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Potamiscus whitteni, a new freshwater crab from Chin State, Myanmar (Crustacea: Brachyura: Potamidae)

Peter K. L. Ng[1*], Hla Htoo[2] & Win Mar[3]

Abstract. A new species of freshwater crab, *Potamiscus whitteni*, is described from Chin State in western Myanmar. It is morphologically most similar to *P. rangoonensis* (from Yangon, Myanmar) and *P. palelensis* (from Manipur, India), but can easily be distinguished by the carapace features and male first gonopod structure.

Key words. *Potamiscus*, semiterrestrial crab, Potamicinae, Myanmar, Southeast Asia, taxonomy

INTRODUCTION

The primary freshwater crabs (Potamidae and Gecarcinucidae) of Myanmar remain poorly known (Yeo & Ng, 1999). In recent years, increased collections by various expeditions and Myanmarese biologists have obtained material from many parts of the country, and a number of new taxa have been reported (Ng & Whitten, 2017; Ng & Win Mar, 2018; Ng, 2018).

In this paper, we describe a new species of potamid freshwater crab, *Potamiscus* Alcock, 1909, from Chin State in western Myanmar, only the second species of the genus known from the country.

MATERIAL AND METHODS

The terminology used follows Ng (1988) and Davie et al. (2015). Measurements provided (in millimetres) are of the maximum carapace width and length, respectively. The abbreviations G1 and G2 are used for the male first and second gonopods, respectively. The material examined is deposited in the Zoological Reference Collection (ZRC), Lee Kong Chian Natural History Museum, National University of Singapore.

[1]Lee Kong Chian Natural History Museum, 2 Conservatory Drive, National University of Singapore, Singapore 117377, Republic of Singapore. Email: peterng@nus.edu.sg (*corresponding author)

[2]Department of Zoology, Meiktila University, Mandalay Division, Republic of the Union of Myanmar

[3]Mandalay University of Distance Education, Mandalay Division, Republic of the Union of Myanmar

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SYSTEMATICS

Family Potamidae Ortmann, 1896 sensu Yeo & Ng, 2004

Genus *Potamiscus* Alcock, 1909

Type species. *Potamon* (*Potamiscus*) *annandali* Alcock, 1909, by original designation.

Remarks. Alcock (1909) established *Potamiscus* Alcock, 1909 (as a subgenus of *Potamon* Savigny, 1816) primarily because its members lacked or only had a vestigial flagellum on the exopod of the third maxilliped. In the decades since, the value of this character has been questioned and in a number of major revisions (e.g., Bott, 1966, 1970; Bott & Türkay, 1977; Türkay & Naiyanetr, 1987; Brandis, 2000, 2002), the presence or absence of the third maxilliped flagellum has been downplayed or even ignored. While the flagellum can certainly be lost through damage and vary to some degree in a few species, it has proven to be a reliable feature when used with characters of the carapace, ambulatory legs and G1 (e.g., Ng, 1986, 1988, 1992; Naiyanetr, 1992, 1994; Ng & Naiyanetr, 1993; Dai, 1999). Yeo & Naiyanetr (1999) had noted that *Pupamon prabang* Yeo & Naiyanetr, 1999, from Thailand has a flagellum that varied slightly from short to vestigial but it never reached greater lengths. Yeo & Ng (2007) re-examined many species retained in *Potamiscus* up to that time and decided that several needed to be moved to other genera. Those with well developed flagella on the exopod of the third maxilliped were moved to various genera (e.g., *Potamiscus cucphuongensis* Dang, 1975, was transferred to *Kukrimon* Yeo & Ng, 2007). One group of species which lacked the flagellum were moved to *Quadramon* Yeo & Ng, 2007 (type species *Potamon* (*Potamiscus*) *aborense* Kemp, 1913), with the authors distinguishing it from *Potamiscus* sensu stricto by its members possessing a squarish carapace, gently convex

anterolateral margins, weakly convergent posterolateral margins, weakly developed but strongly rugose postorbital cristae, broad and subtriangular antennular fossae, and relatively longer ambulatory legs lined with short stiff setae. Another group of species with a short to vestigial flagellum allied to *Dromothelphusa* Naiyanetr, 1992, was transferred to *Pupamon* Yeo & Ng, 2007, distinguished from *Dromothelphusa* sensu stricto by its proportionately higher carapace, epigastric cristae slightly anterior to and not confluent with the postorbital cristae, rugose postorbital cristae that do not merge with the anterolateral margin, the external orbital angle acutely triangular, the epibranchial tooth sharp and distinct, the lateral margins of the posterior margin of the epistome distinctly concave, and the G1 terminal segment gently or strongly curved outwards with a large rounded dorsal flap. Another genus associated with *Potamiscus* is *Ranguna* Bott, 1966 (type species *Potamon* (*Potamon*) *rangoonense* Rathbun, 1904). *Ranguna* has a confused taxonomic history (Bott & Türkay, 1977; Türkay & Naiyanetr, 1987) and is currently recognised as a junior subjective synonym of *Potamiscus* (see also Ng et al., 2008). The type species of *Ranguna* only has a vestigial flagellum on the exopod of the third maxilliped but its carapace and G1 features are distinct and it should be eventually recognised as a distinct genus (D. C. J. Yeo, personal communication; Turkay & Naiyanetr, 1989; Ng, 1990). For the moment, *Potamon* (*Potamon*) *rangoonense* is retained in *Potamiscus*.

Seventeen species are now recognised in *Potamiscus* (Table 1). Of these, *P. tumidulus* was originally placed in *Potamon* (*Potamon*) by Alcock (1909, 1910) as it has a long flagellum on the third maxilliped exopod so it has to be removed and must be referred to its own genus (unpublished data and D.C.J. Yeo, personal communication). Ng et al. (2008) listed four Chinese species: *P. loshingensis*, *P. motuoensis*, *P. yongshengensis* and *P. yunnanensis* as doubtful members of the genus as they have different carapace and G1 characters (D. C. J. Yeo and P. K. L. Ng, unpublished

Table 1. List of recognised *Potamiscus* species.

Species	**Locality**
Potamiscus annandali (Alcock, 1909)	Cachar, Assam, India
Potamiscus cangyuanensis Dai, 1999	Yunnan, China
Potamiscus crassus Naruse, Chia & Zhou, 2018	Yunnan, China
Potamiscus decourcyi (Kemp, 1913)	Renging, Arunachal Pradesh, India
Potamiscus elaphrius Dai, Chen, Liu, Luo, Yi, Liu, Gu & Liu, 1990	Yunnan, China
Potamiscus fumariatus Naruse, Chia & Zhou, 2018	Yunnan, China
Potamiscus loshingensis (Wu, 1934)	Yunnan, China
Potamiscus montosus Dai, Song, He, Cao, Xu & Zhong, 1975	Yunnan, China
Potamiscus motuoensis Dai, 1990	Yunnan, China
Potamiscus palelensis Mitra & Waikhom, 2019	Manipur, India
Potamiscus pealianus (Wood-Mason, 1871)	Sibsagar, Assam, India
= *Potamon* (*Potamon*) *pealianum* var. *antennarium* Alcock, 1909	Sibsagar, Assam, India
Potamiscus rangoonensis (Rathbun, 1904) [*Potamon* (*Potamon*)]	Yangon, Myanmar
Potamiscus rongjingensis Dai, Chen, Liu, Luo, Yi, Liu, Gu & Liu, 1990	Yunnan, China
Potamiscus tumidulus (Alcock, 1909)	Pharping, Nepal
Potamiscus whitteni, new species	
Potamiscus yiwuensis Dai & Cai, 1998	Yunnan, China
Potamiscus yongshengensis Dai & Chen, 1985	Yunnan, China
Potamiscus yunnanensis (Kemp, 1924)	Yunnan, China

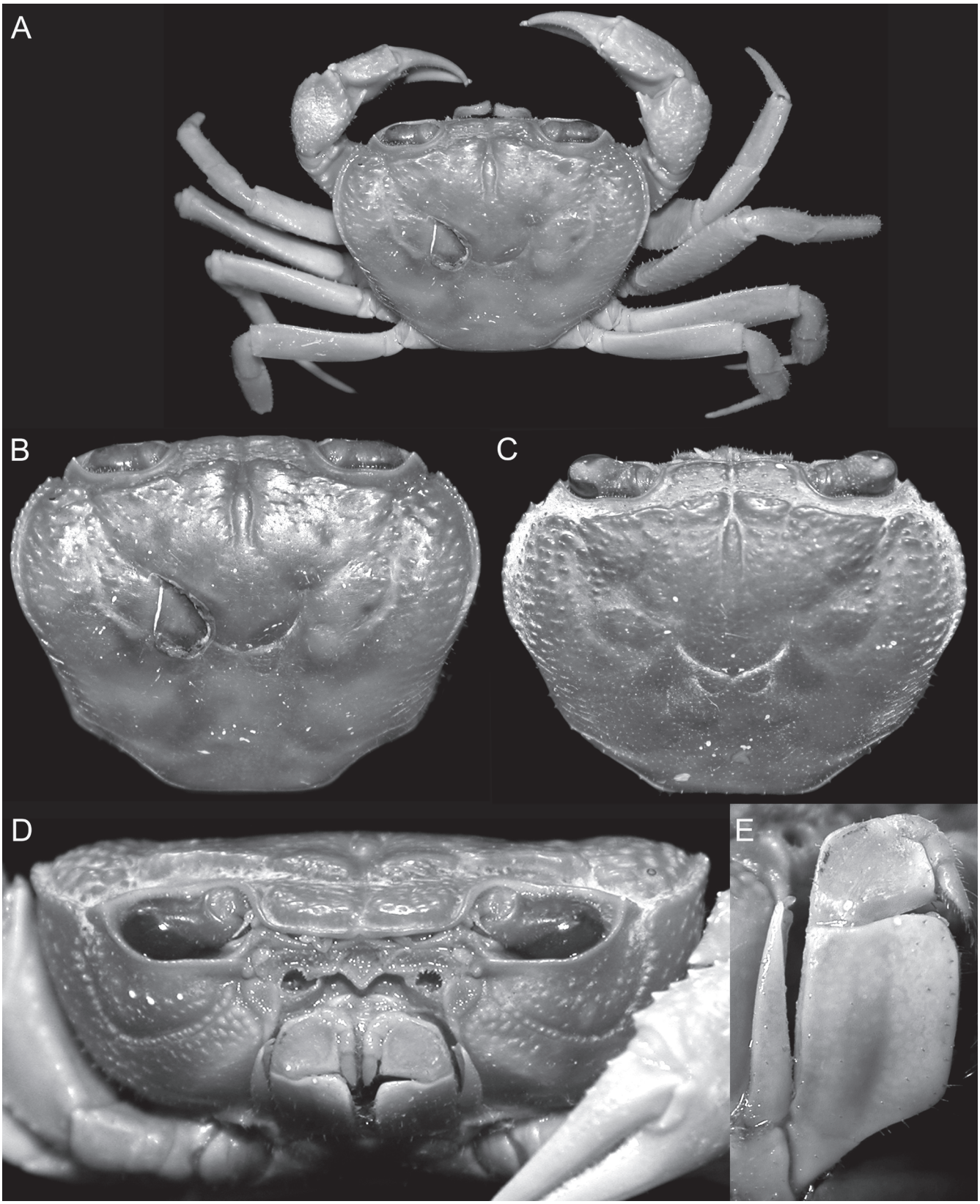

Fig. 1. *Potamiscus whitteni*. A, B, D, E, holotype male (31.7 x 25.1 mm) (ZRC 2018.1385); C, paratype male (24.3 x 19.4 mm) (ZRC 2018.1386). A, overall dorsal view; B, C, dorsal view of carapace; D, frontal view of cephalothorax; E, right third maxilliped.

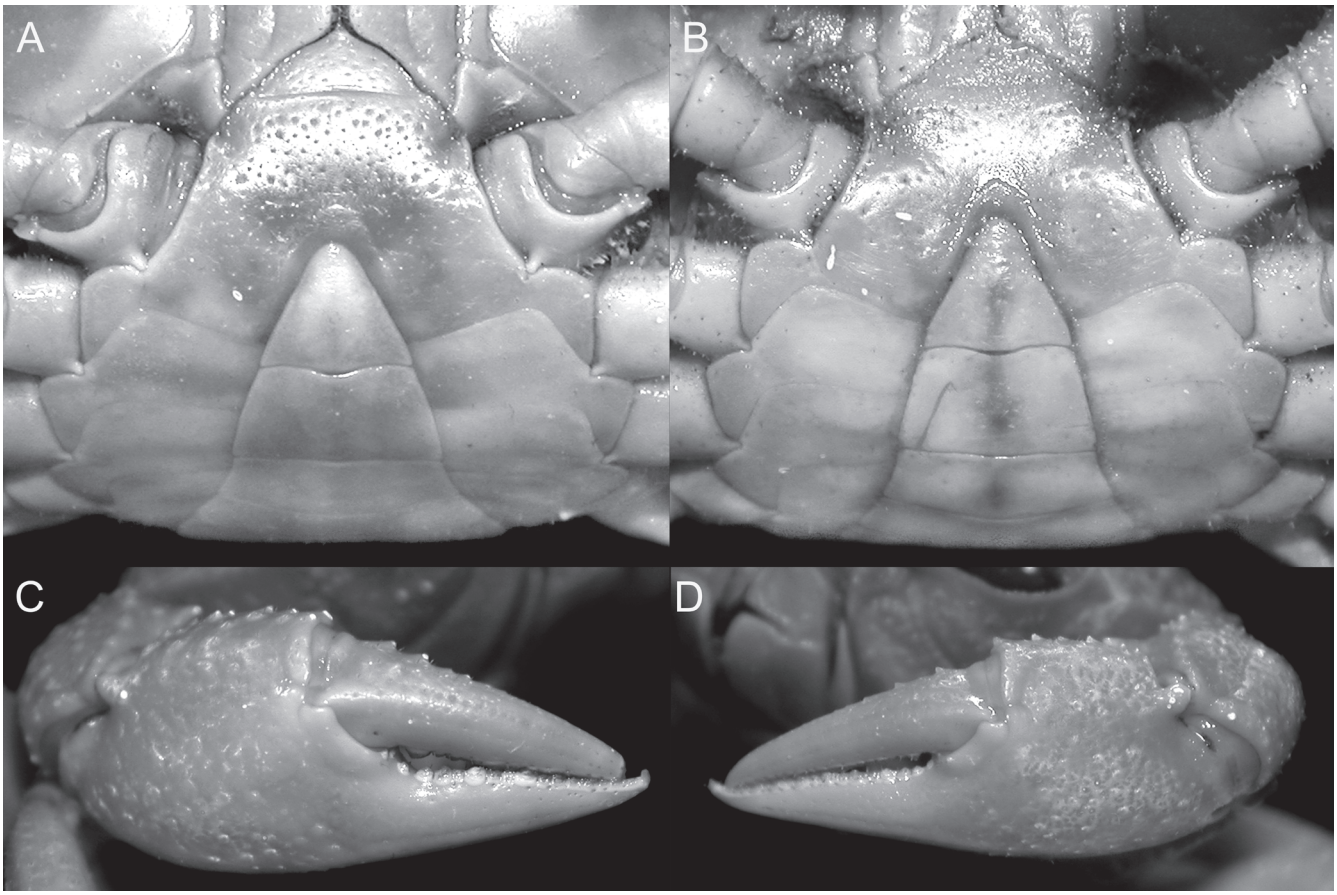

Fig. 2. *Potamiscus whitteni*. A, C, D, holotype male (31.7 x 25.1 mm) (ZRC 2018.1385); B, paratype male (24.3 x 19.4 mm) (ZRC 2018.1386). A, B, anterior thoracic sternum and pleon; C, outer view of right chela; outer view of left chela.

data), and the same generic situation is true for the recently described Chinese *P. crassus* and *P. fumariatus* (see Naruse et al., 2018).

***Potamiscus whitteni*, new species**
(Figs. 1–3)

Material examined. Holotype: male (31.7 x 25.1 mm) (ZRC 2018.1385), station 2, Nui Creek, ca. 1900 m above sea level, ca. 6.5 km west of Hakha, 22°38'31.6"N 98°37'08.4"E, Chin State, Myanmar, coll. Hla Htoo, May 2018. Paratype: male (24.3 x 19.4 mm) (ZRC 2018.1386), same data as holotype.

Diagnosis. Carapace transversely ovate, relatively high in frontal view; dorsal surface gently convex from frontal view, almost glabrous; gastric regions not prominently inflated; branchial regions relatively more raised (Fig. 1A, B, D); lateral parts of anterolateral and branchial regions covered with strong short striae and large granules; mesogastric, urogastric, cardiac and intestinal regions rugose (Fig. 1A, B); epigastric crista distinct, rugose, not cristate, cristae separated by deep, median Y-shaped furrow, anterior of postorbital crista; postorbital crista distinct, outer edge not confluent with anterolateral margin (Fig. 1A, B); frontal margin gently sinuous in dorsal frontal view, weakly separated into 2 very low lobes (Fig. 1A, B, D); external orbital tooth distinct, sharp, triangular, outer margin subequal in length to inner margin, demarcated from rest of anterolateral margin by V-shaped cleft; epibranchial tooth low (Fig. 1A, B); anterolateral margins distinctly convex, cristate, lined with sharp granules, appears gently serrated (Fig. 1A, B); posterolateral margin strongly converging towards almost posterior carapace margin (Fig. 1B); third maxilliped exopod slender, reaching to about one-quarter length of merus gently curved, with tiny flap that is vestigial flagellum (Fig. 3B); ambulatory legs relatively elongate, dactylus elongate, slender, curved, margins with short, sharp pectinate spines (Fig. 1A); thoracic sternite 2 separated from sternite 3 by distinct, gently concave suture (towards buccal cavity) in adult male (Fig. 2A); pleon triangular; somite 6 trapezoidal, wider than long, lateral margin gently convex in adult male (Figs. 2A, 3A); G1 relatively slender, straight; subterminal segment with proximal part gradually tapering to distal part, outer margin with shallow wide cleft on distal part; terminal segment subcylindrical, tapering to relatively sharp tip, dorsal flap low, broad (Fig. 3C–F).

Description of male holotype. Carapace transversely ovate, wider than long (width to length ratio 1.26); carapace relatively high in frontal view; dorsal surface gently convex from frontal view, almost glabrous; gastric regions not prominently inflated; branchial regions relatively more raised (Fig. 1A, B, D). Frontal and orbital regions rugose; lateral parts of anterolateral and branchial regions covered with strong short striae and large granules; mesogastric, urogastric, cardiac and intestinal regions rugose; suborbital region with

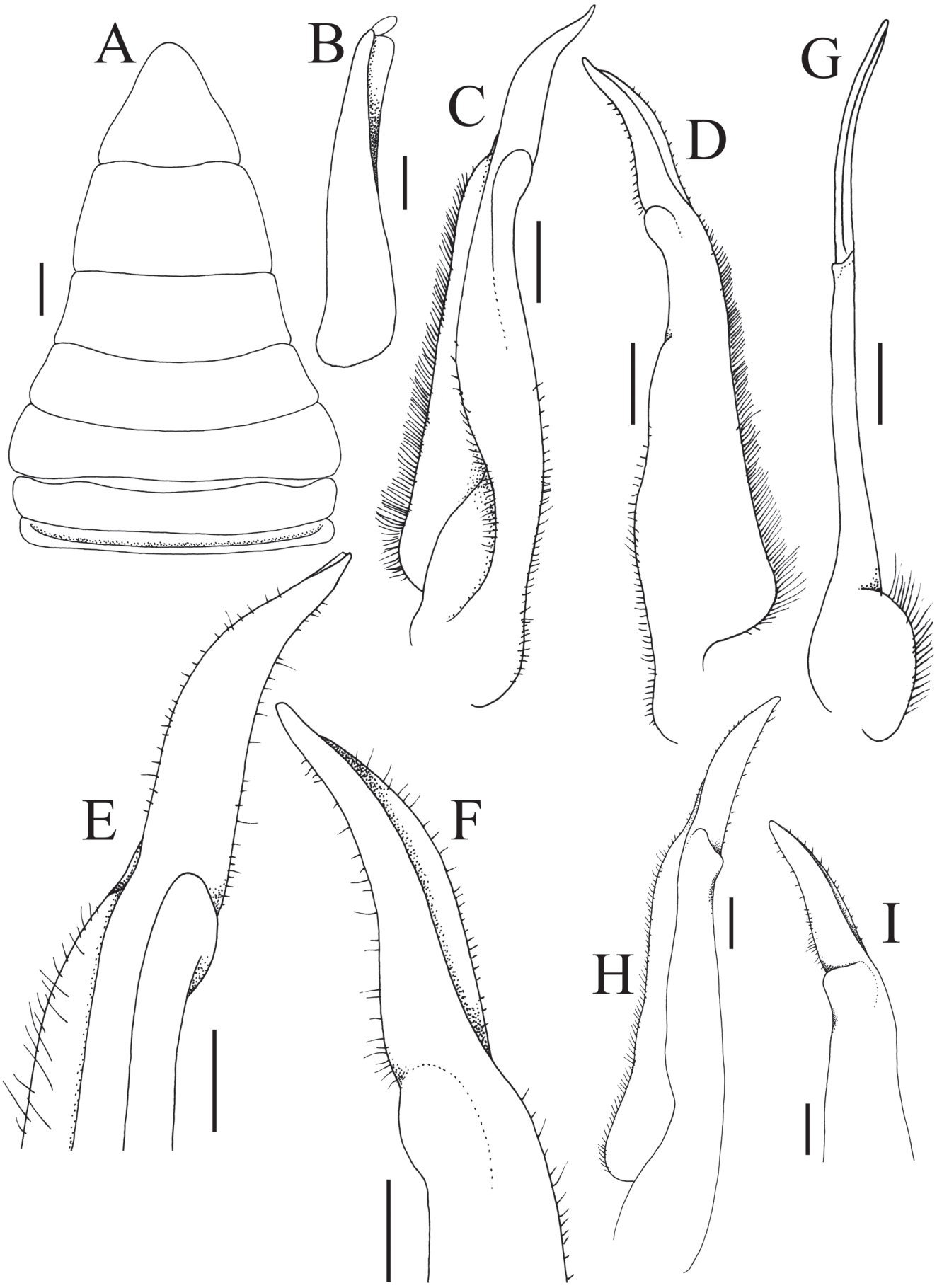

Fig. 3. *Potamiscus whitteni*. A–G, holotype male (31.7 x 25.1 mm) (ZRC 2018.1385); H, I, paratype male (24.3 x 19.4 mm) (ZRC 2018.1386). A, pleon; B, exopod of right third maxilliped; C, H, left G1 (ventral view) D, I, left G1 (dorsal view); E, distal part of left G1 (ventral view); F, distal part of left G1 (dorsal view); G, left G2. Scales: A, 2.0 mm; B–D, G: 1.0 mm; E, F, H, I, 0.5 mm.

small granules; pterygostomial, subhepatic and sub-branchial regions rugose to granulose (Fig. 1A, B, D). Epigastric crista distinct, rugose, not cristate, cristae separated by deep, median Y-shaped furrow, anterior of postorbital crista, separated from postorbital crista by short furrow; postorbital crista distinct, margin sinuous, raised, outer edge breaking up to series of granules and rugae, not confluent with anterolateral margin (Fig. 1A, B). Cervical groove deep along anterior part, shallow posteriorly, not connected to lateral margin, H-shaped median gastric groove distinct (Fig. 1A, C). Frontal margin gently sinuous in dorsal frontal view, weakly separated into 2 very low lobes (Fig. 1A, B, D). External orbital tooth distinct, sharp, triangular, outer margin subequal in length to inner margin, demarcated from rest of anterolateral margin by V-shaped cleft; epibranchial tooth low (Fig. 1A, B). Anterolateral margins distinctly convex, cristate, lined with sharp granules, appears gently serrated (Fig. 1A, B). Posterolateral margin gently sinuous, strongly converging towards almost straight posterior carapace margin (Fig. 1B). Orbits subovate; eye filling orbital space; eye peduncle relatively short, stout; cornea large, round, pigmented (Fig. 1A, B, D). Supraorbital margin gently sinuous, entire (Fig. 1A, B, D). Suborbital margin concave, complete, lined with very small granules (Fig. 1D). Antennae short, reaching base of eyes; antennules short, folding transversely in narrow rectangular fossa (Fig. 1D). Posterior margin of epistome with distinct median triangle, lateral margin gently sinuous (Fig. 1D).

Third maxillipeds covering most of buccal cavity when closed; ischium subrectangular, with shallow but distinct suboblique median groove; merus short, subquadrate, wider than long, margins cristate, anteroexternal angle angular but not produced; exopod slender, reaching to about one-quarter length of merus gently curved, with tiny flap that is vestigial flagellum (Fig. 3B).

Chelipeds asymmetrical, right slightly larger (Figs. 1A, 2C, D). Anterior margin of basis-ischium with 2 or 3 low, sharp tubercles, other parts smooth; margins of merus lined with distinct sharp tubercles, appears serrated. Outer surface of carpus rugose, inner distal angle with prominent sharp tooth and smaller basal tooth (Fig. 1A). Outer surfaces of chelae rugose and pitted, upper part more prominently rugose with low tubercles; major chela stouter, shorter than minor chela (Fig. 1C, D). Fingers of major chela gently curved, longer than palm, outer surface with rows of pits; cutting edges of both fingers with variously sized small sharp teeth and denticles; dorsal margin of dactylus with low sharp tubercles on proximal half (Fig. 2C). Fingers of minor chela similar to major chela in form but relatively more slender (Fig. 2D).

Ambulatory legs relatively elongate, second pair longest, last pair shortest (Fig. 1A). Merus with outer surface gently rugose, dorsal margin uneven, subcristate, with angle on subdistal part but no discernible spine or tooth; carpus almost smooth, outer surface with longitudinal median crista on first 3 pairs of legs, smooth in last pair; surface of propodus smooth; surfaces of merus, carpus and propodus with scattered short setae; dactylus elongate, slender, curved, margins with short, sharp pectinate spines (Fig. 1A).

Thoracic sternum, notably sternites 3 and 4, relatively narrow, surface with numerous pits and short, stiff setae (Fig. 2A). Sternites 1, 2 completely fused to form broadly triangular plate with convex lateral margins; separated from sternite 3 by distinct, gently concave suture (towards buccal cavity); sternites 3, 4 completely fused, transversely narrow, with only short lateral cleft demarcating suture (Fig. 2A). Penis coxal, on condyle of coxa of fourth ambulatory leg. Sternopleonal cavity deep, reaching imaginary line connecting posterior edges of cheliped coxae (Fig. 2A). Male pleonal locking mechanism with peg-like tubercle on proximal third of sternite 5.

Pleon triangular, all somites and telson free; telson triangular, lateral margins slightly sinuous; somite 6 trapezoidal, wider than long, lateral margin gently convex; somites 3–5 trapezoidal, gradually decreasing in width, increasing in length; somites 1 and 2 subrectangular, transversely narrower than somite 3, reaching to bases of coxae of fourth ambulatory legs, thoracic sternite 8 not visible when pleon closed (Figs. 2A, 3A).

G1 relatively slender, straight; subterminal segment with proximal part gradually tapering to distal part, outer margin with shallow wide cleft on distal part; clearly separated from terminal segment by slight dilation; terminal segment subcylindrical, tapering to relatively sharp tip, dorsal flap low, broad (Fig. 3C–F). G2 elongate, longer than G1; basal segment longer than distal segment (Fig. 3G).

Variation. The dorsal surface of the smaller paratype is relatively more rugose and the granules and tubercles are more prominent (Fig. 1C). The epibranchial tooth is also proportionately lower but still distinct (Fig. 1C). The suture between male thoracic sternites 2 and 3 in the smaller paratype is also straight (Fig. 2B) rather than gently concave (Fig. 2A); the male pleon is proportionately less broad with somites 3–6 more quadrate, and the lateral margins of the telson are also somewhat more concave (Fig. 2B versus Fig. 2A). The G1 of the smaller paratype male is developed but is relatively less chitinised and less setose than that of the larger holotype male, with the outer subdistal cleft on the subterminal segment indistinct and the terminal segment proportionately shorter, less curved with the dorsal flap less prominent (Fig. 3H, I). The degree of variation in the G1 structure has been observed for the Myanmarese potamid *Indochinamon khinpyae* (see Ng & Win Mar, 2018).

Colour in life. The dorsal surfaces were all dull red to maroon, with the ventral surfaces dirty white. The chelae are red but the tips of the fingers and along the cutting edges of the fingers are white.

Etymology. The species is named after Tony Whitten. The first author has known Tony for the better part of 30 years and has partnered him on many interesting ventures as well

as collaborated on numerous crab discoveries. He has been an excellent colleague, fervent naturalist, passionate discoverer of new species, ardent conservation biologist and most importantly, a very good friend. He is sorely missed.

Remarks. *Potamiscus whitteni* is perhaps most similar to *P. rangoonensis* described from near Yangon in southern Myanmar. The type localities of the two species are very far from each other, with the type locality of *P. whitteni* obtained from a high altitude of some 1,900 m. The precise habitat for *P. rangoonensis*, known from only one specimen collected in 1865, however, was not documented (Rathbun, 1904: 281). *Potamiscus whitteni*, however, has the frontal and postorbital regions relatively wider (Fig. 1A–C) (versus regions distinctly more compressed in *P. rangoonensis*; cf. Türkay & Naiyanetr, 1987: fig. 1; Brandis, 2000: pl. 20a); the epigastric cristae are distinctly anterior of the postorbital cristae (Fig. 1A–C) (versus the epigastric cristae are level with the postorbital cristae in *P. rangoonensis*; cf. Türkay & Naiyanetr, 1987: fig. 1; Brandis, 2000: pl. 20a); the outer surface of the chelae are less rugose (Fig. 2C, D) (versus surfaces of chelae strongly rugose in *P. rangoonensis*; cf. Türkay & Naiyanetr, 1987: fig. 1); the lateral margins of the male telson are gently concave to almost straight (Fig. 2A, B) (versus deeply concave in *P. rangoonensis*; cf. Brandis, 2000: pl. 20a); and the G1 subterminal segment has a low cleft on the distal outer margin with the terminal segment gently curved upwards with a distinct dorsal flap (Fig. 3C–F) (versus G1 subterminal segment without a discernible cleft on the distal outer margin and the terminal segment subconical with a very low dorsal flap in adults of *P. rangoonensis*; cf. Türkay & Naiyanetr, 1987: fig. 2a, b; Brandis, 2000: pl. 20b, c). Although the holotype male of *P. rangoonensis* is large (65.0 x 49.8 mm) compared to the type series of *P. whitteni*, the differences observed, notably those of the carapace and gonopods, are unlikely to be associated with size.

Potamiscus whitteni is also close to *P. palelensis* from Manipur in eastern India in that its carapace dorsal surface is distinctly more rugose (Fig. 1A–D) (versus dorsal surface smoother with smaller granules and less rugosities in *P. palelensis*; cf. Mitra & Waikhom, 2019: fig. 1A, B); the frontal and postorbital regions are relatively wider (Fig. 1B, C) (versus these regions are more narrow in *P. palelensis*; cf. Mitra & Waikhom, 2019: fig. 1A, B); the lateral margins of the male telson are gently concave (Figs. 2A, B, 3A) (versus distinctly concave in *P. palelensis*; cf. Mitra & Waikhom, 2019: fig. 1C); and the G1 subterminal segment is relatively straighter with the terminal segment proportionately longer with the distal part directed anteriorly (Fig. 3C–F) (versus G1 subterminal segment more sinuous with the terminal segment shorter and directed obliquely laterally in *P. palelensis*; cf. Mitra & Waikhom, 2019: figs. 2B, E, F, 4B, C).

The holotype male of *P. palelensis* (29.5 x 24.2 mm) is comparable to the paratype male of *P. whitteni* (24.3 x 19.4 mm), and their G1 structures are more similar in shape. The dorsal surface of the paratype male of *P. whitteni*, however, is still substantially more granulose and rugose (Fig. 1C) than that of *P. palelensis* (Mitra & Waikhom, 2019: fig. 1A, B). In any case, the G1 subterminal segment of *P. palelensis* is still more sinuous overall and the terminal segment is more curved (Mitra & Waikhom, 2019: figs. 2B, E, F, 4B, C) than that of the smaller *P. whitteni* (Fig. 3H, I). The type locality of *P. whitteni* in Myanmar is some 200 km south-southwest of the type locality of *P. palelensis* (Palel village in Manipur) and separated by several mountain ranges.

Ecology. *Potamiscus whitteni* was collected from a small shallow creek (Nui), which originates from high in the mountains, and flows down to a small stream (Themit) before entering the Manipura River. The relatively more swollen carapace and elongate ambulatory dactyli suggest that *P. rangoonensis*, *P. palelensis* and *P. whitteni* are terrestrial or semiterrestrial in habits, as has been observed for many similar genera like *Thaipotamon* Ng & Naiyanetr, 1993, *Pudaengon* Ng & Naiyanetr, 1995, and *Dromothelphusa* in Thailand and Indo-China (Naiyanetr, 1992, 1994; Ng & Naiyanetr, 1993, 1995).

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