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ON A NEW GENUS AND FOUR NEW SPECIES OF FRESHWATER CRABS (CRUSTACEA: DECAPODA: BRACHYURA: PARATHELPHUSIDAE) FROM BORNEO AND JAVA

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ABSTRACT. - A new genus of terrestrial parathelphusid crab, *Torhusa*, is established for *Mainitia nieuwenhuisi* Bott, 1970, from central Borneo. Four new species of parathelphusid crabs are also described, viz. *Terrathelphusa ovis* (from Sarawak), *Terrathelphusa telur* (from Brunei), *Parathelphusa baweanensis* (from Bawean Islands) and *Parathelphusa quadrata* (from Lombok).

KEY WORDS. - Freshwater crabs, Brachyura, Parathelphusidae, Borneo, Java, taxonomy.

INTRODUCTION

Over the last 10 years, I have examined a large amount of Javan and Bornean freshwater crab material in various museums. While most of the new genera and species have been described, for one reason or another, several have remained "in limbo" and have not been reported. The present paper intends to resolve this. A new genus and four species of parathelphusids are described here.

Specimens examined are deposited in the following institutions: MZB - Museum Zoologicum Bogoriense, Balitbang Zoology, Bogor, Indonesia; RMNH - Rijksmuseum van Natuurlijke Historie, Leiden; SM - Sarawak Museum, Kuching; and ZRC - Zoological Reference Collection, School of Biological Sciences, National University of Singapore. All measurements are of the carapace width and length respectively. The abbreviations G1 and G2 are used for the male first and second pleopods respectively. The terminology basically follows that utilised by Ng (1988).

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TAXONOMY

Parathelphusidae Alcock, 1910

Torhusa, new genus

Mainitia - Bott, 1970: 81 (part) (not *Mainitia* Bott, 1969).

Type species. - *Mainitia nieuwenhuisi* Bott, 1970, by present designation.

Diagnosis. - Carapace transverse, surfaces smooth, strongly convex, very inflated; anterolateral margins strongly convex, smooth, crested; external orbital angle very low, broadly triangular; frontal margin narrow, sinuous; postorbital cristae distinct, adjacent to supraorbital margin, sharp, confluent with well defined epigastric cristae; posterolateral margins concave, strongly converging. Frontal median triangle very small but visible, lateral margins not confluent with frontal margin. Exopod of third maxilliped with well developed flagellum. Fingers of larger adult male chela with distinct gape when closed. Male abdomen distinctly T-shaped, segments 3-5 strongly constricted. G1 very stout, relatively short, directed outwards; terminal segment about one third length of subterminal segment, cone-shaped with sharply tapered, slender tip, distalmost part strongly setose; G2 distal segment about half-length of basal segment.

Etymology. - The name *Torhusa* is derived from the Latin, alluding to the swollen shape of the carapace, in arbitrary combination with a common ending for freshwater crabs (*Thelphusa*). Gender feminine.

Remarks. - Bott (1970) described this species from two males and a female collected from Borneo. Bott placed this species in *Mainitia* Bott, 1969 (type species *Parathelphusa* (*Perithelphusa*) *mainitensis* Balss, 1937), mainly on the basis of its stout G1, although as he commented, the external features closely resemble *Terrathelphusa loxophthalma* (as *Perbrinckia loxophthalma*). The orbits and G1 of *M. nieuwenhuisi*, however, are very different, the orbits being almost horizontal (not sloping), and the G1 is very stout, short and not sinuous, with the terminal segment much shorter and stouter as well (cf. Ng, 1989). It is obvious, however, that Bott's species does not belong to *Mainitia* s. str., their external morphologies and distribution being very different. Transferring *M. nieuwenhuisi* to *Terrathelphusa* would also be difficult as their G1s are so different. Ng (1989) had earlier showed that Javan and Bornean species referred to *Perbrinckia* Bott, 1969, by Bott (1970) actually belonged to a separate genus, *Terrathelphusa* Ng, 1989 (see also Ng, 1995). A new genus for *M. nieuwenhuisi* is clearly required, and *Torhusa* is established here specifically for this species. At this stage, it is uncertain if *Torhusa* is closely allied to *Terrathelphusa* species, or if the similarities between the two genera are merely a result of convergent evolution.

Torhusa nieuwenhuisi (Bott, 1970)
(Figs. 1, 2)

Mainitia nieuwenhuisi Bott, 1970: 81, Pl. 36 figs. 51-53, 61, 62.

Material examined. - Holotype male (42.0 by 28.0 mm) (RMNH 53), Kajan River, central Borneo (1°22'N, 115°12'E), coll. A. W. Nieuwenhuis, 1900.

Paratype - 1 male (RMNH 53), same data as holotype. — 1 female (25.6 by 11.7 mm) (RMNH 29368), Kapuas River, central Borneo (0°48'N, 113°54'E), coll. A. W. Nieuwenhuis, 1897.

Diagnosis. - As for genus.

Remarks. - This species has never been reported or collected since it was collected. It remains uncertain if the female paratype from Kapuas is conspecific with the holotype and paratype males. This paratype female (RMNH 29368) is much smaller and is still young and it is possible that the carapace differences observed (less broad and less swollen) are simply due to age differences. Until males from the Kapuas can be collected, nothing much else can be said and it seems best to leave this female under *T. nieuwenhuisi* for the time being.

Nothing known about the biology of this species, although its swollen carapace suggests that this species has terrestrial or semi-terrestrial habits (see Ng, 1989).

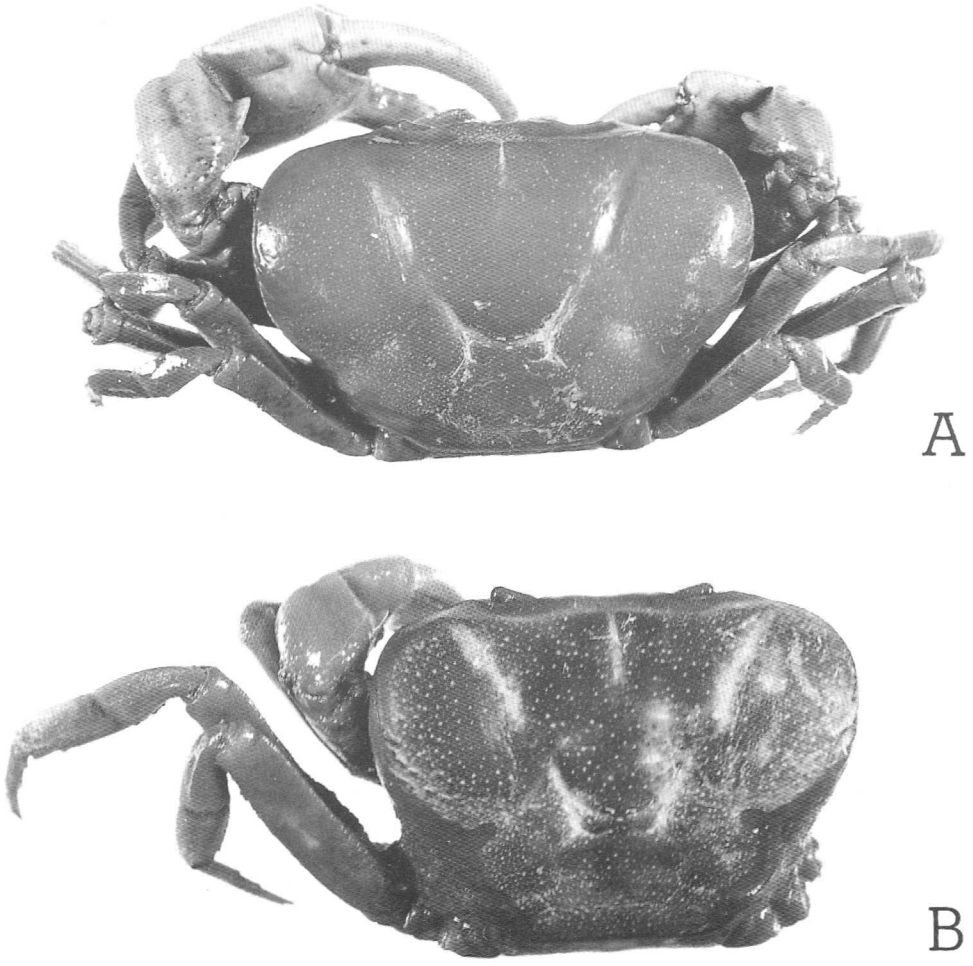

Fig. 1. *Torhusa nieuwenhuisi* (Bott, 1970). A, holotype male (42.0 by 28.0 mm) (RMNH 53); B, paratype female (25.6 by 11.7 mm) (RMNH 29368).

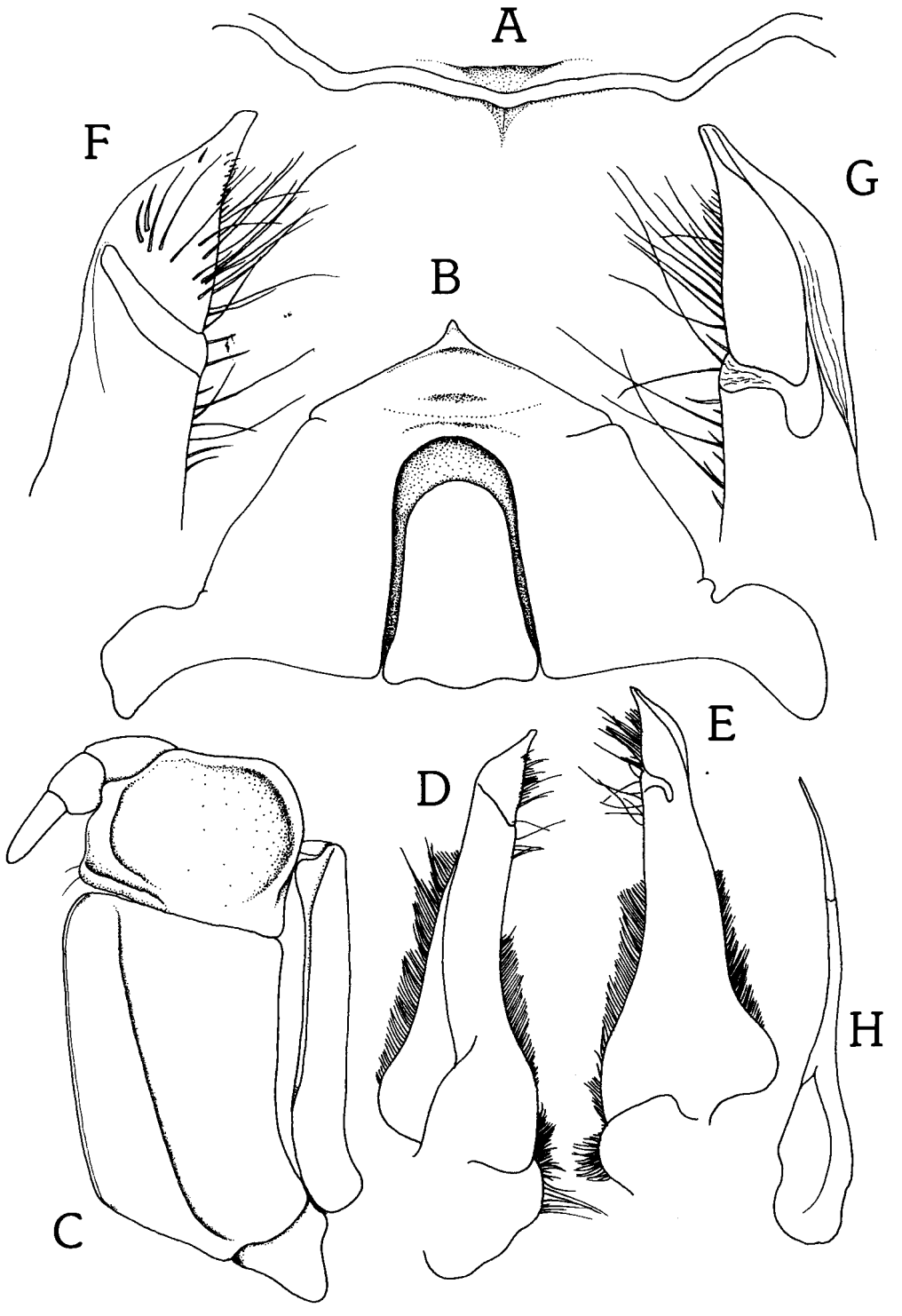

Fig. 2. *Torhusa nieuwenhuisi* (Bott, 1970). A, holotype male (42.0 by 28.0 mm) (RMNH 53). A, frontal margin; B, anterior thoracic sternites and telson; C, left third maxilliped; D, ventral view of left G1; E, dorsal view of left G1; F, ventral view of left G1 terminal segment; G, dorsal view of left G1 terminal segment; H, left G2.

Terrathelphusa Ng, 1989

Remarks. - The genus *Terrathelphusa* was established by Ng (1989) for four species, viz. *P. kuhli* (De Man, 1883) (type species) (Java), *P. modesta* (De Man, 1892) (Java), *P. loxophthalma* (De Man, 1892) (Borneo) and *P. kuchingensis* (Nobili, 1901) (Borneo). Ng & Wowor (1990) subsequently described a fifth species, *T. adipis*, from Borneo, although they commented that because the sole specimen was a female, its generic placement was tentative.

Terrathelphusa ovis, new species

(Figs. 5, 6)

Potamon (*Geothelphusa*) *loxophthalmum* - Nobili, 1900: 504 (part).
Potamon loxophthalmum - Nobili, 1901: 5 (part).
Potamon (*Geothelphusa*) *loxophthalmum* - Rathbun, 1905: 221 (part).
Perbrinckia loxophthalma - Bott, 1970: 67 (part), Pl. 10 figs. 18-20, Pl. 28 fig. 44; Holthuis, 1979: 37, Pl. 6 (part); Collins, 1980: 81.
Terrathelphusa loxophthalma - Ng, 1989: 125 (part), colour pl. 2A, Fig. 2G-K, pl. 3.

(not *Geothelphusa loxophthalma* De Man, 1892)

Material examined. - Holotype male (23.6 by 16.6 mm) (RMNH 31963a), pitfall trap in alluvial, often flooded lowland forest, Gunong Mulu National Park, 4°03'N, 114°56'E, Fourth Division, Sarawak, East Malaysia, Borneo, leg. N. M. Collins, 24 Mar.1978.

Paratypes - 2 males (28.0 by 21.0 mm, 35.0 by 25.0 mm), 1 female (30.0 by 22.0 mm) (RMNH 31963b), same data as holotype. — 1 male (34.0 by 23.9 mm) (SM Cru 1986.113), 1 male (25.7 by 16.8 mm) (ZRC), pitfall trap in alluvial lowland forest, Gunong Mulu National Park, 4°03'N, 114°56'E, Fourth Division, Sarawak, East Malaysia, Borneo, leg. N. M. Collins, 18 Jul.1978.

Diagnosis. - Carapace very swollen, surfaces convex, unevenly oval, anterolateral and frontal regions appearing compressed, distinctly narrower than posterior regions, epibranchial tooth usually undiscernible, confluent with anterolateral margin, supraorbital margin sharply sloping, not parallel with frontal margin, eyes and orbits sloping downwards and outwards from frontal view. Ischium of third maxilliped rectangular, ca. 1.6 times longer than maximum width. Carpus of cheliped covered with small rounded or low, squamate granules; inner distal angle with acutely triangular tooth. Ambulatory meri relatively stout, length of fourth merus ca. 3.5 times maximum width. Lateral margins of sixth male abdominal segment gently concave. G1 terminal segment relatively long, cone-shaped, gradually tapering to blunt tip, tip gently curving upwards, 0.6-0.7 times length of subterminal segment. G2 distal segment ca. 0.3 times length of basal segment.

Etymology. - The name is derived from the Latin for egg, alluding to the general carapace shape of the species.

Remarks. - *Terrathelphusa loxophthalma* (De Man, 1892) is one of the most distinctive freshwater crabs in northern Borneo, with its swollen carapace and terrestrial habits. The species was originally described from a single specimen from somewhere in Borneo, and Nobili (1900, 1901), Bott (1970), Holthuis (1979) and Ng (1989) have since reported this species from Sarawak. Bott (1970) and Holthuis (1979) had examined the type and felt that the Sarawakian specimens were conspecific with *T. loxophthalma* (as a *Perbrinckia*). Although De Man (1892) merely listed the type locality of the single male specimen of *T.*

loxophthalma as "Borneo", Holthuis (1979) discussed its origins and suggested that it was probably collected from southeastern Borneo. No other specimens of *T. loxophthalma* or of any other *Terrathelphusa* species, however, have been reliably recorded from this area.

After examination of the type of *Geothelphusa loxophthalma* De Man, 1892, and the specimens from Sarawak and Brunei which had been referred to this species (Bott, 1970; Holthuis, 1979; Ng, 1989), it is clear that three species are involved, differing most distinctly in the structure of their G1s. When compared to the G1s of *T. ovis* and *T. telur*, that of *T. loxophthalma* s. str. is less strongly bent outwards (see Figs. 4D, E vs. 6C, D, H, I), the terminal segment curves distinctly outwards (curves gently upwards in *T. telur*, Figs. 4F, G vs. 6E, F) and the tip of the G1 is distinctly "flared" (conical in *T. ovis* and *T. telur*, Figs. 4F, G vs. 6E, F). In addition, the G1 terminal segment of *T. telur* is proportionately shorter than that of *T. loxophthlama* s. str. (0.3 times length of subterminal segment vs. 0.5 times). There are also differences in the proportions of the fourth ambulatory legs, third maxillipeds, surface texture of the carpus of the major chelipeds, shape of the sixth male abdominal segments and G2 structures. The differences between the three species are summarised in Table 1. The series of specimens of *T. ovis* and *T. telur* show that these differences are not associated with age. A large Sarawakian specimen of *T. ovis* (34.0 by 23.9 mm, SM Cru 1986.113) which is comparable in size to the holotype male of *T. loxophthalma* s. str. (35.0 by 23.0 mm) (RMNH 1287) shows the same differences. The holotype of *T. loxophthalma* s. str. is refigured here (Figs. 3, 4) so that effective comparisions can be made for all the key characters discussed here.

Bott (1970) had indicated that Nobili's (1899) record of *Potamon (Geotelphusa) loxophthalmum* from the Aru Islands (Moluccas) belongs to *Sundathelphusa aruana* instead. Rathbun's (1905) record included Nobili's Aru Island specimen (a male) and must thus be regarded as heterogeneous.

Fig. 3. *Terrathelphusa loxophthalma* (De Man, 1892). Holotype male (35.0 by 23.0mm) (RMNH 1287).

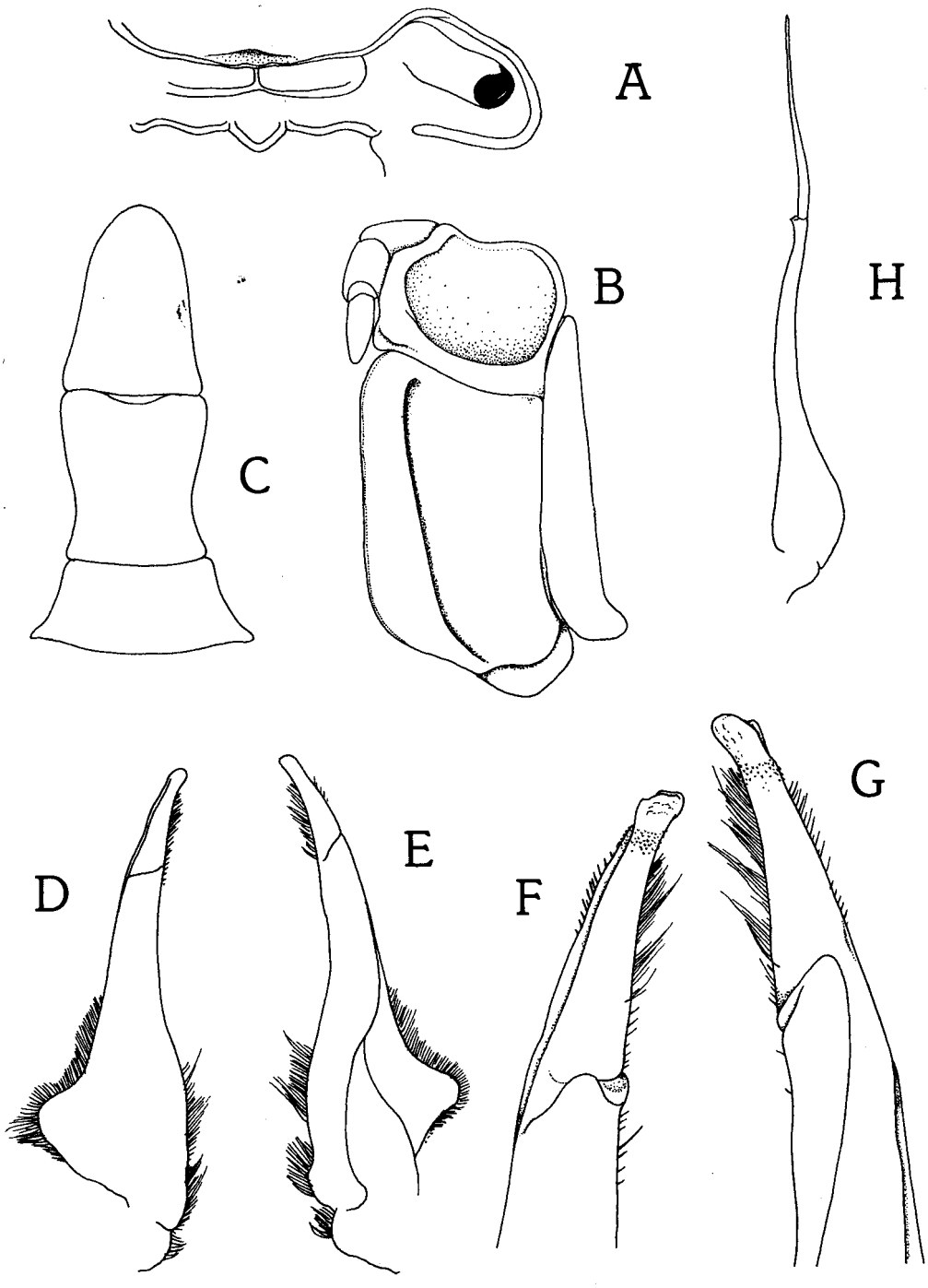

Fig. 4. *Terrathelphusa loxophthalma* (De Man, 1892). Holotype male (35.0 by 23.0mm) (RMNH 1287). A, frontal margin and orbit; B, left third maxilliped; C, abdominal segments 5, 6 and telson; D, ventral view of right G1; E, dorsal view of right G1; F, ventral view of right G1 terminal segment; G, dorsal view of right G1 terminal segment; H, right G2.

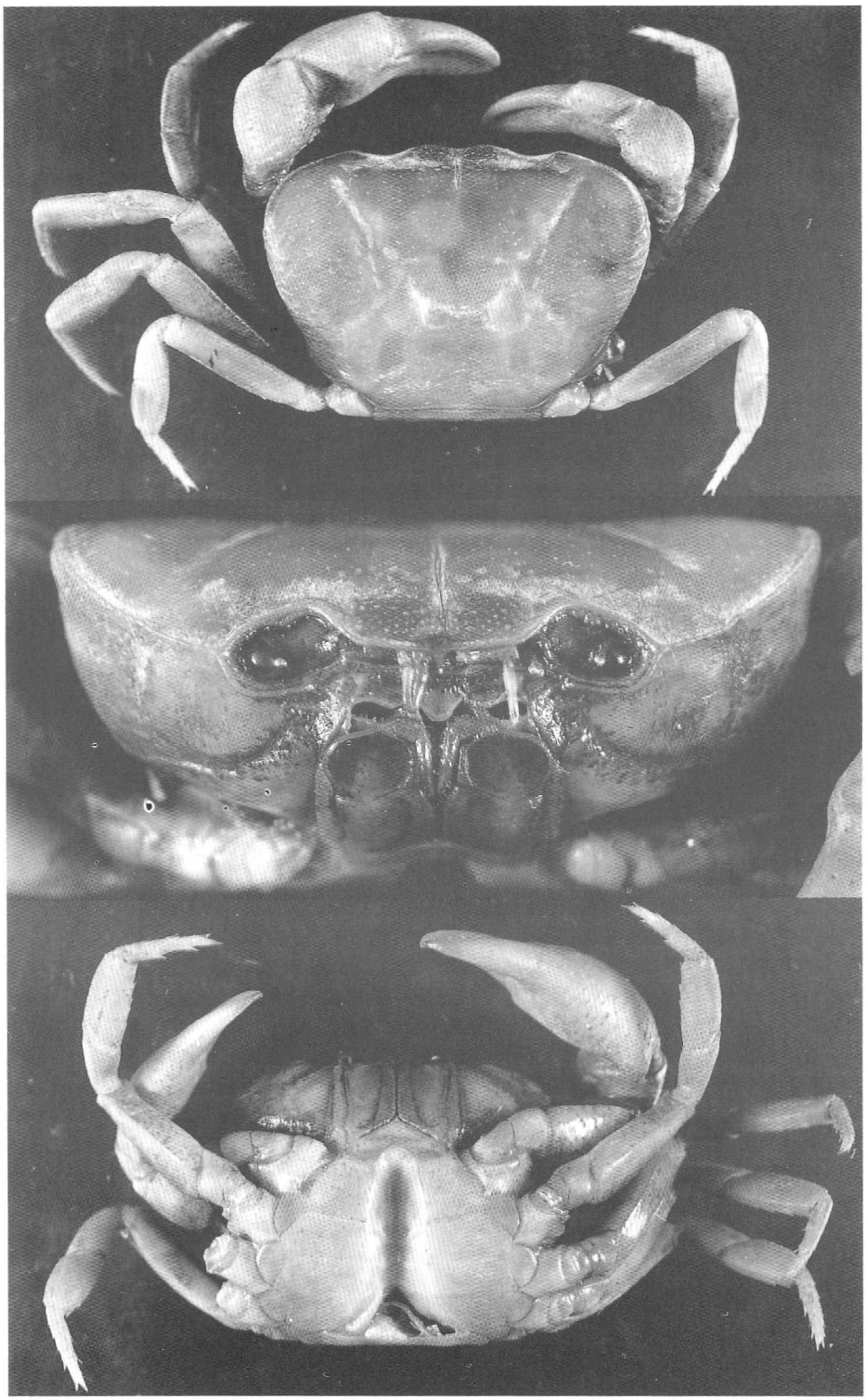

Fig. 5. *Terrathelphusa ovis*, new species (De Man, 1892). Holotype male (23.6 by 16.6 mm) (RMNH 31963a).

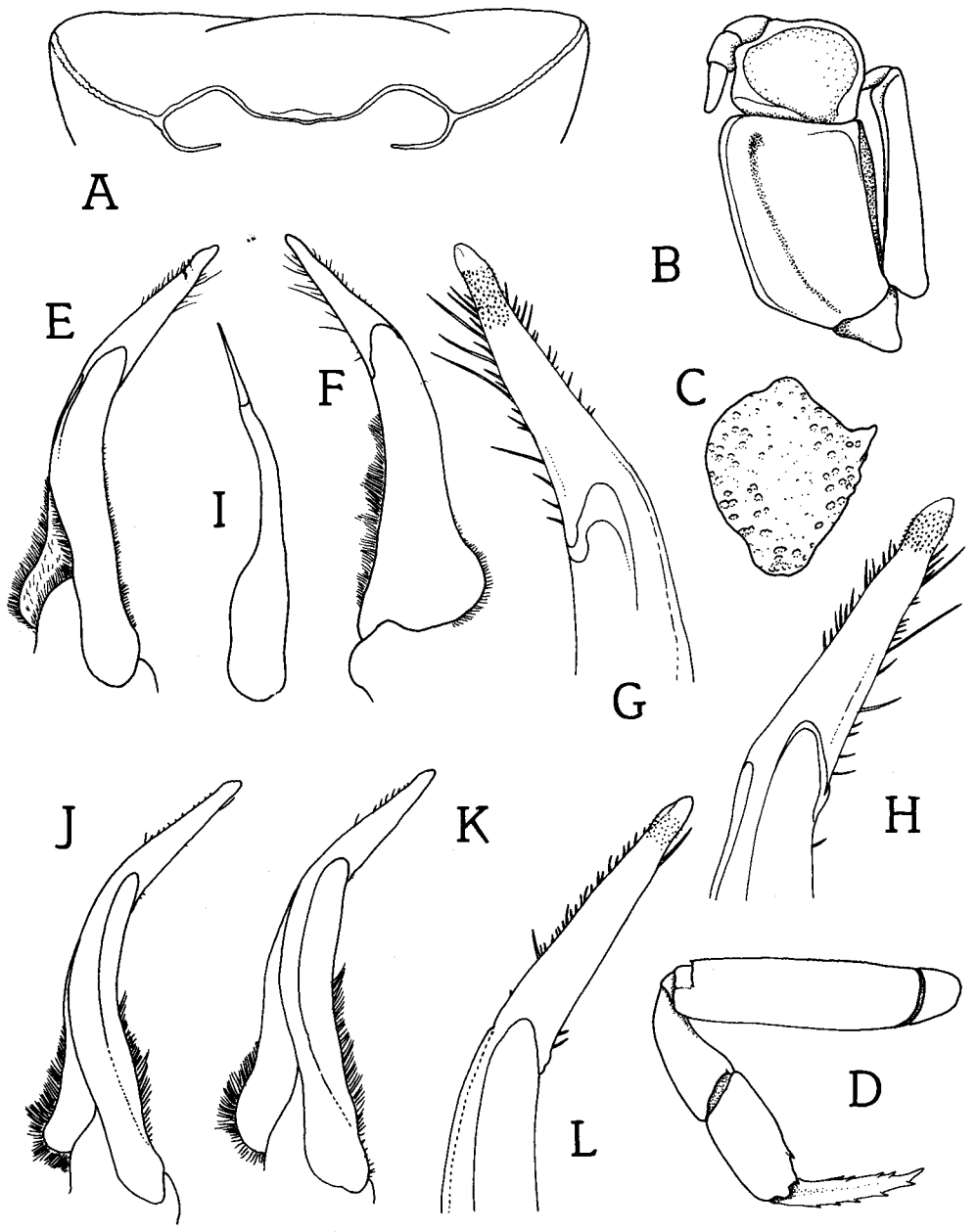

Fig. 6. *Terrathelphusa ovis*, new species (De Man, 1892). A-I, holotype male (23.6 by 16.6 mm) (RMNH 31963a); J-L, male (34.0 by 23.9 mm) (SM Cru 1986.113). A, frontal margin and orbit; B, left third maxilliped; C, right carpus of cheliped; D, left fourth ambulatory leg; E, ventral view of right G1; E, J, K, ventral view of left G1; F, dorsal view of left G1; G, dorsal view of left G1 terminal segment; H, L, ventral view of left G1 terminal segment; I, left G2. (J and K drawn at slightly different orientations to show apparent shape differences)

Terrathelphusa ovis is a terrestrial species, occuring in burrows in the alluvial forest of Sarawak, and probably in other parts of its range (Holthuis, 1979; Collins, 1980) (as *Perbrinckia loxophthalma*). Collins (1980) reported that this species was quite common along the banks of larger rivers and nocturnal in habits. He reported that their guts contained vegetable, mineral and insect matter, and suggested that they may contribute significantly to leaf litter degradation and their removal from the alluvial forest floor. The habits of *T. ovis* thus appear to parallel those of the Christmas Island land crabs of the genus *Gecarcoidea* (family Gecarcinidae). Whether the burrows of this species harbour dipterans is not known (see Bright & Hogue, 1972).

Live *T. ovis* are brown to olive green overall (see Ng, 1989).

Terrathelphusa telur, new species
(Figs. 7, 8)

Material examined. - Holotype male (22.7 by 16.5 mm) (ZRC), forest floor, near summit of East Kuala Belalong, Temburong, Brunei, coll. S. C. Choy, 28 Mar.1991.

Fig. 7. *Terrathelphusa telur*, new species. Holotype male (22.7 by 16.5 mm) (ZRC).

Diagnosis. - Carapace very swollen, surfaces convex, unevenly oval, anterolateral and frontal regions appearing compressed, distinctly narrower than posterior regions, epibranchial tooth undiscernible, confluent with anterolateral margin, supraorbital margin sloping, not parallel with frontal margin, eyes and orbits sloping downwards and outwards from frontal view. Ischium of third maxilliped distinctly rectangular, ca. 1.5 times longer than maximum width. Carpus of cheliped covered with low rugae or uneven grooves, never granulated; inner distal angle with broadly triangular tooth. Ambulatory meri relatively slender, length of fourth merus ca. 3.1 times maximum width. Lateral margins of sixth male abdominal segment concave. G1 terminal segment relatively long, cone-shaped, gradually tapering to blunt tip, tip gently curving upwards, ca. 0.5 times length of subterminal segment. G2 distal segment ca. 0.5 times length of basal segment.

Etymology. - The name is derived from the Malay for egg ("telur"), alluding to the egg-shaped carapace of the species. The name is used as a noun in apposition.

Remarks. - The differences between *T. telur*, *T. ovis* and *T. loxophthalma* have been summarised in Table 1. Although *T. loxophthalma* is known from only one large male, the type series of *T. ovis* is better represented. There are two male specimens of *T. ovis* (holotype 23.6 by 16.6 mm, RMNH 31963a; paratype 25.7 by 16.8 mm, ZRC) comparable in size to the holotype of *T. telur* (22.7 by 16.5 mm), and the differences noted in Table 1 between *T. ovis* and *T. telur* are still valid. In any case, the series of specimens of *T. ovis* show that the key characters (especially in the G1) are not affected by changes in size of the specimen.

Table 1. Differences between *Terrathelphusa loxophthalma*, *T. ovis* and *T. telur*.

	T. loxophthalma	*T. ovis*	*T. telur*
Third maxilliped	length of ischium ca. 1.8 times maximum width	length of ischium ca. 1.6 times maximum width	length of ischium ca. 1.5 times maximum width
Last ambulatory merus	relatively slender, length ca. 3.5 times width	relatively slender, length ca. 3.5 times width	relatively stout length ca. 3.1 times width
Carpus of cheliped	surface with small, low to squamate granules; inner angle with acutely triangular tooth	surface with small, low to squamate granules; inner angle with acutely triangular tooth	surface rugose, without granules; inner angle with broadly triangular tooth
Sixth male abdominal segment	lateral margins gently concave	lateral margins gently concave	lateral margins concave
G1	gently curving outwards; tip of terminal segment flared; terminal segment ca. 0.3 times length of subterminal segment	strongly curving outwards; tip of terminal segment tapering to blunt tip; terminal segment 0.6-0.7 times length of subterminal segment	strongly curving outwards; tip of terminal segment tapering to blunt tip; terminal segment ca. 0.5 times length of subterminal segment
G2	distal segment relatively long, ca. 0.6 times length of basal segment	distal segment relatively long, ca. 0.3 times length of basal segment	distal segment relatively short, ca. 0.5 times length of basal segment

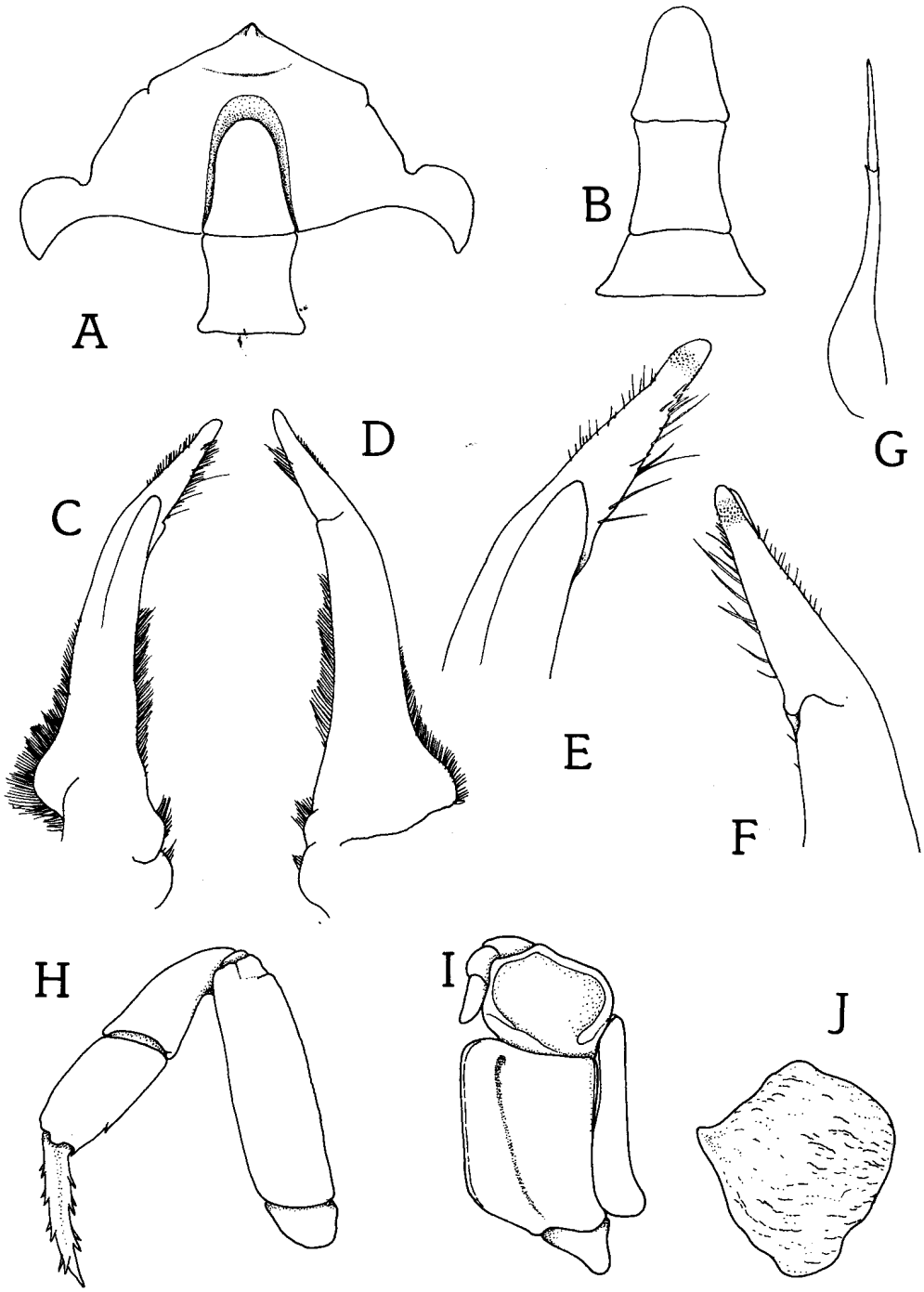

Fig. 8. *Terrathelphusa telur*, new species. Holotype male (22.7 by 16.5 mm) (ZRC). A, anterior thoracic sternites, male abdominal segment 6 and telson; B, male abdominal segments 5, 6 and telson; C, ventral view of left G1; D, dorsal view of left G1; E, ventral view of left G1 terminal segment; F, dorsal view of left G1 terminal segment; G, left G2; H, left fourth ambulatory leg; I, left third maxilliped; J, left carpus of cheliped.

The habit of *T. telur* probably parallel those of *T. ovis*, with the holotype having being collected from the forest floor.

Parathelphusa H. Milne Edwards, 1853

Parathelphusa baweanensis, new species
(Figs. 9, 10)

Paratelphusa tridentata - De Man, 1879: 61 (part) (nec H. Milne Edwards, 1853).

Material examined. - Holotype male (43.7 by 33.7 mm) (ZRC 1984.4426) (ex. MZB), Bawean Islands, coll. K. Th. Dammerman, May.1928.

Paratypes - 1 female (ZRC 1984.4469) (ex. MZB), 3 males (largest 52.7 by 39.1 mm), 1 female (MZB 021), same data as holotype. — 6 males (RMNH D 338), Bawean Islands, Java Sea, coll. P. Diard, 1841. — 5 males (RMNH D 1792), Bawean Islands, Java Sea, no other data.

Others - 2 specimens (badly damaged) (MZB 055), north Bawean Islands, coll. Delsman, Jun.1920. — 2 females (MZB 481), Krong, north Bawean Islands, Java, coll. 19 Jun.1964.

Diagnosis. - Carapace transverse, dorsal surfaces slightly convex, smooth. Epibranchial teeth well developed, directed anteriorly; external orbital tooth triangular. Ambulatory meri smooth, unarmed. G1 slender, sinuous, gently curving outwards; distal part gently curving upwards.

Etymology. - The species is named after the Bawean Islands, where it is apparently endemic.

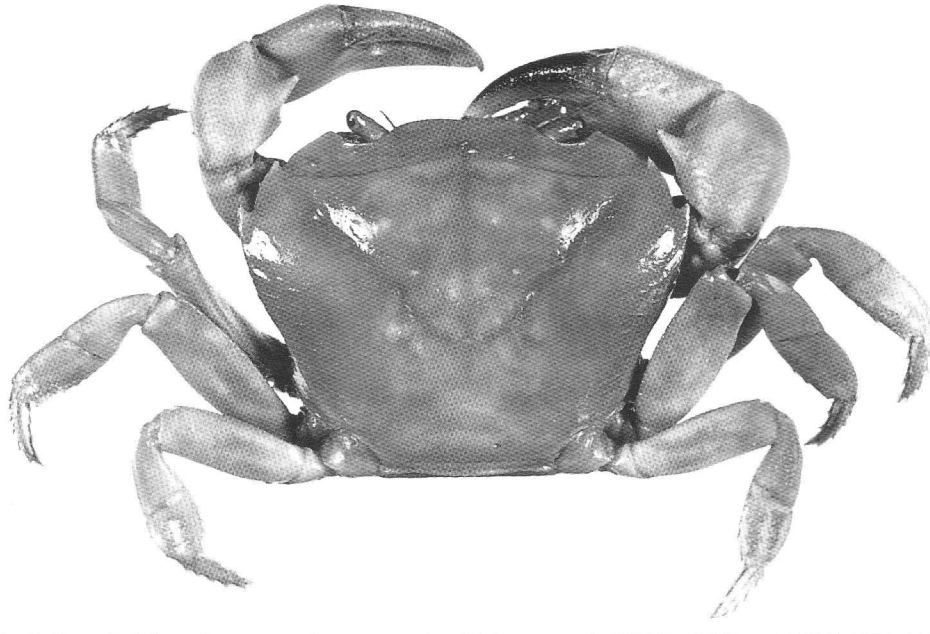

Fig. 9. *Parathelphusa baweanensis*, new species. Holotype male (43.7 by 33.7mm) (ZRC 1984.4426).

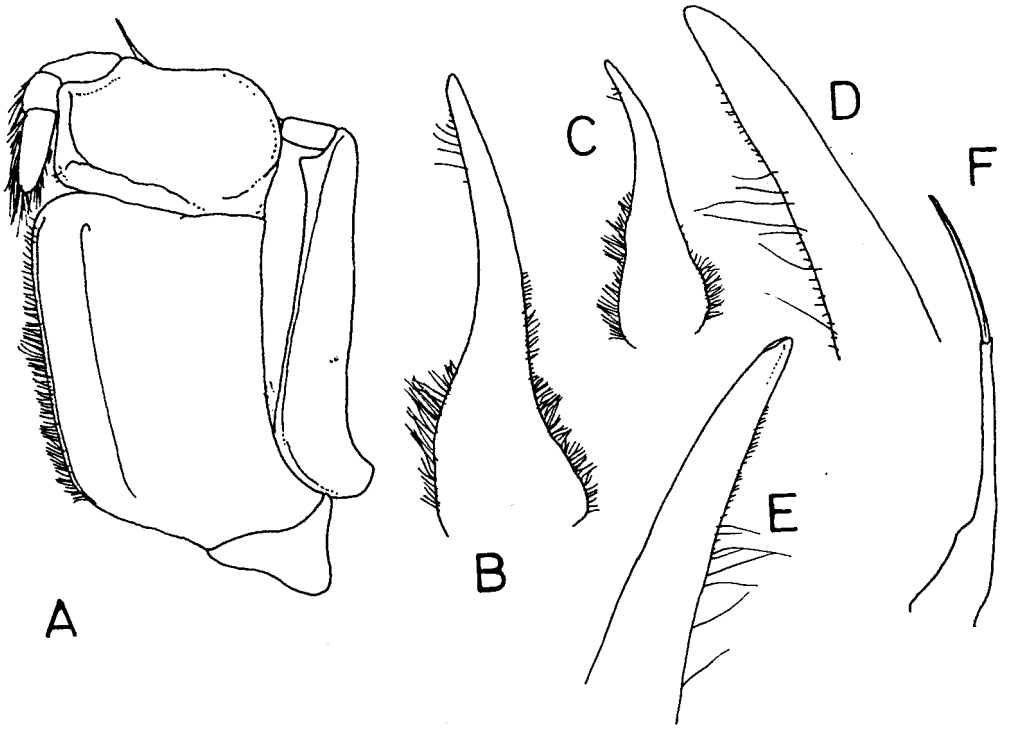

Fig. 10. *Parathelphusa baweanensis*, new species. A, B, F, holotype male (43.7 by 33.7mm) (ZRC 1984.4426); C-E, paratype male (52.7 by 39.1 mm) (MZB 021). A, left third maxilliped; B, C, ventral views of left G1s; D, ventral view of left G1 terminal segment; E, dorsal view of left G1 terminal segment; F, left G2.

Remarks. - De Man (1879) had provisionally referred specimens from the Bawean Islands to *P. tridentata*. A study of specimens from these islands showed that the specimens from the Baweans should be referred to a new species, *P. baweanensis*. *Parathelphusa baweanensis* more closely resembles *P. bogorensis* Bott, 1970, than *P. tridentata* H. Milne Edwards, 1853, s. str. *Parathelphusa bogorensis* is a somewhat variable species, with the dorsal surface of the carapace usually been flat to slightly convex. In a few specimens of *P. bogorensis*, the dorsal surface of the carapace is more convex, giving the specimens a somewhat more inflated appearance (unpublished data). This more convex form of *P. bogorensis* is the one which most closely resembles *P. baweanensis*. The outermost epibranchial tooth of *P. baweanensis* on the other hand, is closer to *P. tridentata*, being directed more obliquely outwards. The G1 of *P. baweanensis*, however, is quite distinct, being sinuous in shape, and curved outwards, quite unlike those of *P. tridentata* or *P. bogorensis*. With regards to the structure of the G1, *P. baweanensis* is closest to *P. sabari* Ng, 1986, from eastern Kalimantan, but in that species, the G1 is slightly stouter, and the ambulatory meri have a distinct subterminal spine.

Parathelphusa quadrata, new species

(Figs. 11, 12)

Material examined. - Holotype male (23.8 by 17.6 mm) (ZRC 1985.2105) (ex. MZB), Air Sigaguruh, Lombok Island, leg. Munandar, 5 Feb.1983.

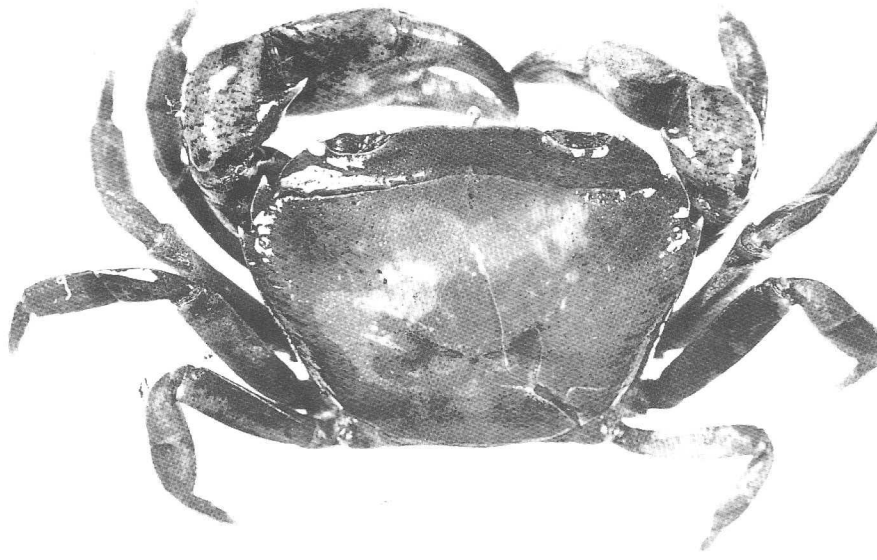

Fig. 11. *Parathelphusa quadrata*, new species. Holotype male (23.8 by 17.6 mm) (ZRC 1985.2105).

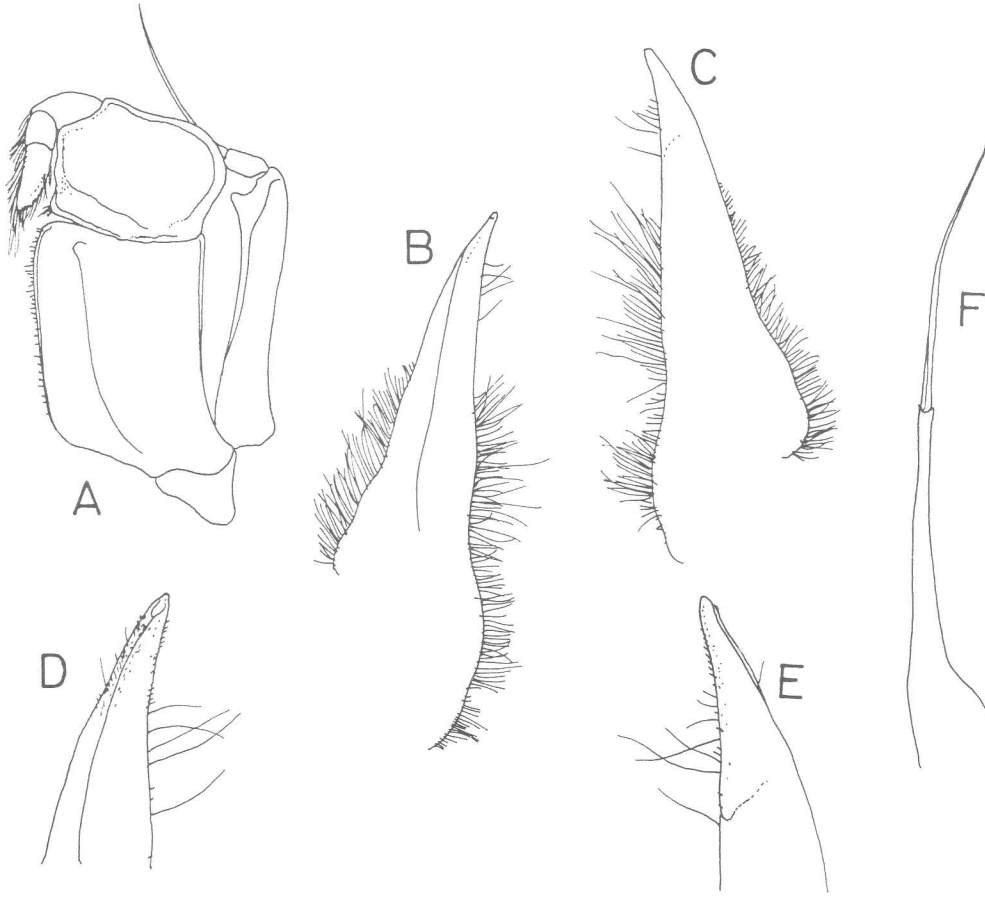

Fig. 12. *Parathelphusa quadrata*, new species. Holotype male (23.8 by 17.6 mm) (ZRC 1985.2105). A, left third maxilliped; B, dorsal view of left G1; C, ventral view of left G1; D, dorsal view of left G1 terminal segment; E, ventral view of left G1 terminal segment; F, left G2.

Paratypes - 4 males, 3 females (MZB 1209), 1 female (ZRC 1985.2106) (ex. MZB), same data as holotype.

Diagnosis. - Carapace transverse, distinctly wider than long, dorsal surfaces smooth, convex, but not strongly inflated; epibranchial teeth well developed, second epibranchial tooth directed obliquely outwards; external orbital tooth triangular; posterolateral almost straight. Ambulatory meri with sharp subterminal spine. G1 stout, outer margin slightly sinuous, directed outwards, without trace of proximal cleft, tip relatively sharp; G2 with long distal segment, subequal to basal segment.

Etymology. - The name "quadrata" is derived from the shape of the carapace of this species.

Remarks. - Specimens from Lombok, while superficially resembling young *P. convexa* De Man, 1879, externally, are nevertheless quite different from that Javanese species in several key features. Compared to equivalent sized specimens of *P. convexa*, the dorsal surfaces of the carapaces of the Lombok specimens are distinctly flatter, the epigastric and postorbital cristae are closer to the frontal and supraorbital margins, the epibranchial teeth are better developed (the second being distinctly directed obliquely outwards, not forwards), and the anterolateral and posterolateral margins are less convex. The outer margin of the G1 of the Lombok specimens is also less sinuous, and lacks the distinct cleft on the proximal part of the subterminal segment. These Lombok specimens clearly belong to a distinct species and is here recognised as new, *P. quadrata*.

Another very different looking species, *P. lombokensis* Bott, 1970, is known from Lombok, but this species can easily be separated by its anterolateral margin possessing two broad and very uneven lobes (including the external orbital angle). The G1 of *P. lombokensis* is also distinctly more slender and is directed upwards.

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I thank Lipke Holthuis and Charles Fransen (RMNH) as well as Daisy Wowor (MZB) and Charles Leh (SM) for making available the specimens in their respective collections and their kind help. Satish Choy kindly passed the type of the new *Terrathelphusa* to him for study. Most of the photographs were taken by Mr. H. K. Yip. This study is partially supported by grant RP 950326 from the National University of Singapore.

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