



HOKKAIDO UNIVERSITY

Title	Descriptions and Records of Marine Harpacticoid Copepods from Hokkaido, VII (With 18 Text-figures and 1 Table)
Author(s)	ITÔ, Tatsunori
Citation	北海道大學理學部紀要, 22(1), 42-68
Issue Date	1979-12
Doc URL	https://hdl.handle.net/2115/27651
Type	departmental bulletin paper
File Information	22(1)_P42-68.pdf



Descriptions and Records of Marine Harpacticoid Copepods from Hokkaido, VII¹⁾

By

Tatsunori Itô

Zoological Institute, Hokkaido University

(With 18 Text-figures and 1 Table)

In a previous paper (Itô, 1978) I reported the general account of the study of meiobenthos of a shallow-water sandy bottom in Ishikari Bay, Hokkaido, conducted through six months from June to November 1977. Publication of the details of the results obtained, however, was postponed. Since the unpublished data about harpacticoid species indicated seasonal changes in abundance as well as species composition, another series of monthly samplings, in order to obtain additional data, especially of the winter, has been carried out during a period from May 1978 to April 1979 with the aid of SCUBA for warmer months and a Smith-McIntyre grab for colder months.

In the present paper, as a taxonomic outcome from these series of samplings, a new species of the genus *Harpacticus* (Family Harpacticidae) is described, and a new genus is established for a previously unknown species of the family Diosaccidae.

All of the specimens were selected from some of the samples collected at the sandy bottom off Oshoro, Hokkaido (cf. Itô, 1978). The type-series are deposited in Zoological Institute, Faculty of Science, Hokkaido University.

Before going further, I would like to express my sincere gratitude to Professor Mayumi Yamada, Hokkaido University, for reading the manuscript. Sincere thanks are also due to Messrs. K. Kito, Sh. Kubota, and K. Shinta who provided me field assistance. This work was supported in part by a grant from the Itô Science Foundation.

Harpacticus purpureus n. sp.

(Figs. 1-10)

Female (Holotype). Body (Fig. 1-1, 2), rostrum and furcal setae excluded, 0.87 mm long, 0.30 mm wide, somewhat depressed dorso-ventrally. Cephalothorax and first three thoracic somites tintured with yellowish brown at most areas and pale purple along each hind margin and at each pleural region. Basal parts of

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

Jour. Fac. Sci. Hokkaido Univ. Ser. VI, Zool. 22 (1), 1979.

each thoracic appendage purple. Fourth thoracic somite and anterior subdivision of genital double-somite tintured with deep purple. Posterior subdivision of genital double-somite and other abdominal somites colorless and semitransparent.

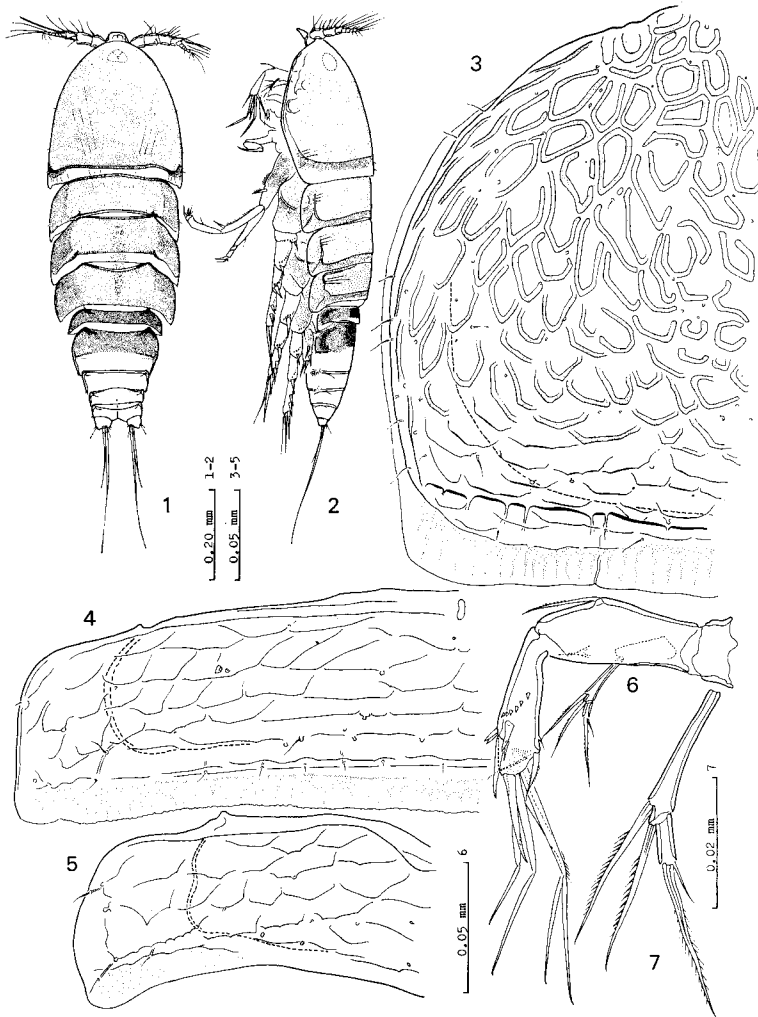


Fig. 1. *Harpacticus purpureus* n. sp. Female (holotype). 1. habitus, dorsal; 2. ditto, ventral; 3. integument of cephalothorax; 4. pleurotergite of first thoracic somite; 5. pleurotergite of third thoracic somite; 6. antenna; 7. exopodite of antenna.

Rostrum (Fig. 3-1) a little longer than wide, with two pairs of fine sensillae. Cephalothoracic integument (Fig. 1-3) with many thickenings of particular

patterns. Pleurotergite of each thoracic somite (Fig. 1-4, 5) with scale-like thickenings. Genital double-somite (Fig. 2) subdivided by a circumambient chitinous suture, armed with a transverse row of conspicuous spinules near its posterior margin of ventral surface; three closely set setulae attached onto each ventro-lateral extremity of genital area (Fig. 2-3). Antepenultimate somite armed

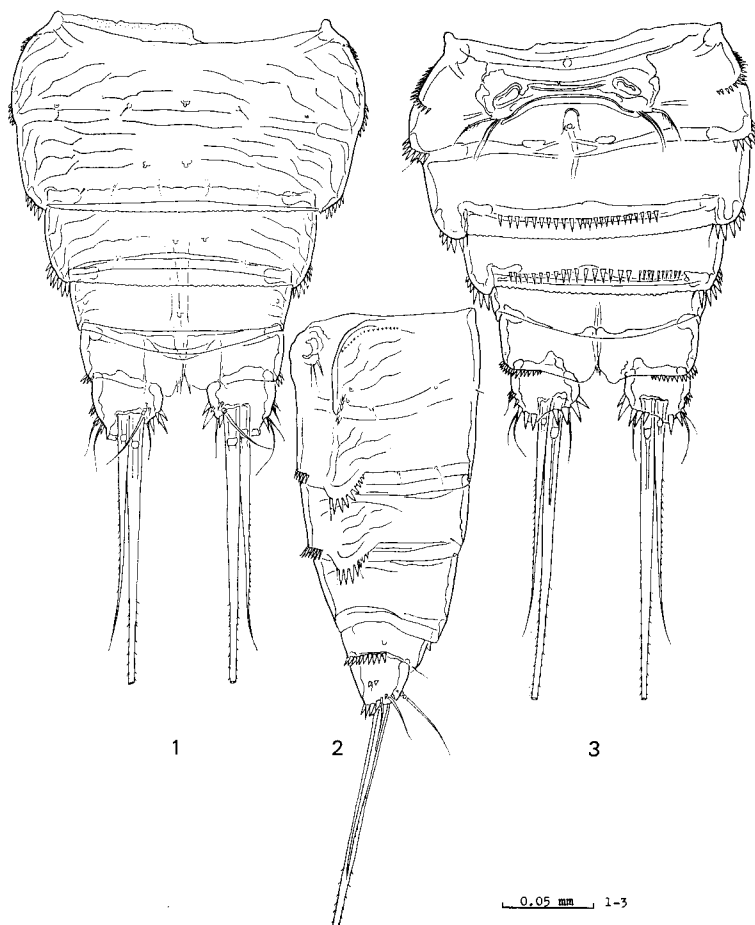


Fig. 2. *Harpacticus purpureus* n. sp. Female (holotype). 1. abdomen, dorsal; 2. ditto, lateral; 3. ditto, ventral.

with a transverse row of spinules on its ventral surface as in the preceding somite. Penultimate somite unornamented. Anal operculum (Fig. 2-1) rounded, bare. Furcal ramus approximately as long as wide, armed with setae and spinules as illustrated (Fig. 2). *Antennule* (Fig. 3-1) nine-segmented; first four segments

stout; fourth segment furnished with an aesthetasc; apical five segments combined shorter than third and fourth segments combined. *Antenna* (Fig. 1-6). Coxa short, bare. Allobasis 3.4 times as long as its basal diameter, armed with one sparsely hairy seta on anterior face. Endopodite a little longer than allobasis, armed with an oblique row of spinules on about a midway of inner surface; two spines, one of which is accompanied by a short narrow spine close to its posterior base, on inner subdistal face; one simple spine, four long geniculate spines, one narrow bare seta, and one thick hairy seta on distal end; a transverse row of very fine spinules near outer distal end. Exopodite (Fig. 1-7) narrow, two-segmented; first segment about three times as long as second one, somewhat thickening distally, armed with two hairy setae, one arising from a subdistal ledge and the other located at distal edge; second segment terminating in one hairy seta and a very narrow setula. *Mandible* (Fig. 3-2). Praecoxa well sclerotized. Coxa-basis widening distally, with four bare setae in all on inner half of distal edge. Exopodite indistinctly two-segmented; first segment about three times as long as second segment, armed with one long seta near its base; second segment with one seta subproximally and four closely set setae apically. Endopodite composed of a cylindrical segment, somewhat longer than exopodite, armed with three setae on a midway of its ventral edge, and eight setae apically or subapically. *Maxillula* (Fig. 3-3). Arthrite of praecoxa armed with seven (?) more or less spinulose claws and two spinulose thick setae along inner edge, two parallel setae on posterior face, and a short vertical row of spinules on anterior face. Inner process of coxa reaching the middle of arthrite of praecoxa, terminating in three setae, at least two of which are spinulose, ornamented with a few spinules near tip. Inner process of basis extending beyond the tip of basal process, armed with two narrow bare setae on ventral edge near tip, terminating in four setae, at least two of which are thick and spinulose; some spinules attached onto posterior face near its tip. Exopodite composed of one segment with long hairs along both sides, armed with three bare setae terminally and one plumose seta on inner (ventral) apical corner. Endopodite directed inwards, fringed with long hairs along ventral margin, armed with three bare setae in all apically or subapically. *Maxilla* (Fig. 3-4). Syncoxa with spinules on outer rim, furnished with three endites; each endite armed with three hairy or spinulose thick setae; distalmost endite with a short row of spinules. Basis armed with a strong pectinate claw accompanied by a set of one spinulose spiniform seta and a narrow bare seta near its anterior base and a seta near posterior base. Endopodite represented by four closely set setae. *Maxillipede* (Fig. 3-6). Coxa short, with a few spinules on outer edge. Basis tapering apically, more than twice longer than basal diameter, with an oblique and three transverse rows of spinules, and armed with one short hairy seta on inner edge subapically. First endopodite segment longer than basis; inner margin almost straight, without ledge; one bare setula arising from inner edge near distal end. Second endopodite segment represented by an arched claw, which is somewhat shorter than the preceding segment and accompanied by a setula subproximally.

Leg 1 (Fig. 4-1). Coxa a little shorter than wide, with a row of fine spinules on anterior face along distal border, some arched rows of very delicate spinules on inner half of anterior surface, fringed with long spinules along outer margin. Basis about as long as wide, with an oblique row of stout spinules on anterior face; outer

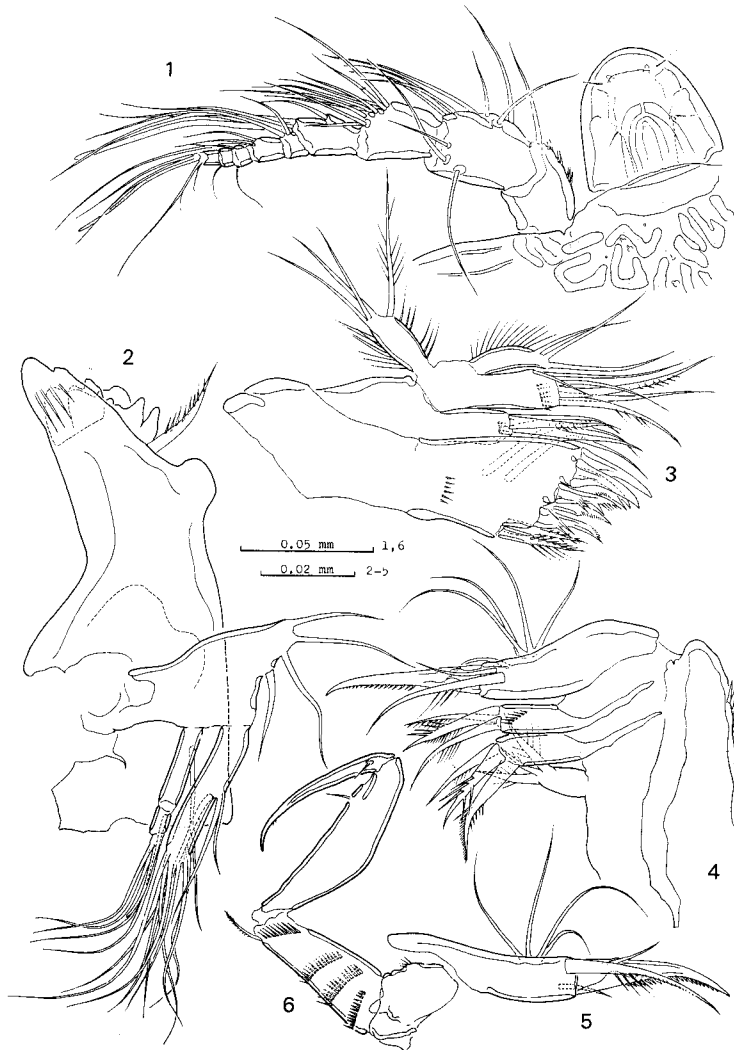


Fig. 3. *Harpacticus purpureus* n. sp. Female (holotype). 1. rostrum and antennule; 2. mandible; 3. maxillula; 4. maxilla; 5. basis of the other maxilla; 6. maxillipede.

spine and inner seta spinulose. Both rami three-segmented. Exopodite: first segment armed with one finely spinulose seta on subapical outer edge; second segment shorter and narrower than the first, armed with one inner seta on a point at two-thirds¹⁾ of the length and one very narrow outer seta subapically; third segment very short, armed with one geniculate and four arched spines which are rather narrow and almost bare (not comb-like). Endopodite: first segment with one hairy inner seta arising from a point at four-fifths of the length;

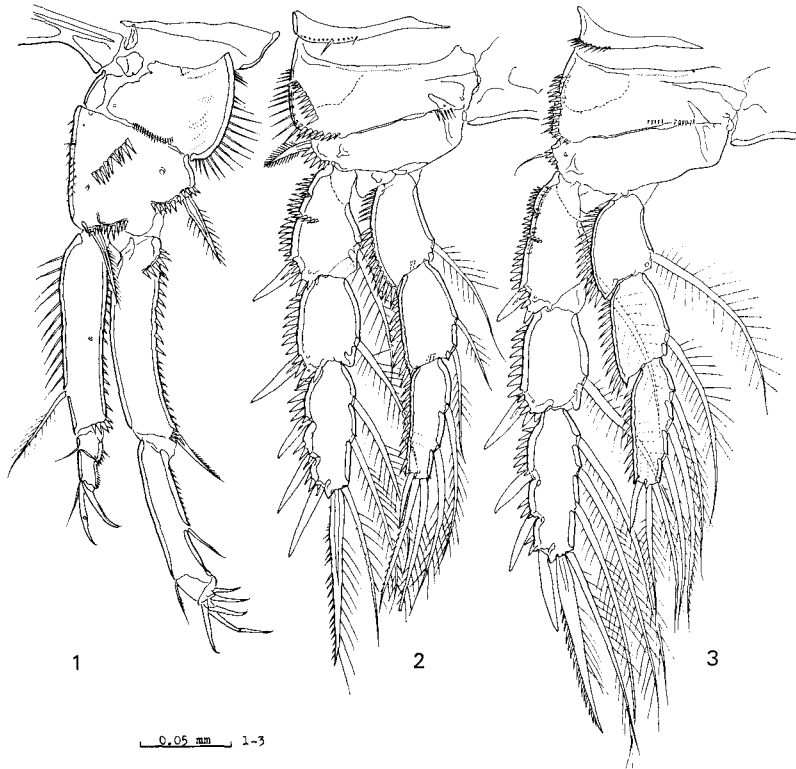


Fig. 4. *Harpacticus purpureus* n. sp. Female (holotype). 1. leg 1; 2. leg 2; 3. leg 3.

second segment with a bare setula on inner distal edge; third segment a little longer than the second, armed with one arched claw, one geniculate spine, and one narrow seta. *Leg 2* (Fig. 4-2), *leg 3* (Fig. 4-3), *leg 4* (Fig. 5-1). Outer spines of each

1) In the present paper, such expression is used to indicate a certain locality on a given part, measured from the base toward the distal end as far as unstated otherwise.

exopodite almost bare. Each last exopodite segment of legs 2-4 with two, three, and three inner setae, respectively. Second endopodite segment of leg 2 armed with two inner setae. Each last endopodite segment of legs 2-4 with two, three,

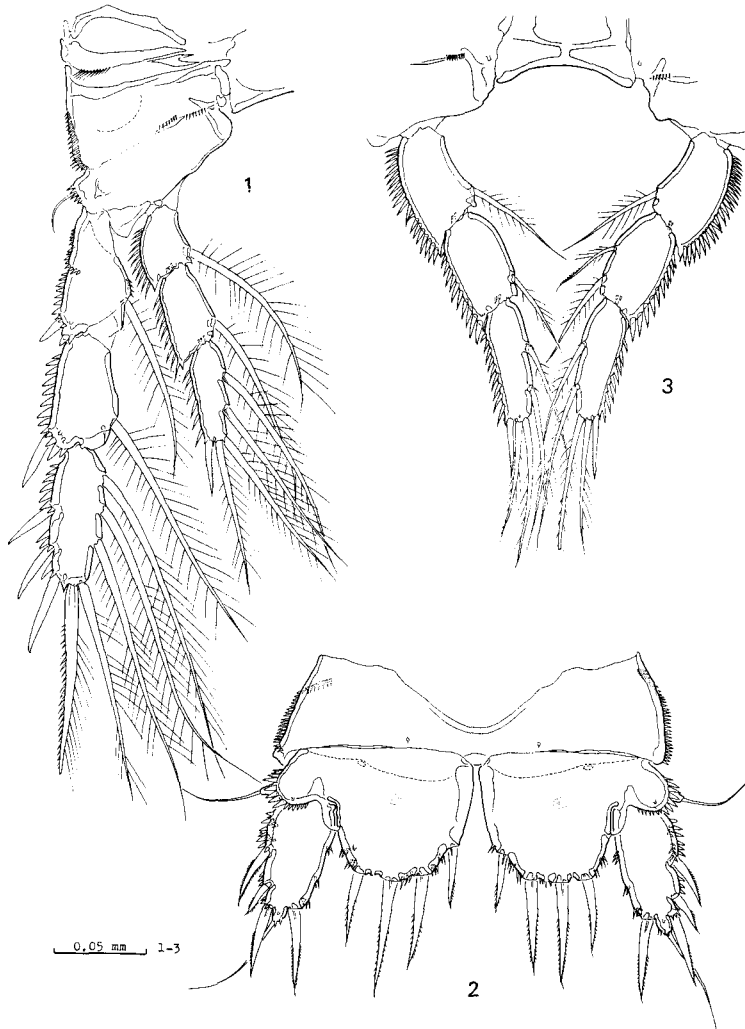


Fig. 5. *Harpacticus purpureus* n. sp. Female (1-2, holotype; 3, a paratype). 1. leg 4; 2. leg 5; 3. abnormal leg 2.

and two inner setae, respectively. Middle inner seta of last endopodite segment of leg 3 furnished with spinules along its distal half. Outer spine of each last endopodite

segment delicately spinulose. *Leg 5* (Fig. 5-2). Baseoendopodite wider than long; inner expansion reaching about the middle of exopodite segment, armed with four spiniform setae, which are alike and finely spinulose. Exopodite more than twice longer than wide, with three separate groups of spinules along inner margin, one spiniform seta on a subapical inner ledge; apical part rather cylindrical, terminating in a narrow bare seta; three spiniform setae attaching onto outer margin; all of the spiniform setae finely spinulose.

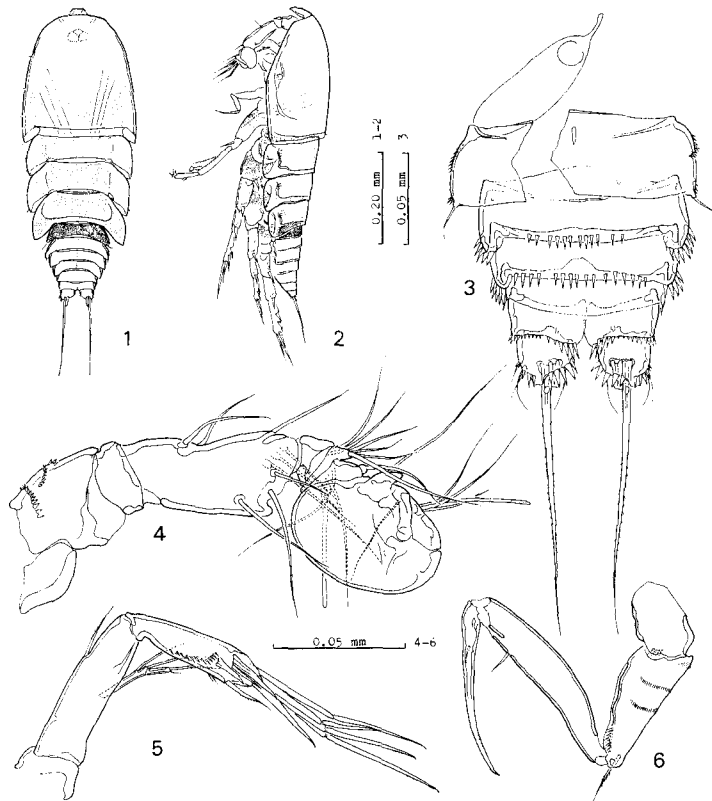


Fig. 6. *Harpacticus purpureus* n. sp. Male (allotype). 1. habitus, dorsal; 2. ditto, lateral; 3. abdomen, ventral; 4. antennule; 5. antenna; 6. maxillipede.

Male (Allotype). Body (Fig. 6-1, 2) about 0.62 mm long, depressed dorso-ventrally. Coloration almost as in the female but rather faint; fourth free thoracic somite tintured with purple. Two abdominal somites (Fig. 6-3) furnished with a transverse row of spinules ventrally. *Antennule* (Fig. 6-4) subchirocer. *Antenna* (Fig. 6-5) as in the female, but somewhat narrower. *Mandible*, *maxillula*, *maxilla*, and *maxillipede* (Fig. 6-6) principally as in the female.

Leg 1 as in the female. *Leg 2* (Fig. 7-1). Endopodite: first segment narrower than that of the female; second endopodite segment forming a spur-shaped process which extends beyond third segment, armed with one inner seta; third segment armed with a dwarfed seta on a subapical portion of outer margin, two terminal setae, of which the inner is narrow and short, and two inner marginal setae. *Leg 3* (Fig. 7-2). Third exopodite segment somewhat shorter than first exopodite segment; outer spines, especially the distalmost, more developed rather

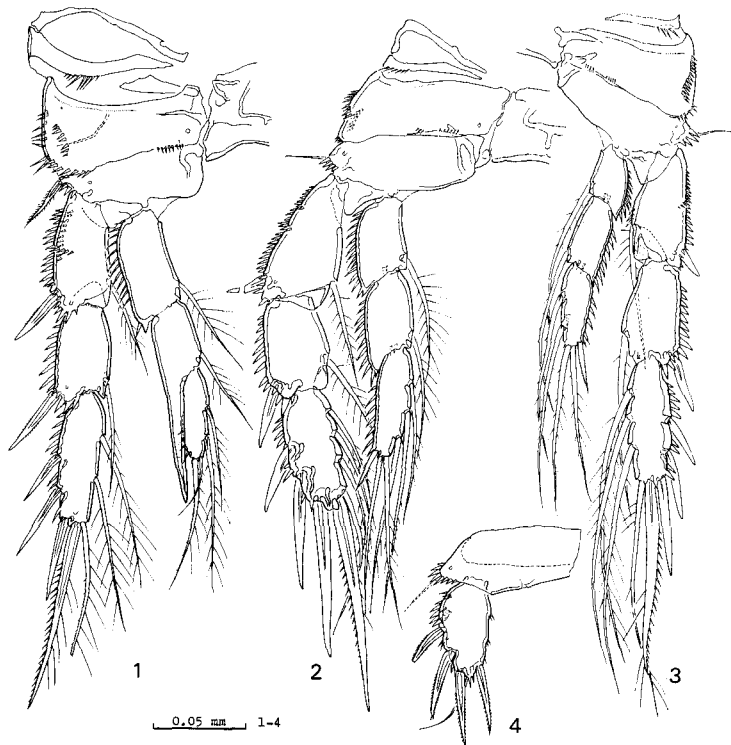


Fig. 7. *Harpacticus purpureus* n. sp. Male (allotype). 1. leg 2; 2. leg 3; 3. leg 4; 4. leg 5.

than those of the female, but inner setae narrower. First two endopodite segments furnished with two spinules on each posterior face near distal border. *Leg 4* (Fig. 7-3). Coxa and basis smaller than those of the female. First two endopodite segments with two spinules on posterior face near each distal border; third endopodite segment with a spinule on posterior face near base of second inner seta. *Leg 5* (Fig. 7-4). Baseendopodite with no inner expansion. Exopodite about twice as long as wide, armed with three outer spines and one subapical inner spine, all of the spines finely spinulose, and one terminal seta which is very narrow

and bare. *Leg 6* (Fig. 6-3) represented by a small protuberance terminating in a bare setula.

Variation and abnormality. Other than the holotypic female described, four non-ovigerous adult females were dissected and examined. In the five females, the largest is the holotypic specimen, and the smallest is 0.80 mm long. The average body length is 0.852 mm. Coloration of two specimens was the same as that of the holotype. Other two specimens are without purple tinge, but the corresponding parts where are purple in the holotype are all orange-yellow. An abnormality is found in one of the orange-yellow specimens, of which the middle endopodite segment of the right leg 2 has only one inner seta (Fig. 5-3).

Another adult male dissected is 0.79 mm long. This specimen was tintured with deep purple along the posterior margin of the cephalothoracic integument, and on the succeeding four thoracic somites and basal parts of the thoracic legs.

Remarks. Among *Harpacticus*-species previously known, the following three species are known having the maxillipedes of non-ledged elongate 'hand' (the first endopodite segment), i.e. *H. flexus* Brady et Robertson, 1873 from Atlantic coasts of Europe and the Mediterranean Sea (cf. Lang, 1948), *H. superflexus* Willey, 1920 from Canadian and other arctic or boreal regions (cf. Lang, 1948), and *H. spinulosus* Lang, 1965 from California. The present new species differs clearly from these three known species in the segmentation of the endopodite of leg 1, from *H. spinulosus* in the number of the female antennular segments, and from both *H. flexus* and *H. spinulosus* in the setal number of the middle endopodite segment of the female leg 2. These differences are summarized in Table 1.

Table 1. Comparison of three characters of the *Harpacticus*-species having the maxillipedes of non-ledged elongate hand.

Character	Species			
	<i>flexus</i>	<i>superflexus</i>	<i>spinulosus</i>	<i>purpureus</i>
Number of antennular segments, ♀	9	9	8	9
Number of endopodite segments of leg 1	2	2	2	3
Setal number of middle endopodite segment of leg 2, ♀	1	2	1	2

On the other hand, the proportion and the armature of the antennal exopodite of the present new species markedly differ from those of the other three species (for *H. flexus* see the redescription by Bodin, 1970).

Type-series. Holotype: adult female. Allotype: adult male. Paratypes: four adult females and one adult male. Type-locality: sandy bottom off Oshoro, Hokkaido. (15-V-1978, Itô leg.).

Description of copepodid stages.

Two copepodites, both of which are safely referable to *H. purpureus* because of the presence of prominent characters, the antennal exopodite typical for the species and the non-ledged elongate hand of maxillipede, were captured at the type-locality. One of them is the third copepodid stage (sex unknown), the other is a female of the fifth copepodid stage. The morphology of these copepodites is described and discussed.

Third copepodid stage (sex unknown). Body (Fig. 8-1, 2) 0.60 mm long, composed of seven somites. Colorless and semitransparent. Pleurotergite of first three thoracic somites differentiated. Penultimate somite (Fig. 8-3) unornamented. Anal somite with spinules laterally and ventrally. Furcal ramus a little longer than wide. *Antennule* (Fig. 8-4) seven-segmented; second segment longest, armed with a long aesthetasc. *Antenna*. Exopodite as in the adult. *Maxillipede* (Fig. 8-5) almost as in the adult.

Leg 1 (Fig. 8-6). Coxa and basis demarcated from each other by an oblique suture. Outer spine and inner seta of basis present. Both rami two-segmented. Exopodite: first segment with one hairy seta on a point at three-quarters of the length of outer edge; second segment about half as long as the first, armed with one short outer seta at about the middle, and four spines on and near distal end. Endopodite a little shorter than exopodite; first segment about three times as long as second segment, armed with one plumose inner seta; second segment armed with two spines and a setula apically. *Leg 2* (Fig. 8-7). Coxa and basis differentiated and ornamented almost as in the adult. Both rami two-segmented. Exopodite: first segment armed with one outer spine and one inner seta; second segment a little longer than the first, with three equally spaced outer spines, two terminal setae, and two inner setae. Endopodite: first segment with one inner seta; second segment about 1.5 times as long as the first, armed with one outer spine subapically, two terminal setae, and two inner setae; a small notch occurring at a quarter of the length of inner margin of second segment. *Leg 3* (Fig. 8-8). Coxa and basis differentiated and ornamented almost as in the adult. Both rami two-segmented. Exopodite: first segment with one outer spine, with no inner seta; second segment longer than the first, armed with two outer spines subapically, two terminal setae, and two setae on distal half of inner margin. Endopodite narrower than exopodite; first segment pointed at its outer distal corner, with one inner seta; second segment 1.7 times as long as the first, with a small notch on a point at a quarter of the length of inner margin, armed with one outer spine subapically, two terminal setae, and two inner setae. *Leg 4* (Fig. 8-9). Coxa unornamented. Basis ornamented as in the adult. Both rami one-segmented. Exopodite armed with three outer spines, in which the first two are widely spaced from each other, two terminal setae, and one inner seta subapically. Endopodite shorter and narrower than exopodite, armed with one outer spine subapically, two terminal setae, and one inner seta on a point at about three-quarters of the length. *Leg 5* (Fig. 8-3)

represented by a small protuberance with one bare seta.

Fifth copepodid stage. Female. Body (Fig. 9-1) 0.68 mm long, consisting of nine somites. Colorless and semitransparent. Rostrum (Fig. 9-3) longer than

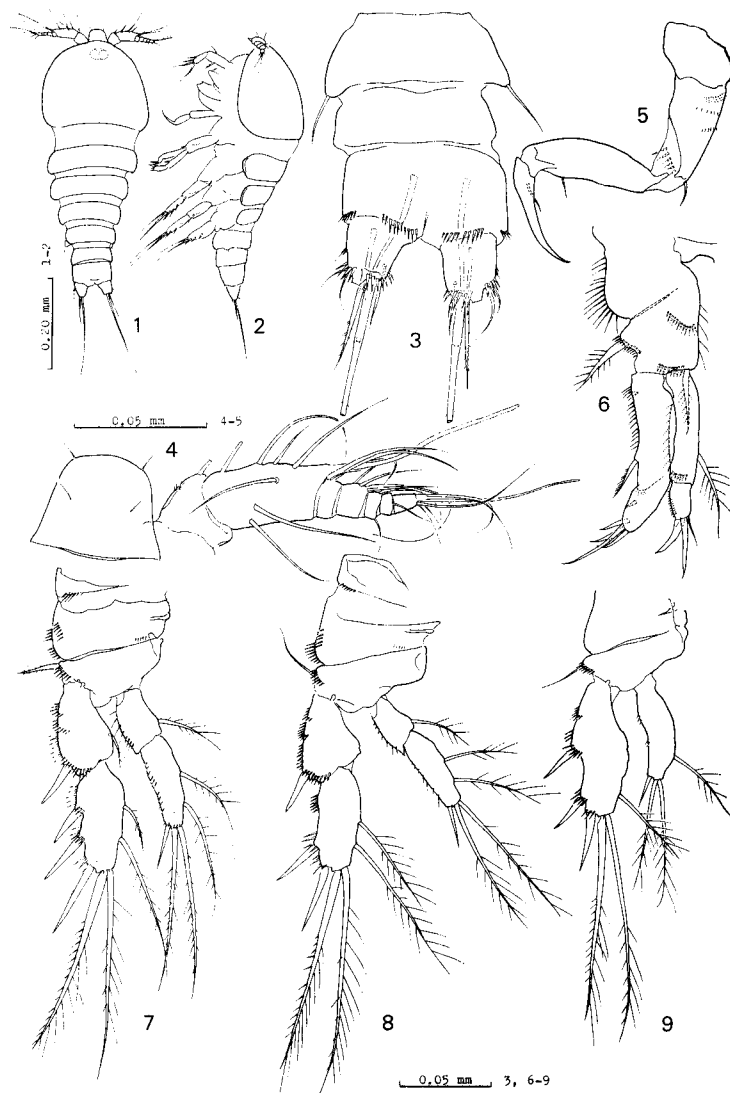


Fig. 8. *Harpacticus purpureus* n. sp. Third copepodid stage (sex unknown). 1. habitus, dorsal; 2. ditto, lateral; 3. leg 5 and abdomen, ventral; 4. rostrum and antennule; 5. maxillipede; 6. leg 1 (posterior face); 7. leg 2; 8. leg 3; 9. leg 4.

first antennular segment. Genital double-somite not yet formed, represented by two separate somites (Fig. 9-2), with no trace of leg 6. *Antennule* (Fig. 9-3) nine-segmented. *Antenna* armed as in the adult. *Maxillipede* (Fig. 9-4) as in the adult.

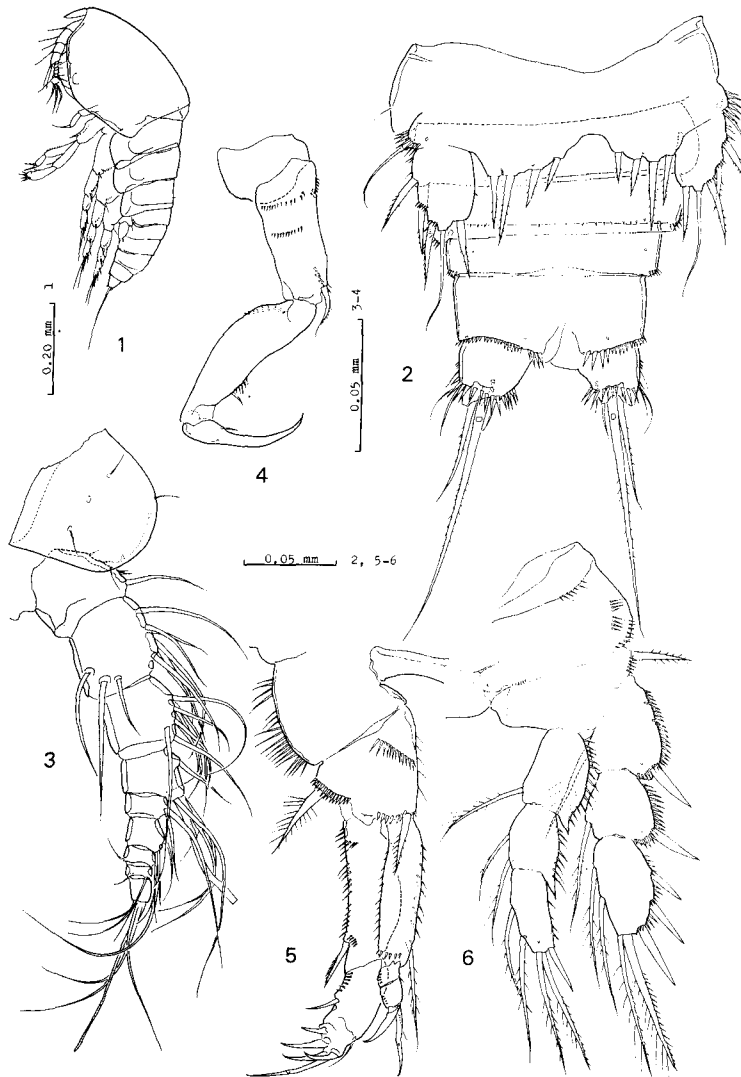


Fig. 9. *Harpacticus purpureus* n. sp. Fifth copepodid female. 1. habitus, lateral; 2. leg 5 and abdomen, ventral; 3. rostrum and antennule; 4. maxillipede; 5. leg 1; 6. leg 2.

Leg 1 (Fig. 9-5), *leg 2* (Fig. 9-6), *leg 3* (Fig. 10-1), *leg 4* (Fig. 10-2). Spinal and setal armature of each leg as in the adult. The shape and armature of the endopodite of the left leg 3, however, is apparently aberrant. *Leg 5* (Fig. 9-2). Both baseoendopodites not yet separated from each other; four setae present on each inner expansion. Exopodite armed almost as in the adult.

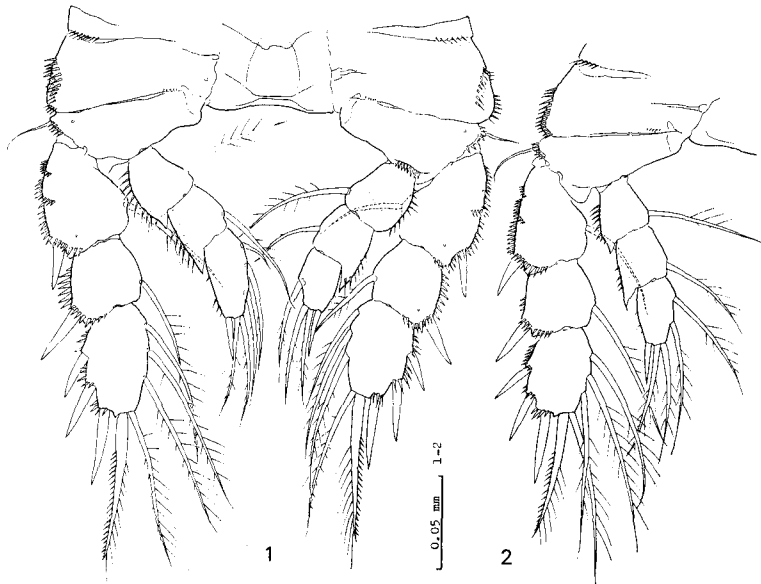


Fig. 10. *Harpacticus purpureus* n. sp. Fifth copepodid female. 1. a pair of leg 3; 2. leg 4.

Discussion. The morphology of copepodid stages of *Harpacticus*-species has hitherto been known for *H. gracilis* Claus (Pugliesi, 1914), *H. nicaeensis* Claus (Brian, 1919), *H. uniremis* Kröyer (Itô, 1971), *H. littoralis* Sars (Castel, 1976), *H. nipponicus* Itô (Itô, 1976), and *H. furcatus* Lang (Itô and Fukuchi, 1978). Among them *H. uniremis* and *H. furcatus* are, no doubt, of the non-retarded formation type in the differentiation of the endopodite outer spine of each leg 2, leg 3, and leg 4; *H. gracilis* and *H. nipponicus* the retarded formation type. In this connection the third copepodid stage of the present species, *H. purpureus*, apparently has the outer spine on each endopodite of legs 2-4; therefore, this species can be assumed as the non-retarded formation type. Incidentally, the setula occurring at subapical outer edge of the last endopodite segment of the male leg 2 (Fig. 9-1) must be the dwarfed outer spine as it was clearly shown in *H. uniremis* by Itô (1971). It is an interesting fact that the present species accords with the other two species of the non-retarded formation type in the possession of two inner setae on the second endopodite segment of the female leg 2.

The second antennular segment of the third copepodid female of *H. furcatus*, on the other hand, is partially demarcated by a transverse suture (Itô and Fukuchi, op. cit.). The examined single specimen of the third copepodid stage of *H. purpureus* has no such suture.

***Onychostenhelia* n. gen.**

Since this new genus is proposed for a sole previously unknown species which will be described below, generic characters are tentatively treated here.

General body shape like *Stenhelia*-species. Rostrum prominent. Female antennule composed of seven segments; the fifth bearing an aesthetasc. Antenna with allobasis; exopodite composed of three segments, of which the middle is very short. Mandibular endopodite with no extremely elongate seta. Legs 1-4: exopodite three-segmented, endopodite two-segmented; setal and spinal armature almost as in *Pseudostenhelia*-species; exopodite of male leg 4 transformed in a special way. Exopodite of leg 5 armed with a strong spur-shaped claw.

The generic name alludes the possession of a spur-shaped claw on the fifth leg and the general affinity with the genus *Stenhelia* Boeck. Gender feminine. Type-species: *Onychostenhelia falcifera*.

***Onychostenhelia falcifera* n. sp.**

(Figs. 11-18)

Female (Holotype). Body (Fig. 11-1, 2) very much sclerotized (so, dissection was quite difficult), 0.84 mm long, rostrum and furcal setae excluded; colorless and semitransparent. Rostrum (Fig. 11-3) prominent, represented by a triangular plate which is articulated at base and with a protrusion ventrally (see Fig. 11-2), furnished with a setula on each side of narrow apex. Cephalothorax wider than other somites, much longer than succeeding three thoracic somites combined. Thorax tapering behind. Fourth thoracic somite protruding postero-laterally. Genital double-somite (Fig. 12-1, 2) subdivided by a circumambient suture into two parts; anterior subdivision widening posteriorly and protruding postero-laterally; posterior subdivision tapering behind, with two sets of three spinules on ventral face near posterior end, forming two sclerotized protuberances, each of which is located at ventral side of its anterior border where an egg sac attaches. Antepenultimate and penultimate abdominal somites narrower than genital double-somite, with no spinule. Anal somite markedly divaricating, with spinules along ventro-posterior edge, a hair arising from dorsal face near each side of anus; anal operculum not developed. Furcal ramus very much elongated, longer than the last three abdominal somites combined, armed with one basally geniculate seta on a point at about four-fifths of the length of inner side, two fine setae each located subapically on dorso-outer face and outer face; inner principal terminal seta proximally thickening, about three times as long as furcal ramus; outer principal

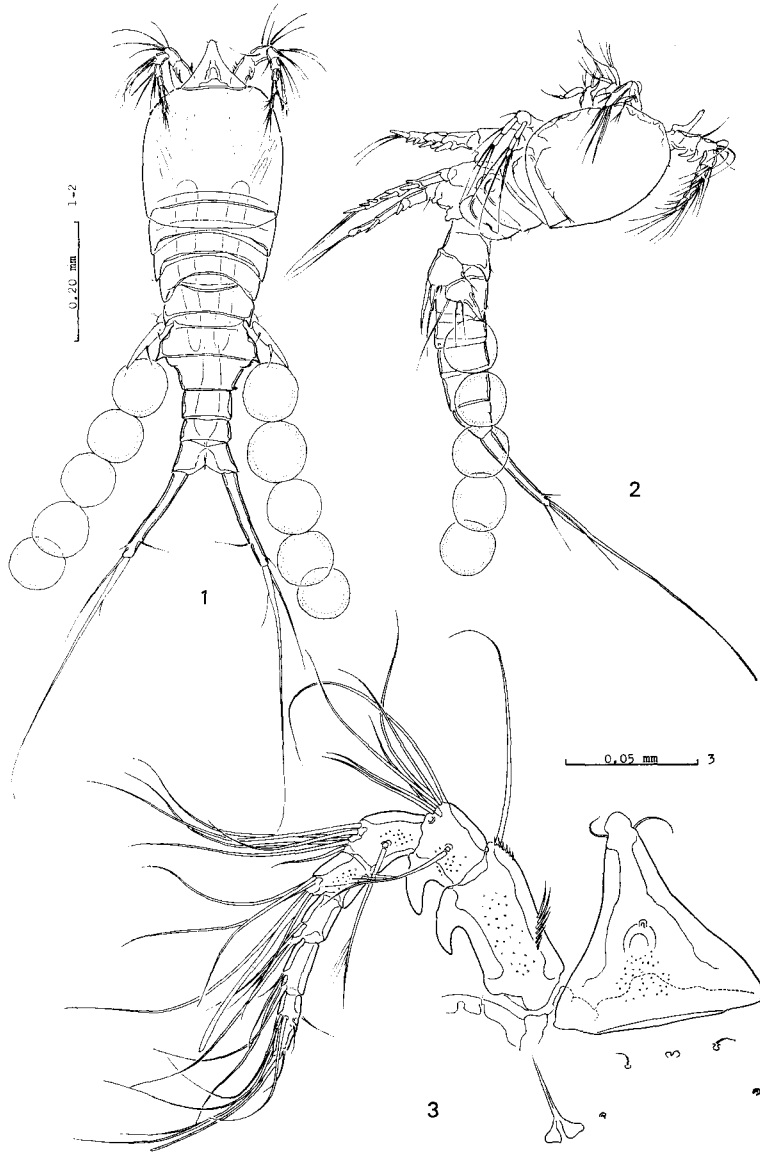


Fig. 11. *Onychostenhelia fulcifera* n. gen. et n. sp. Female (holotype). 1. habitus, dorsal; 2. ditto, lateral; 3. rostrum and antennule.

terminal seta somewhat shorter than furcal ramus; a narrow seta arising terminally. Two egg sacs attaching onto genital double-somite; each egg sac containing five eggs arranged into a single row.

Antennule (Fig. 11-3) seven-segmented; first segment longest, provided with a strong spur-shaped protuberance at a distal outer portion, armed with a bare



Fig. 12. *Onychostenhelia falcifera* n. gen. et n. sp. Female (holotype). 1. abdomen, ventral; 2. ditto, dorsal; 3. antenna; 4. mandible.

seta on inner subdistal face where some spinules occur, a row of spinules on about the middle of inner face; second segment short, provided with a protuberance like that of the previous segment, armed with setae, of which the dorsal one is geniculate basally and hairy; a dorsal seta of third segment also basally geniculate and hairy; fourth one shorter than the third, furnished with an aesthetasc; apical three segments subequal in length, distinctly narrower than other segments. *Antenna* (Fig. 12-3). Coxa short. Allobasis about four times as long as thick, with some very fine spinules subproximally, armed with a seta on a point at about two-thirds of the length of anterior face. Endopodite shorter than allobasis, spinulose anteriorly, armed with two closely set spines subapically, of which the distal is accompanied by a narrow seta, terminating in one spine, one narrow seta, and four geniculate setiform spines, of which the outermost is bifurcate proximally. Exopodite consisting of three segments, of which the second is the shortest; first two segments armed with one bare long seta on each distal edge; third segment about as long as the first, armed with one seta on a point at a quarter of the length, terminating in three narrow setae. *Mandible* (Fig. 12-4). Praecoxa much sclerotized. Coxa-basis longer than praecoxa, somewhat thickening distally, armed with three narrow setae subapically. Exopodite represented by a rather slender segment armed with three narrow setae along inner margin, of which the distal two are located close to each other, and three closely set narrow setae terminally. Endopodite about as long as exopodite segment but a little thicker, armed with two closely set setae on about the middle of inner edge, and six setae terminally, one of which is rather stout and very delicately spinulose and the other three are very narrow. *Maxillula* (Fig. 13-1, 2; see also Fig. 13-7 of a paratypic male). Arthrite of praecoxa armed with six more or less serrate or spinulose claws and one spinulose seta along cutting edge, two parallel setae on anterior face. Coxa obliquely arising from praecoxa, armed with three setae on inner apical end. Basis widening inwards, armed with seven setae in all, of which the dorsal four are separated from other three by a chitinous rim. Exopodite and endopodite set very close to each other (fused basally?). Exopodite smaller than endopodite, armed with one terminal seta and one seta on subapical outer edge. Endopodite terminating in four setae. All setae of coxa, basis, exopodite, and endopodite bare. *Maxilla* (Fig. 13-3; see also Fig. 13-5 of a paratypic female). Syncoxa tapering distally, furnished with three endites; first endite located almost medially, armed with two spinulose short setae apically and one rather slender, bare seta subproximally; second and third endites each apically with two spinulose spines and one (bare?) seta. Basis protruding inwards and forming a short subcylindrical process which is armed with two claws and three narrow setae in all. Endopodite represented by a small cylindrical segment armed with five setae apically or subapically. *Maxillipede* (Fig. 13-4; see also Fig. 13-6 of a paratypic female). Coxa rudimental. Basis more than twice longer than thick, with some spinules on inner subdistal edge, armed with two thick setae which are fringed with long fine spinules, and one spinulose slender seta. First endopodite segment a little shorter

than basis, spinulose along inner edge, armed with two bare slender setae on inner edge subapically. Second endopodite segment small and cylindrical, armed with one slender, somewhat arched spine, one narrow bare seta, and a fine setula apically.

Leg 1 (Fig. 14-1). Coxa longer than wide, ornamented with a row of long spinules on anterior surface near distal border. Basis short, armed with one narrow bare seta near outer edge, one spine-like seta on subdistal inner edge; a few spinules occurring on subproximal inner edge. Both rami slender, fairly

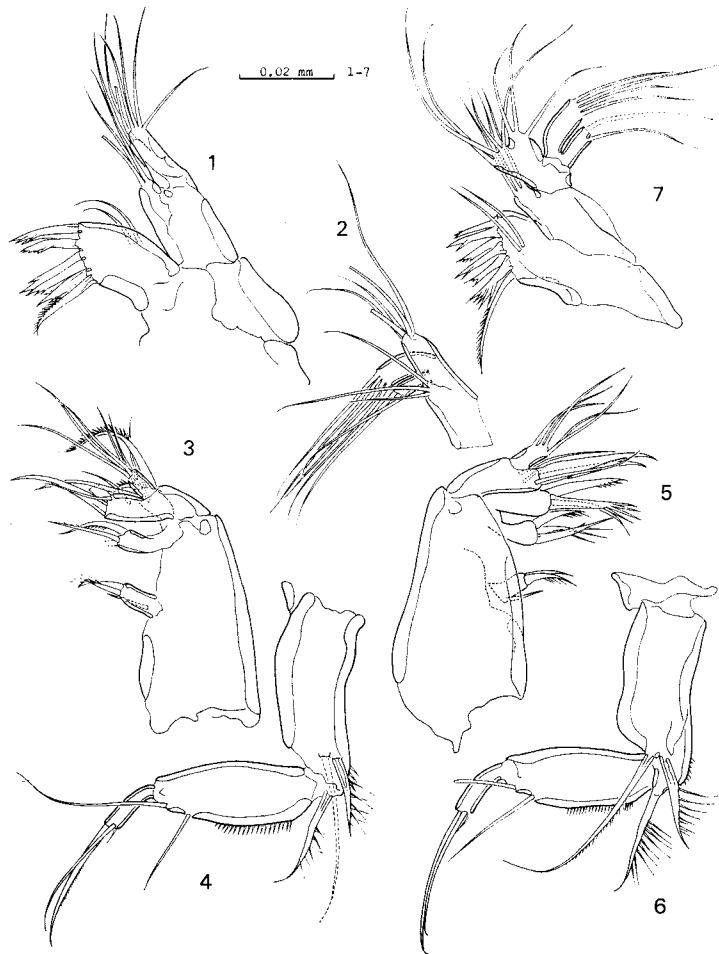


Fig. 13. *Onychostenhelia falcifera* n. gen. et n. sp. Female (1-4, holotype; 5-6, paratypes). 1. maxillula; 2. maxillula (praecoxa omitted); 3. maxilla; 4. maxillipede; 5. maxilla; 6. maxillipede. Male (a paratype). 7. maxillula.

inclined outwards. Exopodite three-segmented; first segment longest, about as long as other two segments combined, armed with one long seta on a point at about two-thirds of the length of outer edge, with a row of minute spinules on anterior surface near distal border; second segment armed with one outer seta and one inner seta; third segment shorter than the second, armed with two outer setae, one terminal seta, and one inner seta, the last mentioned two hairy along an apical short length; all setae of this ramus very long. Endopodite a little shorter than exopodite, two-segmented; first segment armed with one long inner seta on a

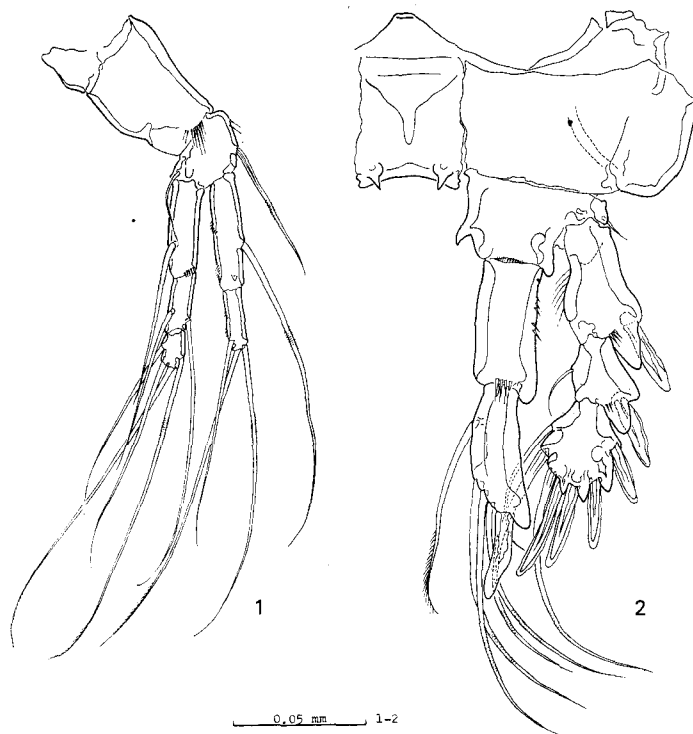


Fig. 14. *Onychostenhelia falcifera* n. gen. et n. sp. Female (holotype). 1. leg 1; 2. leg 2.

point at two-thirds of the length, with two widely separate rows of minute spinules on outer edge; second segment about half as long as the first, armed with one outer seta subapically, one terminal seta which is hairy along an apical short length, and one inner seta close to distal end. *Leg 2* (Fig. 14-2). Intercoxal plate ornamented with a pair of salient spiniform projections on its anterior face near distal edge. Coxa very big, much wider than long. Basis narrower than coxa, ornamented with a short spiniform projection on inner edge, armed with a small

bare seta on outer edge. Both rami with markedly thick rims. Exopodite three-segmented; first segment longest, widening distally, protruding toward an outer distal angle, armed with one outer spine, some hair-like spinules along inner rim; second segment protruding as in the preceding segment, armed with one outer spine, and one small bare inner seta located midst; third segment armed with three outer spines, one spine and one seta (corresponding with the terminal spine and seta in usual forms) on a obliquely cut distal edge, and two inner setae, of which the distal is thicker than the other; all spines of this ramus thick, fringed with a hyaline membrane, not sharply pointed. Endopodite about as long as exopodite, subequally two-segmented; first segment almost cylindrical, about twice as long as wide, with a few spinules both outwards and distally, without any seta; second segment a little narrower than the first, ending in a rather round apex, with a slightly curved inner rim which bears one strong spine distally and four setae in all, of which the first (the proximalmost) is widely separated from the next and spinulose along its distal half. *Leg 3* (Fig. 15-1). Intercoxal plate without spiniform projections. Coxa narrower than that of leg 2. Basis provided with a small spiniform projection on its inner edge, armed with a hairy seta on outer edge. Both rami with thick rims. Exopodite three-segmented, much longer than that of leg 2; first segment with one outer spine; second segment shorter than the first, with one outer spine and one hairy inner seta, some hair-like spinules along inner edge; third segment about as long as the first, armed with three outer spines on distal half, each of which arises from a conspicuous ledge, one spiniform seta and one long seta terminally, of which the former is fringed with long hairs and the latter with both long hairs and numerous short spinules, and three inner setae, of which the first is small and located at opposite side of the first outer spine, and the second is rather stout and spinulose; all outer spines fringed with a hyaline membrane. Endopodite two-segmented, much shorter than exopodite; first segment armed with one spine at almost the middle of inner margin, some long hair-like spinules along outer margin and proximal half of inner margin; second segment about as long as the first, not reaching distal end of second exopodite segment, armed with one spine at a subapical outer ledge and five long setae which are located along distal half of inner and distal edge and fringed with a narrow hyaline frill along each outer side. *Leg 4* (Fig. 15-2). Intercoxal plate lower than that of leg 3. Coxa narrower than that of leg 3. Segmentation of both rami the same as in leg 2. Exopodite segments narrower than those of leg 3, subequal in length; number of setae and spines of each segment the same as in leg 3 but differing in following characteristics; outer spines narrower; of third segment, three outer spines and two terminal setae narrower, without long hairs on the terminal ones, first inner seta stout and spinulose along its apical short length, second inner seta very much thick and stout. Endopodite resembling that of leg 3; first segment with one inner spine which is very thick, much longer than this segment; second segment with one spine on outer distal edge, four long setae which are similar to the setae of the last endopodite segment of leg 3. *Leg 5* (Fig. 15-3). Both

baseoendopodites represented by a common plate; a slightly protruding edge, which corresponds with each inner expansion, bearing, from inner, two spinulose spines, one long seta which is bilaterally fringed with a hyaline membrane, and two small setae. Exopodite provided with a very strong spiniform process which

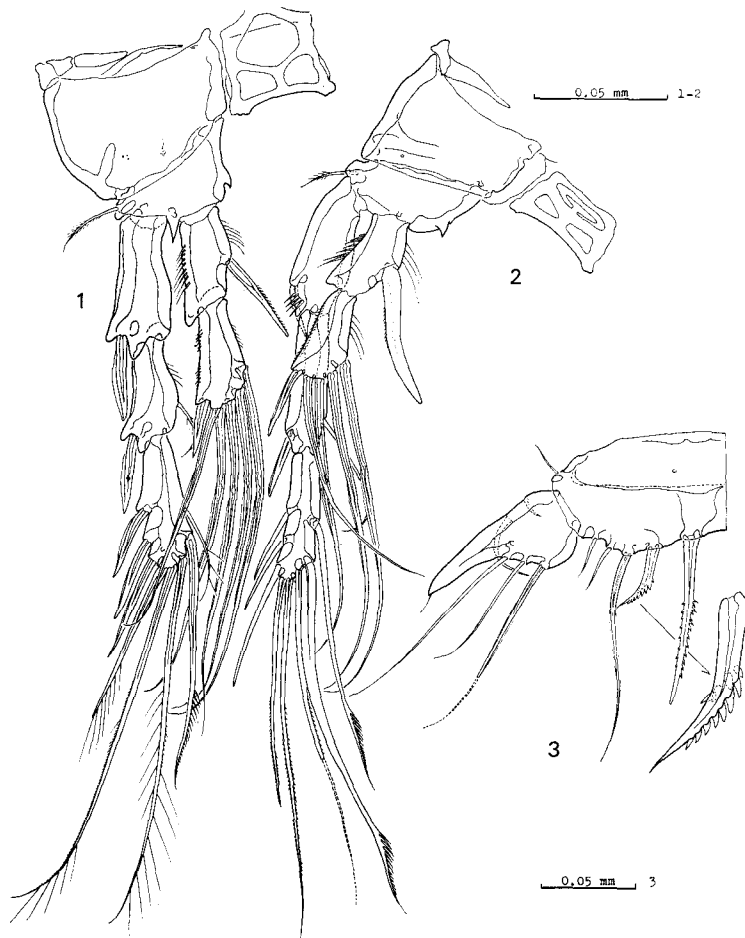


Fig. 15. *Onychostenhelia falcifera* n. gen. et n. sp. Female (holotype). 1. leg 3; 2. leg 4; 3. leg 5.

terminates in a hair, armed with two arched narrow spines on outer (dorsal in the natural position) edge and three long setae, of which the innermost is of hyaline frills, on inner (ventral) edge.

Male (Allotype). Body (Fig. 16-1) 0.81 mm long. Rostrum (Fig. 16-2) somewhat narrower than that of the female. Posterior hind edge of fourth free thoracic somite and succeeding two somites protruding (Fig. 18-1). Penultimate and antepenultimate abdominal somites ornamented with a few spinules ventrally (Fig. 18-2).

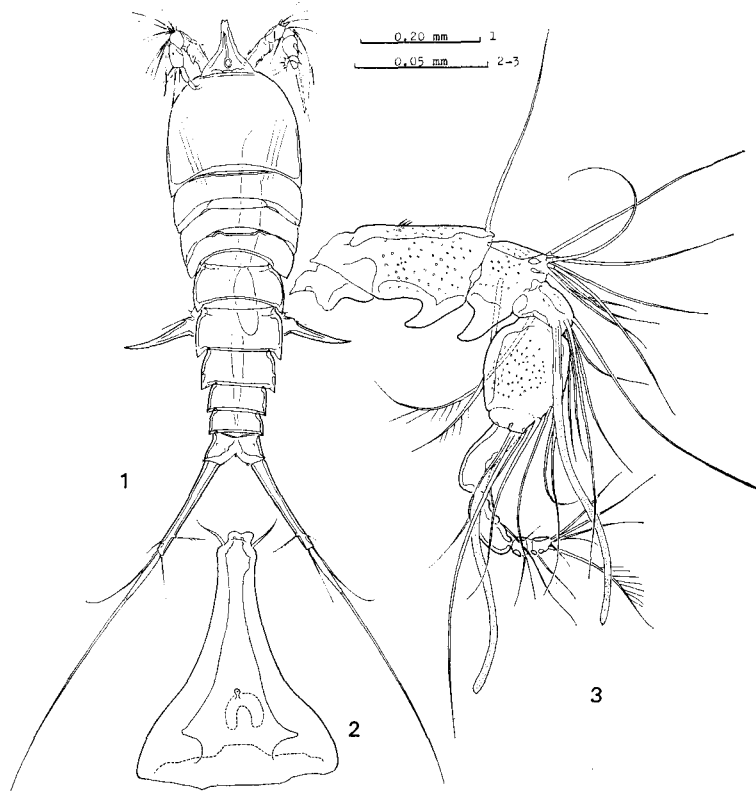


Fig. 16. *Onychostenhelia falcifera* n. gen. et n. sp. Male (allotype). 1. habitus, dorsal; 2. rostrum; 3. antennule.

Antennule (Fig. 16-3) haplocer. Each of first two segments furnished with a strong spur-shaped process; at least one seta of each second, third, and last segment with long hairs. *Antenna* and *oral appendages* principally as in the female.

Leg 1 and *leg 2* as in the female. *Leg 3* (Fig. 17-1). Third exopodite segment somewhat differing from that of the female in proportion and bigger size of the first outer spine (cf. Fig. 15-1). First endopodite segment with no inner spine. *Leg 4* (Fig. 17-2). Exopodite markedly transformed. Second exopodite segment

gradually widening from its base toward about the middle where its outer edge is pointed and abruptly incurved, and is continuously outcurved, so the distal half of the outline is markedly sinuate; outer spine very much thick, arising from subapical posterior face (not lateral edge; cf. Fig. 17-3 and 4) near outer edge; inner edge with long hairs and one plumose inner seta. Third exopodite segment forming a big falciform projection which arises from its outer base and extends toward an outer direction; this segment proper narrowing subproximally, slightly curving

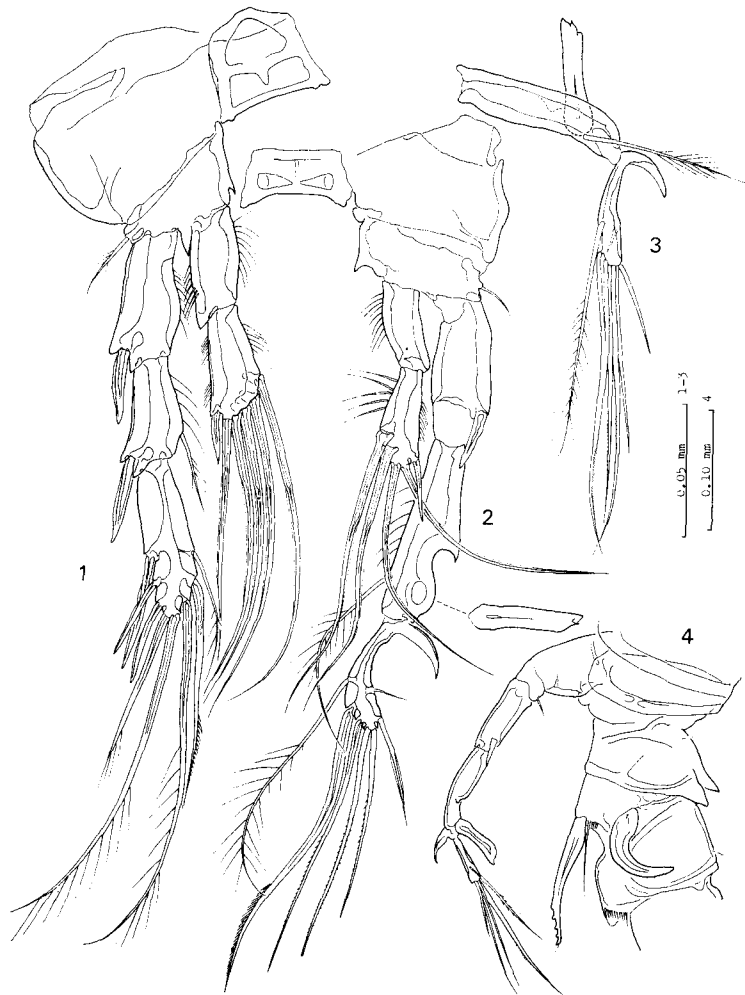


Fig. 17. *Onychostenhelia falcifera* n. gen. et n. sp. Male (1-3, allotype; 4, a paratype). 1. leg 3; 2. leg 4; 3. apical two exopodite segments of right leg 4; 4. lateral view of leg 4 and leg 5 *in situ*.

toward an outer direction, thickening subapically, armed with one setula on a point at two-thirds of the length of outer edge, one seta, which is fringed with hyaline membranes, at subapical outer edge, two finely spinulose terminal setae, and three inner setae, of which the first is plumose, the second thick, sclerotized and spinulose,

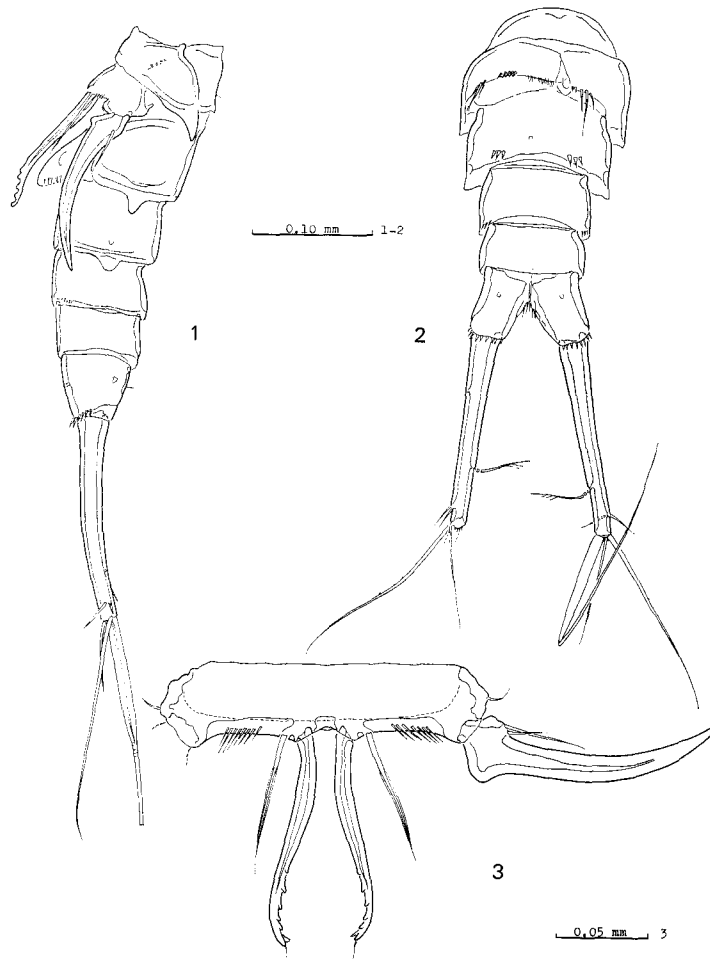


Fig. 18. *Onychostenhelia falcifera* n. gen. et n. sp. Male (allotype). 1. leg 5 and abdomen, lateral; 2. abdomen, ventral (partially broken); 3. leg 5.

the third finely spinulose. First endopodite segment with no inner spine. *Leg 5* (Fig. 18-3). Both baseoendopodites represented by a wide common plate; ventral (posterior) free edge armed with two sets of one arched long claw which has a row of small protuberances and one seta which is fringed with hyaline

membranes; some slender spinules occurring between the seta described and the base of exopodite; a bare setula arising from outer edge. Exopodite represented by a very large claw accompanied by two fine setae on subproximal outer edge. *Leg 6* (Fig. 18-2) represented by a plate with three setulae and a few spinules.

Variation. Besides the pair described, two ovigerous females and one male were dissected and examined. No particular variation was noticed even in the body length. Egg sacs of a paratypic female seemed to be partially broken; those of the other female contained five eggs for each as in the holotype.

Remarks. The present new species resembles *Pseudostenhelia*-species (*P. prima* Wells, 1967, *P. secunda* Wells, 1971, and *P. wellsii* Coull et Fleeger, 1977) especially in the segmentation and general armature of the thoracic legs, but markedly differs from not only the latter but also any of other harpacticoids in the peculiar transformation in the exopodite of leg 4 of the male. The exopodite of the female leg 5 of the present new species, on the other hand, is similar to that of *Stenhelia* (*Delavalia*) *cornuta* Lang, 1936.

Type-series. Holotype: ovigerous female. Allotype: adult male. Paratypes: two ovigerous females and one adult male. Type-locality: sandy bottom off Oshoro, Hokkaido. (6-VII-1977, except for the allotype which was collected 5-XI-1977; Itô leg.).

The trivial name alludes the falciform projection of the last exopodite segment of the male leg 4.

References

- Bodin, Ph. 1970. Copépodes Harpacticoides de environs de La Rochelle. 1—Espèces de la vase intertidale de Châtelailon. *Tethys* 2: 385-436.
- Brady, G. S. and D. Robertson 1873. Contributions to the study of the Entomostraca. No. VII. On marine Copepoda taken in the west of Ireland. *Ann. Mag. nat. Hist.*, Ser. IV. 12: 126-142, pls. 8-9.
- Brian, A. 1919. Sviluppo larvale della *Psamathe longicauda* Ph. e dell' *Harpacticus uniremis* Kröy. *Atti Soc. Italiana* 58: 29-58, 2 pls.
- Castel, J. 1976. Développement larvaire et biologie de *Harpacticus littoralis* Sars 1910 (Copépode, Harpacticoides) dans les étangs saumâtres de la région d'Arcachon. *Cah. Biol. Mar.* 17: 195-212.
- Coull, B. C. and J. W. Fleeger 1977. A new species of *Pseudostenhelia*, and morphological variations in *Nannopus palustris* (Copepoda, Harpacticoida). *Trans. Amer. micros. Soc.* 96: 332-340.
- Itô, T. 1971. The biology of a harpacticoid copepod, *Harpacticus uniremis* Kröyer. *J. Fac. Sci. Hokkaido Univ.*, Ser. VI. 18: 235-255, pl. 11.
- 1976. Descriptions and records of marine harpacticoid copepods from Hokkaido, VI. *Ibid.* 20: 448-567.
- 1978. Meiobenthos of a shallow-water sandy bottom in Ishikari Bay, Hokkaido: A general account. *Ibid.* 21: 287-294.
- and M. Fukuchi 1978. *Harpacticus furcatus* Lang from the Antarctic Peninsula,

- with reference to the copepodid stages (Copepoda: Harpacticoida). *Ant. Rec.* **61**: 40-64.
- Lang, K. 1948. *Monographie der Harpacticiden*. 1682 pp. Nordiska Bokhandeln. Stockholm.
- 1965. Copepoda Harpacticoida from the Californian Pacific coast. *K. Sven. Vetenskapsakad. Handl.* **10**(2): 1-560, pls. 1-6.
- Pugliesi, E. 1914. Sullo sviluppo larvale di *Harpacticus gracilis* Cls. (serie copepodiforme). *Padova Atti Acc. Veneto Trentino* **7**: 81-95, pl. 1.
- Wells, J. B. J. 1967. The littoral Copepoda (Crustacea) of Inhaca Island, Mozambique. *Trans. roy. Soc. Edinb.* **67**(7): 189-358.
- 1971. The Harpacticoida (Crustacea: Copepoda) of two beaches in south-east India. *J. nat. Hist.* **5**: 507-520.
- Willey, A. 1920. Marine Copepoda. In: Report of the Canadian Arctic expedition 1913-18. Vol. VII: Crustacea. Part K. pp. 3-46.
-