

# NOTES OF DIET IN HIGHLAND SNAKES *RHADINAEA CALLIGASTER* AND *RHADINELLA GODMANI* (SQUAMATA:DIPSADIDAE) FROM COSTA RICA

## NOTAS SOBRE LA DIETA DE LAS SERPIENTES DE TIERRAS ALTAS *RHADINAEA CALLIGASTER* AND *RHADINELLA GODMANI* (SQUAMATA:DIPSADIDAE) DE COSTA RICA

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**Resumen.**— Se reportan observaciones de la dieta de dos especies de serpientes elegantes: *Rhadinaea calligaster* fue observada depredando una salamandra del género *Bolitoglossa*; también se reportan observaciones sobre el forrajeo y alimentación de *Rhadinella godmani*, la cual se observó alimentándose de ranas del género *Craugastor* e *Isthmohyla*. Estos ítems alimenticios pueden ser un recurso importante en la dieta de estas serpientes poco conocidas ante la disminución de anfibios en zonas altas de Costa Rica.

**Palabras clave.**— Serpientes elegantes, comportamiento, alimentación, depredación.

**Abstract.**— I report observations in the diet of two species of graceful snakes: *Rhadinaea calligaster* was observed preying on a salamander of the genus *Bolitoglossa*. I also report observations on foraging and feeding behavior of *Rhadinella godmani*, which was observed feeding on frogs of the genres *Craugastor* and *Isthmohyla*. Those food items may be an important resource in the diet of these little-known snakes due to the decrease in amphibian species in Costa Rican highlands.

**Keywords.**— Graceful snakes, behavior, feeding, predation.

Snakes of the genus *Rhadinaea* and *Rhadinella*, known as graceful snakes or leaf litter snakes are a small size species (40-60 cm) that usually have secret habits and inhabits leaf litter or underground (Myers, 1974); due to this behavior some species are infrequently observed and their natural history is scarce or unknown. In Costa Rica, 3 species of the genus *Rhadinaea* (*R. decorata*, *R. pulveriventris*, *R. calligaster*) and two species of the genus *Rhadinella* (*R. godmani* and *R. serperaster*) have been reported (Savage, 2002). Of these, only *R. decorata* is common to observe and is the only one that is distributed in lowland areas (below 1200 m), while the other four are less frequent and inhabit highland mountain forests from 1200 to 2650 m (Solórzano, 2004). Diet of several of these species is unknown, from the Costa Rican species diet reports have only been made for *R. decorata* and *R. serperaster*. A few or no items have been reported in the diet of *R. pulveriventris*, *R. calligaster* or *R. godmani* (Leenders, 2018). In this note I describe some observations of the diet of two species *R. calligaster* and *R. godmani* in the highlands of Costa Rica.

The Spot-lipped Litter snake, *Rhadinaea calligaster* (Fig. 1) is distributed from the Cordillera de Tilarán in Costa Rica to the extreme western Panama between 1200 and 2500 m (Savage,

2002; Kholer, 2008). This is a small green and black snake, relatively common and found under the logs and surface debris in pastures and other disturbed areas or in primary forest of humid forests or crossing roads in forested areas (Savage, 2002; Solórzano, 2004). On 8 August 2015, at 1145 h, Felipe Saprissa Vargas (FSV) encountered an adult *R. calligaster* (aprox.50



Figura 1. *Rhadinaea calligaster* del Parque Nacional Braulio Carrillo, Heredia, Costa Rica.

Figure 1. *Rhadinaea calligaster* from Braulio Carrillo National Park, Heredia, Costa Rica.

cm total size) coiling around and biting a purple salamander (ca 10 cm total size) along a forested trail at km 9 (Barbas de Viejo) on the Cerro Chirripó way at Chirripó National Park, Limón Province, Costa Rica (elev. 2900 m). The salamander belongs to the genus *Bolitoglossa*, and was probably *B. pesrubra* according to its distribution and purple coloration (Eduardo Boza, com.pers.). The observation was videorecorded and can be watched at (<https://www.youtube.com/watch?v=-MQeRqLaiNM&feature=youtu.be>). The snake was stretched and held the salamander at the back of the head. The salamander tried to move at the beginning of the observation, but after a couple of minutes stopped moving (Fig. 2). After 10 minutes, the snake began to eat it through the top of the head, but FSV did not witness the complete swallowing process, but based on the immobility of the salamander we assume the snake completed the task.



**Figura 2.** *Rhadinaea calligaster* depredando una salamandra púrpura, posiblemente *Bolitoglossa pesrubra*. Imágen tomada de video.

**Figure 2.** *Rhadinaea calligaster* preying on purple salamander, possible *Bolitoglossa pesrubra*. Image taking from video.

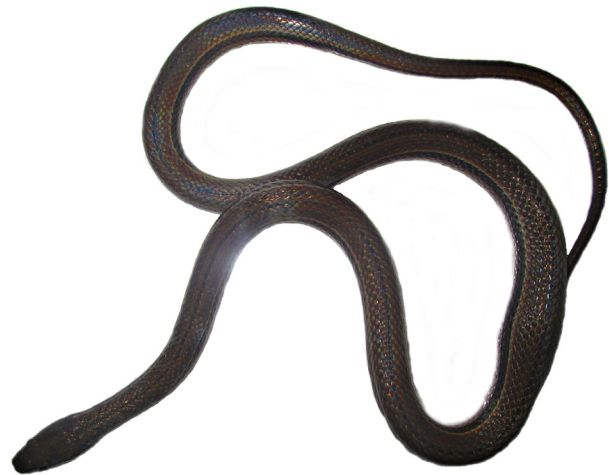
The Yellow-bellied Litter snake, *Rhadinella godmani* (Fig. 3) is distributed from Oaxaca and Chiapas in Mexico to the western of Panama from 1200 to 2650 m (Kholer, 2008). This is an uncommon small brown to salmon striped snake with yellow venter that has been observed active during the day under logs and surface debris in forests or pastures (Savage, 2002; Loza et al., 2017). On 23 February 2020, at 19:00 h I observed an adult of *R. godmani* moving among the leaf litter accumulated on the edges of a small stream tributary of the Tambor river in a forest



**Figura 3.** *Rhadinella godmani* de Fraijanes, Alajuela, Costa Rica.

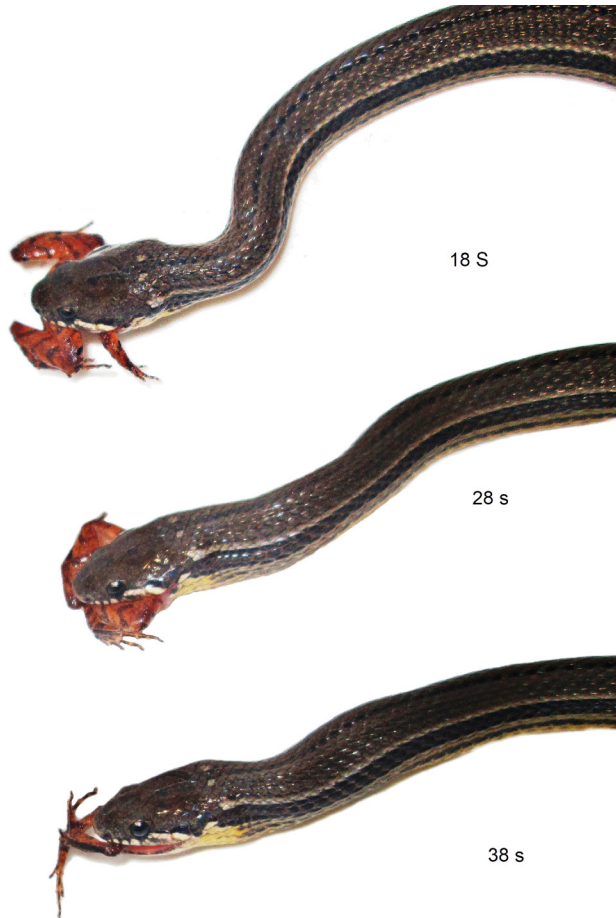
**Figure 3.** *Rhadinella godmani* from Fraijanes, Alajuela, Costa Rica.

patch of Fraijanes, Alajuela Province, Costa Rica (10.127151° N, 84.184322° W, elev. 1670 m). The snake had a bulge in its belly, probably because it had recently fed (Fig. 4). A large abundance of frogs of the species *Craugastor cf. podiciferus* was observed in the stream, in addition to the presence of juveniles of *Isthmohyla pseudopuma*. The snake was captured and placed in a terrarium to observe its feeding habits and some possible prey present in the place were captured and placed together with the snake to observe food preference for one week. The snake eagerly fed on a total of 4 individuals of *C. podiciferus* and 3 juveniles of *I. pseudopuma*, frogs were quickly caught and swallowed in less than two minutes (Fig. 5). The snake was released in the same place where it was found.



**Figura 4.** *Rhadinella godmani* mostrando un abultamiento en el vientre que indica que la serpiente se alimentó recientemente.

**Figure 4.** *Rhadinella godmani* showing a bulge in the belly indicating that the snake recently fed.



**Figura 5.** Comportamiento alimenticio de *Rhadinella godmani*, mostrando los segundos después de la captura de la presa (*Craugastor cf. podiciferus*).

**Figure 5.** Feeding behavior of *Rhadinella godmani*, showing seconds after prey capture (*Craugastor cf. podiciferus*).

Graceful snakes are principally predators of small frogs, salamanders, amphibian eggs, lizards, reptile eggs and there are a few reports of invertebrates in their diet (Myers, 1974). *R. decorata* can feed on frogs, salamanders, lizards and amphibian eggs (Myers, 1974) also on poison dart frogs (*Oophaga*) while *R. serperaster* can feed on eggs of other snakes, using the posterior teeth (McConnelly, 2016; Leenders, 2018; Kholer, 2003). No item has been reported in the diet of *R. calligaster*, but we consider that *R. calligaster* is capable of feeding on salamanders and tolerating certain levels of toxicity because salamanders and toxic frogs was reported in the diet of other species in this group also in the closely related *R. decorata* (Myers, 1974; Savage, 2002; Leenders, 2018). From the diet of *R. godmani*,

only stomach contents of two Honduran specimens are known, which contained a single insect pupa and snake or lizard egg, and another other Honduran specimen fed on *Eleutherodactylus planirostris* in captivity (McCranie & Wilson, 1992). We were able to confirm that this species can easily feed on frogs; it is possible that the snake was foraging in the river taking advantage of the abundance of frogs that occurs during the dry season when leaf litter amphibians move to rivers banks (Toft, 1980). In general, these leaf litter snakes have been reported mainly as diurnal, but other have also been observed prowling at night (Myers, 1974), the observed nocturnal activity of *R. godmani* may be due both of the frog species from which the snake feeds have a higher activity during the night hours.

Much of the natural history of these species is scarce and knowing aspects of their diet can facilitate the interpretation of current ecological dynamics in our ecosystems. It has been suggested that declining amphibian populations may negatively affect the survival of some snake species (Zipkin et al., 2020). Both *R. calligaster* and *R. godmani* are examples of snakes that can be directly affected by these declines since they are distributed in the highlands where amphibian declines have mainly occurred (Whitfield et al., 2016). *B. pesrubra*, *C. podiciferus* and *I. pseudopuma* are amphibian species that are still frequent in the high areas of the mountain ranges and therefore represent important food sources for these graceful snakes in Costa Rica.

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