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Copepods of the Family Bomolochidae Parasitic on Fishes of Kojima Bay, Okayama Prefecture

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(Figs. 1–162)

Between May, 1980 and March, 1981, one of us (TTD) examined 770 fishes (belonging to 54 species) that were caught in four collections from Kojima Bay located in Okayama Prefecture. The parasitological examination of these fishes has yielded seven species of bomolochid copepods, with two of them being new to science. In this report we treat all seven species, regardless of new or known, with a full description because information on fine structures of the appendages, which has increasingly become significant in the modern taxonomy of Bomolochidae, are either lacking or incomplete in the five known species.

The Bomolochidae are parasites of marine teleosts. They live on the head of their hosts occurring mainly in the branchial cavities, but occasionally they are found in the nostrils or orbits. Currently, fourteen species of bomolochids are known from Japan, they are listed in the following with their Japanese fish hosts:

*1. *Bomolochus bellones* Burmeister, 1833
on *Strongylura anastomella* Cuvier et Valenciennes

2. *Bomolochus decapteri* Yamaguti, 1936
on *Decapterus maruadsi* (Temminck et Schlegel), *Cololabis saira* (Brevoort), *Hemirhamphus sajori* (Temminck et Schlegel), *Trachurus japonicus* (Temminck et Schlegel), and *Ditrema temmincki* Bleeker.

3. *Bomolochus hyporhamphi* (Yamaguti & Yamasu, 1959)
on *Hemirhamphus sajori* (Temminck et Schlegel) and *Tylosurus schismatorhynchus* (Bleeker).

4. *Bomolochus tumidus* (Shiino, 1957)
on *Cololabis saira* (Brevoort) and *Ablennes hians* (Cuvier et Valanciennes).

5. *Nothobomolochus cypseluri* (Yamaguti, 1953)
on *Prognichthys agoo* (Temminck et Schlegel)

6. *Nothobomolochus gibber* (Shiino, 1957)
on *Tylosurus giganteus* (Temminck et Schlegel).

*7. *Nothobomolochus lateolabracis* (Yamaguti & Yamasu, 1959)
on *Lateolabrax japonicus* (Cuvier).

*8. *Nothobomolochus triceros* (Bassett-Smith, 1898)
on *Pampus argenteus* (Euphrasen).

*9. *Orbitacolax hapalogenyos* (Yamaguti & Yamasu, 1959)
on *Hapalogenys mucronatus* (Eydoux et Souleyet).

10. *Orbitacolax leptoscari* (Yamaguti, 1953)
on *Leptoscarus japonicus* (Cuvier et Valenciennes).

*11. *Pumiliopes squamosus* Cressey & Boyle, *1973*
on *Harengula zunasi* Bleeker.

12. *Unicolax collateralis* Cressey & Cressey, 1980
on *Auxis* sp. and *Euthynnus affinis* (Cantor).

13. *Unicolax mycterobius* (Vervoort, 1965)
on *Auxis* sp. and *Euthynnus affinis* (Cantor).

14. *Unicolax reductus* Cressey & Cressey, 1980
on *Katsuwonus pelamis* (Linnaeus)

Tegobomolochus nasicola Izawa was reported by Izawa[1] as a member of bomolochid parasitic on a goatfish, *Pseudupeneus spilurus* (Bleeker), from Tanabe Bay, but it was later removed from this family by Avdeev[2]. Two species in the above list, *Bomolochus hyporhamphi* and *Bomolochus tumidus,* were found in the course of the present study to be synonymous with *Bomolochus bellones.* Therefore, with the deletion of these two species and subsequent addition of the two new species: *Naricolax atypicus* gen. et sp. nov. and *Nothobomolochus thambus* n. sp., there still remain fourteen species of bomolochids known from Japan. A key to these fourteen species of Japanese bomolochids is included in this report. Five species in the above list marked with an asterisk are found from the fishes of Kojima Bay, they will be redescribed in the present report based on the newly collected materials.

The type specimens have been deposited in the United States National Museum of Natural History, Smithsonian Institution, Washington, D. C. We would like to thank Dr. Shin-ichi Uye of the Faculty of Applied Biological Science, Hiroshima University for supplying us fishes for parasite examination.

Bomolochus bellones Burmeister, 1835
(Figs. 1-21)

Bomolochus bellones Burmeister, 1835, pp. 298, pl. 24, figs. 1–6; Pillai & Natarajan, 1977, p. 22, figs. 11–20; Kabata, 1979, p. 64, figs. 25–37.

Parabomolochus bellones, Vervoort, 1962, p. 34, figs. 1–4; Cressey & Collette, 1970, p. 365, figs. 71–72.

Bomolochus tumidus Shiino, 1957, p. 417, figs. 3–4.

Parabomolochus tumidus, Vervoort, 1962, p.47.

Artacolax tumidus, Yamaguti, 1963, p. 13, pl. 2, fig. 1.

Bomolochus hyporhamphi Yamaguti & Yamasu, 1959, p. 92, pl. 1, figs. 12–21.

Parabomolochus hyporhamphi, Vervoort, 1962, p. 48.

Pseudartacolax hyporhamphi, Yamaguti, 1963, p. 14, pl. 7, fig. 7.

Bomolochus hemirhamphi Pillai, 1965, p. 49, figs. 20A–R.

Material examined: 5 females found on the gills of 2 *Hemirhamphus sajori* (Temminck & Schlegel) collected 13 May, 1980.

Female: The body (Figs. 1,2) has a typical bomolochid form with enlarged cephalothorax and first two metasomal somites. The average length of body is 2.02 mm, ranging from 1.92 to 2.19 mm. The urosome (Fig. 3) consists of five somites all wider than long. The caudal ramus (Fig. 4), measuring in average 76 × 48μm, carries the usual six setae typical of many poecilostomatoid copepods. The egg sac (Fig. 5) is about 1,023 × 436 μm.

The rostral area (Fig. 6) bears two foliate but sharp-tipped tines. The first antenna (Fig. 7) is slender, with indistinctly but heavily sclerotized basal part and 3-segmented cylindrical distal part. The basal part is fringed with 14 robust, hairy setae and 1 recurved hook (modified seta located fourth from the base of the appendage). In addition, there are 7 naked setae on the dorsal surface and 5 small hairy and 1 naked setae on the ventral surface; two of the dorsal setae are long. The formula for the armature on the 3-segmented distal part (Figs. 7,8) is 4, 2 + 1 aesthete, and 7 + 1 aesthete. The 3-segmented second antenna (Fig. 9) is strongly flexed outwardly at the junction between the first two segments, with each carrying a simple seta. The third segment, representing the remnant endopod, is long and carries about six or seven rows of small curved hooks on the ventral (inner) surface and one row of longer and slender curved hooks on the anterior margin. Terminally, the third segment is protruded into a blunt, cylindrical process and armed with a lamella bearing a row of marginal hooks, 4 curved claws and 4 naked setae. One of the naked seta is borne subterminally on the cylindrical terminal process (see Fig. 10).

The tip of mandible (Fig. 11) bears two unequal blades. The paragnath (Fig. 12) is a pointed process armed with both denticles and hairs. The first maxilla (Fig. 13) carries 3 plumose and 1 naked robust setae. The tip of the second maxilla (Fig. 14) bears a patch of spinules and carries 1 naked subterminal seta and 1 large spinulose spine. The maxilliped (Fig. 15) is 3-segmented, with the terminal segment, assuming a sigmoid claw so distinctive of the bomolochids. The first segment carries a small, naked seta; the second segment is greatly enlarged and carries two extremely unequal hairy setae; and the terminal claw bears a hooklet on the mid, outer surface and a large hairy seta in the proximal part.

Legs 1 to 4 (Figs. 16, 18, 19, 20) are biramous, their formulae of spines (Roman numerals) and setae (Arabic numerals) are as follows:

	Exopod	Endopod
Leg 1	I – 0; IV, 6	0 – 1; 0 – 1; 5
Leg 2	I – 0; I – 1; III, I,5	0 – 1; 0 – 2; II, 3
Leg 3	I – 0; I – 1; II, I,5	0 – 1; 0 – 1; II, 2
Leg 4	I – 0; I – 1; II, I, 4	0 – 1; 0 – 1; I, 1, I

Leg 1 (Fig. 16) has on its coxa an inner large, blunt, plumose process and on its basis a slender hairy seta. The outer spines on the exopod of leg 1 (Fig. 17) are extremely unequal. The third exopodal segments on legs 2, 3 and 4 have an indentation between the first and second (Figs. 19, 20) or the second and third (Fig. 18) outer spines, assuming a partial division of the segment. The outer spines on the exopod of these legs carry a terminal flagellum. The terminal spines on the endopod of leg 4 are bluntly tipped. Leg 5 (Fig. 21) is 2-segmented, both segments bearing patches of spinules. The proximal segment is armed with 1 outer distal seta and the distal segment, 2 outer spines and 2 unequal terminal setae. Leg 6 is represented by 3 slender setae located at the area of egg sac attachment (Fig. 3).

Remarks: When Shiino[3] described *B. tumidus* no reference to *B. Bellones* was made, simply because the true identity of it was then unavailable. As a matter of fact, *B. bellones* was not properly characterized until 1962 when Vervoort[4] redescribed it based on the specimens recovered from the Dutch needlefish.

Yamaguti & Yamasu[5] were correct in realizing the closeness between their *B. hyporhamphi* and Shiino's *B. tumidus.* Differences between these two species exhibited in the mandible, maxilliped, intercoxal plate of leg 1, and armature of the terminal segment of leg 2 endopod were considered by them to be significant enough for establishing the bomolochids from the halfbeak as a new species. However, according to our current knowledge of the Bomolochidae, these alleged discrepancies are not genuine but merely improper interpretation of certain inadequate observations. For instance, in *B. tumidus* as described by Shiino[3], the mandible with a single terminal blade and the leg 2 endopod with only one terminal spine in the third segment are clearly attributable to the oversight of its author. In our works on the bomolochids, we have experienced in seeing different armatures and ornamentations of the same dissected appendage at different angles of view.

Although Pillai[6] pointed out differences in the egg sac and second maxilla as distinguishing characters between his Indian *B. hemirhamphi* and the Japanese *B. hyporhamphi,* these disparities are again resultant of cursory original description of *B. hyporhamphi* and not genuine species distinction. Pillai has also realized close similarity between his *B. hemirhamphi* and Shiino's *B. tumidus,* but he stop short of further elaboration. Vervoort's[4] redescription of *B. bellones* was apparently unknown to Pillai, for it was not mentioned in his "References" to the work of *B. hemirhamphi.*

Based on our present knowledge on the character state of the Bomolochidae, we can conclude that the aforementioned three species of Indo-West Pacific *Bomolochus* (*tumidus, hyporhamphi,* and *hemirhamphi*) cannot be anything but conspecific. Kirtisinghe's[7] resoning of relegating *B. tumidus* to a synonym of *B. unicirrus* Richiardi is

not acceptable. A detailed discussion of this matter is given by Ho[8] in relation to a study of another Japanese species of *Bomolochus, B. decapteri* Yamaguti.

As noted by Vervoort[4] in his key to the species of *"Parabomolochus"* (= *Bomolochus*), the European *B. bellones* was in the past contended to be different from the Japanese forms (*tumidus* and *hyporhamphi*) in the relative size of the third pedigerous somite; while it is normally developed in the former, this somite in the latter is enlarged and partly or entirely covers the subsequent (fourth) pedigerous somite. However, this alleged distinction was selfdefeated when Cressey & Collete[9] depicted a *B. bellones* with a swollen third pedigerous somite as large as what was illustrated by Shiino[3] for *B. tumidus.*

Due to its highly modified nature for clinging to host integument, the outer spines on leg 1 exopod (see Figs. 16, 17) are some of the female bomolochid features that are very difficult to study. Their true morphology is impossible to make out unless the exopod is studied alone from a dorsal view. Consequently, the description of this part of the appendage is chaotic in the literature. Nonetheless, Kabata's[10] depiction and statement of six spines for the British *B. bellones* needs to be confirmed; according to Vervoort[11] there should not be more than five spines in leg 1 exopod of *Bomolochus.*

Nineteen species of *Bomolochus* were accepted by Kabata[10]. By removing from this list two species as suggested by Cressey & Cressey[12] and another three species as discussed above, and adding to it a new species recently described by Roubal[13], there remain fifteen species of *Bomolochus* that can be recognized with reasonable certainty. Of these fifteen species, *B. psettobius* (Vervoort) shows the closest affinity with *B. bellones,* with significant difference found so far only in the armature of the third segment of the second antenna.

B. bellones is the most widely distributed species of *Bomolochus* that occur circumglobally in the tropical, subtropical, and temperate regions. It is chiefly a parasite of needlefish, but can also be found on halfbeaks and saury that share the same ecological requirements.

Naricolax gen. nov.

Diagnosis: Body form typical of family, with only first pedigerous somite incorporated into cephalothorax. Abdomen 3-segmented in female and 2-segmented in male. Caudal ramus with 6 setae, 2 of which on the distomedian margin are much longer than the other 4. Fourth element on female first antenna modified to form a rather straight spine. Second antenna, mandible, paragnath, first maxilla, and second maxilla typical of family. Female maxilliped without hooklet (accessory process) in terminal claw. Legs 1 to 4 biramous and trimerite in both sexes, except for female leg 1 exopod and male leg 4 endopod. Second segment in leg 2 and leg 3 endopods of both sexes with 2 inner setae. Leg 5 typical of family.

Type species: Naricolax atypicus gen. et sp. nov.

Etymology: The generic name is a combination of *naris* (= nostril, in Latin), alluding to its microhabitat on the host, and *colax* (= a parasite, in Greek) which is a common ending of six generic names in the Bomolochidae.

Remarks: The new genus shares with *Unicolax* the following four characteristics: 1) having only the fourth element of the female first antenna modified, 2) lacking a hooklet in the terminal claw of female maxilliped, 3) bearing a blunt process on the basis of male leg 1 between the rami, and 4) occurring in the nasal cavity of their hosts. These combined characteristics distinguish them clearly from the other fourteen genera of Bomolochidae.

The most distinctive features between *Unicolax* and *Naricolax* is found in the armature of the second segment of leg 3 endopod. Five species are currently known under *Unicolax*, and all of them have only one inner seta in this segment in both sexes, but in the new genus there are two such setae. The male *Naricolax* also bears two inner setae in the second segment of leg 2 endopod, but there is only one such seta in the male *Unicolax* (with the exception of *U. reductus* Cressey & Cressey, 1980). The modified fourth setae in the female first antenna of *Naricolax* is not as straight and heavily sclerotized as in *Unicolax*.

It must be pointed out that there exhists an extremely unusual feature in the type species of *Naricolax*, i.e., the replacement of outer spines in the male leg 1 exopod with large, sturdy, hairy setae (see Fig. 52). Is this replacement a generic character state? We can not answer this question before more species of *Naricolax* are made known.

We would like to take this opportunity to point out that Avdeev's[14] new genus, *Cephalocolax*, is a junior synonym of *Unicolax*, because the issue of Parasitologiia that contained his proposition of this genus was published in July, 1980 which is three months after the appearance of Cressey & Cressey's[12] work. Furthermore, the type species, *Cephalocolax katsuwoni* Avdeev, 1980, is a junior synonym of *Unicolax collateralis* Cressey & Cressey, 1980.

Naricolax atypicus sp. nov.
(Figs. 22–60)

Material examined: All 32 specimens were found in the nasal cavity of *Hexagrammos otakii* Jordan & Starks: 2 females from 2 hosts collected May 13, 1980; 8 females from 3 hosts collected July 22, 1980; 2 females from 1 host collected November 11, 1980; 13 females and 7 males from 5 hosts collected March 24, 1981.

Female: The body (Figs. 22,23) is slightly different from a typical bomolochid form in having a rather long urosome, which occupies about 45% of the total body length. The long urosome is the resultant of the prolonged first and second abdominal segments (see Fig. 24). The anal segment and caudal ramus (Fig. 25) bear patches of spinules on their ventral surfaces. The average length of body is 1.82 mm, ranging from 1.50 to 1.92 mm; the caudal ramus measures in average 89 × 43 μm; and the measurements of a complete egg sac is 1,150 × 380 μm.

The rostral area is unarmed. The first antenna (Figs. 26,27) is basically of *Bomolochus*-form with the same number and distribution of setae as in *B. bellones*. The fourth element in the basal part is relatively straight but not as heavily sclerotized as in *Unicolax*. The terminal aesthete (Fig. 28) is only about half the length of the longest

terminal seta. The second antenna (Fig. 29) is essentially similar to that in *B. bellones*.

The mandible (Fig. 30), paragnath (Fig. 31), first maxilla (Fig. 32), and second maxilla (Fig. 33) are essentially as those in *Bomolochus*, but the maxilliped (Fig. 34) is a typical *Unicolax*-form, lacking a hooklet in the terminal claw and bearing a hairy (instead of a naked) seta in the proximal segment.

Legs 1 to 4 (Figs. 35, 38, 40, 42) are biramous, their formulae of spines (Roman numerals) and setae (Arabic numerals) are as follows:

	Exopod	Endopod
Leg 1	I – 0; IV, 6	0 – 1; 0 – 1; I,5
Leg 2	I – 0; I – 1; III,I,5	0 – 1; 0 – 2; II,3
Leg 3	I – 0; I – 1; II,I,5	0 – 1; 0 – 2; II,2
Leg 4	I – 0; I – 1; II,I,5	0 – 1: 0 – 1; I,2

Two of the five outer spines on leg 1 exopod are very small and difficult to find (see Fig. 36), and so is the single outer spine in the distal segment of leg 1 endopod (see Fig. 37). There is a row of fine spinules along the outer-distal margin of the first two segments of leg 2 endopod (Fig. 39), leg 3 endopod (Fig. 41), and leg 4 endopod (Fig. 42). Leg 5 (Fig. 44) is segmented and ornamented as in many species of bomolochids, but armature of the distal segment is different in bearing 4 elements of similar nature only varying in length. Leg 6 is represented by 3 slender setae located at the area of egg sac attachment (see Fig. 24).

Male: The body (Fig. 45) is slender than female, with an average length of 1.09 (1.06 – 1.13) mm. The genital segment (Fig. 46) is distinctly longer than wide, measuring 222 (220–223) μm long and 160 (158 – 163) μm wide. The anal segment and caudal ramus (Fig. 47) are ornamented more or less like those in the female, except for a row of spinules on the anteroventral surface.

The first antenna (Fig. 48) is 6-segmented, bearing various numbers of three kinds of elements (hairy seta, naked seta, and aesthete) on each segment. The first segment is the least armed, carrying only 5 large hairy setae on its anterior margin; the second segment bears 13 setae in total, of which 4 are naked and occur exclusively on the dorsal surface; the third segment is the longest and carrying 6 hairy and 1 naked setae; the fourth segment bears 1 large hairy and 3 small naked setae; and the last two segments (Fig. 49) are armed as in the female with the formula of 2 + 1 aesthete and 7 + 1 aesthete, respectively. The second antenna shows no significant sexual dimorphism.

The oral appendages (Fig. 50) are essentially like those in the female except for the maxilliped, which is a massive, 3-segmented appendage bearing armature and ornamentation as shown in Fig. 49.

Legs 1 to 4 (Figs. 52, 54, 56, 58) are biramous, with 3-segmented rami except for endopod of leg 4 which is 2-segmented. The formulae of spines (Roman numerals) and setae (Arabic numerals) are as follows:

	Exopod	Endopod
Leg 1	I – 0; 1 – 1; 1, I, 4	0 – 1; 0 – 1; I,5

Leg 2	I – 0; I – 0; II,I,5	0 – 1; 0 – 2; II,3
Leg 3	I – 0; 0 – 1; II,I,5	0 – 1; 0 – 2; II,2
Leg 4	I – 0; 0 – 1; II,I,4	0 – 1; I,2

The outer spines so typical on the bomolochid leg 1 exopod are here in this species replaced with large hairy setae (see Fig. 53); another unusual feature is the presence of a small, naked seta between the distal most hairy seta and the spine. The terminal spines on the endopod of leg 2 (Fig. 55) and leg 3 (Fig. 57) are flagellated as in the outer spines of their exopods. The endopod of leg 4 (Fig. 59) is tipped with only one flagellated spine. Leg 5 bears only 2 terminal setae on its free segment as shwon in Fig. 60. Leg 6 is missing.

Etymology: The species name *atypicus* means "not typical" in Greek. It alludes to the extremely unusual feature of outer elements on the exopod of male leg 1.

Nothobomolochus lateolabracis (Yamaguti & Yamasu, 1959)
(Figs. 61–81)

Artacolax lateolabracis Yamaguti & Yamasu, 1959, p. 90, pl. 1, figs. 1–11.
Nothobomolochus lateolabracis, Vervoort, 1962, p. 71.
Pseudartacolax lateolabracis, Yamaguti, 1963, p. 14, pl. 7, fig. 3.

Material examined: All 55 specimens were found on the gills of *Lateolabrax japonicus* (Cuvier): 3 females from 1 host collected May 13, 1980; 51 females from 5 hosts collected July 22, 1980; 1 female from 1 host collected March 24, 1981.

Female: The body (Figs. 61, 62) and urosome (Fig. 63) are of typical bomolochid form. The caudal ramus (Fig. 64) is unornamented on its ventral surface, but the anal segment has a row of spinules. The average length of body is about 1.55 mm, ranging from 1.29 to 1.63 mm. The egg sac (Fig. 65) is fairly large, measuring 944 (750 – 1,040) μm long and 293 (220–270) μm wide.

The rostral area is unarmed. The basal part of the first antenna (Fig. 66) is armed on its anterior margin with 12 sturdy, hairy setae and 3 spines; on its dorsal surface with 7 slender setae; and on its ventral surface with 6 small setae. The formula for the armature on the 3-segmented distal part is 4, 2 + 1 aesthete, and 7 + 1 aesthete. The three modified elements in the basal part of the first antenna (Fig. 67) are rather short, and the two aesthetes (Fig. 68) in the terminal part are about the same length. The second antenna (Fig. 69) is constructed essentially as in *Bomolochus*, except for the terminal process on the third segment (see Fig. 70), which is distinctly longer than the pectinate lamella. Also one less seta is found terminally, so that the armature is 4 hooks + 3 setae.

There is a bilobate, fleshy lobe located just lateral to the oral area (see Fig. 71). The mandible (Fig. 72), paragnath (Fig. 73), first maxilla (Fig. 71), and second maxilla (Fig. 74) are almost like those in *Bomolochus*. The maxilliped (Fig. 75), however, is different from *Bomolochus* in lacking a hooklet on the terminal claw.

Legs 1 to 4 (Figs. 76, 78, 79, 80) are biramous, their formulae of spines (Roman numerals) and setae (Arabic numerals) are as follows:

	Exopod	Endopod
Leg 1	I – 0; III,6	0 – 1; 0 – 1; 5
Leg 2	I – 0; I – 1; III,I,5	0 – 1; 0 – 2; II,3
Leg 3	I – 0; I – 1; II,I,5	0 – 1; 0 – 2; II,2
Leg 4	I – 0; I – 1; II,I,4	0 – 1; 0 – 1; I,1

The three outer spines on the second segment of leg 1 exopod (Fig. 77) are very small. Leg 5 (Fig. 81) is armed with weak spinous setae in the free segment. Leg 6 is represented by 3 slender setae located at the area of egg sac attachment (see Fig. 63).

Remarks: The most outstanding characteristic of *N. lateolabracis* is the reduction of armature (1,I instead of I.1,I) in the terminal segment of leg 4 endopod. Of the 24 nominal species of *Nothobomolochus* only *N. fradei* Marques shares this specific feature with the present species. *N. fradei* is a gill parasite of *Sardinella maderensis* Lowe at Sao Tome Island in the Gulf of Guinea and, according to Marques[15], has "external margin of exopodite of legs 2 to 4 with very strong teeth and terminal spur." These heavily serrated outer spines in the exopods of legs 2 to 4 are good discriminating features from *N. lateolabracis.*

N. lateolabracis has not yet been reported outside Japanese waters.

Nothobomolochus triceros (Bassett-Smith, 1898)
Figs. 82-101)

Bomolochus triceros Bassett-Smith, 1898, p. 2, pl. 1, figs. la-g; Pillai, 1965, p. 39, figs. 15A-O.

Nothobomolochus triceros, Vervoort, 1962, p. 64; Pillai, 1969, p. 149, figs. 1–4.

Pseudobomolochus triceros, Yamaguti, 1963, p. 16.

Bomolochus (Pseudobomolochus) managatuwo Yamaguti, 1939, p. 396, pl. 3, figs. 28–29, pl. 4, figs. 30–36; Shen, 1957, p. 304, pl. 4, figs. 33–45.

Nothobomolochus managatuwo, Vervoort, 1962, p. 66.

Pseudobomolochus managatuwo, Yamaguti, 1963, p. 15, pl. 10, fig. 1.

Material examined: 8 females found in branchial cavity of a *Pampus argenteus* (Euphrasen) collected July 22, 1980.

Female: The body (Figs. 82, 83) is rather large, about 3.28 (3.11 – 3.52) mm long. The urosome (Fig. 84) is stockier than in *N. lateolabracis.* The anal segment (Fig. 85) bears two patches of spinules on the ventral surface, but it is unornamented in the caudal ramus. The egg sac (Fig. 86) is about 1.77 (1.65 – 2.08) mm long and 480 (410 – 520) μm wide.

The rostral area is unarmed. The armature of the first antenna (Fig. 87) is similar to that of *N. lateolabracis* and only differs in the quality of the armaments. For instance, in the present species, the three modified elements in the basal part (see Fig. 88) are much slender. The second antenna (Figs. 89, 90) is about the same as in *N. lateolabracis.*

There is a bilobate, fleshy lobe in the oral area (Fig. 91) as in *N. lateolabracis.* The mandible (Fig. 92) and first maxilla (Fig. 81) are not much different from those of *N.*

lateolabracis, but the paragnath (Fig. 93) and second maxilla (Fig. 94) are somewhat different. The maxilliped (Fig. 95) has a slightly slender terminal claw.

The formulae of spines and setae in legs 1 to 4 (Figs. 96, 98, 99, 100) are identical with the previous species, except for the terminal segment of leg 1 exopod (Fig. 97) and leg 4 endopod (Fig. 100) where it is (IV, 6) and I, 1, I), respectively. Leg 5 (Fig. 101) has a characteristic curve in the free segment, it is tipped with 2 flagellated spines and 1 plumose seta. Leg 6 is represented by 3 slender setae located at the area of egg sac attachment (see Fig. 84).

Remarks: We concur with Vervoort[4] and Pillai[6] in considering *Bomolochus (Pseudobomolochus) managatuwo* Yamaguti, 1939[16] a junior synonym of *N. triceros* (Bassett-Smith, 1898)[17][18].

Although the details of fine structure are lacking in the literature for many species of *Nothobomolochus*, information of the three modified elements (spines) on the basal part of the first antenna is exceptional. Therefore, we shall compare in the following *N. triceros* with those species of *Nothobomolochus* that have rather long and subequal spines in the basal part of the first antenna (see Fig. 88).

N. multispinosus (Gnanamuthu), a parasite of *Dussumieria hasselti* Bleeker from India[6] can be separated from *N. triceros* by the structure of leg 4 endopod. *N. kanagurta* Pillai, a parasite of *Rastrelliger* spp. from the Red Sea, India, the Philippines, and China[12], has differently constructed maxilliped, caudal ramus, and leg 4 endopod. *N. quadriceros* Pillai, a parasite of *Gazza minuta* (Bloch) from India[19], is distinguishable in having the sixth element in the first antenna also modified to assume a spinous appearance. *N. gerresi* Pillai, a parasite of *Gerres filamentosus* Cuvier from India[19], differs in the structure of leg 4 endopod and spines on leg 5 free segment.

Nothobomolochus thambus sp. nov.
(Figs. 102–121)

Material examined: All 11 specimens were found on the gills of *Konosirus punctatus* (Temminck & Schlegel): 6 females from 5 hosts collected July 22, 1980; 5 females on 1 host collected March 24, 1981.

Female: The body (Figs. 102, 103) has a short urosome (Fig. 104) which is about 32% of the total body length. There are two patches of fine spinules on the ventral surface of anal segment. The caudal ramus (Fig. 105) is unornamented. The average body length is 1.92 mm, ranging from 1.83 to 1.96 mm. The egg sac (Fig. 106) is about 1.68 (1.65 – 1.70) mm long and 295 (290 – 300) μm wide.

The rostral area is unarmed. The first antenna (Fig. 107) is generally similar to *N. lateolabracis* and differs only in the nature of the three modified elements in the basal area (see Fig. 108). The second antenna (Figs. 109, 110) is about the same as in the previous two species of *Nothobomolochus*.

There is also a bilobate, fleshy lobe in the oral area (Fig. 111) as in the previous two species of *Nothobomolochus*. The mandible (Fig. 112), first maxilla (Fig. 111), and

second maxilla (Fig. 114) are similar to those in *N. triceros.* The paragnath (Fig. 113) has a single row of spinules. The maxilliped (Fig. 115) has several rather unusual features: the terminal claw is relatively small, one of the two sturdy, hairy setae in the second segment has become naked, and the distal inner corner of the same segment is protruded to support the smaller hairy seta.

The formulae of spines and setae in legs 1 to 4 (Figs. 116, 118, 119, 120) are identical with *N. lateolabracis,* except for the terminal segment of leg 4 endopod, where it is (I, 1, I) instead of (I, 1). The outer spines on leg 1 exopod (Fig. 117) are weaker than those in *N. lateolabracis.* Leg 5 (Fig. 121) bears the usual armature. Leg 6 is represented by 3 slender setae located at the area of egg sac attachment (see Fig. 104).

Etymology: The species name *thambus* means "astonished" in Greek. It alludes to our surprise about the discovery of the unusual traits in the maxilliped, which is one of the most stable appendages in the Bomolochidae.

Remarks: The armature in the maxilliped of *N. thambus* is so unique that this appendage alone will suffice its distinction from all other species of *Nothobomolochus.*

Orbitacolax hapalogenyos (Yamaguti & Yamasu, 1959)
(Figs. 122–141)

Taeniacanthus hapalogenyos Yamaguti & Yamasu, 1959, p. 95, pl. 3, figs. 44–55;
Yamaguti, 1963, p. 21, pl. 19, fig. 8.

Orbitacolax hapalogenyos, Vervoort, 1962, p. 84; Ho & Dojiri, 1976, p. 257, figs. 2A-B.

Material examined: 3 females in the branchial cavity of 1 *Hapalogenys mucronatus* (Eydoux & Souleyet) collected May 13, 1980.

Female: The body (Figs. 122, 123) is slightly flattened, with a broad cephalothorax (containing the first pedigerous somite) and two wide metasomal somites (representing the second and the third pedigerous somites). The urosome (Fig. 124) is relatively short, occupying only about 23% of the total body length. All three abdominal segments and the caudal ramus (Fig. 125) are ornamented with patches of spinules on the ventral surface. The average length of body is 1.70 mm, ranging from 1.58 to 1.87 mm. The egg sac (Fig. 126) is flat and broad, measuring 680 × 345 (340 – 350) μm.

The large, prominent rostrum (Fig. 127) bears two sharp tines on its ventral surface. The first antenna is 4-segmented in ventral view (Fig. 127) but 5-segmented in dorsal view (Fig. 128), with the incomplete segmentation occurring between the second and the third segments. The first segment is fringed with 5 sturdy, hairy setae; the longest second segment carries 7 slender, naked setae, 3 small plumose setae, and 10 sturdy, hairy setae. The formula for the armature of the remaining 3 segments is 4 (one of them large and hairy), 2 + 1 aesthete, and 7 + 1 aesthete. The second antenna (Fig. 129) is a typical bomolochid form with the terminal armament (Fig. 130) similar to *Bomolochus* and *Naricolax,* but not to *Nothobomolochus.*

The labrum (Fig. 131) is covered with two patches of denticles. The mandible (Fig. 132), paragnath (Fig. 133), second maxilla (Fig. 134), and maxilliped (Fig. 135) are quite

similar to those in *Bomolochus*. The first maxilla has the regular armature of 3 hairy and 1 naked setae, but one of the hairy setae is unusually long (see Fig. 131).

Legs 1 to 4 (Figs. 136, 138, 139, 140) are biramous, their formulae of spines (Roman numerals) and setae (Arabic numerals) are as follows:

	Exopod	Endopod
Leg 1	III,1,6	0 – 1; 6
Leg 2	1 – 0; 1 – 0; 2,I,3	0 – 1; 0 – 2; 1,3
Leg 3	1 – 0; 1 – 0; 2,I,3	0 – 1; 0 – 1; 1,2
Leg 4	1 – 0; 1 – 0; 2,I,3	0 – 1; 0 – 1; 1,2

The distal most outer element in leg 1 exopod (Fig. 137) is not a spine, but a short hairy seta. The endopodal segments of leg 1 are covered with a patch of denticles on their dorsal (posterior) surfaces and a row of long hairs along their outer margins. Leg 5 is armed with weak elements as shown in Fig. 141. Leg 6 is represented by 3 slender setae located at the area of egg sac attachment (see Fig. 124).

Remarks: Only one species of *Orbitacolax*, *O. aculeatus* (Pillai) on *Rostrelliger kanagurta* (Cuvier) from India and Philippines, has two long inner plumose setae in the second segment of leg 2 endopod as in the present species; other species has in this segment either one short naked seta (in *O. analogus* Vervoort, O. *dactyloperusi* (Carvalho) and *O. oniscoides* Vervoort) or no seta at all (in *O. leptoscari* (Yamaguti) and *O. uniunguis* Shen). According to Pillai[20] and Cressey & Cressey[12], *O. aculeatus* has only one outer spine in the second segment of leg 1 exopod, but *O. hapalogenyos* has two such spines (see Fig. 137). Other differences between these two closely resembling species are found in the appearance of the cephalothorax and metasomal somites, and armature of the first maxilla and the third segment of leg 3 endopod.

O. hapalogenyos has been recorded from Great Barrier Reef, Australia[21], it is so far the only report of this species outside Japanese waters.

Pumiliopes squamosus Cressey & Boyle, 1973
(Figs. 142–162)

Material examined: All 50 specimens were found on the eye of *Harengula zunasi* Bleeker: 26 females from 18 hosts collected May 13, 1980; 15 females and 4 copepodids from 9 hosts collected July 22, 1980; 5 females from 4 hosts collected November 11, 1980.

Female: The body (Figs. 142, 143) is flattened with broad cephalothorax followed by narrow metasome and urosome. The ventral surface of abdominal segments (Fig. 144) and caudal ramus (Fig. 145) are ornamented with spinules. The average length of body is 2.02 mm, ranging from 1.99 to 2.27 mm. The egg sacs (Fig. 142) are flat as in *Orbitacolax*.

Rostrum is well developed, but unarmed. The first antenna (Figs. 146, 147) is 5-segmented and bears the same formula of armature as *O. hapalogenyos*. However, the three distal segments (Fig. 148) are much stubbier than *O. hapalogenyos*. The second

antenna (Fig. 149) has a relatively short third segment, which is also unusual in lacking the subterminal pectinate lamella (see Fig. 150) that is so characteristic of the Bomolochidae.

The labrum (Fig. 151) has two patches of denticles. The mandible (Fig. 152), paragnath (Fig. 153), first maxilla (Fig. 154) and second maxilla (Fig. 155) are different from *O. hapalogenyos* only in fine structures. The maxilliped (Fig. 156) has a reduced, small terminal claw and associated seta. One of the two setae in the second segment is also reduced.

Legs 1 to 4 (Figs. 157, 159, 160, 161) are biramous, their formulae of spines (Roman numerals) and setae (Arabic numerals) are as follows:

	Exopod	Endopod
Leg 1	III,1,6	0 – 1; 6
Leg 2	1 – 0; 1,I,3	0 – 1; 5
Leg 3	1 – 0; 1,I,3	0 – 1; 3
Leg 4	1 – 0; 1,I,3	0 – 1, 0 – 1; 2

The protopod of leg 1 (Fig. 157) is very much reduced and carries an outer hairy seta and an inner plumose seta. Leg 1 exopod shows a short suture line between the first and the second outer spines (see Fig. 158). The four naked terminal setae on the exopods of legs 2 to 4 are very small. Leg 5 (Fig. 162) is armed with weakly sclerotized elements. Leg 6 is represented by 3 slender setae located at the area of egg sac attachment.

Remarks: This species was first described by Cressey & Boyle[22] from Nagasaki, Japan, but now, it is known to occur as far as Madagascar[23].

Only three species of bomolochids are known under *Pumiliopes*. The distinguishing characters between *P. squamosus* and the other two congeners (*P. jonesi* and *P. opisthopteri*) have already been discussed in detail by Cressey & Boyle[22].

When Shen[24] erected *Pumiliopes* to accomodate a Chinese bomolochid parasitic on *Opisthopterus tardore* (Cuvier & Valenciennes), he noted that the second antenna was "very different from those in bomolochids." However, he did not elaborate further on this unusual character state of the second antenna. Now with three species known in *Pumiliopes*, we can add that the untold peculiar feature of the second antenna is: missing the pectinate lamella in the terminal segment (cf. Figs. 130 and 150).

Key to the bomolochids of Japan

As in many other parasitic Copepoda, most of the bomolochids are known of the female only. Therefore, the following key is prepared for identifying chiefly adult females of the fourteen Japanese bomolochids. However, since the male bomolochid is seldom found alone, a key to the female may also indirectly lead to identifying the male that occurs together. In order to facilitate the use of this key, some structures illustrated in this report are cited in the key for a quick and accurate recognition of the characteristics considered.

1. First antenna without modified seta on the basal segment (Fig. 128) 2
   First antenna with one (4th) seta on the basal segment modified to form a heavy spine, other setae on this segment simply plumose (Fig. 26) 4
   First antenna with one (4th) seta on the basal segment modified to form a hook, other setae on this segment plumose and reinforced with a strip of sclerite (Fig. 7) 6
   First antenna with three (3rd, 4th, 5th) setae on the basal segment modified to form spines, other setae on this segment simply plumose (Fig. 66) 7
2. Second antenna with a pectinate lamella in the terminal segment (Fig. 130) 3
   Second antenna without such armature (Fig. 150) ..... *Pumiliopes squamosus*
3. Second segment of leg 2 endopod with 2 long plumose inner setae (Fig. 138) ..... *Orbitacolax hapalogenyos*
   Second segment of leg 2 endopod unarmed ..... *Orbitacolax leptoscari*
4. Second segment of leg 3 endopod with 2 long plumose inner setae (Fig. 40) ..... *Naricolax atypicus*
   Second segment of leg 3 endopod with 1 long plumose inner seta 5
5. Third segment of leg 2 exopod with 4 spines and 5 setae ..... *Unicolax collateralis*
   Third segment of leg 2 exopod with 3 spines and 5 setae ..... *Unicolax mycterobius*
   Third segment of leg 2 exopod with 3 spines and 4 setae ..... *Unicolax reductus*
6. Leg 4 endopod shorter than exopod; spines on the latter armed with many small teeth (Fig. 20) ..... *Bomolochus bellones*
   Leg 4 endopod distinctly longer than exopod; spines on the latter armed with only a few but coarse teeth ..... *Bomolochus decapteri*
7. Third segment of leg 4 endopod armed terminally with 1 seta and 1 spine (Fig. 80) ..... *Nothobomolochus lateolabracis*
   Third segment of leg 4 endopod armed terminally with 1 seta and 2 spines (Fig. 100) 8
8. Three spines on the basal segment of first antenna rather long and subequal (Fig. 88) ..... *Nothobomolochus triceros*
   Three spines on the basal segment of first antenna unequal in length (Fig. 108) 9
9. Maxilliped with small terminal claw and bearing 1 naked and 1 plumose setae in the second segment (Fig. 115) ..... *Nothobomolochus thambus*
   Maxilliped with large terminal claw and bearing 2 plumose setae in the second segment (Fig. 75) 10
10. Second maxilla tipped with 2 pointed, spinulose process ..... *Nothobomolochus gibber*
    Second maxilla terminated in a spatulate process ..... *Nothobomolochus cypseluri*

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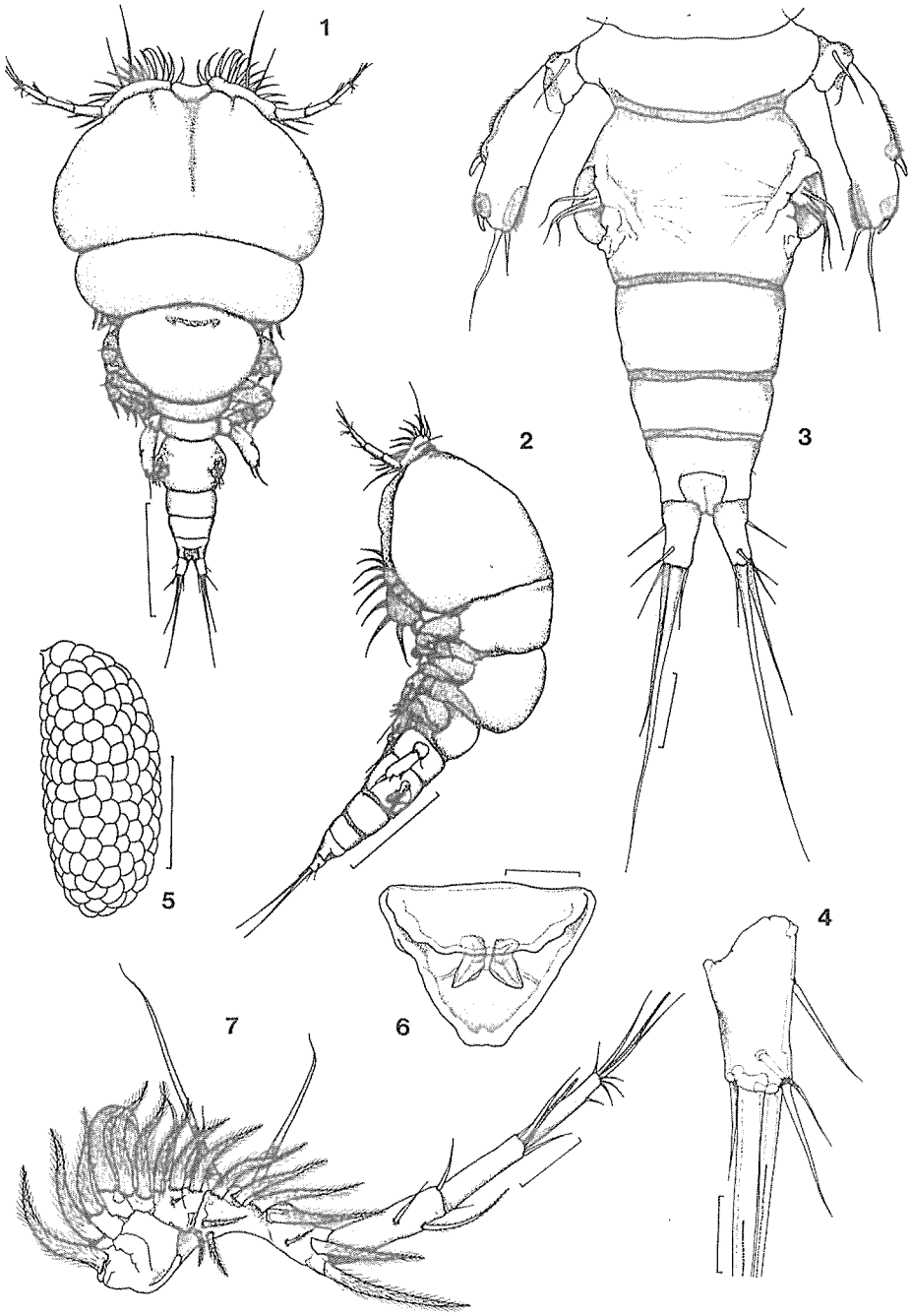
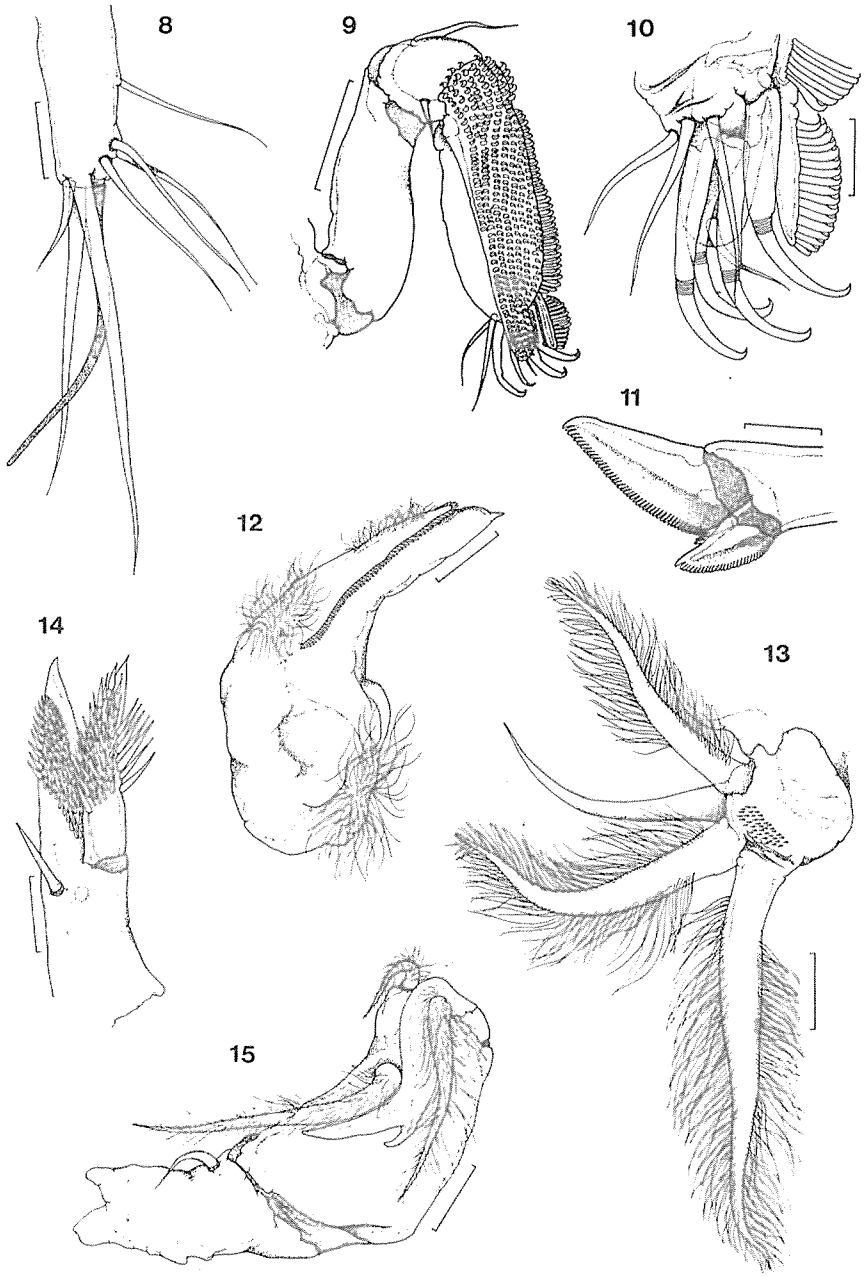
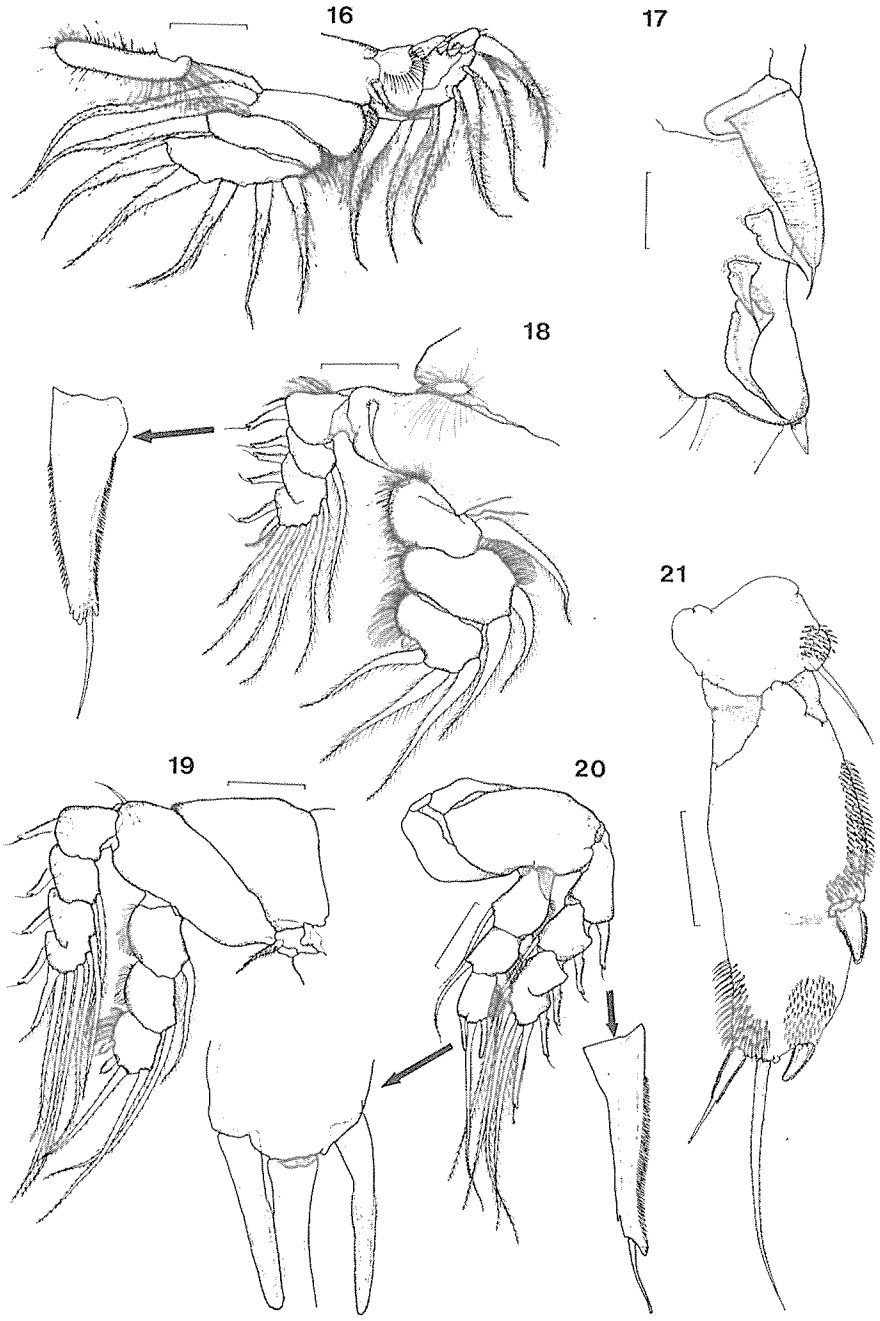


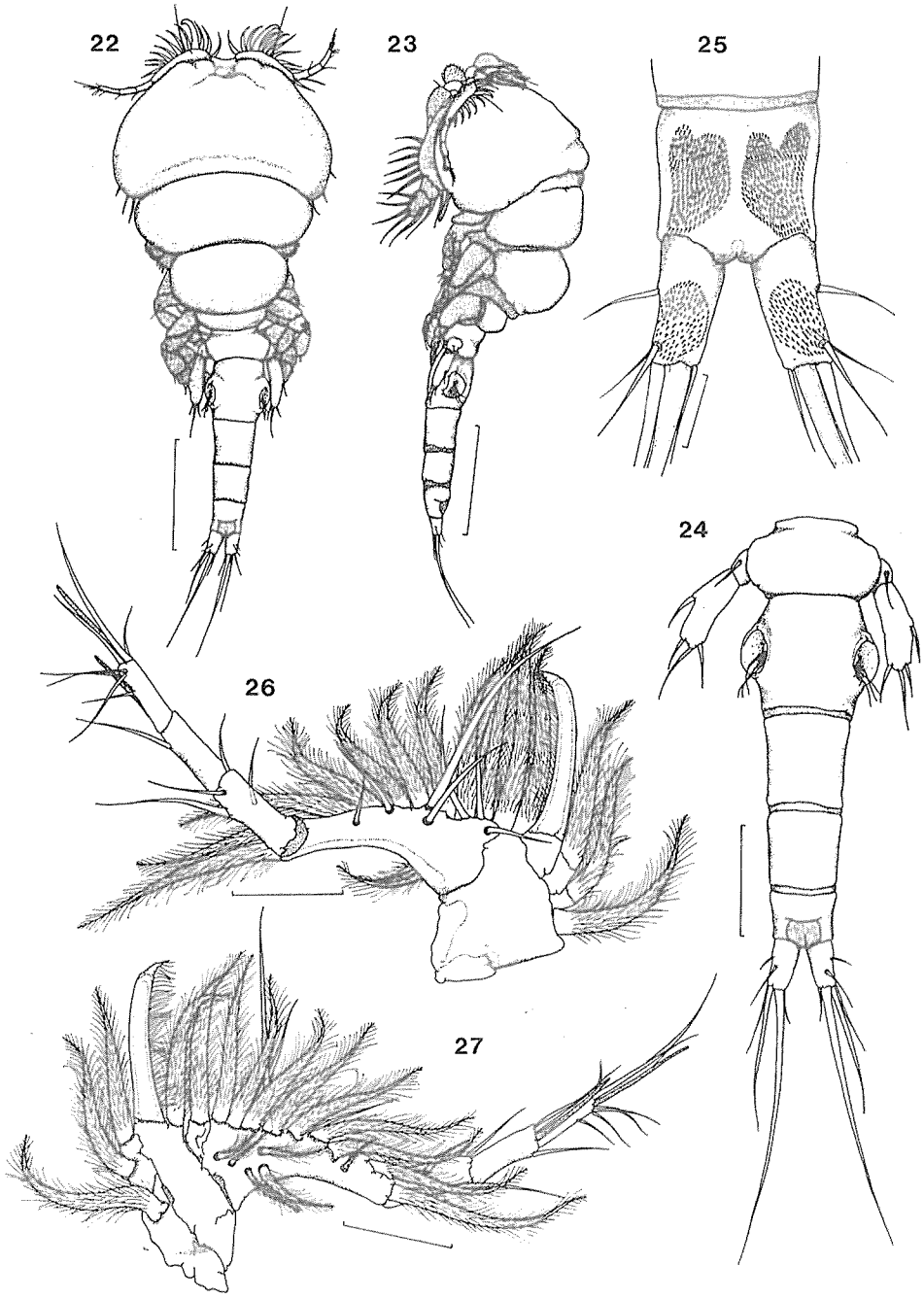
Figs. 1–7. *Bomolochus bellones* Burmeister, female.
Fig. 1: habitus, sorsal; Fig. 2: habitus, lateral; Fig. 3: urosome, dorsal; Fig. 4: caudal ramus, ventral; Fig. 5: egg sac; Fig. 6: rostral area, ventral; Fig. 7: first antenna, ventral. Scales: 500μm in 1, 2, 5; 100μm in 3, 7: 50μm in 4, 6.



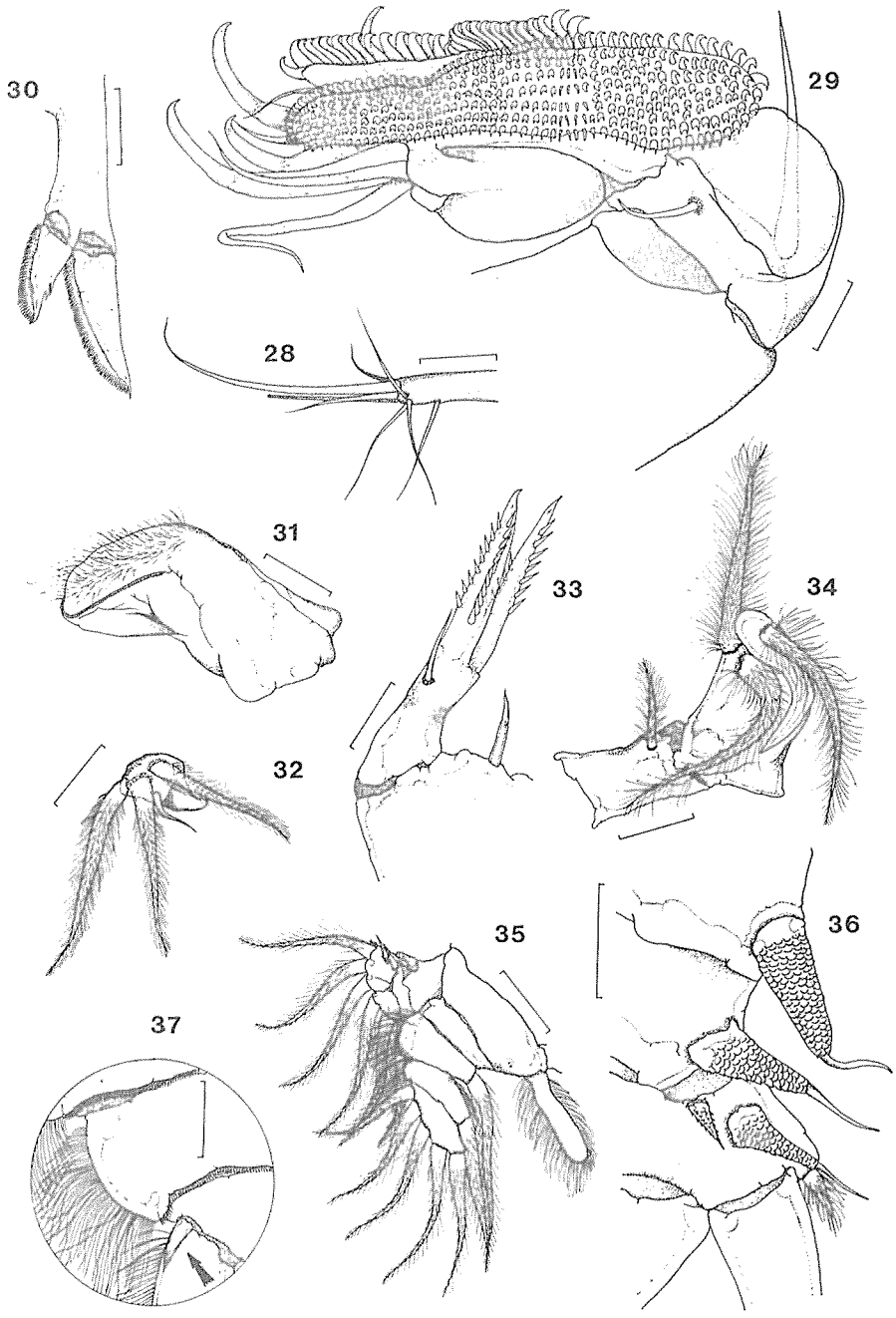
Figs. 8–15. *Bomolochus bellones* Burmeister, female.
Fig. 8: tip of first antenna; Fig. 9: second antenna, ventral; Fig. 10: tip of second antenna; Fig. 11: tip of mandible; Fig. 12: paragnath; Fig. 13: first maxilla; Fig. 14: tip of second maxilla; Fig. 15: maxilliped. Scales: 20 μm in 8, 11, 12, 13, 14; 50μm in 9, 15.



Figs. 16–21. *Bomolochus bellones* Burmeister, female.
Fig. 16: leg 1, dorsal; Fig. 17: outer spines of leg 1 exopod, dorsal; Fig. 18: leg 2, dorsal; Fig. 19: leg 3, ventral; Fig. 20: leg 4, ventral; Fig. 21: leg 5, ventral. Scales: 100μm in 16, 18, 19, 20; 20μm in 17; 50 μm in 21.



Figs. 22–27. *Naricolax atypicus* gen. et sp. nov., female.
Fig. 22: habitus, dorsal; Fig. 23: habitus, lateral; Fig. 24: urosome, dorsal; Fig. 25: anal somite and caudal rami, ventral; Fig. 26: first antenna, dorsal; Fig. 27: first antenna, ventral. Scales: 500μm in 22, 23; 200μm in 24; 50μm in 25; 100μm in 26, 27.



Figs. 28–37. *Naricolax atypicus* gen. et sp. nov., female.
Fig. 28: tip of first antenna; Fig. 29: second antenna, ventral; Fig. 30: mandible; Fig. 31: paragnath; Fig. 32: first maxilla; Fig. 33: second maxilla; Fig. 34: maxilliped; Fig. 35: leg 1, dorsal; Fig. 36: outer spines on leg 1 exopod, dorsal; Fig. 37: outer spine on leg 1 endopod. Scales: 50μm in 28, 32, 34; 20μm in 29, 30, 31, 33, 36, 37; 100μm in 35.

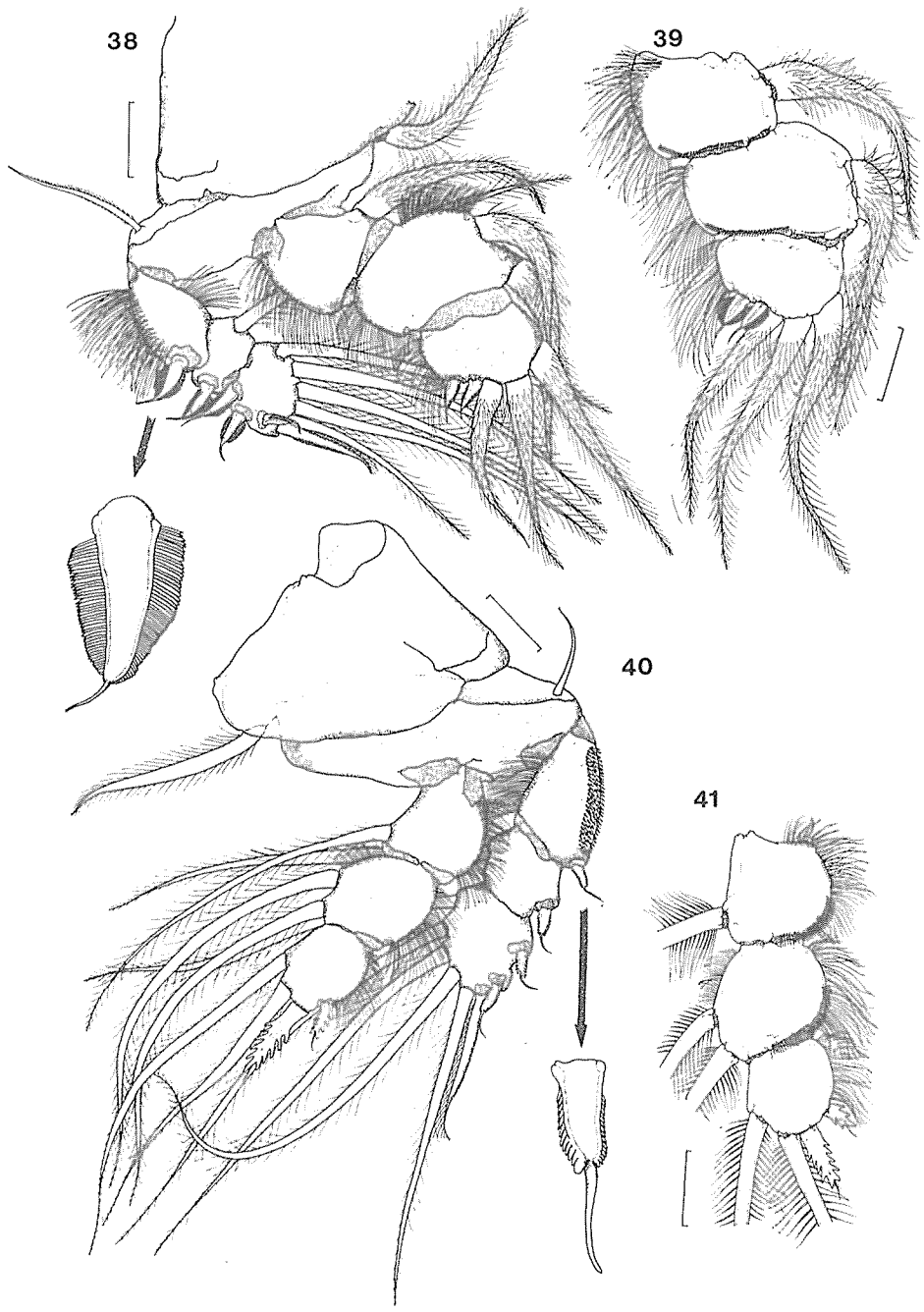
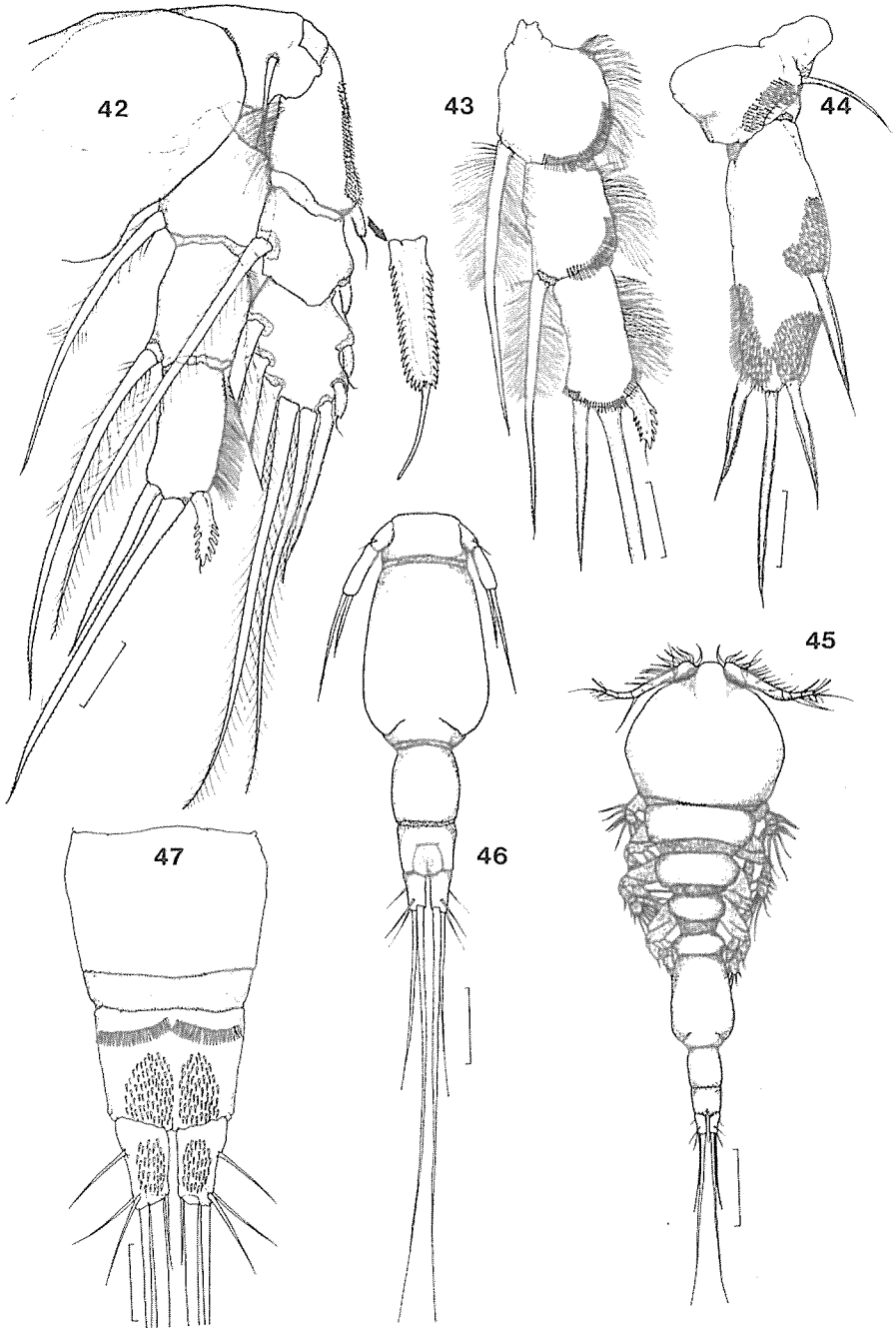
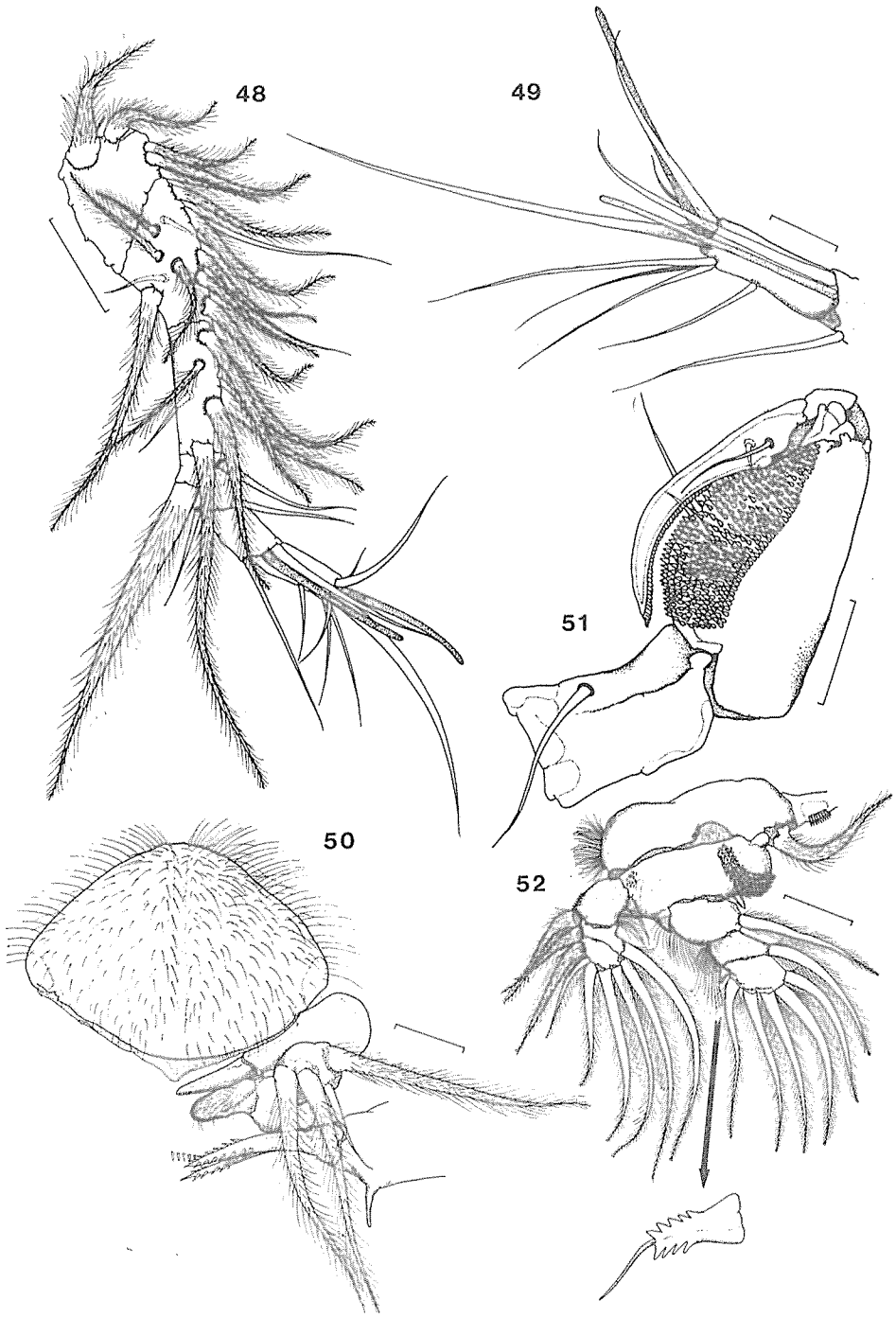


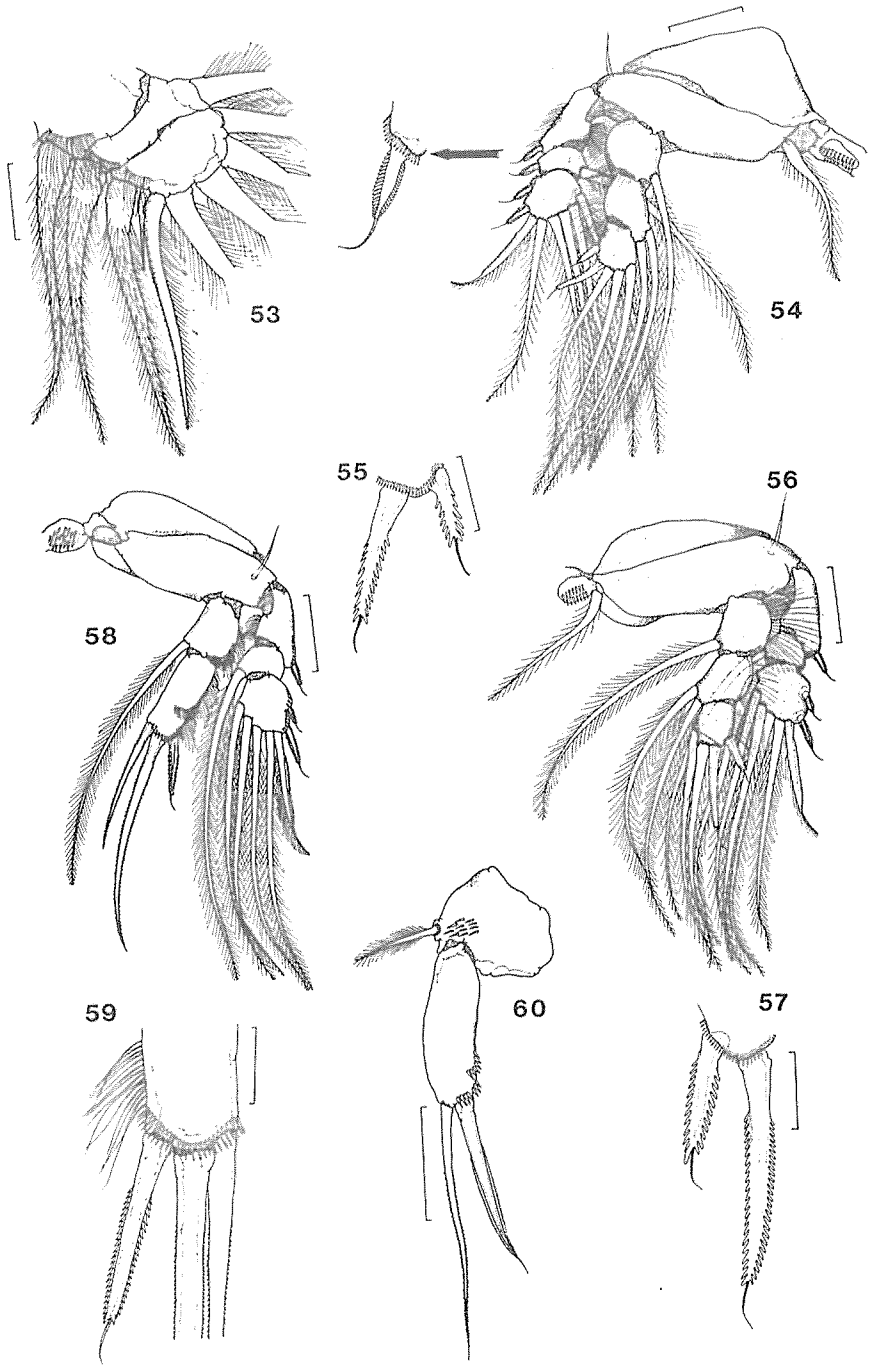
Fig. 38–41. *Naricolax atypicus* gen. et sp. nov., female.
Fig. 38: leg 2, dorsal; Fig. 39: leg 2 endopod, ventral; Fig. 40: leg 3, dorsal; Fig. 41: leg 3 endopod, ventral. Scales: 50μm in all figures.



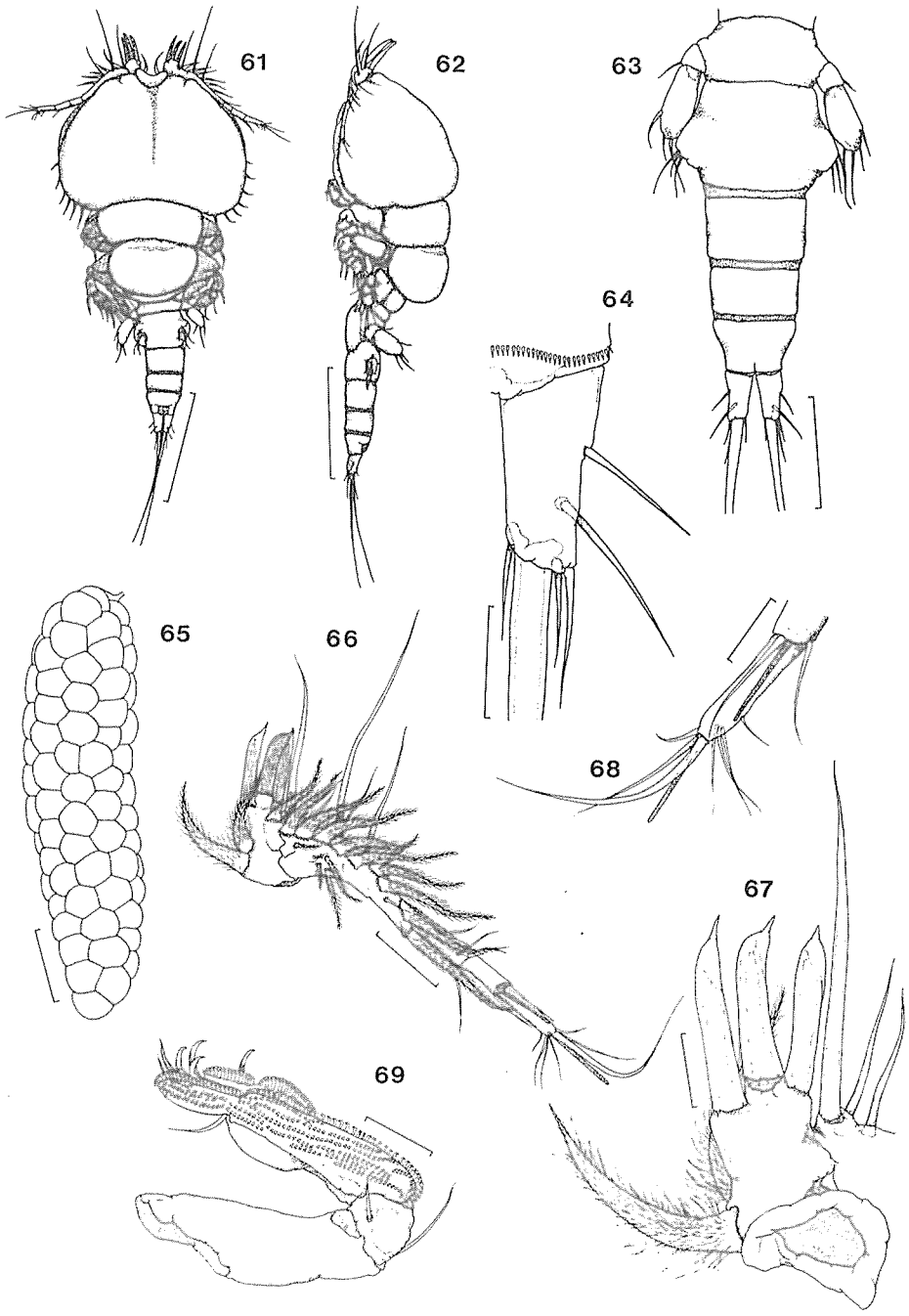
Figs. 42–47. *Naricolax atypicus* gen. et sp. nov., female and male.
Female: Fig. 42: leg 4, dorsal; Fig. 43: leg 4 endopod, ventral; Fig. 44: leg 5, ventral. Male: Fig. 45: habitus, dorsal; Fig. 46: urosome, dorsal; Fig. 47: anal somite and caudal rami, ventral. Scales: 50μm in 42, 43, 44, 47; 200μm in 45; 100μm in 46.



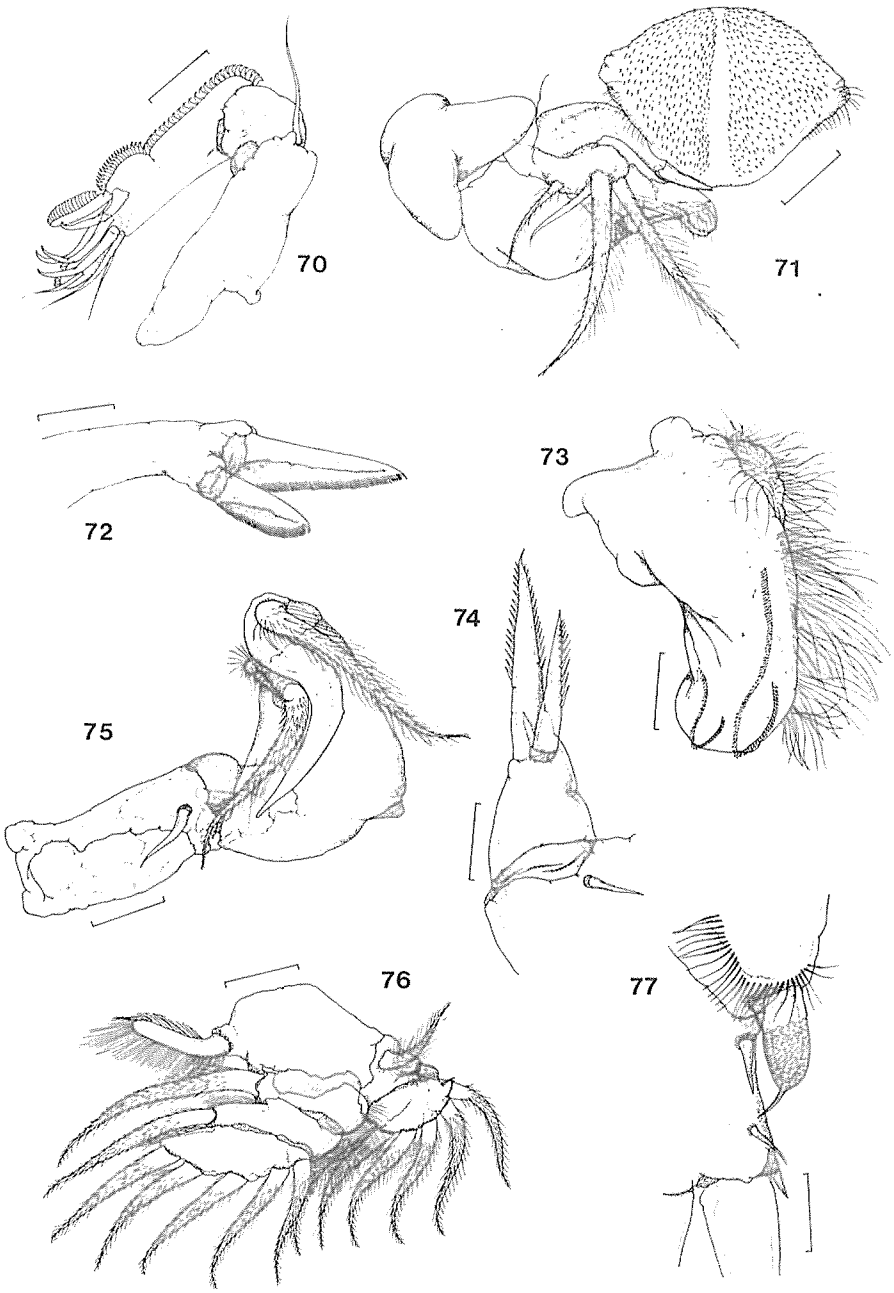
Figs. 48–52. *Naricolax atypicus* gen. et sp. nov., male.
Fig. 48: first antenna, ventral; Fig. 49: tip of first antenna; Fig. 50: labrum and oral appendages; Fig. 51: maxilliped; Fig. 52: leg 1, ventral. Scales: 50μm in 48, 51, 52; 20μm in 49, 50.



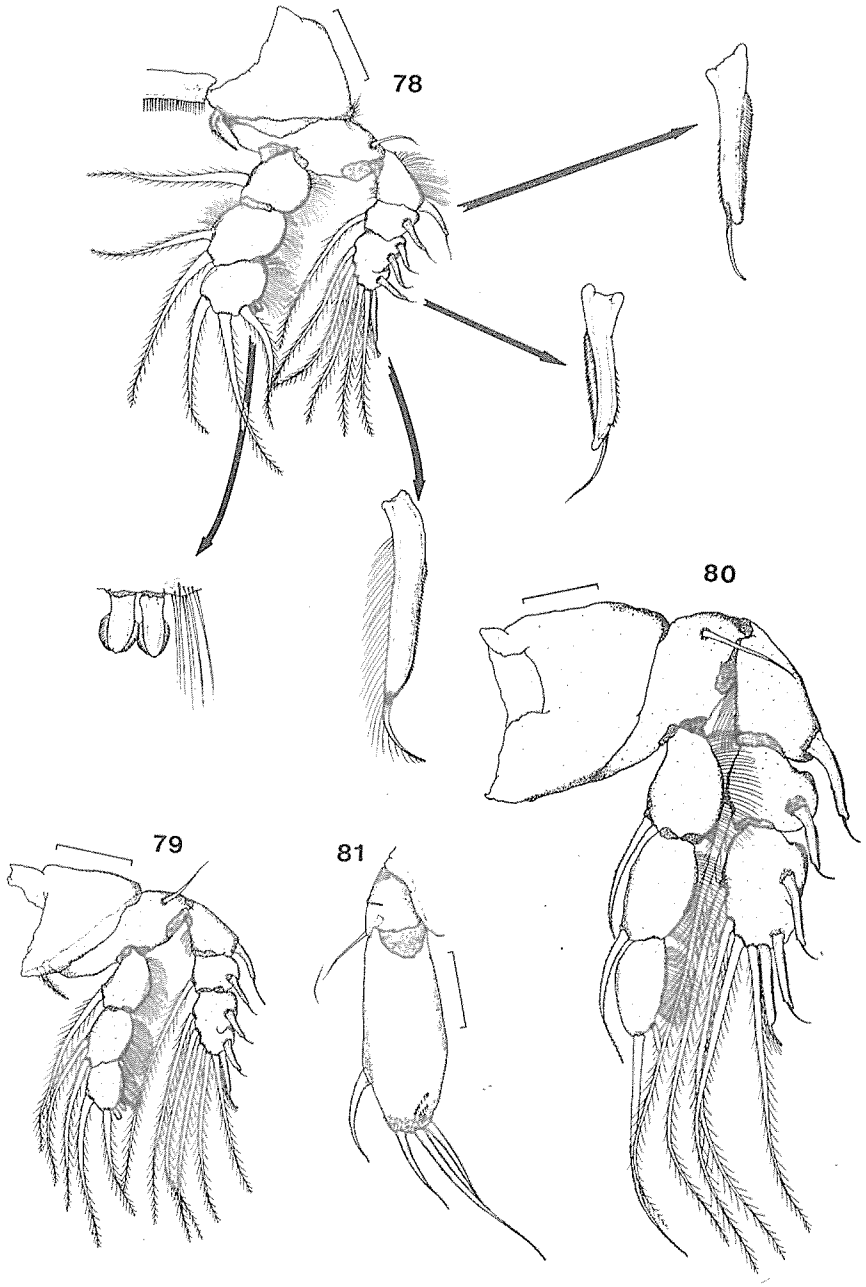
Figs. 53–60. *Naricolax atypicus* gen. et sp. nov., male.
Fig. 53: outer elements of leg 1 exopod; Fig. 54: leg 2, ventral; Fig. 55: terminal spines on leg 2 endopod; Fig. 56: leg 3, ventral; Fig. 57: terminal spines on leg 3 endopod; Fig. 58: leg 4, ventral; Fig. 59: tip of leg 4 endopod; Fig. 60: leg 5, lateral. Scales: 20μm in 53, 57, 59; 50μm in 54, 56, 58, 60; 10μm in 55.



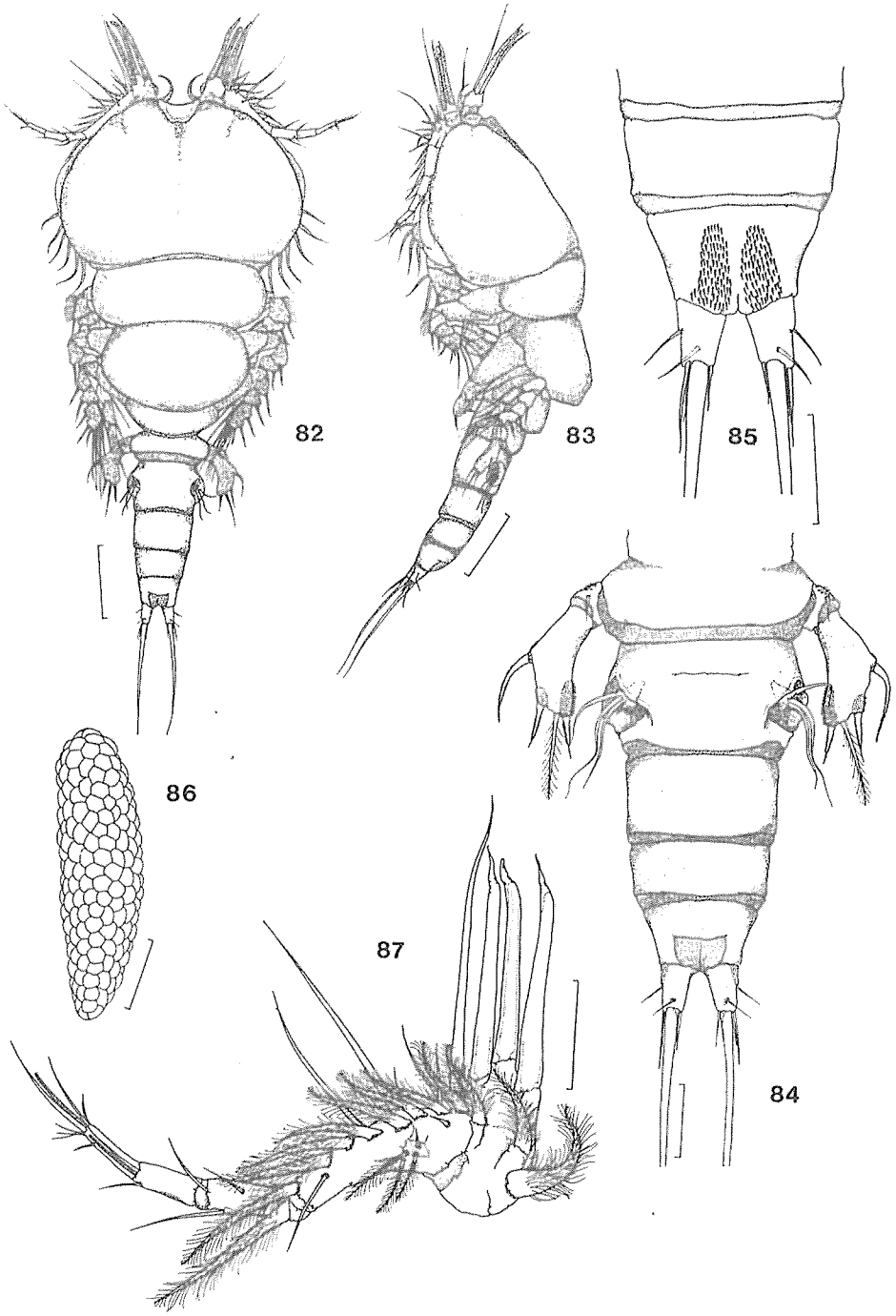
Figs. 61–69. *Nothobomolochus lateolabracis* (Yamaguti & Yamasu), female.
Fig. 61: habitus, dorsal; Fig. 62: habitus, lateral; Fig. 63: urosome, ventral; Fig. 64: caudal ramus, ventral; Fig. 65: egg sac; Fig. 66: first antenna, ventral; Fig. 67: proximal part of first antenna, dorsal; Fig. 68: tip of first antenna; Fig. 69: second antenna, posterior. Scales: 500μm in 61, 62; 200μm in 63, 65; 50μm in 64, 67, 68, 69; 100μm in 66.



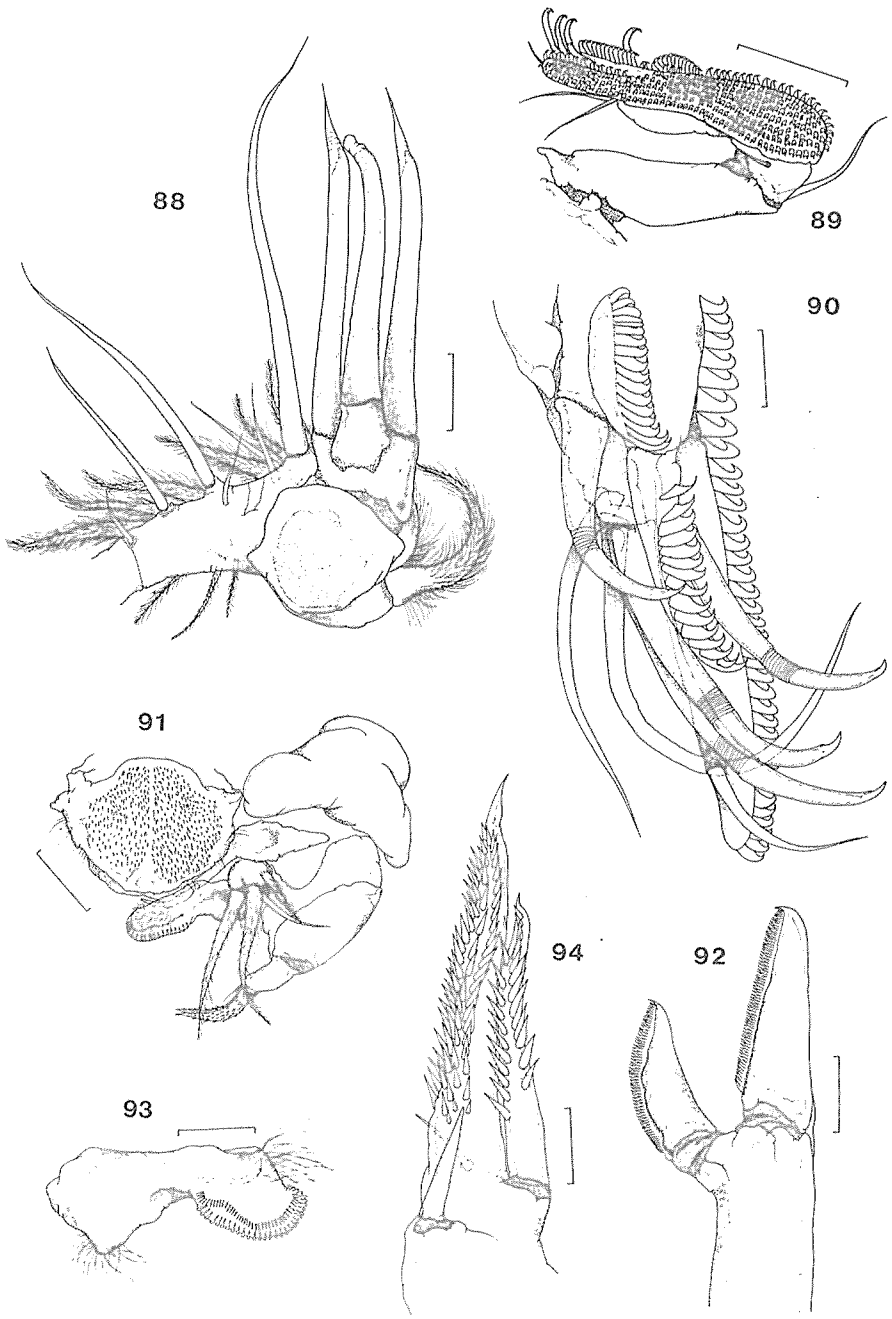
Figs. 70–77. *Nothobomolochus lateolabracis* (Yamaguti & Yamasu), female.
Fig. 70: second antenna, anterior; Fig. 71: labrum and oral appendages, ventral; Fig. 72: mandible; Fig. 73: paragnath; Fig. 74: second maxilla; Fig. 75: maxilliped; Fig. 76: leg 1, dorsal; Fig. 77: outer spines on leg 1 exopod, dorsal. Scales: 50μm in 70, 71, 75; 20μm in 72, 73, 74, 77; 100μm in 76.



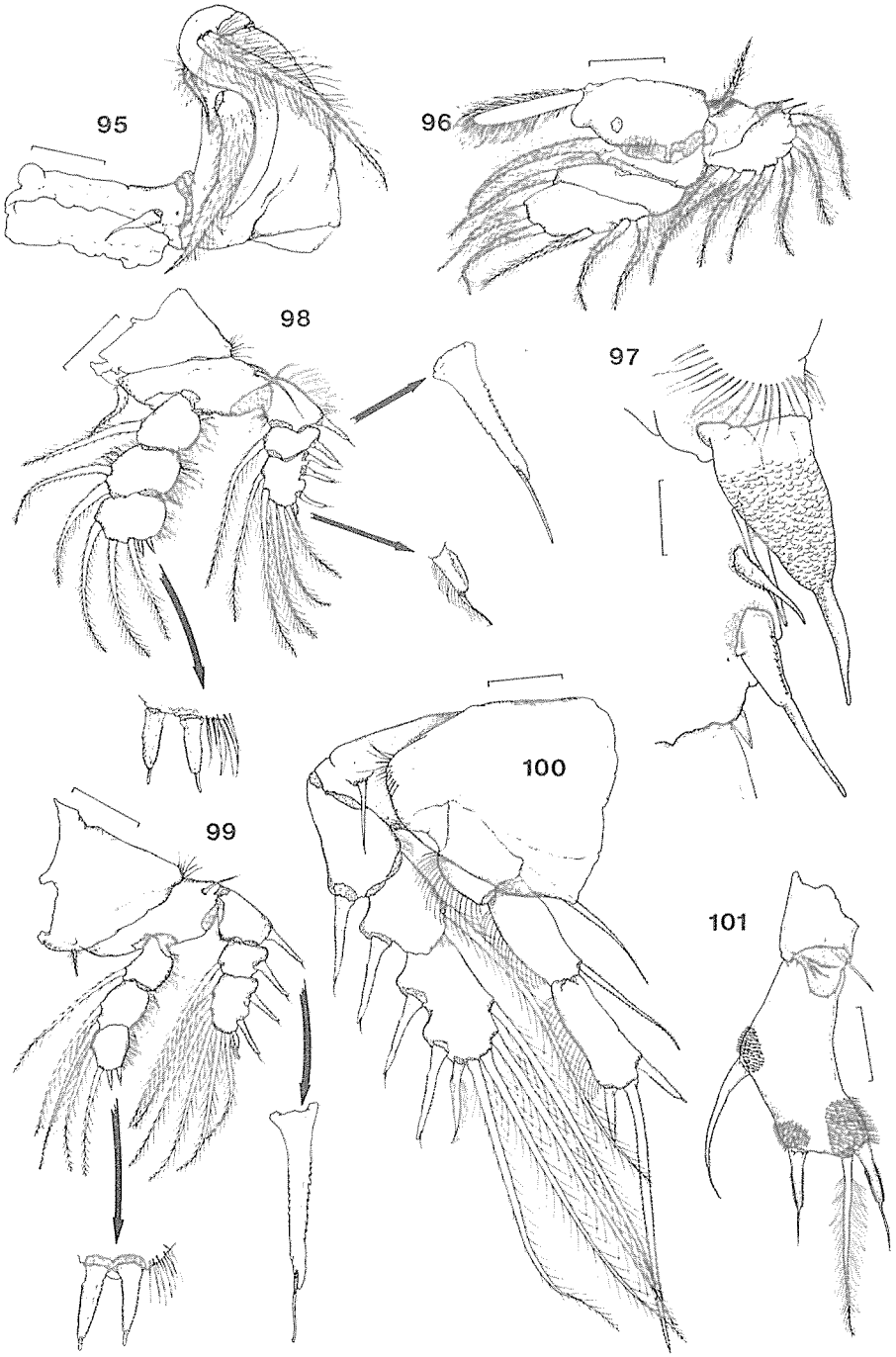
Figs. 78–81. *Nothobomolochus lateolabracis* (Yamaguti & Yamasu), female.
Fig. 78: leg 2, dorsal; Fig. 79: leg 3, dorsal; Fig. 80: leg 4, dorsal; Fig. 81: leg 5, lateral. Scales: 100μm in 78, 79; 50μm in 80, 81.



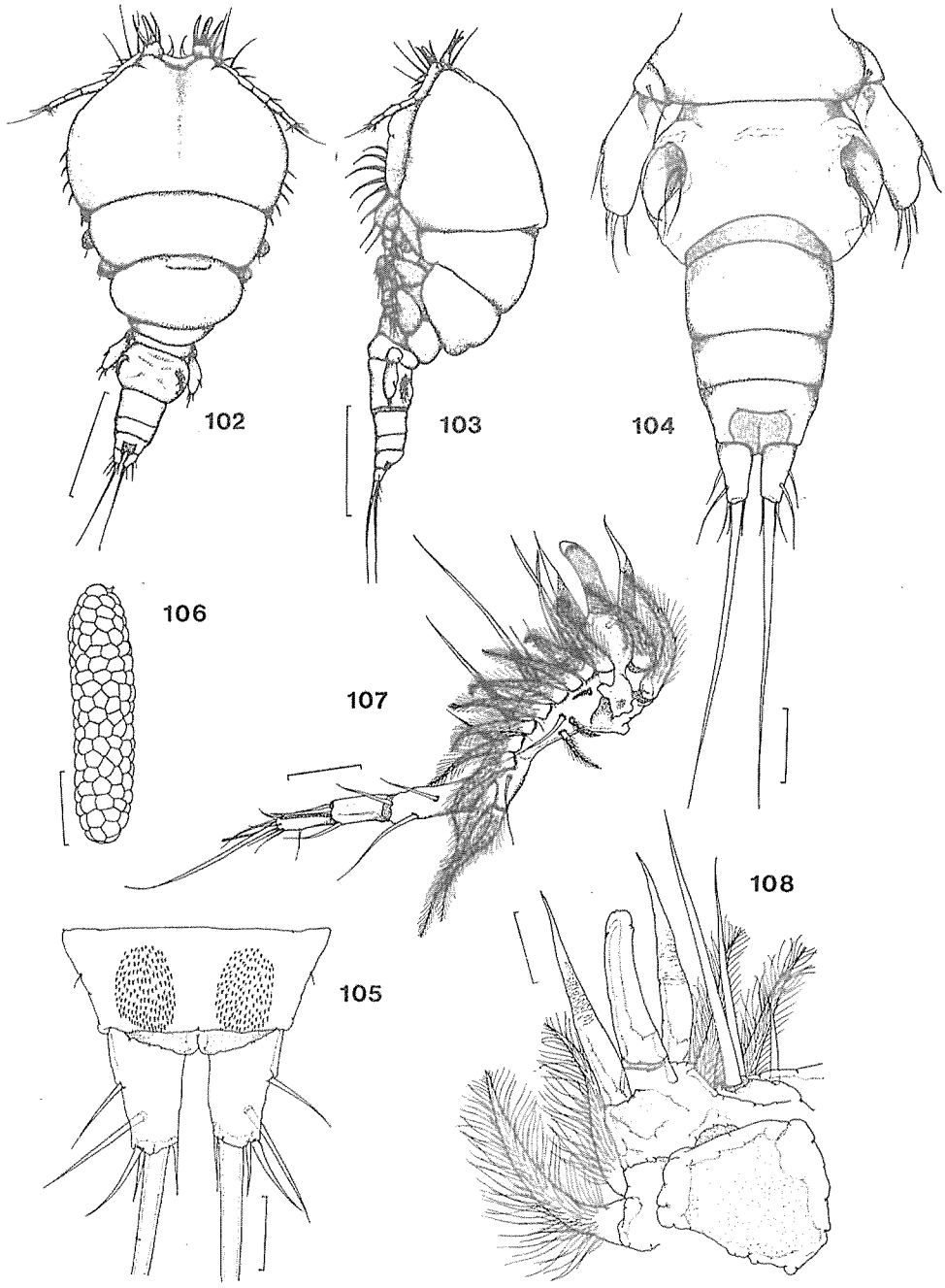
Figs. 82–87. *Nothobomolochus triceros* (Bassett-Smith), female.
Fig. 82: habitus, dorsal; Fig. 83: habitus, lateral; Fig. 84: urosome, dorsal; Fig. 85: posterior part of urosome, ventral; Fig. 86: egg sac; Fig. 87: first antenna, ventral. Scales: 500μm in 82, 83, 86; 100μm in 84; 200 μm in 85, 87.



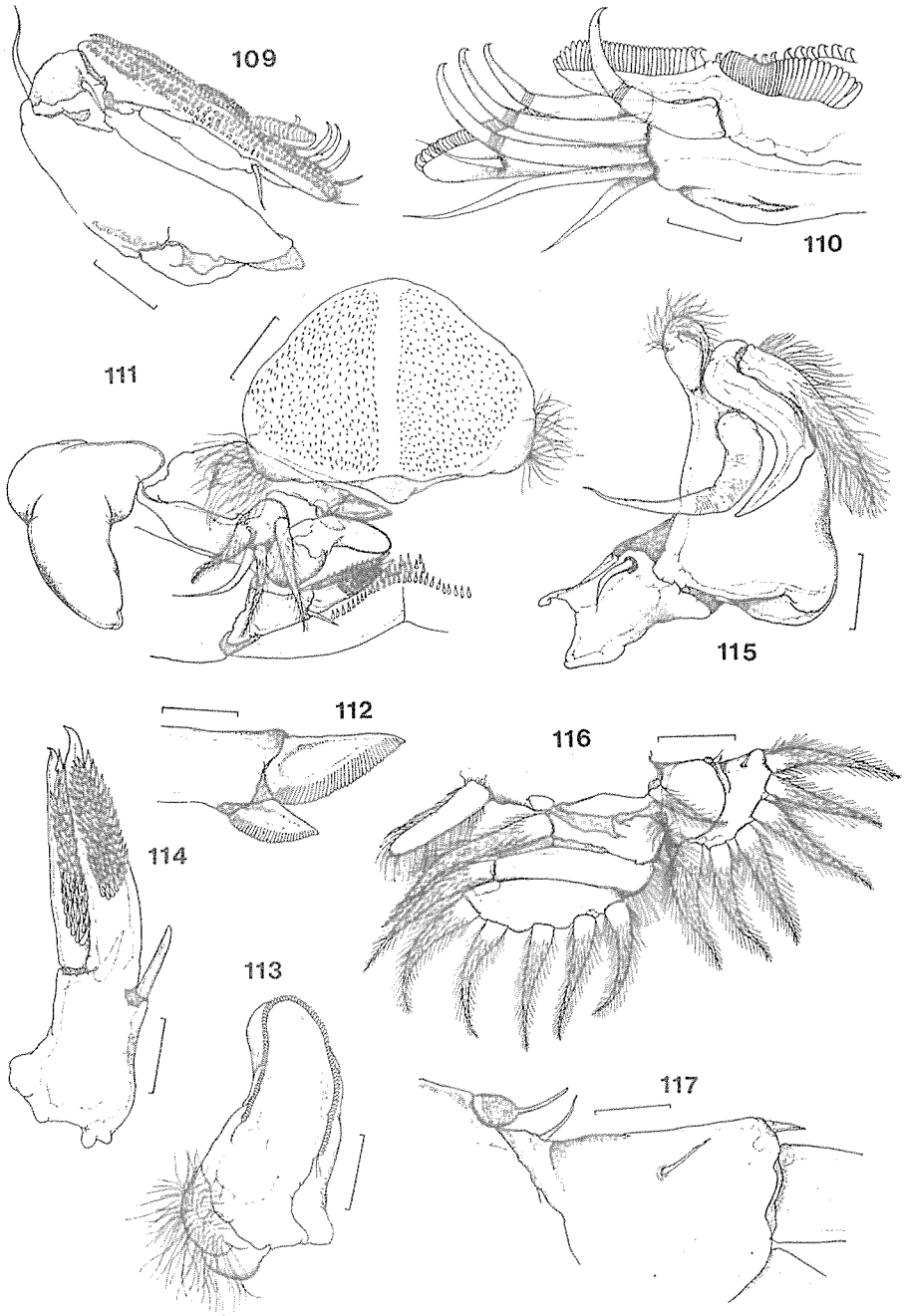
Figs. 88–94. *Nothobomolochus triceros* (Bassett-Smith), female.
Fig. 88: proximal part of first antenna, dorsal; Fig. 89: second antenna, posterior; Fig. 90: tip of second antenna, anterolateral; Fig. 91: labrum and oral appendages; Fig. 92: tip of mandible; Fig. 93: paragnath; Fig. 94: tip of second maxilla. Scales: 100μm in 88, 89, 91; 20 μm in 90, 92, 94; 50μm in 93.



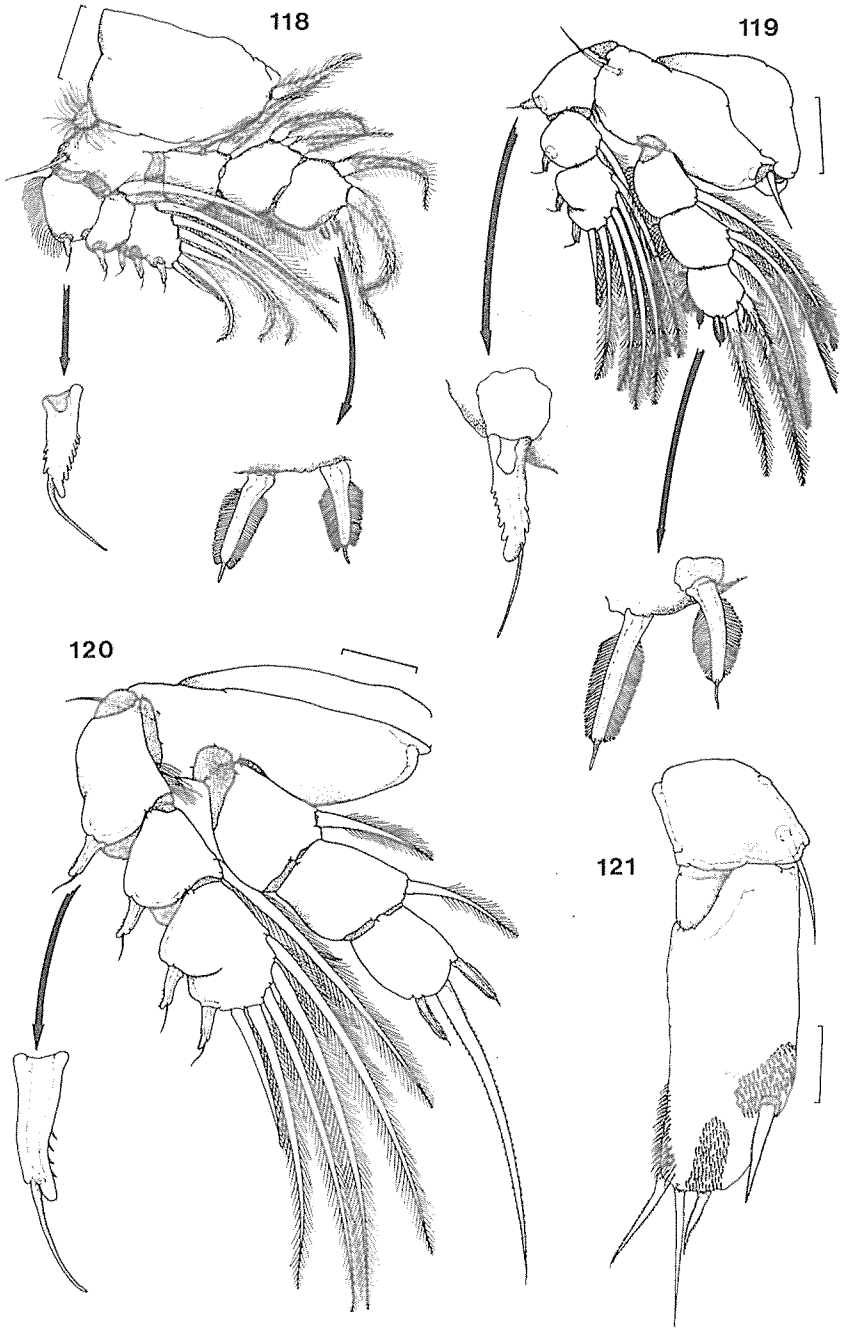
Figs. 95–101. *Nothobomolochus triceros* (Bassett-Smith), female.
Fig. 95: maxilliped; Fig. 96: leg 1, dorsal; Fig. 97: outer spines of leg 1 exopod, dorsal; Fig. 98: leg 2, dorsal; Fig. 99: leg 3, dorsal; Fig. 100: leg 4, dorsal; Fig. 101: leg 5, ventral. Scales: 100μm in 95, 100, 101; 200μm in 96, 98, 99; 20μm in 97.



Figs. 102–108. *Nothobomolochus thambus* sp. nov., female.
Fig. 102: habitus, dorsal; Fig. 103: habitus, lateral; Fig. 104: urosome, dorsal; Fig. 105: caudal ramus, ventral; Fig. 106: egg sac; Fig. 107: first antenna, ventral; Fig. 108: proximal part of first antenna, dorsal. Scales: 500μm in 102, 103, 106; 100μm in 104, 107; 50μm in 105, 108.



Figs. 109–117. *Nothobomolochus thambus* sp. nov., female.
Fig. 109: second antenna, ventral; Fig. 110: tip of second antenna; Fig. 111: labrum and oral appendages; Fig. 112: tip of mandible; Fig. 113: paragnath; Fig. 114: tip of second maxilla; Fig. 115: maxilliped; Fig. 116: leg 1, dorsal; Fig. 117: outer spines on leg 1 exopod, dorsal. Scales: 50μm in 109, 111, 115; 20μm in 110, 112, 113, 114, 117; 100μm in 116.



Figs. 118–121. *Nothobomolochus thambus* sp. nov., female.
Fig. 118: leg 2, dorsal; Fig. 119; leg 3, ventral; Fig. 120: leg 4, ventral; Fig. 121: leg 5, ventral. Scales: 100μm in 118, 119; 50μm in 120, 121.

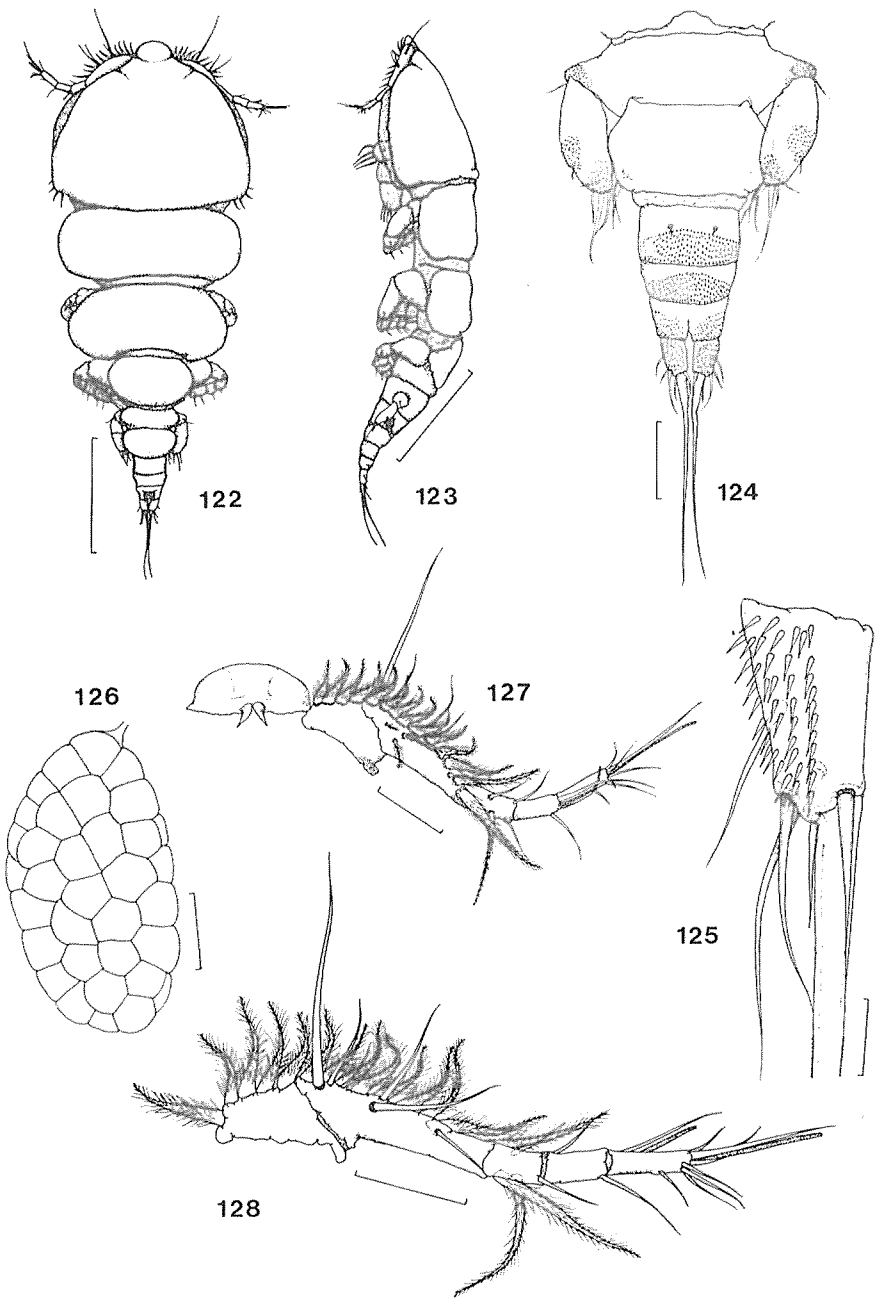
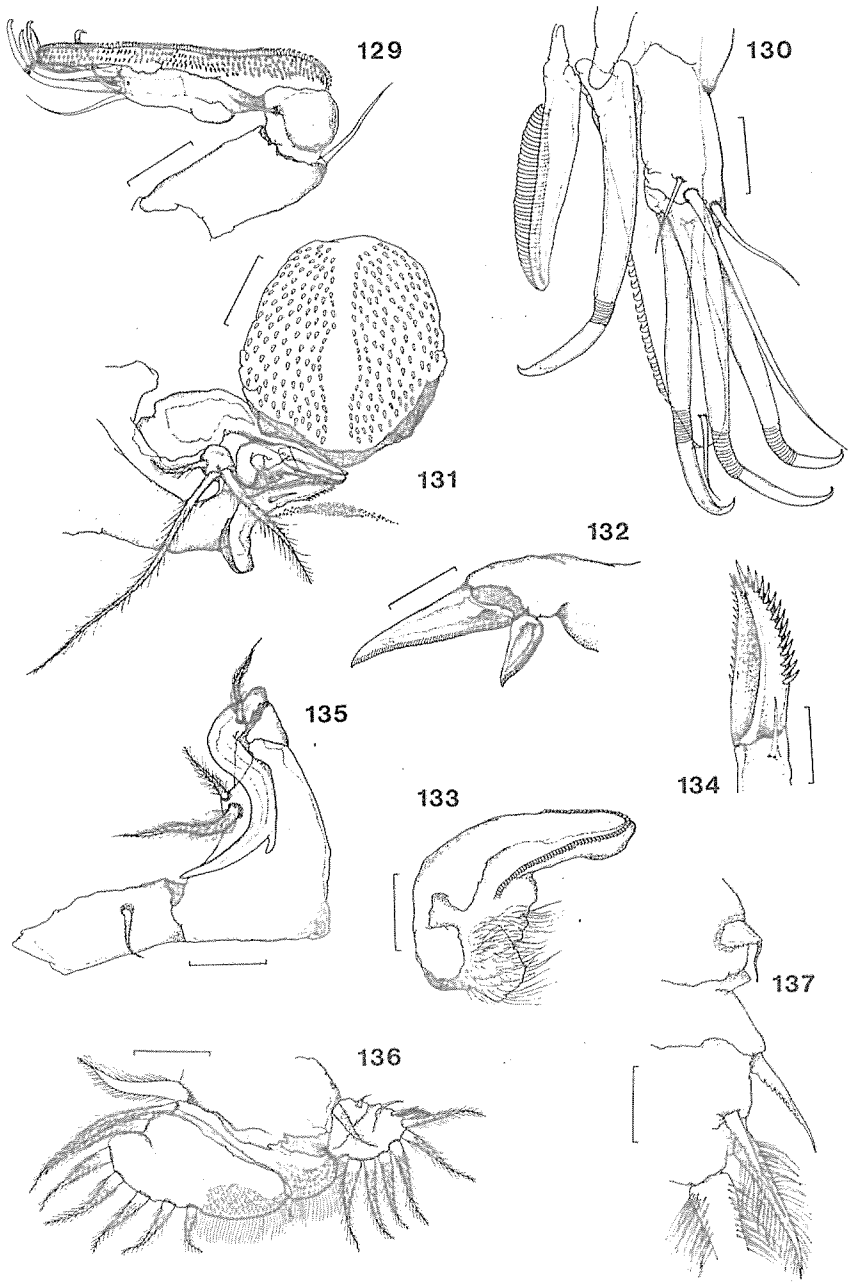
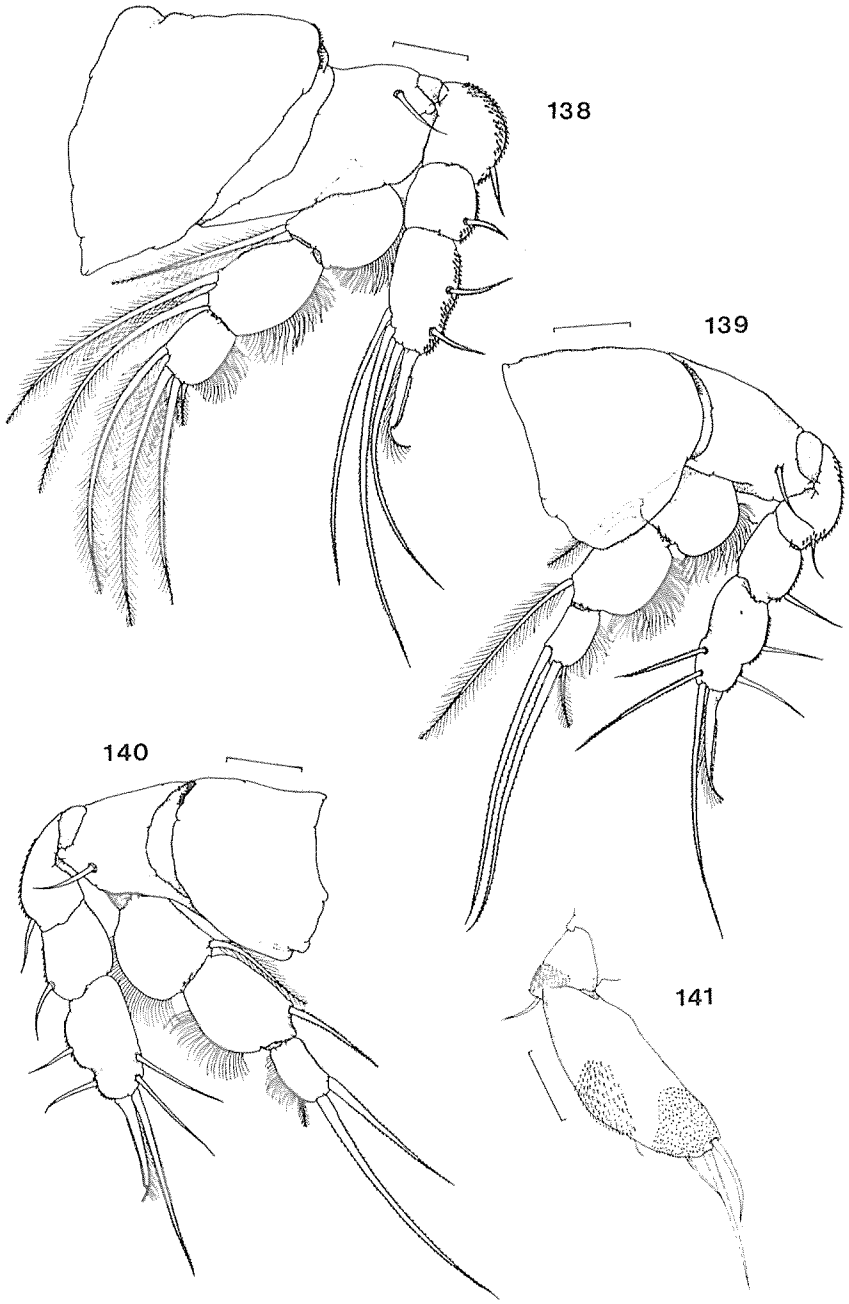


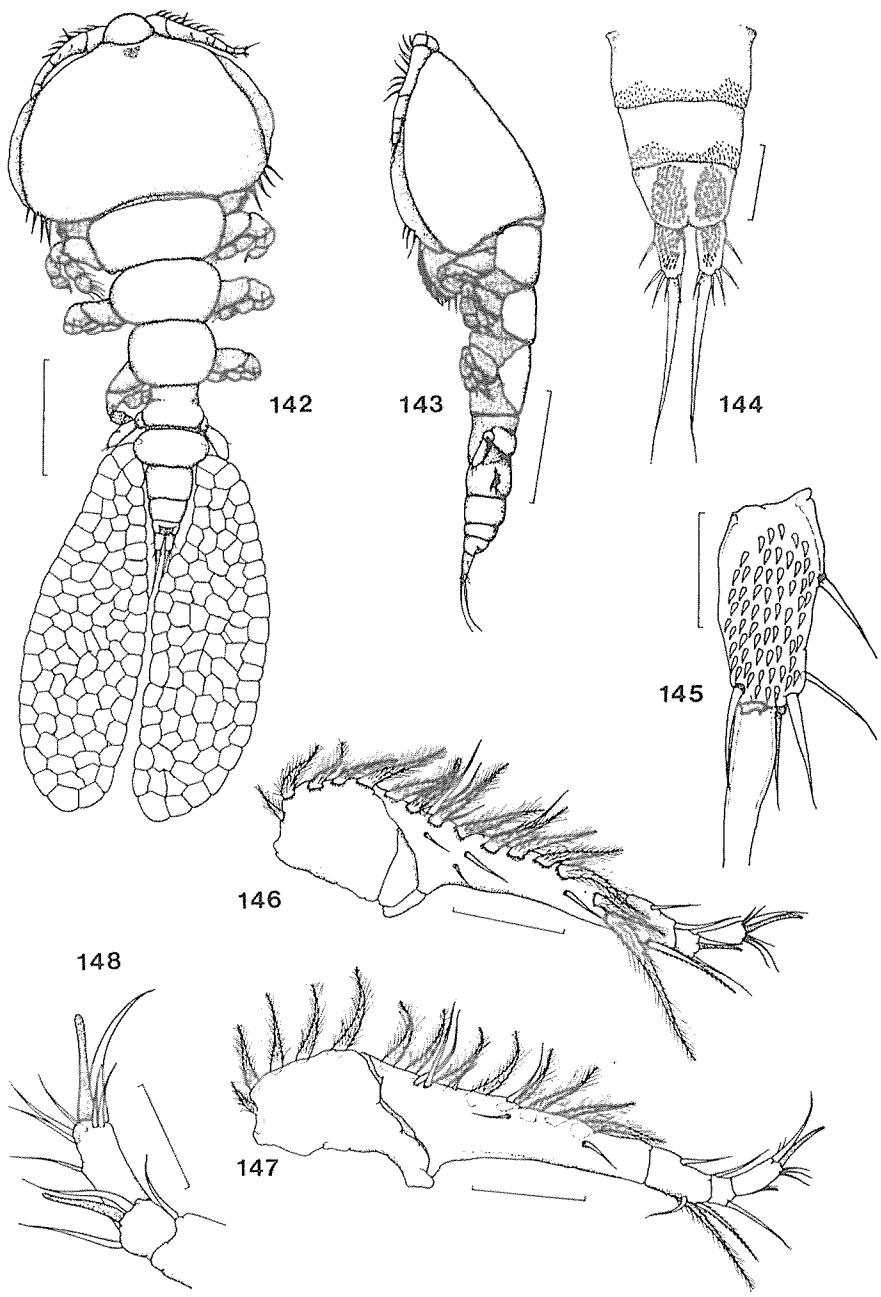
Fig. 122–128. *Orbitacolax hapalogenyos* (Yamaguti & Yamasu), female.
Fig. 122: habitus, dorsal; Fig. 123: habitus, lateral; Fig. 124: urosome, ventral; Fig. 125: caudal ramus, ventral; Fig. 126: egg sac; Fig. 127: rostrum and first antenna, ventral; Fig. 128: first antenna, dorsal. Scales: 500μm in 122, 123; 100μm in 124, 127, 128; 20μm in 125; 200μm in 126.



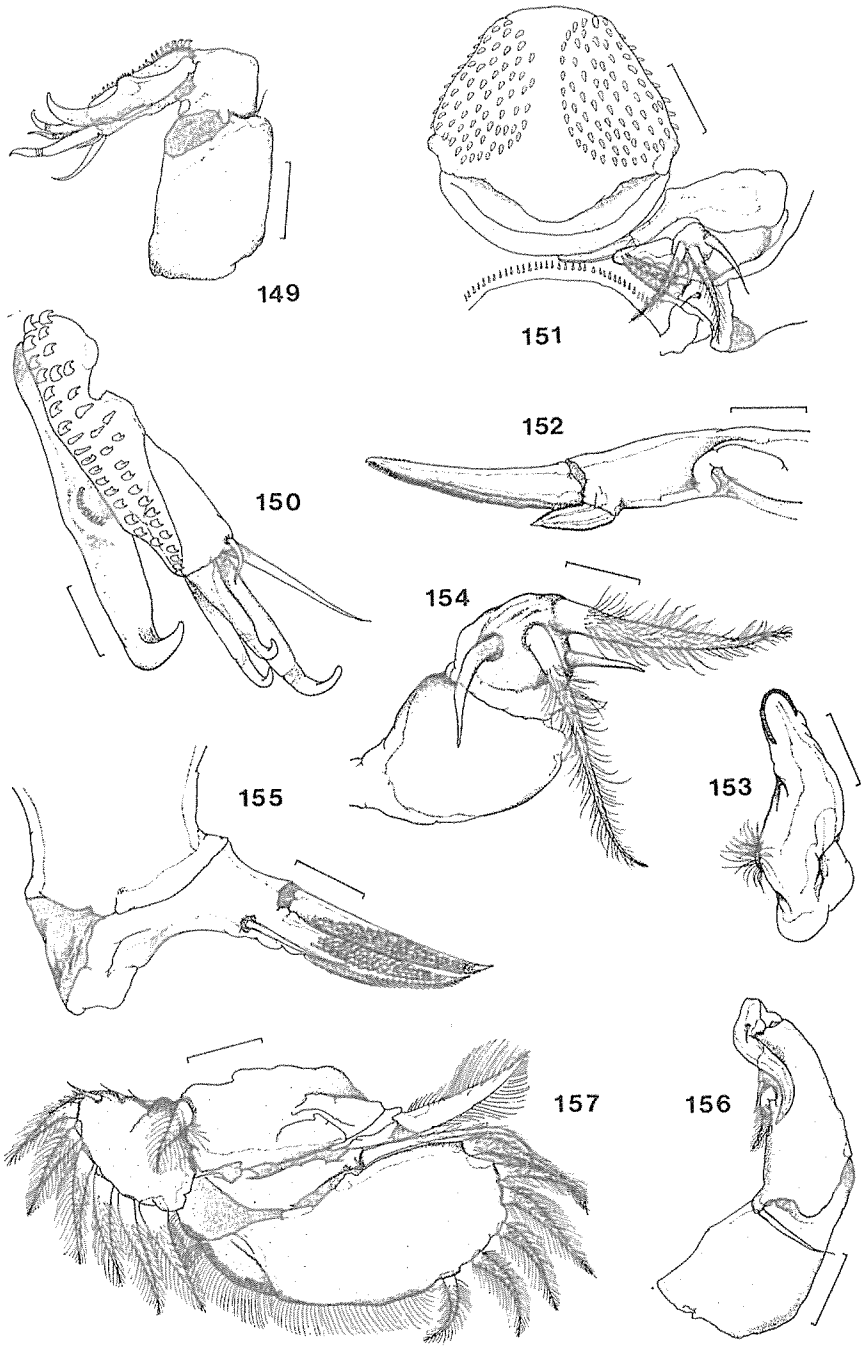
Figs. 129–137. *Orbitacolax hapalogenyos* (Yamaguti & Yamasu), female.
Fig. 129: second antenna, ventral; Fig. 130: tip of second antenna, anterior; Fig. 131: labrum and oral appendages; Fig. 132: tip of mandible; Fig. 133: paragnath; Fig. 134: tip of second maxilla; Fig. 135: maxilliped; Fig. 136: leg 1, dorsal; Fig. 137: outer spines on leg 1 exopod. Scales: 50 μm in 129,131,135; 20μm in 130, 132, 133, 134, 137; 100μm in 136.



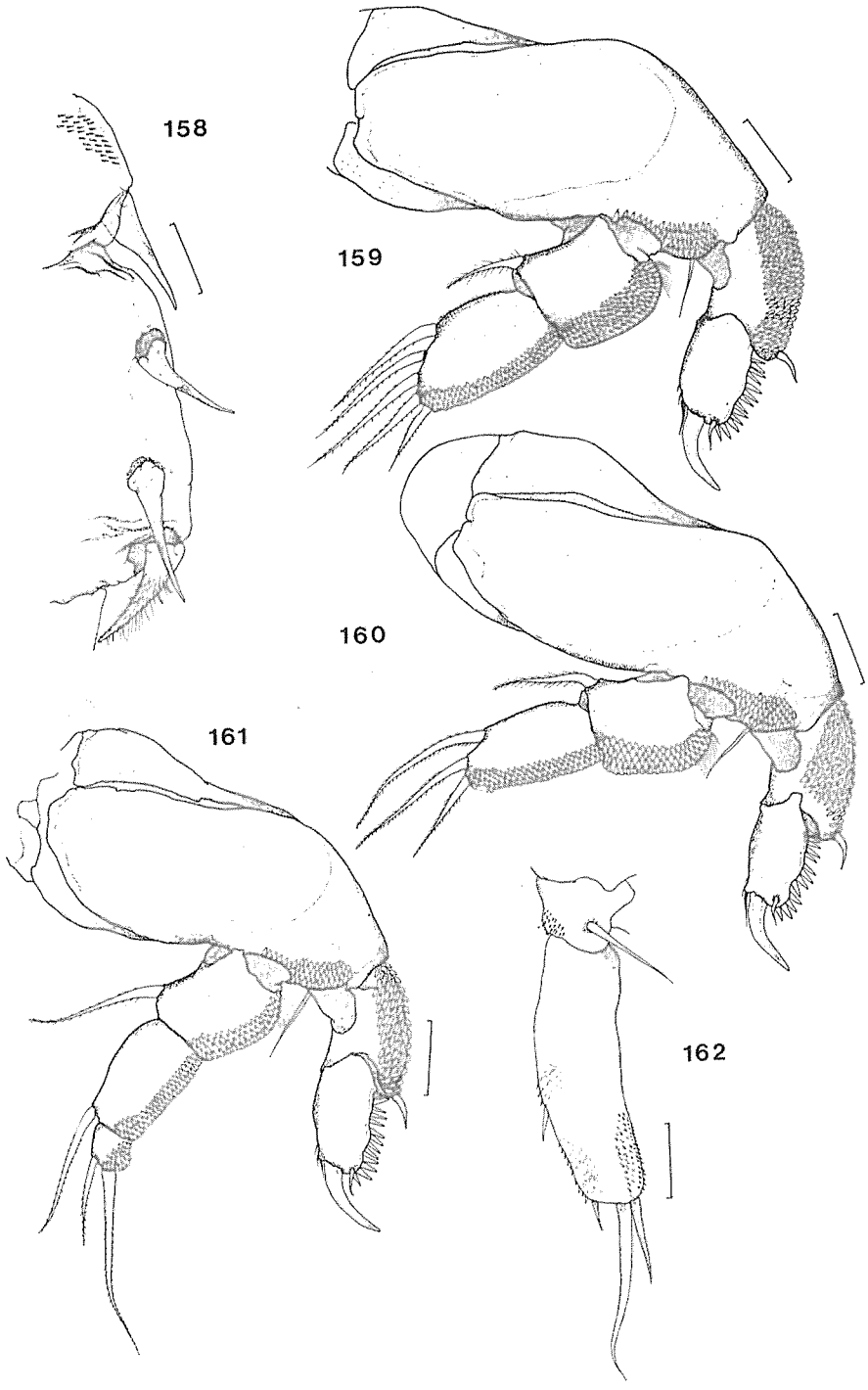
Figs. 138–141. *Orbitacolax hapalogenyos* (Yamaguti & Yamasu), female.
Fig. 138: leg 2, dorsal; Fig. 139: leg 3, dorsal; Fig. 140: leg 4, dorsal; Fig. 141: leg 5, posterior. Scales: 50μm in all figures.



Figs. 142–148. *Pumiliopes squamosus* Cressey & Boyle, female.
Fig. 142: habitus, dorsal; Fig. 143: habitus, lateral; Fig. 144: abdomen and caudal rami, ventral; Fig. 145: caudal ramus, ventral; Fig. 146: first antenna, ventral; Fig. 147: first antenna, dorsal; Fig. 148: tip of first antenna, ventral. Scales: 500 μm in 142, 143; 100μm in 144, 146, 147; 50μm in 145, 148.



Figs. 149–157. *Pumiliopes squamosus* Cressey & Boyle, female.
Fig. 149: second antenna, dorsal; Fig. 150: third segment of second antenna; Fig. 151: labrum and oral appendages; Fig. 152: mandible; Fig. 153: paragnath; Fig. 154: first maxilla; Fig. 155: second maxilla; Fig. 156: maxilliped; Fig. 157: leg 1, dorsal. Scales: 50μm in 149, 151; 20μm in 150, 152, 153, 154; 100μm in 156, 157.



Figs. 158–162. *Pumiliopes squamosus* Cressey & Boyle, female.
Fig. 158: outer spines on leg 1 exopod, dorsal; Fig. 159: leg 2, ventral; Fig. 160: leg 3, ventral; Fig. 161: leg 4, ventral; Fig. 162: leg 5, dorsal. Scales: 50μm in all figures.

岡山県児島湾産魚類にみられた寄生性橈脚類 Bomolochidae 科について

Ju-shey Ho·Tran The Do・笠原正五郎

岡山県児島湾において，1980年5月から1981年3月まで季節毎に計4回にわたり採集した魚類54種770尾から見いだされた寄生性橈脚類のうち，Bomolochidae科の7種類について記載した。これらは，サヨリ(*Hemirhamphus sajori* (Temminck & Schlegel))の鰓に寄生していた*Bomolochus bellones* Burmeister, 1835を始め，アイナメ(*Hexagrammos otakii* Jordan & Starks)の鼻腔内から得た新属新種*Naricolax atypicus* gen. et sp. nov.，スズキ(*Lateolabrax japonicus* (Cuvier))の鰓からの*Nothobomolochus lateolabracis* (Yamaguti & Yamasu, 1959)，マナガツオ(*Pampus argenteus* (Euphrasen))の鰓腔内からの*Nothobomolochus triceros* (Bassett-Smith, 1898)，コノシロ(*Konosirus punctatus* (Temminck & Schegel))の鰓からの新種*Nothobomolochus thambus* sp. nov.，セトダイ(*Hapalogenys mucronatus* Eydoux & Souleyet)の鰓腔内からの*Orbitacolax hapalogenyos* (Yamaguti & Yamasu, 1959)，およびサッパ(*Harengula zunasi* Bleeker)の眼瞼下から得た*Pumiliopes squamosus* Cressey & Boyle, 1973の，計7種である。

これらのうち，*B. bellones*についてはその形態と分布を詳細に検討した結果，本種とすでに報告されている*B. hyporhamphi* Yamaguti & Yamasu, 1959, *B. tumidus* Shiino, 1957, *B. hemirhamphi* Pillai, 1965とは何れも同一種であると判断された。また，アイナメの鼻腔内にみられた新属*Naricolax* gen. nov.は，*Unicolax* Cressey & Cressey, 1980と共通するいくつかの形態的特徴が認められたが，両者の間には第3遊泳脚内肢第2節目の剛毛数に差があることから区別され，さらにコノシロの鰓からの新種*N. thambus*は，顎脚の形態により同属における他の種類と明瞭に区別できることを指摘した。

以上，本論文に記載された2新種を加え，今日までに明らかとなった日本産寄生性橈脚類Bomolochidae科の種類は14種であると認められ，今後の研究に資するためこれらの種類の分類検索表を示した。