Zoological Journal of the Linnean Society (1996), *118:* 59–82. With 10 figures

New genera of Copepoda (Poecilostomatoida) from the scleractinian coral *Psammocora* in New Caledonia

ARTHUR G. HUMES

Boston University Marine Program, Marine Biological Laboratory, Woods Hole, Massachusetts, 02543, U.S.A.

Received June 1995, accepted for publication November 1995

Three new monotypic genera of copepods (Poecilostomatoida) are associated with the hermatypic shallow-water coral *Psammocora (Stephanaria) togianensis* near Noumea, New Caledonia: in the Anchimolgidae, *Lipochaetes extrusus* (antenna 4-segmented, endopods absent in legs 3 and 4) and *Dumbeana undulatipes* (antenna 3-segmented, endopod of leg 3 with formula 0–1; 0–2; I,II,2; leg 4 endopod with 0–1:I); and in the Rhynchomolgidae; *Emunoa protenta* (leg 4 endopod with 0–1;II, antenna 4-segmented, mandible with outer pointed process and inner row of spines). Copepoda (primarily Poecilostomatoida and Siphonostomatoida, but also relatively few Cyclopoida and Harpacticoida) are very frequent associates or parasites of Scleractinia. At present 245 species from 48 scleractinian coral genera are known. Species of these copepod associates, their host genera, and localities, described since (and those not included in) previous publications of the author are listed.

ADDITIONAL KEY WORDS: — Copepoda – Poecilostomatoida – associates – scleractinian corals – New Caledonia.

CONTENTS

INTRODUCTION

Scleractinian corals, abundant in shallow tropical waters of the oceans of the world, offer copepods a readily available microhabitat. It is thus not surprising to find that copepods are very frequent associates or parasites of these cnidarians. Humes (1985a) reported 172 species from 47 host genera. Since then, the number of host genera has remained essentially the same, except for the addition of *Flabellum* by

0024–4082/96/090059 + 24 $18.00/0

stock (1985). The number of species of associated copepods, however, has more than doubled.

The great diversity of Copepoda living with hermatypic Scleractinia has become known only during the past 35 years. Although Sewell (1940: 215) described a new harpacticoid, *Eudactylopus fasciatus*, "from among weed growing on the stems of colonies of Stag's Horn Madrepore coral", it seems unlikely that this copepod was actually associated with this coral (probably a species of *Acropora*) from the Maldive Archipelago. Recognition of copepod parasites of corals began in 1960 with the description of two new species of *Xarifia* and mention of both an undescribed species of *Xarifia* from *Pocillopora* in the Maldive Islands, and a second undescribed species of *Xarifia* from *Stylophora* in the Red Sea (Humes, 1960).

At present, 245 species of copepods are known to be associated with approximately 138 species of scleractinian corals belonging to 48 genera. Most of these copepods belong to the Poecilostomatoida (85%), followed by the Siphonostomatoida (11%), Harpacticoida (3%), and Cyclopoida (1%)). In addition, several poecilostomatoids, living with various coral genera, are known to genus only. With the exception of one deep-water solitary coral (Stock, 1985), all hosts are shallow-water hermatypic corals.

The coral hosts from which copepods have been described are spread over 14 families: Pocilloporidae (3 genera), Poritidae (3), Acroporidae (3), Siderastreidae (1), Agariciidae (3), Fungiidae (5), Oculinidae (2), Pectiniidae (2), Mussidae (3), Merulinidae (3), Faviidae (13), Caryophylliidae (4), Dendrophylliidae (3), and Trochosmiliidae (3). (For the classification of the corals I have relied upon the work of Vaughan & Wells (1943). Further information has been obtained from Veron (1986)).

The diversity in body form among copepods living with corals reflects the degree of the association. Those regarded as endoparasitic in the coral polyps often have highly modified, wormlike, sometimes swollen bodies, with reduction or loss of appendages, as in *Xarifia*, *Corallovexia*, and *Kombia*. Others, apparently more loosely associated with their hosts, for example, *Anchimolgus* and *Hetairosyna*, show less modification and are readily recognizable as copepods.

Very few observations have been made on the exact locations in the corals or the relationships of the copepods to the hosts. Gerlach in Humes (1960) observed that species of the endoparasitic genus *Xarifia* crawl in and out of the polyps, tearing the polyp tissue with their claws. In certain cases, it appears obvious that the copepods reside within the coral polyps. Such is believed to be the situation, for example, in *Cerioxynus alatus* Humes, 1974, where, after three successive vigorous washings of the coral *Favia favus* Forskål, the copepods were found in numbers of 20, 15, and 5, respectively.

MATERIAL AND METHODS

Immediately after collection in the field, the corals were isolated in plastic bags, returned to the laboratory, and placed in pails with the original sea water to which a small amount of 95% ethanol was added to make approximately a 5% solution. The corals remained in this slightly alcoholized water for a few hours, and then were thoroughly shaken and rinsed. The water was then passed through a fine net (125

holes per 2.5 cm, each hole approximately 120 μm square) and the copepods recovered from the sediment retained in the net.

The copepods were measured and dissected in lactic acid according to the method of Humes & Gooding (1964). All figures were drawn with the aid of a camera lucida. The letter after the explanation of each figure refers to the scale at which it was drawn. The body length does not include the setae on the caudal rami. The lengths of the segments of the antennules were measured along their posterior nonsetiferous margins. In the formulas for legs 1–4 the Roman numerals indicate spines, the Arabic numerals represent setae.

Poecilostomatoida Thorell, 1859
Anchimolgidae Humes & Boxshall, 1996b
Lipochaetes ***gen. nov.***

Diagnosis. Anchimolgidae. Body cyclopiform, elongate, modified. Antennule 6-segmented. Formula 4, 9, 4, 2, 2 + 1 aesthetasc, and 7 + 2 aesthetascs in female; similar in male but 2 aesthetascs added on second segment and 1 on fourth segment. Antenna 4-segmented with 1 terminal claw. Mandible with outer toothlike process directed distally.

Legs 1 and 2 with 3-segmented rami, legs 3 and 4 with 3-segmented exopods but lacking endopods. Second segment of exopod of leg 2 without outer spine. Endopods of legs 1 and 2 with first 2 segments unarmed. Exopods of legs 3 and 4 with 0-0; 0-0; II. Sexual dimorphism in endopods of legs 1 and 2 in male. Setae on all legs much reduced or absent. In tercoxal plates of legs 1–4 weak. Leg 5 with free segment bearing 2 setae. Leg 6 represented by 2 setae on ventrally located genital area. Egg sac multiseriate.

Associated with Scleractinia.

Gender. Masculine.

Type species. Lipochaetes extrusus sp. nov.

Etymology. The name of the genus is a combination of the Greek words *leípo*, to lack, and *chaíte*, a long hair, alluding to the absence of long feathered setae on legs 1–4.

Remarks. Lipochaetes might at first be mistaken for *Allopodion* Humes, 1978, in which, as in the new species, legs 1 and 2 have 3-segmented exopods and endopods and legs 3 and 4 have 3-segmented exopods but lack endopods. There are, however, significant differences. In the new species, the genital openings in the female are located ventrally (versus dorsally), the antennule is 6-segmented (versus 7-segmented), the mandible has a distally directed toothlike process (versus proximally directed process), segments 1 and 2 of the endopods of legs 1 and 2 are unarmed (versus 0-1; 0-1), segment 2 of the exopod of leg 2 is unarmed (versus I-1), and the exopods of legs 3 and 4 have 0-0; 0-0; II (versus I-0; I-0; I,5, or I,4).

***Lipochaetes extrusus* sp. nov.**
(Figs 1a–g, 2a–k, 3a–g, 4a–i)

Type material. 11 ♀♀, 11 ♂♂ from *Psammocora (Stephanaria) togianensis* Umbgrove, reef between Ile N'dié and Mt. Kumuru, Baie Dumbea, near Noumea, New Caledonia,

22°13'40"S, 166°24'18"E, 9 July 1971. Holotype ♀ (USNM 274116), allotype ♂ (USNM 274117), and 15 paratypes (7 ♀♀, 8 ♂♂) (USNM 274118) deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C. Remaining paratypes (dissected) in the collection of the author.

Female. Body (Fig. 1a,b) elongate, slender. Length 1.27 mm (1.22–1.30 mm) and greatest width 0.36 mm (0.35–0.37 mm), based on 5 specimens. Greatest dorsoventral thickness 0.33 mm. Somite bearing leg 1 incompletely separated from cephalosome by weak transverse dorsal suture. Epimera of metasomal somites rounded in dorsal view, incomplete in lateral view. Ratio of length to width of prosome 2.03:1. Ratio of length of prosome to that of urosome 1.56:1.

Somite bearing leg 5 (Fig. 1c) 78 × 255 μm. Genital double-somite in dorsal view 133 × 205 μm, much wider than long, ratio 0.66:1, sides rounded. Genital areas located ventrally, each area bearing 2 minute setae. Three postgenital somites from anterior to posterior 62 × 116, 53 × 88, and 83 × 92 μm.

Caudal ramus (Fig. 1d) unornamented, elongate, 114 μm long, 27 μm wide proximally, 15.5 μm wide distally, and 23 μm wide at midregion; ratio 4.96:1 (width taken at midregion). Outermost lateral seta, inserted near midregion of ramus, 26 μm; dorsal seta minute, 3 μm, obscure. Outermost terminal seta 17 μm, innermost terminal seta 17 μm, and 2 very unequal median terminal setae 19 μm (outer) and 168 μm (inner).

Surface of body without visible sensilla.

Egg sac (Fig. 1e) oval, 385 × 218 μm, with usually 6 eggs, each egg approximately 117–125 μm in diameter. Egg sacs in 1 female with 5 eggs (Fig. 1f).

Rostrum (Fig. 1g) weak, sublinguiform. Antennule (Fig. 2a) short, 170 μm long, 6-segmented (although third segment showing 2 sclerotized bars suggesting subdivision as 2 segments). Lengths of segments: 26 (39 μm along anterior side), 57, 16, 16, 16, and 14 μm. Formula for armature: 4, 9, 4, 2, 2 + 1 aesthetasc, and 7 + 2 aesthetascs. All setae smooth. Antenna (Fig. 2b) 250 μm long including claw, much longer than antennule, 4-segmented. Armature: 1, 1, 3, and 1 terminal claw. Fourth segment elongate, 68 μm along inner side, 49 μm along outer side, and 18 μm wide. Claw 42 μm.

Labrum (Fig. 2c) with 2 posteroventral lobes. Paragnath not seen. Mandible (Fig. 2d) with distally directed dentiform process on convex side of base. Row of setules at almost right angle to base of long lash beyond indentation on concave side of base. Maxillule (Fig. 2e) with 3 setae. Maxilla (Fig. 2f) 2-segmented, first segment unarmed, second segment with 2 setae and long lash bearing unilateral graduated spines. Maxilliped (Fig. 2g) 3-segmented, first segment unarmed, second segment with 2 setae, and small third segment having spiniform tip and bearing spiniform seta.

Ventral area between maxillipeds and first pair of legs (Fig. 2h) not protuberant, lacking median sclerite anterior to intercoxal plate of leg 1.

Legs 1 and 2 (Figs 2i–k, 3a) biramous with 3-segmented rami. Legs 3 and 4 (Figs 2k, 3a) with 3-segmented exopods but endopods absent. Formula for armature:

P_1	coxa 0–0	basis 1–0	exp I–0;	I–0;	III, I, 2
			enp 0–0;	0–0;	I,I
P_2	coxa 0–0	basis 1–0	exp I–0;	0–0;	I, II, 2
			enp 0–0;	0–0;	I,II

P_3	coxa 0–0	basis 1–0	exp 0–0; enp –	0–0;	II
P_4	coxa 0–0	basis 1–0	exp 0–0; enp –	0–0;	II

Intercoxal plates short, strongest in leg 1, weakest in leg 4. Inner seta on coxa absent in all 4 legs. Spines on leg 1 laterally barbed, those on legs 2–4 with narrow lamellae. Leg 4 with terminal spines unequal, 21 and 53 μm, ratio 1:2.52.

Leg 5 (Fig. 3b) with elongate unornamented free segment 110 × 34 μm, ratio 3.26:1. Two terminal setae 36 and 70 μm. Adjacent dorsal seta 39 μm. All setae smooth.

Leg 6 represented by 2 minute setae on genital area (Fig. 1c).

Colour of living specimens in transmitted light opaque grey, eye red.

Male. Body (Fig. 3c,d) elongate, slender. Length 1.29 mm (1.28–1.32 mm) and greatest width 0.29 mm (0.28-0.30 mm), based on 5 specimens. Greatest dorsoventral thickness 0.32 mm. Epimera of metasomal somites less rounded than in female. Ratio of length to width of prosome 2.4:1. Ratio of length of prosome to that of urosome 1.04:1.

Somite bearing leg 5 (Fig. 3e) 52 × 172 μm. Genital somite in dorsal view 200 × 200 μm, with gently rounded lateral margins. Four postgenital somites from anterior to posterior 83 × 90, 65 × 86, 60 × 78, and 64 × 68 μm.

Caudal ramus (Fig. 3e) 110 × 21 μm, resembling that of female, ratio 5.24:1.

Body surface smooth.

Rostrum as in female. Antennule like that of female but 3 long aesthetascs added, 2 on second segment and 1 on fourth segment, their locations indicated by dots in Figure 2a. Distal aesthetasc on second segment 160 μm long, approximately as long as entire antennule (162 μm). Antenna (Fig. 3f) resembling that of female, but slight sexual dimorphism evident in longer setae on first and second segments.

Labrum, mandible, maxillule, and maxilla as in female. Maxilliped (Fig. 3g) 4-segmented, assuming proximal part of claw to represent fourth segment. First segment unarmed, second segment with 2 inner setae (1 with bulbous base), third segment unarmed, claw 85 μm with 2 very unequal setae proximally.

Ventral area between maxillipeds and first pair of legs as in female.

Legs 1–4 (Fig. 4a,c,e,f) segmented as in female. Sexual dimorphism in endopods of legs 1 and 2. Endopod of leg 1 (Fig. 4b) with third segment having strong, recurved outer spine, distal spiniform process on this segment larger than in female. Endopod of leg 2 (Fig. 4d) with spines slightly longer than those in female. Leg 4 with 2 spines 18 and 55 μm, ratio 1:3.06.

Leg 5 (Fig. 4g) with small rectangular free segment 26 × 9 μm, ratio 2.34:1. Two terminal setae 50 and 34 μm. Adjacent dorsal seta 44 μm.

Leg 6 (Fig. 4h) posteroventral flap on genital somite bearing 2 setae.

Spermatophore (Fig. 4i), attached to female in pairs, elongate, 257 × 100 μm, not including neck.

Colour of living specimens as in female.

Etymology. The name of the species, *extrusus*, Latin meaning thrust out, alludes to the extended antennae and legs 1–4.

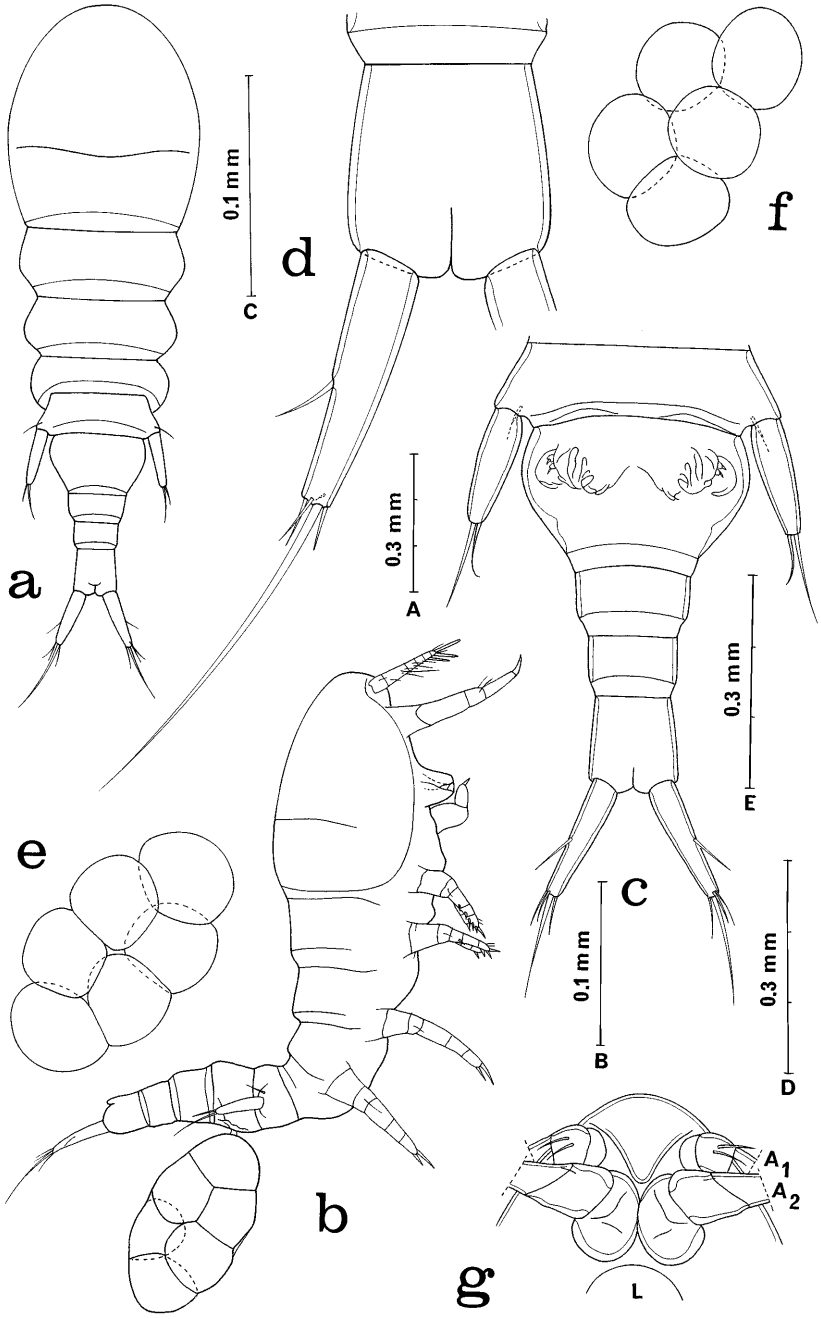

Figure 1. ***Lipochaetes extrusus* gen. nov., sp. nov.** Female. a, dorsal (scale A); b, lateral (A); c, urosome, ventral (B); d, anal somite and caudal ramus, ventral (C); e, egg sac, dorsal (E); f, egg sac, dorsal (E); g, rostrum, ventral (D). A_1 = antennule, A_2 = antenna, L = labrum.

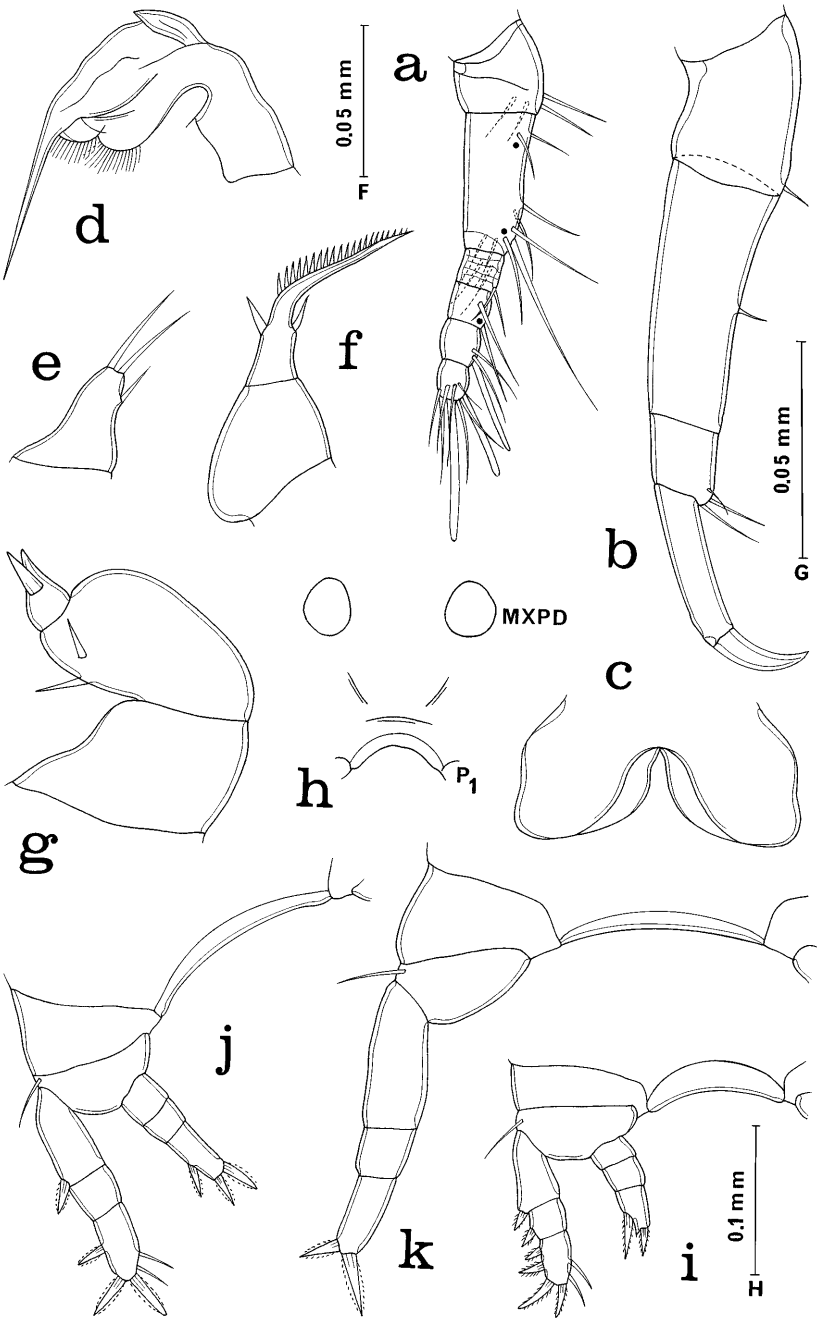

Figure 2. ***Lipochaetes extrusus* gen. nov., sp. nov.** Female. a, antennule, with dots indicating positions of aesthetascs in male, postero-inner (scale C); b, antenna, inner (C); c, labrum, ventral (F); d, mandible, posterior (F); e, maxillule, anterior (G); f maxilla, posterior (F); g, maxilliped, inner (E); h, area between maxillipeds and first pair of legs, ventral (D); i, leg 1 and intercoxal plate, posterior (H); j, leg 2 and intercoxal plate, posterior (H); k, leg 3 and intercoxal plate, posterior (H). MXPD = maxilliped; p1 = leg 1.

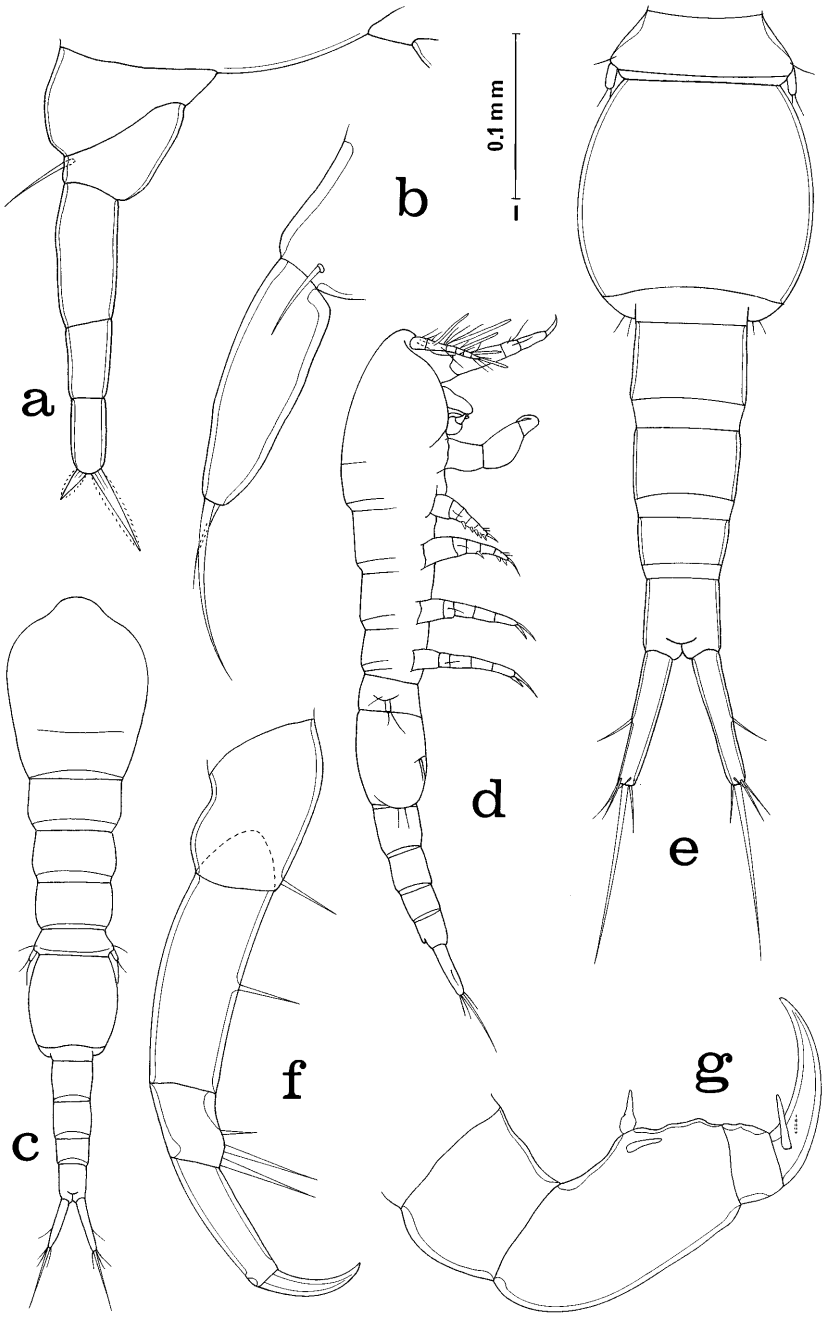

Figure 3. ***Lipochaetes extrusus*** **gen. nov., sp. nov.** Female. a, leg 4 and intercoxal plate, anterior (scale H); b, leg 5, dorsal (C). Male. c, dorsal (A); d, lateral (A); e, urosome, dorsal (I); f, antenna, inner (C); g, maxilliped, inner (C).

Dumbeana **gen. nov.**

Diagnosis. Anchimolgidae. Close to *Unicispina* Humes, 1993, but leg 3 with third segment of endopod armed with I,II,2.

Type Species. Dumbeana undulatipes sp. nov.

Gender. Feminine.

Etymology. The generic name is a noun formed by the combination of Dumbea, the name of the bay near Noumea where the copepods were found, and the Latin suffix *-ana*, meaning pertaining to.

Remarks. Six genera belonging to the lichomolgoid complex (Humes & Boxshall, 1996b) have the formula 0-1; I for the endopod of leg 4. Of these, four may be distinguished from *Dumbeana* by their 4-segmented antenna: *Euxynus* Humes, 1992a, *Juxtandrianellus* Humes, 1995a, *Moluccomolgus* Humes 1992a, and *Parandrianellus* Humes 1991a. The two remaining genera, *Jamescookina* Humes, 1991a, and *Unicispina* Humes, 1993, both with 3-segmented antennae, may be distinguished on

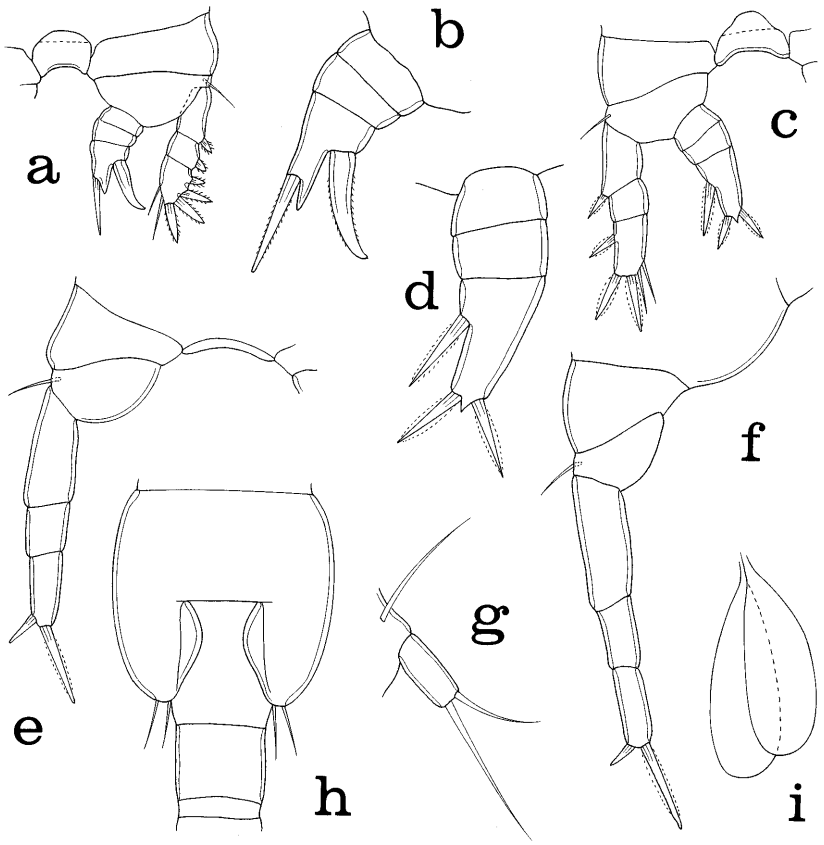

Figure 4. ***Lipochaetes extrusus* gen. nov., sp. nov.** Male. a, leg 1 and intercoxal plate, anterior (scale H); b, endopod of leg 1, anterior (F); c, leg 2 and intercoxal plate, posterior (H); d, endopod of leg 2, posterior (F); e, leg 3 and intercoxal plate, anterior (H); f, leg 4 and intercoxal plate, anterior (H); g, leg 5, dorsal (F); h, genital somite showing leg 6 and first postgenital somite, ventral (D); i, spermatophores, attached to female, ventral (E).

other grounds. In *Jamescookina* the caudal ramus has very short setae and the mandible has a pointed hyaline process on its convex side. *Unicispina* resembles *Dumbeana* in several features, for example, the mandible and leg 4, but differs conspicuously from the new genus in having the formula 0-1; 0-2; I,2 for the endopod of leg 3.

Dumbeana undulatipes **sp. nov.**

(Figs 5a–d, 6a–h, 7a–i)

Type material. 10 ♀♀, 9 ♂♂ from *Psammocora (Stephanaria) togianensis* Umbgrove, in 3 m, between Ile N'Dié and Mt. Kumuru, near Noumea, New Caledonia, 22°13'40"S, 166°24'18"E, 9 July 1971. Holotype ♀ (USNM 274119), allotype ♂ (USNM 274120) and 13 paratypes (6 ♀♀, 7 ♂♂) (USNM 274121) deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C. Remaining paratypes (dissected) in the collection of the author.

Female. Body (Fig. 5a) with moderately broad prosome. Length 1.06 mm (0.99–1.12 mm) and greatest width 0.44 mm (0.41–0.51 mm), based on 10 specimens. Greatest dorsoventral thickness 0.35 mm. Somite bearing leg 1 slightly separated laterally from cephalosome by incomplete transverse suture. Epimera of metasomal somites rounded. Ratio of length to width of prosome 1.43:1. Ratio of length of prosome to that of urosome 1.71:1.

Somite bearing leg 5 (Fig. 5b) 73 × 148 μm. Genital double-somite in dorsal view slightly wider than long, 164 μm long, 179 μm wide at anterior 'shoulders' and 135 μm wide at more posterior expansions. Ratio of length to width (taken at anterior shoulders) 0.92:1. Ratio of length to width at posterior expansion 1.22:1. Genital areas located dorsolaterally between 2 expansions, both areas bearing 2 small setae. Three postgenital somites from anterior to posterior 39 × 81, 34 × 81, and 57 × 86 μm.

Caudal ramus (Fig. 5c) unornamented, 70 × 38 μm, ratio 1.84:1. Outer lateral seta 86 μm, dorsal seta 31 μm, outermost terminal seta 104 μm, innermost terminal seta 156 μm, and 2 median terminal setae 286 μm (outer) and 385 μm (inner). All setae with lateral setules except smooth dorsal seta.

Body surface without visible sensilla.

Egg sac not seen.

Rostrum (Fig. 5d) with incomplete posteroventral margin. Antennule (Fig. 6a) 352 μm long. Lengths of its 7 segments: 31 (55 μm along anterior margin), 117, 26, 61, 49, 31, and 23 μm. Armature: 4, 13, 6, 3, 4 + 1 aesthetasc, 2 + 1 aesthetasc, and 7 + 1 aesthetasc. All setae smooth. One seta on first segment unusually long. Antenna (Fig. 6b) 3-segmented, 270 μm long, including claw. Formula: 1, 1, 3, and 1 terminal claw. First segment 86 μm long, second segment 73 μm long, third segment 107 × 17 μm (width at midregion). Claw 40 μm.

Labrum (Fig. 5d) with 2 posteroventral lobes. Mandible (Fig. 6c) having broad expansion bearing row of setules beyond indentation on convex side, and 2 unequal lobes on concave side separated by incision, with slender setules on smaller lobe and stouter setules on larger lobe. Lash long with delicate lateral setules. Paragnath not seen. Maxillule very small, approximately 20 μm long, with apparently 3 setae. Maxilla (Fig. 6d) with second segment bearing 2 setae and extended as strong lash

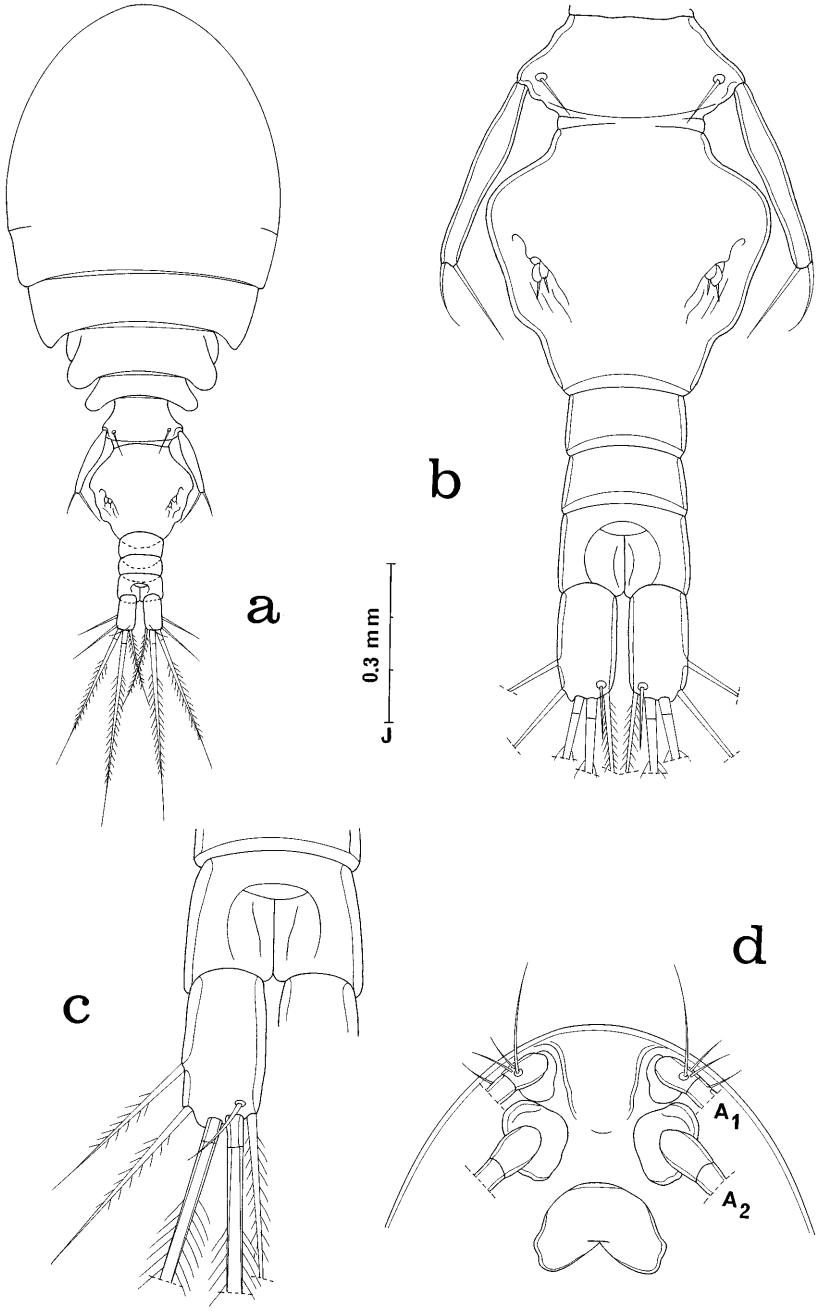

Figure 5. ***Dumbeana undulatipes*** **gen. nov., sp. nov.** Female. a, dorsal (scale J); b, urosome, dorsal (H); c, anal somite and caudal ramus, dorsal (C); d, rostrum and labrum, ventral (D). A_1 = antennule, A_2 = antenna.

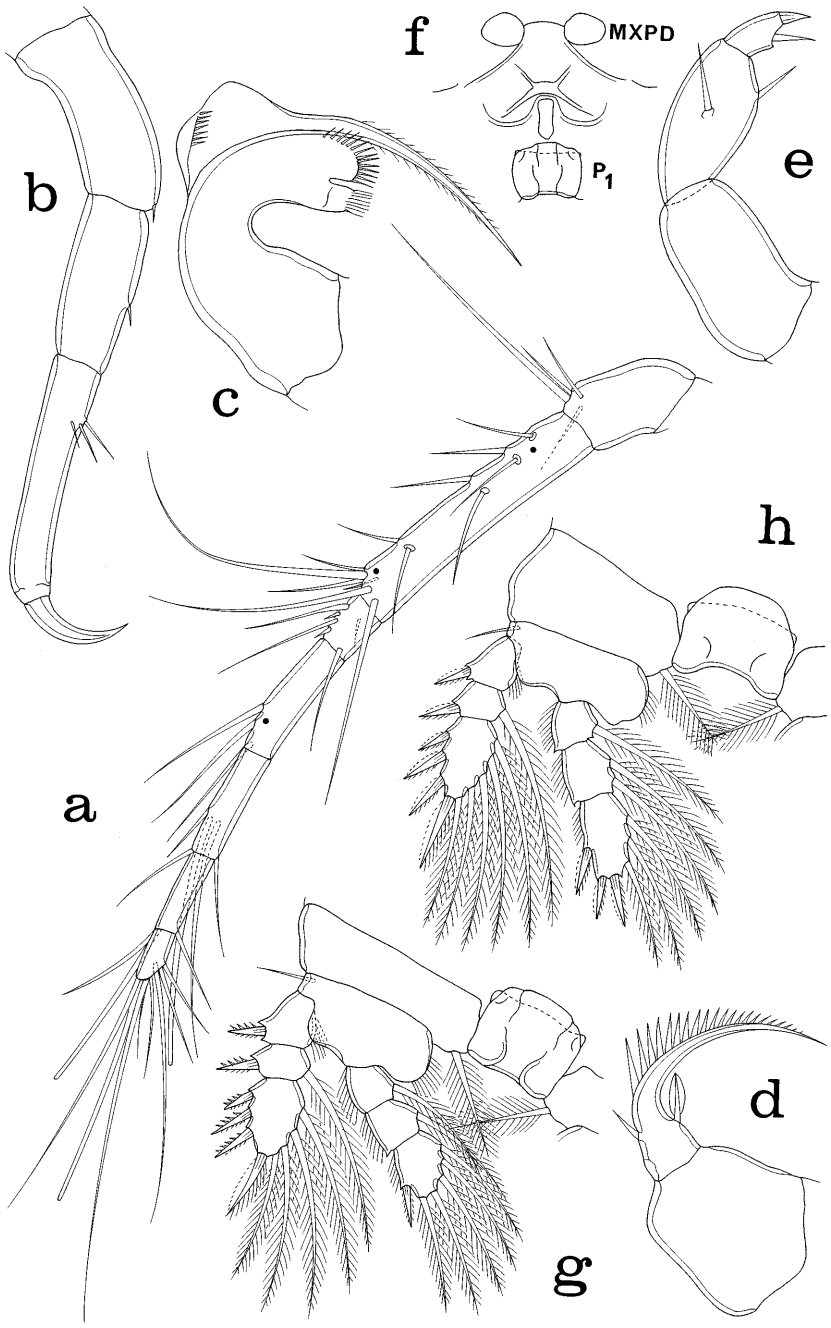

Figure 6. ***Dumbeana undulatipes*** **gen. nov., sp. nov.**. Female. a, antennule, with dots indicating positions of aesthetascs in male, anterodorsal (scale C); b, antenna, posterior (C); c, mandible, anterior (G); d, maxilla, anterior (F); e, maxilliped, antero-inner (F); f, area between maxillipeds and first pair of legs, ventral (D); g, leg 1 and intercoxal plate, anterior (H); leg 2 and intercoxal plate, anterior (H). MXPD = maxilliped, P_1 = leg 1.

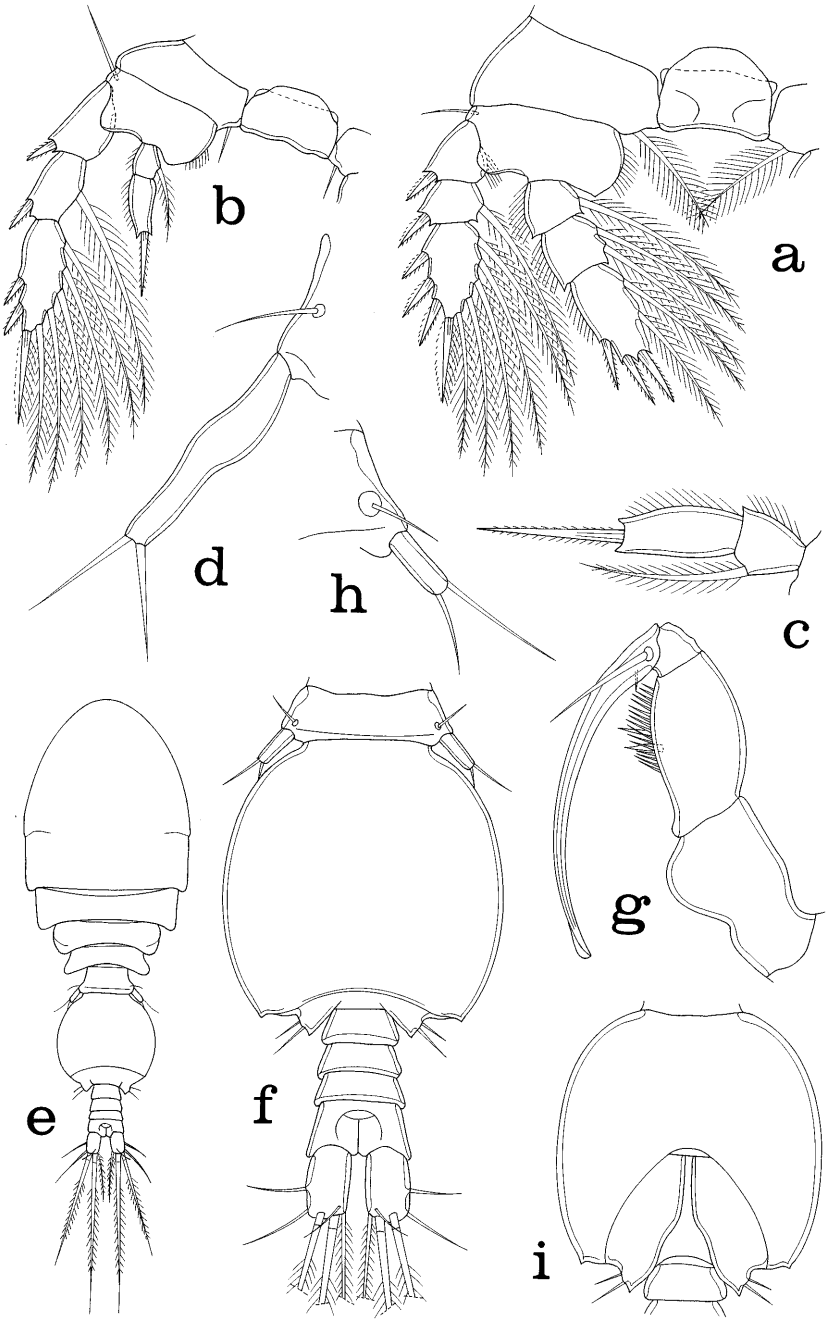

Figure 7. ***Dumbeana undulatipes*** **gen. nov., sp. nov.** Female, a, leg 3 and intercoxal plate, anterior (scale H); b, leg 4 and intercoxal plate, anterior (H); c, endopod of leg 4, anterior (F); d, leg 5, dorsal (C). Male. e, dorsal (J); f, urosome, dorsal (H); g, maxilliped, inner (E); h, leg 5, dorsal (F); i, genital somite showing leg 6 and first postgenital somite, ventral (H).

armed unilaterally with graduated spines. Maxilliped (Fig. 6e) with second segment bearing 2 setae, small third segment with seta and short terminal spine.

Ventral area between maxillipeds and first pair of legs (Fig. 6f) only slightly protuberant.

Legs 1–4 (Figs 6g,h, 7a,b) with 3-segmented rami except 2-segmented endopod in leg 4. Formula for armature:

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	

Leg 4 with exopod 166 μm long. Endopod (Fig. 7c) with first segment 21 × 19 μm, its inner seta 44 μm; second segment 39 × 17 μm, its terminal delicately barbed spine 45 μm. Outer margin of both endopodal segments with setules.

Leg 5 (Fig. 7d) with long, slender, unornamented slightly undulating free segment 104 μm long, 21 μm in greatest width, and 11 μm wide terminally. Ratio 4.95:1, taking greatest width. Two terminal setae 50 μm and 48 μm. Adjacent dorsal seta on somite 44 μm. All setae smooth.

Leg 6 represented by 2 small setae on genital area (Fig. 5b).

Colour of living specimens in transmitted light opaque grey, eye red.

Male. Body (Fig. 7e) with prosome slightly more slender than in female. Length 0.82 mm (0.79–0.87 mm) and width 0.29 mm (0.28–0.35 mm), based on 9 specimens. Greatest dorsoventral thickness 0.22 μm. Ratio of length to width of prosome 1.61:1. Ratio of length of prosome to that of urosome 1.45:1.

Somite bearing leg 5 (Fig. 7f) 31 × 99 μm. Genital somite 180 μm long including leg 6 (169 μm long without leg 6), width 172 μm. Ratio 1.05:1. Four postgenital somites 21 × 52, 21 × 54, 17 × 57, and 40 × 66 μm.

Caudal ramus 49 × 31 μm, ratio 1.58:1, resembling that of female.

Body surface smooth as in female.

Rostrum like that of female. Antennule segmented and armed as in female, but 3 aesthetascs added (at points shown by dots in Fig. 6a). Antenna like that of female.

Labrum, mandible, maxillule, and maxilla similar to those of female. Maxilliped (Fig. 7g) with second segment having 2 setae and row of slender spindules. Claw 109 μm long and bearing 2 very unequal setae proximally.

Ventral area between maxillipeds and first pair of legs as in female.

Legs 1–4 like those of female.

Leg 5 (Fig. 7h) small, unornamented, rectangular, 23 × 9 μm, ratio 2.56:1.

Leg 6 (Fig. 7i) with 2 setae.

Colour as in female.

Etymology. The specific name *undulatipes* is a combination of the Latin words *undulatus*, wavy, and *pes*, foot, forming a noun in apposition and alluding to the form of the free segment of leg 5.

Rhynchomolgidae Humes & Stock, 1972
Emunoa **gen. nov.**

Diagnosis. Rhynchomolgidae. Mandible beyond proximal notch (deep indentation) with large pointed unornamented process on convex side and row of spines perpendicular to lash on concave side. Lash long. Maxillule with 3 setae. Otherwise similar to *Anchimolgus* and as in description below.

Gender. Feminine.

Type species. Emunoa protenta sp. nov.

Etymology. The generic name is an anagram of Noumea, the city in New Caledonia near which the copepods were found.

Remarks. In the key to the genera of the Rhynchomolgidae provided by Humes & Boxshall (1996b) *Emunoa* approaches *Paramolgus* Humes & Stock, 1973. However, there are several distinguishing features between these two genera. In *Paramolgus* the mandible bears an outer scale incorporated into the margin of the mandible and bearing spinules; and, in most species, setules are found near the insertion of the terminal claw of the antenna and sexual dimorphism occurs in the endopod of leg 1 of the male, with the third segment having II,4 (instead of I,5 as in the female).

The form of the mandible in *Emunoa* is distinctive, having an outer hyaline, pointed, unornamented process beyond the proximal notch (on the convex side) and an inner row of spines (on the convex side).

***Emunoa protenta* sp. nov.**
(Figs 8a–i, 9a–j, 10a–j)

Type material. 80 ♀♀, 123 ♂♂ from *Psammocora (Stephanaria) togianensis* Umbgrove, in 3 m, reef between N'dié and Mt. Kumuru, near Noumea, New Caledonia, 22°13'40"S, 166°24'18"E, 9 July 1971. Holotype ♀ (USNM 274130), allotype ♂ (USNM 274131), and 175 paratypes (66 ♀♀, 109 ♂♂) (USNM 274132) deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C. Remaining paratypes (dissected) in the collection of the author.

Female. Body (Fig. 8a,b) elongate. Length 1.27 mm (1.17–1.38 mm) and greatest width 0.44 mm (0.40–0.46 mm), based on 10 specimens. Greatest dorsoventral thickness 0.33 mm. Somite bearing leg 1 separated from cephalosome by weak dorsal transverse suture. Epimera of metasomal somites rounded. Ratio of length to width of prosome 1.64:1. Ratio of length of prosome to that of urosome 1.13:1.

Somite bearing leg 5 (Fig. 8c) 73 × 180 μm. Genital double-somite in dorsal view 156 × 127 μm, ratio 1.23:1, with gently rounded lateral margins; in lateral view (Fig. 8d) indented dorsally. Genital areas located dorsolaterally, both bearing 2 minute setae; open inverted V-shaped sclerotization between these areas. Three postgenital somites from anterior to posterior 101 × 70, 83 × 62, and 86 × 52 μm.

Caudal ramus (Fig. 8e) elongate, unornamented, 125 × 18 μm, ratio 6.94:1. Outer lateral seta 52 μm, dorsal seta 19 μm, outermost terminal seta 57 μm, innermost terminal seta 60 μm, all smooth, and 2 median terminal setae 166 (outer) and 213 μm (inner), both with delicate lateral setules.

Body surface without visible sensilla.

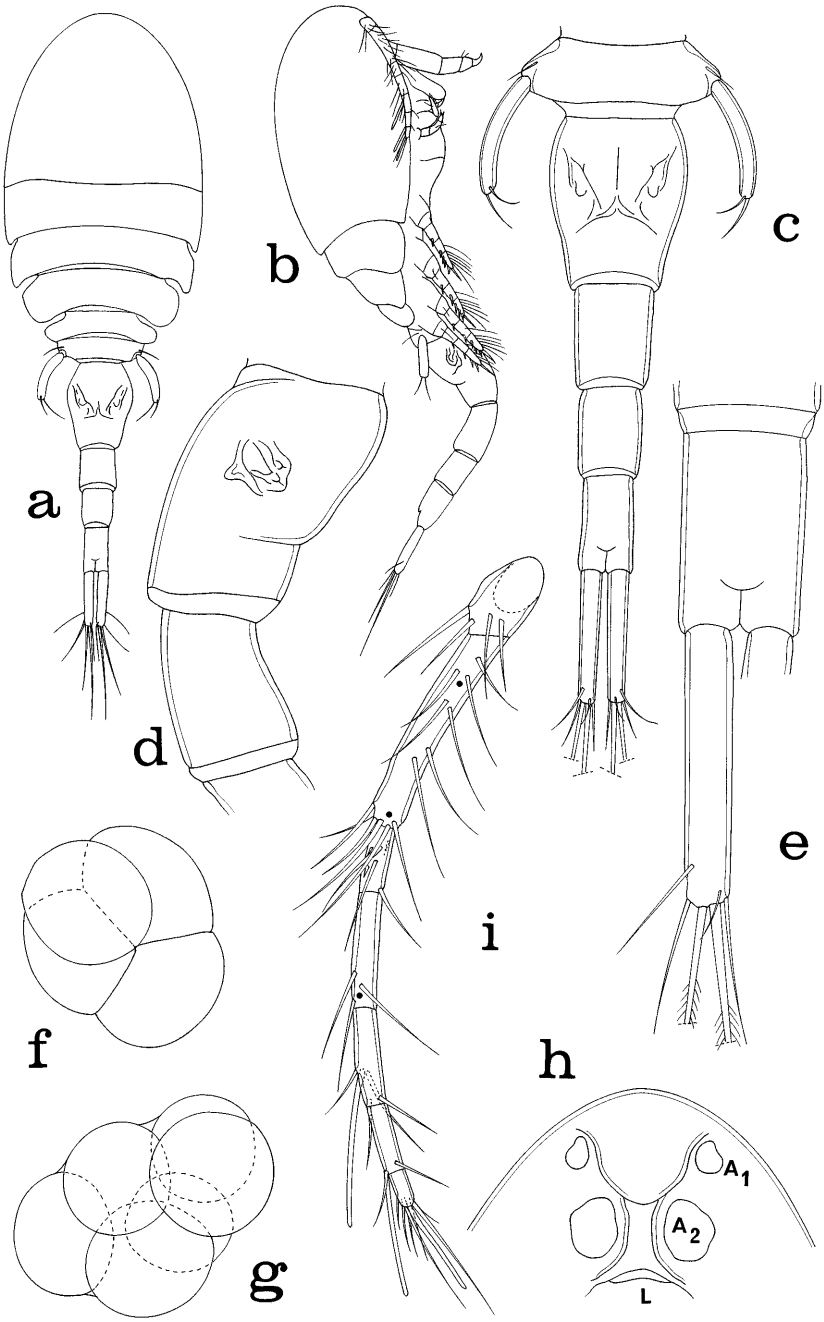

Figure 8. ***Enumoa protenta*** **gen. nov., sp. nov.** Female. a, dorsal (scale A); b, lateral (A); c, urosome, dorsal (D); d, genital double-somite and first postgenital somite, lateral (F); e, anal somite and caudal ramus, dorsal (C); f, egg sac, ventral (D); g, egg sac, ventral (D); h, rostrum, ventral (D); i, antennule, with dots indicating positions of aesthetascs in male, anterodorsal (C). A_1 = antennule, A_2 = antenna, L = labrum.

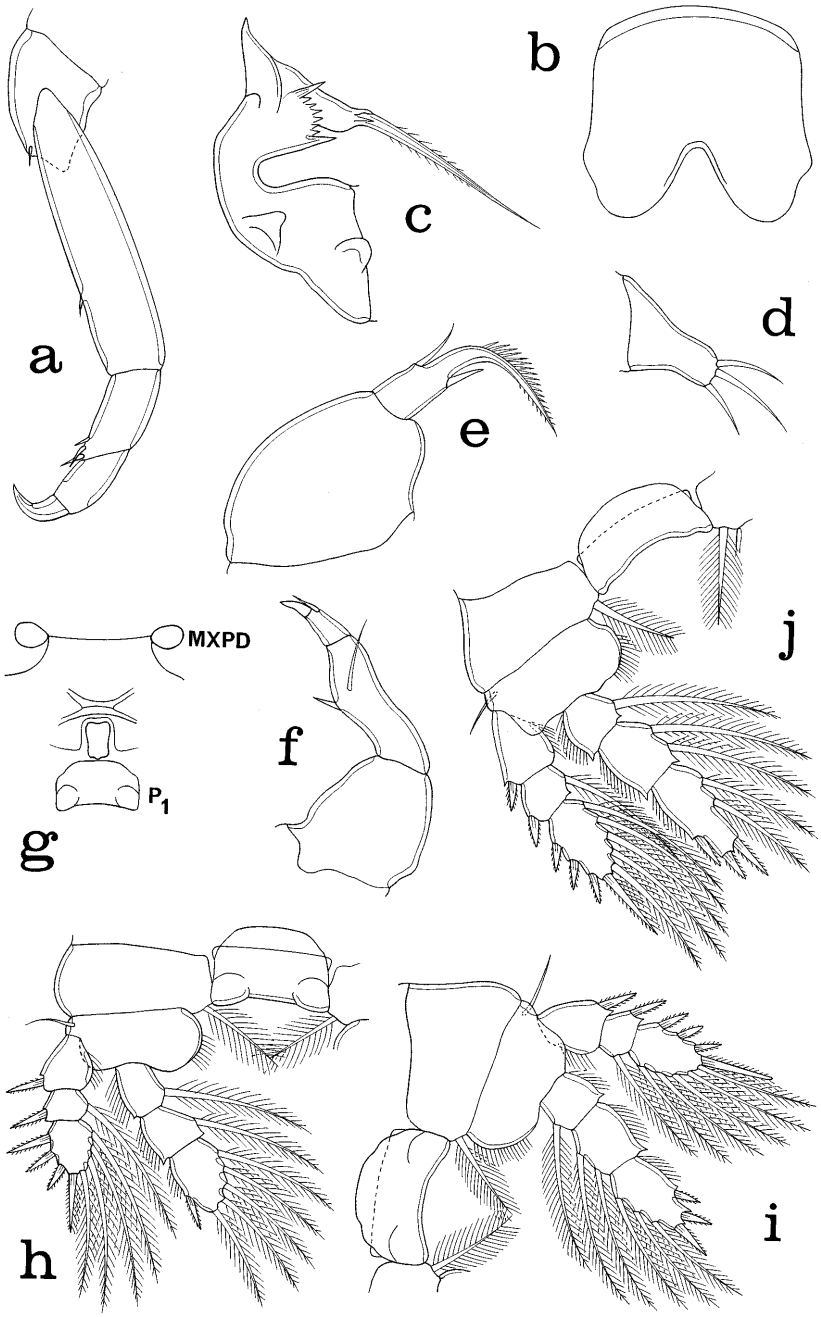

Figure 9. ***Enumoa protenta*** **gen. nov., sp. nov.** Female. a, antenna, outer (scale C); b, labrum, ventral (C); c, mandible, anterior (F); d, maxillule, anterior (F); e, maxilla, posterior (F); f, maxilliped, posterior (F); g, area between maxillipeds and first pair of legs, ventral (D); h, leg 1 and intercoxal plate, posterior (H); i, leg 2 and intercoxal plate, anterior (H); j, leg 3 and intercoxal plate, anterior (H), MXPD = maxilliped, P_1 = leg 1.

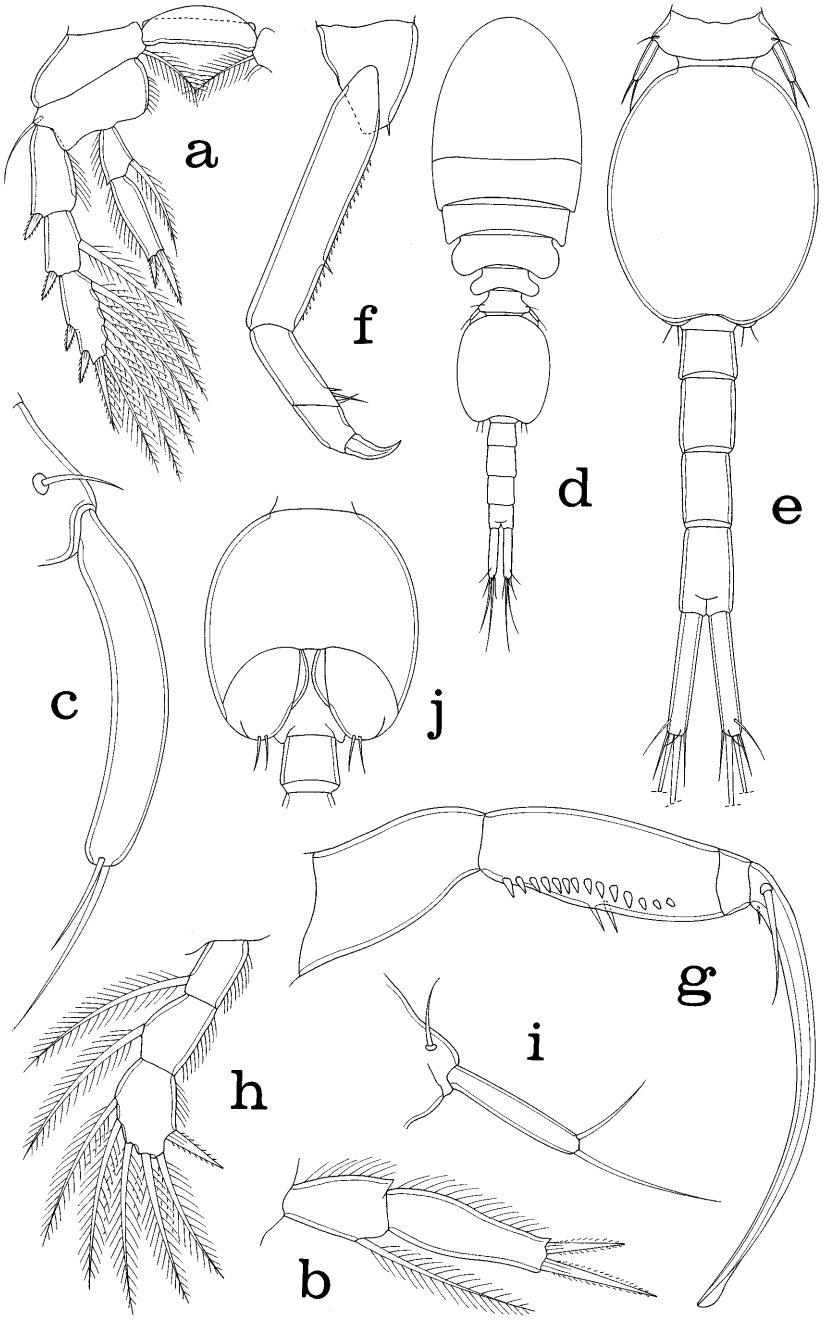

Figure 10. ***Enumoa protenta*** **gen. nov., sp. nov.** Female. a, leg 4 and intercoxal plate, anterior (scale H); b, endopod of leg 4, anterior (F); c, leg 5, dorsal (F). Male. d, dorsal (A); e, urosome, dorsal (D); f, antenna, dorsal (C); g, maxilliped, outer (C); h, endopod of leg 1, posterior (C); i, leg 5, dorsal (F); j, genital somite showing leg 6 and first postgenital somite, ventral (D).

Egg sac oval, containing 4 eggs (Fig. 8f), 221 × 187 μm, 5 eggs, or 6 eggs (Fig. 8g), 264 × 187 μm, eggs 104-150 μm in diameter.

Rostrum (Fig. 8h) broadly linguiform, with weak posteroventral edge. Antennule (Fig. 8i) 295 μm long, 7-segmented. Lengths of its segments: 21 (39 μm along anterior side), 90, 24, 52, 45, 25, and 18 μm. Formula for armature: 4, 13, 6, 3, 4 + 1 aesthetasc, 2 + 1 aesthetasc, and 7 + 1 aesthetasc. All setae smooth. Antenna (Fig. 9a) 213 μm including claw, 4-segmented. Formula: 1, 1, 3, and 1 terminal claw. Fourth segment 31 μm along inner side, 17 μm along outer side, and 21 μm wide.

Labrum (Fig. 9b) with 2 broad posteroventral lobes. Mandible (Fig. 9c) with deep indentation. Large pointed process beyond indentation on convex side; row of spines perpendicular to base of lash on concave side, those spines at ends of row large. Lash long, with 2 small spiniform processes at base and with delicate lateral setules. Paragnath not seen. Maxillule (Fig. 9d) with 3 setae. Maxilla (Fig. 9e) and maxilliped (Fig. 9f) segmented and armed as in species of *Anchimolgus*. Second segment of maxilliped concave on outer side.

Ventral area between maxillipeds and first pair of legs as in Fig. 9g.

Legs 1–4 (Figs 9h–j, 10a) with 3-segmented rami, except for 2-segmented endopod in leg 4. Formula for armature:

P_1	coxa 0–1	basis 1–0	exp I–0;	I–1;	III, I, 4
			enp 0–1;	0–1;	1,5
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;	II	

Leg 4 with exopod 153 μm long. Endopod (Fig. 10b) with first segment 31 × 18 μm, its inner plumose seta 60 μm; second segment 52 × 17 μm, its 2 terminal, delicately barbed spines 29 μm and 26 μm. Outer margin of both endopodal segments with setules.

Leg 5 (Fig. 10c) with elongate, recurved, unornamented free segment 125 × 18 μm, ratio 6.94:1. Two terminal setae 30 μm and 60 μm, seta on body adjacent to free segment 26 μm. All setae smooth.

Leg 6 represented by 2 minute setae on genital area (Fig. 8d).

Colour of living specimens in transmitted light opaque grey, eye red.

Male. Body (Fig. 10d) slender. Length 1.17 mm (1.09-1.21 mm) and greatest width 0.32 mm (0.26–0.34 mm), based on 10 specimens. Greatest dorsoventral thickness 0.30 mm. Ratio of length to width of prosome 1.82:1. Ratio of length of prosome to that of urosome 0.95:1, urosome slightly longer than prosome.

Somite bearing leg 5 (Fig. 10e) 52 × 112 μm. Genital somite 234 × 203 μm, ratio 1.15:1. Four postgenital somites from anterior to posterior 44 × 65, 68 × 65, 62 × 55, and 69 × 52 μm.

Caudal ramus 117 × 21 μm, resembling that of female.

Body surface smooth, as in female.

Rostrum like that of female. Antennule 294 μm, long, segmented and armed as in female, but 3 long aesthetascs added (at points indicated by dots in Fig. 8i), distal aesthetasc on second segment 156 μm long. Antenna (Fig. 10f) similar to that of

female, but showing sexual dimorphism in having row of small spines along outer side of second segment.

Labrum, mandible, maxillule, and maxilla resembling those of female. Maxilliped (Fig. 10g) slender, 4-segmented (assuming proximal part of claw to represent fourth segment). Second segment with 2 setae and row of spines. Claw 195 μm long with 2 very unequal proximal setae.

Ventral area between maxillipeds and first pair of legs as in female.

Legs 1–4 segmented and armed as in female. Endopod of leg 1 (Fig. 10h) showing slight sexual dimorphism in third segment, this being held at slight angle to rest of endopod.

Leg 5 (Fig. 10i) with free segment 37 × 8 μm, ratio 4.63:1. Two terminal setae 39 μm and 30 μm.

Leg 6 (Fig. 10j) posteroventral flap on genital somite bearing 2 setae.

Colour of living specimens as in female.

Etymology. The name *protenta*, a Latin adjective meaning stretched out or elongate, alludes to the slender form of the body.

Copepod associates of corals, their host genera, and localities, described since (and those not listed in) the publications of Humes (1979a, 1985c) and Humes & Dojiri, 1982

Suborder Cyclopoida Burmeister, 1834

Cyclopidae Sars, 1913

Euryte bellatula Humes, 1992b (from *Montipora*, Ambon, Banda, northeast Australia, New Caledonia); *E. verecunda* Humes, 1992b (from *Porites*, Panama (Pacific side)).

Cyclopinidae Sars, 1913

Pterinopsyllus stirpipes Humes, 1996a (from *Galaxea*, Madagascar).

Suborder Poecilostomatoida Thorell, 1959

Clausidiidae Embleton, 1901

Hemicyclops columnaris Humes, 1984a (from *Porites*, Panama (Pacific side)).

Anchimolgidae Humes and Boxshall, 1996b

Amarda goniastreae Humes, 1985b (from *Goniastrea*, Ceram; *Favia*, northeastern Australia).

Anchimolgus abbreviatus Humes, 1991a. Also Humes (1996a) (from *Acrhelia*, northeastern Australia; *Galaxea*, New Caledonia); *A. breviarius* Humes, 1995 (from *Goniopora*, Banda); *A. compressus* Humes, 1996a (from *Galaxea*, New Caledonia, Halmahera); *A. conformatus* Humes, 1995 (from *Goniopora*, Banda); *A. exsertus* Humes, 1991a (from *Echinopora*, northeastern Australia); *A. gigas* Humes, 1995, (from *Goniopora*, Banda); *A. mimeticus* Humes, 1995 (from *Goniopora*, Banda, Halmahera); *A. moluccanus* Humes, 1996a (from *Galaxea*, Halmahera, Banda); *A. nasutus* Humes, 1996a (from *Galaxea*, Halmahera, New Caledonia); *A. tenaus* Humes, 1991a. Also Humes (1996a) (from *Acrhelia*, northeastern Australia; *Galaxea*, New Caledonia).

Cerioxynus montastreae Humes, 1986 (from *Montastrea*, northeastern Australia); *C. oulophylliae* Humes, 1986 (from *Oulophyllia*, northeastern Australia, Banda).

***Dumbeana undulatipes* gen. nov., sp. nov.** (from *Psammocora*, new Caledonia).

Ecphysarion ampullulum Humes, 1993 (from *Acropora*, New Caledonia); *E. spinulatum* Humes, 1993 (from *Acropora*, Pulau Gomumu).

Euxynus capulus Humes, 1992a (from *Gardineroseris*, Pulau Gomumu).

Haplomolgus incolumis Humes, 1991b (from *Montipora*, New Caledonia).

Jamescookina redacta Humes, 1991a (from *Echinopora*, northeastern Australia).

Juxtandrianellus probus Humes, 1995b (from *Leptoria*, New Caledonia).

***Lipochaetes extrusus* gen. nov., sp. nov.** (from *Psammocora*, New Caledonia).

Odontomolgus bulbalis Humes, 1991a (from *Merulina*, northeastern Australia); *O. pumilus*. Humes, 1992c (from *Gardineroseris*, northeastern Australia).

Panjakus directus Humes, 1995b (from *Leptoria*, New Caledonia); *P. eumeces* Humes, 1991a (from *Hydnophora*, northeastern Australia); *P. necopinus* Humes, 1995b (from *Leptoria*, New Caledonia).

Parandrianellus annulatus Humes, 1991a (from *Hydnophora*, northeastern Australia).

Schedomolgus exiliculus Humes, 1993 (from *Acropora*, New Caledonia); *S. idanus* Humes, 1993 (from *Acropora*, New Caledonia, Enewetak Atoll); *S. insignellus* Humes, 1993 (from *Acropora*, New Caledonia); *S. majusculus* Humes, 1993 (from *Acropora*, New Caledonia).

Scyphuliger aristoides Humes, 1993 (from *Acropora*, New Caledonia); *S. concavipes* Humes, 1991a. Also Humes (1993) (from *Acropora*, New Caledonia, northeastern Australia); *S. eumorphus* Humes, 1993 (from *Acropora*, New Caledonia, Ceram, Halmahera); *S. manifestus* Humes, 1991a. Also Humes (1993) (from *Acropora*, New Caledonia, northeastern Australia); *S. tenuatus* (Humes, 1990). Also Humes (1991a, 1993) (from *Acropora*, New Caledonia, northeastern Australia).

Unicispina latigenitalis Humes, 1993 (from *Acropora*, New Caledonia).

Rhynchomolgidae Humes & Stock, 1972

Diallagomolgus productus Humes, 1979b (from *Cyphastrea*, New Caledonia); *D. vicinus* Humes, 1979b (from *Cyphastrea*, New Caledonia).

***Emunoa protenta* gen. nov., sp. nov.** (from *Psammocora*, New Caledonia).

Indomolgus humesi Nair & Pillai, 1987 (from *Symphyllia*, southeastern India).

Kombia curvata Nair & Pillai, 1985 (from *Porites*, southeastern India); *K. incrassata* Humes, 1984b (from *Porites*, Moorea).

Mandobius regalis Humes, 1991c (from *Pectinia*, New Caledonia).

Moluccomolgus lordus Humes, 1992a (from *Gardineroseris*, Pulau Gomumu).

Monomolgus torulus Humes, 1984b (from *Porites*, Moorea).

Paramolgus ampullaceus Humes, 1992c (from *Gardineroseris*, northeastern Australia); *P. angustus* Humes, 1992a (from *Gardineroseris*, Pulau Gomumu); *P. eparmatoides* Humes, 1992a (from *Gardineroseris*, Pulau Gomumu); *P. gibberulus* Humes, 1992a (from *Gardineroseris*, Pulau Gomumu); *P. pavonae* Humes, 1994 (from *Pavona*, New Caledonia); *P. setellus* Humes, 1992a Also Humes (1994) (from *Gardineroseris*. Pulau Gomumu; *Pavona*, New Caledonia).

Pennatulicola corallophilus Nair & Pillai, 1985 (from *Porites*, Arabian Sea).

Pionomolgus gallicolus Dojiri & Grygier, 1990 (from *Echinopora*, northeast Australia).

Sociellus torus Humes, 1992c (from *Gardineroseris*, northeastern Australia).

Solitaricola bipes Stock, 1985 (from *Flabellum*, in 1,035 m, west of Sri Lanka).

Pseudanthessiidae Humes & Stock, 1972

Pseudanthessius thorelli (Brady, 1880). Stock & Weinberg (1985) (from *Cladocora*, near Banyuls, France).

Incertae sedis

Parangium abstrusum Humes, 1985b (from *Goniastrea*, Ceram).

Suborder Siphonostromatoida Thorell, 1959

Asterocheridae Giesbrecht, 1899

Asterocheres longisetosus Nair & Pillai, 1984 (from *Porites*, Arabian Sea); *A. maxillatus* Stock, 1989. Also Stock (1987) (from *Manicina*, *Montastrea*, Curaçao); *A. stocki* Nair & Pillai, 1984 (from *Acropora*, Arabian Sea.

Asteropontella foliata Stock, 1989 (from *Montastrea*, Curaçao).

Asteropontius iuxtus Stock, 1989 (from *Meandrina*, Curaçao); *A. laccadivensis* Nair & Pillai, 1984 (from *Acropora*, Arabian Sea); *A. proximus* Stock, 1987 (from *Colpophyllia*, Curaçao)

Asteropontopsis faviae Stock, 1987 (from *Favia*, Curaçao).

Hermacheres diploriae Stock, 1987 (from *Diploria*, Curaçao); *H. montastreae* Stock, 1989 (from *Montastrea*, Curaçao).

Hetairosyna bucculentus Humes, 1996a (from *Galaxea*, Madagascar); *H. galaxeae* Humes, in press b (from *Galaxea*, Halmahera); *H. laciniata* Humes, 1991b (from *Montipora*, New Caledonia, northeastern Australia, Madagascar); *H. sororia* Humes, 1991b (from *Montipora*, Madagascar, New Caledonia, Ceram, northeastern Australia); *H. terpna* Humes, 1991b (from *Montipora*, New Caledonia, Ambon, Banda, Enewetak Atoll, northeastern Australia, Madagascar); *H. wedensis* Humes, 1996a (from *Galaxea*, Halmahera).

Madacheres serrulatus Humes, 1996a (from *Galaxea*, Madagascar).

Meandromyzon coronatum Stock, 1989 (from *Meandrina*, Curaçao).

Tychomyzon petalum Humes, 1991b (from *Montipora*, northeastern Australia).

Coralliomyzontidae Humes & Stock, 1991

Coralliomzon tenens Humes & Stock, 1991 (from *Turbinaria*, Madagascar).

Suborder Harpacticoida Sars, 1903

Peltidiidae Sars, 1904

Alteuthellopsis corallina Humes, 1981a. Also Humes (1984c, 1991a, 1992c) (from *Astreopora*, *Merulina*, *Platygyra*, Madagascar; *Pocillopora*, *Acropora*, New Caledonia; *Goniastrea*, Ceram: *Merulina*, *Gardineroseris*, *Stylophora*, northeastern Australia).

Tegastidae Sars, 1904

Tegastes acroporanus Humes, 1981b (from *Acropora*, Enewetak Atoll); *T. gemmeus* Humes, 1984c (from *Cyphastrea*, *Montipora*, Hawaii); *T. georgei* Marcus and Masry, 1970 (from *Stylophora*, Red Sea (Gulf of Elat)); *T. paulipes* Humes, 1984c (from *Pocillopora*, Moorea).

ACKNOWLEDGEMENTS

Field work in New Caledonia during June–August 1971 and the subsequent study of the new copepods were supported by grants GB-8381X and BSR-8514561 from the National Science Foundation of the United States.

REFERENCES

Dojiri M, Grygier MJ. 1990. *Pionomolgus gallicolus*, gen. et sp. nov. (Poecilostomatoida: Lichomolgidae), a gall-inducing copepod of a scleractinian coral from Australia. *Australian Journal of Zoology* **37:** 695–703.

Humes AG. 1960. New copepods from madreporarian corals. *Kieler Meeresforschungen* **16:** 229–235.

Humes AG. 1974. Cyclopoid copepods associated with the coral genera *Favia*, *Favites*, *Platygyra*, and *Merulina* in New Caledonia. *Pacific Science* **28:** 383–399.

Humes AG. 1978. Lichomolgid copepods (Cyclopoida) associated with the coral genus *Montipora* in the Moluccas. *Publications of the Seto Marine Biological Laboratory* **24:** 387–407.

Humes AG. 1979a. Coral-inhabiting copepods from the Moluccas, with a synopsis of cyclopoids associated with scleractinian corals. *Cahiers de Biologie Marine* **20:** 79–107.

Humes AG. 1979b. Cyclopoid copepods (Lichomolgidae) associated with the scleractinian *Cyphastrea* in New Caledonia. *Pacific Science* **33:** 195–206.

Humes AG. 1981a. Harpacticoid copepods associated with Cnidaria in the Indo-West Pacific. *Journal of Crustacean Biology* **1:** 227–240.

Humes AG. 1981b. A new species of *Tegastes* (Copepoda: Harpacticoida) associated with a scleractinian coral at Enewetak Atoll. *Proceedings of the Biological Society of Washington* 94: 254–263.

Humes AG. 1984a. *Hemicyclops columnaris* sp. n. (Copepoda, Poecilostomatoida, Clausidiidae) associated with a coral in Panama (Pacific side). *Zoologica Scripta* **13:** 33–39.

Humes AG. 1984b. Copepods associated with the scleractinian coral *Porites* in French Polynesia. *Cahiers de Biologie Marine* **25:** 181–195.

Humes AG. 1984c. Harpacticoid copepods associated with cnidarians in the tropical Pacific Ocean. *Zoologica Scripta* **13:** 209–221.

Humes AG. 1985a. Cnidarians and copepods: a success story. *Transactions of the American Microscopical Society* **104:** 313–320.

Humes, AG. 1985b. Poecilostomatoid copepods parasitic in the scleractinian coral genus *Goniastrea* in the Moluccas. *Publications of the Seto Marine Biological Laboratory* **30:** 277–286.

Humes AG. 1985c. A review of the Xarifiidae (Copepoda, Poecilostomatoida), parasites of scleractinian corals in the Indo-Pacific. *Bulletin of Marine Science* **36:** 467–632.

Humes AG. 1986. Two new species of *Cerioxynus* (Copepoda: Poecilostomatoida) parasitic in corals (Scleractinia: Faviidae) in the South Pacific. *Systematic Parasitology* **8:** 187–198.

Humes AG. 1990. Lichomolgid copepods of the genus *Schedomolgus* (Poecilostomatoida) associated with the scleractinian coral *Acropora cymbicyathus* (Brook) in New Caledonia. *Beaufortia* **41:** 121–127.

Humes AG. 1991a. Copepods associated with scleractinian corals on the Great Barrier Reef, northeastern Australia, with a key to the genera of the Lichomolgidae. *Journal of Natural History* **25:** 1171–1231.

Humes AG. 1991b. Copepoda associated with the scleractinian coral genus *Montipora* in the Indo-Pacific. *Proceedings of the Biological Society of Washington* **104:** 101–137.

Humes AG. 1991c. *Mandobius regalis* gen. et sp. n. (Copepoda: {Poecilostomatoida: Lichomolgidae) associated with the coral *Pectinia lactuca* in New Caledonia. *Zoologica Scripta* **20:** 277–282.

Humes AG. 1992a. Copepods (Poecilostomatoida: Lichomolgidae) associated with the scleractinian coral *Gardineroseris planulata* in the Moluccas. *Invertebrate Taxonomy* **6:** 303–335.

Humes AG. 1992b. *Euryte verecunda*, new species (Copepoda: Cyclopoida), associated with the coral *Porites lobata* on the Pacific coast of Panama. *Proceedings of the Biological Society of Washington* **105:** 268–274.

Humes AG. 1992c. Copepoda associated with the coral *Gardineroseris planulata* (Dana) on the Great Barrier Reef, northeastern Australia. *Hydrobiologia* **234:** 41–57.

Humes AG. 1993. Poecilostomatoid copepods associated with the scleractinian coral *Acropora* in the tropical western Pacific Ocean. *Invertebrate Taxonomy* **7:** 805–857.

Humes AG. 1994. Two species of *Paramolgus* (Copepoda: Poecilostomatoida: Lichomolgidae) associated with the scleractinian *Pavona* in New Caledonia with a key to females of *Paramolgus. Beaufortia* **44:** 1–9.

Humes AG. 1995a. New species of *Anchimolgus* (Copepoda: Poecilostomatoida: Lichomolgidae) associated with the scleractinian coral *Goniopora* in the southwest Pacific. *Journal of Natural History* **29:** 65–84.

Humes AG. 1995b. Copepods from the coral *Leptoria tenuis* in New Caledonia. *Cahiers de Biologie Marine* **36:** 69-80.

Humes AG. 1996a. Copepoda associated with the scleractinian *Galaxea* in the Indo-Pacific. *Publications of the Seto Marine Biological Laboratory* **37**: 1-49.

Humes AG, Boxshall GA. 1996b. A revision of the lichomolgoid complex (Copepoda: Poecilostomatoida) with the recognition of six new families. *Journal of Natural History* **30:** 175-227.

Humes AG, Dojiri M. 1982. Xarifiidae (Copepoda) parasitic in Indo-Pacific scleractinian corals. *Beaufortia* **32:** 139–228.

Humes AG, Gooding RU. 1964. A method for studying the external anatomy of copepods. *Crustaceana* **6:** 238–240.

Humes AG, Stock JH. 1972. Preliminary notes on a revision of the Lichomolgidae, cyclopoid copepods mainly associated with marine invertebrates. *Bulletin Zoologisch Museum, Universiteit van Amsterdam* **2:** 121–133.

Humes AG, Stock JH. 1991. Coralliomyzontidae, fam. n. (Copepoda: Siphonostomatoida), associated with scleractinian corals in Madagascar. *Bulletin Zoologisch Museum, Universiteit van Amsterdam* **13:** 15–24.

Marcus A, Masry D. 1970. *Tegastes georgei* n. sp. a new harpacticoid (Crustacea, Copepoda), found on corals in the Gulf of Eilat. *Israel Journal of Zoology* **19:** 169–174.

Nair BU, Pillai NK. 1984. On three new species of asterochereid copepods, with a redescription of *Indomyzon quasimi* Ummerkutty. *Records of the Zoological Survey of India* **81:** 357–372.

Nair BU, Pillai NK. 1985. Three new species of copepods associated with South Indian invertebrates. *Crustaceana* **50:** 27–38.

Nair BU, Pillai NK. 1987. Description of a new species of *Indomolgus* (Copepoda: Lichomolgiae) associated with corals in the Bay of Bengal, South India. *Journal of Natural History* **21:** 405–409.

Sewell RBS. 1940. Copepoda, Harpacticoida. *John Murray Expedition Scientific Reports* **7:** 117–382.

Stock JH. 1985. A new poecilostomatoid copepod associated with solitary deep-water corals. *Hydrobiologia* **120:** 129–132.

Stock JH. 1987. Copepoda Siphonostomatoida associated with West Indian hermatypic corals 1: associates of Scleractinia: Faviinae. *Bulletin of Marine Science* **40:** 464–483.

Stock JH. 1989. Copepoda Siphonostomatoida associated with West Indian hermatypic corals, 2. *Studies in honour of Dr. Pieter Wagenaar Hummelinck. Foundation for Scientific Research in Surinam and the Netherlands Antilles. Amsterdam* **123:** 145–169.

Stock JH, Weinberg S. 1985. *Pseudanthessius thorelli* (Brady, 1880) (Copepoda, Poecilostomatoida, Pseudanthesiidae): redescription et présence en Méditerranée. *Vie et Milieu* **35:** 93–97.

Vaughan TW, Wells JH. 1943. Revision of the suborders, families, and genera of the Scleractinia. *Geological Society of America Special Papers* **44:** i-xv, 1–363.

Veron JEN. 1986. *Corals of Australia and the Indo-Pacific*. North Ryde, Australia. Angus & Robertson: 1–644.