

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

CYCLOPOID COPEPODS (LICHOMOLGIDAE) FROM
GORGONACEANS IN MADAGASCAR

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Lichomolgid copepods associated with Gorgonacea have been reported from the West Indies (Humes and Stock, 1973), Bermuda (Humes, 1973a), and the Mediterranean coast of France and Spain (Stock and Kleeton, 1963). In addition three lichomolgid copepods are known to be associated with Gorgonacea in Madagascar. These are *Acanthomolgus astrictus* Humes and Stock, 1973, from *Acanthogorgia aspera* Pourtalès, *Acanthomolgus hales* Humes and Stock, 1973, from *Solenocaulon tortuosum* Gray, and *Metaxymolgus cinctus* Humes and Stock, 1973, from *Psammogorgia ramosa* Kükenthal.

This paper includes the descriptions of three new species of *Acanthomolgus* and one new species of *Paramolgus*, along with new records for certain species of *Acanthomolgus*, *Metaxymolgus*, and *Telestacicola*. All these were collected by the author from shallow-water gorgonaceans in the vicinity of Nosy Bé in northwestern Madagascar. The specimens were recovered from the sediment obtained after washing the hosts in approximately 5 per cent ethyl alcohol in sea water.

The field work in 1963-64 was carried out while the author was chief scientist in Madagascar for the U. S. Program in Biology of the International Indian Ocean Expedition. The work in 1967 was supported by a grant (GB-5838) from the National Science Foundation. The study of the material has been aided by another grant (GB-8381X) also from the Na-

tional Science Foundation. I wish to acknowledge with many thanks the generous assistance given by the staff of the Centre O.R.S.T.O.M. de Nosy Bé, where the field work was done.

I am greatly indebted to Dr. J. Vervoort, Rijksmuseum van Natuurlijke Historie, Leiden, for the identification of the gorgonacean hosts.

The observations and measurements were made on specimens cleared in lactic acid. Measurements are in microns unless otherwise specified. The dimensions of the body are based on ten specimens and the body length does not include the setae on the caudal rami. The lengths of the segments of the first antennae are taken along their posterior nonsetiferous margins. 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.

Acanthomolgus Humes and Stock, 1972

Acanthomolgus mopsellae, new species

Figures 1–17

Type-material: 285 ♀♀, 470 ♂♂, and 311 copepodids from one colony of the gorgonacean *Mopsella rubeola* Wright and Studer, in 3 m, Pte. Lokobe, Nosy Bé, Madagascar, 3 June 1967. Holotype ♀, allotype, and 567 paratypes (201 ♀♀, 366 ♂♂) deposited in the National Museum of Natural History (USNM), Washington; 90 paratypes (40 ♀♀, 50 ♂♂) in the Zoölogisch Museum, Amsterdam; the remaining paratypes in the collection of the author.

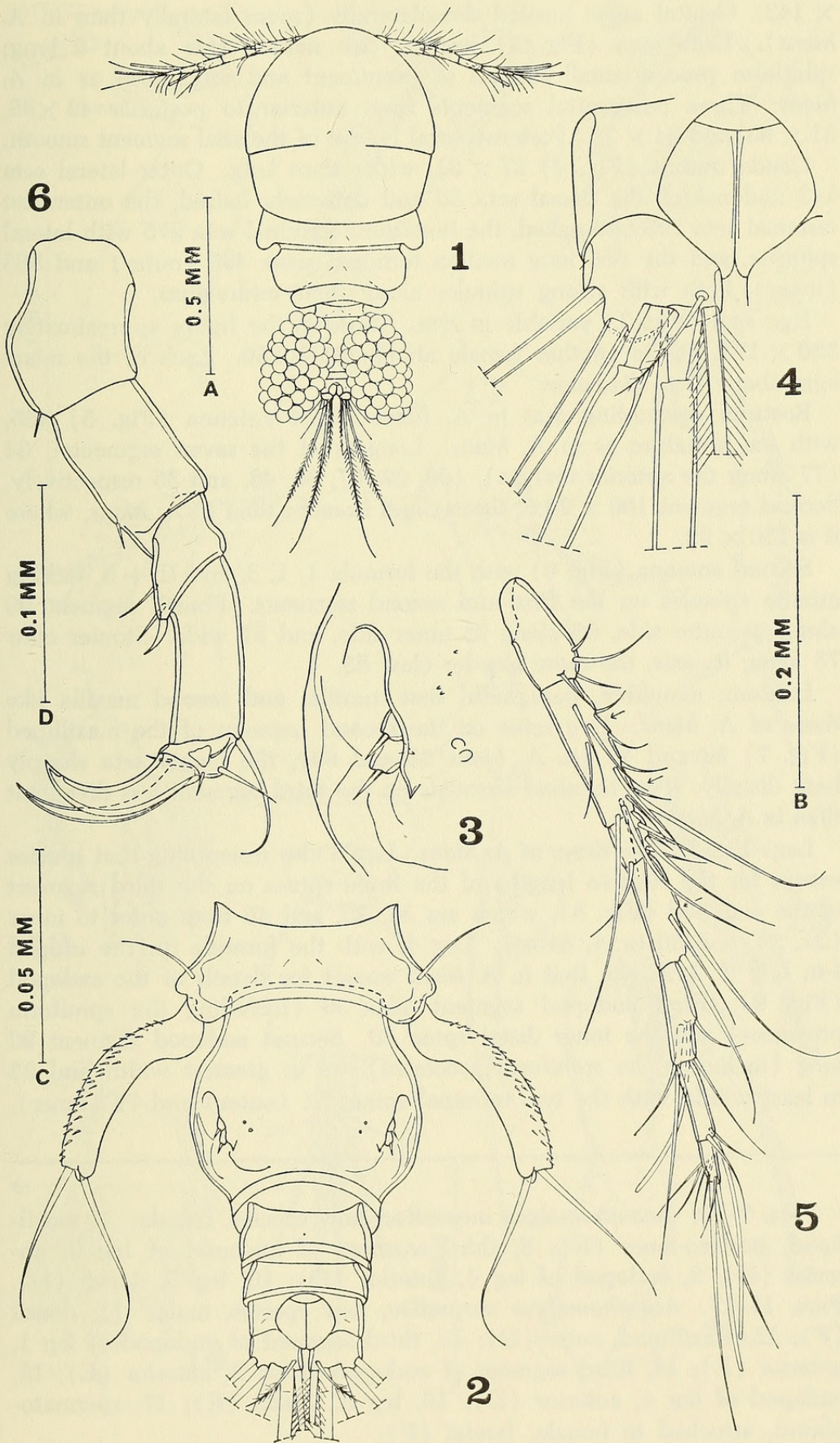
In the following description those features not mentioned may be assumed to be essentially like those of *Acanthomolgus hians* (Humes and Ho, 1968a).

Female: Body (Fig. 1) with a moderately slender prosome. Length 0.98 mm (0.89–1.02 mm) and the greatest width 0.49 mm (0.46–0.56 mm). Ratio of the length to the width of the prosome 1.45:1. Ratio of the length of the prosome to that of the urosome 2.91:1.

Segment of leg 5 (Fig. 2) 73×156 . Between this segment and the genital segment no ventral intersegmental sclerite. Genital segment 143

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FIGS. 1–6. *Acanthomolgus mopsellae*, new species, female: 1, dorsal (A); 2, urosome, dorsal (B); 3, genital area, dorsal (C); 4, caudal ramus, dorsal (C); 5, first antenna, with arrows indicating positions of three aesthetes added in the male, dorsal (B); 6, second antenna, anterior (inner) (D).



× 143. Genital areas located dorsolaterally (more laterally than in *A. hians*). Each area (Fig. 3) bearing two naked setae about 9 long; spiniform process small instead of prominent and unguiform as in *A. hians*. Three postgenital segments from anterior to posterior 42 × 88, 31 × 83, and 34 × 75. Posteroventral border of the anal segment smooth.

Caudal ramus (Fig. 4) 27 × 31, wider than long. Outer lateral seta 143 and naked, the dorsal seta 30 and delicately haired, the outermost terminal seta 198 and naked, the innermost terminal seta 275 with lateral spinules, and the two long median terminal setae 495 (outer) and 583 (inner), both with strong spinules along their midregions.

Egg sacs (Fig. 1) variable in size. Those in the figure approximately 320 × 175, but in another female about 495 × 250. Each of the many eggs about 47 in diameter.

Rostrum resembling that in *A. hians*. First antenna (Fig. 5) 425, with the armature as in *A. hians*. Lengths of the seven segments: 34 (77 along the anterior margin), 100, 29, 67, 69, 48, and 35 respectively. Second segment 100 × 28.5, shorter and broader than in *A. hians*, where it is 130 × 22.

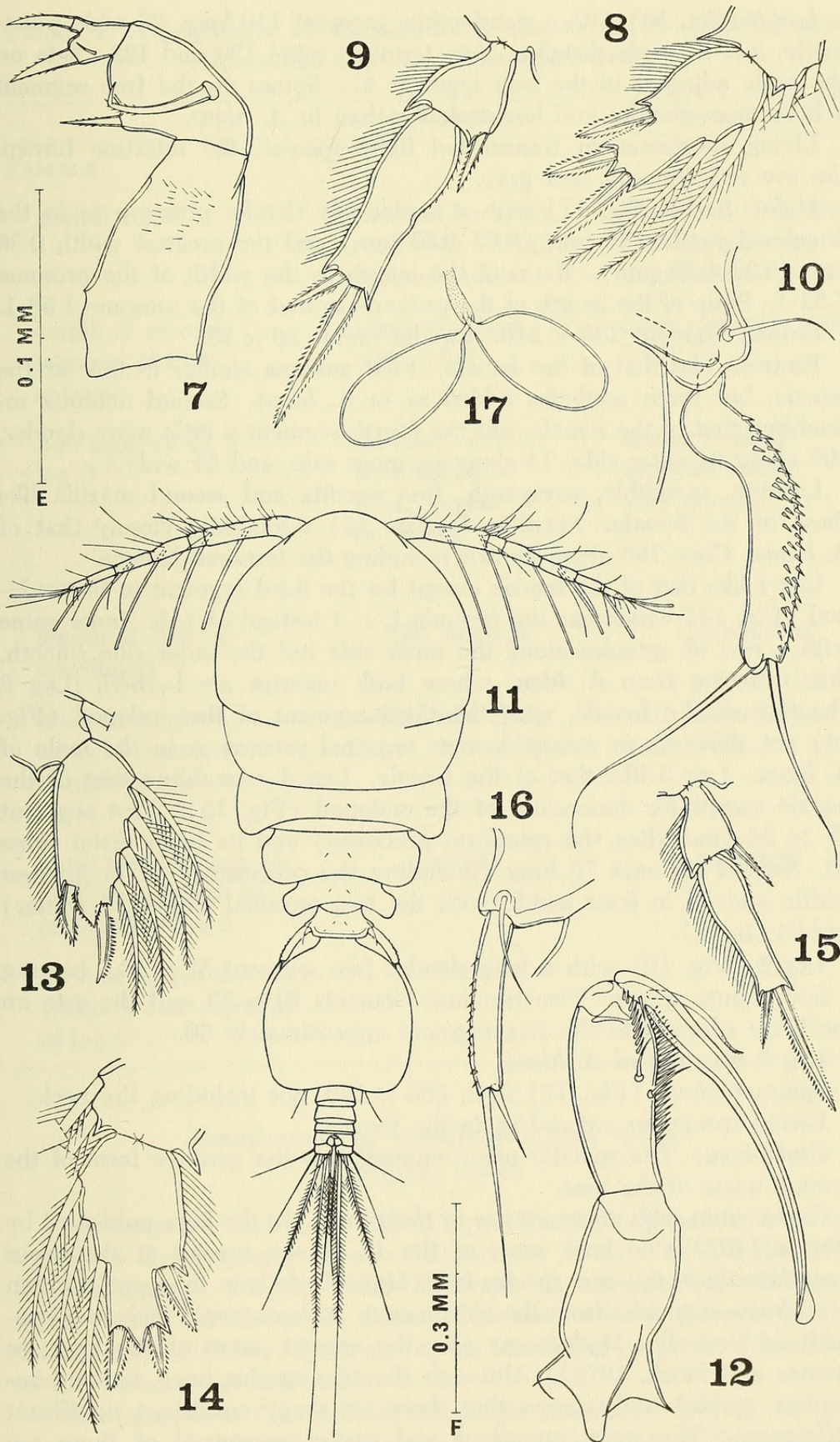
Second antenna (Fig. 6) with the formula 1, 1, 3, and II + 5, lacking minute spinules on the first and second segments. Fourth segment 99 along its outer side, 66 along its inner side, and 31 wide. Stouter claw 73 along its axis, the more slender claw 83.

Labrum, mandible, paragnath, first maxilla, and second maxilla like those of *A. hians*. Two setae on the second segment of the maxilliped (Fig. 7) 22 and 43 (in *A. hians* 28 and 66), the longer seta sharply bent distally. Two terminal elements on the third segment less divergent than in *A. hians*.

Legs 1 and 2 like those of *A. hians*. Leg 3 also resembling that species except for the relative lengths of the three spines on the third segment of the endopod (Fig. 8), which are 38, 35, and 45 from outer to inner (31, 24, and 36 in *A. hians*). Leg 4, with the formula for the exopod I-0; I-1; II, I, 5, like that in *A. hians* except for details of the endopod (Fig. 9). First endopod segment 48 × 36 (including the spiniform processes) and the inner distal spine 30. Second endopod segment 93 long (including the spiniform processes), 32 in greatest width and 23 in least width, with the two terminal spines 31 (outer) and 72 (inner).

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FIGS. 7-10. *Acanthomolgus mopsellae*, new species, female: 7, maxilliped, postero-inner (E); 8, third segment of endopod of leg 3, anterior (D); 9, endopod of leg 4, anterior (D); 10, leg 5, dorsal (D). FIGS. 11-17. *Acanthomolgus mopsellae*, new species, male: 11, dorsal (F); 12, maxilliped, outer (D); 13, third segment of endopod of leg 1, anterior (E); 14, third segment of endopod of leg 2, anterior (E); 15, endopod of leg 4, anterior (D); 16, leg 5, dorsal (E); 17, spermatophores, attached to female, lateral (F).



Leg 5 (Fig. 10) with a slender free segment 140 long, 28 wide proximally, and 22 wide distally. Two terminal setae 130 and 122. Seta on the body adjacent to the free segment 47. Spines on the free segment a little more slender and less scalelike than in *A. hians*.

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

Male: Body (Fig. 11) with a moderately slender prosome as in the female. Length 0.86 mm (0.83–0.89 mm) and the greatest width 0.36 mm (0.32–0.39 mm). Ratio of the length to the width of the prosome 1.52:1. Ratio of the length of the prosome to that of the notosoma 1.58:1.

Genital segment 230×210 . Caudal ramus 20×25 .

Rostrum like that of the female. First antenna similar to that of the female, but three aesthetes added as in *A. hians*. Second antenna resembling that of the female, but the fourth segment a little more slender, 105 along its outer side, 74 along its inner side, and 25 wide.

Labrum, mandible, paragnath, first maxilla and second maxilla like those of the female. Maxilliped (Fig. 12) resembling closely that of *A. hians*. Claw 180 along its axis including the terminal lamella.

Leg 1 like that of the female except for the third segment of the endopod (Fig. 13) which has the formula I, I, 4 instead of I, 5. Inner spine with a row of spinules along the inner side but the outer side smooth, thus differing from *A. hians* where both margins are barbed. Leg 2 like that of the female, with the third segment of the endopod (Fig. 14) not showing an enlarged outer terminal process as in the male of *A. hians*. Leg 3 like that of the female. Leg 4 resembling that of the female except for dimensions of the endopod (Fig. 15). First segment 37×24 (including the spiniform processes) and its inner distal spine 26. Second segment 70 long (including the processes), 21 in greatest width, and 15 in least width, with the two terminal spines 25 (outer) and 64 (inner).

Leg 5 (Fig. 16) with a long slender free segment 57×10.5 bearing a few minute spines. Two terminal elements 81×23 and the seta on the body adjacent to the free segment approximately 30.

Leg 6 like that of *A. hians*.

Spermatophore (Fig. 17) oval, 200×100 , not including the neck.

Living specimens colored as in the female.

Etymology: The specific name *mopsellae* is the genitive form of the generic name of the host.

Comparison with other species in the genus: In the keys published by Humes (1973a) to both sexes of the 17 known species of the genus *Acanthomolgus*, the new species from *Mopsella* falls in the same position as *A. hians*, a species from the alcyonacean *Siphonogorgia pichoni* Verseveldt at Nosy Bé, Madagascar (for the correct name of the host see Humes and Stock, 1973). Although the two species have certain similarities, careful study shows that there are many consistent significant differences. The more important and easily recognized of these are summarized in Table 1.

TABLE 1. Comparison of distinguishing characters of *Acanthomolgus mopsellae* and *Acanthomolgus hians*.

	<i>A. mopsellae</i>	<i>A. hians</i>
FEMALE		
genital areas	situated far apart, each with a small pointed process	closer together, each with a prominent unguiform process
length of second segment of first antenna	relatively short, ratio 3.5:1	more elongate, ratio 5.9:1
free segment of leg 5	slender, with 2 terminal setae nearly equal in length	stouter, with 2 terminal setae very unequal
MALE		
length of claw on maxilliped	180 microns	159 microns
inner of 2 spines on third segment of endopod of leg 1	with barbs along inner side only	with barbs along both sides
outer terminal process on third segment of endopod of leg 2	small	enlarged
ratio of length to width of free segment of leg 5	5.4:1	4.4:1

***Acanthomolgus combinatus*, new species**

Figures 18-41

Type-material: 114 ♀♀, 278 ♂♂, and many copepodids from one colony of *Echinogorgia sasappo* (Esper), in 10 m, Pte. Lokobe, Nosy Bé, Madagascar, 18 July 1967. Holotype ♀, allotype, and 384 paratypes (110 ♀♀, 274 ♂♂), deposited in the National Museum of Natural History (USNM), Washington; the remaining paratypes (dissected) in the collection of the author.

Other specimens (all from *Echinogorgia sasappo*): 3 ♀♀, 10 ♂♂, and a few copepodids from one colony, in 10 m, Nosy N'Tangam, near Nosy Bé, 1 January 1964; 4 ♀♀, 18 ♂♂, and a few copepodids from

one colony, in 25 m, Tany Kely, a small island to the south of Nosy Bé, 14 August 1964; 55 ♀♀, 57 ♂♂, and a few copepodids from one colony, in 25 m, Tany Kely, 14 August 1964; 1 ♀, 2 ♂♂, and a few copepodids from one colony, in 13 m, opposite Antsiabe, Nosy Komba, near Nosy Bé, 2 September 1967.

Female: Body (Fig. 18) resembling in general form that of *A. mopsellae*. Length 1.10 mm (1.02–1.19 mm) and the greatest width 0.60 mm (0.58–0.62 mm). Ratio of the length to the width of the prosome 1.47:1. Ratio of the length of the prosome to that of the urosome 3.06:1.

Segment of leg 5 (Fig. 19) 86×174 . Between this segment and the genital segment no ventral intersegmental sclerite. Genital segment 143×169 , in dorsal view broadest in its midregion, posterior to which the lateral margins are obliquely truncated, then abruptly constricted near the end of the segment. Genital areas located dorsolaterally along the truncated margins. Each area (Fig. 20) bearing two short naked setae 11 and 20 and a small spiniform process. Adjacent to the area two spiniform papillate processes, one larger than the other. Three post-genital segments from anterior to posterior 22×91 , 23×86 , and 34×84 . Posteroventral border of the anal segment bearing a row of minute spinules on each side.

Caudal ramus (Fig. 19) quadrate, 34×34 . Outer lateral seta 112 and the dorsal seta 39, both naked. Outermost terminal seta 230 and naked, the innermost terminal seta 350 with spinules along the inner side. Two long median terminal setae 570 and 690, both with strong lateral spinules along their midregions. A minute setule on the proximal outer side of the ramus.

Body surface bearing only a few small hairs (sensilla) as in Fig. 18.

Egg sac (Fig. 21) $550\text{--}600 \times 240$, reaching nearly to the ends of the longest setae on the caudal ramus, and containing many eggs about 50 in diameter.

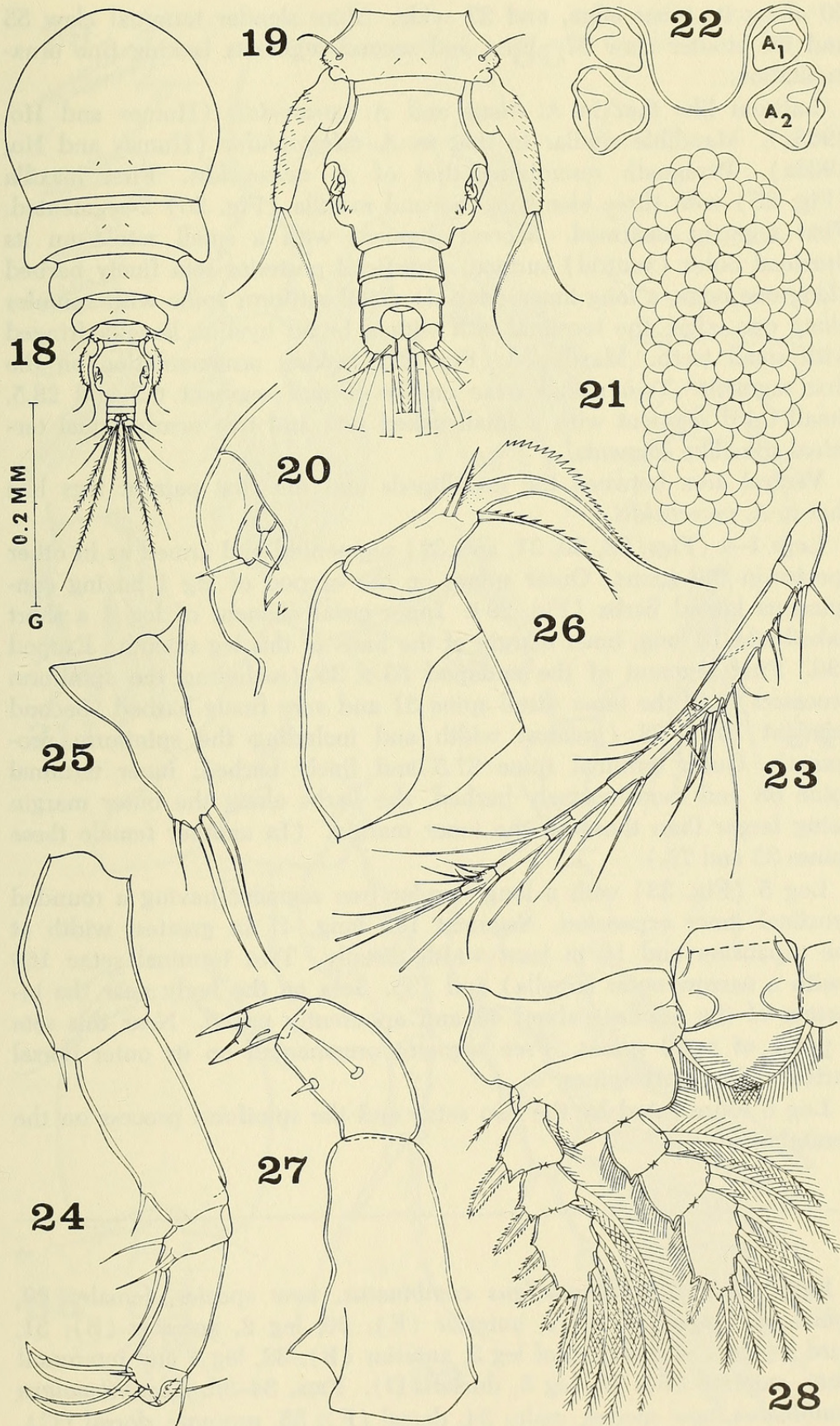
Rostrum (Fig. 22) in ventral view broadly rounded posteroventrally.

First antenna (Fig. 23) 492 long. Lengths of the seven segments: 36 (75 along the posterior margin), 135, 31, 78, 76, 62, and 35 respectively. Formula for the armature the same as in other species of the genus: 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All the setae naked.

Second antenna (Fig. 24) 4-segmented with the formula 1, 1, 3, and II + 5. All the setae naked. Fourth segment 86 along its outer edge,

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FIGS. 18–28. *Acanthomolgus combinatus*, new species, female: 18, dorsal (A); 19, urosome, dorsal (G); 20, genital area, dorsal (E); 21, egg sac, dorsal (F); 22, rostrum, ventral (B); 23, first antenna, ventral (G); 24, second antenna, posterior (outer) (D); 25, first maxilla, posterior (C); 26, second maxilla, posterior (E); 27, maxilliped, posterior (E); 28, leg 1 and intercoxal plate, anterior (B).



50 along its inner edge, and 27 wide. More slender terminal claw 55 and the stouter claw 57. First and second segments lacking fine ornamentation.

Labrum like that in *A. hians* and *A. verseveldti* (Humes and Ho, 1968a). Mandible similar to that in *A. telestophilus* (Humes and Ho, 1968a). Paragnath resembling that of *A. verseveldti*. First maxilla (Fig. 25) with three elements. Second maxilla (Fig. 26) 2-segmented. First segment unarmed. Second segment with a small setule on its proximal outer (ventral) surface, a surficial posterior seta finely barbed along one edge, a long inner (dorsal) distal setiform spine with spinules along one edge; the terminal lash with a broad hyaline lamella fringed with small teeth. Maxilliped (Fig. 27) lacking ornamentation on the first segment. Two naked setae on the second segment 6.5 and 28.5. Small third segment with a small naked seta and two nearly equal terminal spinelike elements.

Ventral area between the maxillipeds and the first pair of legs like that in *A. verseveldti*.

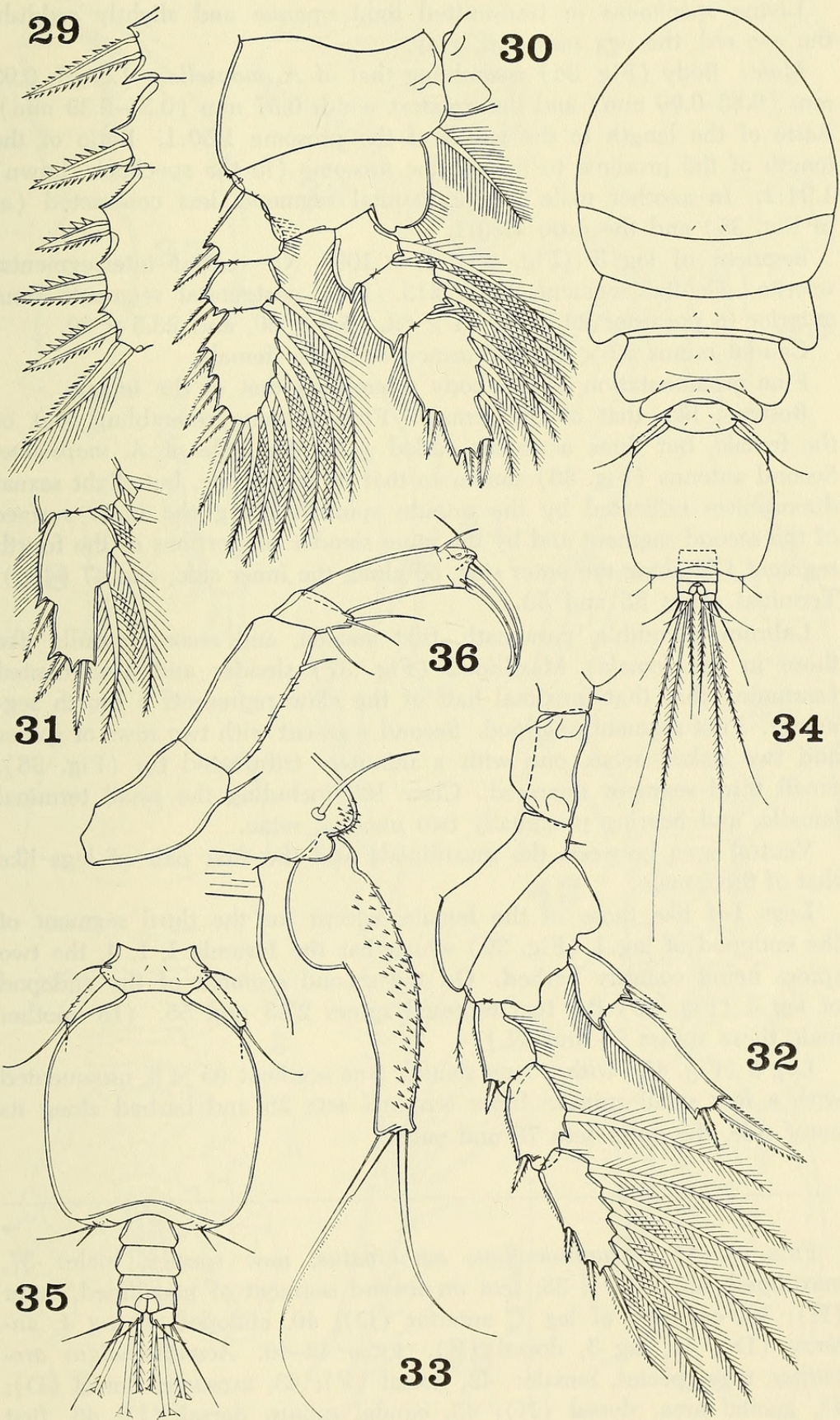
Legs 1-4 (Figs. 28, 30, 31, and 32) segmented and armed as in other species in the genus. Outer spines on the exopod of leg 1 having conspicuous lateral barbs (Fig. 29). Inner coxal element of leg 4 a short naked seta 10 long; inner margin of the basis of this leg smooth. Exopod 196. First segment of the endopod 53×35 (including the spiniform processes) and the inner distal spine 31 and very finely barbed. Second segment 107×32 (greatest width and including the spiniform processes). Outer terminal spine 27.5 and finely barbed; inner terminal spine 68 and more coarsely barbed, the barbs along the outer margin being larger than those on the inner margin. (In another female these spines 33 and 72.)

Leg 5 (Fig. 33) with a long slender free segment having a rounded proximal inner expansion. Segment 143 long, 47 in greatest width at the expansion and 18 in least width distally. Two terminal setae 169 (with a narrow outer lamella) and 135. Seta on the body near the insertion of the segment about 44 and apparently naked. Near this seta a patch of small spines. Free segment ornamented on its outer dorsal surface with short spines.

Leg 6 represented by the two setae and the spiniform process on the genital area.

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FIGS. 29-33. *Acanthomolgus combinatus*, new species, female: 29, spines on exopod of leg 1, anterior (E); 30, leg 2, anterior (B); 31, third segment of endopod of leg 3, anterior (B); 32, leg 4 and intercoxal plate, anterior (B); 33, leg 5, dorsal (D). FIGS. 34-36. *Acanthomolgus combinatus*, new species, male: 34, dorsal (F); 35, urosome, dorsal (G), 36, second antenna, posterior (outer) (D).



Living specimens in transmitted light opaque and slightly reddish, the eye red, the egg sacs dark gray.

Male: Body (Fig. 34) resembling that of *A. mopsellae*. Length 0.93 mm (0.83–0.99 mm) and the greatest width 0.37 mm (0.34–0.39 mm). Ratio of the length to the width of the prosome 1.50:1. Ratio of the length of the prosome to that of the urosome (in the specimen drawn) 1.94:1. In another male the postgenital segments less contracted (as in Fig. 35) and the ratio 1.70:1.

Segment of leg 5 (Fig. 35) 47×109 . No ventral intersegmental sclerite. Genital segment 224×213 . Four postgenital segments from anterior to posterior 29×57 , 21×62 , 15.5×60 , and 23.5×60 .

Caudal ramus 22×24 , and armed as in the female.

Fine ornamentation of the body resembling that of the female.

Rostrum like that of the female. First antenna resembling that of the female, but three aesthetes added as in the male of *A. mopsellae*. Second antenna (Fig. 36) similar to that of the female, but slight sexual dimorphism indicated by the minute spinules along the inner surface of the second segment and by the more slender proportions of the fourth segment (79 along the outer side, 53 along the inner side, and 47 wide). Terminal claws 55 and 53.

Labrum, mandible, paragnath, first maxilla, and second maxilla like those in the female. Maxilliped (Fig. 37) slender and 4-segmented (assuming that that proximal half of the claw represents a fourth segment). First segment unarmed. Second segment with two rows of spines and two naked setae, one with a minutely trifurcated tip (Fig. 38). Small third segment unarmed. Claw 168 including the small terminal lamella, and bearing proximally two unequal setae.

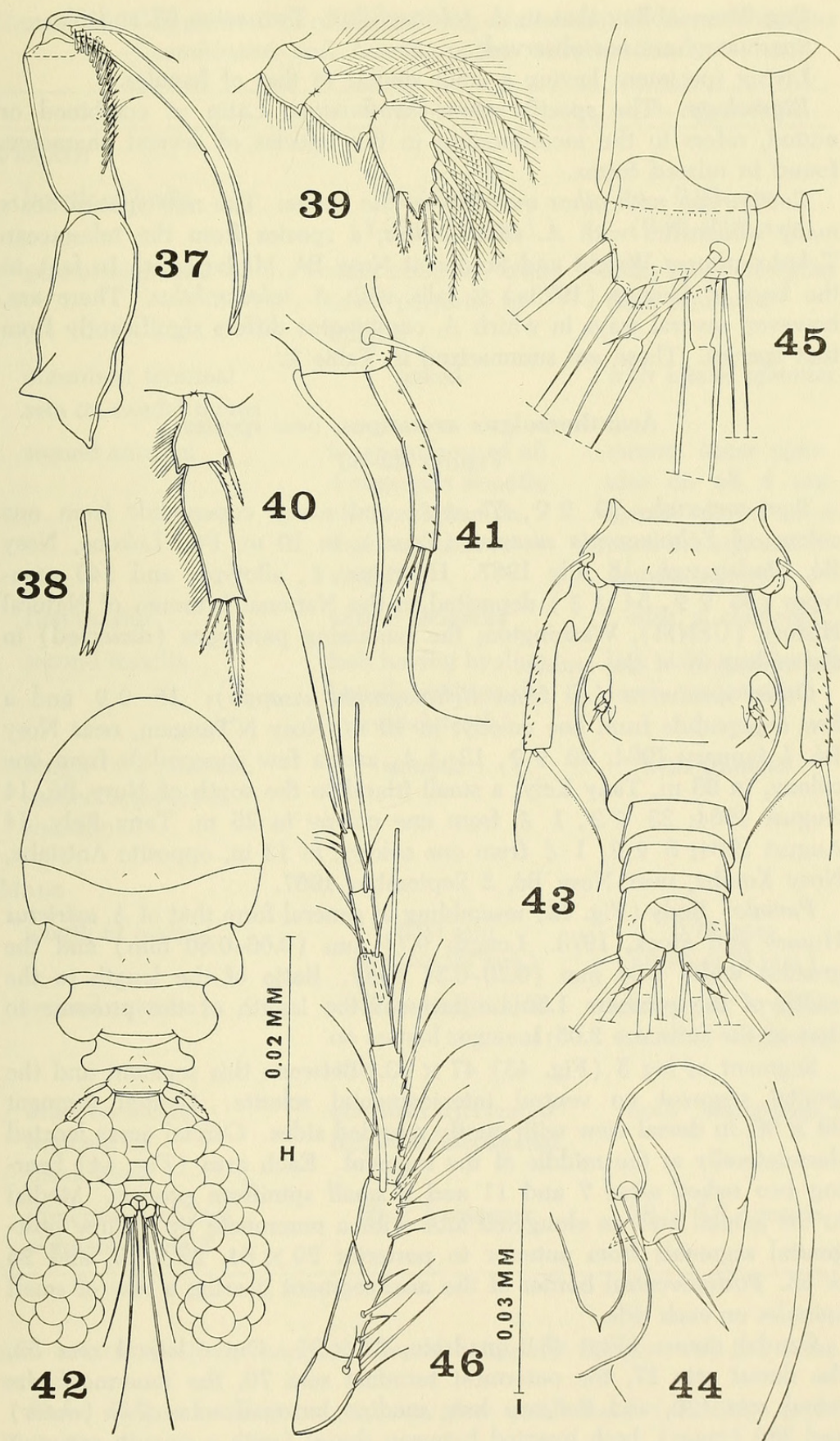
Ventral area between the maxillipeds and the first pair of legs like that of the female.

Legs 1–4 like those of the female, except for the third segment of the endopod of leg 1 (Fig. 39) which has the formula I, I, 4, the two spines being coarsely barbed. On the second segment of the endopod of leg 4 (Fig. 40) the two terminal spines 27.5 and 55. (In another male these spines 25 and 52.)

Leg 5 (Fig. 41) with a long slender free segment 65×8 , ornamented with a few small spines. Inner terminal seta 28 and barbed along its outer side, the outer seta 70 and naked.

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FIGS. 37–41. *Acanthomolgus combinatus*, new species, male: 37, maxilliped, inner (D); 38, seta on second segment of maxilliped, outer (H); 39, endopod of leg 1, anterior (D); 40, endopod of leg 4, anterior (D); 41, leg 5, dorsal (E). FIGS. 42–46. *Acanthomolgus arc-tatipes*, new species, female: 42, dorsal (F); 43, urosome, dorsal (D); 44, genital area, dorsal (H); 45, caudal ramus, dorsal (I); 46, first antenna, dorsal (D).



Leg 6 resembling that in *A. telestophilus*. Two setae 65 and 39. Spermatophore not observed.

Living specimens having a color similar to that of females.

Etymology: The specific name *combinatus*, Latin = combined or united, refers to the incorporation in this species of several characters found in related forms.

Comparison with other members of the genus: The new species bears many similarities with *A. telestophilus*, a species from the telestacean *Telesto arborea* Wright and Studer at Nosy Bé, Madagascar. In fact, in the keys of Humes (1973a) it falls with *A. telestophilus*. There are, however, several ways in which *A. combinatus* differs significantly from that species. These are summarized in Table 2.

***Acanthomolgus arctatipes*, new species**

Figures 42–63

Type-material: 99 ♀♀, 57 ♂♂, and many copepodids from one colony of *Echinogorgia sasappo* (Esper), in 10 m, Pte. Lokobe, Nosy Bé, Madagascar, 18 July 1967. Holotype ♀, allotype, and 149 paratypes (95 ♀♀, 54 ♂♂) deposited in the National Museum of Natural History (USNM), Washington; the remaining paratypes (dissected) in the collection of the author.

Other specimens (all from *Echinogorgia sasappo*): 16 ♀♀ and a few copepodids from one colony, in 10 m, Nosy N'Tangam, near Nosy Bé, 1 January 1964; 49 ♀♀, 13 ♂♂, and a few copepodids from one colony, in 25 m, Tany Kely, a small island to the south of Nosy Bé, 14 August 1964; 33 ♀♀, 1 ♂ from one colony in 25 m, Tany Kely, 14 August 1964; 6 ♀♀, 1 ♂ from one colony, in 13 m, opposite Antsiabe, Nosy Komba, near Nosy Bé, 2 September 1967.

Female: Body (Fig. 42) resembling in general form that of *A. astrictus* Humes and Stock, 1973. Length 0.74 mm (0.66–0.80 mm) and the greatest width 0.34 mm (0.29–0.37 mm). Ratio of the length to the width of the prosome 1.52:1. Ratio of the length of the prosome to that of the urosome 2.05:1.

Segment of leg 5 (Fig. 43) 47×93 . Between this segment and the genital segment no ventral intersegmental sclerite. Genital segment 99×90 , in dorsal view with gently rounded sides. Genital areas located dorsolaterally at the middle of the segment. Each area (Fig. 44) bearing two naked setae 7 and 11 and a small spiniform process. Medial to the genital area an elongated lobe with a mucronate tip. Three post-genital segments from anterior to posterior 29×54 , 23×52 , and 24×52 . Posteroventral border of the anal segment bearing a row of small spinules on each side.

Caudal ramus (Fig. 45) quadrate, 21×21 . Outer lateral seta 52, the dorsal seta 17, the outermost terminal seta 70, the innermost terminal seta 130, and the two long median terminal setae 247 (outer) and 380 (inner), both inserted between dorsal (with a smooth margin)

TABLE 2. Comparison of distinguishing characters of *Acanthomolgus combinatus* and *Acanthomolgus telestophilus*.

	<i>A. combinatus</i>	<i>A. telestophilus</i>
FEMALE		
length of body	1.10 mm (1.02–1.19 mm)	0.91 mm (0.85–0.95 mm)
genital segment	sides obliquely truncated posterior to middle	sides rounded rather than truncated
outermost terminal seta on caudal ramus	naked	with lateral spinules
second antenna	inner surfaces of all 4 segments smooth; all three setae on third segment straight	minute inner spinules on all 4 segments; one of setae on third segment angularly bent
first maxilla	with 3 elements	with 4 elements
second maxilla	lash having hyaline lamella with small marginal teeth	lash with graduated teeth; no lamella
longer of 2 setae on second segment of maxilliped	smooth	with spinules
MALE		
length of body	0.93 mm (0.83–0.99 mm)	0.75 mm (0.72–0.79 mm)
second antenna	with inner spinules on second segment only	with inner spinules on all 4 segments
setae on second segment of maxilliped	one with trifurcated tip, other attenuated	both attenuated
dimensions of free segment of leg 5	65 × 8 microns	38 × 8.5 microns

and ventral (with a marginal row of spinules) flanges. All the setae naked.

Body surface bearing only a very few small hairs (sensilla) as in Fig. 42.

Egg sac (Fig. 42) 350×145 , reaching to more than half the length of the longest ramal setae, and containing numerous eggs 45–47 in diameter.

Rostrum like that in *A. astrictus*.

First antenna (Fig. 46) 285 long. Lengths of the seven segments: 21 (44 along the anterior edge), 81, 21, 36, 44, 34, and 25 respectively. Formula for the armature like that in *A. combinatus*. All the setae naked.

Second antenna (Fig. 47) segmented and armed as in the previous two species. One of the three setae on the third segment characteristically bent. Fourth segment 62 along the outer side, 43 along the inner side, and 14 wide. Stouter claw 42 along its axis, the more slender claw 38. All the setae naked.

Labrum (Fig. 48) with two broad posteroventral lobes.

Mandible (Fig. 49) basically similar to that of *A. astrictus*, but the convex side of the base having an expanded hyaline area without spinules followed by a minutely serrated portion. Paragnath (Fig. 48) a small hairy lobe. First maxilla (Fig. 50) with four elements, one of them with small spinules. Second maxilla (Fig. 51) resembling in general structure that of *A. astrictus*, but the lash having along its convex side an expanded hyaline lamella with a finely dentate margin. Maxilliped (Fig. 52) also resembling that of *A. astrictus* but the first segment lacking spinules and the two setae on the second segment more unequal, 7.5 and 22, with a ratio of approximately 1:3.

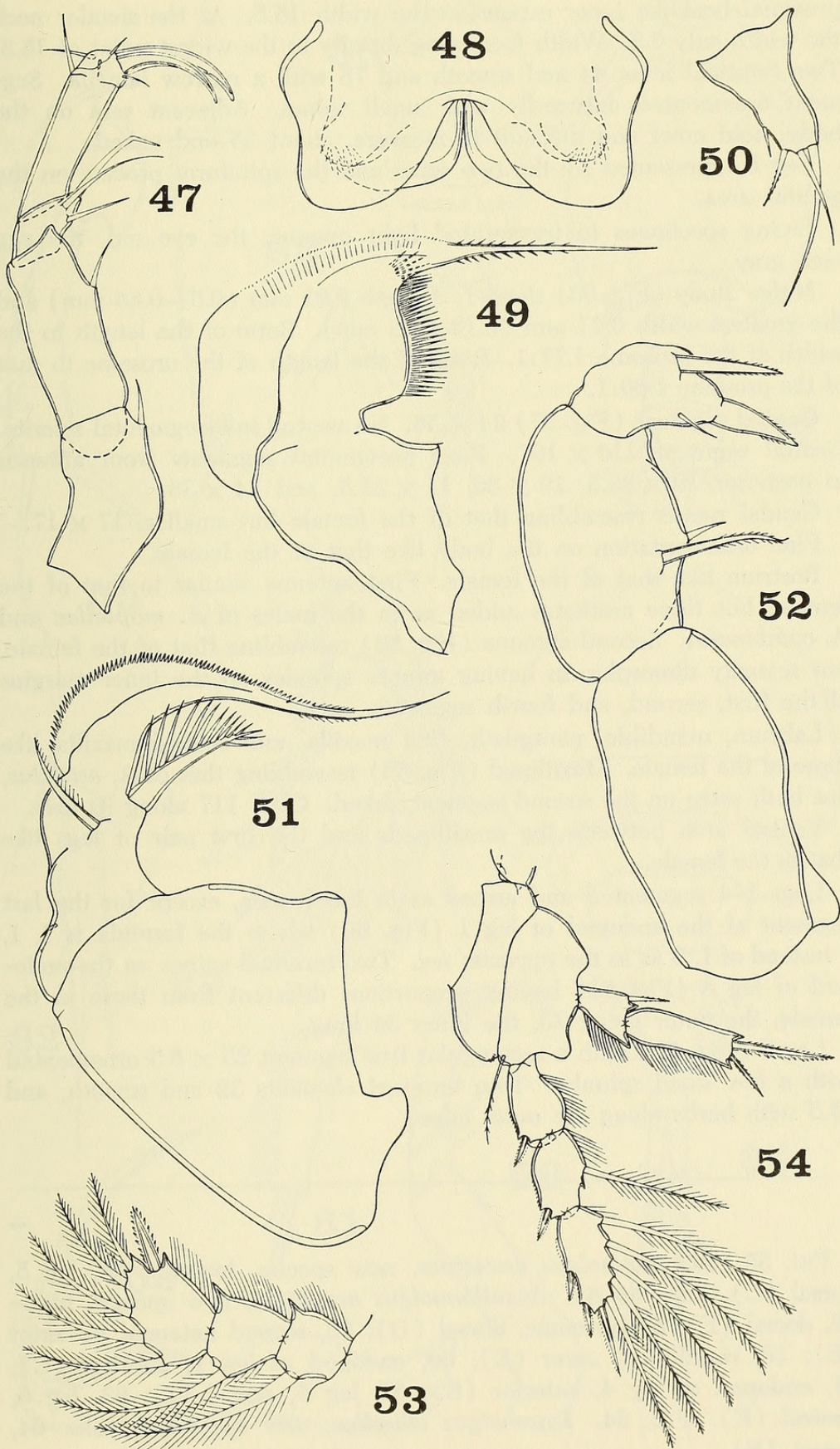
Ventral area between the maxillipeds and the first pair of legs like that in *A. astrictus*.

Legs 1–4 segmented and armed as in *A. astrictus* with only minor differences in details. In the endopod of leg 1 (Fig. 53) the terminal process on the third segment having a slightly different form than in that species. In leg 4 (Fig. 54) the inner coxal seta only 2 long. Exopod 112. First segment of the endopod 28.5×22 (including the terminal spiniform processes) and its inner distal spine (extremely finely barbed) 13. Second segment 55×17.5 (greatest width and the length including the terminal spiniform processes). Two terminal spines unequal, the outer 21 and slender with very small barbs, the inner 42 and stouter with more prominent barbs along the outer side than the inner side.

Leg 5 (Fig. 55) with an elongated free segment 86 long. At the

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FIGS. 47–54. *Acanthomolgus arctatipes*, new species, female: 47, second antenna, posterior (E); 48, labrum, with paragnaths indicated by broken lines, ventral (C); 49, mandible, anterior (I); 50, first maxilla, anterior (C); 51, second maxilla, posterior (I); 52, maxilliped, posterior (I); 53, endopod of leg 1, anterior (E); 54, leg 4, anterior (D).



proximal beaklike inner expansion the width 15.5. At the slender neck the width only 6.5. Width increasing distally to the widest point of 15.5. Two terminal setae 44 and smooth and 78 with a narrow lamella. Segment ornamented outwardly with small spines. Adjacent seta on the body, held erect and difficult to measure, about 35 and naked.

Leg 6 represented by the two setae and the spiniform process on the genital area.

Living specimens in transmitted light opaque, the eye red, the egg sacs gray.

Male: Body (Fig. 56) slender. Length 0.61 mm (0.57–0.65 mm) and the greatest width 0.21 mm (0.19–0.23 mm). Ratio of the length to the width of the prosome 1.77:1. Ratio of the length of the urosome to that of the prosome 1.60:1.

Genital segment (Fig. 57) 24×56 . No ventral intersegmental sclerite. Genital segment 110×107 . Four postgenital segments from anterior to posterior 19×38.5 , 19×36 , 11×35.5 , and 14×36 .

Caudal ramus resembling that of the female but smaller, 17×17 .

Fine ornamentation on the body like that of the female.

Rostrum like that of the female. First antenna similar to that of the female, but three aesthetes added as in the males of *A. mopsellae* and *A. combinatus*. Second antenna (Fig. 58) resembling that of the female, but sexually dimorphic in having minute spinules on the inner margins of the first, second, and fourth segments.

Labrum, mandible, paragnath, first maxilla, and second maxilla like those of the female. Maxilliped (Fig. 59) resembling that of *A. strictus*, but both setae on the second segment naked. Claw 117 along its axis.

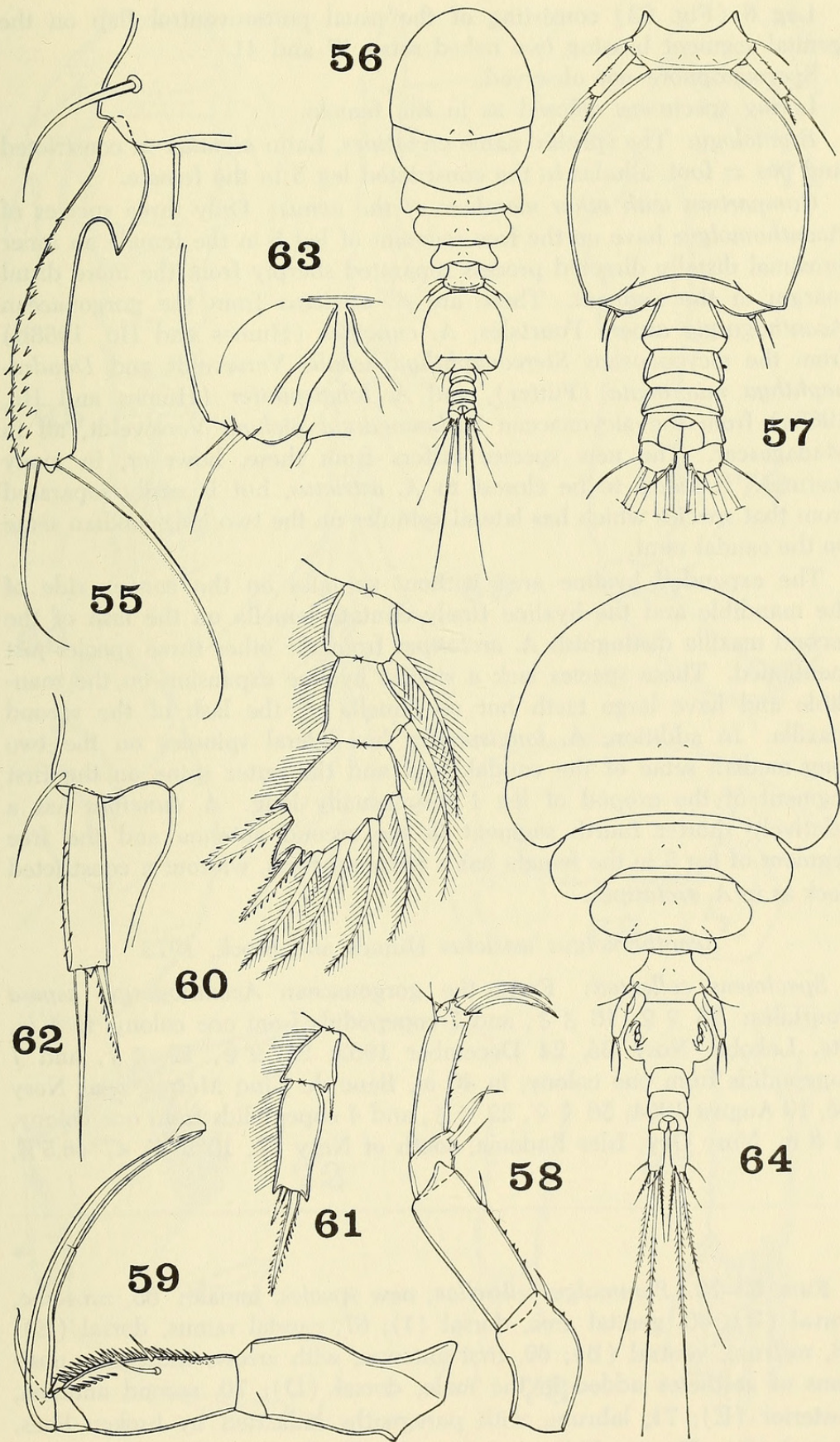
Ventral area between the maxillipeds and the first pair of legs like that in the female.

Legs 1–4 segmented and armed as in the female, except for the last segment of the endopod of leg 1 (Fig. 60) where the formula is I, I, 4 instead of I, 5 as in the opposite sex. Two terminal spines on the endopod of leg 4 (Fig. 61) having proportions different from those in the female, the outer being 13, the inner 34 long.

Leg 5 (Fig. 62) with a rectangular free segment 25×6.5 ornamented with a few small spinules. Two terminal elements 32 and smooth, and 15.5 with barbs along the outer edge.

→

FIG. 55. *Acanthomolgus arctatipes*, new species, female: 55, leg 5, dorsal (C). FIGS. 56–63. *Acanthomolgus arctatipes*, new species, male: 56, dorsal (F); 57, urosome, dorsal (D); 58, second antenna, posterior (E); 59, maxilliped, outer (E); 60, endopod of leg 1, anterior (C); 61, endopod of leg 4, anterior (E); 62, leg 5, dorsal (I); 63, leg 6, ventral (E). FIG. 64. *Paramolgus ellisellae*, new species, female: 64, dorsal (F).



Leg 6 (Fig. 63) consisting of the usual posteroventral flap on the genital segment bearing two naked setae 17 and 41.

Spermatophore not observed.

Living specimens colored as in the female.

Etymology: The specific name *arctatipes*, Latin *arctatus* = constricted and *pes* = foot, alludes to the constricted leg 5 in the female.

Comparison with other members of the genus: Only three species of *Acanthomolgus* have on the free segment of leg 5 in the female an inner proximal distally directed process separated sharply from the more distal margin of the segment. These are *A. astrictus* from the gorgonacean *Acanthogorgia aspera* Pourtalès, *A. cuneipes* (Humes and Ho, 1968b) from the alcyonaceans *Stereonephthya acaulis* Verseveldt and *Dendronephthya mucronata* (Pütter), and *A. longispinifer* (Humes and Ho, 1968a) from the alcyonacean *Siphonogorgia pichoni* Verseveldt, all in Madagascar. The new species differs from these, however, in many features. It seems to be closest to *A. astrictus*, but is easily separated from that species which has lateral spinules on the two long median setae on the caudal rami.

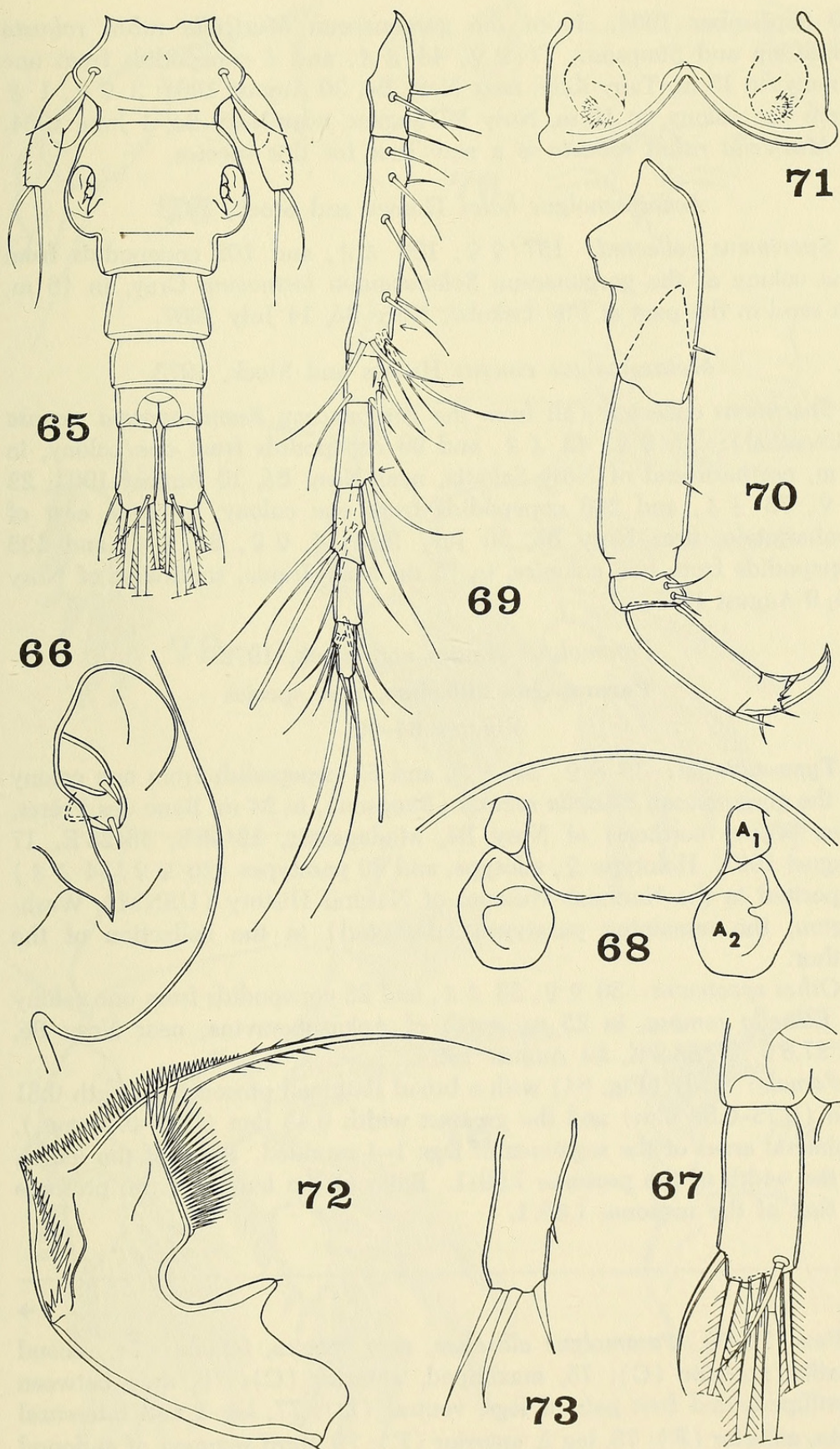
The expanded hyaline area without spinules on the convex side of the mandible and the hyaline finely dentate lamella on the lash of the second maxilla distinguish *A. arctatipes* from the other three species just mentioned. These species lack a similar hyaline expansion on the mandible and have large teeth but no lamella on the lash of the second maxilla. In addition, *A. longispinifer* has lateral spinules on the two long median setae of the caudal rami and the outer spine on the first segment of the exopod of leg 1 is unusually long. *A. cuneipes* has a relatively shorter fourth segment in the second antenna and the free segment of leg 5 in the female has a different form, without a constricted neck as in *A. arctatipes*.

Acanthomolgus astrictus Humes and Stock, 1973

Specimens collected: From the gorgonacean *Acanthogorgia aspera* Pourtalès: 15 ♀♀, 16 ♂♂, and 7 copepodids from one colony, in 4 m, Pte. Lokobe, Nosy Bé, 24 December 1963; 28 ♀♀, 17 ♂♂, and 7 copepodids from one colony, in 40 m, Banc de Cinq Mètres, near Nosy Bé, 19 August 1964; 56 ♀♀, 22 ♂♂, and 4 copepodids from one colony, in 8 m, Nosy Ovy, Isles Radama, south of Nosy Bè, 13°59'S, 47°46.5'E,

→

FIGS. 65–73. *Paramolgus ellisellae*, new species, female: 65, urosome, dorsal (B); 66, genital area, dorsal (I); 67, caudal ramus, dorsal (E); 68, rostrum, ventral (B); 69, first antenna, with arrows indicating positions of aesthetes added in the male, dorsal (D); 70, second antenna, posterior (E); 71, labrum, with paragnaths indicated by broken lines, ventral (E); 72, mandible, posterior (I); 73, first maxilla, anterior (I).



30 September 1964. From the gorgonacean *Muricella rubra robusta* Thomson and Simpson: 77 ♀♀, 44 ♂♂, and 4 copepodids from one colony, in 15 m, Tany Kely, near Nosy Bé, 30 August 1964; 3 ♀♀, 1 ♂ from one colony, in 10 m, Nosy N'Tangam, near Nosy Bé, 1 June 1964.

Muricella rubra robusta is a new host for this species.

Acanthomolgus hales Humes and Stock, 1973

Specimens collected: 157 ♀♀, 190 ♂♂, and 103 copepodids from one colony of the gorgonacean *Solenocaulon tortuosum* Gray, in 18 m, on sand in the pass at Pte. Lokobe, Nosy Bé, 14 July 1967.

Metaxymolgus cinctus Humes and Stock, 1973

Specimens collected (all from the gorgonacean *Psammogorgia ramosa* Kükenthal): 17 ♀♀, 43 ♂♂, and 99 copepodids from one colony, in 2 m, northern end of Nosy Sakatia, near Nosy Bé, 19 August 1963; 22 ♀♀, 73 ♂♂, and 206 copepodids from one colony, in 2 m, east of Ambariotelo, near Nosy Bé, 20 July 1967; 4 ♀♀, 60 ♂♂, and 132 copepodids from two colonies, in 15 m, Nosy Iranja, southwest of Nosy Bé, 9 August 1967.

Paramolgus Humes and Stock, 1972

Paramolgus ellisellae, new species

Figures 64–90

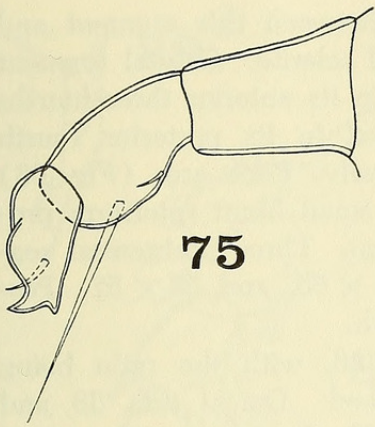
Type-material: 30 ♀♀, 38 ♂♂, and 63 copepodids from one colony of the gorgonacean *Ellisella ramosa* (Simpson), in 24 m, Banc des Frères, Isles Mitsio, northeast of Nosy Bé, Madagascar, 12°58'S, 48°28'E, 17 August 1967. Holotype ♀, allotype, and 60 paratypes (26 ♀♀, 34 ♂♂) deposited in the National Museum of Natural History (USNM), Washington; the remaining paratypes (dissected) in the collection of the author.

Other specimens: 30 ♀♀, 23 ♂♂, and 22 copepodids from one colony of *Ellisella ramosa*, in 25 m, north of Ankazoberavina, near Nosy Bé, 13°27.6'S, 47°58.2'E, 24 August 1967.

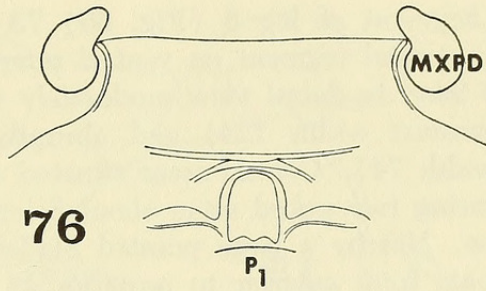
Female: Body (Fig. 64) with a broad flattened prosome. Length 0.81 mm (0.75–0.86 mm) and the greatest width 0.43 mm (0.37–0.46 mm). Epimeral areas of the segments of legs 1–4 rounded. Ratio of the length to the width of the prosome 1.09:1. Ratio of the length of the prosome to that of the urosome 1.65:1.

→

FIGS. 74–79. *Paramolgus ellisellae*, new species, female: 74, second maxilla, anterior (C); 75, maxilliped, anterior (C); 76, area between maxillipeds and first pair of legs, ventral (D); 77, leg 1 and intercoxal plate, anterior (E); 78, leg 2, anterior (E); 79, third segment of endopod of leg 3, anterior (E).



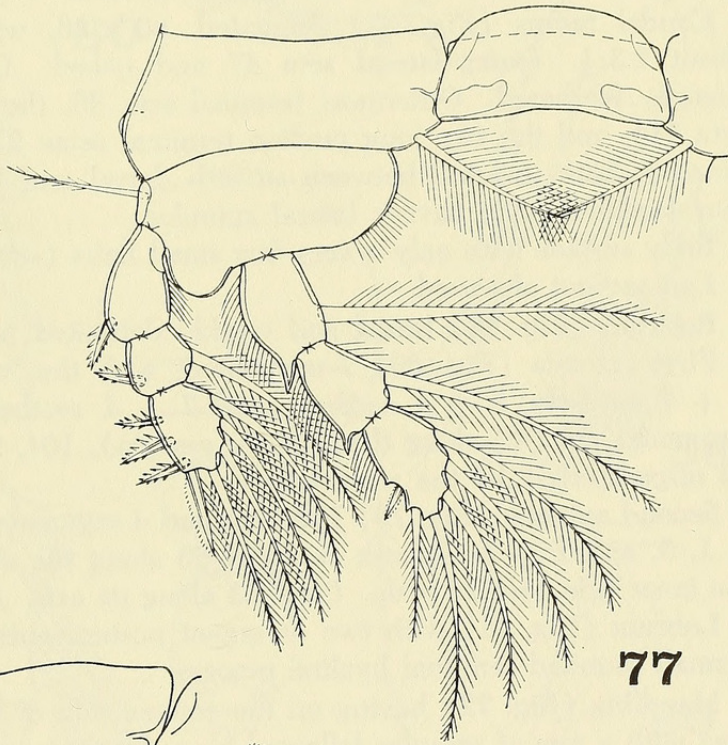
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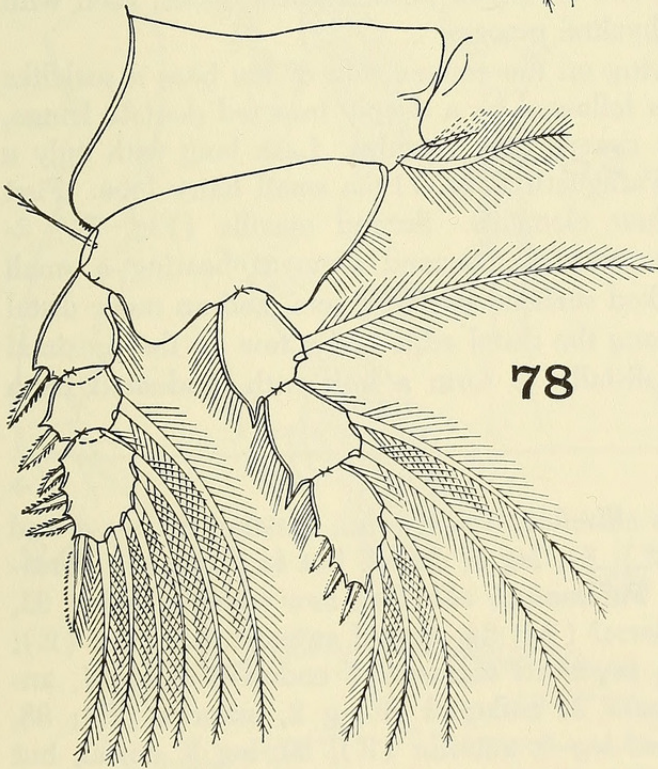
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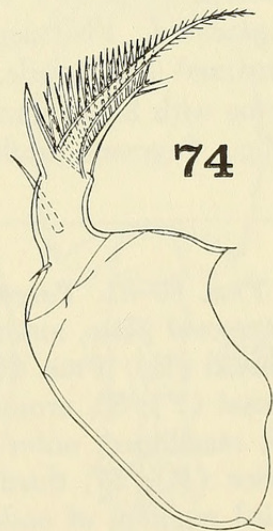
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74

Segment of leg 5 (Fig. 65) 73×112 . Between this segment and the genital segment no ventral intersegmental sclerite. Genital segment 96 long, in dorsal view moderately widened in its anterior three-fourths (greatest width 122) and abruptly narrowed in its posterior fourth (width 74). Genital areas situated dorsolaterally. Each area (Fig. 66) bearing two naked setae about 8 long and a small blunt spiniform process. Nearby a large pointed bladelike process. Three postgenital segments from anterior to posterior 42×68 , 31×65 , and 26×57 . Posteroventral border of the anal segment smooth.

Caudal ramus (Fig. 67) elongated, 60×26 , with the ratio being about 2.3:1. Outer lateral seta 47 and naked. Dorsal seta 38 and sparsely feathered. Outermost terminal seta 88, the innermost terminal seta 115, and the two long median terminal setae 210 (outer) and 400 (inner), both inserted between smooth dorsal and ventral flanges. All four terminal setae having lateral spinules.

Body surface with only a very few small hairs (sensilla) as in Fig. 64. Egg sac not observed.

Rostrum (Fig. 68) broad and weakly delimited posteroventrally.

First antenna (Fig. 69) 7-segmented, with the formula 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Lengths of the segments: 24 (49 along the anterior margin), 104, 24, 38, 34, 27, and 24 respectively. All the setae naked.

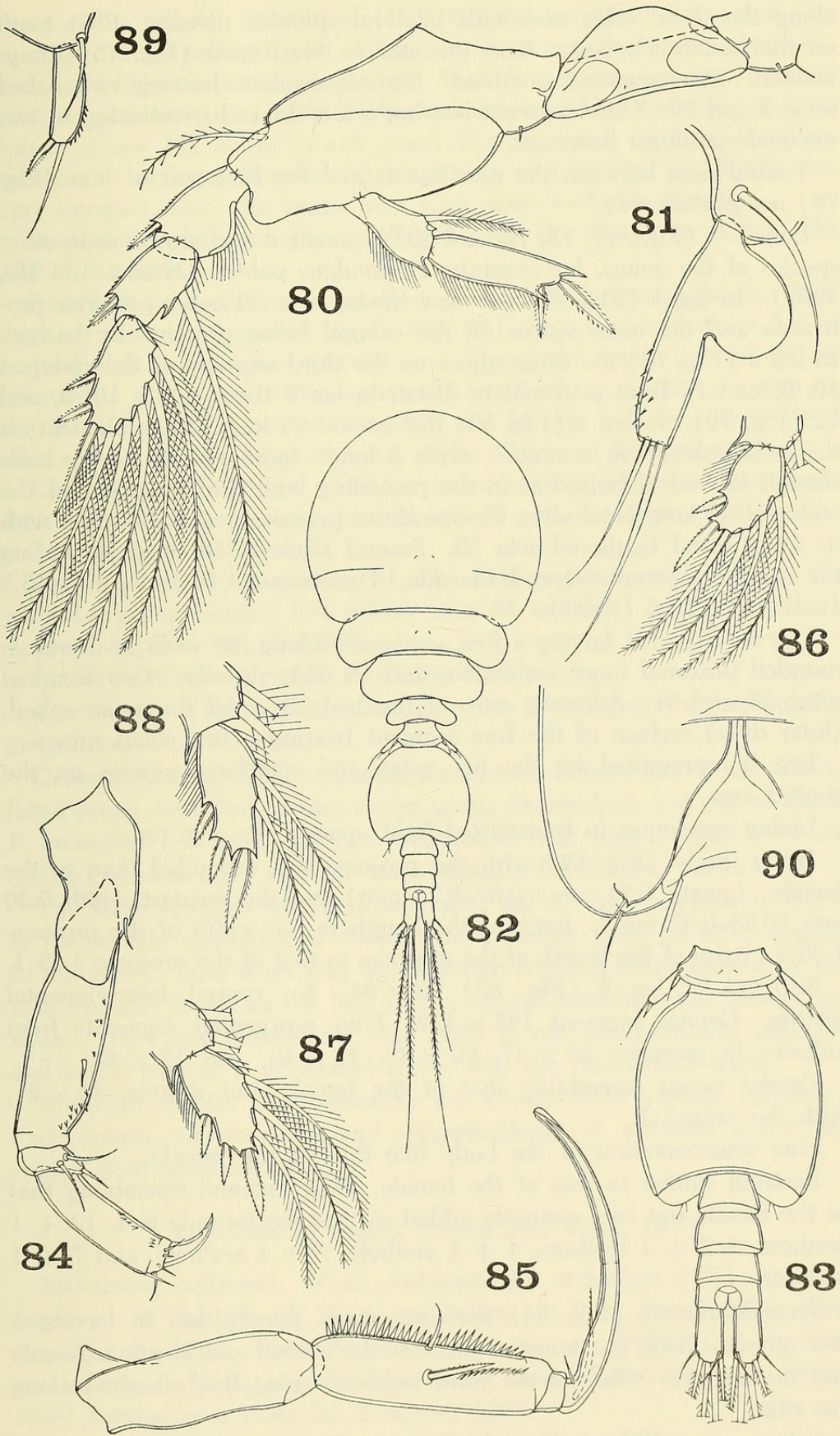
Second antenna (Fig. 70) 180 long and 4-segmented with the formula 1, 1, 3, and I + 5. Fourth segment 60 along the outer side, 45 along the inner side, and 17 wide. Claw 23 along its axis. All the setae naked.

Labrum (Fig. 71) with two divergent posteroventral lobes, each with a small rounded terminal hyaline process.

Mandible (Fig. 72) having on the convex side of the base a scalelike area with a row of spinules followed by a deeply insected dentate fringe, and on the concave side a row of long spinules. Lash long with only a few spinules proximally. Paragnath (Fig. 71) a small hairy lobe. First maxilla (Fig. 73) with four elements. Second maxilla (Fig. 74) 2-segmented. First segment unarmed. Second segment bearing a small proximal inner setule, a naked surficial posterior seta, and an outer distal spine with long spinules along the distal edge and a few on the proximal edge. Segment produced distally to form a lash with graduated teeth

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FIGS. 80-81. *Paramolgus ellisellae*, new species, female: 80, leg 4 and intercoxal plate, anterior (E); 81, leg 5, dorsal, but free segment dorsoventral (E). FIGS. 82-90. *Paramolgus ellisellae*, new species, male: 82, dorsal (F); 83, urosome, dorsal (B); 84, second antenna, posterior (E); 85, maxilliped, outer (D); 86, third segment of endopod of leg 1, anterior (E); 87, third segment of endopod of leg 2, anterior (E); 88, third segment of endopod of leg 3, anterior (E); 89, leg 5, dorsal, but free segment dorsoventral (E); 90, leg 6, ventral (E).



along the distal edge and with bilateral spinules distally. First tooth on the lash much larger than the others. Maxilliped (Fig. 75) 3-segmented. First segment unarmed. Second segment bearing two naked setae 5 and 50. Third segment bearing a seta 14 and terminating in two unequal spiniform processes.

Ventral area between the maxillipeds and the first pair of legs (Fig. 76) not protuberant.

Legs 1-4 (Figs. 77, 78, 79, and 80) segmented and armed as in other species of the genus, for example, *Paramolgus politus* (Humes and Ho, 1967). In leg 1 (Fig. 77) the coxa having a small outer posterior protrusion and the outer spines on the exopod being prominently barbed. In leg 2 (Fig. 78) the three spines on the third segment of the endopod 10, 9, and 11 from proximal to distal; in leg 3 these spines 10, 9, and 12 (Fig. 79). In leg 4 (Fig. 80) the exopod 95 long. Inner element on the coxa reduced to a minute setule 5 long. Inner margin of the basis smooth instead of haired as in the preceding legs. First segment of the endopod 30 long (including the spiniform processes) and 16 wide, with its inner distal feathered seta 33. Second segment 54 long (including the spiniform processes) and 13 wide. Two terminal barbed spines 15.5 (outer) and 27.5 (inner).

Leg 5 (Fig. 81) having a free segment 80 long, 39 wide at the large rounded proximal inner expansion, and 18 wide distally. Two terminal setae 57 and 81. Adjacent seta on the body 57. All the setae naked. Outer distal surface of the free segment bearing a few small spines.

Leg 6 represented by the two setae and spiniform process on the genital area.

Living specimens in transmitted light opaque, the eye red.

Male: Body (Fig. 82) with the prosome less expanded than in the female. Length 0.71 mm (0.67-0.73 mm) and the greatest width 0.30 mm (0.28-0.32 mm). Ratio of the length to the width of the prosome 1.30:1. Ratio of the length of the prosome to that of the urosome 1.49:1.

Segment of leg 5 (Fig. 83) 29×64 . No ventral intersegmental sclerite. Genital segment 143×122 . Four postgenital segments from anterior to posterior 26×47 , 29×47 , 21×43 , and 18×42 .

Caudal ramus resembling that of the female, but shorter, 42×21 , with the ratio 2:1.

Fine ornamentation of the body like that of the female.

Rostrum similar to that of the female. First antenna resembling that of the female but two aesthetes added so that the formula is 4, 13 + 1 aesthete, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete.

Second antenna (Fig. 84) showing sexual dimorphism in having a few spinules along the inner surfaces of the second and fourth segments and in the three setae on the third segment being finely barbed along one edge.

Labrum, mandible, paragnath, first maxilla, and second maxilla like

those of the female. Maxilliped (Fig. 85) slender and 4-segmented (assuming that the proximal part of the claw represents the fourth segment). First and third segments unarmed. Second segment bearing a naked seta, a spiniform seta finely barbed along one side, and two rows of spines. Claw 142 along its axis (including the small terminal lamella), showing a weak subdivision about midway, and bearing proximally two very unequal setae, the longer seta with short barbules distally.

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

Legs 1-4 segmented and armed as in the female, except for the third segment of the endopod of leg 1 (Fig. 86) where the formula is I, I, 4 instead of I, 5 as in the opposite sex. These two spines 13 and 22 respectively. Slight sexual dimorphism in leg 2 where the three spines on the third endopod segment (Fig. 87) are 14, 14, and 23 and in leg 3 where these spines (Fig. 88) are 15.5, 15.5, and 28.5 respectively.

Leg 5 (Fig. 89) with a small free segment 33×11 , armed terminally with a short spiniform finely barbed seta 15 with a narrow inner lamella, and a longer naked seta 34.

Leg 6 (Fig. 90) consisting of the usual posteroventral flap on the genital segment bearing two naked setae 24 and 28.

Spermatophore not observed.

Living specimens colored as in the female.

Etymology: The specific name *ellisellae* is the genitive form of the generic name of the host.

Comparison with other species in the genus: Humes and Stock (1973) listed seven described species in the genus *Paramolgus*, but one of these, *P. anomalus* (A. Scott, 1909) was included with reservations. Two additional species have recently been described (Humes, 1973b).

The large rounded proximal expansion on the free segment of leg 5 in the female distinguishes *Paramolgus ellisellae* from all other species in the genus. Both sexes may be separated from all other species by the proximalmost tooth on the lash of the second maxilla being greatly enlarged. In other *Paramolgus* this tooth is not conspicuously enlarged and forms part of a graduated series with the succeeding teeth.

Although species of *Paramolgus* are known from various cnidarians (actinarians, alcyonaceans, and antipatharians), *P. ellisellae* is the first record from gorgonaceans.

Telestacicola angoti Humes and Stock, 1973

Specimens collected: From *Suberogorgia reticulata* (Ellis and Solander): 14 ♀♀, 6 ♂♂ from one colony, in 8 m, Pte. Lokobe, Nosy Bé, 25 July 1967. From *Suberogorgia suberosa* (Pallas): 1 ♀ from one colony, in 17 m, near the black buoy north of Pte. Ambarionaomby, Nosy Komba, near Nosy Bé, 5 August 1967.

These two gorgonaceans are new hosts for *T. angoti*.

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