

ON THE SPECIES OF JAPANESE ATYID SHRIMPS (DECAPODA: CARIDEA)  
DESCRIBED BY WILLIAM STIMPSON (1860)

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A B S T R A C T

The taxonomic status of the six Japanese species of *Caridina* described by W. Stimpson (1860) is clarified on the basis of fresh specimens from the type localities. *Caridina grandirostris*, which has long been synonymized under *C. longirostris* H. Milne Edwards, 1837, is shown to be a distinct species; *C. leucosticta* is redescribed; *C. multidentata* is the senior synonym of *C. japonica* De Man, 1892; *C. acuminata* and *C. brevirostris* are regarded as junior synonyms of *Atyoida pilipes* (Newport, 1847); and *C. exilirostris* is synonymized with *C. typus* H. Milne Edwards, 1837. Neotypes for the six species are designated to stabilize their taxonomy, all of which are redescribed and figured. The various nomenclatural problems associated with these species are discussed.

INTRODUCTION

On the basis of the United States North Pacific Exploring Expedition (see Habersham, 1857, for details of the cruise), Stimpson (1860) published preliminary descriptions of seven new species of atyid shrimps of the genus *Caridina*: *C. grandirostris*, *C. leucosticta*, *C. multidentata*, *C. serrata*, *C. acuminata*, *C. brevirostris* and *C. exilirostris* (see also Stimpson, 1907). Unfortunately, almost the entire crustacean collection together with most of the associated manuscripts in preparation and drawings were lost when the Chicago Academy of Sciences was destroyed in the great fire of 1871 (see Deiss and Manning, 1981). Although some of Stimpson's syntypes have subsequently been found in the British Museum (Natural History), London, no species of *Caridina* are known to be extant (Evan, 1967). The descriptions of the new species of *Caridina* in Stimpson (1860) were very brief and no figures provided. This has caused many taxonomic and nomenclature problems over the years. One of these "problematic" taxa, *Caridina serrata*, originally described from Hong Kong, was redescribed in detail by Cai and Ng (1999) and a neotype was designated.

In the present study, the taxonomic status of the remaining six Japanese species of *Caridina* described by Stimpson (1860) are clarified on the basis of a large number of fresh specimens from the type localities. Redescriptions are provided, the species are illustrated in detail, and the various taxonomic and nomenclature problems involved are discussed. Specimens involved in this study are deposited in the National Science Museum, Tokyo, Japan (NSMT); Department of Chemistry, Biology and Marine Science, Faculty of Science, University of the Ryukyus, Okinawa, Japan (UR); National Institute for Environmental Studies, Ibaraki, Japan (NIES); Zoological Reference Collection,

Raffles Museum of Biodiversity Research, National University of Singapore, Singapore (ZRC); National Museum of Natural History, Leiden, the Netherlands (RMNH); Zoological Museum, Amsterdam, the Netherlands (ZMA); Basel Natural History Museum, Basel, Switzerland (NHMB); Senckenberg Museum, Frankfurt am Main; Germany (SMF); and Muséum National d'Histoire Naturelle, Paris, France (MNHN). The abbreviation cl is used for carapace length, measured (in millimeters) from the post-orbital margin to the posterior dorsal margin of the carapace. Notation for rostral formula follows that of Chace and Bruce (1993).

SYSTEMATICS

*Atyoida pilipes* (Newport, 1847)

Figs. 1-3

*Atyoida pilipes* Newport, 1847:160 [type locality: Apia, Upoln, Navigator or Samoan group (see Chace, 1983)].

*Atyoida pilipes*: A. Milne-Edwards, 1864:150; De Man, 1892a: 363; Bouvier, 1925: 304; Shokita, 1979: 199.

*Atyoida tahitensis* Stimpson, 1860: 28 [type locality: Tahiti, French Polynesia].

*Atyoida pilipes*: Smith and Williams, 1982: 345 (part); Chace, 1983: 10, figures 3-8; Chace, 1997: 4; Hayashi, 1989a: 127, fig. 161; Shokita, 1997: 507.

*Caridina acuminata* Stimpson, 1860: 98 [type locality: Ogasawara (Bonin) Islands, Japan]; Ortmann, 1895: 401; Balss, 1914: 24, fig. 18; Kamita, 1976:23.

*Caridina typus acuminata*: Bouvier, 1925: 252 (part).

Not *Caridina acuminata*: Shokita, 1979: 205; Hayashi, 1989c: 311, fig. 169b, c, 170f.

Not *Caridina typus acuminata*: Bouvier, 1925: 126, figures 271.

Not *Caridina typus acuminata*: Roux, 1934: 222.

*Caridina brevirostris* Stimpson, 1860: 98 [type locality: Okinawa (Loo Choo) Island, Ryukyu Islands, Japan]; Bouvier, 1905: 78 (part).

Not *Caridina brevirostris*: Bouvier, 1904: 136; Rathbun, 1906: 919, fig. 67; Edmondson, 1935: 16; Fujino, 1972: 7, fig. 5.

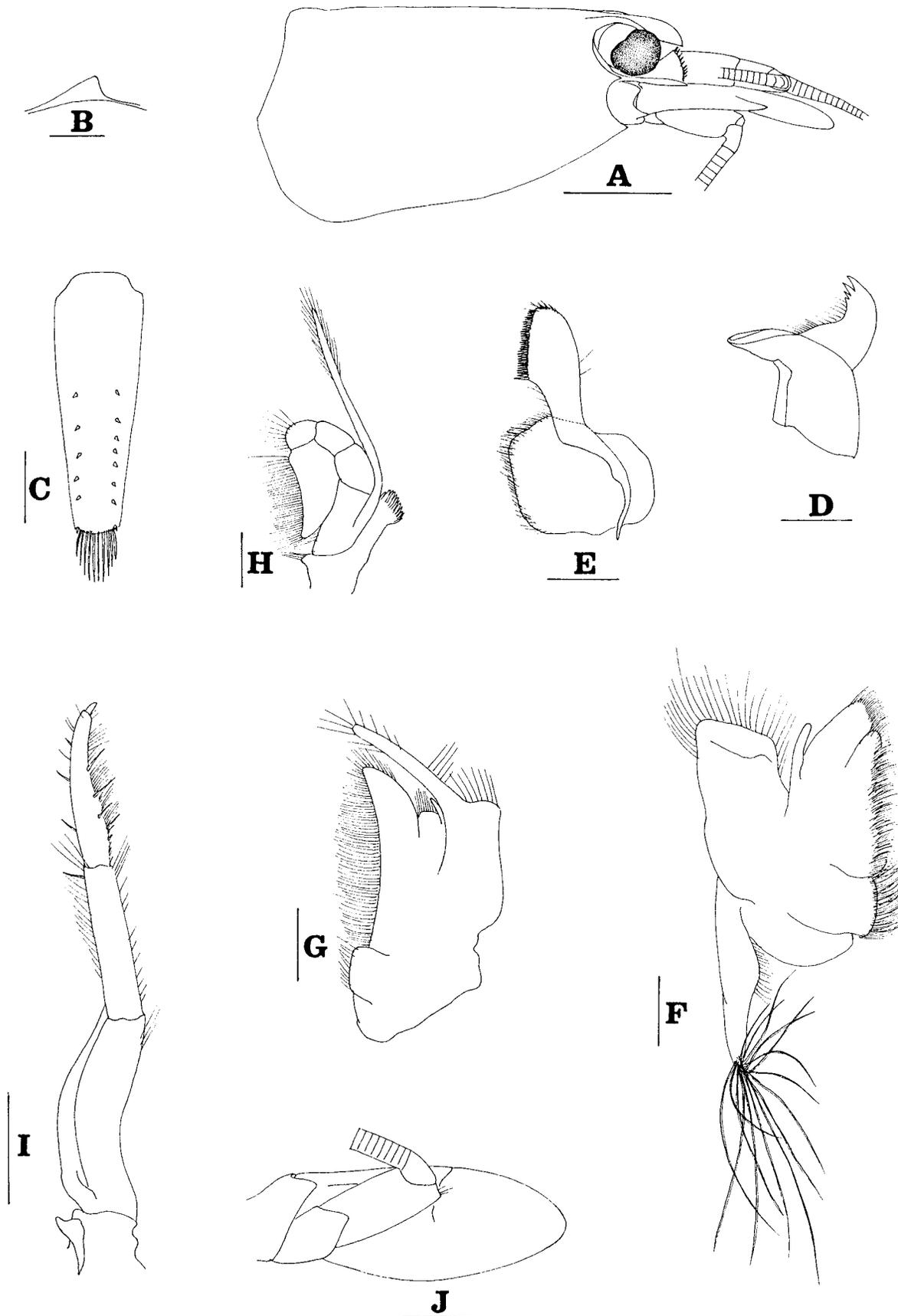


Fig. 1. *Atyoida pilipes*. A, cephalothorax and cephalic appendages, lateral view; B, preanal carina; C, telson; D, mandible; E, maxillula; F, maxilla; G, first maxilliped; H, second maxilliped; I, third maxilliped; J, scaphocerite. Scales: A, I = 1.0 mm; B-H, J = 0.5 mm. (neotype of *Caridina acuminata*, male, cl 5.7 mm, NSMT, Chichi-jima Island)

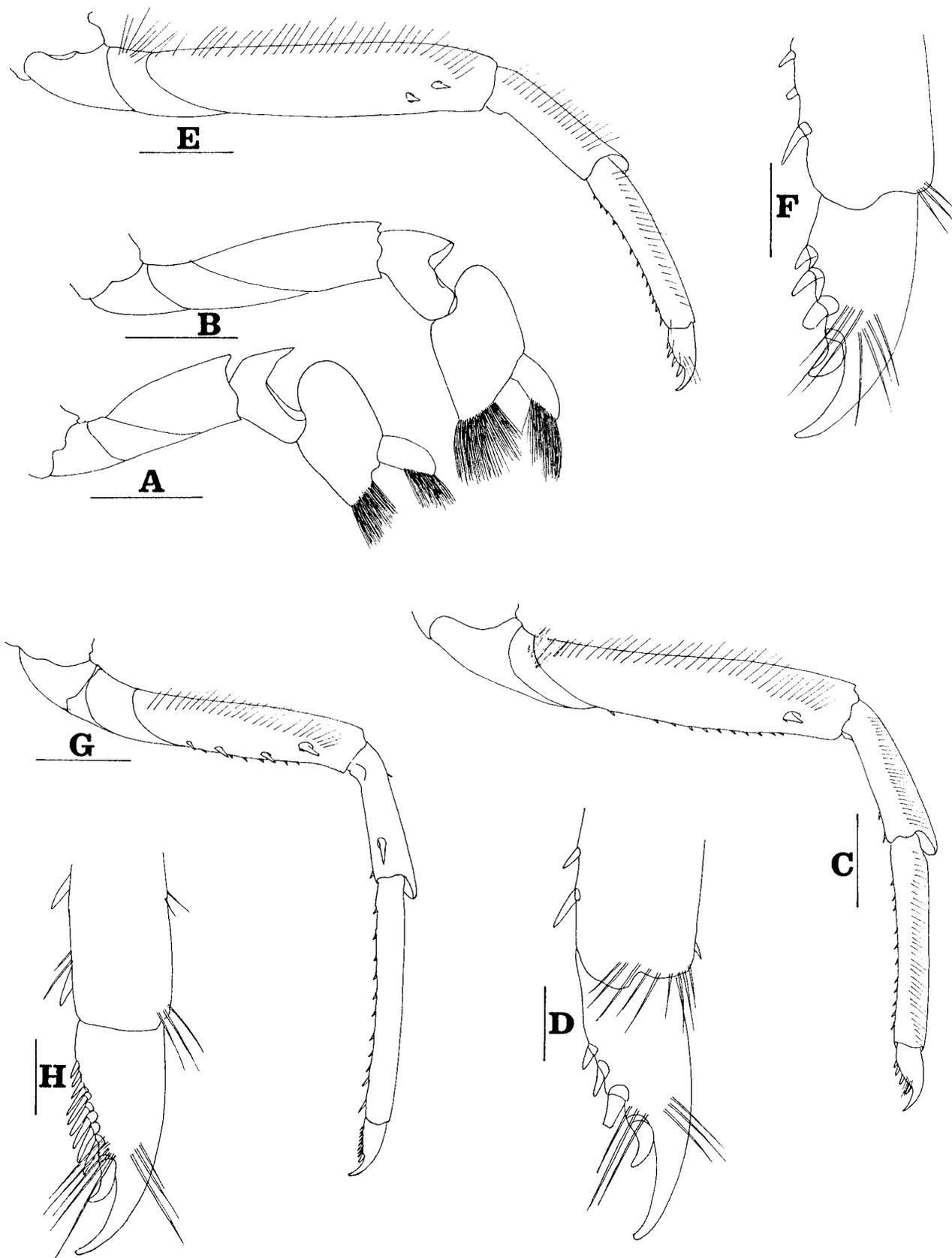


Fig. 2. *Atyoida pilipes*. A, first pereiopod; B, second pereiopod; C, third pereiopod; D, dactylus of third pereiopod; E, fourth pereiopod; F, dactylus of fourth pereiopod; G, fifth pereiopod; H, dactylus of fifth pereiopod. Scales: A, B = 1.0 mm; C, E, G = 0.5 mm; D, F, H = 0.5 mm; G, I = 0.2 mm. (neotype of *Caridina acuminata*, cl 5.7 mm, NSMT, Chichi-jima Island)

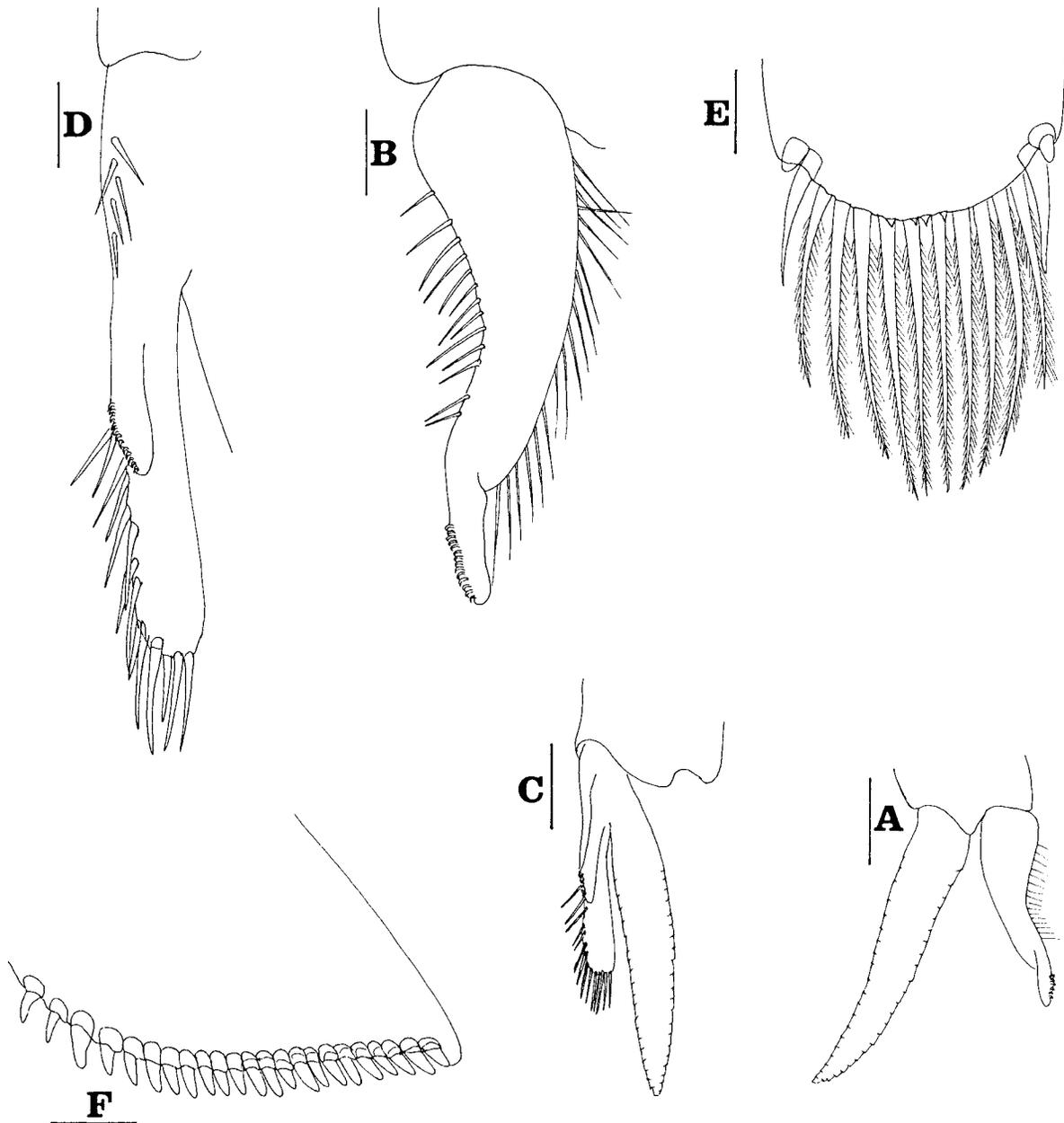


Fig. 3. *Atyoida pilipes*. A, male first pleopod; B, endopod of male first pleopod; C, male second pereiopod; D, appendix masculina and appendix interna of male second pleopod; E, distal portion of telson; F, uropodal diaeresis. Scales: A, C = 0.5 mm; B, D, E, F = 0.2 mm. (neotype of *Caridina acuminata*, cl 5.7 mm, NSMT, Chichi-jima Island)

**Material Examined.**—Neotype of *Caridina acuminata*: 1 male, cl 6.5 mm, NSMT, a stream of Naka-kaigan Coast, lotic system, EC 380, 60 to 70 meters above sea level, Chichi-jima Island, Ogasawara Islands, coll. K. Satake, R. Ueno and M. Inaba, 28 Feb 2000. Neotype of *Caridina brevirostris*: 1 male, cl 6.8 mm, NSMT, River Aritsu, Kume-jima Island, coll. A. Kawakami, 8 Dec 1995. Others: 6 males, cl 4.1–5.8 mm, NIES-H-3, Nagahama-bashi, lotic system, EC 270–610, 130 to 140 meters above sea level, Haha-jima Island, Ogasawara Islands, coll. K. Satake, 13 Feb 1998; 5 males, cl 5.3–6.6 mm, 14 females, cl 4.5–8.6 mm; 2 ovigerous females, cl 8.3–8.8 mm, NIES-H-6, upper reach of Koromodate Stream, freshwater, lotic system, EC 590–700, 70 to 110 meters above sea level, Haha-jima Is-

land, Ogasawara Islands, coll. K. Satake and R. Ueno, 24 Feb 2000; 10 females, cl 7.5–8.9 mm (3 females, ZRC 2004.0518), NIES-CH-17, a stream of Naka-kaigan Coast; freshwater; lotic system; EC 380; 60 to 70 meters above sea level, Chichi-jima Island, Ogasawara Islands, coll. K. Satake, R. Ueno and M. Inaba, 28 Feb 2000; 1 male, cl 5.4 mm, 4 females, cl 6.8–7.4 mm; NIES-CH-23, a stream of Tenno-ura, lotic system, EC 610, 90 meters above sea level, Chichi-jima Island, Ogasawara Islands, coll. K. Satake and H. Suzuki, 4 May 2000; 2 males, cl 6.2–7.1 mm, UR, Omija River, Iriomote, coll. T. Naruse, 1 Aug 1999.

**Description.**—Rostrum short, with dorsal margin convex, apex slightly directed ventrally, reaching near to or slightly

beyond end of basal segment of antennular peduncle, median dorsal carina unarmed, ventral margin unarmed, rarely with 1 or 2 teeth; antennal spine fused with inferior orbital angle, acute; pterygostomian angle acute. Sixth abdominal somite 0.4 times as long as carapace, 1.3 times as long as fifth somite, shorter than telson. Telson 3.0 times as long as wide, with 5-7 pairs (or 10-12 if not in pairs) dorsal spinules, situated on distal half, 1 pair of dorsolateral spines near distal end, posterior margin with 4 inconspicuous median fixed teeth and 5 pairs of spine-like plumose setae on distal margin, lateral pair distinctly shorter than intermediate pairs; preanal carina triangular, without spine.

Eyes well developed. Antennular peduncle stout, half length of carapace; basal segment shorter than half length of antennular peduncle, second segment longer than third segment; stylocerite reaching slightly beyond end of basal segment. Scaphocerite 2.5 times as long as wide, inner margin straight, with large distolateral tooth reaching near end of antennular peduncle.

Incisor process of mandible ending in irregular teeth, molar process truncated. Lower lacinia of maxillula broadly rounded, upper lacinia elongate, widened distally, with many distinct teeth on inner margin, palp slender. Upper endites of maxilla subdivided, palp short, scaphognathite tapering posteriorly with more than 20 long setae at posterior end. Palp of first maxilliped ending in a finger-like process. Second maxilliped with ultimate segment not fused with penultimate segment; well developed podobranch present. Third maxilliped reaching near end of antennular peduncle, with a short exopod, reaching only slightly beyond end of antepenultimate segment, ultimate segment as long as penultimate segment.

Epiopods on first 4 pereopods. First pereopod short, reaching to end of basal segment of antennular peduncle, merus 1.5 times as long as broad; carpus excavated strongly anteriorly, length shorter than width; chela variable, with almost no discernable palm to palm longer than finger. Second pereopod reaching end of proximal segment of antennular peduncle, merus more slender than that of first pereopod, more than twice as long as width, carpus excavated strongly anteriorly, as long as width or shorter than width, chela variable, similar to previous leg. Last 3 pereopods subequal in length. Third pereopod with row of setae on outer surface of each joint, reaching to end of antennular peduncle, propodus distinctly shorter than merus, 5.6 times as long as broad, 3.0 times as long as dactylus; dactylus ending in a strong claw; 2.5 times as long as wide (spines included), flexor margin with 4 accessory spines. Fourth pereopod reaching slightly beyond end of proximal segment of antennular peduncle, similar to third pereopod in form. Fifth pereopod, with setae only present on merus, reaching slightly beyond post orbital margin, propodus longer than merus, 8.5 times as long as broad, 3.2 times as long as dactylus; dactylus 4.2 times as long as wide, with 6-10 spinules on flex or margin.

Endopod of male first pleopod extending to half length of exopod, subtriangular, 2.6 times as long as broad, with a distinct appendix interna near distal end of endopod. Appendix masculina of male second pleopod slender, reaching to 2/3 length of endopod, inner and distal surface densely lined with long spines; appendix interna at basal 2/5

of appendix masculina, extending to distal 1/3 of appendix masculina. Diaeresis of uropodal exopod with 19-23 spinules.

Remarks.—Stimpson (1860) gave a very short description of *C. acuminata*: “Thorax sat compressus. Rostrum breve, oculos parce superans, trigonum, ad basin horizontaliter latum, ad extremitate paullo deflexum; marginibus totis levibus; crista dorsali non dilatata, dorso continua. Antennularum flagella longitudine aequalia. Manuum penicilli parvi, breves. Pedes postici spinulis asperi; tertii et quinti paris quam quarti paris longiores. Color olivaceus, punctatus.” [Carapace compressed. Rostrum short, situated above eyes, triangular, horizontal at base laterally; tip slightly downturned, margin normally smooth, crest of dorsal margin of rostrum not dilated. Antennular flagella as long as body length. Chela short, with setae. Walking legs armed with rough spinules; third and fifth legs as long as fourth leg. Olivaceous in colour, spotted.]

During a recent faunistic survey of the Ogasawara Islands (= Bonin Islands), the type locality of *C. acuminata*, six species of atyid shrimps were found, including three species of *Caridina*, namely *C. multidentata* Stimpson, 1860 (= *C. japonica* De Man, 1892b, see later), *C. typus* H. Milne Edwards, 1837, *C. celebensis* De Man, 1892, one species of *Atyoida* and one species of *Paratya* (see Satake and Cai, 2005). Utilising the specimens on hand and reading the brief description of Stimpson (1860) carefully, it leaves us in little doubt that *C. acuminata* closely matches what is today called *Atyoida pilipes*. It certainly does not appear to be a species of *Caridina*.

Balss (1914) recorded *C. acuminata* from Ito, Japan. Kubo (1938), however, commented that Balss' specimens "... show discrepancy to the material at my disposal in having 7 spinules (instead of 60 setae) on the posterior border of fifth leg." It seems to us that Balss' specimens are also *Atyoida pilipes* while Kubo's material probably belongs to *C. typus* instead. The exact identities of their shrimps, however, can only be ascertained after this material is reexamined. Bouvier (1925: 126, figure 271) provided detailed illustrations of *Caridina typus* var. *acuminata*, on the basis of specimens from Poulo Condor (So'n Island), southern Vietnam. His specimens are clearly referable to *C. typus* H. Milne Edwards, 1837 (see remarks under *C. typus*) instead. The *C. typa acuminata* from Admiralty Islands reported by Roux (1934) should also be assigned to *C. typus*. Kamita (1976) reported *C. acuminata* from Hawai'i. According to his description and figures, notably in the form of rostrum, stout carpus of second pereopod (1.5 times as long as high), and number of spinules on the dactylus of the fifth pereopod (15), his species is almost certainly *A. bisulcata* Randall, 1840, instead. Although *A. bisulcata* is very close to *A. pilipes* and cannot be separated by characters given by Kamita (1976), *A. pilipes* is not known from the Hawaiian Islands as yet (Eldredge and Miller, 1997). Shokita (1979) reported *C. acuminata* from Arakawa River, Okinawa. These specimens are no longer extant, but fresh material collected from the same locality shows that *C. typus* is the only species there, and it seems a fair assumption that Shokita's record of *C. acuminata* is almost certainly *C. typus* instead.

A second species described by Stimpson (1860) is also involved in this confusion. Stimpson (1860) described *C. breviostris* in a short passage: "Corpus gracile. Rostrum brevissimum, oculis brevius, trigonum; margine superiore obtuso, laevi. Margo carapacis ad basin antennarum inermis. Manus primi paris digiti breves, quam palma multo breviores. Pedum posticorum dactyli robusti, vix curvati; et quartam partem articuli penultimi;(?) longitudine aequantes. Long 0.5 poll. *C. acuminata* affinis, rostrubreviore. Hab.-Ad insulam "Loo Choo"; in aquis dulcibus." [Body slender. Rostrum very short, unarmed, not reaching beyond eye stalk, triangular. Margin of carapace reaching base of antenna. Chela of first pair of legs with short fingers, much shorter than palm. Dactylus of posterior legs stout, very curved and 1/4 as long as propodus. Short rostrum similar to *C. acuminata*.] The type locality, Loo Choo Island, is now called Okinawa (T. Naruse, personal communication). This description, albeit brief, actually agrees well with young specimens of *Atyoida pilipes*. *Atyoida pilipes* has been reported from Yona River of Okinawa Island by Shokita (1979). Unfortunately, Shokita's (1979) specimens are no longer extant, and as recent collections from the Yona River did not reveal any specimens of *A. pilipes*, his identification cannot be confirmed.

Bouvier (1904: 136; 1925: 227) reported *C. breviostris* from the Seychelles. His material (56 specimens, MNHN Na 690-693) was re-examined by the first author. These specimens have a variable rostrum with ovigerous females having large eggs, and they most likely belong to an undescribed species of *Caridina*. They certainly do not match what Stimpson (1860) described as *C. breviostris*. The "*Caridina breviostris*" reported by Rathbun (1906: 919, figure 67) and Edmondson (1935: 16) from the Hawaiian Islands has been referred to *Halocaridina rubra* Holthuis, 1963 (cf. Holthuis, 1973). Kubo (1941) reported and described in detail specimens he identified as *C. breviostris* from Ishigaki Island, and transferred the species to *Neocaridina* Kubo, 1938. This record has been cited by several subsequent authors (Shokita, 1975; 1979; Miyake, 1977; Hayashi, 1990; Cai, 1996). As discussed above, the true *C. breviostris* Stimpson, 1860, is now regarded as a junior synonym of *Atyoida pilipes*. Kubo's specimens are no longer extant in the Tokyo University of Fisheries, where the late Prof. Itsuo Kubo worked (T. Naruse, personal communication), and subsequent surveys on the freshwater shrimp fauna of Ishigaki did not obtain any specimens that can be referred to Kubo's "*N. breviostris*." "*Neocaridina breviostris*" has also been reported from Iriomote Island (Shokita, 1975; 1979). Reexamination of specimens from Iriomote Island has shown that they belong to a new species of *Neocaridina* instead (Naruse et al., 2006). For the moment, Kubo's (1941) specimens are referred to an undescribed species of *Neocaridina* Kubo, 1938.

To prevent further taxonomic confusion with the identities of Stimpson's (1860) species, we here designate an adult male specimen (cl 6.5 mm, NSMT) of *Atyoida pilipes* from Chichi-jima Island, Ogasawara Islands, as the neotype of *Caridina acuminata* Stimpson, 1860; and one male (cl 6.8 mm, NSMT), from Kume-jima Island, a small island near Okinawa Island, as the neotype of *C. breviostris* Stimpson, 1860.

Distribution.—*Atyoida pilipes* has been reported from the Philippines and eastern Lesser Sunda Islands at about 120°E, and eastward through the Pacific high islands (Chace, 1983). In Japan, it has been reported from Okinawa, Ishigaki (Shokita, 1979), Iriomote (Shokita, 1997) and Kume-jima Island of the Ryukyus.

Habitat.—*Atyoida pilipes* lives among the roots of trees or vegetation of fast flowing waters. It also occurs in small waterfalls with vertical trenches that serve as hiding places.

### *Caridina grandirostris* Stimpson, 1860

Figs. 4-6

*Caridina grandirostris* Stimpson, 1860: 97 [type locality: Okinawa (Loo Choo) Island, Ryukyus, Japan].

*Caridina grandirostris*: Kubo, 1938: 85, figs. 15a-m.

*Caridina nilotica*: Fujino, 1972: 7; Miyake, 1977: 39; Shokita, 1975: 119;

*Caridina longirostris*: Shokita, 1979: 202; Hayashi, 1989c: 312, fig. 169c;

Suzuki et al., 1993: 56, Suzuki and Sato, 1994: 62.

Material Examined.—Neotype: 1 male, cl 4.9 mm, NSMT, upper stream of Tima River, about 4 km from river mouth, Okinawa Island, Ryukyu Islands, coll. Y. Cai, N. K. Ng, T. Naruse and S. Islam, 11 Jun 2000. Others: 3 males, cl 3.2-3.8 mm, 1 female, cl 4.3 mm, 6 ovigerous females, cl 4.2-5.3 mm, UR, 26°33.48'N 128°02.48'E, freshwater stream draining to a small patch of mangrove, Oura River, Okinawa Island, Ryukyu Islands, coll. Y. Cai, N. K. Ng, T. Naruse and S. Islam, 11 Jun 2000; 13 ovigerous females, cl 4.6-5.6 mm, 4 females, cl 3.6-4.6 mm, 10 males, cl 3.1-3.8 mm, ZRC 2004.0519, 26°33.42'N 128°04.60'E, upstream of Tima River, about 1-2 km from river mouth, Okinawa Island, Ryukyu Islands, pH 7.4, coll. Y. Cai, N. K. Ng, T. Naruse and S. Islam, 11 Jun 2000; 46 males, cl 3.6-4.6 mm, 12 females, cl 3.6-4.9 mm, 1 ovigerous female, cl 4.7 mm, ZRC 2004.0520, 26°33.63'N 128°05.52'E, upstream of Tima River, about 3 Km from the river mouth, Okinawa Island, Ryukyu Islands, pH 7.4, coll. N. K. Ng and S. Islam, 11 Jun 2000; 6 males, cl 3.8-5.1 mm, 12 females, cl 4.7-6.5 mm, 4 ovigerous females, cl 5.8-6.5 mm, ZRC 2004.0521, upper stream of Tima River, about 4 km from river mouth, Okinawa Island, Ryukyu Islands, coll. Y. Cai, N. K. Ng, T. Naruse and S. Islam, 11 Jun 2000; 20 males, cl 3.5-4.4 mm, 1 female, cl 5.2 mm, 25 ovigerous females, cl 5.7-6.1 mm, ZRC 2004.0522, 26°36.61'N 128°07.04'E, Arume River, Okinawa Island, Ryukyu Islands, coll. Y. Cai, N. K. Ng, T. Naruse and S. Islam, 11 Jun 2000; 8 males, cl 2.9-4.0 mm, 10 females, cl 5.0-5.6 mm, 15 ovigerous females, cl 5.0-5.6 mm, ZRC 2004.0523, 24°30.11'N 124°15.26'E, Gaburumata River, Ishigaki Island, Ryukyu Islands, pH 7.3, coll. Y. Cai and T. Naruse, 13 Jun 2000; 2 males, cl 3.6-4.1 mm, 1 female, cl 6.8 mm, 1 ovigerous female, cl 6.1 mm, ZRC 2004.0524, 24°24.42'N 124°09.80'E, fast flowing stream, with pH 7.6 at one of the tributaries of Nagura River, below reservoir, Ishigaki Island, Ryukyu Islands, coll. Y. Cai and T. Naruse, 13 Jun 2000; 2 males, cl 3.9-4.0 mm, 1 female, cl 5.6 mm, 1 ovigerous female, cl 5.3 mm, ZRC 2004.5025, 24°25.00'N 124°09.86'E, fast flowing tributary of Nagura River, below a reservoir, Ishigaki Island, Ryukyu Islands, pH 7.2, coll. Y. Cai and T. Naruse, 13 Jun 2000; 1 female, cl 6.1 mm, ZRC 2004.5026, 24°23.65'N 123°51.84'E, fast flowing water, about 200 metres from sea, Omija River,

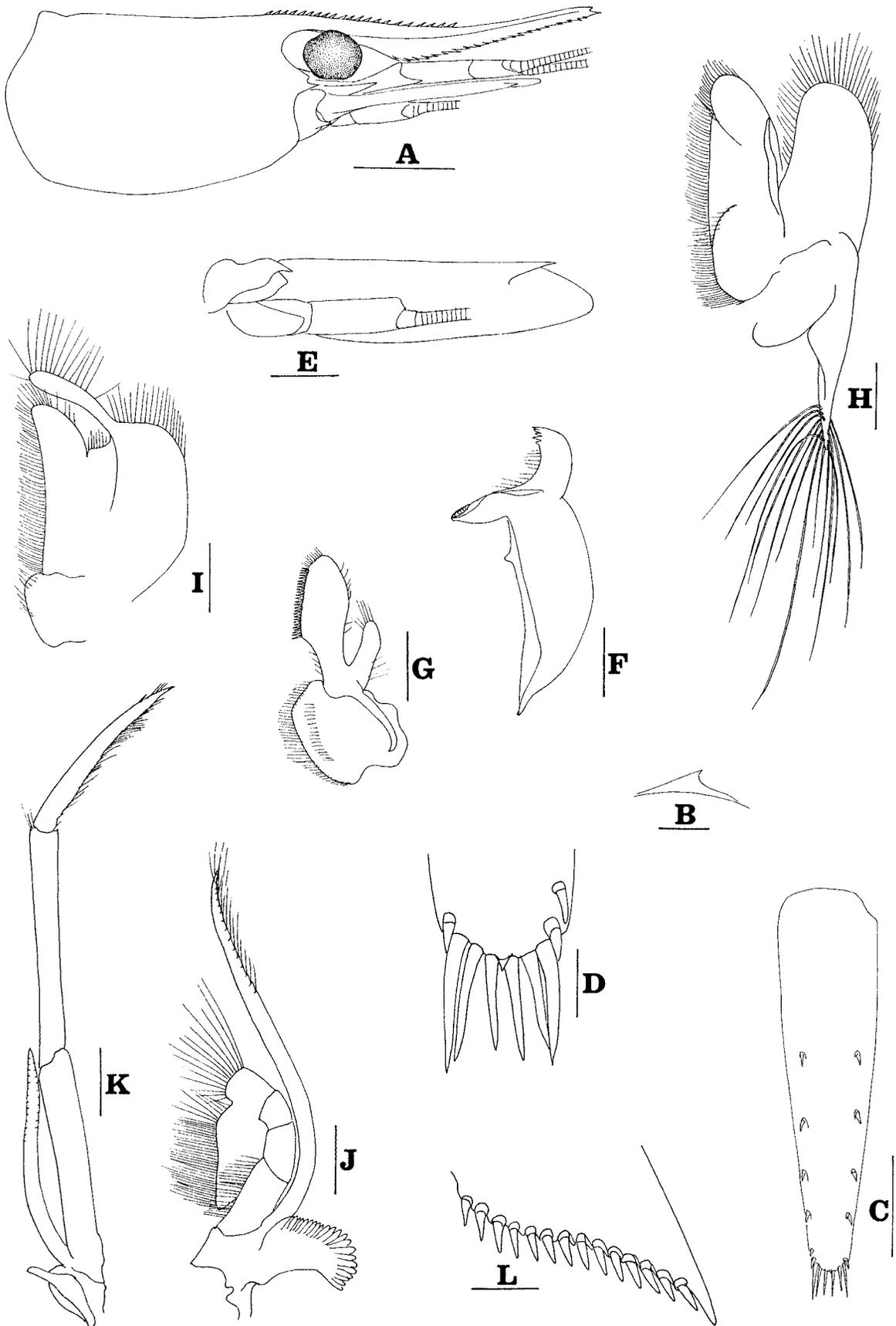


Fig. 4. *Caridina grandirostris*. A, cephalothorax and cephalic appendages, lateral view; B, preanal carina; C, telson; D, distal portion of telson; E, scaphocerite; F, mandible; G, maxillula; H, maxilla; I, first maxilliped; J, second maxilliped; K, third maxilliped; L, uropodal diaeresis. Scales: A, C = 1.0 mm; B, E-K = 0.5 mm, D, L = 0.2 mm. (neotype male, cl 4.9 mm, NSMT, Tima River, Okinawa, Ryukyu Islands)

Iriomote Island, Ryukyu Islands, coll. Y. Cai, N. K. Ng and T. Naruse, 15 Jun 2000; 1 male, cl 4.0 mm, ZRC 2004.0527, fast flowing water, upper part of Omija River, Iriomote Island, Ryukyu Islands, coll. Y. Cai and T. Naruse, 15 Jun 2000; 6 males, cl 3.6-3.7 mm, 8 females, cl 4.8-5.5 mm, 3 ovigerous females, cl 5.0-5.3 mm, ZRC 2004.0528, 24°17.81'N 124°33.76'E, pH 7.7, Kara Stream, Ishigaki Island, Ryukyu Islands, coll. Y. Cai, N. K. Ng and T. Naruse, 17 Jun 2000; 1 male, cl 4.3 mm, ZRC 2004.0529, Taiho River, Okinawa Island, Ryukyu Islands, coll. P. K. L. Ng et al., 31 May 1998; 2 females, cl 5.0-5.6 mm, 2 ovigerous females, cl 5.3-6.1 mm, ZRC, Okuma River, Okinawa Island, Ryukyu Islands, coll. P. K. L. Ng et al., 31 May 1998.

Comparative Material Examined.—*Caridina longirostris* H. Milne Edwards, 1837: one male, cl 3.3 mm, 2 females, syntypes, MNHN Na746, Macta, Near Oran, Algeria, coll. P. Roux, no date; 2 males, cl 2.3 mm, 12 females, cl 2.8-3.7 mm, 2 ovigerous females, cl 2.7-3.7 mm, syntypes, ZMA DE 240085, Macta, near Oran, Algeria, coll. P. Roux, no date. *Caridina gracilipes* De Man, 1892: 1 ovigerous female, cl 5.3 mm, 2 females, cl 4.2-4.4 mm, syntypes of *Caridina* var. *gracilipes* De Man, 1892a, RMNH D 1317, Maros River, Sulawesi, Indonesia, coll. M. Weber, Sep.-Oct., 1888. 38 specimens, ZMA De 102636, Balingnipa Brook, Sulawesi, Indonesia, coll. M. Weber, 1888.

Description.—Rostrum long, reaching beyond end of scaphocerite, anterior 1/3-1/2 slightly upturned, rostral formula: 1-2+16-19+1-2/8-21 (mode 13-19), normally unarmed 1/3 length of rostrum at anterior dorsal margin between subapical and other teeth; antennal spine distinctly ventral to inferior orbital angle; pterygostomial angle sub-rectangular or slightly produced. Sixth pleomere 0.67 times as long as carapace, 1.6 times as long as fifth somite, slightly shorter than telson. Telson 4.0 times as long as wide, terminating in posteromedian projection; with 3 or 4 pairs of dorsal spinules situated on distal 3/5, 1 pair of dorsolateral spines near distal end, 3 or 4 pairs of spines on distal margin, lateral pair longer than sublateral pair, median pair shortest; preanal carina with distinct spine.

Eyes well developed. Antennular peduncle slender, as long as or slightly shorter than carapace length; proximal segment half length of antennular peduncle, intermediate segment 1.5 times as long as third one; stylocerite reaching 0.8 times length of proximal segment. Scaphocerite 4.2 times as long as wide, inner margin straight, with distolateral spine distinctly reaching beyond end of antennular peduncle.

Incisor process of mandible ending in irregular teeth, molar process truncated. Lower lacinia of maxillula broadly rounded, upper lacinia elongate, with many distinct teeth on inner margin, palp slender. Upper endites of maxilla subdivided, palp short, scaphognathite tapering posteriorly with more than 20 long setae at posterior end. Palp of first maxilliped ending broadly triangular. Second maxilliped typical of genus. Third maxilliped reaching level of end of antennular peduncle, with short exopod, reaching only slightly beyond end of antepenultimate segment, ultimate segment distinctly shorter than penultimate segment.

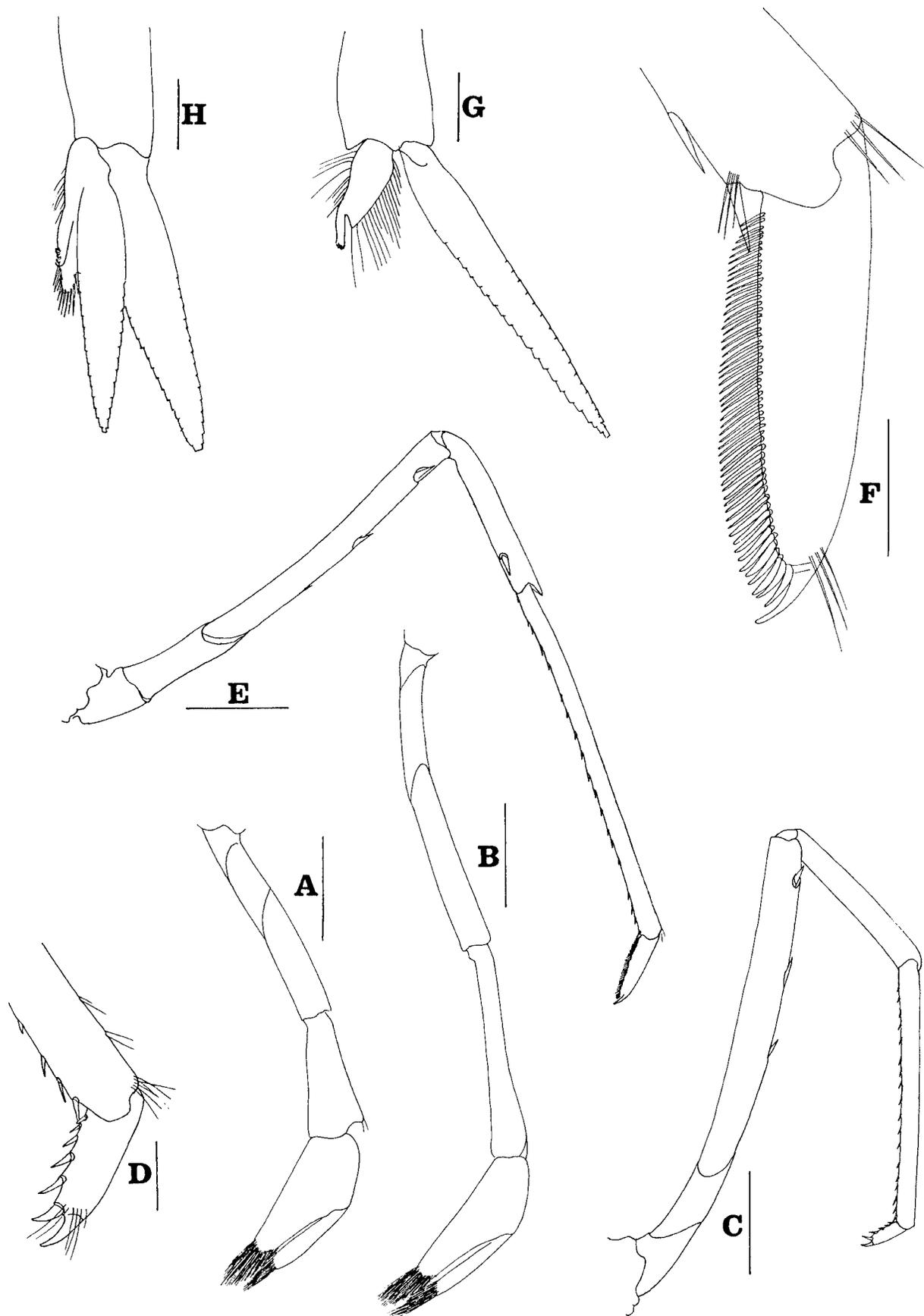
Epipods on first 4 pereopods. First pereopod reaching to end of proximal segment of antennular peduncle, merus

3.5-3.7 times as long as broad, as long as carpus; carpus excavated anteriorly, shorter than chela, 2.4-2.5 times as long as high; chela 2.2-2.4 times as long as broad; fingers 1.1-1.2 times as long as palm. Second pereopod reaching end of intermediate segment of antennular peduncle, merus shorter than carpus, 5.6-5.8 times as long as broad; carpus distinctly longer than chela, 1.3 times as long as chela, 5.7-6.3 times as long as high; chela 2.8-2.9 times as long as broad; fingers 1.3-1.4 times as long as palm. Third pereopod long, slender, reaching beyond end of antennular peduncle by entire dactylus, propodus distinctly shorter than merus, 13-15 times as long as broad, 5.0-5.5 times as long as dactylus; dactylus ending in 2 claws; 2.3-2.9 times as long as wide (spines included), with 3-5 accessory spines strongly curved inwards. Fifth pereopod reaching beyond end of antennular peduncle by entire dactylus, propodus distinctly longer than merus, 16-17 times as long as broad, 2.9 times as long as dactylus; dactylus 4.1-4.6 times as long as wide, with 39-54 spinules on flexor margin.

Endopod of male first pleopod extending to 1/4 length exopod, rounded, subtriangular, 2.2 times as long as broad, with distinct appendix interna near distal end of endopod. Appendix masculina of male second pleopod short, reaching level of half length of endopod, inner and distal surface densely lined with long spines; appendix interna at basal 2/5 of appendix masculina, extending to distal 1/5 of appendix masculina. Diaeresis of uropodal exopod with 12-14 spinules.

Egg size 0.41-0.43 × 0.22-0.23 mm in diameter.

Remarks.—Stimpson (1860) briefly described *Caridina grandirostris* from the Loo Choo Islands (= Okinawa): "Rostrum carapace vix brevius, appendices antennarum superans, extremitate gracile paulo reflexum; crista dorsali supra oculos fere recta et denticulis minutis ad 20 serrata, denticulo postico supra basim pedunculorum oculorum sito; cristae parte quarta anteriore edentula, denticulo uno mediano et duobus apicalibus exceptis; rostri margine inferiore obscure 8-10 denticulato. Pedum primi paris carpus quam manus multo brevior; secundi paris carpus valde gracilis et manu parce longior. Segmentum caudale lamellis lateralibus quarta parte brevius, dorso paribus sex aculeorum instructum." [Rostrum rarely shorter than carapace, reaching beyond end of antennular peduncle, anterior portion slender, slightly upturned; posterior portion of dorsal margin crested over orbit, armed with about 20 small teeth, with fewer of them located at carapace posterior to orbital margin; anterior quarter no teeth, except 1 or 2 apical teeth and subapical teeth; ventral margin armed with 8-10 very small teeth. Carpus of first pereopod much shorter than dactylus; carpus of second pereopod very slender, longer than dactylus. Telson 4 times as long as wide, dorsal surface equipped with 6 spinules.]. Our specimens agree generally with the original description, although some variation could be observed: the number of teeth on the ventral margin of the rostrum is 8 to 21 in our specimens (vs. 8-10 in Stimpson's) and the unarmed anterior dorsal margin of the rostrum measured from 1/4 to 1/2 (vs. 1/4 in Stimpson's). These differences can easily be explained by the intra-specific variation among populations and the fact that Stimpson only had a small sample size from one location.



With regard to the possession of small eggs, a telson which terminates in a posteromedian projection and the preanal carina having a distinct spine, *C. grandirostris* most closely resembles *C. longirostris* H. Milne Edwards, 1837, and *C. gracilipes* De Man, 1892. However, it differs from both species by the endopod of the male first pleopod possessing a distinct appendix interna. It can also be distinguished from *C. longirostris* by the more slender carpus of the first pereopod (2.4–2.5 times as long as high vs. 1.5 times in *C. longirostris*); the smaller number of spines on the dactylus of the third pereopod (5–7 vs. 7–10), the presence of more spinules on the dactylus of the fifth pereopod (40–55 vs. 35–40 in *C. longirostris*), and slightly larger eggs (0.41–0.43 × 0.22–0.23 mm vs. 0.35–0.38 × 0.21–0.26 mm). Stimpson (1860) did compare *C. grandirostris* with *C. longirostris*, commenting that “A *C. longirostris* differt dentibus rostri superne numerosis.” This difference, however, is not valid. Studies of a large number of specimens show that the number of spines on the dorsal margin of the rostrum ranges from 8–21 in *C. grandirostris* and 14–21 in *C. longirostris*. *Caridina grandirostris* can further be separated from *C. gracilipes* by the more slender carpus of the first pereopod (2.4–2.5 times as long as high vs. 2.0–2.3 times in *C. gracilipes*); the relatively shorter fingers of the first pereopod (1.1–1.2 times as long as palm vs. 1.3–1.7 in *C. gracilipes*); the shorter and stouter dactylus of the third pereopod (propodus 4.5–5.0 times as long as dactylus vs. 3.8–4.4 times in *C. gracilipes*; dactylus 2.3–2.9 times as long as wide vs. 4.2–4.8 times in *C. gracilipes*); the smaller number of spines on the dactylus of the third pereopod (5–7 vs. 9–10); and the longer and stouter dactylus of the fifth pereopod (propodus 2.9 times as long as dactylus vs. 3.7–3.8 times in *C. gracilipes*; dactylus 4.1–4.6 times as long as wide vs. 5.0–6.0 times in *C. gracilipes*). Although Kubo (1938) rediagnosed *C. grandirostris*, all subsequent authors have used the name *C. nilotica* (see Fujino, 1972; Miyake, 1977; Shokita, 1975) or *C. longirostris* (see Shokita, 1979; Hayashi, 1989c; Suzuki and Sato, 1994) instead. Since the type specimens of *C. grandirostris* are lost, and because of the taxonomic problems discussed, a specimen from Tima River of Okinawa Island is herein designated as the neotype of *Caridina grandirostris*, to stabilize the taxonomy of the species. The neotype, a male (cl 4.9 mm), from Tima River of Okinawa Island, Ryukyu Islands, is deposited in the NSMT.

Distribution.—Known only from the Ryukyu Islands, Japan.

Habitat.—Freshwater bodies with connections to the sea.

*Caridina leucosticta* Stimpson, 1860  
Figs. 7–10

*Caridina leucosticta* Stimpson, 1860: 97 [type locality: Simoda, Izu Peninsula, Honshu, Japan].

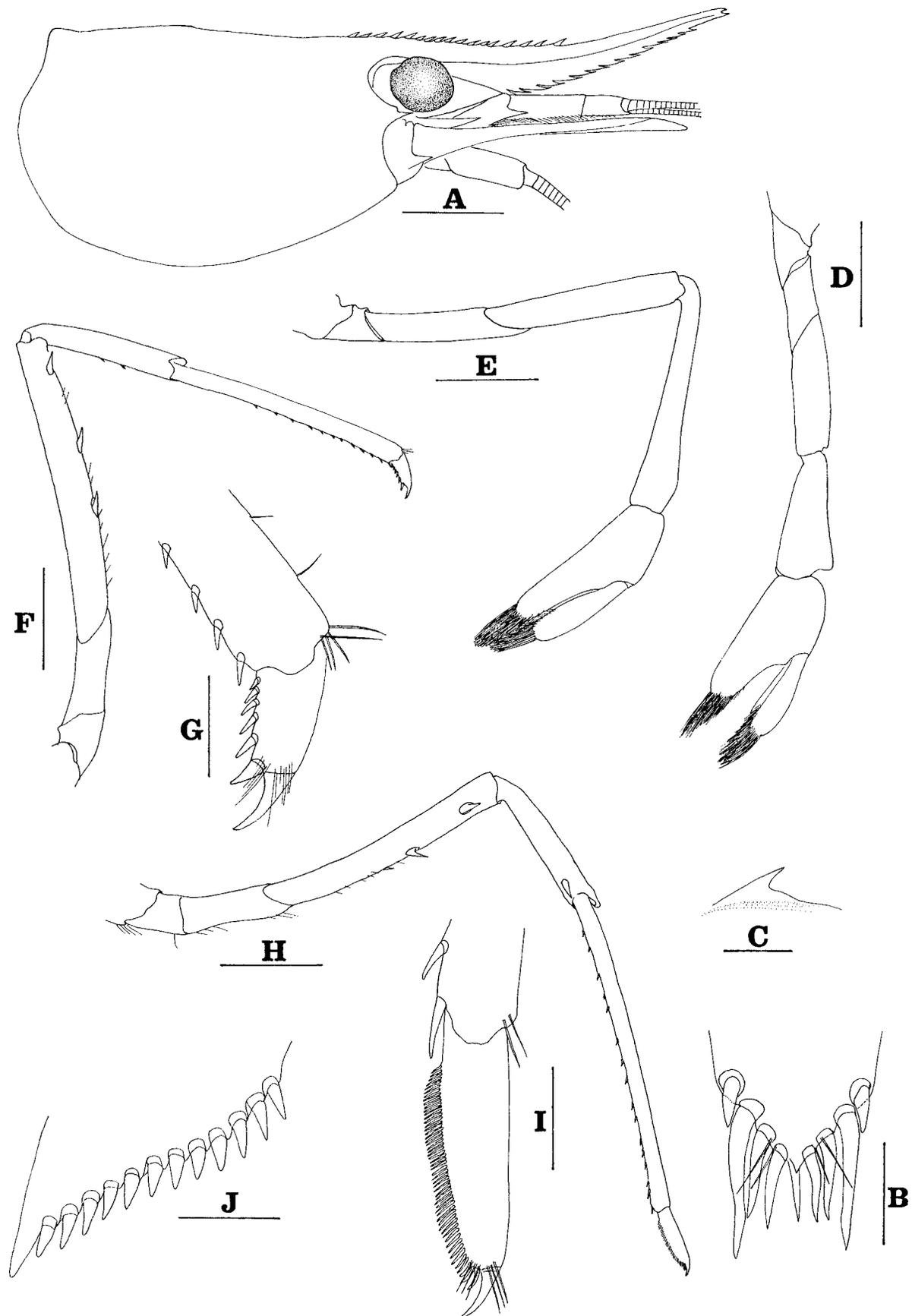
*Caridina leucosticta* Bouvier, 1905: 93; Kubo, 1938: 87, figs. 16a–h; 1986: 493, fig. 20–79–3; Kamita, 1961: 64, figs. 28a–d; Fujino, 1972: 7, fig. 19; Shokita, 1975: 119; 1979: 202; Miyake, 1977: 39; Hayashi, 1989b: 230; Suzuki *et al.*, 1993: 56; Suzuki and Sato, 1994: 64.

Not *Caridina leucosticta*: Kamita, 1967: 5, fig. 5.

Material Examined.—Neotype: ovigerous female, cl 7.7 mm, NSMT (NIES-Iz-1), 138°56.43'E 34°41.83'N, Inouzawa River, freshwater, lotic, EC 134, Shimoda City, Izu Peninsula, coll. K. Satake, 10 Aug 2004. Others: 14 males, cl 3.9–5.6 mm, 7 ovigerous females, cl 6.9–8.5 mm, NIES-Iz-1, 138°56.43'E 34°41.83'N, Inouzawa River, freshwater, lotic, EC 134, Shimoda City, Izu Peninsula, coll. K. Satake, 10 Aug 2004; 24 males, cl 3.9–5.0 mm, 10 ovigerous females, cl 4.8–7.3 mm, NIES-Iz-2, 138°52.58'E 34°38.72'N, a small stream draining into Aono River, brackish water, lotic, EC 3810, Minami-Izu, Izu Peninsula, coll. K. Satake, 10 Aug 2004; 3 ovigerous females, cl 7.5–9.0 mm, NIES-Iz-3, 138°47.67'E 34°45.21'N, Naka River, freshwater, lotic, EC 139, Matsuzaki-cho, Izu Peninsula, coll. K. Satake, 10 Aug 2004; 1 male, cl 3.9 mm, NSMT, 26°36.61'N 128°07.04'E, Arume River, Okinawa Island, Ryukyu Islands, coll. Y. Cai, N. K. Ng, T. Naruse and S. Islam, 11 Jun 2000. Others: 1 male, cl 4.4 mm, 1 female, cl 6.3 mm, 2 ovigerous females, cl 5.8–5.9 mm, ZRC 2004.0531, Okuma River, Okinawa Island, Ryukyu Islands, 31 Jun 1998; 14 males, cl 3.5–3.9 mm, 1 female, cl 4.0 mm, 7 ovigerous females, cl 4.5–5.8 mm, ZRC 2004.0530, 26°33.48'N 128°02.48'E, freshwater stream draining to a small patch of mangrove, Oura River, Okinawa Island, Ryukyu Islands, coll. Y. Cai *et al.*, 11 Jun 2000; 5 males, cl 3.0–4.0 mm, 20 females, cl 4.5–5.2 mm, 19 Jan 1975, Yona River, Okinawa Island, Ryukyu Islands; 1 male, cl 48.0 mm, Aritsu River, Kume-jima, coll. A. Kawakami, 8 Dec 1995; 1 male, cl 3.8 mm, 1 ovigerous female, cl 6.5 mm, ZRC, 24°16.64'N 123°52.80'E, shallow freshwater stream of Aira River, Iriomote Island, Ryukyu Islands, coll. Y. Cai, N. K. Ng and T. Naruse, 14 Jun 2000; 9 males, cl 3.0–4.2 mm, 12 ovigerous females, cl 4.7–6.5 mm, ZRC 2004.0532, 24°16.60'N 123°52.74'E, shallow freshwater stream, downstream of Aira River, Iriomote Island, Ryukyu Islands, coll. Y. Cai, N. K. Ng and T. Naruse, 14 Jun 2000; 7 males, cl 3.1–3.5 mm, 7 ovigerous females, cl 4.4–4.9 mm, ZRC 2004.0533, 24°18.39'N 123°51.29'E, downstream from the headwater of Nakama River, Iriomote Island, Ryukyu Islands, coll. Y. Cai, N. K. Ng and T. Naruse, 15 Jun 2000; 6 males, cl 4.2–4.7 mm, 8 females, cl 5.8–6.4 mm, 15 ovigerous females, cl 5.8–6.3 mm, ZRC 2004.0534, fast flowing water, upper part of Omija River, Iriomote Island, Ryukyu Islands, coll. Y. Cai and T. Naruse, 15 Jun 2000; 3 males, cl 2.4–4.0 mm, 8 females, cl 4.6–6.4 mm, 1 ovigerous female, cl 5.7 mm, ZRC 2004.0535, upper Hiji fall, Hiji River, coll. P. K. L. Ng *et al.*, 4 Nov 1987; 3 females, cl 5.0–5.9 mm, UR1750, no data; 1 ovigerous female, cl 5.7 mm, UR1221, Kawachi-gawa River, Amami-ohshima Island, Ryukyu Islands, coll. M. Takeda, 15 Jul 1988; 1 female, cl

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Fig. 5. *Caridina grandirostris*. A, first pereopod; B, second pereopod; C, third pereopod; D, dactylus of third pereopod; E, fifth pereopod; F, dactylus of fifth pereopod; G, male first pleopod; H, male second pleopod. Scales: A–C, E = 1.0 mm; D, F = 0.2 mm; G, H = 0.5 mm. (neotype male, cl 4.9 mm, NSMT, Tima River, Okinawa, Ryukyu Islands)



3.0 mm, UR1181, Sisa-gawa River, Matsuura city, Nagasaki Pref., Kyushu, no date; 1 female, cl 3.0 mm, Kanyu-gawa River, Amami-ohshima Island, Ryukyu Islands, coll. M. Takeda, 16 Jul 1988; 4 males, cl 4.4-5.0 mm, 6 ovigerous females, cl 6.6-6.8 mm, UR1111, Kawauchi-gawa River, Amami-oshima Island, Ryukyu Islands, coll. M. Takeda, 18 Jul 1988; 1 ovigerous female, cl 6.2 mm, UR1219, Kawauchi-gawa River, Amami-ohshima Island, Ryukyu Islands, 18 Jul 1988.

Comparative Material Examined.—*Caridina wyckii* (Hickson, 1888): 11 females, cl 3.6-4.1 mm, 1 ovigerous female, cl 3.6 mm, syntypes, RMNH D 1456, Lake Tondano, leg. (S. Hickson, Apr 1886); *Caridina brachydactyla* De Man, 1908: 1 female, cl 6.7 mm, 2 ovigerous females, cl 5.1-5.3 mm, RMNH D 2552, syntype of *Caridina nilotica* var. *brachydactyla*, Luwu, River near Palopo, Celebes (Sulawesi), coll. M. Weber, Feb 1889; *Caridina nilotica meridionalis* J. Roux, 1926: 14 males, cl 2.4-5.3 mm, 6 females, cl 2.4-5.7 mm, 1 ovigerous female, cl 5.7 mm, NHMB, syntypes, Tiouaka Tal, New Caledonia, 20 Aug 1911.

Description.—Rostrum long, reaching to or slightly beyond end of scaphocerite, straight or anterior 1/3 slightly upturned, rostral formula: 2-4 (mode 3) + 15-22 (mode 15-18) + 1-3 (mode 1)/7-13 (mode 8-10), normally unarmed anterior dorsal margin between subapical teeth and others 1/4 length of rostrum or less; antennal spine distinctly lower than inferior orbital angle; pterygostomian margin produced. Sixth pleomere 0.8 times as long as carapace, 1.9 times as long as fifth somite, slightly shorter than telson. Telson 3.2 times as long as wide, terminating in posteromedian projection; with 3 or 4 pairs of dorsal spinules, 1 pair of dorsolateral spines near distal end, 3 or 4 pairs of spines on distal margin, lateral pair longer than sublateral pair, median pair shortest; preanal carina moderately high, without spine.

Eyes well developed. Antennular peduncle slender, 0.7 to 0.9 times as long as carapace; proximal segment a little more than half length of the antennular peduncle, intermediate segment 1.6 times as long as distal segment; stylocerite reaching 0.85 times length of proximal segment. Scaphocerite 3.4 times as long as wide, with distolateral spine reaching slightly beyond end of antennular peduncle.

Mouthparts similar to *C. grandirostris*. Third maxilliped reaching to end of antennular peduncle, with a short exopod, reaching only slightly beyond end of antepenultimate segment, ultimate segment distinctly shorter than penultimate segment.

Epipods on first 4 pereopods. First pereopod short, reaching to distal end of eye stalk, merus 2.8-3.2 times as long as broad, as long as carpus; carpus excavated anteriorly, shorter than chela, 1.9-2.2 times as long as high; chela 2.0-2.4 times as long as broad; fingers 1.1-1.4 times as long as palm. Second pereopod reaching end of second

segment of antennular peduncle, merus shorter than carpus, 5.0-5.6 times as long as broad; carpus distinctly longer than chela, 1.2-1.3 times as long as chela, 4.5-5.5 times as long as high; chela 2.3-2.8 times as long as broad; fingers 1.2-1.6 times as long as palm. Third pereopod slender, reaching to end of antennular peduncle, propodus distinctly shorter than merus, 13-15 times as long as broad, 4.0-5.2 times as long as dactylus; dactylus ending in 2 claws; 2.9-3.2 times as long as wide (spines included), with 5 accessory spines strongly curved inwards; fifth pereopod reaching end of antennular peduncle, propodus distinctly longer than merus, 16-19 times as long as broad, 2.9 times as long as dactylus; dactylus 3.8-4.8 times as long as wide, with 41-61 spinules on its flexor margin.

Endopod of male first pleopod reaching 1/4 length of exopod, subtriangular, 2.0-2.2 times as long as broad, no appendix interna, or with a vestige. Appendix masculina of male second pleopod short, reaching to half length of endopod, inner and distal surfaces densely lined with long spines; appendix interna at basal 2/5 of appendix masculina, extending to distal 1/5 of appendix masculina. Diaeresis of uropodal exopod with 14 or 15 spinules.

Egg size 0.38-0.40 × 0.23-0.28 mm in diameter.

Remarks.—Stimpson (1860) briefly described *Caridina leucosticta* from Simoda, Japan, as follows: "Rostrum circiter carapacis longitudine, pedunculo antennularum longius; margine superiore recto, dentibus tenuibus ad 17 + 3 armato, apicem versus parce resimo et edentulo; margine inferiore 10 dentato. Spina antennalis alte posita. Pedes gracillimi; posticorum merus margine inferiore spinulis 2-5 armatus. Color obscure-fuscus, maculis vel stigmis minutis crebris albis notatus." [Rostrum as long as carapace, longer than antennular peduncle; upper margin straight, armed with 17 small teeth, apical region slightly upturned, with 3 apical teeth, no teeth between apical and straight upper margin; ventral margin with 10 teeth. Antennular spine not located at inferior angle. Legs slender, inferior margin of merus armed with 2-5 spines, Color obscure dark, covered with numerous tiny white spots.]. Our specimens agree well with the original description. With regard to the small egg size, the form of the rostrum, the lack of a preanal spine and having a posteromedian projection on the distal margin of the telson, *C. leucosticta* appears closest to *C. brachydactyla* De Man, 1908. It can be distinguished from *C. brachydactyla* by the relatively shorter fingers of first pereopod (fingers 1.1-1.4 times as long as palm vs. 2.0-2.5 times in *C. brachydactyla*); the lack of a prominent spine at the distal end of propodus of fifth pereopod (vs. having such spine which reaches beyond half of dactylus in *C. brachydactyla*); the longer dactylus of third pereopod (propodus 4.0-5.2 times as long as dactylus vs. 6.0 times in *C. brachydactyla*); and the longer and more slender dactylus of the fifth pereopod (propodus 3.8-4.8 times as

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Fig. 6. *Caridina grandirostris*. A, cephalothorax and cephalic appendages, lateral view; B, distal portion of telson; C, preanal carina; D, first pereopod; E, second pereopod; F, third pereopod; G, dactylus of third pereopod; H, fifth pereopod; I, dactylus of fifth pereopod; J, uropodal diaeresis. Scales: A, D-F, H = 1.0 mm; C = 0.5 mm; B, G, I, J = 0.2 mm. (ovigerous female, 6.1 mm, ZRC, Okuma River, Okinawa Island, Ryukyu Islands)

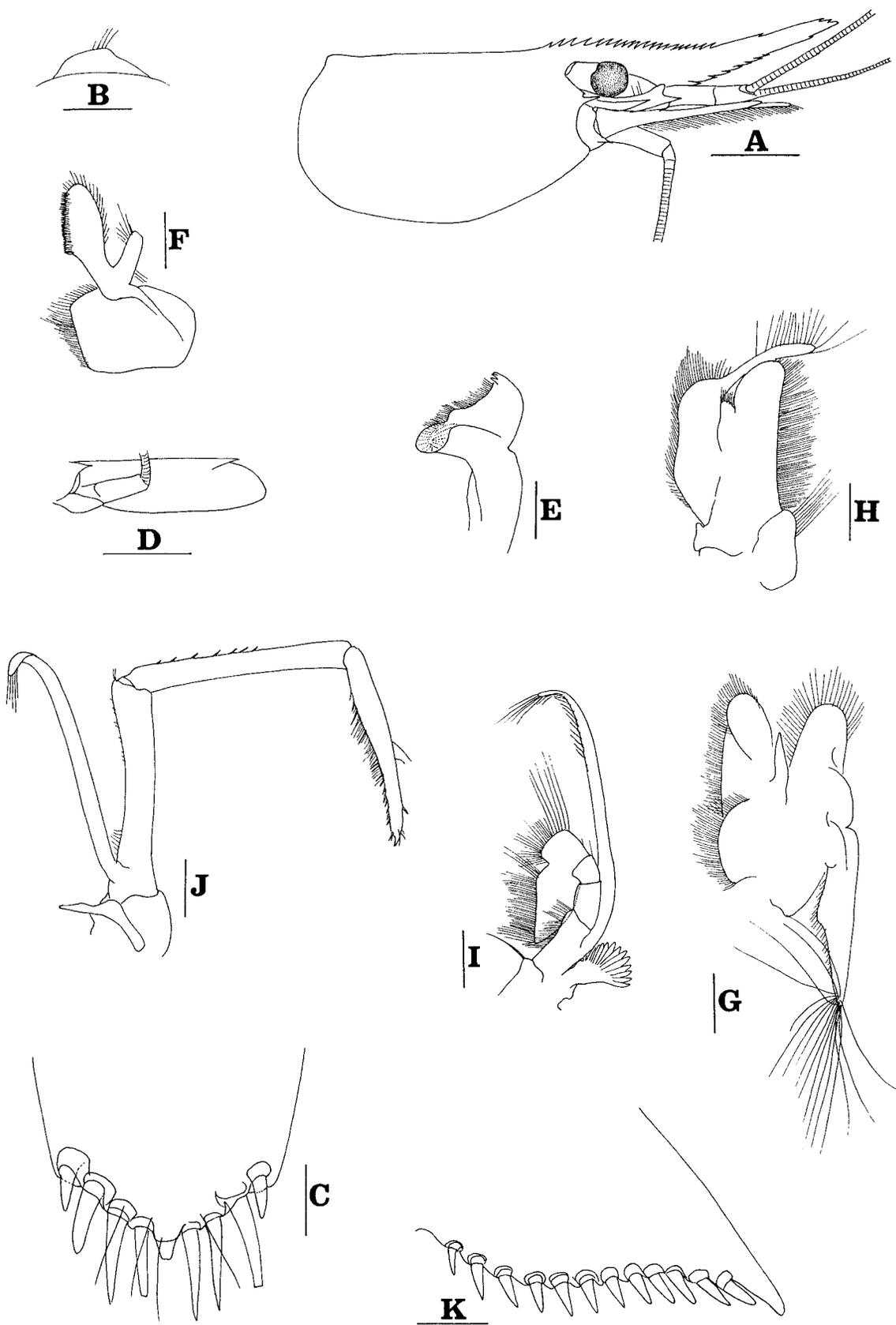


Fig. 7. *Caridina leucosticta*. A, cephalothorax and cephalic appendages, lateral view; B, preanal carina; C, distal portion of telson; D, scaphocerite; E, mandible; F, maxillula; G, maxilla; H, first maxilliped; I, second maxilliped; J, third maxilliped; K, uropodal diaeresis. Scales: A, D = 1.0 mm; B, E-J = 0.5 mm, C, K = 0.2 mm. (neotype: ovigerous female, cl 7.7 mm, NSMT, Inouzawa River, freshwater, Shimoda, Izu Peninsula)

long as dactylus vs. 5.0-6.0 times in *C. brachydactyla*; dactylus 3.8-4.8 times as long as wide vs. 3.4-3.8 times in *C. brachydactyla*). Bouvier (1905) commented that with respect to the straight rostrum, *C. leucosticta* strongly resembles *C. wyckii* (Hickson, 1888). However, *C. leucosticta* can be immediately distinguished from *C. wyckii* by its longer rostrum which reaches or is slightly beyond the end of scaphocerite (vs. not reaching beyond end of antennular peduncle); the stouter scaphocerite (3.4 times as long as wide vs. 4.3 times); the more slender carpus of the first pereopod (1.9-2.2 times as long as high vs. 1.4-1.5); the preanal carina without a spine (vs. with spine), and the relatively smaller egg size (0.38-0.40 vs. 0.23-0.28 mm vs.  $0.52 \times 0.30$  mm). *Caridina leucosticta* also resembles *C. nilotica meridionalis* Roux, 1926, from New Caledonia, in the form of the rostrum, but differs from the latter by lacking an appendix interna on the male first pleopod and having a smaller egg size ( $0.38-0.40 \times 0.23-0.28$  mm vs.  $0.65-0.70 \times 0.40$  mm).

Kamita (1967) reported *C. leucosticta* from New Caledonia on the basis of one female specimen. This record was subsequently cited by Holthuis (1969). Kamita's (1967) specimen has a rostrum, which is shorter than the antennular peduncle, with 15 ventral teeth, while in *C. leucosticta*, the ventral teeth are always no more than 13. Kamita's (1967) material is more likely to be *C. nilotica meridionalis* rather than *C. leucosticta*.

In view of the potential for taxonomic problems, an ovigerous female, cl 7.7 mm, collected from Inouzawa River, Shimoda City, Izu Peninsula, is herein designated as the neotype of *C. leucosticta* Stimpson, 1860. It is deposited in National Science Museum, Tokyo, Japan.

Distribution.—Known with certainty only from Japan. Reported from Korea.

Habitat.—*Caridina leucosticta* lives in rivers which are connected to the sea, in freshwater or brackish waters. When collected together with *C. grandirostris* from the same river in the Ryukyus, *C. leucosticta* is usually present in the upper regions, while *C. grandirostris* occupies the lower parts. In some cases, both were caught together. The similar distribution pattern is also found in Izu Peninsula. However, the species collected together with it is *Paratya compressa* De Haan, 1849.

### *Caridina multidentata* Stimpson, 1860

Figs. 11, 12

*Caridina multidentata* Stimpson, 1860: 98 [type locality: Ogasawara (Bonin) Islands, Japan].

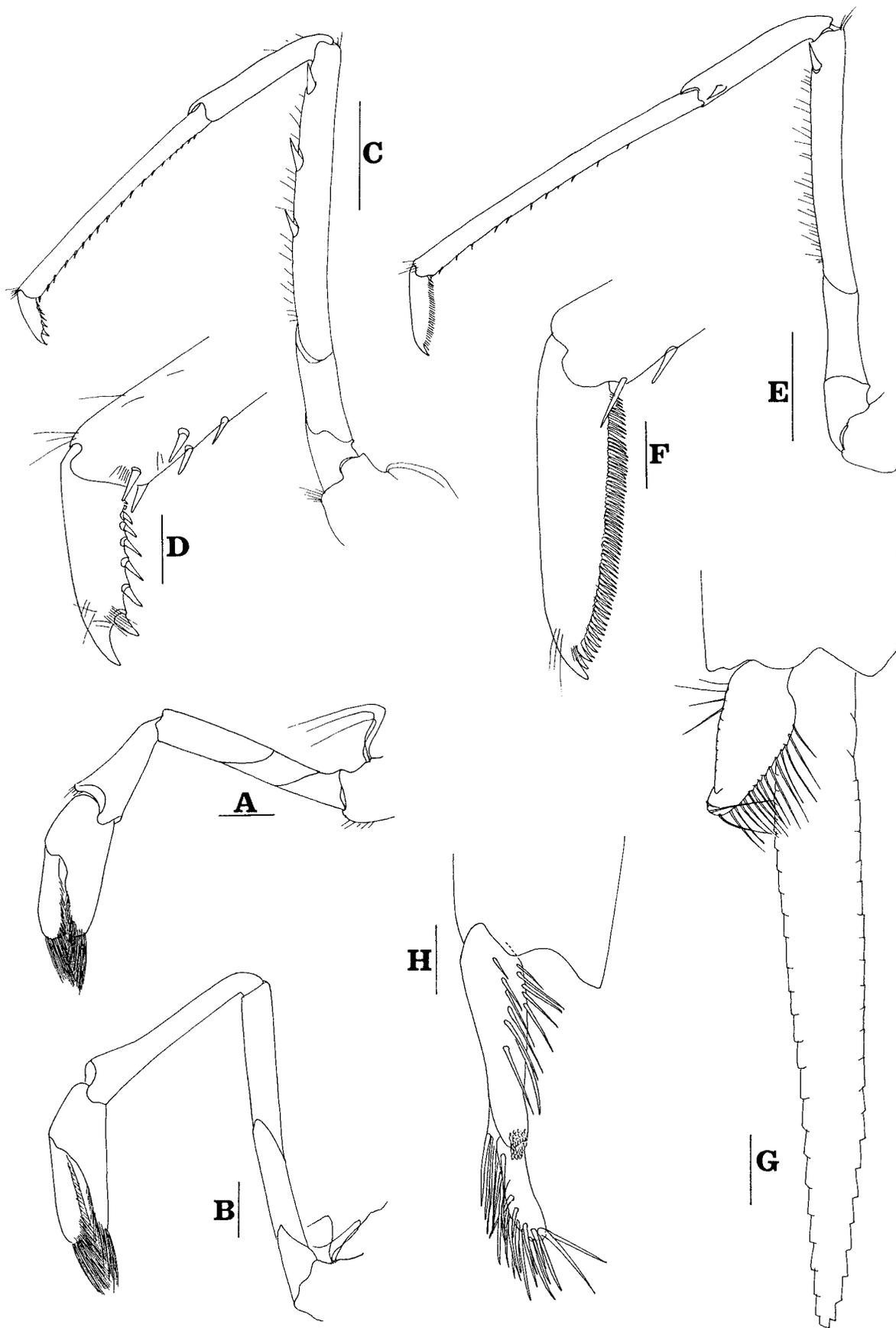
*Caridina multidentata*: Chace, 1997: 16 (part).

*Caridina japonica* De Man, 1892b: 261, pl. IX, figs. 7, 8 [type locality: Kagar, Hayagana, Japan]; Bouvier, 1904: 133; 1905: 75; 1925: 239, figs. 550-554; Kubo, 1938: 89, figs. 17, 18a-h; Kamita, 1956: 14; 1959: 21, figs. 1-3; 1961: 50, figs. 20-27; Holthuis, 1965: 12, fig. 4; Suzuki, 1972: 6, figs. 4-7; Fujino, 1972: 7, fig. 11; Shokita, 1975: 119; 1979: 203, pl. 1g; Hayashi and Hamano, 1984: 571; Hayashi, 1989b: 229, figs. 166a-h; Choy, 1991: 353; Hung et al., 1993: 495, fig. 9a, 10a-f; Suzuki, et al., 1993: 58; Suzuki and Sato, 1994: 68; Shy and Yu, 1998: 55, fig. 23.

*Caridina japonica sikokuensis* Kubo, 1938: 91, figs. 20a-m [Ryugado, Kochi Prefecture, Shikoku, Japan].

Not *Caridina multidentata* De Man, 1892a: 380, pl. 22, fig. 26; Bouvier, 1905: 74.

Material Examined.—Neotype of *Caridina multidentata*: ovigerous female, cl 9.8 mm, NSMT, from a stream in Tenno-ura, Chichi-jima Island, Ogasawara Islands, coll. K. Satake and H. Suzuki, 4 May 2000. 1 male, cl 8.0 mm, lectotype of *Caridina japonica* De Man, 1892b, ZMA De 102876, Japan, coll. J. Anderson, 1881, 4 males, cl 7.8-8.2 mm; paralectotype of *Caridina japonica* De Man, 1892b, data same as lectotype; 1 male, cl 8.8 mm, paralectotype, MNHN-Na 731, Kagar, Hayagana, Japan. Others: 4 males, cl 6.0-7.4 mm, 16 ovigerous females, cl 7.5-9.1 mm, NIES-H-3, Nagahama-bashi, lotic system, EC 270-610, 130 to 140 meters above sea level, Haha-jima Island, Ogasawara Islands, coll. K. Satake and R. Ueno, 2 Mar 1999; 23 ovigerous females, cl 6.5-9.0 mm, NIES-H-6, upper reach of Koromodate Stream, lotic system, EC 590-700, 70 to 110 meters above sea level, Haha-jima Island, Ogasawara Islands, coll. K. Satake and R. Ueno, 24 Feb 2000; 1 male, cl 7.4 mm, 1 ovigerous female, cl 7.9 mm, NIES-H-9, an inlet stream of Chibusu Dam, lotic system, EC 250-600; 60 meters above sea level, Haha-jima Island, Ogasawara Islands, coll. K. Satake, 25 Feb 2000; 4 males, cl 6.3-7.5 mm, NIES-H-10, an inlet stream of Chibusu East Dam, lotic system, EC290-550, 70 meters above sea level, Haha-jima Island, Ogasawara Islands, coll. K. Satake and R. Ueno, 26 Feb 2000; 3 males, cl 7.4-8.0 mm, NIES-CH-12, east inlet stream of Shigure Dam, lotic, EC 200, 90 meters above sea level, Chichi-jima Island, Ogasawara Islands, coll. K. Satake, R. Ueno, K. Horikoshi and M. Inaba, 27 Feb 2000; 5 females, cl 6.8-9.5 mm, 8 males, cl 6.2-8.0 mm, NIES-CH-5, Minamifukuro-zawa stream, lotic system, EC 960-1200, 0 to 10 meters above sea level, Chichi-jima Island, Ogasawara Islands, coll. K. Satake and R. Ueno, 11 Feb 1998; 14 males, cl 5.1-6.0 mm, 10 females, cl 5.9-9.0 mm, NIES-CH-17, one stream of Naka-kaigan Coast, freshwater, lotic system, EC 380, 60 to 70 meters above sea level, Chichi-jima Island, Ogasawara Islands, coll. K. Satake, R. Ueno and M. Inaba, 28 Feb 2000; 20 males, cl 5.8-8.5 mm, 8 females, cl 7.3-9.1 mm, 12 ovigerous females, cl 7.8-9.5 mm, NIES-CH-18, a stream of Higashi-kaigan Coast, lotic system, EC 400-510, 140 meters above sea level, Chichi-jima Island, Ogasawara Islands, coll. K. Satake, 29 Feb 2000; 7 males, cl 6.1-6.9 mm, 2 females, cl 6.6-9.8 mm, NIES-CH-19, one tributary of a stream of Higashi-kaigan Coast, lotic system, EC 420, 250 meters above sea level, Chichi-jima Island, Ogasawara Islands, coll. K. Satake and M. Inaba, 28 Apr 2000; 1 female, cl 7.2 mm, NIES-CH-20, the other tributary of a stream of Higashi-kaigan Coast, lotic, EC 280, 200 meters above the sea level Chichi-jima Island, Ogasawara Islands, coll. K. Satake and M. Inaba, 3 May 2000; 26 males, cl 5.7-6.5 mm, 1 females, 3.2-8.6 mm, NIES-CH-23, a stream in Tenno-ura, lotic system, EC 610, 90 meters above sea level, Chichi-jima Island, Ogasawara Islands, coll. K. Satake and H. Suzuki, 4 May 2000; 1 male, cl 5.7 mm, 3 ovigerous females, cl 7.0-8.4 mm, ZRC 2004.0536, from a stream in Tenno-ura, Chichi-jima Island, Ogasawara Islands, coll. K. Satake and H. Suzuki, 4 May 2000; 1 ovigerous female, cl 11.0 mm, NSMT-Cr1673, 33°06'15"N 139°48'17"E, Kamogawa River, Hachijo-jima Island, Izu Archipelago, coll. J. Okuno, 15 July 1992; 7 males, cl 7.2-8.2 mm, NSMT-



Cr2144, 33°06'15"N 139°48'17"E, Kamo-gawa River, Hachijo-jima Island, Izu Islands, coll. J. Okuno, 25 Sep 92; 4 ovigerous females, cl 9.5-11.5 mm, NSMT-Cr1674, 33°06'15"N 139°48'17"E, Kamo-gawa River, Hachijo-jima Island, Izu Island, coll. J. Okuno, 15 Sep 1992; 1 male, cl 11.3 mm, NSMT-Cr1542, upper stream of Kochi-gawa River, Numazu, Izu Peninsula, Honshu, 200 meters above sea level, coll. N. Seno, 2 Nov 1987; 1 female, cl 9.9 mm, NSMT-Cr1745, no data; 1 male, cl 7.5 mm, NSMT-Cr1121, upper of Kawauchi-gawa River, Amami-oshima Island, Ryukyu Islands, coll. M. Takeda, 15 Jul 88; 1 ovigerous female, cl 7.9 mm, NSMT-Cr1754, Shino-Kawa River, Amami-oshima Island, Ryukyu Islands, coll. M. Takeda, 17 Jul 1988; 1 male, cl 8.3 mm, 2 ovigerous females, cl 7.3-9.8 mm, ZRC 2004.0538, Omija River, Iriomote Island, Ryukyu Islands, coll. T. Naruse, 1 Aug 1999; 1 ovigerous female, cl 8.2 mm, NSMT, Amami-ohshima Island, Ryukyu Islands, 29 Jul 1992; 1 male, cl 16 mm, 2 ovigerous females, cl 10-12 mm, ZRC, 26°39.94'N 128°15.31'E, Arakawa River, Okinawa Island, Ryukyu Islands, coll. Y. Cai, N. K. Ng, T. Naruse and S. Islam, 11 Jun 2000; 1 female, cl 4.9 mm, ZRC, fast flowing water, upper part of Omija River, Iriomote Island, Ryukyu Islands, coll. Y. Cai and T. Naruse, 15 Jun 2000; 1 female, cl 9.5 mm, 2 ovigerous females, 6.2-9.8 mm, ZRC 2004.0539, Taiho River, Okinawa Island, Ryukyu Islands, coll. P. K. L. Ng et al., 31 May 1998.

**Description.**—Rostrum reaching slightly beyond end of basal segment of antennular peduncle to near end of third segment at most, posterior 2/3 sloping down, with a crest over orbit, anterior 1/3 horizontal; armed normally throughout both margins except subapical region, rostral formula: 15-30/5-18; antennal spine fused with inferior orbital angle; pterygostomial margin subrectangular. Sixth abdominal somite 0.60 times as long as carapace, 1.5 times as long as fifth somite, slightly shorter than telson. Telson 3.2 times as long as wide, terminating in a posteromedian projection; 3 or 4 pairs of dorsal spinules, situated on posterior half, 1 pair of dorsolateral spines near distal end, 3 or 4 pairs of spines on distal margin, lateral pair subequal to intermediate pairs; preanal carina high, without spine.

Eyes well developed. Antennular peduncle slender, 0.8 times as long as carapace; basal segment a little more than half length of the antennular peduncle, second segment 1.5 times as long as third segment; stylocerite reaching 0.8 times length of basal segment. Scaphocerite 2.7 times as long as wide, with distolateral spine reaching end of antennular peduncle.

Third maxilliped reaching to end of third segment of antennular peduncle, with a short exopod, reaching only slightly beyond end of antepenultimate segment, ultimate segment distinctly shorter than penultimate segment.

Epipods on first 4 pereopods. First pereopod short, reaching to end of basal segment of antennular peduncle,

merus 2.0-2.2 as long as broad, slightly longer than carpus; carpus excavated strongly anteriorly, shorter than chela, 1.1-1.3 times as long as high; chela 2.0-2.3 times as long as broad; length of fingers variable, at most, shorter than palm, sometimes as long as or even slightly longer. Second pereopod reaching end of second segment of antennular peduncle, merus shorter than carpus, 3.9-4.4 times as long as broad; carpus slightly longer than chela, 3.8-4.0 times as long as high; chela 2.5-2.7 times as long as broad; fingers 1.5-1.7 times as long as palm. Third pereopod long, slender, reaching beyond end of antennular peduncle by entire dactylus and 1/4 of propodus, propodus distinctly shorter than merus, 10-15 times as long as broad, 3.7-4.4 times as long as dactylus; dactylus ending in a strong claw; 2.0-2.4 times as long as wide (spines included), flexor margin with 5 or 6 accessory spines strongly curved inwards, distal accessory spine distinctly shorter than the following one. Fifth pereopod reaching to end of antennular peduncle, propodus distinctly longer than merus, 11-15 times as long as broad, 5.3 times as long as dactylus; distal end of propodus normally with an enlarged spine reaching to half or 3/4 of the dactylus length; dactylus 2.2-2.6 times as long as wide, with 35-48 spinules on flexor margin.

Endopod of male first pleopod extending to 1/3 length of exopod, rounded, subrectangular, 2.0-2.3 times as long as broad, with a distinct appendix interna near distal end of endopod. Appendix masculina of male second pleopod short, reaching to half length of endopod, inner and distal surface densely lined with long spines; appendix interna at basal 1/3 of appendix masculina, extending to distal 1/3 of appendix masculina. Diaeresis of uropodal exopod with 19-23 spinules.

Egg size 0.38-0.40 × 0.23-0.28 mm in diameter.

**Remarks.**—Stimpson (1860) described *C. multidentata* from Bonin Islands (Ogasawara Islands) in the following words: "Rostrum medium articuli ultimi pedunculi antennularum attingens; crista dorsai lamellato-dilatata, arcuata, supra bases oculorum oriente, et denticulis 20-30 serrata; extremitate robusta, acuta, vix denticulata; margin inferior 14-denticulato. Margo carapacis anterior spina antennali armatus. Pedes secundi paris pedunculum antennularum superantes; carpo manu longiore; digitis degressis, penicillis densis, latis, fere flabelliformibus. Dactyli pedum posticorum breves, septimam partem articuli penultimi longitudine non superantes. Segmentum caudale dorso non concavum, paribus quinque aculeorum instructum; lamellae laterales grandes, segmento caudale fere duplo longiores, extremitatibus productis subtriangularibus." [Rostrum medium, reaching to ultimate segment of antennular peduncle, dorsal crest ridged dilated, bending against base of ocular region, serrated with 20-30 denticles; upper surface stout, sharp, heavily denticulate; lower margin with 14 denticles. Margin of carapace armed anteriorly with antennal spine. Second pair of legs longer than antennular peduncle; carpus elon-

←

Fig. 8. *Caridina leucosticta*. A, first pereopod; B, second pereopod; C, third pereopod; D, dactylus of third pereopod; E, fifth pereopod; F, dactylus of fifth pereopod; G, male first pleopod; H, male second pleopod. Scales: A, B = 0.5 mm, C, E = 1.0 mm; D, F = 0.2 mm; G, H = 0.2 mm. (neotype: ovigerous female, cl 7.7 mm, NSMT, Inouzawa River, freshwater, Shimoda, Izu Peninsula).

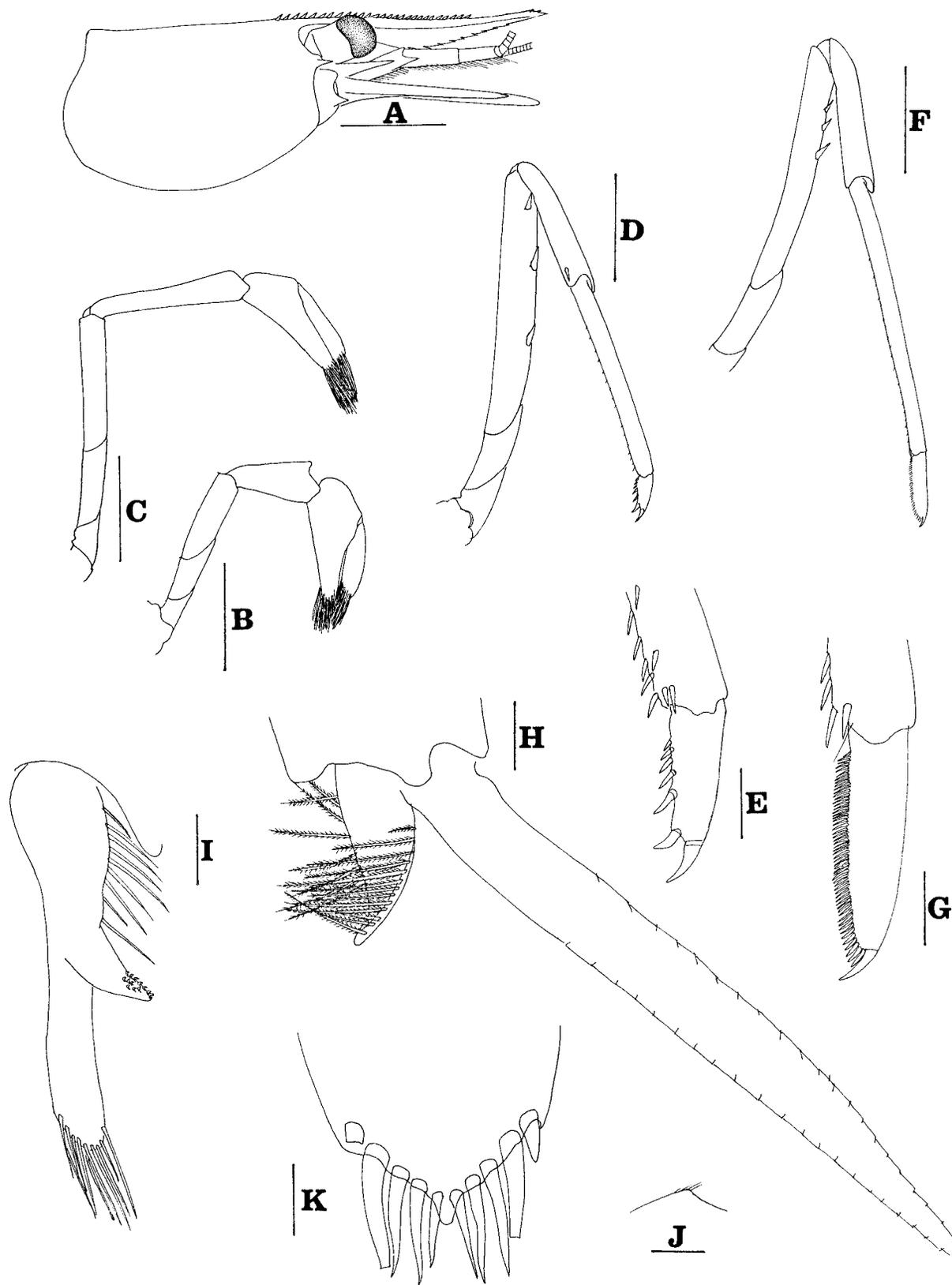


Fig. 9. *Caridina leucosticta*. A, cephalothorax and cephalic appendages, lateral view; B, first pereiopod; C, second pereiopod. D, third pereiopod; E, dactylus of third pereiopod; F, fifth pereiopod; G, dactylus of fifth pereiopod; H, male first pleopod; I, appendix masculina and appendix interna of male second masculina; J, preanal carina; K, distal portion of telson. Scales: A-D, F = 1.0 mm; H, I = 0.5 mm; E, G, K = 0.2 mm. (male, cl 4.0 mm, ZRC 2004.0535, Hiji River, Okinawa Island, Ryukyu Islands)

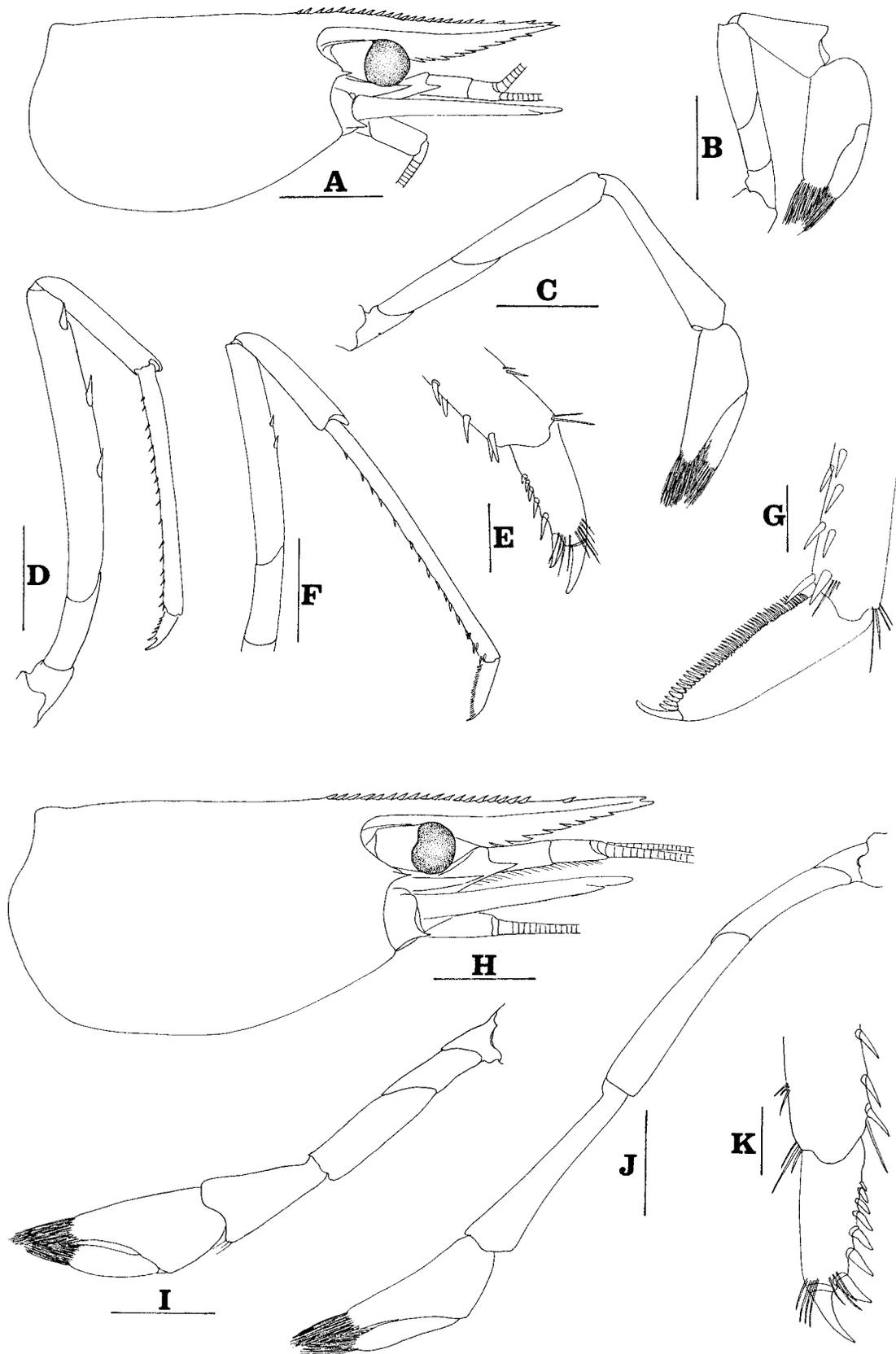


Fig. 10. *Caridina leucosticta*. A, cephalothorax and cephalic appendages, lateral view; B, first pereiopod; C, second pereiopod; D, third pereiopod; E, dactylus of third pereiopod; F, fifth pereiopod; G, dactylus of fifth pereiopod; H, cephalothorax and cephalic appendages, lateral view; I, first pereiopod; J, second pereiopod; K, dactylus of third pereiopod. Scales: A-C, D, F, H-J = 1.0 mm; E, G, K = 0.2 mm. (A-G, female, cl 5.2 mm, ZRC 2004.0535, Hiji River, Okinawa Island, Ryukyu Islands; H-K, female, cl 6.1 mm, ZRC 2004.0535, Hiji River, Okinawa Island, Ryukyu Islands)

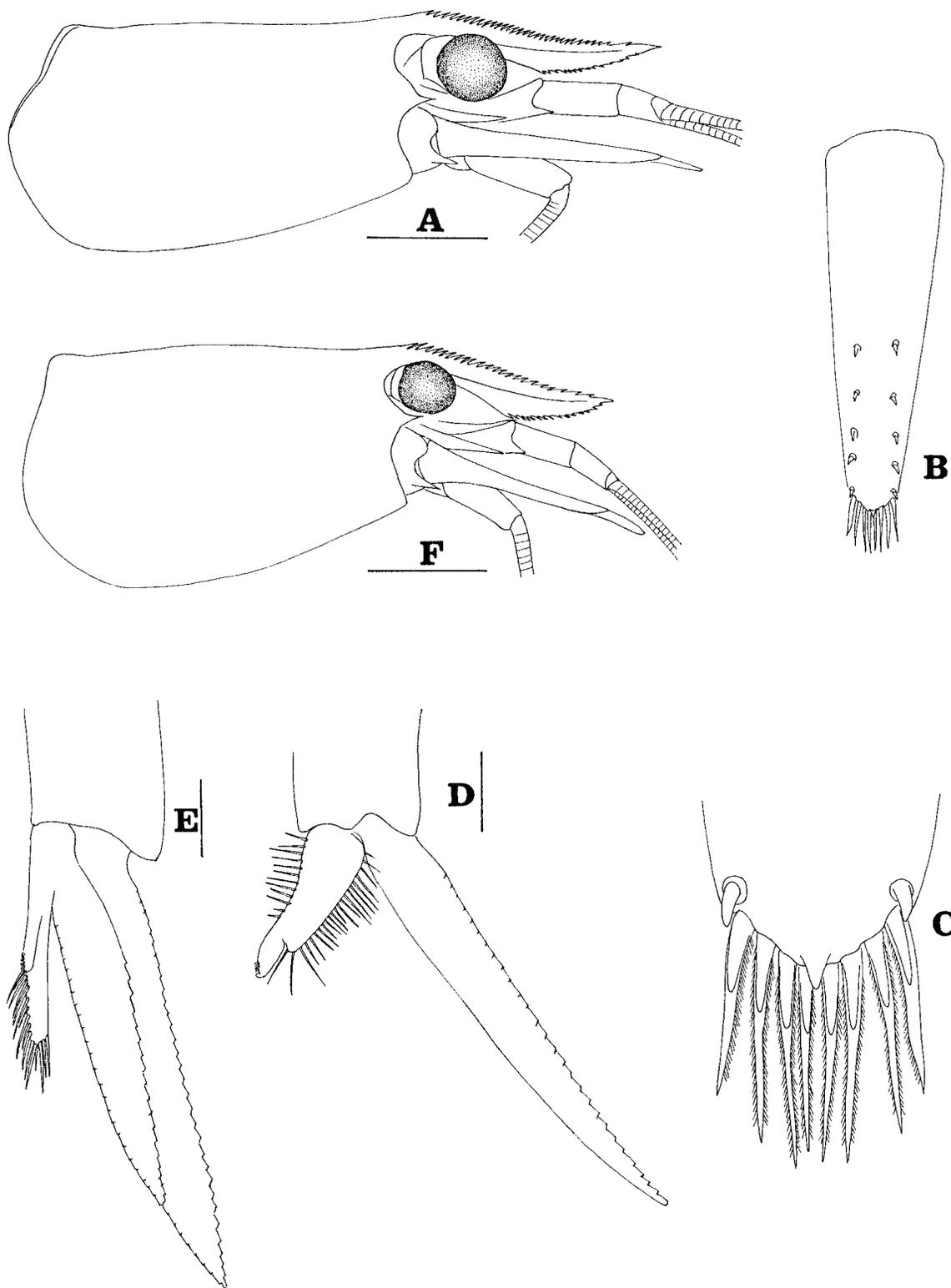
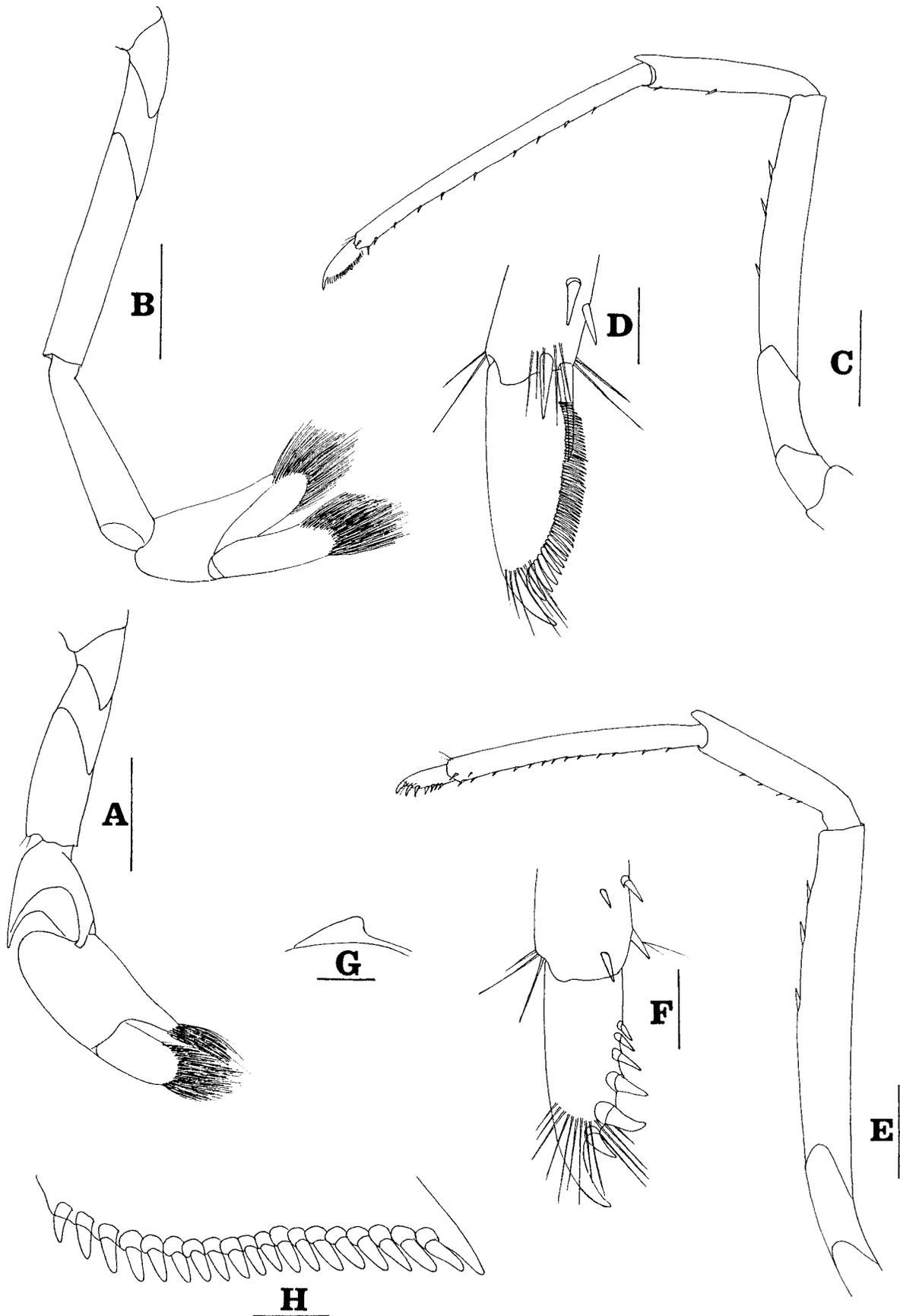


Fig. 11. *Caridina multidentata*. A, F, cephalothorax and cephalic appendages, lateral view; B, telson; C, distal portion of telson; D, male first pleopod; E, male second pleopod. A, B, F = 1.0 mm; D, E = 0.5 mm; C = 0.2 mm. (A-E, male, cl 5.7 mm, F, ovigerous female, cl 9.8 mm, neotype, NSMT, from a stream of Tenno-ura, Chichi-jima Island, Ogasawara Islands)

Fig. 12. *Caridina multidentata*. A, first pereopod; B, second pereopod; C, fifth pereopod; D, dactylus of fifth pereopod; E, third pereopod; F, dactylus of third pereopod; H, uropodal diaeresis. Scales: A-C, G = 0.5 mm; E = 1.0 mm; D, F, H = 0.2 mm (male, cl 5.7 mm, ZRC 2004.0536, from a stream of Tenno-ura, Chichi-jima Island, Ogasawara Islands)



gate, fingers small, thick pointed, flattened, tip expanded. Dactylus of posterior legs sharp, penultimate article of seventh part longitudinally not produced. Caudal segment dorsally not concave, equal in size to fifth, with large lateral ridges, tip of caudal segment twice as long, triangular.]

Surprisingly, the name *C. multidentata* Stimpson, 1860, has been totally ignored in treatments of the crustacean fauna of Japan since its original report (e.g., see Kubo, 1938; Kamita, 1956; Shokita, 1975; Suzuki, 1972; Hayashi, 1989a-c, 1990). De Man (1892a), however, reported *C. multidentata* from Indonesia, on which Chace (1997) stated that its identification must be considered questionable for the time being. According to the description and figures (De Man, 1892a; Bouvier, 1925), the Indonesian material distinctively differs from *C. multidentata* in having a straight, not crested rostrum (vs. crested), smaller number of uropodal teeth on the diaeresis (13-14 vs. 19-23), and the larger egg size (near 1 mm in diameter vs. 0.38-0.40 × 0.23-0.28 mm). De Man's material appears to belong to an undescribed taxon.

De Man (1892b) described *C. japonica* on the basis of six specimens from Kagar, Hayagana, Japan. According to his description, the upper margin of the rostrum is straight or very slightly concave, with a rostral formula of 15-22/5-18, and the pereopods are of the stout form. In fact, this species is almost identical to *C. multidentata* as originally described by Stimpson (1860). The re-examination of the extant syntypes in ZMA and MNHN confirms this synonymization. Thus, the specimens previously identified under the name *C. japonica* should be reassigned to *C. multidentata* instead. Holthuis (1965) stated that a "... comparison of the Madagascar material with the good description and figures given by Kubo (1938: 89, figs. 17-19) of Japanese specimens failed to produce any difference that might be considered of specific or subspecific value." When Hung et al. (1993) reported *C. japonica* from Taiwan, they commented that it is distinct in having a basal crest on the rostrum. However, the material from Madagascar reported by Holthuis (1965: fig-4a) lacks such a crest. A comparison of the Indian Ocean material with that from the Western Pacific will be necessary to ascertain whether the present species truly has such a wide geographical distribution. Two females of Holthuis' (1965) material were re-examined. One has a straight rostrum, while the other one has a small crest over the eyes, a characteristic dactylus on the third pereopod and there is an enlarged spine on the large specimen. All these clearly indicate that the Madagascar specimens are in fact *C. multidentata* (= *C. japonica*) as presently defined. Kubo (1938) described a new subspecies, *C. japonica sikokuensis*, on the basis of specimens living in a limestone cave, Ryugado, Shikoku. However, the only characters used to separate this subspecies; the shorter and sharply bent rostrum, fall easily within the known variation for *C. multidentata* as observed here. Kamita

(1956) commented that the typical form could also be collected in the waters inside and outside of the cave. Therefore it is likely that this subspecies is merely a variation form of the typical species. Choy (1991: 354) reported the occurrence of *C. japonica* in Fiji and commented that "A comparison of original descriptions with the Fijian material indicate that the morphometric and meristic variations of many of the characters are large and overlap considerably thus not justifying the separation of the Fijian form to a distinct subspecies", although he found that there are some minor differences in the dactylus of the last three pereopods and in the placement of rostral teeth.

To stabilize the taxonomy of this species, an ovigerous female, with a carapace length of 8.8 mm (NSMT), from a stream in Tenno-ura, Chichi-jima Island, Ogasawara Islands, is designated as the neotype of *Caridina multidentata* Stimpson, 1860. A lectotype for *Caridina japonica* is also selected (male, cl 8.0 mm, ZMA).

Distribution.—Main islands of Japan, Ogasawara Islands, Ryukyu Islands, Taiwan, Fiji and Madagascar.

Habitat.—*Caridina multidentata* lives in large rivers with big rocks on the substrate.

*Caridina typus* H. Milne Edwards, 1837  
Figs. 13-15

*Caridina typus* H. Milne Edwards, 1837: 363, Pl. 25, figs. 4, 5 [type locality: unknown].

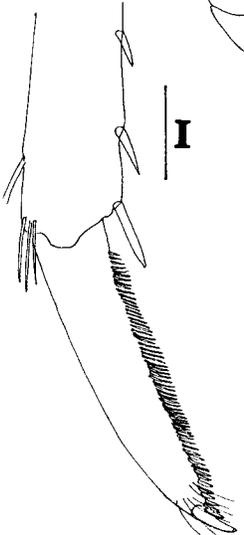
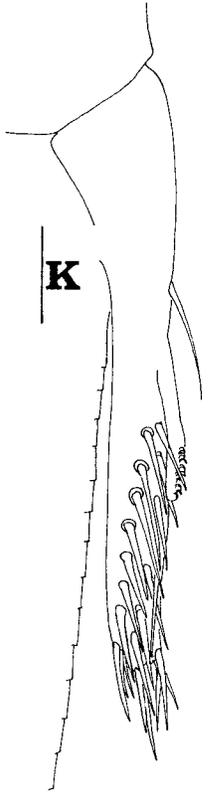
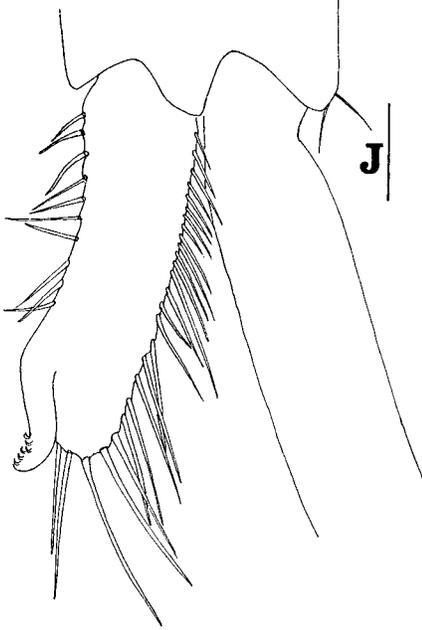
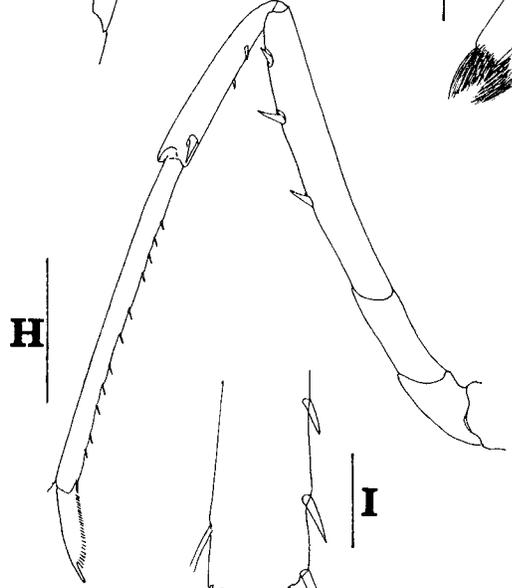
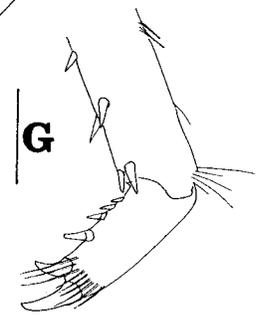
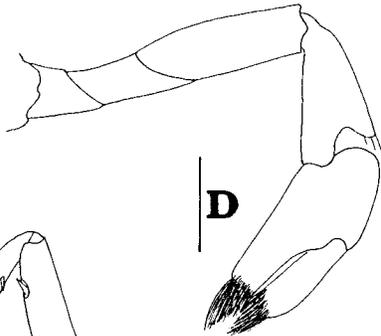
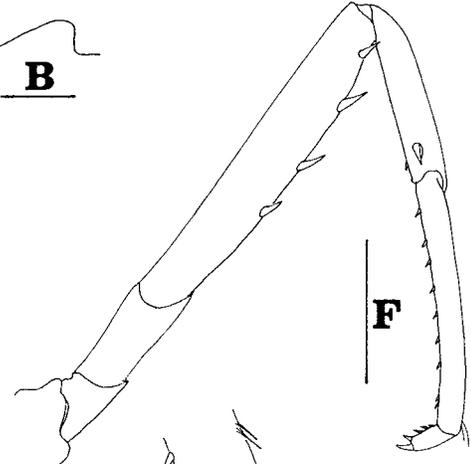
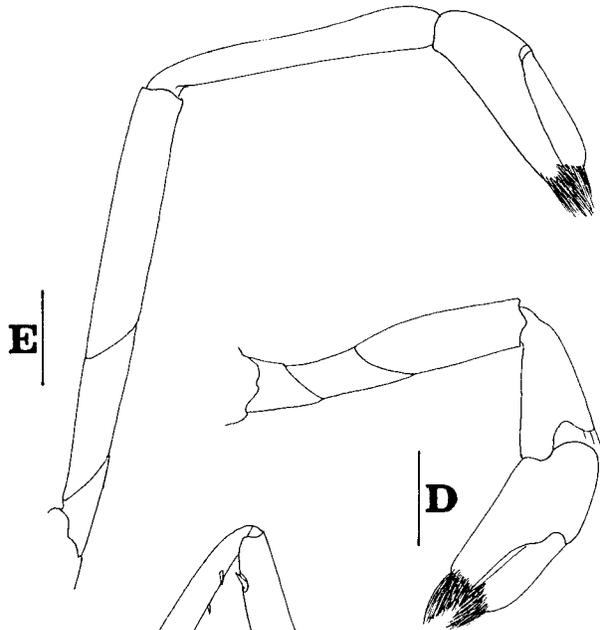
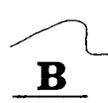
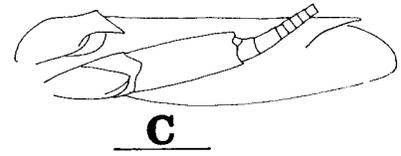
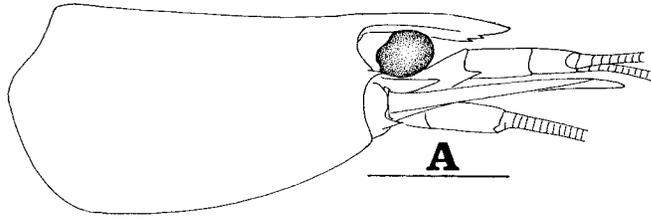
*Caridina typus*: Bouvier, 1904: 133; Kamita, 1959: 21; Ooishi, 1970: 87; Suzuki, 1972: 10, figs. 8-10; Fujino, 1972: 7, fig. 8; Shokita, 1975: 119; 1979: 204, pl. 1e; Hayashi, 1989c: 310, fig. 168; Suzuki et al., 1993: 56; Suzuki and Sato, 1994: 60.

*Caridina typus*: Bouvier, 1905: 77.

*Caridina exilirostris* Stimpson, 1860: 98 [type locality: Okinawa (Loo Choo) Island, Ryukyu Islands, Japan]; Bouvier, 1904: 134.

Material Examined.—Syntypes of *Caridina typus* H. Milne Edwards: 3 females, cl 7.0-8.4 mm, MNHN-Na 930, locality unknown, no date. Neotype of *Caridina exilirostris*: ovigerous female, cl 7.4 mm, NSMT, Okuma River, Okinawa Island, Ryukyu Islands, coll. P. K. L. Ng et al., 31 May 1998. Others: 28 males, cl 3.3-5.1 mm, 2 females, cl 5.7-5.8 mm, 10 ovigerous females, cl 6.5-8.3 mm, 10 males, cl 3.7-6.6 mm, NIES-H-6, upper reach of Koromodate Stream, lotic system, 70 to 110 meters above sea level, Haha-jima Island, Ogasawara Islands, coll. K. Satake and R. Ueno, 24 Feb 2000; 1 male, cl 5.0 mm, 1 female, cl 6.0 mm, NIES-H-10, an inlet stream of Chibusu East Dam, lotic system, 70 meters above sea level, Haha-jima Island, Ogasawara Islands, coll. K. Satake and R. Ueno, 26 Feb 2000; 2 females, cl 7.0-8.1 mm, 1 ovigerous female 7.0 mm, NIES-H-11, one tributary of a stream of Iguma Bay, 310 meters above sea level, Haha-jima Island, Ogasawara Islands, coll. K. Satake, 30 Apr 2000; 3 males, cl 4.7-5.3 mm, 1 female, cl 7.6 mm, NIES-H-11', another tributary of

Fig. 13. *Caridina typus*. A, cephalothorax and cephalic appendages, lateral view; B, preanal carina; C, scaphocerite; D, first pereopod; E, second pereopod; f, third pereopod; G, dactylus of third pereopod; H, fifth pereopod; I, dactylus of fifth pereopod; J, endopod of male first pleopod; K, appendix masculina of male second pleopod. Scales: A, D-F, H = 1.0 mm; B, C = 0.5 mm; G, I-K = 0.2 mm. (male, cl 5.3 mm, ZRC 2004.0560, Okuma River, Okinawa island, Ryukyu Islands)



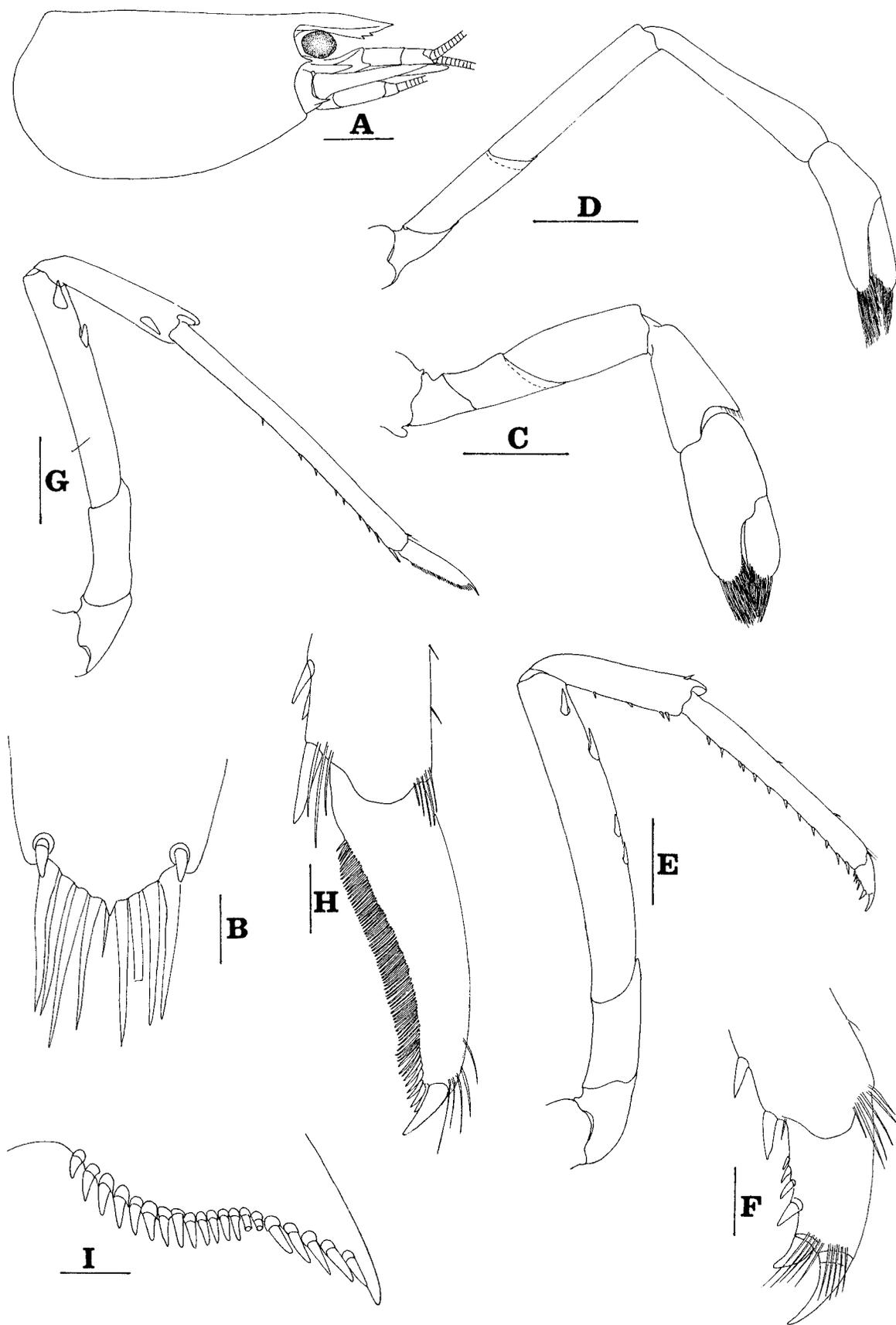


Fig. 14. *Caridina typus*. A, cephalothorax and cephalic appendages, lateral view; B, distal portion of telson; C, first pereopod; D, second pereopod; E, third pereopod; F, dactylus of third pereopod; G, fifth pereopod; H, dactylus of fifth pereopod; I, uropodal diaeresis. Scales: A = 0.5 mm; B, F, H, I = 0.2 mm; C-E, G = 1.0 mm. (ovigerous female, cl 7.4 mm, neotype of *Caridina exilirostris*, NSMT, Okuma River, Okinawa island, Ryukyu Islands)

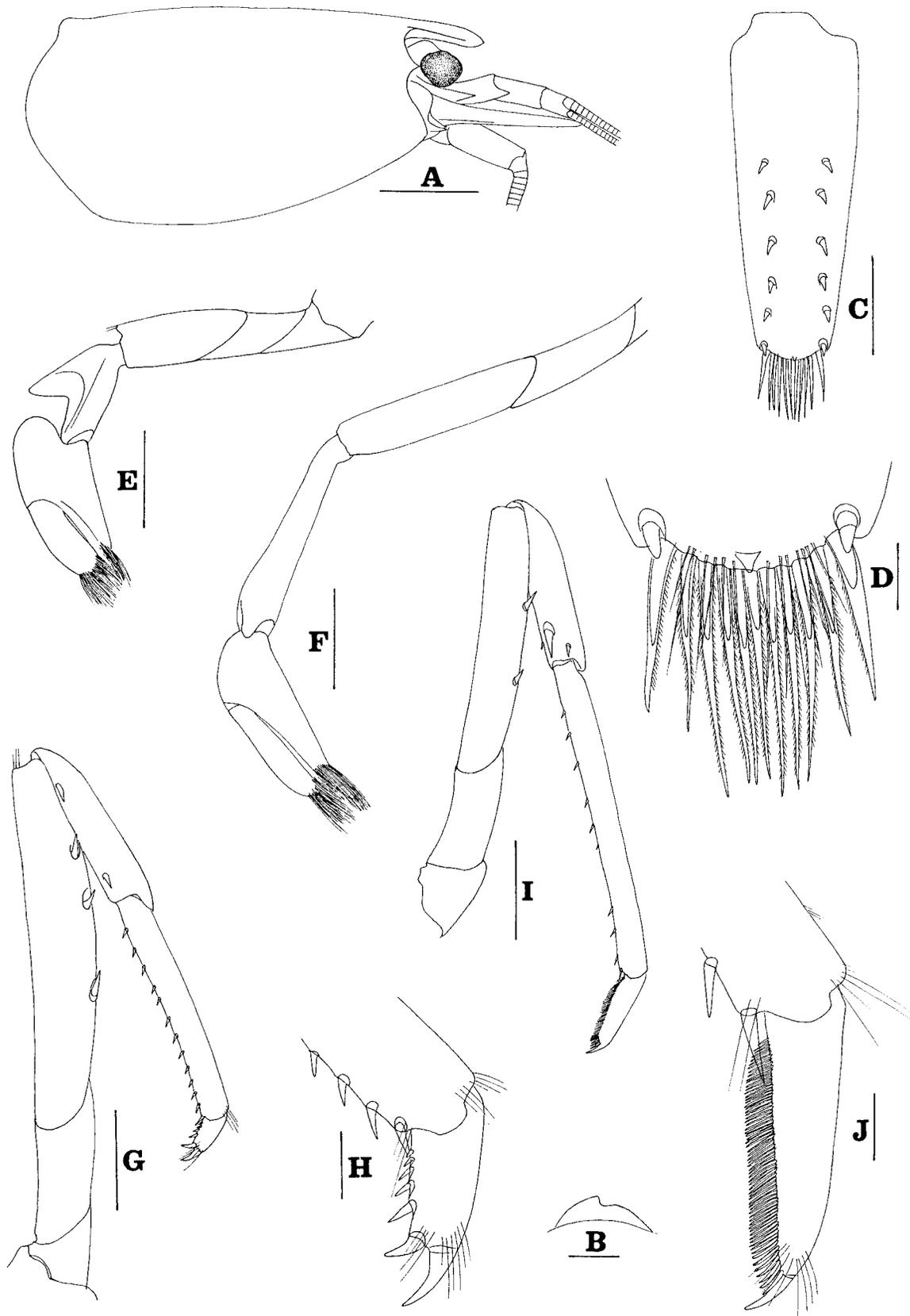


Fig. 15. *Caridina typus*. A, cephalothorax and cephalic appendages, lateral view; B, preanal carina; C, telson; D, distal portion of telson; E, first pereiopod; F, second pereiopod; G, third pereiopod; H, dactylus of third pereiopod; I, fifth pereiopod; J, dactylus of fifth pereiopod. Scales: A, C, E-G, I = 1.0 mm; B = 0.5 mm, D, H, J = 0.2 mm. (male, cl 7.0 mm, NIES-H-11, a stream to Iguma Bay, Haha-jima Island, Ogasawara Islands)

the stream of Iguma Bay, 270 meters above sea level, Haha-jima Island, Ogasawara Islands, coll. K. Satake, 30 Apr 2000; 43 males, cl 3.3-5.5 mm, 11 females, cl 6.7-8.3 mm, 5 ovigerous females, cl 7.2-9.8 mm, NIES-H-12, an inlet stream of Oh-zawa Dam, lotic, EC 230, 230 to 240 meters above sea level, Haha-jima Island, Ogasawara Islands, coll. K. Satake, 2 May 2000; 1 male, cl 4.8 mm, NIES-CH-2, Oku-ohtaki, a tributary of west inlet stream of Shigure Dam, lotic system, 210 to 220 meters above sea level, Chichi-jima Island, Ogasawara Islands, coll. K. Satake and M. Inaba, 3 May 2000; 4 males, cl 6.7-6.9 mm, NIES-CH-26, upper reach of a stream of Higashi-kaigan Coast, lotic, 200 metres above sea level, Chichi-jima Island, Ogasawara Islands, coll. K. Satake and M. Inaba, 3 May 2000; 34 males, cl 3.6-6.8 mm, NIES-CH-17, one stream of Naka-kaigan Coast, lotic system, EC 380, 60 to 70 meters above sea level, Chichi-jima Island, Ogasawara Islands, coll. K. Satake, R. Ueno and M. Inaba, 28 Feb 2000; 6 males, 4.0-4.6 mm, 1 female, cl 6.1 mm; 1 ovigerous female, cl 7.1 mm, NIES-CH-19, one tributary of a stream of Higashi-kaigan Coast, 250 meters above the sea level, Chichi-jima Island, Ogasawara Islands, coll. K. Satake and M. Inaba, 28 Apr 2000; 6 males, cl 2.2-4.5 mm, NIES-CH-23, a stream of Tenno-ura, lotic system, 90 meters above sea level, Chichi-jima Island, Ogasawara Islands, coll. K. Satake and H. Suzuki, 4 May 2000; 34 males, cl 3.2-5.8 mm, 1 female, cl 4.7 mm, NIES-CH-20, tributary of a stream of Higashi-kaigan Coast, lotic system, 200 meters above sea level, Chichi-jima Island, Ogasawara Islands, coll. K. Satake and M. Inaba, 3 May 2000; 10 males, cl 3.0-4.1 mm, 2 females, cl 4.7-5.0 mm, NIES-CH-21, stream at Naka-kaigan Coast, 150 meters above the sea level, Chichi-jima Island, Ogasawara Islands, coll. K. Satake and H. Suzuki, 4 May 2000; 27 males, 3.7-8.1 mm, NIES-CH-13, upper reach of Tokoyo Fall, 90 to 110 meters above sea level, Chichi-jima Island, Ogasawara Islands, coll. K. Satake, R. Ueno, K. Horikoshi and M. Inaba, 27 Feb 2000; 4 males, cl 5.5-7.0 mm, NIES-CH-15, Fukiage-dani Dam, lotic system, 50 to 60 meters above sea level, Chichi-jima Island, Ogasawara Islands, coll. K. Satake, R. Ueno and Inaba, 23 Feb 2000; 21 ovigerous females, cl 5.6-6.9 mm, 9 females, cl 4.0-6.3 mm, 50 males, cl 3.8-5.0 mm, ZRC 2004.0540, 26°33.42'N 128°04.60'E, upstream of Tima River, about 1-2 km from river mouth, Okinawa Island, Ryukyu Islands, pH 7.4, coll. Y. Cai, N. K. Ng, T. Naruse and S. Islam, 11 Jun 2000; 3 males, cl 3.7-4.0 mm, ZRC 2004.0541, 26°33.63'N 128°05.52'E, upstream of Tima River, about 3 km from the river mouth, Okinawa Island, Ryukyu Islands, pH 7.4, coll. N. K. Ng and S. Islam, 11 Jun 2000; 83 males, cl 4.3-5.7 mm, 1 female, 18 ovigerous females, cl 6.3-7.1 mm, ZRC 2004.0542, upper stream of Tima River, about 4 km from river mouth, Okinawa Island, Ryukyu Islands, coll. Y. Cai, N. K. Ng, T. Naruse and S. Islam, 11 Jun 2000; 42 males, cl 3.8-5.2 mm, 3 females, cl 5.7-6.3 mm, 5 ovigerous females, cl 6.4-7.0 mm, ZRC 2004.0543, 26°39.94'N 128°15.31'E, Arakawa River, Okinawa Island, Ryukyu Islands, coll. Y. Cai, N. K. Ng, T. Naruse and S. Islam, 11 Jun 2000; 1 male, cl 4.7 mm, 1 female, cl 4.6 mm, 3 ovigerous females, cl 5.2-7.2 mm, ZRC 2004.0544, 24°30.11'N 124°15.26'E, Gaburumata River, Ishigaki Island, Ryukyu Islands, pH 7.3, coll. Y. Cai and T. Naruse, 13 Jun 2000; 1 male, cl 4.5 mm, 1 female, cl 7.0 mm, 4 juveniles, ZRC 2004.0545, 24°24.42'N 124°09.80'E, fast flowing stream, with pH 7.6 at one of the tributaries of Nagura River, below the reservoir, Ishigaki Island, Ryukyu Islands, coll. Y. Cai and T. Naruse, 13 Jun 2000; 50 males, cl 3.5-5.7 mm, 29 females, cl 4.5-7.5 mm, 10 ovigerous females, cl 5.6-7.9 mm, ZRC 2004.0546, 24°25.00'N 124°09.86'E, fast flowing tributary of Nagura River, below a reservoir, Ishigaki Island, Ryukyu Islands, pH 7.2, coll. Y. Cai and T. Naruse, 13 Jun 2000; 22 males, cl 3.0-4.1 mm, 7 females, cl 3.2-4.3 mm, ZRC 2004.0547, 24°16.60'N 123°52.74'E, river mouth at Haemida beach, Iriomote Island, Ryukyu Islands, coll. Y. Cai, N. K. Ng and T. Naruse, 14 Jun 2000; 6 males, cl 4.0-4.5 mm, 2 females, cl 3.5-4.0 mm, 6 ovigerous females, cl 5.4-6.4 mm, ZRC 2004.0548, 4°16.64'N 123°52.80'E 2, shallow freshwater stream with pH 6.8, Aira River, Iriomote Island, Ryukyu Islands, coll. Y. Cai, N. K. Ng and T. Naruse, 14 Jun 2000; 7 males, cl 3.1-4.7 mm, 1 ovigerous female, cl 6.2 mm, ZRC 2004.0549, 24°16.60'N 123°52.74'E, shallow freshwater stream, downstream of Aira River, Iriomote Island, Ryukyu Islands, coll. Y. Cai, N. K. Ng and T. Naruse, 14 Jun 2000; 1 male, cl 5.2 mm, 2 females, cl 4.9-5.2 mm, ZRC, 24°18.24'N 123°51.21'E, very small, shallow stream, up in the hills, headwater of Nakama River, Iriomote Island, Ryukyu Islands, pH 7.4, coll. Y. Cai, N. K. Ng and T. Naruse, 15 Jun 2000; 6 males, cl 4.8-5.3 mm, 8 females, cl 4.8-7.5 mm, 1 ovigerous female, cl 7.0 mm, ZRC 2004.0550, 24°18.32'N 123°51.19'E, freshwater, slow flowing stream, slightly downstream of headwater of Nakama River, Iriomote Island, Ryukyu Islands, pH 7.4, coll. Y. Cai, N. K. Ng and T. Naruse, 15 Jun 2000; 35 males, cl 3.2-5.3 mm, 4 females, cl 5.4-6.3 mm, 15 ovigerous females, cl 5.5-7.2 mm, ZRC 2004.0551, 24°18.39'N 123°51.29'E, downstream from the headwater of Nakama River, Iriomote Island, Ryukyu Islands, coll. Y. Cai, N. K. Ng and T. Naruse, 15 Jun 2000; 26 males, cl 3.8-4.5 mm, 20 females, cl 3.3-5.6 mm, 3 ovigerous females, cl 5.4-6.1 mm, ZRC 2004.0552, 24°23.65'N 123°51.84'E, fast flowing water, about 200 meters from sea, Omija River, Iriomote Island, Ryukyu Islands, coll. Y. Cai, N. K. Ng and T. Naruse, 15 Jun 2000; 8 males, cl 3.8-5.5 mm, 13 females, cl 4.5-7.1 mm, 3 ovigerous females, cl 5.5-6.5 mm, ZRC 2004.0553, fast flowing water, upper part of Omija River, Iriomote Island, Ryukyu Islands, coll. Y. Cai and T. Naruse, 15 Jun 2000; 9 males, cl 3.4-4.3 mm, 6 females, cl 4.1-4.6 mm, ZRC 2004.0554, 24°23.65'N 123°51.84'E, fast flowing water, about 200 metres from sea, Omija River, Iriomote Island, Ryukyu Islands, coll. Y. Cai and T. Naruse, 16 Jun 2000; 15 males, cl 4.3-5.1 mm, 5 females, cl 3.3-7.3 mm, 8 ovigerous females, cl 6.3-7.1 mm, ZRC 2004.0555, 123°51.29'E 24°18.39'N, upstream of Nakama River, near the head water, Iriomote Island, Ryukyu Islands, coll. Y. Cai and T. Naruse, 16 Jun 2000; 2 males, cl 3.9-5.1 mm, 2 ovigerous females, 7.2-7.6 mm, egg 3.0 × 5.2 mm, ZRC 2004.0556, 24°18.39'N 123°51.29'E, headwaters of Nakama River, Iriomote Island, Ryukyu Islands, coll. Y. Cai and T. Naruse, 16 Jun 2000; 43 males, cl 4.1-5.7 mm, 18 females, cl 3.8-7.5 mm, 1 ovigerous female, cl 7.4 mm,

ZRC 2004.0557, 24°35.13'N 124°18.91'E, pH 7.7, a stream in Hirakubo, Ishigaki Island, Ryukyu Islands, coll. Y. Cai, N. K. Ng and T. Naruse, 17 Jun 2000; 1 male, cl 2.9 mm, 1 female, cl 5.1 mm, 3 ovigerous females, cl 5.3-6.8 mm, ZRC 2004.0558, 24°17.81'N 124°33.76'E, pH 7.7, Kara Stream, Ishigaki Island, Ryukyu Islands, coll. Y. Cai, N. K. Ng and T. Naruse, 17 Jun 2000; 20 males, cl 3.6-5.7 mm, 7 females, cl 5.6-7.5 mm, 4 ovigerous females, cl 5.4-6.1 mm, ZRC 2004.0559, 24°24.36'N 124°14.82'E, small stream in Ohno town, Ishigaki Island, Ryukyu Islands, coll. Y. Cai, N. K. Ng and T. Naruse, 17 Jun 2000; 4 males, cl 3.4-4.2 mm, 2 females, cl 5.0-7.8 mm, 3 ovigerous females, cl 6.7-7.5 mm, ZRC 2004.0560, Okuma River, Okinawa Island, Ryukyu Islands, coll. P. K. L. Ng et al., 31 Jun 1998; 1 male, cl 4.8 mm, 1 ovigerous female, cl 8.0 mm, ZRC 2004.0561, Taiho River, Okinawa Island, Ryukyu Islands, 31 May 1998; 5 males, 4.4-5.2 mm, 5 females, cl 6.9-7.9 mm, 4 ovigerous females, cl 6.8-7.2 mm, NSMT-Cr 1226, Akina-gawa River, Amami-oshima Island, 17 July 1988, coll. M. Takeda; 3 females, cl 3.0-3.2 mm, 4 males, cl 4.4-4.7 mm, NSMT, upstream of Nakama river, Iriomote, Ryukyu Islands, M. Tomokuni, 3 Nov 1985; 2 males, cl 5.3-5.6 mm, 4 females, cl 6.6-7.3 mm, NSMT, Kiyose-bashi bridge, Chichi-jima Island, Ogasawara Islands, 13 Oct 1974; 1 female, cl 7.7 mm, NSMT, upper area of Kawauchi-gawa River, Amami-oshima Island, Ryukyu Islands, coll. M. Takeda, 15 Jul 1988; 2 males, cl 5.0-5.2 mm, UR1176, Sueyoshi, Hachijo-jima Island, Izu Islands, 28 Jun 1976; 2 males, cl 5.0-5.4 mm, 1 female, cl 6.7 mm, 1 ovigerous female, cl 6.8 mm, UR1114, Kawauchi-gawa River, Amami-oshima Island, Ryukyu Islands, coll. M. Takeda, 18 Jul 1988; 3 males, cl 4.0-4.4 mm, 2 females, cl 4.6-4.8 mm, 4 juv., UR1904, from an outlet stream of the Isunadamari Pond, Kikai-jima Island, coll. Nagaoka, 26 Oct 1993; 6 females, cl 4.5-6.7 mm, 4 males, cl 4.8-5.5 mm, UR1903, Kikai-jima, Bird Hill Park, coll. Nagaoka, 27 Oct 1993; 4 males, cl 5.5-5.8 mm, 3 ovigerous females, cl 6.5-8.7 mm, UR1905, Kikai-jima Island, pond at edge of stream, coll. Nagaoka, 26 Oct 1993; 1 male, cl 6.0 mm, UR1761, a substream of Nakama River, Iriomote Island, Ryukyu Islands, Aug 1968; 1 female, cl 5.4 mm, UR1230, Sumiyoh-gawa River, Amami-ohshima Island, Ryukyu Islands, coll. M. Takeda, 17 Jul 1988; 1 male, cl 4.8 mm, 1 ovigerous female, cl 6.9 mm, UR1112, Shino-kawa River, Amami-oshima Island, Ryukyu Islands, coll. M. Takeda, 17 Jul 1988; 4 females, cl 5.4-6.8 mm, UR1182, Kauauchi-gawa River, Amami-ohshima Island, Ryukyu Islands, coll. M. Takeda, 15 Jul 1988; 3 males, 4.9-5.9 mm, 4 females, cl 6.5-7.5 mm, 2 ovigerous females, cl 6.1-6.5 mm, UR1218, Kawauchi-gawa River, Amami-ohshima Island, Ryukyu Islands, coll. M. Takeda, 18 Jul 1988; 1 male, cl 4.2 mm, 2 females, cl 4.8-5.2 mm, 2 ovigerous females, cl 5.2-5.6 mm, UR1135, Kanyu-gawa River, Amami-ohshima Island, Ryukyu Islands, coll. M. Takeda, 16 Jul 1988; 2 ovigerous females, cl 4.3-5.2 mm, UR1759, no data.

Comparative Material Examined.—34 males, cl 3.5-4.6 mm, 9 females, cl 3.2-5.0 mm, 4 ovigerous females, cl 4.3-6.3 mm, 39 juveniles, syntypes of *Caridina typus brevirostris*

Roux, 1934, SMF-2148, Elat and Ohoinaugau, Kei Islands, Indonesia, coll. Merton, 3 Jun 1908.

Description.—Rostrum reaching near to end of basal segment, or to end of second segment of antennular peduncle, unarmed dorsally, armed ventrally with 1-4 teeth; antennal spine fused inferior orbital angle; pterygostomial margin subrectangular. Sixth pleomere 0.40 times as long as carapace, 1.2 times as long as fifth somite, shorter than telson. Telson 2.8 times as long as wide, terminating in posteromedian projection; 4 or 5 pairs of dorsal spinules, situated on distal two-third of telson length, 1 pair of dorsolateral spines near distal end, 4 or 5 pairs of spines on distal margin, lateral pair subequal to intermedian pairs; preanal carina lacking spine.

Eyes well developed. Antennular peduncle slender, 0.7 times as long as carapace; basal segment half length of the antennular peduncle, second segment 1.5 times as long as third one; stylocerite reaching 0.8 times length of basal segment. Scaphocerite 3.3 times as long as wide.

Mouthparts similar to *C. grandirostris*. Third maxilliped reaching to end of second segment of antennular peduncle, with a short exopod, reaching to middle of antepenultimate segment, ultimate segment distinctly shorter than penultimate segment.

Epipods on first 4 pereopods. First pereopod short, reaching to end of basal segment of antennular peduncle, merus 2.2-2.8 as long as broad, slightly longer than carpus; carpus excavated strongly anteriorly, shorter than chela, 1.2-1.6 times as long as high; chela 2.0-2.2 times as long as broad; length of fingers variable, at most shorter than palm, sometimes as long as or even slightly longer. Second pereopod reaching end of second segment of antennular peduncle, merus shorter than carpus, 4.3-5.5 times as long as broad; carpus distinctly longer than chela, 5.0-6.2 times as long as high; chela 2.7-3.0 times as long as broad; fingers 1.3-1.8 times as long as palm. Third pereopod long, slender, reaching to end of antennular peduncle, propodus distinctly shorter than merus, 7.7-9.1 times as long as broad, 3.7-4.4 times as long as dactylus; dactylus ending in a strong claw; 2.4-2.9 times as long as wide (spines included), flexor margin with 4-6 accessory spines strongly curved inwards; fifth pereopod reaching to end of scaphocerite, propodus distinctly longer than merus, 11-14 times as long as broad, 3.3-3.7 times as long as dactylus; dactylus 3.3-4.2 times as long as wide, with 60-77 spinules of flexor margin.

Endopod of male first pleopod extending to half length of exopod, elongate, subrectangular, 2.0-2.3 times as long as broad, with distinct appendix interna near distal end of endopod. Appendix masculina of male second pleopod slender, reaching to 2/3 length of endopod, inner and distal surface densely lined with long spines; appendix interna at basal 1/3 of appendix masculina, extending to distal 1/3 of appendix masculina. Uropodal diaeresis with 19-24 spinules.

Egg size 0.45-0.48 × 0.26-0.23 mm in diameter.

Remarks.—Bouvier (1925) treated *C. exilirostris* Stimpson, 1860, as a junior synonym of *C. typus*. Chace (1997) recently commented that *Caridina exilirostris* is possibly a synonym of *C. valladolida* Blanco, 1939. Cai and Ng (2001) com-

pared *Caridina villadolidi* Blanco, 1939, with *C. exilirostris*, and stated that *Caridina exilirostris* is most probably *C. typus*. The rostrum of *Caridina exilirostris* as described by Stimpson (1860:98) was as follows "... valde gracile, compressum, angustum, acutum, medium articuli penultimi antennularum pedunculi parce superans ..." (slender, compressed, narrow, acute, reaching to middle of second segment of antennular peduncle), while that of *C. villadolidi*, as a rule, reaches to or nearly to the end of the antennular peduncle. Until now, *C. villadolidi* has never been reported from the Ryukyu Islands, the type locality of *C. exilirostris*. Stimpson (1860) noted the similarity between *C. typus* and *C. exilirostris*, but failed to recognize that both are identical. To stabilize the taxonomy of these species, an ovigerous female, cl 7.4 mm, Okuma River, Okinawa Island (type locality) is hereby designated as the neotype (NSMT) of *C. exilirostris* Stimpson, 1860.

That the length of the rostrum of *C. typus* is variable is well known (see Ng, 1995). During a faunistic survey by K. Satake on the freshwater shrimps of Chichi-jima Island and Haha-jima Island, Ogasawara Islands, 67 lots of specimens were collected, but only three of them have a very short rostrum which does not reach beyond the end of the antennular peduncle. All these specimens were found from the headwaters. The specimens found at the headwater region of the Nakama River also have relatively shorter rostrums when compared with those living in the lower parts of the same river. Bouvier (1925: 126, fig. 271) reported *C. typus* var. *acuminata* from Poulo Condor (So'n Island), southern Vietnam. These specimens (ca. 30 specimens in bad condition, MNHN Na-932) were re-examined and shown to be *C. typus*, which have a relatively shorter rostrum. The syntypes of *Caridina typus brevisrostris* Roux, 1934, were reexamined. *Caridina typus brevisrostris* has a short rostrum, very short fingers of the first pereopod, and sexually dimorphic dactylus of third and fourth pereopods. It should be regarded as a distinct species. As the name *Caridina typus brevisrostris* Roux, 1934, is preoccupied by *C. brevisrostris* Stimpson, 1860, a replacement name has to be proposed. This matter is now being investigated by the first author.

Habitat.—*Caridina typus* occurs in rivers or streams on islands or in coastal areas, prefers to hide under rocks or stones during the day time and go out to forage at night.

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