

A second new species of terrestrial long-legged *Terrapotamon* Ng, 1986 (Crustacea: Brachyura: Potamidae) from karst forests in Peninsular Thailand

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Abstract. A new species of potamid crab of the genus *Terrapotamon* Ng, 1986, is described from karst forests in Satun, Peninsular Thailand. *Terrapotamon thungwa* n. sp. has very long ambulatory legs and superficially resembles *T. longitarsus*, the only other long-legged species in the genus. They can easily be distinguished by life colouration, carapace features, as well as structures of the epistome, male thoracic sternum, cheliped and male first gonopod.

Key words. Freshwater crab, new species, Potamidae, Peninsular Thailand, karst, caves, taxonomy

INTRODUCTION

Lheknim & Ng (2016) recently described a distinctive long-legged terrestrial potamid crab, *Terrapotamon longitarsus*, from Satun in Peninsular Thailand. During the study of this species, a female specimen of what appeared to be a second species of long-legged *Terrapotamon* was also collected by the headman of Tambon Pa Kae Bo Hin, the same province where *T. longitarsus* was collected, and sent to first author. Over the last year, more specimens of both species of long-legged *Terrapotamon* (including males) were collected by the first and second authors. The fresh material confirmed our observations that there are two species occurring in the same region, with the second species differing markedly from *T. longitarsus* in life coloration as well as structures of the carapace, epistome, male thoracic sternum, cheliped and male first gonopod. This new species, here named *T. thungwa*, is described herein.

The following abbreviations are used: G1, male first gonopod; G2, male second gonopod. Measurements are given in millimetres (mm) as carapace width × length. Terminology used essentially follows Ng (1988) and Davie et al. (2015). Thai words used in the text are Khao [= mountain], Tambon [= sub-district], Amphoe [= district], and Changwat [= province]. Specimens examined are deposited in the Natural History Museum and Local Learning Networks, Prince of

Songkla University, Pattani, Thailand (PSUNHM), Princess Maha Chakri Sirindhorn Natural History Museum, Prince of Songkla University, Hat Yai, Thailand (PSUZYC); and the Zoological Reference Collection of the Lee Kong Chian Natural History Museum, National University of Singapore (ZRC).

TAXONOMY

Family Potamidae Ortmann, 1896

Subfamily Potamiscinae Bott, 1970, sensu Yeo & Ng, 2004

Genus *Terrapotamon* Ng, 1986

Terrapotamon thungwa n. sp. (Figs. 1–5, 7A, C, E)

Material examined. Holotype: adult male (44.6 × 35.0 mm) (ZRC 2016.0595), limestone bedrock, ca. 350 m asl, Ban Rao Pla, Tambon Thung Wa, Amphoe Thung Wa, Changwat Satun, coll. Y. Pun et al., 12 June 2016. Paratypes: 2 adult females (41.4 × 32.9, 40.0 × 32.8 mm) (PSUNHM-2016.0001), same data as holotype; 1 adult female (46.1 × 37.2 mm) (ZRC 2016.0596), limestone bedrock at Khao Wang Phak Kud, Tambon Pa Kae Bo Hin, Amphoe Thung Wa, Changwat Satun, Peninsular Thailand, coll. R. Promdam & S. Promwichit, 10 September 2015; 1 adult male (41.1 × 33.3 mm), 1 adult female (31.1 × 25.5 mm) (PSUZYC-CRU-0072), Ban Namtok Than Plio, Amphoe Thung Wa, Changwat Satun, Peninsular Thailand, coll. R. Promdam & S. Jantarit, 23 April 2016; 3 adult males (45.9 × 37.4 mm, 43.1 × 33.4 mm, 40.5 × 32.2 mm), 1 young female (29.4 × 23.8 mm) (PSUZYC-CRU-0073), 1 young male (28.8 × 23.8) (ZRC 2016.0597) Ban Namtok Than Plio, Amphoe Thung Wa, Changwat Satun, Peninsular Thailand, coll. R. Promdam & S. Jantarit, 27 April 2016.

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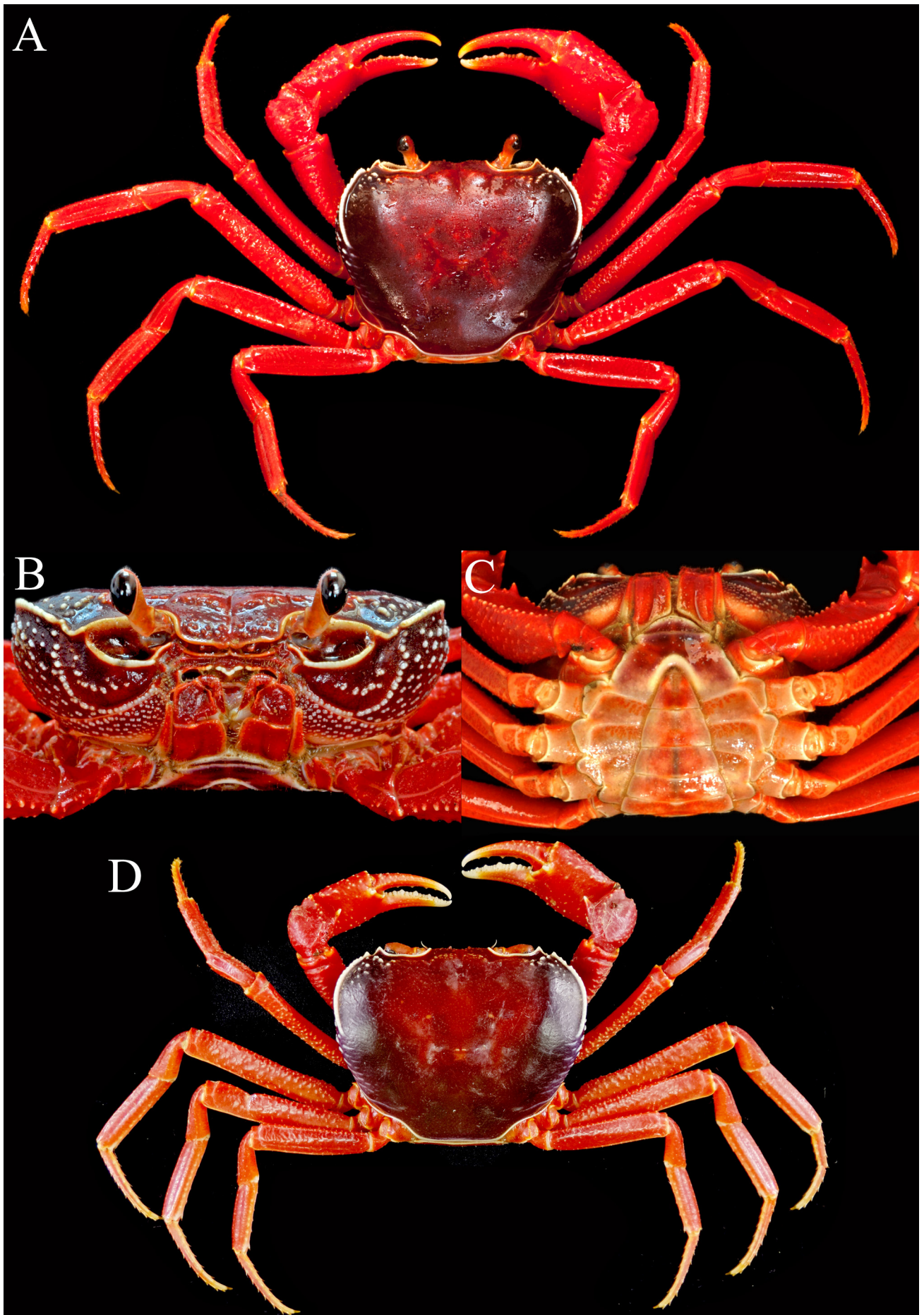


Fig. 1. *Terrapotamon thungwa* n. sp., colour in life. A–C, holotype male (44.6 × 35.0 mm) (ZRC 2016.0595), Satun, Thailand; D, paratype female (46.1 × 37.2 mm) (ZRC 2016.0596), Satun, Thailand.

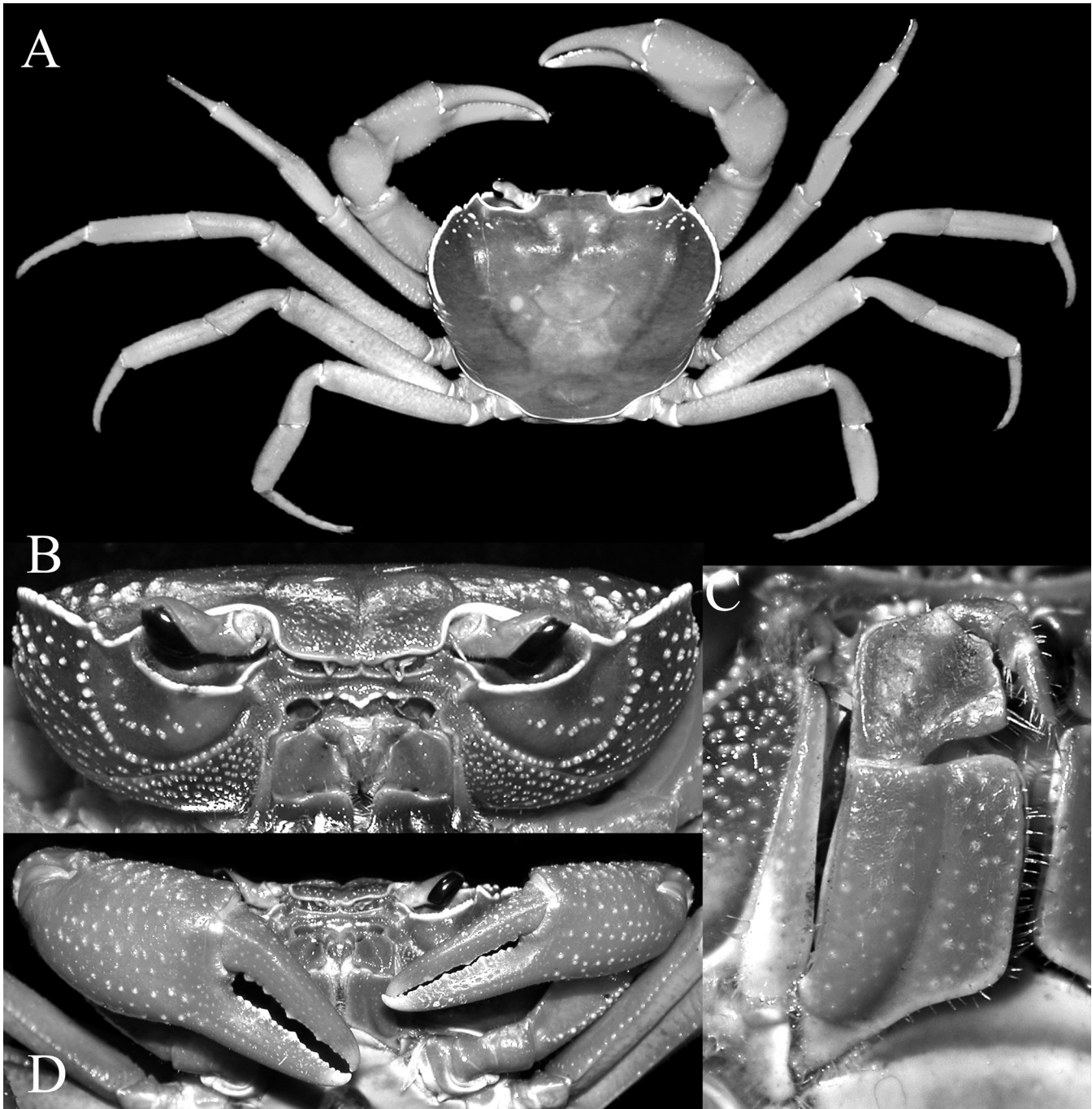


Fig. 2. *Terrapotamon thungwa* n. sp., holotype male (44.6 × 35.0 mm) (ZRC 2016.0595), Satun, Thailand. A, overall habitus; B, frontal view of cephalothorax; C, outer view of chelae; D, right third maxilliped.

Comparative material. *Terrapotamon longitarsus* Lheknim & Ng, 2016 – Holotype: male (47.4 × 38.6 mm) (ZRC 2016.0161), on limestone bedrock at Khao Raya Bung Sa, southernmost of Nakhon Si Thammarat mountain range, 30 m above mean sea level, Tambon Khuan Po, Muang Satun District, Changwat Satun, coll. V. Lheknim & P. Leelawathanagoon, 9 September 1999. Paratypes: 1 male (40.8 × 32.5 mm) (PSUZYC 20150726-01.01), limestone rock crevice, near locality of holotype, coll. R. Promdam & R. Engchoun, 26 July 2015; 1 male (28.4 × 23.8 mm) (PSUZYC 20150611-01.01), limestone rock crevice, near locality of holotype, coll. R. Promdam & R. Engchoun, 11 June 2015. Others: 1 male (35.0 × 29.5 mm), 1 female (23.8 × 20.2 mm) (ZRC 2016.0162), Changwat Satun, coll. Y. Pun & S.

Buatip, 20 May 2016; 1 male (33.2 × 28.1 mm) (PSUZYC-CRU-0071), Ban Namtok Than Plio, Amphoe Thung Wa, Changwat Satun, coll. R. Promdam & S. Jantarit, 23 April 2016. All locations in southernmost part of Nakhon Si Thammarat mountain range, Peninsular Thailand.

Diagnosis. Carapace, chelipeds and ambulatory legs bright red in life (Fig. 1); carapace transversely ovate, distinctly broader than long; dorsal surfaces almost smooth, gently convex, regions poorly demarcated (Figs. 1A, D, 2A, 5A, 7A); lateral regions with low, short, oblique striae (Figs. 1A, D, 2A, 5A, 7A); external orbital tooth triangular (Figs. 1A, D, 2A, 5A, 7A); anterolateral margin distinctly cristate (Figs. 1A, D, 2A, 5A, 7A); posterolateral margin gently

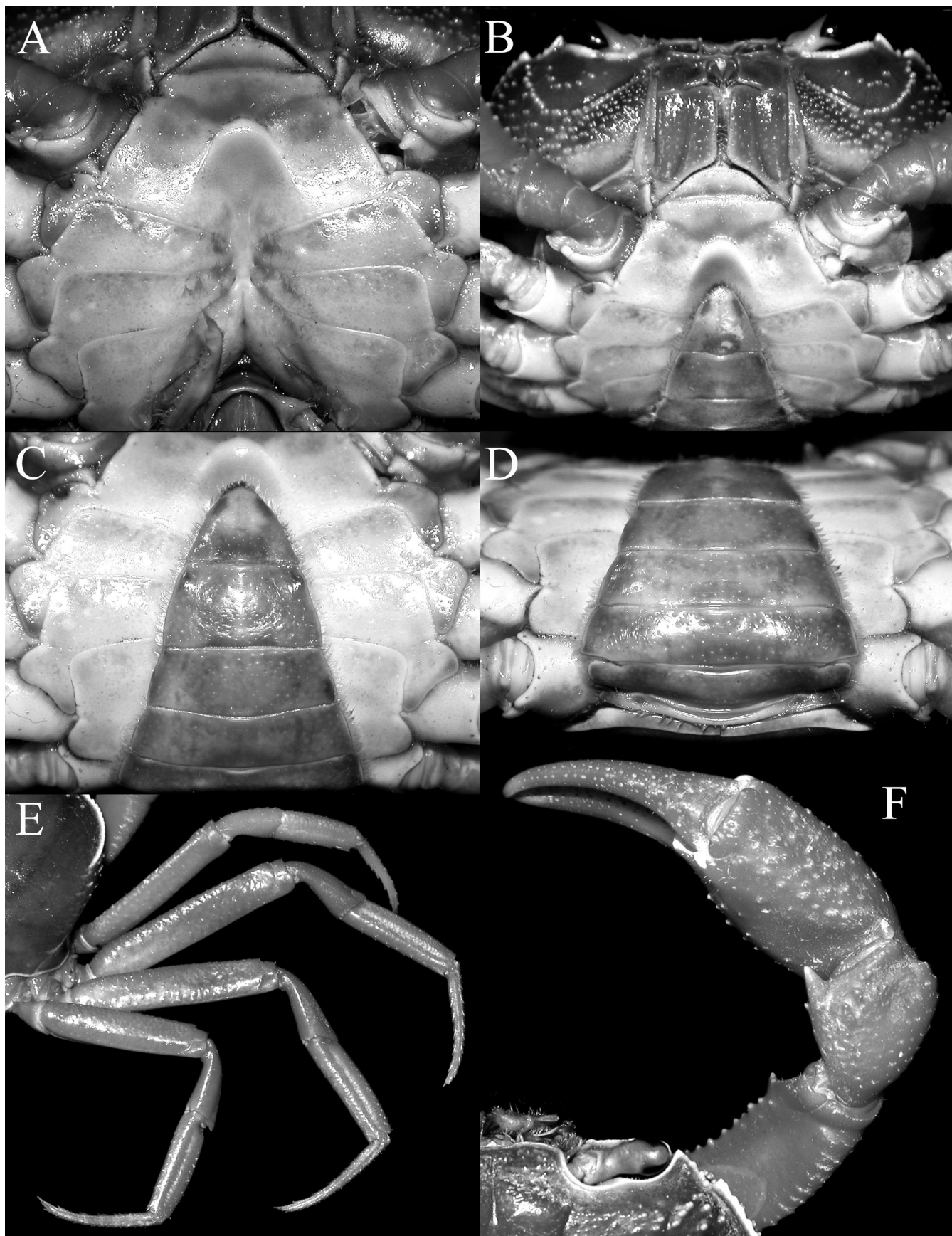


Fig. 3. *Terrapotamon thungwa* n. sp., holotype male (44.6 × 35.0 mm) (ZRC 2016.0595), Satun, Thailand. A, thoracic sternum and sternopleonal cavity; B–D, thoracic sternum and pleon; E, right ambulatory legs; F, dorsal view of right major cheliped.

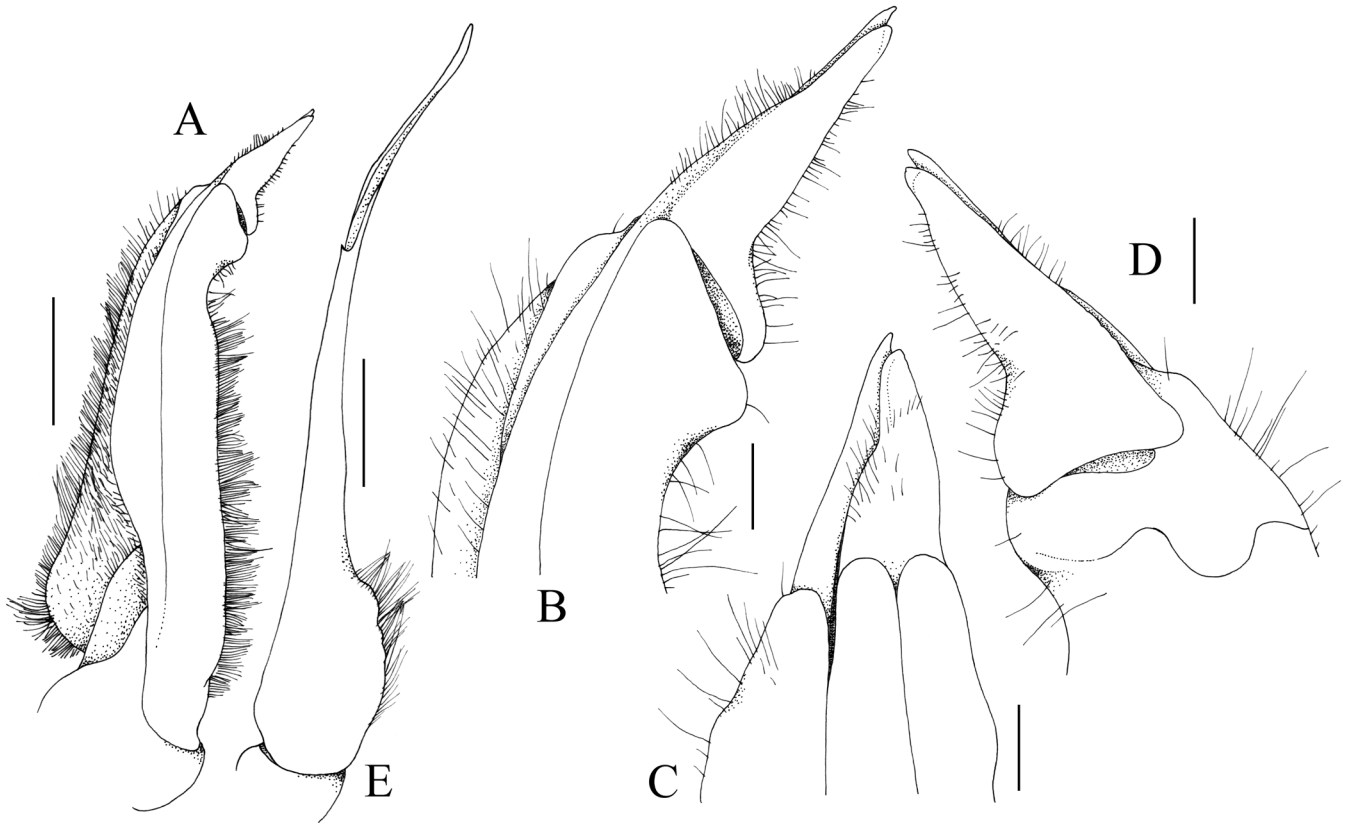


Fig. 4. *Terrapotamon thungwa* n. sp., holotype male (44.6 × 35.0 mm) (ZRC 2016.0595), Satun, Thailand. A–D, left G1; E, left G2. B–D, distal part of left G1; A, B, E, ventral view; C, dorsomesial view; D, dorsal view.

converging to posterior carapace margin (Figs. 1A, D, 2A, 5A, 7A); epigastric and postorbital cristae distinct, rugose, not sharp, epigastric cristae distinctly anterior of postorbital cristae (Figs. 1A, D, 2A, 5A, 7A); sub-orbital, sub-branchial, pterygostomial regions covered with numerous well-spaced small sharp granules (Figs. 1B, 2B, 7C); posterior margin of epistome with relatively broad median triangular tooth (Figs. 1B, 2B, 7C); ambulatory legs very long, slender (Figs. 1A, D, 2A, 3E, 5A); anterior thoracic sternum relatively broad (Fig. 3B); outer surface of major chela prominently granulated (Figs. 2D, 7E); last ambulatory propodus relatively long, 3.5–3.8 times longer than broad (Fig. 3E); G1 with strongly developed swelling on outer margin between terminal and subterminal segments, terminal segment relatively long, about 0.2 times length of subterminal segment, with distal part slender, elongated, tip bifurcated (Fig. 4A–D).

Description of male holotype. Carapace (Figs. 1A, 2A, 7A) transversely ovate, distinctly broader than long, relatively flat; dorsal surface almost smooth, glabrous, regions poorly demarcated, lateral regions with distinct oblique striae, cervical grooves faint, H-shaped median groove distinct. Anterolateral margins (Figs. 1A, 2A, 7A) arcuate, distinctly cristate, lined with blunt granules, appearing gently serrated, distinctly separated from gently converging posterolateral margins. Frontal margin (Figs. 1A, B, 2A, B, 7A, C) gently deflexed, sinuous, 2 lobes separated by broad, shallow sinus; epibranchial tooth distinct, clearly separated from external orbital angle margin by deep, V-shaped cleft; external orbital angle triangular, outer margin straight, gently serrated, subequal to inner margin. Epigastric and postorbital cristae

(Figs. 1A, 2A, 7A) distinct, rugose, not sharp; epigastric cristae distinctly anterior of postorbital cristae, separated by distinct oblique groove. Orbits large (Figs. 1A, B, 2A, B, 7A, C); eyes well developed, cornea large, pigmentation well developed. Sub-orbital, sub-branchial, pterygostomial regions (Figs. 1B, 2B, 7C) covered with numerous well-spaced small sharp granules. Lateral part of epistome, outer surfaces (between anterior, posterior margins), inner part of pterygostomial regions hirsute (Figs. 1B, 2B, 7C). Anterior margin of epistome (Figs. 1B, 2B, 7C) straight, parallel with frontal margin; posterior margin with relatively broad median triangular tooth, lateral margins gently concave.

Exopod of third maxilliped (Fig. 2C) extending beyond distal margin of ischium, just reaching midway of merus; with distinct flagellum reaching about half width of merus. Ischium (Fig. 2C) subrectangular, relatively short, with deep median groove; merus squarish, cristate along margins.

Chelipeds (Figs. 1A, 2A, D, 7E) elongate, unequal, fingers of both chelae nearly as long as palm; outer surfaces of all articles distinctly granulated. Carpus (Figs. 1A, 2A, 3F) with long sharp, obliquely directed subdistal spine on inner angle; merus with subterminal spine behind inner part.

Ambulatory legs (Figs. 1A, 2A, 3E) very long, slender, last pair shortest, second pair longest; surfaces of all articles rugose, dorsal margin gently serrated; lower margin of merus, propodus and dactylus with scattered short stiff setae. Merus (Figs. 1A, 2A, 3E) without distinct subdistal spine; propodus relatively broad, distinctly longer than carpus,

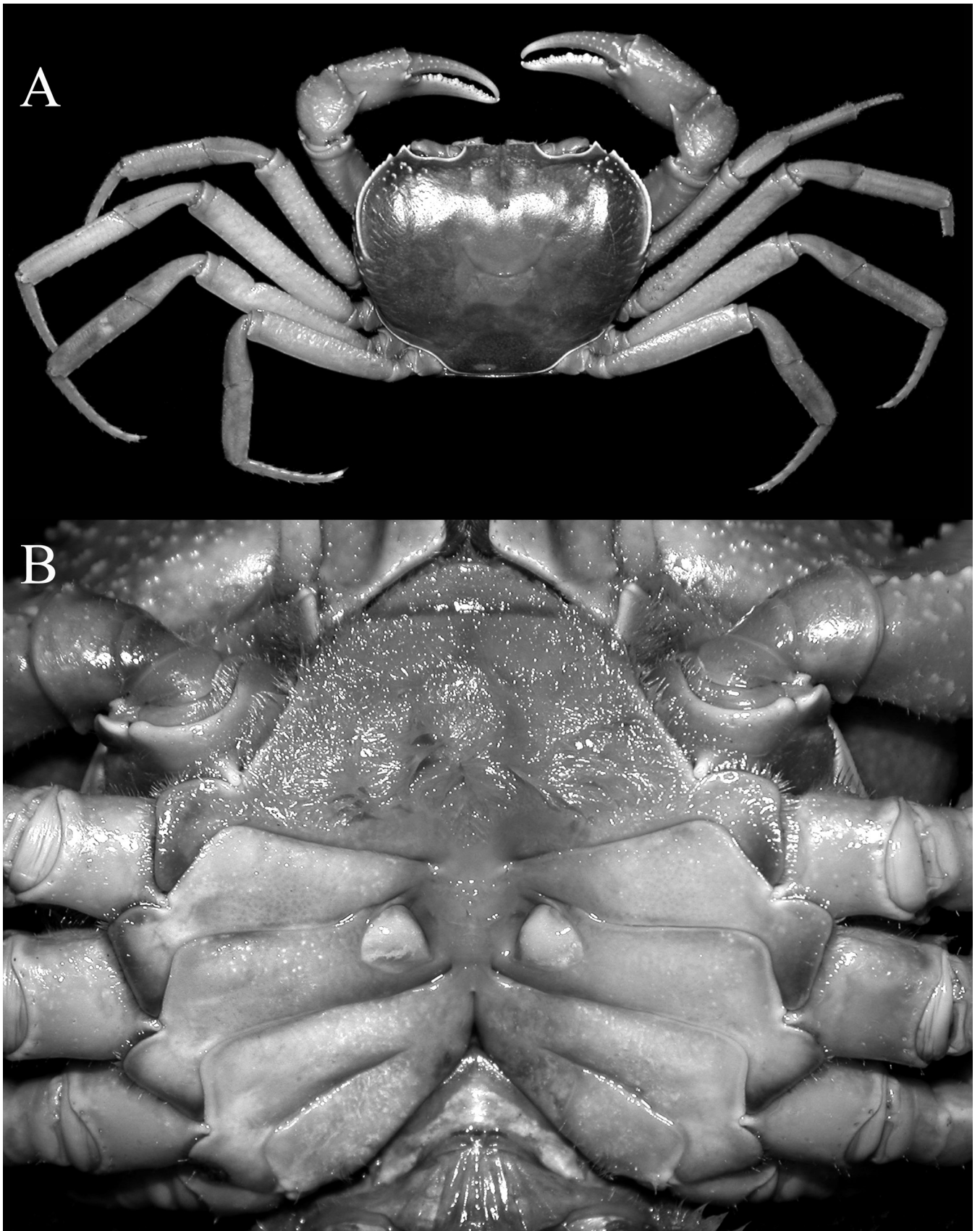


Fig. 5. *Terrapotamon thungwa* n. sp., paratype female (46.1 × 37.2 mm) (ZRC 2016.0596), Satun, Thailand. A, overall habitus; B, thoracic sternum showing vulvae.

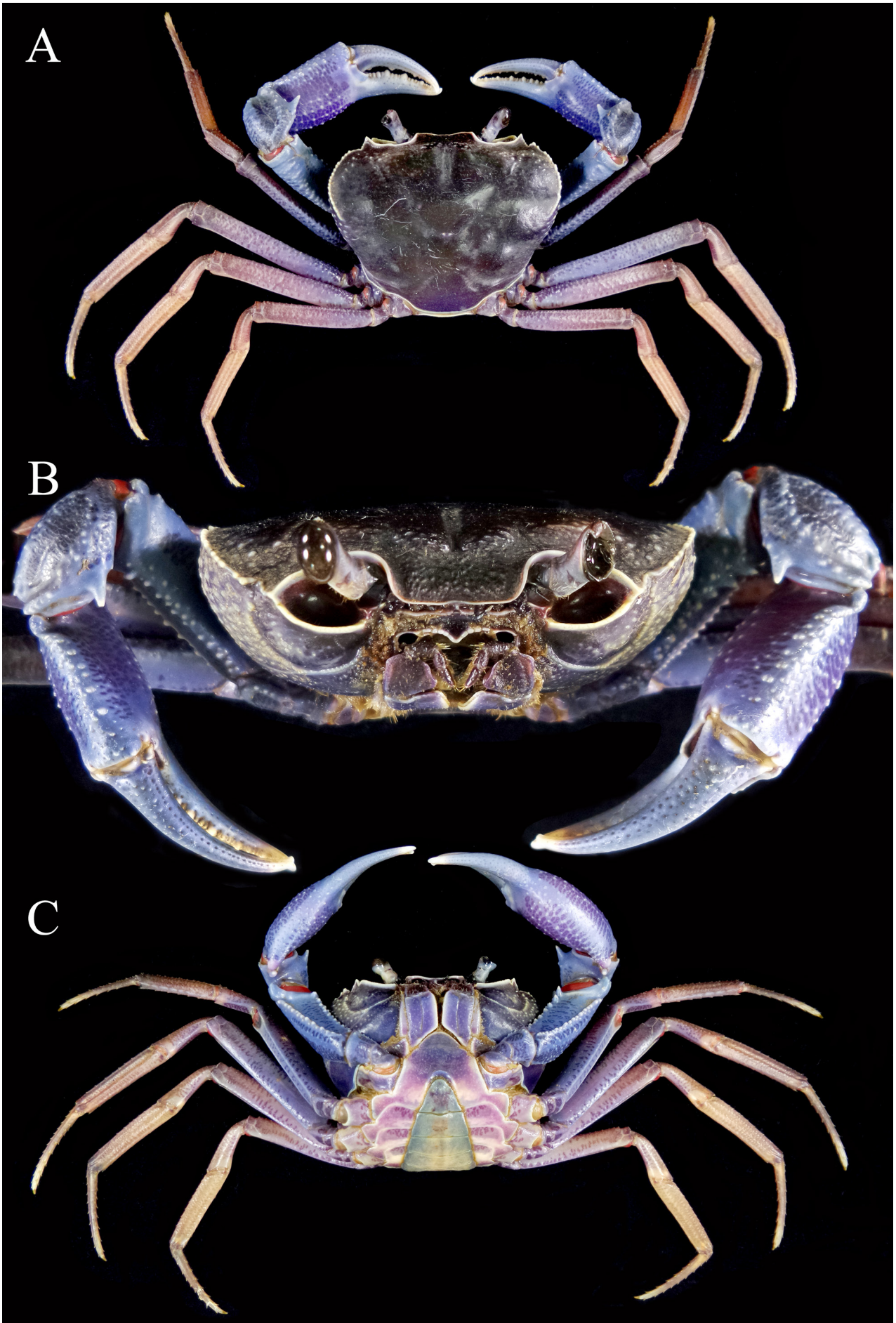


Fig. 6. *Terrapotamon longitarsus* Lheknim & Ng, 2016; paratype male (40.8 × 32.5 mm) (PSUZC 20150726-01.01), Satun, Thailand.

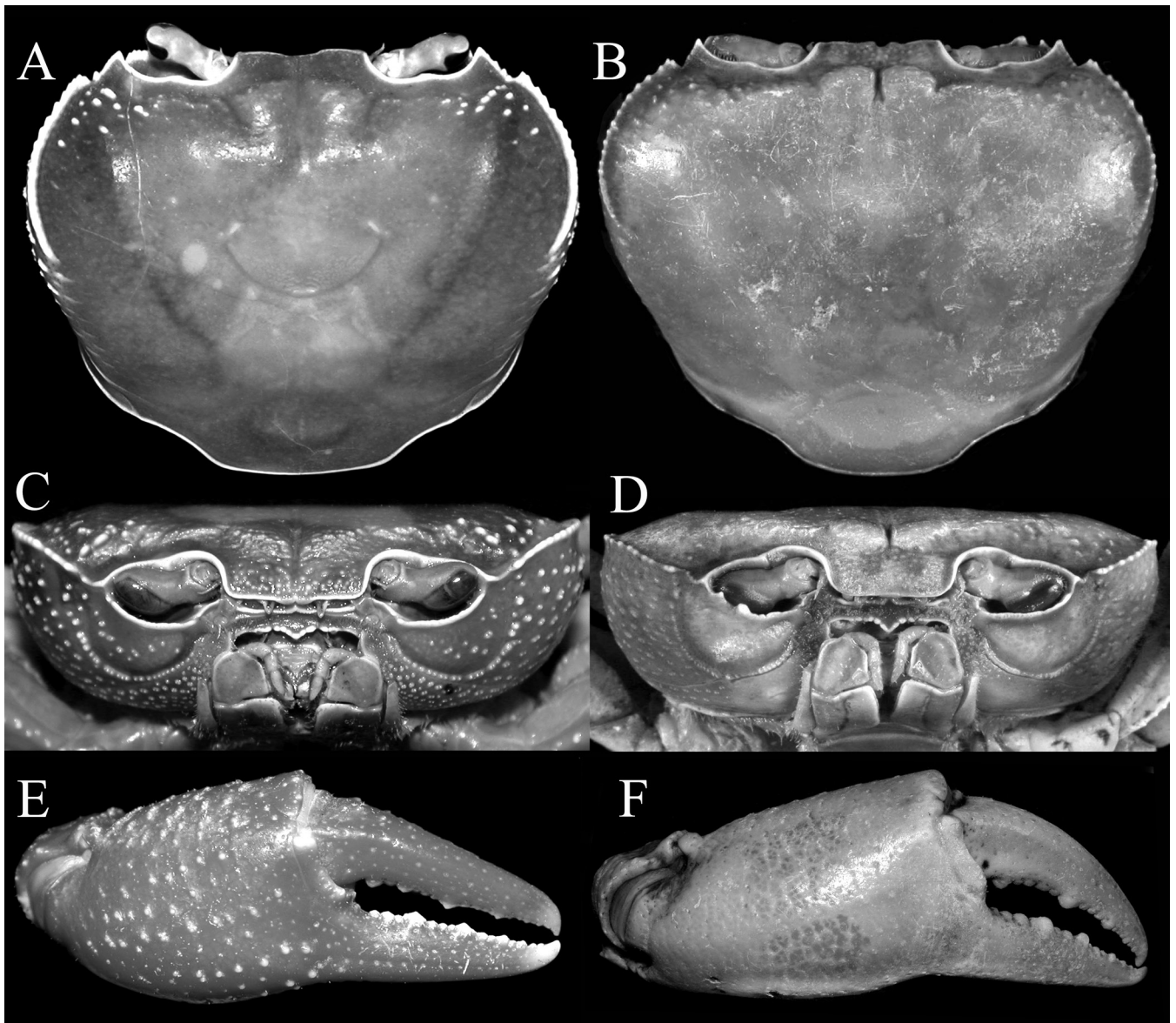


Fig. 7. A, E, *Terrapotamon thungwa* n. sp., holotype male (44.6 × 35.0 mm) (ZRC 2016.0595), Satun, Thailand; C, *T. thungwa* n. sp., paratype female (46.1 × 37.2 mm) (ZRC 2016.0596), Satun, Thailand; B, D, F, *T. longitarsus* Lheknim & Ng, 2016, holotype male (47.4 × 38.6 mm) (ZRC 2016.0161), Satun, Thailand. A, B, dorsal view of carapace; C, D, frontal view of cephalothorax; E, F, outer view of right major chela.

that of last leg 3.5–3.8 times longer than broad; dactylus of fourth pair about 10 times longer than proximal width; as long as propodus.

Anterior thoracic sternum (sternites 1–4) transversely broad (Fig. 3B). Suture between thoracic sternites 2, 3 (Figs. 1C, 3A, B) distinct, nearly straight. Thoracic sternites 3, 4 (Figs. 1C, 3A, B) separated by faintly discernible groove, extending from base of chelipeds to tip margin of sternopleonal cavity. Thoracic sternite 8 (Fig. 3A) completely separated by longitudinal median line, lacking transverse ridge. Press button pleonal locking mechanism on sternite 5 (Fig. 3A), knob-like, small. Male gonopore on coxa of fifth ambulatory leg.

Pleon (Figs. 1C, 3B–D) triangular; telson subequal in length to somite 6, lateral margins nearly straight, tip rounded; somite

1 reaches base of last pair of legs; somites 2–6 progressively broader, longer anteriorly.

G1 (Fig. 4A–D) stout; terminal segment clearly separated from subterminal segment, with strongly developed swelling on outer margin between terminal and subterminal segments; terminal segment relatively long, about 0.2 times length of subterminal segment, tapered, cone-shaped, with distal part slender, elongated, tip bifurcated, dorsal and ventral folds appressed. G2 (Fig. 4E) gently sinuous; with long flagellum, as long as basal segment.

Female characters. Non-sexual characters similar to the male holotype in nearly all respects (Figs. 1D, 5A). Chelipeds of females relatively smaller and less stout (Fig. 5A) compared to males. Female pleon almost round, covering almost whole of thoracic sternum. Vulvae (Fig. 5B) large, each without



Fig. 8. *Terrapotamon thungwa* n. sp., observed in the cave at Ban Namtok Than Plio, Amphoe Thung Wa, Satun, Thailand. A, paratype male (41.1×33.3 mm) (PSUZC-CRU-0072); B, C, paratype female (29.4×23.8 mm) (PSUZC-CRU-0073).



Fig. 9. A, B, *Terrapotamon thungwa* n. sp., specimen observed in cave in Ban Namtok Than Plio, Amphoe Thung Wa, Satun, Thailand; C, D, *T. longitarsus* Lheknim & Ng, 2016, specimens observed in forest and near cave entrances, Amphoe Khuan Kalong, Satun, Thailand. Specimens not collected.

operculum; occupying almost entire width of sternite 6 along inner portion; openings covered by chitinised membranes.

Colour. In life, adult males and females of *T. thungwa* are similarly coloured (Fig. 1). The dorsal surface of the carapace is almost bright red, with outer parts of the branchial to cardiac and intestinal regions, as well as the sub-orbital, sub-branchial and pterygostomial regions reddish-brown. The anterolateral and most of the orbital margins, rugosities on the hepatic region, outer part of the postorbital cristae, sub-orbital, sub-branchial and pterygostomial regions and posterior margin of the epistome are white. The cheliped colour varies with different localities; the chelipeds of the male holotype and female paratype (46.1 × 37.2 mm, ZRC 2016.0596) from the outside of the cave are bright red, while those of other paratypes from inside the cave have bright red palms and fingers but the carpus to basis-ischium is reddish-brown. The tips of fingers are always beige to bright yellow. The integument at the articulations between the carpus and merus of the cheliped is bright red. The ambulatory legs are bright red to dark brown (Figs. 1, 8A, B). The small crab from inside the cave had a dirty brown dorsal carapace surface, and orange chelipeds and ambulatory legs (Fig. 9B).

Etymology. The name is derived from the type locality at Amphoe Thung Wa. The name is used as a noun in apposition.

Remarks. The long ambulatory legs of *T. thungwa* n. sp. is a character shared only by one other species of *Terrapotamon*, *T. longitarsus* Lheknim & Ng, 2016, also from the Satun area in Peninsular Thailand. It is surprising to find two similar species occurring in the same area, but the differences between the two species are very marked and leave no doubt they are separate taxa. *Terrapotamon thungwa* can most easily be separated in its bright red overall coloration in life (Figs. 1, 8A) (purple in *T. longitarsus*; Fig. 6); the carapace appears proportionately broader, with the posterolateral margins gently converging towards the posterior carapace margin (Figs. 1A, D, 2A, 7A) (carapace appears longer, with the posterolateral margins prominently converging towards the posterior carapace margin in *T. longitarsus*; Figs. 6A, 7B); the external orbital tooth is relatively broader (Figs. 1A, D, 2A, 7A) (acutely triangular in *T. longitarsus*; Figs. 6A, 7B); the anterolateral crista is relatively stronger and more prominent (Figs. 1A, D, 2A, 7A) (weaker and less pronounced in *T. longitarsus*; Figs. 6B, 7B); the upper part of the branchiostegal region has several groups of small sharp granules (Figs. 1B, 2B, 7A, C) (absent or with only scattered granules in *T. longitarsus*; Figs. 6B, 7B, D); the suborbital region has prominent small sharp granules (Figs. 1B, 2B, 7A, C) (surface almost smooth in *T. longitarsus*; Figs. 6B, 7B, D); the pterygostomial region has numerous small sharp granules (Figs. 1B, 2B, 7A, C) (surface almost smooth or with very low rounded granules on outer part in *T. longitarsus*; Figs. 6B, 7B, D); the triangular median projection on the posterior margin of the epistome is relatively broader (Figs. 1B, 2B, 7B) (more acute in *T. longitarsus*; Figs. 6B, 7D); the male anterior thoracic sternum (sternites 1–4) is proportionately transversely broader (Fig. 3B) (transversely narrower in *T.*

longitarsus; Fig. 6C, cf. Lheknim & Ng, 2016: figs. 1D, 4D); the outer surface of the major chela is prominently granulated (Figs. 2D, 7E) (rugose or with scattered low granules in *T. longitarsus*; Fig. 7F); the last ambulatory propodus is relatively broader, being 3.5–3.8 times longer than broad (Fig. 3E) (about 4.5–5.5 times in *T. longitarsus*); and the distal part of the G1 terminal segment is relatively more elongate, with the distal part tapering to a long slender tip (Fig. 4A–D) (relatively shorter, gradually tapering in *T. longitarsus*; cf. Lheknim & Ng, 2016: Fig. 5A–D).

Habitat. All the specimens of *Terrapotamon thungwa* were obtained from the karst landscape of Satun. From the material collected, it would appear that the area and habitat where *T. thungwa* occurs overlaps with *T. longitarsus*. Both species were found inside and outside the caves as well as in the karst forest. In the dark zone inside the cave, adults of *T. thungwa* were observed climbing on the cave walls (Fig. 8B, C), with a small specimen observed in a pool on the cave floor (Fig. 9A, B). Up to five specimens have been observed on the cave floor. Adult males of both two species were observed in rock pools at the bottom of deep crevices in the karst forest, while a small specimen of *T. longitarsus* were seen at a sheltered rock pool near the cave entrance (Fig. 9C, D). The crabs use these collected pools to replenish their gill chambers.

Conservation. There is a growing trade in aquarium crabs in Thailand, both for the local market as well as the international market. There seems to be growing interest in keeping colourful and exotic Chinese and Indo-Chinese freshwater crabs, with increasing varieties and quantities exported to first-world countries. As such, we have opted not to divulge precise location data with the type series for the present new species. Its relatively large size, rich colours and semiterrestrial habits would make it a prime candidate to be hunted down by unscrupulous collectors, even if the areas they occur in may be protected. The karst forest of Thung Wa is generally protected and there are no concessions for mining or logging as yet. There are no immediate development threats, and as such, the species faces no obvious threats to their survival.

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LITERATURE CITED

- Bott R (1970) Die Süßwasserkrabben von Europa, Asien, Australien und ihre Stammesgeschichte. Eine Revision der Potamoidea und der Parathelphusoidea. (Crustacea, Decapoda). Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft, 526: 1–338.
- Davie PJF, Guinot D & Ng PKL (2015) Anatomy and Functional Morphology of Brachyura. In: Castro P, Davie PJF, Guinot D, Schram FR & von Vaupel Klein JC (eds.) Treatise on Zoology – Anatomy, Taxonomy, Biology. The Crustacea. Volume 9C–I. Decapoda: Brachyura (Part 1). Pp. 11–163.
- Lheknim V & Ng PKL (2016) A new species of long-legged terrestrial *Terrapotamon* Ng, 1986 (Crustacea: Brachyura: Potamidae) from limestone formations in Satun, southern Thailand. Zootaxa, 4200(1): 143–152.
- Ng PKL (1986) *Terrapotamon* gen. nov., a new genus of freshwater crabs from Malaysia and Thailand, with description of a new species, *Terrapotamon aipooae* sp. nov. (Crustacea: Decapoda: Brachyura: Potamidae). Journal of Natural History, 20: 445–451.
- Ng PKL (1988) The Freshwater Crabs of Peninsular Malaysia and Singapore. Department of Zoology, National University of Singapore, Shinglee Press, Singapore, viii + 156 pp., figs. 1–63, 4 colour pls.
- Ortmann A (1896) Das System der Decapoden-Krebse. Zoologische Jahrbücher, Abtheilung für Systematik, Geographie und Biologie der Thiere, 9: 409–453.
- Yeo DCJ & Ng PKL (2004) Recognition of two subfamilies in the Potamidae Ortmann, 1896 (Brachyura, Potamidae) with a note on the genus *Potamon* Savigny, 1816. Crustaceana, 76(10): 1219–1235.