Report on Some New Atyid Shrimps (Crustacea, Decapoda, Caridea) from the Ryukyu Islands

Report on Some New Atyid Shrimps (Crustacea, Decapoda, Caridea) from the Ryukyu Islands

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SUMMARY The present paper contains the morphological description and some ecological informations of four new atyid shrimps including one new subgenus from the Ryukyu Islands, Japan. The new shrimps described herein are *Caridina denticulata ishigakiensis* subsp. nov., *C. rubella* sp. nov., *C. sakishimensis* sp. nov., and *Halocaridina* (*Halocaridinides*) *trigonophthalma* subgen. & sp. nov. The genus *Halocaridina* Holthuis, as well as the new subgenus *Halocaridinides*, are known from Japanese and its adjacent inland waters for the first time.

There have so far been many taxonomical studies on fresh-water shrimps of the family Atyidae in the Ryukyu Islands by such authors as Stimpson[1], Balss[2], Kemp[3], Kubo[4][5] and recently by Kuramoto[6]. The shrimps hitherto been recorded from this locality, referable to three genera, *Atya*, *Caridina* and *Paratya* are nine : *A. moluccensis* de Haan, *C. typus* H. Milne-Edwards, *C. nilotica* Roux, *C. leucosticta* Stimpson, *C. japonica* de Man, *C. serratirostris* de Man, *C. s. celebensis* de Man, *C. brevirostris* Stimpson and *P. compressa* (de Haan).***

The senior author has recently carried out the faunal and ecological investigation on the fresh-water shrimps in the Ryukyu Islands, from Yaku Island southward to the Okinawa Islands, Yaeyama Group and Yonaguni Island. This study reveals the presence of some interesting new and rare species in addition to the above-mentioned forms from this locality. In the present work are included only four new shrimps, *Caridina denticulata ishigakiensis* subsp. nov., *C. sakishimensis* sp. nov., *C. rubella* sp. nov., and *Halocaridina* (*Halocaridinides*) *trigonophthalma* subgen. & sp. nov. The genus *Halocaridina* Holthuis now for the first time is known from the Ryukyu Islands as well as from the adjacent waters in Japan, and the subgenus *Halocaridinides* is newly established for including the last species.

This paper mainly provides the morphological description of these species, and the reader is referred to the following paper by the senior author, S. Shokita, for the detailed ecology, distribution and larval development[7].

Received April 30, 1974.

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*** The present investigation in the Minami-daito Island found out the rare species, *Antecaridina lauensis* Edmondson, 1954, which is newly recorded from the Ryukyu Islands.

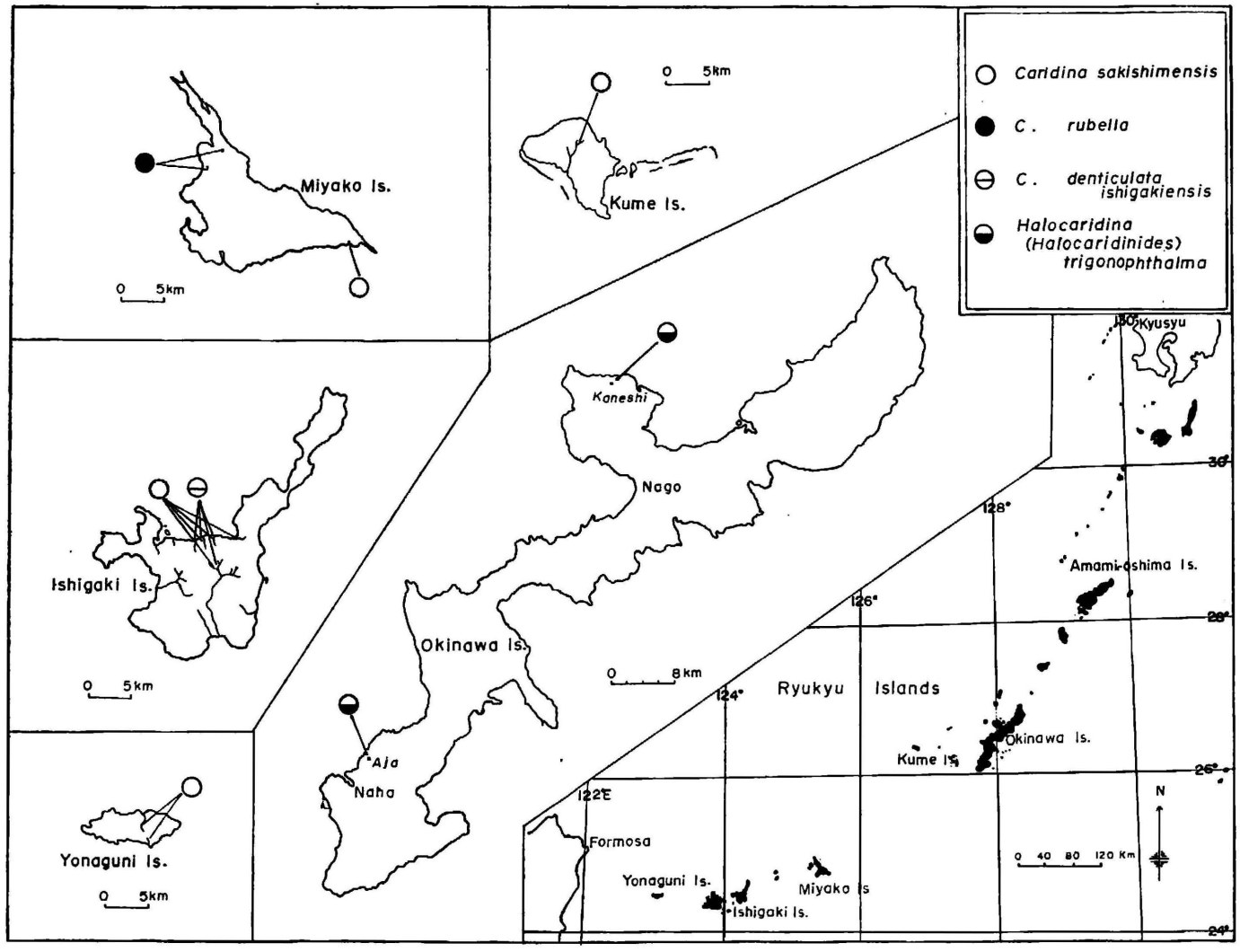

Fig. 1 Map of the Ryukyu Islands, showing the localities of the four new species mentioned in the text.

Caridina H. Milne-Edwards, 1837

Caridina denticulata ishigakiensis subsp. nov.

(New Japanese name: Ishigaki-numaebi)

(Figs. 2, 3, 4)

Material examined: Ishigaki I. : Yonehara River, Feb. 23, 1972, S. Shokita leg.—1♂, 1 ovig. ♀, 3 ♀♀; Yonehara River, Mar. 17, 1972, S. Shokita leg.—98 ♂♂, 31 ovig. ♀♀, 12 ♀♀; Miyara River, Jan. 18, 1972, S. Shokita leg.—2 ♂♂, 2 ♀♀; Sakutara River, Jan. 18, 1972, S. Shokita leg.—2 ♂♂; Arakawa River, S. Shokita leg., without other data—2 ♂♂.

Description: The rostrum is shallow and horizontally straight, exceeding the middle of the first antennular segment, but not reaching the end of the second segment. On the upper border of the rostrum, there are 2 to 11 teeth, usually 6 to 8, of which the distal one or two and the proximal one are somewhat or considerably smaller than the others. The lower border has 0 to 4 much smaller teeth, usually 1 or 2, near the apex. In the young specimens, the rostrum is feeble and acute, barely extending to the end of the first antennular segment. The frequency histogram of the rostral teeth number is shown in fig. 2.

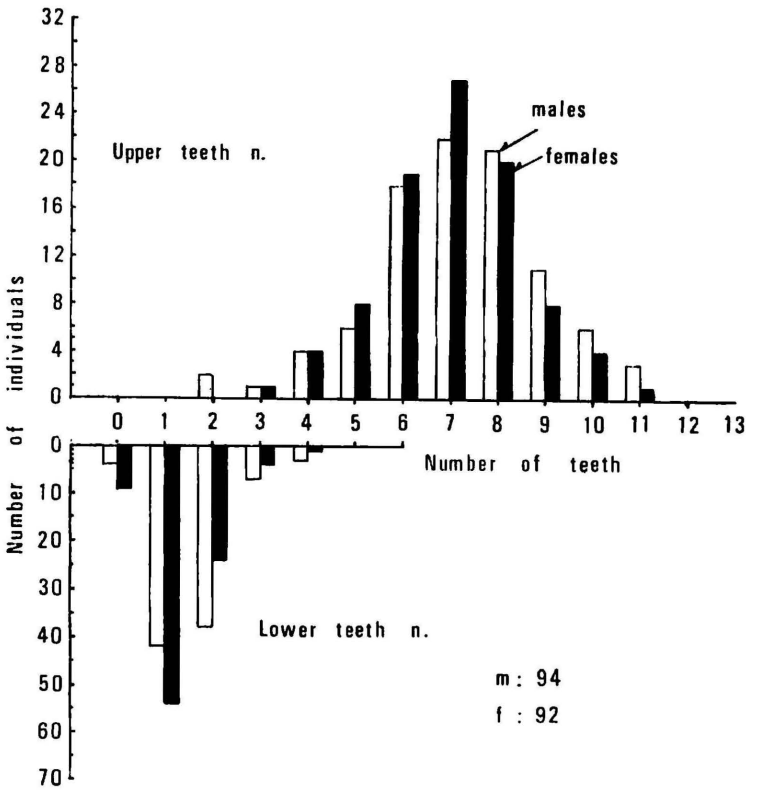

Fig. 2 The frequency histogram of the rostral teeth number in *Caridina denticulata ishigakiensis*.

The carapace is spiniform at the anterolateral corner. The pterygostomian angle is pointed into a small spine.

The preanal carina is of a low, broad and round convexity, with fine setae near the top.

The dorsal surface of the telson is ornamented with five or six pairs of small and equidistantly placed spines, of which the distal is close to the posterior margin. There are three or four pairs of subequal spines at the posterior margin; in the young specimens, the median pair is much shorter than the others.

The eyes are well developed, with a hemispherical cornea.

The antennula is stout. The stylocerite is slender and acute, outreaching the middle of the basal segment, but not exceeding its distal end. The anterolateral angle of the basal segment forms a triangular tooth barely reaching the proximal third of the second segment.

The final tooth of the antennal scale is large and triangular, being far exceeded by the lamella.

The mouthparts closely resemble those of *Caridina denticulata* de Haan. The third maxilliped, when expanded, reaches somewhat beyond the end of the antennal scale. The ultimate segment is 0.9 times as long as the penultimate, bearing a terminal claw, some other spinules and setae posteriorly.

Epipods are present on the first four pereiopods. The first pereiopods are short, outreaching the anterior margin of the carapace by the length of the chela. The fingers measure a little more than 0.6 times as long as the chela. The chela is robust, somewhat longer than the carpus. The carpus is short and thickened distally; its anterior margin is excavated deeply. The merus is longer than the chela.

The second pereiopods are much more slender than the first. The carpus is distinctly longer than the chela, and subequal to the merus in length.

The dactylus of the third pereiopods has two stout terminal spines, of which the anterior is larger and colored black; five small spines on the posterior border. The propodus is 3.6 times as long as the dactylus. The propodus of the fifth pereiopods is 3.2 times as long as the dactylus.

The endopod of the first pleopod in the male is enlarged to form a pear-shaped lamella, whose peripheral region is finely spinose; a minute appendix interna is present near the base. In the female the endopod of the first pleopod is much more elongate and narrow distally, being fringed with hairs on the outer margin throughout.

There are about 20 spines on the diaeresis of the uropodal exopod.

The ova are elliptical and large, 1.1×0.6 mm, and few in number, ca. 30.

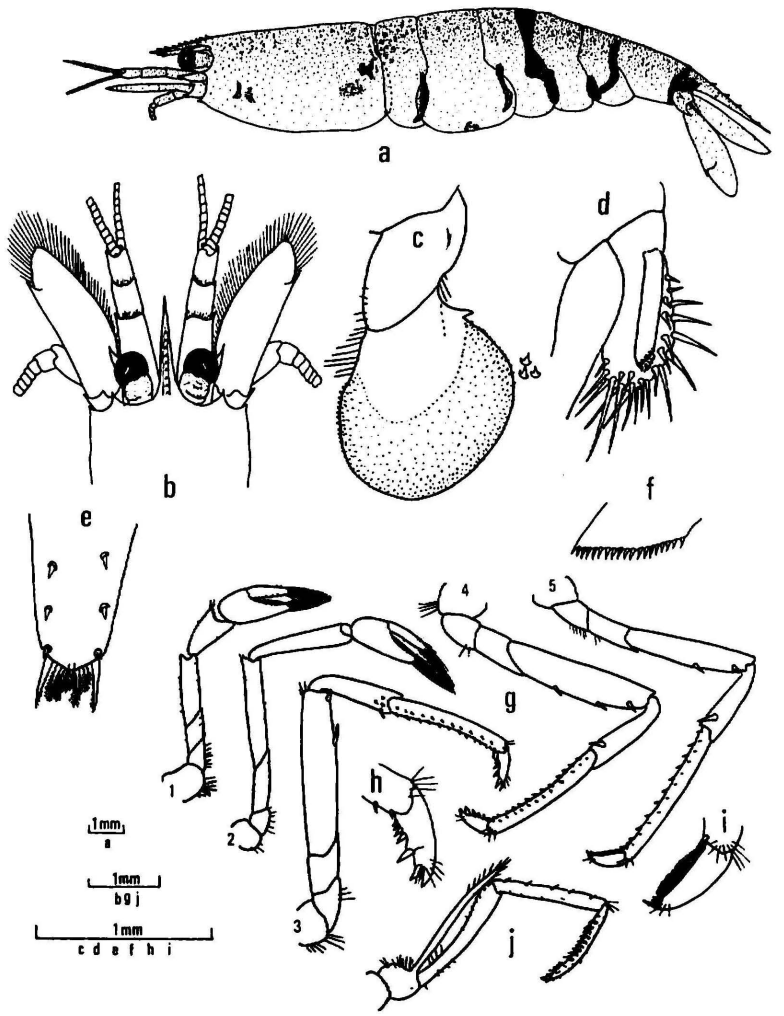

Fig. 3 *Caridina denticulata ishigakiensis* sp. nov., paratype, male. a, lateral view; b, anterior part of body in dorsal view; c, endopod of first pleopod; d, appendix masculina and appendix interna of second pleopod; e, tip of telson; f, diaeresis; g-1~5, first, second, third, fourth and fifth pereiopods; h, dactylus of third pereiopod; i, dactylus of fifth pereiopod; j, third maxilliped.

Type: A male specimen is selected as the holotype and has been deposited in the collections of the Department of Biology, University of the Ryukyus, URB-491; paratypes, URB-492.

Measurements: The holotype measures 4.5 mm in the length of the carapace. Adult males are 4.0 to 4.5 mm, and ovigerous females 4.5 to 5.5 mm.

Color in life: The body is transparent, with small blackish blue chromatophores scattered all over the surface. There are transverse narrow, somewhat curved bands of dark blue on the first, third, fourth and fifth abdominal somites. These bands are partly covered by the pleura. The most striking pattern of them is in the third somite;

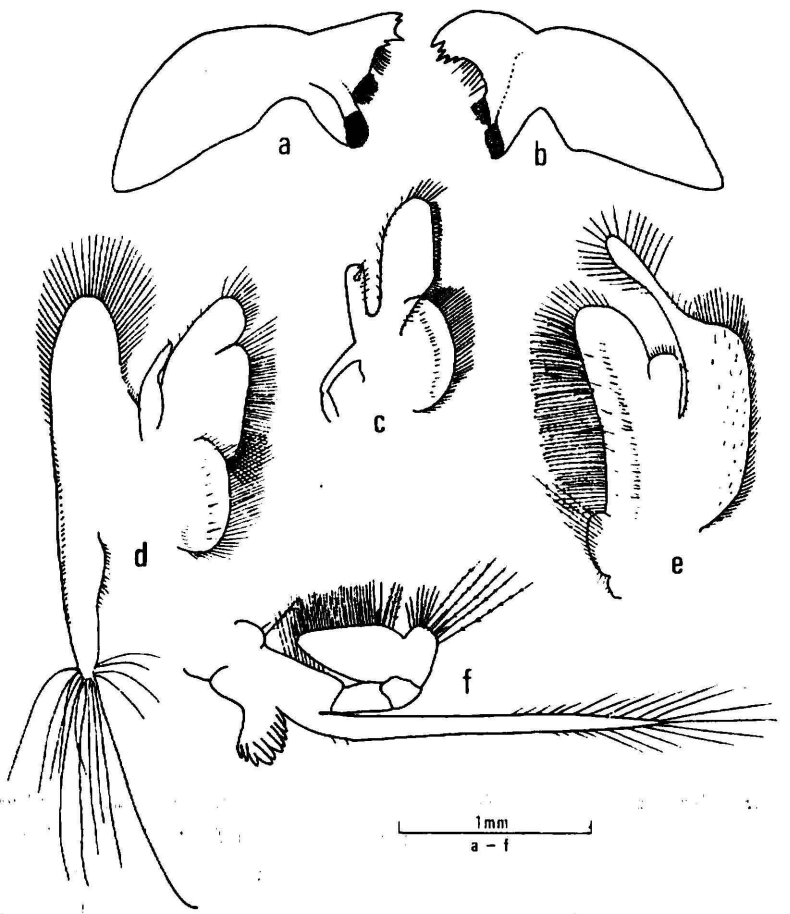

Fig. 4 *Caridina denticulata ishigakiensis* sp. nov., paratype, male. a, left mandible; b, right mandible; c, maxillula; d, maxilla; e, first maxilliped; f, second maxilliped.

it runs along the posterior border of the somite and continues to the fourth somite. The color pattern is observed considerably varied among individuals, probably irrespective of sex and age. In some specimens, these patterns are completely absent.

Ecology and distribution: The shrimps inhabit small pools near the upper stream and river-head where the current is sluggish.

Remarks: Kemp[3] separated *Caridina denticulata sinensis* from *C. denticulata* (de Haan), based upon Chinese specimens. These forms appear to be distinguished from each other in the number of the rostral teeth and in the degree of the excavation in the anterior margin of the carpus of the first pereiopods. After that, Kubo[4] erected *C. d. koreana* under the new genus of *Neocaridina*, whose type locality is Huzan, Korea. The most striking point of this form distinguishable from the two above-mentioned shrimps is the size of the endopod of the first pleopod in the male as well as of the appendix masculina.

Caridina denticulata ishigakiensis subsp. nov., is most closely similar to *C. d. sinensis*, especially in the deeply excavated anterior margin of the carpus. However, the former is mainly differentiated from the latter in the character of the rostrum; the much shorter rostrum falling short of the middle of the second antennular segment and the fewer teeth on the rostrum.

Caridina sakishimensis sp. nov.
(New Japanese name: Sakishima-numaebi)
(Fig. 5)

Material examined: Yonaguni I. : Arakawabana River, Mar. 27, 1972, S. Shokita leg. – 3 ♂♂, 4 ♀♀ ; Spring of Tendabanata, Mar. 25-26, 1972, S. Shokita leg. – 3 ♂♂, 3 ♀♀; Tabaru River, Mar. 25-26, 1972, S. Shokita leg. – 5 ♂♂, 5 ♀♀.

Ishigaki I. : Miyara River, Jan. 18, 1972, S. Shokita leg. – 2 ♀♀; Yonehara River, July 15, 1972, S. Shokita leg. – 1 ♂; Sakutara River, Jan. 18, 1972, S. Shokita leg. – 2 ♀♀; Fukido River, Mar. 17, 1972, S. Shokita leg. – 3 ♂♂, 3 ♀♀.

Miyako I. : Izaga Cave, Sept. 19, 1964, S. Shokita leg. – 2♂♂, 2♀♀; Bora River, Sept. 23, 1973, S. Shokita leg. – 3♂♂, 4♀♀; T. Kuramoto leg., without other data – 1♀.

Kume I. : Shirase River, Sept. 29, 1973, S. Shokita leg. – 2♂♂, 3 ♀♀.

Description: The rostrum is short, extending to or somewhat beyond the middle of the second antennular segment. It is rather high and curved feebly downwards. The upper margin bears 4 to 6 small teeth near the tip only, but O in two young specimens, and 12 teeth in one male exceptionally. On the lower border are placed 4 to 6 teeth, and 2 in the two young specimens abovementioned. These teeth are very small and indistinct in some specimens.

The inferior orbital angle of the carapace is produced into an acute projection. The pterygostomian angle is rectangular or a little more acutely produced. Fine hairs are grown over the entire surface of the body.

The preanal carina is distinct and rounded, with an indistinct angle posteriorly.

The dorsal surface of the telson bears five or six pairs of small spines. The posterior margin of the telson is rounded, with a minute process in the middle. The intermediate ones of the posterior spines are five to ten, the inner ones of which are longer than the outer.

The eyes are well developed.

The antennula is robust, with the short segments. The stylocerite is slender, with an acute tip extending beyond the middle of the basal segment, but not reching the tip of the same segment. The anterolateral angle of the basal segment is produced into a blunt tooth, not reaching the middle of its segment.

The final tooth of the antennal scale is large and triangular, being far overreached by the anterior margin of the lamella.

The mandible is normal. The incisor process ends in about seven irregular teeth. The molar process is provided with short, brush-like spines; between both the processes there are thin tufts of setae. The maxillula is normal. The upper endite is rather broad. The palp is distinct. The upper and the lower endites of the maxilla are subdivided. The scaphognathite tapers posteriorly, with long hairs at the posterior end. The first maxilliped consists of the exopod bearing a well-developed caridean lobe, the broad palp whose tip is slightly incised and the bilobed endite. The second maxilliped is typical of the genus. The third maxilliped reaches the anterior border of the lamella of the antennal scale. The ultimate segment is about 0.8 times as long as the penultimate, with a terminal claw colored black, spinules and setae.

The chela of the first pereiopods is robust. The fingers are slightly shorter than the palm. The carpus is short and subtriangular in lateral view, the anterior margin being deeply hollowed; it is about as long as high, subequal to the merus in length, and somewhat shorter than the chela.

The second pereiopods are much more slender than the first. The chela is slightly shorter than the carpus.

The dactylus of the third pereiopods terminates in two stout spines and other four small spinules on the posterior border. The propodus is 4.5 to 4.8 times as long as the dactylus. The propodus of the fifth pereiopods is 4.5 to 5.0 times as long as the dactylus, whose posterior margin is fringed with many minute, closely packed spinules. Epipods are present on the first four pereiopods.

The endopod of the first pleopod in the male is subtriangular, with a distinct appendix interna. The appendix masculina is large and much longer than the interna.

There are about 22 spinules on the diaeresis of the uropodal exopod.

Type: A female specimen is designated as the holotype and is deposited in the collections of the Department of Biology, University of the Ryukyus, URB-493; paratypes, URB-494.

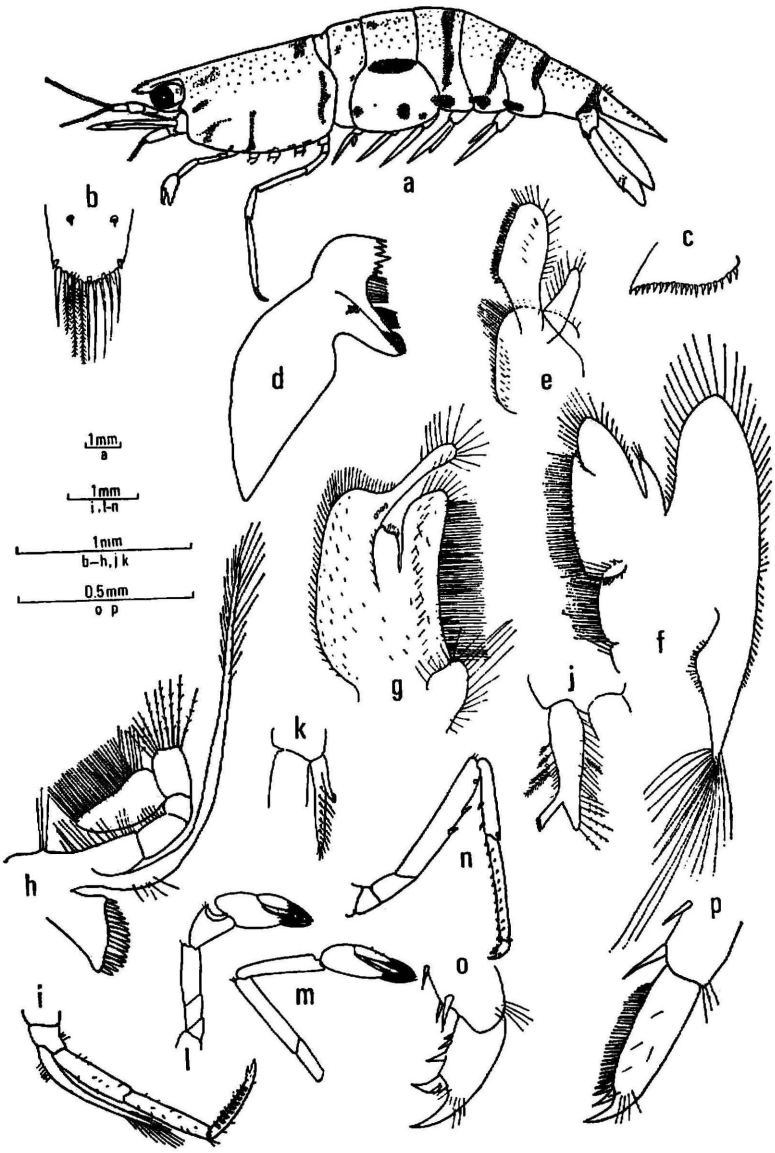

Fig. 5 *Caridina sakishimensis* sp. nov., paratype, male. a, lateral view; b, tip of telson; c, diaeresis; d, mandible; e, maxillula; f, maxilla; g, first maxilliped; h, second maxilliped; i, third maxilliped; j, endopod and appendix interna of first pleopod; k, appendix masculina and appendix interna; l, first pereiopod; m, second pereiopod; n, third pereiopod; o, ductylus of third pereiopod; p, ductylus of fifth pereiopod.

Measurements: The holotype measures 6.0 mm in the length of the carapace. Three males are 2.8 to 4.6 mm, and three females 3.4 to 7.2 mm.

Color in life: The color pattern is considerably varied among individuals, but the basic pattern is rather stable. The variation appears to be attributed to some extent to the difference of the localities. The body is transparent, with either small or large, short or long blackish blue blotches. A long vertical band is marked along the posterior margin of the carapace. Some other small spots are either present or absent. There is a transverse band laterally just at the base of the second abdominal pleuron. In the specimens from Ishigaki Island, the pleuron possesses two large patches. While, these patches are only partly left in the specimens from Yonaguni Island. In the third somite is present a long vertical band running almost through the length, which is diversed below. The following three somites bear some short patches and spots.

Ecology and distribution: This species lives under stones in the depths of the mountain streams, associated together with *Caridina typus* and *C. leucosticta*, and is also in the caves in Miyako Island. The shrimp is distributed throughout the Sakishima Group.

Remarks: The present species may fall into the *Caridina brevirostris* group proposed by Bouvie[8], and is characterized by the short rostrum with some small teeth restricted only near the apex. This character is diagnostic of the species and comes to the marked point to distinguish it from the other species of this group.

Caridina rubella sp. nov.

(New Japanese name : Ashinaga-numaebi)

(Fig. 6)

Material examined: Miyako I.: Izaga Cave, Sept. 19, 1964, S. Shokita leg. – 4 ♀♀, 2 sp. (damaged); Morikaga Cave, May 28, 1965, T. Kuramoto leg. – 1 ♂ (strongly damaged); Nikadori, Hirara City, in well, Apr. 16, 1971, S. Shokita leg. – 1 ♂, 1 sp.

Description: The rostrum is nearly straight horizontally, reaching the middle of the third antennular segment. It is deep in about the middle. The upper margin is straight and armed with 25 to 32 small teeth, of which 10 to 12 teeth are placed behind the orbit on the carapace; these teeth are close together and located throughout the length; the most proximal tooth stands at about the anterior third of the carapace. The lower border, except for a short terminal portion, is serrated into 11 to 23 teeth. The lateral ridge, which is ill-defined anteriorly, continues backwards to the anterior margin of the orbit.

The inferior orbital angle of the carapace is angulated squarely. The distinct antennal spine is present. The pterygostomian angle is broadly angulate.

The abdomen is smooth. The pleuron of the fifth somite has the posterior angle narrow and blunt. The sixth somite measures about twice as long as the fifth, slightly

shorter than the telson; the posterolateral angle is produced into a triangular lobule.

The preanal process is of a simple swelling, with a small spine and thin setae at the top.

The telson is elongate and the posterior margin is broadly rounded. It is 3.4 times as long as broad. On the dorsal surface, in the posterior half of the telson, there are five pairs of small spines which are rather equidistantly set. The posterior margin bears 11 spines; a pair of lateral small spines and five pairs of inner long and stout spines, of which the outermost is the longest.

The eyes are rather reduced, but are provided with the cornea pigmented. The peduncle is short and stout.

The stylocerite is well developed, with an acute tip reaching feebly beyond the anterior margin of the basal antennular segment. The anterolateral angle of the basal segment is somewhat projected into a triangular process. The second segment is shorter than the basal, but is much longer than the third.

The basicerite of the antennal peduncle is devoid of the lateral spine. The carpocerite is cylindrical, slightly exceeding the end of the basal antennular segment. The antennal scale far overreaches the end of the antennular peduncle ; its outer margin is straight or feebly concave, terminating in a very strong tooth which is far exceeded by the lamella; the anterior margin of the lamella is narrowly rounded.

The mouthparts are typical of the genus. The mandible has the incisor process whose distal edge is indented for six teeth. The molar process is thickly covered with short bristles; between both the processes are grown long thin hairs. The third maxilliped almost reaches the end of the antennal scale. The ultimate segment ends in two pointed teeth; the posterior border is beset with many tufts of setae in about the proximal half. The penultimate segment is somewhat longer and stouter than the ultimate, with many tufts of thin setae posteriorly. The antepenultimate segment is as long as the ultimate. The exopod reaches beyond the end of the antepenultimate segment. A small epipod is present.

The first pereiopods extend to the second antennular segment. The chela is short and narrow. The fingers are thin and distinctly longer than the palm. The carpus is more than one and a half times as long as the chela, and slightly longer than the merus; the anterior margin is not excavated deeply.

The second pereiopods almost reach the end of the antennal scale. The chela is closely similar to that in the first pereiopods. The carpus is slender and elongate, measuring twice as long as the chela; no distinct excavation is present at the anterior end. The merus is somewhat shorter than the carpus. The ischium is half as long as the merus.

The ambulatory pereiopods are elongate and slender. The third pereiopods reach with half the length of the propodus beyond the antennal scale. The dactylus of the

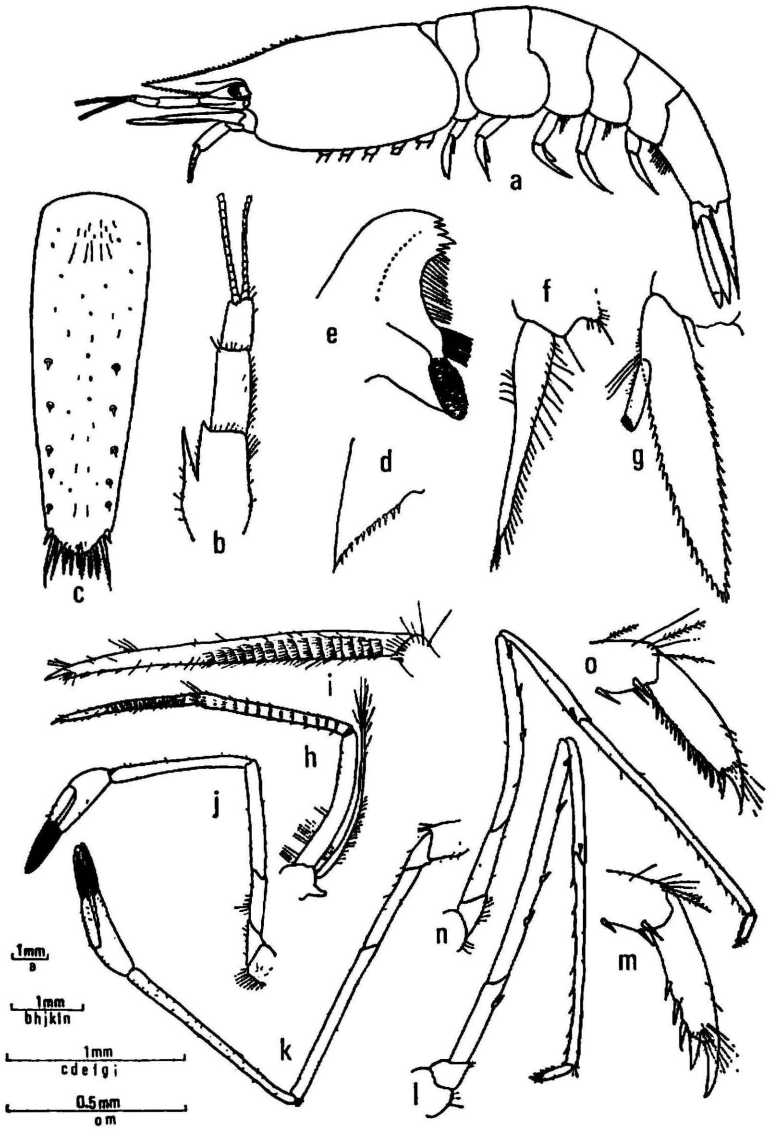

Fig. 6 *Caridina rubella* sp. nov., paratype, female. a, lateral view; b, antennula; c, telson; d, diaeresis; e, mandible; f, endopod of first pleopod; g, appendix interna and endopod of second pleopod; h, third maxilliped; i, penultimate segment of third maxilliped; j, first pereiopod; k, second pereiopod; l, third pereiopod; m, ductylus of third pereiopod; n, fifth pereiopod; o, ductylus of fifth pereiopod.

third pereiopods is narrow, bearing two strong claws distally, and other three spines on the posterior border. The propodus is more than four times as long as the dactylus, with nine small spines posteriorly. The carpus is slightly longer than half the length of the propodus, and possesses a subterminal spine laterally. The merus is longer than the carpus, with four strong spines on the posterior border. The ischium has a single spine. The fourth pereiopods well resemble the third. The fifth pereiopods are much more slender and longer than the third. The dactylus bears two strong teeth terminally and 13 other smaller spines posteriorly. The propodus is well elongate and 5.6 times as long as the dactylus. The carpus is less than half the length of the propodus, with a tooth subterminally. The merus is distinctly shorter than the propodus, with three large teeth posteriorly.

The endopod of the first pleopod of the male is small and distinctly tapers distally, and hirsute marginally. The appendix masculine is well-developed and covered with bristles, much longer than the appendix interna.

The uropodal exopod terminates in a sharp distinct tooth, with 11 spines on the diaeresis.

The ova are rather small and numerous.

Type: A female is selected as the holotype and has been preserved in the collections of the Department of Biology, University of the Ryukyus, URB–495; paratypes, URB–496.

Measurements: The holotype measures 6.1 mm in the length of the carapace, and two females 6.0 and 5.4 mm.

Color in life: The body is translucent with reddish brown. The gastric region has a tincture of yellow.

Ecology and distribution: The specimens from Miyako Island were collected in either caves or wells, which are saline.

Remarks: The new species is to be incerted into the *Caridina africana* group, and is most closely related to *C. serratirostris* de Man which has a wide distribution in the Indo-West Pacific region including the Okinawa Islands. The differences between the two species may be detected in the number of the lower rostral teeth, in the arrangement of the spines on the posterior margin of the telson, in the proportional length of the pereiopods, especially in the first pereiopods, the spinulation on the posterior margin of the dactylus of the first pereiopods, and in the number of the spines along the diaeresis.

Among the *Caridina* species found in the Ryukyu Islands this species is remarkable for possessing the long ambulatory pereiopods, after which the new Japanese name is given. The eyes to some degree reduced, though with pigment in the cornea, appear to be resulted from the habit of inhabiting caves.

Halocaridina Holthuis, 1963
(New Japanese name: Shiomizu-numaebi zoku)
Halocaridinides subgen. nov.
(New Japanese name: Chika-numaebi azoku)

Definition of subgenus: Atyid shrimps of small size. Rostrum unarmed. Supraorbital, antennal and pterygostomian spines absent. Telson broad, with two pairs of dorsal spines. Eyes reduced, but with pigment, cornea conical. Carpus of first two pereiopods excavated anteriorly. Palm of chelipeds distinct. Exopods absent from all pereiopods. Epipods on first three pereiopods. Pleurobranchs on first four pereiopods. First male pleopod without appendix interna. Uropodal exopod ending in a tooth, without movable spines at its inner side. Some spines along diaeresis.

The type and only species known is *Halocaridina (Halocaridinides) trigonophthalma* sp. nov.

Remarks: In the number of branchiae and the other general characters the following species may be referred to the genus *Halocaridina* Holthuis, 1963[9]. The definite difference of the new subgenus *Halocaridinides* from *Halocaridina* s. st. is the feature of the uropodal exopod, namely, the terminal tooth of the exopod lacks one or two movable spines just inside it, and instead, some spines are present along the diaeresis. It may be probable that this character is stable and worth establishing a new subgenus *Halocaridinides*, separating from *Halocaridina* s. st. Moreover, the male first pleopod without appendix interna, the triangular eye form, and the short and broad stylocerite may also be the distinguishing characters between them.

Halocaridina (Halocaridinides) trigonophthalma sp. nov.
(New Japanese name: Chika-numaebi)
(Figs. 7, 8)

Material examined: Okinawa I.: Kaneshi, Nakijin, Jan. 2-3, 1964, in well, 10m deep, S. Shokita leg. —3 ♂♂, 1 ♀; Aja, Naha City, in well, Nov. 1971, S. Shokita leg.—1 sp. (damaged).

Description: The body is small and cylindrical. The rostrum is very short, acutely pointed and curved strongly downwards, falling somewhat short of the anterior border of the eyepeduncle. It is dorsoventrally depressed, being broadly triangular in dorsal view. In lateral view it is shallow, with the dorsal border roundly convex.

The anterior margin of the carapace is feebly convex, without antennal spine, and is broadly rounded at the pterygostomian angle. The branchiostegal groove is visible.

The abdomen is smooth. The pleura of both the fourth and the fifth somites are angularly rounded posteroventrally. The sixth somite is as long as or somewhat longer than the fifth somite; the posterolateral angle is triangular, with an obtuse tip.

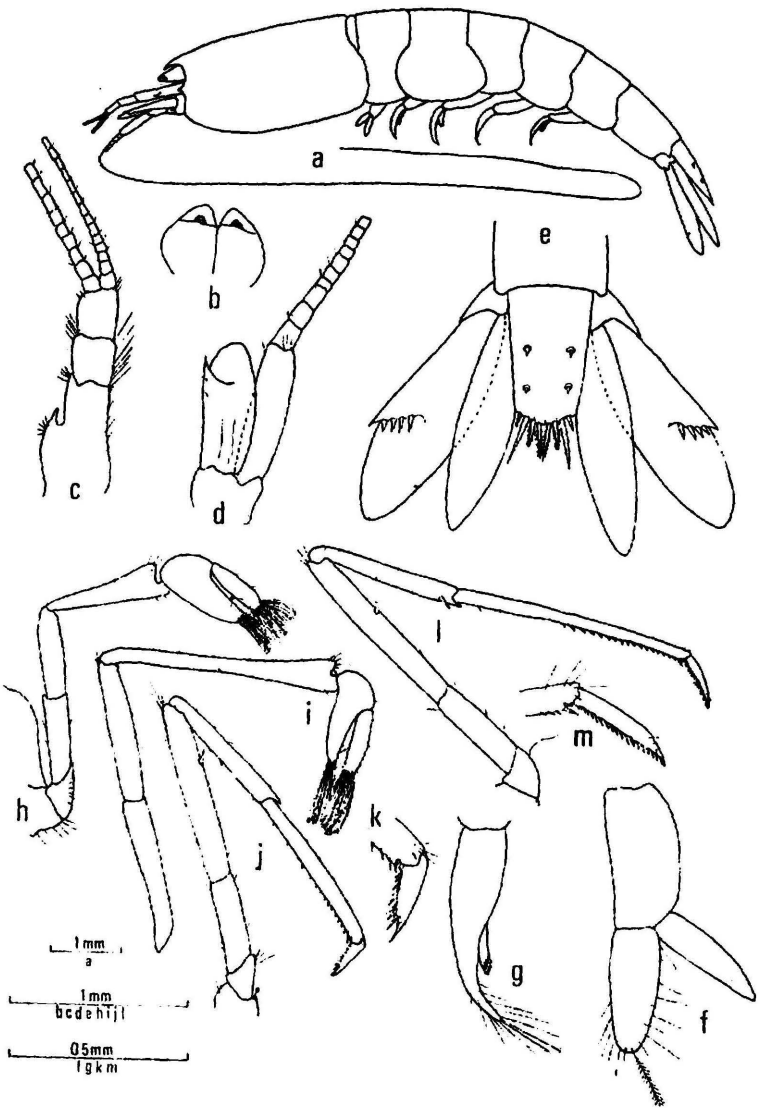

Fig. 7 *Halocaridina* (*Halocaridinides*) *trigonophthalma* sp. nov., paratype, female. a, lateral view; b, eyes in dorsal view; c, antennula; d, antenna; e, telson and uropods; f, first pleopod; g, endopod of second pleopod with appendix interna; h, first pereiopod; i, second pereiopod; j, third pereiopod; k, ductylus of third pereiopod; l, fifth pereiopod; m, ductylus of fifth pereiopod.

The preanal process is a small round tubercular projection.

The telson is broad and flat, distinctly shorter than the sixth abdominal somite. It is about one and a half times the maximum breadth at about its articulation with the sixth abdominal somite. The lateral margin is feebly convex, terminating in a minute tooth. The posterior margin is broadly rounded, measuring about two-thirds the breadth at the base of the telson. On the posterior margin there are three pairs of spines; the outermost is short, and the second outer the longest and somewhat shorter than half the length of the telson. The dorsal surface is armed with two pairs of small spines; the anterior pair is in about the middle, and the posterior halfway between the anterior pair and the posterior margin of the telson.

The eyes are short and nearly extend to the proximal third of the basal antennular segment. The cornea is very small but pigmented, being placed obliquely on the peduncle; it is bluntly pointed anterointernally and swollen basally. The inner border of the peduncle is rather straight.

The stylocerite is broad at the base, with the sharply pointed tip which falls distinctly short of the anterior margin of the basal antennular segment; its outer margin is feebly convex. The two antennular distal segments are short and subequal in length, much shorter than the basal one.

The basicerite of the antennal peduncle bears a triangular projection outside. The carpocerite is cylindrical and long, extending to the end of the second antennular segment, and slightly overreaching the antennal scale. The flagellum is long, measuring about one and a half times as long as the body. The antennal scale reaches the end of the second antennular segment; it is 2.4 times as long as its breadth; the outer margin is straight and ends in a distinct tooth which is exceeded by the lamella.

Incisor process of the mandible terminates in some small teeth. Between the incisor and the molar process are thick setae. The surface of the molar process is concave and thickly covered with short bristles. The lower endite of the maxillula is very broad and oval. The upper endite is also broad with the inner border armed with minute spines throughout. The palp is developed, with the top rounded. The maxilla is of normal shape. The lower endite is short and broad, and the upper deeply cleft. The scaphognathite is normal. The palp is slender and simple. The exopod of the first maxilliped has a developed caridean lobe, and the flagellum is very short and vestigial. The palp is developed and broad. The two endites are distinctly separated. The epipod of the second maxilliped is divided into a larger and a smaller lobe. The third maxilliped is pediform. It exceeds the end of the antennal scale by the length of the ultimate segment. The ultimate segment is slightly shorter than the penultimate, with two stout spines terminally; there are long and short spinules on the posterior border. The exopod is somewhat longer than the antepenultimate segment.

The first pereiopods reach beyond the antennal scale by the length of the chela. The chela is short and swollen, with the fingers much longer than the palm. At the

tips of the fingers there are tufts of long brush-like hairs. The carpus is slender, elongate and cylindrical, subequal to the chela in length; it is much swollen distally and deeply excavated anteriorly. The merus is as long as the ischium, and much shorter than the carpus. An epipod is present.

The second pereiopods are much more slender than the first. They exceed the antennal scale by the length of the chela and the distal third of the carpus combined. The chela is similar to that in the first pereiopods but somewhat narrower and weaker. The palmar portion is short. The carpus is long and elongate; it is about twice as long as the chela, and the anterior border is distinctly excavated. The merus is slightly shorter than the ischium, a little shorter than two-thirds the length of the carpus.

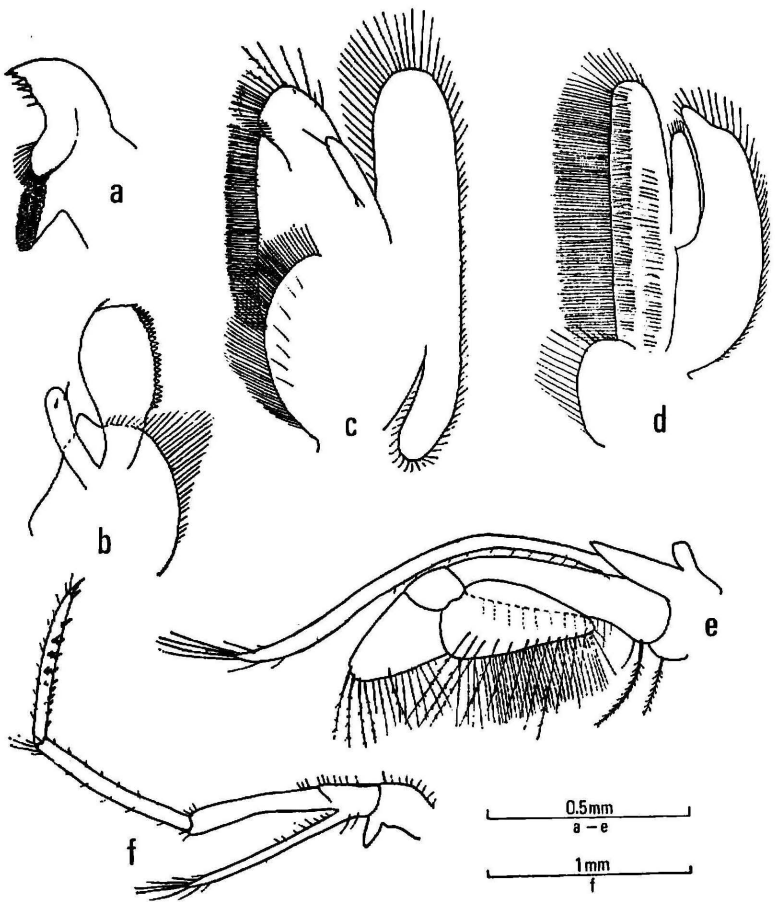

Fig. 8 *Halocaridina* (*Halocaridinides*) *trigonophthalma* sp. nov., paratype, female. a, mandible; b, maxillula; c, maxilla; d, first maxilliped; e, second maxilliped; f, third maxilliped.

The dactylus of the third pereiopods ends in a sharp spine and bears about eight accessory spines on the posterior border. The propodus is about three times as long as the dactylus, subequal to the carpus in length. The merus is much longer and more slender than the distal segments; there is a small spine on the posterior border at the distal third. The fourth pereiopods are closely similar to the third. The propodus of the fifth pereiopods is narrow, three times as long as the dactylus whose posterior border is provided with a row of 18 to 19 small spines. The carpus is two-thirds the length of the propodus, with a spine subterminally. The merus is longer than the carpus.

The endopod, as well as the exopod, of the male first pleopod is relatively small. The exopod is rather broad, with the round distal tip. The endopod is somewhat shorter and more slender than the exopod; it gradually tapers distally, with the tip blunt and smooth without an appendix. The second male pleopod is long and lobular, and bears long setae marginally, with the well-developed appendix masculina; the appendix interna, on the contrary, is short and narrow, being grown at the base of the appendix masculina.

The protopod of the uropod is provided with a sharp, well-defined spinous projection over the base of the exopod, but a blunt angle on the endopod. The outer margin of the exopod ends in a fixed tooth, bearing no accessory spines. There are four to six small spines on the diaeresis.

The endopod of the female first pleopod is as long as the exopod, narrowing distally, with a blunt tip, without any hairs and spines.

Types: A male specimen is designated as the holotype and a female the allotype. These types are deposited in the collections of the Department of Biology, University of the Ryukyus, male holotype, URB-497; female allotype, URB-498; paratypes, URB-499.

Measurements: The holotype measures 2.4 mm in the length of the carapace. Two males 2.4 and 2.0 mm, and one female, 2.8 mm.

Color in life: The body is mainly transparent, being pinkish laterally. The antennular segments, the basal portion of the antennal scale and its peduncle, and the eyepeduncle, are finely colored with pale red. The gut is seen yellowish white through the carapace.

Ecology and distribution: All the specimens were taken in wells which are slightly saline.

Remarks: The present species is easily distinguished from the only other known form of *Halocaridina* s. st., *H. rubra* Holthuis, 1963, whose type locality is the Hawaiian Islands. The differences between them are listed below for easy comparison. The most striking differences are on the characters of the uropodal exopod, the male pleopod, the eye and the stylocerite.

Halocaridina rubra, according to Holthuis[9], lives in brackish water near the sea, and its distribution seems restricted to the Hawaiian Islands. The present specimens

of *H. trigonophthalma*, from only Okinawa Island, as noted in the material examined, were taken in some deep wells which are dark and slightly saline. Both the species are probably ecologically and geographically restricted on the islands near the sea. The reduced eyes and the development of the antennal flagella seem to be attributed to this shrimp's peculiar habitat.

	H. (Halocaridina) rubra	*H. (Halocaridinides) trigonophthalma*
Rostrum	straight or slightly curved downwards, reaching far beyond anterior margin of eye	curved strongly downwards, not reaching anterior margin of eye
Telson	elongate, slightly longer than 6th abdominal somite	very broad, distinctly shorter than 6th abdominal somite
Eye	quadrangular, truncate anteriorly	subconical, bluntly pointed anteriorly
Antennula	each segment short and broad, terminal segment not reaching end of antennal scale	each segment elongate, terminal segment exceeding antennal scale
Stylocerite	slender, sharply pointed, reaching end of basal antennular segment	short, broad, never reaching end of basal antennular segment
Antenna		
Scale	with small terminal tooth	with distinct terminal tooth
Carpocerite	broad and short, not reaching middle of antennal scale	slender and elongate, slightly exceeding antennal scale
Mandible		
Molar process	naked	with brush-like spines
Incisor process	slender	broad
Maxillula		
Upper endite	normal	ovate
Maxilla		
Palp	with a finger-like process	simple
3rd Maxilliped		
Ultimate segment	distinctly longer than penultimate segment	slightly shorter than penultimate segment
1st pereiopods		
Fingers	as long as or shorter than palm	longer than palm
Carpus	thick and short, as long as palm	slender and elongate, as long as chela

Merus	much longer than ischium	as long as ischium
2nd pereiopods		
Carpus	shorter than chela	much longer than chela
3rd pereiopods		
Dactylus	with 5 spines on posterior border	with 8 spines on posterior border
5th pereiopods		
Dactylus	25 comb-like arranged spinules on posterior border	18 comb-like arranged spinules on posterior border
Male 1st pleopod		
Endopod	with long and slender appendix	without appendix
Male 2nd pleopod		
Endopod	slender and short	broad, long and lobular
Uropod		
Protopod	ending in two sharp teeth	ending in a tooth or a blunt angle
Exopod	one or two accessory spines on outer margin; with no spines on diaeresis	no accessory spines on outer margin; with 4 to 6 spines on diaeresis

Acknowledgements

The authors express their gratitude to Mr. M. Arakaki of the Yaeyama Branch of the Okinawa Prefectural Fisheries Research Station, for his giving a great facility to the senior author during staying in Ishigaki Island.

It is also pleasant to express their thanks to Dr. T. Kuramoto of the Akiyoshi-dai Science Museum in Yamaguchi Prefecture, for his interest and rendering some valuable specimens to the authors.

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