

# FIRST REPORT OF THANATOSIS IN *BOTHROPS ASPER* (GARMAN, 1883) (SERPENTES: VIPERIDAE) IN PANAMA

## PRIMER REPORTE DE TANATOSIS EN *BOTHROPS ASPER* (GARMAN, 1883) (SERPENTES: VIPERIDAE) EN PANAMÁ

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**Resumen.** – La tanatosis es un comportamiento defensivo en animales que simulan la muerte para evitar ataques de depredadores. En serpientes, se ha documentado en varias familias, incluidos pitónidos, colúbridos, elápidos y vipéridos, aunque en América hay solo unos pocos registros en vipéridos. Observamos la conducta de tanatosis en *Bothrops asper* durante su rescate y reubicación, la serpiente mostró inmovilidad tónica y otros comportamientos, aparentando estar muerta. Este es el primer caso documentado para la especie.

**Palabras clave.** – Camuflaje, comportamiento, depredador, inmovilidad tónica, supervivencia.

**Abstract.** – Thanatosis is a defensive behavior in animals that simulates death to avoid attacks from predators. In snakes, it has been documented in several families, including pythonids, colubrids, elapids and viperids, although in America there are only a few records in viperids. We observed thanatosis in a *Bothrops asper* during its rescue and relocation, the snake showed tonic immobility and other behaviors, pretending to be dead. This is the first documented case for the species.

**Keywords.** – Behavior, camouflage, predator, survival, tonic immobility.

Thanatosis is a defensive animal behavior, which consists in a voluntary motor inhibition, and a reduction of the response to respond to external stimulation (Suzuki et al., 2013), Adopting a posture that mimics death, which can deter or discourage a predator's attack (Toledo et al., 2010; Humphreys & Ruxton, 2018; Fuentes et al., 2021). Thanatosis is considered an adaptive anti-predation strategy, which increases the chances of survival (Toledo et al., 2010).

In snakes, thanatosis has been documented in some taxa ranging from ancient lineages such as pythonids, to more recent ones such as colubrid, elapids and viperids (Muscat & Entiauspene Neto, 2016; Gonzales & de Oliveira, 2020; Thomas et al., 2020; Salazar-Saavedra et al., 2021, Fuentes et al., 2021). In America there are only three records of thanatosis in viperids (Fuentes

et al., 2021): *Crotalus cerastes* in the United States of America (Thomas et al., 2020), *Bothrops jararacussu* (Muscat & Entiauspene Neto, 2016), and *Bothrops erythromelas* (dos Santos & Da Silva Muniz, 2012), both in Brazil (South America).

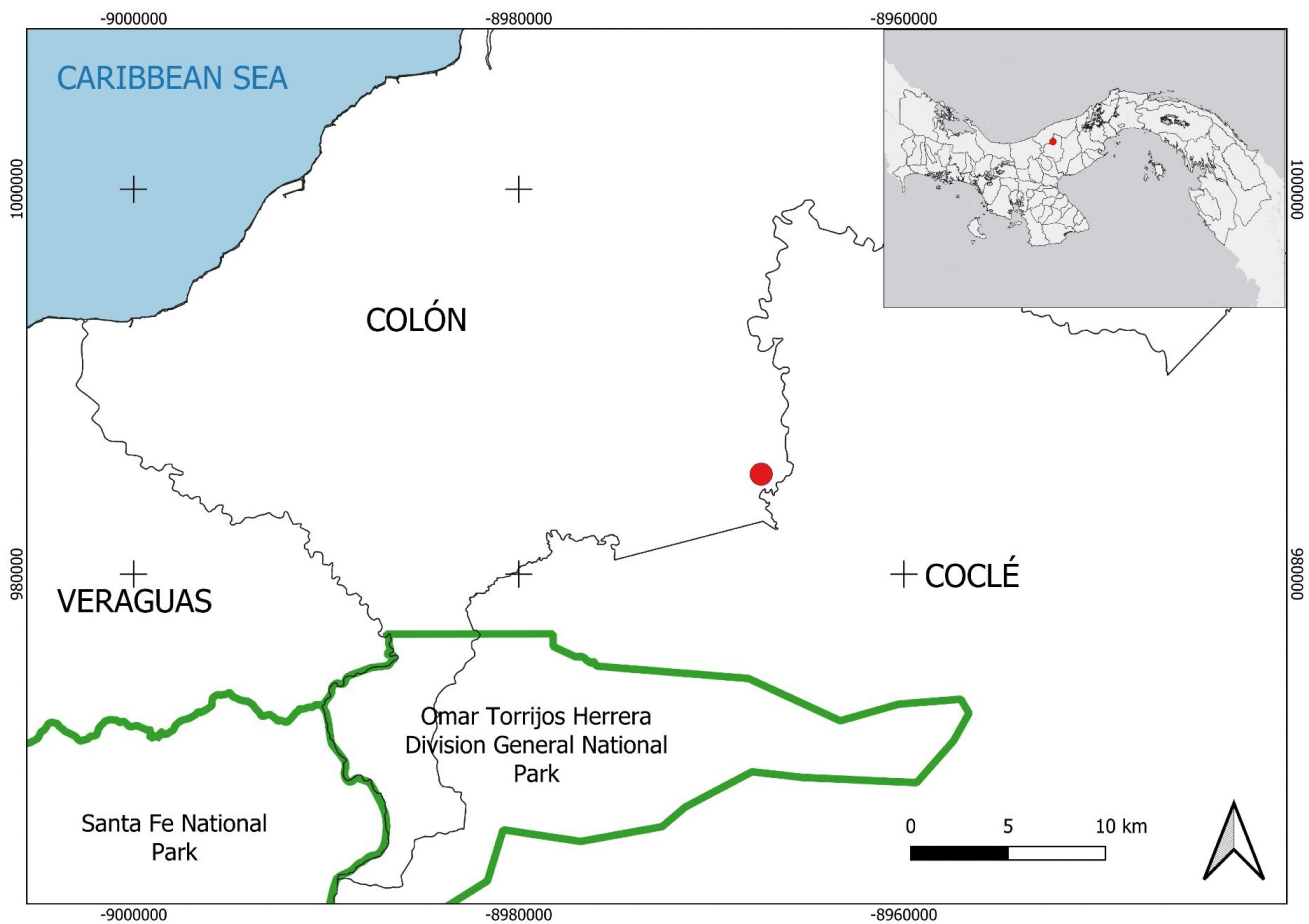
*Bothrops asper* (Garman, 1883) is known as the X-shaped viper in Panama and is considered the most common venomous snake (Batista & Miranda, 2020). It stands out for its generally aggressive temperament among all Viperidae and is the species that produces the largest amount of venom in Central America (Bolaños, 1982b). Up to 50 % of snakebite cases are attributed to *B. asper* in the region (Instituto Clodomiro Picado, 2009). It is distributed along the Atlantic slope, ranging from Tamaulipas, Mexico, south through Central America to northern Colombia, northern Venezuela, and the island of Trinidad. On the Pacific

slope, it can be found from Chiapas, Mexico, through Guatemala, and from northwestern Costa Rica down to northern Peru (Campbell & Lamar, 2004; Acosta-Chávez et al., 2015), in Mexico it is distributed from 0 to 1,400 m a.s.l. (Batista et al., 2020).

On August 12, 2021, at 11:56 h in Coclesito, Province of Colón, central Caribbean slope of the Republic of Panama (coordinates: 8.81521° N, 80.55565° W) (Fig. 1), a 1.60 m long *Bothrops asper* was found during a road clearing. The snake was rescued using a hook, tongs and a Snake Bagger's triangular frame, following all safety measures, and subsequently relocated to a safe place. During the rescue, the snake released cloacal fluids (defecation) when being held to place it in the herpetological bag. Upon reaching the relocation site and removing the snake from the bag, it showed Tonic Immobility (TI), Stiffness (ST), Contortions (C), Supination (S) and not responding to repeated stimuli near its head with the herpetological tongs. This led biologists to think it was dead. However, upon turning it over, the snake came out

of thanatosis completely and withdrew from the area, the event last about 40 seconds (Appendix 1).

*Bothrops asper* shows a variety of distinctive behaviors that highlight it as a successful predator. When it feels threatened, it can respond aggressively and has a high tendency to bite (Bolaños, 1982a; Villalobos, 2008). It has a color pattern that allow it to camouflage in its natural environment to hunt, injecting their venom and subsequently tracking the wounded prey (Sasa et al., 2019). Furthermore, its defensive behavior includes actions such as raising and curling the front part of its body in an "S" shape, adopting a posture that allows it to be ready to attack and emitting a loud hiss as a warning before attacking (Bolaños, 1982a; Villalobos, 2008; Sasa et al., 2019), and shakes its tail or taps it against the ground as a warning (video in <https://youtube.com/shorts/wVIROlPjfw?feature=share>, minute 1:12). Greene (1988) mentions that *B. asper* also employs various defensive strategies to avoid conflict and deter predators, such



**Figura 1.** Mapa que muestra la ubicación del evento de tanatosis en *Bothrops asper*. / **Figure 1.** Map showing the location of the thanatosis event in *Bothrops asper*.

as tail vibrations, preemptive strikes, or aggressive defensive tactics, further reinforcing its position as a formidable predator in its habitat.

With so many strategies and qualities, is it necessary to play dead? We believe that this event was caused by the interaction between the rescue biologists and the snake as a predator-prey, similar to what was proposed by Humphreys and Ruxton (2018) and Fuentes et al. (2021), that circumstances such as the presence of a nearby predator, the intensity of the attack and the lack of escape possibilities, can affect the decision of whether or not to adopt thanatosis and the possible costs and benefits that it represents for the snake, since it can increase the chances of survival by preventing predators from finding and attacking them. However, immobility and lack of response might not work in some situations, and using this strategy prevents the snake from exhibiting other behaviors that could save it. In addition, the strategy might work with some specific predators but would expose the snake to different predators. Durso & Smith (2018) They emphasize that the complexity of snake behavior, along with various genetic and environmental factors, influences their evolution. They conclude that this defensive behavior arises from the intricate interactions between genetics, the environment, and the selective pressures faced by the species.

Evidence of this behavior in snakes in the wild is scarce and most cases were witnessed and documented in species in captivity or in controlled situations (dos Santos & Da Silva Muniz, 2012). This is the first case documented on video of thanatosis in the species *Bothrops asper* and the third for the genus *Bothrops* on the American continent.

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## APPENDICES

**Apéndice 1.** Video del comportamiento de tanatosis en *Bothrops asper* registrado en Coclesito, Provincia de Colón, Panamá. <https://youtube.com/shorts/wVIROlPjpfw?feature=share>

**Appendix 1.** Video of thanatosis behaviour in *Bothrops asper* recorded in Coclesito, Province of Colón, Panama. <https://youtube.com/shorts/wVIROlPjpfw?feature=share>