Invertebr. Taxon., 1992, **6**, 741–68

The Potamidae and Parathelphusidae (Crustacea : Decapoda : Brachyura) of Hong Kong

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Abstract

The taxonomy of three freshwater crabs from Hong Kong is discussed. Two poorly known potamid species, *Potamon anacoluthon* Kemp, 1918, and *Potamon hongkongensis* Shen, 1940, are referred to *Cryptopotamon*, gen. nov., and *Nanhaipotamon* Bott, 1968, respectively. The taxonomic problems associated with the genus *Nanhaipotamon* are briefly reviewed. The identity of the parathelphusid *Somanniathelphusa sinensis* (H. Milne Edwards, 1853) is clarified on re-examination of the types, and two new species, *S. falx* (from China) and *S. zanklon* (from Hong Kong), are described. Notes on the general biology of the three Hong Kong species are also provided.

Introduction

The freshwater crab fauna of China is very diverse, and some 160 species and subspecies of Potamidae Ortmann, 1896 *sensu* Ng, 1988, and Parathelphusidae Alcock, 1910 *sensu* Bott, 1970, are known (Dai Ai Yun, personal communication). The identities and taxonomic positions of the two known Hong Kong potamids, *Potamon* (*Potamon*) *anacoluthon* Kemp, 1918, and *Potamon* (*Potamon*) *hongkongensis* Shen, 1940, however, are unclear. Bott (1970*b*), in his revision of the Asiatic potamid fauna, did not treat either *Potamon anacoluthon* or *P. hongkongensis*. Dai and Chen (1987) suggested that *P. hongkongensis* was only a subspecies of *Nanhaipotamon formosanum* (Parisi, 1916), although they did not examine any specimens. *Potamon anacoluthon* had not been reported since its original description. There is also some uncertainty as to the identity of the lowland freshwater crab *Somanniathelphusa sinensis* (H. Milne Edwards, 1853) (Parathelphusidae). The species was described from unspecified localities in China, and the taxonomically important male first gonopod of the type material has never been figured.

On the basis of fresh material, both potamid species are here redescribed and their generic classification is clarified. *Potamon anacoluthon* is referred to a new genus, *Cryptopotamon*, which is allied to *Sinolapotamon* Tai & Sung, 1975, whereas *Potamon hongkongensis* is recognised as a distinct species of *Nanhaipotamon* Bott, 1968. Opportunity is also taken to briefly review the confused taxonomy of *Nanhaipotamon* and its constituent species.

The material of *Somanniathelphusa sinensis* (H. Milne Edwards, 1853) in the Paris Museum that has been labelled as types was from two collectors: Callery and Jouan. Callery's specimens, however, as the present study shows, are not conspecific with Jouan's. One of Callery's specimens is designated the lectotype of *S. sinensis*. The two specimens collected by Jouan belong to a different species, described here as *S. falx*, sp. nov. The specimens of *Somanniathelphusa* from Hong Kong are also different from *S. sinensis* (H. Milne Edwards, 1953), and are here described as new, *S. zanklon*.

0818-0164/92/030741$10.00

The abbreviations G1 and G2 are used for the male first and second pleopods respectively. All measurements, in millimetres, are of the carapace width and length respectively. The terminology used here follows that used by Ng (1988). Specimens are deposited in the Zoological Reference Collection (ZRC), Department of Zoology, National University of Singapore. Voucher specimens have also been deposited at the Muséum National d'Histoire Naturelle (MP), Paris, France, and the Academia Sinica (AS), Beijing, People's Republic of China.

Systematics

Family **POTAMIDAE** Ortmann

Genus *Nanhaipotamon* Bott

Nanhaipotamon Bott, 1968*a*: 124.—Bott, 1970*b*: 195; Dai and Chen, 1987: 30.

Type species: *Geothelphusa formosana* Parisi, 1916 (by original designation). The gender of the genus is neuter.

Diagnosis

Carapace inflated, surfaces smooth. Epigastric cristae low, indistinct; postorbital cristae well developed but blunt, confluent with epibranchial teeth. Anterolateral margins strongly convex, epibranchial tooth when distinct, blunt, forming distinct junction with acutely triangular external orbital angle; tooth sometimes appearing almost confluent with anterolateral margin. Third maxilliped with short but distinct flagellum. Male abdomen triangular, lateral margins of 7th segment slightly concave or almost straight. G1 relatively stout, almost straight; subterminal segment with relatively broad base tapering to a slender distal part; terminal segment cone-shaped, distinctly tapered, as long as or shorter than half length of subterminal segment, dorsal part may be extremely dilated to form flattened triangular sail-like structure; tip sharp or rounded; groove for G2 distinctly ventral throughout almost entire length. G2 with long distal segment.

Distribution

Hong Kong, China and Taiwan.

Discussion

Nanhaipotamon Bott, 1968, was originally established as one of the three subgenera of *Isolapotamon* Bott, 1968, with three species: *I.* (*N.*) *formosanum formosanum* (Parisi, 1916) (type species) (Taiwan), *I.* (*N.*) *formosanum globosum* (Parisi, 1916) (Okinawa, Ryukyu Is, southern Japan), and *I.* (*N.*) *balssi* Bott, 1968 (Mindoro, Philippines). Bott (1970*b*) raised *Nanhaipotamon* to full generic level, and regarded *Potamon hainanense* Parisi, 1916, as a junior synonym of *N. formosanum formosanum*. Minei (1973) described *N. yaeyamense* from the Ryukyu Is (see also Sakai 1976). Dai and Lin (in Dai *et al.* 1979) added another new species, *N. angulatum*, from Fujian Province in China. This was followed by the description of *N. obtusum* Dai & Chen, 1979 (Fujian Province). Dai and Chen (1979) also reported *N. formosanum formosanum* from Fujian Province. Dai and Chen (1987) reviewed the genus *Nanhaipotamon* from China, describing two new species, *N. ramipodum* and *N. planopodum* (both from Fujian Province), and relegating one of Shen's (1940*b*) species to a subspecies of *N. formosanum*, *N. f. hongkongense*.

Nanhaipotamon, as defined by Bott (1968*a*, 1970*b*) was characterised as having a short G1 with a flattened terminal segment. A classification based entirely on the G1, however, is unsatisfactory. While *N. formosanum formosanum*, *N. formosanum hongkongense*, *N. angulatum*, *N. obtusum*, *N. ramipodum* and *N. planopodum* clearly belong together in one group, *N. balssi* and *N. yaeyamense* certainly do not. With regard to *N. balssi*, the carapace and G1 morphology differ significantly from those of *N. formosanum*. In fact, the only characters shared by *N. balssi* and *N. formosanum* are the short G1 and its terminal segment.

There are also some serious problems with what Bott (1968*a*, 1970*b*) calls *N. formosanum* and *N. globosum* because Bott had not examined Parisi's (1916) original material. For *N. formosanum*, Bott (1968*a*, 1970*b*) had only one male specimen from 'Kagi, Formosa' from the Berlin Museum, whereas for *N. globosum*, he had material from Okinawa (Ryukyu Is), Hong Kong and southern China. Froglia and Grippa (1986) redescribed the type specimens of *Potamon formosanum* Parisi, 1916, and depicted a G1 very different from that figured by Bott (1968*a*, 1970*b*) which was much shorter and different in shape. Hwang and Mizue (1985) figured the G1 of *N. formosanum* from fresh Taiwanese specimens and their figures agree with those of Froglia and Grippa (1986). The different G1 of *N. formosanum* s. str., however, does not significantly change the generic diagnosis or composition of *Nanhaipotamon*, for which *N. formosanum* s. str. is the designated type species. It would appear that Bott's (1968*a*, 1970*b*) specimen of '*N. formosanum*' in the Berlin Museum represents an undescribed species of *Nanhaipotamon*. Although the Berlin Museum specimen is labelled as being from Taiwan, only one Taiwanese *Nanhaipotamon* is known at present and that is *N. formosanum* s. str.

Froglia and Grippa (1986) also showed that *Potamon globosum* Parisi, 1916, is very different from what Bott (1968*a*, 1970*b*) had referred to this species. The G1 of Parisi's types of *P. globosum* is clearly not that of a *Nanhaipotamon*, but resembles that of *Potamon orientalis* Parisi, 1916, instead (cf. Bott 1970*b*; Froglia and Grippa 1986). Bott (1970*b*) had referred *Potamon orientalis* to the genus *Ranguna* Bott, 1966. *Potamon globosum* must thus, be transferred out of *Nanhaipotamon*, and, if Bott (1970*b*) is followed, should be transferred to *Ranguna* instead.

There are, however, serious taxonomic problems with *Ranguna*. Türkay and Naiyanetr (1987) showed that the type species of *Ranguna* had been incorrectly identified by Bott (1966, 1970*b*), and *Ranguna* is, in fact, a subjective junior synonym of *Potamiscus* Alcock, 1909 (see Türkay and Naiyanetr 1989; Holthuis 1990; Ng 1990; ICZN 1991, Opinion 1640). The classification of the Chinese, Indo-Chinese and Thai potamids previously placed in *Ranguna* is in need of revision. As a result, the generic placements of both *Potamon orientalis* Parisi, 1916, and *P. globosum* Parisi, 1916, s. str. remain unclear.

The identity of what Bott (1968*a*, 1970*b*) calls *N. globosum* is uncertain. Froglia and Grippa (1986) noted that one specimen of Parisi's type series had been donated to the Munich Museum; the G1 of this specimen was figured by Balss (1937). The figure of the G1 by Balss agrees well with those of Froglia and Grippa (1986), but not with those of Bott (1968*a*, 1970*b*). Bott (1970*b*) had indicated that the photograph of the whole animal (his pl. 57, fig. 84) was that of a paratype male in the Munich Museum, but did not indicate the origin of the G1 (his pl. 41, fig. 84). Bott (1970*b*) had also examined a male and female from Hong Kong in the Berlin Museum and he could have figured the G1 from those specimens. This is possibly what happened because the G1 figured by Bott, purportedly of *N. globosum*, is similar to that of *Potamon hongkongensis* Shen, 1940, a species not treated by Bott (1970*b*) (see later) and classified at present in *Nanhaipotamon*.

Potamon (*Potamon[a]utes*) *hainanense* Parisi, 1916, is certainly not synonymous with *N. formosanum formosanum*, as suggested by Bott (1970*b*). Parisi's species was described from only one female, but Balss (1937) figured the G1 of a topotypic 49·0×37·0 mm male. Balss' (1937) specimen is much larger than Bott's (1970*b*) specimen of *N. formosanum formosanum* (34·0×27·0 mm), but its G1 appears to be less developed. The carapace features of *P. hainanense* differ from *N. formosanum formosanum* significantly, the external orbital angle being much broader, the anterolateral margin more serrated, and the surfaces distinctly more rugose. Froglia and Grippa (1986) redescribed *Potamon hainanense* with good figures of the external features and G1. *Potamon hainanense* is clearly a valid species, but cannot be retained in *Nanhaipotamon* because of its very different carapace morphology. The G1 and carapace, however, strongly suggest its placement in *Tenuilapotamon* Dai (in Dai *et al.* 1984), and it is transferred there for the moment.

The present study of specimens of Shen's (1940*b*) *Potamon hongkongensis* shows that it is sufficiently different from *N. formosanum* s. str. to warrant its recognition as a distinct species. Minei's (1973) new species, *N. yaeyamense*, was separated from *N. formosanum* and *N. globosum* (both *sensu* Bott 1970*b*) by the form of the cheliped fingers, and the G1

being slender (not stout), its G1 terminal segment short, tapered, curved outwards, the distal part hook-like, and much shorter than half the length of the subterminal segment. The present authors are more inclined to believe that *N. yaeyamense* is closer to crabs of the genus *Geothelphusa* Stimpson, 1858, especially with regard to the general form of the G1, and that it should be referred to a new genus.

With respect to Dai and Chen's (1979) record of *N. formosanum formosanum* from Fujian Province on mainland China, their specimens appear to belong to an undescribed species. Dai and Chen (1979) commented that Fujian was quite near Taiwan, the type locality of *N. formosanum*, being separated only by a narrow stretch of sea. Although Bott's (1968*a*, 1970*b*) G1 figures of *N. formosanum* are unlikely to be of that species, those by Hwang and Mizue (1985) and Froglia and Grippa (1986) suggest that the Chinese specimens are probably different from those in Taiwan. This matter, however, can only be resolved by a careful revision of *Nanhaipotamon* and all its constituent species, a study beyond the scope of the present paper.

With respect to *N. balssi*, a new genus should be erected to accommodate it. It differs from *Nanhaipotamon* s. str. in having a flatter and more quadrilateral carapace (the dorsal surfaces of which are more rugose), lower and less developed epigastric and postorbital cristae, a more narrow male abdomen which reaches beyond the base of the chelipeds (very close to the suture between sternites 2 and 3), and a more sinuous G1.

The genus *Nanhaipotamon*, as recognised here, is restricted to the following species: *N. formosanum* (Parisi, 1916), *N. hongkongense* (Shen, 1940), *N. angulatum* Dai & Lin, 1979, *N. obtusum* Dai & Chen, 1979, *N. ramipodum* Dai & Chen, 1987, and *N. planopodum* Dai & Chen, 1987. An emended generic diagnosis has been provided above. *Nanhaipotamon globosum* (Parisi, 1916) is referred back to *Potamon*. s. l., *N. yaeyamense* to an unnamed new genus, *P. hainanense* Parisi, 1916, to *Tenuilapotamon* Dai (in Dai *et al.* 1984), and *N. balssi* Bott, 1969, is transferred from *Nanhaipotamon* Bott, 1968 to a yet unnamed genus.

Nanhaipotamon hongkongense (Shen)

(Figs 1, 2, 3*A*)

Potamon (*Potamon*) *hongkongensis* Shen, 1940*a*: 213, 229 (nomen nudum).
Potamon (*Potamon*) *hongkongensis* Shen, 1940*b*: 255, figs 1–5.
Potamon globosum.—Pretzmann, 1963: 367 [not *Potamon* (*Geothelphusa*) *globosa* Parisi, 1916].
Nanhaipotamon formosanum globosum.—Bott, 1968*a*: 125 (part); Bott, 1970*b*: 196 (part) [not *Potamon* (*Geothelphusa*) *globosa* Parisi, 1916].
Nanhaipotamon formosanum hongkongense.—Dai and Chen, 1987: 30.

Material Examined

1♂ (ZRC 1991.1776), Nai Chung stream, New Territories, Hong Kong, coll. Mar. 1981; 1♀ (ZRC 1991.1777), nr Victoria Peak, Hong Kong island, coll. D. Dudgeon, June 1987; 2♂, 3♀, 1 juv. (ZRC 1991.1778–1783), 1♂ (AS), Tai Po Kau Forest Reserve, New Territories, Hong Kong, coll. P. K. L. Ng, June 1991.

Description

Carapace squarish, high, surfaces smooth, distinctly convex transversely and longitudinally. Epigastric cristae very low, barely visible, separated by narrow furrow; postorbital cristae distinct, relatively sharp, confluent with epigastric cristae and epibranchial tooth. Cervical grooves shallow. H-shaped depression visible but grooves shallow. Frontal margin distinctly deflexed, almost straight; confluent with smooth supraorbital margin; external orbital angle sharp, acutely triangular, tip not projecting beyond frontal margin; inner margin slightly shorter than length of outer, outer margin almost straight, not confluent with epibranchial tooth. Epibranchial tooth distinct but blunt. Anterolateral margin strongly convex, junction of anterolateral and posterolateral margins indistinct; posterolateral margins strongly converging. Exopod of third maxilliped reaching half length of merus, with short flagellum not reaching half width of merus; merus squarish, with deep submedian sulcus.

Chelipeds asymmetrical in adults of both sexes, outer surfaces of both chelae smooth. Carpus with well-developed strong spine on inner distal margin, armed with small spine at the base. Fingers of large and small chela subequal or longer than palm, not gaping when closed, with numerous blunt teeth and denticles along cutting edges.

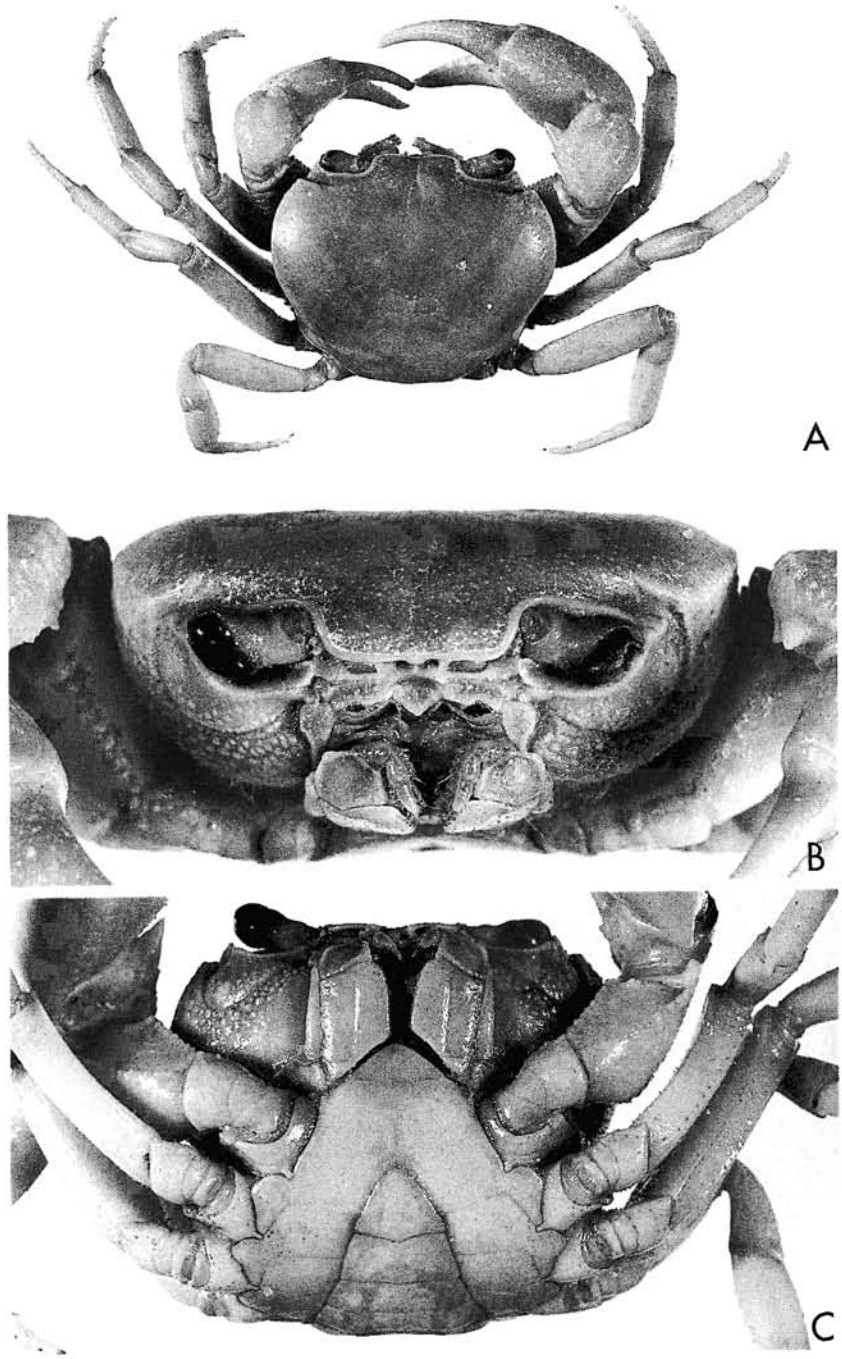


Fig. 1. *Nanhaipotamon hongkongense* (Shen, 1940). Male, 28·2×23·6 mm (ZRC 1991.1776), Hong Kong: *A*, dorsal view; *B*, frontal view; *C*, ventral view.

Ambulatory legs relatively long; second pair of ambulatory legs longest, merus smooth, without dorsal subterminal spines.

Suture between second and third male sternites gently concave (towards mouth), suture between third and fourth sternites not visible. Male abdominal cavity reaches imaginery line joining posterior edges of bases of chelipeds. Male abdomen broadly triangular, seventh segment distinctly triangular, lateral margins of seventh segment straight or slightly convex.

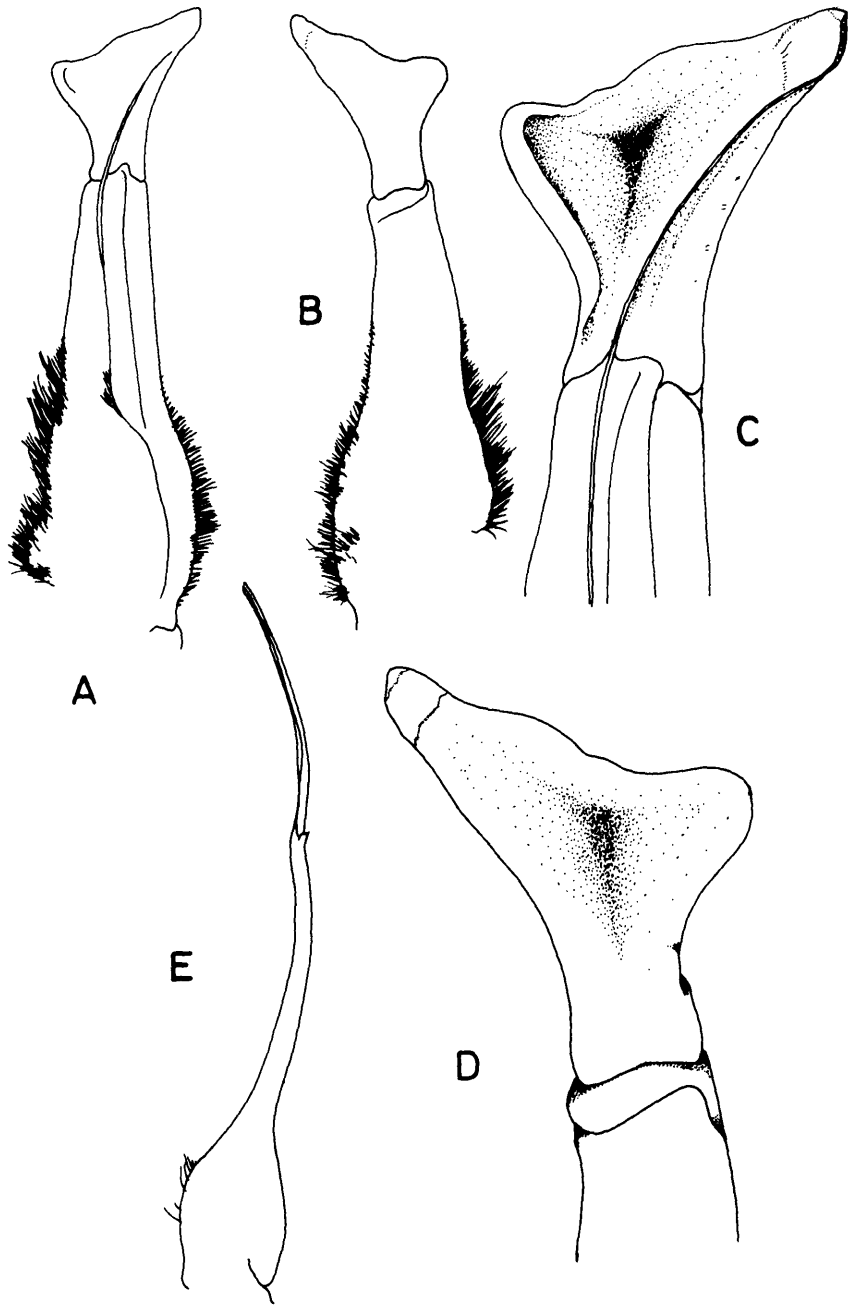


Fig. 2. *Nanhaipotamon hongkongense* (Shen, 1940). Male, 28·2×23·6 mm (ZRC 1991.1776), Hong Kong: *A–D*, left G1; *C*, *D*, G1 terminal segment; *E*, left G2. *A*, *C*, ventral view; *B*, *D*, dorsal view.

G1 stout, straight; terminal and subterminal segments clearly demarcated; terminal segment 0·34× length of subterminal segment, dorsal part dilated to form broad and high structure, tip directed laterally, groove for G1 visible ventrally. G2 with long distal segment, longer than half length of basal segment.

Distribution

Known only from Hong Kong.

Discussion

The present series of specimens agrees with Shen's (1940*b*) descriptions very well. The spelling of the name of the species should be amended from '*hongkongensis*', as originally used by Shen (1940*a*, 1940*b*): the gender of *Nanhaipotamon* is neuter, and the species name, derived from the type locality Hong Kong, should be corrected to '*hongkongense*' accordingly.

The G1 of *N. hongkongense* superficially resembles that of *N. formosanum* s. str., but the terminal segment in *N. hongkongense* is longer, with the dorsal fold much more pronounced and auriculiform. Dr Dai Ai Yun was kind enough to send the first author detailed figures of all the known Chinese species for detailed comparison.

Shen (1940*a*) first used the name '*Potamon hongkongensis*' in his paper documenting the brachyuran fauna of Hong Kong. He listed one male and one female (the types) collected by G. A. C. Herklots of the University of Hong Kong in 1930. No depository was cited, and no descriptions or figures were provided, but Shen (1940*a*) cited another paper by himself ('Shen, 1940, pp. 255–257') in the synonymy of '*Potamon hongkongensis*'. The paper by Shen (1940*b*: 255–257), however, appears later in the same volume as Shen's 1940*a* paper. It would appear that the paper by Shen (1940*b*) was supposed to have been printed first before his 1940*a* paper, but a mistake was made in the sequence of publication. The name '*Potamon hongkongensis*', as appears in Shen (1940*a*), is thus a *nomen nudum*.

The whereabouts of the two type specimens of *Nanhaipotamon hongkongense* are not known. They do not appear to be in Hong Kong or China, and are presumably lost.

Pretzmann (1963) referred several specimens from Hong Kong in the Berlin Museum to *Potamon globosum* Parisi, 1916, commenting that the gonopods of this species were similar to those of what Shen (1940*a*, 1940*b*) described as a new species, *Potamon hongkongensis*. The G1 figured by Shen (1940*b*) agrees very well with what is described here. Bott (1968*a*,

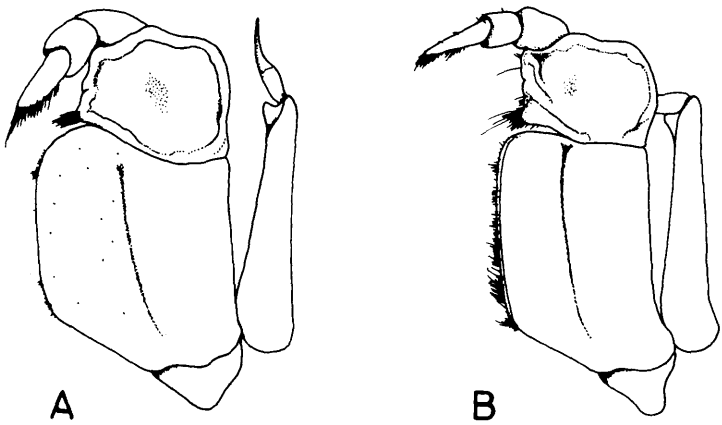


Fig. 3. Left third maxillipeds: *A*, *Nanhaipotamon hongkongense* (Shen, 1940), male, 28·2×23·6 mm (ZRC 1991.1776), Hong Kong; *B*, *Cryptopotamon anacoluthon* (Kemp, 1918), male, 27·9×23·1 mm (ZRC 1991.1784), Hong Kong.

1970*b*) re-examined these specimens from Hong Kong, identified them as *P. globosum* Parisi, 1916, and transferred the species to his new genus *Nanhaipotamon*. Bott (1968*a*, 1970*b*) appeared, however, to have overlooked Shen's (1940*a*, 1940*b*) papers describing *Potamon hongkongensis*. As discussed above, it is possible that the G1 he figured as '*Nanhaipotamon globosum*' could have been *N. hongkongense* instead. The actual *P. globosum* Parisi, 1916, is here transferred out of *Nanhaipotamon*.

General Biology

In life, larger specimens of *N. hongkongense* are bright red dorsally. Smaller specimens are dark to reddish brown. The species is found predominantly in secondary forest above 100 m above sea level. It is very terrestrial, and rarely occurs in the water proper, inhabiting the dry areas beyond the banks of streams. In Tai Po Kau Forest Reserve, they are most common at the base of embankments, especially near roots and large rocks. They excavate gradually sloping burrows, and are difficult to dig out. During rain, the adult crabs move freely from their burrows, even during daylight. Smaller crabs and juveniles appear to stay closer to pools or patches or wet ground. In captivity, the crabs are agile, climbing semi-vertical surfaces with little effort. The crab has the habit of directing the last pair of ambulatory legs over the back of the carapace when it is in a corner or in a narrow vial. As with most potamids, they are aggressive, particularly to conspecifics, and specimens cannot be kept together in confined spaces.

Nanhaipotamon hongkongense can be found around (sometimes in) the streams inhabited by *Cryptopotamon anacoluthon*, but the primary niches of both species appear different, with *N. hongkongense* being more terrestrial.

Cryptopotamon, gen. nov.

Type species: *Potamon* (*Potamon*) *anacoluthon* Kemp, 1918, here designated.

Diagnosis

Carpace gently convex, surfaces smooth, sometimes covered with short stumps of hair. Epigastric cristae weak, not sharp; postorbital cristae absent; external orbital angle triangular, outer margin strongly convex, rounded, lined with numerous small granules. Epibranchial tooth well developed, sharp, triangular, separated from external orbital angle by prominent deep V-shaped notch. Anterolateral margin cristate, lined with numerous small rounded granules. Third maxilliped with well-developed slender flagellum. Male abdomen triangular, lateral margins straight or slightly convex, lateral margins of 7th segment concave. G1 slender, subterminal segment gradually tapering from relatively broad base to narrow distal part, distal part of terminal segment dilated to form fan-like structure, longer than half length of subterminal segment. G2 with distinct distal segment.

Distribution

Hong Kong.

Discussion

Tai and Sung (1975) established the genus *Sinolapotamon*, for *Potamon* (*Geothelphusa*) *patellifer* Wu, 1934. The genus was characterised by the dilated and fan-like distal portion of the terminal segment of G1. The present new genus is allied to *Sinolapotamon* Tai & Sung, 1975, in this respect. In almost all other external features, however, the type species of *Sinalopotamon*, *S. patellifer*, differs from *P. anacoluthon* so substantially (see Table 1), that *S. patellifer* and *P. anacoluthon* cannot be congeneric. The new genus, *Cryptopotamon*, is thus established for *Potamon* (*Potamon*) *anacoluthon* Kemp, 1918.

Etymology

The genus is named for the Greek 'kryptos' for hidden and 'Potamon', alluding to the poorly known affinities of the type species, *Potamon anacoluthon*. The gender is neuter.

Table 1. Differences between *Cryptopotamon*, gen. nov. and *Sinolapotamon* Tai & Sung, 1975

Cryptopotamon	*Sinolapotamon*
Dorsal surface of carapace gently convex, not inflated	Dorsal surface of carapace strongly inflated
Epigastric cristae triangular, weak	Epigastric cristae truncate, strong
Postorbital cristae absent	Postorbital cristae distinct, confluent with epigastric cristae and epibranchial tooth
Epibranchial tooth well developed, sharp	Epibranchial tooth low, rounded, poorly developed
Epibranchial tooth separated from external orbital angle by deep V-shaped notch	Epibranchial tooth not separated from external orbital angle by notch, both structures almost confluent
G1 terminal segment 0·85× length of subterminal segment	G1 terminal segment 0·67× length of subterminal segment

Cryptopotamon anacoluthon (Kemp)

(Figs 3*B*, 4, 5)

Potamon (*Potamon*) *anacoluthon* Kemp, 1918: 243, fig. 5.—Gee, 1925: 161, Wu, 1934: 339; Shen, 1940*b*: 229.

Material Examined

1♂ (ZRC 1991.1784), 27·9×23·1 mm, Tai Po Kau Forest Reserve stream, New Territories, Hong Kong, coll. D. Dudgeon, Aug. 1980; 1♂ (AS), stream at Wu Kwai Sha, New Territories, Hong Kong, coll. D. Dudgeon, 24.iii.1983; 3♂ (ZRC 1991.1785–1787), Tai Po Kau Forest stream, New Territories, Hong Kong, coll. D. Dudgeon, 30.iv.1981; 3♂, 5♀ (ZRC 1991.1788–1795), stream at Wu Kwai Sha, New Territories, Hong Kong, coll. D. Dudgeon, Mar. 1986; 5♂, 1♀, 1 juv. (ZRC 1991.1786–1802), in fish trap, Kwun Yum Shan stream, New Territories, Hong Kong, coll. D. Dudgeon, 2.xi.1989; 5♂, 3♀, 2 juvs (ZRC 1991.1803–1812), 1♂, 1♀ (MP), Tai Po Kau Forest stream, New Territories, Hong Kong, coll. D. Dudgeon, Apr. 1984; 6♂, 2♀ (ZRC 1991.1813–1820), Tai Po Kau Forest Reserve stream, New Territories, Hong Kong, coll. P. K. L. Ng and D. Dudgeon, June 1991.

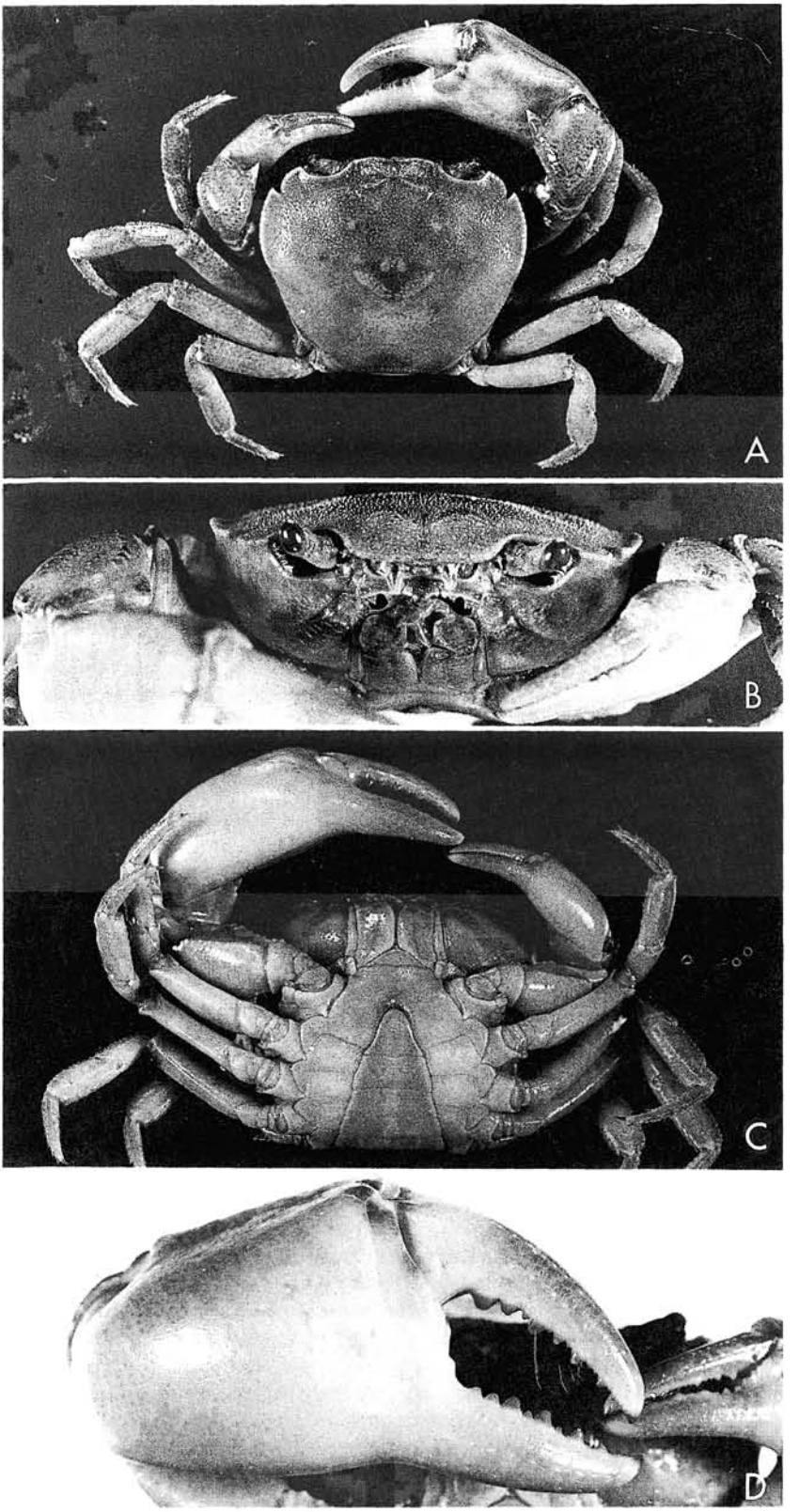
Description

Carapace broader than long, surfaces not distinctly inflated, gently convex transversely, smooth, occasionally with numerous very small stumps of hair, appearing punctate. Epigastric cristae distinct but relatively weak, sloping posteriorly, separated by narrow furrow; postorbital cristae not visible. Cervical grooves very shallow, indistinct; H-shaped depression visible but grooves shallow. Frontal margin gently sinuous; confluent with smooth supraorbital margin. External orbital angle truncate, tip not projecting beyond frontal margin; inner margin shorter than half length of outer, outer margin convex, lined with numerous small blunt granules, separated from epibranchial tooth by deep, V-shaped cleft. Epibranchial tooth sharp, well developed. Anterolateral margin slightly cristate, gently convex, lined with numerous small blunt granules, clearly demarcated from converging posterolateral margin. Exopod of third maxilliped reaching half length of merus, with long flagellum exceeding width of merus; merus quadrilateral, with deep submedian sulcus.

Chelipeds strongly asymmetrical in larger males, outer surfaces of both chelae smooth. Carpus with well-developed strong spine on inner distal margin, armed with a small spine at the base; upper surface with weak row of low granules adjacent to inner edge. Fingers of smaller chela subequal or slightly longer than palm, not gaping when closed, with numerous denticles along cutting edges; fingers shorter than palm in larger chela, distinctly gaping when closed, cutting edges lined with large and small blunt teeth.

Second pair of ambulatory legs longest, margins of all segments slightly cristate. Merus with distinct dorsal subterminal spine.

Suture between male second and third sternites gently convex (towards mouth), suture between third and fourth sternites indistinct, marked by shallow groove. Male abdominal


A
B
C
D

cavity reaches imaginary line joining median points of bases of chelipeds. Male abdomen triangular, seventh segment triangular with lateral margins distinctly concave.

G1 relatively stout, straight; terminal and subterminal segments clearly demarcated; terminal segment 0·85 × length of subterminal segment, broadly dilated to form broad, dilated structure. G2 with well-developed distal segment, longer than half length of basal segment.

Distribution

Known only from Hong Kong.

Discussion

The species was described from two specimens (one male 17·8 × 14·6 mm; one female, 19·9 × 17·3 mm, both syntypes, in the Zoological Survey of India, Calcutta, India, No. 9475/10) obtained by Annandale from the Peak (= Victoria Peak) in Hong Kong (*fide* Kemp, 1918: 243).

The present specimens from Tai Po Kau and other areas in Hong Kong agree quite well with the original descriptions of Kemp (1918), except that several of the males, being larger than the type male, have one of their chelipeds enlarged. The chelipeds of smaller males and females are symmetrical. The dorsal surface of the carapace of small specimens may be covered with small tufts of hair; however, in larger crabs, these tufts are so sparse that the carapace appears punctate or even smooth.

General Biology

Cryptopotamon anacoluthon appears to be most numerous in shaded shallow streams with clear, fast-flowing water, rocky substratum, and accumulations of leaf-litter, which serve as shelter and food. The water is often tea-coloured, with a pH of 6·5–7·0. It is never found in polluted waters and seems to be relatively stenotopic. Annandale's specimens were obtained from '... under large stones at the edge of a small stream at an altitude of 2000 ft' (Kemp 1918: 245). Large specimens have been observed preying upon the aquatic snail *Brotia hainanensis* (Brot), which is attacked via the operculum without damage to the shell.

For a potamid, *C. anacoluthon* is unusually timid, and specimens can be kept together without too much damage to each other (see Ng 1988). The colour patterns vary from uniform dark brown to a more orangish hue, or mottled.

Family **PARATHELPHUSIDAE** Alcock

Genus *Somanniathelphusa* Bott

Somanniathelphusa Bott, 1968*b*: 407.—Bott, 1969: 365; Bott, 1970*b*: 109; Chuensri, 1974: 16; Naiyanetr, 1975: 23; Naiyanetr, 1980: 50; Naiyanetr, 1988: 4; Ng, 1988: 105.

Type species: *Parathelphusa sinensis* H. Milne Edwards, 1853 (by original designation). The gender of the generic name is feminine.

Discussion

This is a large genus of freshwater crabs typically associated with lowlands and ricefields in China, Taiwan, Burma, Laos, Cambodia, Vietnam and northern Peninsular Malaysia (see Ng 1988). Some 15 species are known (Ng 1988), but many more species remain undescribed (P. Naiyanetr, personal communication). The type species of the genus, *Parathelphusa sinensis*, is not well known and the taxonomically important G1 of the types has never been figured. A study of part of the type material in the Paris Museum has shown that two separate species, one new to science, are represented.

Fig. 4. *Cryptopotamon anacoluthon* (Kemp, 1918). Male, 27·9 × 23·1 mm (ZRC 1991.1784), Hong Kong: *A*, dorsal view; *B*, frontal view; *C*, ventral view; *D*, larger chela.

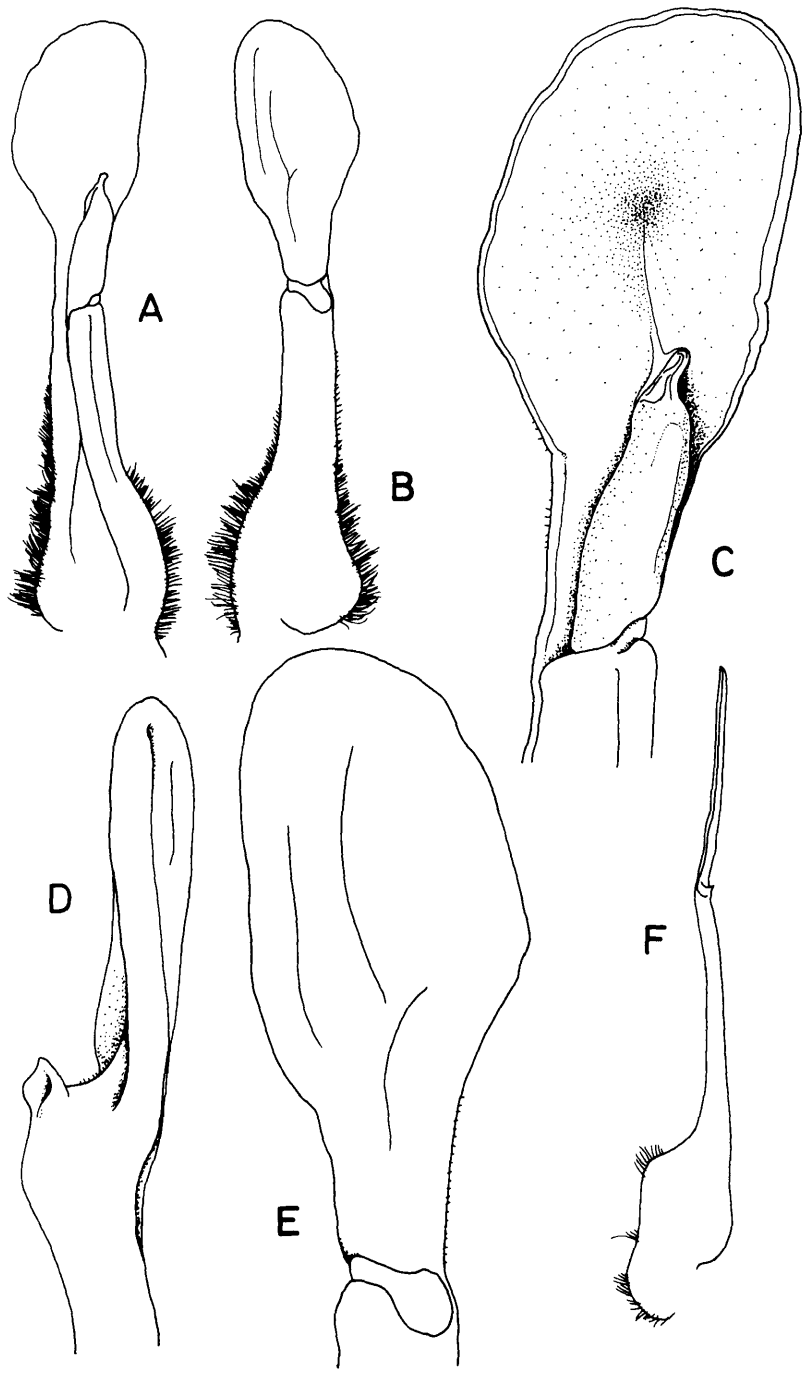


Fig. 5. *Cryptopotamon anacoluthon* (Kemp, 1918). Male, 27·9×23·1 mm (ZRC 1991. 1784), Hong Kong: *A–E*, left G1; *C–E*, G1 terminal segment; *F*, left G2. *A*, *C*, ventral view; *B*, *D*, dorsal view; *D*, lateral view.

Somanniathelphusa sinensis (H. Milne Edwards)

(Figs 6–8)

Parathelphusa sinensis H. Milne Edwards, 1853: 179.—Milne Edwards, 1854: 173, pl. 13, fig. 2; Stimpson, 1858: 101; Stimpson, 1907: 114; Balss, 1914: 408; Pretzmann, 1963: 369.

Potamon (Parathelphusa) sinensis.—Rathbun, 1905: 241 (part), pl. 11, fig. 7.

Parathelphusa (Parathelphusa) sinensis.—Gee, 1925: 159 (part); Wu, 1934: 339 (part); Balss, 1937: 145.

Somanniathelphusa sinensis sinensis.—Bott, 1968*b*: 409 (part); Bott, 1970*b*: 111 (part), pl. 30, fig. 81 (?); Tai and Sung, 1975: 170, pl. 1, fig. 1, pl. 4, fig. 14; Dai *et al.*, 1975: 258; Ng, 1988: 105 (part).

Material Examined

Lectotype (here designated). ♂, 24·9×20·4 mm (MP-B 3842S), (dried), China, coll. Callery, no date.

Paralectotypes. 1♂, 26·8×21·0 mm (dried) (MP-B 3842S), same data as lectotype; gonopods only (MP-B 3843S), same data as lectotype.

Description (of lectotype)

Carapace broader than long, surfaces convex transversely, smooth. Epigastric cristae distinct, sharp, separated by narrow groove, approximately parallel with frontal margin; postorbital cristae distinct, long, outer edges reaching bases of external orbital angles, separated from epigastric cristae by very narrow, indistinct groove, inner edge does not or barely reaches outer edge of epigastric cristae, appearing almost confluent with epigastric cristae, sloping posteriorly gradually. Cervical grooves shallow. H-shaped depression distinct. Frontal margin almost straight; confluent with smooth supraorbital margin. External orbital angle triangular, relatively sharp, inner margin longer than half length of outer, outer margin gently convex, smooth. Anterolateral margin with 3 epibranchial teeth, all directed anteriorly.

Chelipeds distinctly asymmetrical in larger males, outer surfaces of both chelae smooth. Carpus with well-developed strong spine on inner distal margin. Fingers of both chela longer than palm, fingers of smaller chela not gaping when closed, with numerous denticles along cutting edges; fingers in larger chela distinctly gaping when closed, cutting edges lined with large and small blunt teeth.

Second pair of ambulatory legs longest. Merus with distinct dorsal subterminal spine.

Male abdominal cavity reaches slightly beyond imaginary line joining anterior edges of bases of chelipeds. Male abdomen T-shaped, seventh segment broadly triangular, lateral margins distinctly concave; sixth segment subequal to seventh segment, constricted to anterior end; segments 3 to 5 progressively more trapezoidal.

G1 terminal and subterminal segments not demarcated; distal part slender, gradually curving laterally outwards, tip bifurcated; basal part broad, dilated, subquadrate, outer margin gently convex, appears almost straight. G2 with short distal segment and long basal segment.

Distribution

Known from south-western China.

Discussion

One of the major problems regarding *Potamon (Parathelphusa) sinensis* H. Milne Edwards, 1853 (made the type species of the new genus *Somanniathelphusa* by Bott 1968*b*) has been the identity of the types. This species has been reported from China and Hong Kong (Bott 1968*b*, 1970*b*; Dai *et al.* 1975; Tai and Sung 1975), but a redescription of the types was never undertaken. The type specimens were originally collected from an unspecified location in China and all the specimens are preserved dried in the Paris Museum, compounding the problem because the taxonomically very important G1s were thus not easily accessible.

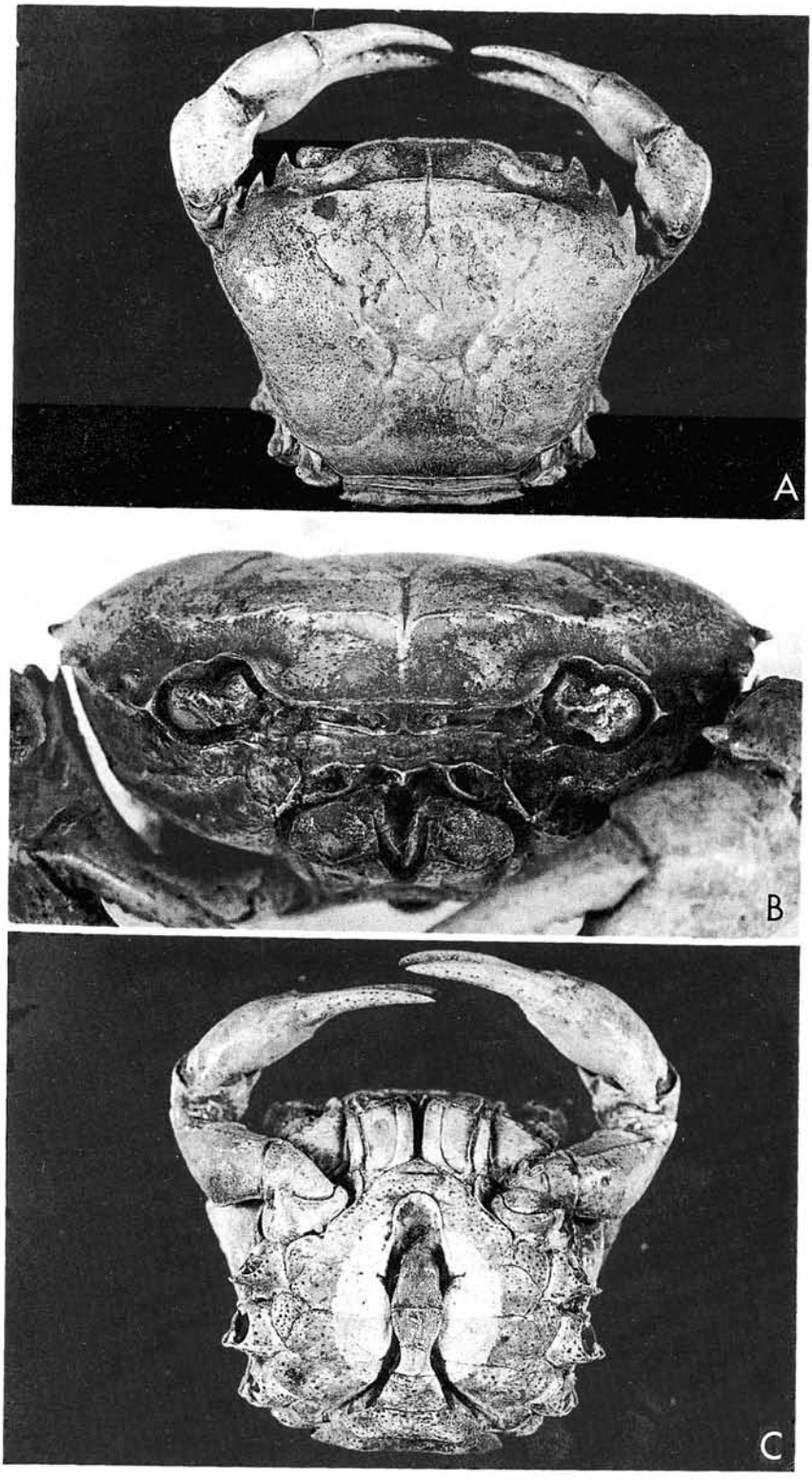


Fig. 6. *Somanniathelphusa sinensis* (H. Milne Edwards, 1853). Paralectotype male, 26·8× 21·0 mm (MP-B 3842S), China: *A*, dorsal view; *B*, frontal view; *C*, ventral view.

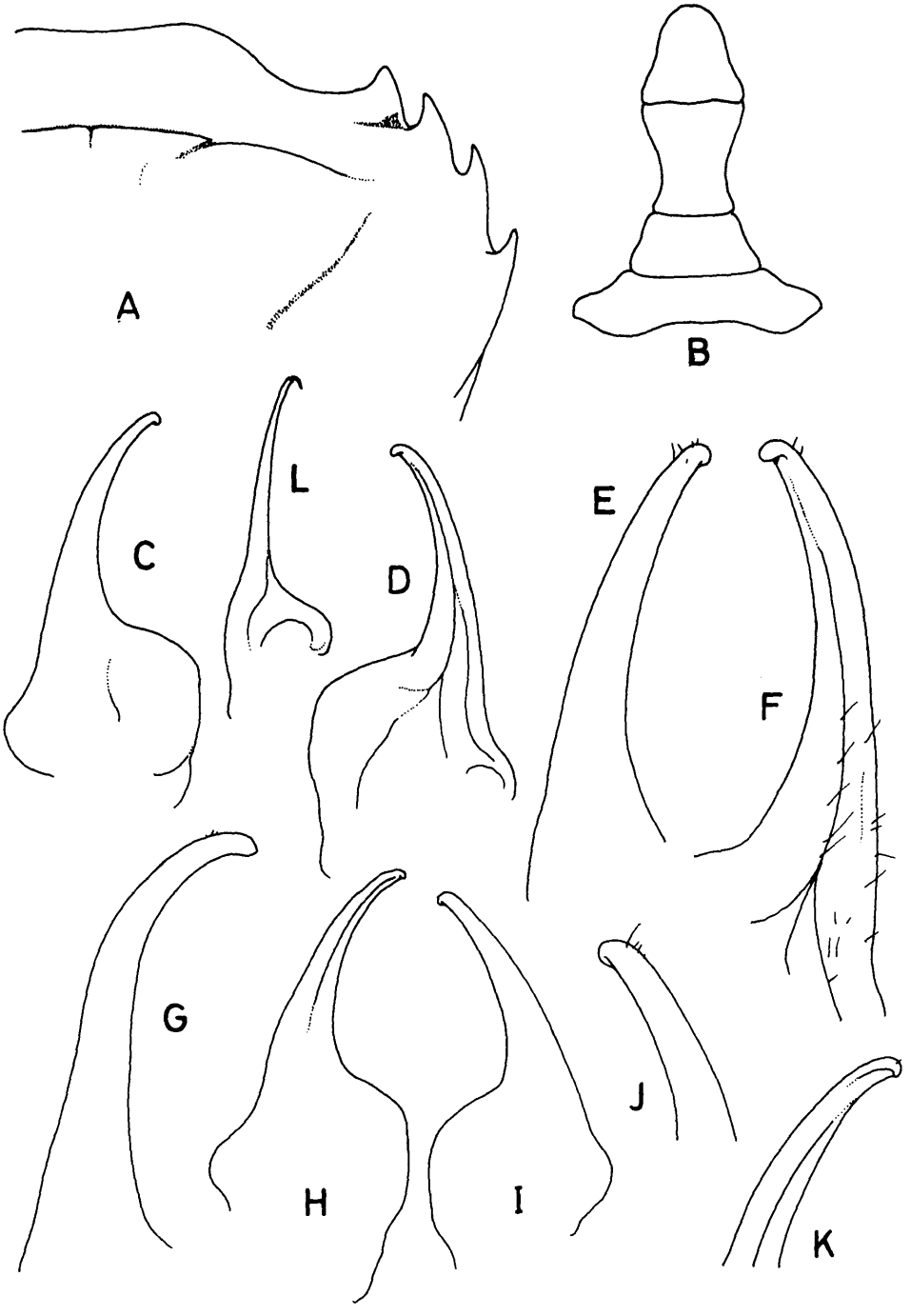


Fig. 7. *Somanniathelphusa sinensis* (H. Milne Edwards, 1853). Lectotype male, 24·9×20·4 mm (MP-B 3842S), China: *A*, right part of carapace; *B*, abdominal segments 4 to 7; *C–G*, right G1; *H–K*, left G1; *L*, right G2. *D*, *F*, *H*, *K*, ventral views; *C*, *E*, *G*, *I*, *J*, dorsal views; *E–G*, *J*, *K*, distal parts of G1; *G* drawn at a different orientation from *F*.

Dr Danièle Guinot lists the following specimens which have been labelled as types of *Parathelphusa sinensis* in the Paris Museum:

1 box with 2 males, 'Chine', Callery coll., 5-46 (MP-B 3842S);
1 box with 2 specimens, 'Chine', Callery coll., 5-46 (MP-B 3843S);
1 box with 2 specimens, 'Chine', Callery coll., 5-46 (MP-B 3844S);
1 box with 2 males, 'Chine', Jouan coll., 578-66 (MP-B 4377S).

Of these specimens, the first author has examined both males of lot MP-B 3842S (Callery coll.), one rehydrated male of MP-B 4377S (Jouan coll.) and a pair of gonopods from lot MP-B 3843S (Callery coll.).

Comparisons of the specimens of Callery and Jouan, however, reveal that lots MP-B 3842S and MP-B 4377S are not conspecific, as has been assumed, but represent two separate species. In the first description of *Parathelphusa sinensis*, Milne Edwards (1853) did not state how many specimens he had seen or who had obtained them. He did, however, refer to another paper by himself in the Archives du Muséum Histoire Naturelle (Milne Edwards 1854). In his 1854 paper, however, Milne Edwards only mentioned Callery's material, without indicating the number of specimens. All of Callery's material are thus syntypes. Rathbun (1905), in her synopsis of the world's freshwater crabs, listed four males and four females in the Paris Museum collected by Callery as types. One male and one female specimen obtained by Jouan in the Paris Museum were also listed by Rathbun (1905), but not as types. This, however, disagrees with what the Paris Museum actually holds and has listed as types (see above).

It is certain, however, that the designation of the Jouan specimens as types was done by Milne Edwards: the original box in which they were kept has a label specifically stating that the male specimens contained within are 'TYPES!' (D. Guinot, personal communication). Although Milne Edwards' (1854) paper mentions only Callery's material, he did not specify that these were the only specimens he had. Callery and Jouan appear to have been contemporaries and it is certain that Milne Edwards had examined both Callery's and Jouan's specimens when the description was being prepared (D. Guinot, personal communication). Recommendation 72B of the ICZN (1985) code states that 'If an author, in establishing a

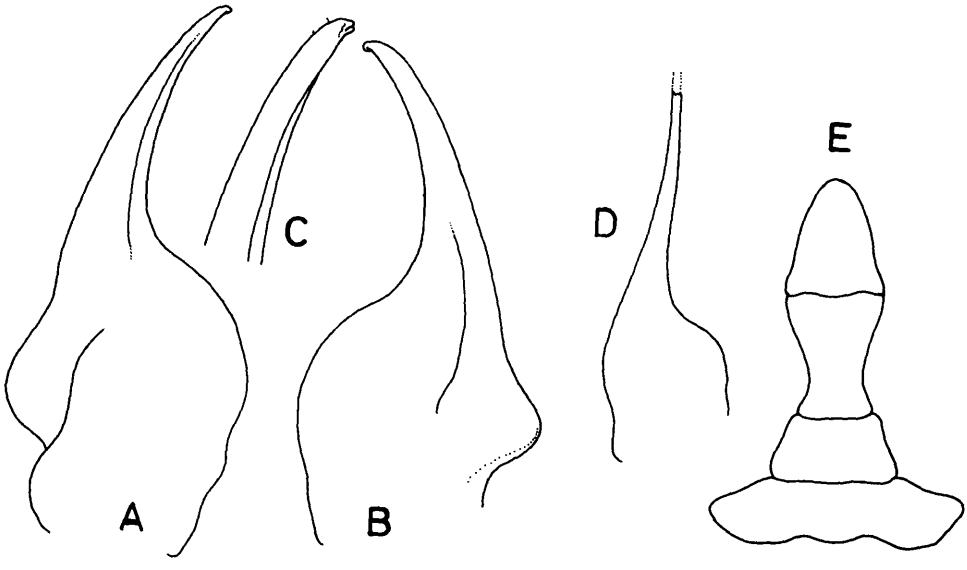


Fig. 8. *Somanniathelphusa sinensis* (H. Milne Edwards, 1853). Paralectotype males, China: *A–D*, (MP-B 3843S); *E*, 26·8×21·0 mm (MP-B 3842S). *A*, *B*, left G1; *C*, distal part of G1; *D*, left G2 (distal part broken); *A*, *C*, ventral view; *B*, dorsal view.

nominal species-group taxon, does not explicitly state what specimens constitute a type series, evidence in addition to published evidence may be taken into account in recognising type specimens (e.g. labels by the original author and specimens known to have been in appropriate collections at the appropriate time)'. Due consideration of the information supplied by Dr Guinot and ICZN Recommendation 72B, would necessitate that both Callery's and Jouan's material be treated as types of *S. sinensis*.

In any event, Callery's material agrees best with what most authors have identified as *S. sinensis*. It thus seems appropriate and in the interests of stability to designate one of Callery's specimens as the lectotype. Of the two Callery specimens examined by the first author from lot MP-B 3842S, the gonopods of the larger male cannot be discerned, and may have been removed or damaged. The G1s of the slightly smaller male, however, are intact. The smaller male specimen of Callery's (MP-B 3842S) material (24·9×20·4 mm) is hereby designated the lectotype of *Parathelphusa sinensis* H. Milne Edwards, 1853.

It is uncertain whether all of Callery's material is conspecific. The carapace of the larger male specimen in lot MP-B 3842S (26·8×21·0 mm) differs from the lectotype in that its postorbital cristae are distinctly lower than the epigastric cristae, with the inner edges extending distinctly below the outer ridge of the epigastric cristae, the sixth male abdominal segment is narrower, proportionately longer and the anterior end more strongly constricted, and the seventh male abdominal segment is proportionately longer, narrower and more acutely triangular. The G1 of the specimen from lot MP-B 3843S differs from that of the designated lectotype in having a proportionately longer distal part and a less truncate basal part. These differences suggest that even Callery's material may contain more than one species. No attempt is made here to resolve their identities as no exact locality data are available, the specimens are not well preserved and the male gonopods not always intact. The larger male of lot MP-B 3842S and specimens from lot MP-B 3843S are thus, tentatively regarded as paralectotypes of *S. sinensis* until a revision of the southern Chinese *Somanniathelphusa* species can be done.

As for Jouan's specimens (MP-B 4377S), they are here referred to another species, *Somanniathelphusa falx*, sp. nov. (see below).

Bott (1968*b*) recognised three subspecies of *S. sinensis*: *sinensis sinensis* s. str., *sinensis dugasti* (Rathbun, 1902) and *sinensis taiwanensis* Bott, 1968. Dai *et al.* (1975) described a new subspecies, *S. s. brevipodum* from China, and regarded *Parathelphusa* (*Parathelphusa*) *chongi* Wu, 1935, as a subspecies of *S. sinensis*. Ng (1988) listed all but *S. sinensis brevipodum* as distinct species. More recently, Dai (1990: 377) regarded both *S. sinensis chongi* and *S. sinensis brevipodum* as distinct species. The identity of *S. dugasti* is very confused. The specimens identified as *S. dugasti* by Bott (1968*b*, 1970*b*) and subsequent authors in fact belong to a complex of species, and the true *S. dugasti* has only recently been rediscovered in north-eastern Thailand (P. Naiyanetr, personal communication). Tai and Sung (1975) reported *S. sinensis sinensis* (with a simple figure of the G1) from various parts of southern China including Hainan I.

Some of the older records cannot be confirmed. Stimpson's (1858, 1907) material from Canton and Whampoa (both in China) might contain *S. sinensis*, but, unfortunately, his specimens are no longer extant (see Ng 1987*a*). The records of *S. sinensis* by Wood Mason (1876), Henderson (1893) and Alcock (1910) from Burma are doubtful. The same is also true for specimens reported by Balss (1914) from Annam and Tonkin (Vietnam). A re-examination of these specimens will probably show that they represent one or more undescribed species of *Somanniathelphusa*. Balss (1937) listed specimens from Hainan I. and Kapuas in west Borneo. Balss' (1937) record from Borneo is very doubtful; either he had misidentified his specimens, or, more likely, the locality data were wrong. Lanchester (1901) initially listed specimens from Singora and Tale Sap in southern Thailand as *S. sinensis*, but later (1906) referred them to a new species, *S. sexpunctata* (see also Ng and Ng 1987). Rathbun (1905) lists specimens of *S. sinensis* from Tonkin, Hanoi and Sumatra. These records must be checked, especially the Sumatran one. The genus *Somanniathelphusa* is not known to occur in insular south-east Asia (see Ng 1988).

Bott's (1968*b*, 1970*b*) records of *S. sinensis* are composite. He listed specimens from Hong Kong, Canton, Litong (China) and North Vietnam. While the Canton or Litong

specimens are possibly *S. sinensis*, those from Hong Kong are not, and are referred here to a new species (see below). Bott's (1968*b*: figs 11, 12, 30, Senckenberg Museum catalogue number SMF 2765) illustrations for '*S. sinensis*' from Hong Kong agree well with the features of *S. zanklon*, sp. nov., recognised here. Bott's (1970*b*: pl. 20, figs 42–44, SMF 2765) figures also show the new Hong Kong species. His (1970*b*: pl. 30, fig. 81) figure of the G1, however, is different from that which he illustrated in 1968*b* (his fig. 30). Bott (1970*b*) did not state the origins of the G1 figures, and whether it was from the Chinese or Vietnamese specimen is not known. The G1 figured by Bott (1970*b*) is similar to that of the paralectotype (MP-B 3843S) of *S. sinensis*. The identity of the North Vietnamese specimens cannot yet be determined.

Somanniathelphusa falx, sp. nov.

(Figs 9, 10)

Potamon (*Parathelphusa*) *sinensis*. – Rathbun, 1905: 241 (part) (not *Parathelphusa sinensis* H. Milne Edwards, 1853).

Material Examined

Holotype (MP-B 4377S). ♂, 31·7×24·2 mm, China, coll. Jouan, no date (rehydrated 23.iv.1991).

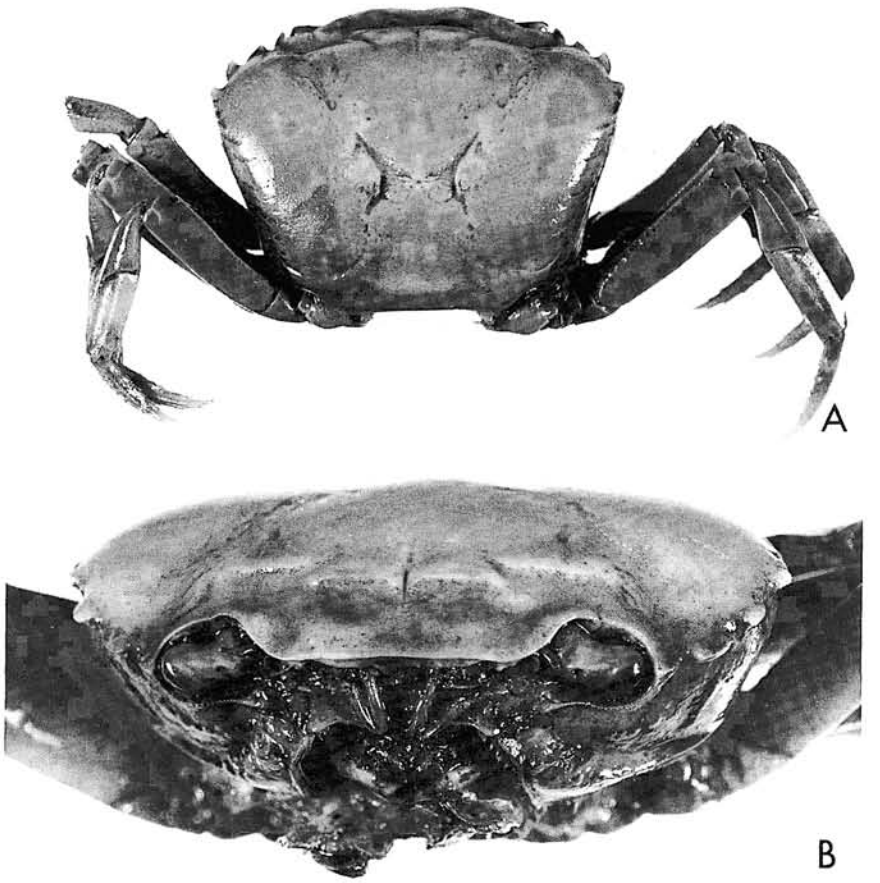


Fig. 9. *Somanniathelphusa falx*, sp. nov. Holotype male, 31·7×24·2 mm (MP-B 4377S), China: *A*, dorsal view; *B*, frontal view.

Diagnosis

Epigastric and postorbital cristae not confluent, separated from each other by broad groove, epigastric cristae distinctly anterior of postorbital cristae, margins of epigastric and postorbital cristae approximately parallel. Sixth male abdominal segment constricted at proximal part, slightly longer than 7th segment. G1 hook-like, distal part strongly bent, basal part dilated, subquadrate, outer margin crenulated.

Description

Carapace broader than long, surfaces convex transversely, smooth. Epigastric cristae distinct, sharp, separated by distinct narrow groove, approximately parallel with frontal margin, distinctly anterior of postorbital cristae; postorbital cristae distinct, short, outer edges reaching half width of supraorbital margin below epigastric cristae and separated by broad groove, approximately parallel to frontal margin. Cervical grooves shallow, indistinct. H-shaped depression deep. Frontal margin gently sinuous, confluent with smooth supraorbital margin. External orbital angle acutely triangular, relatively sharp, inner margin longer than half length of outer, outer margin gently convex, smooth. Anterolateral margin with 3 epibranchial teeth, first broadly triangular, first and second directed forwards, third directed obliquely outwards.

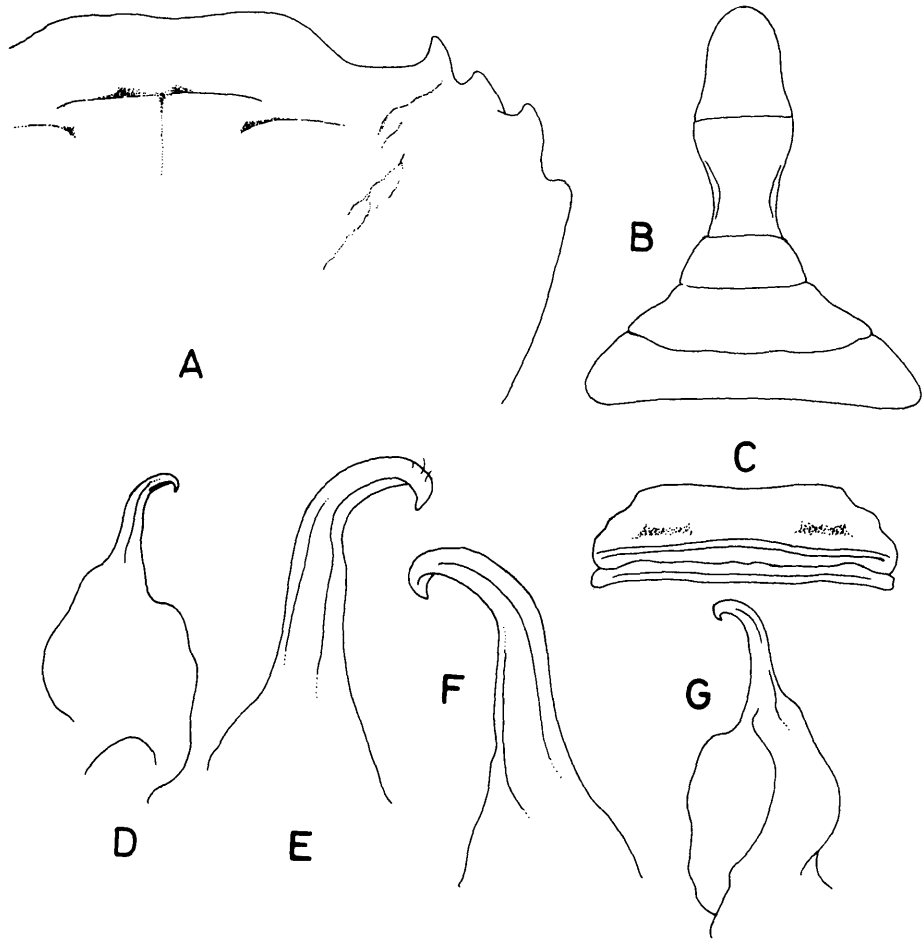


Fig. 10. *Somanniathelphusa falx*, sp. nov. Holotype male, 31·7×24·2 mm (MP-B 4377S), China: *A*, carapace; *B*, male abdomen; *C–F*, G1.

Chelipeds strongly asymmetrical in larger males, outer surfaces of both chelae smooth. Carpus with well-developed strong spine on inner distal margin. Fingers of both chelae longer than palm, fingers of smaller chela not gaping when closed, with numerous denticles along cutting edges; fingers in larger chela distinctly gaping when closed, cutting edges lined with large and small blunt teeth.

Second pair of ambulatory legs longest. Merus with distinct dorsal subterminal spine.

Male abdominal cavity reaches slightly beyond imaginary line joining anterior edges of bases of chelipeds. Male abdomen T-shaped, 7-segmented; seventh segment broadly triangular, lateral margins distinctly concave; sixth segment longer than seventh segment, constricted at proximal part; segments 3 to 5 progressively trapezoidal.

G1 relatively stout, terminal and subterminal segments not demarcated; distal part slender, gradually tapering towards tip, sharply bent laterally outwards, tip sharp, twisted obliquely; basal part broad, dilated, subquadrate, outer margin crenulated. G2 condition undiscernible.

Distribution

Known only from an unspecified locality in China.

Discussion

The confusion between the identities of Callery's and Jouan's specimens has already been discussed under *S. sinensis* s. str. Rathbun (1905) listed Jouan's specimens (two males) as part of the material for *Potamon (Parathelphusa) sinensis*. Dr Danièle Guinot kindly rehydrated one of Jouan's two male specimens for the first author. The G1s of parathelphusids are sufficiently heavily cutinised not to deform to any significant degree on dehydration or subsequent rehydration. The structure of the G1 of Jouan's specimen is remarkable, and looks nothing like what Bott (1968*b*, 1970*b*) figured for *S. sinensis*. The form of the carapace epigastric and postorbital cristae, shape and proportion of the male's sixth abdominal segment, and unusual G1 of Jouan's specimen, necessitate the establishment of a separate species, here named *Somanniathelphusa falx*, sp. nov.

The epigastric and postorbital cristae of *S. falx* are well developed but are clearly disjunct from each other, the epigastric cristae being more anterior and separated from the postorbital cristae by a relatively broad gap. In this respect, *S. falx* somewhat resembles Thai and Malaysian species like *S. sexpunctata* (Lanchester, 1906) and *S. germaini* (Rathbun, 1902). None of the known Chinese *Somanniathelphusa* (including *S. sinensis*) have a similar epigastric-postorbital cristal structure. Compared to *S. sinensis*, the postorbital cristae of *S. falx* are also distinctly shorter.

The sixth male abdominal segment of *S. falx* is more constricted at the proximal part, the sixth and seventh segments are proportionately longer compared to *S. sinensis*, and the seventh segment is less triangular in shape. The form of the male's sixth abdominal segment and the epigastric-postorbital cristal structures easily distinguish *S. falx* from poorly known species like *S. prolatus* (Rathbun, 1902), *S. chongi* (Wu, 1935), and *S. grayi* (Alcock, 1909).

The G1 of *S. falx* resembles that of *S. dugasti*, figured by Bott (1968*b*, 1970*b*), the distal part being hook-like and recurved. *Somanniathelphusa falx* differs from *S. dugasti* in having a less inflated carapace, the postorbital cristae being stronger and sharper, and the epigastric and postorbital cristae being distinctly separated from each other (almost confluent and separated by only a narrow notch in *S. dugasti*). In *S. falx*, the distal part of the G1 bends suddenly at an angle, and is more strongly recurved, with the tip twisting backwards. In *S. dugasti*, however, the distal part of the G1 curves gently, with the tip directed downwards. As the identity of *S. dugasti* is unclear, Professor Phaibul Naiyanetr was kind enough to send me a figure of a G1 from one of the types of *S. dugasti*. Although similar to that of *S. falx*, the tip of the G1 of *S. dugasti* is distinctly shorter and less recurved. The recurved G1 of *S. falx* also resembles that figured for *S. chongi* (see Wu 1935). Wu's figure of the G1, however, is too schematic to permit detailed comparisons. Wu (1935), however, described the epigastric cristae as joining the postorbital cristae, the latter being weak, which is in sharp contrast to the condition in *S. falx*. The male abdomen of *S. chongi* also has a more elongate sixth segment than does *S. falx*.

Etymology

The name '*falx*' alludes to the sickle-shaped G1 of the species. The species name is used as a noun in apposition.

Somanniathelphusa zanklon, sp. nov.

(Figs 11–13)

Parathelphusa sinensis.—Doflein, 1902: 662 (not *Parathelphusa sinensis* H. Milne Edwards, 1853).

Parathelphusa (*Parathelphusa*) *sinensis*.—Gee, 1925: 159 (part); Wu, 1934: 339 (part) (not *Parathelphusa sinensis* H. Milne Edwards, 1853).

Somanniathelphusa sinensis sinensis.—Bott, 1968*b*: 409 (part), figs 11, 12, 30; Bott, 1970*a*: 338; Bott, 1970*b*: 111 (part), pl. 20, figs 42–44; Ng, 1988: 105 (part) (not *Parathelphusa sinensis* H. Milne Edwards, 1853).

Material Examined

Holotype. ♂, 28·5×23·1 mm (ZRC 1991.1822), lower course of Lam Tsuen R., main channel, New Territories, Hong Kong, coll. D. Dudgeon, no date.

Paratypes. 2♂, 21·5×18·0 mm, 30·5×24·8 mm, 3♀, 11·8×9·9 mm, 16·1×13·5 mm, 25·7×20·0 mm (ZRC 1991.1852–1856), in irrigation ditch, lower course of Lam Tsuen R., New Territories, Hong Kong, coll. D. Dudgeon, 15.vii.1983; 1♀, 27·8×22·4 mm (ZRC 1991.1821), water hyacinth bed, lower course of Lam Tsuen R., New Territories, Hong Kong, coll. D. Dudgeon, 28.ix.1978; 3♂, 7·6×6·7 mm, 11·4×9·7 mm, 14·1×12·2 mm, 3♀, 11·9×10·0 mm, 14·7×12·5 mm, 16·4×13·4 mm (ZRC 1991.1823–1828), 1♂, 22·7×18·2 mm, 1♀, 22·5×18·4 mm (MP), 1♂, 21·0×17·1 mm, 1♀, 25·5×20·5 mm (AS), Lam Tsuen R., water hyacinth bed, Hong Kong, coll. D. Dudgeon, 1978; 1♂, 36·6×29·1 mm (ZRC 1991.1829), in irrigation ditch, Su Kwun, New Territories, Hong Kong, coll. D. Dudgeon, 29.x.1980; 3♂, 1♀ (ZRC 1991.1830–1833), Lam Tsuen R. valley, Hong Kong, coll. P. K. L. Ng and D. Dudgeon, June 1991.

Diagnosis

Epigastric and postorbital cristae separated from each other by distinct narrow groove, not confluent, epigastric cristae slightly anterior of postorbital cristae, inner edge of postorbital cristae extends slightly below outer edge of epigastric cristae. Sixth male abdominal segment constricted, slightly longer than 7th segment. G1 curves laterally outwards gently, tip slightly bent, basal part dilated, outer margin distinctly convex.

Description

Carapace broader than long, surfaces convex transversely, smooth. Epigastric cristae distinct, sharp, separated by distinct narrow groove, postorbital cristae distinct, reaching to beginning of cervical grooves, inner edge of postorbital cristae reaching below inner edge of epigastric cristae. Cervical grooves shallow. H-shaped depression deep. Frontal margin sinuous, confluent with smooth supraorbital margin. External orbital angle acutely triangular, relatively sharp, inner margin longer than half length of outer, outer margin gently convex, smooth. Anterolateral margin with 3 epibranchial teeth, first triangular, first to third teeth directed forwards.

Chelipeds strongly asymmetrical in larger males, outer surfaces of both chelae smooth. Carpus with well-developed strong spine on inner distal margin. Fingers of both chelae subequal or longer than palm, fingers of smaller chela not gaping when closed, with numerous denticles along cutting edges; fingers in larger chela distinctly gaping when closed, cutting edges lined with large and small blunt teeth.

Second pair of ambulatory legs longest. Merus with distinct dorsal subterminal spine.

Male abdominal cavity reaches an imaginary line joining anterior edges of bases of chelipeds. Male abdomen T-shaped, seventh segment broadly triangular, lateral margins distinctly concave; sixth segment slightly longer than seventh segment, constricted at proximal part; segments 3 to 5 progressively more trapezoidal.

G1 relatively stout, terminal and subterminal segments not demarcated; distal part slender, gradually curving laterally outwards, tip bent; basal part broad, dilated, outer margin distinctly convex. G2 with very short distal segment and elongated basal segment.

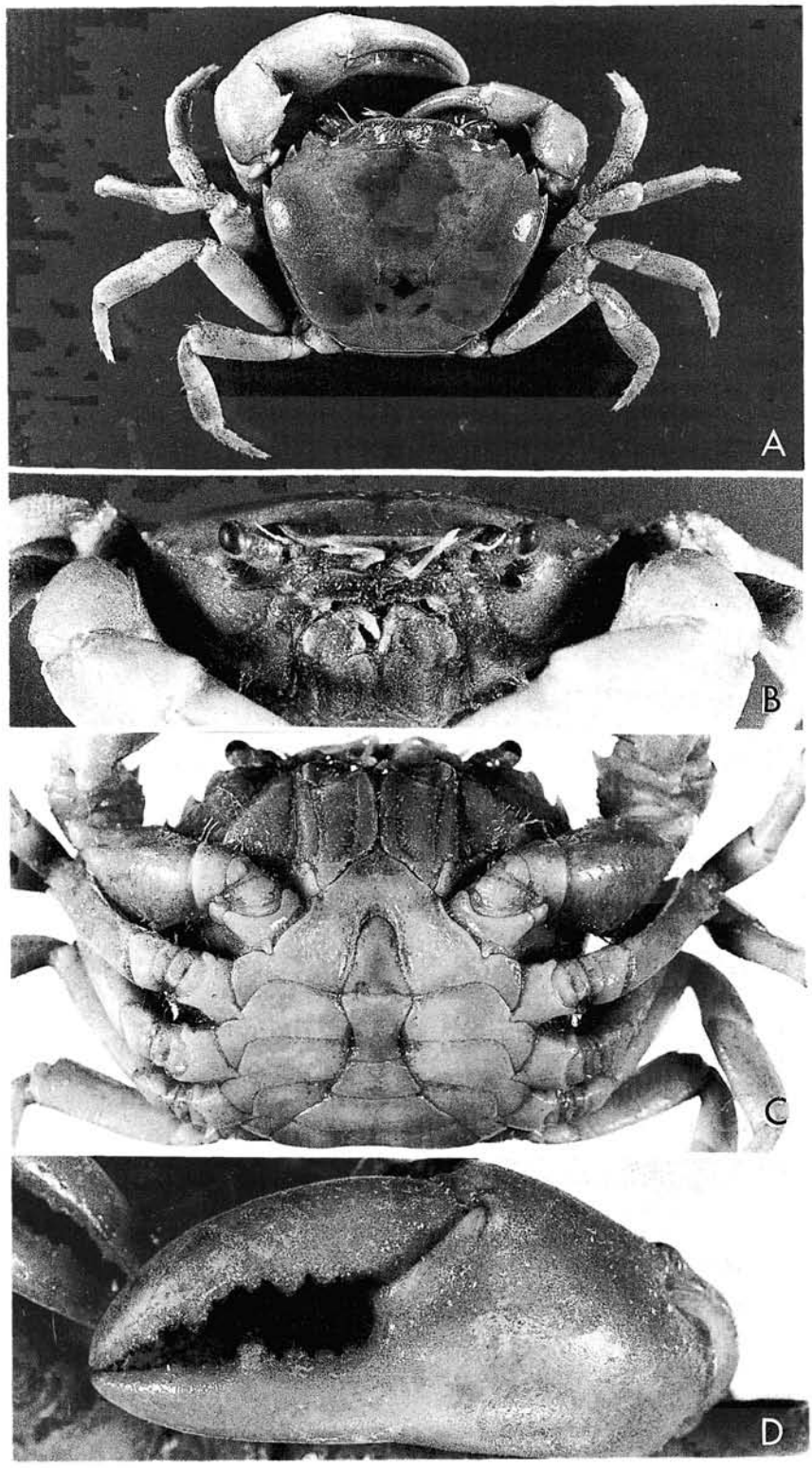


Fig. 11. *Somanniathelphusa zanklon*, sp. nov. Holotype male, 28·5 × 23·1 mm (ZRC 1991. 1822), Hong Kong: *A*, dorsal view; *B*, frontal view; *C*, ventral view; *D*, larger chela.

Discussion

Although similar to *S. sinensis* (H. Milne Edwards, 1853), *S. zanklon*, sp. nov., differs in several key features. The epigastric and postorbital cristae of *S. zanklon* do not overlap to any degree and appear almost confluent, the groove separating these cristae being

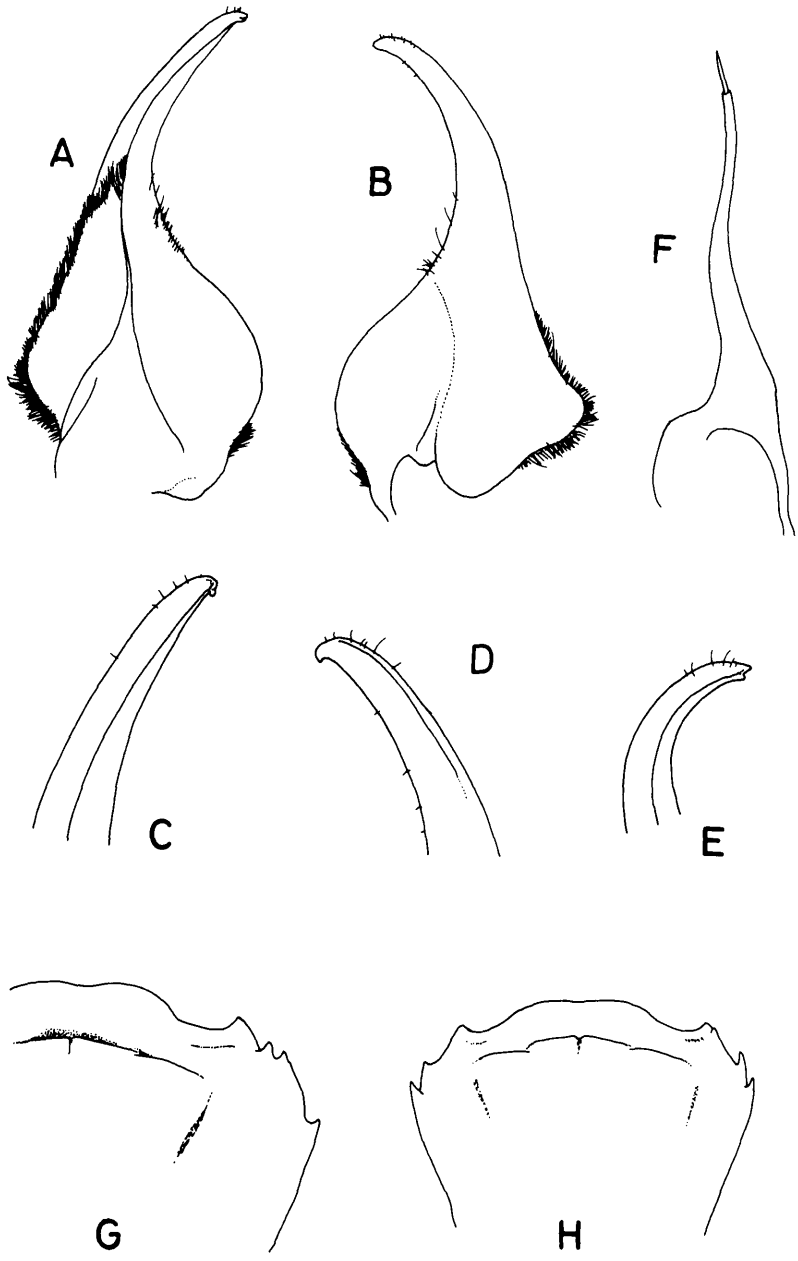


Fig. 12. *Somanniathelphusa zanklon*, sp. nov.: *A–F*, holotype male, 28·5×23·1 mm (ZRC 1991.1822), Hong Kong; *G*, paratype male, 30·5×24·8 mm (ZRC 1991.1852), Hong Kong, *H*, paratype male, 21·5×18·0 mm (ZRC 1991.1853), Hong Kong. *A–E*, left G1; *F*, left G2; *G*, *H*, carapace. *A–E*, left G1; *F*, left G2; *G*, *H*, right part of carapace. *A*, *C*, *E*, ventral views; *B*, *D*, dorsal views; *C* drawn at a different orientation from *E*.

very narrow and indistinct. The sixth male abdominal segment of *S. zanklon* is also more constricted at the proximal part than in the lectotype of *S. sinensis*. The G1s of the two species differ conspicuously. In the lectotype of *S. sinensis*, the basal segment is more

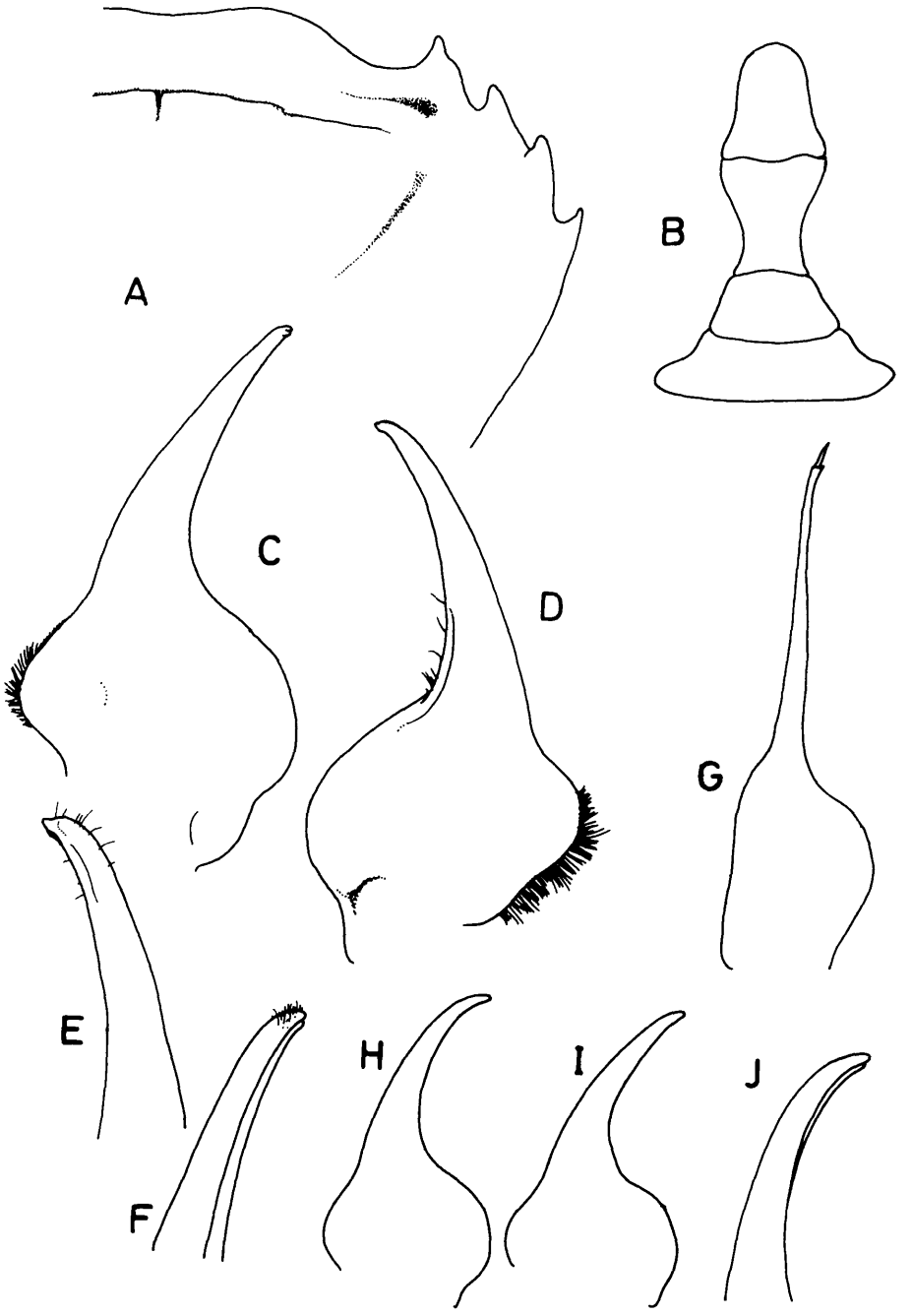


Fig. 13. *Somanniathelphusa zanklon*, sp. nov.: *A–G*, paratype male, 66·6×29·1 mm (ZRC 1991.1829), Hong Kong; *H–J*, paratype male, 20·6×16·9 mm (ZRC 1991.1830), Hong Kong. *A*, right part of carapace; *B*, abdominal segments 4 to 7. *C–F*, *H–J*, left G1; *G*, left G2. *C*, *F*, *H–J*, ventral views; *D*, *E*, dorsal views; *E*, *F*, *J*, distal part of G1; *H* drawn at a different orientation from *I*.

subquadrate in shape, the outer margin being only slightly convex, appearing almost straight, whereas in *S. zanklon*, the basal segment is more bulbous, with the outer margin distinctly convex. The distal part of the G1 of *S. zanklon* is also proportionately shorter and slightly stouter than in *S. sinensis*. The differences in the epigastric and postorbital cristae of *S. zanklon* are also valid compared with the paralectotypes of *S. sinensis*. The differences in G1, however, are less obvious, although the G1 of *S. zanklon* has a consistently more bulbous basal segment and the distal part is shorter than in the paralectotypes of *S. sinensis*.

These differences, though apparently minor, are consistent for all the specimens of *S. zanklon* examined. They are apparent even in Bott's (1968*b*, 1970*b*) figures of the species from Hong Kong (as *S. sinensis sinensis*). Professor Phaibul Naiyanetr (personal communication), who has examined Bott's (1968*b*, 1970*b*) material as well as recent specimens from southern China, concurs on the validity of the observed differences.

There is some variation in the armature of the carapace for two male specimens from the Lam Tsuen River. One (30·5×24·8 mm, ZRC 1991.1852) has the right first epibranchial tooth reduced and the second tooth growing in a more forward position (Fig. 12*G*). In the other specimen (21·5×18·0 mm, ZRC 1991.1853), the left anterolateral margin has only two epibranchial teeth, the first being absent; while the right margin has the first epibranchial tooth greatly reduced and almost confluent with the external orbital angle (Fig. 12*H*). These specimens are regarded as aberrant in this respect. Other specimens from the same area have normal anterolateral margins. In fully mature females (especially brooding or ovigerous ones), the broad and convex abdomen makes the carapace appear more swollen than in equivalent-sized males.

General Biology

Somanniathelphusa zanklon, sp. nov., occurs in a variety of lotic and lentic lowland habitats, and is fairly tolerant of organic pollution. It seems, however, to prefer unpolluted riverine habitats and slow-flowing low-gradient streams where the substratum may be muddy. They also inhabit irrigation ditches and flooded furrows associated with market-gardening activities. These crabs sometimes dwell among the roots of floating plants, such as the exotic water hyacinth, *Eichhornia crassipes* (Mart.) Solms, or the trailing roots and stems of riparian grasses and other plants. While the species is likely to be omnivorous in the wild, Dudgeon and Cheung (1990) have demonstrated that these crabs show distinct preferences with regard to gastropod prey in the laboratory, and selectively consume thin-shelled species (see also Ng 1988; Ng and Ng 1987 for *Somanniathelphusa sexpunctata*). Circumstantial evidence of the importance of crab predation in the field can be deduced from the fact that there is a notable absence of thin-shelled pulmonate snails at sites which, apart from the presence of crabs, appear to be ideal snail habitats. Heavy-shelled prosobranchs, such as the viviparid *Sinotaia quadrata* (Benson) and the thiarid *Melanoides tuberculata* (Muller), which are virtually invulnerable to predation from all the but largest *S. sinensis*, abound in habitats where the crabs are common.

The carapace colour of live *S. zanklon* is a dull uniform olive-brown. The legs may be covered with numerous pale reddish brown spots and markings. The cheliped fingers are light brown.

Etymology

The species name '*zanklon*' is derived from the Greek for sickle, alluding to the shape of its G1. The species name is used as a noun in apposition.

General Discussion

Despite different habitat occupancy, the three Hong Kong potamid and parathelphusid freshwater crabs exhibit similar life cycles with suppressed planktonic development and hatchlings that resemble the adults. The eggs are held in place under the abdomen, where they are brooded for at least 3 weeks. Brooding females are reclusive and retreat into burrows or cavities beneath large stones. Juveniles are released near the onset of the wet season in Hong Kong, and production of young during the monsoon seems to be typical of freshwater crabs in tropical Asia (see also Fernando 1960; Ng 1987*b*, 1988).

Acknowledgments

The authors are very grateful to Dr Danièle Guinot (Paris Museum) for her kind assistance in checking the types of *Parathelphusa sinensis* and help with the literature. She also undertook the onerous task of reviewing this paper, and her very helpful and constructive comments are greatly appreciated and have helped to improve the paper substantially. Professor Phaibul Naiyanetr (Chulalongkorn University, Bangkok), who is revising the genus *Somanniathelphusa* at the moment, was most generous with his ideas and shared his unpublished data with us. He as a most gracious host to the first author during his visit to Chulalongkorn University and kindly 'sacrificed' his New Year holidays explaining the intricacies of *Somanniathelphusa* taxonomy to him. Dr Dai Ai Yun (Academia Sinica, Beijing) was generous with her time and made many helpful suggestions about the genus *Nanhaipotamon*. We are also most appreciative of the many useful suggestions provided by two anonymous reviewers. Photographs were taken by Mr H. K. Yip of the National University of Singapore. This study is partially supported by a research grant (RP 900360) to the first author from the National University of Singapore.

References

Alcock, A. (1909). Diagnoses of new species and varieties of freshwater crabs. Nos 1–4. *Records of the Indian Museum* **3**, 243–52, 375–81.

Alcock, A. (1910). 'Brachyura I. Fasc. II. The Indian Freshwater Crabs—Potamonidae. Catalogue of the Indian Decapod Crustacea in the Collection of the Indian Museum.' (Calcutta.) pp. 1–135.

Balss, H. (1914). Potamonidenstudien. *Zoologische Jahrbucher (Systematics)* **37**, 401–10.

Balss, H. (1937). Potamoniden (Dekapoda Brachyura) der Philippinen und des Malayischen Archipels. *International Revue der gesellschaft Hydrobiologie und Hydrographie* **34**, 143–87.

Bott, R. (1966). Potamiden aus Asien (*Potamon* Savigny und *Potamiscus* Alcock) (Crustacea, Decapoda). *Senckenbergiana biologica* **47**, 469–509.

Bott, R. (1968*a*). Potamiden aus Süd-Asien (Crustacea, Decapoda). *Senckenbergiana biologica* **49**, 119–30.

Bott, R. (1968*b*). Parathelphusiden aus Hinterindien (Crustacea, Decapoda, Parathelphusidae.). *Senckenbergiana biologica* **49**, 403–22.

Bott, R. (1969). Flüsskrabben aus Asien und ihre Klassifikation. (Crustacea, Decapoda). *Senckenbergiana biologica* **50**, 359–66.

Bott, R. (1970*a*). Betrachtungen über entwicklungsgeschichte der Süsswasserkrabben nach der Sammlung des Naturhistorischen Museums in Genf/Schweiz. *Revue Suisse (Zoologie)* **77**, 327–44.

Bott, R. (1970*b*). Dis Süsswasserkrabben von Europa, Asien, Australien und ihre Stammesgeschichte. Eine Revision der Potamoidea und Parathelphusoidea (Crustacea, Decapoda). *Abhandlungen Senckenbergischen Naturforschenden Gesellschaft* **526**, 1–338.

Chuensri, C. (1974). Freshwater crabs of Thailand. *Kasetsart University Fisheries Research Bulletin* **7**, 12–40.

Dai, A. Y. (1990). On the zoogeographical distribution of freshwater crabs in southwestern China. In 'From Water to Land, Snake Research Institute'. **1**, 375–85.

Dai, A. Y., and Chen, G. X. (1979). On the freshwater crabs of Fujian province. *Acta Zoologica Sinica* **25**, 243–9.

Dai, A. Y., and Chen, G. X. (1987). A study on the genus *Nanhaipotamon* (Decapoda: Isolapotamidae). *Acta Zootaxonomica Sinica* **12**, 30–5.

Dai, A. Y., Song, Y. Z., He, L. Y., Cao, W. J., Xu, Z. B., and Zhong, W. L. (1975). Description of several new species of freshwater crabs belonging to the intermediate hosts of lung flukes. *Acta Zoologica Sinica* **21**, 257–64.

Dai, A. Y., Chen, G. X., Song, Y. Z., Fan, P. F., Lin, Y. G., and Zeng, Y. Q. (1979). On new species of freshwater crabs harbouring metacercariae of lung flukes. *Acta Zootaxonomica Sinica* **4**, 122–31.

Dai, A. Y., Song, Y. C., Li, M. G., Chen, Y., Wang, P. P., and Hu, Q. X. (1984). A study of freshwater crabs from Guizhou Province. I. *Acta Zootaxonomica Sinica* **9**, 257–67.

Doflein, F. (1902). Ostasiatische Dekapoden. *Abhandlungen k. bayerischen Akademie Wissenschaft* (2)**21**, 613–70.

Dudgeon, D., and Cheung, C. P. S. (1990). Selection of gastropod prey by a tropical freshwater crab. *Journal of Zoology (London)* **210**, 147–55.

Fernando, C. (1960). The Ceylonese freshwater crabs (Potamonidae). *Ceylon Journal of Science (Biological Sciences)* **3**, 191–222.

Froglia, C., and Grippa, G. B. (1986). A catalogue of the types kept in the collections of the Museo Civico di Storia Naturale di Milano. VIII. Types of decapod Crustacea (Annotated Catalog). *Atti Societas italiano Sciences naturelle Museo civico Storia nationale Milano* **127**, 253–83.

Gee, N. G. (1925). Tentative list of Chinese decapod Crustacea, including those represented in the collections of the United States National Museum (marked with an *) with localities at which collected. *Lignan Agricultural Review* **3**, 156–66.

Henderson, J. R. (1893). A contribution to Indian carcinology. *Transactions of the Linnean Society of London, Zoology* (2)**5**, 325–458.

Holthuis, L. B. (1990). Comments on the proposed fixation of type species for *Larnaudia* and *Runguna* Bott, 1966 (Crustacea, Decapoda). *Bulletin of Zoological Nomenclature* **47**(1), 45.

Hwang, J. J., and Mizue, K. (1985). Fresh-water crabs of Taiwan. *Bulletin of the Faculty of Fisheries, Nagasaki University* **57**, 1–21.

International Commission of Zoological Nomenclature (1985). 'International Code of Zoological Nomenclature.' Third Edition. Adopted by the XX General Assembly of the International Union of Biological Sciences. (International Trust for Zoological Nomenclature, in association with the British Museum (Natural History): London.) 338 pp.

International Commission of Zoological Nomenclature (1991). Opinion 1640. *Ranguna* Bott, 1966 and *Larnaudia* Bott, 1966 (Crustacea, Decapoda): *Potamon rangoonensis* Rathbun, 1904 and *Thelphusa larnaudii* A. Milne Edwards, 1869 confirmed as the respective type species. *Bulletin of Zoological Nomenclature* **48**, 171–2.

Kemp, S. (1918). Zoological results of a tour in the Far East. Decapod and stomatopod Crustacea. *Memoirs of the Asiatic Society of Bengal* **6**, 210–97.

Lanchester, W. F. (1901). The crustacea of the 'Skeat' Expedition to the Malay Peninsula, together with a note on the genus *Actaeopsis*. Part 1, Brachyura, Stomatopoda and Macrura. *Proceedings of the Zoological Society of London* **1901**, 534–74.

Lanchester, W. F. (1906). Report on the Crustacea. In 'Fasciculi Malayensis, Part 3'. pp. 127–34.

Milne Edwards, H. (1853). Observations sur les affinités zoologiques et la classification naturelle des Crustacés. [Mémoire sur la famille des Ocypodiens.] *Annales de Sciences Naturelle, Zoologie* (3) **20**, 163–228.

Milne Edwards, H. (1854). Notes sur quelques Crustacés nouveaux ou peu connus conserves dans la collection du Muséum d'Histoire Naturelle. *Archives du Muséum d'Histoire Naturelle, Paris* **7**, 143–92.

Minei, H. (1973). Potamoid crabs of the Ryukyu islands, with description of five new species (Crustacea, Decapoda, Potamoidea). *Journal of the Faculty of Agriculture, Kyushu University* **17**, 203–26.

Naiyanetr, P. (1975). Genus *Somanniathelphusa*. Distribution of freshwater crabs genus *Somanniathelphusa* in Thailand. Abstracts of Crustacea, Department of Biology, Faculty of Science, Chulalongkorn University, Bangkok, pp. 23–4.

Naiyanetr, P. (1980). 'Crustacean Fauna of Thailand (Decapoda and Stomatopoda).' Department of Biology, Faculty of Science, Chulalongkorn University, Bangkok, 73 pp. (Mimeographed.)

Naiyanetr, P. (1988). Freshwater crabs in Thailand. In 'Book published in memory of the Royal Cremation of Associate Professor Dr. Praphun Chitachumnong, Chulalongkorn University'. (Phaisalsilpa Press: Bangkok.) 15 pp.

Ng, P. K. L. (1987*a*). The Indo-Pacific Pilumnidae II. A revision of the genus *Rhizopa* Stimpson, 1858 and the status of the Rhizopinae Stimpson, 1858 (Crustacea: Decapoda: Brachyura). *Indo-Malayan Zoology* **4**(1), 69–111.

Ng, P. K. L. (1987*b*). A revision of the Malayan freshwater crabs of the genus *Johora* Bott, 1966 stat. nov. (Decapoda: Brachyura: Potamidae). *Malayan Nature Journal* **41**, 13–44.

Ng, P. K. L. (1988). 'The Freshwater Crabs of Peninsular Malaysia and Singapore.' (Shinglee Press: Singapore.) 156 pp.

Ng, P. K. L. (1990). Comments on the proposed fixation of type species for *Larnaudia* and *Ranguna* Bott, 1966 (Crustacea, Decapoda) (Case 2624). *Bulletin of Zoological Nomenclature* **47**(1), 45–6.

Ng, P. K. L., and Ng, H. P. (1987). The freshwater crabs of Pulau Langkawi, Peninsular Malaysia. *Malaysian Journal of Science, Kuala Lumpur* **9**, 1–15.

Ortmann, A. (1896). Das System der Decapoden-Krebse. *Zoologische Jahrbucher, Systematics* **9**, 409–53.

Parisi, B. (1916). I Decapodi Giapponesi del Museuo di Milano. IV. Cyclometopa. *Atti Societas italiano Sciences naturelle* **55**, 153–90.

Pretzmann, G. (1963). Uber einige Süd- und Ostasiatische Potamoniden. *Annales der Naturhistorischen Museum Wien* **66**, 361–72.

Rathbun, M. J. (1902). Description des nouvelles espèces de *Parathelphus* appartenant au Muséum de Paris. *Bulletin du Muéum d'Histoire Naturelle, Paris* (1902)**3**, 184–7.

Rathbun, M. J. (1905). Les crabes d'eau douce. *Nouvelles Archives Muéum d'Histoire Naturelle, Paris* (4)**7**, 159–323.

Sakai, T. (1976). 'Crabs of Japan and the Adjacent Seas.' 3 volumes. (Kodansha Ltd: Tokyo.)

Shen, C. J. (1940*a*). The brachyuran fauna of Hong Kong. *Journal of the Hong Kong Fisheries Research Station* **1**, 211–42.

Shen, C. J. (1940*b*). Four new species of Brachyura from Chinese seas. *Journal of the Hong Kong Fisheries Research Station* **1**, 255–62.

Stimpson, W. (1858). Prodromus descriptionis animalium everbratorum quoe in Expeditione ad Oceanum Pacificum eptentrionalem a Republica Federata Missa, Cadwaladaro Ringgold et Johann Rodgers Ducibus, observatit et descripsit—Part V, Crustacea Ocypopoidea. *Proceedings of the Academy of Natural Sciences, Philadelphia* **9**, 93–110.

Stimpson, W. (1907). Report on the Crustacea (Brachyura and Anomura) collected by the North Pacific Exploring Expedition 1853–1856. *Smithsonian Miscellaneous Collections* **49**(1717), 1–240.

Tai, A. Y., and Sung, Y. C. (1975). A preliminary study of the freshwater crabs as intermediate hosts of lung flukes from China. *Acta Zootaxonomica Sinica* **21**, 169–78.

Türkay, M., and Naiyanetr, P. (1987). The identity of *Potamon rangoonense* Rathbun 1904 and *Thelphusa larnaudii* A. Milne-Edwards 1869, with introduction of *Neolarnaudia botti* n. g. n. sp. (Crustacea: Decapoda: Potamidae). *Senckenbergiana biologica* **67**, 389–96.

Türkay, M., and Naiyanetr, P. (1989). Case 2624. *Ranguna* Bott, 1966 and *Larnaudia* Bott, 1966 (Crustacea, Decapoda): proposed fixation of *Thelphusa longipes* A. Milne Edwards, 1869 and *Thelphusa larnaudii* A. Milne Edwards, 1869 as the respective type species. *Bulletin of Zoological Nomenclature* **46**, 101–3.

Wood Mason, J. (1876). A conspectus of the species of *Parathelphusa*, an Indo-Malayan genus of freshwater crabs. *Annals and Magazine of Natural History* (4)**17**, 120–22.

Wu, H. W. (1934). Enumeration of the river-crabs (Potamonidae) of China with descriptions of three new species. *Sinensia* **4**, 338–52.

Wu, H. W. (1935). On a new river crab, *Parathelphusa* (*Parathelphusa*) *chongi* sp. nov. *Chinese Journal of Zoology* **1**, 69–73.

Manuscript received 24 September 1991; accepted 29 January 1992