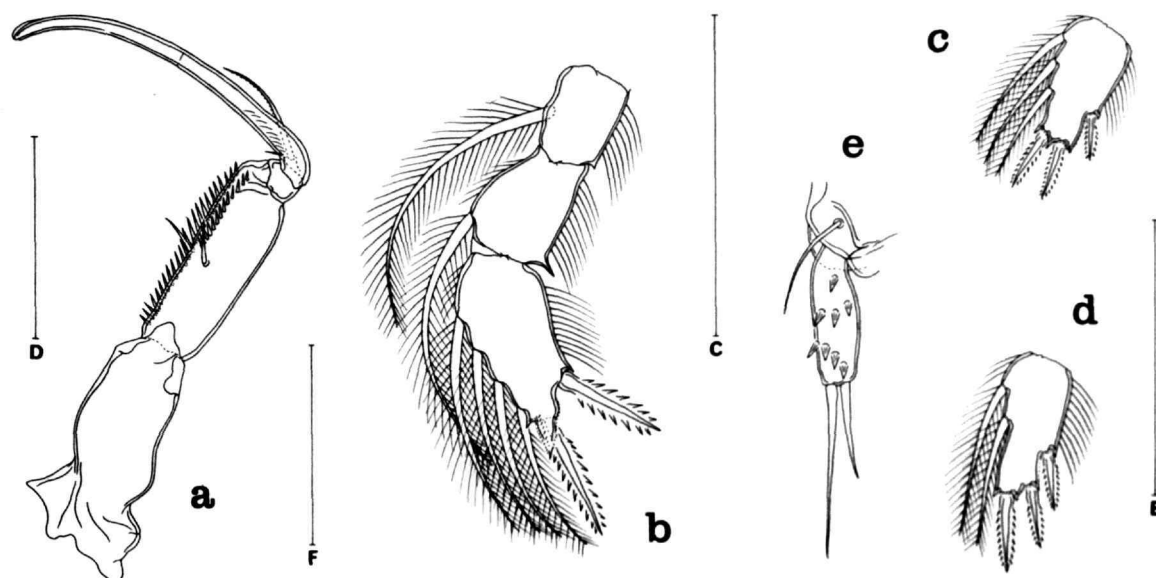


FIGURE 61.—*Acanthomolgus plantei*, new species. Male: a, maxilliped, ventro-outer (D); b, endopod of leg 1, anterior (F); c, third segment of endopod of leg 2, anterior (C); d, third segment of endopod of leg 3, anterior (E); e, leg 5, dorsal (C). Scale: C, F, 0.05 mm; D, E, 0.1 mm.

of leg 3 (Figure 61d) where the spines are 24, 23, and 34 μ (in the female 26, 19, and 27.5 μ). The endopod of leg 4 is like that in the female.

Leg 5 (Figure 61e) has a moderately short free segment, 22 x 8 μ , without a proximal expansion. The dorsal surface bears a few broad spines. The two terminal elements are 19 μ and 31 μ .

Leg 6 (Figure 60h) is like that in *A. hales*, its two setae being 23 μ and 31 μ .

The spermatophore, attached to the female in pairs and resembling that of *A. hales*, is 117 x 55 μ (without the neck).

The color in life in transmitted light is like that of the female.

ETYMOLOGY.—This species is named for Dr. Raphael Plante, Centre ORSTOM de Nosy Bé, Madagascar, who, by SCUBA diving, collected the colony of *Umbellulifera striata* on which the type specimens were found.

REMARKS.—*Acanthomolgus plantei* may be separated from all other species in the genus except *A. hales* on the basis of the ornamentation of the two long ramal setae, consisting of extremely short lateral spinules. (As mentioned above, eight species have long spinules on these setae, and in two species the setae are naked.) The new species may

be distinguished from *A. hales* by the shape of the genital segment and leg 5 in the female, and by the nature of the ornamentation of leg 5 and the degree of sexual dimorphism in the second antenna of the male.

The vestigial nature of the spiniform element on the third segment of the second antenna of the female of *A. plantei* is a feature found in no other species of *Acanthomolgus*.

***Acanthomolgus telestophilus* (Humes and Ho, 1968)**

Lichomolgus telestophilus Humes and Ho, 1968d, pp. 725–730, figs. 109–127 [from the telestacean *Telesto arborea* Wright and Studer, Antany Mora, Isles Radama, Madagascar, 14°06'10" S, 47°45'10" E.

***Acanthomolgus variostratus* (Humes and Ho, 1968)**

Lichomolgus variostratus Humes and Ho, 1968b, pp. 2–7, figs. 1–21 [from the alcyonaceans *Dendronephthya mucronata* (Pütter), *Dendronephthya regia* Verseveldt, *Dendronephthya stocki* Verseveldt, and *Dendronephthya koellikeri* Kükenthal, region of Nosy Bé, Madagascar].

NEW RECORDS (all from Madagascar, collected by AGH).—From *Dendronephthya mucronata*: 8 ♀♀,

7 ♂♂, from single colony, in 4 m, Antsamantsara, Nosy Bé, 9 June 1967; 6 ♀♀, 2 ♂♂, and 2 copepodids, from single colony, in 2 m, off Ampombilava, Nosy Bé, 7 July 1967; 2 ♀♀, 4 ♂♂, and 3 copepodids, from single colony, in 24 m, Banc des Frères, Isles Mitsio, near Nosy Bé, 12°58' S, 48°28' E, 18 August 1967; many specimens, from four colonies, in 10 m, Rocher du N.E., Nosy Bé, 19 August 1967; many specimens, from two colonies, in 10 m, Rocher du N.E., Nosy Bé, 19 August 1967; many specimens, from single colony, in 25 m, north of Ankazoberavina, near Nosy Bé, 13°27.6' S, 47°58.2' E, 24 August 1967; and several specimens, from single colony, in 24 m, north of Ankazoberavina, near Nosy Bé, 25 August 1967.

From *Dendronephthya regia*: 28 ♀♀, 11 ♂♂, and 52 copepodids, from single colony, in 25 m, north of Ankazoberavina, near Nosy Bé, 13°27.6' S, 47°58.2' E, 24 August 1967.

From *Dendronephthya stocki*: many specimens, from single colony, in 25 m, north of Ankazoberavina, near Nosy Bé, 13°27.6' S, 47°58.2' E, 24 August 1967.

From *Dendronephthya* sp.: many specimens, from part of single colony, in 27 m, Banc des Frères, Isles Mitsio, near Nosy Bé, 12°58' S, 48°28' E, 17 August 1967.

NEW HOSTS (all from Madagascar, collected by AGH).—From *Dendronephthya cirsiium* Kükenthal: 7 ♀♀, 13 ♂♂, and 9 copepodids, from single colony, in 35 m, near Nosy Bé, 13°15'50" S, 48°08'35" E, 29 August 1967.

From *Dendronephthya lokobeensis* Verseveldt: many specimens, from single colony, in 15 m, Pte. Lokobe, Nosy Bé, 13 June 1967; 35 ♀♀, 14 ♂♂, from seven colonies, in 18 m, in pass at Pte. Lokobe, Nosy Bé, 30 August 1967.

From *Dendronephthya speciosa* Kükenthal: 10 ♀♀, 5 ♂♂, and 7 copepodids, from two colonies, in 10 m, Rocher du N.E., Nosy Bé, 19 August 1967.

From *Stereonephthya cordylophora* Verseveldt: many specimens, from single colony, in 24 m, north of Ankazoberavina, near Nosy Bé, 13°27.6' S, 47°58.2' E, 25 August 1967.

Acanthomolgus verseveldti (Humes and Ho, 1968)

Lichomolgus verseveldti Humes and Ho, 1968d, pp. 694–702, figs. 1–26 [from the alcyonacean *Heteroxenia elisabethae* Kölliker, region of Nosy Bé, Madagascar].

NEW ALCYONACEAN HOSTS (collected by AGH).—28 ♀♀, 26 ♂♂, and 68 copepodids from *Xenia lepida* Verseveldt, in 10 m, Pte. Lokobe, Nosy Bé, Madagascar, 18 July 1967; 3 ♀♀, 3 ♂♂, and 4 copepodids from *Heteroxenia fuscescens* (Hemprich and Ehrenberg), in 20 m, Banc de Cinq Mètres, near Nosy Bé, Madagascar, 6 August 1967.

Genus *Amarda* Humes and Stock, 1972

DIAGNOSIS.—Body transformed. Urosome 5-segmented in the female, 6-segmented in the male. Caudal ramus with six short setae. Rostrum subtriangular but rounded posteroventrally. First antenna 7-segmented, in the female with the formula 3 or 4, 12, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male 3 or 4, 12 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 3-segmented, with the armature 1, 1, 3 + 1, there being a single terminal claw.

Labrum with a median cleft separating the two lobes. Mandible with its basal area having on its convex side a slight rounded swelling followed by a prominent winglike process and then by a serrated fringe; its concave side beyond the indentation having two lobes, one with small serrations, the other with large serrations; lash relatively short and smooth. First maxilla with four elements. Second maxilla with the armature on the second segment much reduced; lash short and reflexed. Maxilliped in the female 3-segmented with a somewhat pointed tip; in the male 4-segmented (assuming the proximal part of the claw to be a fourth segment) and unusual in lacking rows of spinules on the second segment.

Legs 1–3 similar in both sexes with reduced armature. Legs 1, 2 with 3-segmented exopods and either 2- or 3-segmented endopods. Leg 3 with a 2-segmented exopod (0–0; I, II or 0–0; II) but lacking an endopod. Leg 4 absent in both sexes. Leg 5 in both sexes with a small free segment not clearly delimited from the body bearing two terminal setae. Leg 6 in the female represented by the two setae and the spiniform process near the area of attachment of each egg sac; in the male by a posteroventral flap on the genital segment bearing two setae.

Other features as in the species described below. Associated with madreporarian corals.

TYPE-SPECIES.—*Amarda cultrata*, new species.

ETYMOLOGY.—The generic name is an anagram

of Radama I, a king of Madagascar who reigned 1810–1828. Gender feminine.

Key to Species of *Amarda*

- Endopods of legs 1 and 2 two-segmented; leg 3 exopod with the formula 0-0-I,II; caudal ramus with the two median terminal setae broad and bladelike *A. cultrata*
 Endopods of legs 1 and 2 three-segmented; leg 3 exopod with the formula 0-0-II; caudal ramus with the two median terminal setae slender *A. compta*

Amarda cultrata, new species

FIGURES 62–64

TYPE MATERIAL.—2 ♀♀, 5 ♂♂ from single colony of *Favia* sp., in 2 m, Ambariotelo, a small island almost between Nosy Komba and Nosy Bé, northwestern Madagascar, 23 May 1964, collected by AGH. Holotype ♀, allotype, and 5 paratypes (1 ♀, 4 ♂♂) deposited in USNM.

OTHER MATERIAL EXAMINED (all from *Favia* sp.).—1 ♀ from several colonies, in 2 m, Pte. à la Fièvre, Nosy Bé, Madagascar, 26 December 1963; 1 ♀, 1 ♂ from single colony, in 2 m, Ambariotelo, 23 May 1964; 2 ♀♀, 5 ♂♂, and 1 copepodid from single colony, in 2 m, off Ampombilava, Nosy Bé, 26 September 1964; and 1 ♀, 1 ♂ from single colony, in 2 m, east of Ambariobe, a small island almost between Nosy Komba and Nosy Bé, 4 October 1964. All collected by AGH.

FEMALE.—The body (Figure 62a,b) has a moderately broad and flattened prosome. The length (excluding the setae on the caudal rami) is 1.59 mm (1.49–1.68 mm) and the greatest width 0.75 mm (0.68–0.79 mm) based on four specimens in lactic acid. The ratio of the length to the width of the prosome is 1.29:1. The ratio of the length of the prosome to that of the urosome is 1.51:1. The segment of leg 1 is distinctly set off dorsally from the cephalosome by a transverse furrow. The epimeral areas of the segments of legs 1–3 are prominent, but the segment which ordinarily would bear leg 4 (absent in this species) lacks such epimera.

The segment of leg 5 (Figure 62c) is 86 x 285 μ . There is no ventral intersegmental sclerite between that segment and the genital segment. The genital segment is 177 x 280 μ in greatest dimensions in dorsal view, broadest in its anterior half. The areas of attachment of the egg sacs are situated dorso-laterally at the middle of the segment. Each area

(Figure 62d) bears two minute naked setae, 8 μ and 7 μ , and a small spinous process. The three postgenital segments are 109 x 169 μ , 86 x 139 μ , and 133 x 127 μ from anterior to posterior. The posteroventral border of the anal segment is smooth.

The caudal ramus (Figure 62e) is 85 x 32 μ , or 2.66 times longer than wide. The outer lateral seta is 30 μ , the dorsal seta 28 μ , the outermost terminal seta 34 μ , and the innermost terminal seta 36 μ , all of them naked. The two median terminal setae are relatively short and broad, the outer 53 μ , the inner 82 μ , both naked.

The body surface has numerous minute hairs (sensilla) and refractile points.

The egg sac is unknown, but a few eggs were attached to one female. The eggs are 115–130 μ in diameter.

The rostrum (Figure 62f) has a subtriangular but rounded posteroventral margin. Between the rostrum and the labrum there is a knoblike area protruding ventrally.

The first antenna (Figure 62g) is 297 μ long. It is considered as 7-segmented, but the last two segments appear to be incompletely separated. The lengths of the segments (measured along their posterior nonsetiferous margins) are 33 (73 μ along the anterior margin), 96, 29, 36, 31, 21, and 11 μ respectively. The formula for the armature is 3, 12, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All the setae are naked.

The second antenna (Figure 62h) is 3-segmented. The first two segments bear a short inner seta. The third segment (representing a fusion of two segments) bears on its inner side two small setae and the suggestion (vaguely defined) of a very minute third element. Terminally the segment has a digitiform extension with a few minute spinules and bears three small setae and a sinuous terminal claw 39 μ along its axis (Figure 62i).

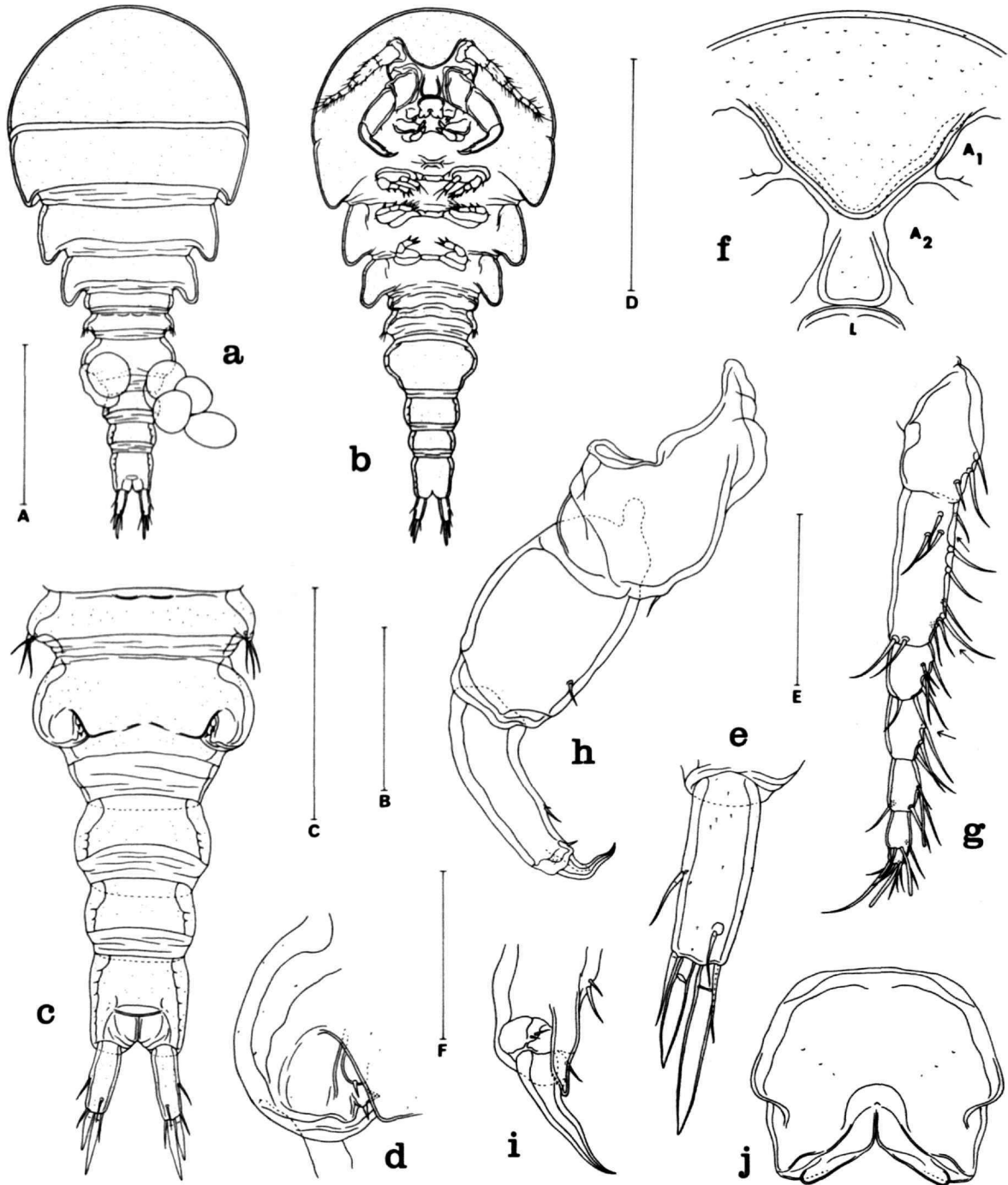


FIGURE 62.—*Amarda cultrata*, new species. Female: a, dorsal (A); b, ventral (A); c, urosome, dorsal (B); d, area of attachment of egg sac, dorsal (C); e, caudal ramus, dorsal (C); f, rostrum, ventral (D); g, first antenna, with arrows indicating positions of additional aesthetes in male, anterior (E); h, second antenna, posterior (E); i, tip of second antenna, anterior (F); j, labrum, ventral (C). Scale: A, 0.5 mm; B, D, 0.2 mm; C, E, 0.1 mm; F, 0.05 mm.

The labrum (Figure 62j) has two, weakly cleft, posteroventral lobes.

The mandible (Figure 63a) has on the concave side of the base a deep indentation followed by two transverse lobes, one with a finely serrated margin, the other with a coarsely serrated margin; on the convex side there is a slight rounded swelling and distally a very prominent winglike process followed by a serrated hyaline fringe. The lash is relatively short and smooth. Paragnaths could not be identified with certainty. The first maxilla (Figure 63b) consists of a single segment bearing four elements. The second maxilla (Figure 63c) is 2-segmented. The first segment is large and unornamented. The second segment is much modified, with only one minute seta on its posterior surface and with its stout short terminal lash reflexed and bearing a row of prominent teeth. The maxilliped (Figure 63d) is 3-segmented. The first segment is unarmed. The second segment bears two very unequal minute inner setae and a row of extremely small spines distally. The third segment bears a blunt seta and a row of small spines near the pointed tip.

The ventral area between the maxillipeds and the first pair of legs (Figure 63e) is not protuberant. A fine line connects the bases of the maxillipeds. The region immediately in front of the intercoxal plate of leg 1 lacks the elongated sclerite seen in most lichomolgids.

Leg 1 (Figure 63f) and leg 2 (Figure 63g) have 3-segmented exopods and 2-segmented endopods. Leg 3 (Figure 63h) has a 2-segmented exopod but lacks an endopod entirely. Leg 4 is absent.

The armature of the legs may be expressed as follows:

P ₁	coxa	0-0	basis	1-0	exp	I-0; I-0; III,I,I
					enp	0-0; I,2
P ₂	coxa	0-0	basis	1-0	exp	I-0; I-0; III,I,I
					enp	0-0; I,II
P ₃	coxa	0-0	basis	1-0	exp	0-0; I,II
					enp	absent
P ₄	absent					

The coxa in all three legs lacks an inner seta.

Leg 4 is absent (Figure 62b), but there is a small internal sclerotization indicating its former position.

Leg 5 (Figure 63i) has a small unornamented segment, 15.5 x 11 μ , which is not clearly separated from the body. It bears two terminal naked setae,

40 μ and 45 μ . The seta on the body near the segment is 50 μ and naked.

Leg 6 is represented by the two setae on the area of attachment of each egg sac (Figure 62d).

The color in life in transmitted light is opaque, the ventrally placed eye red, the intestine light brown, the ovary gray, the extruded eggs black.

MALE.—The body (Figure 64a) resembles in general form that of the female. The length (not including the ramal setae) is 1.31 mm (1.18–1.37 mm) and the greatest width 0.59 mm (0.54–0.63 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1.19:1. The ratio of the length of the prosome to that of the urosome is 1.14:1.

The segment of leg 5 (Figure 64b) is 65 x 280 μ . There is no ventral intersegmental sclerite. The genital segment is 146 x 264 μ , much wider than long. The four postgenital segments are 83 x 149 μ , 88 x 133 μ , 75 x 115 μ , and 112 x 114 μ from anterior to posterior.

The caudal ramus resembles that of the female.

The rostrum is like that of the female.

The first antenna is similar to that of the female but has three additional aesthetes so that the formula is 3, 12 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete.

The second antenna, labrum, mandible, paragnath (?), first maxilla, and second maxilla are like those of the female.

The maxilliped (Figure 64c) is slender and 4-segmented (assuming that the proximal part of the claw represents a fourth segment). The first segment is unarmed. The second bears two inner setae and a few refractile areas but lacks the rows of spinules commonly seen in other lichomolgids. The small third segment is unarmed. The claw is 120 μ along its axis, lacks a terminal lamella and any indication of division, and bears two very unequal proximal setae.

The ventral area between the maxillipeds and the first pair of legs is like that of the female.

Legs 1–3 have the same segmentation and armature as in the female. The outer margin of the second segment of the endopods of leg 1 (Figure 64d) and leg 2 may be smooth or may have 1–3 spiniform processes which are larger than those in the female. Leg 4 is absent as in the female.

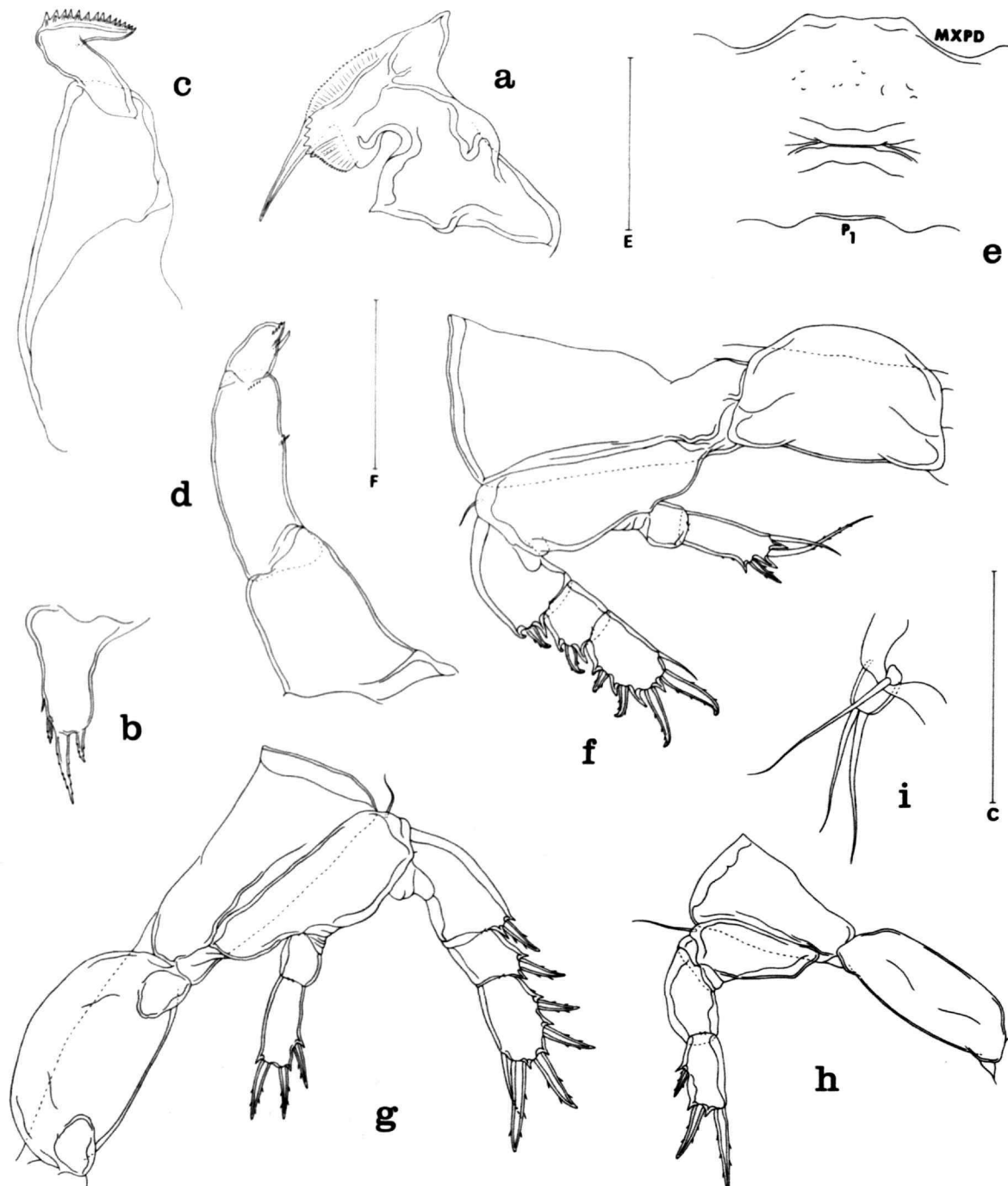


FIGURE 63.—*Amarda cultrata*, new species. Female: *a*, mandible, posterior (F); *b*, first maxilla, posterior (F); *c*, second maxilla, anterior (F); *d*, maxilliped, anterior (F); *e*, area between maxillipeds and first pair of legs, ventral (E); *f*, leg 1 and intercoxal plate, anterior (C); *g*, leg 2 and intercoxal plate, anterior (C); *h*, leg 3 and intercoxal plate, anterior (C); *i*, leg 5, dorsal (F). Scale: C, E, 0.1 mm; F, 0.05 mm.

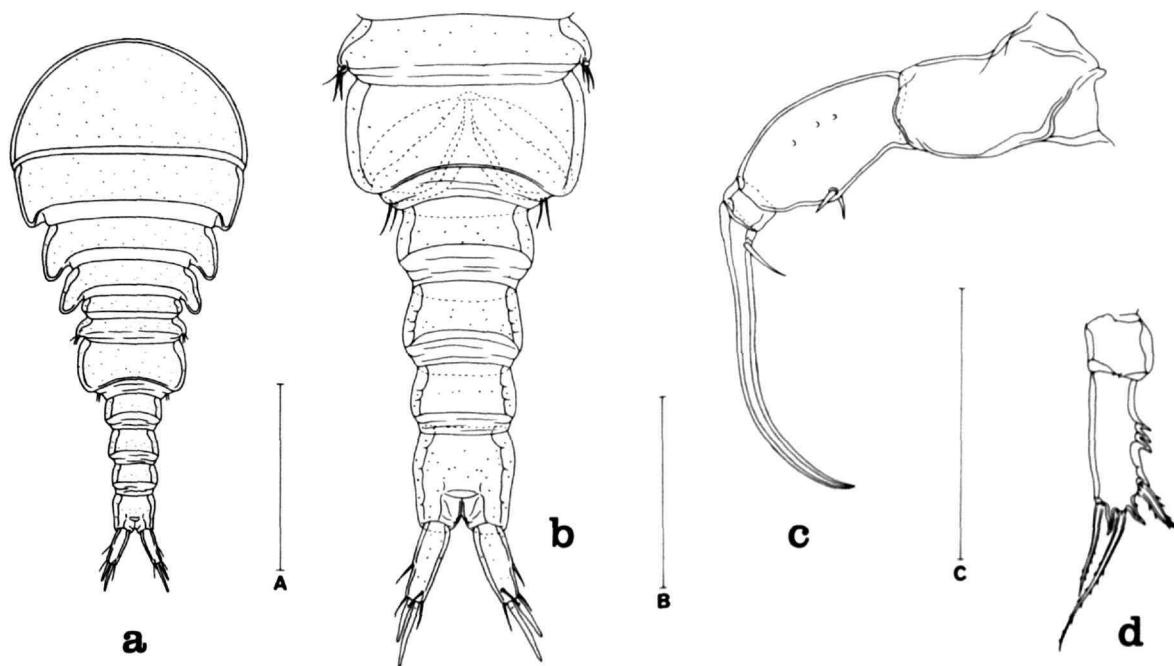


FIGURE 64.—*Amarda cultrata*, new species. Male: *a*, dorsal (A); *b*, urosome, dorsal (B); *c*, maxilliped, inner (C); *d*, endopod of leg 1, anterior (C). Scale: A, 0.5 mm; B, 0.2 mm; C, 0.1 mm.

Leg 5 is similar to that of the female, though the segment is somewhat smaller and less clearly set off from the body.

Leg 6 (Figure 64*b*) consists of a posteroventral flap on the genital segment bearing two naked setae, 34 μ and 39 μ .

The spermatophore was not observed.

The color in life in transmitted light is opaque, the eye red, the intestine brown.

ETYMOLOGY.—The specific name *cultrata* (Latin, shaped like a knife) alludes to the two broad, bladelike setae on the caudal ramus.

Amarda coarpta, new species

FIGURES 65, 66

TYPE MATERIAL.—4 ♀♀, 4 ♂♂ from single colony of *Favia* sp. (the same colony in which *A. cultrata* was found), in 2 m, off Ampombilava, Nosy Bé, northwestern Madagascar, 26 September 1964, collected by AGH. Holotype ♀, allotype, and 2 paratypes (1 ♀, 1 ♂) deposited in USNM, the remaining paratypes (dissected) in the collection of AGH.

OTHER MATERIAL EXAMINED (also from *Favia* sp.).—2 ♀♀, 4 ♂♂, and 1 copepodid from single colony (the same colony in which *A. cultrata* was found), in 2 m, east of Ambariobe, a small island nearly between Nosy Komba and Nosy Bé, Madagascar, 4 October 1964, collected by AGH.

FEMALE.—The body (Figure 65*a,b*) has a large, broad, thickened prosome. The length (without the ramal setae) is 1.12 mm (1.06–1.20 mm) and the greatest width 0.60 mm (0.57–0.62 mm), based on four specimens in lactic acid. The ratio of the length to the width of the prosome is 1.17:1. The ratio of the length of the prosome to that of the urosome is 2.46:1. The segment of leg 1 is distinctly delimited from the cephalosoma by a dorsal transverse furrow. The segment which ordinarily would bear leg 4 (absent in this species) lacks projecting epimera.

The segment of leg 5 (Figure 65*c*) is 65 x 229 μ . There is no ventral intersegmental sclerite between that segment and the genital segment. The genital segment is 117 x 205 μ . In dorsal view the lateral borders of the segment are rounded; in lateral view (Figure 65*b*) the dorsal surface is somewhat

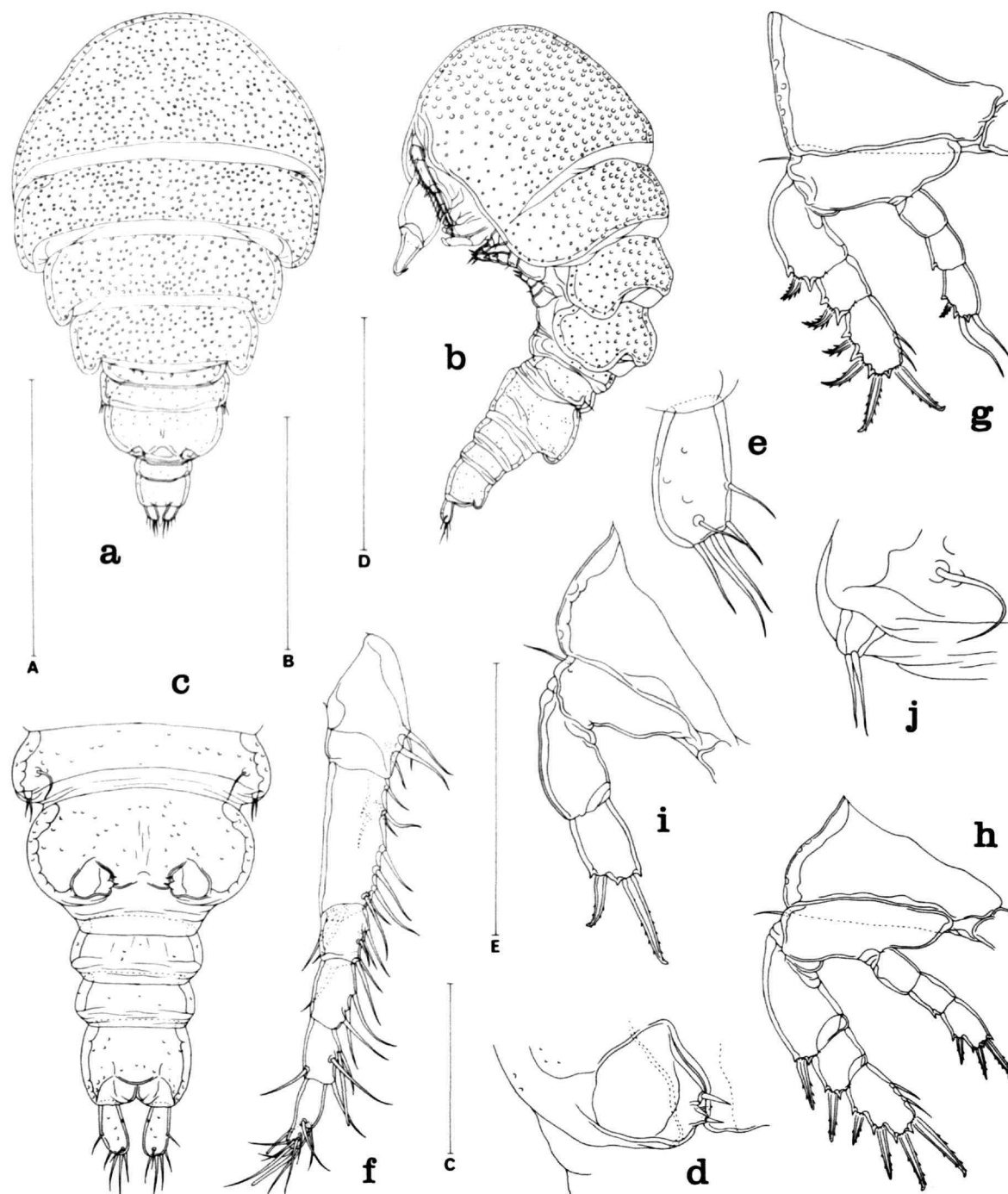


FIGURE 65.—*Amarda compta*, new species. Female: *a*, dorsal (A); *b*, lateral (A); *c*, urosome, dorsal (B); *d*, area of attachment of egg sac, dorsal (C); *e*, caudal ramus, dorsal (C); *f*, first antenna, posterior (D); *g*, leg 1, anterior (D); *h*, leg 2, anterior (D); *i*, leg 3, anterior (C); *j*, leg 5, dorsal (E). Scale: A, 0.5 mm; B, 0.2 mm; C, E, 0.05 mm; D, 0.1 mm.

protruded. The areas of attachment of the egg sacs are located dorsally behind the middle of the segment. Each area (Figure 65d) bears two small naked setae, 6 μ and 9 μ , and a small spinous process. The three postgenital segments are 47 x 120 μ , 44 x 104 μ , and 67 x 99 μ from anterior to posterior. The posteroventral border of the anal segment is smooth.

The caudal ramus (Figure 65e) is 44 x 23 μ , or about 1.9 times longer than wide. It bears six naked setae, all of them slender and shorter than the ramus itself.

The body surface bears many small round refractile areas (Figure 65a,b).

The egg sac is unknown.

The rostrum resembles that of the male, shown in Figure 66c.

The first antenna (Figure 65f) is 233 μ long. The sixth and seventh segments are incompletely separated as in the preceding species. The lengths of the segments (measured along their posterior non-setiferous margins) are 23 (61 μ along the anterior margin), 72, 17, 27, 27, 20, and 9 μ respectively. The formula for the armature is 4, 12, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All the setae are naked.

The second antenna, labrum, mandible, paragnath(?), first maxilla, second maxilla, maxilliped, and ventral area between the maxillipeds and the first pair of legs are similar to those in *A. cultrata*.

Leg 1 (Figure 65g) and leg 2 (Figure 65h) have 3-segmented exopods and endopods. Leg 3 (Figure 65i) has a 2-segmented exopod but lacks an endopod. Leg 4 is absent.

The armature of the legs is as follows:

P ₁	coxa	0-0	basis	1-0	exp	I-0; I-0; III,I,2
					enp	0-0; 0-0; I,2
P ₂	coxa	0-0	basis	1-0	exp	I-0; I-0; III,I,2
					enp	0-0; 0-0; I,II
P ₃	coxa	0-0	basis	1-0	exp	0-0; II
					enp	absent
P ₄	absent					

As in *A. cultrata*, the coxa in all three legs lacks an inner seta and leg 4 is absent.

Leg 5 (Figure 65j) has a small unornamented segment only 8 μ long which is not clearly delimited from the body.

Leg 6 is represented by the two setae on the area of attachment of each egg sac (Figure 65d).

The color in life resembles that of *A. cultrata*.

MALE.—The body (Figure 66a) resembles in outline that of the female. The length (not including the setae on the caudal rami) is 0.85 mm (0.81–0.92 mm) and the greatest width 0.42 mm (0.41–0.43 mm), based on four specimens in lactic acid. The ratio of the length to the width of the prosome is 1.22:1. The ratio of the length of the prosome to that of the urosome is 2.49:1.

The segment of leg 5 (Figure 66b) is 55 x 213 μ . There is no ventral intersegmental sclerite. The genital segment is 91 x 208 μ , much wider than long. The four postgenital segments are 42 x 107 μ , 42 x 94 μ , 34 x 87 μ , and 62 x 78 μ from anterior to posterior.

The caudal ramus is like that of the female.

The rostrum (Figure 66c), like that of the female, has a broad trilobate posteroventral margin. In the midline between the rostrum and the labrum there is a large ventrally protruding knob.

The first antenna has three additional aesthetes, as in the male of *A. cultrata*.

The second antenna, labrum, mandible, paragnath(?), first maxilla, and second maxilla resemble those of the female. The maxilliped, its claw 108 μ along its axis, is similar to that in the male of *A. cultrata*. The ventral area between the maxillipeds and the first pair of legs, legs 1–3, and leg 5 (with its segment even smaller than in the female) resemble those of the female. Leg 4 is absent as in the female.

Leg 6 (Figure 66b) is similar to that of the male of *A. cultrata*.

The spermatophore was not observed.

The color in life resembles that of *A. cultrata*.

ETYMOLOGY.—The specific name *compta* (Latin, ornamented) refers to the small refractile areas ornamenting the body surface.

REMARKS.—*Amarda compta* may be readily distinguished from *A. cultrata* by its small size, the refractile areas scattered over the body surface, the nature of the two median terminal setae on the caudal rami (slender rather than broad), the number of setae on the first segment of the first antenna (four rather than three as in *A. cultrata*), the segmentation of the endopod in legs 1 and 2 (3-segmented instead of 2-segmented as in *A. cultrata*), and the number of spines on the second segment of the exopod in leg 3 (two rather than three as in *A. cultrata*).

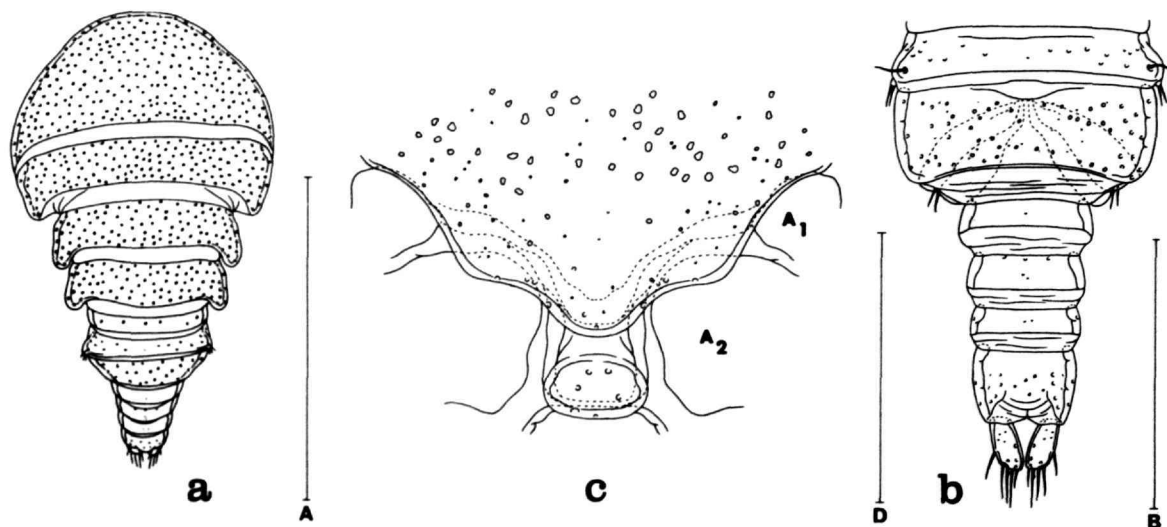


FIGURE 66.—*Amarda compta*, new species. Male: a, dorsal (A); b, urosome, dorsal (B); c, rostrum, ventral (D). Scale: A, 0.5 mm; B, 0.2 mm; D, 0.1 mm.

Amarda compta is similar to *A. cultrata* in important ways, such as the transformed body, the segmentation of the first antenna (with the last two segments incompletely separated), the 3-segmented second antenna, the nature of the labrum and mouthparts, the absence of the endopod in leg 3, the absence of leg 4, and the reduction of leg 5. The host of the two species is the same, *Favia* sp.

Genus *Anchimolgus* Humes and Stock, 1972

DIAGNOSIS.—Body cyclopiform. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six moderately short setae. Rostrum weakly developed. First antenna 7-segmented, in the female with the formula 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male with 4, 13 + 2 aesthetes, 6,

3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented, with the formula 1, 1, 3, and I + a few minute elements, there being only a single short terminal claw.

Labrum with a deep cleft separating the two lobes. Mandible with the basal area beyond the indentation having on its concave side two small digitiform lobes followed by a serrated fringe and on its concave edge two lobes with marginal spinules; lash long. Paragnath a small hairy lobe. First maxilla with three or four elements. Second maxilla of the usual lichomolgid type. Maxilliped in the female 3-segmented with a pointed tip; in the male 4-segmented (regarding the proximal part of the claw as a fourth segment).

Legs 1-4 with 3-segmented rami except for leg 4 endopod which is 2-segmented. Leg 4 exopod with

Key to Species of the Genus *Anchimolgus*

FEMALES

- Free segment of leg 5 small, $36 \times 17 \mu$, much shorter than genital segment; caudal ramus about 6.1:1 *A. digitatus*
 Free segment of leg 5 elongated, $203 \times 30 \mu$, longer than genital segment; caudal ramus 2.65:1.....
 *A. proluxipes*

MALES

- Genital segment a little wider than long; caudal ramus about 4.3:1..... *A. digitatus*
 Genital segment longer than wide; caudal ramus 2:1..... *A. proluxipes*

the third segment having II,I,5. Leg 4 endopod with the formula 0-1;II, the seta being feathered. Leg 1 endopod of the male with the third segment I,I,4 instead of I,5 as in the female. Leg 5 with a free segment bearing two setae. Leg 6 in the female represented by the two setae and the process near the area of attachment of each egg sac; in the male by the ventral posterolateral flap on the genital segment bearing two setae.

Other features as in the species below.

Associated with madreporarians.

TYPE-SPECIES.—*Anchimolgus digitatus* (Humes and Ho).

ETYMOLOGY.—The name is a combination of the Greek words *αγγι* (near), suggesting the affinity of this genus with other lichomolgids, and *μολγος*. Gender masculine.

Anchimolgus digitatus (Humes and Ho, 1968)

FIGURE 67

Lichomolgus digitatus Humes and Ho, 1968a, pp. 357-359, figs. 25-52 [from the hard coral *Goniopora* sp., Nosy Bé-Madagascar].

NEW HOST.—1 ♀, 1 ♂ from *Favia* sp., in 5 m, Nosy Taolankena, near Nosy Bé, Madagascar, 24 July 1964, collected by AGH.

NEW RECORD.—8 ♀♀, 7 ♂♂, and 3 copepodids from *Goniopora* sp., in 17 m, near black buoy north of Pte. Ambarionaomby, Nosy Komba, near Nosy Bé, Madagascar, 5 August 1967, collected by AGH.

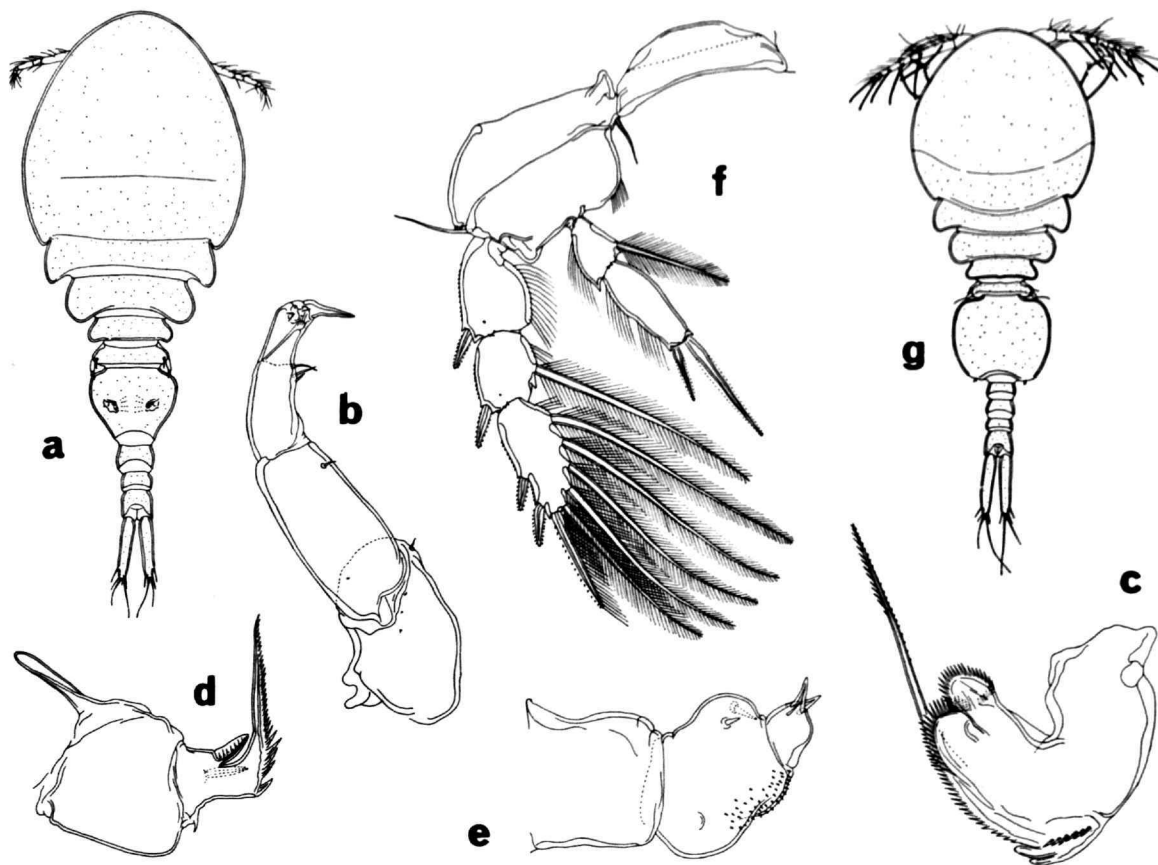


FIGURE 67.—*Anchimolgus digitatus* (Humes and Ho). Female: a, dorsal; b, second antenna; c, mandible; d, second maxilla; e, maxilliped; f, leg 4 and intercoxal plate. Male: g, dorsal. (From Humes and Ho, 1968a, figs. 25, 31, 33, 36, 42, 44.) Length of female 1.89 mm, of male 1.55 mm.

***Anchimolgus prolixipes* (Humes and Ho, 1968)**

Lichomolgus prolixipes Humes and Ho, 1968a, pp. 359-362, figs. 53-78 [from the hard corals *Porites* sp. cf. *andrewsi* Vaughan, *Porites* sp. cf. *nigrescens* Dana, and *Porites* (*Synaraca*) sp., region of Nosy Bé, Madagascar].

NEW RECORD.—28 ♀♀, 14 ♂♂, and 16 copepodids from *Porites* sp., in 2 m, off Ampombilava, Nosy Bé, Madagascar, 5 June 1967, collected by AGH.

Genus *Andrianellus* Humes and Stock, 1972

DIAGNOSIS.—Body modified. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six relatively short setae. Rostrum with a weakly defined posteroventral margin. First antenna 7-segmented, in the female with the formula 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete, in the male with 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented, with the formula 1,1,3,1, there being a single small terminal claw.

Labrum with an indentation separating the two lobes. Mandible with the base divided by an indentation into an unornamented proximal part and a distal area having on its convex side a slender spiniform process followed by a weakly serrated fringe and on its concave side two lobes, one with a single row of spinules, the other with two rows; lash stout and moderately long. First maxilla with four elements. Second maxilla of the usual lichomolgid type, but the first segment bearing a long digitiform process. Maxilliped in the female 3-segmented with a pointed tip, in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1-4 with 3-segmented rami except for leg 4 endopod which is 2-segmented. Formula for the armature the same in both sexes. Leg 4 exopod with the third segment having II, I, 5. Leg 4 endopod 0-1; I. Leg 5 in both sexes with a free segment (not clearly delimited from the body) with two terminal setae. Leg 6 in the female represented by the two seta near the area of attachment of each egg sac; in the male by a posteroventral flap on the genital segment bearing two setae.

Other features as in the species described below. Associated with madreporarian corals.

TYPE-SPECIES.—*Andrianellus exsertidens*, new species.

ETYMOLOGY.—The generic name is a combination of "Andrian," from Andrianampoinimerina, the first king of Madagascar who reigned 1787-1810, and the Latin diminutive suffix "-ellus." Gender masculine.

***Andrianellus exsertidens*, new species**

FIGURES 68-70

TYPE MATERIAL.—18 ♀♀, 10 ♂♂ from single colony of the madreporarian *Favia* sp., in 2 m, Ambariotelo, a small island nearly between Nosy Komba and Nosy Bé, northwestern Madagascar, 20 July 1967, collected by AGH. Holotype ♀, allotype, and 20 paratypes (14 ♀♀, 6 ♂♂) deposited in USNM; 2 paratypes (1 ♀, 1 ♂) in ZMA; and the remaining paratypes (dissected) in the collection of AGH.

OTHER MATERIAL EXAMINED.—2 ♀♀, 2 ♂♂, and 1 copepodid from single colony of the madreporarian *Platygyra daedala* (Ellis and Solander), in 2 m, Pte. à la Fièvre, Nosy Bé, 26 December 1963.

FEMALE.—The body (Figure 68a,b) has a somewhat thickened prosome. The length (not including the setae on the caudal rami) is 1.28 mm (1.26-1.33 mm) and the greatest width 0.47 mm (0.44-0.49 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1.4:1. The ratio of the length of the prosome to that of the urosome is 1.13:1. The segment of leg 1 is fused with the cephalosome. The epimera of the segments of legs 1-4 are as illustrated in Figure 68a.

The segment of leg 5 (Figure 68c) is 62 x 220 μ. There is no ventral intersegmental sclerite between that segment and the genital segment. The genital segment is 210 x 234 μ, broadest anteriorly and tapered posteriorly. The areas of attachment of the egg sacs are dorsal in position, situated near the middle of the segment. Each area (Figure 68d) has two small naked setae, 8 μ and 4 μ, and a small spinous process. The three postgenital segments are 75 x 120 μ, 57 x 96 μ, and 68 x 93 μ from anterior to posterior. The posteroventral border of the anal segment bears a row of small spinules on each side.

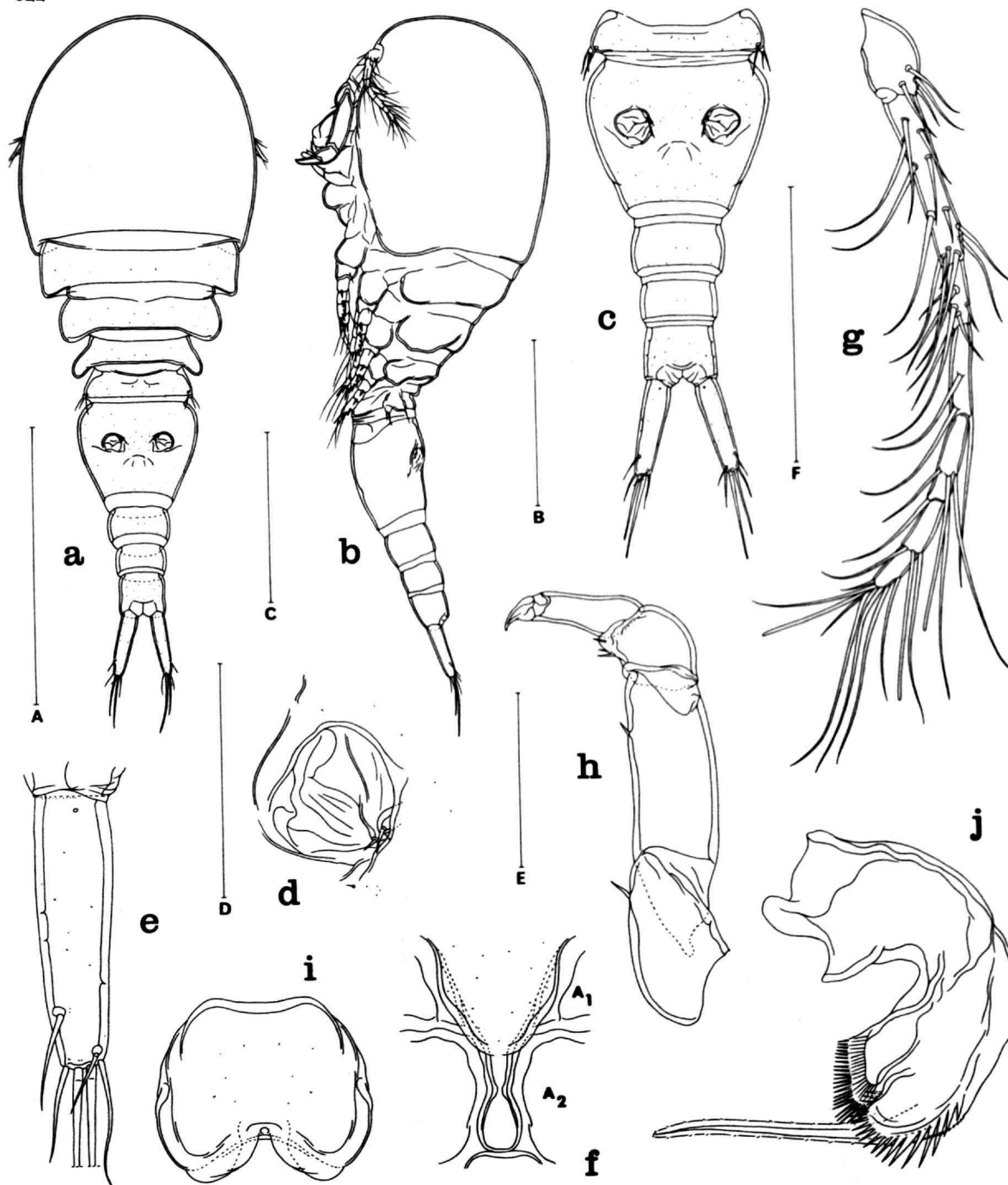


FIGURE 68.—*Andrianellus exsertidens*, new species. Female: *a*, dorsal (A); *b*, lateral (A); *c*, urosome, dorsal (B); *d*, area of attachment of egg sac, dorsal (C); *e*, caudal ramus, dorsal (D); *f*, rostrum, ventral (E); *g*, first antenna, anterodorsal (D); *h*, second antenna, posterior (D); *i*, labrum, ventral (D); *j*, mandible, posterior (F). Scale: A, 0.5 mm; B, 0.2 mm; C, F, 0.05 mm; D, E, 0.1 mm.

The caudal ramus (Figure 68e) is elongated, $120 \times 31 \mu$, or 3.87 times longer than wide. The outer lateral seta is 39μ , the dorsal seta 22μ , the outermost terminal seta 42μ , the innermost terminal seta 52μ , and the two median terminal setae 88μ and 120μ (outer and inner respectively), all six setae being naked. The tips of the two median terminal setae are blunt.

The body surface has small hairs (sensilla) and refractile points as in Figure 68a.

The egg sac is unknown.

The rostrum (Figure 68f) is a moderately elongated lobe with a weakly defined posteroventral margin. Between the rostrum and labrum there is an oval protrusion.

The first antenna (Figure 68g) is 7-segmented and slender, 278μ long. The lengths of the segments (measured along their posterior nonsetiferous margins) are 22 (44μ along the anterior edge), 75, 30, 41, 40, 26, and 22μ respectively. The formula for the armature is 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All the setae are naked.

The second antenna (Figure 68h) is 4-segmented. Each of the first two segments bears a small inner seta. The third segment has three such setae. The fourth segment bears only a small terminal claw 20μ in length.

The labrum (Figure 68i) has two rounded posteroventral lobes with somewhat lobate margins.

The mandible (Figure 68j) has on its concave edge an indentation followed by two transverse lobes, one with two rows of slender spinules and the other with a single row of coarser spinules; on its convex edge there is a slender spiniform process followed by a weakly serrated hyaline fringe. The lash is moderately long, stout, and sparsely barbed. *Paragnaths* could not be identified with certainty. The first maxilla (Figure 69a) has four elements. The second maxilla (Figure 69b) is 2-segmented. The large first segment has no armature, but bears a long (60μ), slender, blunt, digitiform process which may be seen in the whole animal extending ventrally and anteriorly in lateral view (Figure 68b). The second segment bears two setae, one barbed, the other naked, and terminates in a moderately long lash with a row of spinules. The maxilliped (Figure 69c) is 3-segmented. The first segment is unarmed. The second segment bears two minute setae. The third segment bears two

small setae and terminates in a finely barbed spiniform process.

The ventral area between the maxillipeds and the first pair of legs (Figure 69d) protrudes ventrally. A line connects the bases of the maxillipeds.

Legs 1-4 (Figure 69e-h) have 3-segmented rami except for the endopod of leg 4 which is 2-segmented. The armature of these legs is as follows:

P_1	coxa	0-1	basis	1-0	exp	I-0; I-1; III,I,4
				enp	0-1; 0-1; I,5	
P_2	coxa	0-1	basis	1-0	exp	I-0; I-1; III,I,5
				enp	0-1; 0.2; I,II,3	
P_3	coxa	0-1	basis	1-0	exp	I-0; I-1; III,I,5
				enp	0-1; 0-2; I,II,2	
P_4	coxa	0-1	basis	1-0	exp	I-0; I-1; II,I,5
				enp	0-1; I	

The coxa of legs 1-3 bears a long plumose inner seta, but in leg 4 this seta is minute (6μ) and naked. The inner margin of the basis is haired in legs 1-3 but smooth in leg 4. The spines on all four legs have smooth rather than barbed lamellae. The exopod of leg 4 is 112μ long. The first segment of the endopod is $22 \times 16.5 \mu$, with its distal inner plumose seta 30μ ; the second segment, rather almond-shaped, is $35 \times 16.5 \mu$ (the length not including the small spiniform process) and its terminal spine 33μ . Both segments of the endopod have outer marginal hairs.

Leg 5 (Figure 70a) has a small unornamented segment 11μ long, not clearly set off from the body and armed with two setae.

Leg 6 is represented by the two setae on the area of attachment of each egg sac (Figure 68d).

The color in life in transmitted light is opaque, the eye red.

MALE.—The body (Figure 70b) resembles in its general form that of the female. The length (without the ramal setae) is 1.19 mm (1.17 – 1.22 mm) and the greatest width 0.43 mm (0.42 – 0.44 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1.39:1. The ratio of the length of the prosome to that of the urosome is 1.04:1. The segmentation and the development of the epimera resemble the female.

The segment of leg 5 (Figure 70c) is $44 \times 195 \mu$. There is no ventral intersegmental sclerite. The genital segment is $230 \times 234 \mu$, about as long as wide. The four postgenital segments are $65 \times 99 \mu$, $56 \times 91 \mu$, $42 \times 82 \mu$, and $60 \times 83 \mu$ from anterior to posterior.

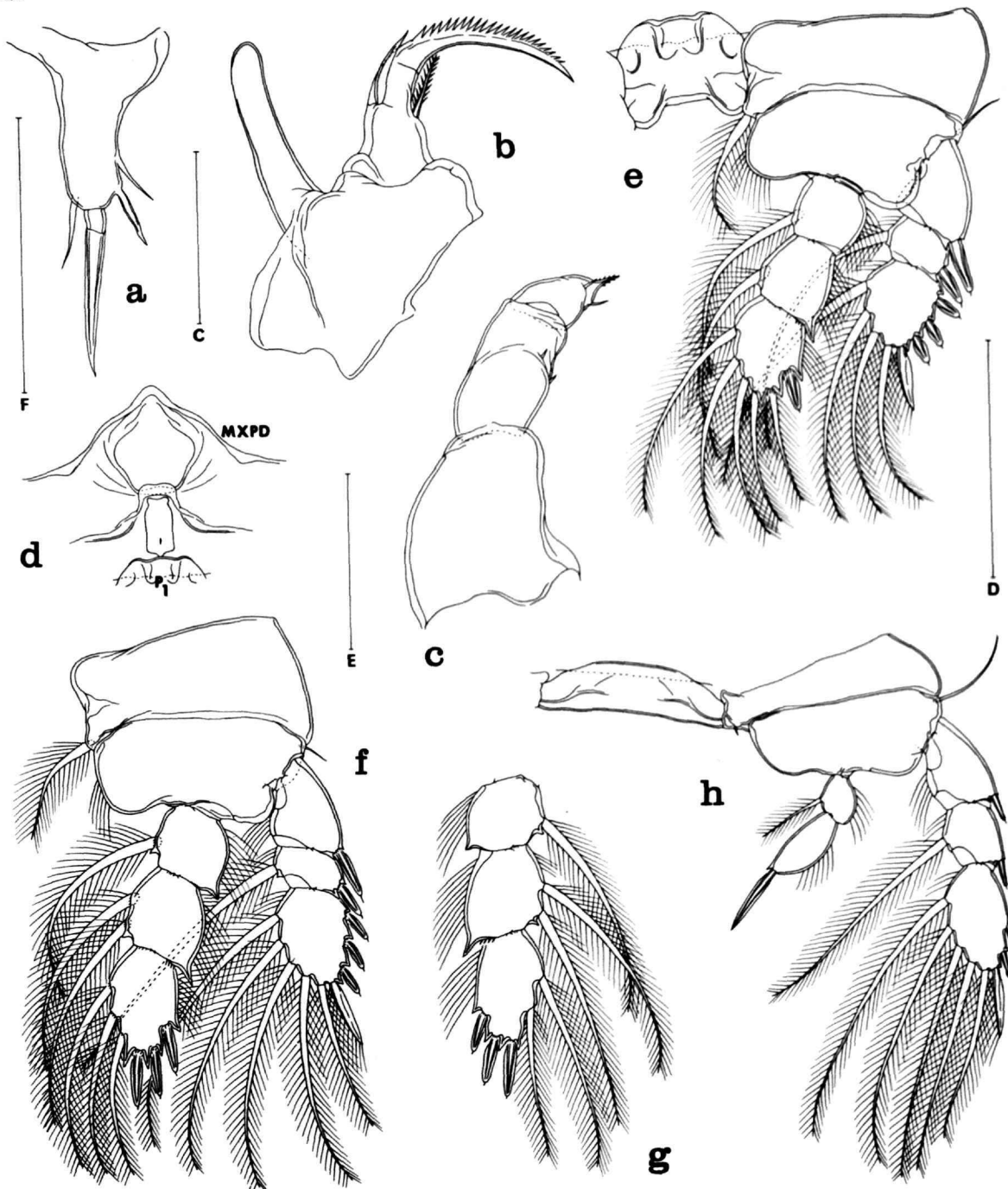


FIGURE 69.—*Andrianellus exsertidens*, new species. Female: *a*, first maxilla, posterior (F); *b*, second maxilla, anterior (C); *c*, maxilliped, inner (C); *d*, area between maxillipeds and first pair of legs, ventral (E); *e*, leg 1 and intercoxal plate, anterior (D); *f*, leg 2, anterior (D); *g*, endopod of leg 3, anterior (D); *h*, leg 4 and intercoxal plate, anterior (D). Scale: C, F, 0.05 mm; D, E, 0.1 mm.

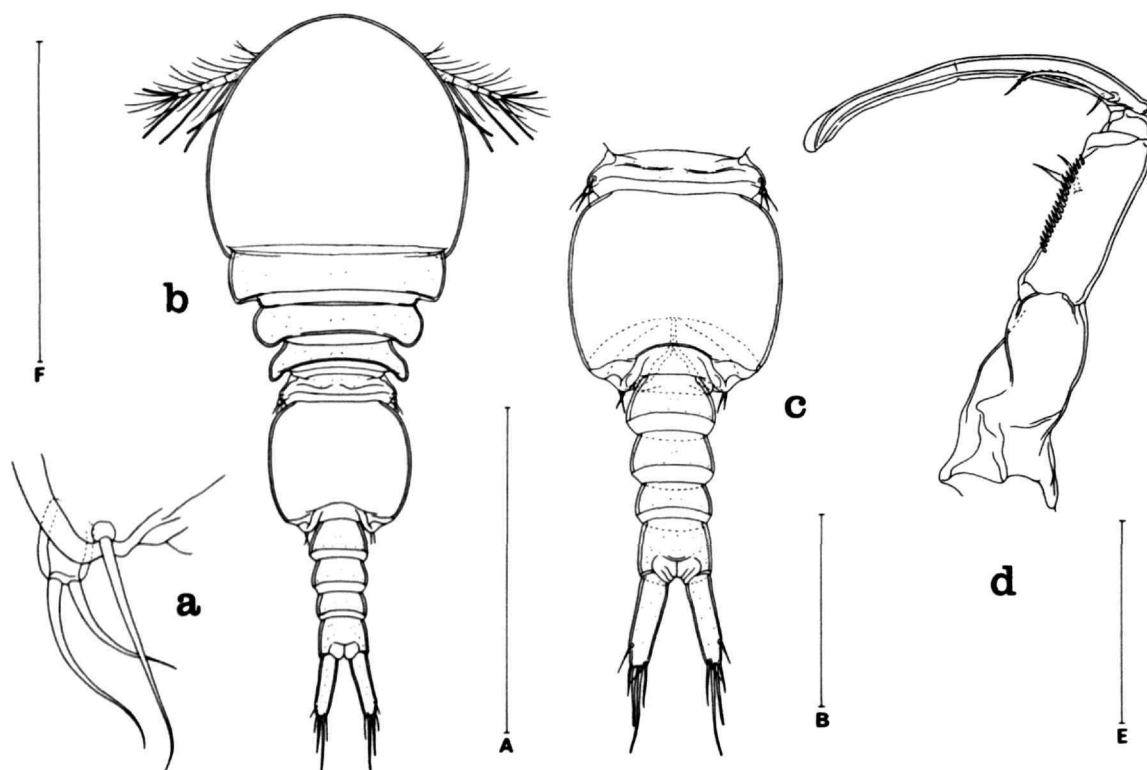


FIGURE 70.—*Andrianellus exsertidens*, new species. Female: a, leg 5, dorsal (F). Male: b, dorsal (A); c, urosome, dorsal (B); d, maxilliped, inner (E). Scale: A, 0.5 mm; B, 0.2 mm; E, 0.1 mm; F, 0.05 mm.

The caudal ramus is similar to that of the female, but a little shorter, $107 \times 30 \mu$, or 3.57 times longer than wide.

The body surface has hairs and refractile points as in the female.

The rostrum resembles that of the female.

The first antenna is like that of the female, but there are three additional, long aesthetes so that the formula is 4, $13 + 2$ aesthetes, 6, $3 + 1$ aesthete, $4 + 1$ aesthete, $2 + 1$ aesthete, and $7 + 1$ aesthete.

The second antenna is similar to that of the female except that there is an additional row of small spinules along the inner margin of the second segment proximal to the seta.

The labrum, mandible, paragnath(?), first maxilla, and second maxilla are like those in the female. The maxilliped (Figure 70d) is slender and 4-segmented (assuming that the proximal part of the claw represents a fourth segment). The first

segment is unarmed. The second segment bears a seta with a bulbous base, a recurved seta, and a row of spinules. The small third segment is unarmed. The slender, slightly recurved claw is 185μ along its axis including the terminal lamella, is divided about midway, and bears proximally two very unequal setae.

The ventral area between the maxillipeds and the first pair of legs is like that of the female.

Legs 1–5 are like those of the female.

Leg 6 is a posteroventral flap on the genital segment bearing two naked setae, 22μ and 30μ .

The spermatophore was not observed.

The color in life resembles that of the female.

ETYMOLOGY.—The specific name *exsertidens* is derived from the Latin words *exsertus* (protruded) and *dens* (tooth or tusk), alluding to the extraordinary toothlike process on the first segment of the second maxilla.

Genus *Anisomolgus* Humes and Stock, 1972

DIAGNOSIS.—Body cyclopidiform. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six setae. Rostrum rounded posteroventrally. First antenna 7-segmented, in the female with the formula 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male with 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented, with the armature 1, 1, 3, I + several small elements, there being a single terminal claw.

Labrum with the two lobes separated by a deep cleft. Mandible with the basal area distal to the indentation having on its convex side a scalelike area with spinules followed by a serrated fringe and on its concave side a row of spinules; lash long. Paragnath a small hairy lobe. First maxilla with three elements. Second maxilla of the usual lichomolgoid form. Maxilliped of the female 3-segmented with a pointed tip; in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1-4 with 3-segmented rami, except for leg 4 endopod which is 2-segmented. Third segment of the exopod of legs 3 and 4 either II, I, 5 or III, I, 5. Leg 4 endopod with the formula 0-1; 1, I, the seta on the second segment being naked. Armature similar in both sexes except for leg 1 endopod in the male where the last segment is I, I, 4 instead of I, 5 as in the female. Leg 5 with a free segment bearing two setae. Leg 6 in the female represented by the two setae and the process near the area of attachment of each egg sac; in the male by a ventral posterolateral flap on the genital segment bearing two setae.

Other features as in the species below.

Associated with alcyonaceans.

TYPE-SPECIES.—*Anisomolgus protentus* (Humes and Frost).

ETYMOLOGY.—The name is a combination of the Greek ανισος (unequal), referring to the spine and the seta on the second segment of leg 4 endopod, and μολγος. Gender masculine.

REMARKS.—The male of *A. spinipes* is unknown.

Key to Species of the Genus *Anisomolgus*

FEMALES

1. Maxilliped of female with outer side of third segment swollen and membranous *A. incisus*
Maxilliped of female with outer side of third segment not swollen and membranous 2
2. Third segment of leg 3 exopod with II, I, 5; free segment of leg 5 unornamented *A. insolens*
Third segment of leg 3 exopod with III, I, 5; free segment of leg 5 ornamented with spinules 3
3. Free segment of leg 5 relatively short (53 μ) and straight; genital segment expanded laterally near the middle; caudal ramus about 2:1 *A. protentus*
Free segment of leg 5 long and slightly arcuate, about two-thirds as long as genital segment; caudal ramus wider than long *A. spinipes*

KNOWN MALES

1. Inner side of second segment of second antenna with a notched lamella *A. incisus*
Inner side of second segment of second antenna with a striated membrane or spinules 2
2. This segment with a long striated membrane; third segment of leg 3 exopod with II, I, 5 *A. insolens*
This segment with rows of spinules; third segment of leg 3 exopod with III, I, 5 *A. protentus*

Anisomolgus protentus (Humes and Frost, 1964)

FIGURE 71

Lichomolgus protentus Humes and Frost, 1964, pp. 148-150, figs. 203-236 [from the alcyonacean *Sarcophyton* sp., Ankify, on the mainland of Madagascar, near Nosy Bé; the host later being described as *Sarcophyton globosum* Tixier-Durivault, 1966].—Bouligand, 1966, p. 269.

NEW HOST.—The alcyonacean *Sarcophyton glaucum* (Quoy and Gaimard), collected by AGH: 10 ♀♀, 6 ♂♂, and 11 copepodids from three colonies, in 4 m, Antsamantsara, Nosy Bé, Madagascar, 9 June 1967; 24 ♀♀, 26 ♂♂, and 27 copepodids from single colony, in 17 m, near black buoy north of Pte. Ambarionaomby, Nosy Komba, near Nosy

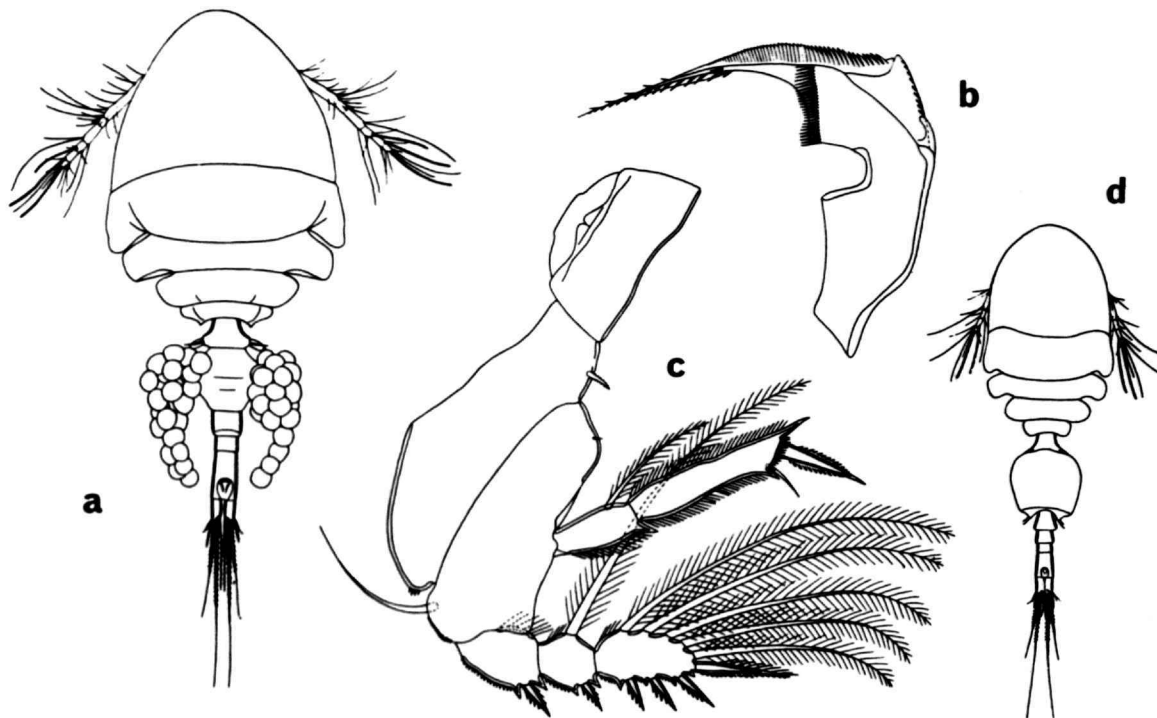


FIGURE 71.—*Anisomolgus protentus* (Humes and Frost). Female: a, dorsal; b, mandible; c, leg 4 and intercoxal plate. Male: d, dorsal. (From Humes and Frost, 1964, figs. 203, 214, 224, 226.) Length of female 1.67 mm, of male 1.14 mm.

Bé; 14 ♀♀, 3 ♂♂, and 13 copepodids from two colonies, in 1 m, Ankify, near Nosy Bé, 23 August 1967.

***Anisomolgus incisus* (Humes and Ho, 1968)**

Lichomolgus incisus Humes and Ho, 1968c, pp. 680–685, figs. 148–167 [from the alcyonacean *Sarcophyton ehrenbergi* Marenzeller, Nosy Bé, Madagascar].

NEW RECORD.—21 ♀♀, 16 ♂♂, and 14 copepodids from single colony of *Sarcophyton ehrenbergi*, in 4 m, Antsamantsara, Nosy Bé, 9 June 1967.

***Anisomolgus insolens* (Humes and Ho, 1968)**

Lichomolgus insolens Humes and Ho, 1968c, pp. 668–674, figs. 107–127 [from the alcyonacean *Lobophytum crassum* Marenzeller, Nosy Bé, Madagascar].

***Anisomolgus spinipes* (Sewell, 1949)**

Macrochiron (*Macrochiron*) *spinipes* Sewell, 1949, pp. 106–108, fig. 27a-i [in weed washings, Nicobar Islands].

Macrochiron spinipes.—Stock, 1957, p. 382.

Lichomolgus spinipes.—Stock, 1957, p. 382.

REMARKS.—The male is unknown.

Genus *Ascetomolgus* Humes and Stock, 1972

DIAGNOSIS.—Body cyclopiform. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six setae. Rostrum broadly rounded posteroventrally. First antenna 7-segmented, in the female with the formula 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented with the armature 1, 1, 3, II + 5 setae, there being two terminal claws.

Labrum with the two lobes separated by a deep cleft. Mandible with the basal area distal to the indentation having on its convex side a large hyaline area followed by a serrated fringe and on its concave side a row of spinules; lash very short. Paragnath a small hairy lobe. First maxilla with

four elements. Second maxilla with its general structure as in other lichomolgids, but the lash of peculiar form and set off from the segment by a break in the sclerotization. Maxilliped of the female 3-segmented, with a pointed tip; in the male 4-segmented (assuming the proximal part of the claw to represent a fourth segment).

Legs 1-4 with 3-segmented rami, except for leg 4 endopod which is 2-segmented. Leg 4 exopod with II, I, 5. Leg 4 endopod with 0-1; II, the seta on the first segment being naked. Armature similar in both sexes except for leg 1 endopod in the male where the formula of the third segment is I, I, 4 instead of I, 5 as in the female. Leg 5 with a free segment bearing two terminal setae. Leg 6 in the female represented by the two setae and spiniform process near the area of attachment of each egg sac; in the male by a posteroventral flap on the genital segment bearing two setae.

Other features as in the species described below. Associated with octocorals.

TYPE-SPECIES.—*Ascetomolgus plicatus*, new species.

ETYMOLOGY.—The name is formed from the Greek words *ασκητος* (curiously made), alluding to the form of the lash on the second maxilla, and *μολγος*. Gender masculine.

REMARKS.—The genus *Ascetomolgus* resembles the genera *Colobomo'gus* and *Contomolgus* in having a large protruding hyaline area (instead of a scale with spinules) on the convex edge of the base of the mandible and in having the formula II, I, 5 (instead of III, I, 5) on the third segment of the exopod of leg 4. In addition, it is unlike *Colobomo'gus* in having two claws (instead of one claw) on the last segment of the second antenna.

Ascetomolgus plicatus, new species

FIGURES 72-74

TYPE MATERIAL.—6 ♀♀, 6 ♂♂ from three colonies of the alcyonacean *Studerioties semperi* (Studer), in 17 m, on sandy bottom in pass between Nosy Komba and Nosy Bé, northwestern Madagascar, 23 August 1967, collected by AGH. Holotype ♀, allotype, and 6 paratypes (3 ♀♀, 3 ♂♂) deposited in USNM and the remaining paratypes (dissected) in the collection of AGH.

OTHER MATERIAL EXAMINED.—6 ♀♀, 4 ♂♂ from single colony of *Studerioties semperi*, in the same locality as type material, 25 August 1967.

FEMALE.—The body (Figure 72a) has a moderately slender prosome. The length (excluding the ramal setae) is 0.85 mm (0.78-0.90 mm) and the greatest width is 0.42 mm (0.40-0.45 mm), based on five specimens in lactic acid. The ratio of the length to the width of the prosome is 1.38:1. The ratio of the length of the prosome to that of the urosome is 2.21:1. The segment of leg 1 is distinctly separated dorsally from the head by a transverse furrow. The epimeral areas of the segments of leg 1-4 are more or less rounded.

The segment of leg 5 (Figure 72b) is 52 x 128 μ. There is a short ventral intersegmental sclerite between that segment and the genital segment. The genital segment is 122 x 135 μ in greatest dimensions, a little wider than long, in dorsal view distinctly divided transversely into two parts, the smaller posterior part being 113 μ in width; in ventral view the segment is entire, without a transverse division. The areas of attachment of the egg sacs are located dorsolaterally near the middle of the anterior part of the genital segment. Each area (Figure 72c) bears two small naked setae, 8 μ and 9 μ, with a small spiniform process between them. The three postgenital segments are 31 x 74 μ, 19 x 57 μ, and 23 x 61 μ from anterior to posterior. The anal segment has on its posteroventral margin on both sides a row of very small spinules.

The caudal ramus (Figure 72d) is quadrate, 24 x 24 μ. The outer lateral seta is 96 μ, the dorsal seta 30 μ, and the outermost terminal seta 140 μ, all three of these setae being naked. The innermost terminal seta is 208 μ and usually naked, though in one female there were a few inner hairs proximally. The two long median terminal setae are 340 μ (outer) and 450 μ (inner), both with prominent lateral spinules along their midregions and both inserted between dorsal (unornamented) and ventral (with a marginal row of minute spinules) flaps.

The surface of the body is ornamented with a few small hairs (sensilla) as in Figure 72a,b.

The egg sac (Figure 72a) is moderately elongated, 410 x 198 μ, reaches far beyond the caudal rami, and contains many eggs rather loosely bound together, each egg about 49 μ in diameter.

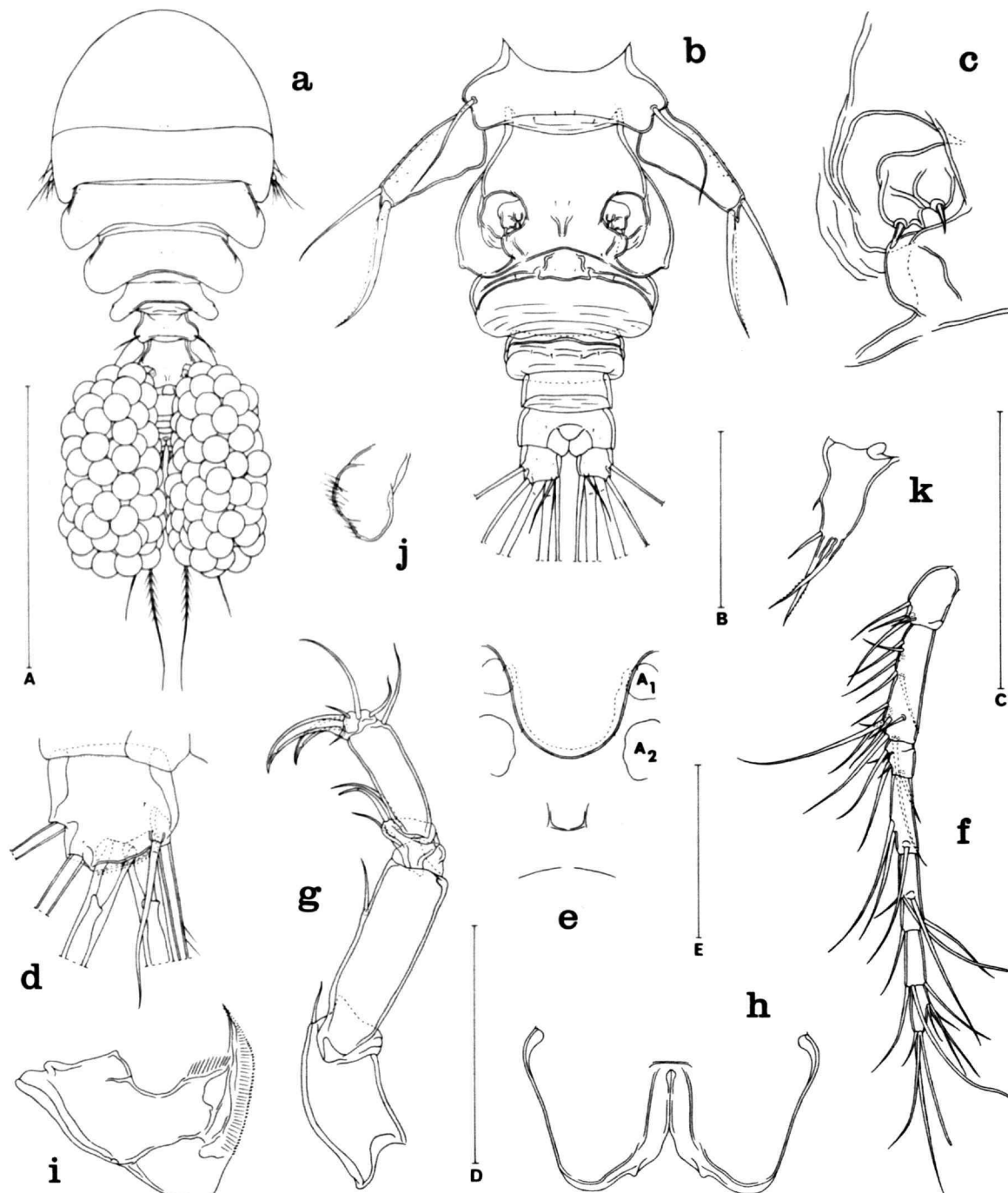


FIGURE 72.—*Ascetomolgus plicatus*, new species. Female: *a*, dorsal (A); *b*, urosome, dorsal (B); *c*, area of attachment of egg sac, dorsal (C); *d*, caudal ramus, dorsal (C); *e*, rostrum, ventral (B); *f*, first antenna, ventral (B); *g*, second antenna, anterior (D); *h*, labrum, ventral (E); *i*, mandible, posterior (E); *j*, paragnath, ventral (C); *k*, first maxilla, posterior (E). Scale: A, 0.5 mm; B, D, 0.1 mm; C, E, 0.05 mm.

The rostrum (Figure 72e) has a well-defined and broadly rounded posteroventral margin.

The first antenna (Figure 72f) is 305 μ long. The lengths of the seven segments (measured along their posterior nonsetiferous margins) are as follows: 18 (45 μ along the anterior margin), 80, 23, 47, 44, 35, and 29 μ respectively. The formula for the armature is 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All the setae are naked.

The second antenna (Figure 72g) is 4-segmented. The first and second segments bear an inner seta. The third segment has three inner setae, one of them bent. The fourth segment, 65 μ along its outer edge, 44 μ along its inner edge, and 17 μ wide, bears two unequal terminal claws, 45 μ and 35 μ , along their axes and five hyaline setae. All the setae are naked.

The labrum (Figure 72h) has two rather narrow posteroventral lobes.

The mandible (Figure 72i) has on the concave side of its basal region a moderately deep indentation followed by a row of spinules; on the convex margin there is a large, protruding, very hyaline area followed by a serrated fringe. The lash is very short and finely barbed. The paragnath (Figure 72j) is a small hairy lobe. The first maxilla (Figure 72k) has four elements. The second maxilla (Figure 73a) has a large unornamented first segment. The slender second segment bears a minute outer (ventral) setule, a surficial posterior seta finely barbed along one edge, and an inner (dorsal) seta similarly barbed along one edge; the segment terminates in a long lash of peculiar form delimited from the segment by a break in the sclerotization. The proximal spinose margin of the lash is protruded ventrally, thus giving the lash the appearance of being folded. The maxilliped (Figure 73b) is 3-segmented. The first segment is unarmed. The second segment bears two very unequal setae, the longer one barbed. The third segment, bearing a small naked seta and a bilaterally barbed spine, terminates in a bilaterally barbed spiniform process.

The ventral area between the maxillipeds and the first pair of legs (Figure 73c) is not protuberant. A sclerotized line connects the bases of the maxillipeds.

Legs 1-4 (Figures 73d-g) have trimerous rami except for the endopod of leg 4 which is 2-seg-

mented. The armature is like that of species of *Metaxymolgus*—for example, *M. cuspis* (Humes). The inner seta on the coxa of legs 1-3 is long and plumose, but in leg 4 it is minute (7 μ) and naked. The inner margin of the basis is haired in legs 1-3 but naked in leg 4. The exopod of leg 4 is 138 μ long, its last segment having the formula II,I,5. The first segment of the endopod is 28 x 24 μ (not including the spiniform processes), with its inner distal seta 21 μ and naked. The second segment is 61 μ long, 22 μ in greatest width, and 15.5 μ in least width (including the spiniform processes), and its two terminal fringed spines are 26 μ (outer) and 48 μ (inner). Both segments have outer hairs and, in addition, the second segment bears minute terminal spinules.

Leg 5 (Figure 73h) has a free segment, 80 x 33 μ (greatest dimensions including the ventral terminal pointed process), broadest proximally and tapering distally. Its outer surface bears a few very small spinules. The two terminal elements consist of a slender naked seta, 67 μ , and a stouter somewhat spiniform seta, 72 μ , with a unilateral fringe. The seta on the body near the free segment is 55 μ and naked; near its insertion there are a few minute spinules.

Leg 6 is probably represented by the two setae and the spiniform process near the attachment of each egg sac (Figure 72c).

The color in life in transmitted light is opaque, the eye red, the egg sacs gray.

MALE.—The body (Figure 73i) resembles that of the female in general form. The length (not including the setae on the caudal rami) is 0.72 mm (0.68-0.74 mm) and the greatest width 0.31 mm (0.29-0.32 mm), based on six specimens in lactic acid. The ratio of the length to the width of the prosome is 1.45:1. The ratio of the length of the prosome to that of the urosome is 1.60:1.

The segment of leg 5 (Figure 74a) is 42 x 81 μ . There is no ventral intersegmental sclerite between that segment and the genital segment. The genital segment is 159 x 155 μ . The four postgenital segments are 26 x 49 μ , 26 x 47 μ , 15.5 x 42 μ , and 18 x 47 μ from anterior to posterior.

The caudal ramus is like that of the female, but smaller, 21 x 21 μ . The proximal inner hairs on the innermost terminal seta are present more often than in the female.

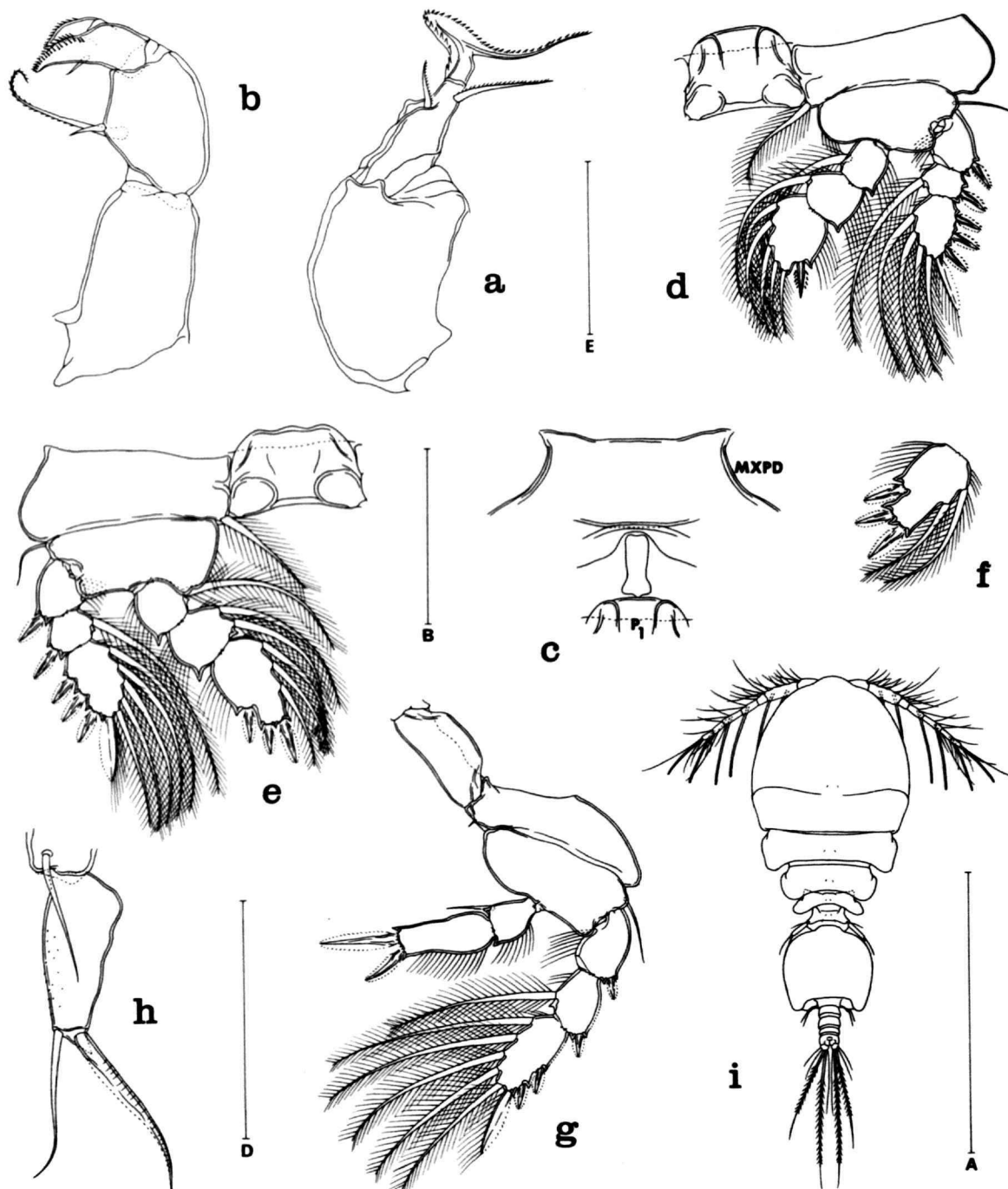


FIGURE 73.—*Ascetomolgus plicatus*, new species. Female: a, second maxilla, posterior (E); b, maxilliped, anterior (E); c, area between maxillipeds and first pair of legs, ventral (B); d, leg 1 and intercoxal plate, anterior (B); e, leg 2 and intercoxal plate, anterior (B); f, third segment of endopod of leg 3, anterior (B); g, leg 4 and intercoxal plate, anterior (B); h, leg 5, dorsal (D). Male: i, dorsal (A). Scale: A, 0.5 mm; B, D, 0.1 mm; E, 0.05 mm.

The surface of the body has a few small hairs (sensilla) as in the female.

The rostrum is like that of the female.

The first antenna resembles that of the female but has three additional aesthetes so that the formula is 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete.

The second antenna also is similar to that of the female but it shows sexual dimorphism in having very small spinules on the inner surfaces of the first, second, and fourth segments.

The labrum, mandible, paragnath, first maxilla, and second maxilla are like those in the female. The maxilliped (Figure 74b) is 4-segmented (assuming that the proximal part of the claw represents a fourth segment). The first segment is unornamented. The second segment bears two naked setae and a row of spines. The small third segment is unornamented. The claw is 139 μ along its axis (including the prominent terminal lamella) and shows a weak division midway. Its concave margin has a few small serrations proximal to the

division. The claw bears two very unequal proximal setae, the longer one finely barbed.

The ventral area between the maxillipeds and the first pair of legs resembles that of the female.

Legs 1-4 are segmented as in the female, with the spine and setal formula as in that sex except for the last segment of the endopod of leg 1 (Figure 74c) which has the formula 1,1,4 (the outer spine being 21 μ , the inner 20 μ) instead of 1,5. Sexual dimorphism is expressed also in the last segment of the endopod of leg 2 (Figure 74d) where the three spines, from outer to inner, are 13 μ , 7 μ , and 17 μ (instead of 20 μ , 16.5 μ , and 25 μ in the female). Legs 3 and 4 are like those of the female.

Leg 5 (Figure 74e) has an elongated free segment, 38.5 x 8.5 μ , not expanded proximally and bearing a few outer small spinules. It carries terminally a long naked seta, 46 μ , and a short spiniform element, 21 μ , with a serrated fringe along one edge. The adjacent naked seta on the body is 40 μ .

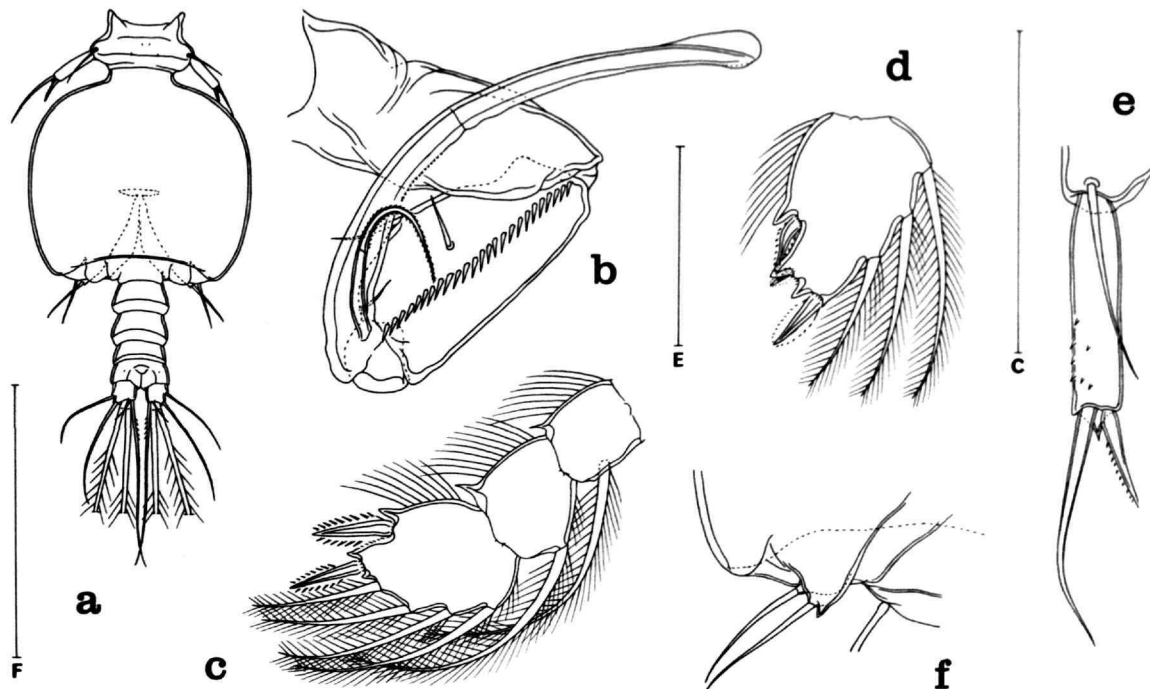


FIGURE 74.—*Ascetomolgus plicatus*, new species. Male: a, urosome, dorsal (F); b, maxilliped, inner (E); c, endopod of leg 1, anterior (E); d, third segment of endopod of leg 2, anterior (E); e, leg 5, dorsal (C); f, leg 6, ventral (E). Scale: c, E, 0.05 mm; F, 0.2 mm.

Leg 6 (Figure 74f) consists of a posteroventral flap on the genital segment bearing two naked setae, 41 μ and 44 μ , and a small spiniform process.

The spermatophore was not observed.

The color in life is like that of the female.

ETYMOLOGY.—The specific name *plicatus* (Latin, folded) refers to the folded appearance of the lash of the second maxilla.

Ascidioxynus Humes and Stock, 1972

DIAGNOSIS.—Body cyclopidiform. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six setae. Rostrum triangular or pointed. First antenna 7-segmented, in the female with the armature 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented, with the formula 1, 1, 3, and 2 terminal claws + 5 setae.

Labrum with two lobes separated by a median indentation. Mandible of simple form, with a slender base merging into a long bipectinate blade and lash. Paragnath a small lobe. First maxilla with three elements. Second maxilla of the usual lichomolgid type. Maxilliped in the female 3-segmented, with very small and indistinct third segment; in the male 4-segmented (assuming that

the proximal part of the claw represents a fourth segment).

Legs 1–4 with 3-segmented rami, except leg 4 endopod which is 2-segmented. Armature lichomolgidiform in pattern. Leg 4 exopod with the third segment having II, I, 5. Leg 4 endopod with the formula 0–1; II, 1. Leg 1 endopod with the same formula in both sexes. Leg 5 with a free segment bearing two terminal elements. Leg 6 represented by two setae near the genital openings.

Other features as in the species described below.

Associated with ascidians.

TYPE-SPECIES.—*Ascidioxynus floridanus*, new species.

ETYMOLOGY.—The generic name is a combination of *ασκιδιον*, alluding to ascidians, and *ξυνος*, companion or partner. Gender masculine.

REMARKS.—*Ascidioxynus* resembles species of *Lichomolgus* Thorell, from ascidians, in the simple form of the mandible. The genus differs notably from such species, however, in the armature of the endopod of leg 4 (0–1, II in *Lichomolgus*).

The formula for the endopod of leg 4 in *Ascidioxynus* (0–1; II, 1) suggests a relationship with *Stellicola* Kossmann and *Synstellicola* Humes and Stock. However, in those genera (mostly associated with echinoderms) the second antenna is 3-segmented and the mandible has a more complex form.

Key to Species of the Genus *Ascidioxynus*

FEMALES

1. Caudal ramus a little wider than long (30 x 38 μ) *A. jamaicensis*
Caudal ramus longer than wide 2
2. Genital segment elongated in dorsal view, 195 x 138 μ , broadest near the middle; free segment of leg 5 with an inner proximal expansion without a lamella *A. bermudensis*
Genital segment less elongated in dorsal view, 160 x 140 μ , broadest behind the midregion; free segment of leg 5 with an inner proximal expansion bearing a hyaline lamella with a serrated margin *A. floridanus*

MALES

1. Leg 1 showing slight sexual dimorphism in the stronger development of the obtusely tipped inner coxal seta; both setae on second segment of maxilliped strongly bent *A. jamaicensis*
Leg 1 not showing sexual dimorphism, with inner coxal seta plumose; setae on second segment of maxilliped not strongly bent 2
2. Second segment of maxilliped with one modified seta (Figure 76k) and one straight seta; genital segment with sides subparallel in dorsal view *A. floridanus*
Second segment of maxilliped with two straight setae; genital segment with slightly rounded margins in dorsal view *A. bermudensis*

Ascidioxynus floridanus, new species

FIGURES 75, 76

TYPE MATERIAL.—3 ♀♀, 3 ♂♂ from the pharynx of two large solitary ascidians (unidentified), dredged in 13–14 fathoms, 290°–340° northwest of wreck buoy on chart 1113, 15–25 miles from Key West, Florida, in the Gulf of Mexico, August 1951. Holotype ♀, allotype, and 3 paratypes (2 ♀♀, 1 ♂) deposited in USNM and the remaining paratypic male (dissected) in the collection of AGH.

OTHER MATERIAL EXAMINED.—1 ♀, 1 ♂ from a large unidentified solitary ascidian, \pm 3.5 miles SW of Longboat Pass, Sarasota Bay, on the Gulf coast of Florida, 9 February 1951, collected by J. B. Knight; and 2 ♀♀, 1 ♂ from single ascidian, in 5–6 fathoms, \pm 3.5 miles SW of Longboat Pass, Sarasota Bay, Florida, 24 March 1951, collected by J. B. Knight. Both collections in USNM (190466).

FEMALE.—The body (Figure 75a) is moderately slender, and in lateral view the prosome has approximately the same relative thickness as in *Henicoxiphium redactum* Illg and Humes (1971). The length (excluding the ramal setae) is 1.13 mm (1.01–1.22 mm) and the greatest width 0.43 mm (0.35–0.47 mm), based on three specimens in lactic acid. The segment of leg 1 is separated from the cephalosome by a dorsal transverse furrow. The epimeral areas of the pedigerous segments are as indicated in the figure. The ratio of the length to the width of the prosome is 1.55:1. The ratio of the length of the prosome to that of the urosome is 1.75:1.

The segment of leg 5 (Figure 75b) is 78 x 135 μ . There is no ventral intersegmental sclerite between that segment and the genital segment. The genital segment is 169 x 140 μ , in dorsal view is broadest just behind the middle and gently contracted posteriorly, and bears a posteroventral row of spines. The areas of attachment of the egg sacs are situated dorsolaterally in front of the widest part of the segment. Each area (Figure 75c) bears two naked setae, about 17 μ , and a minute spiniform process. The three postgenital segments are 83 x 60 μ , 73 x 48 μ , and 70 x 55 μ from anterior to posterior. The posteroventral borders of the first two postgenital segments bear a row of spines and the posteroventral border of the anal segment

bears on each side a row of minute spinules.

The caudal ramus (Figure 75d) is moderately short, 49 x 34 μ in greatest dimensions, or 1.44 times longer than wide. The outer lateral seta is 70 μ , the dorsal seta 75 μ , the outermost terminal seta 130 μ , the innermost terminal seta 143 μ , and the two long median terminal setae 200 μ (outer) and 360 μ (inner), both inserted dorsally to a ventral flap which bears a marginal row of small spinules. All six setae are naked, but the two long median terminal setae have a lamella along one edge (on the inner edge of the outer seta and on the outer edge of the inner seta).

The surface of the body bears a few hairs (sensilla) as indicated in Figure 75a.

The egg sac is unknown.

The rostrum (Figure 75e) is a triangular, bluntly pointed beak.

The first antenna (Figure 75f) is 7-segmented and 289 μ long. The lengths of the segments (measured along their posterior nonsetiferous margins) are 23 (58 μ along the anterior margin), 69, 23, 50, 43, 28, and 18 μ respectively. The formula for the armature is 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All the setae are naked.

The second antenna (Figure 75g) is 4-segmented, with the separation between the third and fourth segments strong on the anterior (inner) surface but weak on the posterior (outer) surface. The first and second segments bear a small inner seta. The third segment bears three setae, one much shorter than the other two. The fourth segment, 78 μ along its outer edge, 50 μ along its inner edge, and 24 μ wide, bears terminally two claws, 35 μ along their axes, and five slender setae. All the setae are naked.

The labrum (Figure 75h) has a short nipple-like protusion on the margin of both posteroventral lobes.

The mandible (Figure 75i) is slender, its concave side without a pronounced indentation or a transverse row of spinules, its convex side smooth and lacking a serrated fringe. The lash merges gradually with the base and bears a row of spinules on both sides. Paragnaths could not be identified with certainty but probably are represented by two small lobes dorsal to the labrum (Figure 75h). The first maxilla (Figure 75j) has three elements. The second maxilla (Figure 76a) is 2-segmented, with the

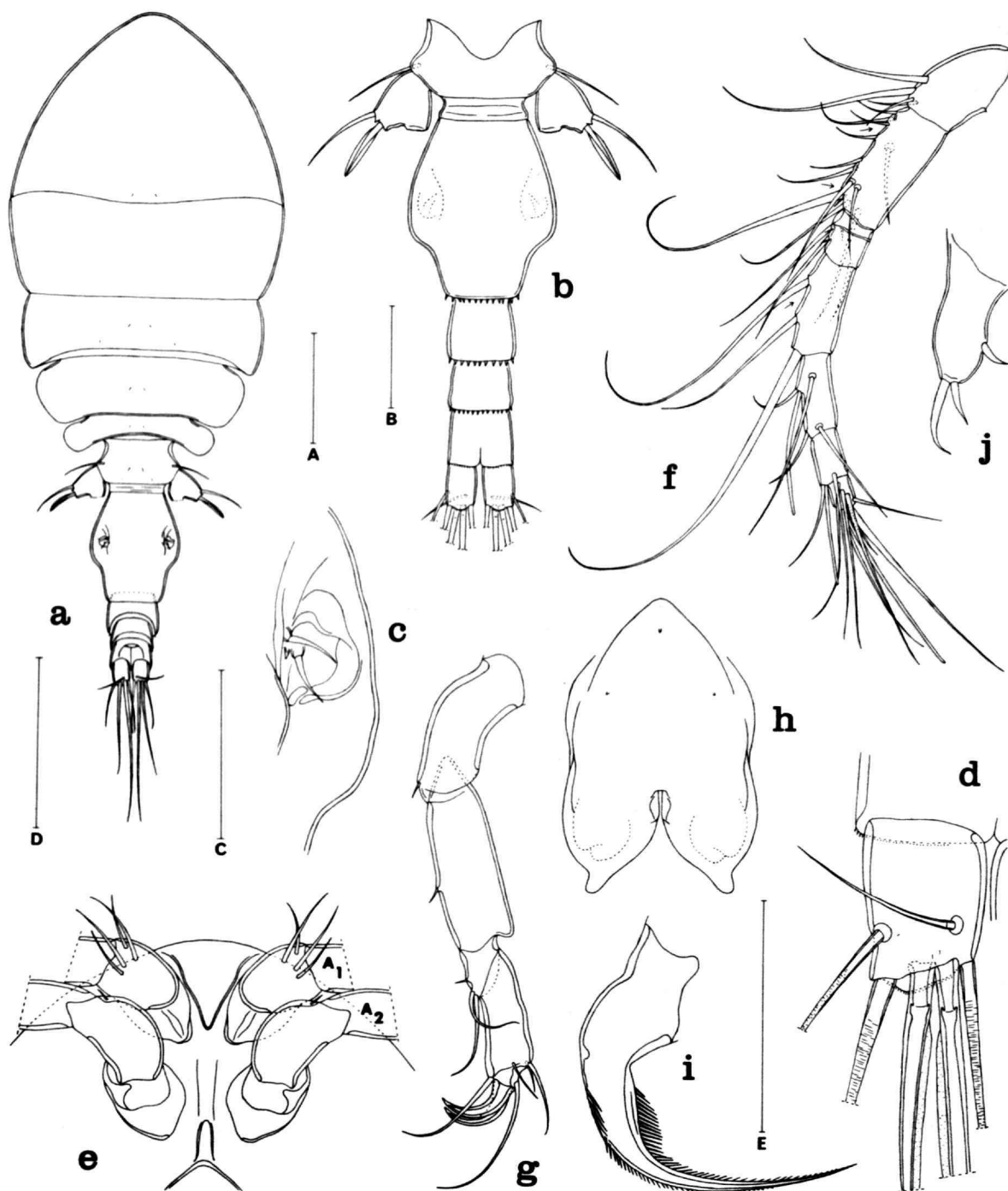


FIGURE 75.—*Ascidioxynus floridanus*, new species. Female: a, dorsal (A); b, urosome, ventral (B); c, area of attachment of egg sac, dorsal (C); d, caudal ramus, dorsal (D); e, rostrum, ventral (E); f, first antenna, with arrows indicating positions of additional aesthetes in male, ventral (D); g, second antenna, posterior (outer) (D); h, labrum, with paragnaths (?) indicated by broken lines, ventral (E); i, mandible, posterior (C); j, first maxilla, anterior (E). Scale: A, 0.2 mm; B, D, E, 0.1 mm; C, 0.05 mm.

second segment armed with the usual number of elements seen in lichomolgids; the lash has a row of long slender spines. The maxilliped (Figure 76b) is 3-segmented. The first segment is unarmed. The second segment bears two naked setae and its posterior and inner surfaces are finely spinulose. The minute third segment bears a very small setule and terminates in a minuscule spiniform process.

The ventral area between the maxillipeds and the first pair of legs (Figure 76c) is protuberant as in *Henicoxiphium redactum*. A line connects the bases of the maxillipeds.

Legs 1-4 (Figure 76d-g) have the same segmentation and armature as in *Henicoxiphium redactum* except for the endopod of leg 4 which here is 2-segmented with the formula 0-1;II,1.

The inner coxal seta of legs 1-4 is plumose, that of leg 4 about half as long as in the preceding legs. The inner margin of the basis bears a row of hairs in all four legs. The exopod of leg 4 is 164 μ long, the armature of the third segment being II,1,5. The endopod of leg 4 (Figure 76g) is about 120 μ long. The first segment is 33 x 32 μ (not including the spiniform processes), with its plumose inner seta 58 μ . The second segment is 88 μ long (including the terminal spiniform processes), its greatest width 34 μ proximal to the outer spinous process, its least width distally 19 μ . The inner plumose seta is 66 μ and the two terminal fringed spines are 38 μ (outer) and 65 μ (inner). The outer margin of the first segment has a row of hairlike spinules; that of the second segment has two rows of such spinules and a third distal row of very short spinules. There is a row of extremely small spinules at the insertions of the terminal spines. Although the outer spinous process and the inner seta suggest a division of the segment, no line of articulation or break in the sclerotization was observed.

Leg 5 (Figure 76h) has a broad unornamented free segment 69 x 50 μ in greatest dimensions (the length including the terminal spiniform process of 3 μ). The inner margin of the segment is expanded to form a hyaline lamella with a serrated margin. The segment bears terminally a bilaterally lamellose spine, 55 μ , and a naked seta, 66 μ . The adjacent seta on the body is 57 μ and naked.

Leg 6 is represented by the two setae near the attachment of each egg sac (Figure 75c).

The color in life is unknown.

MALE.—The body is slender, resembling in general form that of the female. (Each of the few males studied had the urosome strongly flexed, making it impossible to prepare an accurate figure of the entire animal.) The length (estimated, and not including the setae on the caudal rami) is 0.65 mm (0.63–0.70 mm) and the greatest width 0.21 mm (0.21–0.22 mm), based on three specimens in lactic acid. The ratio of the length to the width of the prosome is 2.08:1.

The segment of leg 5 (Figure 76i) is 29 x 69 μ . There is no ventral intersegmental sclerite. The genital segment is 104 x 94 μ . The four postgenital segments are 31 x 56 μ , 31 x 52 μ , 23 x 52 μ , and 29 x 47 μ from anterior to posterior.

The caudal ramus is similar to that of the female, but smaller, 26 x 22 μ , and relatively shorter, about 1.18 times longer than wide.

The body surface has a few hairs as in the female. The rostrum resembles that of the female.

The first antenna is similar to that of the female but has three additional aesthetes (at the locations indicated by arrows in Figure 75f) so that the formula is 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. The second antenna, labrum, mandible, paragnath(?), first maxilla, and second maxilla are like those of the female. The maxilliped (Figure 76j) is 4-segmented (assuming that the proximal part of the claw represents a fourth segment). The first and third segments are unarmed. The second segment bears two setae (one modified as in Figure 76k) and two rows of spines. The slender claw is 114 μ along its axis, with a very small terminal lamella, with a slight indentation about midway on its concave edge, and with the usual two very unequal proximal setae.

The ventral area between the maxillipeds and the first pair of legs is like that of the female.

Legs 1-4 are like those of the female, with the same spinal and setal formula.

Leg 5 (Figure 76l) has a small rectangular unornamented free segment, 21 x 11 μ . The terminal spine is 28 μ and the seta 40 μ .

Leg 6 (Figure 76i) is a posteroventral flap on the genital segment bearing two slender naked setae, 25 μ .

The spermatophore was not observed.

The color in life is unknown.

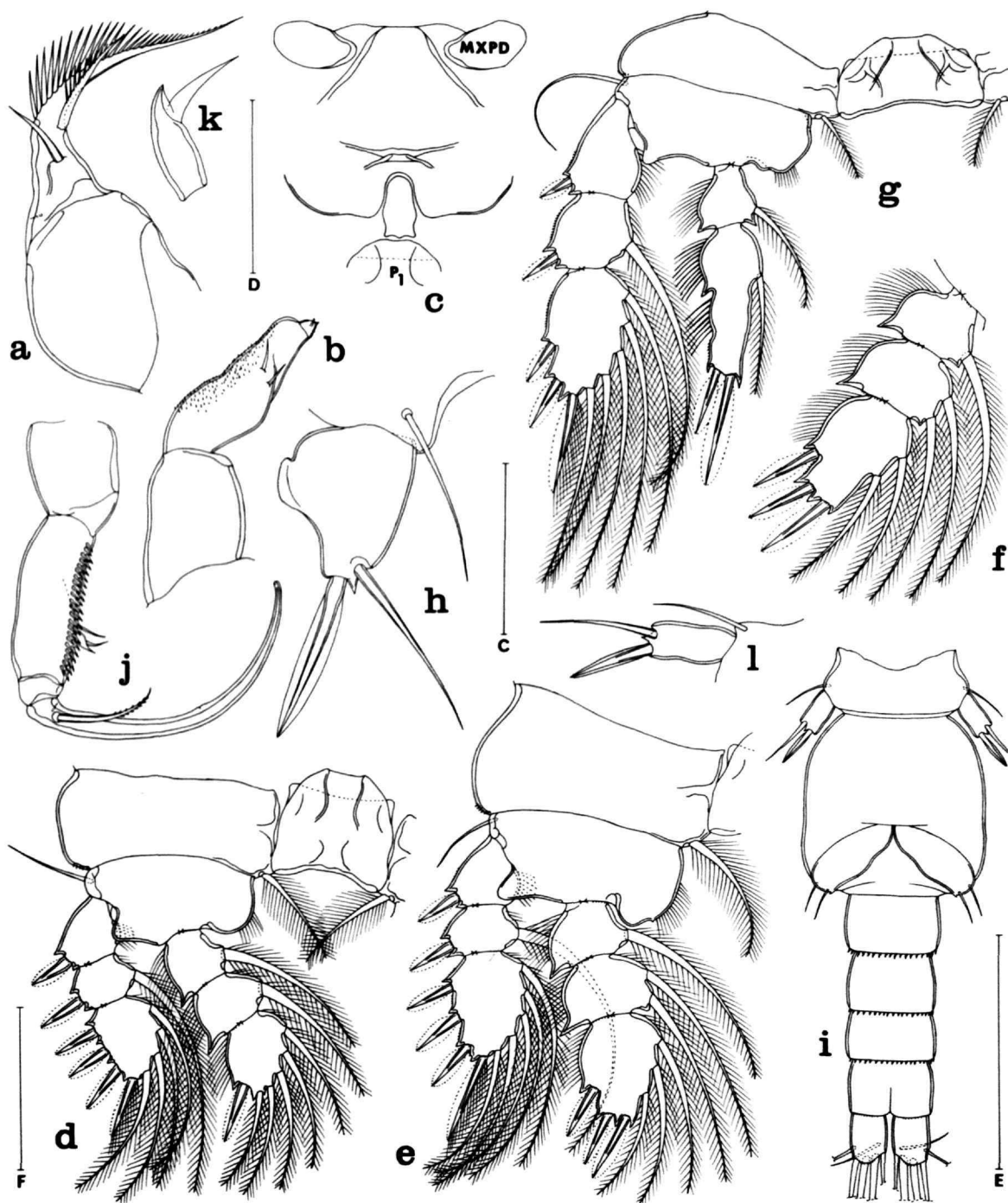


FIGURE 76.—*Ascidioxynus floridanus*, new species. Female: *a*, second maxilla, posterior (c); *b*, maxilliped, postero-inner (c); *c*, area between maxillipeds and first pair of legs, ventral (b); *d*, leg 1 and intercoxal plate, anterior (b); *e*, leg 2, anterior (b); *f*, endopod of leg 3, anterior (b); *g*, leg 4 and intercoxal plate, anterior (b); *h*, leg 5, dorsal (E). Male: *i*, urosome, ventral (b); *j*, maxilliped, inner (E); *k*, modified seta on second segment of maxilliped, outer (F); *l*, leg 5, dorsal (c). Scale: c, 0.05 mm; d, E, 0.1 mm; F, 0.02 mm.

ETYMOLOGY.—The specific name *floridanus* refers to the known geographical range, Florida.

Ascidioxynus bermudensis, new species

FIGURES 77–79

TYPE MATERIAL.—195 ♀♀, 12 ♂♂ from several masses of the ascidian *Ecteinascidia turbinata* Herdman, in 1 m, on rocks and piling, Long Bird Bridge, between Ferry Reach and Castle Harbor, Bermuda, 24 July 1962, collected by AGH and RUG. Holotype ♀, allotype, and 181 paratypes (172 ♀♀, 9 ♂♂) deposited in USNM; 10 paratype ♀♀ in ZMA; and the remaining paratypes in the collection of AGH.

OTHER MATERIAL EXAMINED (all from *Ecteinascidia turbinata*).—25 ♀♀, 3 ♂♂, and 5 copepodids, in 3 m, northwest of Long Bird Bridge, Bermuda, 14 July 1962; and 8 ♀♀, 10 ♂♂, and 16 copepodids, in 9 m, Murray's Anchorage, 3 miles northwest of St. George's Island, Bermuda, 9 August 1962. All collected by AGH and RUG.

FEMALE.—The body (Figure 77a) has a moderately broad prosome. The length (without the ramal setae) is 1.29 mm (1.12–1.36 mm) and the greatest width is 0.50 mm (0.46–0.54 mm), based on ten specimens in lactic acid. The segment of leg 1 is separated from the cephalosome by a dorsal transverse furrow. The epimeral areas of the pedigerous segments are similar to those in *A. floridanus*. The ratio of the length to the width of the prosome is 1.51:1. The ratio of the length of the prosome to that of the urosome is 1.89:1.

The segment of leg 5 (Figure 77b) is 73 x 148 μ . There is no ventral intersegmental sclerite between that segment and the genital segment. The genital segment is 195 x 138 μ in greatest dimensions dorsally, slightly expanded in its anterior half. The areas of attachment of the egg sacs are situated dorsolaterally near the middle of the segment. Each area (Figure 77c) bears two naked setae, about 25 μ , and a small spiniform process. The three postgenital segments are 73 x 94 μ , 65 x 90 μ , and 78 x 96 μ from anterior to posterior. The posteroventral border of the anal segment bears a row of minute spinules on each side. The posteroventral borders of the genital segment and the first two postgenital segments are smooth, without spinules.

The caudal ramus (Figure 77d) is moderately short, 52 x 41 μ in greatest dimensions or 1.27 times longer than wide. The outer lateral seta is 40 μ with outer hairs. The dorsal seta is 65 μ with a few short hairs. The outermost terminal seta is 110 μ with outer hairs and the innermost terminal seta is 190 μ with inner hairs. The two long median terminal setae are 400 μ (outer) and 500 μ (inner), both naked; the inner and longer of these two setae has a lamella along its outer edge. Both terminal setae are inserted dorsally to a terminal ventral flap bearing a marginal row of minute spinules.

The surface of the body has very few hairs (sensilla).

The egg sac (Figure 77e) is elongated, 860 x 230 μ , extends beyond the tips of the longest ramal setae, and contains numerous eggs about 65 μ in diameter.

The rostrum (Figure 77f) is less pointed than in *A. floridanus*.

The first antenna (Figure 77g) is 322 μ long. The lengths of its seven segments (measured along their posterior nonsetiferous margins) are 24 (53 μ along the anterior margin), 88, 33, 50, 45, 32 and 21 μ respectively. The formula for the armature is as in *A. floridanus*. All the setae are naked.

The second antenna (Figure 77h) resembles that of *A. floridanus*. The fourth segment, 66 μ along its outer edge, 45 μ along its inner edge, and 23 μ wide, bears two small claws, the stouter claw 25 μ , the more slender claw 21 μ , and five setae, the longest slightly unguiform. A few small spinules occur along the outer margin of the segment. All the setae are naked.

The labrum (Figure 77i) resembles that of *A. floridanus*.

The mandible (Figure 77j) and first maxilla (Figure 77k) are very similar to those of *A. floridanus*. The paragnath (Figure 77i) is a small lobe with a few hairs. The second maxilla (Figure 78a) resembles that of *A. floridanus*, but the lash is long and reflexed, with fewer long spines. The maxilliped (Figure 78b) is 3-segmented. The second segment has two naked setae. The third segment is weakly delimited, bears a slender naked setule, and terminates in a spiniform process with a few small barbules.

The ventral area between the maxillipeds and the first pair of legs (Figure 78c) is slightly pro-

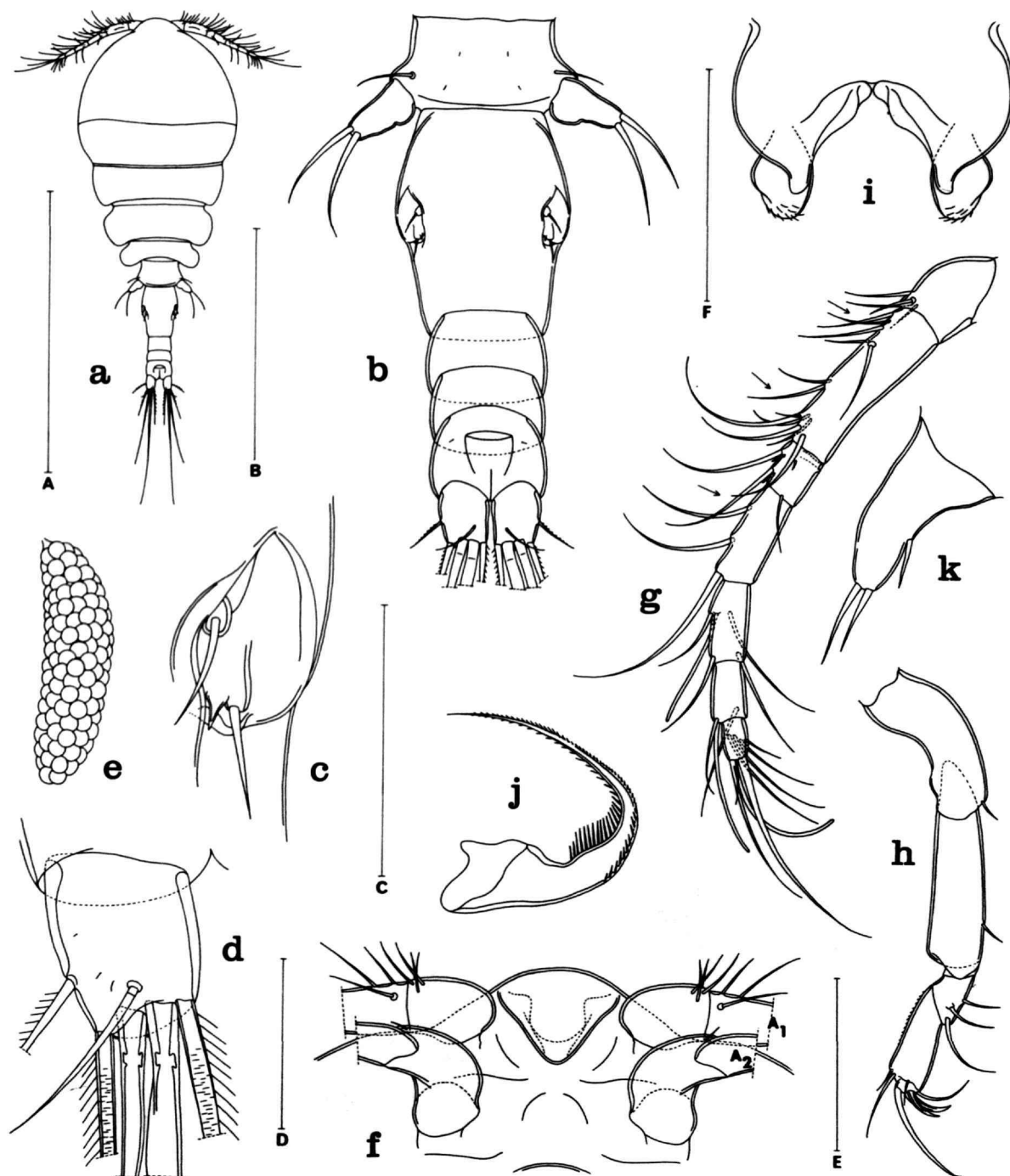


FIGURE 77.—*Ascidioxynus bermudensis*, new species. Female: *a*, dorsal (A); *b*, urosome, dorsal (B); *c*, area of attachment of egg sac, dorsal and slightly lateral (C); *d*, caudal ramus, dorsal (D); *e*, egg sac, ventral (A); *f*, rostrum, ventral (E); *g*, first antenna, with arrows indicating positions of additional aesthetes in male, dorsal (E); *h*, second antenna, posterior (outer) (E); *i*, labrum and paragnaths, ventral (F); *j*, mandible, posterior (F); *k*, first maxilla, posterior (D). Scale: A, 1.0 mm; B, 0.2 mm; C, D, 0.05 mm; E, F, 0.1 mm.

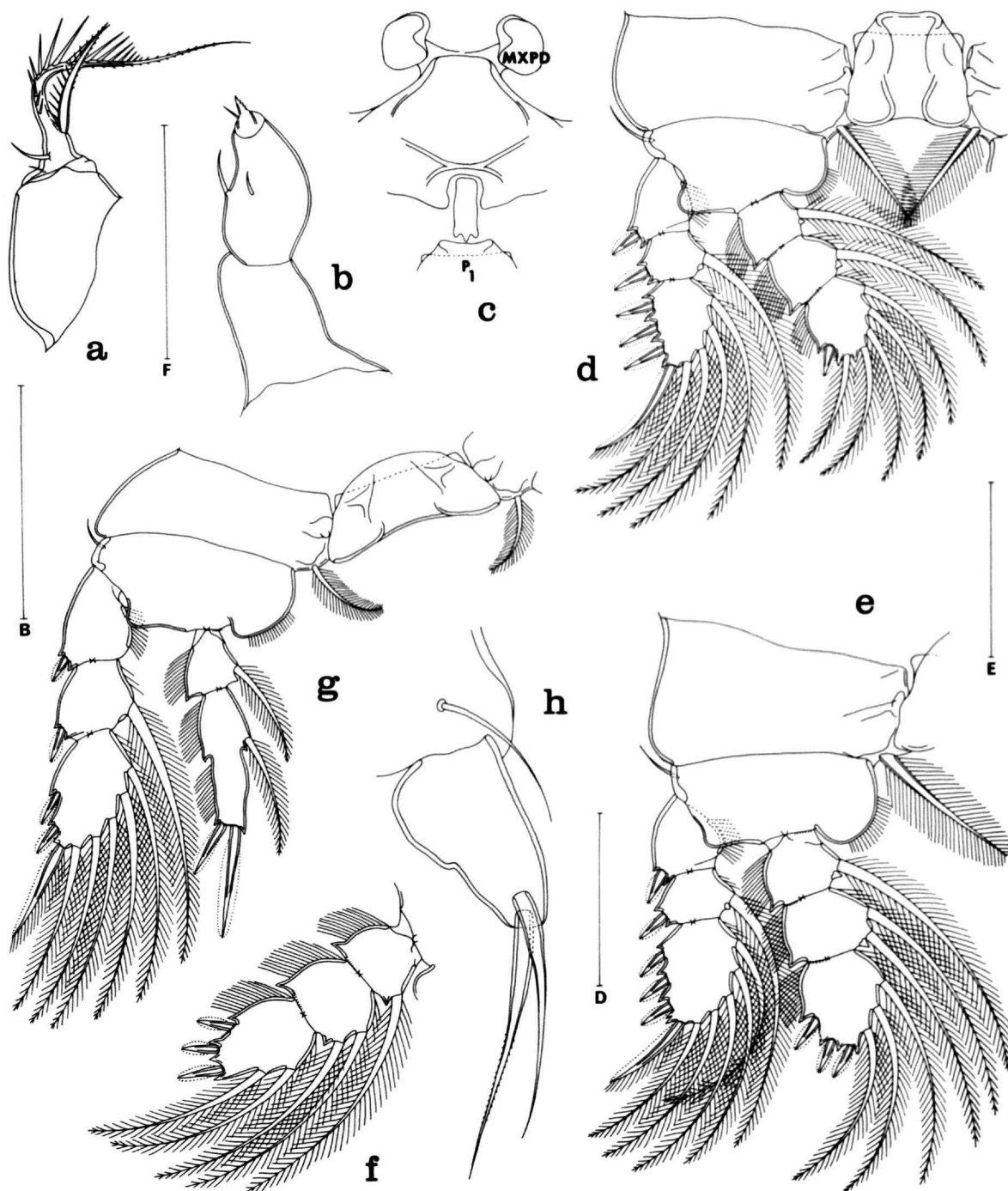


FIGURE 78.—*Ascidioxynus bermudensis*, new species. Female: a, second maxilla, posterior (F); b, maxilliped, postero-inner (F); c, area between maxillipeds and first pair of legs, ventral (B); d, leg 1 and intercoxal plate, anterior (E); e, leg 2, anterior (E); f, endopod of leg 3, anterior (E); g, leg 4 and intercoxal plate, anterior (E); h, leg 5, dorsal (D). Scale: B, 0.2 mm; D, 0.05 mm; E, F, 0.1 mm.

tuberant. A line connects the bases of the maxillipeds.

Legs 1–4 (Figures 78d–g) have the same segmentation and armature as in *A. floridanus*. The exopod of leg 4 is 160 μ long, the armature of the third segment being II,I,5. The endopod of leg 4 (Figure 78g) is 114 μ long, including the terminal spiniform processes. The first segment is 33 x 29 μ (without the spiniform processes) and its plumose inner seta is 55 μ . The second segment is 81 μ long (including the terminal spiniform processes), its greatest width 28 μ , its least width 17 μ . The inner plumose seta is 58 μ and the two terminal fringed spines are 31 μ (outer) and 73 μ (inner). The outer margin of both segments bears hairlike spinules. The second segment has outer and inner spinous processes suggesting division of the segment, but no line of articulation or break in the sclerotization was seen. A row of very small spinules occurs near the insertions of the two terminal spines.

Leg 5 (Figure 78h) has an unornamented free segment 47 x 36 μ in greatest dimensions, with its proximal margin expanded inwardly. The two terminal elements are 68 μ (naked) and 86 μ (with very small barbules). The adjacent seta on the body is 40 μ and naked.

Leg 6 is represented by the two setae near the attachment of each egg sac (Figure 77c).

The color in life in transmitted light is translucent to opaque, the eye red, the egg sacs gray or tan.

MALE.—The body (Figure 79a) is slender. The length (not including the setae on the caudal rami) is 0.75 mm (0.73–0.79 mm) and the greatest width 0.24 mm (0.22–0.26 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1.85:1. The ratio of the length of the prosome to that of the urosome is 1.35:1.

The segment of leg 5 (Figure 79b) is 30 x 67 μ . There is no ventral intersegmental sclerite. The genital segment is 110 x 94 μ . The four postgenital

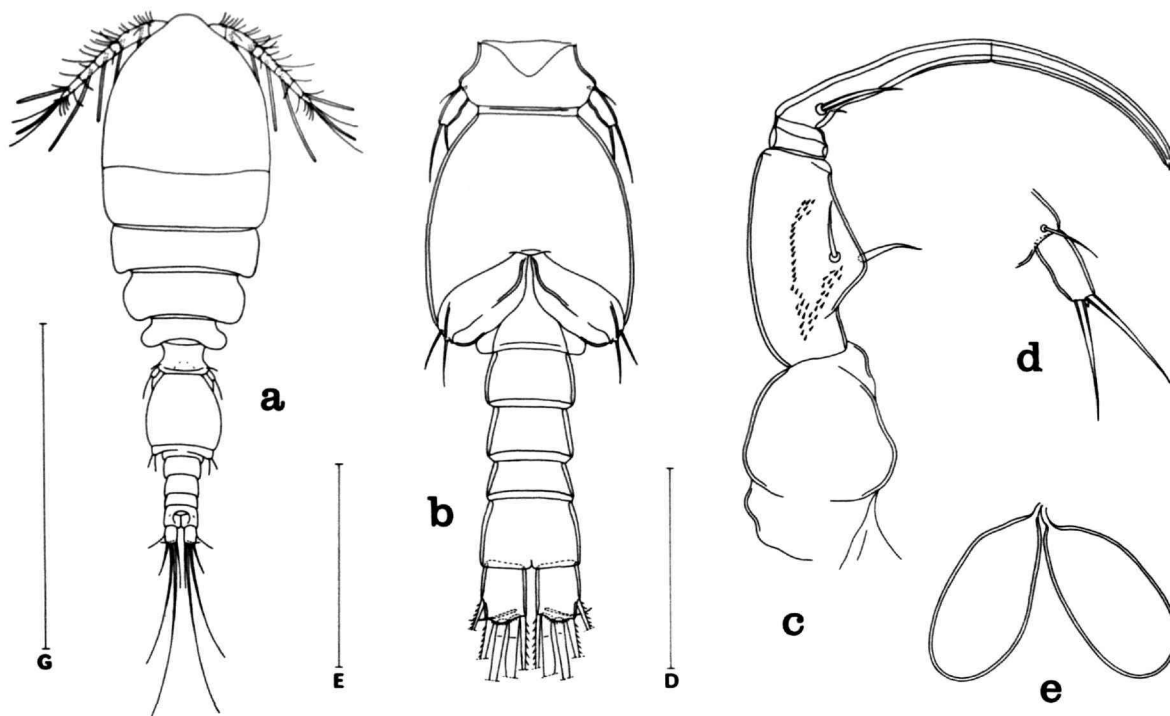


FIGURE 79.—*Ascidioxynus bermudensis*, new species. Male: a, dorsal (c); b, urosome, ventral (E); c, maxilliped, inner (D); d, leg 5, dorsal (D); e, spermatophores, attached to female, dorsal (E). Scale: D, 0.05 mm; E, 0.1 mm; C, 0.5 mm.

segments are $29 \times 43 \mu$, $26 \times 42 \mu$, $18 \times 41 \mu$ and $32 \times 48 \mu$ from anterior to posterior.

The caudal ramus, $30 \times 23 \mu$, resembles that of the female.

The body surface has few hairs as in the female.

The rostrum is like that of the female.

The first antenna is similar to that of the female but has three additional, long aesthetes (at locations indicated by arrows in Figure 77g), so that the formula is 4, 13 + 2 aesthetes, 6 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. The second antenna, labrum, mandible, paragnath, first maxilla, and second maxilla are like those of the female. The maxilliped (Figure 79c) has the first and third segments unarmed. The second segment bears two naked setae and a V-shaped group of small spines. The claw is 96μ along its axis with a very small terminal lamella, with a line of division about midway, and with two very unequal proximal setae.

The ventral area between the maxillipeds and the first pair of legs is like that in the female.

Legs 1-4 are similar to those in the female, with the same spine and setal formula but with very slight sexual dimorphism in the relative length of the spine on the third segment of the endopod of leg 1, where, in the male, the spine is 18μ and the segment 24μ without spiniform processes (in the female the spine is 20μ and the segment 36μ).

Leg 5 (Figure 79d) has a free segment, $19 \times 9 \mu$, without a proximal inner expansion.

Leg 6 (Figure 79b) is a posteroventral flap on the genital segment, bearing two naked setae about 18μ long.

The spermatophore (Figure 79e), attached to the female, is $86 \times 43 \mu$, not including the neck.

ETYMOLOGY.—The specific name *bermudensis* refers to the known geographical range, Bermuda.

REMARKS.—This species differs from *A. floridanus* in several, easily recognizable features. In the female of *A. bermudensis* the free segment of leg 5 is much less conspicuously expanded inwardly and the genital segment is broadest near the middle instead of beyond the middle. In the male both setae on the second segment of the maxilliped are unmodified. Other, more subtle, differences may be seen in the nature of the setae on the caudal rami, the shape of the rostrum, the relative size of the two claws on the second antenna, the

form of the lash on the second maxilla, and the details of the female maxilliped.

Ascidioxynus jamaicensis (C. B. Wilson, 1921)

FIGURES 80-82

Modiolicola jamaicensis C. B. Wilson, 1921, pp. 15, 16, pl. 7, figs. 58-65 [from black ascidians on mangrove roots, Bogue Islands, Montego Bay, Jamaica].

NEW MATERIAL EXAMINED.—8 ♀♀, 9 ♂♂, from the branchial sac of *Ascidia atra* (Savigny), depth about 2 m, entrance of Fuik Bay, Curaçao, 23 October 1958, collected by JHS.

FEMALE.—The total length is 0.93-1.01 mm (mean, based on five specimens, 0.99 mm), the greatest width of the cephalosome 0.40-0.47 mm (mean 0.45 mm). The first pedigerous segment is almost completely incorporated in the cephalosome (Figure 80a). Pedigerous segments 2-4 rapidly and regularly diminish in width. The urosome is 5-segmented. The genital segment is swollen in its anterior two-thirds, narrower and regularly cylindrical in its posterior third. On the ventral surface, the posterior margin of urosomal segments 2-4 bears coarse cuticular serrulations; urosomal segment 5 (or anal segment) is finely denticulated. The caudal ramus (Figure 80b) is 30μ long and 38μ wide. The smooth lateral seta is implanted not far from the distal margin. There are four terminal setae, all of which are smooth except for a distinct ciliation of the inner margin of the inner seta. The dorsal seta, implanted over the base of the innermost terminal seta, is indistinctly plumose. The longest seta presents a curious lateral, membranous, keel-like projection at some distance from the base.

The rostrum (Figure 80c) is a fleshy, rather nondescript mass, tapering into an obtuse point.

The first antenna (Figure 80d) is fundamentally 7-segmented, though it may appear to be 8-segmented (segment 3 being partially subdivided into two segments). The armature of the segments is as follows: 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete.

The second antenna (Figure 80e) probably should be considered as 4-segmented. Segment 1 is armed with one short distal seta; segment 2 has one short subdistal seta. Segments 3 and 4 are separated rather weakly; at the junction there is

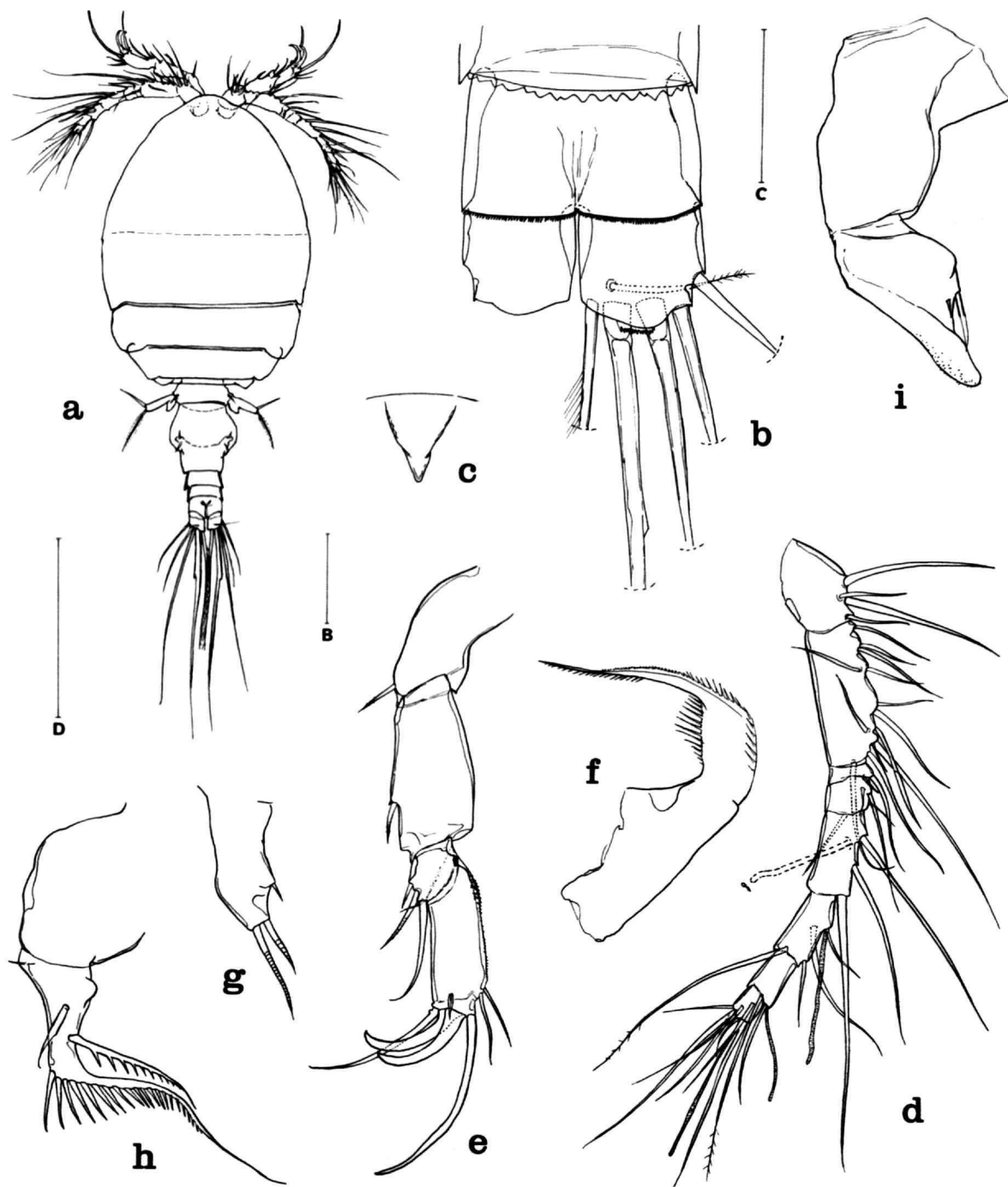


FIGURE 80.—*Ascidioxynus jamaicensis* (C. B. Wilson). Female: *a*, dorsal (*B*); *b*, posterior part of urosome and caudal ramus, ventral (*C*); *c*, rostrum (*D*); *d*, first antenna, with the aesthete added in the male indicated by broken lines (*D*); *e*, second antenna (*D*); *f*, mandible (*C*); *g*, first maxilla (*C*); *h*, second maxilla (*C*); *i*, maxilliped (*C*). Scale: *B*, 0.2 mm; *C*, 0.05 mm; *D*, 0.1 mm.

on one surface a membranaceous, curved ridge, on the other surface there are wrinkles in the chitin. No doubt, this ridge and these wrinkles are rudiments of an articulation line, but no functional articulation is present. The basal portion (segment 3) of this apparent fusion complex bears two long and two short setae; the distal portion (segment 4) has a terminal armature consisting of two setae, one daggerlike spine, two long clawlike setae, and two claws.

The mandible (Figure 80f) has a somewhat widened blade, tapering abruptly into a long lash. Both margins of the mandible bear sharp, fine spinules, longest in the proximal portion.

The first maxilla (Figure 80g) bears two long, annulated, terminal setae and one short medial setule or spinule.

The second maxilla (Figure 80h) has long, sharp, needle-like teeth on the medial margin of its terminal lash. The auxiliary lash also has teeth (shorter than on the terminal lash) on its medial margin.

The maxilliped (Figure 80i) is 2-segmented; the robust basal segment is unarmed; the second segment is produced into a finger-shaped, hispid terminal lobe; the medial side bears two spines.

Legs 1-3 (Figures 81a-c) are biramous, each ramus being 3-segmented. Leg 4 (Figure 81d) has a 3-segmented exopod and a 2-segmented endopod. Intercoxal plates, lateral basipod setae (plumose), and medial coxopod setae (reduced in leg 4) are present in all legs. The fourth endopod has a normal basal segment, but the second segment is constricted, bearing spinelike protuberances on either end of the swollen part and a plumose seta on the medial end. The terminal armature consists of two spines.

The chaetotaxis formula of the rami of legs 1-4 is as follows:

P₁ exp I-0; I-1; III-I-4
 end 0-1; 0-1; I-5
 P₂ exp I-0; I-1; III-I-5
 end 0-1; 0-2; III-3
 P₃ exp I-0; I-1; III-I-5
 end 0-1; 0-2; III-2
 P₄ exp I-0; I-1; II-I-5
 end 0-1; II-1

The fifth leg (Figure 81e) has a single free segment with a strong, more or less rounded-triangular projection at the inner margin near the base. The segment has a width of 39 μ at the level of this

projection. Distally, the segment is nearly rectangular and has a width of 19 μ . The segment is 59 μ in total length. It is distally armed with an annulated seta and a denticulated spine.

MALE.—The total length is 0.69-0.79 mm (mean, based on five specimens, 0.75 mm); the width of the cephalosome is 0.27-0.37 mm (mean 0.31 mm). The genital segment (Figure 82b) is slightly wider than long and bears two feathered setules on each side posteroventrally (=rudimentary leg 6). There are four postgenital segments (Figure 82a), denticulated as in the female. The caudal ramus (38 μ wide, 30 μ long) is armed and ornamented as in the female.

The first antenna is like that of the female but has an additional aesthete (dashed area in Figure 80d) on segment 5.

The maxilliped (Figure 82c) is prehensile. Segment 1 is naked. Segment 2 has two thorny patches and one band of longer spinules; its medial margin bears two abruptly bent spines. The terminal claw is long, curved, and armed with a minute spinule and a crenulated spine near its base.

Leg 1 (Figure 82d) shows slight sexual dimorphism in the stronger development of the obtusely tipped medial coxopod seta.

Leg 5 (Figure 82e) is without a basal projection and measures 35 x 14 μ .

The other appendages are like those in the female.

REMARKS.—Wilson's *Modiolicola jamaicensis* was found in "black ascidians common upon the mangrove roots." The present specimens were recovered from the same host, *Ascidia atra* (=nigra). Since Wilson's description deviates in several points from the new material, it was thought wise to re-examine the type material. Through the kind assistance of Drs. Fenner A. Chace and Thomas E. Bowman, a female paratype (USNM 53568) was borrowed and dissected. From this study it became clear that Wilson's specimens (from Montego Bay, Jamaica) were identical with the present material (from Curaçao). It is rather irrelevant to indicate the points where Wilson's description was incomplete or erroneous (e.g., his figure of leg 5 of the female is in reality leg 5 of the male; his figure of leg 3 is in reality leg 2, etc.).

In our opinion, this species should be attributed to the genus *Ascidioxynus*, with which it shares the structure and armature of leg 4, the nature of the

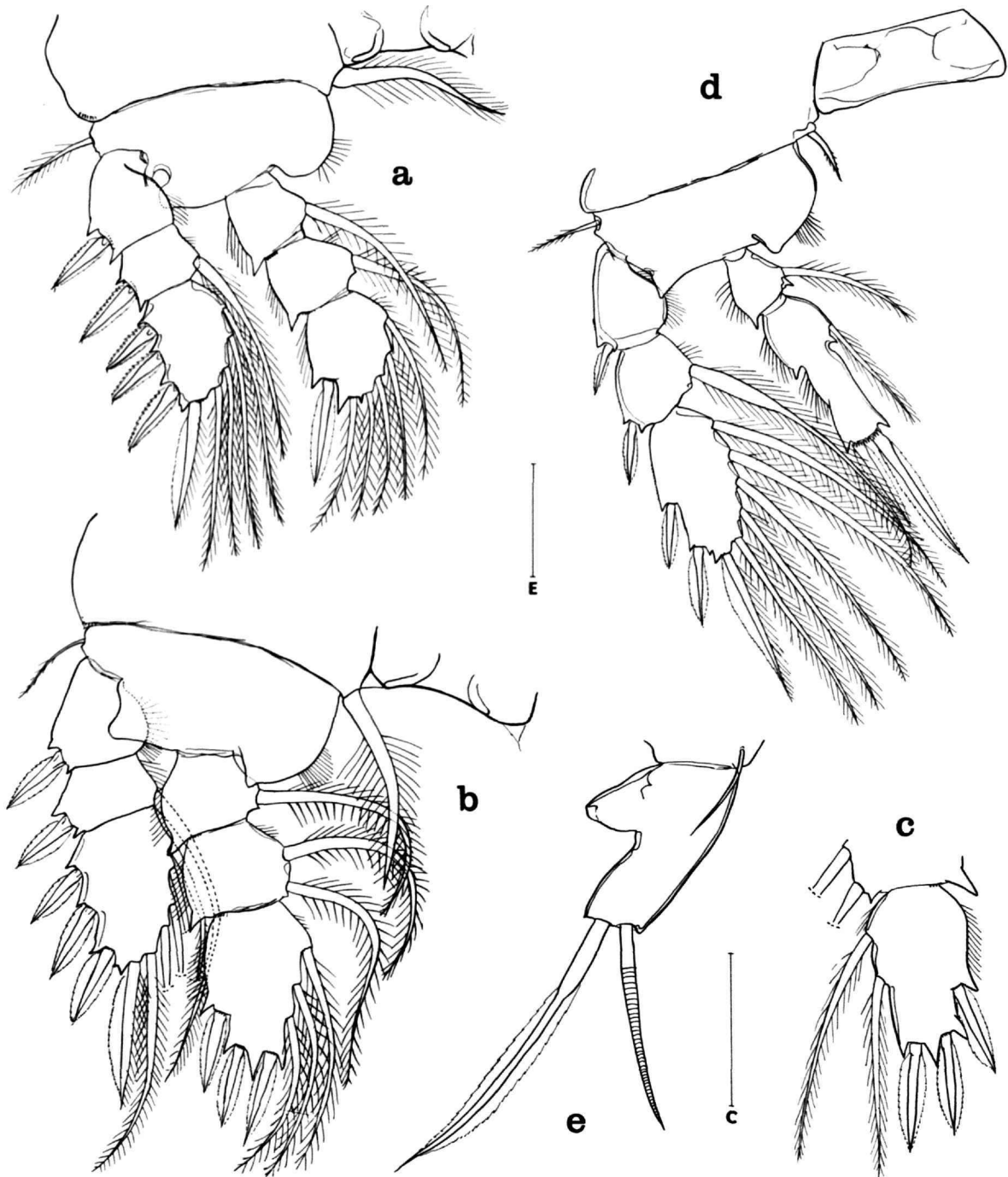


FIGURE 81.—*Ascidioxynus jamaicensis* (C. B. Wilson). Female: *a*, leg 1 and part of intercoxal plate (E); *b*, leg 2 and part of intercoxal plate (E); *c*, third segment of endopod of leg 3 (E); *d*, leg 4 and intercoxal plate (E); *e*, leg 5 (c). Scale: c, E, 0.05 mm.

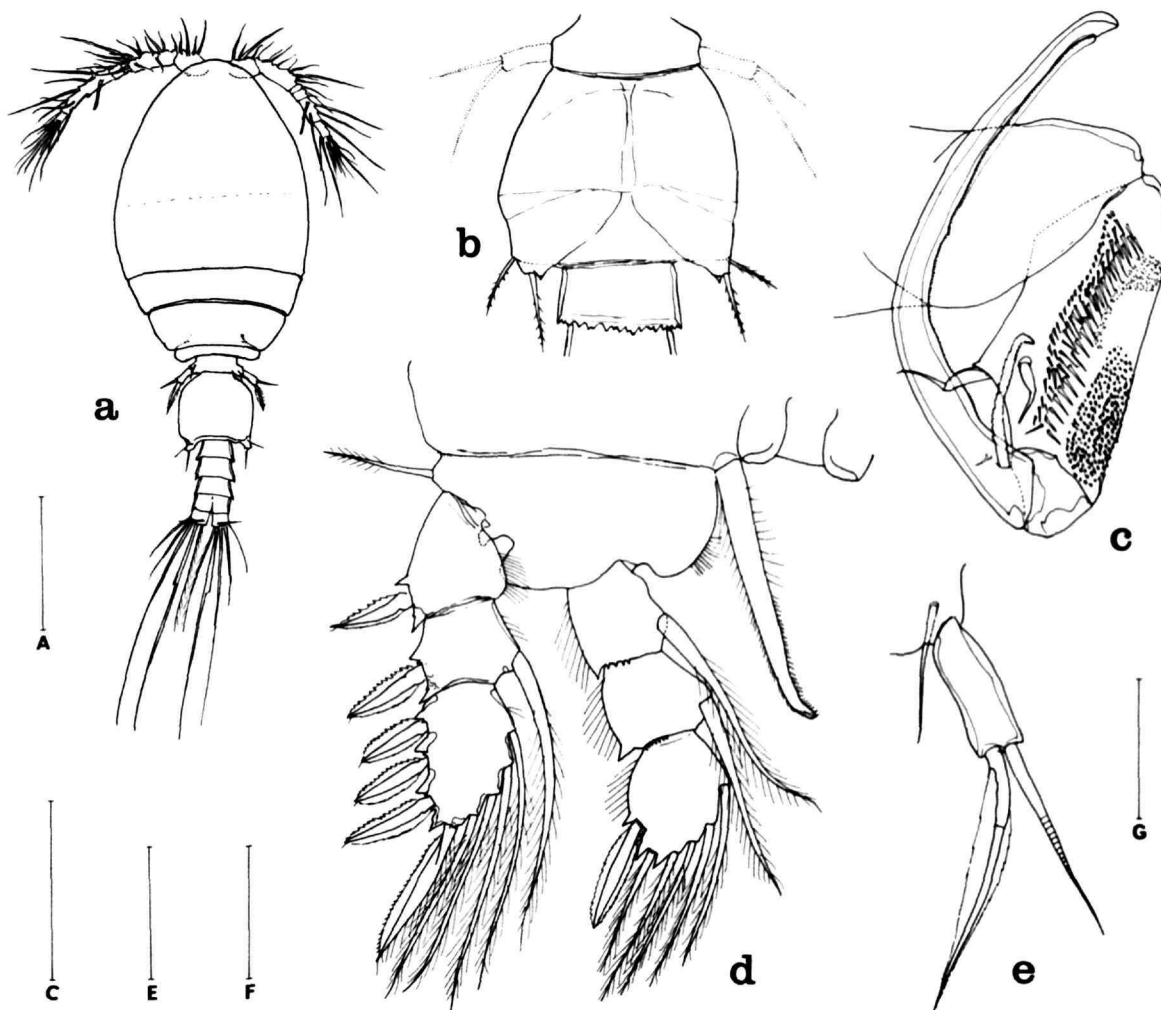


FIGURE 82.—*Ascidioxynus jamaicensis* (C. B. Wilson). Male: a, dorsal (A); b, anterior part of urosome (F); c, maxilliped (G); d, leg 1 and part of intercoxal plate (E); e, leg 5 (G). Scale: A, 0.2 mm; E, G, 0.05 mm; F, 0.1 mm.

mandible, the pointed rostrum, the very small or totally absent third segment on the female maxilliped, and the 4-segmented nature of the second antenna with two claws.

Genus *Aspidomolgus* Humes, 1969

DIAGNOSIS.—Body modified. Prosome in the female shield-shaped, expanded, and orbicular, with the tergum of the segment of leg 4 overlapping the urosome. Prosome in the male similar, but the tergum of the segment of leg 4 not expanded and

the orbicular outline completed by the large broadened genital segment. Urosome 5-segmented in the female, 6-segmented in the male. Caudal ramus with six setae. Rostrum broadly truncated postero-ventrally. First antenna 7-segmented in both sexes with the armature being 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 3-segmented (the original third and fourth segments apparently fused), with the formula 1, 1, 3 + II + 5 small setae, there being two terminal claws. In the male the seta on the second segment transformed to a sucker.

Labrum with a deep median cleft between the two lobes. Mandible with the concave side of the base having an indentation followed by a row of stout spinules and the convex side having a scale-like area with a row of short spinules followed by a serrated fringe; terminal lash long. Paragnath a small hairy lobe. First maxilla with three setae. Second maxilla of the usual lichomolgoid type. Maxilliped of the female digitiform, apparently 2-segmented though a partial crease suggests the separation of second and third segments; tip of maxilliped bluntly rounded. Maxilliped of the male 4-segmented (assuming that the fourth segment is represented by the proximal part of the claw).

Legs 1-4 with 3-segmented rami, except for leg 4 endopod which is 1-segmented or with a slight indication of division. Armature of the usual lichomolgoidiform pattern, except leg 4 endopod which is II,I. Formula of the male similar except leg 1 endopod where the third segment is I,I,5 instead of

I,5 as in the female. In both sexes the first segment of leg 1 exopod elongated and broad, with its outer distal area much produced to form a rounded lobe. Leg 5 in both sexes with a free segment bearing two terminal elements (a spine and a seta). Leg 6 in the female represented by two minute setae near the area of attachment of each egg sac; in the male by a ventral flap on the genital segment bearing two setae.

Other features as in the species below.

Associated with actinarian coelenterates.

TYPE-SPECIES. — *Aspidomolgus stoichactinus* Humes.

Aspidomolgus stoichactinus Humes, 1969

FIGURE 83

Aspidomolgus stoichactinus Humes, 1969a, pp. 226-241, figs. 1-68 [associated with the actinarian *Stoichactis helianthus* (Ellis), apparently living in the gastrovascular cavity; from Barbados, Puerto Rico, Jamaica, and the Bahamas].

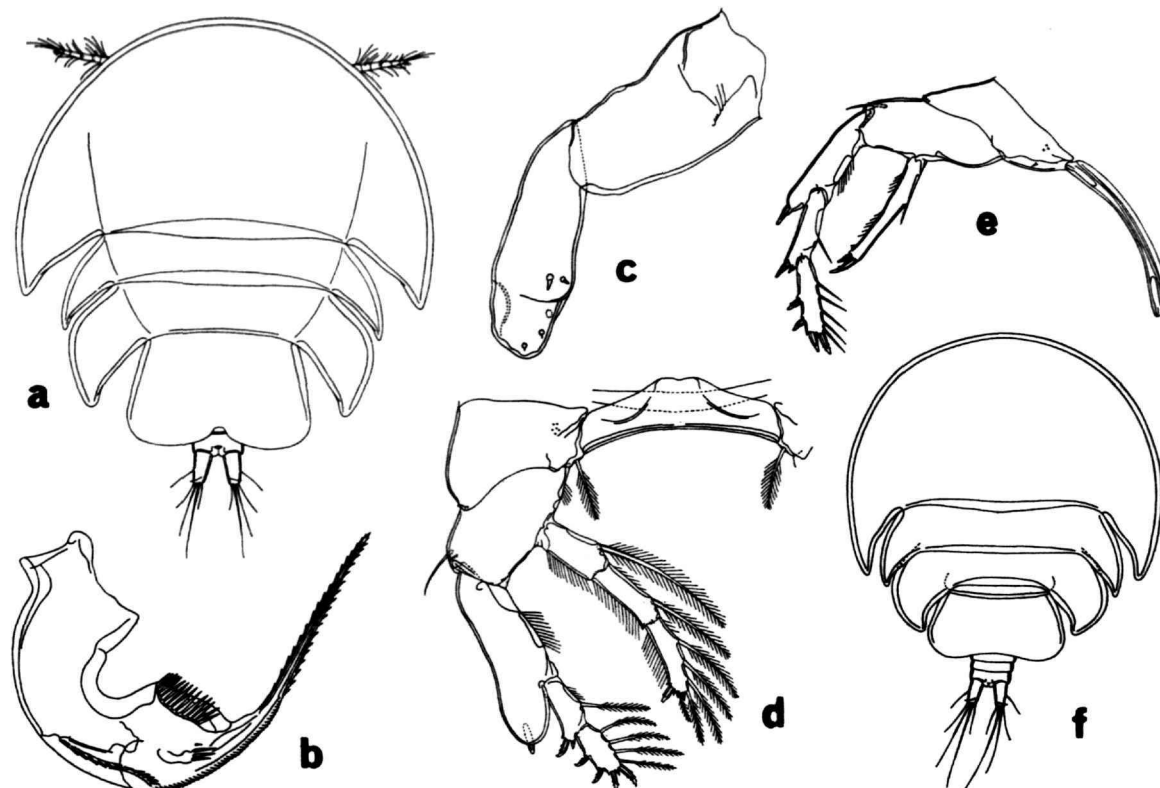


FIGURE 83.—*Aspidomolgus stoichactinus* Humes. Female: a, dorsal; b, mandible; c, maxilliped; d, leg 1 and intercoxal plate; e, leg 4 and intercoxal plate. Male: f, dorsal. (From Humes, 1969a, figs. 1, 13, 17, 19, 23, 26.) Length of female 1.84 mm, of male 1.60 mm.

Genus *Astericola* Rosoll, 1889

DIAGNOSIS.—Body cyclopiform, the prosome not unusually broad and the urosome relatively long. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six setae. Rostrum broadly truncated or rounded. First antenna 7-segmented, in both sexes with the armature 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 3-segmented, the third segment resulting from the fusion of two original segments; formula 1, 1, 3 + three terminal claws + several small elements (two claws in *A. clausi*).

Labrum deeply incised medially. Mandible with the basal area distal to the indentation, having on its convex side a row of teeth or serrations and on its concave side a row of spinules; lash long. Paragnath a small hairy lobe. First maxilla with four elements. Second maxilla with the initial few teeth on the lash enlarged. Maxilliped in the female 3-segmented with a pointed tip; in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1–4 with 3-segmented rami except for leg 4 endopod which is 2-segmented. Armature of the lichomolgiform pattern. Leg 4 exopod with the third segment having II, I, 5. Leg 4 endopod with 0–1; 2, 1. Basis of leg 4 not laterally elongated. No sexual dimorphism in the formula of leg 1 endopod. Leg 5 with a free segment bearing two terminal elements and having its inner edge swollen, irregular, or with a process. Leg 6 represented by the two setae near the genital openings.

Other features as in the species below.

Associated with asteroid echinoderms.

TYPE-SPECIES.—*Astericola clausi* Rosoll.

***Astericola clausi* Rosoll, 1889**

Astericola clausi Rosoll, 1889, pp. 197–201, pl. 2, figs. 7, 8 [from the asteroid *Asteracanthion glaciale* O. F. Müller, Trieste, Italy].—Graeffe, 1900, p. 9 [from the asteroid *Astropecten aurantium*, Trieste, Italy].—Clark, 1921, p. 636 [on *Marthasterias glacialis* (O. F. Müller)].

Lichomolgus asterinae.—Bocquet, 1952, pp. 498–501, figs. 1–3 [from the asteroid *Asterina gibbosa* (Pennant), Roscoff, northern France].

Key to Species of the Genus *Astericola***FEMALES**

1. With two claws on last segment of second antenna *A. clausi*
 With three claws on last segment of second antenna 2
2. Length about 1.0 mm; genital segment a little longer than wide 3
 Length 1.3–1.6 mm; genital segment about as long as wide 4
3. Caudal ramus 48 x 36 μ , ratio 1.33:1 *A. frequens*
 Caudal ramus 60 x 28 μ , ratio 2.14:1 *A. astropectinis*
4. Genital segment much wider in its anterior half than in its posterior half; free segment of leg 5 with a prominent, toothlike, distally directed process on inner margin *A. dentifer*
 Genital segment not much wider anteriorly than posteriorly; free segment of leg 5 without such a process 5
5. Caudal ramus 61 x 38 μ , ratio 1.61:1 *A. luidiae*
 Caudal ramus 96 x 43 μ , ratio 2.23:1 *A. lautus*

MALES

1. With two claws on last segment of second antenna *A. clausi*
 With three claws on last segment of second antenna 2
2. Free segment of leg 5 about 24–26 x 12–13 μ 3
 Free segment of leg 5 about 36–38 x 17 μ 5
3. Caudal ramus about 4.4:1 *A. dentifer*
 Caudal ramus about 1.3–2.1:1 4
4. Caudal ramus a little longer than wide, ratio about 1.3:1 *A. frequens*
 Caudal ramus more elongated, ratio about 2.1:1 *A. astropectinis*
5. Caudal ramus somewhat elongated, ratio about 1.6:1 *A. luidiae*
 Caudal ramus more elongated, ratio about 2.2:1 *A. lautus*

Stellicola asterinae.—Stock, 1960c, p. 247 [from *Asterina gibbosa*, Banyuls, southern France].—Bocquet, Carton, and Sroehlich, 1970, pp. 500–508, figs. 1–5 [from *Asterina gibbosa*, Roscoff, France]. [These authors hold that *S. asterinae*, though close, is distinct from *S. clausi*].

Stellicola clausi.—Bocquet and Stock, 1962a, pp. 80–90, figs. 1–4 [from *Marthasterias glacialis* and *Asterina gibbosa*, Channel coast of France, and from *Asterina gibbosa*, Banyuls, Mediterranean coast of France].—Carton, 1964, p. 14 [from *Marthasterias glacialis* and *Asterina gibbosa*, region of Roscoff, northern France].—Barel and Kramers, 1970, table 5 [from *Asterina gibbosa*, Roscoff, northern France].—Bocquet, Carton, and Sroehlich, 1970, pp. 508–516, fig. 9 [from *Marthasterias glacialis*, Roscoff, France].

***Astericola astropectinis* (Humes and Cressey, 1958)**

Lichomolgus astropectinis Humes and Cressey, 1958b, pp. 334–336, figs. 41–54 [from the asteroid *Astropecten mitchaelseni* Koehler, Accra, Ghana; and Freetown, Sierra Leone].—Humes and Ho, 1967e, p. 221.—Ummerkutty, 1968, p. 317.

Stellicola astropectinis.—Humes, 1969d, p. 6.

***Astericola dentifer* (Humes, 1969)**

Stellicola dentifer Humes, 1969d, pp. 2–6, figs. 1–30 [from the asteroid *Luidia clathrata* Gray, Port Royal, Jamaica].

***Astericola frequens* (Humes and Cressey, 1958)**

FIGURE 84

Lichomolgus frequens Humes and Cressey, 1958b, pp. 330–334, figs. 1–40 [from the asteroid *Asterina stellifer* (Möbius), Dakar, Senegal; Accra, Ghana; and Pointe Noire, Moyen Congo].

Stellicola frequens.—Humes and Ho, 1967e, p. 221.—Humes, 1969d, p. 6.

***Astericola lautus* (Humes and Cressey, 1958)**

Lichomolgus lautus Humes and Cressey, 1958b, pp. 339–341, figs. 81–94 [from the asteroid *Astropecten hupferi* Koehler, near Freetown, Sierra Leone].

Stellicola lautus.—Humes and Ho, 1967e, p. 221.—Humes, 1969d, p. 6.

***Astericola luidiae* (Humes and Cressey, 1958)**

Lichomolgus luidiae Humes and Cressey, 1958b, pp. 336–338, figs. 55–80 [from the asteroids *Luidia alternata* Say var. *numidica* Koehler and *Luidia atlantidea* Madsen, near Freetown, Sierra Leone].

Stellicola luidiae.—Humes and Ho, 1967e, p. 221.—Humes, 1969d, p. 6.

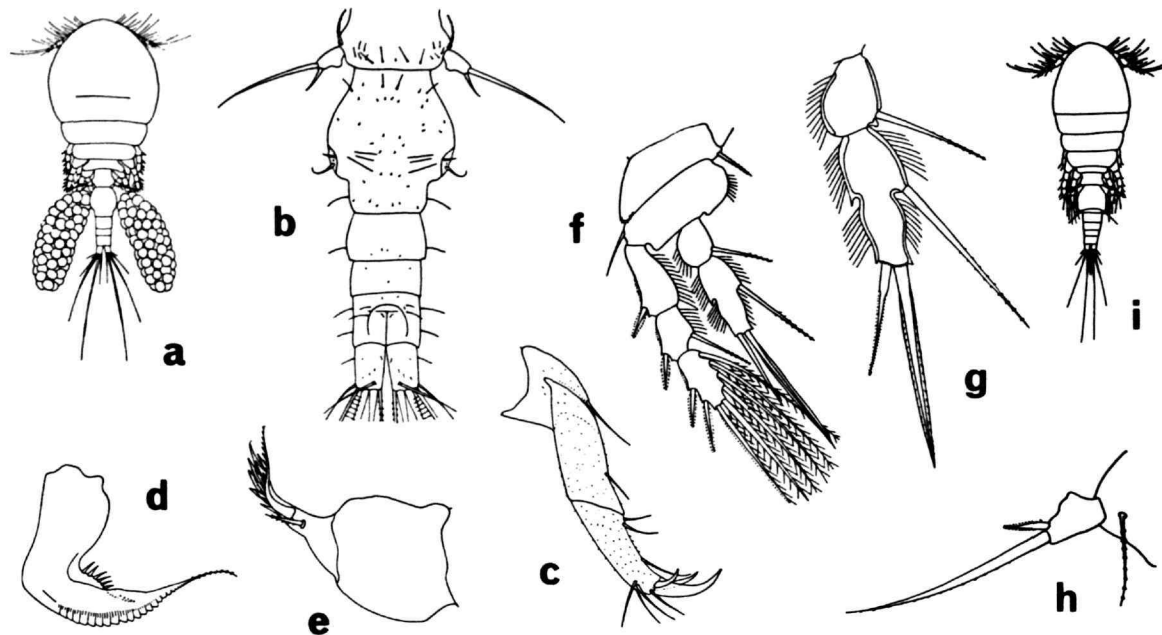


FIGURE 84.—*Astericola frequens* (Humes and Cressey). Female: *a*, dorsal; *b*, urosome; *c*, second antenna; *d*, mandible; *e*, second maxilla; *f*, leg 4; *g*, endopod of leg 4; *h*, leg 5. Male: *i*, dorsal. (From Humes and Cressey, 1958b, figs. 1, 3, 10, 12, 14, 21, 22, 24, 33.) Length of female 0.99 mm, of male 0.81 mm.

Genus *Colobomolgus* Humes and Stock, 1972

DIAGNOSIS.—Body cyclopiform. Urosome in the female 5-segmented, in the male either 5- or 6-segmented (in *C. dentipes* the preanal and anal segments fused, but in *C. laboutei* separate). Caudal ramus with six setae. Rostrum either with a delicate rounded posteroventral margin or without a well-defined margin. First antenna 7-segmented in the female with the formula 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented, with the formula 1, 1, 3, 1 + 6, there being a single terminal claw.

Labrum with a median cleft separating the two lobes. Mandible with the basal area beyond the indentation having on its convex edge a scalelike area bearing a row of spinules and a serrate fringe and on its concave side a row of spinules; lash extremely reduced, represented only by a small pointed process. Paragnath a small hairy lobe. First maxilla with two or three elements. Second maxilla of the usual lichomolgid type. Maxilliped of the female 3-segmented, with a pointed tip; in the male 4-segmented (taking the proximal part of the claw to represent a fourth segment).

Legs 1-4 with 3-segmented rami except for leg 4 endopod which is 2-segmented. Armature of the usual lichomolgidiform type. Leg 4 exopod with the third segment III, I, 5. Leg 4 endopod 0-1; II, the seta on the first segment being feathered. Leg 1 endopod in the male with the third segment I, I, 4 instead of I, 5 as in the female. Leg 5 in both sexes with a free segment bearing two terminal setae.

Leg 6 in the female represented by two setae and pointed process near the area of attachment of each egg sac; in the male by a posteroventral flap on the genital segment bearing two setae.

Other features as in the species below.

Associated with alcyonaceans.

TYPE-SPECIES.—*Colobomolgus dentipes* (Thompson and A. Scott).

ETYMOLOGY.—The name is a combination of the Greek words *κολοβος* (short-horned), referring to the very reduced lash on the mandible in the form of a small process, and *μολγος*. Gender masculine.

REMARKS.—The male of *C. cristatus* is unknown.

***Colobomolgus dentipes* (Thompson and A. Scott, 1903)**

Lichomolgus dentipes Thompson and A. Scott, 1903, p. 281, pl. 16, figs. 27-30 [in washings of dredged invertebrates, Ceylon].—Humes and Ho, 1968c, pp. 637-644, figs. 1-28 [from the alcyonacean *Sinularia humesi* Verseveldt, Nosy Bé, northwestern Madagascar].

Lichomolgus (Stellicola) dentipes.—Monod and Dollfus, 1932a, p. 139.

NEW RECORDS.—78 ♀♀, 52 ♂♂ from *Sinularia humesi* in 18 m, Banc du Touareg, Bay of Ampasindava, near Nosy Bé, Madagascar, 11 July 1967, collected by AGH; 23 ♀♀, 19 ♂♂ from *Sinularia humesi* in 13 m, opposite Antsiabe, southern shore of Nosy Komba, near Nosy Bé, 2 September 1967, collected by AGH.

***Colobomolgus cristatus* (Humes and Ho, 1968)**

Lichomolgus cristatus Humes and Ho, 1968c, pp. 644-650, figs. 29-50 [from the alcyonacean *Sinularia leptoclados* Ehrenberg, Nosy Bé, Madagascar].

Key to Species of the Genus *Colobomolgus***FEMALES**

1. Free segment of leg 5 with a very large toothlike process *C. dentipes*
Free segment of leg 5 with at most only a slight expansion 2
2. Caudal ramus elongated, ratio 4.5:1 *C. cristatus*
Caudal ramus short, ratio 1.6:1 *C. laboutei*

KNOWN MALES

- Third and fourth postgenital segments fused, the region of the fourth segment distinctly broader than the other postgenital segments *C. dentipes*
Third and fourth postgenital segments not fused, fourth segment not distinctly broader than the other postgenital segments *C. laboutei*

NEW RECORDS (all from *Sinularia leptoclados* in Madagascar, collected by AGH).—2 ♀♀ in 15 m, Nosy Iranja, southwest of Nosy Bé, 9 August 1967; 1 ♀ in 1 m, Ankify, on the mainland near Nosy Bé, 11 August 1967; and 21 ♀♀ in 20 m, west of Andilana, Nosy Bé, 13°18' S, 48°07' E, 24 August 1967.

REMARKS.—The male is unknown.

Colobomolgus laboutei, new species

FIGURES 85, 86

TYPE MATERIAL.—51 ♀♀, 20 ♂♂ from two colonies of the alcyonacean *Sinularia leptoclados* (Hemprich and Ehrenberg), in 1 m, Ankify, on the mainland of Madagascar opposite Nosy Komba, near Nosy Bé, northwestern Madagascar, 23 August 1967, collected by AGH. Holotype ♀, allotype, and 64 paratypes (48 ♀♀, 16 ♂♂) deposited in USNM, the remaining paratypes (dissected) in the collection of AGH.

OTHER MATERIAL EXAMINED (all from *Sinularia leptoclados*).—5 ♀♀, from single colony, in 1 m, Ankify, 11 August 1967; and 24 ♂♂ from single colony, in 20 m, west of Andilana, Nosy Bé, 13°18' S, 48°07' E, 24 August 1967. All collected by AGH.

FEMALE.—The body (Figure 85a) resembles in general form that of *C. cristatus* (Humes and Ho). The length is 0.83 mm (0.77–0.96 mm) and the greatest width 0.52 mm (0.50–0.53 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1.21:1. The ratio of the length of the prosome to that of the urosome is 2.17:1. The segment of leg 1 is separated from the head dorsally by a transverse furrow. The epimera of the segments of legs 2–4 are truncated.

The segment of leg 5 is 86 x 161 μ . Near the base of the leg the edge of the segment is protruded laterally, forming a small bulge. Ventrally between this segment and the genital segment is a short very weak ventral intersegmental sclerite. The genital segment, 82 x 134 μ in greatest dimensions, resembles that of *C. cristatus*. The areas of attachment of the egg sacs are like those of *C. cristatus*. The three postgenital segments are 36 x 62 μ , 23.5 x 61 μ , and 47 x 57 μ from anterior to posterior.

The caudal ramus (Figure 85b) is 34 x 22 μ , about 1.6 times longer than wide. The outer lateral seta is 68 μ and naked. The dorsal seta is 44 μ and lightly feathered. The outermost terminal seta is 70 μ and the innermost terminal seta 153 μ , both with spinules. The two long median terminal setae are 250 μ (outer) and 410 μ (inner), both with spinules and both inserted between dorsal (unornamented) and ventral (with a row of marginal spinules) flaps. Several small spinules occur near the insertion of the outer lateral seta and there are a few small surficial hairs.

The body surface is ornamented with a few hairs (sensilla) as indicated in Figure 85a. The posteroventral margin of the anal segment is unornamented.

No complete egg sacs were seen. Each egg is about 47 μ in diameter.

The rostrum is like that of *C. cristatus*.

The first antenna has the same segmentation and armature as in *C. cristatus*. The lengths of the segments (measured along their posterior non-setiferous margins) are 33 (68 μ along the anterior edge), 135, 29, 53, 24, 17, and 15 μ respectively. The plumose setae have fewer, shorter, and more weakly developed hairs than in *C. cristatus*.

The second antenna resembles that of *C. cristatus*. The fourth segment is 75 μ along its outer edge, 45 μ along its inner edge, and 19 μ wide. The terminal claw is 45 μ along its axis.

The labrum, mandible (Figure 85c), paragnath, first maxilla, and second maxilla are like those in *C. cristatus*. The maxilliped (Figure 85d) resembles that of *C. cristatus* but is a little more ornamented.

The ventral area between the maxillipeds and the first pair of legs is similar to that in *C. cristatus*.

Legs 1–4 are segmented and armed as in *C. cristatus*. The spine on the last segment of the endopod of leg 1 (Figure 85e) is straight rather than recurved as in that species. The exopod of leg 4 is 80 μ long. The first segment of the endopod of this leg is 22 x 9 μ and its distal inner feathered seta 31 μ . The second segment is 45 x 7.5 μ (the length including the terminal spiniform processes and the width taken at the middle); its two terminal unequal barbed spines being 17 μ (outer) and 39 μ (inner). As in *C. cristatus*, there is an outer row of hairs on both segments.

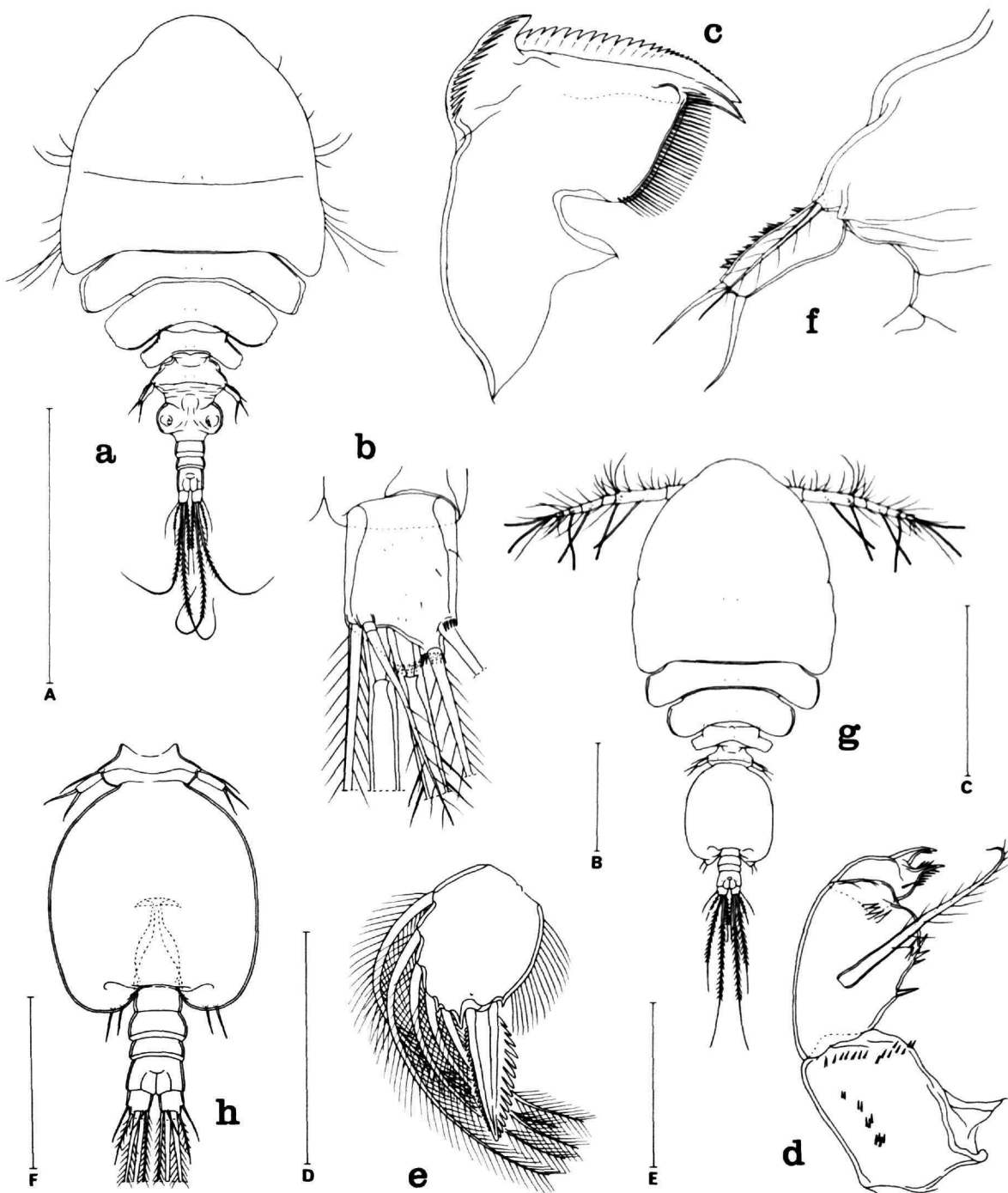


FIGURE 85.—*Colobomolgus laboutei*, new species. Female: *a*, dorsal (A); *b*, caudal ramus, dorsal (B); *c*, mandible, posterior (B); *d*, maxilliped, posterior (C); *e*, third segment of endopod of leg 1, anterior (D); *f*, leg 5, dorsal (C). Male: *g*, dorsal (E); *h*, urosome, dorsal (F). Scale: A, 0.5 mm; B, 0.02 mm; C, 0.05 mm; D, F, 0.1 mm; E, 0.2 mm.

Leg 5 (Figure 85f) has a moderately elongated free segment $47\text{ }\mu$ long, $16\text{ }\mu$ wide at the slight proximal inner expansion, and $11\text{ }\mu$ wide near the distal end. The outer surface is ornamented with spinules. The two terminal naked elements are $26\text{ }\mu$ and $28\text{ }\mu$. The adjacent seta on the body is $52\text{ }\mu$ and lightly feathered.

Leg 6 is probably represented by the two setae near the area of attachment of each egg sac.

The color in life in transmitted light is opaque, the eye red.

MALE.—The body (Figure 85g) is a little less expanded than in the female. The length is 0.58 mm ($0.56\text{--}0.63\text{ mm}$) and the greatest width 0.23 mm ($0.21\text{--}0.26\text{ mm}$), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is $1.33:1$. The ratio of the length of the prosome to that of the urosome is $1.84:1$.

The segment of leg 5 (Figure 85h) is $24 \times 59\text{ }\mu$, without the lateral swelling seen in the female. There is no ventral intersegmental sclerite. The genital segment is $122 \times 117\text{ }\mu$. The four post-

genital segments are $13 \times 25\text{ }\mu$, $14 \times 32\text{ }\mu$, $10 \times 31\text{ }\mu$, and $18 \times 34\text{ }\mu$ from anterior to posterior.

The caudal ramus is $17 \times 14.5\text{ }\mu$, relatively shorter than in the female. The armature is like that of the female, except that the inner (and sometimes also the outer) of the two long median terminal setae is often naked or nearly so.

The rostrum is like that of the female.

The first antenna is segmented and armed as in the female, but there are two additional aesthetes on the second segment and one additional aesthete on the fourth segment (Figure 85g) so that the formula is 4, $13 + 2$ aesthetes, 6, $3 + 1$ aesthete, $4 + 1$ aesthete, $2 + 1$ aesthete, and $7 + 1$ aesthete.

The second antenna (Figure 86a) is segmented and armed in the female, but the second segment has fewer outer spinules and bears a long inner fringe of short slender spinules. The fourth segment, more slender than in the female, is $53\text{ }\mu$ along its outer edge, $35\text{ }\mu$ along its inner edge, and $10\text{ }\mu$ wide, with its claw $28\text{ }\mu$ along its axis.

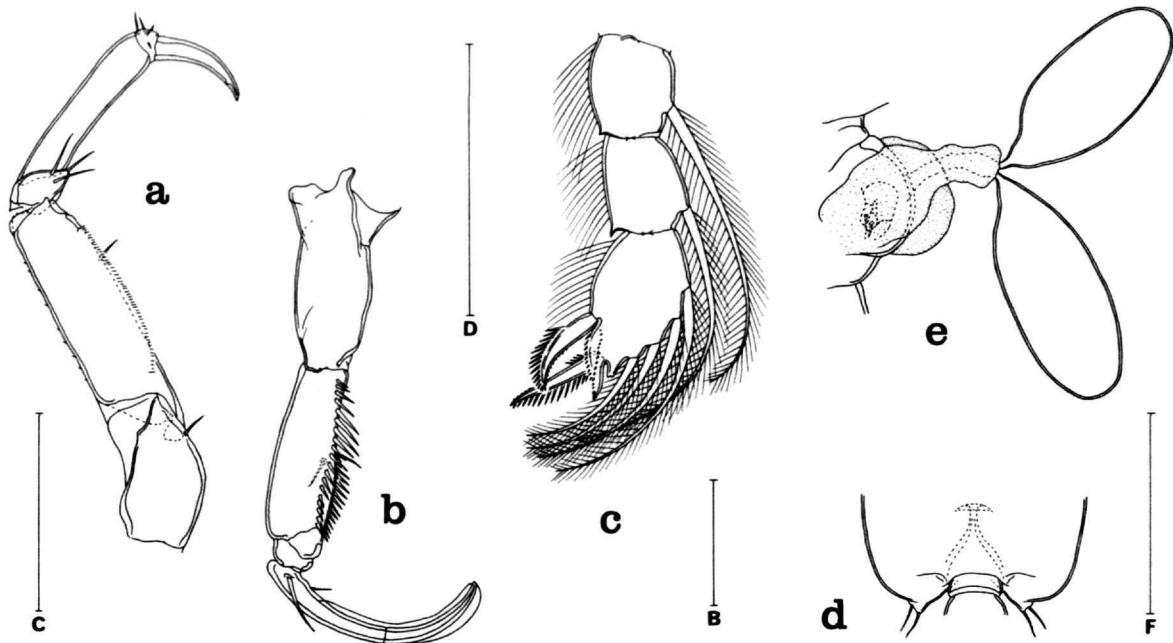


FIGURE 86.—*Colobomolgus laboutei*, new species. Male: a, second antenna, posterior (c); b, maxilliped, inner (d); c, endopod of leg 1, anterior (B); d, posterior portion of genital segment, dorsal (F); e, spermatophores, attached to female, dorsal (F). Scale: a, 0.02 mm ; c, 0.05 mm ; d, F, 0.1 mm .

The labrum, mandible, paragnath, first maxilla, and second maxilla are like those of the female. The maxilliped (Figure 86b) is slender and 4-segmented (assuming that the proximal part of the claw represents a fourth segment). The armature and ornamentation are similar to *C. dentipes*. The recurved claw is relatively short, 86 μ along its axis.

The ventral area between the maxillipeds and the first pair of legs is like that of the female.

Legs 1-4 are segmented and armed as in the female except that the armature for the last segment of the endopod of leg 1 (Figure 86c) is I,1,4 instead of I,5 as in the other sex. The outer spine is recurved, the terminal spine straight, and both are prominently spinulose along one edge and have very small spinules along the other edge. Between the two spines there is a long, pointed, somewhat sinuous process with very small spines. The endopod of leg 4 is like that of the female.

Leg 5 (Figure 85h) has an unornamented rectangular free segment, 16.5 x 5.5 μ . The terminal elements are 23 μ and 27 μ , and the seta on the body adjacent to the free segment is 33 μ and naked.

Leg 6 is a posteroventral flap on the genital segment, slightly protruded in some specimens (Figure 86d) or not protruded in others (Figure 85h). The two naked setae are 14 μ and 17 μ .

The spermatophore (Figure 86e), attached to the female in pairs, is 120 x 49 μ , not including the neck. (In the figure one spermatophore appears shorter than the other because of the slight angle at which it was held in the specimen drawn.)

The color in life in transmitted light is like that of the female.

ETYMOLOGY.—This species is named for Pierre Laboute, the diver at the Centre ORSTOM de Nosy Bé who accompanied AGH on many SCUBA dives during the fieldwork at Nosy Bé and thereby made possible the collection of hosts otherwise difficult to obtain.

REMARKS.—The new species resembles closely *C. cristatus* in the form of the genital segment in the female, in the numerous feathered setae on the first antenna, and in the crest of long setae on the lash of the second maxilla, but it may be distinguished from that species by the shorter caudal ramus (4.5:1 in *C. cristatus*) and by the spinules

on leg 5 (this leg being unornamented in *C. cristatus*). The male of *C. cristatus* is unknown.

Colobomolgus laboutei differs from *C. dentipes* in three readily observable features. In *C. laboutei* the first antenna in both sexes has numerous feathered setae, while in *C. dentipes* there are very few such setae. In the female of *C. laboutei* leg 5 lacks the large toothlike process seen in *C. dentipes*. In the male of the new species the outer spine on the last segment of the endopod of leg 1 is recurved, while in *C. dentipes* this spine is straight.

Genus *Contomolgus* Humes and Stock, 1972

DIAGNOSIS.—Body cyclopiform. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six setae. Rostrum broadly rounded posteroventrally. First antenna 7-segmented, the armature in the female being 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented, with the armature I, 1, 3, and II + 5 hyaline elements, there being two terminal claws.

Labrum with the two lobes separated by a deep cleft. Mandible with the basal area distal to the indentation having on its convex side a scalelike protrusion with a row of spines followed by a serrated fringe and on its concave side a row of slender spinules followed by a few stouter ones; lash very short and barbed. Paragnath a small hairy lobe. First maxilla with four elements. Second maxilla of the usual lichomolgid type. Maxilliped in the female 3-segmented, with a pointed tip; in the male 4-segmented (the proximal part of the claw probably representing a fourth segment).

Legs 1-4 with 3-segmented rami, except for leg 4 endopod which is 2-segmented. Armature of the usual lichomolgidiform type, leg 4 endopod being 0-1;II, the seta on the first segment naked. Leg 4 exopod with the third segment having III,I,5. In the male, leg 1 endopod showing sexual dimorphism, with I,I,4 instead of I,5 as in the female. Leg 5 in both sexes with a free segment bearing two terminal setae. Leg 6 in the female represented by the two setae and small process near the area of attachment of each egg sac; in the male by a posteroventral flap on the genital segment bearing two setae.

Associated with alcyonaceans.

TYPE-SPECIES.—*Contomolgus lokobeensis*, new species.

ETYMOLOGY.—The name is a combination of the Greek words *kovtos* (short), referring to the very short lash on the mandible, and *molgos*. Gender masculine.

***Contomolgus lokobeensis*, new species**

FIGURES 87-90

TYPE MATERIAL.—14 ♀♀, 53 ♂♂, and 70 copepodids from single colony of the alcyonacean *Studeriotis semperi* (Studer), in 17 m, with its base embedded in sand, in pass at Pte. Lokobe, Nosy Bé, northwestern Madagascar, 25 August 1967, collected by AGH. Holotype ♀, allotype, and 61 paratypes (11 ♀♀, 50 ♂♂) deposited in USNM, the remaining paratypes (dissected) and the copepodids in the collection of AGH.

OTHER MATERIAL EXAMINED.—From *Studeriotis semperi*: 7 ♀♀, 13 ♂♂, and 92 copepodids from three colonies, in 17 m, in pass at Pte. Lokobe, 23 August 1967; 5 ♀♀, 20 ♂♂, and 118 copepodids from single colony, in 18 m, in pass at Pte. Lokobe, 14 July 1967. From the alcyonacean *Dendronephthya (Morchellana) stocki* Verseveldt: 11 ♀♀, 7 ♂♂, and 3 copepodids from single colony, in 25 m, north of Ankazoberavina, 13°27.6' S, 47°58.2' E, near Nosy Bé, 24 August 1967. All collected by AGH.

FEMALE.—The body (Figure 87a) has a moderately broad prosome. The length is 1.41 mm (1.39–1.49 mm) and the greatest width 0.70 mm (0.67–0.72 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1.42:1. The ratio of the length of the prosome to that of the urosome is 2.46:1.

The segment of leg 5 (Figure 87b) is 99 x 250 μ. Between this segment and the genital segment there is a short, weakly developed ventral intersegmental sclerite. The genital segment is 220 x 205 μ, a little longer than wide, expanded in the anterior two-thirds where there is a pair of median, dorsally raised areas. The areas of attachment of the egg sac are located dorsolaterally at about the middle of the segment. Each area (Figure 87c) bears two small naked spiniform setae 11 μ and 22 μ, with a bluntly pointed process between them. The three

postgenital segments are 62 x 117 μ, 47 x 112 μ, and 43 x 104 μ from anterior to posterior.

The caudal ramus (Figure 87d) is quadrate, 39 x 40 μ. The outer lateral seta is 225 μ and naked. The dorsal seta is 47 μ and lightly feathered. The outermost terminal seta is 285 μ, with spinules along its proximal outer fourth. The innermost terminal seta is 400 μ, the spinules along its outer edge a little more sparse than those on its inner edge. The two long median terminal setae are 616 μ (outer) and 670 μ (inner), both with spinules and both inserted between dorsal (unornamented) and ventral (with a few very minute marginal spinules) flaps.

The body surface bears hairs (sensilla) as shown in Figure 87a,b. The posteroventral margin of the anal segment bears a row of extremely small spinules on both sides.

The egg sac (Figure 87a) is oval, 660 x 310 μ, reaches far beyond the caudal rami, and contains many eggs about 48 μ in diameter.

The rostrum (Figure 87e) is well defined and rounded posteroventrally.

The first antenna (Figure 87f) is 583 μ long. The lengths of the seven segments (measured along their posterior nonsetiferous margins) are as follows: 50 (95 μ along the anterior margin), 146, 36, 81, 97, 78, and 50 μ respectively. The formula for the armature is 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All the setae are naked except for one on segment 5, one on segment 6, and two on segment 7.

The second antenna (Figure 87g) is 4-segmented. Each of the first two segments bears a seta. The third segment has three setae. The last segment, 110 μ along its outer edge, 73 μ along its inner edge, and 31 μ wide, bears two slightly unequal terminal claws, 75 μ and 64 μ, along their axes and five hyaline elements, the longest one setiform. All the elements are naked. The inner surface of the fourth segment bears a row of minute spines.

The labrum (Figure 87h) has two posteroventral lobes, their borders at the median indentation bearing a row of small spinules.

The mandible (Figure 88a) has on the concave side of the base a strong indentation followed by a row of slender spinules and then a group of stouter ones. The convex margin of the base bears a protruding scalelike area with a row of spinules followed by a serrated hyaline fringe. The lash is

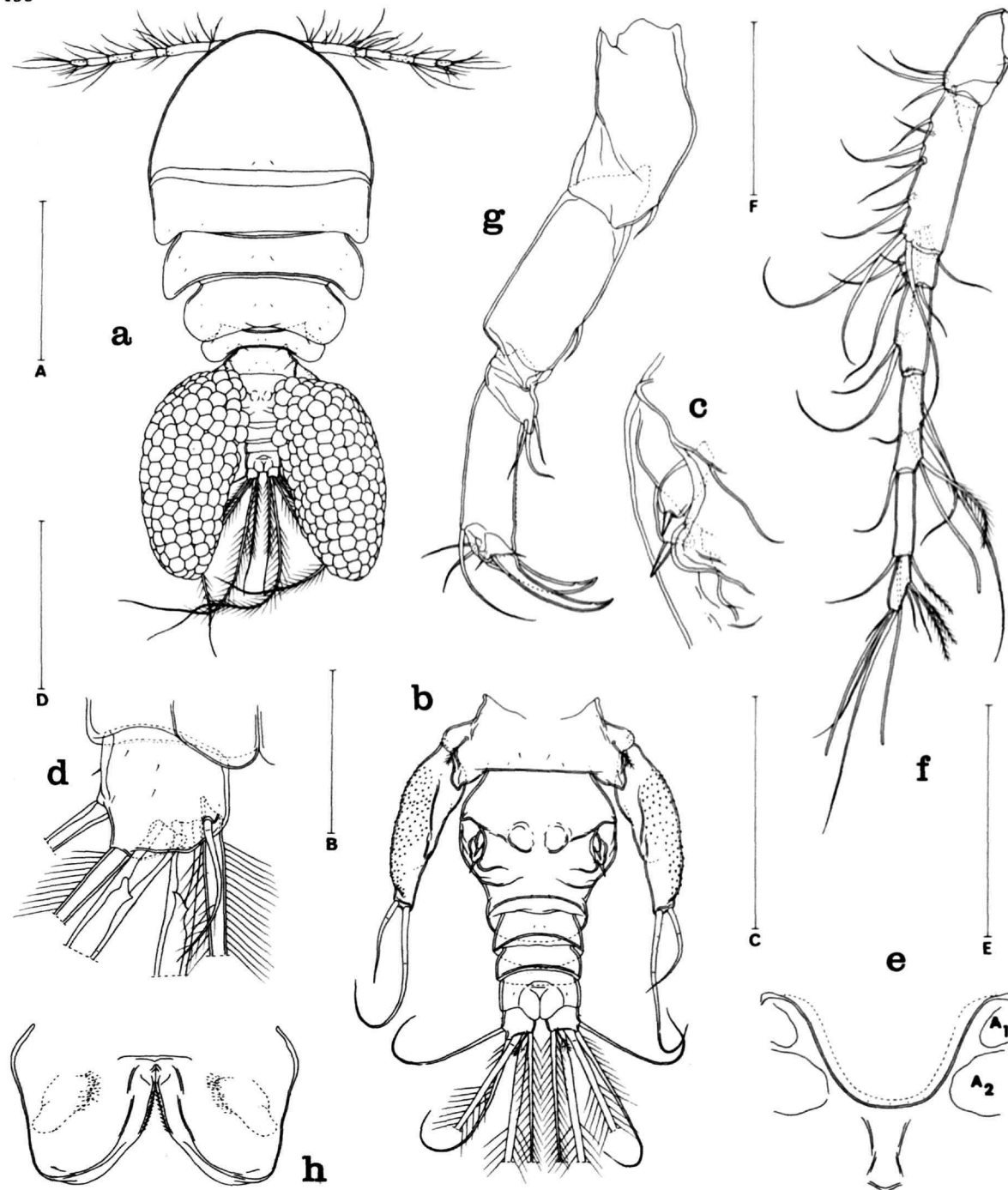


FIGURE 87.—*Contomolgus lokobeensis*, new species. Female: *a*, dorsal (A); *b*, urosome, dorsal (B); *c*, area of attachment of egg sac, dorsal (C); *d*, caudal ramus, dorsal (D); *e*, rostrum, ventral (E); *f*, first antenna, dorsal (F); *g*, second antenna, posterior (F); *h*, labrum, with paragnaths indicated by broken lines, ventral (C). Scale: A, 0.5 mm; B, E, 0.2 mm; C, F, 0.1 mm; D, 0.05 mm.

very short and bilaterally barbed (not a smooth spike as in *Colobomolgus*). The paragnath (Figure 87h) is a small hairy lobe. The first maxilla (Figure 88b) bears four elements, the longest with a few minute barbules. The second maxilla (Figure 88c) has a large unornamented first segment. The second segment has an outer (ventral) proximal naked setule, a more distal posterior surficial spiniform seta, and a bilaterally spinulose spine which is much shorter than the terminal lash (with small teeth along one edge). The maxilliped (Figure 88d) is 3-segmented. The first segment is unornamented. The second bears two very unequal setae, the longer one almost as long as the entire maxilliped and bearing a row of erect slender spines. The third segment bears a barbed spine, a small setule, and a terminal barbed spiniform process lacking an articulation.

The ventral area between the maxillipeds and the first pair of legs (Figure 88e) is not protuberant. A fine line connects the bases of the maxillipeds.

Legs 1-4 (Figure 88f-i) have trimerous rami, except for the endopod of leg 4 which is 2-segmented. The armature is as follows:

P ₁	coxa	0-1	basis	1-0	exp	I-0; I-1; III,I,4
				enp	0-1; 0-1; I,5	
P ₂	coxa	0-1	basis	1-0	exp	I-0; I-1; III,I,5
				enp	0-1; 0-2; I,II,3	
P ₃	coxa	0-1	basis	1-0	exp	I-0; I-1; III,I,5
				enp	0-1; 0-2; I,II,2	
P ₄	coxa	0-1	basis	1-0	exp	I-0; I-1; III,I,5
				enp	0-1; II	

The inner element on the coxa of legs 1-3 is a large feathered seta, but in leg 4 it is reduced to a minute, naked element 5 μ long. The inner margin of the basis in legs 1-3 bears a row of hairlike spinules but in leg 4 this margin is smooth. The exopod of leg 4 is 234 μ in length. The usual formula for the last segment is III,I,5, but one female showed II,I,5 on the right leg. The first segment of the endopod is 57 x 44 μ (not including the spiniform processes) and its inner distal naked seta is 54 μ . The second segment is 112 μ long (including the terminal spiniform processes), 42 μ in greatest width proximally, and 27 μ in least width distally; the outer terminal spine is 46 μ and the inner spine 106 μ , both fringed and with minutely bifurcated tips. Both segments have an outer row of hairs.

Leg 5 (Figure 88j) has a broad free segment 226 x 101 μ in greatest dimensions, finely spinulose on its dorso-outer surface. (The free segment in dorsal view, as in Figure 87b, appears to be much more slender.) The two terminal naked jointed setae are 130 μ and 270 μ . The adjacent seta on the body is approximately 45 μ and lightly feathered.

Leg 6 is probably represented by the two elements near the attachment of each egg sac (Figure 87c).

The color in life in transmitted light is opaque, the eye red, the egg sacs gray.

MALE.—The body (Figure 89a) is a little more slender than in the female. The length is 1.15 mm (1.10-1.22 mm) and the greatest width 0.44 mm (0.42-0.46 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1.63:1. The ratio of the length of the prosome to that of the urosome is 1.81:1.

The segment of leg 5 (Figure 89b) is 61 x 130 μ . There is no ventral intersegmental sclerite. The genital segment is 235 x 239 μ . The four postgenital segments are 34 x 78 μ , 34 x 77 μ , 26 x 74 μ , and 29 x 75 μ from anterior to posterior.

The caudal ramus is like that of the female, but smaller, 30 x 29 μ .

The surface of the body is ornamented with hairs as in the female.

The rostrum is similar to that in the female.

The first antenna is segmented and armed as in the female, but there are two additional aesthetes on segment 2 and one additional aesthete on segment 4 (Figure 89a) so that the formula is 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Certain setae are feathered as in the female.

The second antenna (Figure 89c) is a little more slender than in the female. The fourth segment is 102 μ along its outer edge, 73 μ along its inner edge, and 24 μ wide; its two terminal claws are 60 μ and 53 μ . The inner surfaces of the first two segments and the fourth segment bear small spines.

The labrum, mandible, paragnath, first maxilla, and second maxilla are like those of the female. The maxilliped (Figure 89d) is slender and 4-segmented (assuming that the proximal part of the claw represents a fourth segment). The first segment is unornamented. The second segment bears two setae and two rows of spines (one row short).

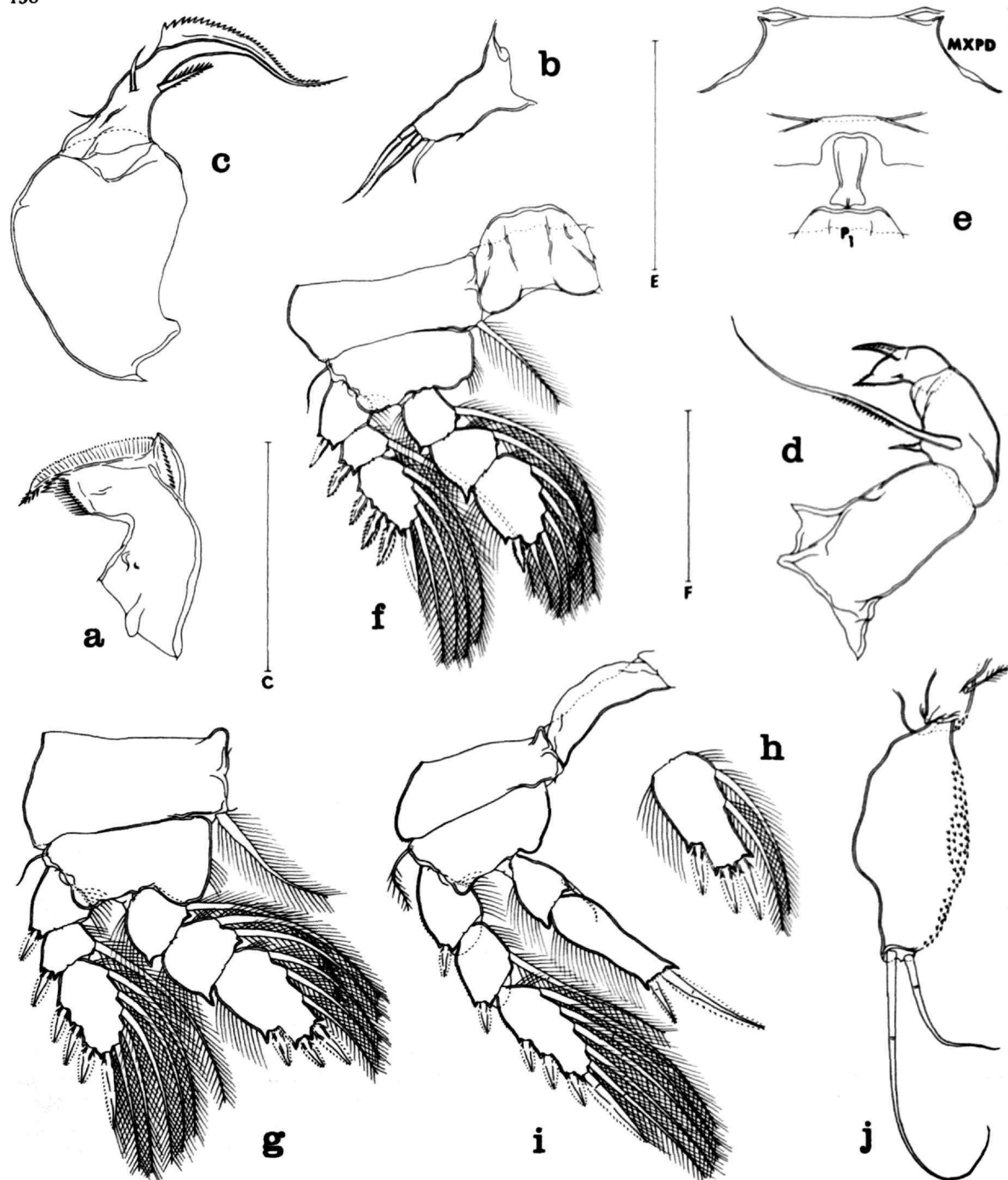


FIGURE 88.—*Contomolgus lokobeensis*, new species. Female: *a*, mandible, posterior (c); *b*, first maxilla, anterior (c); *c*, second maxilla, posterior (c); *d*, maxilliped, postero-inner (F); *e*, area between maxillipeds and first pair of legs, ventral (E); *f*, leg 1 and intercoxal plate, anterior (E); *g*, leg 2, anterior (E); *h*, third segment of endopod of leg 3, anterior (E); *i*, leg 4 and intercoxal plate, anterior (E); *j*, leg 5, dorso-inner (E). Scale: *c*, *f*, 0.1 mm; *e*, 0.2 mm.

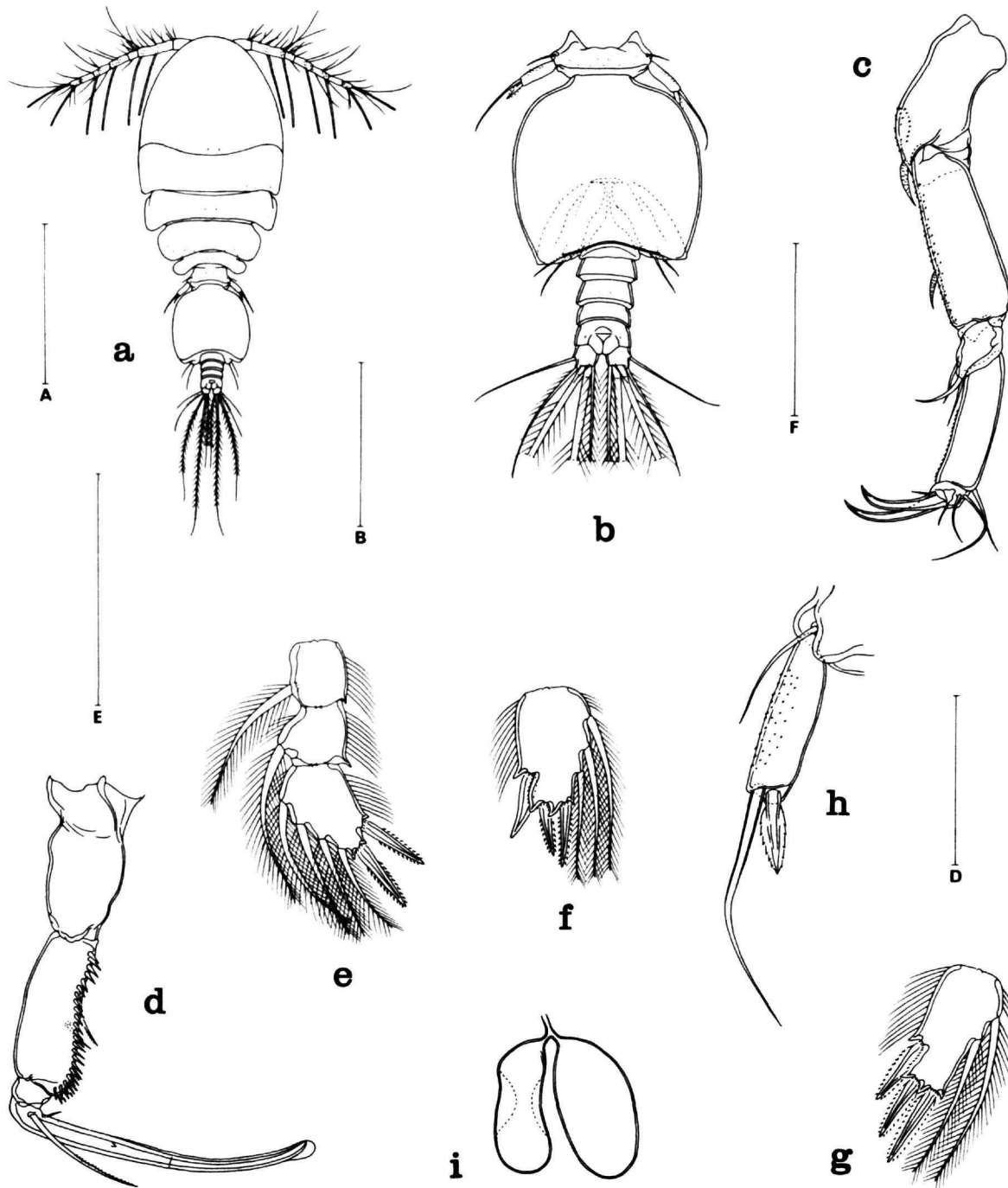


FIGURE 89.—*Contomolgus lokobeensis*, new species. Male: *a*, dorsal (A); *b*, urosome, dorsal (B); *c*, second antenna, anterior (F); *d*, maxilliped, inner (E); *e*, endopod of leg 1, anterior (F); *f*, third segment of endopod of leg 2, anterior (F); *g*, third segment of endopod of leg 3, anterior (F); *h*, leg 5, dorsal (D); *i*, spermatophores, attached to female, dorsal (B). Scale: A, 0.5 mm; B, E, 0.2 mm; D, 0.05 mm; F, 0.1 mm.

The small third segment is unarmed. The claw is $273\ \mu$ along its axis (including the terminal lamella) and only slightly recurved. It is weakly divided about midway and is ornamented on the proximal half with a pointed knob. There are two very unequal proximal elements, the longer one with unilateral barbules.

The ventral area between the maxillipeds and the first pair of legs is like that in the female.

Legs 1-4 are segmented and armed as in the female, except for the last segment of the endopod of leg 1 (Figure 89e), where the formula is I,I,4 instead of I,5 as in the female. Slight sexual dimorphism occurs in the last segment of the endopod of leg 2 (Figure 89f) where the outer spine is $40\ \mu$ and smooth, the terminal outer spine $33\ \mu$, and the terminal inner spine $40\ \mu$ (in the female these spines being 36 , 33 , and $48\ \mu$ respectively, all fringed). The last segment of the endopod of leg 3 (Figure 89g) shows only very slight dimorphism in the lengths of the spines, 45 , 43 , and $53\ \mu$ from outer to inner (in the female 46 , 44 , and $60\ \mu$). Leg 4 is like that of the female.

Leg 5 (Figure 89h) has a moderately slender free segment $52 \times 19\ \mu$, spinulose on its dorso-outer surface as in the female. The terminal elements consist of a long naked seta, $74\ \mu$, and a short fringed spine, $25\ \mu$. The adjacent seta on the body is $33\ \mu$ and naked.

Leg 6 (Figure 89b) is a posteroventral flap on the genital segment bearing two naked setae, $39\ \mu$ and $56\ \mu$.

The spermatophore (Figure 89i), attached to the female in pairs, is oval, $187 \times 96\ \mu$ (not including the neck). Eight females were observed with spermatophores, seven with a pair on both sides, and one with a pair on the right side only.

The color in life in transmitted light is like that of the female.

ETYMOLOGY.—The specific name refers to Pte. Lokobe, the type-locality.

REMARKS.—The distinguishing features of *C. lokobeensis* are the very short barbed lash on the mandible, the two claws on the second antenna, the distal spine on the second segment of the second maxilla much shorter than the lash, and the

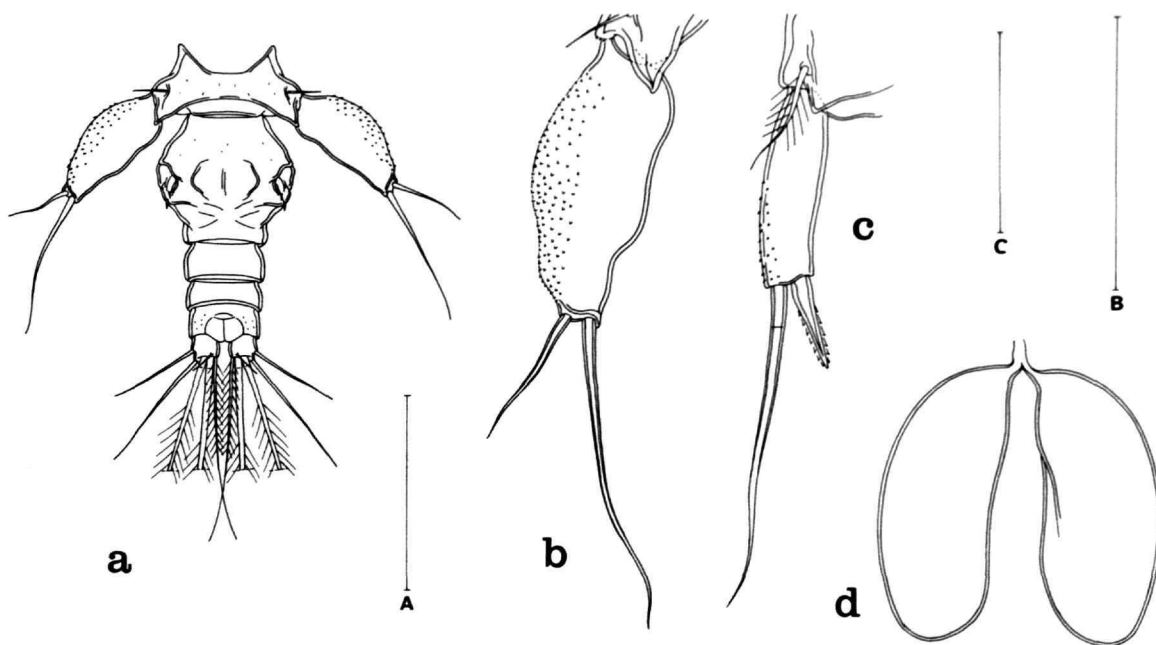


FIGURE 90.—*Contomolgus lokobeensis*, new species. Female: a, urosome, dorsal (A); b, leg 5, dorsal (B). Male: c, leg 5, dorsal (C); d, spermatophores, attached to female, dorsal (B). Scale: A, 0.3 mm; B, 0.2 mm; C, 0.05 mm.

naked seta on the first segment of the endopod of leg 4.

The specimens from *Dendronephthya* (*Morchellana*) *stocki* differ in certain minor details from those found on *Studeriotis semperi*. In the specimens from the former the genital segment of the female (Figure 90a) is $109 \times 211 \mu$ and has a slightly different form; the free segment of leg 5 in the female (Figure 90b), $216 \times 86 \mu$, has a slightly different contour (though the contour may depend upon the precise orientation of the appendage when drawn); the free segment of leg 5 in the male (Figure 90c) is $53 \times 13 \mu$, a little more slender than in the material from *Studeriotis*, the ratio being 4.08:1; the serrated fringe on the terminal spine is less developed; and the spermatophore (Figure 90d) is more elongated, $208 \times 94 \mu$, not including the neck.

These differences are so minor that we consider the specimens from *Dendronephthya* to represent *C. lokobeensis*. In other respects, such as body size and the structure of the appendages, the specimens from the two hosts are very similar.

Genus *Debruma* Humes and Stock, 1972

DIAGNOSIS.—Body cyclopiform. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six setae. Rostrum linguiform. First antenna 7-segmented, in the female with the formula 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented, with the armature 1, 1, 4, and III + 3, there being three terminal claws.

Labrum with the two lobes separated by an indentation. Mandible with the base bearing a slender bipectinate blade. First maxilla with one element. Second maxilla of the usual lichomolgid type. Maxilliped of the female 2-segmented, the second and third segments fused, with a rounded tip; in the male 4-segmented (the proximal part of the claw probably representing the fourth segment).

Legs 1–4 with 3-segmented rami, except for leg 4 endopod which is 2-segmented. Armature of the usual lichomolgidiiform type, but leg 4 endopod having the formula 0–1;I. Leg 4 exopod with the third segment II,I,5. No sexual dimorphism in leg

1 endopod. Leg 5 in both sexes with a free segment bearing two unequal terminal elements. Leg 6 represented in the female by the two setae and process near the area of attachment of each egg sac and in the male by a posteroventral flap on the genital segment bearing two setae.

Other features as in the species described below.

Associated with ascidians.

TYPE-SPECIES.—*Debruma clavelinae*, new species.

ETYMOLOGY.—The generic name is an anagram of Bermuda, the type locality of *D. clavelinae*. Gender masculine.

REMARKS.—*Debruma* appears to be related to *Gelastomolgus* Humes, 1968. Both genera have four setae on the third segment and three claws on the fourth segment of the second antenna, a blade-like mandible, a fusion of the second and third segments of the maxilliped in the female, the formula II,I,5 on the third segment of the exopod of leg 4, and the endopod of leg 4 with only a single terminal element. There are several important differences, however. In *Debruma* the first and second segments of the second antenna are clearly separated; the mandible has a base wider than the blade (which lacks a distal spinous process); the third segments of the exopods in legs 1–3 have three outer spines instead of two; and legs 1–4 lack hyaline flanges.

Debruma clavelinae, new species

FIGURES 91–93

TYPE MATERIAL.—3 ♀♀, 1 ♂, and 6 copepodids from the pharynx of the ascidian *Clavelina picta* (Verrill), in 1 m, Swing Bridge, Ferry Reach, Bermuda, 15 July 1962, collected by AGH and RUG. Holotype ♀, allotype, one paratypic female, and the copepodids deposited in USNM, the remaining paratypic female (dissected) in the collection of AGH.

FEMALE.—The body (figure 91a) is cyclopiform. The length (not including the setae on the caudal rami) is 1.14 mm (1.12–1.15 mm) and the greatest width 0.45 mm (0.44–0.48 mm), based on three specimens in lactic acid. The ratio of the length to the width of the prosome is 1.49:1. The ratio of the length of the prosome to that of the urosome is 1.33:1.

The segment of leg 5 (Figure 91b) is $78 \times 120 \mu$. There is no ventral intersegmental sclerite between

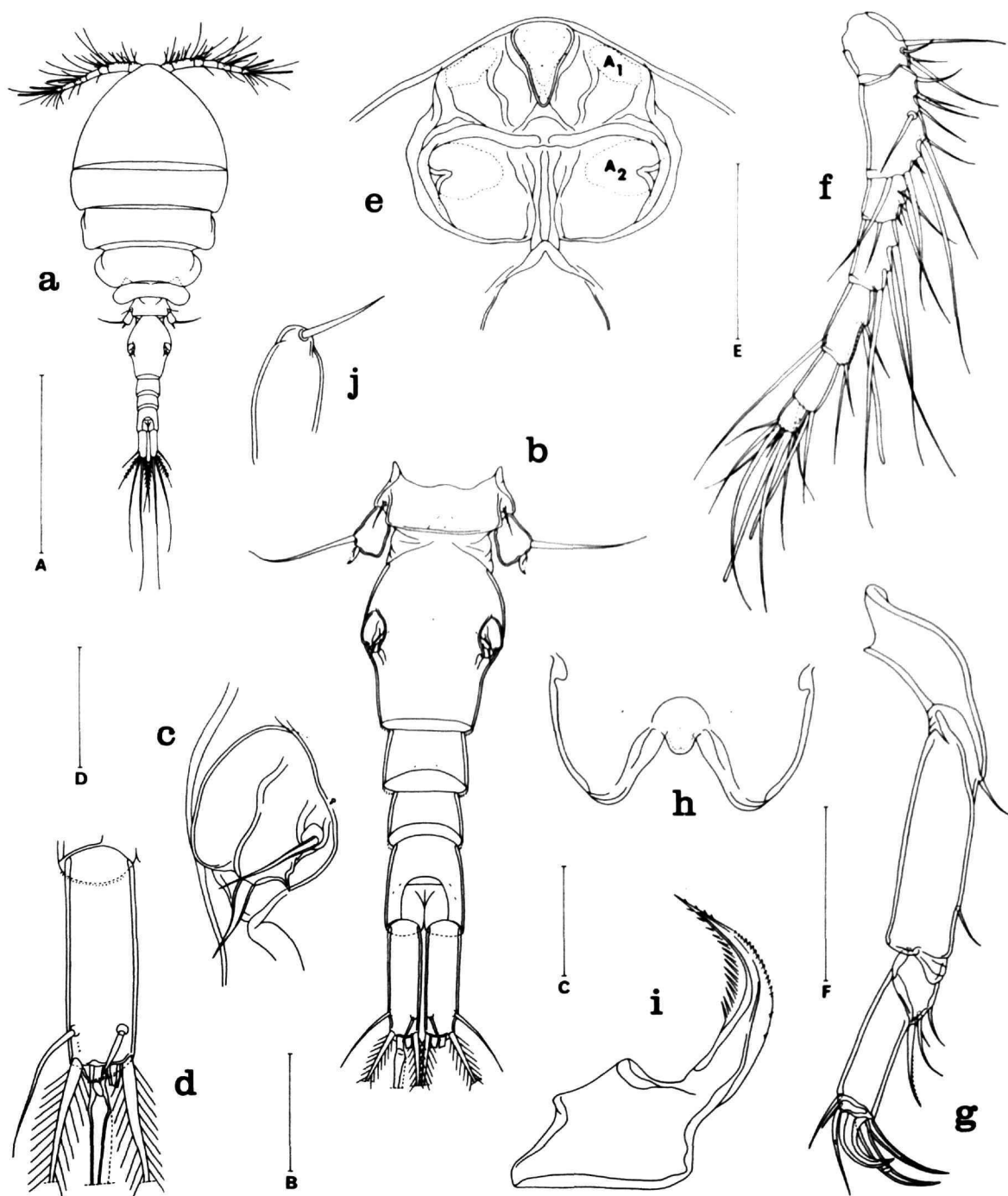


FIGURE 91.—*Debruma clavelinae*, new species. Female: *a*, dorsal (A); *b*, urosome, dorsal (B); *c*, area of attachment of egg sac, dorsal (C); *d*, caudal ramus, dorsal (D); *e*, rostrum, ventral (E); *f*, first antenna, dorsal (E); *g*, second antenna, anterior (F); *h*, labrum, ventral (F); *i*, mandible, anterior (C); *j*, first maxilla, anterior (C). Scale: A, 0.5 mm; B, 0.1 mm; C, 0.02 mm; D, F, 0.05 mm; E, 0.1 mm.

that segment and the genital segment. The genital segment is elongated, $151 \times 122 \mu$, broadest in its anterior half. The areas of attachment of the egg sacs are located dorsolaterally near the middle of the segment. Each area (Figure 91c) bears two naked setae, 19μ and 23μ , with a minute jointed process between them. The three postgenital segments are $52 \times 70 \mu$, $48 \times 62 \mu$, and $75 \times 65 \mu$ from anterior to posterior.

The caudal ramus (Figure 91d) is moderately elongated, $96 \times 31 \mu$, or 3.1 times longer than wide. The outer lateral seta is 73μ and naked. The short, stout, naked dorsal seta is 20μ . The outermost terminal seta is 96μ , the innermost 114μ , both with lateral hairs proximally. The two median terminal setae (broken in most specimens) are 210μ (outer) and 260μ (inner), with inner and outer lamellae respectively, but otherwise naked; both of these setae inserted between dorsal (unornamented) and ventral (with a row of spinules) flaps.

The body surface has very few hairs (sensilla). The posteroventral margin of the anal segment bears a row of minute spinules.

The egg sac is unknown.

The rostrum (Figure 91e) is linguiform, but slender, with a narrow rounded tip.

The first antenna (Figure 91f) is 225μ long. The lengths of the seven segments (measured along their posterior nonsetiferous margins) are 19 (39μ along the anterior margin), 62 , 22 , 39 , 43 , 31 , and 19μ respectively. The formula for the armature is $4, 13, 6, 3, 4 + 1$ aesthete, $2 + 1$ aesthete, and $7 + 1$ aesthete. All the setae are naked.

The second antenna (Figure 91g) is 4-segmented. Both the first and second segments bear an inner naked seta. The third segment carries four setae, the longest with minute barbs along the proximal edge. The fourth segment, 64μ along its outer edge, 44μ along its inner edge, and 19μ wide, bears a strong recurved claw 25μ along its axis, two weaker, less recurved claws, 36μ and 40μ , and three naked setae, one of them weakly jointed. The second segment is ornamented along its outer margin with small spinules.

The labrum (Figure 91h) has two rather narrow posteroventral lobes, the indentation between them not acute and having a small rounded median lobe.

The mandible (Figure 91i) has a moderately broad base which carries a slender attenuated blade

having short dentiform spines on its convex side and longer spinules on its concave side. Paragnaths were not identified in the specimens available. The first maxilla (Figure 91j) bears a single naked seta. The second maxilla (Figure 92a) is 2-segmented. The first segment is unornamented. The second segment bears two naked setae and terminates in a long lash with short spinules along one edge. The maxilliped (Figure 92b) is 2-segmented, the original third and fourth segments having fused. The compound second segment bears about midway two naked setae and distally two small spiniform elements, the tip of the segment being finely spinulose.

The ventral area between the maxillipeds and the first pair of legs (Figure 92c) is not protuberant. There is a sclerotized line (incomplete medially) between the bases of the maxillipeds.

Legs 1-4 (Figure 92d-g) are segmented and armed as in *Contomolgus lokobeensis*, but the third segment of the exopod of leg 4 is II, I, 5 and the endopod of leg 4 is 0-1; I. The inner seta on the coxa of legs 1-3 is large and feathered, but in leg 4 this seta is shorter (24μ) and naked. The inner margin of the basis of all four legs is haired. The exopod of leg 4 is 148μ long. The first segment of the endopod is $24 \times 23 \mu$, with its inner distal plumose seta 50μ . The second segment is 55μ long, including the terminal spiniform processes, and 22μ in greatest width. The outer margin of this segment may be notched (as in Figure 92g) or smooth (as in Figure 92h). (One female had both endopods notched; two females had only the right endopod notched.) The endopod bears terminally a fringed spine, 44μ . The outer margins of both segments of the endopod are haired.

Leg 5 (Figure 93a) has an unornamented free segment $37 \times 29 \mu$ in greatest dimensions. The two terminal elements are very unequal, the long naked seta is 96μ and the short spine is 17μ with a fringe on its outer side. On the body near the insertion of the dorsal seta there is a group of small spinules.

Leg 6 is probably represented by the two setae near the attachment of each egg sac (Figure 91c).

The color in life in transmitted light is opaque, the eye red.

MALE.—The body (Figure 93b) is a little more slender than in the female. The length (not including the ramal setae) is 0.66 mm and the greatest width 0.20 mm , based on the allotype in lactic

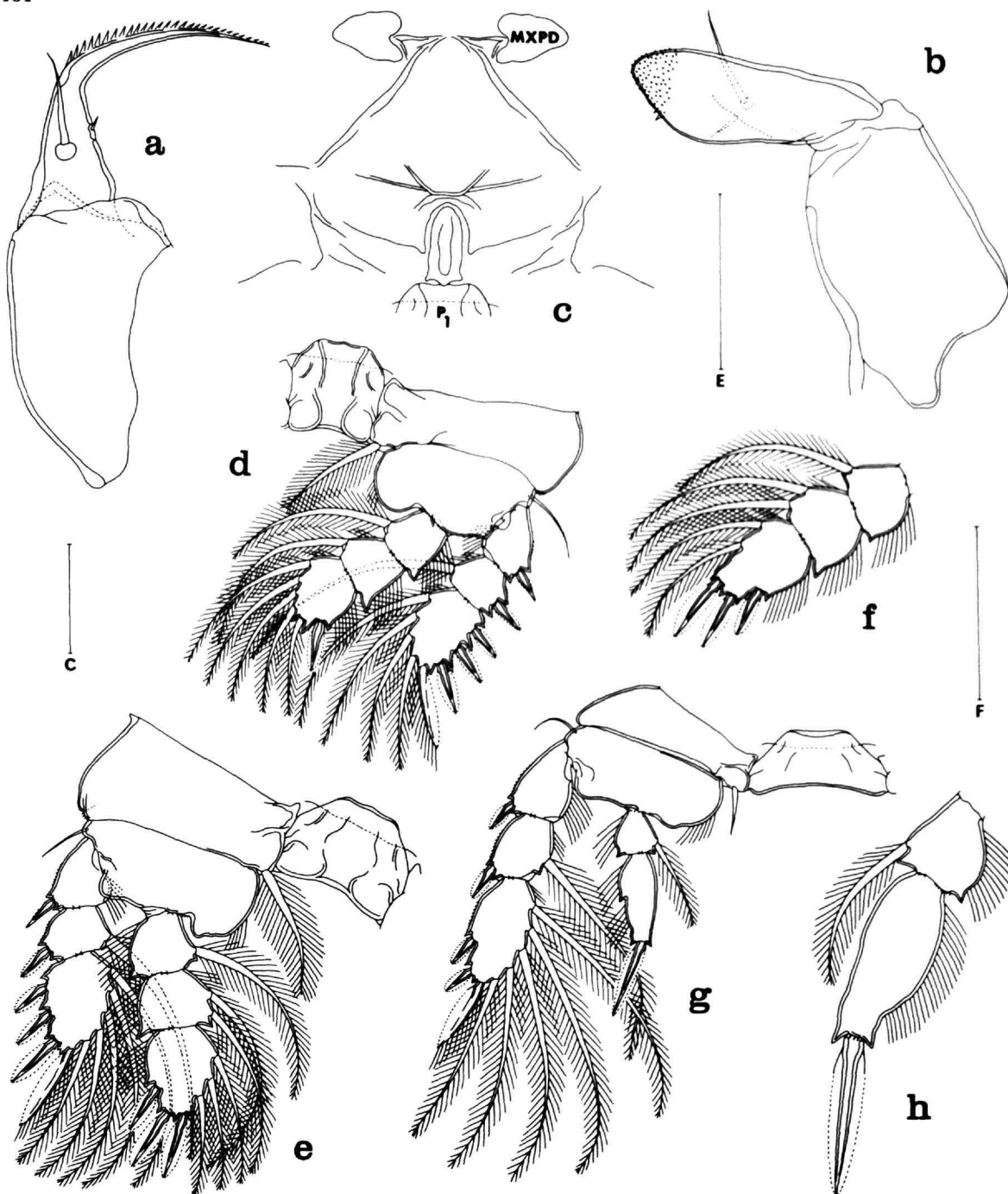


FIGURE 92.—*Debruma clavelinae*, new species. Female: *a*, second maxilla, posterior (c); *b*, maxilliped, antero-inner (c); *c*, area between maxillipeds and first pair of legs, ventral (E); *d*, leg 1 and intercoxal plate, anterior (E); *e*, leg 2 and intercoxal plate, anterior (E); *f*, endopod of leg 3, anterior (E); *g*, leg 4 and intercoxal plate, anterior (E); *h*, endopod of leg 4, anterior (F). Scale: c, 0.02 mm; E, 0.1 mm; F, 0.05 mm.

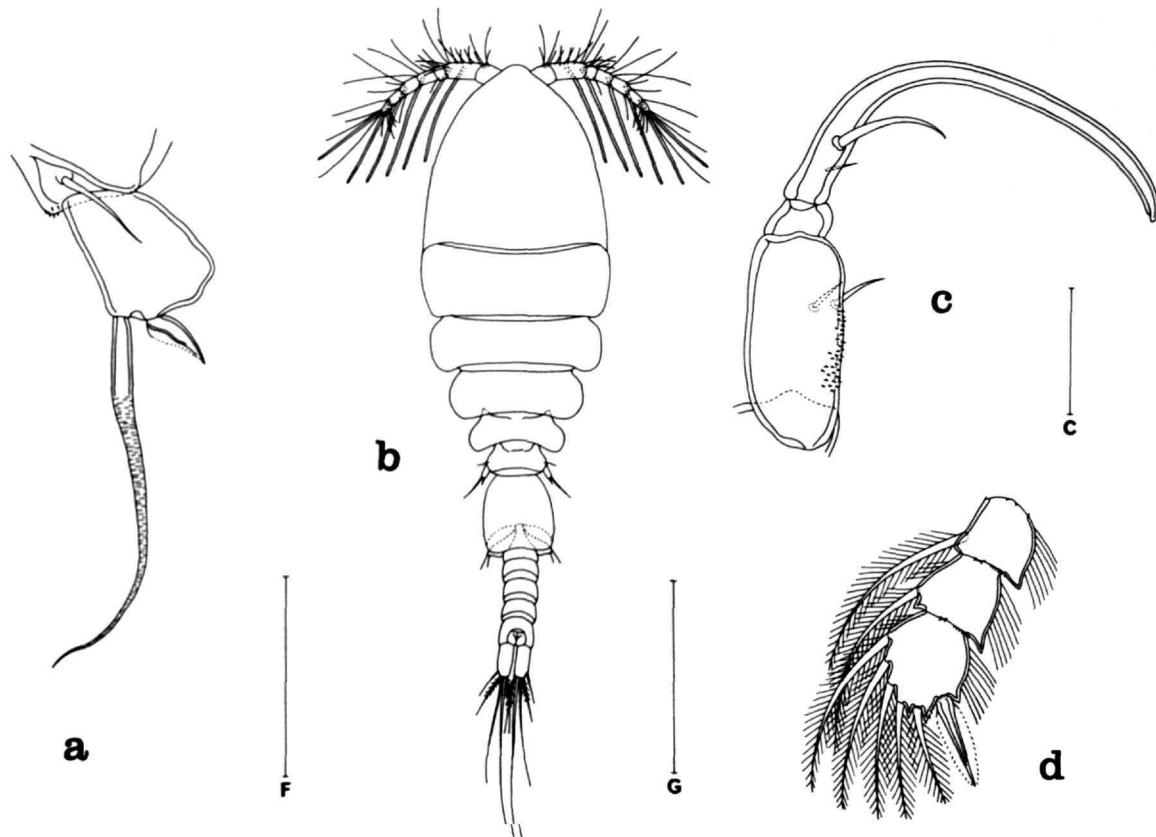


FIGURE 93.—*Debruma clavelinae*, new species. Female: *a*, leg 5, dorsal (F). Male: *b*, dorsal (c); *c*, maxilliped, first segment incomplete, posterior (c); *d*, endopod of leg 1, anterior (F). Scale: c, 0.02 mm; F, 0.05 mm; c, 0.2 mm.

acid. The ratio of the length to the width of the prosome is 2.0:1. The ratio of the length of the prosome to that of the urosome is 1.58:1.

The allotype was not dissected and therefore not all parts were studied in detail. The following notes are based on examination of the entire animal in lactic acid.

The rostrum is like that of the female. The first antenna resembles that of the female but has three additional aesthetes (Figure 93*b*) so that the formula is 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. The second antenna is like that of the female.

The labrum resembles that of the female.

The maxilliped (Figure 93*c*) has a long recurved claw.

Legs 1–4 are like those in the female. There is only slight sexual dimorphism in the endopod of leg 1, where the formula for the armature is the same as in the female, but the spine on the third segment (Figure 93*d*) is a little longer in relation to the length of the segment.

The caudal ramus resembles that of the female.

The color is similar to that of the female.

ETYMOLOGY.—The specific name is the genitive form of the generic name of the host.

Genus *Doridicola* Leydig, 1853

DIAGNOSIS.—Body cyclopiform. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six setae. Rostrum rounded.

First antenna 7-segmented, in the female with the armature 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male with 4, 13 + 2 aesthetes (1 aesthete in *D. astrophyticus*), 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete (so far as known). Second antenna 4-segmented, the formula 1, 1, 3, and two terminal claws + several small elements (in *D. fishelsoni* with one claw and a long spine).

Labrum incised medially. Mandible with the basal region beyond the indentation having on its convex side a scalelike area with spinules often followed by a serrated fringe and on its concave side a row of spinules; lash long. Paragnath a small hairy lobe. First maxilla with three or four elements. Second maxilla of the usual lichomolgid

type. Maxilliped in the female 3-segmented with a pointed tip; in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1-4 with 3-segmented rami except leg 4 endopod which is 2-segmented. Armature of the typical lichomolgiform type. Leg 4 exopod with the third segment having III, I, 5. Leg 4 endopod with the formula 0-1; II, the seta being feathered (except in *D. astrophyticus*, *D. foxi*, and perhaps *D. buddhensis*). Leg 1 endopod of the male with the third segment, as far as known, having the formula I, I, 4 instead of I, 5 as in the female, except in *D. magnificus* where both sexes have I, 5. (In *D. gemmatus* this segment is I, II, 3 in the male). Leg 5 with a free segment bearing two terminal ele-

Key to Species of the Genus *Doridicola*

FEMALES

1. Body length 3 mm; caudal ramus with ratio 7.8:1 *D. magnificus*
Body length 2 mm or less; caudal ramus with ratio less than 3.5:1 2
2. Second antenna terminally with a claw and a long spine *D. fishelsoni*
Second antenna with two claws 3
3. Second maxilla with second tooth on lash much larger than the others in the series *D. astrophyticus*
Second maxilla with teeth on lash evenly graded 4
4. Two claws on second antenna setiform, long and slender *D. brevipes*
Two claws on second antenna stouter and clearly unguiform 5
5. Free segment of leg 5 with an inner proximal expansion sharply set off by a marginal indentation 6
Free segment of leg 5 without an inner proximal expansion thus delimited 7
6. Two terminal elements on second segment of leg 4 endopod very unequal (2.7:1); inner seta on first segment of this endopod naked *D. foxi*
Two terminal elements on second segment of leg 4 endopod more nearly equal (2.1:1); inner seta on first segment of this endopod feathered *D. bulbipes*
7. Inner margin of free segment of leg 5 with a distinct notch. *D. audens*
Inner margin of free segment of leg 5 smooth 8
8. Two setae on second segment of maxilliped nearly equal in length *D. buddhensis*
Two setae on second segment of maxilliped very unequal in length 9
9. Genital segment in dorsal view with subparallel sides 10
Genital segment in dorsal view with rounded lateral expansions 12
10. Caudal ramus with ratio 1.8:1; free segment of leg 5 with many small spinules *D. gemmatus*
Caudal ramus only a little longer than wide, or about as long as wide, free segment of leg 5 apparently smooth 11
11. Caudal ramus a little longer than wide; leg 4 endopod with second segment having the two elements very unequal in length (2:1) *D. rigidus*
Caudal ramus about as long as wide; leg 4 endopod with second segment having the two elements more nearly equal in length (1.3:1) *D. trispinosus*
12. Caudal ramus about as long as wide; body length 1.2 mm *D. agilis*
Caudal ramus clearly longer than wide (1.5-2:1); body length 1.5-2.3 mm 13
13. Two claws on second antenna nearly equal; two setae on second segment of maxilliped about 2:1; medial margin of caudal ramus straight *D. actinae*
Two claws on second antenna distinctly unequal; two setae on second segment of maxilliped about 5.6:1; medial margin of caudal ramus slightly bowed *D. ptilosarci*

ments and usually ornamented with spinules, spines, or setules, and often having an inner proximal expansion. Leg 6 represented in both sexes by the two setae near the genital openings.

Other features as in the species below.

Associated with actinarians, octocorals, opisthobranch mollusks, crinoids, ophiuroids, and polychaetes.

TYPE-SPECIES.—*Doridicola agilis* Leydig.

REMARKS.—The histories of the genera *Doridicola* and *Lichomolgus* have been rather confused. Leydig (1853) established his *Doridicola agilis* for a copepod species found on the nudibranch *Doris lugubris* at Trieste. His description and figures were very incomplete. Six years later Thorell (1859) described his new genus *Lichomolgus* based on several copepods found in ascidians. Later, various authors transferred Leydig's *agilis* to *Lichomolgus* (for example, Aurivillius, 1882b, 1883, Canu, 1892, etc.).

The genus *Doridicola* was used by relatively few authors after Leydig's original description. Both Claus (1875) and Aurivillius (1882a) employed this generic name. The work of Claus (1889) is of special interest, since it contains a description (under the name *Lichomolgus doridicola*) of *D. agilis* from *Doris* at the type locality. In this description Claus confirmed the nature of the mandible (with a scalelike area on the convex side of the base) and the presence of two claws on the second antenna. Canu (1892) also described these features.

It has been apparent for several years, following the studies by Stock on European *D. agilis*, that this species belongs to *Doridicola*, and that this generic name should be retained. Other species such as Thorell's *Lichomolgus albens*, having a slender mandible without a scalelike area and lacking sexual dimorphism in leg 1, remain in *Lichomolgus*.

A key to the males of *Doridicola* is not included here because sufficient information is not available in existing descriptions and figures. The male is unknown in four species: *D. brevipes*, *D. buddhensis*, *D. fishelsoni*, and *D. trispinosus*.

Doridicola agilis Leydig, 1853

Doridicola agilis Leydig, 1853, pp. 377–382, pl. 14, figs. 1–8 [from the nudibranch *Doris lugubris*, Trieste, Adriatic Sea].—Aurivillius, 1882a, pp. 34–39, pl. 5, figs. 1–12 [from the nudibranchs *Doris tuberculata* Cuvier and *Doris ver-*

rucosa Penn., Gullmarn, Sweden]; 1883, pp. 4–9, pl. 4, fig. 9 [from *Doris tuberculata* and *Doris verrucosa*, Gullmarn, Sweden].—Carus, 1885, p. 352.—Graeffe, 1900, p. 41 (= *Lichomolgus doridicola*) [from *Doridopsis limbata* and *Doris tuberculata*, Trieste, Italy].—Stock and Kleeton, 1963b, p. 258.

Doridicola agilis.—Odhner, 1922, p. 33 [from the nudibranch *Facelina drummondi* Thompson, Farsund, Norway].

Ergasilus.—Alder and Hancock, 1855, p. 27 [on the nudibranchs *Doris tuberculata* and *Antiope cristata*, England].
Eolidicola tenax M. Sars, 1862, p. 135.

Doridicola.—Hancock and Norman, 1863, p. 49.—Claus, 1875, pp. 348, 349, pl. 24, figs. 29, 29' [from *Doris lugubris*, Trieste, Italy].

Lichomolgus chromodoridis Della Valle, 1880a, pp. 101, 102, pl. 6, figs. 43–48 [from the nudibranch *Chromodoris elegans*, Naples, Italy]; 1880b, pp. 120, 121, pl. 2, figs. 43–48 [from *Chromodoris elegans*, Naples, Italy].—Carus, 1885, p. 351.

Lichomolgus agilis.—Aurivillius, 1882b, pp. 42, 43, pl. 13, fig. 9 [from *Doris tuberculata* and *Doris verrucosa*, Gullmarsfjord, Sweden]; 1883, pp. 38, 39, pl. 1, figs. 1–12 [from *Doris tuberculata* and *Doris verrucosa*, Gullmarsfjorden, Sweden].—Canu, 1892, pp. 228–230, pl. 22, figs. 1–14 [from the gills of the nudibranchs *Doris tuberculata* Cuvier, *Doris millegrana* Alder and Hancock, and *Doris johnstoni* Alder and Hancock, on the dorsal papillae of *Eolis coronata* Forbes, *Antiope cristata* Della Chiaje, and *Antiope hyalina* Alder and Hancock, Boulogne coast of France, and from *Doris tuberculata* and *Doris johnstoni*, Concarneau, France]; 1894a, p. 3; 1894b, p. 137 [among algae, Isles Chausey, northern France]; 1898, p. 399 [on *Eolis drummondi* W. Thompson, Saint-Marcouf, France].—T. Scott, 1894b, pp. 233, 258 (= *Lichomolgus concinnus* T. Scott); 1905, p. 207 [from *Doris tuberculatus*, Firths of Forth and Clyde, Scotland]; 1906, pp. 352, 353 [from St. Monans, Scotland, and from the gills of *Doris* (?) *tuberculatus*, Granton, Scotland].—Herdman, 1895, p. 45 [in tow-net, Morecambe Bay, near Port Erin, England].—Thompson, 1895, p. 102 [Morecambe Bay, England].—Gadeau de Kerville, 1898, pp. 342, 343 [on *Aeolis drummondi*].—Cuénot, 1903, p. 20.—Farran, 1913, p. 6 [on *Eolis papillosa*, Ballynakill Harbor, Clare Island, Ireland].—G. O. Sars, 1917a, pp. 161, 162, pl. 90 [from the nudibranchs *Doris*, *Eolis*, and *Polycera*, Norway].—Flattely and Walton, 1922, p. 146.—Pelseneer, 1928, p. 179.—Monod and Dollfus, 1932a, pp. 137, 138, figs. 3B, 8 [from the nudibranch *Armina verrucosa* (Cantraine), coast of Morocco, 30°34'30" N, 9°49'30" W; hosts listed as *Aeolidia papillosa* (Linnaeus), *Facelina longicornis* (Montagu) = *Eolidia coronata* Forbes and Goodsir, *Facelina curta* (Alder and Hancock) = *Eolis drummondi* Thompson, *Janolus hyalinus* (Alder and Hancock) = *Antiope hyalina* Alder and Hancock, *Janolus cristatus* (Della Chiaje) = *Antiope cristata* Alder and Hancock, *Idulia coronata* (Gmelin) = *Doto coronata* (Gmelin), *Armina verrucosa* (Cantraine) = *Pleurophylidia pustolosa* Bergh, *Sphaerostoma hombergi* (Cuvier) = *Tritonia hombergi* Cuvier, *Staurodoris verrucosa* (Cuvier) Bergh = *Dorodigitata derelicta* (Paul Fischer), *Proctonotus mucronifer* Alder and Hancock, *Eolis auctorum*,

- sensu lato, *Archidoris tuberculata* (Cuvier), *Archidoris britannica* (Johnston) Bergh = "*Doris tuberculata* Cuvier" Alder and Hancock, non Cuvier, *Thordisa millegrana* (Alder and Hancock) Bergh, *Jorunna tomentosa* (Cuvier) = *Doris johnstoni* Alder and Hancock, *Glossodoris elegans* Cantraine = *Chromodoris elegans* (Cantraine), *Dendrodoris lugubris* (I. L. C. Gravenhorst), *Euphurus claviger* (O. F. Müller) = *Triopa clavigera* (O. F. M.) Alder and Hancock, *Palio lessoni* (d'Orbigny) Bergh = *Polycera ocellata* Alder and Hancock, and *Polycera* sensu lato].—Leigh-Sharp, 1933, p. 113 [from the nudibranch *Archidoris britannica* (=tuberculata), Plymouth, England]; 1935, p. 48 [from the nudibranchs *Aeolidia papillosa* (Linnaeus), *Archidoris britannica* (Johnston), *Facelina longicornis* (Montagu), *Idulia* (*Doto*) *coronata* (Gmelin), *Janolus cristatus* (Della Chiaje), *Janolus hyalinus* (Alder and Hancock), *Jorunna tomentosa* (Cuvier), and *Sphaerostoma* (*Tritonia*) *hombergi* Cuvier, England].—Wilson, 1936, p. 268 [free, 66° to 67° off Cape Penryn, Melville Peninsula, Canada].—Lang, 1949, p. 8 [from *Archidoris tuberculata* (Cuvier), Gullmar Fjord, Bohus, Sweden].—Stock, 1952, p. 58 [from the nudibranch *Aeolidia papillosa* (Linnaeus), The Netherlands]; 1959a, p. 45 [from the tectibranch *Aplysia punctata* Cuvier, Gulf of Naples, Italy]; 1960c, pp. 241, 242 [from the gills of nudibranchs and sometimes tectibranchs, *Archidoris tuberculata* Cuvier, *Doris* ("*Staurodoris*") *verrucosa* (Linnaeus), *Facelina drummondi* (Thompson), and *Gasteropteron rubrum* (Rafinesque) = *G. meckeli* (de Blainville), Banyuls, Mediterranean coast of France]; 1964a, p. 67.—Pruvot-Fol, 1954, pp. 25, 26 [cites ex litt. the following hosts: *Dendrodoris limbata*, *Limacia clavigera*, *Polycera dubia*, *Polycera* sp., *Doris millegrana*, *Jorunna tomentosa*, *Doris verrucosa*, *Archidoris tuberculata*, *Glossodoris valenciennesi*, *Tritonia hombergi*, *Janolus hyalinus*, *Antipella cristata*, *Facelina drummondi*, *Zephyrina pilosa*, *Armina tigrina*, *Armina verrucosa*, *Doto coronata*, *Facelina coronata*].—Marine Biological Association, 1957, p. 176 [from *Archidoris tuberculata* (= *Archidoris pseudoargus*), *Archidoris britannica*, and *Jorunna tomentosa*, Rum Bay, Plymouth, England].—Bresciani and Lützen, 1962, p. 377.—Bocquet and Stock, 1963, p. 295.—Bocquet, Stock, and Kleeton, 1963, p. 38 [from the polychaete *Polynoe* sp., Rade de Brest, France].—Bruce, Coleman, and Jones, 1963, p. 127 [on 11 species of nudibranchs, Isle of Man, England].—Crothers, 1966, p. 52 [from *Archidoris pseudoargus*, Wales].—Swennen, 1967, p. 108 [on *Archidoris tuberculata*, The Netherlands].—Glaçon, 1971, p. 23 (unnumbered).—Shih, Figuiera, and Grainger, 1971, p. 214.
- Lichomolgus* (*Lichomolgus*) *agilis*.—Capart, 1941, p. 172 [from the nudibranch *Armina tigrina* Rafinesque, Kasamane, Senegal, 12°47' N, 17°7' W].
- Lichomolgus doridicola*.—Claus, 1889, pp. 2, 12, 13, pl. 2, figs. 1–12.—Canu, 1891a, p. 478 [from the gills of the nudibranchs *Doris tuberculata*, *Doris johnstoni*, and *Doris millegrana* and from the dorsal papillae of the nudibranchs *Antipoda hyalina* and *Eolis coronata*, Boulogne and Concarneau, France]; 1899, p. 73.—Voigt, 1892, p. 35.—Hecht, 1895, pp. 624, 625 [from the nudibranchs *Doris tuberculata*, *Doris johnstoni*, *Triopa clavigera*, *Eolis papillosa*, *Eolis coronata*, *Protonotus mucroniferus*, and *Antipoda cristata*, Roscoff, France].—Eliot, 1910, p. 26.—Hoffmann, 1926, p. 50.
- non *Lichomolgus agilis*.—Herdman, 1893, p. 83.—T. Scott, 1892, pp. 266, 267. (= *Herrmannella rostrata*.)
- Lichomolgus diordicola*.—Canu, 1892, p. 338.
- Lichomolgus concinnus* (provisional name).—T. Scott, 1892, p. 261 [off St. Monans, Firth of Forth, Scotland]; 1893b, p. 212, pl. 7, figs. 12–15 [from *Doris* (?) *tuberculata*, Granton, Scotland].
- Doridicola* sp. (cf. *agilis* Leydig, 1853)**
- Lichomolgus* sp. (cf. *agilis* Leydig).—Stock, 1960c, p. 242 [from the gills of cephalopod *Ommastrephes sagittatus* (Lamarck), in the market at Rosas, Catalanian coast of Spain].
- REMARKS.—Stock (1960c) was unable to make a definitive determination of the single female that he found. Since *D. agilis* has thus far been found only on opisthobranchs, its occurrence on a cephalopod would be very unusual. Because of the uncertain status of this form it has not been included in the key to species of *Doridicola*.
- Doridicola actinae* (Della Valle, 1880)**
- non *Doridicola antheae* Ridley, 1879, p. 458 [from the actiniarian *Anthea cereus*, near Ilfracombe, North Devon, England (perhaps = *Parantheus anemoniae* Claus, 1889)].
- Lichomolgus actinae* Della Valle, 1880a, pp. 97–99, pl. 6, figs. 27–32 [from the actiniarian *Actinia concentrica* var. *viridis*, Naples, Italy]; 1880b, pp. 118–119, pl. 1, figs. 27–30, pl. 2, figs. 31–32 [from *Actinia concentrica* var. *viridis*, Naples, Italy].—Carus, 1885, p. 351.—Canu, 1898, pp. 399–401, pl. 6, figs. 1–8 [in plankton, Grandchamp-les-Bains, France]; 1899, p. 76.—Gadeau de Kerville, 1898, p. 343.—De Zulueta, 1912, pp. 9, 10, 50.—Stock, 1960c, pp. 234–238, figs. 9, 10 [from the actiniarians *Actinia equina* Linnaeus and *Anemonia sulcata* (Penn.), Banyuls, Mediterranean coast of France, and from *Anemonia sulcata*, Split, Yugoslavia].—Carton, 1963, p. 1148 [from *Anemonia sulcata* and *Actinia equina*, Banyuls, France, and from *Anemonia sulcata*, Roscoff, France].—Bouligand, 1966, p. 269, pp. 301, 302 [from *Actinia equina* and *Anemonia sulcata*, Banyuls, France].
- Lichomolgus anemoniae* Claus, 1889, pp. 13, 14, pl. 3, figs. 1–7 [from the actiniarian *Anemonia sulcata*, Trieste, Italy].
- Lichomolgus fucicola* (non Brady).—Canu, 1899, p. 76.
- Doridicola astrophyticus*, new species**
- FIGURES 94–96
- TYPE MATERIAL.—91 ♀♀, 98 ♂♂ from eight basket stars, *Astrophyton muricatum* (Lamarck), in

7 m, Oistin's Bay, Christchurch, Barbados, 15 July 1959, collected by AGH and RUG. Holotype ♀, allotype, and 183 paratypes (88 ♀♀, 95 ♂♂) deposited in USNM; other paratypes (dissected) in the collection of AGH.

OTHER MATERIAL EXAMINED (all from *Astrophyton muricatum*).—*Barbados*: 12 ♀♀, 9 copepodids from single host, in 2 m, Six Men's Bay, St. Peter, 21 June 1959; and 8 ♀♀, 13 ♂♂ from single host, in 5 m, Carlisle Bay, Bridgetown, 16 June 1959.

Puerto Rico: 7 ♀♀, 7 ♂♂, and 16 copepodids from single host, in 2 m, Corona del Diablo Reef, south of La Parguera, southwestern Puerto Rico, 24 August 1959; 23 ♀♀, 32 ♂♂, and 5 copepodids from 19 hosts, in 4 m, lee side of Terremoto Reef, southeast of La Parguera, 6 August 1959; 2 ♂♂ from two hosts, in 9 m, south side of Terremoto Reef, 6 August 1959; 6 ♀♀, 17 ♂♂ from 20 hosts, in 3 m, Terremoto Reef, 9 August 1959; 27 ♀♀, 37 ♂♂ from 18 hosts, in 3 m, Laurel Reef, west of La Parguera, 13 August 1959; 4 ♀♀, 11 ♂♂, and 2 copepodids from 19 hosts, in 7 m, north side of Terremoto Reef, 15 August 1959; and 4 ♀♀, 13 ♂♂ from three hosts, in 4 m, Terremoto Reef, 6 August 1959.

Jamaica: 14 ♀♀, 41 ♂♂ from seven hosts, in 3 m, Lime Cay, near Kingston, 30 August 1959; and 9 ♀♀, 14 ♂♂ from single host, in 1.5 m, Maiden Cay, near Kingston, 4 September 1959. All collected by AGH and RUG.

FEMALE.—The body (Figure 94a) has the prosome not unusually expanded. The length (not including the setae on the caudal rami) is 1.30 mm (1.22–1.40 mm) and the greatest width 0.53 mm (0.48–0.56 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1.44:1. The ratio of the length of the prosome to that of the urosome is 1.43:1. The segment of leg 1 is separated from the cephalosome by a transverse dorsal furrow. The epimeral areas of the pedigerous segments are more or less rounded.

The segment of leg 5 (Figure 94b) is 99 x 172 μ. There is no ventral intersegmental sclerite between that segment and the genital segment. The genital segment is elongated, 213 x 156 μ. The areas of attachment of the egg sacs are located dorsolaterally just in front of the middle of the segment. Each area (Figure 94c) bears two small naked setae, 7 μ

and 14 μ. The three postgenital segments are 78 x 86 μ, 67 x 78 μ, and 70 x 81 μ from anterior to posterior. The anal segment has on its posteroventral border on each side a row of minute spinules.

The caudal ramus (Figure 94d) is 66 x 31 μ, or 2.13 times longer than wide. The outer lateral seta is 165 μ and naked, the dorsal seta 45 μ and lightly feathered, the outermost terminal seta 130 μ with hairs along the inner side proximally, the innermost terminal seta 208 μ and plumose proximally. The two long median terminal setae are 440 μ (outer) and 640 μ (inner), both plumose and inserted between dorsal (unornamented) and ventral (with a row of minute spinules) flaps.

The egg sac (Figure 94a) is globular, scarcely reaching to the anal segment, in dorsal view 340 x 240 μ in a specimen 1.28 mm long, and 260 x 187 μ in a specimen 1.20 mm long. There are numerous eggs about 52 μ in diameter.

The rostrum (Figure 94e) is broadly rounded posteroventrally.

The first antenna (Figure 94f) is 516 μ long. The lengths of its seven segments (measured along their posterior nonsetiferous margins) are 44 (83 μ along the anterior margin), 126, 31, 88, 78, 62, and 48 μ respectively. The formula for the armature is 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All the setae are naked.

The second antenna (Figure 94g) is 4-segmented. The first two segments bear a small inner seta. The third segment bears three setae, one of them bent. The fourth segment, 110 μ along its outer edge, 77 μ along its inner edge and 26 μ wide, has two terminal claws, the more slender one 42 μ along its axis, the stouter one 43 μ, and five slender setae. All the setae are naked.

The labrum (Figure 94h) has two linguiform posteroventral lobes.

The mandible (Figure 95a) has on the convex edge of the base a scalelike area with a curved row of spines followed by a serrated lamella; the concave edge has a shallow indentation followed by a transverse row of slender spinules which become coalesced. The lash is moderately long and barbed. The paragnath (Figure 94h) is a slender hairy lobe. The first maxilla (Figure 95b) has three elements. The second maxilla (Figure 95c) has an unornamented first segment. The second segment has a proximal seta on the outer (ventral) surface, a surficial posterior barbed seta, and a distal inner

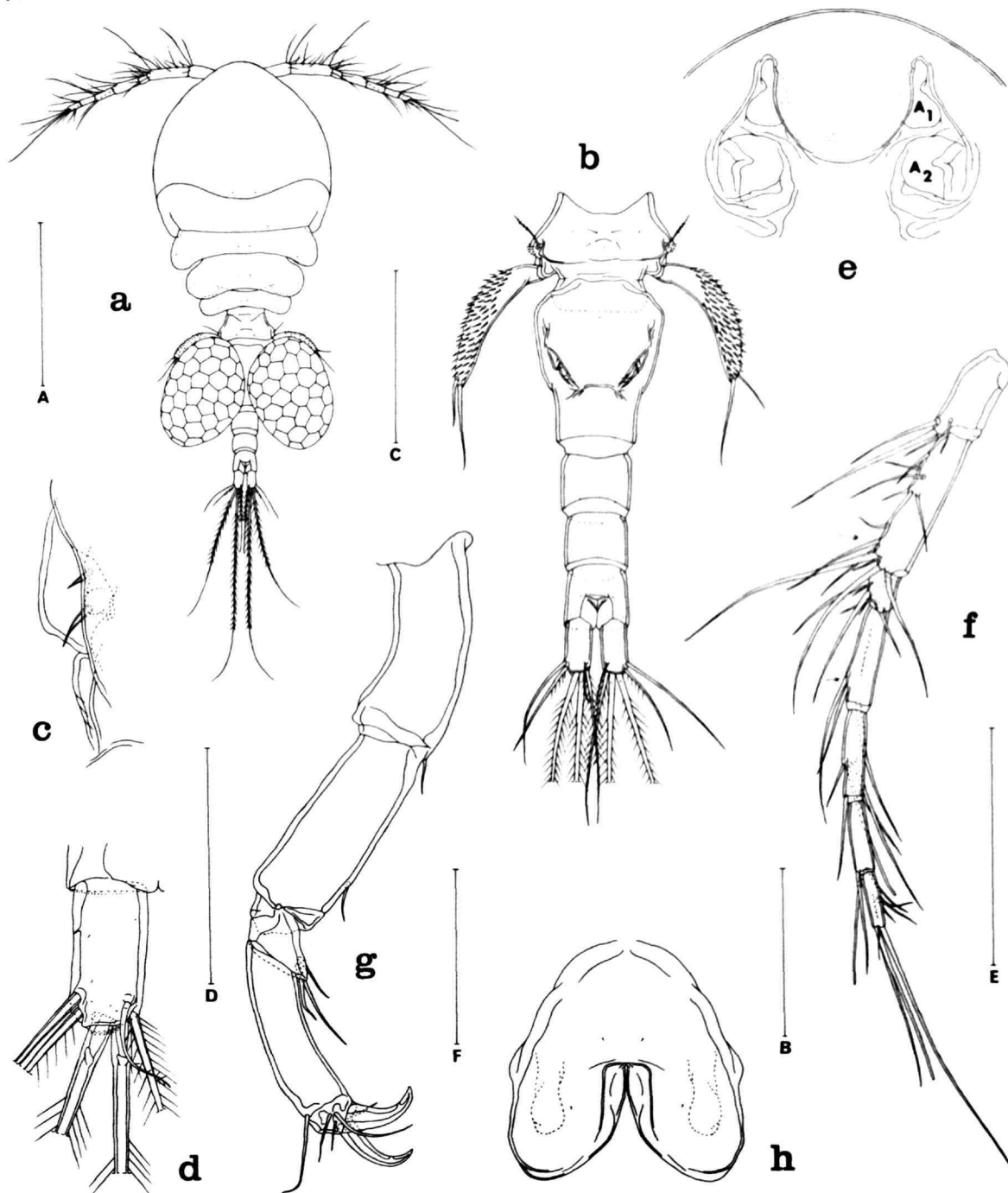


FIGURE 94.—*Doridicola astrophyticus*, new species. Female: a, dorsal (A); b, urosome, dorsal (B); c, area of attachment of egg sac, dorsal (C); d, caudal ramus, dorsal (D); e, rostrum, ventral (E); f, first antenna, with arrows indicating positions of additional aesthetes in male, dorsal (E); g, second antenna, anterior (F); h, labrum, with paragnaths indicated by broken lines, ventral (D). Scale: A, 0.5 mm; B, E, 0.2 mm; C, 0.05 mm; D, F, 0.1 mm.

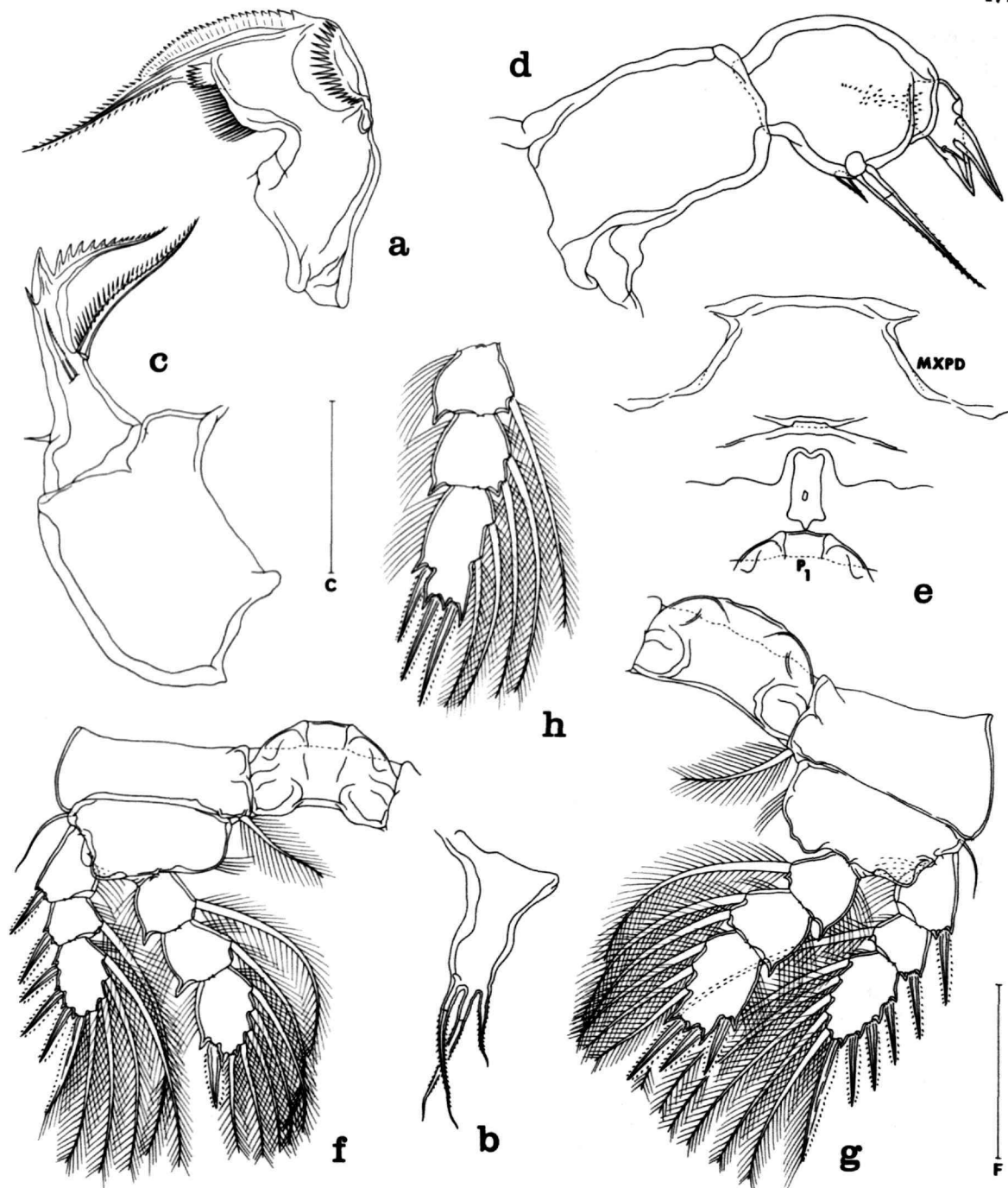


FIGURE 95.—*Doridicola astrophyticus*, new species. Female: *a*, mandible, posterior (c); *b*, first maxilla, posterior (c); *c*, second maxilla, posterior (c); *d*, maxilliped, posterior (c); *e*, area between maxillipeds and first pair of legs, ventral (F); *f*, leg 1 and intercoxal plate, anterior (F); *g*, leg 2 and intercoxal plate, anterior (F); *h*, endopod of leg 3, anterior (F). Scale: c, 0.05 mm; F, 0.1 mm.

(dorsal) seta with slender spinules along one edge, and it terminates in a short lash whose second tooth is much larger than the rest. The maxilliped (Figure 95d) has an unornamented first segment. The second segment bears two very unequal, finely barbed setae and a group of posterior surficial spinules. The third segment has a barbed spine and a slender setule and terminates in a barbed spiniform process.

The ventral area between the maxillipeds and the first pair of legs (Figure 95e) is not protuberant. A sclerotized line connects the bases of the maxillipeds.

Legs 1-4 (Figures 95f-h, 96a) have the usual segmentation and armature of the genus. The inner coxal seta is long and plumose in legs 1-3 but short (17 μ) and naked in leg 4. The inner margin of the basis is haired in legs 1-3 but naked in leg 4. The three spines on the last segment of the endopod of leg 3 (Figure 95h) are 46, 50, and 64 μ from outer to inner. The exopod of leg 4 is 177 μ long. The endopod of leg 4 (Figure 96a) has the first segment 51 x 37 μ (without the spiniform processes), with its distal inner naked seta 29 μ . The second segment is 110 μ long (including the spinous processes) and 21 μ wide at the middle, its two terminal fringed spines 64 μ (outer) and 83 μ (inner). Both segments bear outer hairs, and the second segment has spinules near the insertions of the spines.

Leg 5 (Figure 96b) has a recurved free segment, 156 x 47 μ , one of its two terminal elements 55 μ and naked, and the other 96 μ with a slight lamella. The segment is ornamented outwardly with strong spines. The adjacent seta on the body is relatively short and finely haired, with a group of spinules near its insertion.

Leg 6 is represented by the two setae near the area of attachment of each egg sac (Figure 94c).

The color in life in transmitted light is very light brown, the eye red, the egg sacs dark brown.

MALE.—The body (Figure 96c) resembles that of the female in general form. The length (without the ramal setae) is 1.04 (1.01-1.10 mm) and the greatest width 0.36 mm (0.35-0.37 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1.52:1. The ratio of the length of the prosome to that of the urosome is 1.18:1.

The segment of leg 5 (Figure 96d) is 44 x 112 μ . There is no ventral intersegmental sclerite. The genital segment is 195 x 188 μ . The four postgenital segments are 47 x 70 μ , 47 x 68 μ , 45 x 62 μ , and 57 x 65 μ from anterior to posterior.

The rostral area is like that of the female.

The first antenna is like that of the female but has two additional aesthetes (at points indicated by arrows in Figure 94f) so that the formula is 4, 13 + 1 aesthete, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete.

The second antenna resembles that of the female but the inner surface of the second segment is squamous (Figure 96e).

The labrum, mandible, paragnath, first maxilla, and second maxilla are like those of the female. The maxilliped (Figure 96f) is slender. The first segment has a small inner distal spiniform process. The second segment is expanded inwardly, bears two setae, one slender and naked and the other stouter and finely barbed, and two rows of spines. The third segment is unornamented. The claw is 200 μ along its axis, with a weak division about midway, and bears two very unequal proximal setae.

Leg 1 has an exopod like that in the female; the endopod (Figure 96g) has the last segment with the formula I,I,4, the outer spine being stouter than in the female and having more slender barbules. Leg 2 has an exopod like that in the female; the endopod (Figure 96h) has the middle spine on the last segment curiously bent. Legs 3 and 4 are like those of the female.

Leg 5 (Figure 96d) has a rectangular free segment, 43 x 12 μ , ornamented with a few small spines; its two terminal elements are 46 μ and 35 μ .

Leg 6 (Figure 96d) consists of a posteroventral flap on the genital segment, bearing two naked setae 30 μ and 44 μ .

The spermatophore is unknown.

The color resembles that of the female.

ETYMOLOGY.—The specific name *astrophyticus* is a modification of the generic name of the host (adapted from *φυτικός*, of plants).

REMARKS.—*Doridicola astrophyticus* differs from all other members of the genus in the much enlarged tooth on the lash of the second maxilla in both sexes. Another distinctive character is the naked seta on the first endopod segment of leg 4. In all species except *D. foxi* (Gurney, 1927) and

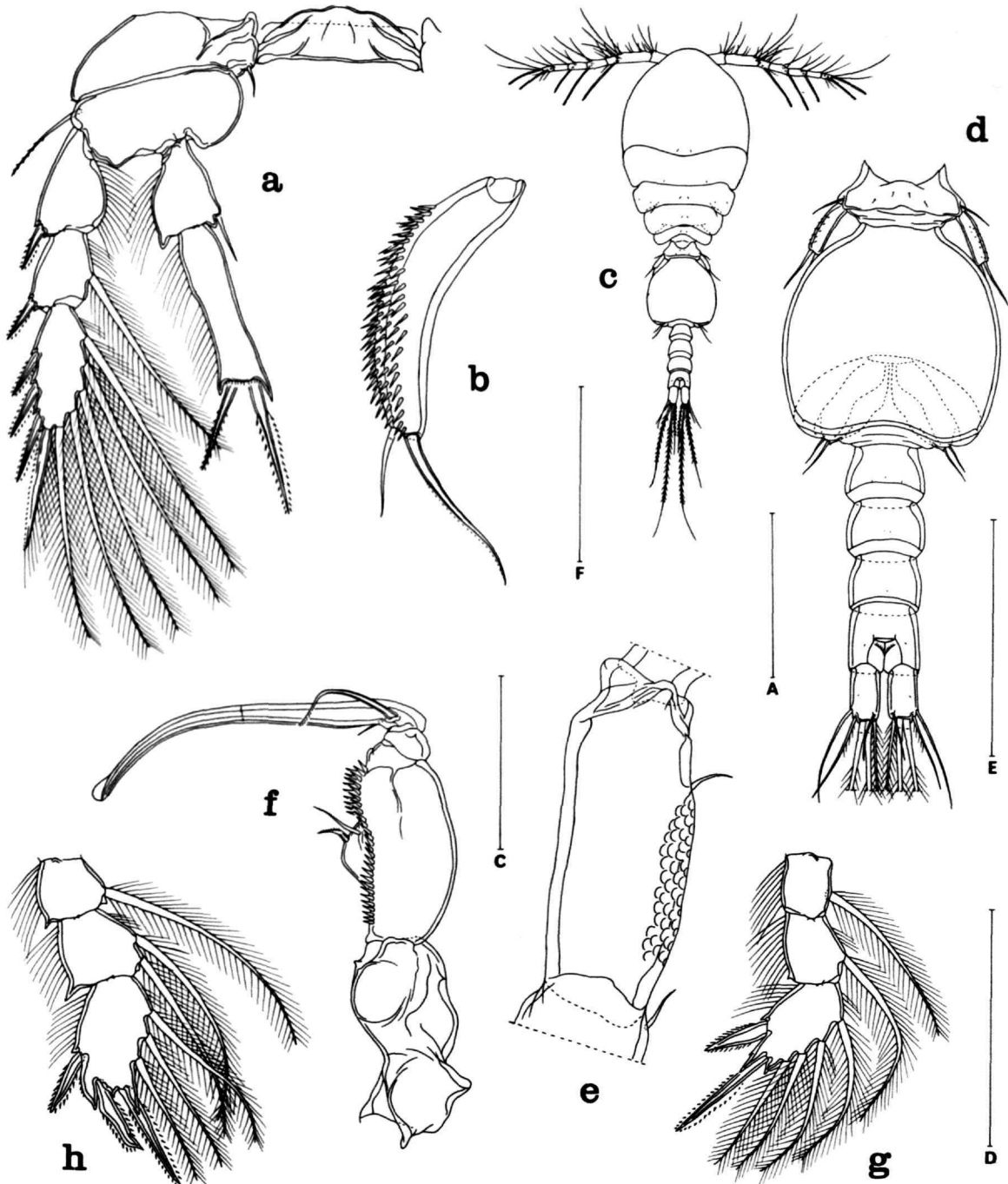


FIGURE 96.—*Doridicola astrophyticus*, new species. Female: *a*, leg 4 and intercoxal plate, anterior (F); *b*, free segment of leg 5, inner (F). Male: *c*, dorsal (A); *d*, urosome, dorsal (E); *e*, second segment of second antenna, posterior (C); *f*, maxilliped, inner (F); *g*, endopod of leg 1, anterior (D); *h*, endopod of leg 2, anterior (D). Scale: A, 0.5 mm; C, 0.05 mm; D, F, 0.1 mm; E, 0.2 mm.

D. buddhensis (Thompson and A. Scott, 1903) this seta is feathered. These two species may be separated from *D. astrophyticus*, however, by the ratio of the length to the width of the caudal ramus (quadrate in *D. buddhensis*, 1.16:1 in *D. foxi*).

***Doridicola audens* (Humes, 1959)**

Lichomolgus audens Humes, 1959, pp. 303-309, figs. 97-124 [from the nudibranch *Platydoris scabra* (Cuvier), region of Nosy Bé, Madagascar].

***Doridicola brevipes* (Shen and Lee, 1966)**

Macrochiron (*Macrochiron*) *brevipes* Shen and Lee, 1966, pp. 218, 219, 223, figs. 18-26 [from plankton, Chaikiang River, Kwantung Province, China].

REMARKS.—The male is unknown.

***Doridicola buddhensis* (Thompson and A. Scott, 1903)**

Lichomolgus buddhensis Thompson and A. Scott, 1903, p. 279, pl. 15, figs. 18-24 [from washings of dredged invertebrates, Ceylon].—A. Scott, 1909, pp. 263, 264 [in washings of dredged invertebrates, Siboga Stations 164 and 226, midway between the Lucipara and Schildpad Islands].
Macrochiron buddhensis.—Stock, 1957, p. 381.

REMARKS.—The male is unknown.

***Doridicola bulbipes* (Stock and Kleeton, 1963)**

Lichomolgus bulbipes Stock and Kleeton, 1963b, pp. 251-257, figs. 4-6 [from the alcyonaceans *Alcyonium acaule* Marion and *Parerythropodium coralloides* (Pall.), vicinity of Banyuls, France, and Cap Creus, Spain].

***Doridicola fishelsoni* (Stock, 1967)**

Lichomolgus fishelsoni Stock, 1967b, pp. 574-578, figs. 4, 5 [from the crinoid *Oligometra serripinna* (P. H. Carpenter), Gulf of Aqaba, Israel].

REMARKS.—The male is unknown.

***Doridicola foxi* (Gurney, 1927)**

Lichomolgus foxi Gurney, 1927, pp. 468, 469, fig. 113 [from Suez Canal].—Humes and Ho, 1968c, pp. 655-662, figs. 67-88 [from the alcyonaceans *Cladiella kremppii* Hickson, *Cladiella laciniosa* (Tixier-Durivault), and *Cladiella pachyclados* (Klunzinger), region of Nosy Bé, Madagascar].

NEW RECORD.—From *Cladiella laciniosa*: 25 ♀♀, 9 ♂♂, and 4 copepodids, in 2 m, west of Pte. de Tafondro, Nosy Bé, Madagascar, 30 May 1967.

NEW HOSTS.—From *Cladiella latissima* (Tixier-Durivault): 55 ♀♀, 43 ♂♂, and 45 copepodids, in 1 m, Pte. de Tafondro, Nosy Bé, Madagascar, 12 July 1967; 2 ♀♀, 2 ♂♂, in 18 m, Banc du Touareg, near Nosy Bé, Madagascar, 11 July 1967.

From *Cladiella sphaerophora* (Hemprich and Ehrenberg): 14 ♀♀, 24 ♂♂, and 24 copepodids, in 1 m, Nosy N'Tangam, near Nosy Bé, Madagascar, 21 July 1967. All collected by AGH.

***Doridicola gemmatus* (Humes, 1964)**

Lichomolgus gemmatus Humes, 1964, pp. 60-62, figs. 1-42 [from the actinarian *Stoichactis giganteum* (Forskål), Nosy Bé, Madagascar].—Bouligand, 1966, p. 269.

REMARKS.—This species is unusual in its formula for the third segment of leg 1 endopod in the male (1,11,3).

***Doridicola magnificus* (Humes, 1964)**

Lichomolgus magnificus Humes, 1964, pp. 63-65, figs. 43-73 [from the actinarian *Stoichactis giganteum* (Forskål), Nosy Bé, Madagascar].—Bouligand, 1966, p. 269.

REMARKS.—This species is unique in *Doridicola* (so far as known) in lacking sexual dimorphism in the formula for the third segment of leg 1 endopod.

***Doridicola ptilosarci*, new species**

FIGURES 97-100

TYPE MATERIAL.—47 ♀♀, 11 ♂♂, and 2 copepodids between the flaps and from the surface of the stem of the sea pen *Ptilosarcus gurneyi* Gray [= *Leioptilum quadrangulare* (Moroff)], Friday Harbor, San Juan Island, Washington, 17 August 1949, collected by J. L. Mohr. USNM 184568.

FEMALE.—The body (Figure 97a) has a moderately broad prosome. The length (not including the ramal setae) is 1.94 mm (1.82-2.08 mm) and the greatest width 0.85 mm (0.83-0.90 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1.36:1. The ratio of the length of the prosome to that of the urosome is 1.74:1. The segment of leg 1 is separated from the cephalosome by a transverse dorsal furrow. The epimera of legs 1-4 are rounded.

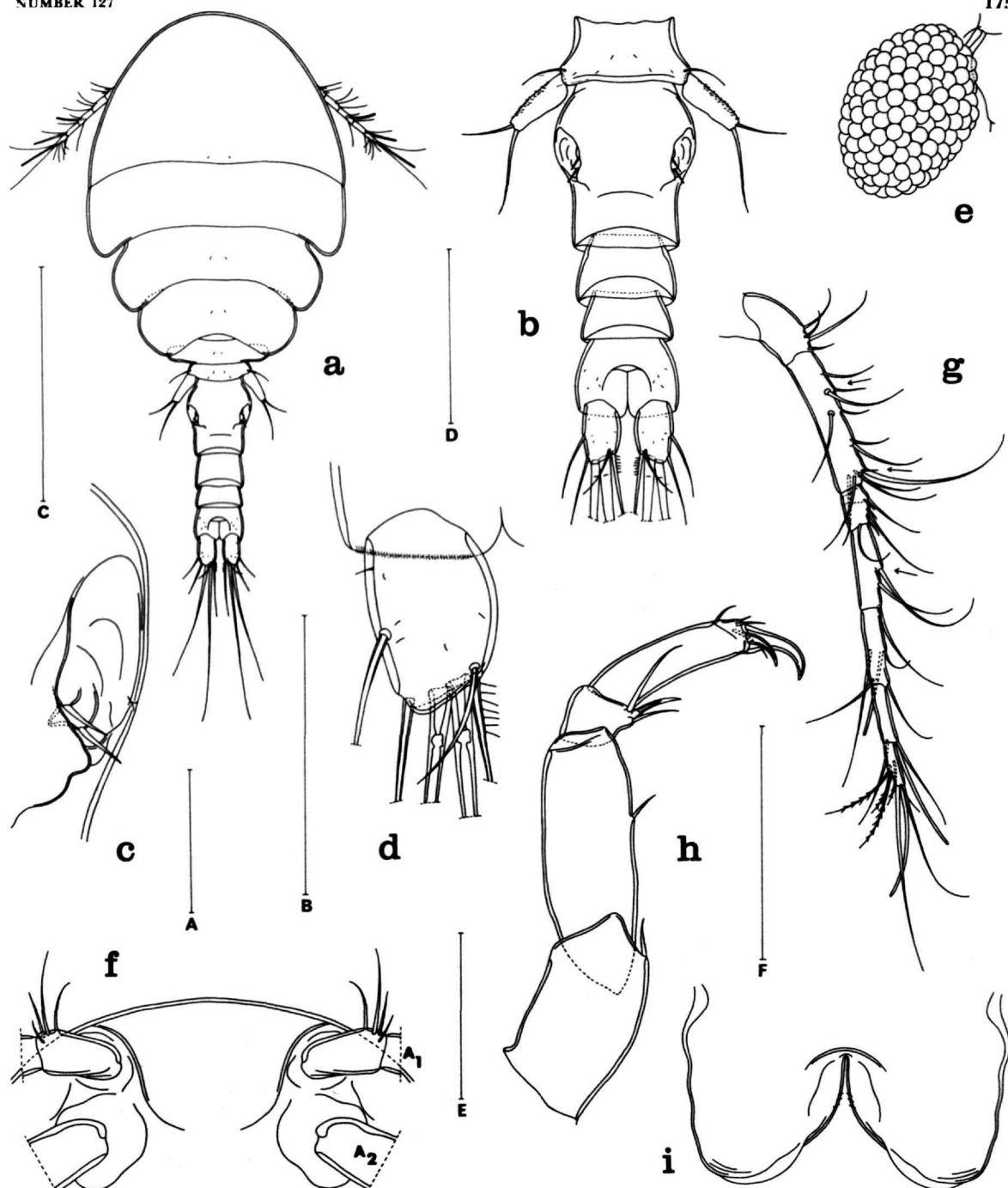


FIGURE 97.—*Doridicola ptilosarci*, new species. Female: a, dorsal (A); b, urosome, dorsal (B); c, area of attachment of egg sac, dorsal (C); d, caudal ramus, dorsal (D); e, egg sac, with outline of adjacent urosome, dorsal (A); f, rostrum, ventral (E); g, first antenna, with arrows indicating positions of additional aesthetascs in male, dorsal (E); h, second antenna, posterior (F); i, labrum, ventral (D). Scale: A, B, 0.5 mm; C, D, 0.1 mm; E, F, 0.2 mm.

The segment of leg 5 (Figure 97b) is $109 \times 224 \mu$. There is no ventral intersegmental sclerite between that segment and the genital segment. The genital segment is $292 \times 260 \mu$ in greatest dimensions, a little longer than wide, in dorsal view swollen laterally in its anterior half. The areas of attachment of the egg sacs are located dorsolaterally near the middle of the segment. Each area (Figure 97c) bears two naked setae about 20μ long. The three postgenital segments are $127 \times 174 \mu$, $96 \times 164 \mu$, and $130 \times 182 \mu$ from anterior to posterior. The posteroventral border of the anal segment bears on both sides a row of small, slender spinules.

The caudal ramus (Figure 97d) is $107 \times 70 \mu$, about 1.5 times longer than wide. The outer lateral seta is 114μ , the dorsal seta 66μ , the outermost terminal seta 130μ , the innermost terminal seta 177μ , and the two long median terminal setae 470μ (outer) and 640μ (inner), both inserted between smooth dorsal and ventral flaps. All these setae are naked except the innermost terminal one which has an inner proximal row of slender spinules. The dorsal surface of the ramus bears a few hairs.

The body surface has a few hairs (sensilla) as indicated in Figure 97a,b.

The egg sac (Figure 97e) is ovoid, $640 \times 450 \mu$, reaches as far as the anal segment, and contains many eggs about 57μ in diameter.

The rostrum (Figure 97f) is rounded, with its posteroventral margin incompletely defined.

The first antenna (Figure 97g) is slender, 597μ long. The lengths of the seven segments (measured along their posterior nonsetiferous margins) are 47 (99μ along the anterior margin), 159, 44, 94, 86, 65, and 50μ respectively. The formula for the armature is 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All the setae are naked except four on the terminal segment which are lightly haired.

The second antenna (Figure 97h) bears a very finely barbed inner seta on each of the first two segments. The third segment bears two slender setae and a spiniform seta, all naked. The fourth segment, 140μ along its outer edge, 104μ along its inner edge, and 39μ wide, bears terminally two unequal claws 58μ and 36μ along their axes and five small hyaline elements.

The labrum (Figure 97i) has two rounded posteroventral lobes.

The mandible (Figure 98a) resembles in general features that of *Paradoridicola squamiger* (Humes and Frost, 1964). The transverse row of spinules beyond the indentation turns anteriorly at the base of the lash. The paragnath (Figure 98b) is a small hairy lobe. The first maxilla (Figure 98c) bears four elements. The second maxilla (Figure 98d) has a row of a few minute spinules on the outer (ventral) surface of the first segment. The second segment bears proximally on its outer (ventral) margin a short, naked setule, on its posterior surface a seta with a few hairs, and on its inner (dorsal) margin a spinelike seta with long strong spinules. The terminal lash has a row of graduated teeth. The maxilliped (Figure 98e) has two very unequal setae on the second segment, the longer one finely barbed, the shorter one naked. The third segment, bearing a slender setule and a barbed spine, terminates in a barbed spiniform process.

The ventral area between the maxillipeds and the first pair of legs (Figure 98f) is only slightly protuberant, with a fine line connecting the bases of the maxillipeds.

Legs 1-4 (Figures 98g-i, 99a) have the same segmentation and armature as in *P. squamiger*. The inner coxal seta of legs 1-3 is long and plumose, but in leg 4 this seta is short (16μ) and naked. The inner margin of the basis is haired in legs 1-3 but naked in leg 4. The exopod of leg 4 is 265μ long, with the third segment having the formula III, I, 5. The first segment of the endopod (Figure 99a) is $60 \times 36 \mu$ (not including the spiniform processes) and its inner distal plumose seta 51μ . The second segment is $128 \times 30 \mu$, including the spiniform processes. The two terminal barbed spines are 70μ (outer) and 120μ (inner). Both segments have an outer row of hairs.

Leg 5 (Figure 99b) has a free segment 125μ long, 47μ in greatest width proximally, and 23μ in least width distally. The two terminal naked setae are 143μ and 88μ . The segment is ornamented with small spinules along its outer surface. The adjacent seta on the body is 65μ and naked.

Leg 6 is represented by two setae near the attachment of each egg sac (Figure 97c).

The color in life is unknown.

MALE.—The body (Figure 99c) resembles in general shape that of the female. The length (without the setae on the caudal rami) is 1.57 mm ($1.44\text{--}1.63 \text{ mm}$) and the greatest width 0.58 mm (0.55--

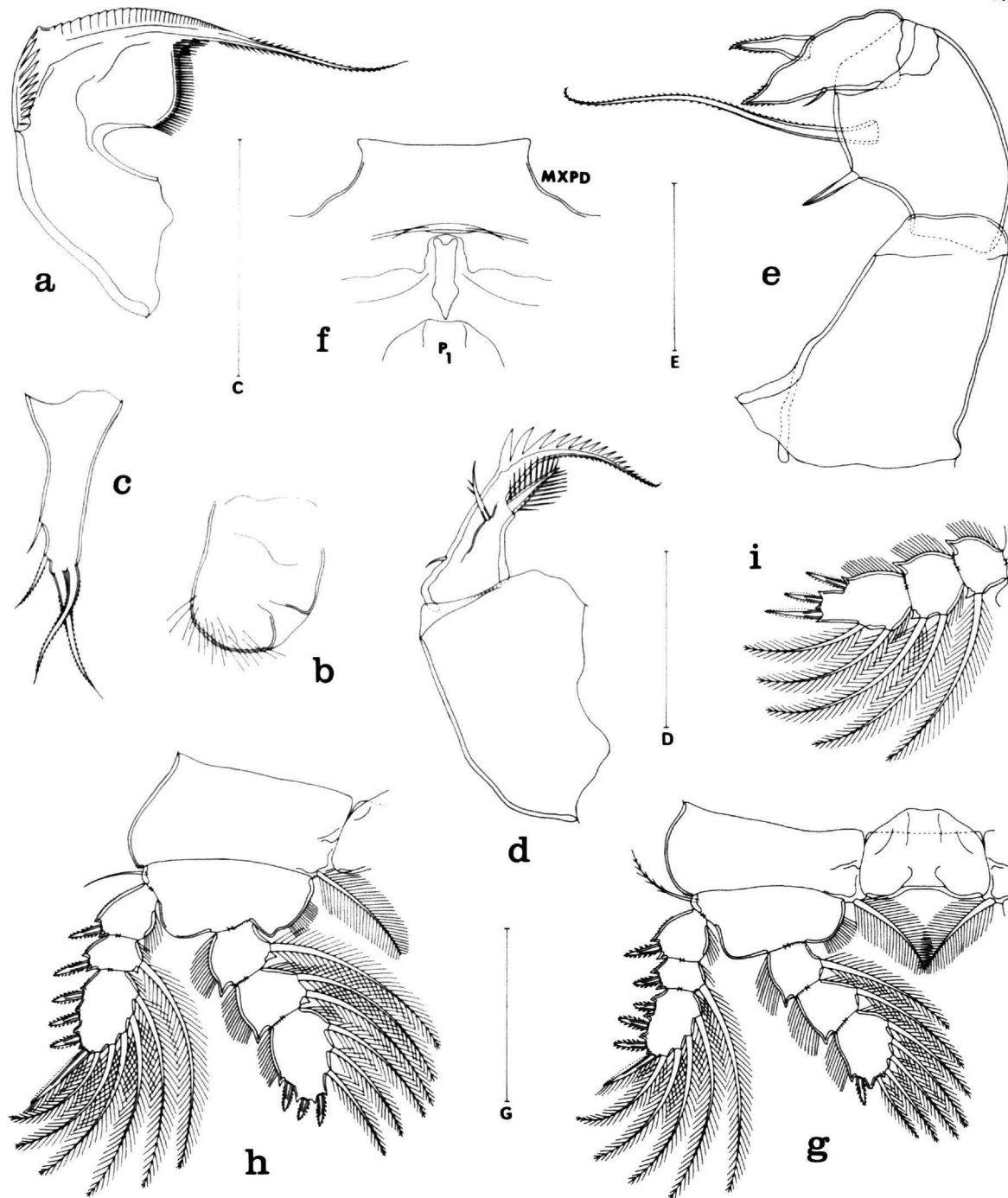


FIGURE 98.—*Doridicola ptilosarci*, new species. Female: a, mandible, posterior (c); b, paragnath, posterior (c); c, first maxilla, posterior (c); d, second maxilla, posterior (D); e, maxilliped, anterior (c); f, area between maxillipeds and leg 1, ventral (E); g, leg 1 and intercoxal plate, anterior (E); h, leg 2, anterior (E); i, endopod of leg 3, anterior (E). Scale: c, d, 0.1 mm; e, 0.2 mm; g, 0.05 mm.

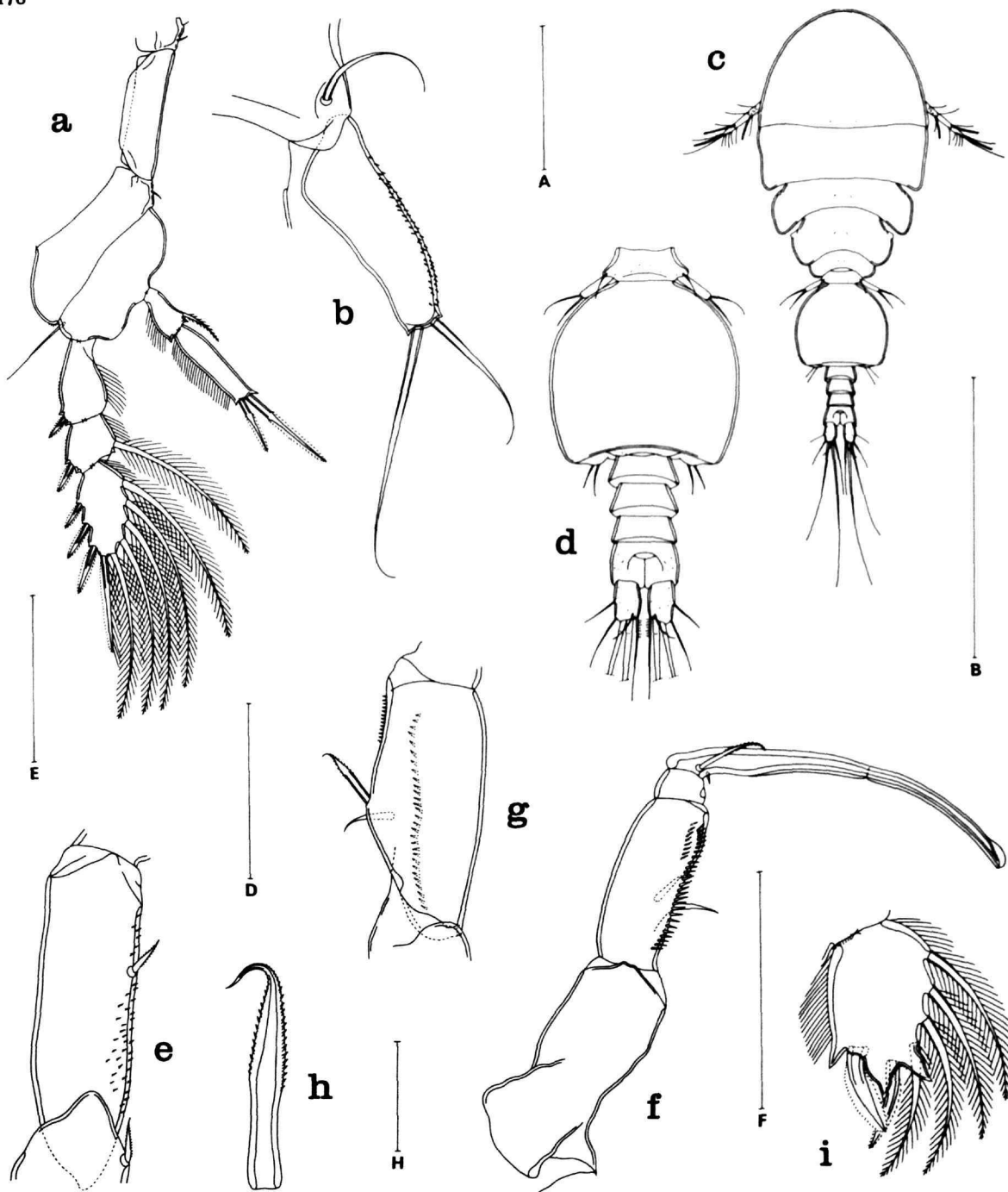


FIGURE 99.—*Doridicola ptilosarci*, new species. Female: *a*, leg 4 and intercoxal plate, anterior (E); *b*, leg 5, dorsal (D). Male: *c*, dorsal (A); *d*, urosome, dorsal (B); *e*, second segment of second antenna, posterior (D); *f*, maxilliped, postero-inner (F); *g*, second segment of maxilliped, inner (D); *h*, barbed seta on second segment of maxilliped, outer (H); *i*, third segment of endopod of leg 1, anterior (D). Scale: A, B, 0.5 mm; D, 0.1 mm; E, F, 0.2 mm; H, 0.02 mm.

0.63 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1.54:1. The ratio of the length of the prosome to that of the urosome is 1.52:1. The form of the epimera of the pedigerous segments is slightly different from that in the female.

The segment of leg 5 (Figure 99d) is $55 \times 159 \mu$. There is no ventral intersegmental sclerite. The genital segment is $308 \times 326 \mu$. The four postgenital segments are $55 \times 122 \mu$, $57 \times 117 \mu$, $42 \times 109 \mu$, and $78 \times 112 \mu$ from anterior to posterior.

The caudal ramus resembles that of the female, but is smaller, $78 \times 50 \mu$.

The rostrum is like that of the female.

The first antenna is similar to that of the female, but there are two additional aesthetes on the second segment and one additional aesthete on the fourth segment (at locations indicated by arrows in Figure 97g), so that the formula is 4, $13 + 2$ aesthetes, 6, $3 + 1$ aesthete, $4 + 1$ aesthete, $2 + 1$ aesthete, and $7 + 1$ aesthete.

The second antenna is similar to that of the female, but the inner surface of the second segment bears small slender needlelike spinules (Figure 99e).

The labrum, mandible, paragnath, first maxilla, and second maxilla are like those of the female. The maxilliped (Figure 99f) is long and slender. The second segment is stouter in an inner view (Figure 99g) than in a postero-inner view. It bears two rows of spines and two setae, one of them naked, the other barbed (Figure 99h). The claw, 280μ along its axis and weakly divided about

midway, is slightly swollen proximally and carries the usual two unequal proximal setae.

The ventral area between the maxillipeds and the first pair of legs is like that of the female.

Legs 1–4 are segmented as in the female and have the same spine and setal formula except for the endopod of leg 1 where the last segment (Figure 99i) is 1,1,4. Slight sexual dimorphism occurs in the endopod of leg 2 where the outer spine is stouter than in the female (Figure 100a). Legs 3 and 4 are like those of the female.

Leg 4 (Figure 100b) has a free segment $54 \times 20 \mu$, slenderer than in the female. The two terminal setae are 72μ (naked) and 69μ (with outer barbules). The segment is outwardly spinulose as in the female.

Leg 6 (Figure 100c) consists of a posteroventral flap on the genital segment that bears two naked setae, 75μ and 55μ , and shows an outer group of undulating striations.

The spermatophore (Figure 100d), attached to the female in pairs, is $234 \times 112 \mu$, not including the neck.

The color in life is unknown.

ETYMOLOGY.—The specific name, *ptilosarci*, is based on the name of the pennatulacean genus serving as host.

REMARKS.—Most species of *Doridicola* are distinctly smaller than *D. ptilosarci*, and only one, *D. magnificus* (Humes, 1964), is larger. Two species, *D. fishelsoni* (Stock, 1967) and *D. actinae* (Della Valle, 1880), have a size similar to that in the new species. Both of these species, however, may be

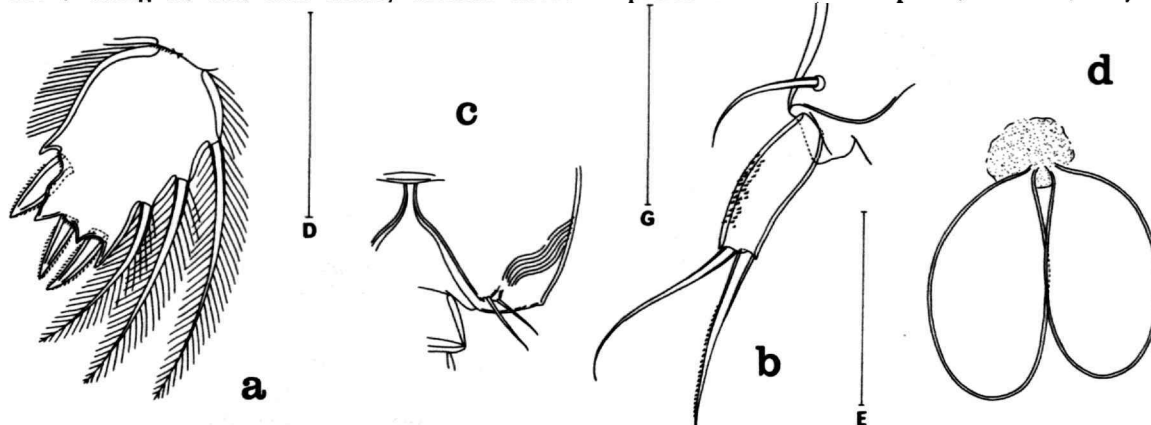


FIGURE 100.—*Doridicola ptilosarci*, new species. Male: a, third segment of endopod of leg 2, anterior (d); b, leg 5, dorsal (c); c, leg 6, ventral (e); d, spermatophores, attached to female, dorsal (e). Scale: d, 0.1 mm; e, 0.2 mm; c, 0.05 mm.

readily distinguished from *D. ptilosarci*. In *D. actiniae* the length to width ratio of the female caudal ramus is about 2.2:1 and the ramal setae are haired. The relative length of the two setae on the second segment of the female maxilliped also serves as a distinguishing feature. In *D. fishelsoni* the last segment of the second antenna bears a claw and a long spine, instead of two claws as in the new species.

***Doridicola rigidus* (Ummerkuty, 1962)**

Macrochiron (*Macrochiron*) *rigida* Ummerkuty, 1962, pp. 47-52, pl. 9, figs. 6-9, pl. 10, figs. 1-6 [from washings of weeds and invertebrates, mainly sponges, Gulf of Mannar, southeastern India].

***Doridicola trispinosus* (Stock, 1959)**

Lichomolgus trispinosus Stock, 1959b, pp. 64-66, figs. 3, 4 [from the pennatulacean *Pennatula rubra* Ell., Gulf of Naples, Italy].—Bouligand, 1966, p. 269.

REMARKS.—The male is unknown.

Genus *Epimolgus* Bocquet and Stock, 1956

DIAGNOSIS.—Body of the female somewhat transformed, with a moderately swollen prosome. Body

of the male cyclopiform. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six setae. Rostrum broadly rounded. First antenna 7-segmented. Second antenna 4-segmented, robust, with terminally a large claw, a smaller clawlike spine, and two setae.

Labrum indented medially. Mandible with a slender base distally with a row of spinules on its concave side and on its convex side; lash long and pectinate. First maxilla with three elements. Second maxilla of the usual lichomolgid type. Maxilliped in the female 3-segmented, in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1-4 with 3-segmented rami except for leg 4 endopod, which is 2-segmented. Leg 4 exopod with the third segment having II, I, 5. Leg 4 endopod with the formula 0-1; II, the seta being feathered. Leg 1 endopod of the male with an armature like that in the female. Leg 5 with a free segment bearing two terminal elements. Egg sacs longer than the body.

Other features as in the species below.

Associated with gastropod mollusks.

TYPE-SPECIES.—*Epimolgus trochi* (Canu).

REMARKS.—The male of *E. orientalis* is unknown.

Key to Species of the Genus *Epimolgus*

FEMALES

- Prosomal segments bulging laterally; egg sacs arcuate *E. orientalis*
 Prosomal segments not bulging laterally; egg sacs almost straight *E. trochi*

***Epimolgus trochi* (Canu, 1899)**

FIGURE 101

Lichomolgus trochi Canu, 1899, pp. 75-79, pl. 8, figs. 1-10 [from the gastropod *Trochus umbilicatus* Linnaeus = *Gibbula umbilicalis* (da Costa), Wimereux, channel coast of France].—Dollfus, 1927, pp. 120, 121 [from *Gibbula* (*Steromphalus*) *cineraria* (Linnaeus), Roscoff, northern France].—Pelseneer, 1929, p. 44.—Gotto, 1962, p. 103.—Arvy, 1963, p. 146.

Lichomolgus (*Macrochiron*) *trochi*.—Monod and Dollfus, 1932a, p. 141, figs. 1A-F, 24c [from the pallial cavity of *Gibbula cineraria* Linnaeus, Roscoff, northern France].
 non *Lichomolgus trochi*.—Gaillard, 1953, p. 16 (= *Trochicola entericus*).

Lichomolgus (*Epimolgus*) *trochi*.—Bocquet and Stock, 1956, pp. 10-16, figs. 1, 2 [from the gastropods *Gibbula cineraria* (Linnaeus), *Gibbula umbilicalis* (da Costa), and *Mono-*

donta lineata (da Costa), northern France].—Stock, 1960c, pp. 246, 247, fig. 15 [from pallial cavity of *Gibbula varia* (Linnaeus), Banyuls, Mediterranean coast of France].

Epimolgus trochi.—Stock, 1957, p. 381.

Macrochiron trochi.—Stock, 1957, p. 381.

***Epimolgus orientalis* (Heegaard, 1962)**

Alimeda orientalis Heegaard, 1962, pp. 155, 156, figs. 27-36 [from the gill flaps of the opisthobranch *Aplysia*, Port Jackson, New South Wales].—Ho, 1970, p. 113.

REMARKS.—Heegaard placed this species in the family Chondracanthidae, but it is obviously a lichomolgid and as far as can be learned from the original description it belongs in the genus *Epimolgus*.

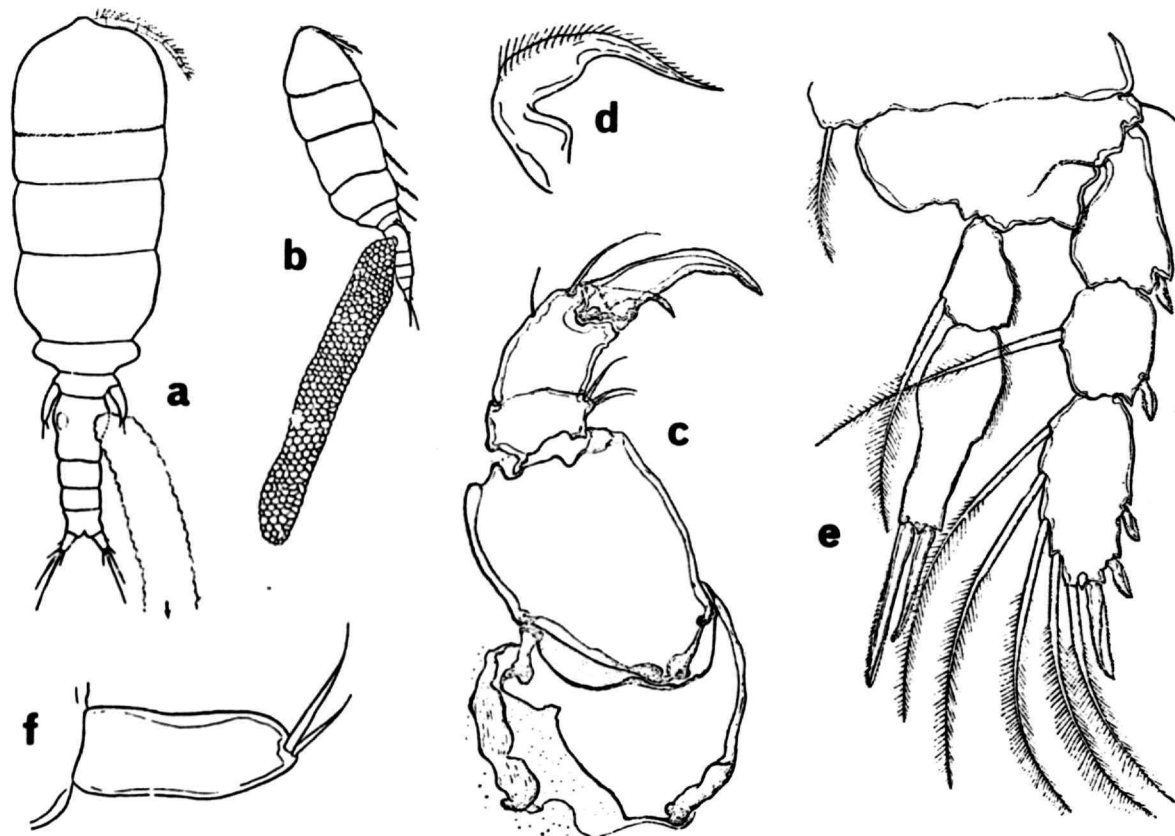


FIGURE 101.—*Epimolgus trochi* (Canu). Female: a, dorsal; b, lateral; c, second antenna; d, mandible; e, leg 4; f, leg 5. (a, b, d, f from Bocquet and Stock, 1956, figs. 1a,b,e, 2f; c, e from Canu, 1899, pl. 8, figs. 5, 9.) Length of female 1.95 mm.

The two females given the provisional name *Strongylopleura* (?) *pruvoti* by Monod and Dollfus (1932a, p. 204; 1932b, p. 295; 1934, pp 315, 316) probably belong to *Epimolgus* (Bocquet and Stock, 1958c) but the available information leaves some doubt about their generic position. Monod and Dollfus (1934) record two molluscan hosts, *Aplysia* sp., Noumea, New Caledonia, and *Acclesia striata* Quoy and Gaimard, Ile des Pins, New Caledonia.

The male is unknown.

Genus *Gelastomolgus* Humes, 1968

DIAGNOSIS.—Body modified, with elongated prosome which in the female is pointed anteriorly and broadened posteriorly and in the male is rounded anteriorly and narrowed posteriorly. Segment of leg 4 with a pair of ventrolateral lobes. Urosome

5-segmented in the female, 6-segmented in the male. Caudal ramus with six setae. Rostrum broadly rounded. First antenna 7-segmented, the armature in both sexes being 4, 12, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented, but the first and second segments not distinctly separated. Formula: 1, 1, 4, III + one spine + three setae, there being three terminal claws.

Labrum with two lobes separated by a median indentation. Mandible a broad elongated bipectinate blade rather abruptly attenuated distally; toward the distal end of the blade a well-sclerotized marginal spinous process. Paragnath a minute spinulose lobe. First maxilla with three setae. Second maxilla of the usual lichomolgid type. Maxilliped of the female with very weak armature and apparently 2-segmented, though cuticular creases

suggest further segmentation; in the male maxilliped 4-segmented (the proximal part of the claw probably representing the fourth segment).

Legs 1-4 with 3-segmented rami, except for leg 4 endopod which is 2-segmented. Third exopod segments of legs 1-4 bearing three spines, one fewer than usual in lichomolgids. Leg 4 endopod with 0-1;1. Formula for legs 1-4 in the male as in the female. Leg 5 in both sexes with a free segment bearing two terminal setae. Leg 6 in the female represented by a spine and a seta near the area of attachment of each egg sac; in the male by a weak ventrolateral flap on the genital segment bearing two setae.

Other features as in the species below.

Associated with bivalve mollusks.

TYPE-SPECIES.—*Gelastomolgus spondyli* Humes.

Gelastomolgus spondyli Humes, 1968

FIGURE 102

Gelastomolgus spondyli Humes, 1968b, pp. 66-74, figs. 1-36 [in the mantle cavity of the bivalve *Spondylus varians* Sowerby, region of Nosy Bé, northwestern Madagascar].

NEW RECORD.—1 ♀ from *Spondylus varians*, in 18 m, in lagoon west of beach between Parry Island and Eniwetok Island, Eniwetok Atoll, Marshall Islands, 10 July 1969, collected by AGH.

NEW HOST.—10 ♀♀, 12 ♂♂ from the madreporarian *Plerogyra* sp., in 22 m, Tany Kely, near Nosy Bé, Madagascar, 17 June 1967, collected by AGH. This host may be accidental. The coral was taken from the type-locality of *G. spondyli* in close proximity to living *Spondylus varians*.

Genus *Haplomolgus* Humes and Ho, 1968

DIAGNOSIS.—Body cyclopiform. Urosome 5-segmented in the female, 6-segmented in the male. Caudal ramus with six setae. Rostrum linguiform. First antenna 7-segmented, the armature in the female being 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented; the armature 1, 1, 3, and 1, there being a single terminal claw without accessory elements.

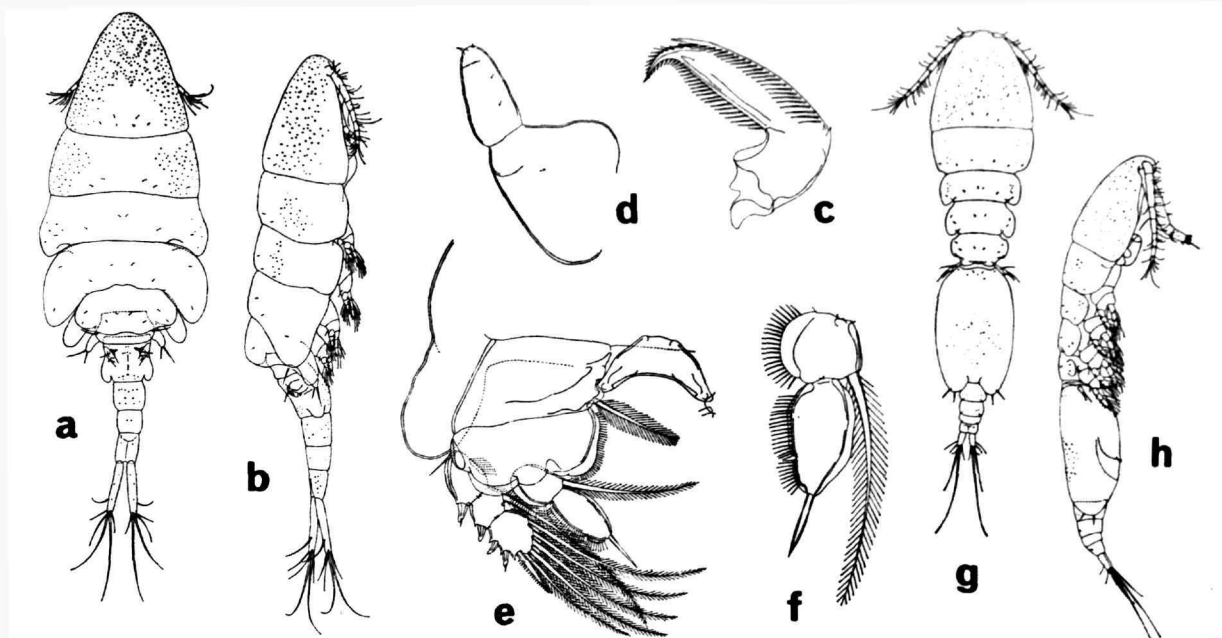


FIGURE 102.—*Gelastomolgus spondyli* Humes. Female: a, dorsal; b, lateral; c, mandible; d, maxilliped; e, leg 4 and intercoxal plate with adjacent process; f, endopod of leg 4. Male: g, dorsal; h, lateral. (From Humes, 1968b, figs. 1, 2, 13, 17, 22, 23, 25, 26.) Length of female 1.16 mm, of male 0.59 mm.

Labrum with two widely divergent lobes separated by a median notch. Mandible having the base divided by a constriction into a slender unornamented proximal part and a broadened distal part, the latter bearing on its concave edge two lobes, each with a row of spinules, and on its convex edge a large, pointed, posteriorly directed process followed by a row of small serrations; lash moderately long. Paragnath a small hairy lobe. First maxilla with four setae. Second maxilla of the usual lichomolgid type. Maxilliped of the female 3-segmented, but in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1-4 with 3-segmented rami except for leg 4 endopod, which is a single unarmed segment that often bears a small distal lobe. Leg 3 endopod 0-1;0-2;II,2. Formula of legs 1-4 of the male like that of the female. Leg 5 in both sexes with a free segment bearing two setae. Leg 6 in the female represented by two setae near the area of attachment of each egg sac, in the male by a posteroventral flap on the genital segment with two setae.

Other features as in the species below.

Associated with madreporarian corals.

TYPE-SPECIES.—*Haplomolgus montiporae* Humes and Ho.

***Haplomolgus montiporae* Humes and Ho, 1968**

FIGURE 103

Haplomolgus montiporae Humes and Ho, 1968a, pp. 375-378, figs. 211-240 [associated with the hard corals *Montipora sinensis* Bernard, *Montipora* sp., and *Montipora* sp. cf. *stellata* Bernard, region of Nosy Bé, northwestern Madagascar].

NEW RECORD.—32 ♀♀, 12 ♂♂ from *Montipora* sp., in 3 m, Ambatoloaka, Nosy Bé, northwestern Madagascar, 23 June 1967, collected by AGH.

Genus *Indomolgus* Humes and Ho, 1966

DIAGNOSIS.—Body modified, elongated. Urosome 5-segmented in the female, 6-segmented in the male. Caudal ramus with six short setae. Rostrum

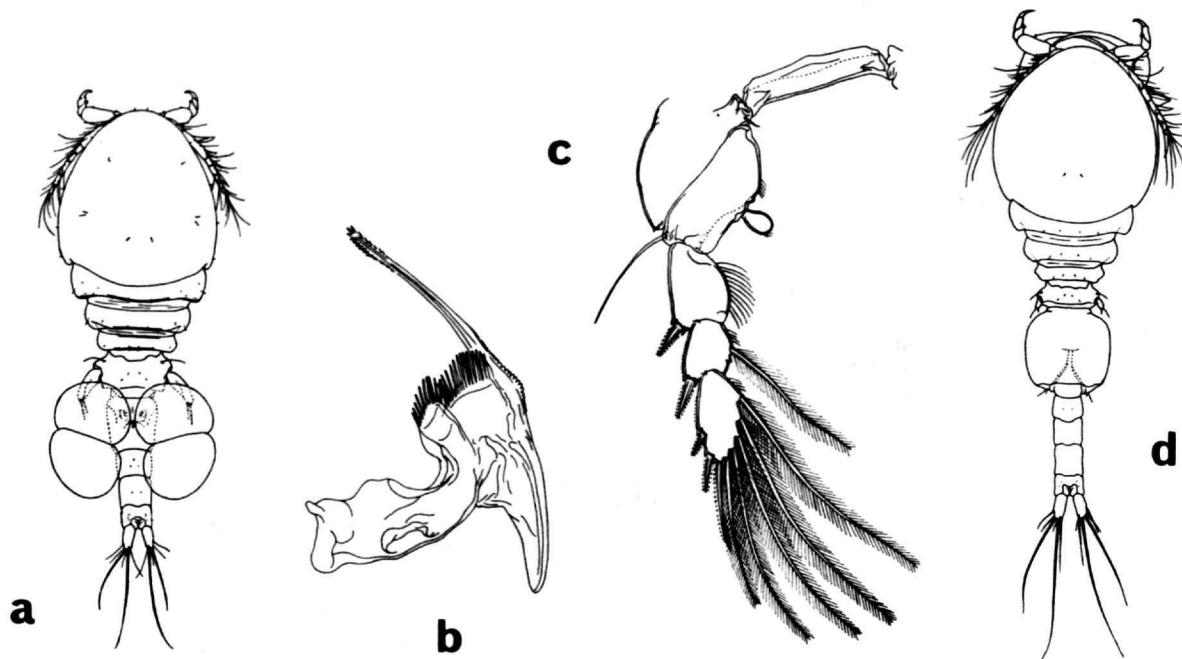


FIGURE 103.—*Haplomolgus montiporae* Humes and Ho. Female: a, dorsal; b, mandible; c, leg 4. Male: d, dorsal. (From Humes and Ho, 1968a, figs. 211, 220, 228, 233.) Length of female 0.86 mm, of male 0.87 mm.

linguiform or not well defined. First antenna 7-segmented with short setae, the formula not the same in all species; in the female 4, 11, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete, or, 3, 12, 6, 3, 4 + 1 aesthete, 2 + aesthete, and 7 + 1 aesthete, or 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; and in the male 4, 11 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete, or 3, 12 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete, or 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete, with no aesthetes added. Second antenna 4-segmented, the formula 1, 1, 3, and II + several small elements, there being two terminal claws.

Labrum with the two lobes separated by an indentation. Mandible with the basal part distal to the indentation having on its convex side a scalelike area either smooth or with spinules and a fringelike process followed by a serrated fringe and on its concave side a row of spinules; lash moderately short or long. Paragnath a small hairy lobe. First maxilla with three or four elements. Second maxilla of the usual lichomolgoid type. Maxilliped in the female 3-segmented with pointed tip, in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1-4 with 3-segmented rami except for leg 4 endopod which is 2-segmented. Leg 4 exopod with the third segment III, I, 4, or III, I, 5, or I, I, I, 5. Leg 4 endopod with the first segment having the formula 0-1, but the second segment variable with II, 2, or I, 3, or II, 3. Armature of the legs in the male like that in the female. Leg 5 with a free segment bearing two setae. Leg 6 represented in the female by the two setae and the process near the area of attachment of each egg sac, in the male by the ventral posterolateral flap on the genital segment bearing two setae.

Other features as in the species below.

Associated with actiniarian and zoanthidean coelenterates.

TYPE-SPECIES.—*Indomolgus brevisetosus* Humes and Ho.

REMARKS.—The four species assigned to the genus *Indomolgus* show considerable interspecific variation in the armature of the first antenna and leg 4, and on this basis a possible division of the genus might be suggested. However, since the armature of both these appendages varies at times intraspecifically, it would be unwise, as Humes and Ho (1966a) have mentioned, to make generic distinctions based on the armature.

The following key to the females applies also to the males of this genus, but information on the male of *I. panikkari* is scanty.

Key to Species of the Genus *Indomolgus*

FEMALES

1. Caudal ramus longer than last two postgenital segment together *I. panikkari*
Caudal ramus shorter than last two postgenital segments together 2
2. Last segment of exopod of leg 4 with three outer spines; last segment of endopod of leg 4 with either II, 3 or II, 2 3
Last segment of exopod of leg 4 with I, I, I, 5; last segment of endopod of leg 4 with I, 3 *I. mutatus*
3. Last segment of exopod of leg 4 with III, I, 5; last segment of endopod of leg 4 with II, 3 *I. brevisetosus*
Last segment of exopod of leg 4 with III, I, 4; last segment of endopod of leg 4 with II, 2 *I. diversus*

Indomolgus brevisetosus Humes and Ho, 1966

FIGURE 104

Indomolgus brevisetosus Humes and Ho, 1966a, pp. 11-14, figs. 56-85 [from the zoanthideans *Palythoa tuberculosa* (Esper) and *Palythoa liscia* Haddon and Duerdon, region of Nosy Bé, Madagascar].

Indomolgus diversus Humes and Ho, 1966

Indomolgus diversus Humes and Ho, 1966a, pp. 14-17, figs. 86-114 [from *Palythoa tuberculosa* and *Palythoa liscia*, region of Nosy Bé, Madagascar].

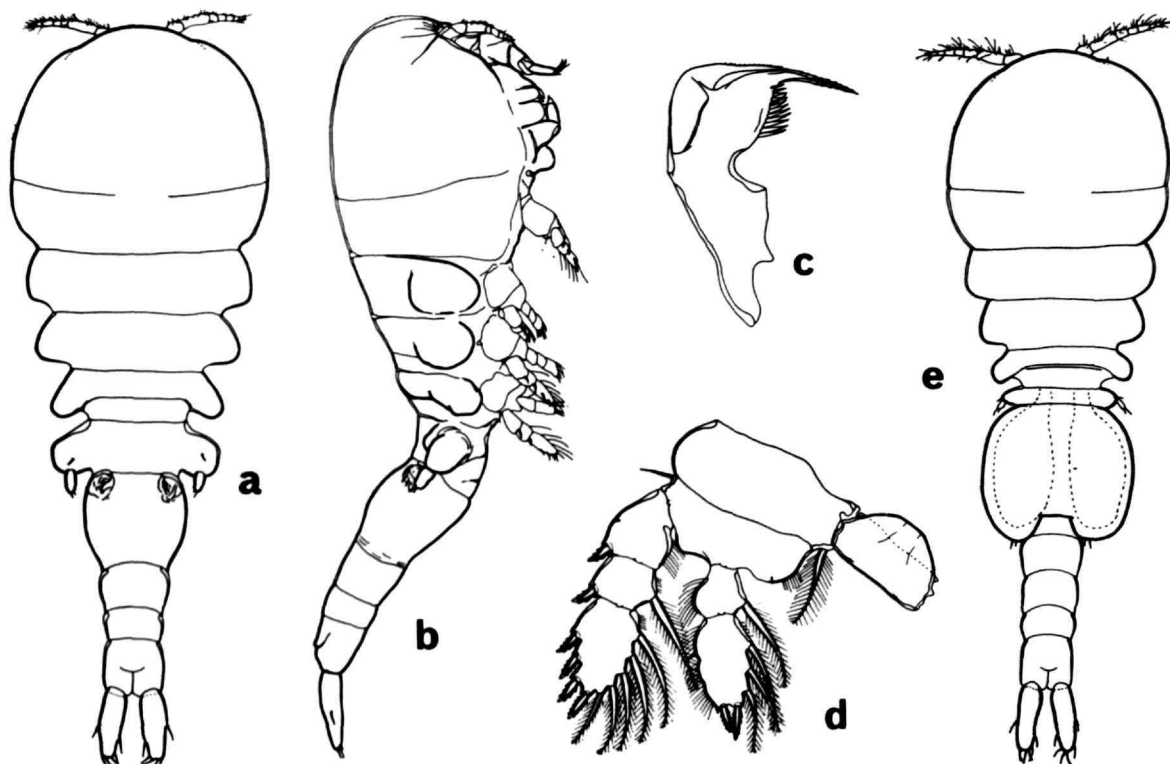


FIGURE 104.—*Indomolgus brevisetosus* Humes and Ho. Female: a, dorsal; b, lateral; c, mandible; d, leg 4 and intercoxal plate. Male: e, dorsal. (From Humes and Ho, 1966a, figs. 56, 57, 67, 78, 80.) Length of female 2.02 mm, of male 2.20 mm.

***Indomolgus mutatus* Humes and Ho, 1966**

Indomolgus mutatus Humes and Ho, 1966a, pp. 17–20, figs. 115–143 [from *Palythoa tuberculosa*, Nosy Bé, Madagascar].

***Indomolgus panikkari* (Gnanamuthu, 1955)**

Lichomolgus panikkari Gnanamuthu, 1955, pp. 151–156, figs. 1–3 [from the actiniarian *Phytocoeteopsis ramunni* Panikkar, Madras, India].—Bouligand, 1966, p. 269.
Indomolgus panikkari.—Humes and Ho, 1966a, p. 11.

Genus *Kelleria* Gurney, 1927

DIAGNOSIS.—Body cyclopiform. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six setae. Rostrum rounded posteroventrally. First antenna 7-segmented, in the female with the armature 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male with 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aes-

thete. Second antenna 4-segmented, with the formula 1, 1, I + 2, and II + 5, the claws being slender and setiform.

Labrum with a deep indentation separating the two lobes. Mandible with the basal area distal to the weak indentation, bearing on its convex side a patch of spinules followed by a row of conspicuous spiniform teeth which grade into small spinules on the lash and on its concave side a row of stout spines; lash moderately long. Paragnath a small lobe with hairlike spinules. First maxilla with four elements. Second maxilla 2-segmented, with the usual lichomolgid components but the lash short and stout, forming an angle with the segment and bearing irregularly sized spines; the element next to the lash a strongly barbed spine. Maxilliped in the female 3-segmented, with the proximal seta on the second segment bearing one or two spinules on its proximal margin, and with the small third segment having four elements; in the male 4-seg-

mented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1-4 with 3-segmented rami except for leg 4 endopod which is 1-segmented. Third segment of leg 4 exopod II, I, 5. Leg 4 endopod with the formula II, 1. Armature similar in both sexes except for leg 1 endopod in the male where the third segment is I, I, 4 instead of I, 5 as in the female. Leg 5 with a free segment bearing two terminal elements. Leg 6 in the female represented by the two setae and the spiniform process near the area

of attachment of each egg sac; in the male by a posteroventral flap on the genital segment bearing two setae.

Other features as in the species below.

Free-living, in intertidal burrows, or associated with crinoids.

TYPE-SPECIES.—*Kelleria regalis* Gurney.

REMARKS.—Lack of information on the males of this genus prevents the construction of a key for that sex.

Key to Species of the Genus *Kelleria*

FEMALES

1. Proximal spine on second segment of maxilliped with a large lateral spinule producing a bifid appearance 2
This spine regularly pectinate or plumose, without such a spinule 3
2. Body length not less than 1.25 mm, average 1.3 mm *K. regalis*
Body length 0.7 mm *K. rubimaculata*
3. Medial margin of leg 5 with one or two pointed processes 4
Medial margin of leg 5 with an obtuse swelling or straight 6
4. Medial margin of leg 5 with one pointed process 5
Medial margin of leg 5 with two pointed processes *K. australiensis*
5. Mediobasal tooth of mandibular blade much larger than the others *K. propinqua*
This tooth not oversized *K. purpurocincta*
6. Medial teeth of lash of second maxilla graded in size, with 5 or 6 teeth in all *K. gradata*
Medial teeth of lash of second maxilla irregular in size (long and short teeth mixed), with 7-10 teeth in all 7
7. Basal spine of second segment of maxilliped unilaterally pectinate 8
This spine bilaterally with barbules *K. camortensis*
8. Free segment of leg 5 about five times as long as wide *K. andamanensis*
Free segment of leg 5 about three times as long as wide *K. pectinata*

Kelleria regalis Gurney, 1927

FIGURE 105a-f

Kelleria regalis Gurney, 1927, pp. 471-474, figs. 116-117 [from Suez Canal].—Marques, 1961, p. 47, pls. 1c-f, 2a [from Portuguese Guinea].—Humes and Ho, 1969a, pp. 221-225, figs. 1-30 [from intertidal burrows, region of Nosy Bé, Madagascar].—Anonymous, 1969, p. 414.

Kelleria andamanensis Sewell, 1949

Kelleria andamanensis Sewell, 1949, pp. 112-114, fig. 29a-i [in surface tow-net, Andaman Islands].

REMARKS.—The male is unknown.

Kelleria australiensis Bayly, 1971

Kelleria australiensis Bayly, 1971, pp. 111-116, 2 figs [from brackish water, Victoria, Australia].

Kelleria camortensis Sewell, 1949

Kelleria camortensis Sewell, 1949, pp. 114-117, fig. 30a-m [in weed-washings, Nicobar Islands and Maldives Archipelago].

Kelleria gradata Stock, 1967

Kelleria gradata Stock, 1967b, pp. 569-573, figs. 1-3 [from the crinoid *Heterometra savignyi* (J. Müller), Gulf of Aqaba, Israel].

REMARKS.—The male is unknown.

Kelleria pectinata (A. Scott, 1909)

FIGURE 105g

Pseudanthessius pectinatus A. Scott, 1909, pp. 268-269, pl. 68, figs. 21-27 [in plankton, 8°0.3' S, 116°59' E, Bali Sea].

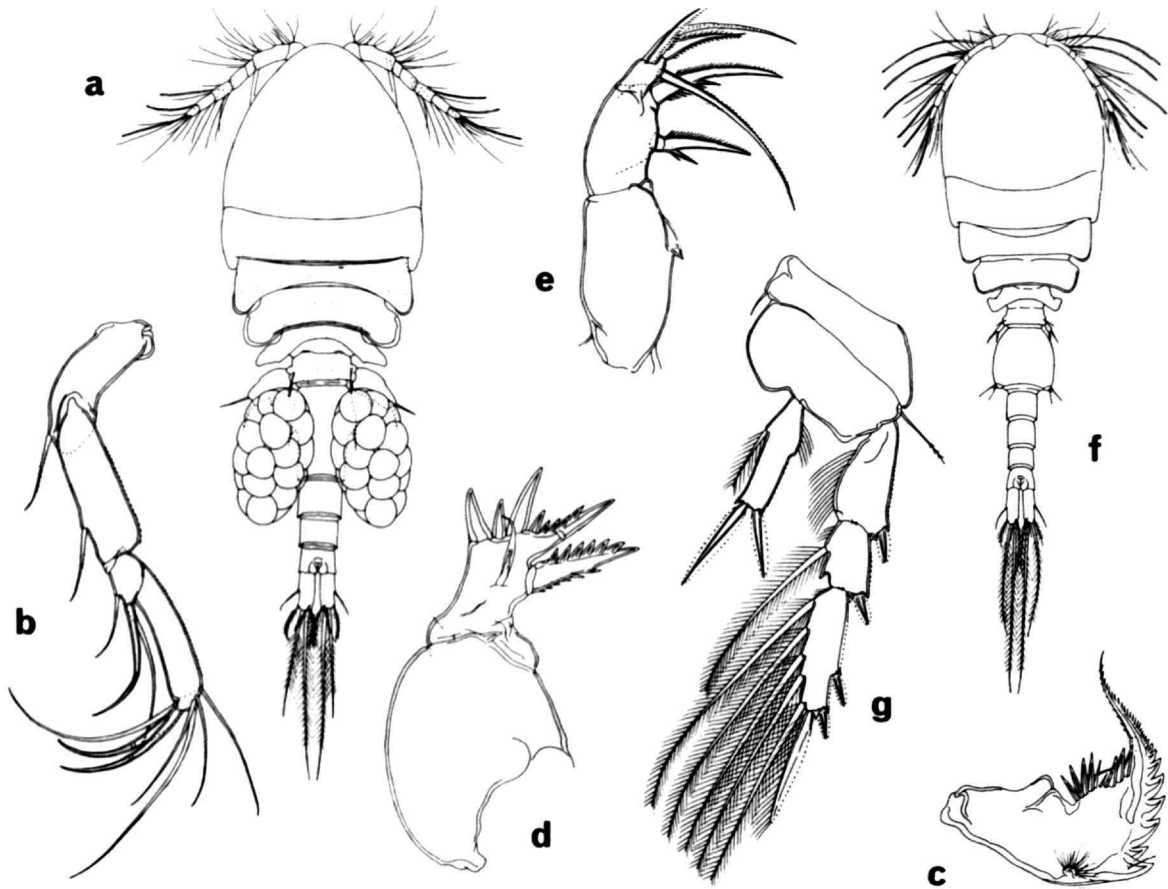


FIGURE 105.—a-f, *Kellera regalis* Gurney. Female: a, dorsal; b, second antenna; c, mandible; d, second maxilla; e, maxilliped. Male: f, dorsal. Length of female 1.32 mm, of male 1.05 mm. g, *Kellera pectinata* (A. Scott). Female: leg 4. (From Humes and Ho, 1969a, figs. 1, 8, 10, 13, 15, 22, 43.)

Kellera pectinata.—Humes and Ho, 1969a, pp. 225–228, figs. 31–53 [from intertidal burrows, including those of the shrimp *Axius* (*Neaxius*) *acanthus* A. Milne Edwards, region of Nosy Bé, Madagascar].—Anonymous, 1969, p. 414, figs. a, b.

***Kellera propinqua* (T. Scott, 1894)**

Pseudanthessius propinquus T. Scott, 1894a, p. 121, pl. 13, figs. 49–56, pl. 14, figs. 1, 4 [in surface tow-net, Loanda, Gulf of Guinea].

***Kellera purpurocincta* Gurney, 1927**

Kellera purpurocincta Gurney, 1927, pp. 474–476, fig. 118 [from Suez Canal].

***Kellera rubimaculata* Krishnaswamy, 1952**

Kellera rubimaculata Krishnaswamy, 1952, pp. 326–330, fig. 3 [in plankton, Madras, India]; 1953, pp. 66, 67 [in plankton, Madras, India].

Genus *Lichomolgella* G. O. Sars, 1918

DIAGNOSIS.—Body cyclopiform. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six setae. First antenna 7-segmented. Second antenna 4-segmented, with the formula 1, 1, 3 + a slender claw, and 5 + a slender claw. Mandible and first maxilla unknown. Second maxilla of the usual lichomolgid type. Maxilliped in the female 3-segmented with a pointed

tip, in the male 4-segmented (the proximal part of the claw representing the fourth segment).

Legs 1-4 in both sexes with 3-segmented rami except leg 4 endopod which is a single segment armed with two terminal spines. Leg 4 exopod with the third segment having II,I,5. Apparently no sexual dimorphism in the formula of leg 1 endopod. Leg 5 with a free segment bearing two terminal elements.

Other features as in the species below.

Free-living or associated with algae.

TYPE-SPECIES.—*Lichomolgella pusilla* G. O. Sars.

REMARKS.—The two species comprising this genus should be carefully restudied as existing descriptions are inadequate. The male of *L. pusilla* is unknown.

Key to Species of the Genus *Lichomolgella*

FEMALES

Second segment of second antenna relatively short and stout, ratio about 2:1 *L. pusilla*

Second segment of second antenna long and slender, ratio about 3.5:1 *L. isseli*

Lichomolgella pusilla G. O. Sars, 1918

FIGURE 106

Lichomolgella pusilla G. O. Sars, 1918, pp. 216, 217, pl. 118, fig. 1 [in 20 fathoms, Skutesnaes, southwestern coast of Norway]; 1921, pp. 111, 112, pl. 73, fig. 2 [from Skutesnaes, Norway].—Gallingani, 1952, p. 72, fig. A.

REMARKS.—The male is unknown.

Lichomolgella isseli Gallingani, 1952

Lichomolgella isseli Gallingani, 1952, pp. 71-75, figs. 1-7 (p. 74) [from the alga *Posidonia*, Paraggi, Italy].

Genus *Lichomolgides* Gotto, 1954

DIAGNOSIS.—Body of the female modified, with the prosome strongly inflated dorsally and with

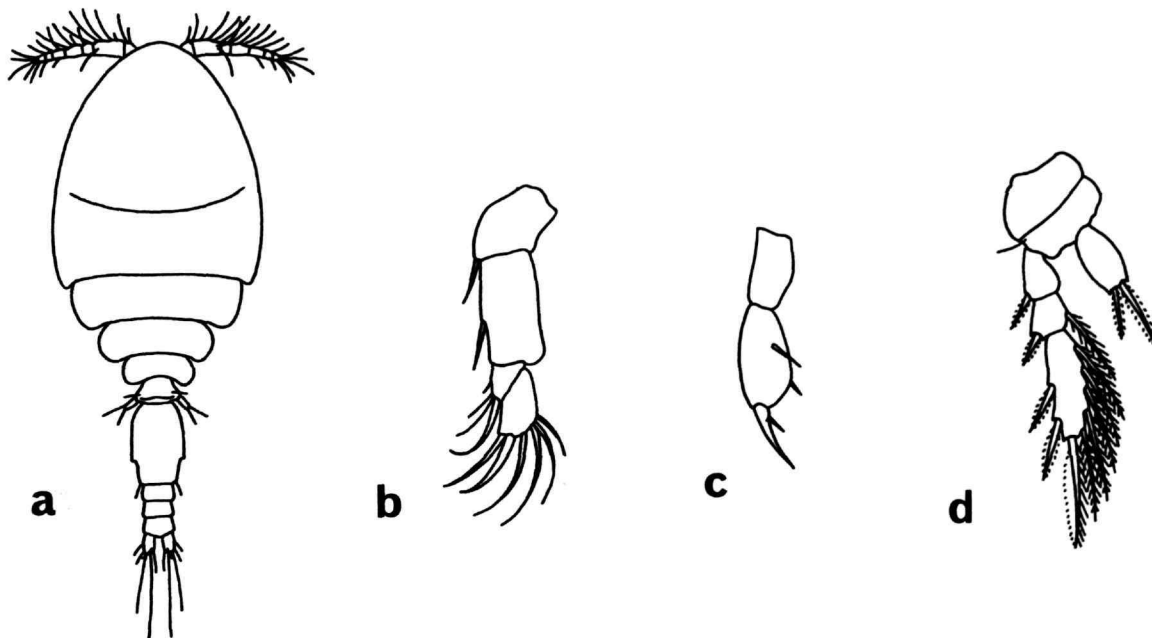


FIGURE 106.—*Lichomolgella pusilla* G. O. Sars. Female: a, dorsal; b, second antenna; c, maxilliped; d, leg 4. (Redrawn from G. O. Sars, 1918, pl. 118, fig. 1.) Length of female 0.45 mm.

the cephalic area sharply delimited. Body of the male cyclopiform. Urosome in the female 5-segmented, in the male probably 6-segmented.⁴ Caudal ramus with six setae. Rostrum present. First antenna 7-segmented. Second antenna 4-segmented, with the formula 1, 1, 2 + one claw, and 3 + four terminal claws.

Labrum with a shallow median cleft. Mandible with a long lash. First maxilla with two elements. Second maxilla of the usual lichomolgid form. Maxilliped of the female 3-segmented with a pointed tip; in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment). Postorally with a median, ventrally produced structure terminating in two small hooks (this structure absent in the male).

Legs 1-4 with 3-segmented rami except leg 4 endopod which is 2-segmented. Leg 4 exopod with the third segment having II,I,5. Leg 4 endopod

with the formula 0-1;II, the seta being feathered. Leg 1 endopod with the same formula as in the female. Leg 5 with a minute free segment bearing a spine and a seta.

Other features as in the species below.

Lives in ascidians.

TYPE-SPECIES.—*Lichomolgides cuanensis* Gotto.

Lichomolgides cuanensis Gotto, 1954

FIGURE 107

Lichomolgides cuanensis Gotto, 1954b, pp. 379-385, figs. 1-20 [in the cloacal cavities of the ascidian *Trididemnum tenerum* (Verrill), Strangford Lough, Northern Ireland]; 1960b, p. 223, fig. 28; 1966, p. 194.

Genus *Lichomolgius* Thorell, 1859

DIAGNOSIS.—Body cyclopiform. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six setae. Rostrum rounded though sometimes elongated. First antenna 7-segmented, in the female with the armature 4, 13, 6, 3, 4 + 1

⁴Although in the text of the original description of the male the number of postgenital segments is given as three, Gotto's (1954b) figures 8 and 9 suggest the presence of four.

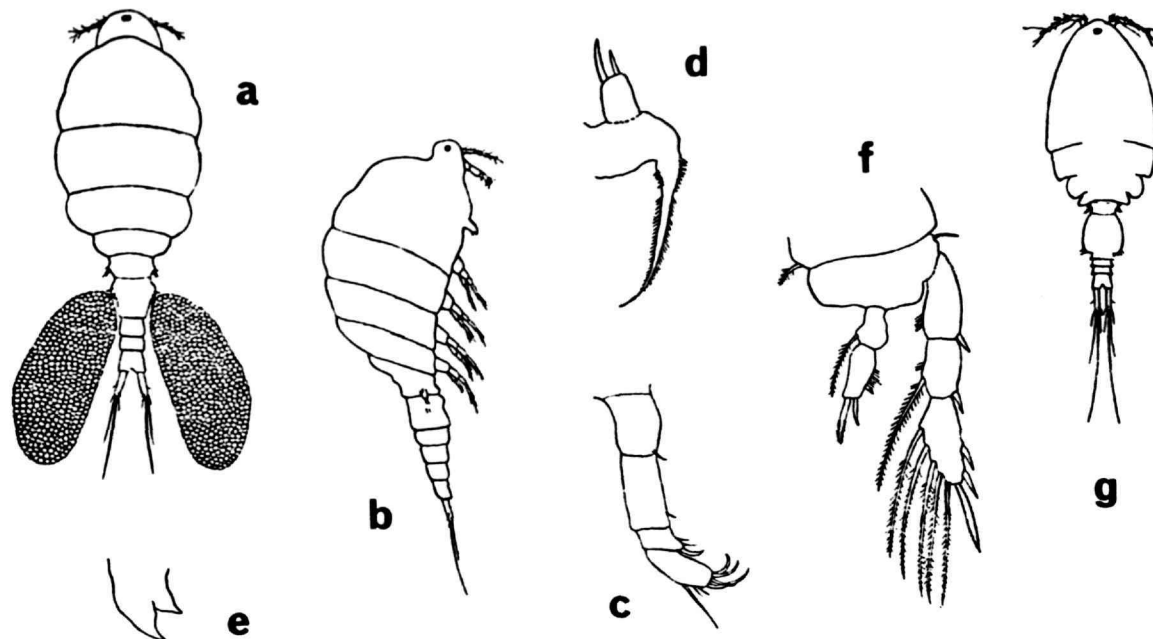


FIGURE 107.—*Lichomolgides cuanensis* Gotto. Female: a, dorsal; b, lateral; c, second antenna; d, mandible and first maxilla; e, distal portion of postoral hooked organ; f, leg 4. Male: g, dorsal. (From Gotto, 1954b, figs. 1, 2, 4, 5, 8, 12, 16.). Length of female 1.5-2.1 mm, of male 0.74 mm.

aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male with 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented (though in *L. chamarum* the articulation between

the third and fourth segments is obscure); formula 1, 1, 3, and 1-4 terminal claws + several setae (last segment in *L. minor* with five slender setae, no claws).

Labrum deeply incised medially. Mandible with

Key to Species of the Genus *Lichomolgus*

FEMALES

1. Second antenna terminally with five slender setae *L. minor*
 Second antenna terminally with 1-4 claws 2
2. Second antenna terminally with one claw 3
 Second antenna terminally with more than one claw 8
3. Rostrum elongated, moderately slender, and beaklike, extending between the bases of the second antenna *L. chamarum*
 Rostrum broadly rounded, not extending between the bases of the second antennae 4
4. Caudal ramus with length to width ratio 4:1 or less 5
 Caudal ramus with length to width ratio 5:1 or greater 7
5. Genital segment in dorsal view widest posterior to middle; free segment of leg 5 elongated with ratio 2.73:1 *L. tridacnae*
 Genital segment in dorsal view widest anterior to middle; free segment of leg 5 short, ratio less than 2:1 6
6. Leg 5 minute, without an adjacent dorsal lobe; segment bearing leg 5 with a pair of small (13 μ long) posterodorsal processes *L. arcamus*
 Leg 5 minute, with an adjacent dorsal lobe; segment bearing leg 5 without posterodorsal processes *L. spodyli*
7. First antenna with smooth setae; segment bearing leg 5 with a pair of small posterodorsal spinous processes (13 μ long); caudal ramus with ratio 5.7:1 *L. asaphidis*
 First antenna with many setae haired; segment bearing leg 5 apparently without posterodorsal processes; caudal ramus with ratio a little more than 5:1 *L. inflatus*
8. Second antenna terminally with two claws 9
 Second antenna terminally with more than two claws 17
9. Anal segment elongated, as long as or longer than the first two postgenital segments combined 10
 Anal segment short, much shorter than the first two postgenital segments combined 11
10. Caudal ramus very long, tapered, ratio about 12:1, somewhat bent in the middle where it carries two setae *L. forficula*
 Caudal ramus very long, less tapered, about 10:1, straight, carrying one seta near the middle *L. marginatus*
11. Caudal ramus wider than long *L. indicus*
 Caudal ramus longer than wide 12
12. Caudal ramus long, ratio about 7:1 *L. ieverisi*
 Caudal ramus shorter, ratio 6:1 or less 13
13. Longest seta on caudal ramus much longer than the ramus *L. longicauda*
 Longest seta on caudal ramus shorter or only as long as the ramus 14
14. Caudal ramus with ratio 5:1-6:1 15
 Caudal ramus with ratio less than 4.5:1 16
15. Longest seta on caudal ramus less than one-half as long as the ramus; ramus about 6:1 *L. albens*
 Longest seta on caudal ramus about as long as the caudal ramus; ramus about 5:1 *L. diazonae*
16. Free segment of leg 5 about 2.4:1, with a notch in the middle of the outer edge *L. furcillatus*
 Free segment of leg 5 about 1.8:1, with the inner edge forming a conspicuous bulge *L. canui*
17. Second antenna terminally with three claws *L. leptodermatus*
 Second antenna terminally with four claws *L. elegantulus*

a usually slender base, merging gradually into a long, slender, attenuated pectinate lash. Paragnath a small lobe with hairs or spinules. First maxilla with two or three elements. Second maxilla of the usual lichomolgoid form. Maxilliped in the female 3-segmented; in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1-4 with 3-segmented rami except for leg 4 endopod which is 2-segmented. Armature of the typical lichomolgoid type. Leg 4 exopod with the third segment having II, I, 5. Leg 4 endopod with the formula 0-1; II, the seta being feathered. Leg 1 endopod of the male with the third segment having the same formula as in the female (as far as known). Leg 5 with a free segment bearing two terminal elements and usually unornamented. Leg 6 represented in both sexes by the two setae near the genital openings.

Other features as in the species below.

Associated mainly with ascidians and mollusks.

TYPE-SPECIES.—*Lichomolgus albens* Thorell.

REMARKS.—The seventeen species of *Lichomolgus* show considerable variation in the number of claws (1-4) on the second antenna, yet otherwise they form a cohesive group, especially in the form of the mandible. One might suppose that generic subdivisions could be made on the number of claws combined with host preferences. Most of the species associated with bivalve mollusks, for example, have only one claw (*L. arcanus*, *L. asaphidis*, *L. chammarum*, *L. inflatus*, and *L. spondyli*). Two other species from bivalves, however, have more than one claw (*L. leptodermatus* with three claws and *L. elegantulus* with four). Thus, a division on this basis does not seem natural.

All the species associated with ascidians have two claws on the second antenna (*L. albens*, *L. canui*, *L. diazonae*, *L. forficula*, *L. furcillatus*, and *L. marginatus*). The single remaining species (*L. longicauda*) with two claws is associated with cephalopod mollusks.

Since subdivisions of the genus on the number of second antennal claws and host preference appear to be artificial at present, we have broadly interpreted the genus to embrace all the species listed below.

Mariscal (1967) found several undetermined species of copepods of the genus *Lichomolgus* associated with sea anemones in the Indo-Pacific. Since

he used *Lichomolgus* in its older, broad sense, however, these copepods may in actuality belong to other lichomolgoid genera. This would seem probable in view of the species of *Lichomolgus* in its restricted sense being found associated with ascidians or mollusks, rather than with actinurians.

A key for the males of *Lichomolgus* has not been prepared because sufficient information is not available from the existing descriptions and figures.

Lichomolgus albens Thorell, 1859

Lichomolgus albens Thorell, 1859, pp. 340, 341; 1860, pp. 69-71, pls. 10, 11, 13 [from the ascidians *Ascidia parallelogramma*, *Ascidia mentula*, and *Ascidia canina*, Bohuslän, Sweden].—Möbius, 1874, p. 275 [from the ascidian *Molgula*, Zuiderzee, The Netherlands; this may represent *L. canui*, below].—Aurivillius, 1882b, pp. 98-100, pl. 16, figs. 9, 10 [from the ascidians *Phallusia patula* O. F. Müller, *Phallusia virginea* O. F. Müller, and *Corella parallelogramma* Alder, Gullmarsfjord, Sweden]; 1883, pp. 94-96, pl. 7, figs. 9, 10 [from *Phallusia patula*, *Phallusia virginea*, and *Corella parallelogramma*, Bohuslän, Sweden].—Carus, 1885, pp. 350, 351.—Canu, 1891a, p. 478 [from *Ciona intestinalis* O. F. Müller, *Molgula socialis* Alder, and *Cynthia lurida* Thorell, northern France]; 1892, pp. 230, 231, pl. 22, figs. 15, 23, pl. 23, figs. 1-4 [from *Ciona intestinalis*, *Molgula socialis*, *Cynthia lurida*, and *Perophora listeri* M. Don., Boulogne coast of France].—Thompson, 1893, p. 207, pl. 15, fig. 3c [from Puffin Island, Liverpool Bay, England]; 1889, pp. 182, 189 [in tow-net, Puffin Island, Liverpool Bay, England].—T. Scott, 1894b, p. 258; 1898, p. 269 [from Otter Spit, Clyde, Scotland]; 1907, p. 371.—Farran, 1913, p. 6 [in *Asciidiella aspersa*].—G. O. Sars, 1917a, pp. 151-153, pl. 83 [from the branchial cavity of various ascidians, most frequently *Corella parallelogramma*, Norway].—Lang, 1949, p. 8 [from the ascidian *Corella parallelogramma*, Sörgrundsberget, Sweden].—Gotto, 1960b, pp. 213, 222.—Bresciani and Lützen, 1962, p. 377.

REMARKS.—This species has been designated the type-species following G. O. Sars (1917, p. 153).

Lichomolgus arcanus Humes and Cressey, 1958

Lichomolgus arcanus Humes and Cressey, 1958a, pp. 938-941, figs. 127-156 [from the mantle cavity of the bivalves *Arca senilis* Linnaeus, *Ostrea tulipa* Lamarck, and *Pitar tumens* Gmelin, Senegal].—Cheng, 1967, pp. 315, 343.

Lichomolgus asaphidis Humes, 1959

Lichomolgus asaphidis Humes, 1959, pp. 309-315, figs. 125-159 [from the bivalves *Asaphis rugosa* Lamarck and *Standella solanderi* Gray, Nosy Bé, Madagascar].

NEW HOST.—3 ♀♀, 1 ♂ from 30 bivalves, *Solen conneus* Lamarck, intertidal, west of Pte. Mahatsinjo, Nosy Bé, Madagascar, 4 October 1960, collected by AGH.

***Lichomolgus canui* G. O. Sars, 1917**

Lichomolgus canui G. O. Sars, 1917a, pp. 157–158, pl. 87 [from ascidians, Norway].—Klie, 1933, p. 15 [in the ascidian *Styelopsis* (*Dendrodoa*) *grossularia*, Kiel, Germany].—Stock, 1960b, pp. 72, 73 [from the ascidians *Molgula manhattensis* (de Kay), *Molgula* sp., *Asciella aspersa* (Müller), and *Ciona intestinalis* (Linnaeus), The Netherlands].—Gotto, 1960b, p. 227; 1961b, p. 88 [from the ascidian *Clavelina lepadiformis* (O. F. Müller), northern Ireland]; 1966, p. 194.—Leloup et al., 1963, p. 29; 1964, p. 30.—Leloup and Polk, 1967, pp. 17, 86.—Costanzo, 1968, pp. 27–37, figs. 1–6 [from the ascidians *Clavelina lepadiformis* and *Styela plicata*, Lago di Faro, Messina, Sicily]; 1969, pp. 143–158.

Lichomolgus albens.—Möbius, non Thorell, 1873, p. 275 [from Zuiderzee, The Netherlands; probably = *L. canui*, cf. Stock, 1960b].

Lichomolgus chamarum

FIGURE 108

Lichomolgus chamarum Humes, 1968b, pp. 74–81, figs. 37–64 [from the bivalve *Chama iostoma* Conrad, region of Nosy Bé, Madagascar].

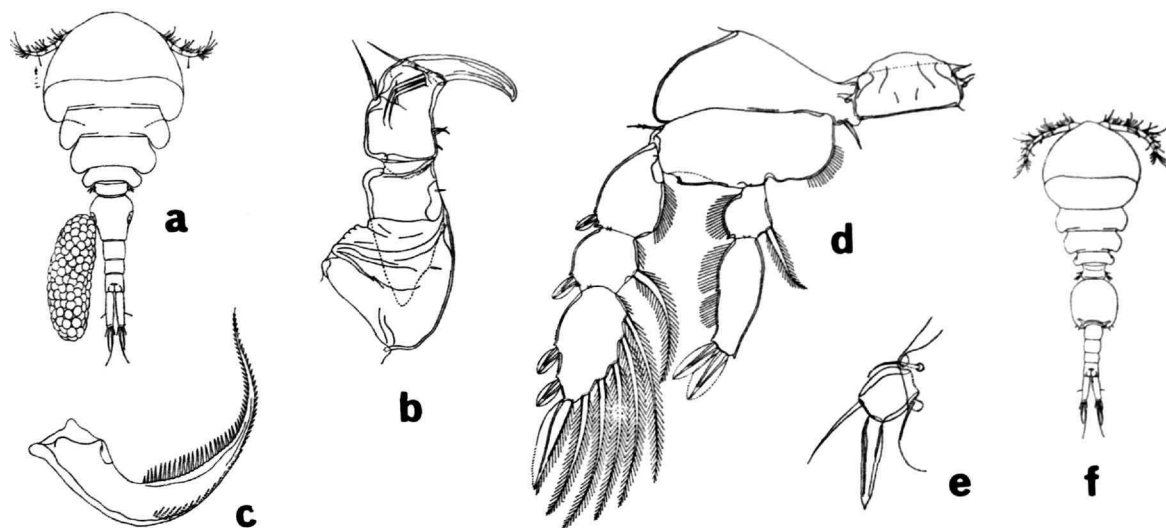


FIGURE 108.—*Lichomolgus chamarum* Humes. Female: a, dorsal; b, second antenna; c, mandible; d, leg 4; e, leg 5. Male: f, dorsal. (From Humes, 1968b, figs. 37, 43, 46, 55, 57, 58.) Length of female 1.66 mm, of male 1.34 mm.

***Lichomolgus diazonae* Gotto, 1961**

Lichomolgus diazonae Gotto, 1961b, pp. 85–88, fig. 1a–r [from the ascidian *Diazona violacea* Savigny, Plymouth, England]; 1962, p. 104.

***Lichomolgus elegantulus* Stock, 1960**

Lichomolgus elegantulus Stock, 1960c, pp. 238–241, figs. 11, 12 [from the bivalve *Pteria hirundo* (Linnaeus), Banyuls, Mediterranean coast of France].

***Lichomolgus forficula* Thorell, 1859**

Lichomolgus forficula Thorell, 1859, p. 340; 1860, pp. 73, 74, pls. 12, 13, fig. 19 [from the ascidian *Ascidia canina*, Bohuslän, Sweden].—Claus, 1875, p. 347.—Kossmann, 1877, pp. 18, 19, pl. 4, fig. 2 [from various ascidians, Naples, Italy].—Brady, 1880, pp. 50–52, pl. 85, figs. 12–16, pl. 86, figs. 14–18, Scotland and Ireland].—Aurivillius, 1882b, pp. 100, 102, pl. 16, figs. 11, 12 [from *Phallusia mentula*, Bohuslän, Sweden]; 1883, pp. 96–98, pl. 7, figs. 11, 12 [from *Phallusia mentula*, Bohuslän, Sweden].—Giebrecht, 1882, pp. 295, 296 [from the ascidians *Phallusia mentula* O. F. Müller and *Phallusia mamillata* Cuvier, Naples, Italy].—Carus, 1885, p. 350.—Gourret, 1887, p. 187; 1889, p. 474 (*L. elongatus*).—T. Scott, 1894b, p. 258; 1897a, p. 153 [from the branchial chambers of large ascidians, Loch Tyne and East Loch, Tarbert, Scotland]; 1907, p. 370 [from large ascidians, Scotland].—Herdman, 1896, p. 48.—Graffe, 1900, p. 41 [from ascidians, Trieste, Italy].—Pearson, 1905, p. 163 [from simple ascidians, *Ascidia* sp., Ireland].—Norman and

- T. Scott, 1906, p. 198 [from the branchial chambers of *Phallusia mamillata*, Plymouth, England].—Farran, 1913, p. 6 [in *Ascidia mentula*, Ireland].—G. O. Sars, 1917a, pp. 153, 154, pl. 84 [from the ascidians *Ascidia mentula* and *Ascidia canina*, Norway].—Bocquet, 1952, p. 497 [from the echinoid *Psammechinus miliaris*, Beccles, Roscoff, northern France].—Fouque and Franc, 1953, p. 24 [from *Ascidia aspersa* Müller and *Ascidia mentula* Müller, northern France].—Marine Biological Association, 1957, p. 175.—Gotto, 1960b, pp. 213, 222, fig. 29; 1966, p. 193.—Bresciani and Lützen, 1962, p. 377.—Bruce, Colman, and Jones, 1963, p. 127.
- Lichomolgus elongatus* Buchholz, 1869, pp. 151–153, pl. 11, fig. 9 [from the ascidian *Phallusia mamillata* and several others, Naples, Italy; probably = *L. forficula*, cf. Kossmann, 1877, p. 18, Della Valle, 1880a, p. 84, and Giesbrecht, 1882, p. 295].
- Lichomolgus forficulus*.—D'Arcy Thompson, 1901, p. 47.

Lichomolgus furcillatus Thorell, 1859

- Lichomolgus furcillatus* Thorell, 1859, p. 341; 1860, pp. 74, 75, pl. 13, fig. 20 [from the ascidian *Ascidia intestinalis* (sic), Bohuslän, Sweden].—Brady and Robertson, 1873, p. 140 [from Roundstone Bay, western Ireland].—var. *mediterranea* Kossmann, 1877, p. 19, pl. 4, fig. 1 [from Mediterranean Sea].—Brady, 1880, pp. 49–50, pl. 88, figs. 10–14 [from the branchial sac of the ascidian *Corella parallelogramma*, England].—Aurivillius, 1882b, pp. 102–105 [from *Ciona intestinalis*, Gullmarsfjord, Bohuslän, Sweden]; 1883, pp. 98–101 [from *Ciona intestinalis*, Gullmarsfjorden, Bohuslän, Sweden].—T. Scott, 1891, p. 304 [from the branchial cavity of an ascidian, west of May Island, Firth of Forth, Scotland]; 1894b, pp. 233, 258; 1897a, p. 153 [off Inveraray, Upper Loch Fyne, Scotland]; 1902, p. 470 [from Inchkeith, Scotland]; 1906, p. 352 [from the branchial cavity of large ascidians, May Island and Inchkeith, Firth of Forth, Scotland]; 1907, p. 371.—Thompson, 1893, p. 207, pl. 25, fig. 3 [Liverpool Bay, England].—Herdman, 1896, p. 66.—Canu, 1898, p. 415.—Pearson, 1905, p. 162 [in tow-net, Ireland].—G. O. Sars, 1917a, pp. 156, 157, pl. 86 [from the branchial cavity of the ascidian *Styela intestinalis*, Norway].—Marine Biological Association, 1957, p. 175.—Gotto, 1960b, pp. 213, 223; 1966, p. 194.—Bresciani and Lützen, 1962, p. 377.
- Pseudanthessius furcillatus*.—Norman and T. Scott, 1906, p. 198 [from England].—Farran, 1913, p. 6 [from Ireland].

Lichomolgus ieveri Thompson and A. Scott, 1903

- Lichomolgus ieveri* Thompson and A. Scott, 1903, p. 278, pl. 15, figs. 10–17 [from washings of invertebrates including pearl oysters, Ceylon].

Lichomolgus indicus Ummerkutty, 1962

- Lichomolgus indicus* Ummerkutty, 1962, pp. 62–66, pl. 12, figs. 4–10, pl. 13, figs. 1–4 [from starfish and sponge washings, Gulf of Mannar, southeastern India].

REMARKS.—According to its describer, this species has the very unusual formula of II, I, 4 on the third segment of leg 4 exopod, with only four setae instead of five as in other lichomolgids.

Lichomolgus inflatus Tanaka, 1961

- Lichomolgus inflatus* Tanaka, 1961, pp. 263–266, pl. 30, figs. 1–8, pl. 31, figs. 1–10, pl. 32, figs. 1–5 [from the bivalve *Paphia*, Sasebo Bay, Japan].—Kô, Murakami, and Daiku, 1962, p. 114 [from the bivalves *Tapes japonica*, *Saxidomus purpuratus* (Sowerby) and *Pinctada martensii* (Dunker), Japan].—Kô, 1969b, pp. 83–86, 90, 91 [from *Tapes japonica*, Sasebo Bay, Japan].

Lichomolgus leptodermatus Gooding, 1957

- Lichomolgus leptodermatus* Gooding, 1957, pp. 207–212, figs. 4, 5a–m, [from the gills of the bivalve *Laevicardium crassum* (Gmelin), Plymouth, England].—Marine Biological Association, 1957, p. 176.—Bocquet and Stock, 1959c, pp. 119, 120 [from *Cardium crassum* Gmelin (= *Laevicardium crassum* (Gmelin) = *Cardium norvegicum* Spengler), Channel coast of France, and Plymouth, England].

Lichomolgus longicauda (Claus, 1860)

- Sepicola longicauda* Claus, 1860, pp. 4, 5, pl. 1, figs. 7–9 [from the gills of the cephalopod *Sepia officinalis*, Nice (Nizza), France].
- Lichomolgus sepicola*.—Claus, 1875, p. 348.—Wiezejski, 1877, pp. 574–580, pl. 34, figs. 18–32 [from *Sepia officinalis*, Trieste, Italy].—Stossich, 1880, p. 250 [from the gills of *Sepia officinalis*, Trieste, Italy].—Pesta, 1909, pp. 262, 263, pl. 2, fig. 7 [from the gills of *Sepia officinalis*, Trieste, Italy].
- Lichomolgus sepicola*.—Carus, 1885, p. 351.—Graeffe, 1900, p. 41 [from the gills of *Sepia officinalis* var. *filliouxii* Lafont, Trieste, Italy].
- Lichomolgus longicauda*.—Cuénot, 1927, p. 287 [from *Sepia officinalis* and *Sepia filliouxii*, Arcachon, France].—Stock, 1956, pp. 117–120, figs. 1–12 [from the gills and mantle cavity of *Sepia officinalis* Linnaeus, The Netherlands]; 1960c, p. 242 [from the gills of *Sepia officinalis* Linnaeus, Banyuls, Mediterranean coast of France]; 1964a, p. 67.—Gotto, 1962, p. 102.—Glaçon, 1971, p. 23 (unnumbered).
- Lichomolgus* (*Lichomolgus*) *longicauda*.—Monod and Dollfus, 1932a, p. 138 [on *Sepia filliouxii* Lafont].
- Lichomolgus* (*Sepicola*) *longicauda*.—Bresciani, 1970, p. 11.

Lichomolgus marginatus Thorell, 1859

- Lichomolgus marginatus* Thorell, 1859, p. 340; 1860, pp. 71–73, pl. 12, fig. 18 [from the ascidians *Ascidia venosa* and *Ascidia canina*, Bohuslän, Sweden].—G. O. Sars, 1917a, pp. 155, 156, pl. 85 [from Norway].—Fouque and Franc, 1953, pp. 24, 25 [from *Ascidia mentula* Müller, northern France].—Boschma, 1956, p. 8.—Mulder, 1956, p. 11 [in

tunicate, The Netherlands].—Gotto, 1960b, p. 213, p. 223; 1966, p. 194.—Bresciani and Lützen, 1962, p. 377.

Lichomolgus minor A. Scott, 1902

Lichomolgus minor A. Scott, 1902, pp. 417, 418, pl. 1, fig. 17, pl. 2, figs. 15–24 [in plankton from bathroom tap on ship, Red Sea and Indian Ocean].—Thompson and A. Scott, 1903, p. 277 [between Port Said and Suez, and in washings of a young pearl oyster, Ceylon].—Gurney, 1927, p. 465 [from Suez Canal].

Lichomolgus spondyli Yamaguti, 1936

Lichomolgus spondyli Yamaguti, 1936, pp. 124, 125, pl. 13, figs. 76–84 [from the mantle cavity of the bivalve *Spondylus japonicus* Kuroda, Pacific coast of Wakayama Prefecture, Japan].—Tanaka, 1961, p. 249.

Lichomolgus tridacnae Humes, 1971

Lichomolgus tridacnae Humes, 1971, pp. 348–357, figs. 1–32 [from the mantle cavity of the bivalves *Tridacna gigas* (Linnaeus) and *Tridacna squamosa* Lamarck, Eniwetok Atoll, Marshall Islands].

Genus *Macrochiron* Brady, 1872

DIAGNOSIS.—Body cyclopiform. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six setae. Rostrum with a slender, needle-like process. First antenna 7-segmented, in the female with the armature 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete.

the. Second antenna 3-segmented, the third segment resulting from the fusion of the original third and fourth segments; formula 1, 1, and 3 + terminally one pectinate claw and one clawlike seta, or two pectinate claws and five setae.

Labrum incised medially. Mandible with the basal region beyond the indentation having on its convex side a scalelike area with spinules followed by a serrated fringe and on its concave side a row of spinules; lash long. Paragnath a small hairy lobe. First maxilla with four elements. Second maxilla of the usual lichomolgid type, bearing near the base of the apical lash an ornamented seta and a smooth, hyaline, often blunt seta. Maxilliped in the female 3-segmented, slender, the first two segments elongated and held at a sharp angle to each other, the last segment small and indistinctly separated from the second segment; in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1–4 with 3-segmented rami, except for leg 4 endopod which is 1- or 2-segmented. Leg 4 exopod with the third segment having II, I, 5 or III, I, 5. Leg 4 endopod with the formula 0–0; 2 or, if 1-segmented, simply 2. Leg 1 endopod in the male I, I, 4, so far as known, instead of I, 5 as in the female. Leg 5 with a free segment having two terminal setae; leg 6 represented by two setae near the genital openings.

Other features as in the species below.

Associated mainly with algae or hydroids, in certain cases with ascidians or echinoids.

TYPE-SPECIES.—*Macrochiron fucicolum* Brady.

Key to Species of the Genus *Macrochiron*

FEMALES

1. Last segment of exopod of leg 5 with armature II, I, 5 2
 Last segment of exopod of leg 5 with armature III, I, 5 6
2. Endopod of leg 4 a single segment (or at most with only a weak and incomplete indication of division) 3
 Endopod of leg 4 composed of two distinct segments *M. fucicolum*
3. Genital segment abruptly constricted in its posterior third; rostrum with a subconical beak *M. rostratum*
 Genital segment broadest anteriorly and tapering posteriorly; rostrum with a needle-like process 4
4. With a pair of posterior protuberances on segment of leg 5 medial to fifth leg *M. verwoorti*
 Without such protuberances 5
5. Free segment of leg 5 tapered distally; endopod of leg 4 without an outer marginal notch *M. cheliferum*
 Free segment of leg 5 not tapered; endopod of leg 4 with an outer marginal notch *M. vulgum*

6. Endopod of leg 4 composed of two distinct segments *M. mutatum*
Endopod of leg 4 a single segment (although in *M. echinicum* and *M. lytocarpi* there may be a very indistinct line of division) 7
7. Second antenna with one claw (though a jointed seta may be present also) 8
Second antenna with two claws 9
8. With a pair of conspicuous, well-sclerotized posterior lobes on segment of leg 5 medial to fifth legs *M. lobatum*
Without such lobes *M. lytocarpi*
9. Claws on last segment of second antenna nearly equal to length of segment; maxilliped with armature dentiform in appearance *M. sargassi*
Claws on last segment of second antenna much shorter than segment; maxilliped with usual setiform or spiniform armature *M. echinicum*

MALES

1. Last segment of exopod of leg 4 with armature II,I,5 2
Last segment of exopod of leg 4 with armature III,I,5 6
2. Endopod of leg 4 a single segment (or at most with only a weak and incomplete indication of division) 3
Endopod of leg 4 composed of two distinct segments *M. fuciculum*
3. Rostrum with a subconical beak *M. rostratum*
Rostrum with a needle-like process 4
4. Without sexual dimorphism in formula of endopod of leg 1 (Vervoort, 1964) *M. cheliferum*
With sexual dimorphism in this ramus (last segment, I,I,4) 5
5. Caudal ramus $54 \times 23 \mu$ (2.35:1); a single claw on second antenna *M. valgum*
Caudal ramus $36 \times 20 \mu$ (1.8:1); two claws on second antenna *M. vervoorti*
6. Endopod of leg 4 composed of two distinct segments *M. mutatum*
Endopod of leg 4 a single segment 7
7. Second antenna with one claw (though a jointed seta may be present also) 8
Second antenna with two claws 9
8. Outermost spine on last segment of endopod of leg 1 with proximal half swollen medially and abruptly delimited from distal portion *M. lobatum*
Outermost spine on last segment of endopod of leg 1 swollen medially along most of its length *M. lytocarpi*
9. Claws on second antenna nearly equal to length of last segment *M. sargassi*
Claws on second antenna distinctly shorter than last segment *M. echinicum*

Macrochiron fuciculum Brady, 1872

Macrochiron fuciculum Brady, 1872a, pp. 9, 10, pl. 3, figs. 9-18 [among *Fucus*, between Ryhope and Sunderland, England; spelled "*Macrocheiron*" on plate].—Sewell, 1949, pp. 99, 152, 156, 185-187.—Stock, 1957, pp. 380, 381, figs. 8-10 [from The Netherlands].—Stock and de Vos, 1960, p. 206 [among *Fucus* and edible mussels, The Netherlands].

Macrochiron fucicolus.—Sewell, 1949, pp. 94, 95.

Macrochiron (Macrochiron) fuciculum.—Shen and Lee, 1966, p. 223.

Macrocheiron fuciculum.—Brady, 1872a, pl. 3, figs. 9-18; 1872b, p. 434, pl. 18, figs. 9-18 [among *Fucus*, between Ryhope and Sunderland, England].—G. O. Sars, 1917a, pp. 163-165, pl. 91 [from Norway].—C. B. Wilson, 1932, pp. 349, 350, fig. 209 [from Katama Bay, Martha's Vineyard, Massachusetts].—Gallingani, 1952, p. 75.—Marine Biological Association, 1957, p. 176.—Bruce, Colman, and Jones, 1963, p. 128.—Vervoort, 1964, p. 47.

Macrocheiron fuciculum.—Brian, 1923, p. 131 [from Rovigno, Italy].—Vátova, 1928, p. 179 [on *Sargassum*, Bagnole, near Rovigno, Italy].

Lichomolgus fucicolus.—Brady and Robertson, 1873, p. 140 [among weeds, western Ireland; England]; 1876, p. 197 [from England].—Brady, 1880, pp. 41-44, pl. 85, figs. 1-11 [from England]; 1902, p. 55 [off Newcastle, County Down; Roundstone Bay; Portpatrick Harbour, Wigtownshire].—Thompson, 1889, p. 189 [among algae, Puffin Island, Liverpool Bay, England]; 1893, p. 207, pl. 25, fig. 1 [from Liverpool Bay, England]; 1897b, p. 98 [from St. Aubin's Bay, English Channel].—T. Scott, 1894b, pp. 233, 258; 1897a, p. 153 [from Upper Loch Fyne, Scotland]; 1901, p. 252 [from Sound of Mull, Scotland]; 1906, p. 352 [from Firth of Forth, Scotland].—Herdman, 1896, p. 66.—Timm, 1896, p. 384 [from Cuxhaven, Germany].—Pearson, 1905, pp. 162, 163 [among weeds and in tow-net, Ireland].—Conseil Permanent International pour l'Exploration de la Mer, 1906, p. 95 [from English Channel].—L. W. Williams, 1907, p. 75 [from Wickford and Charlestown Pond, Rhode Island].—Sharpe, 1910, pp. 408, 421, 422, fig. 16 [in surface net, Buzzards Bay, Woods Hole, Massachusetts].—Farran, 1913, p. 6 [from Ireland].—Sumner, Osburn, and Cole, 1913, p. 639 [from Buzzards Bay, Massachusetts].

Lichomolgus fucicola.—Norman and T. Scott, 1906, p. 198 [from England].—T. Scott, 1912, p. 571 [from floating seaweed, 33°53' N, 32°27' W].

***Macrochiron cheliferum* (Thompson and A. Scott, 1903)**

Pseudanthessius chelifer Thompson and A. Scott, 1903, p. 277, pl. 14, figs. 12–18 [from Ceylon].

Macrochiron chelifer.—Gurney, 1927, p. 469 [from Suez Canal].

Macrochiron cheliferum.—Vervoort, 1964, pp. 47–54, figs. 11a, 12–14 [from Ifaluk Atoll, Caroline Islands].

Macrochiron cheliferum.—Stock, 1957, p. 381.

Macrochiron (Paramacrochiron) cheliferum.—Sewell, 1949, p. 108.

Lichomolgus (Macrochiron) chelifer.—Monod and Dollfus, 1932a, p. 139.

***Macrochiron echinicum*, new species**

FIGURES 109, 110

MATERIAL EXAMINED.—From *Lytechinus variegatus* (Leske), the green-white sea urchin (determined by Dr. W. Schroevers, Amsterdam): *Bonaire* (collected by JHS): many specimens (holotype, allotype, and paratypes), sea-grass field, depth 1–2 m, Lac, near Cai, 23 December 1958, ZMA Co. 100.647a-c. *Curaçao* (collected by JHS): 16 specimens, partly ovigerous, dredged in about 3 m in Piscadera Innerbay, near the former turtle hatchery, 17 December 1958, ZMA Co. 100.648; many specimens, on sandy bottom, depth about 3 m, Fuikbay, 10 December 1958, ZMA Co. 100.649. *Puerto Rico* (collected by AGH and RUG): 7 ♀♀, 4 ♂♂ from 63 hosts, Cayo Corral, south of La Parguera, 30 July 1959; 107 ♀♀, 150 ♂♂, and 43 copepodids from 150 hosts, depth 1 m, Cayo Majimo, near La Parguera, 2 August 1959. *Jamaica* (collected by AGH and RUG): many specimens, depth 1.5 m, Rackham's Cay, near Kingston, 31 August 1959.

From *Echinometra viridis* A. Agassiz, the dark sea urchin (determined by Prof. H. Engel, Amsterdam): *Curaçao* (collected by JHS): 1 ♂, depth about 1 m, Fuikbay, 10 December 1958, ZMA Co. 100.650a-b.

From *Tripaneustes ventricosus* (Lamarck), the white sea urchin (determined by Dr. W. Schroevers, Amsterdam): *Curaçao* (collected by JHS): 1 ♂ from 20 hosts, depth about 1 m, Piscadera Bay, 27

September 1958, ZMA Co. 100.651. *Bahamas* (this and the following eight collections made by AGH and RUG): 1 ♀ from single host, off the Lerner Marine Laboratory, North Bimini, 1 June 1959. *Barbados*: 1 ♂, 3 copepodids from 9 hosts, Six Men's Bay, 18 June 1959; 24 ♀♀, 13 ♂♂ from 3 hosts, depth 8 m, near wreck in Carlisle Bay, 6 July 1959; 116 ♀♀, 46 ♂♂ from 11 hosts, depth 5 m, Carlisle Bay, 16 July 1959; 5 ♀♀, 1 ♂ from a single host, depth 6 m, Oistin's Bay, 15 July 1959; 20 ♀♀, 20 ♂♂, and 1 copepodid from 6 hosts (white variety), depth 1.5 m, Carlisle Bay, 20 July 1959; and 133 ♀♀, 91 ♂♂, and 21 copepodids from 5 hosts (black and white variety), depth 1.5 m, in front of Bellairs Research Institute, St. James, 17 July 1959. *Puerto Rico*: 255 ♀♀, 618 ♂♂, and 20 copepodids from 25 hosts (plus many copepods unsorted from debris), Cayo Corral, south of La Parguera, 30 July 1959. *Jamaica*: 274 ♀♀, 420 ♂♂, and 331 copepodids (1,025 in all) from 7 hosts, depth about 1.5 m, Rackham's Cay, near Kingston, 31 August 1959.

The collections were made by AGH and RUG during field work supported by the National Science Foundation (G-8628), and by JHS during a stay at the Caribbean Marine Biological Institute, Piscadera Bay, Curaçao, subventioned by the former WOSUNA (now Netherland's Organization for the Advancement of Scientific Research in the Tropics, The Hague).

FEMALE.—The total length, without the furcal setae, is 1.49–1.41 mm (mean, 1.32 mm), based on six specimens. The metasome (Figure 109a) is elongately oval in outline, not very enlarged. The first pedigerous segment is completely fused with the cephalic segment. The ratio of the length to the width of the prosome is 1.57:1. The ratio of the length of the prosome to that of the urosome is 1.31:1.

The urosome consists of the usual five segments. The genital segment is 230 x 187 μ . The caudal ramus (Figure 109b) is 113 x 35 μ , about three times as long as wide, and more than 1.5 times as long as the anal segment. Each ramus bears five long, feathered setae—one at about $\frac{3}{5}$ of the outer margin, one lateral subterminal, two terminal, and one internal subterminal. A short, smooth dorsal seta is borne near the base of the latter. A row of minute spinules occurs on the posterior border of the anal segment on both sides.

The egg sac (Figure 109a) is short, not reaching the extremity of the caudal rami and in some specimens hardly reaching the second postgenital segment, is oval in shape, and contains numerous small eggs about 46 μ in diameter.

The first antenna (Figure 109d) is 343 μ long. The lengths of the seven segments (measured along their posterior nonsetiferous margins) are 22 (64 μ along the anterior margin), 88, 24, 61, 46, 32, and 28 μ respectively. The formula for the armature is the same as in *Macrochiron lytocarpi* Humes, with each of the three terminal segments bearing an aesthete. The rostrum (Figure 109c) is a pointed, tongue-shaped lobe. The second antenna (Figure 109e) is 3-segmented. The stout basal segment bears a spiniform seta which is finely pectinate on the inner margin. A similar seta occurs at three-fourths of the inner margin of the second segment. The third segment is slender, being nearly three times as long as wide, and bears (1) on the proximal inner margin two setae (one smooth and short, the other finely plumose and long) and (2) before the middle a pectinate seta. There is a complex terminal armature consisting of three smooth setae, two setae whose margins are provided with widely spaced, short ciliations, and two claws with finely and uniformly denticulated inner margins. The longer of these claws (58 μ along its axis) is strongly curved, the shorter (47 μ) is indistinctly 2-segmented.

The labrum is similar to that in *M. lytocarpi*.

The mandible (Figure 109f) is of the rather complex structure typical for *Macrochiron*. The paragnath is a small hairy lobe as in other species of the genus. The first maxilla (Figure 109f) consists of a simple lobe armed with one lateral smooth seta and three terminal compound setae. The second maxilla (Figure 109g) has a large basal segment; the terminal main lash bears more than 20 denticulations on its medial margin; the auxiliary lash also bears nearly 20 slender denticulations; a crenulated spinelike element arises near the implantation of the auxiliary lash.

The maxilliped (Figure 109h) is 3-segmented, the first segment being rather short and obscure. The second segment is smooth and rectangular. The third segment has an irregular shape and bears (1) a strong denticulated spine on its medial margin and (2) a terminal projection armed with two

rows of denticulations and with two spinules at its base.

The ventral area between the maxillipeds and the first pair of legs resembles that of *M. lytocarpi*.

Legs 1-4 are biramous, each ramus being trimerous except the endopod of leg 4 which is a single segment. Legs 1 and 2 are as figured (Figures 109i, 110a). Leg 3 resembles leg 2 but has the armature of the third endopod segment slightly different (Figure 110b). Leg 4 (Figure 110c) has a 3-segmented exopod 213 μ in length. The endopod, 98 x 31 μ in greatest dimensions including the spinous processes, is functionally 1-segmented (Figure 110c), although an indication of a segmentation line may sometimes exist (Figure 110d). The place of the former articulation is indicated by a distinct indentation of the outer margin of the segment. The only armature of the fourth endopod consists of two spines, the outer 52 μ , the inner 75 μ . The inner side of the basipods of legs 2-4 bears a strong bicuspidate process. On leg 1 a similar process is usually lacking, but in one specimen it was observed, though only on one side and thus probably representing an anomaly. The chaetotaxis of the rami of the legs is shown by the following formula:

P_1	exp	I-0; I-1; III, I, 4
	enp	0-1; 0-1; I, 5
P_2	exp	I-0; I-1; III, I, 5
	enp	0-1; 0-2; I, II, 3
P_3	exp	I-0; I-1; III, I, 5
	enp	0-1; 0-2; I, II, 2
P_4	exp	I-0; I-1; III, I, 5
	enp	II

Legs 1-4 have well-developed intercoxal plates, each with a medial coxopod seta (plumose, reduced in leg 4 to only 18 μ in length) and a lateral basipod seta (plumose).

The 1-segmented fifth leg, 114 x 26 μ in greatest dimensions, is clavate, long, slender, and curved (Figure 110e). The distal part of its lateral margin bears short spinules; there are two distal spines of very unequal length (39 μ and 83 μ). The adjacent seta on the body is 40 μ and lightly feathered.

Leg 6 is represented by two small, naked setae 10 μ and 8.5 μ and a small spinous process near the area of attachment of each egg sac.

MALE.—The total length, without the furcal setae, is 1.00-1.18 mm (mean, 1.09 mm), based on six specimens. In general aspect (Figure 110f) the

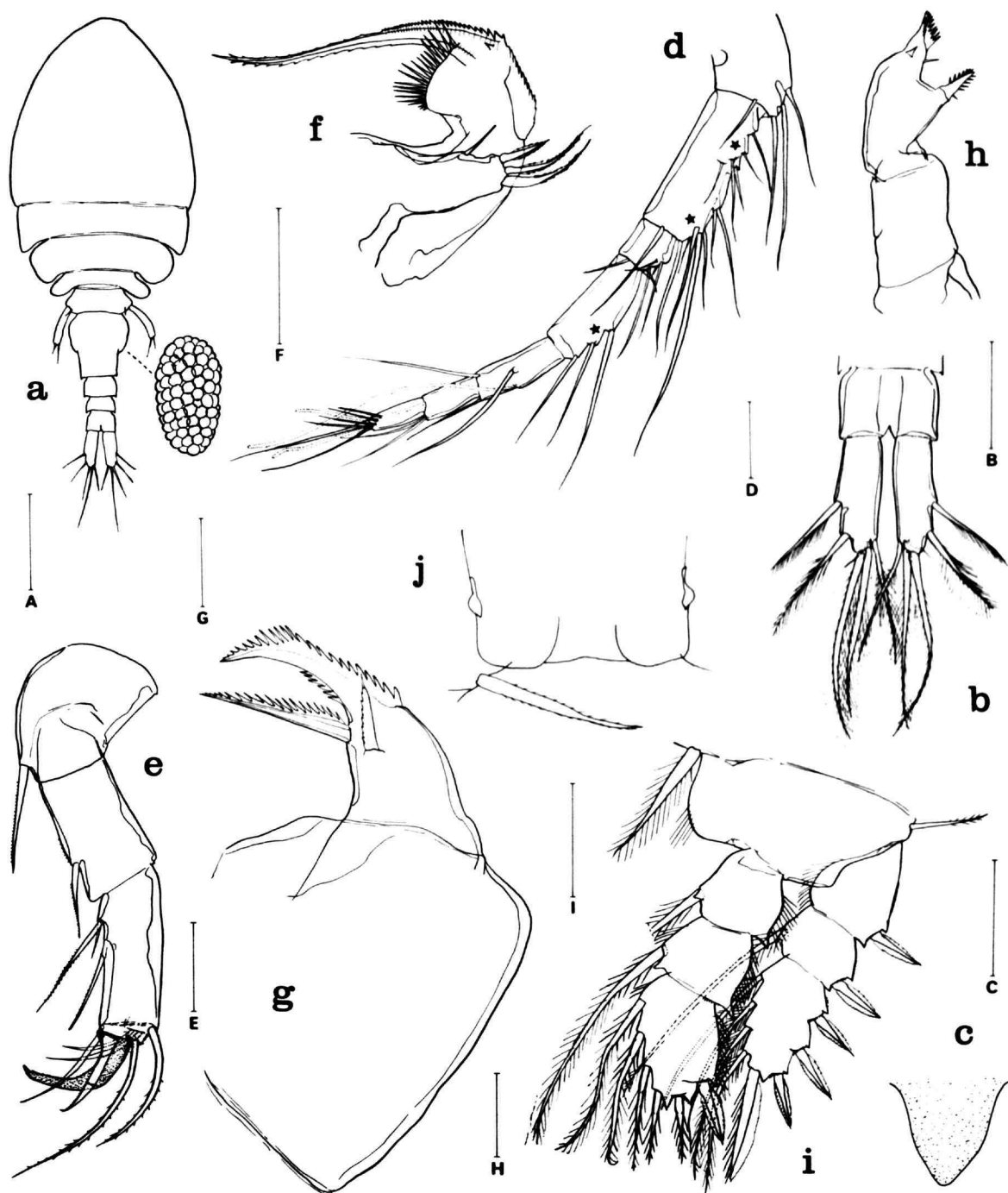


FIGURE 109.—*Macrochiron echinicum*, new species. Female: *a*, dorsal (A); *b*, anal segment and caudal rami (B); *c*, rostrum (C); *d*, first antenna, with asterisks indicating positions of additional aesthetes in male, (D); *e*, second antenna (E); *f*, mandible and first maxilla (F); *g*, second maxilla (G); *h*, maxilliped (H); *i*, leg 1 (I); *j*, intercoxal plate of leg 1 (J). Scale: A, 0.25 mm; B, C, 0.1 mm; D-F, H, I, 0.05 mm; C, 0.025 mm. (Drawn from sample ZMA Co.100.647.)

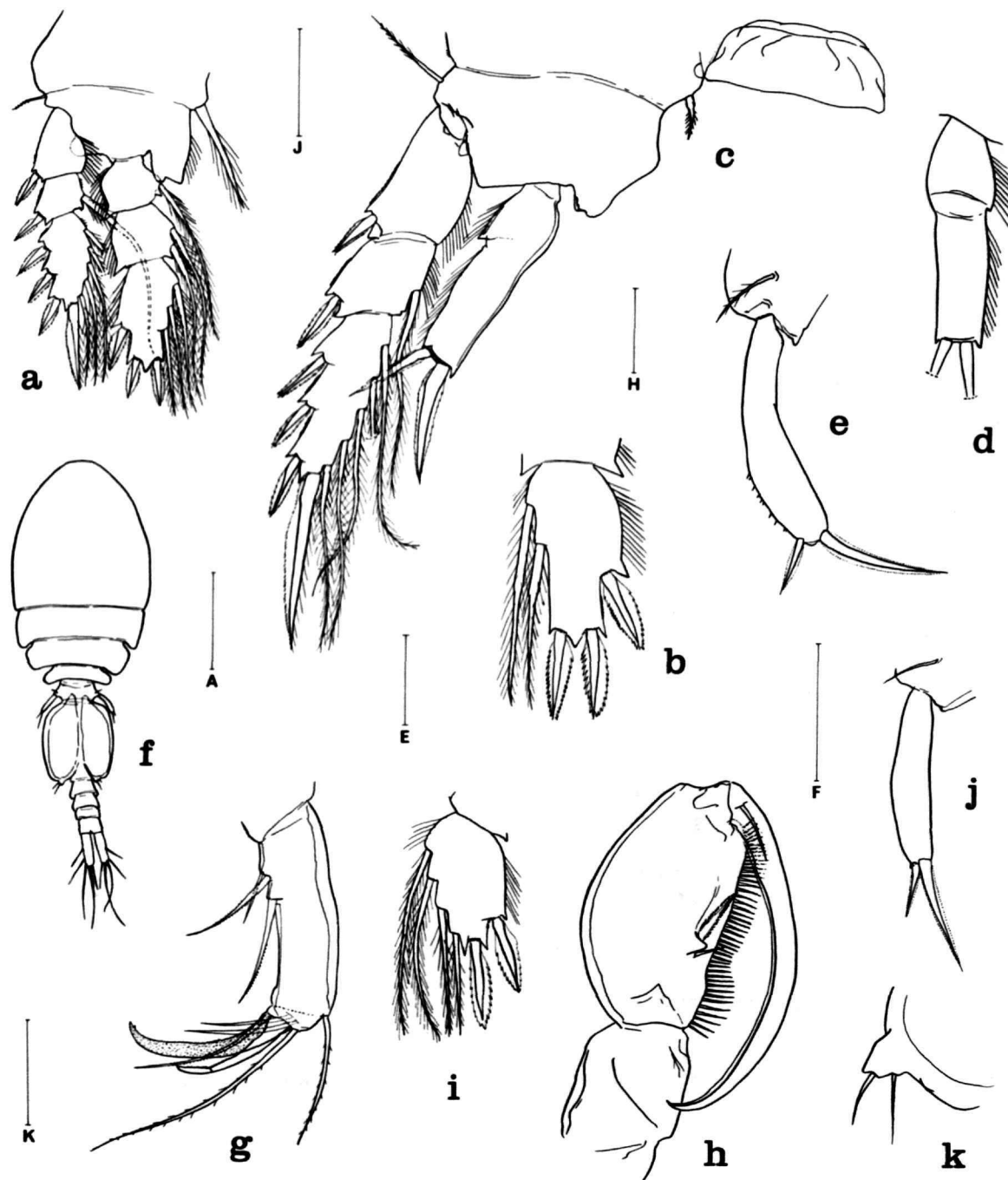


FIGURE 110.—*Macrochiron echinicum*, new species. Female: a, leg 2 (J); b, third segment of endopod of leg 3 (E); c, leg 4 and intercoxal plate (H); d, endopod of leg 4 of another female (H); e, leg 5 (E). Male: f, dorsal (A); g, distal segments of second antenna (K); h, maxilliped (E); i, third segment of endopod of leg 1 (K); j, leg 5 (F); k, leg 6 (H). Scale: A, 0.25 mm; E, F, H, K, 0.05 mm; J, 0.1 mm. (Drawn from sample ZMA Co.100.647.)

body is more slender than in the female. The ratio of the length to the width of the prosome is 1.57:1. The ratio of the length of the prosome to that of the urosome is 1.11:1. The urosome is 6-segmented. The genital segment, $253 \times 215 \mu$, is striking. Left and right on the posterior margin of this segment we find a pointed prominence (Figure 110k) armed with two setae, 29μ and 31μ , presumably representing the rudimentary sixth legs. The caudal ramus is $89 \times 30 \mu$.

There are several secondary sexual differences in the structure of the appendages. The first antenna bears, in addition to the three aesthetes present in the female, two long aesthetes on the second segment and one such aesthete on the fourth segment (the position of these aesthetes being indicated by an asterisk in Figure 109d). The second antenna has a more slender terminal main claw (78μ along its axis), which is moreover less curved than the corresponding claw in the female (compare Figures 109e and 110g). The male maxilliped (Figure 110h) is strongly prehensile; it consists of a smooth basal segment, a large second segment, a very small third segment, and a long, curved claw 198μ along its axis. The palmar edge of the second segment is armed with a row of sharp needlelike spines, with a strong compound spine, and with a slender smooth spine. Two setae arise near the base of the claw. The cutting edge of the claw is smooth, not crenulated.

The first leg of the male is similar to that of the female except that the outer distal seta of the third endopod segment (Figure 110i) has been replaced by a spine in the male. Consequently, the chaetotaxis formula of the endopod of leg 1 of the male is 0-1;0-1;II,4. The second and third legs are similar to those of the other sex. The fourth leg differs only slightly from that of the female—in having the third exopod segment a trifle more elongate.

The fifth leg (Figure 110j), $64 \times 13 \mu$, is less slender and straighter than that of the female, with its two terminal elements 30μ and 57μ ; its outer margin is smooth.

Leg 6 is shown in Figure 110k.

The spermatophore is unknown.

COLORATION.—Specimens associated with *Lytotechninus* and *Echinometra* have an opaque, grayish or ivory prosome; the egg sacs have the same color; the eye is pale red; the urosome is colorless. The

specimens found on *Tripneustes* have a dark red eye, an opaque, colorless body, and a somewhat yellowish intestine.

ETYMOLOGY.—The specific name *echinicum* (Latin *echinus*, a sea urchin, and *colo*, to inhabit) refers to the association of this species with echinoids.

REMARKS.—This is a common, sometimes abundant, associate of two edible sea urchins in the West Indian region. The number of copepods associated with a host may be considerable, as in the case of the seven *Tripneustes ventricosus* from Kingston, Jamaica, which had an average number of 146 copepods, including adults and copepodids, per urchin.

From the other West Indian species, *Macrochiron sargassi*, this species differs in the following details: leg 5 of the female is more elongate and less clavate in *M. sargassi*; the second antenna of the female of *M. echinicum* has a hooked and unsegmented main claw; the second maxilla shows a slightly different apical armature in the two species; the female maxilliped differs markedly in the ornamentation of the terminal segment; the caudal rami of *M. echinicum* are more elongate.

***Macrochiron lobatum* Humes and De Maria, 1969**

Macrochiron lobatum Humes and De Maria, 1969, pp. 139-144, figs. 1-21 [from the hydroid *Lytocarpus phoeniceus* Busk (= *Lytocarpus spectabilis* Allman), region of Nosy Bé, Madagascar].

***Macrochiron lytocarpi* Humes, 1966**

Macrochiron lytocarpi Humes, 1966a, pp. 6-14, figs. 1-32 [from the hydroid *Lytocarpus philippinus* (Kirchenpauer), region of Nosy Bé, Madagascar]; 1969, p. 152 [from *Lytocarpus philippinus*, region of Nosy Bé, Madagascar].

***Macrochiron mutatum* Stock, 1957**

Macrochiron mutatum Stock, 1957, p. 381.
Macrocheiron fucicolum.—G. O. Sars, non Brady, 1917, pp. 163-165, pl. 91 [from Norway].
Macrocheiron mutatum.—Vervoort, 1964, p. 47.

***Macrochiron rostratum* Humes, 1966**

Macrochiron rostratum Humes, 1966a, pp. 18-24, figs. 61-88 [from the hydroids *Lytocarpus philippinus* and *Lytocarpus spectabilis* Allman (= *Lytocarpus phoeniceus* Busk), region

of Nosy Bé, Madagascar].—Humes and De Maria, 1969, pp. 152, 153 [from the hydroids *Lytocarpus philippinus*, *Lytocarpus phoeniceus*, *Gymnangium hians* (Busk), *Gymnangium gracilicaulis* (Jäderholm), and *Aglaophenia delicatula* (Busk), region of Nosy Bé, Madagascar].

***Macrochiron sargassi* G. O. Sars, 1916**

FIGURES 111, 112

Macrocheiron sargassi G. O. Sars, 1916, pp. 3, 10, 11, pl. 2, [from Sargasso Sea].

Macrochiron sargassi.—Campbell, 1930, p. 181, pl. 1, figs. 13–16 [from Vancouver Island, Canada].—Clemens, 1933, p. 44.—Yeatman, 1962, pp. 256–259, figs. 1–17 [from *Sargassum* washings, 27°49' N, 48°29' W, Atlantic Ocean].—Fulton, 1968, p. 46.—Shih, Figuiera, and Grainger, 1971, p. 155.

MATERIAL EXAMINED.—1 ♀, 2 ♂♂, and 3 copepodids from washings of blackish brown compound ascidians, *Didemnum candidum* Sav. (determined by Dr. R. H. Millar, Millport), on mangrove roots, Piscadera Innerbay, Curaçao, 6 October 1958 (ZMA Co.100.644); 3 ♀♀ from washings of orange synascidians *Tridemnum ? orbiculare* (Van Name) (determined by Dr. R. H. Millar), same locality and date (ZMA Co.100.645); 1 copepodid, probably this species, from a coelenterate, *Renilla reniformis* (Pall.) (determined by F. M. Bayer, Washington), in sandy bottom, depth about 1 m, Little Bay, St. Martin, 2 February 1959 (ZMA Co.100.646).

REMARKS.—There can be little doubt that the species described by Sars from material collected by Prince Albert of Monaco in the Sargasso Sea is the same as the present form, found in washings of compound ascidians. The very characteristic female maxilliped and, to a lesser degree, the second antenna and the second maxilla agree well with Sars' illustrations. On the other hand, there are a few slight deviations from the original description. For example, Sars figures on the inner side of the basipod of leg 1 a slender seta which arises near the base of the endopod. Such a seta never occurs, as far as we know, in the family Lichomolgidae to which *Macrochiron* belongs, but it is characteristic in certain siphonostome families. At any rate, neither our specimens nor those described by Yeatman (1962) possess this seta, and we can but suppose that the seta figured by Sars is an error. The original illustrations do not show aesthetes on the first antenna, but we must point

out that often they are discernible only with a high-magnification or phase-contrast microscope (phase-contrast being unknown in Sars' time).

All appendages of the female reillustrated here (Figures 111, 112a-c) are on a somewhat larger scale than in Sars' and Yeatman's papers. The male (Figure 112d-f) differs in the usual characters of external anatomy (the shape of the genital segment, the number of urosomal segments); in the presence of long, perhaps aesthete-like setae (two on the second segment and one on the fourth segment); in the maxilliped (Figure 112d); in the elongate leg 5 (Figure 112f); and in the different chaetotaxis of the third endopod segment of leg 1 (Figure 112e).

The four females in our collection measure 0.84, 0.85, 0.85, and 1.06 mm in length, the two males 0.61 and 0.64 mm, and are consequently slightly smaller than the specimens recorded by Sars (female 1.03 mm) and Yeatman (female 1.05–1.12 mm, male 0.82–0.92 mm).

The fifth leg in the female copepodid V is very short (Figure 111d).

The association of *M. sargassi* with ascidians reported here is unique so far as known in the genus. The various species of *Macrochiron* hitherto have been known only as free-living animals or as associates of hydroids (except for *M. echinicum* described above from echinoids).

It is a matter of considerable doubt whether Campbell's record from the Canadian Pacific coast actually belongs to this species. The descriptions, illustrations, and locality do not provide sufficient basis for a positive recognition of this record.

***Macrochiron valgum* Humes, 1966**

Macrochiron valgum Humes, 1966a, pp. 14–18, figs. 33–60 [from the hydroid *Lytocarpus philippinus*, Nosy Bé, Madagascar].—Humes and De Maria, 1969, p. 152 [from the hydroids *Gymnangium hians* and *Gymnangium gracilicaulis*, region of Nosy Bé, Madagascar].

***Macrochiron verwoorti* Humes and De Maria, 1966**

Macrochiron verwoorti Humes and De Maria, 1966, pp. 144–152, figs. 22–52 [from the hydroid *Aglaophenia cupressina* Lamouroux, region of Nosy Bé, Madagascar].

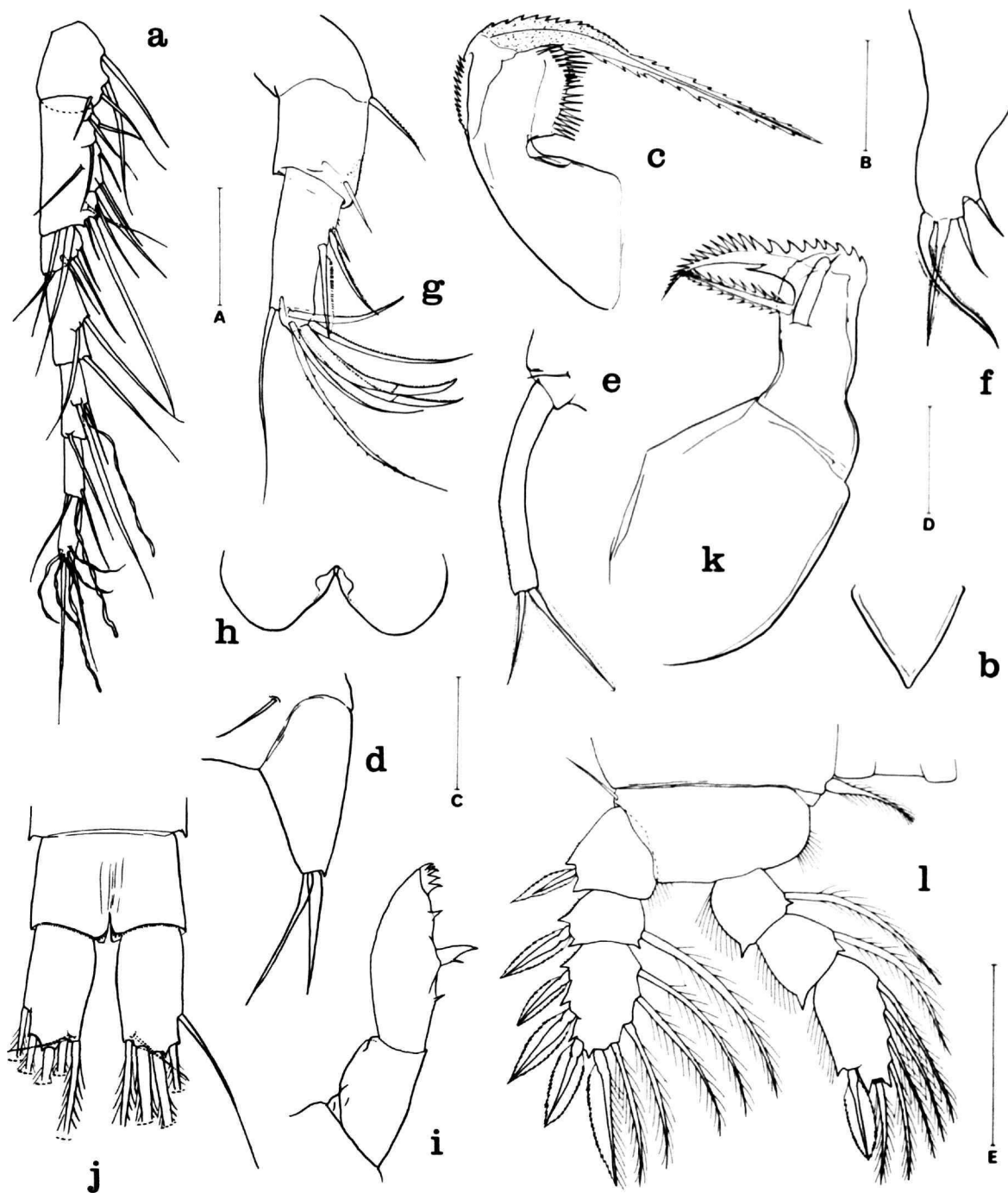


FIGURE 111.—*Macrochiron sargassi* G. O. Sars. Female: *a*, first antenna (A); *b*, rostrum (A); *c*, mandible (B); *d*, leg 5 of copepodid V (C); *e*, leg 5, adult (D); *f*, first maxilla (B); *g*, second antenna (A); *h*, labrum (D); *i*, maxilliped (D); *j*, anal segment and caudal rami (D); *k*, second maxilla (B); *l*, leg 1 (E). Scale: A, 0.07 mm; B, 0.03 mm; C, 0.025 mm; D, 0.05 mm; E, 0.1 mm. (All drawn from sample ZMA Co.100.645, except leg 5 of copepodid V, which is drawn from sample ZMA Co.100.644.)

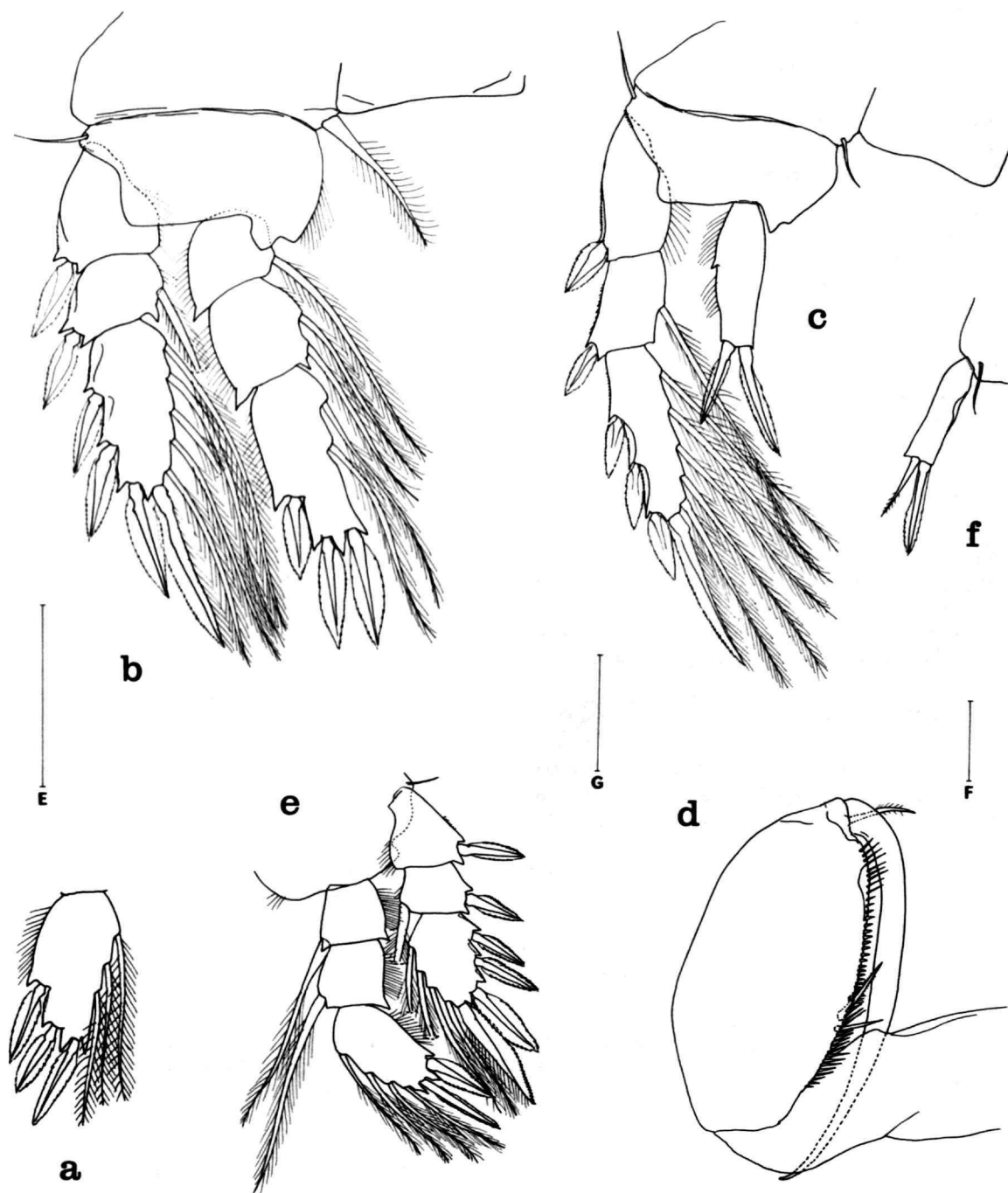


FIGURE 112.—*Macrochiron sargassi* G. O. Sars. Female: a, third segment of endopod of leg 2 (E); b, leg 3 (E); c, leg 4 (E). Male: d, maxilliped (F); e, leg 1 (G); f, leg 5 (F). Scale: E, 0.1 mm; F, 0.025 mm; G, 0.05 mm.

Genus *Meringomolgus* Humes and Stock, 1972

DIAGNOSIS.—Body cyclopiform. Urosome 5-segmented in the female, 6-segmented in the male. Caudal ramus with six setae. Rostrum broadly rounded posteroventrally. First antenna 7-segmented, with the formula in the female 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented, with the armature being 1, 1, 3, and 1 + 6 small elements, there being a single terminal claw.

Labrum with a deep cleft between the two lobes. Mandible with the base divided by an indentation into an unornamented proximal part and a distal area having on its convex side a scalelike region with a row of spinules; lash long. Paragnath a small hairy lobe. First maxilla with four elements. Second maxilla of the usual lichomolgid type, with the terminal lash and the adjacent seta of about equal length, but sexually dimorphic, the outer (ventral) proximal element on the second segment in the female being minute, but in the male an unusually large, proximally directed seta. Maxilliped in the female 3-segmented; in the male slender and 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1-4 with 3-segmented rami, except for leg 4 endopod which is 2-segmented. Coxa of leg 1 with a posterior outer lobe. Armature of the usual lichomolgidiform type, with leg 4 endopod being

0-I;II. Third segment of leg 4 exopod III,I,5. Inner element on the coxa of leg 4 spiniform. Sexual dimorphism in leg 1 endopod where the third segment is I,I,4 instead of I,5 as in the female (in *M. devotus* the inner spine is, however, only slightly spiniform). Leg 5 with a free segment bearing two terminal setae. Leg 6 in the female with two small spines and a spiniform process; in the male a posteroventral flap on the genital segment bearing two setae.

Other features as in the three species described below.

Associated with alcyonaceans.

TYPE-SPECIES.—*Meringomolgus facetus*, new species.

ETYMOLOGY.—The name is a combination of the Greek words *μηρίν* (bristle), alluding to the long proximal anteroventral element on the second segment of the second maxilla in the male, and *μολγος*. Gender masculine.

REMARKS.—*Meringomolgus* resembles *Acanthomolgus* in having a spine instead of a seta on the first segment of the endopod of leg 4. It differs prominently from that genus, however, in having only one claw on the second antenna, the lash and the adjacent seta on the second segment of the second maxilla being about equal in length (and in the male this segment bearing an unusually large outer proximal seta), the armature of the last segment of the exopod of leg 4 being III,I,5, and the inner element on the basis of leg 4 being a barbed spine.

Key to Species of the Genus *Meringomolgus*

FEMALES

1. Genital segment not sharply incised laterally *M. facetus*
 Genital segment sharply incised laterally 2
2. Second antenna with outer side of second segment smooth, first segment of leg 4 endopod with inner element plumose proximally but barbed distally *M. hamatus*
 Second antenna with outer side of second segment with spinules; first segment of leg 4 endopod with inner element barbed *M. devotus*

MALES

1. Third segment of leg 1 endopod with inner spine setiform and plumose *M. devotus*
 Third segment of leg 1 endopod with inner spine barbed 2
2. Second antenna with both outer and inner sides of second segment bearing spinules *M. facetus*
 Second antenna with only inner side of second segment bearing spinules *M. hamatus*

Meringomolgus facetus, new species

FIGURES 113-117

TYPE MATERIAL.—7 ♀♀, 42 ♂♂, and 51 copepodids washed from a single colony of an alcyonacean, *Sinularia polydactyla* (Hemprich and Ehrenberg), in 2 m, at Ambariobe, a small island almost between Nosy Komba and Nosy Bé, northwestern Madagascar, 22 August 1967, collected by AGH. Holotype ♀, allotype, and 43 paratypes (4 ♀♀, 39 ♂♂) deposited in USNM, the remaining paratypes (dissected) and the copepodids in the collection of AGH.

OTHER MATERIAL EXAMINED.—From *Sinularia polydactyla*: 6 ♀♀, 5 ♂♂, and 49 copepodids from single colony, in 12 m, west of the harbor at Hellville, Nosy Bé, 4 August 1967. From *Sinularia minima* Verseveldt: 6 ♀♀, 3 ♂♂, and 6 copepodids from seven colonies, in 15 m, Banc du Touareg, south of Nosy Bé, 13°32'05" S, 48°15'20" E, 1 September 1967.

FEMALE.—The body (Figure 113a) is cyclopid form. The length (not including the ramal setae) is 1.36 mm (1.28–1.44 mm) and the greatest width 0.57 mm (0.59–0.68 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1.43:1. The ratio of the length of the prosome to that of the urosome is 2:1.

The segment of leg 5 (Figure 113b) is 99 x 200 μ . There is no ventral intersegmental sclerite between that segment and the genital segment. The genital segment is 200 x 172 μ in greatest dimensions, in dorsal view constricted in its posterior half where the width is 104 μ . The areas of attachment of the egg sacs are situated dorsolaterally in the anterior half. Each area (Figure 113c) bears two small, spiniform, finely barbed elements, 6.5 μ and 10 μ in length, with a pointed process between them. The three postgenital segments are 73 x 94 μ , 44 x 100 μ , and 76 x 88 μ from anterior to posterior.

The caudal ramus (Figure 113d) is somewhat wider than long, 32 x 41 μ . The six setae are naked except for the dorsal seta which is 72 μ long and delicately feathered. The outer lateral seta and the outermost terminal seta are distally weak and hyaline, and they were broken in all specimens examined. The innermost terminal seta is 320 μ . The two long median terminal setae are

490 μ (outer) and 680 μ (inner), and both are inserted between dorsal (unornamented) and ventral (with a few minute crenations but no spinules) flaps. The ramus bears an inner dorsal setule and its outer margin has a very minute hair.

The body surface bears hairs (sensilla) as indicated in Figure 113a,b. The posteroventral margin of the anal segment is smooth.

The egg sac (Figure 113e) is oval, 495 x 242 μ , reaches slightly beyond the caudal rami, and contains many eggs about 45 μ in diameter.

The rostrum (Figure 113f) is broadly rounded posteroventrally.

The first antenna (Figure 113g) is 536 μ long. The lengths of the seven segments (measured along their posterior nonsetiferous margins) are 41 (88 μ along the anterior margin), 164, 39, 101, 57, 44, and 43 μ respectively. The formula for the armature is 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All the setae are naked.

The second antenna (Figure 113h) is 4-segmented. Each of the first two segments bears an inner seta. The third segment bears three setae. The last segment, 91 μ along its outer edge, 66 μ along its inner edge, and 26 μ wide, bears a single terminal claw 53 μ along its axis and six small hyaline elements. All the setae are naked. The outer surface of the second segment is ornamented with a few small spines.

The labrum (Figure 114a) has two broad posteroventral lobes.

The mandible (Figure 114b) has on the concave side of the base a deep indentation, distal to which there is a row of long spinules; the convex margin of the base bears a scalelike area with a row of spinules followed by a serrated hyaline fringe. The lash is moderately long and barbed on both sides. The paragnath (Figures 114a,c) is a small hairy lobe with a somewhat attenuated tip. The first maxilla (Figure 114d) bears four naked setae. The second maxilla (Figure 114e) is 2-segmented. The first segment is large and unornamented. The second segment has only a vestige of an outer (ventral) proximal element; more distally it bears a posterior surficial seta finely barbed along one edge and a prominent, unilaterally spinose seta which is about as long as the terminal lash (also spinose along one edge and with a few slender spinules distally along the opposite edge). The maxilliped (Figure 114f) is 3-segmented. The first segment

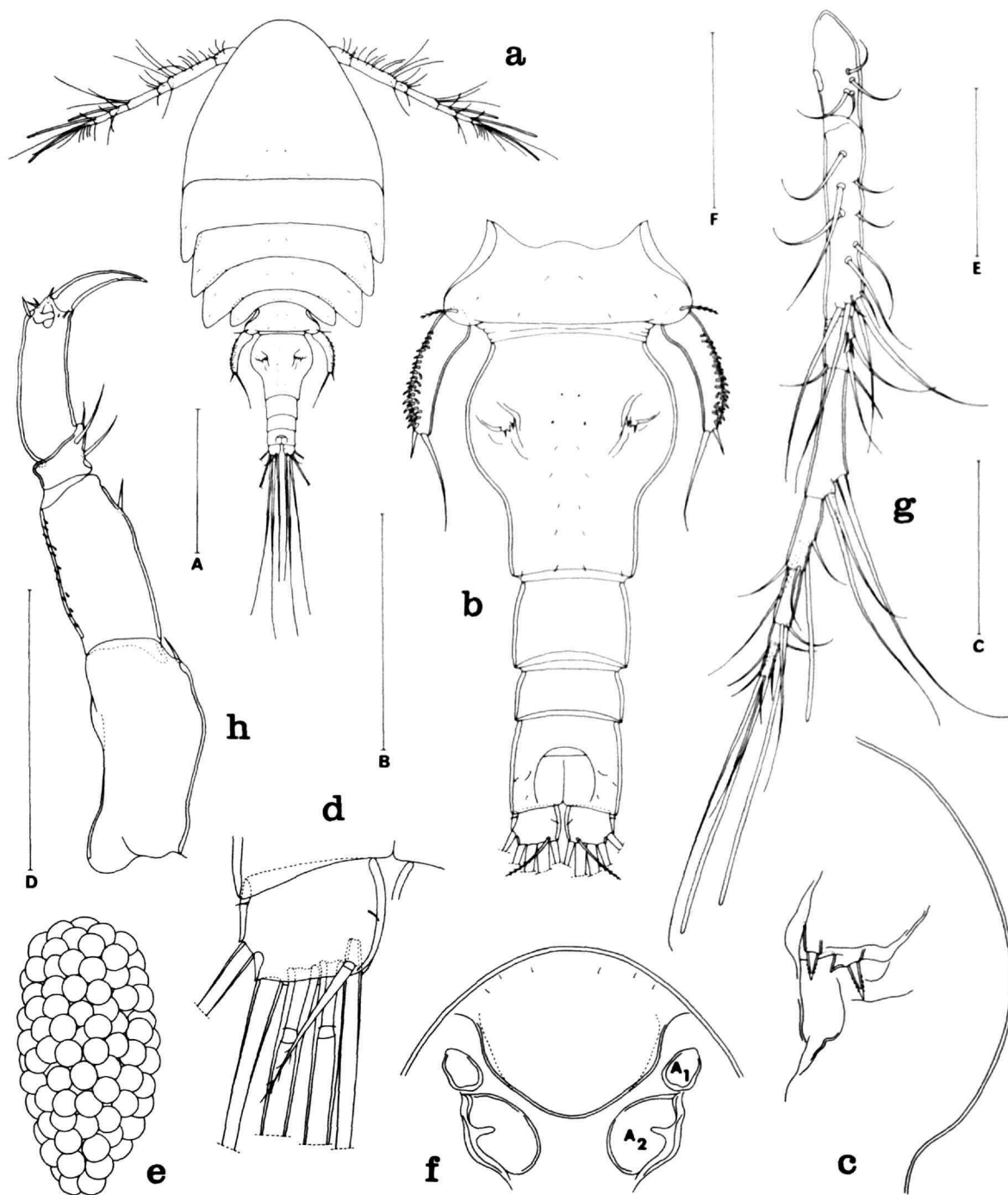


FIGURE 113.—*Meringomolgus facetus*, new species. Female: a, dorsal (A); b, urosome, dorsal (B); c, area of attachment of egg sac, dorsal (C); d, caudal ramus, dorsal (D); e, egg sac, dorsal (D); f, rostrum, ventral (E); g, first antenna, dorsal (B); h, second antenna, anterodorsal (F). Scale: A, D, 0.5 mm; B, E, 0.2 mm; C, 0.05 mm; F, 0.1 mm.

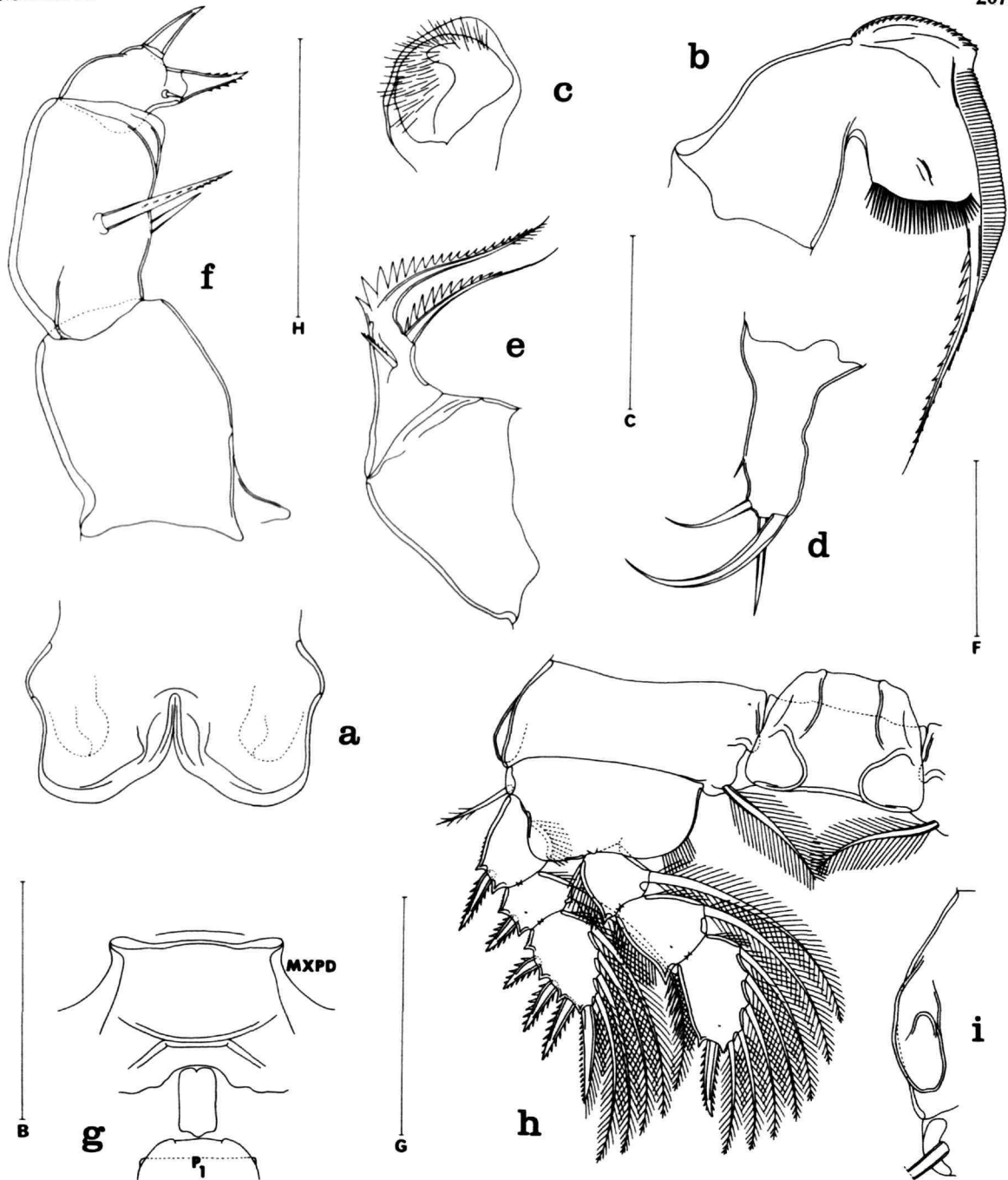


FIGURE 114.—*Meringomolgus facetus*, new species. Female: a, labrum, with paragnaths indicated by broken lines, ventral (c); b, mandible, posterior (c); c, paragnath, ventral (H); d, first maxilla, anterior (c); e, second maxilla, posterior (c); f, maxilliped, postero-inner (c); g, area between maxillipeds and first pair of legs, ventral (B); h, leg 1 and intercoxal plate, anterior (F); i, outer edge of coxa of leg 1, posterior (c). Scale: B, 0.2 mm; c, H, 0.05 mm, F, c, 0.1 mm.

is unornamented; the second segment bears two unequal setae, the shorter one naked, the longer one bilaterally spinose; and the third segment bears a stout, naked spine, a small, naked spinule, and a terminal spiniform barbed process lacking a distinct articulation.

The ventral area between the maxillipeds and the first pair of legs (Figure 114g) is only slightly protuberant, just behind the level of the maxilliped. A sclerotized line connects the bases of the maxillipeds.

Legs 1-4 (Figures 114h, 115a-c) have trimerous rami, except for the endopod of leg 4 which is 2-segmented. The armature is as follows:

P ₁	coxa	0-1	basis	1-0	exp	I-0; I-1; III,I,4
					enp	0-1; 0-1; I,5
P ₂	coxa	0-1	basis	1-0	exp	I-0; I-1; III,I,5
					enp	0-1; 0-2; I,II,3
P ₃	coxa	0-1	basis	1-0	exp	I-0; I-1; III,I,5
					enp	0-1; 0-2; I,II,2
P ₄	coxa	0-1	basis	1-0	exp	I-0; I-1; III,I,5
					enp	0-1; II

The inner element on the coxa of legs 1-3 is large, setiform, and feathered, but in leg 4 this element is shorter (31 μ), spiniform, and barbed. The coxa of leg 1 bears an outer posterior lobe (Figures 114h,i). The inner margin of the basis of all four legs bears a row of hairs. The endopod of leg 4 has hairs along the outer margins of both segments. The first segment is 55 x 34 μ (the length not including the spinous processes) and bears an inner distal barbed spine 52 μ (Figure 115e). The second segment is 110 μ long (including the terminal spiniform processes) and 28 μ in greatest width; the outer terminal spine is 31 μ , the inner spine 77 μ , both barbed. One female showed slightly different proportions in this endopod (Figure 115d): the first segment 66 x 36 μ with its spine 70 μ , and the second segment 143 x 25 μ (19 μ in least width) with its terminal spines 44 μ and 94 μ . Although the lobe of the basis overlying anteriorly the first segment of the exopod is usually smooth, in one female this lobe bore a row of spinules (Figure 115f).

Leg 5 (Figure 115g) has a moderately elongated free segment 104 x 22 μ (29 μ wide at the slight proximal expansion and 16 μ wide at the tip), slightly recurved, and not reaching the level of the middle of the genital segment (Figure 113b). The dorsal outer surface of the segment has large,

broad, scalelike spines, in flat view (Figure 115h) each scale being about 11 x 9 μ . One terminal seta is weak and hyaline, and broken in all specimens seen; the other seta is 83 μ long and very finely barbed along the middle of one edge. The seta on the body near the insertion of the free segment is 30 μ and feathered.

Leg 6 is probably represented by the two elements near the attachment of each egg sac (Figure 113c).

The color in life in transmitted light is opaque, the eye red, the egg sacs gray.

MALE.—The body (Figure 116a) is more slender than in the female. The length is 1.15 mm (1.09-1.20 mm) and the greatest width 0.36 mm (0.35-0.39 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 2.08:1. The ratio of the length of the prosome to that of the urosome is 1.71:1.

The segment of leg 5 (Figure 116b) is 52 x 112 μ . There is no ventral intersegmental sclerite. The genital segment is 185 x 169 μ , slightly longer than wide. The four postgenital segments are 49 x 81 μ , 47 x 74 μ , 34 x 70 μ , and 50 x 73 μ from anterior to posterior.

The caudal ramus is similar to that in the female, but smaller, 28 x 34 μ .

The surface of the body is ornamented with hairs as in the female.

The rostrum is like that of the female.

The first antenna (Figure 116c) is segmented and armed as in the female, but there are two additional aesthetes on segment 2 and another on segment 4, so that the formula is 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All the setae are naked.

The second antenna (Figure 116d) is a little more slender than in the female, with the fourth segment markedly so. The dimensions of the fourth segment are 105 μ along the outer edge, 77 μ along the inner edge, and 17 μ wide. In addition to the armature and ornamentation already noted in the female, the first segment bears a row of spines near the insertion of the seta, the second segment bears inwardly a row of slender spinules and three rows of broad spines, and the fourth segment bears an inner marginal row of small spinules and scattered minute spines on its antero-inner surface. The terminal claw is 57 μ along its axis.

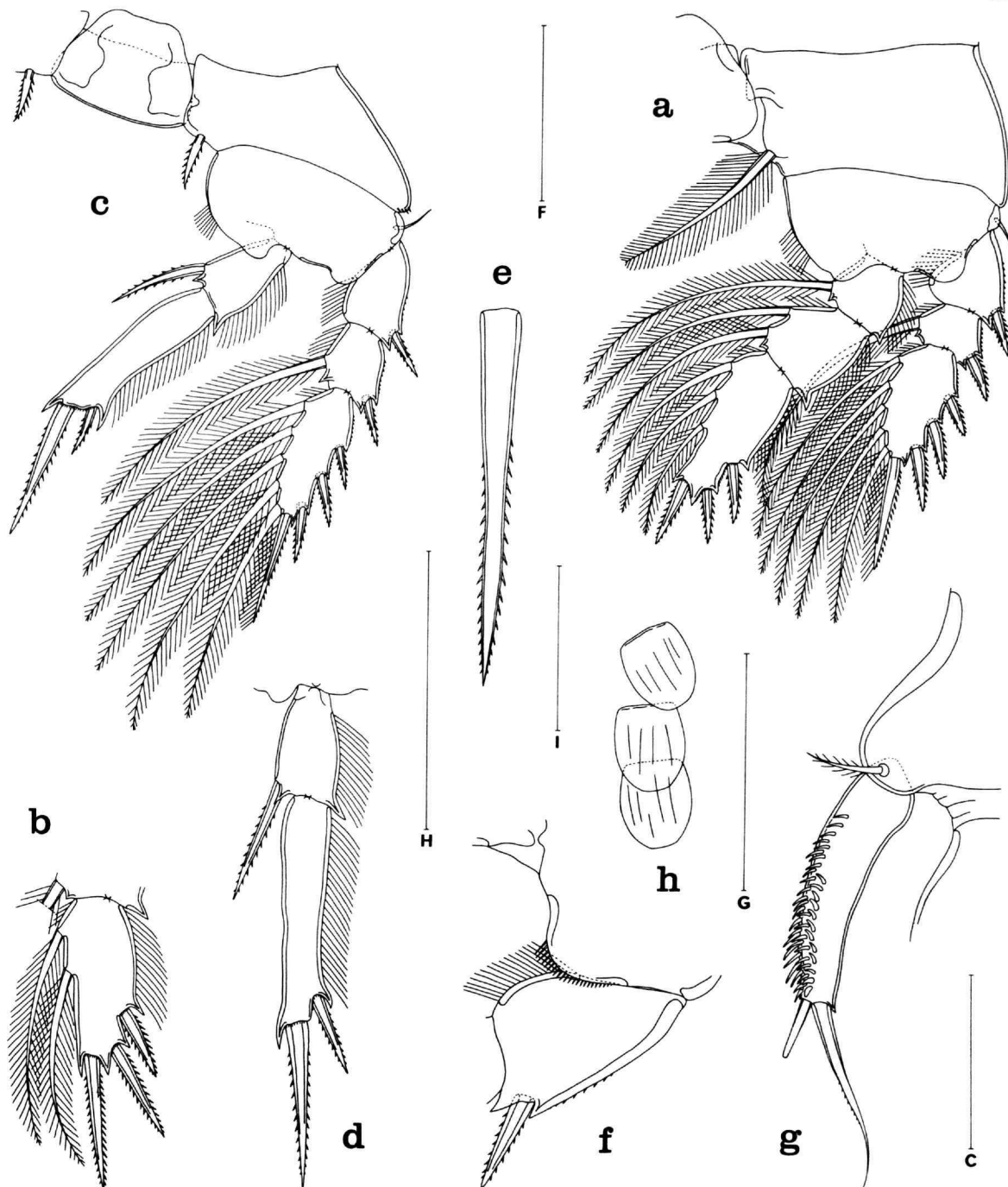


FIGURE 115.—*Meringomolgus facetus*, new species. Female: a, leg 2, anterior (F); b, third segment of endopod of leg 3, anterior (F); c, leg 4 and intercoxal plate, anterior (F); d, endopod of leg 4, anterior (F); e, inner spine on first segment of endopod of leg 4, anterior (H); f, lobe of basis overlying first segment of exopod of leg 4, anterior (C); g, leg 5, dorsal (C); h, three scales on leg 5, antero-inner (I). Scale: C, H, 0.05 mm; F, G, 0.1 mm; I, 0.02 mm.

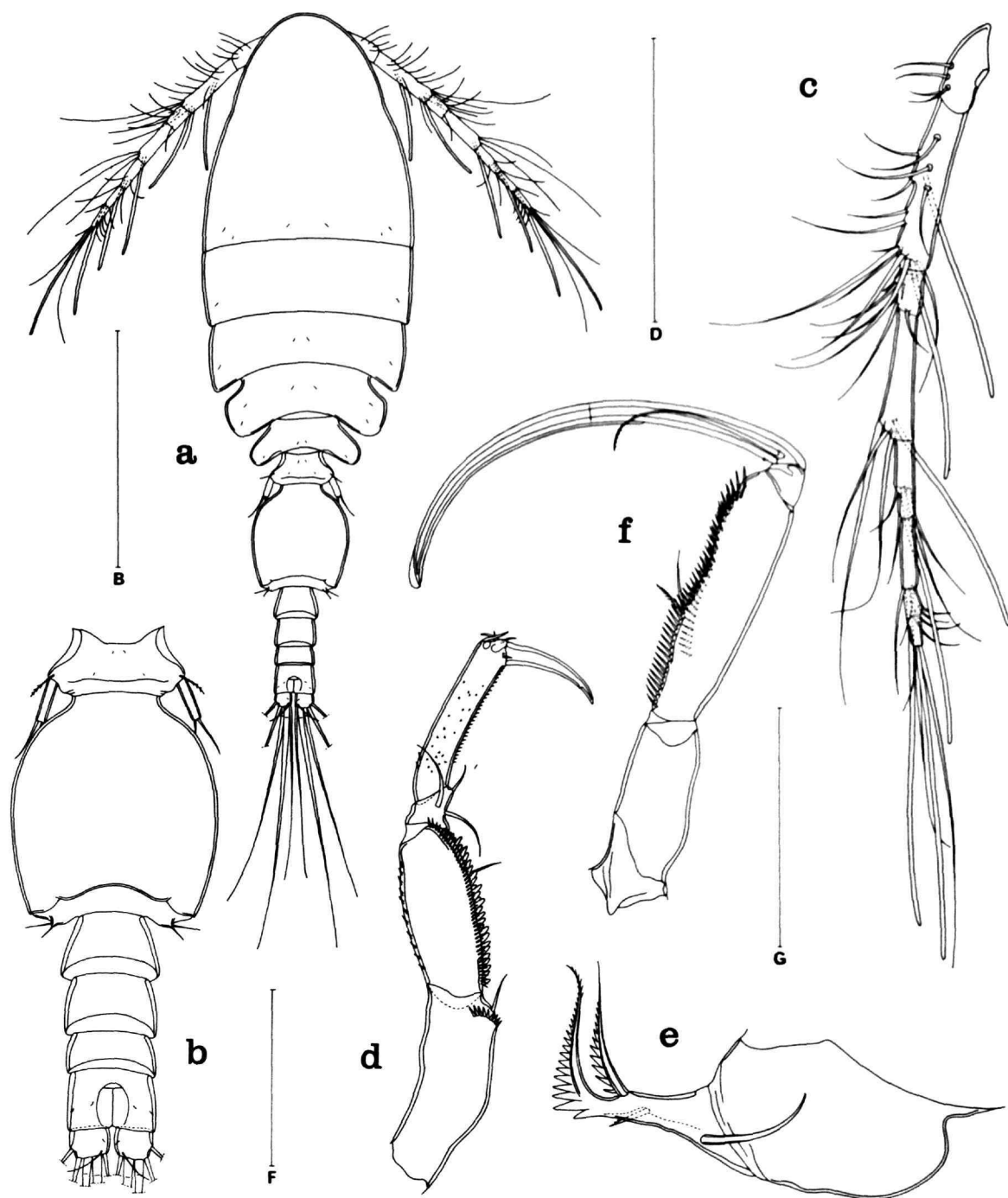


FIGURE 116.—*Meringomolgus facetus*, new species. Male: a, dorsal (D); b, urosome, dorsal (B); c, first antenna, dorsal (B); d, second antenna, antero-inner (F); e, second maxilla, posterior (C); f, maxilliped, inner (B). Scale: B, 0.2 mm; D, 0.5 mm; F, C, 0.1 mm.

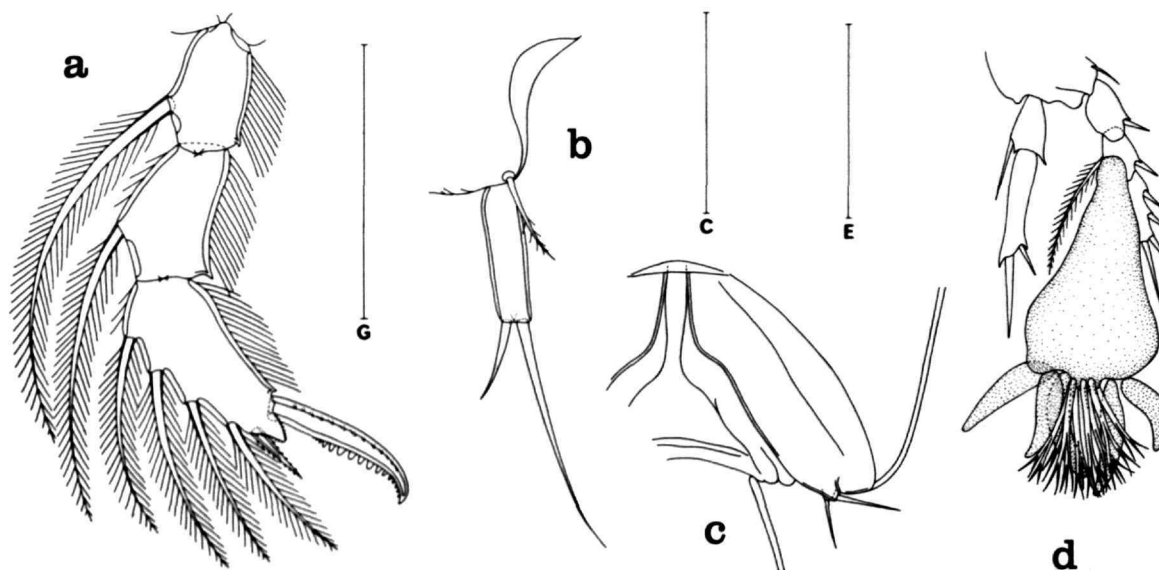


FIGURE 117.—*Meringomolgus facetus*, new species. Male: a, endopod of leg 1, anterior (c); b, leg 5, dorsal (c); c, leg 6, ventral (c); d, suctorian attached to second segment of exopod of leg 4, posterior (e). Scale: c, 0.05 mm; e, 0.2 mm; a, 0.1 mm.

The labrum, mandible, paragnath, and first maxilla resemble those of the female. The second maxilla (Figure 116e) has an unusually large outer (ventral) proximal seta on the second segment. The maxilliped (Figure 116f) is slender and 4-segmented (assuming that the proximal part of the claw represents a fourth segment). The first segment is unornamented. The second segment bears two setae (one with a row of slender barbules along one edge, the other smooth) and two rows of spinules. The small third segment is unarmed. The recurved claw is slender and elongated, 335 μ along its axis, with a small terminal lamella, and with weak indication of division about midway. Proximally the claw bears a long seta with unilateral subterminal barbules and only a trace of the second seta usually seen in lichomolgids.

The ventral area between the maxillipeds and the first pair of legs is like that of the female.

Legs 1–4 are segmented and armed as in the female, except for the last segment of the endopod of leg 1 (Figure 117a) where the formula is I,I,4 instead of I,5 as in the female. The outer spine, recurved distally, is 56 μ and the inner straight spine 23 μ . Legs 2–4 resemble those of the female.

Leg 5 (Figure 117b) has a slender, subrectangular, unornamented free segment 34 \times 9 μ . The two

naked terminal setae are 20 μ and 65 μ and the slightly feathered seta on the body near the segment is 28 μ .

Leg 6 (Figure 117c) consists of a posteroventral flap on the genital segment, bearing two naked setae 26 μ and 34 μ .

The spermatophore was not observed.

The color in life in transmitted light is like that of the female.

ETYMOLOGY.—The specific name *facetus* (Latin, elegant) alludes to the general form and ornamentation of this species.

REMARKS.—One female had a large suctorian (Figure 117d) attached to the posterior surface of the second segment of the exopod of the right leg 4. The body of the suctorian is 244 \times 138 μ ; the tentacles and five buds are about 106 μ long, making the overall length 350 μ . It seems probable that this suctorian is similar to the *Ophryodendron* sp. reported from *Lichomolgus singularipes* by Humes and Ho (1968c).

Meringomolgus devotus, new species

FIGURES 118–120

TYPE MATERIAL.—49 ♀♀, 41 ♂♂, and 35 copepodids from three colonies of the alcyonacean

Sinularia leptoclados (Hemprich and Ehrenberg), in 1 m, Ankify, on the mainland of Madagascar opposite Nosy Komba, 23 August 1967, collected by AGH. Holotype ♀, allotype, and 84 paratypes (46 ♀♀, 38 ♂♂) deposited in USNM, the remaining paratypes (dissected) and the copepodids in the collection of AGH.

OTHER MATERIAL EXAMINED (all from *Sinularia leptoclados*).—15 ♀♀, 15 ♂♂, and 21 copepodids from single colony, in 1 m, Ankify, 22 July 1967; and 5 ♀♀, 2 copepodids from single colony, in 1 m, Ankify, 11 August 1967.

FEMALE.—The body (Figure 118a) is cycloform. The length is 1.37 mm (1.18–1.46 mm) and the greatest width 0.58 mm (0.53–0.64 mm), based on seven specimens in lactic acid. The ratio of the length to the width of the prosome is 1.51:1. The ratio of the length of the prosome to that of the urosome is 1.93:1.

The segment of leg 5 (Figure 118b) is 94 × 180 μ. Between this segment and the genital segment there is no ventral intersegmental sclerite. The genital segment in dorsal view is broadened in its anterior three-fourths (146 × 185 μ) and abruptly narrowed in its posterior fourth (50 × 114 μ). The overall length of the segment is 196 μ. The margins of the expanded portion are slightly lobulate as indicated in the figure. The areas of attachment of the egg sacs are located dorsolaterally at the middle of the anterior portion. Each area (Figure 118c) bears two naked elements, 8 μ and 17 μ, with a spiniform process between them. The three postgenital segments are 62 × 101 μ, 39 × 88 μ, and 70 × 91 μ from anterior to posterior.

The caudal ramus, 34 × 35 μ, resembles that of *M. facetus*. The dorsal seta is 78 μ and feathered. The outer lateral seta and the outermost terminal seta are broken. The innermost terminal seta is 210 μ, and the two long median terminal setae 375 μ (outer) and 550 μ (inner), both inserted between unornamented flaps. All three of these setae are naked.

The body surface is ornamented with hairs (sensilla) as in Figure 118a,b. The posteroventral margin of the anal segment is smooth.

The egg sac was not observed.

The rostrum is like that in *M. facetus*.

The first antenna, 477 μ in length, is segmented and armed as in *M. facetus*. The lengths of the seven segments (measured along their posterior

nonsetiferous margins) are 61 (89 μ along the anterior margin), 140, 44, 75, 53, 42, and 34 μ respectively. All the setae are naked.

The second antenna (Figure 118d) resembles that of *M. facetus*, but the fourth segment is more slender, 115 μ along its outer edge, 88 μ along its inner edge, and 21 μ wide. The claw is 62 μ along its axis.

The labrum and paragnath are like those of *M. facetus*. The mandible (Figure 118e) resembles closely that of *M. facetus*. The first maxilla (Figure 118f) also resembles that of *M. facetus* except that the longest element has a few minute unilateral barbules. The second maxilla (Figure 118g) is similar to that in *M. facetus*, but the terminal lash is armed with a dentiform spine followed by a row of long, slender spines with slightly recurved tips. The maxilliped (Figure 118h) resembles that of *M. facetus*, but the first and second segments are ornamented with groups of spinules as shown in the figure.

The ventral area between the maxillipeds and the first pair of legs is like that in *M. facetus*.

Legs 1–4 are segmented and armed as in *M. facetus*. As in that species, the coxa of leg 1 has an outer posterior lobe, the inner margin of the basis in all four legs bears a row of hairs, and the inner element on the coxa of leg 4 is short (32 μ), spiniform, and barbed, rather than long, setiform, and feathered as in legs 1–3. The spine on the last segment of the endopod of leg 1 (Figure 119a) is straight. The endopod of leg 4 (Figure 119b) closely resembles that of *M. facetus*. The first segment is 51 × 37 μ (not including the spinous processes) and its inner distal barbed spine is 66 μ. The second segment is 113 μ long (including the terminal spiniform processes) and 27 μ in greatest width; the outer terminal spine is 42 μ, the inner spine 84 μ, both barbed.

Leg 5 (Figure 119c) has a free segment somewhat like that of *M. facetus*, but the shape is slightly different and the scalelike spines are fewer in number. The dimensions are 108 × 23 μ (the width taken at the middle). The three setae (two terminal and one on the body near the free segment) are similar to those in *M. facetus*.

Leg 6 is probably represented by the two elements near the attachment of each egg sac (Figure 118c).

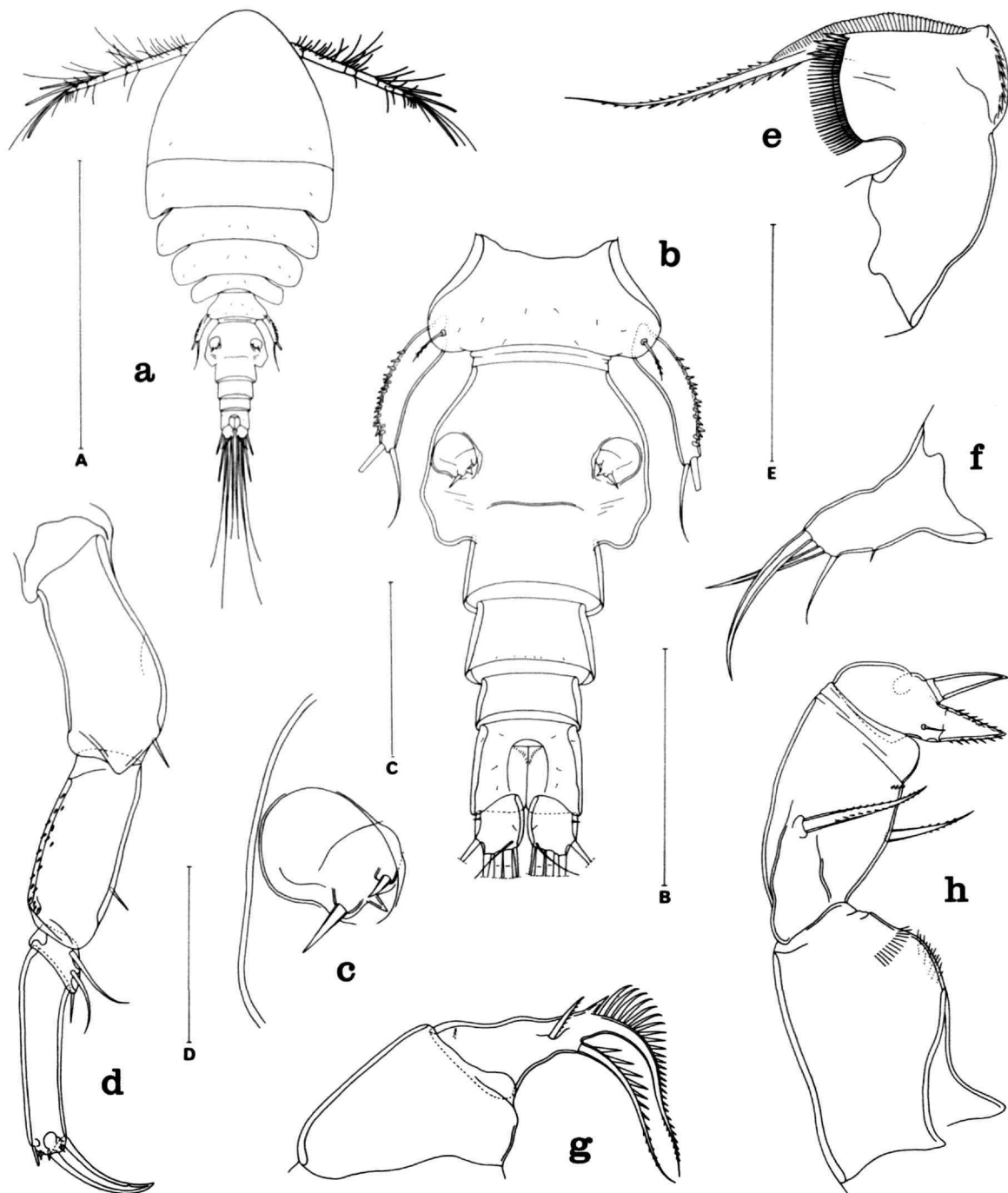


FIGURE 118.—*Meringomolgus devotus*, new species. Female: *a*, dorsal (A); *b*, urosome, dorsal (B); *c*, area of attachment of egg sac, dorsal (C); *d*, second antenna, antero-inner (D); *e*, mandible, posterior (E); *f*, first maxilla, posterior (F); *g*, second maxilla, posterior (G); *h*, maxilliped, postero-inner (H). Scale: A, 1.0 mm; B, 0.2 mm; C, 0.05 mm; D, E, 0.1 mm.

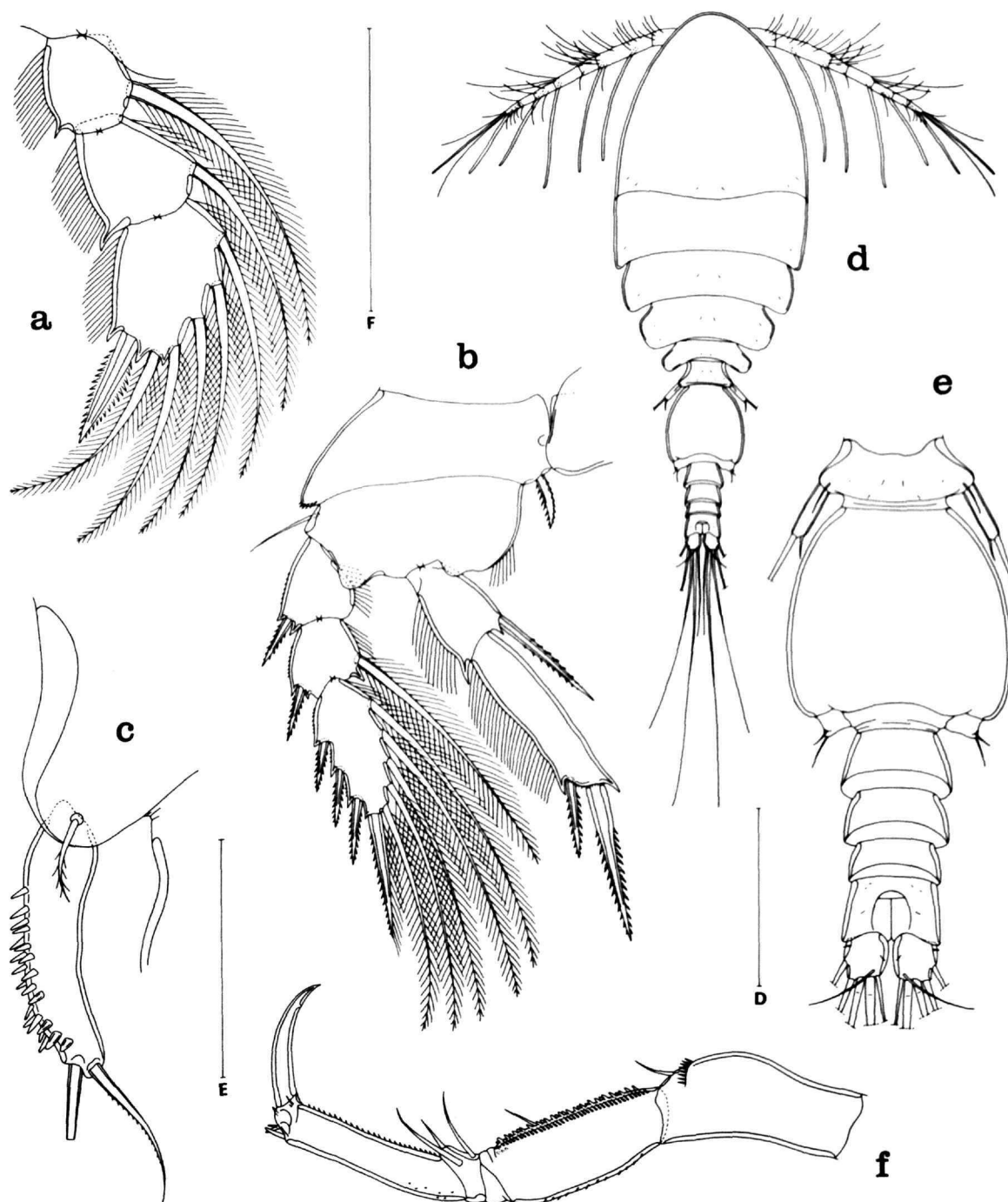


FIGURE 119.—*Meringomolgus devotus*, new species. Female: *a*, endopod of leg 1, anterior (E); *b*, leg 4, anterior (D); *c*, leg 5, dorsal (E). Male: *d*, dorsal (F); *e*, urosome, dorsal (D); *f*, second antenna, antero-inner (E). Scale: D, E, 0.1 mm; F, 0.5 mm.

The color in life in transmitted light resembles that of *M. facetus*.

MALE.—The body (Figure 119d) resembles that of the female. The length is 0.88 mm (0.83–0.92 mm) and the greatest width 0.31 mm (0.30–0.33 mm), based on six specimens in lactic acid. The ratio of the length to the width of the prosome is 1.83:1. The ratio of the length of the prosome to that of the urosome is 1.86:1.

The segment of leg 5 (Figure 119e) is $34 \times 84 \mu$. There is no ventral intersegmental sclerite. The genital segment is $127 \times 124 \mu$. The four post-genital segments are $33 \times 63 \mu$, $31 \times 57 \mu$, $22 \times 52 \mu$, and $35 \times 54 \mu$ from anterior to posterior.

The caudal ramus is like that of the female, but smaller, $28 \times 28 \mu$.

The surface of the body is ornamented with hairs as in the female.

The rostrum resembles that of the female.

The first antenna is similar to that of the female, but there are three additional aesthetes as in the male of *M. facetus*. The second antenna (Figure 119f) resembles that of *M. facetus*. The last segment is 83μ along its outer edge, 62μ along

its inner edge, and 16μ wide; there are fewer minute spines on the antero-inner surface than in *M. facetus*. The terminal claw is 55μ along its axis.

The labrum, mandible, paragnath, and first maxilla are like those in the female. The second maxilla (Figure 120a) has an unusually long outer (ventral) proximal seta on the second segment. The maxilliped (Figure 120b) resembles that of *M. facetus*, but the claw is shorter (205μ along its axis) and its proximal seta is relatively longer than in that species.

The ventral area between the maxillipeds and the first pair of legs is like that of the female.

Legs 1–4 are segmented and armed as in the female, except for the last segment of the endopod of leg 1 (Figure 120c), where the spine (35μ long) is slightly recurved rather than straight as in the female and the adjacent element, though not distinctly spiniform as in *M. facetus*, is shorter than in the female, straight, and feathered. Legs 2–4 are like those of the female.

Leg 5 (Figure 119e) resembles that of *M. facetus*, with the free segment $32 \times 10 \mu$.

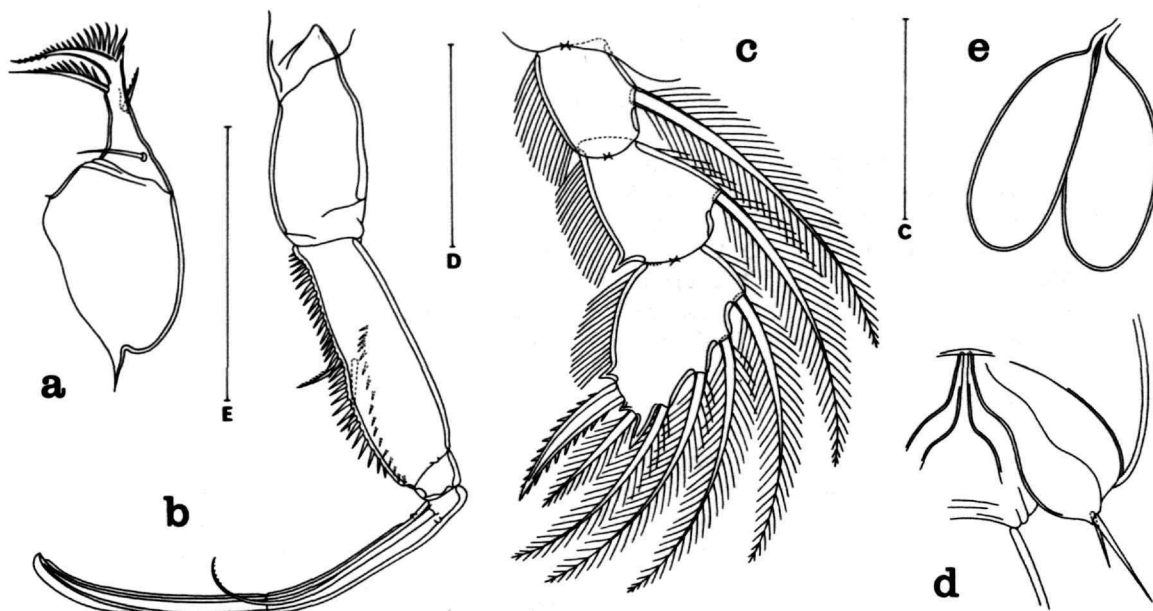


FIGURE 120.—*Meringomolgus devotus*, new species. Male: a, second maxilla, posterior (E); b, maxilliped, inner (D); c, endopod of leg 1, anterior (C); d, leg 6, ventral (E); e, spermatophores, attached to female, dorsal (D). Scale: c, 0.05 mm; d, e, 0.1 mm.

Leg 6 (Figure 120d) consists of a posteroventral flap on the genital segment bearing two naked setae, 30 μ and 16 μ .

The spermatophore (Figure 120e), attached to the female in pairs, is 150 x 44 μ (not including the neck).

ETYMOLOGY.—The specific name *devotus* (Latin, attached or faithful) alludes to the association with an octocoral.

REMARKS.—The female of this species may be distinguished from *M. facetus* by the shape of the genital segment; the male by the nature of the sexual dimorphism in the armature of the last segment of the endopod of leg 1. *M. devotus* has in both sexes the terminal lash on the second maxilla ornamented differently than in *M. facetus*.

Meringomolgus hamatus, new species

FIGURES 121–123

TYPE MATERIAL.—11 ♀♀, 14 ♂♂ from three colonies of the alcyonacean *Sinularia leptoclados* (Hemprich and Ehrenberg), in 1 m, Ankify, on the mainland of Madagascar, opposite Nosy Komba, 23 August 1967, collected by AGH. Holotype ♀, allotype, and 17 paratypes (7 ♀♀, 10 ♂♂) deposited in USNM, the remaining paratypes (dissected) in the collection of AGH.

OTHER MATERIAL EXAMINED.—From *Sinularia leptoclados*: 1 ♂ in 1 m, Ankify, 22 July 1967; 2 ♀♀, 5 ♂♂, and 10 copepodids from single colony, in 15 m, Nosy Iranja, southwest of Nosy Bé, 13°35'10" S, 48°49'00" E, 9 August 1967; 3 ♀♀, 2 ♂♂ from single colony, in 1 m, Ankify, 11 August 1967; and 3 ♀♀, 4 ♂♂ and 3 copepodids from single colony, in 20 m, west of Andilana, Nosy Bé, 13°18' S, 48°07' E, 24 August 1967. From *Sinularia maxima* Verseveldt: 3 ♀♀, 13 ♂♂, and 150 copepodids from single colony, in 1 m, Pte. Lokobe, Nosy Bé, 12 June 1967. From *Sinularia humesi* Verseveldt: 3 ♀♀, 6 ♂♂ from single colony, in 18 m, Banc du Touareg, south of Nosy Bé, 13°32'05" S, 48°15'20" E, 11 July 1967; and 8 ♀♀, 12 ♂♂, and 16 copepodids from single colony, in 13 m, opposite Antsiabe, southern shore of Nosy Komba, 2 September 1967.

FEMALE.—The body (Figure 121a) is more slender than in either of the two preceding species. The length is 1.32 mm (1.12–1.57 mm) and the

greatest width 0.57 mm (0.56–0.66 mm), based on ten specimens in lactic acid. The ratio of the length to width of the prosome is 1.74:1. The ratio of the length of the prosome to that of the urosome is 1.92:1.

The segment of leg 5 (Figure 121b) is 99 x 224 μ . Between this segment and the genital segment there is no ventral intersegmental sclerite. The genital segment in dorsal view is 234 x 237 μ , broadened in its anterior three-fourths with regularly curved margins but abruptly constricted in its posterior fourth where the width is 135 μ . The areas of attachment of the egg sacs are situated dorsolaterally on the expanded anterior portion of the segment. Each area (Figure 121c) bears two unequal elements, one 31 μ and naked, the other 8.5 μ with a minute distal spur, and a spiniform process between them. The three postgenital segments are 73 x 117 μ , 52 x 109 μ , and 69 x 104 μ from anterior to posterior.

The caudal ramus, 42 x 45 μ , resembles that of *M. facetus* and *M. devotus*. The dorsal seta is 90 μ and feathered. The outer lateral seta and the outermost terminal seta are broken. The innermost terminal seta is 295 μ and the two long median terminal setae 400 μ (outer) and 510 μ (inner), both inserted between unornamented flaps. All three of these setae are naked.

The body surface is ornamented with hairs (sensilla) as in Figure 121a,b. The posteroventral margin of the anal segment is smooth.

The egg sac was not observed.

The rostrum (Figure 121d) has a broadly rounded posteroventral margin in ventral view; in lateral view (Figure 121e) it projects somewhat ventrally.

The first antenna, 475 μ long, is segmented and armed as in the two preceding species. The lengths of the seven segments (measured along their posterior nonsetiferous margins) are 44 (81 μ along the anterior margin), 135, 34, 72, 65, 52, and 36 μ respectively. All the setae are naked.

The second antenna (Figure 121f) is segmented and armed as in the two previous species. The second segment lacks ornamentation on its outer margin. The longest of the three setae on the third segment has extremely short barbules. The fourth segment is 83 μ along its outer edge, 58 μ along its inner edge, and 18 μ wide. The claw is 61 μ along its axis.

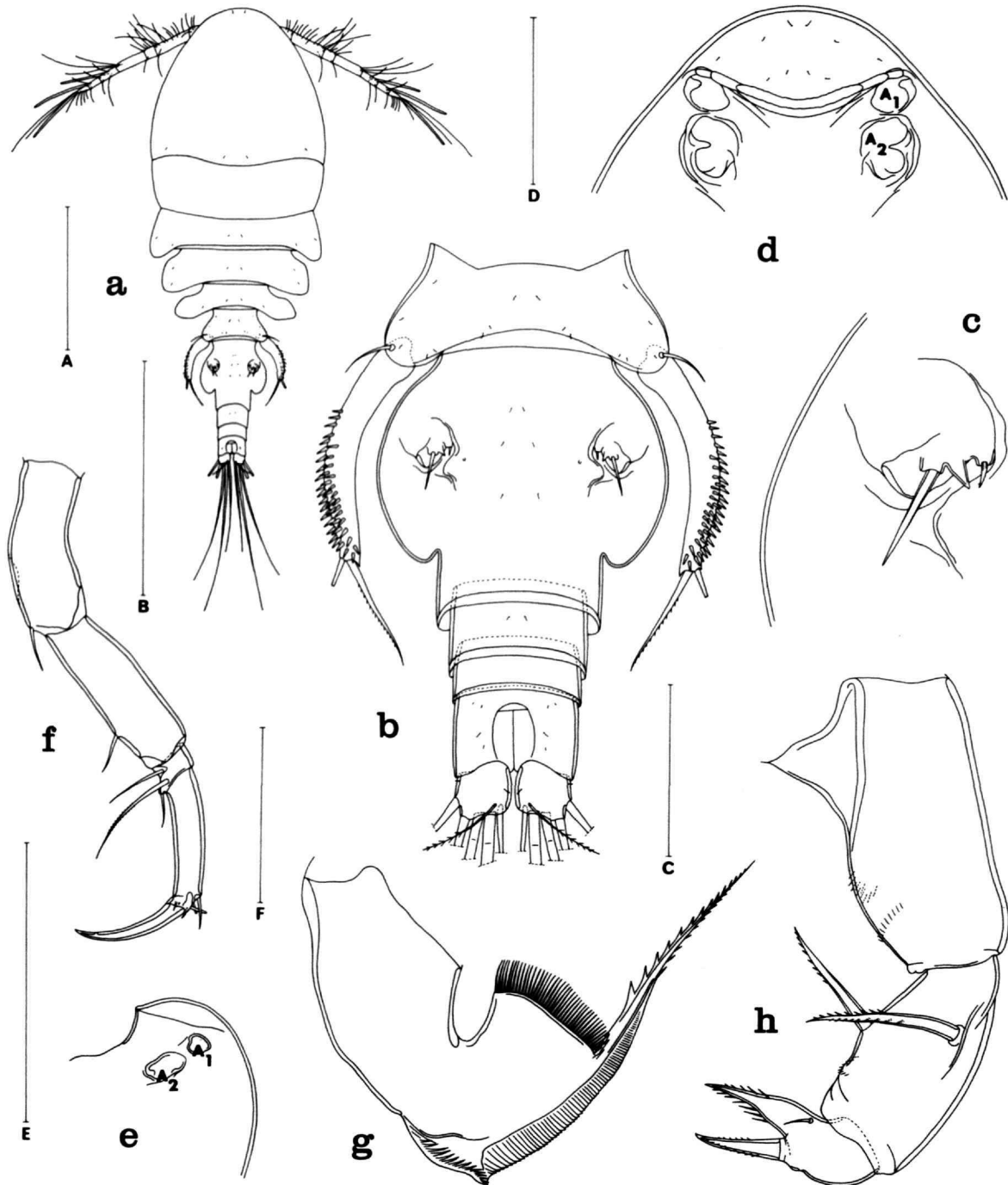


FIGURE 121.—*Meringomolgus hamatus*, new species. Female: *a*, dorsal (A); *b*, urosome, dorsal (B); *c*, area of attachment of egg sac, dorsal (C); *d*, rostrum, ventral (D); *e*, rostrum, lateral (E); *f*, second antenna, antero-inner (F); *g*, mandible, posterior (C); *h*, maxilliped, postero-inner (C). Scale: A, E, 0.5 mm; B, D, 0.2 mm; C, 0.05 mm; F, 0.1 mm.

The labrum, mandible (Figure 121g), and paragnath resemble those in *M. facetus* and *M. devotus*. The first maxilla is like that of *M. devotus*, but all the elements are naked. The second maxilla is similar to that of *M. devotus*. The maxilliped (Figure 121h) resembles in major respects that of *M. devotus*. In one female the two setae on the second segment were more unequal in length and the unarticulated spiniform process on the third segment had unusually long lateral spinules (Figure 122a).

The ventral area between the maxillipeds and the first pair of legs is like that in the two preceding species.

Legs 1-4 are segmented and armed as in *M. facetus* and *M. devotus*. The detailed ornamentation closely resembles that in *M. facetus*. As in both preceding species, the coxa of leg 1 has an outer posterior lobe, and the inner element on the coxa of leg 4 is short (39 μ), spiniform, and barbed rather than long, setiform, and feathered as in legs 1-3. The inner margin of the basis in leg 4 is naked, but in legs 1-3 it bears a row of hairs. The endopod of leg 4 (Figure 122b) is more slender than in either of the two preceding species. The first segment is 42 x 29 μ (not including the spinous processes) and its inner distal spine is 61 μ . This spine (Figure 122c) is feathered with very slender spinules in its proximal half but barbed in its distal half. The second segment is 113 μ long (including the terminal spiniform processes) and 17 μ wide at the middle; the outer terminal spine is 25 μ and the inner spine 72 μ , both barbed.

Leg 5 (Figure 122d) has a slender, elongated free segment reaching to about the posterior limit of the expanded part of the genital segment. (In Figure 121b leg 5 appears to be shorter because the legs were held at somewhat dorsal angle in the specimen drawn.) The dimensions are 195 x 23 μ (the width taken at the middle), with the width at the slight proximal expansion 31 μ and the terminal width 30 μ . The three setae (two terminal and one on the body near the free segment) resemble those in the two previous species, but the barbs along one side of the intact terminal seta are more prominent than in either of those two species.

Leg 6 is probably represented by the two elements near the attachment of each egg sac (Figure 121c).

The color in life in transmitted light is similar to that in the two previous species.

MALE.—The body (Figure 122e) is slender. The length is 1.04 mm (0.90–1.16 mm) and the greatest width 0.36 mm (0.31–0.43 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1.91:1. The ratio of the length of the prosome to that of the urosome is 1.69:1.

The segment of leg 5 (Figure 122f) is 47 x 117 μ . There is no ventral intersegmental sclerite. The genital segment is 205 x 179 μ , a little longer than wide, with its lateral margins in dorsal view slightly flattened. The four postgenital segments are 47 x 83 μ , 47 x 78 μ , 34 x 70 μ , and 49 x 75 μ from anterior to posterior.

The caudal ramus is similar to that of the female, but smaller, 33 x 34 μ .

The surface of the body is ornamented with hairs as in the female.

The rostrum is like that of the female.

The first antenna resembles that of the female, but there are three additional aesthetes as in the males of *M. facetus* and *M. devotus*. The second antenna (Figure 122g) has the same segmentation, armature, and ornamentation as in those species. The claw is 68 μ along its axis.

The labrum, mandible, paragnath, and first maxilla resemble those of the female. The second maxilla (Figure 123a) has an unusually long outer (ventral) proximal seta on the second segment. The maxilliped (Figure 123b) resembles that in the two previous species. The claw is 360 μ along its axis.

The ventral area between the maxillipeds and the first pair of legs is like that of the female.

Legs 1-4 are segmented and armed as in the female, except for the last segment of the endopod of leg 1 (Figure 123c), where the formula is I,I,4 instead of I,5 as in the female. The outer spine on this segment is 65 μ long, distinctly recurved distally, and ornamented with prominent bilateral stout spinules; the inner spine is 34 μ , straight, and barbed. Legs 2-4 are like those of the female. There appears to be some variation in the dimensions of the endopod of leg 4. The average dimensions for three males are 37 x 26 μ for the first segment, with its spine 62 μ , and 95 x 14 μ for the second segment. The measurements for each of the three males are as follows: (1) 34 x 21 μ with the spine 51 μ , 83 x 12 μ , (2) 43 x 30 μ with the spine 67 μ , 98 x 13 μ , and (3) 36 x 28 μ with the spine 67 μ , 104 x 16.5 μ .

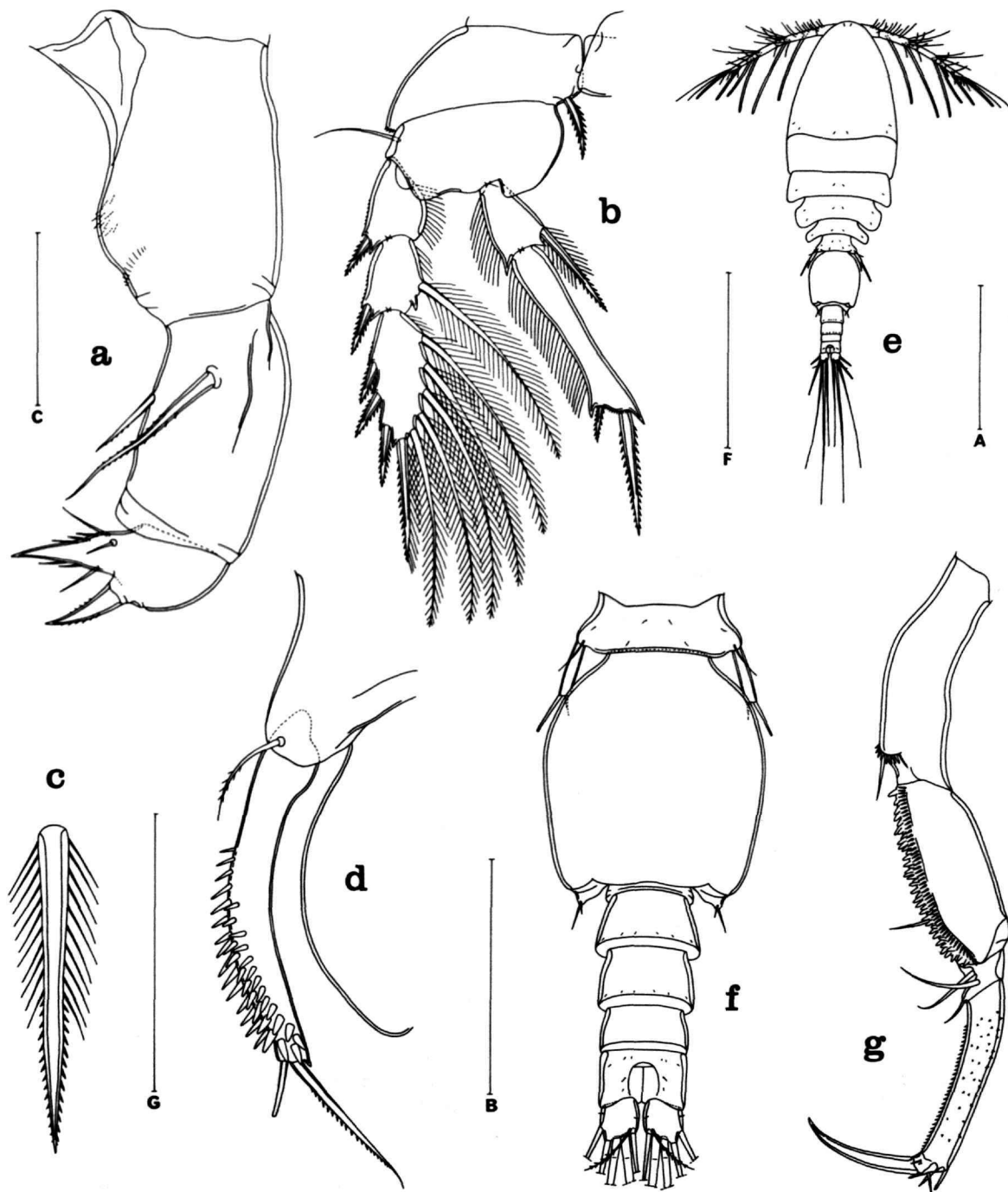


FIGURE 122.—*Meringomolgus hamatus*, new species. Female: *a*, maxilliped, as seen in one individual, postero-inner (*c*); *b*, leg 4, anterior (*F*); *c*, inner spine on first segment of endopod of leg 4, anterior (*c*); *d*, leg 5, dorsal (*F*). Male: *e*, dorsal (*A*); *f*, urosome, dorsal (*B*); *g*, second antenna, antero-inner (*F*). Scale: *A*, 0.5 mm; *B*, *D*, 0.2 mm; *C*, *C*, 0.05 mm; *F*, 0.1 mm.

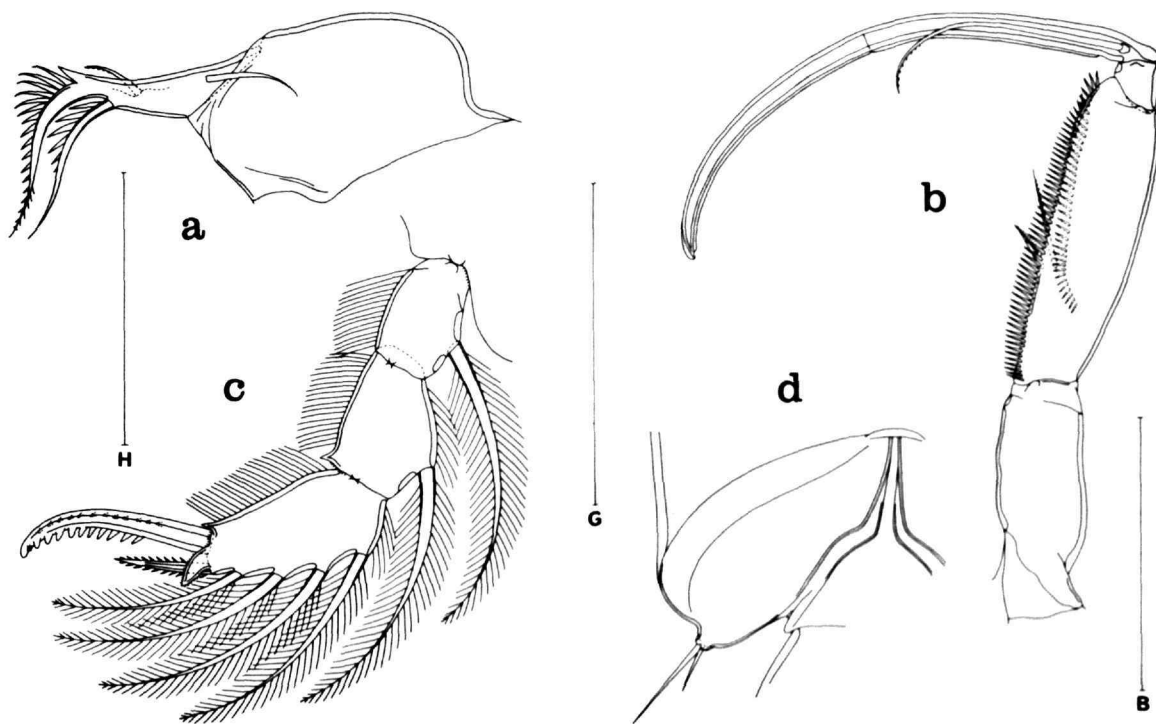


FIGURE 123.—*Meringomolgus hamatus*, new species.. Male: a, second maxilla (H); b, maxilliped, inner (B); c, endopod of leg 1, anterior (H); d, leg 6, ventral (G). Scale: B, 0.2 mm; C, 0.05 mm; H, 0.1 mm.

Leg 5 (Figure 122f) resembles that in the two previous species, with the free segment $44 \times 11 \mu$.

Leg 6 (Figure 123d) consists of a posteroventral flap on the genital segment bearing two naked setae, 44μ and 22μ .

The spermatophore was not observed.

ETYMOLOGY.—The specific name *hamatus* (Latin, curved like a hook) refers to the recurved spine on the last segment of the endopod of leg 1 in the male.

REMARKS.—The female of *M. hamatus* may be distinguished from both *M. facetus* and *M. devotus* by the shape of the genital segment and the longer leg 5; the male by the relatively long, hooked spine on the last segment of the endopod of leg 1. In both sexes of *M. hamatus* the spine on the first segment of the endopod of leg 4 is half feathered and half barbed rather than completely barbed as in the two previous species. The second segment of this endopod is more slender than in either *M. facetus* or *M. devotus*.

Genus *Metaxymolgus* Humes and Stock, 1972

DIAGNOSIS.—Body cyclopiform. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six setae. Rostrum rounded posteroventrally or not well developed. First antenna 7-segmented, in the female with the armature 4, 13, 6, 3, $4 + 1$ aesthete, $2 + 1$ aesthete, and $7 + 1$ aesthete; in the male with 4, $13 + 2$ aesthetes, 6, $3 + 1$ aesthete, $4 + 1$ aesthete, $2 + 1$ aesthete, and $7 + 1$ aesthete, so far as known. Second antenna 4-segmented, with the formula 1, 1, 3, and II + several small elements, there being two terminal claws.

Labrum incised medially. Mandible with the basal region beyond the indentation having on its convex side a scalelike area with spinules followed by a serrated fringe and on its concave side a row of spinules; lash long. Paragnath a small hairy lobe. First maxilla with four elements. Second maxilla of the usual lichomolgid type. Maxilliped in the female 3-segmented, with a pointed tip; in

Partial Key to Species of the Genus *Metaxymolgus*

FEMALES

1. Genital segment in dorsal view constricted at junction of anterior two-thirds, forming a "waist" *M. cinctus*
Genital segment not constricted 2
2. Genital segment distinctly longer than wide; sides not expanded and nearly parallel 3
Genital segment not elongated; sides expanded to some degree 6
3. Leg 4 endopod functionally 1-segmented, with an incomplete line of articulation between the two segments; caudal ramus nearly 4:1 *M. claudus*
Leg 4 endopod functionally 2-segmented, with a distinct line of articulation between the two segments; caudal ramus at most 2:1 4
4. Longer of two claws in second antenna clearly longer than fourth segment *M. aculeatus*
Longer of two claws on second antenna not longer than fourth segment, usually much shorter 5
5. Spines on lash of second maxilla obtuse; caudal ramus subquadrate, 28 x 25 μ ; body length 1.10 mm *M. antheliae*
Spines on lash of second maxilla spiniform; caudal ramus about 1.8:1; body length 0.81 mm *M. inaequalis*
6. Free segment of leg 5 broad, 81 x 34 μ , its inner margin abruptly expanded a short distance from distal end of segment, contour of margin from this point to base of segment being irregular *M. singularipes*
Free segment of leg 5 not so shaped 7
7. Genital segment clearly broader than long (ratio at least 1:1.26) 8
Genital segment not distinctly broader than long (ratio at most 1:1.1) 10
8. Free segment of leg 5 not ornamented with spinules; body length 1.50 mm *M. myorae*
Free segment of leg 5 ornamented with spinules; body length less than 1.30 mm 9
9. Prosoma broad and suborbicular; free segment of leg 5 76 μ long; setae on caudal ramus barbed *M. patulus*
Prosoma not unusually broadened and not suborbicular; free segment of leg 5 49 μ long; setae on caudal ramus naked *M. venustus*
10. Caudal ramus 1.7:1 or longer 11
Caudal ramus less than 1.5:1 12
11. Caudal ramus 1.7:1; free segment of leg 5 not ornamented with spinules and without a proximal inner expansion *M. cuspis*
Caudal ramus 3.3:1; free segment of leg 5 ornamented with spinules and with a proximal inner expansion *M. spinulifer*
12. Caudal ramus quadrate or wider than long 13
Caudal ramus a little longer than wide 17
13. Free segment of leg 5 with a large proximal inner expansion *M. securiger*
Free segment of leg 5 with only a slight expansion or none 14
14. Free segment of leg 5 not ornamented with spinules 15
Free segment of leg 5 ornamented with spinules 16
15. Body length 1.53 mm; lateral margins of genital segment smoothly rounded *M. gracilipes*
Body length 0.84 mm; lateral margins of genital segment slightly irregular *M. hetaericus*
16. Free segment of leg 5 108 μ long; lateral margins of genital segment slightly irregular *M. commodus*
Free segment of leg 5 77 μ long; lateral margins of genital segment smoothly rounded *M. inflatseta*
17. Body length 1.52 mm *M. sensilis*
Body length less than 1 mm 18
18. Spines on lash of second maxilla very long, forming a crest; second antenna slender, with two subequal claws nearly as long as fourth segment *M. botulosus*
Spines on lash of second maxilla short; second antenna robust, with two very unequal claws distinctly shorter than fourth segment *M. chalydis*

the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1-4 with 3-segmented rami except for leg 4 endopod which is 2-segmented. Armature of the usual lichomolgiform pattern. Leg 4 exopod with the third segment having II,I,5. Leg 4 endopod with the formula 0-1;II, the seta feathered. Leg 1 endopod with the third segment having I,I,4, so far as known, instead of I,5 as in the female. Leg 5 with a free segment having two terminal elements. Leg 6 represented by the two setae near the genital openings.

Other features as in the species below.

Associated with opisthobranchs, bivalves, alcyonaceans, gorgonaceans, actinarians, zoanthids, and ophiuroids.

TYPE-SPECIES.—*Metaxymolgus securiger* (Humes).

ETYMOLOGY.—The name is a combination of the Greek words μεταξύ (between, alluding to the rather intermediate position of this genus within the family Lichomolgidae) and μόλος. Gender masculine.

REMARKS.—In the following key to the females, four species (*M. brevifurcatus*, *M. congoensis*, *M. hirsutipes*, and *M. simplex*) have been omitted because of lack of information. A key to the males has not been prepared. In many cases, the males of this genus can be distinguished only by careful study, and largely on the basis of qualitative characters.

Metaxymolgus securiger (Humes, 1964)

Lichomolgus securiger Humes, 1964, pp. 68-71, figs. 109-138 [from the nudibranch *Doris mabilla* Abraham, Madagascar].

NEW HOST.—From the nudibranch *Asteronotus cespitosus* (van Hasselt): 8 ♀♀, 48 ♂♂, and 49 copepodids from two hosts, intertidal, Ambatozavavy, Nosy Bé, Madagascar, 29 January 1964; 13 ♀♀, 23 ♂♂, and 12 copepodids from single host, in 15 cm, on sandy bottom with *Cymodocea*, Antafianambitry, Nosy Bé, 8 September 1964. Both collections by AGH.

Metaxymolgus aculeatus (Humes and Ho, 1968)

Lichomolgus aculeatus Humes and Ho, 1968b, pp. 20-23, figs. 97-113 [from the alcyonaceans *Nephthea aberrans* Verseveldt, *Nephthea sphaerophora* Kükenthal, *Nephthea*

crassa Kükenthal, *Nephthea tixierae* Verseveldt, and *Litophyton arboreum* Forskal, region of Nosy Bé, Madagascar].

NEW HOSTS (all from Madagascar, collected by AH).—From *Nephthea amentacea* Studer: 33 ♀♀, 14 ♂♂, and 6 copepodids, from single colony, in 2 m, west of Pte. de Tafondro, Nosy Bé, 30 May 1967; 19 ♀♀, 47 ♂♂, and 23 copepodids, from single colony, in 13 m, off Antsiabe, Nosy Komba, near Nosy Bé, 2 September 1967.

From *Nephthea bumasta* Verseveldt: 64 ♀♀, 115 ♂♂, and 87 copepodids, from single colony, in 8 m, Pte. Lokobe, Nosy Bé, 25 July 1967.

From *Nephthea filamentosa* Verseveldt: 56 ♀♀, 45 ♂♂, and 57 copepodids, from single colony, in 23 m, Tany Kely, near Nosy Bé, 30 July 1967.

From *Nephthea galbuloides* Verseveldt: 78 ♀♀, 72 ♂♂, from single colony, in 1 m, Pte. Ambarionaomby, Nosy Komba, near Nosy Bé, 8 June 1967; 92 ♀♀, 81 ♂♂, and 21 copepodids, from single colony, in 22 m, Tany Kely, near Nosy Bé, 17 June 1967; 17 ♀♀, 22 ♂♂, and 12 copepodids, from single colony, in 25 m, Tany Kely, near Nosy Bé, 14 August 1967.

From *Nephthea lanternaria* Verseveldt: 122 ♀♀, 17 ♂♂, and 19 copepodids, from single colony, in 15 m, Banc de la Lanterne, Bay of Tsimipaika, near Nosy Bé, 26 July 1967.

From *Stereonephthya nosybearia* Verseveldt: 1 ♀, 5 ♂♂, and 16 copepodids, from single colony, in 10 m, Rocher du N.E., Nosy Bé, 19 August 1967.

From *Stereonephthya scaphis* Verseveldt: 2 ♀♀, 11 ♂♂, and 13 copepodids, from single colony, in 24 m, north of Ankazoberavina, near Nosy Bé, 13°27.6' S, 47°58.2' E, 25 August 1967.

Metaxymolgus antheliae, new species

FIGURES 124-126

TYPE MATERIAL.—24 ♀♀, 67 ♂♂, and 17 copepodids from single colony of the alcyonacean *Anthelia glauca* Lamarck, in 12 m, west of the harbor at Hellville, Nosy Bé, Madagascar, 4 August 1967, collected by AGH. Holotype ♀, allotype, and 67 paratypes (17 ♀♀, 50 ♂♂) deposited in USNM, the remaining paratypes and the copepodids in the collection of AGH.

OTHER MATERIAL EXAMINED.—3 ♀♀, 5 ♂♂, and 9 copepodids from single colony of *Anthelia ternatana* (Schenk), in 18 m, Banc du Touareg, south

of Nosy Bé, 13°32'05" S, 48°15'20" E, 11 July 1967, collected by AGH.

FEMALE.—The body (Figure 124a) has a moderately broad prosome. The length is 1.10 mm (1.02–1.14 mm) and the greatest width is 0.49 mm (0.46–0.52 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1.55:1. The ratio of the length of the prosome to that of the urosome is 1.68:1.

The segment of leg 5 (Figure 124b) is 49 x 138 μ . Between this segment and the genital segment there is a short weak ventral intersegmental sclerite. The genital segment is 172 x 130 μ in greatest dimensions in dorsal view, its sides not much expanded and nearly parallel. The areas of attachment of the egg sacs are located laterally at the middle of the segment; posterior to this level there is a transverse dorsal sclerotized fold which does not continue ventrally. Each area of attachment (Figure 124c) bears two slender naked setae, 7 μ and 12 μ , with an obscure spiniform process between them. The three postgenital segments are 42 x 81 μ , 29 x 73 μ , and 36 x 68 μ from anterior to posterior.

The caudal ramus (Figure 124d) is 28 x 25 μ , only a little longer than wide. The dorsal seta is 31 μ and the outer lateral seta 68 μ , both naked. The outermost terminal seta is 109 μ with inner proximal hairs. The innermost terminal seta is 151 μ with bilateral spinules. The two long median terminal setae are 262 μ (outer) and 400 μ (inner), both with spinules and both inserted between dorsal (unornamented) and ventral (with a marginal row of small spinules) flaps.

The body surface has a few hairs (sensilla) as shown in Figure 124a,b. The posteroventral margin of the anal segment bears a row of spinules on both sides.

The egg sac (Figure 124a) is oval, 440 x 185 μ , reaches beyond the caudal rami, and contains 16–20 large eggs, each about 88 μ in diameter.

The rostrum (Figure 124e) is broadly rounded posteroventrally.

The first antenna (Figure 124f) is 338 μ long. The lengths of the seven segments (measured along their posterior nonsetiferous margins) are 25 (55 μ along the anterior margin), 94, 24, 59, 49, 34, and 23 μ respectively. The formula for the armature is 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All the setae are naked.

The second antenna (Figure 124g) is 4-segmented. Each of the first two segments bears a seta. The third segment has three setae. The fourth segment, 65 μ along its outer edge, 35 μ along its inner edge, and 23 μ wide, bears two short unequal terminal claws. The stouter claw is 28 μ along its axis, the more slender claw 21 μ . Near the insertions of the claws there are five hyaline elements, two of them large and three small. All the setae are naked. The second segment has a few small spines along its inner surface.

The labrum (Figure 124h) has two rather elongated and rounded posteroventral lobes.

The mandible (Figure 124i) is deeply indented on the concave margin of the base, beyond which there is a row of long spinules; the convex margin of the base is also indented, and distal to it is a protruded scalelike area bearing a row of small spinules and a hyaline, serrated fringe. The lash is moderately long and barbed. On the posterior surface of the mandible near the base of the lash there is usually a group of long striations. (On one mandible these striations were absent.) The paragnath (Figure 124h) is a small hairy lobe. The first maxilla (Figure 124j) has four elements, one of the three terminal ones being unusually stout. The second maxilla (Figure 125a) has an unornamented first segment. The second segment is armed with a small setule on its proximal outer (ventral) surface, a surficial posterior seta barbed along one edge, an inner (dorsal) distal spine bilaterally with large spinules, and is produced to form a lash which is ornamented along one edge with a series of large obtuse teeth grading distally into smaller spines, and along the opposite edge with small barbs. The maxilliped (Figure 125b) has two groups of spinules on the first segment. The second segment has two unequal setae, both with very short barbules, and a group of long spinules. The third segment has a slender, barbed spine and a naked seta, and terminates in an unarticulated spiniform barbed process.

The ventral area between the maxillipeds and the first pair of legs (Figure 125c) is moderately protuberant; a sclerotized line connects the bases of the maxillipeds.

Legs 1–4 (Figure 125d–g) have the same segmentation and spine and setal formula as in other species in the genus—for example, *M. cuspis* (Humes). The inner coxal element of leg 4 is a

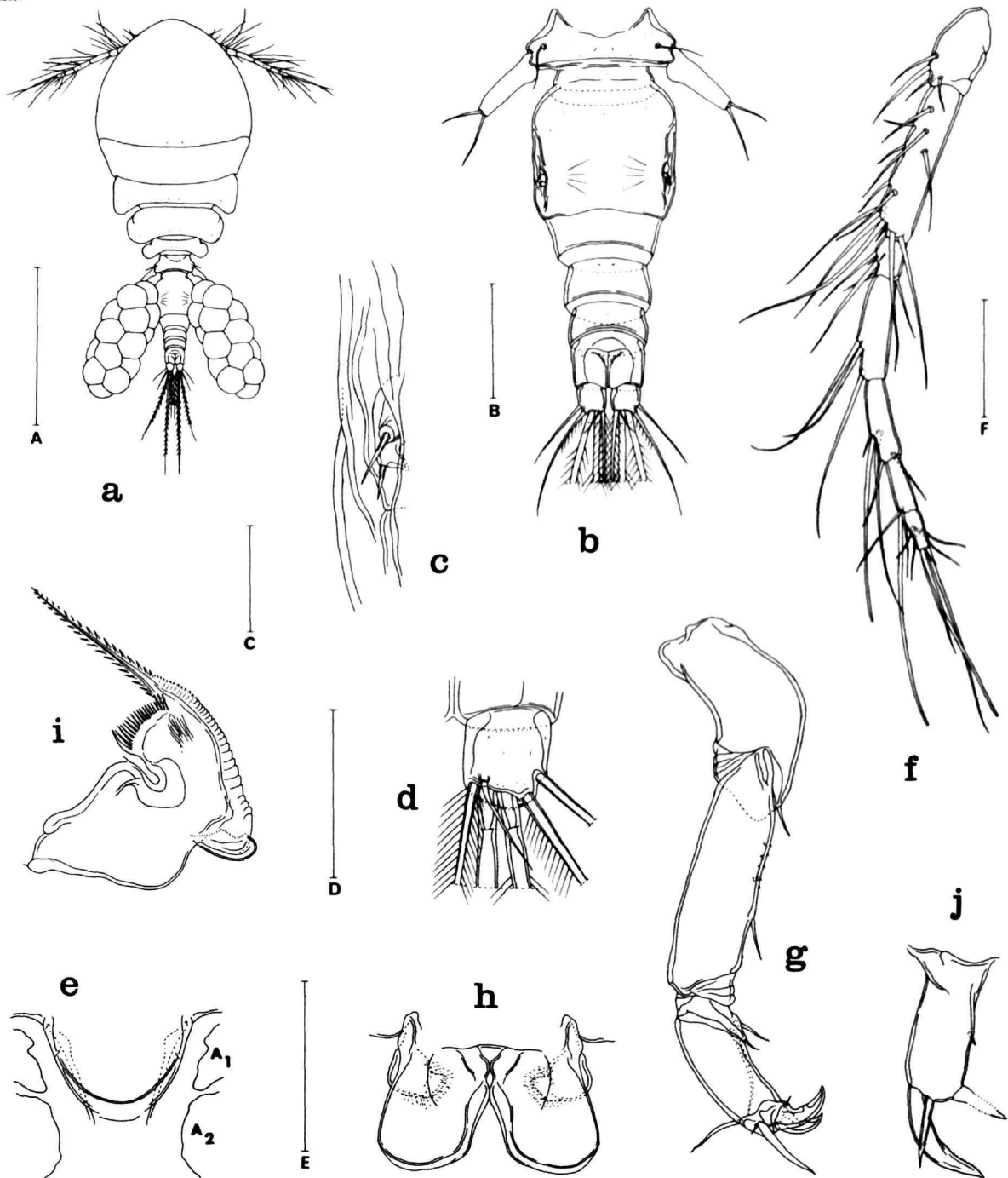


FIGURE 124.—*Metaxymolgus antheliae*, new species. Female: a, dorsal (A); b, urosome, dorsal (B); c, area of attachment of egg sac, dorsal (C); d, caudal ramus, dorsal (D); e, rostrum, ventral (E); f, first antenna, dorsal (F); g, second antenna, anterior (F); h, labrum and paragnaths, ventral (E); i, mandible, posterior (F); j, first maxilla, anterior (F). Scale: A, 0.5 mm; B, E, 0.1 mm; C, 0.02 mm; D, F, 0.05 mm.

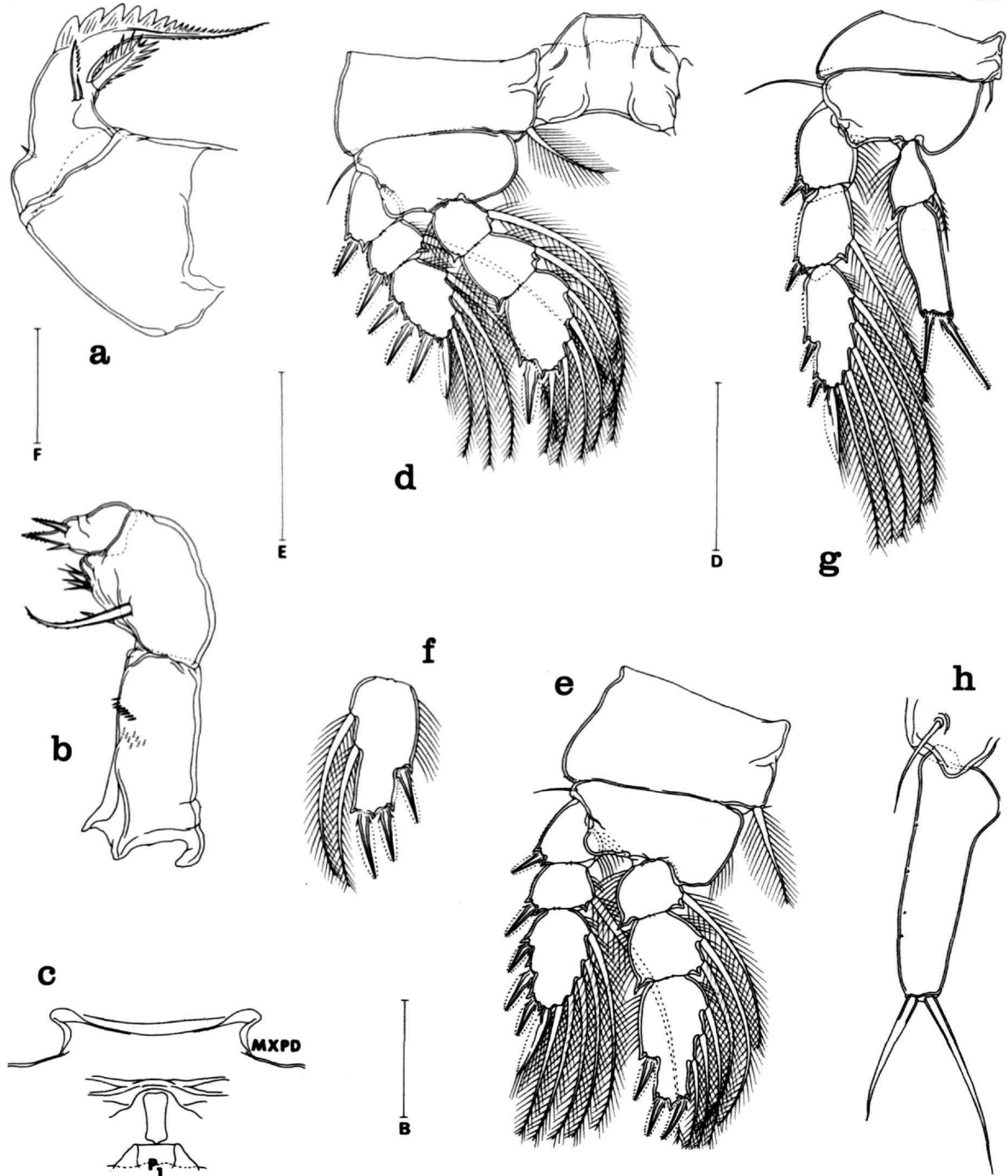


FIGURE 125.—*Metaxymolgus antheliae*, new species. Female: a, second maxilla, posterior (F); b, maxilliped, posterior (F); c, area between maxillipeds and first pair of legs, ventral (B); d, leg 1 and intercoxal plate, anterior (E); e, leg 2, anterior (E); f, third segment of endopod of leg 3, anterior (E); g, leg 4, anterior (E); h, leg 5, dorsal (D). Scale: B, E, 0.1 mm; D, F, 0.05 mm.

small, naked seta of $19\ \mu$ instead of a long, feathered seta as in legs 1–3. The inner margin of the basis of leg 4 is smooth instead of having a row of hairs as in the other legs. The exopod of leg 4 is $174\ \mu$ long. The endopod of leg 4 has hairs along the outer margins of both segments. The first segment is $36 \times 29\ \mu$ (without the spiniform processes) and its inner distal seta is $33\ \mu$ and lightly feathered. (The feathering is visible only with high magnification, as with an oil immersion objective.) The second segment is $73\ \mu$ long (including the terminal spiniform processes), $26\ \mu$ in greatest width proximally, and $20\ \mu$ in least width distally; the two terminal spines are fringed, the outer $33\ \mu$, the inner $55\ \mu$.

Leg 5 (Figure 125h) has an elongated free segment $75\ \mu$ long. The greatest width at the proximal inner expansion is $25\ \mu$. The only ornamentation consists of a very few minute spines on the outer surface of the segment. The two terminal naked setae are $39\ \mu$ and $60\ \mu$. The naked seta on the body near the insertion of the segment is $32\ \mu$.

Leg 6 is probably represented by the two setae near the areas of attachment of the egg sacs (Figure 124c).

The color in life in transmitted light is opaque, the eye red, the egg sacs grayish.

MALE.—The body (Figure 126a) is only slightly more slender than in the female. The length is $0.81\ \text{mm}$ (0.77 – $0.85\ \text{mm}$) and the greatest width $0.27\ \text{mm}$ (0.25 – $0.29\ \text{mm}$), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is $1.78:1$. The ratio of the length of the prosome to that of the urosome is $1.49:1$.

The segment of leg 5 (Figure 126b) is $36 \times 86\ \mu$. There is no ventral intersegmental sclerite. The genital segment is $190 \times 156\ \mu$, longer than wide. The four postgenital segments are $28 \times 48\ \mu$, $23 \times 47\ \mu$, $18 \times 46\ \mu$, and $23 \times 46\ \mu$ from anterior to posterior.

The caudal ramus resembles that of the female but is smaller, $23 \times 19\ \mu$.

The surface of the body is ornamented with hairs as in the female.

The rostrum is like that of the female.

The first antenna is segmented and armed as in the female but there are two additional aesthetes on segment 2 and one additional aesthete on segment 4. The second antenna (Figure 126c) shows sexual dimorphism in its ornamentation. The first

segment has a group of small spinules on its inner surface. The second segment has on its inner surface small spines proximal to the seta and minute spinules distal to it. The fourth segment is $54\ \mu$ along its outer edge, $31\ \mu$ along its inner edge, and $17.5\ \mu$ wide; the two claws are $24\ \mu$ and $20\ \mu$.

The labrum is like that of the female. The mandible (Figure 126d) resembles that of the female, but the scalelike area on the convex margin of the basal area is not as protruded. The paragnath and first maxilla are similar to those in the female. The second maxilla (Figure 126e) is much like that of the female, but the large teeth on the lash are spiniform rather than obtuse. The maxilliped (Figure 126f) has an unornamented first segment, the second segment has two slender naked setae and two rows of long spinules, and the small third segment is unornamented. The claw is $162\ \mu$ along its axis, shows a weak division about midway, and proximally has two very unequal setae and a few inner surficial striations.

The ventral area between the maxillipeds and the first pair of legs resembles that of the female.

Legs 1–4 are segmented and armed as in the female except for the last segment of the endopod of leg 1 (Figure 126g) where the formula is I, I, 4 instead of I, 5 as in the female.

Leg 5 (Figure 126b) has a rectangular, unornamented free segment $31 \times 7\ \mu$, its two terminal naked setae being $19\ \mu$ and $30\ \mu$, and the naked seta on the body $22\ \mu$.

Leg 6 (Figure 126b) consists of a posteroventral flap on the genital segment, bearing two naked setae $20\ \mu$ and $25\ \mu$.

The spermatophore (Figure 126h), attached to the female in pairs, is oval, $159 \times 79\ \mu$ (not including the neck).

The color in life in transmitted light is like that of the female.

ETYMOLOGY.—The specific name, *antheliae*, is the genitive form of the generic name of the host.

REMARKS.—In nearly all species of *Metaxymolgus* the lateral margins of the genital segment in the female are expanded. The only species in which this segment has almost parallel lateral margins, as in the new species, is *M. aculeatus* (Humes and Ho). *M. antheliae* may be easily separated from it, however, by the proportions of the caudal ramus ($2.2:1$ in *M. aculeatus*). The mandible of the female of *M. antheliae* is unlike that of nearly all other

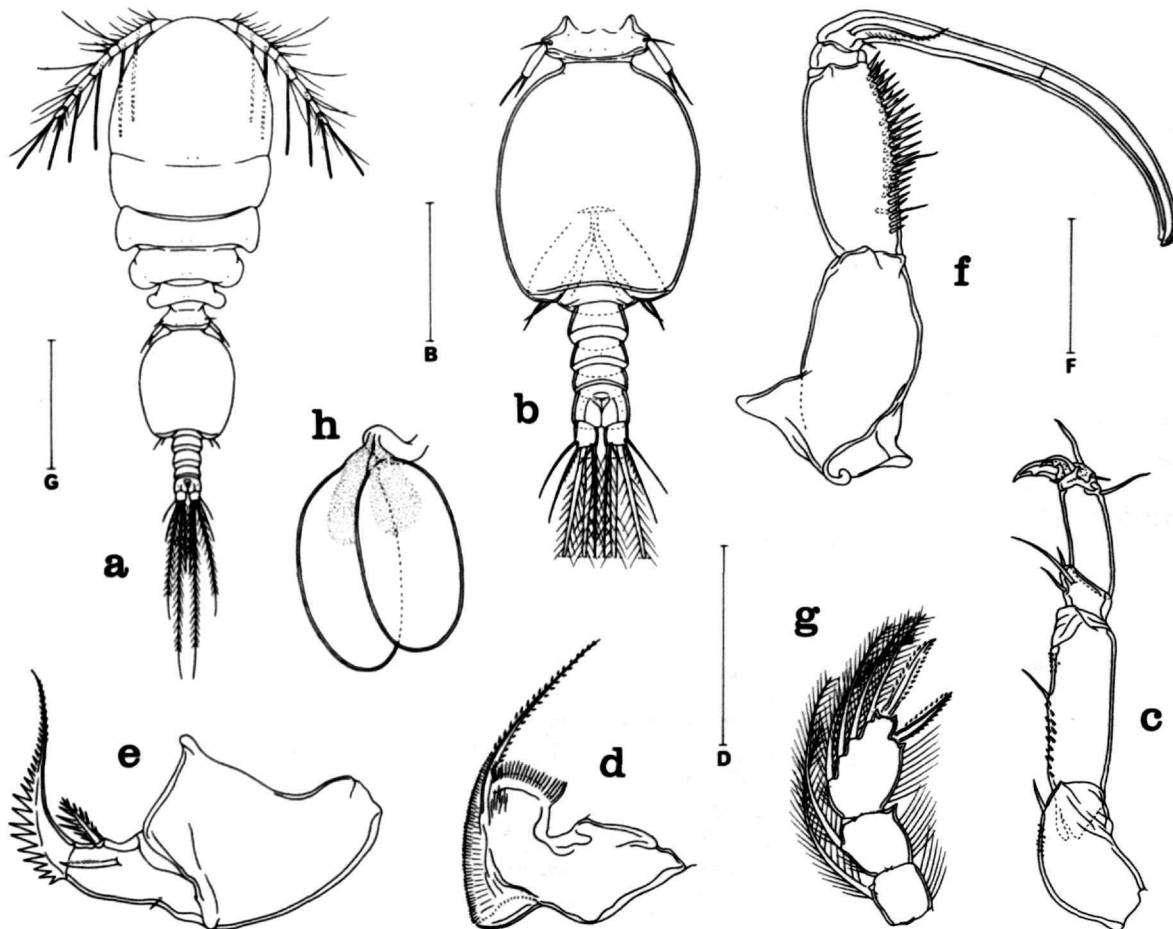


FIGURE 126.—*Metaxymolgus antheliae*, new species. Male: a, dorsal (c); b, urosome, dorsal (b); c, second antenna, posterior (F); d, mandible, posterior (D); e, second maxilla, posterior (D); f, maxilliped, inner (F); g, endopod of leg 1, anterior (F); h, spermatophores, attached to female, dorsolateral (B). Scale: a, 0.1 mm; d, F, 0.05 mm; c, 0.2 mm.

species. Only in *M. singularipes* (Humes and Ho) does the scalelike area protrude in a somewhat similar manner. The fifth leg of the female of *M. singularipes*, however, is wholly unlike that of the new species. The obtuse teeth on the lash of the second maxilla in the female of *M. antheliae* are unique, all other species having pointed spiniform teeth.

***Metaxymolgus botulosus* (Stock and Kleeton, 1963)**

Lichomolgus botulosus Stock and Kleeton, 1963b, pp. 247–251, figs. 1–3 [from the gorgonaceans *Eunicella stricta* (Bert.), Banyuls, Mediterranean coast of France; and *Paramuricea chameleon* (von Koch), Cap Creus, Spain].

***Metaxymolgus brevifurcatus* (Ummerkutty, 1962)**

Lichomolgus brevifurcatus Ummerkutty, 1962, pp. 59–62, pl. 11, figs. 1–7, pl. 12, figs. 1–3 [from starfish washings, Gulf of Mannar, southeastern India].

***Metaxymolgus chlamydis*, new species**

FIGURES 127–129

TYPE MATERIAL.—6 ♀♀, 2 ♂♂, and 2 copepodids from the bivalve *Chlamys varia* (Linnaeus), Banc de St. Marc, Rade de Brest, France, 26 March 1956, collected by JHS. Holotype ♀, allotype, 6 paratypes (3 entire ♀♀, 2 dissected ♀♀, and 1

dissected ♂) and the 2 copepodids are deposited in ZMA.

FEMALE.—The body (Figure 127a) has a moderately broadened prosome. The length and the greatest width of two females in lactic acid (the length not including the setae on the caudal rami) are 0.98×0.44 mm and 0.97×0.51 mm. The ratio of the length to the width of the prosome is 1.38:1. The ratio of the length of the prosome to that of the urosome is 2:1. The segment of leg 1 is distinctly set off from the head dorsally by a transverse furrow.

The segment of leg 5 (Figure 127b) is 78×160 μ . Between this segment and the genital segment there is a short ventral intersegmental sclerite. The genital segment is 156×172 μ , a little wider than long, in dorsal view only moderately expanded. The areas of attachment of the egg sacs are situated almost laterally but slightly dorsally just behind the middle of the segment. Each area (Figure 127c) bears two small, naked setae, 9 μ and 7 μ , with a small spiniform process between them. The three postgenital segments are 57×96 μ , 42×91 μ , and 48×94 μ from anterior to posterior. The posteroventral border of the anal segment is smooth.

The caudal ramus (Figure 127d) is 43×35 μ in greatest dimensions. The outer lateral seta is 60 μ , the dorsal seta 33 μ , and the outermost terminal seta 68 μ , all three of these setae being naked. The innermost terminal seta is 140 μ with inner proximal hairs. The two long median terminal setae are 300 μ (outer) and 560 μ (inner), both with lateral spinules along their midregions and both inserted between dorsal (unornamented) and ventral (with a marginal row of minute spinules) flaps.

The surface of the body bears a few small hairs (sensilla) as in Figure 127a,b.

The egg sac (Figure 127a) is elongated oval, 450×230 μ , reaches well beyond the caudal rami, and contains many eggs about 52 μ in diameter but somewhat variable in shape.

The rostrum (Figure 127e) is broadly rounded posteroventrally.

The first antenna (Figure 127f) is 392 μ long. The lengths of the seven segments (measured along their posterior nonsetiferous margins) are 22 (61 μ along the anterior margin), 114, 24, 61, 57, 45, and 30 μ respectively. The formula for the armature is

4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All the setae are naked.

The second antenna (Figure 127g) is 4-segmented, with a small seta on the first and second segments and three setae on the third segment, one of them bent. The fourth segment, 87 μ along its outer edge, 55 μ along its inner edge, and 34 μ wide, bears two very unequal claws, 64 μ and 23 μ , along their axes and five setae (two long and three short). All the setae are naked.

The labrum (Figure 128a) has two divergent, narrow lobes.

The mandible (Figure 128b) has on its concave side a deep indentation followed by a row of long slender spinules; on its convex side there is a prominent scalelike area with spinules. The lash is long and bilaterally spinulose. The paragnath is a small lobe with a few hairs. The first maxilla (Figure 128c) bears four elements. The second maxilla (Figure 128d) has an unornamented first segment. The second segment bears a hyaline outer (ventral) setule, a surficial posterior seta barbed along one edge, and an inner (dorsal) spiniform element with prominent lateral spinules. The segment terminates in a long lash ornamented along one edge with a row of large spines distally diminishing in size. The maxilliped (Figure 128e) has an unornamented first segment, two finely barbed setae on the second segment, and a naked seta, a barbed spine, and a barbed, spiniform terminal process on the third segment.

The ventral area between the maxillipeds and the first pair of legs (Figure 128f) is not protuberant. A fine line connects the bases of the maxillipeds.

Legs 1–4 (Figure 128g–j) have trimerous rami except for the endopod of leg 4 which is 2-segmented. The armature is like that in other species of *Metaxymolgus*—for example, *M. cuspis* (Humes). The inner seta on the coxa of legs 1–3 is long and plumose, but in leg 4 this seta is shorter (28 μ) and naked. The inner margin of the basis in leg 4 is smooth instead of haired as in the other legs. The exopod of leg 4 is 125 μ long. The endopod varies slightly in form. In Figure 128j the first segment is 28×23 μ (not including the spiniform processes) with its inner distal feathered seta 48 μ . The second segment is 47×22 μ (greatest dimensions, including the terminal spiniform processes), its two terminal fringed spines 27 μ (outer) and 36

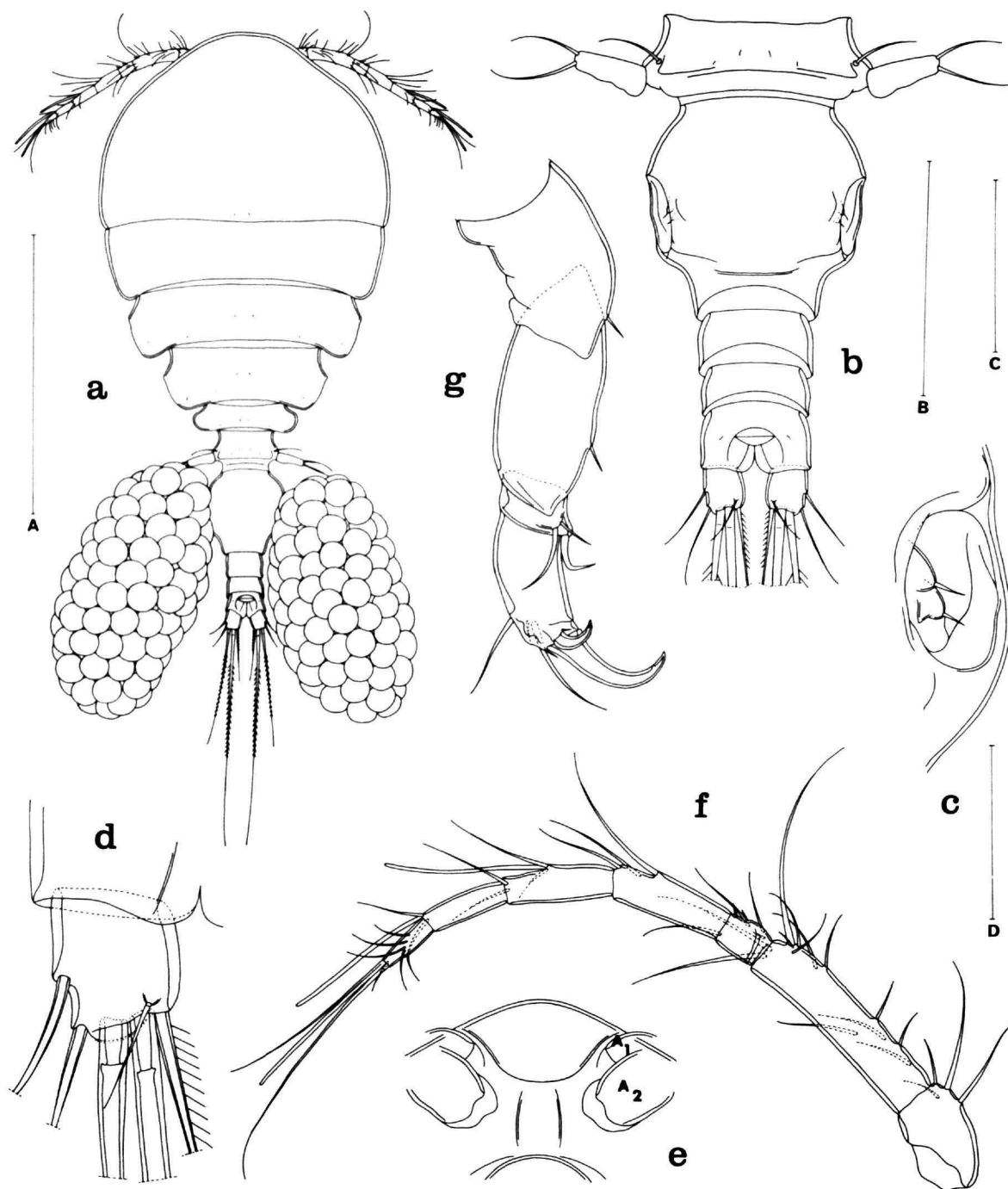


FIGURE 127.—*Metaxymolgus chlamydis*, new species. Female: a, dorsal (A); b, urosome, dorsal (B); c, areas of attachment of egg sac, dorsal and slightly lateral (C); d, caudal ramus, dorsal (D); e, rostrum, ventral (B); f, first antenna, ventral (D); g, second antenna, posterior (D). Scale: A, 0.5 mm; B, 0.2 mm; C, 0.05 mm; D, 0.1 mm.

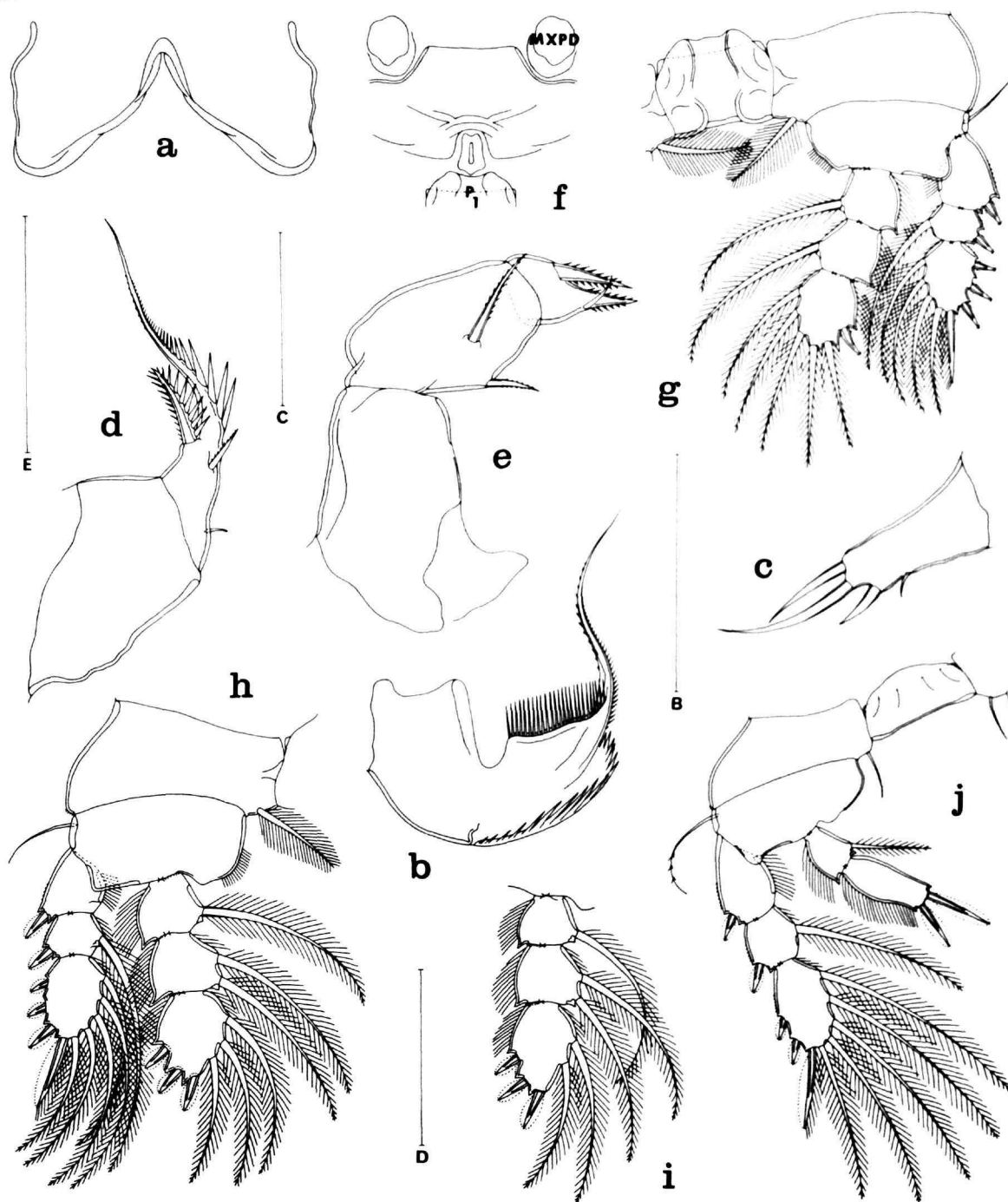


FIGURE 128.—*Metaxymolgus chlamydis*, new species. Female: *a*, labrum, ventral (E); *b*, mandible, posterior (C); *c*, first maxilla, ventral (C); *d*, second maxilla, posterior (C); *e*, maxilliped, posterior (C); *f*, area between maxillipeds and first pair of legs, ventral (B); *g*, leg 1 and intercoxal plate, anterior (D); *h*, leg 2, anterior (D); *i*, endopod of leg 3, anterior (D); *j*, leg 4 and intercoxal plate, anterior (D). Scale: B, 0.2 mm; C, 0.05 mm; D, E, 0.1 mm.

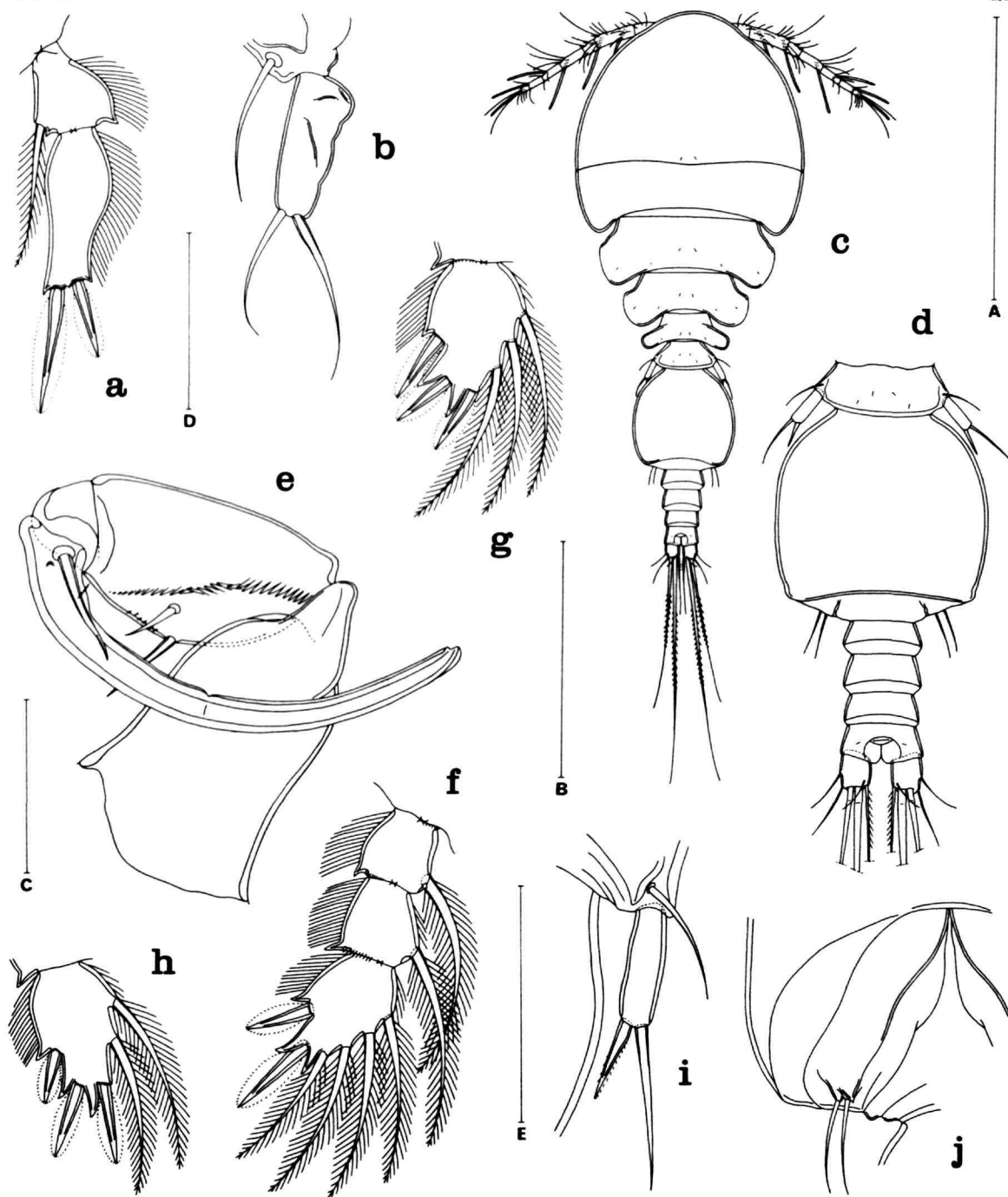


FIGURE 129.—*Metaxymolgus chlamydis*, new species. Female: *a*, endopod of leg 4, anterior (**D**); *b*, leg 5, dorsal (**E**). Male: *c*, dorsal (**A**); *d*, urosome, dorsal (**B**); *e*, maxilliped, inner (**C**); *f*, endopod of leg 1, anterior (**E**); *g*, third segment of endopod of leg 2, anterior (**E**); *h*, third segment of endopod of leg 3, anterior (**E**); *i*, leg 5, dorsal (**C**); *j*, leg 6, ventral (**E**). Scale: **A**, 0.5 mm; **B**, 0.2 mm; **C**, 0.05 mm; **D**, **E**, 0.1 mm.

μ (inner). In Figure 129a the first segment is $33 \times 32 \mu$, the seta 58μ ; the second segment is $65 \times 26.5 \mu$, its two spines 32μ and 52μ . Both segments are haired along their outer margins; the second segment bears minute terminal spinules.

Leg 5 (Figure 129b) has an unornamented free segment, $58 \times 24 \mu$ (greatest dimensions), with its proximal inner margin slightly expanded. The two terminal naked setae are 52μ and 68μ . The adjacent seta on the body is 61μ .

Leg 6 is probably represented by the two setae near the attachment of each egg sac (Figure 127c).

The color in life is unknown.

MALE.—The body (Figure 129c) resembles that of the female in general form. The length and the greatest width of two males in lactic acid (the length excluding the ramal setae) are 0.88×0.39 mm and 0.91×0.40 mm. The ratio of the length to the width of the prosome is 1.45:1. The ratio of the length of the prosome to that of the urosome is 1.5:1.

The segment of leg 5 (Figure 129d) is $39 \times 105 \mu$. There is only an indistinct trace of the ventral intersegmental sclerite. The genital segment is $166 \times 172 \mu$. The four postgenital segments are $29 \times 68 \mu$, $29 \times 65 \mu$, $26 \times 60 \mu$, and $28 \times 65 \mu$ from anterior to posterior.

The caudal ramus is similar to that of the female but smaller, $33 \times 25 \mu$.

The body surface has a few hairs (sensilla) as in the female.

The rostrum resembles that of the female.

The first antenna is like that of the female, but there are three additional aesthetes (Figure 129c) so that the formula is 4, $13 + 2$ aesthetes, 6, $3 + 1$ aesthetes, $4 + 1$ aesthetes, $2 + 1$ aesthetes, and $7 + 1$ aesthete.

The second antenna resembles that of the female but shows sexual dimorphism in having very small spinules along the inner surfaces of the second and fourth segments.

The labrum, mandible, paragnath, first maxilla, and second maxilla are similar to those in the female. The maxilliped (Figure 129e) has an unornamented first segment. The second segment bears two naked setae, a row of prominent spinules, and a group of small spinules. The small third segment is unornamented. The claw is 127μ along its axis, including the small terminal lamella, and is weakly divided about midway. It bears proxi-

mally two very unequal setae, the longer one with a few very small distal barbules.

The ventral area between the maxillipeds and the first pair of legs is like that of the female.

Legs 1-4 are segmented as in the female, with the spine and setal formula as in that sex except for the last segment of the endopod of leg 1 (Figure 129f) which has the formula 1,1,4 (the outer spine being 25μ , the inner spine 34μ) instead of 1,5. Slight sexual dimorphism is seen also in the last segment of the endopod of leg 2 (Figure 129g) where the three spines from outer to inner are 29μ , 26.5μ , and 30μ (in the female these being 16.5μ , 16.5μ , and 21μ) and the spiniform processes are longer; and in leg 3 (Figure 129h) where the spines are 22μ , 31μ , and 34μ (instead of 16.5μ , 19μ , and 24μ in the female) and the processes are also longer than in the female. Leg 4 is like that of the female.

Leg 5 (Figure 129i) has an unornamented, unexpanded, slender free segment, $33 \times 10 \mu$, bearing terminally an inner fringed spiniform element 22μ and a naked seta 44μ .

Leg 6 (Figure 129j) consists of a posteroventral flap on the genital segment bearing two naked setae, 44μ and 45μ , near a small spiniform process.

The spermatophore was not observed.

The color in life is unknown.

ETYMOLOGY.—The specific name, *chlamydis*, is the Latin genitive form of the generic name of the host.

REMARKS.—Of all the species in the genus *Metaxymolgus*, this species resembles most closely *M. commodus* (Humes). However, that species from nudibranchs in Madagascar differs in the caudal ramus being wider than long and in the ornamented fifth leg in the female.

Metaxymolgus cinctus, new species

FIGURES 130, 131

TYPE MATERIAL.—32 ♀♀, 19 ♂♂, and 48 copepodids from single colony of the gorgonian *Psammogorgia ramosa* Kükenthal, in 12 m, Rocher du N.E., Nosy Bé, Madagascar, $13^{\circ}11'52''$ S, $48^{\circ}19'24''$ E, 19 August 1967, collected by AGH. Holotype ♀, allotype, and 39 paratypes (25 ♀♀, 14 ♂♂) deposited in USNM, the remaining paratypes and the copepodids in the collection of AGH.

FEMALE.—The body (Figure 130a) is moderately slender. The length is 1.12 mm (1.06–1.19 mm) and the greatest width 0.49 mm (0.48–0.51 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1.56:1. The ratio of the length of the prosome to that of the urosome is 2.15:1.

The segment of leg 5 (Figure 130b) is $60 \times 132 \mu$. There is no ventral intersegmental sclerite between that segment and the genital segment.

The genital segment is 143μ long, in dorsal view constricted sharply at the level of the junction of the anterior two-thirds. The width anterior to the constriction is 101μ , at the constriction 89μ , and posterior to the constriction 106μ . The areas of attachment of the egg sacs are situated laterally near the constriction. Each area (Figure 130c) bears two naked setae, 7μ and 10μ , with a spiniform process between them. The three postgenital segments are $57 \times 75 \mu$, $42 \times 66 \mu$, and $37 \times 71 \mu$ from anterior to posterior.

The caudal ramus (Figure 130d) is $39 \times 31 \mu$, only a little longer than wide. The dorsal seta is 47μ and the outer lateral seta 68μ , both naked. The outermost terminal seta is 124μ , the innermost terminal seta 177μ , both with bilateral spinules. The two long median terminal setae are 319μ (outer) and 374μ (inner), both with spinules and both inserted between dorsal (unornamented) and ventral (with a marginal row of minute spinules) flaps.

The body surface has a few hairs (sensilla) as shown in Figure 130a,b. The posteroventral margin of the anal segment bears a row of minute spinules on both sides.

The egg sac (Figure 130a) was incomplete in all ovigerous specimens seen. Each egg is about 53μ in diameter.

The rostrum is like that of *M. antheliae*.

The first antenna is 389μ long and resembles that of *M. antheliae*. The lengths of the seven segments (measured along their posterior nonsetiferous margins) are 30 (77μ along the anterior margin), 109, 31, 55, 50, 34, and 33μ respectively. The formula for the armature is the same as in *M. antheliae*. All the setae are naked.

The second antenna (Figure 130e) is segmented and armed as in *M. antheliae*, with the formula I, 1, 3, and II + 5 hyaline elements. The fourth segment is 72μ along its outer edge, 44μ along its

inner edge, and 23μ wide. Of the two unequal terminal claws the more slender one is 32μ along its axis, the stouter one 36μ . All the setae are naked and there is no fine ornamentation on the segments.

The labrum (Figure 130f) has two rather truncated and angular posteroventral lobes.

The mandible (Figure 130g) resembles that of *M. antheliae* but the scalelike area is not as protruded and has longer spinules and the posterior surficial striations seen in that species are absent. The paragnath (Figure 130f) is a hairy lobe. The first maxilla (Figure 130h) has four slender elements. The second maxilla (Figure 130i) resembles that of *M. antheliae* but the large teeth on the lash are acutely pointed rather than obtuse and the inner (dorsal) distal spine has unilateral spinules. The relatively short maxilliped (Figure 130j) has an unornamented first segment. The second segment bears two unequal barbed setae and a group of erect spines. The third segment has a large naked spine and a small naked seta and terminates in an unarticulated, spiniform, naked process much shorter than the spine.

The ventral area between the maxillipeds and the first pair of legs (Figure 130k) is slightly protuberant; a sclerotized line connects the bases of the maxillipeds.

Legs 1–4 have the same segmentation and spine and setal formula as in *M. antheliae*. On leg 1 (Figure 130l) the barbs on the outer spines of the exopod are stronger than in *M. antheliae*. Leg 2 shows only subtle differences from *M. antheliae* in the last segment of the exopod (Figure 131a). Leg 3 is identical with that of *M. antheliae*. In leg 4 (Figure 131b) the inner coxal element is a long, feathered seta 55μ (nearly as long as in leg 3 where it is 78μ), and the inner margin of the basis is smooth instead of haired as in legs 1–3. The exopod of leg 4 is 159μ long. The endopod has outer hairs on both segments. The first segment is $43 \times 33 \mu$ (not including the spiniform processes) and its inner distal feathered seta is 90μ . The second segment is 105μ long (including the terminal spiniform processes), 26μ in greatest width proximally, and 19μ in least width distally; the outer terminal spine is 32μ , the inner 67μ , both finely barbed.

Leg 5 (Figure 131c) has a free segment $73 \times 30 \mu$ in greatest dimensions. The two naked terminal setae are 42μ and 58μ . The naked seta on the body

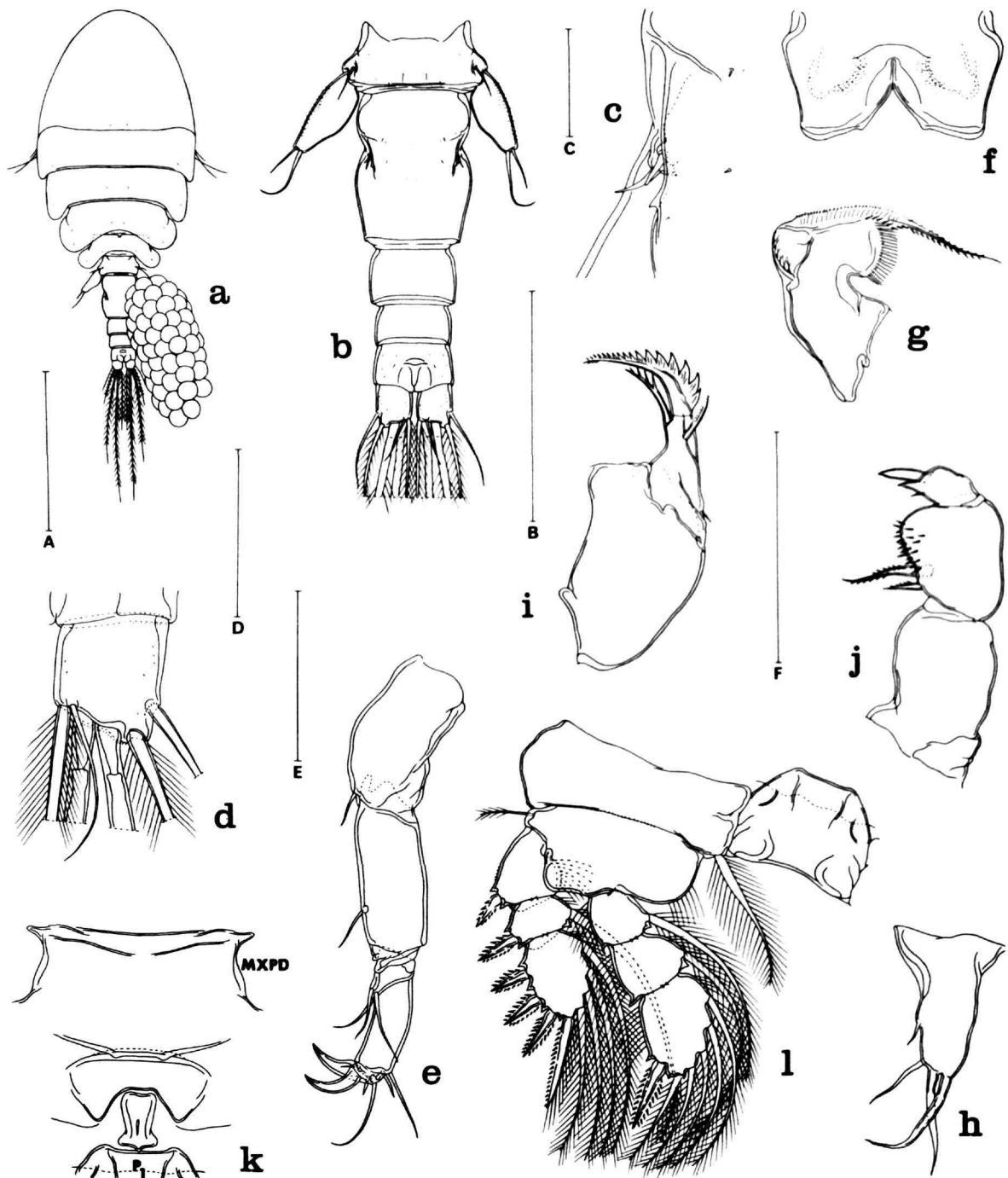


FIGURE 130.—*Metaxymolgus cinctus*, new species. Female: a, dorsal (A); b, urosome, dorsal (B); c, area of attachment of egg sac, dorsal (C); d, caudal ramus, dorsal (D); e, second antenna, posterior (E); f, labrum, with paragnaths indicated by broken lines, ventral (F); g, mandible, posterior (F); h, first maxilla, posterior (D); i, second maxilla, posterior (F); j, maxilliped, anterior (F); k, area between maxillipeds and first pair of legs, ventral (E); l, leg 1 and intercoxal plate, anterior (E). Scale: A, 0.5 mm; B, 0.2 mm; C, 0.02 mm; D, 0.05 mm; E, F, 0.1 mm.

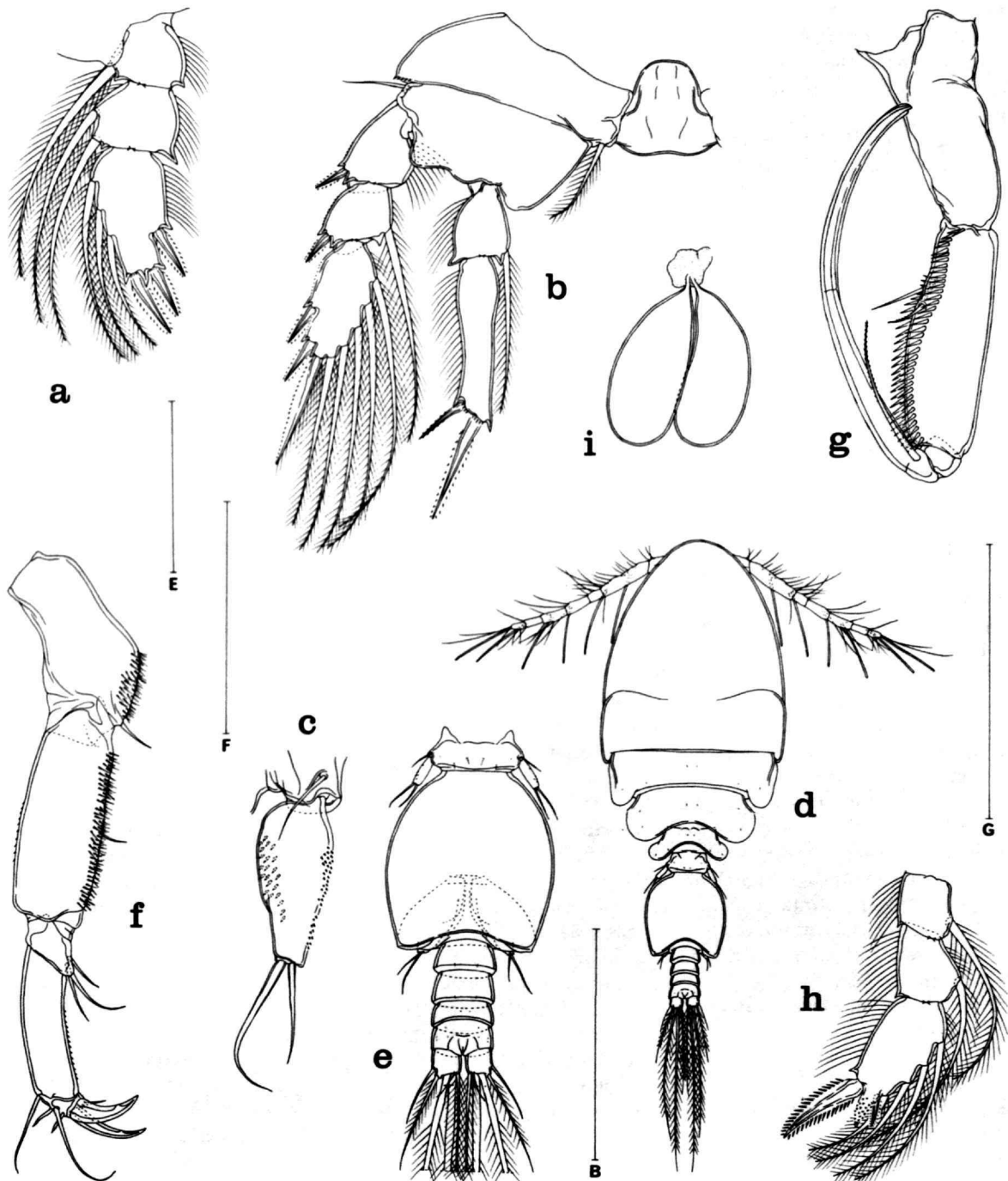


FIGURE 131.—*Metaxymolgus cinctus*, new species. Female: *a*, endopod of leg 2, anterior (E); *b*, leg 4 and intercoxal plate, anterior (E); *c*, leg 5, dorsal and slightly inner (F). Male: *d*, dorsal (G); *e*, urosome, dorsal (B); *f*, second antenna, anterior (F); *g*, maxilliped, inner (E); *h*, endopod of leg 1, anterior (F); *i*, spermatophores, attached to female, ventral (B). Scale: B, 0.2 mm; E, F, 0.1 mm; C, 0.5 mm.

near the insertion of the segment is $33\ \mu$. The segment is ornamented with small spines along its outer surface and with larger spines on its ventro-inner surface.

Leg 6 is probably represented by the two setae near the areas of attachment of the egg sacs (Figure 130c).

The color in life in transmitted light is opaque, the eye red, the egg sacs gray.

MALE.—The body (Figure 131d) has a form similar to that of the female. The length is 0.93 mm (0.86–0.96 mm) and the greatest width 0.35 mm (0.33–0.36 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1.49:1. The ratio of the length of the prosome to that of the urosome is 1.77:1.

The segment of leg 5 (Figure 131e) is $32 \times 87\ \mu$. There is no ventral intersegmental sclerite. The genital segment is $164 \times 152\ \mu$. The four postgenital segments are $25 \times 63\ \mu$, $26 \times 58\ \mu$, $20 \times 55\ \mu$, and $22 \times 58\ \mu$ from anterior to posterior.

The caudal ramus resembles that of the female but is smaller, $30 \times 26\ \mu$.

The surface of the body is ornamented with hairs as in the female.

The rostrum is similar to that of the female.

The first antenna is segmented and armed as in the female but there are two additional aesthetes on the second segment and one additional aesthete on the fourth segment (Figure 131d). The second antenna (Figure 131f) resembles that of the female except for the fine ornamentation consisting of numerous long inner spinules on segments 1 and 2 and a row of minute spinules along the outer edge of segment 2 and the inner edge of segment 4. The fourth segment is $77\ \mu$ along the outer edge, $55\ \mu$ along the inner edge, and $18\ \mu$ wide, the two claws being $37\ \mu$ and $32\ \mu$.

The labrum, mandible, paragnath, first maxilla, and second maxilla are like those in the female. The maxilliped (Figure 131g) resembles in general form that of *M. antheliae*. The claw is $228\ \mu$ along its axis, proximally with the usual two unequal setae and without surficial striations.

The ventral area between the maxillipeds and the first pair of legs is like that of the female.

Legs 1–4 are segmented and armed as in the female except for the last segment of the endopod of leg 1 (Figure 131h) where the formula is I,I,4, the two spines being very unequal. Between the

two spines there is a pointed process a little longer than the shorter spine and covered with small spines.

Leg 5 (Figure 131e) has a rectangular free segment, $27 \times 9\ \mu$, ornamented with a few minute outer spinules. The two terminal setae are $29\ \mu$ and $35\ \mu$ and the adjacent seta on the body $24\ \mu$, all three setae naked.

Leg 6 (Figure 131e) consists of a posteroventral flap on the genital segment, bearing two naked setae $29\ \mu$ and $42\ \mu$.

The spermatophore (Figure 131i), attached to the female in pairs, is oval, $146 \times 65\ \mu$ (not including the neck).

The color in life in transmitted light is similar to that of the female.

ETYMOLOGY.—The specific name, *cinctus* (Latin, girded or tied about) refers to the constriction of the genital segment of the female, as if the segment were tied with a string.

REMARKS.—Two features of the new species serve to distinguish it from all others in the genus: the constriction of the genital segment in the female is unique; and the very unequal nature of the two spines on the last segment of the endopod of leg 1 of the male and the spinose process between them are characteristic.

Metaxymolgus claudus, new species

FIGURES 132–134

TYPE MATERIAL.—17 ♀♀, 3 ♂♂, and 2 copepodids from the stomach of a basket star, *Euryale aspera* Lamarck, at Palembang, Indonesia, collected by MacGillivray. One female is made the holotype, one male the allotype, and the remaining specimens paratypes (ZMA Co.102.287).

FEMALE.—The total length (excluding the setae on the caudal rami) is 0.88 mm (0.85–0.90 mm) and the greatest width of the cephalosome is 0.30 (0.29–0.31 mm), based on ten specimens.

The body (Figure 132a) is slender. The first pedigerous segment is completely incorporated in the cephalosome. The first metastomal segment is about as wide as the cephalosome, the second and third segments less wide. The first urosomal segment is longer than wide and carries leg 5. The genital segment (Figure 132b) is $136 \times 72\ \mu$, thus very slender; there is one setule near each genital opening. The three postgenital segments are un-

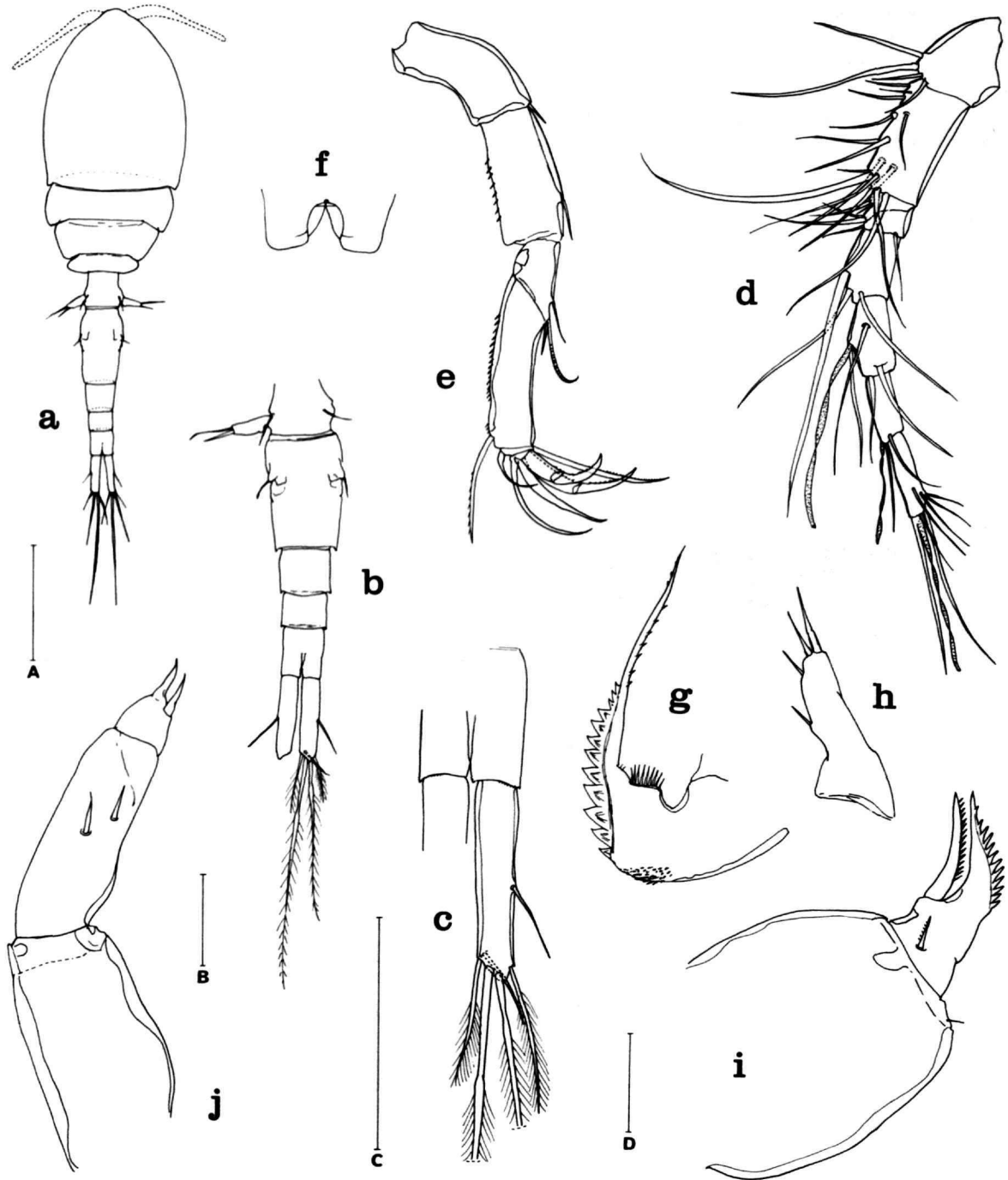


FIGURE 132.—*Metaxymolgus claudus*, new species. Female: a, dorsal (A); b, urosome (B); c, caudal ramus (C); d, first antenna (D); e, second antenna (C); f, labrum (C); g, mandible (D); h, first maxilla (D); i, second maxilla (D); j, maxilliped (D). Scale: A, 0.2 mm; B, C, 0.1 mm; D, 0.02 mm.

ornamented except for the anal segment ($52 \times 44 \mu$) which has a row of minute spinules along its posteroventral border (Figure 132c). The caudal ramus (Figure 132c) is $82\text{--}83 \mu$ long (mean 82.4μ) and $19\text{--}24 \mu$ wide (mean 23.1μ), thus nearly four times as long as wide. The armature of the caudal ramus consists of a smooth, lateral seta at almost half its length, four plumose terminal setae, and a smooth dorsal seta implanted near the base of the innermost terminal seta.

The first antenna (Figure 132d) is 7-segmented. The third segment is partially subdivided. The lengths of the segments (measured along their posterior margins) are 15, 48, 15, 30, 31, 26, and 35μ respectively. The formula for the armature is 4, 14, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete.

The second antenna (Figure 132e) is 4-segmented. The armature is 1, 1, 3, and 5 + two jointed claws. The second and fourth segments bear inner spinules.

The labrum (Figure 132f) is incised medially.

The mandible (Figure 132g) has an enlarged basal portion and a slender lash. The medial (convex) margin is armed with twelve triangular teeth. The first maxilla (Figure 132h) has four setae—two terminal, one subterminal, and one lateral. The second maxilla (Figure 132i) has a very stout basal segment. The distal segment attenuates into a short lash armed with about twelve teeth. The auxiliary lash is about as long as the main lash and armed with smaller teeth. The maxilliped (Figure 132j) consists of an unarmed basal segment, a slender second segment with two short spines, and a rounded terminal segment ending in a slender claw and a spine.

Legs 1–4 (Figures 133a–d) are biramous, with the exopods 3-segmented and the endopods of legs 1–3 being 3-segmented. The endopod of leg 4 (Figure 133d) is short and functionally 1-segmented, being provided with an incomplete line of articulation. An intercoxal plate, lateral basipod seta, and median coxopod seta are present on all legs (the latter small and glabrous in leg 4). The chaetotaxis formula is usual for the genus.

Leg 5 (Figure 133e) has a free segment which is tapered distally, its greatest length 37μ and greatest width 16μ . The medial margin has a proximal swelling and a distal row of fine cilia. A long, smooth seta is borne near the implantation of the

free segment. Terminally the free segment is armed with a smooth seta (46μ) and a spine (32μ).

MALE.—The total length (without the ramal setae) is 0.77 mm (0.76–0.81 mm) and the greatest width of the cephalosome 0.24 mm (0.23–0.26 mm), based on three specimens. The urosome (Figure 134a) is 6-segmented. The segment of leg 5 is wider than long. The genital segment ($104 \times 100 \mu$) bears posterolaterally two long setae (representing leg 6).

The caudal ramus is $62 \times 22 \mu$, thus nearly three times as long as wide.

Secondary sexual differences occur only in the following appendages: the strongly prehensile maxilliped (Figure 134b), leg 1 (Figure 134c) with the third endopod segment having I,I,4 instead of I,5 as in the female, and leg 5 (Figure 134d) where the free segment is less slender ($16 \times 11 \mu$), not tapering, with the medial margin not ciliated.

ETYMOLOGY.—The specific name, *claudus* (Latin, cripple), alludes to the incomplete segmentation of the inner ramus of leg 4 in both sexes.

REMARKS.—In most species in this genus the caudal ramus is distinctly shorter than in *M. claudus*. *M. antheliae*, *M. botulosus*, *M. brevifurcatus*, *M. chylamydis*, *M. cinctus*, *M. commodus*, *M. congoensis*, *M. cuspsis*, *M. gracilipes*, *M. hetaericus*, *M. inflatiseta*, *M. myorae*, *M. patulus*, *M. sensilis*, *M. singularipes*, and *M. venustus* have, at least in the female, a short caudal ramus of about equal length and width. In *M. inaequalis* and *M. aculeatus* the length of the caudal ramus is about twice the width. In *M. spinulifer*, *M. simplex*, and *M. hirsutipes* the caudal ramus is 3–4 times as long as wide, resembling that in the new species. These three species may be distinguished from *M. claudus*, however, on other characters.

Metaxymolgus claudus differs from *M. spinulifer* in having a much shorter exopod in leg 4, in the longer terminal claws on the second antenna, in the much shorter terminal lash on the second maxilla, and in having short elements only on the second segment of the maxilliped of the female. Also, it differs from the incompletely known *M. simplex* in having a short terminal lash on the second maxilla, in a much more complex terminal armature on the second antenna (two claws and no seta in *M. simplex*), and in the more slender genital segment in the female. Finally, *M. claudus* differs from *M. hirsutipes* in the shape of leg 5 in the fe-

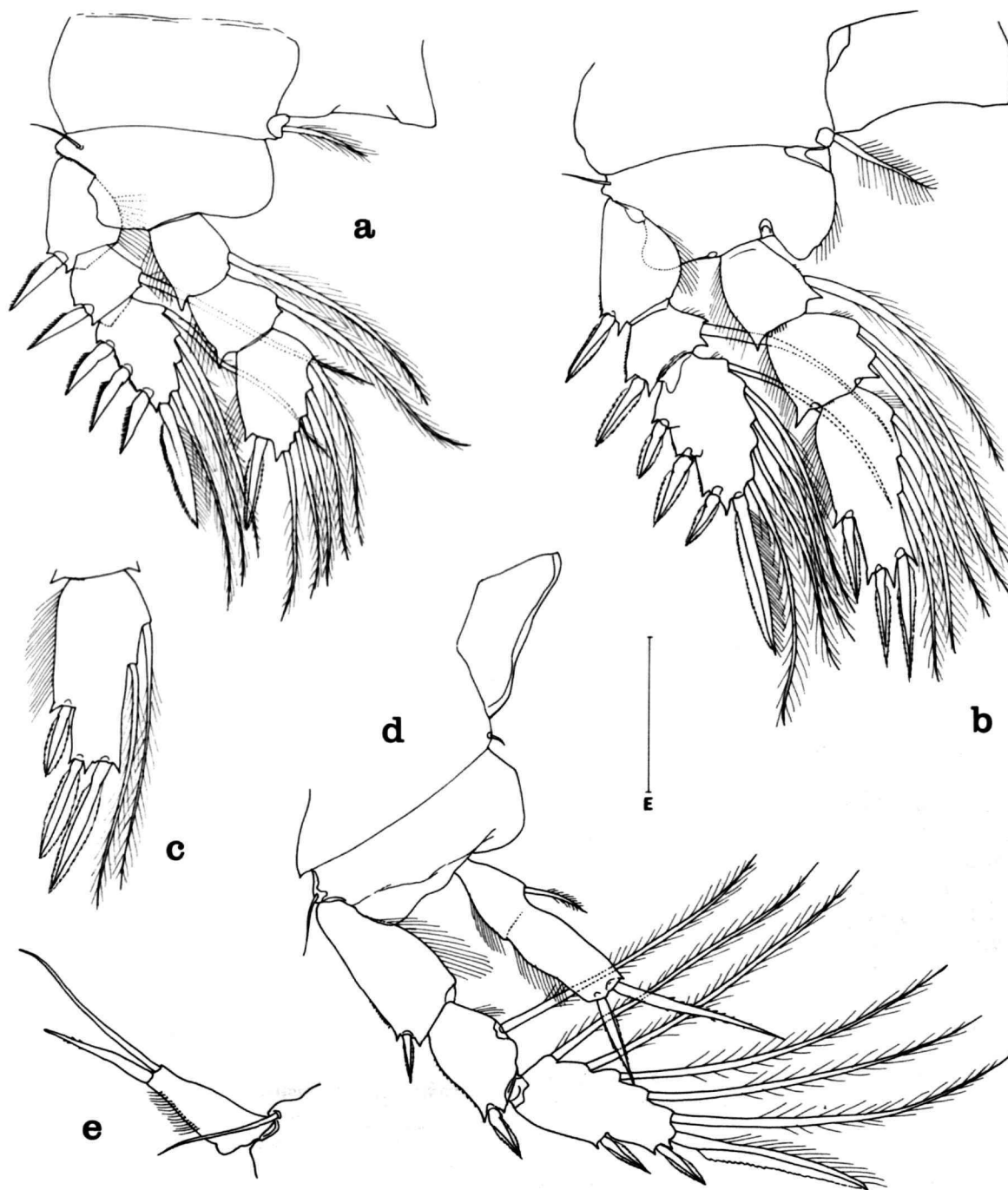


FIGURE 133.—*Metaxymolgus claudus*, new species. Female: *a*, leg 1 and part of intercoxal plate; *b*, leg 2 and part of intercoxal plate; *c*, third segment of endopod of leg 3; *d*, leg 4 and intercoxal plate; *e*, leg 5. Scale: E, 0.05 mm, applies to all drawings.

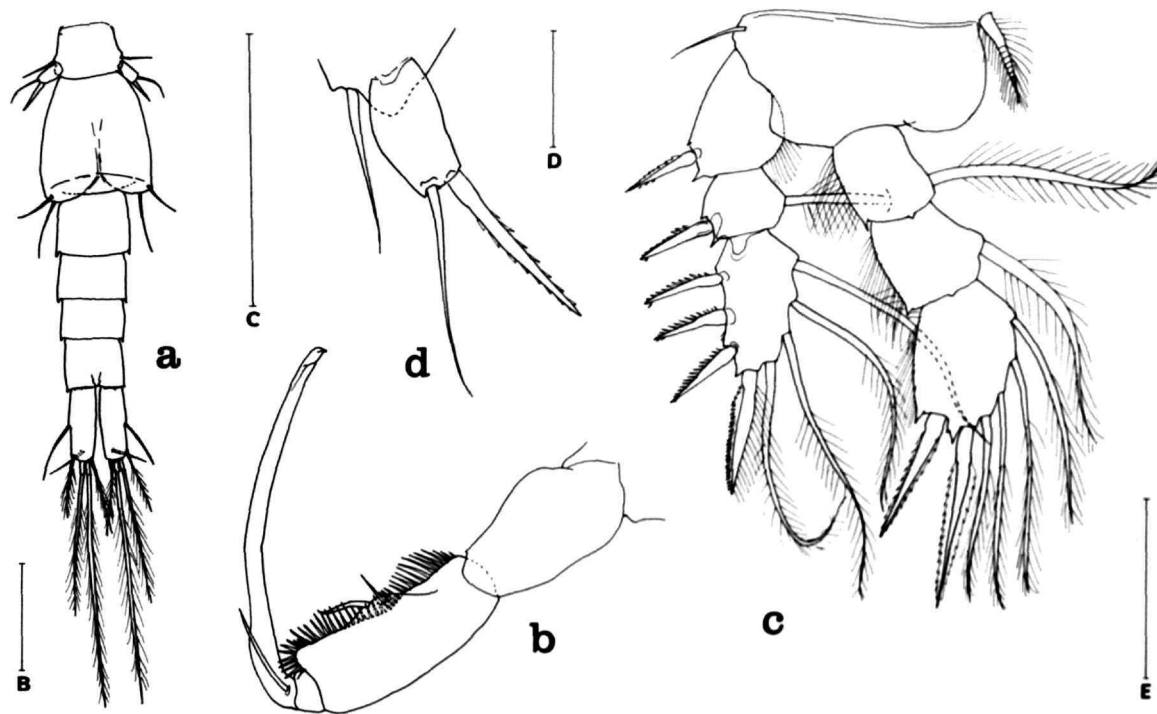


FIGURE 134.—*Metaxymolgus claudus*, new species. Male: a, urosome (B); b, maxilliped (C); c, leg 1 (E); d, leg 5 (D). Scale: B, C, 0.1 mm; D, 0.02 mm; E, 0.05 mm.

male (longer and curved in *M. hirsutipes*), in the more proximal position of the lateral seta on the caudal ramus, in the shorter endopod of leg 4, and in the different shape of the maxilliped of the female.

The most remarkable character of *Metaxymolgus claudus*, and by which it differs from all known species of the genus, is the incomplete nature of the articulation between the first and second segments of the endopod of leg 4 in both sexes. In this feature *M. claudus* resembles the genera *Kelleria* and *Octopicola*. These genera are, however, otherwise (especially in the structure of the various cephalosomal appendages) very different. In the totality of its morphological characters *M. claudus* fits best in *Metaxymolgus*. The somewhat reduced nature of the fourth endopod may be related to the endoparasitic mode of life of *M. claudus*, whereas all other species in this genus are ecto-associates.

Metaxymolgus commodus (Humes, 1964)

Lichomolgus commodus Humes, 1964, pp. 71–74, figs. 139–165 [from the nudibranchs *Hexabranhus orbicularis* Abraham and *Doridopsis ruber* Kelaart, region of Nosy Bé, Madagascar].

NEW HOST.—From *Hexabranhus* sp. (cf. *H. marginatus* (Quoy and Gaimard): 19 ♀♀, 21 ♂♂, and 39 copepodids, from single host, intertidal, Antsakoabe, Nosy Bé, Madagascar, 9 August 1964; 71 ♀♀, 75 ♂♂, and 44 copepodids, from five hosts, intertidal, Nosy N'Tangam, Nosy Bé, 15 April 1964. Both collections by AGH.

Metaxymolgus congoensis (T. Scott, 1894)

Lichomolgus congoensis T. Scott, 1894a, pp. 120, 121, pl. 13, figs. 39–48 [in surface tow-net, Bananah Creek, Congo River, Africa].

Metaxymolgus cuspis (Humes, 1964)

Lichomolgus cuspis Humes, 1964, pp. 65–68, figs. 74–108 [from the actinarians *Radianthus ritteri* (Kwietniewski)]

and *Stoichactis giganteum* (Forskål), region of Nosy Bé-Madagascar].—Bouligand, 1966, p. 269.

Metaxymolgus gracilipes (A. Scott, 1909)

Lichomolgus gracilipes A. Scott, 1909, pp. 265, 266, pl. 68, figs. 11–20 [from a nudibranch,⁵ Pepla Bay, east coast of Rotti Island, near Timor, 10°28' S, 123°24' E].

Lichomolgus (*Macrochiron*) *gracilipes*.—Monod and Dollfus, 1932a, p. 139.

?*Epimolgus gracilipes*.—Stock, 1957, p. 381.

Macrochiron gracilipes.—Stock, 1957, p. 381.

Metaxymolgus hetaericus (Humes and Ho, 1968)

Lichomolgus hetaericus Humes and Ho, 1968c, pp. 663–668, figs. 89–106 [from the alcyonaceans *Cladiella pachyclados* (Klunzinger) and *Cladiella krempfi* Hickson, region of Nosy Bé, Madagascar].

NEW HOST.—204 ♀♀, 112 ♂♂, and 72 copepodids from single colony of the alcyonacean *Cladiella laciniosa* (Tixier-Durivault), in 2 m, west of Pte. de Tafondro, Nosy Bé, Madagascar, 30 May 1967, collected by AGH.

Metaxymolgus hirsutipes (T. Scott, 1893)

Lichomolgus hirsutipes T. Scott, 1893, pp. 206, 207, pl. 4, figs. 1–12 [from Firth of Forth, Scotland]; 1894b, pp. 234, 258; 1902, p. 470 [from North Craig, Firth of Forth, Scotland]; 1905, pp. 202, 203 [in tubes of the polychaete *Sabella*, Scotland]; 1906, p. 352 [on tubes of *Sabella*, Bass Rock and North Craig, Firth of Forth, Scotland].—Thompson and A. Scott, 1900a, p. 335 [from *Zostera* beds, Liverpool Bay, England]; 1900b, p. 143 [from *Zostera* beds, Liverpool Bay, England].—d'Arcy Thompson, 1901, p. 47.—Herdman, 1901, p. 27.—T. Scott and A. Scott, 1901, p. 352 [from Kolguev Island, near south end of Novaya Zemlia, Arctic].—Stock, 1957, p. 381.

Macrocheiron hirsutipes.—G. O. Sars, 1917a, pp. 155–166, pl. 92 [from Norway].

?*Macrochiron* (*Macrochiron*) *hirsutipes*.—Sewell, 1949, pp. 100–104, figs. 24a–g, 25a–h [from weed-washings, Addu Atoll, Maldive Archipelago].

Macrochiron hirsutipes.—Stock, 1957, p. 381.

Metaxymolgus inaequalis (Humes and Ho, 1966)

Lichomolgus inaequalis Humes and Ho, 1966a, pp. 3–6, figs. 1–28 [from the zoanthids *Palythoa tuberculosa* (Esper) and

Palythoa liscia Haddon and Duerden, region of Nosy Bé, Madagascar].

Metaxymolgus inflatseta, new species

FIGURES 135–137

TYPE MATERIAL.—5 ♀♀, 5 ♂♂, and 1 copepodid from one euthyneuran gastropod, *Onchidium*? sp., intertidal under rock, Pte. Mahatsinjo, Nosy Bé, Madagascar, 22 June 1963, collected by AGH. Holotype ♀, allotype, and 5 paratypes (3 ♀♀, 2 ♂♂) deposited in USNM, the remaining paratypes (dissected) in the collection of AGH.

OTHER MATERIAL EXAMINED (all probably from *Onchidium* sp.).—1 ♀, 2 ♂♂, and 1 copepodid from two hosts, intertidal, Pte. Lokobe, Nosy Bé, Madagascar, 5 August 1960; 1 ♂ from one host, intertidal, Pte. Mahatsinjo, Nosy Bé, 21 August 1960; 4 ♀♀, 4 ♂♂, and 3 copepodids from two hosts, intertidal, Ambanoro, Nosy Bé, 23 August 1960; 2 ♀♀, 1 ♂ from one host, intertidal, Pte. Ambarionaomby, Nosy Komba, near Nosy Bé, 27 August 1960; 1 copepodid from two hosts, intertidal, Ambariotelo, a small island nearly between Nosy Komba and Nosy Bé, 9 September 1960; and 2 ♀♀, 5 ♂♂ from four hosts, Tany Kely, a small island south of Nosy Bé, 9 August 1960. All collected by AGH.

FEMALE.—The body (Figure 135a) has a moderately expanded prosome. The length (not including the setae on the caudal rami) is 1.04 mm (1.02–1.07 mm) and the greatest width 0.53 mm (0.51–0.54 mm), based on five specimens in lactic acid. The segment of leg 1 is incompletely set off from the cephalosome. The epimeral areas of the segments of legs 2 and 3 are slightly truncated, those of the segment of leg 4 rounded. The ratio of the length to the width of the prosome is 1.28:1. The ratio of the length of the prosome to that of the urosome is 2.04:1.

The segment of leg 4 (Figure 135b) is 70 x 153 µ. There is no ventral intersegmental sclerite between this segment and the genital segment. The genital segment in dorsal view is 161 x 164 µ, rather globular, but constricted posteriorly. The areas of attachment of the egg sacs are located dorsolaterally just behind the middle of the segment. Each area (Figure 135c) bears two naked setae, 10 µ and 8 µ, and a small spiniform process. The three postgenital segments are 54 x 96 µ, 39 x 83 µ, and 49 x

⁵ The host is one of the following three nudibranchs collected at Siboga Station 301: *Hexabranhus marginatus* (Quoy and Gaimard), *Glossodoris annae* (Bergh) (= *Chromodoris quadricolor* Rüppel and Leuckart, var. *annae* Bergh), and *Trevelyana rubromaculata* Bergh. See Monod and Dollfus, 1932a, p. 139 and table.

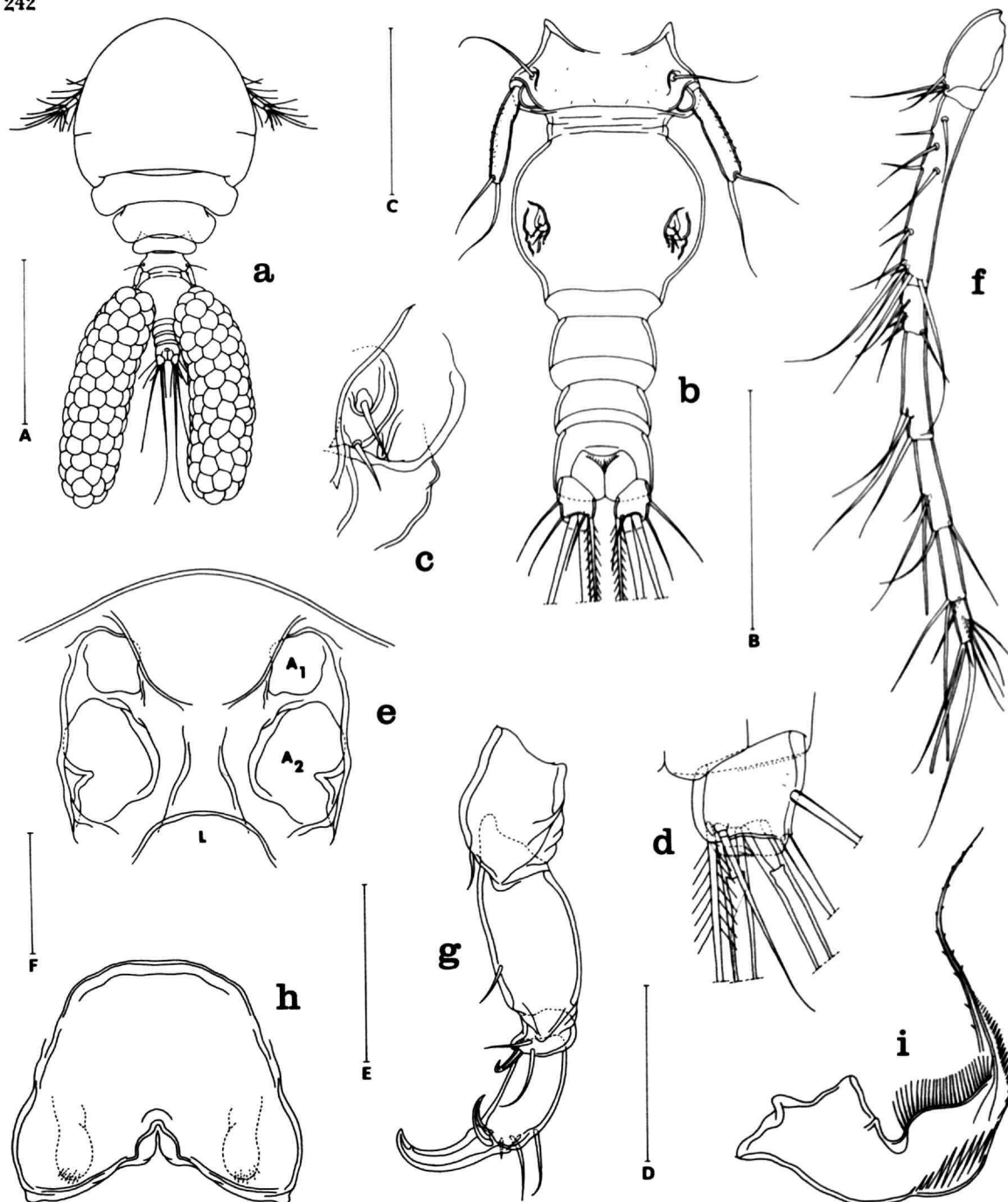


FIGURE 135.—*Metaxymolgus inflatseta*, new species. Female: *a*, dorsal (A); *b*, urosome, dorsal (B); *c*, area of attachment of egg sac, dorsal (C); *d*, caudal ramus, dorsal (D); *e*, rostrum, ventral (E); *f*, first antenna, anterodorsal (F); *g*, second antenna, postero-inner (E); *h*, labrum, ventral (F); *i*, mandible, posterior (D). Scale: A, 0.5 mm; B, 0.2 mm; C, 0.03 mm; D, F, 0.05 mm; E, 0.1 mm.

83 μ from anterior to posterior. The anal segment bears on its posteroventral margin a row of minute spinules on both sides.

The caudal ramus (Figure 135d) is quadrate, 30 x 30 μ . The outer lateral seta is 60 μ , the dorsal seta 50 μ , and the outermost terminal seta 68 μ , all three of them naked. The innermost terminal seta is 143 μ with proximal hairs. The two long median terminal setae are 300 μ (outer) and 495 μ (inner), both with very fine barbules along their midregions.

The body surface bears very few hairs (sensilla).

The egg sac (Figure 135a) is elongated, 760 x 240 μ , reaching to the ends of the longest ramal setae. There are many eggs, each about 60 μ in diameter.

The rostrum (Figure 135e) has an incomplete, broadly rounded posteroventral margin.

The first antenna (Figure 135f) is slender, 360 μ long, and 7-segmented. The lengths of the segments (measured along their posterior nonsetiferous margins) are 28 (55 μ along the anterior margin), 105, 26, 59, 52, 39, and 24 μ respectively. The formula for the armature is 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All the setae are naked.

The second antenna (Figure 135g) is 4-segmented. Each of the first two segments bears a slender seta. The third segment bears two slender setae and a spiniform recurved seta. The fourth segment, 74 μ along its outer edge, 50 μ along its inner edge, and 31 μ wide, bears terminally two very unequal claws, 55 μ and 32 μ , and five setiform elements. All the elements are naked.

The labrum (Figure 135h) has two broad posteroventral lobes separated by a shallow median incision. The mandible (Figure 135i) has on the convex side of its basal region beyond the indentation a scalelike area with strong spinules followed by a row of shorter spinules and on the concave side a row of slender spinules; the lash is long and sparsely barbed. The paragnath (Figure 135h) is a small hairy lobe. The first maxilla (Figure 136a) has four elements, one of them with short spinules. The second maxilla (Figure 136b) has an unornamented first segment. The second segment bears on its convex (ventral) side a small proximal spinule, on its posterior surface a seta barbed along one edge, and on its concave (dorsal) side a spine with strong lateral spinules. The lash is elongated

with graduated spines along one edge and with both edges barbed distally. The maxilliped (Figure 136c) is 3-segmented. The first segment is unarmed. The second segment bears two very unequal setae, one short and naked, the other more than ten times as long and barbed. The third segment bears a naked spine and a small naked setule and terminates in a spiniform barbed process with a slender tip.

The ventral area between the maxillipeds and the first pair of legs (Figure 136d) is not protuberant. A sclerotized line connects the bases of the maxillipeds.

Legs 1-4 (Figures 136e-h) have 3-segmented rami except for the endopod of leg 4 which is 2-segmented. The armature is typically lichomolgid. The inner seta on the coxa of legs 1-3 is large and plumose, but in leg 4 is minute (9 μ long) and naked. The inner margin of the basis is haired in legs 1-3 but naked in leg 4. The exopod of leg 4 is 159 μ long, the third segment having II,I,5. The endopod of leg 4 has hairs along the outer margins of both segments. The first segment is 31 x 18 μ , with its inner distal plumose seta 37 μ . The second segment is 58 x 18 μ in greatest dimensions (including the terminal spiniform processes); the outer terminal spine is 30 μ and the inner spine 45 μ , both fringed.

Leg 5 (Figure 137a) has an elongated free segment, 77 x 21 μ , without a distinct proximal inner expansion, though a crease in the cuticula suggests such a development. (In an outer view of the segment, as in Figure 137b, neither a crease nor an expansion is evident.) The segment bears two terminal naked setae, 66 μ and 72 μ , and is ornamented along the outer dorsal side with minute spines. The adjacent seta on the body is naked.

Leg 6 is represented by the two setae near the attachment of each egg sac (Figure 135c).

The color in life in transmitted light is translucent, the ovary gray, the eye red.

MALE.—The body (Figure 137c) resembles in general form that of the female, though the epimeral areas of the segment of leg 4 are truncated rather than rounded. The length (without the ramal setae) is 0.89 mm (0.84-0.94 mm) and the greatest width 0.37 mm (0.36-0.38), based on five specimens in lactic acid. The ratio of the length to the width of the prosome is 1.41:1. The

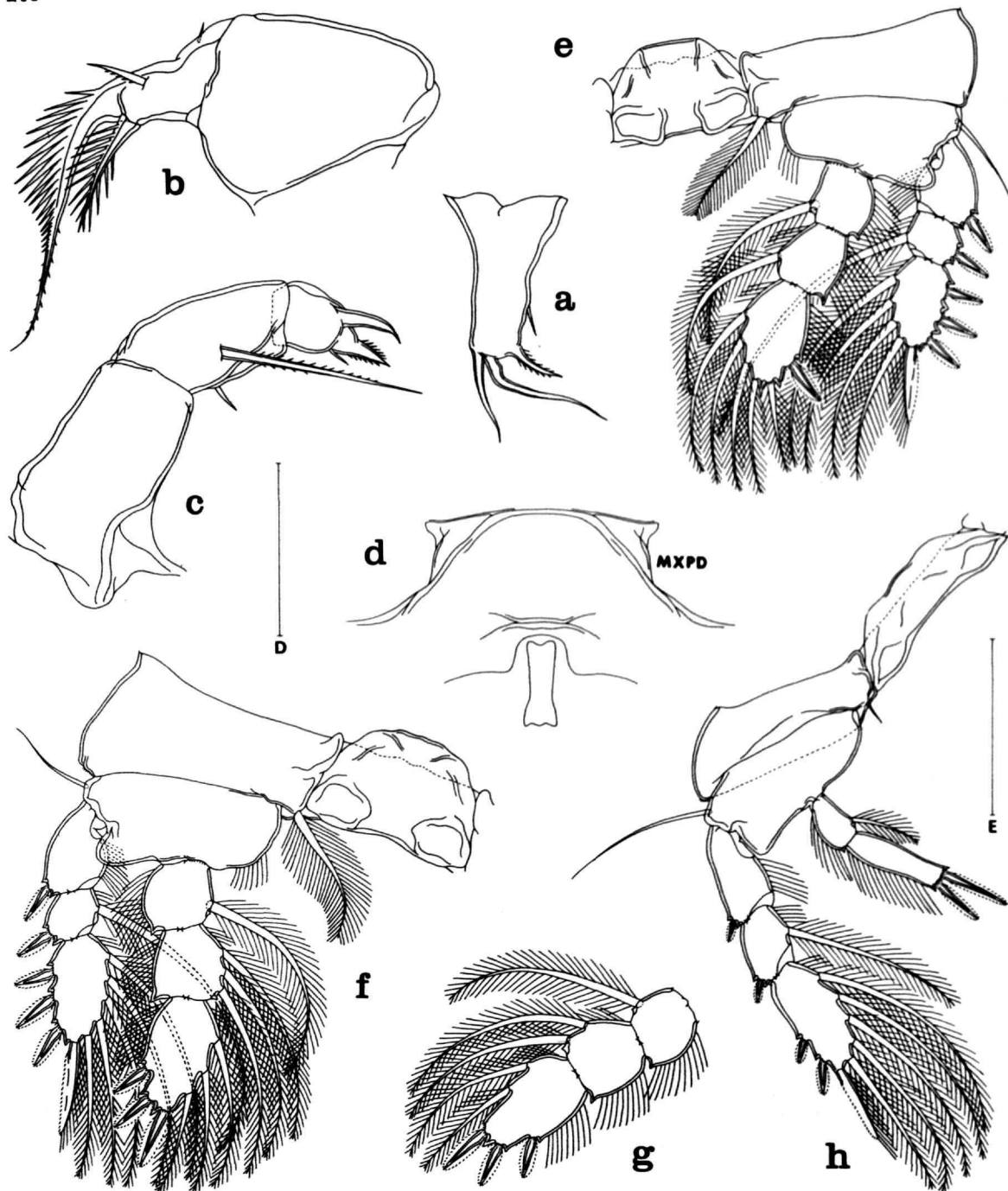


FIGURE 136.—*Metaxymolgus inflatseta*, new species. Female: a, first maxilla, anterior (v); b, second maxilla, posterior (v); c, maxilliped, posterior (v); d, area between maxillipeds and first pair of legs, ventral (E); e, leg 1 and intercoxal plate, anterior (E); f, leg 2 and intercoxal plate, anterior (E); g, endopod of leg 3, anterior (E); h, leg 4 and intercoxal plate, anterior (E). Scale: v, 0.05 mm; E, 0.1 mm.

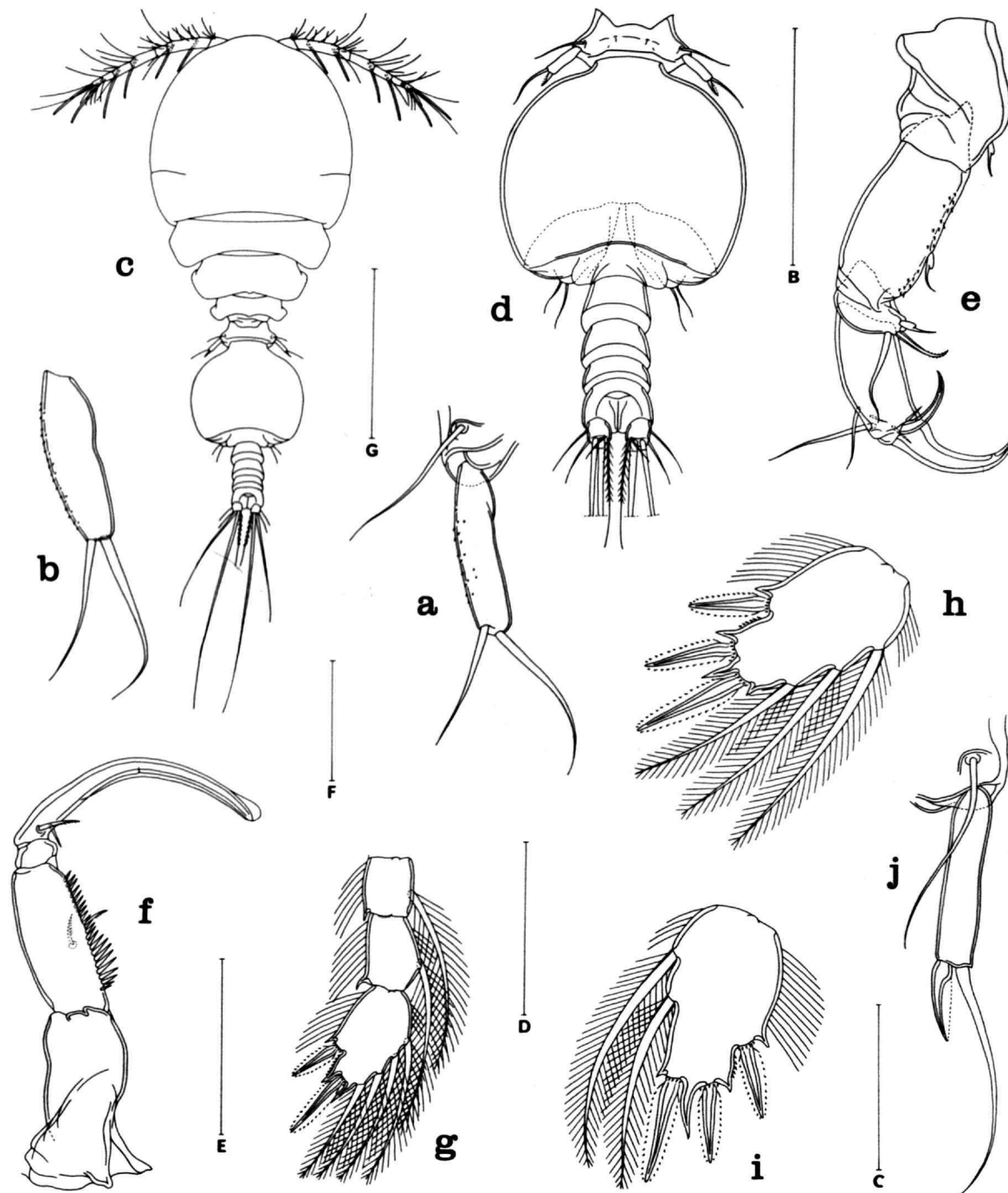


FIGURE 137.—*Metaxymolgus inflatseta*, new species. Female: a, leg 5, dorsal (F); b, free segment of leg 5, outer (F). Male: c, dorsal (C); d, urosome, dorsal (B); e, second antenna, postero-inner (F); f, maxilliped, inner (E); g, endopod of leg 1, anterior (F); h, third segment of endopod of leg 2, anterior (D); i, third segment of endopod of leg 3, anterior (D); j, leg 5, dorsal (C). Scale: B, 0.2 mm; C, 0.03 mm; D, F, 0.05 mm; E, 0.1 mm; C, 0.3 mm.

ratio of the length of the prosome to that of the urosome is 1.46:1.

The segment of leg 5 (Figure 137d) is $44 \times 96 \mu$. There is no ventral intersegmental sclerite. The genital segment is $180 \times 195 \mu$, a little wider than long. The four postgenital segments are $38 \times 65 \mu$, $36 \times 60 \mu$, $22 \times 58 \mu$, and $31 \times 61 \mu$ from anterior to posterior.

The caudal ramus is quadrate as in the female, but smaller, $25 \times 25 \mu$.

The body surface is largely unornamented as in the female.

The rostrum resembles that of the female.

The first antenna is segmented and armed as in the female, but there are two additional aesthetes on the second segment and another additional aesthete on the fourth segment (Figure 137c) so that the formula is 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete.

The second antenna (Figure 137e) shows sexual dimorphism in certain details. The setae on the first and second segments and one seta on the third segment are inflated proximally. The spiniform seta on the third segment is less recurved than in the female and bears small barbules. The inner surface of the second segment bears minute spinules.

The labrum, mandible, paragnath, first maxilla, and second maxilla are like those of the female. The slender maxilliped (Figure 137f) is 4-segmented (assuming that the proximal part of the claw represents a fourth segment). The first and third segments are unornamented. The second segment bears two setae, barbed along one edge, and a row of spines. The claw is 140μ along its axis including the terminal lamella, is weakly divided about midway, and bears proximally two small setae, one of them barbed along one edge.

The ventral area between the maxillipeds and the first pair of legs is like that of the female.

Legs 1-4 have the same segmentation and armature as in the female except for the formula of the third segment of the endopod of leg 1 (Figure 137g) which is I,1,4 instead of I,5 as in that sex. In leg 2 the third segment of the endopod (Figure 137h) is 53μ long (without the longest spiniform process of 12μ) and the three spines from outer to inner are 23, 26, and 36μ . (In the female this segment is 65μ , without the process of 7μ , and the

spines are 23, 26, and 34μ .) In leg 3 the third segment of the endopod (Figure 137i) is 52μ (without the spiniform process of 18μ) and the three spines from outer to inner are 23, 23, and 35μ . (In the female this segment is 62μ , without the process of 7μ , and the spines are 23, 26, and 34μ .) The endopod of leg 4 is similar to that in the female.

Leg 5 (Figure 137j) has a slender, elongated unornamented free segment, $33 \times 8 \mu$, with nearly parallel sides. The two terminal elements comprise an inner spine, 15μ , with a unilateral lamella and a long naked seta, 46μ .

Leg 6 consists of a posteroventral flap on the genital segment bearing two naked setae 39μ and 50μ (Figure 137d).

The spermatophore was not observed.

The color in life resembles that of the female.

ETYMOLOGY.—The specific name *inflatseta* (Latin, *inflatus*, swollen, and *seta*) alludes to the three swollen setae on the second antenna of the male.

REMARKS.—In the form of the genital segment of the female, *M. inflatseta* resembles four known species: *M. securiger* (Humes), *M. botulosus* (Stock and Kleeton), *M. sensilis* (Humes), and *M. hetaericus* (Humes and Ho). In the first three of these, however, the free segment of leg 5 in the female has a proximal inner expansion. In *M. hetaericus* the free segment of leg 5 is unornamented and short, the ratio being 2.3:1.

The male of *M. inflatseta* may be separated from all others in the genus by the peculiar inflated setae on the second antenna. The only other species with swollen setae on this appendage is *M. sensilis*, but here the swelling has a different form (compare Humes, 1964, fig. 192, with our Figure 137e). The free segment of leg 5 in *M. sensilis* has a few small spinules, whereas in *M. inflatseta* it is unornamented.

Certain appendages of *M. inflatseta* and *M. securiger* are sufficiently similar to suggest a rather close relationship between these two species, both from opisthobranchs. Such similarities are seen in the second antenna, mandible, second maxilla, maxilliped, and legs 1-4.

Metaxymolgus myorae (Greenwood, 1971)

Lichomolgus myorae Greenwood, 1971, pp. 298-306, figs. 1a-h, 2a-h, 3a-i, table 1 [from the actiniarian *Stoichactis haddoni* (Sav.-Kent), Moreton Bay, Queensland, Australia].

***Metaxymolgus patulus* (Humes, 1959)**

Lichomolgus patulus Humes, 1959, pp. 298–303, figs. 65–96 [from the nudibranch *Phyllidia trilineata* Cuvier, region of Nosy Bé, Madagascar].—Gotto, 1962, p. 104.

NEW HOSTS.—From the alcyonacean *Sinularia mayi* Lüttschwager: 2 ♀♀, 1 ♂ from two colonies, in 20 m, Tany Kely, a small island south of Nosy Bé, Madagascar, 20 December 1963, collected by JHS.

From the crinoid *Cenometra emendatrix* (Bell): 1 ♀, 6 ♂♂ from five hosts, in 20 m, Tany Kely, near Nosy Bé, Madagascar, 10 September 1963, collected by AGH.

***Metaxymolgus sensilis* (Humes, 1964)**

Lichomolgus sensilis Humes, 1964, pp. 74–78, figs. 166–197 [from the nudibranch *Trevelyana rubromaculata* Bergh, region of Nosy Bé, Madagascar].

***Metaxymolgus simplex* (Thompson and A. Scott, 1903)**

Lichomolgus simplex Thompson and A. Scott, 1903, p. 279, pl. 15, figs. 27–34 [from washings of sponges, Gulf of Mannar, Ceylon].—Stock, 1957, p. 381.

Macrochiron simplex.—Stock, 1957, p. 381.

***Metaxymolgus singularipes* (Humes and Ho, 1968)**

Lichomolgus singularipes Humes and Ho, 1968c, pp. 685–689, figs. 168–187 [from the alcyonacean *Parerythropodium rubiginosum* Verseveldt, region of Nosy Bé, Madagascar].

NEW RECORDS.—2 ♀♀, 6 ♂♂, and 2 copepodids from pieces of single colony of *Parerythropodium rubiginosum* Verseveldt, in 1 m, Pte. Mahatsinjo, Nosy Bé, Madagascar, 7 June 1967; 10 ♀♀, 4 ♂♂, and 4 copepodids from pieces of single colony of *Parerythropodium* sp., in 1 m, Pte. à la Fièvre, Nosy Bé, Madagascar, 15 June 1967. Both collections by AGH.

***Metaxymolgus spinulifer* (Humes and Frost, 1964)**

Lichomolgus spinulifer Humes and Frost, 1964, pp. 142–145, figs. 134–166 [from the alcyonacean *Lemnalia* sp., Nosy Bé, Madagascar].—Bouligand, 1966, p. 269.—Humes and Ho, 1968b, p. 23 [from the alcyonaceans *Lemnalia flava* May, *Lemnalia elegans* (May), *Lemnalia amabilis* Tixier-Durivault, *Lemnalia africana* (May), and *Paralemnalia thyrsoidea* (Hemprich and Ehrenberg), region of Nosy Bé, Madagascar].—Humes, 1970c, p. 160.

NEW ALCYONACEAN HOSTS (all collected by AGH).

—From *Lemnalia longiramus* Verseveldt: 104 ♀♀, 186 ♂♂, and 173 copepodids from single colony, in 12 m, west of the harbor at Hellville, Nosy Bé, Madagascar, 4 August 1967.

From *Lemnalia digitata* (May): 25 ♀♀, 14 ♂♂, and 67 copepodids from single colony, in 17 m, near the black buoy between Pte. Ambarionaomby, Nosy Komba, and Pte. de Tafondro, Nosy Bé, Madagascar, 5 August 1967; 15 ♀♀, 16 ♂♂, and 1 copepodid from single colony, in 2 m, Ambariobe, a small island almost between Nosy Komba and Nosy Bé, Madagascar, 22 August 1967.

From *Lemnalia cervicornis* (May): 99 ♀♀, 70 ♂♂, and 48 copepodids from single colony, in 20 m, Banc de Cinq Mètres, near Nosy Bé, Madagascar, 6 August 1967; 1 ♀, 3 ♂♂ from two small colonies, in 20 m, Banc de Dzamandzar, near Nosy Bé, Madagascar, 30 August 1967.

From *Lemnalia crassicaulis* Verseveldt: 62 ♀♀, 41 ♂♂, and 2 copepodids from single colony, in 20 m, Banc de Cinq Mètres, near Nosy Bé, Madagascar, 6 August 1967.

From *Lemnalia tenuis* Verseveldt: 23 ♀♀, 11 ♂♂, and 2 copepodids from single colony, in 50 m, Banc de Cinq Mètres, near Nosy Bé, Madagascar, 3 September 1967.

From *Lemnalia madagascarensis* Verseveldt: 51 ♀♀, 73 ♂♂, and 38 copepodids from single colony, in 24 m, Banc des Frères, Isles Mitsio, near Nosy Bé, Madagascar, 12°58' S, 48°28' E, 17 August 1967.

From *Paralemnalia clavata* Verseveldt: 93 ♀♀, 95 ♂♂, and 19 copepodids from single colony, in 2 m, Ambariobe, near Nosy Bé, Madagascar, 25 May 1967; 52 ♀♀, 44 ♂♂, and 10 copepodids from single colony, in 1 m, Ambariobe, 25 June 1967.

From *Sinularia polydactyla* (Hemprich and Ehrenberg): 2 ♀♀ from single colony, in 2 m, Ambariobe, near Nosy Bé, Madagascar, 22 August 1967.

NEW RECORDS FROM ALCYONACEANS (collected by AGH).—From *Lemnalia flava* (May): 186 ♀♀, 153 ♂♂, and 14 copepodids from single colony, in 1 m, Pte. Ambarionaomby, Nosy Komba, near Nosy Bé, Madagascar, 8 June 1967; 2 ♀♀, 2 ♂♂ from single colony, in 1 m, Pte. Ambarionaomby, 8 June 1967; 2 ♀♀, 2 ♂♂ from single colony, in 1 m, Pte. Ambarionaomby, 8 June 1967; 136 ♀♀, 66 ♂♂,

and 9 copepodids from single colony, in 2 m, east of Ambariotelo, a small island almost between Nosy Komba and Nosy Bé, Madagascar, 20 July 1967; and 25 ♀♀, 38 ♂♂, and 6 copepodids from single colony, in 1.5 m, Ambariobe, near Nosy Bé, Madagascar, 22 August 1967.

From *Lemnalia africana* (May): 8 ♀♀, 16 ♂♂, and 21 copepodids from single colony, in 12 m, west of the harbor at Hellville, Nosy Bé, Madagascar, 4 August 1967.

From *Paralemnalia thyrsoidea* (Hemprich and Ehrenberg): 36 ♀♀, 68 ♂♂, and 13 copepodids from single colony, in 18 m, Banc de Touareg, Bay of Ampasindava, near Nosy Bé, Madagascar, 11 July 1967; 31 ♀♀, 37 ♂♂, and 41 copepodids from two colonies, in 12 m, west of the harbor at Hellville, Nosy Bé, Madagascar, 4 August 1967; and 38 ♀♀, 33 ♂♂, and 1 copepodid from single colony, in 20 m, west of Andilana, Nosy Bé, Madagascar, 13°18' S, 48°07' E, 24 August 1967.

Metaxymolgus venustus (Humes, 1959)

Lichomolgus venustus Humes, 1959, pp. 290-298, figs. 36-64.

From the nudibranch *Phyllidia trilineata* Cuvier, region of Nosy Bé, Madagascar.—Gotto, 1962, p. 104.

NEW HOST.—16 ♀♀, 8 ♂♂ from five crinoids, *Cenometra emendatrix* (Bell), in 20 m, Tany Kely, near Nosy Bé, Madagascar, 10 September 1963, collected by AGH.

Genus *Monomolgus* Humes and Frost, 1964

DIAGNOSIS.—Body cyclopiform. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six moderately long setae. Rostrum either not well developed or rounded postero-

ventrally. First antenna 7-segmented, in the female with the formula 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male with 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented, with the armature 1, 1, 3, and 1 + a few minute elements, there being only a single terminal claw.

Labrum indented medially. Mandible with the basal region distal to the indentation with its convex side lacking a scalelike area with spinules but having distally a serrated fringe and with its concave side bearing spinules; lash either short or long. Paragnath a small lobe with setules or hairs. First maxilla with three or four elements. Second maxilla of the usual lichomolgid type. Maxilliped 3-segmented in the female with a pointed tip; in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1-4 with 3-segmented rami except for leg 4 endopod which is 2-segmented. Leg 4 exopod with the third segment having either II, I, 5 or III, I, 5. Leg 4 endopod with the formula 0-0; I. Leg 1 endopod in the male with the last segment either I, 5 as in the female or I, I, 4. Leg 5 with a free segment bearing two setae. Leg 6 represented in the female by the two small elements near the area of attachment of each egg sac; in the male by the ventral posterolateral flap on the genital segment bearing two setae.

Other features as in the species below.

Associated with madreporarian corals.

TYPE-SPECIES.—*Monomolgus unihastatus* Humes and Frost.

REMARKS.—The two species placed in the genus *Monomolgus* show certain differences which may be of generic value. These may be noted particularly

Key to Species of the Genus *Monomolgus*

FEMALES

- Caudal ramus 2.63:1; third segment of leg 3 with formula I, I, 2; third segment of exopod of leg 4 with II, I, 5 *M. psammocorae*
 Caudal ramus 3.9:1; third segment of leg 3 with I, I, 2; third segment of exopod of leg 4 with III, I, 5 *M. unihastatus*

MALES

- Caudal ramus 2.6:1; without sexual dimorphism in formula of leg 1 endopod *M. psammocorae*
 Caudal ramus 5.7:1; with sexual dimorphism in formula of leg 1 endopod (third segment I, I, 4) *M. unihastatus*

in the mandible, the third segment of leg 4 exopod, and the third segment of leg 1 endopod in the male. In spite of these it seems best to regard the two species as congeneric until more related species are discovered to provide more information on the weight of such characters.

***Monomolgus unihastatus* Humes and Frost, 1964**

FIGURE 138

Monomolgus unihastatus Humes and Frost, 1964, pp. 132-135, figs. 1-36 [from the hard coral *Porites* sp. cf. *andrewsi* Vaughan, region of Nosy Bé, Madagascar].—Bouli-

gand, 1966, p. 269.—Humes and Ho, 1968a, p. 371 [from *Porites* sp. cf. *nigrescens* Dana, Nosy Bé, Madagascar].

NEW HOST.—2 ♀♀, 4 ♂♂ from the alcyonacean *Parerythropodium fulvum* (Forskål), in 1 m, Ambariobe, near Nosy Bé, Madagascar, 15 January 1964, collected by AGH. (This is perhaps an accidental host.)

NEW RECORDS (collected by AGH).—46 ♀♀, 28 ♂♂, and 20 copepodids from *Porites* sp., in 2 m, off Ampombilava, Nosy Bé, Madagascar, 5 June 1967; 25 ♀♀, 3 ♂♂, and 1 copepodid from *Porites* sp., in 2 m, Ambariobe, near Nosy Bé, Madagascar, 22 August 1967.

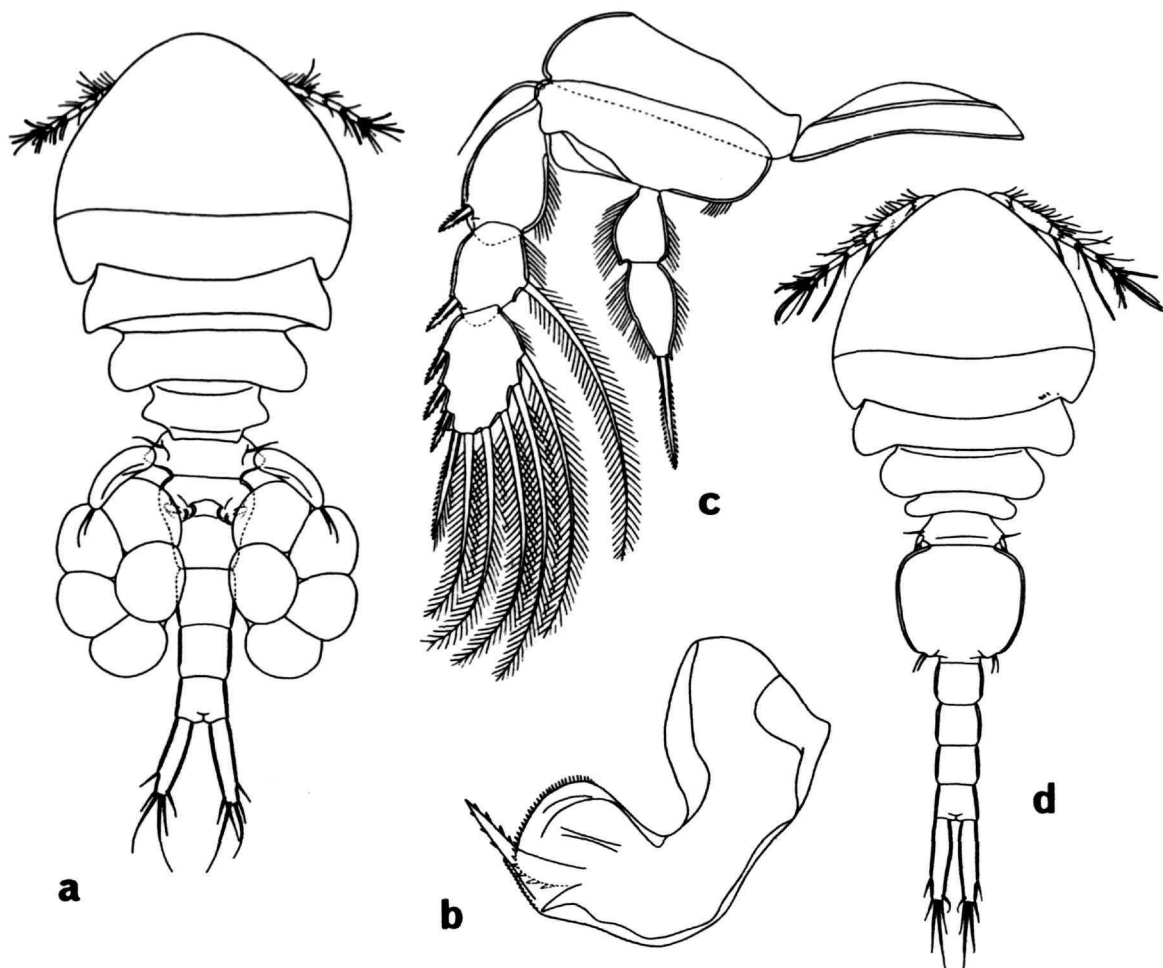


FIGURE 138.—*Monomolgus unihastatus* Humes and Frost. Female: a, dorsal; b, mandible; c, leg 4. Male: d, dorsal. (From Humes and Frost, 1964, figs. 1, 12, 22, 25.) Length of female 1.30 mm, of male 1.24 mm.

***Monomolgus psammocorae* Humes and Ho, 1967**

Monomolgus psammocorae Humes and Ho, 1967b, pp. 9-14, figs. 52-79 [from the hard coral *Psammocora contigua* (Esper), Ambariobe, near Nosy Bé, Madagascar].

Genus *Nasomolgus* Sewell, 1949

DIAGNOSIS.—Body cyclopiform. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six setae. Rostrum not well developed. First antenna 7-segmented, in both sexes with the formula 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented, the formula being 1, 1, 3, and II + 5 small elements, there being two terminal claws.

Labrum with the two lobes separated by an indentation and with two prominent, ventrally directed setae on its anterolateral areas. Mandible with a slender, unornamented base carrying distally and at an angle to it a bipectinate blade. Paragnath a small hairy lobe. First maxilla with four elements. Second maxilla with the usual lichomolgid form but with a very short lash.

Maxilliped in the female 3-segmented, slender, with a greatly elongated and very slender third segment; in the male 4-segmented (taking the proximal part of the claw as a fourth segment).

Legs 1-4 with 3-segmented rami except for leg 4 endopod which is 2-segmented. Leg 4 exopod with the third segment having II, I, 5. Leg 4 endopod with the formula 0-1;2, the seta on the first segment feathered, those on the second segment naked or with very short barbules. Leg 1 endopod of the male with the same armature as in the female. Leg 5 with a minute free segment bearing two setae. Leg 6 represented in the female by the two setae near the area of attachment of each egg sac; in the male by the ventral posterolateral flap on the genital segment bearing two setae.

Other features as in the species below.

Associated with polychaete annelids.

TYPE-SPECIES.—*Nasomolgus cristatus* Sewell.

REMARKS.—The five species of *Nasomolgus* constitute a well-unified group in respect to both their morphological characters and their host preferences.

The males of *N. cristatus* and *N. parvulus* are unknown.

Key to Species of the Genus *Nasomolgus***FEMALES**

- | | |
|--|---------------------|
| 1. Third segment of endopod of leg 3 with formula I,II,2 | 2 |
| Third segment of endopod of leg 3 with formula II,2 | <i>N. firmus</i> |
| 2. Caudal ramus 14.6:1 | <i>N. leptus</i> |
| Caudal ramus much shorter, not exceeding 3:1 | 3 |
| 3. Caudal ramus about 2.5:1 | <i>N. cristatus</i> |
| Caudal ramus less than 1.5:1 | 4 |
| 4. Length (without ramal setae) 0.87 mm; greatest dimensions of genital segment 99 x 112 μ | <i>N. rudis</i> |
| Length (without ramal setae) 0.57 mm; greatest dimensions of genital segment 72 x 83 μ | <i>N. parvulus</i> |

KNOWN MALES

- | | |
|--|------------------|
| 1. Third segment of endopod of leg 3 with formula I,II,2 | 2 |
| Third segment of endopod of leg 3 with formula II,2 | <i>N. firmus</i> |
| 2. Caudal ramus 8.4:1 | <i>N. leptus</i> |
| Caudal ramus 1.3:1 | <i>N. rudis</i> |

***Nasomolgus cristatus* Sewell, 1949**

Nasomolgus cristatus Sewell, 1949, pp. 126, 127, fig. 35a-e [from coast of southern Arabia].—Humes and Ho, 1967c, pp. 386, 397.

REMARKS.—The male is unknown.

***Nasomolgus firmus* Humes and Ho, 1967**

FIGURE 139a-e

Nasomolgus firmus Humes and Ho, 1967c, pp. 386-390, figs. 60-86 [from the polychaete *Sabellastarte magnifica* (Shaw), region of Nosy Bé, Madagascar].

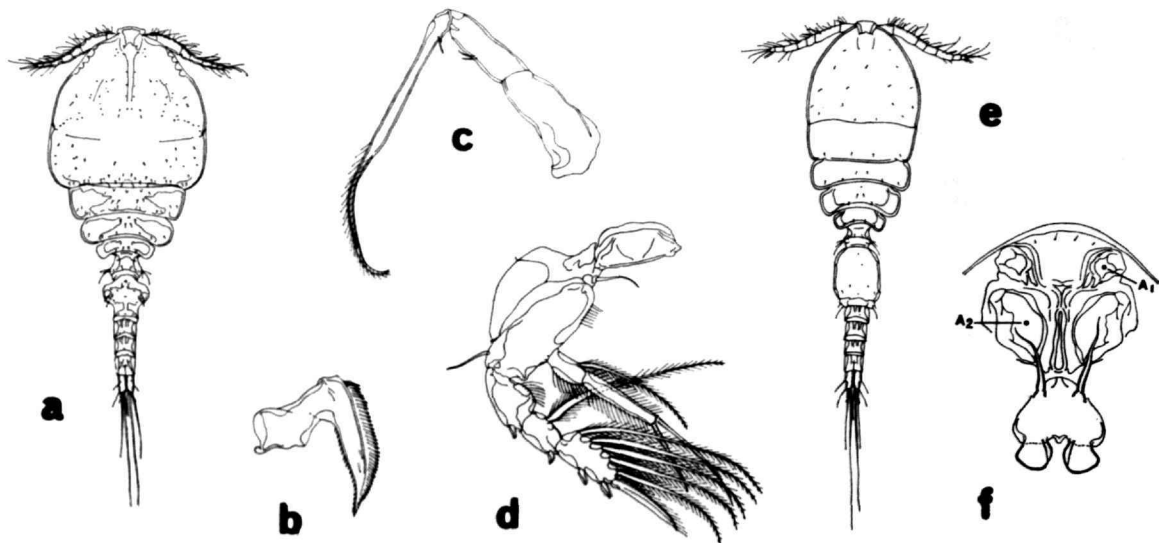


FIGURE 139.—*Nasomolgus firmus* Humes and Ho. Female: a, dorsal; b, mandible; c, maxilliped; d, leg 4. Male: e, dorsal. *Nasomolgus leptus* Humes and Ho. Female: f, rostral area and labrum. (From Humes and Ho, 1967c, figs. 60, 68, 72, 76, 78, 91.) Length of *N. firmus* female 0.81 mm, male 0.58 mm.

Nasomolgus leptus Humes and Ho, 1967

FIGURE 139f

Nasomolgus leptus Humes and Ho, 1967c, pp. 390–393, figs. 87–109 [from *Sabellastarte magnifica*, Nosy Bé, Madagascar].

Nasomolgus parvulus Humes and Ho, 1967

Nasomolgus parvulus Humes and Ho, 1967c, pp. 395–397, figs. 136–142 [from *Sabellastarte magnifica*, region of Nosy Bé, Madagascar].

REMARKS.—The male is unknown.

Nasomolgus rudis Humes and Ho, 1967

Nasomolgus rudis Humes and Ho, 1967c, pp. 393–395, figs. 110–135 [from *Sabellastarte magnifica*, region of Nosy Bé, Madagascar].

Genus *Octopicola* Humes, 1957

DIAGNOSIS.—Body cyclopiform, but elongated and slender. Urosome in both sexes 6-segmented. Caudal ramus with six setae. Rostrum subtriangular with a rounded tip. First antenna 7-segmented, in both sexes with the armature 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete.

Second antenna 4-segmented, the formula being 1, 1, 3 (some of these elements being spines), and IV + 3, there being four terminal claws.

Labrum with two long, slender lobes separated by an indentation. Mandible with a strong, distally directed tooth on the convex side of the base; blade broad and attenuated, placed at an angle to the base, with its concave edge spinulose or denticulated. Paragnath a small obscure lobe. First maxilla with three elements. Second maxilla of the usual lichomolgid type. Maxilliped in the female 3-segmented with a pointed tip; in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1–4 in both sexes with 3-segmented rami except leg 4 endopod which is 1-segmented, armed with three terminal setae (two with lateral spinules, the third plumose). Leg 4 exopod with the third segment having II, I, 5. No sexual dimorphism in the formula of the legs. Leg 5 with a minute lobe bearing two terminal elements and a seta nearby. Leg 6 in the female represented by a spinule and a seta near the genital openings; in the male by the two seta on the genital flap.

Other features as in the species below.

Associated with octopuses.

TYPE-SPECIES.—*Octopicola superbus* Humes.

Key to Species of the Genus *Octopicola*

FEMALES

1. Caudal ramus 7.6:1; seta adjacent to lobe of leg 5 inserted on a distinct, subrectangular lobe *O. stocki*
Caudal ramus 9-10:1; seta adjacent to lobe of leg 5 inserted directly on body surface rather than on a lobe 2
2. Fifth pedigerous segment with small but distinct tergal plates; longer of the two setae of leg 6 short, reaching only slightly beyond genital segment *O. superbus antillensis*
Fifth pedigerous segment without tergal plates; longer of the two setae of leg 6 very long, reaching to the end of the first postgenital segment or beyond *O. superbus superbus*

MALES

1. Length 1.30 mm; outermost seta of leg 4 endopod showing sexual dimorphism, being sinuous and spiniform *O. stocki*
Length 1.56-1.90 mm; outermost seta of leg 4 endopod not sinuous and spiniform 2
2. Longer of the two setae of leg 6 short, less than one-fifth the length of the first postgenital segment; third segment of second antenna with a prominent, densely spinulose projection *O. superbus antillensis*
Longer of the two setae of leg 6 very long, reaching nearly to the end of the first postgenital segment; third segment of second antenna with a short, finely denticulated triangular process *O. superbus superbus*

Octopicola superbus superbus Humes, 1957

Octopicola superba Humes, 1957, pp. 2-7, pl. 1, figs. 1-12, pl. 2, figs. 13-22 [from the eggs and skin of the cephalopod *Octopus vulgaris* Lamarck, Banyuls, Mediterranean coast of France].—Delamare Deboutteville, Humes, and Paris, 1957, pp. 504-506.

Octopicola superbus.—Boucquet and Stock, 1960, pp. 1-6, figs. 1-4 [from *Octopus vulgaris*, Roscoff, Channel coast of France; Banyuls-sur-mer, Mediterranean coast of France].—Gotto, 1962, p. 101.—Laubier, 1966, p. 234 [from Gulf of Marseille, France].

Octopicola superbus antillensis Stock, Humes, and Gooding, 1963

Octopicola superbus antillensis Stock, Humes, and Gooding, 1963a, pp. 5-9, figs. 1, 2 [from *Octopus vulgaris*, Barbados, Curaçao].

NEW HOST.—3 ♀♀, 1 ♂ from *Octopus briareus* Robson, Key Largo, Florida, 11 May 1969, collected by E. S. McSweeney, University of Miami.

NEW RECORD.—4 ♀♀, 1 copepodid from *Octopus vulgaris*, off Alligator Point, Franklin County, Florida, 18 December 1965, collected by J. Rudloe.

Octopicola stocki Humes, 1963

FIGURE 140

Octopicola stocki Humes, 1963, pp. 271-279, figs. 1-30 [from a cephalopod—originally identified as *Octopus* (*Tritaxeo-*

pus) *cornutus* Owen but later determined by Dr. G. L. Voss to be *Octopus cyaneus* Gray—at Nosy Bé, Madagascar].

Genus *Odontomolgus* Humes and Stock, 1972

DIAGNOSIS.—Body cyclopiform. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six setae. Rostrum without a distinct posteroventral margin. First antenna 7-segmented, with the armature in the female 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male 4, 13 + 2, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented, with the formula 1, 1, 3, and I, there being a single terminal claw.

Labrum with the two lobes separated by a median indentation. Mandible with the basal part having on its convex side a pointed, proximally directed tooth followed by a series of serrations and on its concave side beyond the indentation two lobes with spinules; lash long. Paragnath a small lobe. First maxilla with three elements. Second maxilla of the usual lichomolgid type. Maxilliped of the female 3-segmented with a pointed tip; in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1-4 with 3 segmented rami except for leg 4 endopod which is 2-segmented, and with the

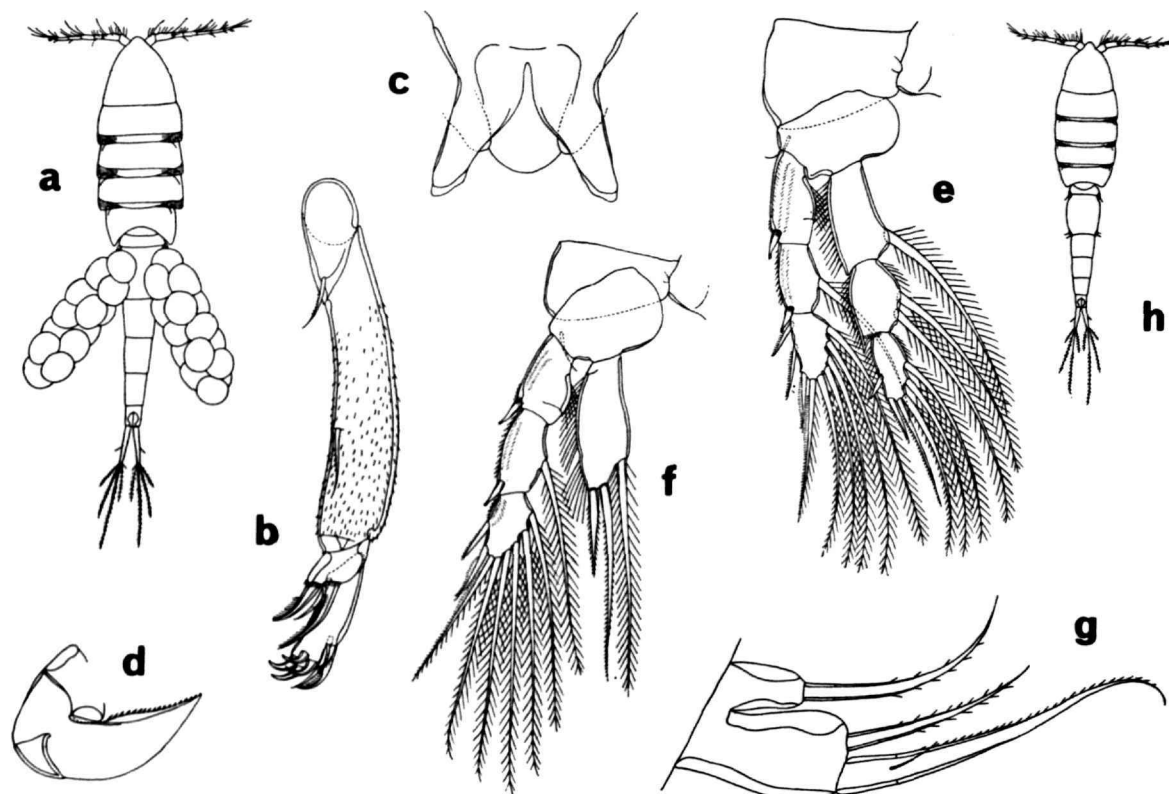


FIGURE 140.—*Octopicola stocki* Humes. Female: a, dorsal; b, second antenna; c, labrum; d, mandible; e, leg 3; f, leg 4; g, leg 5. Male: h, dorsal. (From Humes, 1963, figs. 1, 8–10, 20–22, 24.) Length of female 1.72 mm, of male 1.30 mm.

Key to Species of the Genus *Odontomolgus*

FEMALES

1. Second segment of second maxilla with a setiferous sphere; longest seta on caudal ramus shorter than ramus *O. actinophorus*
 Second segment of second maxilla without a setiferous sphere; longest seta on caudal ramus much longer than ramus 2
2. Genital segment abruptly constricted in its posterior fourth; free segment of leg 5 elongated (90 μ long) with a slight inner proximal expansion *O. rhadinus*
 Genital segment pyriform, without a sharp constriction; free segment of leg 5 short (34 μ long) without an inner proximal expansion *O. campulus*

MALES

1. Longest seta on caudal ramus shorter than ramus; ornamentation of second segment of second antenna consisting of only a few (2–4) conical protuberances *O. actinophorus*
 Longest seta on caudal ramus much longer than ramus; ornamentation of second segment of second antenna composed of many spinules or spinelike bosses 2
2. Second segment of second antenna with an inner row of spinules; two setae on free segment of leg 5 in the ratio of 3:1; genital segment longer than wide *O. rhadinus*
 Second segment of second antenna with many short spinelike bosses; two setae on free segment of leg 5 in the ratio of about 3:2; genital segment wider than long ... *O. campulus*

usual lichomolgoidiform armature. Leg 4 exopod with the last segment II,I,5. Leg 4 endopod 0-1;II, the seta on the first segment being feathered. In the male of *O. actinophorus* and of *O. rhadinus*, leg 1 endopod with the third segment having the formula I,I,4 rather than I,5 as in the female; in *O. campulus* no sexual dimorphism in the formula of leg 1. Leg 5 in both sexes with a free segment bearing two terminal setae. Leg 6 represented in the female by the two small setae near the area of attachment of each egg sac, in the male by a posteroventral flap on the genital segment bearing two setae.

Other features as in the species below.

Associated with madreporarian corals.

TYPE-SPECIES. — *Odontomolgus actinophorus* (Humes and Frost).

ETYMOLOGY.—The name is a combination of the Greek words *odon* (a tooth), alluding to the tooth-

like process on the mandible, and *molgos*. Gender masculine.

Odontomolgus actinophorus (Humes and Frost, 1964)

FIGURE 141

Lichomolgus actinophorus Humes and Frost, 1964, pp. 135-137, figs. 37-65 [from the hard corals *Pavona angulata* Klunzinger and *Pavona cactus* (Forskål), region of Nosy Bé, Madagascar].—Bouligand, 1966, p. 269.—Humes and Ho, 1968a, p. 371 [from *Pavona danai* (Milne Edwards and Haime), *Pavona danai* or *Pavona angularis* (Klunzinger), and *Pavona ? venusta* (Dana), region of Nosy Bé, Madagascar].

Odontomolgus campulus (Humes and Ho, 1968)

Lichomolgus campulus Humes and Ho, 1968a, pp. 354-357, figs. 1-24 [from the hard coral *Alveopora* sp., Nosy Bé, Madagascar].

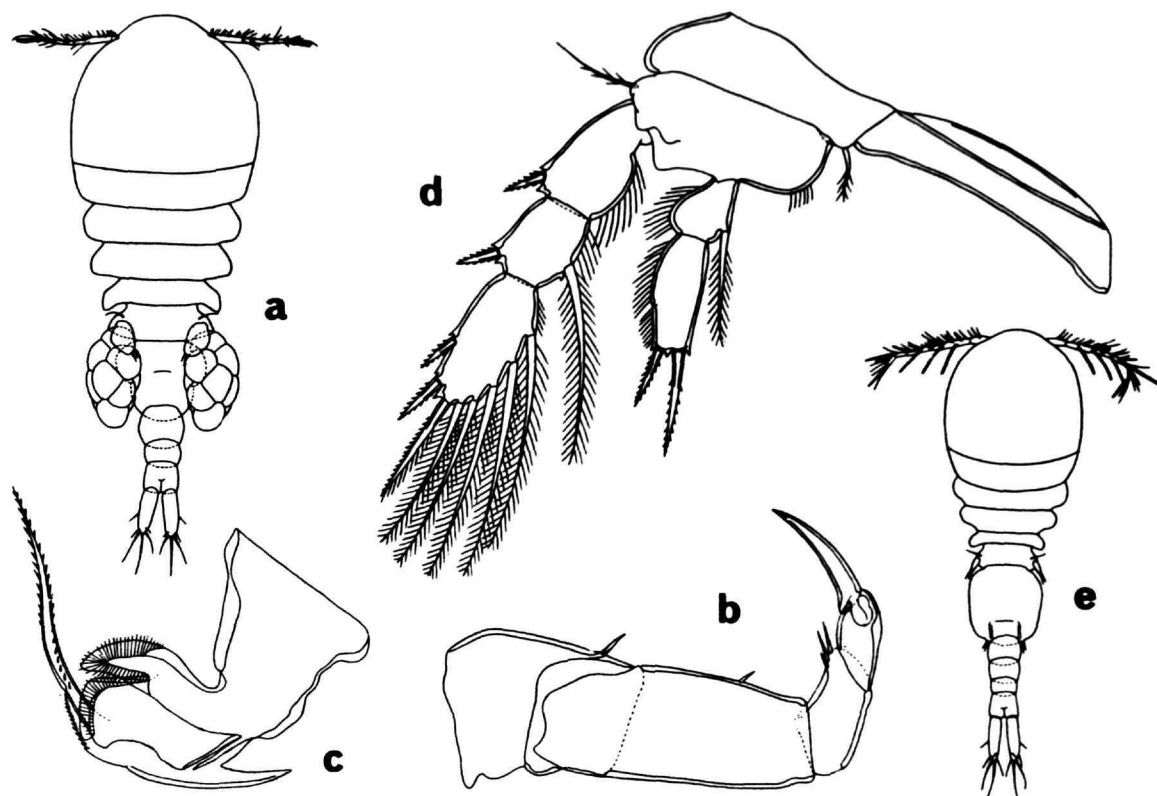


FIGURE 141.—*Odontomolgus actinophorus* (Humes and Frost). Female: a, dorsal; b, second antenna; c, mandible; d, leg 4 and intercoxal plate. Male: e, dorsal. (From Humes and Frost, 1964, figs. 37, 44, 46, 56, 58.) Length of female 1.42 mm, of male 1.28 mm.

NEW HOST.—9 ♀♀, 3 ♂♂ from the hard coral *Goniopora* sp., in 3 m, Nosy N'Tangam, Nosy Bé, Madagascar, 24 June 1967, collected by AGH.

***Odontomolgus rhadinus* (Humes and Ho, 1967)**

Lichomolgus rhadinus Humes and Ho, 1967b, pp. 5-9, figs. 25-51 [from the madreporarian *Psammocora contigua* (Esper), Nosy Bé, Madagascar].

NEW HOST.—Many specimens from *Pavona* sp., intertidal to 10 cm, Nosy Iranja, southwest of Nosy Bé, Madagascar, 9 August 1967, collected by AGH.

Genus *Panjakus* Humes and Stock, 1972

DIAGNOSIS.—Body cyclopiform. Urosome 5-segmented in the female, 6-segmented in the male. Caudal ramus with six setae. Rostrum rounded posteroventrally. First antenna 7-segmented, in the female with the formula 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male with 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented, with the armature 1, 1, 3, and 1, there being a single terminal claw.

Labrum with a deep cleft separating the two lobes. Mandible with the basal area distal to the indentation having on the convex side a short, distally directed digitiform process followed by a serrated fringe and on its concave side two lobes each with a row of spinules; lash moderately long. Paragnath a small hairy lobe. First maxilla with four elements. Second maxilla of the usual lichomolgid type, but with a large stout digitiform process on the first segment. Maxilliped of the female 3-segmented, with a pointed tip; in the male

4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1-4 with 3-segmented rami except for leg 4 endopod which is 2-segmented. Armature of the usual lichomolgidiform type. Leg 4 exopod with the third segment having II,I,5 or III,I,5. Leg 4 endopod with 0-1;II, the seta on the first segment being feathered. In the male the third segment of leg 1 endopod with I,I,4 instead of I,5 as in the female. Leg 5 in both sexes with a free segment bearing two terminal setae. Leg 6 in the female represented by two setae and a small spiniform process, in the male by a posteroventral flap on the genital segment bearing two setae.

Other features as in the species described below. Associated with madreporarian corals.

TYPE-SPECIES. — *Panjakus hydnophorae*, new species.

ETYMOLOGY.—The generic name is a Latinized form of the Malgache word "mpanjaka," meaning chief or king. Gender masculine.

REMARKS.—The genus *Panjakus* bears a certain relationship to the genera *Andrianellus* and *Rakotoa* mentioned elsewhere in this work, both of which have strong similarities (the 4-segmented second antenna with a single terminal claw, the mandible with two spinulose lobes on the concave side, and the second maxilla with a large, prominent toothlike process on the first segment). *Panjakus* differs from *Andrianellus*, which has the formula 0-1;I on the endopod of leg 4 and which shows no sexual dimorphism in leg 1. *Panjakus* may be distinguished from *Rakotoa* where the endopod of leg 4 is reduced to an unarmed lobe, where the armature of the third segment of the exopod of leg 4 is I,3, and where in the male the second antenna and leg 1 do not show sexual dimorphism.

Key to Species of the Genus *Panjakus*

FEMALES

- Free segment of leg 5 long, more than half as long as the genital segment; leg 4 exopod with third segment having III,I,5 *P. hydnophorae*
 Free segment of leg 5 short, only about one-ninth the length of the genital segment; leg 4 exopod with third segment having II,I,5 *P. platygyrae*

MALES

- Second segment of second antenna ornamented with knobs; leg 4 endopod with third segment having III,I,5 *P. hydnophorae*
 Second segment of second antenna smooth; leg 4 endopod with third segment having II,I,5 *P. platygyrae*

Panjakus hydnophorae, new species

FIGURES 142-144

TYPE MATERIAL.—59 ♀♀, 30 ♂♂ from the madreporarian coral *Hydnophora* sp., in 2 m, Ambariotelo, a small island almost between Nosy Komba and Nosy Bé, northwestern Madagascar, 20 July 1967, collected by AGH. Holotype ♀, allotype, and 83 paratypes (56 ♀♀, 27 ♂♂) deposited in USNM, the remaining paratypes (dissected) in the collection of AGH.

OTHER MATERIAL EXAMINED.—From *Hydnophora* sp.: 18 ♀♀, 7 ♂♂, in 2 m, Tany Kely, a small island south of Nosy Bé, 21 May 1967; and 24 ♀♀, 14 ♂♂, in 2 m, off Ampombilava, Nosy Bé, 5 June 1967. All collected by AGH.

From *Hydnophora* ? *exesa* (Pallas): 4 ♀♀, 3 ♂♂, in 1 m, west of Pte. de Tafondro, Nosy Bé, 2 October 1963.

From *Hydnophora tenella* Quelch: 8 ♀♀, 14 ♂♂, and 3 copepodids, in 3 m, opposite Ambariot-simaramara, southern shore of Nosy Bé, 18 October 1963.

FEMALE.—The body (Figure 142a,b) is moderately slender, with the prosome a little thickened in lateral view. The length (excluding the setae on the caudal rami) is 1.34 mm (1.23–1.42 mm) and the greatest width 0.51 mm (0.47–0.55 mm), based on ten specimens in lactic acid. The segment of leg 1 is separated from the cephalosome by a dorsal transverse furrow. The epimeral areas of the pedigerous segments are formed as illustrated in the figures. The ratio of the length to the width of the prosome is 1.50:1. The ratio of the length of the prosome to that of the urosome is 1.14:1.

The segment of leg 5 (Figure 142c) is 57 x 260 μ. There is no ventral intersegmental sclerite between that segment and the genital segment. The genital segment is 156 x 208 μ, wider than long, broadest in its anterior half and tapering posteriorly. The areas of attachment of the egg sacs are located dorsolaterally, just in front of the middle of the segment. Each area (Figure 142d) bears two small setae about 7 μ (one sharply pointed and the other with a hyaline tip often broken off) and a small spiniform process. The three postgenital segments are 94 x 107 μ, 83 x 94 μ, and 88 x 91 μ from anterior to posterior. The posterior border of the anal segment bears on each side a row of small spinules.

The caudal ramus (Figure 142e) is greatly elongated, 212–234 x 26 μ, the width taken at the middle, about 8.58 times longer than wide. The longest terminal seta is not much longer than the ramus. The outer lateral seta is 91 μ, the dorsal seta 55 μ and displaced toward the inner margin of the ramus, the outermost terminal seta 72 μ, the innermost terminal seta 88 μ, and the two median terminal setae 185 μ (outer) and 255 μ (inner), both inserted a little ventrally on the ramus. All six setae are naked.

The body surface bears a few hairs (sensilla) as indicated in Figure 142a,b.

The egg sac (Figure 142a) is oval, 330 x 230 μ, contains a few large eggs (eight in the specimen drawn), and reaches only to the last postgenital segment.

The rostrum (Figure 142f) is a linguiform lobe. Posterior to the rostrum there is a ventrally raised area (shown also in Figure 142b).

The first antenna (Figure 142g) is slender, 7-segmented, and 390 μ long. The lengths of the segments (measured along their posterior nonsetiferous margins) are 31 (55 μ along the anterior margin), 96, 33, 58, 64, 45, and 39 μ respectively. The formula for the armature is 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All the setae are naked.

The second antenna (Figure 142h) is 4-segmented. The first and second segments bear a small inner seta. The third segment bears three setae, one much shorter than the other two. The fourth segment, 52 μ along its outer edge, 20 μ along its inner edge, and 23 μ wide, has a single terminal claw 33 μ along its axis.

The labrum (Figure 143a) has two broad postero-ventral lobes with wide, hyaline membranous margins.

The mandible (Figure 143b) has on its concave margin a shallow indentation followed by two lobes, each with a marginal row of spinules, and on its convex margin a short, distally directed digitiform process followed by a serrated hyaline fringe. The lash is moderately long with short lateral spinules. The paragnath (Figure 143c) is a small, elongated lobe with distal hairs. The first maxilla (Figure 143c) has four elements. The second maxilla (Figure 143d) is 2-segmented. The first segment is unarmed but has a large stout digitiform process extending ventrally (see Figure 142b). The second

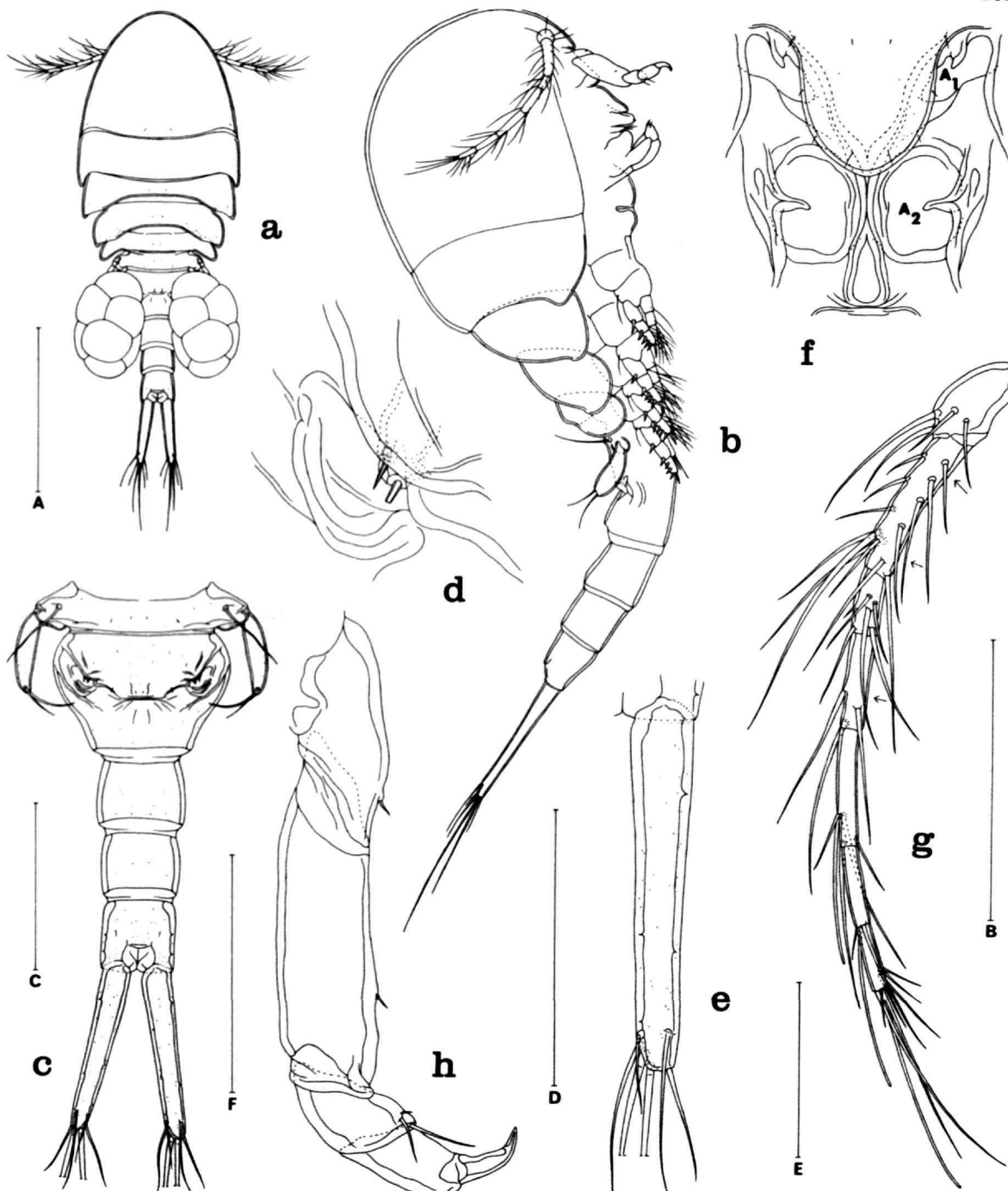


FIGURE 142.—*Panjakus hydnophorae*, new species. Female: *a*, dorsal (A); *b*, lateral (B); *c*, urosome, dorsal (C); *d*, area of attachment of egg sac, dorsal (D); *e*, caudal ramus, dorsal (E); *f*, rostrum, ventral (F); *g*, first antenna, with arrows indicating positions of additional aesthetes in male, anterodorsal (E); *h*, second antenna, inner (F). Scale: A, B, 0.5 mm; C, 0.2 mm; D, 0.05 mm; E, F, 0.1 mm.

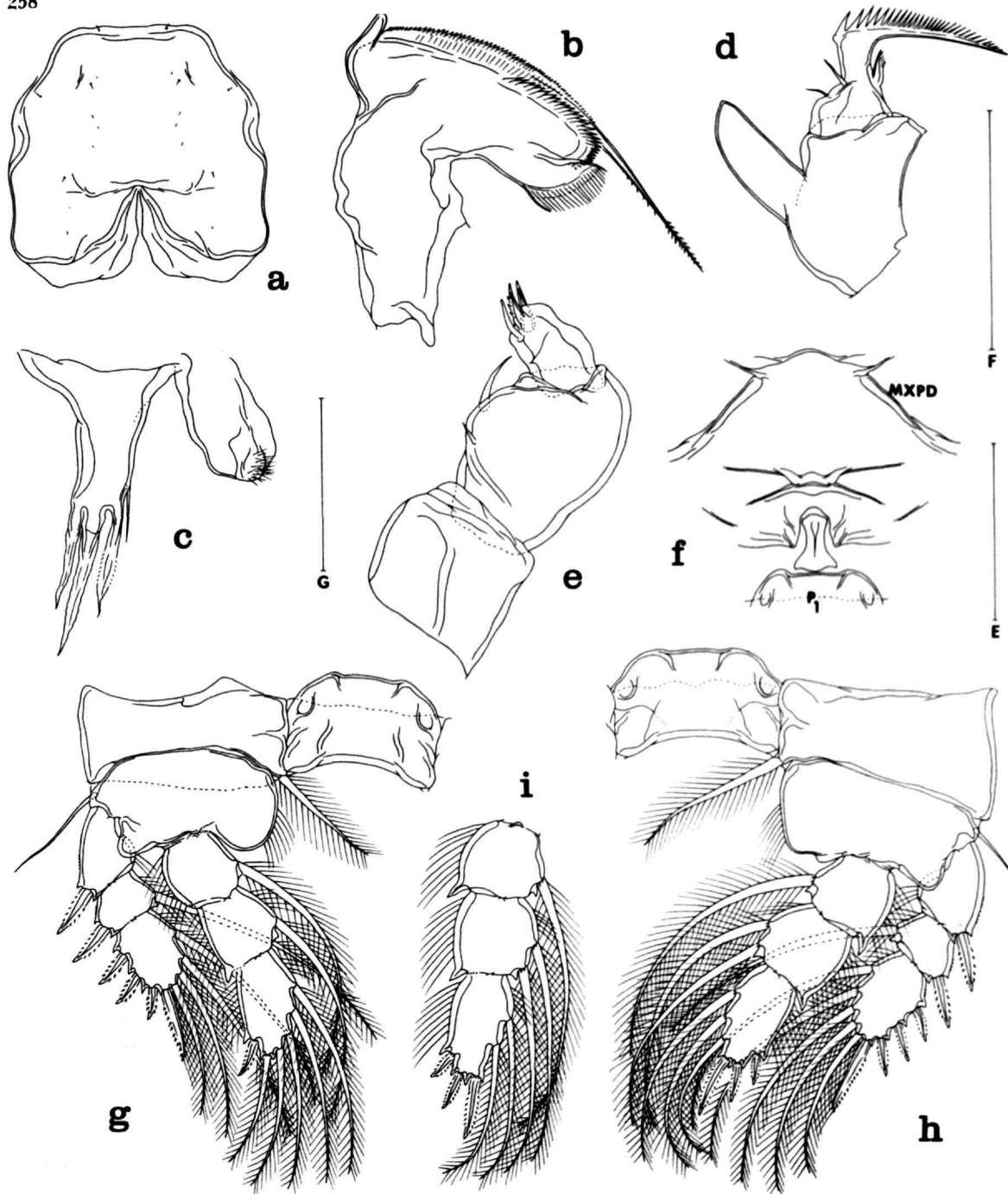


FIGURE 143.—*Panjakus hydnophorae*, new species. Female: *a*, labrum, ventral (F); *b*, mandible, posterior (G); *c*, first maxilla and paragnath, posterior (G); *d*, second maxilla, posterior (F); *e*, maxilliped, anterior (G); *f*, area between maxillipeds and first pair of legs, ventral (E); *g*, leg 1 and intercoxal plate, anterior (E); *h*, leg 2 and intercoxal plate, anterior (E); *i*, third segment of endopod of leg 3, anterior (E). Scale: E, F, 0.1 mm; G, 0.05 mm.

segment bears two setae (one naked, the other with a pectinate fringe) and a slender setule; the terminal lash bears a row of spines. The maxilliped (Figure 143e) is 3-segmented. The first segment is unarmed. The second segment bears two short, naked setae. The third segment bears a naked seta and a naked spine and terminates in a spiniform process with a few spinules.

The ventral area between the maxillipeds and the first pair of legs (Figure 143f) protrudes a little ventrally (Figure 142b). A line connects the bases of the maxillipeds.

Legs 1-4 (Figures 143g-i, 144a) have 3-segmented rami except for the endopod of leg 4 which is 2-segmented. The spinal and setal formula is as follows:

P ₁	coxa	0-1	basis	1-0	exp	1-0; 1-1; III,I,4
				enp	0-1; 0-1; I,5	
P ₂	coxa	0-1	basis	1-0	exp	1-0; 1-1; III,I,5
				enp	0-1; 0-2; I,II,3	
P ₃	coxa	0-1	basis	1-0	exp	1-0; 1-1; III,I,5
				enp	0-1; 0-2; I,II,2	
P ₄	coxa	0-1	basis	1-0	exp	1-0; 1-1; III,I,5
				enp	0-1; II	

The inner coxal seta of legs 1-3 is long and plumose, but in leg 4 that seta is minute (7 μ) and naked. The inner margin of the basis is haired in all four legs. The exopod of leg 4 is 146 μ long. The first segment of the endopod is 33 x 31 μ (the length not including the spinous processes), with its inner distal plumose seta 102 μ . The second segment is 54 x 23 μ in greatest dimensions, including the terminal spiniform processes; its two terminal spines are 28 μ (outer) and 77 μ (inner). Both endopod segments have outer marginal hairs.

Leg 5 (Figure 144b,c) has a free segment 96 x 34 μ in greatest dimensions when seen in lateral (outer) view. The two terminal setae are 50 μ and 60 μ , and the adjacent seta on the body is 105 μ . All three setae are naked. The dorsal and outer surfaces of the distal half of the ramus are ornamented with minute spinules.

Leg 6 is represented by the two setae near the attachment of each egg sac (Figure 142d).

The color in life in transmitted light is brownish opaque, with a few small reddish brown dots scattered on the dorsal surfaces of the prosome, the eye red, the egg sacs gray.

MALE.—The body (Figure 144d) is slender. The length is 1.29 mm (1.24-1.33 mm) and the greatest

width 0.42 mm (0.40-0.44 mm), based on ten specimens in lactic acid. The line of separation between the cephalosome and the segment of leg 1 is more weakly developed than in the female. The ratio of the length to the width of the prosome is 1.55:1. The ratio of the length of the prosome to that of the urosome is 1:1.06, the urosome being slightly longer than the prosome.

The segment of leg 5 (Figure 144e) is 42 x 195 μ . There is no ventral intersegmental sclerite. The genital segment is 234 x 234 μ , in dorsal view with its lateral edges subparallel. The four postgenital segments are 52 x 95 μ , 62 x 83 μ , 60 x 74 μ , and 70 x 78 μ from anterior to posterior.

The caudal ramus resembles that of the female but is a little more slender, 208 x 21 μ , or 9.91 times longer than wide.

The body surface has a few hairs as in the female.

The rostrum is like that of the female.

The first antenna is similar to that of the female but has three additional long aesthetes (at points indicated by arrows in Figure 142g), so that the formula is 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete.

The second antenna (Figure 144f) resembles that of the female but the inner surface of the second segment has numerous small, rounded knobs.

The labrum, mandible, paragnath, first maxilla, and second maxilla are like those of the female. The maxilliped (Figure 144g) is 4-segmented (assuming that the proximal part of the claw represents a fourth segment). The first segment is unarmed but has a small postero-inner distal digitiform lobe. The second segment bears two naked setae and two rows of spines. The small third segment is unarmed. The claw is 268 μ along its axis, including the large terminal lamella, and is only slightly recurved. It shows an incomplete division about midway and bears two proximal unequal naked setae.

The ventral area between the maxillipeds and the first pair of legs is like that in the female.

Legs 1-4 are segmented as in the female and have the same armature as in that sex except for the third endopod segment of leg 1 (Figure 144h) which has the formula I,I,4. These two spines are 27 μ (outer) and 57 μ (inner).

Leg 5 (Figure 144i) has an unornamented free segment 42 x 13 μ , with the terminal setae 35 μ and 50 μ .

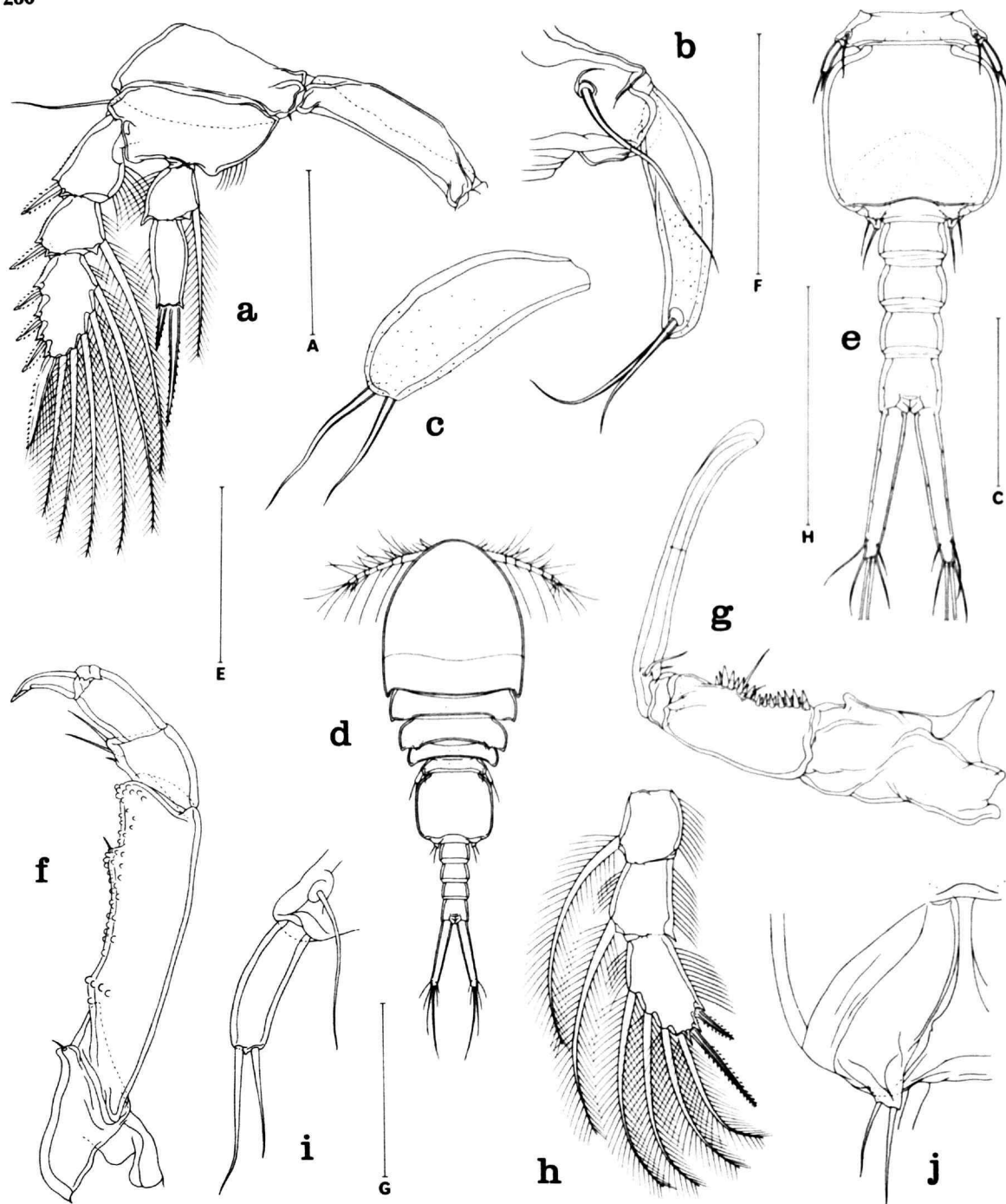


FIGURE 144.—*Panjakus hydnophorae*, new species. Female: *a*, leg 4 and intercoxal plate, anterior (E); *b*, leg 5, dorsal (F); *c*, free segment of leg 5, lateral (outer) (F). Male: *d*, dorsal (A); *e*, urosome, dorsal (C); *f*, second antenna, outer (F); *g*, maxilliped, inner (H); *h*, endopod of leg 1, anterior (E); *i*, leg 5, dorsal (C); *j*, leg 6, ventral (E). Scale: A, 0.5 mm; C, H, 0.2 mm; E, F, 0.1 mm; C, 0.05 mm.

Leg 6 (Figure 144j) is a posteroventral flap on the genital segment bearing two slender naked setae 50 μ and 60 μ .

The spermatophore was not observed.

The color in life in transmitted light resembles that of the female but the body tends to be less brownish and the prosomal dots are smaller.

ETYMOLOGY.—The specific name *hydnophorae* is formed from the generic name of the host coral.

Panjakus platygyrae, new species

FIGURES 145, 146

TYPE MATERIAL.—6 ♀♀, 4 ♂♂ from single colony of the madreporarian coral *Platygyra ? lamellina* (Ehrenberg), in 2 m, Ambariotele, a small island almost between Nosy Komba and Nosy Bé, northwestern Madagascar, 23 May 1964, collected by AGH. Holotype ♀, allotype, and 4 paratypes (3 ♀♀, 1 ♂) deposited in USNM, the remaining four paratypes (dissected) in the collection of AGH.

OTHER MATERIAL EXAMINED (all collected by AGH).—From *Platygyra daedala* (Ellis and Solander): 2 ♀♀, 2 ♂♂ from single colony, in 4 m, Pte. Lokobe, Nosy Bé, 24 December 1963; and 2 ♂♂, 1 copepodid, from single colony, in 2 m, Pte. à la Fièvre, Nosy Bé, 26 December 1963.

From *Platygyra* sp. cf. *daedala* (Ellis and Solander): 4 ♀♀, 1 ♂ from single colony, in 1 m, Ambariobe, a small island almost between Nosy Komba and Nosy Bé, 16 January 1964.

FEMALE.—The body (Figure 145a) is moderately slender. The prosome in lateral view is a little thickened as in *Panjakus hydnophorae*. The length (not including the setae on the caudal rami) is 1.45 mm (1.37–1.53 mm) and the greatest width 0.57 mm (0.55–0.59 mm), based on six specimens in lactic acid. The segment of leg 1 is completely fused with the cephalosome. The epimeral regions of the pedigerous segments are formed as shown in the figure. The ratio of the length to the width of the prosome is 1.29:1. The ratio of the length of the prosome to that of the urosome is 1.04:1.

The segment of leg 5 (Figure 145b) is 65 x 210 μ . There is no ventral intersegmental sclerite between that segment and the genital segment. The genital segment is 208 x 215 μ , broadest just in front of the middle of the segment and tapering posteriorly. The areas of attachment of the egg sacs are situated

dorsally near the middle of the segment. Each area (Figure 145c) bears two naked setae 10 μ long (the posterior one peculiar in having a sclerotized proximal part and a hyaline, blunt distal part) with a small spinous process between them. The three postgenital segments are 78 x 96 μ , 57 x 78 μ , and 101 x 68 μ from anterior to posterior. The posteroventral border of the anal segment bears a row of minute spinules on each side.

The caudal ramus (Figure 145d) is greatly elongated, 140 x 18 μ , or 7.8 times longer than wide. The longest terminal seta is shorter than the ramus. The outer lateral seta is 44 μ , the dorsal seta 27 μ , the outermost terminal seta 52 μ , the innermost terminal seta 63 μ , and the two median terminal setae 88 μ (outer) and 97 μ (inner). All six setae are naked.

The body surface bears a few small hairs (sensilla) as indicated in the figures.

The egg sac is unknown. One female, however, had three large eggs attached to the genital segment, each egg about 130 μ in diameter.

The rostrum is similar to that of *P. hydnophorae*.

The first antenna (Figure 145e), 389 μ long, resembles that of *P. hydnophorae*. The lengths of the seven segments (measured along their posterior nonsetiferous margins) are 24 (55 μ along the anterior margin), 108, 44, 54, 58, 42, and 28 μ respectively. The formula for the armature is the same as in *P. hydnophorae*. All the setae are naked.

The second antenna (Figure 145f) is similar to that of *P. hydnophorae*. The fourth segment, 38 μ along its outer edge, 21 μ along its inner edge, and 22 μ wide, bears a single claw 33 μ along its axis.

The labrum is like that of *P. hydnophorae*.

The mandible resembles closely that of *P. hydnophorae*, the only apparent difference being that the short digitiform process on the convex side is a little more slender than in that species. The paragnath is similar to that in *P. hydnophorae*. The first maxilla (Figure 145g) bears four elements. The second maxilla (Figure 145h) has a large digitiform process on the first segment, and the dorsal (inner) seta on the second segment has a broad spinulose flap. The maxilliped (Figure 145i) is more elongated than in *P. hydnophorae* but has the same number of elements as in that species.

The ventral area between the maxillipeds and the first pair of legs (Figure 145j) protrudes ventrally. A line connects the bases of the maxillipeds.

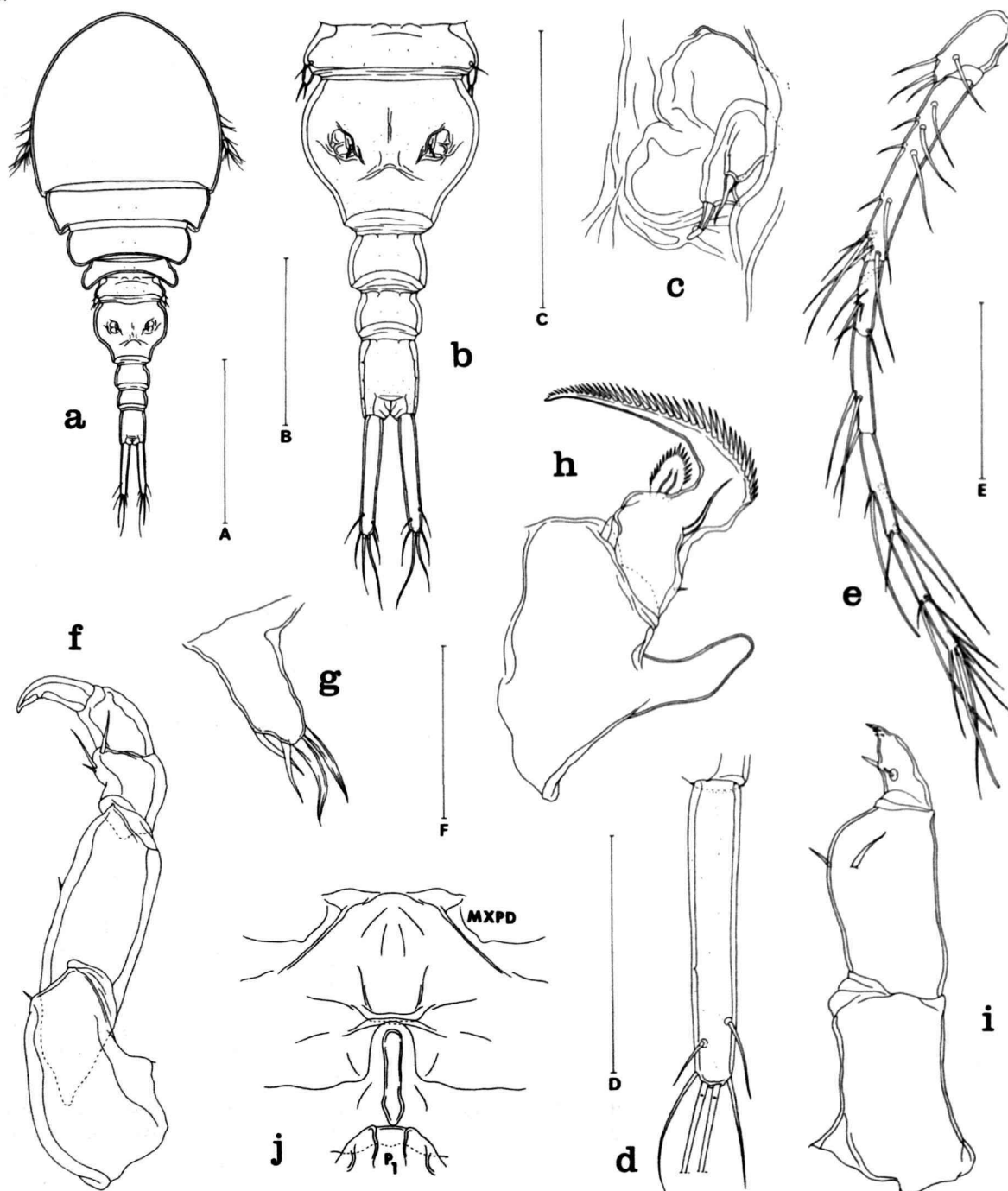


FIGURE 145.—*Panjakus platygyrae*, new species. Female: a, dorsal (A); b, urosome, dorsal (B); c, area of attachment of egg sac, dorsal (C); d, caudal ramus, dorsal (D); e, first antenna, anterodorsal (E); f, second antenna, postero-inner (F); g, first maxilla, posterior (F); h, second maxilla, anterior (F); i, maxilliped, posterior (F); j, area between maxillipeds and first pair of legs, ventral (E). Scale: A, 0.5 mm; B, 0.2 mm; C, F, 0.05 mm; D, E, 0.1 mm.

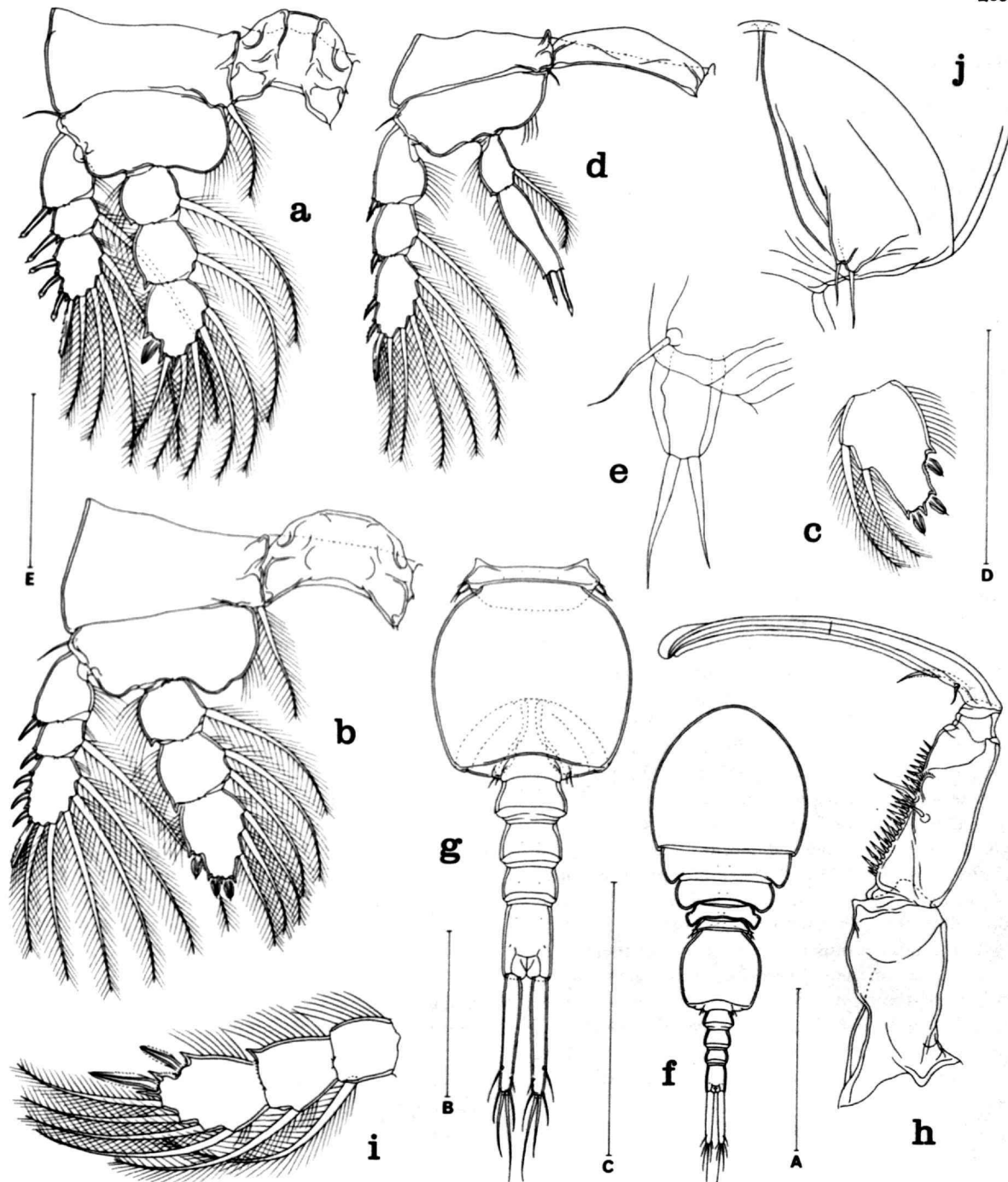


FIGURE 146.—*Panjakus platygyrae*, new species. Female: a, leg 1 and intercoxal plate, anterior (E); b, leg 2 and intercoxal plate, anterior (E); c, third segment of endopod of leg 3, anterior (D); d, leg 4 and intercoxal plate, anterior (E); e, leg 5, dorsal (C). Male: f, dorsal (A); g, urosome, dorsal (B); h, maxilliped, outer (E); i, endopod of leg 1, anterior (D); j, leg 6, ventral (D). Scale: A, 0.5 mm; B, 0.2 mm; C, 0.05 mm; D, E, 0.1 mm.

Legs 1-4 (Figure 146a-d) are segmented and armed as in *P. hydnophorae*, except that the third segment of the exopod of leg 4 has the armature II,I,5. The inner coxal seta is naked and much smaller (12 μ) in leg 4 than in legs 1-3. The inner margin of the basis bears a row of hairs in all four legs. The exopod of leg 4 is 125 μ long. The first segment of the endopod is 32 x 20 μ (the length not including the spinous processes), with its inner distal plumose seta 55 μ . The second segment is 57 x 19 μ (including the terminal spiniform processes); its two terminal spines are 17 μ (outer) and 23 μ (inner). Both endopod segments have outer marginal hairs.

Leg 5 (Figure 146e) has a small, unornamented free segment 22 x 14 μ . The two terminal setae are 31 μ and 25 μ , and the adjacent seta on the body is 25 μ . All three setae are naked.

Leg 6 is represented by the two setae near the attachment of each egg sac (Figure 145c).

The color in life in transmitted light is opaque, the intestine slightly yellowish, the eye dark red.

MALE.—The body (Figure 146f) resembles in general form that of the female. The length is 1.31 mm (1.26-1.36 mm) and the greatest width 0.47 mm (0.46-0.47 mm), based on four specimens in lactic acid. The ratio of the length to the width of the prosome is 1.38:1. The ratio of the length of the prosome to that of the urosome is 1:1.04, the urosome being slightly longer than the prosome.

The segment of leg 5 (Figure 146g) is 44 x 166 μ . There is no ventral intersegmental sclerite. The genital segment is 234 x 237 μ , in dorsal view with slightly rounded lateral edges. The four postgenital segments are 49 x 88 μ , 55 x 74 μ , 14 x 62 μ , and 87 x 60 μ from anterior to posterior.

The caudal ramus is like that of the female.

The rostrum resembles that of the female.

The first antenna (350 μ long) is similar to that of the female but there are three additional long aesthetes (the longest one 200 μ) as in the male of *P. hydnophorae*, so that the formula is the same as in that species.

The second antenna, labrum, mandible, paragnath, first maxilla, and second maxilla resemble those of the female. The maxilliped (Figure 146h) has a small postero-inner distal knob on the first segment. The second segment bears two naked setae, two rows of spines, and a small spinulose crest. The small third segment is unarmed. The claw is

200 μ along its axis, including the terminal lamella, and is only slightly recurved. It is partially divided about midway and bears proximally two unequal setae.

The ventral area between the maxillipeds and the first pair of legs is like that of the female.

Legs 1-4 are segmented as in the female and have the same spine and setal formula except for the third endopod segment of leg 1 (Figure 146i) which has the formula I,I,4. These two spines are 20 μ (outer) and 31 μ (inner).

Leg 5 resembles that of the female, with its free segment being 18 x 10 μ .

Leg 6 (Figure 146j) is a posteroventral flap on the genital segment bearing two slender naked setae, 17 μ and 24 μ .

The spermatophore was not observed.

The color in life resembles that of the female.

ETYMOLOGY.—The specific name *platygyrae* is derived from the generic name of the host coral.

REMARKS.—*Panjakus platygyrae* differs from *P. hydnophorae* chiefly in the much smaller leg 5 in the female, the formula II,I,5 on the last exopod segment of leg 4, the longest seta on the caudal ramus being shorter than the ramus, the male genital segment in dorsal view having slightly rounded lateral edges, and the male second antenna not showing sexual dimorphism.

Genus *Paradoridicola* Humes and Stock, 1972

DIAGNOSIS.—Body cyclopiform. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six setae. Rostrum rounded. First antenna 7-segmented, in the female with the armature 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete (so far as known); in the male 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented, the formula 1, 1, 3, and one terminal claw + several small elements.

Labrum incised medially. Mandible with the basal region beyond the indentation having on its convex side a scalelike area with spinules followed by a serrated fringe and on its concave side a row of spinules; lash long. Paragnath a small hairy lobe. First maxilla with three or four elements. Second maxilla of the usual lichomolgid type. Maxilliped in the female 3-segmented with a pointed tip, in the male 4-segmented (assuming

that the proximal part of the claw represents a fourth segment).

Legs 1-4 with 3-segmented rami except leg 4 endopod which is 2-segmented. Armature of the typical lichomolgiform type. Leg 4 exopod with the third segment having III,I,5. Leg 4 endopod with the formula 0-1;II, the seta being feathered or with short spinules. Leg 1 endopod of the male with the third segment having the formula I,I,4 instead of I,5 as in the female (male unknown in *P. robustus*). Leg 5 with a free segment bearing two terminal elements. Leg 6 represented in both sexes by the two setae near the genital openings.

Other features as in the species below.

Associated with octocorals.

TYPE-SPECIES.—*Paradoridicola squamiger* (Humes and Frost).

ETYMOLOGY.—The generic name is formed from *παρά* (beside) and *Doridicola*. Gender masculine.

REMARKS.—A key to the males of *Paradoridicola* has not been prepared because the subtle interspecific differences are virtually impossible to use satisfactorily in a key. Reference should be made to the original descriptions and figures. The male of *P. robustus* is unknown.

Key to Species of the Genus *Paradoridicola*

FEMALES

1. Caudal ramus with ratio 3.4:1 *P. glabripes*
Caudal ramus with ratio about 1.5:1 or quadrate 2
2. Caudal ramus with ratio about 1.5:1 3
Caudal ramus quadrate 4
3. Genital segment in dorsal view gradually constricted posterior to genital openings
Genital segment in dorsal view abruptly constricted behind genital openings where sides are parallel *P. robustus*
..... *P. adelphus*
4. Free segment of leg 5 broad and subtriangular *P. triquetrus*
Free segment of leg 5 not broad and triangular 5
5. Free segment of leg 5 with ratio 2.4:1, distinctly shorter than genital segment ... *P. squamiger*
Free segment of leg 5 with ratio 6.7:1, much longer than genital segment *P. sinulariae*

Paradoridicola squamiger (Humes and Frost, 1964)

Lichomolgus squamiger Humes and Frost, 1964, pp. 145-148, figs. 167-202 [from the alcyonacean *Sinularia polydactyla* (Ehrenberg), region of Nosy Bé, Madagascar].—Humes and Ho, 1968c, pp. 689-690 [from *Sinularia whiteleggei* Lüttschwager, Nosy Bé, Madagascar].—Bouligand, 1966, p. 269.

NEW RECORD.—From *Sinularia polydactyla* (Ehrenberg): 9 ♀♀, 26 ♂♂, and 22 copepodids, in 15 m, Banc de la Lanterne, Bay of Tsimipaika, near Nosy Bé, Madagascar, 26 July 1967, collected by AGH.

Paradoridicola adelphus (Humes and Ho, 1968)

Lichomolgus adelphus Humes and Ho, 1968c, pp. 650-655, figs. 51-66 [from the alcyonaceans *Sinularia whiteleggei* Lüttschwager, *Sinularia pedunculata* Tixier-Durivault, and *Sinularia polydactyla* (Ehrenberg), region of Nosy Bé, Madagascar].

Paradoridicola glabripes (Humes and Ho, 1968)

Lichomolgus glabripes Humes and Ho, 1968d, pp. 707-713, figs. 49-68 [from the alcyonacean *Xenia umbellata* Lamarck, Nosy Bé, Madagascar].

NEW HOSTS.—From *Xenia macrospiculata* Gohar: 7 ♀♀, 7 ♂♂, and 12 copepodids, in 20 m, Banc de Cinq Mètres, near Nosy Bé, Madagascar, 6 August 1967, collected by AGH.

From *Xenia viridis* Schenk: 73 ♀♀, 76 ♂♂, and 58 copepodids, intertidal, Navetsy, Nosy Bé, Madagascar, 7 August 1967, collected by AGH.

Paradoridicola robustus (Thompson and A. Scott, 1903)

Lichomolgus robustus Thompson and A. Scott, 1903, p. 280, pl. 16, figs. 14-20 [from washings of dredged invertebrates, Ceylon].

REMARKS.—The male is unknown.

Paradoridicola sinulariae, new species

FIGURES 147-149

TYPE MATERIAL.—23 ♀♀, 12 ♂♂, and 22 copepodids from ten colonies of the alcyonacean *Sinularia arborea* Verseveldt, in 13 m, opposite Antsiabe, on the southern shore of Nosy Komba, near Nosy Bé, northwestern Madagascar, 2 September 1967, collected by AGH. Holotype ♀, allotype, and 29 paratypes (20 ♀♀, 9 ♂♂) deposited in USNM, the remaining paratypes (dissected) and the copepodids in the collection of AGH.

OTHER MATERIAL EXAMINED (all from *Sinularia arborea*).—14 ♀♀, 9 ♂♂, and 11 copepodids from single colony, in 2 m, Pte. Lokobe, Nosy Bé, 3 June 1967; 30 ♀♀, 31 ♂♂, and 29 copepodids from single colony, in 23 m, Tany Kely, a small island south of Nosy Bé, 30 June 1967; 3 ♀♀, 3 ♂♂ from single colony, in 2 m, off Ampombilava, Nosy Bé, 7 July 1967; 12 ♀♀, 14 ♂♂, and 6 copepodids from single colony, in 12 m, west of harbor at Hellville, Nosy Bé, 4 August 1967; and 3 ♀♀, 11 ♂♂, and 6 copepodids from six small colonies, in 13 m, opposite Antsiabe, Nosy Komba, 2 September 1967. All collected by AGH.

FEMALE.—The body (Figure 147a) has a moderately broad prosome. The length (not including the ramal setae) is 1.33 mm (1.23–1.46 mm) and the greatest width is 0.56 mm (0.52–0.62 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1.62:1. The ratio of the length of the prosome to that of the urosome is 2.12:1. The segment of leg 1 is almost completely fused with the cephalosome. The epimera of the segments of legs 2–4 are extended laterally as illustrated in the figure.

The segment of leg 5 (Figure 147b) is 104 x 205 μ . There is no ventral intersegmental sclerite between that segment and the genital segment. The genital segment is 179 x 161 μ , in dorsal view broadest in its anterior two-thirds with rounded margins. The areas of attachment of the egg sacs are situated dorsolaterally just in front of the middle of the segment. Each area (Figure 147c) bears two naked setae, 19 μ and 7 μ , with a small spiniform process between them. The three postgenital segments are 81 x 95 μ , 65 x 84 μ , and 57 x 78 μ from anterior to posterior. The posteroventral borders of the genital segment and the first two postgenital segments bear broad hyaline spinules without articu-

lations. The posteroventral border of the anal segment is smooth.

The caudal ramus (Figure 147d) is quadrate, 34 x 34 μ . The outer lateral seta is 96 μ , the dorsal seta 66 μ , the outermost terminal seta 130 μ , the innermost terminal seta 330 μ , and the two long median terminal setae 400 μ (outer) and 550 μ (inner), both inserted between dorsal (unornamented) and ventral (with a row of minute spinules) flaps. All six setae are naked. The dorsal surface of the ramus bears a few hairs.

The body surface has a few hairs (sensilla) as indicated in Figure 147a,b.

In all ovigerous females collected the egg sacs were incomplete. The general shape, however, is elongated and oval, with numerous eggs about 47 μ in diameter.

The rostrum (Figure 147e) is broadly rounded posteroventrally.

The first antenna (Figure 147f) is slender, 506 μ long, with the elongated second and fourth segments about equal in length. The lengths of the seven segments (measured along their posterior nonsetiferous margins) are 50 (88 μ along the anterior margin), 141, 38, 139, 44, 30, and 26 μ . The proximal part of the fourth segment is much more slender (18 μ wide) than the corresponding part of the second segment (30 μ wide). The formula for the armature is 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All the setae are naked.

The second antenna (Figure 147g) is elongated. The first two segments bear a small inner seta; the third segment bears three inner setae. The elongated fourth segment, 107 μ along its outer edge, 78 μ along its inner edge, and 17 μ wide, bears terminally a slender claw 60 μ along its axis and six small hyaline elements. All the setae are naked.

The labrum (Figure 147h), mandible (Figure 147i), paragnath (Figure 147h), first maxilla (Figure 148a), second maxilla (Figure 148b), and maxilliped (Figure 148c) resemble closely those of *P. squamiger* (Humes and Frost), differing only in very small details.

The ventral area between the maxillipeds and the first pair of legs (Figure 148d) is only slightly protuberant, with a fine line connecting the bases of the maxillipeds.

Legs 1–4 (Figure 148e–h) are similar to those of *P. squamiger*, with the same segmentation and

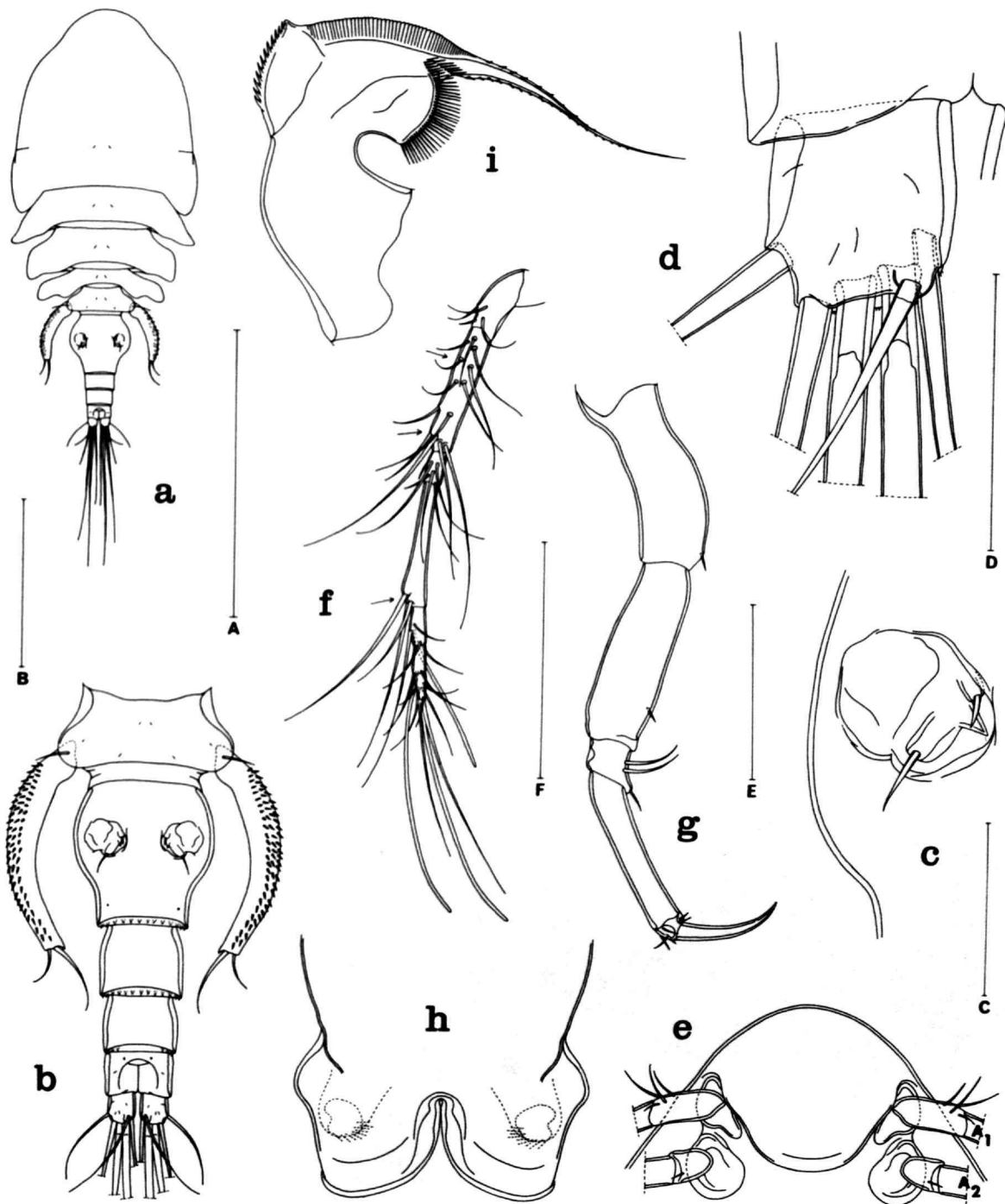


FIGURE 147.—*Paradoridicola sinulariae*, new species. Female: *a*, dorsal (A); *b*, urosome, dorsal (B); *c*, area of attachment of egg sac, dorsal (C); *d*, caudal ramus, dorsal (D); *e*, rostrum, ventral (E); *f*, first antenna, with arrows indicating positions of additional aesthetes in male, antero-dorsal (B); *g*, second antenna, postero-inner (E); *h*, labrum, with paragnaths indicated by broken lines, ventral (F); *i*, mandible, posterior (C). Scale: A, 1.0 mm; B, 0.2 mm; C, D, 0.05 mm; E, F, 0.1 mm.

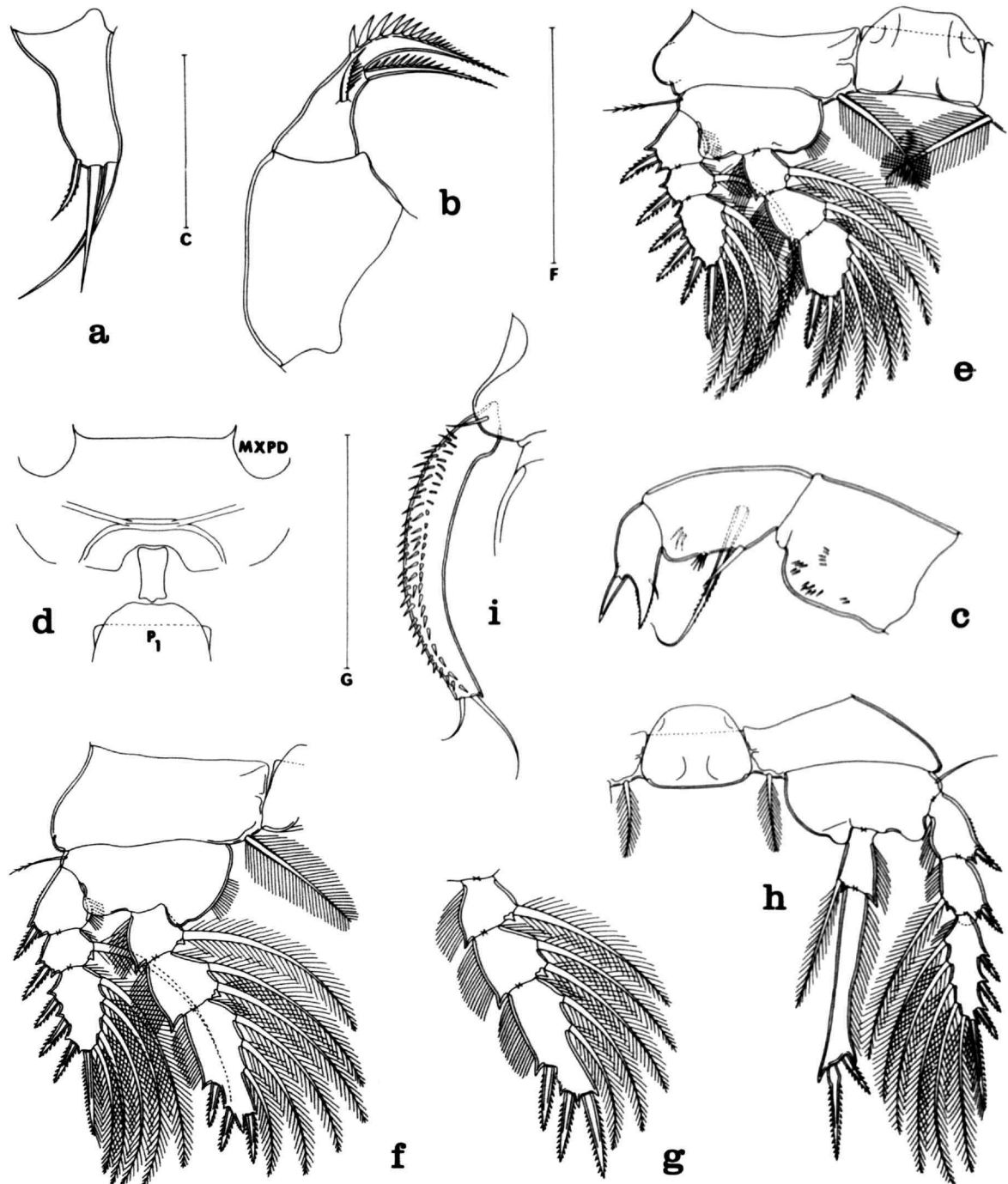


FIGURE 148.—*Paradoridicola sinulariae*, new species. Female: *a*, first maxilla, anterior (*c*); *b*, second maxilla, posterior (*F*); *c*, maxilliped, anterior (*F*); *d*, area between maxillipeds and first pair of legs, ventral (*c*); *e*, leg 1 and intercoxal plate, anterior (*c*); *f*, leg 2, anterior (*c*); *g*, endopod of leg 3, anterior (*c*); *h*, leg 4 and intercoxal plate, anterior (*c*); *i*, leg 5, dorsal (*c*). Scale: *c*, 0.05 mm; *F*, 0.1 mm; *c*, 0.2 mm.

armature. The inner coxal seta of leg 4 is 65 μ and plumose. The exopod of leg 4 is 185 μ , with the third segment having the formula III,I,5. The first segment of the endopod is 52 x 31 μ (not including the spinous processes), with its inner distal plumose seta 112 μ . The long second segment is 159 x 15.5 μ (least width), including the spiniform processes. The two terminal barbed spines are 39 μ (outer) and 78 μ (inner). Both segments have an outer row of hairs.

Leg 5 (Figure 148i) has an elongated arched free segment, 240 x 36 μ in greatest dimensions and reaching almost to the middle of the first post-genital segment. The two terminal setae are 47 μ and 83 μ , and the adjacent seta of the body is 33 μ . All three setae are naked. The free segment is conspicuously ornamented with broad, scalelike spines on its outer surface.

Leg 6 is represented by the two setae near the attachment of each egg sac (Figure 147c).

The color in life in transmitted light is opaque, with a few small red globules, the eye red, the egg sacs opaque gray.

MALE.—The body (Figure 149a) has proportions similar to those in the female. The length (not including the setae on the caudal rami) is 0.97 mm (0.09–1.05 mm) and the greatest width 0.34 mm (0.32–0.36 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1.69:1. The ratio of the length of the prosome to that of the urosome is 1.67:1. The epimera of the segments of legs 2–4 are formed differently than in the female.

The segment of leg 5 (Figure 149b) is 39 x 100 μ . There is no ventral intersegmental sclerite. The genital segment is 220 x 186 μ . The four postgenital segments are 36 x 66 μ , 39 x 64 μ , 35 x 58 μ , and 33 x 57 μ from anterior to posterior.

The caudal ramus resembles that of the female but is smaller, 20 x 24.5 μ , and slightly wider than long.

The rostrum is like that of the female.

The first antenna is similar to that of the female but there are two additional aesthetes on the second segment and one additional aesthete on the fourth segment (at locations indicated by arrows in Figure 147f) so that the formula is 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete.

The second antenna (Figure 149c) has a general form like that of the female but shows sexual dimorphism in having on the first segment a few obtuse spines near the seta, on the second segment a row of slender spinules and an interrupted row of obtuse spines, and on the fourth segment a few small inner spinules. The fourth segment is 76 μ along its outer edge, 57 μ along its inner edge, and 13 μ wide, with the claw 51 μ along its axis.

The labrum, mandible, paragnath, first maxilla, and second maxilla resemble those of the female. The slender maxilliped (Figure 149d) is very similar to that of *P. squamiger*. The claw is 265 μ along its axis, with very small rugosities along its distal concave edge.

The ventral area between the maxillipeds and the first pair of legs is like that of the female.

Legs 1–4 are segmented as in the female and have the same spine and setal formula except for the endopod of leg 1 (Figure 149e) where the last segment is I,1,4. Sexual dimorphism also occurs on the last segment of the endopod of leg 2 (Figure 149f) where the three spines are much shorter than in the female and the shape of the segment is different. Legs 3 and 4 are like those of the female.

Leg 5 (Figure 149g) has a slender, straight free segment, 55 x 11 μ , and its two terminal setae are 31 μ and 39 μ . The segment is ornamented with a few very small outer spinules.

Leg 6 is much like that of *P. squamiger*; its two naked setae are about 23 μ .

The spermatophore (Figure 149h), attached to the female in pairs, is elongated, 156 x 65 μ not including the neck.

The color in life is similar to that of the female but with fewer red globules.

ETYMOLOGY.—The specific name, *sinulariae*, is based on the name of the alcyonacean genus serving as host.

REMARKS.—*Paradoridicola sinulariae* is similar in many respects to *P. squamiger* (Humes and Frost), a species associated with *Sinularia polydactyla* (Ehrenberg). It may be distinguished from *P. squamiger*, however, by the fourth segment of the first antenna being about as long as the second segment, by the relatively longer and more slender fourth segment of the second antenna, by the longer fifth legs and the shape of the genital segment in the female, and by the nature of the sexual dimorphism in the endopod of leg 1 of the male.

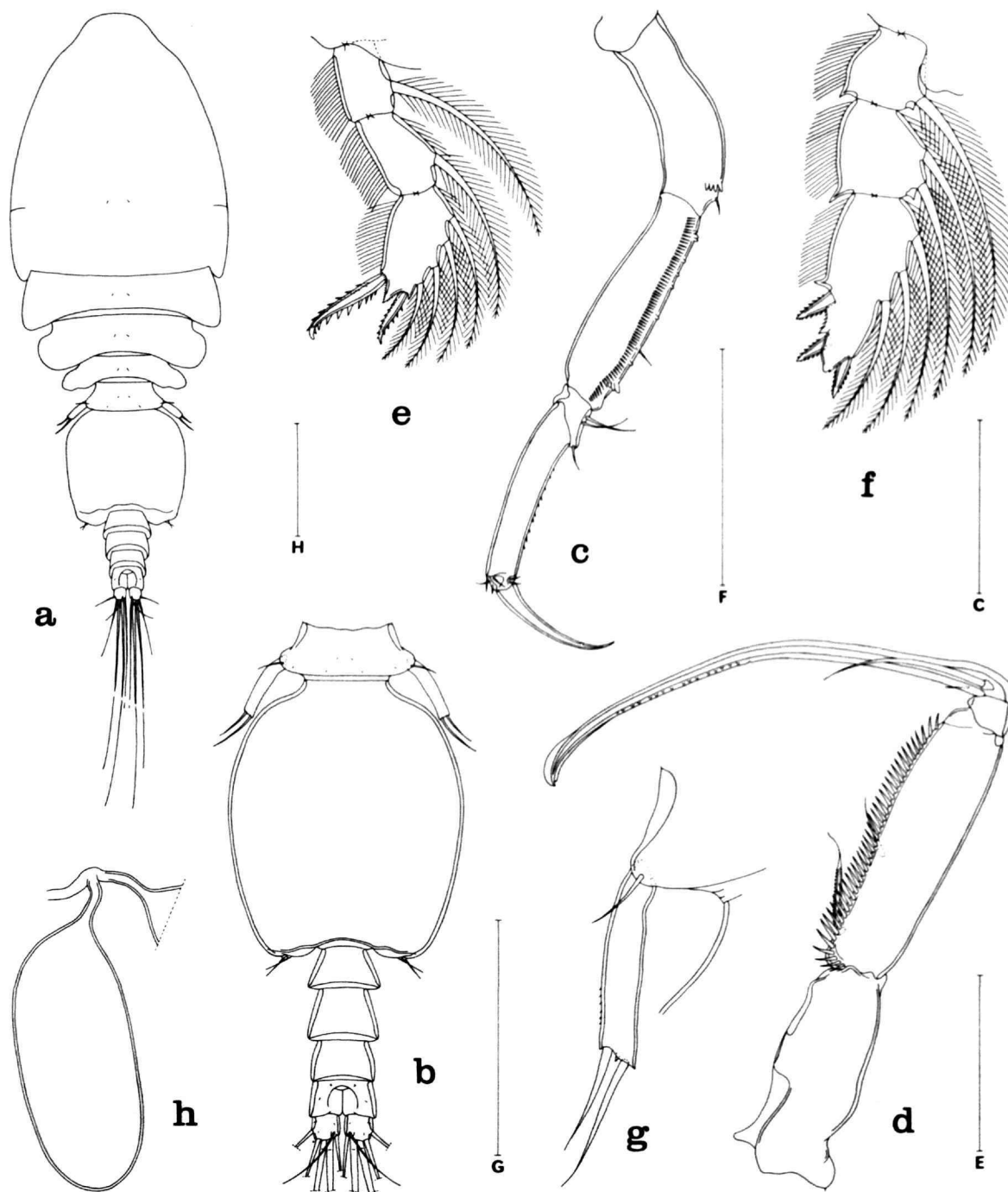


FIGURE 149.—*Paradoridicola sinulariae*, new species. Male: *a*, dorsal (H); *b*, urosome, dorsal (C); *c*, second antenna, postero-inner (F); *d*, maxilliped, inner (E); *e*, endopod of leg 1, anterior (F); *f*, endopod of leg 2, anterior (F); *g*, leg 5, dorsal (C); *h*, spermatophore, one of a pair attached to female, dorsal (E). Scale: c, 0.05 mm; E, F, 0.1 mm; C, H, 0.2 mm.

***Paradoridicola triquetrus* (Humes and Ho, 1968)**

Lichomolgus triquetrus Humes and Ho, 1968d, pp. 702-707, figs. 27-48 [from the alcyonacean *Anthelia gracilis* (May), Nosy Bé, Madagascar].

Genus *Paramacrochiron* Sewell, 1949

DIAGNOSIS.—Body cyclopiform. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six setae. First antenna 7-segmented. Second antenna 4-segmented, with a single terminal claw.

Mandible with the basal region distal to the indentation having on its convex side a setiform spinulose process and on its concave side a row of spinules; lash long. Paragnath a small hairy lobe. First maxilla with three or four elements. Second maxilla of the usual lichomolgid type. Maxilliped in the female 3-segmented with a pointed tip, in

the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1-4 with 3-segmented rami except leg 4 endopod which is 1-segmented. Armature of the lichomolgidiform pattern. Leg 4 exopod with the third segment having II,I,5. Leg 4 endopod with two terminal elements; in the female the segment nearly as long as the exopod, in the male relatively shorter, about equal to the first two exopod segments. Leg 5 with a free segment bearing two terminal elements. Leg 6 represented by two elements near the genital openings.

Other features as in the species described below.

Associated with scyphozoan medusae.

TYPE-SPECIES. — *Paramacrochiron maximum* (Thompson and A. Scott).

REMARKS.—Males are insufficiently known for the preparation of a key for that sex.

Key to Species of the Genus *Paramacrochiron***FEMALES**

1. Endopod of leg 4 with an outer marginal notch *P. maximum*
Endopod of leg 4 without an outer marginal notch 2
2. Second segment of first antenna with a prominent outer protuberance; body length less than 2.7 mm *P. sewelli*
Second segment of first antenna without a prominent outer protuberance; body length more than 2.8 mm 3
3. Second segment of second antenna with a short outer marginal process; outer spines on exopod of leg 4 aciculate *P. pacificum*
Second segment of second antenna without an outer process; outer spines on exopod of leg 4 with serrated fringes 4
4. Maxilliped with terminal process bent at a right angle *P. rhizostomae*
Maxilliped with terminal process not bent at a right angle 5
5. Egg sac reaching only a little beyond second postgenital segment; free segment of leg 5 with ratio 4.5:1, two terminal elements unarmed *P. ennorensis*
Egg sac reaching a little beyond caudal ramus; free segment of leg 5 with ratio 4.0:1, two terminal elements with barbules *P. japonicum*

***Paramacrochiron maximum* (Thompson and A. Scott, 1903)**

Pseudanthessius maximus Thompson and A. Scott, 1903, p. 276, pl. 14, figs. 1-11 [in surface tow-net, Ceylon].—Krishnaswamy, 1950, pp. 52, 53, figs. 60-63 [in plankton, Madras, India].

Lichomolgus (Macrochiron) maximus.—Monod and Dollfus, 1932a, p. 139.

Macrochiron (Paramacrochiron) maximum.—Sewell, 1949, pp. 108, 109 [in surface tow-net, Andaman Islands].—Krishnaswamy, 1953, pp. 67, 68, fig. 9 [in plankton, Madras, India].

Macrochiron maximus.—Stock, 1957, p. 381.

Paramacrochiron maximum.—Stock, 1957, p. 381.—Humes, 1969e, p. 180.

***Paramacrochiron ennorensis* Reddiah, 1968**

Paramacrochiron ennorensis Reddiah, 1968a, pp. 195-201, figs. 1-3 [from unidentified medusae, near Madras, India].—Humes, 1969e, p. 182.

***Paramacrochiron japonicum* Humes, 1970**

FIGURE 150

Paramacrochiron japonicum Humes, 1970d, pp. 223-232, figs. 1-31 [from the medusa *Thysanostoma thysanura* Haeckel, Sirahama, Wakayama-ken, Japan].

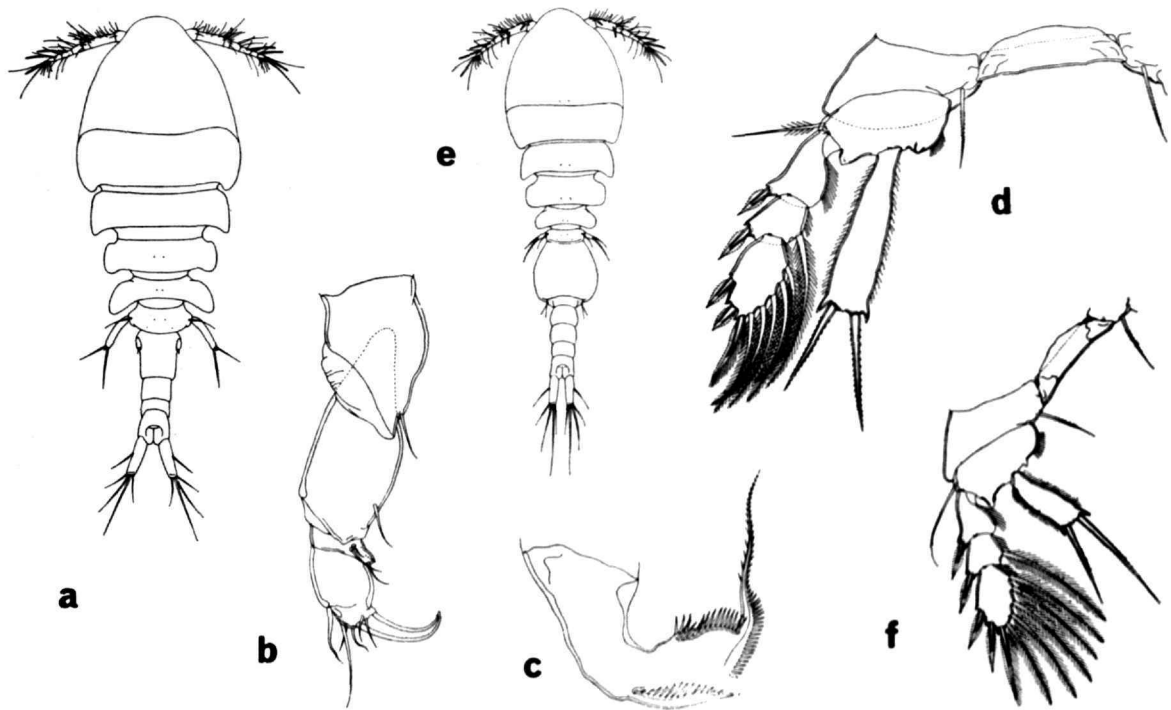


FIGURE 150.—*Paramacrochiron japonicum* Humes. Female: a, dorsal; b, second antenna; c, mandible; d, leg 4 and intercoxal plate. Male: e, dorsal; f, leg 4 and intercoxal plate. (From Humes, 1970d, figs. 1, 9, 11, 20, 23, 27.) Length of female 3.28 mm, of male 2.69 mm.

***Paramacrochiron pacificum* (C. B. Wilson, 1950)**

Pseudanthessius pacificus C. B. Wilson, 1950, pp. 315, 316, pl. 32, figs. 481–489 [in plankton, off Luzon, Philippine Islands].

REMARKS.—Although the original description lacks certain information, on the basis of the large size and the relatively long endopod of leg 4 it seems justified to place this species in *Paramacrochiron*.

***Paramacrochiron rhizostomae* Reddiah, 1968**

Paramacrochiron rhizostomae Reddiah, 1968a, pp. 205–208, figs. 5–6 [from the medusa *Rhizostoma* sp., Gulf of Mannar, India].—Humes 1969e, p. 182.

***Paramacrochiron sewelli* Reddiah, 1968**

Paramacrochiron sewelli Reddiah, 1968a, pp. 201–205, fig. 4 [from the medusa *Lychnorhiza malayensis* Stiasny, near Madras, India].—Humes, 1969e, p. 182.

Genus *Paramolgus* Humes and Stock, 1972

DIAGNOSIS.—Body cyclopiform. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six setae, in *P. clavatus* very short. Rostrum rounded or incomplete posteroventrally. First antenna 7-segmented, in the female with the formula 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male with 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete (except that in *P. constrictus* and *P. insectus* the second segment is 13 + 1 aesthete). Second antenna 4-segmented with the formula 1, 1, 3 and I + several small elements, there being only one terminal claw.

Labrum with the two lobes separated by a cleft or indentation. Mandible with the basal region distal to the indentation having on its convex side a scalelike area with spinules followed by a serrated fringe (except that in *P. constrictus* the scalelike area is naked and the first few serrations in the

fringe are directed proximally) and on its concave side a row of spinules. Paragnath a small hairy lobe. First maxilla with four elements (three in *P. constrictus* and *P. insectus*). Second maxilla of the usual lichomolgid form. Maxilliped in the female 3-segmented with a pointed tip, in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1-4 with 3-segmented rami except for leg 4 endopod which is 2-segmented. Leg 4 exopod with the third segment having II, I, 5. Leg 4 endopod with the formula 0-1; II, the seta feathered. Leg 1 endopod in the male with the third segment I, I, 4 instead of I, 5 as in the female (except without such sexual dimorphism in *P. clavatus*). Leg 5

with a free segment bearing two elements. Leg 6 represented in the female by the two setae and the process near the area of attachment of each egg sac, in the male by the ventral posterolateral flap on the genital segment bearing two setae.

Other features as in the species below.

Associated with actinarians and octocorals.

TYPE-SPECIES.—*Paramolgus politus* (Humes and Ho).

ETYMOLOGY.—The name is a combination of the Greek *παρά* (near), alluding to the lichomolgid affinities of this genus, and *μολγος*. Gender masculine.

REMARKS.—The six species of *Paramolgus* form a fairly cohesive group. *P. anomalus* is placed here with reservations since we have not seen actual

Key to Species of the Genus *Paramolgus*

FEMALES (except *P. anomalus*)

1. Area of attachment of egg sacs bearing a large pointed bladelike process in addition to the two setae *P. spathophorus*
Area of attachment of egg sacs with only a small spinous process in addition to the two setae 2
2. Body length 2.27 mm; longest seta on caudal ramus much shorter than ramus; lash of second maxilla short, bearing only two large spines and two spikelike spinules *P. clavatus*
Body length less than 2 mm; longest seta on caudal ramus much longer than ramus; lash of second maxilla longer, with a graded row of spinules or teeth 3
3. Lash of second maxilla with a graded row of teeth; two elements on second segment of maxilliped very unequal in length 4
Lash of second maxilla with a graded row of spinules; two elements on second segment of maxilliped nearly equal in length 5
4. Caudal ramus 3.8:1; free segment of leg 5 without an inner proximal expansion *P. politus*
Caudal ramus 1.5:1; free segment of leg 5 with an inner proximal expansion *P. simulans*
5. Caudal ramus 1.9:1; third segment of second antenna with an unusually long seta (reaching to more than halfway on the claw) *P. constrictus*
Caudal ramus 2.65:1; all three setae on third segment of second antenna short (less than half the length of segment) *P. insectus*

MALES (except *P. anomalus*)

1. Lash of second maxilla short, bearing only two large spines and two spikelike elements; inner seta on coxa of leg 4 long and plumose *P. clavatus*
Lash of second maxilla longer, with a graded row of spinules or teeth; inner seta on coxa small and either naked or with a few barbules 2
2. Rostrum with two small knoblike protuberances on posteroventral margin *P. insectus*
Rostrum without such knobs 3
3. Free segment of leg 5 unornamented; third segment of second antenna with an unusually long seta (reaching to more than halfway on the claw) *P. constrictus*
Free segment of leg 5 with very small spinules; all three setae on third segment of second antenna shorter, reaching at most to half way on the fourth segment 4
4. Caudal ramus quadrate *P. spathophorus*
Caudal ramus distinctly longer than wide 5
5. Caudal ramus 3.8:1; with refractile knobs on inner surface of first two segments of second antenna *P. politus*
Caudal ramus 1.5:1; with spinules on inner surface of first two segments of second antenna *P. simulans*

specimens and since A. Scott's original description is incomplete. *P. constrictus* and *P. insectus*, while possessing many of the generic features, have certain characters in common which are somewhat at variance with the other members of the genus; for example, only one aesthete on the second segment of the first antenna of the male, only three elements on the first maxilla, and the laterally notched or insected genital segment in the female. *P. clavatus* similarly differs in having very short setae on the caudal ramus and in lacking sexually dimorphic armature on the endopod of leg I in the male. Nevertheless, we feel that, for the present at least, all six species should be grouped in the one genus.

Paramolgus anomalus has been omitted from the following keys because of inadequate information in the available description and figures.

***Paramolgus politus* (Humes and Ho, 1967)**

FIGURE 151

Lichomolgus politus Humes and Ho, 1967d, pp. 3-6, figs. 1-28 [from the actinarian *Rhodactis rhodostoma* Ehrenberg, Nosy Komba, near Nosy Bé, Madagascar].

***Paramolgus anomalus* (A. Scott, 1909)**

Lichomolgus anomalus A. Scott, 1909, pp. 264-265, pl. 67, figs. 6-17 [from Banda Sea, south of Amboina, 5°26.7' S, 127°6.5' E].—Sewell, 1949, p. 97 [in debris from a jar of Alcyonacea, southern coast of Arabia].

?*Lichomolgus* (*Macrochiron*) *albus*.—Monod and Dollfus, 1932a, p. 139.

***Paramolgus clavatus* (Humes and Ho, 1968)**

Lichomolgus clavatus Humes and Ho, 1968d, pp. 730-735, figs. 128-148 [from the telestacean *Coelogorgia palmosa* Milne Edwards and Haime, region of Nosy Bé, Madagascar].

NEW HOSTS (collected by AGH).—2 ♂♂ from *Lemnalia longiramus* Verseveldt, in 12 m, west of harbor at Hellville, Nosy Bé, Madagascar, 4 August

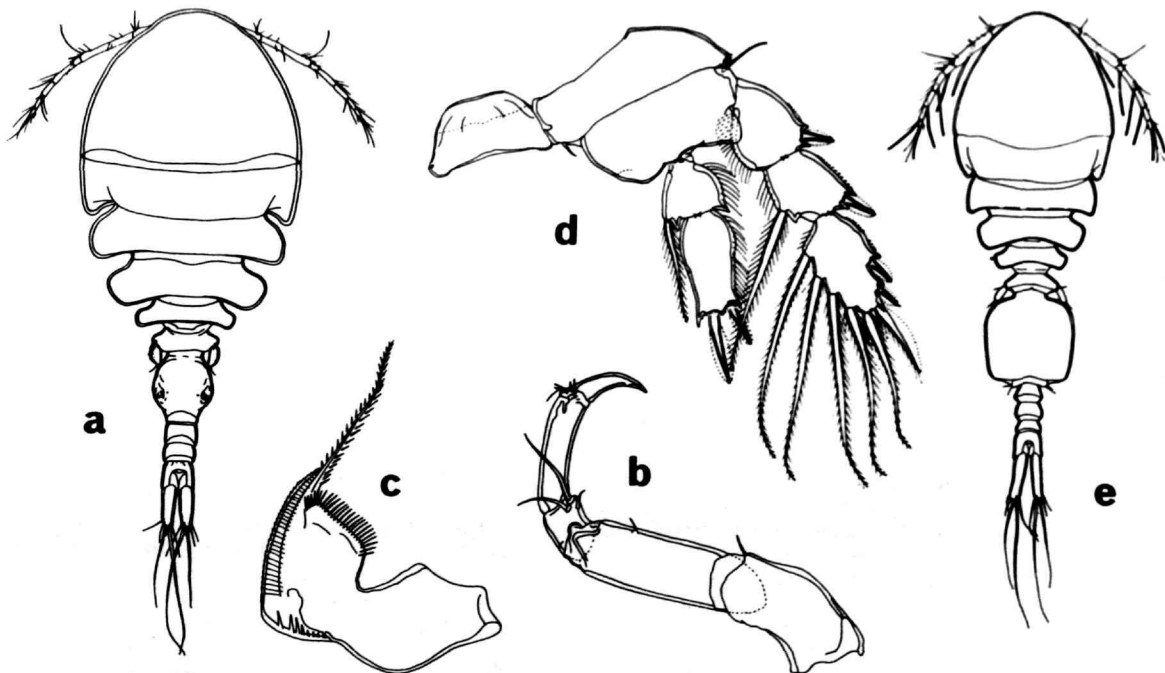


FIGURE 151.—*Paramolgus politus* (Humes and Ho). Female: a, dorsal; b, second antenna; c, mandible; d, leg 4 and intercoxal plate. Male: e, dorsal. (From Humes and Ho, 1967d, figs. 1, 8, 10, 19, 21.) Length of female 1.78 mm, of male 1.33 mm.

1967; 1 ♂, 1 ♀ copepodid from *Lemnalia cervicornis* (May), in 20 m, Banc de Cinq Mètres, near Nosy Bé, 6 August 1967; 1 ♀ from *Lemnalia crassicaulis* Verseveldt, in 20 m, Banc de Cinq Mètres, near Nosy Bé, 6 August 1967.

***Paramolgus constrictus* (Humes, 1969)**

Lichomolgus constrictus Humes 1969b, pp. 2-10, figs. 1-31 [from the antipatharian *Antipathes ericoides* Pallas, region of Nosy Bé, Madagascar].

***Paramolgus insectus* (Humes, 1969)**

Lichomolgus insectus Humes, 1969b, pp. 10-17, figs. 32-63 [from the antipatharians *Antipathes* sp. cf. *spinescens* Gray, *Antipathes myriophylla* Pallas, and *Antipathes abies* (Linnaeus), region of Nosy Bé, Madagascar].

***Paramolgus simulans* (Humes and Ho, 1967)**

Lichomolgus simulans Humes and Ho, 1967d, pp. 6-9, figs. 29-53 [from the actiniarian *Rhodactis rhodostoma* (Ehrenberg), Nosy Komba, near Nosy Bé, Madagascar].

***Paramolgus spathophorus* (Humes and Ho, 1968)**

Lichomolgus spathophorus Humes and Ho, 1968c, pp. 674-680, figs. 128-147 [from the alcyonacean *Sarcophyton glaucum* (Quoy and Gaimard), Tany Kely, near Nosy Bé, Madagascar. (Dr. Verseveldt has recently changed this host identification to *Sarcophyton trocheliophorum* Marenzeller.)]

NEW RECORD.—2 ♀ ♀ from single colony of *Sarcophyton glaucum*, in 1 m, Ankify, on the mainland of Madagascar, near Nosy Bé, 23 August 1967, collected by AGH.

NEW HOST.—5 ♀ ♀ from single colony of the alcyonacean *Sarcophyton acutangulum* (Marenzeller), in 25 m, Tany Kely, a small island south of Nosy Bé, Madagascar, 14 August 1967, collected by AGH.

Genus *Paraphiloconcha* Yamaguti, 1936

DIAGNOSIS.—Body transformed, elongated, the prosome in the female with the segments of legs 2-4 having long, blunt, digitiform lateral processes, but in the male with similar processes only on the segments of legs 2 and 3. External segmentation of both prosome and urosome obscure. Caudal ramus with setae shorter than the ramus. Rostrum

present. First antenna 7-segmented. Second antenna 4-segmented with a single terminal claw.

Labrum incised medially. Mandible with a long, tapered blade and lash. First maxilla with two elements. Second maxilla of the usual lichomolgid type. Maxilliped in the female 3-segmented, in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1-4 with 3-segmented rami except for leg 4 endopod which is 2-segmented. Leg 4 exopod with the third segment having two outer spines and one terminal spine. Leg 1 endopod with the same formula in both sexes. Leg 5 with a free segment bearing two terminal elements.

Other features as in the species below.

Associated with bivalve mollusks.

TYPE-SPECIES.—*Paraphiloconcha meretricis* Yamaguti.

***Paraphiloconcha meretricis* Yamaguti, 1936**

FIGURE 152

Paraphiloconcha meretricis Yamaguti, 1936, pp. 121-123, pl. 12, figs. 63-75 [from the pericardium of *Meretrix lamarcki* Deshayes, Sea of Japan].

Genus *Paredromolgus* Humes and Stock, 1972

DIAGNOSIS.—Body cyclopiform. Urosome 5-segmented in the female, 6-segmented in the male. Caudal ramus with six setae. Rostrum not well developed. First antenna 7-segmented, with the armature 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented, with the formula 1,1,3 and II + a mucronate seta and several smaller elements, there being two unequal terminal claws, one slender and unjointed.

Labrum with a deep cleft separating the two lobes. Mandible with the basal area beyond the indentation having on its convex side a distally directed tooth and a striated fringe and on its concave side a row of spinules; lash long. Paragnath a hairy lobe. First maxilla with three elements. Second maxilla of the usual lichomolgid type. Maxilliped of the female 3-segmented, with a pointed tip, in the male 4-segmented (assuming the prox-

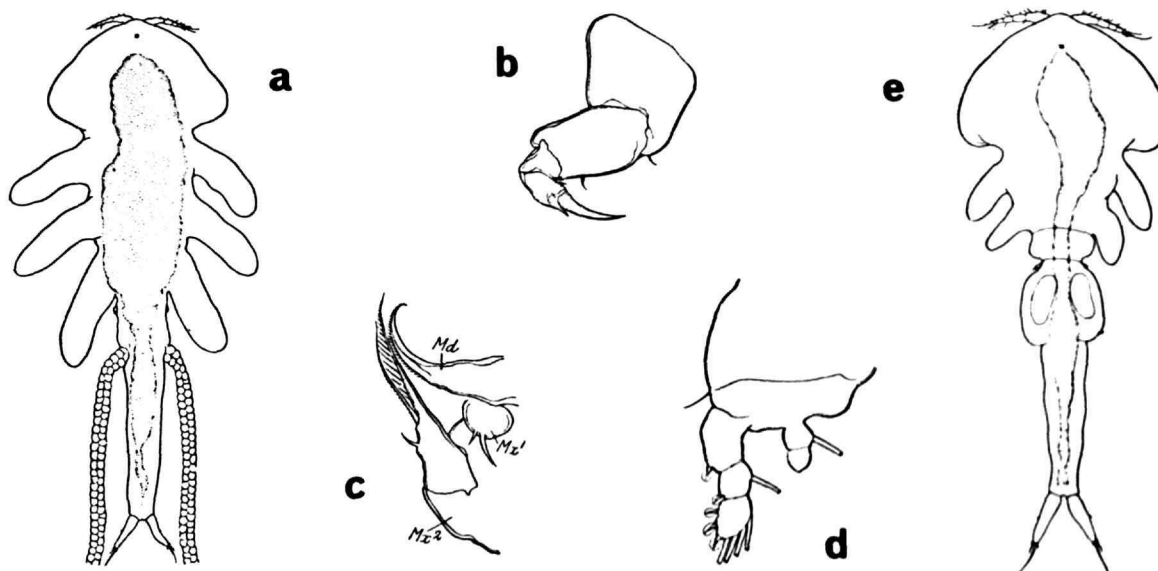


FIGURE 152.—*Paraphiloconcha meretricis* Yamaguti. Female: *a*, dorsal; *b*, second antenna; *c*, mouthparts, including mandible, first maxilla, and second maxilla; *d*, leg 4. Male: *e*, dorsal. (From Yamaguti, 1936, pl. 12, figs. 63, 64, 67, 68, 74.) Length of female 3.1–5.5 mm, of male 2.4–2.75 mm.

imal part of the claw to represent a fourth segment).

Legs 1–4 with 3-segmented rami except for leg 4 endopod which is 2-segmented. Leg 4 exopod with the third segment III, I, 5. Leg 4 endopod with 0–1; II; the seta naked in the female, with extremely small barbules in the male. In the male, leg 1 endopod with the third segment I, I, 4 instead of I, 5 as in the female. Leg 5 in both sexes with a free segment bearing two terminal setae. Leg 6 in the female represented by two small spines near the area of attachment of each egg sac, in the male by a posteroventral flap on the genital segment bearing two setae.

Other features as in the species below.

Associated with alcyonaceans.

TYPE-SPECIES.—*Paredromoligus decorus* (Humes and Frost).

ETYMOLOGY.—The name is a combination of the Greek words *παρεδρος* (beside), referring to its affinity with *Lichomoligus*, and *μολγος*.

Paredromoligus decorus (Humes and Frost, 1964)

FIGURE 153

Lichomoligus decorus Humes and Frost, 1964, pp. 140–142, figs. 99–133 [from the alcyonacean *Cladiella laciniosa*

Tixier-Durivault, Nosy Bé, Madagascar].—Bouligand, 1966, p. 269.

NEW HOST RECORDS (specimens collected by AGH).—From *Cladiella latissima* (Tixier-Durivault): 65 ♀♀, 62 ♂♂, and 3 copepodids in 1 m, Pte. de Tafondro, Nosy Bé, Madagascar, 12 July 1967; 43 ♀♀, 16 ♂♂, and 12 copepodids in 18 m, Banc du Touareg, Bay of Ampasindava, near Nosy Bé, 11 July 1967. From *Cladiella sphaerophora* (Hemprich and Ehrenberg): 2 ♀♀, 3 ♂♂ in 1 m, Nosy N'Tangam, near Nosy Bé, 21 July 1967.

Genus *Pennatulicola* Humes and Stock, 1972

DIAGNOSIS.—Body cycloform, with broad, flattened prosome and short urosome. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six setae. First antenna 7-segmented. Second antenna 4-segmented, with two terminal claws.

Mandible with the basal region beyond the indentation having on its convex side a prominent, spinose, scalelike area followed by numerous spinules and on its concave side rows of spinules; lash long. First maxilla with two or three elements. Second maxilla of the lichomolgid type. Maxilliped

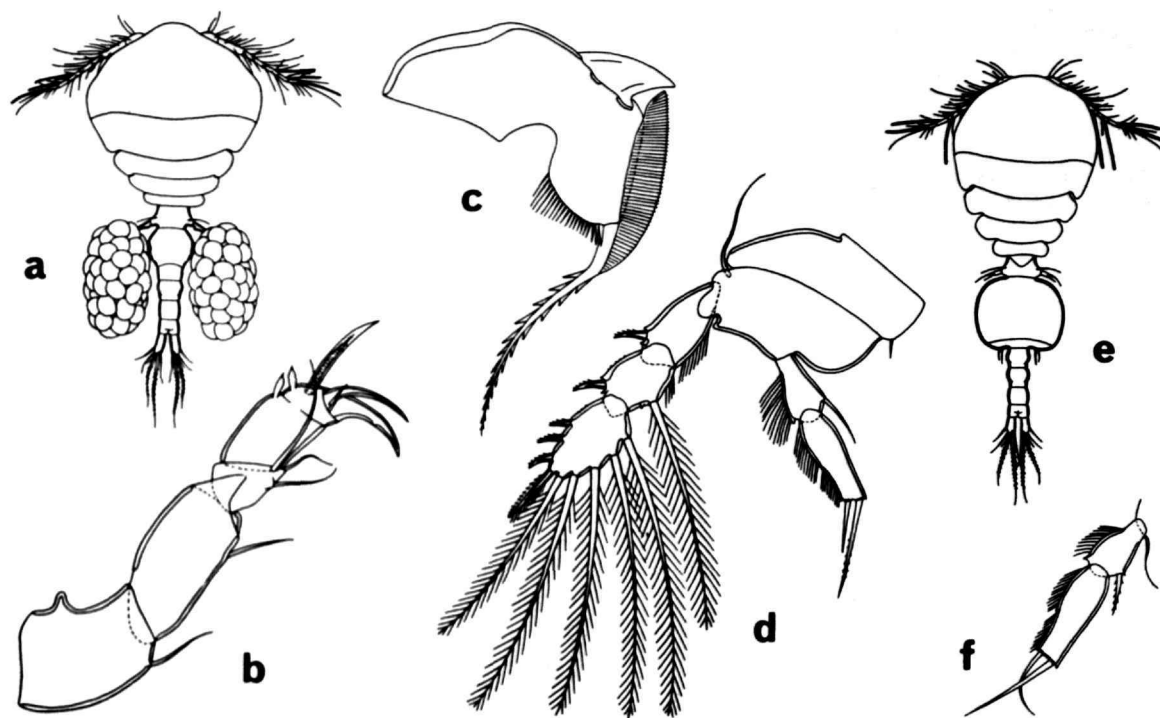


FIGURE 153.—*Paredromoligus decorus* (Humes and Frost). Female: *a*, dorsal; *b*, second antenna; *c*, mandible; *d*, leg 4. Male: *e*, dorsal; *f*, endopod of leg 4. (From Humes and Frost, 1964, figs. 99, 106, 108, 118, 120, 131 in part.) Length of female 0.93 mm, of male 0.94 mm.

in the female 3-segmented with a pointed tip, in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1-4 with 3-segmented rami except for leg 4 endopod which is 2-segmented. Armature lichomolgidiiform in pattern. Leg 4 exopod with the third segment having II,I,5. Leg 4 endopod with the formula 0-1;II, the seta feathered. Leg 1 endopod with the same formula in both sexes. Leg 5 with a free segment bearing two terminal elements and having a process on its inner margin.

Other features as in the species below.

Associated with pennatulaceans.

TYPE-SPECIES.—*Pennatulicola pteroidis* (Della Valle, 1880).

ETYMOLOGY.—The generic name is formed from *Pennatulacea* and the Latin *colo*, to inhabit. Gender masculine.

REMARKS.—A satisfactory key to the males of *Pennatulicola* cannot be prepared from the existing descriptions of that sex.

Key to Species of the Genus *Pennatulicola*

FEMALES

1. Second segment of the endopod of legs 1-3 with two outer spiniform projections (in a beaklike arrangement) *P. pterophilus*
- Second segment of the endopod of legs 1-3 with a single spiniform projection 2
2. Free segment of leg 5 broadest in its distal half, with a small toothlike process on its inner margin *P. pteroidis*
- Free segment of leg 5 broadest in its proximal half, with a prominent toothlike process on its inner margin *P. serratipes*

***Pennatulicola pteroidis* (Della Valle, 1880)**

Lichomolgus pteroidis.—Della Valle, 1880a, pp. 99–100, pl. 6, figs. 33–42 [from *Pteroides spinulosus*, Naples, Italy]; 1880b, pp. 119, 120, pl. 2, figs. 33–42 [from the sea pen *Pteroides spinulosus* Herkl., Naples, Italy].—Carus, 1885, p. 351.—De Zulueta, 1912, pp. 10–11, 50.—Stock, 1959b, pp. 66–70, figs. 5, 6 [from *Pteroides spinulosus*, Gulf of Naples, Italy]; 1960c, p. 242 [from the pennatulacean *Pteroides griseum* Bohadsch, Banyuls, Mediterranean coast of France].—Bouligand, 1960, p. 258; 1966, p. 269.—Stock and Kleeton, 1963b, pp. 257, 258, fig. 7 [from *Pteroides griseum*, Banyuls, Mediterranean coast of France].

Stellicola kossmanniana Valle, 1880, pp. 52–53, figs. 1–6 [from the pennatulacean *Pteroides griseum longespinosum* Klk., Gulf of Constantinople].

Pennatulicola pterophilus* (Stock, 1962)*FIGURE 154**

Lichomolgus pterophilus Stock, 1962, pp. 155–163, figs. 1–20 [from the pennatulacean *Pteroides lacazei* Kölliker (perhaps *Pteroides argenteum* Ellis and Solander), Billiton Island, Sunda Sea].—Bouligand, 1966, p. 269.

***Pennatulicola serratipes* (Ummerkutty, 1962)**

Lichomolgus serratipes Ummerkutty, 1962, pp. 55–59, 69, pl. 13, figs. 5–10, pl. 14, figs. 1–5, addendum fig. 1a–e [from the sea pen *Pteroides esperi* Herklots, Gulf of Manar, southeastern India].

Genus *Philoconcha* Yamaguti, 1936

DIAGNOSIS.—Body modified, elongate. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six setae. Rostrum present. First antenna 7-segmented. Second antenna 4-segmented, with a single terminal claw.

Labrum incised medially. Mandible with a long, slender bipectinate blade and lash. First maxilla with two setae. Second maxilla of the usual lichomolgid type. Maxilliped in the female reduced, swollen, tipped with a small digitiform process and two setae; in the male 4-segmented (considering the proximal part of the claw to represent a fourth segment).

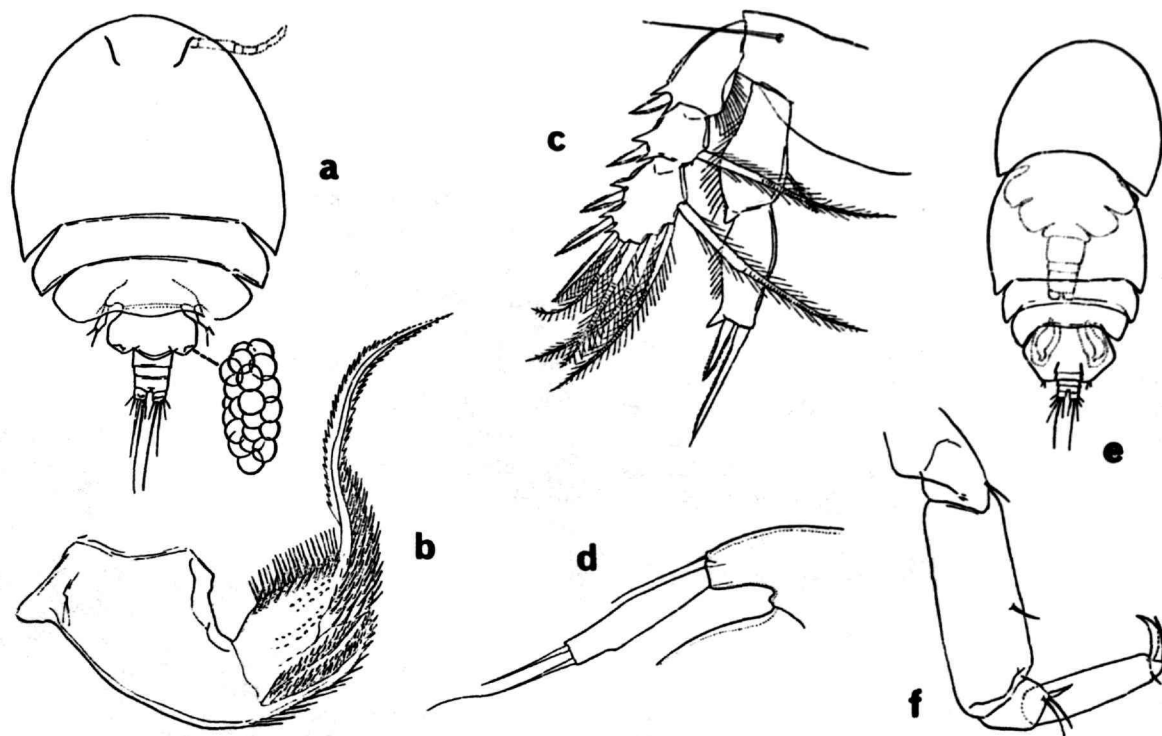


FIGURE 154.—*Pennatulicola pterophilus* (Stock). Female: a, dorsal; b, mandible; c, leg 4; d, leg 5. Male: e, couple consisting of an adult male and a female copepodid; f, second antenna. (From Stock, 1962, figs. 1, 2, 4, 13, 18, 19.) Length of female 1.87 mm, of male 1.25 mm.

Key to Species of the Genus *Philoconcha*

FEMALES

- Length up to 6.6 mm; caudal ramus $0.65-0.66 \times 0.21-0.23$ mm. *P. amygdalae*
 Length 7.5 mm; caudal ramus 1.1×0.25 mm *P. paphiae*

MALES

- Length 2.7-2.8 mm; caudal ramus $0.45 \times 0.12-0.13$ mm *P. amygdalae*
 Length 3.75-4.4 mm; caudal ramus $0.82-0.96 \times 0.15-0.25$ mm. *P. paphiae*

Legs 1-4 with 3-segmented rami except for leg 4 endopod which consists of two, usually unarmed, nodular segments. Armature lichomolgiform in pattern. Leg 4 exopod with the third segment having two outer spines and one terminal spine. Leg 1 endopod with the same formula in both sexes. Leg 5 with a free segment bearing two terminal elements.

Other features as in the species below.
 Associated with bivalve mollusks.

TYPE-SPECIES.—*Philoconcha amygdalae* Yamaguti.

Philoconcha amygdalae Yamaguti, 1936

FIGURE 155a-g

Philoconcha amygdalae Yamaguti, 1936, pp. 118, 119, pl. 10, figs. 39-48; pl. 11, figs. 49-51 [from the bivalve *Venerupis (Amygdala) philippinarum* (Adams and Reeve), Tiba Prefecture, Japan].

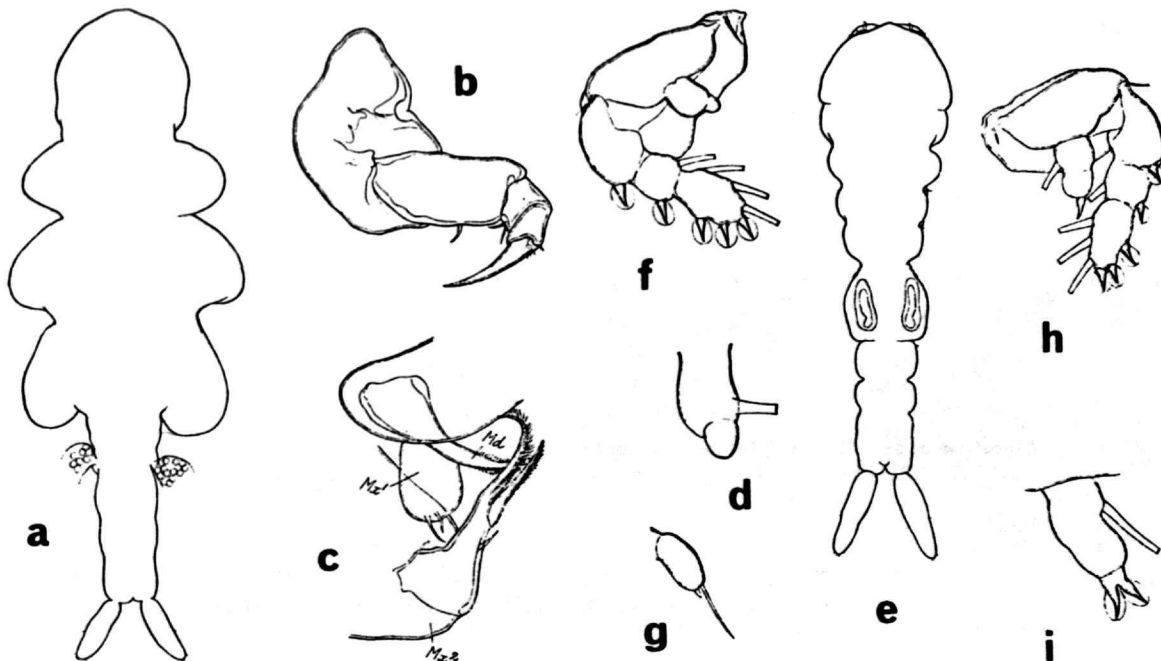


FIGURE 155.—a-g, *Philoconcha amygdalae* Yamaguti. Female: a, dorsal; b, second antenna; c, mouthparts, including mandible, first maxilla, and second maxilla; d, endopod of leg 4. Male: e, dorsal; f, leg 4; g, leg 5. (From Yamaguti, 1936, pl. 10, figs. 39, 40, 42, 43, pl. 11, figs. 49-51. On Yamaguti's pl. 10 the designation for figs. 42 and 43 should be reversed.) Length of female up to 6.6 mm, of male 2.7-2.8 mm. h, i, *Philoconcha paphiae* Yamaguti. Male: h, leg 4; i, endopod of leg 4. (From Yamaguti, 1936, pl. 11, figs. 60, 61.) Length of female 7.5 mm, of male 3.75-4.4 mm.

***Philoconcha paphiae* Yamaguti, 1936**FIGURE 155*h,i*

Philoconcha paphiae Yamaguti, 1936, pp. 119, 120, pl. 11, figs. 52-62 [from the pericardium of the bivalve *Paphia euglypta* (Philippi), Inland Sea, Japan].

Genus *Plesiomolgus* Humes and Stock, 1972

DIAGNOSIS.—Body cyclopiform. Urosome 5-segmented in the female, 6-segmented in the male. Caudal ramus with six setae. Rostrum rounded posteroventrally. First antenna 7-segmented, in the female with the formula 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male with 4, 13 + 1 aesthete, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented, with the armature 1,1,3 and II + 5 setae, there being two terminal claws.

Labrum with a deep cleft separating the two lobes. Mandible with the basal part bearing a small sclerotized area on its posterior surface, its convex side with a proximally directed, toothlike process followed by a striated fringe, its concave side with a row of spinules; lash long. Paragnath a small hairy lobe. First maxilla with two elements. Sec-

ond maxilla of the usual lichomolgid type. Maxilliped of the female 3-segmented, with a pointed tip; in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1-4 with 3-segmented rami, except for leg 4 endopod which is 2-segmented. Armature of the usual lichomolgiform type. Leg 4 exopod with the third segment II,1,5. Leg 4 endopod 0-1;II, the seta plumose. In the male, leg 1 endopod with the third segment I,1,4 instead of I,5 as in the female. Leg 5 in both sexes with a free segment bearing two terminal setae. Leg 6 in the female represented by the two setae near the area of attachment of each egg sac, in the male by the posteroventral flap on the genital segment bearing two setae.

Other features as in the species below.

Associated with stoloniferan octocorals.

TYPE-SPECIES.—*Plesiomolgus organicus* (Humes and Ho).

ETYMOLOGY.—The name is a combination of the Greek word πλησιος (near), referring to the affinity of this genus to *Lichomolgus*, and μολγος. Gender masculine.

Key to Species of the Genus *Plesiomolgus***FEMALES**

- Genital segment with lateral indentations near middle; caudal ramus 36 x 24 μ (1.5:1) *P. organicus*
 Genital segment with lateral indentations further back; caudal ramus 28 x 23 μ (1.22:1) *P. conjunctus*

MALES

- Caudal ramus 31 x 21 μ (1.48:1); free segment of leg 5 36 x 9 μ (4:1) *P. organicus*
 Caudal ramus 25 x 21 μ (1.19:1); free segment of leg 5 28 x 8 μ (3.5:1) *P. conjunctus*

***Plesiomolgus organicus* (Humes and Ho, 1967)**

FIGURE 156

Lichomolgus organicus Humes and Ho, 1967a, pp. 2-7, figs. 1-30 [from the stoloniferan *Tubipora musica* (Linnaeus), region of Nosy Bé, Madagascar].

***Plesiomolgus conjunctus* (Humes and Ho, 1967)**

Lichomolgus conjunctus Humes and Ho, 1967a, pp. 7-10, figs. 31-36 [from *Tubipora musica*, region of Nosy Bé, Madagascar].

NEW RECORD.—4 ♀♀, 1 ♂ from *Tubipora musica*, in 1 m, Tany Kely, near Nosy Bé, Madagascar, 27 May 1967, collected by AGH.

Genus *Prionomolgus* Humes and Ho, 1968

DIAGNOSIS.—Body cyclopiform. Urosome 5-segmented in the female, 6-segmented in the male. Caudal ramus with six setae. Rostrum weakly developed, without a definite posteroventral margin. First antenna 7-segmented, in the female with the

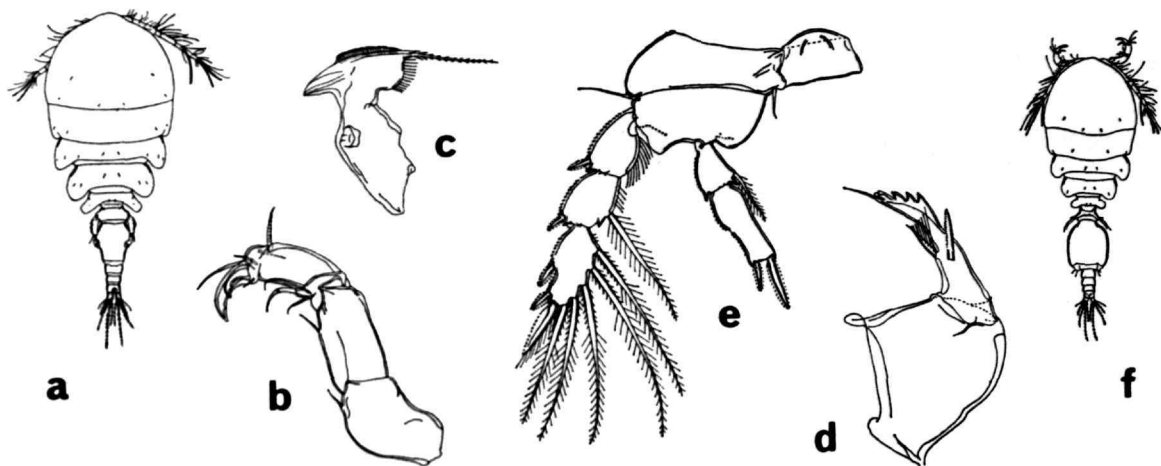


FIGURE 156.—*Plesiomolgus organicus* (Humes and Ho). Female: a, dorsal; b, second antenna; c, mandible; d, second maxilla; e, leg 4 and intercoxal plate. Male: f, dorsal. (From Humes and Ho, 1967a, figs. 1, 8, 10, 20, 22.) Length of female 0.99 mm, of male 0.89 mm.

formula 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male with 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 3-segmented (the original third and fourth segments fused), with the formula 1, 1, 3 + 1 + one small element, there being a single terminal claw.

Labrum with a deep median cleft between two lobes. Mandible with the base separated by a constriction into an unornamented proximal part and a distal area whose concave edge has two lobes, both with strongly serrated margins, and whose convex edge has a short row of spinules followed by a triangular process and then by a finely spinulose margin; lash relatively short. Paragnath a small lobe, naked except for one setule. First maxilla with three elements with serrated flanges. Second maxilla of the usual lichomolgoid type. Maxilliped of the female 3-segmented, the third segment with a spiniform tip. Maxilliped of the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1-4 with 3-segmented rami, except for leg 4 endopod which is 2-segmented. Armature of the usual lichomolgoidiform pattern, except leg 4 endopod which has the formula 0-1;1. Leg 4 exopod with the last segment having II,1,5. Formula for the male similar except leg 1 endopod, where the third segment is I,1,4 instead of I,5 as in the female. Leg 5 in both sexes with a free segment bear-

ing two terminal setae. Leg 6 in the female represented by two setae near the area of attachment of each egg sac, in the male by a posteroventral flap on the genital segment bearing two setae.

Other features as in the species below.

Associated with madreporarian corals.

TYPE-SPECIES.—*Prionomolgus lanceolatus* Humes and Ho.

Prionomolgus lanceolatus Humes and Ho, 1968

FIGURE 157

Prionomolgus lanceolatus Humes and Ho, 1968a, pp. 372-375, figs. 183-210 [associated with the hard coral *Pachyseris speciosa* (Dana), region of Nosy Bé, northwestern Madagascar].

Genus *Pseudomacrochiron* Reddiah, 1969

DIAGNOSIS.—Body cyclopiform. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six setae. First antenna 7-segmented. Second antenna 4-segmented, the last segment with two claws (except one clawlike spine in *P. fucicolum*) and several setae. Mandible with the basal region beyond the indentation having on its concave side a row of setae and on its convex side a spinulose scalelike area followed by a serrated fringe; lash long. First maxilla with three or four elements. Second maxilla of the usual licho-

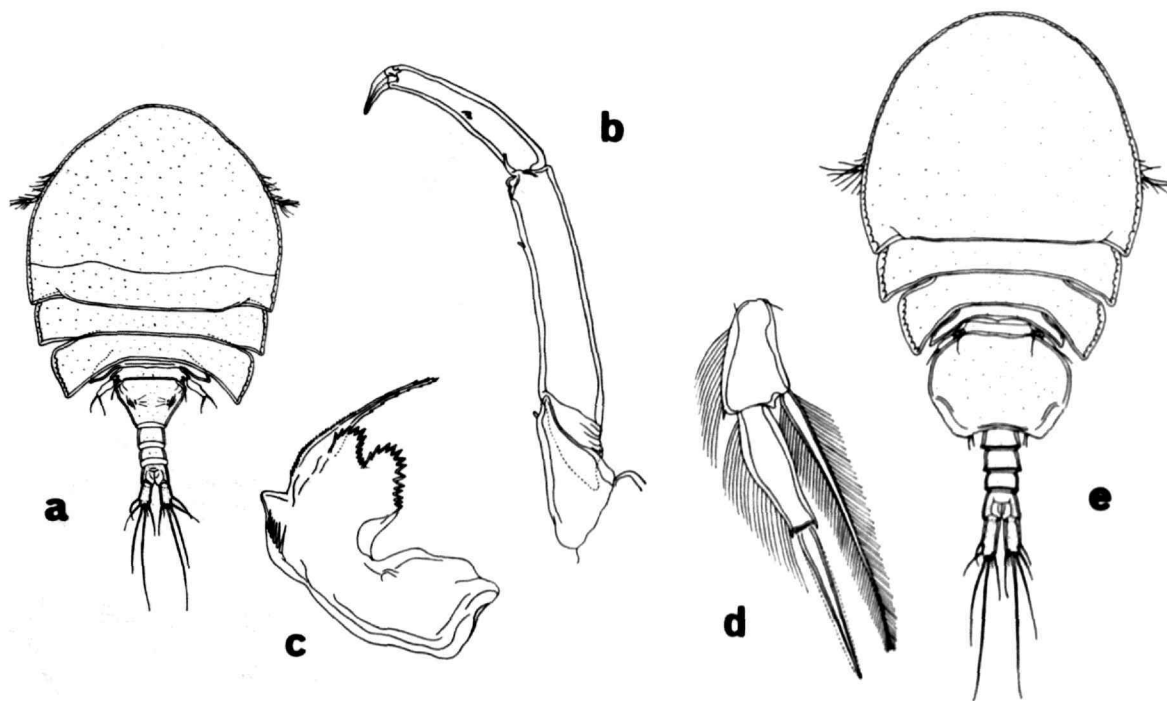


FIGURE 157.—*Prionomolgus lanceolatus* Humes and Ho. Female: *a*, dorsal; *b*, second antenna; *c*, mandible; *d*, endopod of leg 4. Male: *e*, dorsal. (From Humes and Ho, 1968a, figs. 183, 190, 192, 201, and 203.) Length of female 1.36 mm, of male 1.04 mm.

molgid type. Maxilliped in the female 3-segmented; in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).⁶

Legs 1–4 with 3-segmented rami, except for leg 4 endopod which is 1-segmented. Armature lichomolgidiform in pattern. Leg 4 exopod with the third segment having II,I,5 (formula unknown in *P. malayense*). Leg 4 endopod in the female much shorter than the exopod and bearing two terminal spines. Leg 5 with a free segment bearing two terminal elements.

Other features as in the species below.

Associated with scyphozoan medusae, as far as known.

TYPE-SPECIES.—*Pseudomacrochiron parvum* (A. Scott).

⁶The maxillipeds in *P. stocki* represented by Reddiah (1969) as 2-segmented in the female and 3-segmented in the male, are, judging from his figs. 2b and 3a, in all probability 3- and 4-segmented respectively.

REMARKS.—We find it impossible to prepare a satisfactory key to the species of *Pseudomacrochiron* on the basis of available information.

Pseudomacrochiron parvum (A. Scott, 1909)

FIGURE 158

Pseudanthessius parvus A. Scott, 1909, pp. 269, 270, pl. 69, figs. 1–7 [from Lawui, coast of Obi Major, 0°24' S, 127°36' E.]

Lichomolgus (*Macrochiron*) *parvus*.—Monod and Dollfus, 1932a, p. 139.

Macrochiron (*Paramacrochiron*) *parvum*.—Sewell, 1949, p. 109 [in weed-washings, Nankauri Harbor, Nicobar Islands].

—Ganapati and Shanthakumari, 1962, pp. 10, 12, 16.

Macrochiron parvum.—Stock, 1957, p. 381.

Pseudomacrochiron parvum.—Reddiah, 1969, p. 44.

Pseudomacrochiron fucicolum (T. Scott, 1912)

Pseudanthessius fucicolus T. Scott, 1912, pp. 571, 572, pl. 12, figs. 1–13 [from gulf-weed, St. Helena, 15°57' S, 5°40' W, to Tuskar Rock, 51°13' N, 7°20' W].

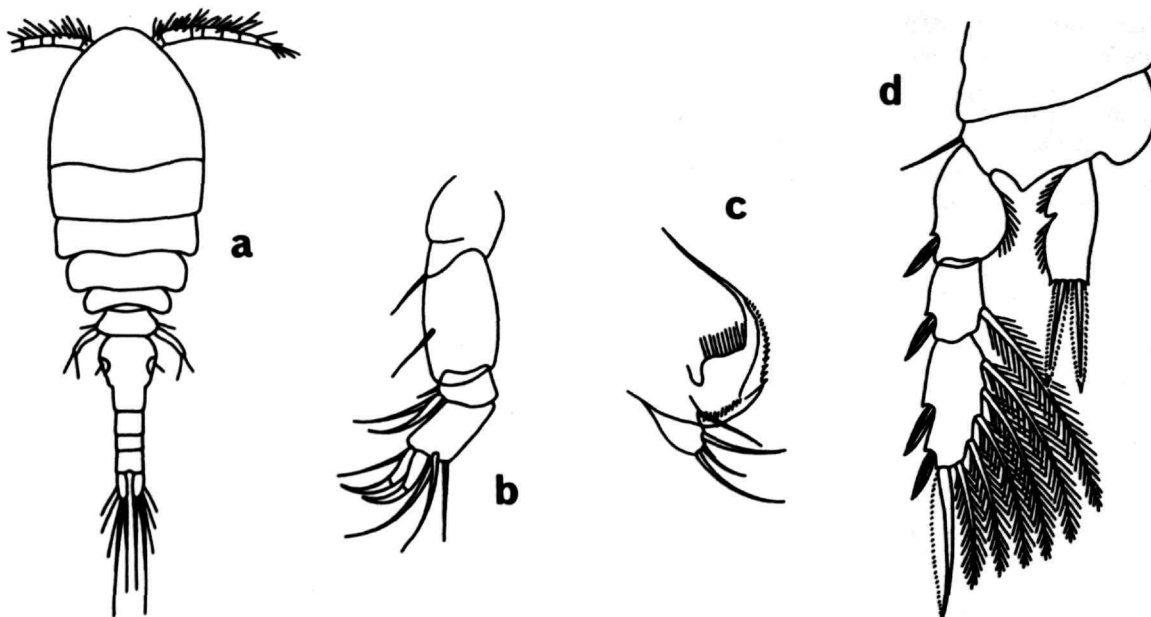


FIGURE 158.—*Pseudomacrochiron parvum* (A. Scott). Female: a, dorsal; b, second antenna; c, mandible and first maxilla; d, leg 4. (Redrawn after A. Scott, 1909, pl. 69, figs. 1, 3, 4, 7.) Length of female 0.9 mm; male unknown.

Pseudanthessius fucicolus.—non *Kelleria*, see Nicholls, 1944, p. 54.

Macrochiron (*Paramacrochiron*) *fuciculum*.—Sewell, 1949, p. 108.

Kelleria fucicola.—Bayly, 1971, p. 111.

***Pseudomacrochiron malayense* (Sewell, 1949)**

Macrochiron (*Paramacrochiron*) *malayense* Sewell, 1949, pp. 109–111, fig. 28A–F [in surface tow-net, Kurau River, Perak, Federated Malay States; and off Viper Island, Port Blair, Andaman Islands].

Macrochiron malayense.—Stock, 1957, p. 382.

Pseudomacrochiron malayense.—Reddiah, 1969, p. 44.

***Pseudomacrochiron ornatum* (Krishnaswamy, 1952)**

Macrochiron (*Paramacrochiron*) *ornatum* Krishnaswamy, 1952, pp. 330–333, fig. 4 [in plankton, Madras, India]; 1953, p. 67 [in plankton, Madras, India].

Pseudomacrochiron ornatum.—Reddiah, 1969, p. 44.

***Pseudomacrochiron stocki* Reddiah, 1969**

Pseudomacrochiron stocki Reddiah, 1969, pp. 44–49, figs. 1–3 [from the medusa *Dactylometra quinquecirrha* L. Agassiz, Madras, India].

Genus *Rakotoa* Humes and Stock, 1972

DIAGNOSIS.—Body modified. Urosome 5-segmented in the female, 6-segmented in the male. Caudal ramus with six relatively short setae. Rostrum with a weakly defined posteroventral margin. First antenna 7-segmented, with the formula in the female 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented, with the armature 1, 1, 3, and I + 1 setule, there being a single terminal claw.

Labrum with the two lobes separated by a broad indentation. Mandible with the basal area distal to the indentation having on its convex side a serrated fringe and on the concave side two lobes, each with two rows of spinules; lash stout and moderately long. First maxilla with three elements. Second maxilla of the usual lichomolgid type, but the first segment bearing a long digitiform process as in *Andrianellus*. Maxilliped in the female 3-segmented, with a pointed tip, in the male 4-segmented (assuming the proximal part of the claw to represent a fourth segment).

Legs 1-4 with 3-segmented rami except for leg 4 endopod which is vestigial and represented only by an unornamented lobe which may bear a minute distal lobe suggesting a 2-segmented condition. Armature of legs 3, 4 reduced, leg 3 endopod being 0-1; 0-2; 1 and leg 4 exopod 1-0; 0-1; 1,3. Both sexes with similar armature. Leg 5 in both sexes with a free segment bearing two terminal setae. Leg 6 in the female represented by the two setae and spiniform process near the area of attachment of each egg sac, in the male by a postero-ventral flap on the genital segment bearing two setae.

Other features as in the species described below. Associated with madreporarian corals.

TYPE-SPECIES.—*Rakotoa proteus*, new species.

ETYMOLOGY.—The generic name is for Rakoto, a prince who became King Radama II of Madagascar. Gender masculine.

Rakotoa proteus, new species

FIGURES 159-161

TYPE MATERIAL.—10 ♀♀, 4 ♂♂ from seven colonies of the madreporarian coral *Favia* sp., in 10 cm, Boloboxo, Nosy Faly, an island to the east of Nosy Bé, northwestern Madagascar, 10 August 1964, collected by AGH. Holotype ♀, allotype, and 8 paratypes (7 ♀♀, 1 ♂) deposited in USNM, the remaining paratypes (dissected) in the collection of AGH.

FEMALE.—The body (Figure 159a) has a somewhat thickened prosome as in *Andrianellus exsertidens*. The length (not including the setae on the caudal rami) is 1.60 mm (1.58-1.64 mm) and the greatest width 0.60 mm (0.55-0.63 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1.38:1. The ratio of the length of the prosome to that of the urosome is 1.26:1. The segment of leg 1 is separated from the cephalosome by a transverse dorsal furrow. The epimera of the segments of legs 1-4 are only slightly developed and rounded.

The segment of leg 5 (Figure 159b) is 96 x 350 μ . There is no ventral intersegmental sclerite between that segment and the genital segment. The genital segment is 230 x 286 μ in greatest dimensions, broadest in its anterior fourth, and tapered posteriorly. The areas of attachment of the egg sacs are

located dorsolaterally just in front of the middle of the segment. Each area (Figure 159c) bears two very small setae about 5 μ long and a minute spiniform process. The three postgenital segments are 109 x 156 μ , 83 x 138 μ , and 109 x 143 μ from anterior to posterior. The posterior border of the anal segment bears on each side dorsal and ventral rows of minute spinules.

The caudal ramus (Figure 159d) is elongated, 125 x 47 μ , or 2.66 times longer than wide. All the setae are shorter than the ramus and naked. The outer lateral seta is 44 μ , the dorsal seta (displaced to the inner distal edge of the ramus) 40 μ , the outermost terminal seta 45 μ , the innermost terminal seta 43 μ , and the two median terminal setae 68 μ (outer) and 65 μ (inner).

The body surface has a few small hairs (sensilla) and refractile points as shown in Figure 159a,b.

The egg sac is unknown.

The first antenna (Figure 159e) is 7-segmented and 307 μ long. The lengths of the seven segments (measured along their posterior nonsetiferous margins) are 18 (55 μ along the anterior margin), 87, 34, 48, 41, 24, and 18 μ respectively. The formula for the armature is 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All the setae are naked.

The second antenna (Figure 159f) is 4-segmented. Each of the first two segments bears a small inner seta. The third segment bears three setae. The fourth segment, 50 μ along its outer edge, 30 μ along its inner edge, and 22 μ wide, bears terminally a claw, 33 μ along its axis, and a minute setule.

The labrum (Figure 159g) has two broad, posteroventral lobes.

The mandible (Figure 159h) resembles that of *Andrianellus exsertidens*, but each of the two spinulose lobes on the concave side has two rows of spinules and the convex side of the base is smooth, without a spiniform process. Paragnaths could not be identified with certainty. The first maxilla (Figure 159i) has three elements. The second maxilla (Figure 159j) resembles that of *A. exsertidens*, but the toothlike process on the first segment is relatively shorter and more slender. The maxilliped (Figure 159k) also is similar to that of *A. exsertidens*, but the two setae on the second segment are more unequal; the third segment has a larger

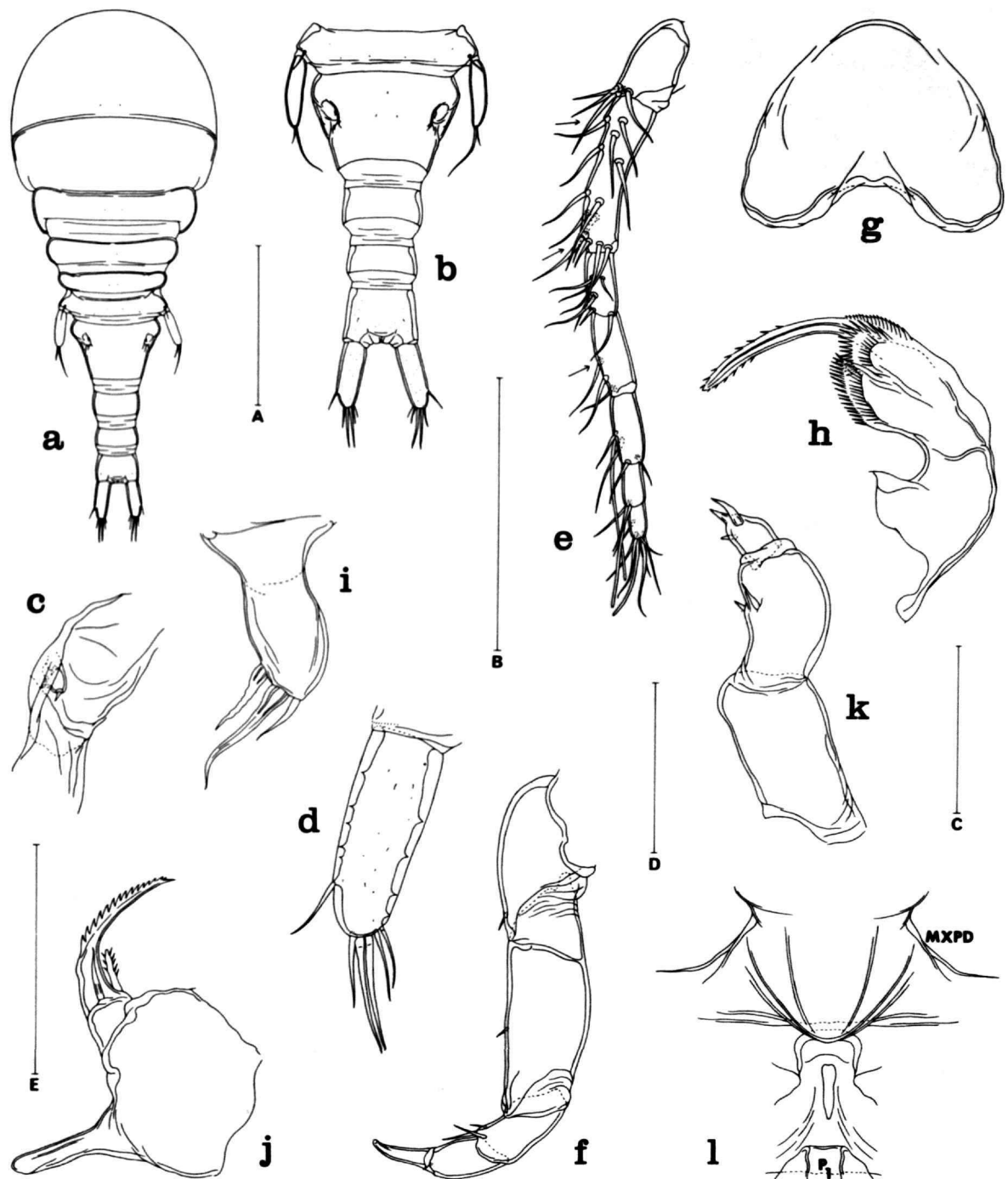


FIGURE 159.—*Rakotoa proteus*, new species. Female: *a*, dorsal (A); *b*, urosome (B); *c*, area of attachment of egg sac, dorsal (C); *d*, caudal ramus, dorsal (D); *e*, first antenna, with arrows indicating positions of additional aesthetes in male, anterodorsal (D); *f*, second antenna, posterior (D); *g*, labrum, ventral (D); *h*, mandible, posterior (C); *i*, first maxilla, anterior (C); *j*, second maxilla, anterior (E); *k*, maxilliped, inner (E); *l*, area between maxillipeds and first pair of legs, ventral (E). Scale: A, B, 0.5 mm; C, 0.05 mm; D, E, 0.1 mm.

naked articulated spine and a small seta and terminates in a naked spiniform process.

The ventral area between the maxillipeds and the first pair of legs (Figure 159*l*) protrudes ventrally. The bases of the maxillipeds are not connected by a line as in many lichomolgids.

Legs 1-4 (Figure 160*a-c,e*) have 3-segmented rami except for the endopod of leg 4 which is vestigial. The armature of these legs is as follows:

P ₁	coxa	0-1	basis	1-0	exp	I-0; I-1; III,I,4
				enp	0-1; 0-1; I,5	
P ₂	coxa	0-1	basis	1-0	exp	I-0; I-1; II,I,5
				enp	0-1; 0-2; I,II,2	
P ₃	coxa	0-1	basis	1-0	exp	I-0; I-1; I,I,4
				enp	0-1; 0-2; 1	
P ₄	coxa	0-1	basis	1-0	exp	I-0; 0-1; I,3
				enp	—	

The coxa of legs 1-3 bears a long plumose inner seta, but in leg 4 that seta is much smaller (17 μ) and naked. The inner margin of the basis bears a row of hairs in legs 1-3 but is naked in leg 4. The spines on the rami have their distal ends slightly expanded as a smooth lamella surmounted by a slender flagellum. In one female the endopod of the right leg (Figure 160*d*) shows an incomplete separation of the second and third segments (the line of articulation being present only on the posterior surface). In another female the exopod of leg 4 (Figure 160*f*) shows a similar incomplete separation of these segments and has an extra spine, so that the formula is I-0; 0-1; I,I,3. The endopod of leg 4 is vestigial, represented in Figure 160*e* by a small lobe only 5 μ long. The form of this endopod is variable, however, with occasionally a minute distal lobe, suggesting a 2-segmented condition. Figure 160*g,h* illustrates the pairs of endopods in two females.

Leg 5 (Figure 160*i,j*) has an elongated unornamented free segment 133 x 47 μ in lateral (outer) view. The two terminal setae are 18 μ and 40 μ , and the adjacent seta on the body is 20 μ . All three setae are naked.

Leg 6 is represented by the two minute setae on the area of attachment of each egg sac (Figure 159*c*).

The color in life in transmitted light is opaque gray, the intestine reddish, the eye not visible.

MALE.—The body form (Figure 161*a*) resembles that of the female. The length (without the ramal

setae) is 1.51 mm (1.48–1.55 mm) and the greatest width 0.54 mm (0.53–0.54 mm), based on four specimens in lactic acid. The ratio of the length to the width of the prosome is 1.42:1. The ratio of the length of the prosome to that of the urosome is about 1:1. The segmentation and the development of the epimera are like the female.

The segment of leg 5 (Figure 161*b*) is 70 x 275 μ . There is no ventral intersegmental sclerite. The genital segment is 234 x 319 μ , wider than long. The four postgenital segments are 91 x 138 μ , 86 x 122 μ , 70 x 113 μ , and 94 x 135 μ from anterior to posterior.

The caudal ramus is similar to that of the female, 117 x 44 μ .

The body surface has hairs and refractile points as in the female.

The rostrum resembles that in the female.

The first antenna is like that of the female, but there are three additional long aesthetes (at the locations indicated by arrows in Figure 159*e*), so that the formula is 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete.

The second antenna, labrum, mandible, first maxilla, and second maxilla are like those of the female. The maxilliped (Figure 161*c*) is 4-segmented (assuming that the proximal part of the claw represents a fourth segment). There are two setae and a row of short spinules on the second segment. The claw is 139 μ along its axis, including the small terminal lamella, lacks a distinct division but has a row of minute spinules, and has the usual two unequal proximal setae, the larger with a hyaline, weakly sclerotized distal half.

The ventral area between the maxillipeds and the first pair of legs is like that in the female.

Legs 1-4 are like those of the female. In one male the left leg 4 (Figure 161*d*) is abnormal in that the second exopod segment bears three inner setae and is rather indistinctly separated from the third segment. In another male the left endopod of this leg has two setae on the third segment (Figure 161*e*).

Leg 5 (Figure 161*b*) has a small unornamented free segment, 22 x 13 μ , with the two terminal setae 36 μ and 66 μ .

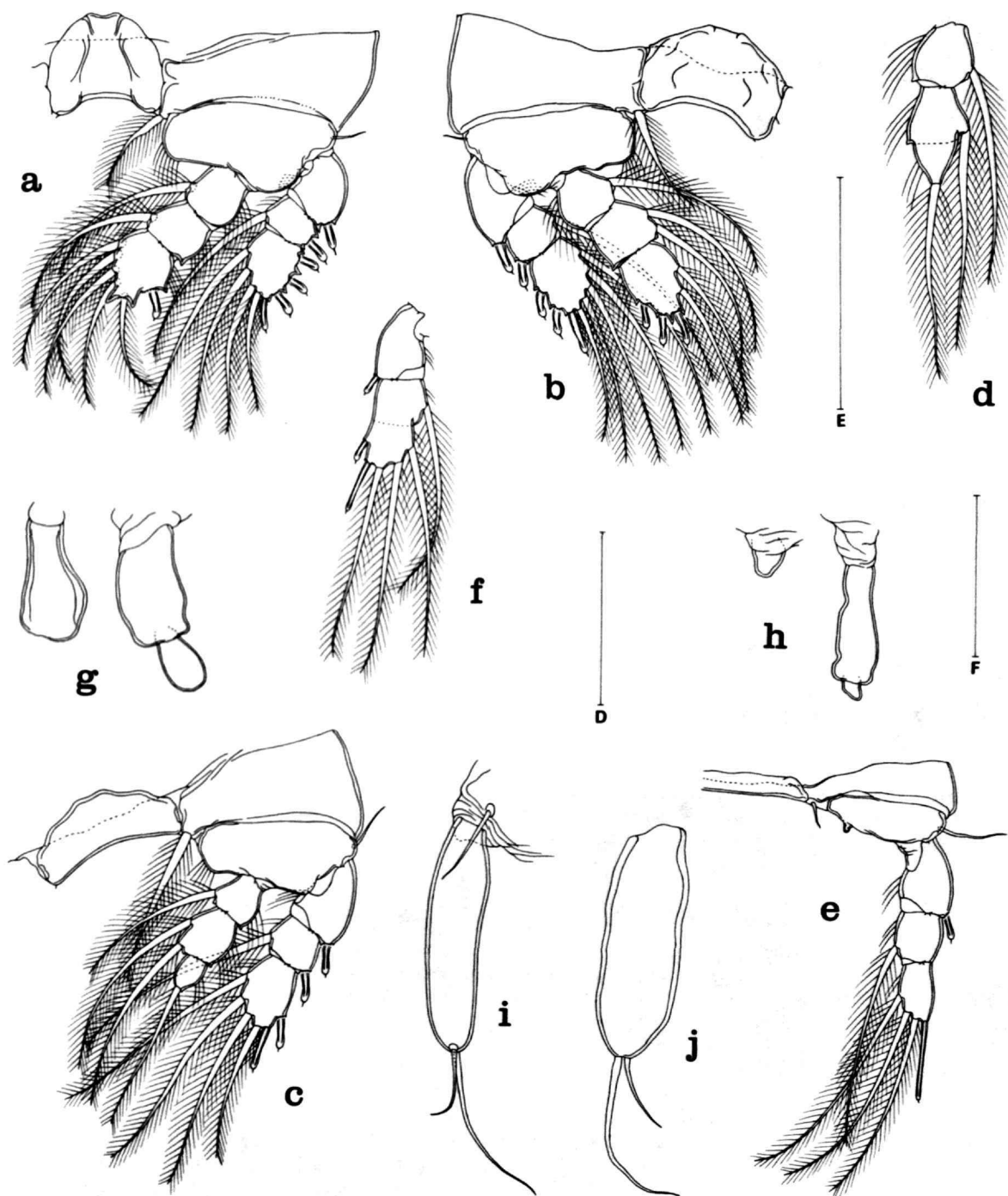


FIGURE 160.—*Rakotoa proteus*, new species. Female: a, leg 1 and intercoxal plate, anterior (D); b, leg 2 and intercoxal plate, anterior (D); c, leg 3 and intercoxal plate, anterior (D); d, abnormal endopod of leg 3, anterior (E); e, leg 4, anterior (D); f, abnormal exopod of leg 4, anterior (D); g, right and left endopods of leg 4 of a single female, anterior (F); h, right and left endopods of leg 4 of a single female, anterior (F); i, leg 5, dorsal (D); j, free segment of leg 5, lateral (outer) (D). Scale: D, 0.1 mm; F, 0.02 mm.

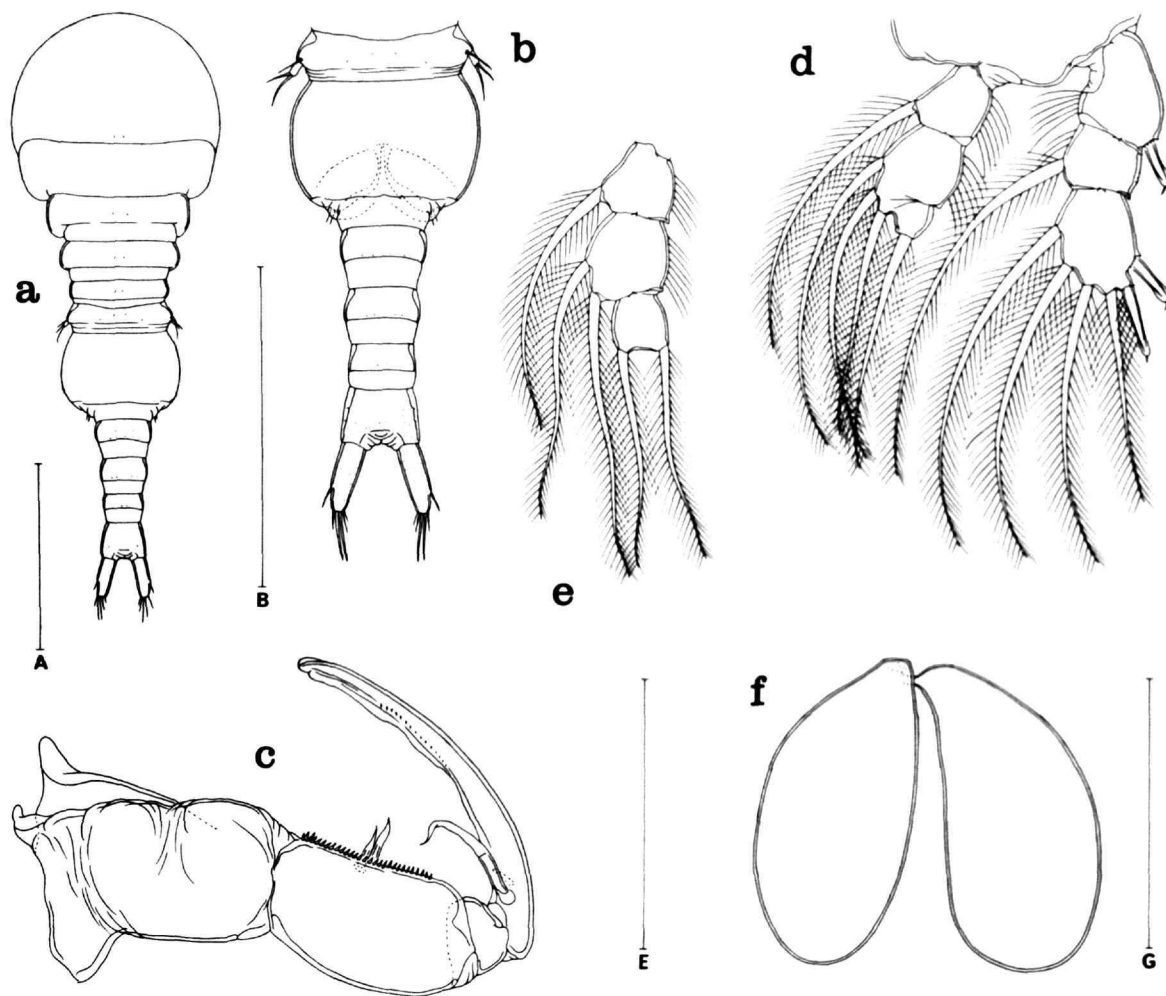


FIGURE 161.—*Rakotoa proteus*, new species. Male: a, dorsal (A); b, urosome, dorsal (B); c, maxilliped, inner (C); d, abnormal leg 3, anterior (E); e, abnormal left endopod of leg 3, anterior (E); f, spermatophores, attached to female, lateral (G). Scale: A, B, 0.5 mm; E, 0.1 mm, C, 0.2 mm.

Leg 6 (Figure 161b) consists of the usual posteroventral flap on the genital segment bearing two naked setae, 31 μ and 34 μ .

The spermatophore (Figure 161f), attached to the female in pairs, is elongated oval, 229 x 108 μ , not including the neck.

The color in life in transmitted light is like that of the female.

ETYMOLOGY.—The specific name *proteus*, from

Proteus, the name of a sea deity who could change himself into all kinds of shapes, alludes to the variability of the armature in legs 2–4.

REMARKS.—*Rakotoa proteus* is remarkable in the armature of legs 2–4. The normal pattern is shown in the formula given above. The armature of leg 1 is constant in each of the 28 legs of the 14 specimens (10 ♀♀, 4 ♂♂) collected. The armature of legs 2–4, however, varies as follows:

P_2	Exp	1-0; 1-1; II,1,5	in 23 legs	82.15%
		1-0; 0-1; II,1,5	in 5 legs	17.85%
	Enp	0-1; 0-2; I,II,2	in 24 legs	85.71%
		0-1; 0-2; I,II,3	in 4 legs	14.29%
P_3	Exp	1-0; 1-1; I,1,4	in 23 legs	82.15%
		1-0; 0-1; I,1,4	in 3 legs	10.70%
		1-0; 0-1; I,1,3	in 2 legs	7.15%
		0-1; 0-2; 1	in 19 legs	67.87%
	Enp	0-1; 0-1; 1	in 3 legs	10.70%
		0-1; 0-1; -	in 1 leg	3.57%
		0-1; 0-1; 2	in 1 leg	3.57%
		0-1; 2	in 1 leg	3.57%
		0-1; 3	in 2 legs	7.15%
		0-1; 4	in 1 leg	3.57%
P_4	Exp	1-0; 0-1; 1,3	in 21 legs	75.01%
		1-0; 0-1; II,3	in 1 leg	3.57%
		1-0; 0-1; 0,3	in 1 leg	3.57%
		1-0; 1-1; 1,3	in 3 legs	10.70%
		1-0; 0-1; 1,2	in 2 legs	7.15%

Genus *Ravahina* Humes and Ho, 1968

DIAGNOSIS.—Body transformed, with an expanded and swollen prosome. Urosome 5-segmented, slender, and sometimes contractile. Caudal ramus with six short setae. Rostral area weakly developed. First antenna 7-segmented, the formula being 3, 14, 5, 4, 5, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented, with the armature 1, 1, 3, and 6 + I, there being a single terminal claw, but an adjacent seta jointed and spiniform.

Labrum with the two lobes separated by a median cleft. Mandible with the base divided into

two parts by an indentation, the part distal to the indentation having on its convex side two small surficial lobes and a distal serrated fringe, and on its concave side a row of spines; tip of mandible forming a small spiniform process. First maxilla with three elements. Second maxilla of the usual lichomolgid type. Maxilliped 3-segmented, with the third segment terminating in a spine or spiniform process.

Legs 1-4 lacking the inner coxal seta and all exopods 3-segmented but with reduced number of elements on the third segment. Leg 1 endopod 0-0;0-0;I,2 and leg 2 endopod 0-0;0-1;II. Endopods of legs 3 and 4 unarmed and vestigial, consisting of a small knob without clear articulation with the basis. Leg 5 with a free segment bearing two terminal setae. Leg 6 represented by two setae near the area of attachment of each egg sac.

Other features as in the species below.

Associated with madreporarian corals.

TYPE-SPECIES.—*Ravahina tumida* Humes and Ho.

REMARKS.—The male is unknown.

Ravahina tumida Humes and Ho, 1968

FIGURE 162

Ravahina tumida Humes and Ho, 1968a, pp. 378-380, figs. 241-259 [associated with *Porites* sp. cf. *andrewsi* Vaughan, region of Nosy Bé, northwestern Madagascar].

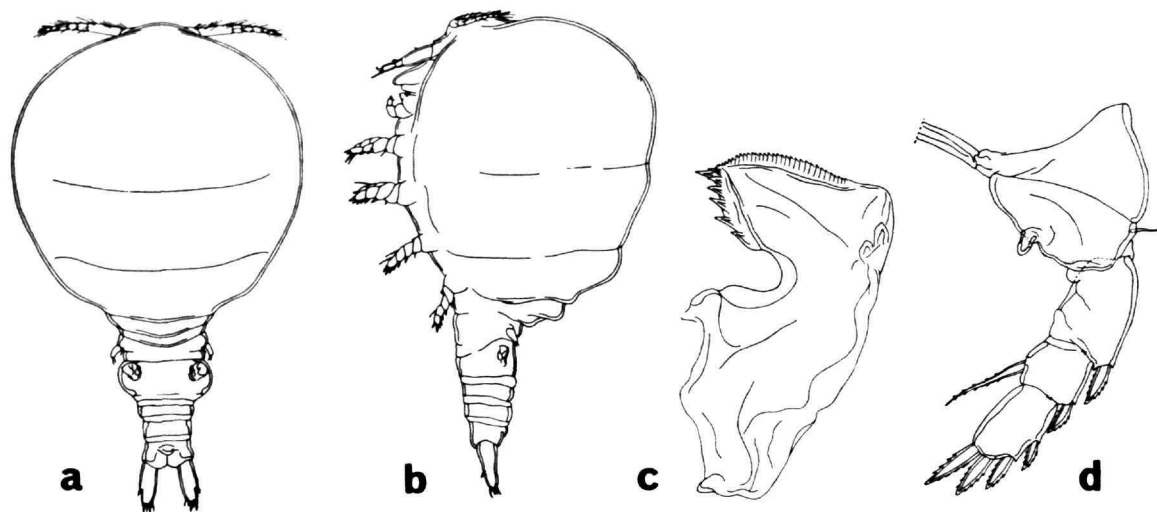


FIGURE 162.—*Ravahina tumida* Humes and Ho. Female: a, dorsal; b, lateral; c, mandible; d, leg 4. (From Humes and Ho, 1968a, figs 241, 242, 251, 258.) Length of female, 1.67-1.97 mm.

Genus *Schedomolgus* Humes and Stock, 1972

DIAGNOSIS.—Body cyclopiform. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six moderately short setae. Rostrum not well developed. First antenna 7-segmented, in the female with the armature 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male with the formula 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 3-segmented (apparently from a fusion of the original third and fourth segments). First and second segments with one seta. Third segment either without a trace of the inner setae or, at most, with only minute spiniform projections, and with a single terminal claw.

Labrum with a deep cleft separating the two lobes. Mandible with the basal area distal to the indentation having on its convex side four slender, digitiform processes followed by a broadly triangular process and then a serrated fringe and on its concave side two lobes bearing long spinules; lash long. Paragnath a small hairy lobe. First maxilla with three elements. Second maxilla of the usual

lichomolgid form. Maxilliped in the female 3-segmented and with a pointed tip; in the male 4-segmented (recognizing the proximal part of the claw as a fourth segment).

Legs 1-4 with 3-segmented rami except for leg 4 endopod which is 2-segmented. Leg 4 exopod with the third segment having 11, 1, 5. Leg 4 endopod with 0-1; 11, the seta being feathered. Armature similar in both sexes except for the last segment of leg 1 endopod in the male being 1, 1, 4 instead of 1, 5 as in the female. Leg 5 with a free segment bearing two setae. Leg 6 represented in the female by the two setae and the process near the area of attachment of each egg sac, in the male by a ventral posterolateral flap on the genital segment bearing two setae.

Other features as in the species below.

Associated with madreporarians.

TYPE-SPECIES.—*Schedomolgus arcuatipes* (Humes and Ho).

ETYMOLOGY.—The name is a combination of the Greek words *σχεδον* (near), alluding to the affinity of this genus with lichomolgid genera, and *μολγος*. Gender masculine.

Key to Species of the Genus *Schedomolgus*

FEMALES

- First postgenital segment with a prominent posteroventral lobe; second segment of first antenna without sclerotizations on proximal dorsal surface *S. lobophorus*
 First postgenital segment without a posteroventral lobe; second segment of first antenna with small sclerotizations on proximal dorsal surface *S. arcuatipes*

MALES

- Second postgenital segment with a prominent posteroventral lobe; free segment of leg 5, 68 x 19 μ , with small spinules; second segment of first antenna without sclerotizations on proximal dorsal surface *S. lobophorus*
 Second postgenital segment without a posteroventral lobe; free segment of leg 5, 48 x 12 μ , without ornamentation; second segment of first antenna with small sclerotizations on proximal dorsal surface *S. arcuatipes*

Schedomolgus arcuatipes (Humes and Ho, 1968)

FIGURE 163

Lichomolgus arcuatipes Humes and Ho, 1968a, pp. 362-364 figs. 79-104 [from the hard coral *Acropora paliifera* (Lamarck), region of Nosy Bé, northwestern Madagascar].

Schedomolgus lobophorus (Humes and Ho, 1968)

Lichomolgus lobophorus Humes and Ho, 1968a, pp. 364-366, figs. 105-133 [from the hard corals *Acropora scherzeriana*

Brueggemann, *Acropora* sp., and *Acropora cytherea* Dana, region of Nosy Bé, Madagascar].

NEW HOST.—15 ♀♀, 13 ♂♂, and 1 copepodid from the madreporarian *Acropora florida* (Dana), in 2 m, Rigili Island, Eniwetok Atoll, Marshall Islands, 3 July 1969; 3 ♀♀, 2 ♂♂ from *Acropora florida*, in 4 m, south end of Parry Island, Eniwetok Atoll, 5 July 1969. Both collections by AGH.

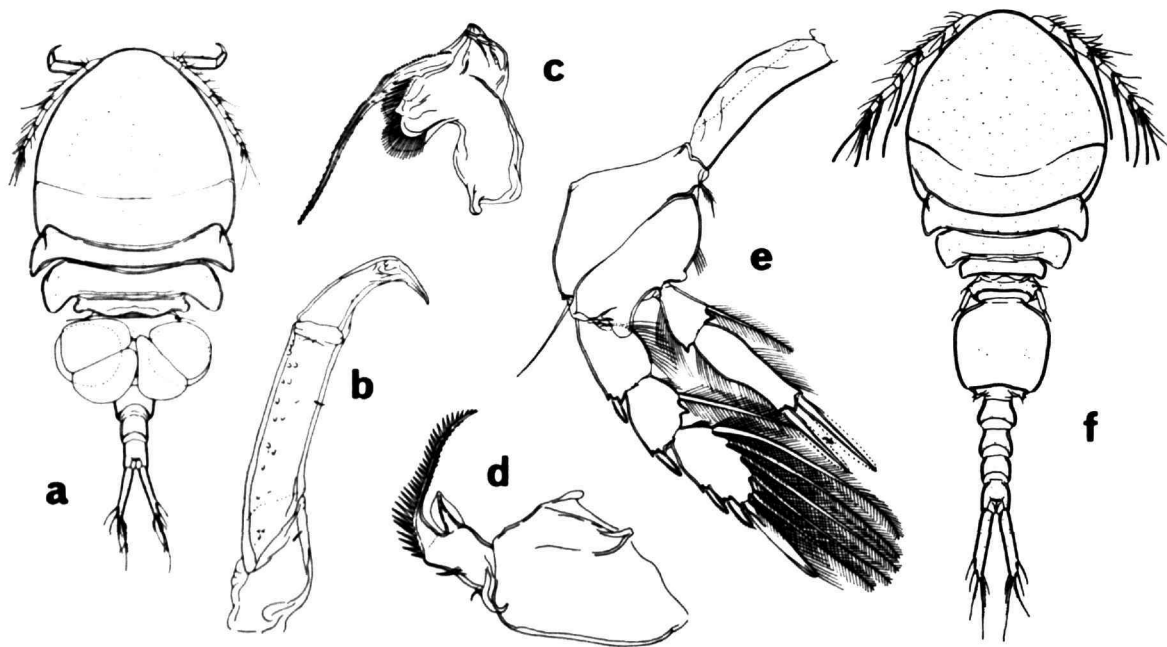


FIGURE 163.—*Schedomolgus arcuatipes* (Humes and Ho). Female: *a*, dorsal; *b*, second antenna; *c*, mandible; *d*, second maxilla; *e*, leg 4 and intercoxal plate. Male: *f*, dorsal. (From Humes and Ho, 1968a, figs. 79, 85, 87, 90, 96, 98.) Length of female 1.06 mm, of male 1.23 mm.

Genus *Sewellochiron* Humes, 1969

DIAGNOSIS.—Body cyclopiform. Urosome 5-segmented in the female, 6-segmented in the male. Caudal ramus with six setae. Rostrum broadly triangular with a rounded tip. First antenna 7-segmented, the armature in the female being 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male, 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 3-segmented (the original third and fourth segments fused), with the formula 1,1,3 + 1 and 6 setae, there being one terminal claw (but one of the six setae almost clawlike).

Labrum with a deep, median cleft between the two lobes. Mandible with the concave side having a deep incision followed by a row of spinules and the convex side having a scalelike area with a row of spinules, followed by a hyaline spike, and then by a row of toothlike serrations. Paragnath a small hairy lobe. First maxilla with four setae. Second maxilla of the usual lichomolgid type. Maxilliped

of the female 3-segmented, the third segment indistinctly set off from the second and with a spiniform tip. Maxilliped of the male 4-segmented (recognizing the proximal part of the claw as the fourth segment).

Legs 1–4 with 3-segmented rami, except for leg 4 endopod which consists of a single segment. Armature of the usual lichomolgidiform pattern, except leg 4 endopod which has two spines and is distinctly shorter than the exopod in both sexes. Formula for the male similar except for leg 1 endopod where the third segment is I,I,5 instead of I,5 as in the female. Leg 5 in both sexes with a free segment bearing two terminal elements (a spine and a seta). Leg 6 in the female represented by the two setae and the spiniform process near the area of attachment of each egg sac, in the male by a posteroventral flap on the genital segment bearing two setae and a minute spiniform process.

Other features as in the species below.

Associated with scyphozoan medusae.

TYPE-SPECIES.—*Sewellochiron fidens* Humes.

Sewelochiron fidens Humes, 1969

FIGURE 164

Sewelochiron fidens Humes, 1969e, pp. 172-182, figs. 1-27 [associated with the medusa *Cassiopea xamachana* R. P. Bigelow, near La Parguera, southwestern Puerto Rico].

Genus *Spaniomolgus* Humes and Stock, 1972

DIAGNOSIS.—Body cyclopiform or modified. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six short setae, the two median terminal ones expanded. Rostral area without a posteroventral border but with long setules. First antenna 7-segmented, in the female with the formula 1, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male with the

armature 1, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 3-segmented (apparently the result of fusion of the original third and fourth segments). First and second segments with one seta. Third segment with three small vestigial elements and terminally bearing a single small claw plus several minute elements.

Labrum with the two lobes separated by a deep cleft. Mandible with the basal area beyond the indentation having on its convex side a large hyaline expansion followed by a serrated fringe and on its concave side rows of spinules; lash long. Paragnath a small hairy lobe. First maxilla with four elements. Second maxilla of the usual lichomolgid form. Maxilliped in the female 3-seg-

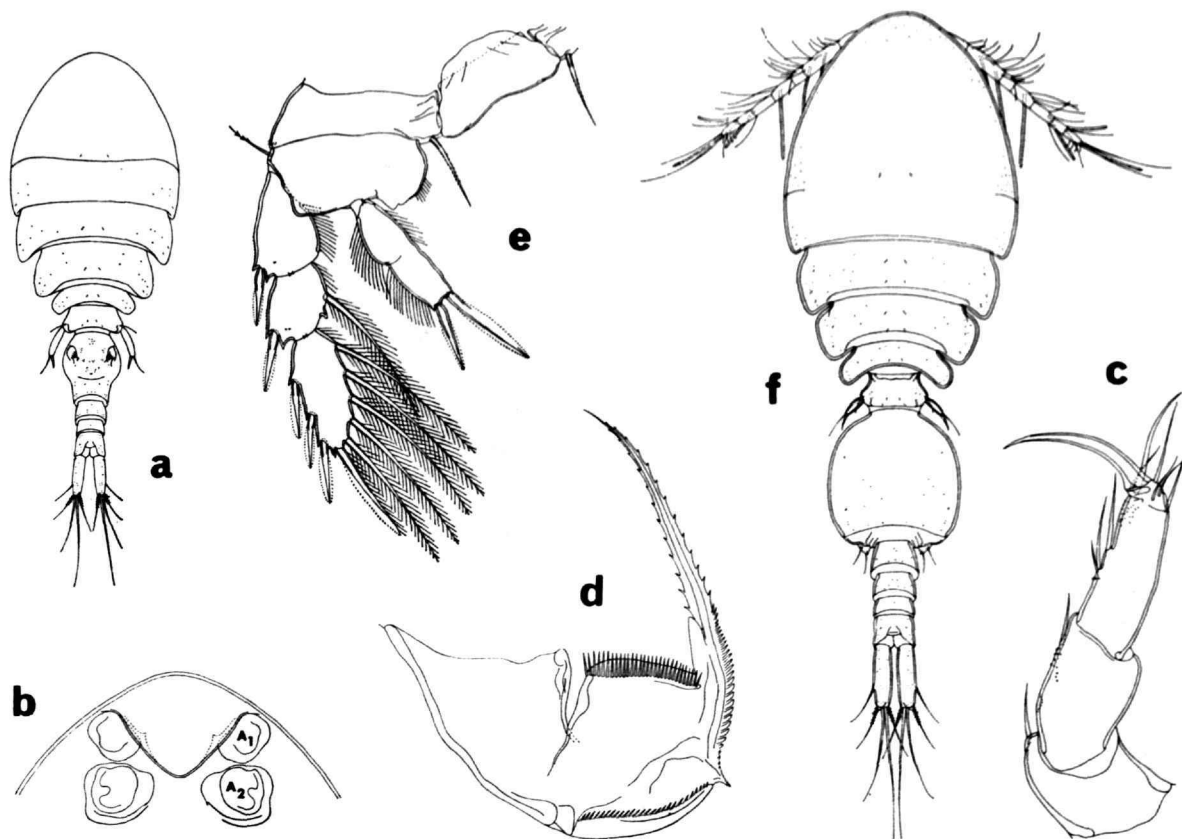


FIGURE 164.—*Sewelochiron fidens* Humes. Female: a, dorsal; b, rostrum; c, second antenna; d, mandible; e, leg 4 and intercoxal plate. Male: f, dorsal. (From Humes, 1969e, figs. 1, 7, 10, 12, 21, 23.) Length of female 1.84 mm, of male 1.43 mm.

mented with a pointed tip, in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1-4 with 3-segmented rami except for leg 4 endopod which is 2-segmented. Leg 4 exopod with the third segment having II, I, 5. Leg 4 endopod with the formula 0-1; II, the seta being feathered. Leg 1 endopod of the male with the third segment I, I, 4 or I, 5. Leg 5 with a free segment bearing two setae. Leg 6 in the female represented by the two setae and the process near the area of attach-

ment of each egg sac, in the male by the ventral posterolateral flap on the genital segment bearing two setae.

Other features as in the species below.

Associated with madreporarians.

TYPE-SPECIES.—*Spaniomolgus compositus* (Humes and Frost, 1964).

ETYMOLOGY.—The name is a combination of the Greek words *σπανιος* (few, or scanty), referring to the presence of only one seta on the first segment of the first antenna, and *μολγος*. Gender masculine.

Key to Species of the Genus *Spaniomolgus*

FEMALES

1. Prosome unusually broad and thickened, ratio 1.07:1, urosome slender; caudal ramus 2.87:1; outer spines on leg 4 exopod with smooth lamellae *S. crassus*
 Prosome not unusually broad, ratio 1.27:1 or 1.38:1; caudal ramus 5:1 or 9.1:1; outer spines on leg 4 exopod with barbed lamellae 2
2. Caudal ramus 9.1:1; free segment of leg 5, 147 x 14 μ (10.5:1) *S. geminus*
 Caudal ramus 5:1; free segment of leg 5, 135 x 17 μ (7.9:1) *S. compositus*

MALES

1. Third segment of leg 1 endopod with I, 5 as in female *S. crassus*
 Third segment of leg 1 endopod with I, I, 4 2
2. Caudal ramus 7.4:1; middle spine on leg 2 endopod modified, with truncated tip *S. geminus*
 Caudal ramus 4.7:1; middle spine on leg 2 endopod not modified *S. compositus*

Spaniomolgus compositus (Humes and Frost, 1964)

FIGURE 165

Lichomolgus compositus Humes and Frost, 1964, pp. 137-139, figs. 66-98 [from the hard coral *Seriatopora subseriata* Ehrenberg, Nosy Bé, northwestern Madagascar].—Bouligand, 1966, p. 269.—Humes and Ho, 1968a, p. 371 [from the hard coral *Seriatopora octoptera* Ehrenberg and *Seriatopora* sp., region of Nosy Bé, Madagascar].

NEW RECORD.—103 ♀♀, 28 ♂♂, and 6 copepodids from *Seriatopora* sp., in 2 m, Ambariobe, a small island almost between Nosy Komba and Nosy Bé, Madagascar, 25 May 1967, collected by AGH.

Spaniomolgus crassus (Humes and Ho, 1968)

Lichomolgus crassus Humes and Ho, 1968a, pp. 368-371, figs. 151-182 [from the hard corals *Stylophora pistillata* (Esper), *Stylophora mordax* (Dana), and *Acropora* sp., region of Nosy Bé, Madagascar].

Spaniomolgus geminus (Humes and Ho, 1968)

Lichomolgus geminus Humes and Ho, 1968a, pp. 366-368, figs. 134-150 [from the hard corals *Stylophora pistillata*, *Stylophora mordax*, and *Acropora* sp., region of Nosy Bé, Madagascar].

NEW RECORD.—26 ♀♀, 24 ♂♂, and 16 copepodids from *Stylophora* sp., in 4 m, Antsamantsara, Nosy Bé, Madagascar, 6 June 1967, collected by AGH.

Genus *Stellicola* Kossmann, 1877

DIAGNOSIS.—Body cycloform, in the female with a broad prosome and relatively short urosome. Urosome in the female 5-segmented, in the male fundamentally 6-segmented but with the segment of leg 5 fused with the genital segment. Genital segment in the female wider than long. Caudal ramus with six setae. Rostrum broadly rounded or

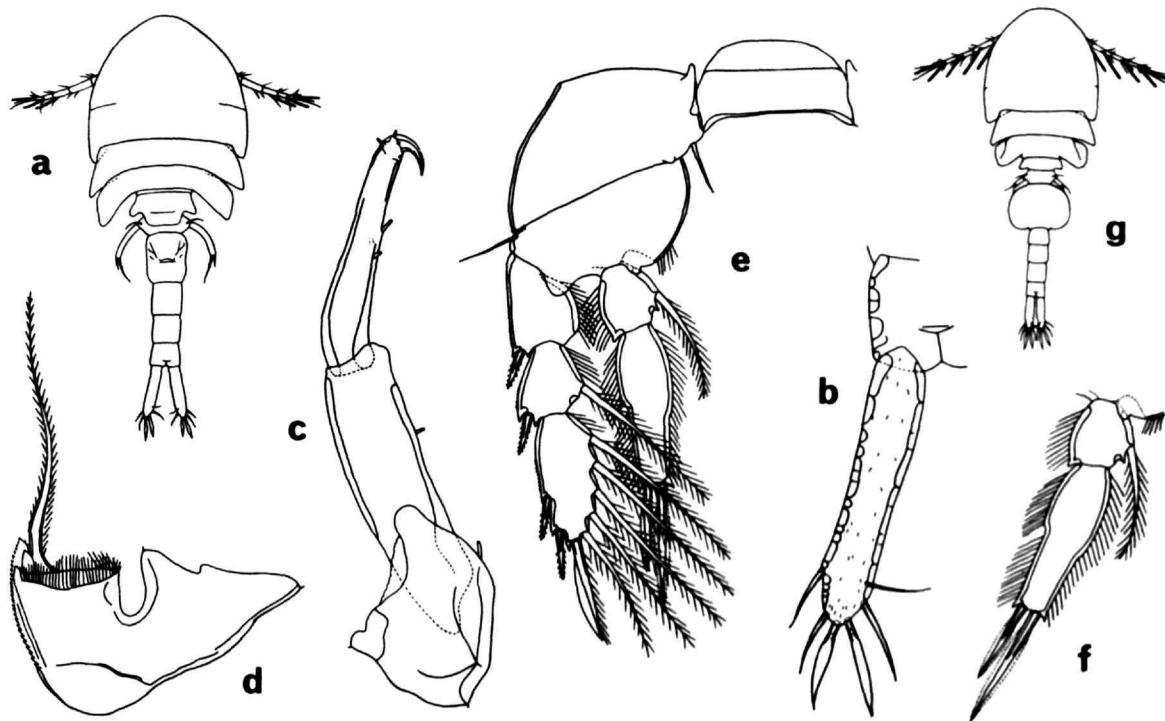


FIGURE 165.—*Spaniomolgus compositus* (Humes and Frost). Female: a, dorsal; b, caudal ramus; c, second antenna; d, mandible; e, leg 4 and intercoxal plate; f, endopod of leg 4. Male: g, dorsal. (From Humes and Frost, 1964, figs. 66, 70, 75, 77, 87, 88, 90.) Length of female 1.58 mm, of male 1.21 mm.

truncated. First antenna 7-segmented, in both sexes with the armature 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 3-segmented, the third segment being the result of fusion of two original segments; formula 1,1, and 3 + one terminal claw + several small elements.

Labrum deeply incised medially. Mandible with the basal area distal to the constriction having on its convex side a row of spinules or a serrated fringe and on its concave side a row of spinules; lash long. Paragnath a small hairy lobe. First maxilla with four elements. Second maxilla with the initial few teeth on the lash enlarged and with an unusually strong, spinose, auxiliary element. Maxilliped in the female 3-segmented and with pointed tip; in the male 4-segmented (assuming that the

proximal part of the claw represents a fourth segment) except in *L. femineus* (see below).

Legs 1-4 with 3-segmented rami, except leg 4 endopod which is 2-segmented. Armature lichomolgidiiform in pattern. Leg 4 exopod with the third segment having II, I, 5. Leg 4 endopod with 0-1; II, 1 or, (in *S. pollex*) 0-0; II. Basis of leg 4 in both sexes laterally elongated. No sexual dimorphism in the formula of leg 1 endopod. Leg 5 with a free segment with two terminal elements. Leg 6 represented by the two setae near the genital openings.

Other features as in the species below.

Associated mainly with asteroid echinoderms.

TYPE-SPECIES.—*Stellicola thorelli* Kossmann.

REMARKS.—The males of four species are unknown.

Key to Species of the Genus *Stellicola*

FEMALES

1. Endopod of leg 4 with formula 0-0;II *S. pollex*
Endopod of leg 4 with formula 0-1;II,1 2
2. Genital segment with two posterior dorsal sclerotized elevations *S. caeruleus*
Genital segment without such elevations 3
3. Free segment of leg 5 a little more than 3:1 4
Free segment of leg 5 less than 3:1 5
4. Body length 1.41 mm; genital segment 135 x 239 μ , much wider than long; several setae on first antenna with short hairs *S. femineus*
Body length 1.00 mm; genital segment 130 x 177 μ , wider than long; all setae on first antenna naked *S. illgi*
5. Ratio of body length to width about 1.28:1 *S. longicaudatus*
Ratio of body length to width about 1.5:1 6
6. Two setae on segment of leg 5 about equal in length 7
Two setae on segment of leg 5 distinctly unequal in length 8
7. Basis of leg 4 greatly elongated, ratio of its length to length of exopod about 13.5:5 *S. pleurobranchi*
Basis of leg 4 not as greatly elongated, ratio of its length to length of exopod about 9:5 *S. oreastriphilus*
8. Postgenital segments and caudal rami together more than four times as long as genital segment *S. thorelli*
Postgenital segments and caudal rami together only a little longer than genital segment or shorter than that segment 9
9. Postgenital segments and caudal rami together a little longer than genital segment *S. curticaudatus*
Postgenital segments and caudal rami together a little shorter than genital segment *S. holothuriae*

KNOWN MALES

1. With thumblike process on third segment of second antenna; formula of endopod of leg 4, 0-0;II *S. pollex*
Without such a thumblike process; formula of endopod of leg 4, 0-1;II,1 2
2. Maxilliped with last segment having a serrated truncated tip instead of being attenuated and clawlike *S. illgi*
Maxilliped with last segment being pointed and clawlike 3
3. Maxilliped female-like, with terminal spiniform process instead of a claw *S. femineus*
Maxilliped with a distinctly prehensile claw 4
4. Maxilliped elongated, 4-segmented, with long prehensile claw *S. oreastriphilus*
Maxilliped small, 2-segmented, with relatively small but prehensile claw 5
5. First segment of second maxilla with three peculiar sclerotized processes *S. caeruleus*
First segment of second maxilla without such processes *S. holothuriae*

Stellicola thorelli Kossmann, 1877

Stellicola thorelli Kossman, 1877, pp. 11-13, pl. 1, fig. 1 [from the asteroid *Ophidiaster multifloris* M. and Tr., Red Sea].—Stock, 1957, p. 382.—Humes and Ho, 1967e, p. 222.

REMARKS.—The male is unknown.

Stellicola caeruleus (Stebbing, 1900)

Linchiomolgus caeruleus Stebbing, 1900, pp. 664-666, pl. 74a [from the asteroid *Linchia*, Feather Island, China straits, eastern end of New Guinea].—Clark, 1921, p. 636.

Stellicola semperi.—Monod and Dollfus, 1952a, p. 142.

Stellicola caeruleus.—Stock, 1957, p. 382.—Humes and Ho, 1967e, pp. 219-221, pl. 15, figs. 121-128; pl. 16, figs. 129-134; pl. 17, figs. 135-141.

Stellicola curticaudatus (Thompson and A. Scott, 1903)

Paralichomolgus curticaudatus.—Thompson and A. Scott, 1903, pp. 281, 282, pl. 16, figs. 1-7 [from washing of dredged invertebrates, Ceylon].—A. Scott, 1909, p. 267 [*Siboga* Station 226, midway between the Lucipara and Schildpad Islands].

Lichomolgus (Stellicola) curticaudatus.—Monod and Dollfus, 1932a, p. 139.

Stellicola curticaudatus.—Stock, 1957, p. 382.—Humes and Ho, 1967e, p. 222.

REMARKS.—The male is unknown.

Stellicola femineus Humes and Ho, 1967

Stellicola femineus Humes and Ho, 1967e, pp. 213–215, pl. 8, fig. 67; pl. 9, figs. 68–75; pl. 10, figs. 76–84; pl. 11, figs. 85–92 [from the asteroids *Leiaster leachi* Gray and *Leiaster speciosus* von Martens, region of Nosy Bé, Madagascar].

REMARKS.—The male of this species is unusual in having a female-like maxilliped, without a long terminal claw.

Stellicola holothuriae (Ummerkutty, 1962)

Lichomolgus holothuriae Ummerkutty, 1962, pp. 52–55, pl. 8, figs. 4–12, pl. 9, figs. 1–5 [from holothurian washings, Gulf of Mannar, southeastern India].

Stellicola holothuriae.—Humes and Ho, 1967e, p. 222.

Stellicola illgi, new species

FIGURES 166–168

TYPE MATERIAL.—104 ♀♀, 14 ♂♂ from the sea star *Linckia laevigata* (Linnaeus), Urukthapel, Palau Islands, 21 July 1955; USNM 206221. Holotype ♀, allotype, and 109 paratypes (99 ♀♀, 10 ♂♂) deposited in USNM, the remaining paratypes (dissected) in the collection of AGH.

OTHER MATERIAL EXAMINED.—226 ♀♀, 262 ♂♂, and 8 copepodids from 10 specimens of *Linckia laevigata*, in 2 m, behind reef at Nukumbutho Passage, southeast of Suva, Viti Levu, Fiji, 13 August 1971, collected by AGH. These copepods were readily visible crawling over the body surface of the sea stars.

FEMALE.—The body (Figure 166a) has a broad, flattened prosome and relatively short urosome. The length (not including the setae on the caudal rami) is 1.00 mm (0.94–1.06 mm) and the greatest width 0.74 mm (0.72–0.80 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1:1. The segment of leg 1 is fused with the cephalosome. The epimera of the segments of legs 1–3 are characteristically formed as illustrated in the figure. The segment

of leg 4 is small, without expanded epimera, and partly covered in dorsal view by the tergum of the preceding segment. The ratio of the length of the prosome to that of the urosome is 2.18:1.

The segment of leg 5 (Figure 166b) is 112 x 195 µ. There is no ventral intersegmental sclerite between that segment and the genital segment. The genital segment is 130 x 177 µ, wider than long. The areas of attachment of the egg sacs are situated ventrolaterally in the posterior part of the segment. Each area (Figure 166c) bears a plumose seta, 44 µ, mounted on an elongated, well-sclerotized base (shown in detail in Figure 166d), a unilaterally spinulose seta, 27 µ, and a small spinous process. The neck of the egg sac enters the segment ventral to the two setae. The three post-genital segments are 42 x 78 µ, 35 x 70 µ, and 44 x 66 µ (greatest width). The posterodorsal margin of the anal segment bears on each side a row of very small spinules.

The caudal ramus (Figure 166e) is short, 29 x 23 µ in greatest dimensions. The outer lateral seta is 65 µ and naked. The dorsal seta is 50 µ and naked. The outermost terminal seta is 130 µ with lateral spinules, those on the proximal inner side being especially strong. The innermost terminal seta is 114 µ with strong proximal outer spinules. The two median terminal setae are 315 µ (outer) and 528 µ (inner), both weakly haired and inserted dorsally to a small ventral flap with a row of minute spinules. There is a prominent setule on the proximal outer edge of the ramus.

The body surface bears a few small hairs (sensilla) as indicated in Figure 166a,b.

The egg sac (Figure 166a) is elongated, 485–500 x 230 µ, broadest distally, and tapering proximally near the attachment. The numerous eggs are about 56 µ in diameter.

The rostrum (Figure 166f) is broad with slightly angular lateral margins.

The first antenna (Figure 167a) is 331 µ long. The lengths of the seven segments (measured along their posterior nonsetiferous margins) are 13 (47 µ along the anterior margin), 138, 42, 49, 26, 15, and 14 µ respectively. The formula for the armature is 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All the setae are naked.

The second antenna (Figure 167b) is 330 µ long and 3-segmented, without a trace of division of the third segment. The first two segments bear an

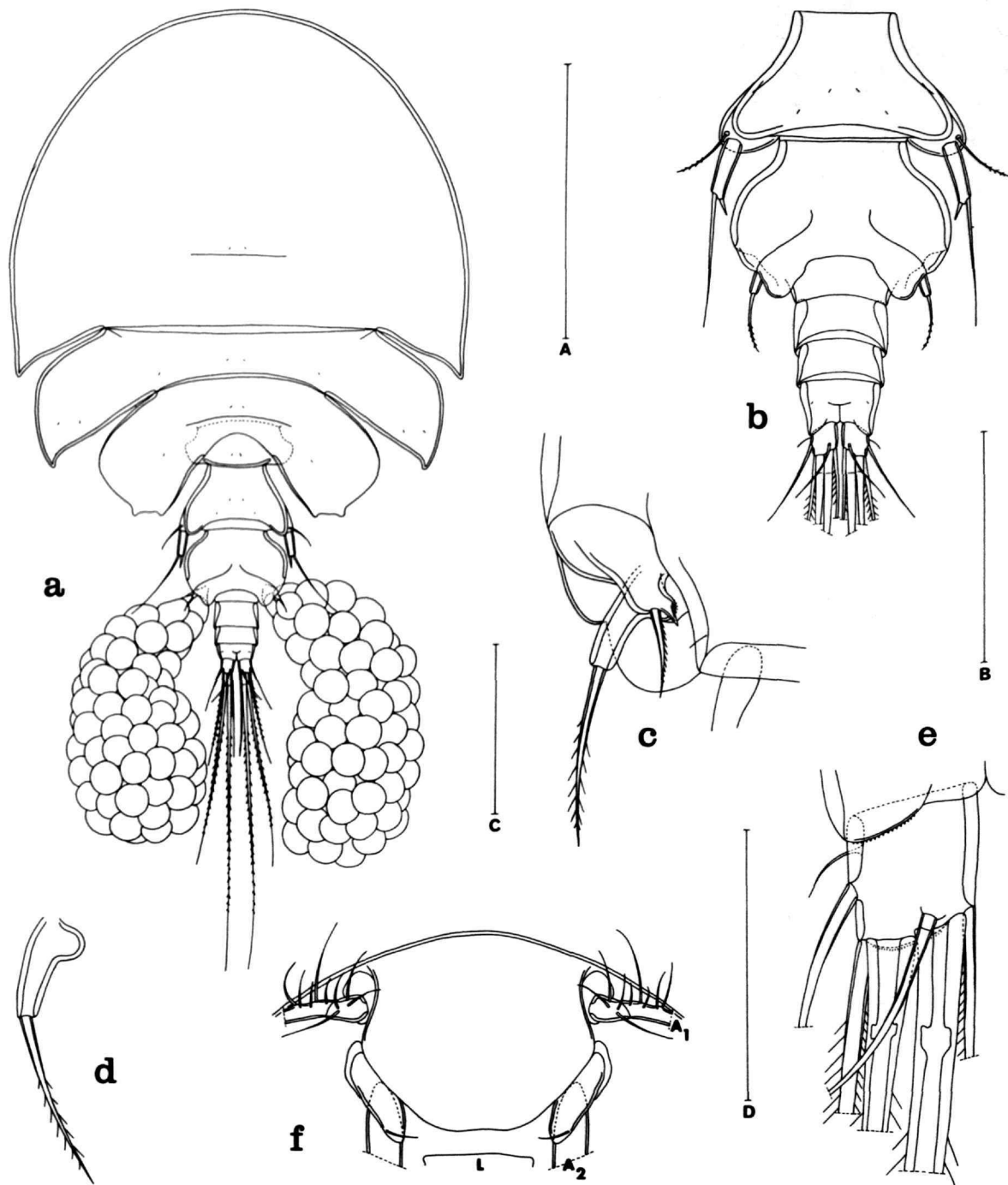


FIGURE 166.—*Stellicola illgi*, new species. Female: *a*, dorsal (A); *b*, urosome, dorsal (B); *c*, area of attachment of egg sac, ventral (C); *d*, base of seta of leg 6, dorsal (D); *e*, caudal ramus, dorsal (D); *f*, rostrum, ventral (A₁, A₂). Scale: A, 0.5 mm; B, 0.2 mm; C, D, 0.05 mm.

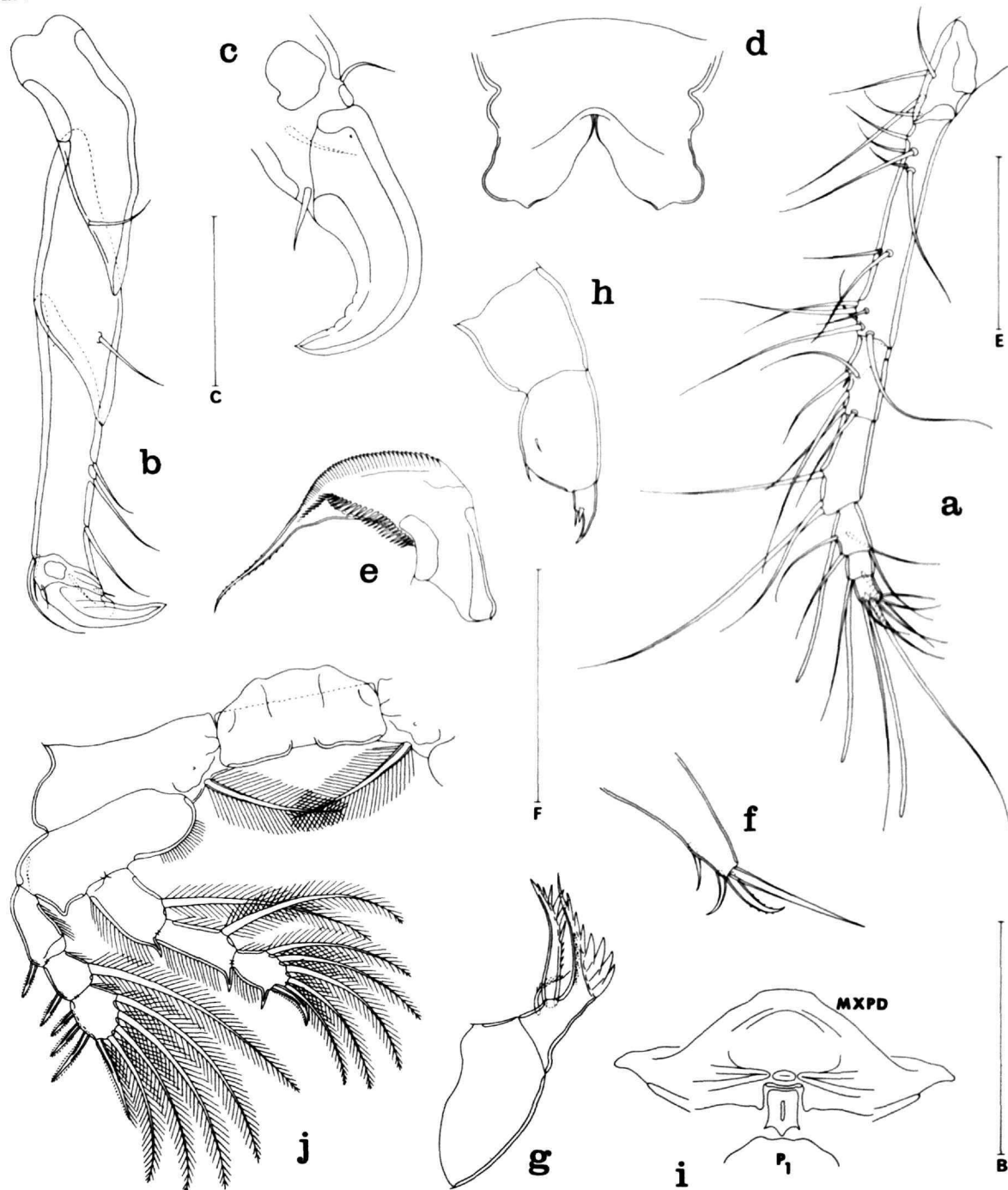


FIGURE 167.—*Stellicola illgi*, new species. Female: *a*, first antenna, dorsal (E); *b*, second antenna, posterior (E); *c*, claw on second antenna, flat view and anterior (C); *d*, labrum, ventral (E); *e*, mandible, posterior (F); *f*, first maxilla, posterior (C); *g*, second maxilla, anterior (F); *h*, maxilliped, posterior (E); *i*, area between maxillipeds and first pair of legs, ventral (B); *j*, leg I and intercoxal plate, anterior (E). Scale: B, 0.2 mm; C, 0.05 mm; E, F, 0.1 mm.

unusually long seta. The last segment, 148 μ along its outer edge, 94 μ along its inner edge, and 31 μ wide, bears three inner setae; terminally there is a single claw, 70 μ along its axis (turned ventrally in Figure 167*b* but shown in flat view in Figure 167*c*), and five setae. All the setae are naked.

The labrum (Figure 167*d*) has two divergent posteroventral lobes.

The mandible (Figure 167*e*) bears a serrated fringe along its convex margin; the concave margin is not noticeably indented and bears a row of spinules which continues on the posterior surface of the base. The lash is moderately long and bears small lateral spinules. The paragnath is a small lobe with a few hairs, located medially to the first maxilla. The first maxilla (Figure 167*f*) bears four elements. The second maxilla (Figure 167*g*) has a relatively small, unarmed first segment. The second segment bears a surficial posterior barbed seta and a large inner spine with strong unilateral spinules. The terminal lash is short (about as long as the inner spine) and bears strong teeth and a posterior row of spines. The maxilliped (Figure 167*h*) is 3-segmented. The second segment bears two small setae. The third segment has a hyaline setule and a small spine and terminates in a spiniform process. All the elements are naked.

The ventral surface between the maxillipeds and the first pair of legs (Figure 167*i*) is not protuberant.

Legs 1-4 (Figures 167*j*, 168*a-c*) have 3-segmented rami except for the endopod of leg 4 which is 2-segmented. The spinal and setal formula is as follows:

P ₁	coxa	0-1	basis	1-0	exp	1-0;	I-1;	III,I,4
					enp	0-1;	0-1;	I,5
P ₂	coxa	0-1	basis	1-0	exp	1-0;	I-1;	III,I,5
					enp	0-1;	0-2;	I,II,3
P ₃	coxa	0-1	basis	1-0	exp	1-0;	I-1;	III,I,5
					enp	0-1;	0-2;	I,II,2
P ₄	coxa	0-1	basis	1-0	exp	1-0;	I-1;	II,I,5
					enp	0-1;	II,1	

The inner coxal seta of legs 1-3 is long and plumose but in leg 4 this seta is minute (6 μ) and naked. The basis becomes progressively more elongated laterally until in leg 4 it is about 5.5 times longer than wide. The exopod of leg 4 is 58 μ long. The first segment of the endopod is 25 x 14 μ , with its inner distal naked seta 30 μ . The second segment is 31 x 13 μ , with its two

barbed spines 22 μ (outer) and 61 μ (inner) and its inner plumose seta 66 μ . Hairs are present on the outer margins of both segments and on the inner margin of the second segment.

Leg 5 (Figure 168*d*) has an unornamented free segment, 50 x 15 μ (greatest length, width at middle). The two terminal elements are 15 μ (finely barbed) and 127 μ (naked). The adjacent seta on the body is 55 μ and plumose.

Leg 6 is represented by the two setae near the attachment of each egg sac (Figure 166*c*).

The color in life is unknown.

MALE.—The body (Figure 168*e*) in general outline is similar to that of the female. The length (without the ramal setae) is 0.60 mm (0.55-0.64 mm) and the greatest width 0.43 mm (0.41-0.43 mm), based on seven specimens in lactic acid. The ratio of the length to the width of the prosome is 1.02:1. The ratio of the length of the prosome to that of the urosome is 1.64:1.

The segment of leg 5 is fused with the genital segment (Figure 168*f*), the combined segment being 180 x 138 μ . The four postgenital segments are 27 x 60 μ , 24 x 54 μ , 22 x 46 μ , and 23 x 41 μ (width at the middle) from anterior to posterior.

The caudal ramus resembles that of the female but is smaller, 16 x 15 μ , and of slightly different proportions.

The rostrum, first antenna (without added aesthetes), and second antenna are like those of the female.

The labrum (Figure 168*g*) has more elaborately outlined lobes than in the female.

The mandible, paragnath, first maxilla, and second maxilla are similar to those of the female. The maxilliped (Figure 168*h*) is small, 4-segmented, and somewhat twisted. The first segment is unarmed. The second segment bears two small, naked setae and a hyaline crest with a serrated edge. The small third segment is unarmed. The elongated fourth segment is not clawlike but bears a long, naked seta and has a serrated tip.

The ventral area between the maxillipeds and the first pair of legs is like that of the female.

Legs 1-4 are like those of the female.

Leg 5 is similar to that of the female but the free segment is smaller, 22 x 8 μ .

Leg 6 (Figure 168*i*) is a posteroventral flap on the genital segment bearing two naked setae, 52 μ and 28 μ .

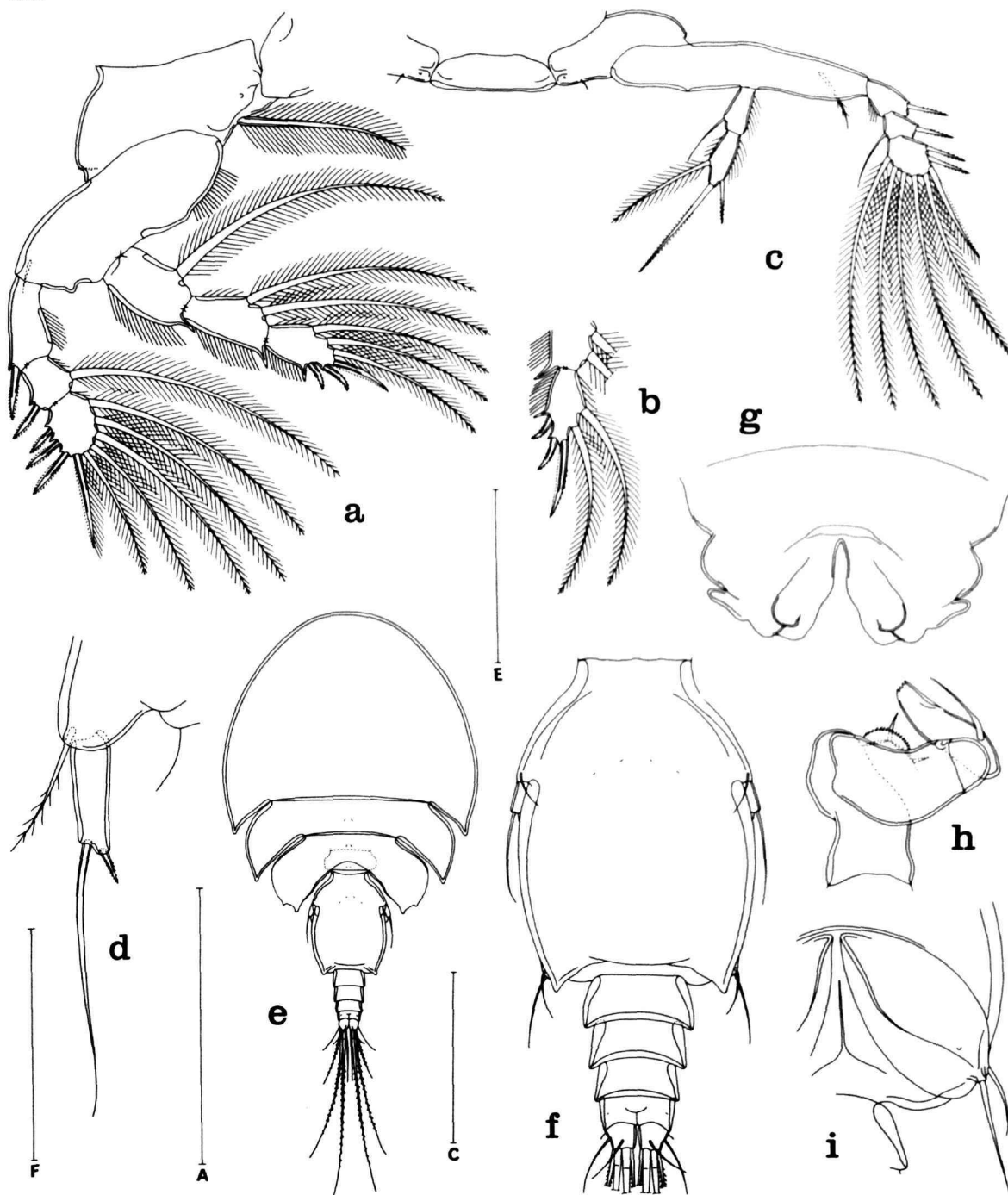


FIGURE 168.—*Stellicola ilgi*, new species. Female: *a*, leg 2, anterior (E); *b*, third segment of endopod of leg 3, anterior (E); *c*, leg 4 and intercoxal plate, anterior (E); *d*, leg 5, ventral (F). Male: *e*, dorsal (A); *f*, urosome, dorsal (E); *g*, labrum, ventral (C); *h*, maxilliped, postero-outer (C); *i*, leg 6, ventral (F). Scale: A, 0.5 mm; C, 0.05 mm; E, F, 0.1 mm..

The spermatophore was not observed.

The color in life is unknown.

ETYMOLOGY.—This species is named for Dr. Paul L. Illg, of the University of Washington, who most generously sent us the specimens for study.

REMARKS.—*Stellicola illgi* may be distinguished from other species in the genus by a combination of the following characters: the short lash on the second maxilla, the second endopod segment of leg 4 with two spines and a plumose seta, the size and form of leg 5, and the nature of the male maxilliped (without a true claw).

***Stellicola longicaudatus* (Thompson and A. Scott, 1903)**

Paralichomolgus longicaudatus Thompson and A. Scott, 1903, p. 282, pl. 20, figs. 6–8 [from washings of dredged invertebrates, Ceylon].

Stellicola longicaudatus.—Humes and Ho, 1967e, p. 222.

REMARKS.—The male is unknown.

***Stellicola oreastriphilus* Kossman, 1877**

Stellicola oreastriphilus Kossman, 1877, p. 13, pl. 2, fig. 1 [from the asteroid *Asteropsis carinifera* M. Tr., Red Sea].—Humes and Ho, 1966b, pp. 100, 101 [from the asteroid *Choriaster granulatus* (Lütken), region of Nosy Bé, Madagascar]; 1967e, pp. 218, 219, pl. 14, figs. 115–120 [from the asteroid *Protoreaster nodosus* (Linnaeus), Nosy Bé, Madagascar].

Lichomolgus (*Stellicola*) *oreastriphilus*.—Humes and Cressey, 1961c, pp. 83–92, figs. 1–31 [from the asteroids *Protoreaster lincki* (Blainville), *Culcita schmideliana* (Retzius), *Pentaceraster mammillatus* (Audouin), and *Poraster superbus* (Möbius), region of Nosy Bé, Madagascar].

***Stellicola pleurobranchi* Kosmann, 1877**

Stellicola pleurobranchi Kosmann, 1877, pp. 15–16, pl. 3, fig. 3 [from the tectibranch *Pleurobranchus*, Palau Archipelago].—Aurivillius, 1883, p. 3.—Stock, 1957, p. 382.—Humes and Ho, 1967e, p. 222.

Lichomolgus (*Stellicola*) *pleurobranchi*.—Monod and Dollfus, 1932a, p. 143.

REMARKS.—The male is unknown.

***Stellicola pollex* Humes and Ho, 1967**

Stellicola pollex Humes and Ho, 1967e, pp. 216–218, pl. 2, fig. 93; pl. 12, figs. 94–101; pl. 13, figs. 102–109; pl. 14, figs. 110–114 [from the asteroid *Linckia laevigata* (Lin-

naeus), 13°59' S, 47°46' 30" E, Nosy Ovy, southwest of Nosy Bé, Madagascar].

NEW HOSTS.—From three specimens of *Linckia diplx* (Müller and Troschel): 2 ♀♀, 1 ♂; 9 ♀♀, 39 ♂♂; and 6 ♀♀, 2 ♂♂, 2 copepodids; subtidal, Hookena, Hawaii, 2 January 1959, collected by P. L. Illg.

From ten specimens of *Linckia multiflora* (Lamarck): 3 ♀♀, 2 ♂♂, Hawaiian Islands, 13 December 1958, collected by A. H. Banner.

From a single specimen of *Linckia guildingi* Gray: 3 ♀♀, 5 ♂♂, 2 copepods, subtidal, Hookena, Hawaii, 2 January 1959, collected by P. L. Illg.

Genus *Synstellicola* Humes and Stock, 1972

DIAGNOSIS.—Body cyclopiform, the prosome not greatly widened, the urosome relatively long. Urosome in the female 4-segmented, in the male 5-segmented (though in *S. kossmanni* and *S. acanthasteris* the anal segment in both sexes has an indication of division). Caudal ramus with six setae. Rostrum rounded. First antenna 7-segmented, in both sexes with the armature 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 3-segmented, the third segment the result of fusion of two original segments (this segment sometimes showing an incomplete division line), the formula being 1, 1, and 3 + 1 terminal claw + several small elements.

Labrum deeply incised medially. Mandible with the basal area distal to the indentation having on its convex side a row of teeth and on its concave side a row of spinules; lash long. Paragnath a small hairy lobe. First maxilla with four elements. Second maxilla with the initial few teeth on the lash often enlarged. Maxilliped in the female 3-segmented and with a pointed tip, in the male 4-segmented (considering the proximal part of the claw to represent a fourth segment).

Legs 1–4 with 3-segmented rami, except leg 4 endopod which is 2-segmented. Armature lichomolgiform in pattern. Leg 4 exopod with the third segment having II, I, 5. Leg 4 endopod with 0–1; II, 1. No sexual dimorphism in the formula of leg 1 endopod. Leg 5 with a free segment bearing two terminal elements. Leg 6 represented by the two setae near the genital openings.

Other features as in the species below.

Associated mainly with asteroid echinoderms.

TYPE-SPECIES.—*Synstellicola affinis* (Humes and Ho).

ETYMOLOGY.—The generic name is formed from the Greek word σὺν (together) and *Stellicola*. Gender masculine.

REMARKS.—The male of *Synstellicola lankensis* is unknown.

Key to Species of the Genus *Synstellicola*

FEMALES

1. Areas of attachment of egg sacs near middle of genital segment 2
Areas of attachment of egg sacs well behind middle of genital segment 5
2. Caudal ramus short, nearly quadrate *S. acanthasteris*
Caudal ramus about 2 times longer than wide, or at least 4 times longer than wide 3
3. Caudal ramus at least 4 times longer than wide 4
Caudal ramus about 2 times longer than wide *S. lankensis*
4. Caudal ramus 6.3–7 times longer than wide *S. affinis*
Caudal ramus 4 times longer than wide *S. gracilis*
5. Seta on first segment of second antenna unusually long, reaching nearly to end of appendage;
free segment of leg 5 swollen on inner margin *S. longiseta*
Seta on first segment of second antenna not unusually long; free segment of leg 5 with sides
nearly parallel 6
6. Genital segment in dorsal view with lateral margins anterior to genital openings nearly
parallel and with anterior "shoulders"; shorter of two elements on free segment of leg 5
with delicately serrate lamellae *S. kosmanni*
Genital segment in dorsal view with lateral margins recurved, without anterior "shoulders";
shorter of two elements on free segment of leg 5 with short spinules *S. pichoni*

KNOWN MALES

1. Anal segment with annular suture 2
Anal segment without an annular suture 3
2. Genital segment in dorsal view not globose, with lateral margins only slightly rounded;
longer of two setae on free segment of leg 5 and on leg 6 very long (equal to about four-
fifths the width of genital segment) *S. kosmanni*
Genital segment in dorsal view globose, with lateral margins strongly rounded; longer of
two setae on free segment of leg 5 and on leg 6 short (less than one-fifth the width of
genital segment) *S. acanthasteris*
3. Caudal ramus distinctly elongated 4
Caudal ramus nearly quadrate 5
4. Caudal ramus 7.5 times longer than wide *S. affinis*
Caudal ramus about 4 times longer than wide *S. gracilis*
5. Seta on first segment of second antenna not unusually long; claw of maxilliped evenly
recurved; free segment of leg 5 nearly 4 times longer than wide *S. pichoni*
Seta of first segment of second antenna unusually long; claw of maxilliped with two slight
flexures; free segment of leg 5 about 2 times longer than wide *S. longiseta*

Synstellicola affinis (Humes and Ho, 1967)

FIGURE 169

Stellicola affinis Humes and Ho, 1967e, pp. 206–209, pl. 4, figs. 25–31, pl. 5, figs. 32–41, pl. 6, figs. 42–48 [from the asteroids *Maculaster maculata maculata* (Müller and Troschel), *Maculaster savingnyi* (Audouin), *Retaster cribrus* von Martens, and *Luidia maculata* Müller and Troschel, region of Nosy Bé, Madagascar]; 1970b, p. 337.

Synstellicola acanthasteris (Humes, 1970)

Stellicola acanthasteris Humes, 1970b, pp. 329–337, figs. 1–30 [from the asteroid *Acanthaster planci* (Linnaeus), Eniwetok Atoll, Marshall Islands].

NEW RECORDS (all from *Acanthaster planci*, collected by AGH).—390 ♀♀, 657 ♂♂, and 29 copepodids, from eight hosts (diameter about 20 cm),

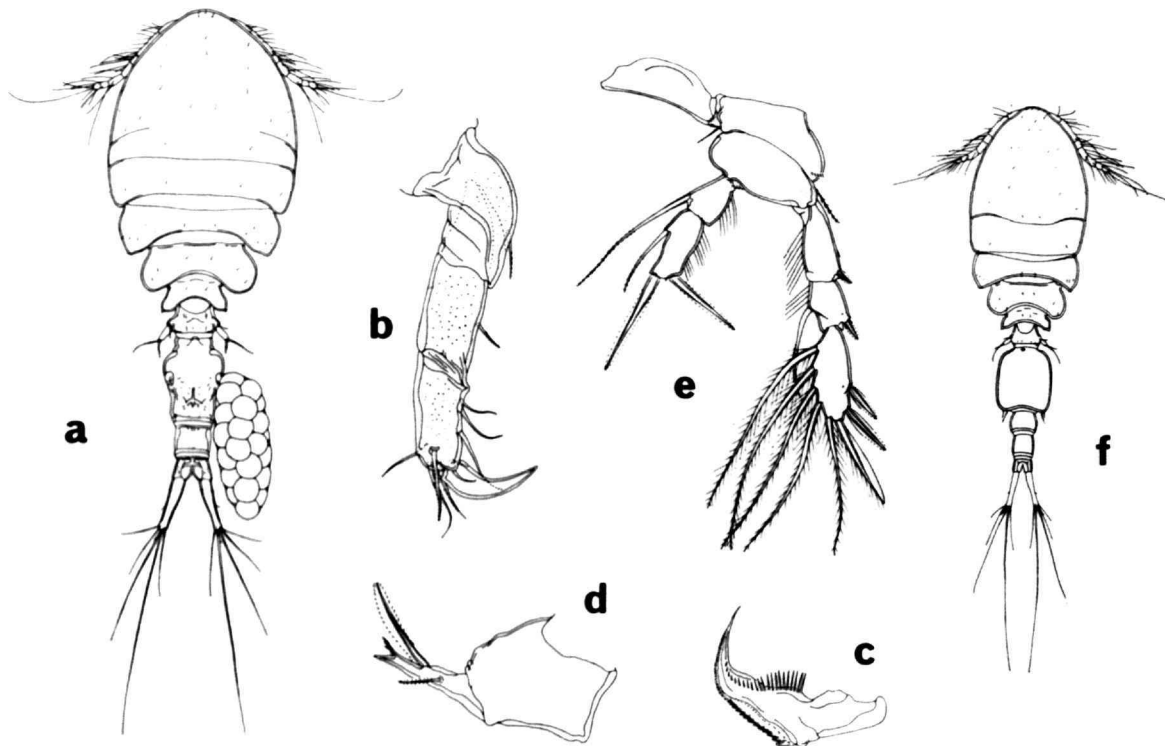


FIGURE 169.—*Synstellicola affinis* (Humes and Ho). Female: *a*, dorsal; *b*, second antenna; *c*, mandible; *d*, second maxilla; *e*, leg 4 and intercoxal plate. Male: *f*, dorsal. (From Humes and Ho, 1967c, figs. 25, 32, 34, 36, 42, 44.) Length of female 1.01 mm, of male 0.78 mm.

in 3 m, behind reef at Nukumbutho Passage, south-east of Suva, Viti Levu, Fiji, 13 August 1971; 18 ♀♀, 11 ♂♂, from single host, in 4 m, west of I. Ngou, northwest of Noumea, New Caledonia, 22°13'44" S, 166°23'01" E, 3 August 1971; 7 ♀♀, 7 ♂♂, from single host, in 2 m, Ricaudy Reef, near Noumea, New Caledonia, 22°19'05" S, 166°26'28" E, 20 July 1971.

***Synstellicola gracilis* (Thompson and A. Scott, 1903)**

Lichomolgus gracilis Thompson and A. Scott, 1903, p. 278, pl. 15, figs. 1-9 [from washings of dredged invertebrates, Ceylon].

Stellicola gracilis.—Stock, 1957, p. 382.—Humes and Ho, 1966b, p. 100; 1967e, pp. 223, 224.—Humes, 1970b, p. 337.

***Synstellicola kossmanni* (Humes and Ho, 1967)**

Stellicola kossmanni Humes and Ho, 1967e, pp. 202-205, pl. 1, figs. 1-6, pl. 2, figs. 7-15, pl. 3, figs. 16-21, pl. 4, figs. 22-24 [from the asteroid *Protoreaster lincki* (Blainville), Nosy Bé, Madagascar].

***Synstellicola lankensis* (Thompson and A. Scott, 1903)**

Lichomolgus lankensis Thompson and A. Scott, 1903, p. 279, pl. 15, figs. 25, 26 [from washings of dredged invertebrates, Ceylon].

Stellicola lankensis.—Stock, 1957, p. 382.—Humes and Ho, 1966b, p. 100; 1967e, pp. 209, 223.—Humes, 1970b, p. 337.

REMARKS.—The male is unknown.

***Synstellicola longiseta* (Humes and Ho, 1967)**

Stellicola longiseta Humes and Ho, 1967e, pp. 209-213, pl. 6, figs. 49, 50, pl. 7, figs. 51-60, pl. 8, figs. 61-66 [from the asteroid *Mithrodia clavigera* (Lamarck), region of Nosy Bé, Madagascar].

***Synstellicola pichoni* (Humes and Ho, 1966)**

Stellicola pichoni Humes and Ho, 1966b, pp. 97-100, figs. 30-59 [from the asteroid *Choriaster granulatus* (Lütken), region of Nosy Bé, Madagascar]; 1967e, pp. 215, 223, 224.—Humes, 1970b, p. 337.

Genus *Telestacicola* Humes and Stock, 1972

DIAGNOSIS.—Body cyclopiform. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with six setae. Rostrum linguiform. First antenna 7-segmented, in the female with the armature 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male 4, 13 + 1 aesthete, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented, with the formula 1, 1, 3 and two terminal dentate claws + five long setae.

Labrum incised medially. Mandible with the basal region beyond the indentation having on its convex side a patch of spinules followed by a row of broad teeth and on its concave side a row of spinules; lash long. Paragnath a small hairy lobe. First maxilla with four elements. Second maxilla of the lichomolgoid type, the auxiliary spine about as long as the rather short lash which has evenly graded teeth. Maxilliped in the female 3-segmented, with a pointed tip and two elements; in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1-4 with 3-segmented rami except for leg 4 endopod which is a single segment. Armature lichomolgoidform in pattern. Leg 4 exopod with the third segment having II, I, 5. Leg 4 endopod with II, I, the seta being feathered. Leg 1 endopod in the male with the formula I, I, 4 instead of I, 5 as in the female. Leg 5 with a free segment bearing two terminal elements. Leg 6 represented by two setae near the genital openings.

Other features as in the species described below. Associated with telestacean octocorals.

TYPE-SPECIES.—*Telestacicola angoti*, new species.

ETYMOLOGY.—The generic name, coined from *Telestacea* and the Latin *-cola* (inhabiting), refers to the association of this copepod with telestaceans. Gender masculine.

REMARKS.—Several genera of the Lichomolgidae have a 1-segmented endopod in leg 4. However, only *Kelleria* Gurney, 1927, has, as in *Telestacicola*, the combination of a 4-segmented second antenna with two terminal claws and the formula II, I on the fourth endopod, suggesting a close relationship between the two genera.

Telestacicola shows several significant differences from *Kelleria*, however. In Gurney's genus the male has two aesthetes on the second segment of

the first antenna; one of the elements on the third segment of the second antenna is a slender claw, and the two claws of this appendage are slender and not toothed; the spinules on the concave side of the mandibular base are stout; the lash on the second maxilla forms an angle with the segment and bears irregularly sized spines; and the third segment of the female maxilliped bears four elements.

Although *Telestacicola* is strikingly similar to *Kelleria* in the nature of the fourth leg, it cannot be included in that genus without an unnatural extension of the generic diagnosis.

Telestacicola angoti, new species

FIGURES 170-172

TYPE MATERIAL.—23 ♀♀, 29 ♂♂, and 5 copepodids from single colony of the telestacean *Coelogorgia palmosa* Milne Edwards and Haime, in 3 m, Pte. Lokobe, Nosy Bé, Madagascar, 3 June 1967, collected by AGH. Holotype ♀, allotype, and 46 paratypes (20 ♀♀, 26 ♂♂) deposited in USNM, the remaining paratypes (dissected) in the collection of AGH.

OTHER MATERIAL EXAMINED.—5 ♀♀, 16 ♂♂, and 7 copepodids from single colony of the gorgonacean *Muricella rubra robusta* J. A. Thompson and J. Simpson, in 3 m, Pte. Lokobe, Nosy Bé, Madagascar, 3 June 1967, collected by AGH.

FEMALE.—The body (Figure 170a) is slender and elongated. The length (not including the setae on the caudal rami) is 0.92 mm (0.90-0.95 mm) and the greatest width 0.31 mm (0.30-0.32 mm), based on ten specimens in lactic acid. The segment of leg 1 is incompletely set off from the cephalosome. The epimeral areas of the pedigerous segments are varied, as illustrated in the figure. The ratio of the length to the width of the prosome is 1.57:1. The ratio of the length of the prosome to that of the urosome is 1.08:1.

The segment of leg 5 (Figure 170b) is 60 x 84 μ. There is no ventral intersegmental sclerite between that segment and the genital segment. The genital segment is elongated and in dorsal view not much expanded, 140 x 91 μ. The areas of attachment of the egg sacs are situated dorsolaterally in the anterior half of the segment. Each area (Figure 170c) bears two naked setae, 10 μ and 35 μ, and a small

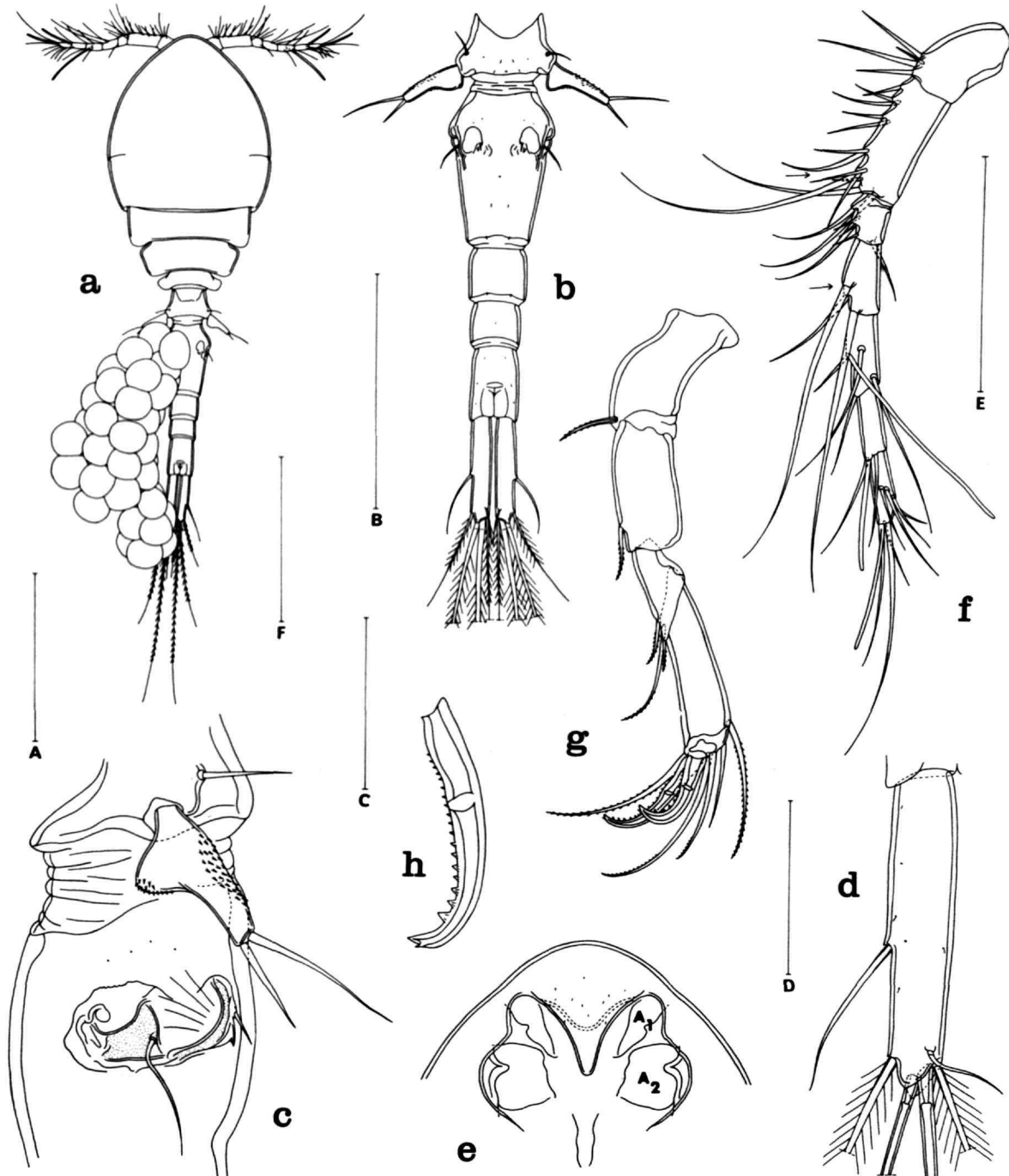


FIGURE 170.—*Teletaticola angoti*, new species. Female: a, dorsal (A); b, urosome, dorsal (B); c, part of segment of leg 5 and genital segment, lateral (C); d, caudal ramus, dorsal (D); e, rostrum (D); f, first antenna, with arrows indicating positions of additional aesthetes in male, posterior (E); g, second antenna, posterior (E); h, terminal claw of second antenna, posterior (F). Scale: A, 0.3 mm; B, 0.2 mm; C, 0.05 mm; D, E, 0.1 mm; F, 0.03 mm.

spiniform process. The three postgenital segments are $49 \times 49 \mu$, $39 \times 42 \mu$, and $62 \times 39 \mu$ from anterior to posterior. The posteroventral border of the anal segment is smooth.

The caudal ramus (Figure 170d) is elongated, $96 \times 20 \mu$, or 4.8 times longer than wide. The outer lateral seta is 52μ and the dorsal seta 25μ , both of them naked. The outermost terminal seta is 86μ and the innermost terminal seta 110μ , both haired. The two long median terminal setae are 176μ (outer) and 275μ (inner), both haired and inserted between unornamented dorsal and ventral flaps.

The body surface has a few small hairs (sensilla) as indicated in the figures.

The egg sacs were incomplete in all females seen (Figure 170a). Each egg is about 60μ in diameter.

The rostrum (Figure 170e) is a slender linguiform lobe.

The first antenna (Figure 170f) is 231μ long and 7-segmented. The lengths of the segments (measured along their posterior nonsetiferous margins) are 28 (42μ along the anterior margin), 53, 18, 31, 30, 28, and 29μ respectively. The formula for the armature is 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All the setae are naked.

The second antenna (Figure 170g) is 4-segmented. Each of the first two segments has a barbed seta, that on the first segment being slightly spiniform. The third segment has three barbed setae. The long fourth segment is 77μ along its outer edge, 51μ along its inner edge, and 18μ wide; it bears two claws 42μ and 47μ along their axes. Each claw (Figure 170h) is coarsely dentate along its concave side and bears a small subterminal process on its convex side. In addition to the two claws the segment bears five setae, two barbed on both sides, two barbed only on one side, and one naked.

The labrum (Figure 171a) has two posterior lobes separated by a deep median incision. The mandible (Figure 171b) has on the convex side of the basal region a group of slender spinules followed by a row of broad teeth; on its concave side beyond the indentation there is a row of spinules. The lash is long. The paragnath (see Figure 172c of the male) is a small hairy lobe. The first maxilla (see Figure 172c of the male) has four elements. The second maxilla (Figure 171c) has an unornamented first segment. The second segment bears

a small posterior surficial seta barbed along one edge and a large inner auxiliary spine with long spinules. The terminal lash is relatively short, approximately the length of the auxiliary spine, and bears a unilateral row of small teeth. The maxilliped (Figure 171d) has an unornamented first segment and two setae on the second segment. The small third segment bears a spinule and a naked spine with indistinct articulation and it terminates in a finely barbed spiniform process.

The ventral area between the maxillipeds and the first pair of legs (Figure 171e) is only slightly protuberant. A sclerotized line connects the bases of the maxillipeds.

Legs 1-4 (Figure 171f-i) have 3-segmented rami except for the endopod of leg 4 which consists of a single segment. The inner coxal seta in legs 1-3 is long and plumose, but in leg 4 this seta is minute (5μ) and naked. The inner margin of the basis in legs 2 and 3 is haired, but in legs 1 and 4 this margin is naked. The spine and setal formula is typically lichomolgid in pattern. Leg 4 exopod is 128μ long, with the third segment having the formula 11,1,5. Leg 4 endopod is $64 \times 16 \mu$ in greatest dimensions. The distribution along the outer edge of long hairs proximally and short spinules distally, in addition to the location of the short inner plumose seta (12μ), suggests a prior division into two segments. There is, however, no trace of a division of the segment. The two terminal fringed spines are 41μ (outer) and 56μ (inner).

Leg 5 (Figure 171j) has a free segment $55 \times 20 \mu$ in greatest dimensions, with a proximal inner (ventral) expansion. (The free segment of leg 5 shown in Figure 170c is foreshortened in the particular position drawn.) The two terminal elements are 26μ and 47μ , both naked. The adjacent seta on the body is 22μ and naked. The free segment is ornamented with two groups of spinules, one on the expansion, the other along the outer (dorsal) side.

Leg 6 is represented by the two setae and the process near the area of attachment of each egg sac.

The color in life in transmitted light is translucent, the alimentary tract in the prosome orange-red, but in the urosome bluish, the eye red, the egg sacs pale lavender to brown.

MALE.—The body (Figure 172a) is more slender than in the female. The length (excluding the ramal setae) is 0.65 mm ($0.59\text{--}0.74 \text{ mm}$) and the

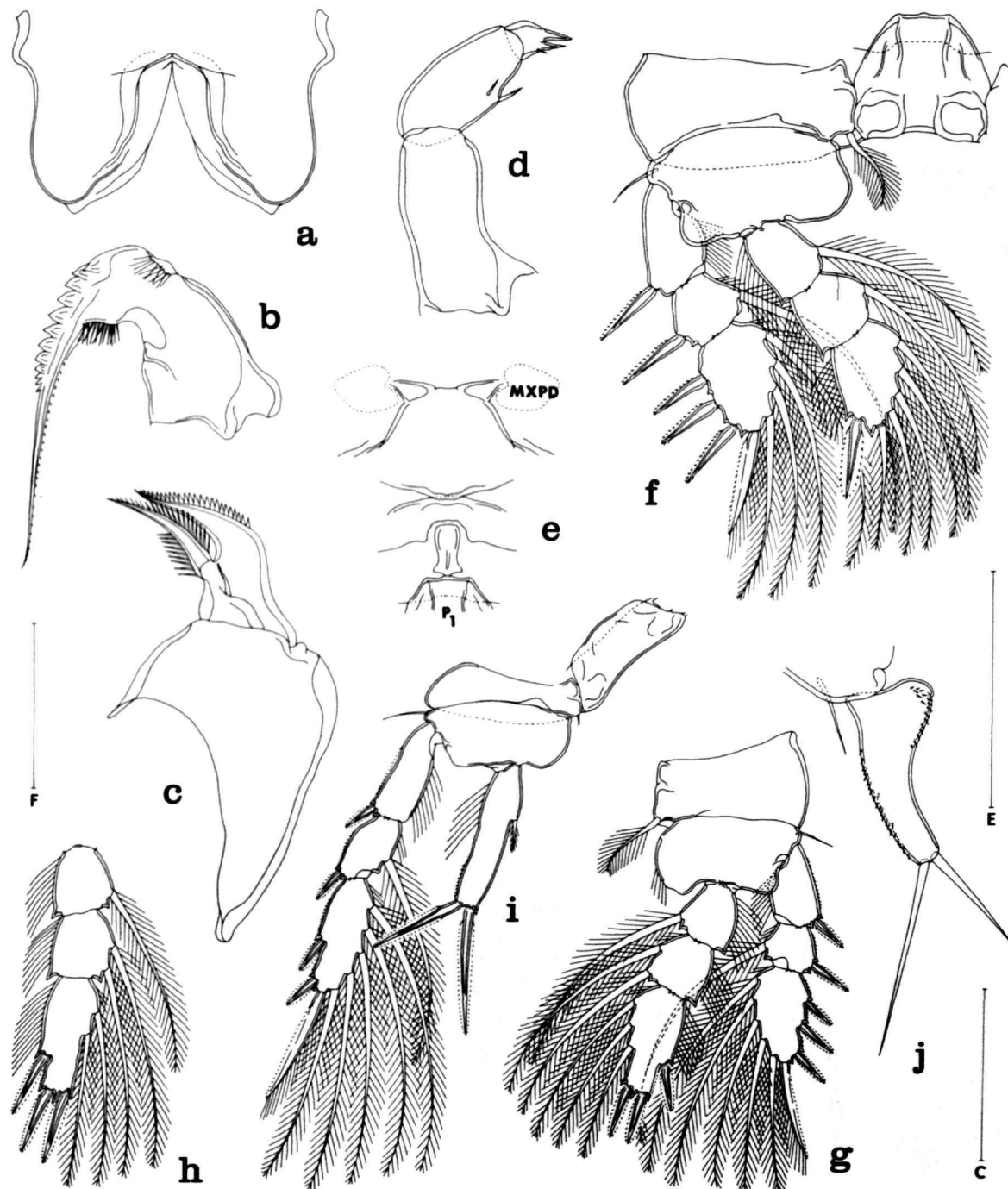


FIGURE 171.—*Teletaticola angoti*, new species. Female: a, labrum, ventral (F); b, mandible, posterior (F); c, second maxilla, posterior (F); d, maxilliped, posterior (C); e, area between maxillipeds and first pair of legs, ventral (E); f, leg 1 and intercoxal plate, anterior (C); g, leg 2, anterior (E); h, endopod of leg 3, anterior (E); i, leg 4 and intercoxal plate, anterior (E); j, leg 5, dorsal (C). Scale: c, 0.05 mm; E, 0.1 mm; F, 0.03 mm.

greatest width 0.18 mm (0.16–0.19 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 2.07:1. The ratio of the length of the prosome to that of the urosome is 1.20:1.

The segment of leg 5 (Figure 172b) is $29 \times 46 \mu$. There is no ventral intersegmental sclerite. The genital segment in dorsal view is $99 \times 86 \mu$, with nearly parallel sides. The four postgenital segments are $37 \times 40 \mu$, $33 \times 34 \mu$, $24 \times 31 \mu$, and $35 \times 32 \mu$ from anterior to posterior.

The caudal ramus resembles that of the female, but is smaller, $51 \times 16 \mu$, and relatively shorter, with the ratio 3.19:1.

The rostrum is like that in the female.

The first antenna resembles that of the female, but there are two additional aesthetes, one on segment 2 and the other on segment 4 (their positions indicated by arrows in Figure 170f), so that the formula is 4, 13 + 1 aesthete, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. The second antenna, labrum, mandible, paragnath (Figure 172c), first maxilla (Figure 172c), and second maxilla are similar to those in the female. The maxilliped (Figure 172d) is 4-segmented (the proximal part of the claw probably representing a fourth segment). The first and third segments are unarmed. The second segment bears two setae and

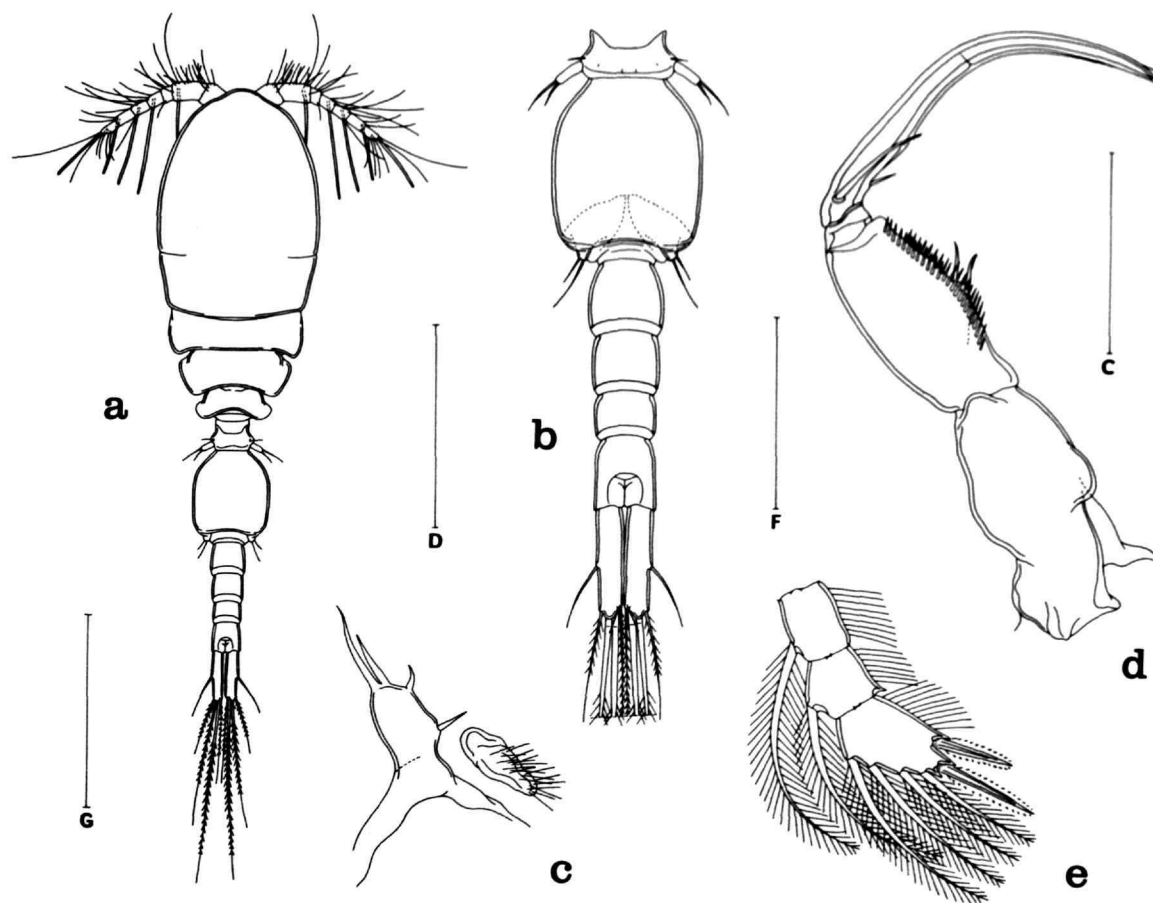


FIGURE 172.—*Teletacicola angoti*, new species. Male: a, dorsal (c); b, urosome, dorsal (b); c, mandible and paragnath, anterior (ventral) (F); d, maxilliped, inner (c); e, endopod of leg 1, anterior (c). Scale: c, 0.05 mm; D, 0.1 mm; F, 0.03 mm; C, 0.2 mm.

two rows of spinules. The claw is 92 μ along its axis, with an incomplete line of division about midway and with two unequal proximal setae.

The ventral area between the maxillipeds and the first pair of legs is like that of the female.

Legs 1–4 are segmented and armed as in the female except for leg 1 endopod (Figure 172e) where the third segment has I,I,4 instead of I,5 as in the opposite sex.

Leg 5 (Figure 172b) has an unornamented, subrectangular free segment, 22 x 6.5 μ , with its two terminal elements 14 μ and 25 μ .

Leg 6 consists of a posteroventral flap on the genital segment bearing two naked setae, 14 μ and 30 μ .

The spermatophore was not observed.

The color in life is similar to that of the female.

ETYMOLOGY.—This species is named for Dr. Michel Angot, former director of the Centre de l'Office de la Recherche Scientifique et Technique Outre-Mer (ORSTOM) at Nosy Bé, Madagascar.

Genus *Xenomolgus* Humes and Stock, 1972

DIAGNOSIS.—Body transformed, elongated. Urosome 5-segmented in the female, 6-segmented in the male. Caudal ramus with six relatively short setae. First antenna 7-segmented, in the female with 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male with 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented, with the armature 1,1,3 and I,1,5, having terminally one claw and one long, almost clawlike seta.

Labrum with the two lobes separated by a median indentation. Mandible with its basal area having on its convex side a small, hyaline expansion followed by a serrated fringe; its concave side deeply indented, distally with a transverse row of long spinules; lash reduced to a very short, naked spiniform process. Paragnath a small lobe. First maxilla with three elements. Second maxilla of the usual lichomolgoid type. Maxilliped in the female 3-segmented, with a pointed tip; in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1–4 with 3-segmented rami, except for leg 4 endopod which is 2-segmented. Last segment of exopod of legs 1–3 with III,I,4; III,I,4; and II,I,2

respectively. Last segment of endopod of legs 1–3 with I,5; I,II,3; and II,1. Leg 4 exopod with last segment III,I,1. Leg 4 endopod with 0–0;II. Considerable variation in armature of legs 1–4. Inner coxal seta on all four legs usually absent. Leg 1 in the male without sexual dimorphism. Leg 5 with a small free segment bearing two terminal setae. Leg 6 represented in the female by the two minute setae on the genital area, in the male by a posteroventral flap on the genital segment bearing two setae.

Other features as in the species below.

Associated with madreporarian corals.

TYPE-SPECIES.—*Xenomolgus varius*, new species.

ETYMOLOGY.—The generic name is formed from the Greek words ξενος (a guest), referring to the association with corals, and μολγος. Gender masculine.

Xenomolgus varius, new species

FIGURES 173–175

TYPE MATERIAL.—291 ♀♀, 20 ♂♂, and 6 copepodids from the hard coral *Porites* sp., in 1–2 m, lagoon at Pte. du Tamarin, Mauritius, 15 February 1964, collected by JHS. Holotype ♀, allotype, and 150 paratypes (140 ♀♀, 10 ♂♂) deposited in ZMA, 137 paratypes (130 ♀♀, 7 ♂♂) in USNM, and the remaining paratypes and the copepodids in the collection of A. G. Humes.

OTHER MATERIAL EXAMINED (collected by JHS).—8 ♀♀ from *Porites* sp., in about 1 m, lagoon at Baie du Tombeau, Mauritius, 12 February 1964; 4 ♂♂ from *Porites* sp., Baie du Tombeau, 14 February 1964.

FEMALE.—The body (Figure 173a,b) is elongated and transformed, with a swollen prosome and slender urosome. The cephalosome is flattened dorsally (Figure 173b). The length (not including the setae on the caudal rami) is 1.69 mm (1.63–1.76 mm) and the greatest width 0.54 mm (0.52–0.55 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1.43:1. The ratio of the length of the prosome to that of the urosome is 1:1.33, the urosome being longer than the prosome. The segment of leg 1 is set off from the cephalosome by a weak dorsal transverse furrow. The pedigerous segments lack projecting epimera.

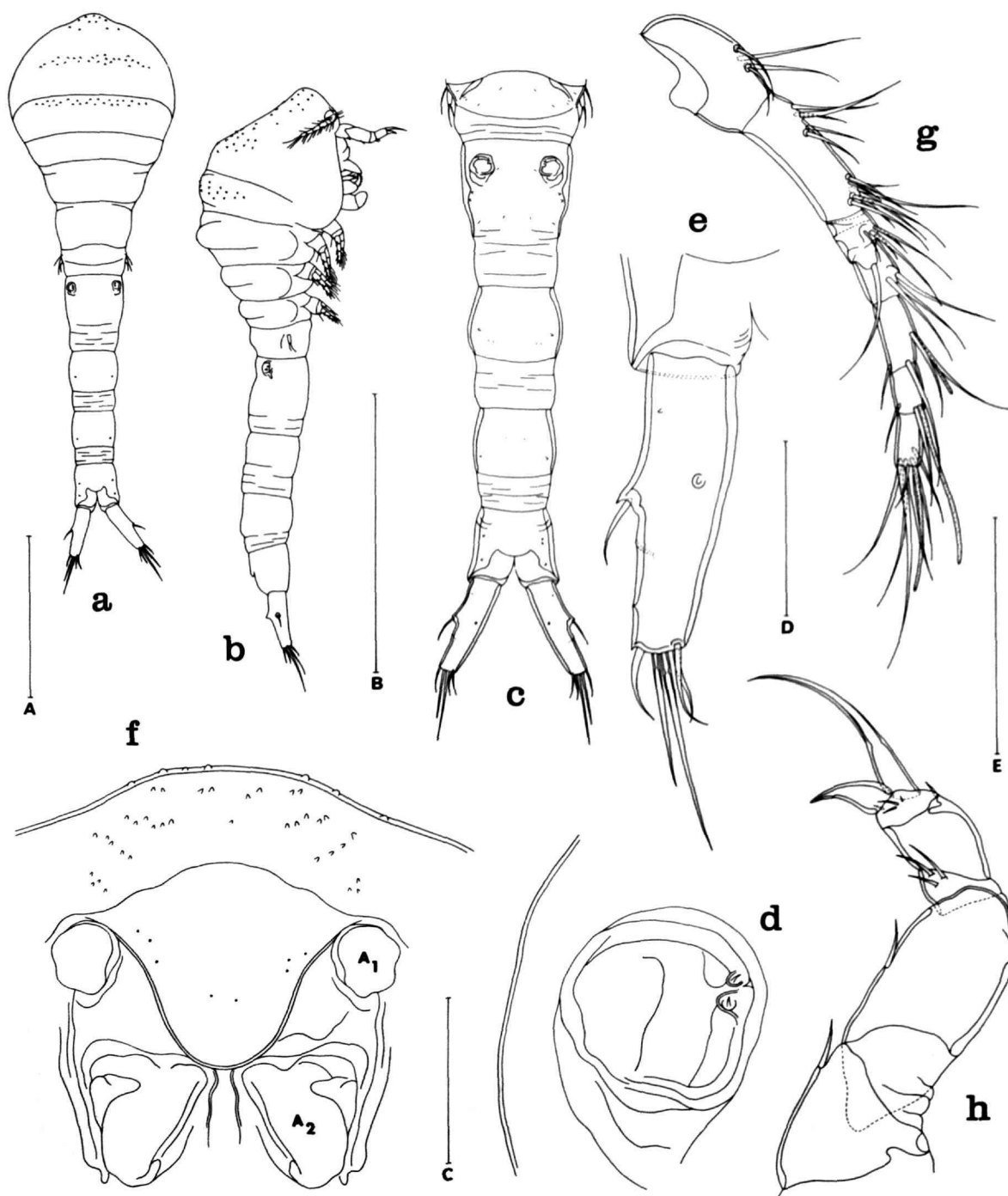


FIGURE 173.—*Xenomolgus varius*, new species. Female: a, dorsal (A); b, lateral (A); c, urosome, dorsal (A); d, area of attachment of egg sac, dorsal (C); e, caudal ramus, dorsal (D); f, rostrum, ventral (D); g, first antenna, dorsal (E); h, second antenna, posterior (E). Scale: A, B, 0.5 mm; C, D, 0.03 mm; E, 0.1 mm.

The segment of leg 5 (Figure 173c) is $104 \times 213 \mu$. There is no ventral intersegmental sclerite between that segment and the genital segment. The genital segment is elongated, $237 \mu \times 185 \mu$ in greatest dimensions. The areas of attachment of the egg sacs are located dorsolaterally and anteriorly. Each area (Figure 173d) bears two, very small ($2-3 \mu$ long) naked setae. The three postgenital segments are $208 \times 166 \mu$, $169 \times 148 \mu$, and $148 \times 146 \mu$ from anterior to posterior. The posteroventral border of the anal segment is smooth. The genital segment and the first two postgenital segments have a weakly sclerotized posterior part.

The caudal ramus (Figure 173e) is $164 \times 52 \mu$ (the width taken proximally to the lateral seta), the ratio being 3.1:1. The width at the lateral seta is 58μ , and distal to that seta it is 38μ . The outer lateral seta is 42μ , the dorsal seta 52μ , the outermost terminal seta 40μ , and the innermost terminal seta 39μ . The two median terminal setae (shorter than the ramus) are 67μ (outer) and 122μ (inner). All six setae are naked. The dorsal surface of the ramus bears two retractile knobs. Near the base of the lateral seta there is a marginal spur, conspicuous in lateral view (Figure 173b).

The fine ornamentation of the body surface consists of a few very small hairs (sensilla) and retractile knobs on the dorsal surface of the urosome (Figure 173c), a dorsal transverse band of retractile knobs on the segment of leg 1 and another band on the posterior part of the cephalosome, as well as a few similar knobs scattered over the anterior extremity of the cephalosome (Figure 173a).

None of the collected females carried intact egg sacs. One female had three irregular elliptical eggs attached, each egg about $170 \times 130 \mu$.

The rostrum (Figure 173f) is a broad, linguiform lobe.

The first antenna (Figure 173g) is 7-segmented and 205μ long. The lengths of the segments (measured along their posterior nonsetiferous margins) are 22 (51μ along the anterior margin), 52, 20, 18, 27, 17, and 20μ respectively. The formula for the armature is 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. (One seta on the third segment is displaced distally, but it is considered to belong to the third rather than the fourth segment). All the setae are naked.

The second antenna (Figure 173h) is 4-segmented. The first two segments bear a seta. The third segment bears three setae. The fourth segment, 44μ along its outer side, 33μ along its inner

side and 29μ wide, bears terminally a short stout claw, 33μ , a long, recurved proximally inflated seta (81μ in length and almost unguiform) with a very narrow lamella along its concave margin, and five small setae. All the elements are naked.

The labrum (Figure 174a) has two broad posteroventral lobes separated medially by an oval, sclerotized area.

The mandible (Figure 174b) has on the concave side of the base a deep indentation, followed by a transverse row of about seven long spinules; on the convex side there is a slight hyaline expansion followed distally by a serrated fringe; the lash is reduced to a very short, naked spiniform process. The paragnath (Figure 174a) is a small, smooth lobe. The first maxilla (Figure 174c) bears three elements. The second maxilla (Figure 174d) is 2-segmented. The first segment is large and unornamented. The second segment is elongated and bears a small outer (ventral) setule, a surficial posterior hyaline smooth seta, and an inner (dorsal) seta with prominent spinules; the lash has unilateral toothlike spines. The maxilliped (Figure 174e) is 3-segmented; the large first segment is unarmed, the second segment bears two naked setae, and the small third segment has a finely barbed spine along one side and terminates in a naked spiniform process (possibly a spine, though the articulation is obscure).

The ventral area between the maxillipeds and the first pair of legs (Figure 174f) is not protuberant. The median sclerite seen in most lichomolgids immediately in front of the intercoxal plate of leg 1 appears to be absent.

Legs 1-4 (Figures 174g-i, 175b) have 3-segmented rami, except for the endopod of leg 4 which is 2-segmented. The formula for the armature of the legs is as follows:

P_1	coxa	0-0(0-1)	basis	1-0	exp	I-0; I-1; III,I,4 (III,I,3)
					enp	0-1; 0-1; I,5
P_2	coxa	0-0	basis	1-0	exp	I-0; I-1 (1-2); III,I,4
					enp	0-1; 0-1; I,II,3 (I,II,2)
P_3	coxa	0-0(0-1)	basis	1-0	exp	I-0; I-1; III,I,2 (III,I,3) (III,I,1)
					enp	0-0; 0-1 (0-2); II,I(I,1)
P_4	coxa	0-0(0-1)	basis	1-0	exp	I-0; I-1; III,I,1
					enp	0-0; II

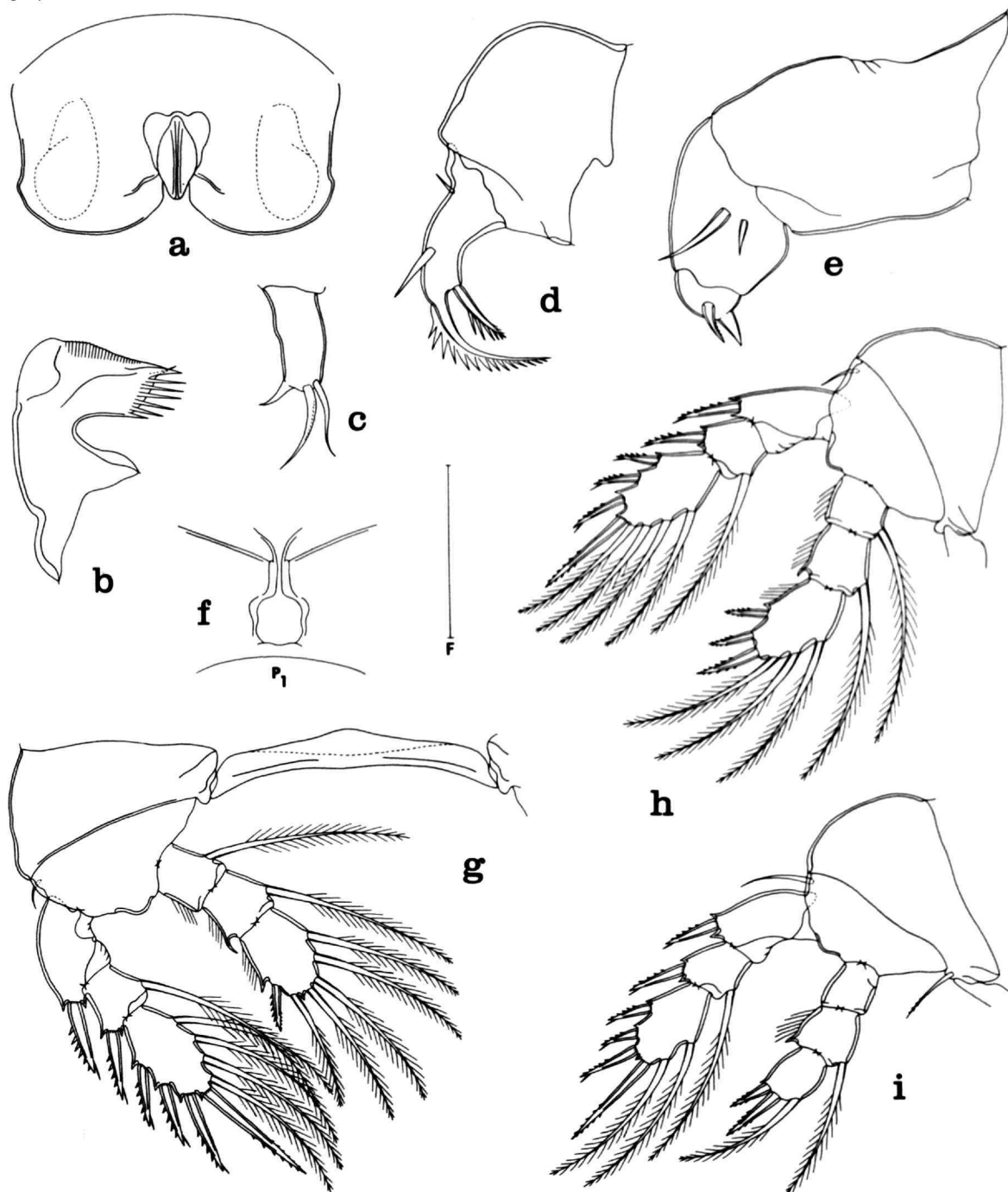


FIGURE 174.—*Xenomolgus varius*, new species. Female: *a*, labrum, with paragnaths indicated by broken lines, ventral (F); *b*, mandible, anterior (F); *c*, first maxilla, dorsal (F); *d*, second maxilla, inner (F); *e*, maxilliped, antero-inner (F); *f*, area between maxillipeds and first pair of legs, ventral (F); *g*, leg 1 and intercoxal plate, anterior (E); *h*, leg 2, anterior (E); *i*, leg 3, anterior (E). Scale: E, 0.1 mm; F, 0.05 mm.

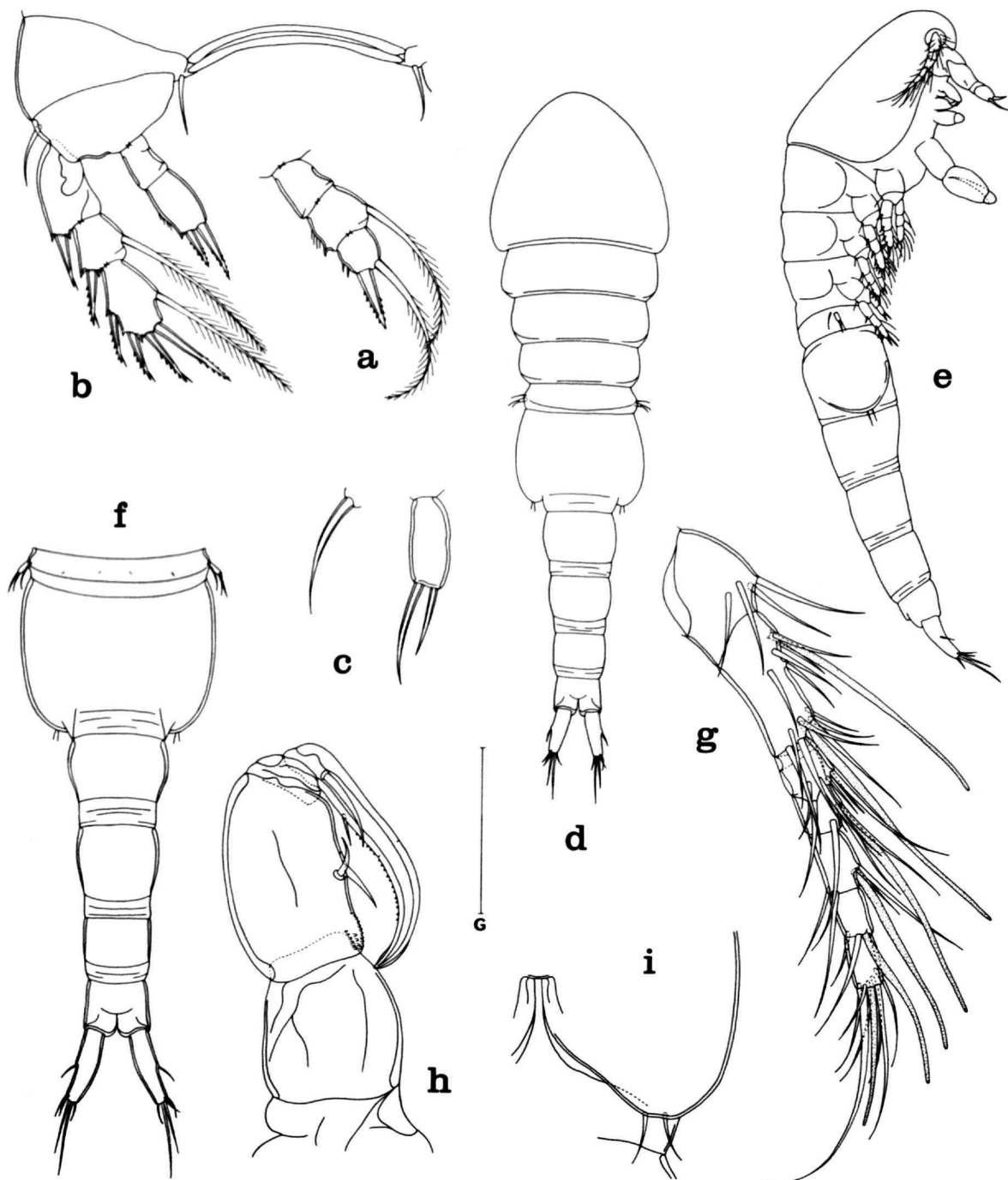


FIGURE 175.—*Xenomolgus varius*, new species. Female: *a*, abnormal endopod of leg 3, anterior (E); *b*, leg 4 and intercoxal plate, anterior (E); *c*, leg 5, lateral (F). Male: *d*, dorsal (B); *e*, lateral (B); *f*, urosome, dorsal (C); *g*, first antenna, dorsal (F); *h*, maxilliped, inner (E); *i*, leg 6, ventral (D). Scale: B, 0.5 mm; D, E, 0.1 mm; F, 0.05 mm; G, 0.2 mm.

In the above formula the armature shown in parentheses (observed in only a few instances) is believed to be abnormal. An example of abnormal armature is shown in leg 3 endopod (Figure 175a). Whenever it occurred, such abnormal armature was present on only one leg of an individual, not symmetrically on both legs of the pair (except in the case of the inner coxal setae shown in leg 4, Figure 175b).

The inner coxal seta apparently is normally absent in this species. Eleven females showed no trace of such a seta. Three females possessed the seta as follows: 1 ♀ with the seta on right leg 1, 1 ♀ with the seta on right leg 3, and 1 ♀ with the seta on right leg 3 and on both right and left leg 4. The inner margin of the basis is naked and weakly sclerified in all four legs.

The outer spines on the exopods of legs 1-4 have well-formed subterminal flagella; the lateral spinules are more strongly developed in leg 1 than in the following legs. The second segment of the endopod in legs 1-3 has a slender, outer distal spiniform process, in leg 1 recurved and longer than in the other two legs. Leg 4 is 86 μ long. The first segment of the endopod is 16 x 14 μ , the second segment 26 x 17 μ , with the outer spine 19 μ , the inner 28 μ .

Leg 5 (Figure 175c) has a small, unornamented free segment 27.5 x 13 μ , with its two naked terminal elements 32 μ and 24 μ . The seta on the body near the free segment is 43 μ and naked.

Leg 6 is represented by the two minute setae on the area of attachment of each egg sac (Figure 173d).

The color in life is unknown.

MALE.—The body (Figure 175d,e) is slender, with the cephalosome not swollen or flattened dorsally as in the female. The length (without the ramal setae) is 1.12 mm (1.03-1.21 mm) and the greatest width 0.33 mm (0.13-0.34 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1.63:1. The ratio of the length of the prosome to that of the urosome is 1:1.28, the urosome being longer than the prosome.

The segment of leg 5 (Figure 175f) is 39 x 211 μ . There is no ventral intersegmental sclerite. The genital segment is 195 x 225 μ , a little wider than long. The four postgenital segments are 99 x 116 μ ,

104 x 104 μ , 78 x 83 μ , and 62 x 74 μ from anterior to posterior.

The caudal ramus resembles that of the female, but there is no spur near the lateral seta, the two dorsal surficial refractile areas are absent, and the dimensions are smaller, 89 x 29 μ .

The rostrum is similar to that of the female.

The first antenna (Figure 175g) is like that of the female, but there are three additional aesthetes, so that the formula is 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete.

The second antenna, labrum, mandible, paragnath, first maxilla, and second maxilla are similar to those in the female.

The maxilliped (Figure 175h) is 4-segmented (assuming that the proximal part of the claw represents a fourth segment). The first segment is unarmed. The second segment bears two equal, naked inner setae and is ornamented with small spines on its proximal inner corner. The small third segment is unarmed. The claw is relatively short, 96 μ along its axis, with slight indication of division midway, bears proximally two unequal naked setae, and has a row of minute denticulations along its concave side. The terminal lamella is very narrow.

The ventral area between the maxillipeds and the first pair of legs is like that of the female.

Legs 1-4 are similar to those of the female, with the same armature. In seven males there was no inner coxal seta. Only one of these males showed abnormal armature (the last segment of the right leg 2 endopod having I,II,2 instead of the usual condition of I,II,3).

Leg 5 resembles that of the female, but the free segment is smaller, 19 x 8 μ .

Leg 6 (Figure 175i) is a posteroventral flap on the genital segment bearing two naked setae, 21 μ and 22 μ .

The spermatophore was not observed.

The color in life is unknown.

ETYMOLOGY.—The specific name *varius* (Latin, diversified or varying) alludes to the variability of the armature on legs 1-4.

Genus *Zamolgus* Humes and Stock, 1972

DIAGNOSIS.—Body cyclopiform. Urosome 5-segmented in the female, 6-segmented in the male.

Caudal ramus with six setae. Rostrum broadly rounded posteroventrally. First antenna 7-segmented, with the formula in the female 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented, with the armature 1, 1, 3, and 1 + 5 small elements, there being a single terminal claw.

Labrum with a deep cleft separating the two lobes. Mandible with the basal part having on its convex side a roughened area followed by a slender, proximally directed digitiform process and then by a serrated fringe, and on its concave side beyond the indentation a row of spinules; lash long. Paragnath a small hairy lobe. First maxilla with four elements. Second maxilla of the usual lichomolgid type. Maxilliped in the female 3-segmented, with a pointed tip; in the male 4-segmented (as-

suming that the proximal part of the claw represents a fourth segment).

Legs 1-4 with 3-segmented rami, except for leg 4 endopod which is 2-segmented. Armature of the usual lichomolgidiform type, with leg 4 endopod having the formula 0-1;II, the seta on the first segment being either feathered or naked. Leg 4 exopod with the third segment having III,I,5. In the male leg 1 endopod with the third segment I,I,4 instead of I,5 as in the female. Leg 5 in both sexes with a free segment bearing two terminal setae. Leg 6 represented in the female by the two seta and process near the area of attachment of each egg sac and in the male by a posteroventral flap on the genital segment bearing two setae.

Other features as in the species described below. Associated with alcyonaceans.

TYPE-SPECIES.—*Zamolgus tridens*, new species.

ETYMOLOGY.—The name is a combination of the Greek words ζα (very) and μόλγος.

Key to Species of the Genus *Zamolgus*

FEMALES

- Free segment of leg 5 with numerous spines; first maxilla with three elements; second maxilla with lash and adjacent seta nearly equal in length; tip of maxilliped with a single, pointed process and a spine; leg 4 endopod with seta on first segment plumose *Z. acanthodes*
 Free segment of leg 5 smooth, not ornamented with spines; first maxilla with four elements; second maxilla with lash and adjacent seta very unequal in length; tip of maxilliped with two pointed processes and a spine; leg 4 endopod with seta on first segment naked *Z. tridens*

MALES

- Free segment of leg 5 with a few small spines; second segment of maxilliped with one row of spines *Z. acanthodes*
 Free segment of leg 5 without small spines; second segment of maxilliped with two rows of spines *Z. tridens*

Zamolgus tridens, new species

FIGURES 176-178

TYPE MATERIAL.—63 ♀♀, 85 ♂♂, and 82 copepodids from single colony of the alcyonacean *Cespitularia turgida* Verseveldt, in 20 m, west of Andilana, Nosy Bé, northwestern Madagascar, 13°18' S, 48°07' E, 24 August 1967, collected by AGH. Holotype ♀, allotype, and 120 paratypes (50 ♀♀, 70 ♂♂) deposited in USNM and the remaining paratypes in the collection of AGH.

FEMALE.—The body (Figure 176a) has a moderately slender prosome. The length (not including

the setae on the caudal rami) is 1.01 mm (0.92-1.10 mm) and the greatest width 0.47 mm (0.43-0.52 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1.48:1. The ratio of the length of the prosome to that of the urosome is 1.94:1. The segment of leg 1 is clearly set off from the cephalosome by a dorsal transverse furrow. The epimeral areas of the pedigerous segments are rounded.

The segment of leg 5 (Figure 176b) is 78 x 156 μ. There is no definite ventral intersegmental sclerite between that segment and the genital segment. The genital segment is 153 x 133 μ, only slightly

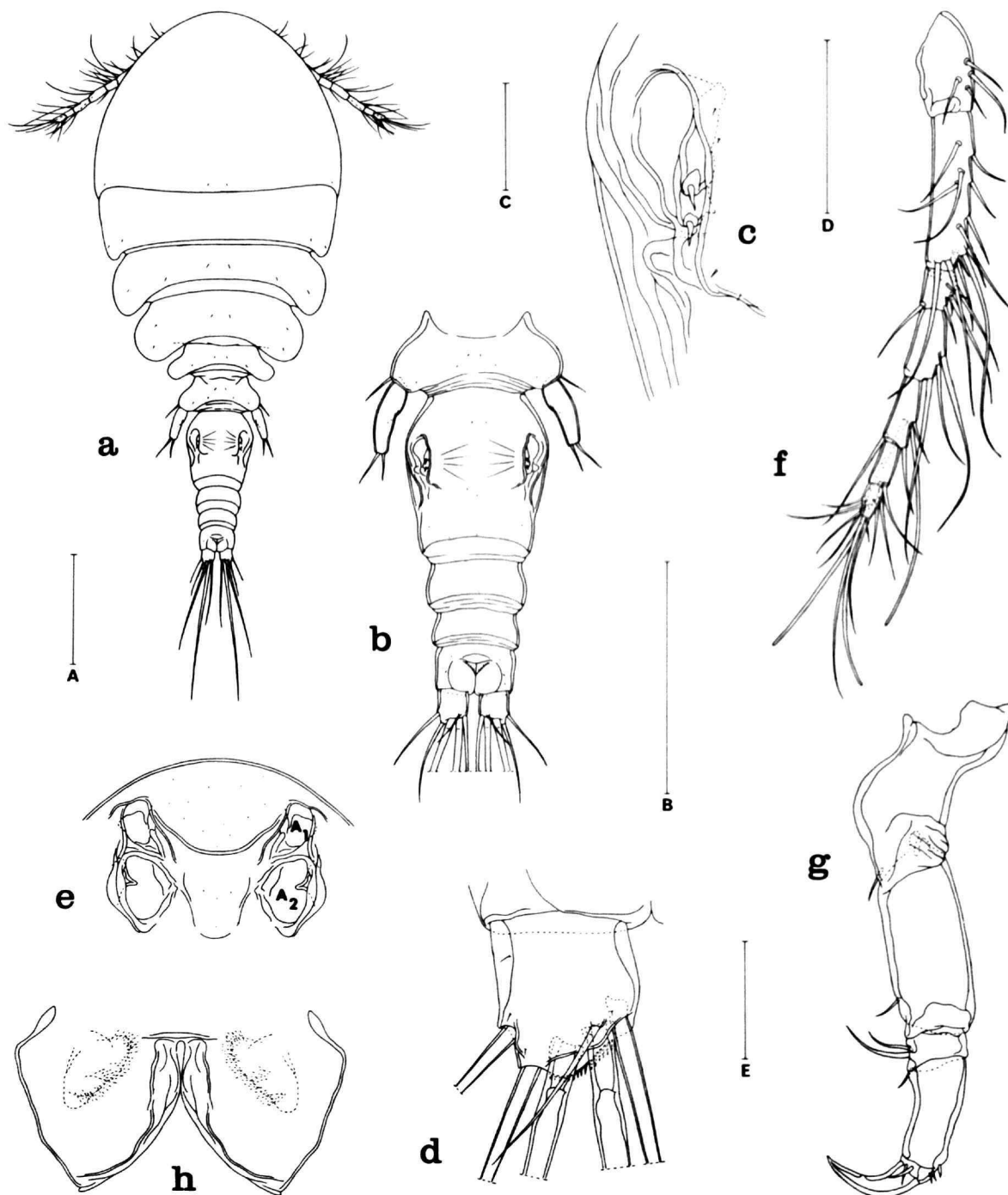


FIGURE 176.—*Zamolagus tridens*, new species. Female: *a*, dorsal (A); *b*, urosome, dorsal (B); *c*, area of attachment of egg sac, dorsal (C); *d*, caudal ramus, dorsal (D); *e*, rostrum, ventral (E); *f*, first antenna, dorsal (D); *g*, second antenna, posterior (E); *h*, labrum, with paragnaths indicated by broken lines, ventral (E). Scale: A, B, 0.2 mm; C, 0.02 mm; D, 0.1 mm; E, 0.05 mm.

expanded. The areas of attachment of the egg sacs are situated dorsolaterally in front of the middle of the segment. Each area (Figure 176c) bears two small, naked setae 6 μ long, with a small process between them. The three postgenital segments are 47 x 88 μ , 31 x 80 μ , and 39 x 73 μ from anterior to posterior.

The caudal ramus (Figure 176d) is only a little wider than long, 32 x 27.5 μ . The dorsal seta is 35 μ , the outer lateral seta 57 μ , the outermost terminal seta 64 μ , and the innermost terminal seta 125 μ . The two long median terminal setae are 198 μ (outer) and 286 μ (inner), both inserted between dorsal (unornamented) and ventral (with a marginal row of spinules) flaps. All the setae are naked.

The body surface is ornamented with hairs (sensilla) as shown in Figure 176a,b. The posteroventral margin of the anal segment is smooth.

The egg sacs were incomplete in all ovigerous females collected. Each egg is about 73 μ in diameter.

The rostrum (Figure 176e) is broadly rounded posteroventrally.

The first antenna (Figure 176f) is 296 μ long. The lengths of the seven segments (measured along their posterior nonsetiferous margins) are 36 (56 μ along the anterior margin), 89, 24, 41, 40, 26, and 20 μ respectively. The formula for the armature is 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All the setae are naked.

The second antenna (Figure 176g) is 4-segmented. Both the first and second segments bear an inner seta. The third segment bears three setae. The fourth segment, 51 μ along its outer edge, 36 μ along its inner edge, and 20 μ wide at the middle, bears a single terminal claw 43 μ along its axis and five small hyaline elements. All the setae are naked.

The labrum (Figure 176h) has two, peculiarly pointed, posteroventral lobes.

The mandible (Figure 177a) has on the concave side of the base an indentation distal to which there is an uninterrupted row of spinules; the convex margin of the base has proximally a roughened area, more distally a slender, proximally directed digitiform process, and finally a serrated, hyaline fringe. The lash is moderately long and bilaterally barbed. The paragnath (Figure 176h) is a small hairy lobe. The first maxilla (Figure 177b) has four elements, one of them finely barbed along one edge. The second maxilla (Figure 177c) is 2-segmented.

The first segment is unornamented. The second segment is relatively large, with proximally on its outer (ventral) margin a small setule, a surficial anterior seta with short spinules along one edge, and distally on its inner (dorsal) margin a barbed seta. The terminal lash has a line of articulation with the segment. Along the outer edge of the lash are four or five large teeth followed by small spinules; the inner edge bears only a few minute distal spinules. The maxilliped (Figure 177d) is 3-segmented. The first segment is unornamented. The second segment bears two, very unequal, naked setae. The third segment bears a small naked setule, a naked spine, and two terminal spiniform processes without articulations, the larger process with a row of denticles on both anterior and posterior surfaces.

The ventral area between the maxillipeds and the first pair of legs (Figure 177e) is only slightly protuberant. There is a sclerotized line (incomplete medially) between the bases of the maxillipeds.

Legs 1-4 (Figure 177f-i) have the same segmentation and spine and setal formula as in *Meringomolgus facetus*. The inner seta on the coxa of legs 1-3 is large and feathered, but in leg 4 this seta is short (11 μ) and naked. The inner margin of the basis of legs 1-3 has a row of hairs but in leg 4 it is naked. The exopod of leg 4 is 140 μ long, with the last segment having the formula III,I,5. The endopod of leg 4 has hairs along the outer margins of both segments. The first segment is 33 x 28 μ (the length not including the spinous processes) and bears an inner distal naked seta, 21 μ . The second segment is 77 μ long (including the terminal spiniform processes), 28 μ in greatest width proximally, and 16.5 μ in least width distally; the outer terminal spine is 22 μ , the inner spine 53 μ , both fringed.

Leg 5 (Figure 177j) has an unornamented free segment 70 μ long, 20 μ wide at the slight proximal inner expansion, and 16.5 μ wide distally. The two naked terminal setae are 33 μ and 27 μ . The naked seta on the body near the free segment is 32 μ .

Leg 6 is probably represented by the two small setae near the attachment of each egg sac (Figure 176c).

The color in life in transmitted light is opaque, the eye red, the egg sacs gray.

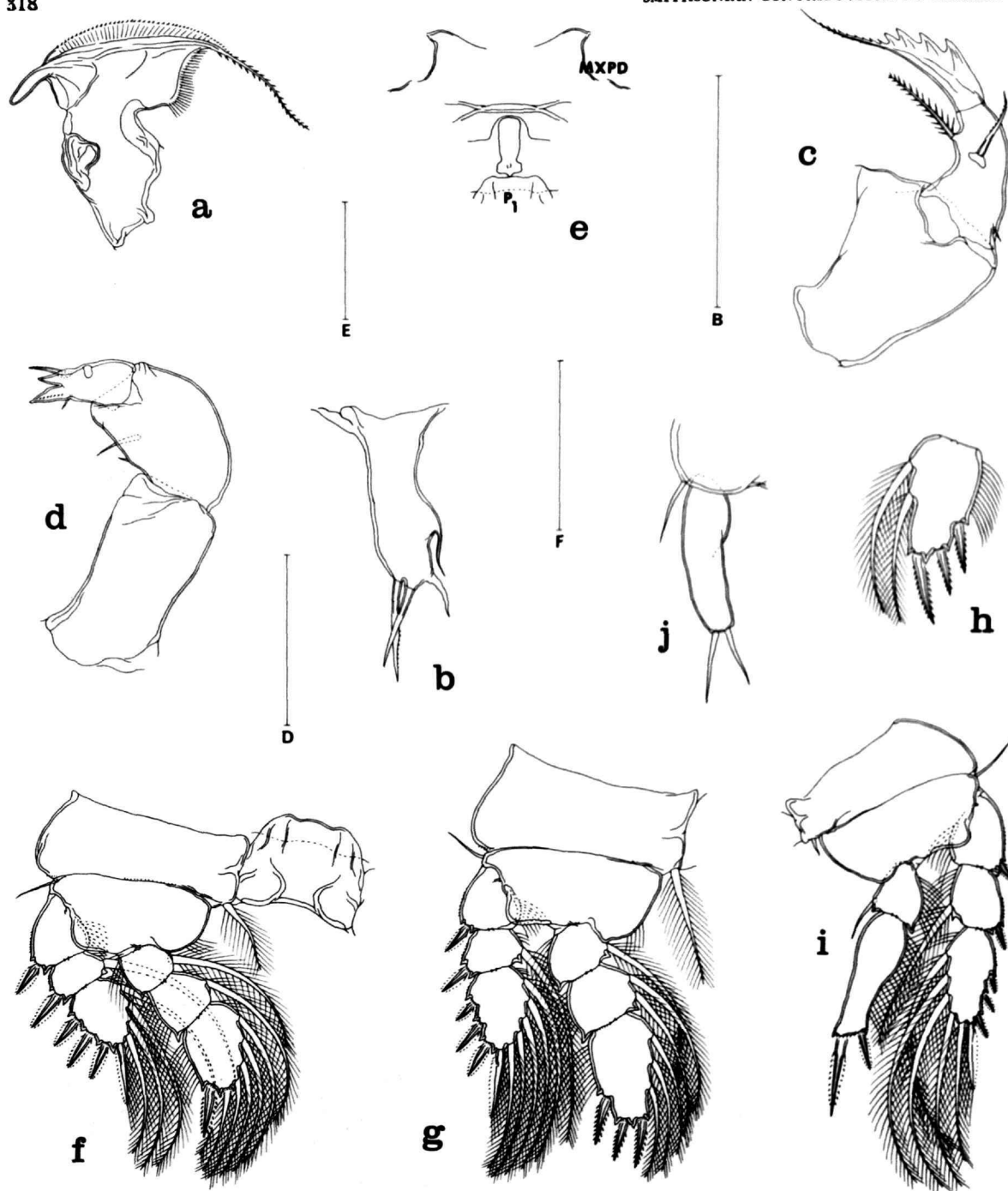


FIGURE 177.—*Zamolgus tridens*, new species. Female: a, mandible, posterior (E); b, first maxilla, posterior (F); c, second maxilla, anterior (E); d, maxilliped, anterior (E); e, area between maxillipeds and first pair of legs, ventral (B); f, leg and intercoxal plate, anterior (D); g, leg 2, anterior (D); h, third segment of endopod of leg 3, anterior (D); i, leg 4, anterior (D); j, leg 5, dorsal (E). Scale: B, 0.2 mm; D, 0.1 mm; E, F, 0.05 mm.

MALE.—The body (Figure 178a) is only slightly more slender than the female. The length (not including the ramal setae) is 0.85 mm (0.74–0.90 mm) and the greatest width 0.31 mm (0.29–0.31 mm), based on ten specimens in lactic acid. The ratio of the length to the width of the prosome is 1.67:1. The ratio of the length of the prosome to that of the urosome is 1.47:1.

The segment of leg 5 (Figure 178b) is $39 \times 97 \mu$. There is no ventral intersegmental sclerite. The genital segment is $208 \times 200 \mu$. The four postgenital

segments are $27 \times 53 \mu$, $27 \times 53 \mu$, $21 \times 48 \mu$, and $23 \times 49 \mu$ from anterior to posterior.

The caudal ramus is like that of the female, but smaller, $24 \times 19 \mu$.

The body surface is ornamented with hairs as in the female.

The rostrum is like that of the female.

The first antenna resembles that of the female, but additionally it has two long aesthetes on the second segment and one long aesthete on the fourth segment, so that the formula is 4, 13 + 2 aesthetes,

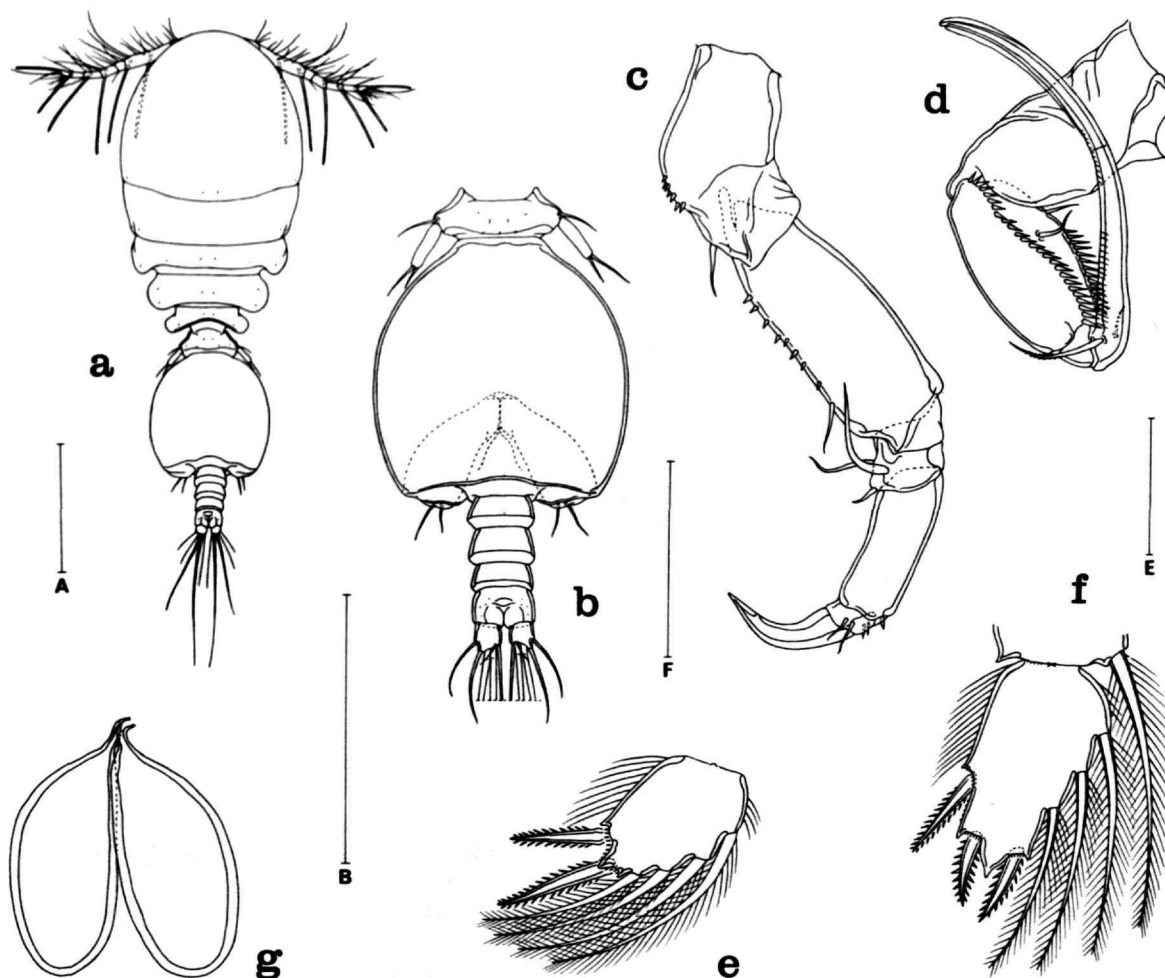


FIGURE 178.—*Zamoligus tridens*, new species. Male: a, dorsal (A); b, urosome, dorsal (B); c, second antenna, posterior (F); d, maxilliped, inner (E); e, third segment of endopod of leg 1, anterior (F); f, third segment of endopod of leg 2, anterior (F); g, spermatophores, attached to female, dorsal (B). Scale: A, B, 0.2 mm; D, 0.1 mm; E, F, 0.05 mm.

6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All the setae are naked.

The second antenna (Figure 178c) is similar to that of the female, but there are short stout spines on the inner margins of the first two segments.

The labrum, mandible, paragnath, first maxilla, and second maxilla are like those of the female. The maxilliped (Figure 178d) is 4-segmented, assuming that the proximal half of the claw represents a fourth segment. The first segment is unarmed. The second segment bears two naked setae and two rows of spinules. The small third segment is unarmed. The claw is 152 μ along its axis, with a line of division about midway, where on the concave edge there is a row of spinuliform serrations. Proximally the claw bears two unequal setae, the longer one with fine distal barbules.

The ventral area between the maxillipeds and the first pair of legs is like that of the female.

Legs 1-4 are segmented and armed as in the female, except for the last segment of the endopod of leg 1 (Figure 178e) where the formula is I,I,4 instead of I,5 as in the female. Slight sexual dimorphism is seen also in the smaller outer distal spinous processes on the first and second segments of the endopods of legs 1 and 2, and in the details of the armature of the last segment of the endopod of leg 2 (Figure 178f), where the barbs on the middle spine are much more prominent than in the female. Legs 3 and 4 are like those of the female.

Leg 5 (Figure 178b) has a slender, subrectangular, unornamented free segment, 38 x 10 μ . The two naked terminal setae are 22 μ and 30 μ .

Leg 6 (Figure 178b) consists of a posteroventral flap on the genital segment bearing two naked setae, 22 μ and 29 μ .

The spermatophore (Figure 178g), attached to the female in pairs, is about 192 x 86 μ , not including the neck. Its wall is unusually thick and golden brown in color.

The color in life in transmitted light is like that of the female.

ETYMOLOGY.—The specific name *tridens* (Latin, having three teeth or prongs) alludes to the tripartite extremity of the maxilliped in the female.

REMARKS.—The genus *Zamolgus* resembles *Odonotomolgus* in having a proximally directed, toothlike process on the mandible. It differs from that genus, however, in the armature of the last segment of the

exopod of leg 4 being III,I,5 and the row of spinules on the concave side of the base of the mandible being uninterrupted instead of being arranged on two lobes.

Zamolgus acanthodes, new species

FIGURES 179-181

TYPE MATERIAL.—9 ♀♀, 6 ♂♂ from single colony of the alcyonacean *Sinularia arborea* Ver-seveldt, in 12 m, west of the harbor at Hellville, Nosy Bé, northwestern Madagascar, 4 August 1967, collected by AGH. Holotype ♀, allotype, and 9 paratypes (6 ♀♀, 3 ♂♂) deposited in USNM, the remaining paratypes (dissected) in the collection of AGH.

OTHER MATERIAL EXAMINED (all from *Sinularia arborea*).—3 ♂♂ from single colony, in 2 m, Pte. Lokobe, Nosy Bé, 3 June 1967; 9 ♀♀, 8 ♂♂ from single colony, in 23 m, Tany Kely, a small island south of Nosy Bé, 30 June 1967; 1 ♀, 2 ♂♂ from single colony, in 2 m, off Ampombilava, Nosy Bé, 7 July 1967; and 5 ♀♀, 1 ♂ from ten small colonies, in 13 m, opposite Antsiabe, southern shore of Nosy Komba, near Nosy Bé, 2 September 1967. All collected by AGH.

FEMALE.—The body (Figure 179a) has a moderately broadened prosome. The length (not including the setae on the caudal rami) is 1.02 mm (0.95-1.09 mm) and the greatest width 0.50 mm (0.47-0.53 mm), based on nine specimens in lactic acid. The ratio of the length to the width of the prosome is 1.31:1. The ratio of the length of the prosome to that of the urosome is 1.93:1. The segment of leg 1 is separated from the head by a dorsal transverse furrow. The epimera of the segment of leg 3 are angular as indicated in the figure.

The segment of leg 5 (Figure 179b) is 78 x 180 μ . There is no ventral intersegmental sclerite between that segment and the genital segment. The genital segment is 133 x 159 μ in greatest dimensions in dorsal view, its anterior two-thirds expanded with rounded lateral margins, its posterior third with parallel margins. The areas of attachment of the egg sacs are located dorsolaterally in the middle of the expanded portion. Each area (Figure 179c) bears two small, naked setae, 6 μ and 11 μ , with a minute spiniform process between them. The three postgenital segments are 66 x 88 μ , 50 x 76 μ , and 44 x 69 μ from anterior to posterior.

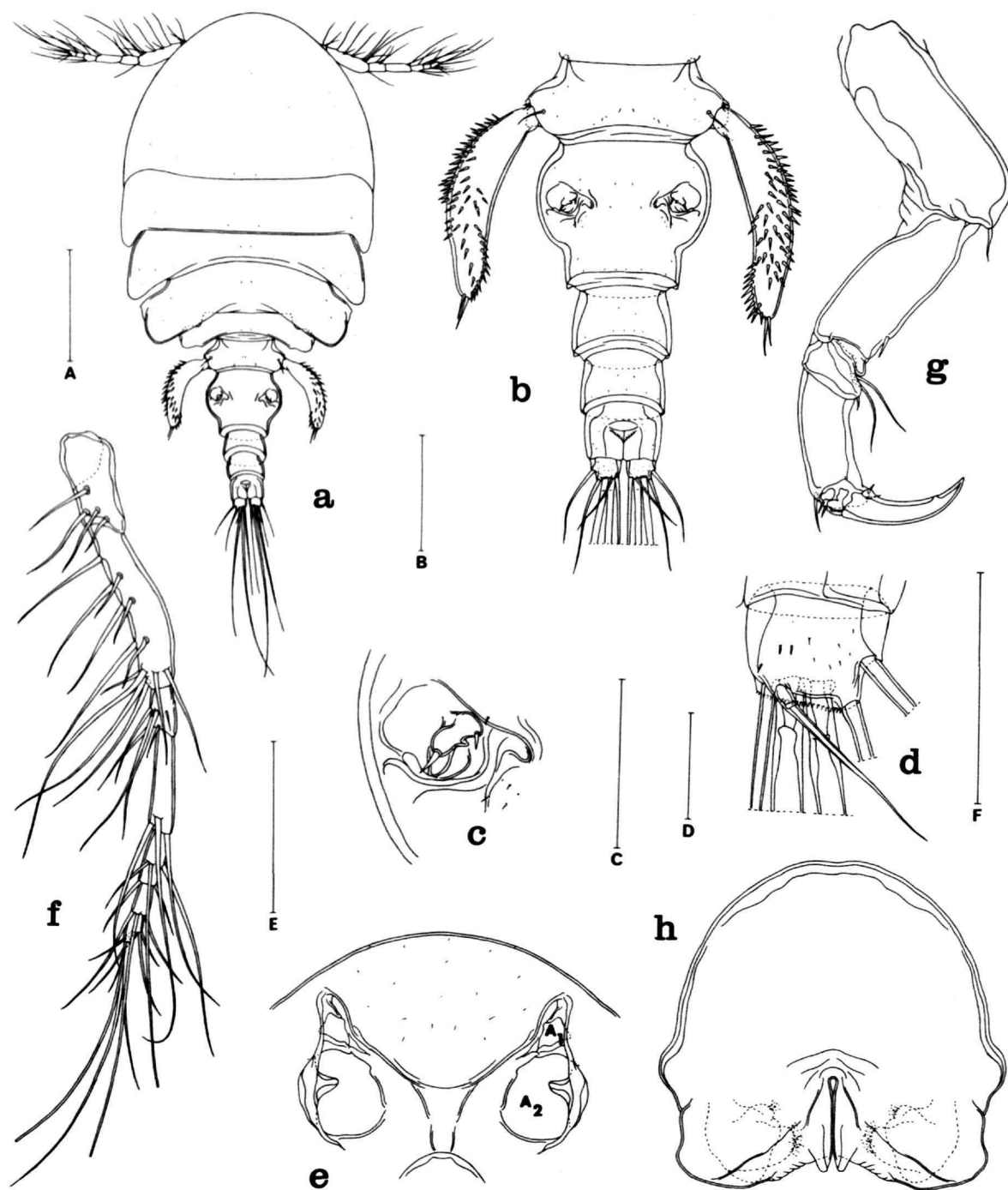


FIGURE 179.—*Zamoligus acanthodes*, new species. Female: a, dorsal (A); b, urosome, dorsal (B); c, area of attachment of egg sac, dorsal (C); d, caudal ramus, dorsal (D); e, rostrum, ventral (E); f, first antenna, ventral (E); g, second antenna, anterior (F); h, labrum, with paragnaths indicated by broken lines, ventral (C). Scale: A, 0.2 mm; B, E, F, 0.1 mm; C, 0.05 mm; D, 0.02 mm.

The caudal ramus (Figure 179d) is slightly wider than long, $24 \times 27.5 \mu$. The dorsal seta is 35μ , the outer lateral seta 72μ , the outermost terminal seta 83μ , and the innermost terminal seta 140μ . The two long terminal setae are 275μ (outer) and 350μ (inner), both inserted between dorsal (unornamented) and ventral (with a marginal row of spinules) flaps. All the setae are naked.

The body surface is ornamented with hairs (sensilla) as shown in Figure 179a,b. The posteroventral margin of the anal segment is smooth.

The egg sacs were broken in all ovigerous females seen. The eggs are numerous, each about 46μ in diameter.

The rostrum (Figure 179e) has a broadly rounded posteroventral margin. Between this margin and the anterior edge of the labrum there are pairs of sclerotized lines.

The first antenna (Figure 179f) is 314μ long. The lengths of the seven segments (measured along their posterior nonsetiferous margins) are 27 (66μ along the anterior margin), 94, 29, 58, 32, 18, and 17μ respectively. The formula for the armature is like that of *Z. tridens*. All the setae are naked.

The second antenna (Figure 179g) has a seta on the first and second segments and three setae on the third segment. The fourth segment, 66μ along its outer edge, 44μ along its inner edge, and 21μ wide, bears a single terminal claw 51μ along its axis and six very small, hyaline elements. All the setae are naked.

The labrum (Figure 179h) has two broad, posteroventral lobes of unusual form.

The mandible (Figure 180a) resembles that of *Z. tridens* but the toothlike process on the convex margin of the base is stouter and more pointed, and just proximal to its origin there is a row of spinules (not present in *Z. tridens*). The paragnath (Figure 179h) is a small hairy lobe. The first maxilla (Figure 180b) has three elements. The second maxilla (Figure 180c) has on its second segment a small setule proximally on its outer (ventral) margin, a surficial anterior seta finely barbed along one edge, and a long, strongly barbed seta distally on its inner (dorsal) margin. The terminal lash has on one side a crest of about nine long falciform spines followed by a series of short spines; the opposite side has a row of spinules. The maxilliped (Figure 180d) has on the first segment a few small inner spines and on the second segment two very

unequal setae (the longer one barbed) and a few small spines. The last segment bears a small, naked setule, a spine with a few minute barbs, and a terminal barbed spiniform process without an articulation.

The ventral area between the maxillipeds and the first pair of legs (Figure 180e) is not protuberant. A sclerotized line extends between the bases of the maxillipeds.

Legs 1-4 (Figure 180f-i) are segmented and armed as in *Z. tridens*. On the outer side of the coxa of leg 1 there is a posterior lobe (Figure 180f). The inner seta on the coxa of legs 1-3 is large and feathered, but in leg 4 this seta is short (20μ) and naked. The inner margin of the basis is haired in legs 1-3 but naked in leg 4. The three spines on the last segment of the endopod of leg 2 are 26, 26, and 29μ from outer to inner. The exopod of leg 4 is 134μ long, with the last segment having the formula III,I,5. The endopod has hairs along the outer margins of both segments and a few minute barbs on the inner margin of the second segment. The first segment is $35 \times 22 \mu$ (not including the spinous processes) and bears an inner distal feathered seta 56μ . The second segment is 88μ long (including the terminal spiniform processes), 17.5μ in greatest width, and 15μ in least width; the terminal outer spine is 26μ , the inner spine 55μ , both fringed.

Leg 5 (Figure 180j) has a long, slightly recurved free segment reaching posteriorly beyond the genital segment. Its greatest dimensions are $187 \times 42 \mu$. The two short terminal naked setae are 28μ and 33μ . The segment is ornamented dorsally and outwardly with moderately long spines. The naked seta on the body adjacent to the free segment is about 28μ ; near this seta is a group of slender spinules.

Leg 6 is probably represented by the two small setae near the attachment of each egg sac (Figure 179c).

The color in life in transmitted light is translucent, the prosome with a few small red globules, the eye red, the egg sacs opaque.

MALE.—The body (Figure 181a) has a somewhat broadened prosome. The length (not including the ramal setae) is 0.76 mm ($0.74\text{--}0.78 \text{ mm}$) and the greatest width 0.31 mm ($0.30\text{--}0.32 \text{ mm}$), based on six specimens in lactic acid. The ratio of the length to the width of the prosome is 1.42:1. The ratio of the length of the prosome to that of the urosome is 1.56:1.

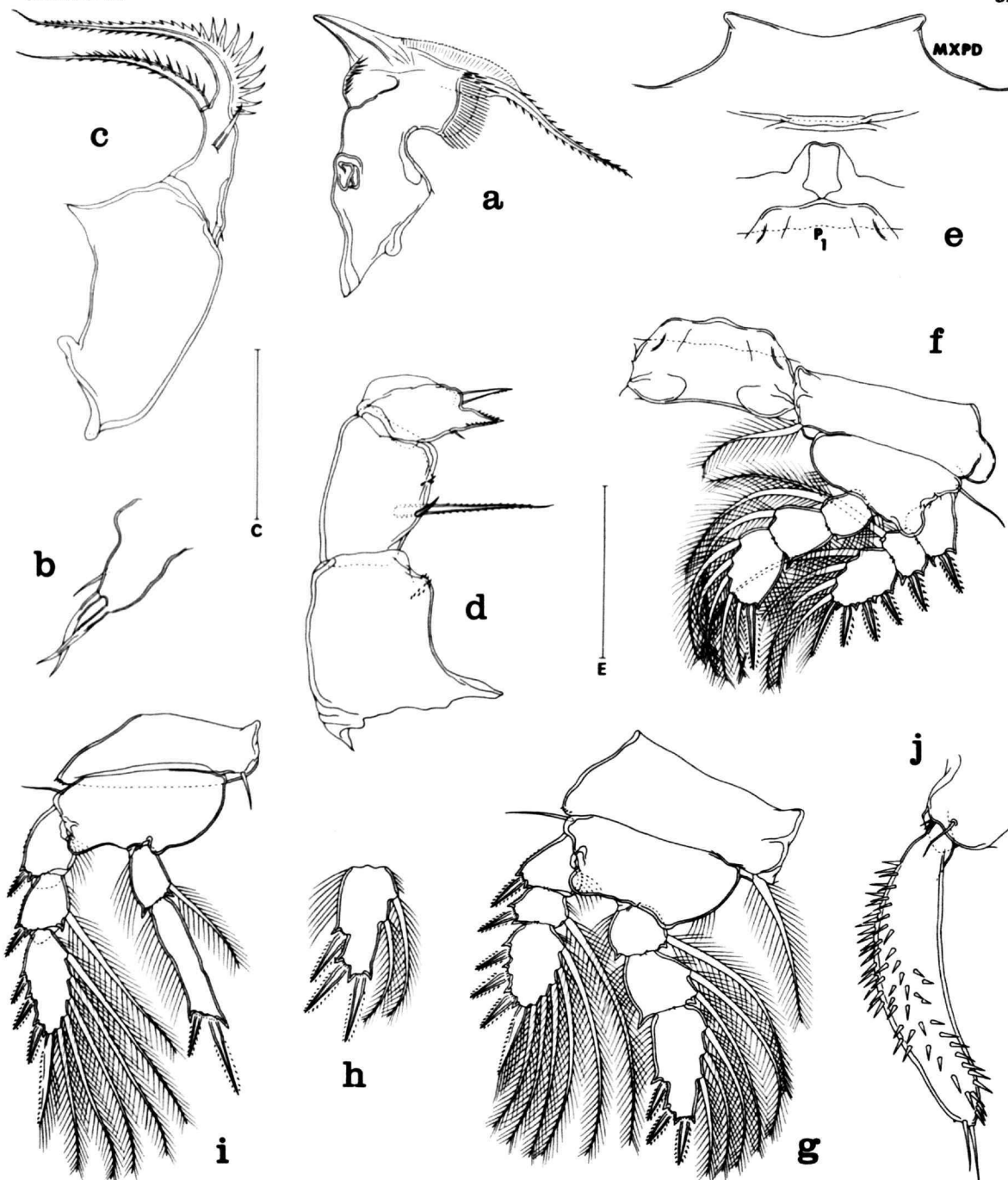


FIGURE 180.—*Zamolgus acanthodes*, new species. Female: a, mandible, posterior (c); b, first maxilla, posterior (c); c, second maxilla, posterior (c); d, maxilliped, anterior (c); e, area between maxillipeds and first pair of legs, ventral (E); f, leg 1 and intercoxal plate, anterior (E); g, leg 2, anterior (E); h, third segment of endopod of leg 3, anterior (E); i, leg 4, anterior (E); j, leg 5, dorsal (E). Scale: c, 0.05 mm; E, 0.1 mm.

The segment of leg 5 (Figure 181*b*) is $52 \times 83 \mu$. There is no ventral intersegmental sclerite. The genital segment is $159 \times 164 \mu$ in dorsal view, its lateral margins only slightly expanded. The four postgenital segments are $28 \times 54 \mu$, $28 \times 53 \mu$, $21 \times 51 \mu$, and $25 \times 50 \mu$ from anterior to posterior.

The caudal ramus resembles that of the female but is smaller, $19 \times 21 \mu$.

The body surface has a few hairs as in the female.

The rostrum is similar to that of the female. The sclerotized lines seen in the female between the

rostrum and the labrum are absent.

The first antenna is like that of the female but there are three additional aesthetes, so that the formula is the same as in the male of *Z. tridens*. All the setae are naked.

The second antenna (Figure 181*c*) is similar in general form and armature to that of the female but has added ornamentation. The first segment has a small spine near the seta. The second segment has a long inner row of spines. The fourth segment, 55μ along its outer edge, 37μ along its inner edge,

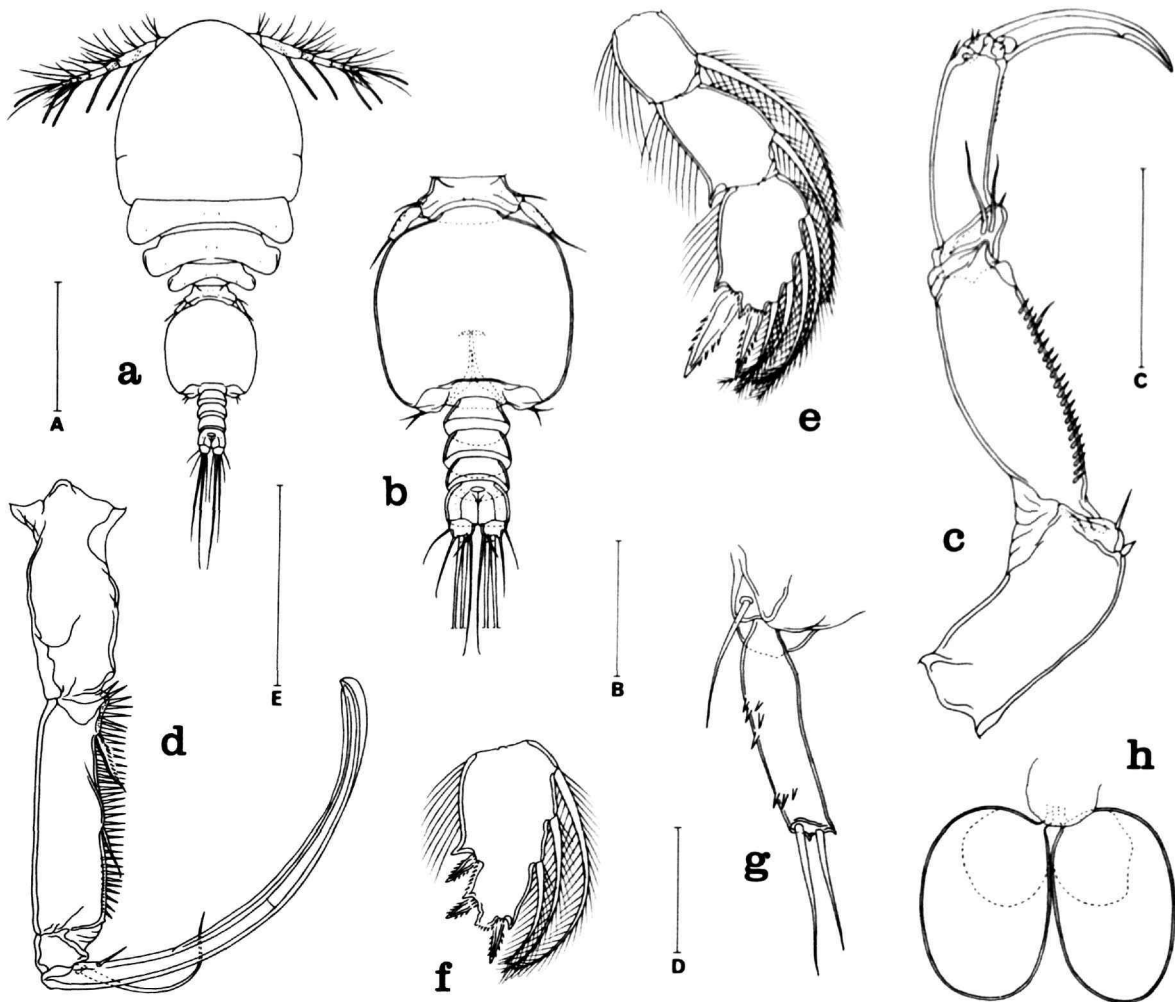


FIGURE 181.—*Zamolpus acanthodes*, new species. Male: *a*, dorsal (A); *b*, urosome, dorsal (B); *c*, second antenna, posterior (C); *d*, maxilliped, outer (D); *e*, endopod of leg 1, anterior (E); *f*, third segment of endopod of leg 2, anterior (C); *g*, leg 5, dorsal (D); *h*, spermatophores, attached to female, dorsal (B). Scale: A, 0.2 mm; B, E, 0.1 mm; C, 0.05 mm; D, 0.02 mm.

and 14 μ wide, with its claw 45 μ along its axis, has a row of very small spines on its distal inner surface.

The labrum, mandible, paragnath, first maxilla, and second maxilla are like those of the female. The maxilliped (Figure 181d) is more elongated and slender than in *Z. tridens*. The second segment bears a seta unilaterally fringed with spinules, a naked seta, and a single row of long spines. The claw is 216 μ along its axis including the terminal lamella and has the usual two unequal proximal setae.

The ventral area between the maxillipeds and the first pair of legs resembles that of the female.

Legs 1-4 are segmented and armed as in the female except for the last segment of the endopod of leg 1 (Figure 181e), where the formula is I,I,4, the two spines being 31 μ and 20 μ . Sexual dimorphism is present also in the last segment of the endopod of leg 2 (Figure 181f) where the three spines from outer to inner are 10, 9, and 11 μ , all shorter than in the female (see Figure 180g). Legs 3 and 4 are like those of the female. The coxa of leg 1 has a postero-outer lobe as in the female.

Leg 5 (Figure 181g) has a small, elongated free segment 37 x 10 μ . The terminal setae are 23 μ and 18 μ . The segment is ornamented with a few small spines. The seta adjacent to the free segment is 22 μ .

Leg 6 consists of a posteroventral flap on the genital segment bearing two naked setae, 11 μ and 13 μ (Figure 181b).

The spermatophore (Figure 181g), attached to the female in pairs, is ovoid, 117 x 70 μ , not including the neck.

ETYMOLOGY.—The specific name *acanthodes*, Greek ακανθωδης (thorny), alludes to the spines on leg 5 in the female.

REMARKS.—This species may be easily distinguished from *Z. tridens* in the female by the ornamentation of spines on leg 5, the shape of the genital segment, and the bidentate appearance (rather than tridentate) of the last segment of the maxilliped. In the male, this species has a different ornamentation on the second antenna, only one row of spines is present on the second segment of the maxilliped, and the outer of the two spines on the last segment of the endopod of leg 1 is longer and stronger than the inner. Both sexes of *Z. acanthodes* may be separated from *Z. tridens* by details of the labrum and the mouthparts.

Genus *Zygomoligus* Humes and Stock, 1972

DIAGNOSIS.—Body cycloform. Urosome in the female 5-segmented. Caudal ramus with six setae. Rostrum rounded so far as known. First antenna 7-segmented. Second antenna 4-segmented, the third segment with a clawlike element and the fourth segment with four claws.

Mandible with a slender base merging into a long, slender pectinate lash. First maxilla with two-four elements. Second maxilla of the usual lichomolgid form. Maxilliped in the female 3-segmented.

Legs 1-4 with 3-segmented rami except for leg 4 endopod which is 2-segmented. Armature generally of the typical lichomolgidiform type. Leg 4 exopod with the third segment having II,I,5. Leg 4 endopod with the formula 0-1;II, the seta being feathered.

Leg 5 with a small, unornamented free segment bearing two terminal elements.

Other features as in the species below.

Associated with ascidians or algae (a single female of *Z. tenuifurcatus* with a holothurian).

Key to Species of the Genus *Zygomoligus*

FEMALES

1. Caudal ramus more than twice as long as anal segment *Z. tenuifurcatus*
Caudal ramus about as long as or scarcely longer than anal segment 2
2. Prosome broad; leg 4 endopod with second segment not much longer than first segment *Z. didemni*
Prosome slender; leg 4 endopod with second segment at least 1½ times longer than first segment 3
3. Leg 3 exopod with third segment having II,I,5 *Z. curtiramus*
Leg 3 exopod with third segment having III,I,5 *Z. poucheti*

TYPE-SPECIES.—*Zygomoligus tenuifurcatus* G. O. Sars.

ETYMOLOGY.—The generic name is a combination of ζυγος (a yoke) and μολγος.

REMARKS.—The male is unknown in all species.

***Zygomoligus tenuifurcatus* (G. O. Sars, 1917)**

FIGURE 182

Lichomoligus tenuifurcatus G. O. Sars, 1917a, pp. 160, 161, pl. 89 [from Norway].—Gotto, 1954a, p. 133 [from the holothurian *Lapidoplax digitata* (Montagu), Strangford Lough, County Down, Northern Ireland]; 1955, p. 391 [from the ascidian *Diplosoma listerianum*, Strangford Lough, County Down, Northern Ireland]; 1960b, pp. 213, 223, fig. 30; 1966, p. 194.

***Zygomoligus curtiramus* (Bocquet and Stock, 1962)**

Lichomoligus curtiramus Bocquet and Stock, 1962b, pp. 244–

249, figs. 1, 2 [from the alga *Lithophyllum incrustans*, Saint Efflam, Côtes-du-Nord, France].

***Zygomoligus didemni* (Gotto, 1956)**

Lichomoligus didemni Gotto, 1956, pp. 600–602, figs. 1–9 [from the ascidian *Didemnum maculosum* (Milne Edwards), Northern Ireland]; 1960b, pp. 213, 223, fig. 1; 1966, p. 194.—Bocquet and Stock, 1962b, pp. 248, 249.—Glaçon, 1971, p. 23 [unnumbered].

***Zygomoligus poucheti* (Canu, 1891)**

Lichomoligus poucheti Canu, 1891a, pp. 478, 479 [from the surface of colonies of the ascidians *Morchellium argus* M. Edwards and *Fragarium areolatum* Giard, Concarneau, France]; Canu, 1892, pp. 231, 232, pl. 23, figs. 5–12 [from *Morchellium argus* and *Fragarium areolatum*, Concarneau, France].—T. Scott, 1907, p. 371.—G. O. Sars, 1917a, pp. 158–160, pl. 88 [from Norway].—Gotto, 1960b, p. 227 [on *Morchellium argus* and *Sidnyum elegans*].—Bocquet and Stock, 1962b, pp. 244, 247–249, fig. 3 [free-living, Côtes-du-Nord, France].

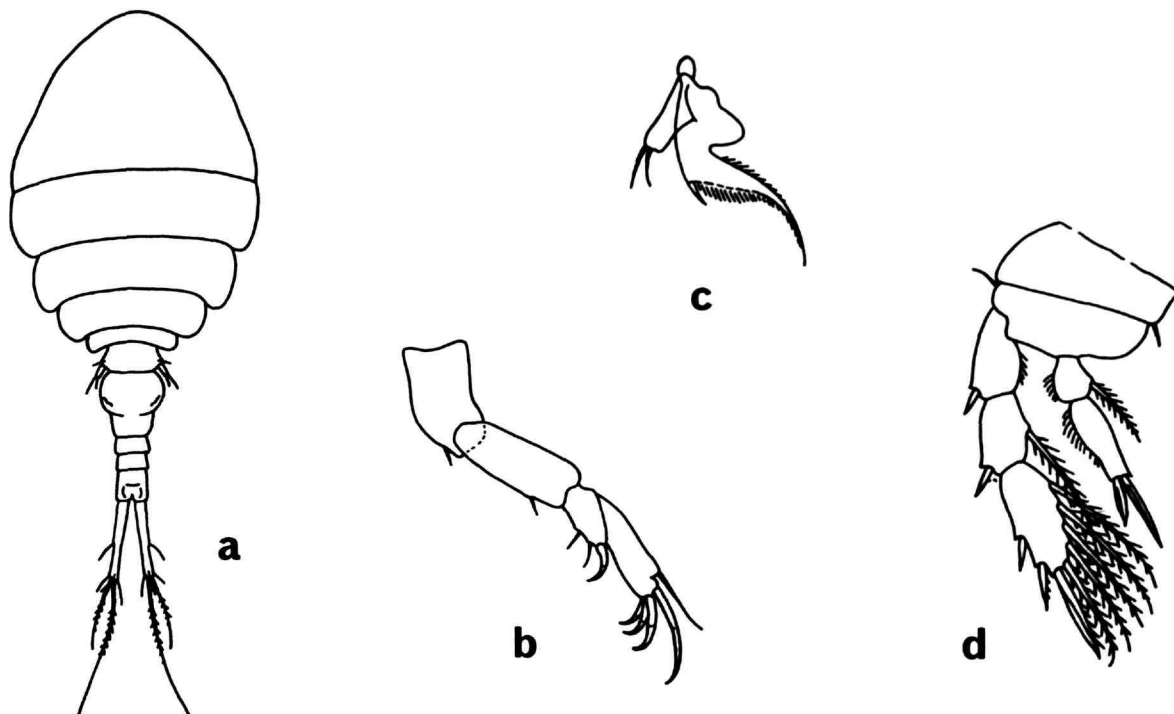


FIGURE 182.—*Zygomoligus tenuifurcatus* (G. O. Sars). Female: a, dorsal; b, second antenna; c, mandible and first maxilla; d, leg 4. [Redrawn from G. O. Sars, 1917a, pl. 89, figs. ♀ (omitting the first antennae and egg sacs), a, m, p₁.] Length of female 1.40 mm.

Lichomolgidae Insufficiently Described or of Uncertain Position

Boholia cerianthiphila Kossman, 1877

Boholia cerianthiphila Kossmann, 1877, pp. 22, 23, pl. 4, fig. 4, pl. 5, fig. 2 [from the ceriantharian *Cerianthus*, canal of Lapinig, Bohol, Philippine Islands].

Boholia cerianthiphyla.—De Zulueta, 1912, pp. 11–12.

Kelleria gurneyi Sewell, 1949

Kelleria gurneyi Sewell, 1949, pp. 117–119, fig. 31 A–H [in surface tow-net, Kurau River, Perak, Federated Malay States].

REMARKS.—The male is unknown.

Kelleria sp.

Kelleria sp., Grice, 1960, p. 220 [in plankton, northwestern coast of Florida].

Lichomolgus aegyptius Gurney, 1927

Lichomolgus aegyptius Gurney, 1927, pp. 467, 468, fig. 112 [from Suez Canal].

REMARKS.—The female is unknown.

Lichomolgus elegans Thompson and A. Scott, 1903

Lichomolgus elegans Thompson and A. Scott, 1903, p. 280, pl. 16, figs. 8–13 [from washings of dredged invertebrates, Ceylon].—A. Scott, 1909, p. 264. [Siboga Station 226, midway between Lucipara and Schildpad Islands].

Lichomolgus (*Macrochiron*) *elegans*.—Monod and Dollfus, 1932, p. 139.

Macrochiron elegans.—Stock, 1957, p. 381.

?*Stellicola elegans*.—Stock, 1957, p. 381.

REMARKS.—The male is unknown.

Lichomolgus fuliginosus Brady, 1910

Lichomolgus fuliginosus Brady, 1910, p. 573, fig. 59 [at 385 m, Gauss Station, Antarctica].—Stock, 1960a, pp. 370, 371, fig. 4.

REMARKS.—Only one specimen is known—a female according to Brady, but sex uncertain according to Stock (1960a).

Lichomolgus gigas Thompson and A. Scott, 1903

Lichomolgus gigas Thompson and A. Scott, 1903, pp. 280, 281, pl. 16, figs. 21–26 [from washings of dredged invertebrates, Ceylon].—A. Scott, 1909, p. 264 [between Lucipara and Schildpad Islands, 5°26.7' S, 127°36.5' E. Siboga Station 226].—Ummerkutty, 1968, p. 315 [in starfish washings, Gulf of Mannar, southeastern India].

Lichomolgus rotundus Sewell, 1949

Lichomolgus rotundus Sewell, 1949, pp. 97–99, fig. 23 A–H [in weed-washings, Addu Atoll, Maldives Archipelago; spelling is *rotundus* on pp. 19, 97 but *rotundatus* on pp. 92, 93, 98].

REMARKS.—The male is unknown.

Lichomolgus (*Lichomolgus*) sp.

Lichomolgus (*Lichomolgus*) sp., Monod and Dollfus, 1932a, p. 138, figs. 2C, 3A, 4A, 5D, 6B,C,G,H [from the nudibranch *Aeolidia nebae* Risbec, New Caledonia].

"Copepode commensal."—Risbec, 1930, p. 296, fig. 60 [from *Aeolidia nebae* Risbec, New Caledonia].

Lichomolgus (*Macrochiron*) sp.

Lichomolgus (*Macrochiron*) sp.—Monod and Dollfus, 1932a, p. 140, figs. 2E, 5C,E, 6A, 7 [from *Chromodoris mouaci* Risbec, Ile Mouae, New Caledonia].

"Copepode commensal."—Risbec, 1930, p. 281 [from the nudibranch *Chromodoris mouaci* Risbec, New Caledonia].

Lichomolgus sp.

Lichomolgus sp.—Marques, 1949, pp. 24, 26, pl. 3, figs. b, c, f [from Portuguese Guinea].—Monniot, 1961, p. 97, fig. 1d [from the ascidian *Microcosmus sabatieri* Roule, Banyuls, Mediterranean coast of France].—Ummerkutty, 1968, pp. 315–317, figs. 22–31 [from weed-washings (sic) of the starfish *Pentaceros hedemanni* (Lütken), Gulf of Mannar, southeastern India].

Lichomolgus tenuicornis Brady, 1910

Lichomolgus tenuicornis Brady, 1910, pp. 571, 572, fig. 58 [at 385 m, Gauss Station, Antarctica].

REMARKS.—The male is unknown.

Lichomolgus vagans Gurney, 1927

Lichomolgus vagans Gurney, 1927, pp. 465, 466, fig. 111 [from Suez Canal].

REMARKS.—The female is unknown.

Macrochiron (*Macrochiron*) *longipes* Sewell, 1949

Macrochiron (*Macrochiron*) *longipes* Sewell, 1949, pp. 104, 105, fig. 26A–I [in weed-washings, Addu Atoll, Maldives Archipelago].

Lichomolgus longipes.—Stock, 1957, p. 382.

REMARKS.—This is a *Lichomolgus* according to Stock (1957, p. 382). The nature of the mandible is not known. The male is unknown.

Macrocheiron sp.

Macrocheiron sp., Grice, 1960, p. 220 [in plankton, Alligator Harbor, west coast of Florida].—Wickstead, 1961, p. 61 [Indo-West-Pacific].—Bruce, Colman, and Jones, 1963, p. 128 [from Isle of Man, England].

Oncaeola specialis Krämer, 1895

Oncaeola specialis Krämer, 1895, p. 220, pl. 18 (figs. 2, 4, 5, 7), pl. 19 (figs. 1, 3, 7a, 8, 9) [in plankton, New Zealand].

Paralichomolgus orbicularis Monod, 1928

Paralichomolgus orbicularis Monod, 1928, pp. 2–8, fig. 2 [from the gills of the nudibranch *Platydoriscruenta* (Quoy and Gaimard), Noumea, New Caledonia].—Risbec, 1928, p. 35, fig. 1 ter [from *Platydoriscruenta* (Quoy and Gaimard), New Caledonia].

Lichomolgus (Stellicola) orbicularis.—Monod and Dollfus, 1932a, p. 139; p. 143, figs. 2A,B, 5A,B, 6E,F.

Pseudanthessius minimus Tanaka, 1960

Pseudanthessius minimus Tanaka, 1960, pp. 75–77, pl. 33, figs. 1–18 [in plankton, Indian Ocean, 08°15' S, 76°15' E].

REMARKS.—This species is perhaps near *Paramacrochiron*.

Stellicola alabatensis Kossmann, 1877

Stellicola alabatensis Kossmann, 1877, pp. 14, 15, pl. 1, figs. 2, 3 [from Philippine Islands].

"Copépode commensal."—Risbec, 1930, p. 290 [from *Trevelyana kouaouae* Risbec, New Caledonia].

Lichomolgus (Macrochiron) alabatensis.—Monod and Dollfus, 1932a, p. 140, figs. 2D, 4B, 6D, 9A–B [from the nudibranch *Gymnodoris (=Trevelyana) kouaouae* (Risbec), Noumea, New Caledonia].

Lichomolgus alabatensis.—Stock, 1957, p. 381.

Macrochiron alabatensis.—Stock, 1957, p. 381.

Stellicola semperi Kossmann, 1877

Stellicola semperi Kossmann, 1877, pp. 13, 14, pl. 3, fig. 1 [from the asteroid *Ophidiaster miliaris*, Isabela, Philippine Islands].

Lichomolgus (Stellicola) semperi.—Monod and Dollfus, 1932a, p. 139.

Paralichomolgus longicaudatus.—Monod and Dollfus, 1932a, p. 139.

Linchiomolgus caeruleus.—Monod and Dollfus, 1932a, p. 142.

Species Undesignated

"Copépodes," Risbec, 1928, p. 34 [on gills of the nudibranchs *Platydoriscruenta* Risbec and *Trevelyana (=Gymnodoris) ceylonica* (Kelaart)] New Caledonia], pp. 34, 169 [on gills of the nudibranch *Noumea flava* (Eliot), New Caledonia]. "Lichomolgide (à décrire)," Pruvot-Fol, 1954, p. 25 [from *Armina maculata*].

Undetermined Lichomolgidae.—Semper, 1862, pp. 105, 106 [from naked mollusks, Philippine Islands].—Boas, 1886, p. 34 [from *Cavolina (=Hyalaea) tridentata* (Forskål), locality unknown; "en *Ergasilus*-lignende Snyltekrebs"].—Pelseneer, 1903, p. 7 [from mantle cavity of the bivalve *Nacella mytilina* (Helbling), Tierra del Fuego].

Copepods Placed by Various Authors in the Old Family Lichomolgidae but Belonging Elsewhere

Anthessius Della Valle, 1880 a,b. Mycolidae. Listed in the Lichomolgidae by Monod and Dollfus, 1932a, pp. 148–151.

Boeckia Brady, 1872 a,b, pp. 430–431. Preoccupied. (= *Anthessius*.)

Cholidya polypti Farran, 1914. Harpacticoida. Listed in the Lichomolgidae by Monod and Dollfus, 1932a, p. 153. (See discussion in Bresciani, 1970, p. 15.)

Hermannella arenicola (Brady, 1872).—Farran, 1913, p. 6.—Norman and T. Scott, 1906, p. 199. (= *Anthessius*.)

Herrmannella concinna A. Scott, 1909, pp. 262–263, pl. 68, figs. 1–10. (= *Anthessius*.)

Lichomolgus aberdonensis T. Scott and A. Scott, 1892b, pp. 149–151, pl. 6 figs. 1–12. (= *Hemicyclops*.)

Lichomolgus adhaerens Williams, 1907, pp. 75, 76, pl. 2. (= *Hemicyclops*.)

Lichomolgus arenicolus (Brady, 1880), vol. 3, pp. 46, 47, pl. 87, figs. 1–7. (= *Anthessius*.)

Lichomolgus brevicaudis Leigh-Sharpe, 1934, pp. 11–13, fig. 7. (= *Anthessius*. See Stock, Humes and Gooding, 1963b, p. 2; Stock, 1964c, pp. 121, 123.)

Lichomolgus littoralis T. Scott, 1892, pp. 260, 261, pl. 10, figs. 1–9. (= *Hemicyclops*.)

Lichomolgus major Williams, 1907, pp. 77, 78, pl. 3. (= *Myocheres*.)

Lichomolgus (Sabelliphilus) spinosus Raffaele and Monticelli, 1885, pp. 303–306, figs. 1–12. (= *Midicola*=*Pseudomyicola*.)

Myicola metisiensis Wright, 1885, and *M. major* (Williams, 1907). Myicolidae. Listed in the Lichomolgidae by C. B. Wilson, 1932, pp. 346–348.

Pachysoma punctatum Claus, 1863, pl. 25, figs. 6–11. (Transferred to the genus *Pachos* Stebbing, 1910, p. 556.) Oncaeidae. Listed in the Lichomolgidae by Ganapati and Shanthakumari, 1962, p. 10, and by A. Scott, 1909, p. 261.

Panaetis incamerata Stebbing, 1900, pp. 666, 667, pl. 71E. Myicolidae. (*Panaetis* placed in Clausiidae by Yamaguti, 1936).

Parapanaetis Hoshina and Sugiura, 1953. Myicolidae. Placed in the Lichomolgidae by Gooding, 1963, p. 13.

Pseudomolgus leptostylis G. O. Sars, 1918, pp. 182, 183, pl. 103. (= *Anthessius*.)

Pseudomolgus navanacis C. B. Wilson, 1935, pp. 780, 781, pl. 26, figs. 13–24. (= *Anthessius*; see Stock, Humes, and Gooding, 1963b, p. 2.) *Pseudomolgus* placed in the Lichomolgidae by Sars, 1916, p. 3; 1918, p. 181.

Pseudomolgus groenlandicus Hansen, 1923, pp. 19, 20, pl. 2, fig. 7a-g. (= *Anthessius*.)

Pseudomolgus dilatatus G. O. Sars, 1918, p. 184, pl. 104 (= *Anthessius*.)

Pseudomolgus sp., in C. B. Wilson, 1923, p. 4. (Probably = *Anthessius*.)

Rhinomolgus anomalus G. O. Sars, 1918, pp. 185–187, pls. 105, 106. Myicolidae. Listed originally in the Lichomolgidae by Sars, 1918, p. 184.

Synaptiphilus luteus Canu and Cuénot, 1892. Synaptiphilidae. (See Bocquet and Stock, 1957b, p. 695.)

Family UROCOPIIDAE Humes and Stock, 1972

Genus *Urocopia* G. O. Sars, 1917

DIAGNOSIS.—Body cyclopiform, elongated. Urosome in the female 5-segmented. Caudal ramus elongated, lamellar, slender proximally, pointed distally, with four setae. Rostrum absent. First antenna 6-segmented. Second antenna 4-segmented, with the last segment having a short, straight claw (regarded by Sars as a fifth segment).

Labrum incised medially. Mandible lamellar and falcate with the distal part of the base having on its convex side a denticulated crest; lash short. First maxilla with four elements. Second maxilla of the general lichomolgid type. Maxilliped in the female 3-segmented, the third segment pointed.

Legs 1–4 with 3-segmented rami. Armature of the lichomolgiform pattern. Leg 4 exopod with the third segment having II,I,5. Leg 4 endopod with the formula 01;0–1;II. Leg 5 rudimentary with two setae, without a free segment.

Other features as in the species below.

TYPE-SPECIES.—*Urocopia singularis* G. O. Sars, 1917.

REMARKS.—The male is unknown.

Urocopia singularis G. O. Sars, 1917

FIGURE 183

Urocopia singularis G. O. Sars, 1917b, pp. 3–11, figs. 1–15 [in plankton, 600–700 m. depth, 59°35' N, 20°40' E, south of Iceland].—Lysholm and Nordgaard, 1921, p. 29.

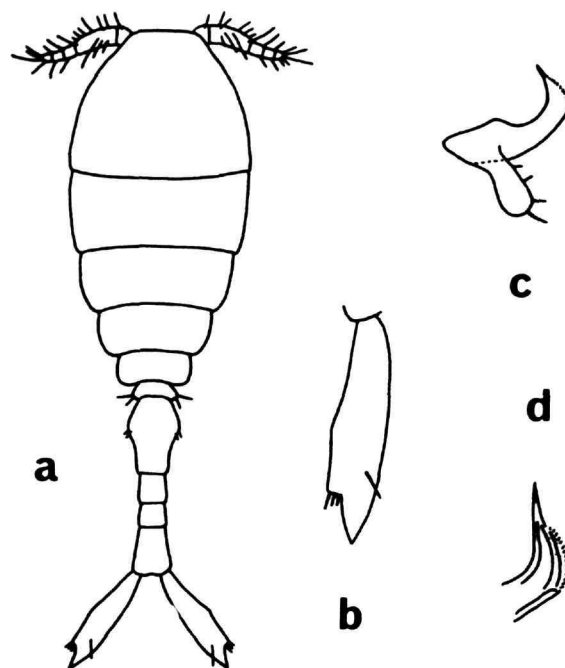


FIGURE 183.—*Urocopia singularis* G. O. Sars. Female: a, dorsal; b, caudal ramus; c, mandible and first maxilla; d, tip of mandible. (Redrawn after G. O. Sars, 1917b, figs. 1, 7, 7a, 15.) Length of female 1.90 mm.

REMARKS.—We have been unable to locate type or other specimens of *Urocopia singularis*. There are none in the Zoologisk Museum, Bergen (letter from Dr. Johanne Kjennerud, 2 February 1970), and none in the Zoologisk Museum, Oslo (letter from Dr. Marit Christiansen, 20 January 1970).

Family PSEUDANTHESSIIDAE Humes and Stock, 1972

Lichomolgidae, Lichomolginae (part).—Gurney, 1927, p. 463.
Lichomolginae (part).—Sewell, 1949, p. 91.

First antenna usually 7-segmented, but 3- or possibly 6-segmented in *Kombia*. Legs 1-4 with a reduction occurring in a posterior-to-anterior se-

ries. In *Heteranthesius* and *Pseudanthesius* with 3-segmented rami except leg 4 endopod which is 1-segmented or reduced to a small knob (in one species of *Heteranthesius*). In *Meomicola* legs 1 and 2 with 3-segmented rami and leg 3 exopod 3-segmented, leg 4 exopod 1-segmented, legs 3 and 4 endopods absent. In *Temnomolgus* legs 1 and 2 with 3-segmented rami, leg 3 reduced to a small sclerotization with two setae, leg 4 absent. In *Kombia* legs 1 and 2 with 3-segmented exopods and 2-segmented endopods, leg 3 exopod 3-segmented but endopod absent, leg 4 absent. Leg 5 without a free segment and represented by two or three elements.

Key to Genera of the Family Pseudanthesiidae

1. Leg 4 absent 2
Leg 4 present, though in some cases much reduced 3
2. Legs 1 and 2 with 3-segmented exopods and 2-segmented endopods; second antenna with one terminal claw *Kombia*
Legs 1 and 2 with 3-segmented rami; second antenna with two terminal claws *Temnomolgus*
3. Leg 3 with 3-segmented exopod, endopod absent; prosome truncated anteriorly *Meomicola*
Leg 3 with both rami 3-segmented; prosome not truncated anteriorly 4
4. Leg 4 with endopod represented only by a small segment or knob without spines or setae;
body of female transformed, with swollen prosome *Heteranthesius*
Leg 4 with endopod 1-segmented with two elements; body of female cyclopiform, not transformed *Pseudanthesius*

Genus *Heteranthesius* T. Scott, 1904

DIAGNOSIS.—Body of the female transformed, the prosome swollen. Body of the male cyclopiform, elongated. Urosome in the female 5-segmented, in the male 6-segmented. Caudal ramus with five or six setae. First antenna 7-segmented. Second antenna 4-segmented, with one terminal claw.

Mandible consisting of a broad basal area and a slender, attenuated recurved blade with denticulated edges. First maxilla with two elements. Second maxilla with the terminal armature simplified, consisting of one spine and one claw (modified lash). Maxilliped in the female 3-segmented with a rounded rather than pointed tip, in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1-4 with 3-segmented rami except leg 4 endopod which consists of a single small segment or is represented only by a small mucronate knob with two terminal setae. Setae on all four legs

short. Leg 4 exopod with third segment having III, I, 5. Leg 5 without a free segment and represented only by two setae.

Other features as in the species below.

Found free or one species associated with an ascidian.

TYPE-SPECIES.—*Heteranthesius dubius* (T. Scott, 1903).

REMARKS.—Keys for the three species cannot be satisfactorily prepared, as only the male is known for *H. dubius* and only the female for *H. scotti* and *H. furcatus*.

Heteranthesius dubius (T. Scott, 1903)

Paranthesius dubius T. Scott, 1903a, pp. 130, 131, pl. 6, figs. 16-24 [from Clyde, Scotland]. (*Paranthesius* gen. nov., preoccupied by *Paranthesius* Claus, 1889. Replaced by *Heteranthesius* T. Scott, 1904, p. 259).

REMARKS.—The female is unknown.

***Heteranthesius furcatus* Stock, 1971**

Heteranthesius furcatus Stock, 1971, pp. 335-340, figs. 1, 2 [from the ascidian *Microcosmus sabatieri* Roule, in 30-40 m, between Canet and St. Cyprien, southwestern (Mediterranean) coast of France].

REMARKS.—The male is unknown.

***Heteranthesius scotti* Bocquet, Stock, and Bénard, 1959**

FIGURE 184

Heteranthesius scotti Bocquet, Stock, and Bénard, 1959, pp. 111-117, figs. 1-3 [in washings of the calcareous alga *Lithophyllum incrustans* Phil., Bretagne, France].

REMARKS.—The male is unknown.

Genus *Kombia* Humes, 1962

DIAGNOSIS.—Body transformed, elongated, the prosome swollen, especially in the female. Urosome with weakly defined segmentation, but ap-

parently in the female 5-segmented and in the male 6-segmented. Caudal ramus with five very short setae. Rostrum weak, without a distinct posteroventral border. First antenna small, with reduced segmentation, 3- (possibly 6-) segmented. Second antenna 4-segmented, with a single terminal claw.

Labrum a broad, transverse plate. Mandible with the basal region beyond the indentation having on its convex side a scalelike area with spinules and on its concave side a row of spinules; lash forming a short, serrated blade. Paragnath a small lobe. First maxilla with three elements. Second maxilla of the usual lichomolgid type. Maxilliped in the female 3-segmented, with a pointed tip; in the male possibly 4-segmented (if the proximal part of the claw is assumed to represent a fourth segment).

Legs 1 and 2 with 3-segmented exopods and 2-segmented endopods. Leg 3 with a 3-segmented exopod but lacking an endopod. Leg 4 absent. Reduced armature on these legs, similar in both

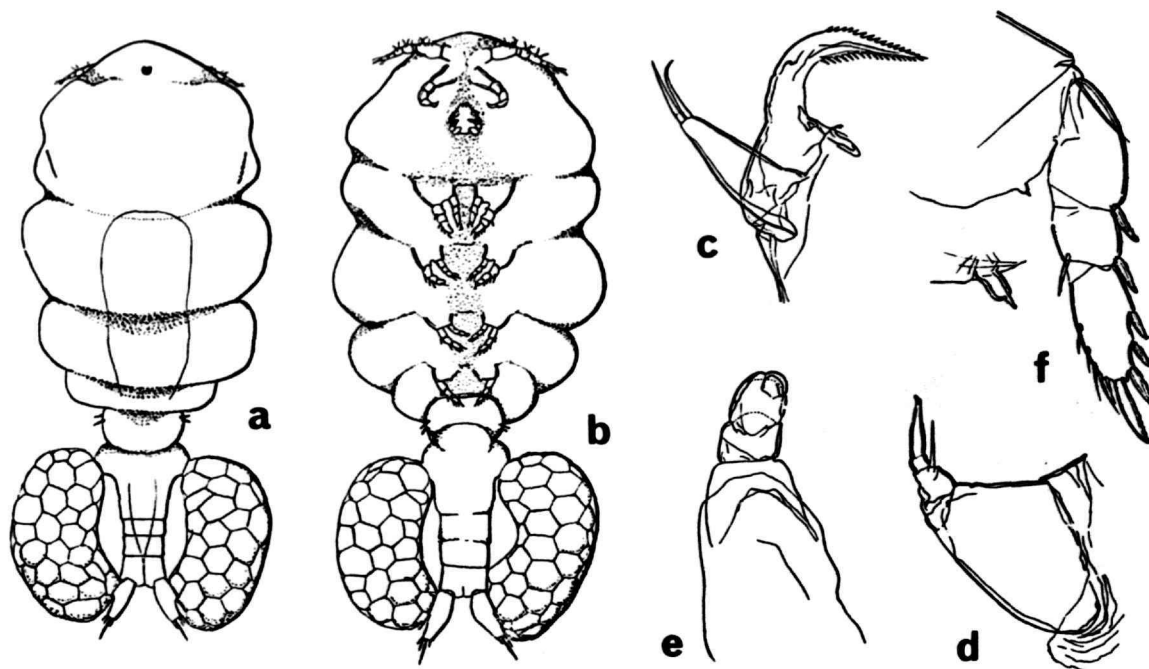


FIGURE 184.—*Heteranthesius scotti* Bocquet, Stock, and Bénard. Female: a, dorsal; b, ventral; c, mandible and first maxilla; d, second maxilla; e, maxilliped; f, leg 4 and detail of the mucronate knob representing the trace of the reduced endopod. (From Bocquet, Stock, and Bénard, 1959, figs. 1, 2d-f, 3e.) Length of female 4.1-4.3 mm. Male unknown.

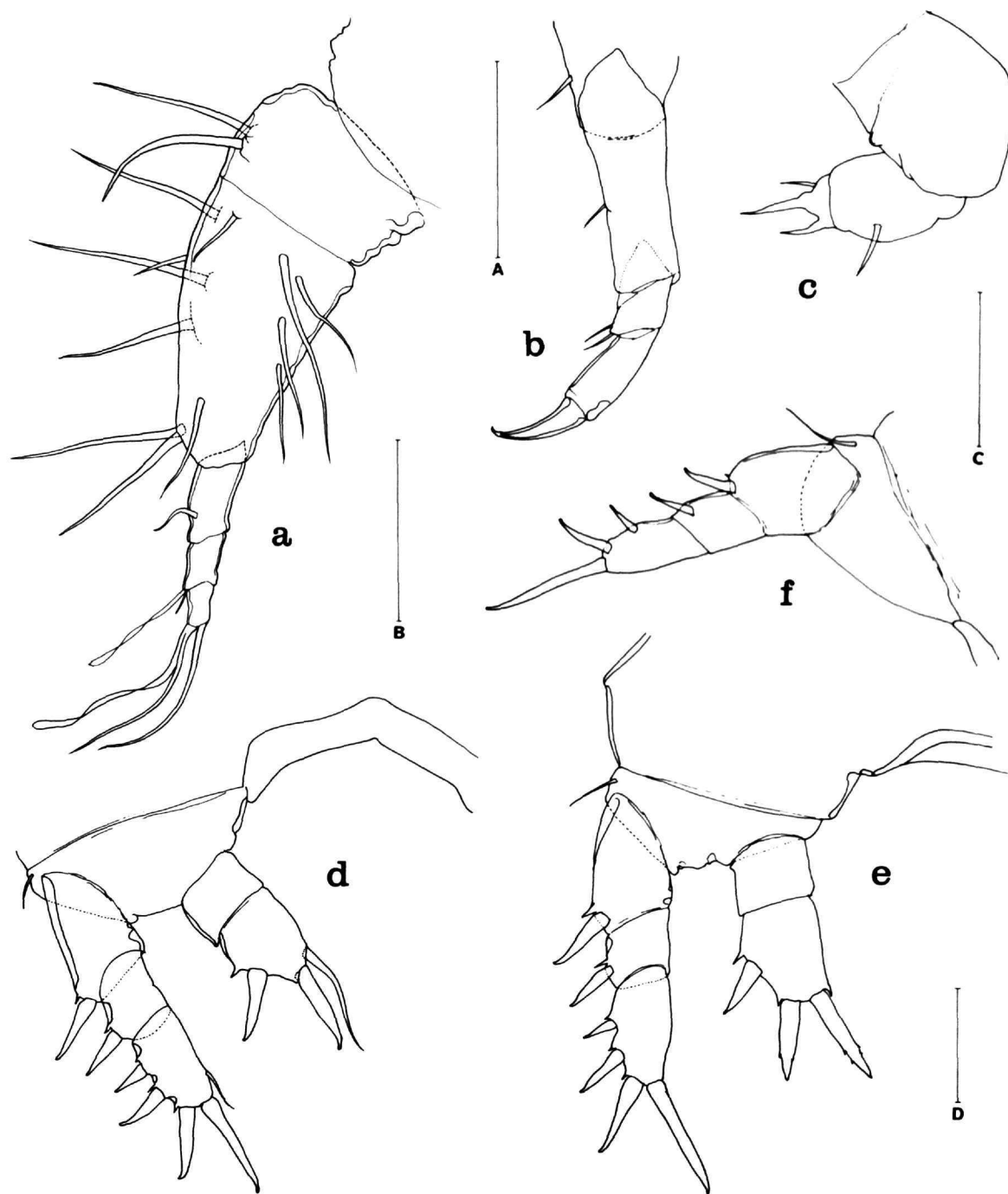


FIGURE 185.—*Kombia angulata* Humes, from *Porites somaliensis* in Mauritius. Female: a, first antenna (A); b, second antenna (B); c, maxilliped (C); d, leg 1 (D); e, leg 2 (D); f, leg 3 (D). Scale: A, C, D, 0.05 mm; B, 0.1 mm.

sexes, without sexual dimorphism on leg 1 endopod. Leg 5 represented only by two setae, without a free segment. Leg 6 in the male represented by two small posterolateral setae on the genital segment.

Other features as in the species below.

Associated with madreporarian corals.

TYPE-SPECIES.—*Kombia angulata* Humes.

***Kombia angulata* Humes, 1962**

FIGURES 185, 186

Kombia angulata Humes, 1962, pp. 49–56, figs. 1–38 [from the hard coral *Psammocora* sp., region of Nosy Bé, Madagascar].—Bouligand, 1966, p. 270.—Humes and Ho, 1968a, pp. 371, 372 [from the hard corals *Porites* (*Synaraea*) sp., *Porites* sp. cf. *nigrescens* Dana, and *Porites*, young colony, region of Nosy Bé, Madagascar].

NEW RECORDS.—3 ♀♀, 3 ♂♂ from *Porites* sp., in 2 m, Ambariotelo, a small island almost between Nosy Komba and Nosy Bé, Madagascar, 22 August 1967, collected by AGH.

NEW HOST.—*Porites somaliensis* Gravier, in Mauritius: 6 ♀♀, 1 ♂, depth about 4 m, offshore reef, 57°21' E, 20°22' S, 4 February 1964; 12 ♀♀, 5 ♂♂, depth 1–2 m, lagoon of Flic en Flacq, 13 February 1964; 1 ♀, depth 1 m, same locality, 3 February 1964. All collected by JHS.

REMARKS.—The Mauritian material from *Porites somaliensis* disagrees in some minor points with that described in the original description (host *Psammocora* in Madagascar). Humes and Ho (1968a) recorded *K. angulata* from *Porites* but did not mention any deviating characters in relation to this different host.

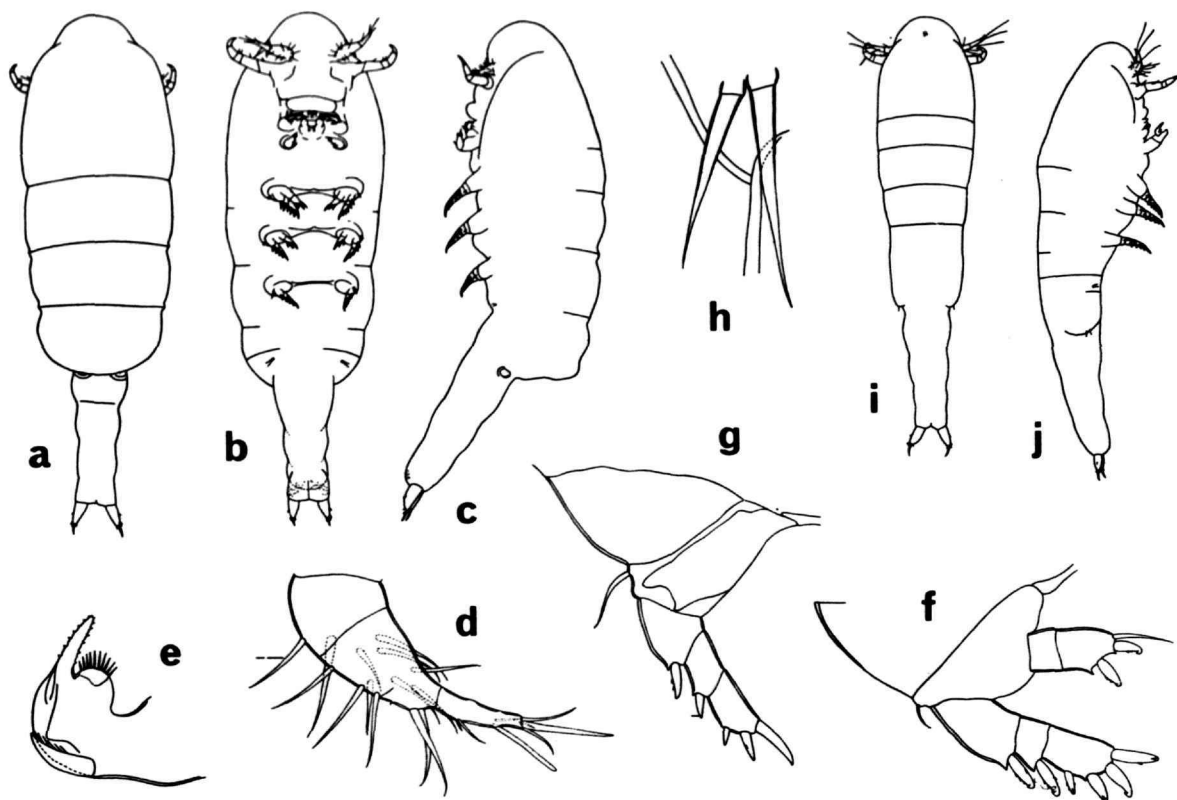


FIGURE 186.—*Kombia angulata* Humes. Female: a, dorsal; b, ventral; c, lateral; d, first antenna; e, mandible, f, leg 1; g, leg 3; h, leg 5. Male: i, dorsal; j, lateral. (From Humes, 1962, figs. 1–3, 7, 10, 16, 20–23.) Length of female 1.40 mm, of male 0.97 mm.

The present specimens deviate in the following ways: (1) the first antenna of the female is clearly 5-segmented (versus 3-segmented), through subdivision of the slender terminal portion (Figure 185a); (2) the second antenna in both sexes has a slightly more slender claw (Figure 185b); (3) the maxilliped of the female has more slender terminal processes on the third segment (Figure 185c) and bears only one seta on the second segment; (4) leg 1 of the female has longer exopod spines, and on the endopod the spines are about as long as the seta (Figure 185d); (5) the exopod spines in leg 2 are slightly longer (Figure 185e); and (6) the exopod spines in leg 3 are much longer (Figure 185f).

On the other hand, complex structures such as the first antenna and the maxilliped of the male are very similar to those figured by Humes (1962). In the light of the variability (especially in the chaetotaxis of the legs) recorded by Humes (1962), it seems wise to consider the present material and the original samples as one variable species.

Genus *Meomicola* Stock, Humes, and Gooding, 1963

DIAGNOSIS.—Body modified, the prosome truncated anteriorly. Urosome in the female 3-segmented, in the male 4-segmented. Caudal ramus with six short setae. Rostrum probably the median part of a broad frontal plate with short lateral horns. First antenna 7-segmented, in both sexes with the formula 3, 11, 3, 4, 4, 3, 8, including aesthetes. Second antenna 4-segmented, the armature being 1, 1, 2 + a large hooklike claw, and four short, bent, clawlike elements + three setae.

Labrum incised medially. Mandible consisting of a small base and a curved, attenuated, bipectinate blade. First maxilla with two elements. Second maxilla of the usual lichomolgid type. Maxilliped of the female 3-segmented with a pointed tip, in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1 and 2 with 3-segmented rami. Leg 3 with 3-segmented exopod, the endopod absent. Leg 4 with a protopod and 1 exopod segment. These legs with reduced armature which is alike in both sexes. Leg 5 represented by three setae, without a free segment. Leg 6 in the male represented by the ven-

tral posterolateral flap on the genital segment having two setae.

Other features as in the species below.

Associated with echinoid echinoderms.

TYPE-SPECIES.—*Meomicola amplexans* Stock, Humes, and Gooding.

***Meomicola amplexans* Stock, Humes, and Gooding, 1963**

FIGURE 187

Meomicola amplexans Stock, Humes, and Gooding, 1963a, pp. 57-71, figs. 20-24 [from the echinoid *Meoma ventricosa* (Lamarck), Curaçao, Jamaica].

NEW RECORD.—One large-form ♀, 5 small-form ♀♀, and 2 small-form ♂♂, free in 6 m, Station no. 26-68, Long Island, Bahamas, 22°52'10" N, 74°63'45" W, collected by A. Fosshagen.

Genus *Pseudanthessius* Claus, 1889

DIAGNOSIS.—Body cyclopidiform. Urosome in the female 5-segmented, in the male 6-segmented except in *P. deficiens* (female 4-, male 5-segmented) and in *P. dubius* (female 4-segmented, male unknown). Caudal ramus with six setae. Rostrum not well developed. First antenna 7-segmented, in the female with the armature 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male with the same armature or in some species with an additional aesthete on the second segment. [In *P. luculentus*, *P. notabilis*, and *P. liber* (sensu Sewell, non Brady and Robertson) with one or two very long elements on the first segment.] Second antenna 4-segmented, with the formula 1,1,3 and variable terminal armature (1-4 claws or clawlike spines and a few setae; or, in *P. tortuosus*, two lamelliform elements, one seta, and three spines; or, in *P. mucronatus*, all elements setiform).

Labrum deeply incised medially. Mandible with the basal region having its convex edge smooth or with a weak scalelike area or a process and on its concave edge a row of spinules; lash long or short. Paragnath a small lobe. First maxilla with three or four elements. Second maxilla of the usual lichomolgid type. Maxilliped in the female 3-segmented, with a pointed tip; in the male 4-segmented (assuming that the proximal part of the claw represents a fourth segment).

Legs 1-4 with 3-segmented rami, except for leg 4 endopod which is 1-segmented with two distal elements. Leg 1 endopod of the male with the same armature as in the female, or with the same formula but with slight differences in the form of the processes or elements, or in *P. deficiens* I,I,4 or in both *P. tortuosus* and *P. aestheticus* I,I,I,4. (In nearly one-third of the species males are unknown.) Leg 5 represented by three elements (a subterminal seta and a terminal spine and seta); no free seg-

ment. Leg 6 represented by the two setae near the genital openings.

Other features as in the species below.

Associated with various invertebrates, chiefly turbellarians, nemerteans, polychaetes, crinoids, asteroids, ophiuroids, and echinoids.

TYPE-SPECIES.—*Pseudanthessius gracilis* Claus.

REMARKS.—Although the genus *Pseudanthessius* is inconveniently large (containing 34 species), attempts to discover natural divisions within it are

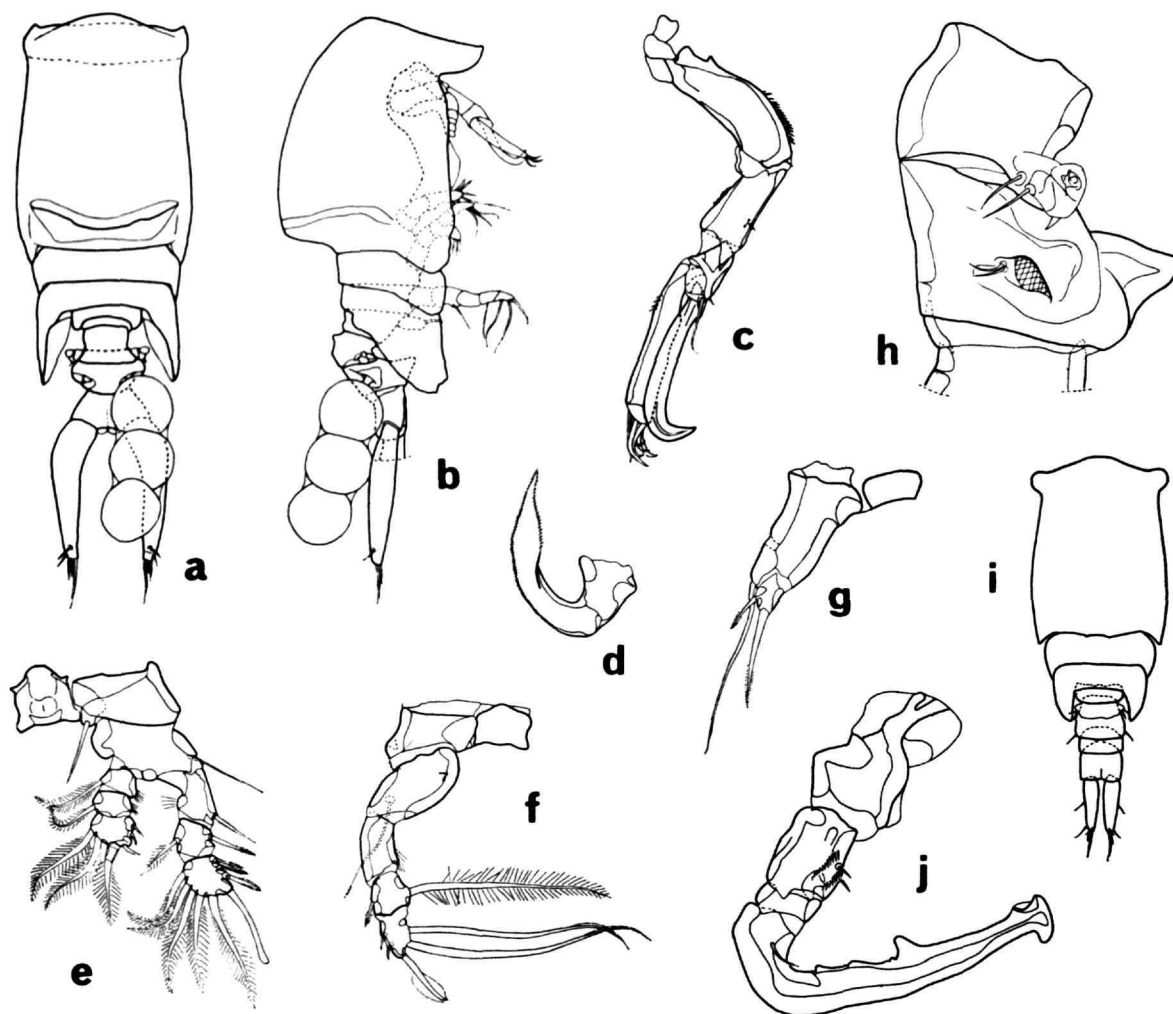


FIGURE 187.—*Meomicola amplexans* Stock, Humes, and Gooding. Female, small form: a, dorsal; b, lateral; c, second antenna; d, mandible; e, leg 2; f, leg 3; g, leg 4; h, legs 5 and 6 in situ. Male, small form: i, dorsal; j, maxilliped. (From Stock, Humes, and Gooding, 1963a, figs. 20a,b,e, 21b,g-i, 22b,f, 23a.) Length of small-form female 0.82 mm, of small-form male 0.57 mm.

plagued by incomplete descriptions (for example, of the mandible) and by the fact that males are unknown in about one-third of the species. The genus appears to be much more variable than other genera considered here. Nevertheless, certain features, such as the form of the mandible and the terminal armature of the second antenna, suggest that it may be possible to arrange the species in several groups. However, since information is lacking about many of the species, not all members of the genus can at present be assigned to such groups. The existing descriptions of species of *Pseudanthessius* demonstrate by their incompleteness the need for detailed and careful descriptions in order to provide the basis for revisionary work. We have noted the following similarities in the species, but without any intention of arranging them in definite taxonomic groups. (Undoubtedly, when all the species are better known other groupings will become apparent.)

(1) Mandible with a long lash and without a tooth or scale on the convex side; with one or two very long elements on the first segment of the first antenna; second antenna with two claws: *P. notabilis*, *P. luculentus*, and probably *P. liber* sensu Sewell.

(2) Mandible with a long lash and without a tooth or scale on the convex side; elements on the first segment of the first antenna not unusually long; second antenna with two claws: *P. procurrens* and *P. pusillus*.

(3) Mandible with a long lash and without a tooth or scale on the convex side; elements on the first segment of the first antenna not unusually long; second antenna with three claws: *P. assimilis*, *P. liber*, and *P. weberi*. (Perhaps *P. pectinifer* belongs here also, but it differs in having a small spinelike element on the convex side of the mandible.)

(4) Mandible with a broad blade and short lash, with a toothlike process or scale on the convex side; second antenna with two claws: *P. angularis*, *P. ferox*, *P. madrasensis*, *P. major*, *P. minor*, and *P. rostellatus*.

(5) Mandible with a short lash, without a tooth or scale on the convex side; second antenna with several slender setiform claws: *P. gracilis* and *P. sauvagei*.

(6) Mandible with a relatively broad blade, but with almost no lash and without a tooth or scale: *P. aestheticus*, *P. obscurus*, and *P. tortuosus*.

(7) Urosome of female 4-segmented instead of 5-segmented: *P. deficiens* and *P. dubius*.

A key to the males has not been prepared because that sex is unknown in so many of the species. In the following key to the females, the species *P. anormalus*, *P. brevicauda*, and *P. minutus* are omitted because of insufficient information; in addition, the female of *P. faouzii* is unknown.

Partial Key to Species of the Genus *Pseudanthessius*

FEMALES

- | | |
|--|------------------------------|
| 1. Urosome 4-segmented | 2 |
| Urosome 5-segmented | 3 |
| 2. Each postgenital segment about two times longer than wide; claw on second antenna slender and gently recurved | <i>P. dubius</i> |
| Each postgenital segment about as long as wide; claw on second antenna stout and strongly recurved | <i>P. deficiens</i> |
| 3. At least one element on basal segment of first antenna almost as long as rest of appendage | 4 |
| Elements on basal segment of first antenna less than half as long as rest of appendage | 6 |
| 4. Two elements on basal segment of first antenna much better developed than the others | 5 |
| A single element on basal segment of first antenna better developed than the others | <i>P. luculentus</i> |
| 5. Terminal spine on exopods of legs 2-4 strongly curved; distal segment of second antenna about six times as long as wide | <i>P. liber</i> sensu Sewell |
| Terminal spine on exopods of legs 2-4 almost straight; distal segment of second antenna about three times as long as wide | <i>P. notabilis</i> |
| 6. Caudal ramus about as long as wide or slightly longer than wide (but distinctly less than 1.5:1) | 7 |
| Caudal ramus distinctly more than 1.5:1 | 13 |
| 7. Two claws on second antenna with denticles | 8 |
| Two claws on second antenna smooth | 9 |
| 8. Fourth segment of second antenna very long and slender, more than eight times longer than wide | <i>P. foliatus</i> |
| Fourth segment of second antenna shorter, about 3.5:1 | <i>P. pectinifer</i> |

9. Rostrum snoutlike; pair of conspicuous spines on dorsal surface of genital segment *P. rostellatus*
- Rostrum weakly developed, not snoutlike; genital segment without such a pair of spines 10
10. Genital segment abruptly indented posteriorly with two acute posterolateral angles *P. angularis*
- Genital segment with broadly rounded lateral margins without acute angles 11
11. Prosome slender (ratio of length to width 1.96:1); caudal ramus slightly longer than wide (about 1.3:1) *P. minor*
- Prosome broader (ratio of length to width 1.37–1.43:1); caudal ramus about as long as wide 12
12. Cephalosome broadly subtriangular; spine on terminal segment of leg 1 endopod straight *P. madrasensis*
- Cephalosome broadly rounded; spine on terminal segment of leg 1 endopod curved *P. major*
13. Caudal ramus close to two times longer than wide 14
- Caudal ramus more than two times longer than wide 15
14. Body length 1–1.3 mm; claws on second antenna slender, setiform *P. sawagei*
- Body length 0.52 mm; claws on second antenna recurved and unguiform *P. pusillus*
15. Caudal ramus not more than four times longer than wide 16
- Caudal ramus more than four times longer than wide 23
16. Lateral margins of genital segment produced medially into conspicuous pointed expansions; two elements on third segment of second antenna modified as slender jointed claws *P. spinifer*
- Lateral margins of genital segment produced at most into small dorsal processes (*P. tenuis*), not conspicuously expanded; not more than one element on third segment of second antenna modified as a claw 17
17. Outer margin of leg 4 endopod smoothly convex 18
- Outer margin of leg 4 endopod sinuate, or broken by a swelling or indentation which may become a conspicuous knob or notch 20
18. Length of leg 4 endopod more than four times the width; second antenna terminally with recurved claws 19
- Length of leg 4 endopod less than three times the width; second antenna terminally with modified armature not including recurved claws *P. tortuosus*
19. Caudal ramus a little longer than anal segment; latter about as long as preceding segment *P. liber*
- Caudal ramus one-fourth longer than anal segment; latter nearly twice as long as preceding segment *P. assimilis*
20. Leg 4 endopod with outer margin bulging or sinuate, without a pronounced notch or indentation 21
- Leg 4 endopod with outer margin regular, with a pronounced notch or indentation 22
21. Leg 4 endopod no longer than basal segment of exopod, with proximal bulge on outer edge but no notch *P. mucronatus*
- Leg 4 endopod much longer than basal segment of exopod, with outer margin distally sinuate *P. ferox*
22. Leg 4 endopod with marked notch on outer edge at proximal third; segments of first antenna short and compact *P. obscurus*
- Leg 4 endopod with notch at center of outer edge; not all segments of first antenna short and compact *P. tenuis*
23. Caudal ramus not more than 7.5 times as long as wide 24
- Caudal ramus at least ten times as long as wide 30
24. Greatest width of leg 4 endopod over one-half length *P. latus*
- Greatest width of leg 4 endopod less than one-half length 25
25. Leg 4 endopod on the outer edge with a notch or at least a break in the sclerotization 26
- Leg 4 endopod with outer edge lacking a notch or break in the sclerotization 29
26. Genital segment elongated, not much expanded laterally 27
- Genital segment expanded in its anterior part but abruptly constricted in its posterior part 28
27. Genital segment with a pair of anterior lateral lobes; caudal ramus about 4.5:1 *P. procurrens*
- Genital segment without such lobes; caudal ramus about 5:1 *P. weberi*

28. Leg 4 endopod less than four times as long as wide; all elements on caudal ramus setiform *P. gracilis*
 Leg 4 endopod more than five times as long as wide; two elements on caudal ramus flattened and spinelike *P. graciloides*
 29. Caudal ramus 4–5 times as long as wide; leg 4 endopod with little proximal swelling *P. nemertophilus*
 Caudal ramus 6–7 times as long as wide; proximal swelling on leg 4 endopod well marked *P. aestheticus*
 30. Last two segments of urosome subequal in length *P. concinnus*
 Anal segment at least twice as long as preanal *P. thorelli*

Pseudanthessius gracilis Claus, 1889

Pseudanthessius gracilis Claus, 1889, pp. 18, 19, pl. 4, figs. 1–7.—T. Scott and A. Scott, 1893a, pp. 241–242, pl. 12, figs. 15–20 [from the polychaete *Filograna*, Moray Firth, Scotland].—Graeffe, 1900, p. 41 (= *Lichomolgus thorelli* Brady) [with algae, Trieste, Italy].—Thompson and A. Scott, 1903, p. 276, pl. 14, figs. 19–23 [from washings of invertebrates, Ceylon].—T. Scott, 1894b, pp. 233, 258, 260 [from Firth of Forth, Scotland]; 1906, p. 353 [from Musselburg, Firth of Forth, Scotland].—Norman and T. Scott, 1906, p. 198 [from England].—G. O. Sars, 1917a, pp. 167, 168, pl. 93 [from Norway].—Lang, 1949, pp. 8, 9, figs. 10, 11 [on the red alga *Rhodymenia palmata*, Smedjan, Sweden].—Marine Biological Association, 1957, p. 176.—Bresciani and Lützen, 1962, p. 377.—Bocquet, Stock, and Kleeton, 1963, p. 38 [from the polychaete *Pomatoceros triqueter* (L.), Roscoff, France, and from the bivalve *Spisula subtruncata* (Da Costa), Brest, France].

Pseudanthessius aestheticus Stock, Humes, and Gooding, 1963

Pseudanthessius aestheticus Stock, Humes, and Gooding 1963a, pp. 23–34, figs. 6–8 [from the polychaete *Hermodice carunculata* (Pallas) and probably *Eurythoe complanata* (Pallas), Jamaica].

Pseudanthessius angularis Humes and Ho, 1970

Pseudanthessius angularis Humes and Ho, 1970b, pp. 12–15, figs. 52–66 [from the crinoids *Stephanometra indica* (Smith) and *Dichrometra sp?* *afra* A. H. Clark, region of Nosy Bé, Madagascar].

Pseudanthessius anormalus Ummerkutty, 1966

Pseudanthessius anormalus Ummerkutty, 1966, pp. 108–110, figs. 1–10 [from sponge washings, Gulf of Mannar, southeastern India].

Pseudanthessius assimilis G. O. Sars, 1917

Pseudanthessius assimilis G. O. Sars, 1917a, pp. 170, 171, pl. 95 [from the echinoid *Echinus elegans*, Norway].

Pseudanthessius brevicauda Ummerkutty, 1966

Pseudanthessius brevicauda Ummerkutty, 1966, pp. 110–112, figs. 11–17 [from washings of littoral weeds, Gulf of Mannar, southeastern India].

Pseudanthessius concinnus Thompson and A. Scott, 1903

Pseudanthessius concinnus Thompson and A. Scott, 1903, p. 277, pl. 14, figs. 24–30 [from washings of invertebrates, Ceylon].

REMARKS.—The male is unknown.

Pseudanthessius deficiens Stock, Humes, and Gooding, 1963

Pseudanthessius deficiens Stock, Humes and Gooding, 1963a, pp. 45–57, figs. 13–19 [from the ophiuroid *Ophioderma cinereum* Müller and Troschel, Curaçao, St. Martin, Puerto Rico; a collection from the holothurian *Ludwigothuria mexicana* (Ludwig) in Curaçao probably represents contamination].

Pseudanthessius dubius G. O. Sars, 1918

Pseudanthessius dubius G. O. Sars, 1918, pp. 214, 215, pl. 117 [from Norway].—Bresciani and Lützen, 1962, p. 402 [from the asteroid *Asterias rubens*, Swedish west coast].

REMARKS.—The male is unknown.

Pseudanthessius faouzii Steuer, 1940

Pseudanthessius faouzii Steuer, 1940, pp. 21–24, figs. 9–14 [from *Amphioxus*-sand, Alexandria, Egypt].

REMARKS.—The female is unknown.

Pseudanthessius ferox Humes and Ho, 1967

Pseudanthessius ferox Humes and Ho, 1967c, pp. 382–386, figs. 30–59 [from the polychaete *Sabella fusca* (Grube), region of Nosy Bé, Madagascar].

***Pseudanthessius foliatus* Stock, 1967**

Pseudanthessius foliatus Stock, 1967a, pp. 235–238, figs. 1a–d, 2a,b, 3a–e [from the echinoid *Echinothrix calamaris* (Pallas), Gulf of Aqaba, Israel].

***Pseudanthessius graciloides* Sewell, 1949**

Pseudanthessius graciloides Sewell, 1949, pp. 123–125, fig. 3A–F [in weed washings, Addu Atoll, Maldivé archipelago].

REMARKS.—The male is unknown.

***Pseudanthessius latus* Illg, 1950**

Pseudanthessius latus Illg, 1950, pp. 130–133, fig. 1 [from the turbellarian *Cryptophallus magnus* Freeman, San Juan Island, Washington, and from unidentified turbellarians, California and Washington].

Pseudanthessius obscurus.—Wilson, 1935, p. 780, pl. 27, fig. 36 [from turbellarians, California].

***Pseudanthessius liber* (Brady, 1880)**

Lichomolgus liber Brady and Robertson, 1876, p. 197 [nomen nudum].—Brady, 1880, pp. 44–46, pl. 86, figs. 1–13 [from England].—Thompson, 1893, p. 207, pl. 25, fig. 2a,b [from Liverpool Bay, England]; 1903, p. 34 [in 270 fathoms at 52°45' N, 12°27' W].—Herdman, 1896, p. 52.—Stock, Humes, and Gooding, 1963a, p. 10.

Pseudanthessius liber.—T. Scott and A. Scott, 1893a, p. 240.—T. Scott, 1894b, pp. 233, 258 [from Firth of Forth, Scotland]; 1897a, p. 154 [from Loch Gair, off Inveraray, Upper Loch Fyne, Scotland]; 1902, p. 470 [from North Craig, Firth of Forth, Scotland]; 1906, p. 353 [from North Craig and Inchkeith, Firth of Forth, Scotland].—d'Arcy Thompson, 1901, p. 47.—Thompson and A. Scott, 1903, p. 277 [from washings of invertebrates, Ceylon].—Pearson, 1905, p. 163 [from Lough Swilly, Ireland].—G. O. Sars, 1916, p. 3; 1917a, pp. 169, 170, pl. 94 [from the echinoids *Echinus sphaera* and *Strongylocentrotus droebakiensis*, Norway].—Stephensen, 1929, pp. 3, 12 [from the Faroes].—Bocquet, 1952, p. 502 [from the echinoids *Paracentrotus lividus*, *Psammechinus miliaris*, and *Echinus esculentus*, region of Roscoff, France].—Gooding, 1957, p. 212 [from the echinoid *Echinus esculentus*, Plymouth, England].—Marine Biological Association, 1957, p. 176.—Bocquet and Stock, 1962a, p. 90 [from the asteroid *Marthasterias glacialis*, region of Roscoff, northern France].—Bresciani and Lützen, 1962, pp. 377, 378 [from *Echinus esculentus*, Flatholmen, mouth of Gullmar Fiord, Swedish west coast].—Bocquet, Stock, and Louise, 1963, pp. 149–152, fig. 1 [from the echinoids *Echinus esculentus* Linnaeus, *Psammechinus miliaris* (Gmelin), and *Paracentrotus lividus* (Lamarck), region of Roscoff, France].—Bruce, Colman, and Jones, 1963, p. 128.—Gotto, 1966, p. 194.—Barel and Kramers, 1970, table 5 [from the echinoids *Echinus esculentus* Linnaeus and *Psammechinus miliaris* (Gmelin), Roscoff, France, and *Paracentrotus lividus* (Lamarck), Morgat, Channel coast of France].

lentus Linnaeus and *Psammechinus miliaris* (Gmelin), Roscoff, France, and *Paracentrotus lividus* (Lamarck), Morgat, Channel coast of France].

***Pseudanthessius liber* sensu Sewell, 1949**

Pseudanthessius liber sensu Sewell, 1949, non Brady and Robertson, 1876.—Sewell, 1949, p. 121, fig. 32A–C [from a short-spined, regular echinoid, Nankauri Harbor, Nicobar Islands].

***Pseudanthessius luculentus* Humes and Cressey, 1961**

Pseudanthessius luculentus Humes and Cressey, 1961b, pp. 75–81, figs. 23–56 [from the echinoid *Stomopneustes variolaris* (Lamarck), Nosy Bé, Madagascar].—Ummerkuty, 1968, pp. 314, 315.

Pseudanthessius agilis Ummerkuty, 1962, pp. 43–47, fig. 7 (1–11), fig. 8 (1–3) [from sponge washings, Gulf of Mannar, southeastern India; misspelled *Pseudoanthessius*].—Stock, Humes, and Gooding, 1963a, p. 10.

***Pseudanthessius madrasensis* Reddiah, 1968**

FIGURE 188

Pseudanthessius madrasensis Reddiah, 1968b, pp. 320–323, figs. 1, 2 [from crinoids, Madras, India].—Humes and Ho, 1970b, pp. 1–5, figs. 1–28 [from the crinoid *Tropiometra carinata* (Lamarck), region of Nosy Bé, Madagascar].

***Pseudanthessius major* Stock, 1967**

Pseudanthessius major Stock, 1967a, pp. 243–248, figs. 7, 8 [from the crinoids *Heterometra savignyi* (J. Müller) and *Lamprometra klunzingeri* (Hartlaub), Gulf of Aqaba, Israel].—Humes and Ho, 1970b, pp. 5–11, figs. 29–44 [from the crinoids *Cenometra emendatrix* (Bell), *Heterometra africana* (A. H. Clark), *Stephanometra indica* (Smith), *Lamprometra klunzingeri* (Hartlaub), *Liparometra?* sp., and *Dichrometra* sp.? *afra* A. H. Clark, region of Nosy Bé, Madagascar].

***Pseudanthessius minor* Stock, 1967**

Pseudanthessius minor Stock, 1967a, pp. 238–242, figs. 4–6 [from the crinoid *Lamprometra klunzingeri* (Hartlaub), Gulf of Aqaba, Israel].—Humes and Ho, 1970b, pp. 11, 12, figs. 45–51 [from the crinoids *Heterometra africana* (A. H. Clark), *Lamprometra klunzingeri* (Hartlaub), *Liparometra?* sp., and *Dichrometra* sp.? *afra* A. H. Clark, region of Nosy Bé, Madagascar].

***Pseudanthessius minutus* Reddiah, 1968**

Pseudanthessius minutus Reddiah, 1968b, pp. 323–328, figs. 3, 4 [from tunicates, Madras, India].

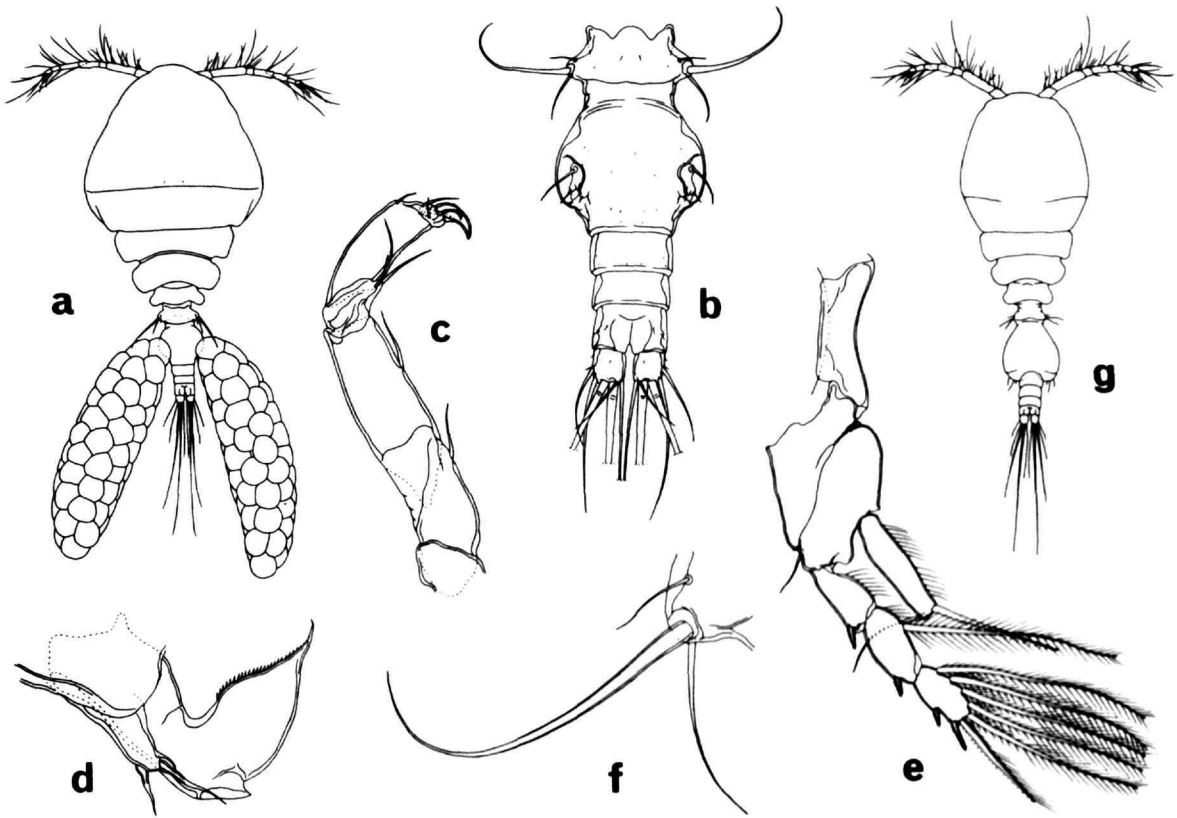


FIGURE 188.—*Pseudanthessius madrasensis* Reddiah. Female: a, dorsal; b, urosome; c, second antenna; d, mandible and first maxilla; e, leg 4 and intercoxal plate; f, leg 5. Male: g, dorsal. (From Humes and Ho, 1970b, figs. 1, 2, 7, 10, 17-19.) Length of female 0.68 mm, of male 0.48 mm.

***Pseudanthessius mucronatus* Gurney, 1927**

Pseudanthessius mucronatus Gurney, 1927, pp. 469, 470, fig. 115 [from Suez Canal].

REMARKS.—The male is unknown.

***Pseudanthessius nemertophilus* Gallien, 1936**

Pseudanthessius nemertophilus Gallien, 1936, pp. 444-459, figs. 1-3 [from the nemertean *Lineus longissimus* Sowerby, Wimereux, France].

***Pseudanthessius notabilis* Humes and Cressey, 1961**

Pseudanthessius notabilis Humes and Cressey, 1961b, pp. 67-75, figs. 1-31 [from the echinoid *Echinometra mathaei* (Blainville), Nosy Bé, Madagascar].—Stock, 1967a, pp. 232-235, fig. 2c,d [from the echinoid *Echinometra mathaei*, Gulf of Aqaba, Israel].

***Pseudanthessius obscurus* A. Scott, 1909**

Pseudanthessius obscurus A. Scott, 1909, pp. 270, 271, pl. 69, figs. 8-14 [from plankton off Laiwui, coast of Obi Major, 0°24' S, 127°36' E].—Sewell, 1949, pp. 121-123, fig. 33A-1 [in weed-washings, Nankauri Harbor, Nicobar Islands].

***Pseudanthessius pectinifer* Stock, Humes, and Gooding, 1963**

Pseudanthessius pectinifer Stock, Humes, and Gooding, 1963a, pp. 15-23, figs. 3-5 [from the echinoid *Clypeaster rosaceus* Linnaeus, Bahamas, Puerto Rico, Jamaica].—Ummerskuty, 1966, pp. 107, 108.

***Pseudanthessius procurrens* Humes, 1966**

Pseudanthessius procurrens Humes, 1966b, pp. 2-7, figs. 1-29 [from the echinoid *Phyllacanthus imperialis* (Lamarck), region of Nosy Bé, Madagascar].

***Pseudanthessius pusillus* Humes, 1969**

Pseudanthessius pusillus Humes, 1969c, pp. 268-277, figs. 1-30 [from the echinoid *Echinodiscus auritus* Leske, region of Nosy Bé, Madagascar].

***Pseudanthessius rostellatus* Humes and Ho, 1970**

Pseudanthessius rostellatus Humes and Ho, 1970b, pp. 15-20, figs. 67-90 [from the crinoid *Comaster* sp.? nov. aff. *distinctus* (P. H. Carpenter), Nosy Bé, Madagascar].

***Pseudanthessius sauvagei* Canu, 1891**

Pseudanthessius sauvagei Canu, 1891a, p. 481 [from the echinoid *Echinocardium cordatum* Pennant, Pointe aux Oies, Wimereux, and Boulogne, France]; 1892, pp. 243, 244, pl. 25, figs. 1-17 [from the echinoid *Echinocardium cordatum*, Channel coast of France].—T. Scott, 1894b, pp. 233, 258, 260 [from Firth of Forth, Scotland]; 1905, p. 202 [from the echinoid *Echinus esculentus*, Scotland]; 1906, pp. 353, 354 [from *Echinus esculentus*, St. Monans, Firth of Forth, Scotland].—T. Scott and A. Scott, 1894, p. 146 [from off St. Monans, Firth of Forth, Scotland].—Herdman, 1895, p. 45 [record from I. C. Thompson: from the echinoid *Spatangus purpureus*, Port Erin, England].—Thompson, 1895, p. 102 [from *Spatangus purpureus*, Port Erin, England].—G. O. Sars, 1917a, pp. 171, 172, pl. 96 [from Norway].—Bocquet, 1952, p. 502 [from *Echinocardium cordatum*, region of Roscoff, northern France].—Stock, 1960c, p. 248 [from *Spatangus purpureus* O. F. Müller, Cap Bear, near Banyuls, Mediterranean coast of France].—den Hartog, 1961, p. 29 [from *Echinocardium cordatum*, The Netherlands].—Bresciani and Lützen, 1962, p. 378 [from *Spatangus* and *Echinocardium flavescens*, Bonden, Swedish west coast].—Barel and Kramers, 1970, p. 166, table 5 [from *Echinocardium cordatum*, Morgat, France, and Salcombe (Plymouth), England].

***Pseudanthessius spinifer* Lindberg, 1946**

Pseudanthessius spinifer Lindberg, 1946, pp. 81-84, figs. a-1 [from Bombay, India].

***Pseudanthessius tenuis* Nicholls, 1944**

Pseudanthessius tenuis Nicholls, 1944, pp. 55, 56, fig. 25 [from South Australia].

NEW RECORD.—1 ♀ in plankton net towed obliquely from bottom to mid-depth (total depth 10 m). Surface temperature 16° C, bottom temperature 15.6° C. Bottom salinity approximately 37 percent. One-half mile from south of Yarra River, Port Phillip Bay, Victoria, Australia. Collected 5 May 1969 by G. H. Arnott of Monash Uni-

versity, who has permitted us to include his record here.

REMARKS.—The male is unknown.

***Pseudanthessius thorelli* (Brady, 1880)**

Lichomolgus thorellii.—Brady and Robertson, 1876, p. 197 [nomen nudum].—Brady, 1880, pp. 47-49, pl. 88, figs. 1-19 [from England].—Thompson, 1893, p. 207, pl. 25, fig. 2c [from Liverpool Bay, England].—Stock, Humes, and Gooding, 1963a, pp. 10, 32.

Pseudanthessius thorellii.—T. Scott and A. Scott, 1893a, p. 240.—T. Scott, 1894b, pp. 233, 258, 259 [from Firth of Forth, Scotland]; 1900, p. 399 [from Clyde area, Scotland].—Norman and T. Scott, 1906, p. 198 [from the bivalve *Pecten opercularis*, Plymouth and Salcombe, England].

Pseudanthessius gracilis (syn. *Lichomolgus thorelli*).—Graeffe, 1900, p. 41 [with algae, Trieste, Italy].

Pseudanthessius thorelli.—T. Scott, 1906, p. 353 [St. Monans and Inchkeith, Firth of Forth, Scotland].—Monod and Dollfus, 1932a, p. 153 [from *Chlamys (Aequipecten) opercularis* (Linnaeus)].—Leigh-Sharpe, 1935, p. 47 [from the mantle cavity of *Chlamys (Aequipecten) opercularis* (Linnaeus), England].—Marine Biological Association, 1957, p. 176.—Bresciani and Lützen, 1962, p. 378 [from the asteroid *Asterias rubens*, near Flatholman, Gullmar Fiord, Swedish west coast].

***Pseudanthessius tortuosus* Stock, Humes, and Gooding, 1963**

Pseudanthessius tortuosus Stock, Humes, and Gooding, 1963a, pp. 34-45, figs. 9-12 [from the polychaete *Hermodice carunculata* (Pallas), Puerto Rico, Jamaica, and Barbados].

***Pseudanthessius weberi* A. Scott, 1909**

Pseudanthessius weberi A. Scott, 1909, pp. 267-268, pl. 67, figs. 18-24 [from washings of dredged invertebrates, midway between Lucipara and Schildpad Islands, 1,595 m, 5°26.7' S, 127°36.5' E].

Genus *Temnomolgus* Humes and Ho, 1966

DIAGNOSIS.—Body transformed, with a broad swollen prosome in the female; somewhat less transformed in the male. Urosome 5-segmented in the female, 6-segmented in the male, but in both sexes the last two segments clearly separated only dorsally. Caudal ramus with six setae. Rostrum linguiform. First antenna 7-segmented, the formula in the female being 3, 13, 4, 5, 3 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male

3, 12 + 1 aesthete, 4, 4 + 1 aesthete, 3 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna 4-segmented, with the formula 1, 1, 3, and II + 4 small setae, there being two terminal claws.

Labrum with a median notch between the two lobes. Mandible with the base divided into two areas by an indentation, the proximal area unornamented, the distal area having on its convex side a scale bearing a row of spinules followed by a striated fringe and on its concave side a similar spinulose scale and a row of hairlike setules; lash moderately long. Paragnath an elongated hairy lobe. First maxilla with two elements. Second maxilla of the lichomolgid type. Maxilliped in the female 3-segmented, terminating in pointed processes, in the male 4-segmented (considering the proximal part of the claw as a fourth segment).

Legs 1 and 2 with 3-segmented rami. Leg 2 exopod with the formula I-0;0-1;II,I,4, the outer spine on the second segment being absent. Leg 3

reduced to a small sclerotization bearing two setae. Leg 4 absent. Male with similar segmentation and armature of the legs. Leg 5 in both sexes rudimentary, without a free segment, and consisting of only three setae. Leg 6 in the female represented by two small spines near the area of attachment of each egg sac, in the male by a posteroventral flap on the genital segment bearing two setae.

Other features as in the species below.

Associated with zoanthidean coelenterates.

TYPE-SPECIES.—*Temnomolgus eurynotus* Humes and Ho.

***Temnomolgus eurynotus* Humes and Ho, 1966**

FIGURE 189

Temnomolgus eurynotus Humes and Ho, 1966a, pp. 7-10, figs. 29-55 [from the gastrovascular cavity of the zoanthidean *Palythoa tuberculosa* (Esper), region of Nosy Bé, northwestern Madagascar].

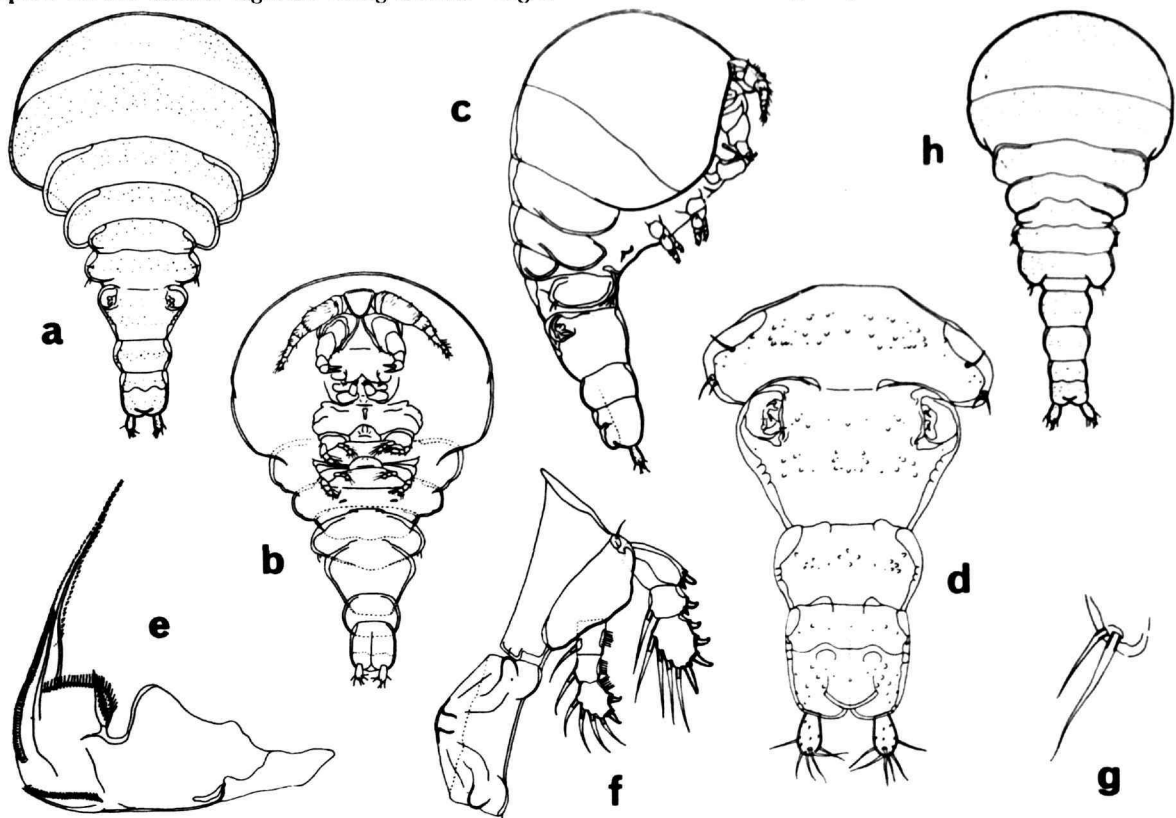


FIGURE 189.—*Temnomolgus eurynotus* Humes and Ho. Female: a, dorsal; b, ventral; c, lateral; d, urosome; e, mandible; f, leg 1 and intercoxal plate; g, leg 3. Male: h, dorsal. (From Humes and Ho, 1966a, figs. 29-32, 41, 47, 49, 50.) Length of female 1.18 mm, of male 1.21 mm.

Pseudanthessiidae Insufficiently Described or of Uncertain Position

***Pseudanthessius* sp., Herbst, 1955**

Pseudanthessius sp., Herbst, 1955, p. 218 [from São Sebastião, São Paulo, Brasil].

Family RHYNCHOMOLGIDAE Humes and Ho, 1972

Genus *Rhynchomolgus* Humes and Ho, 1967

DIAGNOSIS.—Body transformed, in the female with expanded cephalosome, narrow metasome and urosome; in the male the body elongated and almost vermiform. Urosome 5-segmented in the female, with the postgenital segments sometimes telescoped. Urosome in the preadult male 5-segmented, in the adult male 6-segmented. Caudal ramus with six short setae in the female; in the male reduced, lobate, without distinct articulation

with the anal segment, and bearing three spinules. Rostrum a conspicuous tumid snoutlike lobe. First antenna in the female short and 5-segmented, with the formula 3, 10, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete; in the male very short, 1-segmented, with 13 short terminal spines. Second antenna in the female 4-segmented and much longer than the first antenna, with the formula 1, 1, 3, 1 + 5 spinules, there being a single terminal claw. Second antenna in the male probably 3-segmented, terminally with eight short spines. In both sexes a conspicuous lobe external to the base of the second antenna and behind the first antenna.

Mouthparts of the female: Labrum with the two lobes separated by a median indentation. Mandible with the base divided into two areas by an indentation. The proximal area unornamented, the distal area bearing on its convex side a large, digitiform, posteriorly directed process and a row of small dentations and on its concave side a row of spinules; lash relatively short and stout. Parag-

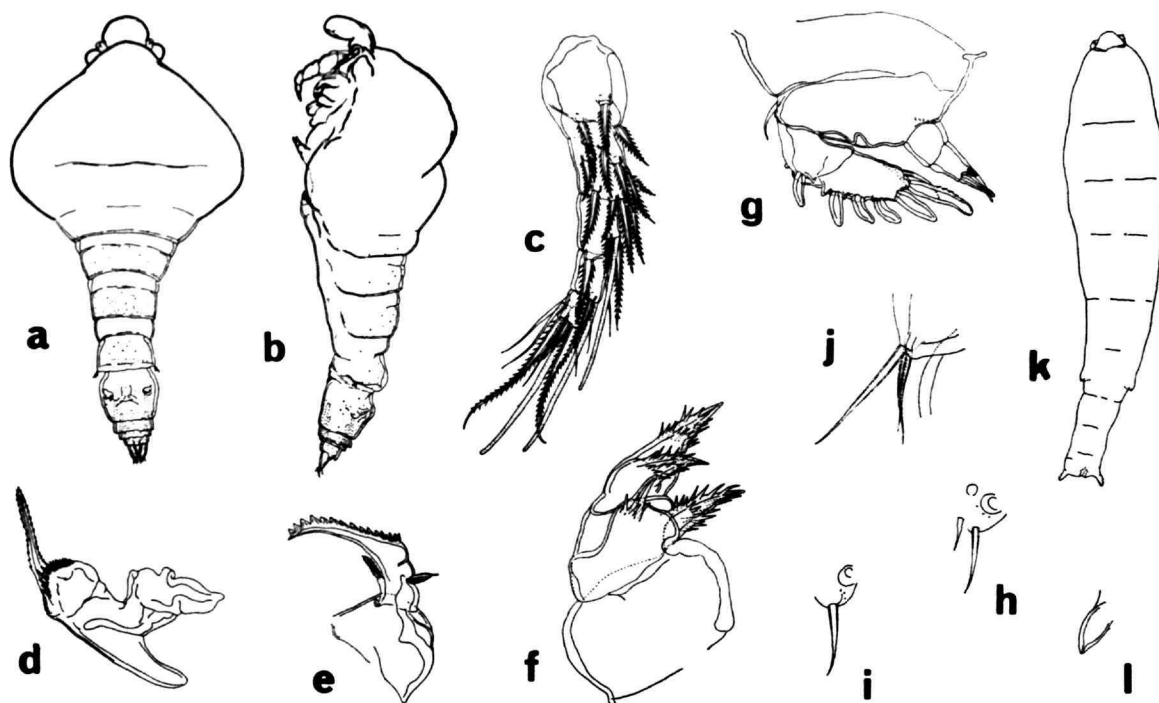


FIGURE 190.—*Rhynchomolgus corallophilus* Humes and Ho. Female: a, dorsal; b, lateral; c, first antenna; d, mandible; e, second maxilla; f, maxilliped; g, leg 1; h, leg 3; i, leg 4; j, leg 5. Male: k, dorsal; l, second maxilla. (From Humes and Ho, 1967b, figs. 80, 81, 86, 90, 92, 93, 95, 97–99, 112, 115.) Length of female 1.07 mm, of mature male 2.04 mm, of small male 1.17 mm.

nath a small hairy lobe. First maxilla with two elements. Second maxilla of the lichomolgoid type. Maxilliped 3-segmented, terminating in a pointed process.

Mouthparts of the male: Labrum a triangular bulbous area without posteroventral lobes or median cleft. Postlabral region with a fold overlapping the end of the labrum. Mandibles, paragnaths, and first maxillae absent. Second maxilla in the preadult male a well-elongated, recurved hook; in the adult male a small spinous process. Maxilliped in the preadult male 1-segmented with a clawlike tip; in the adult male absent.

Legs 1-4 much modified. **Legs of the female:** Legs 1, 2 with 2-segmented rami. Leg 3 reduced to 2 setae and leg 4 to 1 seta, both legs lacking intercoxal plates. Leg 5 without a free segment and reduced to three setae. Leg 6 represented by the two setae near the area of attachment of each egg sac. **Legs of the preadult and adult males:** Legs 1, 2 with poorly defined protopods and lacking intercoxal plates, with a setiform unsegmented exopod and weakly sclerotized unsegmented endopod bearing one hyaline element. Leg 3 a single seta. Legs 4, 5 absent. Leg 6 represented by a posteroventral flap on the genital segment bearing two setae and a spinous process.

Other features as in the species below.

Associated with madreporarian corals.

TYPE-SPECIES. — *Rhynchomolgus corallophilus* Humes and Ho.

Rhynchomolgus corallophilus Humes and Ho, 1967

FIGURE 190

Rhynchomolgus corallophilus Humes and Ho, 1967b, pp. 15-20, figs. 80-115 [from the gastrovascular cavity of *Psammocora contigua* (Esper), region of Nosy Bé, northwestern Madagascar].

Previously Known Copepods Here Recorded from New Hosts

SABELLIPHILIDAE

Herrmannella columbiae (Thompson, 1897), from the bivalve *Schizothaerus* (= *Tresus*) *capax* Gould, Washington.

Herrmannella panopeae (Illg, 1949), from the bivalves *Clinocardium nuttalli* (Conrad) and *Schizothaerus capax* Gould, Washington.

Lichomolgus sardum Kossmann, 1877, from the ascidian *Halocynthia papillosa* (Linnaeus), Banyuls, France.

Lichomolgus cynthiae (Brian, 1924), from the ascidian *Pyura microcosmus* (Savigny), Roscoff, France.

Modiolicola insignis Aurivillius, 1882, from the bivalve *Modiolus barbatus* (Linnaeus), Brest, France.

Modiolicola gracilis C. B. Wilson, 1935, from the bivalve *Mytilus californianus* Conrad, California.

Scambicornus idoneus (Humes and Cressey, 1961), from the holothurian *Holothuria edulis* (Lesson), Madagascar.

Scambicornus tuberatus (Humes and Cressey, 1961), from the holothurian *Bohadschia vitiensis* (Semper), Madagascar.

Thamnomolgus robustus Humes, 1969, from the gorgonian *Acanthogorgia aspera* Pourtales, Madagascar.

LICHOMOLGIDAE

Acanthomolgus cuneipes (Humes and Ho, 1968), from the alcyonacean *Dendronephthya mucronata* (Pütter), Madagascar.

Acanthomolgus exilipes (Humes and Ho, 1968), from the alcyonaceans *Dendronephthya speciosa* Kükenthal and *Stereonephthya cordylophora* Verseveldt, Madagascar.

Acanthomolgus fissisetiger (Humes and Ho, 1968), from the alcyonacean *Lemnalia humesi* Verseveldt, Madagascar.

Acanthomolgus gentilis (Humes and Ho, 1968), from the alcyonaceans *Umbellulifera striata* (Thompson and Henderson), *Dendronephthya lokobeensis* Verseveldt, *D. speciosa* Kükenthal, and *Stereonephthya cordylophora* Verseveldt, Madagascar.

Acanthomolgus varirostratus (Humes and Ho, 1968), from the alcyonaceans *Dendronephthya cirsium* Kükenthal, *D. lokobeensis* Verseveldt, *D. speciosa* Kükenthal, and *Stereonephthya cordylophora* Verseveldt, Madagascar.

Acanthomolgus verseveldti (Humes and Ho, 1968), from the alcyonaceans *Heteroxenia fuscescens* (Hemprich and Ehrenberg) and *Xenia lepida* Verseveldt, Madagascar.

Anchomolgus digitatus (Humes and Ho, 1968), from the madreporarian *Favia* sp., Madagascar.

Anisomolgus protentus (Humes and Frost, 1964), from the alcyonaceans *Sarcophyton glaucum* (Quoy and Gaimard), and *S. globosum* Tixier-Durivault, Madagascar.

Ascidioxynus jamaicensis (C. B. Wilson, 1921), from the ascidian *Ascidia atra* (Savigny), Curaçao.

Doridicola foxi (Gurney, 1927), from the alcyonaceans *Cladiella latissima* (Tixier-Durivault) and *C. sphaerophora* (Hemprich and Ehrenberg), Madagascar.

Gelastomolgus spondyli Humes, 1968, from the madreporarian *Plerogyra* sp., Madagascar.

Lichomolgus asaphidis Humes, 1959, from the bivalve *Solen conneus* Lamarck, Madagascar.

Macrochiron sargassi G. O. Sars, 1916, from the ascidians *Didemnum candidum* Savigny and *Tridemnum orbiculare* (Van Name), Curaçao, and the pennatulacean *Renilla reniformis* (Pall.), St. Martin, West Indies.

Metaxomolgus aculeatus (Humes and Ho, 1968), from the alcyonaceans *Nephthea amentacea* Studer, *N. bumasta* Verseveldt, *N. filamentosa* Verseveldt, *N. galbuloides* Verseveldt, *N. lanternaria* Verseveldt, *Stereonephthya nosybearia* Verseveldt, and *S. scaphis* Verseveldt, Madagascar.

- Metaxymolgus commodus* (Humes, 1964), from the nudibranch *Hexabranchnus* sp. (cf. *H. marginatus* Quoy and Gaimard), Madagascar.
- Metaxymolgus hetaericus* (Humes and Ho, 1968), from the alcyonacean *Cladiella laciniosa* (Tixier-Durivault), Madagascar.
- Metaxymolgus patulus* (Humes, 1959), from the alcyonacean *Sinularia mayi* Lüttschwager and the crinoid *Cenometra emendatrix* (Bell), Madagascar.
- Metaxymolgus securiger* (Humes, 1964), from the nudibranch *Asteronotus cespitosus* (van Hasselt), Madagascar.
- Metaxymolgus spinulifer* (Humes and Frost, 1964), from the alcyonaceans *Lemnalia longiramus* Verseveldt, *L. digitata* (May), *L. cervicornis* (May), *L. crassicaulis* Verseveldt, *L. tenuis* Verseveldt, *L. madagascarensis* Verseveldt, *Paralemnalia clavata* Verseveldt, and *Sinularia polydactyla* (Hemprich and Ehrenberg), Madagascar.
- Metaxymolgus venustus* (Humes, 1959), from the crinoid *Cenometra emendatrix* (Bell), Madagascar.
- Monomolgus unihastatus* Humes and Frost, 1964, from the alcyonacean *Pareythyropodium fulvum* Forskål, Madagascar.
- Octopicola superbus antillensis* Stock, Humes, and Gooding, 1963, from the cephalopod *Octopus briareus* Robson, Florida.
- Odontomolgus campulus* (Humes and Ho, 1968), from the madreporarian *Goniopora* sp., Madagascar.
- Odontomolgus rhadinus* (Humes and Ho, 1967), from the madreporarian *Pavona* sp., Madagascar.
- Paradoridicola glabripes* (Humes and Ho, 1968), from the alcyonaceans *Xenia macrospiculata* Gohar and *X. viridis* Schenk, Madagascar.
- Paramolgus clavatus* (Humes and Ho, 1968), from the alcyonaceans *Lemnalia longiramus* Verseveldt, *L. cervicornis* (May), and *L. crassicaulis* Verseveldt, Madagascar.
- Paramolgus spathophorus* (Humes and Ho, 1968), from the alcyonacean *Sarcophyton acutangulum* (Marenzeller), Madagascar.
- Paredromolgus decorus* (Humes and Frost, 1964), from the alcyonaceans *Cladiella latissima* (Tixier-Durivault), and *C. sphaerophora* (Hemprich and Ehrenberg), Madagascar.
- Schedomolgus lobophorus* (Humes and Ho, 1968), from the madreporarian *Acropora florida* (Dana), Eniwetok Atoll.
- Stellicola pollex* Humes and Ho, 1967, from the asteroids *Linckia diplax* (Müller and Troschel), *L. multiflora* (Lamarck), and *L. guildingi* Gray, Hawaii.
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- Kombia angulata* Humes, 1962, from the madreporarian *Porites somaliensis* Gravier, Mauritius.
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* Instead of adopting the classification proposed by Taylor and Sohl (1962), for convenience we have retained an older classification of the Gastropoda. Taylor and Sohl include tectibranchs, nudibranchs, and pulmonates (among others) in the subclass Euthyneura. They place the family Onchidiidae—containing the genus *Onchidium* and formerly considered to belong to the Pulmonata and more recently to the Opisthobranchia—in the euthyneuran order Soleolifera.

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