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AUTHOR(S):

Hirayama, Akira

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**TAXONOMIC STUDIES ON THE SHALLOW WATER
GAMMARIDEAN AMPHIPODA OF WEST KYUSHU, JAPAN**

II. COROPHIIDAE¹⁾

AKIRA HIRAYAMA²⁾

Amakusa Marine Biological Laboratory, Kyushu University
Reihoku-cho, Amakusa, Kumamoto 863-25, Japan

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Corophiidae

Key to the genera of Corophiidae

- 1 Uropod 3 uniramous2
Uropod 3 biramous4
- 2 Merus and carpus of gnathopod 2 continuous in corophiid fashion*Corophium*
Merus and carpus of gnathopod 2 attached in ordinary fashion.....3
- 3 Ramus of uropod 3 longer than peduncle.....*Grandidierella*
Ramus of uropod 3 shorter than peduncle, small.....*Siphonocetes*
- 4 Inner ramus of uropod 3 shorter than outer one.....5
Inner ramus of uropod 3 subequal or equal to outer one in length.....8
- 5 Accessory flagellum multiarticulate6
Accessory flagellum absent or vestigial7
- 6 Palp articulate 3 of mandible densely setose*Pareurystheus*
Palp articulate 3 of mandible less setose.....*Protomedeia*
- 7 Palm of gnathopods undefined*Pseudophotis*
Palm of gnathopods distinct*Photis*
- 8 Gnathopod 2 larger than gnathopod 19
Gnathopod 2 smaller than gnathopod 110
- 9 Coxae very small, slightly overlapping seriously.....*Aorcho*
This character not combined.....*Gammaropsis*
- 10 Gnathopod 1 of male subchelate*Lembos*
Gnathopod 1 of male merochelate 11
- 11 Accessory flagellum absent.....*Aoroides*
Accessory flagellum present.....*Aora*

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1) Contributions from the Amakusa Marine Biological Laboratory, Kyushu University, No. 284b.

2) Present address: Biological Laboratory, the Department of Liberal Arts, 5-24-10 Sakai, Musashino-shi, Tokyo 180, Japan.

*Corophium*Key to the species of *Corophium*

- 1 Urosome segmented2
 Urosome coalescent.....4
 2 Dactyl of gnathopod 2 with long setae apically, not laminal.....*C. kitamori*
 Dactyl of gnathopod 2 laminal, falcate.....3
 3 Ramus of uropod 3 subequal to peduncle in length, oval.....*C. volutator japonica*
 Ramus of uropod 3 distinctly longer than peduncle.....*C. lamellate*
 4 Grasping margin of dactyl on gnathopod 2 with one tooth.....*C. crassicorne*
 Grasping margin of dactyl on gnathopod 2 with two teeth.....*C. acherusicum*
 Grasping margin of dactyl on gnathopod 2 with three teeth*C. insidiosum*
 Grasping margin of dactyl on gnathopod 2 with four teeth and several spines....
*C. uenoi*

Corophium kitamori Nagata, 1965

C. kitamori: Nagata 1965c, p. 318-319

Material examined: Tomioka Bay, Shijiki Bay, Ariake Sea.

Corophium volutator (Palles, 1766) *japonica* subsp. nov.

(Fig. 43-44)

Body: Body depressed. Rostrum vestigial, anterior head lobe weak. Eyes small. Pleonal epimeron 1 small, rounded, with four long pinnate and three short setae, pleonal epimera 2-3 unknown. Urosome segmented, gradually narrowing, urosomite 1 with one pair of four small setae on ventral sides and one dorsodistal pair of setae, urosomite 2 with one dorsodistal pair of four setae.

Antennae: Antenna 1 slender, setose, peduncular segment 1 with one ventrodistal spine, peduncular segment 2 two thirds as long as peduncular segment 1, peduncular segment 3 about half as long as peduncular segment 2, accessory flagellum absent. Antenna 2 stout, gradually decreasing in thickness, setose, gland cone of peduncular segment 2 stout, falcate, peduncular segment 4 longer than peduncular segment 5, with one ventrodistal acute and stout tooth, with one spine at ventrodistal one third, peduncular segment 5 distinctly narrower than peduncular segment 4, flagellum unarticulate, two thirds as long as peduncular segment 5, attenuate distally.

Mouthparts: Upper lip semicircular, concave and densely bristly on apical margin. Inner plates of lower lip coalescent on inner proximal half, rounded, densely pubescent, medium in size, both outer plates prominently apart from each other, shoulders rounded, inner margin and shoulders densely pubescent, mandibular process vestigial. Inner plate of maxilla 1 unknown, outer plate with five bifid



Fig. 43. Distribution of *Corophium volutator volutator* (Palles) (○) and *Corophium volutator japonica* subsp. nov. (●) in the world.

tooth-like spines and two stout tooth-like spines which are rounded apically and are armed with one tooth, palp broad, extending beyond outer plate, biarticulate, proximal segment very short, apical margin of terminal segment rounded, with eight conical teeth and five setae. Inner plate of maxilla 2 with one longitudinal row of thirty-three pinnate setae on inner margin, apical margin rounded, with one row of nine short setae pectinated distally, outer plate a little broader than inner one, distinctly extending beyond the latter, inner distal margin with twelve pairs of simple setae, apical margin with one row of nine pinnate setae, and one single pinnate seta. Mandibles similar to each other, incisor produced inward, with three acute teeth, lacinia mobilis similar to incisor, with three acute teeth, accessory blades three, finely pectinated distally, proximal one bifid, molar process medium or rather larger, truncate, molar rasp medium, groove, else molar process with accessory trapezoid process densely pubescent apically and one pinnate seta, palp slender, biarticulate, proximal segment with one apical seta, terminal segment attached near apex of proximal one in right angle with it, with one apical seta. Inner plate of maxilliped medium, with one basal transverse row of about eighteen pinnate setae, apex with five simple setae, outer plate not extending beyond 2nd segment of palp, inner margin densely setose, palp four articulate, proximal two segments three fourths as long as palp, proximal segment with three long pinnate setae on outer distal end and one long pinnate seta on inner distal end, inner margin of 2nd segment densely setose, outer distal end with four setae, 3rd segment long oval, densely setose on inner distal margin, outer distal margin with five setae, terminal segment vestigial, with one slender falcate tooth and four distal setae.

Gnathopod 1: Coxa 1 extending forward, not attenuate distally, lower margin rounded, with three long pinnate and two small setae, anterior margin with three short setae. Gnathopod 1 subchelate. Basis one third as long as gnathopod 1, posterodistal margin with one short seta. Ischium short, stout, expanded antero-distally, posterodistal end surrounded by about eleven long pinnate setae. Merus

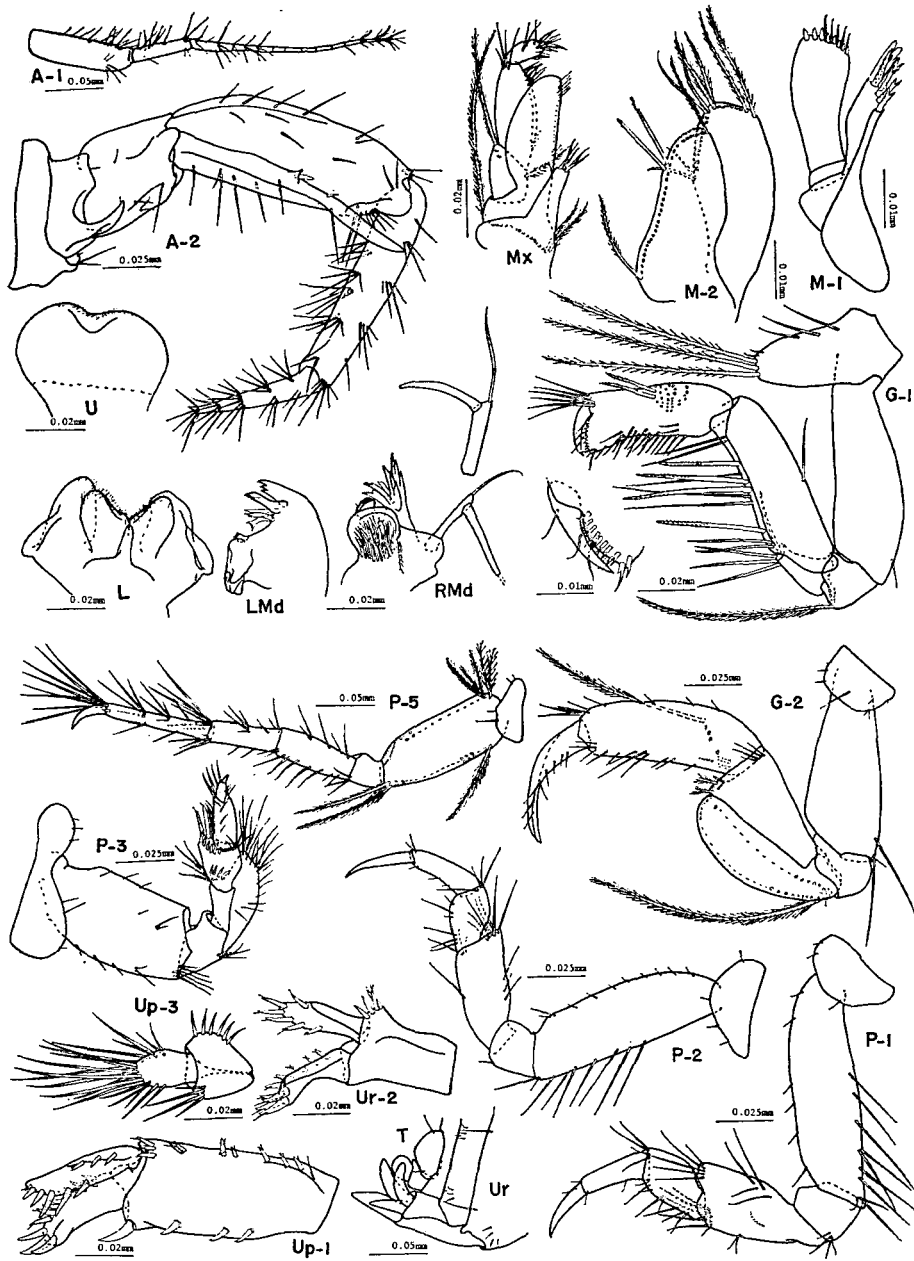


Fig. 44. *Corophium volutator japonica* subsp. nov. Holotype, female, 6.0 mm.

as long as ischium, decreasing in thickness, truncate, posterodistal end with four slender setae. Carpus increasing in width proximally, but following part almost uniform in width, anterior margin with one medial seta, posterior margin with many slender simple setae and many stout setae pectinated on distal half. Propod

cryptic, three fourths as long as carpus, narrow proximally, following part rectangular, but slightly expanded distally, anterior part with many stout setae pectinated distally in rows, anterodistal end with six setae, posterior margin with one, three, two single, two, three, three, two and two short setae in formula, palm transverse, gently rounded, with two opposite rows of nine bifid spines. Dactyl not extending beyond palm, falcate, grasping margin with two or three setae.

Gnathopod 2: Coxa 2 rectangular, but roundish. Basis as long as propod, increasing in width, posterodistal end with two long and one short setae. Ischium short, stout, rounded posteriorly. Merus subequal to basis in length, gently rounded posteriorly, reaching near apex of carpus, with many long pinnate setae in two rows. Carpus about two thirds as long as propod, increasing in width, anterodistal and with four short setae, posterodistal end with two rows of three long pinnate setae. Propod uniform in width, gently rounded anteroproximally, anterior margin with several small setae and one distal pair of short setae, posterior margin with several setae, inner proximal part with one oblique row of seven long pinnate setae. Dactyl lamellate, falcate, shorter than propod, grasping margin with eight short setae.

Peraeopod 1: Coxa 3 small, rounded. Basis three sevenths as long as peraeopod 1, almost uniform in width, anterior margin with six small setae, posterodistal two thirds with five long setae, one pair of long setae, and one distal set of three long and short setae. Ischium short, as long as wide, posterodistal end with five short setae. Merus about half as long as basis, gradually expanding backward, slightly and obliquely extending backward, anterior margin with one medial longitudinal row of four setae and one distal transverse row of five setae, posterior margin with one medial pair of small setae, and one transverse row of six long and short setae on inner distal end. Carpus half as long as merus, narrow proximally, anterodistal end with eight short setae. Propod as long as carpus, decreasing in width, anterodistal end with one minute seta, posterior margin with one proximal minute and one distal minute setae. Dactyl shorter than propod, falcate.

Peraeopod 2: Coxa 4 similar to coxa 3. Peraeopod 2 similar to peraeopod 1 except for numbers of setae.

Peraeopod 3: Coxa 5 bilobate, very shallow, but broad, rounded. Basis three sevenths as long as peraeopod 3, broad, stout, almost uniform in width, anterior margin with three single short setae, one pair of short setae and one distal transverse row of seven short setae. Ischium one third as long as basis, stout, anterodistal end with five short setae. Merus twice as long as ischium, most expanded medially, anterior margin rounded, broadly extending to near apex of carpus, with one proximal longitudinal row of seven setae, two medial pairs of setae and two distal sets of three setae, posterior margin with four medial setae. Carpus about half as long as merus, anterodistal end with four short setae, posteroproximal margin with one transverse row of four spines, posterodistal end surrounded by six small spines, two long stout spines and three short setae. Propod as long as carpus, about half as broad as it, roundish, outer side with one longitudinal row of three small

setae, inner distal end with three small and four short setae. Dactyl small, with one conical tooth apically.

Peraeopod 4: Coxa 6 similar to coxa 5. Peraeopod 4 similar to peraeopod 3, but anterior margin of basis with long setae.

Peraeopod 5: Coxa 7 small, rounded. Peraeopod 5 rather slender, long. Basis shorter than one third as long as peraeopod 5, weakly expanding, rather slender, anterior and posterior margins with two longitudinal rows of many pinnate setae. Ischium short, a little longer than wide, anterodistal end with three short setae. Merus about two thirds as long as basis, uniform in width, anterior margin with seven single short setae and one distal pair of short setae, posterior margin with three single short setae, and two medial and distal pairs of short setae. Carpus shorter and a little narrower than merus, anterior margin with two medial single short and three distal short setae, posterior margin with one short seta, one set of four short setae, and one distal set of seven short and long setae. Propod about one and half times as long as carpus, narrower than it, anterior margin with two single setae and one locking spine, posterior margin with one seta, two sets of four setae and one distal set of eight long setae. Dactyl distinctly shorter than half as long as propod, falcate.

Pleopods: Pleopods similar to those of *C. volutator*.

Uropods: Uropod 1 extending beyond uropod 2, peduncle stout, about one and half times as long as rami, outer margin with one proximal seta, five single spines, one pair of spines and one apical set of three spines, inner margin with three smaller and one apical stout spines, both rami equal to each other in length, clavate, outer ramus with three spines on outer proximal half and six spines on inner distal half, inner ramus with two pairs of spines and six single spines on outer margin, and three stout spines on apex. Uropod 2 subequal to peduncle of uropod 1 in length, peduncle subequal to rami in length, stout, with four apical spines on outer distal end, rami equal to each other in length, clavate, distal half margin of outer ramus with six spines, inner ramus with six spines on outer margin and three stout spines on apex. Uropod 3 longer than half as long as uropod 2, uniramous, peduncle subequal to rami in length, broadly expanding distally, inner distal half with six short setae, outer distal end with one transverse row of four slender setae, ramus oval, distal half margin densely setose, these setae long.

Telson: Telson fleshy, small, broad, rounded, with one pair of setae.

Material examined. Holotype: Female, 6.0 mm. Type-locality: Tomioka Bay. Date: May, 1978. Collection No.: AMBL-Amph. 79.

Remarks. The new subspecies well agrees with *Corophium volutator* and *C. arenarium* (Sars 1895, Crawford 1937, Stock 1960, etc.), but several trifle and important differences can be found. For example, the gland cone of antenna 2 is small and straight, the coxa 1 is triangular, prominently produces forward and tapers distally, and the merus of peraeopod 3 is armed with pinnate setae. The new subspecies is rather similar to *C. orientalis* in these characters (Crawford 1937, Stock 1960).

J.H. Stock (1960) referred that *C. orientalis* differed from *C. volutator* and *C. arenarium* in much stronger development of the gland cone of antenna 2. The present subspecies is, however, clearly distinguished from *C. orientalis* by the uropods, the telson, the merus and the carpus of pereopods 3-4 and so on. The new subspecies rather seems to have the fundamental characters of *C. volutator*, but it is difficult to point the differences between *C. volutator* and *C. arenarium*.

Corophium lamellate sp. nov.

(Fig. 45)

Body: Body depressed. Rostrum vestigial, anterior head lobe weakly producing. Eyes small, circular. Coxae small except for coxa 1 producing forward. Pleonal epimeron 1 rectangular, lower margin with three pinnate setae, posterior margin with two small setae, pleonal epimeron 2 twice as broad as pleonal epimeron 1, rectangular, posterolower margin with three pinnate and one simple setae, pleonal epimeron 3 as broad as pleonal epimera 1-2 combined, rectangular, with one posterodistal blunt tooth, lower margin with three small simple setae. Urosome segmented, urosomite 1 three times as long as urosomite 2, with one dorsodistal pair of small setae, urosomite 3 as long as urosomite 2, prominently produced on both lateral sides which are armed with one distal spine.

Antennae: Antenna 1 slender, peduncular segment 1 longer than head length, inner ventral margin with two medial and one apical spines, peduncular segment 2 as long as and half as thick as peduncular segment 1, with one spine ventroproximally, peduncular segment 3 about half as long as peduncular segment 2, slenderer than it, flagellum subequal to peduncular segments 2-3 combined in length. Antenna 2 unknown.

Mouthparts: Upper lip rectangular in upper view, broad on apex. Inner plate of lower lip developed, coalescent on inner proximal half, densely pubescent, shoulders broad, inner margin of outer plate densely pubescent, mandibular process weakly developed. Inner plate of maxilla 1 unknown, outer plate with two simple tooth-like spines and five tooth-like spines armed with one tooth, palp biarticulate, curved outward, broad, proximal segment short, apex of terminal segment broad, rounded, with two rows of nine setae. Maxilla 2 normal in corophids, inner margin of inner plate with nine pinnate setae and five pairs of simple setae, apical margin with seven simple setae, inner distal half of outer plate with four pinnate setae, apical margin rounded, with four pinnate setae on outer half and ten stiff setae on inner half. Mandibles similar to each other, incisor producing forward, broad, with three teeth, lacinia mobilis similar to incisor, with three teeth, accessory blades three, serrated apically, molar process truncate, with one trapezoid accessory process serrated apically, lower distal margin with nine setae, molar rasp medium, palp biarticulate, proximal segment with one long dispersively pinnate setae apically, terminal segment attached near apex of proximal one, extending to right angle with

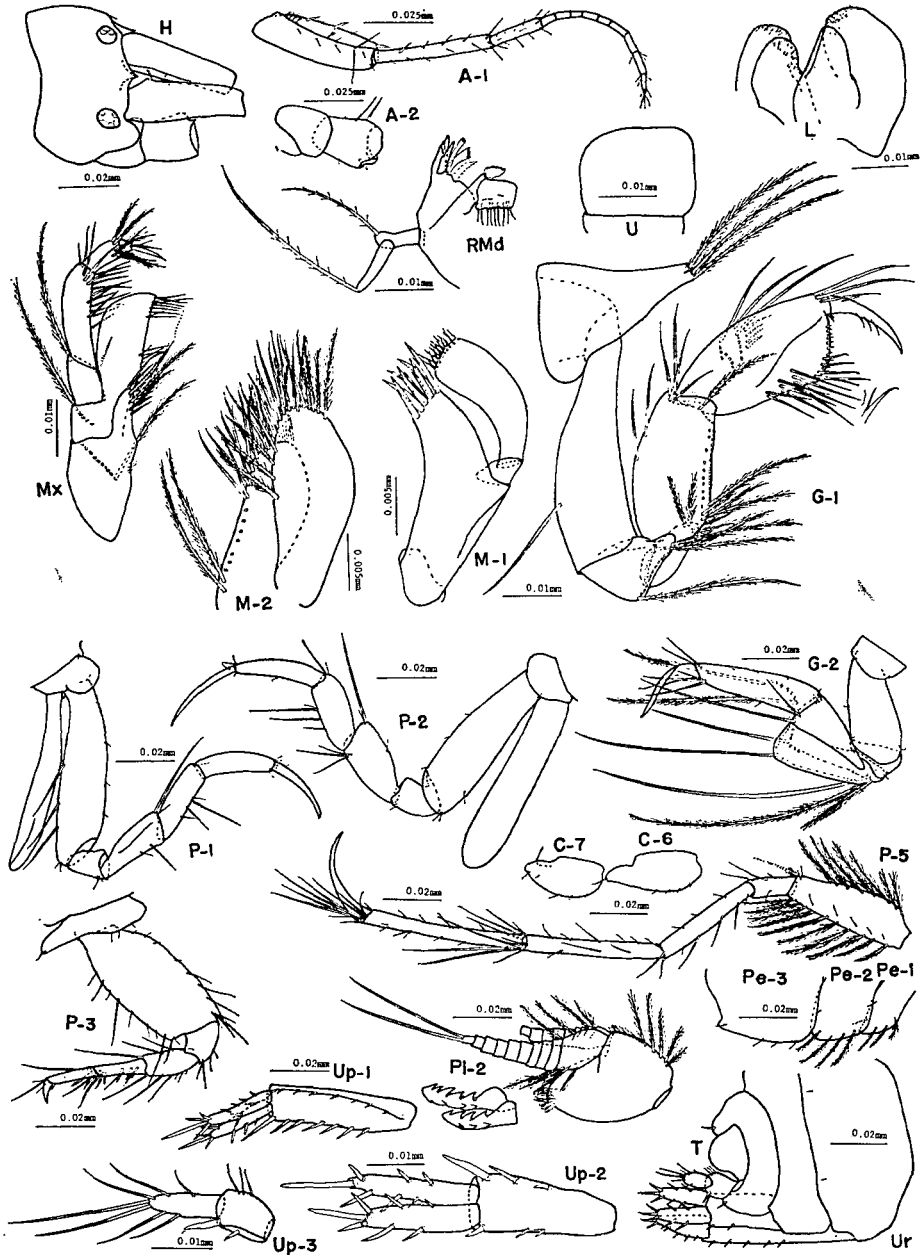


Fig. 45. *Corophium lamellate* sp. nov. Holotype, female, 3.25 mm.

proximal one, with one long dispersively pinnate setae apically. Inner plate of maxilliped medium or rather smaller, not broad, ventrobasal margin with one oblique row of ten pinnate setae, inner distal margin with two short simple, three long pinnate and two short simple setae in formula, outer plate medium, inner distal half densely setose, ventrodistal margin of basal part with one oblique row of six

long pinnate setae, palp four articulate, slender, proximal two segments three fourths as long as palp, outer distal end of proximal segment with one long pinnate seta, inner distal two thirds of 2nd segment setose, 3rd segment about as long as inner margin of proximal segment, a little dilated distally, surrounded by seven distal pinnate setae, terminal segment small, stubby, with two simple setae and one long slender tooth.

Gnathopod 1: Coxa 1 triangular, but distal end not taper, with three long pinnate and two small simple setae. Gnathopod 1 subchelate. Basis about one third as long as gnathopod 1, with one long simple seta at posterodistal one third. Ischium short, but broad and stout, extending forward on anterodistal part, distal margin surrounded by about twenty-two long pinnate setae. Merus as long as ischium, scale-like, posterodistal end with five pinnate setae. Carpus three fifths as long as basis, almost uniform in width, broad, stout, anteromedial margin with two simple setae, anterodistal end surrounded by eight simple setae, posterior margin with two longitudinal rows of twelve and sixteen pinnate setae, inner distal end of posterior margin with one oblique row of five pinnate setae. Propod longer than carpus, cryptic, broad, inner anteromedial part rounded, with many long simple setae in transverse rows and one transverse row of four short setae, anterodistal end with three long simple setae, posterodistal half with two, three and four setae in formula, palm transverse, slightly rounded, finely pectinate, with five setae armed with one seta near apex, with ten small spines throughout and one pair of spines near base of dactyl. Dactyl fitting on palm, falcate, grasping margin with three medial small setae.

Gnathopod 2: Coxa 2 small, rounded. Gnathopod 2 similar to one of *Corophium volutator japonica* subsp. nov., but posterior margin of propod less setose, anterodistal end with two long setae, posterodistal end with three longer setae, grasping margin of dactyl with only two small setae.

Peraeopod 1: Coxa 3 small, rounded. Basis about three fifths as long as peraeopod 1, slender, anterior margin with four minute setae, posterior margin with three medial long setae and one distal pair of small setae. Ischium short, one and half times as long as wide, with one posterodistal pair of small setae. Merus narrowed anteroproximally, anterodistal end with one set of one small and one long setae, posterodistal margin with one small and one short setae. Carpus as long as merus, narrower than it, anterodistal end with one seta, posteromedial margin with four small and short setae. Propod as long as carpus, gently curved, both distal ends with two minute setae respectively. Dactyl as long as propod, falcate.

Peraeopod 2: Coxa 4 small, rounded. Peraeopod 2 similar to peraeopod 1, but posterior margin of basis lacking long setae, propod and dactyl longer than carpus.

Peraeopod 3: Coxa 5 very shallow, broad, extended posterodistally. Peraeopod 3 short. Basis broad, a little narrow proximally, with small and short setae. Ischium short, but broad, anterodistal margin with two single small setae and one pair of small setae. Merus shorter than half as long as basis, not produced distally, anterior margin with three small setae on proximal half and three long setae on

distal half, posterior margin with two medial long and one apical long setae. Carpus as long as merus, narrower than it, inner anterior margin with three spines on proximal half, and four spines and two setae distally, outer anteroproximal margin with two setae, posterodistal end with one long seta. Propod as long as and narrower than carpus, with one anterodistal spine and two posterodistal setae. Dactyl short, stout, falcate.

Peraeopod 4: Coxa 6 broad, extending backward. Peraeopod 4 unknown.

Peraeopod 5: Coxa 7 small, rounded. Peraeopod 5 slender, long. Basis slender, most expanded proximally, anterior margin with seven and one apical pinnate setae, posterior margin straight, with ten pinnate setae, else with one longitudinal row of five minute setae. Ischium about one third as long as basis, slender, uniform in width, anterior margin with three setae. Merus a little shorter than basis, a little slender than ischium, anterior margin with three small setae, posterior margin with four short and one small setae, outer distal end with three short setae. Carpus longer than basis, uniform in width, anterior margin with five short and four distal setae, posterior margin with three setae, and six distal small and long setae. Propod as long as basis and ischium combined, anterior margin with six small setae, posterior margin with four small setae, two pairs of small setae, and one distal set of eight short and long setae. Dactyl two thirds as long as propod, falcate.

Pleopods: Pleopods similar to each other, weakly developed, but stout. Peduncle of pleopod 2 prominently expanding inward, outer proximal half with five pinnate setae, distal half densely pubescent, inner distal margin with two coupling spines, densely pubescent, rami broad, stout, but decreasing in width, outer ramus nine articulate, longer than half as long as inner one, inner ramus ten articulate, proximal segment stout, lacking bifid setae, terminal swimming setae subequal to inner ramus in length.

Uropods: Uropod 1 not beyond uropod 2, peduncle twice as long as rami, stout, with eight smaller spines on outer margin and seven longer spines on inner margin, rami equal to each other in length, clavate, outer ramus with four spines on outer margin and one spine on inner one, apex with three short and one center long spines, both opposite margins of inner ramus with three spines respectively, apex with two and one center long spines. Uropod 2 longer than half as long as uropod 1, peduncle as long as inner ramus, outer distal half with two slender and one apical long stout spines, rami clavate, outer ramus shorter than inner one, both margins with two spines respectively, apex with two short and one center long spines, inner ramus with three spines on both margins, apex with one long spine. Uropod 3 half as long as uropod 2, uniramus, peduncle shorter than ramus, outer margin with one medial small and one distal large spines, inner margin with three medial setae, ramus clavate, with seven marginal setae.

Telson: Telson small, fleshy, semicircular.

Material examined. Holotype: Female, 3.25 mm. Type-locality: Tomioka Bay, Date: May, 1978. Paratype: 5 specimens. Collection No.: AML-*Amph.* 80.

Remarks. The present species belongs to the Section A (Shoemaker 1949) of which members have the distinctly separate segments of the urosome, and is distinguished from any other species of the Section A except for *C. robustum* and *C. rotundirostre* by the following points; (1) dactyl of gnathopod 2 falcate, flattened and without any spine, (2) merus of pereopods 3-4 not producing forward, and (3) ramus of uropod 3 not oval.

In *C. robustum* (Stebbing 1906), the anterior margin of pereopods 1-2 is armed with long setae, these meruses are almost as long as the carpus and the propod combined, and the rami of uropods 1-2 are armed without any spine on the inner margin. In *C. rotundirostre* (Ledoyer 1977), the carpus of pereopod 1 is very short, the palp of mandible is stubby, the coxa is armed with five long setae and the peduncular segment of antenna 1 is armed with only one proximal spine. The present species lacks the above-mentioned characters.

Corophium crassicorne Bruzelius, 1859

(Fig. 46-49)

C. crassicorne: Chevreux 1887, p. 316; Walker 1895, p. 317-318; Sars 1895, p. 614-615; Stebbing 1906, p. 690-691; Chilton 1912, p. 229-233; Chevreux and Fage 1925, p. 367-368; Crawford

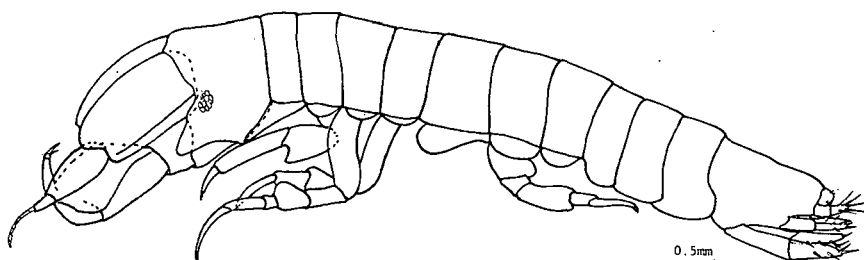


Fig. 46. *Corophium crassicorne* Bruzelius. Female, 6.0 mm.

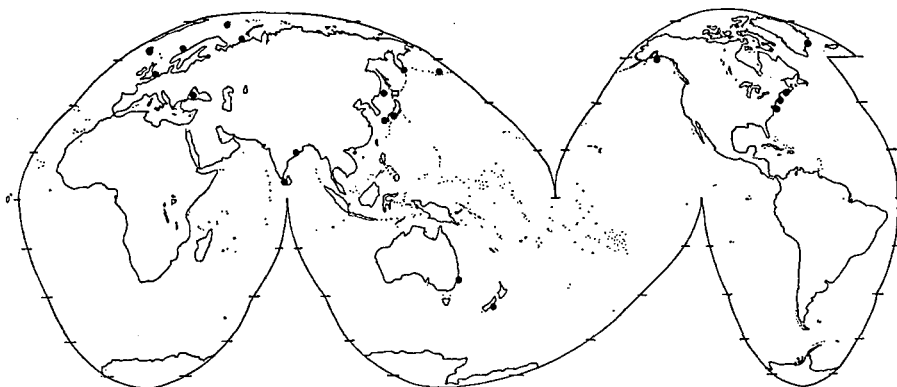


Fig. 47. Distribution of *Corophium crassicorne* Bruzelius (●) in the world.

1937, p. 607-608; Stephensen 1942, p. 410-411; Dahl 1946, p. 20; Shoemaker 1947, p. 53; Shoemaker 1949, p. 76; Gurjanova 1951, p. 976-977; Oldevig 1959, p. 117; Nagata 1965c, p. 317.

Material examined: Ariake Sea, Tomioka Bay, Shijiki Bay.

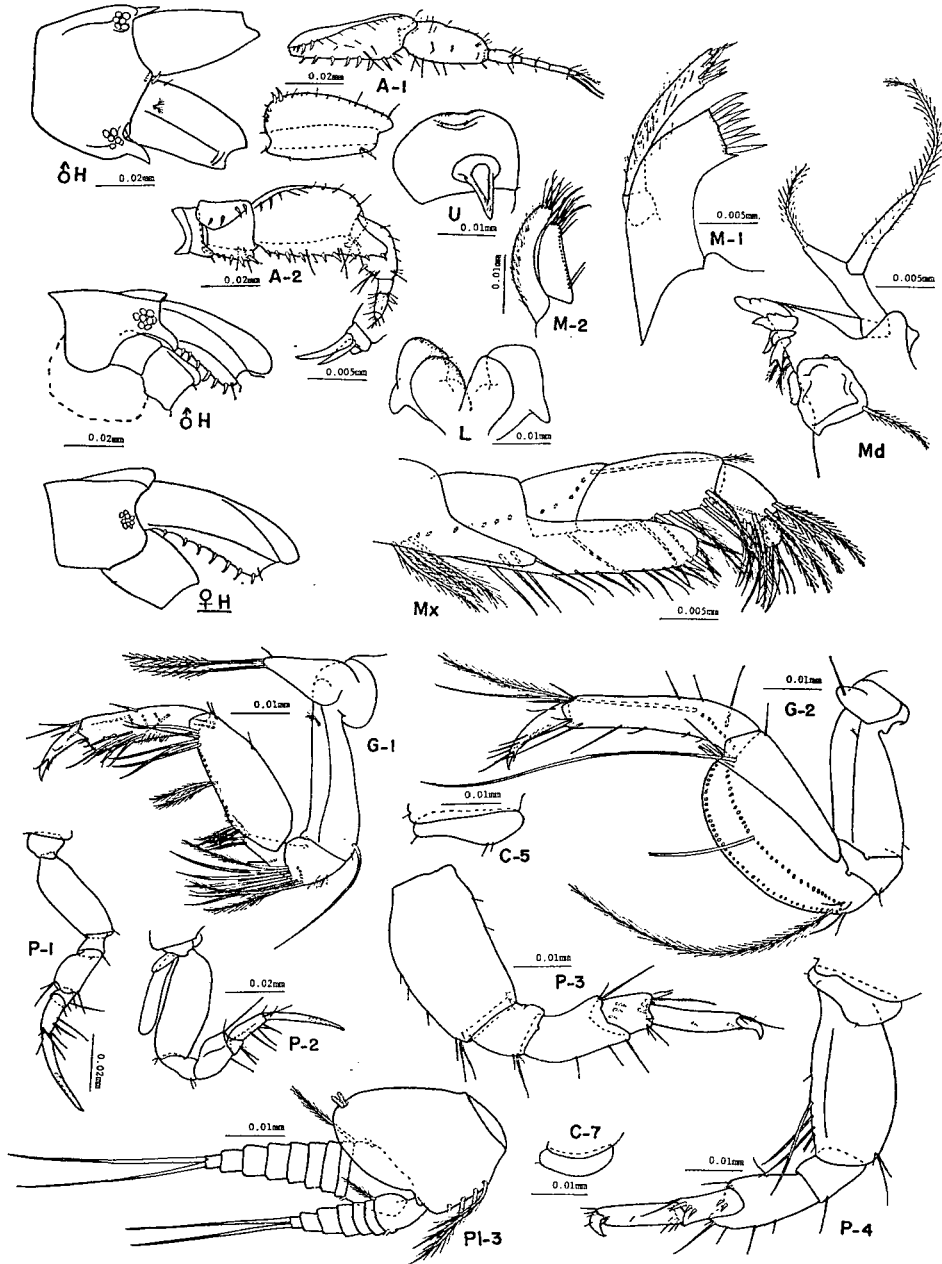


Fig. 48. *Corophium crassicorne* Bruzelius. Female, 6.0 mm.

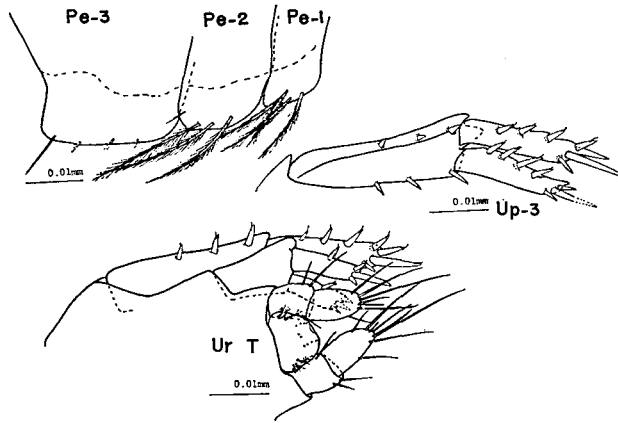


Fig. 49. *Corophium crassicorne* Bruzelius. Female, 6.0 mm.

Corophium acherusicum Costa, 1857

(Fig. 50)

C. acherusicum: Heller 1866, p. 51–52; Chevreux 1900, p. 109; Stebbing 1906, p. 692; K.H. Barnard 1916, p. 272–274; Chevreux and Fage 1925, p. 368; Schellenberg 1928, p. 672; Crawford 1937, p. 617–610; K.H. Barnard 1940, p. 482; Shoemaker 1947, p. 53; Shoemaker 1949, p. 76; Reid 1951, p. 269; Gurjanova 1951, p. 977–978; Hurley 1954c, p. 442–445; J.L. Barnard 1954b, p. 36; J.L. Barnard 1955a, p. 37; Irie 1956, p. 5–6; Nayer 1959, p. 43–44; Nagata 1960, p. 177; J.L. Barnard 1964a, p. 111; Nagata 1965c, p. 317; Reish and J.L. Barnard 1967, p. 16; Ledoyer 1968, p. 214; Fearn-Wannan 1968, p. 134–135; Bellan-Santini 1972a, p. 260–261; J.L. Barnard 1971a, p. 59; J.L. Barnard 1972c, p. 48; Krapp-Schikel 1974b, p. 346; Griffiths 1974a, p. 181–182; Griffiths 1974b, p. 228; Griffiths 1974c, p. 281; Griffiths 1975, p. 109; Fox and Bynum 1975, p. 225.

Material examined: Ariake Sea, Tomioka Bay, Shijiki Bay.

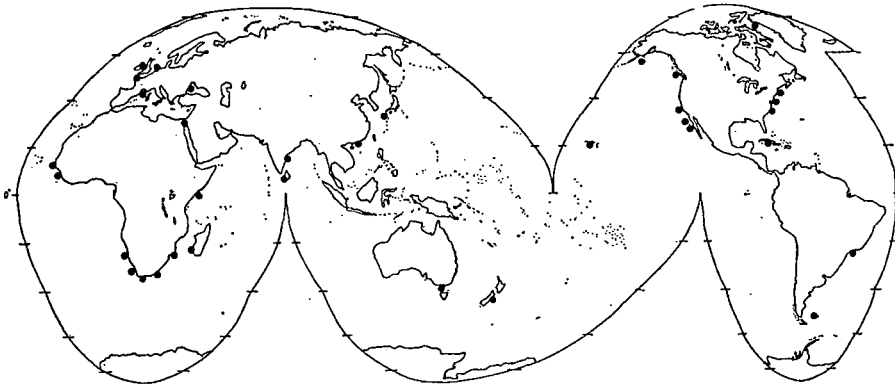


Fig. 50. Distribution of *Corophium acherusicum* Costa (●) in the world.

Corophium insidiosum Crawford, 1937

(Fig. 51)

C. insidiosum: Crawford 1937, p. 615–616; Dahl 1946, p. 21; Shoemaker, 1947 p. 53, 56; Shoemaker 1949, p. 77–78; Oldevig 1959, p. 118; Nagata 1960, p. 177–178; Nagata 1965c, p. 318; Krapp-Schickel 1970, p. 357; J.L. Barnard 1970b, p. 101–102; J.L. Barnard 1971a, p. 61.

Material examined: Ariake Sea, Tomioka Bay, Shijiki Bay.

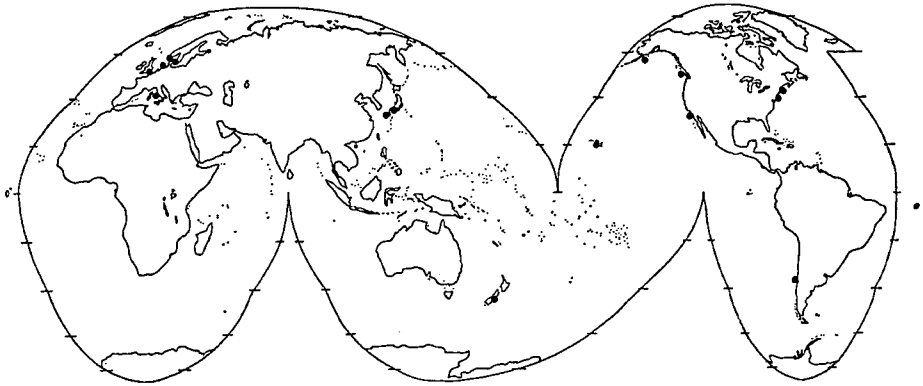


Fig. 51. Distribution of *Corophium insidiosum* Crawford (●) in the world.

Corophium uenoi Stephensen, 1932

(Fig. 52)

C. uenoi: Crawford 1937, p. 616; J.L. Barnard 1952, p. 28–32; Nagata 1960, p. 178; J.L. Barnard 1964a, p. 112; Nagata 1965c, p. 317–318; Reish and J.L. Barnard 1967, p. 16; J.L. Barnard 1969a, p. 197; J.L. Barnard 1969b, p. 102.

Material examined: Tomioka Bay, Shijiki Bay.

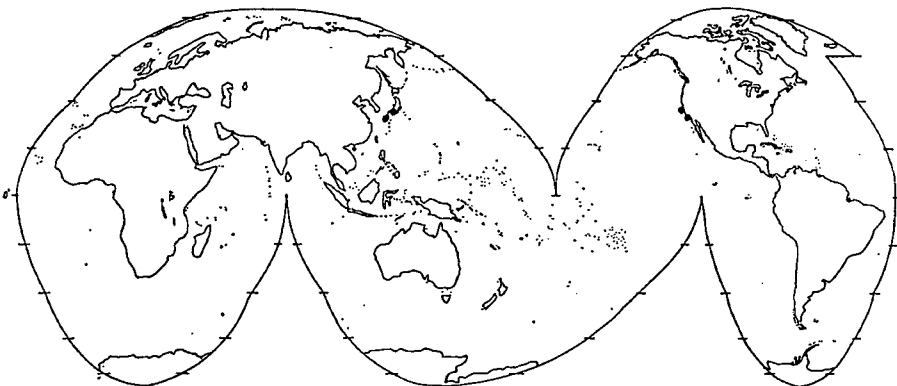


Fig. 52. Distribution of *Corophium uenoi* Stephensen (●) in the world.

Grandidierella

Grandidierella japonica Stephensen, 1938

(Fig. 53-56)

G. japonica: Stephensen 1938a, p. 179-184; Nagata 1960, p. 179; Nagata 1965c, p. 320-321; Chapman and Dorman 1975, p. 104-108.

Material examined: Ariake Sea, Tomioka Bay, Shijiki Bay.

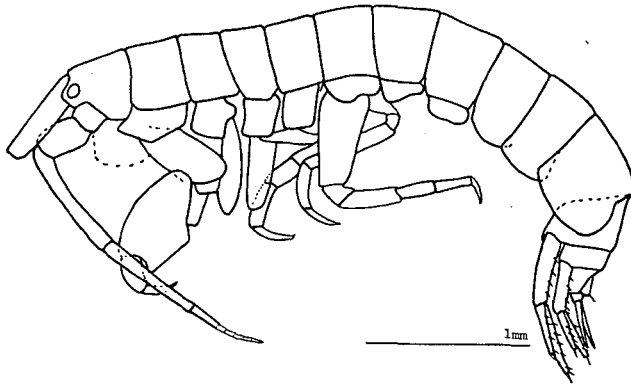


Fig. 53. *Grandidierella japonica* Stephensen. Male, 4.75 mm.

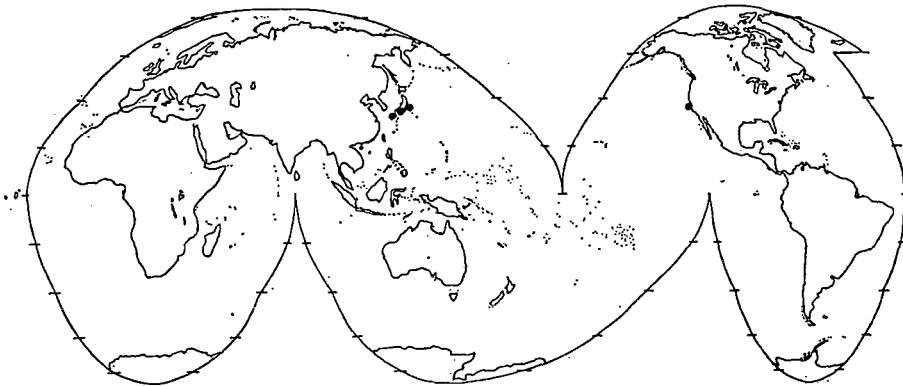


Fig. 54. Distribution of *Grandidierella japonica* Stephensen (●) in the world.

Siphonoecetes

Key to the species of *Siphonoecetes*

- 1 Ramus of uropod 3 very small.....*S. exolitus*
- Ramus of uropod 3 two thirds as long as peduncle.....*S. tanabensis*

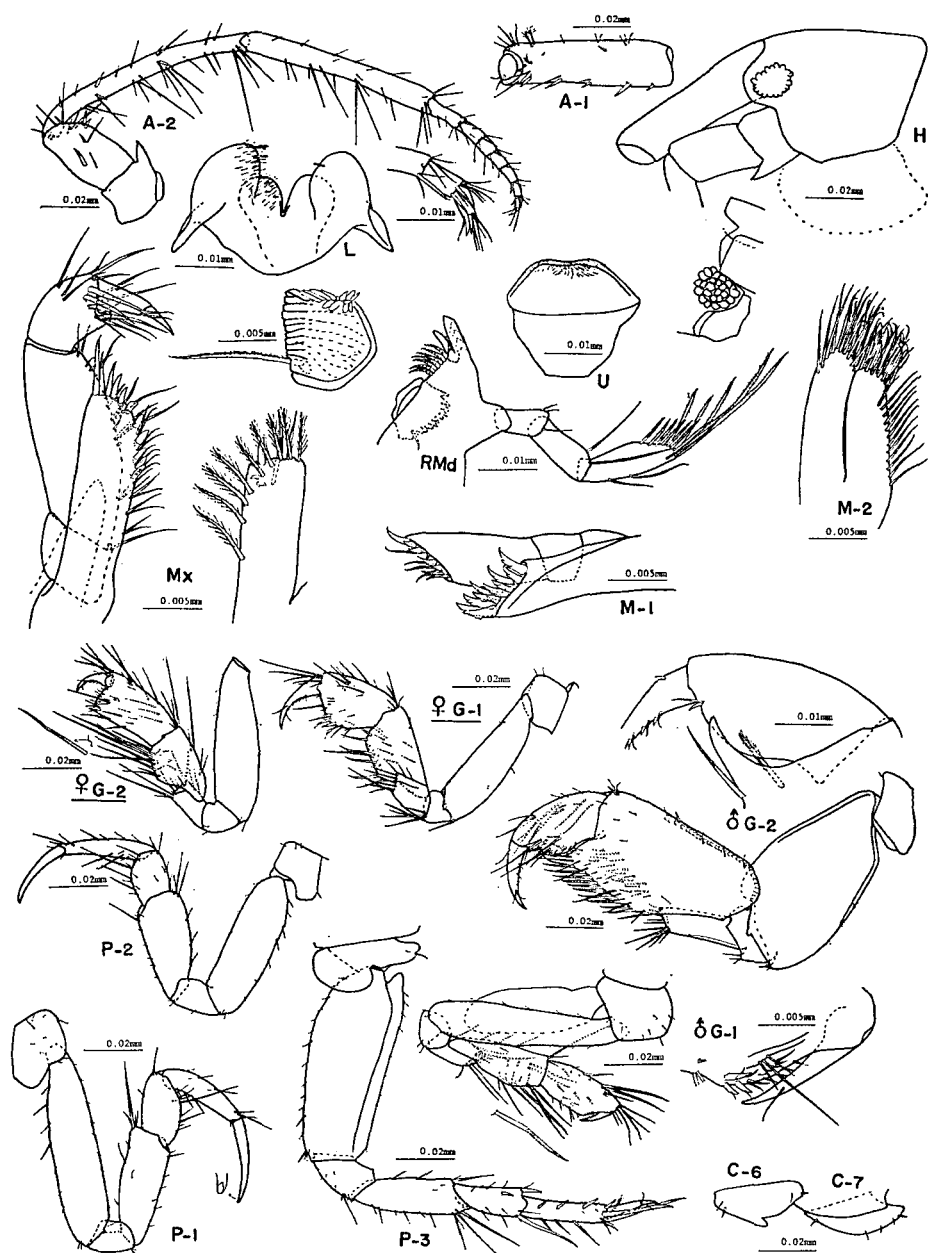


Fig. 55. *Grandidierella japonica* Stephensen. Male, 4.75 mm.

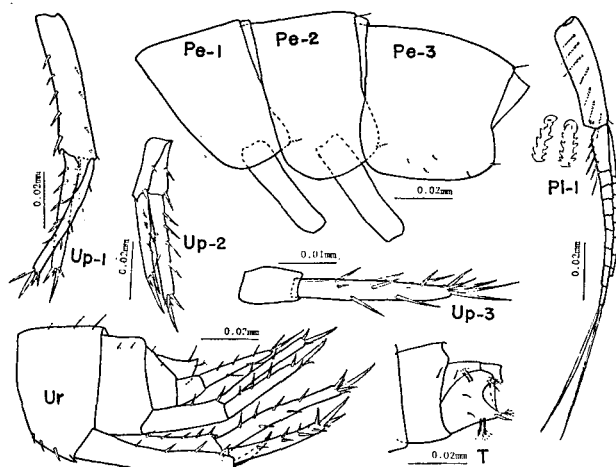


Fig. 56. *Grandidierella japonica* Stephensen. Male, 4.75 mm.

Siphonoecetes exolitus sp. nov.,

(Fig. 57-58)

Body: Body semicylindrical. Rostrum short, but broad, triangular, anterior head lobe prominently produced, semioval, with one or two distal small setae, inferior antennal sinus gently and deeply curved. Eyes placed on anterior head lobe, medium or rather small. Coxae small, not overlapping seriously. Pleonal epimeron 1 small, extending backward, rounded, with four pinnate setae, pleonal epimeron 2 rectangular, roundish, posterior margin with two small setae, pleonal epimeron 3 rectangular, broad, roundish, lower margin with four small setae, posterodistal margin with one small seta. Urosome segmented, urosomite 2 very short, urosomite 3 concealed by telson.

Antennae: Antenna 1 slender, setose, peduncular segment 1 as long as head length, peduncular segment 3 as long as and as thick as peduncular segment 2, flagellum six plus one rudimental segments. Peduncular segments 1-2 of antenna 2 narrow, not distinct, peduncular segment 3 setose, lower margin with one proximal set of three spines and two setae, lower margin with one proximal set of three spines, and two single spines, peduncular segments 4-5 and flagellum lost.

Mouthparts: Upper lip lost. Inner plate of lower lip large, rounded apically, densely pubescent, shoulders broad, rounded apically, densely pubescent, mandibular process medium, taper. Inner plate of maxilla 1 developed, slender, truncate, with two stiff setae and seven flexible setae, outer plate with seven bifid and simple tooth-like spines, palp extending beyond outer plate, gently curved, biarticulate, densely and finely bristly, proximal segment short, extended on outer distal end, apical margin of terminal segment rounded, with one pair of setae and five tooth-like spines. Maxilla 2 normal, inner margin of inner plate with one longitudinal row of ten setae, apical margin with six pairs of setae, outer plate extending

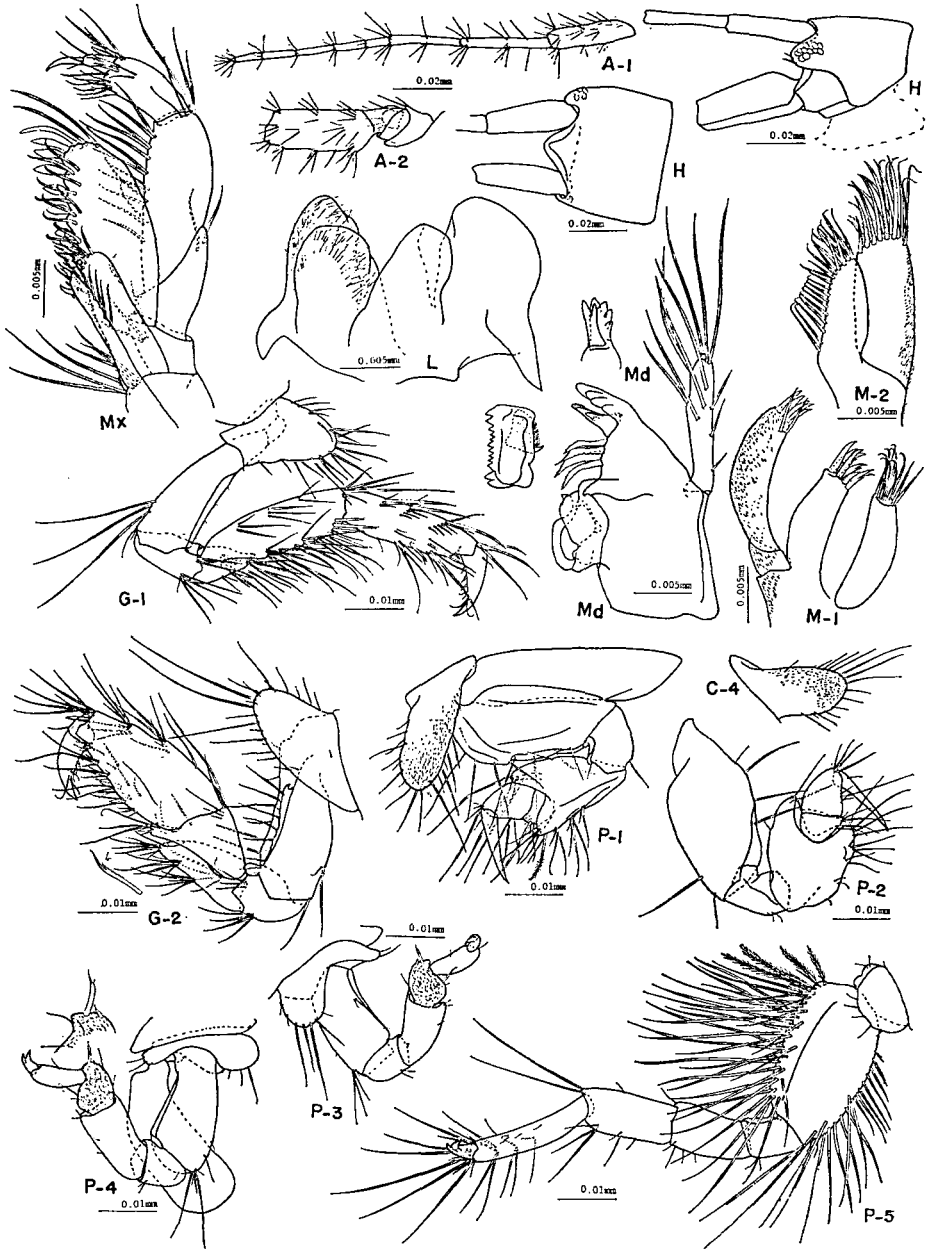


Fig. 57. *Siphonoecetes exolitius* sp. nov. Holotype, female, 2.25 mm.

beyond inner plate, with one single seta, six pairs of stiff setae, and six flexible setae, densely and finely bristly on outer margin. Mandibles stubby, incisor with five teeth, lacinia mobilis of left mandible with five teeth, right one bifid, with four accessory blades, obliquely truncate, finely pectinated apically, molar process large, produced, truncate, fringed, with one trumpet-formed accessory process, palp placing

at upper level of molar process, biarticulate, proximal segment with three short setae on outer margin, else with seven long setae on distal half, terminal segment vestigial, with one apical long seta. Inner plate of maxilliped not extending beyond proximal segment of palp, with three spatulate teeth and one longitudinal row of about eleven simple setae, outer plate not extending beyond 2nd segment of palp, inner margin bristly on proximal one third, following margin with about twenty setae in pairs and singles, inner distal half and apical margins with seven spatulate and slender teeth, else with two apical long setae, palp four articulate, outer extension of proximal segment not extending beyond middle of 2nd segment, with one pair of setae, inner margin of 2nd segment with six pairs of setae and two single setae, outer distal end with six setae, 3rd segment half as long as 2nd segment, inner distal end with four pairs of setae, outer distal end with five setae, else with two bifid setae and one pair of simple setae, dactyl short, stubby, with one apical falcate tooth.

Gnathopod 1: Coxa 1 producing forward and downward, setose except for posterior margin, anterodistal margin rounded, lower margin with one posterior spine, posterior margin straight downward, posterodistal end almost orthogonal. Gnathopod 1 simple, normal. Basis about two sevenths as long as gnathopod 1, gradually increasing in width, outer distal margin with three long setae and one distal pair of setae, anterior margin with six minute setae. Posterior margin of ischium about twice as long as anterior margin, half as long as basis, rounded proximally, with one distal transverse row of five setae, outer anterodistal end with one pair of setae. Merus triangular in lateral view, shorter than ischium, outer margin with two medial pairs of setae and one distal row of five setae, inner medial side with one transverse row of four setae. Carpus subequal to basis in length, uniform in width except for proximal margin, anterior margin with three, three, two and six distal setae in formula, posteromedial margin with three rows of four setae and one pair of setae, posterodistal margin with one longitudinal row of five setae and four spines. Propod shorter than carpus, as broad as it, anterior margin with three transverse rows of three, seven and seven setae, anterodistal end with four setae, posterior margin less setose, with two medial spines. Dactyl stout, falcate, longer than half as long as propod, grasping margin finely pectinate, with four small spines and two pairs of small setae near apex.

Gnathopod 2: Coxa 2 nearly semioval, extending forward and downward, setose, several setae very long. Gnathopod 2 shorter than gnathopod 1, stout. Basis about one third as long as gnathopod 2, anterior margin forming shallow groove, outer margin with narrow thin plate armed with nine setae, inner margin with six setae. Posterior margin of ischium twice as long as anterior one, shorter than half as long as basis, rounded, with one distal transverse row of four setae, outer anterodistal end with three setae. Merus about two thirds as long as basis, triangular in lateral view, anterior free margin very short, posterodistal half with two rows of five setae and one distal row of eleven setae which are bifid and pectinate, else inner submargin with one transverse row of five setae. Carpus as long as merus.

triangular, anterodistal end with one transverse row of four long and one very long setae, posterodistal end prominently produced, its apex rounded, with one spine and five setae. Propod as long as basis, most expanded at proximal one third, anterior margin with one proximal seta, two transverse rows of several setae and one distal row of eight setae, posterior margin gently rounded, with one seta, one pair of setae and five rows of several setae, else with two medial and one distal small spines, palm undefined. Dactyl stout, falcate, half as long as propod, grasping margin with four teeth, one seta and one pair of setae.

Peraeopod 1: Coxa 3 similar to coxa 2, but slenderer than it. Basis as long as ischium and medus combined, stubby, anterior margin gently rounded, most expanded medially, with eight setae, flat on distal half, posterodistal end with one seta. Ischium about one third as long as basis, posterior margin twice as long as anterior one. Merus gradually expanding, broad, largely extending on both distal ends, anterodistal extension far beyond carpus, with three long and two small setae, posterior extension not beyond carpus, with five simple and one pinnate setae, else posterodistal half with three sets of two or four setae. Carpus semicircular, posterodistal end with one long and four short setae. Propod semioval, twice as long as carpus, anterodistal end with one long and three short setae, posterodistal margin with three setae. Dactyl slender, falcate, as long as carpus and propod combined.

Peraeopod 2: Coxa 4 similar to coxa 3. Peraeopod 2 very similar to peraeopod 1.

Peraeopod 3: Coxa 5 bilobate, shallow, broad, anterior lobe rounded, with three long and three small setae, posterior lobe slender, with two distal small setae. Basis two fifths as long as peraeopod 3, broad, but not expanding, anterodistal end with three long and one small setae. Anterior margin of ischium three times as long as posterior one, half as long as basis, with one distal pair of small setae. Merus about two thirds as long as basis, gradually expanding a little, extending a little on both distal ends, both extensions with one pair of small setae respectively. Carpus two thirds as long as merus, rounded, extending on posterodistal end, densely and finely bristly, posterodistal end with two setae, anterodistal end with one small and one longer spines. Propod as long as merus, slender, posteromedial margin with one small seta. Dactyl small, hook-like, bifid.

Peraeopod 4: Coxa 6 similar to coxa 5. Peraeopod 4 also similar to peraeopod 3.

Peraeopod 5: Coxa 7 semicircular, with several small setae. Peraeopod 5 one and half times as long as peraeopod 4. Basis broad, about one third as long as peraeopod 5, both margins densely setose, posterior thin plate narrow, not extending distally. Ischium about one third as long as basis, longer than wide, anterodistal end with one pair of small setae. Merus one and half times as long as ischium, as broad as it, a little produced on posterodistal end which is armed with one small seta, anterodistal margin with four small setae. Carpus as long as and as broad as merus, anterior margin with one, two and three setae, posterior margin with one medial small seta and one distal pair of long setae. Propod as long as ischium

and merus combined, distinctly narrower than carpus, distal end surrounded by long and short setae, anterior margin with two, three and four setae, posterior margin with two small setae and one pair of small setae. Dactyl small, hook-like, bifid.

Pleopods: Pleopods short, broad, stout. Peduncle of pleopod 3 very broad, thick, much expanding and extending outward, its extension with one pair of coupling spines, and two short and one small setae, rami broad, nine or eight articulate, terminal swimming setae as long as rami.

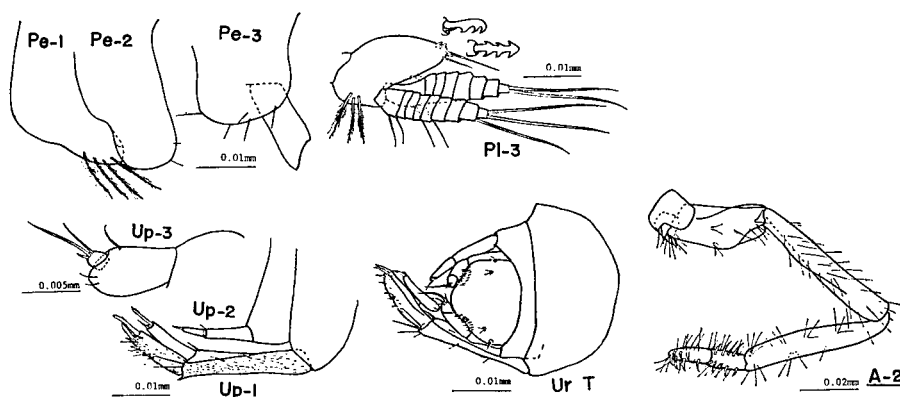


Fig. 58. *Siphonoecetes exolitus* sp. nov. Holotype, female, 2.25 mm. A-2: Paratype no. 1, female, 2.5 mm.

Uropods: Uropod 1 extending beyond uropod 2, slender, densely and finely bristly on outer margin, peduncle twice as long as rami, outer margin with two medial short setae and one apical pair of short setae, inner margin with one short apical seta, both rami truncate, equal to each other in length, outer ramus broader than inner one, with five spines and three setae on outer distal half, one apicomedial short setae and two apical spines which are pectinated medially and are blunt distally, inner ramus not pectinate, with two spines of which one is longer than the other and is pectinated on distal margin. Uropod 2 feeble, longer than rami of uropod 1, uniramous, peduncle about twice as long as ramus, with one apical seta, ramus attenuate, with one apical spine. Uropod 3 longer than half as long as uropod 2, uniramous, peduncle broad, dilating slightly producing on outer distal end, rounded, with two small setae on outer distal end and one seta on inner distal end, ramus small, roundish, apex with one small and two longer setae.

Telson: Telson entire, broad, semicircular, with two pairs of small setae on both outer proximal margins, distal margin with one pair of pectinate patches.

Material examined. Holotype: Female, 2.25 mm. Type-locality: Ariake Sea. Date: September, 1977. Paratype: 1 specimen. Collection No.: AMBL-Amph. 48.

Remarks. The new species is clearly distinguished from any other siphonoecetid species by the peduncle of uropod 3 much expanded.

Siphonoecetes tanabensis Harada, 1971

S. tanabensis: Harada 1971, p. 356–368.

Material examined: Ariake Sea, Tomioka Bay, Shijiki Bay.

*Pareurystheus**Pareurystheus amakusaensis* sp. nov.

(Fig. 59–62)

Body: Body cylindrical, almost uniform in thickness, coxae small, shallow, but a little overlapping or touching seriously. Head large, longer than peraeonites 1–2 combined, rostrum short, decurved, anterior head lobe producing in triangle, not prominent, inferior antennal sinus deep, rectangular, anterodistal ends of ventral margin densely setose. Eyes small, circular, placing on anterior head lobe. Pleonites 1–3 progressively elongate, pleonal epimeron 1 rounded, posterior margin with one pinnate seta, pleonal epimeron 2 rounded, larger than pleonal epimeron 1, lower margin with fourteen pinnate setae, pleonal epimeron 3 broad, rectangular, anterodistal margin rounded, posterodistal end with one notch armed with one

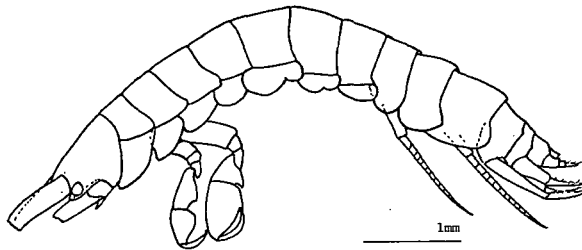


Fig. 59. *Pareurystheus amakusaensis* sp. nov. Holotype, female, 6.5 mm.

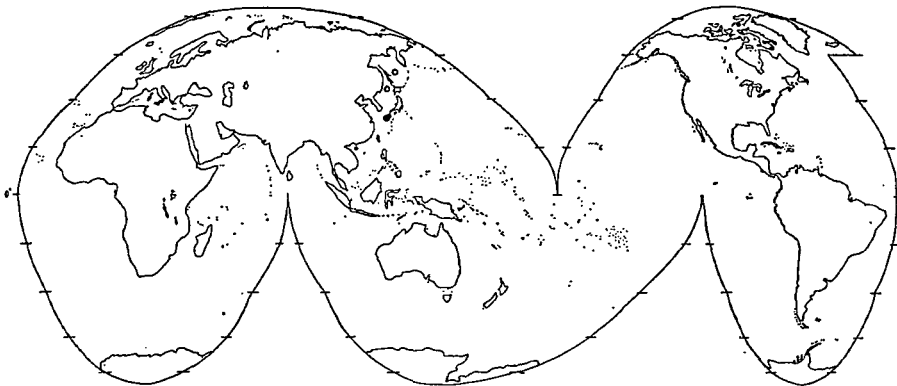


Fig. 60. Distribution of *Pareurystheus amakusaensis* sp. nov. (●) and *Pareurystheus* spp. (○) in the world.

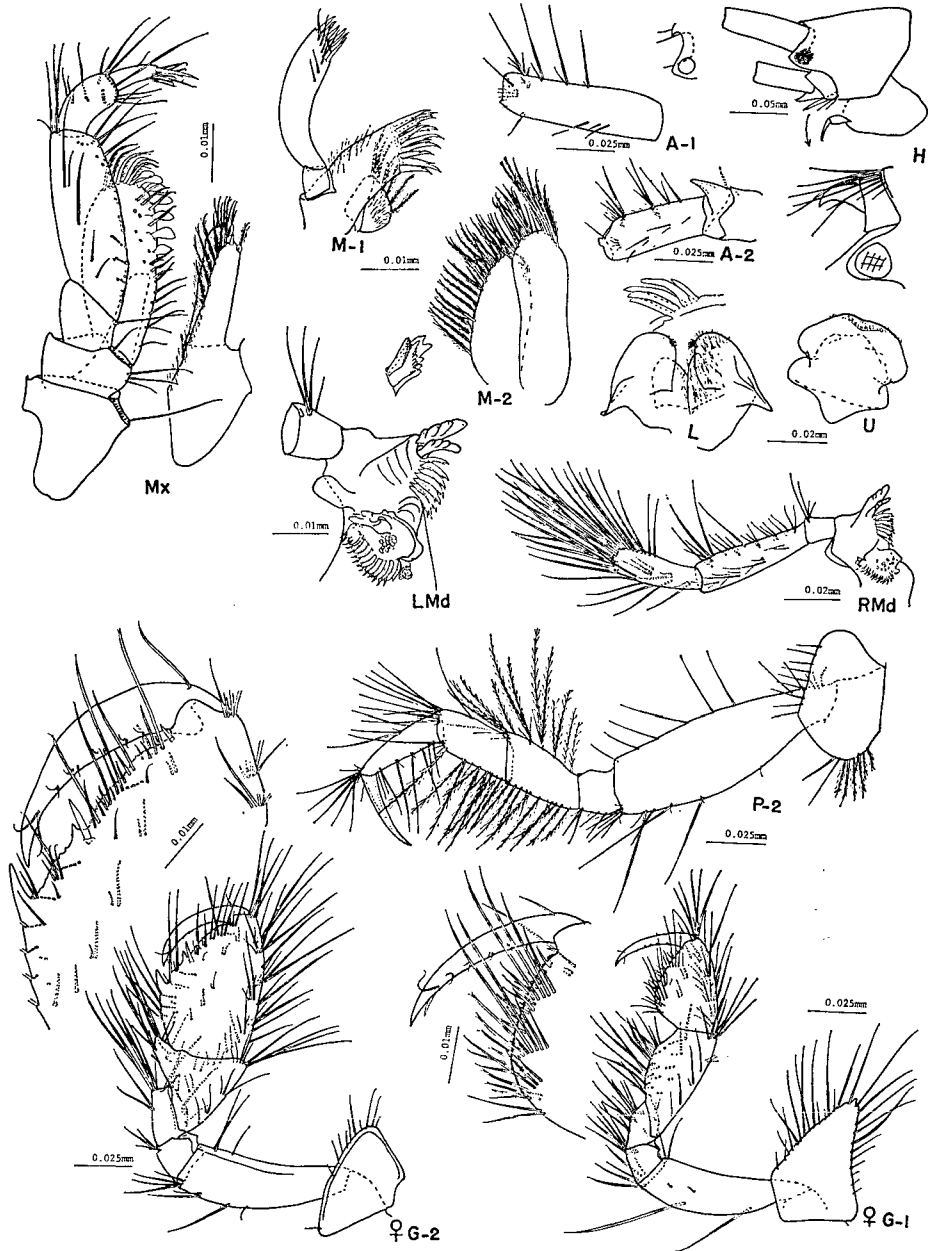


Fig. 61. *Paurystheus amakusaensis* sp. nov. Holotype, female, 6.5 mm.

small seta. Urosome subequal to pleonite 3 in length, urosomite 1 twice as long as urosomite 2, urosomite 2 equal to urosomite 3 in length.

Antennae: Peduncular segment 1 of antenna 1 shorter than head length, ventrodistal half with three pairs of one long and one small setae, one distal set of one long and one small setae, one distal set of one long and three short setae, and

one distal pair of small pinnate setae, following segments lost. Peduncular segment 1 of antenna 2 stout, wider than long, upper margin a little extending beyond peduncular segment 2, peduncular segment 2 short, gland cone stout, attenuate, peduncular segment 3 two thirds as long as peduncular segment 1 of antenna 1, ventral margin with two medial and distal transverse rows of seven setae, else with several small and short setae, following segments lost.

Mouthparts: Upper lip pentagonal, apical margin broad, a little concave medially, densely bristly. Inner plate of lower lip medium, densely pubescent, distance between outer plates narrow, shoulders rounded, densely pubescent, inner distal end with five blunt and unsegmented teeth, mandibular process weakly developed. Inner plate of maxilla 1 developed, broad, pubescent, with seven pinnate setae, outer margin of outer plate pubescent, apex with ten tooth-like spines armed with one minute tooth, palp biarticulate, extending beyond outer plate, medium in width, proximal segment short, terminal segment gently curved outward, apex truncate, broad, with six teeth, else distal part with one oblique row of seven setae. Maxilla 2 broad, both lobes subequal to each other in width, rounded apically, apex and inner margin of inner lobe with about eighteen pinnate setae continuously, else apical margin with seven stiff simple setae, only apical margin of outer plate with six pinnate setae on outer half, and one transverse row of seven stiff setae, two stout setae and seven feeble setae on inner half. In left mandible, incisor producing forward, broad, with four blunt and stout teeth, lacinia mobilis similar to incisor, broad, with four blunt and stout teeth, accessory blades seven, serrate, molar process developed, prominently producing, truncate, with one accessory process of which apex is truncate and pectinate, lower margin largely serrate, with fifteen setae, molar rasp medium, palp placing on upper level, much developed, stout and long, almost uniform in width, triarticulate, proximal segment short, with one transverse row of four setae on upper distal margin, 2nd segment distinctly longer than terminal one, upper margin and both sides setose, terminal segment rounded apically, upper distal half and apical margin densely setose, posterodistal half with two single setae and one pair of setae, one lateral side with one pair of one short and one long setae, and one set of three long setae. Inner plate of maxilliped medium, extending beyond proximal segment of palp, inner margin pubescent, its distal half with seven pinnate setae, apex with four conical teeth, and one pinnate and six simple setae, outer plate reaching proximal two thirds of 2nd segment of palp, inner proximal half with nine setae, inner distal half with eight spatulate teeth, apex with five stout and densely pinnate setae, else inner submargin with one oblique row of two setae and three oblique rows of three blunt setae, palp four articulate, proximal two segments two thirds as long as palp, inner distal end of proximal segment with one long seta, inner margin of 2nd segment dispersively setose, ventral side with three single setae and one pair of setae, posterodistal end with four setae, 3rd segment one third as long as proximal two segments, upper side with three transverse rows of three, seven and seven setae, else distal end with eleven setae, dactyl shorter and narrower than 3rd segment, truncate, inner distal margin and apex with six flexible

setae and two slender spines, especially apex with one long stout spine.

Gnathopod 1 of male: Coxa 1 prominently extending forward, setose marginally. Basis one third as long as gnathopod 1, depressed posteroproximally, anterodistal end with one pair of setae, posterodistal half with one medial long seta,

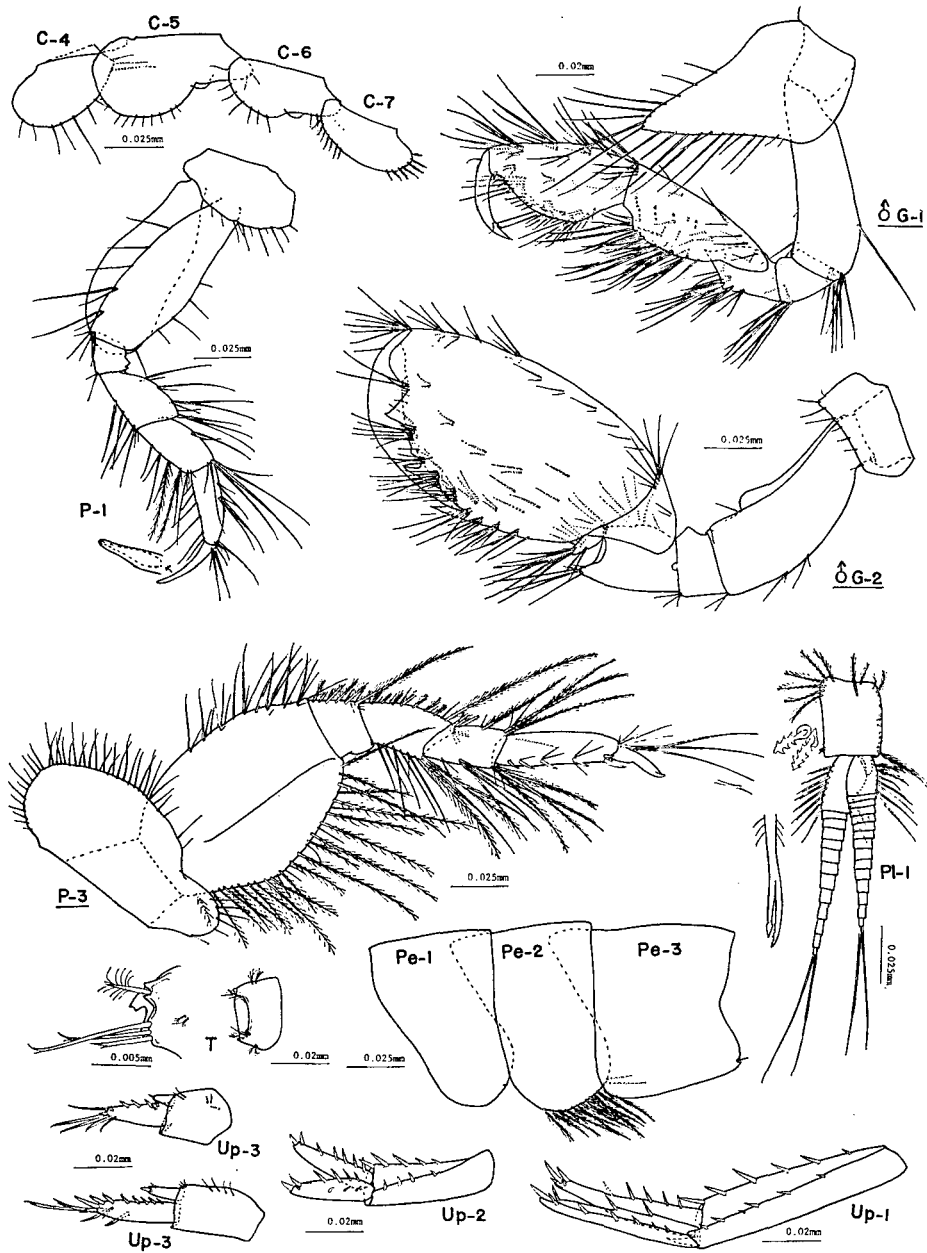


Fig. 62. *Paurystheus amakusaensis* sp. nov. Holotype, female, 6.5 mm. ♂G-1, ♂G-2, Up-3: Paratype no. 5, male, 7.25 mm. P-3: Paratype no. 4, male, 9.0 mm.

posterodistal end with one transverse row of eight setae. Posterior margin of ischium one third as long as basis, twice as long as anterior one, postrodial end with one transverse row of eleven setae. Merus extending forward, attenuate distally, posterior margin as long as one of ischium, with two medial transverse rows of three and five setae, and one distal transverse row of six setae, inner side with two medial transverse rows of seven setae, and eight distal setae, anterior free margin short. Carpus subequal to basis in length, posterior margin depressed proximally and distally, with one proximal seta, three medial transverse rows of six or seven setae, and one distal transverse row of nine setae, anteroproximal half with three single setae and one pair of setae, anterodistal end with six setae, inner side dispersively setose in singles and rows, especially inner distal end with one transverse row of eight setae. Propod slightly shorter than carpus, much expanding backward medially, posterior margin rounded, with one short seta, three pairs of short setae, and two transverse rows of six and seven setae on proximal two thirds of inner side, with nine spines on distal one third of outer side, with one longitudinal row of six small setae and one transverse row of five long setae on distal one third of inner side, anterior margin of outer side with one distal transverse row of three setae, one of inner side with one small seta, one pair of long setae, three transverse rows of five, five and seven setae, else central part of inner side with two medial pairs of short setae and one distal row of three setae. Dactyl stout, falcate, reaching middle of posterior margin of propod, grasping margin with one pair of small setae near apex.

Gnathopod 1 of female: Coxa 1 similar to one of male. Gnathopod 1 similar to one of male in shape, but propod more expanding backward, grasping margin of dactyl with five pairs of small setae and one distal pair of long setae.

Gnathopod 2 of male: Coxa 2 rectangular, shallow, twice as broad as deep, lower margin with several short or small setae. Gnathopod 2 subequal to gnathopod 1 in length, but far more stout than it. Basis one third as long as gnathopod 2, anterior margin prominently produced at distal one third, posterodistal half with three pairs of one small and one short setae. Ischium short, narrower than twice as wide as long, posterodistal end with three setae. Merus twice as long as ischium, prominently produced on posterodistal end, distal end curved inward, receiving posterior extension of carpus, posterodistal end with four long and two short setae, anterior free margin very short, anterior margin of inner side with one medial transverse row of five setae and one distal row of four setae. Carpus two thirds as long as merus, triangular, prominently producing backward, its extension oval, depressed proximally, not extending beyond posterodistal extension of merus, with one pair of setae on outer side, one apical row of eight setae and one row of four setae on inner side, anterodistal end with one transverse row of seven setae. Propod half as long as gnathopod 2, stout, oval, anterior margin with one longitudinal row of three single setae and six pairing setae on proximal half, and three, two, three, five and eight setae on distal half in formula, posterior margin and palm continuously rounded, but palm defined by one stout proximal tooth, with three triangular teeth, four transverse rows of several short and long setae, and several single setae, posterior

margin with one single seta and four transverse rows of several setae, else inner side dispersively setose on proximal half. Dactyl stout, falcate, reaching proximal tooth of palm.

Gnathopod 2 of female: Coxa 2 shallow, gradually extending backward, anterior half of lower margin setose. Gnathopod 2 not far longer than gnathopod 1 in comparison with one of male. Basis two fifths as long as gnathopod 2, anterodistal margin with one seta and one pair of setae, posterodistal half with one small seta, one pair of one small and one long setae, one set of four pairing short setae and one distal row of four setae. Ischium short, longer than wide, posterodistal end with five setae. Merus one and half times as long as ischium, produced on anterodistal end of inner side, inner side of anterior margin setose in rows, posterior margin with one medial pair of long setae and one distal set of six setae. Carpus half as long as basis, triangular, posterodistal end a little extending beyond merus, posterodistal half with one long seta and one row of five setae, posterodistal end of inner side with one transverse row of thirteen long and short setae, outer side of posterior margin with one, two and three setae medially, and one distal transverse row of eight short and long setae. Propod shorter than basis, both sides of anterior margin setose in transverse rows, posterior margin with one, three, four and five setae in formula, palm oblique, defined by one stout tooth, finely serrate, with one medial set of one cusp and one stout spine, and three proximal transverse rows of several setae, else with longitudinal and oblique rows of short and long setae and slender spines on distal two thirds, and one stout spine on distal end. Dactyl stout, falcate, reaching palmar proximal tooth, grasping margin with five pairs of small setae and one pair of short setae near apex.

Peraeopod 1: Coxa 3 shallow, twice as broad as deep, lower margin roundish, setose. Basis two fifths as long as peraeopod 1, not slender, anterior margin with five short setae, posterior margin with three single setae, two pairs of setae and one distal set of four setae. Ischium short, longer than wide, posterodistal end with two setae. Merus twice as long as ischium, gradually expanding forward, anterior margin with two pairs of one short and one long setae, one set of one short and two long setae, and one distal set of two short and two long setae in formula, posterior margin with three single setae, and one distal set of two short and two long setae. Carpus as long as merus, anterior margin with one medial pair of one short and one long setae, and one distal set of six long setae, posterior margin with one long seta, one pair of long setae, two sets of one pinnate, one long simple and one small simple setae, and one distal set of four small and one long setae. Propod longer than carpus, decreasing in width, anterior margin with one pair of one short and one long setae, one set of two short and two long setae, and one distal set of three long and four small setae. Dactyl shorter than propod, falcate, apex blunt, with one glandular pit.

Peraeopod 2: Coxa 4 subrectangular, shallow, lower margin setose, posterior margin with several simple and pinnate setae. Peraeopod 2 very similar to peraeopod 1, but anterior margin of merus with two single pinnate setae, one pair of

pinnate setae, one set of two pinnate and one short simple setae, one set of two pinnate and two short simple setae, posterior margin with nine pinnate single setae, posterior margin of carpus with three pinnate setae, one pair of one simple and one pinnate setae, two pairs of pinnate setae, and one distal set of one pinnate, one long simple and three small simple setae.

Peraeopod 3: Coxa 5 bilobate, shallow, setose marginally, posterior lobe small, extending backward. Basis two fifths as long as peraeopod 3, broadly expanding, especially much expanding medially, not produced and expanded posterodistally, anterodistal half setose in singles and sets, posterior margin with twenty dispersively bristly and several simple setae. Ischium short, broader than long, slightly decreasing in width, anterior margin with six pinnate setae. Merus obliquely truncate, anterior margin with eight single pinnate setae, six short setae and one distal set of five pinnate setae, posterior margin with five single pinnate setae, one pair of pinnate setae and one distal set of four pinnate setae. Carpus a little narrower and shorter than merus, anterior margin with one set of one small simple and one pinnate setae, and one distal set of three simple and three pinnate setae, posterior margin with one pair of small setae, one set of five pinnate setae, and one distal set of three short and four pinnate setae. Propod as long as posterior margin of merus and carpus combined, posterior margin with three sets of one spine and zero to three simple setae, and one pair of one small and one short spines, anterodistal end with three long and several short and small setae. Dactyl half as long as propod, not falcate.

Peraeopods 4-5: Coxae 6-7 shallow, extending backward, anterior margin of coxa 6 with several small simple setae, posterior margin with three short pinnate setae, anterior half of lower margin with seven small pinnate setae, posterior margin with seven pinnate setae. Peraeopods 6-7 lost.

Pleopods: Peduncle of pleopod 1 broad, stout, shorter than half as long as outer ramus, proximal and outer margins with many pinnate setae, outer ramus distinctly shorter than inner one, outer margin of proximal segment with seven setae, inner margin of proximal segment on inner ramus with six bifid pinnate and two ordinary pinnate setae, terminal swimming setae shorter than rami.

Uropods: Uropod 1 not extending beyond uropod 2, peduncle longer than rami, with triangular tooth-like process on ventrodistal end, both margins with six spines respectively, both rami equal to each other in length, producing ventrodistally, outer ramus with five spines on outer margin and two spines on inner margin, apex with one pair of small spines and one distal stout spine, inner margin of inner ramus with five spines, apex with two small and two stout spines. Peduncle of uropod 2 one and half times as long as rami, with four spines on outer margin and five spines on inner one, rami equal to each other in length, stout, outer ramus with three spines on outer margin, four spines on inner margin, and one apical set of one stout spine and two pairing spines, inner ramus with five spines and one apical set of one stout spine and two pairing spines. Peduncle of uropod 3 as long as outer ramus, stubby, outer ramus with five marginal spines, apex with two spines

and five slender spines, inner ramus shorter than half as long as outer one, truncate, apex with one spine.

Telson: Telson small, fleshy, truncate and concave distally, outer margin with one medial pair of pinnate setae, and one distal set of three slender spines and one pinnate seta, else outer distal ends with one upturned tooth.

Material examined. Holotype: Female, 6.5 mm. Type-locality: Tomioka Bay. Date: May, 1978. Paratype: 4 specimens. Collection No.: AMBL-Amph. 70.

Remarks. The present species well agrees with the diagnosis of *Pareurystheus* (Tzsetkova 1977) except for the following points; (1) inner plate of maxilla 1 with eleven to fourteen pinnate setae, (2) inner plate of maxilla 2 with one oblique facial row of setae and (3) outer ramus of uropod 3 longer than half as long as inner one. But these differences are not essential and are caused by the taxonomic information known in only five *Pareurystheus* species.

Pareurystheus is closely related to *Protomedeia* (J.L. Barnard 1973), *Gammaropsis* (J.L. Barnard 1973) and *Cheiriphotis* (J.L. Barnard 1973 and Tzsetkova 1977), and also the present species shows the relation to these genera but fundamentally differs from them in the body plan.

Protomedeia

Protomedeia crudoliops sp. nov.

(Fig. 63-66)

Body: Body semicylindrical. Head equal to peraeonites 1-2 combined in length, anterior head lobe oval, placing on medial level, its distal end with one acute tooth. Eyes occupying anterior head lobe, oval. Coxae weakly developed, coxae 5-7 not seriously overlapping, coxae 3-7 half as deep as coxae 1-2. Pleonal epimeron 1 rounded, especially posterior margin dilating, posterodistal angle with one small tooth and one minute seta, pleonal epimeron 2 very similar to pleonal

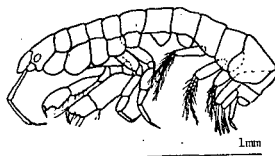


Fig. 63. *Protomedeia crudoliops* sp. nov. Holotype, male, 2.8 mm.

epimeron 1, but longer than it, pleonal epimeron 3 one and half times as broad as pleonal epimeron 2, anterodistal and posterodistal margins rounded, lower margin almost straight, posterodistal angle with one very small tooth and one minute seta. Urosomite 1 half as long as pleonite 3, distal ends of ventral margin with one acute tooth, urosomite 2 about two thirds as long as urosomite 1, urosomite 3 as long as urosomite 2.

Antennae: Antenna 1 defecting from the type specimens in my hand except for peduncular segment 1, peduncular segment 1 slightly shorter than head length. Antenna 2 about one third as long as body length, peduncular segment 2 shorter than half of peduncular segment 1 of antenna 1, peduncular segment 3 as long as peduncular segment 2, stubby, distal margin obliquely truncate, lower margin with one medial stout spine and two distal setae, anteromedial margin with one spine

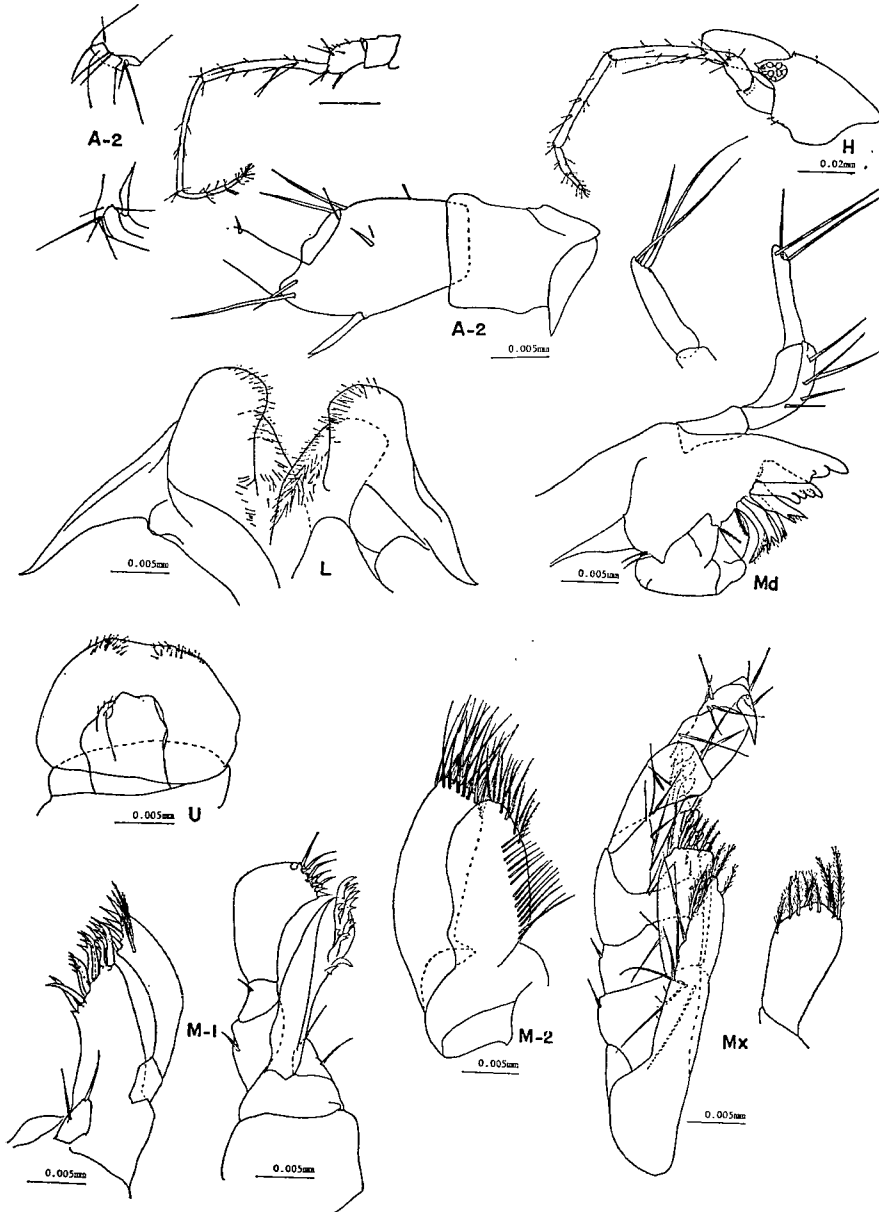


Fig. 64. *Protomeдея crudoliops* sp. nov. Holotype, male, 2.8 mm.

and one seta, anterodistal margin with two long and three short setae, peduncular segment 4 one third as thick as peduncular segment 3, longer than head length, with several short and long setae, peduncular segment 5 slenderer than peduncular segment 4, but as long as it, with several short setae, both distal ends extending, distal margin receiving article 1 of flagellum as coupler, flagellum four articulate, two thirds as long as peduncular segment 5, article 1 about half as long as flagellum, terminal segment very small.

Mouthparts: Upper lip semicircular, apical margin slightly concave, bristly. Inner plate of lower lip developed, densely pubescent, shoulders of outer plate rounded, pubescent, mandibular process elongate, its distal margin acute. Inner plate of maxilla 1 semicircular, very small, with one marginal and one terminal setae, outer plate obliquely truncate, with seven teeth armed with one or two small teeth, and two simple teeth, distal end of inner margin with one stout tooth, palp biarticulate, extending beyond outer plate, article 1 small, outer distal end with one seta, article 2 gently curved outward, truncate, apical margin with six acute teeth, and four simple and one pinnate setae. Maxilla 2 normal, apical setae of outer plate seventeen, simple, apical setae of inner plate six paired, pinnate, facial setae sixteen, simple. Incisor of mandible much developed, with three teeth rounded apically, lacinia mobilis with four teeth rounded apically, accessory blades consisting of four teeth of which three are bifid and armed with many minute setae on distal concavity, and of which the other becomes broad apically, is armed with one acute spine and many minute setae apically and has one plumose seta near base, molar process large, its upper base with one plumose seta, palp triarticulate, much developed, inner margin of article 2 with two short and three long setae, apical margin of article 3 rounded, with three very long setae of which two are longer than article 3. Inner plate of maxilliped with five plumose and several simple setae, outer plate subequal to inner one in size, apical margin rounded, with ten plumose setae, palp much developed, article 2 very long, with seven spatulate accessory process and many setae, article 3 curved inward apically, dactyl geniculate, stout, bristly.

Gnathopod 1: Coxa 1 subrectangular, lower margin roundish, with seven small and minute setae. Basis very stout, posteroproximal margin depressed, posterior margin with two medial long and one distal small setae, proximal half of anterior margin expanding very well, its projection laminal, rounded marginally, crenulate. Ischium narrower than distal part of basis, one third as long as basis, posterodistal end with one short seta. Merus about half as long as basis, triangular, anterior margin almost attached to carpus, posterodistal margin with seven setae. Carpus equal to basis in length, gradually widening, posterior margin with five sets of two, three, four, four and five setae in formula, distal margin surrounded by several small setae. Propod shorter than carpus, long oval, anterior margin with two sets of three short setae, and two distal setae, posterior margin with four sets of one or two simple slender setae and two stout setae minutely pectinated on distal slender half, palm defined by one stout spine, curved inward, outer margin with one circular projection armed with two short stout setae which are minutely pectinated on distal

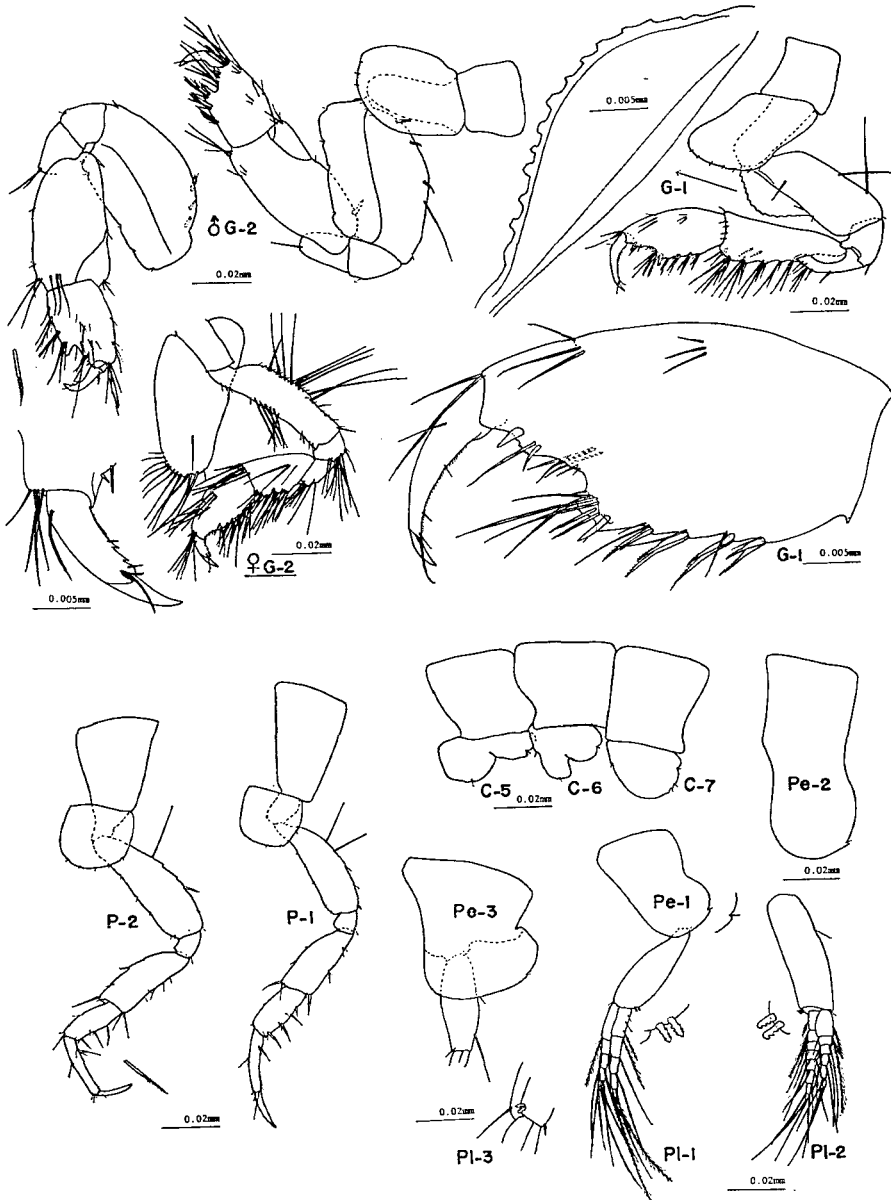


Fig. 65. *Protomedea crudoliops* sp. nov. Holotype, male, 2.8 mm. ♂G-2: Paratype no. 1, female, 3.0 mm.

slender half, three very long setae of which one is at least pectinated distally, and two relatively short setae, medial margin concave, with several setae, distal margin serrate, with one relatively stout short seta, one longer seta and one short stout spine. Dactyl reaching palmar spine, falcate, grasping margin minutely pectinate except for proximal and distal margins, with four setae of which distal one is long.

Gnathopod 2: Coxa 2 almost as large as coxa 1, subrectangular, lower margin

with six minute setae. Gnathopod 2 larger than gnathopod 1. Basis broadly expanding forward, proximally narrow, posteroproximal half rounded, with three spines, distal half almost straight, with one medial long and one distal small setae, anterior expansion rectangular, having five small concavities with one minute seta, nearly as broad as muscular part. Ischium about one third as long as basis, about half as broad as distal part of basis, posterodistal end with one small seta. Merus subequal to ischium in size, rectangular, posterodistal margin with two setae. Carpus subequal to basis in length, stubby, slenderer than basis, subrectangular, anterior margin with one proximal spine, and one medial small and four distal small setae, distal margin with several setae in one row. Propod rectangular, anterior margin with three rows of several setae, posterior margin with one seta, three sets of several setae and one stout seta minutely pectinated on distal slender half, palm deeply concave, inner slope of defining tooth short, minutely serrate, remainder with several long setae and one stout spine. Dactyl falcate, grasping margin with three small setae near apex, outer proximal margin with one small pinnate seta.

Gnathopod 2 of female: Coxa 2 gradually decreasing in width, lower margin rounded, with many relatively long setae. Basis slender, anterior margin with three proximal small setae, four relatively long and one small setae medially, and four distal short setae, posterior margin with many small and short setae except for proximal one, its medial margin with eight long setae. Ischium short, posterior margin rounded, with many long setae on distal half. Merus equal to ischium in length, truncate, anterior margin almost connecting with carpus, posterodistal end with seven short setae, terrace near distal end with one pair of long setae. Carpus about half as long as basis, proximal half triangular, distal half of posterior margin with three terrace armed with several relatively short setae, anterodistal end surrounded by about seven short setae, inner lateral side with three short setae. Propod long oval, palm undefined, anterior margin with three medial rows of several setae, distal end surrounded by several setae, posterior margin with seven rows of two or three setae, its distal margin with several small setae. Dactyl reaching middle of posterior margin of propod, falcate, divided in two parts, inner margin of proximal part with two acute teeth and two small setae, pubescent proximally, its distal end with bifid lobes armed with one short seta on concavity, distal part two thirds as long as proximal stout part, nail-like.

Peraeopod 1: Coxa 3 square, about half of coxa 2 in size, lower margin rounded, with five minute setae. Basis about one third as long as peraeopod 1, gradually expanding a little, anterior margin straight, with three medial small and three distal small setae, posterior margin gently rounded, with one (?) long seta and three (?) spines medially, and two distal small setae. Ischium very small, width narrower than two thirds of the widest part of basis, posterodistal end with one small seta. Merus two thirds as long as basis, anteroproximal margin gently rounded, medial margin with two small setae and one small spine, distal end with one long stout and two small setae, posterior margin with four medial short and three distal setae. Carpus two thirds as long as merus, slightly expanding medially, proximal width about

two thirds as broad as distal one of merus, anterior margin with one medial short seta, and two distal short and long setae, posterior margin with four stout setae minutely pectinated on distal slender half. Propod slightly shorter than merus, very slender, anterior margin with one medial pair of short setae and three distal setae, posteroproximal margin with one set of one short seta and one stout seta minutely pectinated on distal slender half, distal margin with one small seta. Dactyl about half as long as propod, very slender, apex blunt.

Peraeopod 2: Coxa 4 slightly smaller than coxa 3. Peraeopod 2 very similar to peraeopod 1, but both distal ends of merus with one stout seta minutely pectinated on distal slender half.

Peraeopods 3-5: Coxa 5 bilobate, shallower and wider than others, anterior lobe deeper than posterior one, lower margin rounded, with one minute seta, posterodistal angle of posterior lobe having concavity with one small stout seta. Coxa 6 similar to coxa 5, narrower than it. Coxa 7 semicircular, slightly extending backward, anterior margin with one small seta, posterior margin with three minute setae. Peraeopods 3-5 lost.

Pleopods: Pleopods 1-3 similar to each other, peduncle stout, with one pair of coupling spines, both rami shorter than peduncle, five or eight articulate, terminal swimming setae at least longer than rami.

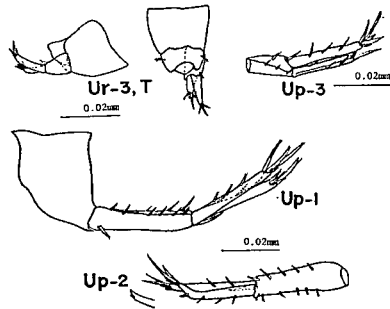


Fig. 66. *Protomeдея crudoliops* sp. nov. Holotype, male, 2.8 mm.

Uropods: Uropod 1 reaching apex of uropod 2, peduncle longer than rami, with one anteroproximal spine, outer margin with six spines, inner margin with five spines, distal end of ventral margin with one long stout spine, both rami equal to each other in length, outer ramus with four marginal and four terminal spines, inner ramus with three marginal and four terminal spines, some terminal spines long. Uropod 2 longer than peduncle of uropod 1, peduncle about two thirds as long as inner ramus, outer margin with three spines, inner margin with two spines, outer ramus about three fourths as long as inner one, with two spines on outer margin, one spine on inner proximal margin and two apical spines of which one is long, else apex with one acute tooth, inner ramus with one spine on outer margin, three spines on inner margin and five terminal spines. Uropod 3 about half as long as uropod 2, peduncle subequal to inner ramus in length, stubby, with one distal spine

on upper and outer margins, outer ramus about twice as long as inner one, with three terminal spines, also outer ramus with three terminal spines.

Telson: Telson fleshy, cylindrical, shorter than peduncle of uropod 3, both proximal margins with one small plumose seta respectively.

Material examined. Holotype : Male, 2.8 mm. Type-locality : Ariake Sea. Date : June, 1976. Paratype : 3 specimens. Collection No. : AMBL-Amph. 11.

Remarks. The new species is plainly distinguished from the known species in the basis of gnathopod 1 broadly expanding on the anteroproximal margin.

Pseudophotis gen. nov.

Diagnosis. Peduncular segment 1 of antenna 1 as long as peduncular segment 3, accessory flagellum vestigial, tubecular. Gnathopod 1 almost simple, palm of gnathopod 2 not defined, dactyl reduced in size. Uropod 3 biramous, inner ramus very small, outer ramus biarticulate, shorter than peduncle. Type-species is *Pseudophotis ariakensis* sp. nov.. The gender is feminine.

Remarks. This typespecies is very similar to *Photis* group but must be divided from the latter in the propod of gnathopods not simplified. Moreover, the smaller inner ramus of uropod 3 and the tubercular accessory flagellum presumably suggest the relation among the new genus, *Microphotis*, *Kuphocheira* and *Simplepalma* (J.L. Barnard 1973).

Pseudophotis ariakensis sp. nov.

(Fig. 67-70)

Body: Head smaller than pereonites 1-3 combined, upper half of anterior head lobe obliquely producing forward, almost rectangular. Eyes small, placing on anterior head lobes. Peraeon gradually deeper, coxae 1-5 deeper than each pereonite. Pleonites gradually widening, pleonal epimeron 1 rounded, pleonal epimeron 2 rectangular, slightly extending backward, lower margin slightly rounded,

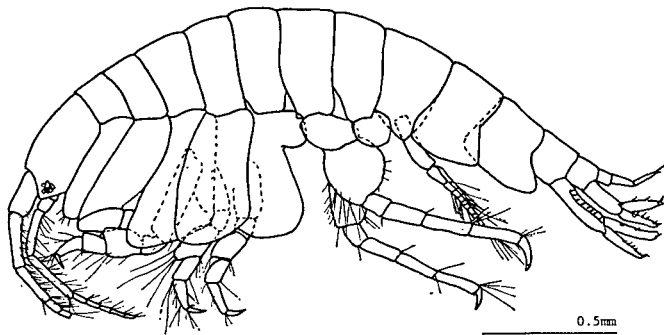


Fig. 67. *Pseudophotis ariakensis* sp. nov. Holotype, female, 2.7 mm.

with four very long plumose setae, pleonal epimeron 3 rectangular at anterodistal angle, about posterior half of lower margin curved upward, extending backward, lower medial submargin with one set of two short and long plumose setae, and four small setae in one row. Urosomite 1 shorter than pleonite 3 in dorsal length, subequal to urosomites 2-3 combined in length, urosomites 2-3 subequal to each other in length.

Antennae: The greater part of flagellum of antenna 1 defecting from the type specimen. Peduncular segment 1 of antenna 1 stout, about half as long as head length, peduncular segment 2 slenderer and longer than peduncular segment 1, with five sets of two pairing pectinate setae and one small one, one pair of small setae, and one single small seta on proximal margin, outer distal end with one small tubercular armed with four small setae, peduncular segment 3 subequal to peduncular segment 1 in length, half as thick as it, lower margin with five pairs of pectinate setae which gradually increase in length, article 1 of flagellum about twice as long as article 2, with one medial short simple seta and one pair of pectinate setae

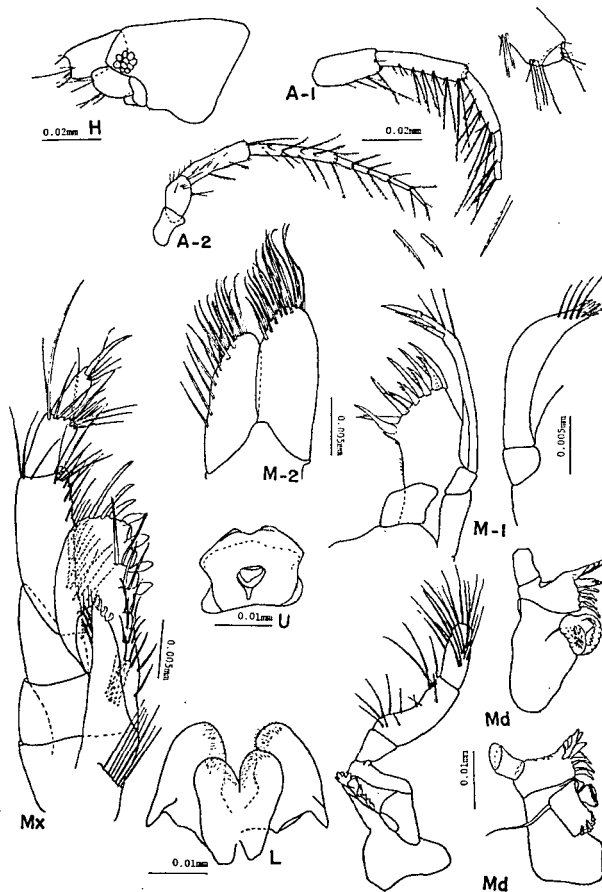


Fig. 68. *Pseudophotis ariakensis* sp. nov. Holotype, female, 2.7 mm.

on distal end, article 2 with one pair of pectinate setae on distal end. Peduncular segments 2-3 of antenna 2 small, peduncular segment 4 shorter than peduncular segment 5, peduncular segment 5 subequal to peduncular segment 2 of antenna 1 in length, flagellum five articulate, apex of terminal segment with one acute spine armed with one small tooth medially.

Mouthparts: Distal margin of upper lip concave medially, both apical processes minutely pectinate. Inner plate of lower lip large, fused on proximal half, pubescent on apical and inner margins, shoulders rounded, pubescent, mandibular process short. Incisor broad, with four teeth, lacinia mobilis with three teeth, distal margin of four accessory blades oblique, minutely pectinate, molar process medium, with one simple seta, molar rasp and ridge weakly developed, palp growing out of outer distal end of body, developed, triarticulate, proximal segment small, 2nd one slightly curved on anterior margin, half as long as palp, anterior margin with many simple setae, terminal one about two thirds as long as 2nd one, distal margin rounded, distal half of anterior margin and apical margin with one row of nine simple setae continuously, medial part of posterior margin with four pairs of setae. Inner plate of maxilla 1 small, rectangular, inner margin finely pubescent, with one distal small seta, apical margin with five large simple and two bifid tooth-like spines, three tooth-like spines armed with two or four small teeth, and one acute unsegmented tooth on inner distal end, palp biarticulate, extending far beyond outer plate, proximal segment short, distal segment gently curved outward, distal part with five simple setae in one oblique row, apical margin with five large spines. Both plates of maxilla 2 subequal to each other in size, eight facial setae of inner plate simple and stiff, nine apical setae simple, two apical setae pinnate, only apical margin of outer plate with one stiff and medially pectinate seta, four simple stiff setae, and about ten simple and flexible setae. Inner plate of maxilliped small, with one marginal row of three plumose setae, five apical simple setae and four apical chisel-like teeth, outer plate reaching two thirds of article 2 of palp, apical margin a little crenulate, with two long slender teeth and one shorter teeth, inner margin with six pairs of setae, one set of three setae, and one proximal seta, distal half with three spatulate teeth, palp four articulate, article 2 three sevenths as long as palp, anterior margin with many sets of two pairing and three setae, and one distal set of five setae, article 3 narrower than article 1, about one third as long as article 2, distal margin surrounded by simple and relatively long setae, article 4 subequal to article 2 in length, slenderer than it, a little produced on outer distal end, inner distal margin with four setae, distal spine-like tooth subequal to article 3 in length, slender.

Gnathopod 1: Coxa 1 long oval, lower margin rounded, minutely crenulate, with eleven setae of which two on both sides are very small. Basis three sevenths as long as gnathopod 1, almost uniform in thickness, posteromedial margin with six very long and finely pectinate setae, and nine small setae, posterodistal end with three very small setae, anterior margin with four long and short setae finely pectinated distally, else with several very small setae. Ischium about one fourth as

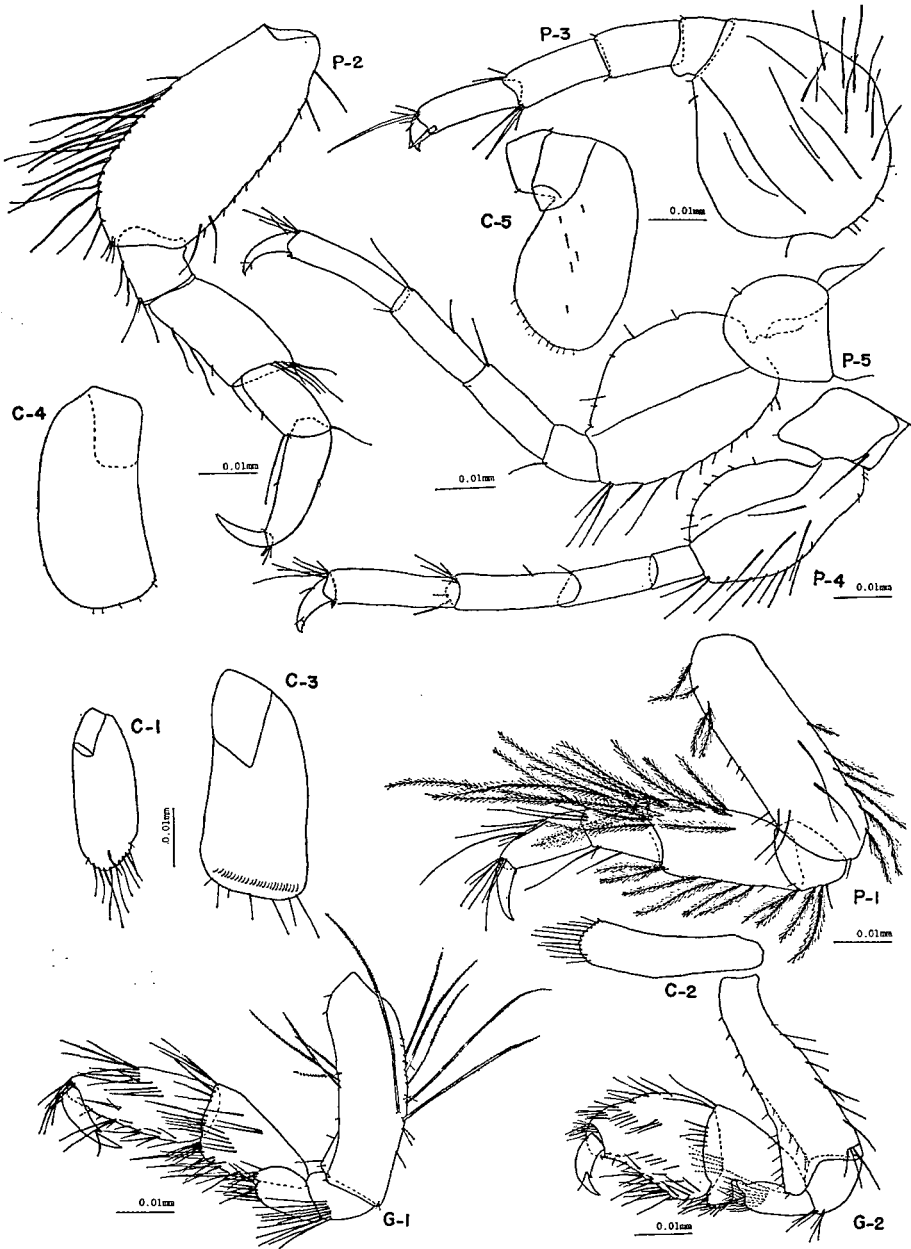


Fig. 69. *Pseudophotis ariakensis* sp. nov. Holotype, female, 2.7 mm.

long as basis, anterodistal half expanded, rounded, posterodistal margin with about nine simple setae in one transverse row. Merus subequal to ischium in size, anterior free margin very short, distal end with many short setae. Carpus triangular, posterodistal half crenulate in three processes, with three pairs of longer setae, else with several slender setae, distal end surrounded by many short setae, outer lateral side

with several short setae in rows. Propod as long as merus and carpus combined, long oval, most expanded proximally, gradually narrowing, palm not defined, proximal two thirds of posterior margin with four pairs of setae and one set of three setae, remainder finely pectinate, with one proximal set of two long and one short setae, and two short stiff setae, anteromedial margin with about seven setae in one transverse row, outer lateral side with one medial oblique row of four setae, else with one pair of setae. Dactyl reaching middle of propod, falcate, stout, with one medial small tooth armed with one seta.

Gnathopod 2: Coxa 2 similar to coxa 1, but deeper than it. Gnathopod 2 subequal to gnathopod 1 in length, but more stout. Basis about two fifths as long as gnathopod 2, anterior margin of outer side increasingly expanding on distal half, extending far beyond ischium, rounded distally, with thirteen small setae marginally and apically, anterior margin of inner side with about six short setae on distal half, posterior margin with one proximal small seta, seven single short setae and one distal set of several short setae. Ischium about one third as long as basis, posterior margin rounded distally, with two sets of three short setae. Merus subequal to ischium in length, anterodistal end produced, fitting posterior concavity of carpus, inner distal margin with many simple setae in one transverse row. Carpus triangular, about half as long as basis, posterodistal margin much expanding backward, its projection beyond posterior margin of merus, rounded, with many marginal setae in one row, lateral margin with five setae on each side, else with two anterodistal setae. Propod subequal to carpus in length, subtriangular, palm not defined, inner margin broad, gently concave, with many short and longer setae, outer margin rounded, with two single setae, two pairs of setae, two sets of three and four setae, and one distal set of about ten setae in formula, else outer lateral side with two rows of three and four setae. Dactyl falcate, stout, one third as long as inner margin of propod, middle of grasping margin with one acute tooth armed with one short seta.

Peraeopod 1: Coxa 3 rectangular, deeper than coxa 2, lower margin straight, with eight short setae, lower submargin of inner side with one transverse row of twenty-five small setae. Basis stout, longer than coxa 3, almost uniform in width, distal margin rounded, with one simple seta, posterior margin with eight plumose setae on distal half, anterior margin with four proximal plumose setae, three medial small simple setae, and two small and relatively long setae on distal margin. Ischium one fourth as long as basis, posterior margin with two medial plumose setae, one medial simple seta, one distal pair of plumose setae and one distal small seta. Merus longer than half of basis, slightly extending on anterodistal end, posterior margin with one proximal short simple seta, four medial plumose setae and one distal pair of plumose setae, anterior margin with one distal row of three plumose setae, two single plumose setae and two long plumose setae in formula, anterodistal end surrounded by seven long plumose setae. Carpus one third as long as basis, two thirds as broad as distal part of merus, posterior margin with one medial short seta and one distal pair of one small and one long setae, anterodistal margin with three

short and long setae. Propod longer than carpus, basal part as broad as distal one of carpus, gradually decreasing a little in width, anterior margin roundish, with three pairs of setae, anterodistal margin surrounded by about eight simple setae, posterodistal margin with one small seta. Dactyl falcate, two thirds as long as propod.

Peraeopod 2: Coxa 4 similar to coxa 3, lower margin with six minute setae. Basis broad, posterior margin rounded distally, distal half with many long and short simple setae, distal end with one set of four short setae, anterior margin with two proximal and distal short setae, anterodistal margin with eight small setae. Ischium one fourth as long as basis, rectangular, posterior margin with two single medial short setae, and one distal set of two short and one small setae. Merus about twice as long as ischium, anterior margin slightly rounded, anterodistal margin surrounded by five short setae, posterior margin almost straight, with two longer, one small and one distal short setae. Carpus three fourths as long as merus, two thirds as broad as it, posterior margin with one medial small seta and one distal set of two small and very long setae, anterodistal end with one long seta. Propod about half as long as basis, basal part a little narrower than distal one of carpus, gradually decreasing in width, both opposite medial margins with one small seta respectively, anterodistal end with four short setae, posterodistal end with one small seta. Dactyl similar to one of peraeopod 1.

Peraeopod 3: Coxa 5 bilobate, anterior lobe as deep as coxa 4, three times as deep as posterior one, slightly dilated distally, lower margin rounded, with eleven small setae, posterior lobe extending backward, lower margin with one minute seta. Basis rounded, inner side with about ten long setae. Ischium rectangular, broader than long, posterodistal end with one small seta. Merus one and half times as long as ischium, rectangular, both anterior and posterior ends with one small seta respectively. Carpus about twice as long as ischium, a little slenderer than merus, posterodistal end with three stout setae, anterodistal end with two short stout setae. Propod subequal to carpus in length, a little slenderer than carpus, posterodistal end with one large spine which extends beyond dactyl, anterodistal end with one very long stout and about three short setae. Dactyl stout, short, hook-like, with one anteromedial tooth.

Peraeopod 4: Coxa 6 rectangular, posterodistal end slightly extending downward and backward, with one minute seta. Basis expanding medially, narrow proximally, posterior expansion with six marginal small setae, distal half of anterior margin with longer setae, anterior half of inner side with four long setae. Ischium one fourth as long as basis, longer than wide. Merus about twice as long as ischium, anterodistal end extended, posterodistal end with one small seta. Carpus longer than merus, posterior margin with one proximal small and four distal setae, anterodistal end with two setae. Propod subequal to carpus in length, posterodistal end with six short and longer setae, anterodistal end with one pair of locking spines. Dactyl falcate, stout, posterior margin with one pair of small setae near distal end.

Peraeopod 5: Coxa 7 semioval, lower margin with one small seta posteriorly.

Basis broadly expanding backward, oval, anterior margin with seven short and two long setae, and one distal set of three long setae. Ischium one fourth as long as basis, longer than wide, anterodistal end with one short seta. Merus a little slenderer than and about twice as long as ischium, distal end with one anterior small and one posterior short setae. Carpus as long as and a little slenderer than merus, anterior margin with one short seta on distal end, posterior margin with one medial short, and one distal long setae. Propod longer and slenderer than carpus, antero-distal end with one pair of locking spines, posterodistal end with four short setae. Dactyl falcate, anterior margin with one pair of small setae near distal end.

Pleopods: Pleopods very similar to each other, peduncle short, but stout, with two coupling spines, peduncle of pleopods with some plumose setae, but peduncle of pleopod 2 without any plumose seta, terminal swimming setae longer than rami or subequal to them.

Uropods: Uropod 1 slightly extending beyond uropod 2, or at least reaching its apex, peduncle produced on distal end of outer margin, with eight small spines

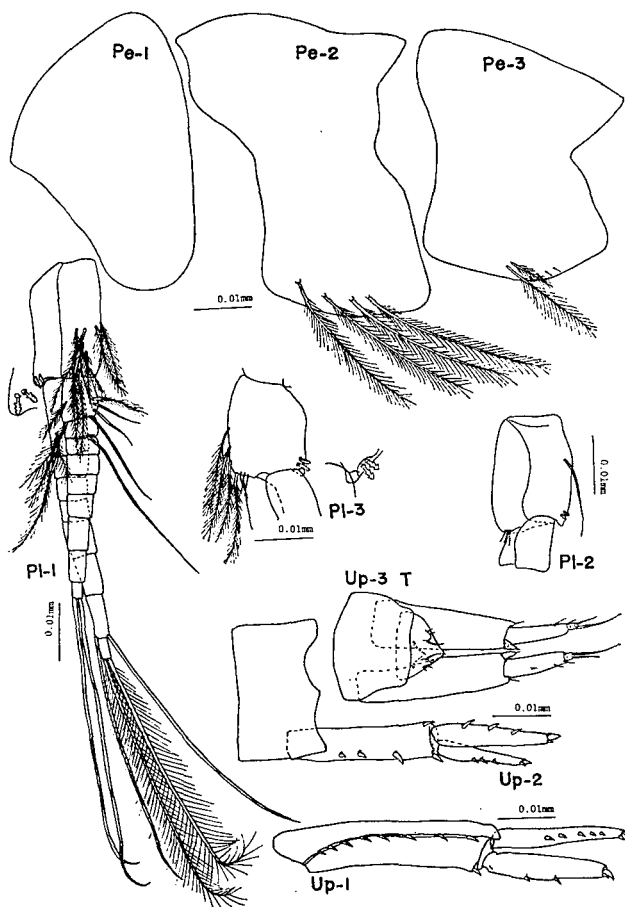


Fig. 70. *Pseudophotis ariakensis* sp. nov. Holotype, female, 2.7 mm.

on outer margin and one small spine on inner distal end, outer ramus two thirds as long as peduncle, with five marginal spines and two terminal spines of which one is stout, inner ramus a little shorter than outer one, with two marginal spines and two terminal spines of which one is stout. Uropod 2 about three fourths as long as uropod 1, outer margin of peduncle with three medial and one apical spines, inner distal end with one spine, outer ramus two thirds as long as peduncle, with three medial spines and two terminal spines of which one is stout, inner ramus longer than outer one, but shorter than peduncle, with three medial spines and three terminal spines of which center one is stout. Uropod 3 shorter than uropod 2, but peduncle subequal to one of uropod 2 in length, with one short seta on inner proximal margin, small projection on distal end of outer margin with one small seta, outer ramus half as long as peduncle, biarticulate, proximal segment with two marginal small and one distal small setae, article 2 very small, with two terminal comparatively long setae, inner ramus very small, with one distal small spine.

Telson: Telson small, triangular, fleshy, with one pair of small tubercles armed with two small setae on outer side and one comparatively long seta on inner side.

Material examined. Holotype : Female, 2.7 mm. Type-locality : Ariake Sea. Date : June, 1976. Paratype : 5 specimens. Collection No. : AMBL-Amph. 15.

Photis

Key to the species of *Photis*

- | | | |
|---|---|------------------------|
| 1 | Anterior head lobe strongly producing..... | <i>P. longicaudata</i> |
| | This character not combined | 2 |
| 2 | Gnathopod 1 simple | <i>P. japonica</i> |
| | Gnathopod 1 subchelate | 3 |
| 3 | Coxa 1 subrectangular, not attenuate | <i>P. reinhardi</i> |
| | Coxa 1 attenuate, narrow on distal half | <i>P. lamina</i> |

Photis longicaudata (Bate and Westwood, 1862)

(Fig. 71)

P. longicaudata: Chevreux 1887, p. 311; Walker 1895, p. 608; Sars 1895, p. 571-572; Walker 1901, p. 306; Stebbing 1906, p. 608; K.H. Barnard 1935, p. 126; Chevreux and Fage 1925, p. 310-311; Chevreux 1935, p. 126; K.H. Barnard 1940, p. 479; Dahl 1946, p. 18; Reid 1951, p. 262; Oldevig 1959, p. 105; Nayer 1959, p. 34; Nagata 1965c, p. 310-311; Nayer 1966, p. 157-158; Ledoyer 1967, p. 19; Ledoyer 1968, p. 208; Ledoyer 1969a, p. 51; Sivaprakasam 1970, p. 566-567; Ledoyer 1973b, p. 42; Ledoyer 1978a, p. 369; Ledoyer 1977, p. 353; Ledoyer 1979, p. 156.

Material examined: Ariake Sea, Tomioka Bay, Shijiki Bay.

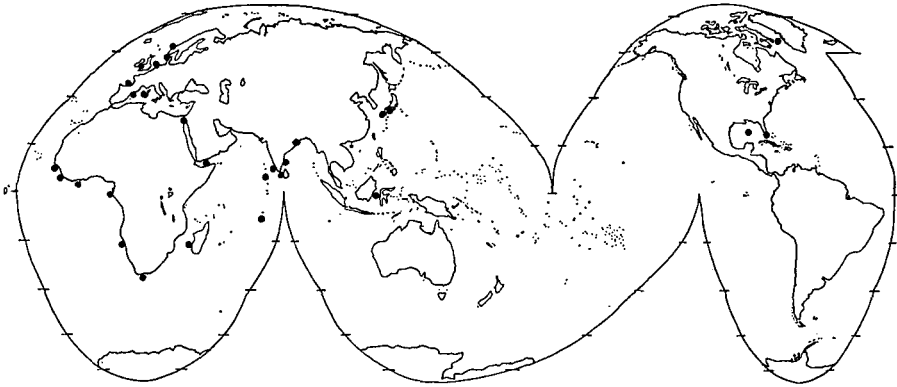


Fig. 71. Distribution of *Photis longicaudata* (Bate and Westwood) (●) in the world.

Photis japonica sp. nov.

(Fig. 72-75)

Body: Anterior head lobe diagonally producing, triangular, its depth two thirds as deep as head one, antennal sinus deep, reaching middle of head. Eyes circular, placed near extremity of anterior head lobe. Peraeonite 1 longer than deep. Coxae 1-5 much developed, deeper than each peraeonite, coxae 6-7 small. Pleonal epimeron 1 gradually narrowing to lower margin, lower margin rounded, pleonal epimeron 2 rounded from anterodistal angle to lower margin, posterodistal angle produced, rounded, posteromedial margin slightly expanding, lower margin of pleonal epimeron 3 gently rounded, posterior margin much expanding backward, semioval. Urosome weakly developed.

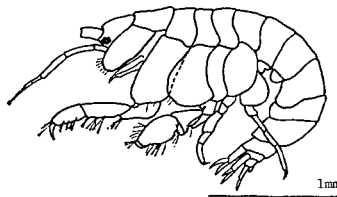


Fig. 72. *Photis japonica* sp. nov. Holotype, male, 3.0 mm.

Antennae: Peduncular segment 1 of antenna 1 half as long as head length, peduncular segment 2 longer than peduncular segment 1, peduncular segment 3 almost as long as peduncular segment 1, lower margin of peduncle and flagellum with many pairs of stiff setae, especially in male with pectinate setae on distal half of peduncular segment 3 and flagellum, accessory flagellum absent, flagellum of male with one aesthetasc except for proximal segment, terminal segment with one aesthetasc and one bifid spine. Antenna 2 subequal to antenna 1 in length, lower margin

with stiff setae, gland cone of peduncular segment 2 developed, peduncular segment 3 as long as peduncular segment 2, peduncular segment 4 longer than twice as long as peduncular segment 3, peduncular segment 5 as long as peduncular segment 4, flagellum four articulate, distal end of articles 2-3 with one pectinate seta, terminal segment with one bifid spine.

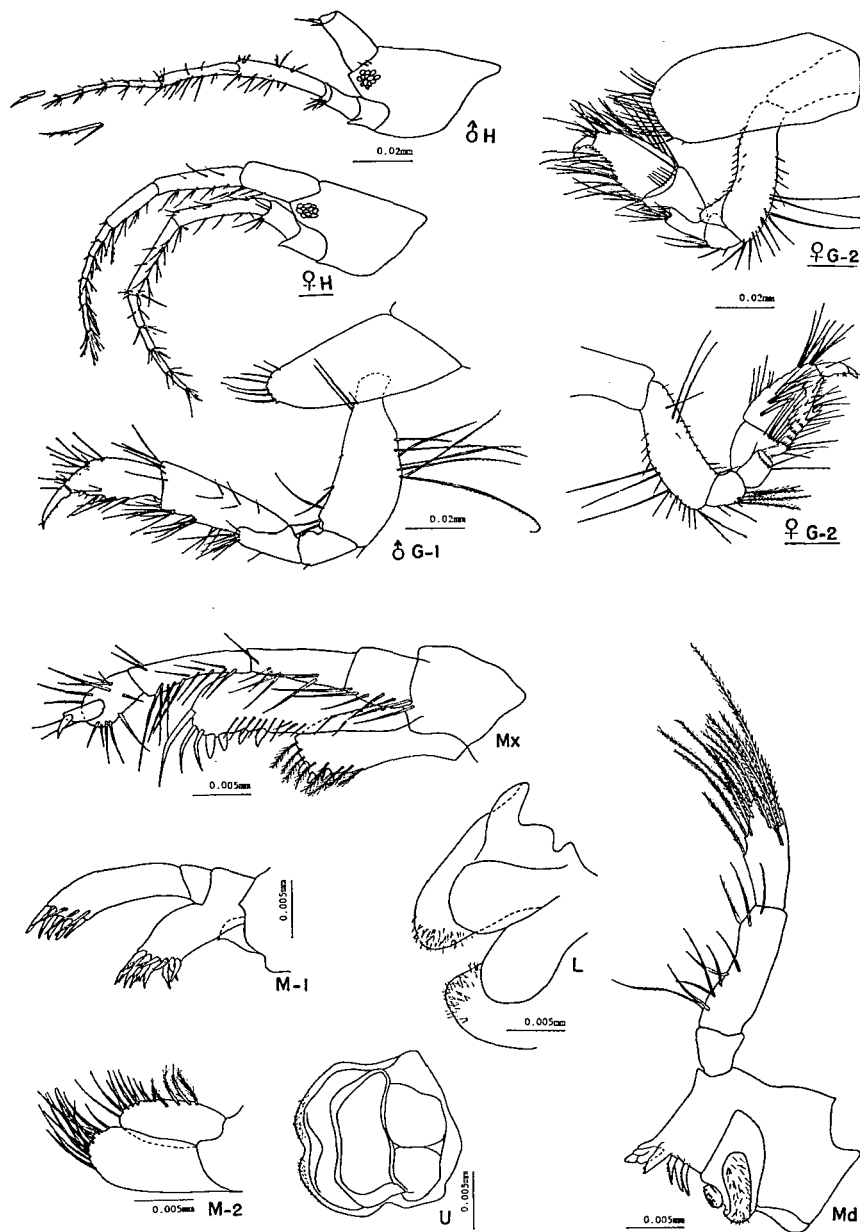


Fig. 73. *Photis japonica* sp. nov. Holotype, male, 3.0 mm. ♀H, ♀G-2: Paratype no. 1, female, 3.0 mm.

Mouthparts: Apical margin of upper lip concave, both apical processes pectinate. Inner plate of lower lip much developed, bristly, shoulders and inner margin of outer plate bristly, mandibular process developed. Incisor of mandible medium, with four blunt teeth, apical margin of lacinia mobilis pectinate, accessory blades three, pectinate medially, molar process cylindrical, small, with rasp, bristly band laid under molar process, palp triarticulate, developed, inner margin of proximal segment with seven proximal simple, two simple and one distal pectinate setae, terminal segment shorter than 2nd one, distal half of both margins and apical margin with many plumose setae. Inner plate of maxilla 1 triangular, without any seta, apical margin of outer plate with six simple teeth, four bifid teeth and one tooth armed with three teeth, palp biarticulate, article 1 small, apical margin of terminal segment diagonally truncate, with five teeth and three stiff setae. Inner plate of maxilla 2 smaller than outer one, facial margin with five plumose setae, five pairs of simple setae and one apical seta, apical margin of outer plate with fourteen simple setae. In maxilliped, inner distal and apical margins of inner plate with three conical teeth and eight plumose setae, outer plate extending beyond middle of palmar article 2, inner distal half with four conical teeth and ten simple setae in one row, apical margin rounded, with three slender teeth which gradually shorten to inner one, palp four articulate, articles 1-2 equal to each other in length, with many setae on inner margin, apical margin of article 3 surrounded by setae, terminal segment small, with one stout nail-like tooth.

Gnathopod 1 of male: Coxa 1 gradually decreasing in width, lower margin undefined, rounded, crenulate, with eight short and one small setae. Gnathopod 1 slender. Basis about one third as long as gnathopod 1, proximal half gradually making broader, posteromedial margin with seven long pectinate setae, posterodistal end with one seta, anteroproximal margin with four pectinate setae, anterodistal margin with four simple setae. Anterior margin of ischium half as long as posterior one, expanded medially, posterodistal end with one small seta. Merus twice as long as ischium, anteroproximal margin expanding forward, anterodistal two thirds gradually decreasing in width, connecting with carpus, distal end forming terrace, surrounded by many setae, posterior margin straight, with one medial short seta. Carpus as long as basis, proximal margin triangular, posterior margin mildly undulated, with one pair of setae and two bundles of several setae, posterodistal margin and inner side of posterodistal end with many setae in rows, anterodistal end with several setae in one row, outer side of medial part with one single seta and two pairs of setae in one row, inner side with many setae. Propod two thirds as long as and narrower than carpus, gradually decreasing in width, distal part subequal to base of dactyl in width, anterodistal half rounded, with several short setae, posterior margin undulated, with rows of some setae, one pair of small spines and one distal small spine, inner side with many short setae in rows, palm not distinct. Dactyl falcate, medial part of grasping margin with three small teeth armed with one or two setae.

Gnathopod 1 of female: Coxa 1 rectangular, lower margin setose. Basis two

fifths as long as gnathopod 1, uniform in width, anterior margin with many small setae in a whole, anterodistal end extending beyond ischium, rounded, posterior margin with many small and short setae, medial margin with three long setae. Ischium rectangular, posterior margin with one set of three plumose setae, and one plumose seta on distal end. Merus as long as ischium, rectangular, anterior

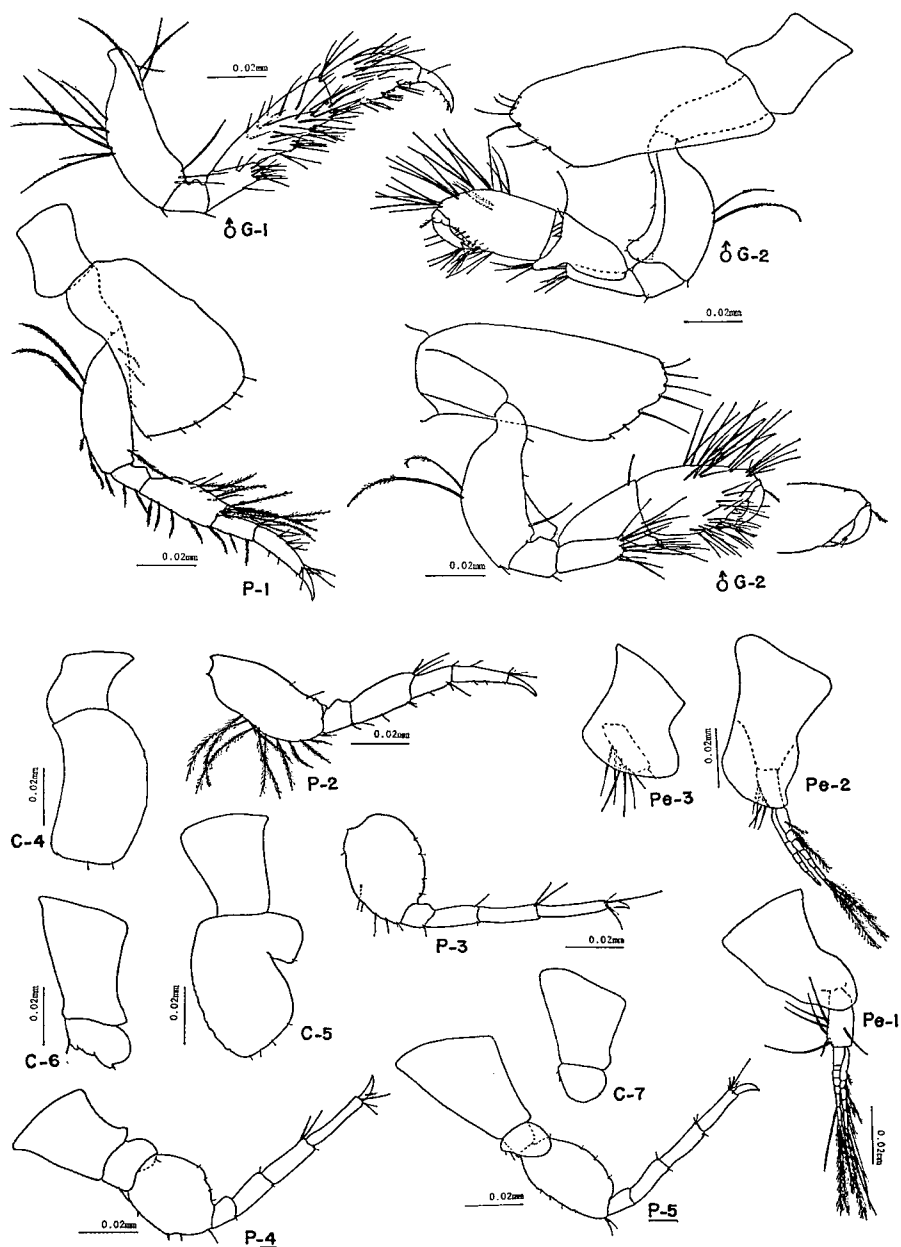


Fig. 74. *Photis japonica* sp. nov. Holotype, male, 3.0 mm.

margin connecting with carpus, distal end forming terrace, surrounded by many setae. Carpus triangular, distal one third of posterior margin expanding backward, but not extending beyond merus, posterior half of distal end on inner side and anterior half of distal end on outer side with many setae. Proximal margin of propod as broad as carpus, anterior and posterior margins setose in rows, palm oblique, defined by one acute tooth and one stout spine, with many small and several long setae. Dactyl stout, falcate, reaching palmar spines.

Gnathopod 2: Coxa 2 subrectangular, lower margin oblique, with four short setae pectinated distally and three small setae. Gnathopod 2 shorter than gnathopod 1. Basis one third as long as gnathopod 2, curved, posteroproximal half gradually expanding, medial part twice as broad as proximal one, with two pectinate setae, posterodistal end with one small seta, anterior expansion of outer side gradually increasing in width, distal end produced, rounded, with three minute setae, inner distal margin with one short seta. Ischium rectangular, small, with one posterodistal small seta. Merus shorter than twice as long as ischium, proximal margin expanding forward, anterior margin almost connecting with carpus, distal end forming terrace, surrounded by many short setae. Carpus triangular, proximal two thirds of posterior margin connecting with merus, distal one third overhanging, gently rounded, distal end produced, rounded, with about five short setae, anterior half of distal end on outer side with five small and short setae in one row. Propod long semioval, anterodistal half with two, one, three, four and eight setae in formula, distal margin and posterodistal margin of inner side with many short setae in rows, palm abruptly oblique, defined by one large tooth, with several pairs of setae. Dactyl falcate, reaching palmar tooth, distal part of inner margin with one tooth.

Peraeopod 1: Coxa 3 flabelliform, posterior margin slightly curved inward, lower margin with six small setae. Basis one third as long as peraeopod 1, anterior margin almost straight, with two proximal short setae, one medial small seta, and one distal set of one small simple and one long plumose setae, posterior margin gently rounded, with two medial long plumose and three distal short plumose setae. Ischium small, longer than wide, anterodistal half expanded, posterior margin with two medial and distal short plumose setae. Merus about half as long as basis, anterior margin gradually expanding on proximal one third, with four pairs of plumose setae on distal two thirds, anterior half edge of distal end surrounded by about six long plumose setae, posterior margin almost straight, with five short plumose setae. Carpus about half as long as merus, half as broad as distal end of it, uniform in width, anterodistal end with one pair of simple setae, posterior margin with one medial short plumose seta and one distal set of one short plumose and one small simple setae. Propod shorter than merus, proximal part as broad as carpus, gradually narrowing a little, anteromedial margin with three pairs of setae, anterodistal end with four setae, posterior margin with two medial small and one distal small setae. Dactyl short, scimitar.

Peraeopod 2: Coxa 4 uniform in width, curved forward in a whole, lower

margin with three small setae. Basis longer than one third of pereopod 2, expanded in a whole, anterodistal margin with three short and small setae, posterodistal two thirds with eleven plumose setae which gradually shorten. Ischium longer than wide, posterodistal end with one pair of short setae. Merus half as long as basis, gradually making broader, anterodistal end produced, with two pairs of setae, posterior margin with one medial small seta and one distal pair of setae. Carpus two thirds as long as merus, narrower than distal end of merus, anterodistal end with one short seta, posterior margin with one medial small seta and one distal pair of setae. Propod a little shorter than merus, proximal width as broad as carpus, gradually shortening, attaining to half in width, anterior margin with one proximal small and four distal setae, posterior margin with two medial small and one distal setae. Dactyl short, scimitar.

Pereopod 3: Coxa 5 bilobate, anterior lobe three times as deep as posterior one, similar to coxa 4, lower margin with four small setae, overhanging under posterior lobe, with one posterodistal minute seta. Pereopod 3 subequal to pereopod 2 in length, slender from ischium to dactyl. Basis oval, broadly expanded in a whole, anterior margin with several short and small setae, posterior margin with four minute setae. Ischium quadrate, anterodistal end with one small seta. Merus twice as long as ischium, both distal ends with one small seta respectively. Carpus longer than merus, posterodistal end with one pair of short setae. Propod as long as ischium and merus combined, distal end with two pairs of short and long setae. Dactyl stout, scimitar.

Pereopod 4: Coxa 6 subrectangular, posterior margin expanding backward, rounded, posterodistal end slightly produced, with one minute seta, anterodistal end with one short seta. Pereopod 4 very similar to pereopod 3.

Pereopod 5: Coxa 7 semioval, anteroproximal margin with two small setae, posteromedial margin with one seta. Pereopod 5 very similar to pereopod 3, but basis slenderer than one of pereopod 3.

Pleopods: Pleopods very similar to each other, peduncle longer than half as long as rami, anterodistal half with several short simple setae, rami slender, six

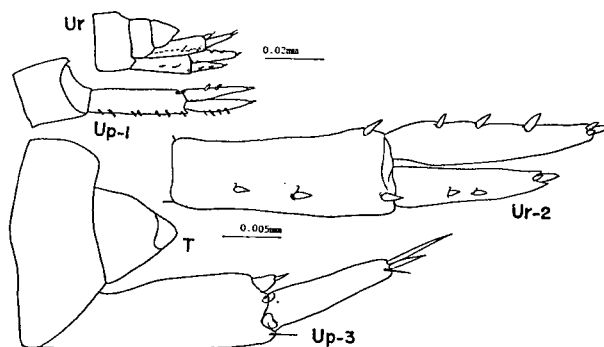


Fig. 75. *Photis japonica* sp. nov. Holotype, male, 3.0 mm.

or seven articulate, terminal swimming setae subequal to rami in length.

Uropods: Peduncle of uropod 1 one and half times as long as rami, outer margin with seven spines, inner distal end with one spine, both rami equal to each other in length, outer ramus with four medial spines on outer margin and one apical spine, inner ramus with two medial spines on inner margin and one apical spine. Peduncle of uropod 2 longer than inner ramus, outer margin with two medial and one distal spines, inner distal end with one spine, outer ramus shorter than inner one, with two medial spines on outer margin, and one apical pair of one small and one stout spines, inner ramus with three medial spines on inner margin, and one apical set of two small and one stout spines. Peduncle of uropod 3 subequal to one of uropod 2 in length, about twice as long as outer ramus, outer distal end with one seta, outer ramus uniaarticulate, rounded apically, apical margin with one fine seta and two stout setae of which one is longer than the other, inner ramus small, budlike, with one apical small stout seta.

Telson: Telson small, triangular, without any seta.

Material examined. Holotype: Male, 3.0 mm. Type-locality: Ariake Sea. Date: June, 1976. Paratype: 3 specimens. Collection No.: AMBL-Amph. 12.

Remarks. The new species is closely similar to *Photis digitata* (K.H. Barnard 1935, Nayer 1959), but the carpus of female gnathopod 1 of *P. digitata* is elongate and this article of the new species is short. Also, the new species is similar to *P. malinalco* (J.L. Barnard 1967) but differs from it in the lobate wrists of gnathopods.

Photis reinhardi Krøyer, 1342

(Fig. 76)

P. reinhardi: Sars 1895, p. 569–571; Stebbing 1906, p. 607; Shoemaker 1930, p. 120; Alderman 1936, p. 67; Stephensen 1942, p. 369–370; Stephensen 1944b, p. 23; Dahl 1946, p. 17–18; Gurjanova 1951, p. 843–844; Oldevig 1959, p. 105; Nagata 1965c, p. 310; Hamond 1967, p. 135;

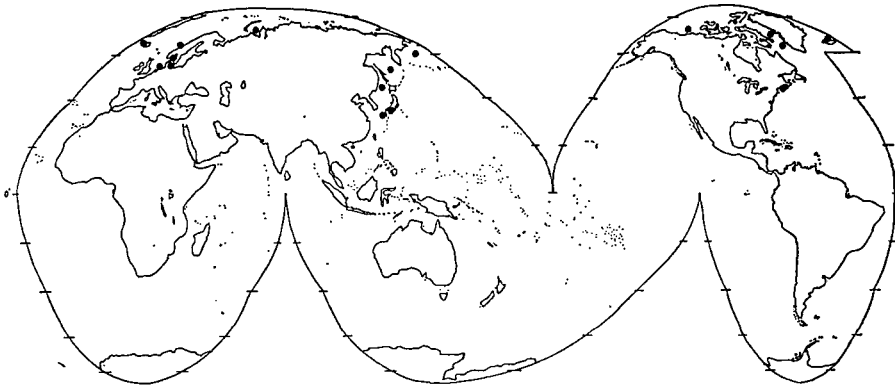


Fig. 76. Distribution of *Photis reinhardi* Krøyer (●) in the world.

Bousfield 1973, p. 186-187; Vader 1974, p. 93-96.

Material examined: Ariake Sea, Tomioka Bay, Shijiki Bay.

Photis lamina sp. nov.

(Fig. 77-79)

Body: Head longer than peraeonite 1, anterior head lobe broadly producing, but not prominent, a little upturning distally, inferior antennal sinus deep. Eyes small, circular, locating on anterior head lobe. Peraeonites 1-4 gradually deeper and shorter, especially peraeonite 1 long, coxae 1-5 developed, deep, coxa 1 prominently extending forward. Pleonites 1-3 equal to each other in length, pleonal epimeron 1 extending backward, pleonal epimeron 2 subrectangular, extending backward, lower margin roundish, pleonal epimeron 3 similar to pleonal epimeron 2, but broader than it. Urosome subequal to pleonites 2-3 combined in length, urosomite 3 clavate.

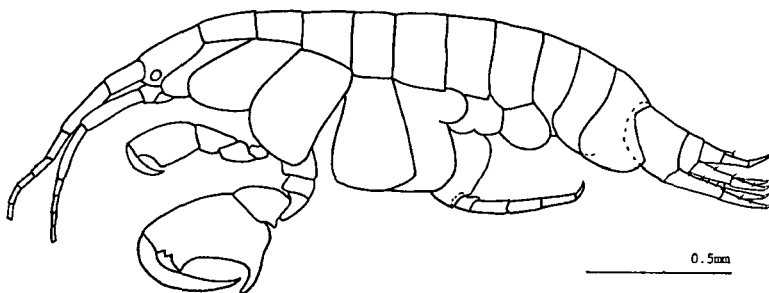


Fig. 77. *Photis lamina* sp. nov. Holotype, male, 2.25 mm.

Antennae: Peduncular segment 1 of antenna 1 not stubby, peduncular segment 2 longer than peduncular segment 1, lower margin with three medial and distal pairs of one small and one short setae, peduncular segment 3 shorter than peduncular segment 1, lower margin with one medial pair of one small and one short setae, and one distal set of one small and two short setae, accessory flagellum uniarticulate, vestigial, each segment of main flagellum with one distal or two medial and distal aesthetascs. Antennae 2 slenderer than antenna 1, proximal two segments short, peduncular segment 2 lacking gland cone, peduncular segment 3 more stout, peduncular segment 4 narrower than peduncular segment 3, longer than twice as long as it, with several marginal minute setae, peduncular segment 5 twice as long as peduncular segment 3, narrower than peduncular segment 4, with several minute and small setae.

Mouthparts: Apical margin of upper lip broad, roundish, prominently concaved in V-formed, bristly on medial part. Inner plate of lower lip medium or more developed, inner margin densely pubescent, mandibular process attenuate, medium. Inner plate of maxilla 1 small, rounded apically, without any seta, outer

plate with five simple tooth-like spines and four tooth-like spines armed with several medial setae, palp extending beyond outer plate, medium in width, curved outward, biarticulate, proximal segment short, apex of terminal segment with two pairs of stiff setae, two simple conical teeth and one pectinate conical tooth. Inner plate of maxilla 2 not slender, inner margin with two pinnate and three simple setae,

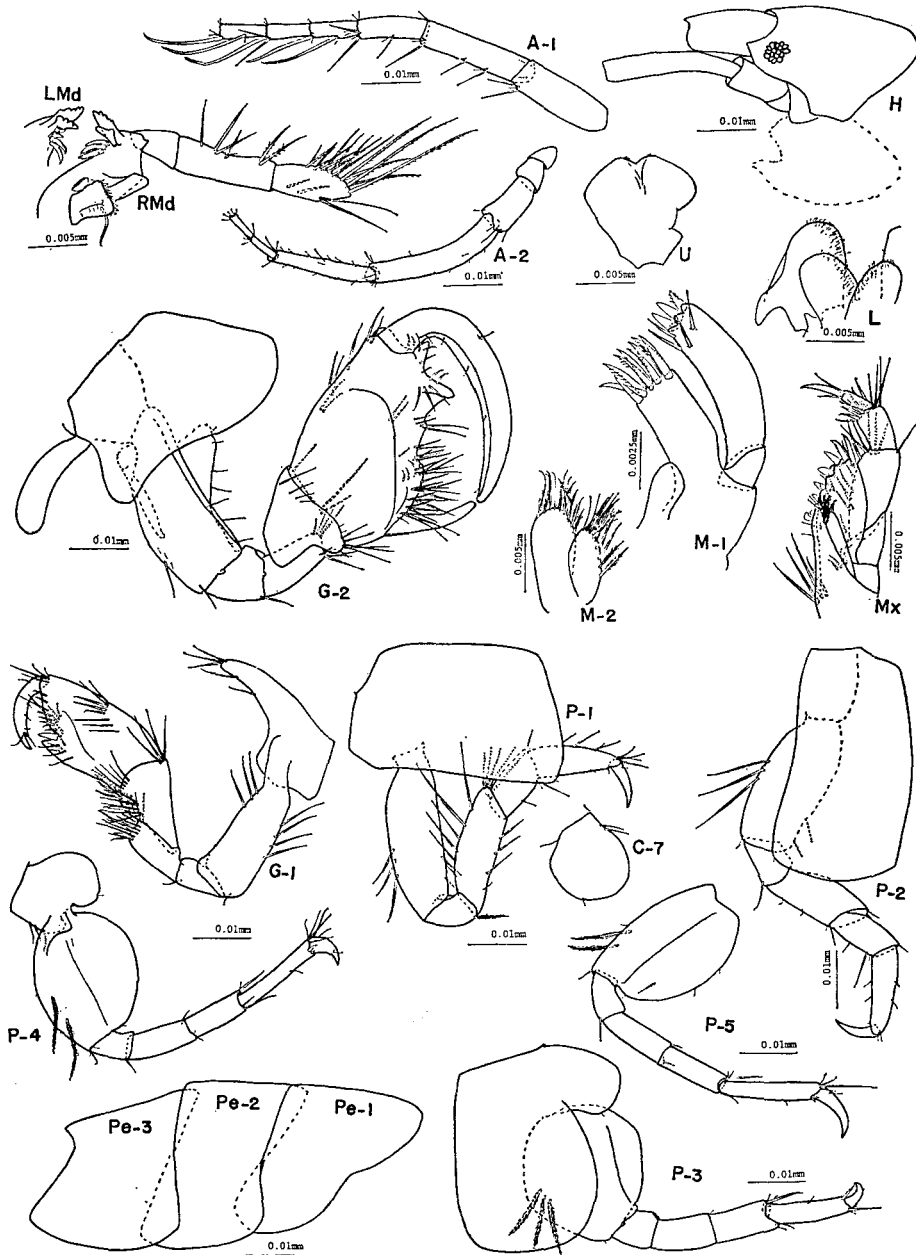


Fig. 78. *Photis lamina* sp. nov. Holotype, male, 2.25 mm.

apical margin with about eleven slender setae, outer plate longer and broader than inner one, apical margin with two pinnate and four simple stiff setae on inner half, and one row of three simple and four pinnate feeble setae. Both mandibles similar to each other except for lacinia mobilis, incisor producing forward, broad, with five blunt teeth, lacinia mobilis of left mandible with four blunt teeth, one of right mandible bifid, accessory blades four, pectinate, molar process medium, truncate and ridged distally, serrate marginally, with one accessory process and one simple seta, molar rasp medium, palpar hump medium, palp grooving on outer distal end of body, much developed, triarticulate, proximal segment gradually widening until half as long as 2nd segment, 2nd segment uniform in width, upper margin with one medial seta, two medial pairs of setae and one distal pair of pectinate setae, terminal segment about half as long as proximal two segments, oval, ventral margin with two single setae and one distal pair of setae, distal two thirds of upper margin with one apical pectinate seta and seven pairs of pectinate setae which gradually elongate. Inner plate of maxilliped medium, distal margin with one row of four pinnate setae, four apical simple setae and three apical conical teeth, outer plate medium, inner margin with several setae and six conical teeth, apex with two slender pectinate teeth, palp rather slender, four articulate, proximal two segments about two thirds as long as palp except for distal spine, inner distal end of proximal segment with one seta, inner margin of 2nd segment with several setae, 3rd segment half as long as 2nd one, uniform in width, only distal margin with eight spines and four setae, terminal segment about two thirds as long as 3rd one, truncate, decreasing in width, apex with two setae and one falcate stout spine which is longer than terminal segment.

Gnathopod 1: Coxa 1 broad proximally, attenuate and expanding forward on distal two thirds, apex and posterodistal margin with five setae. Gnathopod 1 subchelate, prominently smaller than gnathopod 2. Basis one third as long as gnathopod 1, compressed proximally, anterodistal margin with three short setae, posteromedial margin with four short setae. Posterior margin of ischium about one third as long as basis, twice as long as wide, with one distal seta. Merus longer than ischium, semicylindrical, distal end with five setae on inner side and eight spines on outer one. Carpus two thirds as long as basis, increasing in width, anterodistal end with four setae, posterodistal half with one proximal oblique row of five setae and one distal row of four setae on inner side, with one spine, one transverse row of four spines and one distal row of four spines on outer side in formula. Propod slightly shorter than basis, stout, almost uniform in width, inner anterodistal submargin with one row of three spines and two setae, and one oblique row of three setae, anterodistal end with four setae, posterodistal margin with one longitudinal row of three setae on inner side, with one transverse row of three setae on outer side, palm defined by one stout spine and one stout tooth, oblique, with seven spines and several setae on submargin. Dactyl a little extending beyond the stout tooth of palm, falcate, grasping margin with three minute setae, one small tooth and one pair of setae near apex.

Gnathopod 2: Coxa 2 broad, extending forward, lower margin gently sinuous. Gnathopod 2 stout, subchelate. Basis about one third as long as gnathopod 2, anteromedial margin with one triangular thin plate, its distal slope gentle, with four small setae. Ischium short, but stout, posterodistal end with one seta. Merus longer than posterior margin of ischium, narrower than ischium, posterodistal end with five setae, inner anterodistal end with four setae. Carpus as long as merus, triangular, producing backward posterodistally, but a little extending beyond merus, outer anterodistal end with one transverse row of four setae, outer posterodistal end with six small and short setae. Propod very long, anterodistal half with three pairs of setae, and one single seta, posterior margin short, palm steeply oblique, defined by one long stout and clavate tooth of which apex is blunt, with two triangular processes at distal one third and distal end, each process with three setae, part between both processes with five small spines, proximal two thirds densely setose in transverse rows, with one medial slender spine. Dactyl fitting on palm, stout, geniculated proximally, falcate, apex blunt, grasping margin with four minute setae.

Peraeopod 1: Coxa 3 rectangular. Basis about one third as long as peraeopod 1, posteromedial margin with three short setae, anterodistal margin with two short setae. Ischium short, longer than wide, posterodistal end with one pinnate seta. Merus about two thirds as long as basis, a little increasing in width proximally, anterior margin with six short and long setae, and one distal row of five setae, posterior margin with one proximal small and three short setae. Carpus longer than half as long as merus, anterodistal end with one small seta, posterior margin with one medial seta and one distal set of two small and short setae. Propod one and half times as long as carpus, decreasing in width, anterior margin with two single setae, one pair of setae and one distal set of four setae, posterior margin with two single small setae distally. Dactyl half as long as propod, falcate.

Peraeopod 2: Coxa 4 similar to coxa 3. Peraeopod 2 similar to peraeopod 1, but merus lacking long setae.

Peraeopod 3: Coxa 5 bilobate, anterior lobe broad and deep, shallower than coxa 4, posterior lobe extending backward, shallower than half as long as peraeopod 3, circular, but posterior thin plate slender, not extending forward, anterior margin with three medial pinnate setae and one distal minute seta. Ischium short, square. Merus slightly narrower than ischium, about twice as long as it, posterodistal end with one minute seta. Carpus a little producing anterodistally, as broad as and as long as merus, posterodistal end with one stout and two small setae, anterodistal end with two small setae. Propod as long as ischium and merus combined, narrower than carpus, anterodistal end with one stout and three minute setae, posterior margin with one medial minute seta and one distal locking spine. Dactyl short, stout, nail-like.

Peraeopod 4: Coxa 6 bilobate, small, anterior margin with three short setae, posterior lobe expanding backward, rounded. Basis about one third as long as peraeopod 4, broadly expanded, not extending forward, circular, anterior margin

with two pinnate setae on distal half, two medial minute setae and one distal set of three minute setae. Ischium short, longer than wide, anterodistal end with one small seta. Merus twice as long as ischium, slightly producing anterodistally, anterodistal end with two minute setae, posterodistal end with one small seta. Carpus a little longer than merus, anterodistal end with two small and short setae, posterodistal end with one stout and one small setae. Propod one and half times as long as carpus, narrower than it, anterior margin with one medial small seta and one distal pair of one small and one stout spines, posterodistal end with five setae. Dactyl short, falcate, nail-like.

Peraeopod 5: Coxa 7 rounded. Peraeopod 5 similar to peraeopod 4, but basis a little slenderer than one of the latter.

Pleopods: Pleopods weakly developed. Peduncle of pleopod 3 about two thirds as long as outer ramus, outer distal margin with three pinnate setae, bristly, inner distal end with two coupling spines, outer ramus shorter than inner one, six articulate, outer ramus five articulate, inner margin of proximal segment with one bifid and one ordinary pinnate setae, terminal swimming setae prominently longer than rami.

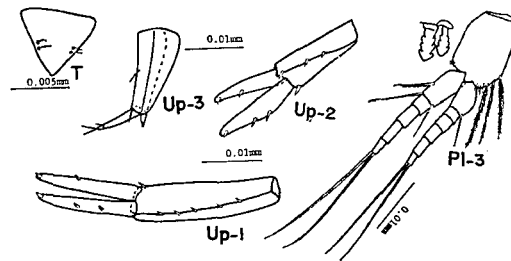


Fig. 79. *Photis lamina* sp. nov. Holotype, male, 2.25 mm.

Uropods: Uropod 1 not extending beyond uropod 2, peduncle one and half times as long as rami, outer margin with five medial and one apical spines, inner margin with one apical spine, both rami equal to each other in length, attenuate, outer ramus with two spines on outer proximal margin and one apical spine, inner ramus with one spine on inner medial margin and one apical spine. Uropod 2 two thirds as long as uropod 1, outer margin with two medial and one apical spines, inner margin with one apical spine, outer ramus a little shorter than inner one, with two medial and apical spines, inner ramus with two medial and one apical spines. Uropod 3 shorter than uropod 2, peduncle stout, about twice as long as outer ramus in length, outer margin with two medial and apical small setae, outer ramus biarticulate, attenuate, proximal segment with one distal small seta, terminal segment vestigial, with two apical setae, outer ramus small, with one apical spine.

Telson: Telson fleshy, short, triangular, both sides of outer medial margin with one pair of small setae respectively.

Material examined. Holotype: Male, 2.25 mm. Type-locality: Tomioka Bay. Date: May, 1978. Collection No.: AMBL-Amph. 104.

Remarks. The new species is easily distinguished from any other species of *Photis* by the attenuate coxa 1, the basis of gnathopod 2 with one anteromedial lamina and the palmar clavate tooth of gnathopod 2.

Aorcho

Aorcho nanus sp. nov.

(Fig. 80–82)

Body: Body rather slender, coxae small, but serially touching or slightly overlapping. Head slightly shorter than pereonites 1–2 combined, anterior head lobe slightly producing, rounded distally, small, inferior antennal sinus almost straight. Eyes small, circular, locating on anterior head lobe. Pleonites 1–2 equal to each other in length, pleonal epimeron 1 subrectangular, anterior margin with one pinnate seta, pleonal epimeron 2 rectangular, broader than pleonal epimeron 1, lower margin roundish, with four pinnate setae, pleonal epimeron 3 distinctly

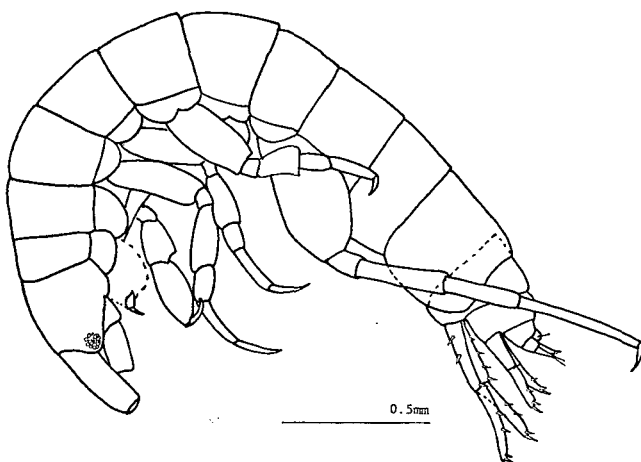


Fig. 80. *Aorcho nanus* sp. nov. Holotype, female (?), 3.25 mm.

broader and more roundish on lower margin than pleonal epimeron 2, lacking pinnate setae. Urosome as long as pleonite 3, urosomite 1 about twice as long as urosomite 2, dorsal margin of urosomite 3 very short, lateral side reaching middle of telson.

Antennae: Peduncular segment 1 of antenna 1 almost as long as head, stout, ventrodistal margin with three pairs of pinnate setae, peduncular segment 2 one and half times as long as peduncular segment 1, prominently narrower than it, peduncular segment 3 as long as peduncular segment 1, almost as thick as peduncular

segment 2, accessory flagellum triarticulate, proximal and distal segments short, main flagellum composing of five long, one small and one rudimental segments, proximal five segments equal to each other in length, distal end of proximal three segments with one thinly haired spine, one of fourth segment with two thinly haired spines and one stout thinly haired seta, fifth and sixth segments with one distal thinly haired spine. Antenna 2 prominently shorter than antenna 1, proximal two segments short, gland cone of peduncular segment 2 vestigial, peduncular segment 4 twice as long as and distinctly narrower than peduncular segments 3, peduncular segment 5 shorter and narrower than peduncular segment 4, flagellum composing of three plus one rudimentary segments, shorter than peduncular segment 5, distal end of 3rd segment with one pair of spines.

Mouthparts: Mouthparts not massive. Upper lip rounded, apical margin bristly. Inner plate of lower lip medium, densely pubescent, inner margin of outer plate densely pubescent, with one distal row of seven spines, shoulders rounded, mandibular process weakly developed, small, distal end rounded. Inner plate of maxilla 1 medium, subrectangular, inner margin with three medial slender setae and one more stout seta near apex, outer plate with four bifid tooth-like spines, four tooth-like spines armed with one or two teeth, and one tooth-like spine armed with three setae, palp biarticulate, a little extending beyond outer plate, broad, gently curved outward, proximal segment shorter than half as long as distal one, with one seta on outer distal end, apex of terminal segment with four conical teeth and three setae. Maxilla 2 broad, inner plate long oval, densely pubescent, with one oblique row of fifteen simple setae, inner distal margin with seven dispersively pinnate and four simple setae, outer plate slightly narrower than inner one, apex rounded, with six stout setae and three pairs of flexible setae. Both mandibles similar to each other, incisor producing inward, broad, with four teeth, lacinia mobilis broad, with four teeth, accessory blades five, serrate, molar process medium or rather more developed, truncate and ridged distally, with one accessory process on upper base and one pinnate seta, deeply serrate marginally, molar rasp medium, palpal hump developed, locating on outer distal end, palp triarticulate, developed, rather slender, clavate, almost uniform in thickness, proximal segment short, 2nd segment the longest, upper margin with two proximal and two distal setae, terminal segment obliquely truncate, three fourths as long as and narrower than 2nd segment, lower margin with one medial seta, apex with two short simple setae, one short pinnate seta, one long stout pinnate seta and one long stout simple seta which is longer than the terminal segment. Inner plate of maxilliped not extending beyond proximal segment of palp, with one row of eight pinnate setae on distal end and apical margins, inner margin with one set of one conical tooth and one pinnate seta, apex with four conical teeth, outer plate medium, reaching two thirds of proximal two segments of palp, inner margin with seven setae, inner distal half with four spatulate teeth, apex with three slender teeth, palp four articulate, proximal two segments about two thirds as long as palp, inner margin of 2nd segment dispersively setose, 3rd segment about one third as long as proximal two segments, uniform in width, ventrodistal end

with one transverse row of three spines and two setae, upper distal end with one seta on inner margin, outer margin with two medial and distal setae, dactyl shorter than 3rd segment, attenuate, apex with one pair of setae and one nail-like spine.

Gnathopod 1: Coxa 1 subrectangular, roundish. Gnathopod 1 subchelate.

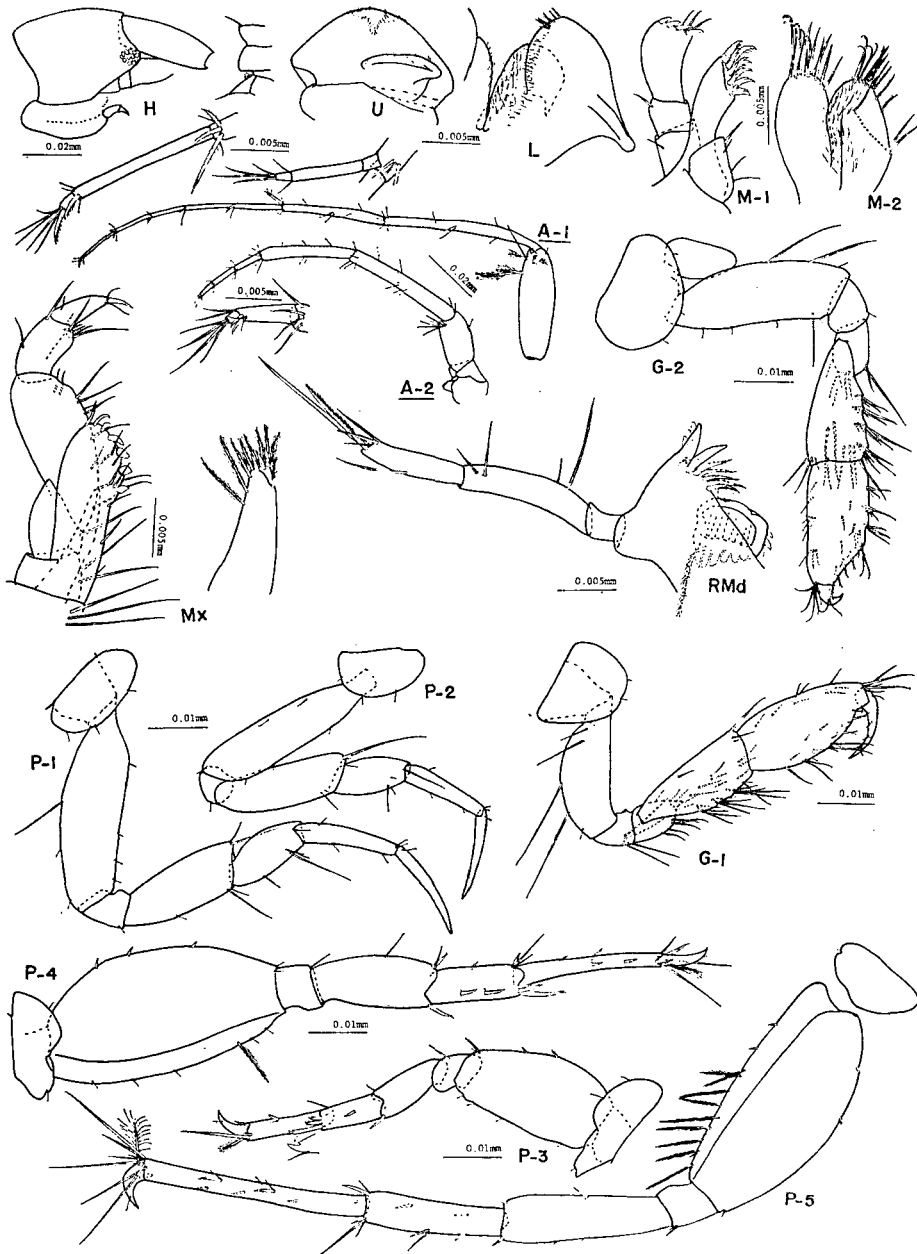


Fig. 81. *Aorcho nanus* sp. nov. Holotype, female (?), 3.25 mm. A-1, A-2: Paratype no. 7, female (?), 3.25 mm.

Basis about two sevenths as long as gnathopod 1, gradually expanding backward proximally, posterior margin with one proximal long and two small setae. Ischium short, longer than wide, posterior margin twice as long as anterior one, with one transverse row of four setae on inner distal end. Merus producing in triangle on anterodistal end of inner side, posterior margin as long as one of ischium, with two single setae and one distal set of three setae, base of the extension with four setae, anterior free margin short. Carpus subequal to basis in length, gradually increasing in width on proximal half, posterior submargin of inner side with three rows of four setae, and one distal row of one small and two short setae, outer distal margin with one medial small seta and one distal set of three setae, central line of inner side with two single setae and two pairs of setae in one row. Propod as long as carpus, long oval, anterior submargin of inner side with two single setae and two sets of three setae, anterodistal end with four setae, palm continuous to posterior margin, but defined by one set of one spine and one small seta, with seven feeble spines and one set of three setae, posterior margin with one seta and one pair of setae. Dactyl fitting on palm, falcate, grasping margin with two spines.

Gnathopod 2: Coxa 2 similar to coxa 1 in shape and size. Gnathopod 2 also very similar to gnathopod 1, but propod less roundish, palm distinct to posterior margin.

Peraeopod 1: Coxa 3 similar to coxa 2. Basis one third as long as peraeopod 1, depressed proximally, anterior margin with four minute setae, posterior margin with one long and two minute setae. Ischium short, posterior margin slightly longer than wide, with one distal minute seta. Merus about two thirds as long as basis, gradually increasing in width, anterodistal end with one set of two short and long setae, posterior margin with one medial small seta, and one distal set of one short and one long setae. Carpus two thirds as long as merus, oval, proximal margin distinctly narrower than merus, outer distal end with one small seta, posterior margin with one medial short seta, and three distal short and long setae. Propod shorter than merus, slender, gradually decreasing in width, anterior margin with one proximal minute seta and one pair of small setae on distal end, posterior margin with two proximal and distal setae. Dactyl as long as propod, attenuate, falcate, apex blunt.

Peraeopod 2: Coxa 4 similar to coxa 3. Peraeopod 2 similar to peraeopod 1, but posterior margin of basis lacking long setae.

Peraeopod 3: Coxa 5 bilobate, very shallow, anterior lobe deeper than posterior one, rounded, posterior lobe extending backward. Peraeopod 3 shorter than peraeopod 2. Basis two fifths as long as peraeopod 3, broad, but posterior thin plate very narrow, not extending downward, with four minute setae, anterior margin roundish, distal half with two spines and one distal set of one minute and one short setae. Ischium short, square, anterodistal end with one short and stout seta. Merus about half as long as basis, a little increasing in width, produced on both distal ends, anterodistal end with one spine and one small seta, posterodistal end with one spine. Carpus shorter than merus, uniform in width, outer side with one medial spine

and three bifid spines on distal end, anterodistal end with one spine and one short seta. Propod longer than merus, anterior margin with one medial set of one spine and one minute seta, and one distal spine, posterodistal end with one spine and one long stout seta. Dactyl half as long as propod, stout, falcate, with one pinnate seta.

Peraeopod 4: Coxa 6 bilobate, both lobes subequal to each other in depth. Peraeopod 4 about twice as long as peraeopod 3, but similar to it in shape. Anterior margin of basis with three medial spines and one distal set of two small setae, posterior margin with five minute and one short pinnate setae. Outer side of carpus with two medial single spines and three distal bifid spines, anterior margin with one medial spine, and one distal set of one spine and two short setae. Anterior margin of propod with three single spines, posterior margin with two medial single spines, and one distal set of one spine and three short and long setae.

Peraeopod 5: Coxa 7 semicircular, but lower margin slightly concaved medially. Peraeopod 5 longer than peraeopod 4. Basis about two sevenths as long as peraeopod 5, slenderer than one of peraeopod 4, posterior thin plate narrow, not extending downward, with two proximal spines, one distal spine and nine pinnate setae on distal two thirds, anteroproximal half with two spines, anterodistal end with one small seta. Ischium short, square, anterodistal end with one short seta. Merus about three fourths as long as basis, anterior margin with two medial small setae and one distal spine, posterior margin with two medial and distal spines. Carpus shorter and narrower than merus, anterior margin with one proximal spine, one medial set of one spine and one short seta, and one distal set of one spine and two short and long setae, posterior margin with two spines, and one distal set of two spines and one short seta. Propod as long as basis, narrower than carpus, anterior margin with three medial and one distal spines, posterior margin with two medial sets of one spine and one small seta, and one distal set of seven short and long setae. Dactyl short, stout, falcate, with one pinnate seta.

Pleopods: Peduncle subequal to outer ramus in length, stout, outer margin with four pinnate setae, inner distal end with one pair of coupling spines, outer ramus six articulate, two thirds as long as inner ramus, inner ramus six articulate, inner margin of proximal segment with two bifid and one ordinary pinnate setae, terminal swimming setae shorter than inner ramus.

Uropods: Uropod 1 extending beyond uropod 2, peduncle as long as outer ramus, ventrodistal end with one falcate tooth which extends to middle of outer ramus, outer lateral side with two spines, upper side with two spines on distal half of outer margin, and four spines and one distal tooth on inner margin, rami slender, uniform in width, truncate, outer ramus longer than inner one, with one medial pair of spines, distal margin with one set of two small and longer spines, three spines, and one tooth on outer distal end, inner ramus with one spine on inner medial margin, apex with one pair of stout spines, one pair of small spines, and one apicomедial long stout spine. Uropod 2 half as long as uropod 1, peduncle as long as rami, ventrodistal end with one falcate tooth which extends to near apex of outer ramus,

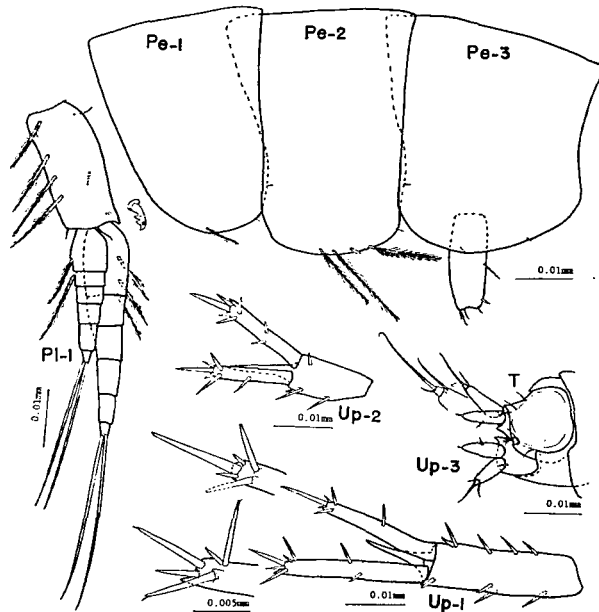


Fig. 82. *Aorcho nanus* sp. nov. Holotype, female (?), 3.25 mm.

outer distal end with one spine, inner margin with one medial spine, and one distal set of one spine and one tooth, rami slender, truncate, equal to each other in length, outer ramus with one medial pair of spines, apex with two pairs of spines, one medial long stout spine and one small tooth on outer distal end, inner ramus with one spine on inner medial margin, apex with one pair of stout spines, one pair of small spines, and one center stout spine. Uropod 3 about half as long as uropod 2, peduncle stout, subequal to rami in length, with one tooth on inner distal end and one spine on outer distal end, outer ramus biarticulate, proximal segment roundish, with one distal pair of setae, terminal segment vestigial, apex with one seta, inner ramus equal to outer one in length, roundish, inner margin with one medial spine, apex with one spine.

Telson: Telson fleshy, small, even on upper side, truncate, roundish marginally, both outer distal halves with two small simple and one distal small pinnate setae.

Material examined. Holotype: Female (?), 3.25 mm. Type-locality: Tomioka Bay. Date: May, 1978. Paratype: 7 specimens. Collection No.: AMBL-Amph. 69.

Remarks. *Aorcho* is hitherto known only two species to science. The present species is distinguished from *A. cuvipalma* (Ledoyer 1978) by the elongate rami of uropod 3, but it is difficult to distinguish the new species from *A. delgadus* (J.L. Barnard 1961, Griffiths 1975) because these two species are very similar to each other in the external appearance and J.L. Barnard (1961) did not describe and figure *A. delgadus* in detail. However, as each segment of the accessory flagellum of *A. delgadus* is small and equal to each other in the figure, *A. nanus* sp. nov. is nominated to the present species.

*Gammaropsis*Key to the species of *Gammaropsis*

- 1 Carpus of gnathopod 1 about twice as long as propod.....2
- Carpus of gnathopod 1 far shorter than twice as long as propod3
- 2 Outer ramus of uropod 2 subequal to peduncle in length*G. nantis*
- Outer ramus of uropod 2 distinctly longer than peduncle*G. sophiae*
- 3 Eyes very large, reniform*G. atlantica varius*
- Eyes small or medium4
- 4 Posterodistal angle of pleonal epimeron 3 rounded, smooth.....*G. longipropodi*
- Posterodistal angle of pleonal epimeron 3 with one small tooth5
- 5 Palm of gnathopod 2 concave and dentate*G. japonicus*
- Palm of gnathopod 2 not concave and smooth*G. utinomi*

Gammaropsis nantis sp. nov.

(Fig. 83-85)

Body: Body cylindrical, coxae less developed, but serially overlapping, both gnathopods remarkably elongate. Head shorter than peraeonites 1-2 combined, rostrum very short, anterior head lobe not prominently producing, acute apically,

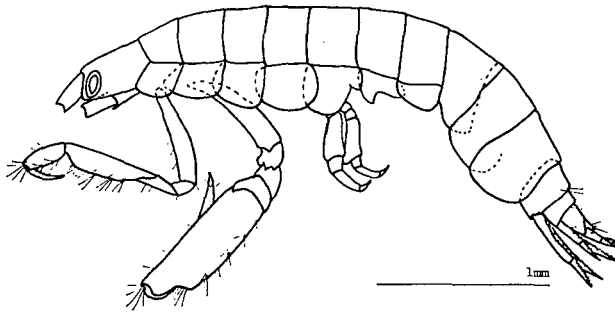


Fig. 83. *Gammaropsis nantis* sp. nov. Holotype, male, 3.75 mm.

inferior antennal sinus deeply concave in rectangle, extending beyond middle of head. Eyes medium, oval, placing on anterior head lobe, central part darkish, marginal part bright. Pleonites 1-3 progressively elongating a little, pleonal epimeron 1 narrower in comparison to other epimera, subrectangular, pleonal epimeron 2 expanding posteriorly, roundish, posterodistal end with one minute seta, pleonal epimeron 3 broader than pleonal epimeron 2, slightly producing anterodistally, posterior margin gently expanding, with one distal minute seta. Urosome subequal to pleonite 3 in length, urosomite 1 distinctly longer than twice as long as urosomite 2, dorsodistal end with one pair of short setae, urosomite 2 with one

dorsodistal pair of small setae, urosomite 3 shorter than urosomite 2 in dorsal length, lateral side extending backward on lower part.

Antennae: Peduncular segment 1 of antenna 1 about half as long as head length, peduncular segment 2 subequal to peduncular segment 1 in length, ventral margin with four pairs of setae, and one distal pair of one short simple and one long pectinate setae, peduncular segment 3 shorter than peduncular segment 1, ventral margin with three pairs of setae, and one distal pair of one short simple and one long pectinate setae, accessory flagellum ten articulate, subequal to each other in length except for distal vestigial segment, the majority of main flagellum with one or two short setae and one aesthetasc on each segment, especially distal five segments with one distal pectinate seta. Antenna 2 long, peduncular segment 2 short, gland cone small, but broad basally, peduncular segment 3 about half as long as and twice as broad as peduncular segment 4, peduncular segment 4 as long as peduncular segment 5, with two longitudinal rows of four and six pairing setae ventrally, peduncular segment 5 slenderer than peduncular segment 4, with two longitudinal rows of eight pairing setae ventrally.

Mouthparts: Apical margin of upper lip broad, concave medially, only both producing margins except for central part bristly. Inner plate of lower lip developed, densely pubescent on inner and apical margins, shoulders of outer plate broad, inner margin and shoulders densely pubescent, mandibular process medium, extending outward. Inner plate of maxilla 1 rather larger, broad, with eight medial and one apical setae, inner distal margin of outer plate with four setae, apex with six bifid tooth-like spines, one tooth-like spine armed with two teeth, and three serrate tooth-like spines, palp extending beyond outer plate, biarticulate, curved outward, proximal segment short, apex of distal segment broad, with five spines and five setae bristly on distal part. Inner plate of maxilla 2 oval, outer margin densely pubescent, lateral side with one oblique row of fourteen simple setae, distal part of inner margin and apex with about fifteen pinnate and several simple setae, outer plate longer and narrower than inner one, only apex with six stiff setae, six pinnate setae on outer margin and about six feeble setae on inner half. Both mandibles similar to each other, incisor producing forward, broad, with five conical teeth, accessory blades six, serrate, molar process medium, truncate, with accessory process serrated apically and one pinnate seta, rugose on half margin, molar rasp developed, palp much developed, stout, triarticulate, almost uniform in width, proximal segment short, 2nd segment with three pectinate setae on posterior margin and eleven pectinate setae on upper margin, terminal segment truncate, posterior margin with one set of three pectinate setae, and two single setae, anterodistal half with five pectinate setae, apex with fifteen pectinate setae. Inner plate of maxilliped not extending beyond proximal segment of palp, with one oblique row of twelve pinnate setae, apex with three conical spines and three pinnate setae, outer plate reaching proximal two thirds of 2nd segment of palp, inner margin with twelve blunt setae, distal margin with five spatulate teeth and three setae on apex, palp rather slender, four articulate, proximal two segments three fifths as long as palp, inner margin of

2nd segment setose, these setae bifid apically, especially medial two setae armed with a few opposite setae, 3rd segment slenderer than 2nd one, longer than distal one, inner distal half with two longitudinal and oblique rows of four and seven setae, outer distal end with eight bifid setae armed with a few opposite setae, terminal

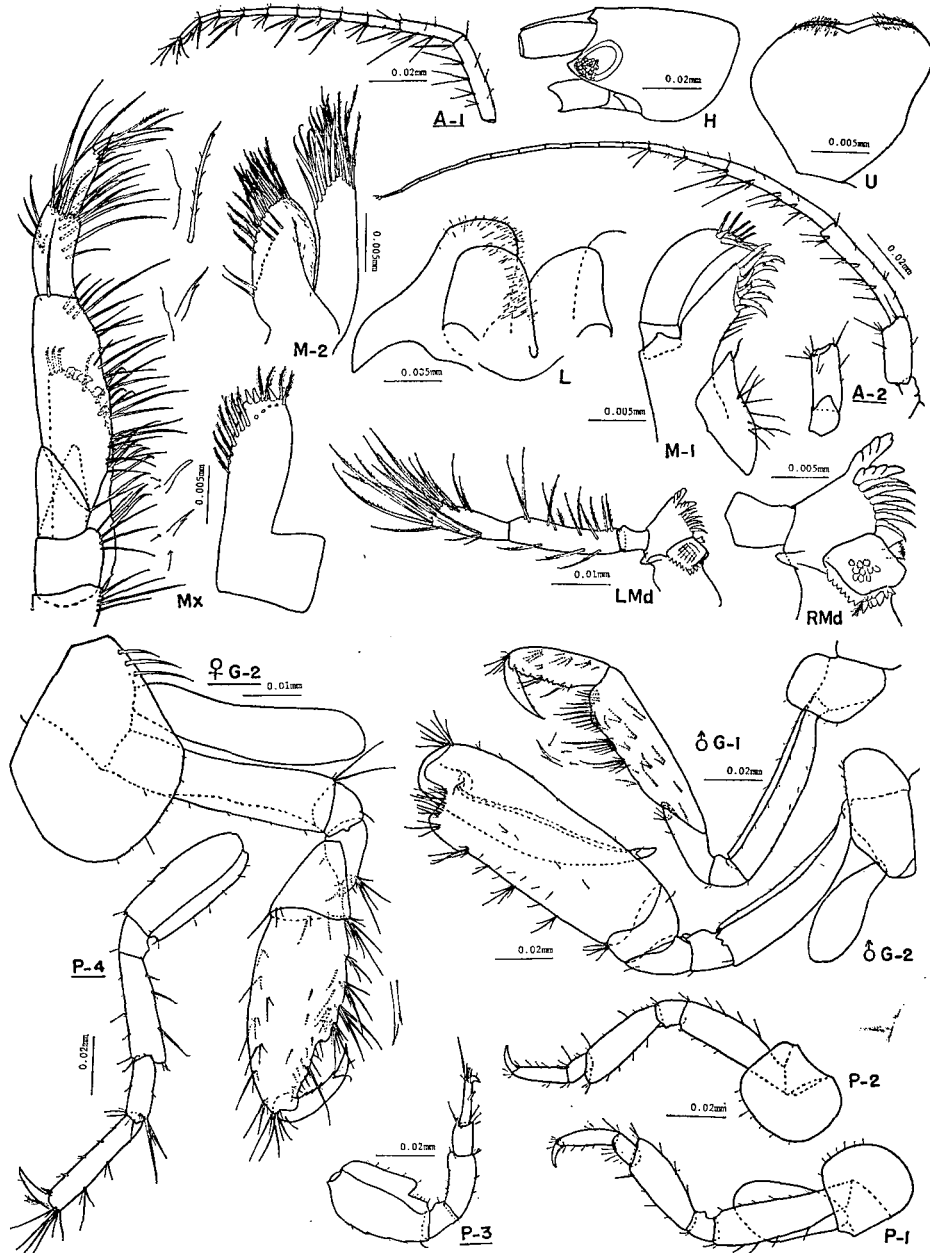


Fig. 84. *Gammaropsis nantis* sp. nov. Holotype, male, 3.75 mm. P-3, P-4, A-1, A-2: Paratype no. 3, male, 3.0 mm. ♀G-2: Paratype no. 4, female, 3.75 mm.

segment a little decreasing in width, truncate, apex with two pairs of small setae, two long setae armed with a few opposite setae, one long seta pectinating on distal part and one long stout tooth.

Gnathopod 1: Coxa 1 rectangular, slightly expanding forward. Gnathopod 1 slender, very long, simple. Basis about one third as long as gnathopod 1, both sides of anterior and posterior margins with several minute setae, posterodistal end with one small seta. Ischium short, longer than wide, posterior margin twice as long as anterior one, with one pair of small setae. Merus about half as long as basis, extending posterodistally, fitting on pocket of carpus, posterior margin three times as long as anterior free one, with one seta and one transverse row of five setae. Carpus as long as basis, posterodistal half with three expanding processes which are armed with several bifid setae, else proximal two processes with one pinnate seta, inner distal end with one transverse row of seven bifid setae, inner side dispersively with several pairs of bifid setae and several single bifid setae. Propod half as long as carpus, slightly narrowed proximally, posterodistal two thirds undulated, with two sets of several bifid setae, three small bifid setae and one distal spine, anterior submargin of inner side with one, three, four and four simple and pectinate setae in formula, anterodistal end with five setae. Dactyl shorter than propod, stout, falcate, grasping margin with eight minute teeth.

Gnathopod 2 of male: Coxa 2 twice as broad as deep, anterior margin rounded. Gnathopod 2 about as long as gnathopod 1, but stout, especially propod stout. Basis one third as long as gnathopod 2, both sides of anterior margin with several minute setae. Ischium short, square. Merus one and half times as long as ischium, anterior free margin short. Carpus narrow, expanding forward, posterodistal end with five small setae. Propod longer than basis and ischium combined, broad, rectangular, uniform in width, anterodistal end with several setae, posterior margin with four sets of several setae, and several single small setae, palm short, transverse, setose in one row. Dactyl stout, subequal to propod in length, most expanded medially, grasping margin with many minute setae.

Gnathopod 2 of female: Coxa 2 square, roundish, posteroproximal margin with three stout setae. Basis two fifths as long as gnathopod 2, uniform in width, anterior margin with several minute setae, posterodistal end with two long and two minute setae. Ischium short, wider than long, with one posterodistal seta. Merus one third as long as basis, triangular in lateral view, anterior free margin short, posterodistal margin with one transverse row of six setae and one pair of setae. Carpus as long as merus, triangular, posterodistal end with seven setae. Propod subequal to basis in length, slightly expanding medially, roundish, anterior submargin dispersively setose in sets or pairs, especially anterodistal end with seven setae, posterior margin half as long as anterior margin, with four sets of several setae, palm oblique, not straight, defined by one spine, with several small setae or slender spines in rows. Dactyl fitting on palm, falcate, grasping margin with five small teeth.

Peraeopod 1: Coxa 3 subsquare, anterior and lower margins continuously

rounded. Peraeopod 1 short. Basis two fifths as long as peraeopod 1, with four small setae and one posterodistal pair of one small and one minute setae, and six anterior minute setae. Ischium short, subsquare, posterodistal end with two small setae. Merus two thirds as long as basis, gradually expanding a little forward, extending anterodistally, with four small setae and one anterodistal set of three small setae, three posterior small setae and one posterior pair of small setae. Carpus subequal to ischium in length, half as broad as merus, anterodistal end with one small and one minute setae, posterior margin with five small setae. Propod about twice as long as carpus, a little decreasing in width, anterior margin with one medial pair of small setae and one distal set of three small setae, posterior margin with three small setae and one pair of small setae. Dactyl about half as long as propod, falcate, apex blunt.

Peraeopod 2: Coxa 4 similar to coxa 3 in shape and size. Peraeopod 2 similar to peraeopod 1.

Peraeopod 3: Coxa 5 bilobate, as deep as coxa 4, posterior lobe small, rounded, with two small setae. Peraeopod 3 short. Basis about two fifths as long as peraeopod 3, broadly expanding, posterodistal margin concave in rectangle, not producing forward, posterior margin with many minute setae, anterior margin with four minute and one distal small setae. Ischium one third as long as basis, anterior margin twice as long as posterior one. Merus twice as long as and as broad as ischium, almost uniform in width, slightly producing on both distal ends, anterior margin with two medial minute setae and one distal set of three minute setae, posterior margin with four medial minute and one distal minute setae. Carpus half as long as and narrower than merus, posterodistal end with two short and one minute setae, anterodistal end with three spines and one short seta. Propod two thirds as long as merus, prominently narrower than carpus, anteromedial margin with one spine, posterodistal end with one spine, and two stout and three minute setae. Dactyl small, nail-like.

Peraeopod 4: Coxa 6 bilobate, as deep as posterior lobe of coxa 5, anterior lobe small, deeper than posterior one, posterodistal angle of posterior lobe rounded, with two small setae. Peraeopod 4 long, slender. Basis two sevenths as long as peraeopod 4, not broadly expanding, especially posterior thin plate narrow, not producing forward, with several small setae, anterior margin with one medial minute seta, one medial spine, and one distal set of one small seta and one spine. Ischium one third as long as basis, with one anterodistal minute seta. Merus distinctly shorter than basis, gradually increasing a little in width, broadly producing forward, anterior margin with three small setae, one medial set of two small and short setae, and one distal set of two short and one small setae, posterior margin with three medial set of one long spine and one minute seta, and one distal set of one spine and one minute seta. Carpus two thirds as long as merus, anterodistal end with three short and two minute setae, posterodistal end with three short and two minute setae, posterodistal end with three stout setae and three spines. Propod subequal to basis in length, uniform in width, anterior margin with two spines,

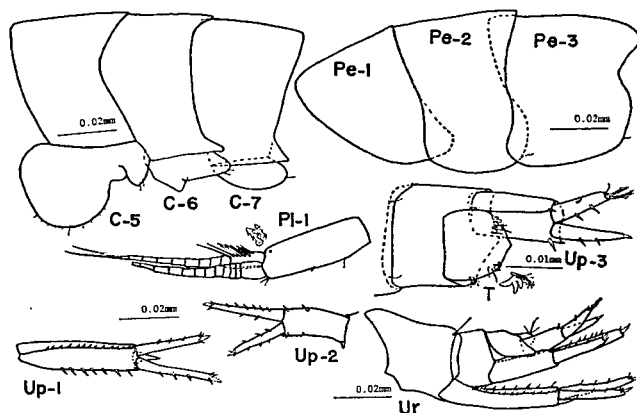


Fig. 85. *Gammaropsis nantis* sp. nov. Holotype, male, 3.75 mm.

two sets of one spine and one minute seta, and one pair of locking spines, posterior margin with two and three medial setae, and seven distal long and short setae. Dactyl shorter than half as long as propod, falcate.

Peraeopod 5: Coxa 7 as deep as coxa 6, posterior margin rounded, with one minute seta. Peraeopod 5 lost.

Pleopods: Pleopod 1 slender, long, peduncle shorter than rami, outer distal end with one pair of small setae, inner distal end with one pair of coupling spines, outer ramus shorter than inner one, proximal segment one fifth as long as outer ramus, with five pinnate setae on outer margin, inner margin of proximal segment on inner ramus with five bifid and two ordinary pinnate setae, terminal swimming setae short.

Uropods: Uropod 1 not extending beyond uropod 2, peduncle one and half times as long as inner ramus, prominently produced in triangle ventrodistally, outer margin with fourteen spines and one apical small tooth, inner margin with seven spines and one apical small tooth, both rami slender, truncate, outer ramus shorter than inner one, with three spines and one apical set of three small and one stout spines, inner ramus with three spines and one apical set of three and one stout spines. Uropod 2 two thirds as long as uropod 1, peduncle as long as outer ramus, distal half of both margins with two spines respectively, outer ramus three fourths as long as inner one, with three medial pairs of spines and one apical set of two pairing and one stout spines, inner ramus with two spines on outer margin, six spines on inner one and one apical set of four pairing and one stout spines. Uropod 3 half as long as uropod 2, peduncle stout, slightly longer than inner ramus, with one apical spine on both margins, else with one tooth on inner apex, outer ramus slightly shorter than inner one, truncate, with one spine on outer margin and two spines on inner one, apex with two small simple and two pinnate setae, inner ramus with two medial and one apical spines.

Telson: Telson fleshy, short, pentagonal, both outer margins with one medial pair of pinnate setae, and one distal set of two simple and one pinnate setae, and one accessory process.

Material examined. Holotype: Male, 3.75 mm. Type-locality: Tomioka Bay. Date: May, 1978. Paratype: 3 specimens. Collection No.: AMBL-Amph. 63.

Remarks. The new species has the elongate dactyl of gnathopod 2. This character is known hitherto in only one species, *Gammaropsis (Podoceroopsis) dubia* (Shoemaker 1942), but the present species is distinguished from *G. (P.) dubia* by the presence of the accessory flagellum and the stubby propod of gnathopod 2.

Gammaropsis sophiae (Boeck, 1861)

(Fig. 86-87)

Podoceroopsis sophiae: Chevreux 1887, p. 314; Sars 1895, p. 574-576; Stebbing 1906, p. 620; Chevreux and Fage 1925, p. 316-317; Stephensen 1942, p. 373; Reid 1951, p. 264; Oldevig 1959, p. 106; Ledoyer 1970, p. 19.

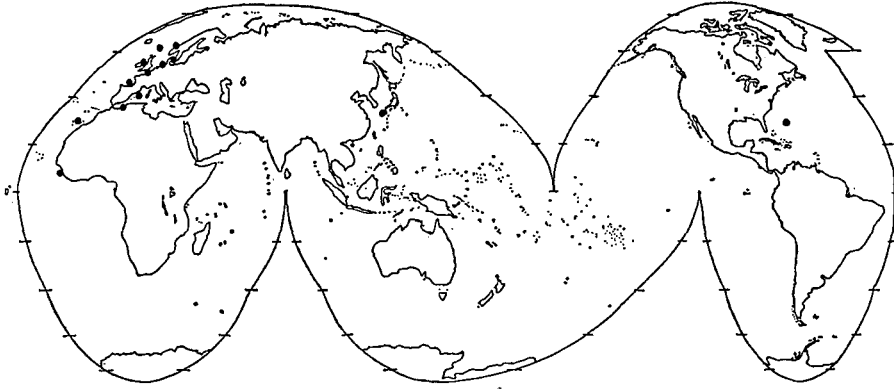


Fig. 86. Distribution of *Gammaropsis sophiae* (Boeck) (●) in the world.

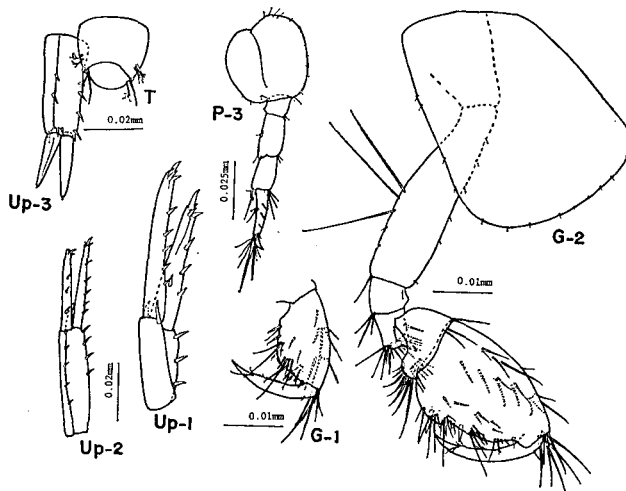


Fig. 87. *Gammaropsis sophiae* (Boeck). Female, 3.5 mm.

Material examined: Female, 3.5 mm. Tomioka Bay. Collection No.: AML-Amph. 108. (1 specimen).

Remarks. The present specimen well agrees with *Podoceroopsis sophiae* (Sars 1895) except for the basis of peraeopod 3 circular and the rami of uropod 3 naked.

Gammaropsis atlantica Stebbing, 1888 *varius* subsp. nov.

(Fig. 88-91)

Body: Body rather stout, coxae shallow. Head medium, back as long as peraeonites 1-2 combined, rostrum vestigial, anterior head lobe prominently and broadly producing in triangle, blunt apically, inferior antennal sinus deeply concave in rectangle, reaching middle of head. Eyes medium, reniform, placing along

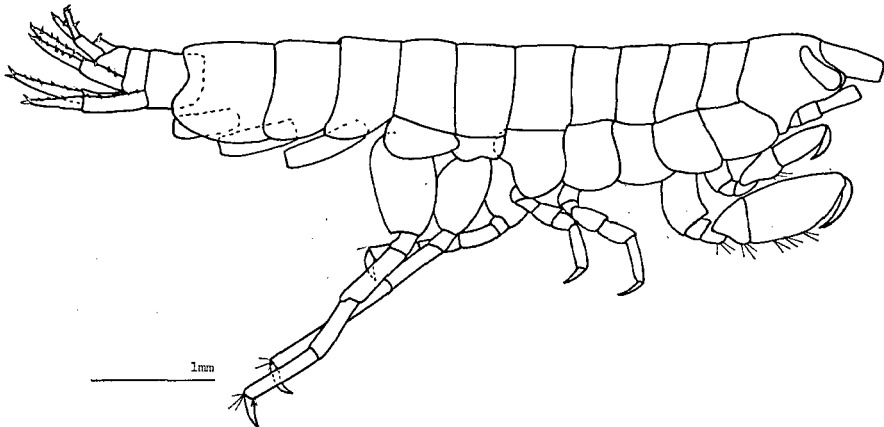


Fig. 88. *Gammaropsis atlantica varius* subsp. nov. Holotype, male, 5.75 mm.

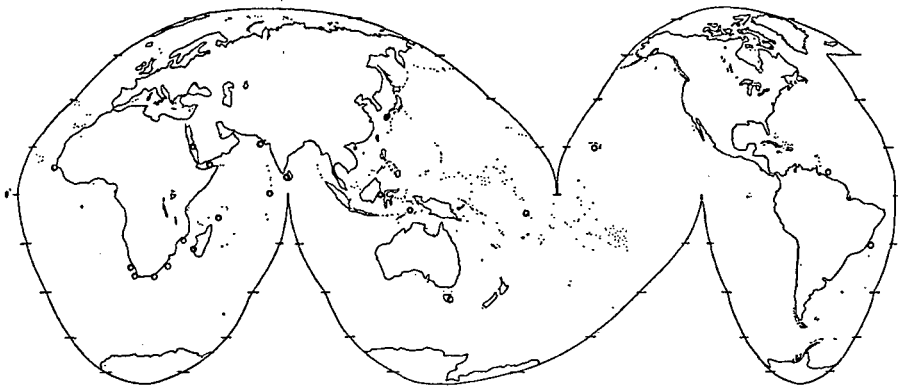


Fig. 89. Distribution of *Gammaropsis atlantica atlantica* Stebbing (○) and *G. atlantica varius* subsp. nov. (●) in the world.

upper margin of anterior head lobe. Pleonite 1–2 equal to each other in lengths, pleonite 3 distinctly longer than pleonite 2, pleonal epimeron 1 rounded, posterodistal angle with one minute notch and one minute seta, pleonal epimeron 2 subrectangular, slightly producing anterodistally, posterior margin slightly expanding, its distal margin with one minute notch and one minute seta, pleonal epimeron 3 wider than pleonal epimeron 2, subrectangular, but largely expanding posteriorly, its posterodistal margin with one minute notch and one minute seta. Urosome shorter than pleonite 3, urosomite 1 longer than twice as long as urosomite 2, slightly concave dorsomedially, dorsodistal end with one pair of short setae, dorsodistal end of urosomite 2 with one pair of setae, urosomite 3 half as long as urosomite 2 in dorsal length, prominently extending backward ventrodistally.

Antennae: Peduncular segment 1 of antenna 1 two thirds as long as head, following segments lost. Peduncular segment 2 of antenna 2 short, gland cone triangular, prominently producing, peduncular segment 3 two thirds as long as peduncular segment 1 of antenna 1.

Mouthparts: Apical margin of upper lip broad, slightly concave medially, densely bristly except for medial concavity. Inner plate of lower lip developed, densely pubescent, shoulder broad, rounded, with one row of nine small setae, densely pubescent on outer margin, inner margin also densely pubescent. Inner plate of maxilla 1 developed, broad, apical margin oblique, with seven setae, outer plate dispersively bristly on inner margin, apex with nine tooth-like spines armed with one or two medial teeth and two stout bristly tooth-like spines, palp extending beyond outer plate, gently curved outward, biarticulate, proximal segment short, apex of terminal segment with six conical teeth and five pectinate setae. Both plates of maxilla 2 oval, broad, inner plate with one facial oblique row of twenty-three simple setae, inner distal and apical margins with seven pinnate, seven simple and two small setae, outer plate slightly longer than inner one, only apical margin with seven stout and about twelve setae, outer margin densely pubescent. Both mandibles similar to each other, incisor broad, producing forward, with five teeth, lacinia mobilis broad, with four teeth, accessory blades eight in left mandible and seven in right one, pectinate, accessory pinnate setae about seven, molar process medium, truncate, with one pinnate seta on right mandible, rugose on lower part of distal margin, molar rasp developed, palp much developed, long, almost uniform in width, placed on outer distal end of body, triarticulate, proximal segment short, trapezoid, 2nd segment longer than terminal one, upper margin with two longitudinal rows of nine setae of which the majority are armed with a few medial setae, posterodistal margin with two pairs of simple setae, terminal segment slightly expanding medially, truncate, apex broad, posterior submargin with one oblique row of seven pectinate setae, upper margin with many long pectinate setae. Inner plate of maxilliped medium, with one longitudinal row of eight pinnate setae, apical margin with three conical teeth and six pinnate setae, outer plate reaching proximal two thirds of palpal 2nd segment, inner submargin with about nine pairs of short setae and several proximal single setae, inner distal margin with

six spatulate teeth, apical margin with four blades armed with several minute setae, palp four articulate, proximal two segments half as long as palp, proximal segment with one seta on inner distal end and two setae on outer distal end, inner margin of 2nd segment with eighteen setae, upper distal end with one transverse row of

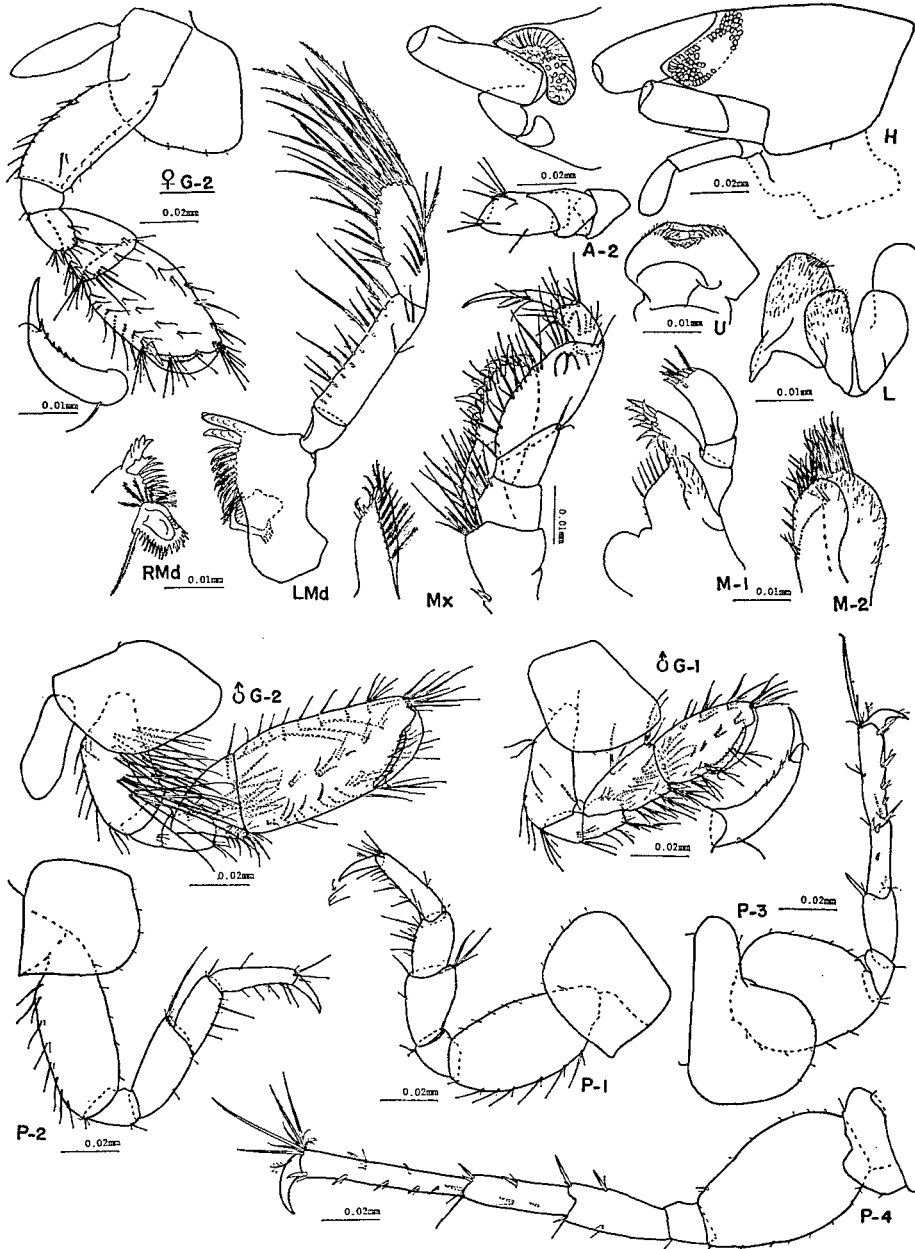


Fig. 90. *Gammaropsis atlantica varius* subsp. nov. Holotype, male, 5.75 mm. ♀G-2: Paratype no. 5, female, 5.25 mm.

four setae, ventrodiscal end with two setae, 3rd segment one third as long as proximal two ones, upper side with one medial transverse row of four setae and one distal oblique row of four setae, ventrodiscal end with five setae, dactyl about twice as long as 3rd segment, slender, falcate, with two medial pairs of setae.

Gnathopod 1: Coxa 1 square, slightly extending anterodistally, lower margin with nine minute setae. Gnathopod 1 smaller than gnathopod 1, subchelate. Basis one third as long as gnathopod 1, broad, gradually expanding backward on proximal margin, posterodistal margin with four single setae and one distal row of three setae. Ischium one third as long as basis, posterodistal end of inner side with one transverse row of five setae. Merus slightly longer than ischium, anterodistal half of inner side with two pairs of setae and two single setae, posterior margin with one seta, one set of three setae and one distal row of seven setae, else inner distal end with four setae. Carpus as long as ischium and merus combined, gradually increasing in width on proximal half, anterior margin with one medial set of two long and one minute setae, and one distal set of three long and one minute setae, posterodistal half with five sets of two to eight setae, inner side with two single setae, one pair of setae, one row of three setae and one distal row of six setae. Propod gradually decreasing in width, anterior submargin of inner side with two single, two, five, five and five distal pectinate setae in formula, posterior margin about one third as long as anterior one, with one single seta and two sets of four setae, palm steeply oblique, continuous to posterior margin, defined by one spine and one row of four setae, with eight medial setae and two pairs of setae, else inner central line with two single setae and two pairs of setae. Dactyl a little overrunning palm, falcate, grasping margin with five small teeth.

Gnathopod 2 of male: Coxa 2 square. Gnathopod 2 stout, not elongate. Basis about one third as long as gnathopod 2, broad, prominently expanding backward proximally, both sides of anterior margin densely setose in transverse rows, posterodistal two thirds with eight setae and one distal pair of setae. Ischium about one third as long as basis, broader than long, posterodistal end with three setae. Merus longer than ischium, anterior margin of inner side with one transverse row of three setae, two single setae and one pair of setae, posterodistal end with three setae. Carpus triangular, shorter than ischium and merus combined, posterior submargin of inner side with three pairs of short stout setae, and three and five setae in rows, inner distal end densely setose. Propod one and half times as long as basis, almost uniform in width, stout, anterior submargin of inner side with nine rows of one to seven setae, anterodistal end with seven setae, posterior submargin of inner side with ten rows of two to seven setae, else inner central line with two single setae, four pairs of setae and one row of three setae, palm oblique, defined by one stout spine and one set of about five setae, with about five pairs of setae and one medial set of three setae. Dactyl fitting on palm, falcate, grasping margin with several minute setae.

Gnathopod 2 of female: Gnathopod 2 similar to one of male, but far less setose than the latter, especially anterior margin of basis lacking long setae, grasping

margin with six teeth.

Peraeopod 1: Coxa 3 rectangular, deeper than wide. Basis broad, roundish, anterior margin with seven minute setae, posterior margin with six pairs of one minute and one short setae, and one distal short seta. Ischium about one third as long as basis, longer than wide, posterodistal end with two small setae. Merus half as long as basis, gradually increasing in width, not extending forward, anterodistal end with three long setae, posterior margin with one medial small and one distal short setae. Carpus shorter than merus, distinctly narrower than distal margin of it, roundish, anterodistal end with two small setae, posterior margin and posterodistal end with several short and small setae. Propod longer than merus, distinctly narrower than carpus, anterior margin with one pair of small setae and one distal set of four setae, posterior margin with two proximal pairs of short setae and four distal single setae. Dactyl half as long as propod, falcate, blunt apically.

Peraeopod 2: Coxa 4 similar to coxa 3. Peraeopod 2 very similar to peraeopod 1 except for number of setae, especially anterodistal end of merus with one long and four minute setae.

Peraeopod 3: Coxa 5 bilobate, posterior lobe shallow, extending backward, anterior lobe semicircular, not extending forward, anterior and posterior margins with several minute setae. Ischium short, anterior margin twice as long as posterior margin, with one distal seta. Merus half as long as basis, gradually increasing in width, anterodistal end with one spine and two small setae, posterodistal end with one spine and one small seta. Carpus slightly narrower than and as long as merus, anterodistal end with two spines and two small setae, posterior margin with one medial spine and one distal set of two spines and one small seta. Propod one and half times as long as carpus, anterior margin with three sets of one spine and one small seta, and one pair of one short and one long spines, posterior margin with one medial pair of short setae and one distal set of one very long spine and four short setae. Dactyl short, stout, falcate.

Peraeopod 4: Coxa 6 bilobate, as deep as posterior lobe of coxa 5, anterior lobe deeper than posterior one. Peraeopod 4 much longer than peraeopod 3. Basis broadly expanding, oval, not extending forward, about two sevenths as long as peraeopod 4, anterior margin with five minute setae on proximal two thirds, two spines and one distal pair of small setae, posterior margin with six minute setae and one distal spine. Ischium short, square, anterodistal end with one small seta. Merus about half as long as basis, slightly increasing in width, a little producing posterodistally, anterior margin with two medial and distal sets of one spine and one small seta, posterior margin with one medial set of one spine and one small seta, and one distal pair of one small and one long spines. Carpus subequal to merus in length, slightly narrower than it, anterior margin with one medial spine, one medial set of one spine and one small seta, and one set of one spine and two setae, posterior margin with one medial set of one spine and one small seta, and one distal pair of spines. Propod one and half times as long as carpus, anterior margin with four sets of one spine and one small seta, and one distal set of one small

and one long spines, posterior margin with one medial spine, one medial set of one spine and five small setae, and one distal set of three long simple stiff, three short simple and one short pinnate setae. Dactyl short, stout, falcate.

Peraeopod 5: Coxa 7 as deep as coxa 6, lower margin rounded. Peraeopod 5 similar to peraeopod 4, but longer than it. Anterodistal half of merus with two sets of one small spine and one small seta, and one distal pair of small pinnate and one short simple setae. Anterior margin of propod with three sets of one spine and one small seta, and one pair of one small and one relatively long spines.

Pleopods: Pleopods developed. Peduncle of pleopod 2 shorter than rami, stout, with several sets of two or three setae, outer distal end with one pair of coupling spines, outer ramus slightly shorter than inner one, proximal segment weakly

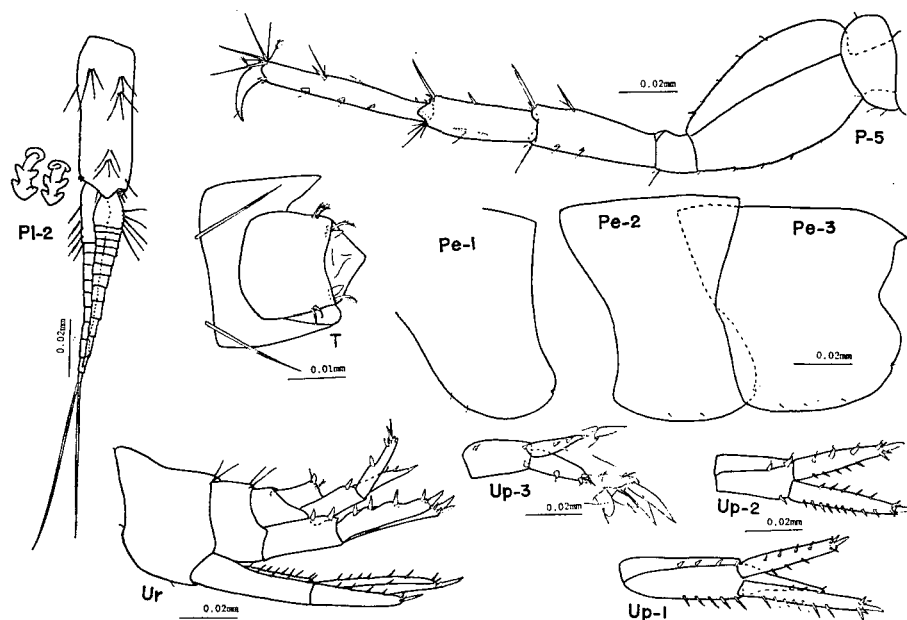


Fig. 91. *Gammalopsis atlantica varius* subsp. nov. Holotype, male, 5.75 mm.

developed, outer margin with five short pinnate setae, following segments gradually narrowing and elongate, proximal segment of inner ramus developed, inner margin with four bifid and one ordinary pinnate setae, terminal swimming setae slightly shorter than rami.

Uropods: Uropod 1 not extending beyond uropod 2, peduncle equal to inner ramus in length, prominently extending ventrodistally, but not extending beyond outer ramus, outer margin with four spines, inner margin with five spines, both rami slender, truncate, outer ramus four fifths as long as inner one, with four spines on outer margin and three spines on inner one, apex with three comparatively small and one central stout spines, inner ramus with three spines on outer margin and seven spines on inner one, apex with two pairs of comparatively small spines and

one central stout spine. Uropod 2 two thirds as long as uropod 1, peduncle shorter than outer ramus, with two spines on outer margin and one spine on inner one, rami slender, truncate, outer ramus shorter than inner one, with three stout spines on outer margin and five spines on inner one, apex with two pairs of comparatively small spines and one central stout spine, inner ramus with five spines on outer margin and nine spines on inner one, apex with two pairs of comparatively small spines and one central stout spine. Uropod 3 longer than half as long as uropod 2, peduncle as long as rami, distal end of both sides with one spine respectively, outer ramus biarticulate, proximal segment with one spine on outer medial margin, and one distal pair of one stout and one medium spines, terminal segment vestigial, with one pair of blade-like setae, inner ramus attenuate, with one spine on outer margin, two spines on inner one and one apical spine.

Telson: Telson fleshy, short, broad, extending in triangle ventrodistally, outer margin with one medial pair of small pinnate setae, and one distal set of one spine and one small pinnate seta.

Material examined. Holotype: Male, 5.75 mm. Type-locality: Tomioka Bay. Date: May, 1978. Paratype: 5 specimens. Collection No.: AMBL-Amph. 64.

Remarks: The present subspecies is closely similar to the group of *Gammaropsis atlantica* (J.L. Barnard 1971a, Ledoyer 1972, etc.) in the following points; uropod 3 with one distal small segment, inner plate of maxilla 1 with at least three medial setae, posterodistal angle of pleonal epimeron 3 rounded, and peduncle of uropod 2 lacking one ventrodistal long tooth. However, the present subspecies is distinguished from it by the palm of gnathopod 2 not smooth.

Gammaropsis longipropodi sp. nov.

(Fig. 92-94)

Body: Body slender. Head longer than peraeonites 1-2 combined, rostrum

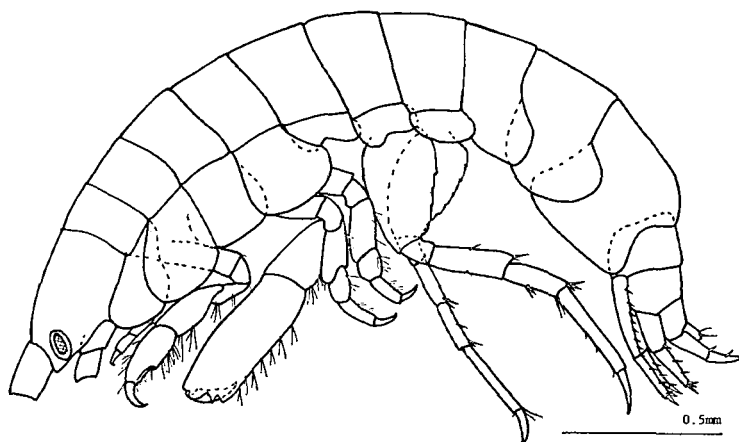


Fig. 92. *Gammaropsis longipropodi* sp. nov. Holotype, male, 3.25 mm.

very small, anterior head lobe slightly producing, inferior antennal sinus deep, beyond middle of head. Eyes small, oval, placed on anterior head lobe. Peraeonites subequal to each other in length. Coxae 1-4 as deep as each peraeonite, coxa 1 distinctly producing forward, covering posterior half of head. Pleonites gradually increasing in length, pleonite 1 as long as peraeonite 7, pleonite 3 twice as long as pleonite 1, pleonal epimeron 1 rounded, extending backward, pleonal epimeron 2 roundish, expanding forward and backward, pleonal epimeron 3 subrectangular, roundish, posteromedial margin gently producing backward. Urosome as long as pleonite 3, urosomite 1 slightly concave on dorsomedial margin, as long as urosomites 2-3 combined, urosomite 2 as long as urosomite 3, twice as deep as it.

Antennae: Antenna 1 less setose, slender, peduncular segment 1 relatively stubby, posterior margin with several setae, peduncular segment 2 one and half times as long as peduncular segment 1, distinctly narrower than it, posterodistal half with three pairs of one long pectinate and one small simple setae, peduncular segment 3 as long as peduncular segment 1, slightly narrower than peduncular segment 2, posterodistal half with one pair of simple setae and two pairs of long pectinate setae, each segment of flagellum with one posterodistal pair of one long pectinate and one small simple setae. Antenna 2 less setose, peduncular segments 1-2 square in lateral view, short, peduncular segment 4 twice as long as peduncular segment 3, peduncular segment 5 as long as peduncular segment 4, proximal two segments of flagellum equal to each other in length, about half as long as peduncular segment 5.

Mouthparts: Apical margin of upper lip rounded, densely pubescent. Inner lobes of lower lip developed, densely pubescent apically, shoulders of outer plate broad, rounded, densely pubescent, mandibular process medium. Inner plate of maxilla 1 small, triangular, with one apical simple seta, outer plate with one simple and ten serrate teeth, palp extending beyond outer plate, biarticulate, gently curved, proximal segment short, terminal segment truncate, with five spines and three setae. Maxilla 2 broad, inner plate oval, with eleven facial simple setae, else inner margin setose, outer plate longer than inner one, only apical margin with three pinnate and ten stiff simple setae. Incisor of mandibles broad, with five or six teeth, lacinia mobilis broad, with four or three teeth, accessory blades four, broad and serrated apically, molar process prominently producing, very much developed, ridged, with one trumpet-formed process and one pinnate seta, palp much developed, broad, triarticulate, proximal segment short, trapezoid, 2nd segment longer than twice as long as proximal one, with several pectinate setae, terminal segment shorter than 2nd one, with one oblique row of five pectinate setae, apical margin rectangular, with nine long simple setae, else with three marginal short setae. Inner plate of maxilliped extending beyond proximal segment of palp, apical margin with four conical teeth and ten pinnate setae, outer plate extending beyond half of 2nd segment of palp, broad, rounded apically, inner margin with one longitudinal row of many single and pairing setae, apical and inner distal margins with eight teeth which gradually increase in length, palp four articulate, not broad, complex of

proximal two segments uniform in width, as long as outer plate, inner margin of 2nd segment with twelve pairs of pectinate setae, 3rd segment one third as long as proximal two segments combined, with one oblique row of four pectinate setae, with four simple setae on outer distal end, terminal segment about half as long as 3rd

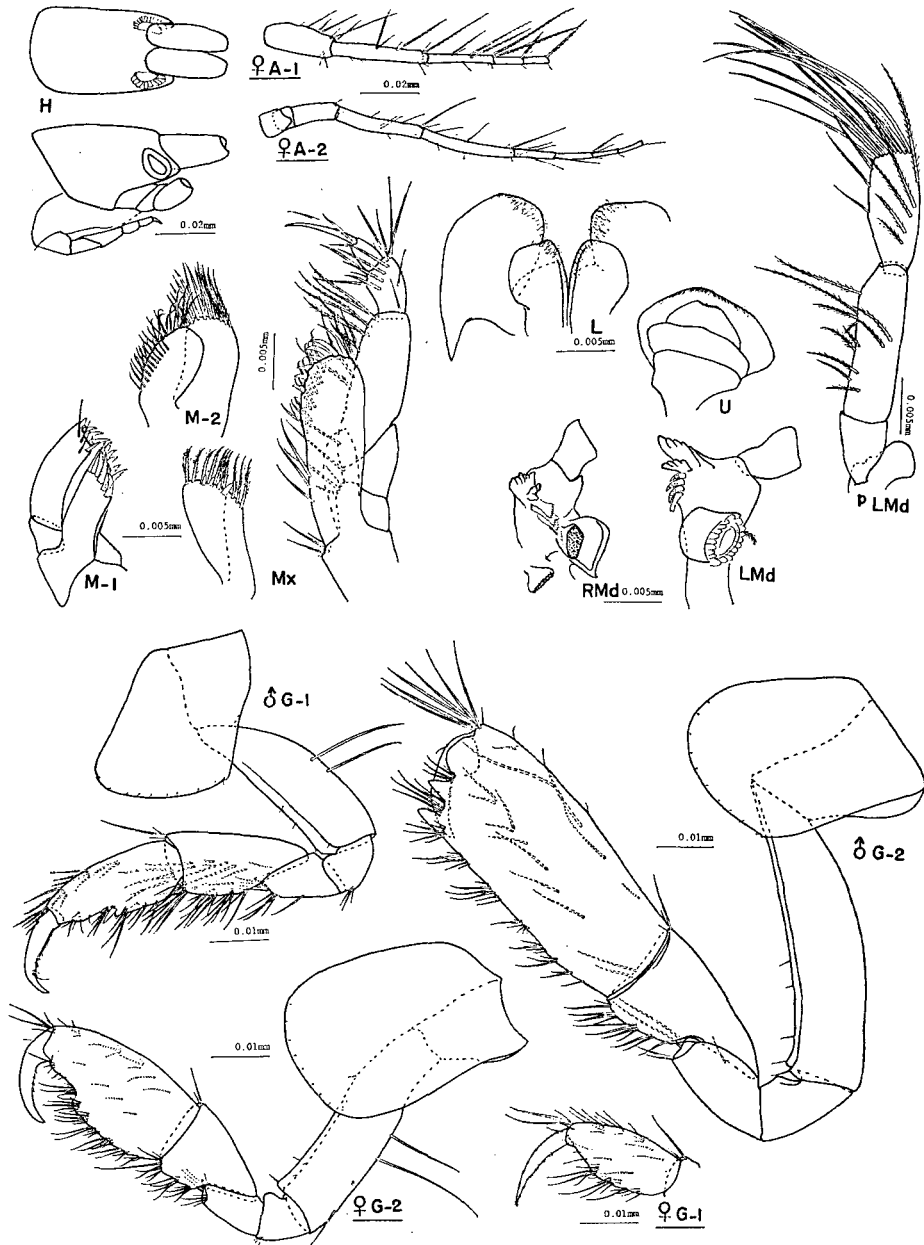


Fig. 93. *Gammaropsis longipropodi* sp. nov. Holotype, male, 3.25 mm. ♀A-1, ♀A-2: Paratype no. 6, female, 2.5 mm. ♀G-1, ♀G-2: Paratype no. 8, female, 4.25 mm.

one, truncate, apex with one long falcate tooth and three long and short setae.

Gnathopod 1 of male: Coxa 1 rectangular, gradually expanding a little forward, posterodistal end with one minute cusp, lower margin slightly roundish, with about ten minute setae. Basis one third as long as gnathopod 1, gradually expanding on posteroproximal half, with two medial long setae. Ischium short, posterior margin rounded, longer than twice as long as anterior margin, with three distal short setae. Merus as long as ischium, obliquely truncate, gradually narrowing a little, posterior margin with one medial seta, distal margin free, with eight setae. Carpus two thirds as long as basis, proximal half gradually widening, posterodistal half with five transverse rows of two to more setae, posterodistal end with two small and one long setae, else with one oblique row of three simple and two pairing setae. Propod as long as carpus, gradually narrowing, anterior margin roundish, with one pair of pectinate setae and three sets of four pectinate setae, posterior margin half as long as anterior one, with three pairs of setae and one set of four setae, palm defined by one stout spine and one small concavity, almost parallel to anterior margin, with one set of three setae, and several setae. Dactyl extending beyond palm, falcate, grasping margin finely pectinate, with three or four small teeth and two small setae.

Gnathopod 1 of female: Gnathopod 1 very similar to one of male except for palm. Palm oblique, defined by one spine, but continuous to posterior margin.

Gnathopod 2: Coxa 2 rectangular, lower margin roundish, posterodistal end with one minute notch. Gnathopod 2 very large. Basis, ischium, merus and carpus very similar to those of gnathopod 1 in shape. Propod rectangular, as long as basis, inner anterior submargin with four single setae and one pair of setae in one longitudinal row, anterodistal end with six long and two short setae, posterior margin with one seta, one pair of setae, three setae and five oblique rows of several setae, central line of inner side with four single setae and two pairs of setae in one longitudinal row, palm transverse, with two large triangular teeth, two concavities with several setae. Dactyl stout, falcate, overlapping palm, grasping margin with four small teeth.

Peraeopod 1: Coxa 3 similar to coxa 2. Basis two fifths as long as peraeopod 1, rather broad, most expanded medially, posterior margin with three long and one distal small setae, anterodistal half with one short seta and one pair of setae. Ischium square, one fourth as long as basis, anteroproximal margin concave, posterodistal end with one small seta. Merus half as long as basis, gradually expanding forward a little, anterodistal half with one medial small seta and one distal pair of short setae, posterior margin with two medial and distal small setae. Carpus longer than half as long as merus, rectangular, anterodistal end with one small seta, posterior margin with one medial short seta and one distal set of three setae. Propod longer than carpus, gradually narrowing a little, anterodistal end with four setae, posterior margin with two pairs of setae and one distal set of three setae. Dactyl falcate, shorter than propod.

Peraeopod 2: Coxa 4 similar to coxa 3. Peraeopod 2 similar to peraeopod 1.

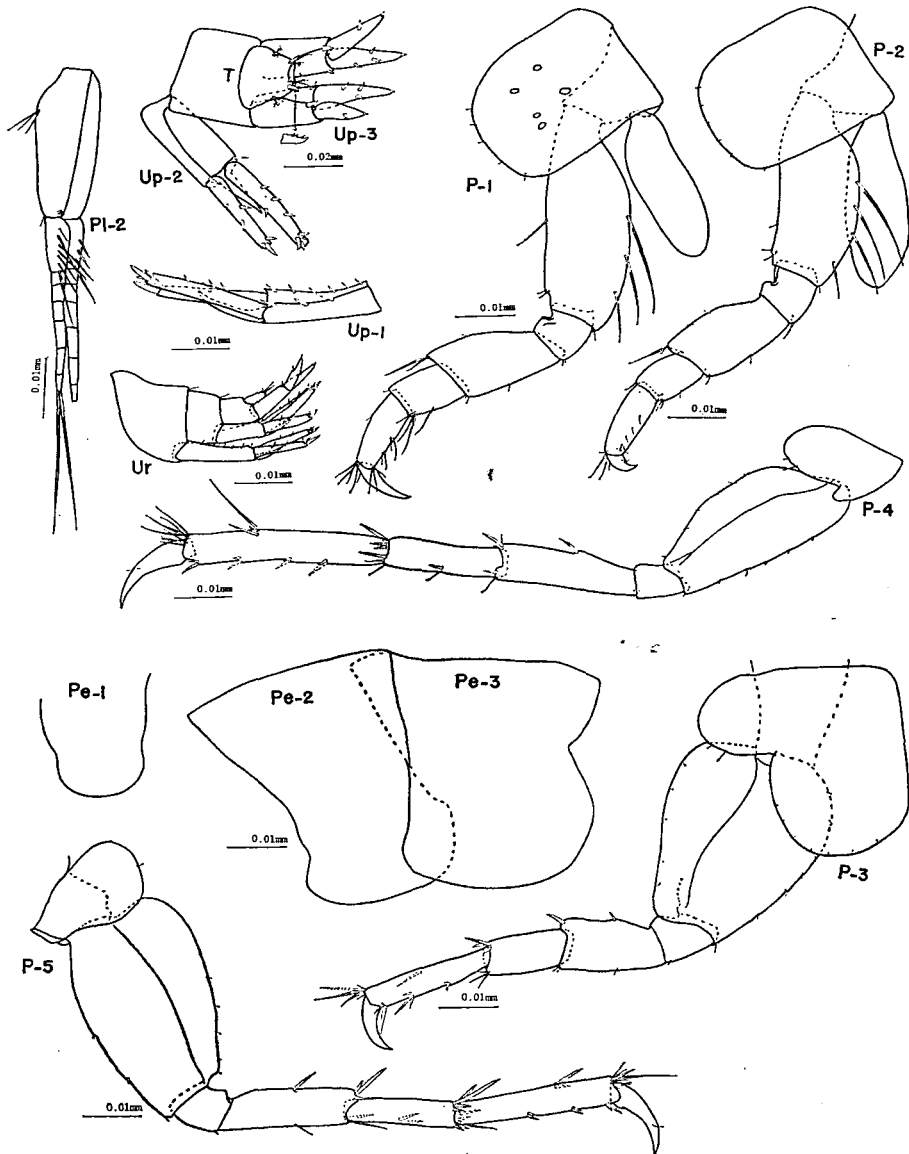


Fig. 94. *Gammaropsis longipropodi* sp. nov. Holotype, male, 3.25 mm.

Peraeopod 3: Coxa 5 bilobate, anterior lobe as deep as wide, two thirds as broad as coxa 5, lower margin rounded, posterior margin of posterior lobe rounded. Peraeopod 3 longer than peraeopod 2. Basis one third as long as peraeopod 3, most expanded proximally, gradually decreasing in width, slightly extending posterodistally, anterior margin rounded, with seven minute setae or spines, posterior thin plate weakly developed. Ischium longer than wide, anterior margin twice as long as posterior one, with one distal small seta. Merus twice as long as ischium, slightly increasing in width, producing on posterodistal end, anterior margin with one medial

small seta, and one distal set of one small seta and one small spine, posterior margin with two medial and distal spines. Carpus shorter and narrower than merus, uniform in width, anterodistal end with three distal setae, posterodistal end with three spines. Propod one and half times as long as and distinctly narrower than carpus, anterior margin with one spine, one set of two small and one long spines, and one distal set of two small and long spines, posterior margin with one medial seta and one distal set of two small stiff and three short setae. Dactyl falcate, stout.

Peraeopod 4: Coxa 6 bilobate, anterior lobe small, rounded, posterior lobe much extending backward, rounded. Peraeopod 4 longer than peraeopod 3, relatively slender. Basis one fourth as long as peraeopod 4, anterior margin slightly roundish, with five small spines and one distal minute seta, posterior thin plate slender, slightly expanding medially, a little extending distally. Ischium about one fourth as long as basis, one and half times as long as wide, anterodistal end with one pair of minute setae. Merus about three times as long as ischium, producing anterodistally, proximal half gradually widening a little, anterodistal extension with one spine and one seta, posterior margin with one medial spine, and one distal set of two spines and one seta. Carpus a little shorter than merus, uniform in width, anterior margin with one medial set of one spine and one seta, and one distal set of one spine and two setae, posterodistal end with three spines. Propod as long as basis, as broad as carpus, anterior margin with four pairs of one short and one longer spines, posterior margin with one medial set of two spines and one seta, and one distal set of six setae. Dactyl falcate, half as long as propod.

Peraeopod 5: Coxa 7 gradually expanding and extending backward, rounded. Peraeopod 5 as long as peraeopod 4, very similar to it. Anterior margin of basis with two medial and one distal spines, posterior thin plate not extending, truncate. Posterodistal end of merus with three spines. Anterior margin of carpus with one medial pair of spines and one distal set of four spines and one seta, posterodistal end with four short and one long spines. Anterior margin of propod with two medial pairs of spines and one pair of locking spines, posteromedial margin with one pair of spines.

Pleopods: Pleopods developed, long. Peduncle of pleopod 2 slightly shorter than rami, with one ventrodial set of three setae, both rami six articulate, proximal segment of outer ramus with one longitudinal row of seven setae, one of inner ramus with two bifid setae, terminal swimming setae shorter than rami.

Uropods: Uropod 1 not extending beyond uropod 2, peduncle as long as rami, outer margin with six spines, inner margin with three spines, ventrodial spine stout, about half as long as rami, rami equal to each other in length, truncate, with two medial spines and one apical set of two small and one longer stout spines. Uropod 2 shorter than uropod 1, peduncle intermediate between both rami in length, with one apical spine on outer and inner margins respectively, ventrodial tooth stout, half as long as inner ramus, both rami truncate, outer ramus shorter than inner one, with two spines on outer margin, one spine on inner one and three spines on apex, inner ramus with one spine on outer margin, three spines on inner one

and two pairs of spines on apex. Uropod 3 about half as long as uropod 1, peduncle as long as rami, with two apical spines on both lateral margins, else with one seta on inner medial margin, rami equal to each other in length, taper, apices with one small conical tooth respectively, outer ramus with one spine on outer margin, inner ramus with one spine on outer margin and two spines on inner one.

Telson: Telson small, fleshy, trapezoid, both lateral margins with one medial pair of pinnate setae, and one distal set of one pinnate and one simple setae and one serrate tooth respectively.

Material examined. Holotype: Male, 3.25 mm. Type-locality: Ariake Sea. Date: June, 1976. Paratype: 9 specimens. Collection No.: AMBL-Amph. 59.

Remarks. The present new species has the characteristic gnathopod 2 in which the posterior margin of carpus is not slenderly produced between the merus and the propod, the propod is uniform in width and very much elongates, and the palm is transverse. In the above-mentioned points, we can clearly distinguish the new species from males of the other *Podoceroopsis* group. *Gammaropsis (Podoceroopsis) inaequistylus* (Shoemaker 1930) and *G. (P.) similis* (Shoemaker 1925) were described and figured in only female but the female of the new species is distinguished from these two species by the palm of gnathopod 2 which is very long and lacks the defining spine.

Gammaropsis japonica (Nagata, 1961)

Eurystheus japonica Nagata, 1961: Nagata 1961b, p. 32-34; Nagata 1965c, p. 311-312

Material examined: Ariake Sea, Tomioka Bay, Shijiki Bay.

Gammaropsis utinomi (Nagata, 1961)

Eurystheus utinomi Nagata 1961: Nagata 1961b, p. 34-35; Nagata 1965c, p. 312.

Material examined: Ariake Sea, Tomioka Bay, Shijiki Bay.

Lembos

Lembos clavatus sp. nov.

(Fig. 95-96)

Body: Head with clavate ocular lobes extending to proximal three fourths of peduncular segment 1 of antenna 1, rostrum vestigial. Eyes small, circular, locating on apex of ocular lobes. Coxae small, shallow, but serially overlapping. Pleonal epimeron 1 rounded, anterior and lower submargins with one row of five pinnate setae continuously, pleonal epimeron 2 broader than pleonal epimeron 1, subrectangular, but lower margin rounded, with five pinnate setae, else outer lateral

side with ten pinnate setae, pleonal epimeron 3 distinctly broader than pleonal epimeron 2, rectangular, lower margin roundish, with one spine and two minute setae. Urosome as long as pleonite 3, urosomite 1 about three times as long as urosomite 2, dorsodistal margin with one pair of small ridges, one small hump on center and one pair of setae, ventroproximal margin with one pair of setae, ventrodistal tooth on both lateral sides acute, dorsal margin of urosomite 2 with one pair of small ridges and one pair of setae, back of urosomite 3 vestigial, both lateral sides broadly extending backward, upper distal end of both sides with one seta respectively.

Antennae: Peduncular segment 1 of antenna 1 as long as head length, outer proximal and ventrodistal margins with three short pinnate setae respectively, ventrodistal end with four spines, one pair of short pinnate setae and several simple setae, following segments lost. Peduncular segment 1 of antenna 2 short, broader than long, peduncular segment 2 as long as peduncular segment 1, upper distal end with one small tooth, gland cone medium, stiff, acute apically, peduncular segment 3 distinctly narrower than peduncular segment 2, half as long as peduncular segment 4, ventrodistal margin with one transverse row of five setae, upper medial margin with three small pinnate setae, ventrodistal end surrounded by eleven simple setae, upper distal end with four simple and one pinnate setae, peduncular segment 4 longer than peduncular segment 5, distinctly narrower than peduncular segment 5, distinctly narrower than peduncular segment 3, ventral margin with two medial transverse rows of five long and short setae, distal end surrounded by several simple

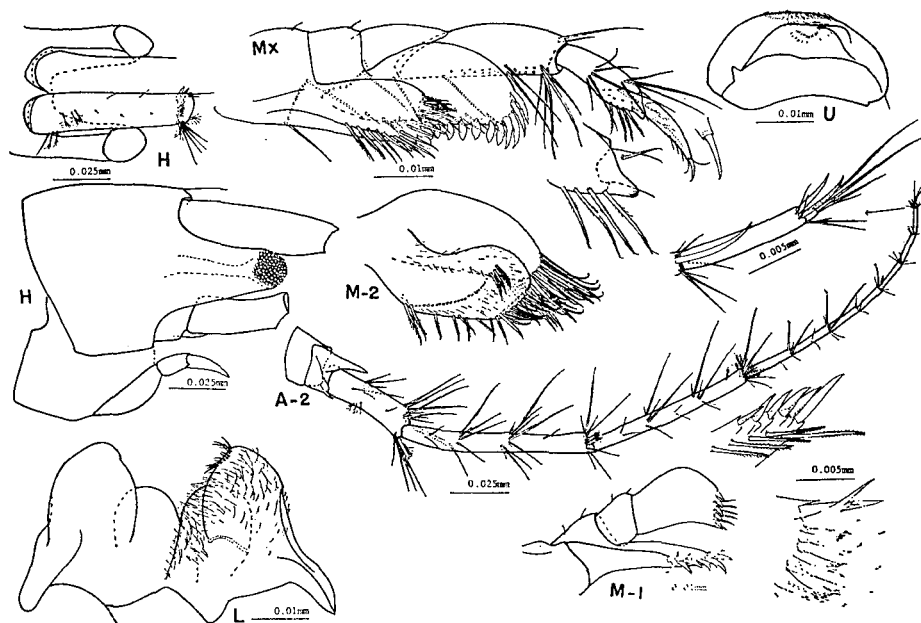


Fig. 95. *Lembo clavatus* sp. nov. Holotype, female, 6.5 mm.

setae and three pinnate setae, peduncular segment 5 distinctly narrower than peduncular segment 4, dispersively setose in sets or pairs, distal end with four pinnate and several simple setae, flagellum subequal to peduncular segments 3-4 combined in length, composing of seven and one vestigial segments, distal end of proximal two segments with one pair of long slender spines, following four segments with one distal stiff spine, distal 2nd segment with one pair of stiff spines.

Mouthparts: Mouthparts not massive. Upper lip semicircular, apical margin densely bristly. Inner plate of lower lip developed, densely pubescent, outer plates densely pubescent, inner distal margin with one row of sixteen small spines, mandibular process medium, extending outward. Inner plate of maxilla 1 unknown, apex of outer plate with one bifid tooth-like spine and nine tooth-like spines armed with one or two teeth, else with one unsegmented tooth, palp extending beyond outer plate, broad, gently curved outward, proximal segment short, with two small setae on inner margin, apex of terminal segment broad, with six spines and one row of five setae pectinated on distal half. Maxilla 2 broad, inner plate pubescent, upper side with one oblique row of thirty-two pinnate setae, inner distal half with seven pectinate setae, apex with two rows of eight simple setae, outer plate narrower than inner one, only apical margin with one row of seven stiff and fourteen feeble setae. Mandibles unknown. Inner plate of maxilliped not extending beyond proximal segment of palp, ventroproximal part with one transverse row of twelve simple setae, inner distal half and apical submargin with fifteen pinnate setae continuously, apical margin with four spatulate teeth and four simple setae, outer plate rounded on outer margin, inner submargin with several pairs of setae and several single setae in one row, inner distal half with six spatulate teeth, apex with four slender minutely serrate teeth, palp four articulate, slender, proximal two segment about half as long as palp, inner margin with nine pairs of setae, two single setae and one distal row of five setae, ventrodistal end with one row of seven setae, 3rd segment slightly dilating distally, broadly and prominently producing ventrodistally, its apex bristly, inner distal half with four setae armed with several medial minute setae, upper side with two transverse rows of five and four setae, ventral side with two longitudinal rows of three setae, dactyl as long as 3rd segment, slender, falcate, inner margin dispersively bristly in rows, inner distal half with three single small setae and one apical pair of small setae, apex with one nail-like spine.

Gnathopod 1: Coxa 1 subsquare. Basis two fifths as long as gnathopod 1, narrow proximally, anterior margin with several minute setae, posterior margin with eight setae. Ischium short, posterior margin twice as long as anterior one, with one row of five setae. Merus subequal to ischium in posterior length, producing in triangle on inner anterodistal end, base of the process with one row of about eight setae, posterior margin with one, three, five and seven setae in formula. Carpus four fifths as long as basis, gradually increasing in width, anterodistal end with seven setae, posterior margin with one seta and six rows of three to five setae, inner side with two single, two, four, three and four setae in formula. Carpus longer than ischium, most expanded backward medially, anterior submargin with one,

two, four, seven and five setae on inner side in formula, anterodistal end with five setae, posterior margin with two, four and six setae in formula, palm defined by spines, densely pubescent, with two rows of three and four long setae, eleven single small spines, two distal pairs of spines, one medial stout spine and a few long setae,

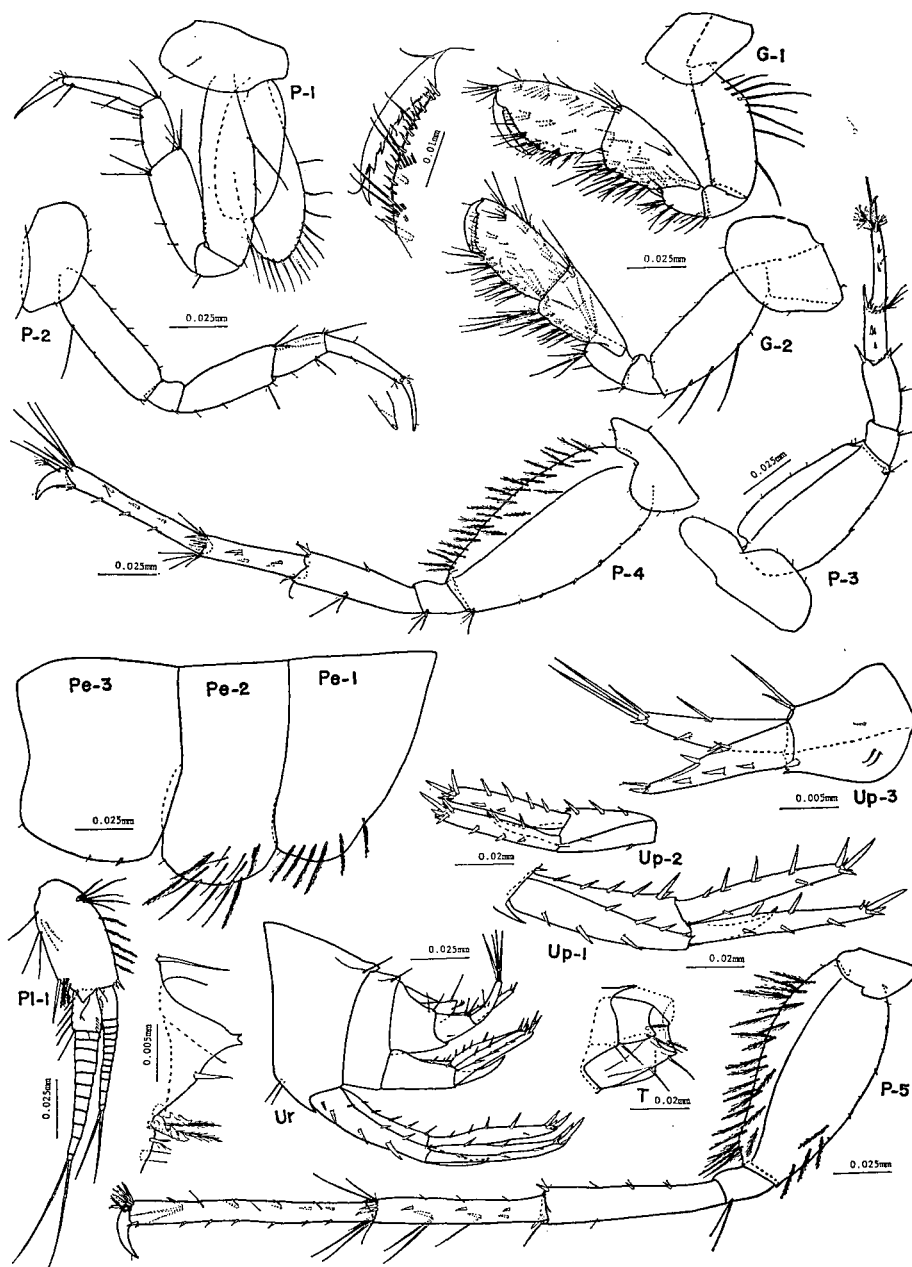


Fig. 96. *Lembos clavatus* sp. nov. Holotype, female, 6.5 mm.

else inner side with one, two and three setae in one oblique row. Dactyl fitting on palm, falcate, grasping margin minutely pubescent, with four small teeth and one pair of setae on distal cusp.

Gnathopod 2: Coxa 2 subsquare, larger and more roundish than coxa 1. Gnathopod 2 very similar to gnathopod 1, less setose, posterodistal half of basis with three long setae, posterior margin of merus with one seta and one distal set of five setae, inner side with one medial transverse row of four setae, propod not expanding backward, roundish.

Peraeopod 1: Coxa 3 subrectangular, shallower on posterior part. Basis two fifths as long as peraeopod 1, posterior margin with three long and two small setae, anterior margin with five minute setae. Posterior margin of ischium twice as long as anterior margin, with one distal pair of small setae. Merus about two thirds as long as basis, gradually widening a little, anterodistal end with four setae, posterior margin with two proximal small setae, and one distal set of two long and two small setae. Carpus narrower than merus, slightly expanding medially, anterodistal end with one long and one small setae, posterior margin with two medial and distal sets of two small and long setae, and one distal small seta. Propod subequal to merus in length, slender, decreasing in width, posterior margin with one proximal small seta and one distal set of three small setae, posterior margin with one proximal short seta, and one pair of one small and one short setae. Dactyl two thirds as long as propod, falcate, blunt apically, with one gland pit on apex.

Peraeopod 2: Coxa 4 subrectangular, extending backward. Peraeopod 2 very similar to peraeopod 1 except for number of setae.

Peraeopod 3: Coxa 5 bilobate, anterior lobe deeper than posterior one, posterior lobe extending backward. Basis not broadly expanding, especially posterior thin plate narrow, not extending downward, with seven marginal minute setae, anterior margin gently rounded, with two spines and two setae alternatively, and one distal set of three short and small setae. Ischium subsquare, anterodistal end with two small setae. Merus shorter than half as long as basis, extending anterodistally, anterior margin with one medial set of two small and short setae, and one distal set of one spine and one short seta, posterodistal end with one spine. Carpus shorter and narrower than merus, outer side with one spine and one medial pair of spines, anterodistal end with one spine and four setae, posterodistal end with four spines. Propod longer than merus, narrower than carpus, anterior margin with one spine, one set of one spine and one minute seta, and one distal pair of one small and one long spines, posterodistal end with three pinnate, one stiff and one minute simple setae. Dactyl short, falcate.

Peraeopod 4: Coxa 6 bilobate, anterior lobe a little deeper and wider than posterior one, semicircular, posterior lobe extending backward. Peraeopod 4 very long. Basis broadly expanded, long oval, posterior thin plate narrow, not extending downward, not expanding distally, with many pinnate setae, anterior margin with six spines and one distal set of four small setae. Ischium short, longer than wide, anterodistal end with three setae. Merus half as long as basis and ischium com-

bined, slightly producing anterodistally, anterior margin with one medial set of three setae, and one distal set of one small seta and one spine, posterior margin with one medial spine, and one distal set of one spine and one minute seta. Carpus shorter and narrower than merus, outer side with one spine, one medial pair of one small and one long spines, and one distal set of four spines, inner side with two medial single and one distal spines, anterodistal end with four setae, posterodistal end with two setae. Propod as long as ischium and merus combined, a little narrower than carpus, anterior margin with three single spines and one distal pair of one small and one long spines, posterior submargin with three medial single spines, posterodistal end with one spine and six long setae. Dactyl short, stout, falcate.

Peraeopod 5: Coxa 7 semicircular, concave medially. Peraeopod 5 similar to peraeopod 4, but longer than it, anterodistal margin of basis with four pinnate setae, posteromedial margin of merus with two sets of one spine and one minute seta, and one small seta, anterior margin of propod with six single spines and one pair of locking spines, posterior submargin with five spines.

Pleopods: Peduncle of pleopod 3 stout, subequal to outer ramus in length, producing in triangle on inner distal end, outer margin with two proximal sets of three and two simple setae, five pinnate setae and one distal set of two spines, inner distal end with two coupling spines, three pinnate and one simple stout setae, inner ramus far longer than outer one, inner margin of proximal segment with four bifid and one ordinary pinnate setae, terminal swimming setae two thirds as long as rami.

Uropods: Uropod 1 not or a little extending beyond uropod 2, peduncle subequal to rami in length, ventrodistal end with one falcate tooth reaching near middle of rami, outer lateral side with three spines, upper margin with four spines on outer side, and five spines and one small tooth on inner one, both rami equal to each other in length, truncate, outer ramus with three spines on outer margin and two spines on inner one, apex with two pairs of one small and one stout spines, one central long stout spine and one small tooth, inner ramus with two spines on outer margin and four spines on inner one, apex with two pairs of spines and one central long stout spine. Uropod 2 about two thirds as long as uropod 3, peduncle three fourths as long as rami, ventrodistal end with one falcate tooth reaching proximal two thirds of rami, outer lateral side with one proximal spine, upper margin with two spines on outer distal one, and three spines and one distal small tooth on inner one, both rami equal to each other in length, truncate, outer ramus with three spines on outer margin and two spines on inner one, apex with five spines, inner ramus with two spines on outer margin and four spines on inner one, apex with five spines. Uropod 3 about two thirds as long as uropod 2, peduncle stubby, shorter than rami, outer distal end with one pair of long slender spines, inner distal end with one stout spine and one small tooth, rami decreasing in width, outer rami as long as or a little longer than inner one, biarticulate, proximal segment with one long slender spine on outer medial margin, two stout spines on inner medial one, and one distal pair of one long slender and one stout spines, terminal segment vestigial, with two apical long setae which are shorter than rami, inner ramus with two spines on outer medial

margin, three spines on inner medial one and two apical spines.

Telson: Telson fleshy, short, truncate and concave distally, outer margin with one medial simple seta and one distal pair of one simple and one pinnate setae.

Material examined. Holotype: Female, 6.5 mm. Type-locality: Tomioka Bay. Date: May, 1978. Collection No.: AMBL-Amph. 68.

Remarks. The type specimen lacks the antenna 1 but well agrees with the diagnosis of the *Lembos* group (J.L. Barnard 1973). The new species is distinguished from any other species by the clavate anterior head lobe.

Aorooides

Aorooides columbiae Walker, 1898

(Fig. 97)

A. columbiae: Walker 1898, p. 285; Stebbing 1906, p. 586; J.L. Barnard 1954b, p. 24-26; J.L. Barnard 1963b, p. 217-218; J.L. Barnard 1964a, p. 110; Nagata 1960, p. 175; J.L. Barnard 1960c, p. 180; Nagata 1965c, p. 309; Reish and J.L. Barnard 1967, p. 15; J.L. Barnard 1969b, p. 89; J.L. Barnard 1970b, p. 68-70; J.L. Barnard 1971b, p. 15.

A. californica Alderman, 1936: Alderman 1936, p. 63-66.

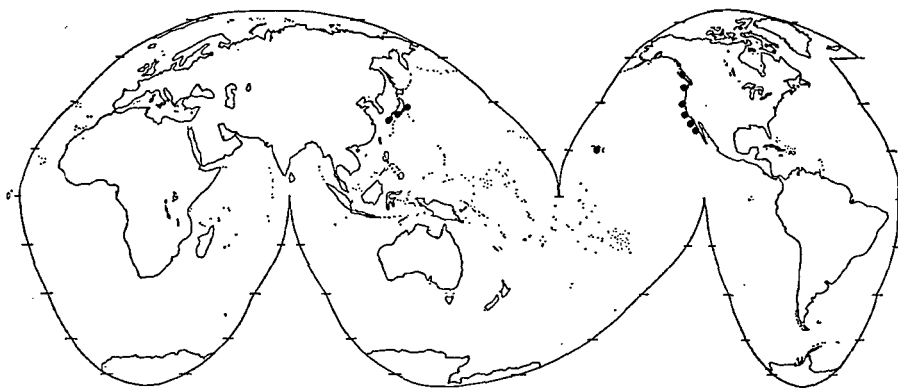


Fig. 97. Distribution of *Aorooides columbiae* Walker (●) in the world.

Aora

Aora pseudotypica sp. nov.

(Fig. 98-100)

Body: Body slender, peraeonites subequal to each other in size, coxae shallow, serially overlapping. Head shorter than peraeonites 1-2 combined, anterior head lobe broadly producing, subrectangular, inferior antennal sinus shallow. Eyes

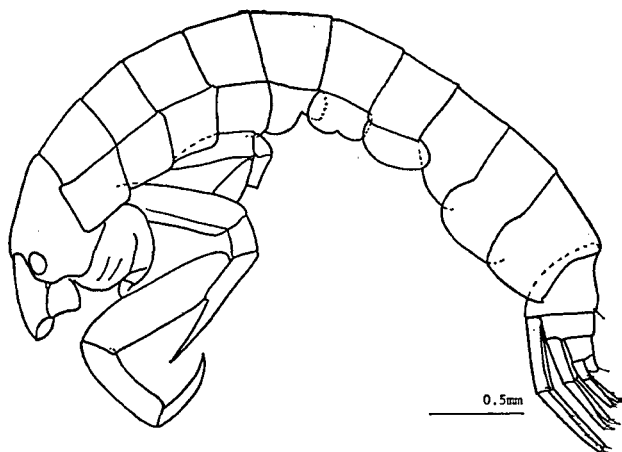


Fig. 98. *Aora pseudotypica* sp. nov. Holotype, male, 5.0 mm.

small, oval, locating on anterior head lobe. Pleonites 1–2 subequal to peraeonite 7, pleonite 3 longer than pleonite 2, pleonal epimera shallow, pleonal epimeron 1 rounded, posterodistal end with one set of one small cusp and one minute seta, pleonal epimeron 2 broader than pleonal epimeron 1, anterior and lower margins continuously rounded, posterodistal end with one tooth and one small seta, posterior margin expanding medially, pleonal epimeron 3 prominently broader than pleonal epimeron 2, lower margin rounded, posterodistal end with one small cusp and one minute seta, posterior margin prominently producing medially. Urosome as long as pleonite 3, urosomite 1 longer than twice as long as urosomite 2, urosomite 2 subequal to urosomite 3 in length.

Antennae: Peduncular segment 1 of antenna 1 a little shorter than head length, ventral margin with one medial set of one stiff and one small setae, ventrodistal end with three spines, following segments lost. Peduncular segment 2 of antenna 2 very short, gland cone medium, reaching middle of peduncular segment 3, peduncular segment 3 as broad as peduncular segment 2, stout, ventrodistal end with nine setae, upper margin with two medial and distal set of three setae, following segments lost.

Mouthparts: Mouthparts massive. Upper lip semicircular, apicomedial margin bristly. Inner plate of lower lip medium or rather well developed, shoulders broad, not smooth, inner margin of outer plate densely bristly, distal part densely pubescent, mandibular process developed, compressed proximally. Inner plate of maxilla 1 short, but broad, with one apical pinnate seta, outer plate with one simple, three bifid and six serrate tooth-like spines, palp extending far beyond outer plate, broad, biarticulate, proximal segment short, terminal segment gently curved outward, rounded apically, inner distal half with twelve pectinate spines and seven setae in rows. Both plates of maxilla 2 medium in breadth, rounded apically, pubescent, inner plate with sixteen facial pinnate setae in one row, inner and apical submargins with one row of eleven pinnate setae, apical margin with one row of five

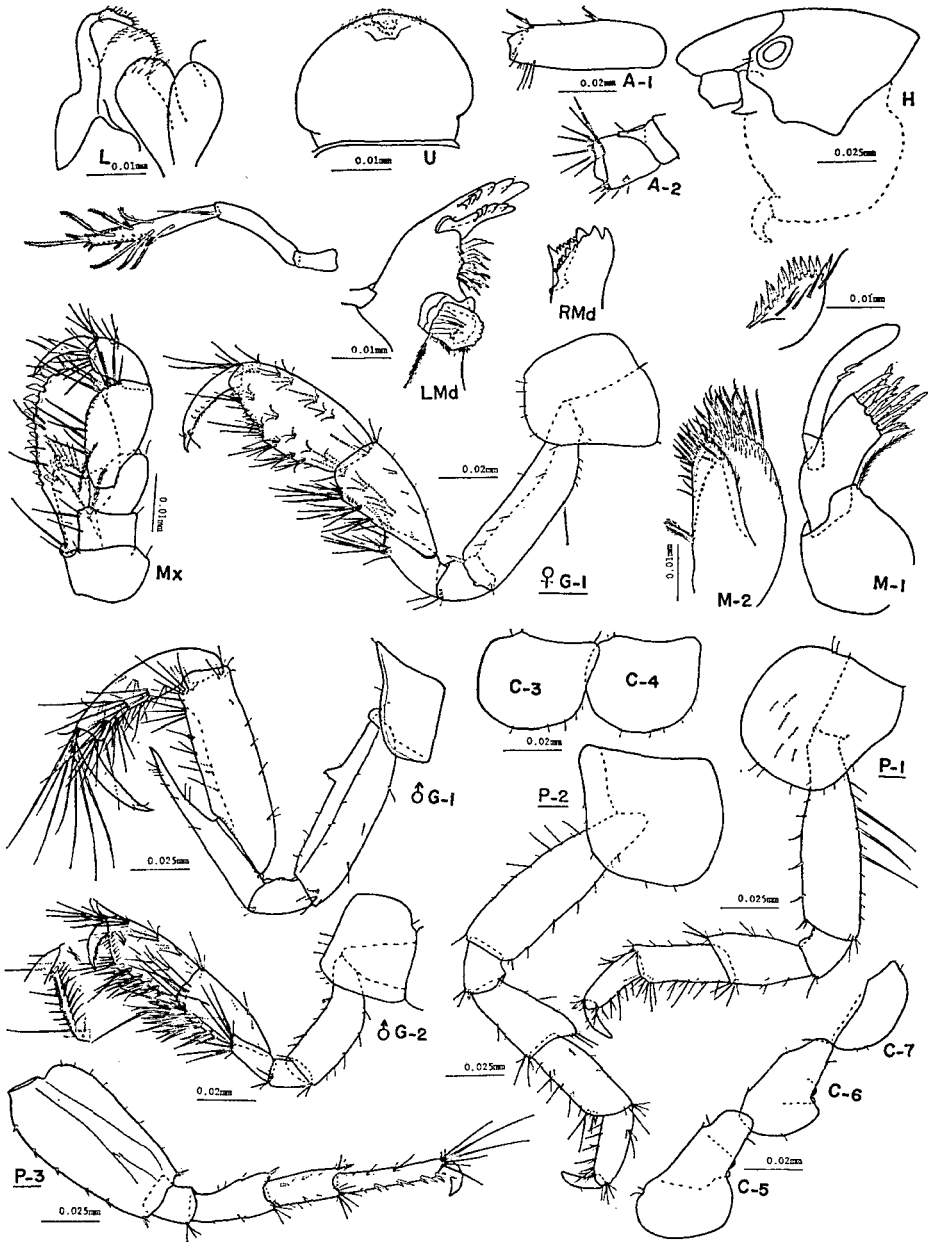


Fig. 99. *Aora pseudotypica* sp. nov. Holotype, male, 5.0 mm. ♀G-1, P-1, P-2, P-3: Paratype no. 3, female, 6.25 mm.

stiff pinnate and four stiff simple setae, and one row of three feeble setae, distal margin of outer plate with five pectinate setae on outer half and about thirteen stiff simple setae on inner half. Both mandibles similar to each other, incisor producing forward, developed, broad, with seven or nine teeth, lacinia mobilis broad, with

six teeth, accessory blades six, serrate, accessory setae three, pinnate, molar process medium, truncate, with one pinnate seta, lower part of apical margin with many tooth-like spines, molar rasp medium, palp locating at level of molar process, developed, slender, almost uniform in thickness, triarticulate, proximal segment shorter than half of 2nd one, 2nd segment with one distal simple seta, terminal segment as long as proximal two ones combined, with ten medial long setae, two marginal rows of twelve and thirteen small setae, and one apical pair of two long and shorter setae, these setae pectinate on distal half. Inner plate of maxilliped medium, with one longitudinal row of eight pinnate setae, distal margin with four conical teeth and six pinnate setae, else inner submargin with two setae, outer plate extending a little beyond 2nd segment of palp, broad, oval, inner margin with twelve teeth, outer distal margin with four long setae, palp four articulate, not slender, especially proximal two segments stout, 2nd segment most expanded at about distal one third, inner margin with one pair of setae and fifteen setae, 3rd segment half as long as proximal two ones, a little dilating distally, inner distal margin surrounded by twelve setae, outer distal half with two medial and distal rows of three setae, dactyl subequal to 3rd segment in length, falcate, with one pair of small setae near apex.

Gnathopod 1 of male: Coxa 1 rectangular, distinctly wider than deep, prominently and obliquely extending forward anterodistally. Gnathopod 1 slender, merochelate. Basis about one fourth as long as gnathopod 1, anterior margin with one small triangular process medially, else with several minute setae, posterodistal end with two pairs of small setae. Ischium one third as long as basis, posterior margin about twice as long as proximal width, with one distal pair of small setae. Merus narrower than ischium, uniform in width, half as long as basis except for distal extension, posterodistal extension running along carpus beyond proximal two thirds of it, attenuate, anterior free margin very short. Carpus distinctly longer than basis, almost uniform in width except for proximal part, anterior margin with a few medial small setae and two distal rows of three setae on both sides, posterior margin with three medial single setae and one distal row of four setae on inner side, and two pairs of setae, one longitudinal row of four setae and one distal row of five setae on outer distal half. Propod two thirds of carpus in width and length, anterior margin with two pairs of small setae, and one distal set of several long and one short setae, posterior margin with three transverse rows of five and six setae on outer side, three transverse rows of three and four setae on inner one, and three distal setae. Dactyl about half as long as carpus, falcate, distal half of grasping margin with four small teeth.

Gnathopod 1 of female: Coxa 1 rectangular, deeper than wide, lower margin with six small setae. Gnathopod 1 subchelate. Basis one third as long as gnathopod 1, anterodistal end with one spine. Ischium short, longer than wide, posterodistal end with two sets of two small and one longer setae on both sides. Merus extended on inner anterodistal end, posterior margin longer than one of ischium, with ten setae distally, base of anterodistal extension with one row of four setae. Carpus two thirds as long as basis, gradually increasing in width, anterior margin

with several medial small setae and two distal sets of three and four setae, posterior margin with one seta and three rows of four to six setae on outer side, else inner side with one longitudinal row of two, one, two and three setae in formula. Propod as long as merus and carpus combined, not broadly expanding, long oval, inner anterior submargin with two, four, five and five setae in formula, outer anterior submargin with two rows of three setae, anterodistal end with four long and short setae, posterior margin with one seta and three rows of five and six setae, inner posterior submargin with one longitudinal row of two, two, three and four short setae in formula, palm remarkably oblique, not rounded, defined by one stout spine, with one proximal oblique row of seven setae, and ten small and one distal more stout spines, else with several setae. Dactyl fitting on palm, falcate, grasping margin with ten small spines, four small setae and one distal set of four setae.

Gnathopod 2: Coxa 2 rectangular, a little wider than deep. Gnathopod 2 slender, but normally subchelate. Basis about one third as long as gnathopod 2, curved proximally, anterior margin with six stout and small setae, posterior margin with five small setae and one distal set of one stout and two small setae. Ischium one third as long as basis, anterodistal end with five setae. Merus a little longer than ischium, outer distal end with nine short and long setae. Carpus a little shorter than basis, gradually increasing in width on proximal one third, distal two thirds uniform in width, anterior margin with one seta on outer medial margin, two setae on inner medial one, and two distal sets of two and three setae, posterior margin with one, three, five, six, three and three pectinate setae in formula, outer medial part with two single long setae, posterior half of outer distal end with one transverse row of about seven long simple setae. Propod as long as carpus, a little narrower than it, anterior margin with two, four and six setae on outer side, with two and four setae on inner side, anterodistal end with seven setae, posterior margin with two, three, four, five and four pectinate setae in formula, else with one or two distal simple setae, outer central line with two, three, one and three simple setae in one longitudinal row, palm oblique, defined by one stout spine, finely serrate, with one proximal oblique row of about seven simple setae, two opposite rows of ten and seven small setae, and one distal spine. Dactyl fitting on palm, grasping margin with five small teeth.

Peraeopod 1: Coxa 3 subsquare, roundish. Basis two fifths as long as peraeopod 1, a little narrow proximally, anterior margin with six short stout setae and one distal pair of short stout setae, posterior margin with three medial long setae, eight small setae and one distal set of four setae. Ischium short, posterior margin as long as wide, with three distal setae. Merus gradually increasing in width, extending anterodistally, posterior margin one and half times as long as one of ischium, with four distal short setae, anterodistal end with four setae. Carpus half as long as basis, uniform in width, as broad as proximal part of merus, anterodistal end with six small and short setae, posterior margin with three single short setae and three pairs of short setae, posterodistal end with two rows of four short setae on both sides. Propod shorter than carpus, narrower than it, decreasing in width, anterior

margin with one proximal pair of setae and one distal set of four setae, posterior margin with one, two, three and six setae in formula. Dactyl about two thirds as long as propod, falcate, apex blunt, with one glandular pit.

Peraeopod 2: Coxa 4 similar to coxa 3. Peraeopod 2 similar to peraeopod 1, but posterior margin of basis lacking long setae.

Peraeopod 3: Coxa 5 bilobate, anterior lobe rounded, posterior lobe rectangular, shallow, extending backward. Basis rectangular, a little decreasing in width, posterior thin plate narrow, not extending downward, with seven minute setae, and one distal set of two spines and two minute setae, anterior margin with five single spines and one distal pair of spines. Ischium short, anterior margin one and half times as long as wide, with four distal setae. Merus one and half times as long as ischium, proximally narrower than it, increasing in width, produced on both distal ends, anterior margin with a few minute setae and one distal set of four short setae, posterior margin with two medial minute setae, one medial spine and one distal set of one spine and two minute setae. Carpus subequal to merus in length, uniform in width, as broad as proximal width of merus, anterior margin with five medial minute setae and one distal set of eight short setae, posterior margin with two medial spines, two medial minute setae, and one distal set of two spines and four small setae. Propod one and half times as long as carpus, narrower than it, anterior margin with one spine, and four pairs of one small and one long spines, posterior margin with one small, two small, and three small and short setae in formula, posterodistal end with seven long and four small setae. Dactyl short, stout, falcate.

Peraeopods 4-5: Coxa 6 similar to coxa 5, but smaller than it. Coxa 7 very shallow, rounded. Peraeopods 4-5 lost.

Pleopods: Pleopods slender, long. Peduncle of pleopod 1 as long as outer ramus, outer distal half with four pinnate setae, inner distal end with two coupling spines, outer ramus ten articulate, two thirds as long as inner one, outer margin of

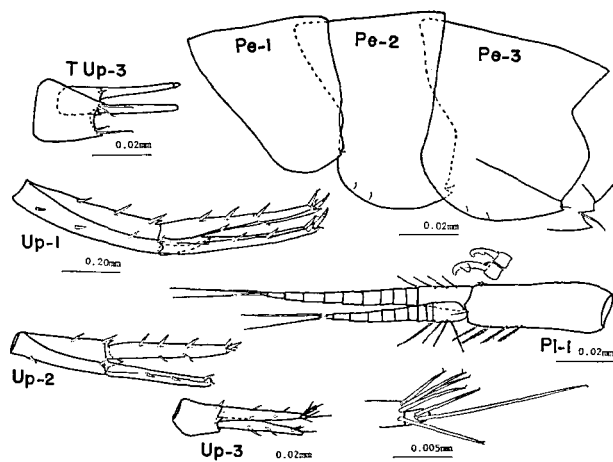


Fig. 100. *Aora pseudotypica* sp. nov. Holotype, male, 5.0 mm.

proximal segment with four pinnate setae, inner ramus eleven articulate, inner margin of proximal segment lacking bifid setae, with four normal pinnate setae, terminal swimming setae about two thirds as long as outer ramus.

Uropods: Uropod 1 extending beyond uropod 2, peduncle as long as rami, ventrodistal end with one stout falcate tooth, proximal half of outer side with two spines, upper margin with two spines on outer side, and three spines and one tooth near apex of inner one, rami slender, truncate, outer ramus with three spines on outer margin, apex with four small stout spines, inner ramus with three spines on both margins, apex with five small stout spines. Uropod 2 two thirds as long as uropod 1, peduncle a little shorter than outer ramus, ventrodistal end with one short triangular process, outer proximal margin with one spine, upper margin with one apical spine on outer side, and one medial spine, one apical spine and one apical tooth on inner side, rami slender, truncate, outer ramus distinctly shorter than inner one, outer margin with two medial spines, apex with four small stout spines, inner ramus with two spines on outer margin and three spines on inner one, apex with five small stout spines. Uropod 3 a little longer than inner ramus of uropod 2, peduncle half as long as outer ramus, stout, with two apical spines, both rami slender, subequal to each other in length, outer ramus biarticulate, proximal segment with two medial spines and five distal setae, terminal segment vestigial, with two apical setae, inner ramus with three medial spines, one pair of setae near apex and one apical seta.

Telson: Telson short, fleshy, truncate and concave distally, both outer distal ends with two setae respectively.

Material examined. Holotype: Male, 5.0 mm. Type-locality: Tomioka Bay. Date: May, 1978. Paratype: 4 specimens. Collection No.: AMBL-Amph. 96.

Remarks. The present species agrees with *Aora typica* collected by Nagata (1965c) in Seto Inland Sea, Japan. As *A. typica* broadly distributes in the world, it is natural that the species group has many variations in the external structure (Griffiths 1974a, etc.), but Japanese specimens should be raised to the species rank by the following points; (1) mandibular palp slender, article 2 much less setose, (2) palpal article 2 of maxilla 2 with one row of many spines on distal half, these spines never restricted on only apical margin, and (3) outer ramus of uropod 3 with one small distal segment.

(to be continued)