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Descriptions and Records of Marine Harpacticoid Copepods from Hokkaido, VI[1)]

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(With 78 Text-figures and 1 Table)

As the sixth report from my serial taxonomic work on the marine harpacticoid fauna in Hokkaido, the present paper deals with two species of the genus *Harpacticus* Milne-Edwards (Family Harpacticidae) and six species of the genus *Scutellidium* Claus (Family Tisbidae). While no any species of the latter genus has been hitherto recorded in Japan, it becomes apparent that some of them are of specific ecological importance as the predominant member of epiphytic animal communities in certain algal zones around Hokkaido. In this connection, one of the most severe problems in such ecological works treating the meiofauna such as harpacticoids would be how to carry out the precise identification of each species *without dissection*. This problem can be solved by using of certain *external* characters, which have been ignored or underestimated in the previous taxonomy within the genus. These useful taxonomic characters will be fully described in every the species reported in the following text.

The specimens were collected from Oshoro near Otaru on the Japan Sea coast, Akkeshi and Muroran, both on the Pacific coast of Hokkaido. The type specimens were deposited in the Zoological Institute, Faculty of Science, Hokkaido University.

In the following text, the description of a new *Harpacticus*-species together with the copepodid stages is based upon a part of my thesis presented to the Faculty of Science, Hokkaido University, 1975. The work was carried out under the direction of Professor Mayumi Yamada, Hokkaido University, to whom I would like to express my sincere gratitude for his kind advices and guidance. Sincere thanks are also due to Dr. R. Hamond, Melbourne University, who kindly sent me some valuable specimens of *Harpacticus* and *Scutellidium* for the comparative study, Dr. R. Oleröd, Naturhistoriska Riksmuseet, Stockholm, under whose understanding of my work I could examine the Lang's specimens of *Scutellidium longicauda* deposited in the museum, and to Messrs. K. Kito and Sh. Hiruta, Hokkaido University, who placed some interesting specimens reported in the present paper at my disposal.

Harpacticus nipponicus n. sp.

(Figs. 1–6)

Female. Body (Figs. 1-1, 2) about 0.90 mm long, rostrum and furcal setae excluded, about 0.26 mm in greatest width measured in cephalothorax. Some

1) Studies on marine harpacticoid copepods from Hokkaido, VIII.

white (cellular ?) clusters scattering in various parts of body, their situation and amount unfixed among specimens. Several parts, dorsal side of cephalothorax, anterior part of pleurotergites of first two thoracic somites, posterior rim of pleurotergite of third thoracic somite, anterolateral part of fourth thoracic somite, tinctured with pale brown, other body parts almost colorless and semitransparent. Thoracic pleurotergites ornamented with two setulae on each lateral edge. Fourth thoracic somite ornamented with two vertical rows of delicate spinules on both lateral sides. Abdomen a little depressed dorsoventrally, with some scattering pits on genital double-somite and succeeding two somites dorsally (Fig. 2–2). Genital double-somite subdivided by a narrow chitinous suture laterally and ventrally; lateral side of anterior subdivision with an oblique long row of many delicate spinules and another one relatively short row of a few spinules; genital area as shown in figure (Fig. 2–1); posterior subdivision ornamented with an oblique row of spinules on each lateral part of posterior rim (Fig. 2–3), and a few delicate spinules along ventral hind edge; at least four hairs arising from dorsal surface near posterior end. Antepenultimate somite with a pit near each posterolateral corner of ventral side, a hair arising from middle dorsal surface near anterior edge

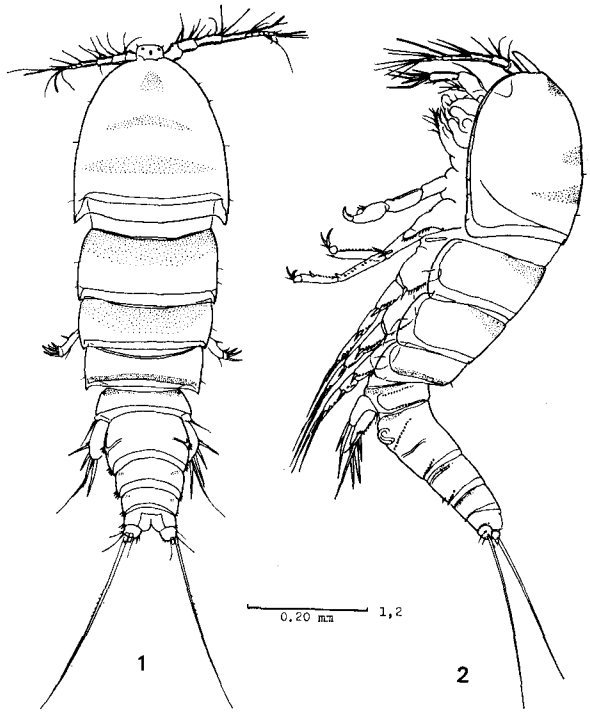

Fig. 1. *Harpacticus nipponicus* n. sp. Female (Holotype). 1. body, dorsal; 2. ditto, lateral.

and two hairs near posterior edge; an oblique spinular row on each lateral side of posterior end, and some spinules on ventral side along posterior margin. Penultimate somite with a hair on each lateral side; hyaline membrane well developed particularly in dorsal side. Anal somite furnished with some spinules ventrally and laterally along posterior end, and with many delicate spinules on dorsal side of anal area; a hair arising from dorsal edge near each furcal ramus. Furcal ramus shorter than wide, furnished with one, basally geniculate, seta accompanied with a few spinules on dorsal side near inner edge, one delicate setula arising from middle outer edge, two setae on outer distal corner, and one longer seta on inner distal end; principal terminal setae well developed. *Rostrum* (Fig. 3–1) rectangular in shape; apical margin slightly curved, with a pair of sensory hairs; dorsal surface with two hairs.

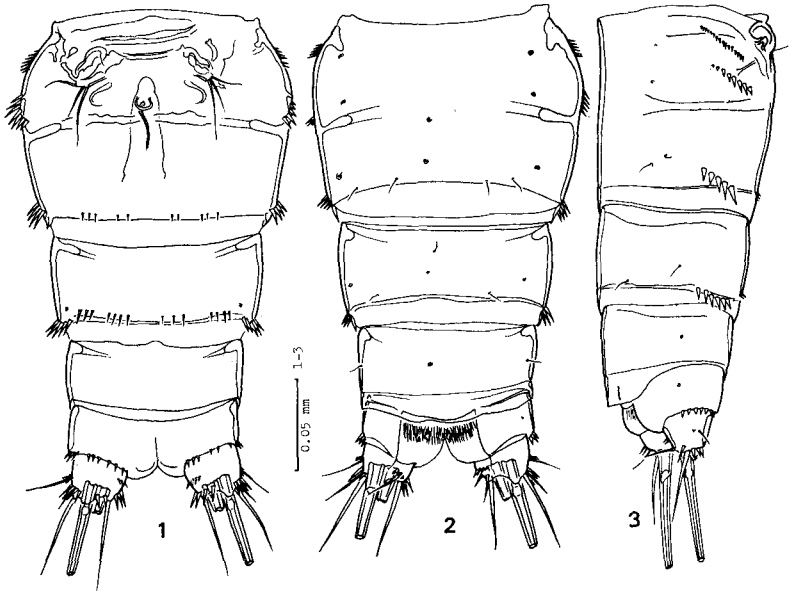

Fig. 2. *Harpacticus nipponicus* n. sp. Female (Holotype). 1. abdomen,ventral; 2. ditto, dorsal; 3. ditto, lateral.

Antennule (Fig. 3–1) nine-segmented, of fairly slenderized appearance; length of first four segments combined almost three times as long as apical five ones combined; first segment much longer than diameter, with three groups of spinules on anterior side and one seta on distal edge; second one a little shorter than first, with some setae anteriorly and dorsally; third one 1.5 times as long as second, with some longer setae on anterodistal corner; fourth one about as long as third, but apparently slenderized, with an aesthetasc and a setula on middle anterior edge;

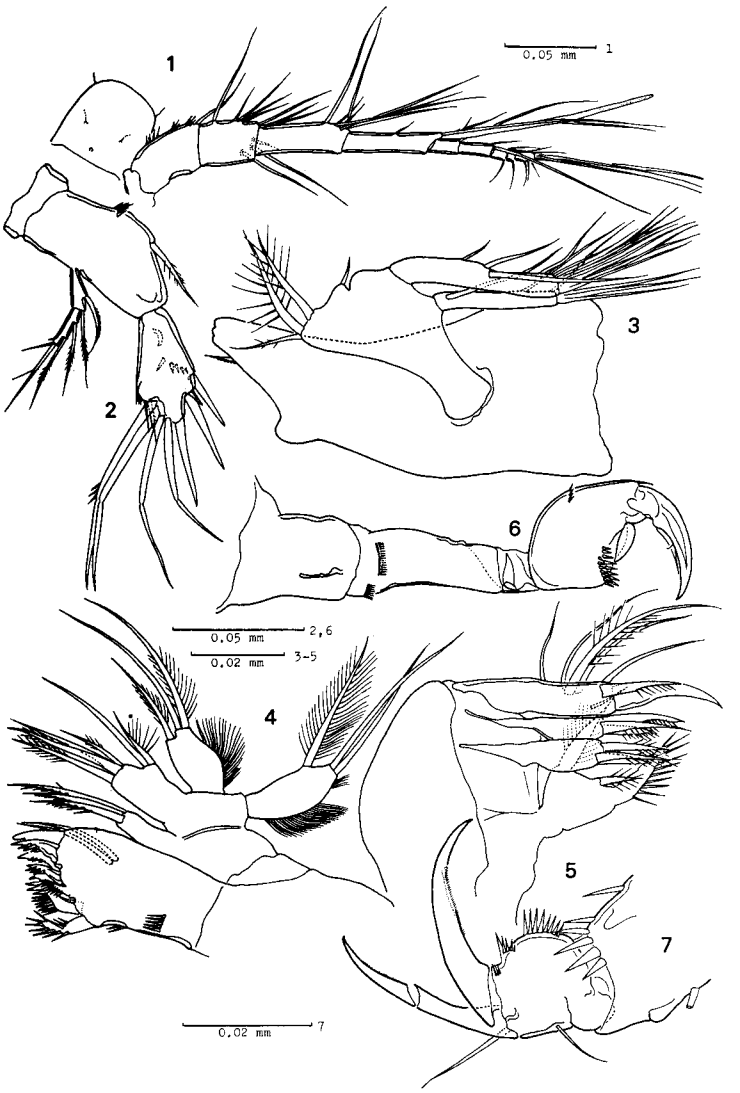

Fig. 3. *Harpacticus nipponicus* n. sp. Female (Holotype). 1. rostrum and antennule; 2. antenna; 3. mandible; 4. maxillula; 5. maxilla; 6. maxillipede; 7. apical part of endopodite of leg 1.

sixth one somewhat longer than fifth; eighth one shorter than neighboring two; apical one terminating in a narrow aesthetasc and some setae. *Antenna* (Fig. 3–2). Coxa short, without any ornamentation. Allobasis more than twice as long as basal diameter, furnished with some spinules on a point basal a third the length

of anterior side, and with one spinulose seta anteriorly. Exopodite consisting of two segments of an equal length; first segment gradually thickened distally, with two hairy setae each on distal end and subdistal edge; second one with two marginal setae, and a spinule, one setula and one slender seta with a hair midst on distal end. Endopodite segment shorter than allobasis, ornamented with an oblique spinular row, two lateral spines, of which distal one is accompanied with a spinule basally, and one simple and four geniculate spines on distal end; a bare setula and a short spinulose seta arising from a distal corner near a spinulose geniculate spine. *Mandible* (Fig. 3–3). Precise structure of cutting edge of praecoxa was not detected; pars incisiva tridentate, pars molaris moderately developed. Coxa-basis much widened distally, terminating in three spinulose setae and one bare setula. Both rami one-segmented, of cylindrical appearance, and very much inclined outwards. Endopodite about 1.5 times as long as exopodite segment, with one setula and two setae on subdistal inner edge; four juxtaposed and three juxtaposed setae on distal end. Exopodite ornamented with one seta subproximally, one seta at a point about three-fourths the length of inner margin, one seta on subdistal inner edge, and three juxtaposed setae terminally. *Maxillula* (Fig. 3–4). Arthrite of praecoxa with at least eight more or less spinulose claws on inner edge, one spinulose thick seta dorsally; two parallel setae arising from anterior side; two spinules on dorsal edge; a vertical row of several spinules on posterior side near dorsal edge. Coxa forming itself a cylindrical process terminating in three spinulose setae. Basis with a fairly widened process ornamented with four more or less spinulose setae apcially, and two close setae, shorter one ventrally spinulose, on a ventral ledge. Both rami one-segmented. Endopodite somewhat swollen midst, fringed with a number of long hairs outwards, and with two elongate terminal setae, in which outer one is hairy and the other is bare, and one hairy seta on inner subdistal edge. Exopodite about 1.3 times as long as endopodite segment, hairy along outer margin, and with two bare terminal setae and one remarkably plumose inner seta subdistally. *Maxilla* (Fig. 3–5). Syncoxa furnished with three well developed endites. Proximal endite much widened apically, of rather triangular appearance, and with two spinulose setae dorsally and one hairy thick seta ventrally. Distal two endites produced, terminating in three spinulose setae (or spiniform setae) on each apex. Basis fairly protruded inwards, with one strong claw, one pectinate spine on anterior side and one bare setula on posterior side; one bare seta arising from ventral edge near inner end; three close setae, one of which is plumose, on posterior side near ventral rim; one bare seta on middle ventral edge. *Maxillipede* (Fig. 3–6). Coxa unornamented. Basis almost cylindrical, three times as long as a diameter measured at middle portion, with two transverse rows of many delicate spinules subproximally, and a setula on subdistal inner ledge. First endopodite segment with two transverse spinular rows inwards and a short row of delicate spinules outwards, and a setula arising from outer distal corner. Second endopodite segment represented by a strong claw with one seta subproximally and a hair on middle inner (or dorsal) edge.

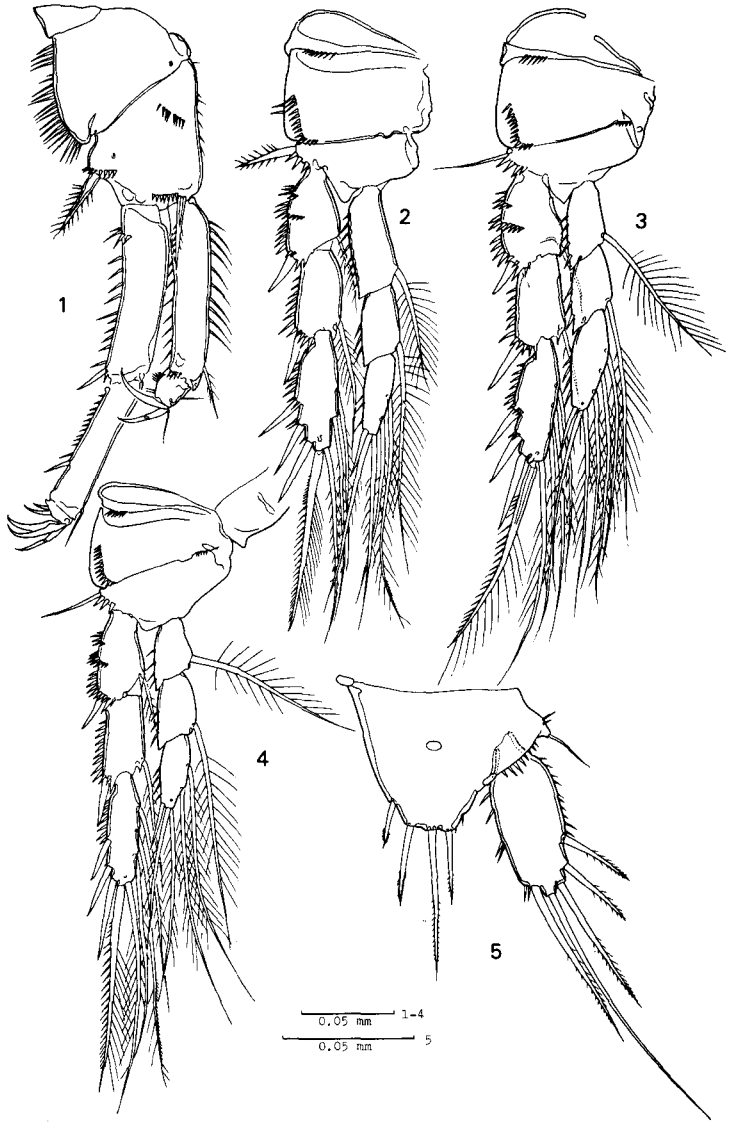

Fig. 4. *Harpacticus nipponicus* n. sp. Female (Holotype). 1. leg 1; 2. leg 2; 3. leg 3; 4. leg 4; 5. leg 5.

Leg 1 (Fig. 4–1). Line of demarcation between coxa and basis remarkably inclined. Outer part of coxa somewhat swelling, fringed with two groups of spinules; a minor pit on anterior side near inner corner. Basis a little narrower

than coxa, somewhat protruded at middle of outer part; a stout outer spine arising from just midway, accompanied with some lower spinules; an oblique row of spinules running on anterior side of inner subproximal part; inner margin almost straight, with a few spinules; an inner seta as long as outer spine, less spinulose. Exopodite three-segmented; first segment about 3.5 times as long as wide, slightly incurved, with four spinules arranged transversely on subproximal outer edge, and some spinules along outer margin between transverse spinular row described and outer spine; second one somewhat shorter than first, with one rather small outer spine at a point two-thirds the length and a bare setula on inner distal corner; third one ornamented with four more or less arched claws with very delicate serration and one geniculate spine. Endopodite precisely two-segmented; first segment as long as first exopodite segment, fringed with a few spinules along both edges, and one hairy setula on subdistal inner edge, several spinules on anterior side along distal extremity. Second endopodite segment (Fig. 3–7) as long as wide, ornamented with one arched claw, one geniculate spine and a bare setula on distal end; several spinules along outer margin distally and subproximally; one setula arising from middle inner edge. *Leg 2* (Fig. 4–2). Anterior side of coxa ornamented with a spinular row arising from middle near outer edge, running distally and a little extending inwards along distal demarcation. Protuberance on basis between both rami fairly developed. Both rami three-segmented; a minor pit on anterior surface of third exopodite segment. Exopodite; first two segments equal in length; third segment much longer than preceding one; of inner setae of last segment, proximal one arising from nearly middle edge; largest width of last segment located at middle. First endopodite segment remarkably elongate, longer than first exopodite segment, and about 2.2 times as long as greatest width. Second endopodite segment furnished with one plumose inner seta bearing some spinules inwards or somewhat anteriorly. Proximal one of inner setae on last endopodite segment delicately serrate on distal part. *Leg 3* (Fig. 4–3). A minor pit on anterior side of last segment of each ramus. Outer edge of each endopodite segment with a few spinules (five, three and four spinules, counting distally, in the illustrated specimen), and outer distal corner of first two segments acutely sharpened. Of three inner setae of last endopodite segment, middle one delicately serrate along inner margin of distal part. Of second endopodite segment inner seta not serrate. *Leg 4* (Fig. 4–4). A minor pit occurring on anterior side of last segment of each ramus. Middle one of three inner setae of last exopodite segment delicately serrate along distal part. Of each endopodite segment outer edge with a few spinules (four, three and four ones, counting distally). Endopodite without any serrate seta. *Leg 5* (Fig. 4–5). Baseo-endopodite rather triangular in appearance, covering over not so little length of exopodite segment; inner expansion with four setae and less spinulose. Exopodite much elongated, more than twice as long as greatest width, fairly narrowed basally; several spinules on outer edge; one hairy seta, about as long as this segment, on subdistal outer edge; one bare elongate seta on distal end; three hairy

setae along distal third outer margin; some spinules along outer margin between base and proximalmost outer seta. *Leg 6* represented by three setae on genital area (Fig. 2–1).

Male. Body (Fig. 5–1) fairly depressed dorsoventrally rather than in female, about 0.66 mm long. First abdominal somite (Fig. 5–2) ornamented with an arched row of very delicate spinules on each lateral side and several conspicuous spinules around leg 6. Second and third abdominal somites ornamented with

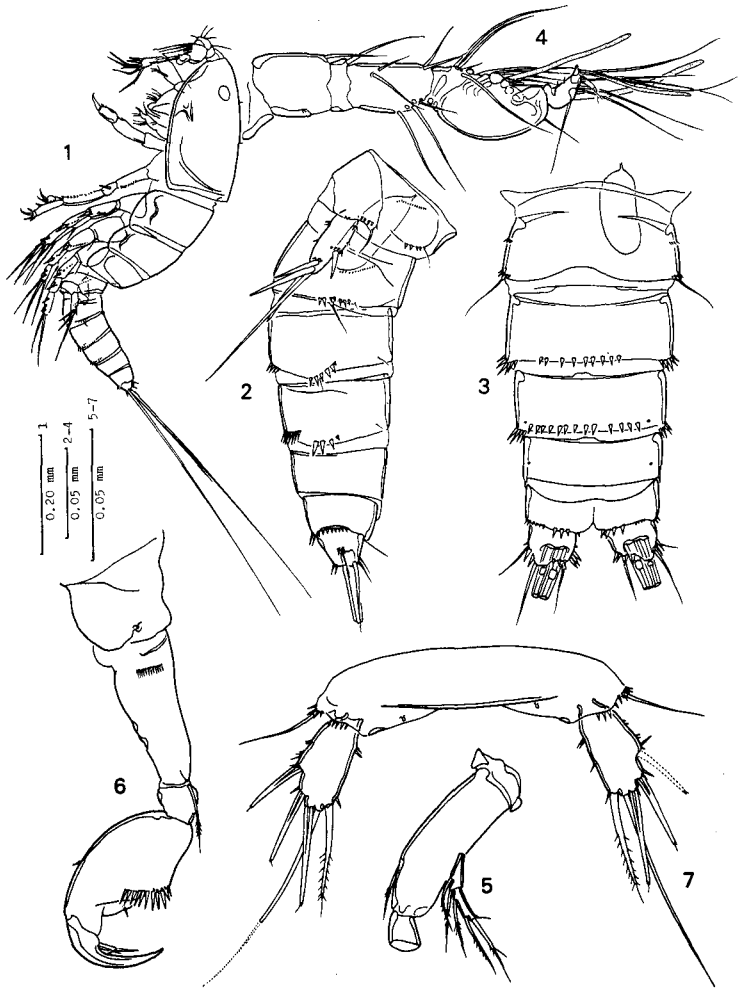

Fig. 5. *Harpacticus nipponicus* n. sp. Male (Allotype). 1. body, lateral; 2. leg 5 and abdomen, lateral; 3. abdomen, ventral; 4. antennule; 5. antenna; 6. maxillipede; 7. leg 5.

several spinules laterally and ventrally near posterior end, and a hair on each dorsolateral side. A pair of minor pits on each ventrolateral side of third and fourth abdominal somites (Fig. 5–3). Spermatophore as shown in figures (Figs. 5–2, 3). *Antennule* (Fig. 5–4) subchirocer; first segment longer than thick, with one bare seta distally; second one very short; third one almost as long as first, much setigerous anteriorly and dorsally; fifth one moderately swollen; sixth one not spur-shaped. *Antenna* (Fig. 5–5). Allobasis fairly slenderized rather than in female, and with no any spinule. *Mandible, maxillula* and *maxilla* same as in female. *Maxillipede* (Fig. 5–6) somewhat narrowed particularly in first endopodite segment.

Leg 1 ornamented as in female. *Leg 2* (Fig. 6–1). Coxa, basis, exopodite and first endopodite segment almost as in female. Second endopodite segment forming itself a mucroniform process about as long as first endopodite segment; inner seta plumose and somewhat spinulose outwards or anteriorly. Third endopodite segment without any trace of outer spine; outer terminal seta well developed, pulmose and with several spinules; inner terminal seta remarkably dwarfed; distal one of inner setae plumose and with some spinules; of inner setae proximal one delicately serrate; several spinules on distal end and outer edge. *Leg 3* (Fig. 6–2). Exopodite much widened, stumpy in appearance; inner seta of second segment considerably reduced; third one about twice as long as wide, with three strong outer

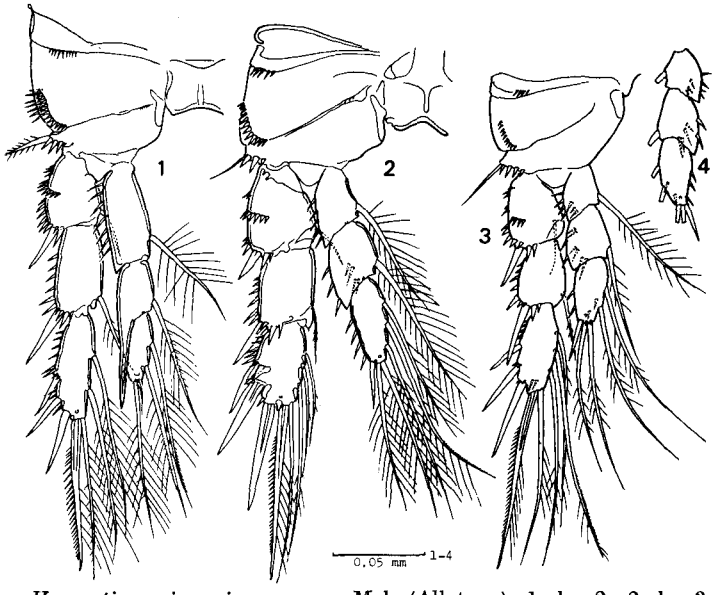

Fig. 6. *Harpacticus nipponicus* n. sp. Male (Allotype). 1. leg 2; 2. leg 3; 3. leg 4; 4. endopodite of leg 4.

spines, and elongate terminal spine, and one terminal and three inner marginal slender setae. Second endopodite segment wider than preceding segment, ornamented with four spinules on posterior side. Of inner setae of last endopodite segment middle one rather rigid and serrate along inner margin of distal part. *Leg 4* (Fig. 6–3). Of inner setae of last exopodite segment middle one rather rigid and serrate; posterior side of this segment with two spinules subdistally. All segments of endopodite ornamented with several spinules on each posterior side as shown in figure (cf. Figs. 6–3 and 6–4). *Leg 5* (Fig. 5–7). A pair of baseoendopodites represented by a plate; outer seta bare, arising from a short cylindrical process accompanied with several spinules basally. Exopodite about twice as long as greatest width, ornamented with three straight spines, each terminating in a hair; one elongate bare seta on distal end; one sparsely spinulose seta on subdistal inner edge; both margins less spinulose. *Leg 6* (Fig. 5–3) represented by one bare seta arising from a short cylindrical process on lateral hind edge of first abdominal somite.

Remarks. The taxonomy within the genus is still much confused by the presence of so many uncertain species inadequately described. As distinguishing characters, the followings are tentatively selected; antennule (♀) nine-segmented; leg 1 with three-segmented exopodite and two-segmented endopodite; first endopdoite segment of leg 2 (not only ♂, but also ♀) remarkably elongate; middle endoopdite segment of leg 2 (♀) furnished with only one seta; inner expansion of baseoendopodite of leg 5 (♀) with four setae, terminal one of which is not longer than exopodite segment; exopodite of leg 5 (♀) more than twice as long as greatest width, with five setae, of which terminal one is bare and the longest, and middle one of three outer setae is not reduced in size; first endopodite segment of maxillipede (so called hand of maxillipede) swollen and with a clear ledge inwards; of leg 2 (♂) last endopodite segment with neither seta nor spine on its outer distal corner (except for marginal spinules). The last mentioned character is separately discussed in a later section (p. 467) after the copepodid stages are described.

There are two another species having a combination of most of these characters, namely *H. pulex* Humes, 1964 and *H. giesbrechti* Klie, 1927. The former species was reported by Humes (1964) from the sloughed skin tissue of a porpoise, *Tursiops truncatus*, and a manatee, *Trichechus manatus latirostrus*, in the Seaquarium at Miami, Florida, and was recorded from the intertidal zone near the Scripps Institution of Oceanography, California, by Frost (1967). Although the present new species is considerably alike to *H. pulex* in many characteristics, we can safely discern them from each other by the good illustrations and precise descriptions of both sexes given by Humes. The inner seta of the exopodite of leg 5 in female is longer than the terminal seta in *H. pulex* while the inner seta is apparently shorter in the present new species. Further, the terminal seta is hairy in *H. pulex*, but is entirely bare in *H. nipponicus*. The shape of furcal ramus in

H. pulex seems to be of certain importance for a diagnostic character as already pointed out by Humes himself. The first endopodite segment of leg 2 in the female of *H. pulex* is not so elongated.

Recently I was noticed by Dr. R. Hamond in a personal communication that *H. nipponicus* had a closest relation with *H. giesbrechti*. The latter species was established by Klie (1927) based upon the description and figures of *H. chelifer* (O. F. Müller) from Kiel by Giesbrecht (1882), but was regarded as a synonym of *H. gracilis* Claus by Lang (1948) and also Vervoort (1964). While I examined the specimens of *H. giesbrechti*, which were sent me by Dr. R. Hamond, selected from his material rediscovered in Danish waters near the Helsingør Laboratory, striking resemblances between *H. giesbrechti* and *H. nipponicus* were recognized in most characters. However, they are not identical with each other, because some characters in *H. giesbrechti*, such as the genital double-somite and the antepenultimate somite of female with no any spinule on the ventral end, almost straight outer margin of the last endopodite segment in leg 3, somewhat bigger ratio of the lengths of the first/second endopodite segments of leg 1 and the antennal allobasis of female lacking in spinules on the anterior side, are different from the corresponding ones in *H. nipponicus*.

On the other hand, *H. littoralis* Sars sensu Sewell (1924) reported from the Chilka Lake, India, shows a resemblance to the present new species in the shape and armature of the leg 5 in female and also in male, while these characters in the latter are apparently discernible from those of the original description and figures of *H. littoralis* by Sars (1910). The Sewell's species checked off by Lang (1948) as a misidentified one, however, is quite distinct in the antennular segmentation in female, and is well discernible from the present new species. The length of proximal four antennular segments combined is shorter than twice as long as the rest segments combined in the Sewell's species, but the corresponding length in *H. nipponicus* is much longer and about three times as long as the apical five segments combined. The relative lengths in two major parts of antennule seem to be of specific importance for the taxonomy within the genus, since greater ratios of proximal four segments combined are recognized in many other species, while a few reliable species of such smaller ratio are enumerated, *H. uniremis* Kröyer, 1842, *H. compressus* Frost, 1967 and so on.

Specimens examined. Holotype; female, Allotype; male. Paratypes; 2 females and 2 males. All the specimens were collected from Oshoro in algal rinsings (7–IX–1973, K. Kito leg.).

Copepodid stages of *Harpacticus nipponicus*

(Figs. 7–14)

The first copepodid stage. Body (Fig. 7–1) consisting of five somites, about 0.24 mm long. Cephalothorax occupying about half of body length, and much higher than other somites. Pleurotergite of first free thoracic somite well

differentiated. Last somite apparently longer than preceding somite, and with a transverse suture together with several spinules on ventral side. Furcal ramus not so shortened rather than in adults. While principal terminal setae of furcal ramus were broken, the remaining basal part apparently shows that they had a common basal part. *Antennule* (Fig. 8–1) six-segmented, first two segments thicker than others; first segment with one spinulose short seta on anterodistal edge and one bare seta dorsally; second one a little shorter than preceding one, furnished with an aesthetasc and one spinulose seta close to other long bare seta on middle anterior side; one setula arising from posterior side of fourth one; apical one terminating in a trifurcate seta. *Antenna* (Fig. 8–2) almost as in adult. Allobasis without spinule. *Maxillipede* (Fig. 8–3). First endopodite segment as long as coxa and basis combined, otherwise as in figure.

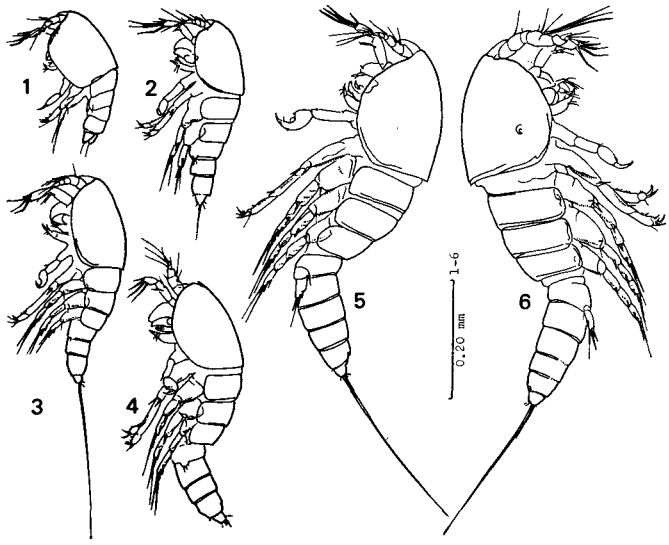

Fig. 7. *Harpacticus nipponicus* n. sp. Copepodids. 1. first cop.; 2. second cop.; 3. third cop.; 4. fourth cop. female; 5. fifth cop. female; 6. fifth cop. male.

Leg 1 (Fig. 8–4). Coxa and basis differentiated. Several spinules along distal part of outer margin. Basis lacking in inner seta, and furnished with one spinulose outer spine on middle edge and a transverse spinular row on inner half of anterior side near distal end. Both rami one-segmented. Exopodite elongate oval in outline, ornamented with one outer spine midst and two outer spines subdistally; two arched and one geniculate spines on distal end; two separate groups of spinules on subproximal outer edge. Endopodite somewhat smaller than exopodite segment, with four groups of spinules on outer edge, two spines and one hairy seta on distal end; inner edge with one longer seta almost midst and one

hairy setula subdistally. *Leg 2* (Fig. 8–5). Coxa apparently wider than long, unornamented. A spinulose outer seta of basis differentiated. Both rami one-segmented. Exopodite about 2.5 times as long as greatest width located midst, with three outer spines; one longer spine and one hairy seta on distal end; one slender seta arising from inner edge at almost same level of middle one of outer spines; two separate groups of several spinules on proximal half of outer edge. Endopodite somewhat smaller than exopodite segment, more than three times as long as greatest width, lacking in outer spine, ornamented with several spinules along outer margin, two setae on distal end and one shorter seta on inner subdistal edge. *Leg 3* (Fig. 8–6). A pair of legs represented by a common plate slightly separable by a shallow notch. Two bare spines and one setula arising from each apex.

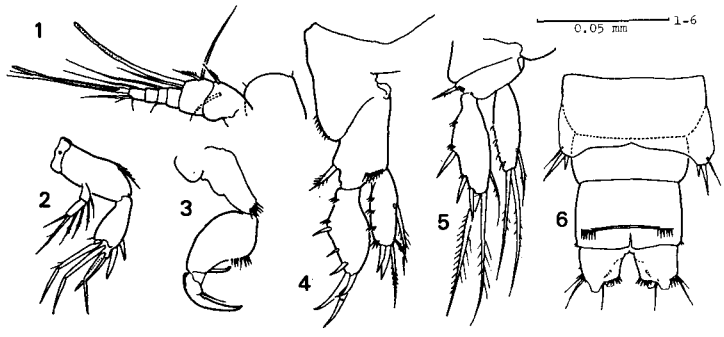

Fig. 8. *Harpacticus nipponicus* n. sp. The first copepodid stage. 1. rostrum and antennule; 2. antenna; 3. maxillipede; 4. leg 1; 5. leg 2; 6. leg 3 and abdomen, ventral.

The second copepodid stage. Body (Fig. 7–2) consisting of six somites, 0.32 mm long. Cephalothorax somewhat shorter than four succeeding somites combined. Pleurotergite of first two thoracic somites well differentiated. Rostrum as shown in figure (Fig. 9–1). Fifth somite unornamented (Fig. 9–5). Last somite with a short transverse suture on ventral side, and a few spinules ventrally and laterally along hind edge. Furcal ramus almost as long as basal width, ornamented nearly as in adult; principal terminal setae differentiated. *Antennule* (Fig. 9–1) seven-segmented, with no spinulose seta; first segment shorter than diameter, with one seta on anterior distal end; second one fairly elongated, about 1.5 times as long as first, and forming itself a clear distal protuberance terminating in an aesthetasc; third one with one remarkably elongate seta on anterior side; one setula arising from posterior side of fifth segment.

Leg 1 (Fig. 9–2). Spinular row along outer margin of coxa apparently interrupted subproximally. Basis ornamented with an arched row of a few spinules on anterior side, and one inner spine on distal edge. Both rami two-segmented. Exopodite wider than endopodite; a line of demarcation between

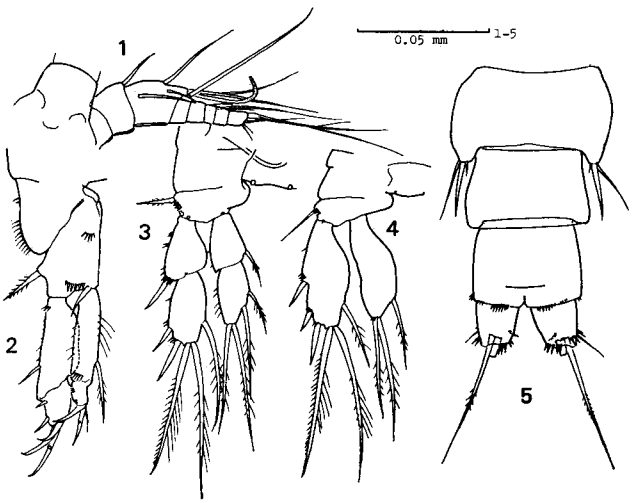

Fig. 9. *Harpacticus nipponicus* n. sp. The second copepodid stage. 1. rostrum and antennule; 2. leg 1; 3. leg 2; 4. leg 3; 5. leg 4 and abdomen, ventral.

both segments remarkably inclined; first segment almost as long as coxa, furnished with one bare spine at a point two-thirds the length of outer margin; second one ornamented with two shorter spines on outer edge, two arched claws and one geniculate spine on distal end. Endopodite almost as long as exopodite; first segment nearly four times as long as second, ornamented with one hairy seta on subdistal inner edge, a transverse spinular row on anterior side near distal end; second one terminating in one claw, one geniculate spine and one bare setula, and with two separate spinular rows near outer margin. *Leg 2* (Fig. 9–3). Coxa slightly elongate. Basis as in previous stage. Both rami two-segmented. Exopodite; first segment apparently narrowed proximally, with one outer spine accompanied with several spinules basally; second one oval in outline, somewhat longer than first, ornamented with two outer spines, one elongate spine and one hairy seta on distal end, and one inner seta. Endopodite shorter than exopodite; first segment with one rather short inner seta; second one almost as long as first, lacking in outer spine, ornamented with two terminal and two inner setae. *Leg 3* (Fig. 9–4). Of basis outer seta differentiated. Both rami one-segmented. Exopodite ornamented as in leg 2 in first copepodid stage. Endopodite without any spinule along outer margin, otherwise ornamented with three setae in total as in leg 2 in preceding stage. *Leg 4* (Fig. 9–5). A common plate representing both legs not so developed rather than that of leg 3 of previous stage. One dwarfed spine, one well developed spine and one bare seta arising from each apex on both sides.

The third copepodid stage. Body (Fig. 7–3) consisting of seven somites,

0.36 mm long. Cephalothorax almost as long as succeeding five somites combined. Pleurotergite of first three thoracic somites well differentiated. Rostrum (Fig. 10–1) as shown in figure. Sixth somite (Fig. 10–6) unornamented. Last somite and furcal rami ornamented almost as in preceding stage.

Leg 1 (Fig. 10–2). Arched spinular row of anterior side of basis not detected. First exopodite and endopodite segments fairly elongated. A bare setula apparently occurring on distal end of second exopodite segment. *Leg 2* (Fig. 10–3). Coxa ornamented with a slightly outcurved spinular row on anterior side near outer edge. Both rami two-segmented. One outer spine and one inner seta added on second exopodite segment. Second endopodite segment still lacking in outer spine, and with four setae in total. *Leg 3* (Fig. 10–4). Coxa with some spinules on subproximal anterior side and along outer edge. Both rami two-segmented. Exopodite fairly longer than endopodite; first segment with one outer spine; second one with two outer spines subdistally, one elongate spine and one hairy seta on distal end, and two inner setae. *Leg 4* (Fig. 10–5). Coxa and basis differentiated. Both rami one-segmented, and ornamented almost as in leg 3 in previous stage. Space between first two outer spines of exopodite much widened. Endopodite fairly elongate and narrow. *Leg 5* (Fig. 10–6) represented by a slight protuberance terminating in one bare seta.

The fourth copepodid stage. Female. Body (Fig. 7–4) consisting of eight

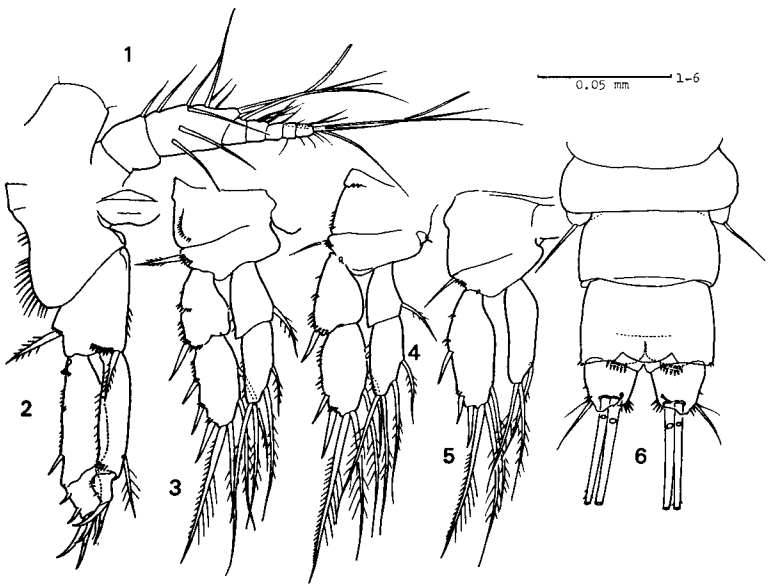

Fig. 10. *Harpacticus nipponicus* n. sp. The third copepodid stage. 1. rostrum and antennule; 2. leg 1; 3. leg 2; 4. leg 3; 5. leg 4; 6. leg 5 and abdomen, dorsal.

somites, 0.42 mm long. Cephalothorax about as long as succeeding four somites combined. Rostrum (Fig. 11–1) as shown in figure. Since the specimen illustrated was one immediate before molting, a part of newly formed head with a rostrum appeared in a crack of rostral base (Fig. 11–7). Sixth and seventh somites without particular ornamentation. Last somite apparently bipartite posteriorly, and with some spinules ventrally and laterally. *Antennule* (Fig. 11–1) eight-segmented. The second and third segments are apparently derivatives from the second segment in the preceding stage. In the third segment, two new segments for the succeeding stage were already formed. By this fact the sex of this specimen was clearly determined. First segment with several spinules on anterior side; second one slightly longer than first, and setigerous anteriorly and dorsally; third one much longer than second, and terminating in an aesthetasc; fourth one furnished with one elongate seta anteriorly.

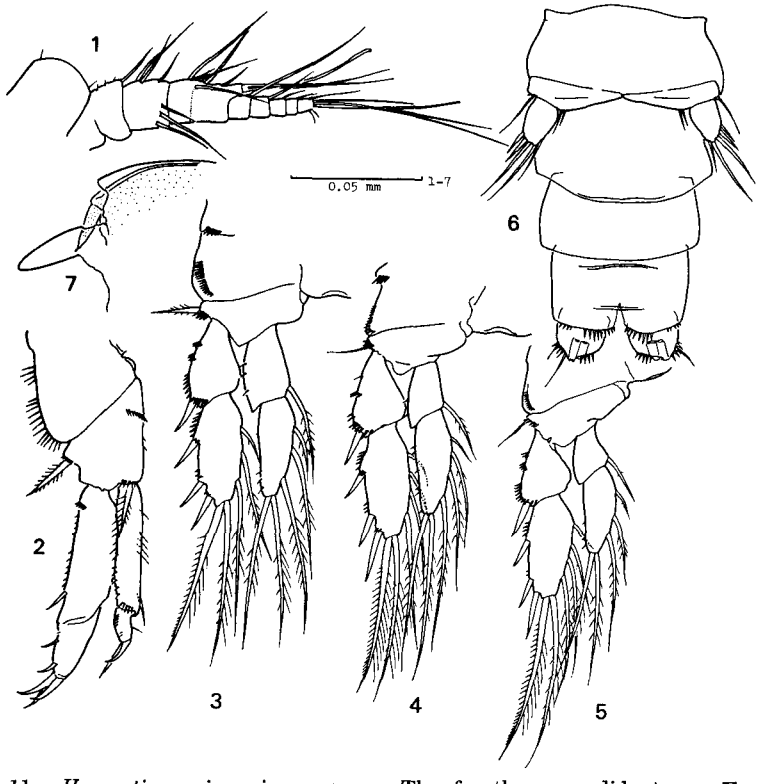

Fig. 11. *Harpacticus nipponicus* n. sp. The fourth copepodid stage. Female. 1. rostrum and antennule; 2. leg 1; 3. leg 2; 4. leg 3; 5. leg 4; 6. leg 5 and abdomen, ventral; 7. rostral area in laterai view.

Leg 1 (Fig. 11–2). First endopodite segment with some fine spinules near inner margin. One setula arising from middle inner edge of second endopodite segment. *Leg 2* (Fig. 11–3). A transverse spinular row added on anterior surface of coxa subproximally. Interspace between first two outer spines of second exopodite segment somewhat widened. One hairy seta added on inner subproximal edge of second exopodite segment. Second endopodite segment still lacking in outer spine, with one additional inner seta, and then, three inner setae in total. *Leg 3* (Fig. 11–4). One outer spine and two inner setae added on second endopodite segment. *Leg 4* (Fig. 11–5). Coxa ornamented with an outcurved spinular row on anterior side near outer margin. Both rami two-segmented. Exopodite much longer than endopodite; first segment with one outer spine; second one fairly longer than first, and with three outer spines, one elongate spine and one hairy seta on distal end, and four inner setae. Endopodite; first segment with one inner seta; second one lacking in outer spine, with two terminal and three inner setae. *Leg 5* (Fig. 11–6). Baseoendopodite very short, with two setulae on inner expansion, and one slender outer seta. Exopodite somewhat longer than greatest width, ornamented with five bare setae in all.

Male. No specimen was collected.

The fifth copepodid stage. Female. Body (Fig. 7–5) consisting of nine somites, about 0.6 mm long. Cephalothorax almost as long as succeeding five somites combined. Sixth somite (first abdominal somite) unornamented. Seventh somite with several spinules on each lateral hind edge. A sign of demarcation between the last two somites of the sixth stage is recognzied (indicated by an arrow in Fig. 13–1) in the last somite. Rostrum (Fig. 12–1) ornamented with precisely two pairs of sensory hairs. *Antennule* (Fig. 12–1) nine-segmented; first four segments subequal in length; an aesthetasc attached onto fourth segment.

Leg 1 (Fig. 12–2). Coxa and basis almost as in adult. Exopodite three-segmented and ornamented as in adult; first segment fringed with more spinules outwards rather than in adult; of second one, outer spine arising from middle edge; one bare setula attaching onto last segment. No setula was detected on the distal end of the last endopodite segment and also on the inner distal part of the second exopodite segment. *Leg 2* (Fig. 12–3), *leg 3* (Fig. 12–4) and *leg 4* (Fig. 12–5). Both rami three-segmented, fairly stumpy in appearance. Outer spine of last endopodite segment differentiated. Spinal and setal number of each segment as in adult. First endopodite segment of leg 2 more than 1.5 times as long as greatest width, and not so longer than first exopodite segment. Outer distal corner of first two endopodite segments of each leg somewhat protruded distally. *Leg 5* (Fig. 13–1). Two bare and two spinulose setae on inner expansion of baseoendopodite. Exopodite almost twice as long as greatest width, with five setae; terminal seta entirely bare and longest.

Male. Body (Fig. 7–6) consisting of nine somites, a little more longer than in female. Abdomen rather slender. Seventh and eighth somites each ornamented

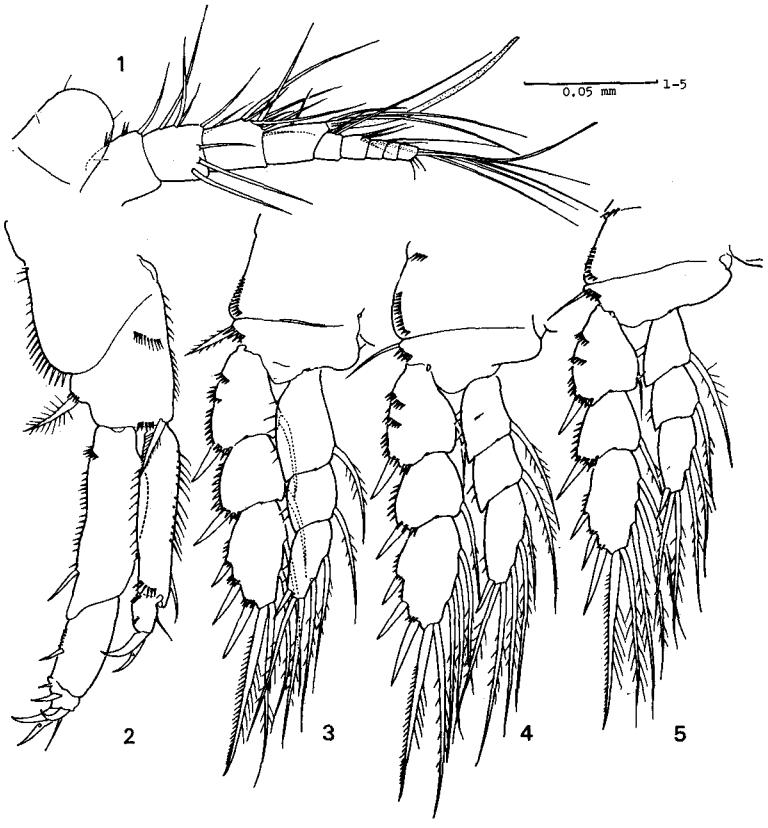

Fig. 12. *Harpacticus nipponicus* n. sp. The fifth copepodid stage. Female. 1. rostrum and antennule; 2. leg 1; 3. leg 2; 4. leg 3; 5. leg 4.

with a transverse row of some rigid spinules on ventral side (Fig. 13–2). The new principal terminal setae of furcal rami for the sixth copepodid stage are formed throughout abdominal somites. *Antennule* (Fig. 14–1) eight-segmented; second segment fairly produced distally at anterior part; third one furnished with one well developed aesthetasc; sixth and seventh segments remarkably reduced in size.

Leg 1 as in female. *Leg 2* (Fig. 14–2). Second endopodite segment forming itself a mucroniform process as in adult male. Last endopodite segment exactly lacking in outer spine as in preceding stage, and inner terminal seta of this segment still not reduced. *Leg 3* (Fig. 14–3). Exopodite scarcely widened. *Leg 4* as in female. *Leg 5* (Fig. 13–2). Both baseoendopodites represented by a common plate, with no ornamentation between both exopodites. Exopodite almost twice

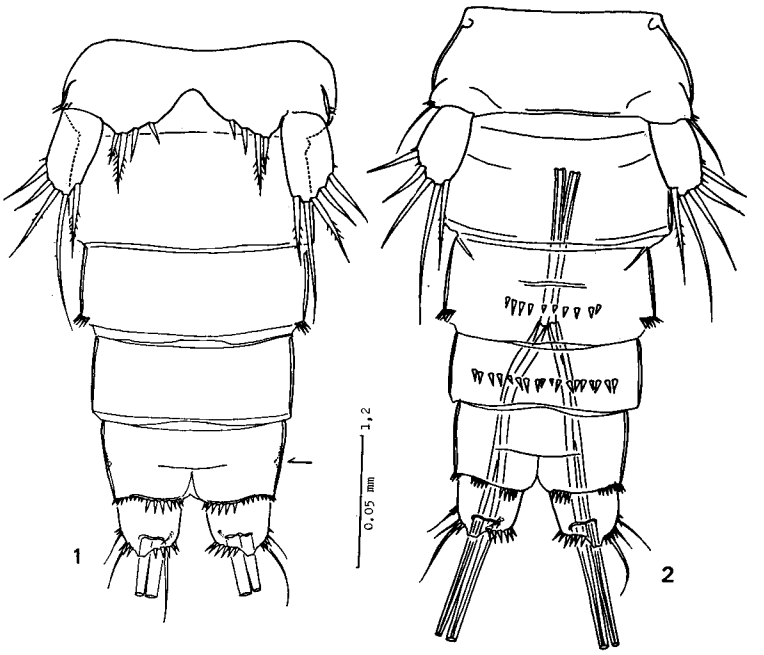

Fig. 13. *Harpacticus nipponicus* n. sp. The fifth copepodid stage. 1. leg 5 and abdomen, female; 2. ditto, male.

as long as basal width, and ornamented with five setae; inner seta somewhat spinulose.

Biological notes. The reproductive season in Oshoro ranges from late summer to autumn (August to October) every year. In cold seasons no specimen has been so far found in Oshoro, neverthless the other congeneric species, *Harpacticus uniremis* Kröyer, has been collected as already reported (Itô, 1971). The period of appearance of each species in Oshoro is never overlapped together. This species seems to be one dwelling in warmer waters. Because in the period first mentioned, this area on the Japan Sea coast of Hokkaido is chiefly influenced by a warm water of the Tsushima Current, and, further, some specimens were collected also from more southern parts of Japan, Izu, middle part of Honshu, and Amakusa, Kyushu, but no specimen has been so far found in Akkeshi, a northeast part of Hokkaido under the strong influence of the Chishima Current, despite of active samplings (Itô, unpublished).

Specimens examined. All the specimens of developmental stages were collected from *Sargassum confusum* Agardh in Oshoro (7–IX–1973) by means of weed-washing.

Discussion. The present new species examained nearly accords with

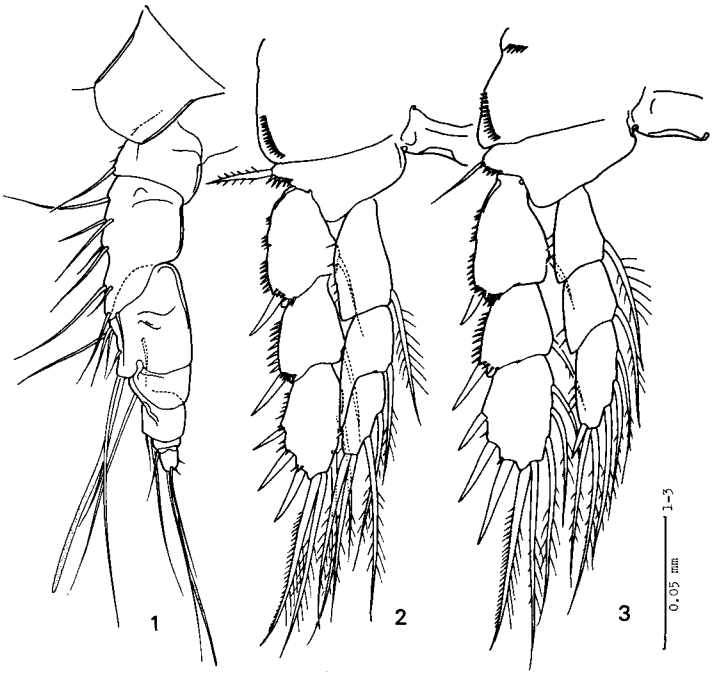

Fig. 14. *Harpacticus nipponicus* n. sp. The fifth copepodid stage. Male. 1. rostrum and antennule; 2. leg 2; 3. leg 3.

H. uniremis in the differentiation process of body somites as well as appendages through copepodid stages (cf. Itô, 1971). Certain spinal differentiation in thoracic legs, however, shows a clear discrepancy between them. That is the differentiation of the outer spine of the last endopodite segment in the second, third and fourth legs. The outer spine in question appears even in the one-segmented ramus in *H. uniremis*, but is first differentiated in the three-segmented ramus of the fifth copepodid stage in *H. nipponicus*. Such retarded formation-type in the spinal differentiation found in *H. nipponicus* is recognized also in *H. gracilis* Claus studied by Pugliesi (1914), while another examples of the non-retarded formation-type as shown in *H. uniremis* are easily detectable even in other genera within the family Harpacticidae, namely, *Tigriopus fulvus* (Fischer) (Fraser, 1936), *T. japonicus* Mori (Itô, 1970), *Zaus robustus* Itô (Itô, 1976) and *Paratigriopus hoshidei* Itô (Itô, 1976). That these different types certainly occur among the *Harpacticus*-species is of special importance for the taxonomy within the genus, in which no particular attention has so far been payed upon the presence or absence of the outer spine (or any degenerated form such as a setula) on the last endopodite segment of leg 2 in the male, nevertheless some species have exactly such appendice on the corresponding part, for examaple, *H. pulvinatus* Brady

sensu Lang (1934), *H. obscurus* T. Scott sensu Candeias (1959) and *H. uniremis* sensu Itô (op. cit.).

As already shown in *H. uniremis* of the non-retarded formation-type, the corresponding part in the adult male has not usually the outer spine, but a setula degenerated from a spine in the fifth copepodid stage, and the presence of the spine in the adult was represented as an abnormality due to incomplete degeneration (see Itô, op. cit.). Further, if the fact that neither any spine nor seta is added to the leg 2, leg 3 and leg 4 in the final molt is considered, it would be reasonable to regard those species having such appendice in the adult male as to be a species of the non-retarded formation-type. Contrary, the species without corresponding outer spine (including any degenerated form as previously noted) in the fifth copepodid male would be regarded as being the retarded formation-type. The latter example is represented with *H. gurneyi* Jakubisiak from the Sargasso Sea (Yeatman, 1962). The new subspecies of *H. septentrionalis* Klie described later, in addition, is apparently of the non-retarded formation-type, because the adult male has the outer spine in question as a normal characteristic. The phylogenetic significance of the presence of these two different types will be discussed in another paper.

Harpacticus septentrionalis Klie *yamadai* n. subsp.

(Figs. 15–24)

Female. Body (Figs. 15–1, 2) about 1.05 mm long, rostrum and furcal setae excluded, about 0.42 mm wide, measured at posterior end of cephalothoracic somite, nearly transparent and colorless, though very delicately tinctured with greenish brown in most parts and dark blue at a small area just above nauplius eye. Body somewhat depressed dorsoventrally, gradually tapering posteriorly through thoracic and abdominal somites. Rostrum (Fig. 17–1) easily detected in dorsal view (Fig. 15–1), well defined at base, approximately rectangular, ornamented with two pairs of sensory hairs. Cephalothorax longer than three succeeding somites combined, with some scattering hairs laterally and dorsally. Fourth free thoracic somite (Fig. 15–3) ornamented with some stout spinules along posterior end of lateral part and an arched row of a number of delicate spinules on anterior part of lateral side. Genital double-somite (Figs. 15–3, 16–1, 2) subdivided by a narrow chitinous suture ventrally and laterally; anterior subdivision ornamented with an arched row of minute spinules on anterolateral part and an oblique row of a few stout spinules on posterolateral part; posterior subdivision ornamented with two oblique rows of some stout spinules laterally and a transverse row of rather slender spinules on full width of ventral side along posterior end; gential area as in figure, with a pair of three setulae representing rudimental leg 6. Antepenultimate somite ornamented nearly as in posterior subdivision of genital double-somite, but spinules on ventral side fairly bigger. Penultimate somite without particular ornamentation; hyaline frill of dorsal part somewhat expanding

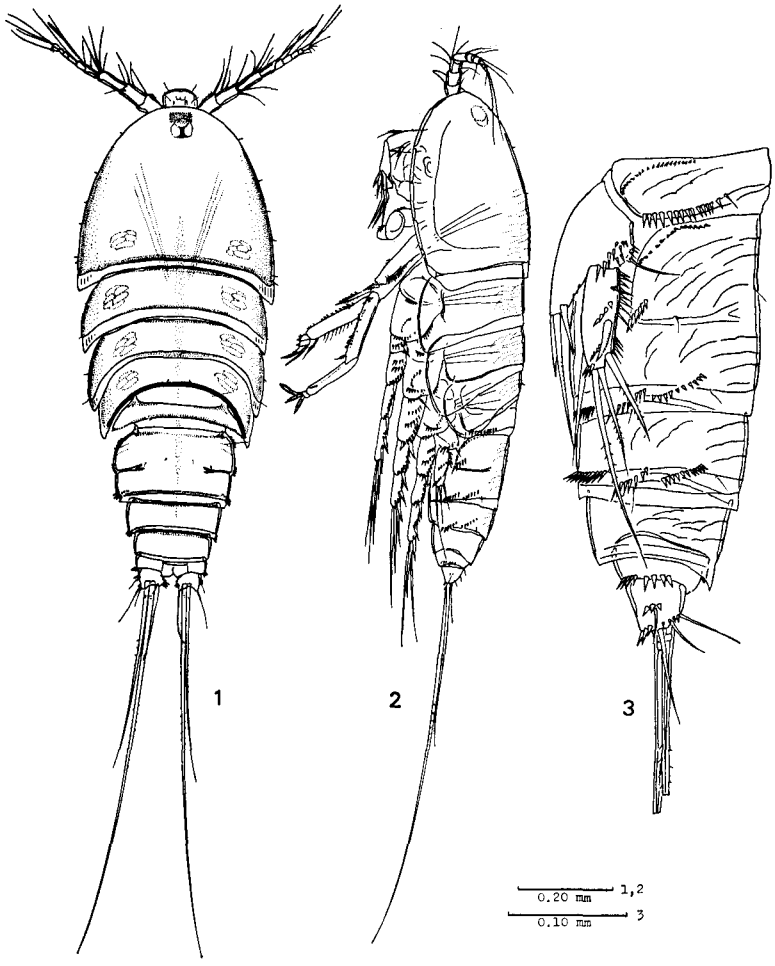

Fig. 15. *Harpacticus septentrionalis yamadai* n. subsp. Female (Holotype). 1. body, dorsal; 2. ditto, lateral; 3. leg 5 and abdomen, lateral.

posteriorly. Anal somite rather short, with some spinules laterally, a delicate hair on dorsal side near each furcal ramus. Furcal ramus somewhat shorter than wide, otherwise as in figure. *Antennule* (Fig. 17–1) nine-segmented; first four segments combined approximately twice as long as apical five ones combined; of first segment anterior side spinulose; second and third ones subequal in length; sixth one a little longer than fifth (cf. corresponding parts of *H. uniremis* shown in Fig. 17–4). *Antenna* (Fig. 17–2). Coxa very short. Allobasis a little shorter than twice as long as thick, furnished with a few stout spinules and one

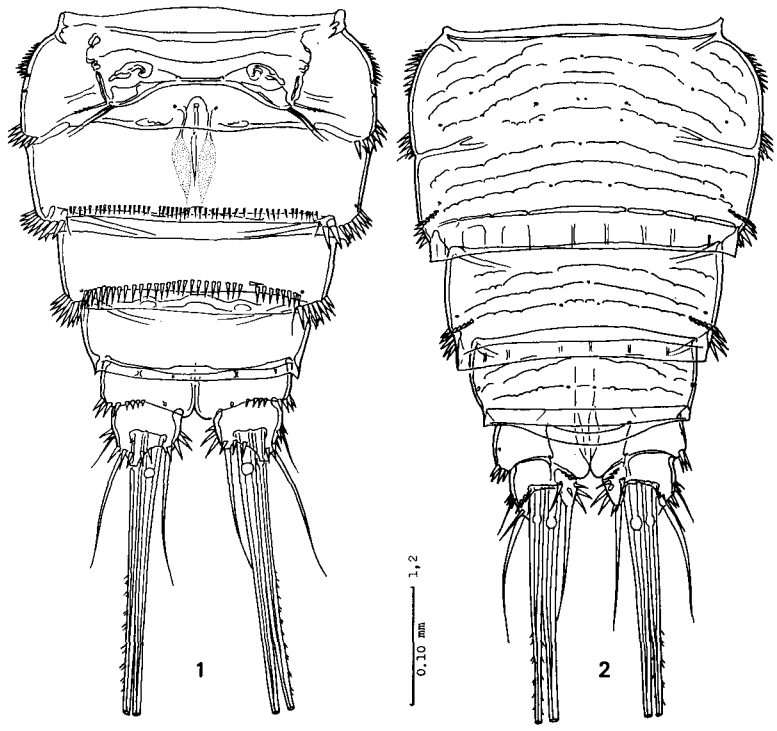

Fig. 16. *Harpacticus septentrionalis yamadai* n. subsp. Female (Holotype). 1. abdomen, ventral; 2. ditto, dorsal.

spinulose seta on anterior side. Exopodite arising from a midway of allobasis, consisting of two segments of an equal length; first segment gradually thickened distally, with two one-sided spinulose setae; second segment with two spinulose setae each situating subproximally and subdistally, and terminating in a few stout spinules, a bare setula and one well developed seta which is about twice as long as two exopodite segments combined and spinulose along both sides of distal half. Endopodite somewhat shorter than allobasis, remarkably thickened distally, furnished with one serrate spine, which is accompanied with a transverse row of spinules near base, at almost middle part of anterior side; one serrate spine, together with a narrow, partially serrate spine and a bare setula, arising from subdistal part of anterior side (see Fig. 17–3); distal end furnished with one long serrate spine, four geniculate spines, one bare seta and one spinulose thick seta. *Mandible* (Figs. 18–1, 2). Praecoxa well sclerotized, furnished with a row of some slender spinules near base of coxa-basis; pars incisiva tri-dentate. Coxa-basis fairly inclined, remarkably widened distally, forming itself a well defined lobe at dorsal corner, which terminates in three slender setae and is of one ventrally

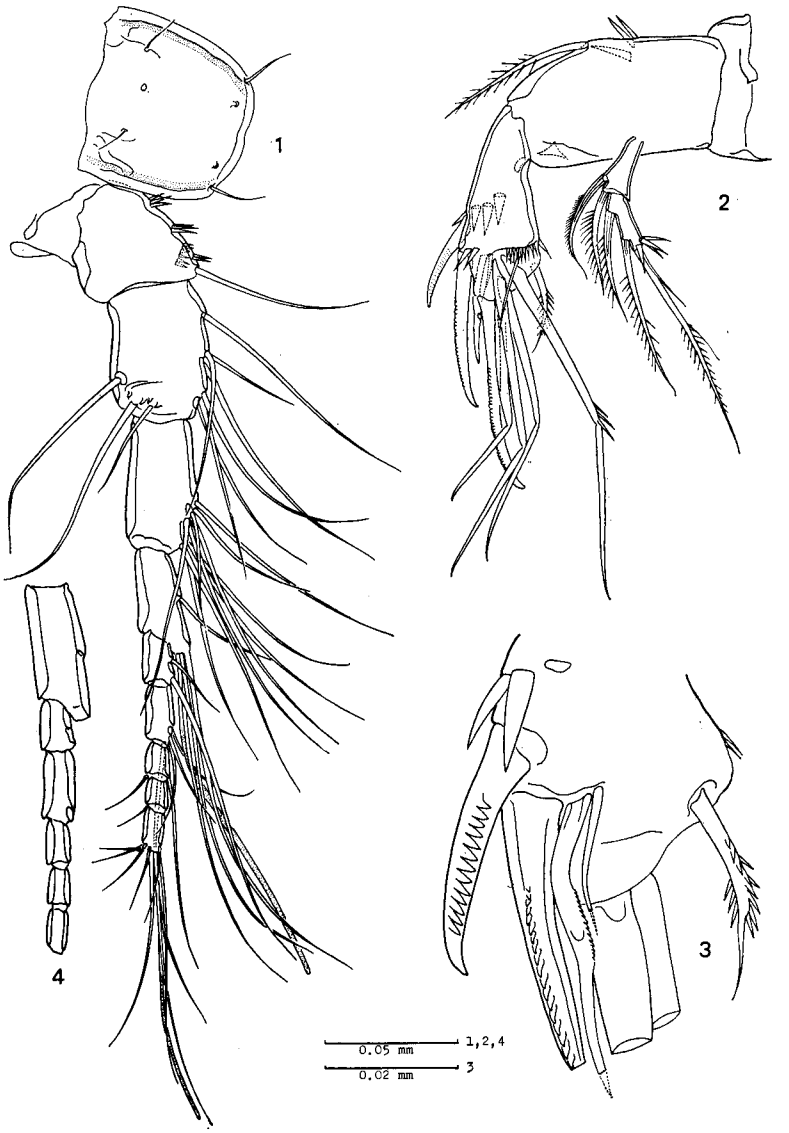

Fig. 17. *Harpacticus septentrionalis yamadai* n. subsp. Female (Holotype). 1. rostrum and antennule; 2. antenna; 3. apical part of antenna. *Harpacticus uniremis* Kröyer from Muroran. 4. distal six antennular segments of a female.

directed seta on submarginal part of its ventral base (see Fig. 18–3). Exopodite cylindrical, indistinctly three-segmented (or two-segmented ?); first segment almost four times as long as thick, furnished with one elongate seta near

Fig. 18. *Harpacticus septentrionalis yamadai* n. subsp. Female (Holotype). 1. mandible; 2. ditto; 3. mandibular coxa-basis; 4. maxillula; 5. maxilla; 6. middle endite of maxillary syncoxa; 7. maxillipede.

subproximal ventral edge and one seta on distal corner; second and third segments very small, each with one seta and three juxtaposed setae, respectively. Endopodite consisting of a single segment, somewhat longer and thicker than exopodite; three close setae arising from a midway of ventral edge; distal end with ten setae in all. *Maxillula* (Fig. 18–4). Arthrite of praecoxa somewhat widened inwards, furnished with a pair of parallel setae and a few fine spinules on anterior side, two stout spinules on dorsal edge; seven more or less spinulose claws on inner edge and two spinulose thick setae on inner half of dorsal edge. Coxal process reaching a midway of arthrite of praecoxa, roughly cylindrical in appearance, and terminating in four more or less spinulose setae. Inner end of basis much more extending beyond inner end of coxal process, with some fine spinules near end; two juxtaposed bare setae on subdistal ledge of ventral side and four spinulose setae terminally. Exopodite not so swelling midst, with some rather flexible spinules along both margins and four narrow bare setae terminally. Endopodite represented by a cylindrical segment directing inwards, ornamented with three bare setae terminally or subterminally and some slender spinules on ventral side. *Maxilla* (Fig. 18–5). Syncoxa with two rows of some spinules on outer part, and furnished with three endites each bearing three more or less spinulose thick setae; of middle endite dorsalmost seta ornamented with a row of considerable number of special spinules arranged in a noticeable way (see Fig. 18–6). Basis forming itself a strong claw, which is remarkably pectinate in two lengthwise rows, accompanied with two bare setulae and one somewhat spinulose seta near its base. Endopodite represented by four close setae. *Maxillipede* (Fig. 18–7). Coxa not so sclerotized, with a longitudinal row of fine spinules on outer side. Basis somewhat narrowed distally, furnished with three transverse rows of a number of spinules subproximally, some tall spinules subdistally and one finely spinulose seta on subdistal inner edge. First endopodite segment strongly built, with a transverse row of some rigid spinules subproximally and a few spinules on a point two-thirds the length of outer side; inner side considerably spinulose. Second endopodite segment represented by a strong claw accompanied with a setula and a spine laterally.

Leg 1 (Fig. 19–1). Coxa somewhat widened; moderately outcurved outer edge bearing some tall spinules; a minor pit occurring at inner distal corner of anterior side. Basis approximately as long as greatest width at a level of outer spine; a row of some thick spinules on posterior side along inner margin; an oblique row of some fine spinules on anterior side; an inner seta reaching a midway of first endopodite segment and spinulose; a minor pit occurring on anterior side near outer proximal corner; an outer spine stout and spinulose. Both rami three-segmented. First exopodite segment slightly incurved, about four times as long as wide, furnished with two parallel spinular rows each on and near outer margin; an arched row of some spinules arising from outer subproximal edge and extending inwards on anterior side; one finely spinulose seta (or spiniform seta) arising from a point three-fourths the length of outer edge. Second exopodite segment nearly as long

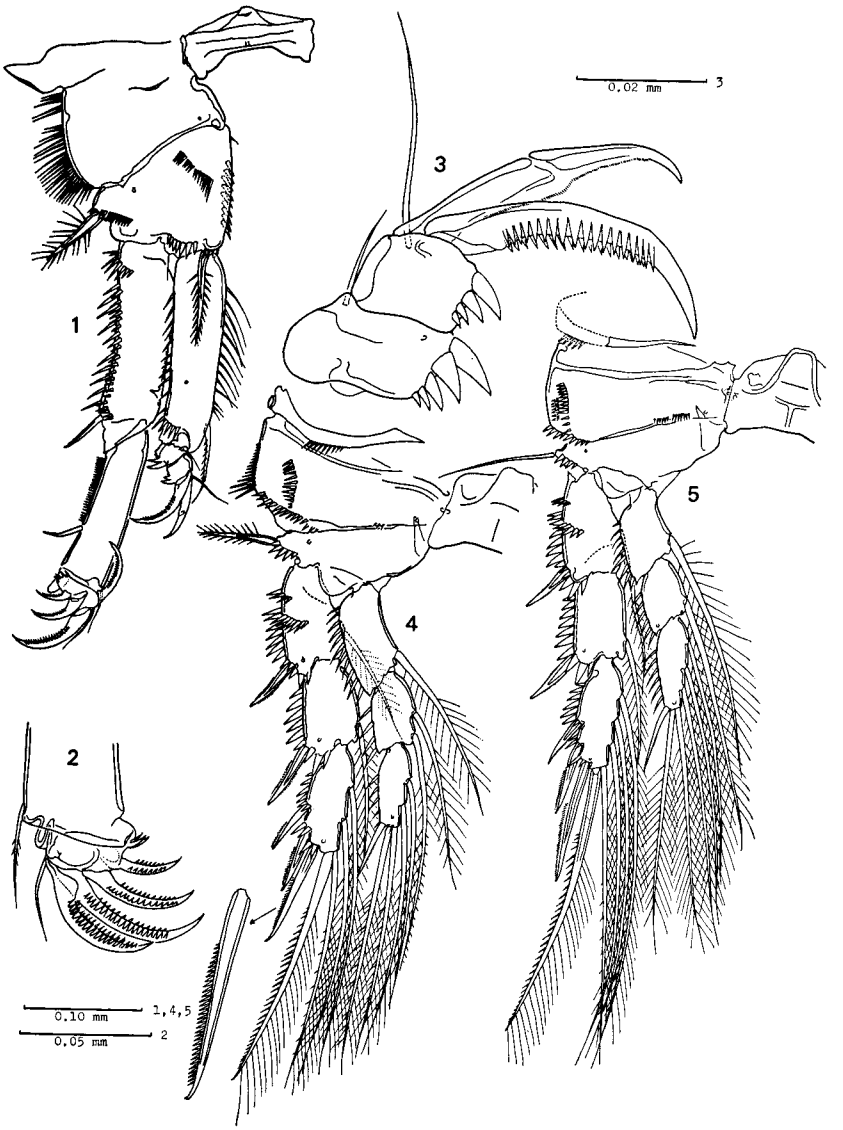

Fig. 19. *Harpacticus septentrionalis yamadai* n. subsp. Female (Holotype). 1. leg 1; 2. apical part of exopodite of leg 1;. 3. apical part of endopodite of leg 1; 4. leg 2; 5. leg 3.

as first segment, a little widened distally, furnished with one bare spiniform seta on a point two-thirds the length of outer margin and a hair-like setula on inner distal corner; proximal two-thirds the length of outer margin densely fringed with a

number of fine spinules (more than 20); a blunt protuberance occurring at outer side of distal end. Last exopodite segment small, with four arched claws, which are finely pectinate in two parallel rows as shown in figure (Fig. 19–2), and a setula on inner edge. First endopodite segment almost as long as first exopodite segment, fringed with some rigid spinules outwards and some rather flexible spinules inwards; a short row of several spinules on anterior side near distal end; one short spinulose seta arising from subdistal inner edge. Second endopodite segment apparently movable, ornamented with five rigid spinules on outer edge and a bare setula near inner distal end. Last endopodite segment immovable, as long as preceding segment, and with four rigid spinules on outer edge, one pectinate claw and one geniculate claw, which is fringed with a finely serrate hyaline membrane on its outer side (see Fig. 19–3); one bare setula arising from posterior side near inner distal corner. *Leg 2* (Fig. 19–4). Coxa extremely widened, about 1.5 times as wide as basis; a transverse spinular row on anterior side of basal part; two spinular rows on anterior side each transversely and longitudinally; a few spinules occurring on distal border; a longitudinal row of some spinules on posterior side along outer edge. Basis shorter than coxa, forming itself a blunt, rather hyaline protuberance between both rami; one outer seta stout, somewhat spiniform and bilaterally spinulose; several rigid spinules occurring near base of outer spine. Three exopodite segments subequal in length, fringed with some stout spinules outwards; of first two segments each outer spine bilaterally with delicate spinules; of last segment three outer spines considerably spinulose along each outer (dorsal) side; inner terminal seta sparsely spinulose outwards and hairy inwards. Endopodite shorter than exopodite; first segment as long as first exopodite segment, slightly outcurved; second segment shorter than first, furnished with two inner setae, distal one of which bears some fine spinules; last one almost as long as preceding segment, gradually tapering distally; a pair of terminal setae plumose, but with some spinules on each outer side. *Leg 3* (Fig. 19–5). Coxa somewhat reduced in width rather than that in preceding leg. Outer seta of basis entirely bare. Exopodite as in figure. First endopodite segment not so longer than succeeding segment, sharply pointed at outer distal corner; last endopodite segment about 1.5 times as long as middle one; no spinule detected in all setae. *Leg 4* (Fig. 20–1) . Coxa as wide as basis. Of basis outer seta short. Distal end of last endopodite segment not reaching to middle of last exopodite segment; first two endopodite segments subequal in length, and last one somewhat elongated; a few spinules occurring on posterior side of first segment; of inner setae of last segment distal one with several spinules on its distal third. *Leg 5* (Fig. 20–2). Chitinous ridges of both segments very thin. Baseoendopodite about 1.3 times as wide as long; inner margin not so inclined, rather straight; distal end of inner expansion scarcely extending beyond middle of exopodite segment; in four setae on inner expansion, inner two rather spiniform and serrate (finely spinulose ?), and other two with roughly arranged spinules; outer distal corner with several well developed spinules; an outer seta bare and arising from a small protuberance;

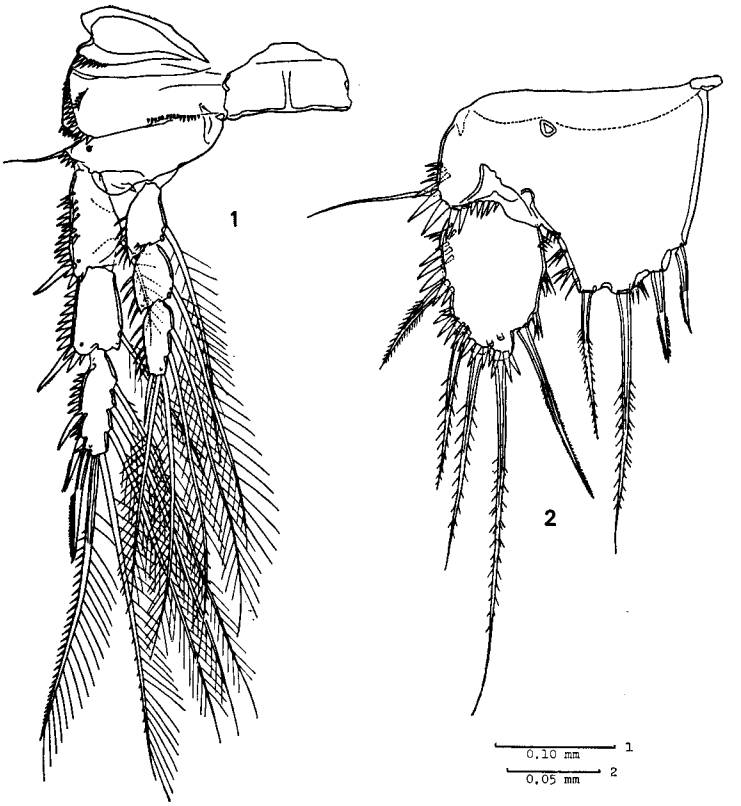

Fig. 20. *Harpacticus septentrionalis yamadai* n. subsp. Female (Holotype). 1. leg 4; 2. leg 5.

near outer base of inner expansion, distal edge forming itself a hyaline protuberance which covers a basal portion of exopodite segment. Exopodite a little shorter than twice as long as greatest width, rather angular in outline, of which inner margin is very clearly interrupted by a setigerous ledge, with five setae in all; terminal seta longest, about twice as long as exopodite segment, with roughly arranged spinules; inner seta finely spinulose bilaterally, arising from a ledge at subdistal portion; interspace between first two outer setae fairly wider than that between second and third ones, counting distally; some stout spinules on and near outer edge and three groups of a few spinules fringing inner edge.

Male. Body (Figs. 21–1, 2) fairly depressed dorsoventrally, about 1.15 mm long, semitransparent. Cephalothorax laterally fringed with a well developed hyaline frill together with some elongate hairs. Fourth thoracic somite (Fig. 21–3) ornamented as in female. First abdominal somite with an oblique spinular row laterally and a transverse row of some spinules near leg 6. Second and third

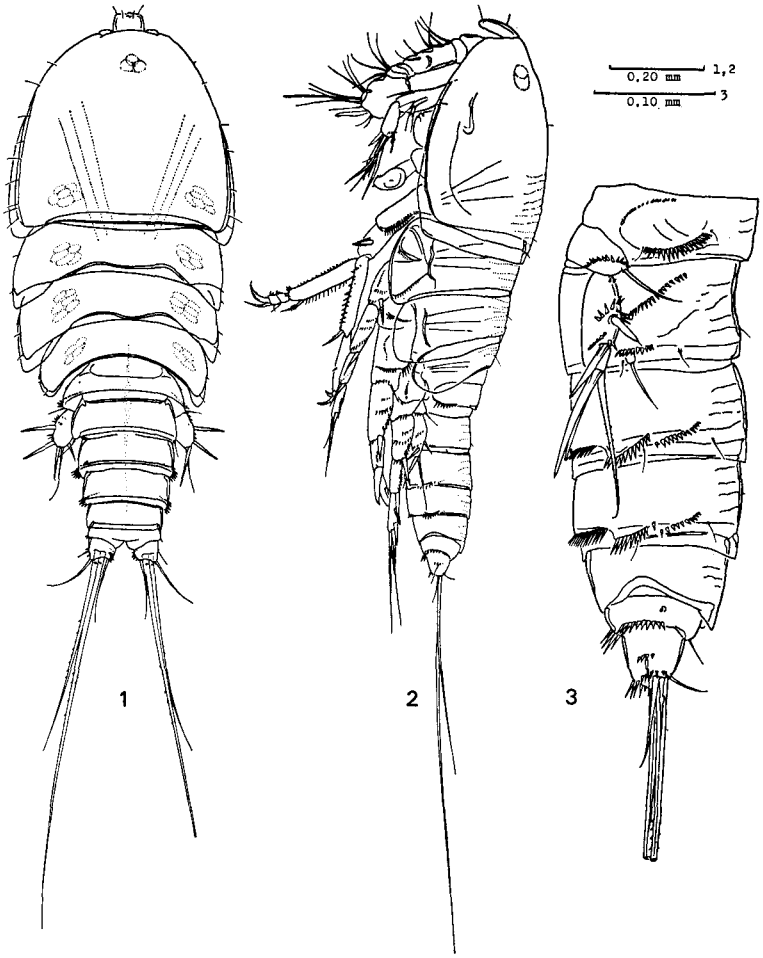

Fig. 21. *Harpacticus septentrionalis yamadai* n. subsp. Male (Allotype). 1. body, dorsal; 2. ditto, lateral; 3. leg 5 and abdomen, lateral.

abdominal somites each ornamented with a transverse row of a number of stout spinules on ventral side along posterior edge and two oblique rows of some spinules laterally. Penultimate somite unornamented. Of anal somite ventroposterior edge densely with spinules. Furcal ramus as in female. Spermatophore as shown in figure (Figs. 22–1, 2). *Antennule* (Fig. 22–3). First segment with some spinular rows on anterior side; second one very short and without particular ornamentation; third one very much setigerous, about as long as proximal two combined; swollen segment furnished with a long aesthetasc, forming itself a small, rather triangular protuberance on distal portion; pre-apical segment

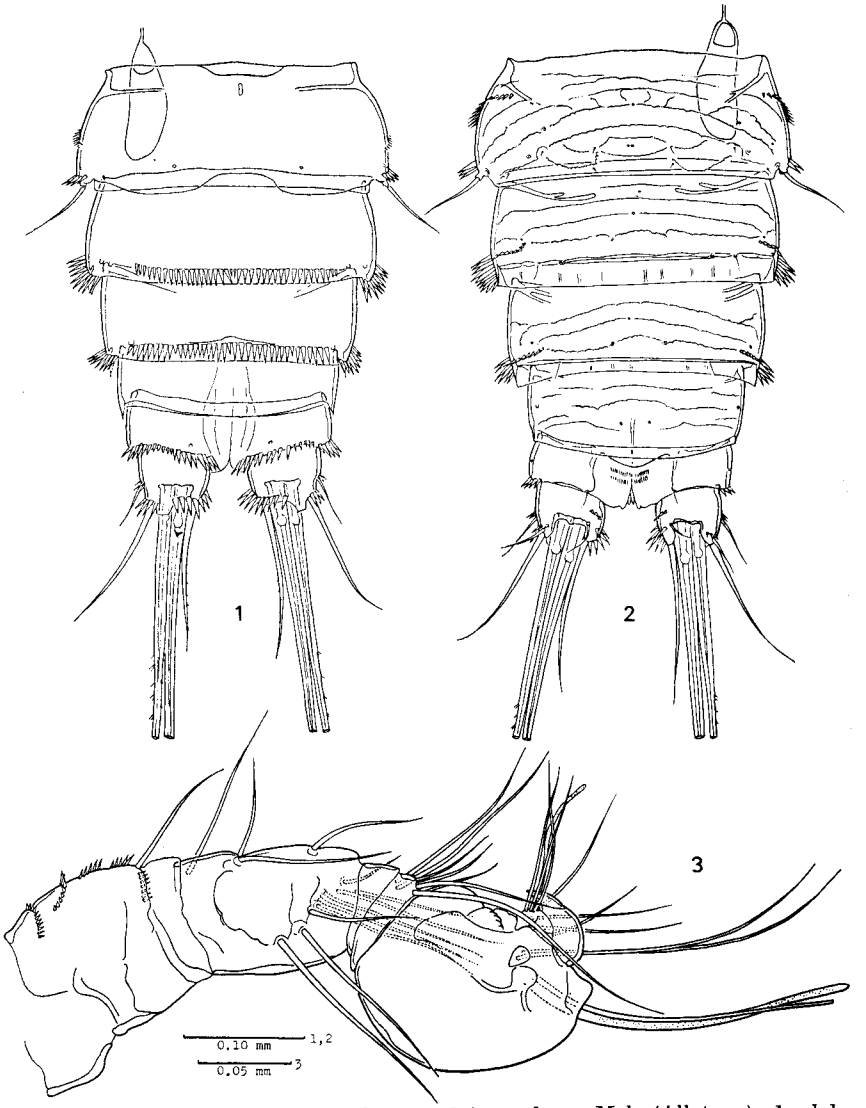

Fig. 22. *Harpacticus septentrionalis yamadai* n. subsp. Male (Allotype). 1. abdomen, ventral; 2. ditto, dorsal; 3. antennule.

spurshaped; apical one small, with a very narrow aesthetasc together with a few setae. *Antenna* (Fig. 24–3). Principal structure as in female, but fairly slenderized. Of allobasis, spinules very fine and anterior seta fairly elongated. *Mandible*, *maxillula* and *maxilla* as in female. *Maxillipede* fairly slenderized and elongated

rather than in female.

Leg 1 as in female. *Leg 2* (Fig. 23–1). Coxa almost as wide as basis, without any spinule on inner portion of distal border. Exopodite not so different from that in female. First endopodite segment longer than first exopodite segment, more than twice as long as greatest width. Of middle endopodite segment tip of mucroniform process not extending beyond distal end of last exopodite segment. Third endopodite segment furnished with one outer spine, which is somewhat reduced in size, at subdistal corner; in two terminal setae, inner one fairly dwarfed and finely hairy, outer one plumose but with some spinules along its outer side; two inner setae bearing some spinules together with usual hairs. *Leg 3* (Fig. 23–2). Coxa lacking in a spinular row on inner portion of distal border. Exopodite transformed as in other congeneric species; first segment about 1.5 times as long as greatest width; last segment rather oval in outline, not so sclerotized; all outer

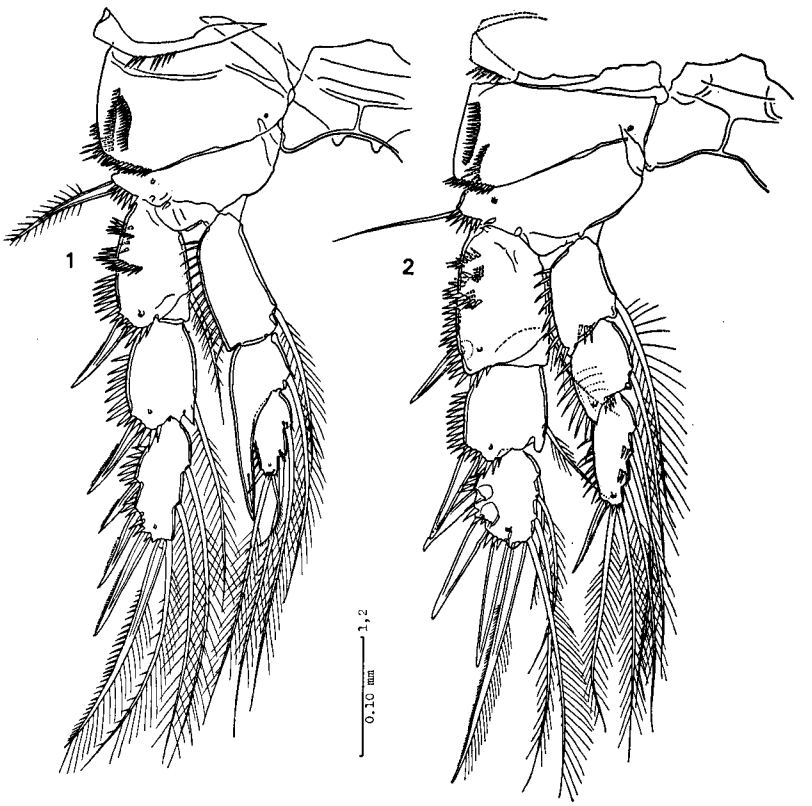

Fig. 23. *Harpacticus septentrionalis yamadai* n. subsp. Male (Allotype). 1. leg 2; 2. leg 3.

spines of three segments entirely bare. Endopodite somewhat thickened; first two segments with three spinules on each posterior side near distal end; of last segment distal two setae accompanied with a few spinules on posteror side of segments near each setal base. *Leg 4* (Fig. 24–1). Coxa and basis nearly as in female. Exopodite somewhat transformed; all outer spines delicately spinulose; of last segment posterior side bearing three rows of a few spinules near each base of distal three inner setae. First two endopodite segments with five and four spinules on each posterior side near distal end; a few spinules occurring on posterior side of last segment. *Leg 5* (Fig. 24–2). A pair of baseoendopodite segments represented by a wide common plate with a bare outer seta accompanied with many spinules on each lateral extremity. Exopodite approximately twice as long as greatest width, narrowed proximally, furnished with one inner spine, one

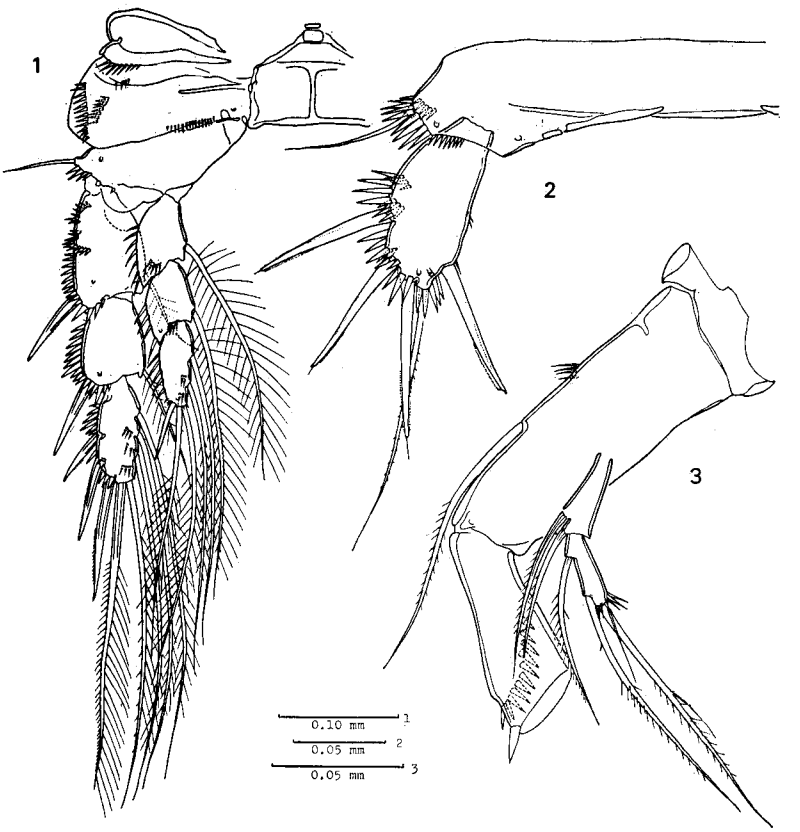

Fig. 24. *Harpacticus septentrionalis yamadai* n. subsp. Male (Allotype). 1. leg 4; 2. leg 5; 3. antenna.

terminal seta and three outer spines; all spines very delicately serrated bilaterally, and outer ones terminating in a delicate hair; terminal seta about 1.5 times as long as exopodite segment, with some fine spinules bilaterally. *Leg 6* (Fig. 22–1) represented by a bare seta arising from a small protuberance.

Valiability. Body length of each a paratypic female and a paratypic male measured 1.03 mm and 1.10 mm respectively. No particular difference was found among them and the holotypic and allotypic specimens. The outer spine of last endopodite segment of leg 2 was exactly detected also in the paratypic male.

Remarks. Before entering into the subject, clarification of certain synonymy as well as homonym among some species would be necessary, because the taxonomy within the genus is still complicated.

Harpacticus chelifer (O. F. Müller) var. *arcticus* Poppe, 1884 is cited as a name *H. arcticus* Poppe, since the specific situation of this variety from the North Pacific Ocean and the Behring Sea was already pointed out by Klie (1941, p. 17), and I myself agree with him. *Harpacticus chelifer* var. *arcticus* T. Scott, 1898 from Franz-Josef Land is a homonym of the variety described above, and was already re-named as *H. chelifer* var. *Scotti* by Mrázek (1902). This variety is cited as a name *H. scotti* Mrázek, because particular relation between the variety and *H. chelifer* can be hardly recognized. As being supposable in the above note, I do not regard both the varieties sensu Poppe and T. Scott as the synonym of *H. uniremis* Kröyer, 1842, though they have been treated as the latter species (Sars, 1904; Lang, 1948; Vervoort, 1965).

The most important character to deside the taxonomic situation of the present material from Hokkaido is the presence of two inner setae on the middle endopodite segment of leg 2 in the female. This character is exactly recognizable also in other five species within the genus, namely *H. uniremis* (An abnormal case was reported by Tschislenko, 1971, in his subspecies *H. uniremis japonicus.*), *H. arcticus*, *H. superflexus* Willey, 1920, *H. septentrionalis* Klie, 1939 and *H. compressus* Frost, 1969. While *H. flexus* Brady & Robertson, 1873 was regarded as a species with two corresponding setae by Frost (1969, p. 139), the species had been already exlcuded from those with two setae by Lang (1965, p. 107) together with *H. tenellus* Sars, 1920. As pointed out by Lang (op. cit., p. 108), *H. flexus* is easily discernible from the other species bearing the two setae in question in the peculiar shape of its maxillipede.

Among these four species, *H. uniremis*, *H. arcticus*, *H. septentrionalis* and *H. compressus*, the first one is distinguishable from the others in the possession of smooth outer spines on the exopodite segments of leg 2, leg 3 and leg 4, and, further, the presence of a spinular row (precisely saying, two close rows; see Itô, 1971) on the anterior side of baseoendopodite segment of leg 5 in the female (see Lang, loc. cit.). I re-confirmed the spinal structure of *H. uniremis* from Hokkaido, of which the outer spines were remarkably distinct from those described as the name *H. septentrionalis yamadai* (see Fig. 19–4). Therefore, the presence of an

abnormal case found in *H. uniremis*, i.e., entire lack of the spinular row of the baseoendopodite of leg 5 (Klie, 1972, p. 6), is scarcely of significance as a reason for regarding *H. arcticus* as being identical with *H. uniremis*.

On the other hand, the shape of the exopodite segment of leg 5 in the female seems to be fairly distinct between *H. arcticus* and *H. septentrionalis*. The segment in question is of an elongate oval outline in the former species, but is rather angular and not so elongated in the latter. While this difference between them has so far been ignored, I like to emphasize its particular importance as a taxonomic character. Because another example of such the elongate oval outline is now known in *H. compressus*, and further, another undescribed specimens from Hokkaido, which are very robust (more than 1.5 mm long in females) and will be reported in the near future, are also nearly identical with *H. arcticus* in this respect. The shape of the segment in question in the present material fairly approaches to that of *H. septentrionalis*. The present material, however, is discernible from the latter in two characteristics as follows; smaller body size (1.45 mm in ♀ and 1.3 mm in ♂ in the Klie's specimens) and wider interspace between first two outer setae of exopodite of leg 5 in the female. From these characteristics, I regard them as a new subspecies of *H. septentrionalis*.

The taxonomic situation of *H. scotti* is still uncertain, though the species is clearly discernible from not only *H. chelifer*, but also *H. arcticus* and *H. uniremis*. In the shape of the exopodite of leg 5 in the female, *H. scotti* approaches to *H. septentrionalis*, but to discern the species originally described by T. Scott from *H. septentrionalis* is very difficult, because of the entire lack in most important characters such as the ornamentation of the middle endopodite segment of leg 2, outer spines of the exopodites in leg 2, leg 3 and leg 4, and so on. It is still an open question.

Beside the taxonomic situation of the present new subspecies, some morphological characteristics are discussed for further precise study of the genus. In the antennule of the female, the sixth segment is fairly elongate rather than the fifth one in *H. uniremis* (see Fig. 17–4) and *H. compressus*, but is not so elongate in *H. septentrionalis yamadai* and *H. arcticus*. As can be seen in the Poppe's figure (Poppe, 1884, Taf. XXIV), the mandibular coxa-basis in *H. arcticus* is clearly protruded and forms itself a distinct lobule at the dorsodistal corner. Such characteristic is well recognzied in *H. septentrionalis yamadai*, but is scarcely detected in *H. uniremis* (see Itô, 1971). The antennal allobasis, especially in female, is furnished with a few spinules in *H. septentrionalis yamadai* as well as *H. arcticus*, though the corresponding segment has no any spinule in *H. uniremis* (checked by me) and *H. compressus* as far as can be seen in the figure by Frost (1969). The pectinate appearance in the claws of the last segment of both rami in the leg 1 is more developed in *H. septentrionalis yamadai* rather than in *H. uniremis*.

Specimens examined. Holotype; female. Allotype; male. Paratypes; a female and a male. All the specimens were collected from Muroran by rinsing a few leaves of a brown alga *Neodilsea yendoana* Tokida (28–IV–1975, Sh. Hiruta leg.). The subspecies

name was selected in honor of Professor Mayumi Yamada of Hokkaido University.

Scutellidium arthuri Poppe

(Figs. 25–36)

Scutellidium Arthuri Poppe, 1884, p. 291, pl. XXI figs. 1–4, pl. XXII figs. 1–12. *Scutellidium arthuri*: Claus, 1889, p. 26, pl. IX, figs. 15–17 (not seen, after Lang, 1948); Monk, 1941, p. 95, pl. II figs. 15–19; Lang, 1948, p. 392, fig, 171; Lang, 1965, p. 156, figs. 84–87. *Scutellidium arthuri* var. *magnum* Monk, 1941, p. 96. *Psamathe arthuri*: Sars, 1909, p. 20, pl. II figs. 7–11. *Machairopus arthuri*: Lang, 1936, p. 36; Jespersen, 1940, p. 77 (not seen, after Lang, 1948).

Before entering into the ordinary description, the color variation, which seems to clearly characterize most of the species within the genus, will be described. The capital letter(s) in the following description represents the abbreviated name tentatively given to each 'form' in order to distinguish among different types of

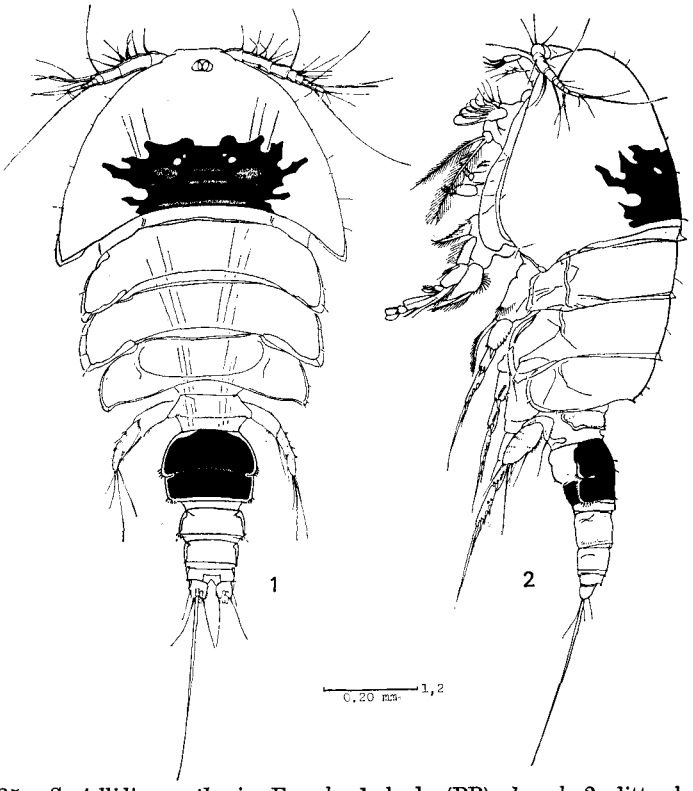

Fig. 25. *Scutellidium arthuri*. Female. 1. body (PP), dorsal; 2. ditto, lateral.

color variation as well as colored patterns for convenience sake. Therefore these 'forms' here mentioned does not specify any particular taxonomic level of the individuals.

Female. Four different forms of coloration were recognized. From-PP (purple patch: Figs. 25–1, 2); a deep purple patch, which laterally branches in a complicate way as shown in the figures, occurring on dorsal side of cephalothorax; genital double-somite tinctured with deep purple on whole dorsal side and both ventrolateral areas of posterior subdivision; otherwise colorless and semitransparent.

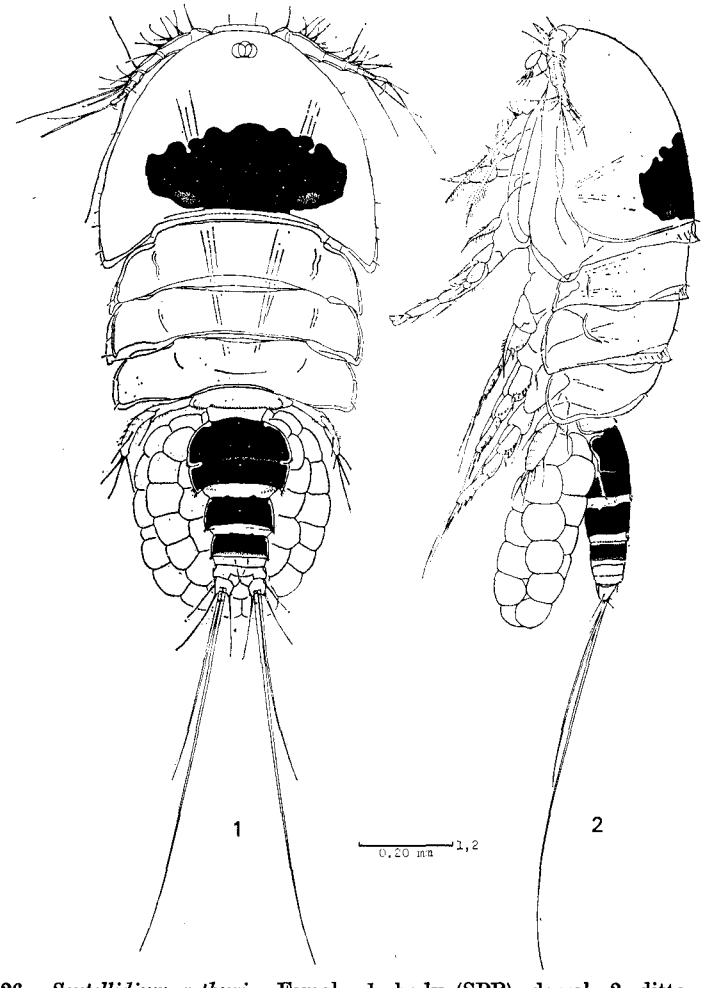

Fig. 26. *Scutellidium arthuri.* Female. 1. body (SPP), dorsal; 2. ditto, lateral.

Form-SP (sinuate patch: Figs. 26–1, 2); a deep purple patch, of which anterior edge is clearly sinuate, occurring on dorsal side of cephalothorax; genital double-somite excluding genital area and succeeding two abdominal somites tinctured with deep purple; otherwise colorless and semitransparent. Form-BP (brownish purple: Figs. 27–1, 2); pleurotergites of four thoracic somites, abdominal somites and five pairs of thoracic legs tinctured with brownish purple or dark reddish purple; coloration of thoracic legs paled posteriorly; otherwise nearly transparent, but somewhat tinctured with light brown or yellowish brown. Form-NP (no patch: Figs. 28–1, 2); body nearly colorless and semitransparent in most cases, but more or less tinctured with pale brown (coloration of abdomen somewhat clearly detectable rather than other body parts); first two or three thoracic legs purplish especially in proximal portion.

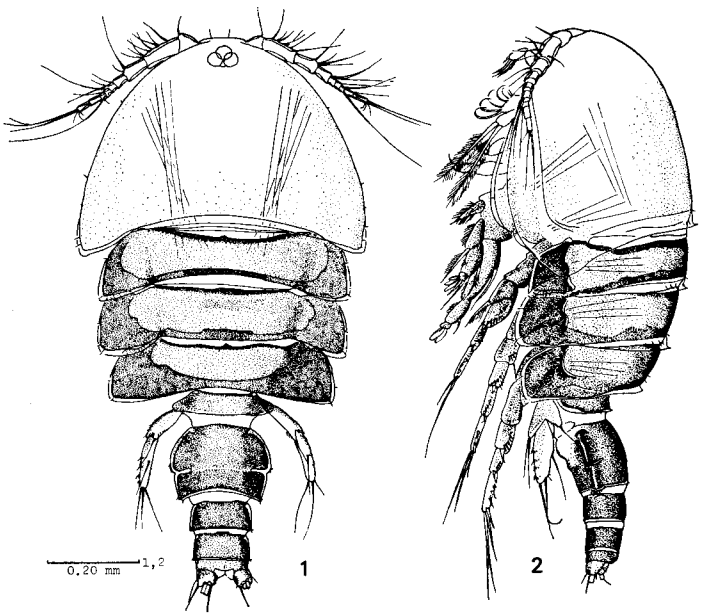

Fig. 27. *Scutellidium arthuri*. Female. 1. body (BP), dorsal; 2. ditto, lateral.

The following description together with corresponding figures was based upon an alcoholic specimen, so its coloration was entirely unknown. Body about 1.03 mm long, depressed dorsoventrally. Rostrum (Fig. 30–1) much wider than long, scarcely visible in dorsal aspect, very delicately ciliated along anterior edge, with a pair of fine sensory hairs arising frontal surface. Cephalothorax somewhat wider than long and longer than succeeding three thoracic somites combined; a well developed hyaline frill hanging from ventral side. In cephalothorax

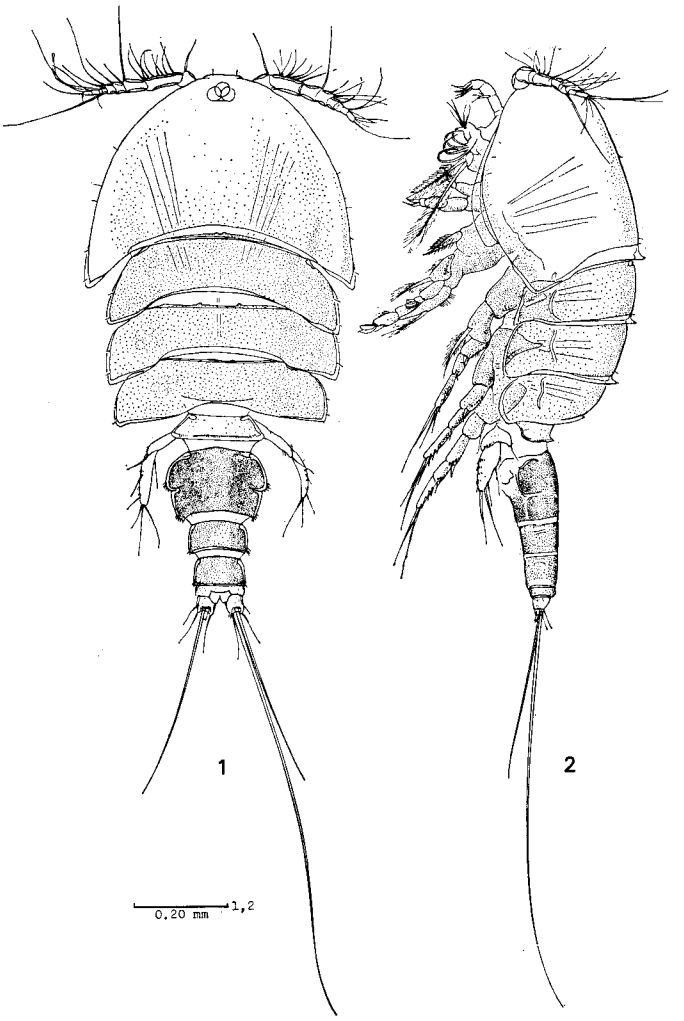

Fig. 28. *Scutellidium arthuri.* Female. 1. body (B), dorsal; 2. ditto, lateral.

and first two thoracic somites, each hyaline membrane along dorsoposterior end moderately rising. First three thoracic somites approximately as wide as cephalothorax, bearing a few hairs laterally. Of third thoracic somite posterior end of pleurotergite not so concaved. Fourth thoracic somite ornamented with a number of fine spinules on dorsal side along posterior edge. Abdomen (Figs. 29-1, 2) tapering behind, about twice as wide as high. Genital double-somite subdivided by a chitinous suture laterally, with a sclerotized hill, which has a laterally directed hairy setula and two posteriorly directed bare setulae, representing

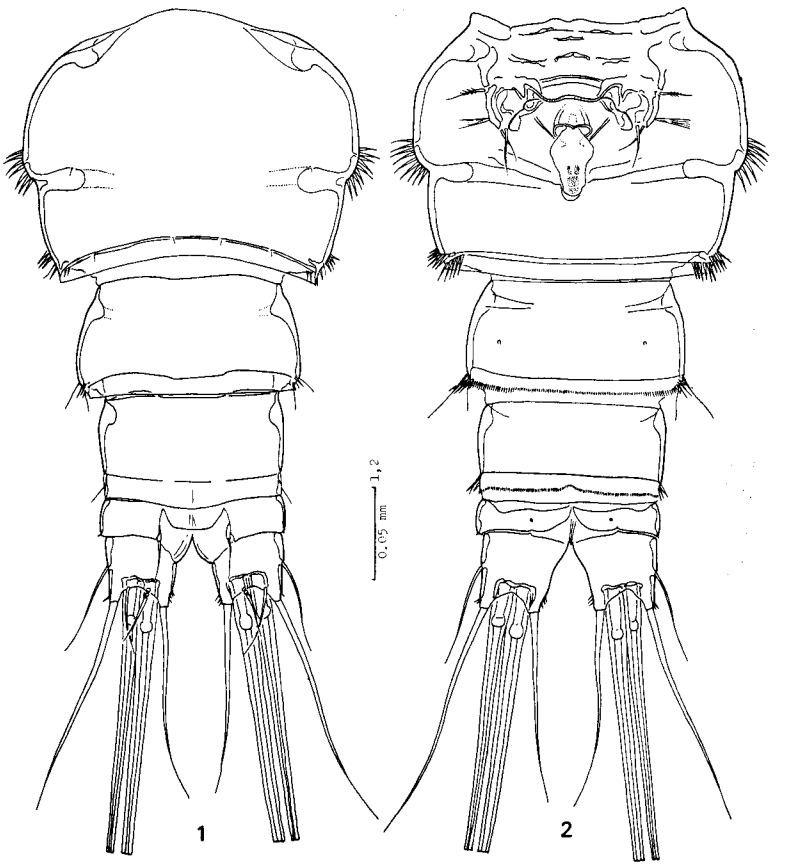

Fig. 29. *Scutellidium arthuri*. Female. 1. abdomen, dorsal; 2. ditto, ventral.

each rudimental leg 6; anterior and posterior subdivisions each with some spinules on lateral side; posterior extremity of ventral side without any spinule. Antepenultimate somite somewhat tapering anteriorly in dorsal aspect, with a few spinules and fine hairs on posterolateral end, and fringed with a great number of delicate spinules (serration of hyaline edge ?) on hind edge of ventral half. Ventral hind edge of penultimate somite ornamented as in preceding somite. Anal somite quite short, dorsally furnished with a cylindrical process, which terminates in a bare setula, on both sides of anal operculum. Furcal ramus a little shorter than wide, furnished with a narrow seta on a midway of lateral side, a basally geniculate seta and a simple seta on dorsal side of hind edge; a well developed seta arising from a small protuberance on both lateral sides of principal terminal setae; a few fine spinules occurring on lateral side near posterior end. *Antennule* (Fig. 30–2) nine-segmented; first segment with a longitudinal row of some spinules

Fig. 30. *Scutellidium arthuri*. Female. 1. rostrum; 2. antennule; 3. antenna; 4. mandible; 5. maxillula; 6. maxilla; 7. maxillipede.

on anterior side and a basally geniculate bare seta; second one almost twice as long as its diameter, much setigerous at anterior side; a rather narrow aesthetasc arising from a cylindrical protuberance of fourth segment; apical five segments

combined as long as second one; most setae basally geniculate at one or two portions, and no hairy seta detected. *Antenna* (Fig. 30–3). Coxa very short and unornamented. Basis about 1.4 times as long as thick, with some spinules on anterior side of distal half and one spinulose seta arising from anterodistal end. Exopodite four-segmented; first segment longest, with two finely spinulose setae each situated distally and subdistally; second one short and bearing a very delicate setula; third one as long as preceding one, with one well developed seta; last one almost as long as preceding two combined, terminating in two spinulose setae and one bare setula, and with some hair-like spinules near tip. First endopodite segment fairly shorter and narrower than basis, furnished with a narrow setula at a point three-fourths the length of anterior side. Second endopodite segment longer than preceding one, furnished with one spinulose small spine at middle of anterior side, one pectinate spine and one simple spine on three-fourths the length, and four elongate spines, all geniculate midst, one bifurcate seta and one narrow seta on distal end; a short row of a few spinules on subproximal edge; a group of a few close spinules on a midway of posterior side. *Mandible* (Fig. 30–4). Praecoxa ornamented with two arched rows of some delicate spinules. Coxa-basis forming itself a well protruded lobule at outer distal corner; inner dorsal edge fringed with a number of short spinules and long hairs; inner end furnished with two extremely thick setae, of which dorsal one bears great numbers of hairs at its full length and ventral one is hairy at distal half. Both rami one-segmented and subequal in length. Endopodite furnished with one hairy thick seta, which is not defined at base and accompanied with two simple setae, on a subproximal ledge of inner side; six setae situated on and near distal end; a group of a few fine spinules arising from a midway near outer edge. Exopodite wider than endopodite, with four hairy setae, in which proximalmost one is fairly narrowed, along inner margin and two plumose terminal setae which are thick and elongate; at least three transverse rows of some fine spinules on its outer half. *Maxillula* (Fig. 30–5). Arthrite of praecoxa tapering inwards, with five (?) rather straight claws, one spinulose spine and one spinulose seta along inner or dorsal edge; two parallel setae arising from anterior side near ventral edge; a row of many elongate, but very narrow spinules on posterior side. Coxa not so protruded inwards, with three more or less spinulose setae in all. Basis terminating in three thick setae and with one rather shorter seta, which is not defined at base, on ventral side. Endopodite represented by a small segment directing inwards, with three hairy setae terminally and fringed with some delicate hairs ventrally. Exopodite segment well developed, with a hair-tuft near ventral edge, of which most length is densely fringed with many long hairs, and some spinules on anterior side near dorsodistal corner; two terminal setae extremely elongate, more than 150 μ long, and beautifully plumose. *Maxilla* (Fig. 30–6). Praecoxa furnished with two thick inner setae which remarkably diverge from each other and sparsely hairy. Coxa elongate, more than 1.5 times as long as greatest width, gradually tapering distally, with a single endite which situates near distal end and terminates in two setulae; two oblique spinular rows occurring at

outer distal corner. Basis forming itself a strong claw, with a spiniform seta which is pectinate along its distal half. *Maxillipede* (Fig. 30–7). Proximal segment tapering distally, terminating in a thick seta which bears a considerable number of delicate soft hairs; a group of some fine spinules, which are closely connected with each other, situating near base of terminal seta; some hairs arranged in a vertical row on a midway of outer edge. First endopodite segment arising from outer distal corner of coxa, with two rows of fine spinules, each situating near outer edge of basal protruded corner and near distal end. Second endopodite segment represented by a small segment furnished with one strong claw and two midst geniculate spines terminally, one seta, which bears some soft hairs and arises from outer distal edge, and two close short setae on inner edge.

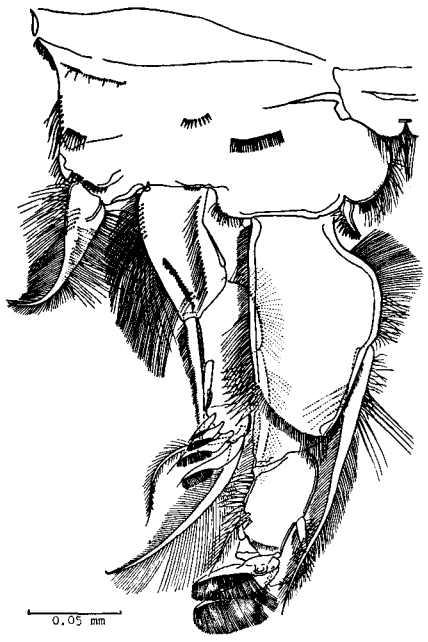

Fig. 31. *Scutellidium arthuri.* Female. Leg 1.

Leg 1 (Fig. 31). Free end of intercoxal plate clearly bilobated and fringed with some extremely elongate hairs together with many usual hairs. Coxa and basis not so clearly demarcated from each other, both segments combined almost twice as wide as long. Coxa furnished with some short hairs along outer margin of proximal half, some rather spatulate hairs on posterior side near outer margin of distal half; anterior side with a long spinular row of different lengths on outer proximal area, a short row of a few spinules near outer distal corner and a somewhat arched row of several spaced spinules on middle near distal border. Of basis outer corner somewhat sclerotized, clearly separated from inner part by a flat depression, where exopodite arises, and terminating in an extremely thickened seta which is almost as long as first exopodite segment and furnished with a number of hairs laterally and posteriorly; inner half of distal end, where endopodite arises, entirely flattened distally, with some fine spinules on and near outer corner; inner edge well protruded and forming itself a rounded lobe marked from exopodite-bearing distal end by a shallow notch, and fringed with some hairs and a few spinules; an outer spine arising from a notch described above, short and spinulose along outer side. Both rami three-segmented. Three exopodite segments combined as long as first endopodite segment, but its distal end not reaching to distal border of first endopodite segment, because it arising from a lower part

rather than endopodite. First exopodite segment approximately twice as long as wide, moderately outcurved, with one elongate and finely spinulose outer seta, of which apical end extends beyond third segment; a longitudinal row of a number of spinules (19 in the illustrated leg) on anterior side just inside outer margin of distal half; inner margin fringed with great numbers of long hairs along its whole length; an oblique row of some outwards directed hairs which arise from proximal inner corner and extends to distal end near base of outer seta. Second exopodite segment nearly as long as preceding one, furnished with one spine, which is fimbriate at distal half of inner side, arising from just middle of outer edge; proximal half of inner edge not so protruded, but moderately rounded and fringed with some soft hairs; an inner seta situating at same level as outer spine, well developed and plumose. Last exopodite segment small, with four spines all fimbriate at each distal half of ventral (inner) side, one thick and plumose seta terminally and one hairy, rather narrow seta arising from posterior side near inner edge. First endopodite segment almost as long as its greatest width situating at a level of proximal third the length, where this segment gradually tapers distally; inner edge almost straight, bearing many short hairs along proximal third and these hairs replaced by longer hairs at succeeding edge; some (about ten) spatulate cirri occurring at subdistal outer edge; a row of many ventrally directed hairs on anterior side, arising from outer edge at a point two-thirds the length and reaching inner distal corner; inner edge fringed with many soft and long hairs along its proximal half and some short hairs along distal half; an inner seta situating midst, finely plumose and with some long and rather rigid hairs on both sides of subproximal part. Second endopodite segment about half as long as preceding one, with some spatulate cirri along outer margin, a few spinules (or cirri) on anterior side near outer edge, a transverse row of some short hairs on anterior side near distal end; an inner seta situating almost midst, rather short and plumose. Last endopodite segment very small, with two well fimbriate spines terminally and a pair of hairy setula on posterior side. *Leg 2* (Fig. 32) remarkably differing from succeeding two legs in total appearance, because of transformation in both rami. Coxa with a short row of some fine hairs, which runs from posterior side near subproximal outer edge and extends along outer margin; distal half of outer edge densely fringed with many hairs. Basis forming itself a blunt protuberance on its distal end between both rami; an inner seta strong, about as long as first two exopodite segments combined, hairy along both sides; some soft hairs on inner edge, and some spinules occurring at base of exopodite. Both rami three-segmented. First exopodite segment extremely narrowed basally, with some spinules and a few spatulate cirri along outer edge; an outer spine thick and bare, accompanied with some spinules around its base; an inner seta rather short, densely plumose. Second exopodite segment as long as preceding one; outer edge without any spinule, but fringed with many long hairs; an outer spine fairly dwarfed, accompanied with a few spinules around base; an inner seta rather narrow and pulmose. Last exopodite segment longer than preceding one, densely bearing

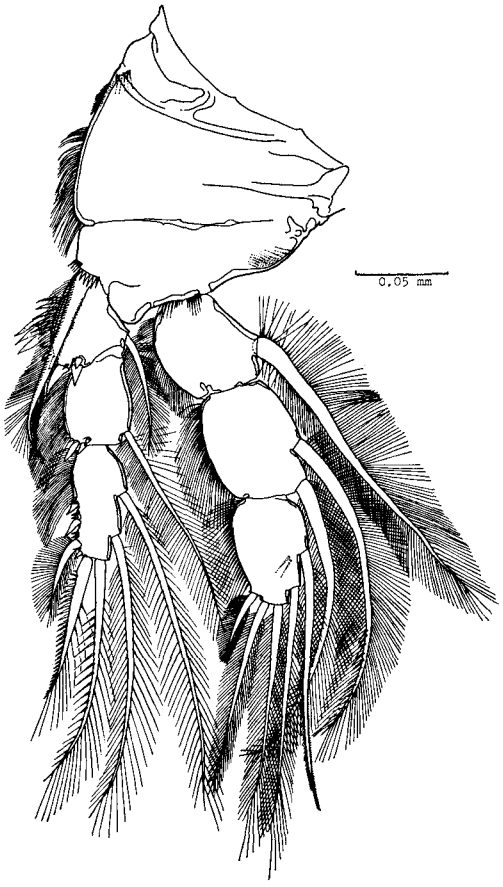

Fig. 32. *Scutellidium arthuri.* Female. Leg 2.

many long hairs along proximal half of outer edge; first outer spine situating midst, dwarfed and bare; second outer spine somewhat longer than previous one, bare; third outer spine rather setiform, with many fine spinules which are bilaterally arranged in a feathered appearance; a few minor spinules occurring at each base of outer spines; an outer distal spine somewhat shorter than 1.5 times as long as last exopodite segment, with many spinules (more than 20) on outer side and hairy along inner side; an inner distal seta spinulose outwards and hairy inwards; two inner setae plumose. Three endopodite segments subequal in length, extremely swollen, densely fringed with many long hairs along whole length of each outer edge; of first segment an inner seta arising from subdistal edge, plumose; of second segment a pair of inner setae which are plumose, and with some spinules on distal third; last segment with one outer seta arising from a subdistal ledge, two

plumose terminal setae, and two inner setae; first inner seta rather rigid and with a number of delicate spinules along distal half of its inner side, otherwise hairy; a pair of narrow spinules on posterior side of last segment, near base of first inner seta. *Leg 3* (Fig. 33). Distal border of coxa fairly inclined. Coxa furnished with some spinules on distal half of outer edge, without any hair. Basis with a bare narrow outer seta and arising from posterior side, a number of hairs along inner edge and some spinules along base of endopodite. Both rami subequal in length. First exopodite segment ornamented with a few cirri on posterior side near middle outer edge, several long hairs arising from posterior side near base of outer spine; second and third segment without any hair; outer edge of each exopodite segment fringed with some stout spinules; outer spines almost bare, but distalmost one finely spinulose; third segment approximately 1.5 times as long as second one; each segment with one, one and three inner setae respectively,

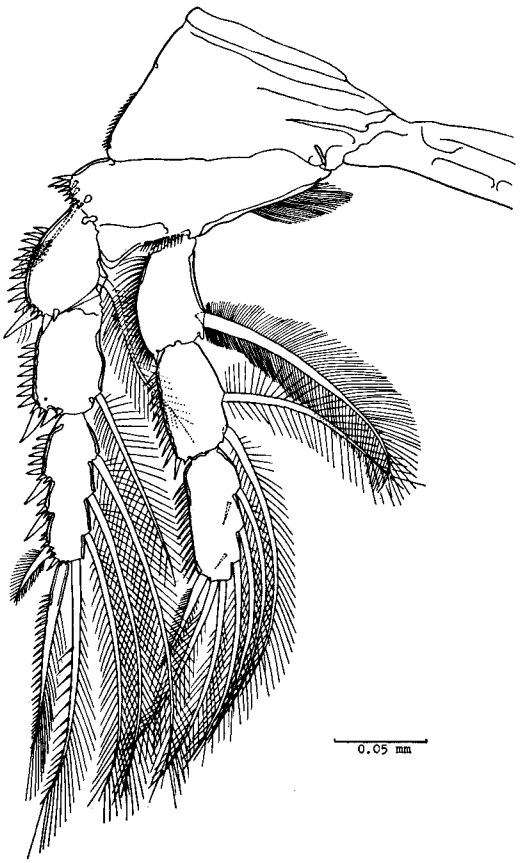

Fig. 33. *Scutellidium arthuri*. Female. Leg 3.

counting distally. Three endopodite segments subequal in length; outer edge of each segment fringed with some spinules, in which those of first segment are rather flexible, but of others are rigid; of first segment an inner seta densely plumose; second and third segments each with two and three inner setae all sparsely plumose; last segment scarcely tapering distally, with two spinules on posterior side, terminating in two plumose setae and with one spiniform outer seta which is somewhat spinulose. *Leg 4* (Fig. 34–1). Distal border of coxa extremely inclined. Coxa with a vertical row of some spinules on ventral side and two groups of a few spinules near outer edge. Basis without any hair at inner edge, furnished with some spinules on posterior side; an outer seta bare and arising from posterior side of

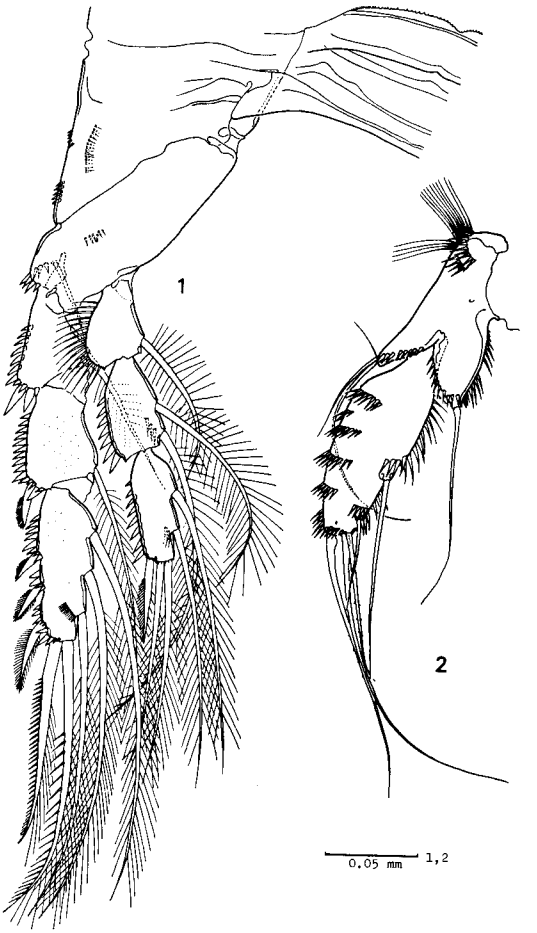

Fig. 34. *Scutellidium arthuri*. Female. 1. leg 4; 2. leg 5.

a short distance inside outer extremity. Of exopodite, first segment without any hair, but succeeding two segments furnished with some hairs on each posterior side; outer spine of first segment bare, those of other two segments more or less spinulose; a comb-shaped row of spinules on anterior side near third inner seta of last segment; setal armature almost as in leg 3. Endopodite smaller than exopodite; three segments distally lengthened; first segment with some flexible spinules, other two segments with some rigid spinules on each outer edge; of first segment an inner seta sparsely plumose; three spinules on posterior side near inner distal corner of middle segment; two inner setae occurring on last segment, of which posterior side bears three spinules near second inner seta. *Leg 5* (Fig. 34–2). Baseoendopodite clearly bilobate distally, with two transverse rows of some narrow spinules on anterior side near outer proximal edge bearing some elongate hairs; inner expansion represented by a remarkably protruded lobe terminating in three bare setae; both outer and distal edges spinulose. Exopodite elongate oval in

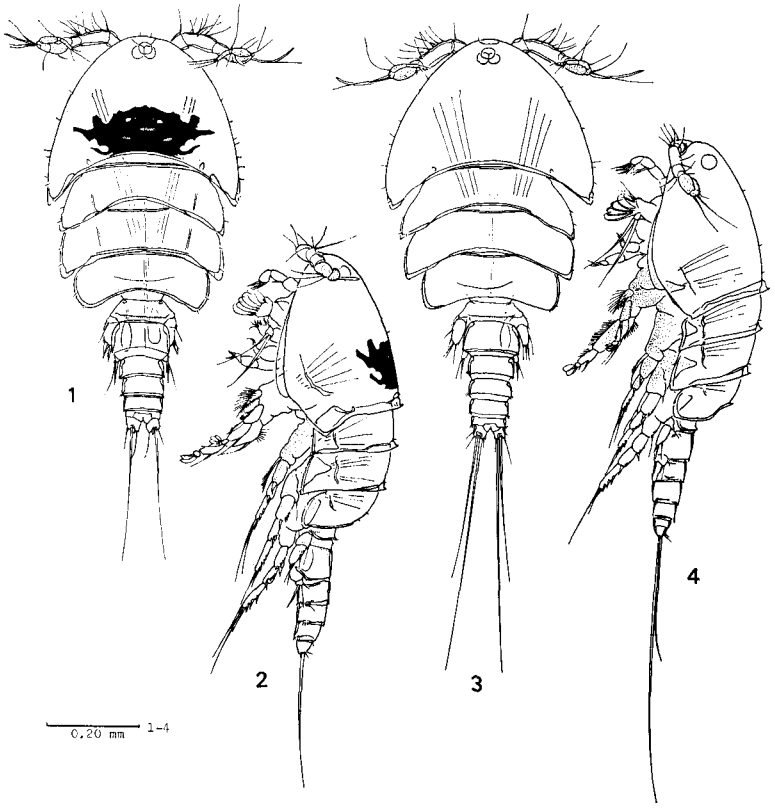

Fig. 35. *Scutellidium arthuri.* Male. 1. body (PP), dorsal; 2. ditto, lateral; 3. body (NP), dorsal; 4. ditto, lateral.

outline, with five setae in all at distal third the length of outer edge and distal end; inner half of anterior side bearing five spinular rows; a distal short length of outer edge spinulose.

Male. Two different forms of the coloration were recognized. Form-PP (purple patch: Figs. 35–1, 2); dorsal side of cephalothoracic somite bearing a deep purple patch which is laterally stretched as in female of Form-PP; several apical segments of antennule and basal part of thoracic legs indistinctly tinctured with reddish purple, otherwise colorless and semitransparent. Form-NP (no patch: Figs. 35–3, 4) with no patch on cephalothorax, otherwise as in previous.

The following description together with the corresponding figures is based upon a alcoholic specimen, of which coloration is entirely unknown. Body 0.75 mm long. Hyaline membrane on each dorsal end of first three somites moderately rising. Abdominal somites from second to third (Fig. 36–3) each furnished with

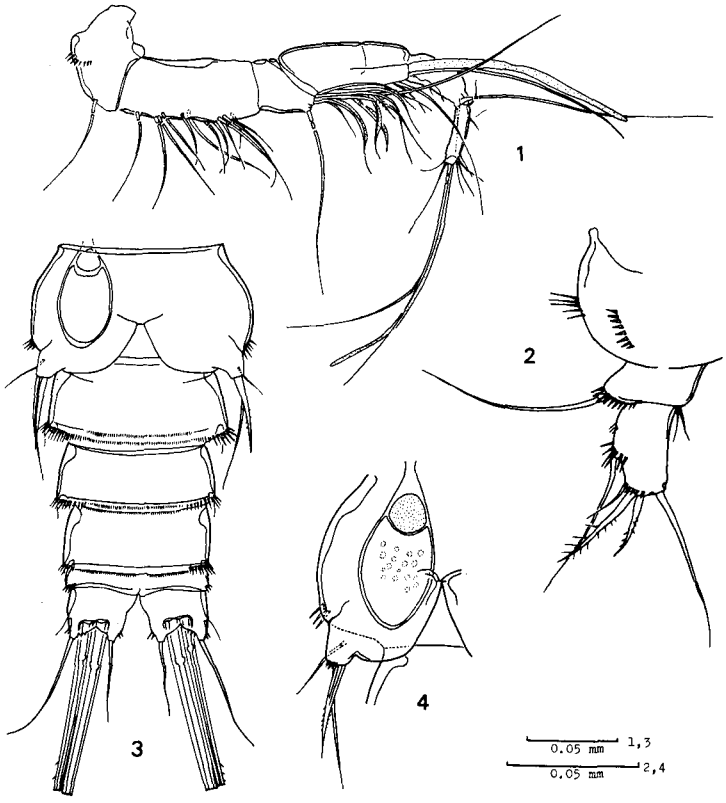

Fig. 36. *Scutellidium arthuri.* Male. 1. antennule; 2. leg 5; 3. leg 6 and abdomen, ventral; 4. leg 6.

some spinules laterally and one or two rows of many delicate spinules on and near hind edge of ventral side. *Antennule* (Fig. 36–1) haplocer; a few spatulate hairs and spinulose setae occurring on anterior side of main aesthetasc-bearing segment; apical segment terminating in a very narrow aesthetasc together with some other simple setae; most setae basally geniculate. *Leg 5* (Fig. 36–2). Baseoendopodite small, with two juxtaposed setulae on inner distal corner, one well developed outer seta arising from a short cylindrical process accompanied with some spinules near base. Exopodite represented by a rectangular segment bearing one bare outer seta midst; one bare setula and two somewhat spinulose thick setae on outer distal corner; one bare seta on inner extremity of distal end. *Leg 6* (Fig. 36–3) represented by a plate with one spiniform seta and one bare seta both on distal end, and with one bare setula on dorsal side near outer edge.

Variability. No any particular difference was detected among the specimens examined, except for size and coloration. In the six females dissected, their body lengths varied from 1.03 mm to 1.20 mm. Two other males dissected were 0.85 mm and 0.84 mm long. While a number of undissected specimens of both sexes were observed, no any form was separable on the account of the coloration of thoracic legs, which was fairly variable in the depth and tone. In the females collected from Muroran, the form-NP was predominant, and the form-PP was subdominant.

Remarks. The present materal well agrees with the description and figures by Poppe (1884) in most important characteristics. The absence of the maxillary praecoxa found in the figures by Poppe and Lang (1965) would be due to failed dissection of the appendage. While the last mentioned author reported his Californian material of this species in great details, some discrepancies occur between our observations. The rostrum is furnished with a number of elongate hairs ("closely ciliated") in the Lang's material, but with very short hairs in my material. In the Lange's one, the antenna is fairly thickset, and seemingly lacks in the most spinules on the basis and a setula on the second exopodite segment.

The taxonomic ambiguity among three forms from California reported by Monk (1941) under the names, *Scutellidium arthuri*, *Scutellidium arthuri* var. *magnum* n. var. and *Scutellidium purpurocincta* n. sp., has already been discussed by Vervoort (1964) and Lang (1965). Comparison among the colorations of those species reported by Poppe and Monk would be of certain importance for further taxonomic study of the genus. The color of the type material reported from the North Pacific is light yellow ("hellgelb"), according to the Poppe's statement in which he did not specify the portion in the body. The coloration of the type material seems to be identical with the Form-NP here reported. Contrary, Monk described his material of *Sc. arthuri* as to be "reddish brown on metasomal segments and urosome, lighter on cephalosome". His description apparently represents the form-BP reported in the present paper. The other two forms by Monk, *Sc. arthuri* var. *magnum* and *Sc. purpurocincta*, were mentioned as to be "with a deep purple band

on the first free segment of the metasome and on the urosome" and "very light brown, with purple on the free segments of the metasome and on the bases of the rami of the swimming legs". I have still found no any specimen of these forms of coloration as described by Monk.

Another relating species, *Scutellidium dentipes* Vervoort, 1965 reported from Ifaluk Atoll, is clearly discernible from *Sc. arthuri* in the setal ornamentation of the antennal exopodite, the smaller body size and the narrower appearance of the endopodite segments of leg 2. The last mentioned characteristic in *Sc. dentipes* is very much alike to that found in the new species from Hokkaido succedingly reported.

Specimens examined. A pair of both sexes (Muroran, 13–VI–1972, T. Itô leg.), five females and two males (Muroran, 28–IV–1975, Sh. Hiruta leg.) selected from a number of specimens collected were dissected. They were collected by rinsing a few blades of a brown alga, *Neodilsea yendoana* Tokida.

Scutellidium caeneus n. sp.

(Figs. 37–48)

Female. Six different forms of the coloration were recognized. Form-PS (purple stripe: Figs. 37–1, 2); all stripes light bluish purple; cephalothorax with a sub-circular stripe dorsally, which is laterally interrupted as in figure, and a somewhat partially interrupted stripe, of which anteriormost part extends to posterior side of antennular base (see Fig. 37–3), along ventral end at both sides; first three free thoracic somites each with a laterally extending stripe; all abdominal somites with a longitudinal stripe along each lateral side. Form-PP (purple patch: Figs. 37–4, 5); cephalothorax with a roughly square patch which is deep purple in most area, but partially paled or entirely colorless (see Fig. 37–6); a small area of underside of third thoracic somite, dorsal side of a succeeding somite, and nearly whole part of first three abdominal somites all tinctured with deep purple. Form-P (purple: Figs. 38–1, 2); first five somites, except for an anterior area of cephalothorax and a short lateral area of succeeding three thoracic somites, tinctured with deep purple; genital double-somite bearing a narrow transverse stripe, which is also tinctured with deep purple, on its anterior extremity of dorsal side; otherwise colorless and semitransparent (coloration of thoracic legs described later). Form-B (brown: Figs. 38–3; 4); cephalothorax bearing two colored stripes, succeeding two thoracic somites bearing a colored stripe on each dorsal side, all stripes tinctured with very pale brown; antepenultimate and penultimate abdominal somites tinctured with brown; otherwise colorless and semitransparent. Form-RP (red patch: Figs. 39–1, 2); cephalothorax bearing a laterally expanded red patch dorsally; each dorsal side of first three free thoracic somites tinctured with red; succeeding fourth thoracic somite obscurely red; otherwise colorless and semitransparent. Form-R (red: Figs. 39–3, 4); cephalothorax, except for an anterior and lateral area, and succeeding four thoracic somites

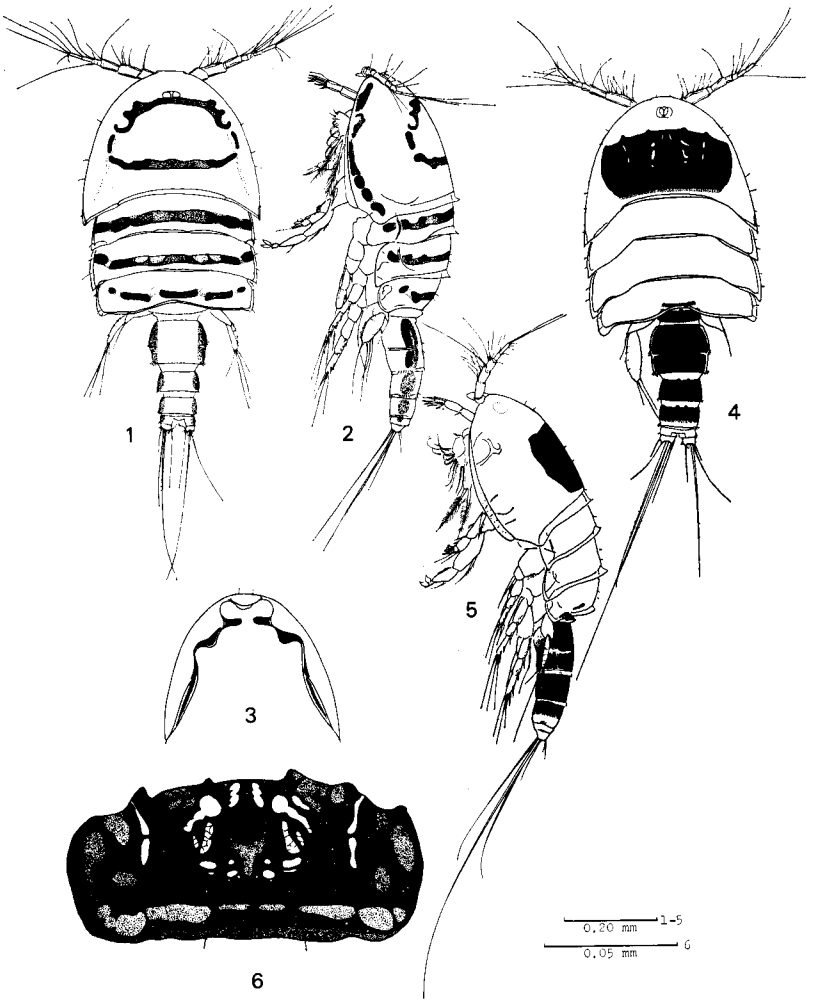

Fig. 37. *Scutellidium caeneus* n. sp. Female (1, 2, holotype; 3–6, paratypes). 1. body (PS), dorsal; 2. ditto, lateral; 3. ventral side of cephalothorax of a paratypic specimen (PS); 4. body (PP), dorsal; ditto, lateral; 6. colored area of cephalothorax.

tinctured with red; of dorsal side of genital double-somite anterior rim clearly red; otherwise colorless and semitransparent. Beside those colorations described, not only several basal segments and intercoxal plate of the first four pairs of thoracic legs but also corresponding sternal plates are occasionally tinctured with purple in various degrees.

The following description as well as most of the figures is based upon the

holotypic female of Form-PS. Body (Figs. 37–1, 2) 0.78 mm long, 0.37 mm in greatest width measured at posterior border of cephalothorax. Of dorsal side of first three somites each hyaline membrane apparently rising. Rostrum (Fig. 41–1)

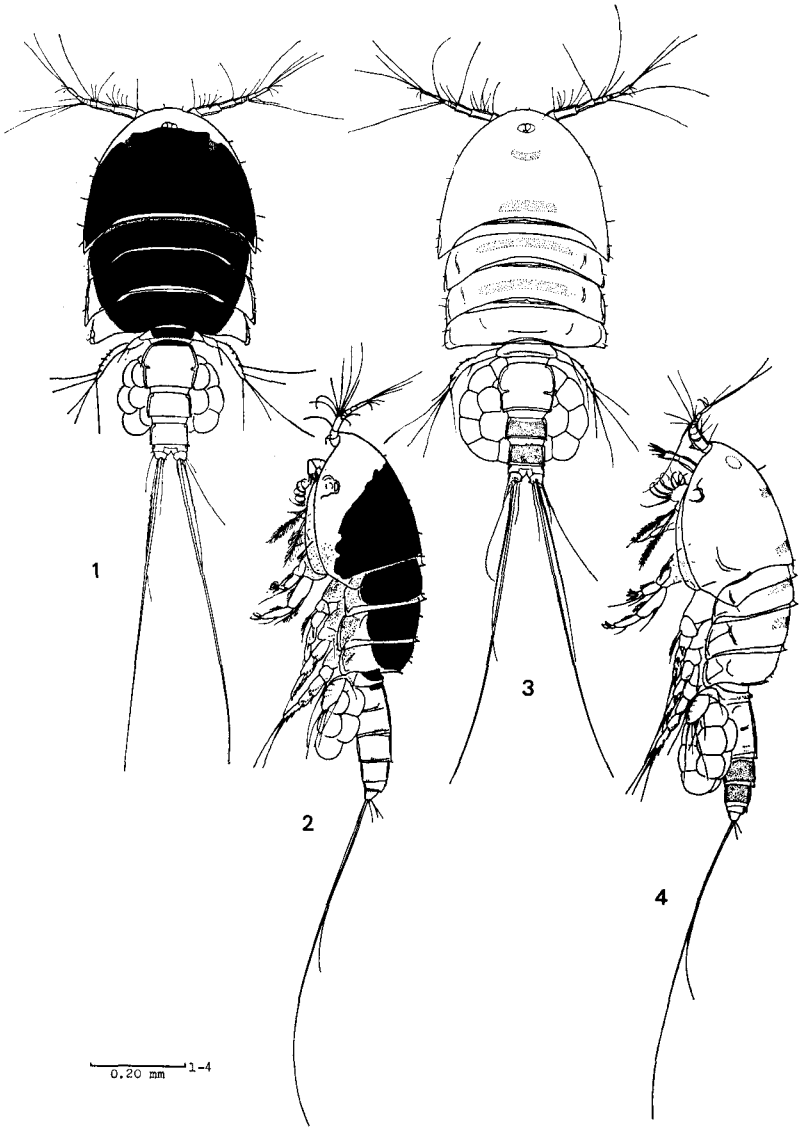

Fig. 38. *Scutellidium caeneus* n. sp. Female (Paratypes). 1. body (P), dorsal; 2. ditto, lateral; 3. body (B), dorsal; 4. ditto, lateral

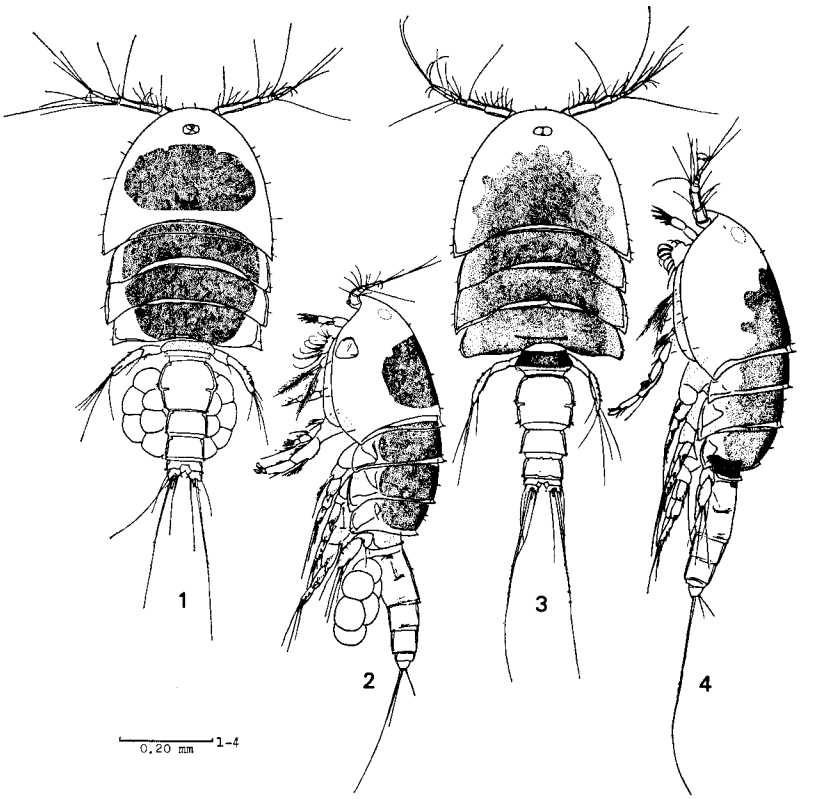

Fig. 39. *Scutellidium caeneus* n. sp. Female (Paratypes). 1. body (RP), dorsal; 2. ditto, lateral; 3. body (R), dorsal; 4. ditto, lateral.

with three pairs of sonsory hairs dorsally, and many delicate hairs along anterior edge. Cephalothorax somewhat longer than succeeding three somites combined, but not so wider than latters; of both lateral sides each ventral border fringed with a hyaline membrane. Hind edge of third free thoracic somite scarcely concaved. Fourth free thoracic somite (Fig. 40–1) ornamented with some spinules and a pair of hairs along its hind edge of dorsal side. Genital area (Fig. 40–2) rather flattened in appearance than that of *Sc. arthuri*; ventral border between two subdivisions rather obscure. Of antepenultimate and penultimate abdominal somites each ventral hind edge fringed with a number of spinules. Anal area (Fig. 40–1) ornamented with some sharp spinules. Furcal ramus somewhat shorter than long; a basally geniculate dorsal seta furnished with some fine hairs sparsely. Abdomen otherwise as in figures (Figs. 40–1, 2 and 3). *Antennule* (Fig. 41–2); first segment with some spinules which are elongate and seemingly flexible; fourth one

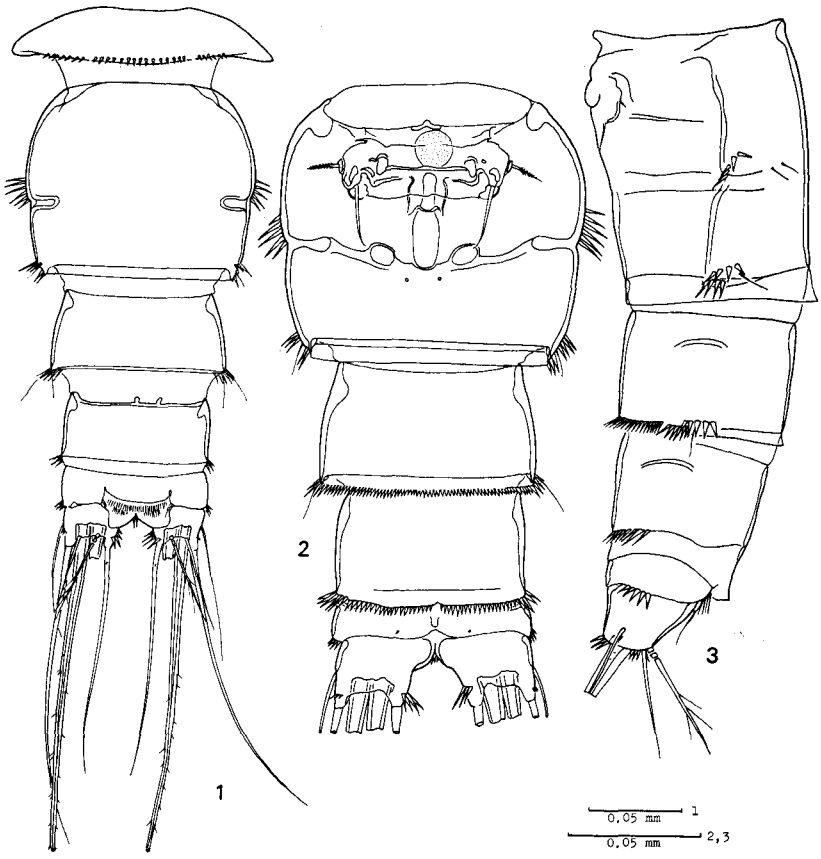

Fig. 40. *Scutellidium caeneus* n. sp. Female (1, 2, holotype; 3, paratype). 1. fourth thoracic somite and abdomen, dorsal; 2. abdomen, ventral; 3. abdomen (PS), lateral.

distally forming itself an elongate cylindrical process terminating in a narrow aesthetasc; fifth, sixth and seventh segments small; apical two segments narrow and elongate rather than those in *Sc. arthuri*; last segment almost twice as long as preceding one; all setae without any hair, and most of them geniculate. *Antenna* (Figs. 41–3, 5). Coxa short and bare. Basis longer than thick, with some small spinules scattered at anterior side, a spinulose anterior seta which does not reach distal end of first endopodite segment. Exopodite indistinctly four-segmented (see Fig. 41–4); first segment longest, with two spinulose setae; second one short, bearing a setula; third one as long as preceding one, with one spinulose seta; last one terminating in three setae and with some fine hairs near tip. First endopodite segment furnished with a bare setula at a point two-thirds the length of anterior side. Second endopodite segment longer than preceding one, with a few spinules and an

Fig. 41. *Scutellidium caeneus* n. sp. Female (Holotype). 1. rostrum; 2. antennule; 3. antenna; 4. antennal exopodite; 5. antenna, anterior side; 6. mandibular coxa-basis; 7. mandible.

oblique row of some fine hairs laterally; one somewhat spinulose spine arising from a point two-thirds the length; two spinulose close spines on subdistal portion; four midst geniculate spines, two juxtaposed setae and one narrow seta on distal end. *Mandible* (Fig. 41–7). Free edge of pars incisiva (Fig. 41–6) serrate. Coxa-basis fringed with many soft hairs and some spinules along dorsal edge, and with two thick setae, which are extremely hairy, on inner end. Endopodite (Fig. 42–1) shorter than exopodite; in three inner setae, two confluent at base and scarcely

Fig. 42. *Scutellidium caeneus* n. sp. Female. (Holotype). 1. mandibular endopodite; 2. mandibular exopodite; 3. maxillula; 4. maxilla; 5. maxillipede.

demarcated from segment, and thickest one extremely hairy; an oblique row of fine spinules on a midway; six setae occurring distally, in which three are juxtaposed. Exopodite (Fig. 42–2) with four inner setae and two terminal setae, of which outer

one is bilaterally plumose and other is plumose in three rows; two (three ?) narrow setulae arising from outer edge near distal end. *Maxillula* (Fig. 42–3). Outer rim of praecoxa somewhat hairy. Arthrite of praecoxa well expanded laterally, furnished with six claws at inner end and two spiniform setae along dorsal edge near inner end, two parallel setae, which are geniculate midst, on anterior side; a row of some elongate and rigid spinules on posterior side near dorsal edge and some scattering spinules on anterior side. Coxal inner process terminating in a spinulose setula and two spiniform setae which are geniculate midst and with a small protuberance near each apex; some spinules on anterior side near inner end. Basal process with one dorsal seta which arises without any articulation at base, terminating in three spinulose setae. Endopodite entirely directed inwards, terminating in two spinulose setae which lack in basal articulation, and with one rather spiniform seta on subterminal ventral edge. Exopodite directed outwards, with a number of long hairs arising from a small area of posterior side, a few spinules on anterior side near dorsodistal edge, some soft hairs along ventral edge; two terminal setae well developed. *Maxilla* (Fig. 42–4). Praecoxa furnished with two thick setae, which are not articulated at base and with many soft hairs, at inner side. Coxa well lengthened, with a few seemingly flexible spinules on distal edge; an endite situated distally, terminating in two bare setulae. Basis forming itself a strong claw, with a spiniform seta, of which dorsal side is pectinate, at a midway of dorsal edge. *Maxillipede* (Fig. 42–5). Proximal segment with several close spinules, one thick hairy seta at inner edge, and some scattering spinules. First endopodite segment with two rows of some close spinules each on and near outer edge; inner edge straight and fringed with a number of soft hairs. Second endopodite segment short, terminating in a stout claw, of which dorsal edge is somewhat spinulose, accompanied with four setae near base; a hairy seta arising from ventral (outer) edge near distal end.

Leg 1 (Fig. 43). Intercoxal plate acutely bipartite, with many hairs along free edge and on posterior side. Coxa with a number of elongate hairs along outer margin and a few narrow spinules on anterior side along distal border near outer edge; otherwise bare. Of basis, outer half less than half as long as inner half; some narrow spinules on outer edge and some delicate short spinules on anterior side along base of outer seta which is well developed and hairy; outer edge of inner half fringed with some fine hairs; a number of elongate soft hairs together with some short spinules on inner edge; an inner seta rather rigid, and spinulose along its outer side; middle anterior side without any spinular row. Distal border of first exopodite segment remarkably inclined; a vertical row of some (ten) stout spinules on anterior side near outer margin. Of second exopodite segment, an inner seta situated at subdistal edge. Of endopodite first segment about 1.3 times as long as second one, with an oblique row of some hairs on subproximal anterior side, two parallel rows of hairs arising from distal third outer edge and extending to inner distal edge on anterior side; outer edge without any spatulate cirrus but hairy. Second endopodite segment fringed with some spaced hairs along outer margin. Ornamentation of

both rami otherwise as in *Sc. arthuri*. *Leg 2* (Fig. 44). Coxa and basis ornamented as in *Sc. arthuri*. Outer edge of first exopodite segment furnished with some stout spinules and about ten cirri. Second endopodite segment without any spinules on its outer edge, but with a number of elongate hairs; an outer spine some-

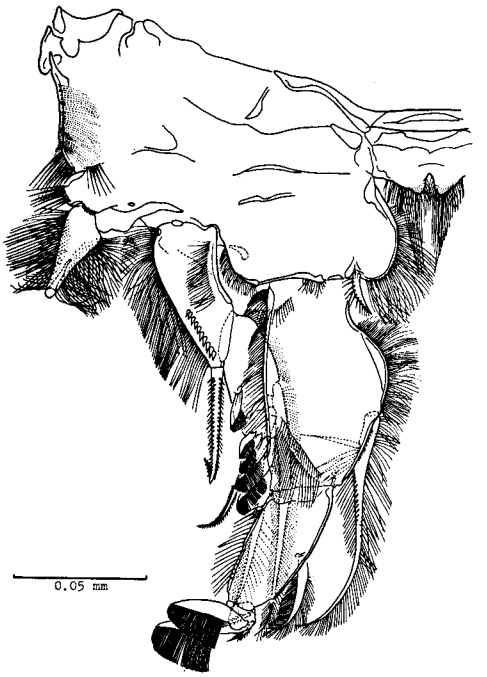

Fig. 43. *Scutellidium caeneus* n. sp. Female (Holotype). Leg 1.

what spinulose and accompanied with a few spinules near base. Of last exopodite segment, a terminal spiniform seta ornamented with 12 spinules along its outer edge. Endopodite segments somewhat narrower than those in *Sc. arthuri*. Of last endopodite segment posterior side furnished with one and two narrow spinules near each base of inner setae; first inner seta somewhat rigid. Ornamentation of both rami otherwise as in *Sc. arthuri*. *Leg 3* (Fig. 45). Coxal outer rim somewhat spinulose. Basis furnished with a long outer seta; no spinule occurring at base of exopodite. Some hairs occurring along outer margin of first exopodite segment together with spinules. Of last exopodite segment, a terminal spiniform seta bearing 12 spaced spinules along outer side, and third outer spine sparsely spinulose. Of posterior side of endopodite, middle segment with a spinule near second inner seta, and third segment with two close spinules near first inner seta and a spinule near last inner seta. Outer margin of both rami more or less spinulose (all

spinules precisely reproduced in figure). *Leg 4* (Fig. 46–1). Of outer edge of coxa, a short length with spinules, otherwise bare. Basal outer seta extremely elongated, longer than three exopodite segments combined. Of exopodite posterior side remarkably hairy (see Fig. 46–2). Of distal two exopodite segments outer

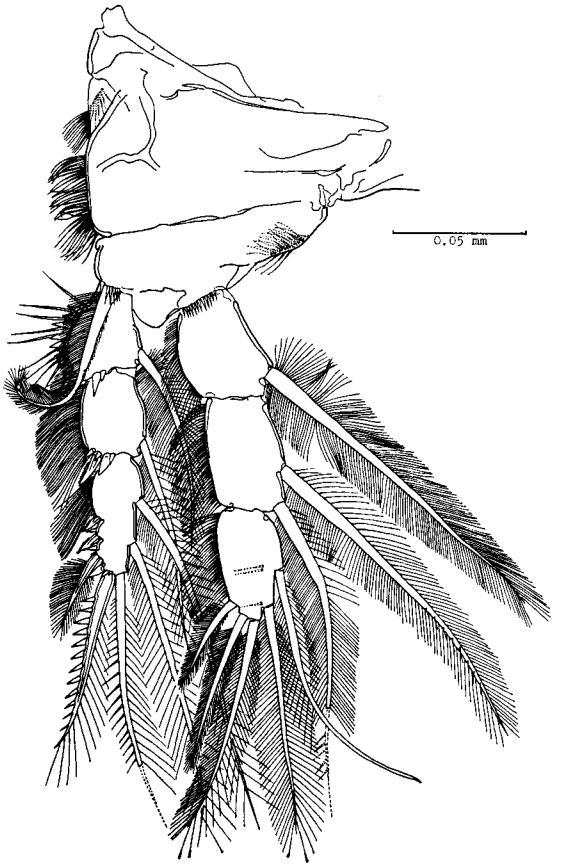

Fig. 44. *Scutellidium caeneus* n. sp. Female (Holotype). Leg 2.

spines spinulose, rather lanceolate. A terminal spiniform seta of last exopodite segment furnished with 18 spinules. A stout spinule occurring at each posterior side of distal two endopodite segments. Outer margin of both rami spinulose as shown in figure. *Leg 5* (Fig. 47–1, and see Fig. 47–2, a paratypic specimen). Of baseoendopodite segment anterior side near proximal edge without any spinular row; of inner expansion a terminal seta accompanied with a short setula at both sides, not extending beyond distal end of exopodite segment. Of exopodite, first

outer seta arising from a short process situating at a point three-fourths the length; terminal seta somewhat thickened at a short length of its base. Other ornamentation almost as in *Sc. arthuri*.

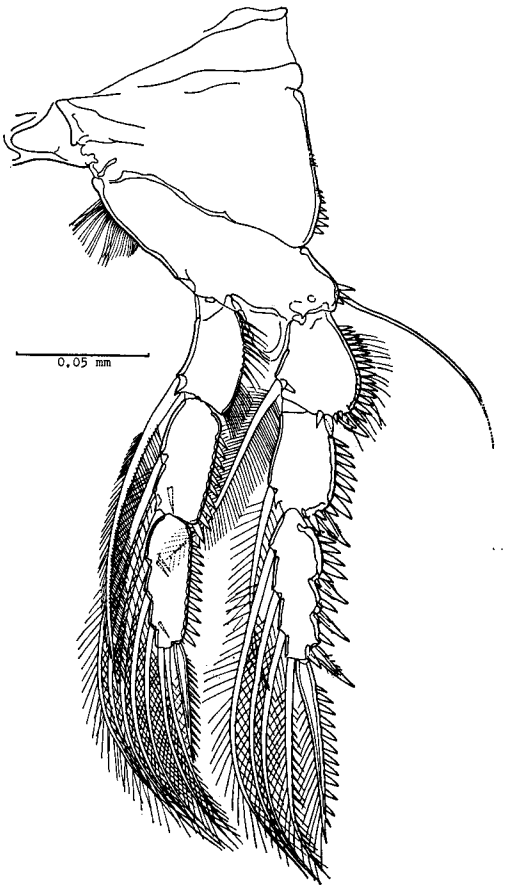

Fig. 45. *Scutellidium caeneus* n. sp. Female (Holotype). Leg 3.

Male. Body (Fig. 48–1) 0.60 mm long, tinctured with purple at each basal part of first three pairs of thoracic legs, together with corresponding intercoxal plate and sternal ridge; otherwise colorless and semitransparent. Rostrum (Fig. 48–2) fringed with many soft hairs along anterior edge. First four somites ornamented with some remarkable hairs laterally. Second, third and fourth abdominal somites furnished with a number of spinules along each hind edge of ventral side. *Antennule* (Fig. 48–2) haplocer; a few spinulose setae and some cirri occurring at anterior side of main aesthetasc bearing segment. *Leg 5* (Fig. 48–3).

Baseoendopodite not demarcated at base, with two setulae at reduced inner expansion. Exopodite longer than wide, with four setae in all, in which middle two are spinulose. *Leg 6* (Fig. 48-3) represented by a plate which is clearly demarcated at base and of one stout spinulose seta and one bare seta terminally, and one bare outer seta. All other appendages ornamented as in female.

Variability. In the seven female specimens dissected, the body length varied between 0.75 mm and 0.85 mm.

Remarks. The present new species is closely allied to *Sc. arthuri* Poppe, 1884,

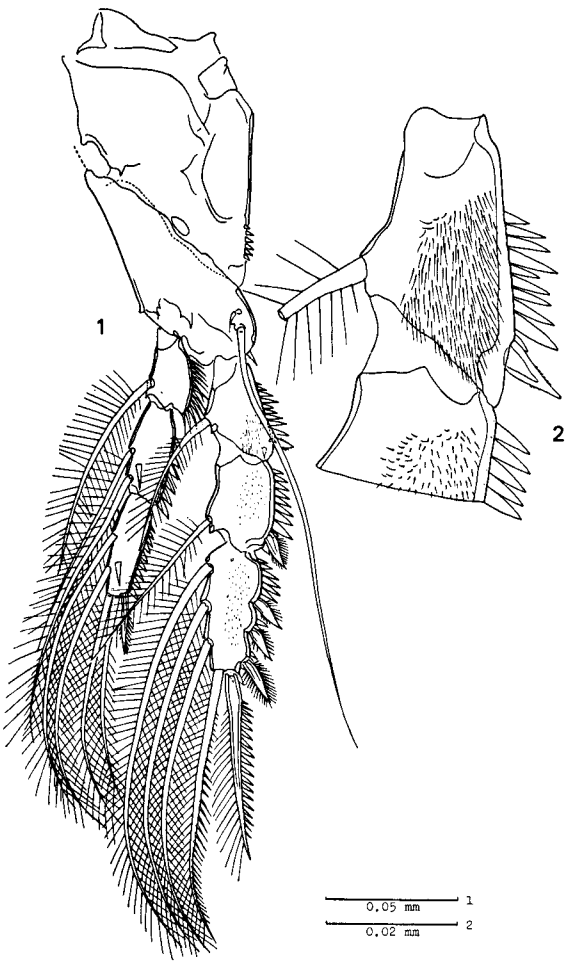

Fig. 46. *Scutellidium caeneus* n. sp. Female (Holotype). 1. leg 4, posterior side; 2. ditto, proximal part of exopodite.

and *Sc. dentipes* Vervoort, 1964, in the following three characteristics relating with the shape and ornamentation of the second pair of thoracic legs; both rami transformed, last endopodite segment with five setae in all and middle exopodite segment without any spinule on its outer margin. From *Sc. arthuri*, however, the present species described is easily discernible in the smaller size, the quite distinct

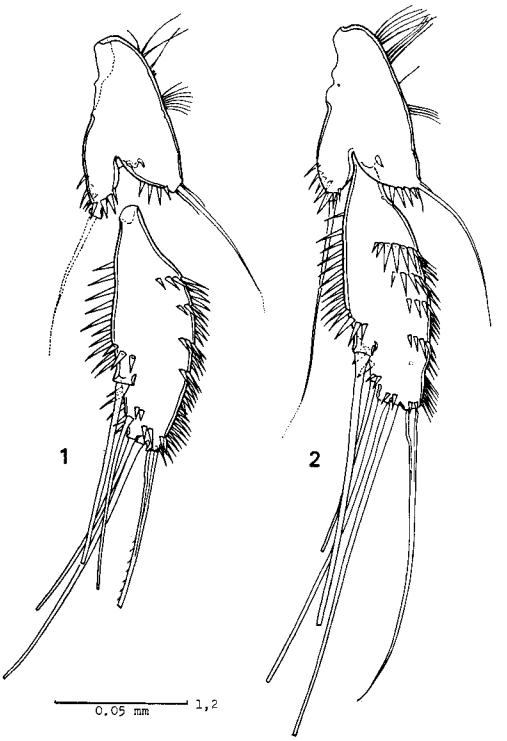

Fig. 47. *Scutellidium caeneus* n. sp. Female (1, holotype; 2, paratype). 1. leg 5; 2. ditto (PS).

color patterns, the extremely elongated outer seta of the basis of leg 4, the proportion of the first two endopodite segments of leg 1, and, further, apparently fewer spinules on the terminal spiniform seta of each the last exopodite segment of leg 2, leg 3 and leg 4. The last mentioned characteristic is also of particular importance to distinguish the present new species and *Sc. dentipes*, though they are fairly alike to each other in the shape of the endopodite segments of leg 2, which are not so swollen rather than those in *Sc. arthuri* (cf. Figs. 32 and 44). *Sc. dentipes* seems to be fairly distinct from the other two in the possession of a not so reduced seta on the antennal second exopodite segment and the shape of the middle exopodite

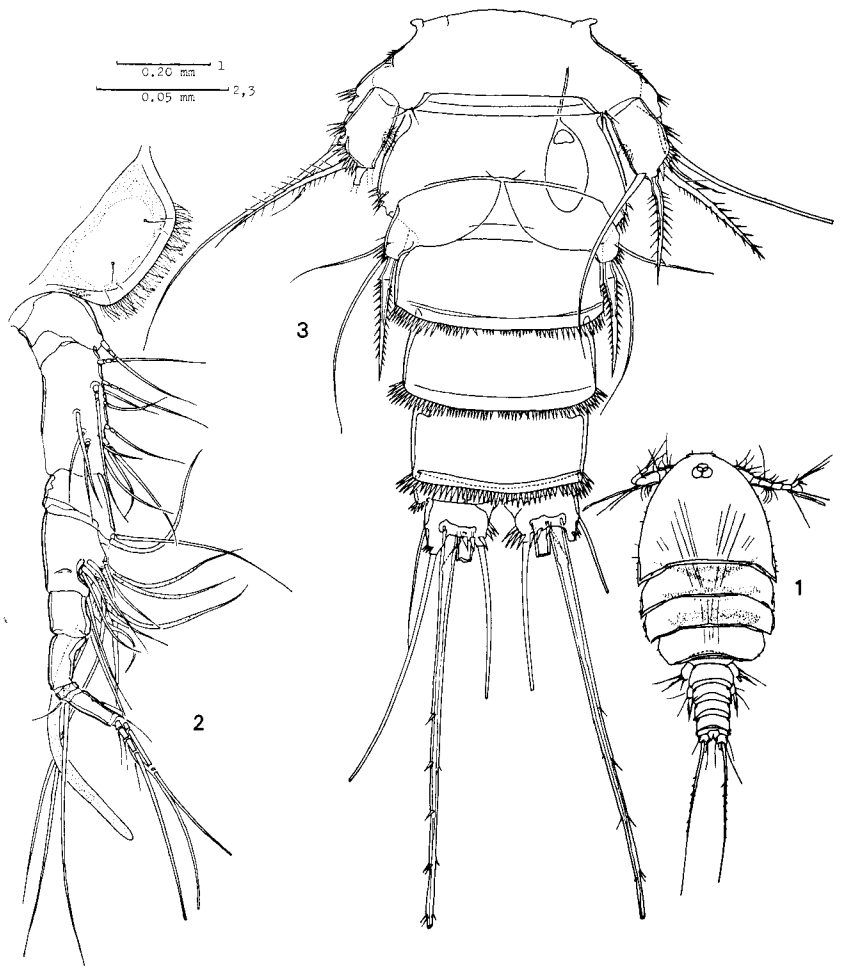

Fig. 48. *Scutellidium caeneus* n. sp. Male (Allotype). 1. body, dorsal; 2. rostrum and antennule; 3. leg 5 and abdomen, ventral.

segment of leg 1. The coloration as well as the basal outer seta of leg 4 is entirely unknown in *Sc. dentipes*. Connecting this, the elongated basal outer seta of leg 4 previously described in the present new species is very remarkable, and is precisely certified in all the specimens of both sexes examined. For another relating species, *Sc. purpurocincta* Monk, we are unable to recognize most of important characteristics in the original description (Monk, 1941), though it would be advisable that the species is likely somewhat smaller (0.65–0.68 mm in the female) and is tinctured "with purple on the three free segments of the metasome . .". No such the pattern of coloration has so far been found in *Sc. caeneus*. A

thorough examination of *Sc. purprocincta*, whose validity has already been doubted by Vervoort (1964, p. 112) and Lang (1965, p. 151), is anyway necessary.

Specimens examined. Holotype; female. Allotype; male. Paratypes; six females and one male. All the specimens were selected from a number of individuals collected from Oshoro by rinsing of *Sargassum confusum* Agardh (5–X–1973, T. Itô leg.).

The trivial name was chosen from a marine fairy appeared in a Greek mythology.

Scutellidium hirutai n. sp.

(Figs. 49–56)

Female. Body (Figs. 49–1, 2) robustly built, about 1.20 mm long, 0.55 mm in greatest width; nearly whole body tinctured with dark purple, but somewhat paled at anterior portion of cephalothorax. Of first four somites each dorsal part of hyaline membrane never rising. Rostrum much wider than long, fringed with some short fine hairs along anterior edge. Of both ventral extremities of cephalothorax each hyaline membrane rather narrow, not so apparent in lateral view. Abdomen (Figs. 50–1, 2) remarkably tapering behind. Genital double-somite subdivided laterally and ventrally; genital area rather flat in appearance, with three setulae representing each rudimental leg 6. Of antepenultimate and penultimate abdominal somites each posterior edge of ventral side fringed with a number of minute spinules. Anal somite short. Furcal ramus almost as long as wide, with a narrow seta on a midway of outer side, one simple setula and one basally geniculate setula both on dorsal hind edge; principal terminal setae well developed. *Antennule* (Fig. 49–3) nine-segmented; first segment with some spinules on anterior side; second one longest, approximately twice as long as diameter, and more than 1.5 times as long as succeeding segment; posterior side of third one thickly sclerotized; fourth one with a rather short process terminating in an aesthetasc; fifth, sixth and seventh segments small; apicalmost segment almost twice as long as preceding one; most setae proximally geniculate, and all entirely bare. *Antenna* (Fig. 49–4) thickset in appearance. Coxa short and without any ornamentation. Basis a little longer than thick, not tapering distally, with some short spinules scattering on its anterior side; a distal seta not reaching to distal end of first endopodite segment, somewhat spinulose. Exopodite clearly four-segmented; first segment longest, with two hairy setae; next two short segments each with one hairy seta which is not reduced in size; apical segment furnished with some hairs subterminally, and ending in three setae. First endopodite segment somewhat shorter than basis, tapering distally, and bearing a diminutive setula on anterior side near distal end. Second endopodite segment longer than preceding segment, with a row of some stout spinules on anterior side near base, some fine spinules on a midway of posterior side, and several stout spinules near anterior distal edge; one somewhat spinulose short spine arising from a point two-thirds the length of anterior side; one pectinate thick spine together with a narrow spine occurring at subdistal portion; distal end furnished with four midst geniculate

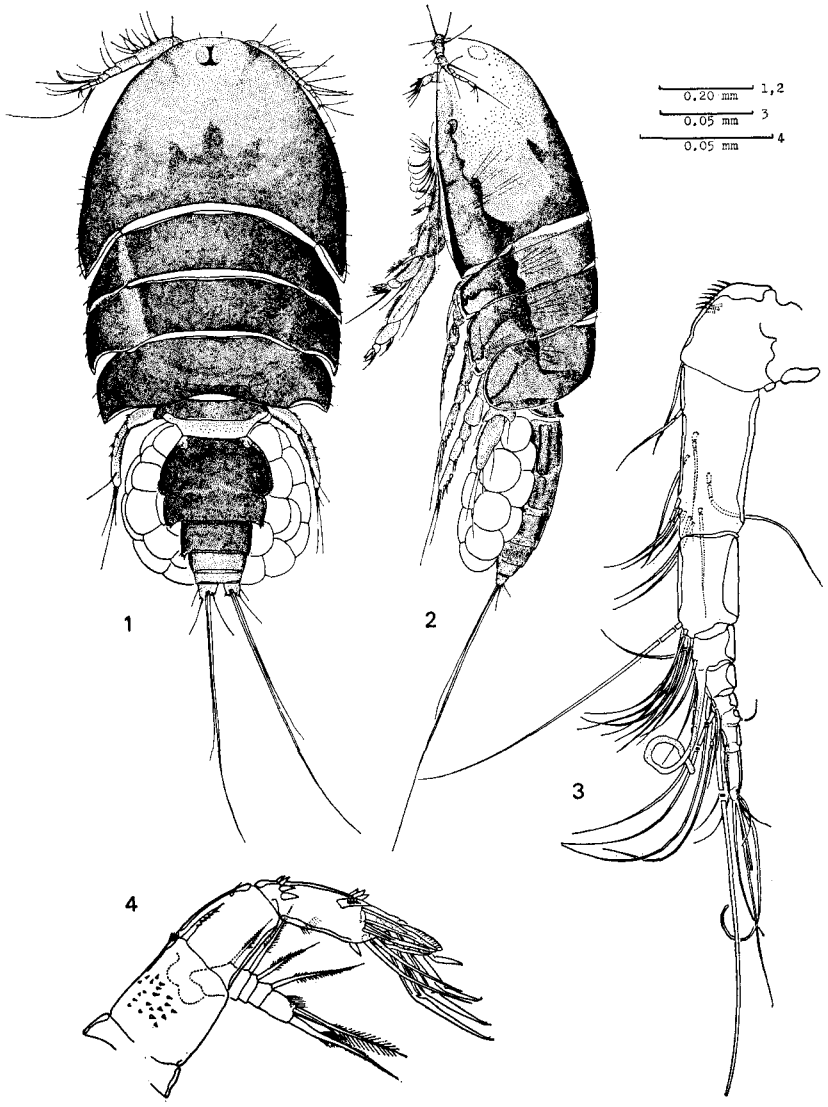

Fig. 49. *Scutellidium hirutai* n. sp. Female (Holotype). 1. body, dorsal; 2. ditto, lateral; 3. antennule; 4. antenna.

spines and three setae. *Mandible* (Fig. 51–1). Praecoxa ornamented with some spinules on outer ventral edge. Of coxa-basis inner dorsal side remarkably rounded and densely hairy; an inner seta thick, with considerable amount of soft hairs; a ventral seta short, having thick basal part and abruptly narrowed distally, and

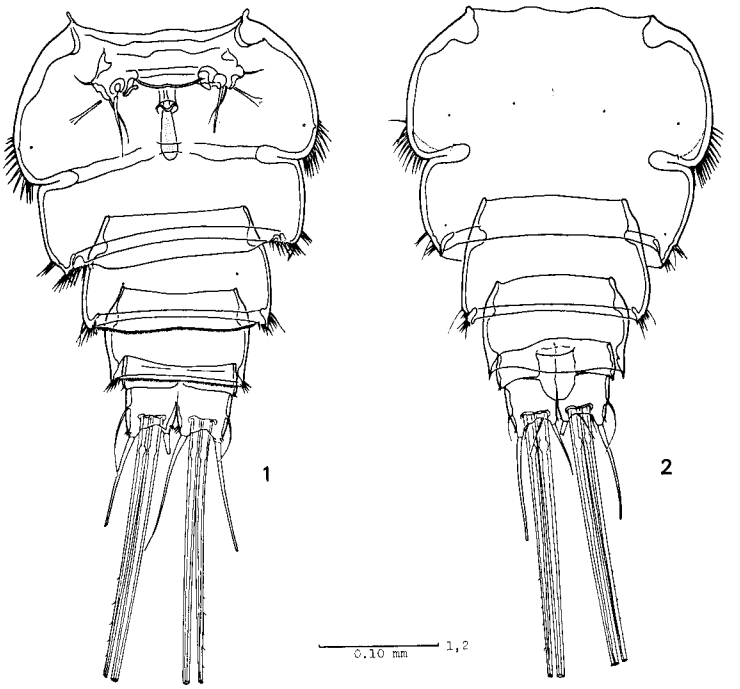

Fig. 50. *Scutellidium hirutai* n. sp. Female (Holotype). 1. abdomen, ventral; 2. ditto, dorsal.

entirely covered with many long hairs. Endopodite furnished with three basally undefined setae arising from a ledge on a midway of inner side, three juxtaposed and two separate setae on distal end and one somewhat thicker seta on subdistal inner edge; a few spinules near distal end. Exopodite bigger than endopodite, with two terminal and four inner marginal plumose setae, proximal one of which is short; several rows of some fine spinules scattering here and there. *Maxillula* (Fig. 51–2). Praecoxa with some hairs on its outer rim; arthrite furnished with a somewhat arched row of some sharp spinules on dorsal base, a few close spinules on a midway of dorsal edge, some spinules scattering on posterior side, two parallel setae arising from anterior side near middle ventral edge and further, five more or less spinulose claws and two spinulose setae along inner and dorsal edge. Coxal inner process not reaching to middle of arthrite of praecoxa, with a spinulose short seta arising from a ledge on subproximal portion of ventral edge, and terminating in two spinulose setae; some fine spinules occurring near end. Endopodite moderately inclined, with many fine hairs on posterior side, two close hairy setae, which are not defined at base, on inner distal corner and one seta arising from outer side of distal edge. Exopodite directed outwards, fringed with

Fig. 51. *Scutellidium hirutai* n. sp. Female (Holotype). 1. mandible; 2. maxillula; 3. maxilla; 4. maxillipede.

considerable amount of soft hairs along ventral edge, some long hairs on a small area of subproximal portion of posterior side, some rigid spinules on anterior side near dorsodistal corner; two terminal setae well developed, bilaterally plumose. *Maxilla* (Fig. 51–3). Praecoxa furnished with two thick setae, both not defined at base and densely covered with soft hairs, proximal one of which is accompanied

with a small seta near base. Coxa elongated, with a short row of some spinules near outer distal corner, and a small cylindrical process, which terminates in two setulae, on distal end of ventral edge. Basis forming itself a strong claw accompanied with one somewhat spinulose spine on dorsal side near base of a claw described. *Maxillipede* (Fig. 51–4). Proximal segment fairly thickened, with some spinules on and near proximal half of inner margin; some close spinules, which are arranged into a row, occurring near base of an inner seta; an inner seta strong, but not reaching to distal end of basis, covered with many long hairs; outer rim bare (In the other appendage of the same specimen the corresponding part is furnished with many long hairs). Some hairs occurring at an articulation membrane between coxa and a succeeding segment (No such hair was detected in the other appendage of the same specimen). First endopodite segment about 1.5 times as long as greatest width; outer edge moderately rounded and with a number of close spinules on its midway; inner edge almost straight, hairy. Second endopodite segment short, but thickly sclerotized, with two short setulae on inner (dorsal) edge, one thick hairy seta on a midway of outer (ventral) edge, and terminating in a strong stout claw, which is somewhat arched and finely pectinate, and two geniculate spines.

Leg 1 (Fig. 52) more robustly built in appearance rather than in *Sc. arthuri* and *Sc. caeneus*. Intercoxal plate moderately bipartite at free edge, remarkably hairy. Coxa not so clearly bordered from basis, much widened; a row of a number of elongate hairs arising from posterior side near subproximal outer edge and extending to distal extremity along outer rim; a tuft of some long hairs occurring on anterior side near outer distal end; a transverse row of spinules, arising from middle of outer edge and extending inwards on its anterior side, outer third of which consists of very minute spinules and other consists of fairy elongate but narrow spinules; a somewhat arched row of some soft hairs on middle anterior side near distal border. Basis clearly separable into two parts by a deep ledge; outer edge forming a round protuberance with some sharp elongate spines; an outer seta thick, covered with considerable amount of hairs; of inner half, outer distal edge somewhat hairy; anterior side of distal end with some minor spinules along base of endopodite; inner edge remarkably protruded and clearly demarcated from distal edge by a spinulose inner spine, and furnished with some stout spinules on anterior side near its distal edge, and bearing a number of hairs along whole edge. First exopodite segment fairly incurved, more than twice as long as wide, ornamented with a vertical row of 19 wide spinules extending on distal half of anterior side; a tuft of some long hairs on posterior side near outer distal corner; whole outer edge densely fringed with fine long hairs; a vertical row of many hairs on anterior side, between inner proximal corner and middle of distal border, hairs of a basal short length somewhat scattering (this condition is not reproduced in the figure); an outer seta extending beyond distal end of succeeding segment. Second exopodite segment almost as long as preceding segment, scarcely rounded at inner edge, furnished with some short hairs roughly arranged in a vertical row on anterior side near outer edge; an outer spine situating at a point three-fifths the length

of outer edge; an inner seta arising from a clear ledge at a point four-fifths the length of inner edge, well developed and plumose. Third exopodite segment almost as long as wide, furnished with a tuft of some fine hairs on anterior side near proximal outer corner; four fimbriate spines, distally lengthened, along outer and

Fig. 52. *Scutellidium hirutai* n. sp. Female (Holotype). Leg 1.

distal edge; a terminal seta stout, about as long as three exopodite segments combined; an inner seta arising from a midway of posterior side near edge. First endopodite segment remarkably lengthened, about 3.5 times as long as outer edge of succeeding segment, and exceeding twice as long as its greatest width locating at a level a third the length; proximal two-thirds the length of outer edge fringed with fine hairs and these hairs replaced by some cirri along succeeding distal edge; distal fifth outer edge entirely bare; a row of some elongate hairs arising from a midway of outer edge and extending to inner distal edge through anterior side;

a short row of some hairs parallel with above mentioned row on inner half of anterior side; an inner seta extending beyond last exopodite segment; inner margin fringed with many soft hairs along its proximal half and short spinules along distal half. Second endopodite segment approximately twice as long as wide, furnished with some hairs near outer edge, a transverse row of a few minor spinules on anterior side near distal border; a plumose seta arising from a point three-fifths the length of inner edge. Third exopodite segment short, well defined at base; a pair of fimbriate spines well developed; two hairy setae on posterior side near inner edge, in which proximally situating one is fairly developed and extends beyond a tip of anterior spine; a row of some close spinules (11 in the illustrated leg and 13 in the other one) occurring at anterior side. *Leg 2* (Fig. 53–1). Coxa much wider than long, fringed with some hairs along a short distal length of outer edge. An outer seta of basis well developed, far exceeding beyond distal end of middle exopodite segment. First exopodite segment without any spinule or hair along outer edge except for distal corner where an outer spine together with a tuft of some long hairs occurs; some stout spinules arranged into two rows occurring on anterior side near an outer spine described; an inner seta finely plumose. Second exopodite segment as long as wide, somewhat shorter than preceding segment, furnished with some stout spinules (10 in the females examined and seven in the male) along outer edge, two parallel rows of some (four) spinules on anterior side near an outer spine which is somewhat spinulose; an inner seta sparsely plumose. Third exopodite segment about 1.7 times as long as preceding segment, fairly swollen at proximal half of outer edge which is fringed with a number of long hairs; first two outer spines small, somewhat spinulose; third outer spine rather setiform, with many fine spinules which are bilaterally arranged in a feathered appearance; an outer terminal seta not so rigid, with a number of (41 in the illustrated leg) narrow spinules along outer side, and an inner terminal seta also with many narrow spinules outwards and longer than three exopodite segments combined; two inner setae rather sparsely plumose. Endopodtie segments remarkably elongate and widened rather than exopodite segments; three endopodite segments combined about 1.3 times as long as three exopodite segments combined or more; all segments subequal in length, fringed with a number of long hairs along nearly whole length of each outer margin; of middle segment two inner setae plumose, and with some spinules on each distal third; of last segment (this segment in Fig. 53–1 is aberrant; see Fig. 53–2 reproduced from the left leg of the same specimen) an outer seta feathered with fine spinules and first inner seta somewhat rigid. *Leg 3* (Fig. 54–1). Coxa with some spinules scattered as in figure. No outer seta was detected on basis, though some spinules occurred at outer distal edge (see the posterior side of corresponding part of another female in Fig. 54–2). First two exopodite segments almost as in leg 2. Third exopodite segment about twice as long as preceding one, with some stout spinules on proximal outer edge; a comb-like spinular row occurring on anterior side near base of third inner seta; otherwise as in figure. Endopodite longer than exopodite. First endopodite segment fringed with two groups of some narrow

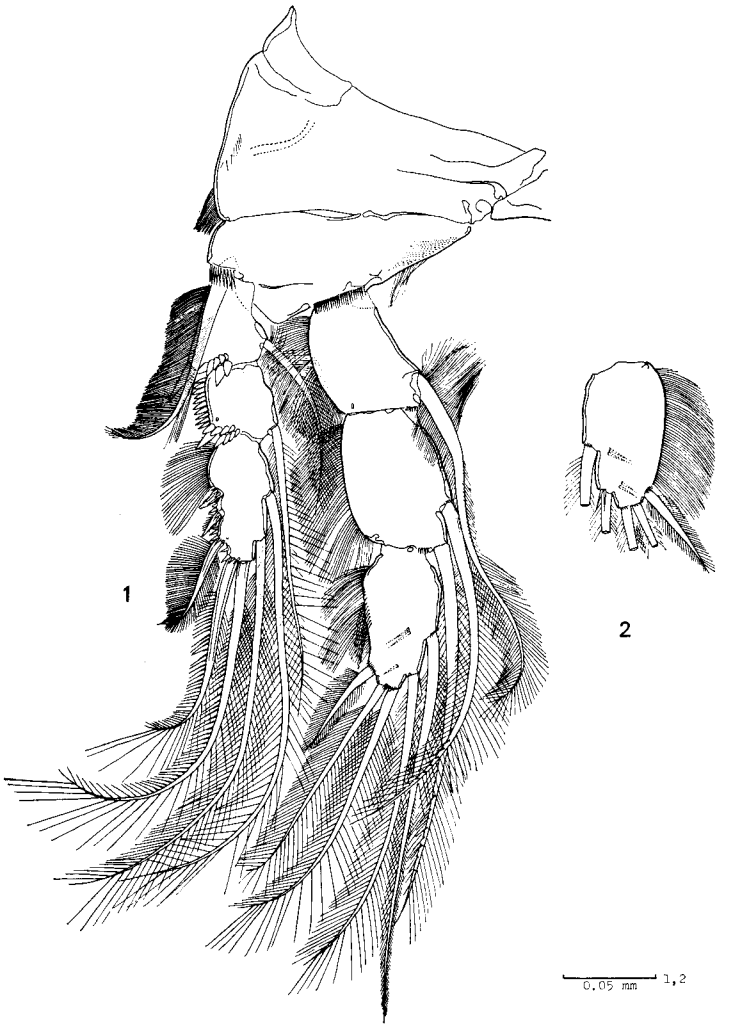

Fig. 53. *Scutellidium hirutai* n. sp. Female (Holotype). 1. leg 2; 2. ditto, last endopodite segment of left leg.

spinules (each group consisting of 10 and 15 spinules; of left leg entirely same in each number); inner distal edge somewhat protruded; an inner seta very finely plumose. Second endopodite segment a little longer than preceding one, furnished with 12 stout spinules along outer margin (10 in the other leg); two close spinules on posterior side near base of second inner seta (three in the other leg); two inner setae sparsely plumose. Third endopodite segment about 1.3 times as long as preceding segment, scarcely tapering distally, furnished with 24 spinules (23 in the

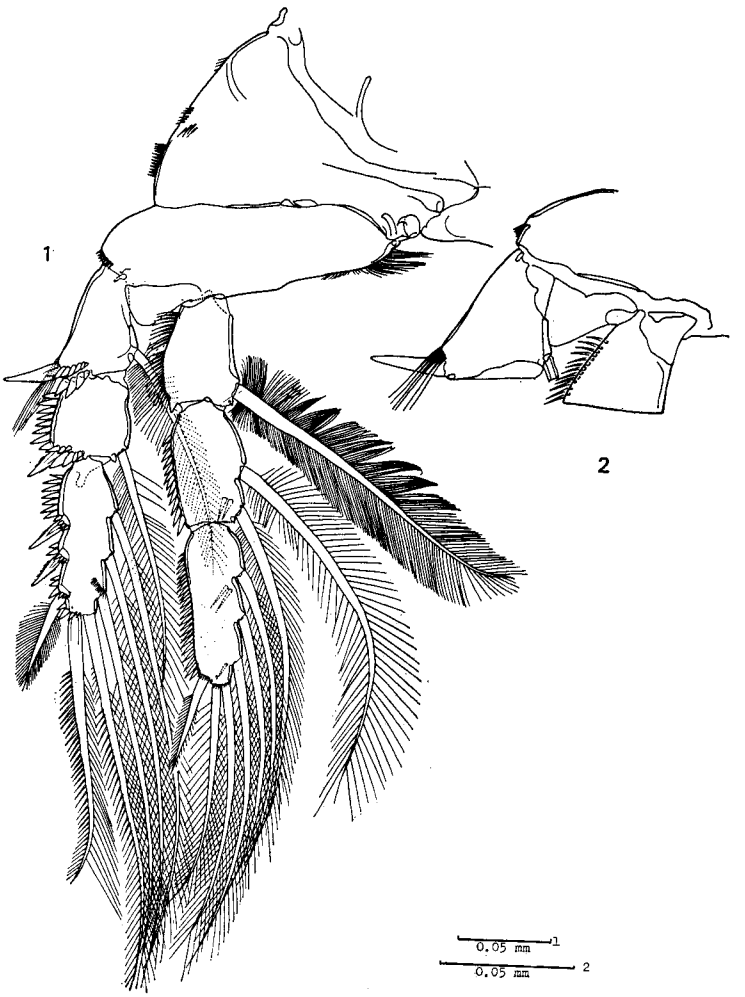

Fig. 54. *Scutellidium hirutai* n. sp. Female (1, holotype; 2, paratype). 1. leg 3; 2. ditto, posterior side of basal part.

other leg), which are somewhat narrower than those of preceding segment, along outer margin; otherwise as shown in figure. *Leg 4* (Fig. 55–1). Coxa ornamented with some spinules on both anterior and posterior sides and outer edge; distal border remarkably inclined. Of basis no outer seta was detected as in the leg 3 (see the posterior side of corresponding part in another female in Fig. 55–2). Exopodite segments without any hair on each posterior side. First exopodite segment lacking in a tuft of hairs, otherwise as in leg 3. Second exopodite segment somewhat longer

than wide; an outer spine apparently spinulose. Third exopodite segment about 1.7 times as long as preceding segment, with a comb-like row of some fine spinules on anterior side near base of third inner seta; not only third outer spine but also first two outer spines well spinulose; otherwise as in figure. Endopodite somewhat

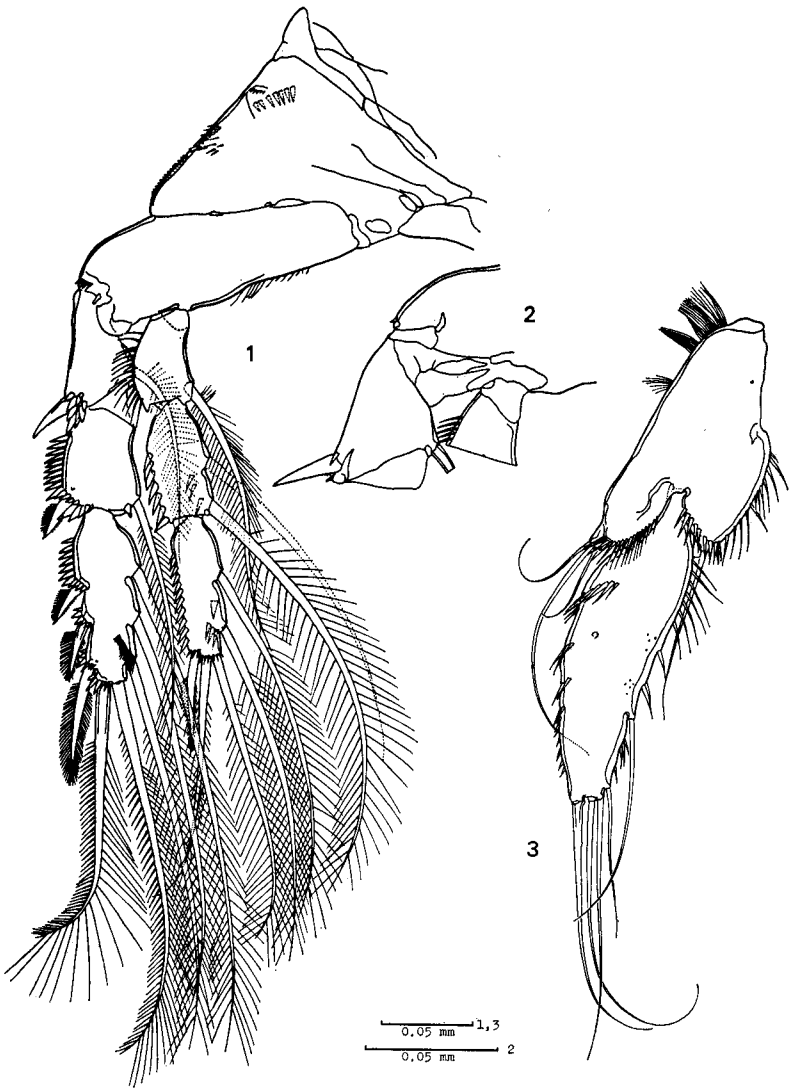

Fig. 55. *Scutellidium hirutai* n. sp. Female (1, 3, holotype; 2, paratype). 1. leg 4; 2. ditto, posterior side of basal part; 3. leg 5.

shorter than exopodite. First endopodite segment shortest and with a small protuberance on outer end of inner edge, 15 narrow and somewhat flexible spinules along outer margin (13 in the other leg); an inner seta rather sparsely plumose. Second endopodite segment about 1.3 times as long as preceding one, with seven stout spinules on outer edge, three spinules on posterior side. Third endopodite segment somewhat narrower and longer than preceding one, with 11 stout spinules on outer edge (nine in the other leg); posterior side with three close spinules near base of third inner seta and a spinule on a midway between two inner setae; otherwise as in figure. *Leg 5* (Fig. 55–3). The leg illustrated seems to be well extended hollizontally, since both lateral edges appear simultaneously. Baseoendopodite fringed with some very fine hairs along proximal half of outer margin which runs almost parallel with opposite edge; anterior side near subproximal inner edge without any spinule; inner expansion distally forming itself a small cylindrical process terminating in two setae, of which outer one nearly reaches to distal end of exopodite segment, and with one narrow seta on outer edge near distal end; on outer edge of inner expansion all spinules rather narrow. Exopodite fairly elongated, about 3.5 times as long as greatest width; spinular rows on inner side scarcely extending to anterior side, therefore anterior side almost naked; first outer seta situating at a point three-fourths the length; other four setae occurring on distal end or subdistal edge; all setae entirely bare.

Male. Body (Figs. 56–1, 2) about 0.90 mm long, remarkably flattened dorsoventrally, tinctured with very pale reddish purple, but nearly colorless and semitransparent. Rostrum as shown in figure (Fig. 56–3). Labrum rather clearly tinctured with reddish purple, all appendages colorless. Abdominal somites from second to fourth (Fig. 56–5) furnished with many spinules laterally and ventrally. *Antennule* (Fig. 56–5) haplocer, with a few spinulose setae on main aesthetasc-bearing segment; some spatulate cirri occurring on third and probably fourth segments. All other prethoracic appendages same as in female.

Leg 1 and *leg 2* as in female. Of *leg 3* and *leg 4*, each basis without any outer seta and each first exopodite segment without any spinule along outer margin as in female. Each last endopodite segment of a pair of leg 3 bearing 17 and 18 spinules along outer margin. Of a pair of leg 4, each middle exopodite segment with nine and eight spinules along outer margin and both last endopodite segments with eight stout spinules along outer margin. Other structures unstated not so different from those of female described. *Leg 5* (Fig. 56–5). Both baseoendopodites entirely confluent with each other, and not demarcated at base; inner expansion represented by a low protuberance terminating in a setula. Exopodite furnished with two spinulose and three bare setae in all; inner edge almost straight. *Leg 6* (Fig. 56–5) represented by a wide plate which forms itself a small protuberance at outer distal end terminating in one spinulose stout seta and one bare narrow seta, and with a very narrow seta on outer edge.

Remarks. The present new species here described is alike to *Sc. pulmosum*

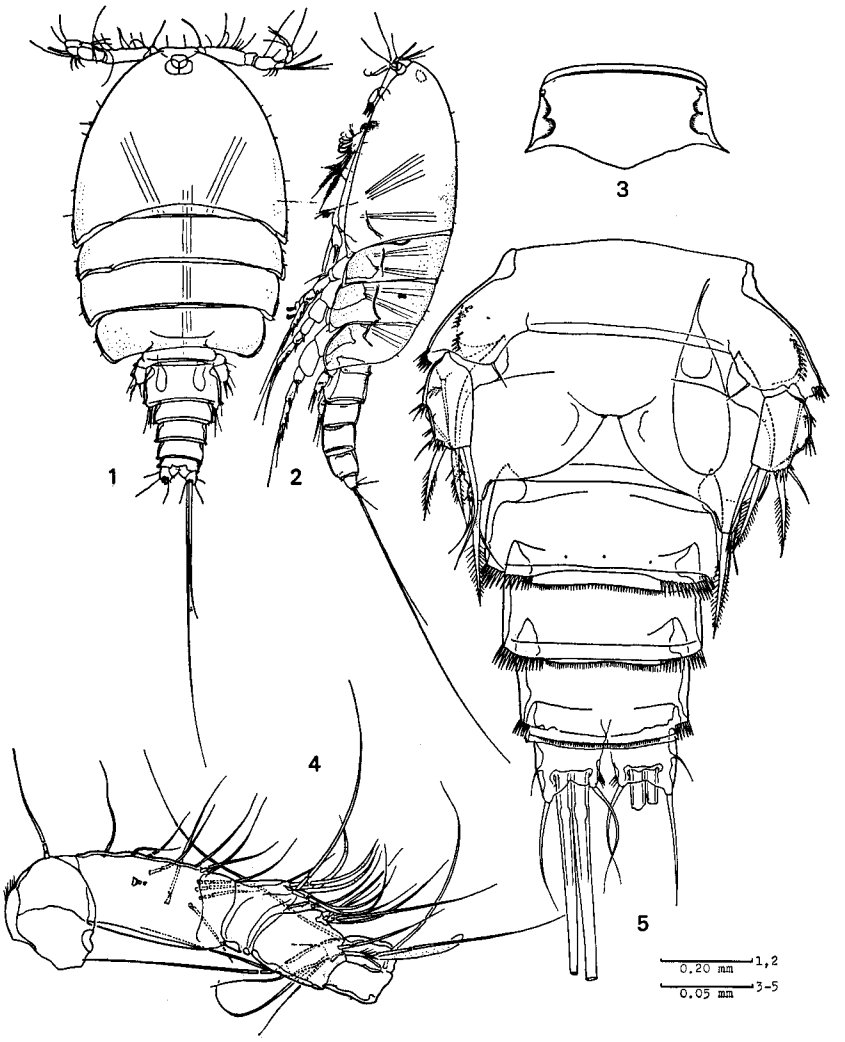

Fig. 56. *Scutellidium hirutai* n. sp. Male (Allotype). 1. body, dorsal; 2. ditto, lateral; 3. rostrum; 4. antennule; 5. leg 5 and abdomen, ventral.

(Brady, 1899), *Sc. ringueleti* Pallares, 1969, *Sc. spinatum* Hicks, 1971 and *Sc. patellarum* Branch, 1974, in the following characteristics appeared in the leg 2; the endopodite much swelling rather than in leg 3 and leg 4, the middle exopodite segment remarkably spinulose and the last endopodite segment with five setae in all. The present species, however, is easily discernible from all the latter species in the shape and ornamentation of some thoracic legs. In the three species, *Sc. ringueleti*,

Sc. spinatum and *Sc. patellarum*, the outer spine of the middle exopodite segment of leg 1 is apparently located at proximal edge, though the corresponding spine in the present species occurs at a midway of well lengthened segment. In this connection, the Lang's figure (Lang, 1934) shows that the corresponding spine occurs at a midway in *Sc. plumosum* from the Campbell Island, while the spine is located at subproximal edge in another specimen of the same species kindly sent me by Dr. R. Hamond (which is labelled as "*Scutellidium plumosum* ♀ common of H.W. in pool+*Tigriopus angulatus*, Point Durham, Chatham Is., 30. II. 1972"). *Scutellidium plumosum* is anyway quite unique within the genus in the shape of the middle exopodite segment of leg 1, of which proximal half of the inner edge is remarkably rounded as already shown in the original report by Brady (1899) as well as the Lang's figure. This characteristic is certifiable also in the Hamond's specimen. On the other hand, the bulbiform appearance of the ventral seta of the mandibular coxa-basis found in *Sc. spinatum* is fairly alike to that of the present new species, but is distinct from each of *Sc. arthuri* and *Sc. caeneus* previously described. Of *Sc. plumosum*, the corresponding seta is of rather intermediate condition. Although the absence of the outer seta of basis in the leg 3 and leg 4 recognized in the present species seems to be unreasonable for myself, no seta was detected inspite of careful examination in two females and one male. If my observation is right and not artificial, this would be of a particular value as one of the most important characteristics for the species. The bilobular appearance of the intercoxal plate of leg 1 in the present species rather approaches to that of *Sc. arthuri* and *Sc. caeneus*, but is clearly different from those of *Sc. plumosum* and *Sc. spinatum* (both checked by me), whose free edge of the intercoxal plate is not bilobular, but weakly incurved through whole the width. Since there are much more remarkable differences as well as important mophological characteristics yet untouched among these species, they will be discussed again in the final section.

Specimens examined. Holotype; female. Allotype; male. Paratype; a female. All the specimens were collected from Muroran by rinsing a few blades of a brown alga, *Neodilsea yendoana* Tokida (28–IV–1975, Sh. Hiruta leg.).

The trivial name is in horner of Mr. Sh. Hiruta who collected these specimens.

Scutellidium hippolytes (Kröyer) *akaba* n. subsp.

(Figs. 57–62)

Female. Body (Figs. 57–1, 2) 0.77 mm long, about 0.40 mm in greatest width measured at posterior end of cephalothorax, moderately depressed dorsoventrally, tinctured with pale reddish purple, semitransparent. Of each dorsal end of prosomal somites a hyaline membrane not rising, but entirely directed posteriorly. Rostrum as shown in figure (Fig. 58–1). Cephalothoracic somite approximately as long as succeeding three thoracic somites combined; ventral hyaline membranes not conspicuous. Fourth free thoracic somite (Fig. 57–3) ornamented with some spinular rows dorsally and laterally. Abdomen (Figs. 57–4 and 58–6) gradually

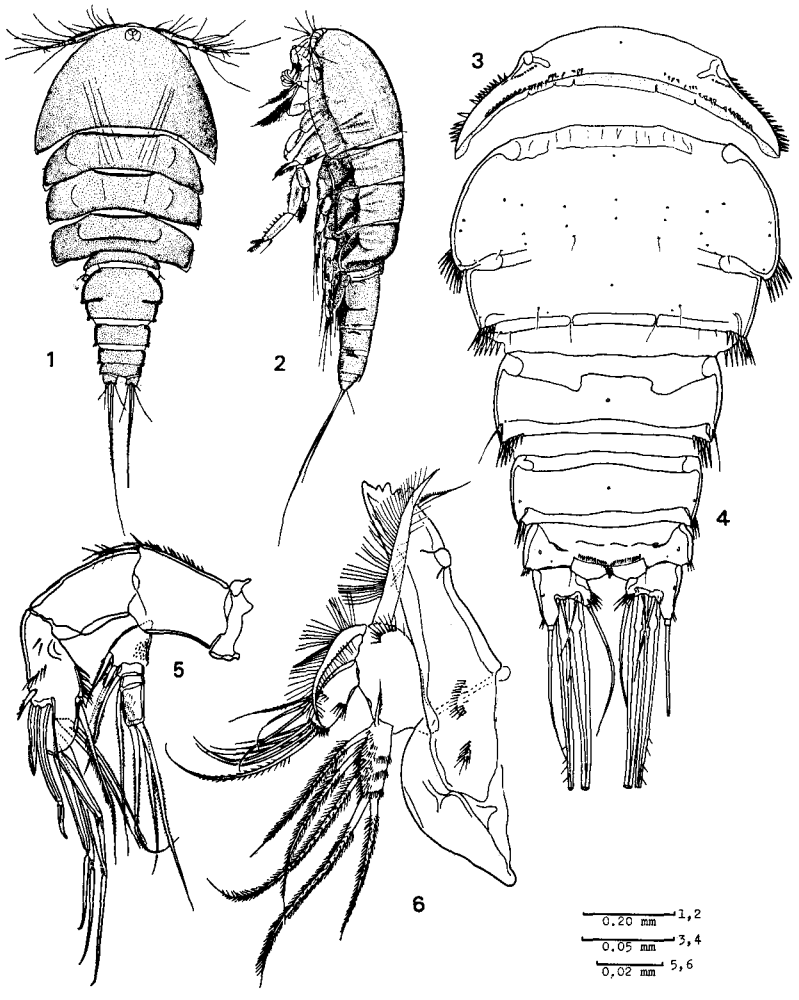

Fig. 57. *Scutellidium hippolytes akaba* n. subsp. Female (Holotype). 1. body, dorsal; 2. ditto, lateral; 3. fourth thoracic somite, dorsal; 4. abdomen, dorsal; 5. antenna; 6. mandible.

tapering behind. Genital double-somite clearly subdivided by a chitinous suture ventrally and laterally, with some spinules on each hind edge of lateral side; genital area (Fig. 58–6) furnished with a pair of three setae. Of each antepenultimate and penultimate abdominal somite, hind edge ornamented with some long spinules laterally and a number of small close spinules ventrally. Anal somite somewhat shorter than preceding somite, with a few spinules at both lateral sides

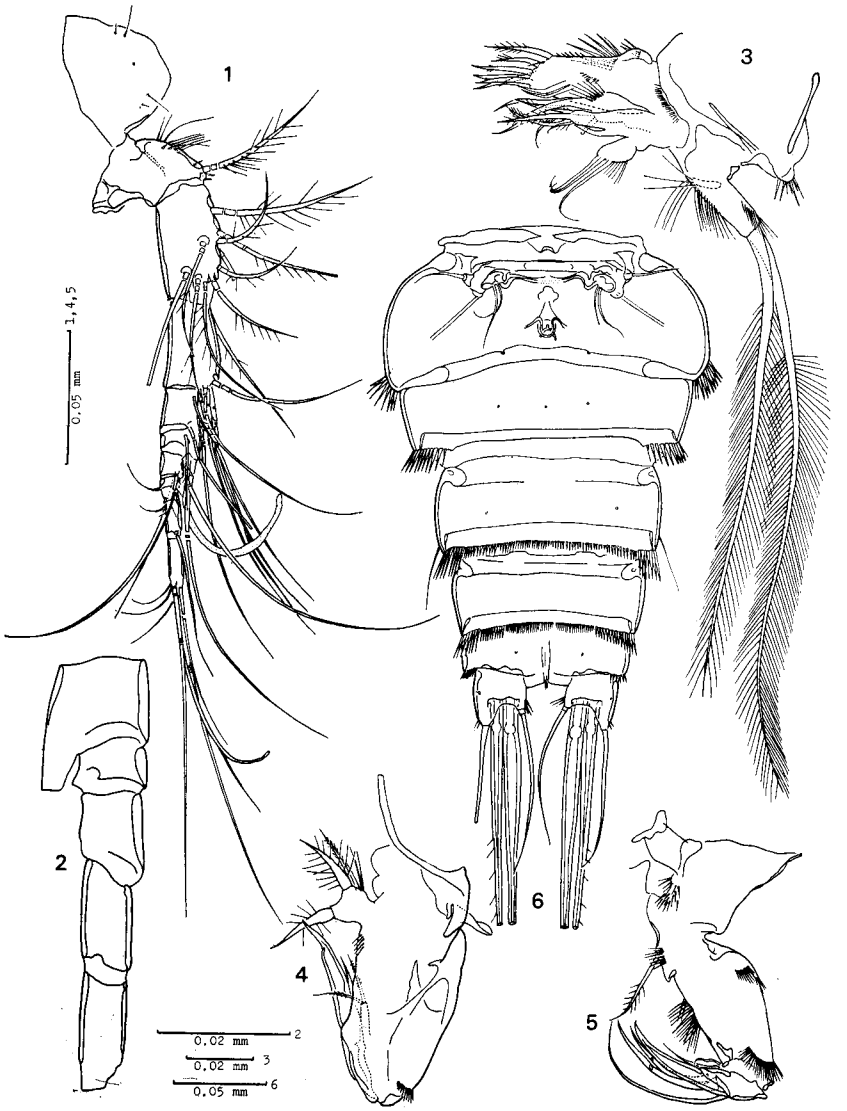

Fig. 58. *Scutellidium hippolytes akaba* n. subsp. Female (Holotype). 1. rostrum and antennule; 2. abnormal left antennule; 3. maxillula; 4. maxilla; 5. maxillipede; 6. abdomen, ventral.

of posterior end and some delicate spinules under an anal operculum. Furcal rami widely separated from each other, fairly protruded at outer part; a minor pit occurring at a midway of lateral edge (where no seta was detected); a pair of dorsal

seta arising from hind edge, in which inner one is basally geniculate. *Antennule* (Fig. 58–1) nine-segmented (left antennule in this specimen abnormally eight-segmented; see Fig. 58–2); first segment ornamented with some spinules and hairs on anterior side, and one spinulose seta, which is geniculate basally, on anterior side near distal border; second one with many setae anteriorly and dorsally, most of them spinulose; third one somewhat shorter than preceding segment, with some setae at anterior side near distal end; fourth segment, excluding aesthetasc-bearing process, about half as long as preceding one; fifth one short, of which a dorsal seta is apparently spinulose; sixth one somewhat longer than preceding one, bearing a spinulose seta dorsally; seventh one small, with a basally geniculate setula arising from posterior side; eighth one almost as long as preceding two segments combined; last one a little longer than preceding one. *Antenna* (Fig. 57–5). Coxa short and unornamented. Basis about 1.5 times as long as basal diameter, with a spinulose spiniform seta not extending beyond middle of first endopodite segment; anterior side spinulose. Exopodite four-segmented; first segment much thickened distally, with a number of minor spinules scattered on inner side and two finely spinulose setae on anterior side; second and third segments short, subequal in length, each furnished with a spinulose seta on anterior distal end; last segment about as long as first one, subcylindrical, terminating in three well developed setae, all spinulose, and with some fine spinules scattering at outer side. First endopodite segment approximately as long as basis, furnished with a setula at a point two-thirds the length of anterior side. Second endopodite segment somewhat longer than preceding segment, with a few spinules on subproximal inner side, an oblique spinular row on a midway of inner side, and some fine spinules along posterior edge; one stout spine of which distal half is pectinate, one fairly elongate spine which is geniculate at a point three-fourths the length, and a narrow but not so shortened seta, all closely attached on anterior side arranged as shown in figure; a short spinulose seta (spiniform seta ?) arising from a midway between a group of three appendices and an oblique spinular row, both described above; distal or subdistal edge furnished with one spine and three elongate spines, all geniculate midst, one bifurcate spinulose seta and one spinulose single seta. *Mandible* (Fig. 57–6). Praecoxa with some spinules as shown in figure. Coxa-basis well expanding distally, with an arched row of some narrow spinules near inner distal edge; an inner terminal seta thick, somewhat extending beyond inner end of praecoxa, sparsely hairy; a ventral terminal seta smaller than above mentioned seta, directed outwards and sparsely hairy. Both rami subequal in length. Endopodite furnished with three close setae, accompanied with a few spinules basally, on a midway of inner edge, terminating in six setae, one of them apparently spinulose and others maybe bare; some spinules occurring near distal end; a short transverse row of a few narrow spinules on a midway of outer side; Exopodite furnished with four inner setae, in which proximal one arises from a somewhat different plane and is shortest; distal end with two setae; all setae remarkably spinulose; a number of spinules scattered on various portions and some

of them arranged into short transverse rows. *Maxillula* (Fig. 58–3). Outer edge of praecoxa forming itself a semicircular protruberance furnished with a few narrow spinules. Arthrite of praecoxa gradually tapering terminally, with a row of a number of minor spinules on anterior side near base, three groups of spinules on dorsal edge, in which middle group consists of very elongate spinules, and a short row of some spinules on central area of anterior side; two parallel setae arising from anterior side; inner edge ornamented with at least five spines and two spinulose setae. Coxal inner process not extending beyond middle of arthrite of praecoxa, somewhat thickened distally, with a row of some narrow spinules on dorsodistal side, terminating in three setae; a short clubbed seta arising from a clear ledge on ventral side. Basal inner process somewhat longer than previous one, terminating in four more or less spinulose setae; one bar seta arising from ventral edge, without basal articulation. Endopodite small, furnished with three bare close setae and a few fine spinules. Exopodite rather cylindrical, directed outwards, terminating in two plumose well developed setae; ventral side hairy and distal half of dorsal side spinulose. *Maxilla* (Fig. 58–4). Praecoxa not so clearly demarcated from coxa; an endite thickened terminally, with two thick short setae, both are sparsely hairy, each on ventroterminal and dorsoterminal corner; one narrow seta and a few fine but fairly elongate spinules on dorsal edge. Coxa furnished with a row of some spinules on outer edge near distal end; an endite occurring at subdistal edge, cylindrical, terminating in two setulae. Basis forming itself a strong claw, which is of a constriction at a subdistal portion, accompanied with a short spiniform seta dorsally. *Maxillipede* (Fig. 58–5). Proximal segment scarcely demarcated from succeeding segment, with some spinules near intercoxal plate; an inner seta spinulose, basally accompanied with some fine spinules. First endopodite segment fringed with some delicate spinules along inner edge; outer side with two spinular rows each situating at subproximal and subdistal edge. Second endopodite segment short, furnished with one strong claw, two parallel elongate spines which are geniculate midst, one narrow simple seta which is much longer than previously mentioned claw and arises from ventral (outer) distal edge, and two setulae at dorsal (inner) edge.

Leg 1 (Fig. 59). Free edge of intercoxal plate scarcely concaved, with a few fine long spinules. Coxa and basis rather clearly demarcated from each other. Coxa fringed with some hair-like spinules along middle portion of outer margin; distal portion furnished with two vertical spinular rows each on posterior or anterior side near outer margin, spinules of anterior row narrower than those of posterior row; two separate rows of a number of spinules occurring on anterior side along distal border. Basis with some remarkable stout spinules around base of an outer seta which is not hairy but spinulose and as long as first exopodite segment, a row of some close spinules along distal edge near anterior side of exopodite base; protruded inner half moderately rounded along outer corner, fringed with a number of close spinules, an inner spine arising from a ledge, remarkably thickened and spinulose; inner distal corner furnished with some rigid spinules,

without any hair; maximum width 1.6 times as long as first exopodite segment. First exopodite segment remarkably widened distally; distal border fairly inclined; outer margin fringed with three groups of spinules, in which proximal group is somewhat separated from next one and consists of minute spinules, other two are continuous to each other (all the spinules in these rows are precisely reproduced in

Fig. 59. *Scutellidium hippolytes akaba* n. subsp. Female (Holotype). Leg 1.

the figure); some hair-like spinules (all not elongate rather than those in the next new species !) on posterior side near outer proximal edge; a vertical row of a number of hairs on anterior side; an outer spine almost as long as outer side of second exopodite segment, arising from outer distal corner, with some sharp remarkable spinules along its outer side and a few delicate spinules on subproximal portion of inner side. Second exopodite segment shorter than preceding segment, somewhat widened distally; inner side not so rounded; a well fimbriate outer spine arising from proximal outer border of anterior side, extending beyond distal end

of this segment, of which all hairs arise from anterior side near inner edge and are entirely directed outwards; an inner seta sparsely hairy, arising from subdistal corner. Third exopodite segment short, furnished with four fimbriate claws, of which hairs are directed outwards (hairs on inner three spines seemingly shortened due to their anteriorly directed orientation), one elongate seta on inner distal end and one small hairy seta arising from posterior side near middle inner edge. First endopodite segment approximately as long as three exopodite segments combined, about twice as long as its greatest width occurring at middle; outer margin almost straight, fringed with some (ten in the illustrated leg) narrow somewhat flexible spinules, which are extremely elongated in proximal ones and distally shortened, along proximal third the length; distal half of outer edge fringed with a row of some rather narrow cirri, which are clearly separated by a wide interspace from proximal spinular row described above; middle of inner edge remarkably protruded, forming itself a clear ledge where a long sparsely plumose seta occurs somewhat posteriorly; a few hairs attached onto most protruding rim of inner edge; a short row of some cirri obliquely arranged on anterior side near outer half of distal border. Second endopodite segment a little shorter than preceding segment, almost cylindrical; ten equally spaced spinules occurring along outer margin; an inner seta thick and rather short, arising from a deep ledge near distal end. Third endopodite segment small, furnished with a pair of inwards fimbriate claws, two hairy setulae arising from posterior side. *Leg 2* (Fig. 60–1). Coxa much wider than long; a short transverse row of a few minor spinules occurring on anterior side of inner portion; a remarkable spinular row, accompanied with a short row of a few spinules, on anterior side at median length near outer rim; subdistal portion of outer edge fringed with some rigid spinules; a few delicate spinules occurring at distal portion of outer edge; some narrow and elongate spinules arranged into a vertical row on posterior side near outer edge. Basis forming itself a rounded protuberance at distal end between both rami, with a hairy thick outer seta accompanied with some spinules near base; distal border with some fine spinules near base of endopodite; inner rim with some fine hairs. First exopodite segment distally thickened, ornamented with some rigid spinules and narrow cirri along outer edge, a few long hairs on posterior side near base of an outer spine; an inner seta sparsely plumose, not extending beyond last exopodite segment. Second exopodite segment narrower than preceding segment; some spinules and long hairs occurring on and near outer margin; an outer spine stout, finely spinulose, accompanied with some spinules near base; an inner seta arising from distal inner corner. Third exopodite segment about 1.5 times as long as preceding one; first outer spine finely spinulose and other two outer spines remarkably spinulose, rather lanceolate; interspace between second and third outer spines a little longer than that between first and second ones; an outer terminal elongate spine fairly rigid, 1.4 times as long as this segment; an inner terminal and two inner setae sparsely plumose, without any spinule; a delicate comb-like spinular row on anterior side close to second inner seta; first inner seta occurring at just opposite side of

first outer spine. Endopodite a little longer than exopodite, not so thickened rather than those in succeeding two legs. First endopodite segment gradually widened distally, pointed at outer distal corner, fringed with two continuous rows of 16 narrow spinules along outer margin; a seta arising from inner edge near distal end. Second endopodite segment about 1.5 times as long as greatest width, fringed

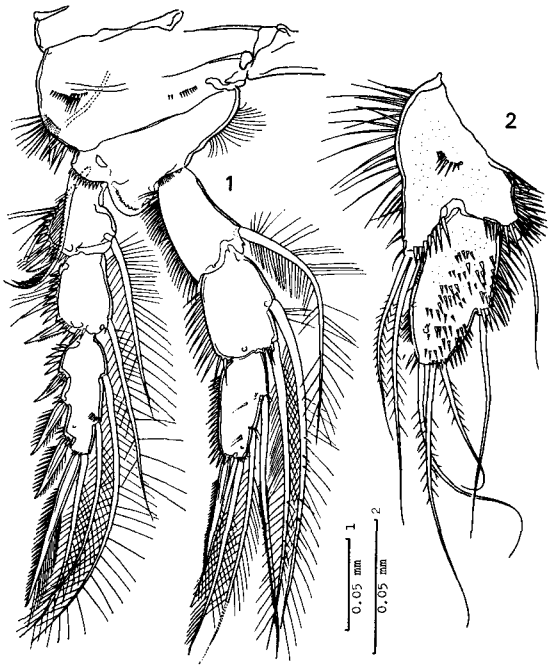

Fig. 60. *Scutellidium hippolytes akaba* n. subsp. Female (Holotype). 1. leg 2; 2. leg 5.

with some (12 in the illustrated leg) rigid elongate spinules along outer margin; in two inner setae, first one arising from a midway and second one from distal corner, both plumose but with some scattering spinules; a few spinules on distal border near outer edge. Third endopodite segment gradually tapering distally, with some (16 in the illustrated leg) spinules along outer margin; an outer spine situating at almost same level of a pair of terminal setae, spinulose; first inner seta rather rigid, finely spinulose; second inner seta plumose; one and two spinules attached onto posterior side near base of each inner seta. *Leg 3* (Fig. 61–1). Of coxa spinules on outer side fewer than in preceding leg; inner portion of anterior side lacking in a transverse spinular row. Basis furnished with an outer seta which is narrow and bare; a rounded protuberance between both rami not so remarkable rather than that in preceding leg; otherwise as in figure. First exopodite segment somewhat elongate, without any cirrus; third segment about 1.6 times as long as

preceding segment, with three equally spaced inner setae. First endopodite segment with two spinular groups, each consisting of 10 and seven spinules (11 and eight in the other leg); second segment with 11 (10 in the other leg) stout spinules along outer margin, with one inner seta which is sparsely plumose and without any spinule; third segment about 1.7 times as long as preceding segment, gradually tapering distally, ornamented with 15 (18 in the other leg) spinules along outer

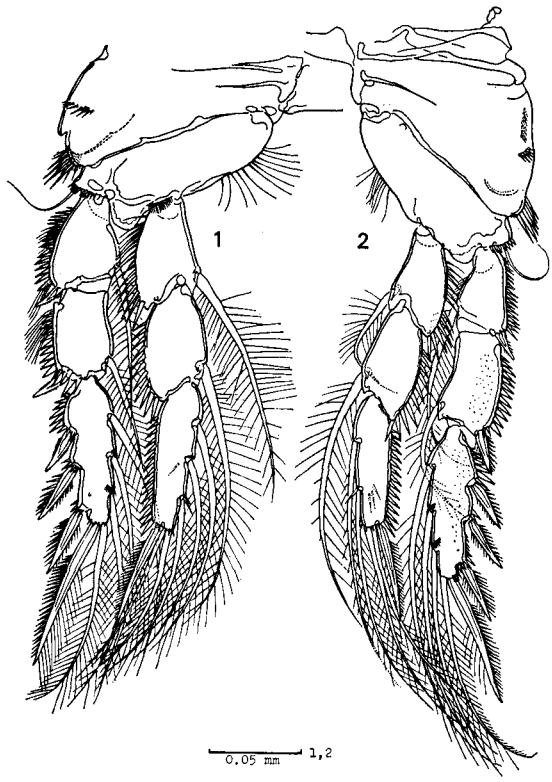

Fig. 61. *Scutellidium hippolytes akaba* n. subsp. Female (Holotype). 1. leg 3; 2. leg 4.

margin, three inner marginal setae, all plumose and without any spinule; otherwise as shown in figure. *Leg 4* (Fig. 61–2). Coxa more developed rather than in preceding two legs; a vertical row of some spinules on posterior side near outer edge; no spinular row occurring at anterior side of inner portion. Basis with a bare narrow outer seta; a protuberance between both rami somewhat reduced; no spinular row occurring at anterrior side near base of endopodite. Border between coxa and basis remarkably inclined. Exopodite longer than endopodite; first segment with some spinules along inner edge; no any hair on posterior side near

distal outer corner; of second and third segments, each posterior side with some scattering hairs, outer spines well spinulose, rather lanceolate; last segment bearing three equally spaced inner setae. First endopodite segment fringed with two spinular groups, each consisting of seven and six spinules, along outer margin; second segment somewhat longer than preceding one, with 10 stout spinules along outer margin; third segment about as long as preceding one, with 15 spinules outwards, three spinules on posterior side near base of second inner seta; two separate inner setae occurring; otherwise as in figure. *Leg 5* (Fig. 60–2). Baseoendopodite fringed with some narrow, rather flexible long spinules along outer margin including inner expansion; an arched row of some spinules, marked by a pore at its outer end, occurring at almost center of anterior side; inner expansion reaching to third the length of exopodite segment, tapering distally, ending in a flat edge with two well developed, sparsely spinulose setae and a setula which arises from outer corner; some rigid spinules occurring on anterior side along outer edge of inner expansion; an outer seta bare, arising from a short cylindrical process; outer rim remarkably spinulose. Exopodite about twice as long as wide; inner margin clearly interrupted by a deep ledge at a somewhat distal portion from just middle, where a bare seta occurring; distal half gradually tapering apically, ending in three well developed spinulose setae, in which innermost one situates terminally and other two subterminally; most area of anterior side covered with some roughly arranged spinular rows; each distal half of both edges spinulose; proximal half of outer edge with some elongate spinules.

Male. Body (Figs. 62–1, 2) at least 0.51 mm long (this specimen maybe somewhat shrunk), tinctured with very pale reddish purple, semitransparent. Second, third and fourth abdominal somites (Figs. 62–4) each hind edge fringed with considerable number of rigid spinules ventrally and laterally. *Antennule* (Fig. 62–3) haplocer, with some spinulose setae on first several segments; main aesthetasc extremely thickened; otherwise as in figure. Other prethoracic appendanges as in female.

Leg 1. Orientation of fimbriate outer spines on distal two exopodite segments entirely as in female. *Leg 2, leg 3* and *leg 4.* No spinular row occurring on inner portion of coxal anterior side of leg 3 and leg 4. Of coxal posterior side of leg 4 a vertical spinular row extremely elongated, extending to near distal border. *Leg 5* (Fig. 62–4). Baseoendopodite partially defined at base, with some spinules scattering on anterior side of inner portion. Endopodite represented by a short, but well defined segment with one spinulose seta on distal end and a setula on subdistal outer edge. Exopodite about twice as long as wide, furnished with one bare narrow seta on a midway of outer edge, one stout spinulose seta on outer edge near distal end, two spinulose setae each on and near distal end, and one setula on middle inner edge. *Leg 6* (Fig. 62–4) represented by a broad plate furnished with one spinulose spiniform seta and two bare small setae.

Remarks. The present new subspecies differs from *Sc. hippolytes* (Kröyer,

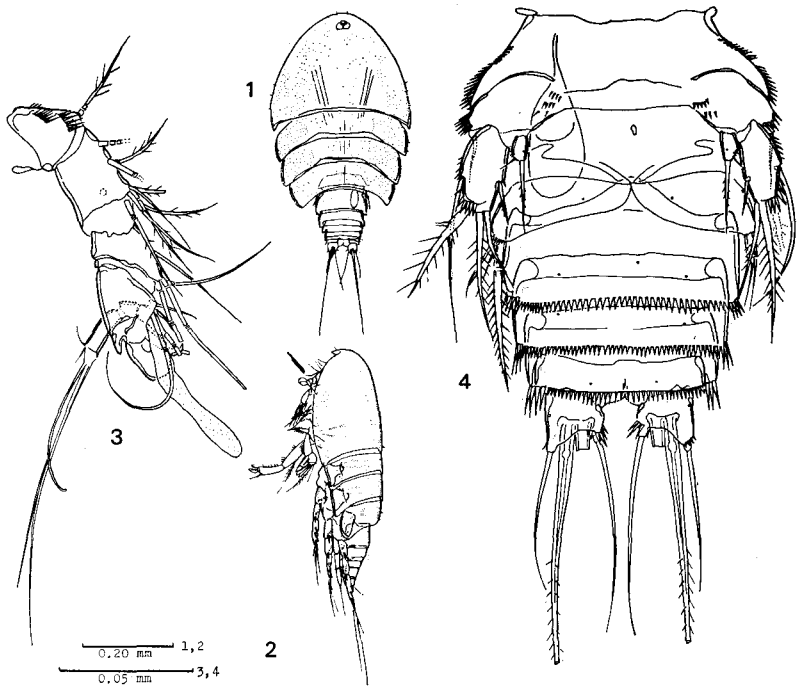

Fig. 62. *Scutellidium hippolytes akaba* n. subsp. Male (Allotype). 1. body, dorsal; 2. ditto, lateral; 3. antennule; 4. leg 5 and abdomen, ventral.

1863) s. str. reported from several European coasts in the following respects; the coloration (see Sars, 1905), the spinules along proximal portion of the first exopodite segment of leg 1 not so elongated, the inner seta of the second endopodite segment of leg 1 more distally situated. These three respects would be also available for valuable characters to discern this new subspecies of *Sc. hippolytes* from the new species succeedingly described. While some problematic structures are noticed in the present new subspecies in comparison to the previous record of *Sc. hippolytes*, they are discussed in the remarks for the following new species who is in closest relation to *Sc. hippolytes* within the genus.

Specimens examined. Holotype; female. Allotype; male. Paratype; a female. All the specimens were collected from Muroran by rinsing a few blades of a brown alga, *Neodilsea yendoana* Tokida (28-VI-1975, Sh. Hiruta leg.).

The subspecies name, *akaba*, alludes the Japanese name of *Neodilsea yendoana*.

Scutellidium boreale n. sp.

(Figs. 63–70)

? Synonym. *Scutellidium hippolytes* (Kröyer): Lang, 1965, p. 152, figs. 82–83.

Female. Body (Figs. 63–1, 2; see Fig. 63–3) about 0.95 mm long, 0.46 mm in greatest width at posterior end of cephalothorax, apparently more depressed dorso-ventrally rather than in *Sc. hippolytes akaba* (in the following text, this subspecies is represented by an abbreviated name, *akaba*). Proximal somites camouflaged with very complicated patterns of both deep or pale reddish purple; dorsolateral and ventral surface of anterior subdivision of genital double-somite, excluding genital area, ventral side of antepenultimate somite and whole surface of penultimate somite tinctured with deep reddish purple; otherwise colorless and semitransparent. An egg sac blue. Rostrum (Fig. 64–1) not so conspicuous, bearing two pairs of sensory hairs. Cephalothorax much wider than long, about as long as succeeding three thoracic somites combined. Of dorsal end of first three somites each hyaline membrane well developed and clearly rising. Fourth free thoracic somite (Fig. 65–2) ornamented with a number of rigid spinules laterally and some spinular rows dorsally and posteriorly. Genital double-somite (Figs. 65–1, 2) subdivided by a chitinous suture laterally and ventrally, with some spinules on lateral end of anterior subdivision; hind edge fringed with some spinules laterally and dorsolaterally; some pores and hairs scattered on dorsal side; a pair of three setulae occurring on gential area. Of antepenultimate and penultimate abdominal somites each hind edge fringed with some stout spinules on lateral side and smaller ones on ventral side, those of ventral side fairly sparse and grosser than those in *akaba*. Of furcal ramus, outer protruding end remarkable; of dorsal setae, inner one basally geniculate and somewhat hairy; otherwise as in *akaba*. *Anntennule* (Fig. 58—1); spinulose setae precisely detected at first four segments; sixth segment not longer than fifth one (but see p. 526); last segment fairly longer than preceding one; otherwise as in *akaba*. *Antenna* (Fig. 64–2). First exopodite segment without any spinule. Posterior side of second endopodite segment densely hairy (see Fig. 64–3). Shape and ornamentation otherwise almost as in *akaba*. *Mandible* (Fig. 64–4). Praecoxa ornamented with some very minute spinules near base of coxa-basis. Inner dorsal edge of coxa-basis fringed with some hairs. Endopodite ornamented as in figure (Fig. 64–5). Of exopodite proximal seta arising from posterior side as in *akaba*. Shape and ornamentation otherwise almost same as in *akaba*. *Maxillula* (Figs. 66–1, 2) ornamented as in *akaba*. *Maxilla* (Fig. 66–3). Praecoxa indistinctly demarcated from coxa; endite furnished with two well developed, sparsely hairy setae and a bare seta. Basis with a diminutive hair on its midway. Ornamentation otherwise as in *akaba*. *Maxillipede* (Fig. 66–4). Proximal segment without any spinule near intercoxal plate. First endopodite segment without any spinule along inner margin (corresponding part of the other maxillipede with some delicate hairs); spinules on outer side smaller and fewer than in *akaba*. Elongate

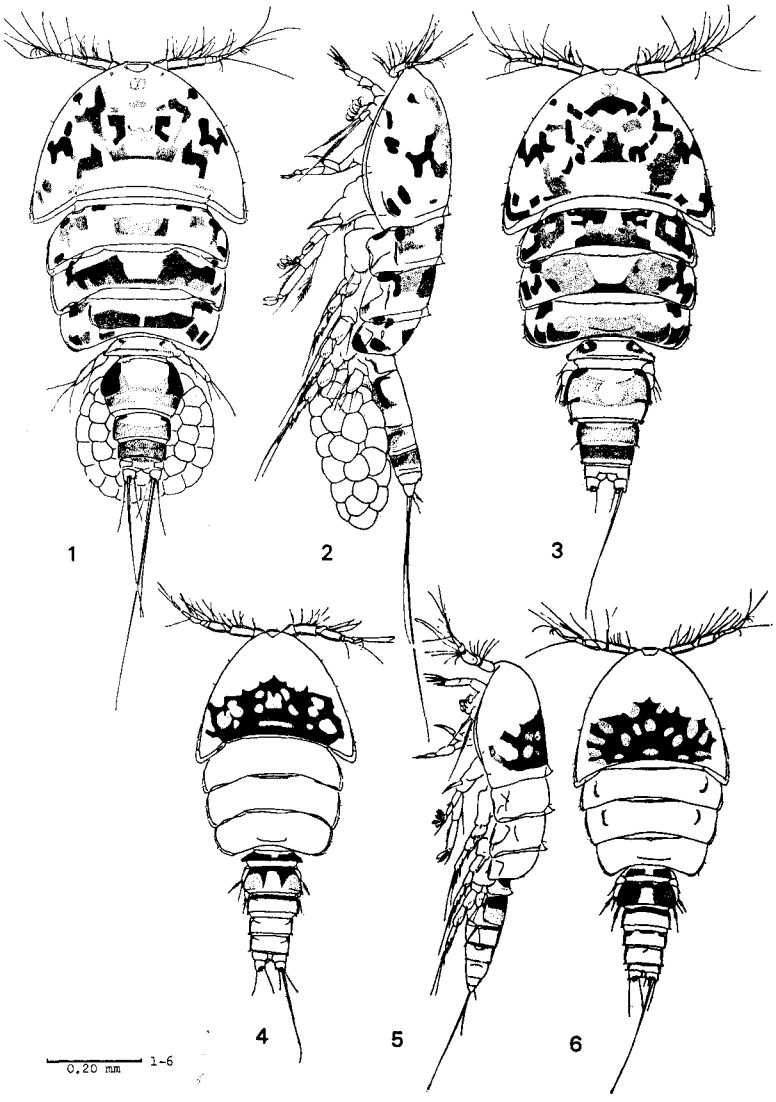

Fig. 63. *Scutellidium boreale* n. sp. Female (1, 2, holotype; 3, paratype). 1. body, dorsal; 2. ditto, lateral; 3. ditto, dorsal. Male (4, 5, allotype; 6, paratype). 4. body, dorsal; 5. ditto, lateral; 6. ditto, dorsal.

seta of apical segment about 1.5 times as long as terminal claw. Ornamentation otherwise as in *akaba*.

Leg 1 (Fig. 67). Free edge of intercoxal plate somewhat concaved, hairy;

Fig. 64. *Scutellidium boreale* n. sp. Female (Holotype). 1. rostrum and antennule; 2. antenna; 3. distal part of antenna; 4. mandible; 5. mandibular endopodite.

some elongate spinules occurring on anterior side. Coxa and basis big and widened (width of basis 1.8 times as long as first endopodite segment). On coxal anterior side, a transverse spinular row near distal border quite remarkable, a short row of some fine hairs at outer subproximal portion, a vertical row of some delicate hairs near outer edge of proximal half, another vertical row of some narrow, extremely elongate spinules near outer edge of distal half. Inner edge of basis ornamented with some hairs together with rigid spinules. Of first exopodite segment,

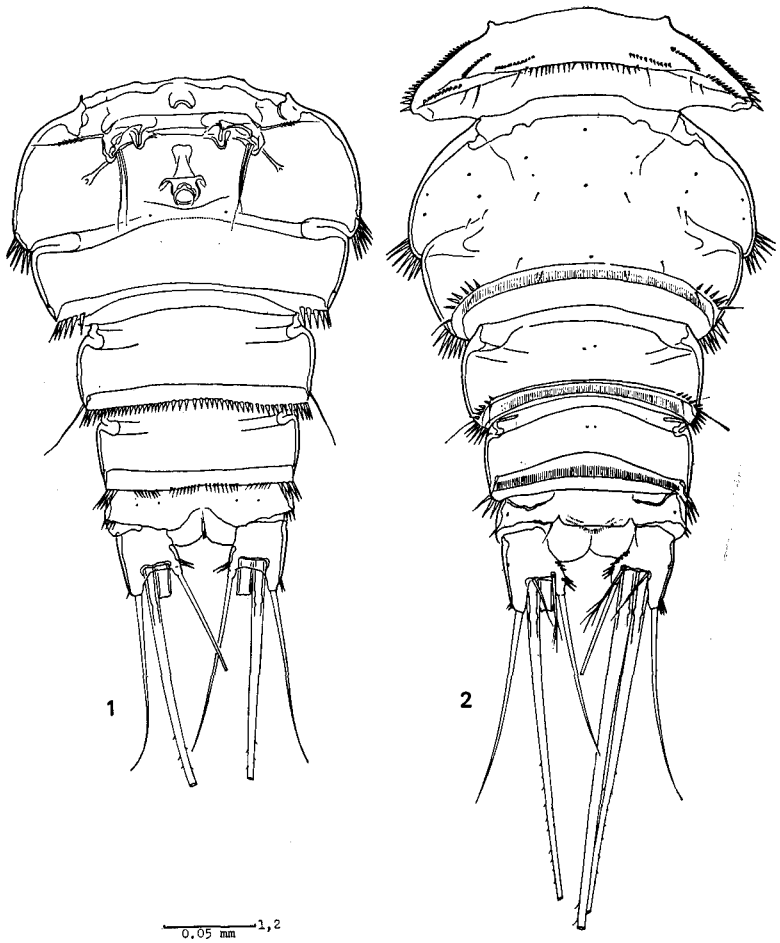

Fig. 65. *Scutellidium boreale* n. sp. Female (Holotype). 1. abdomen, ventral; 2. fourth thoracic somite and abdomen, dorsal.

proximal third outer edge fringed with some (12 in the illustrated leg) extremely elongated, rather rigid hairs; distal border remarkably inclined. Second exopodite segment much widened rather than in *akaba*, furnished with one strong fimbriate outer spine which arises from anterior side (not outer edge !) somewhat inside outer edge near base, and its hairs entirely directed inwards and more sparse; inner rim moderately rounded and outer rim almost straight. Of last exopodite segment, four spines well developed, all sparsely fimbriate at each inner side and hairs entirely directed inwards; a terminal seta thick and stout; an inner seta small and somewhat plumose. Of first endopodite segment, proximal row of spinules, which are not elongate, on outer side reaching to a midway and a row of

Fig. 66. *Scutellidium boreale* n. sp. Female (Holotype). 1. maxillula; 2. ditto; 3. maxilla; 4. maxillipede.

cirri along outer side arising from a point a third the length, therefore both rows of spinules and cirri partially overlapped to each other; several proximal hairs of an inner seta apparently spatulate. Of second endopodite segment, an inner seta arising from a point three-fourths the length, thick and spinulose. Of last endopodite segment both spines sparsely fimbriate. Shape and principal ornamentation

otherwise as in *akaba*. *Leg 2* (Fig. 68–1). On coxal anterior side, a remarkable transverse row of a number of spinules occurring on inner half near distal border; spinules constituting double arched rows rather smaller (a shorter row omitted in the figure). Of last exopodite segment, each interspace between distal two outer spines and two inner setae a little wider than in *akaba* (but not so clear). Other

Fig. 67. *Scutellidium boreale* n. sp. Female (Holotype). Leg 1.

principal ornamentation as in *akaba*, except for minor difference of marginal spinules (these are precesely reproduced in the figure). *Leg 3* (Fig. 68–2). Basal segments big. On anterior side of coxa an arched row of some minor spinules occurring at subproximal portion near outer edge; a quite remarkable transverse row of a number of spinules on inner half near distal border. An outer seta of basis well developed. On posterior side of last endopodite segment a few spinules

occurring near each base of three inner setae as shown in figure. Of last endopodite segment, middle inner seta with some spinules. Principal ornamentation otherwise as in *akaba*. *Leg 4* (Fig. 69–1). Coxa without any vertical spinular row on posterior side, but with a remarkable transverse row of a number of spinules on inner half near distal border of anterior side as in leg 2 and leg 3. An outer seta of basis sparsely plumose. Principal ornamentation as in *akaba*. *Leg 5* (Fig. 69–2,

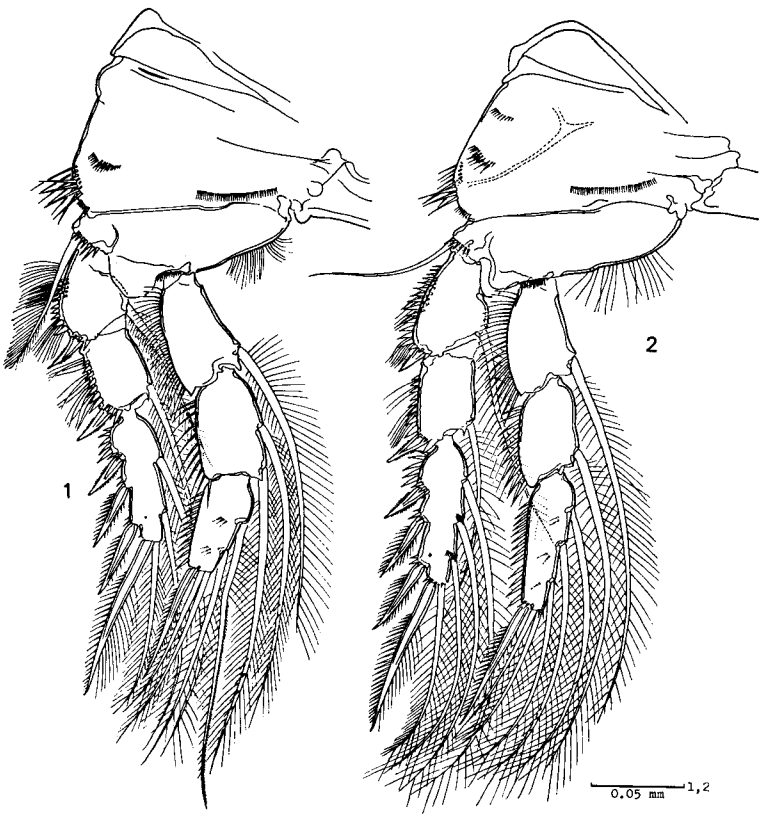

Fig. 68. *Scutellidium boreale* n. sp. Female (Holotype). 1. leg 2; 2. leg 3.

see also Fig. 69–3 based upon a paratype). Shape of baseoendopodite as well as exopodite almost as in *akaba*. A pore and an arched spinular row of anterior side of baseoendopodite segment far separated vertically from each other; spinules around near base of outer seta stout. Spinules on anterior side of exopodite somewhat weaker than those in *akaba*.

Male. Body (Figs. 63–4, 5; see also Fig. 63–6) 0.72 mm. Cephalothorax with a remarkable transverse band, of which anterior or lateral border is roughly

serrate, tinctured with reddish purple. Of fourth free thoracic and first two abdominal somites each dorsal side tinctured with reddish purple in a particular pattern as shown in figure. Of dorsal end of first three somites each hyaline membrane apparently rising. Of abdomen (Figs. 70–2, 3) first somite ornamented with a few spinules on posterior end of each lateral side; second and third somites with some stout spinules on posterior edge of each lateral side; second to fourth somites each ventral hind edge fringed with a number of spinules; otherwise as in female. *Antennule* (Fig. 70–1) haplocer; at least first five segments with more or less spinulose setae; a main aesthetasc very strong. Other prethoracic appendages as in female.

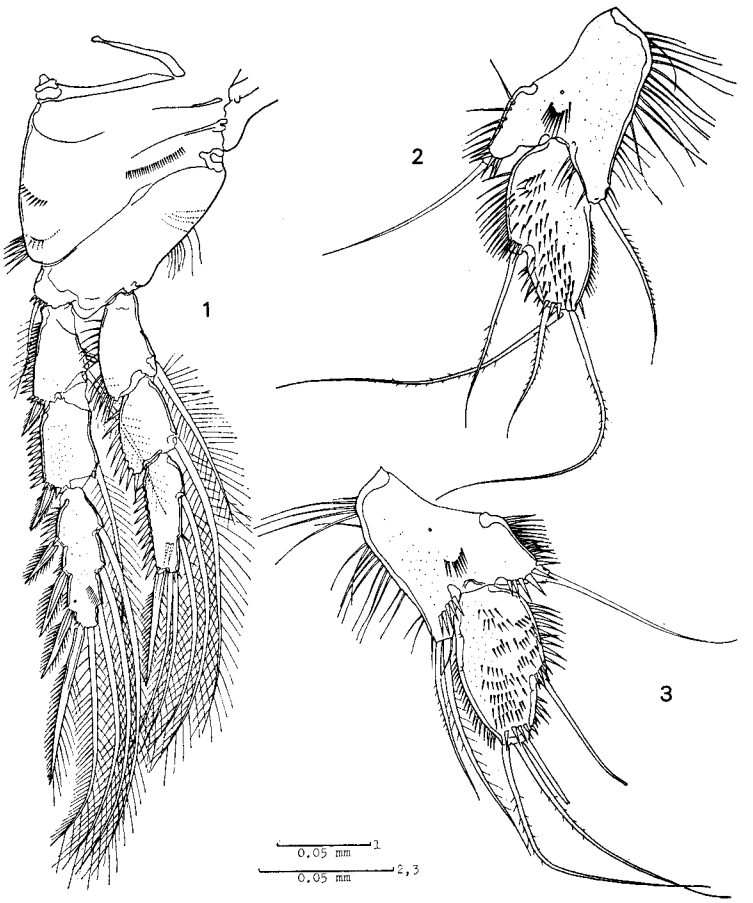

Fig. 69. *Scutellidium boreale* n. sp. Female (1, 2, holotype; 3, paratype). 1. leg 4; 2. leg 5; 3. ditto.

First four thoracic legs almost as in female. Transverse spinular row of coxal anterior side in each leg 2, leg 3 and leg 4 quite remarkable. *Leg 5* (Fig. 70–2). Proximal segment partially defined at base, furnished with some scattering spinular rows on inner half of anterior side. Endopodite represented by a small segment, which is clearly defined at base, terminating in a spinulose seta and with a setula on outer distal corner. Of exopodite segment posterior side fairly spinulose especially at outer half; five setae in all ocurring; an inner subterminal seta entirely bare. *Leg 6* (Fig. 70–2) ornamented as in *akaba*.

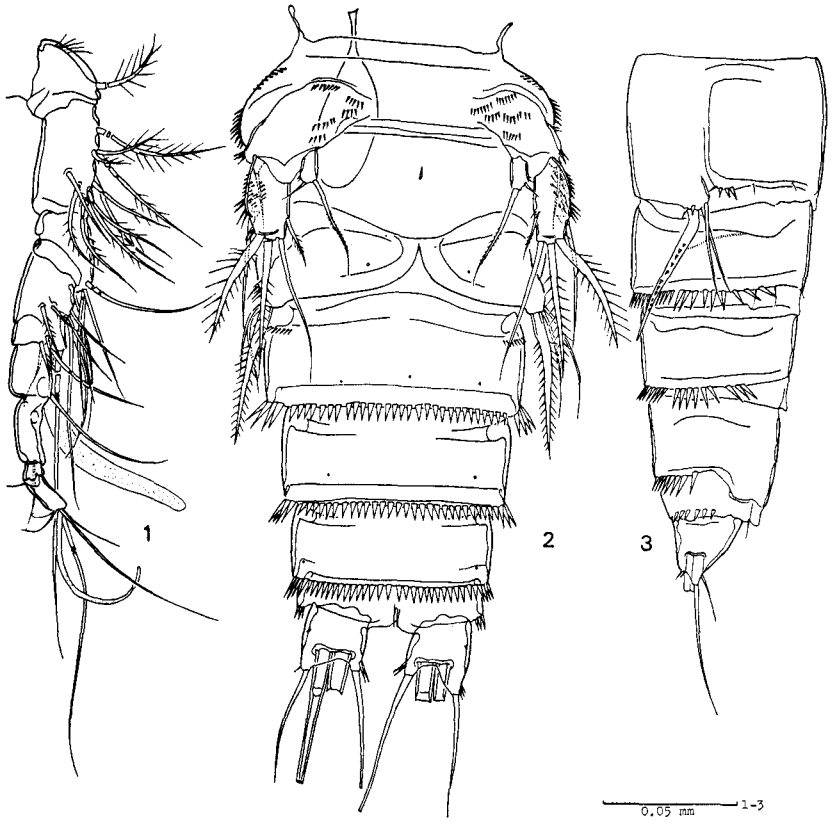

Fig. 70. *Scutellidium boreale* n. sp. Male (Allotype). 1. antennule; 2. leg 5 and abdomen, ventral; 3. abdomen, lateral.

Variability. In the females exmained, the maximum body length measured 1.00 mm in a paratypic specimen from Muroran. The shape and distribution of colored patches on thoracic somites in the female is quite variable. While a number of specimens (undissected) were observed, it seems to be entirely unable to

distinguish any particular forms among them, because they were individually different in various ways. Entirely colorless specimen was not detected in both sexes.

Remarks. As previously mentioned (p. 533), *Sc. hippolytes akaba* is discernible from the present new species in the three respects as follows; the coloration, the spinules along proximal portion of the first exopodite segment of leg 1 not so elongated, the inner seta of the second endopodite segment of leg 1 more distally situated. Adding to these characteristics, more conspicuous differences are easily detected between them. The body of *Sc. hippolytes akaba* is seemingly more compact than in *Sc. boreale* in the total appearance, especially of females. The body of the female in *Sc. boreale* is more widened and flattened dorsoventrally. In *Sc. boreale,* the hyaline membrane of each posterior dorsal side of first three somites clearly rises, whilst the corresponding membrane in *akaba* does not rise, but holizontally stretched. Moreover *Sc. boreale* is distinguishable from *akaba* in the following characteristics; the first exopodite segment of antenna without any spinule, the spines of distal two exopodite sgments of leg 1 inwards fimbirate, the inner portion of anterior side of each coxa in leg 2 as well as succeeding two legs ornamented with a well lengthened transverse row of a number of spinules, and further, the arched row of spinules and the pore on anterior side of baseoendopodite of leg 5 in the female widely separated from each other. Among these characteristics, the most important one safely detectable in *Sc. hippolytes hippolytes* would be the situation of the fimbriate spines of the exopodite of leg 1. The figures of leg 1 and an outer spine by Sars (1905) for *Sc. minor* (=*Sc. hippolytes* s. str., identified by Lang, 1936, p. 35, based upon the type materials of both the species) clearly show the spines are fimbriate along each the outer side and their hairs are entirely directed outwards. Such the situation of those fimbriate spines is quite identical with that found in *Sc. hippolytes akaba.* In this connection, *Sc. hippolytes* reported from California by Lang (1965) approaches to *Sc. boreale* in not only the fimbriate spines of leg 1, but also the widened shape of the middle exopodite segment of leg 1, the antennal first exopodite segment without any spinule and the situation of the inner seta of middle endopodite segment of leg 1, though some other important characteristics of the Lang's species, such as the condition of each the hyaline membrane of the first three somites and coloration, are still incertitude.

On the other hand, the present new species is somewhat larger than *Sc. hippolytes* s. l., because the body length is 0.95 mm or more in the female and 0.72 mm in the male in *Sc. boreale* described, whilst 0.65 mm in the female (Sars, 1905) and 0.53 mm (Lang, 1936), 0.44 mm (Mielke, 1974) and 0.45–0.54 mm (Tschislenko, 1967) in the male of *Sc. hippolytes hippolytes* (the subspecific identification for the last two authors' species is assumptive), and 0.77 mm in the female and more than 0.51 mm in the male of *Sc. hippolytes akaba.* Incidentally, *Sc. hippolytes* sensu Lang (1965) is about 0.72 mm long in the female which was estimated from his figure since the body length was not described by him.

In both the two species, *Sc. hippolytes akaba* and *Sc. boreale*, the male has the well defined endopodite segment on the fifth pair of thoracic legs. This structure is detected also in *Sc. hippolytes* reported from the White Sea by Tschislenko (1967), though no distinct endopodite segment was noticed in the same species from Kristineberg by Lang (1936) and Spitzbergen by Mielke (1974), and also in all the other congeneric species reported in the present paper and hitherto known.

Specimens exmained. Holotype; female. Allotype; male. Paratypes; two pairs of sexes from Akkeshi, and a pair of sexes from Muroran. The holotype and allotype as well as the paratypic specimens from Akkeshi were selected from a number of individuals collected from Aikappu, Akkeshi, by rinsing coarse sands and pebbles of the intertidal zone (15–VII–1973, T. Itô leg.). The paratypic specimens from Muroran were collected by rinsing a few blades of *Neodilsea yendoana* Tokida (28–IV–1975, Sh. Hiruta leg.).

The trivial name alludes the boreal occurrence of the species which seems, in most probability, to be distributed in the northern North Pacific.

Scutellidium longicauda (Philippi) *acheloides* n. subsp.

(Figs. 71–78)

Female. Four different forms of coloration were recognized. Form-FRP (fore-body reddish purple: Figs. 71–1, 2): dorsal side of cephalothorax with a broad transverse stripe which is reddish purple; first three free thoracic somites tinctured with pale reddish purple and color posteriorly darkened; metasome very obscurely tinctured with reddish brown or reddish purple. Form-TRP (totally reddish purple; Figs. 71–3, 4); dorsal side of cephalothorax with a relatively narrow transverse stripe of reddish purple; succeeding three thoracic somites pale reddish purple; genital double-somite and succeeding two abdominal somites tinctured with rather clear reddish purple. Form-TCL (thorax colorless: Figs. 71–5, 6); first three free thoracic somites colorless, otherwise as in TRP (a pair of spots on cephalothorax are found in the illustrated specimen, but these are not always usual). Form-YB (yellowish brown: Figs. 71–7, 8); body totally pale yellowish brown; posterior rim of third free thoracic somite tinctured with somewhat dark brown. In all the forms described, most of the appendages are tinctured with yellow or very light brown. The reddish purple color in various body parts is sometimes changed into rather brownish or opaque reddish purple. The following description is based upon a specimen of FRP which would be designated as the holotype.

Body (Figs. 71–1, 2) not so flattened dorsoventrally, about 0.88 mm long, 0.39 mm in greatest width in cephalothorax which is somewhat longer than succeeding three thoracic somites combined. Rostrum (Fig. 73–1) with two pairs of sensilae on dorsal side and a number of fine hairs along anterior edge. Of dorsal hind edge of first three somites each hyaline membrane not rising, but entirely directed posteriorly. Fourth free thoracic somite ornamented with an oblique row of some minute spinules on both lateral sides, fringed with a number of spinules and a few hairs along hind dorsal edge. Abdomen (Figs. 72–1, 2, 3) gradually

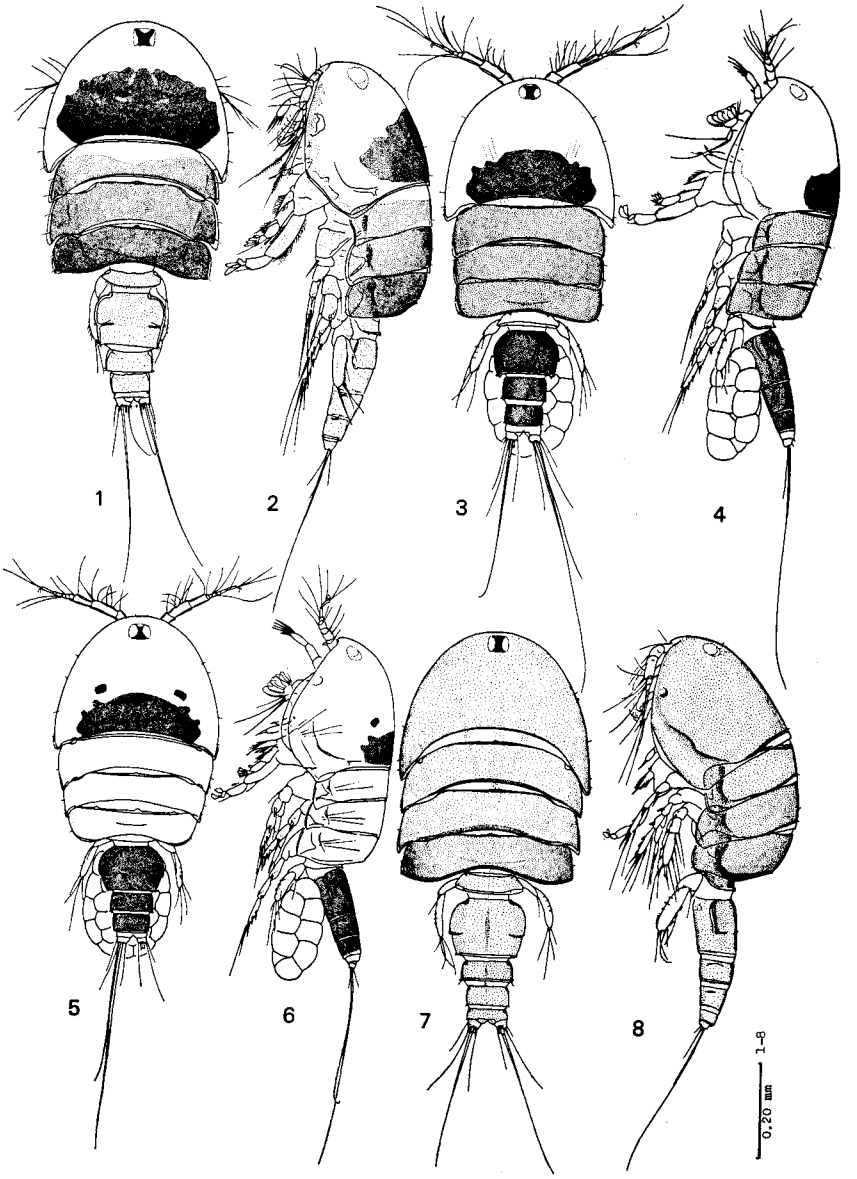

Fig. 71. *Scutellidium longicauda acheloides* n. subsp. Female (1, 2, holotype; 3–8, paratypes). 1, 2. body, dorsal and lateral (FRP); 3, 4. ditto (TRP); 5, 6. ditto (TCL); 7, 8. ditto (YB).

tapering behind. Gential double-somite subdivided by a chitinous suture ventrally and laterally; on both lateral extremities of genital area, three diminutive setulae occurring; each lateral hind edge of both subdivisions furnished with some spinules. Of antepenultimate and penultimate abdominal somites each ventral hind edge fringed with extremely fine spinules (scarcely visible even in ×2000, see Fig. 72–4) accompanied with a same fine fiber in each (internal structure of cuticle ?); each lateral hind edge somewhat spinulose. Anal somite deeply bipartite, with a setula arising from a small cylindrical process attached near each dorsal base of furcal ramus. Furcal ramus not so shortened, a little wider than long; a well developed seta arising from a midway of outer side and dorsal side of somewhat

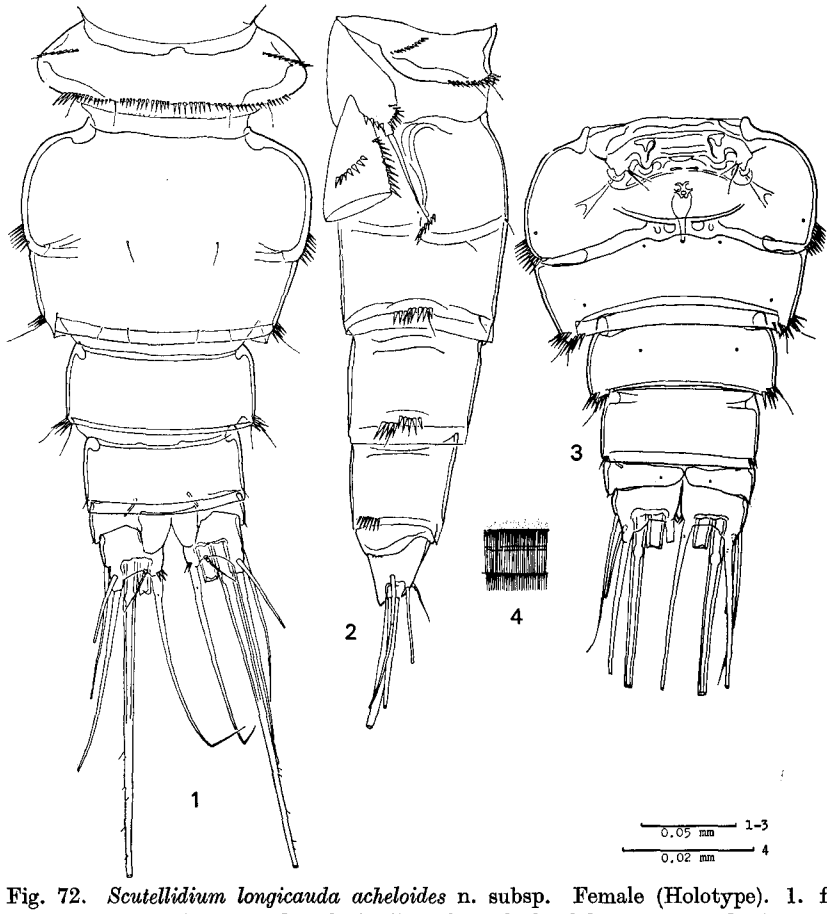

Fig. 72. *Scutellidium longicauda acheloides* n. subsp. Female (Holotype). 1. fourth thoracic somite and abdomen, dorsal; 2. ditto, lateral; 3. abdomen, ventral; 4. a part of ventral hyaline membrane of first free abdominal somite.

protruding part at outer end; a dorsal setula basally geniculate; otherwise as in figure. *Antennule* (Fig. 73–1) eight-segmented, rather slender in appearance; cuticle of each segment not thickened, rather moderate; first segment furnished with a spinular row on anterior side and a sparsely spinulose seta, of which basal part is clearly geniculate, on distal portion of anterior side; second one about 1.8 times as long as third, with some setae anteriorly and dorsally, some of them spinulose; third one much setose at anterodistal corner; fourth one small, anteriorly

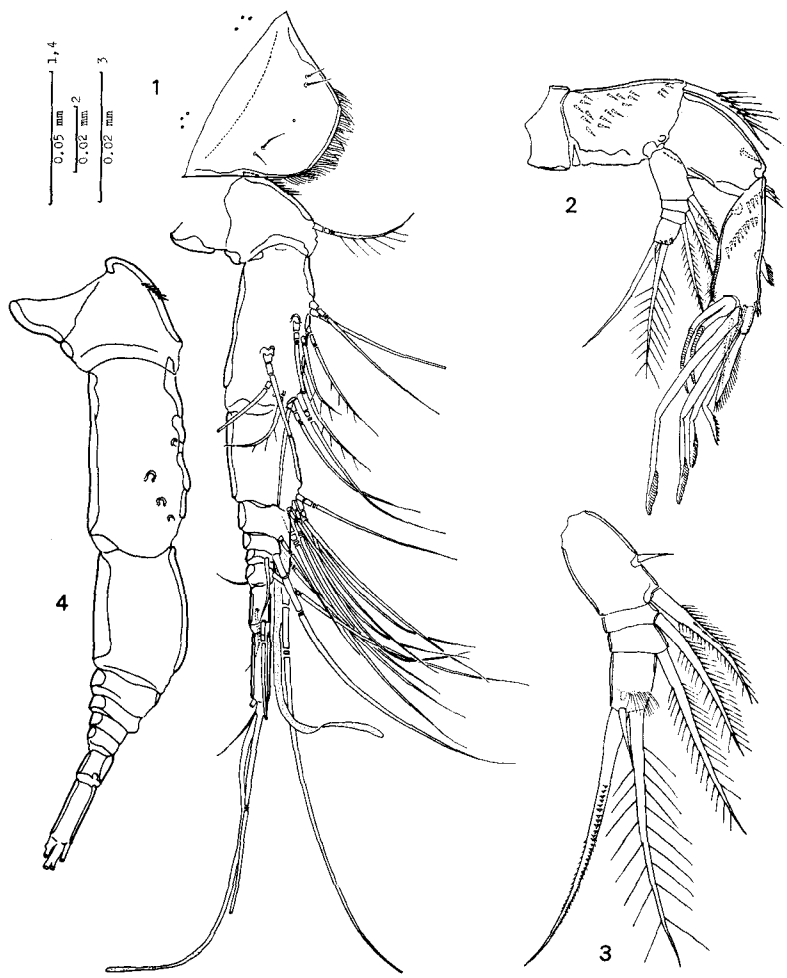

Fig. 73. *Scutellidium longicauda acheloides* n. subsp. Female (Holotype). 1. rostrum and antennule; 2. antenna; 3. antennal exopodite. *Scutellidium longicauda longicauda* (explanation see text). 4. antennule.

forming itself a cylindrical process terminating in a narrow aesthetasc; fifth, sixth and seventh ones small, through them gradually tapering distally; eighth one not so shorter than preceding three segments combined; last one about 1.7 times as long as previous one, cylindrical, terminating in a very narrow and elongate aesthetasc together with a few setae. *Antenna* (Fig. 73–2). Coxa short and unornamented. Basis about 1.5 times as long as diameter, with some scattering spinules on anterior side; a remarkably spinulose, stout seta, which is almost as long as first endopodite segment, occurring at anterodistal corner. Exopodite clearly four-segmented; first segment longest, furnished with a bare short seta on a point about two-thirds the length; three spinulose setae of an equal length, each arising from each distal corner of first three segments; second and third segments short and subequal in length; last one about as long as preceding two combined, terminally furnished with two setae, one of which is sparsely spinulose and other one finely spinulose, and a diminutive setula, and with some fine hair-like spinules and a small protuberance (not clear) near apex. First endopodite segment almost as long as basis, somewhat tapering apically, with a bare setula on a point three-fourths the length of anterior side. Second endopodite segment longer than preceding one, narrowed proximally, furnished with two oblique rows of some stout spinules on proximal half and some hairs along distal half of posterior edge; one spinulose short spine arising from a midway of anterior side; one pectinate spine occurring at a subdistal portion of anterior side, accompanied with a simple setula and a few spinules; distal end furnished with one bifurcate seta on outer side, four elongate spines, which are geniculate almost midst and more or less pectinate distally, and one somewhat hairy seta at inner side. *Mandible* (Fig. 74–1). Praecoxa as in figure. Coxa-basis fairly rounded at inner dorsal side, where a few spinules and a number of spatulate hairs or cirri occur; one extremely thickened seta, which bears considerable amount of hairs, attached onto inner extremity; one rather moderate seta, which is finely plumose, arising from ventral side near inner edge; a row of some ventrally directed flat spinules occurring on posterior side near base of thickened seta described. Endopodite (Fig. 74–2) rather small; subproximal portion of inner edge bearing one thick hairy seta, from its dorsal base, a narrow seta diversing, and one hairy seta arising from anterior side of previous thick seta; one somewhat spinulose trifurcate seta and a pair of setae occurring at distal end; one elongate hairy seta arising from subdistal outer edge. Exopodite segment much larger than endopodite, furnished with four inner setae, in which proximalmost one is narrow and all others thick and elongate, and two thick terminal setae, all setae hairy; inner half of posterior side densely spinulose. *Maxillula* (Fig. 74–3). Arthrite of praecoxa well developed, tapering terminally; dorsal rim and posterior side near dorsal edge remarkably spinulose; a group of some minor spinules occurring at subproximal portion of anterior side; at least five claws and two spinulose stout setae occurring along terminal edge or subterminal dorsal edge; two parallel setae arising from anterior side. Coxal inner process reaching two-thirds the length of arthrite of praecoxa, terminating in two midst geniculate spiniform

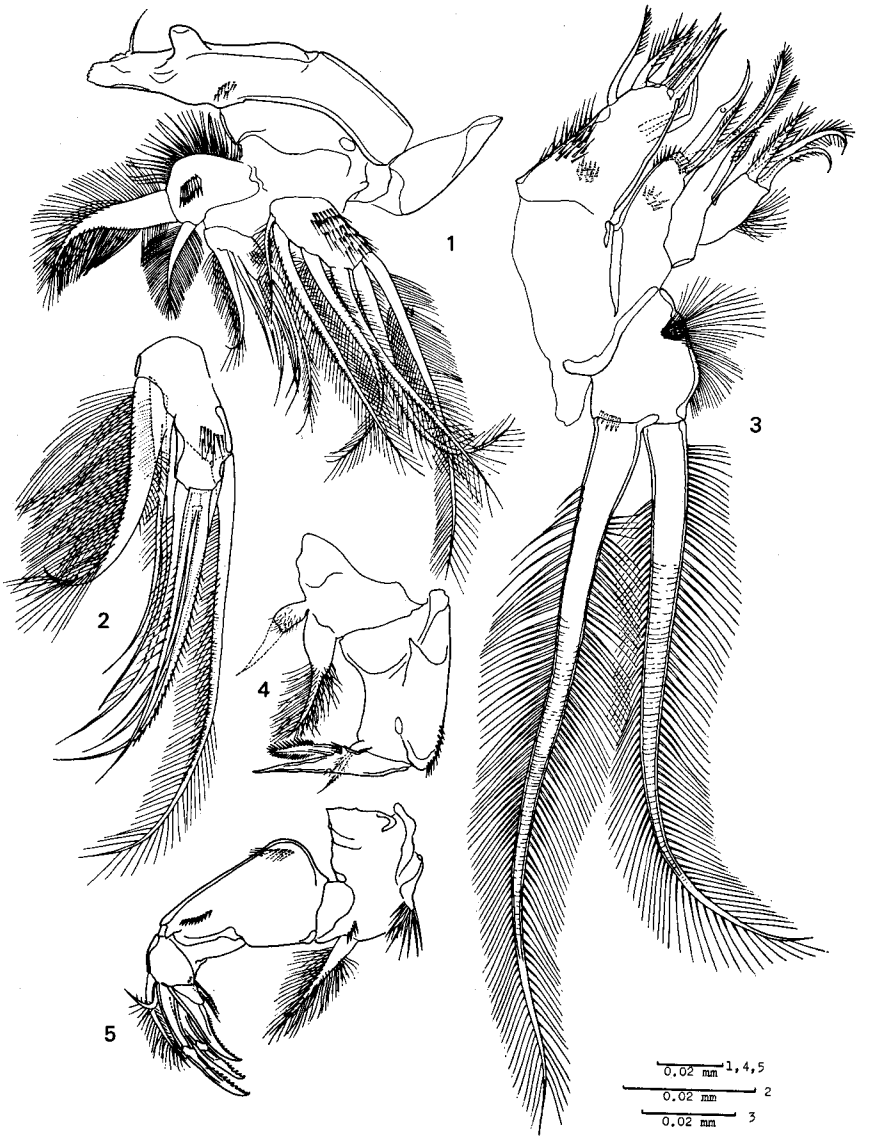

Fig. 74. *Scutellidium longicauda acheloides* n. subsp. Female (Holotype). 1. mandible; 2. mandibular endopodite; 3. maxillula; 4. maxilla; 5. maxillipede.

setae and one somewhat spinulose seta; on anterior side, an arched row of some spinules near apex and a group of a few spinules on a subproximal portion. Basal inner process extending beyond preceding process, forming itself a spinulose seta

(not defined at its base) at ventral proximal portion, and terminating in two finely spinulose setae and a setula rather ventrally. Endopodite segment directed inwards, terminating in three short spinulose setae, fringed with some long hairs along outer (ventral) rim. Exopodite segment directed outwards, thick, as wide as long, and terminating in a pair of plumose, extremely enlarged setae; a few spinules on anterior side along dorsal portion of distal end; a tuft of some elongate hairs on posterior side near ventral subproximal edge; ventral rim hairy. *Maxilla* (Fig. 74–4). Praecoxa furnished with two thick hairy setae on inner edge. Coxa ornamented with a vertical row of some spinules along distal portion of outer rim, and a small cylindrical process, which terminates in two hairy setulae, on distal inner edge. Basis forming itself a claw which is accompanied with one lanceolate spine near its dorsal base, together with a few spinules. *Maxillipede* (Fig. 74–5). Proximal segment ornamented with some elongate spinules near border of intercoxal plate, and one thick hairy seta arising from subdistal inner edge, accompanied with a few spinules. First endopodite segment about 2.5 times as long as basal width; outer subproximal corner moderately rounded, and some spinules occurring; a vertical row of some spinules on distal portion. Second endopodite segment short, furnished with one strong spinulose claw and two midst geniculate spines, both a little longer than previous claw and pectinate at each distal half; two somewhat thickened setae on outer extremity of distal end, both with some fine soft hairs; a pair of hairy setulae arising from inner edge.

Leg 1 (Fig. 75). Of intercoxal plate free edge scarcely concaved, fringed with some elongate hairs. Coxa and basis not clearly defined from each other; outer margin fringed with a number of fine hairs; a short row of a few rigid spinules occurring at posterior side near middle outer edge; on anterior side, a vertical row of some narrow spinules and a semicircular row of some hairs, both on outer portion, some scattering hairs at almost middle area, and two succeeding rows of minute and large spinules at inner portion; of basis, an outer seta extremely thickened and with a number of elongate hairs, and an inner seta rather spiniform, short and spinulose along its outer side; some narrow spinules near base of exopodite and some soft hairs along a sclerotized short rim between both rami; inner edge fringed with considerable amount of soft hairs and some spinules. Three exopodite segments combined about as long as first endopodite segment. First exopodite segment approximately twice as long as its basal width, much widened distally, and forming itself a strong spur-shaped protuberance at inner distal corner; whole outer margin densely fringed with elongate hairs; an outer seta thick, extending beyond distal end of second segment and spinulose; a vertical row of some reduced spinules (20 in the illustrated leg, and 24 in the other one) on distal portion of anterior side; a number of hairs, arranged into a vertical row, arising from inner proximal corner and extending distally. Second exopodite segment somewhat shorter than preceding one; outer margin almost straight; an inwards fimbriate short spine occurring at a midway near outer edge; an inner seta with many soft hairs, arising from a subdistal ledge; inner side sparsely hairy, not

so protruded, and moderately rounded. Third exopodite segment small, a little longer than wide, furnished with four inwards (or ventrally) fimbriate spines, in which three are arranged along outer edge and one occurs at distal end, those spines distally increasing size; one plumose seta arising from distal end; one somewhat plumose seta, which is a little narrower than terminal one described, occurring

Fig. 75. *Scutellidium longicauda acheloides* n. subsp. Female (Holotype). Leg 1.

at inner subproximal edge and directed outwards. First endopodite segment about twice as long as greatest width locating at a level two-sevenths its length; nearly whole outer margin fringed with a number of close cirri; an arched row of ventrally directed sharp spinules on anterior side near distal border; inner half of anterior side densely covered with short hairs or cirri; subproximal inner edge with some soft hairs; an inner seta almost as long as this segment, arising rather posteriorly from a point a third the length, furnished with some elongate cirri on subproximal portion and otherwise plumose. Second endopodite segment a

little longer than half of preceding one, somewhat spinulose at outer edge, and with one hairy inner seta arising from a subdistal ledge, together with a few spinules. Third endopodite segment small, furnished with two fimbriate strong spines, and two somewhat hairy setulae, both shorter than spines described, arising from posterior side near inner edge. *Leg 2* (Fig. 76–1). Coxa broad, fringed with two groups of fine hairs along outer margin; a vertical row of some spinules on anterior side near outer edge. Basis forming itself a blunt protuberance between both rami; an inner seta thick, somewhat hairy, and nearly reaching to distal end of second exopodite segment; inner edge hairy. Exopodite a little longer than endopodite. First exopodite segment widest in three exopodite segments, furnished with some close spinules and large spatulate cirri along outer margin, one delicately spinulose outer spine, a few elongate hairs arising from subdistal portion of outer edge, and one densely plumose inner seta. Second exopodite segment a little shorter than preceding one, furnished with six stout and spaced spinules along outer edge; in three outer spines, distal two fairly spinulose; an elongate terminal spine thick and stout; two inner setae rather widely spaced. Endopodite not so different from those of leg 3 and leg 4 in appearance, and its cuticular rims conspicuous. Of first endopodite segment outer distal corner actuely pointed; outer margin fringed with some short spinules (16 in the illustrated leg, a few minute ones at proximal portion excluded). Second endopodite segment a little longer than preceding one, furnished with eight sharp spinules along outer margin and two narrow spinules on anterior side of inner distal end; two inner setae plumose, without any spinule. Last endopodite segment narrower than preceding one and subequal in length, furnished with 11 spinules along outer margin; an outer spine bilaterally spinulose, almost as long as this segment; first inner seta rather rigid and very delicately spinulose. Setal and spinal ornamentation otherwise as in figure. *Leg 3* (Fig. 76–2). Coxa ornamented with some spinules together with a few spatulate cirri along distal portion of outer margin. Basal outer seta entirely bare. Of first exopodite segment outer margin fringed with eight and six successive spinules, and a few narrow spatulate cirri and hairs. Second exopodite segment fringed with eight strong spinules along outer margin. Last exopodite segment about 1.8 times as long as preceding one; of the three outer spines, first two scarcely spinulose and third one somewhat spinulose. Endopodite shorter than exopodite; of spinules along outer margin of each segment, those of first segment fairly narrowed and of other two stout and strong (all numbers precisely reproduced in the figure); of middle segment outer distal corner not pointed; last one about 1.3 times as long as preceding one. Setal and spinal ornamentation as in figure. *Leg 4* (Fig. 77–1) . Of coxa, distal border inclined; outer margin with some short spinules; a short spinular row occurring at anterior side near outer edge. Exopodite much longer than endopodite; distal two segments covered with delicate hairs scattering on each posterior side; three outer spines of last segment rather lanceolate. Of endopodite, first segment apparently tapering proximally and acutely pointed at its outer distal corner; third

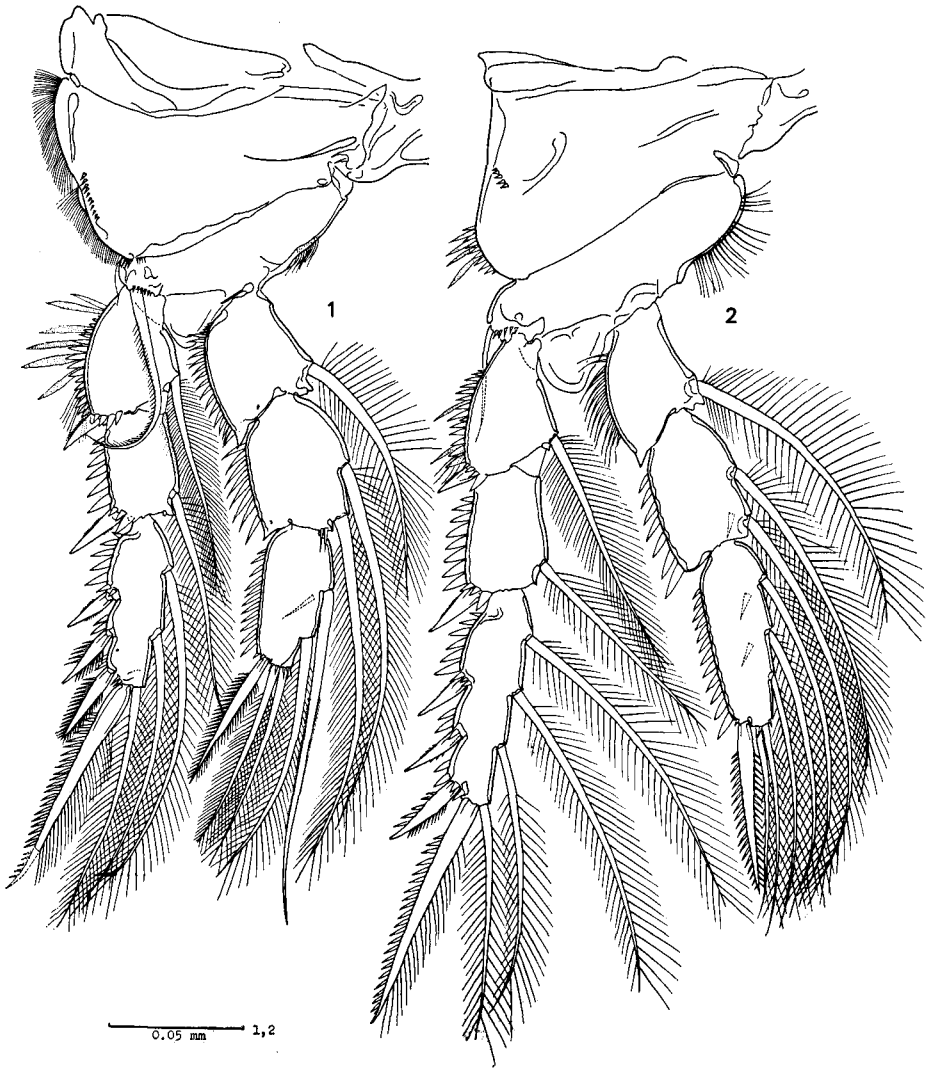

Fig. 76. *Scutellidium longicauda acheloides* n. subsp. Female (Holotype). 1. leg 2; 2. leg 3.

segment gradually narrowed distally. Setal and spinal ornamentation otherwise as in figure. Marginal spinules also precisely reproduced in figure. *Leg 5* (Fig. 77–2). Baseoendopodite clearly bipartite into inner expansion and outer lobe; inner margin fringed with some extremely elongate hairs; inner expansion well protruded, gradually attenuate, and terminating in three bare setae, middle one longest and

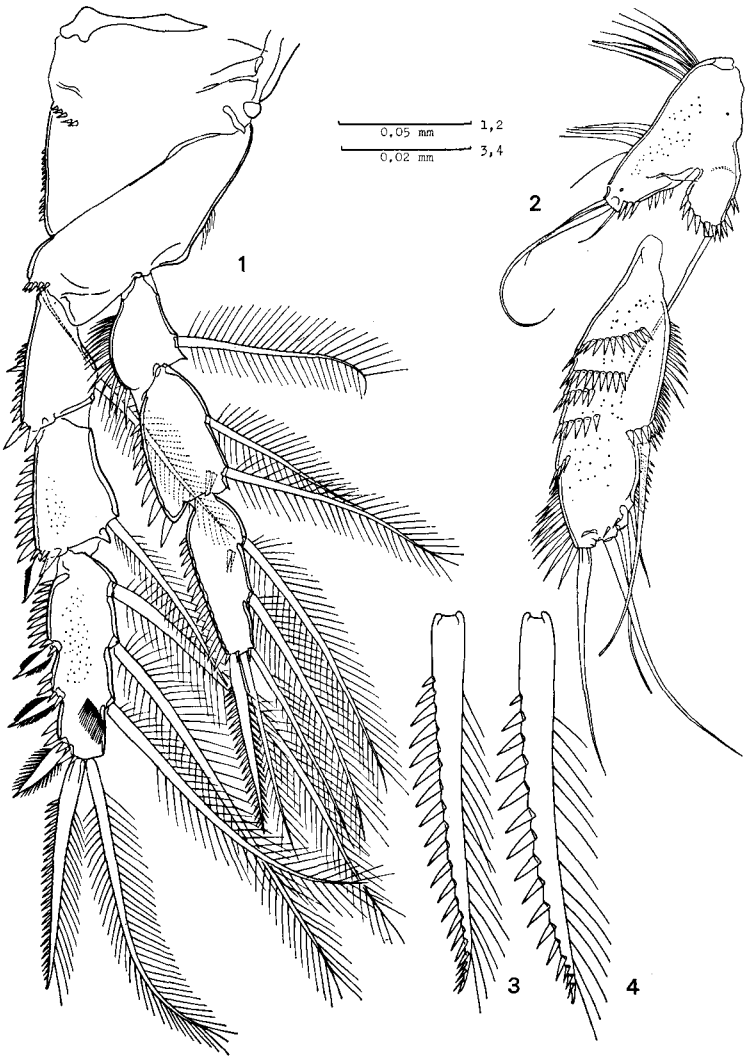

Fig. 77. *Scutellidium longicauda acheloides* n. subsp. Female (Holotype). 1. leg 4; 2. leg 5. Male (Allotype). 3. outer terminal spine of third exopodite segment of leg 2; 4. ditto, leg 3.

a little extending beyond middle of exopodite segment, and furnished with some rigid spinules along outer edge; outer lobe fringed with spinules and terminating in a long seta. Exopodite elongate oval in outline, about 3.5 times as long as greatest width, ornamented with at least five spinular rows, each arising from inner

edge and extending outwards, and some longer spinules along distal portion of inner margin; five setae in all occurring; in four outer setae, first one arising from a clear ledge at a point a third the length, and other three rather distally situated; second outer seta small; of a terminal seta, basal portion somewhat thickened; outer margin fairly spinulose.

Male. No particular color variation was detected, except for slight differences in tone. Dorsal side of cephalothorax with a transverse stripe tinctured with brown (Figs. 78–1, 2; allotype) or brownish purple (Figs. 78–5, 6; paratype). Most of appendages somewhat tinctured with yellowish brown, but not so remarkable. Other body parts almost colorless and semitransparent.

Body (Figs. 78–1, 2) about 0.56 mm long, 0.28 mm in greatst width. Prosome of rather oval outline in dorsal aspect. Of dorsal hind edge of first three somites each hyaline membrane never rising. Rostrum (Fig. 78–3) fringed with some fine hairs along frontal edge. Second, third and fourth abdominal somites (Fig. 78–4) each ventral hind edge fringed with a number of stout spinules. Furcal ramus almost as in female. *Antennule* (Fig. 78–3) haplocer; a seta of first segment and some setae of second one sparsely spinulose; some spatulate cirri arising from anterior side of third segment (and maybe fourth one); main aesthetasc rather narrow. Other prethoracic appendages as in female.

First four pairs of thoracic legs ornamented as in female, except for slight differences in marginal spinules of certain segments and spines; of each first endopodite segment of both leg 3, outer margin fringed with 11 narrow spinules; of leg 2, leg 3 and leg 4, spinules along outer side of outer terminal spine of each exopodite rather fewer than in female (Figs. 77–3, 4). *Leg 5* (Fig. 78–4). Baseoendopodite segment not defined at base; inner expansion scarcely developed, terminating in a bare setula; an arched row of some short spinules on anterior (ventral) side of inner portion. Exopodite rectangular in outline, furnished with one inner seta at subdistal edge, two spinulose spiniform seta terminally and one elongate bare seta at outer side. *Leg 6* represented by a broad plate (defined or undefined at base) terminating in one spinulose spine and one bare seta, and with one seta at subdistal portion of outer edge.

Variability. Body length in the females examained varied between 0.70 mm and 0.88 mm. No particular difference in the principal ornamentation was detected among the specimens examined.

Remarks. Up to the present, this older species *Scutellidium longicauda*, originally reported by Philippi (1840) under the name *Psamathe longicauda* mihi, has been repeatedly recorded from various localities and often appeared in literature (see Lang, 1948). Nobody, however, has so far published the full description and figures of the species, except for Sars (1905), whose figures were apparently most ideal at his epoch, and still provide various useful information for us. Nevertheless, more detailed information is needful for the present taxonomy,

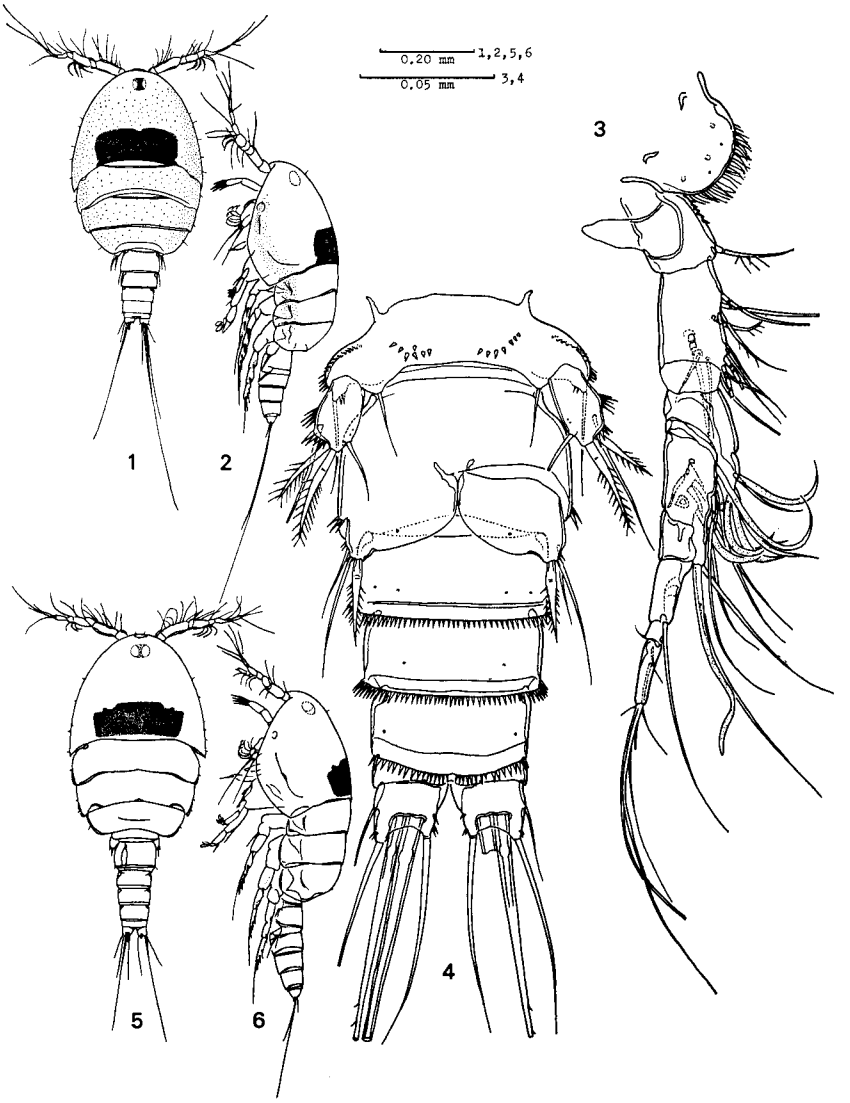

Fig. 78. *Scutellidium longicauda acheloides* n. subsp. Male (1–4, allotype; 5, 6, paratype). 1. body, dorsal; 2. ditto, lateral; 3. rostrum and antennule; 4. leg 5 and abdomen; 5. body, dorsal; 6. ditto, lateral.

since some minor or conspicuous discrepancies occur among the present material here reported and those reported by Sars as well as some other investigators. Recently I have an opportunity to dissect a female of this species, selected from the

Lang's specimens (labelled as: Bonden, Bohuslän 22. 7. 1936. Arger. coll et det. K. Lang) deposited in the Naturhistoriska Riksmuseet, Stockholm, which have been kindly loaned to me for the present study. The specimen dissected, which is here regarded as a representative of *Sc. longicauda longicauda*, has some characteristics to be different from the figures by Sars, as follows; second antennular segment furnished with some spinulose setae together with bare ones; of leg 1 first exopodite segment forming itself a spur-shaped protuberance on its inner distal corner; of middle exopodite segment of leg 1 a fimbriate outer spine not situating distally, but arising from a midway; of exopodite segment of leg 5, distal portion of outer edge, which is fringed with some spinules, fairly rounded (as in the figures by Lang, 1935, and Monard, 1928), and first outer seta more distally situated (at about five-sevenths the length). Incidentally, the specimen dissected is 0.78 mm long, and the hyaline membrane on each dorsal hind edge of the first three somites does not rise.

The female of the present material, named as *Sc. longicauda acheloides* n. subsp., differs from the Lang's specimen of *Sc. longicauda* s. str. in the following remarkable respects; of antennule, the first three or four segments narrower, and not so sclerotized, and, further, the ninth segment apparently shorter than twice as long as the preceding one (fully twice in the Lang's specimen; cf. Figs. 73–1 and 4). In the female of *Sc. longicauda* s. str., the first three or four antennular segments are robustly built and much thicker than the apical two segments (see also Sars, 1905, T. Scott, 1912, and Dussart, 1974). This appearance in the antennule is very much alike to that of *Sc. longicauda paranaense* Steudel, 1970 reported from Brazil. The last mentioned subspecies, however, is quite unique in having the setal sexual dimorphism in the endopodite of leg 2, by this characteristic it is clearly discernible from *Sc. longicauda* s. str. as well as the new subspecies *acheloides* without doubt. The proportional characteristic in the apcial two antennular segments found in the Lang's specimen is quite identical with that in the figure by Sars (1905), though it is somewhat different, as far as estimated from the figure or description, in the same species reported in some other papers (for example, Monard, 1928; Sewell, 1940; Yeatman, 1962). The spur-shaped protuberance of the first exopodite segment of leg 1 found in the present new subspecies as well as the Lang's specimen is one of the most noticeable characteristics to be common between them and absent in the other congeneric species so far reported, and almost the same structure is detectable also in the figure by Dussart (1974) based upon the specimen of *Sc. longicauda* from Ethiopia, though nobody else has mentioned or illustrated such a structure in the same species (for example, Sars, 1905; Sars, 1916, as *Psamathe sargassi*; Brady, 1880, as *Sc. tisboides*; Monard, 1928, as *Psamathe longicauda*; Yeatman, 1962; Steudel, 1970; further, Jakobi, 1954, as *Sc. loureiroi*, whose setal ornamentation of leg 2 is quite doubtful, and regarded as *Sc. longicauda* by Branch, 1974).

On the other hand, as already mentioned in the preceding text, the female of the present new subspecies has very delicate spinules on the ventral hind edge of

each the antepenultimate and penultimate abdominal somite. These are so delicate that they are not detected in lower magnification. This situation of these delicate spinules is entirely identical with that of the Lang's specimen examined. In this connection, the Monard's figure as well as description (Monard, 1928, p. 331) clearly represents that his specimen has conspicuous spinules on the somites in question. Such conspicuous ones are apparently reproduced also in the figure of *Sc. longicauda paranaense* by Steudel (1970). The Monard's species, therefore, is somewhat different from *Sc. longicauda* s. str., and a thorough re-examination on his specimens would be desirable.

While Pallares (1968) reported a congeneric species under the name *Sc. longicauda* from Argentine, her species will be separately discussed later, since it is maybe a distinct species.

Specimens examined. Holotype; female. Allotype; male. Paratypes; four females and a male. All the specimens were selected from a number of specimens, collected from Oshoro by rinsing a brown alga *Sargassum confusum* Agardh (the holotype and two paratypic females, 12–XI–1975; the allotype, 10–IX–1975; paratypic two females and a male, 18–IX–1974. T. Itô leg.).

The subspecies name came from Acheloides, the Sirens, appearing in the Greek mythology, after its possession of some different appearances in the coloration.

Discussion for the genus *Scutellidium*

During the present investigation of the *Scutellidium*-species in Hokkaido, I noticed a taxonomically important fact that two entirely different types of the second pair of legs were present among them. In the first type, the endopodite of leg 2 is of a somewhat swollen appearance, especially in the last segment, rather than in the succeeding two pairs of legs, and its outer rim of each segment is not so sclerotized and, further, densely fringed with long hairs. The second type is characterized by the possession of the endopodite in question not so different from those of the succeeding legs, as being not so swollen, its outer rim well sclerotized and fringed with ordinary spinules. The following three species, *Sc. arthuri*, *Sc. caeneus* and *Sc. hirutai*, are of the first type, while the rest ones, *Sc. longicauda acheloides*, *Sc. hippolytes akaba* and *Sc. boreale*, belong to the second type. Adding to them, the following species are definitely belonged to the two groups of either type judged from the original or additional figures; *Sc. sarsi* (Brady, 1910), *Sc. macrosetum* Branch (1975), *Sc. ringueleti* Pallares (1969), *Sc. spinatum* Hicks (1971), *Sc. patellarum* Branch (1974) and *Sc. dentipes* Vervoort (1964) to a group of the first type, *Sc. ligusticum* (Brian, 1920) and *Sc. australis* (T. Scott, 1912) to the other group of the second type. Furthermore, as far as decided from the original or additional descriptions without precise illustration, both *Sc. intermedius* Nicholls (1941) and *Sc. purpurcoincta* Monk (1941) are the member of the first group, and *Sc. lamellipes* Monk (1941), *Sc. fucicolum* (T. Scott, 1912) and *Sc. cockburni* Fairbrige (1944) are the second one.

In the figure of *Sc. sarsi* by Brady (1910), neither hair nor any spinule was

illustrated on the outer side of the endopodite of leg 2, but the endopodite shows a clear characteristic found in the first type, as a conspicuously swelling appearance. The situations of *Sc. idyoides* (Brady, 1883), *Sc. lenticulare* (Brady, 1910), *Sc. antarcticum* (Lang, 1934) and *Sc. loureiroi* Jakobi (1954) are unable to be decided.

Of *Scutellidium plumosum*, the second leg was not illustrated in the original paper by Brady (1899). According to a specimen of the species, collected from the Chatham Island, which was kindly loaned by Dr. R. Hamond of Melbourne University for the present study, the endopodite of leg 2 is of a somewhat swelling appearance, not so sclerotized at outer rim, and furnished with very long hairs along the last segment (the first two segments with a number of narrow spinules), moreover this ramus is seemingly much wider than those in the following two pairs of legs, nevertheless the ramus itself is not so widened, comparing with that of *Sc. longicauda*, but those of the following legs are extremely narrowed. These characteristics found in the specimen show that the species *Sc. plumosum* occupies an intermediate condition between two groups above mentioned, though it fairly inclines to the first one, represented by *Sc. arthuri* and so on, rather than the second one. Another two species reported by Pallares (1969), *Sc. strigosum* and *Sc. deseadensis*, seem to be also related to *Sc. plumosum* with respect to the appearance of the second pair of legs.

On the other hand, the genus *Scutellopsis* which was first established by Wiborg (1964), based upon a sole species *Scutellopsis armatus* from Tristan Da Cunha, has been regarded as a synonym of *Scutellidium* (Palleres, 1969; Hicks, 1971; Branch, 1975). I have recently had an opportunity to observe a female specimen which was collected from the Chatham Island by Dr. R. Hamond and identified with *Sc. armatum*, and the specimen has, certainly, well agreed with the original description and figures by Wiborg (op. cit.), especially of the first and fifth legs, and with the excellent figures by Pallares (1969) based upon her specimens from Ria Deseado, Argentina. I myself, therefore, am able to regard it as the species identified by Dr. Hamond. The specimen is of a remarkable characteristic on its setal ornamentation of the second pair of legs, that is, the last endopodite segment furnished with two terminal and two inner marginal setae in all. Adding to this characteristic, the endopodite in question is somewhat swelling and widened rather than those of the succeeding two pairs of legs, and its outer margin of each segment is fringed with a number of narrow, rather flexible, spinules. The setal ornamentation (and also its general appearance, though it is not the same) is quite identical with that of *Sc. macrosetum*, clearly illustrated by Branch (1975). This conspicuous characteristic common between them has not so far been evaluated in anyway by both Wiborg and Branch. If the presence of such the reduced setal ornamentation within the genus including *Scutellopsis* is accepted, the unique structure found in *Sc. sarsi* (Brady, 1910), whose corresponding segment bears three setae in all, can not be easily ignored, in spite of his sketchy figure. The much swelling appearance of the endopodite segments in leg 2 appeared in the Brady's figure safely supports the idea to regard it as of the

first group, though a little dobut on its actual setal number still remains. It is, however, not so easy to regard it as being of the closest realtion to *Sc. armatum* as well as *Sc. macrosetum*, because the appearance of the first leg is not so transformed, in comparison with those in the latter two species.

In the first group, on the other hand, the following three species, *Sc. arthuri*, *Sc. dentipes* and *Sc. caeneus*, have a common character as being of dense hairs on their middle exopodite segment of leg 2, instead of conspicuous spinules as occurring in *Sc. armatum*, *Sc. macrosetum*, *Sc. plumosum* and so on.

In the second group, *Sc. ligusticum* is quite unique in having six setae on the exopodite of leg 6 in the female (see Sewell, 1940, as *Sc. machairopoides*; Vervoort, 1964). The shape of this ramus mentioned is also noteworthy, because its outline is not elongate oval or spindle-shape, but rather truncate rectangular shape as in *Sc. australe*, *Sc. cockburni*, *Sc. digitatum*, *Sc. hippolytes* and *Sc. boreale*. In the last mentioned five species, the first three are precisely of four setae on each the ramus in question, and they have been hitherto reported from south boreal or antarctic areas. Contrary, the last two species, *Sc. hippolytes* and *Sc. boreale*, are of only four setae on the corresponding ramus, and seem to be north boreal ones. These two species are apparently in closest relation to each other, because their setal ornamentation of the middle endopodite segment of each leg 3 and leg 4 is reduced into one seta alone, instead of two as in all the other congeneric species.

The species within the genus *Scutellidium* (including *Scutellopsis armatus*), considering these interrelation described above, are apparently divisible into four major groups at least, and maybe into more smaller subgroups if these should be precisely distinguished. These groups are shown in the Table 1, in which the genus *Scutellopsis* is separately treated as a distinct one from the genus *Scutellidium*. I like to call the two genera combined as the *Scutellidium*-complex tentatively. As being apparent in the table, the *Scutellidium*-complex consists of four major groups, the genus *Scutellopsis* and three species-groups of the genus *Scutellidium*, *arthuri*-group s. l., *longicauda*-group and *australe*-group s. l. The *arthuri*-group s. l. is, further, subdivided into the *arthuri*-group s. str., *hirutai*-group and *plumosum*-group. The *plumosum*-group is of the closest relation to the *longicauda*-group with respect to the shape and armature of the endopodite of leg 2, which does not so swell rather than in the typical one as can be seen in *Sc. arthuri* and usually bears fine spinules (not long hairs and not ordinary spinules) along each outer margin. In a specimen of *Sc. plumosum* sent from Dr. Hamond, the endopodite in question bears some long hairs on the last segment, though the corresponding segment illustrated by Pallares (1969, fig. 5–1) seemingly bears fine short spinules. Of *Sc. deseadensis*, its three endopodite segments of leg 2 have not long hairs but fine spinules, as far as can be seen in the Pallares' figure (Pallares, 1969, fig. 6–1). *Sc. ringueleti*, *Sc. spinatum* (its distinctness from the preceding one was doubted by Branch, 1975) and *Sc. patellarum* are of a common noticeable characteristic, that the middle exopodite segment of leg 2 is furnished with a vertical row of some stout spinules on the anterior side just inside of outer margin, beside the ordinary

spinules along outer margin. Although Branch (1974) emphasized the shape of the inner seta of the first endopodite of leg 3 as one of the most important diagnostic characters of *Sc. patellarum*, the same structure is also detected in *Sc. spinatum*, whose corresponding seta is very thick and stout and, incidentally, it vertically arises from the truncate distal edge of the segment (not from the inner edge ! Checked by myself in a Hick's specimen loaned from Dr. Hamond).

No particular species-group name, in the *australe*-group s.l., is prepared for *Sc. ligusticum*, since it is represented by a sole species for the time being. The two subgroups, *australe*-group s. str. and *hippolytes*-group, subdivided from the *australe*-group s.l., are closely related to each other, as already emphasized in

Table 1. Genera and species-groups

Scutellidium-complex	leg 2; endop. swelling, and apparently different from each endop. of leg 3 and leg 4	leg 2; 3rd endop. segment with 4 (or 3) setae in all — ***Scutellopsis*** .....
		corresponding part with 5 setae in all — ***Scutellidium arthuri*-group** s.l.....
	corresponding ramus not swelling, and not so different from each endop. of leg 3 and leg 4	corresponding part with 5 setae in all; ♀ leg 5 exop. elongate oval or spindle-shaped — ***Scutellidium longicauda*-group**....
		same as in above; ♀ leg 5 exop. truncate rectangular — ***Scutellidium australe*-group** s.l. ..

the shape of the exopodite of female leg 5. Their oral appendages, in addition, are also fairly alike among the species of these two subgroups. *Sc. idyoides* (Brady, 1883) reported from the Kerguelen Islands allied to the species of the *australe*-group s. str., as far as respecting with the ornamentation and shape of the female leg 5, though the second pair of legs are unknown.

Incidentally, several doubtful records of some interesting species would be discussed and corrected as far as possible. The record of *Sc. plumosum* from the Nicobar Islands by Sewell (1940) is quite questionable, because the figure of the female leg 2 apparently shows all the considerable characteristics of the *arthuri*-group s. str., and moreover, its leg 2 and leg 4 in the male correspond with those of

of the *Scutellidium*-complex

.....	.....	.... *armatus* Wiborg, 1964
		macrosetus (Branch, 1910)
		? *sarsi* (Brady, 1910)
-leg 2, outer margin of 2nd exop. segment hairy; endop. with long hairs	.....	*arthuri*-group s. str.
		arthuri Poppe, 1884
		dentipes Vervoort, 1964
		caeneus mihi
		? *purpurocincta* Monk, 1941
-corresponding part not hairy, but spinulose	-leg 2; endop. with long hairs	*hirutai*-group
		hirutai mihi
		ringueleti Pallares, 1969
		spinatum Hicks, 1971
		patellarum Branch, 1974
	usually with fine spinules (last segment with long hairs in *plumosum*)	*plumosum*-group
		plumosum (Brady, 1899)
		deseadensis Pallares, 1969
		strigosum Pallares, 1969
		? *intermedius* (Nicholls, 1941)
.....	.....	.... *longicauda* (Philippi, 1840)
		fucicolum (T. Scott, 1912)
		? *lamellipes* Monk, 1941
		? *loureiroi* Jakobi, 1954
-2nd endop. segment of leg 3~4 with 2 inner setae	—♀ leg 5 exop. with 6 setae ..	.... *ligusticum* (Brian, 1920)
-same as in above —	5 setae in all.....	*australe*-group s. str.
		australe (T. Scott, 1912)
		cockburni Fairbrige, 1944
		? *digitatum* (Brady, 1918)
		? *idyoides* (Brady, 1883)
-with 1 seta alone —	4 setae in all.....	*hippolytes*-group
		hippolytes (Kröyer, 1863)
		boreale mihi

the *longicauda*-group. His species, therefore, is a composite one from a pair of sexes of two different species other than *Sc. plumosum* in most probability. The species reported from Argentine by Pallares (1968) under the name *Sc. longicauda* is not the species. Her species is very much allied to *Sc. plumosum* in the following respects in the leg 2; the endopodite somewhat swelling and much wider than the corresponding ramus of leg 4 illustrated (her interpretation as leg 3 is maybe slip of a pen); the last endopodite segment fringed with a number of hairs along outer margin; the middle exopodite segment not hairy but spinulose; the interspace between the distal two outer spines of the last exopodite segment wider than the interspace between the first two spines. In spite of the great similarity to *Sc. plumosum*, her species is unable to be identified with the species, because the first leg was not illustrated in the paper. The first leg of *Sc. plumosum* is of a good diagnostic character typical in the species, as having the inwards protruded middle exopodite segment (see, Brady, 1899; Lang, 1934; Pallars, 1969; also checked by myself in the Hamond's specimen). The species reported by Wiborg (1964) as *Sc. plumosum* is apparently distinct from the species with respect to this characteristic.

Finally, it should be noticed that no particular attention, in the present paper, has been payed upon other related genera such as *Sacodiscus* Willson (1924) and *Neoscutellidium* Zwerner (1967), though they also seem to be of certain importance for considering the phylogenetic relation of the *Scutellidium*-complex within the family Tsibidae and, further, some of the species-groups, here quite tentatively prepared because of the presence of some indisinct species, would be established as either subgenera or distinct genera in the near future after thorough examinations.

Concluding remarks

While six species of the genus *Scutellidium* have been recorded from Hokkaido in the present paper, this number of the congeneric species seems to be remarkably high, as far as considering the relatively shorter shore-line around such a small islet. The number, further, will be certainly increased by more thorough examination, since another one species has already been collected from a brackish water in the Akkeshi Lake by myself. Adding to such the high species number, it would be noticeable for ecologists that some of them are found not only synpatrically but also simultaneously. For example, *Sc. longicauda acheloides* has been found in Oshoro in every autumn together with a rich population of *Sc. caeneus* and, further, the following three species, *Sc. hippolytes akaba*, *Sc. boreale* and *Sc. hirutai*, were collected from the same a few blades of a brown alga in Muroran together with considerable amount of *Sc. arthuri*. The precise identification of each the species within these synpatric species has so far been almost unable without dissection, because most of the tradisional taxonomic characters in the genus have been restricted in certain appendages, which could not be examined without dissection.

All the species here reported, however, are quite easily discernible from each other with no observation of appendages, but by the coloration of certain body parts (see Branch, 1975, who reported the color variation of *Sc. ringueleti* in the detail). If the given samples were entirely colorless specimens, discolored due to the storage in alcoholic solution, they would be safely discernible by the differences in the body shape as well as the size and the situation of the hyaline membrane on each dorsal hind edge of the first three somites. The last mentioned characteristic, which is easily recognized by using a dissecting microscope, is the most important one to discriminate *Sc. longicauda acheloides* from *Sc. caeneus* and *Sc. arthuri* from *Sc. hirutai*. While *Sc. boreale* and *Sc. hippolytes akaba* are quite different from each other in the body shape, the situation of the hyaline membrane here noticed is a very good discriminating character between them too.

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