Description of a new genus and new species of freshwater crab (Brachyura: Potamoidea) from southern Vietnam

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Abstract.—A new genus and new species of potamid freshwater crab, *Xestomon tacu*, is described from Ta Kou mountain in southern Vietnam. The new genus is characterised by its transversely ovate and smooth carapace surface, the very low to undiscernible epigastric and postorbital cristae, complete absence of a flagellum on the third maxilliped, relatively short ambulatory legs, a male telson which is acutely triangular with the lateral margins distinctly concave, and a short stout male first gonopod which has the terminal segment gently curved upwards.

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Key words: Potamidae, taxonomy, new genus, new species, comparative studies, Indochina

Introduction

Among the crab material Louis Deharveng collected from Mount Ta Kou in southern Vietnam in 2006 were three specimens of an unidentified species of potamid freshwater crab, one of which was from a cave. They proved to belong to a new genus and new species, here named *Xestomon tacu*. The description of the new genus and species, and comparisons with allied taxa form the basis of the present paper.

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. Specimens examined are deposited in the Zoological Reference Collection (ZRC) of the Lee Kong Chian Natural History Museum, National University of Singapore; and Southern Institute of Ecology (SIE), Vietnam Academy of Science and Technology, Vietnam.

Taxonomy

Superfamily Potamoidea Ortmann, 1896
Family Potamidae Ortmann, 1896
Subfamily Potamiscinae Bott, 1970, sensu Yeo & Ng, 2004

*Xestomon* n. gen.
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Type species
*Xestomon tacu* n. sp., by present designation.

Diagnosis
Carapace transversely ovate; dorsal surface gently convex, smooth; lateral parts of branchial regions covered with very low, short striae; mesogastric, urogastric, cardiac and intestinal regions almost smooth except for pits; orbital regions smooth; suborbital, subhepatic and pterygostomial regions smooth; epigastric cristae very low; postorbital cristae not discernible; external orbital tooth not visible, confluent with anterolateral margin, without visible epi-
branchial tooth; third maxillipeds with merus subquadratae, wider than long, anteroexternal angle rounded, not expanded; exopod with no trace of flagellum; ambulatory legs not elongated, length to width ratio of fourth merus less than 4; thoracic sternum relatively wide; sternites 3, 4 fused, with separation demarcated by oblique concavity and shallow oblique grooves; male pleonal locking tubercle on submedian part of sternite 5; male pleon with acutely triangular telson, prominently longer than wide, lateral margins distinctly concave; somite 6 trapezoidal with distal margin 1.8 times proximal margin, lateral margins gently sinuous; thoracic sternite 8 not visible when pleon closed; G1 relatively stout, subterminal segment gradually tapering distally, terminal segment relatively short, stout, gently curving upwards, groove for G2 submarginal; G2 distinctly longer than G1; proximal segments long. Vulvae oblique in position, spaced well apart, proximal margin of each just touching suture with sternite 5.

Etymology

The name Xestomon is derived from an arbitrary combination of the Greek word for polished (ξεστος) and the genus name Potamon, alluding to the smooth carapace of the type species. The gender is neuter.

Remarks

The decision to place this new species in a new genus is not because there is a single diagnostic character that easily separates it from other genera. The combination of carapace, third maxillipeds, ambulatory leg, male pleonal, G1 and vulval characters, however, is unique. In the general appearance of the carapace, Xestomon n. gen. is most similar to Tiwaripotamon Bott, 1970 (type species Geothelphusa annamensis Balss, 1914), a genus with 10 species from northern Vietnam and southern China (Ng et al., 2008; Shih & Do, 2014; Do et al., 2016, 2017; Pati et al., 2020). The adult chelifeds and ambulatory legs of Tiwaripotamon species, however, are much longer with the front proportionately narrower, and most taxa have a distinct epibranchial tooth (except T. araneum (Rathbun, 1905)) with the external orbital angle acutely triangular (e.g., Ng & Yeo, 2001: fig. 1A, B); the median triangle on the posterior margin of the epistome is triangular to broadly triangular (Ng & Yeo, 2001: figs. 1B, 3B); the ischium of the third maxilliped is distinctly shorter and the exopod usually has a short flagellum (e.g., Ng & Yeo, 2001: fig. 2A, C; Do et al., 2016: fig. 1C; Do et al., 2017: fig. 2C); the male pleon is proportionately more triangular with the telson broadly triangular (e.g., Ng & Yeo, 2001: fig. 2B); the G1 is more elongate and slender (e.g., Ng & Yeo, 2001: fig. 2D–I); and the vulva is oblique in position, with the proximal margin just touching the suture with sternite 5 (e.g., Dai, 1999: fig. 184(9)); Do et al., 2016: fig. 5E, F; Do et al., 2017: fig. 3C).

Compared to Aparapotamon Dai & Chen, 1985 (type species Potamon (Potamon) grahaimi Rathbun, 1931), Parvuspotamon Dai & Bo, 1994 (type species Parvuspotamon yuxiense Dai & Bo, 1994), and Potamiscus Alcock, 1909 (type species Potamiscus annandali Alcock, 1909), from Indo–China and southern China in which the exopod of the third maxilliped has only a short or no flagellum, Xestomon can easily be separated by its smooth carapace, with the epigastric cristae low, the postorbital cristae barely visible and the lateral regions possessing only low, short striae. The carapaces of Aparapotamon and Potamiscus, however, have a distinct epibranchial tooth, the epigastric and postorbital cristae are prominent and sharp, and the dorsal surface is rougher and more striated (e.g., Dai, 1999: pl. 12 figs. 2–8, pl. 13 fig. 1; pl. 23 figs. 4–8). In Parvuspotamon, the carapace is distinctly more quadrato in shape with the dorsal surface rougher (e.g., Dai, 1999: pl. 28 fig. 1). The structure of the third maxilliped and vulva of Aparapotamon
and *Parvuspotamon* closely resemble those of *Xestomon* (e.g., Dai, 1999: figs. 187(1, 8), 216(1, 8)), but the male pleon (in particular the telson) in these genera is evenly triangular and the G1 terminal segment is proportionately much longer (e.g., Dai, 1999: figs. 187(2, 4, 5), 261(2, 4, 5)). The G1 structure of *Potamiscus* species is quite different, being generally stouter and the terminal segment is more tubular, straight and/or curving outwards (e.g., Dai, 1999: figs. 99(4, 5), 101(4, 5), 103(5, 6); Pati et al., 2020: figs. 4A–D, F–I, 5A–C, E–G). *Potamiscus*, however, is clearly a polyphyletic assemblage of species and will need to be substantially revised in time (see Pati et al., 2020; Mitra et al., 2021).

The smooth carapace features of *Xestomon* resemble those of *Chinapotamon* Dai & Naiyanetr, 1994 (type species *Tiaripotamon depressum* Dai, Song, Li & Liang, 1980), but in the latter genus, the epibranchial tooth is usually low but visible to some degree, with the epigastric and postorbital cristae low but discernible (e.g., Dai, 1999: pl. 4 figs. 4, 5; Ng, 2017: figs. 2A, B, 6A, B). *Chinapotamon* species, however, all have a long flagellum on the exopod of the third maxillipeds (e.g., Dai, 1999: fig. 42(1); Ng, 2017: fig. 2D); the male pleon is evenly triangular (e.g., Dai, 1999: fig. 42(3); Ng, 2017: fig. 3B); the G1 is distinctly more slender and longer (e.g., Dai, 1999: fig. 42(5, 6); Ng, 2017: fig. 8A–C, E–G); and the vulva is distinctly smaller, oblique in position with the proximal edge just touching the suture with sternite 5 (e.g., Dai, 1999: fig. 42(9)).

Interestingly, the carapace and G1 features of *Xestomon* closely resemble those of *Phasmon* Huang, Ahyong & Shih, 2021 (type species *Phasmon typhlops* Huang, Ahyong & Shih, 2021), a troglobitic taxon from Guangxi in southern China (Huang et al., 2021: fig. 1). The G1 terminal segment, however, is relatively longer and the groove for the G2 is marginal in position (Huang et al., 2021: figs. 3C, 4A, B). In addition, *Phasmon* differs in having the medial lobe of posterior margin of epistome more acutely triangular (Huang et al., 2021: fig. 2A); the exopod of the third maxilliped has a long flagellum (Huang et al., 2021: figs. 3A); the male pleon is proportionately broader with the telson broadly triangular and the lateral margins convex (Huang et al., 2021: fig. 2B, C); and the vulva is less broad and not transversely positioned (Huang et al., 2021: fig. 2F). Significantly, as *Xestomon* is not a troglobitic species, with the eyes not reduced and the carapace and appendages have orange colour pigments (cf. Huang et al., 2021: figs. 2A, 3F).

The smooth and ovate carapace of *Xestomon* superficially resembles many species of *Geothelphusa* Stimpson, 1858 (type species type species *Geothelphusa obtusipes* Stimpson, 1858), a large genus endemic to Taiwan and Japan. With the exception of one *Geothelphusa* species, members of this genus have a long flagellum on the exopod of the third maxillipeds and their G1 structures are very different, being more slender and the male pleon is proportionately wider (see Shy et al., 2020). Only in the Okinawan *G. tenuimanus* (Miyake & Minei, 1965) is the flagellum on the exopod of the third maxilliped short (Naruse et al., 2005).

**Xestomon tacu** n. gen, n. sp.

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(Figs. 1–3)

**Material examined**

Holotype: male (21.2 × 15.7 mm) (ZRC 2021.0014), station VN06–232, in cave, Ta Kou (Tà Cú) mountain near Thuấn Nam: Hang Tô, Bình Thuận Province, Vietnam, 10.81378°N 107.895221°E, 470 m asl, coll. L. Deharveng, 13 December 2006. Paratypes: 1 female (19.9 × 15.2 mm) (ZRC 2021.0015), 1 female (15.7 × 12.9 mm) (SIE), station VN06–246, secondary forest, in mountain near hotel, Ta Kou (Tà Cú) mountain near Thuấn Nam, Bình Thuận Province, Vietnam, 10.812798°N
Fig. 1. *Xestomon tacu* n. gen, n. sp., holotype male (21.2 × 15.7 mm) (ZRC 2021.0014). A, overall dorsal view; B, dorsal view of carapace; C, frontal view of cephalothorax; D, frontal view showing antennae, antennules and epistome; E, thoracic sternum and pleon; F, pleon; G, posterior thoracic sternum and pleon; H, left chela; I, right chela. H and I same scale.
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107.892339°E, 400 m asl, coll. J. Arabi, coll. 14 December 2006.

**Diagnosis**
As for genus.

**Description of holotype male**
Carapace transversely ovate, distinctly wider than long, width to length ratio 1.35; dorsal surface gently convex (Fig. 1A–C). Frontal and anterolateral regions smooth; lateral parts of branchial regions covered with very low, short striae; mesogastric, urogastric, cardiac and intestinal regions almost smooth except for pits; orbital regions smooth; suborbital, subhepatic and pterygostomial regions smooth (Fig. 1B, C). Epigastric cristae very low, separated by broad, shallow Y-shaped furrow; postorbital cristae not discernible (Fig. 1A–C). Cervical grooves very shallow, barely visible; H-shaped median gastric groove shallow (Fig. 1B). Frontal margin broad, barely divided into 2 low lobes, separated by broad, very shallow concavity; margin of each lobe gently convex, outer edge angular, confluent with supraorbital margin (Fig. 1B). External orbital tooth not visible, confluent with anterolateral margin, no visible epibranchial lobe or tooth (Fig. 1A–C). Anterolateral margins strongly convex, cristate, lined with low granules (Fig. 1A, B). Postero-lateral margin gently concave, converging towards gently convex posterior carapace margin (Fig. 1A, B). Orbits ovate; eye filling space; ocular peduncle relatively short (Fig. 1A–C). Carnea large, ovate, pigmented (Fig. 1B, C). Supraorbital margin gently sinuous, entire, lined with small granules (Fig. 1B, C). Suborbital margin concave, complete, lined with small granules (Fig. 1C). Antennae very short, not reaching carnea of eyes; antennules short, folding transversely in narrow fossa (Fig. 1C). Posterior margin of epistome with distinct broad median triangle with rounded tip, lateral margin sinuous (Fig. 1C, D).

Mandibular palp 3-segmented; terminal article as single lobe. Third maxillipeds covering entire buccal cavity when closed; ischium sub-rectangular, smooth, with shallow median oblique groove; merus subquadrate, wider than long, surface smooth, anteroexternal angle rounded, not expanded; exopod slender, reaching to one-third length of merus, no trace of flagellum (Figs. 1D, 3A).

Chelipeds asymmetrical (Fig. 1A, H, I). Anterior margin of basis-ischium with small granules; margins of merus finely granulated (Fig. 1E). Outer surface of carpus slightly rugose, punctate, inner distal angle with low tubercle, with small granule basally (Fig. 1A). Outer surfaces of chelae with numerous pits, otherwise smooth (Fig. 1H, I). Fingers of major chela, stout, gently curved, distinctly longer than palm, outer surface lined with 3 rows of pits; cutting edges of both fingers with small teeth on distal half, not forming gape when fingers closed (Fig. 1H). Fingers of minor chela slender, otherwise similar to condition of major chela (Fig. 3I).

Ambulatory legs not elongated; second pair longest, second pair shortest (Fig. 1A). Outer surface of merus almost smooth rugose, dorsal margin subcristate, very weakly serrated, with low subdistal tooth, length to width ratio of fourth merus 3.9; carpus smooth, outer surface with low submedian crista on first to third legs, smooth on fourth leg; propodus subrectangular, length to width ratio of fourth propodus 2.7; dactylus short, gently curved, margins with short, sharp corneous spines (Fig. 1A).

Thoracic sternum relatively wide, surface pitted (Figs. 1E, 2A). Sternal 1, 2 completely fused to form broadly triangular plate; separated from sternite 3 by shallow but distinct complete suture; sternes 3, 4 fused, with separation demarcated by oblique concavity and shallow oblique grooves; sutures 4/5, 5/6, 6/7, and 7/8 medially interrupted; median longitudinal groove on sternites 7 and 8 (Fig. 2A); sternopleonal cavity reaching to imaginary line connecting median part of cheliped coxae,
reaching to proximal edge of sternite 3 (Figs. 1E, 2A). Male pleonal locking tubercle on submedian part of sternite 5.

Male pleon triangular, all somites and telson free; telson acutely triangular, prominently longer than wide, length to width ratio 1.1, lateral margins concave; somite 6 trapezoidal with distal margin 1.8 times proximal margin, lateral margins gently sinuous; somites 3–5 wide, trapezoidal, gradually decreasing in width; somite 2 trapezoidal, less wide than somite 3, reaching to bases of coxae of fourth ambulatory legs, thoracic sternite 8 not visible when pleon closed; sternite 1 narrow, broadly subrectangular (Fig. 1E–G).

G1 with terminal and subterminal segments clearly demarcated; subterminal segment stout with distal part distinctly narrower; terminal segment relatively short, stout, gently curving upwards, tip subtruncate, groove for G2 submarginal in position (Fig. 3B–F). G2 1.2 times longer than G1; distal segment long, ratio of basal to distal segment length 1.8 (Fig. 3G, H).

**Females**

The female specimens agree with the holotype male in most aspects except that the chelifeds are more symmetrical. All their third maxillipeds lack a flagellum on the exopod. The female carapaces are also proportionately slightly less wide (width to length ratios 1.29 and 1.31) (Fig. 2B). Both female specimens are not fully mature, with the pleon of the larger one still subtriangular in shape and the pleopods are not strongly setose (Fig. 2C). The vulvae, however, are developed, being large, transversely ovate, spaced far apart, with the proximal margin appressed against the suture.
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with sternite 5 (Fig. 2D).

Colour
In life, the specimens were light orange (L. Deharveng, personal communication).

Etymology
The species is named after the Vietnamese name for the type locality, Tà Cú. The name is used as a noun in apposition.

Remarks
The male holotype was collected in a cave (Hang To) that is formed by large granite boulders, with a stream running through it. The female paratypes were obtained from the hill forest. The semiterrestrial species does not have any characters associated with cavernicolous taxa, and their habits appear to be similar to those of epigean species of *Tiwaripotamon* (see Shih & Do, 2014; Do *et al.*, 2016, 2017).

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Fig. 3. *Xestomon tacu* n. gen, n. sp., holotype male (21.2 × 15.7 mm) (ZRC 2021.0014). A, left third maxilliped; B, left G1 (ventral view); left G1 (dorsal view); D distal half of left G1 (ventral view); E, distal half of left G1 (inner mesial view); F, distal half of left G1 (dorsal view); G, left G2 (ventral view); H, distal segment of left G2 (dorsal view). Scales: A = 1.0 mm; B–H = 0.5 mm.
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