



## “Hibernation” in Indian Snakes?

Rahul V. Deshmukh<sup>1</sup>, Sagar A. Deshmukh<sup>2</sup>, and Swapnil A. Badhekar<sup>3</sup>

<sup>1</sup>H. No. 26, Teacher colony, Brahmani – Kalmeshwar, Nagpur, M.S. – 441501 (rahul30.snake@gmail.com)

<sup>2</sup>Behind Potdar Nursing Home, Kalmeshwar, Nagpur, M.S. – 441501 (sd.snakefriend@gmail.com)

<sup>3</sup>Tiwaskarwadi, Raipur, Hingana, Nagpur, M.S. – 441110 (swapnilbadhekar86@gmail.com)

Hibernation<sup>1</sup> is typically considered to be a period of little or no activity (Gilles-Baillien 1974; Gregory 1982) but some evidence of mid-winter surface activity has been documented (Nordberg and Cobb 2016, 2017). During this time, organisms retreat to hibernation sites that protect them from cold environmental temperatures that lower body temperatures and metabolic rates, rendering physiological processes much less efficient (Cobb and Peterson 2008; Nordberg and Cobb 2016). Some snakes hibernate individually and some hibernate communally (Gregory 1984; Sexton et. al. 1992). Snakes successfully hibernate in a variety of microhabitats, including tree roots, rodent and crayfish burrows, ant mounds, sinkholes, water-filled cisterns, and human dwellings (Ultsch 1989; Gregory 1982).

India is home to an extraordinary variety of climatic regions, tropical in the south to temperate and even alpine in the Himalayan north, where elevated regions receive sustained winter rainfall. During Indian winters (December–March), the coldest months are December and January, when temperatures are 10–15 °C (50–59 °F) in the northwest, although those in the southeast are 20–25 °C (68–77 °F).

<sup>1</sup> Although the term hibernation is frequently used, the technical term for prolonged inactivity to escape cold conditions in reptiles is “brumation.” Hibernation and brumation are quite similar in many respects, hence the frequent interchangeable use of the two terms, but brumation is less of a true “sleeping” state and often is punctuated with periods of activity, frequently triggered by the need to at least occasionally drink water to avoid lethal levels of dehydration.



**Fig. 1.** An unsexed Green Keelback (*Macropisthodon plumbicolor*) wedged in cracks of black soil near the Gajanan Maharaj Temple, Deoli-Saongi, Hingana, Nagpur, Maharashtra. Photograph by Swapnil A. Badhekar.

Herein we report three encounters that might represent hibernation in Indian snakes. The first occurred at 1330 h on 19 January 2013 when one of us (RD) was monitoring the excavation of a pit for an upcoming long-jump competition at Smurti High School, Brahmani-Kalmeshwar, Nagpur, Maharashtra, India (21°24'20.86"N, 78°90'84.01"E). An unsexed adult Green Keelback, *Macropisthodon plumbicolor* (Cantor 1839), approximately 700 mm in total length, was wedged in gaps of black soil about 400 mm below the surface. The snake looked as if it had died but its heart was beating slowly. It was cold to the touch, its pupils were constricted, and the skin of the body was loose. The snake might have been dehydrated and emaciated from not eating or drinking for an extended period, resulting in a loss of weight that would make the skin appear loose and baggy. We laid the snake on a patch of ground in the sun, where it did not move for about 30 min before awakening and retreating into a nearby rock pile.

A second encounter (by SD and SB) occurred at 0915 h on 27 January 2016 in the outskirts of Ghorad Village near the Mahadeo Temple, Kalmeshwar, Nagpur, Maharashtra (21°24'88.24"N, 78°88'42.50"E). While rescuing an Oriental Ratsnake, *Ptyas mucosa* (Linnaeus 1758), we found four unsexed adult Green Keelbacks lying coiled on the ground in a patch of Tree Cotton (*Gossypium arboretum*). We saw no signs of movement except for slowly beating hearts. The snakes were cold to the touch, pupils were constricted, but the skin was not loose as in the previous case. We placed the snakes in a transparent plastic container and placed it in the sun.

The third encounter occurred at 2015 h on 23 October 2017 during a rescue operation near the Gajanan Maharaj Temple, Deoli-Saongi, Hingana, Nagpur, Maharashtra (21°04'39"N 78°56'82"E) when one of us (SB) found a young Green Keelback (Fig. 1) beneath brick debris wedged in cracks of black soil. The snake was immobile except for a slowly beating heart; it was cold to the touch, but the pupils were not constricted and the skin was not loose. The snake became active while the author was taking photographs.

Ashok Captain (pers. comm.) observed a St. John's Keelback, *Xenochrophis sanctijohannis* (Boulenger 1890), under driftwood. The snake appeared to have recently shed its skin and its pupils were constricted. It awakened after it was captured to count scales.

Although no reports document any Indian snakes hibernating or wintering in dens, all of the snakes described herein probably were hibernating in sheltered situations. Determining how frequently this occurs in India and what other species of snakes might engage in such behaviors will require additional fieldwork, especially in the cooler regions of the Subcontinent.

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