

# O H M U

OCCASIONAL PAPERS  
OF  
ZOOLOGICAL LABORATORY  
FACULTY OF AGRICULTURE  
KYUSHU UNIVERSITY  
FUKUOKA, JAPAN

LIBRARY  
Division of Crustacea

---

Vol. 3

February 29, 1972

No. 6

---

Five species of the genus *Macrobrachium* (Crustacea,  
Decapoda, Palaemonidae) from Taiwan\*

Hsiang-Ping YU and Sadayoshi MIYAKE

---

The freshwater shrimps belonging to the genus *Macrobrachium* in Taiwan are commonly found in mountain streams, ponds, irrigation ditches and rivers. These shrimps are occasionally sold in markets as delicious food.

The first study of *Macrobrachium* from Taiwan was given by Bate (1868), who described a new species, *M. formosense*. It has been, however, well known under the name *Palaemon longipes* de Haan. The second species was reported by Balss (1914) as *Palaemon nipponensis* de Haan. In addition to these species, *Palaemon japonicus* de Haan was recorded by Parisi (1919). In 1923 Maki and Tsuchiya collected a large amount of material from all over Taiwan and described four other species; *M. lar* (Fabricius), *M. equidens* (Dana), *M. asperulus* (von Martens) and *M. sundaicus* (Heller).

Having a chance to examine the Taiwan specimens of this genus, we revised the above-mentioned species on the authority of Holthuis (1950) as follows:

*Macrobrachium formosense* Bate

*Palaemon longipes* de Haan = *Macrobrachium formosense* Bate

*Macrobrachium nipponense* (de Haan)

---

\*) Contributions from the Zoological Laboratory, Faculty of Agriculture, Kyushu University, No. 417.

*Macrobrachium japonicum* (de Haan)  
*Macrobrachium lar* (Fabricius)  
*Macrobrachium eqidens* (Dana)  
*Macrobrachium asperulum* (von Martens)  
*Macrobrachium sundaicus* (Heller) = *Macrobrachium eqidens* (Dana)

The present paper contains the short notes on the ecology and morphology of all the species except for *M. eqidens* (Dana).

### *Macrobrachium lar* (Fabricius, 1798)

(Fig. 1)

- Palaemon vagus*: Heller, 1865, p. 113—Tahiti.  
*Palaemon spectabilis* Heller, 1865, p. 113, pl. 10 fig. 8—Tahiti.  
*Palaemon ornatus*: von Martens, 1868, p. 36—Philippines; Adonara I., E. Flores.  
*Palaemon ornatus*: Semper, 1868, p. 586—Philippines; Fiji; Australia.  
non *Palaemon ornatus*: Haswell, 1882, p. 196—Australia; Mauritius; New Hebrides.  
*Bithynis lar*: Bate, 1888, p. 789, pl. 129 fig. 1—Pasananca, Zamboanga and Mindanao, Philippines; Banda; Fiji; Tahiti.  
*Palaemon ruber*: Ortmann, 1891, p. 705, pl. 47 fig. 3—No new locality.  
*Palaemon lar*: Ortmann, 1891, p. 724—Mauritius.  
*Palaemon lar*: Borradaile, 1898, p. 1008—Tamavua River, Fiji.  
*Palaemon (Eupalaemon) lar*: de Man, 1904, p. 291, pl. 18 fig. 1—Tahiti.  
*Palaemon (Eupalaemon) lar* var.: de Man, 1905, p. 544, pl. 18—Christmas I.  
*Palaemon lar* var.: Calman, 1909, p. 706—Christmas I.  
*Palaemon lar*: Cowles, 1914, p. 380, pl. 2 fig. 7—Manila and Mindoro, Philippines.  
*Macrobrachium lar*: Maki & Tsuchiya, 1923, p. 56, pl. 5 fig. 1—Taiko (Tachia),<sup>1)</sup> Taichu (Taichung),<sup>2)</sup> Taito (Taitoung),<sup>3)</sup> and Kotosho (Botel Tobago; Hontoteu),<sup>4)</sup> Formosa (Taiwan).  
*Macrobrachium lar*: Ohshima, 1935, p. 973 fig. 55—Yaeyama Group, Ryukyu Is.  
*Palaemon lar*: Estempador, 1937, p. 488—Philippines.  
*Palaemon lar*: Miyake, 1938, p. 110—Marianas.  
*Palaemon lar*: Kubo, 1940, p. 23, textfig. 14, pl. 2 figs. a-c—Ryukyu Is.; Palau Is.  
*Palaemon lar*: Kubo, 1941, p. 312—Ryukyu Is.  
*Palaemon longimanus*: Ward, 1942, p. 58—Mauritius.  
*Macrobrachium lar*: Holthuis, 1950, p. 176, fig. 37—Sumatra; Flores; Moluccas; Timor; Ceram; New Guinea.  
*Macrobrachium lar*: Chang, 1965, p. 21, fig. 21—Taiwan.  
*Macrobrachium lar*: Kamita, 1966, p. 138, textfigs. 3, 4, pl. 2—Thailand.

*Material examined.* Pingtung,<sup>5)</sup> 1 ovig. ♀, Zoological Laboratory, Kyushu University (ZLKU) No. 11119, Aug. 28, 1965, H. P. Yu leg.

*Diagnosis.* Carapace smooth. Rostrum sometimes extends beyond tip of antennular peduncle but fails to reach end of scaphocerite, with

1) 大甲 2) 台中 3) 台東 4) 紅頭嶼 5) 屏東

7 to 9 teeth on upper margin and 2 or 3 on lower. Second pereiopod stout with numerous tiny spines or tubercles; fingers strongly curved inward, making a wide gap in male; each cutting edge with one sharp large tooth, behind which 2 or 3 teeth present.

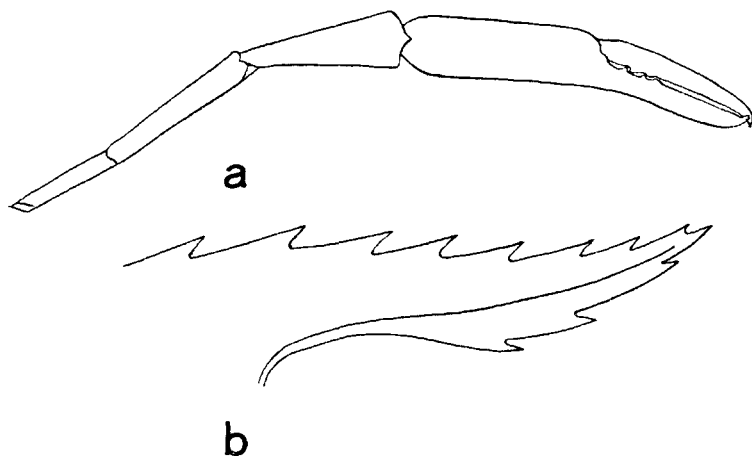


Fig. 1. *Macrobrachium lar* (Fabricius, 1798). a, Second pereiopod,  $\times 1.5$ ; b, rostrum,  $\times 3.3$ .

*Remarks.* This species is fairly large in body size among the freshwater shrimps. The morphological characters of the species have been discussed in details by many authors. The ovigerous female measuring 85 mm in body length excluding the rostrum was collected from an irrigation ditch near a paddy field. The body is semi-transparent in life. The eggs are  $0.73 \times 0.55$  mm in diameter. Chang (1965) mentioned that the species can be obtained from streams and ponds in Taiwan.

The species is widely distributed in the Indo-West Pacific region from E. Africa to S. E. Asia and Micronesia.

### *Macrobrachium japonicum* (de Haan, 1849)

(Fig. 2)

*Palaemon japonicus* de Haan, 1849, p. 172—Japan (Type locality)

*Palaemon boninensis* Stimpson, 1860, p. 110—Bonin I. (Type locality)

*Palaemon boninensis*: Ortmann, 1891, p. 706—No new locality.

*Palaemon japonicus*: Ortmann, 1891, p. 726—No new locality.

*Palaemon (Parapalaemon) japonicus*: Parisi, 1919, p. 83, pl. 6 figs. 3, 11—Kagi (Chiayi),<sup>1)</sup> Formosa.

*Macrobrachium japonicum*: Maki & Tsuchiya, 1923, p. 63, pl. 5 fig. 2—Tansui,

<sup>1)</sup> 嘉義

Taihoku (Taipei), Tamazato (Yuli),<sup>1)</sup> and Taito (Taitung), Formosa.

*Palaemon japonicus*: Kubo, 1940, p. 13, textfigs. 6, 7, pl. 2 fig. d—Henoki (Benoki), Nakijin, Genka-gawa, Kuzi-gawa, Idumi, Yofuke-gawa, Hentona, Sashiki-mura and Shimoji, Ryukyu Is.; Kagoshima, Japan.

*Palaemon boninensis*: Kubo, 1940, p. 15, fig. 8—Chichi-jima, Bonin I.

*Macrobrachium japonicum*: Holthuis, 1950, p. 200, fig. 41—No new locality.

*Macrobrachium japonicum*: Kamita, 1961, p. 113, figs. 47-51—Wakayama, Kochi, Miyazaki and Kagoshima, Japan.

*Macrobrachium japonicus*: Kamita, 1964, p. 20, figs. 18-20—Amami-oshima, Japan.

*Macrobrachium japonicus*: Chang, 1965, p. 21, fig. 21—Taiwan.

*Material examined.* Shungchi,<sup>2)</sup> Taipei Prefecture, 1 ♀, ZLKU No. 11120, Aug. 10, 1966, H. P. Yu leg.

*Diagnosis.* Carapace smooth. Rostrum somewhat shallow, slightly curved upward at tip, with 10 to 14 teeth on upper margin and 3 or 4 on lower. Second pereopod strong and covered with small scales sparsely; fingers short, occasionally making a gap; palm flattened and longer than preceding segment; carpus cylindrical.

*Remarks.* Though Kubo (1940) described that the second pereopods are covered with setae, the pereopods of the present specimen (57 mm in body length) are covered with sparse scales. These scales seem to be one of the most remarkable features of the species. The second pereopods of the specimen are slender and shorter than the body, and the fingers differ from those of the specimens previously recorded from Japan and the Ryukyu Islands, in lacking a wide gap between both the cutting edges (Fig. 2).

Chang (1965) mentioned that the species is abundant in streams and ponds all over Taiwan. Kamita (1961) reported that the species is restricted to the lower or middle reaches of shallow and rapid rivers in Japan.

In Taiwan this shrimp is called as "Ching-Tsui-Hei" (Ching-Tsui means clear water, and Hei is a shrimp).

Kubo (1940) described that *Palaemon boninensis* (Stimpson, 1860) collected from the Bonin Islands was closely related to the present species. In our laboratory there are four shrimps of the genus *Macrobrachium* collected from the Bonin Islands. These specimens are proved to be identical with *M. japonicum*. As already mentioned by Holthuis (1950), *P. boninensis* is a synonym of the present species.

The species has been reported from Kii Peninsula to the Ryukyu Islands, Korea, the Bonin Islands and Taiwan, but has never been recorded from China mainland.

<sup>1)</sup> 玉里 <sup>2)</sup> 双溪

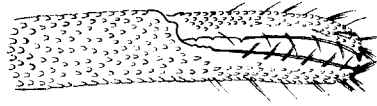


Fig. 2. *Macrobrachium japonicum* (de Haan, 1849), fingers of second pereopod,  $\times 3.5$ .

*Macrobrachium nipponense* (de Haan, 1849)

(Fig. 3)

- Palaemon nipponensis* de Haan, 1849, p. 171—Japan (Type locality)  
*Palaemon asper* Stimpson, 1860, p. 110—Canton, China.  
*Palaemon sinensis* Heller, 1865, p. 119, pl. 10, fig. 11—Shanghai, China (Type locality).  
*Palaemon asper*: Heller, 1865, p. 119—Shanghai, China.  
*Palaemon Sinensis*: von Martens, 1868, p. 42—Yokohama, Japan.  
*Palaemon nipponensis*: Ortmann, 1891, p. 713, pl. 47 fig. 4—No new locality.  
*Palaemon nipponensis*: Doflein, 1902, p. 640—Peping, Shashih,<sup>1)</sup> upper Yangtsechiang, China.  
*Bithynis nipponensis*: Rathbun, 1902, p. 53—Kii and Chikugo, Japan.  
*Palaemon nipponensis*: Balss, 1914, p. 59—Tokyo Bay, Sagami Bay and Okayama, Japan; Tamsui, Taiwan; Shanghai, China.  
*Palaemon nipponensis*: Kemp, 1918, p. 258—Kasumigaura, Japan.  
*Palaemon (Eupalaemon) nipponensis*: Parisi, 1919, p. 80, pl. 6 fig. 2—Yokohama, Japan.  
*Palaemon (Eupalaemon) superbus*: Parisi, 1919, p. 81, pl. 2—China.  
*Macrobrachium nipponensis*: Maki & Tsuchiya, 1923, p. 60, pl. 5 fig. 4—Shinso (Hsinchuang),<sup>2)</sup> Taihoku (Taipei) and Tainan, Formosa.  
*Palaemon nipponensis*: Yu, 1931, p. 271—Shanghai, Peichu,<sup>3)</sup> Chungming,<sup>4)</sup> Yangchou,<sup>5)</sup> Suchou,<sup>6)</sup> Chingchiang,<sup>7)</sup> Chiuchiang,<sup>8)</sup> Nanchang,<sup>9)</sup> Hankow,<sup>10)</sup> Shantow,<sup>11)</sup> Shihu,<sup>12)</sup> Amony,<sup>13)</sup> Tentsin, Ceinhuangtao,<sup>14)</sup> and Shanhaikuan,<sup>15)</sup> China.  
*Palaemon nipponensis*: Yu, 1936, p. 94—Hainan I., China.  
*Palaemon nipponensis*: Kubo, 1940, p. 6, textfigs. 1, 2, pl. 1 fig. f—Miya, Hananoko, Tsurumi-gawa, Ogura-ike and Yukuhashi, Japan.  
*Macrobrachium nipponense*: Holthuis, 1950, p. 172—Takao (Kaouhsiung), Formosa.  
*Macrobrachium nipponense*: Liu, 1955, p. 56, pl. 19 fig. 2—Shanhaikuan, Baiyang-tien,<sup>16)</sup> Wenanua,<sup>17)</sup> Shengfang-shibor,<sup>18)</sup> Hueisanhu,<sup>19)</sup> China.

*Material examined.* Hsinchu, 1 ♂, ZLKU No. 9159, Mar. 1, 1936, M. Nakayama leg.

*Diagnosis.* Carapace somewhat rough with fine granules. Rostrum nearly straight, more or less deep and extends beyond antennular

1) 沙市 2) 新莊 3) 白丘 4) 崇明 5) 揚州 6) 蘇州 7) 清江 8) 九江  
 9) 南昌 10) 漢口 11) 汕頭 12) 西湖 13) 廈門 14) 秦皇島 15) 山海關 16) 白洋淀  
 17) 文安窪 18) 勝芳西泊 19) 徽山湖

peduncle but fails to reach scaphocerite, with 10 to 14 teeth on upper margin and 2 to 5 on lower. Second pereiopod elongate and cylindrical; fingers wholly covered with dense hairs; carpus longer than palm.

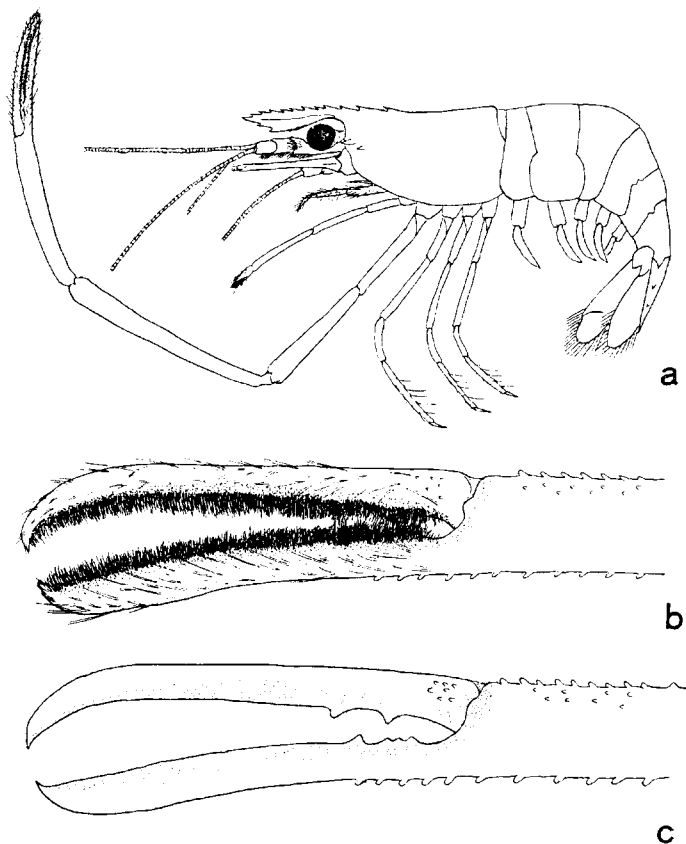


Fig. 3. *Macrobrachium nipponense* (de Haan, 1849). a, Lateral view,  $\times 1$ ; b, fingers of second pereiopod,  $\times 4$ ; c, the same, hairs removed,  $\times 4$ .

*Remarks.* The fingers of the second pereiopods covered with dense hairs are one of the characters of this species as observed in many specimens from Japan. In the present specimen from Taiwan, however, the fingers are fringed with dense hairs on both the cutting edges only.

In China, this shrimp is called "Ching-Shia" (blue shrimp) because of its dark-blue body color. According to Liu (1955), the species is abundant in North and South China along the coastal provinces, and possesses a very important economic value. In Taiwan the present species is rarer than the others.

This species has been reported from Japan, the Ryukyu Islands, China and Taiwan.

*Macrobrachium formosense* Bate 1868

- Palaemon longipes* de Haan, 1849, p. 171—Japan (Type locality).  
*Macrobrachium formosense* Bate, 1868, p. 364, pl. 31, fig. 1—Tamsuy River, Formosa (Type locality).  
*Palaemon formosensis*: Ortmann, 1891, p. 713—No new locality.  
*Palaemon longipes*: Ortmann, 1891, p. 715—No new locality.  
*Bithynis longipes*: Rathbun, 1902, p. 53—Kawatana and Hizen, Japan.  
*Palaemon longipes*: Balss, p. 59—Ito, Fukuura, Sagami Bay, Asaki (Asahi) River, Ogasawara Is., Japan; Tamsu (Tanshuei), Formosa.  
*Palaemon (Eupalaemon) longipes*: Parisi, 1919, p. 79, pl. 6 fig. 4—Nagasaki and Amami-oshima, Japan; Heneji, Ryukyu Is.  
*Palaemon (Parapalaemon) hainanense* Parisi, 1919, p. 87, pl. 3 fig. 1—Hainan I., China (Type locality).  
*Macrobrachium longipes*: Maki & Tsuchiya, 1923, p. 61, pl. 7 fig. 3—Taihoku (Taipei), Formosa.  
*Palaemon longipes*: Kubo, 1940, pl. 11, textfig. 5, pl. 1 fig. d—Kamakura, Japan; Miyako-jima, Ryukyu Is.  
*Macrobrachium formosense*: Holthuis, 1950, p. 156—Takao (Kauhsiung), Formosa.  
*Macrobrachium hainanense*: Holthuis, 1950, p. 158, fig. 35—Java.  
*Macrobrachium longipes*: Kamita, 1961, p. 105, figs. 42, 43—Shimane, Okinoshima, Nagasaki and Miyazaki, Japan.  
*Macrobrachium longipes*: Kamita, 1964, p. 16, fig. 15—Amami-oshima, Yaku-shima and Tanega-shima, Japan.  
*Macrobrachium longipes*: Chang, 1965, p. 26, fig. 24—Taiwan.

*Material examined.* Tachi,<sup>1)</sup> Tauyuan<sup>2)</sup> Prefecture, 6 ♂♂, ZLKU No. 9199, Aug. 5, 1966, H. P. Yu leg.

Shungchi, Taipei Prefecture, 4 ♂♂, ZLKU No. 9205, Aug. 10, 1966, H. P. Yu leg.

Toucheng,<sup>3)</sup> Ilan<sup>4)</sup> Prefecture, 4 ♂♂, ZLKU No. 9209, Aug. 10, 1966, H. P. Yu leg.

*Diagnosis.* Carapace rough with fine granules. Rostrum almost straight, extending slightly beyond tip of antennular peduncle but fails to reach tip of scaphocerite, with 11 to 15 teeth on upper margin and 2 to 4 on lower. Second pereopod enlongate and cylindrical; fingers without hairs; movable finger with two large teeth, immovable finger with one large and two small teeth; carpus longer than palm.

*Remarks.* This species is abundantly found in the markets of Taiwan and is used as one of the foodstuffs by people. Our speci-

1) 大溪 2) 桃園 3) 頭城 4) 宜蘭

mens measure from 65 to 91 mm in body length.

It was reported by Kamita (1961) that the species can be collected from estuaries and lower reaches of rivers in Japan. However, the materials in this study were collected from mountain streams, ponds and irrigation ditches. Furthermore, some specimens were obtained by Mr. M. Takeda of our laboratory from a paddy field at Amami-oshima in Japan. Therefore, the species seems to fit in various fresh waters.

The present species has been known under the name, *Palaemon longipes* de Haan, 1849. Holthuis (1950) suggested that the name *Macrobrachium formosense* Bate, 1868 should be used for the present species, because *Palaemon longipes* de Haan was invalidated by *Palaemon longipes* Olivier, 1811 which was a synonym of *Stenopus hispidus* (Olivier, 1811).

According to Holthuis (1950), *M. hainanense* (Parisi, 1919) occurred in Hainan Island, China is very closely related to the present species, and is considered to be a subspecies. Holthuis mentioned that the present species and *M. hainanense* are separated from each other in the number of rostral teeth. Furthermore, he described that the fingers of *M. formosense* are less than half of the palm, and in *M. hainanense* they are more than half the length of the palm, while in that publication (pp. 157, 160) he also reported that the fingers of the present species measure about 2/3 of the palm, and the palm of *M. hainanense* is about 1.5 times as long as the fingers. In our specimens the fingers of the second pereopod are more than half of its palm. By the reason of the above-mentioned factors we consider that *M. hainanense* may be identical with *M. formosense*.

### *Macrobrachium asperulum* (von Martens, 1868)

(Fig. 4)

*Palaemon asperulus* von Martens, 1868, p. 43, pl. 1 fig. 5—Shanghai, China (Type locality).

*Palaemon asperulus*: Ortmann, 1891, p. 708—No new locality.

*Palaemon* (*Parapalaemon*?) *asperulus*: de Man, 1904, p. 293, pl. 8 figs. 2-8—S. Hu-Peh, China.

*Palaemon asperulus*: Kemp, 1918, p. 259, fig. 8—Tai Hu, China.

*Macrobrachium asperulus*: Maki & Tsuchiya, 1923, p. 59, pl. 7 fig. 2—Sankyo (Shanhsia),<sup>1)</sup> Formosa.

*Palaemon asperulus*: Yu, 1931, p. 286, fig. 3—Ihsing,<sup>2)</sup> Suchou, Chiuchiang, and Chingchiang, China.

*Palaemon asperulus brevirostris* Yu, 1931, p. 287, fig. 4—Ichang<sup>3)</sup> and Changshih,<sup>4)</sup> China.

1) 三峡 2) 宜興 3) 宜昌 4) 長沙



*Palaemon asperulus*: Ping, 1932, p. 169—Lower Yangtsue River, China.

*Palaemon asperulus breviorstris*: Ping, 1932, p. 169—Lower Yangtsue River, China.

*Macrobrachium asperulum*: Holthuis, 1950, p. 193, fig. 39—Marsh near Tein Tsin, China.

*Macrobrachium asperulus*: Chang, 1965, p. 24, fig. 22—Taiwan.

*Material examined.* Tachi, Tauyuan Prefecture, 5 ♂♂, ZLKU No. 9137, Aug. 5, 1966, H. P. Yu leg.

Shungchi, Taipei Prefecture, 6 ♂♂, 3 ovig. ♀♀, 2 ♀♀, ZLKU No. 9126, Aug. 10, 1966, H. P. Yu leg.

*Diagnosis.* Carapace somewhat rough. Rostrum fails to reach tip of antennular peduncle and usually armed with 9 to 11 teeth on upper margin and 2 on lower. Second pereopod elongate; fingers with two small teeth on both proximal parts of cutting edges; carpus shorter than palm.

*Remarks.* The species is abundant in mountain streams of Taiwan. The specimens from mountain streams and small rivers in Shungchi measure from 41 to 56 mm in males and 38 to 45 mm in females. They are pale grey in color. Ping (1932) reported that the fairly large shrimps from the lower Yangtsue River in China, but did not give any dimensions.

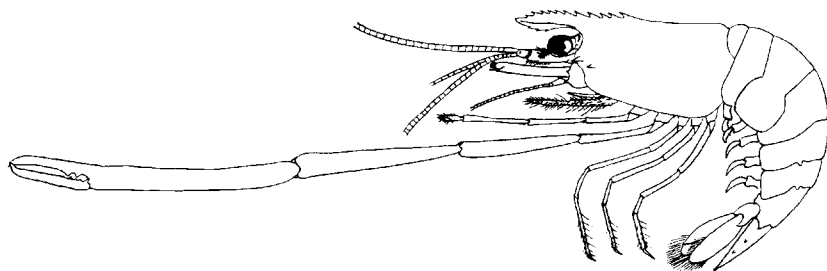


Fig. 4. *Macrobrachium asperulum* (von Martens, 1863),  $\times 1$ .

In our specimens the rostrum fails to reach the end of the scaphocerite, and the carpus of the second pereopod is shorter than the palm. These characters differ from Holthuis' (1950) description and figures (Fig. 39, a, e).

The species was reported from China mainland and Taiwan, and also from S. E. Siberia.

## References

- Balss, H., 1914. Ostasiatische Decapoden. II. Die Natantia und Reptantia. In: Doflein, F., Beiträge zur Naturgeschichte Ostasiens. Abh. Bayer. Akad. Wiss., suppl. vol. 2, pt. 10, pp. 1-101, figs. 1-50, pl. 1.
- Bate, S., 1868. On a new genus, with four new species, of freshwater prawns. Proc. zool. Soc. Lond., 1868, pp. 363-368, pls. 30, 31.
- , 1888. Report on the scientific result of the exploring voyage of H. M. S. Challenger during the years 1873-76. Rep. Voy. Challenger, Zool. vol. 24, pp. i-xc, 1-924, figs. 176, pls. 1-150.
- Borradaile, L. A., 1898. On some Crustacea from the South Pacific. Part III. Macrura. Proc. zool. Soc. Lond., 1898, pp. 1000-1015, pls. 63-65.
- Calman, W. T., 1909. On Decapoda Crustacea from Christmas Island, collected by Dr. C. W. Andrews, F. R. S. Proc. zool. Soc. Lond., 1900, pp. 703-715, pl. 72.
- Chang, C. M., 1965. Edible Crustacea of Taiwan. Chinese-American joint commission on Rural Reconstruction, Taipei, Taiwan, Republic of China, pp. i-vi, 1-60, figs. 1-50.
- Cowles, R. P., 1914. Palaemons of the Philippine Islands. Philipp. Jour. Sci.
- Dana, J. D., 1852. Crustacea. United States Exploring Expedition during the years 1838, 1839, 1840, 1841, 1842 under the command of Charles Wilkes, U. S. N. vol. 13, pp. 1-1620.
- Doflein, F., 1902. Ostasiatische Dekapoden. Abh. Bayer. Akad. Wiss., vol. 21, pp. 613-670, figs. a d, pls. 1-6.
- Estampador, E. P., 1937. A check list of Philippine Crustacea decapods. Philipp. Jour. Sci., vol. 62, pp. 465-559.
- Haan, W. de., 1833-1850. Crustacea. In: Siebold, P. F. de, Fauna Japonica sive descriptio animalium, quae in itinere per Japoniam, jussu et auspiciis superiorum, qui summum in India Batave Imperium tenent, suscepto, annis 1823-1830 collegit, notis observationibus et adumbrationibus illustravit, pp. ixvii, ixviii, 1-243, pls. 1-55, A-Q, 1, 2.
- Haswell, W. A., 1882. Catalogue of the Australian stalk- and sessile-eyed Crustacea, pp. i-xxiv, 132, pls. 1-4.
- Heller, C., 1865. Crustacea. Reise der Osterreichischen Fregatte Novara um die Erd in den Jahren 1857-58-59 unter den Befehlen des Commodors B. Von Wüllerstorff-Urbair. Zool., vol. 2, pt. 3, pp. 1-280, pls. 1-25.
- Holthuis, L. B., 1950. The Decapoda of the Siboga Expedition. Part X. The Palaemonidae collected by the Siboga and Snellius Expeditions with remarks on other species. I. Subfamily Palaemoninae. Siboga Exped., Monogr., 39 a<sup>2</sup>, pp. 1-268, figs. 1-52.
- Kamita, T., 1961. Studies in the freshwater shrimps, prawns and crawfishes of Japan. Sonoyama Book Store, Shimane, Japan, pp. i vi, 1-186, figs. 1-71 (in Japanese)
- , 1964. Freshwater shrimps and prawns of Amami-oshima, Yaku-shima and Tanega-shima (Further studies on the freshwater shrimps, prawns and crawfishes of Japan 1961, pt. 1), Bull. Shimane Univ., Nat. Sci., no. 13, pp. 1-27, figs. 1-21. (in Japanese)
- , 1966. Two species of the freshwater shrimps from Thailand. Bull. Shimane Univ., no. 16, pp. 135-144, figs. 1-4, pls. 1, 2.

- Kemp, S., 1918. Decapod and Stomatopod Crustacea. In: Annanadale, N., Zoological results of a tour in the Far East. Mem. Asiat. Soc. Bengal, vol. 6, pp. 217-297, figs. 1-12.
- Kubo, I., 1940. Studies on Japanese Palaemonid shrimps. I. *Palaemon*, Jour. Imp. Fish. Inst. Tokyo, vol. 34, no. 1, pp. 5-30, figs. 1-16, pls. 1, 2.
- , 1941. On some freshwater shrimps from the Ryukyu Islands. Trans. Biogeogr. Soc. Japan, vol. 3, pp. 303-318, figs. 1-7, pl. 20.
- Liu, J. Y., 1955. Economic shrimps and prawns of Northern China. Biological Institute Academy of Sciences, Peking pp. i-iii, 1-73, pls. 1-24 (in Chinese).
- Maki, M & H. Tsuchiya, 1923. Illustrated reports of the Crustacea decapod from Formosa. Rep. Dept. Agric. Formosa, vol. 3, pp. i-xi, 1-215, pls. 1-24 (in Japanese).
- Man, J. G. de, 1904. On some species of the genus *Palaemon*, Fabr., from Tahiti, Shanghai, New Guinea and West Africa. Trans. Linn. Soc. Lond., Zool., ser. 2, vol. 9, pp. 291-327, pls. 18-20.
- , 1905. On species of Crustacea of the genera *Ptychognathus* Stimpson and *Palaemon* Fabr. from Christmas Island. Proc. zool. Soc. London., 1905, pp. 537-550, pls. 17, 18.
- Miyake, S., 1938. Notes on decapod crustaceans collected by Prof. Teiso Esaki from Micronesia. Annot. zool. Japon., vol. 17, pp. 107-112, fig. 1.
- Ohshima, H., 1935. A glimpse on animals of the Yacyama group, Ryukyu (5). Bot. Zool. Tokyo, vol. 3, pt. 3, pp. 601-612. (in Japanese)
- Ortmann, A., 1891. Die Decapoden-Krebse Strassburger Museum, mit besonderer Berücksichtigung der von Herrn Dr. Döderlein bei Japan und bei den Liu-Kiu gesammelten und z. Z. im Strassburger Museum aufbewahrten Formen. II. Theil. Zool. Jb., Syst., vol. 5, pp. 693-750, pl. 47.
- Parisi, B., 1919. Natantia. I decapodi giapponesi del Museo di Milano. VII. Atti Soc. Ital. Sci. nat., vol. 58, pp. 59-99, pls. 3-6.
- Ping, C., 1923. A partial survey of the Fauna of the Lower Yanagtzé. Peking nat. Hist. Bull., vol. 7, pp. 167-174.
- Rathbun, M. J., 1902. Japanese stalk eyed crustaceans. Proc. U. S. Nat. Mus., vol. 26, pp. 23-55, figs. 1-24.
- Semper, C., 1868. Some remarks on the new genus *Macrobrachium* of Mr. Spence Bate. Proc. zool. Soc. Lond., 1868, pp. 585-587.
- Stimpson, W., 1860. Prodromus descriptionis animarium everttebratorum, quae in Expeditione ad Oceanum Pacificum getenstrionalem a Republica Federata messa, C. Ringgold et J. Rodgers Ducibus, Observavit et descripsit. Proc. Acak. Nat. Sci, Phil., 1860, part 8, Crustacea Macrura. pp. 91-116.
- Ward, M., 1942. Notes on the Crustacea of the Desjardins Museum, Mauritius Institute, with description of new genera and species. Mauritius Inst. Bull., vol. 2, pp. 49-109, pls. 5, 6.
- Yu, S. C., 1931. Note sur les crevettes chinoises appartenant au genre *Palaemon* Fabr. avec descriptio de nouvelles espèces. Bull. Soc. zool. France, vol. 56, pp. 269-288, figs. 1-4.
- , 1936. Report on the *Macrobrachium* Crustacea collected during the "Hainan Biological Expedition" in 1934. Chin. Jour. Zool., vol. 2, pp. 85-99, figs. 1-7.

