

Amphiesma stolatum (striped keelback): Habitat and reproduction

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Amphiesma stolatum (Natricinae) is a non-venomous Asiatic colubrid distributed widely from Pakistan, eastward into Southern Asia, northward into south China and on various mainlands and islands across Southeast Asia. In India, the snake is found up to 2000 feet (610 m). *A. stolatum* is a small species (to 90 cm total length), terrestrial, diurnal, and inhabits well-watered lowland plains, forests, hills, rice paddy, agricultural and rural areas. It has a typical natricine diet and hunts amphibians, fish, invertebrates, small lizards and rodents. Females produce 5-15 eggs per clutch throughout active parts of the year and may also attend clutches. The snake aestivates during hot weather and is more frequently observed during rainy seasons (Whitaker & Captain, 2004).

During monsoon season on 18/07/2014, at midday, we discovered two clutches of snake eggs whilst conducting amphibian refugia surveys along line transects (see Heyer et al., 1994) on an open rocky plateau near Dhamapur, Kolhapur District, Maharashtra, India (N 16 1 53.4, E 73 35 2.4; 85 m) (Fig. 1). The plateau is a ferricrete of laterite with multiple patches of small loose rocks (Fig. 2). The clutches of eggs were found under loose rocks situated next to shallow temporary rain pools in the middle of the plateau habitat. One clutch had two neonate *A. stolatum* under the rock, complete with empty egg shells. These empty egg shells were also attached to the rest of the clutch. We therefore surmised that the egg clutches were most likely to be *A. stolatum*. A nearby rock also unveiled an adult female *A. stolatum* underneath, adding to the known presence of the species in the area. We recorded morphometrics of the specimens and eggs (Tables 1, 2 and 3). In the interests of conservation we left the eggs in-situ to hatch naturally, replacing the covering rock. We also released the snakes at the site of capture, under their refugia.

What is interesting to note about this record of egg-laying was the deposition site. Both clutches and snakes were discovered in the middle of an open rocky plateau habitat with nothing but occasional sparse rocks for cover. The rocks were directly adjacent to the edge of shallow temporary pools that were formed by recent rains. These pools were the subject of our initial study for amphibians on the rocky plateaus and contained ample tadpoles and small frogs belonging to *Fejervarya* spp. genera. It is typical for many oviparous snakes to select a location to lay eggs which has an appropriate temperature and humidity range,

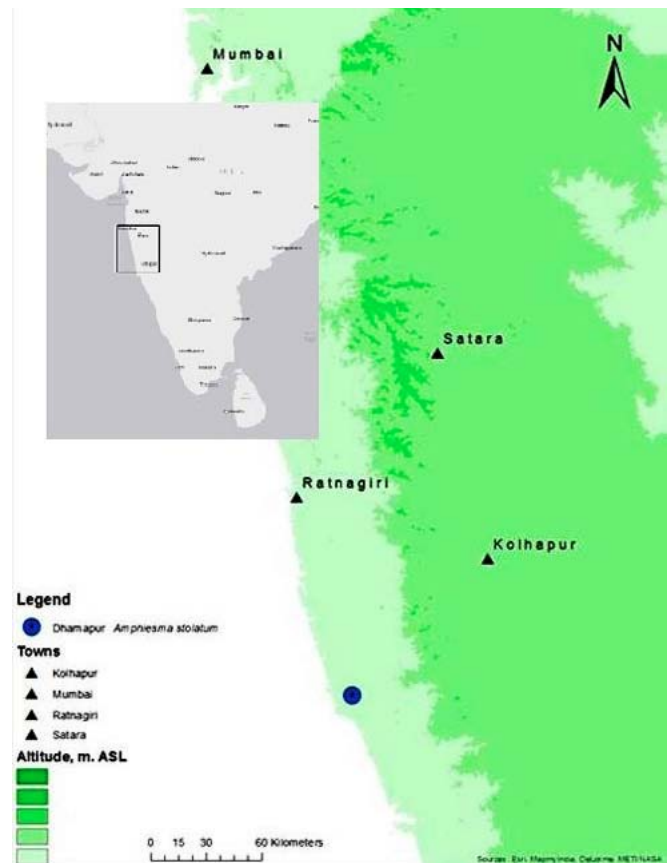


Figure 1. Map showing location of Dhamapur, India.

as well as a substrate capable of maintaining it (Lillywhite, 2014). Such sites are usually warm, moist and free from initial predation so that they may assist in thermal and water regulation of the eggs (Lillywhite, 2014). In this instance, the rock habitat, being out in the open and exposed to full sun, may only have provided temporary resistance to desiccation, and a suitable environment for a limited time. Alternative habitat could have easily been selected nearby in the form of established islands of vegetation (within 300 m of our transect) or the forest edges that surrounded the rocky plateau (within 800 m of our transect). Such alternative locations, close to our transects, contained leaf-litter and shade that arguably might have made for a less precarious egg deposition location. The open plateau rocks had minimal soil and debris under them and although were

Table 1. Egg clutch no. 1 morphometrics and habitat detail.

Clutch 1	Rock: 35x20cm	Temp: 27.1°C
Egg No.	Length (mm)	Width (mm)
1	37.80	17.65
2	21.10	17.00
3	24.10	16.70
4	23.00	16.60
5	23.00	16.20
6	20.10	16.60
7	25.60	14.60

Table 2. Egg clutch no. 2 morphometrics and habitat detail.

Clutch 2	Rock: 55x40cm	Temp: 25.8°C
Egg No.	Length (mm)	Width (mm)
1	23.2	12.7
2	20.7	14.5
3	20.1	12.9
4	20.6	14.2
5	19.6	13.9
6	20.5	14.3
7	20.5	15.6
8	22.3	12.9

Table 3. *Amphiesma stolatum* morphometrics.

Snakes	SVL (mm)	Tail (mm)	Weight (grams)
Neonate	11.6	4.8	1.1
Adult F	29.6	11.2	15.05

wet from recent rains, could easily dry out on sunnier days and thus place developing eggs at risk.

Previous observations by Wall (1925) recorded eggs of the species successfully hatching in a garden in Rangoon confirming that this snake will use semi-natural nesting sites. Our observation suggests that this unusual choice of deposition among lateritic rock by *A. stolatum* may be influenced by seasonality (wet season rains), prey availability (amphibians/tadpole in temporary pools), and/or suitable foraging habitat. We also speculate that in this instance the snakes concerned may have chosen to lay eggs in an area with immediate prey availability in preference over traditional substrate as a way of potentially improving offspring survival.

**Figure 2.** Rocky plateau habitat near Dhamapur comprising lateritic rock ground with sparse woody vegetation, scattered loose lateritic rocks, shallow soil depressions, temporary streams and pools. Insert: rock partially lifted to reveal *A. stolatum* eggs.

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REFERENCES

- Heyer, W.R., M.A. Donnelly, R. McDiarmid, L.C. Hayek & M.S. Foster. (1994). *Measuring and Monitoring Biological Diversity: Standard Methods for Amphibians*. Washington: Smithsonian Institution Press. 320 pp.
- Lillywhite, H.B. (2014). *How Snakes Work: Structure, Function and Behaviour of the Worlds Snakes*. Oxford: Oxford University Press. 256 pp.
- Wall, F. (1925). *Rhabdophis stolatus* (Linné). In: Notes on snakes collected in Burma in 1924. *Journal of the Bombay Natural History Society* 30: 810.
- Whitaker, R. & A. Captain. (2004). *Snakes of India: The Field Guide*. Chennai, India: Draco Books. 495 pp.

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