

*ARTHUR G. HUMES
and JU-SHEY HO*

*Cyclopoid Copepods
of the Genus
Pseudanthessius
Associated with
Crinoids in Madagascar*

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ABSTRACT

Humes, Arthur G., and Ju-Shey Ho. Cyclopoid Copepods of the Genus *Pseudanthessius* Associated with Crinoids in Madagascar. *Smithsonian Contributions to Zoology*, 54:1-20. 1970.—At Nosy Bé, Madagascar, five species of cyclopoid copepods belonging to the genus *Pseudanthessius* occur on various crinoids. Three of these species, *P. madrasensis* Reddiah, 1966, *P. major* Stock, 1967, and *P. minor* Stock, 1967, are redescribed. Two species are described as new: *P. angularis* new species, and *P. rostellatus*, new species.

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Arthur G. Humes
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Cyclopoid Copepods of the Genus *Pseudanthessius* Associated with Crinoids in Madagascar

Three species of the genus *Pseudanthessius* are known to be associated with crinoids. At Madras, India, Reddiah (1966) found *P. madrasensis* Reddiah, 1966, on unidentified crinoids. In the Gulf of Aqaba, Stock (1967) recovered *P. minor* Stock, 1967, from *Lamprometra klunzingeri* (Hartlaub) and *P. major* Stock, 1967, from *Heterometra savignyi* (J. Müller) and *L. klunzingeri*. In the vicinity of Nosy Bé, in northwestern Madagascar, all three of these copepods have been found, in addition to the two new species described below.

The copepods were collected by the first author during field work made possible as follows: in 1960 during an expedition of the Academy of Natural Sciences of Philadelphia, in 1963–1964 as part of the United States Program in Biology of the International Indian Ocean Expedition, and in 1967 supported by a grant (GB-5838) from the National Science Foundation. The study of the copepods has been aided by another grant from the National Science Foundation (GB-8381X).

All figures have been 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 following abbreviations are used: A₁, first antenna; A₂, second antenna; MXP_D, maxilliped; and P₁, leg 1.

All measurements of the body lengths have been made from specimens in lactic acid and do not include the setae on the caudal rami. The lengths of

the segments of the first antenna have been measured along their posterior nonsetiferous margins.

We are greatly indebted to Miss Ailsa M. Clark of the British Museum (Natural History), London, for the identifications of the crinoid hosts.

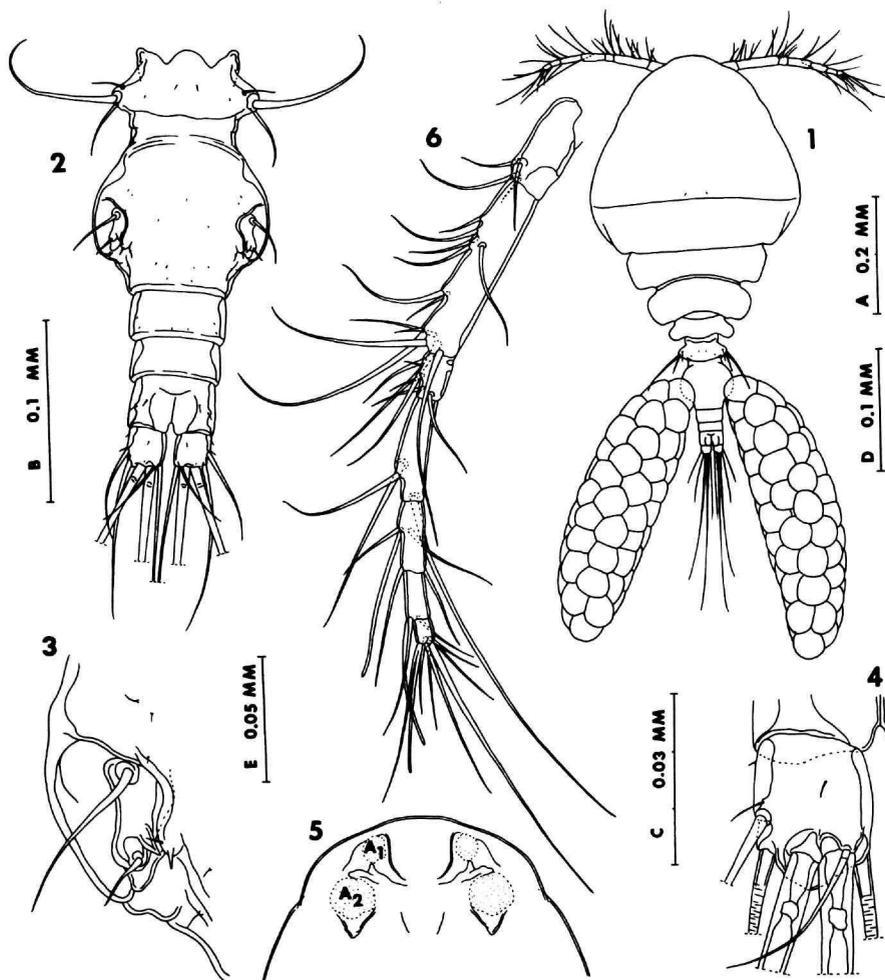
This paper comprises the following: (1) a re-description of *Pseudanthessius madrasensis* Reddiah, 1966, from *Tropiometra carinata* (Lamarck); (2) descriptive notes on *Pseudanthessius major* Stock, 1967, from *Cenometra emendatrix* (Bell), *Heterometra africana* (A. H. Clark), *Stephanometra indica* (Smith), *Lamprometra klunzingeri* (Hartlaub), *Liparometra?* sp., and *Dichrometra* sp.? *afra* A. H. Clark; (3) descriptive notes on *Pseudanthessius minor* Stock, 1967, from *Heterometra africana*, *Lamprometra klunzingeri*, *Liparometra?* sp., and *Dichrometra* sp.? *afra*; (4) a description of *Pseudanthessius angularis*, new species, from *Stephanometra indica* and *Dichrometra* sp.? *afra*; and (5) a description of *Pseudanthessius rostellatus*, new species, from *Comaster* sp.? nov. aff. *distinctus* (P. H. Carpenter).

Pseudanthessius madrasensis Reddiah, 1966

FIGURES 1–28

Collections in Madagascar comprised approximately 440 individuals from *Tropiometra carinata* (Lamarck), as follows: 39 ♀♀, 17 ♂♂, and 1 copepodid from 26 hosts, in 2 m, under dead *Acropora*, Pte. Ambarionaomby, Nosy Komba, near Nosy Bé, 18 August to 12 October 1960; 2 ♀♀, 9 ♂♂, and 2

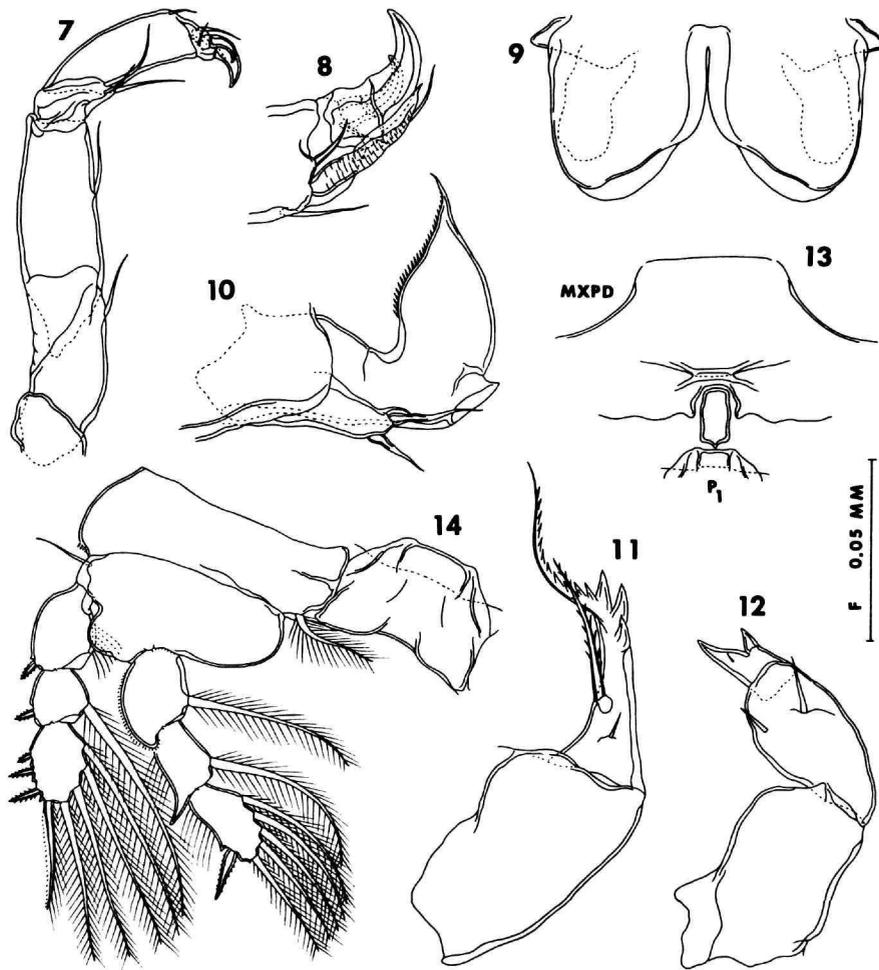
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FIGURES 1-6.—*Pseudanthessius madrasensis* Reddiah, 1966, female: 1, dorsal (A); 2, urosome, dorsal (B); 3, area of attachment of egg sac, dorsal (C); 4, caudal ramus, dorsal (C); 5, rostrum, ventral (D); 6, first antenna, dorsal (E).

copepodids from 6 hosts, in 1 m, Nosy N'Tangam, a small island on the western coast of Nosy Bé, 25 August 1960; 19 ♀♀, 6 ♂♂, and 5 copepodids from 4 hosts, in 1 m, Pte. Mahatsinjo, Nosy Bé, 18 and 26 October 1960; 4 ♀♀ and 7 ♂♂ from 3 hosts, in 1.5 m, Nosy N'Tangam, 20 October 1960; 16 ♀♀, 3 ♂♂, and 2 copepodids from 2 hosts, in 2 m, Antsamantsara, north of Madirokely, Nosy Bé, 31 October 1960; 15 ♀♀, 10 ♂♂, and 1 copepodid from 13 hosts, in 0.5 m, under dead *Acropora*, Pte. Ambarionaomby, 24 June 1963; 9 ♀♀ from 3 hosts, in 1 m, Pte. Ambarionaomby, 3 July 1963; 38 ♀♀, 13 ♂♂, and 3 copepodids from 19 hosts,

in 1 m, Pte. Ambarionaomby, 3 September 1963; 25 ♀♀, 5 ♂♂, and 3 copepodids from 30 hosts, in 1 m, Pte. Ambarionaomby, 30 October 1963; 33 ♀♀, 34 ♂♂, and 4 copepodids from 17 hosts, in 1 m, Pte. Ambarionaomby, 28 November 1963; 8 ♀♀ and 8 ♂♂ from 1 host, in 2 m, Ambato Rano, a small island southeast of Nosy Komba, 13°30'45''S, 48°22'55''E, 2 October 1964; 19 ♀♀, 5 ♂♂, and 1 copepodid from 16 hosts, in 1 m, under dead *Acropora*, Pte. Ambarionaomby, 8 June 1967; 29 ♀♀ and 13 ♂♂ from 25 hosts, in 1 m, Pte. Ambarionaomby, 26 June 1967; 1 ♀ from 1 host, in 3 m, Pte. Mahatsinjo, Nosy Bé, 7 June 1967; 13 ♀♀ from 1



FIGURES 7-14.—*Pseudanthessius madrasensis* Reddiah, 1966, female: 7, second antenna, posterior (ϵ); 8, tip of second antenna, anterior (σ); 9, labrum, with paragnaths indicated by dashed lines, ventral (σ); 10, mandible and first maxilla, posterior (σ); 11, second maxilla, posterior (σ); 12, maxilliped, inner (σ); 13, area between maxillipeds and first pair of legs, ventral (ϵ); 14, leg 1 and intercoxal plate, anterior (σ).

host, in 1 m, Ambatoloaka, Nosy Bé, 23 June 1967; and 4 ♀♀ and 7 ♂♂ from 1 host, in 15 m, Banc du Touareg, south of Nosy Bé, 13°32'05''S, 48°15'20''E, 1 September 1967.

Specimens have been deposited in the United States National Museum and in the Zoologisch Museum, Amsterdam.

The following redescription supplements Reddiah's brief diagnosis, in which certain appendages were left undescribed.

FEMALE.—Body (Figure 1) with a broad subtri-

angular cephalosome. Length 0.68 mm (0.63–0.73 mm) and greatest width 0.36 mm (0.32–0.39 mm), based on 10 specimens. Ratio of length to width of prosome, 1.37:1. Ratio of length of prosome to that of urosome, 2.55:1.

Segment of leg 5 (Figure 2) $55 \times 83 \mu$. Between this segment and genital segment a weakly defined ventral intersegmental sclerite. Genital segment $83 \times 100 \mu$. Areas of attachment of egg sacs situated dorsolaterally just behind middle of segment. Each area (Figure 3) bearing two naked setae, 13μ and

33 μ long, with a spiniform process between them. Three postgenital segments, 26 \times 55 μ , 24 \times 51 μ , and 29 \times 50 μ , from anterior to posterior. Posteroventral margin of anal segment naked.

Caudal ramus (Figure 4) 25 \times 22 μ in greatest dimensions, length including terminal ventral flap. Outer lateral seta 55 μ , dorsal seta 28 μ , outermost terminal seta 104 μ , innermost terminal seta 130 μ , and two median terminal setae (242 μ , outer, and 350 μ , inner). All setae naked.

Dorsal surface of prosome and dorsal and ventral surfaces of urosome ornamented with only a few small hairs (sensilla).

Egg sac (Figure 1) elongated (528 \times 154 μ), extending a little beyond tips of longest ramal setae, and containing approximately 55–65 eggs, each about 56 μ in diameter.

Rostrum (Figure 5) weakly developed, and lacking a distinct posteroventral margin.

First antenna (Figure 6) 232 μ long. Lengths of its seven segments: 25 (39 μ along its anterior margin), 72, 20, 41, 30, 19, and 11 μ , respectively. Formula for armature: 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All setae naked.

Second antenna (Figure 7) with formula 1, 1, 3, II + 1 + 4. Fourth segment 81 μ along outer edge, 51 μ along inner edge, and 21 μ wide. This segment bearing terminally two unequal claws (17 μ and 25 μ), a stout annulated seta with a unilateral lamella (Figure 8), and four slender setae. Appendage lacking fine ornamentation, and all its setae naked.

Labrum (Figure 9) with two nondivergent posteroventral lobes.

Mandible (Figure 10) bearing on its convex margin a scalelike process and on its concave margin a row of small spinules. Lash short and naked. Paragnath (Figure 9) an elongated lobe ornamented distally with a few hairs. First maxilla (Figure 10) bearing three setae. Second maxilla (Figure 11) with an unarmed first segment. Second segment produced to form a unilaterally spinose lash, and bearing a dorsal surficial barbed seta and a posterior proximal setule. Maxilliped (Figure 12) with two naked setae on second segment; third segment bearing a short spine, a minute setule, and produced to form a spiniform tip.

Ventral area between maxillipeds and first pair of legs not protuberant. A fine line connecting bases of maxillipeds (Figure 13).

Legs 1–4 (Figures 14–17) with 3-segmented rami except for endopod of leg 4 which consists of a single

segment. Armature of legs as follows (Roman numerals indicate spines; Arabic numerals, setae):

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

Inner seta on coxa of legs 1–3 long and plumose, but in leg 4 this seta minute (3 μ) and naked. Inner margin of basis of all four legs naked. In leg 1 proximal-most outer spine on third segment of exopod unusually short (4 μ) in relation to adjacent distal spine (8 μ). First segment of endopod of legs 1–3 with a spinulose fringe along its outer edge (in leg 3 with short proximal row of hairs also) and distal outer angle of this segment rounded. Last segment of endopod of leg 2, 24 μ long and its spines 10, 11, and 18 μ , respectively. Last segment of endopod of leg 3, 28 μ , and its spines 13, 23, and 50 μ . In leg 4, exopod 107 μ long. Endopod 62 \times 14 μ , terminally with its naked seta 48 μ and its inner barbed spine 58 μ . Inner row of hairs and a few small spinules near insertion of terminal elements.

Leg 5 (Figure 18) consisting of a large spiniform seta (77 μ), a slender seta (39 μ), and a dorsal seta (22 μ), all three setae naked.

Leg 6 probably represented by two setae near attachment of each egg sac (Figure 3).

Color in life in transmitted light translucent, intestine reddish brown, eye red, egg sacs opaque gray.

MALE.—Body (Figure 19) with a less-broadened and triangular cephalosome than in female. Length 0.48 mm (0.44–0.58 mm) and greatest width 0.19 mm (0.18–0.23 mm), based on ten specimens. Ratio of length to width of prosome, 1.67:1. Ratio of length of prosome to that of urosome, 1.73:1.

Segment of leg 5 (Figure 20) 22 \times 52 μ . Between this segment and genital segment only a trace of a ventral intersegmental sclerite. Genital segment 84 \times 84 μ in dorsal view, tapered anteriorly and broadended posteriorly. Four postgenital segments, 21 \times 38 μ , 19 \times 38 μ , 16 \times 36 μ , and 18 \times 35 μ from anterior to posterior.

Caudal ramus similar to that of female, but smaller (18.5 \times 16.5 μ).

Surface of body bearing only a few hairs as in female.

Rostrum similar to that of female.

First antenna like that of female, but an aesthete added on segment 2, as in *P. major* and *P. minor*. Second antenna, labrum, mandible, paragnath, first maxilla, and second maxilla resembling those of female. Maxilliped (Figure 21) 4-segmented, assuming that proximal part of claw represents fourth segment. Second segment bearing two naked setae and a single row of spines. Claw in some specimens bent (94μ along its axis) as in Figure 21, but in others evenly arched (60μ along its axis) as in Figure 22; bearing usual two unequal proximal setae.

Area between maxillipeds and first pair of legs like that of female.

Legs 1-4 with same spine and setal formula as in female. In leg 1 (Figure 23) proximalmost outer spine longer (7μ) in relation to adjacent distal spine (11μ) than in female. In legs 1-3 distal outer angle of first segment of endopod forming a spiniform process rather than being rounded as in female. Last segment of endopod in legs 1-3 showing sexual dimorphism in nature of armature. In leg 1, two outer setae stout and somewhat spiniform. In a male with a bent claw on maxilliped the segment in leg 2 (Figure 24) 30μ long and its three spines 13, 18, and 38μ ; segment in leg 3 (Figure 26) 36μ long, with its spines 18, 31, and 50μ , with longest spine recurved. In a male with an evenly arched claw on maxilliped, last segment in leg 2 (Figure 25) 20μ and its spines 9, 12, and 24μ ; segment in leg 3 (Figure 27) 22μ , with its spines 12, 21, and 38μ , longest spine straight.

In leg 5 two elements ventral to dorsal seta about 37μ and naked (Figure 20).

Leg 6 (Figure 26) consisting of a posteroventral flap on genital segment, bearing two naked setae (20μ and 35μ), and a rather long and slender spiniform process (12μ).

Spermatophore not observed.

Color in life resembling that of female.

REMARKS.—Through the kindness of Mr. B. K. Tikader, Zoological Survey of India, Calcutta, we have been able to dissect one paratypic female of *Pseudanthessius madrasensis* Reddiah, 1966. A detailed study of this paratype has shown no significant differences from the Madagascan material.

Reddiah's description and figures contain certain errors. The armature of the first antenna and the spine and setal formula of legs 1-4 are as given in the description above, not as Reddiah has shown them. Reddiah described a row of denticles on the first two

segments of the exopod of leg 2, but there are no such denticles in the paratype or in the specimens from Madagascar. The position of these supposed denticles lies along a prominent striated muscle, whose striations may have been misinterpreted as ornamentation. The outer articulated spine on the second segment of the endopod of leg 3, shown in Reddiah's figure 2L, is only an unarticulated spiniform process.

Although we have not had available for study a paratypic male, we have concluded on the basis of the identical features of the paratypic female of *P. madrasensis* and the females from Madagascar that our material from *Tropiometra carinata* is indeed *Pseudanthessius madrasensis*.

The type-specimens of *P. madrasensis* were collected from unidentified crinoids in the harbor of Madras, India. *Tropiometra carinata*, the host crinoid in Madagascar, has been found in Madras harbor (A. H. Clark, 1947, p. 286), where it has been recognized as the subspecies *T. carinata clarki* Gislén. This may perhaps have been the host of Reddiah's specimens.

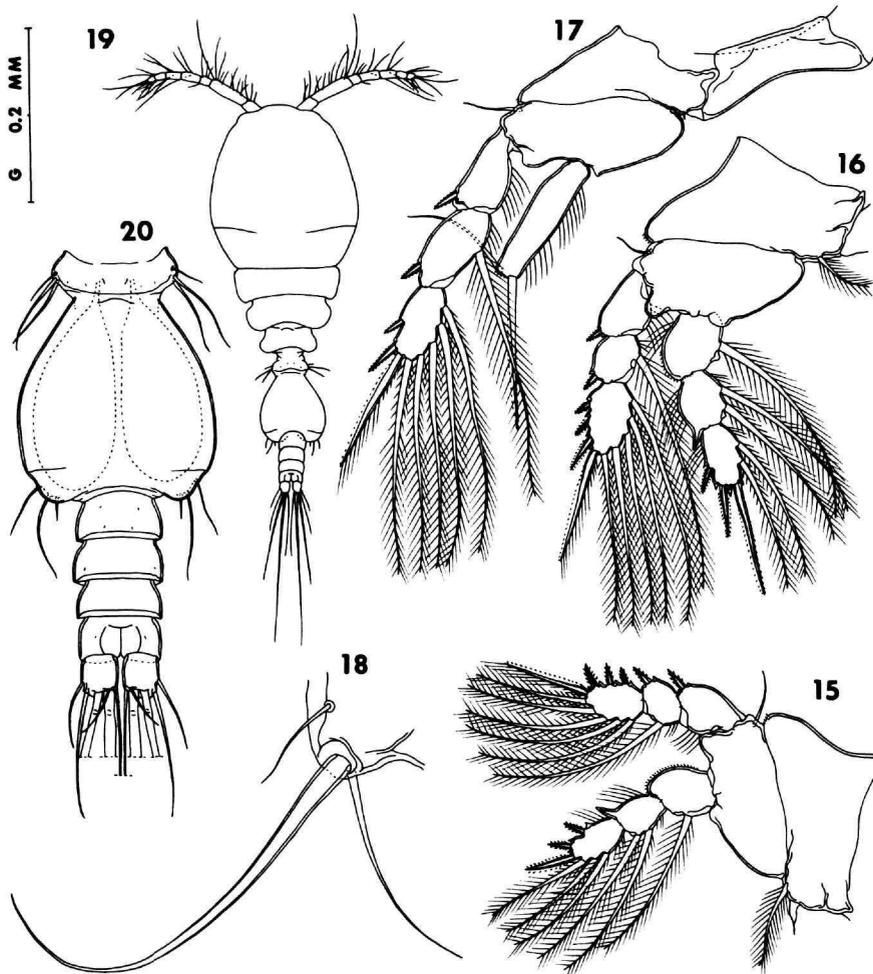
Pseudanthessius major Stock, 1967

FIGURES 29-44

Nearly 900 specimens of this copepod, thus far known only from the Red Sea, have been collected in Madagascar from six different crinoids, as follows:

From *Cenometra emendatrix* (Bell): 43 ♀♀, 42 ♂♂, and 23 copepodids from 5 hosts, in 20 m, south of Tany Kely, a small island to the south of Nosy Bé, 10 September 1963; 49 ♀♀, 24 ♂♂, and 13 copepodids from 6 hosts, in 20 m, south of Tany Kely, 11 October 1963; 23 ♀♀, 6 ♂♂, and 1 copepodid from 2 hosts, in 20 m, south of Tany Kely, 12 October 1963; 19 ♀♀, 12 ♂♂ from 2 hosts, in 10 m, northwestern coast of Nosy Ovy (=Berafia), Isles Radama, $13^{\circ}59'00''S$, $47^{\circ}46'30''E$, 1 October 1964; and 66 ♀♀, 33 ♂♂, and 1 copepodid from 11 hosts, in 20 m, Banc de Dzamandzar, western coast of Nosy Bé, 30 August 1967.

From *Heterometra africana* (A. H. Clark): 4 ♀♀, 8 ♂♂, and 4 copepodids from 1 host, on sand in 18 m, in pass between Nosy Bé and Nosy Komba at Pte. Lokobe, 14 July 1967; 48 ♀♀, 32 ♂♂, and 17 copepodids from 1 host, on shell fragment on sandy bottom in 34 m, 1 km south of crater near Ambatoloaka, Nosy Bé, 24 July 1967; 7 ♀♀ from 1 host, in 25 m, trawl $13^{\circ}29'30''S$, $48^{\circ}02'00''E$ to $13^{\circ}28'00''S$,



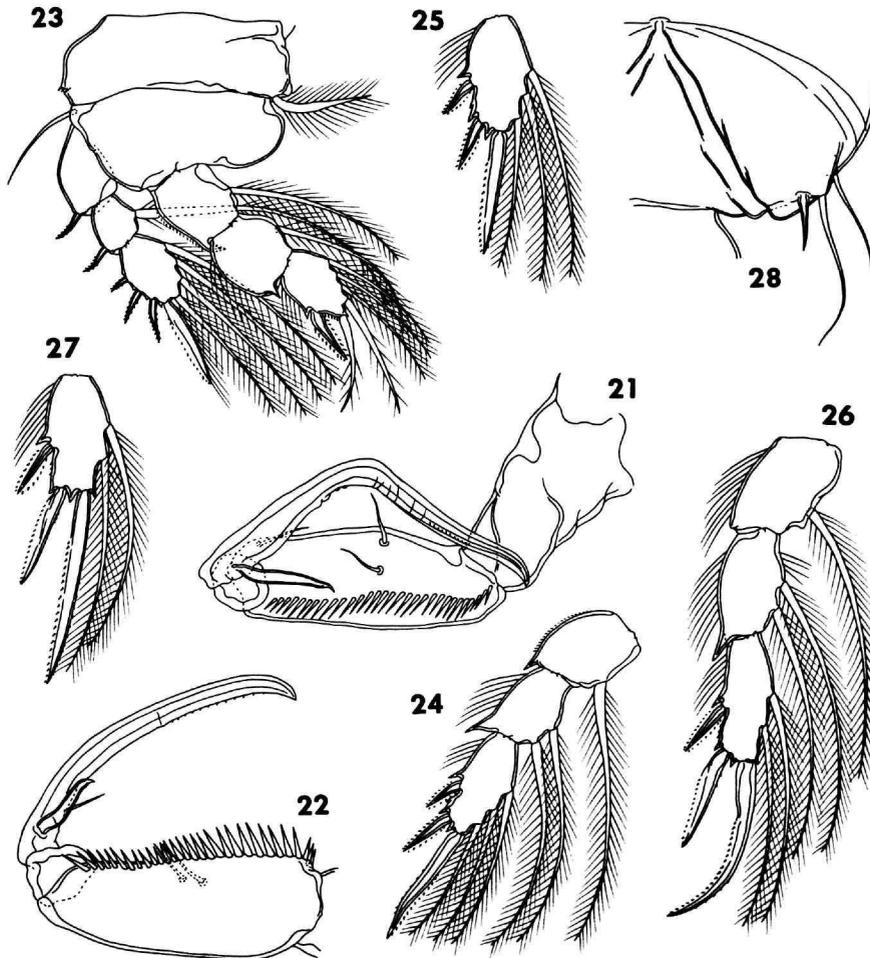
FIGURES 15-20.—*Pseudanthessius madrasensis* Reddiah, 1966. 15-18, female: 15, leg 2, anterior (ε); 16, leg 3, anterior (ε); 17, leg 4 and intercoxal plate, anterior (ε); 18, leg 5, dorsal (c). 19, 20, male: 19, dorsal (α); 20, urosome, dorsal (ε).

48°02'30''E, southwest of Nosy Bé, 11 August 1967; 1 ♀, 2 ♂♂ from 1 host, on sand in 17 m, in pass off Pte. Lokobe, 15 August 1967; 13 ♀♀, 20 ♂♂, and 73 copepodids from 1 host, on octocoral on sandy bottom in 29 m, 1 km south of crater near Ambatoloaka, 21 August 1967; 2 ♀♀, 1 ♂ from 1 host, on sand in 17 m, in pass between Nosy Bé and Nosy Komba, 16 August 1967; 46 ♀♀, 18 ♂♂ from 1 host, in 17 m, in pass off Pte. Lokobe, 23 August 1967; 24 ♀♀, 14 ♂♂, and 5 copepodids from 3 hosts, on sand in 17 m, in pass off Pte. Lokobe, 27 August 1967; and 47 ♀♀, 20 ♂♂, and 10 copepodids from 4 hosts, in 18 m, near black buoy north of Nosy Varona, a

small island almost between Nosy Bé and Nosy Komba, 30 August 1967.

From *Stephanometra indica* (Smith): 1 ♀, 2 ♂♂ from 1 host, in 2 m, Antsiabe, on southern shore of Nosy Komba, 8 July 1967; 20 ♀♀, 17 ♂♂ from 1 host, in 17 m, in pass off Pte. Lokobe, 16 August 1967; and 2 ♂♂ from 1 host, on sand in 13 m, opposite Antisabe, 2 September 1967.

From *Lamprometra klunzingeri* (Hartlaub): 2 ♀♀, 1 ♂ from 1 host, in 1 m, Pte. Ambarionaomby, Nosy Komba, 3 September 1963; and 1 ♀, 4 ♂♂, and 2 copepodids from 1 host, on sand in 13 m, opposite Antsiabe, 2 September 1967.



FIGURES 21-28.—*Pseudanthessius madrasensis* Reddiah, 1966, male: 21, maxilliped, inner (F); 22 maxilliped, postero-inner (C); 23, leg 1, anterior (F); 24, endopod of leg 2, anterior (F); 25, third segment of endopod of leg 2, anterior (C); 26, endopod of leg 3, anterior (F); 27, third segment of endopod of leg 3, anterior (C); 28, leg 6, ventral (C).

From *Liparometra*? sp.: 4 ♀♀, 1 ♂ from 1 host, on sand in 15 m, in pass off Pte. Lokobe, 13 June 1967; 3 ♀♀, 1 ♂ from 1 host, in 27-23 m, trawl 13°29'S, 48°09'E to 13°28.5'S, 48°11.5'E, south of Nosy Bé, 11 August 1967; and 3 ♀♀, 1 ♂ from 1 host, in 35m, trawl 13°26.1'S, 48°11.7'E to 13°25.5'S, 48°11'E, south of Nosy Bé, 24 August 1967.

From *Dichrometra* sp.? *afra* A. H. Clark: 3 ♀♀, 1 ♂ from 1 host, in 2 m, Pte. Lokobe, 2 September 1960; 13 ♀♀, 3 ♂♂ from 1 host, in 1 m, west of Pte. Mahatsinjo, Nosy Bé, 2 November 1960; 4 ♀♀, 3 ♂♂ from 1 host, in 6 m, Ambariobe, a small island almost

between Nosy Bé and Nosy Komba, 28 December 1963; and 16 ♀♀, 13 ♂♂ from 1 host, in 2 m, Ambariotele, a small island near Ambariobe, 24 May 1964.

Specimens have been deposited in the United States National Museum and in the Zoölogisch Museum, Amsterdam.

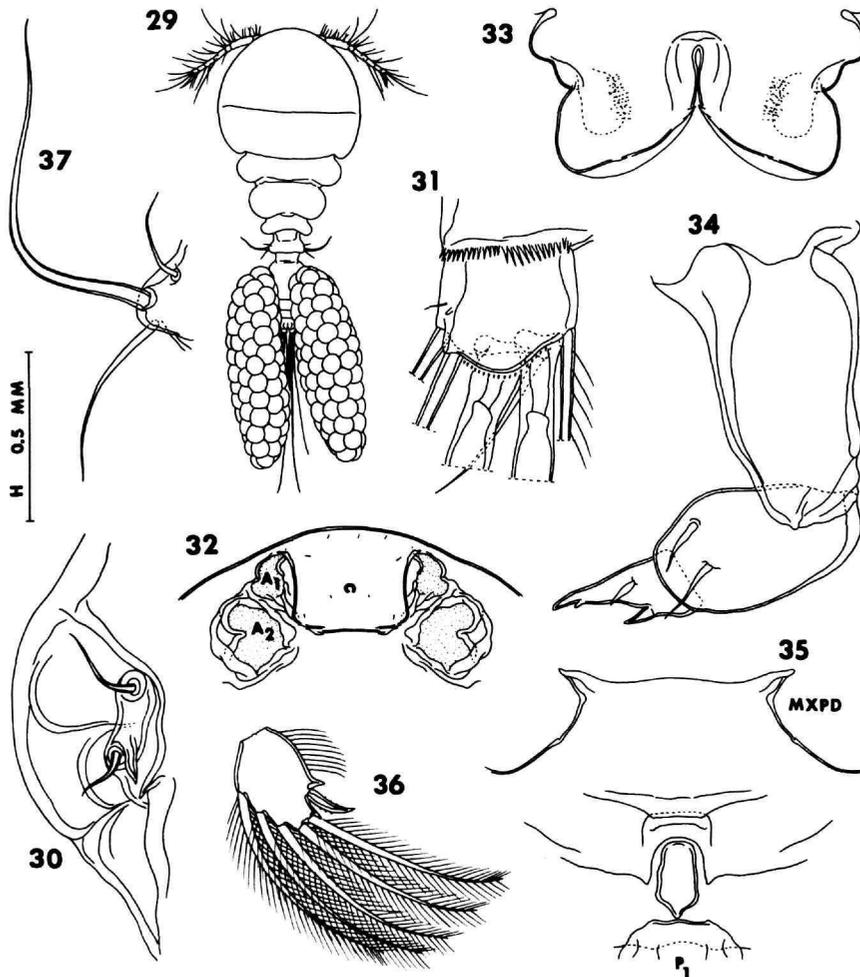
Although the Madagascan specimens are readily determinable from Stock's original description, we take this opportunity to add certain information, based upon specimens from *Cenometra emendatrix* unless otherwise noted. Structures not mentioned may be assumed to be essentially as described by Stock.

FEMALE.—Length of body (Figure 29) 0.85 mm (0.79–0.88 mm) and greatest width 0.45 mm (0.43–0.47 mm), based on ten specimens. Ratio of length to width of prosome, 1.43:1. Ratio of length of prosome to that of urosome, 2:1.

Segment of leg 5, $60 \times 96\mu$. Between this segment and genital segment a short and rather weak ventral intersegmental sclerite. Genital segment $112 \times 122\mu$, with its shape in all specimens like that shown in Stock's figure 7a rather than like that in his figure 7b. Attachment area of each egg sac bearing two naked

setae (18μ and 13μ long) and a spiniform process (Figure 30). Three postgenital segments, $34 \times 69\mu$, $28 \times 62\mu$, and $30 \times 58\mu$, from anterior to posterior.

Caudal ramus (Figure 31) $22 \times 20\mu$, including terminal ventral flange which bears a row of minute spinules. Outer lateral seta 45μ , dorsal seta 25μ , and outermost terminal seta 74μ , all three of them naked. Innermost terminal seta 110μ , with spinules along its inner edge. Two median terminal setae (275μ , outer, and 400μ , inner), both with lateral spinules.



FIGURES 29–37.—*Pseudanthessius major* Stock, 1967, female: 29, dorsal (H); 30, area of attachment of egg sac, dorsal (C); 31, caudal ramus, ventral (C); 32, rostrum, ventral (D); 33, labrum, with paragnaths indicated by dashed lines, ventral (C); 34, maxilliped, inner (C); 35, area between maxillipeds and first pair of legs, ventral (E); 36, third segment of endopod of leg 1, anterior (F); 37, leg 5, dorsal (F).

Egg sac (Figure 29) elongated (in specimen drawn, $638 \times 187\mu$) and having about 90 eggs, each approximately 62μ in diameter. In a female from *Liparometra*, each sac containing about 55 eggs; and in one from *Stephanometra*, about 40 eggs.

Rostrum (Figure 32) weakly developed and often showing, to varying degrees, a small median sclerotized knoblike area.

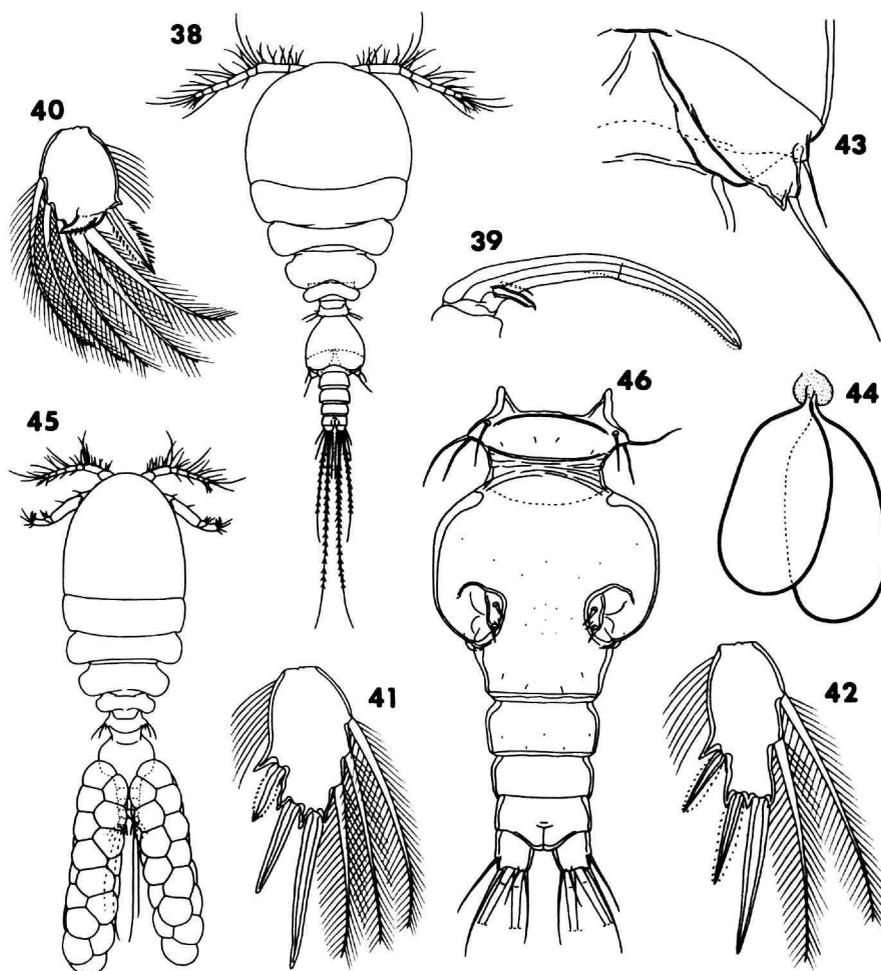
First antenna 250μ long, lengths of its segments being 28 (50μ along its anterior margin), 64, 20, 42, 38, 23, and 13μ , respectively. Third segment with six

setae (rather than five as described by Stock). All setae naked.

Last segment of second antenna 44μ along inner edge, 75μ along outer edge, and 19μ wide. Terminal claws 28μ and 19μ , measured along their axes.

Labrum (Figure 33) with two divergent postero-ventral lobes.

Mandible having on its convex edge a scale more prominent than that illustrated by Stock in his figure 8b, and more like mandible of *P. madrasensis* shown in our Figure 10. Paragnath a small lobe with a few



FIGURES 38-46.—38-44, *Pseudanthessius major* Stock, 1967, male: 38, dorsal (A); 39, claw of maxilliped, inner (F); 40, third segment of endopod of leg 1, anterior (F); 41, third segment of endopod of leg 2, anterior (F); 42, third segment of endopod of leg 3, anterior (F); 43, leg 6, ventral (F); 44, spermatophores, attached to female, ventral (E). 45, 46, *Pseudanthessius minor* Stock, 1967, female: 45, dorsal (A); 46, urosome, dorsal (E).

hairs. Maxilliped (Figure 34) with two setae on second segment, and number of denticles on spine and on spiniform prolongation of third segment varying from none to four.

Ventral area between maxillipeds and first pair of legs (Figure 35) only slightly protuberant. A fine line connecting bases of maxillipeds.

Curved spine on last segment of endopod of leg 1 (Figure 36) finely barbed. Exopod of leg 4, 130 μ long, and endopod 60 μ (including terminal spiniform process) \times 18 μ , with its two terminal elements 47 μ (outer) and 71 μ (inner).

Leg 5 (Figure 37) with a dorsal seta (30 μ) and two unequal posterolateral setae, one stout and 108 μ , the other more slender and 44 μ . All three setae naked.

Color in life in transmitted light translucent to slightly opaque, eye red, egg sacs gray.

MALE.—Length of body (Figure 38) 0.67 mm (0.65–0.70 mm) and greatest width 0.30 mm (0.29–0.31 mm), based on ten specimens. Ratio of length to width of prosome, 1.45:1. Ratio of length of prosome to that of urosome, 1.79:1.

Segment of leg 5, 25 \times 47 μ . Between this segment and genital segment no distinct ventral intersegmental sclerite. Genital segment 88 \times 79 μ . Four postgenital segments, 27 \times 43 μ , 20 \times 40 μ , 15.5 \times 36 μ and 17.5 \times 36 μ , from anterior to posterior. Anal segment as in female bearing on each side a posteroventral row of spinules (more than four in number as in Stock's description).

Caudal ramus 17 \times 16.5 μ and similar to that of female.

Claw of maxilliped (Figure 39) 90 μ along its axis, weakly divided near its middle, bearing two unequal setae proximally.

Last segment of endopod of leg 1 (Figure 40) showing fairly strong sexual dimorphism. Outer spine 22 μ and prominently barbed. Length of segment, 26.5 μ , with ratio of spine to segment 1:1.2. Two outermost setae stouter than other three; near their insertions an antero-inwardly directed spinous process bearing spinules. In specimens from *Dichrometra*, *Stephanometra*, *Heterometra*, *Lamprometra*, and *Liparometra* outer spine 14 μ with much smaller barbules, and length of segment 24 μ , with ratio 1:1.7.

Last segment of endopod of leg 2 usually a with naked outer proximal spine, but in a male from *Cenometra* this spine barbed in right leg (Figure 41) but smooth in left leg. Length of this segment 40 μ

and three spines 17, 28, and 46 μ from proximal to distal.

Last segment of endopod of leg 3 (Figure 42) with a naked inner terminal spine in all specimens except in a male (from *Dichrometra*) where it is very slightly barbed.

Leg 5 like that of female except that two postero-lateral setae are more equal.

Leg 6 (Figure 43) consisting of a posteroventral flap on genital segment, bearing two naked setae (15 μ and 36 μ) and a small spinous process.

Spermatophore (Figure 44) attached to female in pairs, about 85 \times 42 μ , not including neck.

Color in life similar to that of female.

REMARKS.—Although our specimens from Madagascar conform closely to Stock's original description, there are several small differences. These may be noted by comparing the above account with Stock's description. None of the differences is greater than might be expected as a result of technique of observation or possibly as an expression of variability related to host preference.

In the Gulf of Aqaba, Stock (1967) found *P. major* on *Heterometra savignyi* (J. Müller) and *Lamprometra klunzingeri* (Hartlaub). In Madagascar it occurred on *L. klunzingeri* and on the five other crinoids listed above. The numbers of hosts and their copepods are shown in Table 1.

TABLE 1.—Host crinoids and incidence of *Pseudanthessius major*

Species of crinoid	Number of hosts	Number of <i>P. major</i>	Average number of <i>P. major</i> per host
<i>Heterometra africana</i>	14	416	29.7
<i>Cenometra emendatrix</i>	21	355	17.0
<i>Stephanometra indica</i>	3	42	14.0
<i>Lamprometra klunzingeri</i>	2	10	5.0
<i>Liparometra?</i> sp.	3	13	4.3
<i>Dichrometra</i> sp.? <i>afra</i>	4	56	14.0
Totals	47	892	

In Madagascar *Heterometra africana* and *Cenometra emendatrix* appear to be hosts favored by *P. major*. One specimen of *H. africana*, collected in 29 m on 21 August 1967, had 106 copepods; and another, collected in 34 m on 24 July 1967, had 97. The numbers

collected of the other four species of crinoids are relatively small, and the average numbers of copepods per host are not as significant.

Pseudanthessius minor Stock, 1967

FIGURES 45-51.

Approximately 170 specimens were collected in Madagascar from four species of crinoids, as follows:

From *Heterometra africana* (A. H. Clark): 10 ♀♀, 1 ♂ from 2 hosts, in 18 m, near black buoy north of Nosy Varona, a small island almost between Nosy Bé and Nosy Komba, 30 August 1967.

From *Lamprometra klunzingeri* (Hartlaub): 2 ♂♂ from 1 host, on sand in 13 m, opposite Antsiabe, southern shore of Nosy Komba, 2 September 1967.

From *Liparometra?* sp.: 12 ♀♀, 1 ♂, and 4 copepodids from 1 host, on sand in 15 m, in pass off Pte. Lokobe between Nosy Bé and Nosy Komba, 13 June 1967; 79 ♀♀, 7 ♂♂ from 1 host, in 27-23 m, trawl 13°29'S, 48°09'E to 13°28.5'S, 48°11.5'E, south of Nosy Bé, 11 August 1967; and 15 ♀♀ from 1 host, in 35 m, trawl 13°26.1'S, 48°11.7'E to 13°25.5'S, 48°11'E, south of Nosy Bé, 24 August 1967.

From *Dichrometra* sp.? *afra* A. H. Clark: 24 ♀♀, 14 ♂♂, and 2 copepodids from 1 host, in 2 m, Pte. Lokobe, Nosy Bé, 2 September 1960.

Specimens have been deposited in the United States National Museum.

Structures not mentioned in the brief notes which follow may be regarded as conforming to Stock's original description. The text and figures are based on specimens from *Dichrometra* sp.? *afra* unless otherwise stated.

FEMALE.—Length of body (Figure 45) 0.59 mm (0.55-0.64 mm) and greatest width 0.21 mm (0.21-0.22 mm), based on ten specimens. Ratio of length to width of prosome, 1.96:1. Ratio of length of prosome to that of urosome, 2.24:1.

Segment of leg 5 (Figure 46) 41 × 67 μ. Between this segment and genital segment a short weak ventral intersegmental sclerite. Genital segment 88 × 96 μ. (In some specimens lateral borders of this segment in dorsal view more rounded than shown in the figure.) Attachment area of each egg sac bearing two naked setae (11 μ and 7 μ), with a spiniform process between them. Three postgenital segments, 24 × 47 μ, 18 × 42 μ, and 18 × 40 μ, from anterior to posterior.

Caudal ramus 20 × 15.5 μ (length including terminal ventral flange). Outer lateral seta 28 μ, dorsal

seta 15 μ, outermost terminal seta 39 μ, innermost terminal seta 30 μ, and two long median terminal setae (125 μ, outer, and 240 μ, inner).

Egg sac (Figure 45) elongated and slender (400 × 100 μ), with about 23-28 eggs, each approximately 60 μ in diameter, though of irregular dimensions.

Rostrum (Figure 47) with a conspicuous median sclerotized knob, but weakly defined posteroventrally.

First antenna 125 μ long. Lengths of its segments: 13 (29 μ along its anterior edge), 22, 12, 16.5, 20, 14, and 10 μ respectively. Third segment with six setae. All setae naked.

Last segment of second antenna 21 μ along inner edge, 40 μ along outer edge, and 17 μ wide. Two claws, 19 μ and 11 μ (measured along their axes).

Labrum and paragnath like those of *P. major*. First maxilla with three elements. Maxilliped shown in Figure 48.

Ventral area between maxillipeds and first pair of legs similar to that in *P. major*.

Spine on third segment of endopod of leg 1 with very small barbules in one female from *Liparometra?* sp.

Exopod of leg 4, 69 μ long; endopod 34 × 10 μ, with outer terminal element 18 μ and inner 32 μ.

MALE.—Length of body (Figure 49) 0.52 mm (0.51-0.53 mm) and greatest width 0.19 mm (0.19-0.20 mm), based on ten specimens. Ratio of length to width of prosome, 1.54:1. Ratio of length of prosome to that of urosome, 1.45:1.

Segment of leg 5, 29 × 48 μ. Between this segment and genital segment no distinct ventral intersegmental sclerite. Genital segment 99 × 92 μ. Four postgenital segments 25 × 40 μ, 25 × 39 μ, 17.5 × 36 μ, and 15.5 × 35 μ from anterior to posterior.

Caudal ramus 17.5 × 14.5 μ.

Rostrum smooth, without knob seen in female.

Claw of maxilliped 62 μ along its axis and bearing proximally two unequal elements.

Last segment of endopod of leg 1 (Figure 50) showing sexual dimorphism. Outer spine 13.5 μ and segment 23 μ (not including pointed terminal hyaline process); ratio of spine to segment, 1:1.70. As in two previous species, two outer setae stouter than others.

Leg 6 (Figure 51) bearing two naked setae (16 μ and 26 μ) and a slender spiniform process.

Spermatophore, attached to females in pairs, 75 × 14 μ, not including neck, and resembling that of *P. major*.

REMARKS.—Although each time that *P. minor* was collected it was in company with *P. major*, the separation of the two species was relatively easy. In addition to the interspecific differences listed by Stock (1967), *P. minor* may be distinguished from *P. major* by the number of eggs and the shape of the egg sac, by the prominent rostral knob in the female, and by the nature of the third segment of the endopod of leg 1 in the male.

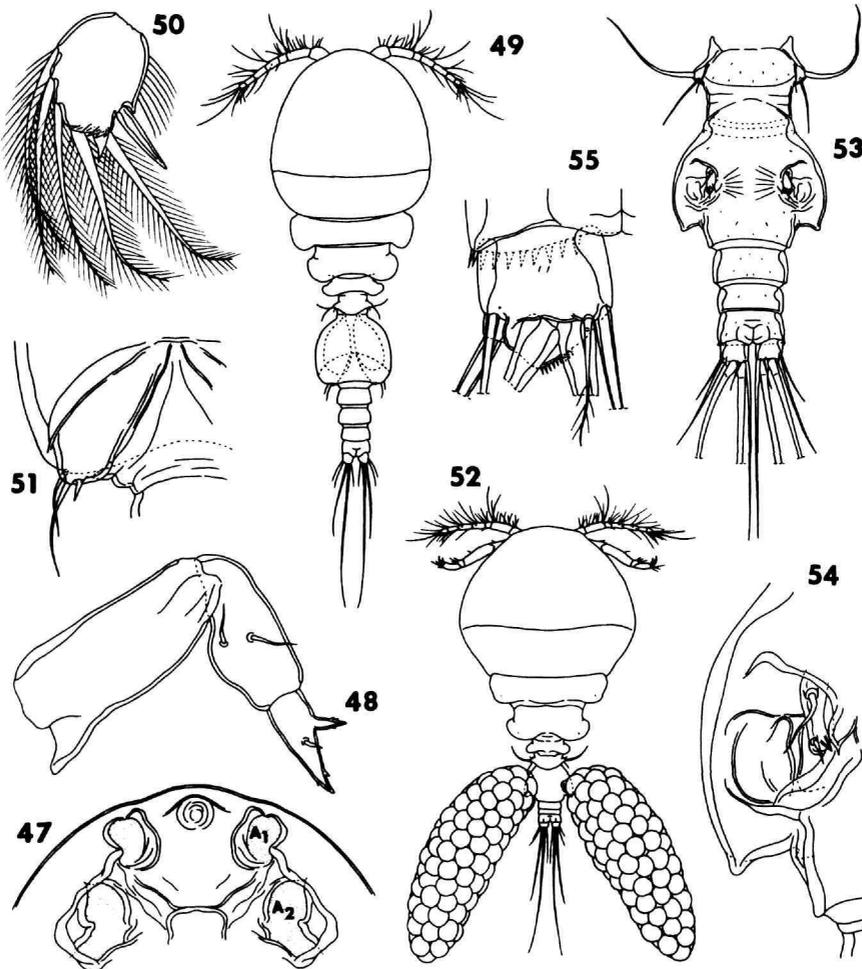
In the Gulf of Aqaba Stock (1967) found *P. minor* on *Lamprometra klunzingeri* (Hartlaub). In Madagascar

it occurred in only one instance on that host; more commonly it was found on *Liparometra?* sp., *Dichrometra* sp.? *afra* A. H. Clark, and *Heterometra africana* (A. H. Clark).

Pseudanthessius angularis, new species

FIGURES 52–66

TYPE MATERIAL.—4 ♀♀, 2 ♂♂ from one *Stephanometra indica* (Smith), in 2 m, Antsiabe, southern shore of Nosy Komba, near Nosy Bé, Madagascar, 8 July



FIGURES 47–55.—47–51, *Pseudanthessius minor* Stock, 1967: 47, 48, female: 47, rostrum, ventral (E); 48, maxilliped, inner (C); 49–51, male: 49, dorsal (G); 50, third segment of endopod of leg 1, anterior (C); 51, leg 6, ventral (F). *Pseudanthessius angularis*, new species, female: 52, dorsal (H); 53, urosome, dorsal (D); 54, area of attachment of egg sac, dorsal (F); 55, caudal ramus, dorsal (C).

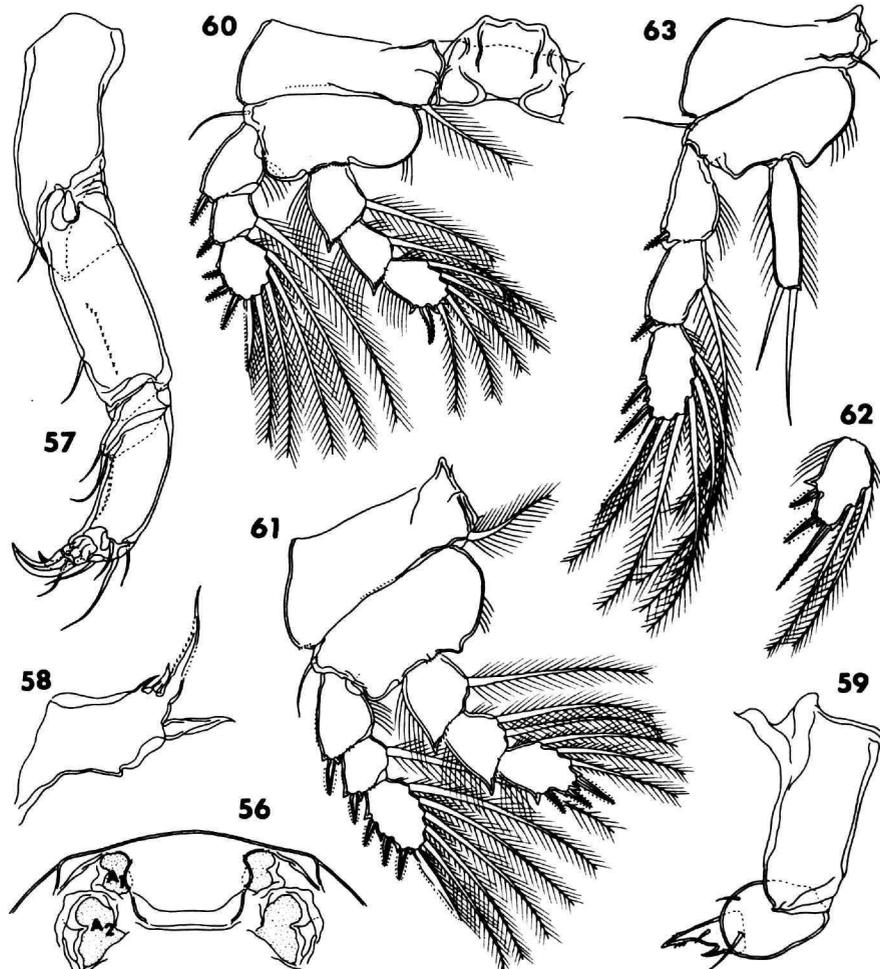
1967. Holotype ♀ and allotype deposited in the United States National Museum; the three paratypes (dissected) in the collection of A. G. Humes.

OTHER SPECIMENS.—From *Stephanometra indica*: 2 ♀♀, 1 ♂ from 1 host, in 6 m, east of Pte. Ambarionaomy, Nosy Komba, 21 September 1964. From *Dichrometra* sp.? *afra* A. H. Clark: 1 ♀ from 2 hosts, in 1 m, west of Pte. Ambarionaomy, 19 August 1960, and 2 ♀♀, 1 ♂ from 1 host, in 1 m, Ambariobe, a small island almost between Nosy Bé and Nosy Komba, 3 November 1960.

FEMALE.—Body (Figure 52) with a broad prosome.

Length 0.85 mm (0.79–0.89 mm) and greatest width 0.46 mm (0.40–0.50 mm), based on nine specimens. Segment of leg 1 set off from head by a dorsal transverse furrow. Ratio of length to width of prosome, 1.20:1. Ratio of length of prosome to that of urosome, 2.37:1.

Segment of leg 5 (Figure 53) $65 \times 96 \mu$. Between this segment and genital segment a weakly sclerotized ventral intersegmental sclerite. Genital segment $117 \times 113 \mu$ in greatest dimensions as seen in dorsal view, expanded laterally except in its posterior fifth. The abrupt junction between these two areas with two



FIGURES 56–63.—*Pseudanthessius angularis*, new species, female: 56, rostrum, ventral (D); 57, second antenna, anterior (E); 58, first maxilla, anterior (C); 59, maxilliped, inner (F); 60, leg 1 and intercoxal plate, anterior (E); 61, leg 2, anterior (E); 62, third segment of endopod of leg 3, anterior (E); 63, leg 4, anterior (E).

acute posterolateral angles. Areas of attachment of egg sacs located dorsally at about middle of segment. Each area (Figure 54) bearing two naked setae (22μ and 8μ), with a spiniform process between them. Three postgenital segments, $31 \times 62\mu$, $22 \times 56\mu$, and $24 \times 57\mu$, from anterior to posterior. Posteroventral margin of anal segment on both sides bearing a row of small spines.

Caudal ramus (Figure 55) nearly quadrate, $28 \times 25\mu$ in greatest dimensions, length including terminal ventral flange. Outer lateral seta 44μ , dorsal seta 24μ , outermost terminal seta 99μ , innermost terminal seta 180μ , and two long median terminal setae (320μ , outer, and 400μ , inner). All setae naked except dorsal seta, which is lightly plumose. Four terminal setae inserted dorsally to a subtriangular terminal flange bearing marginal spinules.

Dorsal surface of prosome and dorsal and ventral surfaces of urosome sparsely ornamented with small hairs.

Egg sac (Figure 52) elongated, $600\text{--}650 \times 220\mu$, extending a little beyond tips of ramal setae, and containing many eggs, each about 56μ in diameter.

Rostrum (Figure 56) weakly developed.

First antenna 252μ long, similar in form and armature to that of *P. madrasensis*. Lengths of its seven segments: 24 (50μ along its anterior margin), 75 , 20 , 36 , 35 , 23 , and 13μ , respectively. All setae naked.

Second antenna (Figure 57) with formula 1, 1, 3, and II + 5. Fourth segment 68μ along outer edge, 39μ along inner edge, and 24μ wide. Segment bearing terminally two claws (28μ and 17μ) and five slender setae. Second segment with an axial row of small spinules on posterior surface. All setae naked.

Labrum resembling that of *P. major*. Mandible like that of *P. madrasensis*. Paragnath similar to that in *P. major*. First maxilla (Figure 58) with four elements. Second maxilla like that of *P. major*. Maxilliped shown in Figure 59.

Ventral area between maxillipeds and first pair of legs resembling that of *P. major*.

Legs 1-4 (Figures 60-63) with same segmentation and armature as in *P. madrasensis* except that endopod of leg 4 bears two setae instead of a spine and a seta as in that species. Inner coxal seta of legs 1-3 long and plumose, but in leg 4 this seta much shorter (18μ) and naked. Inner margin of basis of all four legs bearing a few hairs. In leg 4, exopod 120μ long; endopod $55 \times 15\mu$, with both lateral margins bearing a row of

coarse hairs and with two terminal naked setae (39μ , outer, and 70μ , inner).

Leg 5 like that of *P. madrasensis*.

Leg 6 probably represented by two setae near attachment of each egg sac (Figure 54).

Color in life in transmitted light translucent, eye brownish red, egg sacs light gray.

MALE.—Body (Figure 64) with a much less broadened prosome than in female. Length 0.58 mm ($0.56\text{--}0.62$ mm) and greatest width 0.24 mm ($0.24\text{--}0.25$ mm), based on three specimens. Ratio of length to width of prosome, $1.47:1$. Ratio of length of prosome to that of urosome, $1.85:1$.

Segment of leg 5 (Figure 65) $27 \times 52\mu$. Between this segment and genital segment no ventral intersegmental sclerite. Genital segment $88 \times 92\mu$, broadest in its posterior half. Four postgenital segments $25 \times 41\mu$, $22 \times 39\mu$, $13 \times 36\mu$, and $17 \times 35\mu$, from anterior to posterior.

Caudal ramus like that of female, but smaller ($18 \times 17\mu$).

Surface of body sparsely ornamented with hairs as in female.

Rostrum resembling that of female.

First antenna similar to that of female, but an aesthete added on segment 2 (as in males of three preceding species). Second antenna also like that of female, but axial row of spinules on second segment absent.

Labrum, mandible, paragnath, first maxilla, and second maxilla like those of female. Maxilliped closely resembling that of *P. major*. Claw 77μ along its axis.

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

Legs 1-4 with same spine and setal formula as in female. Sexual dimorphism occurring in endopod of leg 1 (Figure 66), where spine is straight rather than recurved, and where two terminal spiniform processes of female are replaced by two rows of prominent spinules across end of segment. Two outermost setae stouter than others. Legs 2-4 like those of female.

Leg 5 like that of *P. madrasensis*.

Leg 6 similar to that in *P. major*.

Spermatophore not observed.

Color in life resembling that of female.

ETYMOLOGY.—The specific name *angularis* (Latin, having corners or angles) refers to the posterolateral angles on the genital segment of the female.

REMARKS.—The new species may be readily distinguished from 22 species of *Pseudanthessius* in which the caudal ramus is distinctly longer than wide (at least 1.5:1): *P. aestheticus* Stock, Humes, and Gooding, 1963; *P. assimilis* G. O. Sars, 1917; *P. concinnus* Thompson and A. Scott, 1903; *P. deficiens* Stock, Humes, and Gooding, 1963; *P. dubius* G. O. Sars, 1918; *P. ferox* Humes and Ho, 1967; *P. graciloides* Sewell, 1949; *P. gracilis* Claus, 1889; *P. latus* Illg, 1950; *P. liber* (Brady, 1880); *P. luculentus* Humes and Cressey, 1961; *P. mucronatus* Gurney, 1927; *P. nemertophilus* Gallien, 1935; *P. obscurus* A. Scott, 1909; *P. procurrans* Humes, 1966; *P. pusillus* Humes, 1969; *P. sauvagei* Canu, 1892; *P. spinifer* Lindberg, 1945; *P. tenuis* Nicholls, 1944; *P. thorelli* (Brady, 1880); *P. tortuosus* Stock, Humes, and Gooding, 1963; and *P. weberi* A. Scott, 1909.

Pseudanthessius angularis differs from nine species in which the caudal ramus is quadrate (or very nearly so) by its having acute posterolateral angles on the genital segment of the female. These species are *P. anormalus* Ummerkutty, 1966; *P. brevicauda* Ummerkutty, 1966; *P. foliatus* Stock, 1967; *P. madrasensis* Reddiah, 1966; *P. major* Stock, 1967; *P. minor* Stock, 1967; *P. minutus* Reddiah, 1966; *P. notabilis* Humes and Cressey, 1961; and *P. pectinifer* Stock, Humes, and Gooding, 1963.

In *P. liber* sensu Sewell, 1949, the caudal ramus was not described or figured. This form, probably representing a new species (see Humes and Cressey, 1961, p. 81, and Stock, Humes, and Gooding, 1963, p. 10), is unlike *P. angularis* in having two very long elements on the first segment of the first antenna (the longer of the two being more than half the length of the appendage) and in its much longer fourth segment of the second antenna (longer than either of the first two segments).

Pseudanthessius rostellatus, new species

FIGURES 67-90

TYPE MATERIAL.—30 ♀♀, 52 ♂♂, and 9 copepodids from 7 *Comaster* sp.? nov. aff. *distinctus* (P. H. Carpenter), on sponge in 47 m, 13°29'S, 48°06'E, southwest of Nosy Bé, Madagascar, 21 August 1967. Holotype ♀, allotype, and 68 paratypes (23 ♀♀, 45 ♂♂) deposited in the United States National Museum; the remaining paratypes in the collection of A. G. Humes.

FEMALE.—Body (Figure 67) with moderately

slender prosome. Length 0.77 mm (0.72–0.80 mm) and greatest width 0.35 mm (0.34–0.36 mm), based on ten specimens. Ratio of length to width of prosome, 1.50:1. Ratio of length of prosome to that of urosome, 2.48:1.

Segment of leg 5 (Figure 68) 60 × 93 μ. Between this segment and genital segment a very weakly defined ventral intersegmental sclerite. Genital segment (Figures 68, 70) 99 × 101 μ in greatest dimensions in dorsal view. Areas of attachment of egg sacs located dorsolaterally near middle of segment. Each area (Figure 69) bearing two naked setae (33 μ and 18 μ), with a small spiniform process between them. Adjacent and medial to this area a conspicuous spine (12 μ). Three postgenital segments, 24 × 64 μ, 19 × 55 μ, and 27 × 51 μ, from anterior to posterior. Posterior margin of anal segment bearing a row of small spines.

Caudal ramus (Figure 71) 26 × 22 μ in greatest dimensions, including terminal ventral flange. Outer lateral seta 105 μ and naked, dorsal seta 34 μ and naked, outermost terminal seta 135 μ with inner spinules, innermost terminal seta 237 μ with spinules, and two long median terminal setae (375 μ, outer, and 500 μ, inner), both with spinules. Terminal ventral flange bearing a row of marginal spinules.

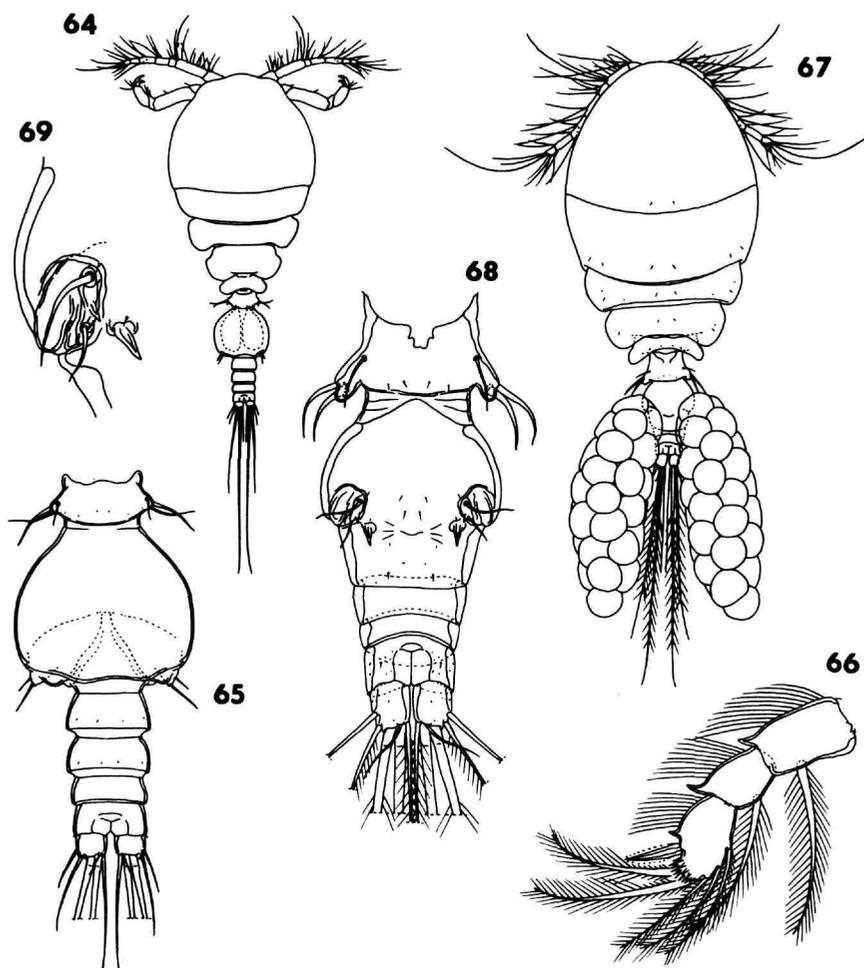
Dorsal surface of prosome and dorsal and ventral surfaces of urosome ornamented with small hairs.

Egg sac (Figure 67) elongated (418 × 143 μ) and containing about 30 eggs, each approximately 62 μ in diameter.

Rostrum (Figures 72, 73) well developed and forming a somewhat triangular snoutlike process directed posteroventrally.

First antenna (Figure 74) 272 μ long. Lengths of its seven segments: 22 (47 μ along its anterior margin), 50, 18, 46, 52, 40, and 19 μ, respectively. Formula for armature same as in four previous species. All setae naked.

Second antenna (Figure 75) 225 μ long and unusually slender. Formula: 1, 1, 3, and II + 2 + 3. Fourth segment 85 μ along outer edge, 55 μ along inner edge, and 15 μ wide. Terminally with two claws (24 μ and 22 μ), two long, weakly jointed setae, and three shorter simple setae. Fine ornamentation of appendage consisting of a row of small spinules along outer margin of second and fourth segments, and an angular row of spines on anterior surface of fourth segment near insertions of claws.



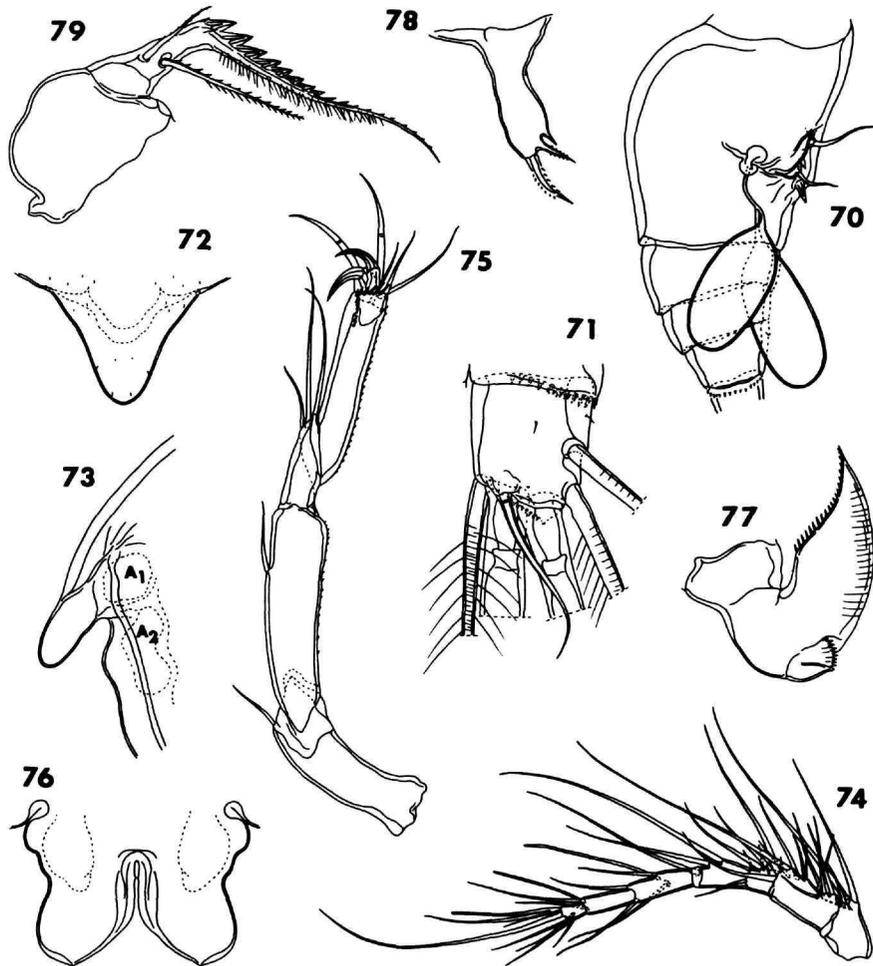
FIGURES 64-69.—64-66, *Pseudanthessius angularis*, new species, male: 64, dorsal (A); 65, urosome: dorsal (B); 66, endopod of leg 1, anterior (F). 67-69, *Pseudanthessius rostellatus*, new species, female, 67, dorsal (A); 68, urosome, dorsal (B); 69, area of attachment of egg sac, dorsal (F).

Labrum (Figure 76) with two rather slender and slightly pointed posteroventral lobes. Mandible (Figure 77) with a row of prominent spinules across distal end of scalelike process on its convex margin and spinules along its concave margin. Lash extremely short and practically indistinguishable from blade. Paragnath (Figure 76) an elongated lobe without hairs. First maxilla (Figure 78) with three elements. Elongated second segment of second maxilla (Figure 79) bearing a barbed seta and a seta barbed along one edge and haired along the other, and produced to form a long lash spinose along one edge but with rows of hairs along the other. Maxilliped (Figure 80)

having two elements on second segment, one slightly spiniform and naked and the other setiform and finely barbed. Attenuated tip of third segment with a few minute barbules.

Ventral area between maxillipeds and first pair of legs similar to that in *P. major*.

Legs 1-4 (Figures 81-84) having same segmentation and armature as in *P. madrasensis*, except that endopod of leg 4 bears two spines instead of a spine and a seta as in that species. Inner coxal seta of leg 4 short (6μ) and naked, instead of being long and plumose as in legs 1-3. Inner margin of basis of leg 4 naked. In leg 4, exopod 135μ long; endopod $66 \times 16\mu$, with



FIGURES 70-79.—*Pseudanthessius rostellatus*, new species, female: 70, genital and postgenital segments, lateral (E); 71, caudal ramus, dorsal (C); 72, rostrum, anteroventral (E); 73, rostrum, lateral (E); 74, first antenna, dorsal (D); 75, second antenna, anterior (E); 76, labrum, with paragnaths indicated by dashed lines, ventral (F); 77, mandible, posterior (F); 78, first maxilla, posterior (F); 79, second maxilla, posterior (F).

both lateral margins haired and with two terminal fringed spines (52μ , outer, and 63μ , inner).

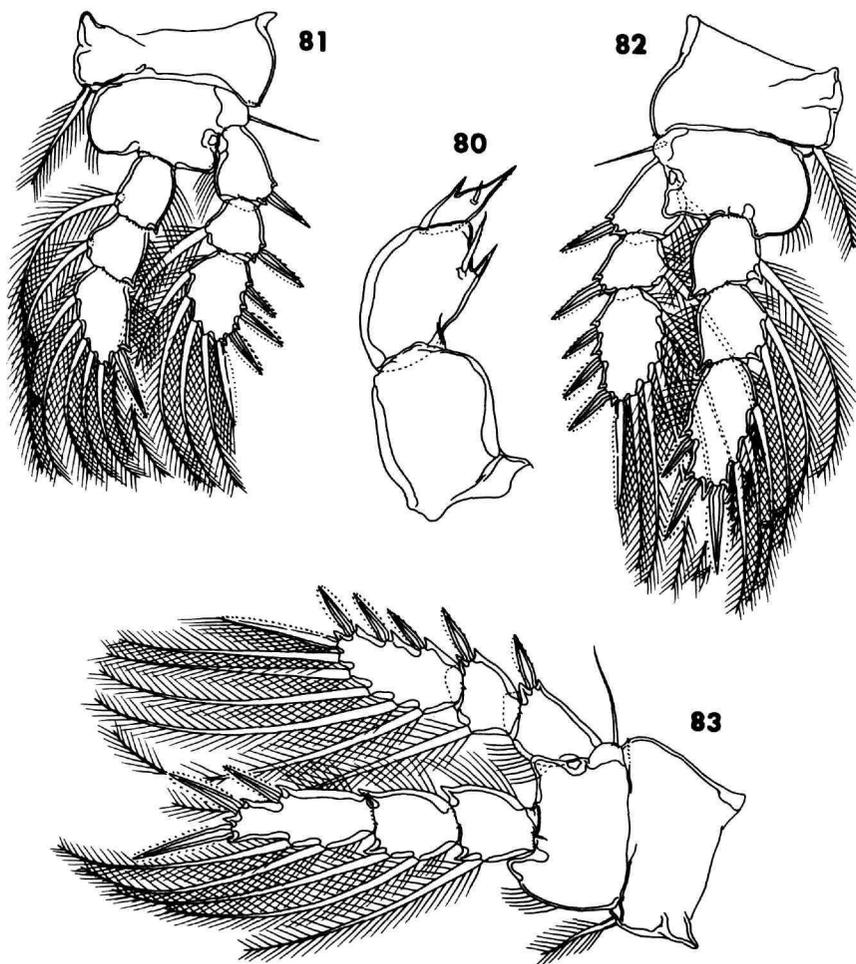
Leg 5 (Figure 85) having a dorsal seta (34μ) and two posterolateral setae, one 53μ and naked, the other 46μ , basally stouter, and with a few minute barbules. Edge of segment forming a distinct lobe dorsal to stouter seta.

Leg 6 probably represented by two setae near attachment of each egg sac (Figure 69).

Color in life in transmitted light translucent, eye red, egg sacs light gray.

MALE.—Body (Figure 86) similar in general form to that of female. Length 0.57 mm (0.53 – 0.61 mm) and greatest width 0.23 mm (0.22 – 0.23 mm), based on ten specimens. Ratio of length to width of prosome, $1.67:1$. Ratio of length of prosome to that of urosome, $1.86:1$.

Segment of leg 5 (Figure 87) $41 \times 55\mu$. Between this segment and genital segment no ventral intersegmental sclerite. Genital segment $86 \times 75\mu$. Four postgenital segments, $23 \times 43\mu$, $18 \times 43\mu$, $9 \times 42\mu$, and $17 \times 41\mu$, from anterior to posterior.



FIGURES 80-83.—*Pseudanthessius rostellatus*, new species, female: 80, maxilliped, inner (F); 81, leg 1, anterior (E); 82, leg 2, anterior (E); 83, leg 3, anterior (E).

Caudal ramus like that of female, but smaller ($21 \times 19\mu$).

Surface of body ornamented with hairs as in female.

Rostrum, first antenna (without an aesthete added), second antenna, labrum, mandible, paragnath, first maxilla, and second maxilla resembling those of female. Maxilliped (Figure 88) with a slender claw 105μ along its axis.

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

Legs 1-4 having same spine and setal formula as in female. Sexual dimorphism occurring in last segment of endopod of leg 1 (Figure 89), where two terminal spiniform processes of female are replaced

by two diagonal rows of spinules converging in an inwardly directed spiniform process. Two outermost setae not stouter than others, and not spiniform. Legs 2-4 like those in female.

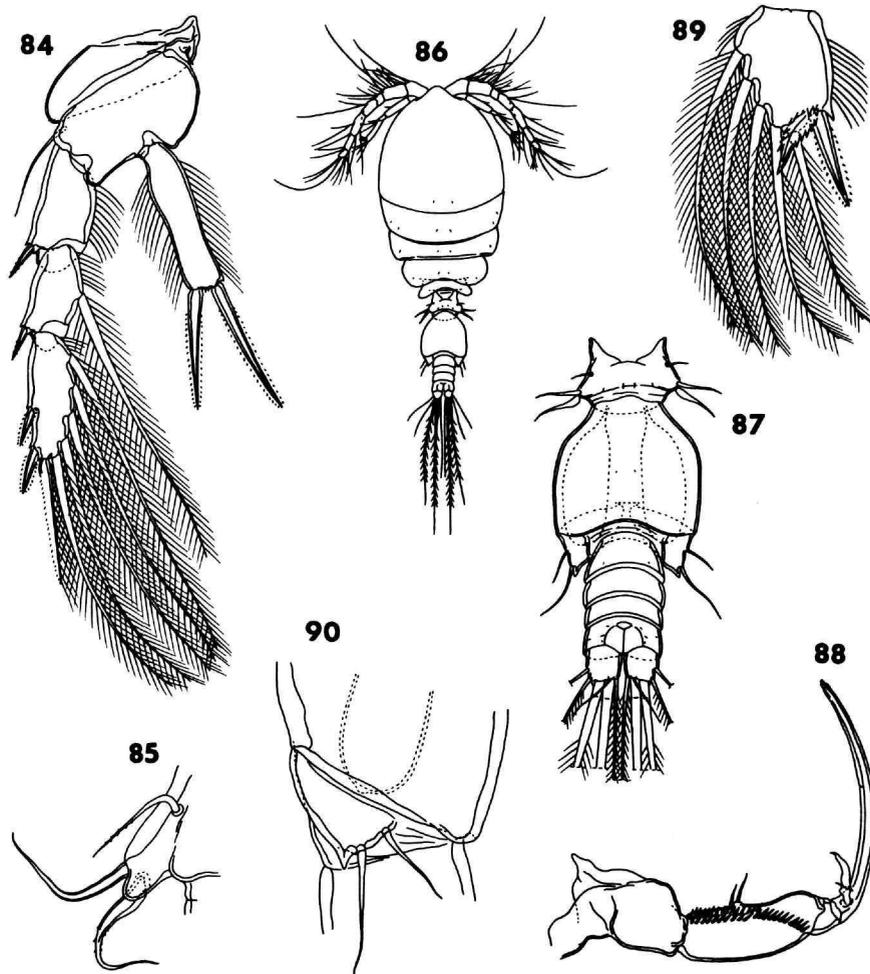
Leg 5 (Figure 87) resembling that of female, but lacking posterodorsal lobe. Two posterolateral setae about 35μ long.

Leg 6 (Figure 90) consisting of usual posteroventral flap on genital segment, bearing two naked setae (44μ and 29μ) and a small spiniform process.

Spermatophore (Figure 70), attached to female in pairs, $65 \times 27\mu$, not including neck.

Color in life resembling that of female.

ETYMOLOGY.—The specific name, *rostellatus* (from



FIGURES 84-90.—*Pseudanthessius rostellatus*, new species. 84, 85, female: 84, leg 4, anterior (x); 85, leg 5, dorsal (y); 86-90, male: 86, dorsal (A); 87, urosome, dorsal (B); 88, maxilliped, inner (z); 89, third segment of endopod of leg 1, anterior (a); 90, leg 6, lateral (f).

the Latin *rostellum*, having a small snout), alludes to the well-developed snoutlike rostrum.

REMARKS.—The snoutlike rostrum in both sexes and the pair of spines on the dorsal surface of the genital segment of the female are distinctive. These two features, however, are not useful for comparison with many species since in more than half the species in the genus the rostrum and the detailed ornamentation of the genital segment are unknown.

Pseudanthessius rostellatus may be separated from 22 species in which the caudal ramus is distinctly longer than wide (at least 1.5:1). These species are listed above, under the remarks on *P. angularis*.

It remains to distinguish the new species from the ten species in which the caudal ramus is quadrate or very nearly so. Six of these have a much less developed rostrum, and in the female lack the pair of spines on the dorsal surface of the genital segment (*P. angularis*, *P. madrasensis*, *P. major*, *P. minor*, *P. notabilis*, and *P. pectinifer*). In three (*P. anormalus*, *P. brevicauda*, and *P. minutus*), the fourth segment of the second antenna is relatively shorter (distinctly shorter than the second segment) and stouter than in the new species. *Pseudanthessius foliatus* differs by having two jointed dentate claws on the second antenna and by one of the elements on leg 5 being a flattened denticulated spine.

In *P. liber* sensu Sewell, 1949 (see above), the fourth segment of the second antenna is nearly twice the length of the second segment, while in *P. rostellatus* these segments are nearly equal in length.

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