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A NEW SPECIES OF FRESHWATER PRAWN, *MACROBRACHIUM PLATYCHELES* (DECAPODA: CARIDEA: PALAEMONIDAE) FROM SINGAPORE AND PENINSULAR MALAYSIA

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ABSTRACT. - A new species of freshwater prawn, *Macrobrachium platycheles* (Decapoda: Caridea: Palaemonidae) is described from Singapore and Peninsular Malaysia. The species differs from its nearest congener, *M. pilimanus* (De Man, 1879), mainly by characters on the male chela of the second pereiopod.

INTRODUCTION

As part of a survey of freshwater fauna in the Central Catchment Area of Singapore, the authors collected specimens of a freshwater prawn closely resembling *Macrobrachium pilimanus* (De Man, 1879) from fast flowing streams leading from the Nee Soon swamp forest. Johnson (1961) had previously caught one from the same location and identified it as *M. pilimanus*. Holthuis (1950, 1979) regarded *M. pilimanus leptodactylus* (De Man, 1892) and *M. pilimanus malayanus* (Roux, 1934) as intraspecific variations and placed them under *M. pilimanus*. Johnson (1960, 1963) however, recognized that there were at least three species within the *M. pilimanus* complex , viz. *M. pilimanus* (De Man, 1879) [Sumatra, Peninsular Malaysia, Borneo, Java, Thailand], *M. leptodactylus* (De Man, 1892) [Sumatra, Java] and *M. malayanum* (Roux, 1934) [Sumatra, Peninsular Malaysia , Borneo]. *Macrobrachium malayanum* (Roux, 1934) has since been excluded from the complex (Chong & Khoo, 1987a, d). Recently, *M. forcipatum* Ng, 1995 [Peninsular Malaysia], *M. gua* Chong, 1989 [Borneo] and *M. ahkowi* Chong and Khoo, 1987 [Peninsular Malaysia] were also described from this complex.

On comparing with a good series of *M. pilimanus* s. str. from Kota Tinggi (ZRC 1994.4471), Pulau Tioman (ZRC 1985.2358-2388) and Gunung Pulai (ZRC 1985.2210-2212; 2230-2241) in Peninsular Malaysia, as well as specimens from Thailand, Sumatra and Borneo that agreed with the description and figures by de Man (1879), the present specimens from the Nee Soon forest showed some consistent differences, especially in the chelae of adult males. The authors

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have assigned it to a new species, here named *Macrobrachium platycheles*. The description of *M. platycheles* and comparison with *M. pilimanus* s. str. is provided here.

Dorsal and ventral margins of the chelae are referred to in relation to how the animal holds it while alive. The fixed finger is placed dorsal and the dactylus ventral. The abbreviations cl (carapace length), pl (propodus length), dl (dactylus length), ch (chela height), cw (chela width) are used. Carapace length is measured from the postorbital margin to the posterior margin. Propodus length is from the tip of the fixed finger to the base. Dactylus length is from the tip of movable finger to the base. Chela height is measured along the widest region as seen from the lateral view and chela width is the widest region as seen from the dorsal view. All measurements are in millimetres. Types are deposited in the Zoological Reference Collection (ZRC), Department of Zoology, National University of Singapore.

SYSTEMATICS

FAMILY PALAEMONIDAE RAFINESQUE, 1815

Macrobrachium platycheles, new species
(Figs. 1-3)

Macrobrachium pilimanus - Johnson 1961: 57, 1963: 11, Ng 1990: 196, Murphy et al 1994: 179, Ng et al 1994: 89 (not *Palaemon pilimanus* De Man, 1897).

Material examined. - Holotype - 1 male (ZRC 1994.4453), stream leading from Nee Soon swamp forest, 150 m upstream from pipeline, Singapore, coll. C.T.Ou, May.1994.

Paratypes - 1 male (ZRC 1994.4459), Nee Soon swamp forest, Singapore, coll. K.Yong, Mar.1990.- 1 male 2 females (ZRC 1994.4458), stream leading from Nee Soon, Singapore, coll. P.K.L.Ng, Aug.1993.- 1 female (ZRC 1994.4456), Nee Soon, Singapore, coll. P.K.L.Ng, Apr.1994.- 1 male (ZRC 1994.4454), Nee Soon swamp forest, Singapore, coll. A.Ramli, May.1994.- 1 female (ZRC 1994.4460), Lorong Banir, Singapore, coll. C.J.Yeo, Jun.1994.- 1 male (ZRC 1994.4457), outside driving range at Seletar, coll. P.K.L.Ng, Jul.1994.- 1 male 6 females (ZRC 1994.4461), Nee Soon swamp forest, Singapore, coll. C.T.Ou & C.J.Yeo, Aug.1994.

Others - 2 ex. (ZRC 1994.4462), Nee Soon swamp forest, Singapore, coll. K.Yong, Mar.1990.- 1 ex. (ZRC 1994.4463), Nee Soon swamp forest, Singapore, coll. A.Ramli, Jun.1994.- 2 ex. (ZRC 1994.4464), Lorong Banir, Singapore, coll. C.J.Yeo, Jun.1994.- 1 ex. (ZRC 1994.4465), Nee Soon swamp forest, Singapore, coll. M.Lee, Jun.1994.- 2 males (ZRC 1994.4466), Nee Soon swamp forest, Singapore, coll. P.K.L.Ng, Apr.1994. 3 ex. (ZRC 1994.4467), Nee Soon swamp forest, Singapore, coll. O.Chia & C.Chia, Jun.1994.- 5 males 7 females (ZRC 1994.4468), Lorong Banir, Singapore, coll. C.T.Ou & C.J.Yeo, Aug.1994.-20 ex. (ZRC 1994.4469), Nee Soon swamp forest, Singapore, coll. C.T.Ou & C.J.Yeo, Aug.1994.- 3 ex. (ZRC 1995.890), Nee Soon, stream leading to swamp forest, Singapore, coll. H.H.Tan & S.W.Tan, 28 Nov.1994.- 2 ex. (ZRC 1995.889), first bridge before entry up Gunong Pulai, Johore, coll. P.K.L.Ng et al, 15 Aug.1995.- 1 ex. (ZRC 1995.888), Gunong Pulai base, entry from Kulai, Johore, coll. P.K.L.Ng et al, 15 Aug.1995.- 1 female (ZRC 1995.887), Sungei Tementang, Kota Tinggi, Johore, coll. P.K.L.Ng et al, 5 Jun.1995.- 11 ex. (ZRC 1995.886), Fifty-four & a half km to Sungei Rengit, Kota Tinggi, Johore, coll. D.C.J.Yeo et al, Aug.1995.- 8 ex. (ZRC 1994.4470), Sungei Tementang, Kota Tinggi, Johore, coll. C.T.Ou & C.J.Yeo, Aug.1994.- 4 males 4 females. (ZRC 1985.2437-2444), Upper Vith English College, Sungei Semalok near Mawai, Johore, 3 Mar.1962.- 3 ex. (ZRC 1985.2445-2447), Sungei Semalok near Kota Tinggi, Johore, coll. D.S.Johnson, 19 Jul.1963.- 11 ex. (ZRC 1985.2448-2458). Sungei Semalok near Kota Tinggi, Johore, no data.- 4 ex. (ZRC 1985.2459-2462), Sungei Mupoh, Kota Tinggi, Mawai Road, Johore, no data.- 1 ex. (ZRC 1985.2463), Sungei Semalok near Kota Tinggi, Johore, no data.- 11 ex. (ZRC 1985.2464-2474), large stream, 9 3/4 mile, Mawai Road, Kota Tinggi, S. Johore, 18 Jul.1961.- 4 ex. (ZRC 1985.2475-2478), stream and adjoining open swamp, 18 1/2 mile, from Johore, on Kota Tinggi Road, coll. D.S.Johnson,

no date.- 4 ex. (ZRC 1985.2479-2482), Kota Tinggi Falls, Johore, coll. C.F.Lim, 19 Sep.1985.-6 ex. (ZRC 1985.2483-2488), Kota Tinggi Falls, Johore, coll. P.K.L.Ng et al, 27 Jan.1985.-8 ex. (ZRC 1985.2489-2496), Kota Tinggi Falls, Johore, leg, coll. P.K.L.Ng & S.S.C.Chong, 11 Jun.1985.- 7 ex. (ZRC 1985.2497-2503), stream 2-65 km before Jemaluang, from Kota Tinggi, Johore, coll. S.S.C.Chong & P.K.L.Ng, 11 Jun.1985.- 1 ex. (ZRC 1985.2504), stream 9 km after Jemaluang, towards Kluang, Johore, coll. P.K.L.Ng & S.S.C.Chong, 12 Jun.1985.- 7 ex. (ZRC 1985.2505-2511), Gunong Pulai, Johore, coll. M.W.F.Tweedie, Apr.1934.- 12 ex. (ZRC 1985.2512-2523), Gunong Ledang Reserve waterfall stream, Malacca, coll. S.S.C.Chong et al, 4 May.1985.- 4 ex. (ZRC 1985.2524-2527), Batu Satu, Taiping, coll. K.S.G., 24 Oct.1960.-1 ex. (ZRC 1985.2634), Nee Soon near Pump House, coll. D.S.Johnson, Nov.1956.

Diagnosis. - Rostrum short and straight, not extending beyond antennular peduncle; dorsal margin of rostrum with 10 to 13 teeth (mode 11); 4 to 6 dorsal teeth extends back into carapace; ventral usually with one to three (mode two). The holotype is slightly unusual in having three ventral teeth. Second pereiopods, subequal, robust; merus greatly inflated; chela laterally flattened; fingers short; dense tufts of velvety hair present on almost entire chela (see fig. 3); fingers with numerous teeth. Third pereiopod with simple dactylus bearing a pair of spines near the tip; propodus twice as long as dactylus, bearing a single row of 5 to 6 spines on posterior margin. Fifth pereiopod more slender than third pereiopod with slightly longer propodus and a simple dactylus. Movable spine on exopod of uropod weak, shorter than outer fixed tooth. Eggs large (1.5-2.0 mm), few; development highly abbreviated.

Colour. - Live specimens caught from the wild are mottled with brown to black patches over a translucent background. However, upon being kept in a clear plastic tank for some time, the mottled appearance is lost and the prawns become uniformly translucent.

Etymology. - The specific name "platycheles" is derived from the Greek word *platys* meaning broad and flat and *chele* alluding to the pincer.

Ecology. - The specimens of *M. platycheles* collected in Singapore were mainly from forest streams draining the Nee Soon Swamp Forest. These streams range from being well-shaded to open and have primarily a sandy substrate with leaf litter; the banks being densely vegetated. The depth of the streams varies (10-100 cm). The waters are fast-flowing, clear and slightly acidic (pH 5-6). The specimens were found under or within submerged logs, branches and leaf litter, mostly clinging on to the underside of the logs. In cases where the streams were open and the banks vegetated with tall grasses, the specimens were found deep within the submerged portions of the grasses. Isolated individuals which were collected from some slow-flowing swampy stretches (e.g. ZRC 1994.4465) are believed to have been washed down from their usual habitat. Some specimens (e.g. ZRC 1994.4467) were collected from an open, fast-flowing, shallow, clear-water stream that feeds the Nee Soon swamp forest. Specimens of *M. platycheles* collected from Johore, Malaysia were also from similar habitats to those in which the majority of the Singapore specimens were obtained.

Ovigerous female specimens were reared in captivity and some larvae were obtained. These are of the highly abbreviated type (see Chong & Khoo, 1987c).

Remarks. - *Macrobrachium platycheles* clearly belongs to the *Macrobrachium pilimanus* complex (sensu Holthuis, 1950; Johnson, 1960; Chong, 1989). *Macrobrachium platycheles* appears to be most closely related to *M. pilimanus* (De Man, 1879) s. str. *Macrobrachium platycheles* can be distinguished from *M. pilimanus* mainly by characters in the major second pereiopod of adults: i) a more inflated merus with distinctly convex margins (versus slightly inflated merus) (figs.2a-d); ii) a more convex propodus dorsal margin (versus distinctly

concave propodus dorsal margin) (figs. 2a-d); iii) a more compact and robust chela (ratio of ch to pl 0.29-0.40 versus 0.17-0.31; ratio of cw to pl 0.21-0.29, versus 0.15-0.20); iv) relatively shorter fingers (ratio of dl to pl 0.37-0.48 versus 0.51-0.59); and v) a more laterally compressed chela with highly convex dorsal and ventral margins (ratio of cw to ch 0.61-0.76 versus 0.79-0.95, chelae being more rounded in cross section).

It must be emphasised that these characters are only effective for distinguishing between mature adults with fully developed chelae. Juveniles of both species, having underdeveloped chelae, tend to be superficially similar. Furthermore, in many females and small adult males, the diagnostic features are less evident and therefore less reliable and there is a wide range of variation in these characters, resulting in overlapping morphometric ratios. However, for large males, these differences are very consistent for all specimens examined as these tend to have larger and better developed chelae, making the diagnostic characters more pronounced. Exceptions include adult males that fail to develop enlarged second major pereiopods in what Coutière (1901) referred to as "males feminses", and individuals with legs in the midst of regeneration.

It is also important to note that we have yet to collect the two species together in Malaysia and they therefore do not appear to be syntopic (pers. observ.). *Macrobrachium pilimanus* s. str. is not yet known from Singapore. Our observations are also supported by the extensive collections of the *Macrobrachium pilimanus* complex in the ZRC from Peninsular Malaysia.

In addition to the differences in the major second pereiopod, some other consistent differences are present. For example, *M. platycheles* has a stouter and more compact carapace and seems to be a smaller species than *M. pilimanus*. The largest specimen of *M. platycheles* examined from Malaysia was a male cl. 13.2 mm from Taiping, Perak (ZRC 1985.2524), the largest from Singapore was a male of cl 9.8 mm (ZRC 1994.4464). The largest male specimen of *M. pilimanus* examined was of cl. 15.5 mm (ZRC 1985.2210). Adult specimens of similar size were used for comparisons between the two species (table 1). Ovigerous females of *M. platycheles* are also usually smaller than those of *M. pilimanus* (table 1). The two species also differ in colouration. Live specimens of *M. platycheles* are a mottled greyish colour (Ng et al., 1994: 89) as compared to the more uniform translucent grey to green of *M. pilimanus* (Ng & Chong, 1986: 28-29; pers. obs.). However, colour is only useful for in situ recognition as *M. platycheles* tends to become uniformly translucent in the shaded aquaria.

The two species also seem to have different habitat preferences - *M. platycheles* appears to be found only in fast flowing waters with sandy substrate, often clinging on to logs and submerged bank vegetation. *Macrobrachium pilimanus* s. str. on the other hand, can be found in flowing to fast flowing streams with sandy and rocky substrates with leaf litter along the banks, but without dense vegetation.

Within the complex, *M. platycheles* can easily be differentiated from the remaining members of the *Macrobrachium pilimanus* complex (see table 2 for a summary of some of the major differences). *Macrobrachium platycheles* can be differentiated from *Macrobrachium gua* Chong, 1989, in that its major second pereiopod has a greatly inflated merus with strongly convex margins (versus slim merus with relatively straight margins). *Macrobrachium gua* also has a longer rostrum which exceeds the anteriormost segment of the antennular peduncle while that of *M. platycheles* never exceeds that point.

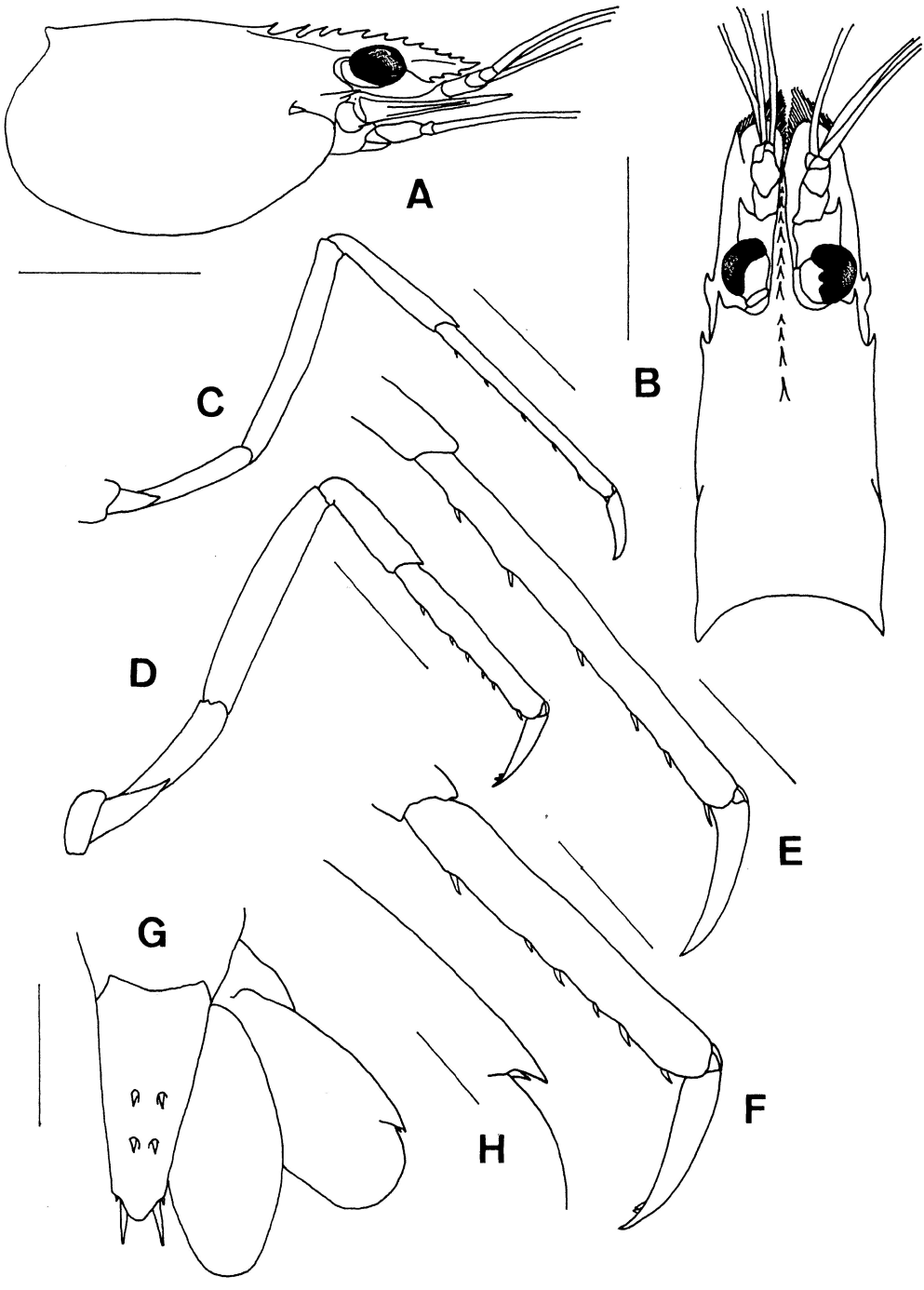

Fig. 1. *Macrobrachium platycheles*, new species. a, b, d, f, g, h, Holotype male, cl 9.25 mm, (ZRC 1994.4453). c, e, Paratype male, cl 7.45 mm, (ZRC 1994.4454). a: lateral view of carapace; b: dorsal view of carapace; c: lateral view of left fifth pereiopod; d: lateral view of left third pereiopod; e: lateral view of propodus and dactylus of left fifth pereiopod; f: lateral view of propodus and dactylus of left third pereiopod; g: dorsal view of uropod and telson; h: dorsal view of movable spine of uropod. Hairs not drawn in. Scales = 5.0 mm in a and b; 2.0 mm in c, d, and g; 1.0 mm in e and f; 0.5 mm in h.

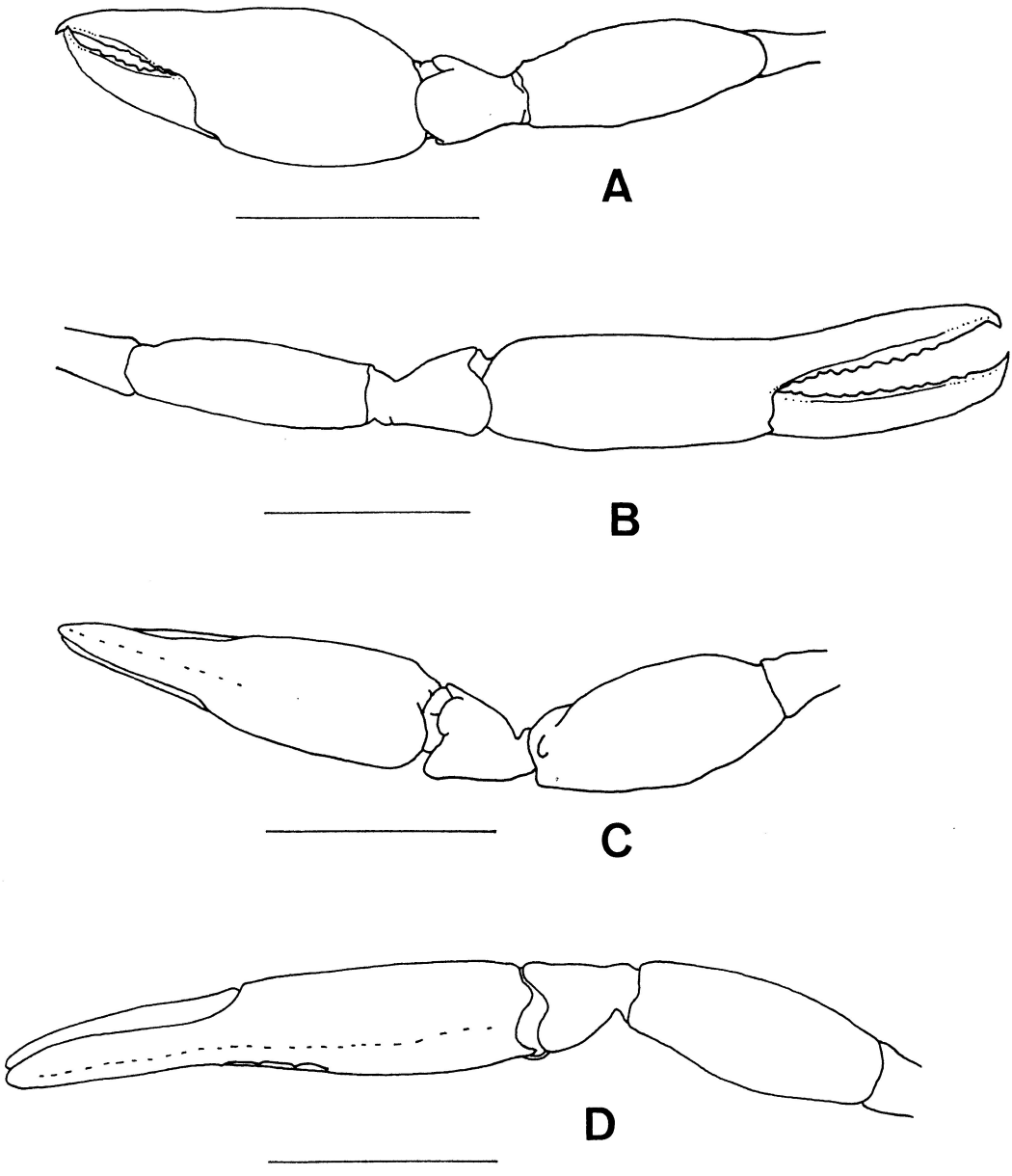

Fig. 2. a, c, *Macrobrachium platycheles*, new species. Holotype male, cl 9.25 mm, (ZRC 1994.4453). b, d, *Macrobrachium pilimanus* (De Man, 1879) s. str. Male, cl 11.4 mm, (ZRC 1985.2389). a, b: lateral views of major second pereiopod; c, d: dorsal views of major second pereiopod. Hairs not drawn in. Scale = 5.0 mm.

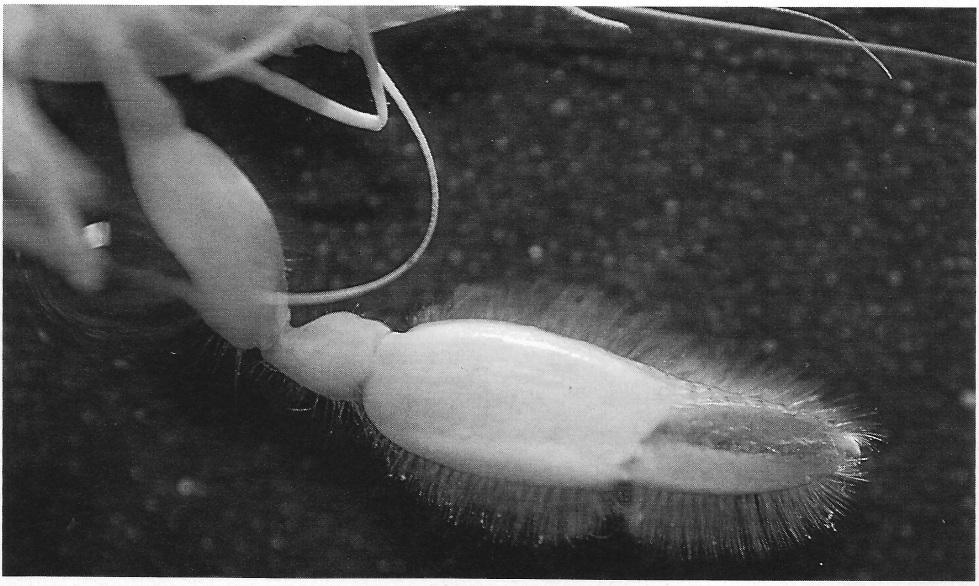

Fig. 3. *Macrobrachium platycheles*, new species. Chela of major second pereiopod, showing pubescence. Non-type male, cl 10.2 mm (ZRC 1995.886).

Macrobrachium platycheles can be distinguished from *Macrobrachium ahkowi* Chong & Khoo, 1987, by the rostrum of the former never exceeding beyond the antennular peduncle while that of the latter does.

Macrobrachium platycheles can be distinguished from *M. leptodactylus* (De Man, 1892) by having a much more robust chela on the major second pereiopod. *Macrobrachium leptodactylus* also has a relatively more elongated carpus as well as merus. The above comparison is based on descriptions and figures of *M. leptodactylus* by De Man (1892). In the ZRC is a large series of specimens of *Macrobrachium pilimanus* collected from Bogor, Java, also the type locality of *M. leptodactylus*. These specimens all agree with the description and figures of what was identified as "*M. pilimanus*" by De Man (1892) from this locality. Examination of these specimens leads us to believe that *M. leptodactylus* may simply be a variant of the Javan "*M. pilimanus*" (sensu De Man, 1892). Javan specimens of "*M. pilimanus*" show consistent differences from the specimens from other localities and might well belong to a separate species. However, this will not be discussed here further as it is not within the scope of the present paper.

Macrobrachium platycheles can be separated from *M. forcipatum* by having a much more compact chela with short fingers (versus elongated chela with fingers longer than palm). The lateral parts of the carapace of *M. platycheles* are also slightly inflated, having slightly convex margins while the carapace of *M. forcipatum* is not inflated.

Distribution. - Nee Soon, Singapore. Kota Tinggi and Gunung Pulai, Johore. Taiping, Perak. In Singapore, *Macrobrachium platycheles* is only restricted to one drainage from the Nee Soon swamp forest.

Table 1. Morphometric characters of *Macrobrachium platycheles,* new species, and similar sized specimens of *Macrobrachium pilimanus* (De Man, 1879) s. str. All measurements in mm.

Specimen	cl	pl	dl	dl/pl	ch	ch/pl	cw	cw/pl	cw/ch
M. platycheles									
Holotype									
ZRC 1994.4453	9.25	8.35	3.90	0.47	3.30	0.40	2.40	0.29	0.73
Paratypes									
ZRC 1994.4458	8.40	8.30	3.60	0.43	3.35	0.40	2.20	0.27	0.66
ZRC 1994.4454	7.45	8.75	3.55	0.41	3.30	0.38	2.20	0.25	0.67
ZRC 1994.4461	8.55	8.50	3.35	0.39	3.00	0.35	2.15	0.25	0.72
ZRC 1994.4461	8.85	7.50	3.05	0.41	2.50	0.33	1.90	0.25	0.76
Non-types									
ZRC 1985.2497	11.50	12.80	6.00	0.47	5.10	0.40	3.40	0.27	0.67
ZRC 1985.2498	11.00	12.00	5.50	0.46	4.45	0.37	2.80	0.23	0.63
ZRC 1985.2500	11.25	14.35	6.60	0.46	5.35	0.37	3.35	0.23	0.63
ZRC 1994.4470	9.75	10.80	4.45	0.41	4.10	0.38	2.50	0.23	0.61
ZRC 1985.2479	12.70	11.70	5.35	0.46	3.90	0.33	2.75	0.24	0.71
M. pilimanus									
ZRC 1994.4471	9.90	8.80	5.20	0.59	2.00	0.23	1.70	0.19	0.85
ZRC 1985.2389	11.40	12.00	6.20	0.52	2.70	0.23	2.20	0.18	0.81
ZRC 1985.2392	9.45	9.20	4.80	0.52	1.90	0.21	1.80	0.20	0.95
ZRC 1985.2245	12.80	11.85	6.35	0.54	2.05	0.17	1.80	0.15	0.88

Table 2. Differences between *Macrobrachium platycheles,* new species, and other members of the *Macrobrachium pilimanus* complex.

Character	*M. platycheles*	*M. gua*	*M. leptodactylus* *	*M. ahkowi*	*M. forcipatum*
Rostrum	Does not extend beyond antennular peduncle	Extends beyond antennular peduncle	Does not extend beyond antennular peduncle	Extends beyond antennular peduncle	Just reaches or extends slightly beyond antennular peduncle
Rostral formula	4-6) 10-13/1-3	3-4) 9-13/2-3	7) 7/2	4-6) 12-17/2-4	4) 6-7/1-2
Chela of major second pereiopod	Laterally compressed, compact and robust; fingers are short	Elongated, less compact and robust; relatively longer fingers	Elongated, less compact and robust; relatively longer fingers	Slightly elongated less compact and robust; relatively longer fingers	Elongated, less compact and robust; relatively much longer fingers (longer than palm)
Merus of major second pereiopod	Compact and greatly inflated	Relatively straight edges	Relatively more elongated and less convex margins	Slightly inflated	Slightly inflated in distal half only
Lateral part of carapace	Slightly inflated	Slightly inflated	Slightly inflated	Slightly inflated	Not inflated

* Data after description and figures by De Man (1892).

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