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A new Freshwater crab *Ghatiana karnataka* sp. nov (Decapoda: Brachyura: Gecarcinucidae) from Karnataka, India

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ABSTRACT

The freshwater crab genus, *Ghatiana* Pati & Sharma, 2014, is represented by 14 species; all are endemic to the Western Ghats of India. This genus is distinct in the family Gecarcinucidae, by having a high, broad carapace; the terminal article of male first gonopod is relatively long, the male second gonopod very short, the third maxilliped exopod lacks a developed flagellum. All the described species of this genus are endemic in the Western Ghats region of India and have distinct colorations. A new species, *Ghatiana karnataka* sp. nov., is illustrated and described herein collected from laterite rocks of the central Western Ghats at Mavinkaru of the Mookambika Wildlife Sanctuary in the Udupi district, Karnataka state, India. *Ghatiana karnataka* sp. nov. is most closely related to *G. dhritiarum* Pati, Naik & Gouda, 2026, recently described from Karnataka, in male first gonopod morphology. Structures of carapace, male pleonal somite 6, vulvae, live colorations and other features of the G1 are used to distinguish them. This state is now known for eight species of *Ghatiana*. The discovery of the new species suggests more exploration need to be conducted along the Western Ghats, especially central Western Ghats.

Keywords: Crustacea, Decapoda, Karnataka, Taxonomy, Western Ghats

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1. INTRODUCTION

The gecarcinucid freshwater crab genus *Ghatiana* Pati & Sharma, 2014, currently recognized for 14 species, all are endemic to the Western Ghats of India (Pati and Pradhan, 2020; Pati et al., 2026). Half of the currently known species of *Ghatiana* have been reported from the Karnataka state (Klaus et al., 2014; Pati and Thackeray, 2018, 2021; Pati et al., 2022, 2023a, 2024, Pati et al., 2026).

During a recent faunistic survey of the coastal region of the Western Ghat in Karnataka, the second author (AK) collected some specimens representing a hitherto unknown species from the forested village of Mavinkaru in the Mookambika Wildlife Sanctuary of the Udupi district, Karnataka, India (Fig. 1A). This locality lies within the central Western Ghats. Based on detailed morphological examination, these specimens are herein described as a new species, *Ghatiana karnataka* sp. nov.

2. MATERIAL AND METHODS

The type material examined is deposited in the Zoological Survey of India, Kolkata, India (ZSIK). Terminologies and measurements of carapace follow Ng (1988), Guinot et al., (2013), Davie et al., (2015), Pati (2021) and Pati et al., (2024). Carapace measurements were taken using a digital caliper and those of individual body parts by the Leica EZ4 stereo zoom microscope. Specimens were photographed by Nikon P-900 digital camera. Images of gonopod was taken by Celestron digital microscope, while line drawings were prepared using a camera lucida.

Abbreviations: CL, length of carapace; CH, height of carapace; coll. collected by; CW, width of carapace; FW, frontal margin width; G1, male first gonopod; G2, male second gonopod; P2–P5, ambulatory legs 2 to 5; S1–S8, thoracic sternites 1 to 8; S3/S4, S4/S5, suture between adjacent thoracic sternites 3, 4 and 4, 5, respectively; VD, shortest distance between vulvae; SW, maximum width of female sternum.

3. SYSTEMATIC ACCOUNTS

Superfamily Gecarcinucoidea Rathbun, 1904

Family Gecarcinucidae Rathbun, 1904

Genus *Ghatiana* Pati and Sharma, 2014

Type species. Ghatiana aurantiaca Pati and Sharma, 2014

Ghatiana karnataka sp. nov.

(Figs. 2a–h, 3a–c, 4A–E)

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Type material. Holotype: adult male (CW 21.3 mm, CL 13.8 mm, CH 9.7 mm, FW 7.5 mm), ZSI-K, Reg. No. CR1079; Locality: India, Karnataka, Udupi District, Baindur Taluk, Mavinakaru, near Kollur Village. Latitude. 13.858912°N, Longitude. 74.794707°E; collector. Ajmeer Kaju; date of collection: 12 August, 2024.

Paratypes: 2 females, large female (CW 24.4 mm, CL 15.4 mm, CH 10.3 mm, FW 8.2 mm), small female (CW 21.1 mm, CL 13.8 mm, CH 10.1 mm, FW 7.5 mm), ZSIK, Reg. No. CR 1080; collection data same as holotype.

Diagnosis. Carapace distinctly broader than long, oval shaped (CW/CL=1.5), convex (CH/CL=0.7); lateral margins gently convex; anterolateral margins short, subcristate; posterolateral margins longer than anterolateral margins (Figs. 2a, c) external orbital angle low, outer margin twice of inner margin; epibranchial tooth very low, blunt, a indistinct notch between the outer margin of external orbital tooth and epibranchial tooth; postorbital region narrow, medially concave; branchial regions inflated, rugose with many short oblique striae, gastric region gently inflated; cervical grooves shallow, broad, not demarcated in posterior part, mesogastric groove narrow, long, bifurcated posteriorly, reaches up to the line of cervical groove (Figs. 2a, c, 3a); Antennular fossae partially visible in frontal view; Ambulatory legs relatively long (P3 length/CL = 2.7) (Figs. 2a, b, 3a). Pleon long, narrow, T-shaped; pleonal somite 5 trapezoidal, lateral margin concave; pleonal somite 6 subquadrate, slightly longer than broad, proximal width approximately 0.9 times medial length (Fig. 2d, e). G1 slender, subterminal article basally broad, gradually narrowing towards terminal article, mesial margin basal half straight, terminal half gently turned outwards, outer margin distinctly sinuate; terminal article conical, slender, long, 0.5 times length of subterminal article, straight from base to tip, tip blunt (Fig. 4A–E); Adult female pleon broadly triangular, with lateral margins of telson gently concave (Fig. 3c). Vulvae in adult relatively separated from each other (VD/SW = 0.3), relatively large, occupying approximately 0.4 times length of S6 (Fig. 3d).

Description of male holotype. Carapace transversely ovate, distinctly broad (CW/CL = 1.5), strongly arched (CH/CL = 0.7); dorsal surface glabrous, smooth except for epigastric cristae and fine striae on anterolateral and posterolateral surfaces, carapace relatively convex in frontal view; lateral margins gently convex; anterolateral margins short, subcristate; posterolateral margins longer than anterolateral margins (Figs. 2a,c), frontal region relatively wide (FW/CW = 0.4), strongly deflexed anteriorly; frontal medial triangle incomplete, with dorsal margin only, lateral margins indiscernible; frontal margin smooth, median part convex (Figs. 2b, f).

Epigastric cristae low, rugose; postorbital cristae indistinct; external orbital angle low, outer margin twice of inner margin; epibranchial tooth very low, blunt, a indistinct notch between the outer margin of external orbital tooth and epibranchial tooth; postorbital region narrow, medially concave; branchial regions inflated, rugose with many short oblique striae; cervical grooves shallow, broad, not demarcated in posterior part, mesogastric groove narrow, long, bifurcated posteriorly, reaches up to the line of

cervical groove; H-shaped groove well marked, cardiac groove broad (Figs. 2a, c); subhepatic region rugose with many striae; suborbital region granulated; pterygostomial region with tubercles; supraorbital margin gently sinuous, smooth; suborbital margin lined by small granules, no any notch between supraorbital and suborbital margin; epistome posterior margin with well-developed, broadly triangular, medial tooth, tip blunt; posterior margin of lateral parts of epistome straight (Figs. 2b, d, f, g). Eyes occupied most of the orbital space; eyestalk long, cornea moderately large, well pigmented (Figs. 2 b, f, g).

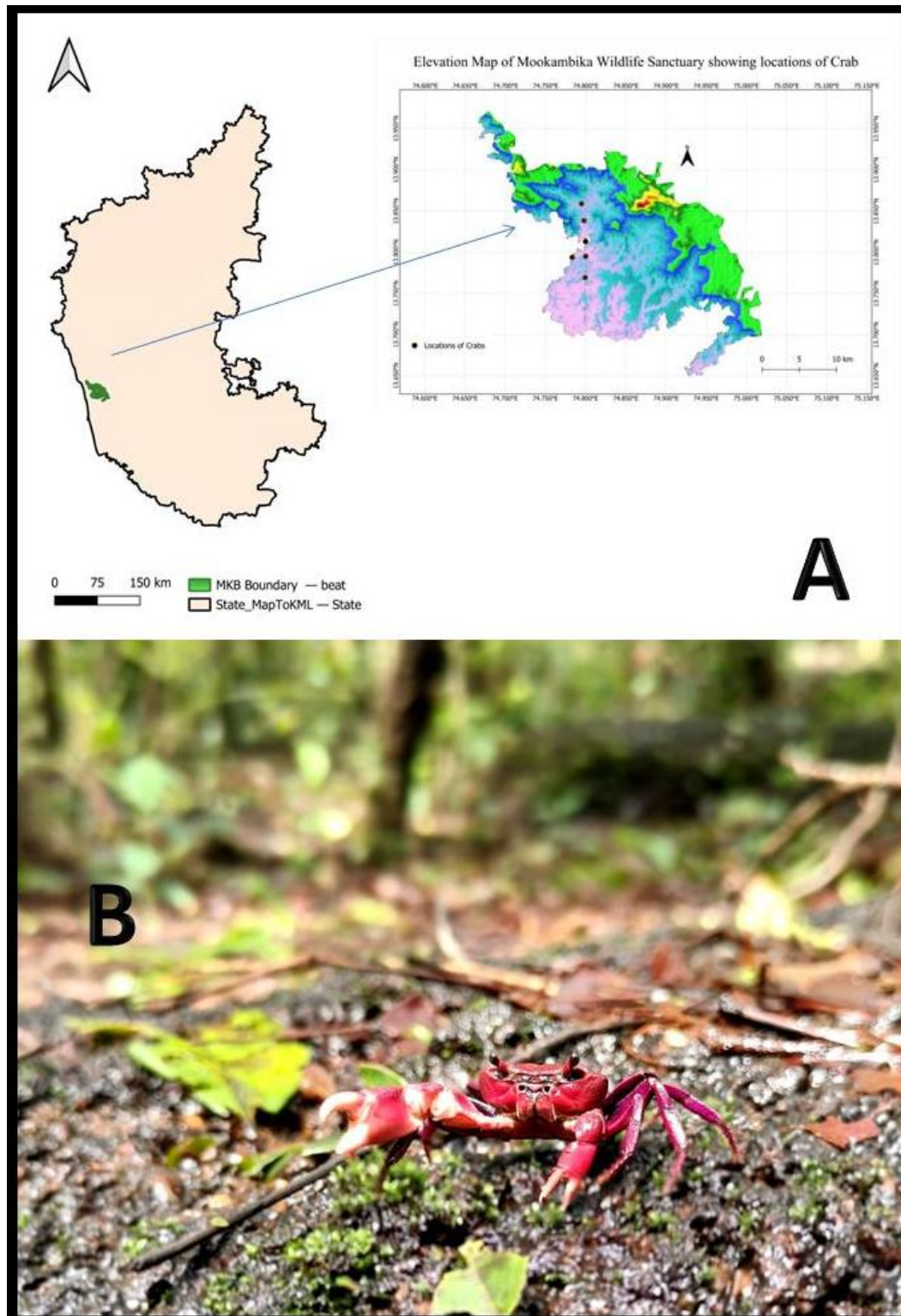


Figure 1. A. Map of Karnataka and Mokambika Wild Life Sanctuary showing the type locality of *Ghatiana karnataka sp. nov.* B. live view of *Ghatiana karnataka sp. nov.* (male) (specimen not collected)

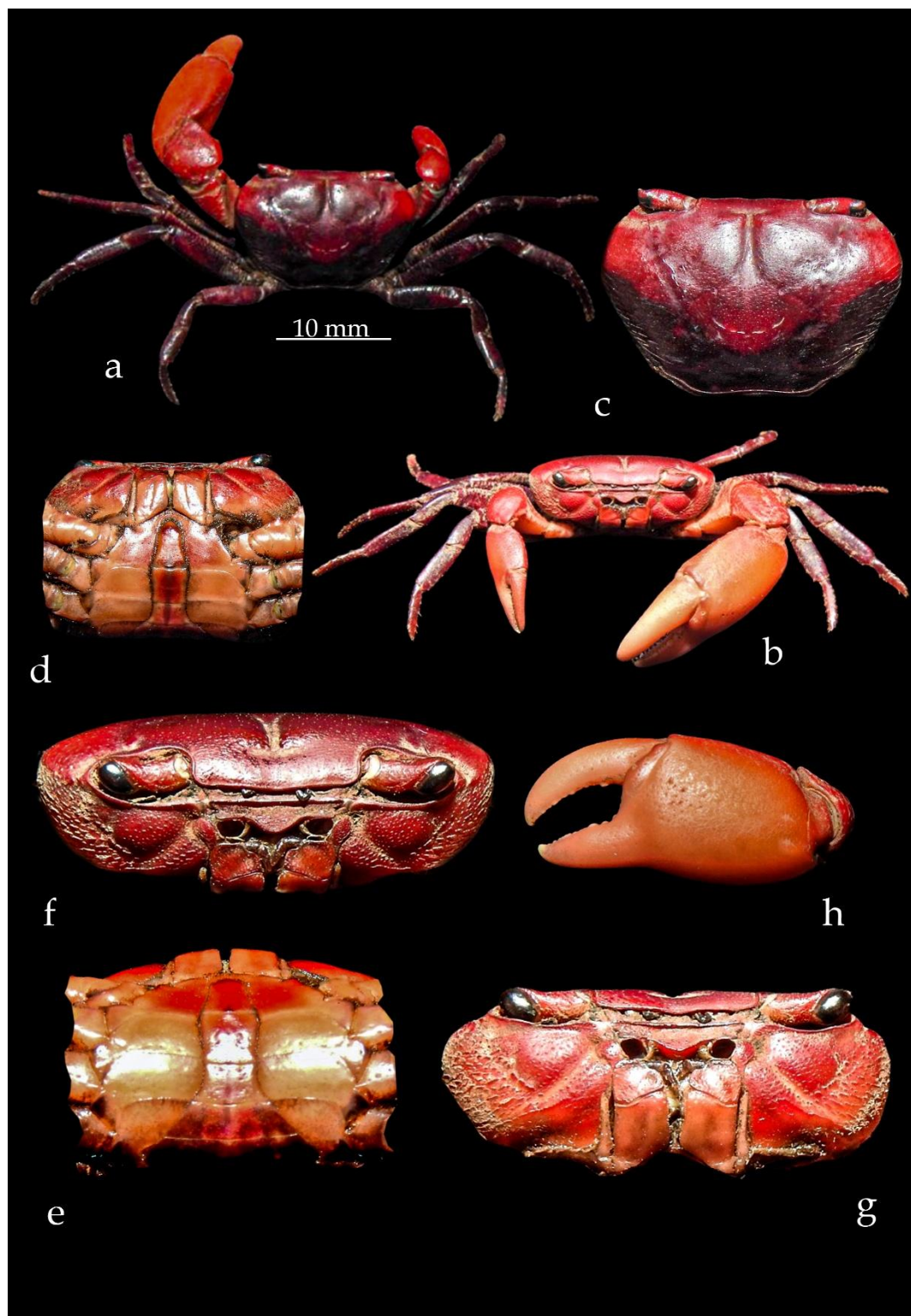


Figure 2. *Ghatiana karnataka* sp. nov., holotype male (CW 21.3 mm, CL 13.8 mm)(ZSI-K, Reg. No. 1079):a, overall dorsal view; b, overall frontal view; c, dorsal view of carapace; d, upper part of pleon; e, lower part of pleon and sternite, f, frontal view of cephalothorax, g, third maxilliped and epistome, h, major or left chela outer view.

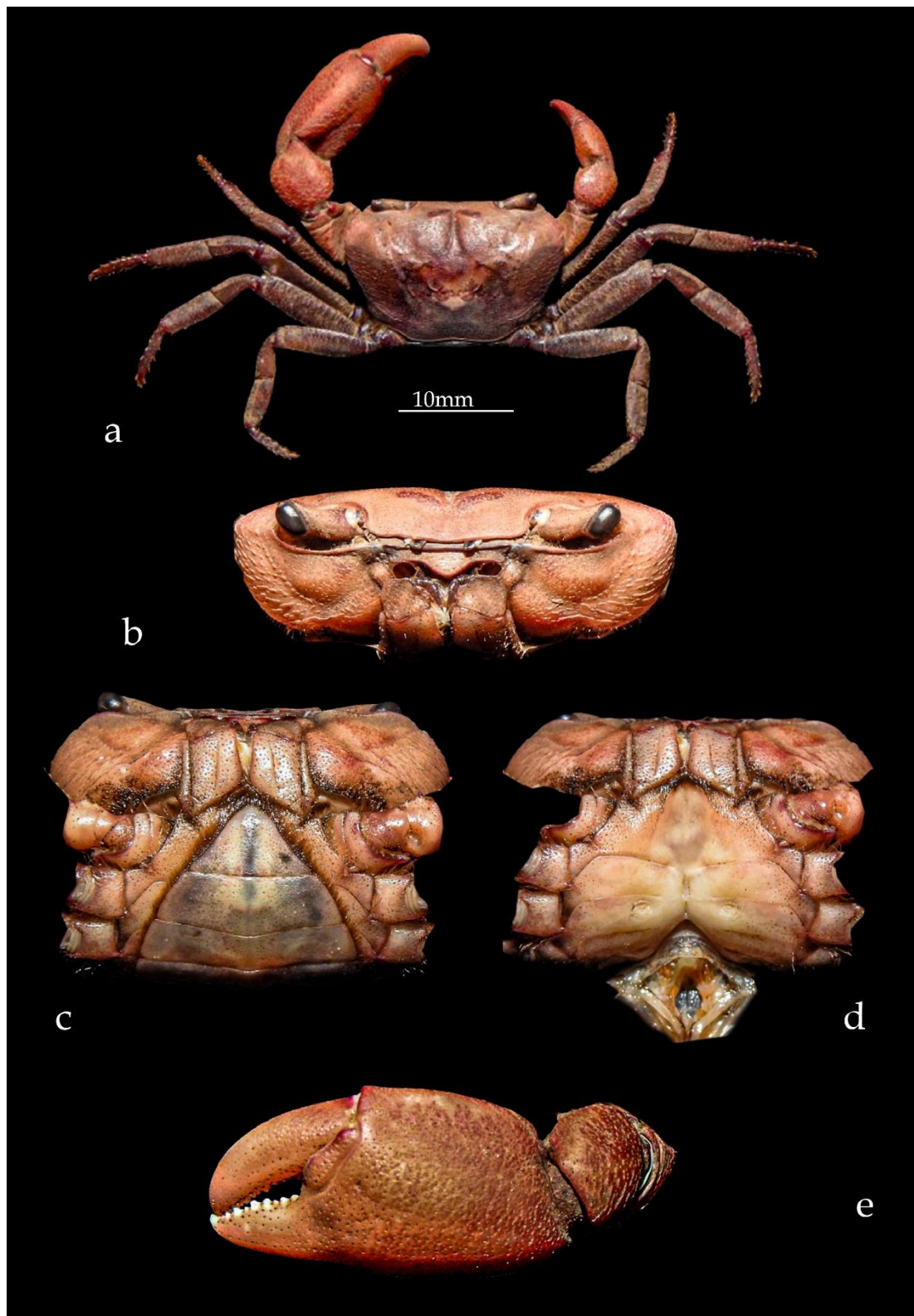


Figure 3. *Ghatiana karnataka* sp. nov., Paratype female (larger) (CW 24.4 mm, CL 15.4 mm) (ZSI-K, Reg. No. 1080): a. dorsal overall view, b. frontal view of cephalothorax, c. female pleon, d. thoracic sternite and vulvae, e. outer part of major chela

Antennular fossae narrow, slit like, dorsally covered by frontal margin, partially visible in frontal view, antennules short, folded in transversely; antennae short (Figs. 2c, f, g); mandibular palp with 2 articles; terminal article bilobed; maxilliped 3 not covers most of the buccal cavity when closed; ischium subrectangular, longer than broad, with a shallow, submedian longitudinal groove; merus pentagonal, distinctly broader than long, lower half of the mesial margin produced; exopod slender, distally narrow, reaching one-third of the merus, lacking a flagellum (Fig. 2g).

Chelipeds glabrous, smooth, unequal, left chela conspicuously larger (Figs. 2a, b, h); major chela with 8 or 10 low, blunt teeth on each finger; distinct gape when fingers closed; dactylus shorter than palm; palm stout, longer than high, outer part with granules, most of the lower margin of palm convex, distal part gently concave; carpus smooth, minutely punctate, gently inflated, inner margin with a low, blunt teeth; merus smooth with few serration along the lower margins, lacking subterminal spine (Figs. 2a, b, h).

Ambulatory legs relatively slender, shorter than major cheliped, P3 longest, 2.7 times longer than carapace length, merus elongated; propodus with small, sharp chitinous spines on posterior margins; dactylus gently recurved, slightly longer than the length of propodus, with few sharp chitinous spines on anterior and posterior margins (Figs. 2a, b).

Thoracic sternites smooth, glabrous, minutely punctate; joints between S1/S2 completely fused, joints between S2/S3 demarcated only as a notch on the lateral side of the sternum, lacking suture or groove; joints between S4/S5 visible as a narrow groove, medially interrupted; S8 almost covered by pleon, narrowed medially, longitudinal medial groove indiscernible (Figs. 2d, e). Sternopleonal cavity deep, distinctly long, reaching beyond the imaginary line joining the basis of maxilliped 3 (Figs. 1 d, e).

Pleon long, narrow, T-shaped; pleonal somite 5 trapezoidal, lateral margin concave; pleonal somite 6 subquadrate, slightly longer than broad, proximal width approximately 0.9 times medial length, lateral margin straight in lower third, slightly convex in upper part, distinctly shorter than telson (Fig. 2d, e). Telson elongated, medial length approximately 1.2 times proximal width, with gently concave lateral margins, terminal end narrow, rounded (Fig. 2d).

G1 slender, subterminal article basally broad, gradually narrowing towards terminal article, mesial margin basal half straight, terminal half gently turned outwards, outer margin distinctly sinuate; terminal article conical, slender, long, 0.5 times length of subterminal article, straight from base to tip, tip blunt; groove for G2 ventral on subterminal article (Figs. 4 B-E). G2 distinctly shorter than G1, distal part of G2 very short, 0.2 times length of the basal part (Figs. 4A).

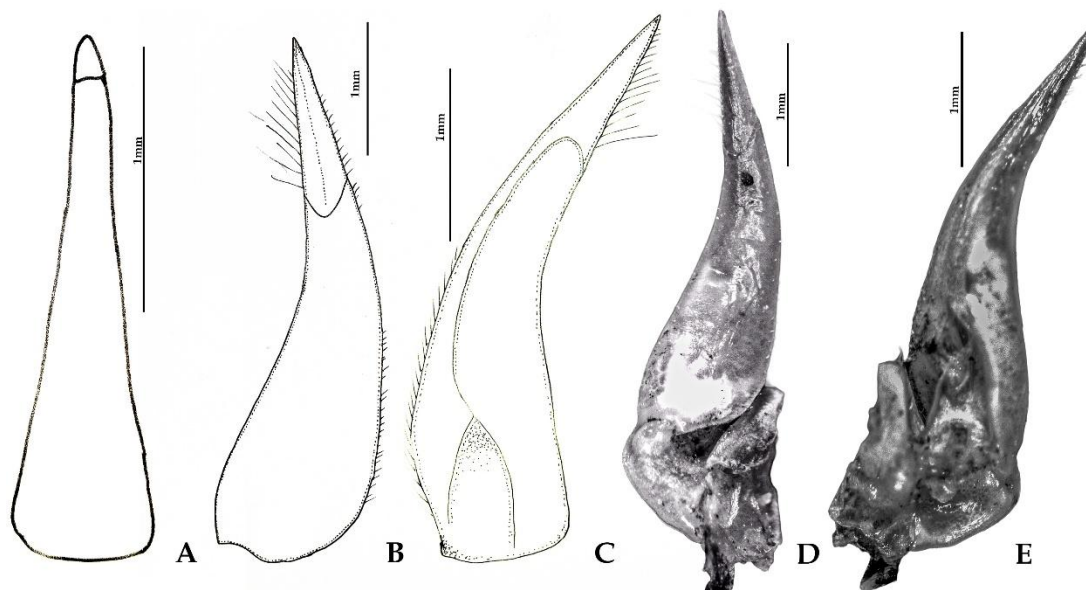


Figure 4. *Ghatiana karnataka* sp. nov., holotype male (CW 21.3 mm, CL 13.8 mm) (ZSI-K, Reg. No. 1079): A. G2, B. drawing of left G1 dorsal view, C. drawing of left G1 ventral view, D. left G1 dorsal view, E. left G1 ventral view

Paratypes

The female paratypes of *G. karntaka* sp. nov. share most of the non-sexual diagnostic character of holotype male, including a proportionately broad carapace (CW/CL = 1.5–1.6) (Fig. 2a, c, 5), third maxilliped does not cover whole of the buccal cavity (Fig. 3b),

The left cheliped is massive than the other cheliped, however the outer part of female chela is heavily rugose with small granules (fig. 3 e). The females, has distinct color variations, the upper surface of carapace with a V- shaped light mauve colour patch, the lower part is dark brown; the ventral part and cheliped are light mauve (Figs. 3 a, b). The pleon has a broadly subtriangular outline and mostly covers the thoracic sternites except the lateral edges (Fig. 3 c); pleonal somite 6 is the longest, trapezoid, more than 4 times broader than median length, lateral margin convex, shorter than the telson; the telson is triangular, broader than long, apex narrow, rounded, lateral margins gently concave (Fig. 3 c). The vulvae in the female paratypes are located on S6, relatively separate from each other ($VD/SW = 0.3$), vulva subovate, small (occupying 0.4 times the length of S6), positioned close to the joints of S5/S6, not touching the joints of S5/S6, surrounded by a low, broad rim, the vulvae covered by a soft membranous operculum (Fig. 3 d).

Color in life. The dorsal surface of the carapace of the adult male is dark purple in lower half, with a light pink to mauve colored 'V'- shaped mark on the anterior surface (Fig. 2a, c; 5). Cheliped light pink, fingers white; ambulatory legs is dark purple, ventral part light pink. In adult female, the color of the carapace are grey-violet in anterior part, dark grey-brown in posterior part; all the pereopods are dark grey, while the chelipeds are light pink in colour. (Figs. 3 a-e).

Etymology. The species is named after the State of Karnataka. The state of Karnataka, situated in the Middle part of the Western Ghats Biodiversity Hotspot, this state is also the type locality of many of the species of the genus *Ghatiana*. The proposed common name for the new species is "Karnataka Ghat Crab".

Ecological notes. The crab was found in the crevices of boulders or holes in the lateritic rocks, even they found to live in the tree holes (Fig. 5). The crab habitats were found as restricted in Mookambika Wildlife Sanctuary, Karnataka, India, located within the Western Ghats biodiversity hotspot (Fig. 1). The area comprises tropical evergreen and semi-evergreen forests characterized by a multi-layered canopy, high humidity, and organic-rich soils. The region is drained by perennial river systems, including the Souparnika, Mavinakuru, and Jadhkal rivers. Specimens were collected from the vicinity of the Mavinakuru River, where crabs occur along riverbanks and adjacent riparian zones with moist soil, leaf litter, and rocky substrates. The study area is protected under the provisions of the Wildlife Protection Act, 1972.

Type locality. India, Karnataka state, Mavinakuru, near Kollur Village, Baindur Taluk, Udupi District; 13.858912°N, 74.794707°E; Alt. 96 Mt.

Geographic distribution. *Ghatiana karnataka* sp. nov. is currently known only from Mavinakuru in the Central Western Ghats within the Udupi district of Karnataka state, India (Fig. 1).

4. RESULTS & DISCUSSIONS

Among the 14 congeners, until now a total 7 species has type locality in the the state of Karnataka, those are the, *G. basalticola* (Klaus et al., 2014); *G. atropurpurea* Pati, Thackeray and Khair, 2016; *G. rouxi* Pati and Thackeray, 2021; *G. dvivarna* Pati, Thackeray, Bajantri and Hegde, 2022; *G. sanguinolenta* Pati, Thackeray & Pawar, 2023; *G. dvirupa* Pati, Bajantri & Hegde, 2024; and *G. dhrithiarum* Pati, Naik and Gouda, 2026 are dorsal surface of the carapace of adult male is known from Karnataka (Klaus et al., 2014; Pati and Thackeray, 2021; Pati et al., 2022, 2023, 2024, 2026).

G. karnataka sp. nov. though has some similarity with *G. basalticola* (Klaus et al., 2014) but the new species is nevertheless distinguished from *G. basalticola* in many morphological characters, carapace is less broader than long in the new species, $CW/CL=1.5$ (Figs. 2a, c) (vs. carapace is more broader than long in *G. basalticola*, $CW/CL=1.6-1.9$; see Pati and Thackeray, 2018: fig. 5A); eyes does not fully occupied the orbital space (Fig. 3f) (vs. eyestalks relatively stouter; see Pati and Thackeray, 2018: fig. 5B); G1 terminal article relatively long, 0.5 times the length of the subterminal article (Figs. 4B-E) (vs. G1 terminal article relatively short, 0.3 times the length of the subterminal article; see Pati and Thackeray, 2018: fig. 5D); Antennular fossae partially exposed in frontal view (Fig. 2F, G; 3B) (vs. Antennular fossae fully exposed in frontal view in *G. basalticola*, see Pati and Thackeray, 2018: fig. 5B); G2 basal part gradually narrower to the terminal end (Fig. 4A) (vs. G2 basal part straight, broad in *G. basalticola*, fig. 5f); the live coloration of *G. basalticola*, has bright red carapace, chelipeds, and ambulatory legs (see Klaus et al., 2014: fig. S1) are also strikingly differs from live coloration of the new species (Fig. 2 a, c, 5).

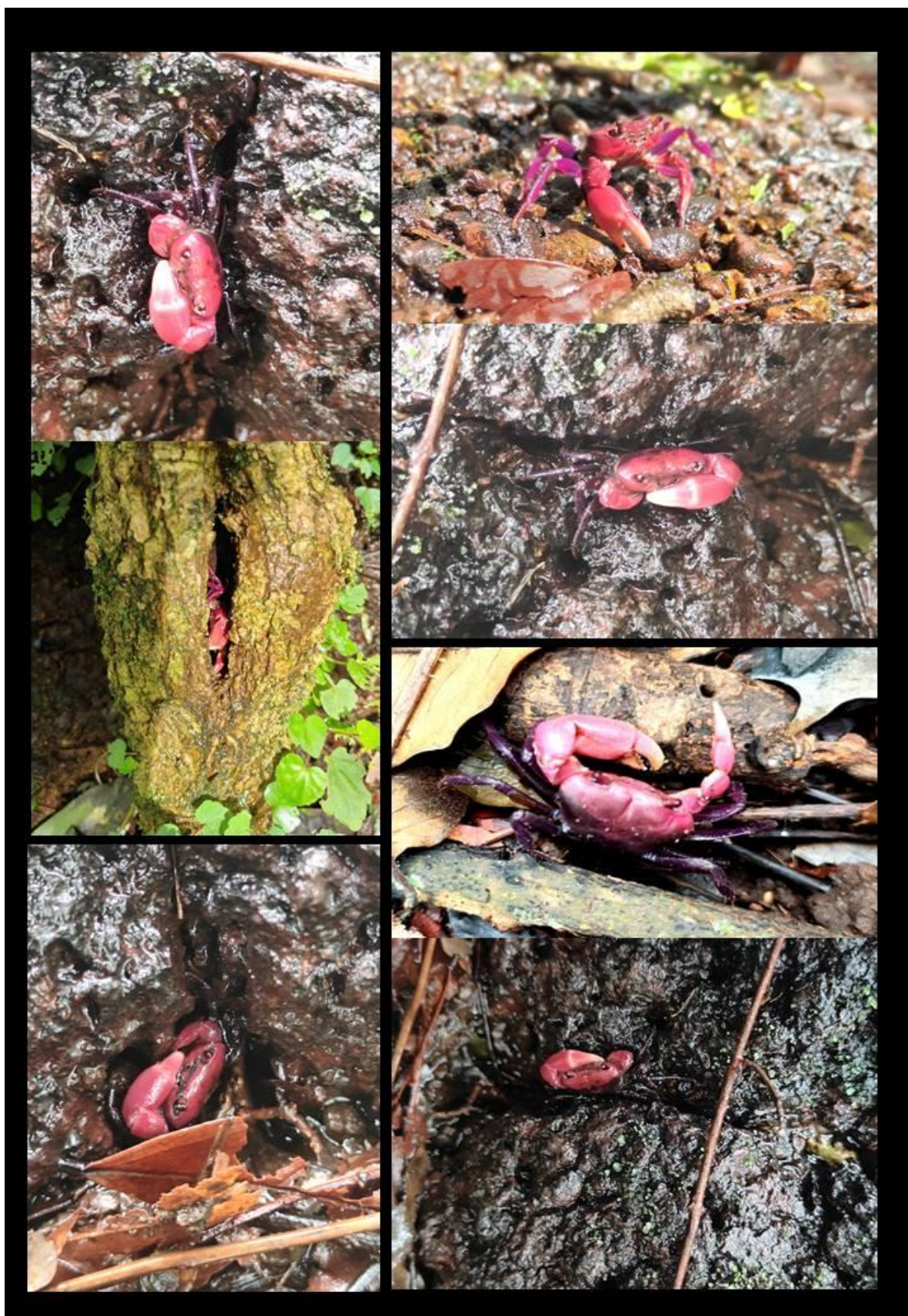


Figure 5. Live crab in different microhabitat of *Ghatiana karnataka* **sp. nov** (specimen not collected)

The new species clearly differs from *G. dvivarna* by its unique color patterns, *Ghatiana karnataka* sp. nov. has a unique coloration of dark purple in lower half, with a light pink to mauve colored 'V'-shaped mark on the anterior surface, ambulatory legs are dark purple (Fig. 2a, c; 5). (vs. *G. dvivarna* has a white carapace anteriorly and dark red-violet posteriorly, ambulatory legs that are red-violet (see Pati et al. 2022: figs. 2A, B, 6B, C; Pati et al., 2026: figs. 4P–R); the antennular fossae quite exposed in frontal view of *G. karnataka* sp. nov. (Figs. 1b, f, g) (vs. the antennular fossae hiding under the frontal margin in frontal view of *G. dvivarna* (see Pati et al. 2022: 3B; Pati et al., 2026: fig. 3L); G1 is distinctly bent outwards in the new species (Fig. 4B–E) (vs. G1 is almost straight in *G. dvivarna* (see Pati et al., 2022: figs. 4, D, E).

Ghatiana karnataka sp. nov. closely resembles the recently described species *Ghatiana dhritiarum* Pati, Naik & Gouda, 2026, in its similar-looking carapace and bright life coloration. However, the new species can easily be differentiated by several morphological characters: in *G. karnataka* sp. nov., the carapace is relatively narrower, with a CW/CL ratio of 1.5 (Fig. 2a) (vs. the carapace being proportionately wider than long in *G. dhritiarum*) (see Pati et al., 2026: Figs. 1A, 2A, D). Furthermore, the dorsal carapace surface of the new species features a mauve-coloured, 'V'-shaped patch over a purple base (Figs. 2a, c), whereas the dorsal surface of *G. dhritiarum* exhibits a complex pattern of dark purplish-brown or white (see Pati et al., 2026: Figs. 4A, 4B–G, L–O, H–K).

Ghatiana dvirupa Pati, Bajantri & Hegde, 2024, differs from its congeners in its distinct coloration: the male carapace, cheliped, and legs are uniformly pink, whereas the females are dark purplish-brown (see Pati et al., 2024: Figs. 5C, D). In contrast, the male of the new species is dark purple on the lower half with a light pink to mauve 'V'-shaped mark on the anterior surface, while the female is grey-violet on the upper part and dark grey-brown posteriorly (Figs. 2a, c, 3a). Additionally, the ambulatory legs are relatively shorter in *G. dvirupa*, with a P3 length/CL ratio of 2.0–2.2 (see Pati et al., 2024: Figs. 2A, 4A, D), compared to the relatively slender ambulatory legs of the new species, which have a P3 length/CL ratio of 2.7 (Figs. 2a, b). The tooth of the epistomal median lobe is blunt but more prominent in *G. dvirupa* (see Pati et al., 2024: Fig. 2B), whereas it is blunter and rounded in the new species (Figs. 2b, f). Finally, the G1 is relatively narrow in *G. dvirupa*, with a distinct notch visible on the outer margin between the subterminal and terminal articles (see Pati et al., 2024: Fig. 3G), whereas there is no distinctive mark between the terminal and subterminal articles of the G1 in the new species (Figs. 4A–E).

Ghatiana karnataka sp. nov. can nevertheless be differentiated from *Ghatiana sanguinolenta* Pati et al., 2023, by several distinct morphological characters. The carapace of the new species is relatively narrower than long, with a CW/CL ratio of 1.5 (Figs. 2a, c), whereas it is wider than long in *G. sanguinolenta*, with a CW/CL ratio of 1.6 (see Pati et al., 2023a: Figs. 2A, 3A, C). The eyestalk is relatively large, and the eye occupies most of the orbital space (Fig. 2f), whereas *G. sanguinolenta* features a slender eyestalk that occupies less of the orbital space (see Pati et al., 2023a: Fig. 2B). The G1 terminal article is relatively less slender, measuring 0.5 times the length of the subterminal article (Figs. 4B–E), compared to the more slender G1 terminal article of *G. sanguinolenta*, which is 0.4 times the length of the subterminal article (see Pati et al., 2023a: Figs. 2H, I). Moreover, *G. sanguinolenta* exhibits a uniform, blood-red coloration across the entire body (see Pati et al., 2023a: Fig. 4), which contrasts sharply with the live coloration of the new species (Figs. 2a, c, 5).

5. CONCLUSION

The discovery of *Ghatiana karnataka* sp. nov. increases the number of recognized species in the genus *Ghatiana* to 15 and represents the eighth species of this genus recorded from the state of Karnataka. This finding further highlights the rich but still incompletely documented freshwater crab diversity of the Western Ghats and underscores the need for more extensive faunistic surveys along the Western Ghats of India.

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Author contributions

SM identified the specimens and finalize the draft manuscript, AK collected the specimens and ecological data, photograph the specimen in habitat, and prepare the draft manuscript.

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Conflict of Interest

The authors declare that they have no conflicts of interest, competing financial interest or personal relationship that could have influenced the work reported in this paper.

Informed consent

Not applicable.

Ethical approval & declaration

In this article, the animal regulations are followed as per the ethical committee guidelines of Crustacea Division, Zoological Survey of India, Fireproof Spirit Building, 27 J. L. Nehru Road, Kolkata 700016, West Bengal, India; the authors observed a new Freshwater crab *Ghatiana karnataka* sp. nov (Decapoda: Brachyura: Gecarcinucidae) from Karnataka, India. The Animal ethical guidelines are followed in the study for species observation, identification & experimentation.

Data and materials availability

Data that support the findings of this study are embedded within the manuscript.

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