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Title	Descriptions and Records of Marine Harpacticoid Copepods from Hokkaido, II (With 11 Text-figures)
Author(s)	ITÔ, Tatsunori
Citation	北海道大學理學部紀要, 17(1), 58-77
Issue Date	1969-09
Doc URL	http://hdl.handle.net/2115/27476
Type	bulletin (article)
File Information	17(1)_P58-77.pdf

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Descriptions and Records of Marine Harpacticoid Copepods from Hokkaido, II [1)2)]

By

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(With 11 Text-figures)

Adding to four species in the previous paper of serial taxonomic work on marine harpacticoid copepods from Hokkaido, the author reports here more four species, of which the first one new to Hokkaido, succeeding two new to science including a new genus, and last one new to Japan and also to interstitial fauna.

Specimens were collected from Oshoro, Rishiri Island (each on and off the Japan Sea coast) and Samani (on the Pacific coast), and some specimens from Abura-tsubo and Shira-hama (both on the Pacific coast of Honshû) were also examined. All the specimens examined are deposited in the Zoological Institute, Faculty of Science, Hokkaido University, Sapporo.

The author expresses his sincere gratitude to Prof. Mayumi Yamada for his guidance to the present study. Sincere thanks are also due to Mr. H. Fukuda, Miss M. Abe and Miss Y. Matsuyama of Hokkaido University, who placed the specimens from Shira-hama, Abura-tsubo and Rishiri Island at the author's disposal.

Tigriopus japonicus Mori

(Figs. 1,2.)

Tigriopus japonicus Mori 1938, p. 294, pl. IX.

The original description of *Tigriopus japonicus*, based upon some specimens from Shimoda, was made by Mori (1938) in comparison with *T. fulvus* (Sars, 1904). Since then, the species has been paid attention as a good material for physiological studies by some authors (Takeda, '39 and '54; Egami, '51; Matsutani, '61, etc.), and the biology in natural condition was investigated by Tokioka & Suzuki (1939). And the localities, except the type locality, are so far reported by the above investigators, Shira-hama and Onagawa, all in Honshû, main island of Japan.

On the other hand, many specimens from two localities of Hokkaido, Oshoro

1) Contribution No. 855 from the Zoological Institute, Faculty of Science, Hokkaido University, Sapporo, Japan 060

2) Studies on marine harpacticoid copepods from Hokkaido, II.

and Rishiri Island near Wakkanai, were examined in 1968. All the specimens are of one species of *Tigriopus*, but some differences were recognized between the specimens and the description of *Tigriopus japonicus* by Mori. Furthermore, the

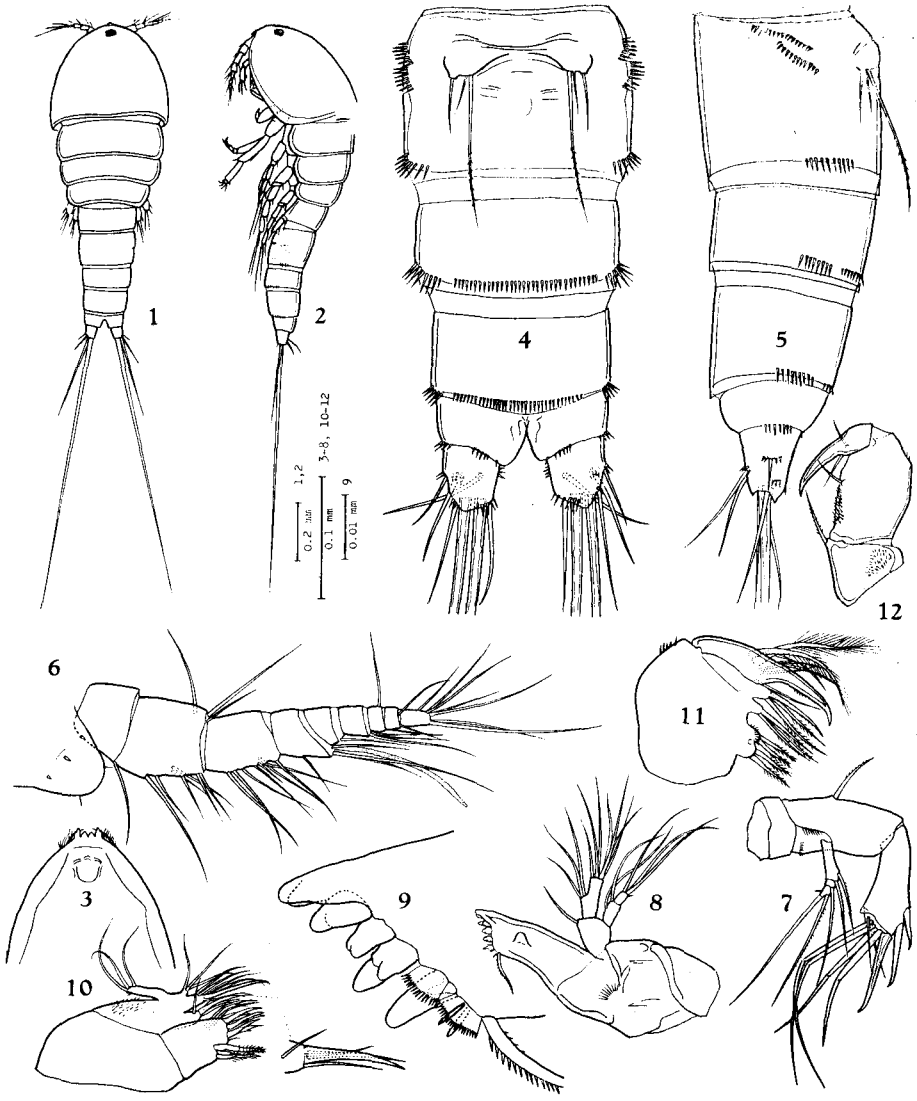

Fig. 1. *Tigriopus japonicus*. 1. ♀, dorsal; 2. ♀, lateral; 3. ♀, labrum; 4. ♀, abdomen, ventral; 5. ♀, abdomen, lateral; 6. ♀ antennule and rostrum; 7. ♀, antenna; 8. ♀, mandible; 9. ♀, cutting edge of mandibular praecoxa; 10. ♀, maxillula; 11. ♀, maxilla; 12. ♀, maxillipede.

author had an opportunity to examine many living specimens from Abura-tsubo near the type locality of *Tigriopus japonicus* and Shira-hama, and some of them were dissected for further morphological study. These specimens completely agreed with the ones from Hokkaido. As the result, it is positive that the all specimens from Abura-tsubo, Shira-hama and also Hokkaido are identified with *Tigriopus japonicus*. Full re-description of the species, based upon the specimens from Oshoro, is made as follows, and lastly comparisons with the other species of the genus are given.

Female (Fig. 1–1 and 2). Length, furcal setae excluded, about 1.2 mm. Body orange or brown in colour. Nauplius eye prominent and red in colour. Cephalothorax as long as succeeding four segments combined. Abdomen slightly tapering posteriorly. Rostrum (Fig. 1–1) as long as first segment of antennule, rounded at tip, and with a sensory seta on each side of the tip. Labrum (Fig. 1–3) prominent, with four spiniform processes and many hairs at apical edge. Genital double-somite (Fig. 1–4 and 5) with two oblique spinular rows on each antero-lateral surface, and one spinular row on each postero-lateral edge. Antepenultimate and penultimate somites, each with three spinular rows on ventral and both lateral edges, ventral row consisting of short spinules. Last somite with some spinules on outer and ventral edges. Furcal ramus almost as long as wide; ventro-posterior end forming a hyaline lappet; inner dorsal seta articulate at base; outer dorsal seta and outer marginal one accompanied with some spinules at anterior base; principal terminal seta as long as two-thirds of body.

Antennule (Fig. 1–6): 9-segmented; second segment longest, fourth one furnished with one aesthetasc, comparatively slender. Length of apical five segments combined almost equal to proximal two combined. *Antenna* (Fig. 1–7): Coxa small and bare. Basis, about two times as long as greatest width, with one comparatively short seta on middle anterior edge, and two rows of spinules as shown in the figure. Exopodite 3-segmented; first segment longest and with two setae; second one shortest and with one seta; third one with one marginal and one terminal seta and one spinule. Endopodite almost same length of basis, with two spines on anterior edge, and one spine, four geniculate spiniform and two slender setae on distal end. *Mandible* (Fig. 1–8): Praecoxa with one arched spinular row near proximal surface; cutting edge with bidentate pars incisiva, weakly bidentate lacinia, three strong and two small spines, two serrate plates, and one spinulose seta; coxa-basis with one apical seta; exopodite 2-segmented, first segment with two setae, second one with three setae and one spinule; endopodite with three setae at middle inner edge, and seven setae on distal end. *Maxillula* (Fig. 1–10): Arthrite of praecoxa with two geniculate setae on surface, six slender spinulose spines, one short bare seta, and three plumose setae on inner edge; coxa with one spine and three setae on inner end and one short seta just inside; basis with many spinules on outer surface; one slender spine and two setae at distal end; three subdistal setae, two of which juxtaposed; exopodite with three setae and some spinules near distal end; endopodite small, with three terminal

setae. *Maxilla* (Fig. 1–11): Syncoxa with three endites; proximal endite bilobular, each lobule with two plumose setae on distal end, and distal one with a spinular row transversely; each other endite with three plumose setae on distal end; basis furnished with a strong, along distal part of inner edge pectinate, claw; two strong, remarkably plumose setae and five slender bare setae near base of the claw, one of which separated from others. *Maxillipede* (Fig. 1–12): Basis with

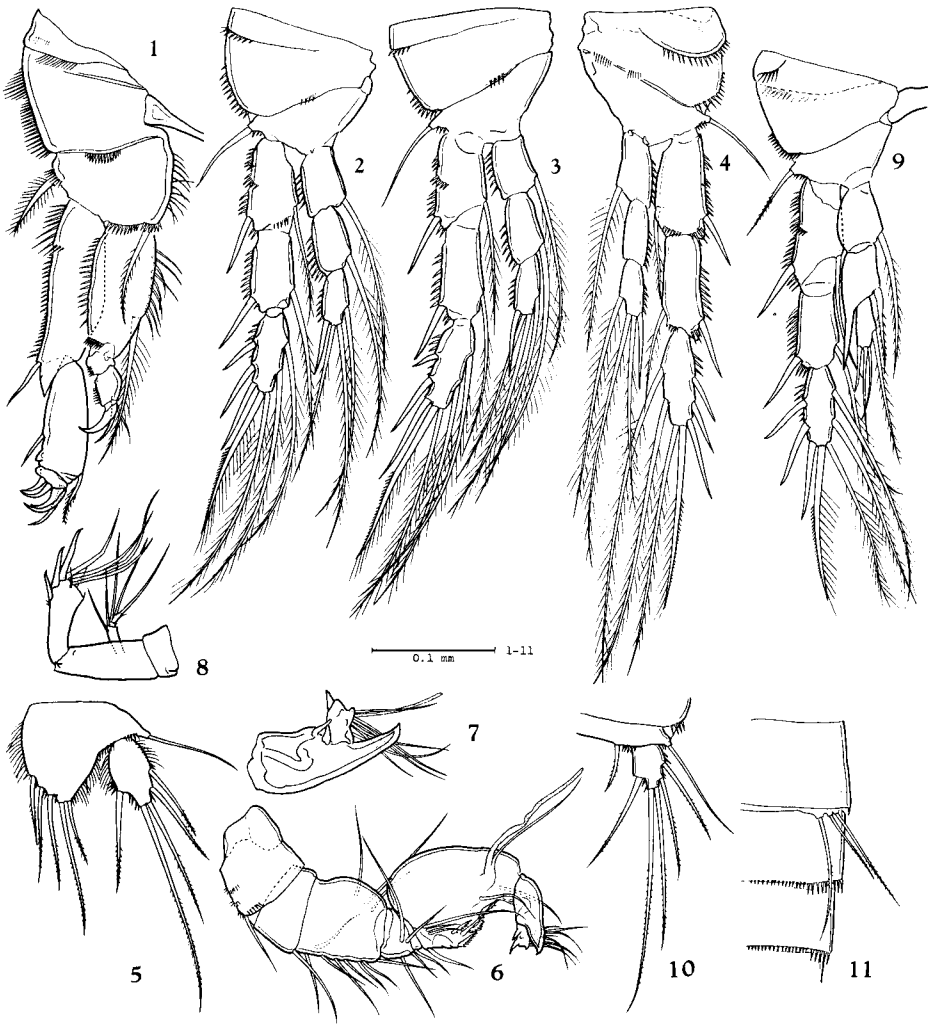

Fig. 2. *Tigriopus japonicus*. 1. ♀, leg 1: 2. ♀, leg 2; 3. ♀, leg 3; 4. ♀, leg 4; 5. ♀, leg 5; 6. ♂, antennule; 7. ♂, apical two segments of antennule; 8. ♂, antenna; 9. ♂, leg 2; 10. ♂, leg 5; 11. ♂, leg 6.

many spinules on surface and one hairy seta on inner distal edge. First endopodite-segment with many spinules and one bare seta on inner edge; second segment claw-formed, with two bare setae.

Leg 1 (Fig. 2–1): Coxa, outer margin about three times as long as inner, with some spinules along outer margin, on surface near base and middle distal surface along joint of basis and coxa. Basis, inner margin about two times as long as outer, with two strong plumose setae, each on middle outer margin and inner distal edge, each seta accompanied with some spinules near base, two spinular rows near base of endopodite and slender spinules along inner margin. Exopodite 3-segmented; first segment about 1.5 times as long as second, and with a bare outer seta about five-sixths from base and three grouped spinules along outer margin, the spinules of proximal group very slender and long; second one with one short outer seta and one plumose inner seta near distal end; third one shortest, with four spines and one spiniform seta. Endopodite 3-segmented; first segment longest, about 3.5 times as long as third one, with one long plumose seta about outer half near distal surface; second one shortest, with small spinules on outer margin; third one with one strong spine, one spiniform seta and one slender seta on distal end, and with some spinules along outer margin. *Leg 2* (Fig. 2–2): Coxa with some spinules along outer margin and on anterior surface of proximal part transversely. Basis with one outer seta and some minute spinules along outer edge. Exopodite 3-segmented, all segments almost equal in length, but a little longer proximally; first and second segments each with one outer spine and one inner marginal seta; third segment with three spines along outer margin, two setae on distal edge, outer one spiniform and outer edge spinulose, and with two setae on inner margin; all segments furnished with some spinules along outer margin; all setae somewhat plumose. Endopodite 3-segmented; first segment longest; first and second ones each with one plumose seta on distal inner edge; third one shortest and the distal end reaching to about a third of third exopodite-segment, with one spine on distal outer edge, two setae on distal end and one seta on inner margin, about two-thirds from proximal end; all segments furnished with some spinules along outer margin and all setae plumose. *Leg 3* (Fig. 2–3): Coxa and basis almost same as in leg 2. Segmentations, setal and spinal structures of exo- and endopodite almost same as in leg 2, except following feature; distal end of third endopodite-segment reaching only to a little beyond second exopodite-segment. *Leg 4* (Fig. 2–4): Distal end of third endopodite-segment not reaching to third exopodite-segment. Second endopodite-segment without seta or spine. Other setal and spinal structures same as in leg 3. *Leg 5* (Fig. 2–5): Basoendopodite with well-developed inner expansion, furnished with five setae, and with one bare outer seta. Exopodite, about two times as long as greatest width, with one inner, two apical and two outer setae. All margins furnished with some long hairs or spinules. *Leg 6* (Fig. 1–4) with three setae; innermost one longest, as long as genital double-somite.

Male. Length about 0.9 mm. *Antennule* (Fig. 2–6 and 7): 8-segmented,

first segment with some spinules on anterior surface, fifth one shortest, sixth one globularly expanded with an aesthetasc, seventh one forming a claw-like process, and last one small, attached on about middle anterior edge of preceding segment. *Antenna* (Fig. 2–8): Anterior edge of allobasis without seta, and the other all setal and spinal structures same as in female. *Leg 2* (Fig. 2–9): Setal and spinal structures of exopodite same as in female. Endopodite 3-segmented; first segment with one inner plumose seta; second one with one inner spinulose seta, comparatively short, and one spiniform process at outer distal corner; third one small, not reaching to third exopodite-segment, with three bare setae on distal end and one plumose seta at inner edge. *Leg 5* (Fig. 2–10): Basoendopodite with one inner seta, comparatively short, and one long slender outer seta. Exopodite, about 1.5 times as long as greatest width, with one inner, two apical, and two outer setae; apical inner seta longest, about five times as long as exopodite-segment. *Leg 6* (Fig. 2–11) represented by three setae, innermost one longest and middle one shortest.

Remarks: According to Mori (1938), as far as judging from his figure of *Tigriopus japonicus*, all margins of first exo- and endopodite-segment of leg 1 are not furnished with any spinules, while of all the present specimens with many spinules. The observation of such spinules is occasionally difficult in the case of the objective legs twisted in the preparation. *Tigriopus japonicus* differs apparently from all other species within the genus in the third exopodite-segment of leg 4 with two inner marginal setae, contrary to three ones of the others.

Specimens examined: Oshoro, 8 ♀♀, 4 ovigerous ♀♀, 4 ♂♂, 27-V-'68. Kutsu-gata, Rishiri Island, 4 ♀♀, 1 ovigerous ♀, 4 ♂♂, 7-VIII-'68. Abura-tsubo, 2 ♀♀, 2 ♂♂, 22-X-'68. Shira-hama, Waka-yama prefecture, 2 ♀♀, 1 ovigerous ♀, 2 ♀♀, 4-IV-'69. Numerous individuals from Oshoro, Abura-tsubo and Shira-hama were kept in culture in the laboratory and are still alive at this writing (May, '69).

Distinct five species of *Tigriopus* have been so far reported, except for the present one: *T. brevicornis* (O.F. Müller, 1776), *T. fulvus* (Fisher, 1860), *T. californicus* (Baker, 1912) (=*T. angulatus* Lang, 1933), *T. brachydactylus* Candeias (1959) and *T. minutus* Božić (1960). Of *T. brevicornis* and *T. fulvus*, Božić (1960) recognized them as distinct ones, but Lang (1948) treated the latter as a synonym of the former. *T. minutus* is very similar to *T. brachydactylus*, particularly in the setal structure of leg 5 of female. In the latter species, as far as judged from the figure of Candeias, the second exopodite-segment of leg 1 is furnished with no outer seta, while of all the other species with one outer seta. In this respect, a re-examination of *T. brachydactylus* is expected in future. For comparison of all the species within the genus, the following key to the species is proposed.

Key to the species of the genus *Tigriopus*

1. Inner margin of third exopodite-segment of leg 4 with two setae .. *japonicus*
– Inner margin of third exopodite-segment of leg 4 with three setae 2
2. Inner expansion of basoendopodite of leg 5 in female with four setae 3

– Inner expansion of basoendopodite of leg 5 in female with five setae 4
3. Second exopodite-segment of leg 1 with one outer seta; first endopodite-segment of maxillipede slight and oval ..... *minutus*
– Second exopodite-segment of leg 1 without outer seta; first endopodite-segment of maxillipede thickset and rectangular ..... *brachydactylus*
4. Exopodite of leg 5 in male with five setae; anal operculum with many hairs ..... *californicus*
– Exopodite of leg 5 in male with four setae; anal operculum bare 5
5. Allobasis of antenna, and exopodite of leg 5 in female with tuft of hairs .... *fulvus*
– Allobasis of antenna, and exopodite of leg 5 in female without tuft of hairs ..... *brevicornis*

Genus *Paratigriopus* n. gen.

The present new genus, belonging to Family Harpacticidae, is closely related to *Tigriopus* Norman in several points, particularly in the 3-segmented exopodite of antenna, but distinctly differs from the latter in the untransformed leg 2 of male, the simple structure of maxillula and maxilla, and the parasitic status. These differences are sufficiently marked to warrant the creation of a new genus represented by the following type-species.

Paratigriopus hoshidei n. gen. et sp.
(Figs. 3, 4, 5)

Female (Fig. 3–1 and 2). Length 0.72 mm, rostrum and furcal setae excluded. Body depressed dorso-ventrally, dark orange in colour. Cephalothorax almost as long as succeeding three segments combined. Nauplius eye prominent, light red in colour. Rostrum (Fig. 3–5) very prominent, rectangular, as long as inner edge of first segment of antennule, and with a sensory seta on each frontal corner. Labrum (Fig. 3–3) comparatively smooth, with some hairs on middle edge. Penultimate somite (Fig. 3–4) with some minute spinules on ventro-posterior edge. Furcal ramus a little longer than wide, with three terminal setae, longest middle one as long as abdomen; one hair-like seta on middle outer margin; two setae on outer subdistal edge; one short seta, articulate at base, on inner subdistal edge.

Antennule (Fig. 3–5): 9-segmented, tapering distally; fourth segment with one thick aesthetasc. *Antenna* (Fig. 3–6): Coxa very short. Allobasis, tapering distally, with a transverse spinular row, and short seta on middle anterior edge. Exopodite 3-segmented; first segment longest, with two setae; second one shortest with one seta; third one with one seta on distal edge; all setae with some very minute hairs. Endopodite about 1.5 times as long as greatest width, with three spines, four geniculate spiniform setae; a spinular low near anterior distal edge. *Mandible* (Fig. 3–7): Praecoxa with bidentate pars incisiva, unidentate lacinia, three

spines and one spinulose slender seta along cutting edge. Coxa-basis without any setae. Exopodite 2-segmented incompletely; first segment with two inner setae on middle and distal edge; second one with three terminal setae, and some spinules on outer margin. Endopodite 1-segmented, with two inner setae, one of

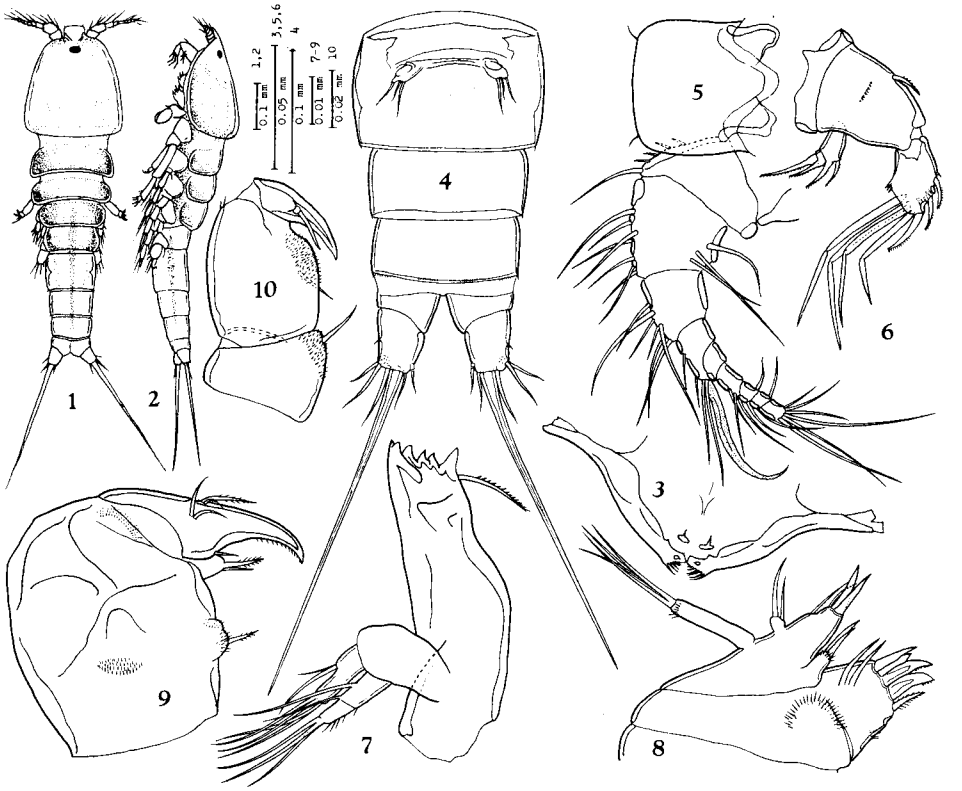

Fig. 3. *Paratigriopus hoshidei* n. gen. et sp. 1. ♀, dorsal; 2. ♀, lateral; 3. ♀, labrum; 4. ♀, abdomen; 5. ♀, antennule and rostrum; 6. ♀, antenna; 7. ♀, mandible; 8. ♀, maxillula; 9. ♀, maxilla; 10. ♀, maxillipede.

which hair-like; four setae on distal end. *Maxillula* (Fig. 3–8): Praecoxa with an arched spinular row on surface; arthrite with four spines and one spinulose seta along inner edge, two parallel bare setae on surface, and some spinules on middle dorsal edge. Coxa with two slender terminal spines, and some spinules subdistally. Basis with two spines and one minute seta on distal end and one slender seta on subdistal edge. Exopodite about five times as long as greatest width, with four terminal setae and a transverse spinular row near distal end. Endopodite small,

almost as long as wide, with one seta on distal end; one slender seta on inner subdistal end. *Maxilla* (Fig. 3–9): Syncoxa with some spinules on surface, an arched spinular row near distal edge, and with two endites; proximal endite with one short hairy seta and some spinules; distal one with two setae, one of which hairy. Basis furnished with one pectinate strong claw; short seta on dorsal edge; two setae on subdistal surface; two setae, one of which hairy, and the other short and bare, on distal edge, probably the two setae representing endopodite. *Maxillipede* (Fig. 3–10): Basis with one seta on inner subdistal edge. First endopodite-segment with one inner seta near middle edge; second one forming a strong claw with one articulate seta. Each inner distal surface of proximal two segments covered with many minute hairs or spinules.

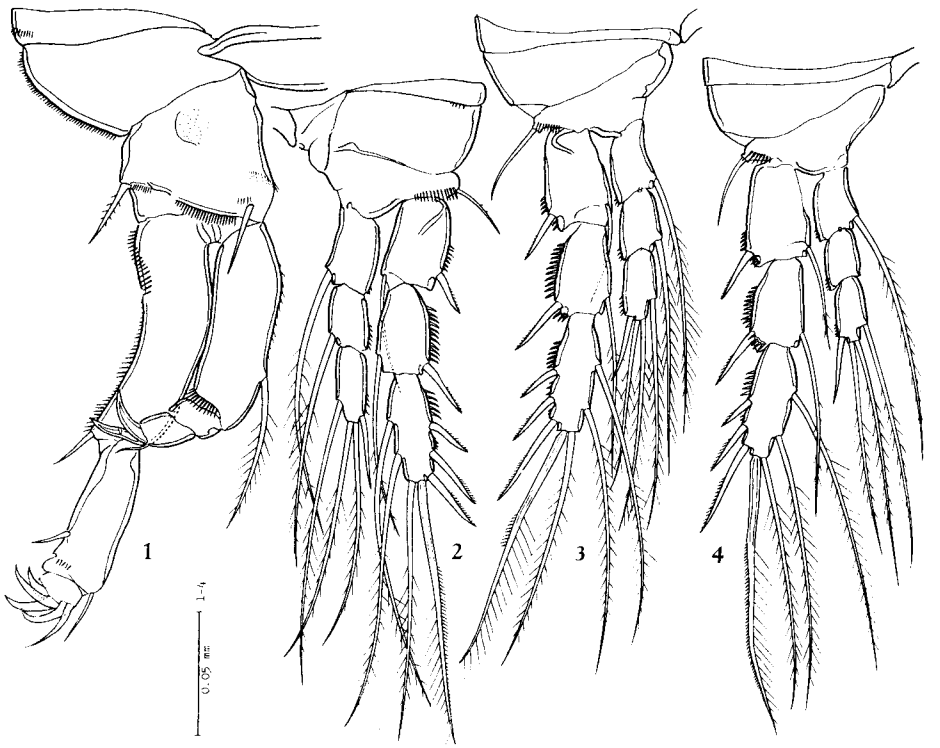

Fig. 4. *Paratigriopus hoshidei* n. gen. et sp. 1. ♀, leg 1; 2. ♀, leg 2; 3. ♀, leg 3; 4. ♀, leg 4.

Leg 1 (Fig. 4–1): Principal structure same as in *Tigriopus japonicus*. Outer margin of coxa with very minute spinules. Basis with an oblique spinular row near inner subdistal edge; inner seta spiniform and comparatively short. First endopodite-segment with some minute hairs along inner margin. Outer margin

of endopodite bare. *Leg 2* (Fig. 4–2), *Leg 3* (Fig. 4–3) and *Leg 4* (Fig. 4–4): Principal structure same as in *T. japonicus* except for outer margin of coxa without any spinules and all outer spines remarkably spinulose. *Leg 5* (Fig. 5–1): Basoendopodite with one outer seta; four setae, all somewhat hairy, on inner expansion. Distal end of inner expansion reaching to about two-thirds of exopodite. Exopodite about 1.5 times as long as greatest width, with four setae, terminal one longest.

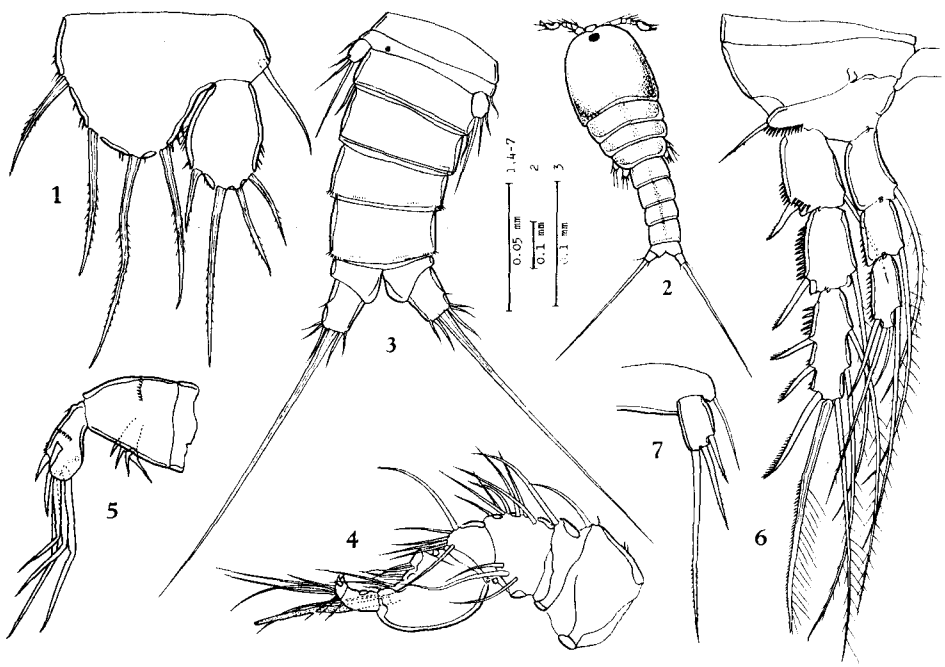

Fig. 5. *Paratigriopus hoshidei* n. gen. et sp. 1. ♀, leg 5; 2. ♂, dorsal; 3. ♂, leg 5, leg 6 and abdomen; 4. ♂, antennule; 5. ♂, antenna; 6. ♂, leg 2; 7. ♂, leg 5.

Male (Fig. 5–2). Length 0.55 mm. Body not remarkably depressed, and almost same as a typical form of *Tigriopus*. *Antennule* (Fig. 5–4): Subchirocer, 8-segmented; fifth segment shortest; seventh one globularly expanded with an aesthetasc. *Antenna* (Fig. 5–5): Anterior edge of allobasis without seta. Other structure same as in female. *Leg 2* (Fig. 5–6): All setal and spinal structures same as in female, except for the shorter inner terminal seta of third endopodite-segment. *Leg 5* (Fig. 5–7): A pair of basoendopodite forming a long common plate, with one slender bare seta on each outer end. Exopodite about 1.8 times as long as greatest width, with one long terminal seta, more than three times as long as the segment; two comparatively short setae on outer margin. *Leg 6* (Fig. 5–3): Only a lobule with one short seta.

Type-specimens: Syntypes; 1 ♀, 29-X-'68; 2 ♀♀ and 4 ♂♂, 19-II-'69. Many specimens were obtained from Oshoro, 4 non-ovigerous females, 29-X-'68, more than 100 non-ovigerous females and 12 males, 19-II-'69, inside the shells of the small rock barnacle, *Cthamalus challengeri* Hoek. The barnacle is very common in Oshoro on the rocks at high-tide level.

Echinolaophonte oshoroensis n. sp.

(Figs. 6, 7, 8, 9.)

Female (Fig. 6–1 and 2). Length about 0.8 mm, rostrum and furcal setae excluded. Nauplius eye prominent. Body yellowish grey in colour, and somewhat covered with dirt. Rostrum (Fig. 7–1) very prominent, rounded at distal part, with a sensory seta on each edge; each margin of proximal half with a thin membranous formation. Labrum (Fig. 7–2) prominent, with many spinules or hairs along distal edge. Cephalothorax, rostrum excluded, almost as long as succeeding three thoracic segments combined; surface and each antero-lateral edge with some sensory setae; posterior dorsal edge furnished with one strong spiniform

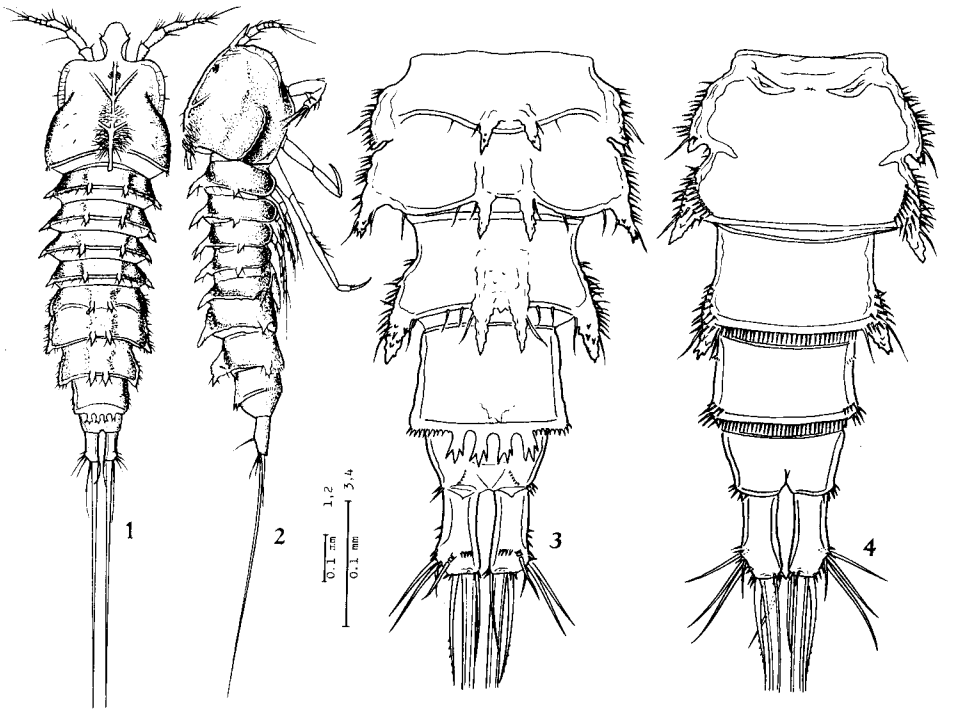

Fig. 6. *Echinolaophonte oshoroensis* n. sp. 1. ♀, dorsal; 2. ♀, lateral; 3. ♀, abdomen, dorsal; 4. ♀, abdomen, ventral.

process (Fig. 7–3), accompanied with many hairs; one distinct long hair on each side of the process. Thorax bellows-like, each segment distinctly separated, and with two strong spiniform processes dorsally, and one process on each lateral edge; some hairs and small granular pojections between each dorsal projection and lateral one. Abdomen slightly tapering posteriorly. Genital double-somite (Fig. 6–3 and 4) dorsally and laterally subdivided by chitinous suture; each subdivision with two dorsal processes; each lateral edge, produced posteriorly into a spiniform process, covered with many spinules and some hairs. Antepenultimate somite ornamented as posterior subdivision of preceding segment, with many spinules along ventro-posterior edge. Penultimate somite with four dorsal projections, each tridentate apically; many spinules along ventro-posterior edge. Anal segment a little shorter than preceding one, with some spinules on postero-lateral end; two oblique spinular rows on dorsal surface. Furcal ramus about two

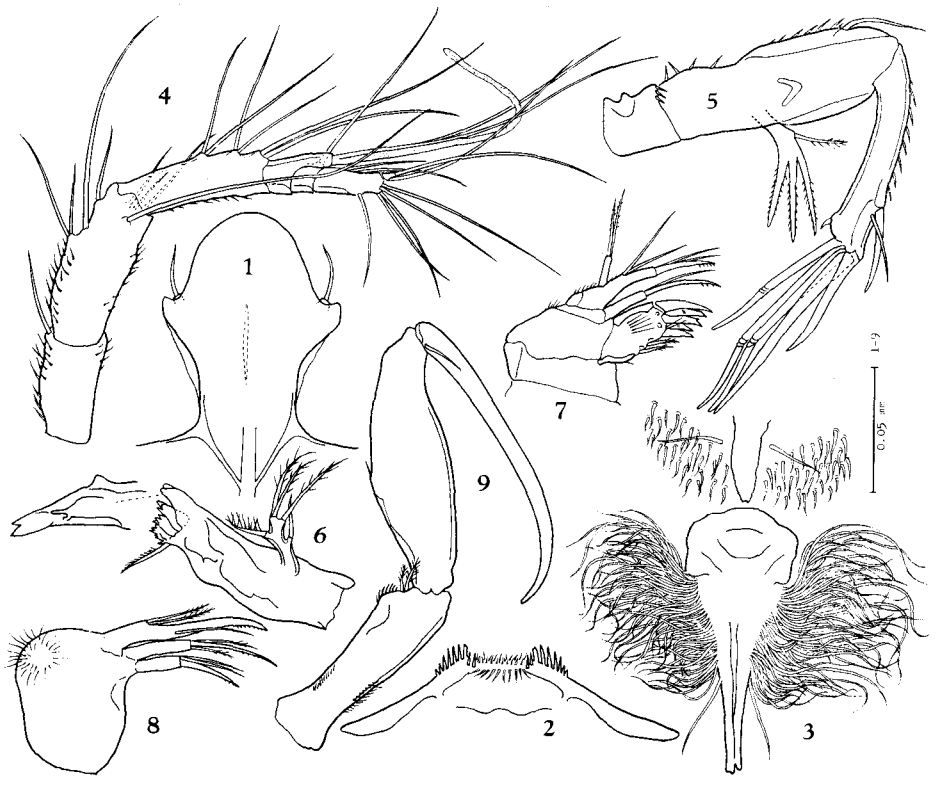

Fig. 7. *Echinolaophonte oshoroensis* n. sp. 1. ♀, rostrum; 2. ♀, labrum; 3. ♀, spinous projection and hairs on cephalothorax; 4. ♀, antennule; 5. ♀, antenna; 6. ♀, mandible; 7. ♀, maxillula; 8. ♀, maxilla; 9. ♀, maxillipede.

times as long as greatest width, with three outer setae; one dorsal seta, articulate at base; three terminal setae, middle longest one about six times as long as furcal ramus; a spinular row on dorsal surface near dorsal seta; some spinules on outer edge and posterior edge.

Antennule (Fig. 7–4): 6-segmented; second segment longest; third one a little shorter than second; fourth one furnished with a long aesthetasc; fifth one shortest. Proximal three segments with some spinules or hairs on each edge. *Antenna* (Fig. 7–5). Coxa small, almost as long as wide. Allobasis about three times as long as greatest width, with one subdistal seta and some spinules on anterior edge. Exopodite 1-segmented, with three terminal setae, not defined at base, and one small seta on subdistal edge, all setae somewhat hairy. Endopodite a little shorter than allobasis, with five spines, three of which geniculate, and one small spinous projection on distal end; one comparatively short spine and one slender seta on subdistal edge; some spinules along anterior edge. *Mandible* (Fig. 7–6): Praecoxa with well-developed bidentate pars incisiva, tridentate lacinia mobilis, two complicated spines, one small spine, and one hairy seta along cutting edge. Coxa-basis with one terminal hairy seta. Exopodite represented by small projection with one bare seta. Endopodite represented by a bilobated projection; each outer and inner lobule with one, and two hairy setae. *Maxillula* (Fig. 7–7): Arthrite of praecoxa with some slender spinules on surface, five spines, two of which geniculate, two hairy setae and some hairs along cutting edge. Coxa with one long spinulose spine and one slender seta. Basis with one pectinate spine, two slender setae terminally, and some hairs along edge. Exopodite well-developed, with two hairy terminal setae. Endopodite represented by two slender setae. *Maxilla* (Fig. 7–8): Syncoxa with some hairs on distal surface, and two endites; proximal endite with one pectinate spine and two setae, distal one with one long spine and two hairy setae. Basis forming a pectinate strong claw, with one bare seta. Endopodite represented by two setae. *Maxillipede* (Fig. 7–9): Basis about three times as long as greatest width, with two short hairy setae on subdistal edge, and some hairs on each edge. First endopodite-segment about 1.3 times as long as basis, with one spinule on middle edge; second one forming a strong arched claw, with one short bare seta near proximal end.

Leg 1 (Fig. 8–1): Coxa about two times as long as proximal width, with some spinules along each margin. Basis about 1.5 times as long as coxa; one hairy seta on a third of outer margin; some long spinules on each outer, inner and sub-inner margin. Exopodite short, 2-segmeted; first segment with one outer seta; second one two times as long as first, with two long terminal, and three outer marginal spiniform setae, the most proximal one on about middle of the segment. Endopodite 2-segmented; first segment a little longer than basis, and about six times as long as greatest width; second one furnished with one strong claw accompanied with one short bare seta at base; some minute spinules along outer margin. *Leg 2* (Fig. 8–2): Coxa a little shorter than wide, with three longitudinal spinular rows on outer margin and surface. Basis with one long plumose seta on small outer

projection; and arched spinular row on outer surface. Exopodite 3-segmented; first segment with one outer spine on subdistal edge, three oblique spinular rows near proximal surface; second one a little shorter than preceding segment, with one subdistal spine; third one slender and a little longer than first segment, with three outer spines, and two terminal setae, outer one spiniform and inner one plumose; all outer margins with some long spinules; all outer spines with many minute

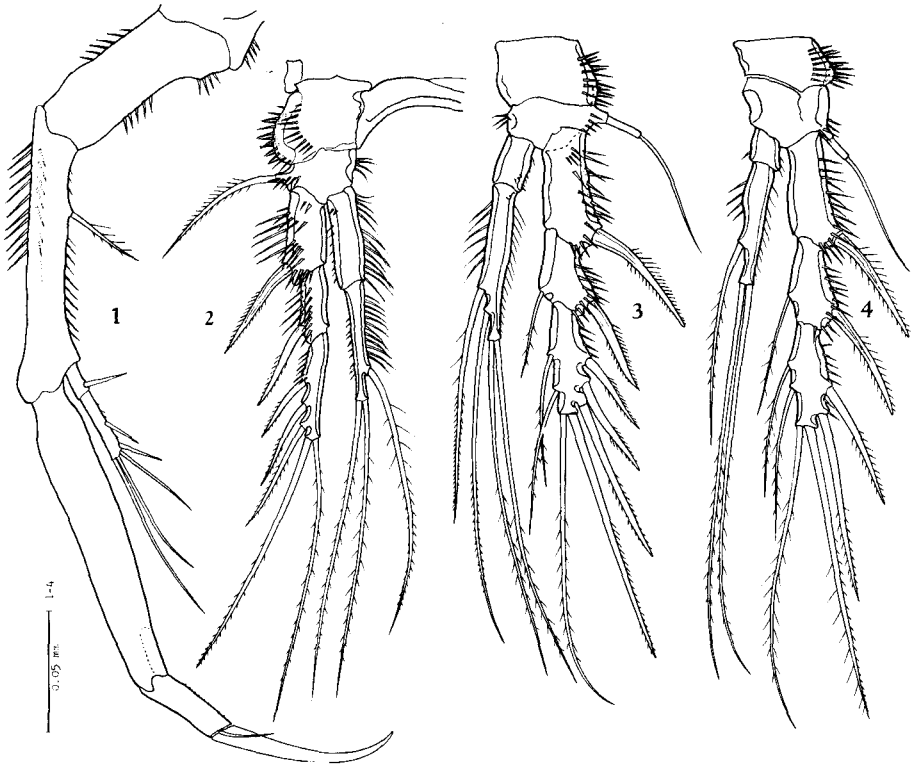

Fig. 8. *Echinolaophonte oshoroensis* n. sp. 1. ♀, leg 1; 2. ♀, leg 2; 3. ♀, leg 3; 4. ♀, leg 4.

hairs. Endopodite 2-segmented; distal end of first segment reaching to middle of second exopodite-segment; second segment a little shorter than first, with one inner and two terminal plumose setae; all margins with some slender spinules. *Leg 3* (Fig. 8–3): Coxa same as in leg 2. Outer seta of basis bare and thickened at proximal part. Segmentation of exo- and endopodite same as in leg 2. Exopodite; all spinal structures of outer margin same as in leg 2 but all stronger; second segment with one short inner marginal seta; third segment with two inner marginal setae. Endopodite; first segment short, distal end reaching to middle of first

exopodite-segment; second one three times as long as first, with two terminal and two inner marginal long setae; some long hairs on each margin. *Leg 4* (Fig. 8–4): Coxa, basis and exopodite almost same as in leg 3. Endopodite; first segment very short and some spinules on each margin; distal end of second segment, about four times as long as first, reaching to middle of second exopodite-segment. *Leg 5* (Fig. 9–1): Basoendopodite with one bare outer seta, thickened at proximal part; four spinulose setae, terminal one longest, on inner expansion; each margin and surface furnished with many spinules. Exopodite small with three spinulose setae, innermost one longest; long slender spinules along outer margin; some spinules on surface and inner margin.

Male. Length 0.75 mm. Ornamentation of cephalothorax same as in female. Structure of dorsal spinous projections on fifth thoracic segment (sixth pedigerous segment) almost same as in the preceding segment. *Antennule* (Fig. 9–2): Subchilocer, 7-segmented; proximal two segments with some spinules on each anterior edge; fourth one furnished with one very long aesthetasc on an oblong projection; fifth one forming a spinous projection posteriorly, three small projections anteriorly. *Leg 3* (Fig. 9–3): Coxa very widened. Basis with one bare outer seta, thickened at proximal part. Each outer edge of coxa and basis spinulose. Exopodite very broader and longer than in female, 3-segmented; first segment with one long outer spinulose spine; second one shorter than first, with one outer spine, and one short inner spine submarginally; third one about two times as long as second, with three outer, one terminal and three, proximal one small, inner spines; some spinules on inner margin of first segment and each outer margin of all segments. Endopodite 3-segmented; first segment a little shorter than other two, with some long spinules along inner margin, and small ones along outer; second one with long slender spinules along each margin, and furnished with one spinous formation on inner distal edge; third one as long as second, with two terminal and two inner marginal hairy setae. *Leg 4* (Fig. 9–4): Coxa, basis and endopodite almost same as in leg 2. Exopodite 3-segmented, first segment longest, with one long outer spine, strongly spinulose at outer distal half; second one about half as long as first, with one long outer spinulose spine and short inner bare spine; third one about 1.5 times as long as second, with two outer, two terminal and two inner spines, outer terminal one longest and inner proximal one shortest; each outer margin of all segments with many slender spinules. *Leg 5* (Fig. 9–5): Basoendopodite forming only a small projection, with one long bare outer seta, thickened at proximal part; some spinules on margin and surface. Exopodite small, about two times as long as greatest width, with one outer and two terminal hairy setae; some spinules on each edge and surface. *Leg 6* (Fig. 9–6) forming a small projection, with one short bare outer seta accompanied with some spinules at base; most projecting part bilobated, outer lobule with one long bare seta, cylindrically thickened at proximal part, and outer one with one long spinulose seta; some slender spinules along margin and basal portion of two lobules.

Remarks: The species described is very similar to *Echinolaophonte horrida*

(Norman) in the shape of rostrum, but is easily distinguishable from the latter in the third exopodite-segment of leg 2 without inner seta, while in the latter with one inner seta (Sars, 1908).

Type-specimens: Syntypes; 1 ovigerous ♀, 3-XII-'67; 1 ♂, 29-II-'68; 1 ♀, 9-II-'69. All specimens were sampled from Oshoro rinsing algae of intertidal zone.

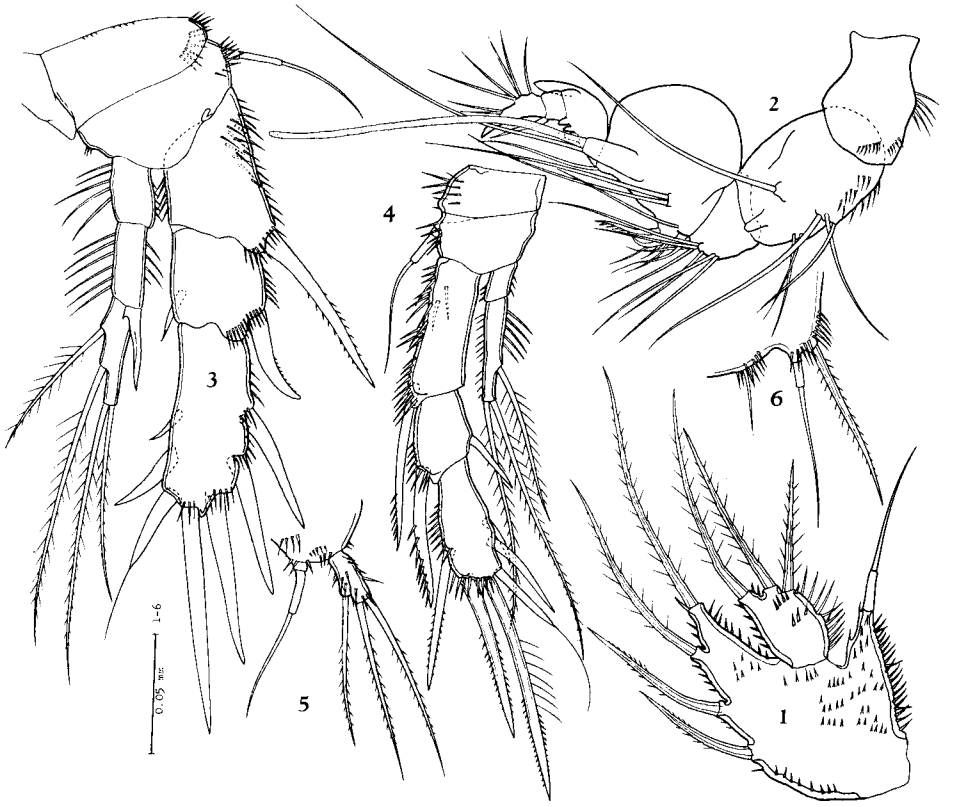

Fig. 9. *Echinolaophonte oshoroensis* n. sp. 1. ♀, leg 5; 2. ♂, antennule; 3. ♂, leg 3; 4. ♂, leg 4; 5. ♂, leg 5; 6. ♂, leg 6.

Arenopontia dillonbeachia Lang
(Figs. 10, 11)

Arenopontia dillonbeachia Lang 1965, p. 419, fig. 421.

Since the present species was originally described by Lang (1965) based upon some females from California, no additional record from the other locality has been

so far published. And the male structure has remained unknown.

The author collected some specimens of the genus from Samani in 1967. The specimens include two distinct forms, one of which[1] is safely identical with *A. dillonbeachia*. The species is reported here as a new member of marine interstitial fauna in Hokkaido. In the present paper the female structure is only briefly redescribed, because it was almost fully described by Lang.

Female. Length about 0.4 mm, furcal setae excluded. Body cylindrical, colourless and semitransparent. Nauplius eye entirely wanting. Rostrum triangular in dorsal view, clearly defined at base. Genital double-somite with no trace of subdivision. Genital area (Fig. 10–1) as in the figure. Anal operculum bare. First segment of antennule with one seta apparently. All principal structures of appendages are almost in accord with following description of male.

Male (Fig. 10–2 and 3). Length 0.38 mm. Furcal ramus (Fig. 10–4) furnished with a strong spiniform process terminally, not defined at base; principal terminal seta branched at two parts as in the figure, accompanied with a short seta at base; one thick seta on outer dorsal edge; one long slender seta on middle dorsal

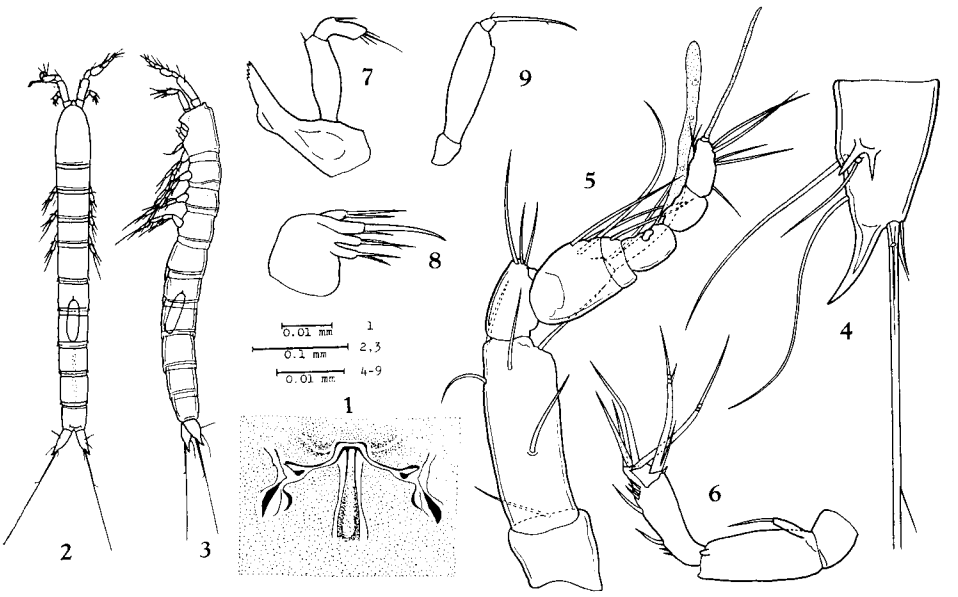

Fig. 10. *Arenopontia dillonbeachia*. 1. ♀, genital area; 2. ♂, dorsal; 3. ♂, lateral; 4. ♂, furcal ramus; 5. ♂, antennule; 6. ♂, antenna; 7. ♂, mandible; 8. ♂, maxilla; 9. ♂, maxillipede.

1) The other one, easily distinguishable from the present species in the shape of leg 5 and furcal rami, will be described in another paper.

edge; one minute seta, articulate at base, and two spinules on inner dorsal edge.

Antennule (Fig. 10–5): Haplocere, 8-segmented, but boundary between fourth segment and fifth one indistinct; first segment short, with one seta; second one longest; fourth one furnished with one very thick aesthetasc; last one with one slender aesthetasc. *Antenna* (Fig. 10–6): Coxa short. Allobasis bare, about two times as long as greatest width. Exopodite 1-segmented, attaching to proximal part of allobasis, with one bare terminal seta. Endopodite with two spines and some spinules on anterior edge; five spines, two of which geniculate, on distal edge. *Mandible* (Fig. 10–7): Teeth along distal end of praecoxa very small indistinctly counting five in number. Palp 2-segmented; first segment (probably coxa-basis) long, with one spinule on distal edge; second one with one marginal and four, two of which very minute, terminal setae. *Maxillula*: Unfortunately no good preparation was obtained. *Maxilla* (Fig. 10–8): Syncoxa with two endites, each endite with two setae apically. Basis with one claw accompanied with a very minute seta at base. Endopodite short, with two setae. *Maxillipede* (Fig. 10–9): Basis small. First endopodite-segment bare, about 3.5 times as long as greatest width; second segment small, furnished with one spiniform apical seta; two hairs on the base and subdistal edge of apical seta.

Leg 1 (Fig. 11–1): Basis shorter than coxa. Exopodite 3-segmented: first segment with one outer spine; second one a little shorter than first, without outer spine; third one almost as long as first, with one outer spine and three apical spiniform setae; each outer margin of all segments with some spinules. Endopodite 2-segmented, slightly longer than exopodite; first segment reaching to distal end of second exopodite-segment, with one inner seta; second one with two apical spiniform setae, inner one longer. *Leg 2* (Fig. 11–2): Exopodite 3-segmented, each segment almost same in length; proximal two segments with one strong outer spine on each subdistal edge and pointed at inner distal edge; third one with one outer spine and two long terminal setae, inner one very long; each outer margin with some spinules. Endopodite 2-segmented; first segment without any setae or spines; distal end of second segment, with one long inner seta proximally and two setae on distal end, not reaching to distal end of second exopodite-segment; each outer margin with some spinules. *Leg 3* (Fig. 11–3): Exopodite almost same as in leg 2. Second endopodite-segment with two setae on distal end, reaching to about middle of second exopodite-segment. *Leg 4* (Fig. 11–4): Third exopodite-segment with one long inner seta. Second endopodite-segment short, with two setae on distal end, inner one longer and not clearly defined at base. *Leg 5* (Fig. 11–5): Forming a broad plate, inner edge straight, each distal and outer edge slightly projected, with one hairy strong seta on inner distal corner, clearly defined at base; two spines on distal end; one slender seta on outer distal corner; one long thick seta on outer edge. *Leg 6* (Fig. 11–6): Slightly curved plate, with one short terminal seta; one long slender seta on outer edge.

Remarks: The present specimens described almost agree with the description and figures of *A. dillonbeachia* by Lang (1965), but some minor discrepancies

are recognized as follows: First segment of antennule with one seta; endopodite of antenna with five spines instead of four; second segment of mandibular palp with four apical setae instead of three; surface of second endopodite-segment of leg 2 without any spinules; principal terminal furcal seta branched. Further, exopodite of antenna attaches on the second segment (allobasis) in the present specimens, while on the basis in *A. dillonbeachia* by Lang. It is very difficult to examine this situation in *Arenopontia*, and as the original description of the genus, Kunz (1939)

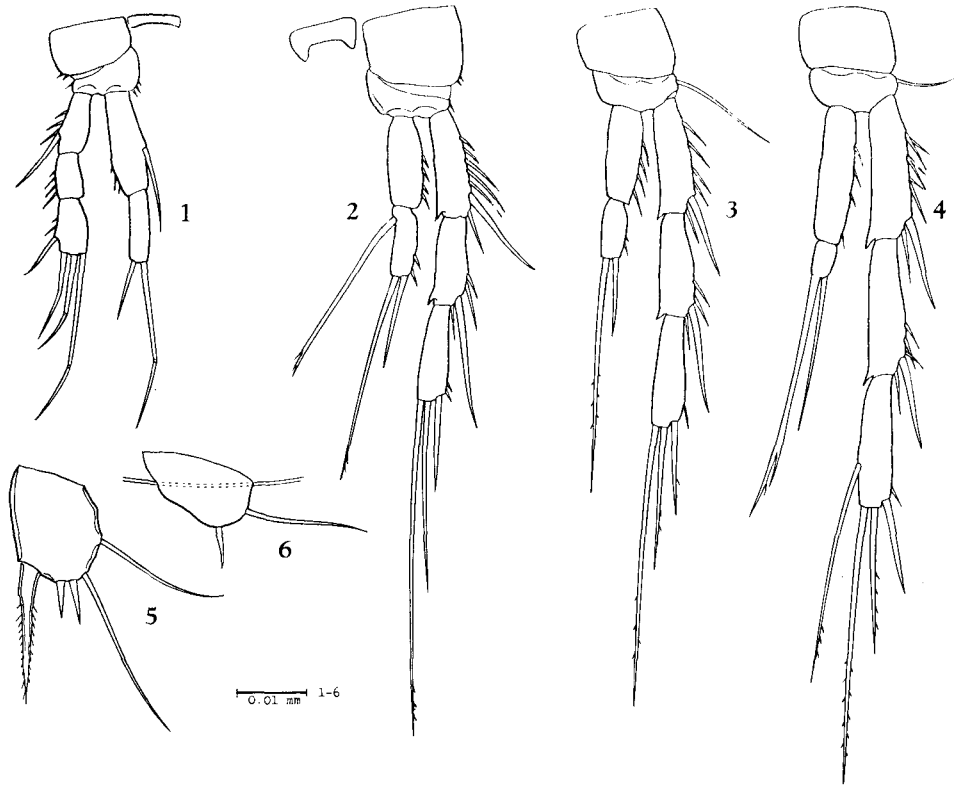

Fig. 11. *Arenopontia dillonbeachia*. 1. ♂, leg 1; 2. ♂, leg 2; 3. ♂, leg 3; 4. ♂, leg 4; 5. ♂, leg 5; 6. ♂, leg 6.

described about *A. subterranea*, "Die 2 gliedrige 2. Antenne zeigt am unteren Drittel die Andeutung einer weiteren Segmentgrenze. Hier setzt der kleine 1 gliedrige Nebenast an, der mit zwei Borsten ungleicher Länge versehen ist." And it is not able to decide the situation in his figure. According to the description of *A. stygia* by Noodt (1955), "A. 2 mit Allobasis, Exp. 1-gliedrig, mit 1 Endoborste."

Because of such uncertain state for the situation of exopodite of antenna, the author got at the result described after carefull examination in the present specimens and moreover in the types of *A. ishikariana* by Itô (1968). Further, re-examination is expected between the present specimens and the types of *A. dillonbeachia* by Lang.

Specimens examined: Samani, 4 ♀♀ and 3 ♂♂, 26-IX-'67, from fine sand.

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