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Head Triangulation in *Dipsas turgida* (Cope, 1868) (Dipsadidae, Dipsadinae, Dipsadini): A Potential Deimatic Behavior?

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Abstract

Head triangulation as a defensive display is documented photographically for the first time in the South American snail-eating snake *Dipsas turgida* (Cope, 1868) in Paraguay. The role of the dorsal head pattern is highlighted as perhaps part of a deimatic display, and the possible association with fecal evacuation may be indicative of a cryptic complexity in such behaviors. It is suggested that in order to better explain seemingly ineffective defensive behaviors in snakes that more detailed field observations are required that adequately document the full range of behaviors observed rather than trying to fit behaviors into existing, broadly-defined categories.

Keywords: defensive behavior, snail-eating snake, Paraguay

Snakes of the genus *Dipsas* Laurenti, 1768, are slow-moving, non-venomous, non-aggressive, specialist mollusk feeders (Cadle and Myers, 2003, Cacciali, 2006). Six members of the genus occur in Paraguay (Cacciali et al., 2016), four of which were, until recently, placed in the genus *Sibynomorphus*—two widespread species: *D. ventrimaculata* (Boulenger, 1885) and *D. turgida* (Cope, 1868); and two restricted range species: *D. mikanii* (Schlegel, 1837) and *D. lavillai* (Scrocchi, Porto and Rey, 1993). *Sibynomorphus* is now considered a junior subjective synonym of *Dipsas* (Arteaga et al., 2018).

Dipsas turgida is a small snake (snout–vent length < 60 cm) found across northern Argentina, Paraguay, Bolivia, southern Brazil and Uruguay (Giraudo and Scrocchi, 2002; Carreira et al., 2005; Cacciali, 2008; Cacciali et al., 2016). It is a familiar garden snake in much of Paraguay, where it is known widely as *Ñanduriré*. Despite the completely inoffensive nature of the species it is commonly believed to be venomous, presumably because of its superficial resemblance to certain *Bothrops* vipers (Cacciali, 2008).

Although many animals possess an innate fear of snakes, their body form makes them particularly vulnerable to injury. Consequently many species employ a variety of defensive tactics in order to avoid predation, death or serious injury (Gallup, 1977; Greene, 1988; Martins, 1996; Passek and Gillingham, 1997; Humphreys and Ruxton, 2018). Cadle and Myers (2003) provided a review of defensive behaviors employed by snakes of the tribe Dipsadini (i.e., the genera *Dipsas*, *Sibon*, *Sibynomorphus* and *Tropidodipsas*) and considered head triangulation to be one of the most commonly performed displays. Head triangulation involves the raising and spreading of the quadrato-mandibular articulations so that the head appears considerably wider than the neck at their union. This display may be intended to mimic the typically triangular head shape of certain venomous Viperidae or it may have other, as yet unclear, functions. The mechanics of head triangulation were studied in unrelated species by Young et al. (1999).

Head triangulation has been reported in 12 species of Dipsadini, including two ex-*Sibynomorphus* species: *D. mikanii* and *D. neuwiedi* (Sazima, 1992; Cadle and Myers, 2003). More recently defensive displays were reported for the first time for *D. ventrimaculata* and *D. turgida* from Paraguay (Cabral et al., 2019). However head triangulation was not observed in either species. In this note I describe and illustrate what is apparently the first report of head triangulation in *Dipsas turgida*.

On 12 April 2019 an adult *D. turgida* (snout–vent length c. 35 cm) was encountered crossing a dusty road at night in Dry Chaco habitat at Fortín Toledo, Boquerón department (22°47'S, 59°57'W), at approximately 8 P.M. After capture, the snake

Figure 1. *Dipsas turgida* showing head triangulation. Fortín Toledo, Boquerón department, Paraguay. Photograph by the author, 12 April 2019.

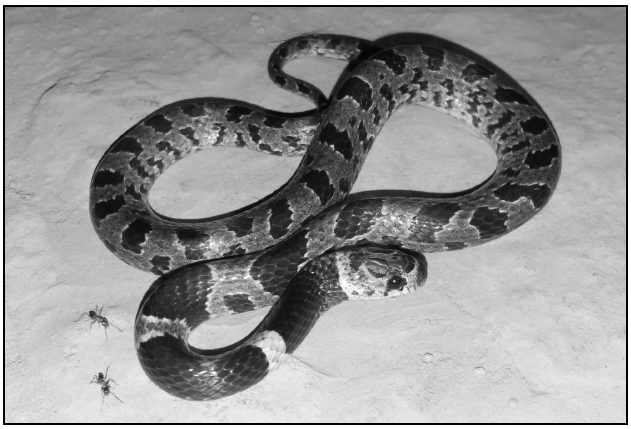

Figure 2. Same specimen following release, showing normal head shape. Photograph by the author, 12 April 2019.

immediately triangulated the head (Figure 1) and defecated a white, foul-smelling substance. The snake was handled for approximately five minutes during which it maintained the triangular head position, but performed no other associated defensive behaviors (e.g., body inflation, coiling, head-hiding) as have been reported in more complex performances by stressed dipsadids (Cadle and Myers, 2003; Cabral et al., 2019). When placed on the ground, the head shape was returned to normal (Figure 2) and the snake was allowed to go free.

Though the fact that Cadle and Myers (2003) remarked on the frequency of head triangulation in Dipsadini snakes means that the presence in *D. turgida* is not entirely unexpected, one aspect of this display that has not been commented on is the possible role of the dark dorsal cephalic spots. As can be seen in Figure 1 this posture gives a remarkably face-like (or skull-like) appearance to the head, emphasized by the white nuchal collar, which perhaps acts deimatically to exaggerate the size of the snake's head when it is faced by larger threats. Deimatic behaviors may be pre-emptive (designed to startle and avoid contact) or counterdefensive (performed in response to contact) (Umbers et al., 2015) but usually result from a failure of crypsis in slow-moving species that necessitates additional defensive action (Umbers and Mappes 2015)

Cadle and Myers (2003) mentioned that voiding of fecal material or foul-smelling glandular secretions was observed in "many or most" newly caught dipsadid snakes, but they did not elaborate further on the behavior. They also seemed unimpressed by the effectiveness of head triangulation as a defense, noting "we suppose occasional predators must be deterred by it." Head spots are not present in all dipsadid snakes that exhibit head triangulation, but the observation reported here raises interesting study questions as to the potentially increased effectiveness of the display in those species that do possess them. Counterdefensive deimatic behaviors are often associated with the secretion of toxins or other chemical defenses, acting as a second line of defense should predation be attempted (Umbers et al., 2015). Thus the role of fecal evacuation becomes potentially more significant if understood as part of a more complex deimatic behavior.

Though this represents only a single observation of this behavior in this species, it may be rewarding for future researchers to take more careful note of the complexity of defensive behaviors in snakes and the contexts in which they are employed. The current practice of categorizing these behaviors according to broad, cross-taxa definitions may potentially be overlooking a hidden complexity.

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