New species of *Lichomolgus* (Copepoda, Cyclopoida) from sea anemones and nudibranchs in Madagascar

by

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The numerous species of the genus *Lichomolgus* already described are associated with several groups of marine invertebrates. In the Indian Ocean the copepods of this genus living on sea anemones or nudibranchs are not well known. Gnanamuthu (1955) described *Lichomolgus panikkari* from a sea anemone, *Phytocoetopsis ramunni* , from brackish water at Adayar, Madras. In the literature on lichomolgid copepods from the Red Sea, the Suez Canal, and the Indian Ocean one finds very little information on possible associations with invertebrates. Very often the species of *Lichomolgus* are reported as free-living or in "weed-washings" or in "washings of dredged invertebrates". One may question whether certain lichomolgids described by such authors as A. Scott (1902) and Gurney (1927) from the Red Sea area and Thompson and A. Scott (1903), Sewell (1949), and Ummerkutty (1962) from the Indian Ocean may not actually be associated with invertebrates (perhaps even sea anemones or nudibranchs).

In Madagascar, Humes (1959, 1961) has described three species of *Lichomolgus* from nudibranchs in the region of Nossi Bé, - *Lichomolgus venustus* and *L. patulus* from *Phyllidia trilineata* Cuvier and *L. audens* from *Platydoris scaber* (Cuvier). The copepods from sea anemones in Madagascar have remained entirely unknown.

The collection of the six new species described below took place while the author was the leader of an expedition sent to Madagascar by the Academy of Natural Sciences of Philadelphia in 1960.

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Lichomolgidae Kossmann, 1877

Lichomolgus gemmatus sp. n.

Figs. 1-42

—Types - 465 females, 381 males, and 56 copepodids from 14 sea anemones, *Stoichactis giganteum* (Forskål, 1775), exposed at low tide buried in the sand with the marine plant *Cymodocea* to the west of Pointe Mahatsinjo, Nossi Bé, Madagascar, August 7, 1960. Holotype female, allotype male, and 209 paratypes (115 females, 94 males) deposited in the United States National Museum at Washington, the same number of paratypes in the Museum National d'Histoire Naturelle at Paris, in the collection of the Centre d'Océanographie et des Pêches at Nossi Bé, and in the collection of the author. Copepodids also in the collection of the author.

—Other specimens - 22 females, 20 males, and 19 copepodids from one *Stoichactis giganteum* attached to a rock in the sand with *Cymodocea* to the north of Madirokely, Nossi Bé, September 3, 1960. 11 females and 5 males from one *Stoichactis giganteum* in sand with *Cymodocea* to the northeast of the beach at Andilana, Nossi Bé, September 4, 1960.

—Female - Body rather elongated, not widened (fig. 1). Total length, including the caudal rami but not their setae, 1.14 mm (1.06-1.19 mm), greatest width 0.43 mm (0.40-0.47 mm), the measurements based on 10 specimens. Segment bearing the first leg separated from the head by an indistinct transverse furrow; the posterolateral corners of this segment not produced. Epimeral areas of the segments of legs 2-4 expanded, but those of the segment of the second leg more angular than the others. Dorsal surface of the segment of the fifth leg with two pairs of hairs as shown in fig. 3. Prosome in lateral view (fig. 2) a little thickened. Genital segment (fig. 3) elongated, 120 μ long, slightly wider in its anterior half (98 μ) than in its posterior half (81 μ), and marked dorsally behind the middle by a transverse constriction (fig. 4). Areas of attachment of the egg sacs situated dorsolaterally on the anterior half of the genital segment, and bearing two small setae 7 μ long (fig. 4). Three postgenital segments almost equal in length (47, 39, and 44 μ long respectively), the last with two small hairs on the dorsal surface. Ratio of the prosome to the urosome about 2.1:1.

Caudal ramus (fig. 5) almost twice as long as wide, 55 x 31 μ, the ratio being 1.8:1, with the dorsal seta weakly pedicellate and bearing short lateral hairs, the outer seta naked, the four terminal setae barbed as indicated in figs. 3 and 5.

Egg sac (fig. 6) elongated oval, 414 x 179 μ, with about 10 eggs (each 145 μ in diameter) and reaching well beyond the extremities of the caudal rami.

Rostral region (fig. 7) not developed, but in lateral view projecting slightly (fig. 8). First antenna (fig. 9) 7-segmented, with the third segment showing a small sclerified region on its ventral surface (fig. 10) which suggests an additional segment. The lengths of the segments (measured along their posterior borders), beginning at the base : 20, 76, 25, 55, 43, 39, and 29 μ. The setae of these segments and their aesthetes arranged as follows : 4, 13, 6, 3, 4 and 1 aesthete, 2 and 1 aesthete, and 7 and 1 aesthete. All the setae naked, except the distal inner seta on the sixth segment and the four setae on the ventral surface of the seventh segment, which are weakly plumose.

Second antenna (fig. 11) 4-segmented, slender, the first segment 96 μ long with a small inner distal seta, the second 138 μ with a small seta beyond the middle of the inner border, the third 19 μ and slightly projecting inwardly and bearing there three setae, and the fourth elongated, 49 μ along the concave inner border, 78 μ along the convex outer border, 21 μ wide at the middle, armed terminally with four setae and two unequal claws, 44 μ and 21 μ long (measured along their axes). All the setae naked. (The two proximal segments, if measured from the indentation and thus not counting the overlapping, are 83 μ and 105 μ long respectively).

Posterior border of the labrum (fig. 12) indented, smooth, in the form of two somewhat rounded lobes. Mandible (fig. 13) with its basal region showing on the inner side a narrow sclerotization bearing a row of small spinules succeeded by a lamella with a finely serrated margin and on the outer side a row of long slender spinules; flagellum attenuated, barbed, and indistinctly delimited from the basal region. Paragnath (fig. 14) a partially hairy lobe. First maxilla (fig. 15) a single segment, bearing four setae as indicated in the figure. Second maxilla (fig. 16) 2-segmented, the first segment large and unarmed; the second recurved, terminating in a long spine (flagellum ?) unilaterally with strong spinules, and having a shorter subterminal spine with a row of spinules along one side, a naked seta on its posterior surface, and a very small basal seta on its outer margin. Maxilliped (fig. 17) 3-segmented, the first segment unarmed, the second with two very unequal setae (the larger 16 μ long and slightly barbed), the third much smaller, terminally with a seta, a spine, and a pointed process between them.

Ventral region between the maxillipeds and the first legs (fig. 18) with a transverse furrow, to be seen also in lateral view (fig. 19).

Rami of legs 1-4 (figs. 20, 21, 22, and 23) 3-segmented, except the endopod of the fourth leg which has only two segments. Spine and setal formula of these legs as follows (the Arabic numerals representing the setae, the Roman numerals the spines) :

P 1	exp.	I-0;	I-1;	III-I-4
	end.	0-1;	0-1;	I-5
P 2	exp.	I-0;	I-1;	III-I-5
	end.	0-1;	0-2;	I-II-3
P 3	exp.	I-0;	I-1;	III-I-5
	end.	0-1;	0-2;	I-II-2
P 4	exp.	I-0;	I-1;	III-I-5
	end.	0-1;	II	

Coxopods with a large inner plumose seta (but this seta on the fourth leg naked and much smaller than the others). Basipods with an outer slightly barbed seta and a row of hairs on the inner margin (except in the fourth leg where this margin is smooth).

Fourth leg (fig. 23) with the endopod reaching almost to the end of the exopod; its proximal segment 40 x 32 μ and bearing an inner seta 83 μ long, the second segment 76 μ long (including the spiniform processes) and 22 μ wide at the middle (ratio of length to width about 3.45:1). The two terminal spines unequal, the outer 30 μ long, the inner 63 μ long with its extremity finely bifurcated.

Fifth leg (fig. 24) with the free segment flattened, slightly recurved, 95 x 30 μ, having very small scales (hairs ?) on its outer surface; the two terminal setae unequal and naked, 45 and 68 μ long. Seta near the base of the segment weakly plumose.

Sixth leg perhaps represented by the two setae near the attachment of the egg sacs (see fig. 4).

Color in life in transmitted light transparent, eye red, egg sacs opaque.

—Male - Form of the body (fig. 25) almost like that of the female. Total length (the setae of the caudal rami excluded) 0.97 mm (0.90-1.01 mm), greatest width 0.34 mm (0.33-0.36 mm), the measurements based on 10 specimens. Genital segment (fig. 26) slightly longer than wide, 170 x 156 μ. Four postgenital segments almost equal in length, 25, 28, 23, and 23 μ respectively. Ratio of the prosome to the urosome about 1.6:1.

Caudal ramus (fig. 27) as in the female, but relatively shorter, 37 x 26 μ, the ratio being 1.4:1.

Rostral region (figs. 28 and 29) almost the same as that of the female. First antenna (fig. 30) 7-segmented, armed with setae as in the female, but bearing six aesthetes; the formula of the seven segments as follows : 4, 13 and 2 aesthetes, 6, 3 and 1 aesthete, 4 and 1 aesthete, 2 and 1 aesthete, and 7 and 1 aesthete. Near the base of the third segment, on the ventral surface, a small sclerified region as in the female.

Second antenna (fig. 31) in general like that of the female, but the last segment longer and slender, 69 μ along the concave inner border, 90 μ along the convex outer border, and 19 μ wide at the middle. One of the two terminal claws strong, 40 μ long, the other weaker, 35 μ long. A row of very small spinules on the inner margin of the last segment. The proximal seta on the penultimate segment unilaterally finely barbed. The inner surfaces of the first two segments with refractile knobs (spinules ?) as indicated in figs. 31 and 32.

Posterior border of the labrum, mandible, paragnath, first maxilla, and second maxilla as in the female. Maxilliped (fig. 33) elongated, slender, 4-segmented (assuming that a part of the claw represents a fourth segment). The first two segments long, the first unarmed; the second (figs. 34 and 35) expanded posteriorly with two setae (one, inserted on the summit of the expansion, unilaterally barbed and flagellate distally, the other, situated on the inner surface of the segment, naked), and provided on its inner surface with a row of strong spines and a group of slender spinules. Third segment very short and unarmed. Fourth segment in the form of a long claw slightly recurved and sinuous, 195 μ long (measured in a straight line from the base to the extremity), weakly divided in the middle, and bearing two setae near its base, one of them very small and naked, the other larger and unilaterally barbed. Postoral region as in the female.

Legs 1-4 as in the female, with the same armature, except the last segment of the endopod of the first leg (fig. 36), where the formula is I-II-3. This sexual dimorphism further expressed in the long terminal process (fig. 37), with its extremity formed like a small hyaline finger. Second leg with the last segment of the endopod (fig. 38) having three spiniform terminal processes larger than in the female. Endopod of the fourth leg (fig. 39) with the first segment 30 x 25 μ with an inner seta 69 μ long, the second segment 72 μ long (including the spiniform processes) and 15 μ wide at the middle (ratio of the length to the width about 4.8:1), the two terminal spines unequal, the outer 29 μ, the inner 70 μ long.

Fifth leg (fig. 40) resembling that of the female but with the free segment narrower, 44 x 11 μ, the two terminal setae being 33 and 41 μ long respectively.

Sixth leg (fig. 41) represented by a ventrolateral ridge on the posterior part of the genital segment, bearing two naked setae 30 and 40 μ long.

Spermatophore (fig. 42) 143 μ long (without the neck of 9 μ) and 73 μ wide.

Color in life as in the female.

(The specific name comes from *gemmatus* = ornamented with jewels, alluding to the refractile knobs on the second antenna of the male).

L. gemmatus may be separated from other species of the genus *Lichomolgus* by the form of the fifth leg (slightly recurved, without a basal expansion, and with very small scales on its outer surface) in the female and by the refractile knobs on the first and second segments of the second antenna in the male.

This species is very close to *L. rigidus* (Ummerkutty, 1962), from "general weed and invertebrate washings mainly sponges" from the Gulf of Manaar, but differs from it in several characters in the female. The species from Madagascar has a caudal ramus almost twice as long as wide, the second segment of the second antenna bears a small seta, and the free segment of the fifth leg is covered with small scales on its outer surface; in the species from Madras the caudal ramus is only slightly longer than wide, the second segment of the second antenna bears a sensory filament, and the free segment of the fifth leg does not show scales (see fig. IX, 6 of Ummerkutty).

Lichomolgus magnificus sp. n.

Figs. 43-73

—**Types** - 41 females and 59 males from 14 sea anemones, *Stoichactis giganteum* (Forskål, 1775), exposed at low tide buried in the sand with the marine plant *Cymodocea* to the west of Pointe Mahatsinjo, Nossi Bé, Madagascar, August 7, 1960. Holotype female, allotype male, and 22 paratypes (8 females, 14 males) deposited in the United States National Museum at Washington, the same number of paratypes in the Muséum National d'Histoire Naturelle at Paris, and in the collection of the Centre d'Océanographie et des Pêches at Nossi Bé; the remaining paratypes in the collection of the author.

—**Other specimens** - 3 males from one *Stoichactis giganteum* attached to a rock in the sand with *Cymodocea* to the north of Madirokely, Nossi Bé, September 3, 1960. 4 females and 11 males from one *Stoichactis giganteum* in sand with *Cymodocea* to the northeast of the beach at Andilana, Nossi Bé, September 4, 1960.

(All the specimens of this species were associated with the same sea anemones as those from which *L. gemmatus*, described above, was taken).

—**Female** - Body elongated, the prosome slightly widened (fig. 43). Total length (the setae of the caudal rami excluded) 3.06 mm (2.98-3.17 mm), greatest width 0.93 mm (0.90-0.96 mm), the measurements based on 10 specimens. Segment of the first leg separated from the head by a transverse dorsal furrow; the posterolateral corners of this segment broadly rounded. Epimeral regions of the segments of legs 2-4 expanded and rounded. Dorsal surface of the segment of the fifth legs with a transverse row of very small spinules and scattered hairs (fig. 44). Dorsal surface of the prosome ornamented with hairs. Genital segment (figs. 44 and 45) elongated, much longer than wide, 538 x 347 μ; in dorsal view with nearly parallel sides, in lateral view with the ventral border slightly convex. Areas of attachment of the egg sacs situated laterally and forward, and armed with two small spines about 10 μ long (fig. 46). Surfaces of the genital segment covered with hairs and bearing a ring of very small spinules posteriorly. Three postgenital segments 242, 112, and 216 μ long respectively, the first with a ring of spinules and scattered hairs, the second with only a ring of spinules, and the third with scattered hairs and a row of spinules laterally and ventrally near the insertion of each caudal ramus. Ratio of the prosome to the urosome about 1:1.17.

Caudal ramus (fig. 47) very elongated, slightly tapered, about 7.8 times longer than wide (the width taken at the middle); 470 μ long, 75 μ wide near the base, 60 μ at the middle, and 47 μ at the level of the outer seta. All six setae short (about 45-55 μ) and naked. Dorsal and ventral surfaces of the ramus ornamented with scattered hairs.

Egg sac (fig. 48) elongated, reaching beyond the end of the genital segment; 638 x 202 μ, with about 23 eggs.

Rostral region (fig. 49) not developed. First antenna (fig. 50) 7-segmented, with the third segment showing a small sclerified region (fig. 51) on its ventral surface as in the preceding species. Lengths of the segments (measured along their posterior borders) 88, 118, 66, 86, 66, 60, and 44 μ. Arrangement of the setae and aesthetes as in *L. gemmatus* (the aesthete on the antepenultimate segment attenuated distally). All the setae naked. Scattered hairs on the anterior surface of the first segment.

Second antenna (fig. 52) 4-segmented, slender, the first segment 109 μ long with a small inner distal seta, the second 174 μ with a small seta beyond the middle of the inner border, the third 55 μ prolonged at the inner distal corner and bearing there three slender setae, and the fourth elongated, 114 μ long on the outer border, 83 μ long on the inner border, 29 μ wide at the middle, provided with five small setae and two claws, one of them distinctly unguiform, 72 μ long, the other setiform and more slender, 86 μ long. (The lengths of the segments represent the actual length, taking into consideration the overlapping of the segments).

Posterior border of the labrum (fig. 53) almost as in the preceding species. Mandible (fig. 54) also resembling that of the preceding species, except that the basal region is armed with an inner row of long spinules and that the flagellum is stouter. Paragnath (fig. 55) a small hairy lobe. First maxilla (fig. 56) with three terminal setae, the shortest with lateral hairs. Second maxilla (fig. 57) 2-segmented, the first segment large and covered with hairs, the second segment resembling that of *L. gemmatus* but the seta on the posterior surface finely barbed, the basal seta extremely small, and the two terminal elements shorter with their lateral spinules strongly developed (fig. 58). Maxilliped (fig. 59) 3-segmented, the first segment unarmed, the second with two short naked setae, and the third small with three spiniform processes.

Ventral region between the maxillipeds and the first legs (figs. 60 and 61) with a transverse furrow as in the preceding species.

Rami of legs 1-4 (figs. 62, 63, 64, and 65) segmented as in *L. gemmatus*, with the formula of these legs as follows (the Arabic numerals representing the setae, the Roman numerals the spines):

P 1	exp.	I-0;	I-1;	III-I-4
	end.	0-1;	0-1;	I-II-3
P 2	exp.	I-0;	I-1;	III-I-5
	end.	0-1;	0-2;	I-II-3
P 3	exp.	I-0;	I-1;	III-I-5
	end.	0-1;	0-2;	I-II-2
P 4	exp.	I-0;	I-1;	III-I-5
	end.	0-1;	II	

Coxopods with a large inner plumose seta (but this seta on the fourth leg smaller and provided with short lateral hairs). Basipods with an outer seta (a group of spinules near its insertion) and a row of hairs on the inner margin. Scattered hairs on the posterior surface of all the rami as indicated in the figures. Segments of the endopods relatively wider than in the preceding species.

Fourth leg (fig. 65) with the endopod shorter than the exopod, its first segment 81 x 82 μ, the second segment 151 x 83 μ, provided with a row of hairs on each side (the row on the outer border interrupted by a small indentation), and bearing two unequal short terminal spines, the outer 34 μ, the inner 57 μ long.

Fifth leg (fig. 66) with the free segment having a rather irregular form, 135 x 47 μ (greatest width), bearing a distal group of spinules on its inner surface and armed with two naked terminal setae, 55 and 73 μ long. The seta near the base of the segment naked.

Sixth leg probably represented by the two small spines near the attachment of the egg sacs (see fig. 46).

Color in life in transmitted light transparent, eye red, egg sacs opaque.

—Male - Form of the body (fig. 67) resembling that of the female. Total length (without the setae of the caudal rami) 2.74 mm (2.62-2.98 mm), greatest width 0.79 mm (0.69-0.86 mm), the measurements based on 10 specimens. Genital segment (fig. 68) rounded, as long as wide, 410 x 414 μ. Four postgenital segments, the first two rather globular, the third the shortest; in order from the anterior 234 x 250, 195 x 200, 91 x 164, and 175 x 169 μ. Ratio of the prosome to the urosome about 1:1.26.

Caudal ramus elongated as in the female, but relatively shorter, about 6.7 times longer than wide (taking the width at the middle), 370 μ long, 65 μ wide near the base, 55 μ at the middle, and 39 μ at the level of the outer seta.

Rostral region, first antenna, second antenna, labrum, mandible, paragnath, first maxilla, and second maxilla as in the female.

Maxilliped (fig. 69) elongated, slender, 4-segmented (assuming that a part of the claw represents a fourth segment). The first two segments long, the first segment unarmed, the second armed with two short naked setae and an inner row of spines (one of them much larger than the rest, situated near the base of the segment and widely separated from the others). Third segment very short and unarmed. Fourth segment in the form of a long recurved claw 370 μ long (measured in a straight line from the base to the extremity), its concave margin somewhat undulating; bearing the usual two unequal setae, both of them naked.

Postoral region like that of the female.

Legs 1-4 with the rami segmented as in the female and having the same spine and setal formula. Last segment of the endopod of the second leg with the inner terminal spiniform process slightly longer than in the other sex. Distal segment of the endopod of the fourth leg (fig. 70) relatively shorter, 122 x 75 μ, with the two terminal spines 47 μ and 26 μ long respectively.

Fifth leg (fig. 71) with the free segment shorter and almost rectangular, 46 x 22 μ, the two terminal setae 63 and 38 μ long respectively. The seta near the base of the segment relatively longer than in the female.

Sixth leg (fig. 72) represented by a ventrolateral ridge on the posterior part of the genital segment, showing refractile points and armed with a small spiniform process and two naked setae 55 and 68 μ long.

Spermatophore (fig. 73) 358 μ long (without the neck of 75 μ) and 177 μ wide (measurements of a spermatophore dissected from the body).

Color in life as in the female.

(The specific name comes from *magnificus* = magnificent, referring to the large size of this species).

L. magnificus is exceptional in its large size (more than 3 mm long in the female). Most of the species of *Lichomolgus* are between 1 and 2 mm in length, and only *L. panikkari* Gnanamuthu (where the female is 2.9 mm long) seems to approach or equal it in length. The female of *L. magnificus* may be recognized by its long slender genital segment, by its elongated hairy caudal rami with very short naked setae, and by the form of the fifth leg (somewhat irregular with a distal group of spinules); the male on the other hand by the form and armature of the maxilliped (the second segment with one spine of the inner row large and isolated from the others, and the claw with its concave margin somewhat undulating).

Lichomolgus cuspis sp. n.

Figs. 74-108

——Types - 45 females and 15 males from 14 sea anemones, *Radianthus ritteri* (Kwietniewski, 1897), found in 0.5 meter of water at low tide attached to blocks of coral to the east of the sandy beach at Ambariobe, to the southeast of Nossi Bé, Madagascar, August 6, 1960. Holotype female, allotype male, and 11 paratypes (9 females, 2 males) deposited in the United States National Museum at Washington, the same number of paratypes in the Muséum National d'Histoire Naturelle at Paris, and in the collection of the Centre d'Océanographie et des Pêches at Nossi Bé; the remaining paratypes in the collection of the author.

—Other specimens - 16 females, 4 males, and 2 copepodids from 2 *Radianthus ritteri* in 2 meters at Pointe Lokobe, Nossi Bé, August 13, 1960. 10 females, 17 males, and 3 copepodids from 14 *Stoichactis giganteum* found at low tide to the west of Pointe Mahatsinjo, Nossi Bé, August 7, 1960 (hosts also for *L. gemmatus* and *L. magnificus*). 10 females and 5 males from one *Stoichactis giganteum* to the north of Madirokely, Nossi Bé, September 3, 1960 (also with *L. gemmatus* and *L. magnificus*). 2 females and 1 male from one *Stoichactis giganteum* at Andilana, Nossi Bé, September 4, 1960 (with *L. gemmatus* and *L. magnificus*). 13 females, 8 males, and 3 copepodids from one *Stoichactis giganteum* attached to coral in 2 meters at low tide to the north of Nosy Sakatia, near Nossi Bé, October 8, 1960. 1 female and 1 male from one *Stoichactis giganteum* attached to coral in 1 meter to the west of Pointe Mahatsinjo, Nossi Bé, October 18, 1960. 12 females, 16 males, and 16 copepodids from 2 *Stoichactis giganteum* attached to coral in 2 meters, to the northeast of Nosy N'Tangam, near Nossi Bé, September 20, 1960.

—Female - Body somewhat widened (fig. 74). Total length (the setae of the caudal rami excluded) 1.53 mm (1.40-1.68 mm), greatest width 0.74 mm (0.67-0.82 mm), the measurements based on 10 specimens. Segment of the first leg separated from the head by an indistinct transverse dorsal furrow; this region much wider than the more posterior segments. Epimeral areas of the segments of legs 1-4 somewhat expanded as in the figure. Dorsal surface of the segment of the fifth leg with hairs. Genital segment (fig. 75) as long as wide, 208 x 208 μ. Areas of the attachment of the egg sacs situated dorsolaterally in the middle of the segment, and bearing two small spines 13 μ long (fig. 76). Three postgenital segments 100, 73, and 88 μ long respectively, and provided dorsally with hairs as indicated in the figure. Ratio of the prosome to the urosome about 1.9:1.

Caudal ramus (fig. 77) somewhat less than twice as long as wide, 74 x 43 μ, the ratio being 1.7:1. Dorsal seta plumose. Outer lateral seta unusually long and bearing extremely short lateral spinules. Outermost terminal seta with very short lateral spinules. Innermost terminal seta bearing an inner row of hairs. The two long terminal setae apparently naked. Dorsal surface of the ramus with scattered hairs.

Egg sac (fig. 74) elongated, 952 x 280 μ, containing numerous small eggs, and reaching far beyond the caudal rami.

Rostral region (fig. 78) not developed, covered with small hairs, the posterior row of these with refractile bases. First antenna (fig. 79) 7-segmented, with the third segment showing a small sclerified region on the ventral surface (fig. 80) as in the two preceding species. The lengths of the segments 94, 176, 40, 90, 57, 44, and 43 μ respectively (measured along their posterior borders). Arrangement of the setae and aesthetes as in *L. gemmatus* and *L. magnificus*. One seta on the antepenultimate segment and four setae on the last segment slightly plumose, the other setae naked.

Second antenna (fig. 81) 4-segmented, rather slender, the first segment 143 μ long with a very small naked seta, the second 208 μ with a similar small seta, the third 27 μ and bearing three inner very unequal setae, and the fourth elongated, rather slender, 101 μ long on the inner border, 130 μ long on the outer border, and 25 μ wide at the middle, provided terminally with 5 setae (one much larger than the others) and two unequal claws, 60 μ and 35 μ long (measured along the axis). Contour of a claw as indicated in fig. 82. (The lengths of the first two segments represent the actual length, taking into consideration the overlapping of these two segments).

Posterior border of the labrum (fig. 83) indented as in the preceding species. Mandible (fig. 84) slender, the basal region with its inner margin somewhat angular, the flagellum rather strong; armature much like that of *L. magnificus*. Paragnath (fig. 85) a somewhat irregular hairy lobe. First maxilla (fig. 86) with three setae, one of them unilaterally with short hairs. Second maxilla (fig. 87) 2-segmented, the first segment rather large and bearing hairs and refractile knobs as indicated in the figure; the second segment armed as usual, the seta on the posterior surface having short hairs along one side, and the basal seta being rather strong. Maxilliped (fig. 88) 3-segmented, the first segment unarmed, the second with two very unequal setae, the larger 70 μ long and barbed, the other 11 μ long and naked; the third segment small, with two small setae and a process which is slightly unguiform.

Ventral region between the maxillipeds and the first legs (fig. 89) with a transverse furrow.

Rami of legs 1-4 (figs. 90, 92, 93, and 94) segmented as in the two preceding species, with the spine and setal formula as follows (the Arabic numerals indicating the setae, the Roman numerals the spines) :

P 1	exp.	I-0;	I-1;	III-I-4
	end.	0-1;	0-1;	I-5
P 2	exp.	I-0;	I-1;	III-I-5
	end.	0-1;	0-2;	I-II-3
P 3	exp.	I-0;	I-1;	III-I-5
	end.	0-1;	0-2;	I-II-2
P 4	exp.	I-0;	I-1;	II-I-5
	end.	0-1;	II	

Coxopods with a large plumose inner seta (but this seta on the fourth leg very small, 10 μ long, and finely barbed). Basipods with the outer seta rather long and slightly plumose, and having a row of hairs on the inner margin (this row reduced on the fourth leg).

Last segment of the exopod of all the rami having the terminal spine of a form shown for that of the first leg in fig. 91. The outer distal corners of the segments of the endopod of the first leg (and less strongly on legs 2 and 3) prolonged in the form of a pointed process (fig. 90). Outer spines of all the rami often recurved posteriorly.

Fourth leg (fig. 94) with the endopod and exopod almost equal in length. Endopod with the first segment 66 x 50 μ, the second segment 97 μ long (the spiniform processes included) and 41 μ wide at the middle, the ratio of the length to the width about 2.37:1. Outer margin of the second segment showing a small indentation; inner margin without hairs. The two terminal spines very unequal, the inner 131 μ, the outer 45 μ long.

Fifth leg (fig. 95) with the free segment 83 x 35 μ (greatest width), having a slight ventral concavity on the inner margin, and with a terminal triangular process; the two terminal setae 187 and 162 μ long and armed with short lateral hairs. The seta near the base of the segment plumose.

Sixth leg probably represented by the two small spines near the attachment of the egg sacs (see fig. 76).

Color in life in transmitted light transparent, eye red, egg sacs opaque.

—Male - Form of the body (fig. 96) resembling that of the female, but the prosome less widened. Total length 1.30 mm (1.22-1.39 mm), greatest width 0.57 mm (0.51-0.61 mm), the measurements based on 10 specimens. Genital segment (fig. 97) about as long as wide, 295 x 302 μ, rather rounded, and the dorsal surface and the ventral surface (see fig. 107) with some hairs. (The posterior ventrolateral swelling on the genital segment indicated on the right side in fig. 97 and on the left side in fig. 107 does not represent a normal structure, but was probably caused by the fixation in alcohol). Four postgenital segments 60, 60, 49, and 44 μ long respectively, and bearing hairs as indicated. Ratio of the prosome to the urosome about 1.9:1.

Caudal ramus (fig. 98) armed as in the female but relatively shorter, 47 μ (greatest length) x 40 μ, the ratio being 1.18:1.

Rostral region and the first antenna as in the female. Second antenna with the first and second segments having small spinules (resembling very small scales) on the inner border (fig. 99); marginal setae of these two segments small, naked, and strongly recurved; two of the three setae on the third segment with short unilateral hairs; last segment as in the female.

Posterior border of the labrum, mandible, paragnath, first maxilla, and second maxilla as in the female. Maxilliped (fig. 100) elongated, slender, 4-segmented (a part of the claw representing a fourth segment). The first segment long and unarmed; the second long with two inner setae, one of them unmodified and unilaterally barbed, the other strongly modified (fig. 101), with the base swollen and spinose and the distal part slender and naked; two rows of spines on the inner surface of this segment. Third segment very short and unarmed. Fourth segment in the form of a long recurved claw, 270 μ long (measured in a straight line from the base to the extremity), and bearing the two usual unequal setae near its base, that on the outer surface larger and unilaterally barbed. Postoral region as in the female.

Legs 1-4 segmented as in the female, with the same spine and setal formula except the last segment of the endopod of the first leg (fig. 102) where the formula is II-4. The last segment of the endopod of the second leg (fig. 103) with the outermost spine stouter than in the female and having a digitiform process between the other two spines. The last segment of the endopod of the third leg (fig. 104) with the two outer spines more obtuse than in the female and with a long pointed terminal process. The first segment of the endopod of the fourth leg (fig. 105) 73 x 40 μ; second segment 101 μ long (the spiniform processes included) and 35 μ wide (ratio of the length to the width about 2.9:1), the two terminal spines 133 μ and 53 μ long respectively.

Fifth leg (fig. 106) with the free segment slender, 79 x 15 μ, the two sides parallel, the inner border with a slight concavity as in the female; the two terminal setae 180 and 135 μ respectively. The seta near the base of the segment plumose as in the other sex.

Sixth leg (fig. 107) represented by a ventrolateral ridge on the posterior part of the genital segment, bearing two slender naked setae 83 μ and 130 μ long respectively.

Spermatophore (fig. 108) 195 μ long (without the neck of 20 μ) and 113 μ wide.

Color in life as in the female.

(The specific name is taken from *cuspis* = the sting of a bee, alluding to the curiously modified seta on the second segment of the maxilliped of the male).

L. cuspis may be distinguished from other species in the genus by the form of the fifth leg in the female (with a slight ventral concavity on the inner margin and with a triangular terminal process) and by the proximally swollen and spinose seta on the second segment of the maxilliped in the male. This species from Madagascar seems to have similarities with *L. rotundus* Sewell, 1949, from "weed-washings" at Addu Atoll, in the Maldive Islands, and with *L. vagans* Gurney, 1927, from the harbor at Port Said, but it differs from them in several respects. *L. rotundus* (of which only the female is known) is smaller (0.7 mm long), the genital segment is wide with two mammilliform protuberances, the second segment of the endopod of the fourth leg bears a spine and a seta of about equal length, and the fifth leg is somewhat swollen on its outer margin. *L. vagans* (of which only the male is known) is smaller (1.07 mm long), the maxilliped has a stouter second segment and the terminal claw is longer, and the fifth leg bears a spine and a seta.

Lichomolgus securiger sp. n.

Figs. 109-138

—Types - 25 females, 56 males, and 41 copepodids from 2 nudibranchs, *Doris mabilla* Abraham, underneath a block of coral exposed at low tide in front of the Centre d'Océanographie et des Pêches (formerly the Station Océanographique) at Pointe à la Fièvre, Nossi Bé, Madagascar, August 22, 1960. Holotype female, allotype male, and 21 paratypes (6 females, 15 males) deposited in the United States National Museum at Washington, the same number of paratypes in the Museum National d'Histoire Naturelle at Paris and in the collection of the Centre d'Océanographie et des Pêches at Nossi Bé; the remaining paratypes and the copepodids in the collection of the author.

—Other specimens - 3 males from one *Doris mabilla* Abraham at Pointe Mahatsinjo, Nossi Bé, September 27, 1960. 4 males from a single nudibranch of the same species at Ambariotelo, near Nossi Bé, October 10, 1960.

—Female - Body rather widened (fig. 109). Total length (without the setae of the caudal rami) 1.22 mm (1.12-1.28 mm), greatest width 0.69 mm (0.64-0.74 mm), the measurements based on 10 specimens. Segment bearing the first leg incompletely separated from the head by slight lateral furrows. Epimeral areas of the segments of legs 1-4 expanded and rounded as in the figure. Dorsal surface of the segment of the fifth leg with two pairs of small hairs. Genital segment (fig. 110) in dorsal view rather globular, 159 x 174 μ, slightly wider than long, and with scattered hairs. Areas of attachment of the egg sacs placed dorsolaterally on the posterior half of the segment, and bearing two small naked setae, 13 μ long (fig. 111). Three postgenital segments 52, 40, and 42 μ long respectively, the last with two small dorsal hairs. Ratio of the prosome to the urosome about 2.2:1.

Caudal ramus (fig. 112) very short, 29 x 37 μ, wider than long. Dorsal and outer setae naked, but the four terminal setae with lateral hairs as indicated in fig. 110. Dorsal and ventral surfaces of the ramus with two small hairs.

Egg sacs (fig. 109) elongated, 660 x 240 μ, held at an angle from the body in specimens in alcohol, reaching almost to the extremities of the setae of the caudal rami, and containing numerous small eggs.

Region of the rostrum (fig. 113) not developed, but covered with small refractile points. First antenna (fig. 114) 7-segmented, with the third segment having a small sclerified region on its ventral surface which suggests a division into two segments. The lengths of the segments (measured along their posterior borders), beginning at the base : 28, 159, 30, 89, 60, 44, and 27 μ. Arrangement of the setae and aesthetes as in *L. gemmatus*. All the setae naked.

Second antenna (fig. 115) 4-segmented, the first segment 93 μ long with a small naked inner distal seta, the second 132 μ with a similar seta beyond the middle of the inner border, the third 33 μ with three naked setae (one of them stouter and more sclerified than the others, almost unguiform), and the fourth rather short and wide, 53 μ along its inner margin, 83 μ along its convex outer margin, 30 μ wide at the middle, armed terminally with four setae and two recurved claws, 33 and 37 μ long (measured along the axis). (The lengths of the segments represent the actual length, taking into account the overlapping of the segments).

Posterior border of the labrum (fig. 116) indented, smooth, in the form of two somewhat rounded lobes. Mandible (fig. 117) slender, with its basal region showing on its inner margin a somewhat sclerotized area bearing a row of spines and on its outer margin a row of rather slender spinules; terminal flagellum long and slender, with the proximal part bearing a row of spines along the inner side and small spinules on the outer side, the distal part of the flagellum naked. Paragnath (fig. 118) an irregular hairy lobe. First maxilla (fig. 119) a single segment bearing four setae, three terminal and barbed, the fourth lateral, small and naked. Second maxilla (fig. 120) 2-segmented, the first segment large and unarmed except for a few small distal knobs; the second segment terminating in a long flagellum with two rows of spinules on one side and a few small spinules on the other side, the subterminal spine with long lateral spinules, the seta on its posterior surface with unilateral hairs, and the basal seta very small and naked. Maxilliped (fig. 121) 3-segmented, the first segment moderately long and unarmed, the second long with two very unequal setae (the larger 61 μ long and unilaterally barbed, the other 11 μ and barbed), the third very small and armed with a barbed spine, a barbed pointed process (spine ?), and two small naked setae (one of them much more obvious than the other).

Ventral region between the maxillipeds and the first legs (fig. 122) with a transverse furrow.

Rami of legs 1-4 (figs. 123, 124, 125, and 126) 3-segmented, except the endopod of the fourth leg which has only two segments. Formula of the spines and setae of these legs as follows (the Arabic numerals representing the setae, the Roman numerals the spines)

P 1	exp.	I-0;	I-1;	III-I-4
	end.	0-1;	0-1;	I-5
P 2	exp.	I-0;	I-1;	III-I-5
	end.	0-1;	0-2;	I-II-3
P 3	exp.	I-0;	I-1;	III-I-5
	end.	0-1;	0-2;	I-II-2
P 4	exp.	I-0;	I-1;	II-I-5
	end.	0-1;	II	

Coxopods with a large inner plumose seta (but this seta on the fourth leg reduced to a small naked seta 13 μ long). Basipods with an outer naked seta, and with a row of hairs on the inner margin (except in the fourth leg where this margin is smooth).

Fourth leg (fig. 126) with the endopod somewhat shorter than the exopod; its first segment 36 x 27 μ and bearing an inner seta 75 μ long, the second segment 79 μ long (the spiniform processes included), 23 μ wide at the middle (27 μ proximally and 20 μ distally), the ratio of the length to the width about 3.4:1, and without hairs along the inner border; the two terminal spines subequal, the inner 50 μ, the outer 39 μ long.

Fifth leg (fig. 127) with the free segment 97 μ long, with a large inner expansion (39 μ wide) in its basal half, becoming abruptly narrow in its distal half (12 μ wide at the extremity); two terminal setae, the inner 102 μ long and unarmed, the outer 78 μ long and barbed. The seta near the base of the segment long and naked.

Sixth leg perhaps represented by the two setae near the attachment of the egg sacs (see fig. 111).

Color in life in transmitted light transparent, eye red, ovary gray, egg sacs opaque.

—Male - Form of the body (fig. 128) resembling that of the female. Total length (the setae of the caudal rami excluded) 1.05 mm (0.98-1.20 mm), greatest width 0.48 mm (0.42-0.58 mm), the measurements based on 10 specimens. Genital segment (fig. 129) globular in dorsal view, 216 x 234 μ, slightly wider than long. Four postgenital segments 29, 29, 21, and 20 μ long respectively. Ratio of the prosome to the urosome about 1.6:1.

Caudal rami as in the female, but the outermost terminal seta apparently naked and the two long setae barbed to their tips.

Rostral region as in the female.

First antenna (fig. 130) with the lengths of the seven segments (measured along their posterior borders), beginning at the base, as follows : 20, 114, 11, 57, 44, 36, and 10 μ. Arrangement of the setae and aesthetes : 4, 13 and 2 aesthetes, 6, 3, 4 and 1 aesthete, 2 and 1 aesthete, and 7 and 1 aesthete. Near the base of the third segment a small sclerified region as in the female.

Second antenna (fig. 131) in general resembling that of the female, but with small knobs (spinules ?) on the inner surface of the second and fourth segments, and with the setae of the first and second segments and the proximal seta of the third segment unilaterally barbed. Fourth segment slightly more slender than in the female, 54 μ along its inner margin, 75 μ along its outer margin, 24 μ wide at the middle. The two claws 54 μ and 32 μ long.

Labrum, mandible, paragnath, first maxilla, and second maxilla as in the female. Maxilliped (fig. 132) elongated, slender, 4-segmented (assuming that a part of the claw represents a fourth segment). The first two segments long, the first unarmed; the second with two setae, one (fig. 133) unilaterally barbed, the other (fig. 134) with a group of small knobs, and with a row of strong spines and another shorter row of spinules. Third segment very short and unarmed. Fourth segment in the form of a recurved claw, 161μ long (measured in a straight line from the base to the tip), weakly divided in the middle, and bearing the usual two setae, one short and naked near the base of the concave margin, the other larger and unilaterally barbed on the inner surface. Postoral region as in the female.

Legs 1-4 resembling those of the female, with the same spine and setal formula, except the endopod of the first leg (fig. 135), where the formula of the third segment is I-I-4, and where the outer distal spiniform processes on the first two segments are smaller and more sharply pointed than in the other sex.

Fourth leg with the second segment of the endopod (fig. 136) 63μ long, 17μ wide at the middle (18μ proximally and 16μ distally), the ratio of the length to the width about 3.7:1; the two terminal spines almost equal, 44 and 43μ long.

Fifth leg (fig. 137) with the free segment subrectangular, 20 x 9μ, without the inner expansion, the two terminal setae unequal, 22 and 55μ long.

Sixth leg (fig. 138) represented by a ventrolateral ridge on the posterior part of the genital segment, bearing two naked setae 41μ long. Spermatophore not seen except inside the body of one male (see fig. 128).

Color in life in transmitted light as in the female.

(The specific name comes from *securiger* = bearing an axe, referring to the form of the free segment of the fifth leg of the female).

The female of *L. securiger* may be recognized by the very characteristic fifth leg (with the remarkable basal expansion of the free segment abruptly delimited from the distal part of the segment) and the male by the globular form of the genital segment and by the armature of the second segment of the maxilliped (one of the two large setae with a group of small knobs).

This new species from Madagascar does not resemble closely any other species of *Lichomolgus*. The female of *L. foxi* Gurney, 1927 (the male is unknown), from Port Taufiq in the Suez Canal, has a fifth leg with a basal expansion rather similar but less pronounced; the formula of the last segment of the exopod of the fourth leg is III-I-5. The male of *L. vagans* Gurney, 1927 (the female is unknown), from the harbor at Port Said, shows a fifth leg more elongated and more slender, bearing a rather long seta and a short spine; the caudal rami of this species are slightly longer than wide. The female of *L. tenuicornis* Brady, 1910 (the male is unknown), from the antarctic region, has a fifth leg also with a rather similar basal expansion but the caudal rami of this species are elongated (about 7:1).

Lichomolgus commodus sp. n.

Figs. 139-165

—Types - 45 females, 52 males, and 67 copepodids from one nudibranch, *Hexabranchus orbicularis* Abraham, collected at night from a pool filled with water among the rocks at low tide at Nosy N'Tangam, to the west of Nossi Bé, Madagascar, October 21, 1960. Holotype female, allotype male, and 21 paratypes (9 females, 12 males) deposited in the United States National Museum at Washington, the same number of paratypes in the Museum National d'Histoire Naturelle at Paris and in the collection of the Centre d'Océanographie et des Pêches at Nossi Bé; the remaining paratypes and the copepodids in the collection of the author.

—Other specimens - 8 females and 8 males from one *Hexabranchus orbicularis* Abraham found at night on the marine plant *Cymodocea* at low tide at Nosy Iranja, about 55 kms to the southwest of Nossi Bé, October 7, 1960. 3 males from one *Doridopsis ruber* Kelaart on sand at a depth of 1 meter among the rocks to the west of Pointe de Tafondro, Nossi Bé, October 19, 1960. 13 females, 21 males, and 38 copepodids from one *Hexabranchus orbicularis* on a rock in 0.5 meter at low tide at Nosy N'Tangam, near Nossi Bé, October 21, 1960. 18 females, 14 males, and 4 copepodids from one *Hexabranchus orbicularis* at Bamoko, Nossi Bé, October 22, 1960.

—Female - Body rather widened (fig. 139). Total length (the setae of the caudal rami not included) 1.17 mm (1.06-1.28 mm), greatest width 0.71 mm (0.61-0.76 mm), the measurements based on 10 specimens. Segment bearing the first leg separated from the head by a transverse dorsal furrow. Epimeral areas of the segments of legs 1-3 expanded, rounded, and finely serrated. Dorsal surface of the segment of the fifth leg with the usual two pairs of small hairs. Genital segment (fig. 140) 138 x 174μ, wider than long, with somewhat irregular borders, and with scattered hairs dorsally. Areas of attachment of the egg sacs situated dorsolaterally on the posterior half of the segment, and armed with two small naked spines, 14μ long (fig. 141). Three postgenital segments short, 33, 30, and 27μ long respectively, with hairs on the dorsal surface as indicated in the figure. Ratio of the prosome to the urosome about 2.5:1.

Caudal ramus (fig. 142) very short, 29 x 32μ, almost square. Dorsal and outer setae naked; of the four terminal setae, the outermost with inner lateral hairs near the base, the innermost with hairs on the inner side, and the two other large setae incompletely barbed as in fig. 140. Scattered hairs on the dorsal surface of the ramus.

Egg sac (fig. 143) elongated, 493 x 190μ, held near the urosome, of a length which reaches to half of the longest seta on the caudal ramus, containing numerous small eggs, each about 45-50μ in diameter.

Rostral region (fig. 144) only slightly developed, with refractile points. First antenna (fig. 145) 7-segmented, with the third segment showing the usual sclerified region (suggesting a division of the segment). The lengths of the segments (measured along their posterior borders), beginning at the base, as follows : 50, 135, 32, 69, 48, 34, and 20μ. Arrangement of the setae and aesthetes as in *L. gemmatus*. All the setae naked.

Second antenna (fig. 146) 4-segmented, the first segment 107μ long with a small naked inner distal seta, the second 156μ with a similar seta beyond the middle of the inner margin, the third 39μ with three naked setae, and the fourth 44μ along its inner margin, 65μ along its outer margin, 30μ wide at the middle, provided toward the tip with five setae (two long, two rather short, and one very small) and two unequal claws, 34 and 20μ long (measured along the axis). (The lengths of the segments represent the actual length, taking into account the overlapping of the segments).

Posterior border of the labrum (fig. 147) indented, smooth, in the form of two rounded lobes. Mandible (fig. 148) generally resembling that of the preceding species, but having a row of spinules (instead of spines) along the inner side of the proximal part of the flagellum. Paragnath (fig. 149) a hairy lobe. First maxilla (fig. 150) armed as in *L. securiger*, but only one of the three terminal setae barbed. Second maxilla (fig. 151) 2-segmented, the first segment large and unarmed except for some small distal knobs; the second with a long flagellum provided on one side with a row of spines and a group of hairs and on the other side with a distal row of small spinules, the subterminal spine strongly barbed with spines, the seta on the posterior surface unilaterally with hairs; the basal seta very small and naked. Maxilliped (fig. 152) 3-segmented, the first segment long and unarmed, the second long with two very unequal setae (the larger 57μ long and barbed, the other 9μ long and naked), the third smaller and armed with a spine and a seta and between these a rather pointed spiniform process.

Ventral region between the maxillipeds and the first legs (fig. 153) showing a transverse furrow.

Rami of legs 1-4 (figs. 154, 155, 156, and 157) 3-segmented, except the endopod of the fourth leg which has only two segments. Spine and setal formula of these legs the same as in *L. securiger*.

Coxopods with a large inner plumose seta (but this seta on the fourth leg only 9μ long and naked). Basipods with a naked outer seta, that of the fourth leg unusually long, 122μ; inner border of the basipods with a row of hairs (except on the fourth leg where this border is naked).

Fourth leg (fig. 157) with the endopod shorter than the exopod; its first segment 33 x 30μ and bearing an inner plumose seta 75μ long, the second segment 51 x 22μ (the ratio about 2.3:1), with very small spinules along the inner side, and armed with two unequal terminal spines, the inner 56μ, the outer 29μ long.

Fifth leg (fig. 158) with the free segment elongated, with a slight inner proximal expansion; 108μ long, 30μ wide at the expansion, 27μ wide at the middle of the segment; the outer margin covered with small spinules; the two terminal setae naked, unequal, 86 and 78μ long respectively. The seta near the base of the segment long and naked.

Sixth leg probably represented by the two small spines near the attachment of the egg sacs (see fig. 141).

Color in life in transmitted light transparent or slightly rose-orange, eye red, eggs sacs opaque.

— Male - Form of the body (fig. 159) in general resembling that of the female, but the cephalosome less expanded. Total length (the setae of the caudal rami excluded) 0.80 mm (0.77-0.86 mm), greatest width 0.36 mm (0.34-0.39 mm), the measurements based on 10 specimens. Genital segment (fig. 160) about as long as wide, 180 x 185μ, without ornamentation. Four postgenital segments short, 29, 23, 16, and 16μ long respectively. Ratio between the prosome and the urosome about 2:1.

Caudal ramus small, 16 x 21μ, resembling that of the female.

Rostral region and the first antenna like the female.

Second antenna (fig. 161) in general form like that of the female, but the inner surface of the second segment covered with hairs, the inner distal surface of the fourth segment with a distal group of small spinules, the setae of the first and second segments and the proximal seta of the third segment unilaterally barbed. Fourth segment slightly more slender than in the female, 41μ along its inner margin, 62μ along its outer margin, 20μ wide at the middle. The two claws 37 and 28μ long.

Posterior margin of the labrum, mandible, paragnath, first maxilla, and second maxilla as in the female. Maxilliped (fig. 162) elongated, slender, 4-segmented (a part of the claw probably representing a fourth segment). The first two segments long, the first unarmed, the second with two unilaterally barbed setae, a row of slender spinules on the margin in front of these setae, and a long row of rather stout spines on the inner surface of the segment. Third segment very short and unarmed. Fourth segment in the form of a strongly recurved claw, 135 μ long (measured in a straight line from the base to the tip), very weakly divided at the middle, and bearing two setae as in *L. securiger*. Postoral region as in the female.

Legs 1-4 resembling those of the female, with the same spine and setal formula, except the endopod of the first leg (fig. 163), where the formula is I-I-4, and where the outer distal spiniform processes on the first two segments are smaller and more sharply pointed than in the other sex. The outer seta of the basipod of the fourth leg relatively much shorter, only 40μ long.

Fifth leg (fig. 164) with the free segment elongated, slender, 41 x 10μ, with its margins rather irregular; without a basal expansion; with small spinules on the outer border; the two terminal setae almost equal, 50 and 54μ long (the inner seta with a slightly thickened base).

Sixth leg (fig. 165) represented by a ventrolateral ridge on the posterior part of the genital segment, bearing two naked setae 40 and 35 μ long.

Spermatophore not seen.

Color in life in transmitted light transparent, eye red.

(The specific name comes from *commodus* = convenient, suitable, in reference to the general characteristics of this species, which are not at all bizarre but certainly lichomolgid).

One may separate the female of *L. commodus* from other species of the genus by the fifth leg whose shape is characteristic (elongated, with a slight basal expansion, and with its outer margin covered with small spinules) and the male by the fine hairs on the inner surface of the second segment of the second antenna and by the characteristic armature of the second segment of the maxilliped.

L. commodus seems to approach *L. alabatensis* (Kossmann, 1877). The original description of this species from the Philippine Islands was very fragmentary, including two drawings made by Semper. Monod and Dollfus (1932) redescribed it from specimens found by Risbec on the nudibranch *Gymnodoris kouaouae* (Risbec) at Noumea, New Caledonia. The comparison with the species from Madagascar is based on their description. The fifth leg of the female has a slight basal expansion as in *L. commodus*, but it lacks the spinules along the outer margin (see fig. 2, D of Monod and Dollfus). The first antenna has very long aesthetes (with the arrangement 0, 2, 0, 2, 1, 0, 2 in their fig. 9, B). Unfortunately, it is impossible to make a comparison of many features because of the lack of information, but it seems evident that *L. alabatensis* and *L. commodus* represent two distinct species.

The new species from Madagascar shows a form of the body rather superficially like two other species from nudibranchs at Nossi Bé, *L. patulus* Humes, 1959, and *L. venustus* Humes, 1959, both with the formula II-I-5 on the last segment of the exopod of the fourth leg. It differs from them, however, in several characters, among them the fifth leg of the female without a basal expansion and the claw of the maxilliped of the male less strongly recurved.

L. commodus differs from *L. vagans* Gurney, 1927 (the female is unknown), from the harbor at Port Said, which has the caudal rami slightly longer than wide, the fourth segment of the second antenna long and slender, the claw of the maxilliped very long, and the fifth leg armed terminally with a rather long seta and a spine.

Lichomolgus sensilis sp. n.

Figs. 166-197

— Types - 47 females, 18 males, and 2 copepodids from 2 nudibranchs, *Trevelyana rubromaculata* Bergh, found in 10 cm. of water at low tide on sand with *Cymodocea* to the south of Nosy Kisimany, a small island about 27 kms to the southwest of Nossi Bé, Madagascar, October 4, 1960. Holotype female, allotype male, and 15 paratypes (11 females, 4 males) deposited in the United States National Museum at Washington, the same number of paratypes in the Muséum National d'Histoire Naturelle at Paris, and in the collection of the Centre d'Océanographie et des Pêches at Nossi Bé; the remaining paratypes and the copepodids in the collection of the author.

— Other specimens - 45 females and 13 males from 17 *Trevelyana rubromaculata* Bergh on *Cymodocea* in 0.5 meter of water at low tide to the southeast of Ambariobe, near Nossi Bé, August 24, 1960. 3 females from 3 *Trevelyana rubromaculata* at Pointe Mahatsinjo, Nossi Bé, September 22, 1960.

— Female - Body (fig. 166) with the cephalosome widened. Total length (the setae of the caudal rami excluded) 1.52 mm (1.44-1.60 mm), greatest width 0.83 mm (0.77-0.90 mm), the measurements based on 10 specimens. Segment of the first leg separated from the head by a dorsal transverse furrow. Epimeral areas of the segments of legs 1-3 rather angular, those of the segment of the fourth leg rounded. Dorsal surface of the segment of the fifth leg with two pairs of small hairs. Genital segment (fig. 167) 225 x 225 μ, widened in the middle but narrowed in front and behind, showing refractile points on its dorsal surface. Areas of attachment of the egg sacs situated dorsolaterally on the widened part of the segment, and bearing two naked setae, 16 μ long (fig. 168). Three postgenital segments 65, 57, and 55 μ long respectively, the last with dorsal hairs. Ratio of the prosome to the urosome about 2.14:1.

Caudal ramus (fig. 169) 52 x 40 μ (the greatest dimensions), having refractile points on its dorsal surface. Outer seta naked and slightly swollen at the base. Dorsal seta rather small, naked, and held erect. Of the four terminal setae, the outermost rather hyaline and naked except for a short row of hairs on the inner border of the proximal part, the innermost with lateral hairs (those on the outer edge more sparse), and the two long setae barbed as indicated in the figure.

Egg sac (fig. 170) very large, elongated, 1130 x 325 μ, slightly recurved, held parallel to the urosome in specimens in alcohol, and reaching beyond the tips of the setae of the caudal rami. Each sac containing many small eggs, each about 50 μ in diameter.

Rostral region (fig. 171) only slightly developed, with refractile points. First antenna (fig. 172) 7-segmented, with the third segment showing a small sclerified region on its ventral surface (fig. 173) which suggests a division into two segments. The lengths of the segments (measured along their posterior margins), beginning at the base, as follows : 70, 122, 31, 78, 68, 48, and 31 μ. Arrangement of the setae and aesthetes as in *L. gemmatus*. All the setae naked.

Second antenna (fig. 174) 4-segmented, rather strong, the first segment 130 μ long with a small naked inner distal seta, the second 140 μ with a similar seta beyond the middle of the inner margin, the third 35 μ with two naked setae and a weakly unguiform seta (its concave wall interrupted as in the true claws), the fourth 62 μ along the inner margin, 99 μ along the outer margin, and 36 μ wide at the middle, provided terminally with five setae (2 large, 3 small) and two recurved claws, 49 and 62 μ long (measured along the axis). (The lengths of the segments represent the actual length, taking into account the overlapping of the segments).

Posterior border of the labrum (fig. 175) of the usual form. Mandible (fig. 176) resembling closely that of *L. commodus*. Paragnath (fig. 177) a hairy lobe. First maxilla (fig. 178) like that of *L. securiger*. Second maxilla (fig. 179) of a general structure like that of *L. securiger*, but the lateral spinules on the subterminal spine rather more numerous and the basal seta slightly larger. Maxilliped (fig. 180) in general form resembling that of *L. commodus* (see fig. 152), but the two setae on the second segment not so unequal, 28 μ and naked, 18 μ and barbed; the last segment similar but the spine long and clearly barbed, the spiniform process long, pointed, and barbed, and with a small spine (process ?) near its base.

Ventral region between the maxillipeds and the first legs (fig. 181) with a transverse furrow.

Rami of legs 1-4 (figs. 182, 184, 186, and 187) 3-segmented, except the endopod of the fourth leg which has only two segments. Spine and setal formula the same as in *L. securiger*.

Coxopods with a large inner plumose seta (but this seta on the fourth leg reduced to a naked seta of somewhat variable length, 28-43 μ). Basipods with an outer naked seta (short on the first leg, long on the fourth leg), and with a row of hairs on the inner margin (except in the fourth leg where this margin is smooth).

The outermost terminal seta on the third segment of the endopod of the first leg (fig. 182) with the basal part spiniform. One female with the terminal spine of one exopod of the first leg with serrated margins (fig. 183) instead of the usual gladiolate form. One female with the formula of the third segment of one exopod of the second leg IV-I-5, with one small supplementary spine (fig. 185).

Fourth leg (fig. 187) with the endopod clearly shorter than the exopod; its proximal segment 37 x 36μ and bearing a plumose seta 60μ long, the distal segment 71μ long (the spiniform processes included), 28μ wide proximally and 20μ wide at the middle, the ratio of the length to the width about 3.5:1, and its inner border smooth. The two terminal spines very unequal, the inner 72μ, the outer 43μ long.

Fifth leg (fig. 188) with the free segment 109μ long, with a rounded expansion which is rather hyaline on the inner side in its proximal fourth; 29μ wide at this expansion, 19μ wide at the middle of the segment; the segment bearing small spinules on the distal half of its outer margin. The two terminal setae naked, the inner 73μ long (with a ventral row of very small spinules near its base), the outer 88μ long. The seta near the base of the segment naked.

Sixth leg probably represented by the two setae near the attachment of the egg sacs (see fig. 168).

Color in life in transmitted light transparent, eye dark red, ovary gray, egg sacs opaque.

—Male - Form of the body (fig. 189) resembling that of the female. Total length (without the setae of the caudal rami) 1.07 mm (0.96-1.22 mm), greatest width 0.43 mm (0.38-0.48 mm), the measurements based on 10 specimens. Genital segment (fig. 190) widened, wider than long, 208 x 231μ, and bearing on its dorsal surface refractile points and small hairs. Four postgenital segments 36, 35, 31, and 30μ long respectively. Ratio of the prosome to the urosome about 1.47:1.

Caudal ramus and the rostral region as in the female.

First antenna (fig. 191) with unusually long aesthetes. The lengths of the seven segments (measured along their posterior margins), beginning at the base, as follows : 30, 103, 25, 65, 57, 41, and 26μ; their armature : 4, 13 and 2 aesthetes, 6, 3 and 1 aesthete, 4 and 1 aesthete, 2 and 1 aesthete, and 7 and 1 aesthete. All the setae naked. Near the base of the third segment a small sclerified region as in the female.

Second antenna (fig. 192) in general form like that of the female, but having small knobs (spinules ?) on the inner surface of the second and fourth segments; with the setae of the first and second segments and the proximal seta of the third segment swollen at the base and unilaterally barbed. Fourth segment of almost the same relative dimensions as in the female. The two terminal claws unequal, 60 and 33μ long.

Posterior border of the labrum, mandible, paragnath, first maxilla, and second maxilla as in the female. Maxilliped (fig. 193) elongated, slender, 4-segmented (assuming that a part of the claw represents a fourth segment). The first two segments long, the first unarmed; the second with two inner spines, one unilaterally barbed, and a row of spines along the inner surface. Third segment very short and unarmed. Fourth segment in the form of a recurved claw, 170μ long (measured in a straight line from the base to the tip), weakly divided in the middle, and bearing the usual two setae, as in *L. commodus*. Postoral region as in the female.

Legs 1-4 like those of the female, with the same spine and setal formula, except the endopod of the first leg, where the formula of the third segment is I-I-4 (fig. 194).

Fifth leg (fig. 195) with the free segment elongated, the sides parallel, without a basal expansion, 42 x 12μ, with some small spinules distally on the outer surface. The two terminal setae unequal and naked, the outer 68μ, the inner 24μ long and rather spiniform, and with a narrow hyaline lamella on its outer margin and terminating in a short flagellum.

Sixth leg (fig. 196) represented by a ventrolateral ridge on the posterior part of the genital segment, bearing two naked setae 56 and 60μ long.

Spermatophore (fig. 197) 198μ long (the neck included) x 86μ wide. Surface very indistinctly striated.

Color in life in transmitted light as in the female.

(The specific name comes from *sensilis* = sensitive, alluding to the long aesthetes on the first antenna of the male).

The female of *L. sensilis* may be recognized by the slender fifth leg with a rather hyaline basal expansion and the male by the long aesthetes on the first antenna and by the small basally swollen setae on the first and second segments of the second antenna. Furthermore, the egg sacs of this species are unusually long, reaching beyond the tips of the setae of the caudal rami.

Like *L. commodus*, *L. sensilis* resembles rather superficially *L. alabatensis* (Kossmann, 1877) (see above following the description of *L. commodus*), but differs from it in several respects. In the female of *L. alabatensis* the ratio of the prosome to the urosome is about 1.86:1 (taking the dimensions from fig. 4, B of Monod and Dollfus) and the cephalosome is relatively wider (as wide as the length of the prosome). The fifth leg has a much weaker basal expansion than in the species from Madagascar. Although the first antenna of the male has long aesthetes, their disposition (see fig. 9, B of Monod and Dollfus) is different.

L. sensilis differs from *L. vagans* Gurney, 1927 (the female is unknown), from Port Said, which has a more slender second antenna, and in which the claw of the maxilliped is much longer.

—Discussion

The copepods from the sea anemones may be collected by washing these coelenterates in sea water with about 5 per cent ethyl alcohol. Very often the first washing will yield no copepods. One specimen of *Stoichactis giganteum* produced no *Lichomolgus* even after four successive washings. After this *Stoichactis* had been torn apart and then washed for the fifth time, numerous specimens of *L. gemmatus* and *L. cuspis* appeared in the sediment. This suggests that the copepods live in the gastrovascular cavity or that they withdraw there after the stimulation by the alcohol.

The collection of copepods from the nudibranchs is much easier, because of the absence of mucus. A single washing suffices for them usually.

The identification of these copepods requires much attention to the preparation of the dissection, which may be done in an uncovered drop of lactic acid. Very often the compression resulting from using a cover glass deforms the dissection. A method for the study of the external anatomy of copepods will soon be published by Humes and Gooding (1964).

Since relatively little is known of the limits of variation in the species of *Lichomolgus*, the description of a species should be as complete as possible. The satisfactory determination of a species is based upon a comparison in detail with other related species. Thus, although the comparisons presented above following the description of each new species are very brief, in each case it is necessary to make a study of the entire external anatomy.

The descriptions of many species of *Lichomolgus* are often lacking in details. In certain cases only one sex is known. Sometimes the appendages are incompletely described or the figures are of poor quality. Certain species have been based upon a single specimen and thus the limits of variation remain unknown. On account of these deficiencies, it is difficult to compare certain species or even to be assured of their validity.

The genus *Lichomolgus* includes a large number of apparently valid species. If one accepts *Stellicola* Kossmann, 1877, as a distinct genus, about 50-60 species remain in *Lichomolgus* as understood in the classic sense. (Stock, 1957, has made mention of the distinctions between *Lichomolgus*, *Stellicola*, and certain neighboring genera). Stock (1960, p. 246) has remarked that the genus *Lichomolgus* probably should be divided into several genera or subgenera (see also Stock, 1962, p. 163). He believed that the structure of the mouthparts, especially that of the mandible, will offer the basis for such a division.

Following the ideas of Stock (1957) the genus *Lichomolgus* may be very briefly characterized as follows : body cyclopoid; the second antenna 4-segmented, rather long and slender; the endopod of the fourth leg 2-segmented with the formula 0-1-II; the egg sacs elliptical and not much longer than the abdomen. Furthermore, the mandible is lichomolgid with a terminal flagellum.

In making the comparisons of the new species from Madagascar with other apparently related species, all the species already described which have these characters have been considered.

Among the six new species described above, certain characters may be pointed out which are common to all. In the female the armature of the seven segments of the first antenna is remarkably stable (4, 13, 6, 3, 4 and 1 aesthete, 2 and 1 aesthete, and 7 and 1 aesthete). Whether the first antenna contains seven segments or eight segments remains a question which is rather difficult to resolve. In all six new species there is on the ventral surface of the first antenna near the base of the third segment a sclerified region. If one examines the antenna on the dorsal surface, this sclerified region is less apparent. Furthermore, this sclerotization seems, at least in some cases, not to extend to the setigerous margin of the segment. Although I have recognized this sclerified region as a separate segment (Humes and Cressey, 1958, Humes, 1959), it seems to me more probable that the region is a part of the third segment of the antenna. Therefore the first antenna is considered to be 7-segmented in the species from Madagascar.

The formula of the last segment of the exopod of the fourth leg in the two sexes is II-I-5 in *L. cuspis*, *L. securiger*, *L. commodus*, and *L. sensilis*, but III-I-5 in *L. gemmatus* and *L. magnificus*. The setae of the caudal rami are short and naked in *L. magnificus*, but of a more usual appearance in the others.

The posterior margin of the labrum, the form of the mandible, and the armature of the second maxilla (which has a small basal seta on the convex border of the second segment) are similar in the six species. The number of setae on the first maxilla is ordinarily four, but three only in *L. magnificus* and *L. cuspis*. Although the details of the form of the tip of the maxilliped of the female vary, in general this extremity bears two spines or setae with a spiniform process between them. The two setae on the second segment of the maxilliped in the female are sometimes very unequal.

In the male, in addition to the sexual dimorphism found in the maxilliped, the fifth leg, the genital segment, the postgenital segments, and the caudal ramus, such dimorphism exists also in the first antenna, the second antenna, and the endopod of the first leg. In the first antenna, although the segmentation and the arrangement of the setae remain the same as in the female, the disposition of the aesthetes on the seven segments varies, the formula being 0, 2, 0, 1, 1, 1, 1 in *L. gemmatus* and *L. sensilis*, and 0, 2, 0, 0, 1, 1, 1 in *L. securiger*; the other three species with a formula as in the female. The ornamentation of the segments of the second antenna is often very different from that of the female, The formula of the last segment of the endopod of the first leg of the male differs often from that of the female (I-II-3 in *L. gemmatus*, II-4 in *L. cuspis*, and I-I-4 in *L. securiger*, *L. commodus*, and *L. sensilis*). *L. magnificus* differs from the other five new species in the similarity of the first antenna, the second antenna, and the endopod of the first leg in the two sexes.

List of sea anemones and their associated lichomolgid copepods in the region of Nossi Bé :

Stoichactis giganteum (Forskål)	*Lichomolgus gemmatus* sp. n.
" "	*Lichomolgus magnificus* sp. n.
" "	*Lichomolgus cuspis* sp. n.
Radianthus ritteri (Kwietniewski)	*Lichomolgus cuspis* sp. n.

List of nudibranchs and their associated lichomolgid copepods in the region of Nossi Bé :

Phyllidia trilineata Cuvier	*Lichomolgus venustus* Humes, 1959
" "	*Lichomolgus patulus* Humes, 1959
Platydoris scaber (Cuvier)	*Lichomolgus audens* Humes, 1959
Doris mabilla Abraham	*Lichomolgus securiger* sp. n.
Hexabranchus orbicularis Abraham	*Lichomolgus commodus* sp. n.
Doridopsis ruber Kelaart	*Lichomolgus commodus* sp. n.
Trevelyana rubromaculata Bergh	*Lichomolgus sensilis* sp. n.

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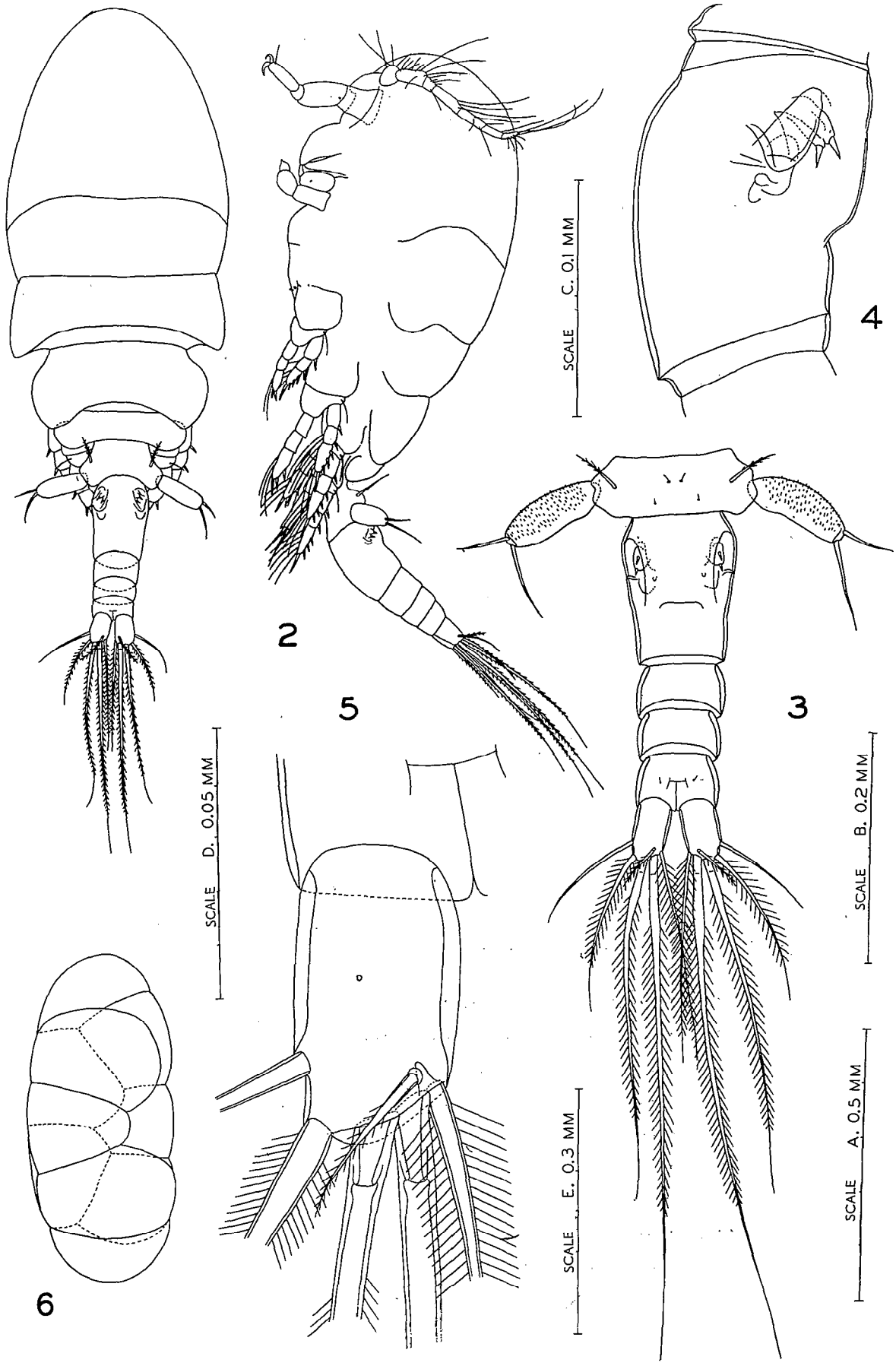
Explanation of the figures

All the 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 the figure was drawn.

Figs. 1-6 - *Lichomolgus gemmatus* sp. n., female

1 - Body, dorsal view (A)
2 - Body, lateral view (A)
3 - Urosome, dorsal (B)
4 - Genital segment and area of attachment of an egg sac, lateral (C)
5 - Caudal ramus, dorsal (D)
6 - Egg sac (E)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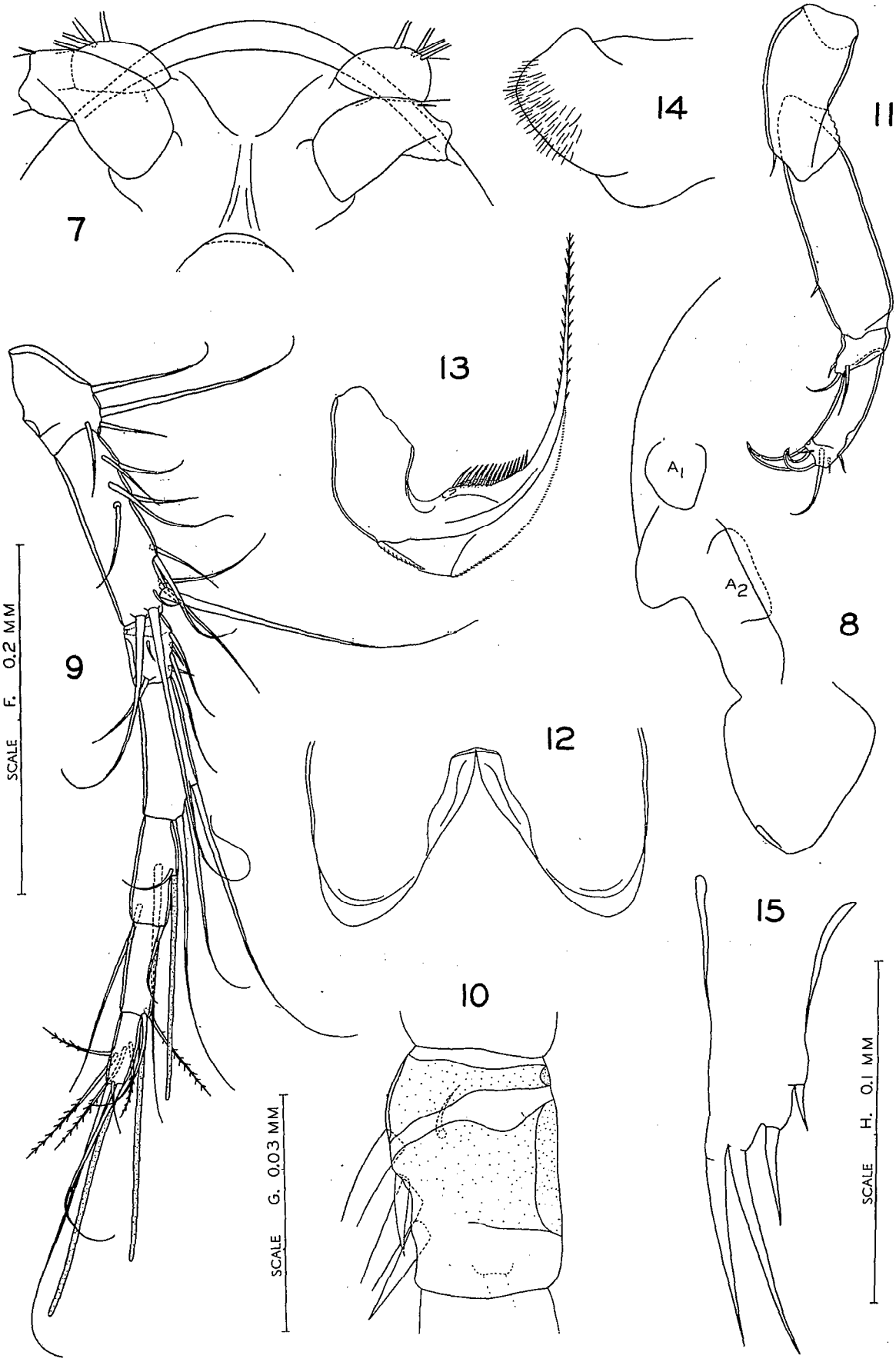
Figs. 7-15 - *Lichomolgus gemmatus* sp. n., female (continued)

7 - Rostral region, ventral (F)
8 - Rostral region and labrum, lateral (F)
9 - First antenna, dorsal (C)
10 - Third segment of the first antenna, ventral (G)
11 - Second antenna, inner (F)
12 - Posterior border of the labrum, ventral (H)
13 - Mandible (H)
14 - Paragnath (G)
15 - First maxilla (G)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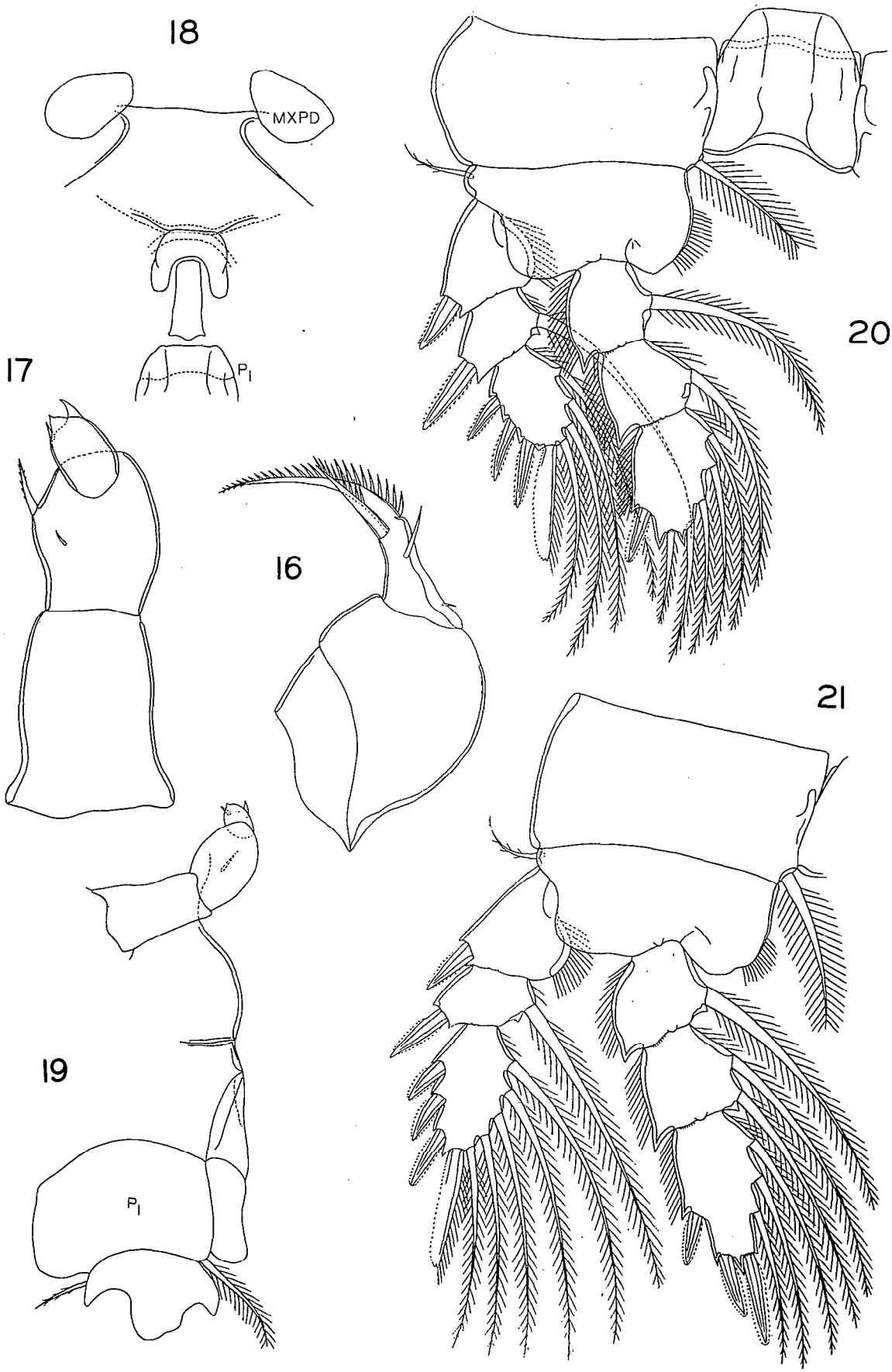
SCALE H. 0.1 MM

Figs. 16-21 - *Lichomolgus gemmatus* sp. n. , female (continued)

16 - Second maxilla, posterior (H)
17 - Maxilliped, inner (H)
18 - Region between the maxillipeds and the first legs, ventral (F)
19 - Same, lateral (F)
20 - First leg and intercoxal piece, anterior (C)
21 - Second leg, anterior (C)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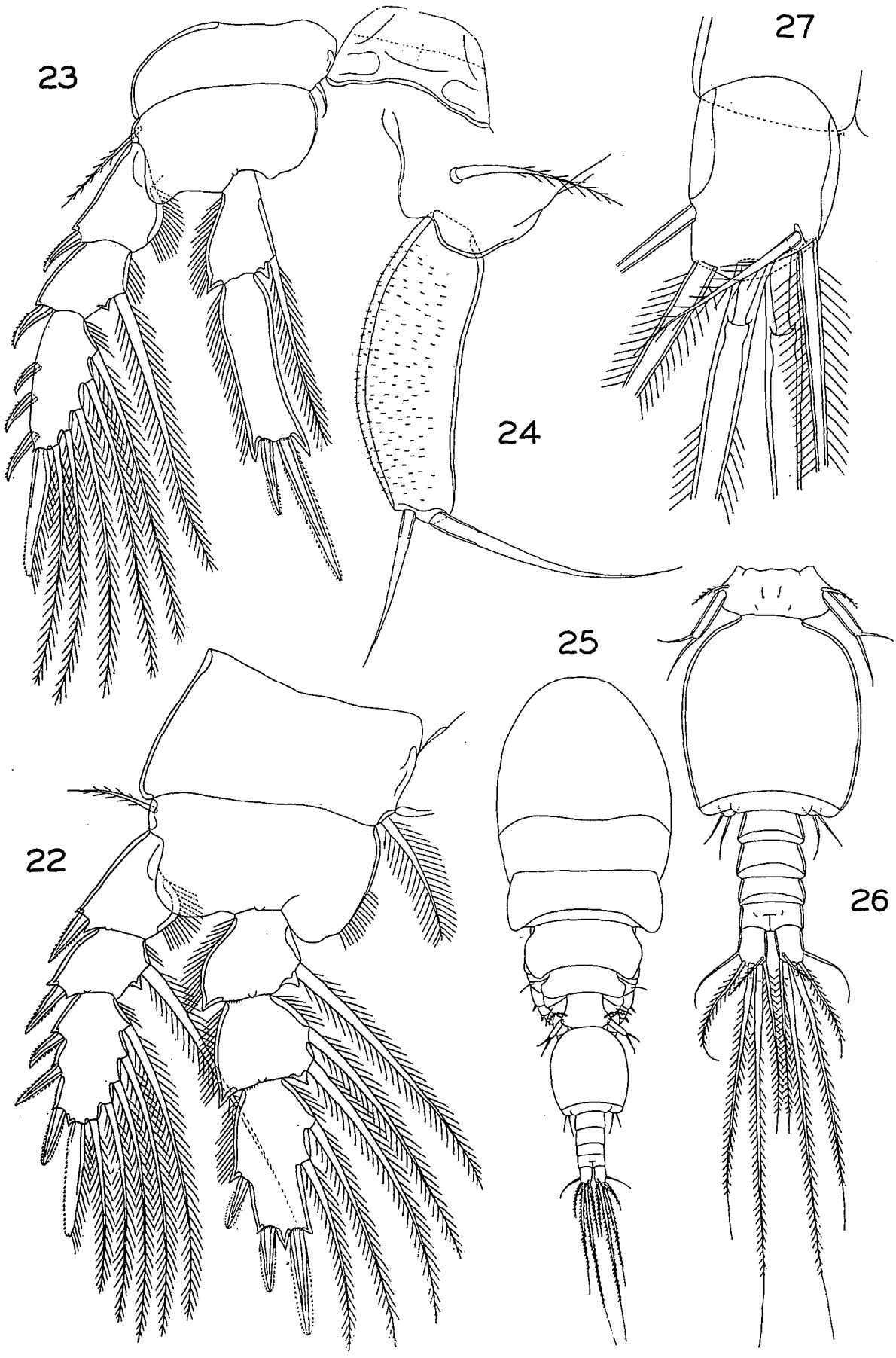
Figs. 22-24 - *Lichomolgus gemmatus* sp. n. , female (continued)

22 - Third leg, anterior (C)
23 - Fourth leg and intercoxal piece, anterior (C)
24 - Fifth leg, dorsal (H)

Figs. 25-27 - *Lichomolgus gemmatus* sp. n. , male

25 - Body, dorsal (A)
26 - Urosome, dorsal (B)
27 - Caudal ramus, dorsal (D)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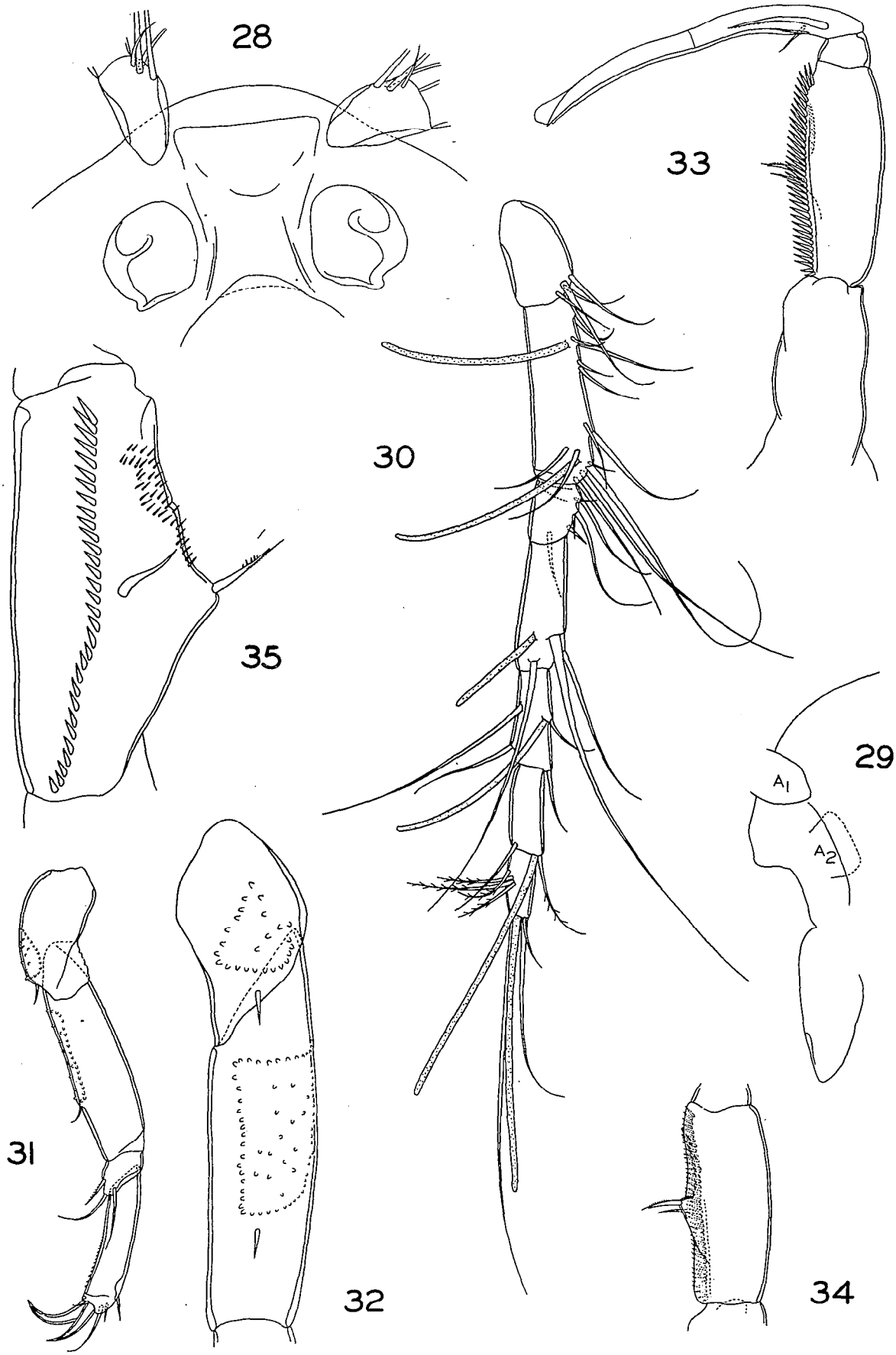
Figs. 28-35 - *Lichomolgus gemmatus* sp. n., male (continued)

28 - Rostral region, ventral (C)
29 - Rostral region and labrum, lateral (F)
30 - First antenna, dorsal (C)
31 - Second antenna, inner (F)
32 - Inner surface of the first two segments of the second antenna (H)
33 - Maxilliped, inner, somewhat oblique (F)
34 - Second segment of the maxilliped, outer, somewhat oblique (F)
35 - Same, inner (H)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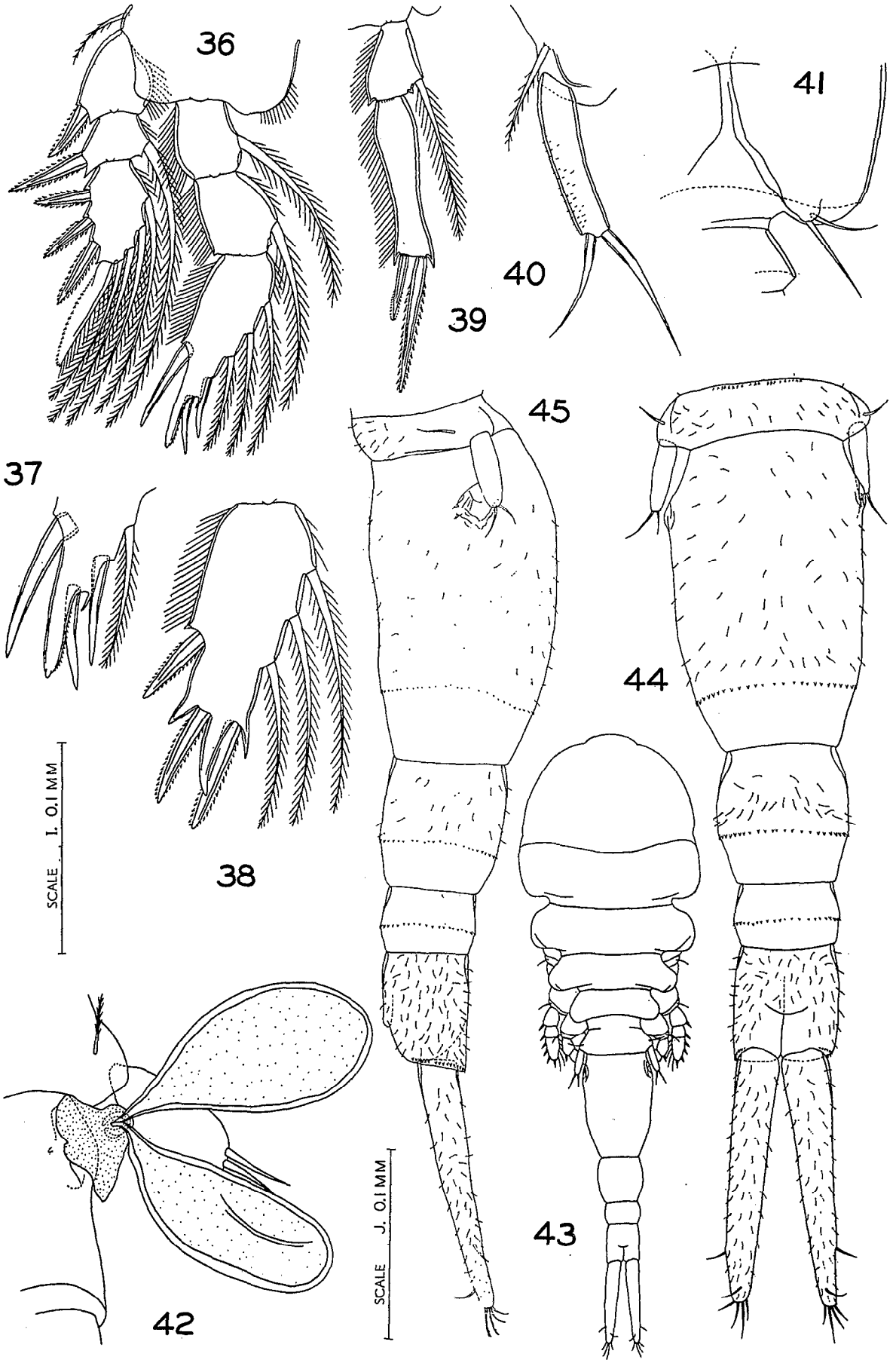
Figs. 36-42 - *Lichomolgus gemmatus* sp. n. , male (continued)

36 - First leg, anterior (C)
37 - Tip of the endopod of the first leg, anterior (H)
38 - Third segment of the endopod of the second leg, anterior (H)
39 - Endopod of the fourth leg, anterior (C)
40 - Fifth leg, dorsal (H)
41 - Sixth leg, ventral (C)
42 - Two spermatophores attached to the genital segment, dorsal (I)

Figs. 43-45 - *Lichomolgus magnificus* sp. n. , female

43 - Body, dorsal (J)
44 - Urosome, dorsal (A)
45 - Same, lateral (A)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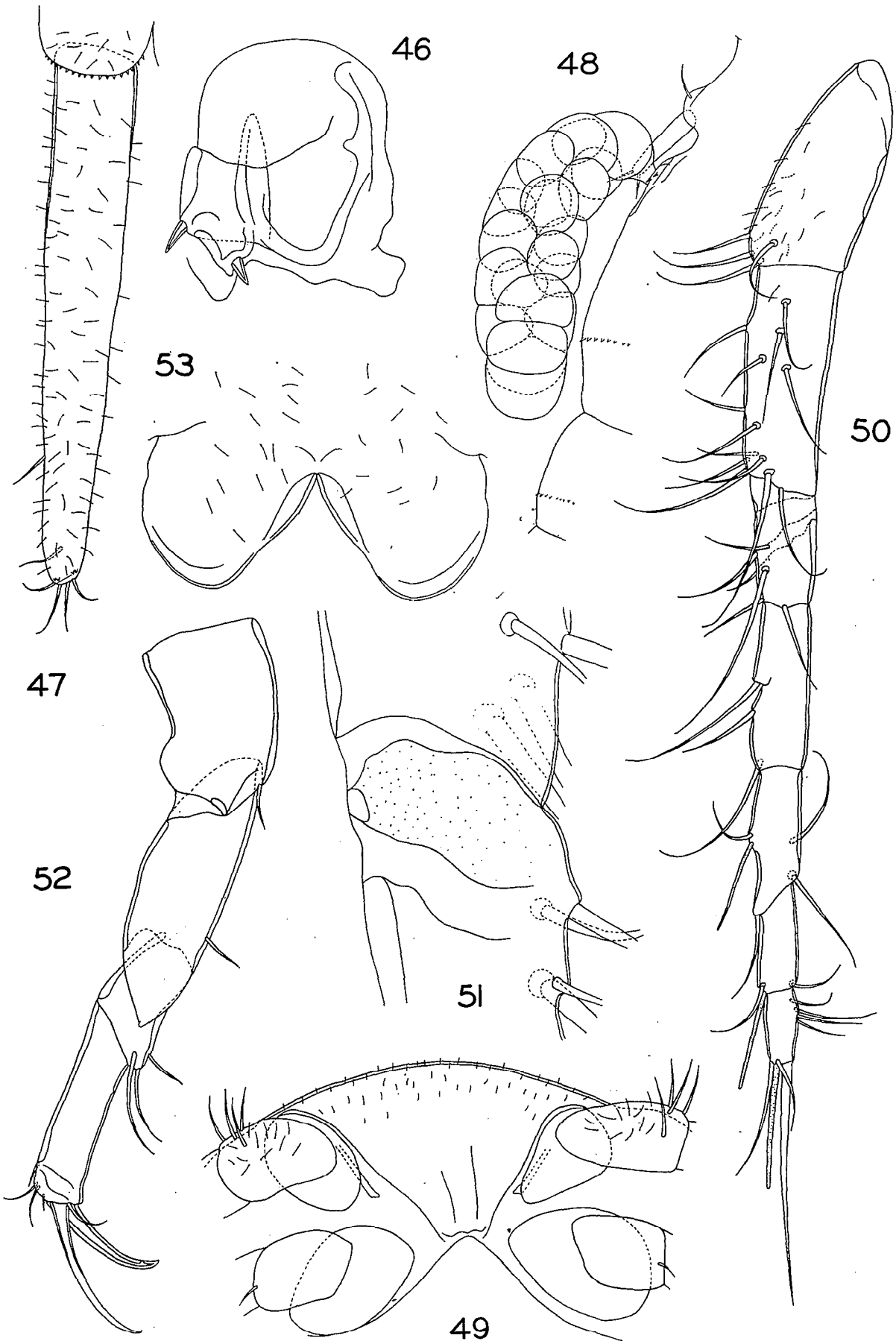
Figs. 46-53 - *Lichomolgus magnificus* sp. n. , female (continued)

46 - Area of attachment of an egg sac, lateral (H)
47 - Caudal ramus, ventral (B)
48 - Egg sac attached to the genital segment, dorsal (A)
49 - Rostral region, ventral (B)
50 - First antenna, dorsal (F)
51 - Sclerified region on the third segment of the first antenna, ventral (D)
52 - Second antenna, somewhat inner (F)
53 - Posterior border of the labrum, ventral (F)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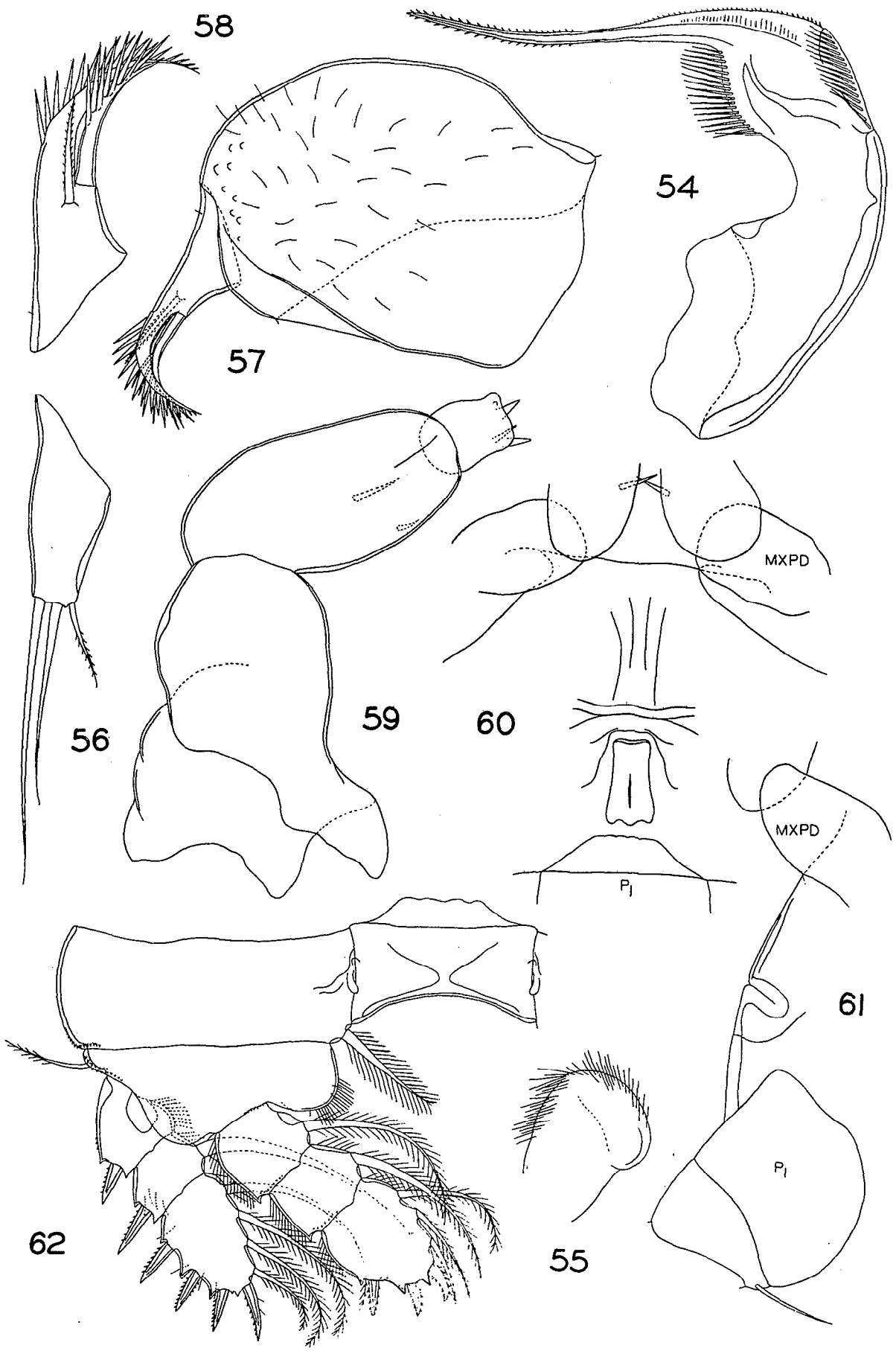
Figs. 54-62 - *Lichomolgus magnificus* sp. n. , female (continued)

54 - Mandible (H)
55 - Paragnath (H)
56 - First maxilla (H)
57 - Second maxilla, anterior (C)
58 - Second segment of the second maxilla, posterior (H)
59 - Maxilliped, outer (C)
60 - Region between the maxillipeds and the first legs, ventral (B)
61 - Same, lateral (B)
62 - First leg and intercoxal piece, anterior (B)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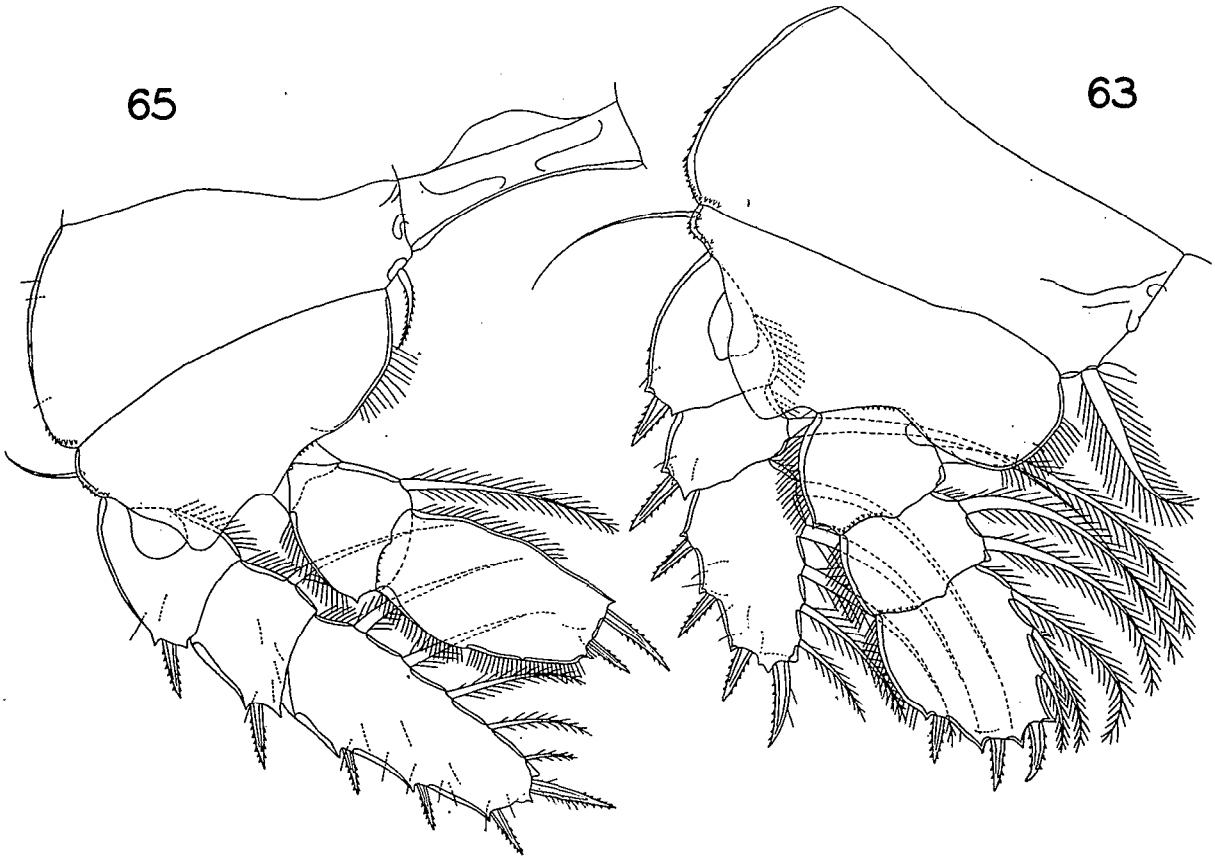
Figs. 63-66 - *Lichomolgus magnificus* sp. n. , female (continued)

63 - Second leg, anterior (B)
64 - Third leg, anterior (B)
65 - Fourth leg, anterior (B)
66 - Fifth leg, dorsal and outer (F)

Fig. 67 - *Lichomolgus magnificus* sp. n. , male

67 - Body, dorsal (J)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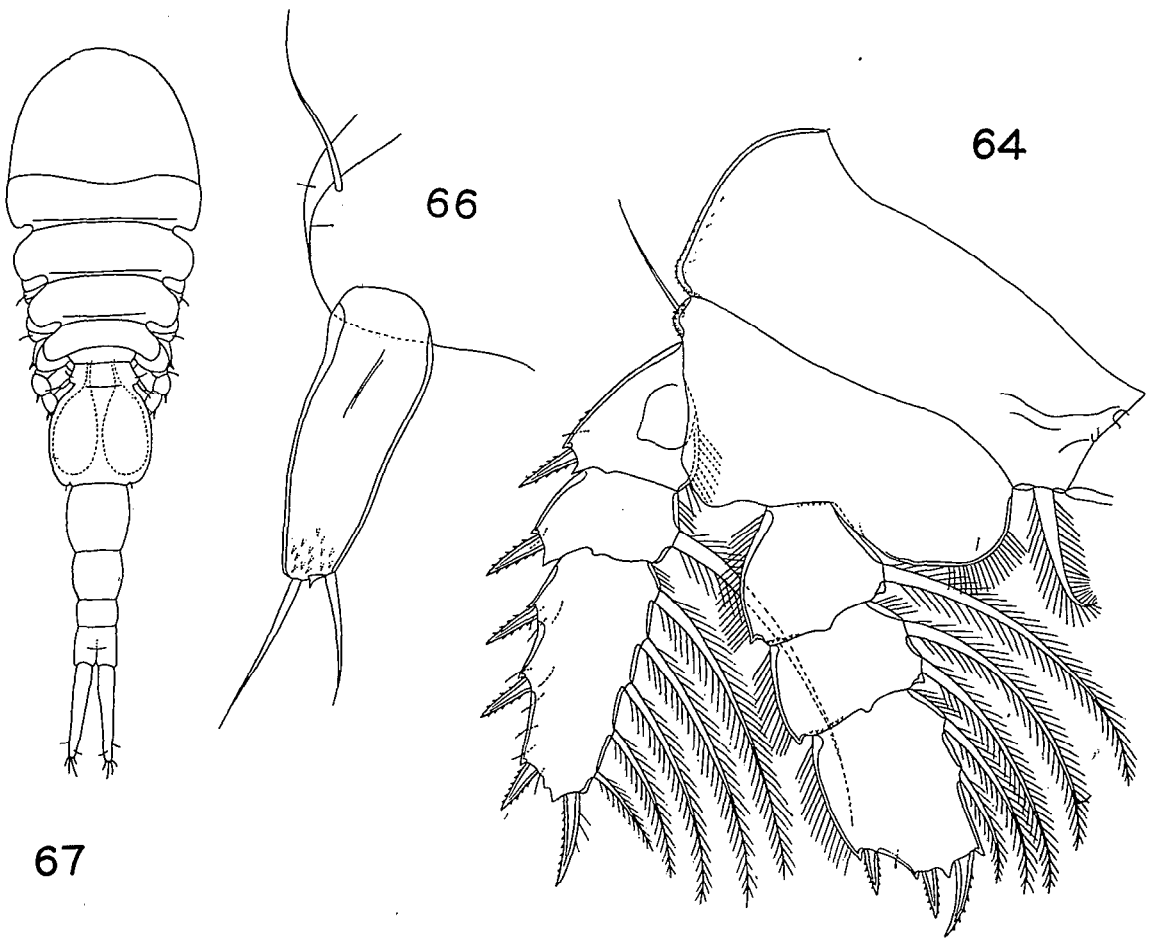
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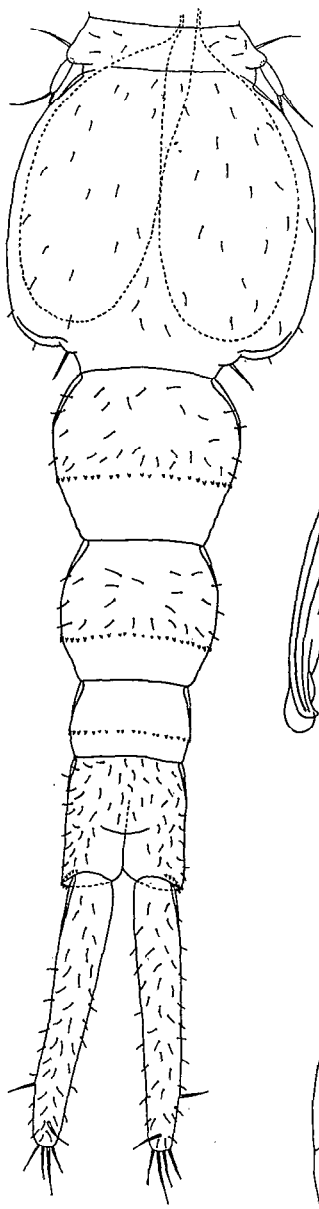
Figs. 68-73 - *Lichomolgus magnificus* sp. n. , male (continued)

68 - Urosome, dorsal (A)
69 - Maxilliped, outer (B)
70 - Endopod of the fourth leg, anterior (B)
71 - Fifth leg, dorsal and outer (H)
72 - Sixth leg, ventral (B)
73 - Spermatophore, dissected from the body (E)

Fig. 74 - *Lichomolgus cuspis* sp. n. , female

74 - Body, dorsal (K)



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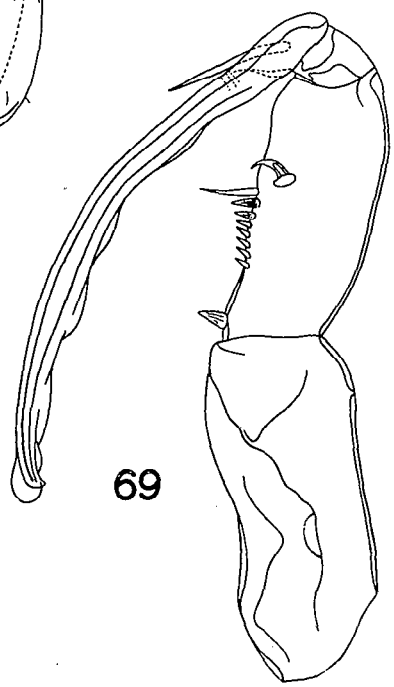

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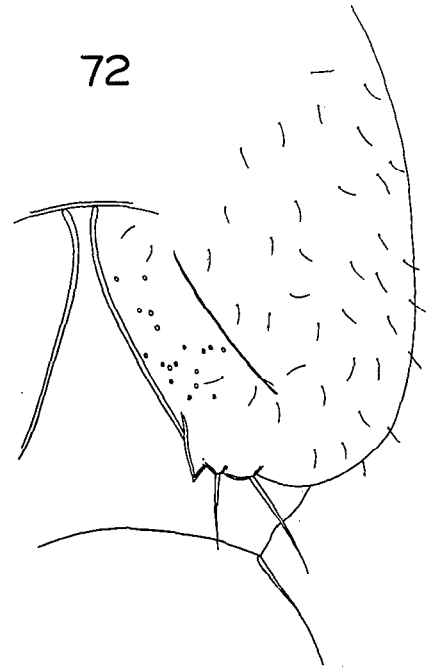

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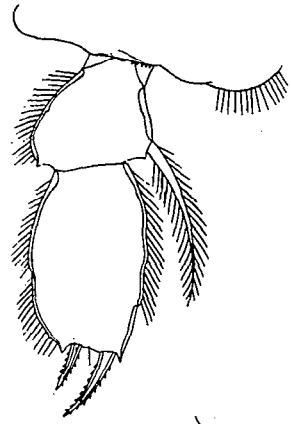

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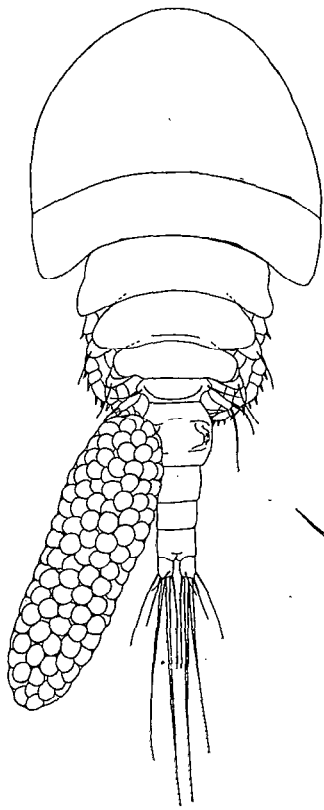

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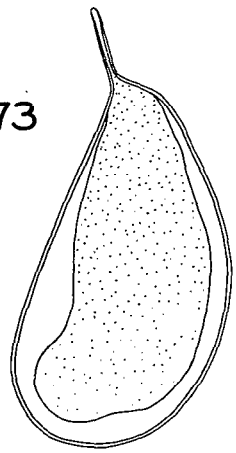

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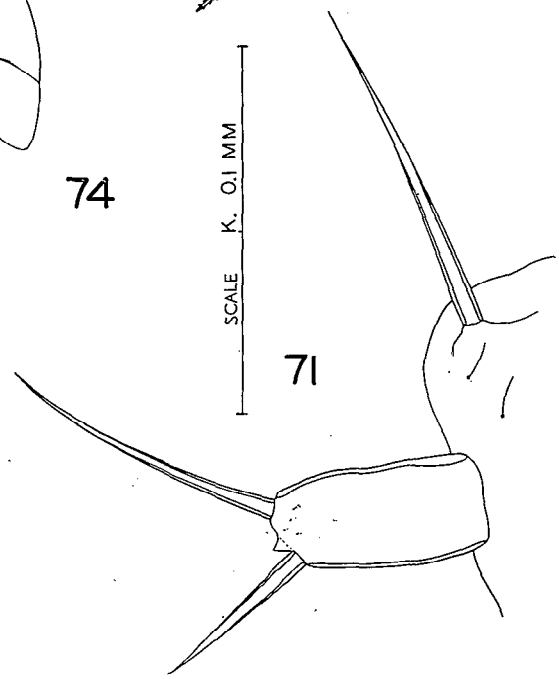

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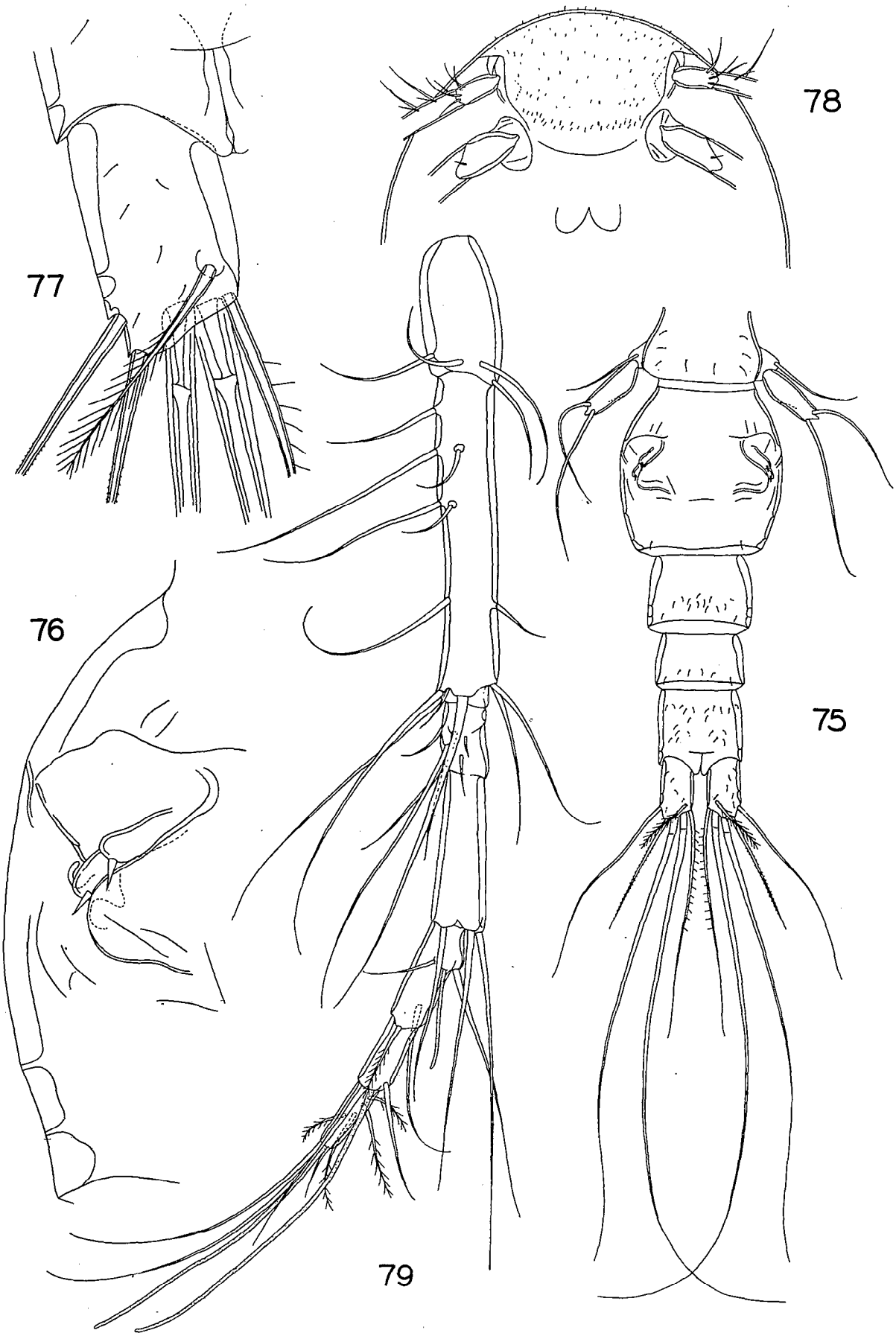
Figs. 75-79 - *Lichomolgus cuspis* sp. n., female (continued)

75 - Urosome, dorsal (E)
76 - Area of attachment of an egg sac, dorsal (H)
77 - Caudal ramus, dorsal (H)
78 - Rostral region, ventral (A)
79 - First antenna, dorsal (F)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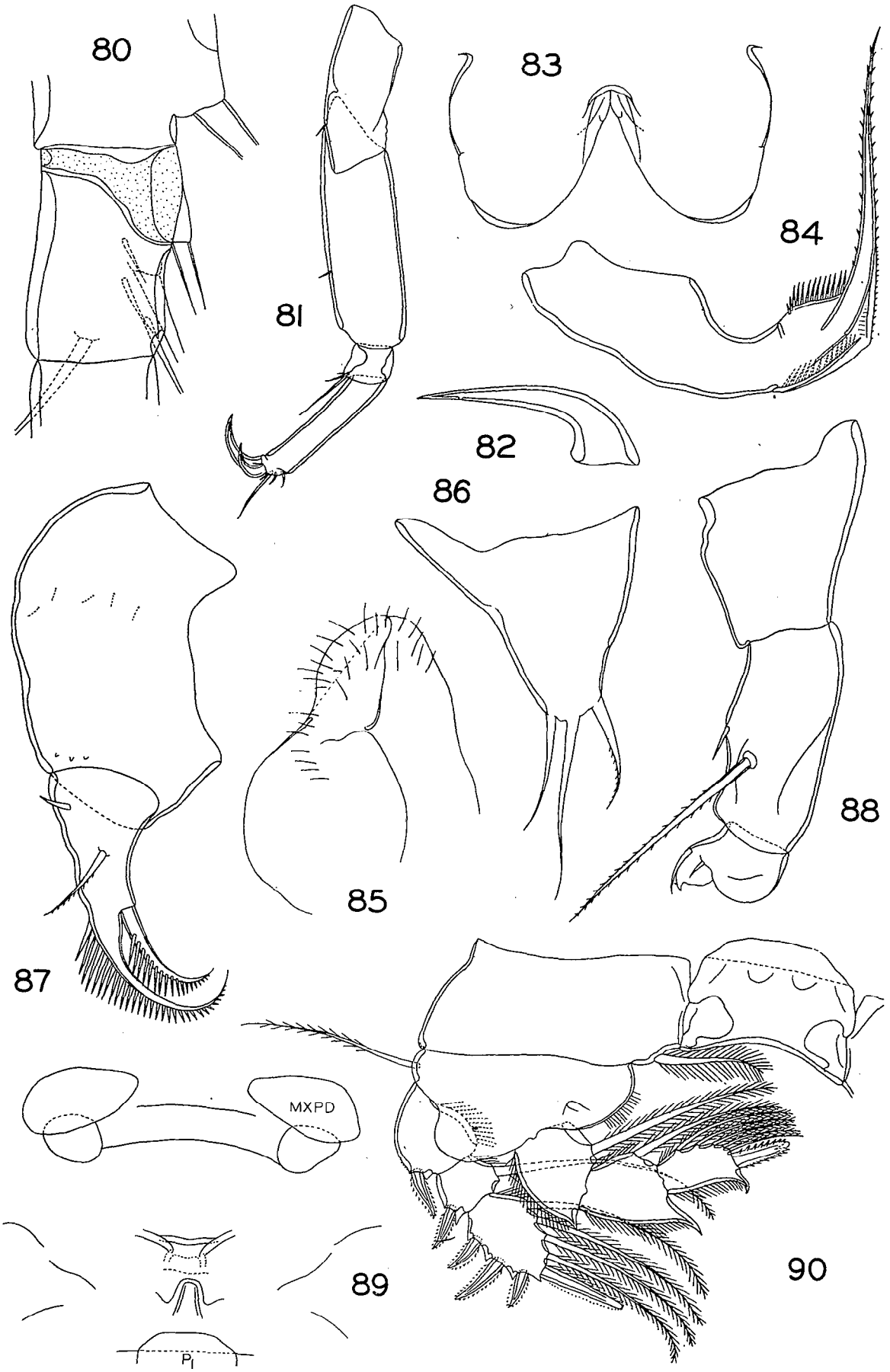
Figs. 80-90 - *Lichomolgus cuspis* sp. n. , female (continued)

80 - Third segment of the first antenna, ventral (D)
81 - Second antenna, inner (B)
82 - Larger terminal claw of the second antenna (H)
83 - Posterior border of the labrum, ventral (C)
84 - Mandible (H)
85 - Paragnath (G)
86 - First maxilla (D)
87 - Second maxilla, posterior (H)
88 - Maxilliped, somewhat posterior (H)
89 - Region between the maxillipeds and the first legs, ventral (B)
90 - First leg and intercoxal piece, anterior (F)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Figs. 91-95 - *Lichomolgus cuspis* sp. n. , female (continued)

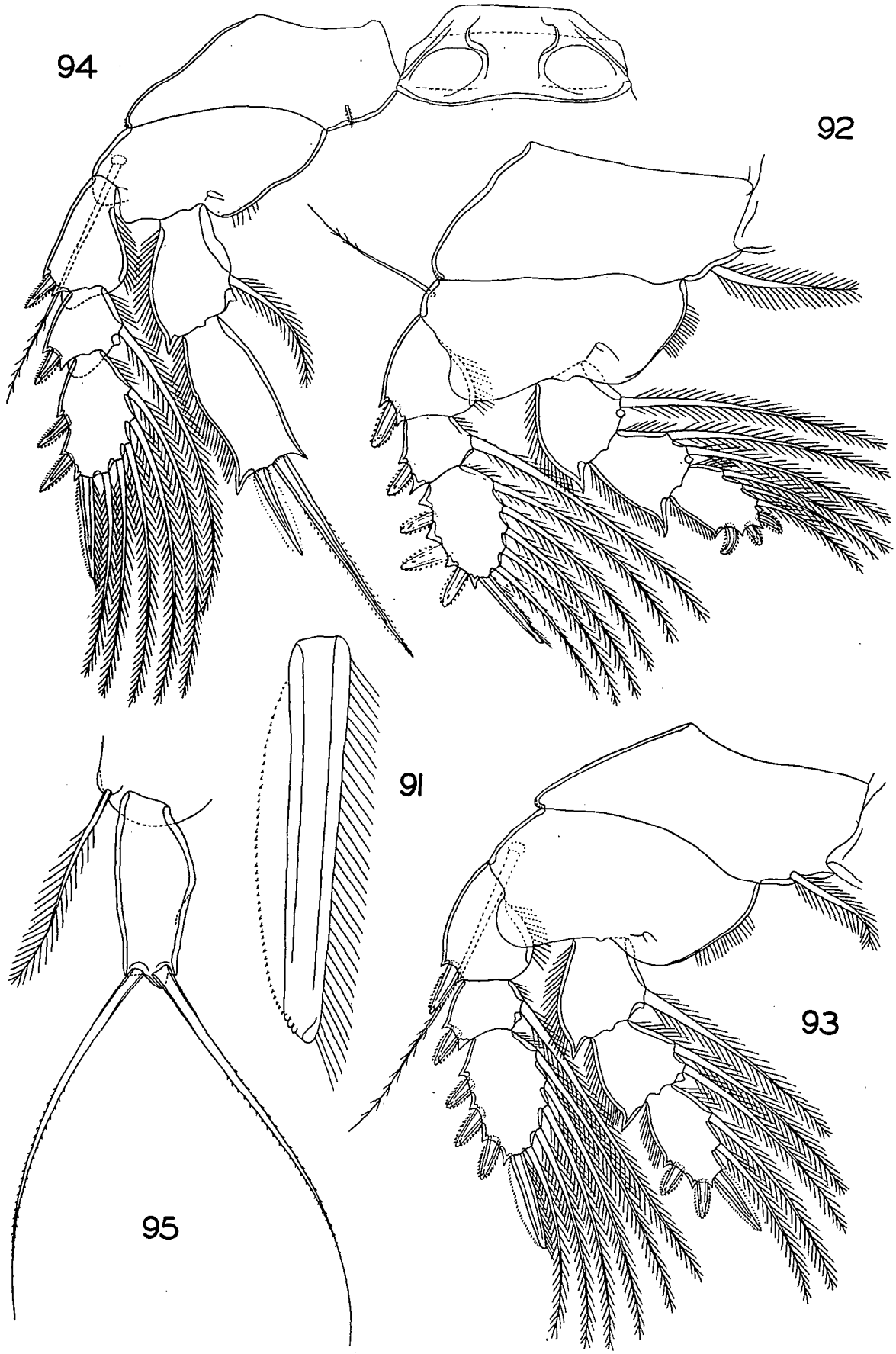
91 - Terminal spine of the exopod of the first leg, anterior (G)

92 - Second leg, anterior (F)

93 - Third leg, anterior (F)

94 - Fourth leg and intercoxal piece, anterior (F)

95 - Fifth leg, dorsal (C)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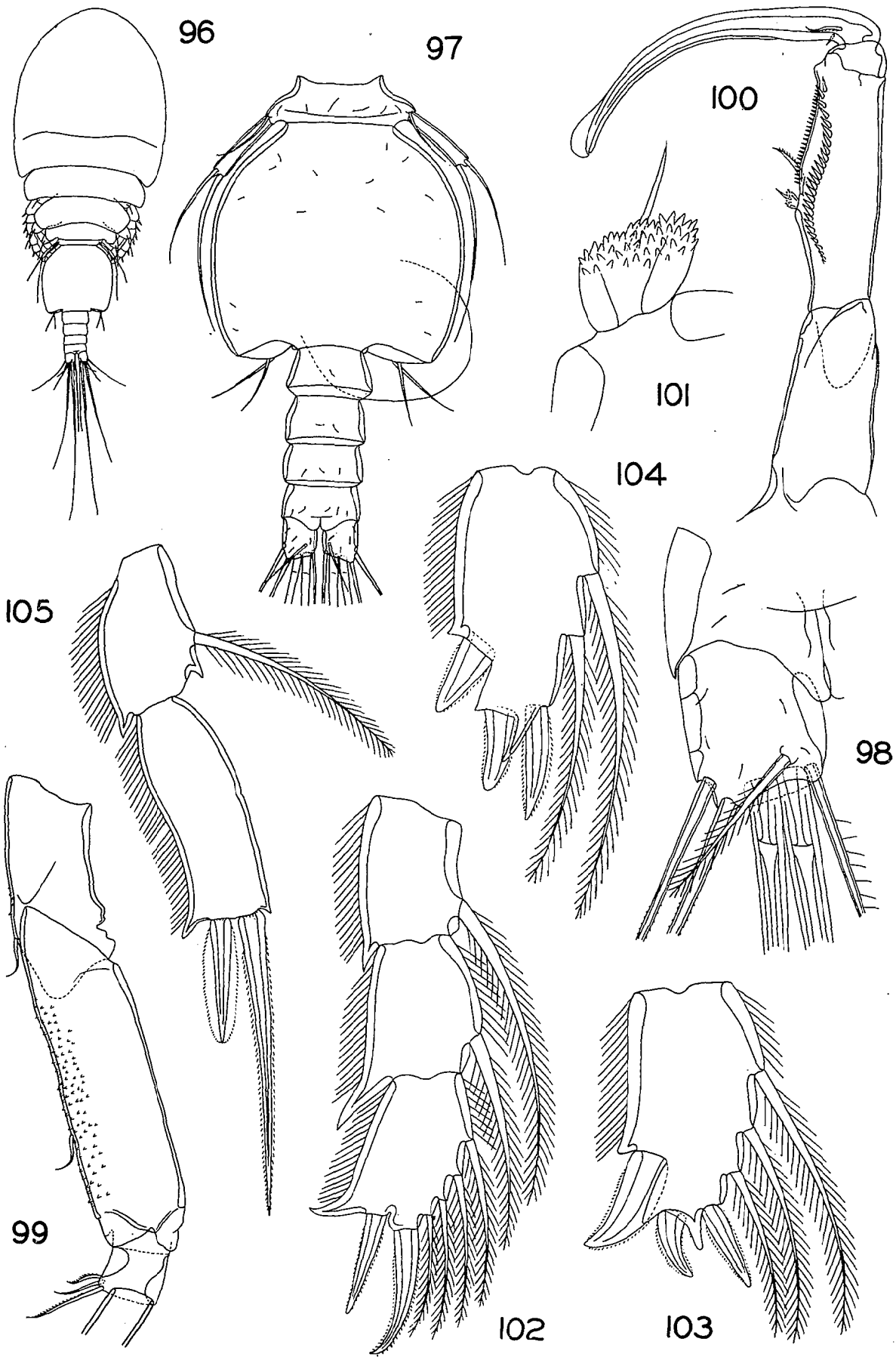
Figs. 96-105 - *Lichomolgus cuspis* sp. n. , male

96 - Body, dorsal (K)
97 - Urosome, dorsal (E)
98 - Caudal ramus, dorsal (H)
99 - First three segments of the second antenna, somewhat inner (B)
100 - Maxilliped, inner (B)
101 - Modified seta on the second segment of the maxilliped (G)
102 - Endopod of the first leg, anterior (C)
103 - Last segment of the endopod of the second leg, anterior (H)
104 - Last segment of the endopod of the third leg, anterior (H)
105 - Endopod of the fourth leg, anterior (C)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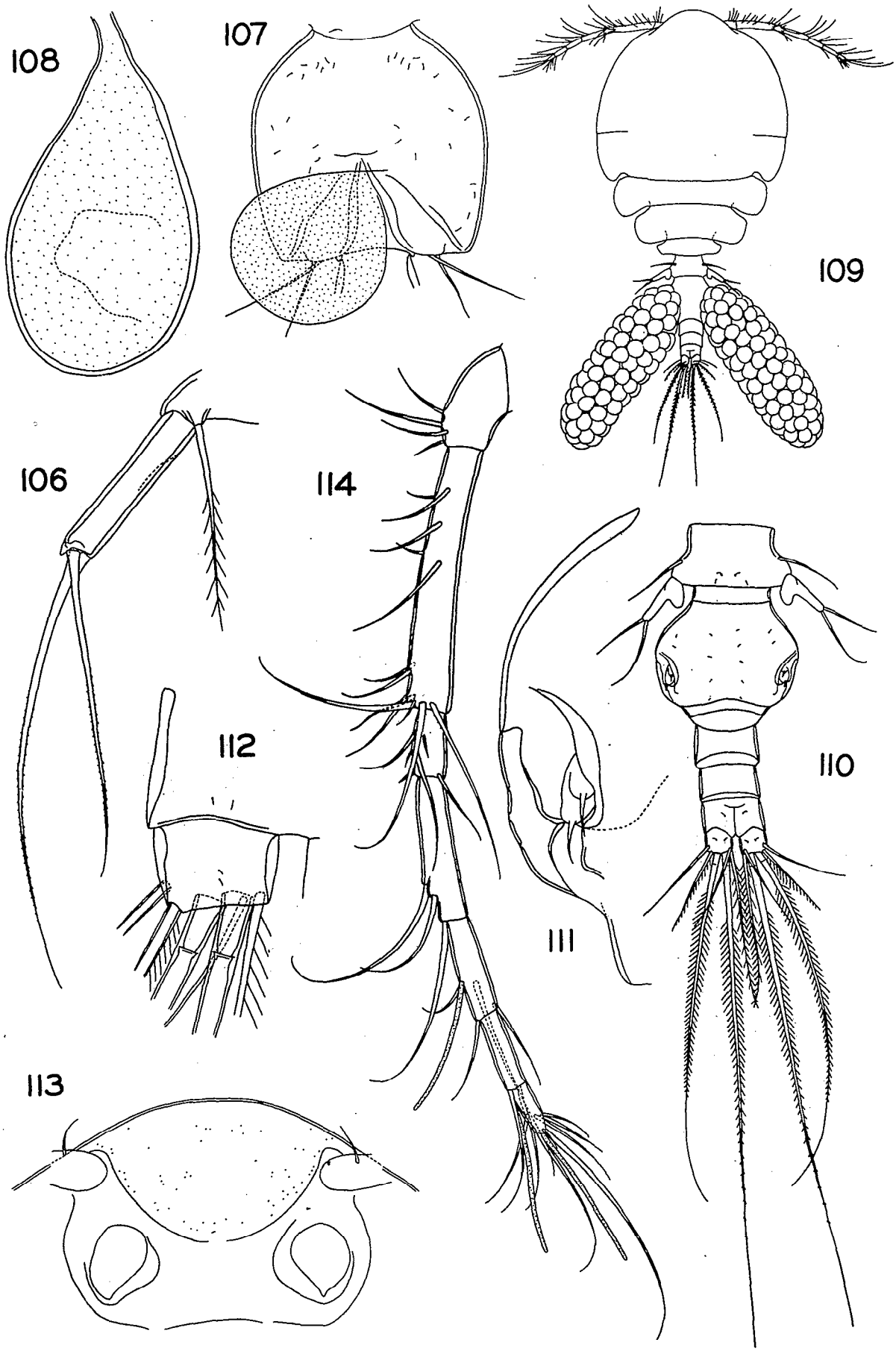
Figs. 106-108 - *Lichomolgus cuspis* sp. n. , male (continued)

106 - Fifth leg, dorsal (C)
107 - Genital segment and sixth leg, ventral (E)
108 - Spermatophore (I)

Figs. 109-114 - *Lichomolgus securiger* sp. n. , female

109 - Body, dorsal (K)
110 - Urosome, dorsal (E)
111 - Area of attachment of an egg sac, dorsal (H)
112 - Caudal ramus, ventral (H)
113 - Rostral region, ventral (B)
114 - First antenna, dorsal (F)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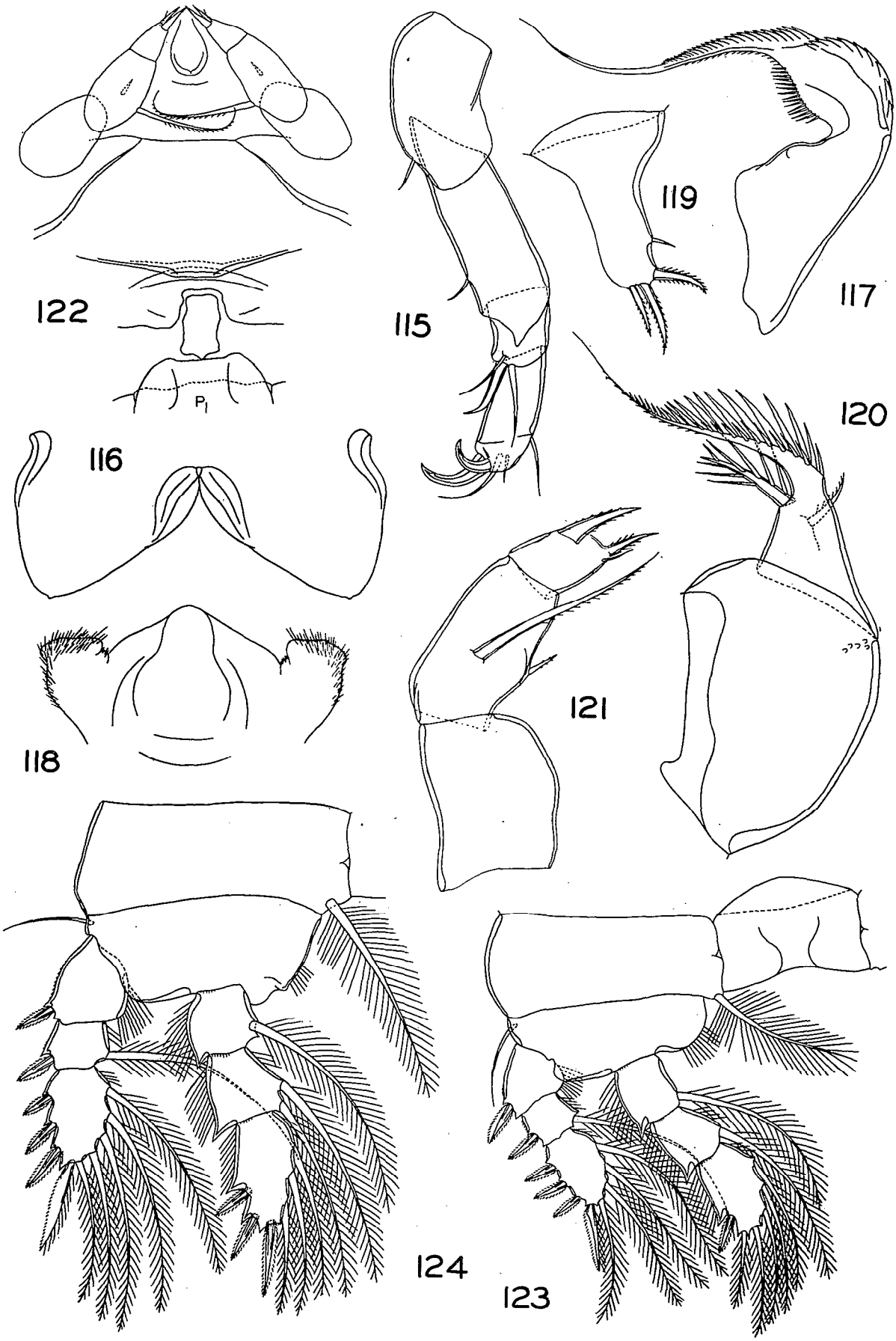
Figs. 115-124 - *Lichomolgus securiger* sp. n. , female (continued)

115 - Second antenna, inner (F)
116 - Posterior border of the labrum, ventral (H)
117 - Mandible (H)
118 - Two paragnaths and the region between them (H)
119 - First maxilla (H)
120 - Second maxilla, anterior (H)
121 - Maxilliped, somewhat posterior (H)
122 - Region between the maxillipeds and the first legs, ventral (F)
123 - First leg and intercoxal piece, anterior (F)
124 - Second leg, anterior (F)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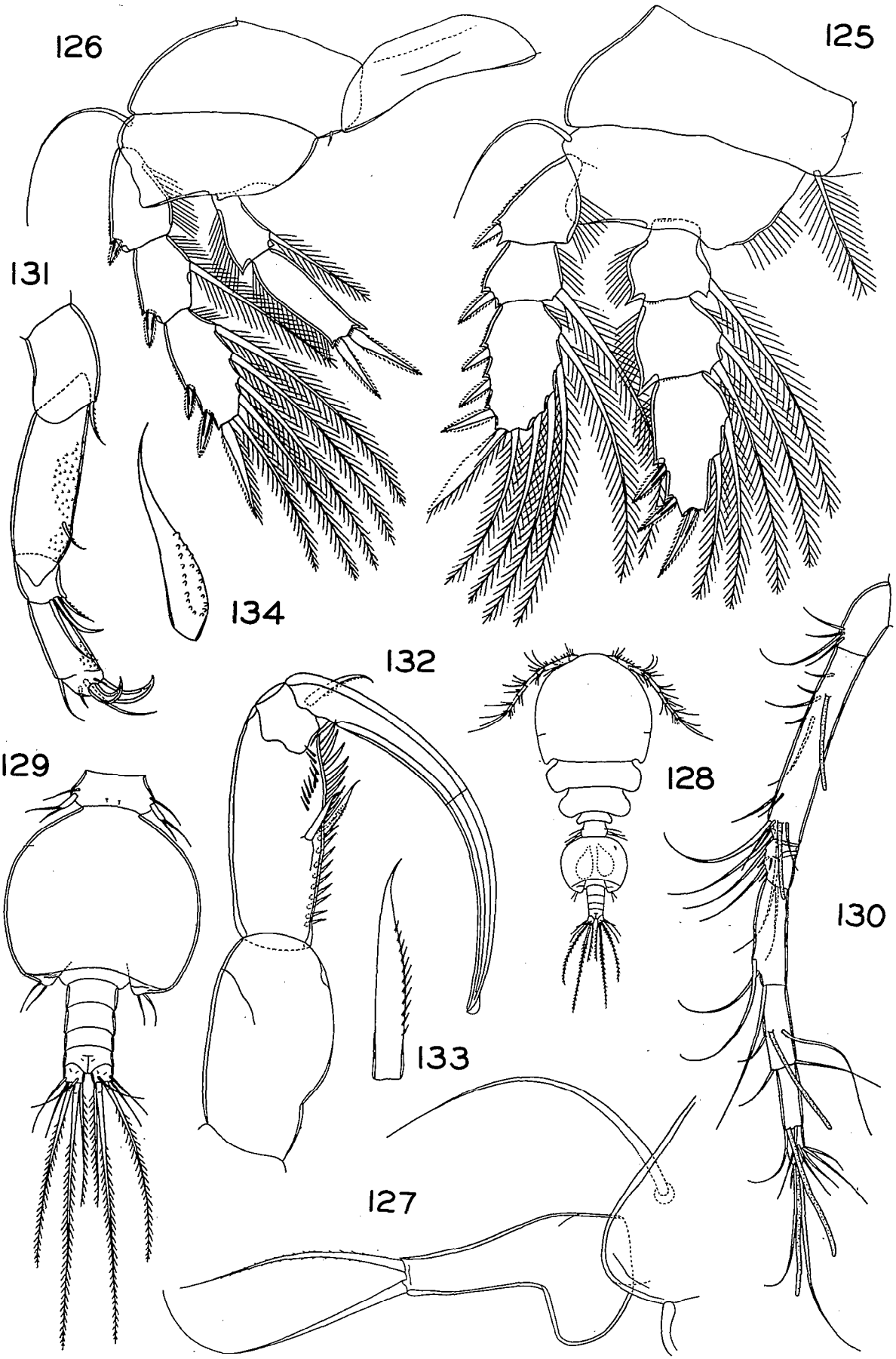
Figs. 125-127 - *Lichomolgus securiger* sp. n., female (continued)

125 - Third leg, anterior (F)
126 - Fourth leg and intercoxal piece, anterior (F)
127 - Fifth leg, dorsal (H)

Figs. 128-134 - *Lichomolgus securiger* sp. n., male

128 - Body, dorsal (K)
129 - Urosome, dorsal (E)
130 - First antenna, ventral (F)
131 - Second antenna, inner (F)
132 - Maxilliped, outer (C)
133 - Spine on the second segment of the maxilliped (G)
134 - Spine on the second segment of the maxilliped (G)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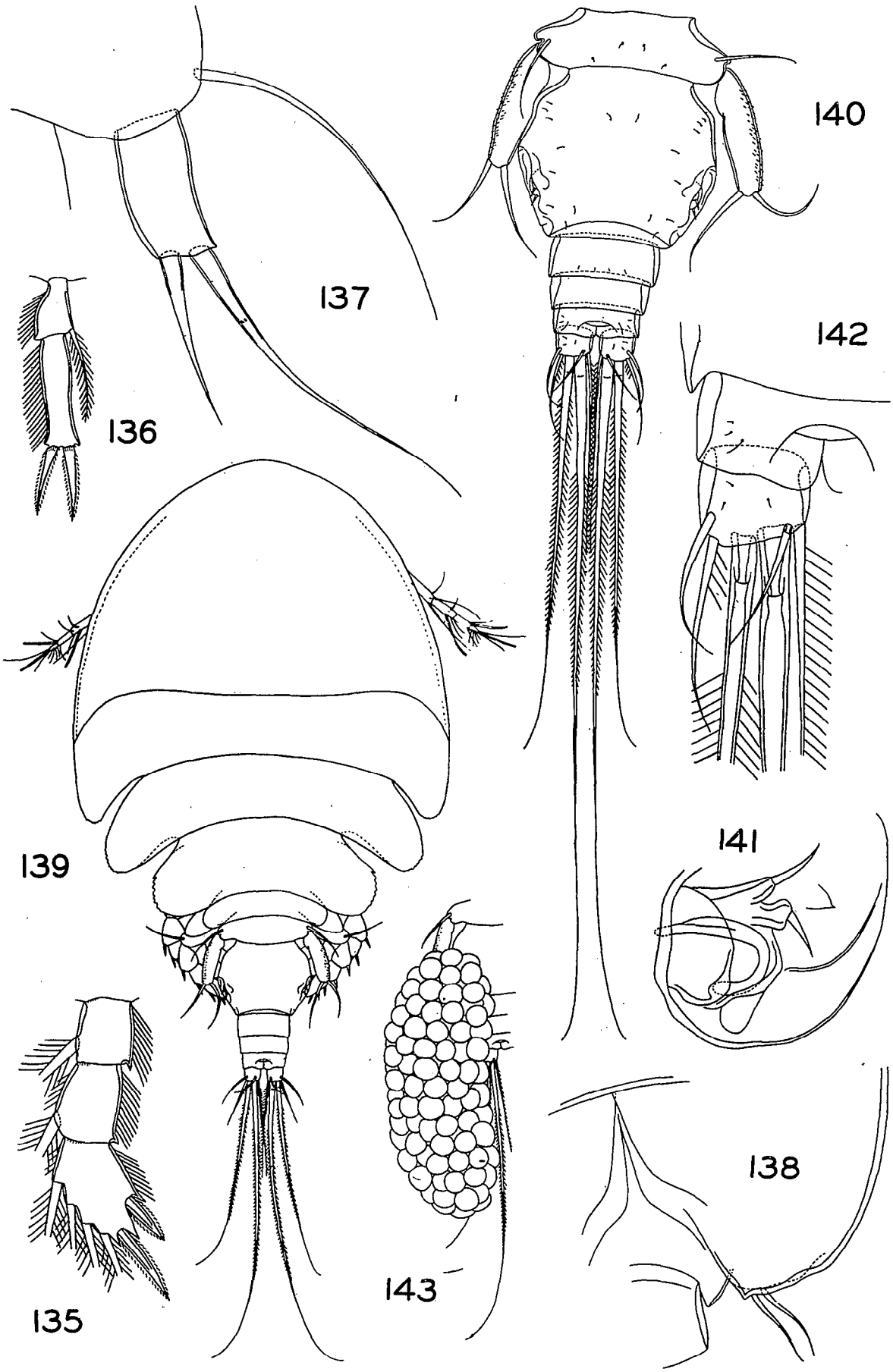
Figs. 135-138 - *Lichomolgus securiger* sp. n., male (continued)

135 - Endopod of the first leg, anterior (C)
136 - Endopod of the fourth leg, anterior (F)
137 - Fifth leg, ventral (G)
138 - Sixth leg, ventral (C)

Figs. 139-143 - *Lichomolgus commodus* sp. n., female

139 - Body, dorsal (A)
140 - Urosome, dorsal (B)
141 - Area of attachment of an egg sac, lateral (H)
142 - Caudal ramus, dorsal (H)
143 - Egg sac attached to the urosome, dorsal (A)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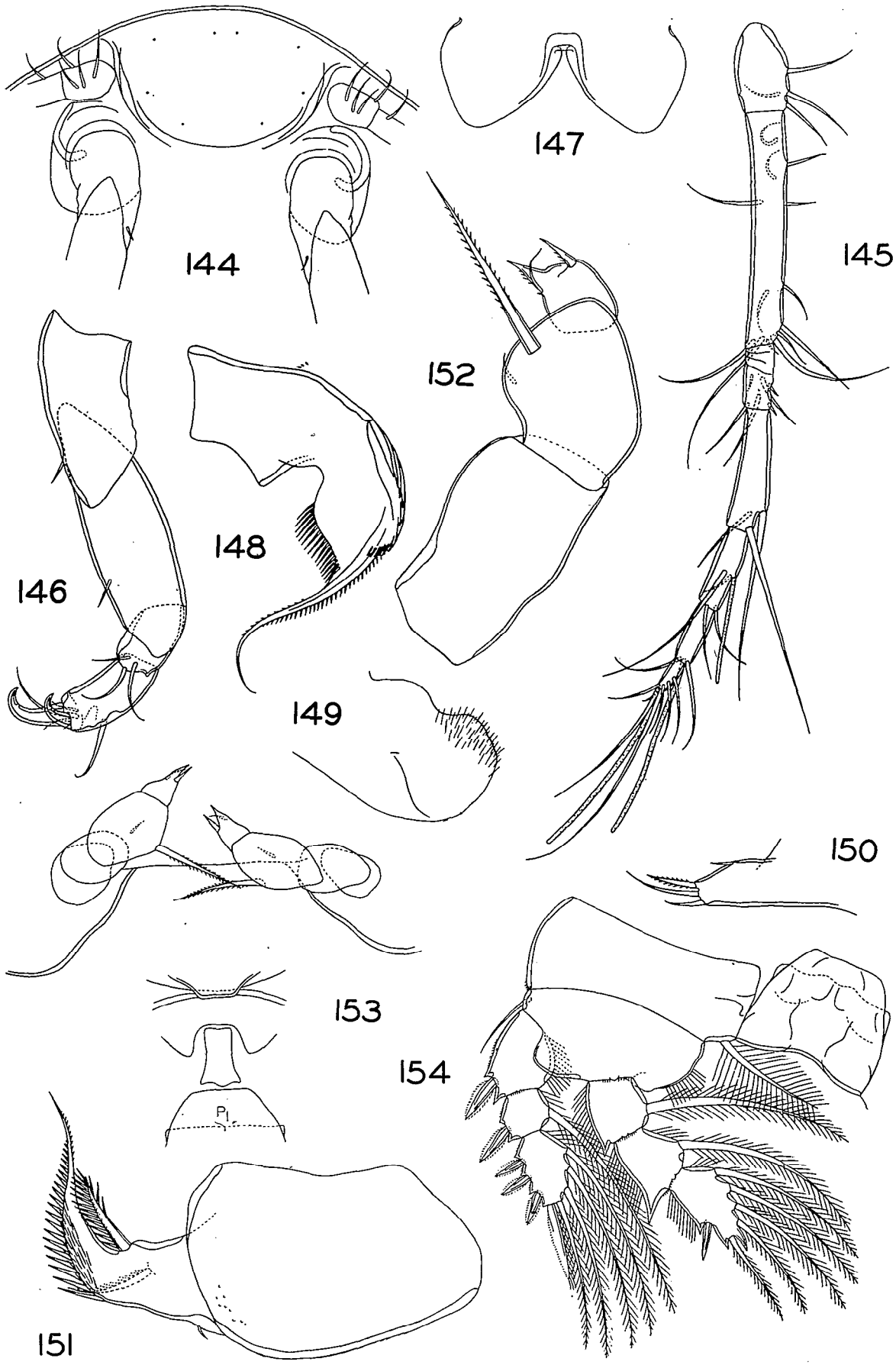
Figs. 144-154 - *Lichomolgus commodus* sp. n. , female (continued)

144 - Rostral region, ventral (B)
145 - First antenna, dorsal (F)
146 - Second antenna, inner (F)
147 - Posterior border of the labrum, ventral (C)
148 - Mandible (H)
149 - Paragnath (G)
150 - First maxilla (H)
151 - Second maxilla, anterior (H)
152 - Maxilliped, somewhat posterior (H)
153 - Region between the maxillipeds and the first legs, ventral (F)
154 - First leg and intercoxal piece, anterior (F)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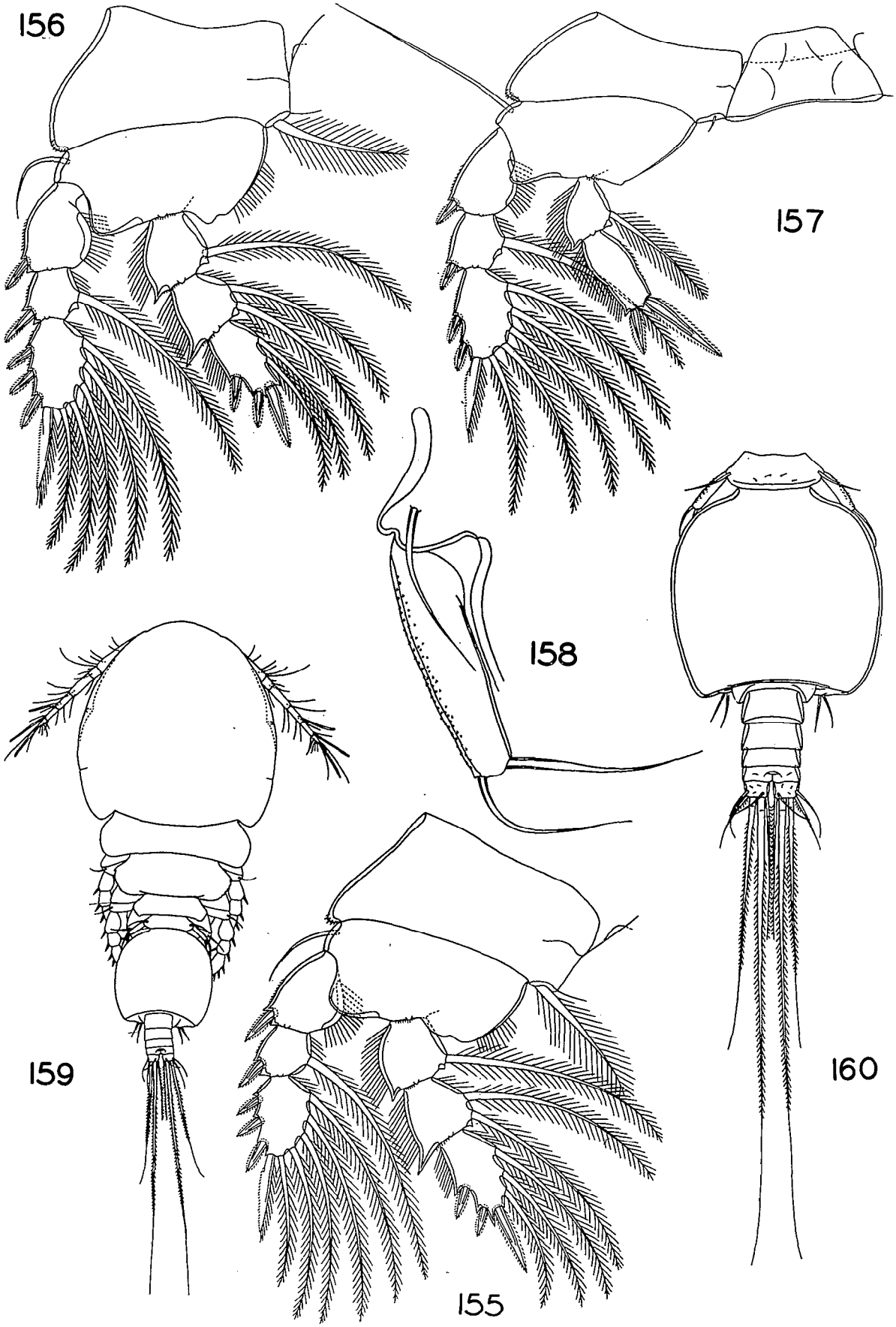
Figs. 155-158 - *Lichomolgus commodus* sp. n. , female (continued)

155 - Second leg, anterior (F)
156 - Third leg, anterior (F)
157 - Fourth leg and intercoxal piece, anterior (F)
158 - Fifth leg, dorsal (C)

Figs. 159-160 - *Lichomolgus commodus* sp. n. , male

159 - Body, dorsal (A)
160 - Urosome, dorsal (B)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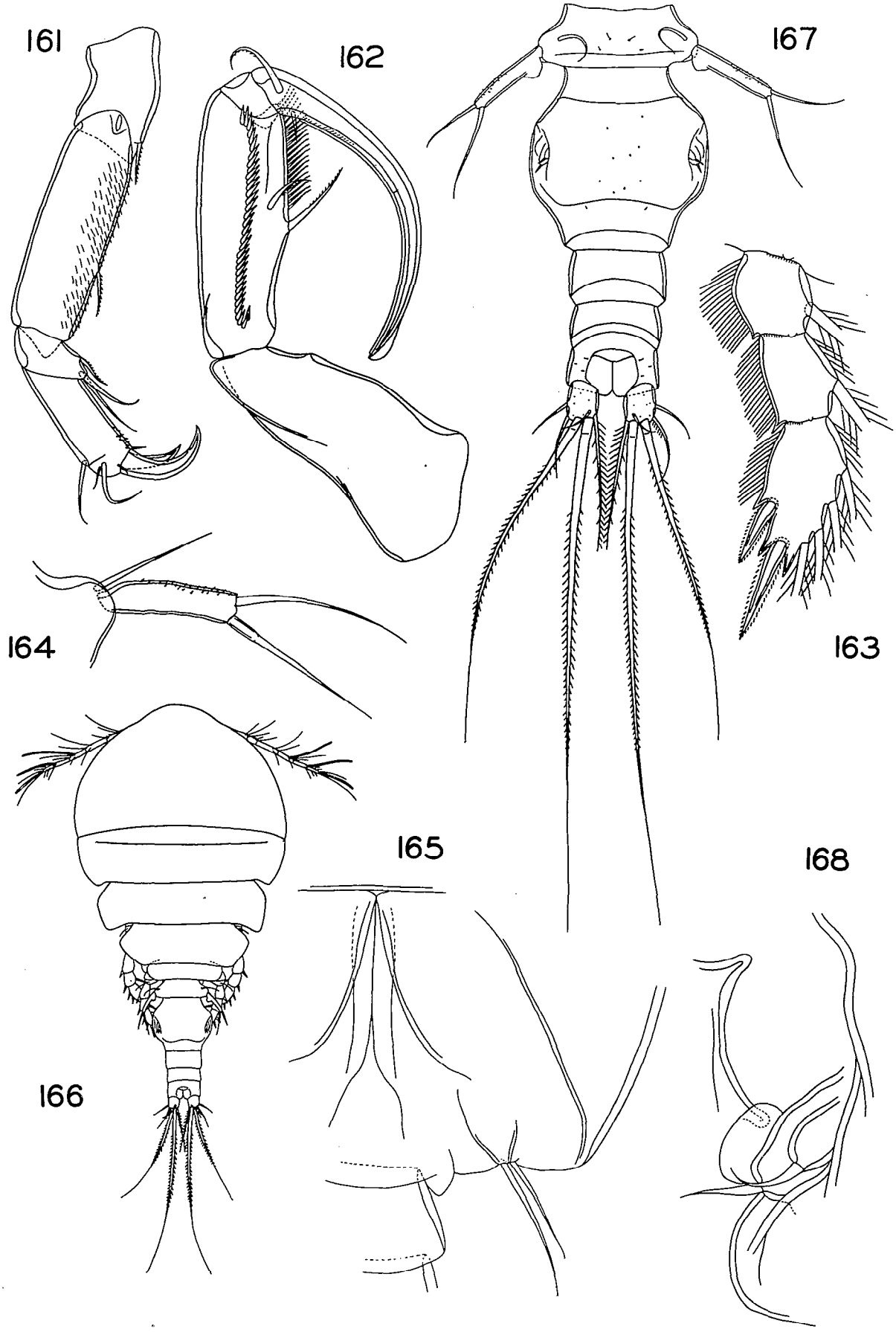
Figs. 161-165 - *Lichomolgus commodus* sp. n. , male (continued)

161 - Second antenna, outer (C)
162 - Maxilliped, inner (C)
163 - Endopod of the first leg, anterior (H)
164 - Fifth leg, ventral (H)
165 - Sixth leg, ventral (H)

Figs. 166-168 - *Lichomolgus sensilis* sp. n. , female

166 - Body, dorsal (K)
167 - Urosome, dorsal (E)
168 - Area of attachment of an egg sac, dorsal (D)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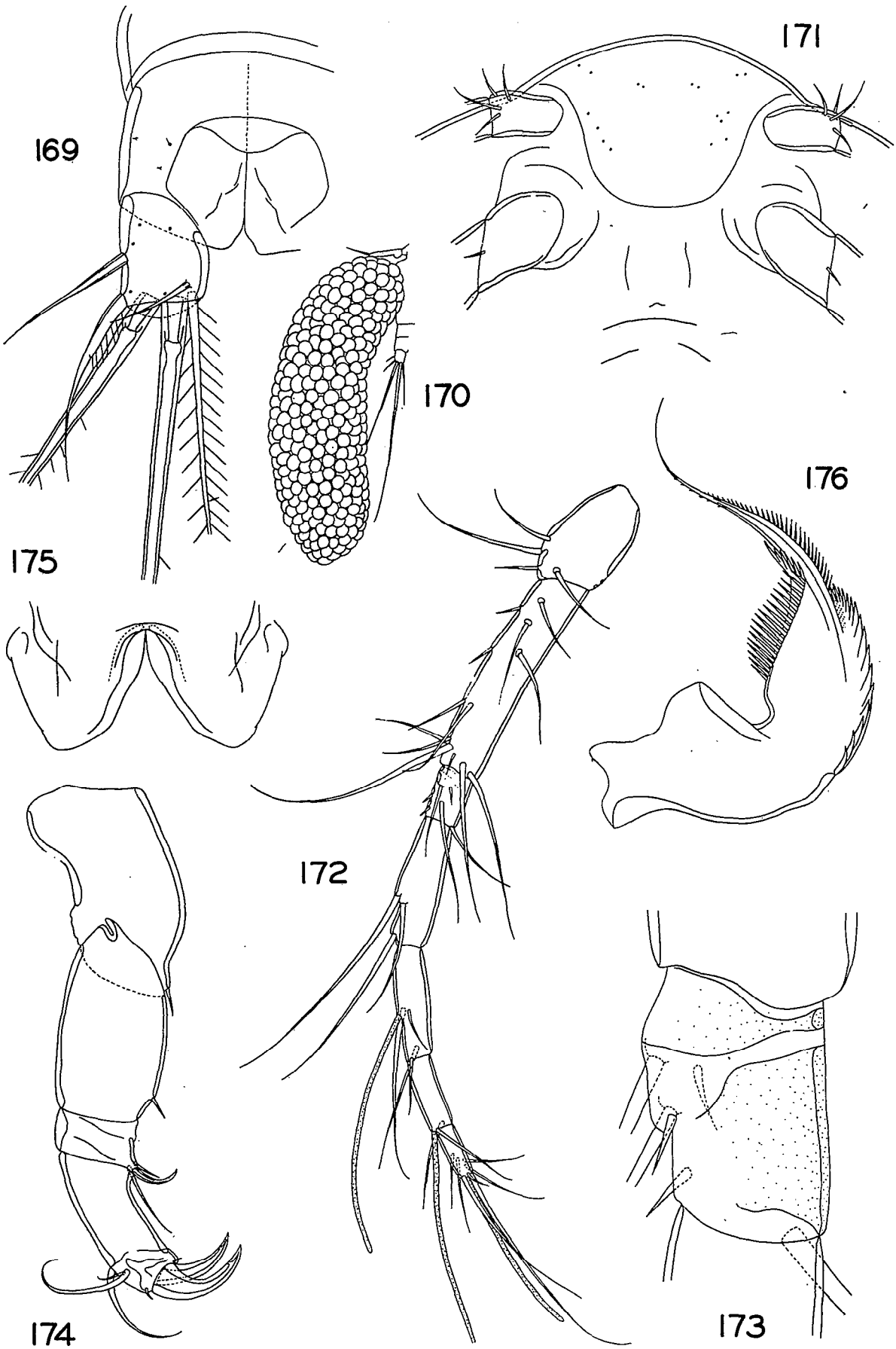
Figs. 169-176 - *Lichomolgus sensilis* sp. n. , female (continued)

169 - Caudal ramus, dorsal (C)
170 - Egg sac attached to the urosome, dorsal (K)
171 - Rostral region, ventral (B)
172 - First antenna, dorsal (F)
173 - Third segment of the first antenna, ventral (G)
174 - Second antenna, somewhat outer (F)
175 - Posterior border of the labrum, ventral (C)
176 - Mandible (H)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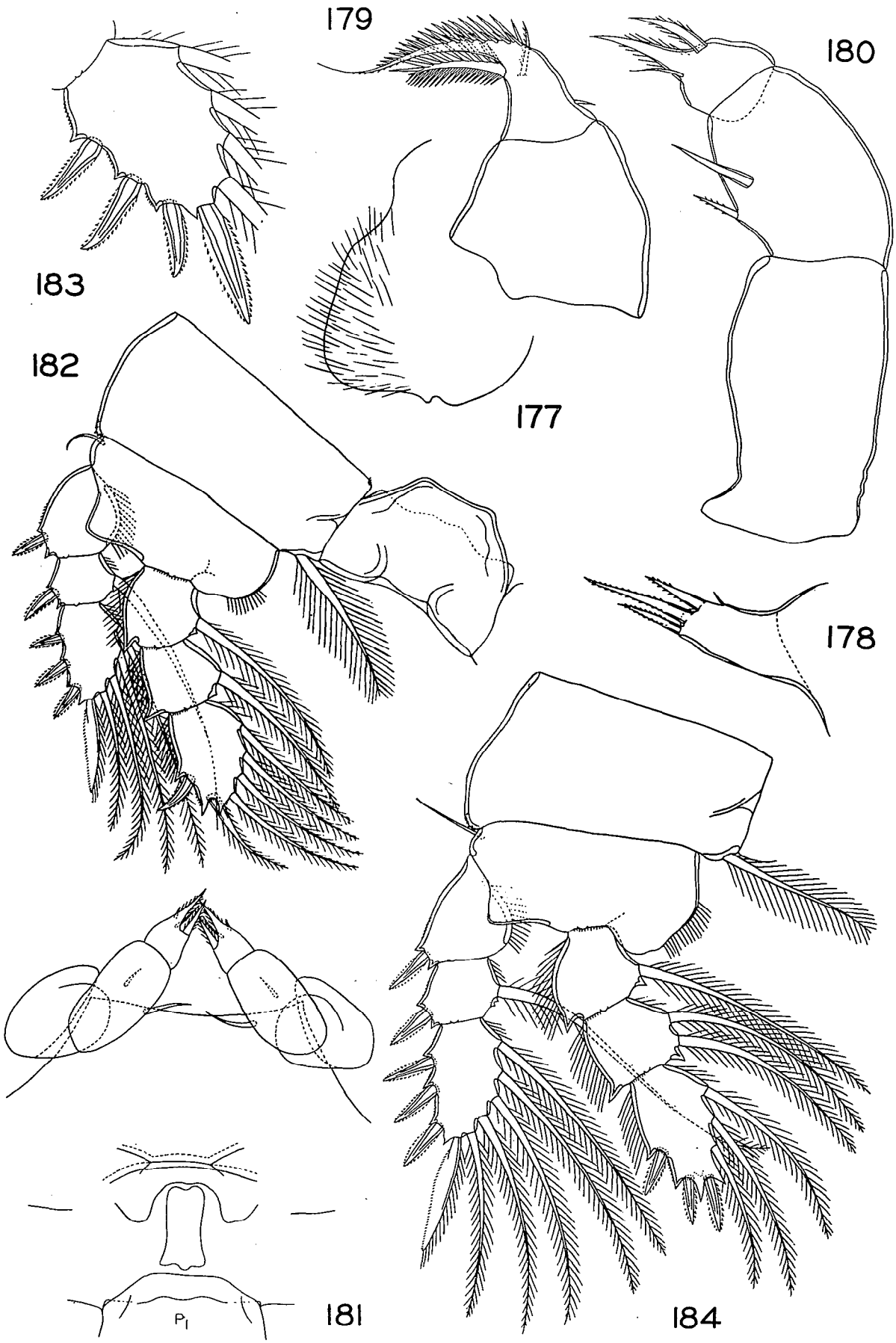
Figs. 177-184 - *Lichomolgus sensilis* sp. n. , female (continued)

177 - Paragnath (G)
178 - First maxilla (H)
179 - Second maxilla, anterior (C)
180 - Maxilliped, somewhat posterior (H)
181 - Region between the maxillipeds and the first legs, ventral (F)
182 - First leg and intercoxal piece, anterior (F)
183 - Last segment of an exopod of the first leg, anterior (H)
184 - Second leg, anterior (F)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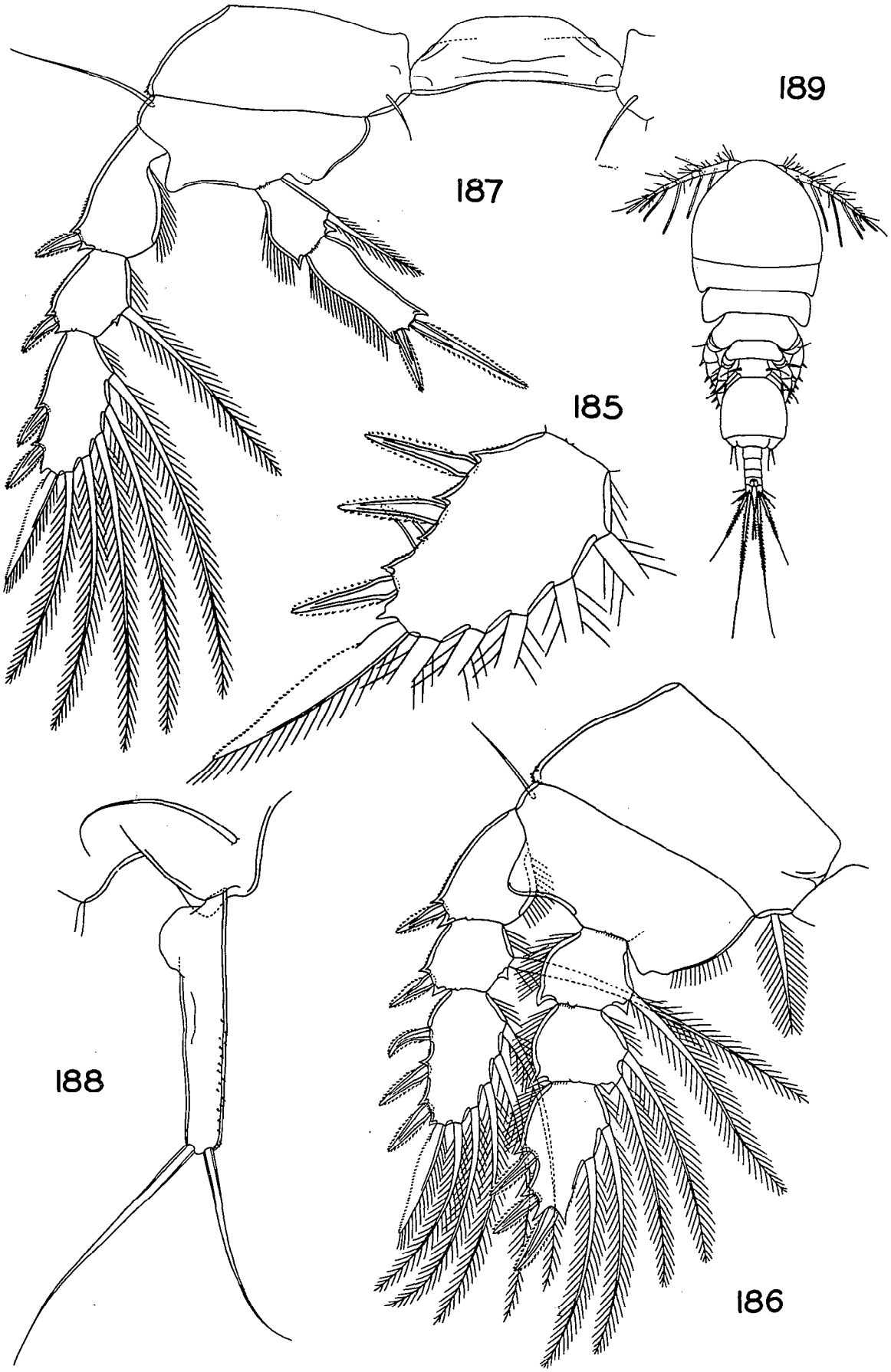
Figs. 185-188 - *Lichomolgus sensilis* sp. n. , female (continued)

185 - Last segment of an exopod of the second leg, anterior (H)
186 - Third leg, anterior (F)
187 - Fourth leg, anterior (F)
188 - Fifth leg, dorsal (C)

Fig. 189 - *Lichomolgus sensilis* sp. n. , male

189 - Body, dorsal (K)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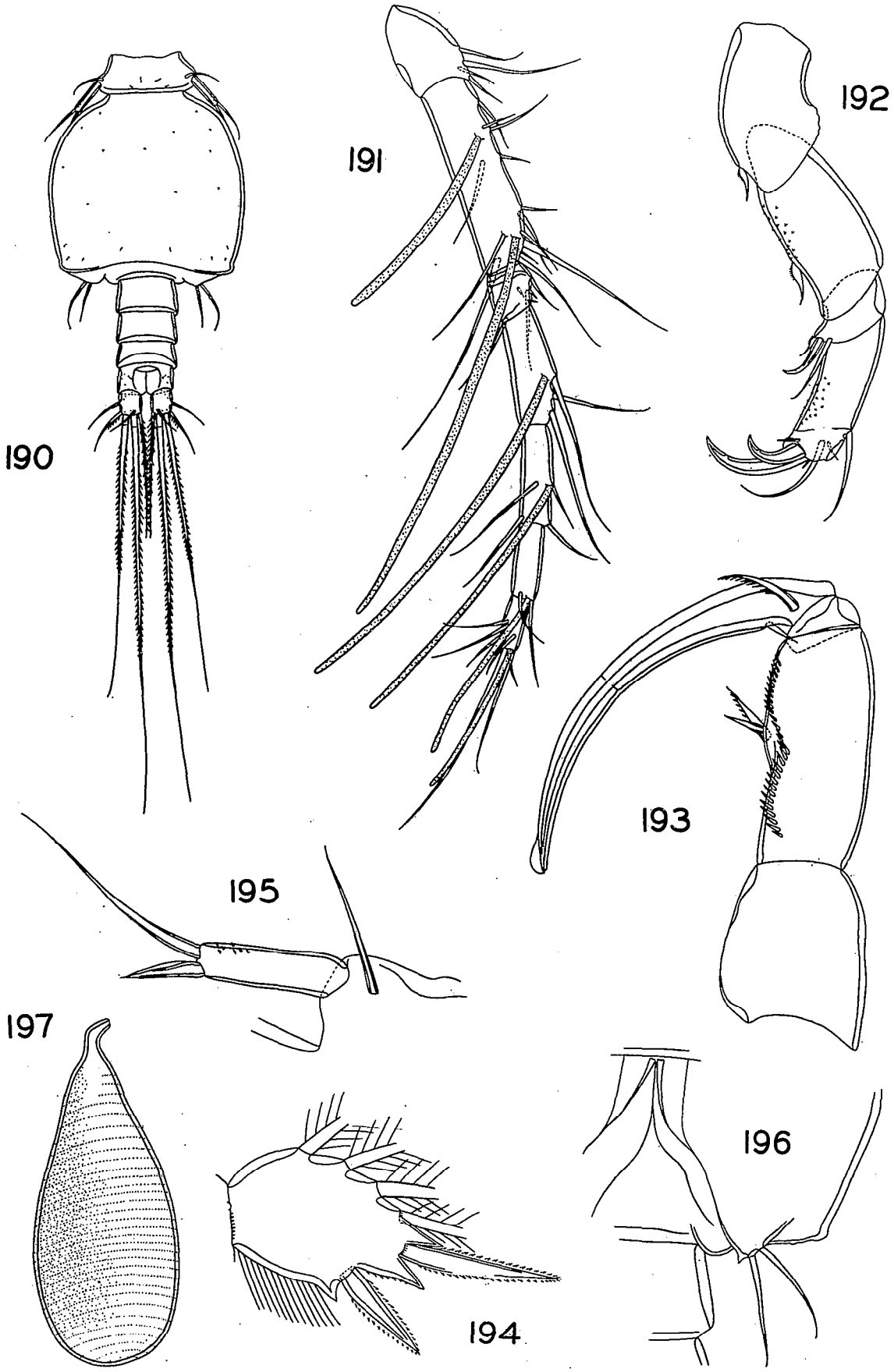
Figs. 190-197 - *Lichomolgus sensilis* sp. n., male (continued)

190 - Urosome, dorsal (E)
191 - First antenna, ventral (F)
192 - Second antenna, somewhat inner (F)
193 - Maxilliped, inner (C)
194 - Last segment of the endopod of the first leg, anterior (H)
195 - Fifth leg, dorsal (H)
196 - Sixth leg, ventral (F)
197 - Spermatophore (F)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RESUME

L'auteur décrit six espèces nouvelles de *Lichomolgus* (Copepoda, Cyclopoida) du nord-ouest de Madagascar. Trois de ces espèces s'associent aux anémones de mer : *Lichomolgus gemmatus* sp. n. et *L. magnificus* sp. n. à *Stoichactis giganteum* et *L. cuspis* sp. n. à *Radianthus ritteri* et *S. giganteum*. Les trois autres espèces s'associent aux nudibranches : *L. securiger* sp. n. à *Doris mabilla*, *L. commodus* sp. n. à *Hexabranchus orbicularis* et *Doridopsis ruber*, et *L. sensilis* sp. n. à *Trevelyana rubromaculata*. Certains caractères de ces copépodes sont brièvement discutés et comparés.