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Two associated hippolytids, *Lebbeus comanthi* sp. nov. and *Lebbeus balssi* Hayashi (Decapoda, Caridea, Hippolytidae) from Japan*¹

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Two hippolytids of the genus *Lebbeus* were found to be associated with invertebrates from the Pacific coast of the central Japan. One is a new species, *L. comanthi*, closely related to *L. miyakei* Hayashi, and was collected from crinoids. The new species is distinguished from *L. miyakei* in having the pleura of the fourth abdominal somite pointed posteriorly and the distal margin of telson with a median spine, and the first species obtained from crinoids in this genus. The other species, *L. balssi* Hayashi, was commensal with a sea anemone, and probably the cryptic species of *L. grandimanus*, which shows the amphi-Pacific distribution and is known to be associated with sea anemones. The description of the new species, and the relationship between these two species and the related ones were presented with their live color pattern.

1 Introduction

The family Hippolytidae contains several species associated with other invertebrates, such as *Thor* with actinarians or scleractinian corals, *Latreutes* with medusae, and *Hippolyte* with alcyonarians, actinarians or crinoids. These genera are all the shallow water tropical origin.

The genus *Lebbeus*, on the other hand, which contains many species distributed from the northern cold waters, has a single commensal species, *L. grandimanus* (Brashnikov), reported from the North Pacific¹⁾. The hosts of this shrimp are sea anemones in the Northeast Pacific²⁾, but their symbiotic relationship has not been confirmed in the

Northwest Pacific. The photographs showing such an association between uncertain hippolytid and deep sea anemones in the Pacific coast of central Japan were published in several popular magazines in Japan, but the specimens collected from the hosts had not been examined taxonomically so far. Recently we actually examined one specimen collected from the host sea anemones. It proved to be *L. balssi* Hayashi previously known from the East China Sea, Sea of Japan and Sagami Bay, at depths of 40-120 m³⁾.

During the preparation of this manuscript, we, fortunately, received an underwater photograph of *L. grandimanus* associated with a sea anemone

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*1 共生生活をする日本産イバラモエビ属の2種について

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taken off Akkeshi, Hokkaido. We include this photograph in the present paper for comparison, because it is the first evidence of the symbiotic association of that species in the Northwest Pacific, though we can not actually examine the specimen.

Another associated species has been collected from the crinoid and is probably a new species of the genus *Lebbeus*. It is closely related to *L. miyakei* Hayashi³⁾, and is the third species of this family associated with the crinoids. The new species, *L. comanthi*, differs from *L. miyakei* by the pointed fourth abdominal pleura and the median spine of the posterior margin of the telson.

We use the abbreviations for the measurement of specimens, such as BL is the body length, from the posterior margin of the orbit to the distal end of the telson, CL is the carapace length, from the posterior margin of the orbit to the posterior margin of carapace and RL is the rostrum length, from the rostral apex to the posterior margin of orbit. The specimens examined are deposited at the institutions indicated by the following abbreviations; CBM: Natural History Museum and Institute, Chiba, and NFU: National Fisheries University.

2 Description of species

Lebbeus balssi Hayashi, 1992

(Figs. 3-1, 4-1)

Material examined:

Izu Ocean Park, Sagami Bay, 60 m in depth, collected from *Dofleinia armata*, SCUBA diving, 30 November 1995, T. Uryu leg.
— 1 ♀ (CBM-ZC 3334).

Color:

The body is transparent, with transverse brilliant red and white bands on the carapace and abdomen (Figs. 3-1, 4-1). A set of anterior red and posterior white (red-white) bands is present on the carapace just after eyes and runs along the lower margin of the carapace. The next set is an anterior

white and posterior red (white-red) bands on the gastric region, usually with a short red band attached anteriorly to the white line; the lower part of this set is curved anteriorly. A short set of red-white bands is on the cardiac region. A long white-red band is near the posterior margin of the carapace.

On the first and the second abdominal somites there is a white-red transverse band on the tergum to the pleuron. Moreover two short red-white bands are present on the pleuron anterior the long band, of these the anterior band is obscure and shorter. Two red-white-red bands are present on the third somite; of these, the posterior band has a large, very striking white part all over the body. A red-white band is present near the posterior margins of both of the fourth and fifth somites. A broad red-white-red band is present on the posterior part of the sixth somite and an outer red line disappears at the protopod of the uropod while the remaining white-red band encloses the outer margin of the tail fan.

The eyestalk and partly the cornea are alternately striped with red and white bands. The antennular flagellum is pure white and the second segment of the antennular peduncle is circled by a yellow band. The antennal scale is margined by a white-red band. The third maxilliped and the first pereopod are whitish. The second pereopod is transparent. The posterior three pereopods are pure white dorsally and obscure red ventrally.

Remarks:

L. balssi seems to be the cryptic species of *L. grandimanus* (Brashnikov), because they are closely related to each other in having not only common morphological features and a similar color pattern but also the same ecological habit. As shown by Hayashi³⁾, they share with the following features; the epipod on the first and second pereopods, the pointed pleura of the fourth and fifth abdominal somites, and a series of spinules on the mesial margin of the distal segments of the third maxilliped.

Their morphological differences between them are the shape and spination of the rostrum and the spination of the telson³⁾. The present material does not show any morphological difference from the type series of *L. balssi*. The rostrum is more slender in *L. balssi* than in *L. grandimanus* in which the distal part of the rostrum is apparently deeper. The ventral margin is armed with one spine near the apex in *L. balssi* but with one to four spines in *L. grandimanus*. The telson is provided with three pairs of dorsal spines and more than seven spines on the posterior margin in *L. grandimanus*. In *L. balssi*, the dorsal spines are two pairs and the posterior spines are only two pairs, situated near the outer distal corner.

The color pattern is rather similar to each other (Fig. 4-1, 4-2, and see Butler²⁾ for *L. grandimanus*). The background is pale milky or semitransparent in *L. grandimanus*, while transparent in *L. balssi*. The transverse bands are composed of red and yellow in *L. grandimanus*, instead of red and white in *L. balssi*. Five or six blue transverse bands are characteristic in *L. grandimanus*, but no blue or violet bands are observed in *L. balssi*.

The habit of these two shrimps is the same, depending on the sea anemones of the order Actiniaria. The present specimen of *L. balssi* was collected from *Dofleinia armata* Wassilieff, which is easily distinguished from other species during a SCUBA observation under water. This anemone bears many (48 in number) robust and long tentacles scattered with white spots of dense concentration of the nematocysts, and usually settles on sandy bottom⁴⁾. The photographs of this sea anemone housing the unknown shrimp were introduced several times in color in Japanese publications⁵⁻⁸⁾.

In Japan the host of *L. grandimanus* was a white type of medium-sized sea anemone, *Tealia asiatica* (Fig. 4-2, Kitaguchi, personal communication). In the Northeast Pacific, it was reported to be associated with sea anemones of different species than that of Japanese waters: *Cribrinopsis fernaldi*, *Tealia crassicornis* and *T. piscivor*²⁾.

Size:

The present material is 7.0 mm in CL and 4.6 mm in RL and a little shorter than the holotype.

Distribution:

Hayashi³⁾ synonymized Balss' material⁹⁾ from Sagami Bay reported under the name of *Spiontocaris brandti* (Brashnikov)¹⁾, but did not actually examine any specimen from that bay³⁾. The type series was collected from the East China Sea and Sea of Japan. The present material proves the distribution of *L. balssi* in the Pacific coast of Japan.

Lebbeus comanthi sp. nov.

(Figs. 1, 2a-o, 3-2, 4-3)

Material examined:

Izu Ocean Park, Sagami Bay, 25 August, 1995, 15 m in depth, collected from *Oxycomanthus japonicus* (Müller), SCUBA diving, J. Okuno and M. Yokota leg. — 1 ♂ (holotype, CBM-ZC 3333).

Futo, near Izu Ocean Park, Sagami Bay, 19 October 1995, 23 m in depth, collected from an unidentified crinoid, J. Okuno leg. — 1 ♂ (paratype, NFU-530-2-1876).

Off Kamogawa, Boso Peninsula, 26 December 1996, 10 m in depth, collected from *Oxycomanthus japonicus*, SCUBA diving, M. Aizawa leg. — 1 ♂ (paratype, CBM-ZC 3335).

Definition:

Rostrum short and straight, with or without one tooth on midlength of upper margin and one tooth on lower margin near apex; rostral apex sharply pointed. Carapace weakly carinated before spine on gastric region. Supraorbital spine large, with small notch on ventral side. Antennal spine developed. Pterygostomial spine small. Pleura of first three somites rounded. Those of fourth to sixth somites pointed. Telson with three pairs of dorsal spines. Antennular peduncle with three or four marginal spines on first segment and one spine on

second and third segments. Third maxilliped without spinules on mesial margin of distal segment. Epipod on first three pereopods.

Description:

Small species (Fig. 1). Rostrum short, not reaching distal margin of first segment of antennular peduncle; tooth present on midlength of upper margin in holotype male, smooth upper margin, without tooth, in one paratype (Fig. 2*a, b*), and shorter rostrum in another paratype and part distal from tooth on upper margin probably broken off. Apex bifid in three types, but their appearance different from each other, one paratype with tooth on upper margin near pointed apex, while holotype and another paratype with small tooth on lower margin near apex. Short lateral carina extending from supraorbital spine to midlength of rostrum (Fig. 2*b*). Carapace smooth, with single tooth on gastric region. Supraorbital spine large and stout

with small concavity on lower margin; antennal spine developed and separated from suborbital angle; pterygostomial angle rectangular or with spiniform process (Fig. 2*b*).

Abdomen smooth dorsally; pleura of first three somites rounded; pleura of fourth and fifth somites pointed posteriorly (Fig. 2*c*). Sixth somite 1.5-1.7 times as long as fifth somite. Telson 1.5-1.6 times as long as sixth somite, with three dorsolateral spines on left side and four spines on right side in holotype, but three or four pairs of spines in paratypes; posterior margin with central spine flanked by two pairs of spines and pair of long plumose setae (Fig. 2*d*).

Eyes well developed, overreaching anteriorly rostral apex, with small ocellus attached to cornea. Basal segment of antennular peduncle longer than distal two segments combined, with three or four marginal spines; stylocerite slender, overreaching distal end of first segment; second segment longer

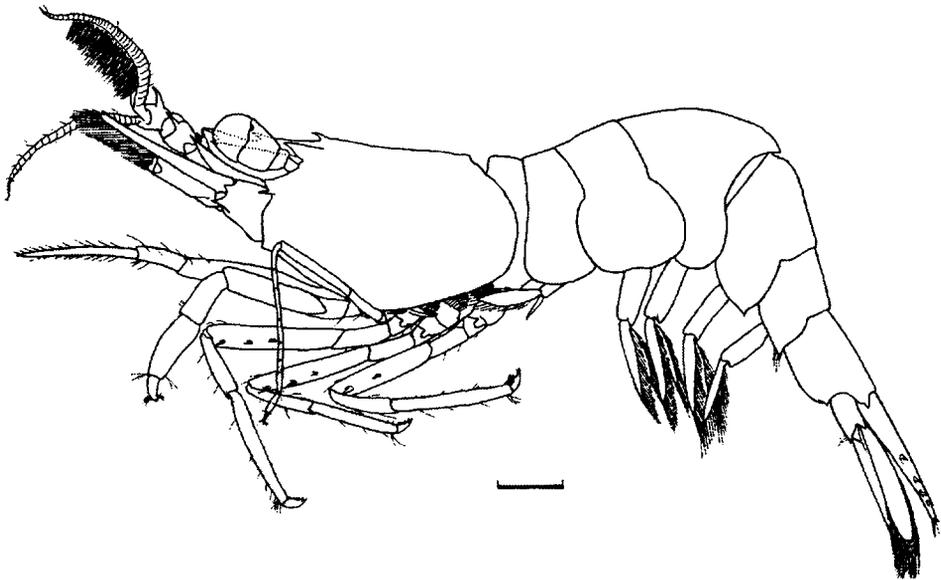


Fig. 1. *Lebbeus comanthi* sp. nov., holotype, male, 2.7 mm in CL (CBM-ZC 3333), associated with a crinoid, *Oxycomanthus japonicus* (Müller). Scale 1.0mm.

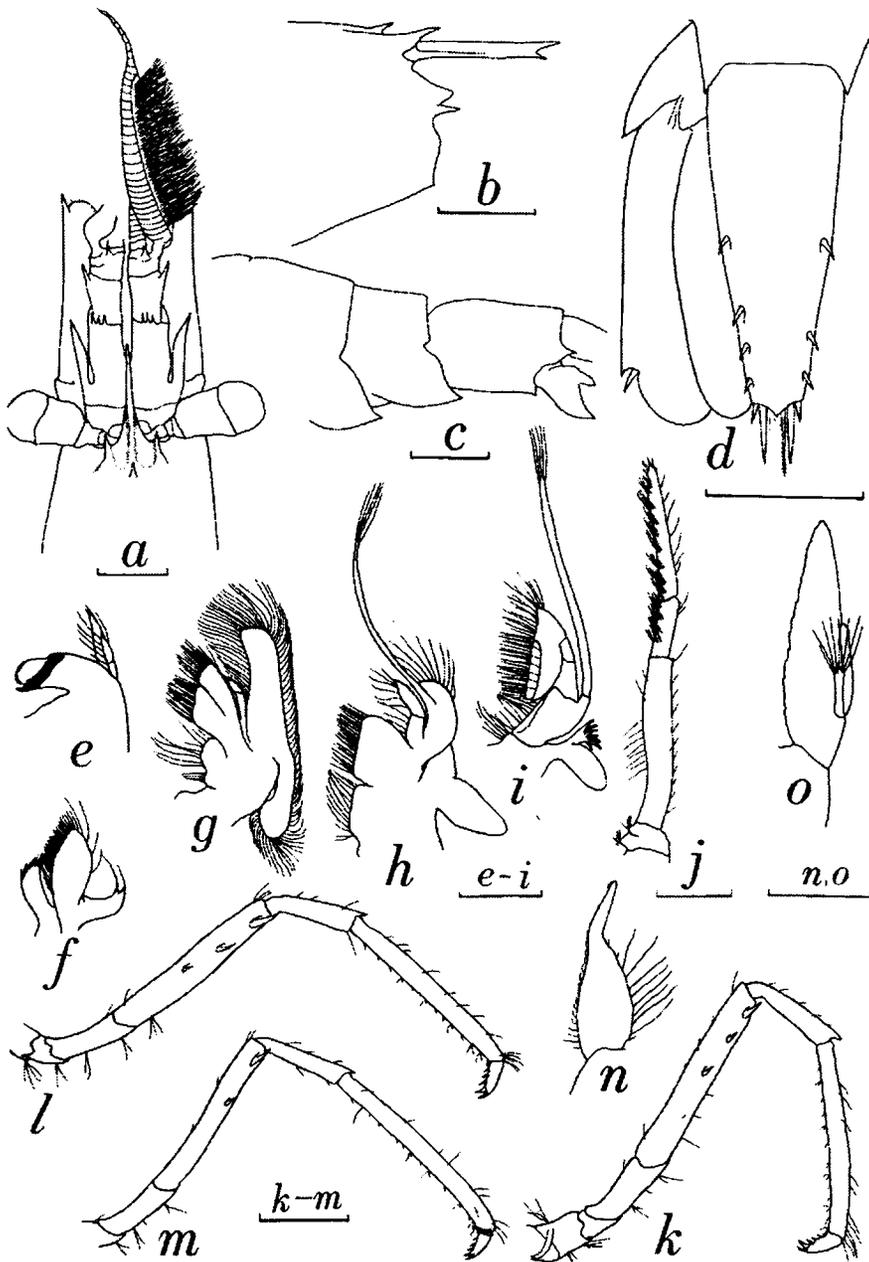


Fig. 2. *Lebbeus comanthi* sp. nov., *a-c*, *e-i*, *k-o*, paratype, male (NFU-530-2-1876), *d*, *j*, holotype, male (CBM-ZC 3333). *a*, anterior part of body, dorsal view, *b*, rostrum, *c*, fourth to sixth abdominal somite, *d*, tail fan, *e*, mandible, *f*, first maxilla, *g*, second maxilla, *h*, first maxilliped, *i*, second maxilliped, *j*, third maxilliped, *k*, third pereopod, *l*, fourth pereopod, *m*, fifth pereopod, *n*, endopod of first pleopod, *o*, endopod of second pleopod. Scales for *a-d*, *j-m*: 1.0 mm and for *e-i*, *n*, *o*: 0.5 mm.

than third, with stout spine near outer distal end; third segment with small marginal spine; outer flagellum swollen with dense aesthetascs in most part, inner flagellum slender; both as long as peduncle. Antennal scale overreaching antennular peduncle by distal part, 2.8-2.9 times as long as broad; outer distal spine overreaching lamella (Fig. 2a). Basicerite with two processes, upper bluntly, lower sharply pointed; carpuerite reaching end of second segment of antennular peduncle; flagellum slightly longer than body.

Mouthparts typical for genus. Mandible with two-jointed palp and pointed incisor process (Fig. 2e). First maxilla with proximal and distal endites toothed distally; small bilobed endopod with one seta each (Fig. 2f). Second maxilla with deeply divided distal endite, small proximal endite, two-jointed endopod and large scaphognathite (Fig. 2g). First maxilliped with distal and proximal endites, both single lobe; endopod two jointed; exopod long with caridean lobe; epipod large and bilobed (Fig. 2h). Second maxilliped with long exopod; epipod small with slightly branched podobranch (Fig. 2i). Third maxilliped overreaching antennal scale by distal part of ultimate segment; distal segment with six or seven apical spinules (Fig. 2j); exopod absent, but epipod present.

First pereopod slender, reaching end of antennular peduncle; chela as long as merus; carpus about half as long as merus. Second pereopod slender, reaching beyond antennal scale by chela or chela and distal joint of carpus; carpus with seven joints. First three pereopods with epipod. Third pereopod overreaching antennal scale by dactylus; merus as long as propodus, with two spines on outer surface; dactylus biunguiculate with four spines on posterior margin (Fig. 2k). Fourth pereopod reaching end of antennal scale, with two or three outer spines (Fig. 2l). Fifth pereopod just reaching end of antennular peduncle; merus with two outer spines; dactylus biunguiculate with three or four spines on posterior margin (Fig. 2m).

Endopod of male first pleopod with appendix

interna with few retinacula on inner distal part (Fig. 2n). Endopod of male second pleopod with appendix masculina and appendix interna; appendix masculina about half as long as appendix interna, with several simple setae distally; appendix interna slender with few retinacula on inner distal part (Fig. 2o).

Color:

The ground color is transparent. Four red bands are present on lateral surface of the carapace (Figs. 3-2, 4-3); the anterior band runs obliquely from anterior margin of carapace to lower margin of carapace, the second band is short and parallel to the anterior band, and the posterior two are shorter, not reaching middorsal part and situated nearly transversely and equidistantly to the former two bands.

A broad longitudinal red band is present along the dorsal surface from the posterior margin of the carapace to the end of the third abdominal somite. A yellow band follows this red band to the end of the sixth somite. A red band runs along the lower margin of the abdomen and at the end of the sixth somite this band is broadened and covers the tail fan. The distal part of the tail fan is tinged with yellow. The space between the dorsal red or yellow bands and the ventral red band is largely transparent, but sometimes there is a narrow obscure red band at the lateral part of the second and third somites.

The flagella and peduncle of the antennule are red. The antennal scale is margined by a red band and the flagella are striped by red rings. The third maxilliped and first pereopod are red. The second pereopod is transparent. The posterior three pereopods are red in the basal part, and the propodus and dactylus are transparent or obscurely red. The pleopods are all red.

Etymology:

The specific name, *comanthi*, is a noun from the popular generic name of the crinoids, referring to

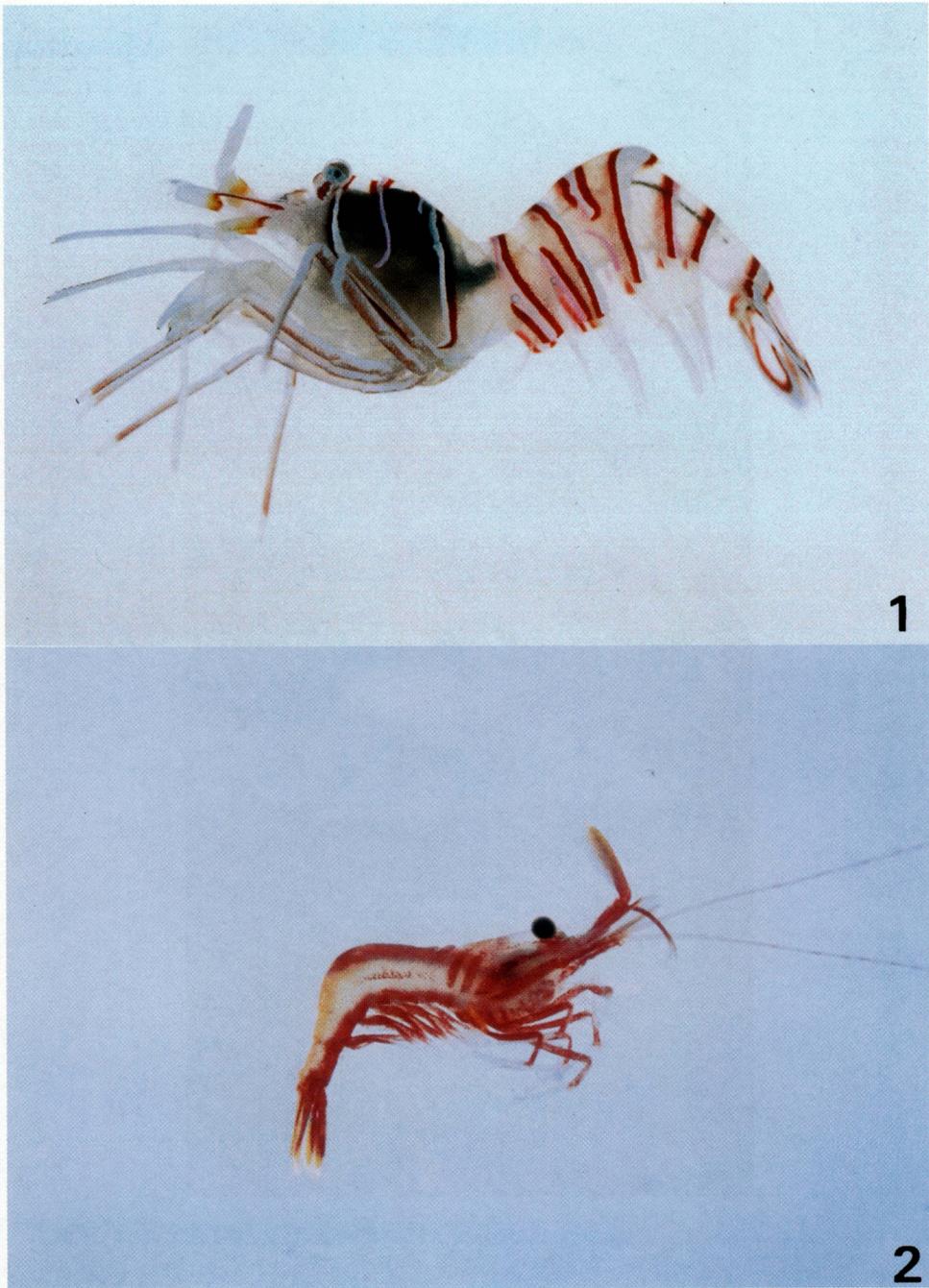


Fig. 3. 1 : *Lebbeus balssi* Hayashi, female, 7.0 mm in CL (CBM-ZC 3334), associated with sea anemone, *Dofleinia armata* (Photo taken by T. Uryu).
2 : *Lebbeus comanthi* sp. nov., paratype, male, 2.7 mm in CL (NFU-530-2-1876), associated with a kind of crinoid (Photo taken by J. Okuno).



Fig. 4. 1 : *Lebbeus balssi* Hayashi associated with *Dofleinia armata*. (Photo taken at Izu Ocean Park at depth of about 60 m by T. Uryu).
 2 : *Lebbeus grandimanus* (Brashnikov) associated with *Tealia asiatica*. (Photo taken off Akkeshi, Hokkaido, at depth of about 20 m by Y. Kitaguchi). The shrimp is slightly apart from the host, of which the yellow column is obscurely shown in the upper part.
 3 : *Lebbeus comanthi* sp. nov., associated with a kind of crinoid. (Photo taken at Izu Ocean Park at depth of 10 m by Y. Kobayashi).

the host of this shrimp.

Remarks:

The present species is closely related to *L. miyakei* Hayashi³⁾, in which no ecological information was given. This species was established on the male type specimen only and no subsequent material has been collected. We directly compared the present materials of *L. comanthi* with the holotype of *L. miyakei*. The following differences are present between them: The new species has the spine on the pleuron of the fourth abdominal somite, which is rounded in *L. miyakei*. The posterior margin of the telson is armed with a median spine in the new species, but unarmed in *L. miyakei*. The merus of the fifth pereopod is provided with two spines in the new species and a single spine in *L. miyakei*.

Bruce¹⁰⁾ reviewed the data on the shrimps associated with Indo-West Pacific echinoderms, and presented 12 species of the subfamily Pontoniinae, six species of Alpheidae and one species of Stenopodidae as the shrimps commensal with crinoids. No species of the family Hippolytidae, however, were known to associate with crinoids, even with echinoderms, in the Indo-West Pacific region.¹⁰⁾

A crinoid associated shrimp from the Izu Ocean Park previously reported as *Periclimenes commensalis*⁶⁾ is surely referred to the present new species.

There are three hippolytid shrimps associated with crinoids, all from the Atlantic. Nouvel¹¹⁾ reported *Hippolyte huntii* (Gosse), commensal with the crinoid *Antedon bifida* from French coast near the Roscoff Biological Station. Criales¹²⁾ presented two examples of this association from Colombian Caribbean Sea: *Thor manningi* Chace and *Nemaster grandis*, and *Thor amboinensis* (De Man) and *Comactinia echinoptera*. *L. comanthi*, therefore, is the first lebbeid associated with crinoids and also the first representative of the association between the hippolytid and the crinoid from the Pacific.

Size:

The type specimens are all males, and nearly same size. The intact specimen is selected as the holotype, about 14 mm in BL, 2.7 mm in CL, and 1.8 mm in RL. In two paratypes BL and CL are the same as the holotype, but RL is different from each other, 1.7 mm in NFU-530-2-1876 and 1.1 mm in CBM-ZC-3335.

Distribution:

Three type specimens were collected by SCUBA from the Izu Ocean Park, Sagami Bay, and Kamogawa, Boso Peninsula, at depths of 10-23 m.

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共生生活をする日本産イバラモエビ属の2種類について

林 健一・奥野淳兒

本州の太平洋側から採集された無脊椎動物と共生生活をするイバラモエビ属(*Lebbeus*)の2種について、分類学的な研究を行った。ミヤケイバラモエビ*L. miyakei* Hayashiに近縁である新種のコマチイバラモエビ(新称)*L. comanthi* sp. nov. は、この属としてはウミシダ類と共生する最初のエビであり、第4腹節や尾節の形態に、ミヤケイバラモエビとの違いがみられる。もう1種はイソギンチャク類と共生するバルスイバラモエビ*L. balssi* Hayashiで、これまで生態や色彩についてはまったく知られていなかった。形態的には北太平洋の両側でやはりイソギンチャク類との共生が知られているヤドリイバラモエビ*L. grandimanus* (Brashnikov) に似ていたが、色彩をはじめ生態も酷似していることが判明した。*L. comanthi*のくわしい記載とこれら2種の生時の生態写真やカラー写真を添えて、類縁種との比較を行った。