



**BODY-BENDING BEHAVIOUR RECORDED IN *Philodryas nattereri* IN THE ATLANTIC FOREST OF NORTHEAST BRAZIL**

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**ABSTRACT**

Snakes have several defense tactics against predators. The body-bending behavior (BBB) is reported for only 24 species of snakes in the world. We present the first record of BBB in *Philodryas nattereri* in a coastal restinga environment in northeastern Brazil. This record seeks to fill in gaps about this behavior that is still little reported in snakes. We indicate the possibility of using the BBB for different strategies in *P. nattereri*. We hope that more work can be published on BBB in order to better understand this intriguing behavior used by snakes.

**Keywords:** Snake; Defense Tactics; Restinga.

**RESUMO**

**Comportamento de flexão do corpo registrado em *Philodryas nattereri* na Floresta Atlântica do Nordeste do Brasil.** Serpentes apresentam diversas táticas de defesa contra predadores. O comportamento de flexão do corpo (BBB) é relatado para apenas 24 espécies de serpentes no mundo. Apresentamos o primeiro registro de BBB em *Philodryas nattereri* em área de restinga no Nordeste do Brasil. Esse registro busca preencher lacunas sobre esse comportamento ainda pouco relatado em serpentes, indicamos a possibilidade do uso do BBB para diferentes estratégias em *P. nattereri*. Esperamos que mais trabalhos possam ser publicados sobre o BBB a fim de entender melhor este comportamento intrigante utilizado por serpentes.

**Palavras-chave:** Serpente; Táticas de Defesa; Restinga.

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## INTRODUCTION

Snakes can present different defensive tactics to escape predators, such as tail vibration, caudal autotomy, death feigning, biting, cloacal discharge, vocalization, opening mouth and immobility (Greene, 1988; 1997). The body-bending behavior (BBB) is a contorting of the body in small curves resembling the shape of lianas and/or vines fallen in a canopy or on the forest floor (Beebee, 1946; Abuys, 1986; Marques et al., 2006; Dorherty-Bone, 2009). The BBB is a strategy still little reported in wild snakes.

So far, the body-bending behavior is described for 24 snake species found in ten countries worldwide, which are Argentina, Brazil, Cuba, Ecuador, India, Spain, Surinam, Thailand, USA and Venezuela. The species are: *Philodryas baroni*; *P. psammophidea*; *P. trilineata*; *P. chamissonis*; *Chironius exoletus*; *C. fuscus* and *Erythrolamprus sagittifer* (França et al., 2020); *Psomophis joberti* (Miranda et al., 2012); *Spilotes pullatus* (Marques et al., 2006; Duarte, 2012); *Phrynonax polylepis* (Beebee, 1946; Abuys, 1986); *Chlorosoma viridissimum* (Marques et al., 2006); *Philodryas nattereri* (Mesquita et al., 2013); *Cubophis cantherigerus* (Torres et al., 2015); *Coniophanes fissidens* (Maddock et al., 2011); *Coelognathus helena* (Khate and Deshmukh, 2020); *Spilotes sulphureus* (Beebee, 1946; Abuys, 1986; Duarte, 2012; França et al., 2020); *Pantherophis obsoletus* (Doherty-Bone, 2009); *Coelognathus radiatus*, *Fowlea piscator*, *Hebius khasiensis*, *Malpolon monspessulanus*, *Oligodon joysoni*, *Rhabdophis siamensis*, *Ptyas carinata* (Hauser et al., 2022). These snake species present arboreal, semi-arboreal or terrestrial habits. Herein, we present the first BBB record in a coastal restinga of Paraguay Green Racer *Philodryas nattereri* Steindachner, 1870, a semi-arboreal snake, in the Atlantic Forest of Northeast Brazil.

## OCCURRENCE DESCRIPTION

On 12st August 2020 at 11:47, an adult of *Philodryas nattereri* (approximately 1 m of total length) was observed and photographed exhibiting the body-bending behavior lying across a path in a coastal restinga environment of the protected area of APA da Barra do Rio Mamanguape, Paraíba state, north-east Brazil (6°77'59.99" N, 34°92'44.17" W, datum WGS 84, 5 m elev.). Initially, the snake was immobile and very similar to fallen branches of liana (Figure 1). After taking the pictures, the observer approached the snake and it fled to a nearby vegetation area.



Figure 1. The Paraguay Green Racer *Philodryas nattereri* exhibiting body-bending behavior in northeastern Brazil. (A) Arrow highlighting the snake's head; (B) A close-up of *P. nattereri* showing the bent body posture.

The body-bending behavior was initially described as a defensive strategy in arboreal and semi-arboreal snakes to increase the resemblance to lianas that are easily found in the vegetation (Beebe, 1946; Abuys, 1986). Torres et al. (2015) registered the Cuban racer *Cubophis cantherigerus* showing the BBB in Cuba, where the snake and the species of liana *Bauhinia glabra* Jacq. have an overlapping distribution. The authors indicated that the body width and color of *C. cantherigerus* is similar to the width and color of the liana stem, confirming the effective strategy of resembling the environment.

However, the BBB has also been described for terrestrial species present in open areas, where lianas are less common (Maddock et al., 2011; Miranda et al., 2012). These snakes can benefit from the BBB due to the “startle effect” and may confuse the predator with the unusual change in body shape (Duarte, 2012). Some authors have also reported confusing the snake with a branch at first sight (Torres et al., 2015; França et al., 2020). The *Philodryas nattereri* was found in Restinga, an open environment of coastal forests in Brazil, characterized by sandy soils and sparse shrubs and medium sized trees. Therefore, the snake using the BBB remained camouflaged in the environment. Mesquita et al. (2013) comment that *P. nattereri* can present BBB when in thermoregulation, however, we recorded this behavior in a shaded and open area, where people pass with frequency. We believe that the snake was displacing and made use of the BBB for the of the “startle effect” in this way, *P. nattereri* can use the BBB for different purposes such assist in thermoregulation or defense tactic against predators.

Despite the knowledge gaps about body-bending behavior, recent data indicate the efficiency of this anti-predator action for snake species that present diverse habits such as arboreal, terrestrial, and even aquatic habits (Khate and Doeshmukh, 2020; Hauser et al., 2022). The BBB recorded throughout the tropical and subtropical areas of the world (Hauser et al., 2022) can point the efficiency of the tactic against visually oriented predators (França et al., 2020). In addition, Hauser et al. (2022) indicates that BBB must be functionally related to fierce and “aggressive” defenses against predators and fast flight for successful escape. They speculate that muscle contractions involved in BBB serve as a “warming up” preparing the snake for an aggressive response and an effective escape. Our work expands the known range of ecological niches for this behavior indicating different functions for the BBB in the same species. We encourage more work on body-bending behavior to be published, so that we can understand the real meaning of this intriguing behavior presented by snakes.

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