

First record of salamander predation by a *Liophis* (Wagler, 1830) snake in the Venezuelan Andes

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Abstract. Information available so far is exceedingly meagre about the diet of the snakes included in the genus *Liophis*, one of the most diverse groups that inhabit terrestrial ecosystems of South America. For the first time is documented the predation of a salamander by *Liophis* from Venezuela, including a brief overview on the alteration of montane and submontane Andean ecosystem and their effect on the natural dynamic.

Keywords. *Bolitoglossa guaramacalensis*, *Liophis reginae zweifeli*, predation, Venezuelan Andes.

Currently, fifty two species of *Liophis* (Wagler, 1830), are recognized, among which we can find a wide variety of prey items, that include amphibians (also eggs and tadpoles), invertebrates, lizards, fishes, birds, and small rodents (Roze, 1966; Duellman, 1978; Chippaux, 1986; Dixon, 1989; Michaud and Dixon, 1989; Cunha and Nascimento, 1993; Martins and Oliveira, 1999; Boos, 2001; Dixon and Tipton, 2003; Savage, 2002; Esqueda et al., 2007). Although there is a considerable advance on their taxonomy and biogeography, information on their feeding habits is scarce, especially for those species that occur in northern South America. Within the material deposited in the Biogeography Laboratory of the University of Los Andes (ULABG), we found an adult male of *Liophis reginae zweifeli* Roze, 1959 (ULABG 2765), coming from the road Potreritos de Cendé to Miquimú, Municipio Carache, Trujillo state, Venezuela, which had in its stomach a partially digested adult specimen of a salamander, which we identified as *Bolitoglossa guaramacalensis* Schargel, García-Pérez, Smith (2002) (Fig. 1).



Fig. 1. Dorsal and ventral views of *Liophis reginae zweifeli* (ULABG 2765). Note the partially digested specimen of *Bolitoglossa guaramacalensis*.

Predation of plethodontids in *Liophis* snakes has been little documented. Michaud and Dixon (1989) made a list of prey items for twenty species in the genus, finding two of them as potential predators of salamanders: *L. reginae* (Linnaeus, 1758) and *L. epinephalus* Cope, 1862, which suggests that predation on plethodontids in this group is rare or not well documented. They assessed the predation of *Bolitoglossa altamazonica* by *L. reginae* (Cope, 1864), while in *L. epinephalus*, the species of salamander was not specified. Following an ecogeographical approach, it is quite possible that in the first case the appropriate name for the snake species is *L. reginae semilineata* (Wagler, 1824) (see Martins and Oliveira, 1999: 40-41), while the salamander may well correspond to what is currently known as *Bolitoglossa paraensis* (Unterstein, 1930) (see Parra-Olea et al., 2004).

Salamanders display an ample repertory of antipredatory strategies, with significant interspecific and/or intraspecific variability as a response to different predators (Whitemann and Wissinger, 1991; García-Paris and Debam, 1995). *B. guaramacalensis* prefers more terrestrial places (associated with rocks near streams), than other arboreal species (associated to epiphytic bromeliads). According to Schargel et al. (2002), some individuals had a regenerated tail, indicating a potential importance about the autotomy of the tail as an antipredatory behavior. Our voucher salamander discovered inside the stomach contents of a *L. r. zweifeli* snake suggests that it was gobbled head-first and without loosing the tail, suggesting that tail autotomy may not always be used as a defense mechanism (it is likely that this poorly documented behavior is dependent on other variables not even clearly defined). *L. reginae* has diurnal habits, contrary with the nocturnal activity of *Bolitoglossa* salamanders. A similar case has been documented for *Bolitoglossa heiroreias* Greenbaum, 2004, where a specimen was regurgitated by a *Rhadinaea monte-cristi* Mertens, 1952 (Greenbaum, 2004), a colubrid with similar habits to *L. reginae*. The



Fig. 2. A living individual of *Bolitoglossa guaramacalensis*.

salamanders in both cases seem to have an arboreal behavior during the night and a terrestrial one by day, the latter most probably associated with salamander refugia). In these cases, perhaps the differential temporal and spatial distribution may help these salamanders to avoid predation by terrestrial and diurnal snake predators.

Of the six species of salamanders recognized in Venezuela, however, only *Bolitoglossa borburata* Trapido, 1942, seems to be eminently arboreal (Manzanilla et al., 1996; Barrios-Amorós and Fuentes, 1999; Schargel et al., 2002; Lotzkat, 2007). All other congeners present similar behavior to the one exhibited by *B. guaramacalensis*, although little is known about other aspects of their natural history.

This voucher constitutes the first known instance of predation of *Bolitoglossa* by snakes in Venezuela. Predation on these vertebrates could likely be occasional in the diet of some terrestrial snakes, but it may be more frequent due to land conversion of natural habitats by antropoc effect (agricultural sowing and/or pasture for sowing, deforestation of the forest cover for logging with different purposes, use of not controlled fires, etc.). Salamander may then be exposed to more open habitats. According to the level of change, the same could drastically affect the prey-predator dynamics (e.g., several examined specimens of *B. guaramacalensis* were found in open places during the day, near roads, increasing the likelihood of predation). A recent study on anuran predation considers *Liophis* as prey-specific predators even though, in general, the genus might be considered generalist and/or opportunist, due to its amplitude of prey types (Toledo et al., 2006).

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MATERIAL EXAMINED

Liophis reginae zweifeli. Road Potreritos de Cendé-Miquimú, Municipio Carache, Trujillo state (ULABG 2765); Vigirima, sector El Guapo, Parque Nacional San Esteban, Municipio Guacara, Carabobo state (ULABG 4139); La Roncona, Municipio Chiguará, Mérida state (ULABG 3772).

Liophis epinephalus opisthotaenius. Road from La Grita until crossroads Bailadores-Pregonero, near Hotel La Montaña, Municipio Jáuregui, Táchira state (ULABG 2148); La Hechicera, Municipio Libertador, Mérida state (ULABG 6699).

Bolitoglossa guaramacalensis. ULABG 2774. Trujillo state, Municipio Carache, on road Potreritos de Cendé-Miquimú, Hacienda El Rincón, 2275 m a.s.l.