

A new semiterrestrial freshwater crab in the genus *Badistemon* and a new record of *Indochinamon* from northern Thailand (Brachyura: Potamidae)

D. Christopher Rogers^{1*}, Laorsri Sanoamuang^{2,3} & Niwat Sanoamuang²

Abstract. A new species of semiterrestrial freshwater crab, *Badistemon nanensis*, is described from northern Thailand, some 750 km from its nearest reported congener. The new species is diagnosed primarily by the unique form of the gonopod I and II, the degree of fusion in the anterior thoracic sternites, the form of male pleon somite VI, the male telson, and the form of the chelipeds. This new species is only known from the type locality. In addition, this new species was found to co-occur with *Indochinamon bhumibol* (Naiyanetr, 2001), which represents a 350-km range extension for that species. Both crabs are important local foods for humans.

Key words. freshwater crabs, Southeast Asia, new species

INTRODUCTION

Badistemon was described and defined by Yeo & Ng (2007), and recently revised by Mitra et al. (2020), who provided a key to the species. Three species are currently ascribed to this genus: *B. turgidulum* (Alcock, 1909) from Myanmar; *B. pealianus* (Wood-Mason, 1871) from Assam and Mizoram provinces in India; and *B. fulvum* Mitra, Monica & Waikhom, 2020, from Manipur, India. However, in their description of the genus, Yeo & Ng (2007) stated: “There are, however, at least two more species in the process of being described (Yeo & P. Naiyanetr, in prep.)” These two undescribed species come from Thailand (D. C. J. Yeo, pers. comm.), but differ from the species we describe here and were collected from different regions of Thailand.

Here, we describe a new species of *Badistemon* from Nan Province in northern Thailand, some 700 km from the nearest reported congener locality in Myanmar. This new species was found co-occurring with *Indochinamon bhumibol* (Naiyanetr, 2001), which represents a significant range extension for that species as well.

MATERIAL AND METHODS

Specimens were collected by local residents using chicken meat as bait. Specimens were given to the third author while alive, and photographed. The specimens were euthanised and preserved in 80% ethyl alcohol. Specimen examination was done under an illuminated magnification lens and a Wild M-80 dissection stereomicroscope. All sketches were done by hand. The specimens are deposited in the Zoological Reference Collection (ZRC) of the Lee Kong Chian Natural History Museum, National University of Singapore.

TAXONOMY

Potamidae Ortmann, 1896

Badistemon Yeo & Ng, 2007

Badistemon nanensis, new species

(Figs. 1, 2F–I)

Material examined. Types. Deposited: Holotype male (carapace length 32.0 mm, width 42.5 mm), ZRC 2021.0454. Paratypes: 1 allotype female (carapace length 34.2 mm, width 40.1 mm), 1 male (carapace length 29.5 mm, width 37.0 mm), ZRC 2021.0455. THAILAND: Nan Province, Chiang Klang District, Ban Nam Meed Stream, 19°20'3"N, 100°50'3"E, ~400 m asl; 2 males, 1 female; August 2018; N. Sanoamuang.

Diagnosis. Carapace transverse, distinctly broader than long, somewhat convex, regions obscure but visible, with dorsal surface almost smooth, bearing anteriolaterally small tubercles on the branchial regions (Fig. 1A–D). External orbital tooth triangular (Fig. 1B, D). Carapace anterolateral

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¹Kansas Biological Survey, and The Biodiversity Institute, The University of Kansas, Higuichi Hall, 2101 Constant Avenue, Lawrence, KS 66047-3759, USA; Email: branchiopod@gmail.com (*corresponding author)

²Applied Taxonomic Research Center, Khon Kaen University, Khon Kaen 40002, Thailand; Email: la_orsri@kku.ac.th, niwat@kku.ac.th

³International College, Khon Kaen University, Khon Kaen 40002, Thailand

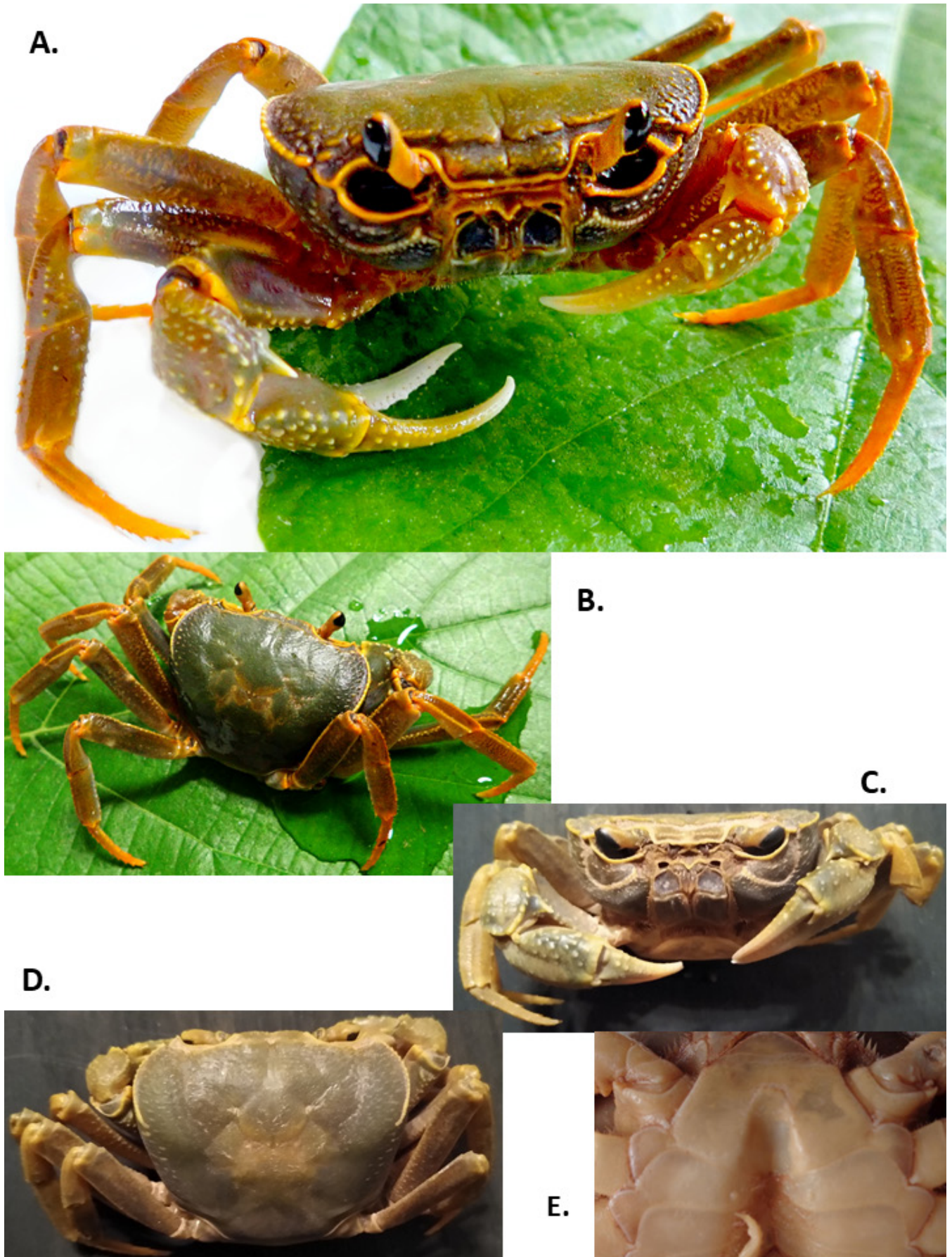


Fig. 1. *Badistemon nanensis*, new species, holotype male, ZRC 2021.0454. A, colour in life, anterior view; B, colour in life, dorsal view; C, preserved, anterior view; D, preserved, dorsal view; E, thoracic sternites.

margins distinctly cristate (Fig. 1A, D), posterolateral margins gently converging to posterior carapace margin (Fig. 1D). Epigastric and postorbital cristae distinct, rugose, rounded. Epigastric cristae oblique, slightly anterior of postorbital cristae (Fig. 1A, D). Suborbital region with a few scattered tubercles. Sub-branchial region with numerous, widely separated, small, transverse to oblique striae. Pterygostomial regions with obscure, transverse striae. Epistome posterior margin with relatively broad median triangular tooth (Fig. 1A, C). Chelae subequal, with lateral and dorsal surfaces bearing numerous tubercles. Ambulatory pereopods long, slender (Fig. 1A–D). Anterior thoracic sternum relatively broad (Fig. 1E). Male thoracic sternite sutures between thoracic sternites II and III and between III and IV obliterated and not visible (Fig. 1E). Gonopod I (Fig. 2H) subterminal article with medial margin straight, lateral margin convex. Gonopod I distal article linear, nearly parallel sided, converging distally to apex, distal article proximally constricted. Gonopod I terminal article length $\sim 0.3\times$ length of subterminal article. Male pleon somite VI width $\sim 2\times$ medial length. Male telson triangular, length subequal to basal width. Female telson broadly rounded, length $0.4\times$ basal width.

Description. Male. Holotype. Carapace (Fig. 1) transversely ovate, distinctly broader than long, relatively flat; dorsal surface glabrous, nearly smooth, anterolateral portions bearing numerous, scattered transverse tubercles. Carapace regions obscure but visible, lateral regions with distinct transverse or oblique striae, cervical grooves obscure, median groove H-shaped, distinct.

Anterolateral margins (Fig. 1A, B, D) arcuate, distinctly cristate, lined with rounded granulae, broadly separated from converging posterolateral margins. Frontal margin (Fig. 1A, B) deflexed, sinuous, two lobes separated by a narrow, deep groove.

Epigastric and postorbital cristae (Fig. 1A–C) distinct, rugose, strongly declivous, anteriorly excavate under margin. Epigastric cristae slightly anterior of postorbital cristae, separated by distinct slightly oblique groove.

Epibranchial tooth indistinct, low, rounded, separated from external orbital angle margin by groove that extends to excavated areas anterior of the epigastric and postorbital cristae.

External orbital angle broadly triangular, apex slightly produced, lateral and medial margins slightly convex, subequal in length and shape, obscurely cristate.

Orbits large (Fig. 1A, B), rounded, length $\sim 1.25\times$ breadth. Eyes developed, cornea large, pigmented. Suborbital region with a few scattered tubercles. Sub-branchial region with numerous, widely separated, small, transverse to oblique striae. Pterygostomial regions with obscure, transverse striae.

Epistome (Fig. 1A, C) densely pilose. Epistome anterior margin parallel to frontal margin; posterior margin sinuate

with median triangular tooth, length subequal to width. Epistome lateral margins slightly concave.

Maxilliped III exopod (Fig. 2F) extending beyond ischium distal margin, exopod proximal article extending to level of merus midlength. Exopod flagellum length $\sim 1.7\times$ maxilliped III merus width. Maxilliped III ischium subrectangular, width $\sim 2.2\times$ length, bearing a deep medial, longitudinal groove. Merus nearly square, margins with robust bead.

Chelipeds (Fig. 1A, B) elongate, subequal, dactylus and pollex slender, length $\sim 1.2\times$ palm length. Lateral and dorsal surfaces of all articles distinctly tuberculate. Carpus (Fig. 1A, B) with robust, acute obliquely anteriorly directed subdistal, mediadorsal single spine. Spine length $\sim 2\times$ eye plus eyestalk length. Merus angles margined with tubercles, facies generally with small tubercles, spine absent.

Ambulatory pereopods (Fig. 1) very long, slender, all subequal in length with pereopod V slightly shorter. Ambulatory pereopods with all articles smooth to very finely granulate, dorsal margin slightly crenulate. Meri and carpi lower margins smooth. Propodi and dactyli with dorsal and ventral margins each bearing a longitudinal row of broadly spaced spines, intervals with scattered setae. Pereopods II–IV with carpi ~ 23.4 mm in length. Carpi length $\sim 3.8\times$ width. Meri without dorsal subdistal spine. Propodi length $\sim 3\times$ width, $\sim 1.3\times$ carpi length. Dactyli all subequal in length.

Anterior thoracic sternites (Fig. 1E) I–IV transverse, with exposed areas glabrous, with shallow, widely scattered punctae separated by a faint mesh of barely impressed fine lines. Sternopleonal cavity hirsute. Suture between thoracic sternites I and II distinct. Suture between thoracic sternites II and III and between III and IV obliterated and not visible. Sternopleonal cavity apical margin with an indistinct groove, becoming obliterated posteriorly, before reaching sternite V anterior margin. Pleonal locking mechanism on sternite V hemispherical, diameter $\sim 0.2\times$ longitudinal width of sternite at point where the mechanism is situated (Fig. 1E). Gonopore on pereopod V coxa. Penis tubular, with triangular lateral membranes.

Gonopod I (Fig. 2H) typical for the genus. Subterminal article hirsute medially and anteriorly, with lateral surface gently convex and medial margin straight. Gonopod I distal article conical, nearly parallel sided, gently converging distally to apex, base wider than adjacent portion of proximal article. Gonopod I terminal article length $\sim 0.3\times$ length of subterminal article. Gonopod II (Fig. 2I) slightly curved laterally, flagellum arcuate, curving 180° laterally, length $\sim 0.25\times$ basal article length.

Pleon triangular, typical for the genus. Pleon somite I reaches base of pereopod V. Pleon somites II–VI progressively narrower and longer. Pleon somite VI basal width $\sim 2\times$ medial length. Telson (Fig. 1G) length $1.2\times$ basal width, $1.3\times$ pleon somite VI. Telson lateral margins slightly convex, apex rounded.

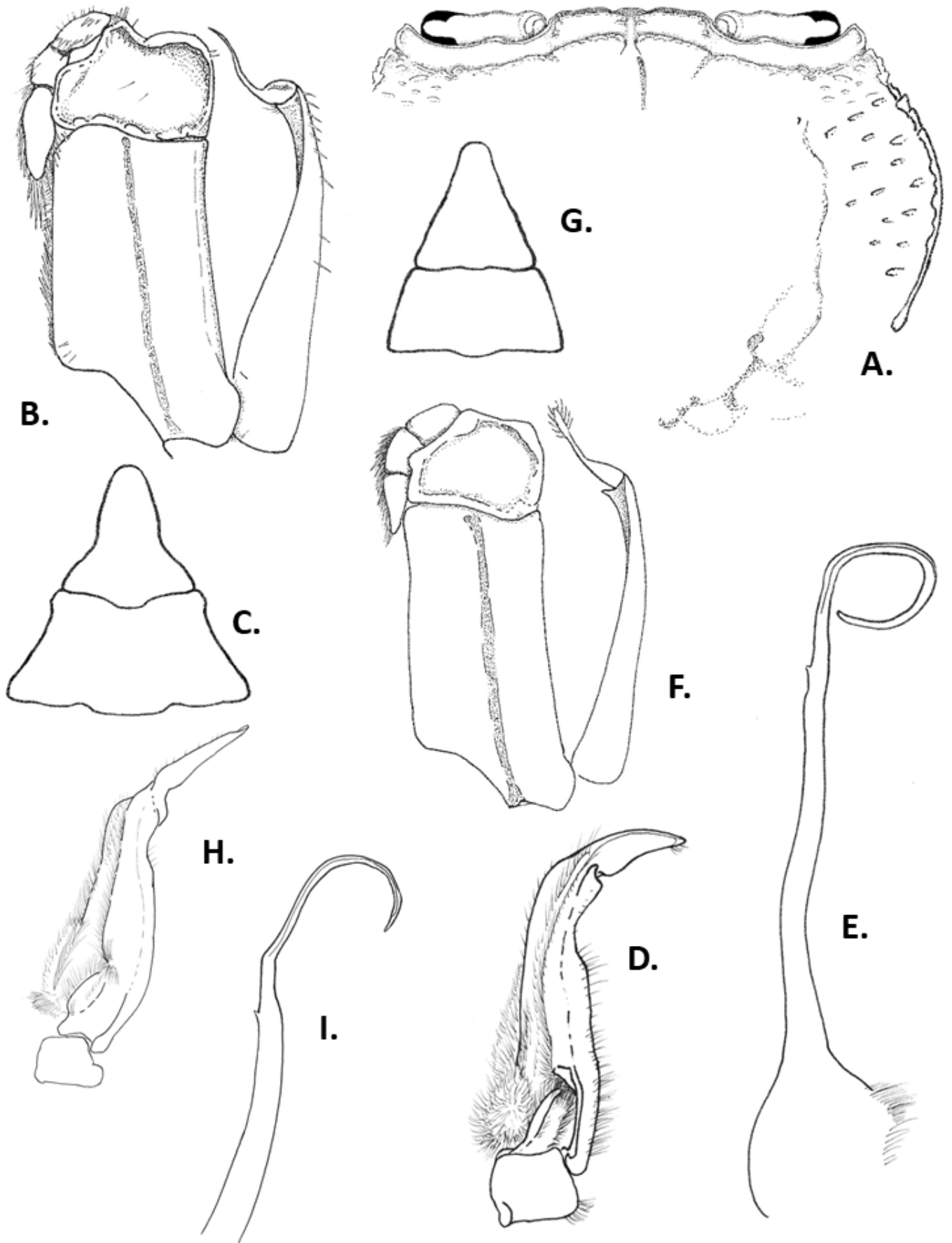


Fig. 2. A–E, *Indochinamon bhumibol*, male, carapace length 51.6 mm. A, carapace anterior and lateral surfaces, dorsal view; B, maxilliped III; C, male distal pleonal somites, ventral view; D, gonopod I, ventral view; E, male gonopod II. F–I, *Badistemon nanensis*, new species, holotype male, ZRC 2021.0454. F, maxilliped III; G, male distal pleonal somites, ventral view; H, gonopod I, ventral view; I, male gonopod II.

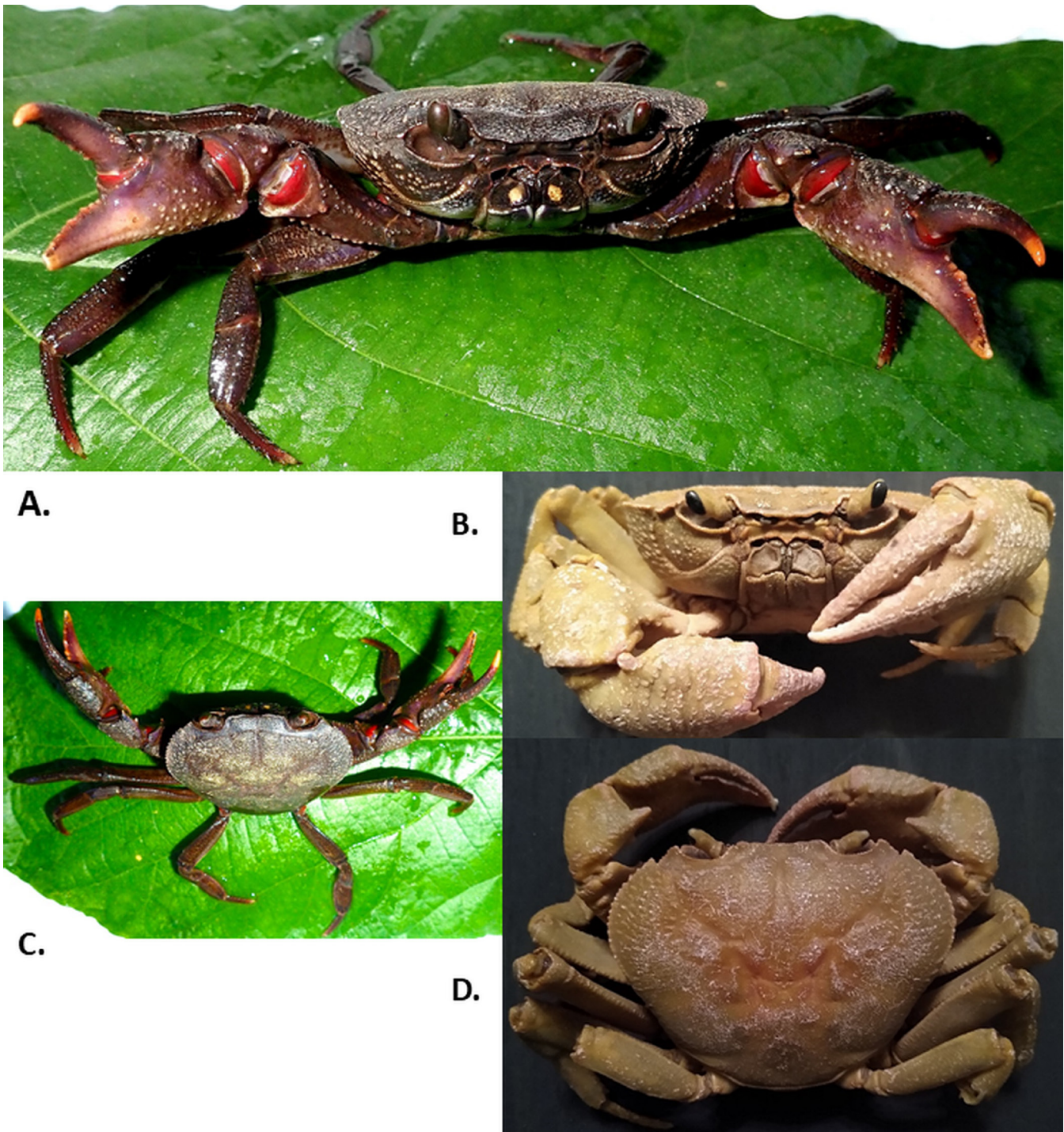


Fig. 3. *Indochinamon bhumibol*, male carapace length 51.6 mm. A, colour in life, anterior view; B, preserved, anterior view; C, colour in life, dorsal view; D, preserved, dorsal view.

Female. Allotype. Generally similar to male holotype, with following exceptions. Thoracic sternites I–IV hirsute, sutures fused and obliterated. Thoracic sternites V and IV with scattered setae. Gonopore lacking operculum, opening anteriomedially and partially covered ventrally by a chitinised membrane. Gonopore wide, encompassing nearly entire width of thoracic sternite VI along sternopleonal cavity wall. Pleon margined in setae, subcircular, covering all thoracic sterna, except sternite I. Pleopods typical for family.

Colour in life. Adult males and females virtually identical in colouration (Fig. 1A, B). Carapace sub-branchial, and

pterygostomial regions dark brownish green, with the anterior, anterolateral, and orbital margins, plus the rugosities, distolateral corners of the postorbital cristae, suborbital cristae, and posterior margin of the epistome bright orange. Chelipeds are greenish with the tubercles, dactylus, and pollex white. The remaining pereopods are orange brown with bright orange tubercles and rugosities.

Etymology. The name ‘*nanensis*’ is derived from the type locality at Ban Nam Meed Stream in Nan Province. The name literally translates as ‘from Nan Province’.

Differential diagnosis. *Badistemon nanensis*, new species, is the only member of the genus reported so far from Thailand. It is readily separated from congeners by the form of the male gonopods. In *B. fulvum*, the distal end of the subterminal article arches to the terminal article, and the terminal article has parallel margins in the proximal third. In *B. nanensis*, new species, the subterminal article's distal arch is absent, and the entire distal article is conical, with the margins converging.

The remaining two congeners also lack the strong arc at the distal end of the subterminal article. However, both *B. fulvum* and *B. nanensis*, new species, have an obvious 'constricted' appearance between the subterminal and terminal articles. This 'constriction' is absent in *B. pealianus* and *B. turgidulum*.

Gonopod II also differs. In *B. pealianus* and *B. fulvum*, the distal flagellum is straight, but in *B. nanensis*, new species, it curves 180°, and in *B. turgidulum* it curves up to 190°.

Other morphological characters are also useful. *Badistemon turgidulum* males have the suture between thoracic sternites III and IV distinctly visible, and pleon somite VI has a basal width ~2.5× the medial length, whereas in all other species the suture is obscure or as in *B. nanensis*, new species, nonexistent, and pleon somite VI has a basal width ~2.0× the medial length. The male telson in *B. pealianus* has a length subequal to its basal width, while in *B. fulvum* and *B. nanensis*, new species, the telson is longer than broad with its length ~1.2× its basal width. *Badistemon nanensis*, new species, is separated from *B. fulvum* by the form of the chelipeds. In male *B. fulvum*, the chelipeds are sometimes unequal, whereas in male *B. nanensis*, new species, they are subequal.

In the key presented in Mitra et al. (2020), *B. nanensis*, new species, would key out to *B. fulvum* using primary characters, but would key out to *B. turgidulum* using the gonopodal characters.

Habitat. All the specimens of *B. nanensis*, new species, were collected from the type locality, which is the only known location for this species. The type locality is in dense dipterocarp forest in karst topography. The crabs are nocturnal, living in burrows under large stones along the stream banks. The local people place chicken meat near the holes at night to lure the crabs out, then capture the crabs for food.

Conservation status. *Badistemon nanensis*, new species, is so far only known from the type locality, where it, and *Indochinamon bhumibol* (see below), are an important local fishery. There is very little agriculture, and no active mining or development upstream, nor in and around the type locality, which is rather remote. Further surveys are needed to determine the full extent of the species distribution and vulnerability to stochastic events. Thus, at this time, according to the IUCN (2012) Red List criteria, this species is data

deficient (DD) as there is inadequate information to make a direct or indirect assessment of the species extinction risk.

***Indochinamon bhumibol* (Naiyanetr, 2001)**

Pu Chao Pho Luang, Giant Mountain Crab
(Figs. 2A–E, 3)

Material examined. THAILAND: Nan Province, Chiang Klang District, Ban Nam Meed Stream, 19°20'3"N, 100°50'3"E, ~400 m asl; 4 males, 1 female; August 2018; N. Sanoamuang.

Remarks. Five specimens (one female, four males) of *Indochinamon bhumibol* were collected at the same site as *B. nanensis*, new species, described above. As with *B. nanensis*, new species, *I. bhumibol* is nocturnal and burrows under large stones along the stream banks. The local people capture them for food using chicken meat.

The largest specimen was a male with a carapace length of 51.6 mm and carapace width of 68.4 mm. Our material fits within the size range presented in the original description, and the form of gonopods I and II (Fig. 1D, E), maxilliped III (Fig. 1B), as well as the habitat and colouration in life (Fig. 2A, B) match the original description very well (Naiyanetr, 2001).

However, some minor differences are evident. In our material, the carapace dorsolateral rugosities appear to be slightly larger, the orbital and epibranchial teeth slightly more prominent, and the orbital tooth bears a weak marginal bead (Figs. 1A, 2B, D). The telson lateral margins are more convex in two of the four males (Fig. 1C).

This new record represents a significant range extension. Our locality is approximately 350 km north of the type locality in Loei province (Naiyanetr, 2001), and is situated in a different drainage system.

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