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**PARATHELPHUSA RETICULATA SPEC. NOV., A NEW SPECIES OF
FRESHWATER CRAB FROM BLACKWATER SWAMPS IN SINGAPORE
(CRUSTACEA: DECAPODA: BRACHYURA: GECARCINUCOIDEA)**

by

PETER K.L. NG

Ng, P.K.L.: *Parathelphusa reticulata* spec. nov., a new species of freshwater crab from blackwater swamps in Singapore (Crustacea: Decapoda: Brachyura: Gecarcinucoidea).

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Key Words: Decapoda; Crustacea; Brachyura; Gecarcinucoidea; freshwater crab; *Parathelphusa*; blackwater swamps; Singapore.

A new species of gecarcinucid crab, *Parathelphusa reticulata* spec. nov. is described from blackwater swamps in Singapore. *Parathelphusa reticulata* is characterized by its relatively small adult size, diagnostic colour pattern, swollen carapace physiognomy, anterolateral armature, male abdominal structure and sharply tapering male first pleopod. This species appears to be closely allied to the poorly known *P. maindroni* from Sumatra.

Peter K.L. Ng, Department of Zoology, National University of Singapore, Kent Ridge, Singapore 0511, Republic of Singapore.

INTRODUCTION

Parathelphusa is a genus of common lowland crabs in Peninsular Malaysia, Sumatra, Java, Borneo, Sulawesi and adjacent islands, and 21 species and subspecies are recognised at present (Ng, 1988: 96). Only one species, the highly adaptable *Parathelphusa maculata* De Man, 1879, has been reported from Singapore, where it is known to occupy many diverse habitats (Ng, 1987: 41, 1988: 98).

Ng (1988: 97) reported some unusual specimens of *P. maculata* from blackwater swamp forests in Singapore, but dismissed differences in their coloration and carapace physiognomy as variation. Extensive collections in recent months have yielded more specimens, including large males. Studies of these show that the differences noticed earlier are constant, and that they correlate

with differences in colour pattern. These blackwater swamp specimens are here recognised as a distinct species, *P. reticulata* spec. nov.

In this paper, *P. reticulata* spec. nov. is diagnosed and detailed figures are provided. Its affiliations and differences with closely allied species are discussed. The abbreviations G1 and G2 are used for the male first and second pleopods, respectively. Specimens are deposited in the Rijksmuseum van Natuurlijke Historie, Leiden (RMNH); National Museum of Natural History, Smithsonian Institution, Washington D.C. (USNM); Muséum Nationale d'Histoire Naturelle, Paris (MNHN); Naturhistorisches Museum Basel (MBA); and the Zoological Reference Collection, Department of Zoology, National University of Singapore (ZRC).

DESCRIPTIVE PART

***Parathelphusa reticulata* spec. nov.**
(figs. 1-3, 4B, 5A, 6B, 7G-L, 8F-J)

Parathelphusa maculata; Ng, 1988: 97 (part), Pl. 3D

Material. — Holotype, ♂ (RMNH), carapace 32.5 by 26.5 mm, in shallow, well shaded, slowly flowing stream, thickly strewn with leaf litter, muddy substrate, Nee Soon swamp forest, Singapore, 1°23'28"N, 103°48'42"E, 17.xii.1988, leg. P.K.L. Ng; Paratypes, all from the type locality and leg. P.K.L. Ng: 1 ♀, 17.xii.1988 (RMNH); 1 ♂, carapace 35.8 by 26.5 mm, 2 ♀♀, 17.xii.1988 (ZRC); 1 ♂, carapace 19.4 by 15.5 mm, vi.1988 (ZRC); 1 juvenile ♂, 1 ♀, 19.viii.1988 (ZRC); 1 ♀, 29.xi.1988 (leg. P.K.L. Ng & H.P. Ng) (ZRC); 1 ♂, xi.1988 (ZRC); 5 ♂♂, 6 ♀♀, 31.xii.1988 (ZRC), 1 ♂, idem (USNM), 1 ♂, idem (MNHN), 1 ♂, idem (MBA).

Diagnosis. — Carapace transverse, smooth; gastric and branchial regions distinctly swollen, surfaces appearing evenly convex. Live coloration reticulate brown and orange for adults, distinctly spotted in juveniles; fingers of larger male chela bright orange, those on smaller male chela and female chelae, especially the dactylus, often pigmented black. External orbital angle broadly triangular, almost truncate; outer margin almost straight or convex. Epibranchial teeth directed forwards. Anterolateral regions with few striae. Suture between male second and third sternal segments straight in adult males; distinct marginal notch present between third and fourth segments. Carpal and meral spines of chelipeds often reduced in larger specimens; fingers of larger male chela strongly curved, with distinct gape between them when closed. Ambulatory legs with distinct subterminal spines on meri of first three pairs, meri of last pair usually without subterminal spines. Lower margin of fourth male abdominal segment slightly concave in adults; seventh segment subequal to half length of sixth. G1 stout, straight, directed upwards, outer margin of

proximal part of subterminal segment straight, not distinctly cleft at proximal part of outer margin, tip sharp, opening very small. G2 with long flagellum, almost as long as basal segment.

Distribution. — Singapore.

Remarks. — Ng (1988: 97) recorded some unusual specimens of *P. maculata* from the Nee Soon swamp forest in Singapore, collected from very soft mud with almost still or very slow moving acidic blackwater in a very well shaded habitat. He noted that these specimens have distinctively more convex carapaces than the typical *P. maculata* from other parts of Singapore. Their carapace and appendages also have a distinctive reticulate colour pattern, being quite brightly coloured with more orange flecks. Since he only had available very few, mostly young specimens, he regarded these more convex specimens as being aberrant, possibly as a result of the extreme conditions of their habitat. That the colour might be affected by still blackwater was demonstrated by the presence of a slightly speckled specimen of the gecarcinucoid *Irmengardia johnsoni* Ng & Yang, 1985, obtained with these “aberrant *P. maculata*” specimens. These specimens of *I. johnsoni*, however, do not differ from typical specimens morphologically.

Present comparisons of equal-sized specimens of *P. reticulata* and *P. maculata* show many clear differences other than the more swollen branchial regions and colour (fig. 8K-O). The suture between the male second and third sternal segments of *P. reticulata* is straight (not convex towards the mouth); the lateral part of the junction between the male third and fourth sternal segments is demarcated by a very sharp, V-shaped notch (not indistinct, with the two segments almost confluent); the epibranchial teeth are distinctly smaller, less stout and directed forwards, especially the outermost (not obliquely sideways); the outer margin of the external orbital angle is always convex (not almost straight or slightly concave); the anterolateral and posterolateral regions have fewer and weaker oblique striae (not numerous and strong); the inner tooth of the infraorbital margin is usually small (not large); the lower margin of the fourth male abdominal segment is concave (curving towards the mouth; not almost straight or convex); the G1 is proportionally longer, more slender and tapering, directed distinctly upwards, the outer margin being almost straight (not sinuous and concave); the proximal part lacks a distinct cleft; the terminal segment is slightly longer, sharper and more slender, the tip being very sharp, the opening very small, and the G2 flagellum is proportionally longer. The G1 characters of *P. maculata* of similar size as adult *P. reticulata* tend to be rather immature, the hairs being sparse and short. Larger specimens of *P. maculata* have the outer margin more sinuous, the proximal cleft deeper and very distinct, the marginal hairs longer and denser, and the G2 flagellum proportionally longer (see Ng, 1988: 99).

There are specimens of *P. maculata* which have the outer margin of the external orbital margin convex, but this is rare, and no specimens from Singapore with this condition are known (see Ng, 1988: 98). The shape of the second and third sternal suture is constantly convex for all sizes of *P. maculata*, although smaller *P. reticulata* also have it convex. The lateral notches at the junction of the third and fourth sternal segments are constantly present; in *P. maculata* they are not apparent, the two segments being confluent with each other. The size of the infraorbital tooth is distinctive in most specimens of *P. reticulata* but is less obvious in small ones. The concavity of the lower margin of the fourth male abdominal segment is a reliable character for larger specimens of *P. reticulata*, although in smaller ones, the margin is straight or convex. All known specimens of *P. maculata* have straight or convex margins. The length of the G2 flagellum of *P. maculata* becomes elongate in larger specimens to match the proportions of smaller *P. reticulata*.

The carpal and meral spines in most of the larger specimens of *P. reticulata* are worn and blunt, which may indicate that the crabs have not moulted for a long period. Smaller specimens have sharp spines, although appearing slightly shorter than in comparably sized specimens of *P. maculata*. The subterminal ambulatory meral spines tend to get rather small in almost all the large specimens of *P. reticulata*, smaller than in equal-sized or larger specimens of *P. maculata*.

The larger male specimens of *P. reticulata* show a distinct gape when the strongly curved fingers of the larger chelae are closed. Specimens of *P. maculata* of comparable size have straighter fingers, which do not form a distinct gape when closed. Even in larger male specimens of *P. maculata*, the fingers are rarely as strongly curved and do not form such a wide gape.

These observations suggest that *P. reticulata* is a progenetic form (see Ng, 1987: 20) of *Parathelphusa*, maturing at a smaller size compared to species like *P. maculata*. No specimens of *P. reticulata* approaching the size of larger *P. maculata* are known. Specimens of *P. maculata* larger than *P. reticulata* have been collected regularly from the same locality together with *P. reticulata*.

With regard to the swollen carapace, anterolateral armature, male sternal structure and general G1 structure, *P. reticulata* is closest to *P. maindroni* Rathbun, 1902. A few notes about this poorly known species (figs. 4A, 6A, 7A-F, 8A-E) seem relevant here. Rathbun (1902) described this species from the island of Bengkalis, east of Sumatra (ca. 1°29'N, 102°09'E). Colosi (1920: 23) suggested that *P. maindroni* may be a junior synonym of *P. convexa*. Pesta (1930: 100) disagreed, arguing that *P. convexa* has never been reported from Sumatra or its vicinity. Bott (1970: 119) regarded *P. maindroni* as conspecific with *P. tridentata tridentata* H. Milne Edwards, 1853, from Sumatra, probably

because both species occur in Sumatra. None of these authors, however, appear to have examined the types. Ng (1988: 96) regarded *P. maindroni* as a distinct species but gave no comment.

The author has examined a syntypic male of *P. maindroni* in the USNM (carapace 24.1 by 18.4 mm (USNM 30021), leg. M. Maindron, no date), and Guinot (*in litt.* 26 September 1985) sent the author photographs and figures of the second syntypic male in the MNHN [carapace 33.0 by 25.0 mm (MNHN-B290), same data as USNM syntype] as well as detailed drawings of the right G1. Study of the two specimens and figures indicates that *P. maindroni* belongs in the group *P. maculata* De Man, 1879/*P. oxygona* Nobili, 1901/*P. convexa* De Man, 1879, in which the ambulatory meri are armed with sharp subterminal spines and the G1s are stout. The carapace of *P. maindroni* is inflated, especially in the branchial regions, much more so than in any typical specimen of *P. maculata* or *P. oxygona* examined, but to a lesser degree if compared to *P. convexa*. From the front, the upper parts of the carapace of *P. convexa* appear sinuous, whilst in *P. maindroni* this is less so. In *P. maculata* and *P. oxygona*, the branchial regions are rather flat. The carapace physiognomy also allies *P. maindroni* with *P. modiglianii* Nobili, 1903, from the Mentawai Islands west of Sumatra, but in this species, the carapace is less convex, and the ambulatory meri are distinctly more slender and unarmed.

The external orbital angles of *P. maindroni* and *P. maculata* differ in the form of their outer margins, being broader, almost straight or slightly concave in *P. maculata*, shorter and convex in *P. maindroni*. The G1 of *P. maindroni* is relatively stout, and resembles that of *P. maculata*, but differs in the tip being sharper, the opening being small (not wide), the outer margin of the proximal part of the subterminal segments being more distinctly and smoothly concave, and the proximal part being without a distinct cleft. The tip of the MNHN syntype male is rather unusual in that it is folded. This fold, absent in the G1 of the USNM male, is possibly an artifact due to damage. The length of the fingers in *P. maindroni* is closer to that in *P. maculata* and *P. oxygona* rather than *P. convexa*, being rather slender and longer than the palm. The preserved condition and the duration of preservation does not allow the pigmentation of the cheliped fingers to be determined with any accuracy, but in both syntypes, the fingers are not pigmented black, as in *P. maculata*.

There can thus be little doubt that *P. maindroni* is a distinct species. The male in the USNM has been selected as the lectotype of the species, that in the MNHN being the paralectotype.

Parathelphusa reticulata can easily be separated from *P. maindroni* by the seventh male abdominal segment being proportionally shorter compared to the sixth, and by the straighter G1 outer margin which is directed upwards (not

obliquely outwards), a longer, more slender and tapered terminal segment, and a sharper tip with a distinctly smaller opening. The differences separating *P. maindroni* from *P. oxygona*, *P. convexa* and *P. modiglianii* also hold for *P. reticulata*.

The diagnostic characteristics of the carapace physiognomy of *P. reticulata* are most obvious in larger specimens (about 1.0 cm width and more); very small specimens can only be separated with difficulty. Why such differences should manifest themselves is difficult to explain. That two closely related species can occur together has already been shown for *Parathelphusa tridentata bogorensis* Bott, 1970, and *P. convexa* from Java (fide Bott, 1970: 121, 122), *P. tridentata tridentata* and *P. maculata* from Sumatra (fide Ng, 1988: 96, 97), as well as for the Pulau Tioman potamids *Johora punicea* (Ng, 1985) and *J. tiomanensis* (Ng & Tan, 1984) (fide Ng, 1985: 156, Ng, 1988: 50).

For *P. reticulata* specimens, the unusual colour pattern and carapace convexity, however, is not lost or reduced after several moults in captivity, the new instar retaining all its earlier characters. The differences observed are suggestive of a genetic basis. It may well explain the tendency for freshwater crabs to speciate so extensively.

Parathelphusa maculata seems to be more common in the parts of the swamp forest where the water flow is faster and the substrate less muddy, whereas *P. reticulata* is more common in the slower, more stale waters, suggesting different ecological preferences.

The colour of live specimens of *P. reticulata* is distinctively reticulated black to dark brown with irregular orange spots, the fingers being bright orange (Ng, 1988: 98). The colour fades in alcohol, becoming brown. The reticulate colour pattern appears to be a very useful character, present in all known adults. Smaller specimens are characteristically spotted, the spots gradually merging to form the reticulate pattern and the orange coloration becoming more pronounced in progressively larger specimens. Small specimens of *P. reticulata*, which cannot be distinguished from very young *P. maculata* morphologically, have been identified as *P. reticulata* on the basis of this coloration. The lower oblique half of the palm and fingers of the larger male chela are bright orange, quite distinct from the brownish or yellowish coloration in *P. maculata*. The fingers of the female chelae and smaller male chela, especially the dactylus, are usually pigmented black throughout their length or along the median parts. In *P. maculata* these fingers are usually brownish, not black.

P. reticulata is more common in shallow stale or slow flowing water in well shaded swamp forest conditions. Water is very acidic blackwater. Larger specimens are only observed and collected after sunset among the leaves. The burrow openings are usually adjacent to the stream, several centimetres above

the water level. Crabs have been seen feeding on dead leaves. This species is much more aggressive than *P. maculata*, and difficult to handle in aquaria.

Etymology. — The species name is derived from the Latin “rete” for net, alluding to the pattern on the carapace of live specimens.

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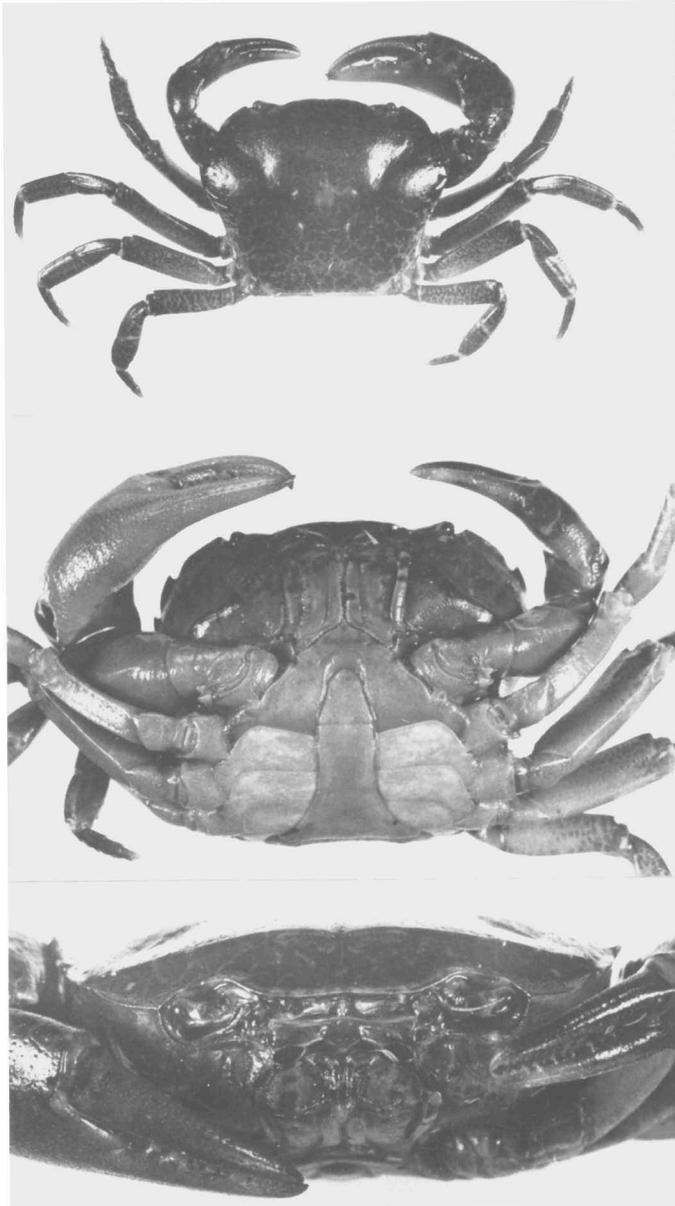


Fig. 1. *Parathelphusa reticulata* spec. nov., ♂, holotype.

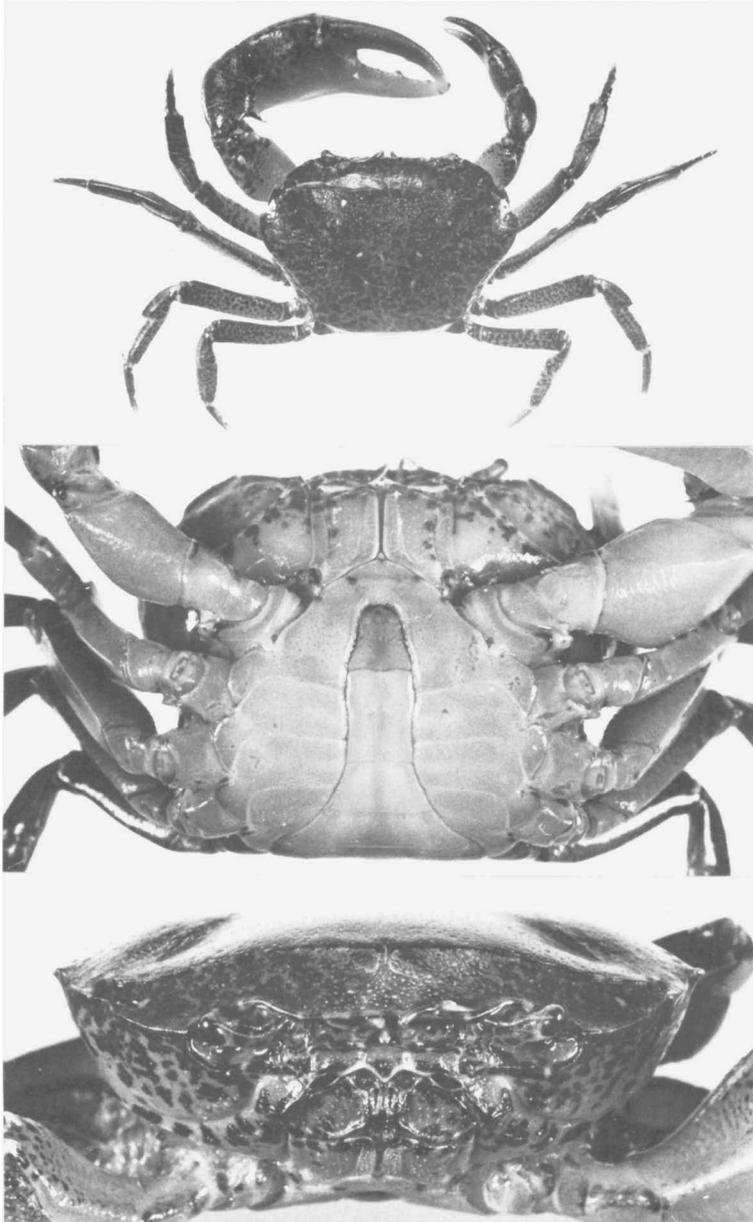


Fig. 2. *Parathelphusa reticulata* spec. nov., ♂, paratype, 35.8 by 26.5 mm (ZRC)

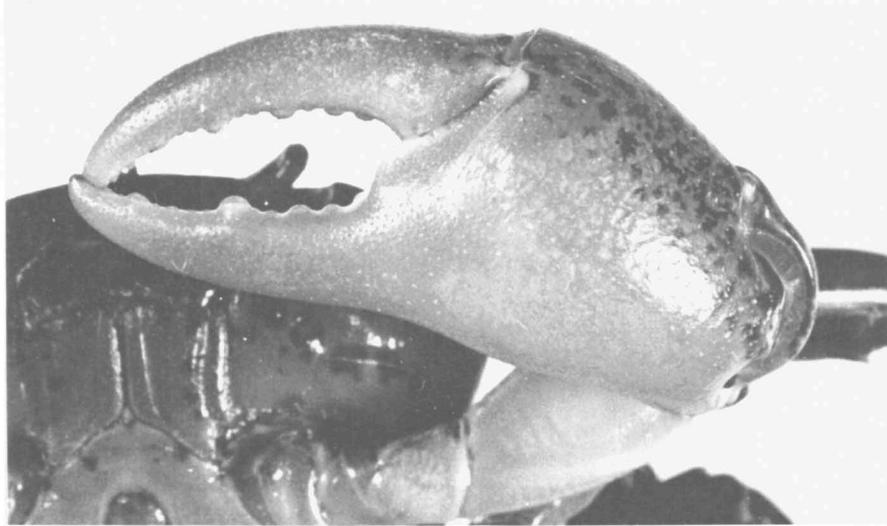


Fig. 3. *Parathelphusa reticulata* spec. nov., ♂, paratype, 35.8 by 26.5 mm (ZRC), left chela.

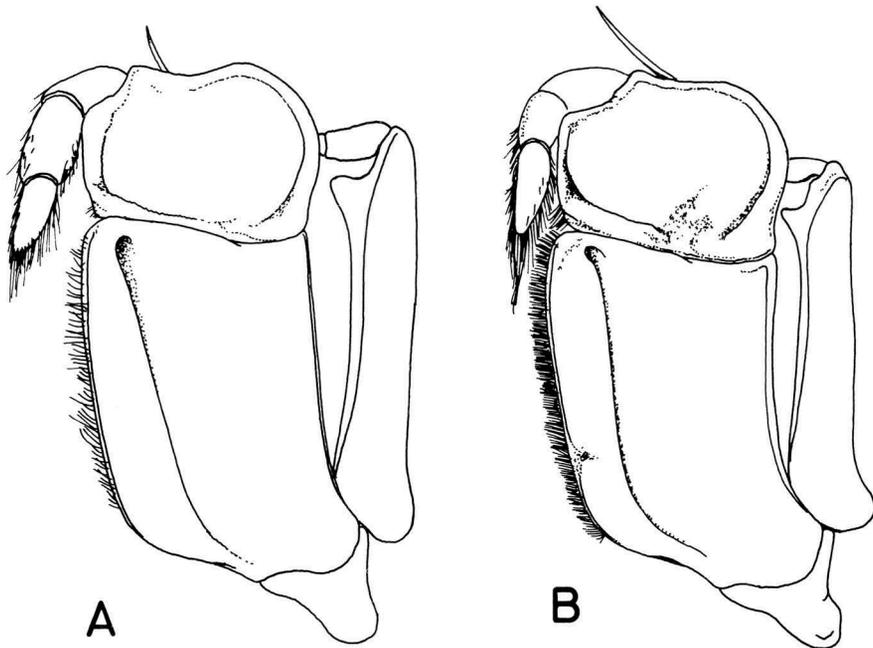


Fig. 4. Left third maxilliped. A, *Parathelphusa maindroni* Rathbun, 1902, ♂, lectotype. B, *Parathelphusa reticulata* spec. nov., ♂, holotype.

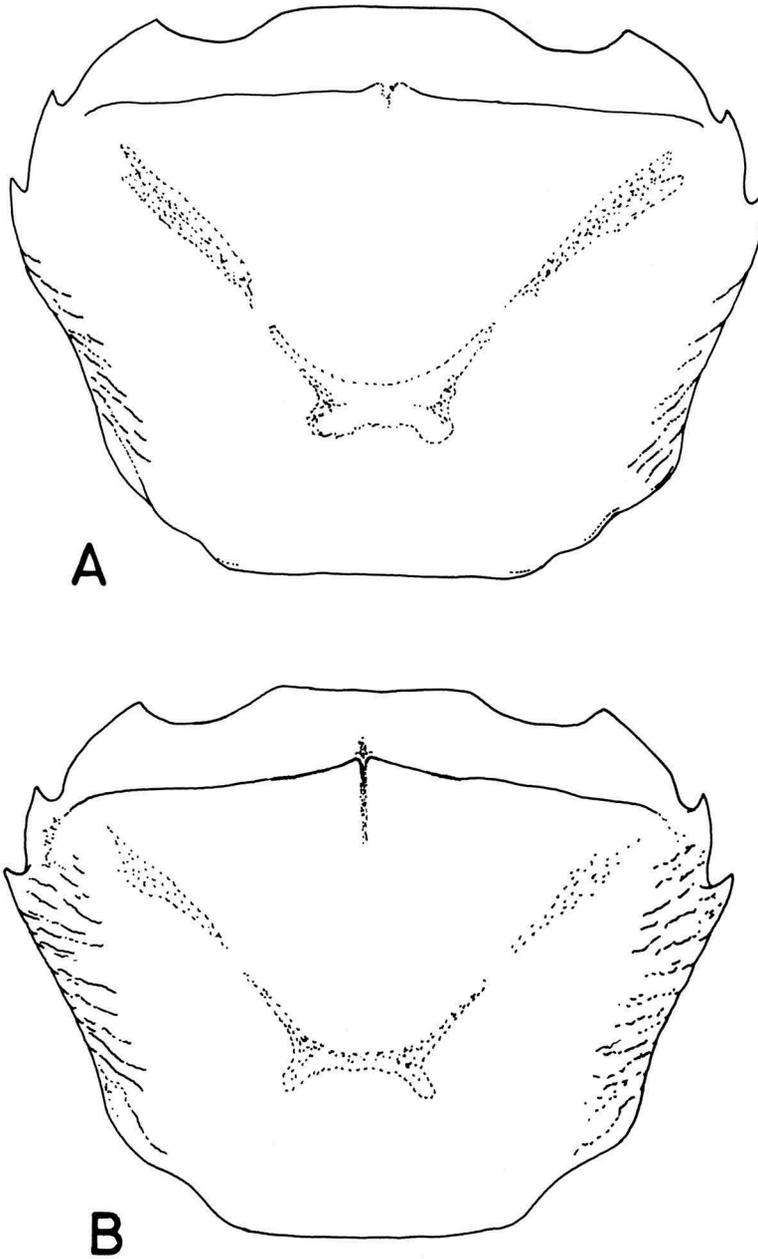


Fig. 5. Carapace, dorsal view. A, *Parathelphusa reticulata* spec. nov., ♂, holotype. B, *Parathelphusa maculata* De Man, 1879, ♂, 31.5 by 25.0 mm, Bukit Batok-Hillview, Singapore.

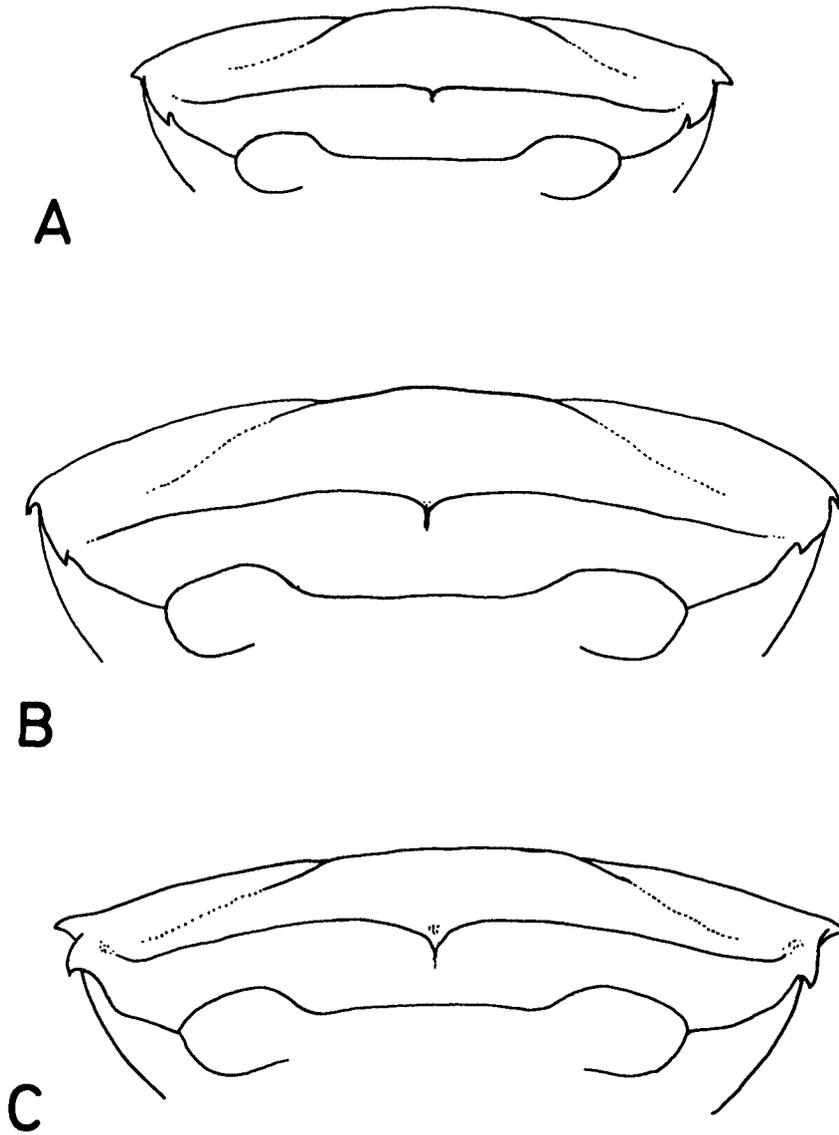


Fig. 6. Carapace, frontal view. A, *Parathelphusa maindroni* Rathbun, 1902, ♂, lectotype; B, *Parathelphusa reticulata* spec. nov., ♂, holotype; C, *Parathelphusa maculata* De Man, 1879, ♂, 31.5 by 25.0 mm.

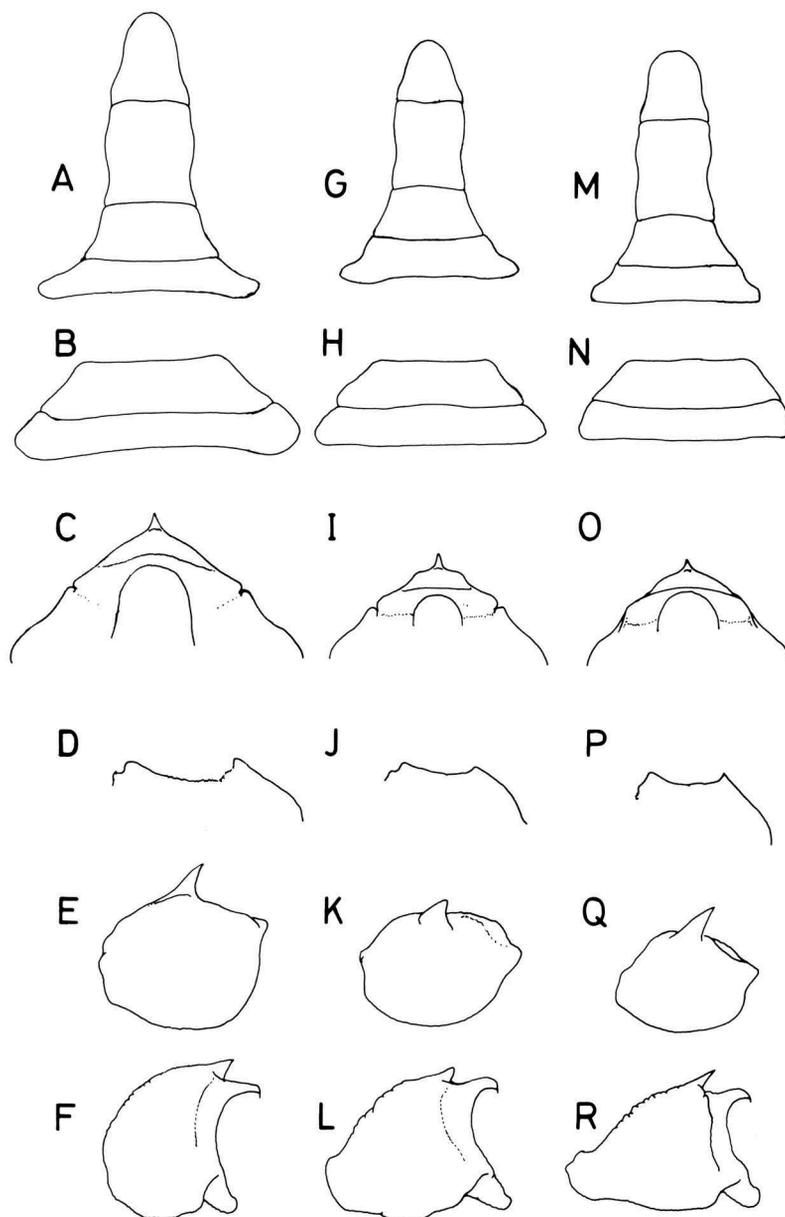


Fig. 7A, G, M: fourth to seventh male abdominal segments; B, H, N: third and fourth male abdominal segments; C, I, O: first -fourth sternal segments; D, J, P: infraorbital margin, ventral view; E, K, Q: right cheliped carpus; F, L, R: right cheliped merus. A-F: *Parathelphusa maindroni* Rathbun, 1902, ♂, lectotype; G-L: *Parathelphusa reticulata* spec. nov., ♂, holotype; M-R: *Parathelphusa maculata* De Man, 1879, ♂, 31.5 by 25.0 mm.

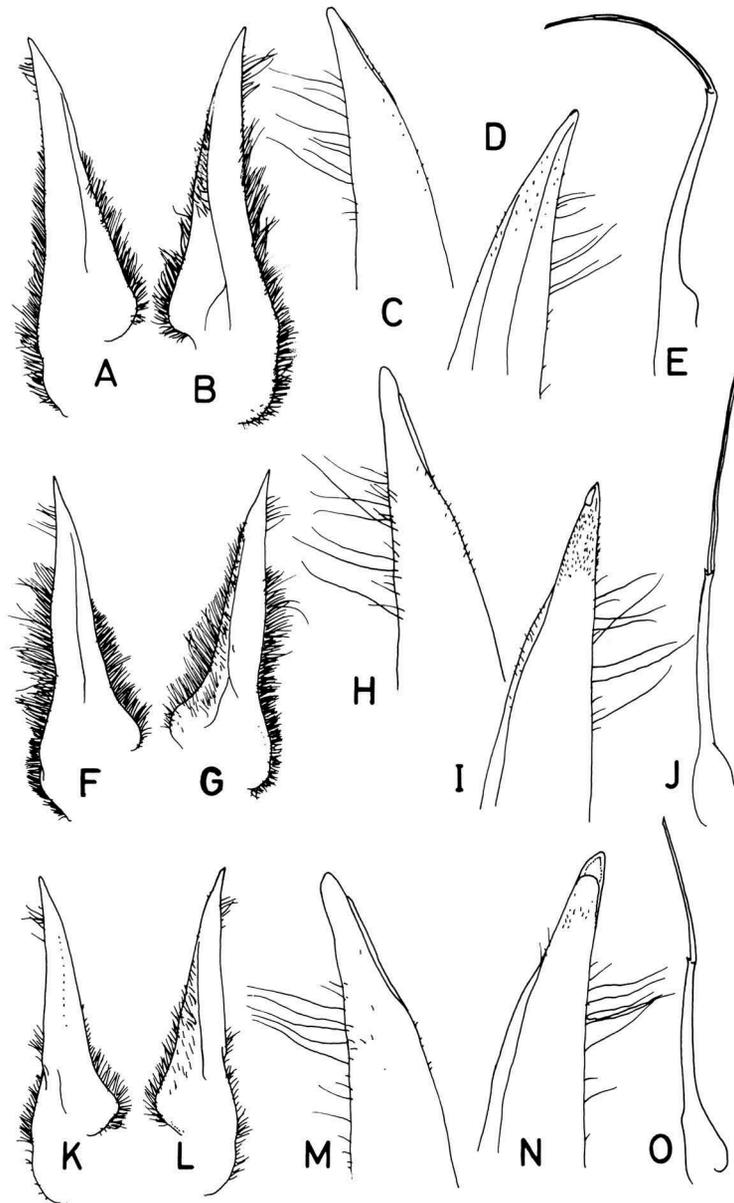


Fig. 8A, F, K: left G1, dorsal view; B, G, L: left G1, ventral view; C, H, M: left G1, terminal segment, dorsal view; D, I, N: left G1, terminal segment, ventral view; E, J, O: G2. A-E: *Parathelphusa maindroni* Rathbun, 1902, ♂, lectotype; F-J: *Parathelphusa reticulata* spec. nov., ♂, holotype; K-O: *Parathelphusa maculata* De Man, 1879, ♂, 31.5 by 25.0 mm.