

Mongabay Series: Almost Famous Species, Beyond Protected Areas,
India's Iconic Landscapes

Indrella ampulla's genetic tapestry unveils colour morphs isolated across the Palghat Gap

by Arathi Menon on 6 February 2024

- *A study finds that the gene flow between the three colour variations of the semi slug Indrella ampulla is limited and highlights the Palghat Gap as a barrier to it.*
- *Despite Indrella ampulla having a delicate shell on its back, it does not fit neatly into the categories of either a snail or a slug.*
- *Endemic to the Western Ghats, the species faces no immediate threat but researchers suggest the importance of a broader landscape approach in conservation.*

A recent study investigates the genetic flow among three colour variations of the semi-slug *Indrella ampulla* and finds that the Palghat

Gap, a low mountain pass in the Western Ghats, is a significant barrier, isolating the red colour morph in the south from its yellow and orange counterparts in the north of the Gap. The study also alludes to the influence of paleoclimatic conditions on the species' genetic diversity.

Endemic to the Western Ghats, *Indrella ampulla* comes in three distinct and vivid colour morphs — yellow, orange and red. The species belongs to the genus *Indrella*, which is a monotypic genus, a taxonomic category which houses only one species under its umbrella.

Distinct from a snail or slug, *Indrella* not only carries a delicate shell on its back but also the distinction of being one of the most visually appealing understory inhabitants in the biodiversity hotspot of the Western Ghats. Under duress, this semi-slug, despite possessing a shell, is unable to retreat into it. Instead, when faced with a predatory threat, *Indrella* froths at the shell. N. A. Aravind, a researcher at the Ashoka Trust for Research in Ecology and Environment (ATREE) who has extensively studied this species, notes that unlike other snails, *Indrella* does not produce a thick slime as a defence mechanism. Instead, it secretes a white foam to deter its sole known predator, the Cochin cane turtle (*Vijayachelys silvatica*).



A yellow *Indrella ampulla* feeds on decomposing waste. Photo by Surya Narayanan.

The activity period of *Indrella ampulla* is limited to late summer after initial monsoon showers (late April to May) and during the southwest monsoon season (June to October), during which the average temperature is around 18 degrees to 25 degrees Celsius. An opportunistic feeder, a 2021 study (https://im.gs.mongabay.com/wp-content/uploads/sites/30/2024/02/05205003/2022_Indrella-Nat-Hist_240201_171243_compressed-1.pdf) reports that the species has been observed to feed on a wide range of flora, including fresh plant matter of angiosperms, mushrooms and lichens and scavenging on dead plant and animal matter. In one instance, the red morph was found feeding on human faeces at Valparai in the Anamalai forest region.

Polymorphism and restricted gene flow

The researchers of the genetic study, published in November 2023 (https://im.gs.mongabay.com/wp-content/uploads/sites/30/2024/02/05205007/blad148_240123_124017_compre1.pdf), looked at 32 individuals of the species and were surprised to find three distinct colour morphs in one species, as they had begun the study with the hypothesis that the three colours were separate species.



A juvenile Indrella ampulla. All juveniles of the semi-slug are brown before they change colour. Photo by Surya Narayanan.

Despite being the same species, the red morph is restricted to the south of Palghat Gap while the yellow and orange are found in the north with no genetic flow between the red and its northern counterparts. Aravind who co-authored the study says that the lack of genetic flow is due to the complete isolation of the red morphs, across the Palghat Gap, from the yellow and orange individuals. The study affirms the role of the Palghat Gap as a

barrier to the gene flow of various taxonomic groups such as mammals, birds, reptiles, amphibians, insects and plants and now, molluscs too.

Mind the Palghat Gap: It isolates the red morph

The Western Ghats of India is a 1600-km-long stretch of hills extending from Gujarat in the west to Kerala in the south. The most prominent geographical break in the region, the Palghat Gap, lies at an elevation of 140 m above mean sea level with a width ranging between 13 and 40 km.



An orange Indrella ampulla. The orange and yellow colour morphs are distributed across the north of the Palghat Gap. Photo by Surya Narayanan.

Aravind points to the probability of aridification and dryness due to scanty monsoon that detached the Palghat Gap from the north and south of it which could've led to the separation and isolation of the red morph. "They probably couldn't cross over the dry patch of the Gap to facilitate the gene flow," he shares.

Though the species is range restricted, it is found in a wide variety of habitats such as wet evergreen forests, coffee and cardamom plantations and even human habitations close to natural forests. "You will see them abundantly in places they are found but the distribution ends abruptly; in the case of the

yellow and orange morphs, at Kudremukh," says Maitreya Sil, one of the first authors of the study.



A yellow Indrella ampulla feeds on a plant. Photo by Surya Narayanan.

The yellow and orange morphs are distributed in Kudremukh and below Kudremukh with Agumbe as the northernmost limit. They are widely distributed in places like Valparai, Silent Valley, Kodagu and other places, says Sil. While yellow and orange both share habitats, orange is more widely distributed than yellow which is largely restricted to Wayanad and surrounding areas.

While the researchers don't see any immediate threat to the species, they do not dismiss the probability of land use and climatic changes impacting its population. Since the species is restricted to certain landscapes but not endangered or threatened, Aravind recommends a larger landscape approach in conservation of the species. "The whole landscape has to be protected so that externalities that affect their survival can be reduced considerably," he says.

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Banner image: Red *Indrella ampulla* that occurs in the south of the Palghat Gap. A recent study investigates the genetic flow among three colour variations of the semi-slug and finds that the Palghat Gap plays the barrier, isolating the red colour morph from its yellow and orange counterparts in the north of the Gap. Photo by Surya Narayanan

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