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Author(s)	ITÔ, Tatsunori
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A New Species of Marine Interstitial Isopod of the Genus *Microcerberus* from Hokkaido¹⁾

By

Tatsunori Itô

Zoological Institute, Hokkaido University

(With 3 Text-figures and 1 Plate)

Since the first finding of a microscopical isopod *Microcerberus stygius* by Karaman (1933) from the subterranean water in Skoplje, Yugoslavia, more than twenty species of the genus including several doubtful ones have been so far reported from subterranean waters or marine interstitial habitats in both tropical and temperate regions of the world (for revision, Delamare Deboutteville, 1960; Lang, 1961). In the far eastern region, however, only one representative of the genus, *M. kiiensis*, has been as yet known from several interstitial habitats in and near Shirahama on the Pacific coast of middle part of Honshu, Japan (Nunomura, 1973).

In the present paper a new species of the genus *Microcerberus* is reported from two localities of Hokkaido, both on the coast of the Sea of Okhotsk, as a new member of the interstitial fauna of Hokkaido.

The specimens were originally collected from the intertidal coarse sand of Hamakoshimizu near Abashiri by Mr. H. Fukuda in 1967, and recently I collected many specimens from Tombetsu locating about 260 km northwestern alongshore from the previous locality. Specimens were rinsed from fresh sand, stirring in sea water, filtrated with a plankton net (mesh number NXX 13 in the Japanese standard) and were preserved in 70 per cent ethyl alcohol or five per cent formaline-sea water solution. All the type specimens are deposited in the Zoological Institute, Faculty of Science, Hokkaido University.

Before going further I express my sincere thanks to Professor Mayumi Yamada of Hokkaido University for his guidance and reading the manuscript. Deepest gratitude is also due to Mr. H. Fukuda who collected some specimens from Hamakoshimizu and kindly offered me all of them for this study. I am also indebted to Mr. K. Kito who helped me for my work at Tombetsu.

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Suborder Microcerberidea Lang, 1961

Microcerberus Karaman, 1933

***Microcerberus fukudai* n. sp.**

(Japanese name; Fukuda-Suna-nanafushi)

Males. Body (Fig. 1-1) extremely elongate in general appearance, clearly transparent and colourless; body length, from anterior dorsal edge of cephalon to posterior end of inner uropod excluding terminal setae, ranging from 0.98 to 1.06 mm in five specimens examined (0.99 mm in mean). Following description was mainly based on the specimen of 0.98 mm in body length. Cephalon without eye, 0.11 mm in length, and 0.07 mm in greatest width; anterior edge with no rostral accessory, quite simply cut off at right angles with longitudinal body axis in dorsal view; each antero-lateral part with at least one hair. First peraeonite (abbr. Peraeonite I) of about half the length of cephalon and tapering posteriorly; tergite moderately protruded on both anterior corners, with a delicate setula on both lateral margins. Peraeonites II~IV a little slighter than preceding two segments in dorsal aspect, and each furnished with a well-differentiated tergite (Fig. 1-2); anterior part of tergite with a pair of accessory plates clearly separated from main tergal plate by a narrow and slightly curved suture; accessory plate covering proximal part of basis of each peraeopod, distinctly produced and sharpened anteriorly, with a longer seta on outer edge near posterior extremity and a short seta on about middle inner edge; anterior part of main tergal plate between both accessory plates clearly bilobated by a deep crevice as shown in the figure, and with a seta near each accessory lobe and a hair on both sides of above mentioned crevice. Peraeonite V much wider than preceding three peraeonites; tergite rather simple, without a pair of accessory plates, and with a hair on surface near both lateral edges; a pair of peraeopods, each basal part partially covered with postero-lateral corner of tergite. Tergite of peraeonites VI and VII, almost same as in peraeonite V, indistinctly separated into two parts by a very shallow longitudinal depression. Peraeonite VII furnished with a pair of fleshy papillae on posterior half of ventral surface and a pair of shallow, longitudinal, grooves (Fig. 2-8). Pleonites I and II with a seta on both lateral edges, and ventral surface of former pleonite with a pair of setulae. Pleotelson a little longer than preceding segment, with a seta at about one-third the length of both lateral edges, and with a pair of setae on posterior ventral surface near both lateral edges; at least three arched spinular rows on ventral surface.

Antennule (Fig. 1-3) six-segmented; first two segments much thicker and longer than others; first one with three bare setae on distal edge; second one a little shorter than first, with three setae, each plumose, spatulate and sparsely hairy, and with two bare setae on inner distal corner; third one a little widened distally, with two juxtaposed setae on inner edge near distal end; fourth one much shorter than preceding segment, with two setae on inner distal corner; fifth one

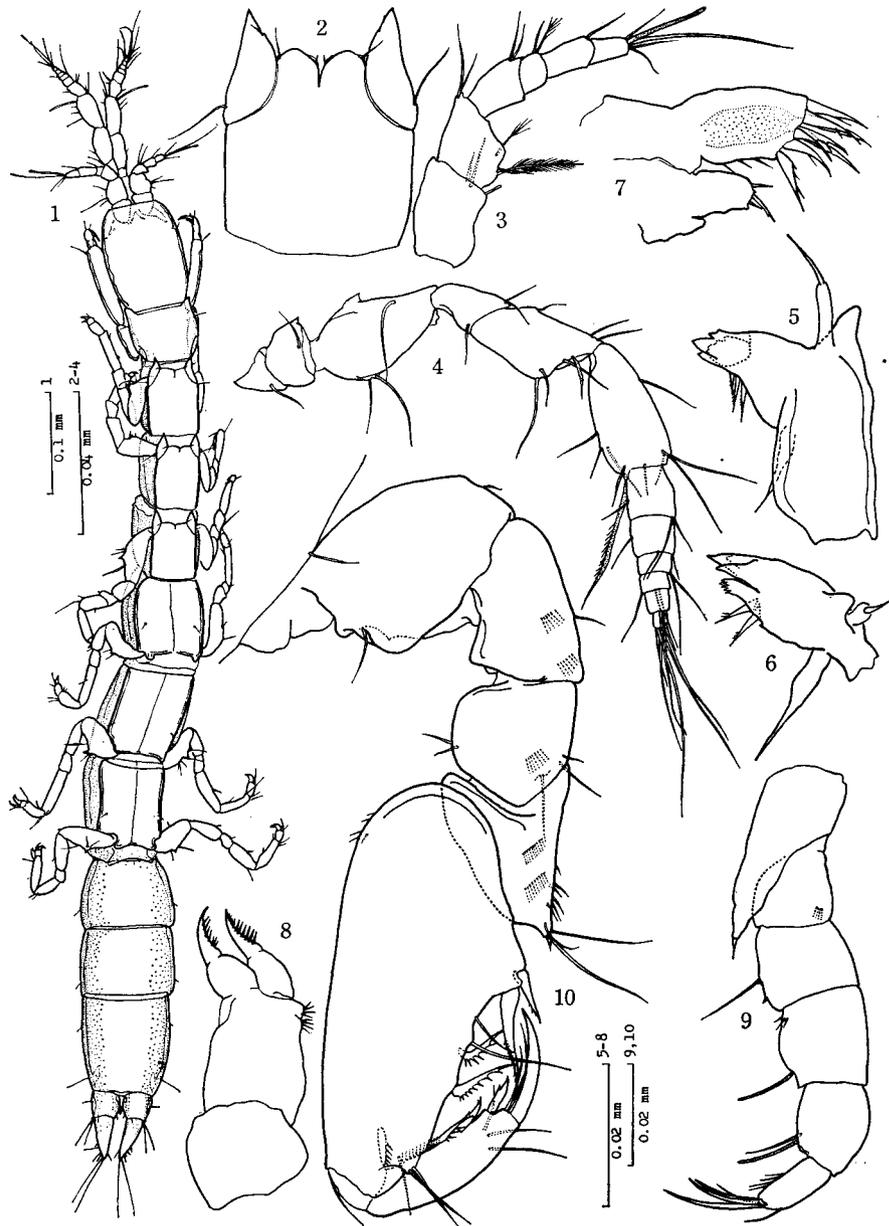


Fig. 1. *Microcerberus fukudai* n. sp. Male. 1. dorsal view; 2. tergite of peraeonite II; 3. antennule; 4. antenna; 5. mandibulum sinistrum; 6. mandibulum dextrum; 7. maxillula; 8. maxilla; 9. maxillipede; 10. peraeopod I.

about twice as long as fourth, with only one seta on inner distal corner; sixth one with one aesthetasc, one much elongate seta and three shorter setae on distal end. *Antenna* (Fig. 1-4) well-developed, approximately twice as long as antennule, and separable into four parts by three distinct constrictions, namely, first two segments combined, third one, fourth and fifth ones combined, and sixth one with a flagellum, these six consecutive segments consisting with peduncular ones; first segment very small, triangular, and with one seta near outer distal corner; second one wider than long, with one dorsal seta on distal edge; third one about three times as long as second, swelling midst, with one inner and two outer setae; fourth one small, thickened distally; fifth one about as long as second, rhombic, with one spatulate and several usual setae distally; sixth one a little longer than preceding, gradually widened distally, furnished with one considerably elongate spatulate seta; flagellum consisting of six, more or less setigerous, segments, tapering distally. *Mandible* (Figs. 1-5, 6; see also Figs. 3-5, 6, 7 in females). Middle ventral edge of corpus forming into a triangular projection. Cylindrical palpus arising from posterior base of triangular projection described above, and furnished with one apical seta which usually bends inwards. Processus molaris about as long as palpus including apical seta; basal half much thickened and distal half acutely sharpened and occasionally with several hairs. Pars incisiva tri-dentate; middle denticle apparently bigger than other two, one of which is weakly bipartite or somewhat modified and another one is simple. Mandibulum dextrum with two spines near dorsal base of lacinia mobilis which is smaller than pars incisiva, and is furnished with two parallel rows of six spinule-like projections along inner free edge (see Fig. 3-6 in female). Mandibulum sinistrum with three spines near dorsal base of lacinia mobilis which quite differs from that of mandibulum dextrum in the larger size and further in the four-dentate free inner edge (see Fig. 3-7). *Maxillula* (Fig. 1-7). Inner endite small, with three, rather small, spines on distal edge (Pl. XXVII-C). Outer endite well-developed, furnished with eight, more or less spinulose, claws on distal edge, and with several spinules along inner margin. *Maxilla* (Fig. 1-8) consisting of two-segmented protopodite; second segment about twice as long as first, with several spinules near inner distal corner, and two stout, comb-like, claws on distal end; basal part of each claw slightly swelling. *Maxillipede* (Fig. 1-9) six-segmented, gradually incurved in total appearance; inner part of first segment protruded distally, a little exceeding distal end of second segment, and terminating one spine; second segment with several spinules near outer distal corner; third, fourth and fifth segments, each with one, one and two inner setae, respectively; sixth segment much slighter than others, with three slender claws and one seta on distal end, one setula near outer distal corner and several hairs along inner margin. *Labium* (Fig. 2-9) extremely wide; both lateral parts incurved, terminating at least five claws and some delicate spinules; less number of spines on both ventro-lateral and dorso-lateral edges.

Peraeopod I (Fig. 1-10) very robust in appearance, subchelate, usually directed forward along lateral surface of cephalon. Basis with one seta on middle

anterior edge and a setula on subdistal posterior edge. Ischium a little smaller than basis, with two spinular rows and a setula on middle posterior edge. Merus much shorter than ischium, with one spinular row on surface, two and three setae on anterior and posterior edges, respectively. Carpus approximately triangular, with two spinular rows on surface, three setae and one small spiniform projection on and near posterior distal end, and several spinules along posterior margin. Propus depressed laterally, about as long as three preceding segments combined, and furnished with two spinulose claws, distal one much smaller than proximal, on a slight protuberance at one-third the length of posterior margin, three serrate claws, which widely separate from each other and bend proximally, along posterior margin, two setae between larger spinulose claw and proximalmost serrate claw described, two setae on distal posterior corner and one seta on opposite side, one serrate claw on lateral surface just inside of distal end and one seta on anterior distal corner; basal margin with several spinules. *Peraeopods II~VII* (Figs. 2-1~6) normal walking leg; basis a little shorter than succeeding two segments combined, with one usual and two spatulate setae on proximal base of a remarkable protruding on middle margin, and with less number of spinules near posterior distal edge; ischium with a pair of setae, each on both approximately middle margins; merus shorter than ischium, clearly thickened distally, and with a pair of setae, each on both distal corners; carpus of peraeopods II~IV with three or five spinular rows on lateral surface, and of III and IV furnished with one spatulate seta near anterior distal corner; propus of peraeopods II~IV nearly as long as each carpus, that of peraeopods II and III with four or five spinular rows on lateral surface, and that of peraeopods V~VII with one marginal spine accompanied with several spinules basally; dactylus small, terminating two claws, one of which is slender and longer, while the other is stout and hooky, and with less number of setae on apical part as shown in the figures.

Pleopod I absent. *Pleopod II* (Figs. 3-1,2, Pl. XXVII-B). Both coxae represented by a broad plate about as wide as body width. A pair of bases nearly contiguous to each other, approximately rectangular in ventral view, slightly longer than width, and about twice as long as thickness; inner distal corner more or less protruded distally as forming a small lobe, and with several spinules. Exopodite very small, bulbiform, with one terminal seta. Endopodite, appendix masculina excluded, almost as long as basis; outer margin bare, clearly swelling near about one-fourth the length, outcurved at three-fourths the length, and ending with a horny and well chitinous projection which is indistinctly bipartite apically (Fig. 3-3b); distal one-third the length of inner margin slightly swelling inwards and with a spinule just inside of tip (Figs. 3-3a, b), and with an arched row of delicate spinules on proximal part of swelling and entirely covering basal one-fourth the length of appendix masculina; inner margin with many transverse spinular rows (or serrate membranes?) which occasionally continue to basal part of appendix masculina; middle part of distal end very thin and membraneous; appendix masculina distinctly separated from main endopodite-segment at two-thirds the length

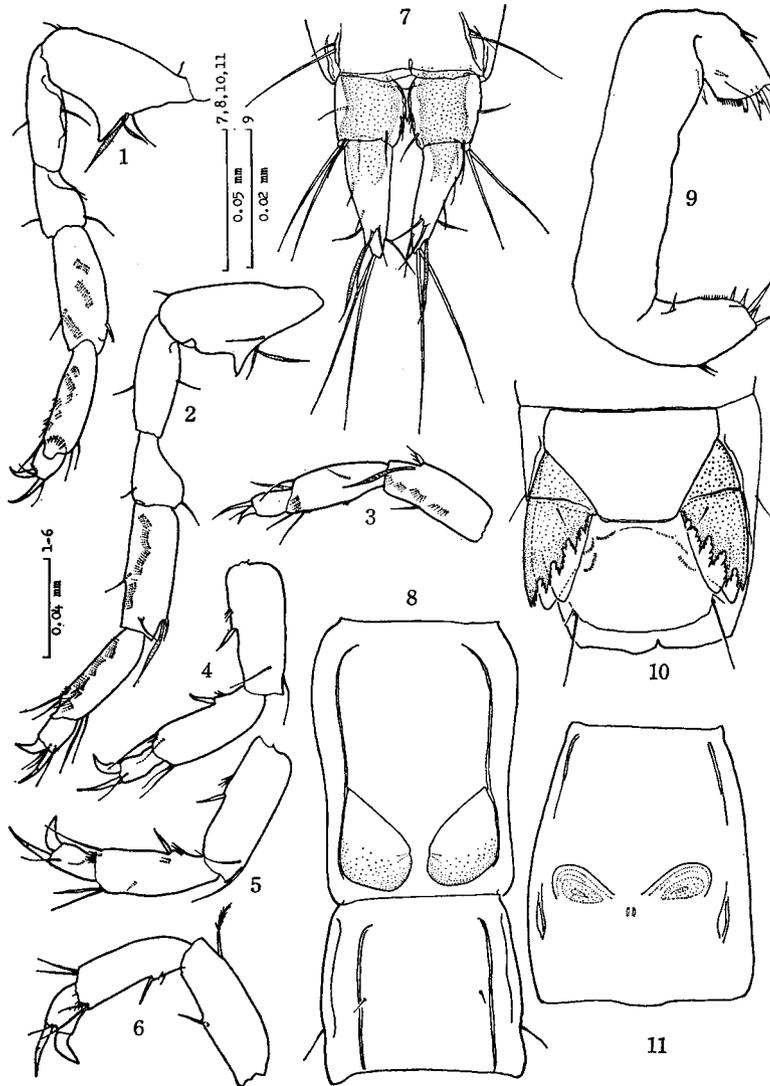


Fig. 2. *Microcerberus fukudai* n. sp. Male. 1~6. peraeopods II~VII, proximal three segments of peraeopods IV~VII were not illustrated; 7. uropods; 8. ventral view of peraeonite VII and pleonite I; 9. labium. Female. 10. ventral view of pleotelson; 11. ventral view of peraeonite V.

of inner margin of endopodite-segment, winding and gradually tapering distally, with a low membrane along inner margin of middle part, continuous to outer margin of distal part. Several spinular formations, seemingly rising from the membrane

base, are scattered at an interval along nearly whole the length of appendix masculina. Those spinular formations were exactly present in all the male specimens examined with no exception, and usually more than five were recognized. However, I could not decide whether those were true spinules distinctly separable from the membrane or spiniform thickenings of the membrane. Further, distal part of the appendix masculina is furnished with a row of some hairs on the production of the membrane. Those hairs, however, might not be true hairs but a delicate serration of the membrane. Regarding the appendix masculina as a branch of endopodite-segment, a slight belt with many transverse spinular rows along inner margin of the segment might consist with the true basal part of appendix masculina. In this case, the basal part of appendix masculina must be restated to be completely fused to the endopodite-segment and be furnished with many transverse spinular rows. Pleopod II is usually lying on the ventral body surface, while sometimes it seems to be erected as shown in a photograph (Pl. XXVII-A).

Pleopod III (Fig. 3-1, Pl. XXVII-D) uniramous; segmentation very obscure, only represented by a small concavity on outer margin and a transverse spinular row; one bare seta on surface near spinular row; inner margin five-lobated, each lobule more or less serrate and never defined at base. *Pleopod IV* (Figs. 3-1, 4) covered with former pleopod, two-segmented; first segment very short, rather triangular in ventral view, and second segment bilobated. Distinct anterior sternite between two pairs of pleopods was not detected in all the males, though it was very easily recognizable in females.

Uropod (Fig. 2-7). Basis almost as long as wide, with four setae, each on middle outer margin, on ventral surface near inner distal end, on distal end of dorsal surface and on just ventral base of exopodite; several spinules along inner margin. Exopodite strikingly dwarf, furnished with two long setae apically. Endopodite about 1.5 times as long as basis, tapering distally, and with four outer marginal setae, distal two of which are spatulate, two much longer setae on distal end.

Females. Body length ranging from 0.84 mm to 1.08 mm in nine specimens examined (0.93 mm in mean).

Ventral surface of pereopodite V decorated with a pattern of cuticular thickenings as shown in the figure (Fig. 3-11); pereopodite VII with a pair of longitudinal grooves on ventral surface, but without any traces of papillae. *Pleopods I* and *II* absent. Anterior sternite of pleotelson (Fig. 2-10) clearly defined, approximately trapezoid, and posterior margin well chitinous. *Pleopod III* (Fig. 2-10) distinctly divided into two segments by a fine suture; inner margin of distal segment five-lobated and serrated as in males. Posterior half of pleotelson furnished with at least three pairs of arched spinular rows on ventral surface. No other differences between sexes were recognized in the external morphology.

Remarks. In the general appearance of pleopod II of males, the present species described is allied to the following four species; *M. abbotti* Lang, 1961, from the subterranean coastal water in fine shell sand near Hopkins Marine Station on

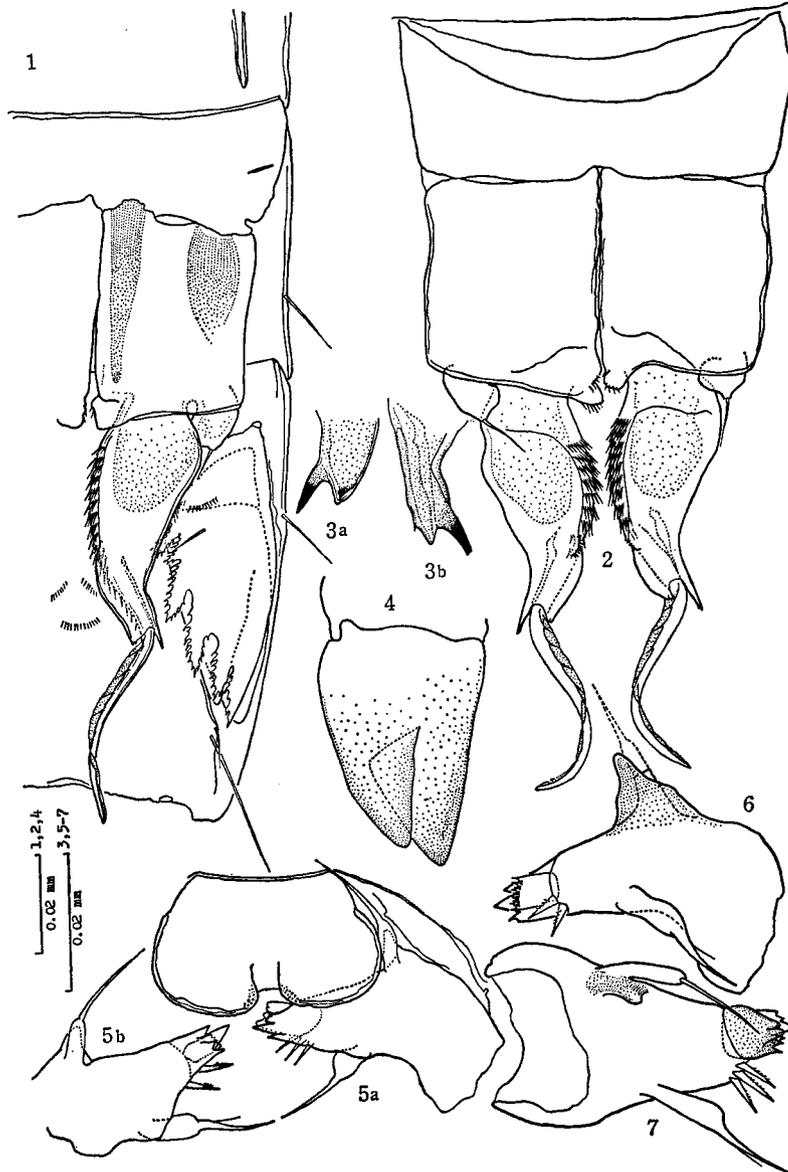


Fig. 3. *Microcerberus fukudai* n. sp. Male. 1. ventral view of pleonite II and pleotelson; 2. pleopod II isolated; 3 a, b. apical part of endopodite of pleopod II, both from the same specimen; 4. pleopod IV. Female. 5. a, labrum and mandibulum sinistrum. b, mandibulum dextrum of the same specimen; 6. mandibulum dextrum; 7. mandibulum sinistrum.

the central Californian coast; *M. abbotti juani* Coineau et Delamare Deboutteville, 1968, from sand and pebbles of San Juan Island, State of Washington; *M. pauliani* Chappuis et Delamare Deboutteville, 1956 (cited from Delamare Deboutteville, 1960) from the beach of Maroantsetra, Madagascar; *M. kiiensis* Nunomura, 1973, from several beaches on and near Shirahama, middle part of Honshu. Among them listed above, *M. abbotti* was redescribed by Coineau et Delamare Deboutteville (1968) based on the specimens from Malibu, Santa Monica, Corona del Mar and Laguna Beach, along Californian coast. Apical structure of appendix masculina in those species was explained by each the author as follows; "with two small hooks" in *M. abbotti*, "deux crochets" in *M. abbotti juani*, "une pointe d'hameçon" in *M. pauliani* and "knife-edged and with a hollow" in *M. kiiensis*. Therefore the present new species is easily distinguishable from the species above mentioned as well as all other species of the genus by the unique feature in the appendix masculina which is furnished with several spinular formations arising from the membrane base and with some hairs near tip.

In the course of the present study, I often noticed many discrepancies in several structures among the species so far reported, though I could not decide whether those were true interspecific differences or superficial ones due to miss observation. For example, several authors described the structure of both mandibulae together with some figures, namely in *M. delamarei* by Remane et Siewing (1953), *M. remyi* by Chappuis (1953), *M. plesai* by Chappuis et Delamare Deboutteville (1958), *M. abbotti* by Lang (1961), *M. remanei* by Coineau (1966), and *M. abbotti* and *M. abbotti juani* by Coineau et Delamare Deboutteville (1968). The mandibulae of *M. delamarei* are exceptionally symmetrical while those of all others are asymmetrical. The dorsal corner of cutting edge of mandibulae is usually equipped with either two or three spines (or setae), though four spines are recognized on the mandibulum sinistrum of *M. plesai*. In my material the mandibulum sinistrum and the mandibulum dextrum are exactly equipped with three and two spines, respectively. As far as regarding to these spines, *M. remyi*, *M. remanei*, *M. abbotti juani*, and *M. abbotti* (by Coineau et Delamare Deboutteville) entirely coincide with the present species. On the contrary, according to the original description and figures of *M. abbotti* by Lang (1961), the mandibulum sinistrum is furnished with two setae and the mandibulum dextrum with three setae. Although it goes without saying that we have to reexamine thoroughly all the species so far indistinctly described to solve such problem, now I like to call attention to another characteristic in mandibulae, that is, the situation of the palpus against the protuberance on corpus (it is identical to those explained as "a hump-shaped elevation" by Lang, 1961, and as "une protubérance chitineuse" by Coineau, 1966). As clearly shown in the present new species (Fig. 3-5) and also in *M. remanei* (Coineau, 1966, Fig. 2-A), the mandibular palpus is attached to the posterior base of the protuberance. This fact is immediately recognizable if we observe the oral part *in situ* from ventral side. It is, therefore, very easy task for us to decide the isolated mandible to be left or right as regarding its situation of

the palpus against the protuberance. For example, in the figures of *M. delamarei* by Remane et Siewing (1953, Tafel 35-6) the right-hand figure apparently represents mandibulum sinistrum and the left-hand one is mandibulum dextrum, and further it is evident that those were illustrated from the posterior side. For another example, the mandible of *M. adriaticus* illustrated by Karaman (1955) is dextrum and shows the posterior side. As already mentioned by several authors, it is very difficult and sometimes impossible to examine the fine structure of mandible as far as observing *in situ*, though the difference between both mandibulae seems to be important problem for the morphology of *Microcerberus*. Then we ought to define our object to be right or left exactly on the basis of isolated ones.

On the other hand, the inner endite of maxillula is furnished with three spines in the present new species but two spines in some other species, *M. abbotti* Lang, *M. abbotti juani* Coineau et Delamare Deboutteville, *M. singhalensis* Enckell (1970), etc. We are unable to compare those of all the species to each other for lack of information. However, as clearly shown by Lang (1961) with a photograph, it is credible that at least some species have two spines on their inner endite of maxillulae. This difference in the maxillulae, therefore, seems to be of value as a specific character.

Specimens examined. Syntypes; 2 ♂♂ and 4 ♀♀, 9-VIII-'67 (H. Fukuda leg.), Hamakoshimizu. Three males and five females of numerous specimens collected from Tombetsu, 25-VII-'73 (T. Itô leg.), were also dissected and examined.

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Explanation of Plate XXVII

Microcerberus fukudai n. sp. Male.

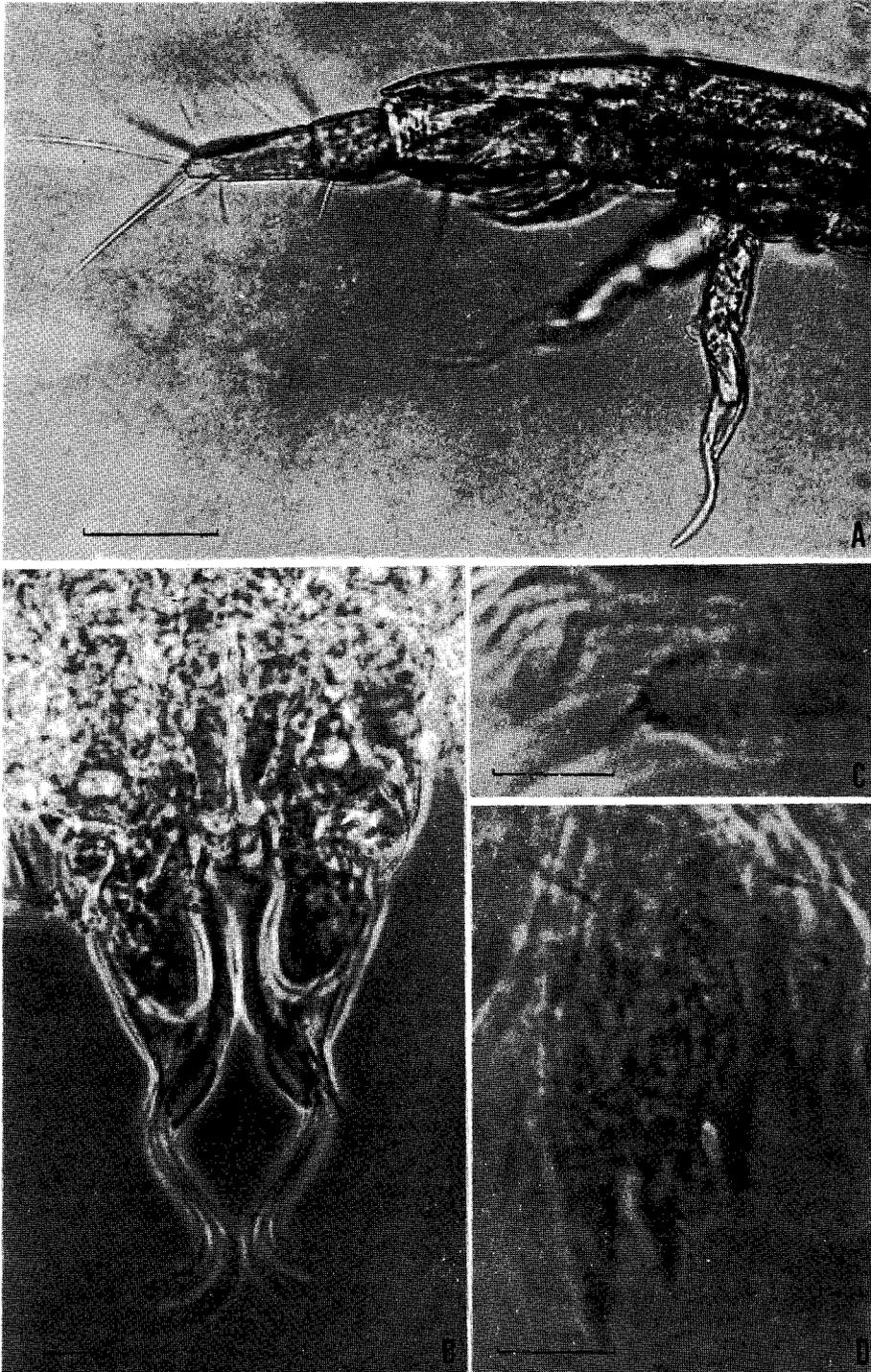
Fig. A. Abdomen in lateral view.

Fig. B. Pleopod II isolated.

Fig. C. Inner endite of maxillula.

Fig. D. Pleopod III.

Each bar represents 0.05 mm in Fig. A and 0.01 mm in Figs. B, C and D.



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