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Bathynellids of the Amami Group of the Ryu-Kyu Islands
(Syncarida, Bathynellacea)¹⁾

By

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On the Amami group of the Ryu-Kyu Islands, a bathynellid was found for the first time in the spring of 1954. In the summer of the same year, the present writer made a preliminary investigation on the Island of Amami-Oshima and found that there inhabited on this island two species of bathynellids, i.e. *Bathynella oshimensis* and *Parabathynella* sp. (UÉNO and MORIMOTO, 1956, p. 52).

In the summer of 1958, a biological expedition was made on these islands by the members of the Zoological and the Botanical Institutes of Kyoto University, under the leadership of Prof. TAGAWA. Collaborating with Mr. UÉNO, the present writer took charge of the zoological section of the expedition, during which he had opportunities to investigate more than 30 caves and 35 wells. Eleven wells among them were proved to be inhabited by bathynellids, which were classified into three species belonging to two different genera. Of these, two forms of the genus *Parabathynella* seem to the writer to be new to science and will be described in the present report.

The writer wishes herewith to express his hearty thanks to Prof. Masuzo UÉNO for his kind supervision during the course of the present study. Deep gratitude is also due to Prof. Motozi TAGAWA as well as to Messrs. Shun-Ichi UÉNO and Kunio IWATSUKI for their kind guidance and warm friendship rendered during the Expedition.

List of the Localities and the Species Obtained

No. 1. A driven well at Kusato-machi, Nazé City, on the northern coast of Is. Amami-Oshima; W.T. 21.2°C, pH 6.6; 31-VII-1958, by S. UÉNO, Y. MORIMOTO and K. IWATSUKI.

Bathynella oshimensis UÉNO et MORIMOTO: 1♂, 1♀.

No. 2. A driven well (A) at Sumiyoshi-machi, Nazé City, Is. Amami-Oshima; W.T. 20.0°C, pH 6.2; 31-VII-1958, by S. UÉNO, Y. MORIMOTO and K. IWATSUKI.

Bathynella oshimensis UÉNO et MORIMOTO: 1♀.

Parabathynella gracillima insularis subsp. nov.: 1♀.

1) Contribution No. 22 from the Spelaeological Society of Japan; Biospeological Results of the Ryu-Kyu Expedition 1958 of Kyoto University, No. 2.

- No. 3. A driven well (B) at Sumiyoshi-machi, Nazé City, Is. Amami-Oshima; W.T. 19.7°C, pH 6.0; 29-VIII-1958, by Y. MORIMOTO.
Bathynella oshimensis UÉNO et MORIMOTO: 4 ♂♂, 2 ♀♀, 5 juv.
- No. 4. A driven well (C) at Sumiyoshi-machi, Nazé City, Is. Amami-Oshima; W.T. 20.9°C, pH 6.0; 29-VIII-1958, by Y. MORIMOTO.
Bathynella oshimensis UÉNO et MORIMOTO: 20 ♂♂, 10 ♀♀, 17 juv.
- No. 5. A driven well at Komata-machi, Nazé City, Is. Amami-Oshima; W.T. 22.5°C, pH 6.0; 29-VIII-1958, by Y. MORIMOTO.
Bathynella oshimensis UÉNO et MORIMOTO: 21 ♂♂, 21 ♀♀, 6 juv.
- No. 6. A driven well (C) at Kariya-machi, Nazé City, Is. Amami-Oshima; W.T. 20.9°C, pH 7.8; 29-VIII-1958, by S. UÉNO and Y. MORIMOTO.
Bathynella oshimensis UÉNO et MORIMOTO: 7 ♂♂, 9 ♀♀, 2 juv.
Parabathynella gracillima insularis subsp. nov.: 1 ♂.
- No. 7. A driven well at Saiwai-machi, Nazé City, Is. Amami-Oshima; W.T. 20.2°C, pH 6.4; 29-VIII-1958, by S. UÉNO and Y. MORIMOTO.
Bathynella oshimensis UÉNO et MORIMOTO: 30 ♂♂, 24 ♀♀, 6 juv.
- No. 8. A driven well (A) at Yakugachi, Sumiyô-son, in the southern part of Is. Amami-Oshima; W.T. 22.0°C, pH 5.8; 28-VIII-1958, by S. UÉNO and Y. MORIMOTO.
Bathynella oshimensis UÉNO et MORIMOTO: 11 ♂♂, 8 ♀♀, 9 juv.
Parabathynella gigantea sp. nov.: 1 ♂, 1 ♀, 10 juv.
- No. 9. A driven well (C) at Yakugachi, Sumiyô-son, Is. Amami-Oshima; W.T. 21.2°C, pH 6.2; 28-VIII-1958, by S. UÉNO and Y. MORIMOTO.
Bathynella oshimensis UÉNO et MORIMOTO: 1 ♀.
Parabathynella gigantea sp. nov.: 1 juv.
- No. 10. A dug well (A) at San, on the northeastern coast of Is. Tokunoshima; W.T. 21.2°C, pH 7.4; 23, 25-VIII-1958, by S. UÉNO and Y. MORIMOTO.
Parabathynella gigantea sp. nov.: 6 ♂♂, 11 ♀♀.
- No. 11. A driven well (E) at San, Is. Tokunoshima; W.T. 24.0°C, pH 7.0; 23, 25-VIII-1958, by S. UÉNO and Y. MORIMOTO.
Bathynella oshimensis UÉNO et MORIMOTO: 14 ♂♂, 14 ♀♀.

***Parabathynella gigantea* Y. MORIMOTO, sp. nov.**

Body elongate, slender and cylindrical, though somewhat compressed; thorax a little longer and narrower than abdomen; cuticle thin, covered with dense minute punctuation; colour white, translucent when alive. Each thoracic somite separated into tergite and sternite; all abdominal somites not separated into the two parts. Thoracic somites 1 and 2 much shorter than the succeeding ones; abdominal somite 4 longest.

Head large, a little longer than the first two thoracic somites together; anterior margin rounded, lower margin excavated at mandibular and maxillular parts. Eyes entirely wanting. Antennules of 8 joints, 3 of which form peduncle, which is as long as the remaining joints together and provided with a minute vestige of

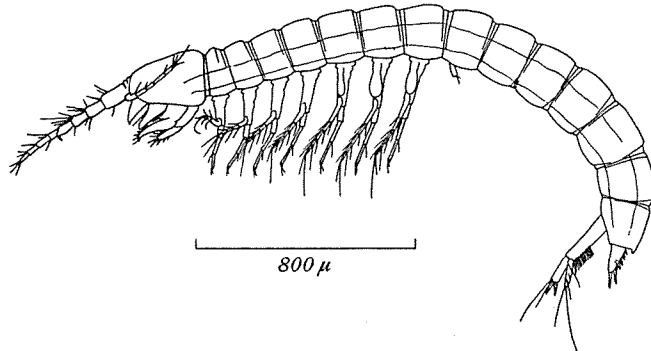


Fig. 1. *Parabathynella gigantea* sp. nov., ♀, of San, Is. Tokunoshima.

endopodite terminating in 3 setae. Antennae of 5 joints, recurved and reaching about two-thirds of head; basal joint strongly curved both outwards and backwards, joint 3 shortest, joint 4 longer than joint 2, the last longest and terminating in 4 setae.

Mouth parts large. Labrum large and broad; lateral margins somewhat convex; front margin slightly concave and provided with 10 small teeth. Mandibles rather slender, terminating in 3 blunt teeth; molar plate armed with 7 recurved spines; mandibular palp unjointed, with a single long terminal seta. Maxillulae slender; proximal endite ending in 2 spines; distal endite armed with 5 incurved spines on

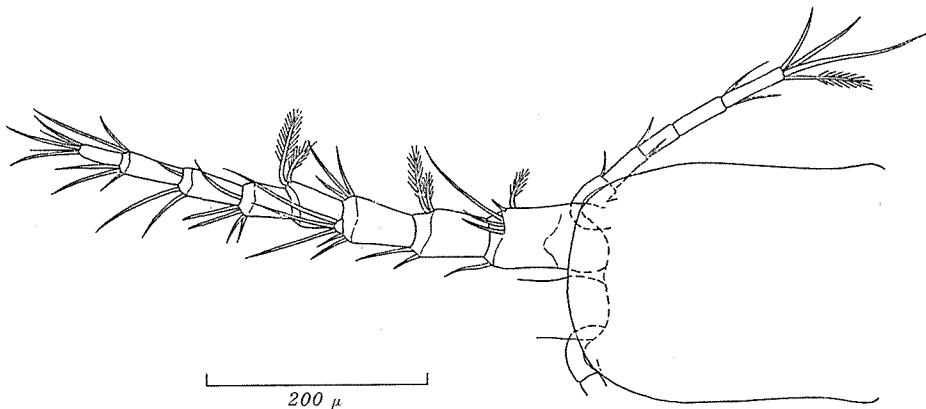
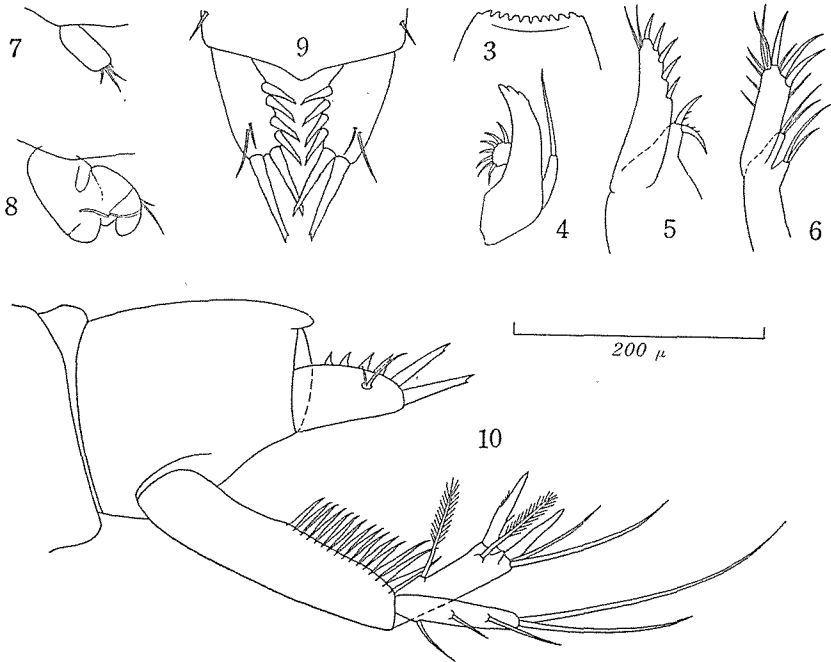


Fig. 2. *Parabathynella gigantea* sp. nov., of San, Is. Tokunoshima; head, right antennule and right antenna, dorsal view.

the inner side and 2 setae on the outer distal side, these setae probably representing a vestige of palp. Maxillae with 3 endites, of which the proximal one is smallest, bearing 2 apical setae, and the middle one with 2 apical setae; distal endite longest, with 3 incurved spines of nearly equal length and with more than 8 setae, 4 of



Figs. 3-10. *Parabathynella gigantea* sp. nov., of San, Is. Tokunoshima.—3. Labrum, dorsal view.—4. Left mandible.—5. Left maxillula.—6. Left maxilla.—7. ♀ pereopod 8.—8. ♂ pereopod 8.—9. Telson, dorsal view.—10. Telson, uropod and last abdominal somite, left lateral view.

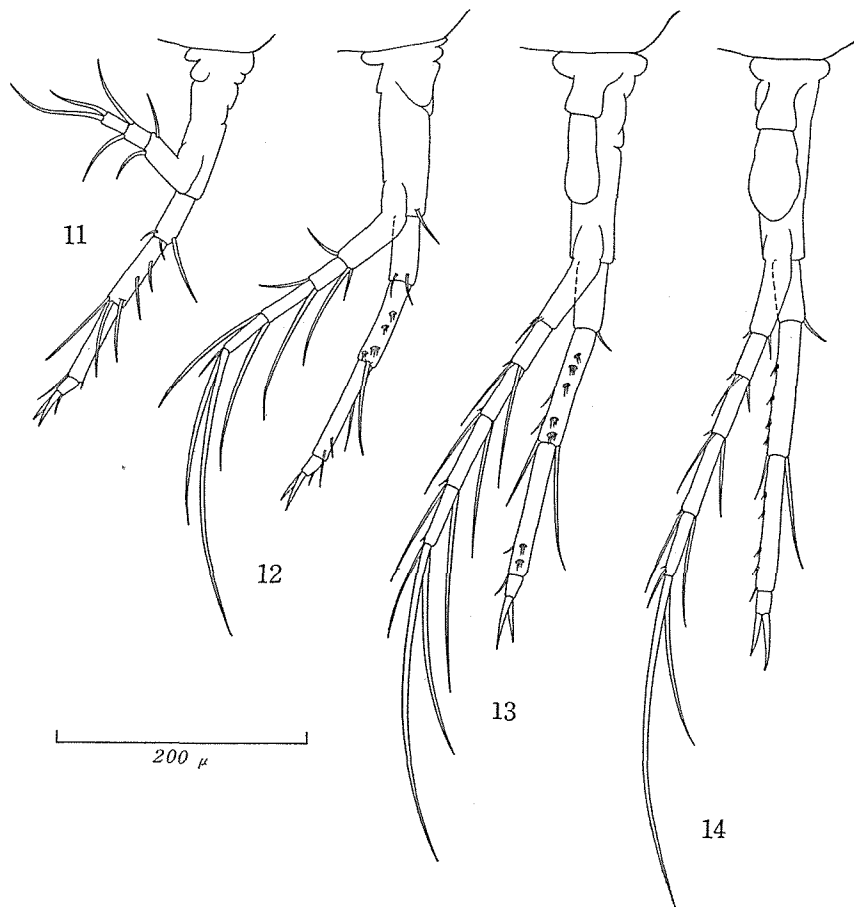
which form a group on the outer distal side and may probably represent maxillary palp.

Eight pairs of pereopods, pair 5 longest, pairs 1-7 of biramous construction, all bearing 4-jointed endopodites; the number of exopodites variable according to individuals as follows: 3:4:4:5:5:5:5; 3:4:4:5:5:4:4; 3:4:4:4:4:4:4; 3:3:4:4:4:4:4. Endopodites with combs of minute spines in pereopods 2-7; one epipodite present on the outer side of coxopodite, well developed in pairs 5-7 but degenerated or even wanting in the other pairs; in ♂, pereopod 8 short and rounded, with endopodite very small and tipped with 2 setae; in ♀, pereopod 8 represented only by a small rudimentary process, which is composed of a single joint bearing 4 small apical setae. No pleopod.

Each lobe of telson armed with a row of 4 spines of nearly equal length on the inner margin, 2 long spines on the apical margin and 2 setae on the outer dorsal side; the outer spine longer than the inner on the apical margin. Uropods large and stout; peduncle long, compressed and armed with a row of 14-15 spines on distal two-thirds of the inner side; of these spines, apical 1-3 long, the others nearly equal in length and slightly curved; exopodite slender, a little less than a

half as long as peduncle, terminating in 2 long setae, one of which is about two-thirds as long as the other; endopodite subequal in length to exopodite, bearing at apex 2 large claw-like spines and 2 or 3 setae, a long seta also present on the inner margin near base.

Length: 1.68–2.10 mm in ♂, 1.60–2.35 mm in ♀ (exclusive of appendages).



Figs. 11–14. *Parabathynella gigantea* sp. nov., of San, Is. Tokunoshima.—11. Pereiopod 1.—12. Pereiopod 3.—13. Pereiopod 5.—14. Pereiopod 7.

Type-specimens: Holotype: ♂, allotype: ♀, paratypes: 5 ♂♂, 10 ♀♀ (San, 23, 25–VIII–1958, collected by S. UÉNO and Y. MORIMOTO).

Further specimens examined: 1 ♂, 1 ♀, 11 juv. (Yakugachi, 28–VIII–1958, by S. UÉNO and Y. MORIMOTO).

The holotype and the allotype are deposited in the collection of Otsu Hydrobiological Station. The other specimens, including the paratypes, are distributed

to the collection of Otsu Hydrobiological Station, of the Zoological Institute (Kyoto University) and of the writer himself.

Type-locality: A dug well at San, on the northeastern coast of the Island of Tokunoshima, central Ryu-Kyu.

Other localities: Two driven wells at Yakugachi of Sumiyô-son, in the southern part of the Island of Amami-Oshima, central Ryu-Kyu.

This new species differs from all the known species of the genus *Parabathynella* in the following combination of morphological features: 1) body remarkably large in size, 2) antennules composed of 8 joints, 3) exopodite composed of 4-5 joints in pereopods 3-7, and, 4) epipodite vestigial in pereopods 1-4. This is the largest species of bathynellid known from the Japanese Islands.

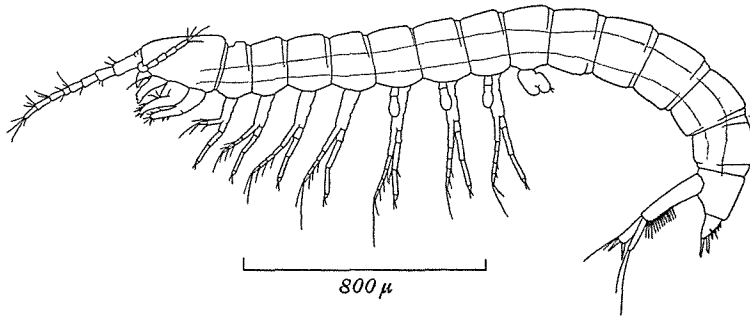
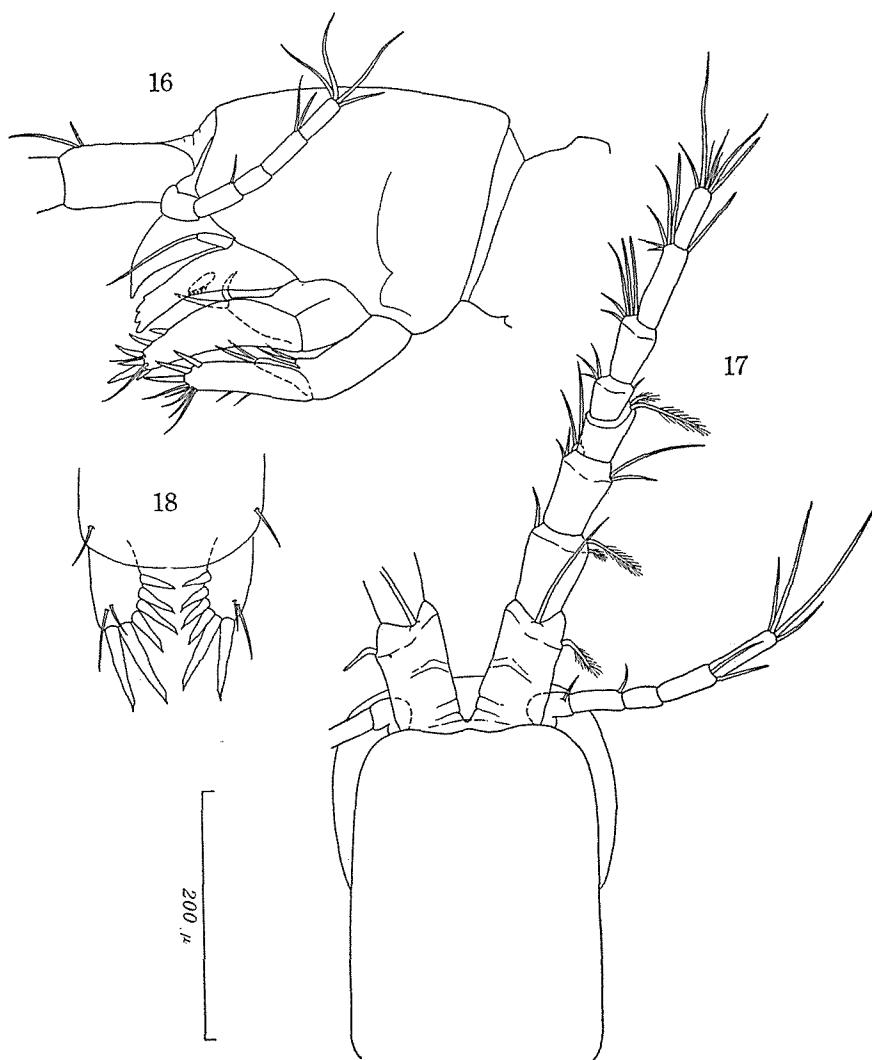


Fig. 15. *Parabathynella gigantea* sp. nov., ♂, of Yakugachi, Is. Amami-Oshima.

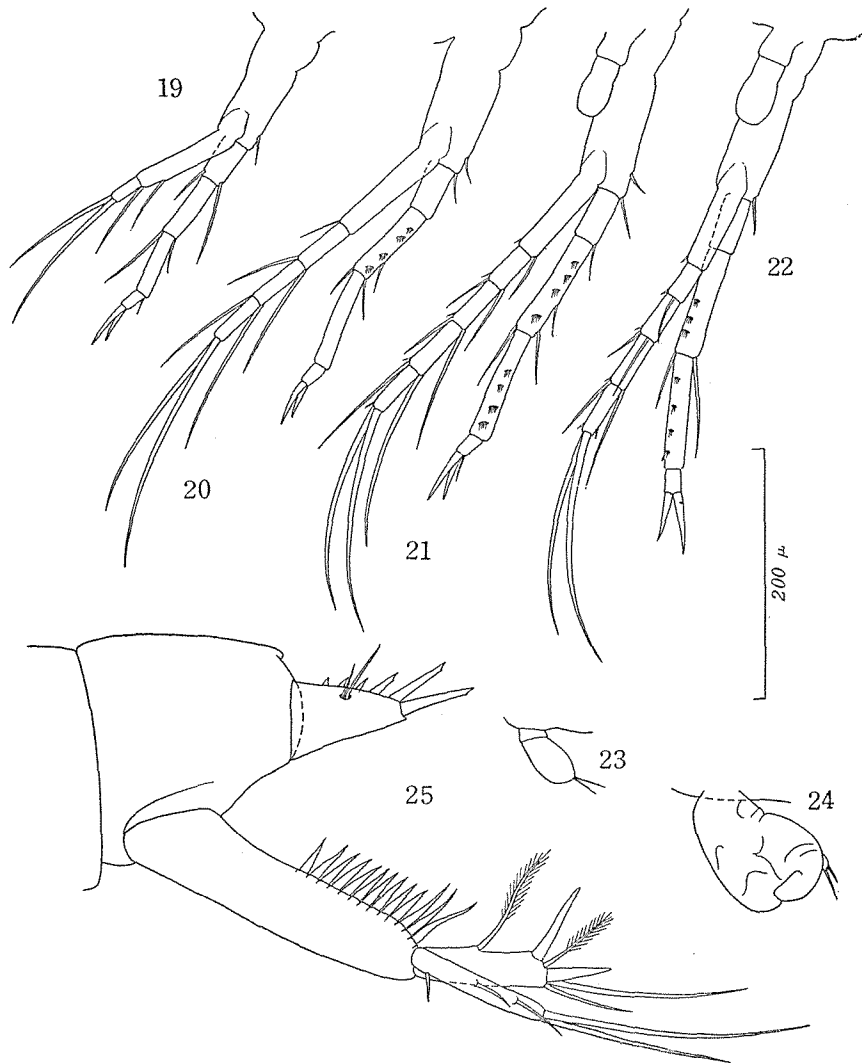
The individuals found at Yakugachi in Amami-Oshima are somewhat different from those of San in Tokunoshima. The difference in the 8th pereopod in ♀ is of special importance and may be regarded as having the subspecific value if the range of individual variation will be confirmed in both the San and the Yakugachi populations. At present, however, the writer prefers to make no subspecific discrimination between the two populations. The individuals of the latter population differs from the type series in the following features:

Thorax longer than that in the type series, much longer than abdomen; vestige of endopodite on each antennule with 2 terminal setae only; distal endite of each maxillula with 6 incurved spines on the inner side, instead of 5; the composition of exopodite joints 2:4:5:5:5:5:5 in pereopods 1-7; in ♀, pereopod 8 composed of 2 joints, apical one of which bears only 2 apical setae; peduncle of uropod provided with a row of 13 spines on the inner side.

Some notes may be necessary concerning the habitats of this crustacean. At Yakugachi in Amami-Oshima, it was pumped up from driven wells as had been usual method for obtaining Japanese bathynellids. At San in Tokunoshima, however, it was taken in a shallow dug well, the bottom of which was exposed to the faint sunlight. The animal was found rather abundantly under stones on the bottom,



Figs. 16-18. *Parabathynella gigantea* sp. nov., of Yakugachi, Is. Amami-Oshima.
—16. Head and mouth parts, left lateral view.—17. Head, right antennule and right antenna, dorsal view.—18. Telson, dorsal view.



Figs. 19-25. *Parabathynella gigantea* sp. nov., of Yakugachi, Is. Amami-Oshima.
 —19. Pereiopod 1.—20. Pereiopod 3.—21. Pereiopod 5.—22. Pereiopod 7.—23. ♀
 pereiopod 8.—24. ♂ pereiopod 8.—25. Telson, uropod and last abdominal somite,
 left lateral view.

where it burrowed tunnels in soft ooze. In the Japanese Islands, no bathynellid has hitherto been known from outside the total darkness within deep wells or limestone caves. The discovery of such a peculiar habitat as noted above is, therefore, very interesting from the ecological view point. It may suggest future discoveries of some habitats of bathynellids in the coastal groundwaters in Japan.

It is very probable that *Parabathynella* sp. reported by UÉNO and MORIMOTO (1956, p. 55) may be referred to this species. During the Expedition 1958, however, no specimen of *P. gigantea* was taken in the well at Kariya-machi in Nazé City, while a male individual of the following new subspecies was obtained from that well.

***Parabathynella gracillima insularis* Y. MORIMOTO, subsp. nov.**

A pair of specimens of *Parabathynella*, obtained in Nazé City during the Expedition 1958, appear to be conspecific with the animals described from Hiroshima Prefecture in Honshu. The Nazé population seems to be more closely allied to

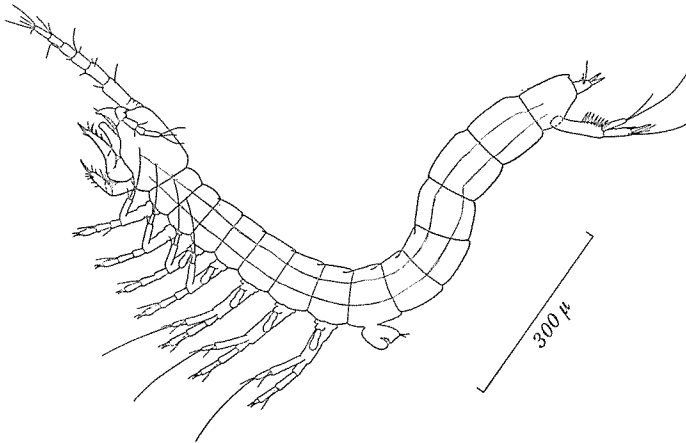
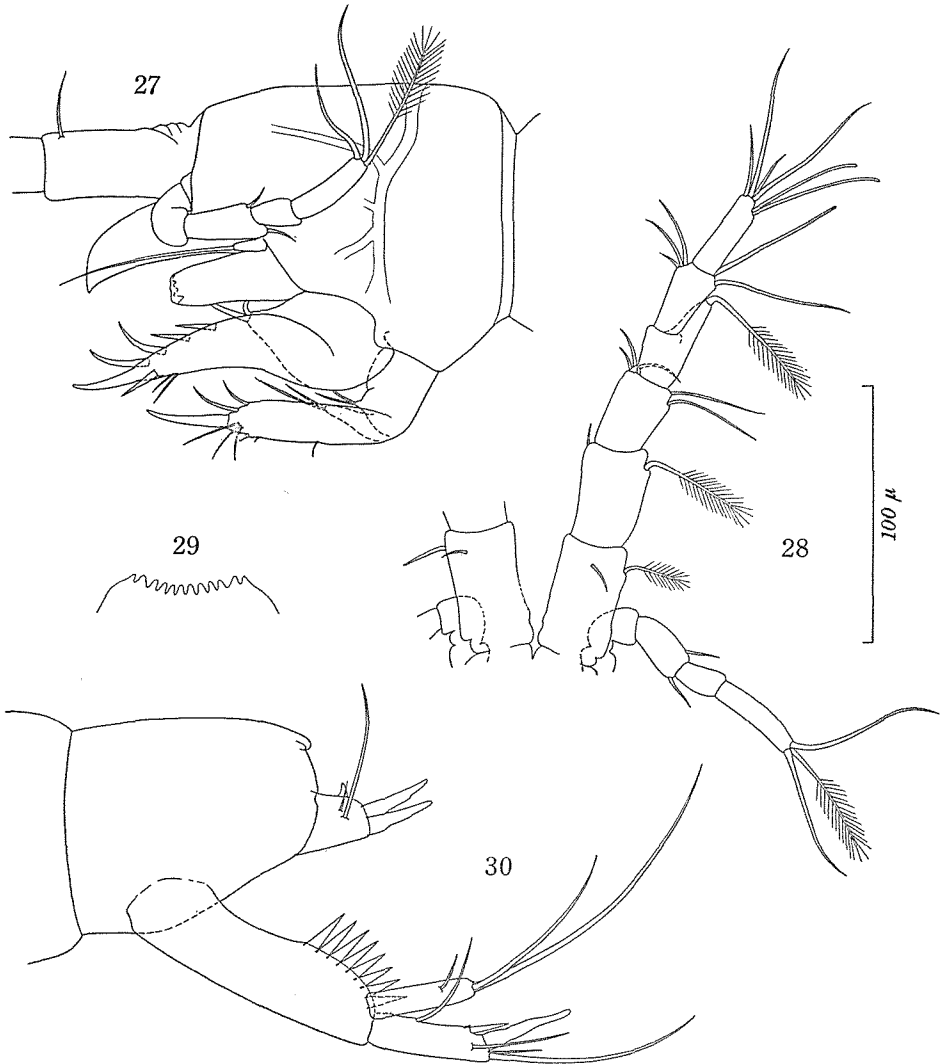


Fig. 26. *Parabathynella gracillima insularis* subsp. nov., ♂, of Nazé, Is. Amami-Oshima.

P. gracillima gracillima UÉNO (1956, p. 109) than to *P. g. yaye* UÉNO (loc. cit., p. 112), but is different from both these races in the following combination of morphological features and is separated as a distinct subspecies: 1) thorax a little longer than abdomen, 2) vestigial epipodite in pereopods 1-2, 3) pereopod 8 of ♀ perceptible only by a very small rudimentary process, 4) peduncle of uropod with 8 large spines, and, 5) dorsal margin of last abdominal somite hardly produced at the posterior end as a sharp process.

Length: 1.1 mm in ♂, 1.2 mm in ♀ (exclusive of appendages).

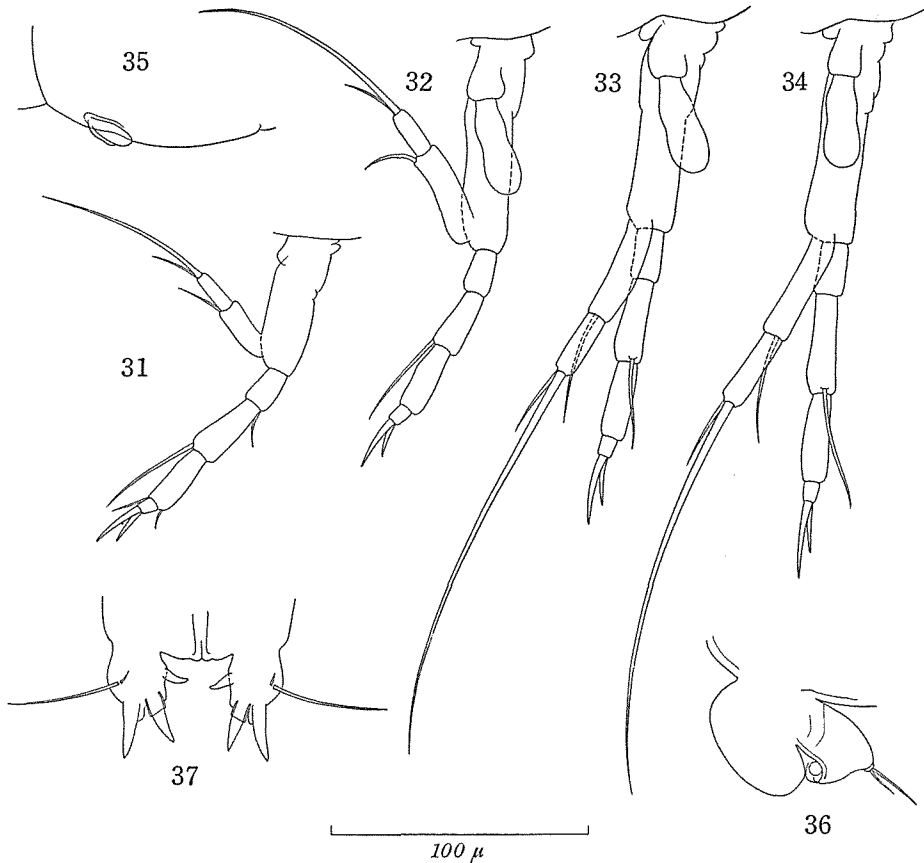
Type-specimens: Holotype: ♂ (Kariya-machi, 29-VIII-1958, collected by S. UÉNO and Y. MORIMOTO). Allotype: ♀ (Sumiyoshi-machi, 31-VII-1958, by S. UÉNO, Y. MORIMOTO and K. IWATSUKI).



Figs. 27-30. *Parabathynella gracillima insularis* subsp. nov., of Nazé, Is. Amami-Oshima.
 —27. Head and mouth parts, left lateral view.—28. Right antennule and right antenna, dorsal view.—29. Labrum, ventral view.—30. Telson, uropod and last abdominal somite, left lateral view.

The type-specimens are preserved in the collection of Otsu Hydrobiological Station.

Type-localities: A driven well at Kariya-machi and a driven well at Sumiyoshimachi, both in Nazé City on the northern coast of the Island of Amami-Oshima, central Ryu-Kyu.



Figs. 31-37. *Parabathynella gracillima insularis* subsp. nov., of Nazé, Is. Amami-Oshima.
 —31. Pereiopod 1, left lateral view.—32. Pereiopod 2, left lateral view.—33. Pereiopod 5, left lateral view.—34. Pereiopod 7, left lateral view.—35. ♀ pereiopod 8, left lateral view.—36. ♂ pereiopod 8, left lateral view.—37. Telson, dorsal view.

General Consideration

The Amami group occupies the central position in the Ryu-Kyu Islands and ranges between the Tokara and the Okinawa groups. It consists of five main islands, i. e. Kikai-ga-shima, Amami-Oshima, Tokunoshima, Okinoérabu and Yoron-jima. The Expedition 1958 visited the latter four islands. Bathynellids were found inhabiting the groundwaters of the Islands of Amami-Oshima and Tokunoshima, but were not obtained on the Islands of Okinoérabu and Yoron-jima in spite of the close investigations made by the members of the Expedition. This is a feature peculiar to the subterranean water fauna of the Amami group of the Ryu-Kyu Isles.

The most reasonable explanation for this fact may be furnished from the difference in the histories of formation of these islands. There are Palaeozoic mountains on the two islands, Amami-Oshima and Tokunoshima, which are considered not to have been suffered from land submergence. On the contrary, the other three islands have repeatedly been submerged since Neogene. There have been developed on them thick coral reefs that raise at present. The animals of the old times appear to have been swept off during the periods when the islands were drowned in the sea. Many remarkable ancient animals are therefore found on the Islands of Amami-Oshima and Tokunoshima, but are absent on the other three islands. The presumption is also confirmed from the fact that in the Island of Tokunoshima the bathynellids are strictly localized in the northeastern part, where there is found no evidence of subsidence, and that they are entirely wanting on its southern part, where there widely spreads the coral limestone excavated by many caves.

The bathynellids of the Amami group seem to belong to three different species-groups. *Bathynella oshimensis*, which is closely allied to *B. intermedia* UÉNO from Takefu City, belongs to the group of *B. pacifica* UÉNO. This species-group is widely distributed over the southwestern areas in Japan.

The group of *Parabathynella kuma* UÉNO is represented in the Amami group by the largest known bathynellid from Japan, *P. gigantea*. Besides these two species, it comprises an undescribed cavernicolous species from the east of Kōchi. The distribution range of the species-group is thus confined to the Pacific coast of the Island of Shikoku, southern Kyushu and the Ryu-Kyu Isles.

The third species, *P. gracillima insularis* is a member of the group of *P. miurai* UÉNO, having the widest range of distribution among the Japanese species-groups of the genus *Parabathynella*. It is obvious that the group of *P. miurai* is more advanced and more specialized than that of *P. kuma*. This is why the former group is more widespread than the latter. It is closely allied even to *P. fagei* DELAMARE-DEBOUTTEVILLE et ANGELIER from southern Europe.

The bathynellids of the Amami group of the Ryu-Kyu Islands have close resemblance to those of the southwestern parts of Japan proper. It may easily be supposed from this fact that the bathynellids of the same phylogenetic groups will be found in future on the Island of Okinawa and its vicinities.

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