

Studies on the Hippolytid Shrimps from Japan-VIII

The Genus *Lebbeus* White

Ken-Ichi Hayashi

In addition to three new members, nine species of the genus *Lebbeus* from the Japanese waters are examined. All the species are described with definition and some biological data. Six other species are shown to be distributed through the northwestern Pacific Ocean. *L. balssi* n. sp. and *L. kuboii* n. sp. bear an epipod on the first two pereopods. The former is characterized by the short and slender rostrum and two pairs of dorsal spines on the telson, and the latter by a medium sized rostrum and two or three marginal spines on the first antennular segment. *L. miyakei* n. sp. is a small species, referred to the species group having an epipod on the first three pereopods. All the known species of this genus are listed and arranged with their epipodal characters. A key to 18 species from the northwestern Pacific Ocean is also presented.

Introduction

As one of the series of this study I present the revision of the genus *Lebbeus* White, 1847. Eight or nine species of this genus have been reported from the Japanese waters (Miyake, 1982). Fortunately I could examine many specimens from the collections of the Shimonoseki University of Fisheries (SUF), Zoological Laboratory, Kyushu University (ZLKU), Tokyo University of Fisheries (TUF), and other institutions. Nine known species and three new species were found from these collections. In addition to the Japanese

species I review all the species from the northwestern Pacific Ocean.

Recently Wicksten and Mendez (1982) reviewed this genus and gave a key to 14 species and one subspecies known from the eastern Pacific Ocean. Five other species were reported from the Indian Ocean, the Central and South Pacific Ocean and Antarctic Ocean. I present the list of all the known species arranged by the geographical divisions as well as the epipodal character, which is thought to be important for grouping the species, though slightly variable in some species.

水産大学校研究業績 第1389号, 1991年10月15日受付.

Contribution from Shimonoseki University of Fisheries, No. 1389. Received Oct. 15, 1991.

Laboratory of Invertebrate Fisheries and Zoology, Department of Aquaculture and Biology, Shimonoseki University of Fisheries (林 健一: 水産大学校増殖学科水産動物学講座).

Genus *Lebbeus* White, 1847

Lebbeus White, 1847, p. 135.

Hetairus Bate, 1888, pp. 577, 610.

Birulaecaris Dons, 1915, p. 26.

Hetairus: Kobjakova, 1936, p. 222.

Lebbeus: Holthuis, 1947, pp. 9, 38.

Lebbeus: Holthuis, 1955, p. 103.

Lebbeus: Holthuis, 1961, p. 322.

Definition: Rostrum usually well developed, upper and lower margins dentate. Carapace smooth with single supraorbital spine. Antennal and pterygostomial spines present. Abdomen rounded, pleura smooth or pectinate. Telson with two to seven pairs of dorsal spines. Carpus of second pereopod having seven joints. Merus of last three pereopods with a row of outer spines. Mandible consisting of an incisor process and two-jointed palp. Pleurobranchs on all pereopods, podobranchs on second maxilliped only, epipod on all maxillipeds but pereopodal epipods varying in species. Exopods and arthrobranchs absent from third maxilliped and all pereopods.

Type species: *Lebbeus orthorhynchus* White, 1847 (= *Alpheus Polaris* Sabine)

Remarks: The genus *Lebbeus* is distinguished from the genus *Spirontocaris* s.s. by having a single supraorbital spine and no exopod on the third maxilliped. Moreover every species of *Spirontocaris* examined bear a small process on the inner surface of the eyestalk (Hayashi, 1977), which is entirely smooth in the present genus. This character is small but may be constant.

Like *Spirontocaris* the present genus exhibits the sexual dimorphism. In some species, for instance in *L. polaris* (Sabine), the female bears some distinct teeth on the dorsal surface of the rostrum and carapace, but these spines disappear in large males. In the other species the chelae of the second pereopod are rather different in both sexes. The fingers of the male are much more slender, about twice as long as the palm.

According to Holthuis (1947), eight species were known from the northwestern Pacific

Ocean. During the preparation and after publication of Holthuis' Siboga report, the following new species were described chiefly from Okhotsk Sea by the Russian authors (Kobjakova, 1936, 1937 and 1967 and Zarenkov, 1960).

L. brevipes (Kobjakova, 1936), Okhotsk Sea, 335 m.

L. heterochaelus (Kobjakova, 1936), Okhotsk Sea, 182 m.

L. longidactylus (Kobjakova, 1936), Okhotsk Sea, 443-504 m.

L. longipes (Kobjakova, 1936), Okhotsk Sea, 167-1002 m and Sea of Japan, 1225-1380 m.

L. possjeticus (Kobjakova, 1967), Possjet Bay, 2.6 m.

L. spirostris (Kobjakova, 1936), Okhotsk Sea, 182 m.

L. uschakovi (Kobjakova, 1936), Okhotsk Sea, 182 m.

L. vinogradovi Zarenkov, 1960, Okhotsk Sea, 204 m.

Of these, *L. longipes* has been rather frequently collected from the Japanese side of the Sea of Japan (Hayashi, 1976). *L. brevipes* was erected chiefly on morphological differences of the chela of the second pereopod. After the re-examination of the Japanese specimens referred to *L. unalaskensis* (Rathbun) by Yokoya (1933), two males proved to show the long fingers of the second pereopod and there are no significant differences between the description of *L. brevipes* and the specimens of *L. unalaskensis* examined. Thus, the former is treated herewith as a synonym of the latter.

Makarov (1935) created a new species, *Hetairus zebra*, from the Bering Sea and Kamchatka. This name was preoccupied by the Atlantic species, described by Leim (1921). As mentioned by Butler (1964), the Pacific species is similar to the Atlantic but the length and armature of the rostrum appear sufficiently different to separate them. Kobjakova (1936 and 1937) and also Makarov (1941) gave the replacement name, *fas-*

ciata, for Makarov's *zebra*. A few years later Urita (1942) also gave another new name, *makarofi*, and moreover added an original subspecies, *makarofi speciosa*, showing apparent differences of color patterns.

In 1967 Kobjakova described the other new species, *L. possjeticus*, but compared it with neither Urita's species nor subspecies, though with her *L. fasciatus*. From the Asian side of the North Pacific both Kobjakova and Urita distinguished two different species of the *zebra* type. One is Makarov's species, which should be named *L. fasciatus* (Kobjakova). The other is probably *Lebbeus*

speciosus (Urita), which has priority over Kobjakova's *possjeticus*. The present material coincides well with this conclusion.

Three new species are found from the present material examined. Of these two species belong to the group containing the species with epipods on the first two pereopods. One is related to *L. brandti* (Brashnikov) but readily distinguished from that species by the rounded pleuron of the fourth abdominal somite and a series of spinules on the inner margin of the distal segment of the third maxilliped. Balss (1914) reported a species under the name *Spirontocaris brandti* from Sagami

Table 1 Species list of the genus *Lebbeus* arranged by the pereopodal epipods and geographical regions (Japanese species with asterisk)

Pereopodal epipod on	Northwest Pacific	Northeast Pacific	Other Oceans
First pereopod	* <i>longipes</i> (Kobjakova)	<i>vicinus vicinus</i> (Rathbun) <i>vicinus montereyensis</i> Wicksten & Mendez	—
First and Second pereopods	* <i>balssi</i> sp. nov. * <i>brandti</i> (Brashnikov) * <i>compressus</i> Holthuis * <i>grandimana</i> (Brashnikov) <i>heterochaetus</i> (Kobjakova) * <i>kuboi</i> sp. nov. <i>longidactylus</i> (Kobjakova) * <i>polaris</i> (Sabine) * <i>unalaskensis</i> (Rathbun) <i>vinogradovi</i> Zarenkov	<i>brandti</i> (Brashnikov) <i>grandimana</i> (Brashnikov) <i>polaris</i> (Sabine) <i>scrippsi</i> Wicksten & Mendez <i>splendidus</i> Wicksten & Mendez	<i>yaldwyni</i> Kensley et al. (Australia)
First to third pereopods	* <i>fasciatus</i> (Kobjakova) * <i>groenlandicus</i> (Fabricius) * <i>miyakei</i> sp. nov. <i>schrencki</i> (Brashnikov) * <i>speciosus</i> (Urita) <i>spinirostris</i> (Kobjakova) <i>uschakovi</i> (Kobjakova)	<i>catalepsis</i> Jensen <i>groenlandicus</i> (Fabricius) <i>lagunae</i> (Schmitt) <i>schrencki</i> (Brashnikov) <i>speciosus</i> (Urita) <i>washingtonianus</i> (Rathbun) <i>zebra</i> (Leim)	<i>antarcticus</i> Hale (Antarctic) <i>bidentatus</i> Zarenkov (southeast Pacific) <i>indicus</i> Holthuis (Indian Ocean) <i>microceros</i> (Kroyer) (Northwest Atlantic) <i>profundus</i> (Rathbun) (Central Pacific) <i>saldahnae</i> (Barnard) (South Africa)
First to fourth	—	—	<i>carinatus</i> Zarenkov (Southeast Pacific)

Bay, which is probably referable to the present new species. I, therefore, propose the new species as *L. balssi* sp. nov. The second new species, *L. kubo* sp. nov., is characterized by a short rostrum, reaching the end of the first segment of the antennular peduncle, which bears two or three marginal spines. *L. miyakei* sp. nov., having an epipod on the third pereopod, is closely related to the Hawaiian species, *L. profundus* (Rathbun). It is clearly distinguished from that species by four marginal spines on the first segment and a single spine on the third segment of the antennular peduncle.

From a geographical viewpoint, *Lebbeus* is chiefly recorded from the northern seas as is *Spirontocaris* s.s., but some species are obtained from the deep waters of the tropical region (Rathbun, 1906 and Holthuis, 1947). Three species were described from the southeast Pacific by Zarenkov (1976), of these, *L. curvirostris* is considered to belong to the genus *Nauticaris* (Wicksten and Mendez, 1982). Moreover three other species are reported from far south (Hale, 1941, Barnard, 1947 and Kensley et al., 1987) (Table 1).

Kobjakova (1936) gave a key to 13 species collected from the Far East Sea based upon the rostral differences. Vinogradov (1950) modified Kobjakova's key and added the short notes and distributional accounts to each species. Holthuis (1947) classified 15 species known at that time into three groups by the number of the pereopodal epipods. Although this epipodal character is slightly variable in a few species, a key to 18 species known from the Asian side of the North Pacific is presented herewith based on these works. Of these six species were reported from the American side of the North Pacific, too (Wicksten and Mendez, 1982).

Following the Russian authors, I give the teeth formula of the rostrum and postrostral carapace in each species as follows: $A+B/C+D$, where A is the teeth on the postrostral carapace, B is those on the upper margin of rostrum proper

and C is those on the lower margin of rostrum, each with range, if present. The last D is the shape of apex; 1 means sharply pointed and 2 is bifid. The abbreviations for measurement, TL, CL and RL, mean the total, carapace and rostrum lengths, respectively.

Key to the species of the genus *Lebbeus* in the Western Pacific Ocean.

- 1 Epipod on first pereopod only. Rostral teeth formula: 2-3+0-3/2-4+1
.....(8) *L. longipes* (Kobjakova, 1936)
- 1 Epipod present on at least first two pereopods 2
- 2 Epipod on first two pereopods only, except for *L. polaris* and *L. kubo*, in which a normal or rudimental epipod rarely present on both or either third pereopods 3
- 2 Epipod present on first three pereopods ... 12
- 3 Pleuron of fourth abdominal somite rounded. Distal segment of third maxilliped with a series of spinules on inner margin (uncertain in *L. longidactylus*) 4
- 3 Pleuron of fourth somite pointed posteriorly. Distal segment of third maxilliped unarmed except for some apical spinules (uncertain in *L. heterochaelus* and *L. vinogradovi*) 7
- 4 Rostrum very short, not extending to end of eye. Carapace extremely high, with large flattened teeth. Third abdominal somite carinate dorsally. First segment of antennular peduncle without marginal spine. Rostral teeth formula: 4-6+0/0-1+1
..... (3) *L. compressus* Holthuis, 1947
- 4 Rostrum overreaching eye. Carapace without high keel. Third abdominal somite not distinctly carinate. First segment of antennular peduncle with marginal spine 5
- 5 Rostrum longer than carapace, reaching beyond antennal scale. Dactyli of last three pereopods slender and long, about one-third length of propodus. Chela of first pereopod less than half as long as carapace. Rostral

- teeth formula: 2+5-6/3+1
*L. longidactylus* (Kobjakova, 1936)
- 5 Rostrum shorter than carapace, not reaching end of antennal scale. Dactyli of last three pereopods short, about one-fourth length of propodus. Chela of first pereopod more than half as long as carapace 6
- 6 Rostrum slender, not broadened on lower margin near apex. Telson with two pairs of small spines on dorsal surface, and with four spines and four setae on posterior margin of telson. Rostral teeth formula: 2+2-3/1+1 (1) *L. balsi* sp. nov.
- 6 Lower margin of rostrum broadened near apex. Telson with three or four pairs of rather large spines on dorsal surface, and with seven to nine setae, in addition to four spines, on posterior margin. Rostral teeth formula: 2-4+1-3/1-4+1
 (5) *L. grandimana* (Brashnikov, 1907)
- 7 Rostrum not reaching end of antennular peduncle. First segment of antennular peduncle with two or three marginal spines. Stylocerite falling short of end of first segment of antennular peduncle. Rostral teeth formula: 1-4+2-3/3-5+1
 (7) *L. kuboii* sp. nov.
- 7 Rostrum reaching at least end of antennular peduncle. First segment of antennular peduncle with single marginal spine. Stylocerite reaching at least end of first segment of antennular peduncle 8
- 8 Rostrum reaching end of antennular peduncle but falling far short of end of antennal scale. First segment of antennular peduncle with stout, erect marginal spine. Supraorbital spine well developed. Rostral teeth formula: 3-4+2-3/2-3+1
 (2) *L. brandti* (Brashnikov, 1907)
- 8 Rostrum overreaching antennular peduncle and reaching almost to or beyond end of antennal scale. First segment of antennular peduncle with small marginal spine. Supraorbital spine moderate 9
- 9 Rostrum longer than carapace and reaching beyond antennal scale. In large males rostral and carapacial teeth not disappearing with age. Fingers of chelae of second pereopods twice as long as palm. Rostral teeth formula: 1-3+2-3/3-9+1-2
 (12) *L. unalaskensis* (Rathbun, 1902)
- 9 Rostrum as long as carapace and extending to end of antennal scale. In large males rostral and carapacial teeth disappearing with age (uncertain in *L. vinogradovi*) 10
- 10 Rostrum with teeth on almost entire dorsal margin. Rostral teeth formula: 4-5+11-12/6+1 *L. vinogradovi* Zarenkov, 1960
- 10 Distal third or more of upper margin of rostrum unarmed 11
- 11 Each carpus of last three pereopods with few outer spines. Endopod of uropod with row of small spines on dorsal surface. Fingers of chela of second pereopod twice as long as palm in large male. Rostral teeth formula, male 0+0/2-5+1, female 2-3+2-3/2-5+1
 *L. heterochaelus* (Kobjakova, 1963)
- 11 Each carpus of last three pereopods without outer spines. Endopod of uropod without spines. In large male chela of second pereopod normal and similar to those of female. Rostral teeth formula, male 0-3+0-5/3-7+1, female 2-3+1-6/3-9+1
 (10) *L. polaris* (Sabine, 1821)
- 12 Abdominal pleura with two to four spines. Rostral teeth formula: 4-5+0-4/1-5+1
 (6) *L. groenlandicus* (Fabricius, 1775)
- 12 First three abdominal pleura rounded 13
- 13 Rostrum reaching just to end of or beyond second segment of antennular peduncle 14
- 13 Rostrum short, not reaching end of second segment of antennular peduncle 16
- 14 Rostrum slender, short, and directed slightly downward, reaching end of second segment of antennular peduncle. Rostral teeth formula:

- la: 2+5-7/2-5+1
 (4) *L. fasciatus* (Kobjakova, 1936)
- 14 Rostrum straight or directed slightly upward, reaching end of or beyond antennular peduncle 15
- 15 Third pereopod long, reaching beyond antennal scale by entire propodus and dactylus. Telson twice as long as sixth abdominal somite. Rostral teeth formula: 3+6/3-4+1
 *L. uschakovi* (Kobjakova, 1936)
- 15 Third pereopod reaching beyond antennal scale by less than half length of propodus. Telson 1.5 times as long as sixth somite. Rostral teeth formula: 2+5-7/2-4+1
 (11) *L. speciosus* (Urita, 1942)
- 16 Fourth abdominal pleura rounded. Rostral teeth formula: 1+1/1+1
 (9) *L. miyakei* sp. nov.
- 16 Fourth abdominal pleura pointed posteriorly. 17
- 17 First segment of antennular peduncle with single marginal spine as on second and third segments. Rostral teeth formula: 4+0-1/1+1
 *L. spinirostris* (Kobjakova, 1963)
- 17 First segment of antennular peduncle with two or more marginal spines. Rostral teeth formula: 2-3+2-4/1-2+1
 *L. schrencki* (Brashnikov, 1907)

Description of species

(1) *Lebbeus balssi* sp. nov.

(Figs. 1-3)

Spirontocaris brandti: Balss, 1914, p. 45, fig. 26
 (not *Hetairus brandti* Brashnikov).

Material examined:

East China Sea, 33° 59.4'N, 128° 48.0'E, dredge, 102 m deep, Jun. 19, 1964, 06:17, H. Yamashita leg. — 1 ♀ (holotype, ZLKU), 1 ♂ (allotype, ZLKU), 1 ♀ (paratype, ZLKU).

Toyama Bay, 30-50 m deep, small Danish seine, Feb. 21, 1976, N. Horii leg. — 1 ♀

(paratype, SUF).

Definition: Small species. Rostral formula 2+2-3/1+1. Carapace carinate on anterior half of middorsal line. Supraorbital spine small, without notch on ventral side. Antennal spine developed. Pterygostomial spine small. Pleura of first four somites rounded. Those of fifth and sixth somites pointed. Telson with two pairs of dorsal spines. Antennular peduncle with marginal spine on each segment. Third maxilliped with 10-20 spinules in mesial margin of distal segment. Epipod on first two pereopods.

Description: Carapace smooth with small supraorbital spine, well developed antennal spine and very small pterygostomial spine. Suborbital angle obtusely angular. Rostrum slender, with four or five spines on dorsal margin. Of these, posterior two on carapace. Single small spine on lower margin near apex.

Abdomen smooth dorsally. Third somite produced mesioposteriorly over fourth somite. Pleura of first four somites rounded, those of fifth and sixth somites pointed posteriorly. Telson about 1.6 times as long as sixth somite with two small spines on distal third of dorsal surface. Apex with two pairs of spines, outer small, inner long and robust, some small setae present between inner pair.

Eyes small, cylindrical, with distinct ocellus. Antennular peduncle long, produced as far forward as tip of rostrum. Basal segment longer than distal two segments combined, with small marginal spine. Stylocerite rather broad, reaching nearly end of second segment of antennular peduncle. Second and third segments subequal in length, each with single marginal spine. Outer antennular flagellum swollen and setose in basal 20 joints. Antennal scale about 2.5-2.6 times as long as broad, lamellar part obliquely truncate distally, far overreaching outer spine. Basicerite with two outer processes, upper obtusely, lower acutely pointed, carpocerite reaching end of second segment of antennular peduncle.

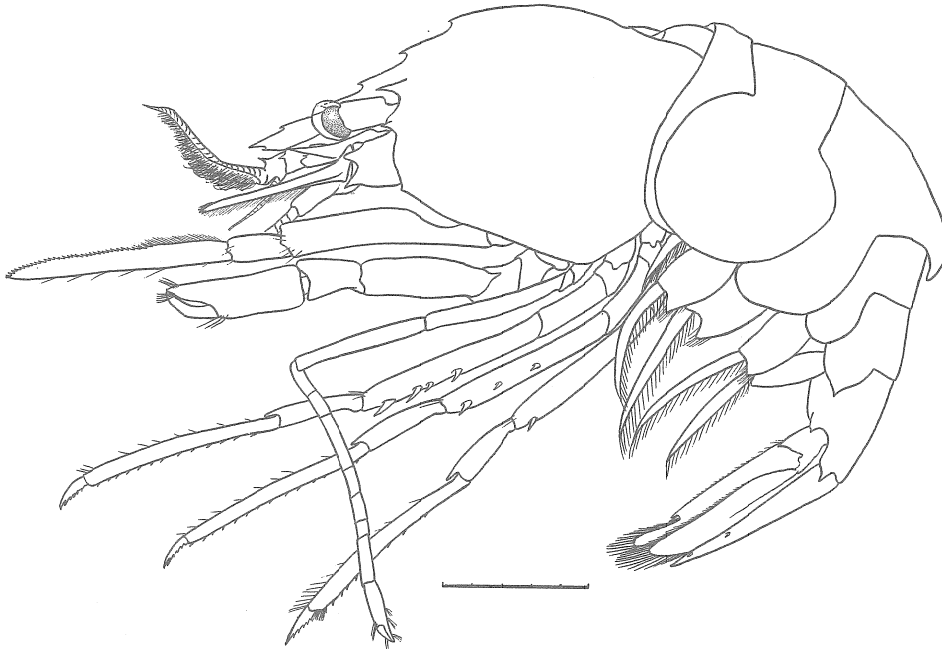


Fig. 1. *Lebbeus balssi* sp. nov. Holotype, female from East China Sea. Scale 5.0mm.

Mouth-parts typical for genus. Endopod of first maxilliped tapered. Third maxilliped well developed, reaching beyond antennal scale by distal four-fifths of distal segment; small epipod present; basal segment stout, with very small spine on outer distal end; second segment short, about one-fourth of basal segment; distal segment as long as basal segment, bearing 13-21 dark-colored spinules on distal three-fourths of mesial margin, three or four similar spinules on apex.

First pereopod reaching just or slightly beyond antennal scale; merus stout, about 2.3 times as long as carpus; chela 2.9 times as long as carpus; palm 1.6 times as long as fingers. Second pereopod slender, reaching beyond antennal scale by chela and distal two or four joints of carpus; ischium and merus subequal in length; carpus 1.6 times as long as merus, subdivided into seven joints; chela as long as distal two

joints of carpus; palm about twice as long as fingers. First two pereopods with epipods. Third pereopod reaching beyond antennal scale by dactylus and distal half of propodus; merus 2.2 times as long as carpus with two to four spines on distal half of outer surface; propodus as long as merus with 16 spinules on posterior margin; dactylus short, about one-fourth length of propodus with six spinules on posterior margin. Fourth pereopod reaching beyond antennal scale by dactylus and distal third of propodus; merus more than twice as long as carpus, with two or three outer spines on distal half. Fifth pereopod reaching tip of antennal scale; merus 1.9 times as long as carpus, with one to three outer spines. Propodi and dactyli of fourth and fifth pereopods similar to those of third pereopod.

Endopod of first pleopod in male as long as exopod, distal fourth slender with a few retinacu-

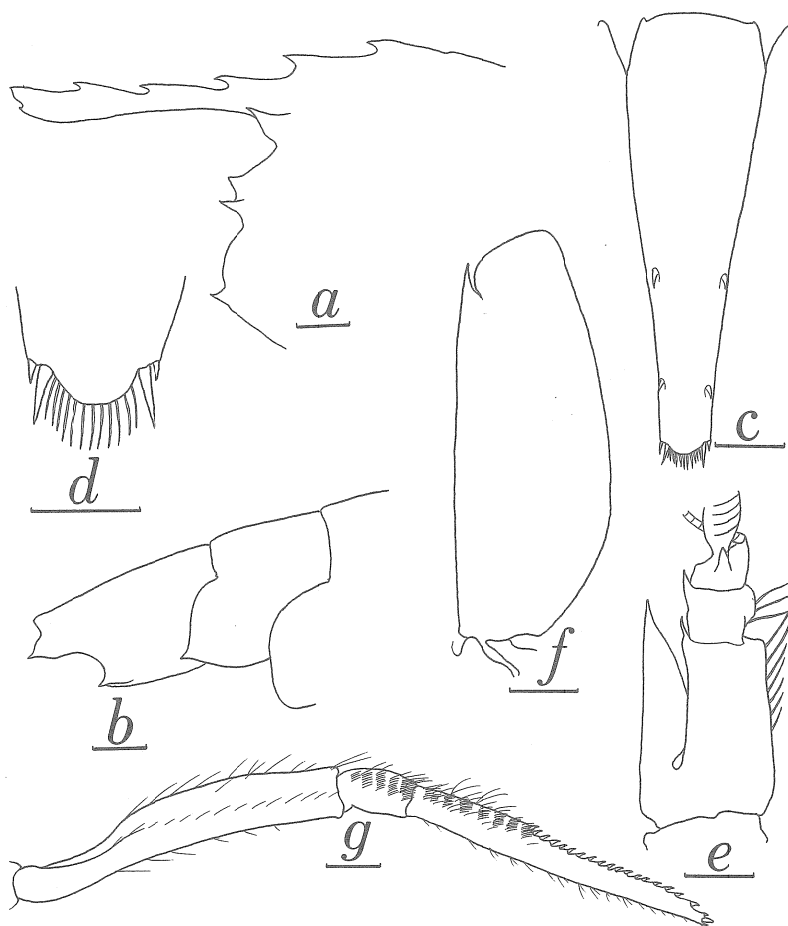


Fig. 2. *Lebbeus balssi* sp. nov. Paratypes, a, female from Toyama Bay, b-g, female from East China Sea.

a, rostrum and anterior part of carapace; b, fourth to sixth abdominal somites; c, telson; d, posterior margin of telson; e, antennular peduncle; f, antennal scale; g, third maxilliped. Scale for a-c, e-f, 1.0mm; scale for d, 0.5mm.

1a. First pleopod in female with slender exopod and broad endopod, without appendix interna or retinacula. Endopod of second pleopod in male with appendix masculina about half as long as appendix interna. Second to fifth pleopods in female biramous with small appendix interna on endopod. Uropod longer than telson, protopod ending in two bluntly pointed processes; outer margin of exopod straight, with two terminal spines, outer small, fixed, inner long, movable. Last tho-

racic sternum with pair of spines, longer in male than in female. Pair of spines on first two abdominal sterna, single spine on last four terga in both sexes.

Size: The holotype is 8.2 mm in CL, 5.1 mm in RL, the allotype is 3.6 mm in CL, 2.0 mm in RL, and the paratypes are 7.4 and 8.1 mm in CL.

Remarks: The present new species belongs to a group having epipods on the first two pereopods, and differs from all the species of this

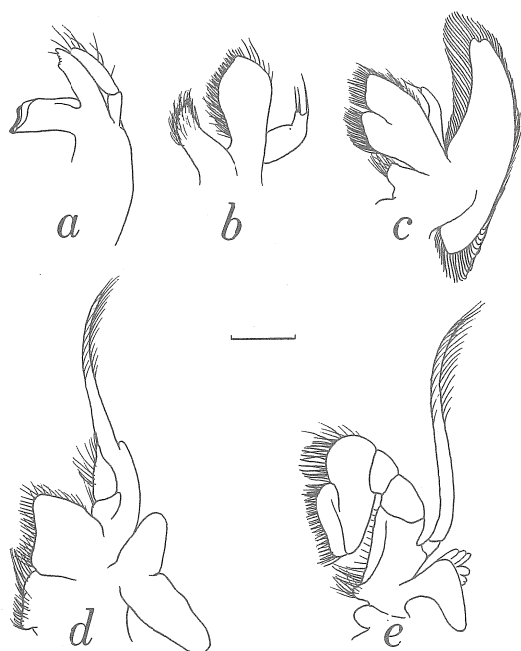


Fig. 3. *Lebbeus balssi* sp. nov. Paratype, female from East China Sea.
a, mandible; b, maxillule; c, maxilla; d, first maxilliped; e, second maxilliped. Scale 1.0mm.

group, except for four species by having the pleuron of the fourth abdominal somite rounded and a series of spinules on the mesial margin of the distal segment of the third maxilliped. Four exceptions are *L. grandimana* (Brashnikov), *L. longidactylus* (Kobjakova), *L. compressus* Holthuis, and *L. yaldwyni* Kensley, Tranter and Griffin, which have these characters like the new species.

L. balssi differs from *L. grandimana* by the following characters.

1) In *L. grandimana* there are two or four teeth on the carapace and one or three teeth on posterior part of the upper margin of the rostrum, while in *L. balssi* two teeth on the carapace and two or three teeth scattered equidistantly on all the upper margin of the rostrum.

2) There are two pairs of small spines on the dorsal surface of the telson in *L. balssi*. Three

or four pairs of spines are present on the dorso-lateral margin of *L. grandimana*. The spines on the posterior margin of the telson are four in the new species and seven to nine in *L. grandimana*.

As for the second species, *L. longidactylus*, the spinules on the mesial margin of distal segment of the third maxilliped were not mentioned in the original and the subsequent descriptions (Kobjakova, 1936, 1937 and Vinogradov, 1950), but is easily distinguished from the new species by the long rostrum, reaching beyond the antennal scale and by the small chela of the first pereopod.

The new species is easily distinguished from *L. compressus* and *L. yaldwyni* by having 1) the slender rostrum and low carina of the carapace, 2) smooth third abdominal somite and 3) one or two spines on each merus of the last three pereopods. Furthermore, *L. yaldwyni* has been only known from Australian waters.

Many specimens from Sagami Bay, which were referred to *Spirontocaris brandti* by Balss (1914) are very probably identical with the present species. The new species is easily distinguished from the true *L. brandti* by the following characters as well as the presence of the mesial spinules on distal segment of third maxilliped.

1) The spines on the middorsal carina of the carapace and rostrum and three spines on the anterior margin of the carapace are much stouter and larger in *L. brandti* than in *L. balssi*.

2) As mentioned above, the first four abdominal pleura are rounded in both sexes of *L. balssi*, while in females of *L. brandti* the first three pleura only are rounded, and in male all the pleura except for the second are pointed.

3) The spine on the first segment of the antennular peduncle is much larger in *L. brandti* than in *L. balssi*.

Distribution: The present materials were obtained from Toyama Bay and East China Sea at the depths of 40-102 m. Balss (1914) reported this species from the Sagami Bay, at a depth of

120 m.

(2) *Lebbeus brandti* (Brashnikov, 1907)

Hetairus brandti Brashnikov, 1907, p. 157, fig. 20.

Hetairus brandti: Derjugin and Kobjakova, 1935, pp. 112, 142.

Hetairus brandti: Kobjakova, 1936, p. 222.

Hetairus brandti: Kobjakova, 1937, p. 109.

Spirontocaris brandti: Urita, 1942, p. 16, fig. 2.

Lebbeus brandtii: Holthuis, 1947, p. 9.

Lebbeus brandti: Vinogradov, 1950, p. 203, fig. 52.

Hetairus brandti: Kobjakova, 1958, p. 228.

Lebbeus brandti: Wicksten and Mendez, 1982, pp. 117, 119.

Material examined:

Northwest Pacific, off Kushiro, Hokkaido, 200–250 m deep, Sep. 21, 1957, T. Sakamoto leg. — 1 ♀ (ZLKU No. 2416).

Locality uncertain, Jun. 20, 1965, H. Ikegami leg. — 1 ♀ (TUF).

Definition: Body small. Rostral formula 3-4+2-3/2-3+1. Carapace carinate on almost all mid-dorsal line. Supraorbital spine well-developed, without notch on ventral side. Antennal spine and pterygostomial spine developed. Third abdominal somite produced posteriorly. In female, pleura of first three somites rounded, in male only second pleuron rounded. Remaining pleura acutely pointed in both sexes. Telson with five or six pairs of dorsal spines. Antennular peduncle with a marginal spine on each segment. Third maxilliped without spinules on mesial margin of distal segment. Epipod on first two pereopods.

Color: Urita (1942) gave a detailed description and a fine figure of the color pattern of this species. "Lateral face of carapace ornamented with three oblique brown bands, pleura of each abdominal segment with one or more bands; flagellum, outer maxilliped, and legs banded with brown and white rings. Five blue spots scattered on posterior margin of carapace, about ten on its

lateral face, two on dorsal of first segment and one on lateral face of third segment of abdomen."

Size: The syntypes (1 ♂, 2 ♀) vary between 6.1 and 10.0 mm in CL, 4.7 and 7.8 mm in RL (Brashnikov, 1907). Urita's female from Sakhalin is rather larger than the syntypes, 12.5 mm in CL, 7.5 mm in RL. The present two specimens are 12.5 and 7.5 mm in CL, 8.0 and 5.7 mm in RL.

Remarks: The present specimens coincide very well with the original (Brashnikov, 1907) and the subsequent descriptions (Kobjakova, 1937 and Urita, 1942).

As mentioned above, Balss' (1914) *Spirontocaris brandti* is not referred to that species, but is probably identical with the specimens from Toyama Bay and the East China Sea, which have not been adequately treated. Thus, I describe them as a new species, *L. balssi* sp. nov. The differences between *L. brandti* and *L. balssi* are given under the account for the new species.

Distribution: Near Cape Terpeniya, Okhotsk Sea, depth 12.6 m (Brashnikov, 1907); Aniwa Bay, Sakhalin, depth about 10 fms. (Urita, 1942); southeast of Sakhalin, depth about 10 fms (Urita, 1942); Shikotan Island, Zelenogo Island, Kurile Islands, depth 6–52 m (Kobjakova, 1958); Gulf of Peter the Great, depth 10–55 m (Kobjakova, 1937).

Northwest Pacific, Wilson Bay, Alaska, 172 m (Wicksten and Mendez, 1982).

Kobjakova (1937) recorded it from the littoral weed belts, such as *Laminaria* and *Zostera*.

(3) *Lebbeus compressus* Holthuis, 1947

Spirontocaris gibberosa Yokoya, 1933, p. 24, fig. 8. (not *Spirontocaris gibberosa*: Balss, 1914 = *Saron marmoratus* (Olivier)).

Lebbeus compressus: Holthuis, 1947, pp. 9, 40.

Lebbeus compressus: Miyake, 1982, p. 53, pl. 18, fig. 4.

Lebbeus compressus: Hayashi, 1986, pp. 111, 264, fig. 68.

Lebbeus compressus: Kensley, Tranter and Griffin, 1987, p. 309, fig. 15 c, d.

Material examined:

Northwest Pacific off northern Japan, Soyo Maru Stn. 26, northeast of Siwoya-Zaki, Fukushima Prefecture, 232 m deep, Jul. 2, 1926, Soyo Maru — 1 ♂ (holotype of *Spirontocaris gibberosa* Yokoya, Soyo Maru Collection).

Northwest Pacific off southwestern Japan, Tosa Bay, Kochi Prefecture, Nov. 19, 1955, S. Nakayama leg. — 1 ovig. ♀ (ZLKU No. 1135); Feb. 29, 1960, K. Sakai leg. — 1 ♂, 1 ovig. ♀, 1 ♀ (ZLKU No. 2030); Jan. 10, 1961, K. Sakai leg. — 1 ♀ (ZLKU); 400 m deep, May 7, 1985, M. Toriyama leg. — 1 ♀ (SUF No. 503-2-1124).

Definition: Body small. Rostral formula 4-6+0/0-1+1. Carapace highly keeled in middorsal line, with 4-6 large teeth. Rostrum short, usually unarmed. Supraorbital spine developed, without notch on ventral side. Antennal spine well separated from suborbital angle. Pterygostomial spine small. Third abdominal somite carinated dorsally. Pleura of first four somites rounded. That of fifth somite bluntly pointed. Telson with three pairs of dorsal spines. Antennular peduncle with marginal spine on second and third segments. Third maxilliped with eight to ten spinules in mesial margin of distal segment. Epipod on first two pereopods.

Color: According to Miyake (1982) and Hayashi (1986), who presented a beautiful color figure of the ovigerous female, carapace with many curved lateral scarlet stripes or uniformly scarlet in ventral half, which change to small dots near the dorsal region of carapace and on carapacial teeth. Abdomen uniformly pink or red, tail fan semitransparent. Bases of antennae, third maxilliped and pereopods with red dots or red tint.

Size: The two ovigerous females are 8.5 and 9.2 mm in CL, 2.9 and 3.4 mm in RL, respectively. A single male is 5.7 mm in CL, 3.0 mm in RL. The largest specimen is a non-ovigerous female,

9.5 mm in CL. The holotype is much shriveled, and could not be exactly measured, but showing about similar size as the male examined. Eggs comparatively large, 1.9 × 2.8 mm in diameter.

Remarks: Fortunately I could examine the holotype of this highly peculiar shrimp, described by Yokoya (1933) under the name *Spirontocaris gibberosa*. The following important characters were overlooked and mistaken in the original description, as partly mentioned by Kensley et al. (1987).

1) Although Yokoya described the type as probably female, it has a small appendix masculina on the endopod of the second pleopod.

2) The anterior margin of the carapace is provided with three spines rather than two spines, supraorbital, antennal and very small pterygostomial spines. The pterygostomial angle is obviously pointed as a spiniform process in the female, but feebly pointed in the male.

3) Yokoya described "rostrum broken off", but the species has a very short rostrum, just like one of the teeth on the middorsal crest of the carapace. The holotype has four strong teeth on the middorsal crest of the carapace, rather than five teeth in the original description, of which, therefore, the anterior tooth is the rostrum proper.

L. compressus is distinguished from the closely related *L. yalduyni* Kensley, Tranter and Griffin, recently reported from the Australian waters, by the following characters.

1) The teeth on the carapace are small and more numerous in the Australian species than in the Japanese species.

2) Spinules on the mesial margin of distal segment of the third maxilliped are 19-20 in the Australian species and 8-10 in the Japanese species.

3) The color patterns also differ. Curved lateral scarlet stripes are four to six on the carapace and five or six similar stripes on the anterior abdominal somites in the Australian species,

while, in the Japanese species lateral scarlet stripes are narrow and numerous, or sometimes fused with each other, and abdomen without stripes, though uniformly red or pink.

Distribution: Siwoya-zaki, depth 232 m (Yokoya, 1933). Off Kamaishi, Iwate Prefecture, depth 290 m (Miyake, 1982). Tosa Bay, 420–450 m (Hayashi, 1986, Kensley et al., 1987). The species is rather common but not numerous in the catches of the deep-sea Danish seine fisheries operating on the continental shelf of the Pacific coast of central and southern Japan. There are no records of this species from the Sea of Japan.

(4) *Lebbeus fasciatus* (Kobjakova, 1936)

(Figs. 4 and 5)

Hetairus zebra Makarov, 1935, p. 319, fig. 1 (not *Spirontocaris zebra* Leim).

Hetairus fasciata Kobjakova, 1936, p. 222, fig. 17.

Hetairus fasciata: Kobjakova, 1937, p. 116.

Hetairus fasciata: Makarov, 1941, p. 123.

Spirontocaris makarofi: Urita, 1942, p. 18, fig. 3.

Lebbeus zebra: Holthuis, 1947, pp. 10, 40.

Lebbeus fasciata: Vinogradov, 1950, p. 204, fig. 49.

Hetairus fasciata: Kobjakova, 1958, p. 228.

Lebbeus fasciatus: Miyake, 1982, p. 53, pl. 18, fig. 1.

Material examined:

Northwest Pacific, off Hokkaido, Akkeshi Bay, brackish water, dredge, 3–4 m deep, Jun. 15, 1981, Akkeshi Marine Biological Laboratory, Hokkaido University, T. Imaoka leg. — 1 ♂ (SUF).

Definition: Small species. Rostral formula 2+5–7/2–5+1. Carapace not carinate on middorsal line. Supraorbital spine large, with notch on ventral side. Antennal spine well developed. Pterygostomial spine small. Pleura of first three somites rounded. Those of fourth to sixth somites pointed. Telson with four pairs of dorsal spines.

Antennular peduncle with three marginal spines on first segment, and a single spine on second and third segments. Third maxilliped without spinules on mesial margin of distal segment. Epi-pod on first three pereopods.

Color: According to Miyake (1982), carapace with four or five brown bands, obliquely transverse. Abdomen with three broad transverse bands on anterior three somites, and posterior three somites and telson uniformly light brown without bands. Pereopods with three or four similar bands on basis to end of merus.

Size: The present material is male, 4.9 mm in CL and 4.0 mm in RL.

Remarks: Makarov (1935) described extensively his new species, *Hetairus zebra*, which name was unfortunately preoccupied by Leim (1921). The new name *H. fasciata* was given by Kobjakova (1936 and 1937, Makarov, 1941). As already mentioned by Butler (1964), Makarov's species is similar to Leim's, but the length and armature of the rostrum appear sufficiently different to separate them. Urita (1942) also gave another new name, *Spirontocaris makarofi*, for this Makarov's species and added his original variety, *S. makarofi speciosa*.

Although Kobjakova (1936) gave the new name, she defined *L. fasciatus* as having an epi-pod on the first two pereopods, in spite of its presence on the first three pereopods. Since then, Kobjakova (1937 and 1958) and Vinogradov (1950) treated the specimens under that name, but detailed descriptions of the species have not appeared.

On the other hand, Urita's new name was in turn preoccupied by *Spirontocaris* s.s. *makarovi* Kobjakova (1936). Urita's species and the variety, *speciosa*, were finely figured, though with a short description. The variety bears a longer third pereopod, and a different color pattern, which prove it to be a distinct species, *L. speciosus*, described later. Thus, the typical species of the so-called "zebra-type" collected from the

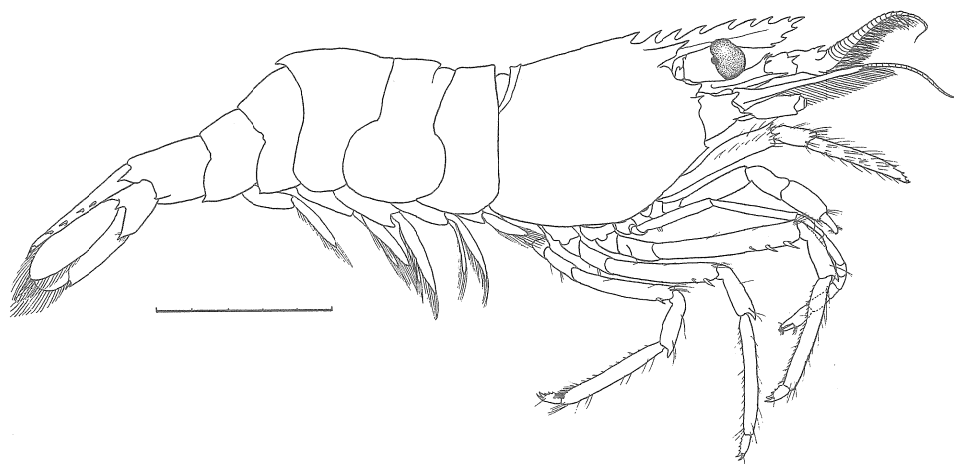


Fig. 4. *Lebbeus fasciatus* (Kobjakova, 1936). Male from Akkeshi Bay. Scale 5.0mm.

Northwest Pacific should be called *L. fasciatus*.

The present species shares the following characters with *L. uschakovi* (Kobjakova), *L. schrencki* (Brashnikov) and *L. speciosus* (Urita): small size, epipod on the first three pereopods and 3-4 marginal spines on the first segment of the antennular peduncle. Of these *L. schrencki* has the shortest rostrum, reaching only the distal margin of the first segment of the antennular peduncle, while in the other species the rostrum reaches at least the distal margin of the second segment of the antennular peduncle. *Lebbeus uschakovi* was collected from rather deep waters and the rostral teeth are continuous with the carapacial teeth without interval or interruption. The remaining two species, *L. fasciatus* and *L. speciosus* are identical with Urita's *S. makarofi* and its variety, *speciosa*, respectively. Both are littoral species and a short interval between the rostral and the carapacial teeth is visible in figures of both forms (Urita, 1942). As mentioned above and already shown by Urita (1942), they are distinguished from each other by the length of the third maxilliped and color pattern, as well

as the comparative length of the rostrum, which is rather longer in *L. speciosus* than in *L. fasciatus*.

Distribution: Littoral species; Bering Sea, depth 30-32 m (Makarov, 1935 and 1941); Sakhalin, depth 4-32 m (Urita, 1942), Akkeshi Lake, Hokkaido, depth 3-4 m (Miyake, 1982).

(5) *Lebbeus grandimana* (Brashnikov, 1907)

Hetairus grandimana Brashnikov, 1907, p. 152, fig. 18.

Hetairus grandimana: Derjugin and Kobjakova, 1935, pp. 112, 142.

Hetairus grandimana: Kobjakova, 1936, p. 222.

Hetairus grandimana: Kobjakova, 1937, p. 108.

Hetairus grandimana: Makarov, 1941, p. 123, figs. 7 and 8.

Spirontocaris grandimana Urita, 1942, p. 20.

Lebbeus grandimanus: Holthuis, 1947, p. 9.

Lebbeus grandimana: Vinogradov, 1950, p. 205, pl. 13, fig. 48.

Hetairus grandimana: Kobjakova, 1958, p. 228.

Lebbeus polaris: Butler, 1964, p. 419 (not *Alpheus polaris* Sabine).

Lebbeus grandimanus: Butler, 1980, p. 178, figs.

Lebbeus grandimanus: Wicksten and Mendez, 1982, pp. 117, 118.

Lebbeus grandimanus: Hayashi, 1983, fig. on cover.

Material examined:

Northwest Pacific, off Shumshu Island, Kurile Islands, Aug. 21, 1936 — 1 ♂ (TUF).

Central Sea of Japan, Toyama Bay, off Hayatsukigawa, 200–250 m deep, N. Horii leg. — 1 ♀ (SUF).

Northeast Pacific, Whytecliffe Park, British Columbia, Canada, November 17, 1972, 30 ft. deep, night dive, T. H. Butler leg. — 1 ♀ (SUF).

Definition: Body of moderate size. Rostral formula 2-4+1-3/1-4+1. Carapace not carinate on middorsal line. Supraorbital spine well developed, without notch on ventral side. Antennal and pterygostomial spine well developed. Pleura of first four somites rounded. Those of fifth and sixth somites pointed. Telson with three pairs of dorsal spines. Antennular peduncle with a marginal spine on each segment. Third maxilliped with eight spinules on mesial margin of distal segment. Epipod on first two pereopods.

Color: Butler (1964 and 1980) presented the description of live color pattern with a beautiful color photograph, and mentioned that "if one examines his species when freshly caught, there is no doubt about its identity, as it is the most colorful shrimp known in local waters".

Size: The male examined is rather smaller than the syntype, 4.7 mm in CL and 4.2 mm in RL, and the female is 9.2 mm in CL and 6.4 mm in RL. The largest female of Brashnikov's syntypes is an ovigerous female, 9.5 mm in CL and 6.4 mm in RL and the male is 5.8 mm in CL and 5.0 mm in RL.

Remarks: The present specimens agree well with Brashnikov's (1907) original and Butler's (1980) subsequent descriptions of this species, except for the presence of only two teeth on the dorsal crest of the carapace, which is thought to

be an individual variation of the Japanese specimens.

Distribution: Kamchatka, Okhotsk Sea, Sea of Japan, depth 16–100 m (Brashnikov, 1907); Sea of Japan, Gulf of Peter the Great, depth 15–84 m (Kobjakova, 1937); Okhotsk Sea, depth 165 m (Kobjakova, 1937); Shikotan Island, Bering Sea (Makarov, 1941); South-Kurile Strait, Kurile Islands, depth 30–72 m (Kobjakova, 1958); Toyama Bay, depth 200–250 m (Hayashi, 1983).

Northeast Pacific Ocean, Pacific coast of Canada (Butler, 1964 and 1980); Puget Sound, Washington (Wicksten and Mendez, 1982).

In the Northwest Pacific, this species was observed to associate with the sea anemones, *Cribrinopsis fernaldi*, *Tealia crassicornis* and *T. piscivora* (Butler, 1980).

(6) *Lebbeus groenlandicus* (Fabricius, 1775)

Restricted synonymy

- Astacus Groenlandicus* Fabricius, 1775, p. 416.
Spirontocaris groenlandica: Rathbun, 1904, p. 61 (synonymy).
Hetairus groenlandica: Brashnikov, 1907, p. 155, fig. 19.
Hetairus groenlandica: Balss, 1914, p. 45.
Spirontocaris groenlandica: Yokoya, 1933, p. 24.
Hetairus groenlandica: Derjugin and Kobjakova, 1935, pp. 112, 142.
Hetairus groenlandica: Kobjakova, 1936, p. 222.
Hetairus groenlandica: Kobjakova, 1937, p. 108.
Hetairus groenlandica: Makarov, 1941, p. 121.
Spirontocaris groenlandica: Urita, 1942, p. 16.
Lebbeus groenlandicus: Holthuis, 1947, p. 9 (synonymy).
Lebbeus groenlandica: Vinogradov, 1950, p. 203, pl. 14, fig. 53.
Lebbeus groenlandicus: Squires, 1957, p. 472.
Hetairus groenlandica: Kobjakova, 1958, p. 227.
Lebbeus groenlandicus: Pike and Williamson, 1961, p. 194.
Lebbeus groenlandicus: Squires, 1962, p. 682, fig. 3.

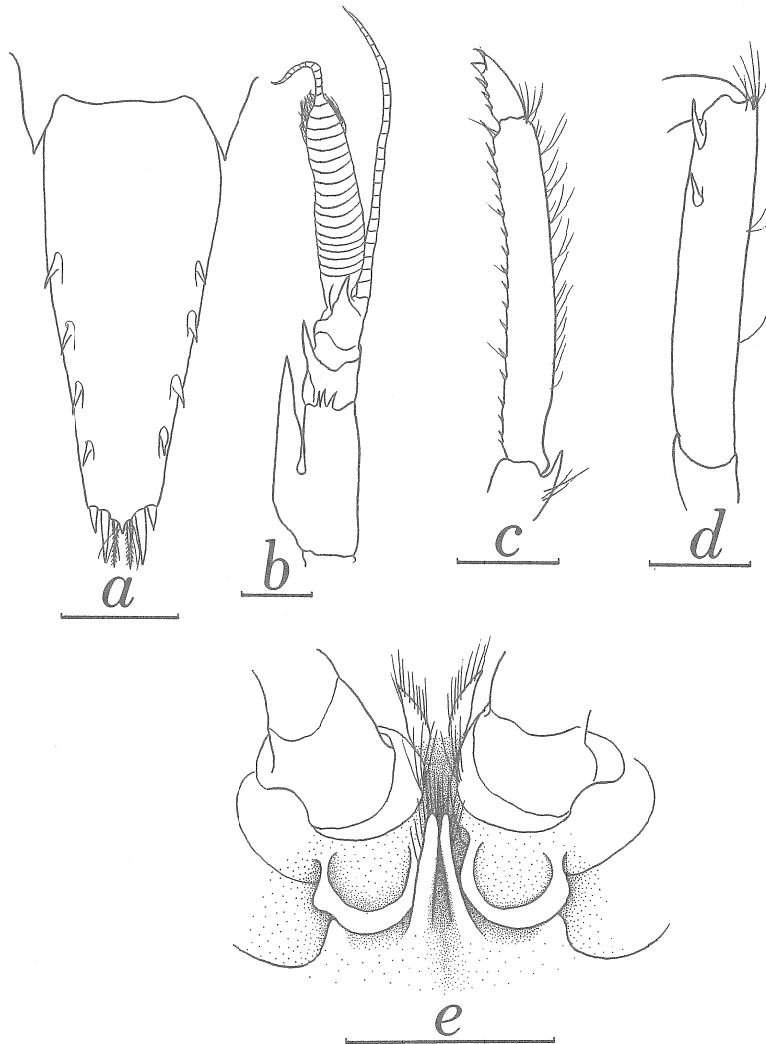


Fig. 5. *Lebbeus fasciatus* (Kobjakova, 1936). Male from Akkeshi Bay. a, telson; b, antennular peduncle; c, dactylus of third pereopod; d, merus of fourth pereopod; e, last thoracic sternite. Scales 1.0mm.

Lebbeus groenlandicus: Miyake, Sakai, and Nishikawa, 1962, p. 123.

Lebbeus groenlandicus: Squires, 1965, p. 46, fig. 14.

Lebbeus groenlandicus: Squires, 1968, p. 356.

Lebbeus groenlandicus: Squires, 1969, p. 1909, fig. 5.

Lebbeus groenlandica: Igarashi, 1969, p. 5, pl. 5, fig. 15.

Lebbeus gloenlandicus: Motoh, 1972, pp. 31, 42, pl. 9, figs. 1, 2.

Lebbeus groenlandicus: Hayashi, 1976, p. 17.

Lebbeus groenlandicus: Kim, 1977, p. 274, pl. 25, 26, fig. 53a-c, textfigs. 113, 116.

Lebbeus groenlandicus: Williams and Wigley, 1977, p. 7.

Lebbeus groenlandicus: Butler, 1980, p. 181, fig.

Lebbeus groenlandicus: Miyake, 1982, p. 53, pl. 18, fig. 3.

Lebbeus groenlandicus: Wicksten and Mendez, 1982, p. 119.

Material examined:

Sea of Okhotsk, 58°08'N, 156°50'E, 90 m deep, Aug. 1, 1959, dredge, Hokuho-maru, — 1 ovig. ♀ (ZLKU No. 11105); off Abashiri, Hokkaido, 170–240 m deep, Jul. 29, 1957, small Danish seine, M. Yamamoto leg. — 1 ♀ (ZLKU No. 2406).

Northwest Pacific, off Kushiro, 180–200 m deep, Jun. 8, 1957, small Danish seine, T. Sakamoto leg. — 1 ♂, 1 ovig. ♀ (ZLKU No. 2402); Aug. 1957, collector uncertain — 1 ovig. ♀ (ZLKU No. 2435); Aug. 1957, collector uncertain — 2 ovig. ♀ (ZLKU No. 2436).

Northern Sea of Japan, off Nishi-Shimamaki, Hokkaido, 130 m deep, Jul. 3, 1959, Danish seine, M. Yoshida leg. — 1 ♀ (ZLKU No. 2405); Soyo Maru Stn. 648, west of Tsugaru Strait, 247 m deep, Aug. 23, 1930, Soyo Maru — 1 ovig. ♀ (Soyo Maru Collection).

Southern Sea of Japan, off Karo, Tottori Prefecture, 300 m deep, Jul. 29, 1961, Tottori Prefectural Fisheries Experimental Station — 1 ♂ (ZLKU No. 2282); off Mishima Island, Yamaguchi Prefecture, 250 m deep, 1977, Yamaguchi Gaikai Prefectural Fisheries Experimental Station — 1 ♂ (SUF).

Definition: Body large. Rostral formula 4-5+0-4/1-5+1. Carapace pubescent and carinate on middorsal line with four or five well developed teeth. Supraorbital spine well developed, without notch on ventral side. Antennal spine nearly as large as supraorbital spine. Pterygostomial spine rather small. Abdomen also pubescent. Pleura of all somites ending in two to four spines posteriorly. Telson with more than five pairs or unpaired number of dorsal spines. Antennular

peduncle with stout marginal spine on each segment. Third maxilliped without spinules on mesial margin of distal segment. Epipod on first three pereopods.

Color: Leim (1921) gave an extensive description of the coloration and a fine figure of the color pattern of the specimen from the east coast of Canada. Miyake (1982) presented a color photograph of the live specimen from the Sea of Japan. "The species is brownish red to dull brownish green" (Butler, 1980).

Size: The ovigerous females are 17.5–26.1 mm in CL and 12.6–18.1 mm in RL. The largest male is 32 mm in CL and 26 mm in RL. Eggs small and numerous. On the Pacific coast of Canada the ovigerous females, 11.7–24.6 mm in CL have occurred in November, January, and February (Butler, 1980), while about 57% were ovigerous in August and September in Northeast Canada (Squires, 1957).

Distribution: Greenland southward to Massachusetts Bay, Arctic Canada, Bering Sea to Puget Sound, Sea of Okhotsk, and Sea of Japan, depth 2–518 m (Holthuis, 1947, Squires, 1957, Kim, 1977 and Butler, 1980). In Japan; Northwest of Noto Peninsula, depth 260 m (Yokoya, 1933); west of Tsugaru Strait, depth 247 m (Yokoya, 1933); southwest of Musashitai (Igarashi, 1969), off Kushiro, off Shimamaki, Hokkaido (Igarashi, 1969); Toyama Bay, (Motoh, 1972); off Sado Island, (Hayashi, 1976); off Wakasa, Fukui Prefecture, depth 250–300 m (Miyake, 1982).

The present materials from Tottori and Yamaguchi Prefectures represent the southernmost recorded distribution of the species. In Toyama Bay, this species is commercially important, usually caught with a Danish seine.

(7) *Lebbeus kubo* sp. nov.

(Figs. 6–8)

Material examined:

Northern Sea of Japan, off Hiyamagun, Hokkaido, Jun. 1, 1981, T. Yoda leg. — 1 ♀ (paratype, SUF).

Central Sea of Japan, off Namerikawa, Toyama Prefecture, 200 m deep, May 4, 1965, K. Oonari leg. — 1 ovig. ♀ (paratype, TUF), fish trap for *Babylonia* shells, Jun. 10, 1986, S. Doi leg. — 1 ♂ (holotype, SUF), 1 ovig. ♀, 1 ♀ (paratypes, SUF).

Southern Sea of Japan, off Mishima Island, Yamaguchi Prefecture, date uncertain, Yamaguchi Gaikai Prefectural Fisheries Experimental Station — 1 ♀ (paratype, SUF).

Definition: Large species. Rostral formula 1-4+2-3/3-5+1. Carapace carinate on middorsal line. Supraorbital spine developed, with notch on

ventral side. Antennal and pterygostomial spines also developed. Pleura of first three somites rounded. Those of fourth to sixth somites pointed. Telson with five or six pairs of dorsal spines. Antennular peduncle with two or three marginal spines on first segment and single spine on second and third segments. Third maxilliped without spinules on mesial margin of distal segment. Epipod usually on first two pereopods.

Description: Large species. Body robust, about 80mm in body length. Rostrum short and slender, overreaching or falling short of distal margin of first segment of antennular peduncle, with two or three teeth on upper margin, with three to five small teeth on lower margin near apex, in front of the anterior tooth of upper margin. Carapace with one to four on middorsal line. Supraorbital spine well developed as in *L. brandti*; antennal spine and pterygostomial spine also

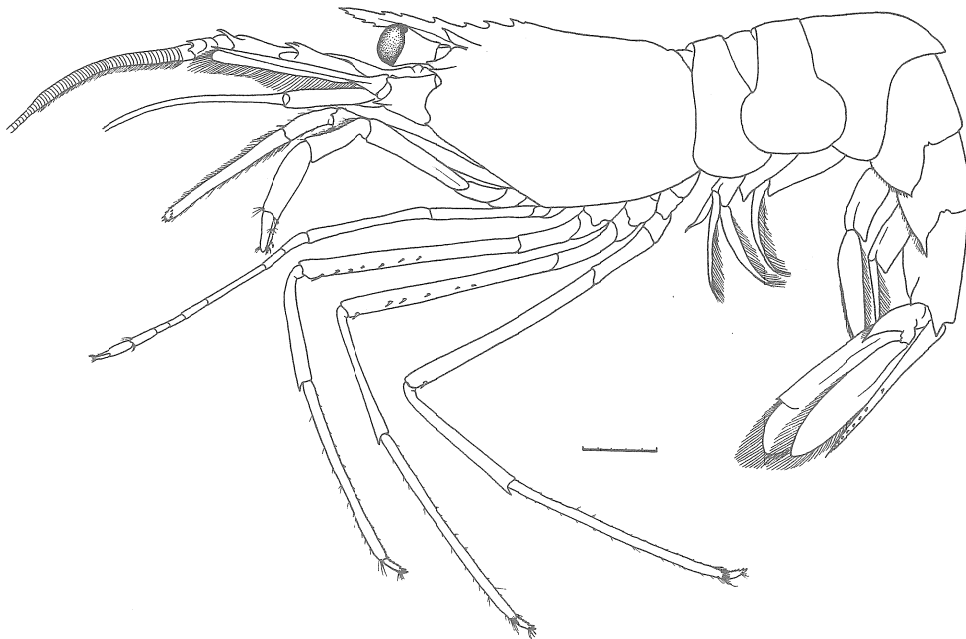


Fig. 6. *Lebbeus kubo* sp. nov. Holotype, male from Toyama Bay. Scale 5.0mm.

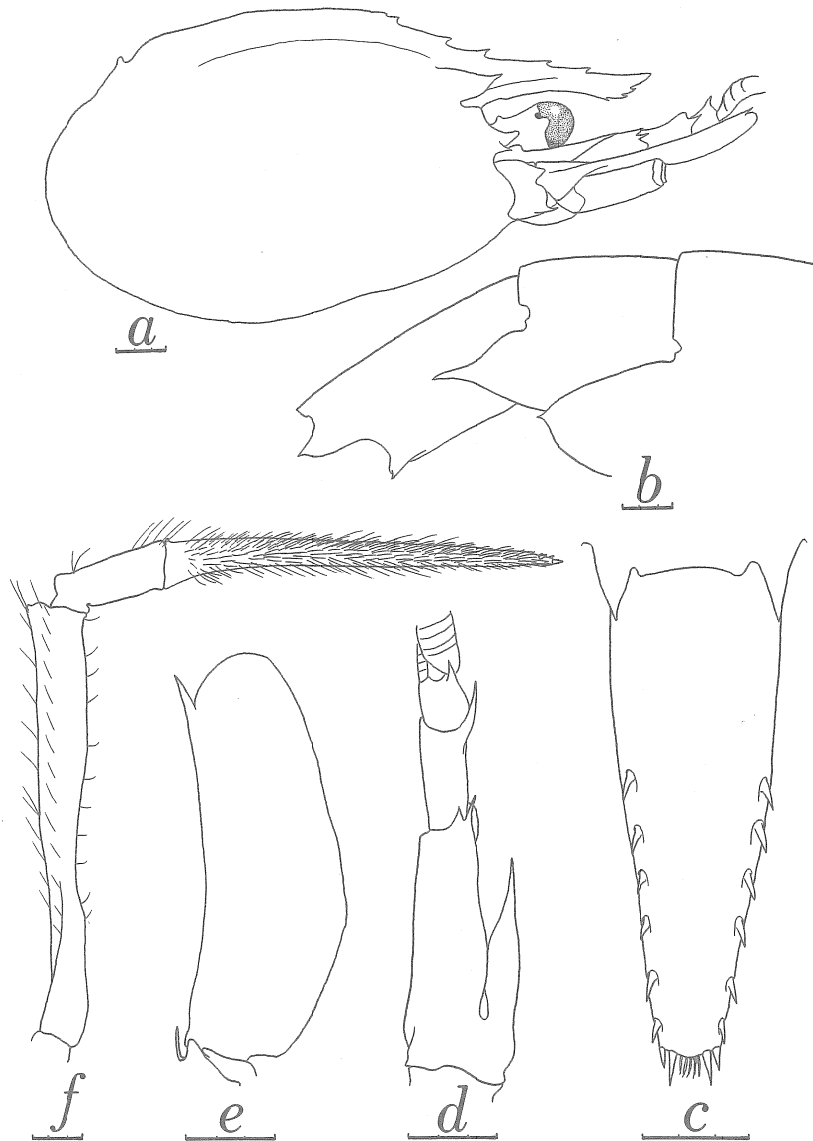


Fig. 7. *Lebbeus kuboï* sp. nov. Paratypes, ovigerous females from Toyama Bay. a, carapace; b, fourth to sixth abdominal somites; c, telson; d, antennular peduncle; e, antennal scale; f, third maxilliped. Scales 3.0mm.

large and stout.

Abdomen dorsally smooth. Pleura of first three somites rounded, those of fourth and fifth acutely pointed. Sixth somite stout, 1.6 times as

long as fifth. Telson 1.5 times as long as sixth somite, with five to seven paired or unpaired spines on dorsal surface, posterior margin with two pairs of spines and several setae between in-

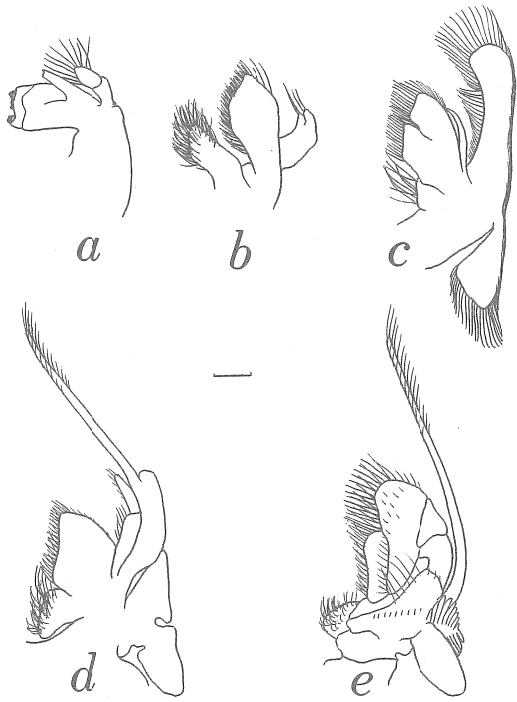


Fig. 8. *Lebbeus kuboii* sp. nov. Paratype, female from Toyama Bay.
a, mandible; b, maxillule; c, maxilla; d, first maxilliped; e, second maxilliped. Scale 1.0mm.

ner pair of spines.

Eyes large, cornea well pigmented with small ocellus. Antennular peduncle much long, first segment more than 1.5 times as long as distal two segments combined, with two or three rather long marginal spines. Stylocerite sharply pointed, falling short of end of first segment. Second segment about three times as long as third segment, each with single marginal spine. Antennal scale long, reaching beyond antennular peduncle by distal one-fifth; outer margin nearly straight ending in stout spine, which overreaches lamella.

Mouth-parts showing no distinct differences from typical form. Third maxilliped well developed, overreaching antennal scale by distal two-thirds of distal segment; distal segment with about ten dark-colored spines near apex, mesial

margin without series of spinules; second segment one-fourth length of distal segment, basal segment as long as distal segment with small marginal spine on upper outer end. First pereopod also long, just reaching end of antennal scale; chela as long as merus; palm 1.6 times length of fingers. Second pereopod slender, reaching beyond antennal scale by chela and distal three joints of carpus; merus slightly longer than ischium; carpus 1.6 times as long as merus, composed of seven joints; palm as long as distal joints of carpus; fingers more than three-fifths as long as palm. Epipod usually present on first two pereopods only, but sometimes rudimentary epipod on third pereopod. Following three pereopods long and slender. Third pereopod overreaching antennal scale by distal extremity of carpus; merus with seven spines on outer surface. Fourth pereopods reaching beyond antennal scale by distal two-thirds of propodus; merus slightly shorter than that of third pereopod, with six or seven outer spines; carpus two-thirds length of merus; propodus little longer than merus, 7.6 times as long as dactylus. Fifth pereopod overreaching antennal scale by distal half of the propodus; merus slightly shorter than that of fourth pereopod, with single terminal spine; propodus 1.2 times as long as merus and 7.8 times as long as dactylus; dactyli of third to fifth pereopods bearing five or six spinules, excluding terminal claw, on posterior margin.

Uropod longer than telson; protopod with stout spine on outer distal end and blunt process on base of endopod; outer margin of exopod nearly straight; ending in two spines, outer small and fixed and inner long and movable; diaeresis well marked. Last thoracic sternum with pair of spines; much longer in male than in female. Pair of short spines on first three abdominal sterna; fourth sternite with small median spine; fifth sternite with large, posteriorly curved spine; sixth sternite with preanal spine in both sexes.

Size: The holotype is 67 mm in TL, 15.5 mm

in CL and 8.8 mm in RL. The ovigerous female is 68 mm in TL, 20.0 mm in CL and 8.9 mm in RL. The largest specimen, non-ovigerous female, 90 mm in TL, 21.9 mm in CL and 11.8 mm in RL. Eggs numerous and rather large, 2.2-2.4×2.9-3.0 mm in diameter.

Remarks: The present new species is related to *L. brandti* (Brashnikov) of the group having an epipod on the first two pereopods, but it is easily distinguished from that species by the following two characters.

1) The rostrum is short, not reaching end of second segment of the antennular peduncle in *L. kuboii*, while it reaches the end of the antennular peduncle in *L. brandti*.

2) There are two or three marginal spines on the first segment of the antennular peduncle in *L. kuboii*, and a single, long erect spine is present on the first segment in *L. brandti*.

L. kuboii, on the other hand, is closely related to *L. scrippsi* Wicksten and Mendez, which is the eastern Pacific member of this group. However, the pleuron of the fourth abdominal somite is pointed in *L. kuboii*, but largely rounded in *L. scrippsi* and the telson bears six or seven paired or unpaired spines in the former, but only three pairs in the latter.

It gives me a great pleasure to dedicate this species to the late Dr. Ituo Kubo of the Tokyo University of Fisheries, who kindly permitted me to examine specimens of several species of this genus belonging to that university.

Distribution: The species is only known from the Sea of Japan from off Hokkaido to the southern part of Honshu, in depths of around 200 m.

(8) *Lebbeus longipes* (Kobjakova, 1936)

(Fig. 9)

Hetairus longipes Derjugin and Kobjakova, 1935, pp. 112, 142 (nomen nudum).

Hetairus longipes Kobjakova, 1936, p. 222, fig. 16.

Hetairus longipes: Kobjakova, 1937, p. 107, pl. 1.

fig. 4.

Lebbeus longipes: Vinogradov, 1950, p. 203, pl. 14, fig. 57.

Lebbeus longipes: Hayashi, 1976, p. 17.

Material examined:

Northern Sea of Japan, off Mashike, Hokkaido, Aug. 29, 1966, T. Igarashi leg. — 1 ♂ (Faculty of Fisheries, Hokkaido University).

Central Sea of Japan, off Niigata, Niigata Prefecture, date uncertain, H. Itano leg. — 1 ♂ (SUF); off Namerikawa, Toyama Prefecture, 200 m deep, May 4, 1965, K. Oonari leg. — 1 ♀ (TUF); fish trap for *Babylonia* shells, Jun. 10, 1986, S. Doi leg. — 1 ovig. ♀, 2 ♀ (SUF).

Definition: Large species. Rostral formula 2-3+0-3/2-4+1. Carapace not carinate on middorsal line. Supraorbital spine small, without notch on ventral side. Antennal and pterygostomial spines developed. Pleura of first three somites rounded. Those of fourth to sixth somites pointed. Telson with three to five pairs of dorsal spines. Antennular peduncle with marginal spine on each segment. Third maxilliped with eight or nine spinules on mesial margin of distal segment. Epipod on first pereopod only.

Size: The larger female is 18.5 mm in CL and 20.0 mm in RL and the smaller female 15.3 mm in CL and 15.9 mm in RL. The male is slightly smaller than females, 11.1 mm in CL. Eggs large, 2.0-2.1×2.4-2.6 mm in diameter. The measurements of the types are not available.

Remarks: *Lebbeus longipes* (Kobjakova) is characterized by an epipod on the third maxilliped and the first pereopod, and the sixth abdominal somite long, about three times as long as broad.

One specimen, collected from Hokkaido, however, bears an epipod on left side of the third maxilliped only but no epipod on right side and moreover on either side of the first pereopod. Other specimens have an epipod on both sides of the third maxilliped and the first pereopods. Except for this difference, these specimens agree

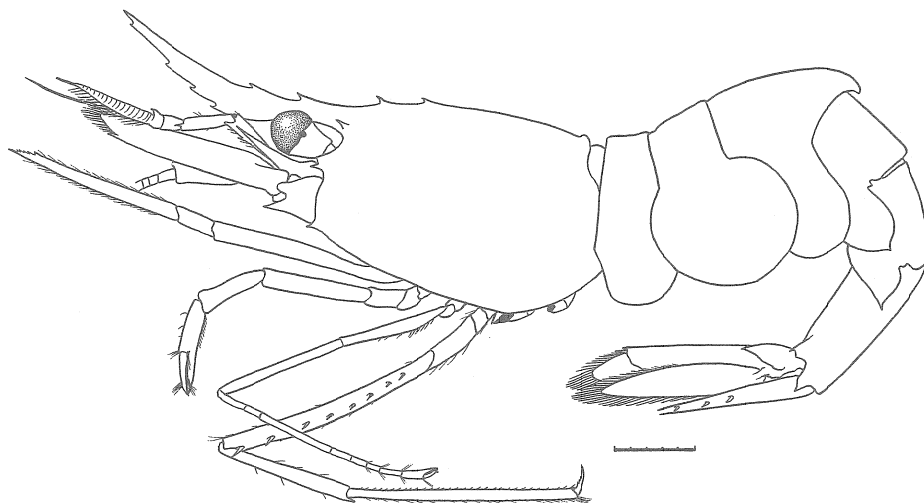


Fig. 9. *Lebbeus longipes* (Kobjakova, 1936). Female from Hokkaido. Scale 5.0mm.

well with each other and coincide with the description of that species given by Kobjakova (1937). Thus I treated them as the same species and referred it to *L. longipes*.

Lebbeus longipes is readily distinguished from *L. vicinus vicinus* (Rathbun) and *L. vicinus montereyensis* Wicksten and Mendez, the other members with an epipod on the first pereopod only, by the following characters.

1) The pleuron of the fourth abdominal somite is pointed in *L. longipes* but rounded in the two subspecies of *L. vicinus*.

2) The distal half of the upper margin of the rostrum is unarmed in *L. longipes* and *L. vicinus montereyensis*, while the rostrum is armed with teeth on almost its entire margin in *L. vicinus vicinus*.

3) Both subspecies of *L. vicinus* have been reported from the northeastern Pacific. *L. vicinus montereyensis* is only known from the far south, off California and Mexico, and in considerably deep waters, 954–2824 m.

On the other hand, the present species is very closely related to *L. unalaskensis* (Rathbun),

mentioned later, in general appearance, but as already pointed out by Kobjakova (1936 and 1937), *L. unalaskensis* has an epipod on the third maxilliped and the first two pereopods, and the sixth abdominal somite is short, at most 2.0 to 2.5 times as long as broad, in contrast to about three times in *L. longipes*.

Distribution: Off Primorskiy (Enkaishu), depth 167–1380 m (Kobjakova, 1936, 1937 and Vinogradov, 1950). Off Himetsu, Niigata Prefecture, depth 200 fms (Hayashi, 1976). This species is known from both sides of the Sea of Japan.

(9) *Lebbeus miyakei* sp. nov.

(Figs. 10 and 11)

Material examined:

Sea of Genkainada, near Orono-shima Island, Fukuoka Prefecture, 30–40 m deep, Jul. 21, 1954, collector uncertain — 1 ♂ (holotype, ZLKU No. 328).

Definition: Small species. Rostral formula 1+1/1+1. Carapace not carinate on middorsal line. Supraorbital spine large, without notch on ventral side. Antennal spine developed. Pterygosto-

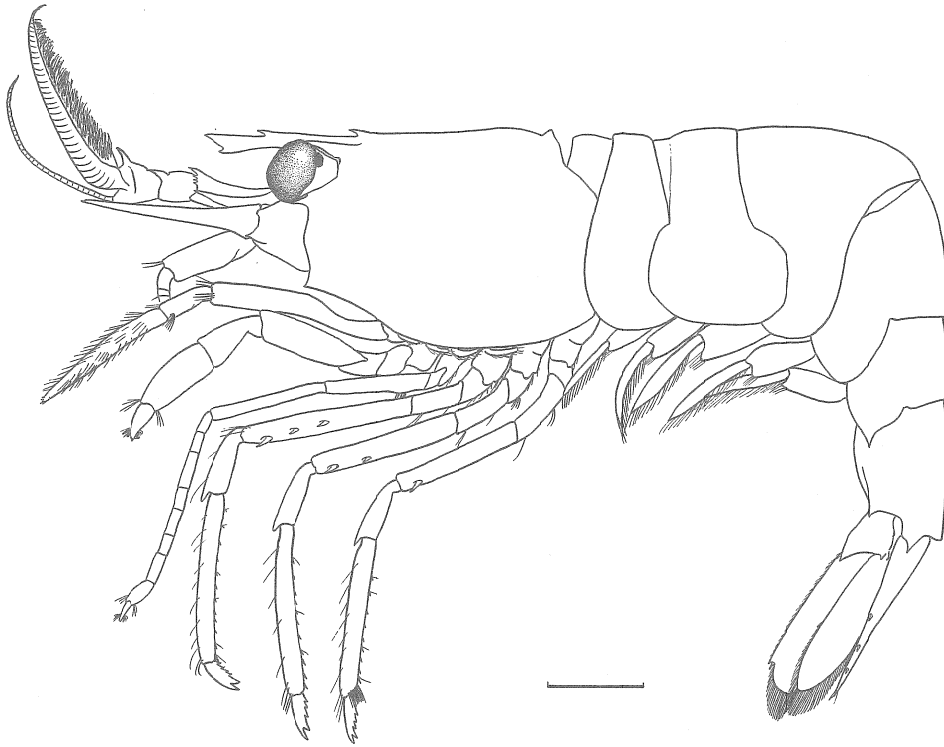


Fig. 10. *Lebbeus miyakei* sp. nov. Holotype, male from off Fukuoka Prefecture. Scale 1.0mm.

mial spine small. Pleura of first four somites rounded. Those of fifth and sixth somites pointed. Telson with three pairs of dorsal spines. Antennular peduncle with three or four marginal spines on first segment, and with a large marginal spine on second and third segment. Third maxilliped without spinules on mesial margin of distal segment. Epipod on first three pereopods.

Description: Rostrum short, not extending beyond first segment of antennular peduncle, with single tooth on middle of upper margin and small tooth on lower margin near apex. Carapace smooth, with single tooth on postrostral carapace. Supraorbital spine large, stout; antennal spine also developed but pterygostomial spine very small.

Abdomen smooth dorsally; pleura of first four somites rounded; pleuron of fifth somite pointed posteriorly. Sixth somite 1.6 times as long as fifth somite. Telson 1.3 times as long as sixth somite, with three pairs of small spines on dorsolateral margin; posterior margin evenly convex with three pairs of spines.

Eyes well developed, reaching anteriorly apex of rostrum, with small ocellus. Basal segment of antennular peduncle longer than distal two segments combined, with four marginal spines on right side, three on left side; second segment as long as third, both with single, stout marginal spine; flagella as long as peduncle. Antennal scale long, overreaching antennular peduncle by distal third, 3.3 times as long as

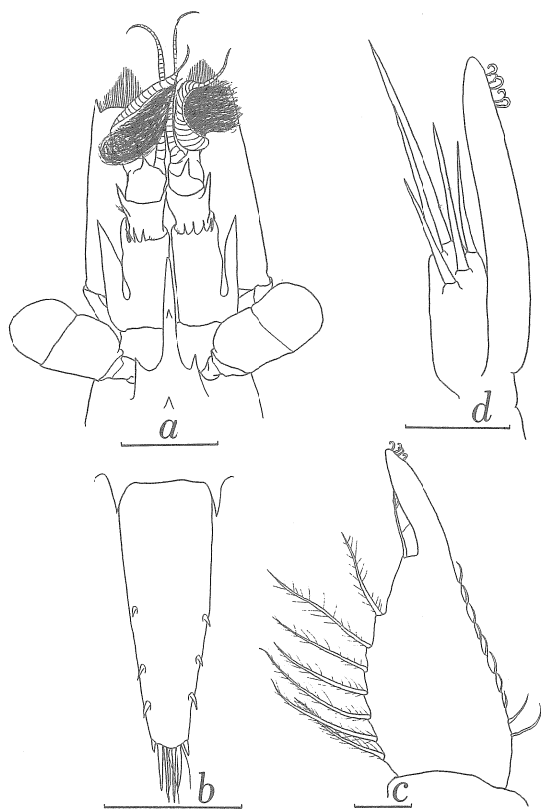


Fig. 11. *Lebbeus miyakei* sp. nov. Holotype, male from off Fukuoka Prefecture. a, anterior part of body; b, telson; c, endopod of first pleopod; d, appendices interna and masculina. Scales for a, b 1.0mm; scales for c, d 0.1mm.

broad; outer distal spine overreaching lamella. Basicerite with two processes, upper bluntly, lower sharply pointed; carpocerite reaching end of second segment of antennular peduncle.

Mouth-parts not examined. Third maxilliped overreaching antennal scale by distal fourth of distal segment; distal segment with five apical spinules, mesial margin with some tufts of hairs only; basal segment three times as long as second segment, without exopod but with epipod. First pereopod rather stout, 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; carpus composed of seven joints. First three pereopods with epipod. Third pereopod overreaching antennal scale by dactylus; merus as long as propodus, with three spines on outer surface; dactylus biunguiculate with four spinules on posterior margin. Fourth pereopod reaching beyond antennular peduncle by dactylus; merus shorter than propodus, with two outer spines. Fifth pereopod just reaching end of antennular peduncle; merus of fifth pereopod with single subterminal spine; dactylus biunguiculate with three spinules on posterior margin.

Endopod of first pleopod (male) provided with appendix interna with retinacula distally. Appendix masculina short, half as long as appendix interna and bearing some simple setae distally. Uropod longer than telson; protopod with two spines, one on outer distal end and other on base of endopod. Outer margin of exopod ending in spine, flanked by movable spine. Last thoracic sternite with pair of long spines. Pair of short spines on first two abdominal sterna; third and fourth sterna with small median spine; fifth sternite with large, posteriorly curved spine; sixth sternite with preanal spine.

Size: The holotype is small, 13.0 mm in TL, 2.1 mm in CL, 1.4 mm in RL.

Remarks: The present species is characterized by having an epipod on the first three pereopods, a short rostrum not reaching beyond the first segment of the antennular peduncle, and a rounded pleuron of the fourth abdominal somite. These characters coincide well with those of the Hawaiian deep water species, *Lebbeus profundus* (Rathbun). However, the present species is distinguished from Rathbun's species as follows:

1) The antennular peduncle bears three marginal spines on the first segment and two similar spines on the third segment in *L. profundus*, while it is armed with four spines on the first segment and a single large spine on the

third segment in *L. miyakei*. The second segment is three times as long as third segment in the former, but it is as long as the third in the latter.

2) The outer spine of the antennal scale falls short of the lamella in *L. profundus*, while it overreaches the lamella in the new species.

3) The third maxilliped is very long, extending beyond the antennal scale by the length of the distal segment and nearly half the second segment in the Hawaiian species. In the new species the third maxilliped is not so long, reaching beyond the antennal scale by only the distal one-fourth of the distal segment.

4) There are four or five spines on the dorsolateral margin of the telson in *L. profundus*, in spite of three pairs in *L. miyakei*.

The new species is named in honor of Dr. Sadayoshi Miyake, Professor Emeritus, Kyushu University. It is great pleasure to express my profound gratitude to him not only for guiding my first steps in the field of the taxonomy of Crustacea Caridea, but also for the innumerable times that he gave me his valuable suggestions and encouragement.

Distribution: The species is only known from the type locality, off Fukuoka Prefecture, at depths of 30-40 m.

(10) *Lebbeus polaris* (Sabine, 1821)

(Fig. 12)

Restricted synonymy

Spirontocaris polaris: Rathbun, 1904, p. 73 (synonymy).

Hetairus polaris: Brashnikov, 1907, p. 148, fig. 17.

Spirontocaris polaris: Leim, 1921, p. 139, pl. 5 fig. 12.

Spirontocaris polaris: Rathbun, 1929, p. 12, fig. 9.

Hetairus polaris: Kobjakova, 1936, p. 222.

Hetairus polaris: Kobjakova, 1937, p. 116.

Hetairus polaris: Makarov, 1941, p. 122.

Spirontocaris polaris: Urita, 1942, p. 20.

Lebbeus polaris: Holthuis, 1947, pp. 9, 38

(synonymy).

Lebbeus polaris: Vinogradov, 1950, p. 205, pl. 12, fig. 44.

Lebbeus polaris: Holthuis, 1955, pl. 105, fig. 72a.

Lebbeus polaris: Squires, 1957, p. 473.

Hetairus polaris: Kobjakova, 1958, p. 228.

Lebbeus polaris: Pike and Williamson, 1961, p. 193.

Lebbeus polaris: Squires, 1962, p. 682, figs. 2, 3.

Lebbeus polaris: Greve, 1963, p. 35, fig. 1E.

not *Lebbeus polaris*: Butler, 1964, p. 419 (= *L. grandimana* Brashnikov).

Lebbeus polaris: Squires, 1965, p. 49.

Lebbeus polaris: Squires, 1968, p. 358.

Lebbeus polaris: Squires, 1969, p. 1910, fig. 5.

Lebbeus polaris: Williams and Wigley, 1977, p. 7, fig.

Lebbeus polaris: Smaldon, 1979, p. 62, with fig.

Lebbeus polaris: Wicksten and Mendez, 1982, p. 119.

Lebbeus polaris: Zarenkov, 1986, p. 797.

Material examined:

Bering Sea, 60° 00'N, 169° 27'E, 28 m deep, Aug. 5, 1937—1 ♀ (TUF).

North Pacific, off Shimshir Island, Kurile Islands, 50-60 m deep, 1937—1 ♀ (TUF); near Hokkaido, definite locality and date uncertain—1 ♂, 1 ♀ (TUF).

Definition: Small species. Rostral formula 0-3+0-5/3-7+1 in male, 2-3+1-6/3-9+1 in female. Carapace not carinate on middorsal line. Supraorbital spine small, without notch on ventral side. Antennal spine developed. Pterygostomial spine small in female and absent in male. Pleura of first three somites rounded, those of fourth to sixth somites pointed posteriorly. Telson with three to five pairs of dorsal spines. Antennular peduncle with a marginal spine on each segment. Third maxilliped without spinules on mesial margin of distal segment. Epipod usually on first two pereopods.

Color: The coloration of the species was mentioned by Sabine (1821), Leim (1921), Greve

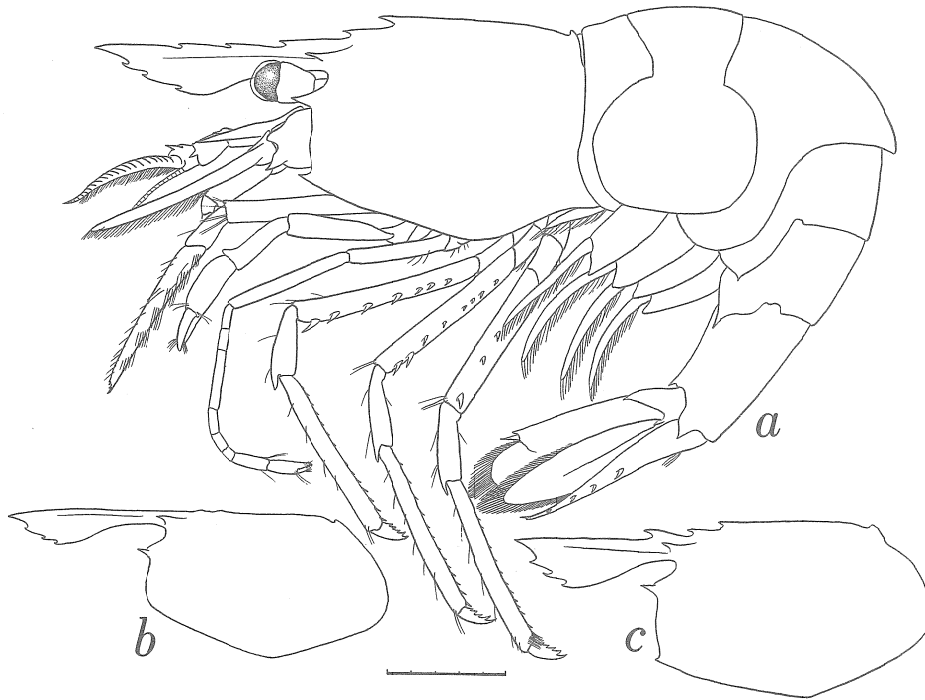


Fig. 12. *Lebbeus polaris* (Sabine, 1821). a, female from Bering Sea, b, male from Kurile Islands, c, female from Kurile Islands. a, animal; b, c, carapace. Scale 5.0mm.

(1963) and Smaldon (1979) as follows; "color pale with red spots and markings and points of claws, and eyes brownish black" (Greve, 1963).

Size: The present material is 8.0 to 10.8 mm in CL and 7.6 to 10.7 mm in RL in female (non ovigerous) and 7.0 mm in CL and 7.5 mm in RL in a single male. The large specimen (female) in literature is 90 mm in TL, 33 mm in CL, including rostrum (Greve, 1963), and 18-20 mm in CL (Squires, 1957).

Remarks: This species is well known to show a distinct sexual dimorphism; in the present material the male bears no spines on the dorsal margin of the rostrum and the anterior middorsal part of the carapace, while the female has three to five spines there. This character is also represented by *Lebbeus heterochaelus* (Kob-

jakova).

Distribution: Holthuis (1947) summarized the distribution of this species known at that time as follows: Circumpolar, southward to the Skagerrak and Hebrides (North Atlantic), Cape Cod (East coast of North America), Bering and Okhotsk Seas, Aleutian Islands (North Pacific), depth 0-930 m. Since then the following localities are added; Northeast Canada and Arctic waters, depth 0-720 m (Squires, 1957, 1962, 1965, 1968, 1969); Norwegian coast, littoral to 700 m, mainly 30-300 m (Greve, 1963); north-eastern United States (Williams and Wigley, 1977); off Shetland (Smaldon, 1979); Chukchi Sea, depth 320 m (Zarenkov, 1986) Shikotan Island, Iturup Island, Zelenogo Island, Kurile Islands, depth 5-60 m (Kobjakova, 1958), which is

the southern most distribution of the Asian side of the North Pacific. Greve (1963) mentioned the spawning of the Norwegian specimens. Squires (1965) and Smaldon (1979) summerized well the biology of this species from North Atlantic. There are no records from waters around the Japanese mainland.

(11) *Lebbeus speciosus* (Urita, 1942)

(Figs. 13 and 14)

Spirontocaris makarofi speciosa Urita, 1942, p. 19, fig. 4.

Lebbeus possjeticus Kobjakova, 1967, p. 235, fig. 4.

Lebbeus speciosus: Miyake, 1982, p. 53, pl. 18, fig. 2.

Lebbeus possjeticus: Wicksten and Mendez, 1982, pp. 118, 119.

Material examined:

Northwest Pacific, off Hokkaido, Akkeshi Bay, shore, May 2, 1957, H. Kurata leg. — 1 ♂, 1 ♀ (ZLKU No. 2417); near low water mark, Jun. 18, 1981, Akkeshi Marine Biological Laboratory, Hokkaido University, T. Imaoka leg. — 3 ♀ (ZLKU).

Definition: Body small. Rostral formula 2+5-7/2-4+1. Carapace not carinate on middorsal line. Supraorbital spine well-developed, with notch on ventral side. Antennal and pterygostomial spines developed. Pleura of first three somites rounded. Those of fourth to sixth somites pointed. Telson with four or five pairs of dorsal spines. Antennular peduncle with three or four marginal spines on first segment, and a rather large marginal spine on second and third segments. Third maxilliped with 11 spinules in mesial margin of distal segment. Epipod on first three pereopods.

Description: Rostrum straight, extending beyond end of antennular peduncle, but falling short of end of antennal scale, with five or six teeth on dorsal margin. Lower margin expanded at distal third, with three teeth there. Two or

three teeth on anterior third of carapace, separated by a short interval from rostral teeth. Supraorbital spine well-developed, with notch along ventral side. Antennal and pterygostomial spines acutely pointed.

Abdomen smooth, pleura of fourth and fifth somites pointed posteriorly. Telson 1.4 times as long as sixth somite, with four pairs or four or five unpaired spines on dorsal surface. Posterior margin with small median spine flanked by three pairs of spines.

Eyes cylindrical, stalk slightly longer than cornea, with ocellus. Antennular peduncle short, first segment with three or four small marginal spines. Stylocerite reaching end of second segment of antennular peduncle. Second segment twice as long as third, each with a rather large marginal spine. Antennal scale three times as long as broad, outer spine reaching level of distal margin of lamella. Basicerite with two processes on distal margin, upper rounded, lower sharply pointed; carpocerite overreaching second segment of antennular peduncle.

Third maxilliped long, reaching beyond antennal scale by distal third of distal segment; distal segment with 11 spinules near apex. First pereopod just reaching tip of antennal scale. Second pereopod reaching beyond antennal scale by chela and distal joint of carpus. Third pereopod overreaching antennal scale by dactylus and half of propodus; merus with four spines on outer margin; dactylus with four spinules on posterior margin. Fourth pereopod reaching beyond antennal scale by dactylus; merus with three or four outer spines. Fifth pereopod falling short of antennal scale; merus with single subterminal spine.

Endopod of first pleopod in male as long as exopod; distal third slender with some retinacula at end. In second pleopod appendix masculina with many stout simple setae, half as long as appendix interna. Uropod longer than telson; protopod with stout spine on outer end and with

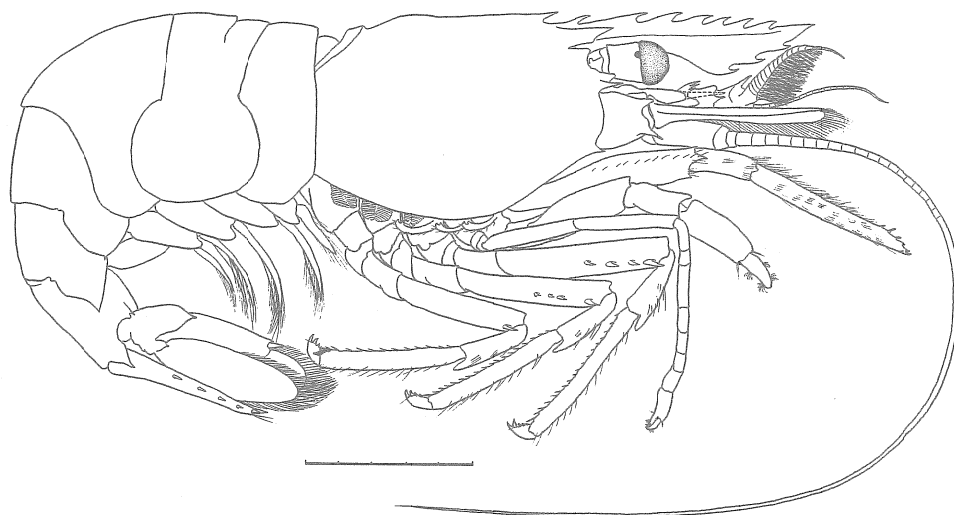


Fig. 13. *Lebbeus speciosus* (Urita, 1942). Female from Akkeshi Bay. Scale 5.0mm.

blunt process on base of endopod. Last thoracic sternite with pair of spines; much longer in male than in female. Pair of short spines on first two abdominal sterna; third and fourth sterna with small median spine; fifth sternite with large, posteriorly curved spine; sixth sternite with preanal spine in both sexes.

Color: Miyake (1982) presented a beautiful color photograph of the live male specimen. Carapace with longitudinal dark brown bands, which start as three anteriorly then branch and curve upward posteriorly. Abdomen with similar longitudinal or curved upward bands, which continue to end of abdomen. Telson dark brown. Posterior three pereopods with dactylus whitish, carpus and propodus dark brown; merus with two bands, ischium with a single band. Third maxilliped dark brown, except for the distal whitish part.

Size: The male is 7.0 mm in CL, 6.2 mm in RL and the female is 6.8 mm in CL, 5.7 mm in RL. The holotype of *L. possjeticus* is 32 mm in TL (Kobjakova, 1967).

Remarks: The present specimens are char-

acterized by the following points.

1) Small species, 30–40 mm in body length, with epipod on the first three pereopods.

2) The rostrum is almost straight and reaches beyond the tip of antennular peduncle but falls short of the tip of the antennal scale. It is armed with five to seven teeth on upper margin and three to four teeth on lower margin.

3) The median crest of the carapace bears two or three teeth, which are separated by a short distance from the rostral teeth.

4) The first segment of the antennular peduncle bears three or four marginal spines.

Like Urita (1942), Kobjakova (1967), too, described *L. possjeticus* as another species of the so-called *zebra* type from the Northwest Pacific. This species was compared with three Russian species, *L. fasciatus* (Kobjakova), *L. uschakovi* (Kobjakova) and *L. schrencki* (Brashnikov), but not with Urita's species nor subspecies (Kobjakova, 1967). The differences among these species are already mentioned above in the account for *L. fasciatus*.

Distribution: Littoral species; Sakhalin, (Uri-

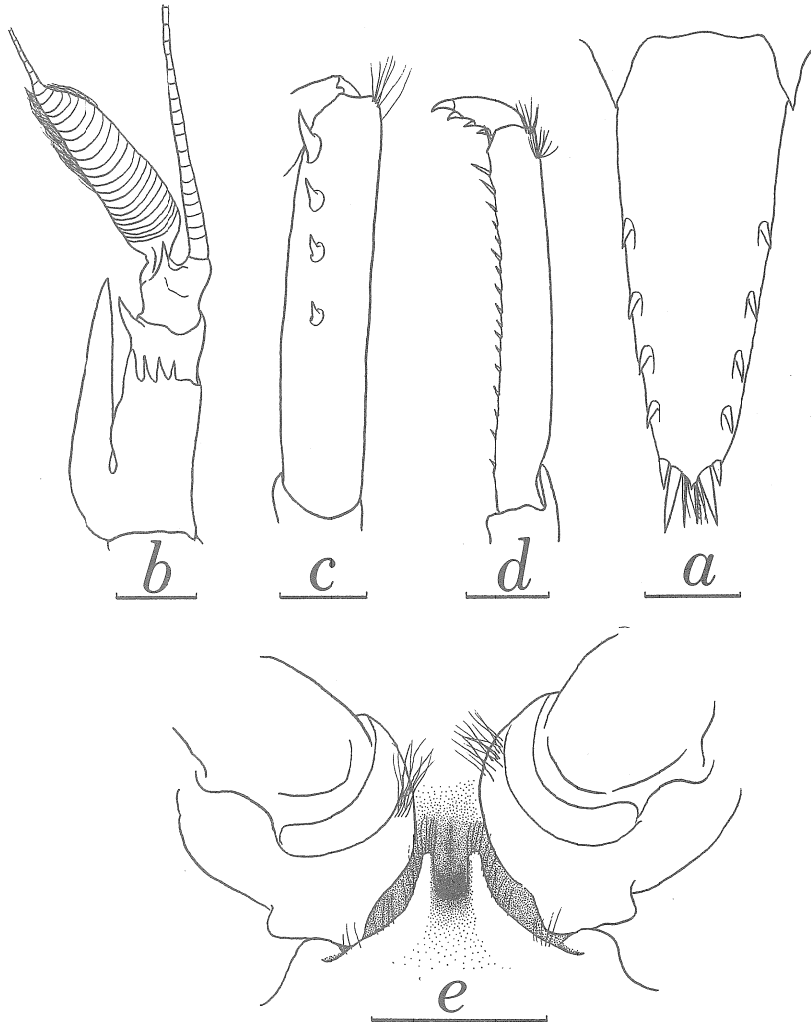


Fig. 14. *Lebbeus speciosus* (Urita, 1942). Specimens from Akkeshi Bay. *a*, male; *b-e*, females. *a*, telson; *b*, antennular peduncle; *c*, merus of fourth pereopod; *d*, dactylus of third pereopod; *e*, last thoracic sternite. Scale 1.0mm.

ta, 1942); Possjet Bay, depth 2.6 m (Kobjakova, 1967). Akkeshi, Hokkaido, shore. The present material was also collected from shallow waters.

(12) *Lebbeus unalaskensis* (Rathbun, 1902)

Spirontocaris unalaskensis Rathbun, 1902, p. 895.
Spirontocaris unalaskensis: Rathbun, 1904, p. 74,

fig. 28.

?*Spirontocaris unalaskensis*: Yokoya, 1933, p. 24,
 fig. 7.

Hetairus unalaskensis var. Derjugin and Kobjakova, 1935, p. 142.

Hetairus unalaskensis japonica Kobjakova, 1936,
 p. 222, fig. 14.

Hetairus unalaskensis ochotensis Kobjakova, 1936, p. 222, fig. 15.

Hetairus brevipes Kobjakova, 1936, p. 222, fig. 9.

Hetairus brevipes: Kobjakova, 1937, p. 111, fig. 5.

Hetairus unalaskensis japonica: Kobjakova, 1937, p. 116, pl. 1, fig. 6.

Hetairus unalaskensis ochotensis: Kobjakova, 1937, p. 116, pl. 1, fig. 7.

Lebbeus unalaskensis: Holthuis, 1947, pp. 9, 39.

Lebbeus brevipes: Vinogradov, 1950, p. 204, fig. 55.

Lebbeus unalaskensis ochotensis: Vinogradov, 1950, p. 206, fig. 46.

Lebbeus brevipes: Birstein and Vinogradov, 1951, p. 357.

Spirontocaris unalaskensis: Miyake, Sakai and Nishikawa, 1962, p. 123.

Lebbeus unalaskensis: Igarashi, 1969, p. 6, pl. 6, fig. 16, pl. 15, fig. 44.

Material examined:

Okhotsk Sea, off Abashiri, Hokkaido, 170–240 m deep, Jul. 29, 1957, M. Yamamoto leg. — 1 ♀ (ZLKU No. 2411).

Northern Sea of Japan, off Yamagata Prefecture, 39°08.3'N, 138°40.0'E, 600–650 m deep, Nov. 30, 1983, A. Ooi leg. — 1 ovig. ♀ (SUF).

Central Sea of Japan, Soyo Maru Stn. 609, near middle point between Sado Island and Oga, 669 m deep, Aug. 10, 1930, Soyo Maru — 2 ♂, 1 ovig. ♀, 1 ♀ (Soyo Maru Collection).

Southern Sea of Japan, off Mishima Island, date uncertain, Yamaguchi Prefectural Gaikai Fisheries Experimental Station — 1 ovig. ♀ (SUF).

Definition: Large species. Rostral formula 1-3+2-3/3-9+1-2. Carapace not carinate on mid-dorsal line. Supraorbital spine small, without 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 five to seven pairs of dorsal spines. Antennular peduncle with marginal spine on each segment. Third maxilliped without spi-

nules in mesial margin of distal segment. Epipod on first two pereopods.

Size: Ovigerous female 18.1 mm in CL, males 9.8 to 12.0 mm in CL, 13 to 15.7 mm in RL. Rathbun's type 60 mm in length, 12.0 mm in CL and 14.5 mm in RL. Eggs large, 2.9–3.1×3.2–3.3 mm in diameter.

Remarks: Yokoya (1933) reported with some doubts four specimens from the Sea of Japan under the name *Spirontocaris unalaskensis* Rathbun. Fortunately I actually examined these Soyo Maru specimens, which are much shriveled and rather broken, but some important specific characters are rather well preserved. The specimens are composed of two males, one ovigerous female and one female, compared with three males and one ovigerous female in Yokoya's description.

As already mentioned by Yokoya (1933) the specimens are rather different from the type description of *L. unalaskensis*; the rostrum is much longer and bears more teeth, 5 or 6 above and 4 to 8 below. With due regard to Yokoya's description, Kobjakova (1936 and 1937) created a new variety *Hetairus unalaskensis japonica* based upon the specimens collected from northern part of the Sea of Japan. Based on the specimens from the Okhotsk Sea he also created a new variety, *H. unalaskensis ochotensis*, which bears a more convex upper margin of the rostrum, 5 to 7 teeth on the lower margin of the rostrum and a unequally spaced rostral teeth. However, these rostral characters are quite variable and of very little specific value.

Moreover the chela of the second pereopods of Yokoya's species shows the distinct sexual dimorphism. In females the fingers are as long as the palm but in males it is very slender, about 1.6 to 2.2 times as long as the palm. Kobjakova (1936 and 1937) also described two new species, *Hetairus brevipes* and *H. heterochaeta*, which show this sexual dimorphism. The males of the present material coincide well with the description of the males of *L. brevipes*. Indeed no definite differences

are present between them. On the other hand, *H. heterochaela* differs from the present specimens by the short rostrum, not reaching end of antennal scale, no teeth on upper margin of the rostrum in males, and some spines present on the outer surface of each carpus of the last three pereopods.

It may be concluded that Kobjakova's *Hetairus unalaskensis japonica*, *H. unalaskensis ochotensis* and *H. brevipes* are the same species and are identical with *L. unalaskensis*.

Distribution: North of Unalaska, depth 277–351 fms (Rathbun, 1902 and 1904); Okhotsk Sea, depth 182–388 m (Kobjakova, 1937, Birstein and Vinogradov, 1951); northern Sea of Japan, depth 391–392 m (Kobjakova, 1937); between Sado Island and Oga Peninsula, depth 669 m (Yokoya, 1933); off Mashike, Hokkaido (Igarashi, 1969).

Acknowledgments

I am much indebted to Emer. Prof. Sadayoshi Miyake of the Kyushu University for his invaluable advice and encouragement in the course of this study. Thanks are also due to Dr. F. A. Chace, Jr. and B. F. Kensley of the United States National Museum for their critical reading the manuscript. I am much indebted to the late Dr. Ituo Kubo of the Tokyo University of Fisheries, who kindly allowed to examine valuable specimens of that university and also many people, who collected and donated interesting specimens, upon which this paper is depend.

References

- Balss, H. 1914. Ostasiatische Decapoden II. Die Natantia und Reptantia, *Abh. Bayer. Akad. Wiss., suppl.*, 2, (2), 1–101, pl. 1.
- Barnard, K. H. 1947. Descriptions of new species of South African decapod Crustacea, with notes on synonymy and new records. *Ann. Mag. nat. Hist.*, (11), 13, 381–392.
- Bate, S. 1888. Report on the Crustacea Macrura dredged by H.M.S. Challenger during the years 1873–1876. *Rep. Voy. Challenger, Zool.*, 24, i-xc+1–942, pls. 1–150.
- Birstein, Y. A. and Vinogradov, L. G., 1951. New and rare Decapoda in Okhotsk Sea and Kurilian waters. *C. R. Acad. Sci. URSS. n. s.*, 79, 357–360 (in Russian).
- Brashnikov, V., 1907. Materials on the fauna of the Russian eastern seas, collected by the schooner "Storoz", 1899–1902. *Mem. Acad. Sci. Petersburg*, (8), 20, (6), 1–185, pls. 1, 2, map 1 (in Russian).
- Butler, T. H. 1964. Records of shrimps (order Decapoda) from British Columbia. *J. Fish. Res. Bd. Can.*, 21, 419–421.
- Butler, T. H. 1980. Shrimps of the Pacific coast of Canada. *Can. Bull. Fish., Aquat. Sci.*, 202, 280 pp.
- Derjugin, K. M. and Kobjakova, S., 1935. Zur Decapodenfauna des Japanischen Meeres. *Zool. Anz.*, 112, 141–147.
- Dons, C. 1915. Nord-Norges Decapoder. *Tromso Mus. Aarsh.*, 37, 15–152, pls. 1, 2.
- Fabricius, J. C. 1775. Systema Entomologiae, sistens Insectorum class ordines, genera, species, adiectis synonymis, locis, descriptionibus, observationibus. 832 pp.
- Greve, L. 1963. The genera *Spirontocaris*, *Lebbeus*, *Eualus* and *Thoralus* in Norwegian waters (Crust. Dec.). *Sarsia*, (11), 29–42.
- Hale, H. M. 1941. Decapod Crustacea. *British Aust. N.Z. Ant. Res. Exped.*, B. 4, (9), 258–285, pl. 3.
- Hayashi, K. 1976. Review of shrimps from the Sado Island and its neighbourhood. *Niigataken Seibutu Kenkyukaishi*, (11), 13–22 (in Japanese with English summary).
- Hayashi, K. 1977. Studies on the hippolytid shrimps from Japan-VI. The genus *Spirontocaris* Bate. *J. Shimonoseki Univ. Fish.*, 25, 155–186.
- Hayashi, K. 1983. *Lebbeus grandimanus*, associ-

- ated with sea anemones in cold waters. *Aquabiology*, (25), i-ii (in Japanese).
- Hayashi, K. 1986. Prawns and shrimps. In: Baba, K., Hayashi, K., and Toriyama, M. Decapod crustaceans from continental shelf and slope around Japan. The intensive research of unexploited fishery resources on continental slopes. pp. 38-149, 232-279 (in Japanese and English).
- Holthuis, L. B. 1947. The Decapoda of the Siboga Expedition. Part IX. The Hippolytidae and Rhynchocinetidae collected by the Siboga and Snellius Expeditions with remarks on other species. *Siboga Exped. Monogr.*, **39 a**⁸, 1-100.
- Holthuis, L. B. 1955. The recent genera of the caridean and stenopodidean shrimps (Class Crustacea, Order Decapoda, Supersection Natantia) with keys for their determination. *Zool. Verhand.* (26), 1-157.
- Holthuis, L. B. 1961. *Lebbeus*, White, 1847, and *Eualus* Thallwitz, 1892 (Crustacea, Decapoda); proposed validation under the plenary powers. *Bull. Zool. Nomen.*, **18**, 322-325.
- Igarashi, T. 1969. A list of marine decapod crustaceans from Hokkaido, deposited at the Fisheries Museum, Faculty of Fisheries, Hokkaido University. I. Macrura. *Fish. Mus., Fac. Fish. Hokkaido Univ., Contribution* (11), 1-15, pls. 1-20.
- Jensen, G. C. 1987. A new species of the genus *Lebbeus* (Caridea: Hippolytidae) from the northeastern Pacific. *Bull. Southern California Acad. Sci.*, **86**, 89-94.
- Kensley, B., Tranter, H. A., and Griffin, D. J. G., 1987. Deepwater decapod Crustacea from Eastern Australia (Penaeidae and Caridea). *Rec. Aust. Mus.*, **39**, 263-331.
- Kim, H. S. 1977. Macrura. *Illustrated Flora and Fauna of Korea*, **19**, 414 pp. (in Korean with English species catalogue).
- Kobjakova, Z. I. 1936. Zoogeographical review of the decapod fauna from the Okhotsk and Japanese Seas. *Trav. Soc. Nat. Leningr.*, **65**, (2), Zool., 185-228 (in Russian).
- Kobjakova, Z. I. 1937. Systematisch Uebersicht der Dekapoden aus dem Ochotskischen und Japanischen Meere. *Uchenie Zapiski Leningr. Univ.*, (15), 93-154, pls. 1-3 (in Russian).
- Kobjakova, Z. I. 1958. Decapoda from South Kurile Islands. *Invest. Far. East Seas USSR.*, **5**, 220-248 (in Russian).
- Kobjakova, Z. I. 1967. Decapoda (Crustacea, Decapoda) from the Possjet Bay (the Sea of Japan). In: *Issledovanija Fauny Morei, Acad. Sci. USSR*, pp. 230-247 (in Russian).
- Leim, A. H. 1921. A new species of *Spirontocaris* with notes on other species from the Atlantic coast. *Trans. Can. Inst. Tronto*, **13**, 133-145, pls. 2-6.
- Makarov, W. W. 1935. Beschreibung neuer Dekapoden-Formen aus den Meeren des Fernen Ostens. *Zool. Anz.*, **109**, 319-325.
- Makarov, W. W. 1941. The decapod Crustacea of the Bering and Chuckchees Seas. *Invest. Far. East. Seas. USSR*, **1**, 111-163 (in Russian with English summary).
- Miyake, S. 1982. Macrura, Anomura and Stomatopoda. *Japanese crustacean decapods and stomatopods in color*, **1**, 261 pp. (in Japanese).
- Miyake, S., Sakai, K., and Nishikawa, S. 1962. A fauna-list of the decapod Crustacea from the coasts washed by the Tsushima warm Current. *Rec. Oceangr. Wrk., spec.* (6), 121-131.
- Motoh, H. 1972. A faunal list of the macrurous Decapoda from Nanao Bay, Ishikawa Prefecture, middle Japan. *Bull. Ishikawa Pref. Mar. Culture Stn.*, (10), 29-52, pls. 1-16.
- Pike, R. B. and Williamson, D. I. 1961. The larvae of *Spirontocaris* and related genera (Decapoda, Hippolytidae). *Crustaceana*, **2**, 187-208.
- Rathbun, M. J. 1902. Descriptions of new decapod crustaceans from the west coast of North America. *Proc. U. S. Nat. Mus.*, **24**,

- 885-905.
- Rathbun, M. J. 1904. Decapod crustaceans of the northwest coast of North America. *Harriman Alaska Exped.*, **10**, 1-190, pls. 1-10.
- Rathbun, M. J. 1929. Arthropoda. 10m, Decapoda. *Biol. Bd. Can., Can. Atl. Fauna*, **10**, 38 pp.
- Sabine, J. 1821. Invertebrate Animals. In: Parry, W. E., Journal of a voyage for the discovery of a north-west passage from the Atlantic to the Pacific: performed in the years 1819-20 in his Majesty's ships Hecla and Griper. Appendix X. Natural History, 219-239.
- Smaldon, G. 1979. British coastal shrimps and prawns. 126 pp.
- Squires, H. J. 1957. Decapod Crustacea of the Calanus Expeditions in Ungava Bay, 1947 to 1950. *Can. J. Zool.*, **35**, 463-494.
- Squires, H. J. 1962. Decapod Crustacea of the Calanus Expeditions in Frobisher Bay, Baffin Island, 1951. *J. Fish. Res. Bd. Can.*, **19**, 677-686.
- Squires, H. J. 1965. Decapod crustaceans of Newfoundland, Labrador and the Canadian Eastern Arctic. *Fis. Res. Bd. Can., MS. Rep. ser., (Biol.)*, (810), 212 pp.
- Squires, H. J. 1968. Decapod Crustacea from the Queen Elizabeth and nearby islands in 1962. *J. Fish. Res. Bd. Can.*, **25**, 347-362.
- Squires, H. J. 1969. Decapod Crustacea of the Beafort Sea and Arctic waters eastward to Cambridge Bay, 1960-65. *J. Fish. Res. Bd. Can.*, **26**, 1899-1918.
- Urita, T. 1942. Decapod crustaceans from Saghalien, Japan. *Bull. Biogeogr. Soc. Japan*, **12**, 1-78.
- Vinogradov, L. G. 1950. Classification of shrimps, prawns, and crabs from Far East. *Bull. TINRO*, **33**, 178-358, pls. 1-53 (in Russian).
- White, A. 1847. List of the specimens of Crustacea in the collection of the British Museum, i-viii+1-143 pp.
- Wicksten, M. K. and Mendez, M. 1982. New records and new species of the genus *Lebbeus* (Caridea: Hippolytidae) in the eastern Pacific Ocean. *Bull. Southern California Acad. Sci.*, **81**, 106-120.
- Williams, A. B. and Wigley, R. L. 1977. Distribution of decapod Crustacea off northeastern United States based on specimens at the northeast Fisheries Center, Woods Hole, Massachusetts. *NOAA Tech. Rep. Cir.*, (407), 44 pp.
- Yokoya, Y. 1933. On the distribution of decapod crustaceans inhabiting the continental shelf around Japan, chiefly based upon the materials collected by S. S. Soyo-Maru during the years 1923-1930. *J. Coll. Agr. Tokyo*, **12**, 1-226.
- Zarenkov, N. A. 1960. Note about some decapod Crustacea of the Okhotsk and the Bering Seas. *Trud. Inst. Okeanol.*, **34**, 343-350, figs. 1-6 (in Russian).
- Zarenkov, N. A. 1976. On the fauna of decapods of the waters adjacent to South America. *Biol. Mor.*, (5), 8-18 (in Russian with English summary).
- Zarenkov, N. A. 1986. On the fauna of decapods in the Chuckchee Sea. *Zool. J.*, **65**, 796-798 (in Russian with English summary).

【和文要旨】

日本産モエビ科の研究—Ⅷ イバラモエビ属
林 健一

日本近海から採集されたイバラモエビ属の3新種を含む12種について、それぞれの種の特徴を述べ、生物学的な情報を与えた。新種の *L. balssi* と *L. kuboii* は第1・第2歩脚に副肢を持つ種類で、前種の特徴は短くて細い額角と、尾節背面の2対の棘である。後者の特徴は、額角が長くなく、第1触角柄部第1節に2棘または3棘を持つ点である。*L. miyakei* は小型の種類で、第1～第3歩脚に副肢がある。歩脚上の副肢の有無と地理的分布を考慮にいれて、既知種すべての一覧表を作成した。また、北西太平洋産18種の検索表を示した。