Body bending: a cryptic defensive behaviour in arboreal snakes

OTAVIO A. V. MARQUES[1], MURILO G. RODRIGUES[1,2] and IVAN SAZIMA[3]

[1] *Laboratório de Herpetologia, Instituto Butantan, 05503-900 São Paulo, SP, Brazil*
E-mail: *otaviomarques@butantan.gov.br*

[2] *Pós graduação em Biologia Animal, Universidade Estadual Paulista, 15054-000 São José do Rio Preto, SP, Brazil*. E-mail: *rodrigues@butantan.gov.br*

[3] *Departamento de Zoologia and Museu de História Natural, C. P. 6109, Universidade Estadual de Campinas, 13083-970 Campinas, SP, Brazil*. E-mail: *isazima@unicamp.br*

SNAKES display a great variety of defensive tactics against predation, from immobility to biting (Greene, 1988, 1997). Some defensive tactics seem to have ecological correlates. For instance, arboreal snakes often have morphology and colour pattern similar to twigs and leaves (Lillywhite & Henderson, 1993). Additionally, vertical head display and open-mouth threats typify many arboreal species (Greene, 1997). Cryptic colouration in arboreal snakes can be accompanied by behaviours that enhance the overall camouflaging effect. Thus, some slender arboreal snakes (e.g., *Ahaetulla* spp., *Opheodrys aestivus*, *Oxybelis aeneus*) sway their body like a branch in the wind (Fleishman, 1985; Greene, 1988). Another distinctive cryptic defensive behaviour is displayed by the arboreal colubrids *Pseustes poecilonotus* and *P. sulphureus*. These snakes bend their bodies when disturbed while on the ground or among branches, which renders them similar to a piece of a liana on the forest floor or on the vegetation (Beebe, 1946; Abuys, 1986). Here we report on similar behaviours for two additional arboreal Neotropical snake species while on the ground, and treat them as instances of defensive convergence. Our records were taken incidentally while performing other field studies, and are described below.

An Amazonian green whiptail (*Philodryas viridissimus*) about 90 cm in total length (TL) was observed in a cloudy day at about 10:00 hrs, crossing a dirt road in the Amazon Forest in the neighbourhoods of the Von den Steinen River (ca. 12º05'S, 53º46'W), Mato Grosso state, north Brazil, in August 2004. The observers (M. M. Barros and F. L. Mesquita) informed that the snake bended its body upon approach (Figure 1). Upon closer approach (about 1.5 m) and photography, the snake apparently increased the bends. The snake remained in that posture during about four minutes, after which the observers left the site.

A Tiger ratsnake (*Spilotes pullatus*) about 120 cm TL was sighted on a sunny day at 12:15 hrs (27ºC), lying across a trail in a remnant of Atlantic Forest at Campinas (ca. 22º49'S, 47º06'W), São Paulo state, southeast Brazil on 10th April 1988. From a distance, the multiple and regular bends on the snake's body made it closely resemble a piece of the liana locally called 'escada de macaco' (monkey ladder), a species of the genus *Bauhinia* (Caesalpinaceae). Upon close approach, the snake slowly withdrew into the vegetation, the bends on its body still visible (Figure 2).

The defensive repertoires of *Pseustes* spp., *Philodryas viridissimus* and *Spilotes pullatus* include lateral compression of the body, S-coil posture, open mouth and striking, all of which are typical for arboreal snakes (Greene, 1979; Marques, 1999; Marques *et al*. 2004; Marques & Sazima, 2004). Bending the body is shared at least by four Neotropical snake species (Beebe, 1946; Abuys, 1986; present paper), a defensive behaviour not mentioned in previous overviews of defence in snakes (e.g. Greene, 1988; Lillywhite & Henderson, 1993). All four species dwell in forest habitats where lianas and bent sticks are frequently found on the ground. Thus, a bent body posture seems an adequate defence on the forest floor or among branches, as it increases the resemblance a snake may already have to portions of its habitat (thus, a camouflage type – see Cott, 1940; Edmunds, 1974). Additionally, the sudden transition from a stretched posture to a bent one, observed in *P. viridissimus*, quickly removes the

Figure 1. *Philodyas viridissimus* displaying the bent body posture upon close approach of the observer. Photograph © M. M. Barros.

Figure 2. *Spilotes pullatus* slowly retreating into the vegetation, with slight bends in its body still visible.

visual cues (elongate "search image") a potential snake predator may have.

The genera *Pseustes* and *Spilotes* belong to the subfamily Colubrinae and may be closely related (Ferrarezzi, 1994). However, the genus *Philodryas* is assigned to the Xenodontinae (Ferrarezzi, 1994). As the two above mentioned colubrine genera and *Philodryas viridissimus* are not closely related (Vidal *et al*., 2000) but all of them are arboreal, their very similar defensive displays possibly evolved independently in the two lineages. Thus, the defensive displays here recorded may be regarded as instances of behavioural, ecologically related convergence. However, even if the bent posture may acquire a defensive function, the possibility of a physiological response (cf. Greene, 1988) due to a sudden threat on a still non-optimally warmed snake cannot be discarded. The persistence of bends here recorded for *S. pullatus* may also be such a response or, alternatively, a slow change from a liana-like shape to a normal snake-like posture adequate for fleeing.

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Notes on the distribution and natural history of the Bluntheaded vine snake, *Imantodes cenchoa*, in Ecuador

DIEGO F. CISNEROS-HEREDIA

College of Biological and Environmental Sciences, Universidad San Francisco de Quito, Casilla 17-12-841, Quito, Ecuador. E-mail: *diegofrancisco_cisneros@yahoo.com*

THE Bluntheaded vine snake, *Imantodes cenchoa,* is a widespread species distributed on the Atlantic and Pacific versants of America from southern Tamaulipas and Oaxaca, México, south to central western Ecuador (Pacific versant) and Bolivia, Paraguay and northeastern Argentina (Atlantic versant); from sea level up to 1500 m elevation (Pérez-Santos & Moreno, 1991; Savage, 2002; Köhler, 2003). *Imantodes cenchoa* has been reported in Ecuador from the provinces of Guayas, Los Ríos, Pichincha, Tungurahua, Napo, Sucumbíos, Orellana, Pastaza, and Morona-Santiago (Rendahl & Vestergren, 1941; Fugler & Walls, 1978; Duellman, 1978; Zug *et al*. 1979; Pérez-Santos & Moreno, 1991; Cisneros-Heredia, 2003; Ken Miyata, in litt.). More recently, it was recorded at the provinces of Esmeraldas and El Oro by Yánez-Muñoz *et al*. (2004) and at Manabí (Fundación Jatun Sacha [Reserva Lalo Loor] in litt.).

A specimen of *Imantodes cenchoa* (FHGO 2801) collected at Bombuscaro, province of Zamora-Chinchipe (Appendix 1), provides the first record from this province, extending the distributional range of the species in Ecuador ca. 200 km SSW from the nearest locality (Sucua) in the province of Morona-Santiago (Fugler & Walls, 1978), representing the westernmost locality in the distribution of the species on the eastern versant of the Andes, and filling the gap between localities from northeastern Peru and central eastern Ecuador. Yánez-Muñoz *et al*. (2004) reported *Imantodes cenchoa* from one locality in the province of Esmeraldas. Five specimens (FHGO 89, 120, 570, 543, 2535) of *Imantodes cenchoa* collected at various localities in the province of Esmeraldas (Appendix 1) provide additional records from this province, and fill the gap between localities from southwestern Colombia and central western Ecuador.

A sample of 23 specimens from various localities in western and eastern Ecuador includes five hatchlings (<450 mm, *sensu* Zug *et al.*, 1979; Martins & Oliveira 1998) collected in western Ecuador in May and in eastern Ecuador in August and November; eight juveniles (<800 mm SVL, *sensu* Zug *et al.*, 1979; Martins & Oliveira, 1998)