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ON SOME FRESH-WATER SHRIMPS FROM THE RYUKYU ISLANDS

(With one plate and seven text-figures)

By

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The collection of the shrimps from Yayeyama and Okinawa Island-groups of the Ryukyu Archipelagoes made by Dr. Yaichirô OKADA in 1935 and 1936 with the aid of a research fund from Marquis YAMASHINA was kindly placed at the author's disposal, and enabled him to make emendation of the genus *Neocaridina* erected by himself in 1938 and to supply detailed descriptions of the species imperfectly recorded by STIMPSON (1860). Of the collection in question, Atyid species were already reported on (KUBO, 1938) and those belonging to the genus *Palaemon* were treated in another paper which appeared quite recently. The present paper, therefore, deals chiefly with the rest and gives a list of all the species from the two island-groups.

Before proceeding any further, my warmest thanks are extended to Dr. Arata TERAO, under whose supervision this study was carried out. My best thanks are due to Dr. Yaichirô OKADA for kindly placing the material at my disposal and also to Messrs. Hazime TORII, Ichinosuke OKUKAWA and Sadayoshi MIYAKE for supplementing the material from the same region. Acknowledgment is also made to Mr. Kazuo KOBA and Mr. Heizi AOYAGI for their kindness extended in various ways.

Genus *Neocaridina* KUBO, emend.

Neocaridina KUBO, 1938, pp. 73–74.

The present genus was created by the present author basing on the species, *Caridina denticulata* DE HAAN, and separated from the genus *Caridina* by having the following characters, viz., (1) endopodite of first maxilliped without a protuberance on its distal outer margin, (2) endopodite of first abdominal appendage greatly enlarged and inverted pear-shaped in male, subtriangularly elongated in female, and (3) appendix masculina of second pleopod much enlarged, thickened and covered with rather densely set setae.

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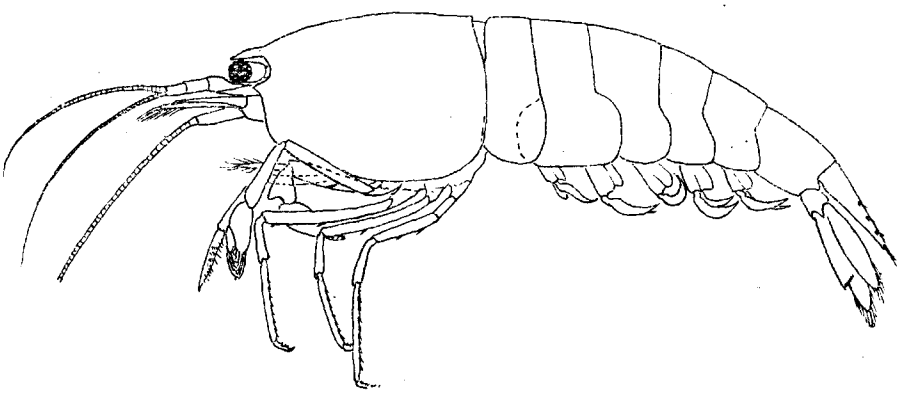
* Contributions from the Zoological Laboratory, Imperial Fisheries Institute, Tokyo, No. 110.

The author has come to a decision that *Caridina brevirostris* STIMPSON should be also transferred to this genus with a change of the generic character, viz., endopodite of first maxilliped *with or without* a protuberance on its distal outer margin.

Neocaridina brevirostris (STIMPSON)

Caridina brevirostris, STIMPSON, 1860, p. 29; BOUVIER, 1904, p. 136; 1912, p. 115; RATHBUN, 1906, p. 919, figs. 67 (a–d); BOUVIER (?) 1913, pp. 445–472, Pls. 27–29.

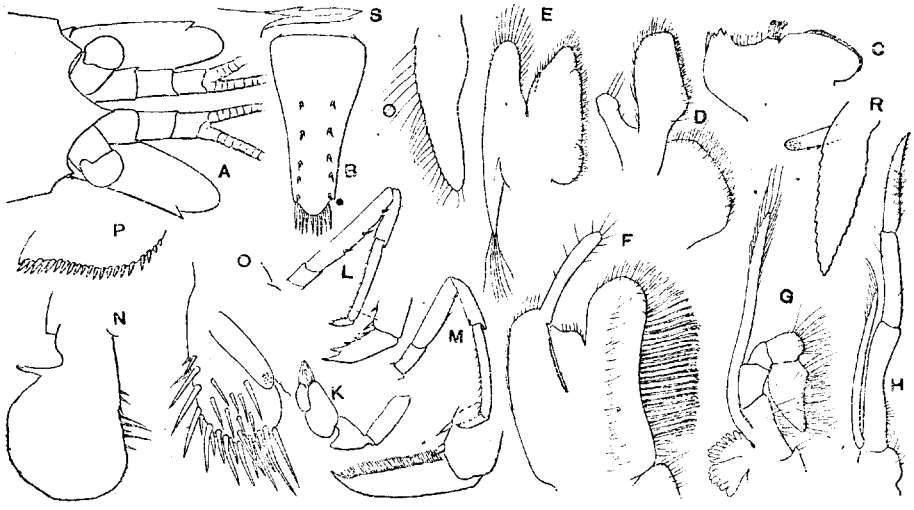
Body small, shell smooth. Rostrum short, about one-sixth the length of carapace, not surpassing first segment of antennular peduncle, triangular in upper aspect, acute, straight, directed somewhat downwards, toothless on both upper and lower borders (Text-figs. 1 and 2 *A*). Carapace without supra-orbital, hepatic and antennal spines, infra-orbital angle pointed, antero-lateral angle rounded. Abdomen rounded dorsally as well as ventrally on inferior border of pleura. Sixth abdominal segment rather slender, about 1.4 times as long as broad. Telson shorter than uropods, but somewhat longer than sixth abdominal



Text-fig. 1. *Neocaridina brevirostris* (STIMPSON), ♀, ×8.

segment, shield-like in outline, proportion against breadth measured at postero-lateral angles: length about 4.1, breadth at proximal widest region Ca. 2.1; each dorso-lateral margin armed with 5 bristles in distal three-fifths, the hindmost one situated close to postero-lateral angle, distal border greatly convex with 8–10 rather long bristles (Text-fig. 2, *B*). Antennular peduncle not reaching to distal margin of antennal scale, terminal two segments subequal in length, and somewhat longer than wide. Antennal scale rather broad, its outer margin well-calcified and ends in a spiniform process which does not reach to distal margin of the lamella. Mandible without palp, molar and incisor processes not well defined, but the former fringed with setae along distal margin, the

latter provided with 5–6 teeth along distal margin (Text-fig. 2, *C*). First maxilla composed of small endopodite, and broad inner and narrow outer laciniae, which are setose on inner margin (Text-fig. 2, *D*). Second maxilla with lamellar exopodite which is anteriorly broad and rounded, posteriorly narrow, pointed, and with many long hairs on posterior margin, endopodite minute and bare, inner endite as broad as exopodite, distally trifid (Text-fig. 2, *E*). All maxillipeds provided with exopodite. First maxilliped bears lobe-like endopodite with a protuberance on distal outer angle, exopodite with rather broad basal lobe, and inner lacinia provided with long, finely segmented hairs along inner border (Text-fig. 2, *F*). Second maxilliped inverted J-shaped, with a bilobed podobranchia (Text-fig. 2, *G*). Third maxilliped pediform, ultimate



Text-fig. 2. *Neocaridina brevirostris* (STIMPSON). *A*, upper aspect of frontal region of a male, 12 mm long, ×12; *B*, telson of a female, 14 mm long, ×16; *C*, mandible, ×28; *D*, maxillula, ×28; *E*, maxilla, ×16; *F*, first maxilliped, ×ca. 8; *G*, second maxilliped, ×20; *H*, third maxilliped, ×ca. 8; *K*, first cheliped, ×ca. 8; *L*, third leg, ×ca. 8; *M*, fifth leg, ×ca. 8; *N*, endopodite of first pleopod of male, 12 mm long, ×28; *O*, stylamblys and appendix masculina of endopodite of second pleopod of male, 12 mm long, ×40; *P*, uropodal spines of male, 12 mm long, ×40; *Q*, endopodite of first pleopod of female, 14 mm long, ×40; *R*, endopodite of second pleopod of female, ×28; *S*, rostrum, ×12.

segment a little longer than penultimate segment, but somewhat shorter than antepenult one; penultimate segment about 5 times as long as broad, about 5/6 the length of antepenult one (Text-fig. 2, *H*). First cheliped short, about 0.8 times as long as carapace, proportions against movable finger: palm and carpus 1.2, merus 2; both fingers with a tuft of long hairs at tip, carpus rather deeply

excavated on upper distal margin, merus about three times as long as wide (Text-fig. 2, *K*). Second cheliped somewhat resembles first one in appearance, but much longer than first one, about 1.1 times as long as carapace; palm 1, carpus 2.5, and merus 3.5 in proportion to movable finger; merus about 7 times as long as broad. Third leg slender, longer than second cheliped, about 1.4 times as long as carapace, ratio against propodus: dactylus 0.3, carpus 0.6, merus 0.9; dactylus accuminated at tip, about three times as long as wide at base, usually armed with 4 spinules along posterior margin, propodus about 7 times as long as wide, provided with equidistant spinules along posterior margin, carpus as long as wide, with a spinule near postero-distal angle; merus about 6 times as long as wide, armed with 3 spinules along posterior margin (Text-fig. 2, *L*). Fourth leg similar to preceding one in shape and proportion. Fifth one a little shorter than third one, about 1.2 times as long as carapace, proportion against propodus: dactylus 0.35, carpus 0.6, merus 0.86; ratio against width at middle of each segment: propodus 8, carpus 3.5, merus 4; dactylus about 4 times as long as wide, more or less curved posteriorly, inner border fringed with 45–50 rather long setae (Text-fig. 2, *M*). Endopodite of first pleopod enlarged, somewhat thickend, inverted pear-shaped in outline, provided with bar-shaped stylamblys near base of inner border (Text-fig. 2, *N*). Endopodite of second pleopod carries short stylamblys and appendix masculina on inner border, the former greatly thickened and a little longer than the latter, distal portion of inner margin furnished with rather thickly set setae, but stylamblys bare and slender (Text-fig. 2, *O*). Uropodal spines vary 20–25 in number (Text-fig. 2, *P*).

Female similar to male in general aspect, but differs from the latter in having the following characters, viz., (1) endopodite of first abdominal appendage elongate leaf-shaped, shorter than exopodite (Text-fig. 2, *Q*), and (2) endopodite of second pleopod provided with stylamblys only (Text-fig. 2, *R*).

Egg rather large, 1.5 mm, 0.9 mm in larger and shorter diameters respectively.

Foregoing description is based on 29 male specimens, measuring 10–12 mm long and 29 females, ranging 8–15 mm long, 3 of which are ovigerous.

Locality: Isigaki-zima (Table 8).

Distribution: Loo Choo (STIMPSON); Hawaii (RATHBUN); Seychelles (BOUVIER)?

Note: The rostrum of the present species is mostly toothless on both upper and lower margins. Of 58 specimens examined, only one is armed with a tooth on the upper margin of the rostrum (Text-fig. 2, *S*).

The specimens surved for the present study tally closely with the STIMPSON's and RATHBUN's descriptions of *Caridina brevirostris*, and also intimately resem-

ble *typica* of BOUVIER's *Caridina brevirostris* (1913) from Seychelles Islands, Indian Ocean. But they differ from BOUVIER's specimens in having the following characters, namely, (1) tip of both fingers of second cheliped is not provided with "ongle", and (2) the setae situated along posterior margin of dactylus of fifth leg are 45–50 in number (34 in BOUVIER's specimens).

Caridina typus MILNE-EDWARDS

Caridina typus, MILNE-EDWARDS, 1837, p. 363, Pl. 25, figs. 4–5; BATE, 1888, p. 704, Pl. 119, fig. 3; BOUVIER, 1904, p. 134; 1905, p. 88, fig. 10; ROUX, 1929, p. 235; 1904, p. 552; EDMONDSON, 1935, p. 14, fig. 3 (g–l); DE MAN, 1892 a, p. 367, Taf. 21, fig. 22; KUBO, 1938, p. 83, figs. 13–14.

Caridina exilirostris STIMPSON, 1860, p. 30; BOUVIER, 1904, p. 133 (in list).

As cited above, the present species was once studied by the present author. But he is now in a position to give variations of several bodily parts on the basis of a large number of specimens as written in the following lines.

The number of the lower rostral spines ranges from 0 to 3 (mostly 1, Table 1) in both sexes. Correlation coefficients were computed between (a) body-length without rostrum and (b) the number of lower rostral spines, but no relation was found irrespective of the sex, viz., $r_{ab}=0.34\pm0.07$ for male and $r_{ab}=0.13\pm0.07$ for female.

TABLE 1. Correlation table between body-length and number of lower rostral spine. f. . . . .frequency.

♀ Body-length (mm)	No. of lower rostral spine 0	1	2	3	f.
14~17	·	1	·	·	1
17~20	1	2	1	·	4
20~23	1	2	1	·	4
23~26	4	10	5	1	20
26~29	7	14	10	·	31
29~32	3	7	7	·	17
f.	16	36	24	1	77
%	20.7	46.7	31.1	1.2	

♂ Body-length (mm)	No. of lower rostral spine 0	1	2	3	f.
12~14	2	·	·	·	2
14~16	·	4	·	·	4
16~18	3	8	·	1	12
18~20	6	10	13	·	29
20~22	2	8	5	3	18
22~24	·	1	1	·	2
24~26	·	·	1	·	1
f.	13	31	20	4	68
%	19.1	45.5	29.4	5.8	

Male is decidedly smaller than female: body-length on average is 18.9 (mm) $\pm$0.17 in the former, but it is 26.4 (mm) $\pm$0.25 in the latter (Table 2).

TABLE 2. Body-length in mm.

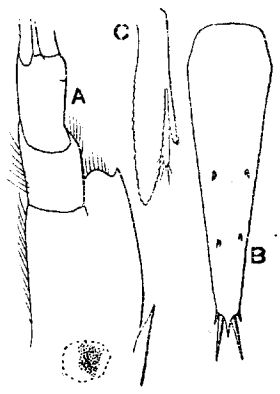
Sex	No.	Range	Mode	Mean	S.D.	C.V.
♂	68	12.5~24.0	19.0	18.9±0.17	2.1±0.12	3.2±0.18
♀	77	14.2~31.0	27.5	26.4±0.25	3.3±0.18	4.3±0.23

The above mentioned description is based on 68 males measuring 12.5~24.0 mm long and 77 females, 14.2~31.0 mm long, obtained from various localities of Ryukyu (Yayeyama-group).

Leander longicarpus STIMPSON

Leander longicarpus, STIMPSON, 1860, p. 41.

Body moderate, slender, shell smooth. Rostrum very long, about two times as long as carapace, narrow, ascends obliquely upwards, dorsal border armed with 5 equidistant spines (last one of them situated on carapace) in about proximal half, distal half toothless but one minute subterminal spine, ventral border with 7 equidistant spines, the hindmost one placed just in front of eye (Pl. 1, fig. 1). Carapace provided with antennal and pterygostomian spines. Abdomen without carina along dorsal median line. Pleura rounded on inferior border. Sixth abdominal segment long, about 0.9 times as long as carapace. Telson shorter than uropods, but as long as sixth abdominal segment, length about 12 times as much as width between postero-lateral angles, subrectangular in upper aspect, gradually reducing its width posteriorly until about one-third of that of proximal border, each dorso-lateral margin armed with two bristles, one standing at middle and the other at three-fourths; distal border acutely pointed at middle, provided with two pairs of outer shorter and inner longer (about 3 times as long as outer one) bristles (Text-fig. 3, *B*). Eyes rather large, well pigmented. Antennular peduncle (Text-fig. 3, *A*) extends to about middle of rostrum, basal segment depressed and about 0.8 times as broad as long, carries a large spine at base of outer margin, terminal margin broad, stretching to about middle of second segment, provided with spiniform process on antero-outer angle, projecting slightly beyond convex margin of lamella which intervenes between the process and second segment, second joint as long as broad, third one about one and half times as long as second segment, provided with outer and inner flagella, the latter basally uniramous with 12 joints, again distally branched into inner shorter with 12 joints and outer longer flagella. Third maxilliped pediform, reaches to or beyond distal border of second segment of antennular peduncle. All thoracic legs very slender. First cheliped the shortest of all legs, about 1.6 times as long as carapace, ratio against movable finger: palm 1, carpus 4, merus 3.8.



Text-fig. 3.
Leander longicarpus STIMPSON.
A, antennular peduncle, × ca. 10; *B*, telson, × ca. 7; *C*, endopodite of second pleopod of male, 22 mm long, × ca. 10.

Second cheliped symmetrical, much longer than first leg, about 2.3 times as long as carapace, proportion to movable finger: palm 1.5, carpus 5.2, merus and ischium 3.3, both fingers without tooth on cutting edges, merus about 10.5 times as long as wide. Third leg somewhat longer than first one. Fourth leg about 2.5 times as long as carapace; propodus 3.1, carpus 1.9, merus 3.2, ischium 1.5 in proportion against dactylus; dactylus slender, accuminate at tip. Fifth leg closely resembles third and fourth legs in general features, but a little longer than fourth one. Endopodite of second pleopod carries shorter stylamblys and longer (about one and half times as long as stylamblys) appendix masculina near middle of inner border.

The description mentioned above is based on a male, measuring 22.0 mm long, obtained from Sonai, Iriomote-zima (Yayeyama-group). Seven males, ranging from 19.0 to 22.0 mm in body-length and ten females (1 ovigerous), 21.5～36.6 mm long, were also examined.

Note: Female is closely allied to male in general aspect, but it differs from the latter in having stylamblys only on inner border of endopodite of second abdominal appendage.

The ovum is subglobular, about 1.0 mm in larger and 0.8 mm in shorter axis.

TABLE 3. Measurements of *Leander longicarpus* in mm.

No.	Sex	Body length	Rostrum	Carapace	Second cheliped					No. rostral spine	
					Isch.	Merus	Carpus	Palm	Finger	upper	lower
1	♂	21.2	8.2	5.0	2.0	2.2	3.5	1.2	0.8	5+1	7
2	"	22.0	8.5	5.0	2.3	2.2	3.6	1.0	0.8	6+1	7
3	"	22.0	—	5.1	2.8	2.6	4.2	1.2	0.9	—	—
4	"	19.0	7.0	4.5	2.0	2.0	3.4	1.0	0.7	5+1	6
5	"	21.0	—	5.0	2.4	2.5	4.0	1.2	0.8	—	—
6	"	19.4	7.0	4.6	1.7	2.4	3.2	1.0	0.7	5+1	5
* 7	"	22.0	8.1	5.0	2.9	2.8	4.4	1.1	0.7	5+1	7
8	"	22.0	8.5	4.8	2.2	2.6	3.8	1.1	0.8	5+1	7
9	♀	25.0	10.4	6.0	3.0	3.0	4.7	1.4	1.1	4+1	6
10	"	21.5	8.2	5.5	3.2	2.8	3.6	1.2	0.9	5+1	6
11	"	21.5	7.5	5.0	2.3	2.6	4.0	1.1	0.9	5+1	6
°12	"	27.2	11.0	6.5	2.8	3.5	5.3	1.6	1.1	6+1	7
13	"	24.0	8.6	6.0	2.4	2.8	4.2	1.3	0.8	5+1	6
14	"	26.2	9.5	6.2	—	—	—	—	—	5+1	6
15	"	24.6	8.7	6.2	2.7	3.0	4.6	1.3	1.0	5+1	7
16	"	22.5	8.5	5.7	2.4	2.8	4.1	1.2	0.9	5+1	7
17	"	23.0	8.0	5.1	2.3	2.5	3.8	1.1	0.8	5+1	7
18	"	36.6	11.4	9.5	4.0	5.0	7.5	2.7	1.8	6+1	6

*....Neotype. °....Ovigerous.

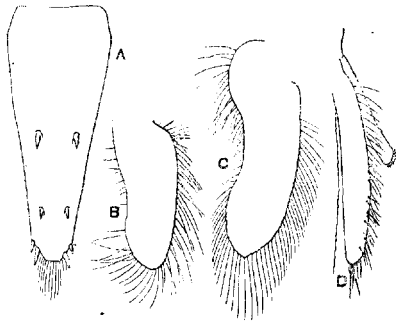
The rostral spines show variations in number, viz., 4～6+1 in upper and 5～7 on lower border. But they are usually 5+1 on dorsal and 6 or 7 on ventral border (Table 3).

The present species intimately resembles *Leander longipes* ORTMANN (1891) and *Leander debilis* (DANA) (1852), but it is easily separable from *L. longipes* in having (1) longer sixth abdominal segment, (2) much longer carpus of second thoracic leg (Table 3) and (3) rostrum trifid at tip. Differs from *L. debilis* in having such characters, viz., (1) second pair of thoracic legs much longer than the first one (both pairs subequal in *L. debilis*) and (2) chela shorter than half the carpus.

Palaemon modestus DE MAN

Palaemon (*Parapalaemon*) *modestus*, DE MAN, 1892a, pp. 469–471, Taf. 27, fig. 43.

Body moderate, somewhat laterally compressed, shell smooth. Rostrum rather shallow and short, about half as long as carapace, mostly horizontal but slightly reflexed near apex, dorsal carina extends to about middle of carapace, bearing 10 equidistant spines, posterior six of them situated on carapace and the foremost one placed near its tip, lower border armed with two spines in distal one-third (Pl. 1, fig. 2). Carapace with antennal and hepatic spines, antero-lateral angle not spiniform. Abdomen dorsally rounded. Telson longer than sixth abdominal segment, but shorter than uropods, shield-like in upper aspect, ratio against width measured at postero-lateral angles: proximal border ca. 2, length along median line ca. 6; each dorso-lateral margin armed with two bristles, anterior one situated at middle and the other placed about midway between centre and tip, distal border trapezoid, with outer shorter and inner longer bristles on its either postero-lateral border (Text-fig. 4, *A*). Antennular peduncle reaches to tip of rostrum. Antennal scale extending beyond tip of rostrum by one-fourth. First cheliped slender, about 1.4 times as long as carapace: palm 1, carpus 4, merus 3, ischium 1.7 in proportion to movable finger; both prehensile edges without tooth. Second leg rather large, covered with rather thickly set microscopic setae, about 2.7 times as long as carapace, palm and merus a little longer, carpus about one and half times, ischium as long as movable finger;



Text-fig. 4. *Palaemon modestus* DE MAN. *A*, telson, ♀, × ca. 3; *B*, endopodite of first pleopod of female, 53.5 mm long, ×10; *C*, endopodite of first pleopod of male, 62.0 mm long, ×10; *D*, stylamblys and appendix masculina of endopodite of second pleopod of male, 62.0 mm long, ×10.

cutting edge of movable finger with two small teeth at about proximal one-third, but fixed one provided with one small tooth fitting to those opposite, palm oval in cross-section (Pl. 1, fig. 2). Third leg somewhat stouter than first cheliped, about 1.4 times as long as carapace, dactylus acuminated, slightly recurved backwards at tip, about one-third of propodus; propodus about 6 times as long as wide; carpus about two-thirds of propodus, merus as long as propodus, about 5 times as long as wide, ischium slightly longer than half of propodus. Fourth and fifth legs closely allied to third one in general aspect and size. Endopodite of second abdominal appendage provided with shorter stylamblys and longer (about twice as long as stylamblys) appendix masculina fringed with rather thickly set setae on inner margin.

Female closely tallies with male in general appearance, but is easily distinguished from the latter by having shorter endopodite of first abdominal appendage (Text-fig. 4, *B* and *C*), and slender stylamblys only on inner border of endopodite of second pleopod.

The preceding description is based on a male specimen, 62.0 mm long. Two females measuring 36.5 and 53.5 mm (ovigerous) in body-length were also examined.

Note: The specimens at my disposal well agree with DE MAN's description of *Palaemon* (*Parapalaemon*) *modestus* obtained from Flores. The measurements of bodily parts are given in the following table.

TABLE 4. Measurements of *Palaemon modestus* in mm.

No.	Sex	Body length	Second thoracic leg											
			Total length		Ischium		Merus		Carpus		Palm		Finger	
			r	l	r	l	r	l	r	l	r	l	r	l
1	♂	62.0	59.0	55.5	9.0	9.0	11.0	11.0	14.0	13.0	11.5	10.0	10.5	9.5
2	♀	53.5	49.5	—	7.5	—	8.5	—	10.0	—	6.5	—	7.0	—
3	♀	36.5	—	—	—	—	—	—	—	—	—	—	—	—

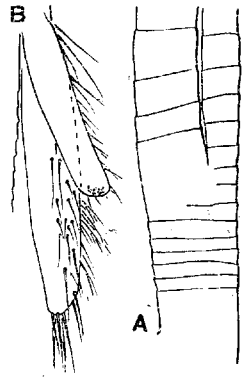
r. . . . . right, l. . . . . left.

Palaemon riukiuensis KUBO

Palaemon riukiuensis, KUBO, 1940, p. 21, figs. 12–13.

Antennular peduncle carries one pair of inner thinner and outer thicker flagella, the latter one proximally uniramous with seven joints, but distally branched into two, shorter and longer rami, the shorter one thinner than the other and comprising 45~50 segments (Fig. 5, *A*). Endopodite of second abdominal appendage of male provided with bar-shaped stylamblys and appendix

masculina on inner proximal border, the former with microscopic curled setae on apex, the latter about tweice as long as stylamblys, fringed with rather thickly set setae along inner margin and apex (Text-fig. 5, *B*), but that of female with stylamblys only.



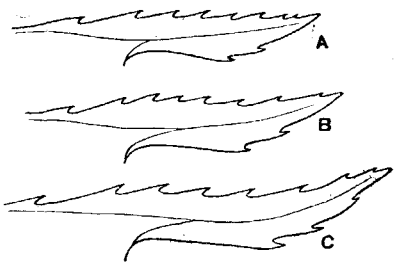
Text-fig. 5. *Palaemon riukiuensis* KUBO. *A*, basal portion of outer antennular flagellum, ×20; *B*, stylamblys and appendix masculina, ×20.

Seven males, 31.5~51.5 mm long, and six females, (2 ovigerous) measuring 36.0~46.0 mm, in body-length were obtained from several localities of Ryukyu.

Palaemon lar FABRICIUS

Palaemon lar, ORTMANN, 1891, 5, p. 724; MIYAKE, 1938, p. 110; ESTAMPADOR, 1937, p. 488.
Palaemon (Eupalaemon) lar, DE MAN, 1892 a, p. 445; ROUX, 1929, p. 236; 1932, p. 565; 1934, p. 531; 1934 a, p. 217.
Palaemon ornatus MILNE-EDWARDS, 1837, p. 396; DE MAN, 1879, p. 168.
Palaemon vagus HELLER, 1865, p. 417, taf. II, figs. 42–43.
Palaemon spectabilis HELLER, 1865; p. 113, taf. 10, fig. 8.
Palaemon ruber (HESS, 1865, p. 39, taf. 7, fig. 20); DE MAN, 1887, p. 710; ORTMANN, 1891, p. 705, taf. 47, fig. 3.
Bithynis lar BATE, 1888, p. 789, Pl. 129, fig. 1.
Macrobrachium lar MAKI and TUTIYA, 1923, p. 56, Pl. 5, fig. 1.

The shape of rostrum is found to vary in the specimens under my examination, but three types may be recognized as shown in the accompanying figure (Text-fig. 6), viz., "A" type which is comparatively short and almost horizontally straight; "B" type or intermediate type which is as short as preceding type, but very slightly curved upwards, and upper border is somewhat convex near the basal portion; and "C" type which is comparatively long, reflexted in about distal half and very slightly convex on dorsal proximal border. It is worthy of note that "A" type is mostly found in younger specimens.



Text-fig. 6. Three types of rostrum of *Palaemon lar* FABRICIUS. *A*, type "A", figured from a male, 71.5 mm long, ×1.6; *B*, type "B", figured from a female, 86.0 mm long, ×1.6; *C*, type "C", figured from a female, 86.0 mm long, ×1.6.

I am inclined to think that the second pair of thoracic legs are usually symmetrical in this species. Though sometimes very remarkable asymmetry has been observed in these legs (Table 5), such phenomenon is probably caused by the regeneration of lost legs.

TABLE 5. Measurements of *Palaemon lar*.

Sex	♂			♀		
No.	Body length	L. of 2nd legs		Body length	L. of 2nd legs	
		right	left		right	left
1	91.5	—	50.6	84.0	51.5	15.3
2	101.0	151.0	—	86.0	—	68.5
3	69.0	66.2	—	86.0	69.0	—
4	85.0	72.5	—	71.0	54.5	55.0
5	47.0	34.3	31.8	67.0	—	41.0
6	66.0	49.0	—	72.0	59.0	51.0
7	99.0	—	145.0	89.0	73.0	74.5
8	105.0	164.5	156.6	76.5	46.0	—
9	104.0	122.5	124.0	78.0	57.0	55.0
10	106.0	151.0	145.0	73.0	—	54.0
11	109.0	126.0	135.0	41.0	22.5	—
12	59.5	38.0	—			
13	61.3	47.0	—			
14	43.5	30.0	26.5			
15	133.0	203.0	—			
16	120.0	107.0	150.0			
17	37.0	—	24.5			

L. ....length.

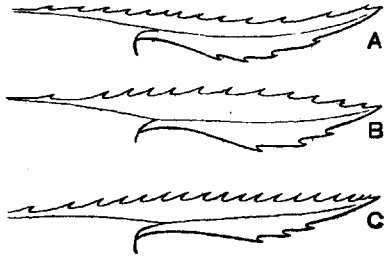
Palaemon sundaicus HELLER

Palaemon sundaicus, HELLER, 1862a, p. 415, taf. 2, figs. 38 and 39; 1865, p. 115; ORTMANN, 1891, p. 719; COWLES, 1914, p. 355, Pl. 2, fig. 3; KEMP, 1918, p. 261; YÜ, 1931, p. 276; ESTAMPADOR, 1937, p. 489; KUBO, 1940, p. 20, fig. 11.

Palaemon (Eupalaemon) sundaicus, DE MAN, 1892a, p. 437, Taf. 26, fig. 35; 1897, p. 779 and 10, Pl. 37, fig. 71; ROUX, 1932, p. 564.

Macrobrachium sundaicus, MAKI and TUTIYA, 1923, p. 57, Pl. 2, fig. 2.

The specimens at my disposal have the rostrum as long as the carapace (Table 6). The variation in the rostrum-profile is shown in Fig. 7. In normal type, the upper border is slightly concave, with the tip not above the level of the dorsal border of the carapace; on the other hand, the lower border is decidedly convex (Text-fig. 7, *A*). The rostral spines range from 10 to 17 (mostly 12 or 13) on the dorsal border and from 3 to 5 (mostly 4) on the ventral. The second



Text-fig. 7. Rostrum-profile of *Palaemon sundaicus* HELLER. *A*, normale type, figured from a male, 45.0 mm long, ×2.5; *B*, an aberrant form figured from a male, 59.0 mm long, ×2.5; *C*, an aberrant form figured from a female, 43.7 mm long, ×3.

chelipeds are subequal in length and symmetrical (Table 6). The ova are small, measuring 0.6~0.8 mm in the longer, and 0.5~0.6 mm in the shorter diameter.

TABLE 6. Measurements of *Palaemon sundaicus* in mm.

Specimen No.	Sex	Body length	Carapace	Rostrum	Length of 2nd legs		No. of rost. spines	
					Right	Left	Upper	Lower
1	♂	40.7	12.5	11.0	36.0	36.0	12	3
2	,,	42.0	12.1	12.0	34.0	34.0	14	5
3	,,	33.2	10.2	9.7	26.1	—	14	4
4	,,	27.2	9.0	9.0	21.0	21.0	12	3
5	,,	36.6	11.6	11.8	—	—	10	4
6	♀	59.0	18.5	14.0	60.0	60.0	12	3
7	,,	45.0	15.1	14.0	—	—	13	4
8	,,	30.5	9.6	10.0	24.2	—	12	3
9	,,	42.0	15.0	13.0	40.0	35.0	12	4
*10	,,	43.7	14.0	12.0	36.2	35.0	14	4
*11	,,	40.0	13.5	11.0	25.0	24.0	17	3
*12	,,	43.0	14.5	11.6	—	—	15	4
13	,,	33.2	10.9	10.5	26.5	—	14	4
14	,,	37.5	12.6	10.5	34.5	35.0	13	4
15	,,	44.5	15.6	13.5	38.4	39.5	13	3
16	,,	35.0	11.5	11.0	—	—	14	5
17	,,	25.5	8.2	7.9	—	—	13	3
18	,,	28.0	8.8	8.9	—	—	14	4
19	,,	25.5	8.0	8.9	—	—	13	4
20	,,	22.0	6.5	7.0	—	—	12	4
*21	,,	43.0	14.0	13.1	—	—	13	4
*22	,,	42.2	14.4	13.5	36.4	36.6	13	4
23	,,	39.5	12.2	11.3	32.0	32.5	13	4
24	,,	35.7	11.0	10.0	—	—	11	4
25	,,	33.5	9.0	11.0	29.0	—	12	4
26	,,	29.5	9.1	9.1	—	—	11	4
27	,,	32.1	10.0	10.2	—	—	12	4

*....Ovigerous.

Five males, 27.2~42.0 mm long, and 22 females (of these, 5 are ovigerous) ranging 22.0~59.0 mm in body-length, were examined.

Remarks

Sixteen species of the fresh-water shrimps, so far as my knowledge goes, have been known from Ryukyu Islands. But two more species, viz., *Leander*

longicarpus STIMPSON and *Palaemon modestus* DE MAN, as given in the present paper, are newly added to the fauna of this region, hence the following 18 species (Table 7) representing two families and five genera:—

TABLE 7.

Atyidae	Palaemonidae
1. *Neocaridina brevirostris* (STIMPSON)	9. *Leander longicarpus* STIMPSON
2. *N. denticulata sinensis* (KEMP)	10. *Palaemon japonicus* DE HAAN
3. *Caridina typus* MILNE-EDWARDS	11. *P. lar* FABRICIUS
4. *C. leucosticta* STIMPSON	12. *P. philippinensis* COWLES
5. *C. grandirostris* (STIMPSON)	13. *P. riukiuensis* KUBO
6. *C. serratirostris* DE MAN	14. *P. grandimanus* RANDALL
7. *C. japonica* DE MAN	15. *P. latimanus* V. MARTENS
8. *Atya moluccensis* DE HAAN	16. *P. sundaicus* HELLER
	17. *P. longipes* DE HAAN
	18. *P. modestus* DE MAN.

Of these 18 species, two ones, namely *P. lar* and *P. riukiuensis*, are found throughout Okinawa and Yayeyama-groups; the former, however, is found more abundantly than the latter. *P. philippinensis*, *P. longipes* and *C. typus* are also rather common, although they were not obtained from Isigaki-zima and Iriomote-zima respectively in the present collection. On the other hand, it seems to me that such species as *N. denticulata sinensis*, *N. brevirostris*, *A. moluccensis*, *C. grandirostris*, *C. serratirostris*, *P. grandimanus*, *P. latimanus*, *P. modestus*, *P. sundaicus* and *L. longicarpus* are meagre.

The fauna of this region is characterized by comprising such southern elements (Table 8), viz., *P. lar*, *P. modestus*, *P. philippinensis*, *P. sundaicus*, *P. latimanus*, *P. grandimanus*, *L. longicarpus*, *C. serratirostris*, *N. brevirostris* and *A. moluccensis* but not embracing the following species, viz., *N. denticulata* (DE HAAN), *Paratya comp. improvisa* KEMP, *L. paucidens* (DE HAAN) and *P. nipponensis* DE HAAN, which are found commonly in Main Island of Japan. It follows, therefore, that Yayeyama and Okinawa Island-groups should be included in the oriental region. Furthermore, it is worth mentioning from the view point of biogeography that the distribution of the following four species belonging to southern type is extended to more northern parts of Japan, viz., *P. japonicus* extending to South Kyûsyû, *C. japonicus* to Kii, Wakayama Prefecture and *C. typus* and *P. longipes* to Pacific side of South-western half of Honsyû (Main Island of Japan).

Five species such as *N. brevirostris*, *C. typus*, *P. sundaicus*, *P. japonicus* and *P. lar* were found from caves, underground-waters and also streams on land. But so far as my investigations go, no morphological modification was

observed between these alcoholic specimens secured from caves or underground-waters and from normal habitats. It may be of interest to note that *N. brevirostris* was represented in the collection from cave only.

TABLE 8.

Species name	Locality, the present specimens obtained	Distribution
1. *N. brevirostris*	Isigaki-zima: Hukahukigusâ (in underground-water)	Ryukyu (STIMPSON); Hawaii (RATHBUN) Seychelles (BOUVIER)?.
2. *N. dent. sinensis*	Isigaki-zima: Siraho	Peking (KEMP); Shanghai, Formosa (KUBO).
3. *C. typus*	Okinawa-zima: Nakagusku-mura, Tenga-gawa, Syuri, Genka, Kim-mura, Nago, Hentona, Nakijin, Idumi, Henoki. Miyako-zima: Simaziri, Sirakawa, Hora-gawa. Isigaki-zima: Siraho, Kawahira.	Flores, Saleyer, Celebes (DE MAN); Palau (MIYAKE); Suba (EDMONDSON); Lombok (ROUX).
4. *C. leucosticta*	Okinawa-zima: Tenga-gawa, Naha, Hentona, Kim-mura. Iriomote-zima: Sonai, Urauti-gawa, Namba-gawa.	Ryukyu (STIMPSON); Kyûsyû, Sikoku, Honsyû, Formosa (KUBO); Kyûsyû (RATHBUN).
5. *C. grandirostris*	Okinawa-zima: Tenga-gawa, Nakijin.	Ryukyu (STIMPSON, KUBO).
6. *C. serratirostris*	Okinawa-zima: Tenga-gawa, Kim-mura.	Saleyer, Flores (DE MAN); Jacquinot Bay (Mélanésienne), Queensland (ROUX).
7. *C. japonica*	Okinawa-zima: Kuji-gawa, Genka-gawa, Henoki.	Japan (DE MAN); Sagami Bay (BALSS); Tanabe, Wakayama Prefecture (KUBO).
8. *A. moluccensis*	Isigaki-zima: Siraho.	Java, Sumatora, Celebes, Timor, Saleyer, Flores (DE MAN); Philippines (BLANCO).
9. *L. longicarpus*	Iriomote-zima: Sonai, Namba-gawa.	Hong Kong (STIMPSON).
10. *P. japonicus*	Okinawa-zima: Genka, Kuji, Nago, Idumi, Hentona, Henoki, Nakijin, Kim. Miyako-zima: Hora, Amagâ.	Japan (DE HAAN); Kyûsyû, Ryukyu (KUBO); Formosa (MAKI & TSUTIYA, PARISI).
11. *P. lar*	Okinawa-zima: Kim-mura, Idumi. Miyako-zima: Sirakawa, Izagâ, Miyaguni. Isigaki-zima: Kawahira. Iriomote-zima: Urauchi-gawa, Sêraba-gawa, Arabara-gawa, Hosidate.	Amboine (M.-EDWARDS); Celebes, Saleyer, Flores, Adonara, Rotti Is., Timor (DE MAN); Tahiti, Fiji, Pasananca, Mindanao, Philippines, Branda Is. (BATE); Philippines (COWLES); Formosa (MAKI & TSUTIYA); Sunda, Madagascar, Bismark Archip., Amirauté Archip. (ROUX); Palau Is. (KUBO).

12. *P. philippinensis*	Okinawa-zima: Kuji, Genka, Idumi, Hentona, Sasiki. Miyako-zima: Sirakawa, Simaziri, Miyaguni. Iriomote-zima: Urauti-gawa, Sâraba-gawa.	Philippines (COWLES, ESTAMPADOR).
13. *P. riukiuensis*	Okinawa-zima: Nakijin, Goga, Mizato. Miyako-zima: Sirakawa. Isigaki-zima: Ibarama. Iriomote-zima: Sonai.	Okinawa (KUBO).
14. *P. grandimanus*	Miyako-zima: Simozi, Hora-gawa, Sirakawa.	Hawaii (DANA, RATHBUN, BATE); Kalihi, Oahu (LENZ); Philippines (ESTAMPADOR).
15. *P. latimanus*	Okinawa-zima: Genka.	Loquilocum and Samar Is. (MARTENS); Rotti, Timor, Flores (DE MAN).
16. *P. sundaicus*	Miyako-zima: Amagâ. Iriomote-zima: Sonai, Urauti-gawa.	Java (HELLER); Flores, Celebes (DE MAN); Philippines (COWLES, ESTAMPADOR); Singoora (KEMP); Amoy (YÜ); Sunda (ROUX); Formosa (KUBO).
17. *P. longipes*	Okinawa-zima: Hentona, Kim, Kuji. Miyako-zima: Sirakawa. Iriomote-zima: Naban-gawa, Sêraba-gawa.	Japan (DE HAAN, DE MAN); Formosa (MAKI & TSUTIYA); Kamakura, Kanagawa Prefecture (KUBO), Okinawa (PARISI).
18. *P. modestus*	Iriomote-zima: Urauti-gawa.	Flores (DE MAN).

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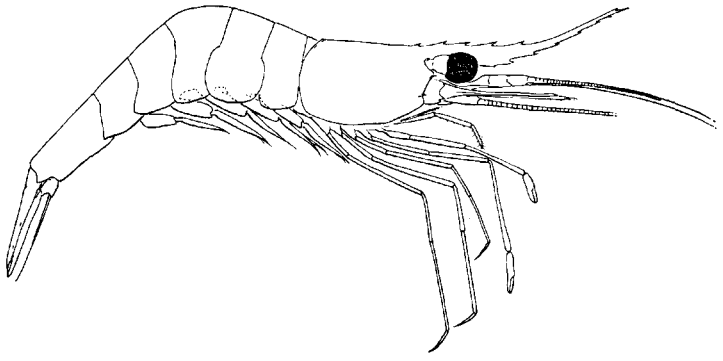

Fig. 1. *Leander longicarpus* STIMPSON, ♂, ×ca. 3.

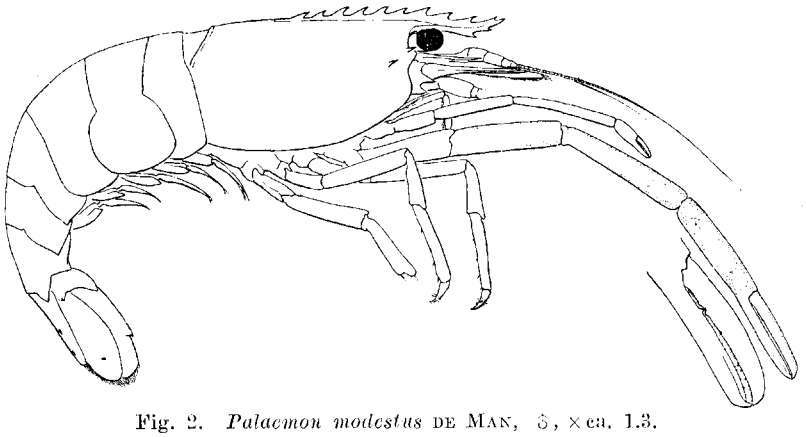

Fig. 2. *Palaemon modestus* DE MAN, ♂, ×ca. 1.3.

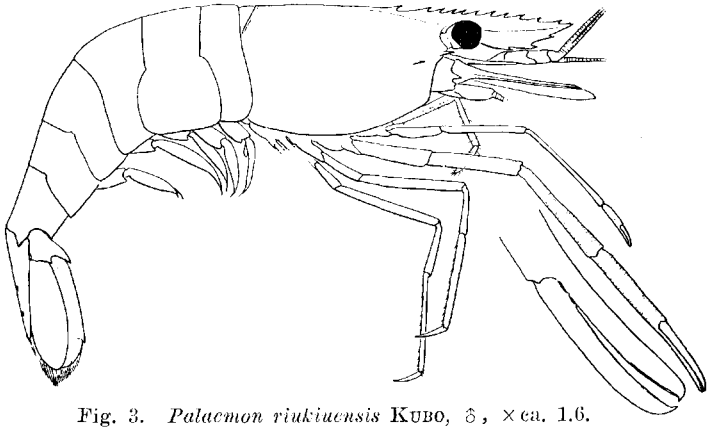

Fig. 3. *Palaemon riukiuensis* KUBO, ♂, ×ca. 1.6.