



# Notes on the Natural History of Two Species of Snakes from Panama: Defensive Behavior in an Ecuador Sipo, *Chironius grandisquamis* (Peters 1869), and Fluorescence in Hoffmann's Earthsnake, *Geophis hoffmanni* (Peters 1859)

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Taxonomic information about the 153 species of snakes known to occur in Panama (Romero-Marcucci et al. 2024) has increased in recent years but knowledge about natural history remains scarce (Pérez-Santos 1999; Ray 2017; Batista and Miranda 2020). Data on natural history contributes to the development of conservation initiatives (Lillywhite 2016) and the relative lack of such information likely contributes to Panama's ongoing conservation issues regarding snakes, such as the many snakes killed due to fear and ignorance (Lynch et al. 2014). We herein present two observations that contribute new data on the natural history of two species of snakes.

**Defensive behavior in *Chironius grandisquamis*.**—Defense mechanisms that mitigate predation risk are seldom documented in snakes (Tozetti et al. 2021). However, *Chironius diamantina*, *C. flavolineatus*, and *C. grandisquamis* were recently documented diving into streams and remaining underwater in order to evade predators (Fernandes and Hamdan 2014; Mascarenhas et al. 2020; Rojas-Morales and Marín-Martínez 2022).

*Chironius grandisquamis*, which ranges from northern Honduras to western Colombia and northwestern Ecuador, is known from every province in Panama where it is associated with streams and ponds in lowland wet and moist forests and premontane rainforests at elevations of 0–1,220 m asl (Ray 2017). Rojas-Morales and Marín-Martínez (2022) noted that *C. grandisquamis* typically hunts its prey, mainly anurans, in streamside vegetation. Reported defensive behaviors include laterally flattening the body, diving, discharging cloacal contents, and attempting to bite when handled (Ray 2017; Rojas-Morales and Marín-Martínez 2022).

On 28 June 2023 along the El Cantar Trail, Residencial Altos de Cerro Azul, Chagres National Park, Panama (9.23010°N; 79.40400°W; elev. 803 m asl), three of us (ASB, MGP, and SS) observed an adult *Chironius grandisquamis* about 2 m high on a tree branch adjacent to a stream. When approached by a snake hook, the snake dropped into the stream and remained immobile while partially hidden under rocks for 11 minutes (Fig. 1). The snake had fled when we returned to the same spot some 50 minutes later.

Similar behavior has been reported in lizards (Savage 2002; Hare and Miller 2009; Zuluaga-Isaza et al. 2022; Miranda et al. 2023) and once previously in *C. grandisquamis* in Colombia (Rojas-Morales and Marín-Martínez 2022), although that snake was completely hidden under a single rock for nearly 15½ minutes.

**Fluorescence in *Geophis hoffmanni*.**—*Geophis hoffmanni* ranges from eastern and central Honduras to Panama (Solórzano 2022). An important part of the diet of these fossorial snakes consists of earthworms (Ray 2017). Because encounters are rare, we used diagnostic characteristics presented by Lotzkat (2014) to confirm the identity of the species.

Fluorescence is widespread in marine organisms but uncommon in terrestrial tetrapods (Sparks et al. 2014). Although fluorescence was recently discovered in snakes (Eipper et al. 2020; Eto 2020; Fuentes et al. 2021; Paul and Mendyk 2021), its ecological and evolutionary implications remain poorly understood.

On 23 June 2023, three of us (EG, SS, and RL) encountered a *Geophis hoffmanni* on a trail near Chorro El Macho, Valle de Antón, Coclé Province, Panama (8.626027°N,



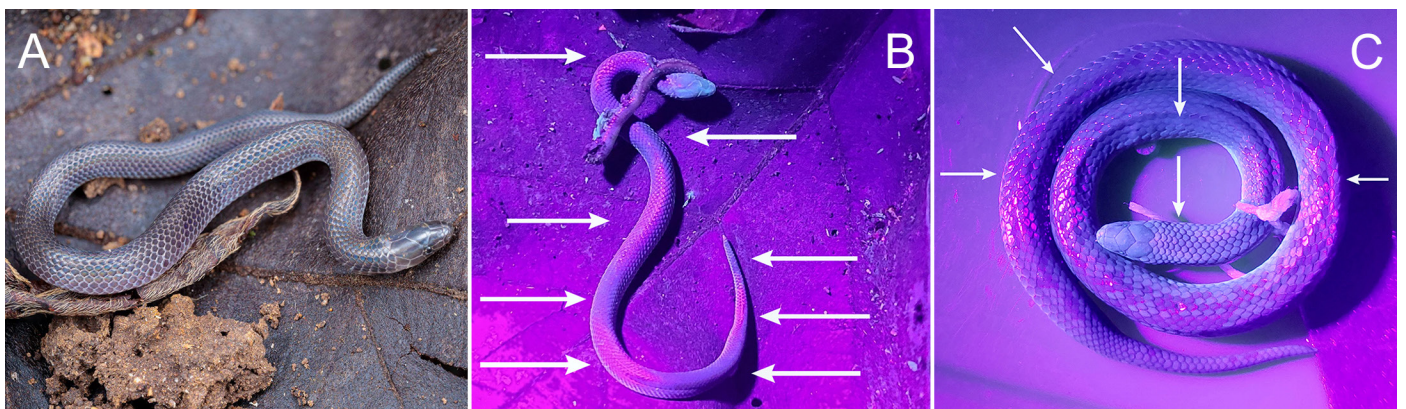


**Figure 1.** An Ecuador Sipo (*Chironius grandisquamis*) fully submerged in a stream (arrows indicate parts of the body) near El Cantar Trail, Chagres National Park, Panamá. Photograph by Samuel Sucre.

80.139234°W; elev. 694 m asl) (Fig. 2A). Exposure to a 395 nm blacklight while eating an earthworm (Fig. 2B) revealed fluorescence of upper cephalic scales and a banded body pattern resembling that of congeners (i.e., *G. brachycephalus*, *G. talamancae*, and *G. tectus*), which might be an example of Batesian mimicry of coralsnakes. Kikuchi and Pfennig (2010) demonstrated that even imperfect mimicry can be successful if registered by a predator's cognitive capabilities. Fluorescence has been reported in another dipsadid,

*Enuliophis sclateri* (Fuentes et al. 2021). We agree with those authors' conclusion that further studies are required to understand the possible advantages of fluorescence in these species but also to determine if a common evolutionary mechanism such as mimicry is responsible.

We detected no fluorescence of preserved neonatal *G. aff. hoffmanni* (COZEM-REP 0022–3) from Colección Zoológica Dr. Eustorgio Méndez of the Instituto Conmemorativo Gorgas de Estudios de la Salud under UV



**Figure 2.** A Hoffmann's Earthsnake (*Geophis hoffmanni*) in natural light (A), preying on an earthworm under fluorescent light showing upper cephalic scale fluorescence and a banded pattern (arrows) not evident in natural light (B), and a preserved specimen (CH 0605) under fluorescent light with patterns barely discernible, although they were clearer under direct observation (C). Photographs by Rafael Lau (A) and Samuel Sucre (B & C).



light. However, one of the only two specimens in the Círculo Herpetológico de Panamá, Smithsonian Tropical Research Institute (CH 0605 collected in the Altos de Campana National Park in 1981) exhibited fluorescence similar to that observed in the field (Fig. 2C; video available at <https://youtube.com/shorts/uBnEwgEu5lo>). The second specimen (CH 4343, collected in the Altos de Campana National Park, Río Trinidad in 1996) showed no fluorescence. When Li et al. (2023) and Prötzel et al. (2018) applied UV light to museum specimens of lizards, some preserved during the 1950s, they readily detected fluorescence. The presence of fluorescence in some of our museum specimens of *G. hoffmanni* and not in others could be attributable to age or sexual dimorphism or could merely reflect variations in how specimens were preserved and stored.

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