

Parasitic Copepods from the
Gulf of Mexico and Caribbean Sea,
II: Bomolochidae

ROGER CRESSEY

SMITHSONIAN CONTRIBUTIONS TO ZOOLOGY • NUMBER 389

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SMITHSONIAN INSTITUTION PRESS

City of Washington

1983

ABSTRACT

Cressey, Roger. Parasitic Copepods from the Gulf of Mexico and Caribbean Sea, II: Bomolochidae. *Smithsonian Contributions to Zoology*, number 389, 35 pages, 119 figures, 1983.—Eight species of bomolochids are described: *Nothobomolochus teres* (Wilson) from *Brevoortia smithii* and *B. tyrannus*; *Bomolochus nitidus* Wilson from *Mugil cephalus*; *B. exilipes* Wilson from *Archosargus probatocephalus* and *Calamus arctifrons*; *Acanthocolax hystricosus*, new species from *Lagodon rhomboides*; *A. similis* Vervoort from *Acanthurus bahianus* and *Pomacanthus paru*; *Holobomolochus scutigerulus* (Wilson) from *Pseudupeneus maculatus*; *H. vervoorti*, new species, from *Microspathodon chrysurus*, and *Pseudoeucanthus uniseriatus* Wilson from *Haemulon sciurus* and *Chaetodon humeralis*. *Bomolochus mugilis* Pearse and the material described as *B. concinnus* Wilson by Vervoort (1969) is placed in synonymy with *B. bellones* Burmiester.

OFFICIAL PUBLICATION DATE is handstamped in a limited number of initial copies and is recorded in the Institution's annual report, *Smithsonian Year*. SERIES COVER DESIGN: The coral *Montastrea cavernosa* (Linnaeus).

Library of Congress Cataloging in Publication Data

(Revised for vol. 2)

Cressey, Roger F., 1930-

Parasitic copepods from the Gulf of Mexico and Caribbean Sea.

(Smithsonian contributions to zoology ; no. 339, 389)

Includes bibliographical references.

Contents: 1. Holobomolochus and Neobomolochus—2. Bomolochidae.

1. Holobomolochus—Classification. 2. Neobomolochus—Classification. 3. Crustacea—Classification. 4. Crustacea—Mexico, Gulf of—Classification. 5. Crustacea—Caribbean Sea—Classification. I. Title.

QL1.S54 no. 389 591s [595.3'4] 81-9055

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Parasitic Copepods from the Gulf of Mexico and Caribbean Sea, II: Bomolochidae

Roger Cressey

Introduction

This is the second in a series of reports describing the copepods parasitic on the fishes of the Gulf of Mexico and Caribbean Sea. The first report (Cressey, 1981) included descriptions of *Holobomolochus glyphosodontis* (Krøyer), *H. centropristis* Cressey, *H. crevalleus* Cressey, *H. serratus* Cressey, and *Neobomolochus elongatus* Cressey. This report describes 8 additional bomolochid species including two new species.

ACKNOWLEDGMENTS.—As before, I thank the staff of the Mote Marine Laboratory, Sarasota, Florida, for the use of their facilities at Charlotte Harbor. The work in Belize was facilitated by Dr. Klaus Ruetzler (Smithsonian Institution), director of the Investigations of Marine Shallow Water Ecosystems project at Carrie Bow Cay, Belize. The illustrations were done by Hillary Boyle Cressey. This paper is contribution number 124 of the Reef and Mangrove Study—Belize, Smithsonian Institution, partly supported by the Exxon Corporation.

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BOMOLOCHIDAE

Nothobomolochus Vervoort

Nothobomolochus teres (Wilson)

FIGURES 1–23

Bomolochus teres Wilson, 1911:379.

Nothobomolochus teres.—Pillai, 1967:265.

MATERIAL EXAMINED.—30♀, 2♂ from the gill area of 1 *Brevoortia smithii* Hildebrand and 5♀ from approximately 100 *Brevoortia tyrannus* (Latrobe), collected by the author Jul 1970 and Jul 1972, respectively, at Charlotte Harbor, Florida.

FEMALE.—Body form as in Figure 1. Total length 1.58 mm, greatest width 0.57 mm (measured at widest part of cephalon). Cephalon short, comprising only about 20% of total body length and nearly twice as wide as long. Thoracic segments bearing legs 2–5 free. Genital segment slightly longer than wide (192 × 180 μm). Abdomen 3-segmented; segments measure (length × width) 192 × 129 μm, 162 × 121 μm, and 109 × 100 μm, respectively. Ventral surface of last abdominal segment and caudal rami (Figure 2) without surface ornamentation. Caudal rami about 3 times longer than wide (118 × 35 μm); longest seta 430 μm, outermost distal seta about twice as long as innermost.

First antenna (Figure 3) 5-segmented, first segment with 3 modified setae; middle one longest, an aesthete present on each of last 2 segments. Second antenna (Figure 4) second segment with 2 naked setae. Third segment with many small hooked spinules arranged in discrete rows, 4 articulated hooked spines, and 4 naked setae. Oral area (Figure 5) with mandible bearing 2 short, fringed blades; paragnath with hairs at base of terminal fringed blade; first maxilla with 4 plumose setae of equal length (Pillai, 1967, fig. 8), shows only 3 setae). Maxilliped (Figure 6) hook relatively short and not strongly recurved. Legs 1-4 biramous. Leg 1 (Figure 7) coxopod with a patch of spinules; exopod with 6 plumose setae (Pillai, 1967, fig. 8(8) shows only 5); endopod with 7 plumose setae, segments weakly divided. Leg 2 (Figure 8) basipod with row of long spinules; exopod first segment with long hairs on outer margin and a heavily sclerotized spine on outer distal corner bearing a subterminal flagellum, second segment with similar outer spine and inner setae, last segment with 3 short spines each with a flagellum, a longer spine fringed along outer margin and 5 setae; endopod first segment with an inner seta, second segment with 2 inner setae, last segment with 2 short, fringed spines and 3 terminal to inner setae. Leg 3 (Figure 9) as in leg 2 except exopod first segment without long marginal hairs and last segment with only 2 short outer spines, endopod last segment with only 2 setae. Leg 4 (Figure 10) as in leg 3 except basipod without row of spinules, endopod second segment with only 1 seta, and last segment with an inner and an outer spine (innermost much longer) separated by a long, toothed seta. Leg 5 (Figure 11) with patches of spinules as in the figure, a stout outer lateral spinulose seta and 3 terminal setae, innermost much longer than other 2 and inner and outer setae fringed. Leg 6 (Figure 12) represented by 3 short setae at area of egg sac attachment.

MALE.—Body form as in Figure 13. Total length 667 μm . Greatest width (measured at widest part of cephalon) 254 μm . Cephalon nearly as long as wide (254 \times 242 μm). Thoracic segments

2-4 free. Genital segment (Figure 14) longer than wide (121 \times 103 μm), widest posteriorly, spermatophores nearly filling genital segment. Abdomen (Figure 14) 2-segmented, each about as long as wide (59 \times 56 μm and 47 \times 47 μm , respectively); last segment (Figure 15) with a ventral transverse row of spinules across anterior part and 2 ventral patches of finer spinules in posterior half. Caudal rami (Figure 15) about 3 times as long as wide (44 \times 15 μm), ventral surface with a diffuse patch of fine spinules in posterior half.

First antenna (Figure 16) 5-segmented, an aesthete on each of last 2 segments. Mouthparts as in female except first maxilla (Figure 17) with one plumose seta much longer and stouter than others (all setae nearly equal in female). Maxilliped (Figure 18) first segment with an inner setae at midlength, second segment inner margin with a large patch of scale-like spinules and a short setae near midlength of inner margin, proximal part of inner margin raised to form a knob-like area, claw with a basal seta and tooth-like spinules on inner margin.

Leg 1 (Figure 19) as in female except a plumose seta on exopod first segment instead of short spine of female and an additional plumose seta on last exopod segment and only one spine. Leg 2 (Figure 20) as in female except first exopod segment without hairs and outer exopod spines finely fringed (toothed in female). Leg 3 (Figure 21) as in female except outer exopod spines finely fringed (toothed in female). Leg 4 (Figure 22) as in female except outer spine of first exopod segment naked, no spine on second segment, outer spines of last segment fringed; endopod 2-segmented, innermost seta of last segment not heavily sclerotized as in female. Leg 5 (Figure 23) with patch of spinules on distal half of inner margin and 2 terminal setae.

REMARKS.—This copepod is apparently common on species of *Brevoortia* from the east coast of the United States. It has been reported also by Pearse (1952) and Causey (1953) from *Mugil cephalus* from Texas. Since Wilson's original description did not call attention to the modified

setae on the first antennae, the earlier records by Pearse and Causey (probably based on Wilson's description) should be considered doubtful.

Bomolochus Nordmann

REMARKS.—While considering *Bomolochus nitidus* Wilson, my examination of the type specimens of *B. concinnus* indicated that this species is identical with *Bomolochus bellones* Burmeister and should be considered a synonym of that species. *Bomolochus bellones* female leg 3 exopod bears 5 setae.

Bomolochus nitidus Wilson

FIGURES 24–35

Bomolochus nitidus Wilson, 1911:374.

Bomolochus mugilis Pearse, 1952:194.

Bomolochoides nitidus.—Vervoort, 1962:30.

Bomolochus concinnus.—Vervoort, 1969:20.

MATERIAL EXAMINED.—17 ♀ from the gill area of 8 *Mugil cephalus* (Linnaeus), collected in Charlotte Harbor, Florida, 27 Jul 1970 by the author. Holotype ♀ *Bomolochus nitidus* (USNM 38611) dissected and mounted on a slide by Vervoort and collected by Wilson from *Mugil cephalus* at Beaufort, North Carolina.

FEMALE.—Body form as in Figure 24. Total length 1.972 mm, greatest width 1.014 mm (measured at widest part of cephalon). Cephalon length about 25% of total body length and about twice as wide as long. Genital segment (Figure 25) wider than long (282 × 176 μm). Abdomen 3-segmented, segments measure (length × width) 82 × 188 μm, 71 × 188 μm, and 82 × 165 μm, respectively. Last abdominal segment (Figure 26) with 2 large patches of spinules on ventral surface. Caudal rami (Figure 26) almost as wide at base as long (59 × 53 μm) tapering posteriorly, bearing a prominent patch of spinules on ventral surface, 2 prominent terminal setae and 4 lateral to terminal smaller setae.

First antenna (Figure 27) 6-segmented. Fourth seta on basal segment more heavily sclerotized

than others and recurved. An aesthete on each of last 2 segments. Second antenna (figure 28) third segment with hooklets not arranged in distinct rows, 4 terminal, articulated spines of equal length, and 3 setae. Mouthparts (Figure 29) typical of family; paragnath distal half finger-like and bearing long hairs in addition to fringe along distal to terminal edge; first maxilla with usual 3 plumose setae, but 4th naked seta more prominent than usual. Maxilliped (Figure 30) terminal claw with accessory process, claw recurved at nearly right angle.

Legs 1–4 biramous. First leg (Figure 31) exopod 2-segmented, first segment unarmed, second segment with 4 small spines and 6 stout setae; endopod first 2 segments each with an inner stout seta, last segment with 5 stout setae. Leg 2 (Figure 32) exopod first segment with spine on outer distal corner, second segment with outer spine and inner seta, last segment with 4 outer spines and 5 terminal to inner setae, all spines with a terminal flagellum; endopod first segment with an inner seta, second segment with 2 inner setae, last segment with 2 shorter outer spines and 3 terminal setae, segments of endopod wider than long. Leg 3 (Figure 33) exopod first segment with outer distal spine, fine serrations along outer edge, second segment as in first except with an inner seta, last segment with 3 outer spines and 4 terminal to inner setae, outer fringe partly bisecting segment. Leg 4 (Figure 34) exopod as in leg 3; endopod outer setae of first 2 segments short, and with spinules on distal margins, last segment with long terminal seta flanked on each side by a short spine. Leg 5 (Figure 35) with 4 short setae, terminalmost about twice length of others, inner 2 with terminal flagellum and fringed. Leg 6 represented by 3 setae at area of egg sac attachment (Figure 1).

MALE.—Unknown.

REMARKS.—This species can be separated from all previously described *Bomolochus*, except *B. hemirhamphi* Pillai, by having only 4 setae on the last exopod segment of leg 3 rather than the usual 5. The fifth leg of *B. nitidus* bears weakly developed spines and terminal seta. That of *B. hemirhamphi*

bears very stout spines and seta. So far this species has been recorded only from *Mugil cephalus*.

Vervoort, 1969, redescribed *B. concinnus* Wilson based on syntype specimens sent to him from the USNM collections labeled "*Bomolochus nitidus*" from *Mugil cephalus*, Beaufort, N.C., and incorrectly designated a female as the holotype of *B. concinnus*. The type specimens (3 females) of *B. concinnus* (USNM 38622 collected from "*Tylosurus marina*") are presently in the Smithsonian USNM collections and Vervoort's designation of a holotype from "*B. nitidus*" material was unnecessary. Examination of the types of *Bomolochus mugilis* Pearse indicate that it is identical to *B. nitidus* and, therefore, is here considered a synonym of that species.

***Bomolochus exilipes* Wilson**

FIGURES 36–48

Bomolochus exilipes Wilson, 1911:377.

MATERIAL EXAMINED.—21 ♀ from the gill area of 10 *Archosargus probatocephalus* (Walbaum) collected by the author at Charlotte Harbor, Florida, Oct 1970, Jul 1972, Apr 1973, Jun 1975, and Jul 1975; 2 ♀ from the gill area of 2 *Calamus arctifrons* Goode and Bean, collected from the same locality, Jul 1972.

FEMALE.—Body form as in Figure 36. Total length 841 μm , greatest width 464 μm (measured at widest part cephalon). Cephalon about 30% of total body length. Thoracic segments bearing legs 2–5 free. Genital segment (Figure 37) wider than longer (135 \times 124 μm). Abdomen (Figure 37) segments 1–3 measure (length \times width) 44 \times 103 μm , 30 \times 94 μm , and 47 \times 86 μm , respectively; last abdominal segment (Figure 38) with 2 large patches of spinules on ventral surface. Caudal rami (Figure 38) about twice as long as wide (50 \times 24 μm), each ramus with a ventral patch of spinules and 6 setae as in figure (note the more anterior placement of the lateral seta, which is usually near midlength of the outer margin in other bomolochids).

First antenna (Figure 39) 6-segmented, the

stout setae on first 2 segments only lightly plumose, an aesthete on each of last 2 segments; Rostral hooks present (Figure 40). Second antenna (Figure 41) with rows of fine hooklets on last segment, tips of 4 subterminal and terminal spines recurved as hooks. Oral area as in Figure 42. Paragnath with hairs and a fine fringe on posterior edge. First maxilla with 3 stout plumose setae and a smaller naked seta. Maxilliped (Figure 43) claw with accessory process. Legs 1–4 biramous. Leg 1 (Figure 44) basipod with rows of spinules as in the figure; exopod first segment with large spine corrugated along outer edge, second and third segments fused, bearing a short outer spine and 6 plumose setae; endopod first and second segments each with an inner seta and a row of spinules along distal margin, last segment with 5 plumose setae. Leg 2 (Figure 45) coxopod with a row of stout hairs at outer distal corner, basipod with an outer plumose seta; exopod first segment with stout hairs on outer margin and a spine at outer distal corner, second segment with an outer spine and an inner seta, last segment with 3 outer spines and 6 setae plumose on inner margins but outermost seta fringed on outer margin, next 4 setae with short plumosities on outer margin and innermost seta with usual plumosities on both margins; endopod segments wider than long, first segment with an inner seta and a row of spinules along distal margin, second segment similar except 2 inner setae, last segment with 2 short plumose outer setae and 3 normally plumose terminal setae. Leg 3 (Figure 46) coxopod with 3 stout spinules at outer distal corner, basipod with outer naked seta; exopod first segment with short spinules along outer edge and a fringe and spine at outer distal corner, second segment with fringe and spine at outer distal corner and an inner seta, last segment with 2 outer spines (proximalmost with a fringe at base) and 6 setae armed as in leg 2; endopod armed as in leg 2 except with 1 fewer inner setae on each of last 2 segments. Leg 4 (Figure 47) coxopod with a row of spinules at outer distal corner, basipod as in leg 3; exopod armed as in leg 3 except lacking spinules on outer edge of first segment, smaller fringes at bases of

outer spines, outer edges of all 4 spines fringed (stout spinules in leg 3), and outer terminal seta with short plumosities along outer edge (fringed in leg 3); endopod first 2 segments armed as in leg 3, last segment with an outer fringed spine, a middle seta with stout spinules, an inner short seta with stout spinules, and a row of long spinules at base of inner seta. Leg 5 (Figure 48) free segment with patches of heavy spinules as in the figure, an outer lateral spine, an outer terminal spine, a midterminal lightly plumose seta (about twice length of spines), and an inner spine longer than other spines (all spines with stout marginal spinules). Leg 6 represented by 3 long setae at area of egg sac attached (Figure 37).

MALE.—Unknown.

REMARKS.—This copepod is so far known only from the sparid fishes *Archosargus probatocephalus* and *Calamus arctifrons*.

***Acanthocolax* Vervoort**

***Acanthocolax hystricosus*, new species**

FIGURES 49–62

MATERIAL EXAMINED.—Holotype ♀ (USNM 197047) and 4 ♀ paratypes (USNM 197048) from the gill area of 17 *Lagodon rhomboides* (Linnaeus) collected by the author, 23 Nov 1975 at Charlotte Harbor, Florida. Additional material (133 ♀) from 1131 specimens of the same host from the same locality during the years 1970–1975.

FEMALE.—Body form as in Figure 49. Total length 2.85 mm, greatest width 1.05 mm (measured at widest part of cephalon). Cephalon about twice as wide as long (1.05 × 0.58 mm) with anterodorsal pair of pointed protuberances opposed by a similar pair of protuberances arising dorsally from the first antenna (Figure 50). Thoracic segments bearing legs 2–5 free. Genital segment (Figure 51) wider than long (354 × 236 μm). Abdomen 3-segmented, segments measure (length × width) 70 × 188 μm, 57 × 177 μm, and 106 × 147 μm, respectively; ventral surface of last segment with 2 patches of scale-like spinules (Figure 52). Caudal rami (Figure 52) about twice as

long as wide (100 × 47 μm), longest seta 324 μm, ventral surface of each ramus with a patch of scale-like spinules.

First antenna (Figure 53) 6-segmented, first 3 segments bearing 15 stout, plumose setae, an aesthete on each of last 2 segments; dorsal surface of first segment with sclerotized protuberance opposed by similar process on cephalon (Figure 54). Second antenna (Figure 55) second segment with hooklets arranged in discrete rows, row of long spinules near mid-inner margin, a subterminal process with inner row of long spinules, 4 recurved spines articulated at distal third and 2 outer naked setae. Oral area (Figure 56) typically bomolochid; first maxilla with 3 plumose setae and 1 shorter naked seta; paragnath linguiform with a row of short spinules along outer edge. Maxilliped (Figure 57) claw recurved at 45° angle and with prominent accessory process.

Legs 1–4 biramose. Leg 1 (Figure 58) basipod with row of fine spinules; exopod first segment with stout, rugose spine at outer distal corner, fused second and third segments with 2 small outer spines and 6 setae; endopod first 2 segments each with a row of fine spinules along distal margin and an inner seta, last segment with a very short outer spine and 5 setae. Leg 2 (Figure 59) coxopod with patch of hairs at outer distal corner and row of fine spinules on distal margin; coxopod unarmed except of usual seta at outer distal corner; exopod first segment with patch of long spinules on outer margin, a row of stout spinules at outer distal corner at base of outer spine, second segment with row of outer spinules at base of spine and an inner seta, last segment with 4 outer spines (variously armed as in the figure) and 5 setae; endopod first segment with outer hairs and an inner seta, second segment with outer hairs and 2 inner setae, last segment with outer hairs, 2 short spines and 3 setae. Leg 3 (Figure 60) coxopod with a row of stout spinules at outer distal corner and a row of small spinules on margin; basipod as in leg 2; exopod first segment with stout spinules scattered in outer margin and a row of finer spinules at base of outer spine, second segment with row of spinules

at base of outer spine and an inner seta, last segment with 3 outer spines (spinules at base of proximal spine only) and 5 setae, all spines with comb-like teeth or outer margin; endopod armed as in leg 2 except for one less inner seta on each of last 2 segments. Leg 4 (Figure 61) armed as in leg 3 except one less seta on last exopod segment, inner setae on first and second endopod segments with stout spinules rather usual plumosities, last endopod segment with usual outer and inner spines flanking a longer seta. Leg 5 (Figure 62) with patches of unusually stout spinules terminalmost seta about twice length of flanking terminal spines. Leg 6 represented by 3 setae at area of egg sac attachment (Figure 51).

MALE.—Unknown.

ETYMOLOGY.—The Latin *hystricosus* (thorny) alludes to the spinose nature of leg 5.

REMARKS.—This new species can be easily separated from the only other member of the genus (*A. similis* Vervoort) by the much stouter spinules on the rami of legs 2–4 of *A. similis*. Also, the setae of leg 5 are much longer in *A. similis* (the longest seta is longer than the free segment).

Acanthocolax similis Vervoort

FIGURES 63–75

Acanthocolax similis Vervoort, 1969:115.

MATERIAL EXAMINED.—6 ♀ from the nasal fossae and gill area of 9 *Acanthurus bahianus* Castelman, collected by the author at Carrie Bow Cay, Belize, Mar and Dec 1980; 1 ♀ from the gill area of *Pomacanthus paru* (Block), collected Mar 1980 from the same locality.

FEMALE.—Body form as in Figure 63. Total length 841 μm , greatest width 507 μm (measured at widest part of cephalon). First free thoracic segment about as wide as cephalon. Genital segment (Figure 64) nearly twice as wide as long (162 \times 89 μm). The 3 abdominal segments measure (length \times width) 59 \times 118 μm , 30 \times 103 μm , 30 \times 83 μm , respectively; last abdominal segment (Figure 65) with 2 ventral patches of stout spinules. Caudal rami (Figure 65) longer than wide

(35 \times 27 μm), ventral surface with a patch of stout spinules, 2 major terminal setae (longest 192 μm) and 4 minor setae as illustrated.

First antenna (Figure 66) 6-segmented with 15 plumose setae on first 3 segments and an aesthete on each of last 2 segments; a dorsal sclerotized process on first segment (Figure 67) opposing a cephalic knob. Rostrum with ventral hooks. Second antenna (Figure 68) last segment with numerous hooklets not arranged in discrete rows, inner margin with comb-like process, 3 mid-outer setae and 4 recurved spines. Oral area (Figure 69) typically bomolochid; paragnath with short hairs on apical surface and fringed apical margin; first maxilla with 3 plumose setae and a short naked seta, middle plumose seta twice length of other 2. Maxilliped (Figure 70) claw with accessory process.

Legs 1–4 biramose. Leg 1 (Figure 71) basipod with row of conspicuous spinules near base of endopod and patches of small spinules on surface; exopod first segment with spinulose spine at outer distal corner, last 2 segments fused bearing 4 outer spines and 6 plumose setae; endopod first 2 segments each with inner seta and a distal row of slender spinules, last segment with 5 plumose setae, interpodal plate with a row of heavy spines. Leg 2 (Figure 72) coxopod with spines at outer distal corner, basipod with a long naked seta at outer distal corner; exopod first segment with a row of spines on outer margin and a long fringed spine at outer distal corner, second segment similar except with an inner seta, last segment with 4 fringed spines, a row of shorter spines along outer margin and 4 plumose setae; endopod segments with spines on outer border, first segment with an inner seta, second with 2 inner setae, last segment with 2 toothed spines and 3 plumose setae; interpodal plate with distal row of spines. Leg 3 (Figure 73) similar to leg 2 except last exopod segment with only 3 outer fringed spines, endopod mid-segment with only 1 inner seta and only 2 setae on last segment. Leg 4 (Figure 74) armed as in leg 3 except exopod with only 3 setae on last segment and last endopod segment with usual seta flanked by 2 spines, endopod longer

than exopod. Leg 5 (Figure 75) with patches of long spinules as in the figure and unusually long setae, distalmost seta longer than free segment and about twice length of innermost seta. Leg 6 represented by 3 setae at area of egg sac attachment (Figure 64).

REMARKS.—Vervoort (1969:115) reported this species from *Acanthurus heptatus* and *A. bahianus* from Curaçao. The present record from *A. bahianus* from Belize may indicate a limited host specificity for this copepod.

Holobomolochus Vervoort

Holobomolochus scutigerulus (Wilson)

FIGURES 76–98, 117–119

Bomolochus scutigerulus Wilson, 1935:335.

Bomolochoides scutigerulus.—Vervoort, 1962:30.

Holobomolochus scutigerulus.—Vervoort, 1969:68.

MATERIAL EXAMINED.—15 ♀ from the gill area of 14 *Pseudupeneus maculatus* (Bloch), collected by the author at Carrie Bow Cay, Belize, Dec 1980.

FEMALE.—Body form as in Figure 76. Total length 1.116 mm, greatest width 0.75 mm (measured at widest part of cephalon); cephalon comprising about 1/3 total body length and much wider than long. Genital segment (Figure 77) wider than long (130 × 83 μm). Abdomen 3-segmented, segments measure (length × width) 33 × 71 μm, 21 × 59 μm, and 56 × 53 μm, respectively; last abdominal segment (Figures 78, 117A) with 2 large patches of scale-like spinules on ventral surface. Caudal rami (Figure 78) longer than wide, ventral surface with scale-like spinules (Figure 117B), 2 major terminal setae (longest 150 μm).

First antenna (Figure 79) 7-segmented; first 4 segments with 15 stout, plumose setae, an aesthete on each of last 2 segments. Rostral area with ventral hooks (Figure 79). Second antenna (Figure 117C–E) with hooklets and hairs not arranged in discrete rows; tip with 4 articulated spines and a seta. Oral area as in Figures 80, 117F. Labrum (Figure 118A) with patches of truncated spinules (Figure 118B). Paragnath unarmed. First maxilla

with 2 long setae with short plumosities and 3 short, naked setae. Second maxilla with spoon-like process (Figure 118C) at outer distal corner of basal segment; outer proximal edge of next segment corrugated.

Maxilliped (Figures 81, 118D) basal segment with posterior lobe, second segment posterior edge (Figure 118E) corrugated, claw sharply recurved and with small accessory process; 3 plumose setae relatively short.

Legs 1–4 biramose. Leg 1 (Figure 82) basipod (Figure 118F) with 2 patches of spatulate spinules (Figure 119A); exopod and endopod typical of genus; interpodal plate (Figure 119B) with 2 large patches of scale-like spinules (Figure 119C) reminiscent of lepidopteran wing scales. Leg 2 (Figure 83) coxopod with a patch of long hairs near outer margin; exopod first segment with 2 large patches of small spinules and a naked spine at outer distal corner, second segment with outer naked spine and inner seta, last segment with 3 spines (distalmost fringed on outer margin) and 5 setae; endopod segments with hairs on outer border, first segment with an inner seta, last segment with 2 small spines and 3 setae. Leg 3 (Figure 84) similar to leg 2 except a patch of closely spaced spinules on coxopod, exopod much smaller than endopod, endopod last segment with 2 setae rather than 3, and interpodal plate with 2 patches of scale-like spinules (Figure 119D). Leg 4 (Figure 85) exopod similar to that of leg 3; endopod first 2 segments each with a patch of spinules on outer distal corner and a short inner seta, last segment with patch of spinules and a terminal naked seta flanked by 2 short, plumose setae. Leg 5 (Figure 86) free segment with a lateral patch of spinules, a lateral and 2 terminal naked setae of about equal length, and a shorter terminal plumose seta. Leg 6 represented by 3 stout, naked setae at area of egg sac attachment (Figures 77, 119F).

MALE.—Body form as in Figure 87. Cephalon about as wide as long. Thoracic segments bearing legs 2–5 free. Genital segment (Figure 88) about as wide as long. Abdomen 2-segmented, each segment about twice as wide as long, last segment with spinules on ventral surface as in Figure 89.

Caudal rami (Figure 89) short, about as wide as long, each with ventral row of spinules as in the figure; each ramus with 2 major terminal setae and 4 minor setae.

First antenna (Figure 90) 6-segmented; first 2 segments with 14 plumose setae, plumosities bristle-like on some setae as indicated in figure, an aesthete on each of last 2 segments. No rostral hooks between bases of antennae. Second antennae (Figure 91) last segment with fine hooklets arranged in indistinct rows, 4 terminal and subterminal articulated spines and 1 seta (usually 2 or 3 in other species). Oral area as in Figure 92. Mandible blade short, posterior edge fringed; flagellum with stout spinules. First maxilla with 2 short unarmed setae. Paragnath blade with stout spinules along posterior edge. Second maxilla with 2 stout, heavily sclerotized spines at tip and scattered subterminal spinules. Maxilliped (Figure 93) base with 2 patches of spatulate spinules on inner margin and 2 medial setae (1 naked, 1 plumose), claw with spinules on inner margin.

Legs 1-4 biramose. Leg 1 (Figure 94) not modified as in female; basipod and both rami with patches of scale-like spinules, inner corner of basipod with patch of stout, pointed spinules; exopod first 2 segments each with an outer fringed spine, second segment with an inner seta, last segment with 3 outer spines (terminalmost without fringe) and 3 setae; endopod first 2 segments each with an inner seta, last segment an outer fringed spine and 5 setae; interpodal plate with 2 patches of spinules. Leg 2 (Figure 95) coxopod and basipod with scattered rows of spinules as indicated in the figure; exopod with large patch of spatulate spinules on first segment only and 1 less seta (4) on last segment than in female; endopod not widened as in female and only 1 seta on midsegment. Leg 3 (Figure 96) similar to leg 2 except exopod midsegment without outer spine and endopod last segment with only 2 setae. Leg 4 (Figure 97) exopod as in leg 3; endopod 2-segmented, last segment with 1 long seta and a short outer spine. Leg 5 (Figure 98) free segment with 2 terminal setae, innermost longest.

REMARKS.—This species, reported by Wilson (1935), Vervoort (1962, 1969), and the present author (herein) has been found only on the goatfish *Pseudupeneus maculatus* from the Gulf of Mexico and Caribbean Sea.

Holobomolochus vervoorti, new species

FIGURES 99-104

Holobomolochus ardeolae.—Vervoort, 1969:41 [misidentified].

MATERIAL EXAMINED.—Holotype ♀ (USNM 195371) and 2 paratype ♀ (USNM 195372) collected from the gills of 2 *Microspathodon chrysurus* (USNM 178061) from Martinique. An additional paratype ♀ (USNM 195373) from the same host, collected by the author at Carrie Bow Cay, Belize, 13 Mar 1980.

FEMALE.—Body form as in Figure 99. Total length 2.55 mm, greatest width 1.5 mm (measured at widest part of cephalon). Cephalon comprising about one-third total body length. Abdomen 3-segmented; segments measure (length × width) 179 × 235 μm, 132 × 207 μm, and 94 × 188 μm, respectively. Caudal ramus as long as wide (63 × 63 μm) with setae as in *H. glyphisodontis* (longest 413 μm), no ornamentation seen on ventral surface of rami or last abdominal segment (Figure 100).

First antenna 7-segmented, armed as in *H. glyphisodontis*. Rostral area without ventral hooks. Second antenna as in *H. glyphisodontis*. Labrum with wide band of fine spinules along posterior margin. Mouth parts as in *H. glyphisodontis* except a fourth short, naked seta present in the new species first maxilla (not seen in my earlier description of *glyphisodontis* but may be present in that species also). Maxilliped as in *H. glyphisodontis*.

Legs 1-4 biramose. Legs as in *H. glyphisodontis* except as noted as follows. Leg 1 sympod (Figure 101) with patches of small spinules as in figure (spinules are spatulate in *H. glyphisodontis*), first and second endopod segments each with a large patch of spinules on outer distal surface (absent in *H. glyphisodontis*). Leg 2 exopod (Figure 102)

with 4 heavily sclerotized spines on outer margin of last segment, each with subterminal flagellum (last 2 not heavily sclerotized and without terminal flagellum in *H. glyphisodontis*). Leg 3 (Figure 103) as in *H. glyphisodontis*, except last exopod segment with 3 heavily sclerotized outer spines, each with a subterminal flagellum. Leg 4 (Figure 104) exopod as in leg 3 (differing from *H. glyphisodontis* in the nature of the outer spines); endopod as in *H. glyphisodontis* except inner seta on midsegment much shorter (in *H. glyphisodontis* this seta extends to tip of last segment). Leg 5 as in *H. glyphisodontis*.

MALE.—Unknown.

ETYMOLOGY.—The specific name “*vervoorti*” is for Dr. W. Vervoort whose 1962 review of bomolochids was the first major revision of the Bomolochidae.

REMARKS.—In 1969, Vervoort described a new genus, *Holobomolochus*, designating *Bomolochus nothrus* Wilson as the type-species and six additional species (*B. ardeolae* Krøyer, *B. attenuatus* Wilson, *B. albidus* Wilson, *B. acutus* Gnanamuthu, *B. confusus* Stock, and *A. palleucus* Wilson). In 1981, I placed *B. nothrus* in synonymy with *B. glyphisodontis* Krøyer, hence *B. glyphisodontis* becomes the genotype. In his diagnosis of the new genus, Vervoort (1969:35) stated that the rostral plate is “usually without sharp points.” Of the approximately 20 species currently recognized belonging to the genus *Holobomolochus* the only species without rostral hooks are *glyphisodontis* and *vervoorti*. I am currently describing 3 additional species from the eastern Pacific in this group without rostral hooks. These 5 species are characterized by the unusual anterior prominence of the first antenna and that, in addition to the absence of the rostral hooks, indicates to me that these 5 species are the only true *Holobomolochus* and the remaining species represent one or more additional new genera, which I am in the process of describing.

It should be noted that the material described as *H. ardeolae* (Wilson) by Vervoort in 1969 from the same host (*Stegastes chrysurus*) is the same as the new species described here.

Pseudoecanthus Brian

Pseudoecanthus uniseriatus Wilson

FIGURES 105–116

Pseudoecanthus uniseriatus Wilson, 1913:203.

MATERIAL EXAMINED.—Holotype ♀ (USNM 43510) from the mouth of *Caranx crysos* (Mitchell) from Jamaica, 11 ♀ from gill washings of 38 *Haemulon sciurus* (Shaw) from Carrie Bow Cay, Belize, collected by the author 7 Mar 1980 and 9 Dec 1980, and 2♀ from 11 *Chaetodon humeralis* Günther (USNM 80878-80888) from Panama market, collected by the author 17 May 1983.

FEMALE.—Body form as in Figure 105. Total length 0.9 mm, greatest width 0.33 mm (measured at widest part of cephalon). Cephalon length 0.26 mm. Rostral hooks present. Thoracic segments bearing legs 2–4 distinct, segments bearing legs 3 and 4 longer than wide, segment bearing leg 5 indistinctly articulated with genital segment. Genital segment (Figure 106) wider than long separated from abdominal segment (124 × 71 μm). Abdomen 3-segmented (Figure 106), segments measure (length × width) 44 × 61 μm, 30 × 53 μm, and 24 × 42 μm, respectively; spinules present on ventral surface of all abdominal segments. Spinules on first 2 segments more closely spaced than those on last segment. Caudal rami (Figure 107) about twice as long as wide (41 × 20 μm), with a patch of spinules on ventrodorsal surface; each ramus with a lateral seta, an outer subterminal seta, and 4 terminal setae (1 major seta much longer [59 μm] than others), all setae naked.

First antenna (Figure 108) 5-segmented, 15 weakly sclerotized plumose setae on anterior edge of first 2 segments, an aesthete on each of last 2 segments. Second antenna (Figure 109) third segment with irregular rows of stout hooklets; last segment with 4 terminal articulated spines and 2 inner setae. Labrum covered with scale-like spinules. Oral area (Figure 110) typically bomolochid except first maxilla with only 2 long, plumose setae (usually 3, sometimes 4, in other bomolochids). Second maxilla, second segment, with

outer proximal corner produced. Maxilliped (Figure 111) claw somewhat recurved and without an accessory process.

Legs 1-4 biramose. First leg (Figure 112) basipod with 2 large patches of spinules; exopod 2-segmented, first segment with a small spine on outer distal corner, second segment with 6 plumose seta and 4 short spines; endopod 3-segmented, first segment with an inner plumose seta, second segment with an inner plumose seta and a row of spinules along outer half of distal margin, last segment with 5 plumose setae. Leg 2 (Figure 113) basipod with 2 patches of small spinules, a patch of stout spinules near origin of endopod, and a seta near outer distal corner, exopod first and second segments indistinctly separated and each with a large patch of spinules and a naked weak spine on outer distal corner, last segment with 2 patches of spinules, 3 naked weak spines on outer edge and 3 setae with short plumosities; endopod first segment with a row of spinules along distal margin and an inner plumose seta, second segment like first except with 2 inner setae. Leg 3 (Figure 114) basipod with a patch of small spinules, a patch of scale-like spinules, and a seta near outer distal corner; exopod as in leg 2;

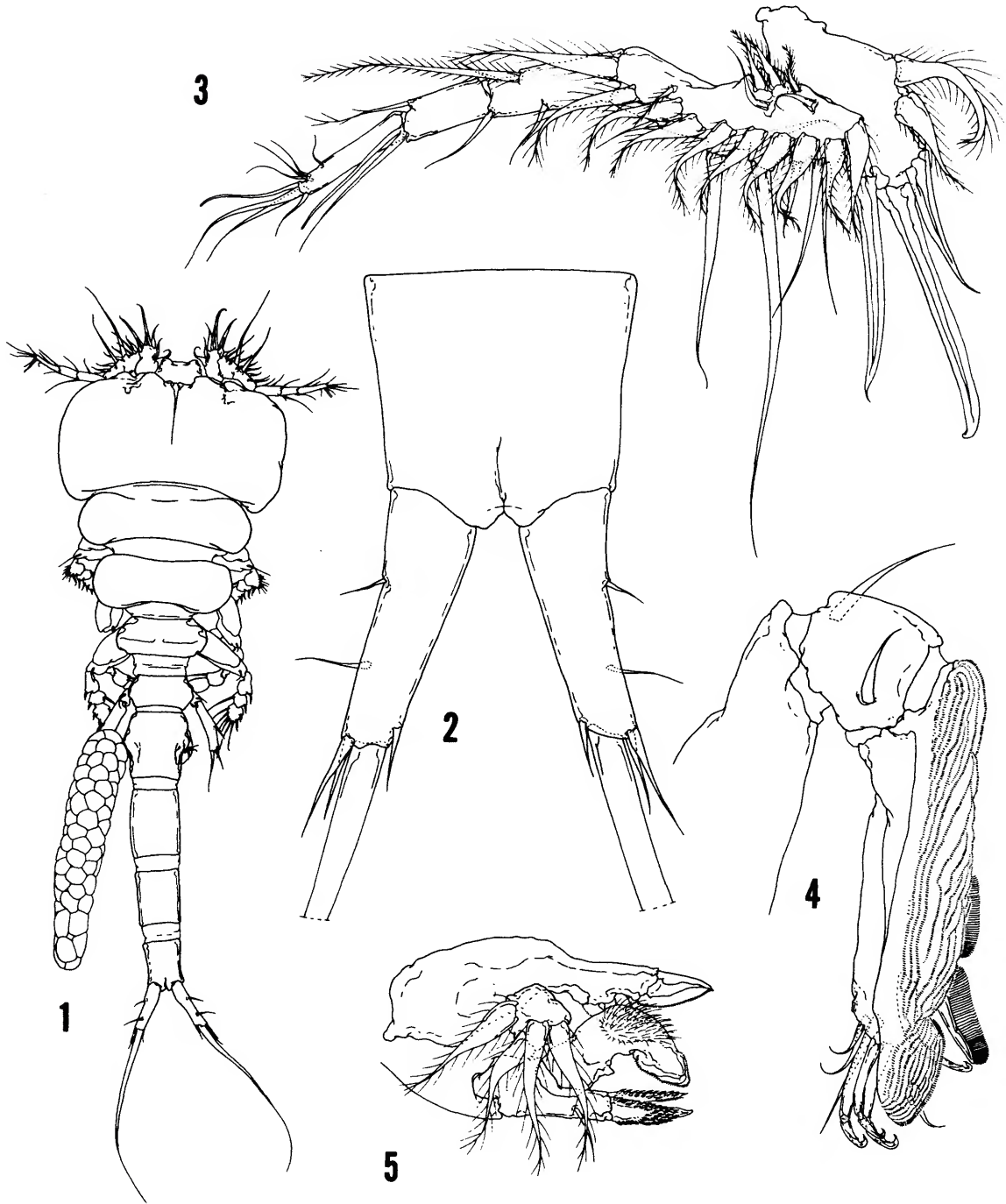
endopod first and second segments each with a patch of stout spinules and an inner seta, last segment with 2 short outer spines and 2 setae (all endopod setae with short plumosities). Leg 4 (Figure 115) exopod as in legs 2 and 3; endopod as in leg 3 except last segment with a short outer spine, a terminal seta and a short inner naked seta. Leg 5 (Figure 116) with patches of spinules as in the figure, a weak lateral subterminal seta and 3 terminal setae, middle seta longest. Leg 6 represented by 3 setae at area of egg sac (Figure 106).

MALE.—Unknown.

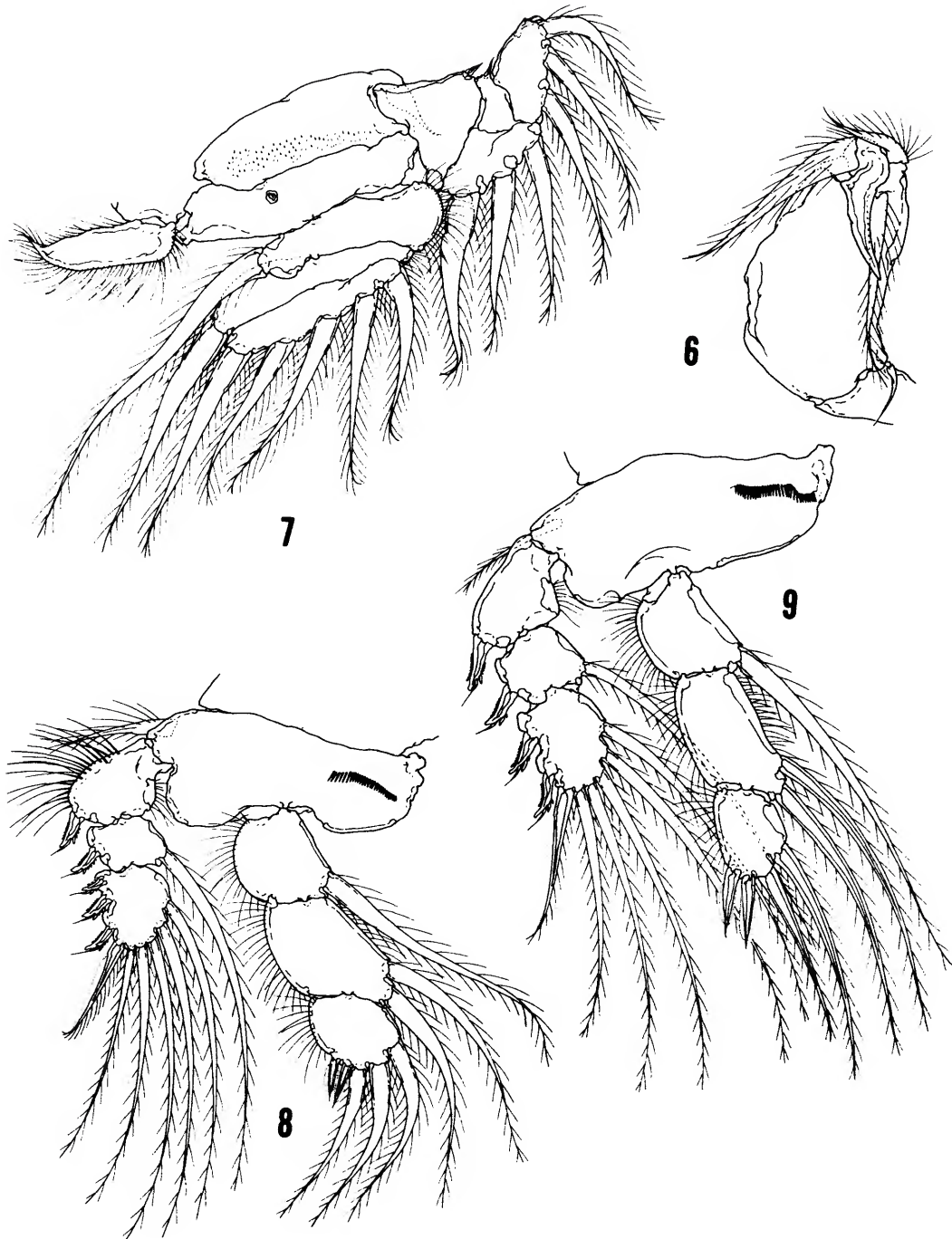
REMARKS.—This species has been known previously only from the original description by Wilson (1913). It differs from the only other described species of the genus *P. alosae* (Brian), from *Clupea alosa* (Linnaeus) from the Mediterranean, by the presence of 2 short setae plus usual long setae on the last endopod segment of legs 2 and 3. In *P. alosae* the setae on these segments are all of about equal length. A third species is being described by F. Roubal (pers. comm.) from Australia. Although the genus is known from only 2 described and 1 undescribed species, it is apparently widely distributed.

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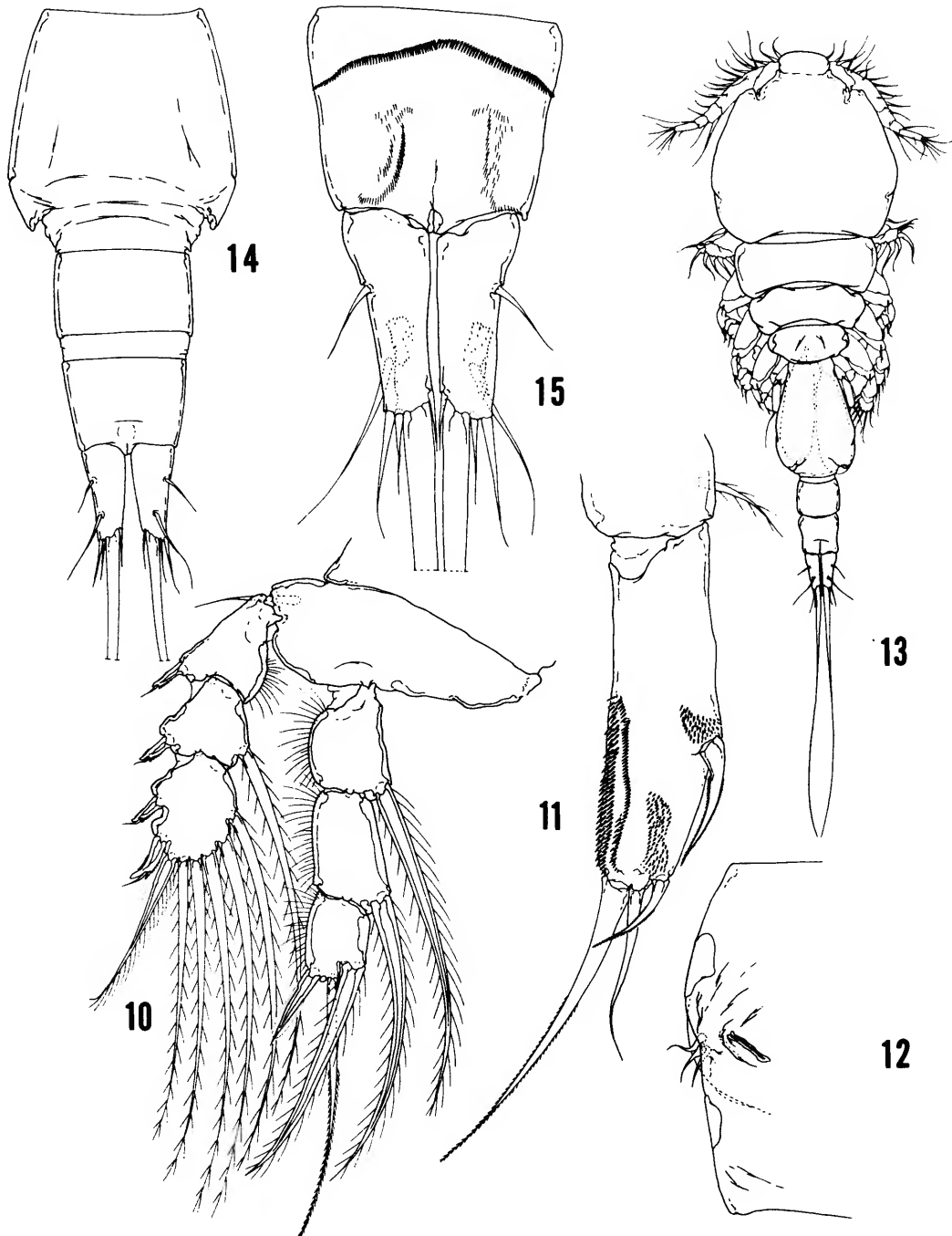
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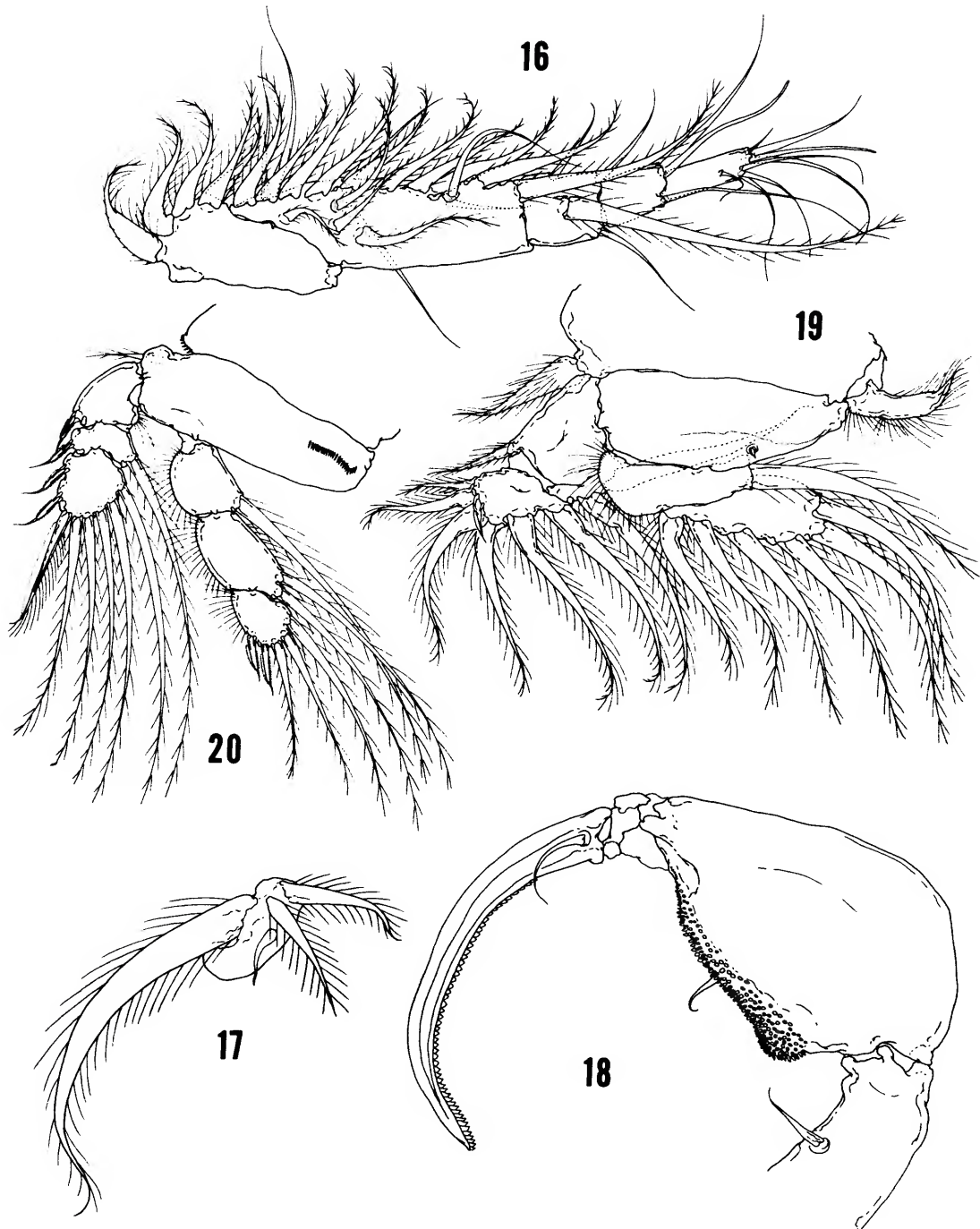
FIGURES 1-5.—*Nothobomolochus teres* (Wilson), female: 1, dorsal view; 2, last abdominal segment and caudal rami, ventral view; 3, first antenna; 4, second antenna; 5, oral area.



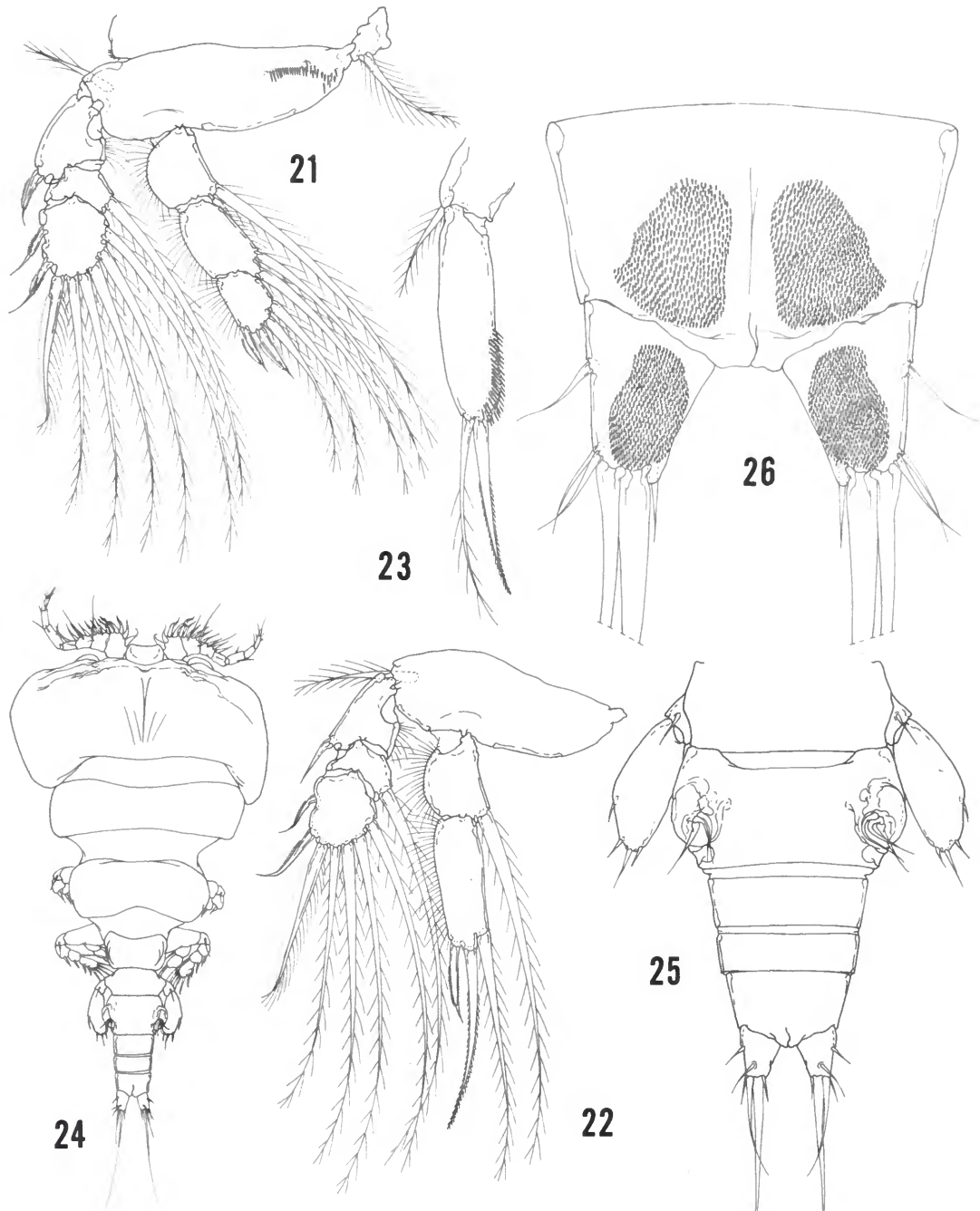
FIGURES 6-9.—*Nothobomolochus teres* (Wilson), female: 6, maxilliped; 7, leg 1; 8, leg 2; 9, leg 3.



FIGURES 10-15.—*Nothobomolochus teres* (Wilson). Female: 10, leg 4; 11, leg 5; 12, leg 6. Male: 13, dorsal view; 14, genital segment, abdomen, caudal ramus, dorsal view; 15, last abdominal segment and caudal rami, ventral view.

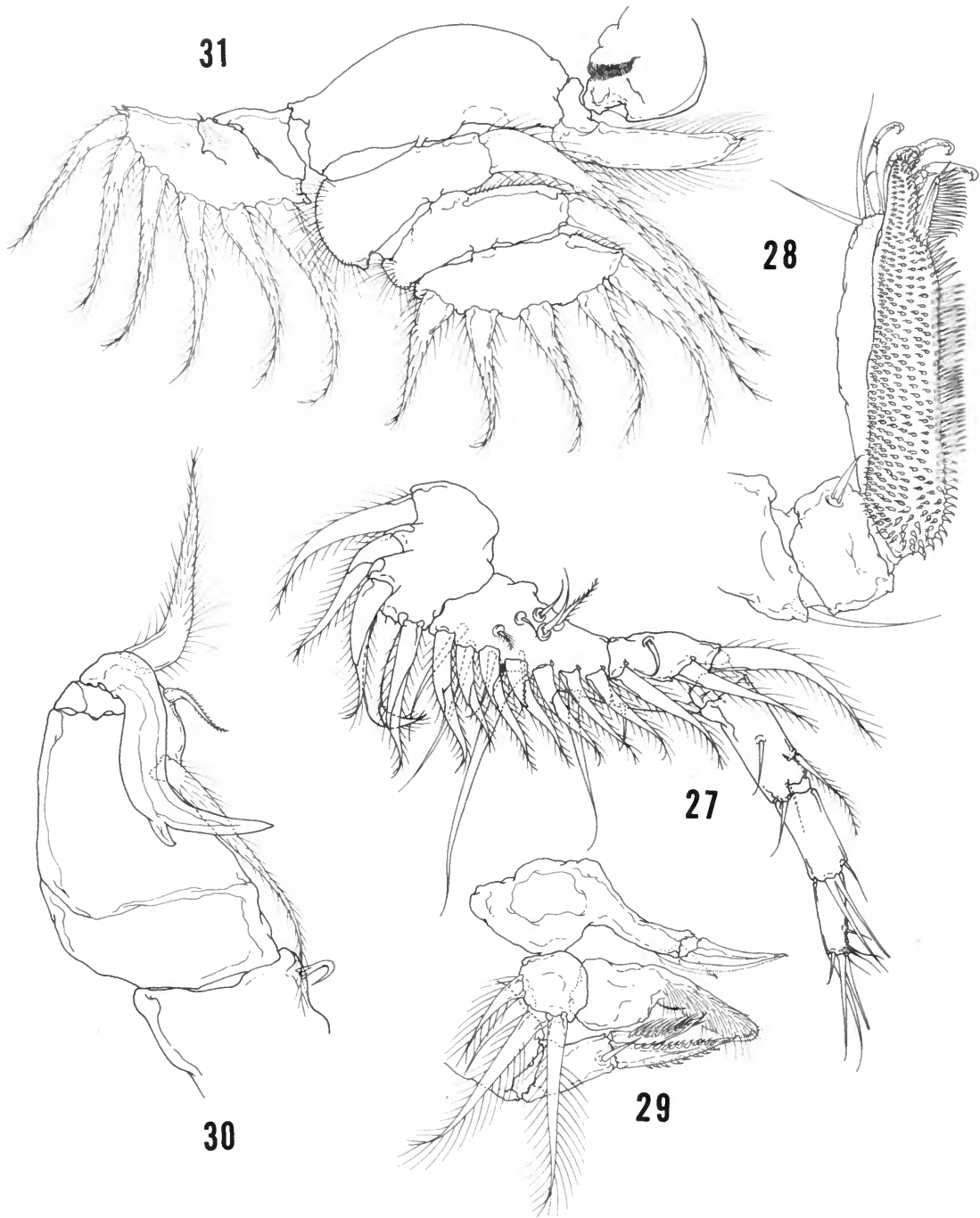


FIGURES 16-20.—*Nothobomolochus teres* (Wilson), male: 16, first antenna; 17, first maxilla; 18, maxilliped; 19, leg 1; 20, leg 2.

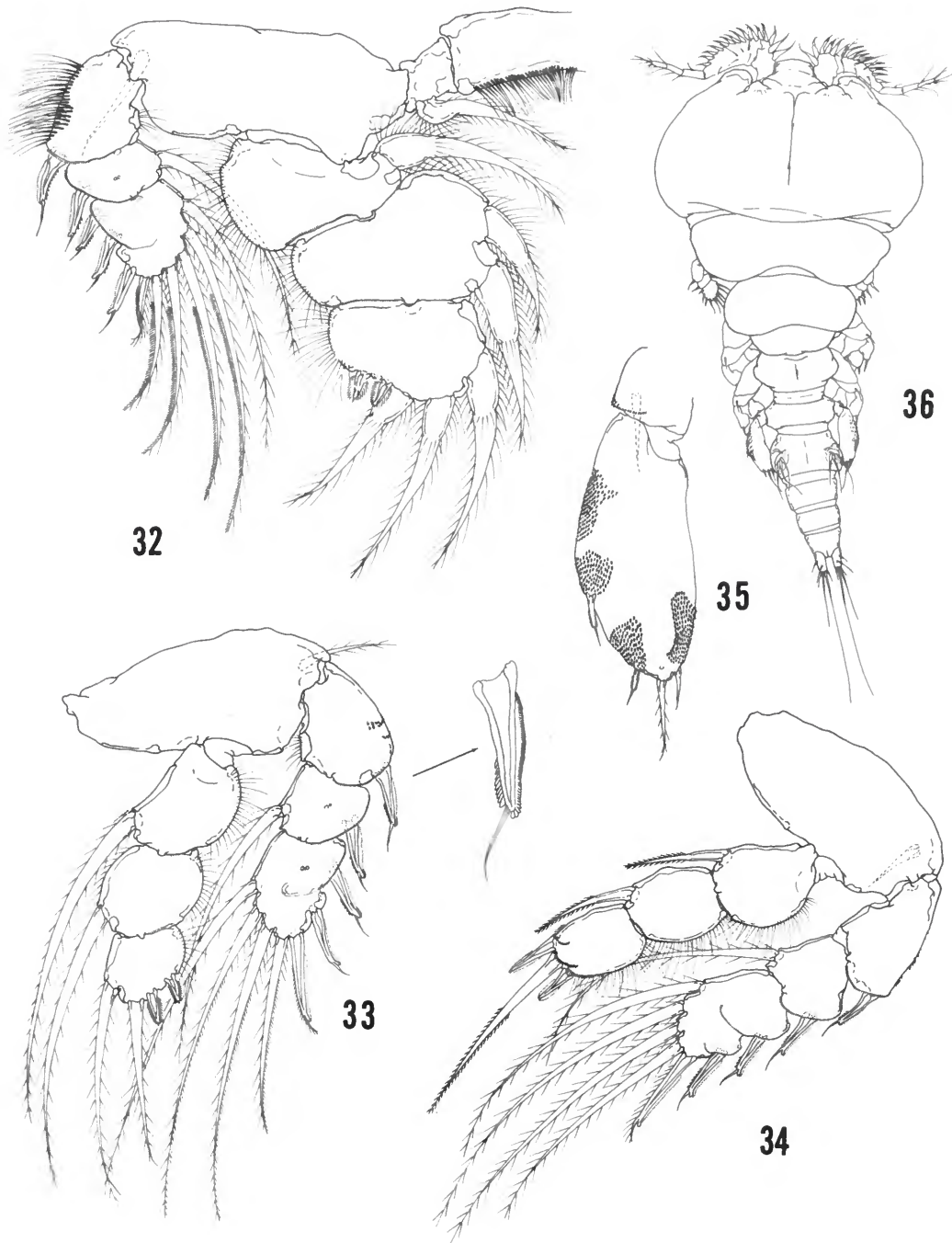


FIGURES 21-23.—*Nothobomolochus teres* (Wilson), male: 21, leg 3; 22, leg 4; 23, leg 5.

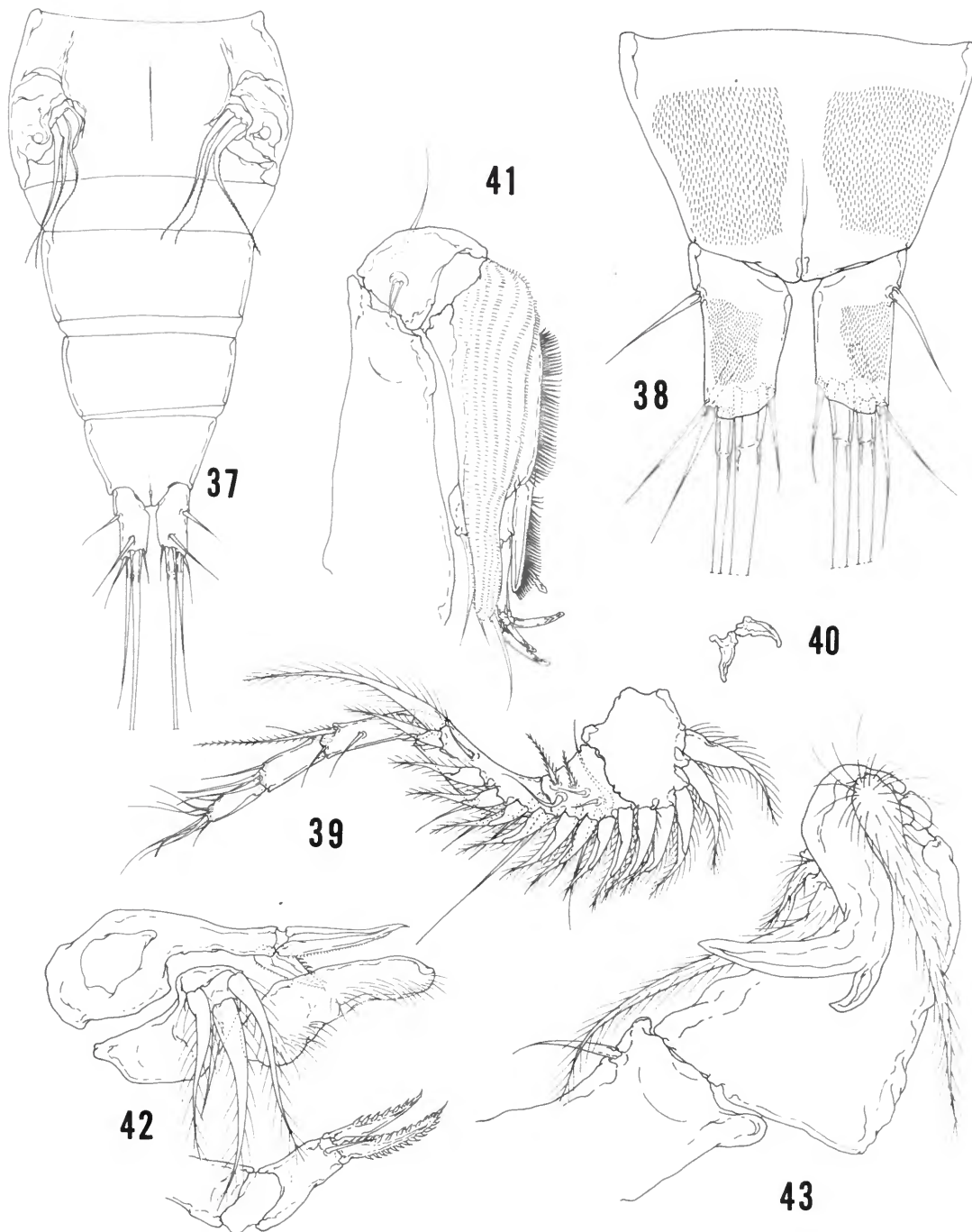
FIGURES 24-26.—*Bomolochus nitidus* Wilson, female: 24, dorsal view; 25, genital segment, abdomen, caudal rami, dorsal view; 26, last abdominal segment and caudal rami, ventral view.



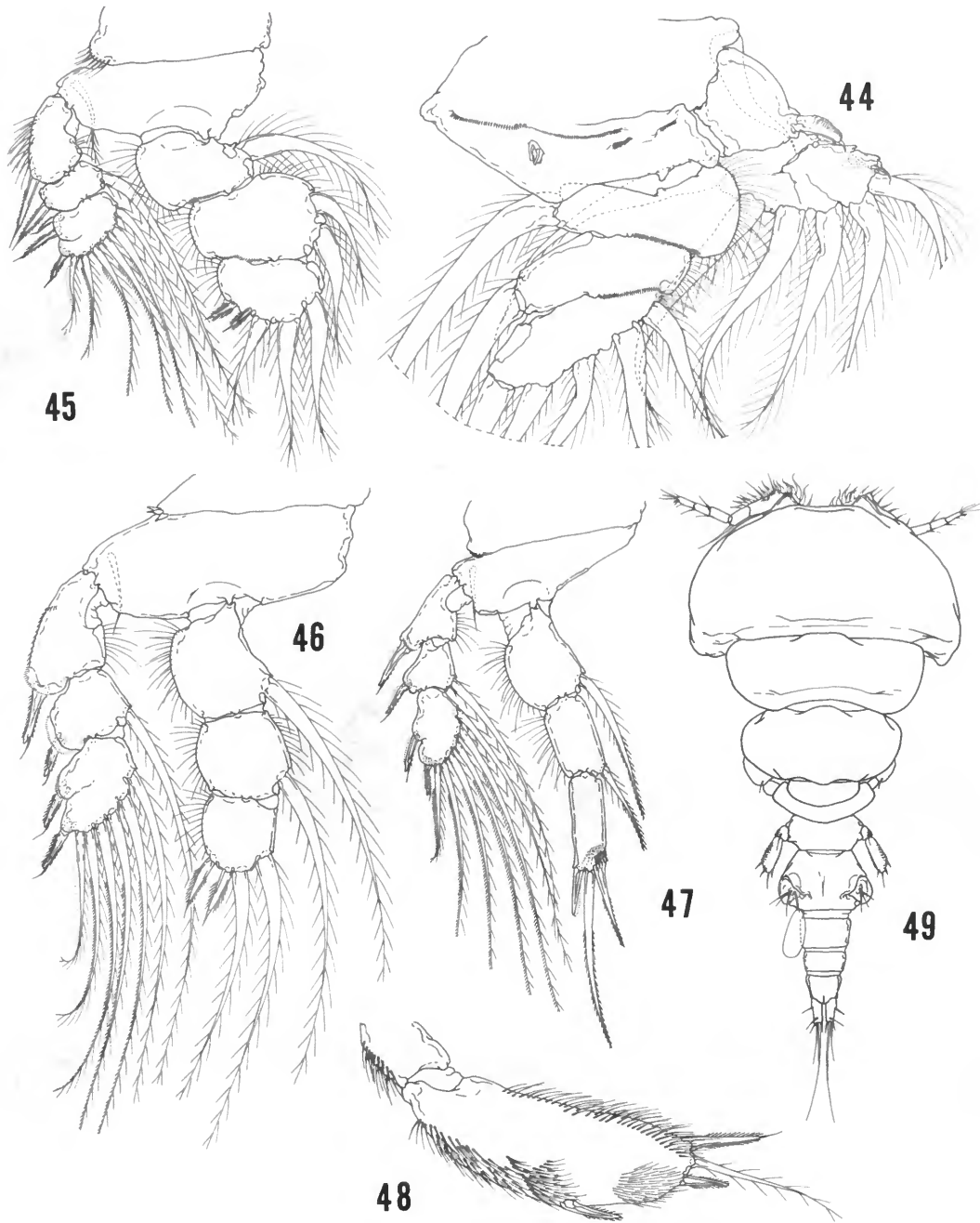
FIGURES 27-31.—*Bomolochus nitidus* Wilson, female: 27, first antenna; 28, second antenna; 29, oral area; 30, maxilliped; 31, leg 1.



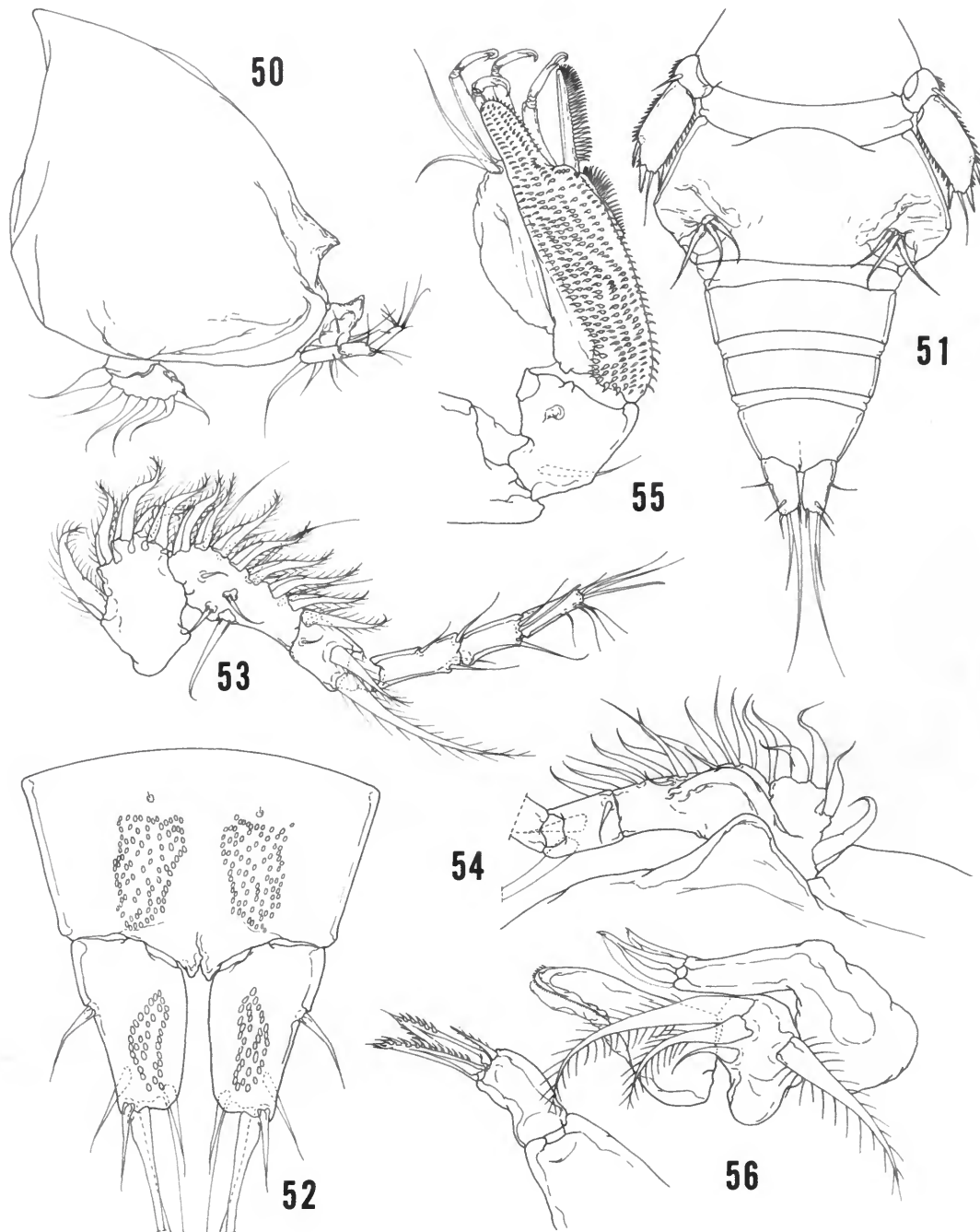
FIGURES 32-35.—*Bomolochus nitidus* Wilson, female: 32, leg 2; 33, leg 3; 34, leg 4; 35, leg 5.
 FIGURE 36.—*Bomolochus exilipes* Wilson, female, dorsal view.



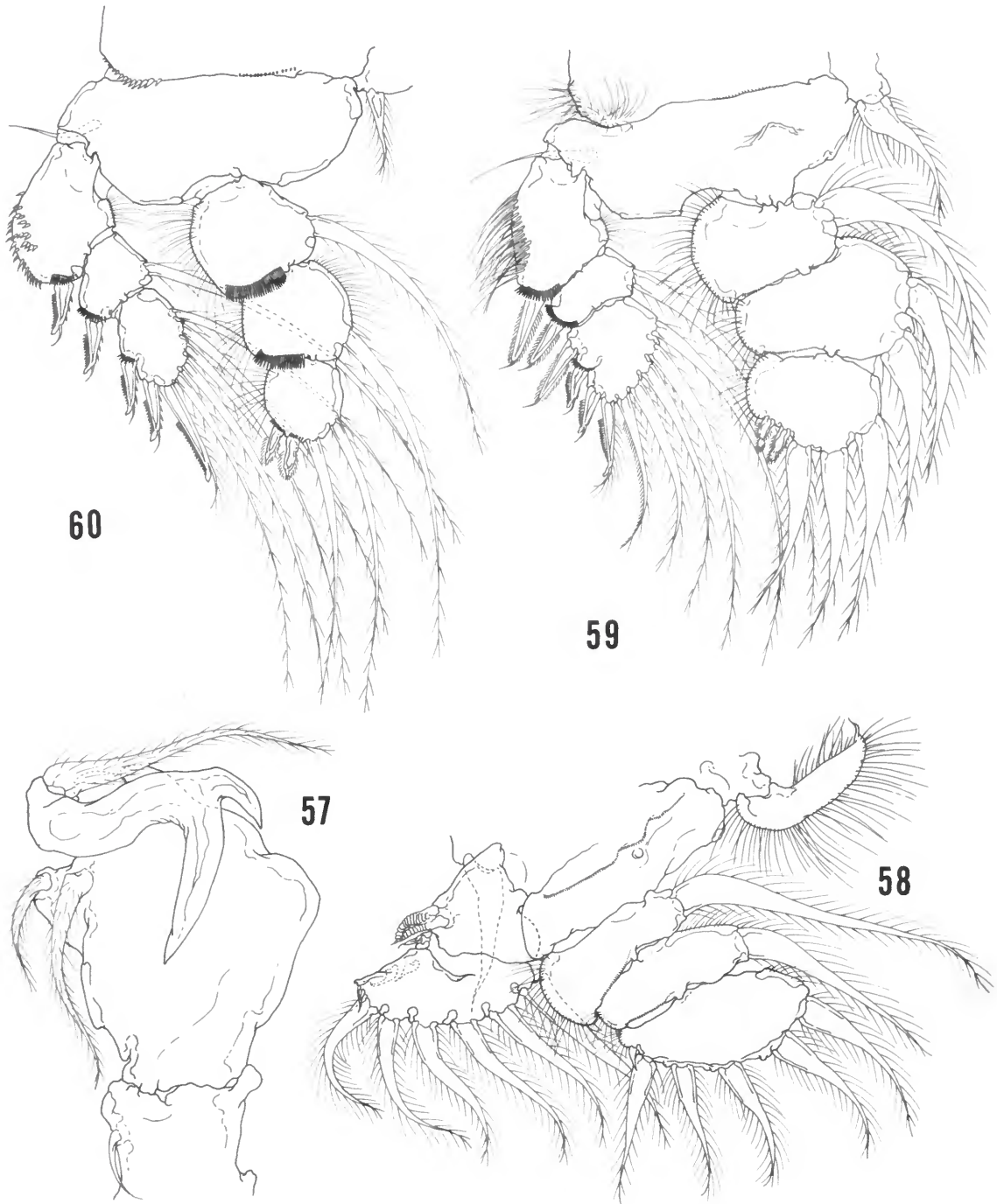
FIGURES 37-43.—*Bomolochus exilipes* Wilson, female; 37, genital segment, abdomen, caudal ramus, dorsal view; 38, last abdominal segment and caudal rami, ventral view; 39, first antenna; 40, rostral hooks; 41, second antenna; 42, oral area; 43, maxilliped.



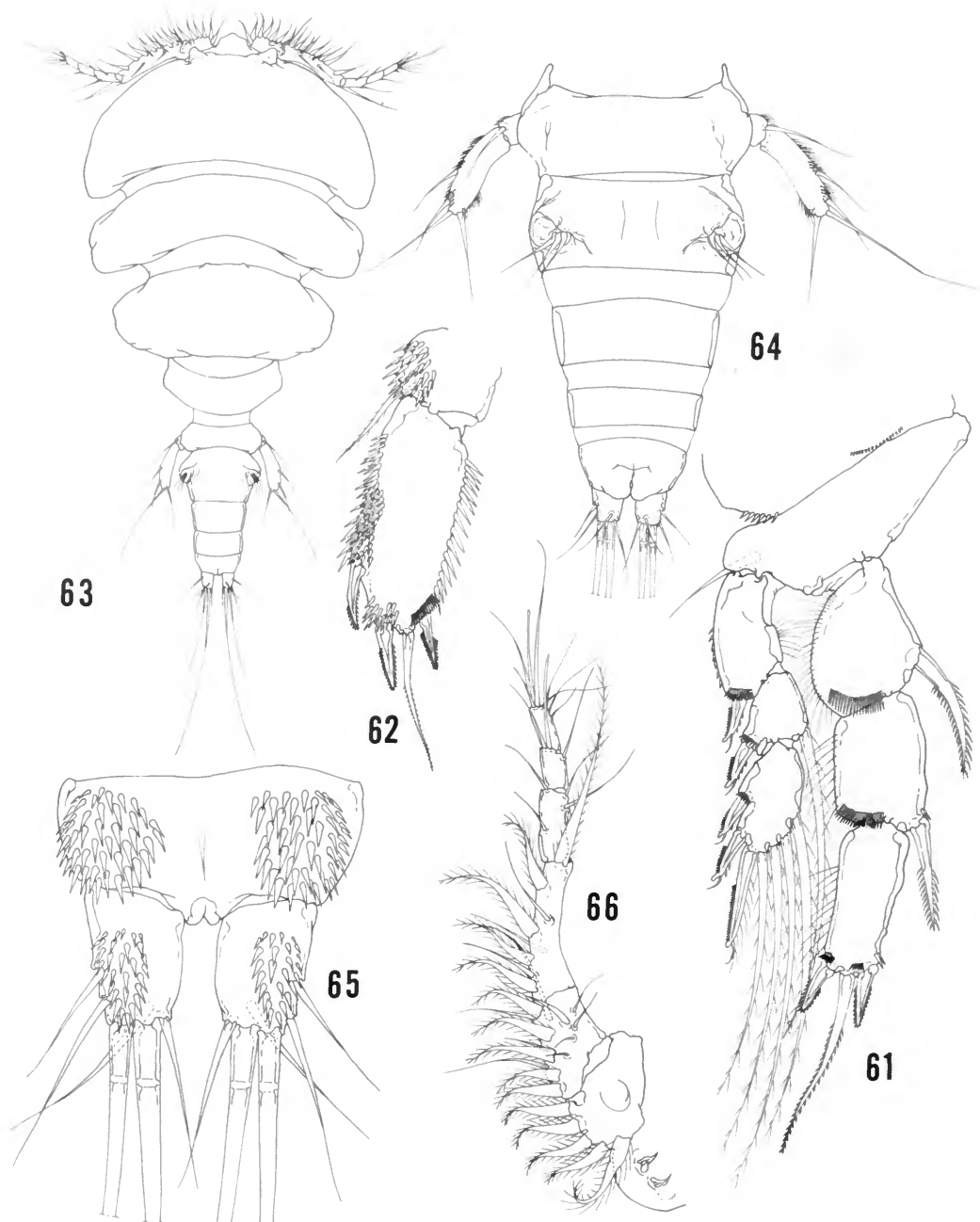
FIGURES 44-48.—*Bomolochus exilipes* Wilson, female: 44, leg 1; 45, leg 2; 46, leg 3; 47, leg 4; 48, leg 5.
 FIGURE 49.—*Acanthocolax hystricosus*, new species, female, dorsal view.



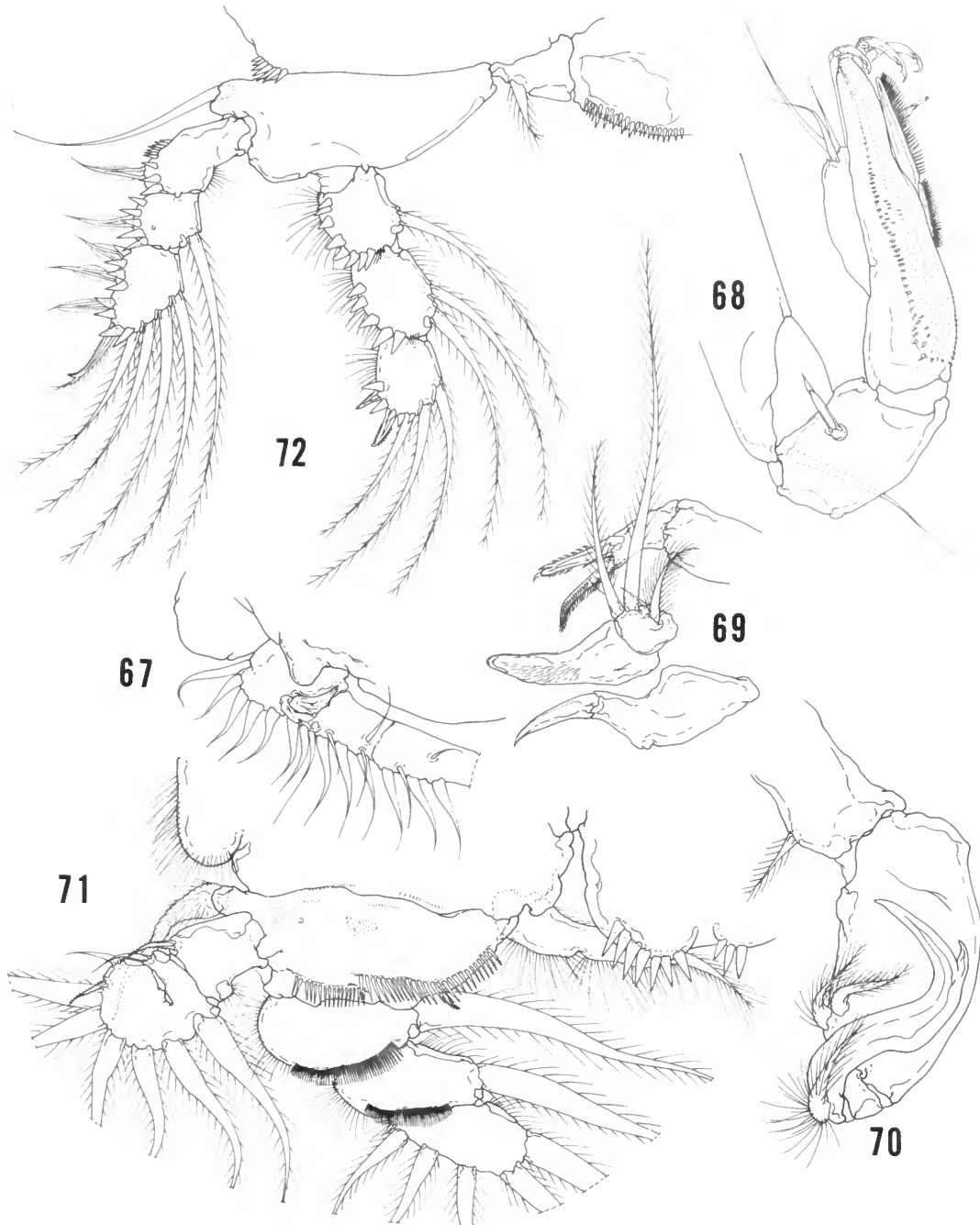
FIGURES 50-56.—*Acanthocolax hystricosus*, new species, female: 50, cephalon, lateral view; 51, 5th pedigerous segment, genital segment, abdomen, caudal rami, dorsal view; 52, last abdominal segment and caudal rami, ventral view; 53, first antenna; 54, base of first antenna, dorsal view; 55, second antenna; 56, oral area.



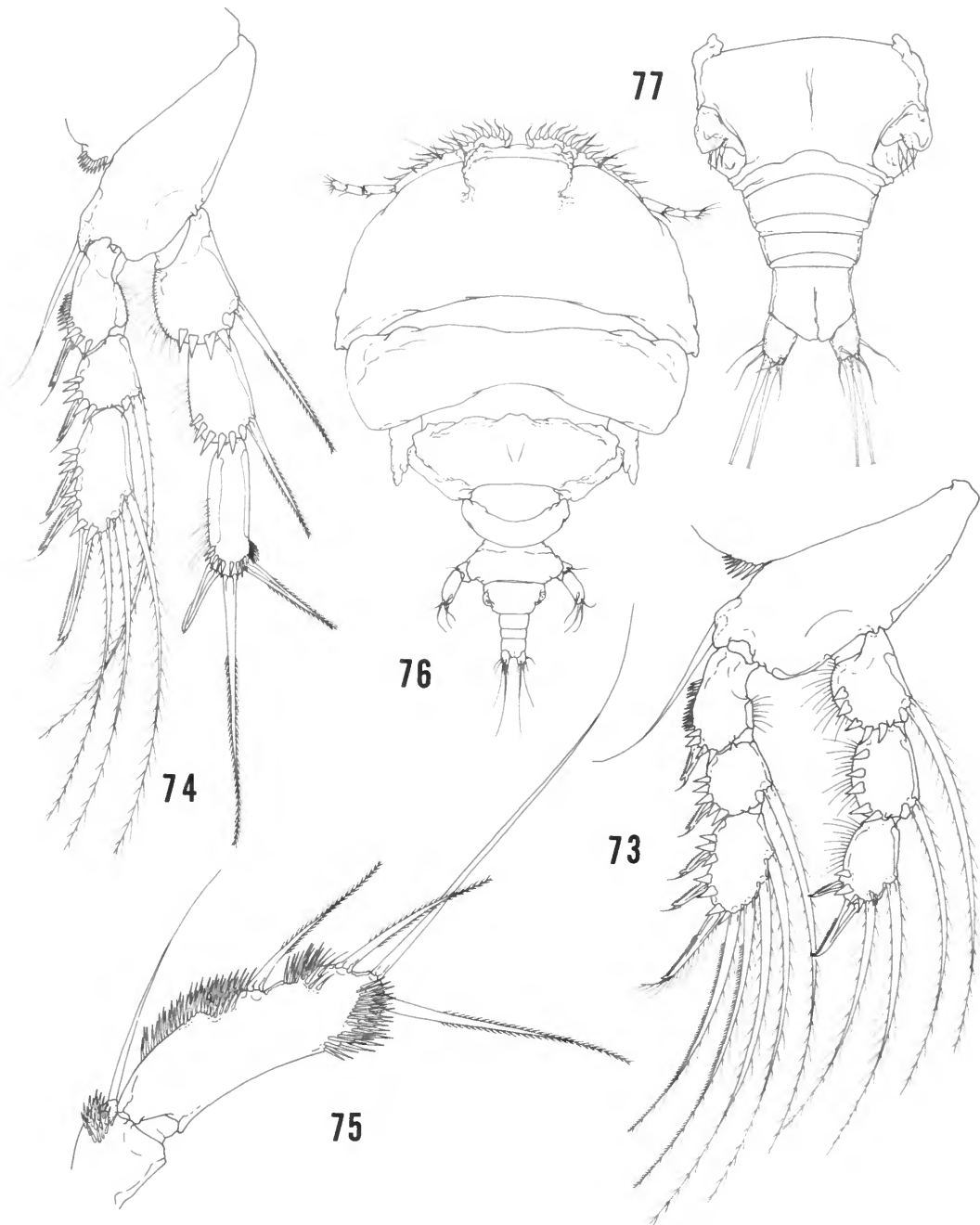
FIGURES 57-60.—*Acanthocolax hystricosus*, new species, female: 57, maxilliped; 58, leg 1; 59, leg 2; 60, leg 3.



FIGURES 61-62.—*Acanthocolax hystricosus*, new species, female: 61, leg 4; 62, leg 5.
 FIGURES 63-66.—*Acanthocolax similis* Vervoort, female: 63, dorsal view; 64, 5th pedigerous segment, genital segment, abdomen, caudal rami, dorsal view; 65, last abdominal segment and caudal rami, ventral view; 66, first antenna.

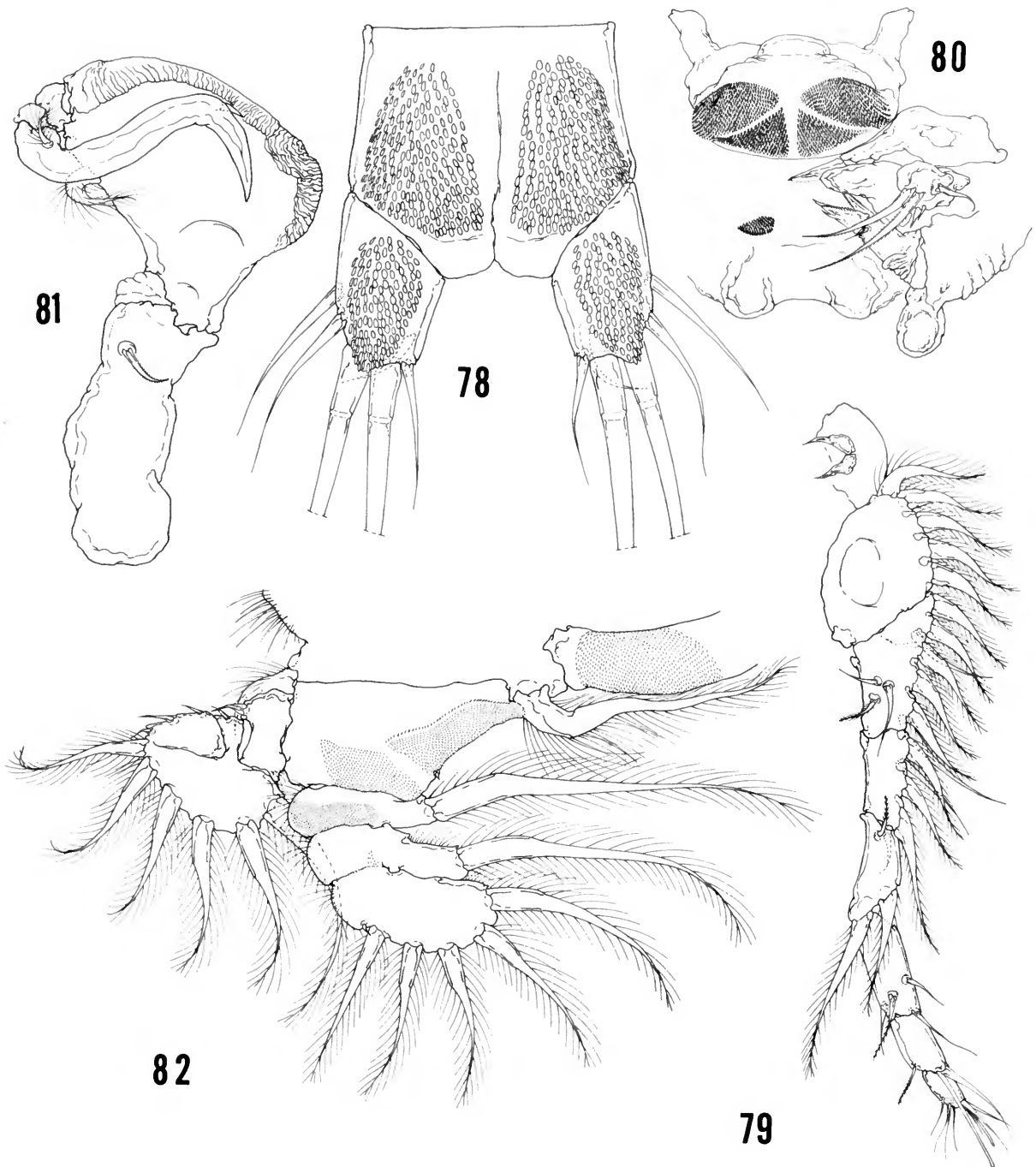


FIGURES 67-72.—*Acanthocolax similis* Vervoort, female: 67, base of first antenna, dorsal view; 68, second antenna; 69, oral area; 70, maxilliped; 71, leg 1; 72, leg 2.

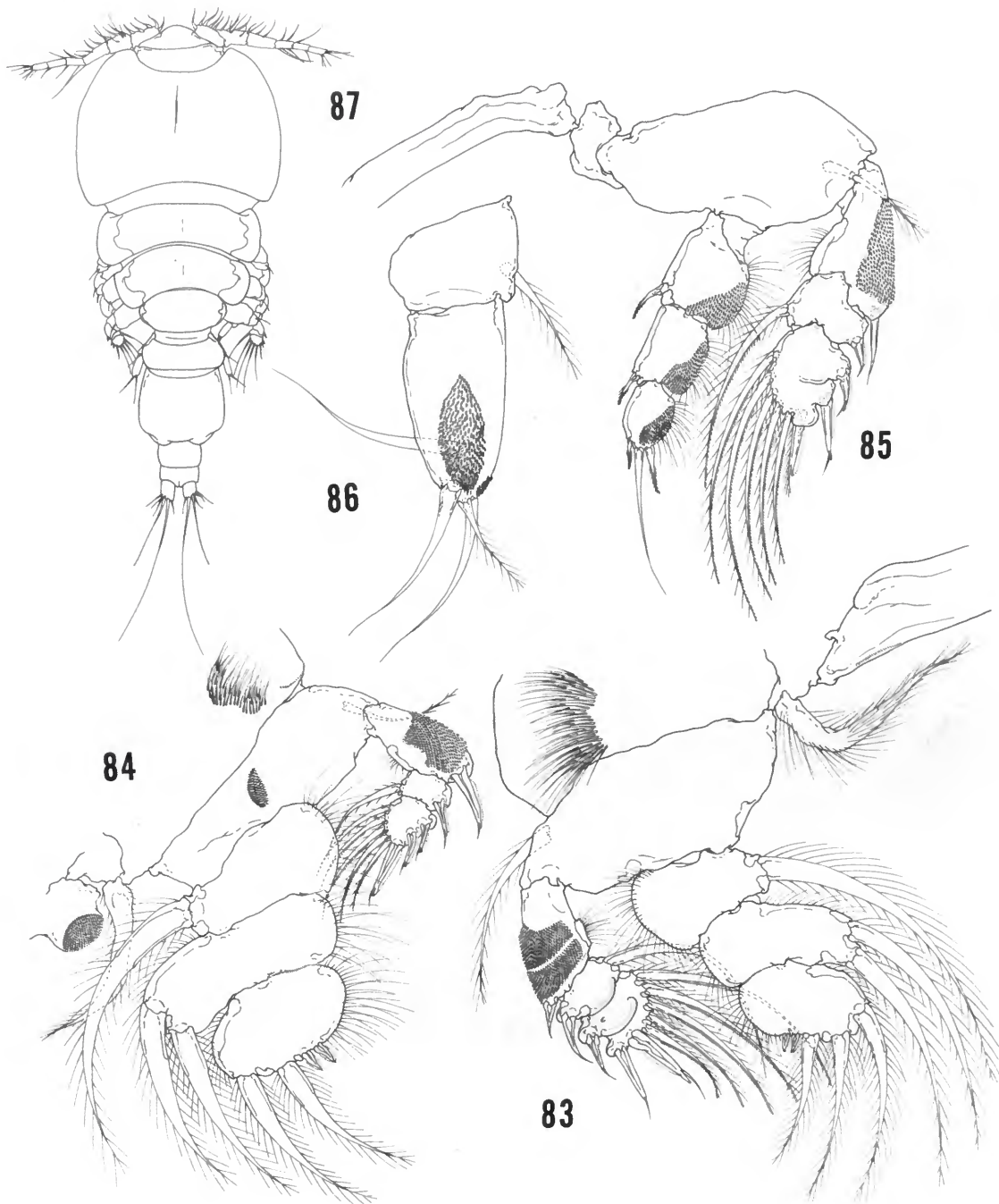


FIGURES 73-75.—*Acanthocolax similis* Vervoort, female: 73, leg 3; 74, leg 4; 75, leg 5.

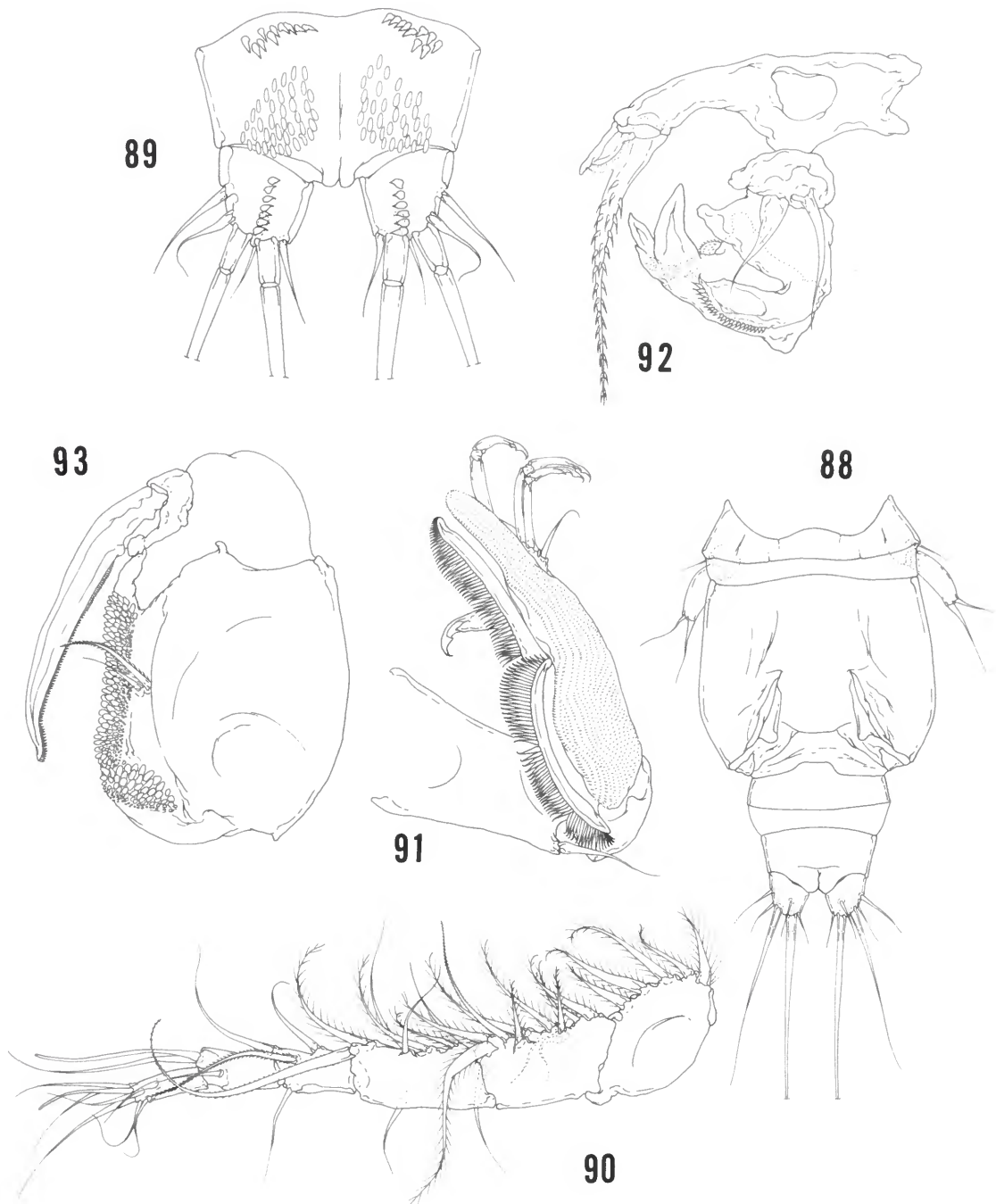
FIGURES 76, 77.—*Holobomolochus scutigerulus* (Wilson), female: 76, dorsal view; 77, genital segment, abdomen, and caudal rami, dorsal view.



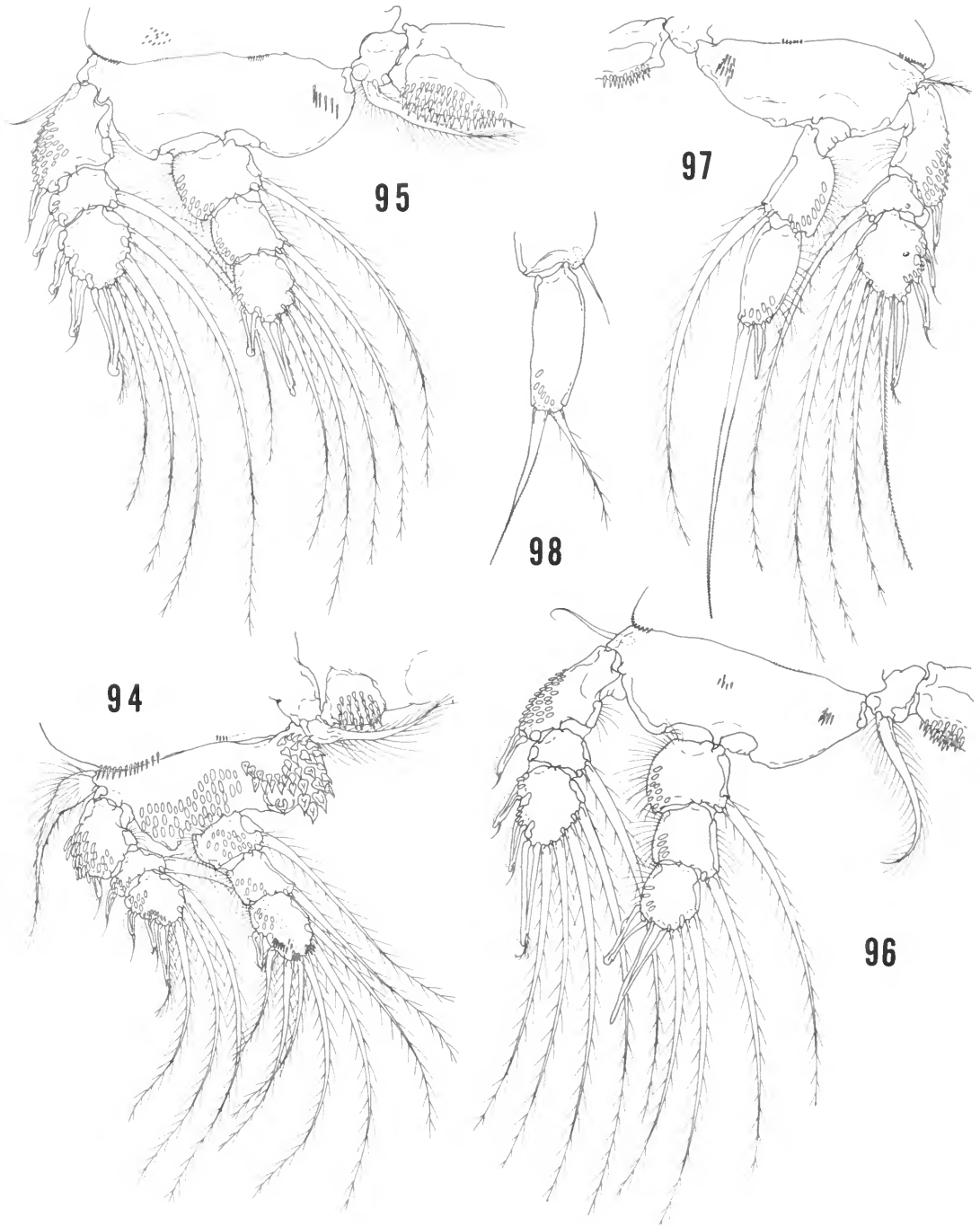
FIGURES 78-82.—*Holobomolochus scutigerulus* (Wilson), female: 78, last abdominal segment and caudal rami, ventral view; 79, first antenna; 80, oral area; 81, maxilliped; 82, leg 1.



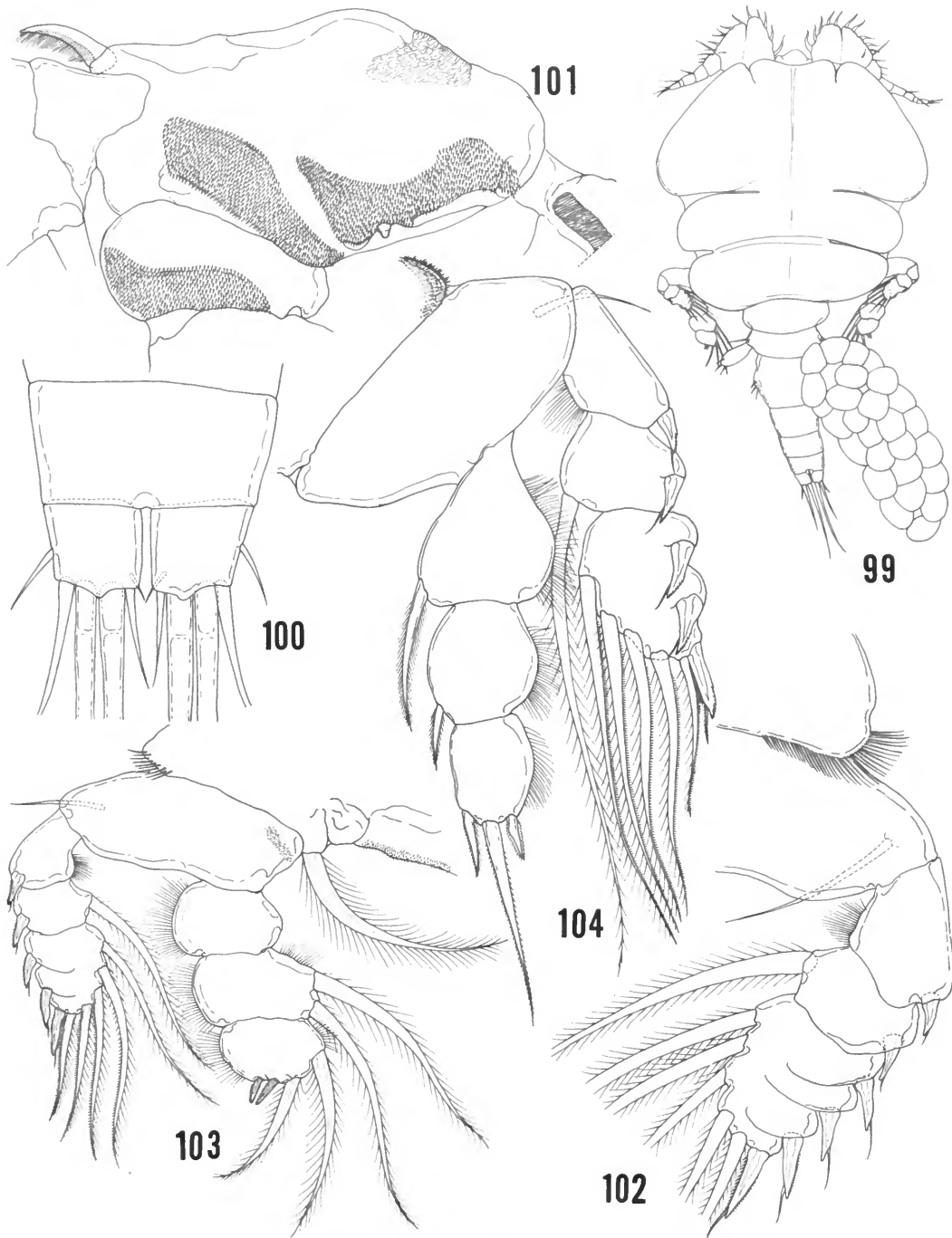
FIGURES 83-87.—*Holobomolochus scutigerulus* (Wilson). Female: 83, leg 2; 84, leg 3; 85, leg 4; 86, leg 5. Male: 87, dorsal view.



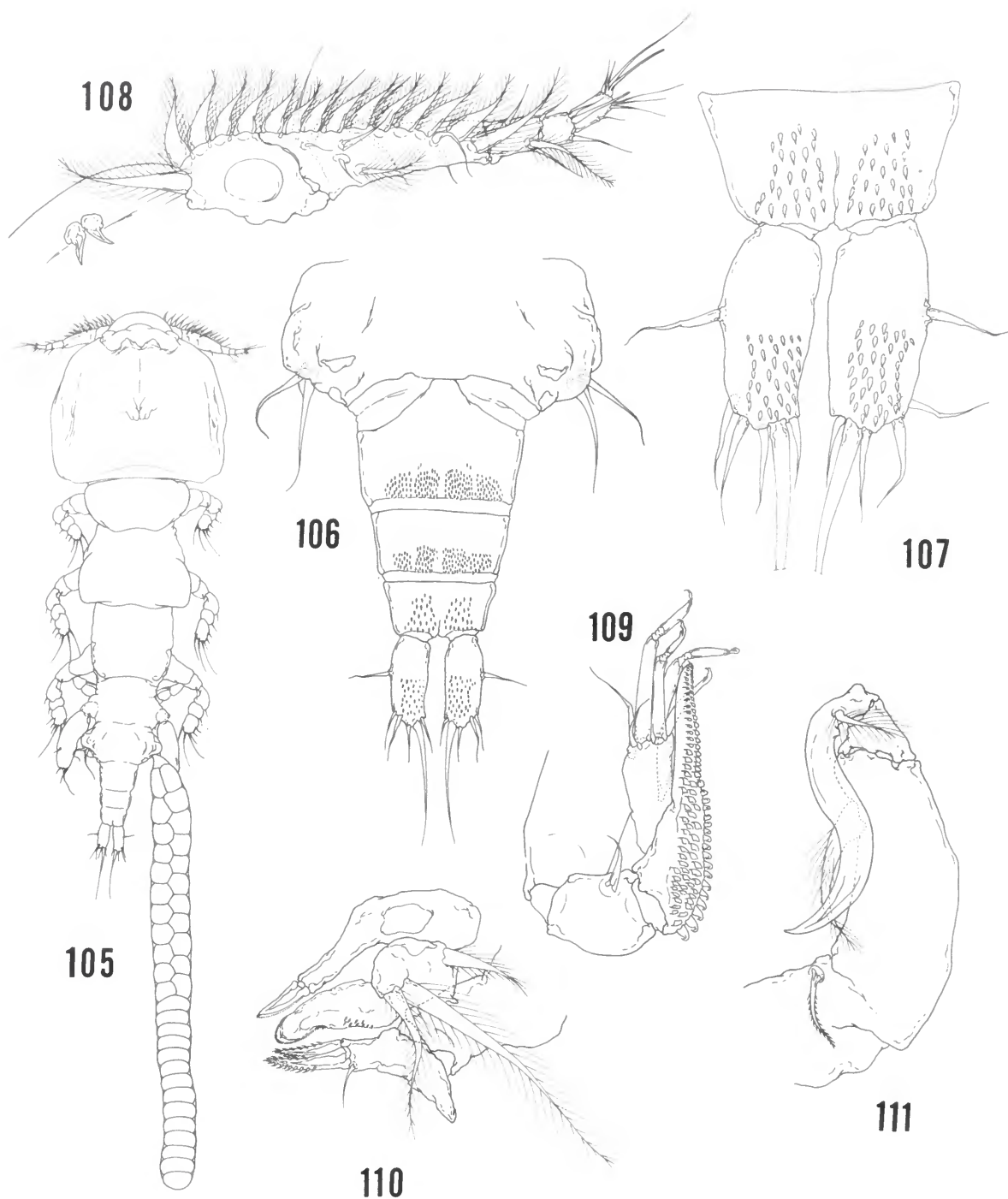
FIGURES 88-93.—*Holobomolochus scutigerulus* (Wilson), male: 88, genital segment, abdomen, caudal rami, dorsal view; 89, last abdominal segment and caudal rami, ventral view; 90, first antenna; 91, second antenna; 92, oral area; 93, maxilliped.



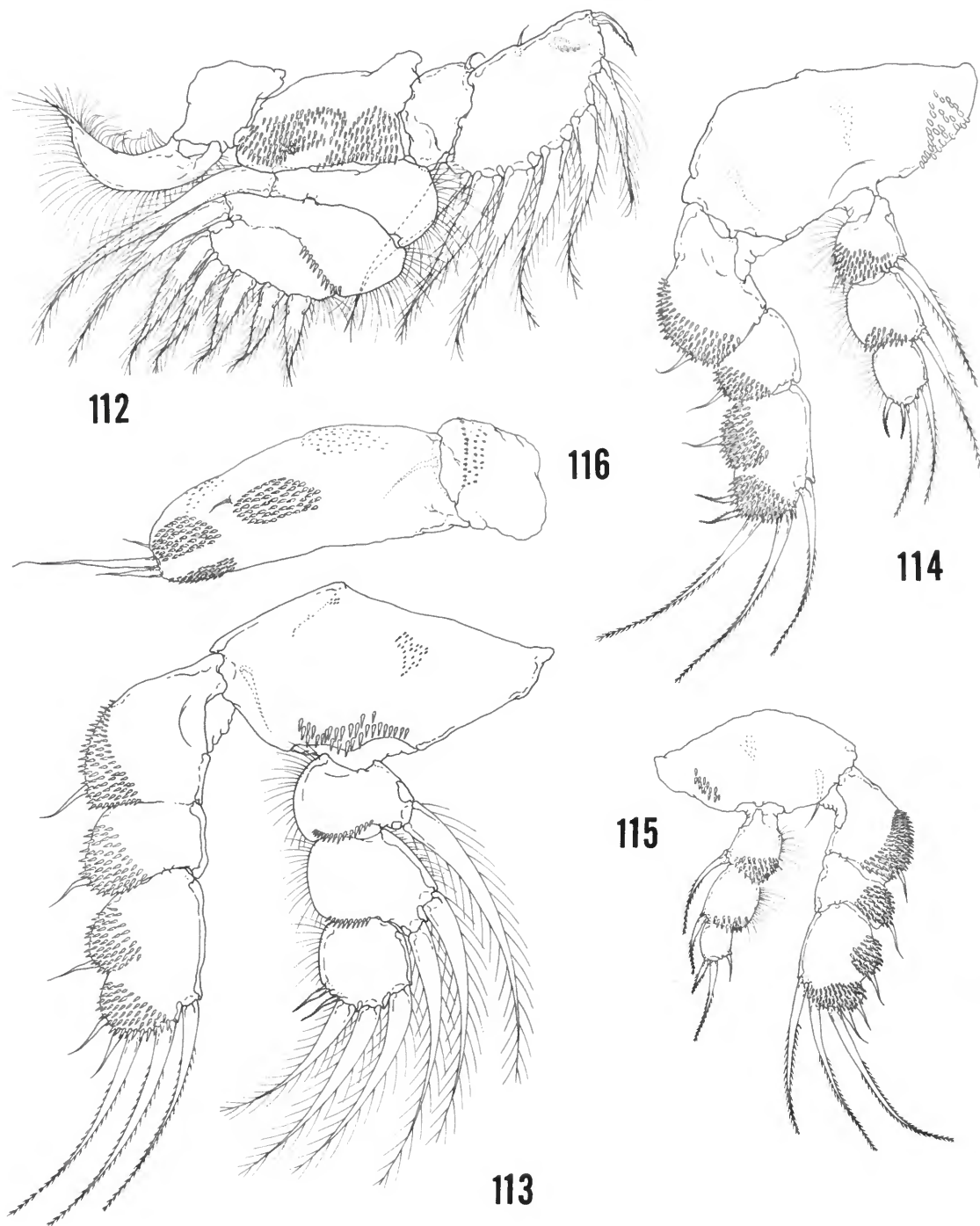
FIGURES 94-98.—*Holobomolochus scutigerulus* (Wilson), male: 94, leg 1; 95, leg 2; 96, leg 3; 97, leg 4; 98, leg 5.



FIGURES 99-104.—*Holobomolochus verwoorti*, new species, female: 99, dorsal view; 100, last abdominal segment and caudal rami, ventral view; 101, leg 1 sympod; 102, leg 2 exopod; 103, leg 3; 104, leg 4.



FIGURES 105-111.—*Pseudoeucanthus uniseriatus* Wilson, female: 105, dorsal view; 106, genital segment, abdomen, caudal rami, ventral view; 107, last abdominal segment and caudal rami, ventral view; 108, first antenna; 109, second antenna; 110, oral area; 111, maxilliped.



FIGURES 112-116.—*Pseudoecanthus uniseriatus* Wilson, female: 112, leg 1; 113, leg 2; 114, leg 3; 115, leg 4; 116, leg 5.

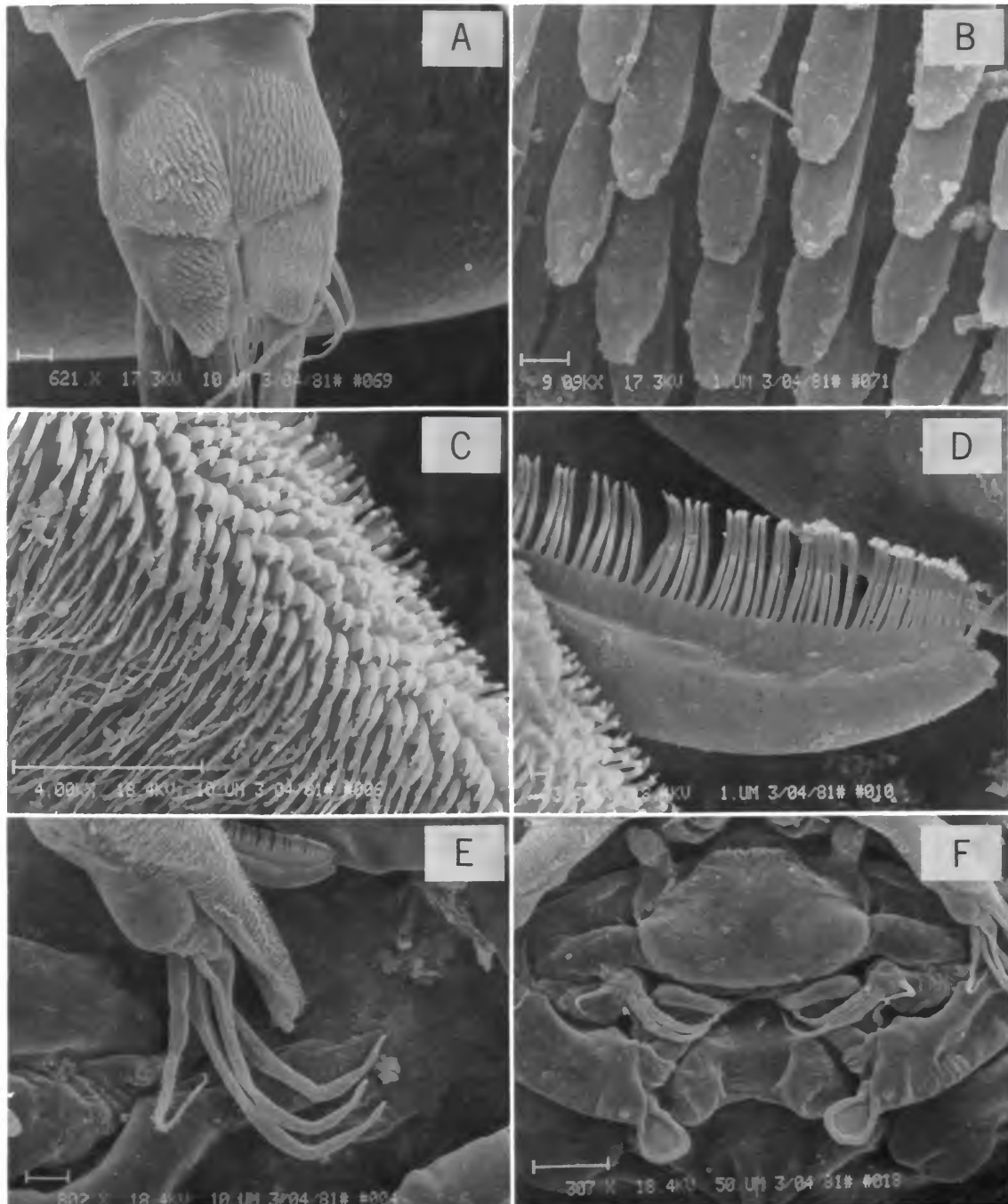


FIGURE 117.—*Holobomolochus scutigerulus* (Wilson), female: A, abdomen and caudal rami, ventral (scale, 10 μ m); B, spinules on caudal ramus (scale, 1 μ m); C, second antenna hairs and hooklets (scale, 10 μ m); D, second antenna comb (scale, 1 μ m); E, tip of second antenna (scale, 10 μ m); F, oral area (scale, 50 μ m).

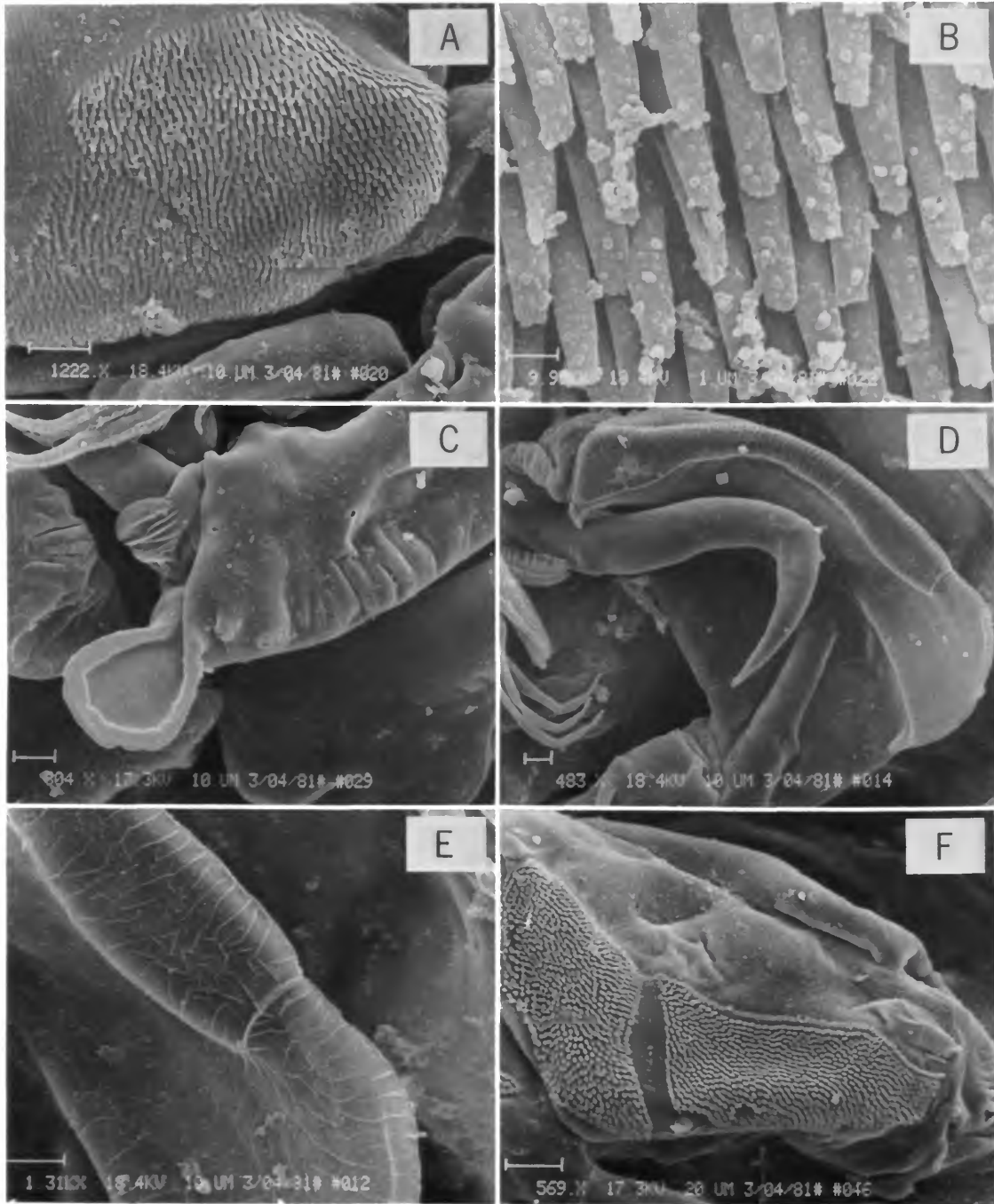


FIGURE 118.—*Holobomolochus scutigerulus* (Wilson), female: A, labrum (scale, 10 μm); B, labrum spinules (scale, 1 μm); C, posterior corner of second maxilla (scale, 10 μm); D, maxilliped (scale, 10 μm); E, posterior edge of maxilliped (scale, 10 μm); F, leg 1 basipod (scale, 1 μm).

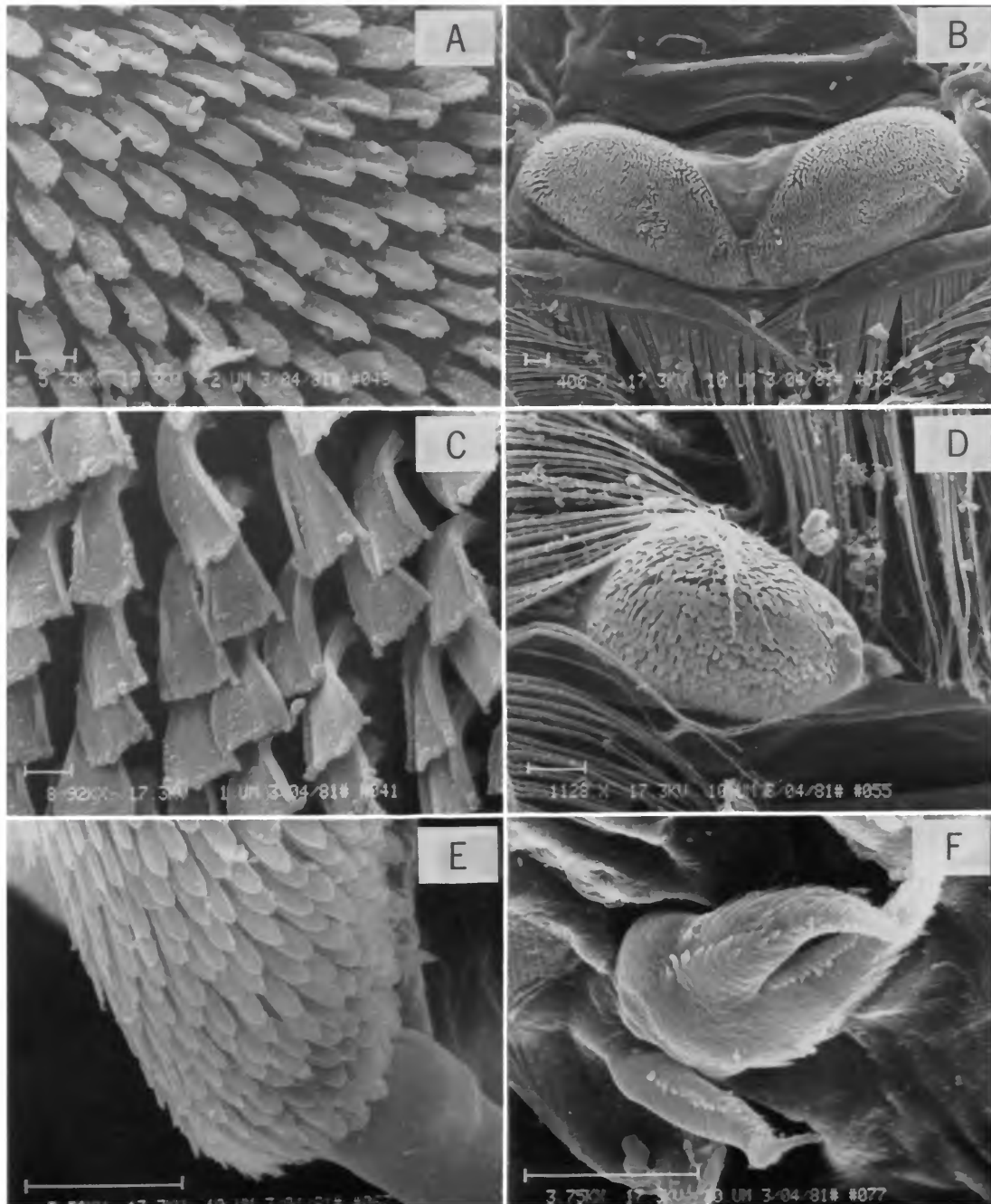


FIGURE 119.—*Holobomolochus scutigerulus* (Wilson), female: A, leg 1 basipod spinules (scale, 2 μm); B, leg 1 interpodal plate (scale, 10 μm); C, leg 1 interpodal plate spinules (scale, 1 μm); D, leg 3 interpodal plate spinules (scale, 1 μm); E, leg 5 tip spinules (scale, 10 μm); F, leg 6 (scale, 10 μm).

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Taxonomic keys in natural history papers should use the aligned-couplet form for zoology and may use the multi-level indent form for botany. If cross referencing is required between key and text, do not include page references within the key, but number the keyed-out taxa, using the same numbers with their corresponding heads in the text.

Synonymy in zoology must use the short form (taxon, author, year:page), with full reference at the end of the paper under "Literature Cited." For botany, the long form (taxon, author, abbreviated journal or book title, volume, page, year, with no reference in "Literature Cited") is optional.

Text-reference system (author, year:page used within the text, with full citation in "Literature Cited" at the end of the text) must be used in place of bibliographic footnotes in all Contributions Series and is strongly recommended in the Studies Series: "(Jones, 1910:122)" or "... Jones (1910:122)." If bibliographic footnotes are required, use the short form (author,

brief title, page) with the full citation in the bibliography.

Footnotes, when few in number, whether annotative or bibliographic, should be typed on separate sheets and inserted immediately after the text pages on which the references occur. Extensive notes must be gathered together and placed at the end of the text in a notes section.

Bibliography, depending upon use, is termed "Literature Cited," "References," or "Bibliography." Spell out titles of books, articles, journals, and monographic series. For book and article titles use sentence-style capitalization according to the rules of the language employed (exception: capitalize all major words in English). For journal and series titles, capitalize the initial word and all subsequent words except articles, conjunctions, and prepositions. Transliterate languages that use a non-Roman alphabet according to the Library of Congress system. Underline (for italics) titles of journals and series and titles of books that are not part of a series. Use the parentheses/colon system for volume(number):pagination: "10(2):5-9." For alignment and arrangement of elements, follow the format of recent publications in the series for which the manuscript is intended. Guidelines for preparing bibliography may be secured from Series Section, SI Press.

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