

## Cyclopoid Copepods Associated with the Coral Genera *Favia*, *Favites*, *Platygyra*, and *Merulina* in New Caledonia<sup>1</sup>

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**ABSTRACT:** In New Caledonia *Cerioxynus* n. gen. (Cyclopoida, Lichomolgidae) contains *Cerioxynus faviticulus* n. sp. from *Favites balicora* (Ehrenberg) and *Cerioxynus alatus* n. sp. from *Favia fava* (Forskål), both hosts belonging to the Faviidae. *Amar-dopsis* n. gen. (Lichomolgidae) contains *Amar-dopsis merulinae* n. sp. from *Merulina ampliata* (Ellis & Solander), a host belonging to the Merulinidae. The lichomolgid *Panjakus platygyrae* Humes & Stock, 1973, is recorded from a new host, *Platygyra astreiformis* (Milne Edwards & Haime), a coral belonging to the Faviidae.

FOURTEEN GENERA of scleractinian corals are known to serve as hosts for lichomolgid copepods (Humes and Stock 1973). In addition to the 25 species so associated, a new lichomolgid genus and three new species from fungiid corals recently have been described (Humes 1973). These, together with the two new genera and three new species described below, bring the total number of lichomolgid copepods from Scleractinia to 17 genera and 31 species.

Four lichomolgid genera described by Humes and Stock (1972) are associated with *Favia* in Madagascar. These are *Amarda*, *Anchimolgus*, *Andrianellus*, and *Rakotoa*. *Platygyra* harbors two lichomolgid genera, *Andrianellus* and *Panjakus*, both described by Humes and Stock (1972). No copepods have been reported from *Favites* or *Merulina*.

This paper deals with three new forms from *Favites*, *Favia*, and *Merulina* respectively, and with a species of *Panjakus* from *Platygyra*.

The collection of copepods such as those described below, living apparently within the gastrovascular cavities of the polyps, must be undertaken with some care. Rapid washing of the living corals in 5 percent ethyl alcohol in seawater will produce few, if any, of these copepods. Maceration of the coral by mechani-

cal means obscures the copepods in the ensuing mass of debris and mucus. When the living corals are allowed to remain in the alcoholized seawater for several hours, however, the copepods emerge and accumulate in the sediment in the container. By straining the wash water through a suitably fine net (125 holes per inch), one then may easily recover the copepods.

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### *Cerioxynus* n. gen.

#### *Diagnosis*

Body modified. Urosome 5-segmented in the female, 6-segmented in the male. Caudal ramus with six short setae. Rostrum rounded postero-ventrally. First antenna 7-segmented, in female with formula 4, 13, 6, 3, 4+1 aesthete, 2+1 aesthete, and 7+1 aesthete; in male 4, 13+2 aesthetes, 6, 3+1 aesthete, 4+1 aesthete, 2+1 aesthete, and 7+1 aesthete. Second antenna 3-segmented, with a single terminal claw.

Labrum with a median cleft separating two lobes. Mandible having on convex side of its basal area a prominent proximally directed winglike process followed distally by a striated fringe; on concave side of this area beyond

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deep indentation mandible having two lobes, one with fine serrations, other with coarse serrations. Lash relatively short. Paragnath a minute lobe. First maxilla with four setae. Second maxilla having a small second segment with reduced armature, lash being short and reflexed. Maxilliped in female 3-segmented; in male 4-segmented (assuming proximal part of claw to represent a fourth segment) with a terminal claw.

Legs 1-4 alike in both sexes with reduced armature. Legs 1 and 2 with 3-segmented exopods and endopods. Leg 3 with a 3-segmented exopod but lacking an endopod. Leg 4 with a 2-segmented exopod and without an endopod. Leg 5 in both sexes having a very small segment not clearly delimited from body and bearing two terminal setae. Leg 6 in female probably represented by two spines and a spiniform process on genital area; in male forming a posteroventral flap on genital segment bearing two setae.

Other features as in new species described below.

Associated with scleractinian corals.

Gender masculine.

Type species *Cerioxynus faviticolus* n. sp.

### *Etymology*

The generic name is a combination of κηρίον, "a honeycomb" and ξυζών, "an associate," alluding to the presence of this genus in honeycomblike faviid corals.

### *Cerioxynus faviticolus* n. sp.

Figs. 1*a-i*, 2*a-k*, 3*a-j*

### *Type Material*

One hundred and eleven females, 55 males from one colony of *Favites halicora* (Ehrenberg) (Faviidae), in 1 m, Isle aux Serpents, near Noumea, New Caledonia, 22°16'52" S, 166°25'12" E, 19 July 1971. Holotype female, allotype, and 145 paratypes (100 females, 45 males) deposited in the National Museum of Natural History (USNM), Washington; the remaining paratypes in the collection of the author.

### *Description of Female*

Body (Figs. 1*a*, 1*b*) with a moderately broad and thick prosome. Length (not including setae on caudal rami) 0.99 mm (0.89-1.12 mm) and greatest width 0.44 mm (0.42-0.46 mm), based on 10 specimens in lactic acid. Epimeral areas not projecting laterally. Ratio of length to width of prosome 1.54:1. Ratio of length of prosome to that of urosome 1.81:1.

Segment of leg 5 (Fig. 1*c*) 68 × 208 μ. Between this segment and genital segment no ventral intersegmental sclerite. Genital segment 120 × 200 μ, broader than long, in dorsal view with rounded lateral margins. Genital areas located dorsally near middle of segment. Each area (Fig. 1*d*) with two small spines about 6 μ long and a small spiniform process. Three post-genital segments from anterior to posterior 60 × 101 μ, 52 × 86 μ, and 81 × 78 μ. Posteroventral border of anal segment smooth.

Caudal ramus (Fig. 1*e*) elongated, 91 × 26 μ, with ratio of length to width 3.5:1. Six setae relatively short and naked. Outer lateral seta 17 μ, dorsal seta 22 μ, and four terminal setae 26, 29, 36, and 26 μ from outer to inner.

Body surface bearing many refractile points as indicated in Figures 1*a* and 1*b*.

Egg sac relatively small. In female drawn in Figure 1*a* sacs about 290 × 215 μ, with five eggs having diameters of 110-145 μ. Number of eggs variable (from 3-7 in Figs. 1*f*, 1*g*, 1*b*, and 1*i*), but most often five.

Rostrum (Fig. 2*a*) weak, with a rounded posteroventral margin.

First antenna (Fig. 2*b*) 252 μ long. Lengths of seven segments (measured along their posterior nonsetiferous margins): 24 (64 μ along anterior margin), 64, 26, 32, 33, 23, and 12 μ respectively. Formula for armature as in generic diagnosis. All setae short and naked.

Second antenna (Fig. 2*c*) 3-segmented and 192 μ long. First and second segments with a single short naked seta. Third segment tapering distally to form a slender terminal claw. On concave margin of this segment three extremely small setules (less than 3 μ long and often difficult to see).

Labrum (Fig. 2*d*) with two posteroventral lobes.

Mandible (Fig. 2*e*) having on concave side of

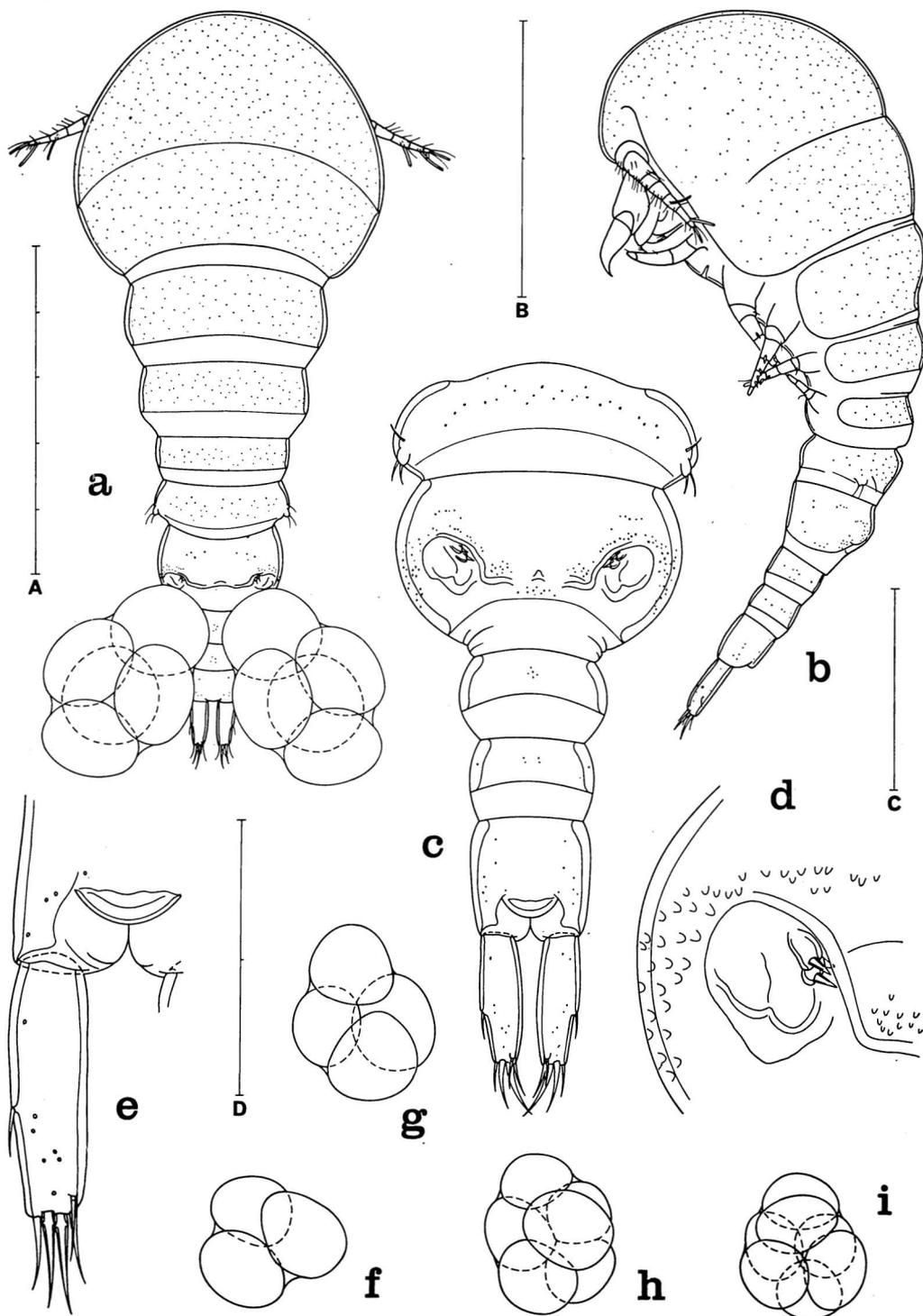


FIG. 1. *Cerioxymus faviticolus* n. gen., n. sp., female. *a*, dorsal (A); *b*, lateral (A); *c*, urosome, dorsal (B); *d*, genital area, dorsal (C); *e*, caudal ramus, dorsal (D); *f*, egg sac, dorsal (A); *g*, egg sac, dorsal (A); *h*, egg sac, dorsal (A); *i*, egg sac, dorsal (A).

Scale A, 0.5 mm; B, 0.2 mm; C, 0.05 mm; and D, 0.1 mm.

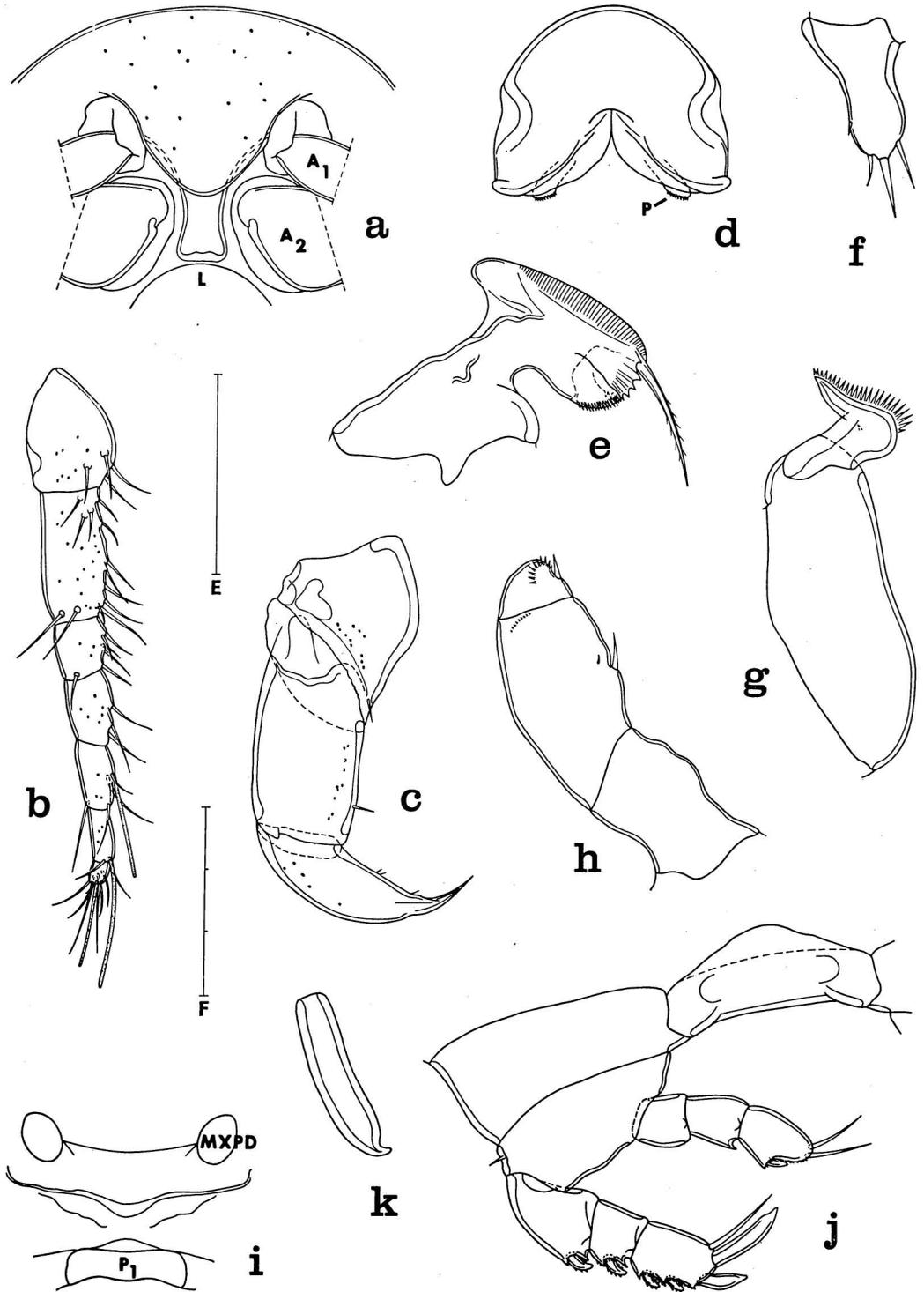


FIG. 2. *Cerioxynus faviticolus* n. gen., n. sp., female. *a*, rostrum, ventral (B); *b*, first antenna, anterodorsal (E); *c*, second antenna, anterior (E); *d*, labrum and paragnaths, ventral (D); *e*, mandible, posterior (C); *f*, first maxilla, posterior (C); *g*, second maxilla, anterior (C); *h*, maxilliped, anterior (C); *i*, area between maxillipeds and first pair of legs, ventral (B); *j*, leg 1 and intercoxal plate, anterior (D); *k*, inner terminal spine on exopod of leg 1, anterior (F). Scale E, 0.1 mm and F, 0.03 mm. A<sub>1</sub>, first antenna; A<sub>2</sub>, second antenna; L, labrum; P, paragnath; MXPD, maxilliped; and P<sub>1</sub>, leg 1. Scales A, B, C, and D appear on Fig. 1.

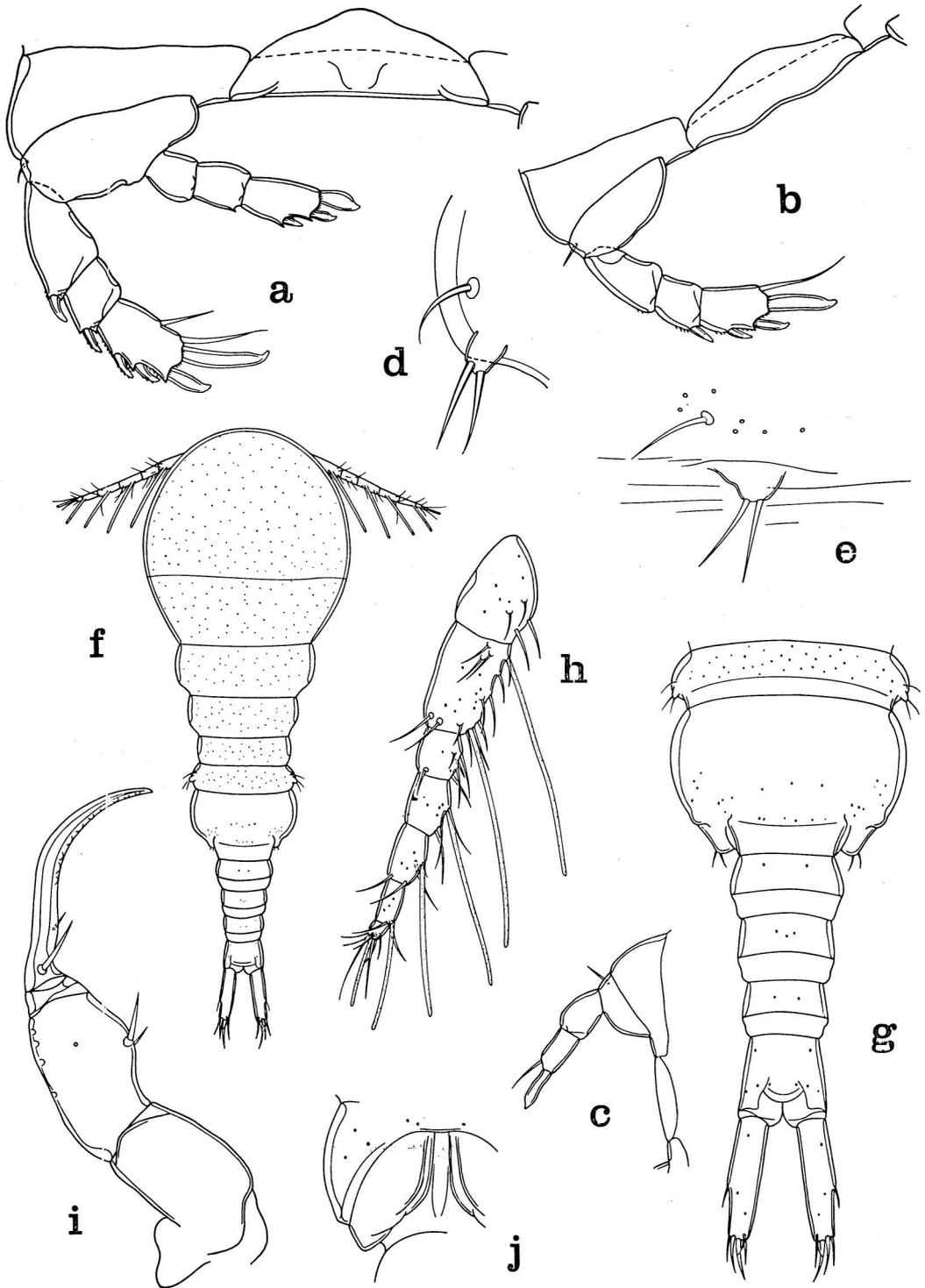


FIG. 3. *Cerioxynus faviticolus* n. gen., n. sp. Female: *a*, leg 2 and intercoxal plate, anterior (D); *b*, leg 3 and intercoxal plate, anterior (D); *c*, leg 4 and intercoxal plate, anterior (D); *d*, leg 5, dorsal (C); *e*, leg 5, lateral (C). Male: *f*, dorsal (A); *g*, urosome, dorsal (B); *h*, first antenna, anterodorsal (E); *i*, maxilliped, inner (D); *j*, leg 6, ventral (B). Scales A, B, C, and D appear on Fig. 1.

base a deep indentation followed by two slightly overlapping lobes, one with a finely serrated margin, other with a coarsely serrated margin; on convex side of mandible a prominent proximally directed winglike hyaline process followed distally by a striated fringe. Lash relatively short and lightly barbed. Paragnath (Fig. 2*d*) a small elongated lobe with a few minute terminal spines. First maxilla (Fig. 2*f*) with four naked setae. Second maxilla (Fig. 2*g*) resembling that of *Amarida* Humes & Stock, 1972. Large first segment unarmed. Small second segment bearing a minute posterior seta and a stout reflexed terminal lash armed with a row of slender teeth. Maxilliped (Fig. 2*b*) 3-segmented and concave on its anterior surface. First segment unarmed. Second segment bearing two very unequal short inner setae and a row of extremely small spines distally. Small third segment bearing a short seta and a crescentic row of small spines.

Ventral area between maxillipeds and first pair of legs (Fig. 2*i*) only slightly protuberant. A fine line connecting bases of maxillipeds. As in *Amarida*, region immediately in front of intercoxal plate of leg 1 lacking elongated sclerite seen in most lichomolgids.

Leg 1 (Fig. 2*j*) and leg 2 (Fig. 3*a*) with 3-segmented exopods and endopods. Leg 3 (Fig. 3*b*) with a 3-segmented exopod but lacking an endopod. Leg 4 (Fig. 3*c*) with a 2-segmented exopod but without an endopod.

Armature of these legs expressed as follows (Roman numerals representing spines, Arabic numerals setae):

P <sub>1</sub>	coxa	0-0	basis	1-0	exp	I-0; I-0;	II, II, 1
					enp	0-0; 0-0;	I, 2
P <sub>2</sub>	coxa	0-0	basis	1-0	exp	I-0; I-0;	II, II, 2
					enp	0-0; 0-0;	I, II
P <sub>3</sub>	coxa	0-0	basis	1-0	exp	0-0; I-0;	I, II, 1
					enp	absent	
P <sub>4</sub>	coxa	0-0	basis	1-0	exp	0-0; 1, I	
					enp	absent	

Coxa in all four legs lacking an inner seta. Spines on rami with recurved slender tips, especially noticeable on large terminal spines (Fig. 2*k*). Two terminal spines on endopod of leg 2 (Fig. 3*a*) slightly swollen. Terminal spine on exopod of leg 4 having an irregular form (Fig. 3*c*).

Leg 5 (Fig. 3*d*) with a small unornamented segment about  $11 \times 8 \mu$  in dorsal view and not clearly separated from body. In lateral view (Fig. 3*e*) segment having a different appearance. Two terminal setae and seta on body adjacent to segment relatively short (about  $17 \mu$ ) and naked.

Leg 6 probably represented by two spines and spiniform process on genital area (Fig. 1*d*).

Living specimens in transmitted light opaque, alimentary tract slightly brown, eye red, egg sacs gray.

#### Description of Male

Body (Fig. 3*f*) with prosome less thickened dorsoventrally than in female. Length (excluding setae on caudal rami) 0.83 mm (0.80–0.88 mm) and greatest width 0.32 mm (0.31–0.34 mm), based on 10 specimens in lactic acid. Ratio of length to width of prosome 1.64:1. Ratio of length of prosome to that of urosome 1.32:1.

Segment of leg 5 (Fig. 3*g*)  $42 \times 164 \mu$ . No ventral intersegmental sclerite. Genital segment  $111 \times 167 \mu$ . Four postgenital segments from anterior to posterior  $44 \times 81 \mu$ ,  $44 \times 68 \mu$ ,  $39 \times 60 \mu$ , and  $56 \times 63 \mu$ .

Caudal ramus similar to that of female.

Rostrum like that of female.

First antenna (Fig. 3*b*) resembling that of female, but three long aesthetes added, with formula as in generic diagnosis. Second antenna, labrum, mandible, paragnath, first maxilla, and second maxilla like those of female.

Maxilliped (Fig. 3*i*) slender and 4-segmented (assuming that proximal part of claw represents a fourth segment). First segment unarmed. Second bearing two unequal naked inner setae, but lacking rows of spinules commonly seen in other lichomolgids. Small third segment unarmed. Relatively short recurved claw  $83 \mu$  along its axis, lacking a terminal lamella and any indication of division, having a row of small knobs along its distal concave surface, and bearing proximally two very unequal naked setae.

Ventral area between maxillipeds and first pair of legs like that of female.

Legs 1–5 similar to those of female.

Leg 6 (Fig. 3*j*) consisting of a posteroventral

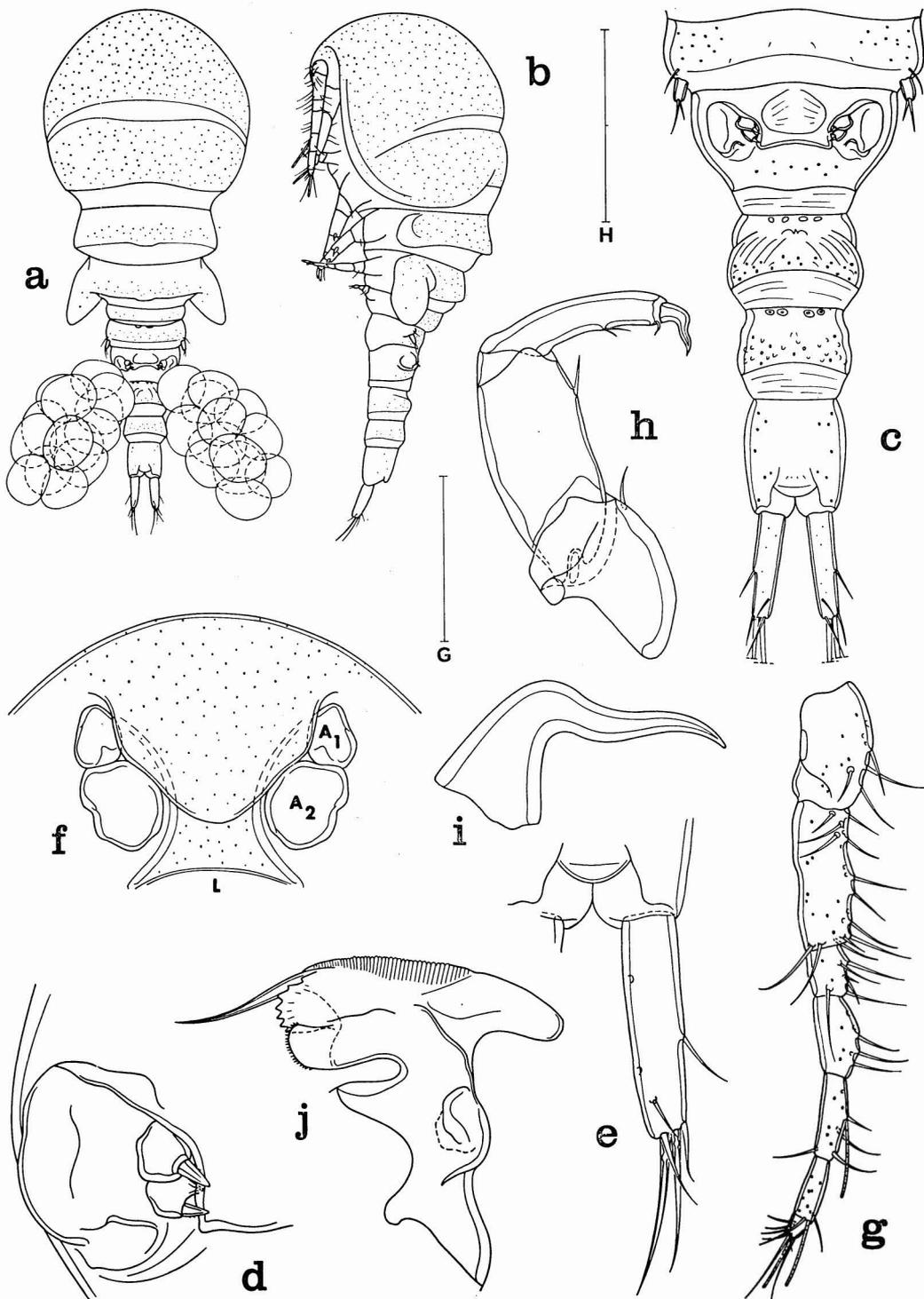


FIG. 4. *Cerioxynus alatus* n. gen., n. sp., female. *a*, dorsal (G); *b*, lateral (G); *c*, urosome, dorsal (H); *d*, genital area, dorsal (C); *e*, caudal ramus, dorsal (E); *f*, rostrum, ventral (H); *g*, first antenna, anterodorsal (B); *h*, second antenna, posterior (B); *i*, claw of second antenna, dorsal (F); *j*, mandible, posterior (C).

Scale G, 0.5 mm and H, 0.2 mm. A<sub>1</sub>, first antenna; A<sub>2</sub>, second antenna; and L, labrum. Scales B and C appear on Fig. 1; scales E and F, on Fig. 2.

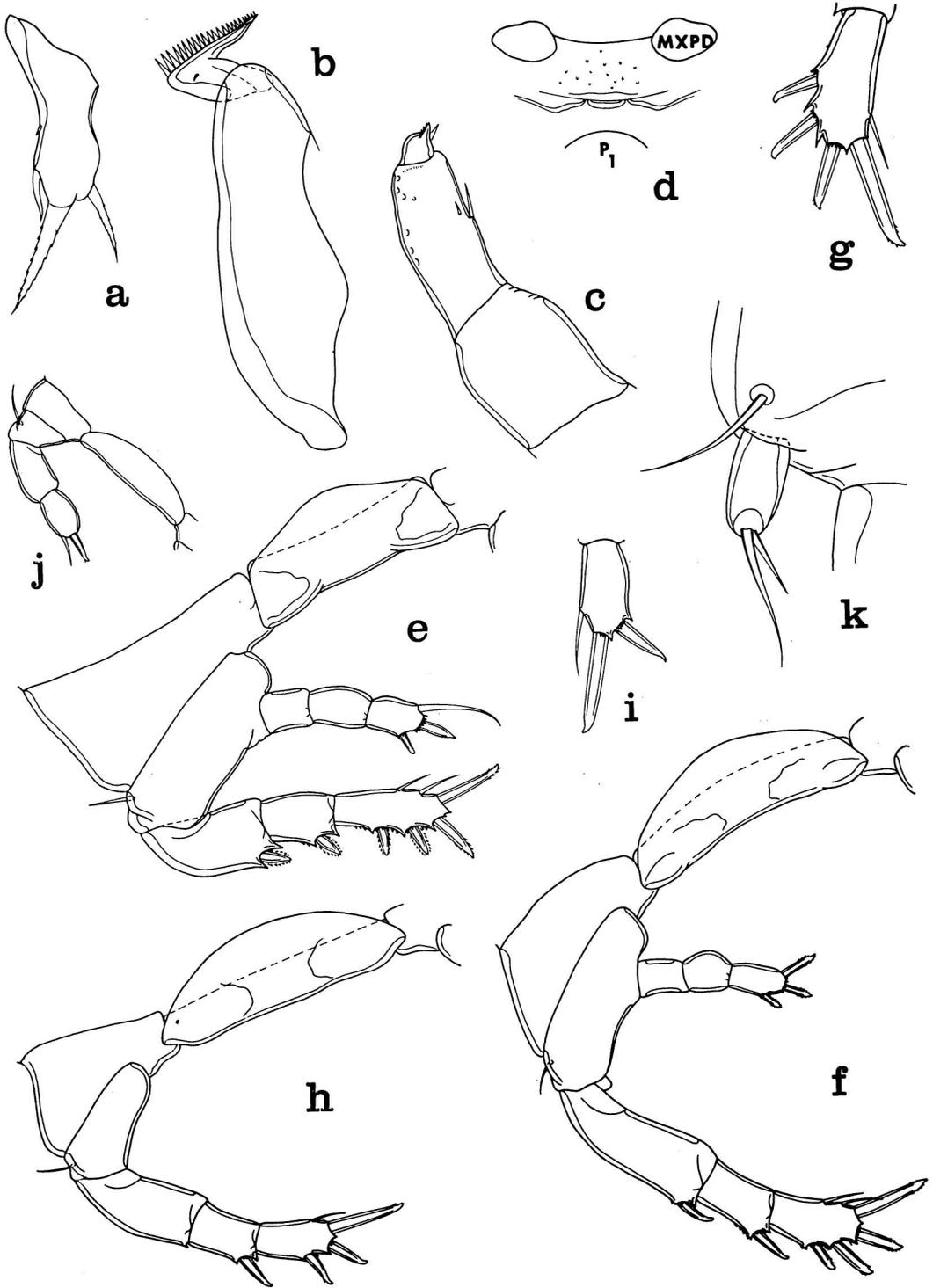


FIG. 5. *Cerioxynus alatus* n. gen., n. sp., female. *a*, first maxilla, anterior (C); *b*, second maxilla, posterior (D); *c*, maxilliped, anterior (D); *d*, area between maxillipeds and first pair of legs, ventral (H); *e*, leg 1 and intercoxal plate, anterior (E); *f*, leg 2 and intercoxal plate, anterior (E); *g*, third segment of exopod of leg 2, anterior (D); *h*, leg 3 and intercoxal plate, anterior (E); *i*, third segment of exopod of left leg 3, anterior (D); *j*, leg 4 and intercoxal plate, anterior (E); *k*, leg 5, dorsal (C).

MXPD, maxilliped, and P<sub>1</sub>, leg 1. Scales C and D appear on Fig. 1; scale E, on Fig. 2; scale H, on Fig. 4.

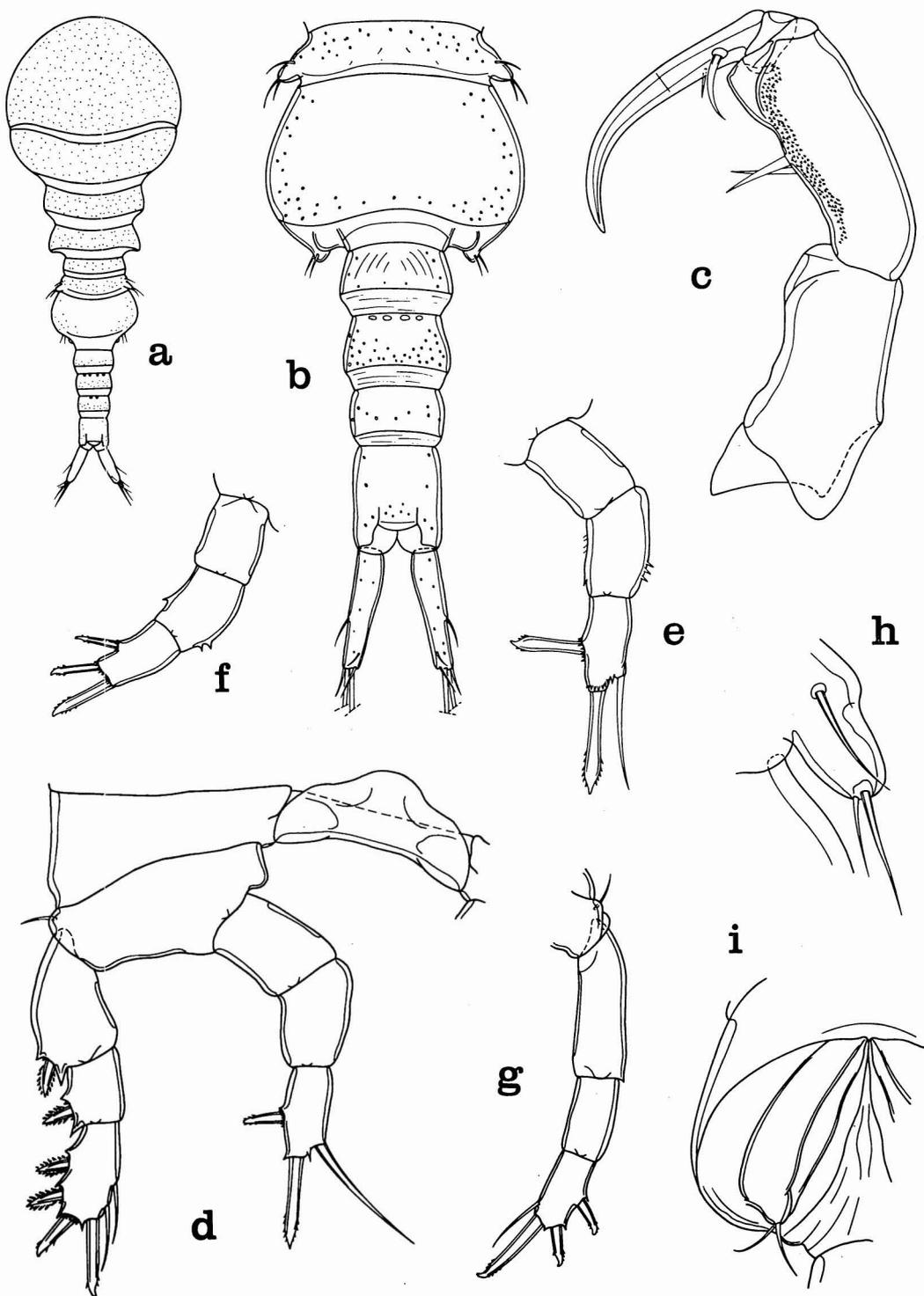


FIG 6. *Cerioxynus alatus* n. gen., n. sp., male. *a*, dorsal (G); *b*, urosome, dorsal (H); *c*, maxilliped, inner (E); *d*, leg 1 and intercoxal plate, anterior (E); *e*, endopod of leg 1, anterior (E); *f*, endopod of leg 2, anterior (E); *g*, exopod of left leg 3, anterior (E); *h*, leg 5, dorsal (C); *i*, leg 6, ventral (B). Scales B and C appear on Fig. 1; scale E, on Fig. 2; scales G and H, on Fig. 4.

flap on genital segment bearing two small setae about 13  $\mu$ .

Spermatophore not observed.

Living specimens colored as in female.

### *Etymology*

The specific name *faviticolus* is a combination of *Favites*, the generic name of the host coral, and the Latin suffix *-colus*, "inhabiting."

### *Cerioxynus alatus* n. sp.

Figs. 4a-j, 5a-k, 6a-i

### *Type Material*

Twenty-six females, 13 males from one colony of *Favia fava* (Forskål) (Faviidae), in 1.5 m, Rocher à la Voile, Noumea, New Caledonia, 22°18'24" S, 166°25'50" E, 17 June 1971. Holotype female, allotype, and 32 paratypes (22 females, 10 males) deposited in the National Museum of Natural History (USNM), Washington; the remaining paratypes (dissected) in the collection of the author.

### *Description of Female*

Body (Figs. 4a, 4b) with a broadened prosome thickened dorsoventrally. Length (without setae on caudal rami) 1.51 mm (1.44–1.60 mm) and greatest width 0.65 mm (0.62–0.73 mm), based on 10 specimens in lactic acid. Epimeral areas of segments of legs 1, 2, and 4 not expanded, but those of segment of leg 3 forming large, posteriorly directed, winglike expansions. Ratio of length to width of prosome 1.53:1. Ratio of length of prosome to that of urosome 1.69:1.

Segment of leg 5 (Fig. 4c) 78  $\times$  260  $\mu$ . Between this segment and genital segment no ventral intersegmental sclerite. Genital segment 130  $\times$  211  $\mu$ , wider than long, and in dorsal view widest in its most anterior fourth and tapered posteriorly. Genital areas located dorsally just anterior to middle of segment. Each area (Fig. 4d) bearing two minutely barbed spines 8  $\mu$  and 5.5  $\mu$  with a small spiniform process between them. Three postgenital segments from anterior to posterior 101  $\times$  140  $\mu$ , 91  $\times$  125  $\mu$ , and 127  $\times$  104  $\mu$ . Anteriormost of

these segments slightly swollen and having dorsal oblique striations directed medially. Posteroventral border of anal segment smooth.

Caudal ramus (Fig. 4e) elongate, in three specimens averaging 109  $\times$  27  $\mu$  (extremes 107–112  $\times$  26–28  $\mu$ ), ratio of length to width being 4:1. Outer lateral seta 27  $\mu$ , dorsal seta 16  $\mu$ , and four terminal setae 25, 66, 77, and 33  $\mu$  from outer to inner.

Body surface bearing many refractile points as shown in Figs. 4a and 4b.

Egg sac (Fig. 4a) elongated oval and containing 13–14 eggs. In female drawn dimensions 506  $\times$  286  $\mu$ , with eggs having diameters of 130–155  $\mu$ .

Rostrum (Fig. 4f) weak with a rounded posteroventral margin.

First antenna (Fig. 4g) 393  $\mu$  long. Lengths of seven segments (measured along their posterior nonsetiferous margins): 52 (88  $\mu$  along anterior margin), 107, 32, 49, 60, 44, and 13  $\mu$  respectively, with last segment weakly delimited from preceding one. Formula for armature same as in new species above. All setae short and naked.

Second antenna (Fig. 4b) about 260  $\mu$  long, with formula for armature same as in *C. faviticolus*. Third segment much more slender, however, than in that species, and claw 44  $\mu$  and sinuous (Fig. 4i).

Labrum similar to that of *C. faviticolus*.

Mandible (Fig. 4j) resembling that in *C. faviticolus* but proximally directed process on convex side of base longer than in that species and lash apparently smooth. Paragnath similar to that of *C. faviticolus*. First maxilla (Fig. 5a) with four elements, two of them finely serrated. Second maxilla (Fig. 5b) much like that of *C. faviticolus*. Maxilliped (Fig. 5c) resembling that species also, but small third segment having a pointed finely barbed apex.

Ventral area between maxillipeds and first pair of legs (Fig. 5d) only slightly protuberant and bearing a few refractile points anterior to transverse sclerotization.

Legs 1–4 (Figs. 5e, 5f, 5b, 5j) segmented as in *C. faviticolus*. Formula for armature as in that species, except for leg 1 where exopod is I-0; I-0; II, II, 2 and endopod is 0-0; 0-0; I, I, 1. Spines on rami having recurved tips and bearing a few minute barbs. One female with atypical formula II, II, 1 on third exopod segment of

both second legs (Fig. 5g). Another female with atypical formula I, I, 1 on third exopod segment of left third leg (Fig. 5i), same segment of right leg being typical I, II, 1.

Leg 5 (Fig. 5k) with a small unornamented segment about  $28 \times 17 \mu$ , more distinctly separated from body than in *C. faviticolus*. Two terminal setae  $42 \mu$  and  $22 \mu$ , and adjacent seta on body  $40 \mu$ , all three setae being naked.

Leg 6 probably represented by two spines and spiniform process on genital area (Fig. 4d).

Living specimens in transmitted light opaque, intestine orange-brown, eye red, egg sacs gray.

#### Description of Male

Body (Fig. 6a) a little more slender than in female. Length (not including setae on caudal rami) 1.35 mm (1.30–1.39 mm) and greatest width 0.54 mm (0.52–0.55 mm), based on 10 specimens in lactic acid. Epimera of segment of leg 3 much less expanded than in female. Ratio of length to width of prosome 1.51:1. Ratio of length of prosome to that of urosome 1.27:1.

Segment of leg 5 (Fig. 6b)  $65 \times 239 \mu$ . No ventral intersegmental sclerite. Genital segment  $174 \times 262 \mu$ . Four postgenital segments from anterior to posterior  $65 \times 117 \mu$ ,  $73 \times 112 \mu$ ,  $62 \times 99 \mu$ , and  $101 \times 94 \mu$ . First postgenital segment not swollen as in female but showing a few similar oblique striations.

Caudal ramus  $120 \times 27.5 \mu$  (average of seven specimens, extremes  $109\text{--}130 \times 26\text{--}29 \mu$ ), a little longer than in female but armed similarly.

Rostrum resembling that of female.

First antenna similar to that of female, but three aesthetes added as in *C. faviticolus*. These aesthetes much shorter, however, than in that species, being relatively about one-half as long. Second antenna, labrum, mandible, paragnath, first maxilla, and second maxilla like those of female.

Maxilliped (Fig. 6c) elongated and slender. First segment unarmed. Second segment bearing inwardly two naked setae and a long narrow field of small spines. Third segment very small and unarmed. Claw  $135 \mu$  along its axis, lacking a terminal lamella, having a weak indication of division about midway, and bearing proximally two unequal naked setae.

Ventral area between maxillipeds and first pair of legs similar to that in female.

Legs 1–4 segmented as in female and with same formula for armature. Leg 1 (Fig. 6d) showing sexual dimorphism in that endopod is geniculate and larger than in female. Terminal spine on endopod relatively longer than in opposite sex. Second segment of endopod unornamented (Fig. 6d) or with small marginal teeth or spines (Fig. 6e). Weak sexual dimorphism occurring in endopod of leg 2 (Fig. 6f) where second segment may have small marginal teeth and where spines on third segment are relatively a little longer than in female. In one male left third leg (Fig. 6g) lacking usual spine on second segment.

Leg 5 (Fig. 6b) with segment incompletely separated from body.

Leg 6 (Fig. 6i) consisting of a posteroventral flap on genital segment bearing two small naked setae about  $35 \mu$ .

Spermatophore not observed.

Living specimens colored as in female.

#### Etymology

The specific name *alatus*, Latin, "winged," refers to the winglike epimera on the segment of leg 3, especially prominent in the female.

#### Comparison with *Cerioxynus faviticolus*

Fundamental similarities in the first and second antennae, the mouthparts (especially the mandible), and legs 1–4 (both segmentation and armature) leave little doubt that *C. faviticolus* and *C. alatus* are congeneric. *C. alatus* may be distinguished from *C. faviticolus* by the winglike epimera on the segment of leg 3, by the sinuous claw on the second antenna, by the longer proximally directed process on the convex side of the mandible, and by the field of small spines on the second segment of the male maxilliped.

#### Comparison of *Cerioxynus* with Related Genera

Only two previously known lichomolgoid genera have, as in *Cerioxynus*, 3-segmented second antennae and show a reduction in segmentation or absence of the rami of legs 1–4. *Amarda* Humes & Stock, 1972, from *Favia* sp.

in Madagascar, has a single 2-segmented ramus (exopod) in leg 3 and lacks leg 4. *Mycoxyenus* Humes, 1973, from *Parabalomitra irregularis* (Gardiner) in New Caledonia has a 3-segmented ramus in leg 4. In other features these two genera approach *Cerioxyenus*. *Mycoxyenus* appears to be more closely related to it than does *Amarda*.

### *Amardopsis* n. gen.

#### Diagnosis

As for *Cerioxyenus* except for the following: first maxilla with two elements; legs 1 and 2 with 3-segmented exopods and 2-segmented endopods; leg 3 reduced to a single small segment; leg 4 absent; and leg 5 lacking a free segment and consisting of a small flange bearing two setae with a third seta nearby dorsally.

Other features as in new species described below.

Associated with scleractinian corals.

Gender masculine.

Type species *Amardopsis merulinae* n. sp.

#### Etymology

The generic name is a combination of *Amarda* and the suffix -οψις, "appearance," alluding to the similarities with *Amarda*.

### *Amardopsis merulinae* n. sp.

Figs. 7a-m, 8a-l

#### Type Material

Ten females, 12 males from part of a colony of *Merulina ampliata* (Ellis & Solander) (Merulinidae), in 2 m, west of Isle Maître, near Noumea, New Caledonia, 22°20'05" S, 166°24'05" E, 21 June 1971. Holotype female, allotype, and 16 paratypes (7 females, 10 males) deposited in the National Museum of Natural History (USNM), Washington; the remaining paratypes (dissected) in the collection of the author.

#### Description of Female

Body (Figs. 7a, 7b) elongated. Length (excluding setae on caudal rami) 1.42 mm (1.33–1.57 mm) and greatest width 0.44 mm (0.42–

0.46 mm), based on 10 specimens in lactic acid. Epimeral areas not developed. Ratio of length to width of prosome 1.90:1. Ratio of length of prosome to that of urosome 1.32:1.

Segment of leg 5 (Fig. 7c) 73 × 275 μ. Between this segment and genital segment no ventral intersegmental sclerite. Genital segment 130 × 234 μ, in dorsal view tapered posteriorly. Genital areas located dorsally just in front of middle of segment. Each area (Fig. 7d) bearing two minute spines about 5 μ with a small spiniform process between them. Three postgenital segments from anterior to posterior 101 × 151 μ, 94 × 143 μ, and 130 × 122 μ. Posteroventral border of anal segment smooth.

Caudal ramus (Fig. 7e) elongated, 169 × 31 μ, with slightly irregular margins. Ratio of length to width 5.45:1. Six setae short and naked. Outer lateral seta 20 μ, dorsal seta 22 μ, and four terminal setae from outer to inner 20, 51, 53, and 33 μ.

Body surface with numerous small refractile points (Figs. 7a, 7b).

Egg sac (Fig. 7a) oval, 335 × 220 μ and 295 × 236 μ in specimen drawn, and containing nine eggs of somewhat variable diameter (104–130 μ).

Rostrum (Fig. 7f) weak with a rounded posteroventral margin.

First antenna (Fig. 7g) 225 μ long. Lengths of seven segments (measured along their posterior nonsetiferous margins): 52 (65 μ along anterior margin), 62, 18, 20, 26, 22, and 12 μ respectively. Formula for armature as in female of *Cerioxyenus*. All setae naked.

Second antenna (Fig. 7b) 3-segmented and about 200 μ long. Both first and second segments bearing a short naked seta. Third segment with three small naked setae, two on inner side and one on anterior surface near base of claw. Claw short, about 25 μ along its axis.

Labrum (Fig. 7i) with two broad posteroventral lobes.

Mandible (Fig. 7j) resembling in general form that of *Cerioxyenus alatus*. Of two lobes on concave side of base beyond indentation one lobe having smaller marginal spinules and other having fewer and shallower serrations than in that species. Paragnath (Fig. 7i) an elongated slender lobe tipped with three small spinous

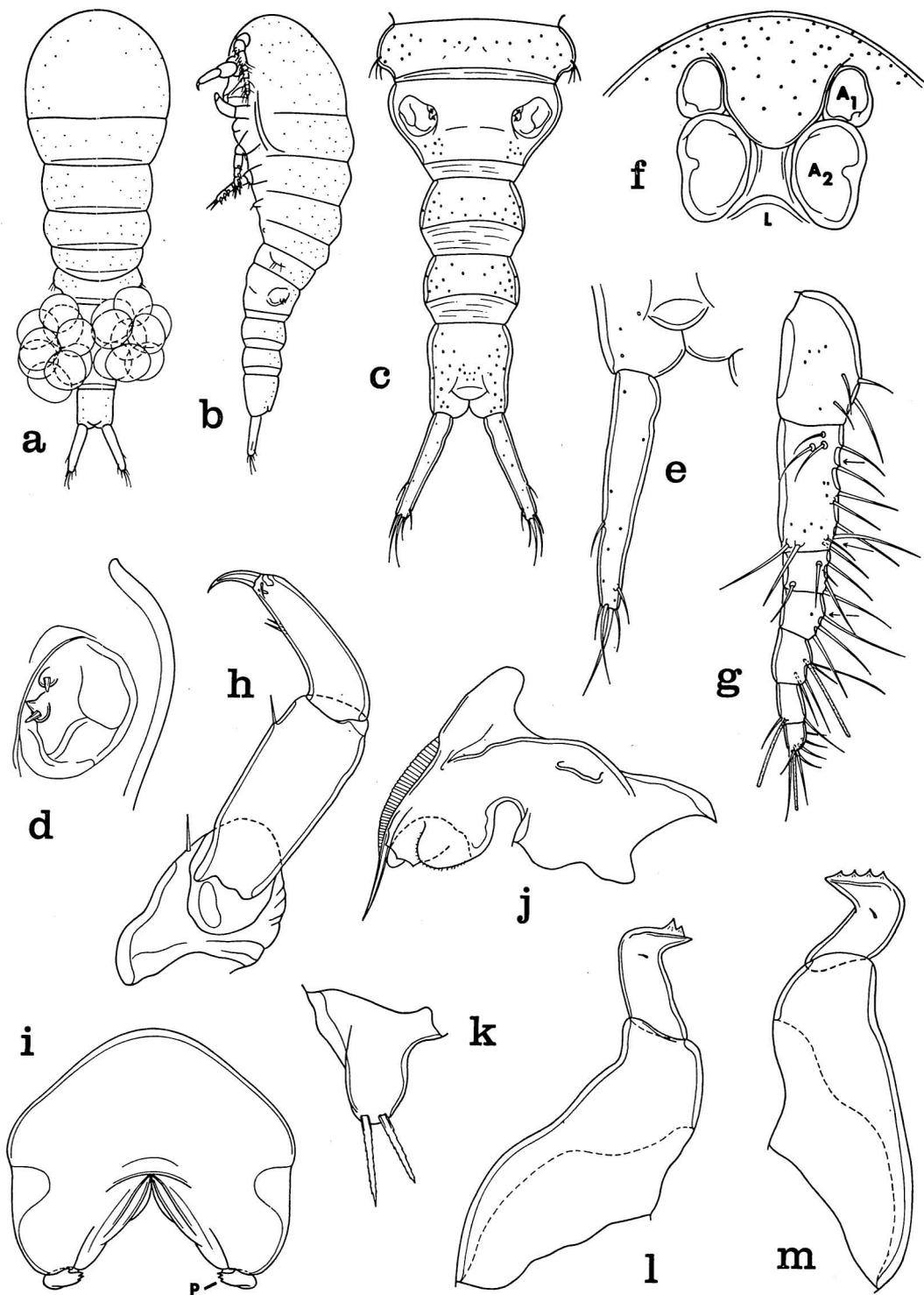


FIG. 7. *Amardopsis merulinae* n. gen., n. sp., female. *a*, dorsal (G); *b*, lateral (G); *c*, urosome, dorsal (A); *d*, genital area, dorsal (D); *e*, caudal ramus, dorsal (B); *f*, rostrum, ventral (H); *g*, first antenna, with arrows indicating positions of aesthetes in male, anterodorsal (E); *h*, second antenna, anterior (E); *i*, labrum and paragnaths, ventral (D); *j*, mandible, posterior (C); *k*, first maxilla, anterior (C); *l*, second maxilla, posterior (C); *m*, second maxilla, posterior (C).

A<sub>1</sub>, first antenna; A<sub>2</sub>, second antenna; L, labrum; P, paragnath. Scales A, B, C, and D appear on Fig. 1; scale E, on Fig. 2; scales G and H, on Fig. 4.

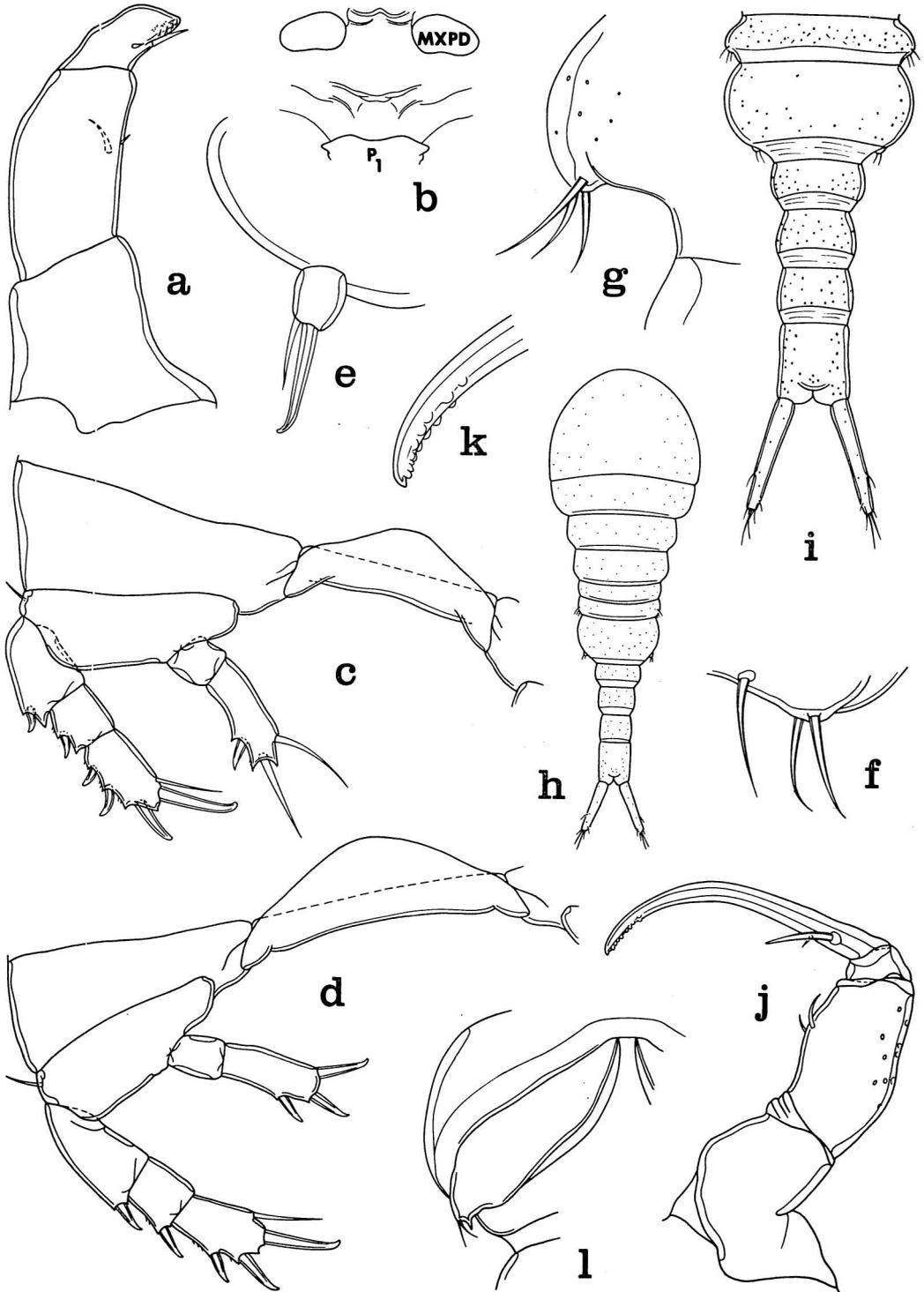


Fig. 8. *Amardopsis merulinae* n. gen., n. sp. Female: *a*, maxilliped, anterior (C); *b*, area between maxillipeds and first pair of legs, ventral (B); *c*, leg 1 and intercoxal plate, anterior (D); *d*, leg 2 and intercoxal plate, anterior (D); *e*, leg 3, anterior (C); *f*, leg 5, lateral (C); *g*, leg 5, dorsal (C). Male: *h*, dorsal (G); *i*, urosome, dorsal (A); *j*, maxilliped, inner (E); *k*, tip of claw of maxilliped, inner (C); *l*, leg 6, ventral (B).

MXPD, maxilliped, and  $P_1$ , leg 1. Scales A, B, C, and D appear on Fig. 1; scale E, on Fig. 2; scale G, on Fig. 4.

processes. First maxilla (Fig. 7*k*) bearing two finely serrated spiniform elements. Second maxilla (Figs. 7*l*, 7*m*) resembling generally that of *Amarda* and *Cerioxynus*, but very short lash with fewer teeth, in various specimens from 2–4 in number. Maxilliped (Fig. 8*a*) much like that in *Cerioxynus*; third segment with two very unequal setae and a subterminal crescentic row of spinules.

Ventral area between maxillipeds and first pair of legs (Fig. 8*b*) slightly protuberant (Fig. 7*b*).

Leg 1 (Fig. 8*c*) and leg 2 (Fig. 8*d*) with 3-segmented exopods and 2-segmented endopods. Leg 3 (Fig. 8*e*) reduced to a single small segment. Leg 4 absent, but a small internal sclerotization perhaps indicating its former position (Fig. 7*b*). Formula for armature as follows:

P <sub>1</sub>	coxa	0-0	basis	1-0	exp	I-0; I-0;	II, II, 1
					enp	0-0; I, 2	
P <sub>2</sub>	coxa	0-0	basis	1-0	exp	I-0; I-0;	I, II, 1
					enp	0-0; I, II	
P <sub>3</sub>	-	-	-	-		I, 1	
P <sub>4</sub>	absent						

Spines on legs smooth with their tips recurved posteriorly. Segment of leg 3 minute,  $14 \times 11 \mu$ . In some specimens long spine ( $27 \mu$ ) apparently missing, creating false impression that armature consists solely of a seta.

Leg 5 (Fig. 8*f*, 8*g*) without a free segment, consisting of a flange bearing two setae with a third seta nearby dorsally, all three setae being naked.

Leg 6 probably represented by two small spines and spiniform process on genital area (Fig. 7*d*).

Living specimens in transmitted light opaque, intestine orange-red, eye red, egg sacs gray.

#### Description of Male

Body (Fig. 8*b*) elongated, resembling in general shape that of female. Length (not including setae on caudal rami) 1.34 mm (1.31–1.41 mm) and greatest width 0.42 mm (0.39–0.44 mm) based on 10 specimens in lactic acid. Ratio of length to width of prosome 1.6:1. Ratio of length of prosome to that of urosome 1:1.

Segment of leg 5 (Fig. 8*i*)  $60 \times 286 \mu$ . No

ventral intersegmental sclerite. Genital segment  $156 \times 275 \mu$ , much wider than long. Four postgenital segments from anterior to posterior  $78 \times 140 \mu$ ,  $86 \times 125 \mu$ ,  $86 \times 117 \mu$ , and  $114 \times 99 \mu$ .

Caudal ramus and rostrum similar to those in female.

First antenna resembling that of female, but three aesthetes added (at points indicated by arrows in Fig. 7*g*), so that formula is same as in male of *Cerioxynus*. Second antenna, labrum, mandible, paragnath, first maxilla, and second maxilla like those of female.

Maxilliped (Fig. 8*j*) segmented and armed as in *Cerioxynus faviticulus*, with distal concave surface of claw having small knobs (Fig. 8*k*). Claw  $140 \mu$  along its axis.

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

Legs 1–5 resembling those in female.

Leg 6 (Fig. 8*l*) consisting of a posteroventral flap on genital segment bearing two small naked setae about  $15 \mu$  and an adjacent rather prominent spiniform process.

Spermatophore not observed.

Living specimens colored as in female.

#### Etymology

The specific name *merulinae* is derived from the generic name of the host.

#### Comparison of *Amardopsis* with Related Genera

Four lichomolgid genera have 3-segmented second antennae and show a reduction in segmentation or absence of the rami of legs 1–4. These may be distinguished from one another by the number of segments in the rami of the legs (Table 1).

*Amardopsis* differs further from the other three genera in the nature of leg 5, consisting as it does of a simple flange and lacking a free segment.

*Panjakus* Humes & Stock, 1972

*Panjakus platygyrae* Humes & Stock, 1973

#### Material

Forty-five females, 53 males, and 7 copepodids from one colony of *Platygyra astreiformis*

TABLE 1

NUMBER OF SEGMENTS IN RAMI OF LEGS 1-4 IN FOUR LICHOMOLGID GENERA THAT HAVE 3-SEGMENTED SECOND ANTENNAE AND THAT SHOW A REDUCTION OR ABSENCE OF CERTAIN RAMI.

RAMUS	<i>Mycoxynus</i>	<i>Cerioxynus</i>	<i>Amarda</i>	<i>Awardopsis</i>
P <sub>1</sub>				
exp	3	3	3	3
enp	3	3	2 (or 3)	2
P <sub>2</sub>				
exp	3	3	3	3
enp	3	3	2 (or 3)	2
P <sub>3</sub>				
exp	3	3	2	1
enp	absent	absent	absent	1
P <sub>4</sub>				
exp	3	2	absent	absent
enp	absent	absent	absent	absent

(Milne Edwards & Haime) (Faviidae), in 1.5 m, Rocher à la Voile, Noumea, New Caledonia, 22°18'24" S, 166°25'50" E, 17 June 1971; and 2 females, 6 males from another colony of the same host species, in 1 m, same locality and date. Specimens have been deposited in the National Museum of Natural History (USNM), Washington.

#### Descriptive Notes

Body size of New Caledonian specimens a little larger than in type material from Madagascar. Length of female (without setae on caudal rami) 1.59 mm (1.44-1.70 mm) and greatest width 0.52 mm (0.50-0.55 mm). Length of male (without ramal setae) 1.57 mm (1.52-1.62 mm) and greatest width 0.46 mm (0.44-0.48 mm). Measurements of both sexes made on 10 specimens in lactic acid. (Average length of Madagascan females 1.45 mm and males 1.31 mm).

Caudal ramus a little larger than in Madagascan specimens; in female  $180 \times 23 \mu$  (average of six specimens), with a ratio of 7.8:1. (Caudal ramus of Madagascan females  $140 \times 18 \mu$ , with same ratio.) Larger caudal ramus in New Cale-

donian specimens apparently a reflection of larger body size.

Free segment of leg 5 a little shorter and wider in New Caledonian specimens, in female about  $19.5 \times 16 \mu$ . (In Madagascan females about  $22 \times 14 \mu$ .)

#### Remarks

The New Caledonian specimens agree in most respects with *Panjakus platygyrae* from *Platygyra* ? *lamellina* (Ehrenberg), *P. daedala* (Ellis & Solander), and *Panjakus* sp. cf. *daedala* in Madagascar. A careful comparison with the original description and a reexamination of paratypes have revealed only the three features mentioned above whereby the specimens from New Caledonia differ noticeably from the Madagascan population. These slight differences may simply be an expression of variation over the geographical range of the species or may be related to the occurrence in a different species of host. Only a comparative study of further collections can elucidate their significance. For the purposes of the present work the differences have been treated conservatively and the New Caledonian specimens placed under the specific umbrella of *Panjakus platygyrae*.

LITERATURE CITED

- HUMES, A. G. 1973. Cyclopoid copepods (Lichomolgidae) from fungiid corals in New Caledonia. *Zool. Anz.* 190 (5/6): 312-333.
- HUMES, A. G., and J. H. STOCK. 1972. Preliminary notes on a revision of the Lichomolgidae, cyclopoid copepods mainly associated with marine invertebrates. *Bull. zool. Mus., Univ. Amsterdam* 2(12): 121-133.
- . 1973. A revision of the family Lichomolgidae Kossmann, 1877, cyclopoid copepods mainly associated with marine invertebrates. *Smithson. Contr. Zool.*, no. 127. v + 368 pp.