

ACONTIOPHORUS EXCAVATUS, A NEW SPECIES
(COPEPODA: SIPHONOSTOMATOIDA) ASSOCIATED
WITH THE SOFT CORAL *DENDRONEPHTHYA*
(ALCYONACEA) IN THE INDO-PACIFIC

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Abstract.—A new species of siphonostomatoid asterocherid copepod, *Acontiphorus excavatus*, is described from Madagascar, the Philippines, and the Moluccas, where it is associated with the alcyonaceans *Dendronephthya mucronata* and *D. koellikeri*. The new copepod, though closely related to *Acontiphorus bracatus* from the Mediterranean, may be distinguished by the excavated outer margin of the first exopod segment of leg 1 and by the presence of only two small dentiform projections between the terminal setae on the free segment of leg 5.

Many poecilostomatoid and siphonostomatoid copepods are associated with shallow-water cnidarians in the Indo-Pacific. While the poecilostomatoid associates of Alcyonacea have received considerable attention in recent years (e.g., Humes 1975, 1980, 1982; Humes & Dojiri 1979a, 1979b, 1979c; Humes & Stock 1973), the siphonostomatoid copepods associated with these hosts are poorly known. The purpose of this work is to describe a new widely distributed asterocherid copepod living as an associate of soft corals belonging to the genus *Dendronephthya* in the Indo-Pacific.

Materials and Methods

The host alcyonaceans were isolated in plastic bags immediately after collection. Later they were soaked for 1-2 hours in sea water with 5% ethanol, rinsed thoroughly, and the sea water passed through a fine net (about 120 holes per 2.5 cm). The copepods were then recovered from the sediment retained in the net.

The copepods were studied using the wooden slide/lactic acid technique described by Humes & Gooding (1974). Measurements were made on specimens in lactic

acid. 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 abbreviations used are: A_1 = first antenna, A_2 = second antenna, and P_1 = leg 1.

Order Siphonostomatoida Thorell, 1859
Family Asterocheridae Giesbrecht, 1899
Genus *Acontiphorus* Brady, 1880
Acontiphorus excavatus, new species
Figs. 1-23

Type material.—43 ♀♀, 70 ♂♂ from *Dendronephthya mucronata* (Pütter), in 25 m, N of Ankazoberavina, near Nosy Bé, NW Madagascar, 13°27.6'S, 47°58.2'E, 24 Aug 1967. Holotype female, allotype, and 103 paratypes (38 ♀♀, 65 ♂♂) deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C.

Other specimens.—18 ♀♀, 43 ♂♂ from *Dendronephthya koellikeri* Kükenthal, in 25 m, southern shore of Goenoeng Api, Banda Islands, Moluccas, 04°32'05"S, 129°52'30"E, 26 Apr 1975; 3 ♀♀, 2 ♂♂ from same host, locality, and date; 5 ♀♀, 9 ♂♂, and 9 copepodids from *Dendronephthya koellikeri*, in 10 m, Poelau Gomumu, S of Obi, Moluccas,

01°50'00"S, 127°30'45"E, 30 May 1975; 5 ♀♀ from *Dendronephthya* sp., in 17 m, southwestern shore of Goenoeng Api, Banda Islands, 04°31'45"S, 129°51'55"E, 30 Apr 1975; 1 ♀ from unidentified alcyonacean, probably *Dendronephthya*, in 30 m, Bohol Island, Philippines, 10°17.9'N, 124°10.9'E, 21 Aug 1975.

Female.—Body (Fig. 1) with broad prosome. Length 1.10 mm (0.99–1.19 mm) and greatest width 0.56 mm (0.51–0.59 mm), based on 10 specimens. Greatest dorsoventral thickness 0.35 mm. Epimeral areas of segments bearing legs 1–3 pointed, those of segment bearing leg 3 especially so. Segment bearing leg 4 much smaller than preceding segment and rounded laterally, with only slight point. Ratio of length to width of prosome 1.22:1. Ratio of length of prosome to that of urosome 2.0:1.

Segment bearing leg 5 (Fig. 2) $78 \times 101 \mu\text{m}$, with small scalelike spines along both lateral margins. Genital segment $172 \mu\text{m}$ long, $200 \mu\text{m}$ wide at small anterior rounded expansions, and $185 \mu\text{m}$ wide posteriorly. Genital areas situated dorsolaterally in front of middle of segment. Each area (Fig. 3) with two small setae, $12 \mu\text{m}$ and $4 \mu\text{m}$. Two postgenital segments from anterior to posterior $49 \times 123 \mu\text{m}$ and $161 \times 126 \mu\text{m}$. Elongate anal segment, more than twice as long as preceding segment, with small scalelike spines along both lateral margins. Posteroventral border of anal segment smooth.

Caudal ramus (Fig. 4) $47 \times 57 \mu\text{m}$, wider than long, ratio 1:1.22. Outer lateral seta, lightly feathered, placed dorsally and subterminally, $209 \mu\text{m}$. Dorsal seta $55 \mu\text{m}$, smooth, with proximal third broader than distal two-thirds. Outermost terminal seta $265 \mu\text{m}$, innermost terminal seta $308 \mu\text{m}$, and two median terminal setae $297 \mu\text{m}$ (outer) and $374 \mu\text{m}$ (inner), all feathered. Inner median terminal seta swollen. Ramus with outer margin having several small scalelike spines and few distal setules, inner margin with several distal setules.

Dorsal surface of body without visible sensilla.

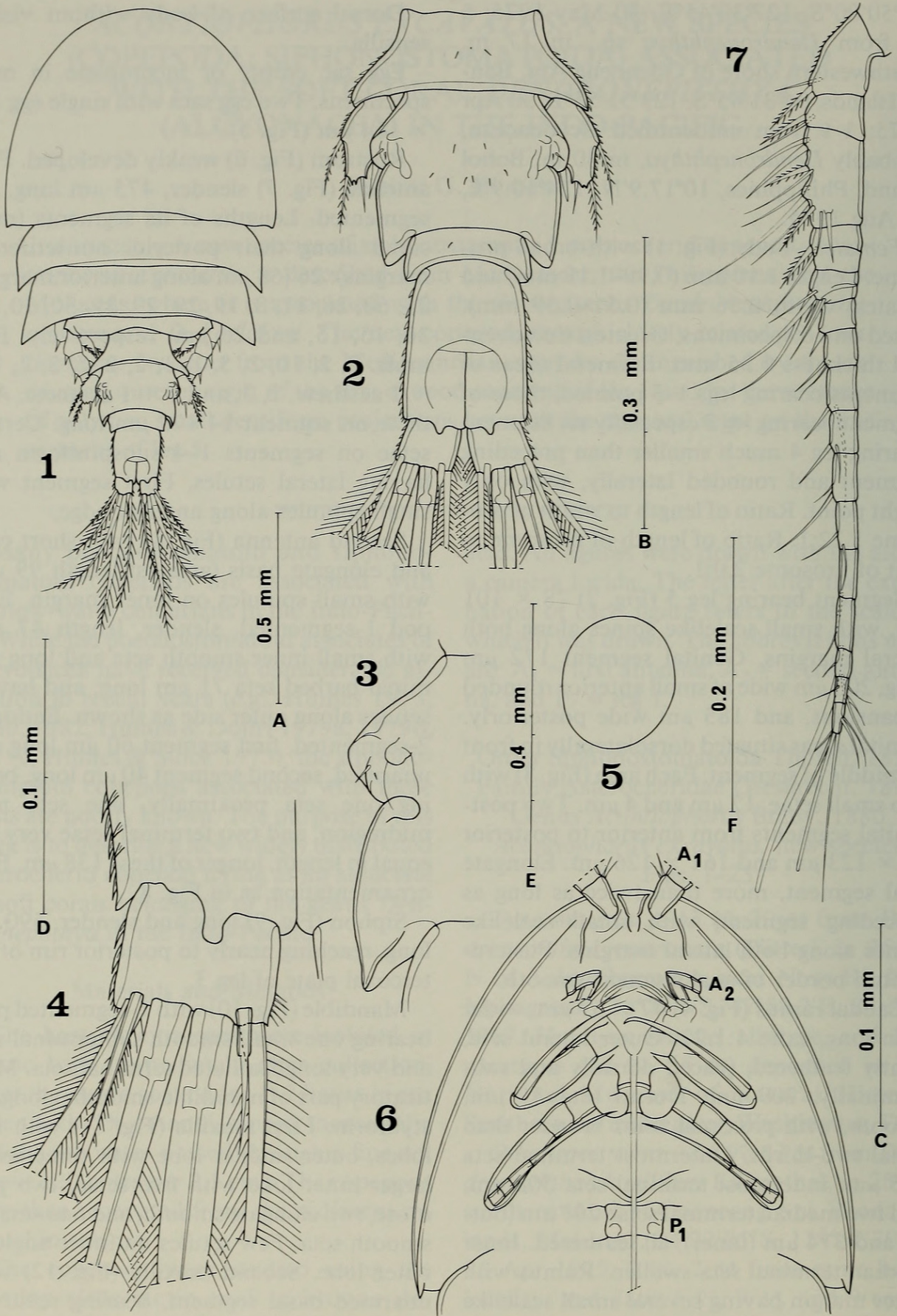
Egg sac empty or incomplete in most specimens. Two egg sacs with single egg $195 \times 164 \mu\text{m}$ (Fig. 5).

Rostrum (Fig. 6) weakly developed. First antenna (Fig. 7) slender, $475 \mu\text{m}$ long, 17-segmented. Lengths of its segments (measured along their posterior nonsetiferous margins): 26 ($68 \mu\text{m}$ along anterior margin), 25, 60, 26, 11, 8, 19, 29, 29, 29, 30, 30, 34, 36, 15, 15, and $20 \mu\text{m}$, respectively. Formula: 2, 2, 10, 2, 5, 1, 1, 2, 2, 2, 2, 1, 2 + 1 aesthete, 2, 3, and 5 + 1 aesthete. Aesthete on segment 14 $172 \mu\text{m}$ long. Certain setae on segments 1–4 subspiniform and having lateral setules. First segment with small spinules along anterior edge.

Second antenna (Fig. 8) with short coxa and elongate basis (greatest length $99 \mu\text{m}$) with small spinules on inner margin. Exopod 1-segmented, slender, length $47 \mu\text{m}$, with small inner smooth seta and long terminal barbed seta $71 \mu\text{m}$ long, and having setules along outer side as shown. Endopod 2-segmented, first segment $60 \mu\text{m}$ long and unarmed, second segment $40 \mu\text{m}$ long, bearing one seta proximally, one seta near midregion, and two terminal setae very unequal in length, longer of these $138 \mu\text{m}$. Fine ornamentation as in Fig. 8.

Siphon (Fig. 9) long and slender, $590 \mu\text{m}$ long, reaching nearly to posterior rim of intercoxal plate of leg 3.

Mandible (Fig. 10) with 1-segmented palp bearing one small smooth subterminal seta and very long feathered terminal seta. Masticatory part of mandible smooth, elongate, styliform. First maxilla (Fig. 11) with two lobes, outer smaller lobe with three setae, larger inner lobe with five setae, two plumose, two elongate smooth, and one smaller smooth seta. Few setules on inner angle of outer lobe. Second maxilla (Fig. 12) with unarmed basal segment, bearing recurved claw armed with two setae near its midregion and having recurved tip (Fig. 13). Max-



Figs. 1-7. *Acontiophorus excavatus*, new species, female: 1, dorsal (scale A); 2, urosome, dorsal (B); 3, genital area, dorsal (C); 4, caudal ramus, dorsal (D); 5, egg, ventral (E); 6, cephalosome, ventral (E); 7, first antenna, dorsal (F).

illiped (Fig. 14) with two short proximal segments, distal of these with one minute inner seta. Third segment elongate and unarmed. Segments 4, 5, and 6 forming part of "claw", fourth segment having one seta, fifth segment two setae, and sixth segment one seta. Claw elongate, 112 μm , recurved, its proximal third swollen.

Ventral region between maxillipeds and first pair of legs not protuberant and having widely diverging U-shaped sclerotization in front of intercoxal plate of leg 1 (Fig. 6).

Legs 1–4 (Figs. 15–18) biramous, with 3-segmented rami throughout. Formula for armature as follows (Roman numerals indicating spines, Arabic numerals representing setae):

- P_1 coxa 0-1 basis 1-I exp I-1; I-1; III,2,3
 enp 0-1; 0-2; 1,2,3
 P_2 coxa 0-1 basis 1-0 exp I-1; I-1; III,I,4
 enp 0-1; 0-2; 1, 1 + I,3
 P_3 coxa 0-1 basis 1-0 exp I-1; I-1; III,I,3
 enp 0-1; 0-2; 1,I,3
 P_4 coxa 0-1 basis 1-0 exp I-1; I-1; III,I,3
 enp 0-1; 0-2; 1,I,2

Basis of leg 1 with inner barbed spine 36 μm , small spinules adjacent to its insertion. First segment of exopod of leg 1 with outer margin excavated (Fig. 15). Coxa of leg 2 with outer pectinate fringe (Fig. 16). Endopod of leg 4 (Fig. 18) with inner margins of segments having slender spinules rather than hairlike setules as in legs 1–3.

Leg 5 (Fig. 19) with oval free segment 76 \times 50 μm , placed ventrally, armed from inner to outer with two smooth spines 30 μm and 25 μm , short smooth seta 26 μm , and two longer weakly feathered setae 60 μm and 52 μm . Adjacent "dorsal" seta, here inserted ventrally, smooth, 40 μm . Pair of small dentiform processes between two terminal setae. Outer margin of segment with small scalelike spines.

Leg 6 represented by two small setae on genital area (Fig. 3).

Color of living specimens in transmitted light pinkish red, eye red.

Male.—Body (Fig. 20) with prosome less broad than in female. Length 0.71 mm (0.69–0.74 mm) and greatest width 0.32 mm (0.30–0.33 mm), based on 10 specimens. Greatest dorsoventral thickness 0.21 mm. Epimera of segment bearing leg 1 rounded, those of segments bearing legs 2 and 3 somewhat pointed but less prominent than in female. Segment bearing leg 4 relatively wider than in female and more pointed. Ratio of length to width of prosome 1.62:1. Ratio of length of prosome to that of urosome 2.14:1.

Segment bearing leg 5 (Fig. 21) 60 \times 120 μm . Genital segment 65 \times 122 μm , with well-rounded lateral margins. Three post-genital segments from anterior to posterior 39 \times 94, 24 \times 78, and 75 \times 73 μm .

Caudal ramus 30 \times 37 μm , resembling that of female.

Body surface as in female.

Rostrum like that of female. First antenna (Fig. 22) geniculate, 400 μm long, 12-segmented. Lengths of its segments (measured along their posterior nonsetiferous margins): 26 (55 μm along anterior margin), 22, 49, 29, 2, 5, 8, 66, 29, 52, 42, and 39 μm , respectively. Formula: 2, 2, 10, 2, 5, 1, 1, 6, 2, 1, 1 + 1 aesthete, and 6. Second antenna, siphon, mandible, first maxilla, second maxilla, maxilliped, and ventral area between maxillipeds and first pair of legs as in female.

Legs 1–4 as in female.

Leg 5 similar to that of female but free segment smaller, 42 \times 28 μm .

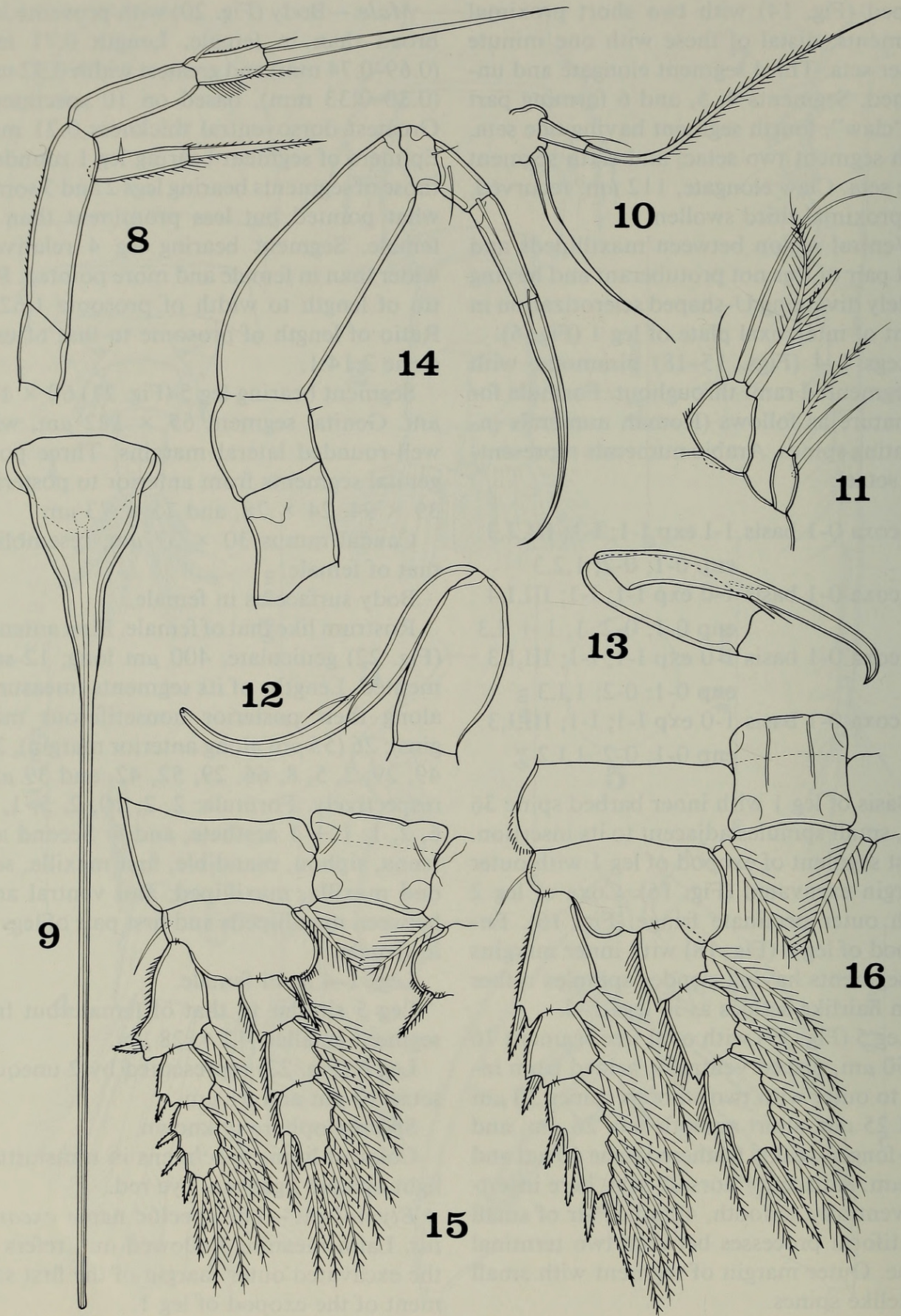
Leg 6 (Fig. 23) represented by 2 unequal setae 10 μm and 31 μm .

Spermatophore unknown.

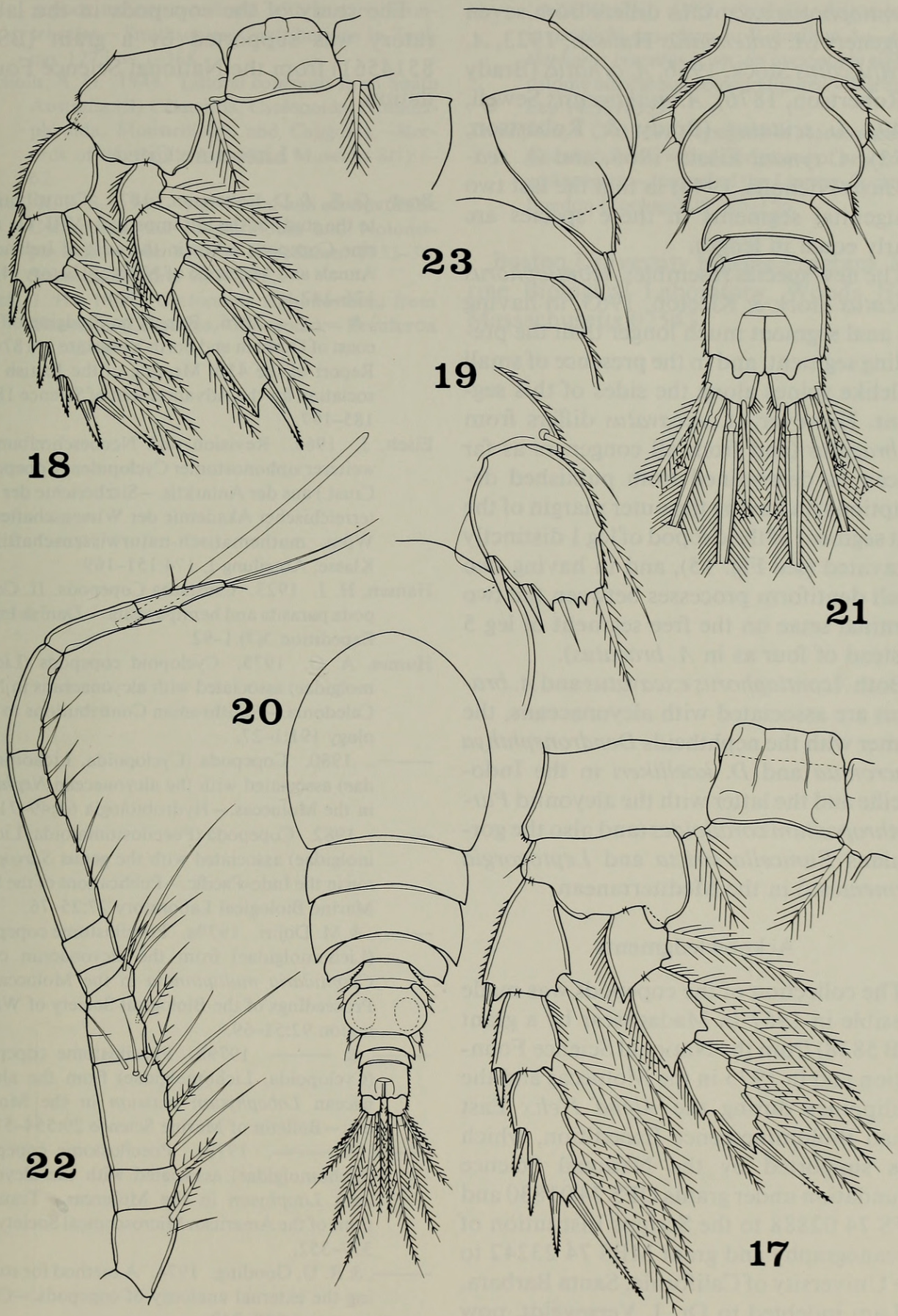
Color of living specimens in transmitted light opaque light tan, eye red.

Etymology.—The specific name *excavatus*, Latin meaning hollowed out, refers to the excavated outer margin of the first segment of the exopod of leg 1.

Remarks.—Eight species are presently recognized in the genus *Acontiophorus* (not including the very insufficiently described *Acontiophorus angulatus* Thompson, 1888).



Figs. 8–16. *Acontiophorus excavatus*, new species, female: 8, second antenna, inner (scale C); 9, siphon, ventral (F); 10, mandible, anteroventral (F); 11, first maxilla, posterodorsal (C); 12, second maxilla, anterodorsal (F); 13, second maxilla, posteroventral (F); 14, maxilliped, posterior (C); 15, leg 1 and intercoxal plate, anterior (F); 16, leg 2 and intercoxal plate, anterior (F).



Figs. 17–23. *Acontiophorus excavatus*, new species. Female: 17, leg 3 and intercoxal plate, anterior (scale F); 18, leg 4 and intercoxal plate, anterior (F); 19, leg 5, ventral (C). Male: 20, body, dorsal (E); 21, urosome, dorsal (F); 22, first antenna, dorsal (C); 23, leg 6, ventral (D).

Acontiphorus excavatus differs from seven congeners (*A. antennatus* Hansen, 1923, *A. brevifurcatus* Stock, 1966, *A. ornatus* (Brady & Robertson, 1876), *A. maldivensis* Sewell, 1949, *A. scutatus* (Brady & Robertson, 1873), *A. tynani* Eiselt, 1965, and *A. zealandicus* Nicholls, 1944) in that the last two postgenital segments in these species are nearly equal in length.

The new species resembles *Acontiphorus bracatus* Stock & Kleeton, 1963, in having the anal segment much longer than the preceding segment, and in the presence of small scalelike spines along the sides of this segment. However, *A. excavatus* differs from *A. bracatus* (and from all congeners as far as can be determined from published descriptions) in having the outer margin of the first segment of the exopod of leg 1 distinctly excavated (see Fig. 15), and in having two small dentiform processes between the two terminal setae on the free segment of leg 5 (instead of four as in *A. bracatus*).

Both *Acontiphorus excavatus* and *A. bracatus* are associated with alcyonaceans, the former with the nephtheids *Dendronephthya mucronata* and *D. koellikeri* in the Indo-Pacific and the latter with the alcyoniid *Parerythropodium coralloides* (and also the gorgonians *Eunicella stricta* and *Leptogorgia sarmentosa*) in the Mediterranean.

Acknowledgments

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