

POECILOSTOME COPEPODS (LICHOMOLGIDAE)
FROM THE ALCYONACEAN CORAL
CESPITULARIA MULTIPINNATA
IN THE MOLUCCAS

Arthur G. Humes and Masahiro Dojiri

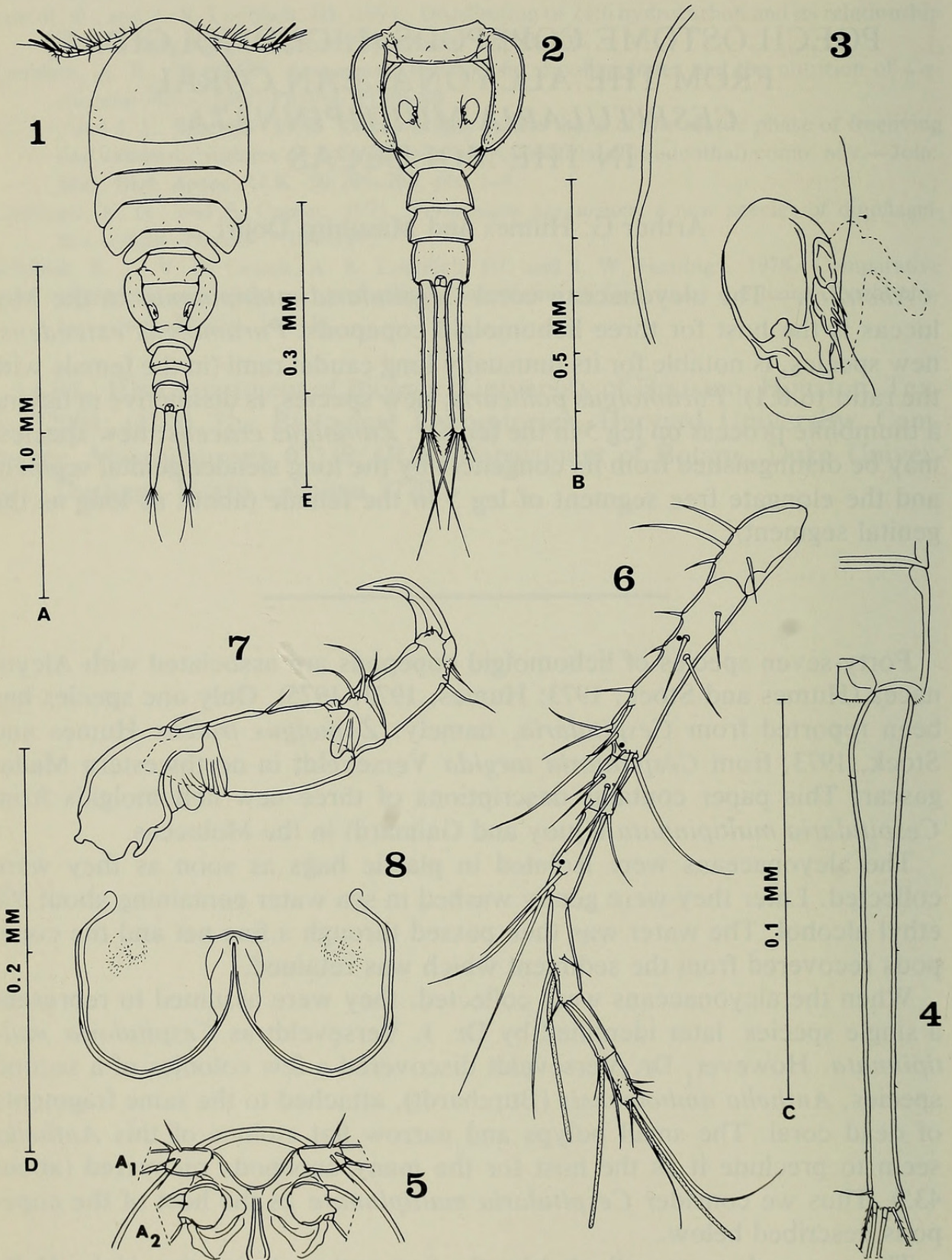
Abstract.—The alcyonacean coral *Cespitularia multipinnata* in the Moluccas is the host for three lichomolgid copepods. *Paramolgus extendens*, new species, is notable for its unusually long caudal rami (in the female with the ratio 16.8:1). *Paramolgus pollicaris*, new species, is distinctive in having a thumblike process on leg 5 in the female. *Zamolgus cracens*, new species, may be distinguished from its congeners by the long slender genital segment and the elongate free segment of leg 5 in the female (about as long as the genital segment).

Forty-seven species of lichomolgid copepods are associated with Alcyonacea (Humes and Stock, 1973; Humes, 1973, 1975). Only one species has been reported from *Cespitularia*, namely, *Zamolgus tridens* Humes and Stock, 1973, from *Cespitularia turgida* Verseveldt in northwestern Madagascar. This paper contains descriptions of three new lichomolgids from *Cespitularia multipinnata* (Quoy and Gaimard) in the Moluccas.

The alcyonaceans were isolated in plastic bags as soon as they were collected. Later they were gently washed in sea water containing about 5% ethyl alcohol. The water was then passed through a fine net and the copepods recovered from the sediment which was retained.

When the alcyonaceans were collected, they were assumed to represent a single species, later identified by Dr. J. Verseveldt as *Cespitularia multipinnata*. However, Dr. Verseveldt discovered a few colonies of a second species, *Anthelia amboinensis* (Burchardt), attached to the same fragments of dead coral. The small polyps and narrow flat stolons of this *Anthelia* seem to preclude it as the host for the many copepods recovered (about 435). Thus we consider *Cespitularia multipinnata* as the host of the copepods described below.

The copepods were collected by the first author during the *Alpha Helix* East Asian Bioluminescence Expedition, which was supported by the National Science Foundation under grants OFS 74 01830 and OFS 74 02888 to the Scripps Institution of Oceanography and grant BMS 74 23242 to the University of California, Santa Barbara. The study of the copepods was aided by NSF grant DEB 77 11879.



Figs. 1-8. *Paramolgus extendens*, new species, female: 1. Dorsal (A); 2. Urosome, dorsal (B). 3. Genital area, dorsal (C). 4. Caudal ramus, dorsal (D). 5. Rostrum, ventral (E). 6. First antenna, with three dots indicating positions of aesthetes in the male, dorsal (D). 7. Second antenna, postero-inner (D). 8. Labrum, with paragnaths indicated by broken lines, ventral (F).

We are greatly indebted to Dr. J. Verseveldt, Zwolle, The Netherlands, for the identification of the alcyonaceans.

The observations and measurements were made on specimens cleared in lactic acid. All figures were drawn with the aid of a camera lucida. The letter after the explanation of each figure refers to the scale at which it was drawn. The abbreviations used are: A_1 = first antenna, A_2 = second antenna, L = labrum, MXPD = maxilliped, and P_1 = leg 1.

Lichomolgidae Kossmann, 1877
Paramolgus Humes and Stock, 1972
Paramolgus extendens, new species
Figs. 1–28

Type-material.—124 ♀♀, 141 ♂♂, and 106 copepodids from 15 colonies of the alcyonacean *Cespitularia multipinnata* (Quoy and Gaimard), in 5 m, southwestern side of Goenoeng Api, Banda Islands, 4°31'45"S, 129°51'55"E, 25 May 1975. Holotype ♀ (USNM 171298), allotype (USNM 171299), and 255 paratypes (118 ♀♀, 137 ♂♂) (USNM 171300) deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C.; the remaining paratypes (dissected) and the copepodids in the collection of the first author.

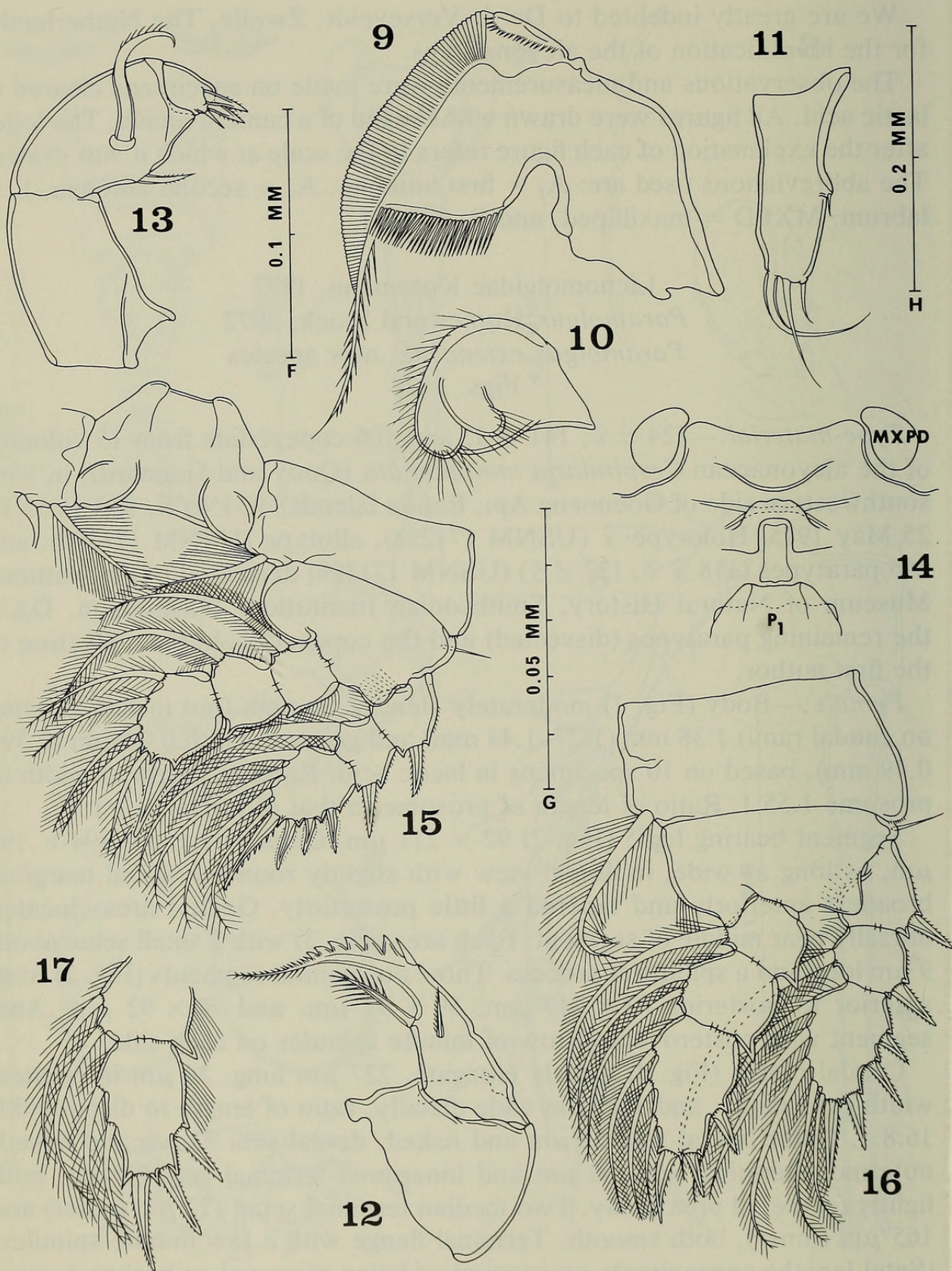
Female.—Body (Fig. 1) moderately slender. Length (not including setae on caudal rami) 1.38 mm (1.27–1.44 mm) and greatest width 0.44 mm (0.39–0.49 mm), based on 10 specimens in lactic acid. Ratio of length to width of prosome 1.55:1. Ratio of length of prosome to that of urosome 1:1.

Segment bearing leg 5 (Fig. 2) $92 \times 211 \mu\text{m}$. Genital segment $194 \times 194 \mu\text{m}$, as long as wide, in dorsal view with slightly rounded lateral margins, broadest anteriorly and tapered a little posteriorly. Genital areas located dorsally near middle of segment. Each area (Fig. 3) with 2 small setae about $9 \mu\text{m}$ long and a spiniform process. Three postgenital segments (Fig. 2) from anterior to posterior $70 \times 113 \mu\text{m}$, $59 \times 97 \mu\text{m}$, and $70 \times 92 \mu\text{m}$. Anal segment with posteroventral row of minute spinules on each side.

Caudal ramus (Fig. 4) greatly elongate, $227 \mu\text{m}$ long, $24 \mu\text{m}$ in greatest width proximally, and $13.5 \mu\text{m}$ wide distally, ratio of length to distal width 16.8:1. Outer lateral seta $52 \mu\text{m}$ and naked, dorsal seta $23 \mu\text{m}$ and naked, outermost terminal seta $60 \mu\text{m}$ and innermost terminal seta $73 \mu\text{m}$, both lightly feathered proximally. Two median terminal setae $122 \mu\text{m}$ (outer) and $165 \mu\text{m}$ (inner), both smooth. Terminal flange with a few minute spinules. (Setal lengths approximate on account of being recurved or broken.)

Body surface with small hairs (sensilla) as in Figs. 1 and 2.

Egg sac approximately $384 \times 184 \mu\text{m}$, containing about 14 eggs ranging from 81–108 μm in diameter. (All egg sacs seen with eggs partly hatched or damaged.)



Figs. 9-17. *Paramolgus extendens*, new species, female: 9. Mandible, posterior (C); 10. Paragnath, ventral (G); 11. First maxilla, anterior (C); 12. Second maxilla, posterior (F). 13. Maxilliped, posterior (F). 14. Area between maxillipeds and first pair of legs, ventral (H). 15. Leg 1 and intercoxal plate, anterior (D). 16. Leg 2, anterior (D). 17. Third segment of endopod of leg 3, anterior (D).

Rostrum (Fig. 5) with rounded posteroventral margin.

First antenna (Fig. 6) 310 μm long. Lengths of 7 segments (measured along posterior nonsetiferous margins): 38 (59 μm along anterior margin), 84, 27, 43, 43, 32, and 22 μm respectively. Formula for armature: 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All setae smooth.

Second antenna (Fig. 7) 218 μm long including claw. Armature: 1, 1, 3, and claw + 5 setules. Fourth segment 57 μm along outer side, 34 μm along inner side, and 25 μm wide. Claw 48 μm along axis.

Labrum (Fig. 8), mandible (Fig. 9), paragnath (Fig. 10), and first maxilla (Fig. 11) resembling in major respects those of *Paramolgus politus* (Humes and Ho, 1967). Second maxilla (Fig. 12) with proximal tooth on lash more spiniform than more distal teeth. Maxilliped (Fig. 13) with second segment bearing 2 unequal setae, shorter seta finely barbed, longer seta with a few hairs along one side. Small third segment with 2 barbed spines and a smooth seta.

Ventral area between maxillipeds and first pair of legs (Fig. 14) slightly protuberant.

Legs 1–4 (Figs. 15, 16, 17, 18) segmented and armed as in other *Paramolgus*. Barbs on outer side of terminal spine on third segment of exopod of leg 1 large and dentiform. Leg 4 with inner coxal seta 13 μm and naked. Exopod 156 μm . First segment of endopod 44 μm long \times 36 μm wide (without spiniform processes), its distal inner plumose seta 36 μm . Second segment 70 \times 31 μm , its 2 unequal barbed spines 25 μm (outer) and 52 μm (inner). Both segments with outer marginal spinules rather than hairs.

Leg 5 (Fig. 19) with elongate ventrally concave free segment 194 \times 59 μm , in ovigerous specimens held around anterior part of egg sac. Two terminal setae 62 μm and 38 μm . Dorsal surface of free segment with small hairlike spinules. Between small dorsal seta and insertion of free segment a patch of spinules.

Leg 6 represented by 2 setae and spiniform process on genital area (Fig. 3).

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

Male.—Body (Fig. 20) slender. Length (excluding setae on caudal rami) 1.14 mm (1.08–1.21 mm) and greatest width 0.31 mm (0.30–0.32 mm), based on 10 specimens in lactic acid. Ratio of length to width of prosome 1.71:1. Ratio of length of prosome to that of urosome 0.91:1, urosome slightly longer than prosome.

Segment of leg 5 (Fig. 21) 38 \times 65 μm . Genital segment 216 \times 178 μm , longer than wide. Four postgenital segments from anterior to posterior 35 \times 62 μm , 32 \times 59 μm , 24 \times 59 μm , and 35 \times 57 μm .

Caudal ramus similar to that of female but a little shorter, 208 \times 14 μm , ratio 14.9:1.

Body surface with hairs (sensilla) as in female.

Rostrum like that of female.

First antenna similar to that of female but 3 aesthetes added (at points indicated by dots in Figure 6). Second antenna (Fig. 22) with inner spines on first and second segments.

Labrum (Fig. 23) with both lobes having a posteriorly directed digitiform process and a minute bifurcate knob. Mandible, paragnath, first maxilla, and second maxilla like those of female. Maxilliped (Fig. 24) with second segment bearing 2 naked setae and 2 rows of spines. Claw 233 μm along its axis, weakly divided midway, with a finely pectinate fringe along its concave margin and bearing 2 unequal proximal setae, larger seta bilaterally pectinate distally, smaller seta smooth.

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

Legs 1–4 segmented and armed as in female, except for third segment of endopod of leg 1 (Fig. 25) where formula is I, I, 4 instead of I, 5 as in female.

Leg 5 (Fig. 26) with small unornamented free segment $25 \times 11 \mu\text{m}$, ratio 2.27:1.

Leg 6 (Fig. 27) consisting of posteroventral flap on genital segment bearing 2 naked setae 33 μm and 26 μm .

Spermatophore $187 \times 81 \mu\text{m}$ without neck, attached to female in pair (Fig. 28).

Color in living specimens resembling that of female.

Etymology.—The specific name *extendens*, from Latin *extendo* meaning to stretch out or prolong, alludes to the unusually long caudal rami in this species.

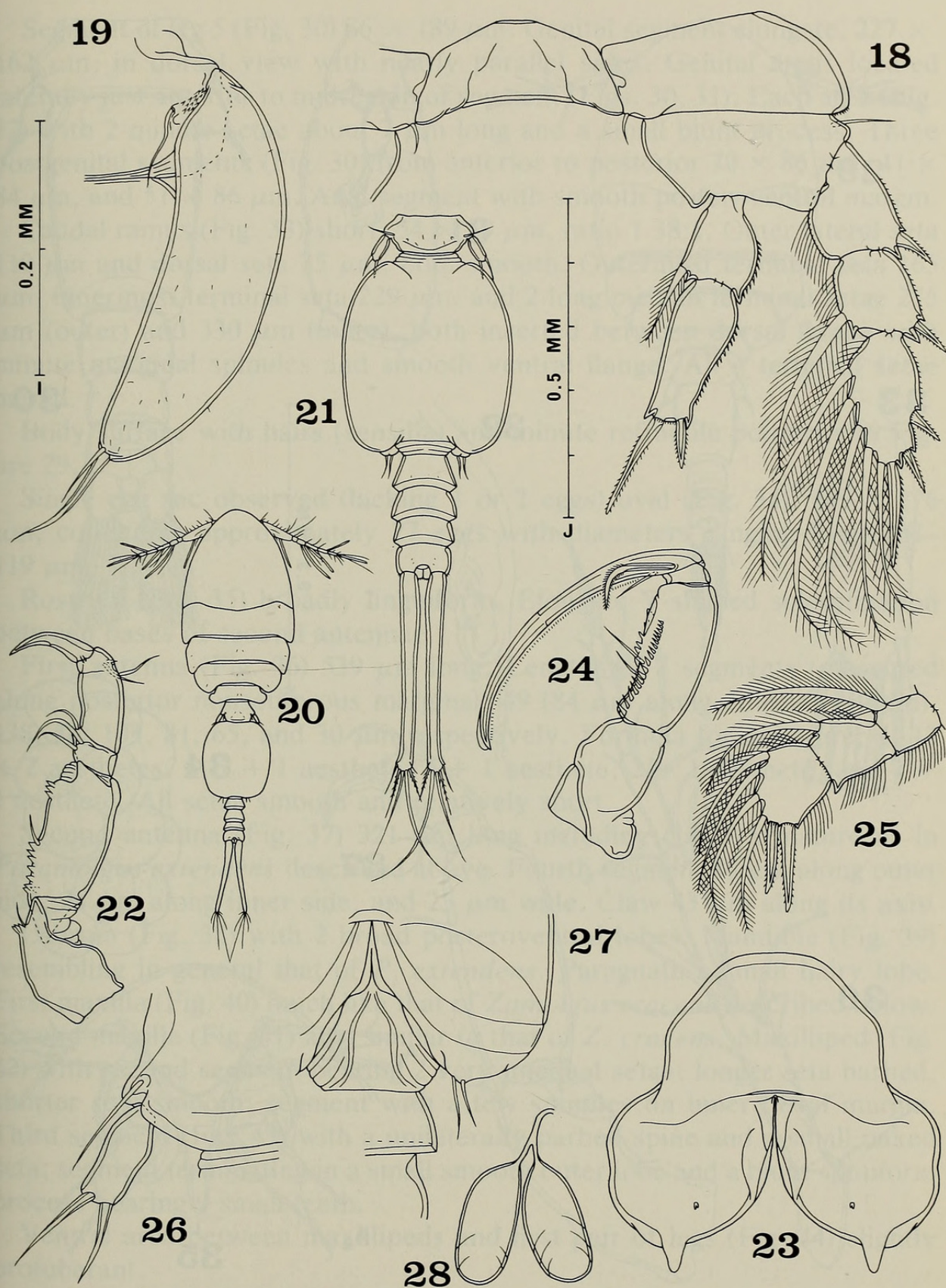
Comparison with other species of Paramolgus.—*Paramolgus extendens* may be distinguished from all its congeners by the unusually long caudal rami, ratio in the female 16.8:1. In all other *Paramolgus* the ratio is less than 5:1.

Paramolgus pollicaris, new species

Figs. 29–57

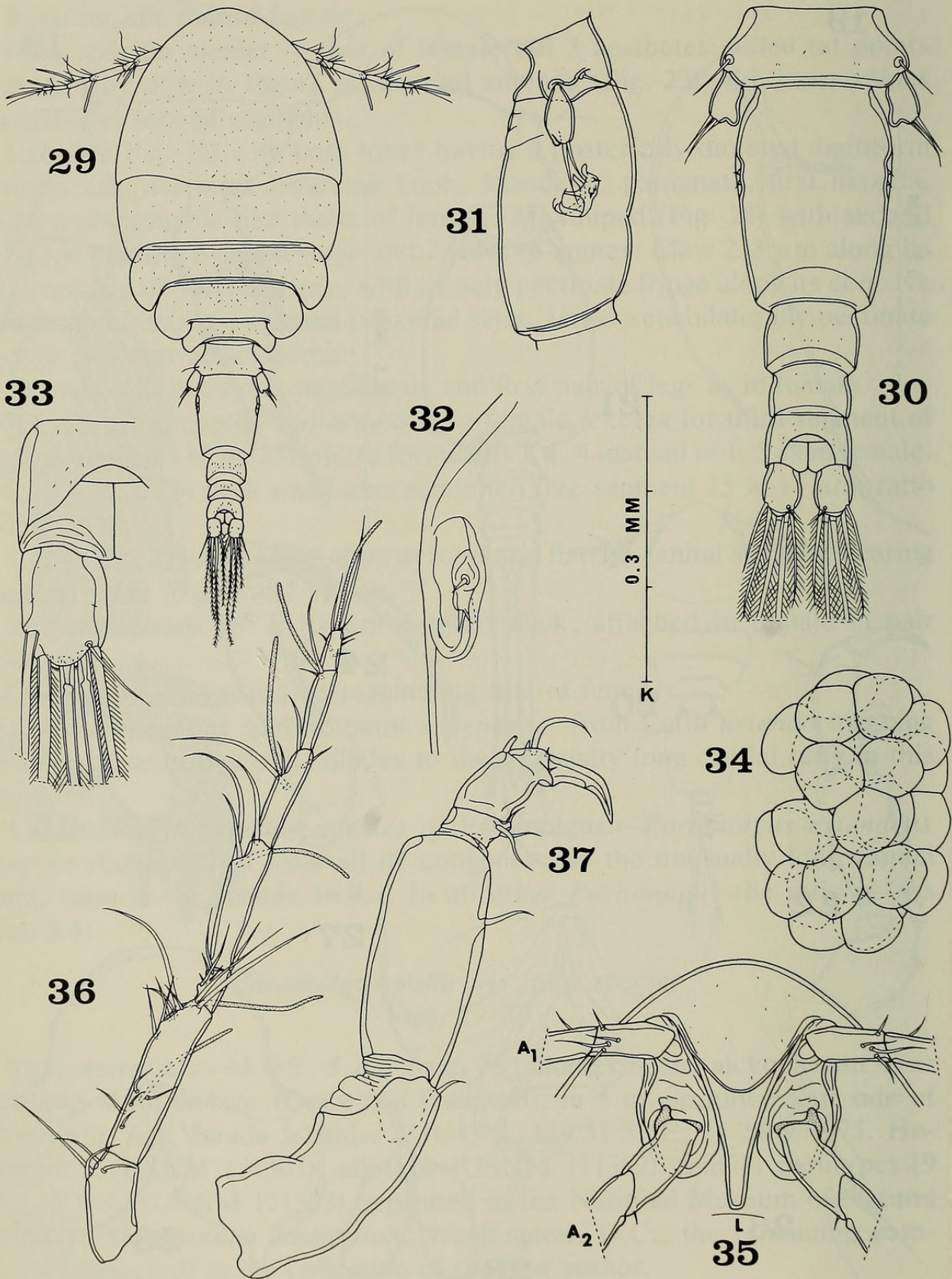
Type-material.—14 ♀♀, 5 ♂♂ from 15 colonies of the alcyonacean *Cespitularia multipinnata* (Quoy and Gaimard), in 5 m, southwestern side of Goenoeng Api, Banda Islands, $4^{\circ}31'45''\text{S}$, $129^{\circ}51'55''\text{E}$, 25 May 1975. Holotype ♀ (USNM 171301), allotype (USNM 171302), and 11 paratypes (9 ♀♀, 2 ♂♂) (USNM 171303) deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C.; the remaining paratypes (dissected) in the collection of the first author.

Female.—Body (Fig. 29) with prosome moderately slender. Length (not including setae on caudal rami) 1.46 mm (1.33–1.53 mm) and greatest width 0.61 mm (0.56–0.63 mm), based on 10 specimens in lactic acid. Ratio of length to width of prosome 1.53:1. Ratio of length of prosome to that of urosome 1.71:1.



Figs. 18–19. *Paramolgus extendsens*, new species, female: 18. Leg 4 and intercoxal plate, anterior (D). 19. Leg 5, dorsal (D).

Figs. 20–28. *Paramolgus extendsens*, new species, male: 20. Dorsal (A); 21. Urosome, dorsal (E). 22. Second antenna, postero-inner (D). 23. Labrum, ventral (C); 24. Maxilliped, inner (I). 25. Endopod of leg 1, anterior (D). 26. Leg 5, dorsal (C). 27. Leg 6, ventral (D). 28. Spermatophores, pair attached to female, dorsal (J).



Figs. 29–37. *Paramolgus pollicaris*, new species, female: 29. Dorsal (A); 30. Urosome, dorsal (E). 31. Segment of leg 5 and genital segment, lateral (K). 32. Genital area, dorsolateral (F). 33. Caudal ramus, dorsal (D). 34. Egg sac (B). 35. Rostrum, ventral (E). 36. First antenna, dorsal (I). 37. Second antenna, posterior (D).

Segment of leg 5 (Fig. 30) $86 \times 189 \mu\text{m}$. Genital segment elongate, $227 \times 162 \mu\text{m}$, in dorsal view with nearly parallel sides. Genital areas located laterally just anterior to midregion of segment (Figs. 30, 31). Each area (Fig. 32) with 2 minute setae about $7 \mu\text{m}$ long and a small blunt process. Three postgenital segments (Fig. 30) from anterior to posterior $70 \times 86 \mu\text{m}$, $41 \times 84 \mu\text{m}$, and $51 \times 86 \mu\text{m}$. Anal segment with smooth posteroventral margin.

Caudal ramus (Fig. 33) short, $54 \times 39 \mu\text{m}$, ratio 1.38:1. Outer lateral seta $110 \mu\text{m}$ and dorsal seta $35 \mu\text{m}$, both smooth. Outermost terminal seta $165 \mu\text{m}$, innermost terminal seta $229 \mu\text{m}$, and 2 long median terminal setae $275 \mu\text{m}$ (outer) and $330 \mu\text{m}$ (inner), both inserted between dorsal flange with minute marginal spinules and smooth ventral flange. All 4 terminal setae haired.

Body surface with hairs (sensilla) and minute refractile points as in Figure 29.

Single egg sac observed (lacking 1 or 2 eggs) oval (Fig. 34), $483 \times 276 \mu\text{m}$, containing approximately 27 eggs with diameters ranging from $108\text{--}119 \mu\text{m}$.

Rostrum (Fig. 35) broadly linguiform. Elongate V-shaped sclerotization between bases of second antennae.

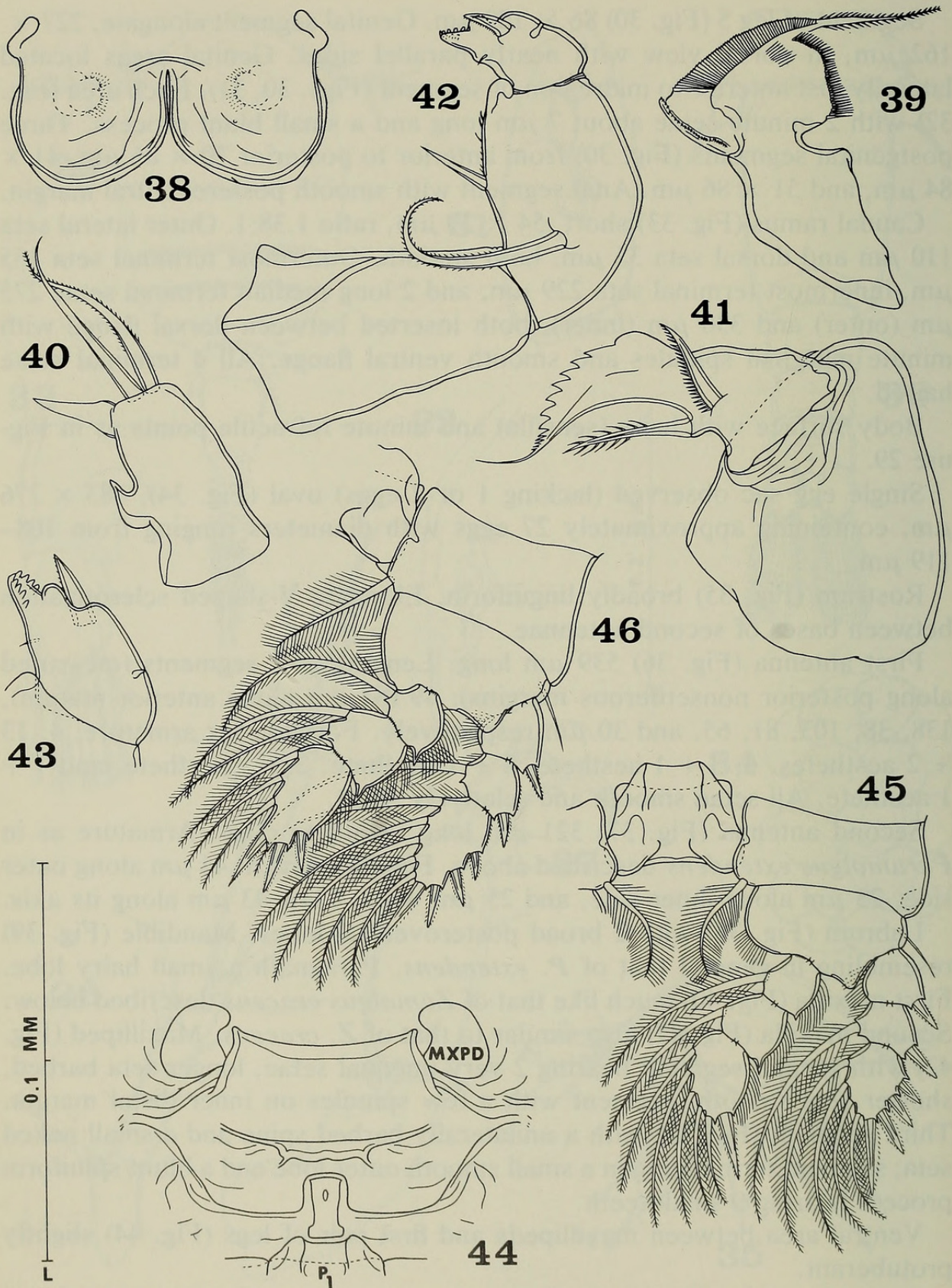
First antenna (Fig. 36) $539 \mu\text{m}$ long. Lengths of 7 segments (measured along posterior nonsetiferous margins): 49 ($84 \mu\text{m}$ along anterior margin), 138, 38, 103, 81, 65, and $30 \mu\text{m}$ respectively. Formula for armature: 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All setae smooth and relatively short.

Second antenna (Fig. 37) $321 \mu\text{m}$ long including claw. Armature as in *Paramolgus extendens* described above. Fourth segment $44 \mu\text{m}$ along outer side, $25 \mu\text{m}$ along inner side, and $25 \mu\text{m}$ wide. Claw $43 \mu\text{m}$ along its axis.

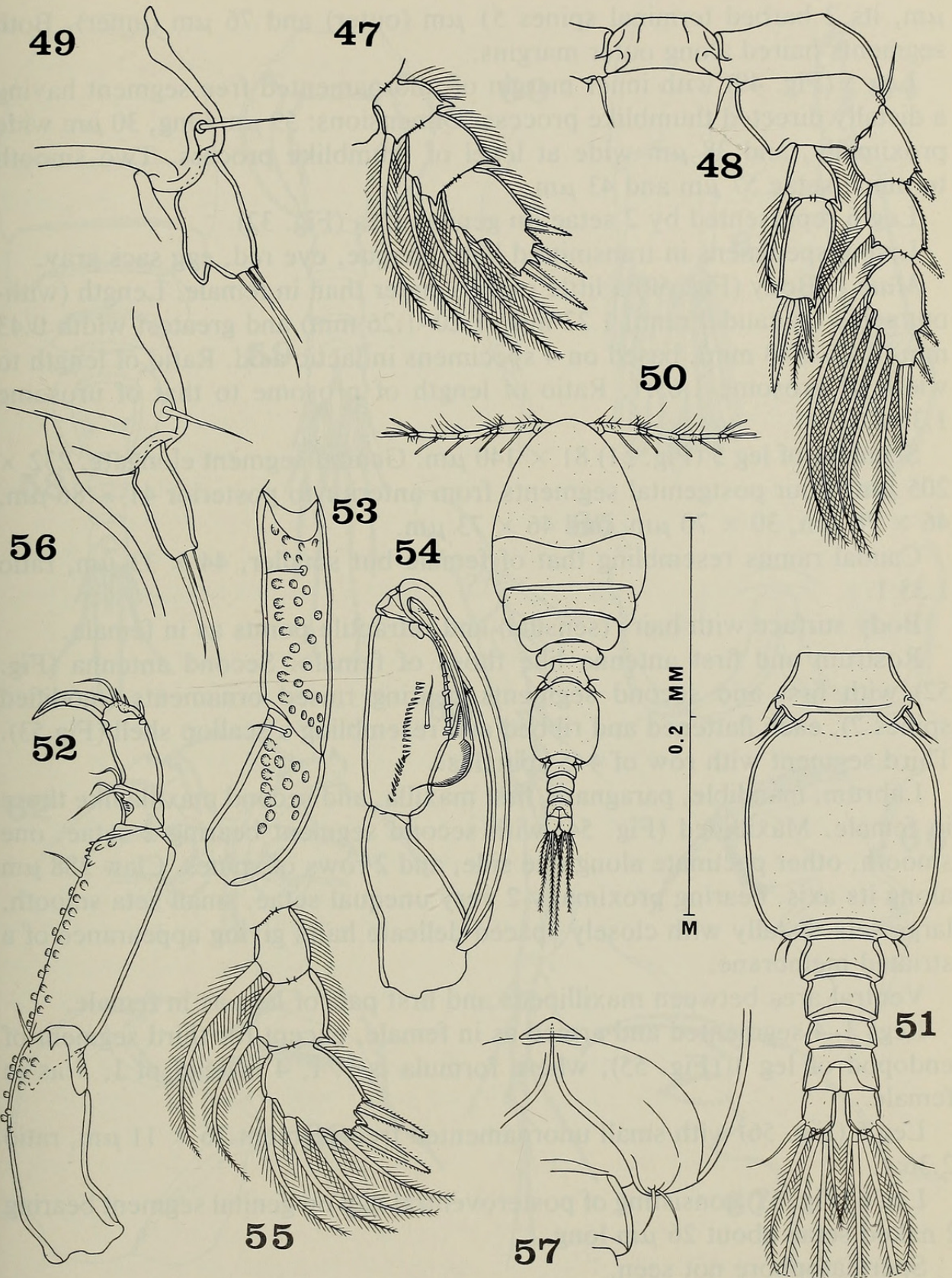
Labrum (Fig. 38) with 2 broad posteroventral lobes. Mandible (Fig. 39) resembling in general that of *P. extendens*. Paragnath a small hairy lobe. First maxilla (Fig. 40) much like that of *Zamolgus cracens* described below. Second maxilla (Fig. 41) also similar to that of *Z. cracens*. Maxilliped (Fig. 42) with second segment bearing 2 very unequal setae, longer seta barbed, shorter seta smooth; segment with a few spinules on inner distal margin. Third segment (Fig. 43) with a unilaterally barbed spine and a small naked seta; segment terminating in a small smooth outer lobe and a blunt spiniform process bearing 9 small teeth.

Ventral area between maxillipeds and first pair of legs (Fig. 44) slightly protuberant.

Legs 1–4 (Figs. 45, 46, 47, 48) segmented and armed as in other *Paramolgus*. Leg 4 with inner coxal seta $35 \mu\text{m}$ and naked. Exopod $195 \mu\text{m}$. First segment of endopod $41 \mu\text{m}$ long (without spiniform processes) $\times 40 \mu\text{m}$ wide, its inner distal feathered seta $70 \mu\text{m}$. Second segment 77×36



Figs. 38–46. *Paramolgus pollicaris*, new species, female: 38. Labrum, with paragnaths indicated by broken lines, ventral (F). 39. Mandible, posterior (F). 40. First maxilla, posterior (C). 41. Second maxilla, postero-inner (F). 42. Maxilliped, posterior (F). 43. Third segment of maxilliped, anterior (L). 44. Area between maxillipeds and first pair of legs, ventral (D). 45. Leg 1 and intercoxal plate, anterior (H). 46. Leg 2, anterior (H).



Figs. 47-49. *Paramolgus pollicaris*, new species, female: 47. Endopod of leg 2, anterior (H). 48. Leg 4 and intercoxal plate, anterior (I). 49. Leg 5, dorsal (D).

Figs. 50-57. *Paramolgus pollicaris*, new species, male: 50. Dorsal (A). 51. Urosome, dorsal (E). 52. Second antenna, posterior (D). 53. First and second segments of second antenna, ventral (M). 54. Maxilliped, inner (I). 55. Endopod of leg 1, anterior (D). 56. Leg 5, dorsal (C). 57. Leg 6, ventral (M).

μm , its 2 barbed terminal spines $51 \mu\text{m}$ (outer) and $76 \mu\text{m}$ (inner). Both segments haired along outer margins.

Leg 5 (Fig. 49) with inner margin of unornamented free segment having a distally directed thumblike process. Dimensions: $59 \mu\text{m}$ long, $30 \mu\text{m}$ wide proximally, and $38 \mu\text{m}$ wide at level of thumblike process. Two smooth terminal setae $57 \mu\text{m}$ and $43 \mu\text{m}$.

Leg 6 represented by 2 setae on genital area (Fig. 32).

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

Male.—Body (Fig. 50) a little more slender than in female. Length (without setae on caudal rami) 1.22 mm (1.20 – 1.26 mm) and greatest width 0.43 mm (0.42 – 0.43 mm), based on 4 specimens in lactic acid. Ratio of length to width of prosome $1.65:1$. Ratio of length of prosome to that of urosome $1.39:1$.

Segment of leg 5 (Fig. 51) $81 \times 140 \mu\text{m}$. Genital segment elongate, $232 \times 205 \mu\text{m}$. Four postgenital segments from anterior to posterior $41 \times 86 \mu\text{m}$, $46 \times 78 \mu\text{m}$, $30 \times 70 \mu\text{m}$, and $46 \times 73 \mu\text{m}$.

Caudal ramus resembling that of female but smaller, $44 \times 33 \mu\text{m}$, ratio $1.33:1$.

Body surface with hairs (sensilla) and refractile points as in female.

Rostrum and first antenna like those of female. Second antenna (Fig. 52) with first and second segments bearing raised ornaments (modified spines?), each flattened and ribbed and resembling a scallop shell (Fig. 53). Third segment with row of 4–5 spinules.

Labrum, mandible, paragnath, first maxilla, and second maxilla like those in female. Maxilliped (Fig. 54) with second segment bearing 2 setae, one smooth, other pectinate along one side, and 2 rows of spines. Claw $288 \mu\text{m}$ along its axis, bearing proximally 2 very unequal setae, small seta smooth, large seta distally with closely spaced delicate hairs giving appearance of a striated membrane.

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

Legs 1–4 segmented and armed as in female, except for third segment of endopod of leg 1 (Fig. 55), where formula is I, I, 4 instead of I, 5 as in female.

Leg 5 (Fig. 56) with small unornamented free segment $26 \times 11 \mu\text{m}$, ratio $2.36:1$.

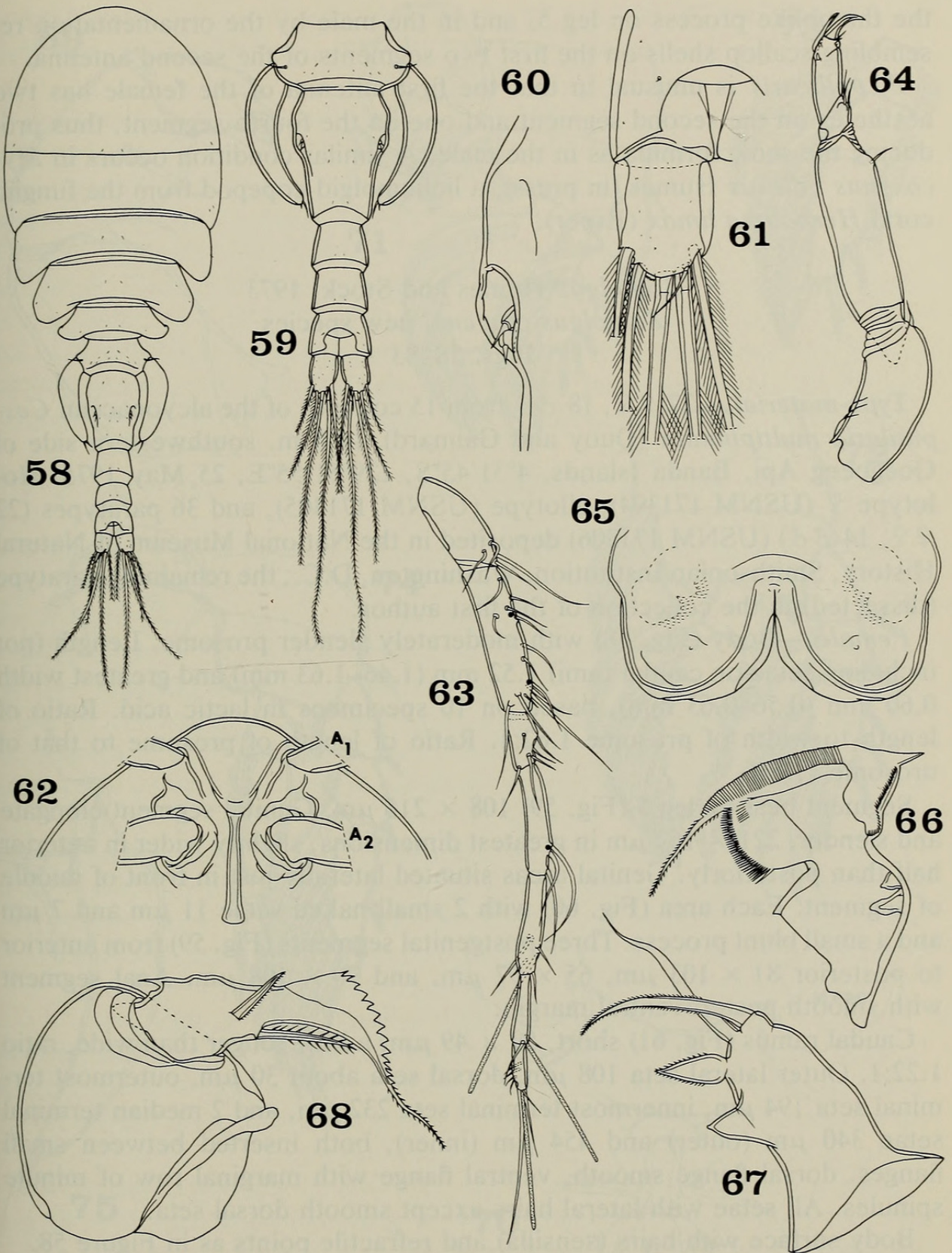
Leg 6 (Fig. 57) consisting of posteroventral flap on genital segment bearing 2 naked setae about $26 \mu\text{m}$ long.

Spermatophore not seen.

Color in living specimens similar to that of female.

Etymology.—The specific name *pollicaris*, Latin meaning of a thumb, alludes to the thumblike process on leg 5 in the female.

Comparison with other species of Paramoligus.—*Paramoligus pollicaris* may be separated from all its congeners by two features: in the female by



Figs. 58–68. *Zamoligus cracens*, new species, female: 58. Dorsal (A). 59. Urosome, dorsal (B). 60. Genital area, dorsal (F). 61. Caudal ramus, dorsal (D). 62. Rostrum, ventral (E). 63. First antenna, with three dots indicating positions of aesthetes in the male, dorsal (I). 64. Second antenna, posterior (I). 65. Labrum, with paragnaths indicated by broken lines, ventral (F). 66. Mandible, posterior (F). 67. First maxilla, posterior (C). 68. Second maxilla, posterior (F).

the thumblike process on leg 5, and in the male by the ornamentation resembling scallop shells on the first two segments of the second antenna.

P. pollicaris is unusual in that the first antenna of the female has two aesthetes on the second segment and one on the fourth segment, thus producing the same formula as in the male. A similar condition occurs in *Mycoxynus villosus* Humes (in press), a lichomolgid copepod from the fungiid coral *Herpolitha limax* (Esper).

Zamolgus Humes and Stock, 1973

Zamolgus cracens, new species

Figs. 58–83

Type-material.—27 ♀♀, 18 ♂♂ from 15 colonies of the alcyonacean *Cespitularia multipinnata* (Quoy and Gaimard), in 5 m, southwestern side of Goegoeng Api, Banda Islands, 4°31'45"S, 129°51'55"E, 25 May 1975. Holotype ♀ (USNM 171304), allotype (USNM 171305), and 36 paratypes (22 ♀♀, 14 ♂♂) (USNM 171306) deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C.; the remaining paratype (dissected) in the collection of the first author.

Female.—Body (Fig. 58) with moderately slender prosome. Length (not including setae on caudal rami) 1.52 mm (1.46–1.63 mm) and greatest width 0.60 mm (0.56–0.63 mm), based on 10 specimens in lactic acid. Ratio of length to width of prosome 1.62:1. Ratio of length of prosome to that of urosome 1.58:1.

Segment bearing leg 5 (Fig. 59) $108 \times 216 \mu\text{m}$. Genital segment elongate and slender, $221 \times 162 \mu\text{m}$ in greatest dimensions, slightly wider in anterior half than posteriorly. Genital areas situated laterally just in front of middle of segment. Each area (Fig. 60) with 2 small naked setae $11 \mu\text{m}$ and $7 \mu\text{m}$ and a small blunt process. Three postgenital segments (Fig. 59) from anterior to posterior $81 \times 103 \mu\text{m}$, $65 \times 97 \mu\text{m}$, and $70 \times 108 \mu\text{m}$. Anal segment with smooth posteroventral margin.

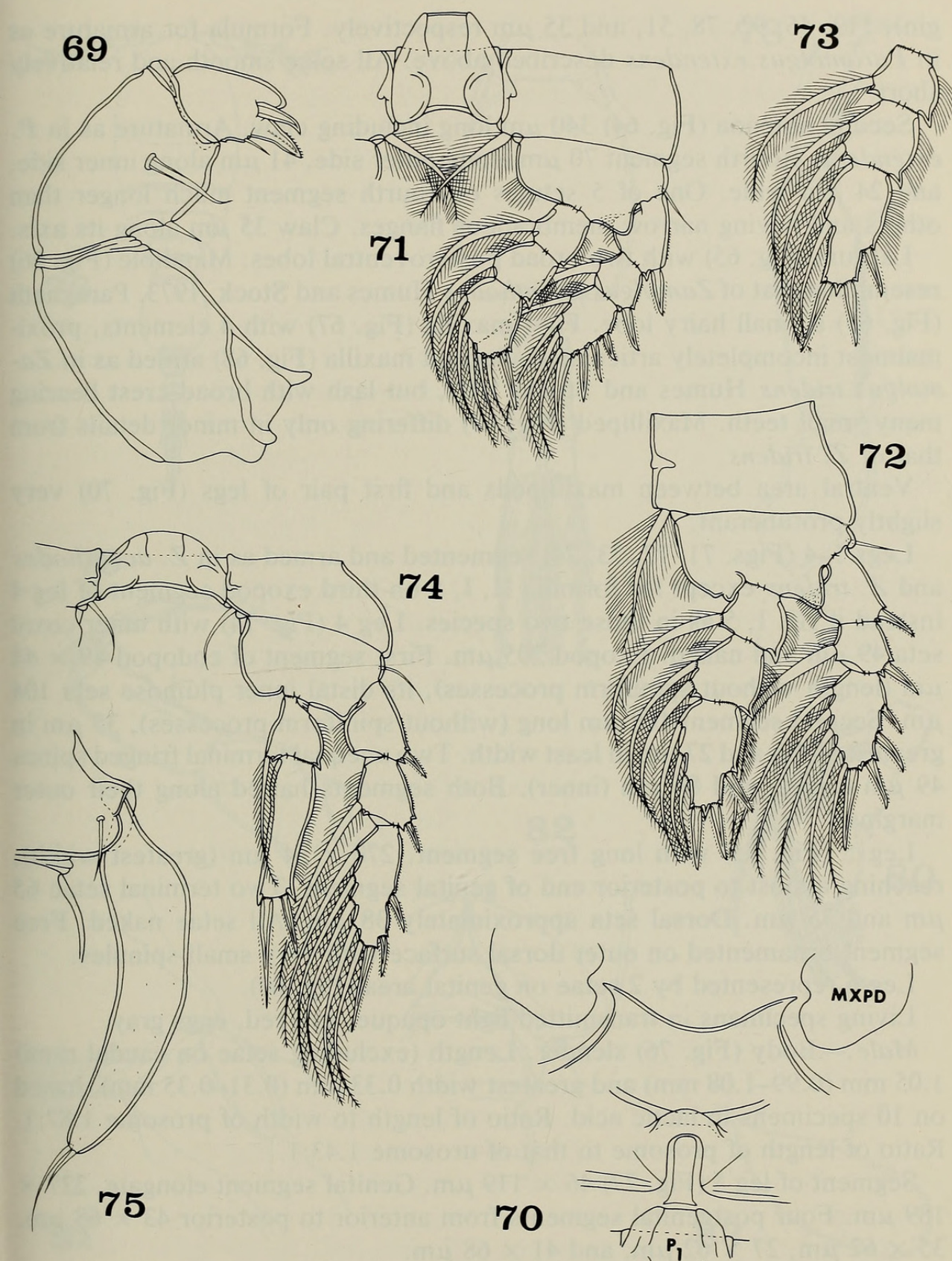
Caudal ramus (Fig. 61) short, $59 \times 49 \mu\text{m}$, a little longer than wide, ratio 1.22:1. Outer lateral seta $108 \mu\text{m}$, dorsal seta about $30 \mu\text{m}$, outermost terminal seta $194 \mu\text{m}$, innermost terminal seta $232 \mu\text{m}$, and 2 median terminal setae $340 \mu\text{m}$ (outer) and $454 \mu\text{m}$ (inner), both inserted between small flanges, dorsal flange smooth, ventral flange with marginal row of minute spinules. All setae with lateral hairs except smooth dorsal seta.

Body surface with hairs (sensilla) and refractile points as in Figure 58.

Complete egg sac not seen, but individual eggs irregular in diameter, with average about $108 \mu\text{m}$.

Rostrum (Fig. 62) linguiform.

First antenna (Fig. 63) $510 \mu\text{m}$ long. Lengths of 7 segments (measured along their posterior nonsetiferous margins): 65 ($89 \mu\text{m}$ along anterior mar-



Figs. 69–75. *Zamoligus cracens*, new species, female: 69. Maxilliped, posterior (F). 70. Area between maxillipeds and first pair of legs, ventral (I). 71. Leg 1 and intercoxal plate, anterior (I). 72. Leg 2, anterior (I). 73. Endopod of leg 3, anterior (I). 74. Leg 4 and intercoxal plate, anterior (I). 75. Leg 5, dorsal (I).

gin), 119, 46, 92, 78, 51, and 35 μm respectively. Formula for armature as in *Paramolgus extendens* described above. All setae smooth and relatively short.

Second antenna (Fig. 64) 340 μm long including claw. Armature as in *P. extendens*. Fourth segment 70 μm along outer side, 41 μm along inner side, and 24 μm wide. One of 5 setules on fourth segment much longer than others and having narrow membranous flanges. Claw 35 μm along its axis.

Labrum (Fig. 65) with two broad posteroventral lobes. Mandible (Fig. 66) resembling that of *Zamolagus acanthodes* Humes and Stock, 1973. Paragnath (Fig. 65) a small hairy lobe. First maxilla (Fig. 67) with 4 elements, proximalmost incompletely articulated. Second maxilla (Fig. 68) armed as in *Zamolagus tridens* Humes and Stock, 1973, but lash with broad crest bearing many small teeth. Maxilliped (Fig. 69) differing only in minor details from that of *Z. tridens*.

Ventral area between maxillipeds and first pair of legs (Fig. 70) very slightly protuberant.

Legs 1–4 (Figs. 71, 72, 73, 74) segmented and armed as in *Z. acanthodes* and *Z. tridens* except for formula II, I, 5 on third exopod segment of leg 4 instead of III, I, 5 as in those two species. Leg 4 (Fig. 74) with inner coxal seta 49 μm and naked. Exopod 205 μm . First segment of endopod 49 \times 44 μm (length without spiniform processes), its distal inner plumose seta 104 μm . Second segment 108 μm long (without spiniform processes), 35 μm in greatest width and 27 μm in least width. Two unequal terminal fringed spines 49 μm (outer) and 86 μm (inner). Both segments haired along their outer margins.

Leg 5 (Fig. 75) with long free segment, 270 \times 54 μm (greatest width), reaching almost to posterior end of genital segment. Two terminal setae 65 μm and 35 μm . Dorsal seta approximately 38 μm . All setae naked. Free segment ornamented on outer dorsal surface with very small spinules.

Leg 6 represented by 2 setae on genital area (Fig. 60).

Living specimens in transmitted light opaque, eye red, eggs gray.

Male.—Body (Fig. 76) slender. Length (excluding setae on caudal rami) 1.05 mm (0.99–1.08 mm) and greatest width 0.33 mm (0.31–0.35 mm), based on 10 specimens in lactic acid. Ratio of length to width of prosome 1.87:1. Ratio of length of prosome to that of urosome 1.43:1.

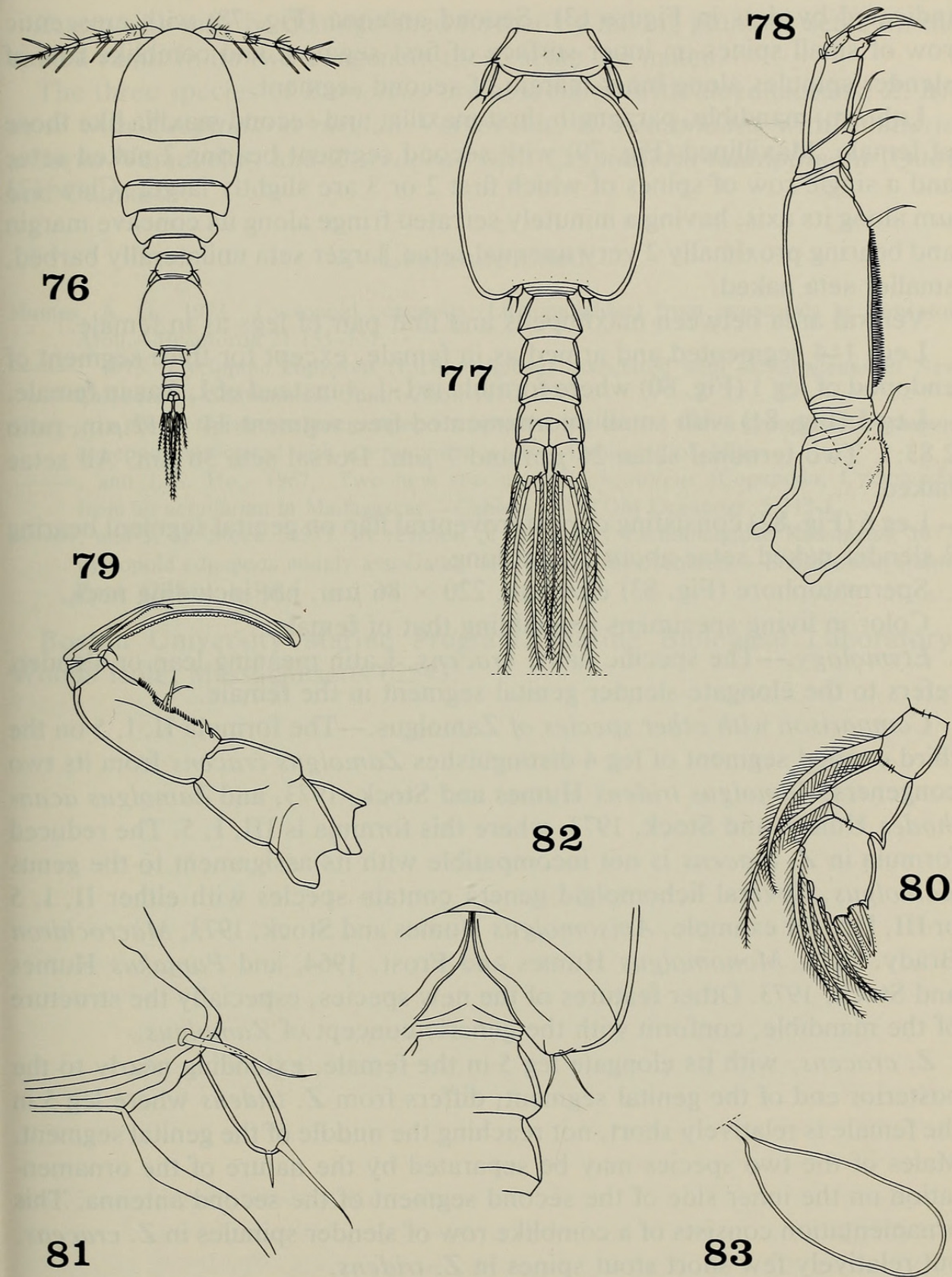
Segment of leg 5 (Fig. 77) 46 \times 119 μm . Genital segment elongate, 227 \times 189 μm . Four postgenital segments from anterior to posterior 43 \times 68 μm , 35 \times 62 μm , 27 \times 62 μm , and 41 \times 68 μm .

Caudal ramus resembling that of female but smaller, 41 \times 30 μm , ratio 1.37:1. Outer lateral seta apparently smooth rather than haired as in female.

Body surface with hairs (sensilla) as in female.

Rostrum similar to that of female.

First antenna resembling that of female, but 3 aesthetes added (at points



Figs. 76-83. *Zamoligus cracens*, new species, male: 76. Dorsal (A). 77. Urosome, dorsal (E). 78. Second antenna, posterior (D). 79. Maxilliped, inner (I). 80. Endopod of leg 1, anterior (D). 81. Leg 5, dorsal (C). 82. Leg 6, ventral (D). 83. Spermatophore, ventral (E).

indicated by dots in Figure 63). Second antenna (Fig. 78) with crescentic row of small spines on inner surface of first segment and comblike row of slender spinules along inner margin of second segment.

Labrum, mandible, paragnath, first maxilla, and second maxilla like those of female. Maxilliped (Fig. 79) with second segment bearing 2 naked setae and a single row of spines of which first 2 or 3 are slightly larger. Claw 173 μm along its axis, having a minutely serrated fringe along its concave margin and bearing proximally 2 very unequal setae, larger seta unilaterally barbed, smaller seta naked.

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

Legs 1–4 segmented and armed as in female, except for third segment of endopod of leg 1 (Fig. 80) where formula is I, I, 4 instead of I, 5 as in female.

Leg 5 (Fig. 81) with small unornamented free segment $34 \times 12 \mu\text{m}$, ratio 2.83:1. Two terminal setae 26 μm and 7 μm . Dorsal seta 30 μm . All setae naked.

Leg 6 (Fig. 82) consisting of posteroventral flap on genital segment bearing 2 slender naked setae about 24 μm long.

Spermatophore (Fig. 83) elongate, $220 \times 86 \mu\text{m}$, not including neck.

Color in living specimens resembling that of female.

Etymology.—The specific name *cracens*, Latin meaning lean or slender, refers to the elongate slender genital segment in the female.

Comparison with other species of Zamoligus.—The formula II, I, 5 on the third exopod segment of leg 4 distinguishes *Zamoligus cracens* from its two congeners, *Zamoligus tridens* Humes and Stock, 1973, and *Zamoligus acanthodes* Humes and Stock, 1973, where this formula is III, I, 5. The reduced formula in *Z. cracens* is not incompatible with its assignment to the genus *Zamoligus*. Several lichomolgid genera contain species with either II, I, 5 or III, I, 5, for example, *Anisomolgus* Humes and Stock, 1973, *Macrochiron* Brady, 1872, *Monomolgus* Humes and Frost, 1964, and *Panjakus* Humes and Stock, 1973. Other features of the new species, especially the structure of the mandible, conform with the generic concept of *Zamoligus*.

Z. cracens, with its elongate leg 5 in the female, extending nearly to the posterior end of the genital segment, differs from *Z. tridens* where leg 5 in the female is relatively short, not reaching the middle of the genital segment. Males of the two species may be separated by the nature of the ornamentation on the inner side of the second segment of the second antenna. This ornamentation consists of a comblike row of slender spinules in *Z. cracens*, but relatively few short stout spines in *Z. tridens*.

From *Z. acanthodes*, where the free segment of leg 5 in the female is ornamented with conspicuous spines, the new species differs in having only very minute spinules on leg 5. Males of *Z. acanthodes* have a subquadrate genital segment, whereas in *Z. cracens* this segment is elongate.

Z. cracens may be distinguished further by having plumose setae on the caudal rami. In its two congeners these setae are naked.

The three species of *Zamoligus* are associated with alcyonaceans, *Z. tridens* with *Cespitularia turgida* Verseveldt, *Z. acanthodes* with *Sinularia arborea* Verseveldt, and *Z. cracens* with *Cespitularia multipinnata* (Quoy and Gaimard).

Literature Cited

- Humes, A. G. 1973. Cyclopoid copepods (Lichomolgidae) from octocorals at Eniwetok Atoll.—*Beaufortia* 21:135-151.
- . 1975. Cyclopoid copepods (Lichomolgidae) associated with alcyonaceans in New Caledonia.—*Smithsonian Contr. Zool.* 191:1-27.
- . In press. Coral-inhabiting copepods from the Moluccas, with a synopsis of cyclopoid copepods associated with scleractinian corals.—*Cahiers Biol. Mar.*
- , and J.-S. Ho. 1967. Two new species of *Lichomoligus* (Copepoda, Cyclopoida) from an actinarian in Madagascar.—*Cahiers ORSTOM Oceanogr.* 5:312-1.
- , and J. H. Stock. 1973. A revision of the family Lichomolgidae Kossmann, 1877, cyclopoid copepods mainly associated with marine invertebrates.—*Smithsonian Contr. Zool.* 127:i-v, 1-368.

Boston University Marine Program, Marine Biological Laboratory,
Woods Hole, Massachusetts 02543.



Humes, A G and Dojiri, M. 1980. "Poecilostome Copepods Lichomolgidae From The Alcyonacean Coral Cespitularia multipinnata In The Moluccas Indonesia." *Proceedings of the Biological Society of Washington* 92, 51–69.

View This Item Online: <https://www.biodiversitylibrary.org/item/110033>

Permalink: <https://www.biodiversitylibrary.org/partpdf/48935>

Holding Institution

Smithsonian Libraries

Sponsored by

Biodiversity Heritage Library

Copyright & Reuse

Copyright Status: In copyright. Digitized with the permission of the rights holder.

Rights Holder: Biological Society of Washington

License: <http://creativecommons.org/licenses/by-nc-sa/3.0/>

Rights: <https://biodiversitylibrary.org/permissions>

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at <https://www.biodiversitylibrary.org>.