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Dicharax tilariensis n. sp., a new micro-snail from the northern Western Ghats, India (Caenogastropoda: Cyclophoridae: Alycaeinae)

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Abstract. We describe a new micro-snail species of *Dicharax* based on 12 specimens collected from Tilari Nagar in Kolhapur District, northern Western Ghats of Maharashtra. *Dicharax tilariensis* n. sp., can be distinguished from its south Indian congeners and from recently described and geographically closest congener, *D. devraivasi* in having an elevated spire, R1 with fine and/or irregular ribs that gradually become stronger and more spaced, R2 with elevated, spaced, blunt ribs, R3 with a sharp swelling, and an operculum with a prominent nipple on the inner surface. Additionally, we describe the living animal, and radula of the new species.

Key words. Biodiversity hotspot, endemic, Sahyadri, taxonomy

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Introduction

The genus *Dicharax* Kobelt & Möllendorff, 1900 is characterised by the absence of spiral striations on the shell, with a few exceptions (Páll-Gergely *et al*. 2021). It is currently the most species-rich genus of the subfamily Alycaeinae W.T. Blanford, 1864, containing 161 species (MolluscaBase Eds 2026). The genus widely occurs from Japan, the Malay Peninsula, the southern arc of the Malay Archipelago including Sumatra and Java, and the south-eastern Himalayan region; it is also distributed in south-western Himalaya and Peninsular India, which is disjunct from the main area (Godwin-Austen 1897–1914; Kobelt 1902; Gude 1921; van Benthem Jutting 1948, 1959; Minato 1988; Gittenberger *et al.* 2017; Páll-Gergely *et al.* 2017, 2020a, 2021, 2025; Aravind & Páll-Gergely 2018; Jirapatrasilp *et al.* 2021; Páll-Gergely & Hunyadi 2022; Bhosale *et al.* 2025a; MolluscaBase Eds 2026).

Previously, 59 species and eight subspecies of genus *Dicharax* were recognised from India. Of these, 17 species and four subspecies were placed in the typical group and the remaining 42 species and four subspecies were placed in the atypical or questionable groups (Páll-Gergely *et al.* 2017, 2020a; Aravind & Páll-Gergely 2018; Bhosale *et al.* 2025a). About 55 species and eight subspecies were known from the Himalayas and North-East Region of India. In a recent revision, Páll-Gergely *et al.* (2025) revised *Chamalycaeus* Möllendorff, 1897, *Cycloryx* Godwin-Austen, 1914 and *Dicharax* species from Himalayas and Myanmar by examination of type material, which resulted in synonymising 37 species and the description of seven new species. Of the Indian *Dicharax*, they synonymised 16 species and seven subspecies; six species were transferred to *Chamalycaeus*; *Dicharax* (?) *daflaensis subdigitatus* (Godwin-Austen, 1876) was elevated to a full species; *Metalycaeus* (?) *magnificus* (Godwin-Austen, 1914) was transferred to *Dicharax*; and four species from Mizoram were described as new. Only *Dicharax lectus* (Godwin-Austen, 1914) was not evaluated by Páll-Gergely *et al.* (2025), even though it was previously listed in an earlier paper by Páll-Gergely *et al.* (2020a). However, *D. lectus* exhibits some morphological similarities to diagnostic characteristics of *Metalycaeus* Pilsbry, 1900, which would better place the species in that genus (Páll-Gergely *et al*. in press). Currently, 48 *Dicharax* species are known from India. Of these, 44 occur in the Himalayas and North-East India, and have been classified into 12 groups based on shell size and characteristics (Páll-Gergely *et al.* 2025). Remaining four species—*D. bawai* Aravind & Páll-Gergely, 2018, *D. devraivasi* Bhosale, Thackeray, Yadav & Khandekar, 2025, *D. expatriatus* (W.T. Blandford

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& H.F. Blanford, 1860), and *Dicharax footei* (W.T. & H.F. Blanford, 1861)—are known from the Western Ghats and southern India, and all are classified as belonging to the atypical or questionable group of *Dicharax*, characterised by the absence of curved R2 ribs (Páll-Gergely *et al.* 2020a; Bhosale *et al.* 2025).

Over the past decade, expanded field surveys in India for land snails have led to the description of several new species (Aravind & Páll-Gergely 2018; Sajan *et al.* 2019; Das & Aravind 2021a, b; Páll-Gergely *et al.* 2025), some of which are result of our systematic field surveys for land snails in the northern Western Ghats of Maharashtra (Bhosale *et al.* 2021a, b, 2022, 2025a, b, c). As part of these ongoing field surveys, we collected 15 specimens of *Dicharax* from the semi-evergreen forests in Tilari Nagar, Kolhapur District, Maharashtra. These specimens differ from the recently described, geographically closest congener, *D. devraivasi*, as well as three other South Indian congeners in several non-overlapping morphological characters. We describe it here as a new species, *Dicharax tilariensis* n. sp., along with notes on its natural history.

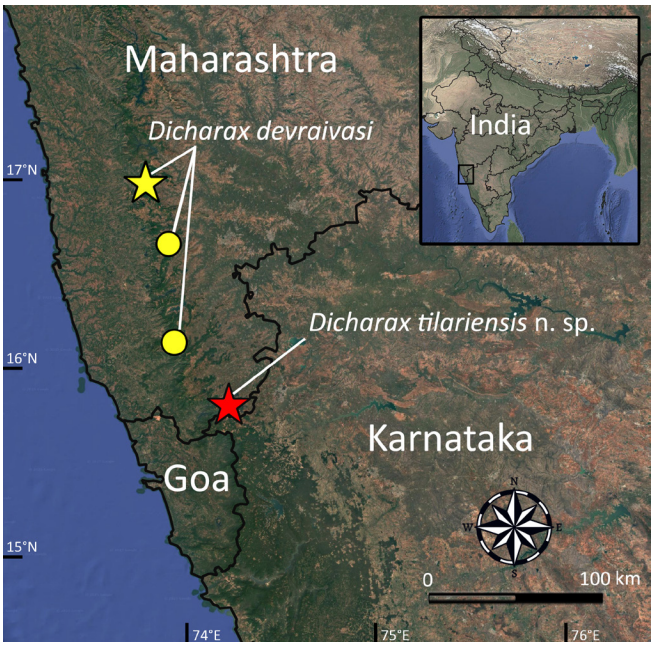


Figure 1. Distribution of *Dicharax* species in the northern Western Ghats of Maharashtra (star = type locality, and circle = additional localities).

Materials and Methods

We collected 15 live individuals of the new species from Swapnavel Point, near Tilari Nagar, Kolhapur District, Maharashtra, India (Fig. 1). Live individuals were photographed *ex-situ* soon after the collection, then euthanised following the guidelines of the American Veterinary Medical Association (2020) and preserved in 80% ethanol for anatomical study. Three individuals were preserved in absolute ethanol and stored at −20 °C for possible future molecular work (measurements excluded). Shells were photographed under a Zeiss Stemi 305 stereo zoom microscope at different planes of focus and stacked using CombineZP v. 1.0 focus-stacking software. The morphology of the new species places it in the atypical group of *Dicharax* following Páll-Gergely *et al.* (2020a), and we compare it with four *Dicharax* species endemic to the Western Ghats and southern India, namely *Dicharax bawai*, *D. devraivasi*, *D. expatriatus*, and *D. footei*, using data from the literature (Arvind and Páll-Gergely 2018; Bhosale *et al.* 2025a). Comparative morphological data of *D. devraivasi* were obtained from the holotype (NRC-AA-8454) and 13 paratypes (NRC-AA-8455–8460, BNHS GAS 206–212) from the type locality (Ambeshwar Temple, Talavade, near Amba, Kolhapur District, Maharashtra; 16° 58′26.7″N 073° 48′05.7″E), and one paratype (BNHS GAS 213) from the only other known locality (Shree Swayambhoo Temple, Shivdav Khurd, near Patgaon, Kolhapur District, Maharashtra; 16° 08′ 15.2″N 073° 57′ 12.1″E). Photographs of the type specimens of *D. expatriatus* and *D. footei* were downloaded from the Natural History Museum, London (NHMUK) website (https://data.nhm.ac.uk/), and images of *D. bawai* types were provided by N.A. Aravind. Individual measurements of *D. bawai*, *D. expatriatus*, and *D. footei* were provided by Páll-Gergely (pers. comm. Oct. 2026). We follow Cox (1960) and Páll-Gergely *et al.* (2017) for the terminology of shell morphology. Whorls were counted following Kerney & Cameron (1979). The radula was prepared following Geiger *et al.* (2007), and the operculum was cleaned with a soft paintbrush and stored in 80% ethanol. The radula and dorsal shell surface were sputter coated with gold and imaged on a Tescan VEGA3 scanning electron microscope in the Department of Botany, Shivaji University, Kolhapur. The type material of the new species was deposited in the Museum and Research Collection Facility at National Centre for Biological Sciences, Bengaluru (NRC).

Systematics

Family Cyclophoridae J.E. Gray, 1847

Subfamily Alycaeinae W.T. Blanford, 1864

Genus *Dicharax* Kobelt & Möllendorff, 1900

***Dicharax tilariensis* n. sp.**

Figures 2–7

ZooBank identifier. urn:lsid:zoobank.org:act:28EA8962-87A0-4FD1-92E5-1FD331793826

Type locality. Swapnavel Point, Kitvade, Tilari Nagar, Kolhapur, Maharashtra state, India (15° 48′ 13.2″ N 074° 14′ 24.7″ E), *c.* 730 m a.s.l.

Type material. Holotype: NRC-AA-9604, adult male, coll. Amrut Bhosale & Swapnil Pawar, 24 June 2024.

Paratypes: NRC-AA-9605–9608, four paratypes, same collection and locality data as holotype; NRC-AA-9609–9613, five paratypes, from near Swapnavel Point (15° 48′ 15.2″ N 074° 14′ 27.8″ E), *c.* 740 m a.s.l., same collection data as holotype except collected on 23 June 2025; NRC-AA-9614, NRC-AA-9615, two paratypes, from near Swapnavel Point (15° 48′ 11.1″ N 074° 14′ 24.1″ E), *c.* 730 m a.s.l., same collection data as holotype except collected on 13 September 2025.

Etymology. The specific epithet is a toponym for Tilari Conservation Reserve, in Kolhapur District, Maharashtra, the type and currently only known locality for this species. The suggested English common name is Tilari Micro-snail.

Diagnosis. A *Dicharax* having a shell with elevated spire; R1 with fine or irregular ribs, gradually becoming stronger and spaced ribs towards end; R2 with spaced, elevated, blunt ribs; and R3 with a sharp swelling.

Comparison with congeners from the Western Ghats and southern India. The new species' morphology places it in the atypical group (species without curved R2 ribs) of *Dicharax* (Páll-Gergely *et al.* 2020a), to which the other *Dicharax* species in the Western Ghats and southern India also belong. Therefore, morphological comparison is restricted to these species. All *Dicharax* species from the Western Ghats and southern India, including the new species, are illustrated in Figure 2, and diagnostic shell characters are provided in Table 1 to facilitate comparison. *Dicharax tilariensis* n. sp. differs from *D. bawai* in having a larger shell, W/H ratio 1.3–1.46 (vs W/H ratio1.48–1.68), a more expanded outer apertural lip, the basal part of the outer peristome much more expanded, a single sharp swelling on R3, and an operculum with a prominent nipple (vs a slightly expanded outer apertural lip, the basal part of the outer peristome simple, two less sharp swellings, and an operculum with a blunt nipple). *Dicharax tilariensis* n. sp. is differentiated from *D. expatriatus* in having a smaller shell, W/H ratio 1.3–1.46 (vs W/H ratio 1.70–1.89), an elevated shell spire, and a sharp swelling on R3 (vs a low shell spire, and a blunt swelling on R3). The new species differs from *D. footei* in having a smaller shell, W/H ratio 1.3–1.46 (vs W/H ratio 1.91), an elevated spire, a much-expanded basal outer peristome, and a single sharp swelling on R3 (vs a low spire, a slightly expanded basal outer peristome, and two sharp swellings on R3). The new species is geographically and morphologically closest to recently described *D. devraivasi*, but the new species can be distinguished from *D. devraivasi* by having a slightly higher shell, W/H ratio 1.3–1.46 (vs W/H ratio 1.52–1.75); an elevated spire, spaced ribs on R1 (last ¼ whorl of R1 with *c.* 24–40 ribs), a sharp swelling on R3, an operculum with a prominent nipple (vs a slightly elevated spire, close (*c.* 39–47) ribs on the last ¼ whorl of R1, an inflated blunt swelling on R3, and an operculum with a moderately prominent nipple).

Description of the holotype.

Shell: white to off-white, with pale-pinkish tinge and reddish-brown apex, depressed (width 4.32 mm, height 3.01 mm). Whorls nearly 4; body whorl rounded (Fig. 3A); outline nearly circular in dorsal view (Fig. 3C). Spire elevated, with apex obtuse. Umbilicus open, showing all whorls within (Fig. 3D). Protoconch slightly elevated, with

Table 1. Diagnostic shell characters of the Western Ghats and southern Indian *Dicharax* species based on the type material.

Species	*D. bawai* (*n* = 4)	*D. devraivasi* (*n* = 15)	*D. expatriatus* (*n* = 4)	*D. footei* (*n* = 1)	*D. tilariensis* n. sp. (*n* = 12)
Shell width in mm	3.90–4.22	4.25–4.75	4.7–5.5	5.8	4.24–4.87
Shell height in mm	2.32–2.85	2.54–3.01	2.7–3.1	3.04	3.01–3.52
W/H ratio	1.48–1.68	1.52–1.75	1.70–1.89	1.91	1.3–1.46
Spire	Elevated	Slightly elevated	Low	Low	Elevated
Outer peristome	Slightly expanded	More expanded	Expanded	Expanded	More expanded
Basal outer peristome	Simple	More expanded	Simple	Simple	More expanded
Swellings on R3	2	1	1	2	1
Operculum nipple	Blunt	Moderately prominent	Prominent	Not known	Prominent

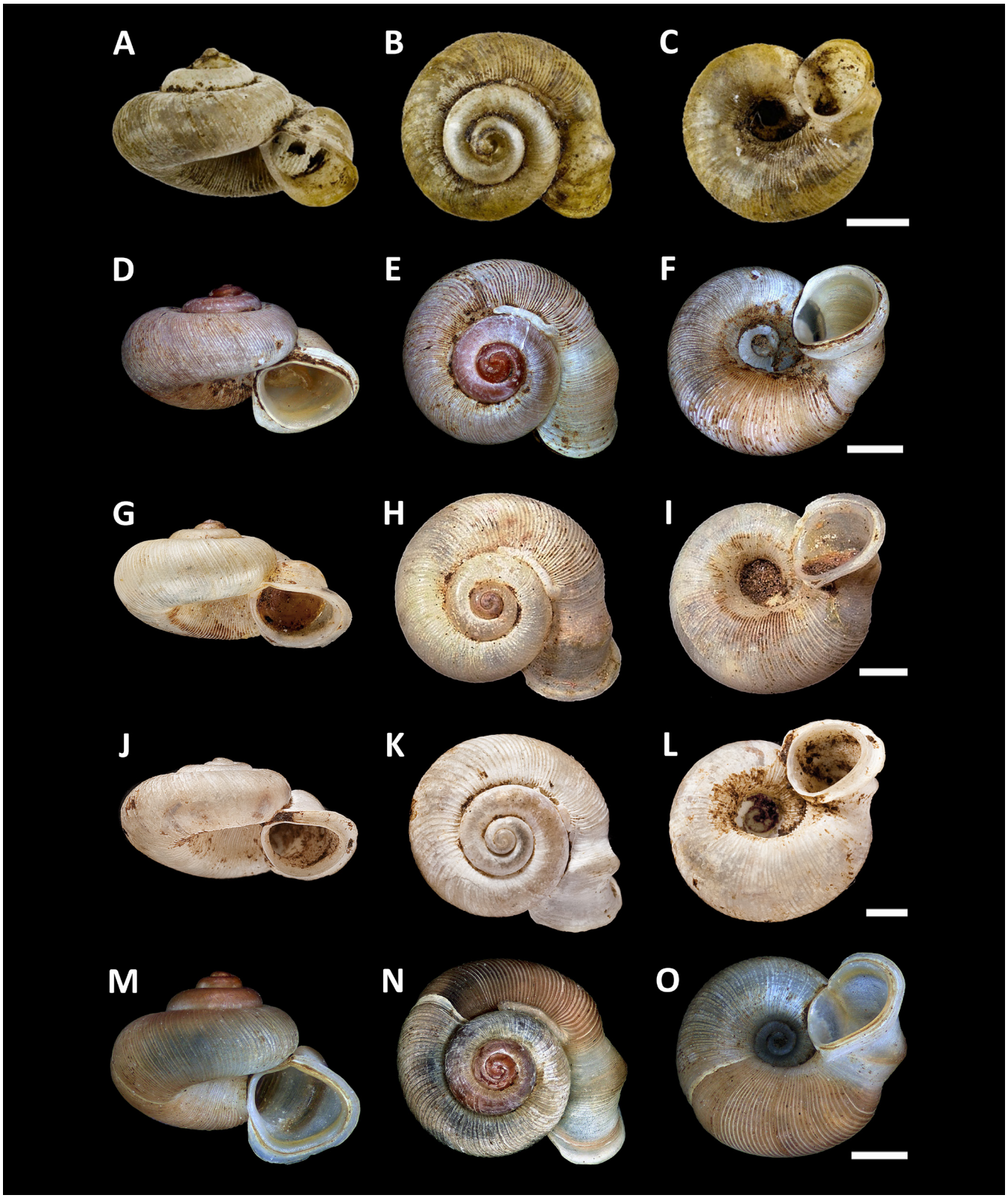


Figure 2. Shells of *Dicharax* spp. from the Western Ghats and southern India. **A–C**, *D. bawai* holotype ZSI/WGRC/9865. **D–F**, *D. devraivasi* holotype NRC-AA-8454. **G–I**, *D. expatriatus* lectotype NHMUK 1906.4.4.58. **J–L**, *D. footei* lectotype NHMUK 1906.4.4.57. **M–O**, *D. tilariensis* n. sp. holotype NRC-AA-9604. Image credit: N.A. Aravind (A–C), and The Trustees of the Natural History Museum, London (G–L). Scale bars = 1 mm.

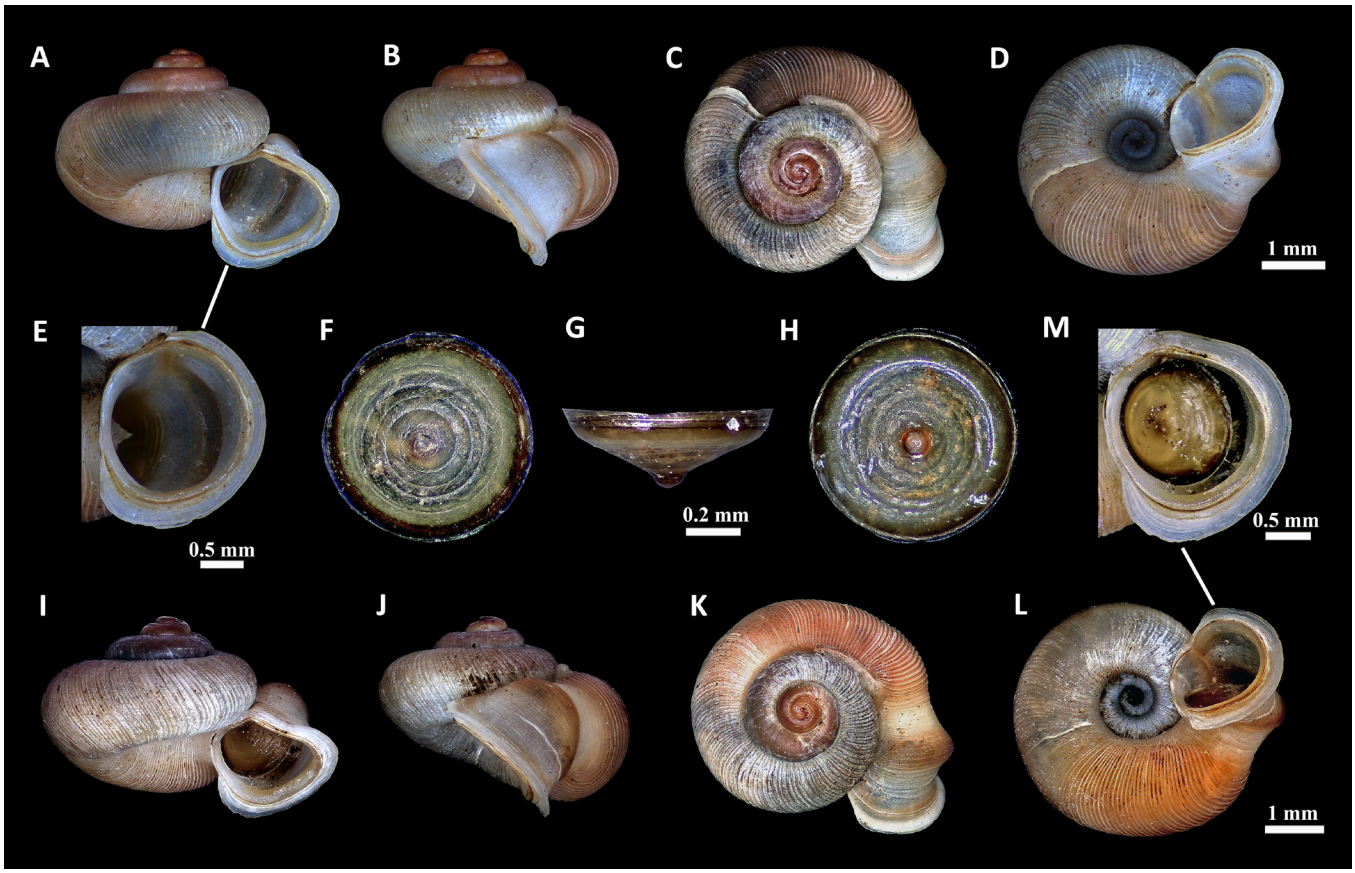


Figure 3. Shell and operculum of *Dicharax tilariensis* n. sp. **A**–**H**, holotype NRC-AA-9604 (male). **I**–**M**, paratype NRC-AA-9605 (female). **A**, I, apertural view. **B**, **J**, lateral view. **C**, **K**, dorsal view. **D**, **L**, ventral view. **E**, **M**, apertural lip. **F**, outer surface. **G**, lateral view. **H**, inner surface.

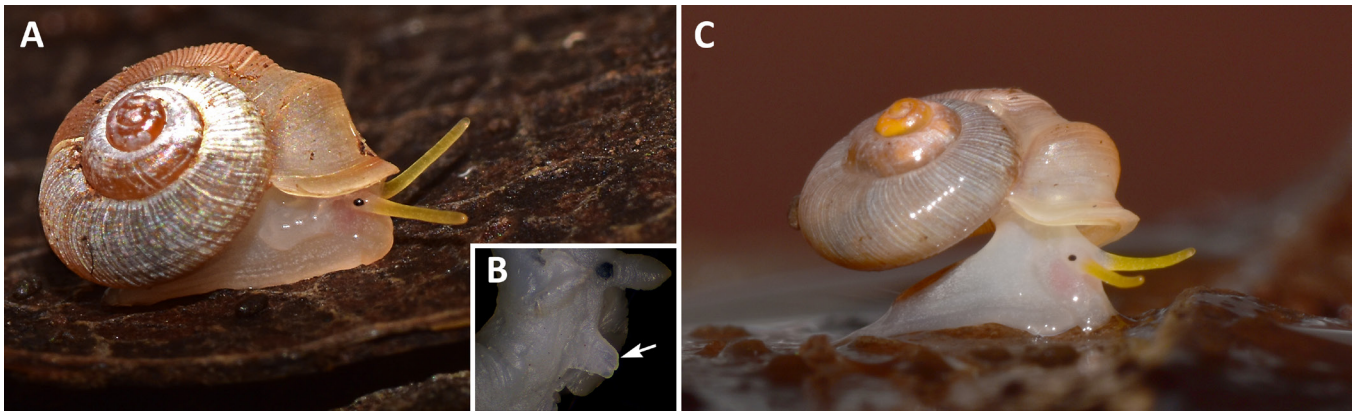


Figure 4. Living snail of *Dicharax tilariensis* n. sp. **A**, male, holotype NRC-AA-9604. **B**, penis with two slight furrows in preserved specimen NRC-AA-9610. **C**, female, paratype NRC-AA-9605.

1½ whorls, glossy, and mostly eroded. R1 composed of *c.* 2 whorls; initially smoothish, with only weak, irregular, fine growth lines, which suddenly change to strong, more regularly spaced ribs towards end of R1; last ¼ of R1 whorl with *c.* 34 ribs; R2+R3 less than ½ of whorl (*c.* 150°); R2 with *c.* 35 blunt, elevated ribs; transition between R2 and R3 marked by a constriction; R3 with single sharp swelling with fine, irregular ribs (Fig. 3C). Aperture nearly circular (Fig. 3E). Peristome double; inner peristome very slightly protruding; outer peristome thin, expanded but not reflected

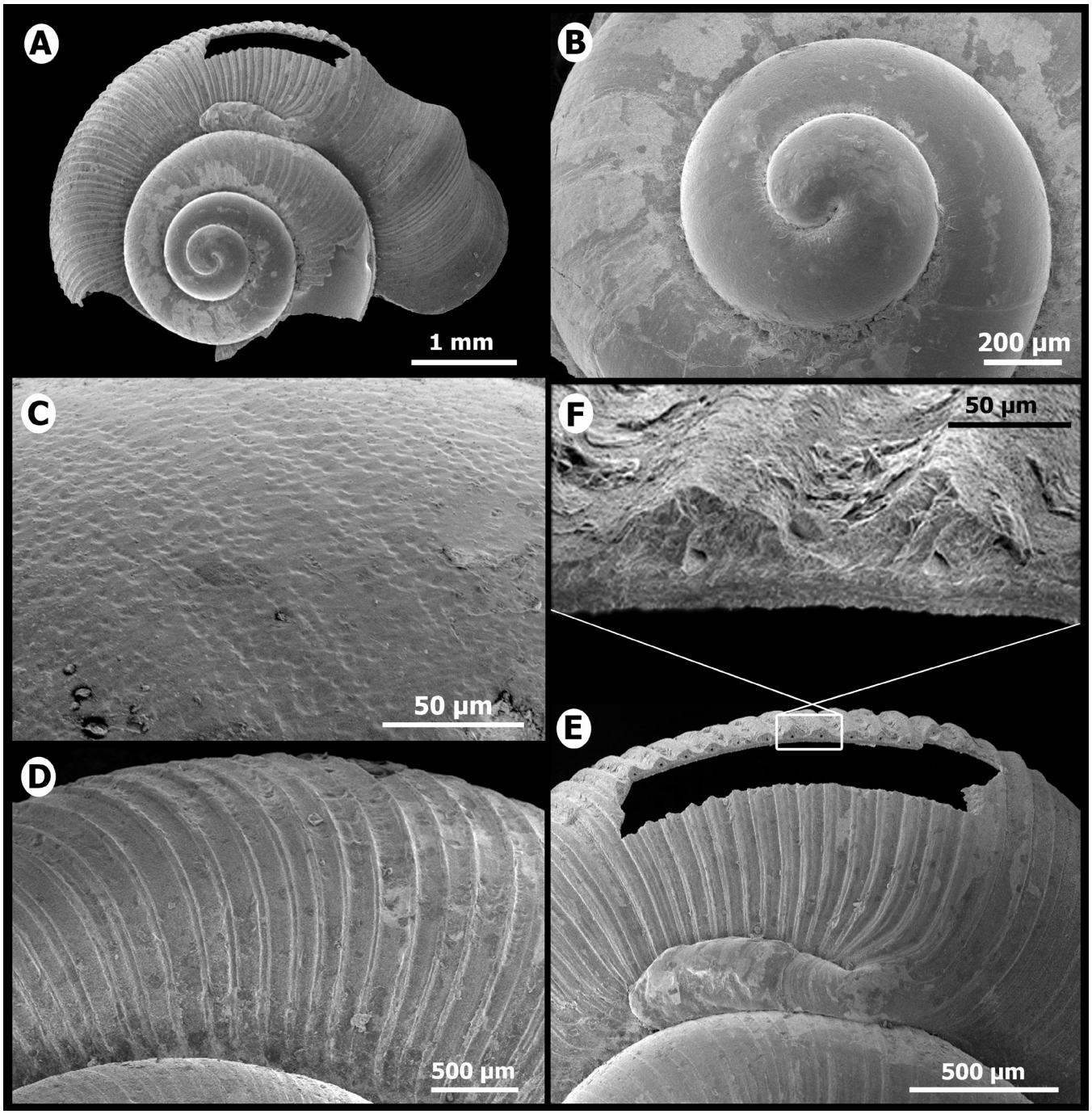


Figure 5. SEM images of shell of *Dicharax tilariensis* n. sp. (paratype NRC-AA-9610). **A**, dorsal view. **B**, protoconch, with (**C**) detail of surface. **D**, surface of R1. **E**, surface of R2 with (**F**) enlarged cross-section (horizontally flipped).

(Fig. 3A, B); basal part of outer peristome (near umbilicus) more expanded than rest of outer peristome (Fig. 3E).

Operculum: discoid, corneous, pale to dark brown; outer surface concave, multispiral, with seven whorls, lamella not elevated but edge of operculum elevated (Fig. 3F, G); inner surface with prominent nipple at centre (Fig. 3H).

Animal: Mostly white (Fig. 4A); tentacles bright yellow, with dark eyespots at their outer base. Tail short. Penis flat, elongate, and with trapezoidal end with two slight furrows (Fig. 4B).

Additional information from paratypes. Shell width 4.21–4.87 mm wide, height 3.01–3.52 mm (n = 12); whorls

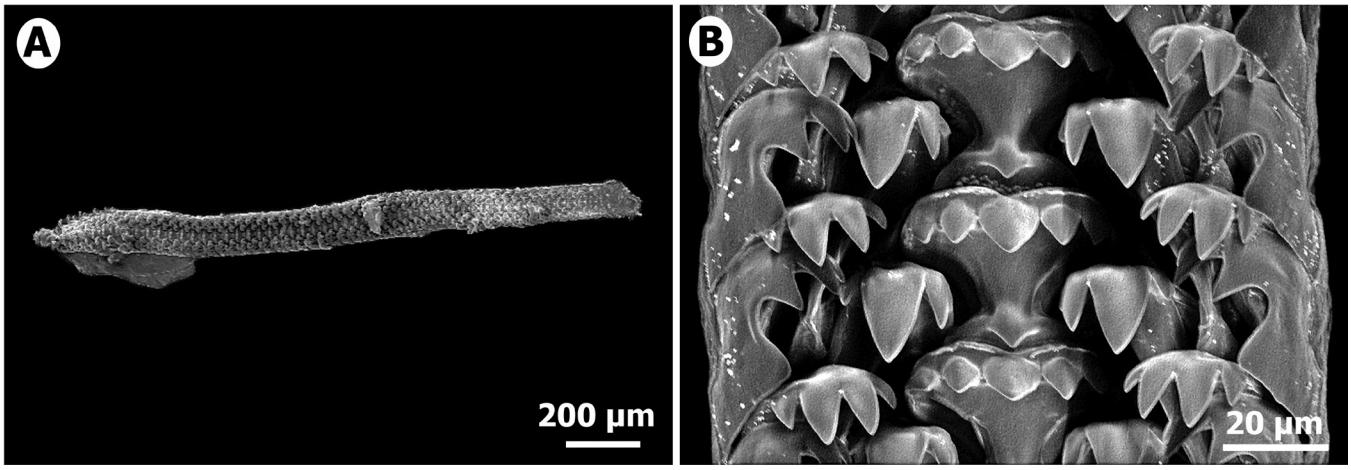


Figure 6. SEM images of radula of *Dicharax tilariensis* n. sp. (paratype NRC-AA-9607). **A**, whole radula. **B**, portion of radula showing several rows of teeth.

3½–4. Protoconch finely pitted (Fig. 5A–C) and/or slightly eroded with 1–1½ whorls. R1 with 1¾–2⅙ whorls; last ¼ of R1 whorl with 24–37 spaced ribs (Fig. 5D), rarely 40 slightly closed ribs observed; R2 with 25–36 blunt, elevated ribs (Figs 3C, K, 5E). Operculum with seven or eight whorls. All paratypes resemble the holotype shell, except as follows: shell whitish, with pale-brown tinge; apex pale brown or yellow, and suture tube short in four paratypes (NRC-AA-9607, NRC-AA-9608, NRC-AA-9610, and NRC-AA-9613). Aperture ovate; inner peristome slightly or significantly protruding in six paratypes (NRC-AA-9606–9608 and NRC-AA-9611–9613). Basal part of outer peristome slightly expanded than rest of outer peristome in NRC-AA-9605 (Fig. 3M). In a cross-sectional view of R2 (NRC-AA-9610), anterior crust forms blunt, slightly elevated, hollow rib with a strong anterior and a weak posterior projection; anterior crust folds over posterior crust; micro-tunnels circular to oval (Fig. 5E, F).

Radula (NRC-AA-9607): taenioglossate, each row with seven teeth (2-1-1-1-2). Central tooth pentacuspid; median cusp large, strong, bluntly pointed, and with two small cups on each side. Lateral teeth tetracuspid, bluntly pointed; first outer and inner cusps small, second inner cusp slightly larger, and second outer cusp much broader than others. Inner marginal teeth tetracuspid, with bluntly pointed cusp; two median cusps nearly double in size of others; outer marginal teeth tricuspid, with bluntly pointed cusps (Fig. 6A, B).

Distribution and natural history. *Dicharax tilariensis* n. sp. is currently known at and near the type locality at elevations of 730–740 m a.s.l. (Fig. 1). It was only found in semi-evergreen forests with dense canopy cover and abundant leaf litter, and the specimens were collected from forest patches located on either side of the road leading towards the entrance to Swapnavel Point. Live individuals were found during the monsoon from June to September in leaf litter, in loose, moist soil at the bases of trees, around decaying logs, and under rocks. In mid-September, when the habitat was relatively dry, 15 individuals (both adults and subadults) of the new species were observed inside a tree hollow containing decaying material, loose moist soil, and leaf litter, approximately 30–60 cm above the ground (Fig. 7B). All individuals were counted following the removal of a 20 cm deep layer of accumulated material (Fig. 7C). The loose soil and decayed tree material in the hollow was moister than surrounding forest floor. Sympatric snails found at the type locality include *Cyclophorus* sp., *Ariophanta* sp., *Tanychlamys* sp., *Glessula* sp., and a species of Succineidae.

Discussion

Dicharax tilariensis n. sp. is the second endemic species of its genus described from the northern Western Ghats. It is only known from the type locality. The new species is morphologically distinct from its Western Ghats and southern Indian congeners. Aravind & Páll-Gergely (2018) provided width and height ranges for *D. expatriatus* and *D. footei* based on type and non-type specimens from multiple localities and documented these species' geographical distributions, and their material examined for the size-range data included type specimens of *D. expatriatus* from Neddiwuttom, Nilgiri Hills, and non-type specimens from South Canara (Páll-Gergely pers. comm.), as well as non-type specimens of *D. footei* from Sheveroy Hills. Although populations from different localities may belong to the same species,

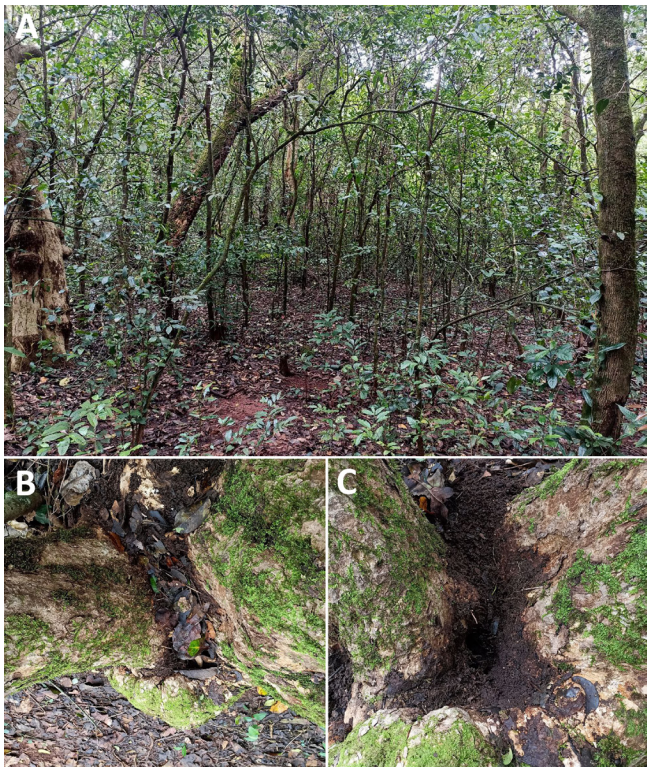


Figure 7. Habitat of *Dicharax tilariensis* n. sp. at Swapnavel Point, Kitvade, Tilari Nagar, Kolhapur, Maharashtra state, India. **A**, overview of habitat. **B**, **C**, tree hollow containing decaying material, loose moist soil, and leaf litter: (**B**) before removal of the accumulated material; (**C**) after removal of ~20 cm deep accumulated material to count the individuals.

the conspecificity of these geographically separated populations, particularly in the case of *D. expatriatus*, requires further taxonomic validation, ideally through the collection of fresh specimens from the respective localities and molecular phylogenetic analyses. Given this uncertainty, our morphometric comparisons were restricted to the type material of the four species described from the Western Ghats and southern India. Some of the shell characters of new species, like shell width, number of ribs on R1 (last ¼ of the R1 whorl), and number of ribs on R2, are similar to those of *D. devraivasi.* However, the new species shows a remarkable difference in shell height, elevated spire, and spacing of ribs on R1, and the swelling on R2 is sharper. *Dicharax devraivasi* is the congener geographically closest to the new species; the type locality of *D. tilariensis* n. sp. is 50 km south of the paratype locality of *D. devraivasi* (Shree Swayambhoo Temple, Shivdav Khurd, near Patgaon); (Bhosale *et al.* 2025a). Along with the Central Western Ghats, a large and topographically complex area north of Mahabaleshwar in the northern Western Ghats has largely remained malacologically unexplored compared to the other areas of the southern Western Ghats (Aravind *et al.* 2005, 2008; Sen *et al.* 2012; Raheem *et al.* 2014; Bhosale *et al.* 2025a, b). Recent descriptions of new species of land snail (Aravind & Páll-Gergely, 2018; Páll-Gergely *et al.* 2020b; Bhosale *et al.* 2021a, b, 2022, 2025a, b, c) and the present work, highlight the need for systematic field sampling in northern Western Ghats to uncover the true diversity and distribution of land snails in the region.

Leaf litter is an important microhabitat for many snails (Bishop, 1977; Müller *et al.* 2005; Kappes *et al.* 2006, 2009; Kemencei *et al.* 2014; Gheoca *et al.* 2021, 2023), and species composition within it is dependent on several factors including vegetation type, leaf-litter depth, and litter and soil composition (Bishop 1977; Wäreborn 1992; Locasciulli & Boag 1987; Millar & Waite 1999; Martin and Sommer 2004a, b; Hylander *et al.* 2005; Horsák 2006; Wehner *et al.* 2019). In the Western Ghats, moist deciduous forests, tropical dry deciduous forests, thorn forests, and shola forests produce several tonnes of leaf litter annually (Kumar & Deepu 1992; Vidyasagaran *et al.* 2004; Pragasan & Parthasarathy 2005; Izayas & Udayakumar 2024). Our field surveys across various habitats found that *Dicharax* species only occur in areas with dense forest canopies and abundant leaf litter. Conversely, regions with less tree cover and low or no leaf litter yielded no samples. *Dicharax tilariensis* n. sp. is described from previously unexplored semi-evergreen forest patch with abundant leaf litter. *Dicharax devraivasi* is also known from the same forest type (Bhosale *et al.* 2025a). *Dicharax* species appear to prefer the deep-leaf litter micro-habitat. *Dicharax bawai* is known from three localities in moist to dry deciduous forests, as well as scrub forests (Arvind and Pall-Gergely 2018). It was found in soil and leaf litter, but two localities were extremely disturbed and dominated by the invasive shrub *Lantana camara* L. (Verbenaceae).

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