

Arboreal behaviour and reproductive biology of the northern banded coffee snake *Ninia pavimentata*

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The northern banded coffee snake *Ninia pavimentata* (Bocourt, 1883) is a small, semi-fossorial dipsadine snake (max. 421 mm) (Köhler, 2008). It can be identified by slate-grey and black bands, and a checkerboard ventral pattern (Fig. 1 A&B). It is differentiated from its close relative *Ninia maculata* by having a significantly higher segmental count, more subcaudals, and a different head shape (Smith & Campbell, 1996; Köhler, 2008; McCranie, 2011). *Ninia pavimentata* occurs in pine-oak and cloud forests of the Central Highlands of Guatemala and western Honduras between 1120 to 1825 m a.s.l. (Campbell & Smith, 1996; Townsend et al., 2005; Townsend et al., 2008). This nocturnal and primarily terrestrial species is thought, like other *Ninia* spp., to feed on earthworms and other soft-bodied invertebrates (Green, 1975; Savage, 2002; Köhler, 2008). However, very little has been reported about the ecology or reproductive behaviour of this species. Herein, we report on natural history observations of *N. pavimentata* from Alta Verapaz, Guatemala.

On 19th April 2017 at 19:00 h, we encountered an adult female *Ninia pavimentata* during a herpetofaunal survey of

a cloud forest canyon near the town of Santa Cruz Verapaz, Alta Verapaz, Guatemala (15° 21'36" N, 090° 20'47.9" W, WGS 84). The snake measured 239 mm snout-vent length and 96 mm tail length (total 335 mm) and was moving through the leaf litter on the forest floor. The air temperature was 18.5° C and relative humidity 95.4 %. During measuring the snake, we noticed that the body close to the vent was highly swollen (Fig. 1B). Upon gentle palpation we recognised four well-formed eggs close to parturition. In the interests of conservation and good field practice we returned the snake to its habitat without further molestation. Several other species of *Ninia* have been documented to lay between 1 and 5 eggs (Greene, 1975; Savage, 2002; Angarita-Sierra & López-Hurtado, 2020). Our observation confirms that *N. pavimentata* may align with such clutch sizes of other *Ninia* spp.

On 2nd July 2018 at 21:33 h, during a survey of the same cloud forest canyon we observed climbing behaviour in *Ninia pavimentata*. Upon sighting, the individual was 100 cm above ground ascending a stem 0.5 cm in diameter, the individual continued to climb to a height of ca. 200 cm before stopping (Fig. 2). A further display of arboreal climbing behaviour was recorded on 9th August 2018 at 21:07 h, in the same canyon 180 cm above the ground on a stem. A final observation was recorded on 18th August 2018 at 21:34 h during a survey of a nearby walnut plantation perched on a branch, diameter 1 cm, at a height of 100 cm.



Figure 1. Female *Ninia pavimentata*, Alta Verapaz 2017 – **A.** In-situ photo on left, **B.** Ventral view showing the proximity of egg bulge to cloaca



Figure 2. Climbing behaviour in *Ninia pavimentata*. This individual was observed to climb from 1 to 2 m above the ground.

The multiple displays of *Ninia pavimentata* climbing above a height of 100 cm, within different environments, suggests this behaviour occurs more commonly than realised, at least at this location. *Ninia* have been highlighted as an important part of leaf-litter herpetofauna (Köhler, 2008) with *N. pavimentata* repeatedly described as semi-fossorial (Smith & Campbell, 1996; Townsend et al., 2005). So, our observations of arboreal climbing between 100–200 cm appears significant for a snake of this genus. Other species of terrestrial/fossorial snake have also been known to exhibit climbing behaviour (Keller & Heske, 2000; Brown et al., 2018; Viteri & Arrivillaga, 2019). Viteri & Arrivillaga (2019) postulate that foraging is a possible explanation for such arboreal venturing by another Guatemalan dipsadine snake - *Adelphicos veraepacis*. Both *A. veraepacis* and *N. pavimentata* are potential invertebrate predators so this may be a plausible explanation, although would need to be confirmed by further behavioural observations in the field. To the best of our knowledge these are the first observations of both reproduction and arboreal climbing behaviour for *N. pavimentata*.

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