

A New Species of the Genus *Pasiphaea* (Crustacea, Decapoda, Pasiphaeidae) from the North Pacific

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ABSTRACT—A new pasiphaeid shrimp, *Pasiphaea oshoroae* sp. nov., is described based on material collected from scattered localities in the northern North Pacific Ocean. It differs from the closely allied congeners in having the short rostrum with regularly concave anterior margin, the telson being shorter than the sixth abdominal somite, the merus of the first pereopod armed with 0–3 (mostly 1) spines, the basis of the first pereopod rounded ventrodistally, and the dactylus of the second pereopod being shorter than the palm. The new species seems to be a mesopelagic inhabitant and to be widely distributed in the northern North Pacific Ocean.

INTRODUCTION

The caridean genus *Pasiphaea* now contains about 50 species from the world oceans, and most of the members are known as pelagic inhabitants. In 1988, T/S *Oshoro-Maru* of Hokkaido University made a collection of the pelagic organisms using a 2.0×2.5 m non-closing rectangular midwater beam trawl net [7] in the eastern part of the northern North Pacific Ocean during the “Cruise 23”; six specimens of a caridean shrimp belonging to the genus *Pasiphaea* were captured from four stations (Table 1). Detailed examination proved that these specimens represent an undescribed species. In addition, a single specimen collected from east of the Cape Erimo, Hokkaido, Japan, was showed to be identical with the eastern Pacific specimens. In this paper we describe these specimens as a new species.

The specimens were preserved in 75% ethyl alcohol. Drawings were made with a camera lucida mounted on a WILD 308700 stereomicroscope. The holotype was deposited in the National Science Museum, Tokyo (NSMT), and the paratypes were deposited at the Laboratory of Marine Zoology, Faculty of Fisheries, Hokkaido University (HUMZ). Postorbital carapace length (CL)

(measured from the orbital margin to the posteromedian margin of the carapace) is used for indication of measurements.

DESCRIPTION

Family Pasiphaeidae

Genus *Pasiphaea* Savigny, 1816

Pasiphaea oshoroae sp. nov.

(Figs. 1–3)

Type series. Holotype: NSMT-Cr 11117, female, 12.3 mm CL, off Aleutian Islands, OBT8822. Paratypes: HUMZ-C 750, 1 female, 12.4 mm CL, Gulf of Alaska, OBT8811; HUMZ-C 751, 1 female, 13.8 mm CL, Gulf of Alaska, OBT 8816; HUMZ-C 752, 1 female, 11.1 mm CL, Gulf of Alaska, OBT8821; HUMZ-C 753, 2 youngs, 8.6 and 8.7 mm CL, OBT8822; HUMZ-C 935, 1 female, 12.0 mm CL, east of Cape Erimo, eastern Hokkaido, Japan, OST8901. Sampling data are summarized in Table 1.

Diagnosis. Rostrum directed upward, falling short of anterior margin of carapace, with regularly concave anterior margin. Carapace bluntly carinate dorsally in anterior three-quarters; branchiostegal sinus obscure. Abdomen rounded, unarmed dorsally. Telson slightly shorter than sixth abdominal somite, with posterior margin deeply notched. Merus of first pereopod armed with 0–3

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TABLE 1. Sampling data of *Pasiphaea oshoroeae* sp. nov.

| Station | Position | Towed depth | Time | Date |
|---------|-------------------------|-------------|-------------|--------------|
| OBT8811 | 54°32.1'N 151°54.5'W | 0-400 m | 20:36-21:31 | 9 July 1988 |
| OBT8816 | 54°58.7'N 139°55.6'W | 0-400 m | 20:53-21:50 | 16 July 1988 |
| OBT8821 | 52°01.2'N 154°34.6'N | 0-400 m | 22:02-23:06 | 31 July 1988 |
| OBT8822 | 49°59.9'N 176°55.4'W | 0-400 m | 21:08-22:12 | 4 Aug. 1988 |
| OST8901 | 42°24.0'N 144°02.3'E | 0-720 m | 11:00-13:31 | 5 Sept. 1988 |

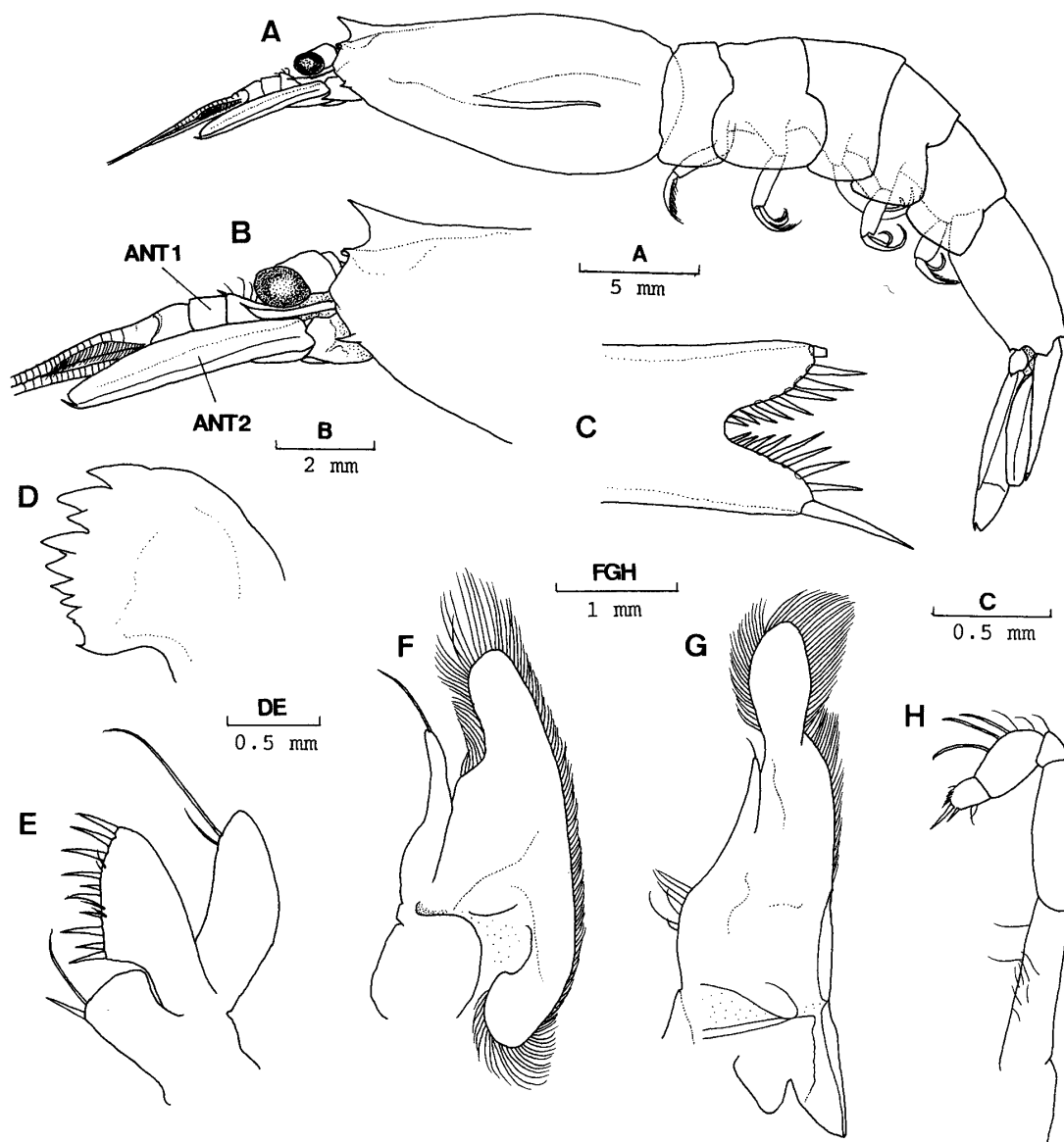


FIG. 1. *Pasiphaea oshoroeae* sp. nov., holotype, female (NSMT-Cr 11117): A, entire animal in lateral view (thoracic appendages removed); B, anterior part of carapace and cephalic appendages; C, posterior part of telson in dorsal view; D, left mandible; E, left maxillule; F, left maxilla; G, left first maxilliped; H, left second maxilliped. ANT1=antennule; ANT2=antenna.

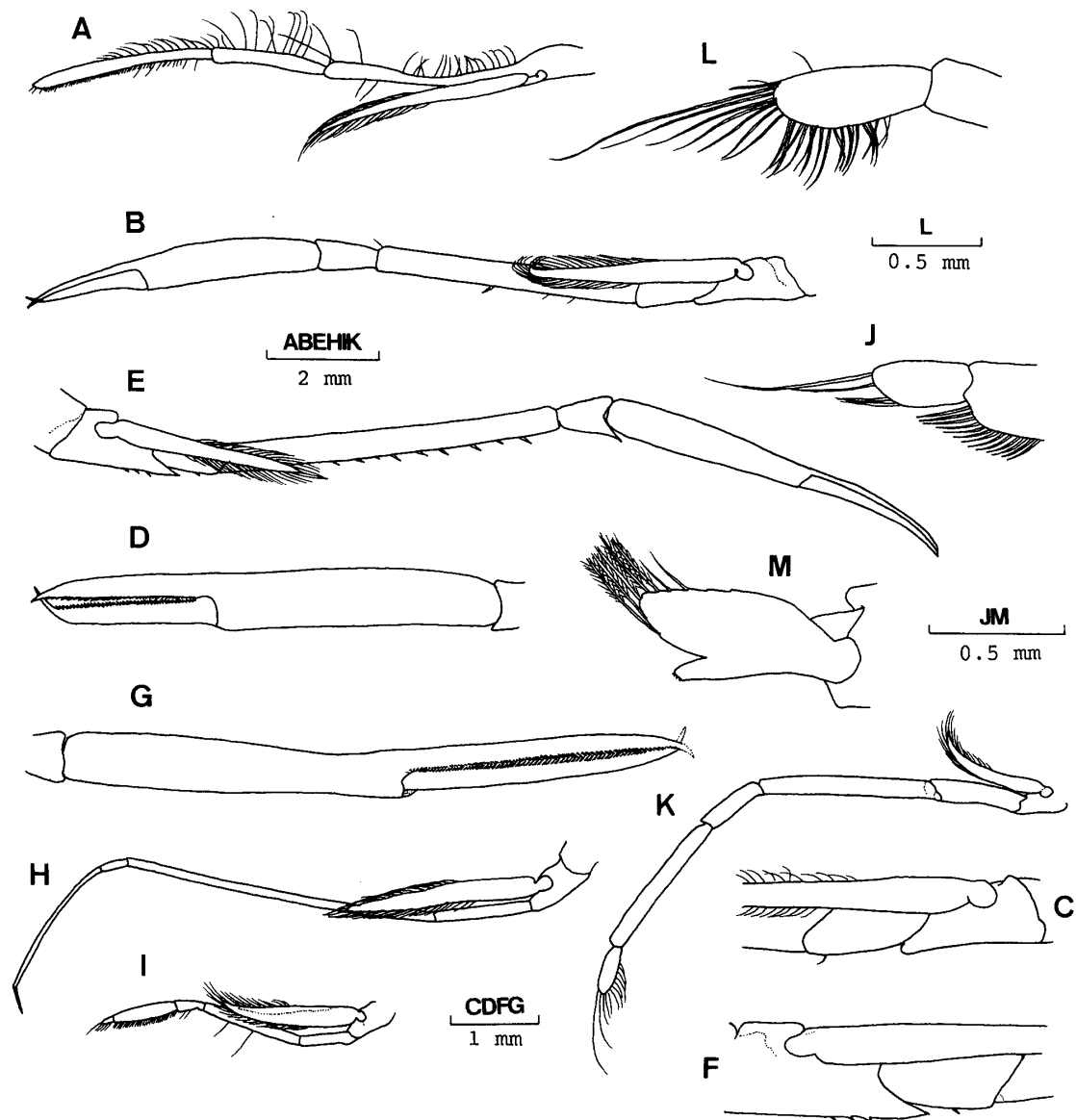


FIG. 2. *Pasiphaea oshoroae* sp. nov., holotype, female (NSMT-Cr 11117): A, left third maxilliped; B, left first pereopod; C, same, basis and ischium; D, same, chela; E, right second pereopod; F, same, basis and ischium; G, same, chela; H, left third pereopod; I, left fourth pereopod; J, same, dactylus; K, left fifth pereopod; L, same, dactylus; M, endopod of left first pleopod.

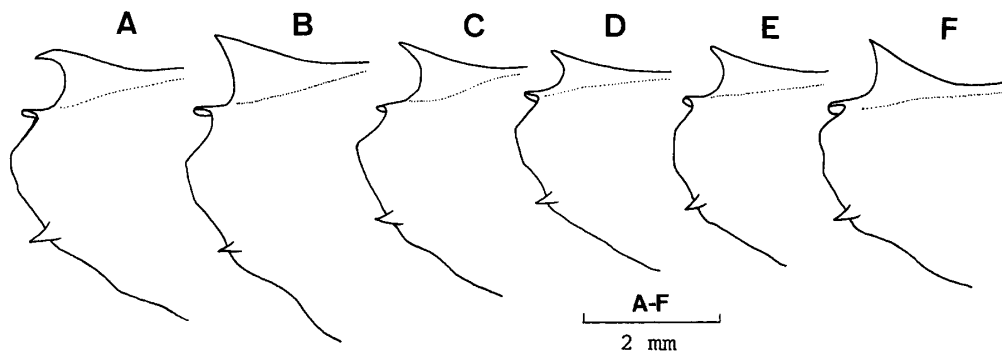


FIG. 3. *Pasiphaea oshoroae* sp. nov., paratypes, variations of rostral shape: A, HUMZ-C 750; B, HUMZ-C 751; C, HUMZ-C 752; D, E, HUMZ-C 753; F, HUMZ-C 935.

spines; basis with rounded ventrodistal angle. Merus of second pereopod armed with 9–11 spines or spinules; ischium with 0 or 1 spine; basis with 0–3 spines; dactylus slightly shorter than palm.

Description of holotype. Body (Fig. 1A) strongly compressed. Integument thin, glabrous.

Rostrum (Fig. 1B) slightly falling short of anterior margin of carapace, directed obliquely upward, anteriorly narrowed into acute tip, anterior margin regularly concave. Carapace (Fig. 1A) bluntly carinate dorsally in anterior three-quarters, posterior quarter rounded; hepatic groove shallow; lower branchial ridge blunt, falling far short of posterior margin of carapace; branchiostegal tooth arising just posterior to anterolateral margin of carapace, supported by short buttress; branchiostegal sinus obscure.

Abdomen (Fig. 1A) dorsally rounded over entire length, all somites lacking posterodorsal tooth. Pleuron of first somite straight ventrally, those of second to fifth somites rounded ventrally. Sixth somite about 0.5 times as long as carapace; posteroventral angle pointed; posterolateral process obliquely truncate. Telson (Fig. 1A, C) 0.9 times as long as sixth somite, dorsally grooved; posterior margin deeply notched, with 9 pairs of spines.

Cornea of eye (Fig. 1B) darkly pigmented, almost as wide as eyestalk.

Antennule (Fig. 1B) with peduncle reaching three-fifths of scaphocerite; stylocerite twisted, distally acute, falling considerably short of proximal segment of peduncle; intermediate segment less than half length of proximal segment; outer flagellum somewhat thickened proximally, ventral excavation filled with aesthetascs.

Antenna (Fig. 1B) with basicerite bearing moderate ventrolateral tooth; scaphocerite with lateral margin slightly convex, distolateral tooth distinctly reaching beyond blade; carpocerite slightly reaching beyond distal end of proximal segment of antennular peduncle.

Mouthparts typical of genus. Mandible (Fig. 1D) with 10 sharply pointed teeth on mesial margin of incisor process; palp absent. Maxillule (Fig. 1E) with palp bearing 2 subapical setae on mesial margin, distal portion broadly rounded; distal endite armed with 10 stout spines on cutting edge; proximal endite truncate, with 2 setae at posterior

angle. Maxilla (Fig. 1F) with endites vestigial, without marginal setae; palp with apical seta. First maxilliped (Fig. 1G) reduced to large elongate lamina, with palp rudimentary; central part of mesial margin with sparse setae; distal lobe ovate, not articulated, fringed with setae; posterior half of lateral margin somewhat thickened, separated into two lobes by shallow, but distinct notch. Second maxilliped (Fig. 1H) five-segmented, pediform, lacking both of epipod and exopod; propodus with sparse setae but no spinules on extensor margin; dactylus armed with 2 spines distally. Third maxilliped (Fig. 2A) overreaching scaphocerite by distal part of ultimate segment; ultimate segment 1.6 times as long as penultimate segment.

All pereopods with well-developed expod (Fig. 2B, E, H, I, K). First pereopod (Fig. 2B) overreaching scaphocerite by length of fingers and one-third of palm; basis (Fig. 2C) with rounded ventrodistal angle; merus bearing 1 or 3 spines on ventral margin; carpus unarmed; dactylus (Fig. 2D) 0.6 times as long as palm, cutting edges of both fingers pectinated with minute spinules. Second pereopod (Fig. 2E) exceeding scaphocerite by length of fingers and half of palm; basis (Fig. 2F) armed with 3 spines on ventral margin; ischium (Fig. 2F) with 1 or 2 spines on ventral margin; merus bearing 11 spines including some minute ones on ventral margin; carpus with ventrodistal spine; dactylus somewhat curved inward (Fig. 2G), 0.8 times as long as palm, cutting edges with minute numerous spinules. Third pereopod (Fig. 2H) very thin, overreaching anterolateral margin of carapace by length of dactylus and distal two-thirds of propodus. Fourth pereopod (Fig. 2I) much shorter than other pereopods, reaching level of slightly anterior to middlength of carapace by tip of dactylus; propodus with flexor face densely setose; dactylus (Fig. 2J) ovate, with setae on distal and flexor margins, 0.25 times as long as propodus. Fifth pereopod (Fig. 2K) falling slightly short of level of branchiostegal tooth of carapace; dactylus (Fig. 2L) ovate, 0.3 times as long as propodus, fringed with setae increasing in length distally on flexor to distal margin.

Branchial formula as shown below. Epipods absent from pereopods; arthrobranchs on first to

third pereopods well developed.

| | Maxillipeds | | | Pereopods | | | | |
|--------------|-------------|---|---|-----------|---|---|---|---|
| | 1 | 2 | 3 | 1 | 2 | 3 | 4 | 5 |
| Pleurobranch | — | — | — | 1 | 1 | 1 | 1 | 1 |
| Arthrobranch | — | — | — | 1 | 1 | 1 | — | — |
| Podobranch | — | — | — | — | — | — | — | — |
| Epipods | — | — | — | — | — | — | — | — |
| Exopods | 1 | — | 1 | 1 | 1 | 1 | 1 | 1 |

Endopod of first pleopod (Fig. 2M) roughly ovate, with short, stout appendix interna. Endopod of uropod (Fig. 1A) exceeding apex of telson by about distal one-fifth; exopod overreaching apex of telson by about distal one-third, distolateral tooth reaching beyond blade.

Coloration. In fresh, entire animal reddish translucent, densely with fine red dots over body; fingers of chelae deep red. Cornea of eye brown.

Variations. The paratypes agree well with the holotype, but show some variations. The anterior margin of the rostrum varies from weakly concave to strongly concave, as depicted in Fig. 3.

In two small specimens with CL 8.6 and 8.7 mm CL, the dorsal carina on the carapace is rather obscure.

The merus of the first pereopod bears 0 or 1 spine. The merus of the second pereopod is armed with 7–12 spines on ventral margin; ischium with 0 or 1 spine; basis with 0–3 spines. It is found that

the number of spines on the ventral margin of the merus and ischium of the second pereopod increases with age in the present new species, as well as in other congeners [4, 5].

Determination of sex. In all of specimens examined, the second pleopod lacks the appendix masculina. Four specimens with CL more than 11.1 mm (holotype, paratypes: HUMZ-C 750; 751; 752) had a small, but distinct ovary containing ova, clearly visible posterodorsally through the transparent cuticle of the carapace. A specimen with CL 12.0 mm (HUMZ-C 935) is seriously damaged in the internal structure of the cephalothorax, but this specimen is probably female judging from its size. In two small specimens with CL 8.6 and 8.7 mm (HUMZ-C 753), the gonad was too poorly developed to determine the sex.

Etymology. Named after T/S Oshoro-Marui of Hokkaido University, which collected the present new species.

Distribution. Known with certainty only by the type series: Gulf of Alaska; Pacific off Aleutian Islands; Pacific off eastern Hokkaido.

DISCUSSION

The carinated carapace, rounded abdomen, and deeply notched posterior margin of the telson distinguish the new species from all but four species of the approximately 50 described and recog-

TABLE 2. Comparison of characters among *Pasiphaea oshoroae* sp. nov. and four allied species

| Items | <i>P. oshoroae</i> sp. nov. | <i>P. alcocki</i> | <i>P. corteziana</i> | <i>P. liocerca</i> | <i>P. rathbunae</i> |
|--|-----------------------------|----------------------------|-------------------------------------|--------------------------|---------------------|
| Anterior margin of rostrum | concave | vertical and sinuous | inclined forward, without concavity | concave | convex and sinuous |
| Dorsal carina of carapace | blunt | sharp | blunt | sharp | sharp |
| Branchiostegal sinus | obscure | distinct | distinct | distinct | distinct |
| Ventrodistal corner of ischium of first pereopod | blunt | acute | blunt | blunt | blunt |
| Number of meral spines of first pereopod | 0–3, mostly 1 | — | 3 or 4 | 0 | 9 |
| Dactylus of second pereopod | shorter than palm | equal to palm | longer than palm | shorter than palm | shorter than palm |
| Distribution | northern North Pacific | Bay of Bengal Indian Ocean | California Eastern Pacific | Bermuda Western Atlantic | Antarctic |
| Reference | present study | [1] | [9] | [2] | [8] |

nized species of the genus *Pasiphaea*. These four species are as follows: *P. alcocki* (Wood-Mason, 1891) from the Bay of Bengal, Indian Ocean; *P. corteziana* Rathbun, 1902 from off California, eastern Pacific; *P. liocerca* Chace, 1940 from Bermuda, Western Atlantic; *P. rathbunae* (Stebbing, 1914) from the Antarctic.

The differences that help to separate the new species from the four allied species are given in Table 2. The anterior margin of the rostrum is regularly concave in the new species and *P. liocerca*, though the rostrum of the latter is considerably smaller than that of *P. oshoroae* [2]. In *P. alcocki*, it is vertical and sinuous [1]. In *P. corteziana*, it is inclined forward and upward without concavity or convexity [9]. In *P. rathbunae*, it is convex and sinuous [8].

The dorsal carina on the carapace of the *P. oshoroae* is blunt as in *P. corteziana* [9], while sharply ridged in the other three species [1, 2, 8].

The branchiostegal sinus is very obscure in *P. oshoroae*, while it is more distinct in the other four species [1, 2, 8, 9].

The number of spines on the merus of the first pereopod is useful in separating these species: the spines are 0 to 3 in the new species, 3 to 4 in *P. corteziana* [9], 9 in *P. rathbunae* [8], and 0 in *P. liocerca* [2]. Unfortunately, this character has been remained uncertain in *P. alcocki*.

P. alcocki appears to be unique among these five species in having the basis of the first pereopod armed with ventrodistal spine [1]. In the other species, the ventrodistal angle of basis of the first pereopod is rounded [2, 8, 9].

In *P. oshoroae* the dactylus of the second pereopod is slightly shorter than the palm as in *P. liocerca* and *P. rathbunae* [2, 8]. On the other hand, the dactylus is equal to the palm in *P. alcocki* [1], and it is distinctly longer than that in *P. corteziana* [9].

Recently, Hayashi [6] enumerated five Japanese species of *Pasiphaea*. Thus, *P. oshoroae* represents the sixth species of the genus from the Japanese waters.

The present specimens strongly suggest that *P. oshoroae* is widely distributed in the northern North Pacific Ocean. Like the other members of this genus as well as related genera [3], the present

new species seems to be a pelagic inhabitant. Unfortunately, the bathymetric range could not be determined satisfactorily, since all of the specimens were collected by oblique tow of open net. All but one of the type series were collected from mesopelagic zone shallower than 400 m where the bottom depth greater than 2000 m. One specimen from the eastern Hokkaido (HUMZ-C 935) was captured by the bottom trawl, but it was entangled in the wing net together with other pelagic organisms such as *Bentheogennema borealis* (Rathbun, 1902) (Dendrobranchiata, Benthesicymidae) or myctophiid fishes.

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