

First report of a freshwater turtle species as a permanent resident of a cave

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Freshwater turtles are biological indicators of a healthy ecosystem, as they are important scavengers, prey and predators (Lovich et al., 2018; Santori et al., 2020). India is home to 34 of the 356 known tortoises and freshwater turtle species worldwide (Jadhav et al., 2018). The freshwater turtles in tropical regions use various artificial/natural, mainly freshwater and sometimes marine habitats (Ahmed et al., 2020; Das & Bhupathy, 2009). During our visit to a laterite cave in the northern Western Ghats of India, in Sindhudurg, Maharashtra, one of the Global Biodiversity Hotspots, we documented the first-ever resident population of a freshwater turtle inside a cave. Close observation identified the species as *Melanochelys trijuga*, the Indian black turtle or Indian pond terrapin.

The Indian black turtle is widespread across India, Bangladesh, Myanmar, Nepal and Sri Lanka (Ahmed et al., 2020). Its conservation status is considered to be of Least Concern in India but is generally considered threatened in Myanmar and Sri Lanka, and some subspecies (*coronata*, *edeniana*, *parkeri*) may be threatened (Ahmed et al., 2020). According to the IUCN's recent assessment, the population is declining (Ahmed et al., 2020) due to threats such as the pet trade, local consumption and medicinal use (Krishnakumar et al., 2009).

Melanochelys trijuga is primarily crepuscular or nocturnal and can be seen foraging after dark (Ahmed et al., 2020; Das & Bhupathy, 2009). Other turtle species have been reported to use subterranean habitats and may use caves as a temporary refuge to hide from predators (Acuña-Mesen, 1994; Tuberville et al., 2005); a fossil turtle has even been found in a cave in Texas (Milstead, 1956). We came across no reports of turtles as permanent inhabitants of caves, although there is a recent report of the Mediterranean stripe-necked terrapin *Mauremys leprosa* using an iron mine tunnel in Spain (Hinckley et al., 2015).

During our first exploration inside the cave on 24 October 2021, we recorded 11 *M. trijuga* roosting. In a further seven visits between November 2021 and May 2023 we made further records of the species. This laterite cave has a single entrance and runs horizontally for 100.2 m (the cave length continues further with inaccessible passages)



Figure 1. The Indian black turtle *Melanochelys trijuga* on a boulder in the laterite cave

with an average height of 6 m. The average temperature inside the cave is 30.8 °C with 100% relative humidity. The cave structure from the inside is highly uneven with several small voids, burrows and clastic sediments (fallen rocks/boulders). A perennial freshwater stream flows from inside the cave to the entrance where there is a pool of water all year round. Within the cave there is a significant population of frugivorous and insectivorous bats, so the stream water brings bat guano to the pool, which may be a food/nutrient source for the fauna and flora. As *M. trijuga* is known to feed opportunistically on various animals and plants (Das, 1991), it seem likely that the fauna (including dead animal bodies) and flora in the pool are their primary food source. The pool outside the cave entrance provides drinking water for cattle and possibly occasionally for humans. Along with

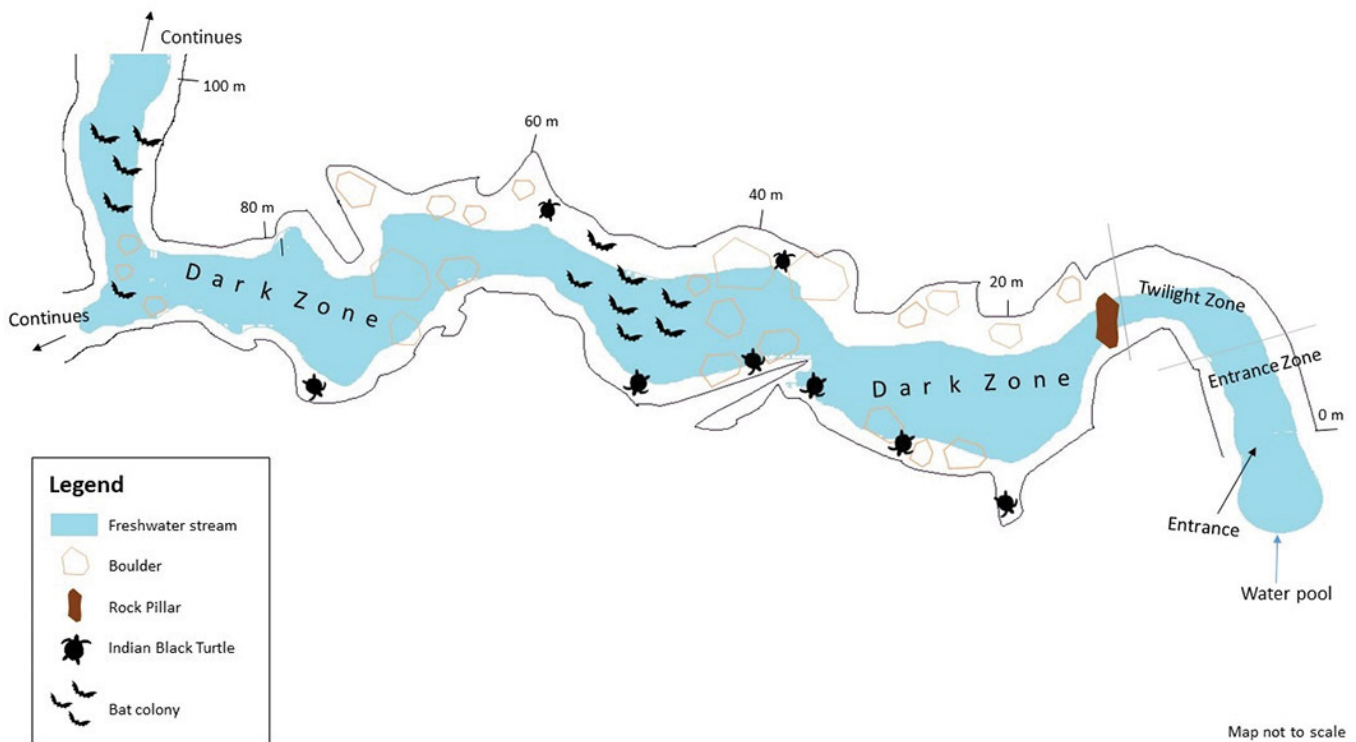


Figure 2. The locations of the Indian black turtle inside the laterite cave

its ecological significance, the cave has cultural importance and is worshipped and preserved by local people.

During our visits to the cave at various times of day, the turtles were mainly seen roosting in the small voids, burrows and under the boulders on the ground (Figs. 1 & 2) and at night were only in the dark zone of the cave. We did not attempt to measure them but based on what we have seen the turtles were of various body sizes. This may indicate that the species is breeding in this safe underground cave habitat. Given the stable microclimatic conditions and the availability of water and food (aquatic flora and fauna and dead animal bodies, including bats) within the cave and at the entrance (pool), it appears likely that the turtles are permanent residents of this laterite cave.

Caves as ecosystems are often overlooked due to their inaccessibility and the absence of light. Along with functioning as a unique habitat for diverse species, caves have an important role in the region's hydrology. Cave ecosystems provide unique habitat conditions for freshwater animals but remain under-explored and insufficiently studied (Culver & Pipan, 2019; Wynne et al., 2021). This note is the first to document a freshwater turtle species inhabiting a cave. Further, recognising this knowledge gap we recommend scientific studies to explore the ecology of the Indian black turtle using caves in its entire distribution range and the identification of the various threats faced in both subterranean and more usual habitats.

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REFERENCES

- Acuña-Mesen, R.A. (1994). Morphometric variation and ecological characteristics of the habitat of the *Kinosternon scorpioides* turtle in Costa Rica (Chelonia, Kinosternidae). *Revista Brasileira de Biologia* 54: 537–547.
- Ahmed, M.F., Praschag, P., de Silva, A., Das, I., Singh, S. & de Silva, P. (2020). *Melanochelys trijuga*. The IUCN Red List of Threatened Species. e.T13039A511745. <https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T13039A511745.en>.
- Culver, D.C. & Pipan T. (2019). *The Biology of Caves and Other Subterranean Habitats*. Oxford University Press: UK. 336 pp.
- Das, I. (1991). *Colour Guide to The Turtles and Tortoises of the Indian Subcontinent*. R&A Publishing Ltd, Postishead, UK. 133 pp.
- Das, I. & Bhupathy, S. (2009). *Melanochelys trijuga* (Schweigger 1812), Indian Black Turtle. Conservation Biology of Freshwater turtles and Tortoises: A compilation project of the IUCN/SSC Tortoise and Freshwater Turtle

- Specialist Group. AGJ Rhodin, PCH.
- Hinckley, A., Herrero, D. & Vidal, A.G.D.C. (2015). Use of a subterranean habitat by the Mediterranean stripe-necked terrapin (*Mauremys leprosa*). *The Herpetological Bulletin* 130: 21.
- Jadhav, T.D., Sawant, N.S. & Shyama, S.K. (2018). Diversity and distribution of freshwater turtles (Reptilia: Testudines) in Goa, India. *Journal of Threatened Taxa* 10(9): 12194–12202. <http://dx.doi.org/10.11609/jott.2835.10.9.12194-12202>.
- Krishnakumar, K., Raghavan, R. & Pereira, B. (2009). Protected on paper, hunted in wetlands: Exploitation and trade of freshwater turtles (*Melanochelys trijuga coronata* and *Lissemys punctata punctata*) in Punnamada, Kerala, India. *Tropical Conservation Science* 2(3): 363–373. <https://doi.org/10.1177/194008290900200306>.
- Lovich, J.E., Ennen, J.R., Agha, M. & Gibbons, J.W. (2018). Where have all the turtles gone, and why does it matter? *BioScience* 68(10): 771–781.
- Milstead, W.W. (1956). Fossil turtles of Friesenhahn Cave, Texas, with the description of a new species of *Testudo*. *Copeia* 1956(3): 162–171.
- Santori, C., Spencer, R.J., Thompson, M.B., Whittington, C.M., Burd, T.H., Currie, S.B., ... & Van Dyke, J.U. (2020). Scavenging by threatened turtles regulates freshwater ecosystem health during fish kills. *Scientific Reports* 10(1): 14383.
- Tuberville, T., Buhlmann, K., Bjorkland, R. & Boother, D. (2005). Ecology of the Jamaican Slider Turtle (*Trachemys terrapen*), with implications for conservation and management. *Chelonian Conservation and Biology* 4: 908–915.
- Wynne, J.J., Howarth, F.G., Mammola, S. et al. (2021). A conservation roadmap for the subterranean biome. *Conservation Letters* 14: e12834. <https://doi.org/10.1111/conl.12834>.

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