

REPORT ON A COLLECTION OF FRESHWATER SHRIMPS (CRUSTACEA: DECAPODA: CARIDEA) FROM THE PHILIPPINES, WITH DESCRIPTIONS OF FOUR NEW SPECIES

Yixiong Cai

*Tropical Marine Science Institute, National University of Singapore,
14 Kent Ridge Road, Singapore 119223, Republic of Singapore
Current address: Biodiversity Centre, National Parks Board, 1 Cluny Road,
Singapore 259569, Republic of Singapore
Email: caiyixiong@yahoo.com (Corresponding author)*

Shigemitsu Shokita

*Department of Chemistry, Biology and Marine Science, Faculty of Science, University of the Ryukyus, Nishihara,
Okinawa 903-0213, Japan
Email: shokita@sci-ryukyu.ac.jp*

ABSTRACT. – The examination of freshwater shrimp collection from six islands of the Philippines, namely Luzon, Mindoro, Panay, Cebu, Palawan and Mindanao, reveals the presence of 35 species of freshwater shrimps, 17 species of atyids, including four new species, *Caridina cebuensis*, *C. buhi*, *C. palawanensis*, *C. mindanao*, and six new records; 17 species of palaemonids, including two *Palaemon*, and 15 *Macrobrachium* species (three of which are new records); and one species of alpheid, which is also a new record for the Philippines. In the present publication, full descriptions for the new species, diagnoses for new records, and taxonomic discussions for all species are provided.

KEY WORDS. – Freshwater shrimp, Atyidae, Palaemonidae, Alpheidae, Philippines.

INTRODUCTION

The freshwater shrimps of Philippines have been previously reported (Dana, 1852; Cowles, 1914; Blanco, 1935; Blanco, 1939a, b; Holthuis, 1950; Johnson, 1962; Chace & Bruce, 1993; Chace, 1997; Sket, 1997; Cai & Anker, 2004). To date, 19 species of palaemonids, including 17 species of *Macrobrachium* and two species of *Palaemon*, 21 species of atyids, including one species of *Atyoida*, one species of *Atyopsis*, one species of *Antecaridina*, 16 species of *Caridina*, one species of *Edoneus*, one species of *Parisia*, and one species of Alpheidae (*Potamalpheops*) have been reported.

As part of the Japanese research project, “Studies of the fauna of warm temperature forest in Southeast Asia, with special reference to animal speciation”, which was financially supported by the Monbusho International Scientific Research Program of the Japanese Government, a freshwater decapod crustacean expedition to the Philippine Islands was carried out by a Japanese team from 10 July to 15 August 1985. During that expedition, a large number of freshwater decapod crustaceans were collected from the islands of Luzon, Mindoro, Panay, Cebu, Palawan and Mindanao and are deposited in the National Science Museum, Tokyo (NSMT,

mainly crabs) and the University of Ryukyu (UR, mainly shrimps). The present paper reports the taxonomic results of the freshwater shrimp collection. The examination shows that there are 35 species of freshwater shrimps in the collection, 17 species of atyids, including four new species and six new records; 17 species of palaemonids, including two *Palaemon* and 15 *Macrobrachium* species, three of the latter are new records; and one species of alpheid, which is also a new record for Philippines. In the present publication, full descriptions for the new species, diagnoses for new records, taxonomic discussions for all species are provided.

Specimens are deposited in the National Science Museum, Tokyo (NSMT), Department of Chemistry, Biology and Marine Science, Faculty of Science, University of the Ryukyus, Okinawa, Japan (UR), and Zoological Reference Collection, the Raffles Museum of Biodiversity Research, National University of Singapore, Singapore (ZRC). Comparative material from Zoological Museum, Amsterdam, the Netherlands (ZMA), National Museum of Natural History, Leiden, the Netherlands (RMNH), National Museum of Natural History, Smithsonian Institution, Washington D. C., USA (USNM), and Institute of Zoology, Chinese Academy of Sciences, Beijing, China (IZAS) are also examined. The

abbreviation “cl” is used for carapace length (measured from the postorbital margin to the posterior margin of the carapace).

TAXONOMY

FAMILY ATYIDAE

Genus *Atyopsis* Chace, 1983

Atyopsis spinipes (Newport, 1847)

Atya spinipes Newport, 1847: 159 [type locality: Philippine Islands]
Atya moluccensis – De Man, 1902: 893.

Atyopsis spinipes – Chace, 1983: 35, Figs. 20-22; Cai & Ng, 2001: 666, Figs. 2a-d; Cai & Anker, 2004: 235.

Material examined. – 10 males, cl 5.2-5.5 mm, UR, San Gabriel, Luzon Island, Philippines, 15 Jul.1985; 1 male, cl 10.5 mm, UR, Panitian River, upper stream, ca 30 km from river mouth, Palawan Island, Philippines, 8 Jun.1985; 1 female, cl 3.8 mm, UR, Sta. Rosa, Luzon Island, Philippines, 15 Jul.1985; 2 males, cl 10.5-12.0 mm, 1 female, cl 11.0 mm, UR, Villaflor River, Mindoro Island, Philippines, 15 Aug.1985; 1 female, cl 3.5 mm, UR, Aninoan River, Mindoro Island, Philippines, 15 Aug.1985.

Remarks. – Chace (1997) reported this species from Luzon, Catanduanes, Cebu and a location that probably from Mindoro.

Distribution. – Philippines and eastern Lesser Sunda Islands (ca. 120°00'E) northwards to Taiwan and as far as Tokuno-shima in the Ryukyus, and eastwards as far as Samoa (cf. Chace, 1983).

Caridina laoagensis Blanco, 1939

Caridina laoagensis Blanco, 1939a: 390, Pl. 2 [type locality: Laoag River, Province of Ilocos Norte, Luzon, Philippines]; Chace, 1997: 12; Cai & Anker, 2004: 237, Fig. 3.

Material examined. – 7 males, cl 3.9-4.9 mm, 3 ovig. females, cl 6.5-7.2 mm, 1 female, cl 3.5 mm, UR, upstream of tributary of Pugo River, Luzon Island, Philippines, 16 Jul.1985; 2 ovig. females, cl 7.0-8.1 mm, 1 female, cl 7.1 mm, 17 males, cl 3.8-5.5 mm, UR, Malayas River, Victoria, Mindanao Island, Philippines, 14 Aug.1985; 9 males, cl 4.1-4.5 mm, 8 ovig. females, cl 6.1-7.2 mm, UR, upper stream of Sagay River, Cebu Island, Philippines, 27 Jul.1985; 1 male, cl 4.2 mm, UR, spring water to Sagay River, Cebu Island, Philippines, 27 Jul.1985; 1 ovig. female, cl 5.7 mm, 1 juv., UR, a spring near Branch of National Museum, Suzoen, Palawan Island, Philippines, no date; 9 males, cl 3.8-5.2 mm, 2 females, cl 4.1-4.2 mm, 13 ovig. females, cl 4.4-5.5 mm, UR, Daakrongsod River, Cebu Island, Philippines, 28 Jul.1985; 3 males, cl 4.5-5.6 mm, 2 females, cl 4.5-4.6 mm, 7 ovig. females, cl 7.5-7.6 mm, UR, river outside the University of Agriculture, Sapiland village, Luzon Island, Philippines, 15 Jul.1985; 2 males, cl 2.8-3.2 mm, 1 female, cl 4.5 mm, 4 ovig. females, 5.5-7.2 mm, UR, Alag River, Mindoro Island, Philippines, 15 Aug.1985; 1 male, cl 3.6 mm, 9 females, cl 4.2-4.9 mm, 9 ovig. females, cl 4.1-6.5 mm, UR, San Gabriel, Luzon Islands, Philippines, 15 Jul.1985; 1 male, cl 3.8 mm, 3 females, cl 5.3-5.8 mm, 1 ovig. female, cl 5.8 mm, UR, Pitogo River, Panay Island, Philippines, 19 Aug.1985; 3 males, cl 3.1-3.5 mm, 8 females,

cl 3.9-5.8 mm, 4 ovig. females, cl 4.7-6.2 mm, UR, Tag Bariri, Palawan Island, Philippines, 9 Aug.1985; 12 ovig. females, cl 4.2-4.5 mm, 8 males, cl 3.0-3.8 mm, UR, Panitian River, upper stream, ca 30 km from river mouth, Palawan Island, Philippines, 6 Aug.1985; 1 male, cl 3.5 mm, 3 ovig. females, cl 5.3-5.6 mm, UR, Sta. Rosa, Luzon, Philippines, 15 Jul.1985; 4 males, cl 4.5-5.5 mm, UR, Sewaragan River, San Joaquin, Panay Island, Philippines, 19 Aug.1985; 3 males, cl 3.6-4.3 mm, 4 females, 5.2-6.4 mm, 4 ovig. females, cl 5.3-6.2 mm, UR, Manuanga River, Cebu Island, Philippines, 29 Jul.1985; 2 males, cl 2.8-3.3 mm, 1 female, cl 5.3 mm, 3 ovig. females, cl 5.4-6.5 mm, UR, Caboroan, Luzon Island, Philippines, 15 Jul.1985; 4 males, cl 3.7-4.2 mm, 2 females, cl 3.6-4.6 mm, 11 ovig. females, cl 5.0-6.1 mm, UR, Papait River, St. 2, Upper stream, Palawan Island, Philippines, 9 Aug.1985; 1 male, cl 4.5 mm, 3 ovig. females, cl 5.9-6.1 mm, UR, Panibacan River, Palawan Island, Philippines, 6 Aug.1985; 4 males, cl 4.0-4.8 mm, 1 female, cl 6.7 mm, 5 ovig. females, cl 6.5-7.4 mm, Bongabong River, Mindoro Island, Philippines, 14 Aug.1985; 4 males, cl 3.0-4.0 mm, 2 females, cl 5.2-6.2 mm, 3 ovig. females, cl 5.8-7.5 mm, UR, Naguilian River, Luzon, Philippines, 15 Jul.1985; 1 female, cl 3.8 mm, 3 ovig. females, cl 5.2-5.7 mm, UR, Iraan River, Philippines, 5 Aug.1985; 3 males, cl 3.8-4.0 mm, 1 female, cl 4.8 mm, 4 ovig. females, cl 5.5-7.0 mm, UR, Agan River, Mindoro Island, Philippines, 14 Aug.1985.

Remarks. – Chace (1997) commented that *Caridina laoagensis* may be a synonym of one of *C. weberi* subspecies. Recent study by Cai & Ng (in preparation) found that *C. laoagensis* differs from all subspecies of *C. weberi* and other congeners, should be regarded as a good species. *C. laoagensis* is characteristic by the straight rostrum, slightly crested at the base, over the orbit, the posterior rostral teeth placed distinctly before the postorbital margin, and the distal spines and setae on the telson. This is one of the most common species in Philippines.

Distribution. – Philippines.

Caridina sumatrensis De Man, 1892

(Figs. 6C-F)

Caridina weberi var. *sumatrensis* De Man, 1892: 375, Pl. 22 Fig. 23g [type locality: Deli, Sumatra, Indonesia]; Bouvier, 1925: 247, Fig. 567.

Material examined. – 1 male, cl 3.2 mm, UR, Santacruz River, Palawan Is., Philippines, 9 Aug.1985; 7 ovig. females, cl 4.0-4.7 mm, Iraan River, Philippines, 5 Aug.1985.

Remarks. – With 4-6 postorbital teeth, *Caridina sumatrensis* is very easy to be separated from other subspecies of *C. weberi*, it is regarded as distinct species here. This is the first record of the species from Philippines.

Distribution. – Sumatra, Malay Peninsula, Philippines.

Caridina serratiostris De Man, 1892

Caridina serratiostris De Man, 1892: 382, Pl. 23: Fig. 28-28e [type locality: “Bangkalan” and “Bonea” rivers, Selajar, Indonesia]; Bouvier, 1925: 218, Figs. 480-486; Kubo, 1938: 92, Fig. 21;

Holthuis, 1965: 25, Fig. 8; 1978: 38, Fig. 13a-h; Shokita, 2003: 250, Figs. 18E, 19J, 20M.

Caridina serratiostris serratiostris – Fujino, 1972: 7; Shokita, 1975: 119.

Caridina celebensis – Holthuis, 1978: 39, Fig. 14 a-i; Yeo, Cai & Ng, 1999: 214, Figs. 8, 9.

? *Caridina serratiostris* – Chace, 1997:19, Figs. 11a-r.

Material examined. – 2 ovig. females, cl 3.1-4.1 mm, UR, San Francisco River, Surigao Del Nork, mindanao, Philippines, 25 Jul.1985; 2 ovig. females, cl 3.8-3.9 mm, Santacruz River, Palawan, Philippines, 9 Aug.1985.

Comparative material examined. – Lectotype of *Caridina serratiostris* De Man, 1892: 1 ovig. female, cl 4.3 mm, syntype of *Caridina serratiostris* De Man, 1892, ZMA De 102625, Indonesia Salejer, Bangkalah River, leg. M. Weber, 1888, present destination. Paralectotypes: 3 males, cl 2.6-4.4 mm, 2 females, cl 3.7-5.1 mm, 28 ovig. females, cl 3.7-5.1 mm, data same as lectotype. Others: 1 male, cl 3.0 mm, 5 females, cl 3.1-3.5 mm, 4 ovig. females, cl 3.3-4.2 mm, ZRC 1996.1753, Sungai Paya, Kampung Paya, Pulau Tioman, Malaysia, coll. P. K. L. Ng et al, 25-27 Jun.1996; 2 ovig. females, cl 3.3-3.5 mm, ZRC 1999.0971, Sungai Paya, Kampung Paya, Pulau Tioman, Malaysia, coll. H. H. Tan et al, 26 Jun.1999; 9 males, cl 2.1-2.6 mm, 5 females, cl 3.2-3.5 mm, 14 ovig. females, cl 3.2-3.8 mm, station 2 at Sungai Keliling, Kampung Juara, Pulau Tioman, Malaysia, coll. Y. Cai et al., 7 Sep.2000; 2 males, cl 2.2-2.3 mm, 6 females, cl 2.9-3.2 mm, 27 ovig. females, cl 3.1-4.0 mm, station 4 at Sungai Keliling, Kampung Juara, Pulau Tioman, Malaysia, coll. Y. Cai et al., Sep.2000; 1 male, cl 2.6 mm, 3 females, cl 3.1-3.5 mm, 6 ovig. females, cl 3.5-3.6 mm, station 8 at Sungai Keliling, Kampung Juara, Pulau Tioman, Malaysia, coll. Y. Cai et al., 8 Sep.2000; 3 females, cl 1.9-3.7 mm, Sungai Baharu, Kampung Juara, Malaysia, coll. Y. Cai, 8 Sep.2000; 1 ovig. female, cl 4.2 mm, ZRC. 2004.0570, 128°07.04'E 26°36.61'N, Arume River, Okinawa Island, Ryukyus, Japan, coll. Y. Cai, N. K. Ng, T. Naruse & S. Islam, 11 Jun.2000; 1 male, cl 3.2 mm, 2 ovig. females, cl 4.9-5.0 mm, ZRC.2004.0571, 123°52.80'E 24°16.64'N, shallow freshwater stream of Aira River, Iriomote Island, Ryukyus, Japan, coll. Y. Cai, N. K. Ng & T. Naruse, 14 Jun.2000; 1 male, cl 40 mm, 5 ovig. females, cl 4.8-5.3 mm, ZRC.2004.0572, 123°52.74'E 24°16.60'N, shallow freshwater stream, downstream of Aira River, Iriomote Island, Ryukyus, Japan, coll. Y. Cai, N. K. Ng & T. Naruse, 14 Jun.2000; 1 female, cl 4.4 mm, 3 ovig. females, cl 4.4-4.5 mm, ZRC.2004.0573, 123°51.84'E 24°23.65'N, fast flowing water, about 200 meters from sea, Omija River, Iriomote Island, Ryukyus, Japan, coll. Y. Cai, N. K. Ng & T. Naruse, 15 Jun.2000; 1 male, cl 3.4 mm, ZRC.2004.0574, 123°51.84'E 24°23.65'N, fast flowing water, about 200 meters from sea, Omija River, Iriomote Island, Ryukyus, Japan, coll. Y. Cai & T. Naruse, 16 Jun.2000.

Remarks. – Holthuis (1978) tentatively treated *Caridina serratiostris serratiostris* De Man, 1892 and *C. s. celebensis* as separate species mainly based on the characters of length of rostrum and stylocerite as the adult specimens that he was dealing with from Sumba could easily be assigned to one another. Yeo et al. (1999) followed Holthuis's idea to recognize these two species, assigned all their Tioman (Malaysia) specimens to *C. celebensis*. They also suggested that *C. leptocarpa* Liang & Zheng, 1988 from Fujian and Guangxi, southern China is most probably *C. celebensis*. Liang (2004: 321), however, pointed out that his material lacking an arthrobranch on the base of first pereopod, and thus moved his species from *Caridina* to *Paracaridina* Liang & Guo, 1999 (in Liang, Guo & Tang, 1999), a genus only

differs from *Caridina* by the lack of arthrobranch on first pereopod. Re-examinations of types of *C. serratiostris* and *C. celebensis* show that the presence of an arthrobranch on the base of first pereopod, although the size could be highly variable, is a good character to separate *C. serratiostris* from *C. celebensis*. Examination of specimens from Ryukyus and Pulau Tioman of Malaysia, however, show that previous characters used by Holthuis (1978) and Yeo et al. (1999) are not always reliable. Specimens with a rostrum reaching to or slightly beyond end of antennular peduncle are normally *C. serratiostris*, while those with shorter rostrum could be either one.

The present study shows that the size of the arthrobranch on the base of first pereopod in *C. serratiostris* is highly variable, from very distinct to almost indiscernible, but is totally absent in *C. celebensis*. Obviously, the lack of arthrobranch on the first pereopod of *C. celebensis* could be reasonably explained as a secondarily lost character, rather than as a primarily lacking character to indicate a different phylogenetic lineage. It should well be remained in the genus *Caridina*. This discovery questions the validity of some species of genera, or genera themselves, e.g. *Parisia* Holthuis, 1956, *Puteonator* Gurney, 1987, *Paracaridina* Liang & Guo, 1999, etc., which were separated from *Caridina* and other related genera mainly by the absence of an arthrobranch on the base of first pereopod. Furthermore, it challenges the validity of the subfamily Caridellinae Holthuis, 1986, as well. Redefinitions on the basis of type material are necessary to validate the above mentioned taxa.

All the Tioman specimens here re-examined, though most of them with shorter rostrum, have an arthrobranch on the first pereopod, thus, should be referred to *C. serratiostris*. In Ryukyus, specimens with short rostrum are mostly of *C. celebensis*, while those with long rostrum, almost all having arthrobranch on the first pereopod, are of *C. serratiostris*. Holthuis (1978: 42) commented that his Sumba specimens "In the branchial formula, pleopods and uropods hardly any difference is noticeable between the two species." Apparently, he was dealing with only one species, *C. serratiostris*. Chace (1997) reported *C. serratiostris* from several localities of Philippines. According to his diagnosis and figures, his specimens have a "...rostrum not reaching as far as distal end of antennular peduncle." It is impossible to assign his specimens to either species with certainty without a reexamination.

Distribution. – Japan, Philippines, Fiji, Malaysia, Indonesia and Madagascar.

Caridina celebensis De Man, 1892

Caridina serratiostris var *celebensis* De Man, 1892: 385, Pl. 23; Figs. 28f-h [type locality: Luwu, Palopo, Celebes (Sulawesi), Indonesia]; Bouvier, 1925: 220

Caridina leptocarpa Liang & Zheng, 1988: 15, Figs. 1-9 [type locality: Minjiang River, Fuzhou, Fujian Province, southern China]; Liang & Zhou, 1993: 231.

Paracaridina leptocarpa – Liang, 2004: 318, Figs. 155a-t.

Material examined. – 1 male, cl 2.2 mm, 1 female, cl 2.4 mm, 4 ovig. females, cl 3.9-4.4 mm, 2 juv., Sta. Rosa, Luzon, Philippines, 15 Jul.1985; 1 female, cl 3.8 mm, 1 ovig. female, cl 3.9 mm, Santacruz River, Palawan Island, Philippines, 9 Aug.1985; 3 ovig. females, cl 3.8-3.9 mm, San Francisco River, Surigao Del Nork, Mindanao Philippines, 25 Jul.1985.

Comparative material examined. – Lectotype of *Caridina celebensis* De Man, 1892: 1 male, cl 2.0 mm, ZMA DE 102630, syntypes of *Caridina serratiostris* var. *celebensis* De Man, 1892, river near Palopo, Luwo, Celebes (=Sulawesi), Indonesia, coll. M. Weber, 1888, present designation. Paralectotypes: 3 females, cl 1.9-3.6 mm, 50 ovig. females, cl 2.7-4.2 mm, data same as lectotype. Others: 2 ovig. females, cl 3.9-4.1 mm, ZRC.2004.0575, upper stream of Tima River, about 4 km from river mouth, Okinawa Island, Ryukyus, Japan, coll. Y. Cai, N. K. Ng, T. Naruse & S. Islam, 11 Jun.2000; 26 ovig. females, cl 3.2-4.1 mm, 7 females, 2.1-3.4 mm, 2 males, cl 2.4-2.5 mm, ZRC.2004.0576, 128°04.60'E 26°33.42'N, upstream of Tima River, about 1-2 km from river mouth, Okinawa Island, Ryukyus, Japan, pH 7.4, coll. Y. Cai, N. K. Ng, T. Naruse & S. Islam, 11 Jun.2000; 1 ovig. female, cl 4.7 mm, ZRC.2004.0577, Okuma River, Okinawa Island, Ryukyus, Japan, 31 May.1998; 1 female, cl 2.9 mm, upper Hiji fall, Hiji River, 4 Nov.1987.

Remarks. – See remarks under previous species. This result represents a new record for the Philippines.

Distribution. – Japan, China, Philippines, Sulawesi.

Caridina villadolidi Blanco, 1939

Caridina typus var. *longirostris* De Man, 1892: 370, Pl. 22 Fig. 22 f-i [type locality: Palopo, Sulawesi (Celebes), Indonesia].

Caridina villadolidi Blanco, 1939a: 389, Pl. 1 [type locality: Laoag River, Luzon, Philippines]; Hung et al., 1993: 485, Fig. 3; Chace, 1997: 21, Fig. 12; Cai & Ng, 2001: 668, Fig. 4a-e.

Caridina typus – De Silva, 1982: 135, Figs. 4a-h.

Material examined. – 2 males, cl 4.7-4.9 mm, UR, Tag Bariri, Palawan Island, Philippines, 9 Aug. 1985; 1 male, cl 4.3 mm, UR, Aninoan River, Mindoro Island, Philippines, 15 Aug.1985; 1 male, cl 4.5 mm, UR, Iraan River, Mindoro, Philippines, 5 Aug.1985.

Remarks. – *Caridina villadolidi* was originally described from Philippines (Blanco, 1939).

Distribution. – Philippines, Sulawesi, Halmahera, Sri Lanka.

Caridina brevicarpalis De Man, 1892

Caridina brevicarpalis De Man, 1892: 397, Pl. 24 Fig. 30-30d [type locality: near Palopo, Celebes (Sulawesi), Indonesia]; Bouvier, 1925: 178, Figs. 372-374; Edmondson, 1935: 7, Figs. 2a-f.

Caridina brevicarpalis brevicarpalis – Chace, 1997: 8.

Material examined. – 2 males, cl 4.2-4.5 mm, 3 females, cl 4.3-4.5 mm, 2 ovig. females, cl 6.7-7.0 mm, UR, Tag Bariri, Palawan Island, Philippines, 9 Aug.1985; 1 ovig. female, cl 7.2 mm, RU, Panitian River, upper stream, ca 30 km from river mouth, Palawan Island, Philippines, 6 Aug.1985; 3 males, cl 3.6-3.9 mm, 4 females, cl 3.9-4.0 mm, UR, Aninoan River, Mindoro Island, Philippines, 15 Aug.1985; 4 males, cl 3.6-4.0 mm, 7 ovig. females, cl 5.8-6.0 mm, UR, Mabuhay River, Mindanao Island, Philippines, 25 Jul.1985; 2

males, cl 3.0-4.2 mm, 4 females, cl 3.0-3.7 mm, 2 ovig. females, cl 5.8-5.9 mm, UR, Santacruz River, Palawan Island, Philippines, 9 Aug.1985; 1 ovig. female, cl 6.2 mm, Iraan River, Philippines, 5 Aug.1985; 1 female, cl 3.6 mm, San Francisco River, Surigao, Del Nork, Mindanao, Philippines, 25 Jul.1985.

Remarks. – When discussed the subspecific status of *Caridina brevicarpalis brevicarpalis* and *C. b. endehensis*, Chace (1997: 8) noted that in the latter subspecies, “(t)he rostrum, suborbital angle, and posterior spines of the telson are very different from those in the typical form of *C. brevicarpalis* that the identification of these specimens as subspecies of that species is justified only because of the desirability of avoiding name changes until taxa are studied more intensively.” On the basis of more specimens available, the differences between these two forms are always distinct, and could be easily used to separate one from the other, even in some cases, two forms are found together. We hereby treat both as distinct species. This is the first record of the species for Philippines.

Distribution. – Sulawesi, Fiji, Philippines.

Caridina endehensis De Man, 1892

Caridina brevicarpalis var. *endehensis* De Man, 1892: 399, Pl. 24 Fig. 30e [type locality: Nuawari, near Ende, Flores, Indonesia]; Bouvier, 1925: 34; Roux, 1928: 218; Blanco, 1935: 34, Pl. 2 Fig. 25; Chace, 1997: 8, Fig. 3.

Caridina brevicarpalis – Holthuis, 1978: 38.

Material examined. – 10 males, cl 2.0-3.2 mm, 12 females, cl 5.1-7.0 mm, 6 ovig. females, cl 5.8-7.8 mm, Alag River, Mindoro Island, Philippines, 15 Aug.1985; 3 males, cl 3.4-4.8 mm, 1 ovig. females, cl 6.8 mm, Caboroan, Luzon Island, Philippines, 15 Jul.1985; 5 males, cl 4.1-4.7 mm, 3 females, cl 4.3-5.7 mm, 8 ovig. females, cl 6.5-6.8 mm, Bongabong River, Mindoro Island, Philippines, 14 Aug.1985; 3 males, cl 3.7-3.9 mm, 1 female, cl 4.6 mm, 2 ovig. females, cl 5.2-5.7 mm, San Francisco River, Surigao, Del Nork, Mindanao, Philippines, 25 Jul.1985.

Remarks. – See remarks under the previous species. Holthuis (1978) reported *Caridina brevicarpalis* from Sumba. According to his description, his specimens “can unhesitatingly be brought to ssp. *endehensis*...” *Caridina endehensis* has previously been reported from Philippines by Blanco (1935) and Chace (1997).

Distribution. – Philippines, Indonesia.

Caridina peninsularis Kemp, 1918

Caridina brachydactyla peninsularis Kemp, 1918: 279, Fig.10a-g [type locality: Patani, southern Thailand and Penang Island, Malaysia].

Caridina peninsularis Cai & Anker, 2004: 237, Fig. 2.

Material examined. – 3 males, cl 4.0-4.3 mm, 3 ovig. females, cl 6.1-6.6 mm, spring water to Sagay River, Cebu Island, Philippines, 27 Jul.1985; 1 male, cl 3.8 mm, 2 females, cl 4.2-4.4 mm, Tag Bariri, Palawan Island, Philippines, 9 Aug.1985; 2 females, cl 2.1-3.1 mm,

1 ovig. female, cl 3.6 mm, Santacruz River, Palawan Island, Philippines, 9 Aug.1985.

Remarks. – *Caridina peninsularis* has just recently been reported from Busuang Island, Philippines by Cai & Anker (2004).

Distribution. – Peninsular Malaysia, southern Thailand and Philippines.

Caridina propinqua De Man, 1908

Caridina propinqua De Man, 1908a: 227, Pl. 19 Fig. 6 [type locality: Dhappa, near Calcutta, India]; Kemp, 1915: 309; 1918: 274; Bouvier, 1925: 181, Figs. 375, 381; Johnson, 1961: 131, Figs. 12-15; De Silva, 1982: 127, Fig. 5; Ng & Choy, 1990: 17.

Material examined. – 2 males, cl 2.7-2.8 mm, 6 females, cl 3.9 mm, Surigao Mangrove, Mindanao Island, Philippines, Station 2, 25 Jul.1985.

Remarks. – The species has a preference to live in mangrove, though sometimes could be found at other freshwater habitats. This is a new record for the Philippines.

Distribution. – Sri Lanka, India, Thailand, Malay Peninsula.

Caridina elongapoda Liang & Yan, 1977

Caridina nilotica elongapoda Liang & Yan, 1977: 220, Figs. 5-8 [type locality: Xinzai, Gulei village, Zhangpu County, Fujian, southern China].

Caridina aff. *brachydactyla* -Yeo, Cai & Ng, 1999: 218, Figs. 10-14.

Caridina longirostris - Chace, 1997: 14 (part), Fig. 6.

Material examined. – 4 ovig. females, cl. 6.3-8.5 mm, 1 female, cl 4.4 mm, 3 males, cl 4.1-4.4 mm, Malayas River, Victoria, Mindoro Island, Philippines, 14 Aug.1985; 3 males, cl 3.5-3.8 mm, 5 ovig. females, cl 4.0-5.6 mm, Daakrongsod River, Cebu Island, Philippines, 28 Jul.1985; 2 males, cl 3.9-4.5 mm, 10 females, cl 4.2-4.7 mm, 3 ovig. females, cl 6.3-7.5 mm, Tag Bariri, Palawan, Island, Philippines, 9 Aug.1985; 4 males, cl 3.9-4.2 mm, 4 ovig. females, cl 5.6-6.2 mm, Panitian River, upper stream, ca 30 km from river mouth, Palawan Island, Philippines, 6 Aug.1985; 5 males, cl 3.2-3.9 mm, 2 females, cl 3.4-5.2 mm, 3 ovig. females, cl 4.4-6.3 mm, 4 juv., Sta. Rosa, Luzon, Philippines, 15 Jul.1985; 1 female, cl 3.5 mm, 2 ovig. females, cl 4.8-5.2 mm, Sewaragan River, San Joaquin, Panay Island, Philippines, 19 Aug.1985; 6 males, cl 2.8-3.7 mm, 3 ovig. females, cl 5.0-5.6 mm, Bororo River, Luzon Island, Philippines, 16 Jul.1985; 4 males, cl 3.7-4.2 mm, 3 females, cl 4.4-5.2 mm, 3 ovig. females, cl 4.4-5.0 mm, Caboroan, Luzon Island, Philippines, 15 Jul.1985; 4 males, cl 3.2-4.0 mm, 1 female, cl 4.2 mm, 5 ovig. females, cl 4.9-6.2 mm, Villalflor River, Mindoro Island, Philippines, 15 Aug.1985; 9 males, cl 3.9-4.4 mm, 2 females, cl 5.1-5.5 mm, 3 ovig. females, cl 4.8-5.6 mm, Papait River, St. 2, upper stream, Palawan Island, Philippines, 9 Aug.1985; 2 males, cl 4.3-4.4 mm, 4 ovig. females, cl 5.5-6.2 mm, Panibacan River, Palawan Island, Philippines, 6 Aug.1985; 1 male, cl 2.9 mm, 1 female, cl 3.6 mm, 2 ovig. females, cl 4.3-6.2 mm, Aninoan River, Mindoro Island, Philippines, 15 Aug.1985; 3 males, cl 3.3-3.6 mm, 4 females, cl 2.7-3.4 mm, 1 ovig. female, cl 5.0 mm, Mabuhay River,

Mindanao Island, Philippines, 25 Jul.1985; 8 males, cl 2.6-4.8 mm, 1 ovig. female, cl 4.8 mm, Santacruz River, Palawan Island, Philippines, 9 Aug.1985; 3 males, 5 females, Naguilian River, Luzon, Philippines, 14 Jul.1985; 1 ovig. female, cl 5.3 mm, Iraan River, Philippines, 5 Aug.1985.

Comparative material examined. – 2 males, cl 3.8-4.1 mm, IZAS, Minjiang River, Fuzhou, Fujian Province, China, no date; 6 males, cl 3.3-3.9 mm, 8 females, cl 3.6-5.5 mm, ZRC, Nan'ao County, Guangdong Province, China, coll. Y. Cai, Nov.1998; 2 males, cl 3.3 mm, USNM, Tilig, Lubang Island, Mindoro Occidental, Philippines, Albatross Philippine Expedition, 14 Jul.1908.

Diagnosis. – Rostrum horizontal or slightly upturn at distal half, reaching to end of antennular peduncle, or slightly beyond distal end of scaphocerite; rostral formula: 2-3+16-22+1-3/7-13. Antennal spine lower than inferior orbital angle. Pterygostomial margin rounded. Sixth abdominal somite 0.6 times as long as carapace length, 1.9 times as long as fifth somite, slightly shorter than telson. Telson 3.0 times as long as wide, terminating in a posteromedian projection, with 4 pairs of dorsal spinules and one pair of dorsolateral spinules; distal margin with 3-4 pairs of spines, lateral pair of posterior spines longer than intermedian pairs. Preanal carina triangular, without spine. Antennular peduncle 0.9 times as long as carapace; scaphocerite 4.0 times as long as wide. First pereopod with merus as long as carpus, 2.5-2.6 times as long as wide; carpus 1.7-2.2 times as long as high; chela 1.9-2.1 times as long as broad, with fingers 1.0-1.8 times as long as palm. Second pereopod with merus shorter than carpus, 5.4 times as long as wide; carpus 5.5 times as long as high. Third pereopod with propodus 12 times as long as wide, 4.0 times as long as dactylus; dactylus of third pereopod 3.1 times as long as wide, with 4-7 accessory spines along flexor margin. Fifth pereopod with propodus 12 times as long as wide, 4.0 times as long as dactylus; dactylus 3.0 times as long as wide (spinules included), with 36-47 denticulate spinules along flexor margin. Endopod of male first pleopod triangular, with an elongated appendix at its distal end. Appendix masculina of male second pleopod reaching to half length of endopod. Uropodal diaeresis with 12-14 movable spinules. Eggs 0.38-0.42 x 0.20-0.25 mm in diameter.

Remarks. – *Caridina elongapoda* is most similar to *C. brachydactyla* with respect to the form of rostrum, form of the pereopods, notably the dactyli of the last three pereopods, but differs by the distal spine on the posterior margin of propodus of third to fifth pereopods which is not enlarged, and the form of first pereopod, which has a short carpus (1.7 to 2.0 times as long as broad vs. 2.1 to 2.5 times) and short fingers (1.0 to 1.8 times as long as palm vs. 2.0 to 2.5 times). Reexamination of the specimens reported from Pulau Tioman, Peninsular Malaysia by Yeo et al (1999) under the name of *Caridina* aff. *Brachydactyla* shows that they should correctly be referred to the present species. According to the drawings of Chace (1997: figure 6), part of his *Caridina longirostris* specimens should be referred to current species too. According to an on going revision on the *Caridina nilotica* species group, *C. longirostris* does not have an appendix interna on the endopod of male first pleopod (Y. Cai pers. observ.). This is a new record for Philippines.

Distribution. – China, Malaysia, Philippines.

Caridina gracilipes De Man, 1892

Caridina Wyckii var. *gracilipes* De Man, 1892: 387, Pl. 24 Fig. 29-29e [type localities: Sulawesi (Celebes), and Selajar, Indonesia].

Caridina wyckii var. *gracilipes* – Schenkel, 1902: 498.

Caridina nilotica gracilipes – De Man, 1908b: 270, Figs. 7a, b; Ueno, 1935: 272, Fig. 2; Yu, 1974; 52, Figs. 2, 3.

Caridina longirostris – Chace, 1997: 14 (part), Fig. 7.

Material examined. – 1 male, cl 4.0 mm, 4 ovig. females, cl 4.1-6.3 mm, UR, San Francisco River, Surigao, Del Nork, Mindanao Philippines, 25 Jul.1985.

Comparative material examined. – Lectotype: 1 ovig. female, cl 5.3 mm, syntypes of *Caridina* var. *gracilipes* De Man, 1892, RMNH D 1317, Maros River, Sulawesi, Indonesia, coll. Max Weber, Sep.-Oct.1888, present designation. Paralectotypes: 2 females, cl 4.2-4.4 mm, RMNH D 1317, data same as lectotype. Others: 8 males, cl 3.4-3.8 mm, 10 ovig. females, cl 4.6-5.7 mm, USNM, Tilig, Lubang Island, Mindoro Occidental, Philippines, Albatross Philippine Expedition, 14 Jul.1908; 5 males, cl 2.6-3.9 mm, USNM 285324, Calawagan River, River mouth, Mindoro, Philippines, Albatross Philippines Expedition, 11 Dec.1908; 1 male, cl 3.6 mm, 14 ovig. females, cl 4.2-5.5 mm, River mouth, Mindoro, Philippines, Albatross Philippines Expedition, 11 Dec.1908; 1 male, cl 3.6 mm, 14 ovig. females, cl 4.3-5.5 mm, USNM 285323, Nato River, Camarines Sur, Luzon, Philippines, Albatross Philippines Expedition, 18 Jun.1909; 3 males, cl 4.0-4.2 mm, 4 females, cl 4.4-4.6 mm, USNM 285332, Lake Ernestine, Cagayan Sulu Island, Palawan, Philippines, Albatross Philippines Expedition, 8 Jan.1909; 2 males, cl 3.0 mm, 1 female, cl 4.0 mm, 13 ovig. females, cl 4.5-5.0 mm, USNM 285321, Malaga River at Hinunangan Bay, Leyte, Philippines, Albatross Philippines Expedition, 30 Jul.1909; 2 females, cl 4.2-4.4 mm, 8 ovig. females, cl 4.2-6.0 mm, USNM 285333, Passi, Panay Island, Philippines, Albatross Philippines Expedition, no date.

Diagnosis. – Rostrum long, upturn anteriorly, reaching beyond end of scaphocerite; rostral formula: 1-3+11-27+1-3/8-18; with toothed dorsal margin proportion subequal to length of untoothed proportion. Antennal spine lower than inferior orbital angle. Pterygostomian angle broadly rounded. Sixth abdominal somite 0.59 times of carapace, 1.9 times as long as fifth somite, as long as telson. Telson 4.0 times as long as wide, terminating in a projection, with 4 pairs of dorsal spinules and 1 pair of dorsolateral spinules; distal margin with 3 pairs distal spines, lateral pair distinctly longer than intermediate pairs, sublateral pair shortest. Preanal carina with a spine. Antennular peduncle 0.8-1.05 times as long as carapace; scaphocerite 4.4 times as long as wide. Epipods on first 4 pereopods. First pereopod with carpus excavated anteriorly, shorter than chela, 2.0-2.5 times as long as high; chela 2.0-2.7 times as long as broad; fingers distinctly longer than palm. Second pereopod with carpus 1.4 times as long as chela, 5.4-6.3 times as long as high; chela 2.5-3.2 times as long as broad; fingers 1.6 times as long as palm. Third pereopod with propodus 10-14 times as long as broad, 3.8-4.4 times as long as dactylus; dactylus 3.3 times as long as wide (spines included), with 8-9 accessory spines on flexor margin. Fifth pereopod with propodus 15-19 times as long

as broad, 3.1-3.8 times as long as dactylus, dactylus 4.1 times as long as wide (spinules included), with 36-57 spinules on flexor margin. Endopod of male first pleopod subtriangular, 0.25 times length of exopod, no appendix interna, or with a vestige of it. Appendix masculina of male second pleopod half length of endopod. Uropodal diaeresis with 8-12 movable spinules. Eggs 0.42-0.53-x0.23-0.33 mm in diameter.

Remarks. – *Caridina gracilipes* De Man, 1892, is different from *C. elongapoda* in lacking an appendix interna in the endopod of male first pleopod. *Caridina gracilipes* can be distinguished from *C. longirostris* in its elongated carpus of fist pereopod and dactylus of last three pereopods. As *Caridina gracilipes* could be easily separated from all the members of the *C. nilotica* group, it is here recognized as a distinct species. According to Chace's (1997: Fig. 7) drawings, at least part of his *C. longirostris*, e.g. specimens from Nato River, lagonoy Gulf, are indeed *C. gracilipes*. Reexamination of Albatross Philippines Expedition specimens confirms this assumption (see comparative material examined for details). *C. gracilipes* has been reported from Taiwan, southern China and Sulawesi and is now recorded from Philippines for the first time.

Distribution. – Sulawesi, Taiwan, mainland China, Philippines.

Caridina gracilirostris De Man, 1892

Caridina gracilirostris De Man, 1892: 399, Pl. 25 Fig. 31-31d [type locality: Balangnipa, Sulawesi (Celebes) Indonesia]; Bouvier, 1925: 142, Figs. 305-307; Holthuis, 1965: 23, Fig. 7; Tiwari & Pillai, 1971: 83, Fig. 2a, b; Chace, 1997: 10, Fig. 4; Cai & Ng, 2001: 674, Fig. 7.

Material examined. – 2 males, cl 3.8-3.9 mm, 3 females, cl 3.1-3.5 mm, UR, Sungao River (downstream of Mabuhay River), Mindanao Island, Philippines, 25 Jul.1985; 3 females, cl 3.8-4.3 mm, Sta. Rosa, Luzon, Philippines, 15 Jul.1985; 1 male, cl 4.2 mm, UR, Bororo River, Luzon, Philippines, 16 Jul.1985; 3 males, cl 3.5-4.1 mm, 12 females, cl 2.5-4.2 mm, 2 ovig. females, cl 4.2-4.6 mm, UR, Pagsanjan River, Philippines, 19 Jul.1985.

Remarks. – Our specimens all have no appendix interna at the endopod of male first pleopod, should clearly be referred to the typical form of *Caridina gracilirostris*. Cai & Ng (in preparation) recently revised the *Caridina gracilirostris* species group, referring the form with no appendix interna in endopod of male first pleopod as *C. gracilirostris* and the other, with a distinct appendix interna in the endopod of male first pleopod as *C. appendiculata* Jalihal & Shenoy, 1998.

Distribution. – Sulawesi, Philippines, Malay Peninsula, India, Madagascar.

Caridina cebuensis, new species

(Figs. 1, 2)

Materials examined. – Holotype: ovig. female, cl 2.9 mm, eggs 0.85 x 0.55 mm, NSMT, spring water to Sagay River, Cebu Island, Philippines.

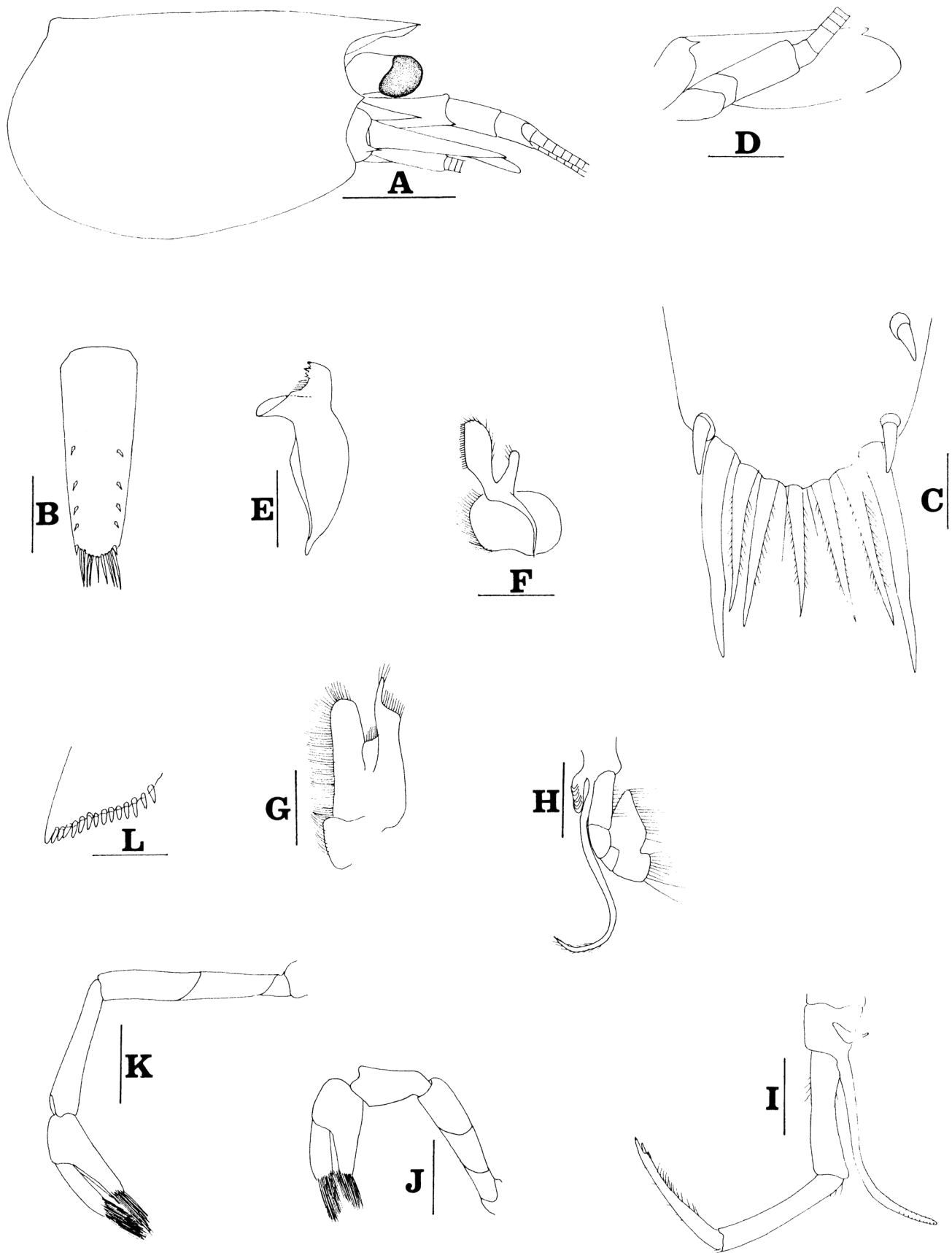


Fig. 1. *Caridina cebuensis*, new species, male, cl 2.5 mm, paratype, Cebu, Philippines: A, cephalothorax and cephalic appendages, lateral view; B, telson; C, distal portion of telson; D, scaphocerite; E, mandible; F, maxillula; G, first maxilliped; H, second maxilliped; I, third maxilliped; J, first pereopod; K, second pereopod; L, uropodal diaeresis. Scale bars: A = 1 mm; B, D-K = 0.5 mm; D, C = 0.1 mm; L = 0.2 mm.

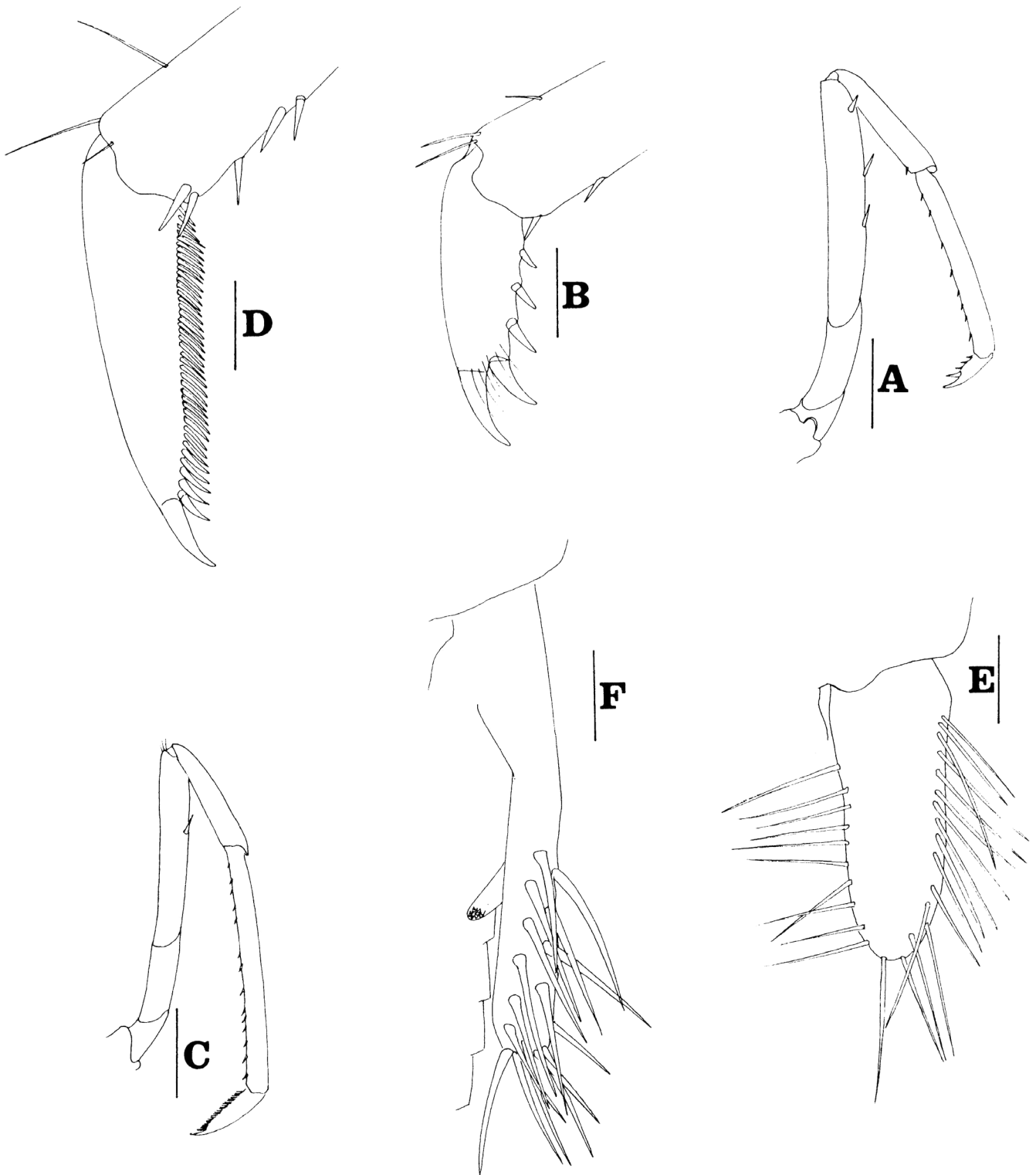


Fig. 2. *Caridina cebuensis*, new species, male, cl 2.5 mm, paratype, Cebu, Philippines: A, third pereiopod; B, dactylus of third pereiopod; C, fifth pereiopod; D, dactylus of fifth pereiopod; E, endopod of male first pleopod; F, appendix masculina and appendix interna of male second pleopod. Scale bars: A, C = 0.5 mm; B, D-F = 0.1 mm.

Paratypes: 2 males, cl 2.1-2.5 mm, 4 females, cl 2.8-3.0 mm, ZRC, 13 males, cl 2.0-2.6 mm, 19 females, cl 1.9-3.2 mm, UR, data same as holotype.

Description. – Rostrum (Fig. 1A) short, pointed, reaching to end of eye stalk or slightly beyond end of first segment of antennular peduncle. Unarmed mostly at both margins, occasionally armed ventrally with 1 small tooth. Antennal spine fused with inferior orbital angle. Pterygostomian margin subrectangular.

Third abdominal somite with moderately convex dorsal profile. Sixth abdominal somite about half length of carapace, 1.7 times as long as fifth somite, slightly shorter than telson. Telson (Fig. 1B, C) 2.8 times as long as wide, not terminating in a projection, with four pairs of dorsal spinules and one pair of dorsolateral spinules; lateral pair of distal spines distinctly longer than intermediate pairs of spiniform setae. Preanal carina lacking spine.

Eyes less developed, with short eye stalk, anterior end reaching only to 0.5 to 0.7 times length of basal segment of antennular peduncle. Antennular peduncle 0.7 times as long as carapace; basal segment of antennular peduncle as long as sum of second and third segment length, anterolateral angle reaching 0.27 length of the second segment, second segment distinctly longer than third segment. Stylocerite reaching 0.7 length of basal segment of antennular peduncle. Scaphocerite (Fig. 1B) 3.1 times as long as wide.

Incisor process of mandible (Fig. 1E) ending in irregular teeth, molar process truncated. Lower lacinia of maxillula (Fig. 1F) broadly rounded, upper lacinia elongated, with a number of distinct teeth on inner margin, palp slender. Upper endites of maxilla subdivided, palp short, scaphognathite tapering posteriorly with some long, curved setae at posterior end. Palp of first maxilliped (Fig. 1G) broadly triangular, with a pointed end; flagellum of caridean lobe short. Second maxilliped (Fig. 1H) typical of genus. Third maxilliped (Fig. 1I) reaching to end of antennular peduncle, with ultimate segment as long as penultimate segment.

Epipods on first four pereopods. First pereopod (Fig. 1J) reaching to end of basal segment of antennular peduncle; ischium as long as merus; merus 1.7 times as long as broad, shorter than carpus; carpus excavated anteriorly, shorter than chela, 1.6 times as long as high; chela 2.2 times as long as broad; fingers distinctly longer than palm. Second pereopod (Fig. 1K) reaching beyond end of second segment of antennular peduncle; ischium as long as merus; merus shorter than carpus, 3.3 times as long as broad; carpus 1.1 times as long as chela, 4.4 times as long as high; chela 2.8 times as long as broad; fingers 1.6 times as long as palm. Third pereopod (Fig. 2A, B) reaching to end of antennular peduncle, propodus 9.0 times as long as broad, 3.7 times as long as dactylus; dactylus 2.9 times as long as wide (spines included), with 4-7 accessory spines on its flexor margin. Fifth pereopod reaching beyond end of second segment of antennular peduncle, propodus 11 times as long as broad, 3.0 times as long as dactylus, dactylus 3.7 times as long as wide (spinules included), with 39 spinules on its flexor margin.

Endopod of male first pleopod (Fig. 2E) subrectangular, one quarter length of exopod, no appendix interna. Appendix masculina of male second pleopod (Fig. 2F) half of endopod length, with appendix interna reaching base of distal one-third of appendix masculina.

Uropodal diaeresis (Fig. 1L) with 14-16 movable spinules.

Ovigerous females with egg sized 0.85 x 0.55 mm in diameter.

Habitat. – *Caridina cebuensis*, new species, was collected from the outlet of a spring water, headwater of a stream running into Sagay River, Cebu Island in central Philippines.

Etymology. – The new species is named after its type locality—Cebu Island, Philippines.

Remarks. – With respect to the short and sharp rostrum form, the large egg size, *Caridina cebuensis*, new species, most resembles the Taiwanese species, *Caridina formosae* Hung, Chan & Yu, 1993. It, however, could be easily separated from the latter by the form of male first pleopod, which has no appendix interna (vs. has a distinct appendix interna in *C. formosae*). Taking the egg size, the short rostrum, the male first pleopod which has no appendix interna and the form of telson into account, *Caridina cebuensis*, is similar to *Caridina isaloensis* Coutière, 1899, from Madagascar (see Holthuis, 1965; Cai, 2005). It differs from *C. isaloensis* by the shape of the endopod of male first pleopod (Subrectangular vs. subtriangular), the more spinules on uropodal diaeresis (14-16 vs. 7-12), and the position of the antennal spine which is fused with the inferior orbital angle (vs. lower than the inferior angle).

Distribution. – Philippines.

Caridina buhi, new species

(Figs. 3, 4)

Materials examined. – Holotype: ovig. female, cl 4.0 mm, NSMT, Binahagan River, Buhi, Camarines Sur, Luzon, Philippines, 19 Aug. 1985.

Paratypes: 1 male, cl 3.3 mm, NSMT, 1 male, cl 3.8 mm, ZRC, 1 ovig. female, cl 4.1 mm, ZRC, 10 males, cl 2.8-3.2 mm, 1 female, cl 3.0 mm, UR, same data as holotype.

Description. – Rostrum (Figs. 3A, 4A) straight, reaching near end of second segment of antennular peduncle, or slightly beyond end of antennular peduncle; armed dorsally with 14 to 25, including 3 to 5 (mostly 4-5) posterior to orbital margin, with anterior 1/4 to 1/3 of rostrum length unarmed, armed ventrally with 3 to 7 (mostly 6-7) teeth; antennal spine situated lower than inferior orbital angle. Pterygostomian angle subrectangular.

Third abdominal somite with moderately convex dorsal profile. Sixth abdominal somite about 0.6 times as long as carapace, 1.8 times as long as fifth somite, slightly shorter than telson. Telson (Fig. 3B, C) 3.0 times as long as wide,

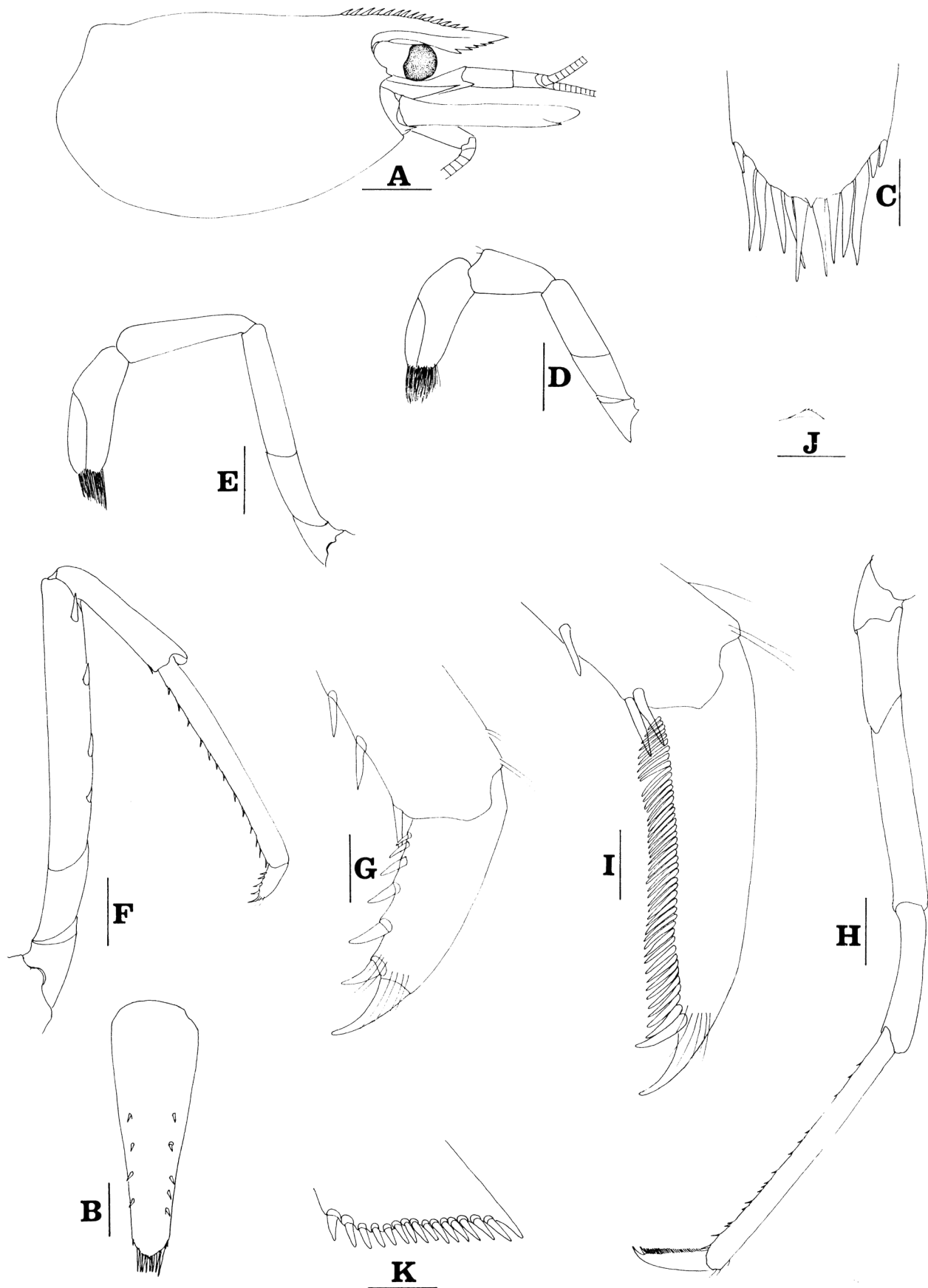


Fig. 3. *Caridina buhi*, new species, ovig. female, cl 4.0 mm, holotype, NSMT, Binahugan River, Buhi, Camarines Sur, Luzon, Philippines: A, cephalothorax and cephalic appendages, lateral view; B, telson; C, distal portion of telson; D, first pereopod; E, second pereopod; F, third pereopod; G, dactylus of third pereopod; H, fifth pereopod; I, dactylus of fifth pereopod; J, preanal carina; K, uropodal diaeresis. Scale bars: A = 1 mm, B, D-F, H, J = 0.5 mm; C, G, I, K = 0.2 mm.

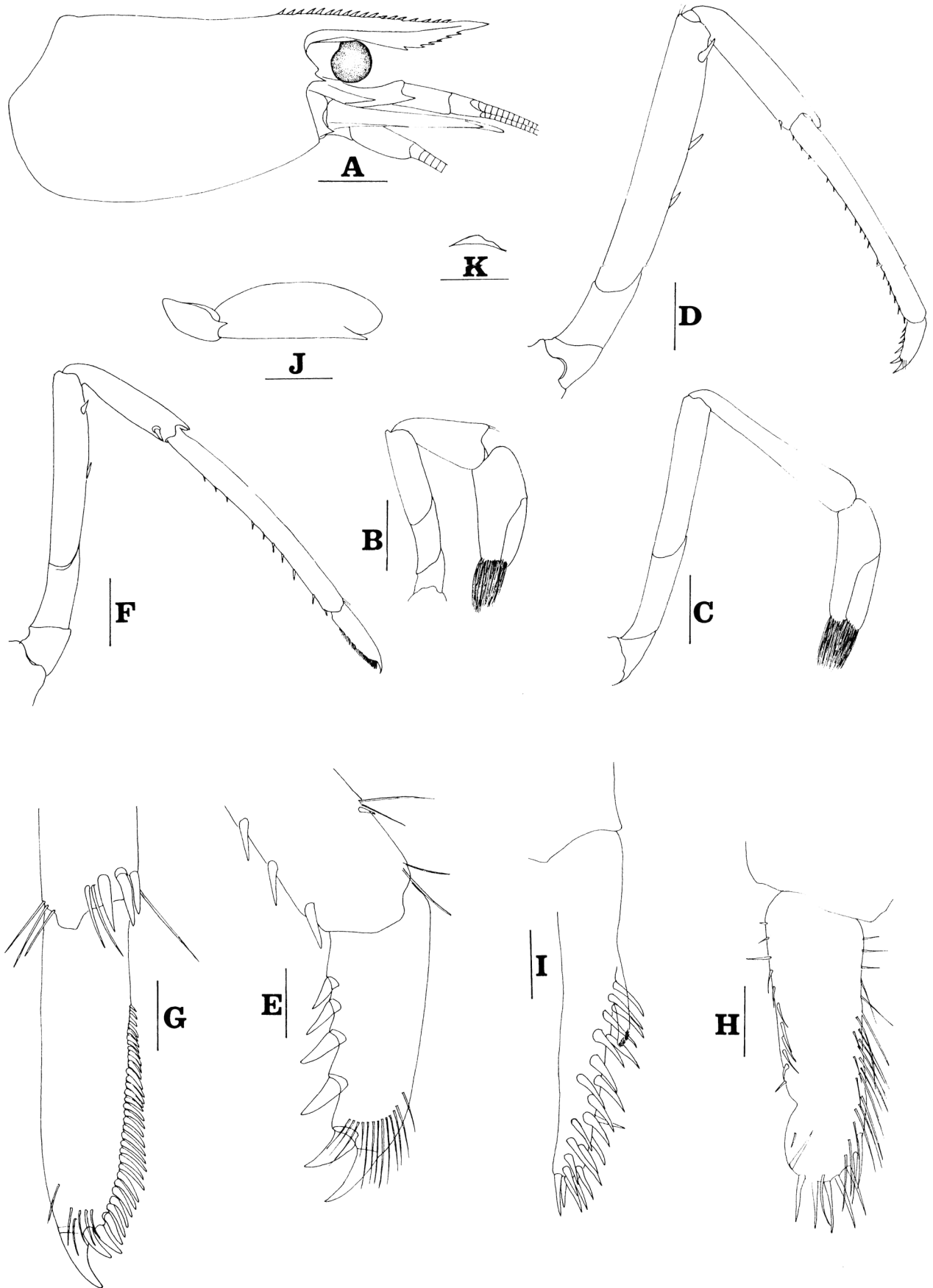


Fig. 4. *Caridina buhi*, new species, male, cl 3.3 mm, paratype, ZRC, Binahugan River, Buhi, Camarines Sur, Luzon, Philippines: A, cephalothorax and cephalic appendages; B, first pereiopod; C, second pereiopod; D, third pereiopod; E, dactylus of third pereiopod; F, fifth pereiopod; G, dactylus of fifth pereiopod; H, endopod of male first pleopod; I, appendix interna and appendix masculina of male second pereiopod; J, scaphocerite; K, preanal carina. Scale bars: A, J = 1 mm, B-D, F, K = 0.5 mm, E, G, H, I = 0.1 mm.

terminating in a small projection, with four to five pairs of dorsal spinules and one pair of dorsolateral spinules; lateral pair of distal spines slightly longer than intermediate pairs. Preanal carina small, lacking spine (Figs. 3J, 4K).

Eyes well developed. Antennular peduncle 0.6 times as long as carapace; basal segment slightly longer than sum of second and third segment length, anterolateral angle reaching 0.25 times length of the second segment, second segment distinctly longer than third segment. Stylocerite reaching 0.7-0.9 times length of basal segment of antennular peduncle. Scaphocerite (Fig. 4J) 3.0 times as long as wide.

Mouthparts similar to that of *Caridina cebuensis*. Palp of first maxilliped broadly triangular, with a pointed end. Second maxilliped typical. Third maxilliped reaching to end of second segment of antennular peduncle, with ultimate segment as long as penultimate segment.

Epipods on first four pereopods. First pereopod (Figs. 3D, 4B) reaching to end of basal segment of antennular peduncle; ischium shorter than merus; merus 2.5-3.0 times as long as broad, as long as carpus; carpus excavated anteriorly, shorter than chela, 1.8-1.9 times as long as high; chela 2.3-2.5 times as long as broad; fingers distinctly longer than palm. Second pereopod (Fig. 3E, C) reaching to end of second segment of antennular peduncle; merus shorter than carpus, 4.2-5.2 times as long as broad; carpus 1.1-1.4 times as long as chela, 4.0-5.5 times as long as high; chela 3.0-3.2 times as long as broad; fingers 1.2-1.3 times as long as palm. Third pereopod (Figs. 3F, G, 4D, E) reaching to end of scaphocerite, ischium shorter than merus; propodus distinctly shorter than merus, 10-12 times as long as broad, 4.5 times as long as dactylus; dactylus 2.5-2.8 times as long as wide (spines included), with 5-6 accessory spines on its flexor margin. Fifth pereopod (Figs. 3H, I, 4F, G) reaching to end of second segment of antennular peduncle, propodus 10-12 times as long as broad, 3.0-3.6 times as long as dactylus; dactylus 3.4-3.8 times as long as broad, with 33-45 spinules on its flexor margin.

Endopod of male first pleopod (Fig. 4H) rectangular, half of exopod length, no appendix interna. Appendix masculina of male second pleopod (Fig. 4I) 2/3 length of endopod, with appendix interna, slender and small, reaching to 1/4 length of appendix masculina.

Uropodal diaeresis (Fig. 3k) with 15-17 movable spinules.

Ovigerous females with egg sized 0.85x0.50 mm in diameter.

Habitat. – *Caridina buhi*, new species, was collected from the Binahugan River.

Etymology. – The new species is named after its type locality-Binahugan River in Buhi, Camarines Sur, Luzon. Name used as a noun in apposition.

Remarks. – With respect to the rostrum, and the various pereopods, *Caridina buhi*, new species, most resembles *C. sumatrensis* De Man, 1892. It could be distinguished from

C. sumatrensis by the antennal spine which situated lower than inferior orbital angle (vs. fused with inferior orbital angle in *C. sumatrensis*), the preanal carina which is much smaller, the endopod of male first pleopod (does not has appendix interna vs. has in *C. sumatrensis*) and the larger egg size (0.85 x 0.50 vs. 0.35 x 0.25 mm). *Caridina buhi*, new species, is morphologically closest to *C. demani* Roux, 1911 in the form of rostrum, the male pleopods, but it differs from *C. demani* by the rostrum having more postorbital teeth (3-5 vs. 2-3) and more ventral teeth (3-7, mostly 6-7 vs. 0-5), the telson which terminates in a small projection (vs. no such projection), and the wider scaphocerite (3.0 times as long as wide vs. 3.7 times).

Distribution. – Philippines.

***Caridina palawanensis*, new species**
(Figs. 5, 6A, B)

Material examined. – Holotype: 1 ovig. female, cl 4.1 mm, NSMT, Panitian River, upper stream, ca 30 km from river mouth, Palawan Island, Philippines, 6 Aug.1985.

Paratypes: 2 males, cl 2.6-2.9 mm, 2 ovig. females, cl 3.8-4.1 mm, ZRC, 3 males, cl 2.2-2.8 mm, 2 ovig. females, cl 4.1-4.2 mm, 2 females, cl 2.6-2.8 mm, UR, data same as holotype.

Description. – Rostrum straight (5A), reaching to or beyond end of antennular peduncle, or slight beyond end of scaphocerite, armed dorsally with 21 to 29 teeth throughout the dorsal margin, including 2 to 3 posterior to postorbital margin; armed ventrally with 5 to 10 teeth on anterior half; antennal spine distinctly lower than sub-orbital angle. Pterygostomian angle sub-rectangular.

Third abdominal somite with moderately convex dorsal profile. Sixth abdominal somite 0.6 times as long as carapace, 1.8 times as long as fifth somite, slightly longer than telson. Telson (Fig. 5B, C) 3.4 times as long as wide, terminating in a small projection, with four pairs of dorsal spinules and one pair of dorsolateral spinules; lateral pair of distal spines slightly longer than intermediate pairs. Preanal carina small, lacking spine (Fig. 5K).

Eyes well developed, small, anterior end reaching to 0.7 length of basal segment of antennular peduncle. Antennular peduncle 0.7 times as long as carapace; basal segment of antennular peduncle longer than sum of second and third segment length; second segment distinctly longer than third segment. Stylocerite reaching to 0.7 length of basal segment of antennular peduncle. Scaphocerite (Fig. 5D) 3.7 times as long as wide.

Mouthparts similar to that of *Caridina cebuensis*, new species. Palp of first maxilliped broadly triangular, ending in a finger-like projection. Second maxilliped typical of the genus. Third maxilliped reaching beyond end of second segment of antennular peduncle, with ultimate segment longer than penultimate segment.

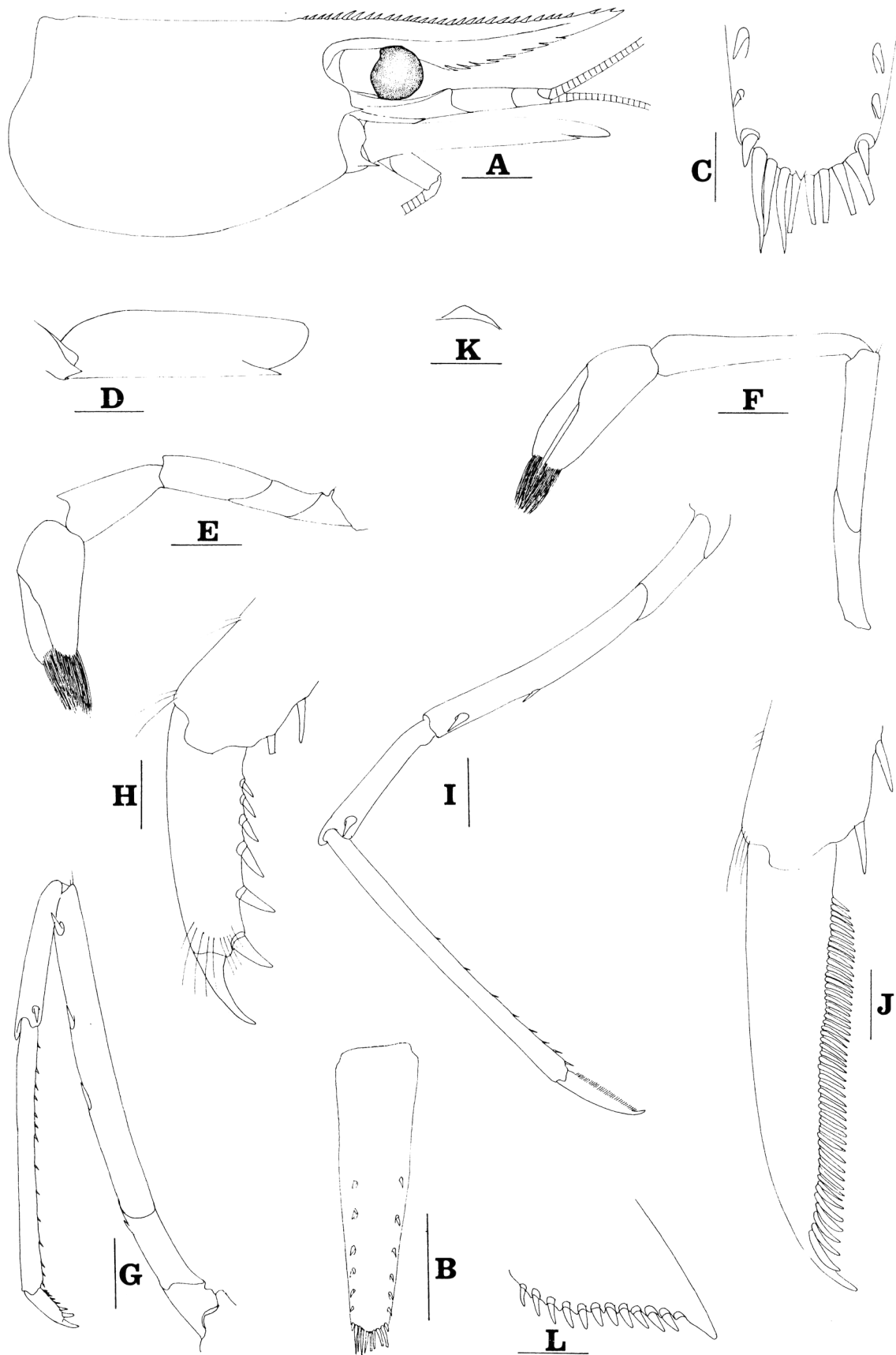


Fig. 5. *Caridina palawanensis*, new species, ovig. females, cl 4.1 mm, paratype, ZRC, Panitian River, upper stream, ca 30 km from river mouth, Palawan Island Philippines: A, cephalothorax and cephalic appendages, lateral view; B, telson; C, distal portion of telson; D, scaphocerite; E, first pereopod; F, second pereopod; G, third pereopod; H, dactylus of third pereopod; I, fifth pereopod; J, dactylus of fifth pereopod; K, preanal carina; L, uropodal diaeresis. Scale bars: A, B, D = 1 mm; E-G, I, K = 0.5 mm; C = 0.2 mm; H, J = 0.1 mm.

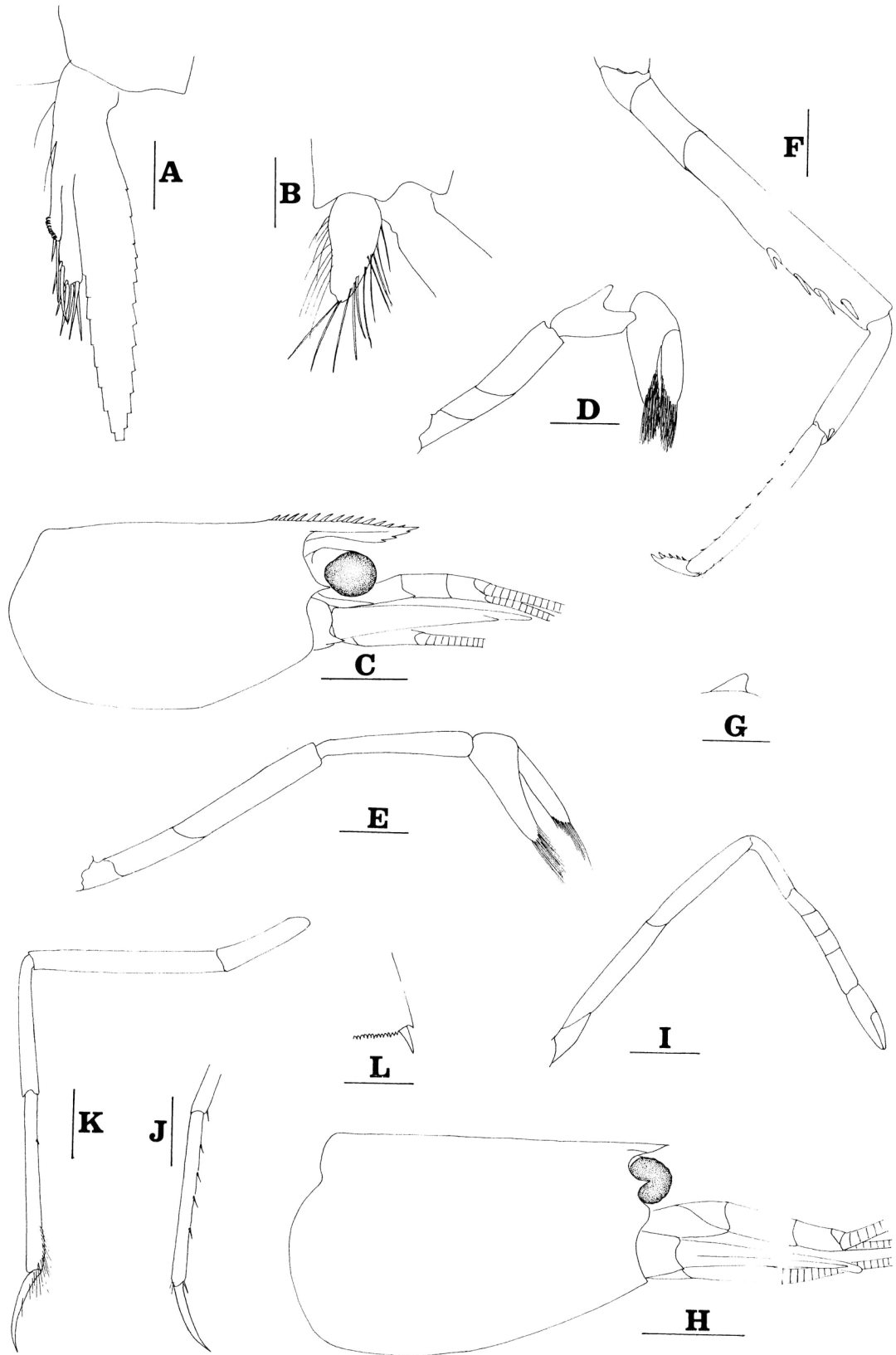


Fig. 6. *Caridina palawanensis*, new species, male, cl 2.8 mm, ZRC, Panitian River, upper stream, ca 30 km from river mouth, Palawan Island, Philippines: A, male second pleopod; B, male first pleopod. *Caridina sumatrensis*, male, cl 3.2 mm, ZRC, Santacruz River, Palawan Island, Philippines: C, cephalothorax and cephalic appendages, lateral view; D, first pereopod; E, second pereopod; F, third pereopod; G, preanal carina. *Potamalpheops miyai*, male, cl 3.0 mm, ZRC, Surigao mangrove, Mindanao Island, Philippines: H, cephalothorax and cephalic appendages, lateral view; I, second pereopod; J, propodus and dactylus of third pereopod; K, fifth pereopod; L, uropodal diaeresis. Scale bars: A, B = 0.2 mm, C, H = 1 mm, D-G, I-L = 0.5 mm.

Epipods on first four pereopods. First pereopod (Fig. 5E) reaching to anterior margin of the eye stalk; ischium shorter than merus; merus 2.7 times as long as broad, slightly shorter than carpus; carpus excavated anteriorly, shorter than chela, 1.8 times as long as high; chela 2.0 times as long as broad; fingers distinctly longer than palm. Second pereopod (Fig. 5F) reaching beyond second segment of antennular peduncle; ischium shorter than merus; merus shorter than carpus, 5.3 times as long as broad; carpus 1.3 times as long as chela, 5.5 times as long as high; chela 2.6 times as long as broad; fingers 1.6 times as long as palm. Third pereopod (Fig. 5G, H) reaching to end of antennular peduncle, propodus distinctly shorter than merus, 13 times as long as broad, 4.2 times as long as dactylus; dactylus 3.0 times as long as wide (spines included), with 6 accessory spines on its flexor margin. Fifth pereopod (Fig. 5I, J) reaching to end of second segment of antennular peduncle, propodus 14 times as long as broad, 3.0-3.6 times as long as dactylus; dactylus 3.7 times as long as broad, with 49 spinules on its flexor margin.

Endopod of male first pleopod (Fig. 6B) triangular, one fourth length of exopod, no appendix interna. Appendix masculina of male second pleopod (Fig. 6A) half of endopod length, with appendix interna reaching half of appendix masculina length.

Uropodal diaeresis (Fig. 5L) with 17 movable teeth.

Ovigerous females with egg sized 0.78-0.82x0.40-0.45 mm in diameter.

Habitat. – *Caridina palawanensis*, new species, was collected from Panitian River, upper stream, ca 30 km from river mouth, Palawan Island.

Etymology. – The new species is named after its type locality – Palawan Island, Philippines.

Remarks. – With respect to the rostrum, the egg size, the pereopods, *Caridina palawanensis*, new species, is most similar to *C. williamsi* Cai & Ng, 2000. It could be distinguished from *C. williamsi* by the endopod of the male first pleopod, which has no appendix interna (vs. has a distinct appendix interna at the distal end of the endopod in *C. williamsi*), the telson which terminates in a small projection (vs. no such projection in the latter), and the shorter antennular peduncle (0.7 times as long as carapace vs. 0.85-1.0 times in *C. williamsi*).

Distribution. – Philippines.

***Caridina mindanao*, new species**
(Figs. 7-9)

Material examined. – Holotype: male, cl 3.3 mm, NSMT, (NSMT), Lake Mainit, Mindanao, Philippines, 24 Jul. 1985, coll. S. Shokita. Paratypes: 5 females, cl 3.5-4.0 mm, 5 ovig. females, cl 3.7-3.8 mm, UR; 3 females, cl 3.3-3.7 mm, 3 ovig. females, cl 3.7-3.9 mm, ZRC, data same as holotype.

Description. – Rostrum (Fig. 7A) long, upturn anteriorly, longer than carapace length, reaching beyond end of scaphocerite; rostral formula: 0-1+7-15+1/16-23. Antennal spine lower than inferior orbital angle. Pterygostomian angle broadly rounded.

Third abdominal somite (Fig. 7B) with strongly convex dorsal profile, sub-rectangular in form. Sixth abdominal somite 0.78 times of carapace, 2.2 times as long as fifth somite, as long as telson. Telson (Fig. 8A, B) 3.8 times as long as wide, not terminating in a projection, with 3-4 pairs of dorsal spinules and one pair of dorsolateral spinules; distal margin with 2 pairs of spines, lateral pair of dorsal spines distinctly longer than intermediate pair of spines. Preanal carina (Fig. 9I) small, lacking spine.

Eyes well developed, anterior end reaching to 0.6 times length of basal segment of antennular peduncle. Antennular peduncle 0.94 times as long as carapace; basal segment of antennular peduncle longer than sum of second and third segment length, anterolateral angle pointed, reaching 0.25 length of the second segment, second segment distinctly longer than third segment. Stylocerite reaching to 0.9 length of basal segment of antennular peduncle. Scaphocerite (Fig. 7C) 4.4 times as long as wide.

Incisor process of mandible (Fig. 7D) ending in irregular teeth, molar process truncated. Lower lacinia of maxillula (Fig. 7E) broadly rounded, upper lacinia elongated, with a number of distinct teeth on inner margin, palp slender. Upper endites of maxilla (Fig. 7F) subdivided, palp short, scaphognathite tapering posteriorly with some long, curved setae at posterior end. Palp of first maxilliped (Fig. 7G) broadly triangular; flagellum short. Second maxilliped (Fig. 7H) typical. Third maxilliped (Fig. 8I) reaching to end of second segment of antennular peduncle, with ultimate segment distinctly shorter than penultimate segment.

Epipods on first four pereopods. First pereopod (Fig. 8C, 9A) reaching to anterior margin of eye stalk; ischium as long as merus; merus 2.2 times as long as broad, slightly longer than carpus; carpus excavated anteriorly, shorter than chela, 1.2-1.4 times as long as high; chela 2.1-2.5 times as long as broad; fingers as long as palm. Second pereopod (Fig. 8D, 9B) reaching middle of second segment of antennular peduncle; ischium as long as merus; merus shorter than carpus, 3.5-3.9 times as long as broad; carpus shorter than chela, 3.1-3.2 times as long as high; chela 2.4-2.6 times as long as broad; fingers as long as palm. Third pereopod (Fig. 8E, F, 9C, D) reaching to end of antennular peduncle, propodus 12-13 times as long as broad, 3.0-3.2 times as long as dactylus; dactylus slender, 4.4-4.5 times as long as wide (spines included), with 10 accessory spines on its flexor margin. Fifth pereopod (Fig. 8G, H, 9E, F) reaching slightly beyond end of second segment of antennular peduncle, propodus 13-15 times as long as broad, 3.0-3.2 times as long as dactylus, dactylus 4.2-4.5 times as long as wide (spinules included), with 36-38 no-denticulate spinules on its flexor margin. Endopod of male first pleopod (Fig. 9G) subtriangular, 1/4 length of exopod, no appendix interna.

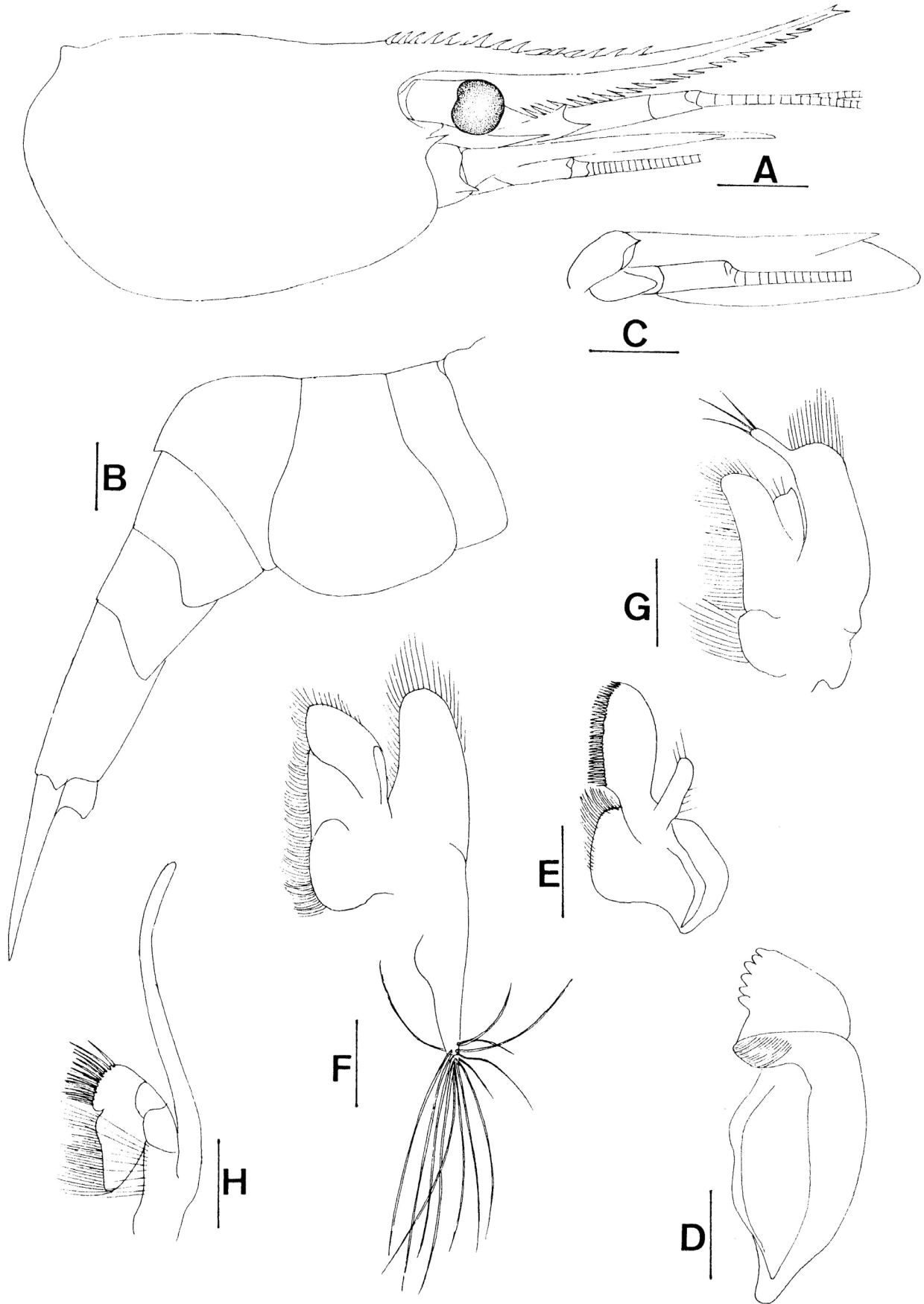


Fig. 7. *Caridina mindanao*, new species, ovig. female, cl 3.8 mm, Mindanao, Philippines: A, cephalothorax and cephalic appendages; B, abdomen and telson; C, scaphocerite; D, mandible; E, maxillula; F, maxilla; G, first maxilliped; H, second maxilliped. Scale bars: A, B = 1 mm; C, H = 0.5 mm.

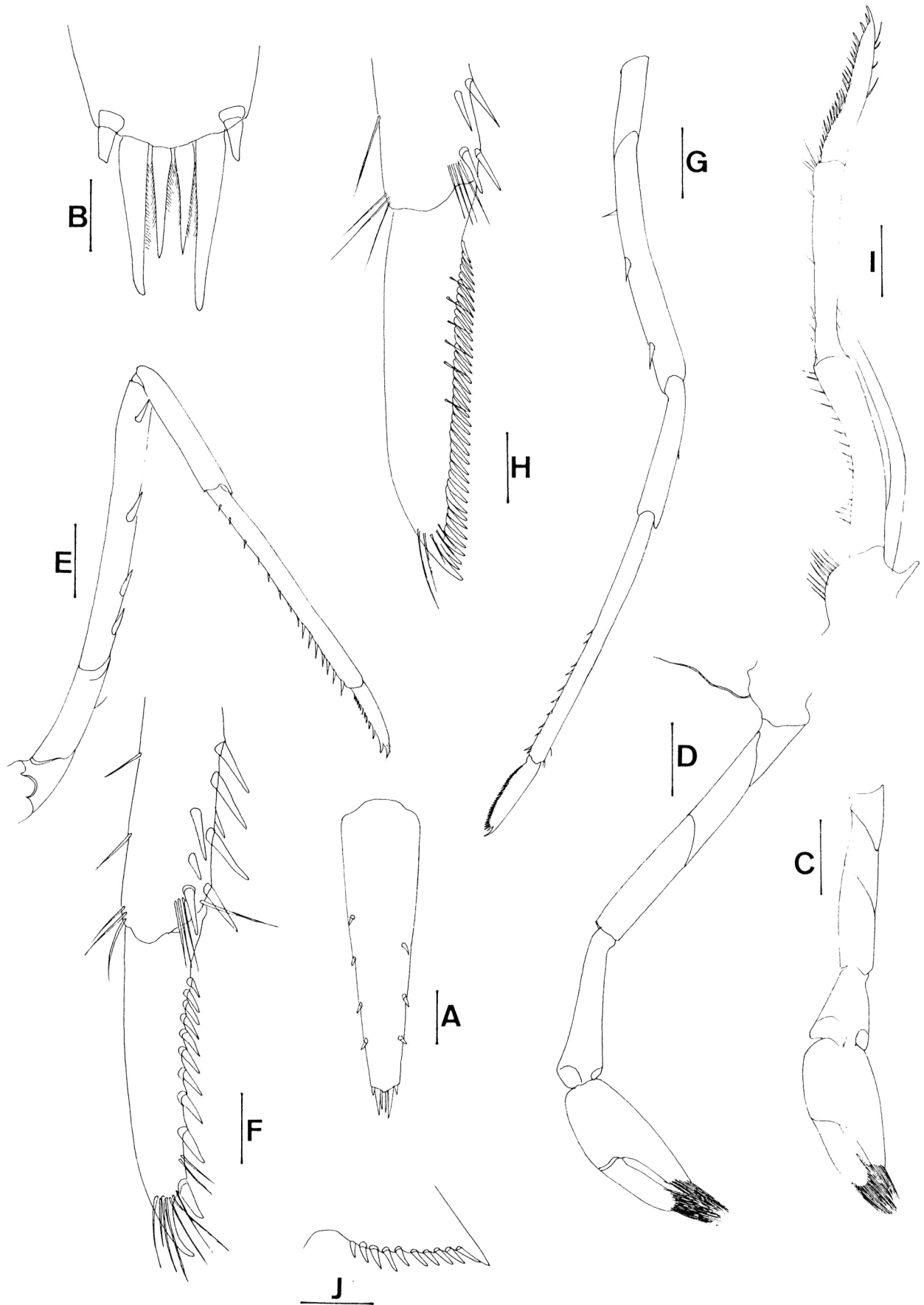


Fig. 8. *Caridina mindanao*, new species, ovig. female, cl 3.8 mm, Mindanao, Philippines: A, telson; B, distal portion of telson; C, first pereiopod; D, second pereiopod; E, third pereiopod; F, dactylus of third pereiopod; G, fifth pereiopod; H, dactylus of fifth pereiopod; I, third maxilliped; J, diaeresis. Scale bars: A, C-E, G, I = 0.5 mm; B, F, H = 0.1 mm; J = 0.2 mm.

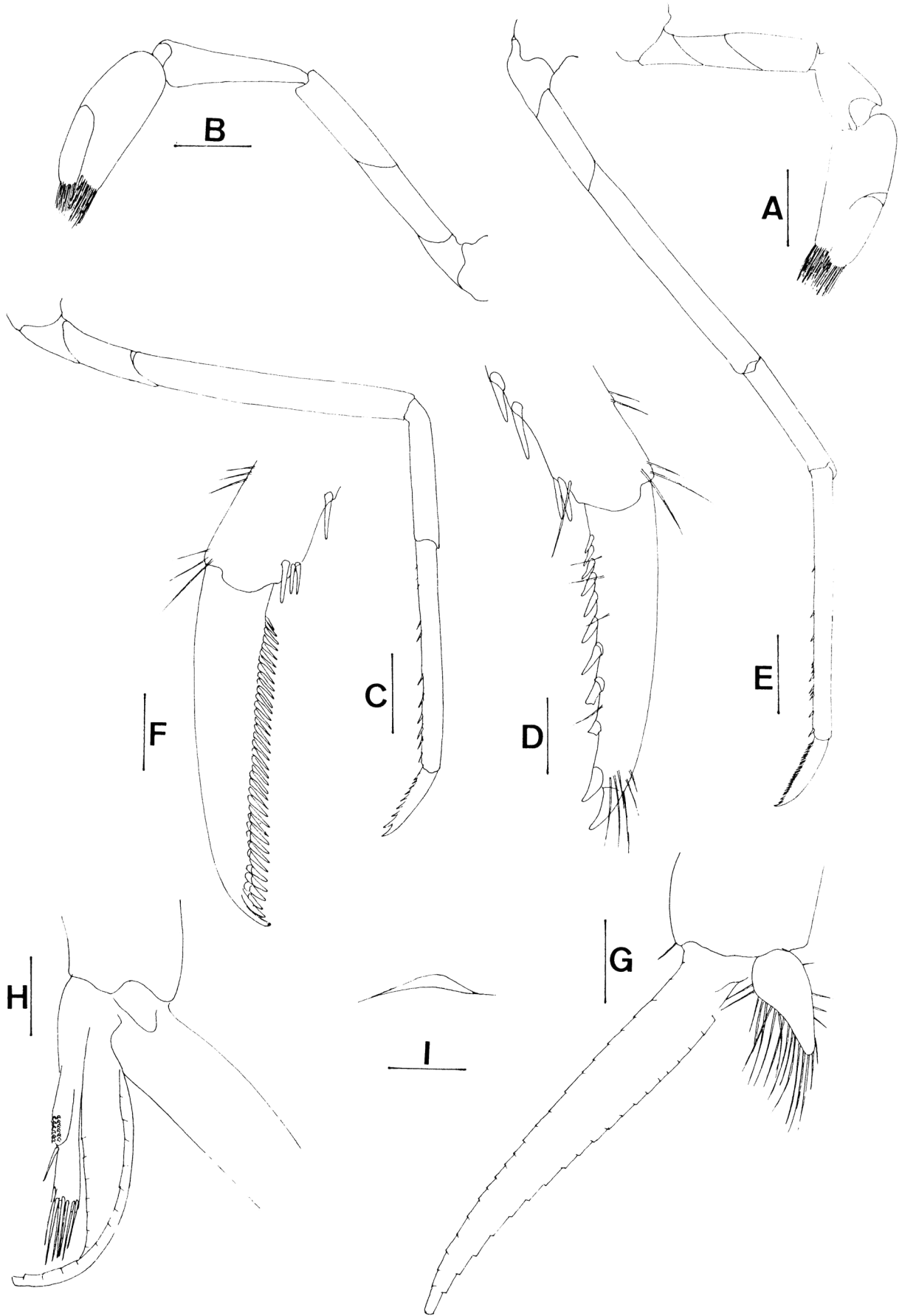


Fig. 9. *Caridina mindanao*, new species, male, cl 3.3 mm, Mindanao, Philippines: A, first pereopod; B, second pereopod; C, third pereopod; D, dactylus of third pereopod; E, fifth pereopod; F, dactylus of fifth pereopod; G, male first pleopod; H, appendix masculina and appendix interna of male second pleopod; I, preanal carina. Scale bars: A-C, E, I = 0.5 mm; D, F = 0.1 mm; G, H = 0.2 mm.

Appendix masculina of male second pleopod (Fig. 9H) half length of endopod.

Uropodal diaeresis (Fig. 8J) with 10 movable spinules.

Ovigerous females with egg sized 0.7-0.8x0.45-0.55 mm in diameter.

Habitat. – *Caridina mindanao*, new species, was collected from the Lake Mainit, Mindanao Island in southern Philippines.

Etymology. – The new species is named after the type locality – Lake Mainit, Mindanao Island in southern Philippines, and used as a noun in apposition.

Remarks. – Taking into consideration the form of the rostrum and endopod of the male first pleopod, *C. mindanao*, new species, is morphologically most similar to *C. gracilipes* De Man, 1892. It can easily be differentiated from *C. gracilipes* by its much longer sixth abdominal segment which is 2.2 times as long as the fifth (vs. 1.9 times in *C. gracilipes*), the rostral formula of 0-1+11-15+1/16-23 (vs. 2+13-20+1-2/13-18), and the larger egg size (0.7-0.8x0.45-0.55 mm vs. 0.42-0.53x0.23-0.33 mm).

Distribution. – Philippines.

FAMILY PALAEMONIDAE

Genus *Macrobrachium* Bate, 1868

Macrobrachium australe (Guérin-Méneville, 1838)

Palaemon australis Guérin-Méneville, 1838: 37 [type locality: Tahiti, French Polynesia].

Palaemon sundaicus Heller, 1862: 415, Pl. 2 Figs. 38, 39 [type locality: Java, Indonesia].

Palaemon dispar Von Martens 1868: 41 [type locality: Pulau Adonara, east of Flores, Indonesia].

Palaemon (Eupalaemon) dispar – De Man, 1902: 766.

Macrobrachium australe – Holthuis, 1950: 124, Figs. 27-30; Chace & Bruce, 1993: 23, Fig. 2; Cai & Ng, 2001: 683, Fig. 14a-d; Cai & Anker, 2004: 258.

Material examined. – 2 males, cl 3.0-3.1 mm, UR, Caboroan, Luzon Island, Philippines, 15 Jul.1985; 1 male, cl 26 mm, UR, Bauang River, Luzon Island, Philippines, 16 Jul.1985; 1 female, cl 10.5 mm, 1 ovig. female, cl 13.5 mm, UR, Iraan River, Philippines, 5 Aug.1985; 1 male, cl 30 mm, UR, Agan River, Mindoro Island, Philippines, 14 Aug.1985.

Remarks. – This is one of the most common and widely distributed species in the Indo-West Pacific.

Distribution. – Indo-West Pacific, from Madagascar to Polynesia.

Macrobrachium rosenbergii rosenbergii (De Man, 1879)

Palaemon Rosenbergii De Man, 1879: 167 [type locality: Andai, New Guinea (Irian Jaya), Indonesia].

Palaemon carcinus rosenbergii – Ortmann, 1891:701.

Palaemon (Eupalaemon) carcinus – De Man, 1902: 763.

Macrobrachium rosenbergii – Holthuis, 1950: 111 (part); Johnson, 1960: 260, fig. 1; Lindenfesler, 1984: 195; Chace & Bruce, 1993: 36, fig. 15.

Macrobrachium rosenbergii rosenbergii – Johnson, 1973: 277; Holthuis, 1995: 148; Cai & Ng, 2001: 674.

Material examined. – 1 cast, cl 32 mm, UR, Panitian River, upper stream, ca 30 km from river mouth, Palawan Island Philippines, 6 Aug.1985; 2 females, cl 15-20 mm, UR, Rosa, Luzon Island, Philippines, 15 Jul.1985.

Remarks. – Only one molted cast (cl 32 mm, rostrum length 40 mm, rostral formula 2+11/9), and two juveniles are available for the present study. Judged by the form of rostrum in the larger specimen, which only slightly beyond the end of scaphocerite and the rostral formula. It most probably belongs to the east subspecies, i.e. *Macrobrachium rosenbergii rosenbergii*. The identity, however, need to be confirmed on the basis of more material.

Distribution. – Philippines, Australia, New Guinea and Sulawesi.

Macrobrachium lar (Fabricius, 1798)

Palaemon Lar Weber, 1795: 94 [nomen nudum]

Palaemon Lar Fabricius, 1798: 402 [type locality: in India Dom. Daldorf; – Cowles, 1914: 380, Pl. 2 Fig. 7.

Palaemon (Eupalaemon) lar – De Man, 1902: 774.

Macrobrachium lar – Holthuis, 1950: 176, Fig. 37; Chace & Bruce, 1993: 30, Fig. 9; Yeo, Cai & Ng, 1999: 236; Cai & Ng, 2001: 683, Fig. 14e; Cai & Anker, 2004: 256.

Material examined. – 2 females, cl 7.5-14.5 mm, UR, River outside the University of Agriculture, Sapiland village, Luzon Island, Philippines, 15 Jul.1985; 3 males, cl 14-20 mm, 1 ovig. female, cl 19.5 mm, UR, Tag Bariri, Palawan Island, Philippines, 9 Aug.1985; 1 male, cl 27.0 mm, UR, Manuanga River, Cebu Island, Philippines, 29 Jul.1985; 4 males, cl 17-30 mm, 2 females, cl 23-30 mm, UR, Villafior River, Mindoro Island, Philippines, 15 Aug.1985; 1 male, cl 11.0 mm, UR, Sagay River, Cebu Island, Philippines, 27 Jul.1985.

Remarks. – *Macrobrachium lar* is a well known species, widely distributed throughout the Indo-West Pacific.

Distribution. – Indo-West Pacific. It has been introduced to Hawaii.

Macrobrachium esculentum (Thallwitz, 1891)

Palaemon esculentus Thallwitz, 1891: 98 [type locality: northern Celebes (Sulawesi), Indonesia].

Palaemon dulcis Thallwitz, 1891: 99 [type locality: northern Celebes (Sulawesi), Indonesia].

Macrobrachium esculentum – Holthuis, 1950: 257; 1980: 91; Domantay, 1956: 363; Chace & Bruce, 1993: 26; Shy & Yu, 1998: 23.

Material examined. – 6 males, cl 15-28 mm, UR, Bauang River, Luzon Island, Philippines, 16 Jul.1985.

Remarks. – *Macrobrachium esculentum* is characterized by the inflated palm, which have a velvety pubescence at the inner surface of the palm. It was firstly reported from Philippines by Domantay (1956), who listed it as one of the most important species commercially in Philippines. Chace & Bruce (1993: 26) doubted this record. The present specimens confirm the distribution of *M. esculentum* in Philippines. Shy & Yu (1998) reported it from Taiwan. Cai, Naiyanetr & Ng (2004) reviewed the Thai *Macrobrachium* and confirmed that there is no *M. esculentum* can be found from Thailand, the record of *M. esculentum* by Lumubol (1980) and Naiyanetr (1998) must be referred to a species of *M. pilimanus* group.

Distribution. – Sulawesi, Philippines, Taiwan.

Macrobrachium jaroense (Cowles, 1914)

Palaemon jaroensis Cowles, 1914: 385, Pl. 3 Fig. 8 [type locality: Hibucawan River near Jaro, Leyte].

Macrobrachium jaroense – Holthuis, 1950: 205; Hwang & Yu, 1982: 167; Chace & Bruce, 1993: 29, Fig. 7.

Macrobrachium cf. jaroensis – Shy & Yu, 1998: 33.

Material examined. – 1 male, cl 16.0 mm, UR, Upstream of tributary of Pugo River, Luzon Island, Philippines, 16 Jul.1985; 1 female, cl 11.5 mm, UR, Alag River, Mindoro Island, Philippines, 15 Aug.1985; 1 female, cl 15.0 mm, 2 ovig. females, cl 11-16.0 mm, UR, San Gabriel, Luzon Island, Philippines, 15 Jul.1985; 2 males, cl 13-15 mm, 3 females, cl 9.5-11.0 mm, 4 ovig. females, cl 10-11.5 mm, UR, Tag Bariri, Palawan Island, Philippines, 9 Aug.1985; 1 male, cl 21 mm, UR, Manuanga River, Cebu Island, Philippines, 29 Jul.1985; 1 male, cl 21.0 mm, UR, Villaflor River, Mindoro Island, Philippines, 15 Aug.1985; 3 males, cl 17.0-17.5 mm, UR, upper stream of Sagay River, Cebu Island, Philippines, 27 Jul.1985; 3 males, cl 13-16 mm, 2 females, cl 12-15 mm, UR, Papait River, Station 2 at Upper stream, Palawan Island, Philippines, 9 Aug.1985; 1 male, cl 17 mm, 3 females, cl 14.0-17.0 mm, UR, Bongabong River, Mindoro Island, Philippines, 14 Aug.1985; 1 male, cl 17 mm, UR, Naguilian River, Luzon Island, Philippines, 14 Jul.1985; 2 males, cl 11-14.5 mm, UR, Iraan River, Mindoro Island, Philippines, 5 Aug.1985; 1 male, cl 7.5 mm, UR, Upstream of tributary of Pugo River, Luzon Island, Philippine, 16 Jul.1985; 2 males, cl 13-13.5 mm, UR, Pitogo River, Panay Island, Philippines, 19 Aug.1985; 1 male, cl 16.5 mm, UR, Sagay River, Cebu Island, Philippines, 27 Jul.1985.

Remarks. – *Macrobrachium jaroensis* is characterized by the presence of the dense stiff setae at the cutting edges of the fingers, and the variable length of fingers, which are from shorter than palm to distinctly longer. It was originally described from Leytes, Philippines. Hwang & Yu (1982) reported it from Taiwan. Chace & Bruce (1993) recorded it from Cebu. The present study shows that it is quite common in the Philippines. Shy & Yu (1998) doubtfully referred some

Taiwanese specimens to *M. jeroensis*. The re-examination of the Taiwanese specimens by the first author confirmed this identity.

Distribution. – Philippines, Taiwan.

Macrobrachium placidulum (De Man, 1892)

Palaemon (Macrobrachium) placidulus De Man, 1892: 489, pl.28: fig. 48 [type localities: Celebes (Sulawesi), Pulau Selajar, Flores, and Timor].

Macrobrachium placidulum – Holthuis, 1950: 253, fig. 51c; Chace & Bruce, 1993: 35, fig. 14.

Macrobrachium placidum – Shokita, 1979: 275.

Macrobrachium horstii – Hwang & Yu, 1982: 164, fig. 5.

Macrobrachium cf. horstii – Shy & Yu, 1998: 30.

Material examined. – 1 male, cl 14 mm, UR, Manuanga River, Cebu Island, Phippines, 29 Jul.1985; 2 males, cl 12.8 -14 mm, 1 ovig. female, cl 12.5 mm, UR, Aninoan River, Mindoro Island, Philippines, 25 Aug.1985; 3 males, cl 11.5-13 mm, UR, Iraan River, Philippines, no date.

Remarks. – *Macrobrachium placidulum* is related to *M. lepidactyloides* and *M. placidum* by having a distinct gap between fingers of the minor second pereiopod, and the gap is filled with stiff setae. It, however, could be easily separated from the latter two species by the less inflated palm and the shorter fingers which are always distinctly shorter than the palm. Shokita (1979) recorded *Macrobrachium placidum* from Okinawa, Ryukyu Island. Re-examination of his specimens shows that it is *M. placidulum* instead. *M. placidum*, which has only been found from west Sumatra and Java, has a more inflated palm in the major male second pereiopod and the fingers are longer. Hwang & Yu (1982) and Shy & Yu (1998) assigned some Taiwanese specimens to *M. horstii*. According the figures that they provides and the re-examination of the reported material, there is a distinct gap filled with stiff setae between fingers of the male miner second pereiopod, a character does not fit the description of *M. horstii*. It is in fact, *M. placidulum* instead.

Distribution. – Philippines, Taiwan, Ryukyus.

Macrobrachium lepidactyloides (De Man, 1892)

Palaemon (Macrobrachium) lepidactyloides De Man, 1892: 497, pl. 29: fig. 51 [type locality: “Raka-mbaha, W. Flores”, Indonesia].

Palaemon lepidactylus – Cowles, 1914: 389, pl. 3: fig. 9 [not *Palaemon lepidactylus* Hilgendorf, 1879].

Macrobrachium hirtimanus – Holthuis, 1950: 245 (part), fig. 51a; Hwang & Yu, 1982: 163, fig. 5; Shy & Yu, 1998: 29.

Macrobrachium lepidactyloides - Holthuis, 1952: 210, pl. 15: fig 2; Chace & Bruce, 1993: 32; Cai & Anker, 2004: 259.

Material examined. – 1 male, cl 12 mm, 3 females, cl 12-12.5 mm, UR, Tag Bariri, Palawan, Island, Philippines, 9 Aug.1985; 4 males, cl 12.5-15 mm, 1 female, cl 15.0 mm, UR, Panitian River, upper stream, ca 30 km from river mouth, Palawan Island, Philippines, 6 Aug.1985; 1 male, cl 12 mm, UR, Sewaragan River, San Joaquin,

Panay Island, Philippines, 19 Aug.1985; 2 males, cl 13-17 mm, Panibacan River, Palawan Island, Philippines, 6 Aug.1985. 3 females, cl 10.0-15.0 mm, UR, Mabuhay River, Mindanao Island, Philippines, 25 Jul.1985; 6 males, cl 14-18 mm, 7 females, cl 11-13 mm, 18 ovig. females, cl 11.5-18 mm, UR, Iraan River, Philippines, 5 Aug.1985; 2 males, cl 22.5-26.0 mm, Agan River, Mindoro Island, Philippines, 14 Aug.1985.

Remarks. – Chace & Bruce (1993: 32) commented that “...two males from the Zamboanga River in which the major second cheliped is intact have the palm less broad than it is in typical specimens of the species, much as in *M. placidum*, suggesting the possibility that *M. lepidactyloides* and *M. placidum* may eventually prove to be indistinguishable.” Our specimens, however, are all having a much broad and more inflated palm than that of *M. placidum*. *M. lepidactyloides* has previously been reported from Luzon (Cowles, 1914) and Mindanao (Chace & Bruce, 1993), Philippines.

Distribution. – Indonesia, Philippines and Taiwan.

Macrobrachium nipponense (De Haan, 1849)

Palaemon nipponensis De Haan, 1849:171 [type locality: Japan].

Macrobrachium nipponense – Holthuis, 1950: 172; Liu, 1955: 56, Pl. 19 Fig. 2; Dang & Nguyen, 1972: 1; Kim, 1976: 141; Dang, 1980: 394, Fig. 225; Chong et al., 1987: 313, Fig. 1, c, d; Liu et al., 1990: 111, Fig. 9 (part); Shy & Yu, 1998: 41, Fig. 16; Cai & Dai, 1999: 220; Cai & Ng, 2002: 78.

Material examined. – 17 males, cl 9.5-19.0 mm, UR, Buhi Lake, Philippines, coll. Myapa, 19 Aug.1985; 6 males, cl 10.5-19.5 mm, 3 females, cl 12-16.0 mm, 4 ovig. females, cl 12-14.5 mm, UR, Binahugan River, Buhi, Camarines Sur, southern Luzon, Philippines, 19 Aug.1985.

Remarks. – *Macrobrachium nipponense* is commonly found in various kinds of inland water bodies in main islands of Japan, Korea, mainland China, Taiwan, Vietnam (Cai & Dai, 1999), Myanmar (Cai & Ng, 2002) and have been introduced to Singapore (Chong et al., 1987). The present specimens were found in the lake of Buhi, Camarines Sur of southern Luzon. The occurrence of *M. nipponense* in Philippines could be a result of introduction. *Macrobrachium nipponense* has not been recorded before although it is very different from other Philippine species in the form of rostrum, which is long and straight, reaching to or beyond the end of scaphocerite, the long and slender second pereopods, with a carpus as long as or slightly shorter than chela and the presence of dense setae on the cutting edges of fingers. This is a new record for the Philippines.

Distribution. – Japan, Korea, mainland China, Taiwan, Vietnam, Myanmar and has been introduced to Singapore and Philippines.

Macrobrachium equidens (Dana, 1852)

Palaemon equidens Dana, 1852: 26 [type locality: Singapore].

Palaemon sundaicus – Cowles, 1914: 355, Pl. 2 Fig. 3.

Macrobrachium equidens – Holthuis, 1950:162, Fig. 36; 1980: 90; Liu et al., 1990: 110, Fig. 8; Chace & Bruce, 1993: 25, Fig. 4; Yeo et al., 1999: 226; Cai, Naiyanetr & Ng, 2004: 389; Cai & Anker, 2004: 258.

Material examined. – 3 females, cl 18-23 mm, UR, Iloilo city market Panay Island, Philippines; 19 Aug. 1985; 1 female, cl 14.5 mm, 1 ovig. female, 16.0 mm, UR, Sewaragan River, San Joaquin, Panay Island, Philippines, 19 Aug.1985; 1 ovig. female, cl 14.0 mm, UR, Bororo River, Luzon Island, Philippines, 16 Jul.1985; 2 females, cl 6.2-7.9 mm, Villaflor River, Mindoro Island, Philippines, 15 Aug.1985; 1 male, cl 15 mm, 1 female, cl 10.0 mm, UR, brackish water in a cave near mangrove, Bahile River, Palawan Island, Philippines, 9 Aug.1985; 1 female, cl 12 mm, UR, San Francisco River, Surigao Del Nork, Mindanao Island, Philippines, 25 Jul.1985; 3 ovig. females, cl 7.5-8.4 mm, UR, Naguilian River, Luzon, Philippines, 14 Jul.1985.

Remarks. – *Macrobrachium equidens* is a brackish water species, with smaller specimens being commonly found in mangrove creeks. It is known from a very wide area in the Indo-West Pacific, from Madagascar to the Solomon Islands.

Distribution. – Indo-West Pacific.

Macrobrachium mammilodactylus (Thallwitz, 1892)

Palaemon idae var. *mammilodactylus* Thallwitz, 1892: 15 [type locality: Luzon, Philippines, or northern Celebes].

Palaemon (Eupalaemon) Wolterstorffi Nobili, 1900: 1 [type locality: Surabaya, eastern Java].

Palaemon philippinensis Cowles, 1914: 340, Pl. 2 Fig. 2 [type locality: San Juan and Pasig river, near Manila, Philippines].

Macrobrachium mammilodactylus - Holthuis, 1950: 148, Fig. 34; Liu, Liang & Yan, 1990: 109, Fig. 7; Shy & Yu, 1998: 40.

Material examined. – 3 males, cl 31-40 mm, 2 females, cl 14.5-16.5 mm, 5 ovig. females, cl 18-26 mm, NSMT, Philippines, coll. M. Takeda, 1985; 1 male, cl 19.5 mm, UR, Panibacan River, Palawan Island, Philippines, 6 Aug.1985.

Remarks. – *Macrobrachium mammilodactylus* is characterized by the long second pereopod and the presence of a series of 8-10 tubercles along inner side of the cutting edges. This character, however, only appears at large size male specimens. Cowles (1914) described a new species, *Palaemon philippinensis*. It was, however, been synonymized with *M. mammilodactylus* by Holthuis (1950).

Distribution. – Indonesia, Philippines, southern China and Taiwan.

Macrobrachium weberi (De Man, 1892)

Palaemon (Eupalaemon) weberi De Man, 1892: 421, Pl. 25 Fig. 33 [type locality: southwestern Celebes (Sulawesi), Indonesia]

Macrobrachium weberi – Holthuis, 1950: 122, Fig. 26; Johnson, 1973: 280.

Material examined. – 2 females, cl 17-19 mm, UR, Iloilo city market Panay Island, Philippines, 19 Aug.1985; 2 ovig., cl 12.5-17.5 mm, Philippines, coll. Takeda, 1985.

Remarks. – *Macrobrachium weberi* is characterized by the crested form of rostrum, the long carpus of the second pereopod, which is distinctly longer than the palm, and the fingers which are covered by dense pubescence. This is the first record for Philippines.

Distribution. – New Guinea, Sulawesi and Philippines.

***Macrobrachium lanceifrons* (Dana, 1852)**

Palaemon lanceifrons Dana, 1852: 26 [type locality: Manila, Luzon, Philippines]; Cowles, 1914: 364, Pl. 2 Fig. 4.

Palaemon lanceifrons var. *montalbanensis* Cowles, 1914: 371, Pl. 2 Fig 6 [type locality: Montalban, near Manila, Luzon, Philippines].

Macrobrachium lanceifrons var. *lanceifrons* – Holthuis, 1950: 154.

Macrobrachium lanceifrons var. *montalbanense* – Holthuis, 1950: 154.

Macrobrachium lanceifrons – Chace & Bruce, 1993: 29.

Material examined. – 1 male, cl 6.7 mm; 1 female, cl 7.7 mm; 1 female, cl 8.8 mm, UR, Binga Lake, Philippines, 13 May.1985; 27 males, cl 7.5-14 mm, 1 female, cl 9.3 mm, 1 ovig. female, cl 10.6 mm, egg 0.8x0.6 mm, UR, San Pablo city, Sampalok Lake, Philippines, 19 Aug.1985; 4 males, cl 10-17 mm, 10 females, cl 8.5-10.0 mm, 1 ovig. female, cl 13 mm, UR, Lake Mainit, Mindanao Island, Philippines, 24 Jul.1985; 4 males, cl 12-13.5 mm, 4 ovig. females, 7.5-9.0 mm, UR, Naujan Lake, Mindoro Island, Philippines, 14 Aug.1985; 2 male, cl 9.5-15 mm, 2 females, cl 9.5-11.5 mm, UR, Pagsanjan River, Philippines, 19 Jul.1985; 10 males, cl 13-16.0 mm, 2 ovig. females, cl 10.5-11.0 mm, UR, Naguilian River, Luzon, Philippines, 14 Jul.1985.

Remarks. – *Macrobrachium lanceifrons* has previously only been reported from Luzon. The present records from Mindoro and Mindanao extend its distribution range further south. This is the only endemic *Macrobrachium* species for Philippines.

Distribution. – Philippines.

***Macrobrachium scabriculum* (Heller, 1862)**

Palaemon scabriculum Heller, 1862: 527 [type locality: Sri Lanka] – Henderson & Matthai, 1910: 296, Pl. 17 Fig. 7a-c, Pl. 18 Fig. 7a-p.

Macrobrachium scabriculum (part) – Holthuis, 1950: 224; Chace & Bruce, 1993: 37; Johnson, 1973: 15; Yeo, Cai & Ng, 1999: 231, Figs. 18; 19.

Material examined. – 1 male, cl 12 mm, UR, San Francisco River, Surigao Del Nork, Mindanao Island, Philippines, 25 Jul.1985.

Remarks. – Yeo et al. (1999) and Cai & Ng (2002) recently reviewed the species group of *Macrobrachium scabriculum*, which share the common characters of velvety pubescence pattern on the major male second chelipeds, i.e. the velvety pubescence cover the proximal half of fingers and almost the whole surface of the palm. There are three species in the group, namely *M. scabriculum* (Heller, 1862), distributed from Sri Lanka, India, Peninsular Malaysia, Sumatra and north Borneo; *M. dolichodactylus* (Hilgendorf, 1879),

distributed in eastern Africa and *M. lanatum* Cai & Ng, 2002, from Myanmar and Peninsular Malaysia. The three species could be differentiated from each other by forms of rostrum, the proportion of the various joints of the second chelipeds, the teeth arrangement in the cutting edges of fingers. The single specimen of the present species from Mindanao, with the carpus shorter than palm, palm stout, and the teeth in the cutting edges of finger of major second cheliped are descended in size distally, clearly belongs to *M. scabriculum*. This is the first record for Philippines and also the eastern most record for the species.

Distribution. – Sri Lanka, Malay Peninsula, Philippines.

***Macrobrachium latidactylus* (Thallwitz, 1891)**

Palaemon latidactylus Thallwitz, 1891: 97 [type locality: Celebes (=Sulawesi), Indonesia]; Thallwitz, 1892: 17, Fig. 3.

Palaemon (Macrobrachium) latidactylus – De Man, 1902: 805.

Palaemon lampropus De Man, 1892: 493, Pl. 29 Fig. 49 [type locality: Celebes and Timor, Indonesia] – Kemp, 1918: 267; Suvatti, 1937: 49.

Macrobrachium latidactylus – Holthuis, 1950: 239, Fig. 50; 1980: 97; Costa, 1979: 57; Naiyanetr, 1980: 17; Yeo, Cai & Ng, 1999: 236; Cai & Ng, 2001: 683, Fig. 15; Cai, Naiyanetr & Ng, 2004: 584; Cai & Anker, 2004: 258.

Material examined. – 1 ovig. female, cl 8.2 mm, 1 female, cl 5.4 mm, UR, Binga Lake (below bridge), Philippines, 13 May.1985; 2 ovig. females, cl 11-12.5 mm, 4 females, cl 7-10.5 mm, UR, Malayas River, Victoria, Mindoro Island, Philippines, 14 Aug.1985; 1 ovig. female, cl 11.5 mm, UR, Daakrongsod River, Cebu Island, Philippines, 28 Jul.1985; 1 male, cl 17.0 mm, 1 female, cl 11 mm, 1 ovig. female, cl 11.0 mm, UR, Alag River, Mindoro Island, Philippines, 15 Aug.1985; 5 females, 3 ovig. females, cl 10.5-12.0 mm, UR, Sta. Rosa, Luzon, Philippines, 15 Jul.1985; 2 males, 13.5-15.0 mm, 4 females, 8.0-11.0 mm, 3 ovig. females, cl 13.5-14.0 mm, UR, Sewaragan River, San Joaquin, Panay Island, Philippines, 19 Aug.1985; 4 males, cl 14-16.0 mm, 10 ovig. females, cl 10.0-14.0 mm, UR, Sta. Rosa, Luzon Island, Philippines, 15 Jul.1987; 2 males, cl 13-13.5 mm, 2 ovig. males, cl 13-1 mm, UR, San Francisco River, Surigao Del Nork, Mindanao Island, Philippines, 25 Aug.1985; 2 females, cl 11-16 mm, UR, Santacruz River, Palawan Island, Philippines; 3 ovig. females, cl 13-17 mm, UR, Naguilian River, Luzon, Philippines, 14 Jul.1985.

Remarks. – *Macrobrachium latidactylus* is one of the most common species in Indo-West Pacific.

Distribution. – Indo-West Pacific, from Sri Lanka to Ryukyu Islands.

***Macrobrachium latimanus* (Von Martens, 1868)**

Palaemon latimanus Von Martens, 1868: 44 [type locality: Loquilocon, Samar, Philippines].

Palaemon singalangensis Nobili, 1900: 487 [type locality: A'ier Mantcior, presso il Monte Singalang, Sumatra, Indonesia].

Palaemon (Macrobrachium) latimanus – De Man, 1902: 780.

Macrobrachium latimanus – Holthuis, 1950: 205, Fig. 43; Costa, 1979: 39; Chace and Bruce, 1993: 31, Fig. 11; Short & Marquet, 1998: 406, Fig. 3; Cai & Ng, 2001: 683.

Material examined. – 1 male, cl 13.5 mm, UR, spring near Branch of National Museum, Suzoen, Palawan, Philippines, 5 Aug.1985.

Remarks. – *Macrobrachium latimanus* was originally described from Samar Island of Philippines (Von Martens,1868).

Distribution. – India, Sri Lanka, Indonesia, Taiwan, Ryukyu Islands and Marquesas.

Genus *Palaemon* Weber, 1795

Palaemon concinnus Dana, 1852

Palaemon concinnus Dana, 1852: 587 [type locality: Fiji Islands].
Palaemon concinnus – Holthuis, 1950: 61, Fig. 12; Chace & Bruce, 1993: 40; Cai & Ng, 2001: 686, Fig. 14f.

Material examined. – 5 males, cl 3.7-7.5 mm; 5 female, cl 2.7-5.8 mm; UR, Sungao River (downstream of Mabuhay River), Mindanao Island, Philippines, 25 Jul.1985; 5 females, cl 12-14 mm, UR, Iloilo city market, Panay Island, Philippines, 19 Aug.1985; 1 male, cl 7.5 mm, 5 females, cl 3.0-3.7 mm, UR, Sta. Rosa, Luzon, Philippines, 15 Jul.1985; 1 female, cl 3.3 mm, 2 juv., UR, Sewaragan River, San Joaquin, Panay Island, Philippines, 19 Aug.1985; 11 males, cl 4.2-4.7 mm, 2 ovig. females, cl 10.0-10.5 mm, UR, Bororo River, Luzon Island, Philippines, 16 Jul.1985.

Remarks. – The species is commonly found in brackish to freshwater in the lower reaches of rivers.

Distribution. – *Palaemon concinnus* has a wide distribution in the Indo-West Pacific, from South Africa, Indonesia, Philippines to Marshall Islands and Tuamotu Archipelago.

Palaemon semmelinkii (De Man, 1881)

Leander semmelinkii De Man, 1881: 137 [type locality: Makasar, Celebes (Sulawesi), Indonesia]

Palaemon (Palaeander) semmelinkii – Holthuis, 1950: 57, Fig. 11; Chace & Bruce, 1993: 41.

Material examined. – 1 female, cl 3.8 mm, UR, Pitogo River, Panay Island, Philippines, 19 Aug.1985.

Remarks. – *Palaemon semmelinkii* is a shallow marine and brackish water species, quite common in mangrove area. It is characterized by the rostrum, which has no sub-apical teeth, thus very easy to be differentiated from its congeners.

Distribution. – India, Southeast Asia to northern Australia.

FAMILY ALPHEIDAE

Genus *Potamalpheops* Powell, 1979

Potamalpheops miyai Yeo & Ng, 1997 (Figs. 7H-L)

Potamalpheops miyai Yeo & Ng, 1997: 175, Fig. 3, 4 [type locality: mangrove of Palau Bintan, Indonesia].

Material examined. – 1 male, cl 3.0 mm, UR, Surigao mangrove, Mindanao Island, Philippines, 25 Jul 1985.

Comparative material examined. – 1 male, cl 2.5 mm, ZRC1996.16, holotype of *Potamalpheops miyai* Yeo & Ng, 1979, Sungai Lagoi, bridge to Kampong Lagoi, Pulau Bintan, Indonesia, coll. H. H. Tan, 27 Jun.1995; 1 male, cl 2.5 mm, 8 females, cl 2.5-3.3 mm, ZRC 1996.42, paratypes, data same as holotype.

Remarks. – *Potamalpheops miyai* is characterized by the short rostrum, and the more concealed eyes. The Mindanao specimen fits well with the detail original description (Yeo & Ng, 1997) with the exception of the proportions of various joints in the carpus of second chelipeds. The ratio of the 5-segmented articles in average is about 10: 2.2: 2.2: 2.2: 4.9 from proximal segment to posterior one while it is 6.0: 2.3: 2.3: 2.3: 4.0 in the Mindanao specimen. This discrepancy could be reasonably regarded as variation in the individual or in the local population. This is the second record for the species, as well as a new record for Philippines. Cai & Anker (2004) recently described the first species of the genus, *P. palawanensis* to occur in Philippines.

Distribution. – Indonesia and Philippines.

ACKNOWLEDGEMENTS

The second author would like to thank the Monbusho International Scientific Research foundation of the Japanese Government for the financially support for expedition, and M. Takeda (NSMT) for the loan of specimens and for his assistant in the field collection. Thanks are also due to T. Naruse (UR), for his assistance, to Peter K. L. Ng (ZRC) for reviewing the manuscript.

LITERATURE CITED

- Bate, C. S., 1868. On a new genus, with four new species of freshwater prawns. *Proceedings of the Zoological Society of London*, 1868: 363-368, Pls. 30, 31.
- Blanco, G. J., 1935. The Atyidae of the Philippines islands. *Philippine Journal of Science*, **56**(1): 29-39, Pls. 1-3.
- Blanco, G. J., 1939a. Four new Philippine species of fresh-water shrimps of the genus *Caridina*. *Philippine Journal of Science*, **70**(4): 389-395, Pls. 1-3.
- Blanco, G. J., 1939b. Two new decapods from the Philippines. *Philippine Journal of Science*, **69**(2): 169-171, Pls. 1, 2.
- Bouvier, E. L., 1925. Recherches sur la morphologie, les variations, la distribution géographique des crevettes des la famille des Atyidés. *Encyclopédie Entomologique*, series A, **4**: 1-370, Figs. 1-761.
- Cai, Y., 2005. On a small collection of atyid shrimps from cave Laketa Zefera, western Madagascar, with description of a new species. *Proceedings of Biological Society of Washington*, **118**(2): 312-318.
- Cai, Y. & A. Anker, 2004. A freshwater shrimp collection from Philippines, with descriptions of five new species. *Tropical Zoology*, **17**: 233-266.

- Cai, Y. & A. Y. Dai, 1999. Freshwater shrimps (Crustacea: Decapoda: Caridea) from the Xishuangbanna region of Yunnan Province, southern China. *Hydrobiologia*, **400**: 211-241, Figs. 1-16.
- Cai, Y. & P. K. L. Ng, 2000. Freshwater shrimps of the genus *Caridina* H. Milne Edwards (Crustacea: Decapoda: Atyidae) from Myanmar. *Proceedings of the Biological Society of Washington*, **113**(4): 931-944, Figs. 1-7.
- Cai, Y. & P. K. L. Ng, 2001. Freshwater decapods of Halmahera, Indonesia. *Journal of Crustacean Biology*, **21**(3): 665-695.
- Cai, Y. & P. K. L. Ng, 2002. The freshwater palaemonid prawns (Crustacea: Decapoda: Caridea) of Myanmar. *Hydrobiologia*, **487**: 59-83.
- Cai, Y., P. Naiyantr & P. K. L. Ng, 2004. The Freshwater Prawns of the genus *Macrobrachium* Bate, 1868 (Crustacea: Decapoda: Palaemonidae) of Thailand. *Journal of Natural History*, **38**: 581-649, Figs. 1-23.
- Chace, F. A., Jr., 1983. The *Atya*-like shrimps of the Indo-Pacific Region (Decapoda: Atyidae). *Smithsonian Contributions to Zoology*, **384**: i-iii, 1-54.
- Chace, F. A., Jr., 1997. The Caridean shrimps (Crustacea: Decapoda) of the Albatross Philippine Expedition 1907-1910. Part 7: Families Atyidae, Eugonatonotidae, Rhynchocinetidae, Bathypalaemonellidae, Processidae, and Hippolytidae. *Smithsonian Contributions to Zoology*, **58**: 1-106, Figs. 1-29.
- Chace, F. A. Jr. & A. J. Bruce, 1993. The Caridean shrimps (Crustacea: Decapoda) of the Albatross Philippine expedition 1907-1910. Part 6: Superfamily Palaemonoidea. *Smithsonian Contributions to Zoology*, **543**: i-vii, 1-152, Figs. 1-23.
- Chong, S. S. C., H. W. Khoo & P. K. L. Ng, 1987. Presence of the Japanese Freshwater Prawn *Macrobrachium nipponense* (De Haan, 1849) (Decapoda: Caridea: Palaemonidae) in Singapore. *Zoologische Mededelingen*, Leiden, **61**(22): 313-317, Fig.1.
- Coutière, H., 1899. Sur quelques Macroures des eaux douces de Madagascar (Voyage de M. G. Grandidier). *Bulletin du Muséum national d'Histoire Naturelle*, Paris, **5**: 382-383.
- Cowles, R. P., 1914. Palaemons of the Philippine Islands. *Philippine Journal of Sciences*, (D), **9**(4): 319-403, Fig. 1, Pls. 1-3.
- Costa, H. H., 1979. The Palaemonidae of the inland water of Sri Lanka. *Ceylon Journal of Science* (Biological Sciences), new series, **13**(1-2): 39-64, 6 text figs., 2 pls.
- Dana, J. D., 1852. Crustacea, Part 1. In United States Exploring Expedition during the years 1838, 1839, 1840, 1841, 1842, under the Command of Charles Wilkes, U. S. N., **13**: 1-685. Atlas (1855): 1-27, Pls. 1-96. Philadelphia.
- Dang, H. T., 1980. *Dinh Loai Dong Vat Khong Xuong Song Nuoc Noot Bac Viet Nam*. Nha Xuat Ban Khoa Hoc Va Ky Thuat, Ha Noi. 464 pp. [The identities of Freshwater Invertebrates of North Vietnam]. (In Vietnamese).
- Dang, N. T. & H. Y. Nguyen, 1972. Dan lieu ve tom nuoc ngot giong *Macrobrachium* Bate (Palaemonidae) cac thuy vuc vung nui mien Bac Viet Nam. *Tap san Sinh Vat-Dia Hoc*, **10**(1-4): 1-6. [Information on freshwater prawn genus *Macrobrachium* Bate (Palaemonidae) from the mountainous regions of North Vietnam. *Journal of Biology-Geology*, **10**(1-4): 1-6] (In Vietnamese with French summary).
- De Haan, W., 1833-1850. Crustacea, in P. F. von Siebold (ed.), *Fauna Japonica sive Descriptio Animalium, quae in Itinere per Japoniam, Jussu et Auspiciis Superiorum, qui Summum in India Batava Imperium Tenent, Suscepto, Annis 1823-1830 Collegit, Notris, Observationibus et Adumbrationibus Illustravit*. Lugduni-Batavorum, Leiden. i-xxxii, ix-xvi, 1-243, Pls. A-J, 1-Q, 1-55, circ. tab. 2.
- De Man, J. G., 1879. On some species of the genus *Palaemon* Fabr. with descriptions of two new forms. *Notes from the Royal Zoological Museum of the Netherlands at Leyden*, **1**(41): 165-184.
- De Man, J. G., 1881. Carcinological studies in the Leyden Museum. No. 1. *Notes Leyden Museum*, **3**: 121-144.
- De Man, J. G., 1892. Decapoden des Indischen Archipels, in Max. Weber (ed.), *Zoologische Ergebnisse einer Reise in Niederländisch Ost-Indien*, **2**: 265-527, Pls. 15-29.
- De Man, J. G., 1902. Die von Herrn Professor Kükenthal in Indischen Archipel gesammelten Dekapoden und Stomatopoden. In W. Kükenthal, *Ergebnisse einer zoologischen Forschungsreise in den Molukken und Borneo. Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft*, **25**(3): 467-929, Pls. 18-20.
- De Man, J. G., 1908a. The fauna of brackish ponds at port Canning, Lower Bengal. Part 10: Decapod crustacea, with an account of a small collection from brackish water near Calcutta and in the Dacca District, Eastern Bengal. *Records of Indian Musuem*, **2**: 211-231, Figs. 1-7.
- De Man, J. G., 1908b. On the *Caridina nilotica* (Roux) and its varieties. *Records of Indian Museum*, **2**: 255-283, Pls. 1-20.
- De Silva, K. H. G. M., 1982. Studies on Atyidae (Decapoda, Caridea) of Sri Lanka I. on a new species, a new subspecies, and two species new to Sri Lanka. *Crustaceana*, **43**(2): 127-141, Figs 1-5.
- Domantay, J. S., 1956. Prawn fisheries of the Philippines. *Proceedings of the Indo-Pacific Fishery Committee*, **6**: 362-266.
- Edmondson, G. H., 1935. Atyidae of Southern Polynesia. *Bernice P. Bishop Museum Occasional Papers*, **11**(3): 1-19, Figs. 1-6.
- Fabricius, J. C., 1798. *Supplementum Entomologiae Systematicae*. Hafniae. Pp. 1-572.
- Fujino, T., 1972. Taxonomy of freshwater shrimps from Japan, with a key to all species. *Nature Study*, **18**(5): 5-10 (In Japanese).
- Guérin-Méneville, F. E., 1829-1838. Crustacés, Arachnides et Insectes. In L. J. Duperrey, *Voyage autour du monde, exécuté par ordre du Roi, sur la corvette de Sa Majesté, La Coquille, pendant les années 1822, 1823, 1924 et 1825*. Zoologie **2** (no. 2, sect. 1): 1-47 (Crustacés), 48-319 (Arachnides et Insectes); Pls. 1-5(Crustacés), 1-21(Insectes). Paris: Arthus Bertrand.
- Gurney, A. R., 1987. *Puteonator iraqiensis* gen. nov., sp. nov., a new genus in the family Atyidae (Decapoda, Caridea) from Southern Iraq. *Crustaceana*, **53**(2): 160-169, Figs. 1a-f, 2a-f, 3a-e, 4a-c.
- Heller, C., 1862. Neue Crustaceen gesammelt während der Weltumsegelung der k. k. Fregatte Novara: Zweiter vorläufiger Bericht. *Verhandlungen des Kaiserlich-Königlichen Zoologisch-botanischen Gesellschaft in Wien*, **12**: 519-528.
- Henderson, J. R. & G. Matthai, 1910. On certain species of *Palaemon* from South India. *Records of Indian Museum*, **4**(4): 277-305, Pls. 15-18.
- Hilgendorf, 1879. Die von Hm. W. Peters in Moçambique gesammelten Crustaceen. *Monatsberichte der Königlich Preussischen Akademie Wissenschaften zu Berlin*, 1878: 782-852, Pls. 1-4.
- Holthuis, L. B., 1950. Subfamily Palaemonidae. The Palaemonidae collected by the Siboga and Snellius Expeditions with remarks on other species. I. The Decapoda of the Siboga Expedition. Part X. *Siboga Expeditie*, **39**(a9): 1-268, Figs. 1-52.

- Holthuis, L. B., 1952. On some Indo-West Pacific Palaemonidae (Crustacea Decapoda Caridea). *Zoologische Mededelingen*, Leiden, **31**(18): 201-211, Fig. 1, Pls. 15.
- Holthuis, L. B., 1956. An enumeration of the Crustacea Decapoda Natantia inhabiting subterranean waters. *Vie et Milieu*, **7**: 43-76.
- Holthuis, L. B., 1965. The Atyidae of Madagascar. *Mémoires du Muséum national d'Histoire Naturelle*, series A (Zoologie), **33**(1): 1-48, Figs. 1-17.
- Holthuis, L. B., 1978. A collection of decapod crustacea from Sumba, Lesser Sunda Islands, Indonesia. *Zoologische Verhandelingen*, Leiden, **162**: 1-55, Figs. 1-14, Pls. 1.
- Holthuis, L. B., 1980. Shrimps and prawns of the world: an annotated catalogue of species of interest to fisheries. *FAO Fisheries Synopsis*, **125**(1), xvii + 271 pages. [Volume 1 of FAO Species Catalogue].
- Holthuis, L. B., 1986. A new genus and species of subterranean shrimp from Western Australia (Crustacea: Decapoda: Atyidae). *Zoologische Mededelingen*, Leiden, **60**(7): 103-111, Figs. 1-2.
- Holthuis, L. B., 1995. Notes on Indo-west Pacific Crustacea Decapoda III to IX. *Zoologische Mededelingen*, Leiden, **69**(1995): 139-151.
- Hung, M. S., T. Y. Chan & H. P. Yu, 1993. Atyid shrimps (Decapoda: Caridea) of Taiwan, with descriptions of three new species. *Journal of Crustacean Biology*, **13**(3): 481-503.
- Hwang, J. J. & H. P. Yu, 1982. Studies on the freshwater shrimps of the genus *Macrobrachium* (Crustacea, Decapoda, Palaemonidae) from Taiwan. *Quarterly Journal of the Taiwan Museum*, **25**(1982): 157-180. (In Chinese).
- Jalihal, D. R. & S. Shenoy, 1998. Taxonomic revision of some Indian prawn species of genus *Caridina* H. Milne Edward, 1837 (Atyidae). *Proceedings and abstracts of the fourth international crustacean congress*. Pp. 128-129.
- Jalihal, D. R., S. Shenoy & K. N. Sankolli, 1988. Freshwater prawns of the genus *Macrobrachium* Bate, 1868 (Crustacea, Decapoda, Palaemonidae) from Karnataka, India. *Records of the Zoological Survey of India*, Occasional Paper, **112**: 1-74, Figs. 1-16.
- Johnson, D. S., 1960. Sub-specific and infra-specific variation in some freshwater prawns of the Indo-Pacific region. *Proceedings of the bicentenary congress of biology*, Singapore, **1958**: 259-267, Figs. 1-5.
- Johnson, D. S., 1961. Notes on the freshwater Crustacea of Malaya I. The Atyidae. *Bulletin of Raffles Museum*, Singapore. **26**: 120-153, Figs. 1-42.
- Johnson, D. S., 1962. On a new species of *Macrobrachium* (Decapoda, Caridea). *Crustaceana*, **4**(4): 307-310, Fig. 1.
- Johnson, D. S., 1973. Notes on some species of the genus *Macrobrachium* (Crustacea: Decapoda: Caridea: Palaemonidae). *Journal of the Singapore National Academy of Sciences*, **3**(3): 273-291.
- Kamita, T., 1951. Notes on the freshwater shrimps from Iwami and Izumo districts of San-In Province, Japan. *Bulletin of Shimane University (Natural Science)*, **1**: 71-82, Figs. A-J. (In Japanese with English summary)
- Kamita, T., 1961. *Studies on the freshwater shrimps, prawns, and crawfishes of Japan*. Sonoyama Shoten. Pp. 1-186, Figs. 1-71. (In Japanese with English summary)
- Kemp, S., 1915. Crustacea Decapoda. Fauna of the Chilka Lake. *Memoirs of Indian Museum*, **5**: 199-325.
- Kemp, S., 1918. Decapod and Stomatopod Crustacea. In: Annandale, N., *Zoological Results of a Tour in the Far East. Memoirs of the Asiatic Society of Bengal*, **6**: 217-297.
- Kim, H. S., 1976. A checklist of *Macrura* (Crustacea, Decapoda) of Korea. *Proceedings of the College of Natural Science, Seoul National University*, **1**(1): 131-152.
- Kubo, I., 1938. On the Japanese atyid shrimps. *Journal of the Imperial Fisheries Institute*, Tokyo, **33**: 67-100, Figs. 1-24.
- Liang, X., 2004. *Fauna Sinica. Invertebrata Volume 36. Crustacea. Decapoda. Atyidae*. Science Press, Beijing, China. 375 pp, 156 figs. (In Chinese with English abstract).
- Liang X.-Q. & M.-Q. Zheng, 1988. Notes on *Caridina* from Fujian, China. *Acta Zootaxonomica Sinica*, **13**(1): 15-19, Figs. 1-9.
- Liang, X. & J. Zhou, 1993. Study on new atyid shrimps (Decapoda, Caridea) from Guangxi, China. *Acta Hydrobiologia Sinica*, **17**(3): 231-239, Figs. 1-4. (In Chinese with English abstract).
- Liang, X., Z. Guo & K. Tang, 1999. On new genus and species of atyid shrimps (Decapoda, Caridea) from Hunan, China. *Journal of Fisheries of China*, **23** (supplement): 69-73, Figs. 1-3. (In Chinese with English abstract).
- Liang, X. -Q. & S. -L. Yan, 1977. New species and subspecies of *Caridina* (Decapoda, Caridea) from Fukien, China. *Acta Hydrobiologia Sinica*, **6**(2): 219-225, Figs. 1-13. (In Chinese with English abstract).
- Lindenfelser, M. E., 1984. Morphometric and allozymic congruence: evolution in the prawn *Macrobrachium rosenbergii* (Decapoda: Palaemonidae). *Systematic Zoology*, **33**(2): 195-204, Figs. 1-4.
- Liu, J. Y., 1955. *Economic shrimps species from northern China*. Science Press, Beijing. Pp 1-73, Figs. 1-24. (In Chinese with English abstract)
- Liu, R., X. Liang & S. Yan, 1990. A study of the Palaemonidae (Crustacea Decapoda) from China I. *Macrobrachium*, *Leander* and *Leandrites*. *Transactions of the Chinese Crustacean Society*, **2**: 102-134, Figs. 1-24. (In Chinese with English abstract).
- Lumubol, P., 1980. Some freshwater Prawns from Thailand. *Thai Fisheries Gazette*, **33**(5): 498-508. (In Thai).
- Milne Edwards, H., 1837. *Histoire naturelle des Crustacés, comprenant l'anatomie, la physiologie et la classification de ces animaux*. Paris, **2**: 1-532, atlas, Pls. 1-14, 14 bis, 15-25, 25 bis, 26-42.
- Newport, G., 1847. Note on the genus *Atya* of Leach, with descriptions of four apparently new species, in the cabinets of the British Museum. *Annals and Magazine of Natural History*, **19**: 158-160, Pls. 8, Fig. 1.
- Naiyanetr, P., 1980. *Crustacean fauna of Thailand (Decapoda and Stomatopoda)*. Department of Biology, Faculty of Science, Chulalongkorn University, Bangkok, Thailand, 73 pp. (In Thai).
- Naiyanetr, P., 1998. *Checklist of Crustacean fauna in Thailand (Decapoda and Stomatopoda)*. OEPP Biodiversity series, **5**: 1-161.
- Ng, P. K. L. & S. Choy, 1990. Notes on some freshwater caridean prawns (Palaemonidae and Atyidae) from the Endau-Kompin area, Johore-Pahang, peninsular Malaysia. *Raffles Bulletin of Zoology*, **38**(1): 11-20.
- Nobili, G., 1900. Decapodi e Stomatopodi Indo-Malesi. *Annali del Museo Civico di Storia Naturale di Genova*, ser. 2, **20**(40): 473-523.
- Ortmann, A., 1891. Versuch einer Revision der Gattungen *Palaemon* sens. strict. und *Bithynis*. Die Decapoden-Krebse des Strassburger Museums, mit besonderer Berücksichtigung der

- von Herrn Dr. Döderlein bei Japan und bei den Liu-Kiu-Inseln gesammelten und z. Z. im Strassburger Museum aufbewahrten Formen. II. Theil. *Zoologische Jahrbücher Abteilung für Systematik, Geographie und Biologie der Thiere*, **5**: 693-750, Pls. 47.
- Powell, C. B., 1979. Three Alpheid shrimps of a new genus from West African fresh and brackish waters: taxonomy and ecological zonations (Crustacea Decapoda Natantia). *Revue de Zoologie Africaine*, **93**(1): 116-150.
- Roux, J., 1911. Nouvelles espèces de décapodes d' eau douce provenant de Papouasie. *Notes from the Leyden Museum*, **33**: 81-106, Figs. 1-5.
- Roux, J., 1928. Notes carcinologiques de l' Archipel indo-australien. *Treubia*, **10**(2-3): 197-216, Figs. 1-9.
- Schenkel, E., 1902. Beitrag zur Kenntnis der Dekapodenfauna von Celebes. *Verhandlungen der naturforschenden Gesellschaft in Basel*, **13**: 485-585, Pls. 7-13.
- Short, J. W. & G. Marquet, 1998. New records of freshwater Palaemonidae (Crustacea, Decapoda) from New Caledonia. *Zoosystema*, **20**(2): 401-410, Figs. 1C-E.
- Shokita, S., 1975. The distribution and speciation of the inland water shrimps and prawns from the Ryukyu Islands—I. *Bulletin of Science & Engineering Division, University of the Ryukyus, Mathematics & Natural Sciences*, **18**: 115-136, Figs. 1-6, Naha, Okinawa.
- Shokita, S., 2003. Atyidae. In: Nishida, M., N. Shikatani & S. Shokita, S. (eds.) *The flora and fauna of inland waters in the Ryukyu Islands*. Tokai University Press, Tokyo, Japan. Pp. 249-254. (in Japanese).
- Smith, M. J. & W. D. Williams, 1981. The occurrence of *Antecaridina lauensis* (Edmondson) (Crustacea, Decapoda, Atyidae) in the Solomon Islands. *Hydrobiologia*, **85**: 49-58.
- Shy, J. Y. & H. P. Yu, 1998. *Freshwater shrimps of Taiwan*. National Museum of Marine Biology and Aquarium. Pp. 1-103. (in Chinese).
- Sket, B., 1997. Hypogean aquatic fauna in Bohol Island, Philippines. Our Caves. *Bulletin of the Speleology Association of Slovenia*, **39**: 62-67.
- Suvatti, C., 1937. *A check-list of aquatic fauna in Siam (excluding fishes)*. Bureau of Fisheries, Bangkok. 116 pp.
- Thallwitz, J., 1891. Ueber einige neue indo-pacifische Crustaceen (vorläufige mittheilung). *Zoologischer Anzeiger*, **14**: 96-103.
- Thallwitz, J., 1892. Decapoden-Studien, insbesondere basirt auf A. B. Meyer's Sammlungen im Ostindischen Archipel, nebst einer Aufzählung der Decapoden und Stomatopoden des Dresdener Museums. *Abhandlungen und Berichte des Königlichen Zoologischen und Anthropologisch -Ethnographischen Museums zu Dresden*, 1890-91(3): 1-55, Pls. 1.
- Tiwari, K. T. & R. S. Pillai, 1971. Atyid shrimps of the genus *Caridina* H. Milne Edwards, 1837, from the Andaman Islands (Decapoda, Caridea). *Crustaceana*, **21**: 79-91.
- Ueno, M., 1935. Inland water fauna of Formosa. I. Crustacea Decapoda. *Transaction of Natural History Society, Formosa*, **25**: 270-276.
- Von Martens, E., 1868. Ueber einige ostasiatische Süßwasserthiere. *Archiv für Naturgeschichte*, **34**(1): 1-67, Pls. 1.
- Weber, F., 1795. *Nomenclator entomologicus secundum Entomologiam systematicam ill. Fabricii adjectis speciebus recens detectis et varietatibus*. Chilonii and Hamburgi. viii + 171 pp.
- Yeo, D. C. J. & P. K. L. Ng, 1997. The alpheid shrimp genus *Potamalpheops* Powell, 1979, (Crustacea: Decapoda: Caridea: Alpheidae) from Southeast Asia, with descriptions of three new species. *Journal of Natural History*, **31**(2): 163-190.
- Yeo, D. C. J., Y. Cai & P. K. L. Ng, 1999. The freshwater and terrestrial Decapod Crustacea of Pulau Tioman, Peninsular Malaysia. *Raffles Bulletin of Zoology*, Supplement **6**: 190-244, Figs. 1-20.
- Yu, S. C., 1936. Report on the Macrurous Crustacea collected during the "Hainan Biological Expedition" in 1934. *Chinese Journal of Zoology*, **2**: 85-99, Figs. 1-7.
- Yu, H. P., 1974. On the Atyidae shrimps (Crustacea, Decapoda, Atyidae) from Taiwan. *Aquaculture*, **2**: 49-58.