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PRESENCE OF THE JAPANESE FRESHWATER PRAWN *MACROBRACHIUM NIPPONENSE* (DE HAAN, 1849) (DECAPODA: CARIDEA: PALAEMONIDAE) IN SINGAPORE

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Chong, Samuel S.C., H.W. Khoo and Peter K.L. Ng: Presence of the Japanese freshwater Prawn *Macrobrachium nipponense* (De Haan, 1849) (Decapoda: Caridea: Palaemonidae) in Singapore.

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Key words: Decapoda; Palaemonidae; *Macrobrachium*; *nipponense*; *sintangense*; introduction.

Characters of adults and larvae are given to differentiate between *Macrobrachium nipponense* and *M. sintangense*. The presence of the former in Singapore is stated and explained as an introduction from Japan or China, possibly with ornamental fishes.

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The dominant genus of freshwater prawns in Peninsular Malaysia is *Macrobrachium* Bate, 1868, and 10 species have been recorded from Singapore (Johnson, 1961, 1963, 1973; Tay, 1968; Chong, 1985). Of these, two species were recorded from still or slow-moving waters, *M. lanchesteri* (De Man, 1911) (*sensu* Chong & Khoo, in press) and *M. sintangense* (De Man, 1898). *Macrobrachium sintangense* has been recorded from Sintang in north-western Kalimantan, Borneo (type locality), Belawan Deli in Sumatra, various localities in Java, Peninsular Thailand, Peninsular Malaysia, and Singapore (Holtuis, 1950; Johnson, 1963, 1973; Naiyanetr, 1980).

Recent collections by the authors in Singapore have consistently obtained a relatively large *Macrobrachium* species that initially seemed to be referable to *M. sintangense*. Further studies show however that it was *M. nipponense* (De Haan, 1849) instead, a northern species which was first described from Japan and has also been recorded from China and Taiwan (formerly Formosa) (Holthuis, 1950; Hwang & Yu, 1971). *Macrobrachium nipponense* bears an extremely close resemblance to *M. sintangense* and the two species can only be effectively separated by the form of their adult male cheliped fingers. In *M. sintangense*, the fingers are covered with a thick carpet of velvety fur on the proximal half or third (fig. 1a, b). Also, a row of tubercles is present on both sides of the cutting edge of the dactylus (tubercles on medial side more prominent) and on the medial side of the fixed finger. In contrast, the fingers of *M. nipponense* lack these but are instead uniformly covered with numerous tufts of stiff hair (fig. 1c, d).

The authors have examined the material which had been identified and labelled by the late Prof. D.S. Johnson as "*M. sintangense*" from Singapore, all of which were juveniles or females. Since the separation of *M. sintangense* and *M. nipponense* is based almost entirely on the form of the fingers of the cheliped of large adult males, Johnson's record of *M. sintangense* is thus questionable. The authors have yet to encounter Singaporean specimens clearly referable to *M. sintangense*. It must be noted, however, that Johnson had also obtained and identified specimens, including large males, from Malacca, Peninsular Malaysia as *M. sintangense*, a reexamination of which confirmed his identification. The absence of large males from Singapore, consideration of the then known distribution of the two species and the extreme similarity of immatures probably misled Johnson to identify his Singaporean specimens as *M. sintangense*.

With regard to larval characters, the first zoea of *M. nipponense* (cf. Kwon & Uno, 1969) differs significantly from that of *M. sintangense* (cf. Sabar, 1979; Chong, 1985) in having a segmented antennal scale (scaphocerite), a long terminal plumose seta on the antennal flagellum, five setae on the scaphognathite of the second maxilla, no epipod on the first maxilliped, only two pairs (first and second) of non-chelate pereopods, no pleopods, and seven pairs of setae on the telson. In contrast, the first zoea of *M. sintangense* has its scaphocerite unsegmented, its antennal flagellum ending in a short spine, 10-12 setae on its scaphognathite, an epipod on its first maxilliped, all five pairs of pereopods (the first two chelate), five pairs of biramous pleopod buds, and eight pairs of setae on the telson. The larvae from the Singaporean *M. nipponense* (Chong, unpublished data) are identical with those from Japan, further supporting the conspecificity of the Singapore and Japanese specimens.

The presence of *M. nipponense* in Singapore is certainly no natural phenomenon, considering the known range of the species and its having been recorded only in recent years (as *M. sintangense*) (Tay, 1968; Johnson, 1973). There are no records of *M. sintangense*, *M. nipponense*, or any other related

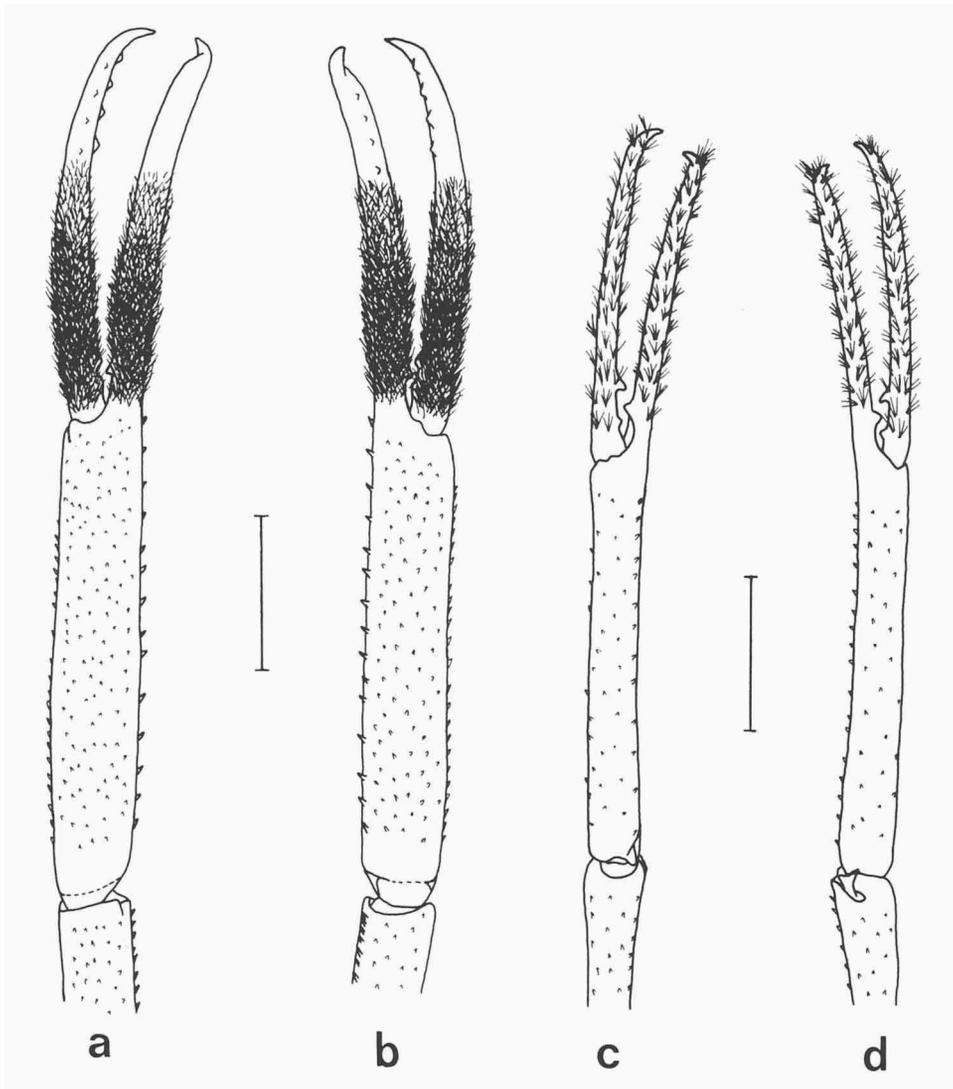


Fig. 1a, b, *Macrobrachium sintangense* (De Man, 1898) adult male (ZRC no. 1985.3858, bl 44.5 mm; tributary of Kesang River, near Kampong Bahru Gubah, Malacca, Peninsular Malaysia), chela of left second pereiopod: a, in lateral view; b, in medial view; c, d, *Macrobrachium nipponense* (De Haan, 1849) adult male (ZRC no. 1986.312, bl 43 mm; Singapore); chela of right second pereiopod: c, in medial view; d, in lateral view. Scales represent 0.5 cm.

species from Singapore in all earlier collections prior to Tay's and Johnson's. More likely, Singapore being a centre of tropical fish import and export, *M. nipponense* may have, accidentally or otherwise, arrived in Singapore together with imported ornamental goldfishes and carps from Japan and China. Some of these prawns may then have been introduced into fish ponds in the more rural areas of Singapore, where they flourished and spread. Local fish ponds usually use nearby streams both for filling up and discharge of waste waters, and *M. nipponense* could thus have easily entered the local freshwater drainage.

M. nipponense and another species, *M. lanchesteri*, are regularly harvested as a "by product" from the fish ponds, which are used to cultivate more valuable aquarium fishes. They are sold in aquarium shops as substitutes for the wild-caught guppies, *Poecilia reticulata* Peters, 1859, which are used as food for popular predatory aquarium fish like the bony tongue, *Scleropages formosus* (Müller & Schlegel, 1844) and the Oscar, *Astronotus ocellatus* (Cuvier, 1829).

Macrobrachium nipponense seems to have spread, through human action, to other areas where it is not native. Holthuis (pers. comm.) records the species from the Philippines and from heated ponds in Moscow, while Kulesh (1982) reports it from reservoirs in Berezovsk, USSR. Holthuis & Hassan (1975) record a similar case of introduction in which *Palaemon elegans* Rathke, 1837, an East Atlantic species, became established in Lake Abu-Dibic, a large saltwater lake in Iraq.

The introduction of species into new areas poses some ecological questions and potential consequences. Being sympatric with smaller, less heavily built species like *M. lanchesteri*, there is a likelihood that it will replace such species in local freshwater systems. There are already signs of this occurring in the Sungei Seletar drainage in north eastern Singapore where the dominant species now appears to be *M. nipponense*. The habitats of both species at the present moment however do not completely overlap. *Macrobrachium lanchesteri* is found more abundantly in still bodies of water, like ponds, whereas *M. nipponense* is more common in slow-moving streams.

The authors are indebted to Prof. L.B. Holthuis for first alerting them to the presence of this species in Singapore, and for his kindness in answering their unceasing enquiries. Specimens examined during the course of this study are deposited in the Zoological Reference Collection National University of Singapore, and the Rijksmuseum van Natuurlijke Historie, Leiden. Specimens were examined with the aid of an Olympus SZH zoom stereomicroscope at magnifications ranging from $\times 7.5$ to $\times 64$, and drawings accomplished with an Olympus SZH-DA drawing attachment. Body length (b1) was measu-

red from the post-orbital margin to the tip of the telson using vernier calipers (to the nearest 0.5 mm).

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