BEAUFORTIA

SERIES OF MISCELLANEOUS PUBLICATIONS

ZOOLOGICAL MUSEUM OF THE UNIVERSITY OF AMSTERDAM

No. 216 Volume 16 April 23, 1969

The cyclopoid copepod genus *Macrochiron* from hydroids in Madagascar

ARTHUR G. HUMES and ALFRED DE MARIA

ABSTRACT

Two new species of *Macrochiron* (Lichomolgidae) from Madagascar, associated with hydroids, are described: *M. lobatum* from *Lytocarpus phoeniceus* and *M. vervoorti* from *Aglaophenia cupressina*. New host records are: *M. valgum* Humes, 1966, from *Gymnangium hians* and *G. gracilicaulis*, and *M. rostratum Humes*, 1966, from *Gymnangium hians*, *G. gracilicaulis*, and *Aglaophenia delicatula*. Keys for both sexes of the species in the genus are included.

INTRODUCTION

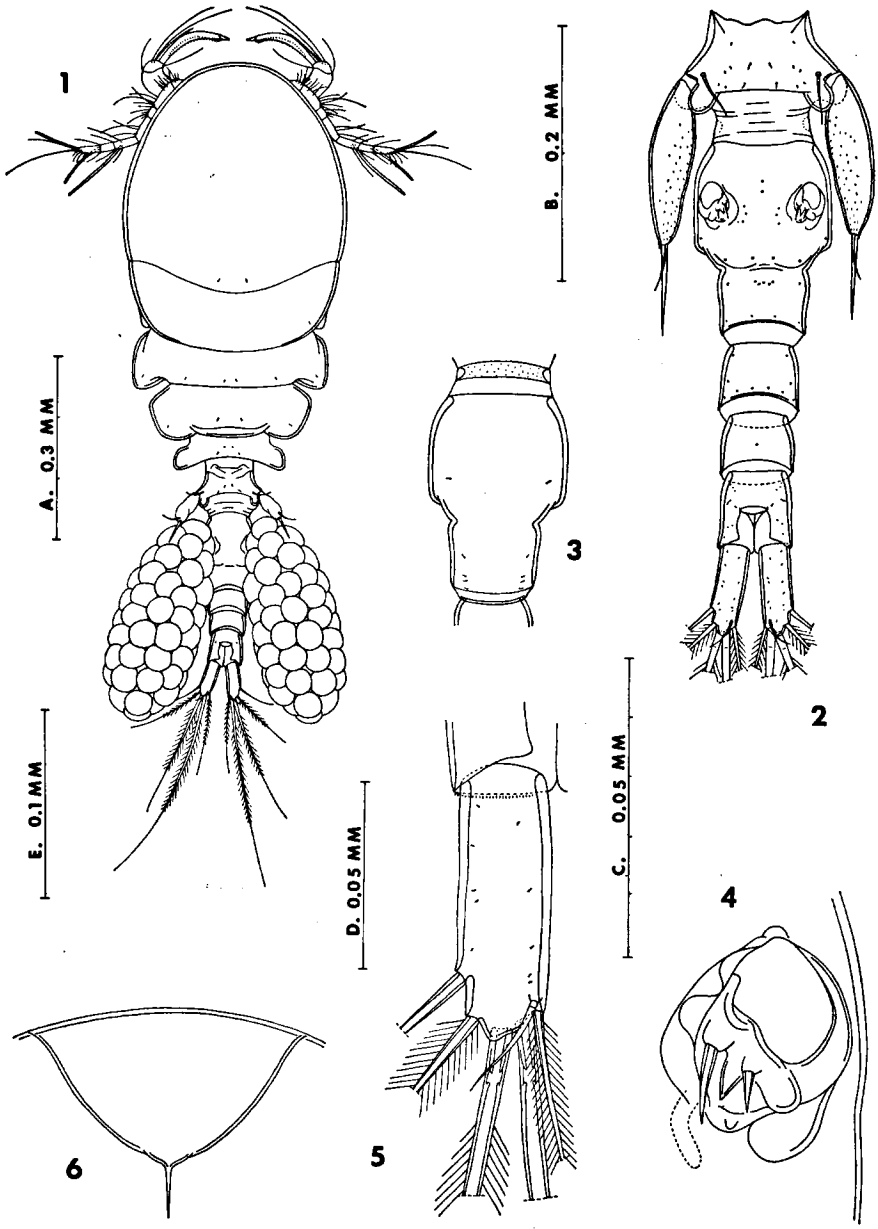
Three species of the lichomolgid genus *Macrochiron* Brady, 1872, are already known from hydroids in Madagascar: *M. lytocarpi* Humes, 1966, and *M. valgum* Humes, 1966, from *Lytocarpus philippinus* (Kirchenpauer), and *M. rostratum* Humes, 1966, from *L. philippinus* and *L. phoeniceus* (Busk) (= *L. spectabilis* Allman).

This paper records new hosts for two of the three known species in Madagascar and contains the descriptions of *Macrochiron lobatum* n. sp. from *Lytocarpus phoeniceus* (Busk) and *Macrochiron vervoorti* n. sp. from *Aglaophenia cupressina* Lamouroux.

All collections were made by the first author in the vicinity of Nosy Bé, in northwestern Madagascar. Previously reported collections (Humes, 1966) were confined to very shallow water (1—2 meters). Many of the hydroids listed below were collected in greater depths (8—50 meters) by SCUBA diving.

All measurements were made from specimens in lactic acid. The 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 and P_5 = leg 5.

Received: August 19, 1968



FIGURES 1—6. *Macrochiron lobatum* n. sp., female: 1, dorsal (A); 2, urosome, dorsal (B); 3, genital segment and intersegmental sclerite, ventral (B); 4, area of attachment of egg sac, dorsal (C); 5, caudal ramus, dorsal (D); 6, outline of rostrum, ventral (E).

ACKNOWLEDGEMENTS

Most of the copepods were collected during field work in 1967 sponsored by a grant (GB-5838) from the National Science Foundation of the United States. Others were collected in 1963—64 while the first author served as chief scientist at Nosy Bé for the U. S. Program in Biology of the International Indian Ocean Expedition. The study of the specimens has been aided by the same NSF grant.

The generous assistance of the staff at the Centre ORSTOM de Nosy Bé is gratefully acknowledged, especially that of Mr. Pierre Laboute and Dr. Raphael Plante, either or both of whom accompanied the first author on all SCUBA dives.

We are greatly indebted to Dr. W. Vervoort of the Rijksmuseum van Natuurlijke Historie, Leiden, for the identifications of the hydroids.

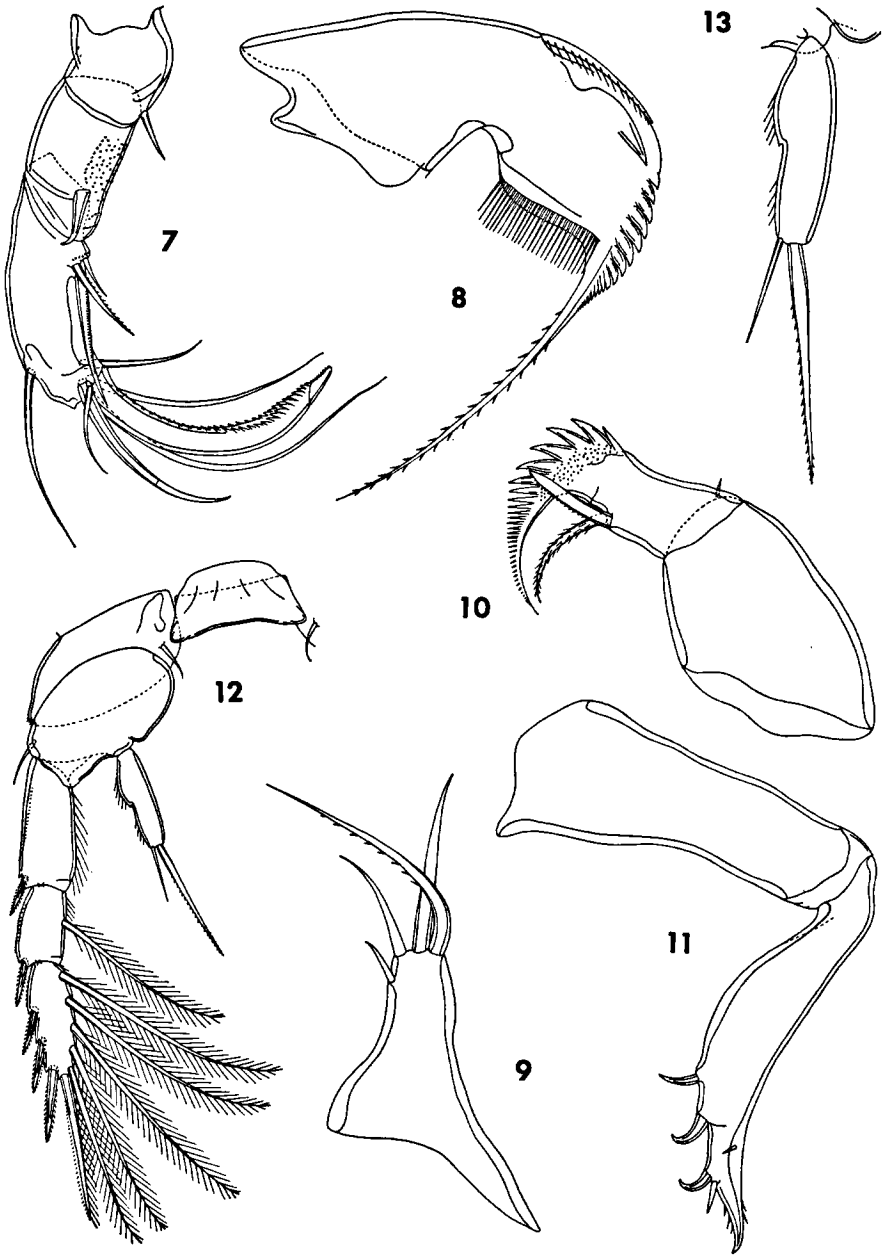
Macrochiron lobatum n. sp. Figs. 1—21.

Type material. — 33 ♀♀ and 50 ♂♂ washed from *Lytocarpus phoeniceus* (Busk), in a depth of 2 m, east of Ambariotelo, a small island nearly between Nosy Komba and Nosy Bé, Madagascar, July 20, 1967. Holotype ♀, allotype, and 45 paratypes (15 ♀♀, 30 ♂♂) deposited in the Zoölogisch Museum, Amsterdam; 19 paratypes (9 ♀♀, 10 ♂♂) in the United States National Museum, Washington; and the remaining paratypes in the collection of A. G. Humes.

Other specimens (all from *Lytocarpus phoeniceus*). — 2 ♀♀, in 1 m, Ambariobe, a small island close to Ambariotelo, near Nosy Bé, February 14, 1964; 6 ♀♀ and 2 ♂♂, in 50 m, Banc de Cinq Mètres, 13°23'30"S, 48°04'00"E, west of Nosy Bé, September 3, 1967.

Female. — Body (fig. 1) resembling in general form that of *M. lytocarpi* Humes, 1966. Length (excluding the setae on the caudal rami) 1.09 mm (1.01—1.13 mm) and greatest width 0.38 mm (0.35—0.41 mm), based on 10 specimens. Ratio of length to width of the prosome 1.82 : 1. Segment bearing leg 1 separated from the head dorsally and laterally by a furrow. Epimeral areas of the metasomal segments similar to those in *M. lytocarpi*.

Segment of leg 5 (fig. 2) 91 × 130 μ. On either side of the segment medial to the fifth legs a conspicuous well-sclerotized lobe of somewhat variable form though generally rounded, slightly overlapping the free segment of leg 5 dorsally (figs. 2 and 14). Between this segment and the genital segment a short ventral intersegmental sclerite (shown in Fig. 3). Genital segment elongated. 153 μ long, composed of two parts, the anterior part 97 × 104 μ, the posterior narrower part 56 × 68 μ, both parts with nearly parallel lateral margins in dorsal view. Dorsally (fig. 2) this segment with a few transverse cuticular lines between the two sections, but ventrally (fig. 3) these lines absent. Areas of attachment of the egg sacs dorsolateral in the midregion of the anterior part, each area (fig. 4) bearing two naked setae 6 μ and 11 μ in length, with a spiniform process between them and with a small knob posteriorly. Three postgenital segments 54 × 58 μ, 42 × 55 μ, and 57 × 52 μ from anterior to posterior. Anal segment with a row of minute spinules along its posteroventral border.



FIGURES 7—13. *Macrochiron lobatum* n. sp., female: 7, second antenna, inner (E); 8, mandible, posterior (C); 9, first maxilla, posterior (C); 10, second maxilla, posterior (D); 11, maxilliped, antero-outer (D); 12, leg 4, anterior (E); 13, endopod of leg 4, anterior (D).

Caudal ramus (fig. 5) moderately elongated, 68 × 23 μ in greatest dimensions. Ratio of length to width about 3 : 1. Outer lateral seta 70 μ long and naked. Pedicellate dorsal seta 31 μ and naked. Outermost terminal seta 120 μ with lateral spinules along its proximal two-thirds; innermost terminal seta 152 μ with similar spinules. Two long median terminal setae 242 μ (outer) and 330 μ (inner) with lateral spinules in their midregions; these two setae inserted between dorsal (smooth) and ventral (with a row of minute spinules) flaps. A few surficial refractile spinuliform points on the ramus.

Dorsal surface of prosome and urosome with a few hairs (sensilla) and refractile points; ventral surface of the urosome ornamented similarly but to a lesser degree. Ratio of the length of the prosome to that of the urosome 1.78 : 1.

Egg sac (fig. 1) elongated and reaching just beyond the end of the caudal ramus; in one female 346 × 143 μ with many eggs each about 45 μ in diameter.

Rostrum (fig. 6) with a slender needlelike process 33 μ long arising from the middle of its posteroventral margin.

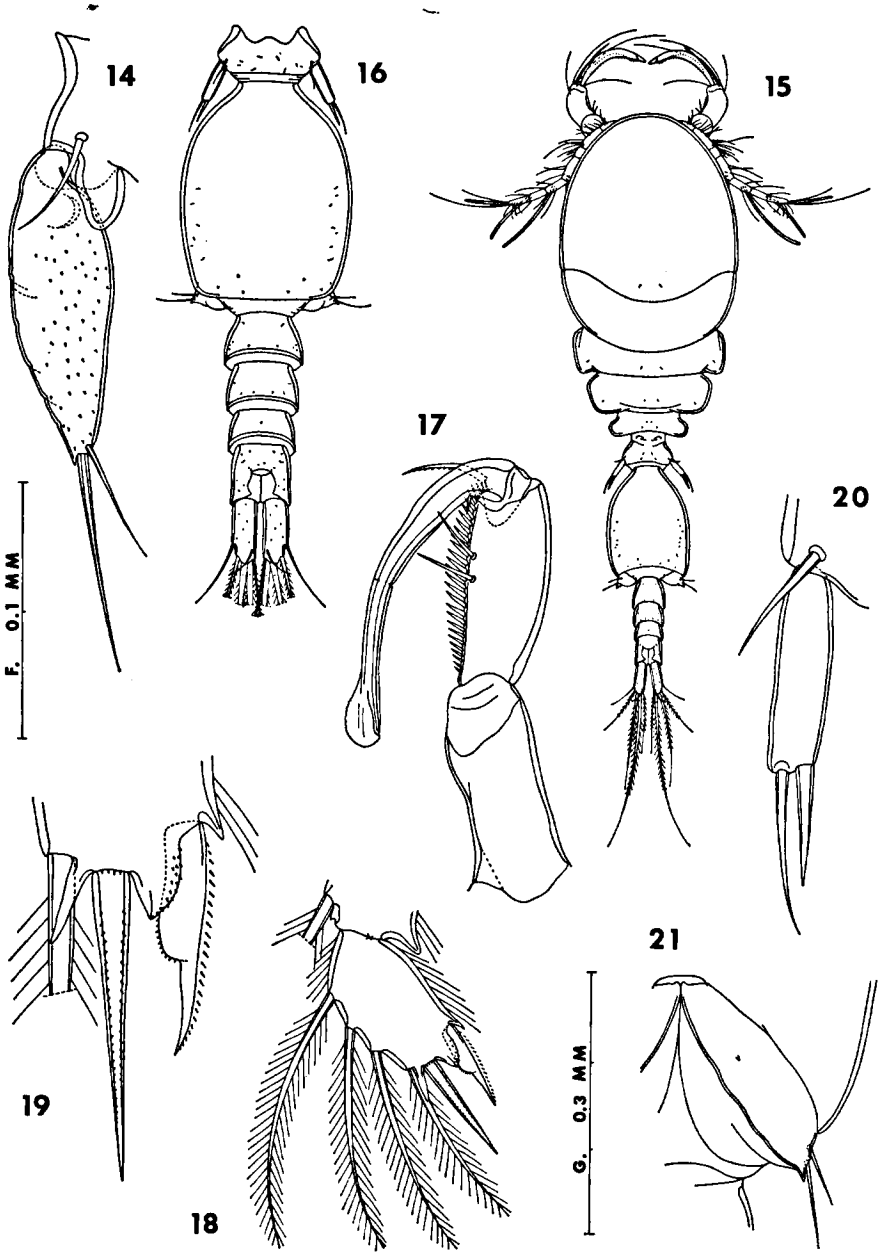
First antenna resembling that of *M. lytocarpi*, with the same formula for the armature and similarly with all setae naked. In specimens in alcohol this antenna somewhat geniculate between segments 4 and 5, as in fig. 1. Lengths of the segments (measured along their posterior margins): 32 (53 μ along the anterior margin), 67, 23, 50, 37, 31, and 37 μ respectively. Terminal seta 140 μ long.

Second antenna (fig. 7) 3-segmented, the last segment 120 μ in greatest length. First segment with a naked seta 28 μ in length. Second segment with a naked spiniform seta 30 μ long and recurved distally. Third segment with the proximal group of three and the distal group of six setae (one of them stronger than the others and jointed) resembling those in *M. lytocarpi*, except that the longest seta in the proximal group has fine blunt serrations instead of a spinulose fringe. Claw 130 μ along its axis. Toothlike spines on the claw arranged in two rows joined proximally and distally.

Labrum, mandible (fig. 8), and paragnath resembling those of *M. lytocarpi*. First maxilla (fig. 9) with small spinules along one side of the longest of the four setae. Second maxilla (fig. 10) similar to that of *M. lytocarpi*, but the teeth on the terminal lash a little different. Maxilliped (fig. 11) as in *M. lytocarpi*, except that the distal part (second and third segments) is slightly bowed rather than straight.

Area between the maxillipeds and the first pair of legs as in *M. lytocarpi*.

Legs 1—4 segmented and armed as in *M. lytocarpi*, with the details of legs 1—3 very closely resembling that species. Three spines on the last segment of the endopod of leg 2 measuring 27.5, 28, and 44 μ in length from outer to inner; those of leg 3, 33, 33, and 50 μ. Leg 4 (fig. 12) with the inner seta on the coxa 23 μ long and naked. (In one female this seta on the right side was 32 μ and distinctly feathered, but on the left side 23 μ and naked). Inner margin of the basis without hairs. Endopod of leg 4 shorter in relation to the exopod than in *M. lytocarpi* (these two rami being in the ratio of 1 : 3.2 in



FIGURES 14—21. *Macrochiron lobatum* n. sp., female: 14, leg 5, dorsal, with free segment somewhat inner (F). Male: 15, dorsal (A); 16, urosome, dorsal (B); 17, maxilliped, antero-outer (F); 18, last segment of endopod of leg 1, anterior (D); 19, terminal elements of last segment of endopod of leg 1, anterior (G); 20, leg 5, dorsal (C); 21, leg 6, ventral (F).

the new species, 1 : 2.75 in *M. lytocarpi*). Endopod (fig. 13) 52 μ long, 15.5 μ wide proximal to the outer marginal notch, 12 μ wide distal to this notch, with the two terminal setae 26 μ and naked (outer) and 61 μ and finely barbed (inner). A few hairs along the outer margin of the endopod. No trace of division other than the marginal notch.

Leg 5 (fig. 14) held obliquely erect in specimens in alcohol. Free segment elongated, 110 × 34 μ in greatest dimensions, tapered distally, with the two naked terminal setae 78 and 47 μ long. Outer margin of this segment a little irregular, dorsal surface with minute spinules, and ventral surface with a proximal crescentic sclerotized ridge. Seta on the body near the insertion of the free segment 39 μ and naked.

Leg 6 probably represented by the two setae near the attachment of each egg sac (fig. 4).

Color in life in transmitted light translucid and rather hyaline, eye red, ovary and egg sacs gray.

Male. — Body (fig. 15) resembling in general that of the female. Length (not including the ramal setae) 0.93 mm (0.89—0.97 mm) and the greatest width 0.29 mm (0.28—0.30 mm), based on 10 specimens. Ratio of length to width of the prosome 1.85 : 1.

Segment of leg 5 (fig. 16) 46 × 73 μ. No ventral intersegmental sclerite. Genital segment longer than wide, 174 × 125 μ. Four postgenital segments 36 × 50 μ, 34 × 46 μ, 29 × 43 μ, and 42 × 42 μ from anterior to posterior.

Caudal ramus like that of the female, but smaller, 52 × 21 μ.

Surfaces of the prosome and urosome with a few hairs and minute refractile points. Ratio of the length of the prosome to that of the urosome 1.30 : 1.

Rostrum like that of the female.

First antenna similar to that of the male of *M. lytocarpi*, with the same armature. Slight geniculation between segments 4 and 5 (fig. 15) as in the female. Lengths of the segments: 17 (39 μ along the anterior margin), 45, 17, 39, 33, 22, and 33 μ respectively. All setae naked.

Second antenna, labrum, mandible, paragnath, first maxilla, and second maxilla as in the female. Maxilliped (fig. 17) closely resembling that of *M. lytocarpi*. Claw 122 μ along its axis, including the terminal lamella.

Area between the maxillipeds and the first pair of legs as in the female.

Legs 1—4 segmented and armed as in *M. lytocarpi*. Last segment of the endopod of leg 1 (fig. 18) with the formula I,I,4, the two spines (fig. 19) separated by a partially spinulose process. Outer spine 25 μ long, its outer margin with a spinulose fringe, its inner margin bulbous in its proximal half with minute marginal spinules. Inner spine 34 μ, with two rows of minute erect spinules on its anterior surface. Slight sexual dimorphism in the lengths of the spines on the last segment of the endopod of legs 2 and 3, those in leg 2 from outer to inner being 21, 19, and 33 μ in length, those in leg 3: 31, 22, and 36 μ. Endopod of leg 4 measuring 34 × 11.5 μ in greatest dimensions, its setae 18.5 and 45 μ.

Leg 5 (fig. 20) with the unornamented free segment 33 × 9 μ, its two naked setae 28 and 19 μ. Seta on the body near the free segment 20 μ and naked.

Leg 6 (fig. 21) a posteroventral flap on the genital segment, bearing two naked setae 18 and 23 μ long.

Spermatophore not observed.

Color in life in transmitted light as in the female.

Etymology. — The specific name *lobatum*, from modern Latin = lobed, alludes to the posterior lobe on each side of the segment of the fifth legs in the female internal to leg 5.

Comparison with related species. — *M. lobatum* differs in the female from all other species in the genus in having a conspicuous well-sclerotized dorsal lobe medial to the base of leg 5. In addition, the shape of the genital segment in the female is unlike that in other species.

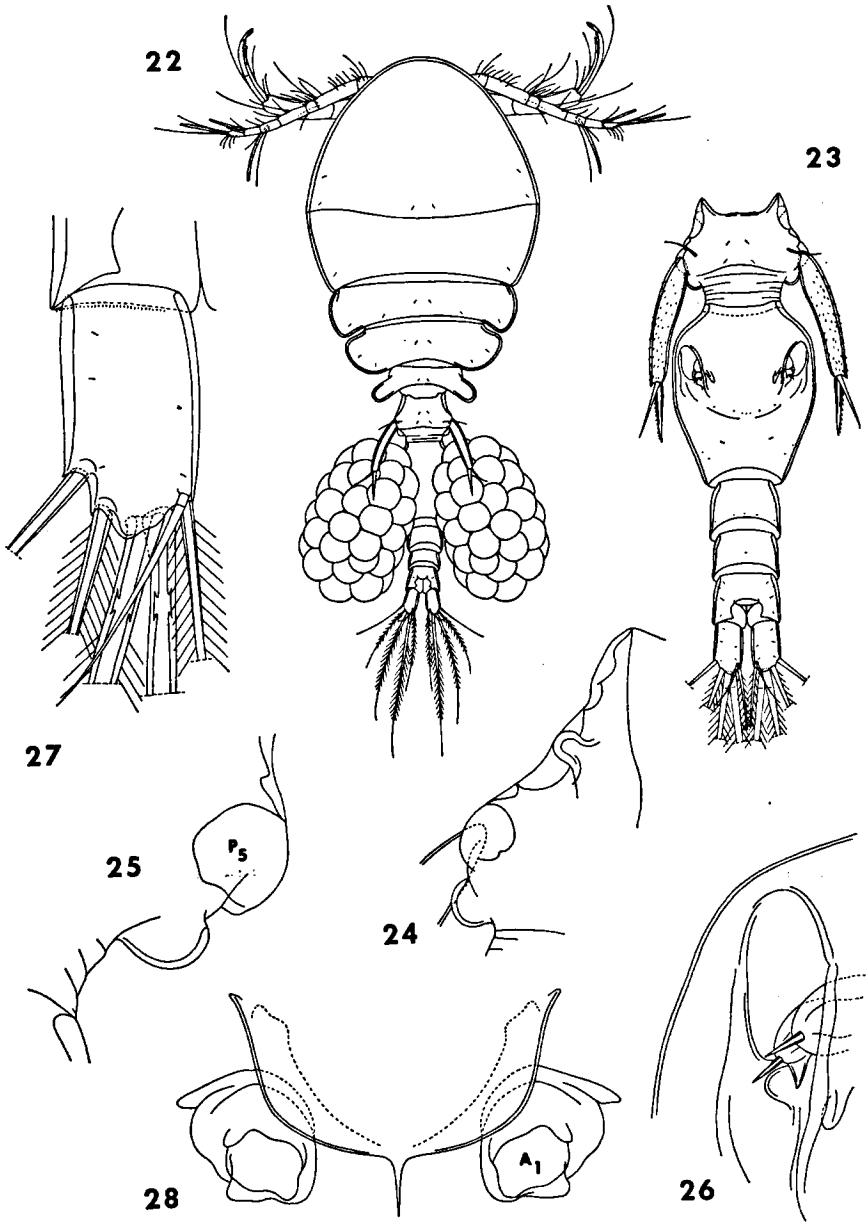
The new species may be further separated from four species, namely *M. fucicolum* Brady, 1872, *M. cheliferum* (Thompson & A. Scott, 1903), *M. valgum* Humes, 1966, and *M. rostratum* Humes, 1966, all of which have II,I,5 as the formula for the last segment of the exopod of leg 4. The remaining three species have the formula III,I,5 as in the new species, but differ from it in other ways. *M. sargassi* G. O. Sars, 1916, has two unequal claws on the second antenna (see Yeatman, 1962). *M. mutatum* Stock, 1957 (= *M. fucicolum* G. O. Sars, 1917, *non* Brady, 1872) has a 2-segmented endopod in leg 4 and the free segment of leg 5 is slender. *M. lytocarpi* Humes, 1966, is larger (♀ 1.28 × 0.51 mm, ♂ 1.08 × 0.37 mm), the claw on the second antenna is a little shorter than the last segment, the endopod of leg 4 is relatively longer when compared with the exopod, and the two spines on the last segment of the endopod of leg 1 of the male are ornamented differently than in *M. lobatum*.

Macrochiron vervoorti n. sp. Figs. 22—52.

Type material. — 100 ♀♀, 95 ♂♂, and 15 copepodids from *Aglaophenia cupressina* Lamouroux, in 1 m, Pte. Ambarionaomby, Nosy Komba, near Nosy Bé, Madagascar, September 27, 1964. Holotype ♀, allotype, and 106 paratypes (50 ♀♀, 56 ♂♂) deposited in the Zoölogisch Museum, Amsterdam; 50 paratypes (30 ♀♀, 20 ♂♂) in the United States National Museum, Washington; and the remaining paratypes in the collection of A. G. Humes.

Female. — Body (fig. 22) with the prosome a little broader than in *M. lobatum*. Length (without the setae on the caudal rami) 0.84 mm (0.79—0.88 mm) and greatest width 0.37 mm (0.35—0.40 mm), based on 10 specimens. Ratio of length to width of the prosome 1.43 : 1. Segment bearing leg 1 separated from the head dorsally and laterally by a furrow. Epimeral areas of the metasomal segments as in the figure.

Segment of leg 5 (fig. 23) 78 × 99 μ, anteriorly on each side with a slightly raised rounded ventral sclerotization (fig. 24). On either side of the segment medial to the fifth leg a posterior flaplike protuberance (fig. 25). Between this segment and the genital segment no ventral intersegmental sclerite. Genital segment elongated, 138 × 115 μ when measured dorsally, subpyriform but



FIGURES 22—28. *Macrochiron vervoorti* n. sp., female: 22, dorsal (A); 23, urosome, dorsal (B); 24, right edge of segment of leg 5, ventral (D); 25, posterior lobe on segment of leg 5, ventral (C); 26, area of attachment of egg sac, dorsal (C); 27, caudal ramus, dorsal (C); 28, rostrum, ventral (F).

with its lateral margins slightly flattened in most specimens. Areas of attachment of the egg sacs dorsolateral in the anterior half of the segment. Each area (fig. 26) bearing two naked setae 6 μ and 8 μ long with a spiniform process between them. Three postgenital segments 39 × 54 μ, 31 × 49 μ, and 35 × 50 μ from anterior to posterior. Anal segment with a row of minute spinules along its posteroventral border.

Caudal ramus (fig. 27) moderately elongated, 40 × 22 μ in greatest dimensions. Ratio of length to width about 1.8 : 1. Outer lateral seta 88 μ long and naked. Pedicellate dorsal seta 39 μ and naked. Outermost terminal seta 113 μ, innermost terminal seta 133 μ. Two long median terminal setae 198 μ (outer) and 270 μ (inner) and inserted between dorsal (smooth) and ventral (with a row of minute spinules) flaps. All four terminal setae with fine lateral spinules as in *M. lobatum*. Very few hairs and refractile points on the surface of the ramus.

Dorsal surface of the prosome and urosome with a few hairs (sensilla) and refractile points; ventral surface of the urosome with only a few refractile points. Ratio of the length of the prosome to that of the urosome 1.51 : 1.

Egg sac (fig. 22) ovoid, 273 × 172 μ, reaching to the middle of the caudal rami, containing many eggs each about 47—50 μ in diameter.

Rostrum (fig. 28) broad, with a posteriorly directed needlelike process 20 μ in length.

First antenna (fig. 29) 272 μ long, with its seven segments having the same arrangement of setae and aesthetes as in *M. lytocarpi* and similarly with all setae naked. Lengths of the segments: 25 (45 μ along the anterior margin), 62, 21, 53, 34, 22, and 35 μ respectively. Terminal seta 114 μ long.

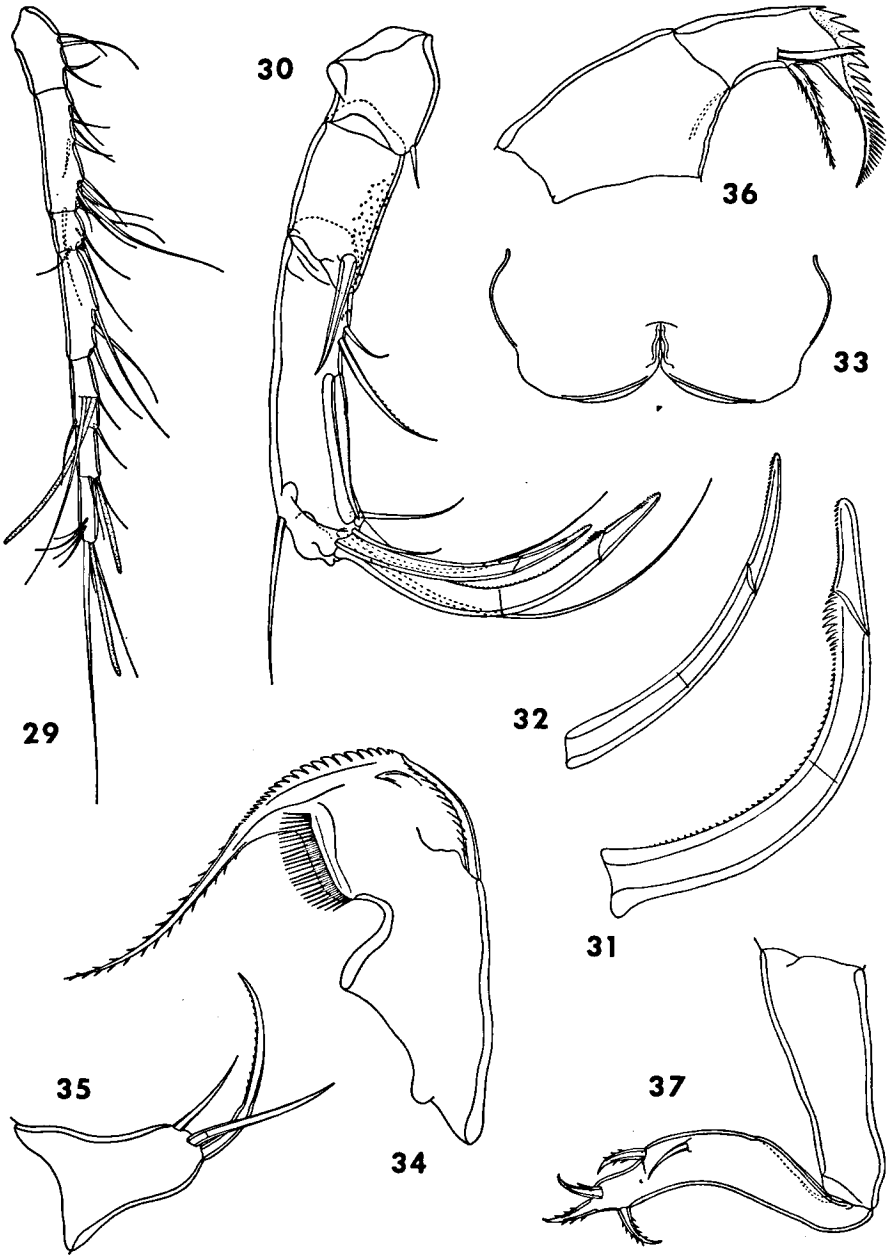
Second antenna (fig. 30) 3-segmented, the last segment 122 μ in greatest length. First segment with a naked seta 15 μ. Second segment with a naked spiniform seta 42 μ. Third segment with the largest element in the proximal group of three having a very narrow minutely serrated fringe. Terminally two unequal bisegmented claws and five naked setae. Longer claw (fig. 31) 122 μ along its axis, the toothlike spines on the concave margin arranged in a single row. Shorter claw (fig. 32) 96 μ, more slender, with a row of small spinules on its second segment, its first segment smooth. Both claws with the first segment showing a weak line of division.

Labrum (fig. 33) with two broad lobes.

Mandible (fig 34) and paragnath resembling those of *M. lytocarpi*. First maxilla (fig. 35) with apparently only three setae. Second maxilla (fig. 36) with the terminal lash set at an angle, giving the second segment an obliquely truncated appearance. Maxilliped (fig. 37) probably 3-segmented as in other species, but the last two segments indistinctly separated. Second segment conspicuously bowed and bearing a naked spiniform seta and a barbed spine. Third segment with a minute hyaline seta, a smooth spine, and two barbed spines (the terminal spine without a clear articulation).

Area between the maxillipeds and the first pair of legs as in *M. lytocarpi*.

Legs 1—4 segmented as in *M. lytocarpi*, with the same spine and setal formula except for the exopod of leg 4 which is I-0; I-1; II,I,5. Leg 1 (fig. 38)



FIGURES 29—37. *Macrochiron vervoorti* n. sp., female: 29, first antenna, dorsal (E); 30, second antenna, inner (F); 31, larger claw on second antenna, outer (D); 32, smaller claw on second antenna, inner (D); 33, labrum, ventral (D); 34, mandible, posterior (C); 35, first maxilla, posterior (C); 36, second maxilla, posterior (D); 37, maxilliped, antero-inner (D).

with details similar to *M. lytocarpi* and *M. lobatum*. Third segment of the endopod of leg 2 as in fig. 39, and that of leg 3 as in fig. 40. Leg 4 (fig. 41) with the coxa having a row of small spinules on its inner posterior surface; inner coxal seta 8 μ, spiniform and naked. Inner margin of the basis smooth. Inner seta on the second segment of the exopod (fig. 42) with its proximal third wider than distally. Endopod (fig. 43) about as long as the first segment of the exopod, the ratio between the endopod and the entire exopod being 1 : 2.34. Endopod 61 μ long, 17 μ wide proximal to the outer marginal notch, 13 μ wide distal to this notch, with the two terminal setae 19 μ and very minutely barbed along one edge (outer) and 64 μ and more conspicuously barbed (inner). Hairs along the outer margin of the endopod as in *M. lobatum*. No evidence of division other than the marginal notch.

Leg 5 (figs. 44 and 45) held somewhat obliquely erect in specimens in alcohol. Free segment elongated, 96 × 15.5 μ in greatest dimensions, with nearly equal width throughout. Terminally with a naked seta 36 μ and a spiniform seta 45 μ barbed along its outer edge. (In another female these elements were 43 μ and 42 μ respectively). Dorsal surface of this segment finely spinulose, ventral surface smooth. Seta on the body near the insertion of the segment about 23 μ and naked.

Leg 6 probably represented by the two setae near the attachment of each egg sac (fig. 26).

Color in life in transmitted light slightly opaque, orange on the bases of the legs and on the urosome (but not on the caudal rami), egg sacs gray.

Male. — Body (fig. 46) a little more slender than in the female. Length 0.78 mm (0.72—0.80 mm) and greatest width 0.27 mm (0.25—0.28 mm), based on 10 specimens. Ratio of length to width of the prosome 1.69 : 1.

Segment of leg 5 (fig. 47) 44 × 68 μ. No ventral intersegmental sclerite. Genital segment 159 × 134 μ, only a little longer than wide, with gently rounded lateral margins. Four postgenital segments 28 × 47 μ, 28 × 45 μ, 22 × 42 μ, and 28 × 43 μ from anterior to posterior.

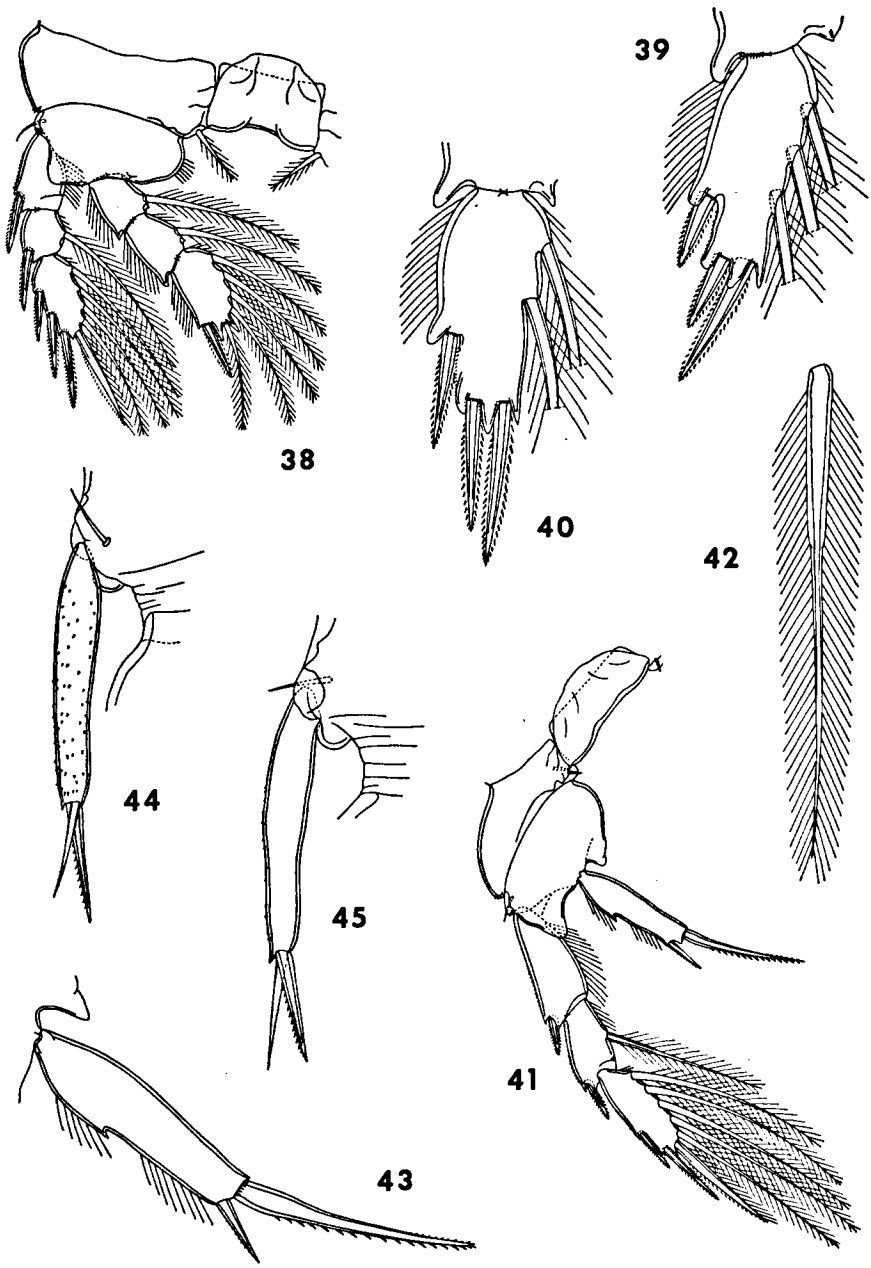
Caudal ramus like that of the female, but a little smaller, 36 × 20 μ.

Surfaces of the prosome and urosome with a few hairs and minute refractile points. Ratio of the length of the prosome to that of the urosome 1.25 : 1.

Rostrum as in the female.

First antenna (fig. 48) having only one aesthete on the second segment, the formula being 4, 13 + 1 aesthete, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Lengths of the segments: 19 (40 μ along the anterior margin), 51, 17, 45, 31, 25, and 34 μ respectively. All setae naked. Second antenna similar to that of the female, but the longer claw a little longer in relation to the third segment (122 μ to 108 μ).

Labrum, mandible, paragnath, first maxilla, and second maxilla as in the female. Maxilliped (fig. 49) resembling that of *M. lytocarpi* and *M. lobatum*. Second segment with a sclerotized line terminating distally in a minute spinous process. Larger element on the proximal part of the claw apparently naked. Claw 125 μ along its axis including the terminal lamella.



FIGURES 38—45. *Macrochiron vervoorti* n. sp., female: 38, leg 1 and intercoxal plate, anterior (E); 39, last segment of endopod of leg 2, anterior (D); 40, last segment of endopod of leg 3, anterior (D); 41, leg 4 and intercoxal plate, anterior (E); 42, inner seta on second segment of exopod of leg 4, posterior (C); 43, endopod of leg 4, anterior (D); 44, leg 5, dorsal (F); 45, leg 5, ventral (F).

Area between the maxillipeds and the first pair of legs as in the female.

Legs 1—4 segmented and armed as in the female, except for the last segment of the endopod of leg 1 (fig. 50) which is I,I,4. Outer spine on this segment barbed and slightly bent distally. Inner spine more slender and recurved distally, with two surficial rows of minute erect spinules which are almost at the limit of visibility under a magnification of 1455 ×. Process medial to this spine long, slender and recurved; proximal to this process a group of prominent spinules on the inner margin of the segment. Legs 2—4 with details as in the female, without apparent sexual dimorphism.

Leg 5 (fig. 51) with the unornamented slender free segment 33 × 7 μ, its two unequal setae 28 μ and naked and 24 μ and barbed. Seta on the body near the free segment 19 μ and naked.

Leg 6 (fig. 52) a posteroventral flap on the genital segment, without the usual two setae, though vestiges of these are possibly indicated by two very indistinct areas in the sclerotization.

Spermatophore not observed.

Color in life in transmitted light as in the female.

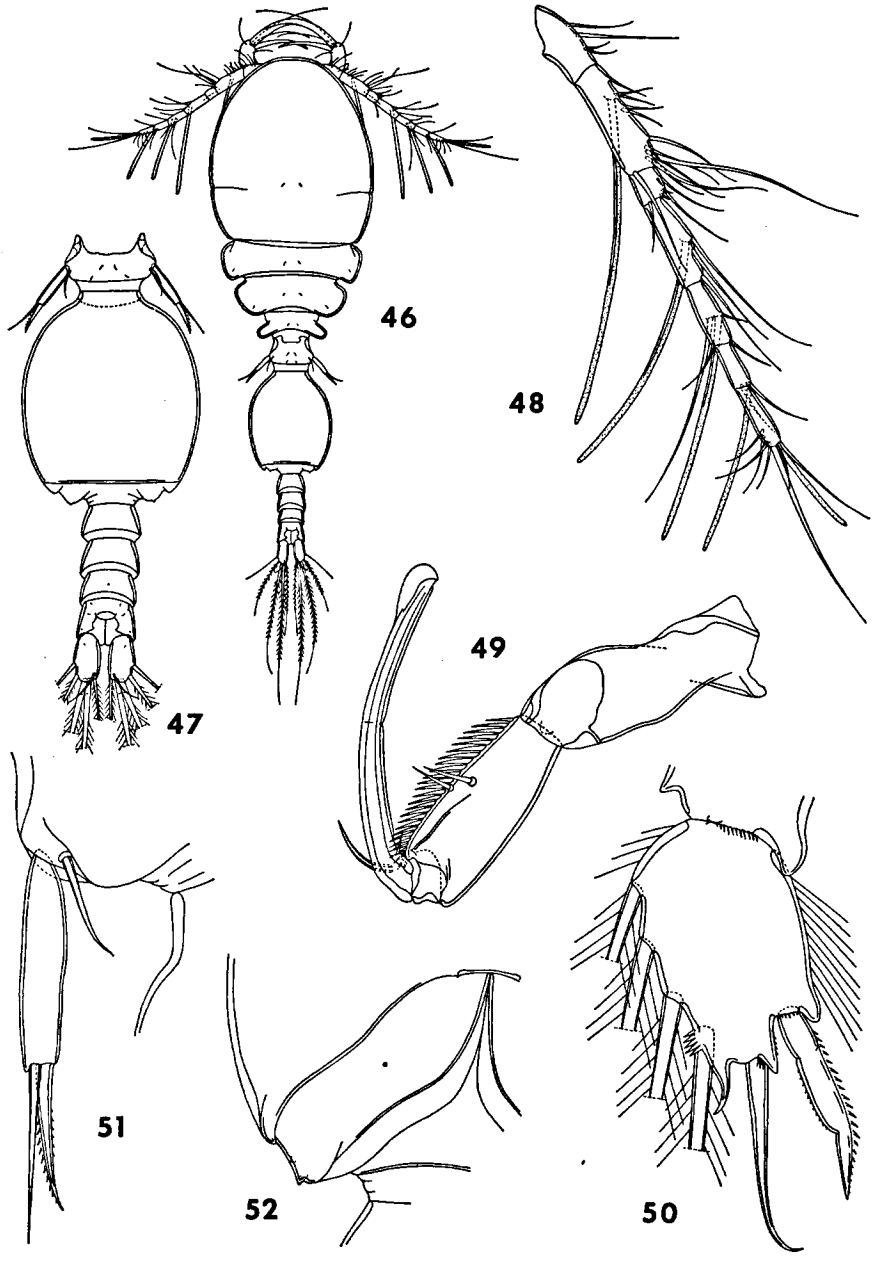
Etymology. — This species is named for Dr. W. Vervoort of the Rijksmuseum van Natuurlijke Historie, Leiden.

Comparison with related species. — Only three other species in the genus have, as in the new species, the following combination of characters: the formula II,I,5 for the last segment of the exopod of leg 4, and a 1-segmented endopod in leg 4. These are *M. cheliferum* (Thompson & A. Scott, 1903), *M. valgum* Humes, 1966, and *M. rostratum* Humes, 1966.

M. valgum has several characters by which it may be distinguished from the new species: the absence of the pair of posterior protuberances on the segment of leg 5 in the female, the caudal ramus in the female with a ratio of 2.5 : 1, the second antenna with one claw (although one terminal seta is jointed), the free segment of leg 5 in the female unornamented, the first antenna of the male with two aesthetes on the second segment, the details of the last segment of the endopod of leg 1 in the male, and the presence of the usual two setae on leg 6 in the male.

M. rostratum may be separated from *M. vervoorti* by the following features: the subconical beak on the rostrum (instead of a needlike processs as in the new species), the absence of the pair of posterior protuberances on the segment of leg 5 in the female, a single claw on the second antenna (though one of the terminal setae is jointed), the maxilliped in the female with the last two segments together shorter than in the new species, the free segment of leg 5 in the female more slender, the details of the last segment of the endopod of leg 1 in the male, and the shape of the genital segment in the female (with a posterior constriction).

M. cheliferum as originally described (female only) by Thompson & A. Scott (1903) differs from the new species in having the caudal ramus with a ratio of about 3 : 1. Unfortunately their description is very incomplete, so



FIGURES 46—52. *Macrochiron vervoorti* n. sp., male: 46, dorsal (A); 47, urosome, dorsal (B); 48, first antenna, ventral (E); 49, maxilliped, antero-outer (F); 50, last segment of endopod of leg 1, anterior (C); 51, leg 5, dorsal (C); 52, leg 6, ventral (D).

that it is impossible to compare many features. Type specimens are not available, since the Andrew Scott collection is no longer extant (in this regard see Humes & Ho, 1967: 209). Vervoort (1964) has redescribed Thompson & A. Scott's species, from both sexes collected at Ifaluk Atoll in the Caroline Islands. Based on his redescription, *M. cheliferum* differs from *M. vervoorti* in several ways: the absence of the pair of posterior protuberances on the segment of leg 5 in the female, the shape of the genital segment in the female, the caudal ramus in the ratio of 8 : 3 (2.66 : 1), the absence of an outer marginal notch on the endopod of leg 4, the tapered free segment of leg 5 in the female, the presence of two setae on leg 6 in the male, and the absence of sexual dimorphism in the endopod of leg 1 in the male. Vervoort showed in his fig. 12g two claws on the second antenna of *M. cheliferum*. Gurney (1927), on the basis of one male, which he regarded as *M. cheliferum*, from the Suez Canal, represented apparently one claw and a jointed seta in his fig. 114A.

Macrochiron lytocarpi Humes, 1966

During the study necessary for the identification of this species two points were noticed which are supplementary to the original description. First, the body size may be smaller than originally given. In the collection from Nosy Iranja, for example, one female was 1.02 × 0.36 mm and a male 0.85 × 0.28 mm. Second, the longer seta on the free segment of leg 5 in both sexes may show a few minute lateral spinules (more noticeable in the male).

Collections made (all in 1967). — From *Lytocarpus philippinus* (Kirchenpauer), the only known host: 3 ♀♀, 5 ♂♂, and 8 copepodids, in 4 m, Antsamantsara, Nosy Bé, June 9; 3 ♀♀, 6 ♂♂, in 20 m, in the pass between Nosy Komba and Ankify, near Nosy Bé, July 5; 2 ♀♀, 3 ♂♂, in 23 m, Tany Kely, south of Nosy Bé, July 30; 45 ♀♀, 52 ♂♂, in 1 m, off Ampombilava, Nosy Bé, July 7; 22 ♀♀, 42 ♂♂, in 15 m, Nosy Iranja, about 50 kms southwest of Nosy Bé, August 9; 43 ♀♀, 31 ♂♂, in 1 m, Pte. Ambarionaomby, Nosy Komba, July 6; and 19 ♀♀, 21 ♂♂, and 28 copepodids, in 8 m, Pte. Lokobe, Nosy Bé, July 25.

Macrochiron valgum Humes, 1966

This species, previously known only from *Lytocarpus philippinus*, was found on two new hosts, *Gymnangium hians* (Busk) and *G. gracilicaulis* (Jäderholm).

Collections made (all in 1967). — From *Gymnangium hians*: 107 ♀♀, 79 ♂♂, and 170 copepodids, in 2 m, Pte. Lokobe, Nosy Bé, June 3; 74 ♀♀, 62 ♂♂, in 2 m, Ambariotelo, near Nosy Bé, June 6; 314 ♀♀, 247 ♂♂, and 34 copepodids, in 2 m, Ambariobe, near Nosy Bé, June 25; 5 ♀♀, 13 ♂♂, in 15 m, Banc de la Lanterne, Bay of Tsimipaika, east of Nosy Komba, July 26; and 50 ♀♀, 80 ♂♂, in 2 m, Ambariotelo, July 20. From *Gymnangium gracilicaulis*: 9 ♂♂, in 24 m, Banc des Frères, Isles Mitsio, 12°58'S, 48°28'E, August 18.

Macrochiron rostratum Humes, 1966

This species, previously known from *Lytocarpus philippinus* and *L. phoeniceus* (= *L. spectabilis*), was found on three new hosts, *Gymnangium hians* (Busk), *G. gracilicaulis* (Jäderholm), and *Aglaophenia delicatula* (Busk).

Collections made (all in 1967). — From *Lytocarpus philippinus*: 1 ♀, 5 ♂♂, in 20 m, in the pass between Nosy Komba and Ankify, near Nosy Bé, July 5; 9 ♀♀, 2 ♂♂, in 23 m, Tany Kely, south of Nosy Bé, July 30; 44 ♀♀, 21 ♂♂, in 1 m, off Ampombilava, Nosy Bé, July 7; 4 ♀♀, 2 ♂♂, in 15 m, Nosy Iranja, about 50 kms southwest of Nosy Bé, August 9; and 5 ♀♀, in 1 m, Pte. Ambarionaomby, Nosy Komba, July 6. From *Lytocarpus phoeniceus*: 37 ♀♀, 29 ♂♂, in 2 m, east of Ambariotelo, near Nosy Bé, July 20; and 6 ♀♀, 2 ♂♂, in 50 m, Banc de Cinq Mètres, west of Nosy Bé, September 3. From *Gymnangium hians*: 1 ♂, in 2 m, Ambariobe, near Nosy Bé, June 25; and 4 ♀♀, 6 ♂♂, in 2 m, Ambariotelo, July 20. From *Gymnangium gracilicaulis*: 5 ♀♀, 7 ♂♂, in 24 m, Banc des Frères, Isles Mitsio, 12°58'S, 48°28' E, August 18. From *Aglaophenia delicatula*: 15 ♀♀, 5 ♂♂, in 25 m, Banc de Cinq Mètres, June 18.

Keys to the species in the genus *Macrochiron*

(The recently described *Macrochiron brevipes* Shen & Lee, 1966, is not included in the keys, since it is obviously a *Lichomolgus*, as Stock, 1967, has already noted.)

Females

1. Armature II,I,5 on last segment of exopod of leg 4 2
   Armature III,I,5 on last segment of exopod of leg 4 6
2. Endopod of leg 4 a single segment (or at most with only a weak and incomplete indication of division) 3
   Endopod of leg 4 composed of two distinct segments ... *M. fucicolum* Brady, 1872
3. Genital segment abruptly constricted in its posterior third; rostrum with a subconical beak ... ... *M. rostratum* Humes, 1966
   Genital segment broadest anteriorly and tapering posteriorly; rostrum with a needlelike process 4
4. With a pair of posterior protuberances on segment of leg 5 medial to fifth legs ... ... *M. vervoorti* n.sp.
   Without such protuberances 5
5. Free segment of leg 5 tapered distally; endopod of leg 4 without an outer marginal notch ... ... *M. cheliferum* (Thompson & A. Scott, 1903)
   Free segment of leg 5 not tapered; endopod of leg 4 with an outer marginal notch ... ... *M. valgum* Humes, 1966
6. Endopod of leg 4 composed of two distinct segments ... *M. mutatum* Stock, 1957
   Endopod of leg 4 a single segment (though in *M. lytocarpi* there may be a very indistinct line of division) 7
7. Second antenna with two claws .... *M. sargassi* G. O. Sars, 1916
   Second antenna with one claw (though a jointed seta present also) 8
8. With a pair of conspicuous well-sclerotized posterior lobes on segment of leg 5 medial to fifth legs ... ... *M. lobatum* n.sp.
   Without such lobes ... ... *M. lytocarpi* Humes, 1966

Males

1. Armature II,I,5 on last segment of exopod of leg 4 2
   Armature III,I,5 on last segment of exopod of leg 4... 6
2. Endopod of leg 4 a single segment (or at most with only a weak and incomplete indication of division) 3
   Endopod of leg 4 composed of two distinct segments ... *M. fucicolum* Brady, 1872
3. Rostrum with a subconical beak ... ... *M. rostratum* Humes, 1966
   Rostrum with a needlelike process 4
4. Without sexual dimorphism in formula of endopod of leg 1 (Vervoort, 1964) ... ... *M. cheliferum* (Thompson & A. Scott, 1903)
   With sexual dimorphism in this ramus (last segment = I,I,4) 5

5. Caudal ramus 54 × 23 μ (2.35:1); a single claw on second antenna ... . *M. valgum* Humes, 1966
   Caudal ramus 36 × 20 μ; two claws on second antenna ... ... *M. vervoorti* n.sp.
6. Endopod of leg 4 composed of two distinct segments ... *M. mutatum* Stock, 1957
   Endopod of leg 4 a single segment 7
7. Second antenna with two claws ... ... *M. sargassi* G. O. Sars, 1916
   Second antenna with one claw (though a jointed seta present also) 8
8. Outermost spine on last segment of endopod of leg 1 with proximal half swollen medially and abruptly delimited from distal portion ... ... *M. lobatum* n.sp.
   Outermost spine on last segment of endopod of leg 1 swollen medially along most of its length ... ... *M. lytocarpi* Humes, 1966

References

BRADY, G. S.

1872 Contributions to the study of Entomostraca, VII. A list of the non-parasitic marine Copepoda of the north-east coast of England. — Ann. Mag. nat. Hist., (4) **10**: 1—17.

GURNEY, R.

1927 Zoological results of the Cambridge expedition to the Suez Canal, 1924, XXXIII. Report on the Crustacea: Copepoda (littoral and semi-parasitic). — Trans. zool. Soc. London, **22** (4): 451—577.

HUMES, A. G.

1966 New species of Macrochiron (Copepoda, Cyclopoida) associated with hydroids in Madagascar. — Beaufortia, **14** (165): 5—28.

HUMES, A. G. & J.-S. HO

1967 New species of Stellicola (Copepoda, Cyclopoida) associated with starfishes in Madagascar, with a redescription of S. caeruleus (Stebbing, 1900). — Bull. Brit. Mus. (nat. Hist.), (Zool.) **15** (5): 201—225.

SARS, G. O.

1916 Liste systématique des Cyclopoidés, Harpacticoidés et Monstrilloidés recueillis pendant les campagnes de S.A.S. le Prince Albert de Monaco, avec descriptions et figures des espèces nouvelles. — Bull. Inst. Océanogr., **323**: 1—15.

1917 An account of the Crustacea of Norway with short descriptions and figures of all the species, **6**. Copepoda Cyclopoida, XI & XII, Clausidiidae, Lichomolgidae (part): 141—172. (Bergen Museum, Bergen).

SHEN, C.-J. & F.-S. LEE

1966 On the estuarine copepods of Chaikiang River, Kwantung Province. — Acta Zootaxon. Sinica, **3** (3): 213—223.

STOCK, J. H.

1957 Some notes on the genus Macrochiron Brady, 1872 (Copepoda, Cyclopoida). — Ann. Mag. nat. Hist., (12) **10**: 378—382.

1967 Copepoda associated with invertebrates from the Gulf of Aqaba, 4. Two new Lichomolgidae associated with Crinoida. — Proc. Kon. Ned. Akad. Wet. Amsterdam, (C) **70** (5): 569—578.

THOMPSON, I. C. & A. SCOTT

1903 Report on the Copepoda collected by Professor Herdman, at Ceylon, in 1902. — Rept. Govt. Ceylon Pearl Oyster Fish. Gulf Manaar, **1**, suppl. Rept. 7: 227—307.

VERVOORT, W.

1964 Free-living Copepoda from Ifaluk Atoll in the Caroline Islands. — Bull. U. S. nation. Mus., **236**: 1—431.

YEATMAN, H. C.

1962 The problem of dispersal of marine littoral copepods in the Atlantic Ocean, including some redescriptions of species. — Crustaceana, **4** (4): 253—272.

Dr. ARTHUR G. HUMES
Professor of Biology
Boston University
Boston, Massachusetts, 02215. — U.S.A.

Mr. ALFRED DE MARIA
Boston University
Department of Biology
Boston, Massachusetts, 02215. — U.S.A.