



Gaping Behavior in a Mottled Snail-eater (*Sibon longifrenis*) and a Yellow Blunt-headed Vinesnake (*Imantodes inornatus*) (Squamata: Dipsadidae)

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The Neotropical genus *Sibon* is comprised of 21 currently recognized species known as snail-eating snakes because of their specializations for eating soft bodied prey (Lewis et al. 2013; Echevarría-Rentería and Medina-Rangel 2021; Arteaga and Batista 2023). The genus *Imantodes* is comprised of eight species known as blunt-headed vinesnakes (Uetz et al. 2023). *Imantodes* and *Sibon* have broad Neotropical distributions, occur at low and middle elevations, and are primarily arboreal (Myers 1982; Ray 2009). Some defensive behaviors have been reported for dipsadid snakes, such as coiling, flattening the head to create a triangular shape (assuming an appearance similar to those of venomous vipers), expulsion of feces or cloacal-gland secretions, dorsoventral compression and expansion of the body, and balling (coiling into a ball and hiding their heads in the coils) (Rojas and Lasso 2010; Maia-Carneiro et al. 2012). Also, colors and patterns of some of these snakes mimic venomous vipers found in the same habitats (Solórzano 2001). Gaping is a common defensive behavior employed by many but not all snakes (Marques and Sazima 2022), and some non-viperid snakes employ that behavior to imitate defensive gaping behavior reported in viperids (Whitford et al. 2020).

The Mottled Snail-eater (*Sibon longifrenis*) is one of seven species of *Sibon* found in Costa Rica. It is relatively common throughout its range in the country (Leenders 2019), and various accounts describe feeding observations, including feeding on frog eggs (Montgomery et al. 2007). Despite relatively extensive knowledge regarding the biology of this species, only one previous publication has described defensive behavior, mentioning a flat spiral posture and no intent to escape or bite, maybe mimicking the fiddlehead of a fern or the coils of an Eyelash Viper (*Bothriechis schlegelii*) (Abarca et al. 2019).

The Yellow Blunt-headed Vinesnake (*Imantodes inornatus*), unlike its Costa Rica congenics (*I. cenchoa* and *I. gemmistratus*), is known to use defensive tactics like assuming an S-shaped position, head triangulation, and flattening its head and spreading its jaws (Savage 2002; Leenders 2019). In addition, species of *Imantodes* are known to use defensive behaviors that include immobility, rotation of the body, body thrashing, cloacal discharge, eversion of the hemipenes, and, most recently, head triangulation by *I. lentiferus* (Enríquez Espinosa and Missassi 2023). Other defensive behaviors have been reported. *Imantodes gemmistratus* was recorded dropping from its perch to lower vegetation when disturbed, its light weight allowing it to land without injury (Henderson and Nickerson 1976). Behaviors of other slug- and snail-eating snakes appear to imitate defensive behaviors of vipers (*Dipsas*



Figure 1. Yellow Blunt-headed Vinesnake (*Imantodes inornatus*) displaying mouth-gaping behavior at Lapa Verde Wildlife Refuge, Sarapiquí, Costa Rica. Photograph by Alexander Moya-Valverde.

albifrons imitating *Bothrops jararaca*) (Sazima 1992). With the exception of one personal observation of a *Sibon nebulatus* striking with an attempt to bite (Rojas and Lasso 2010), no previous reports of gaping by species of *Imantodes* or *Sibon* have been reported. We herein report for the first time observations of gaping behavior in *Sibon longifrenis* and *Imantodes inornatus*.

At 2100 h on 24 July 2022, we observed an adult *Imantodes inornatus* at Lapa Verde Wildlife Refuge, Sarapiquí, Costa Rica (10.465109, -84.054925; elev. 53 m asl), moving on a thick clump of vegetation at a height of about 2.5 m. When captured for research purposes, the snake expelled feces and later, while one of the authors was holding it to take photographs, it opened its mouth for short periods. Moments later, it held its mouth open for ~2 min without trying to escape or bite (Fig. 1). The snake was subsequently released in the same location where it was found.

At 2300 h on 27 July 2022, we observed an adult *Sibon longifrenis* at Lapa Verde Wildlife Refuge, Sarapiquí, Costa Rica (10.469039, -84.073305; elev. 88 m asl), near a small creek on an unidentified plant at a height of about 3 m. The snake was captured to collect relevant data for another study at the refuge and was later placed on an unidentified palm to take photographs. The snake initially tried to escape, moving slowly between the leaves, but minutes later it started opening its mouth for short periods without trying to escape (Fig. 2), with this behavior continuing for more than 5 min. While moving with the snake in hand before placing it on the same leaf where it was found, it continued opening its mouth and posing in a viper-like manner.



Figure 2. The Mottled Snail-eater (*Sibon longifrenis*) displaying mouth-gaping behavior at Lapa Verde Wildlife Refuge, Sarapiquí, Costa Rica. Photograph by Alexander Moya-Valverde.

As mentioned above, *Sibon longifrenis* and *Imantodes inornatus* might be mimicking the different colors of *Bothriechis nigroadpersus* (green and gold, respectively) and imitating the defensive gaping behavior reported in viperids. We interpret these observations as defensive behaviors, but they also might have been triggered by the stress induced when handling the animals. Proper handling techniques were applied, and we have not observed similar reactions in individuals of any other species handled the same way.

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