



## THE INGESTION OF A LARGE PREY FACILITATING THE CAPTURE OF THE PREDATOR: A STUDY CASE IN *Micrurus corallinus* (SERPENTES, ELAPIDAE)

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**Abstract:** We report a case of predation of a large specimen of the *Dipsas neuwiedi* by a *Micrurus corallinus*, in the state of Santa Catarina, Brazil. The ingestion reported here is one of the greatest prey / predator ratios registered for genus *Micrurus* in nature. In this predation event, the ingestion of a large prey limited the *M. corallinus* locomotion, which did not offer resistance and was not able to move efficiently during the capture.

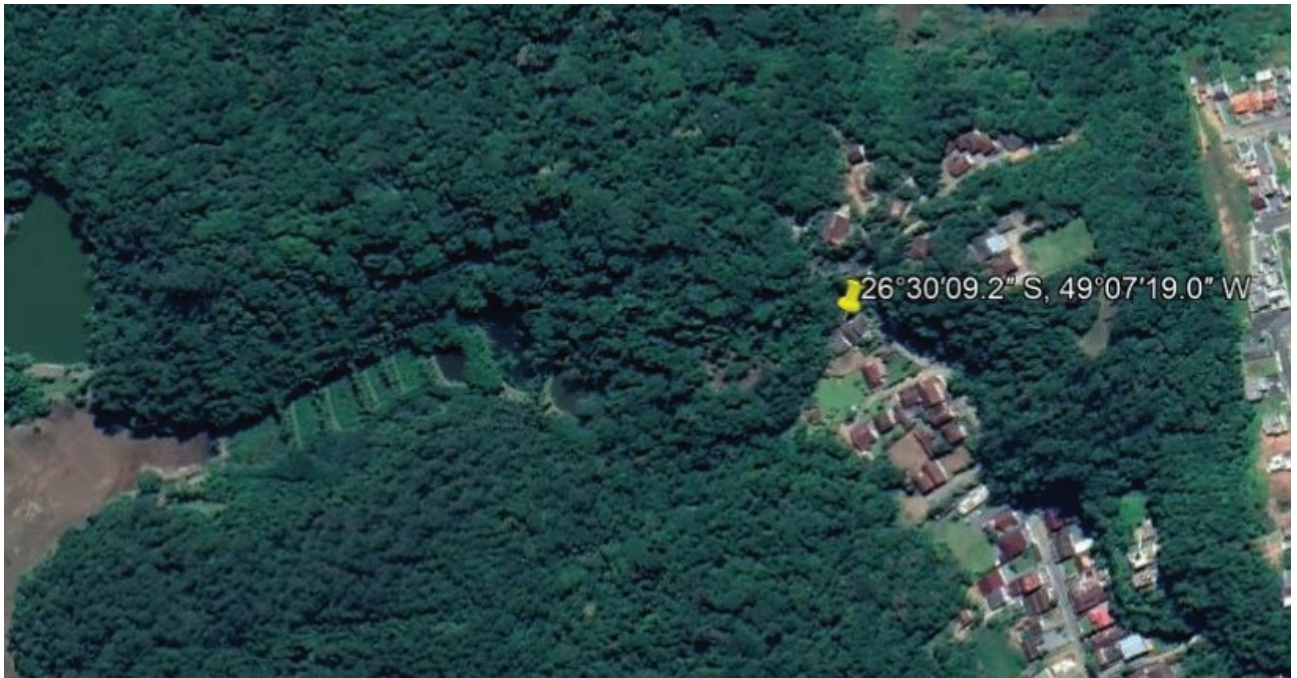
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The snake *Micrurus corallinus* (Merrem, 1820) occurs in Brazil, Argentina and Paraguay. In Brazil, it is widespread in Atlantic Forest areas from northeastern to southern, with marginal records in the Cerrado (Campbell & Lamar 2004, Nogueira *et al.* 2019). Adults of *M. corallinus* usually attain total lengths of 650 to 850 mm (Campbell & Lamar 2004). Like most *Micrurus* species, *M. corallinus* inhabits the most superficial layer of soil and litter, and feed on elongated prey such as amphisbaenids, snakes, lizards and caecilians, found in burrows or underground (Marques & Sazima 1997, Almeida *et al.* 2016, Marques & Sazima 2021). Although the diet of some *Micrurus* species is relatively well documented, little is known about the feeding ecology of many other coral snakes due to their evasive behavior and fossorial habits (Greene 1984, Cavalcanti *et al.* 2012, Almeida *et al.* 2016). Predation events by *Micrurus* are rare to be observed in nature (Maffei 2009) and when reported they can help on understanding ecology aspects of the species. In this note, we report a predation event of a large specimen of the *Dipsas*

*neuwiedi* (Serpentes: Dipsadidae) by *M. corallinus*.

The *M. corallinus* (alive) and the *D. neuwiedi* (regurgitated) were measured with a string, and then a millimeter ruler. A male individual of *M. corallinus* (snout-vent length [SVL] 380 mm; Tol 435 mm) was collected on 26 January 2021, at 16:32 h, in a private residence (26° 30' 09" S, 49° 07' 19" W, datum WGS84) in the district São Luis, city of Jaraguá do Sul, state of Santa Catarina, Brazil. The residence bordering "Park Malwee" is a Private Reserve of Natural Heritage (RPPN), encompassing 150 ha of Atlantic Forest (Figure 1).

The individual of *M. corallinus* was captured in a hot and cloudy day. The snake was found in the garden, among some plants, and was still and the with stretched out body. Snakes of the genus *Micrurus* generally move quickly when are threatened or in escape behavior, and make erratic movements that that can make capturing difficult. However, the *Micrurus* of this report when captured did not show defensive or escape behavior, presenting difficulty in locomotion, probably due to the large volume inside its body.



**Figure 1.** Collection site of *Micrurus corallinus*, bordering “Park Malwee”, a Private Reserve of Natural Heritage in Jaraguá do Sul, Santa Catarina, Brazil.

The snake was collected and placed in a transport box. A few hours later of the capture, the snake regurgitated one specimen poorly digested of *D. newwiedi* (female; total length [ToL] 440 mm) (Figure 2A, B). The prey ToL / predator SVL ratio was 1.16. The prey had been ingested headfirst. In the day after the capture, the *M. corallinus* was released into the nature, in a forested area (26° 38' 32" S; 49° 08' 56" W, datum WGS84), as determined by the Jaraguense Environment Foundation, the municipal environmental agency responsible for licensing, inspection, and rescue of wild fauna from Jaraguá do Sul, Santa Catarina, Brazil. The capture number of *M. corallinus* is Fujama/1082. The prey partially digested was subsequently discarded.

For snakes, initiating ingestion from the head can reduce the resistance offered by the limbs and body covering of the prey, thus reducing the time taken to ingest the food, and consequently decreasing the time that snakes are more vulnerable to predation (Greene 1976, Queiroz & Queiroz 1987). To ophiophagous snakes, starting the ingestion from the head can also be advantageous, decreasing the resistance of the prey's ventral scales at the time of ingestion (Greene 1976). Ingestion starting headfirst is often reported in *Micrurus*, although in *M. corallinus* significant part of ingestions of amphisbaenids

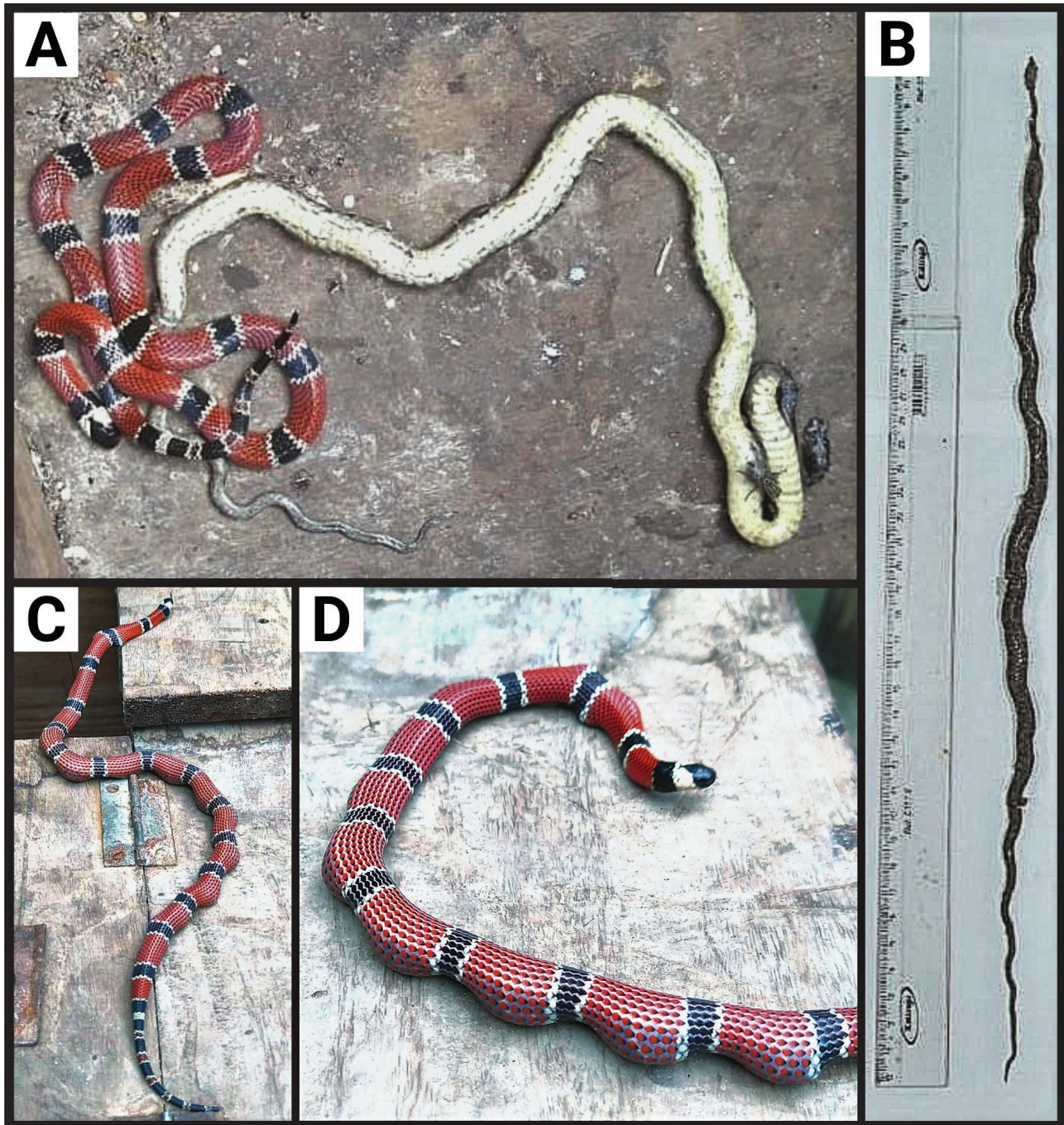
are tailfirst, probably due to underground feeding (Marques & Sazima 1997). In a recent study in captive, which analyzed the ingestion of 197 prey by two individuals of *M. corallinus* (one female and one male), only one prey (an *Erythrolamprus miliaris*) was consumed tail first (Travaglia-Cardoso *et al.* 2021).

In fact, *Micrurus* snakes have the ability to ingest large prey (Travaglia-Cardoso & Puerto 2020), but records in literature of the ingestion of prey (ToL) / predator (SVL) greater than 1.0 are scarce. The ingestion of small and medium sized prey is more frequent (Greene 1997, Marques & Sazima 1997, Aguiar 2008, Almeida *et al.* 2016). For different species of *Micrurus*, the reported relation prey / predator length was 0.29 (Cisneros-Heredia 2005); 0.3 to 0.55 (Aguiar 2008); 0.48 and 0.41 (Ávila *et al.* 2010); 0.99 (Souza *et al.* 2011); 0.66 (Arévalo-Páez *et al.* 2015); 0.85 (Barbosa *et al.* 2019\*); 0.62 (West *et al.* 2019\*); 0.43 (Travaglia-Cardoso & Puerto 2020). Specifically for *M. corallinus*, the literature reports prey / predator length ratio varied from 0.21 to 0.93 (Marques 1992); 0.5 (Banci *et al.* 2017); 0.61 (Gonzales *et al.* 2018\*) and in a recent study that analyzed the ingestion of 197 prey, it ranged from 0.33 to 0.90 (Travaglia-Cardoso *et al.* 2021) (\*ratio calculated from the prey and predator length was reported by the authors).

The ingestion reported here is greatly relevant due to the very high prey (ToL) / predator (SVL) ratio (1.16). If not the largest, this is one of the greatest prey / predator ratio registered for genus *Micrurus* in nature. The mass of *M. corallinus* and the regurgitated prey has not been recorded, but possibly the prey / predator mass ratio would be high. It is possible to observe that the prey, besides being longer, is also more robust than the *M. corallinus* (Figure 2-A). The size of the prey can also

be evidenced by the undulations of the ingested prey inside of the *M. corallinus* body, hampering your movement and the escape behavior (Figure 2C, D).

Many snakes show a large change in effective body mass following feeding (Garland & Arnold 1983). The predation of large prey requires more time for ingestion, reduces the locomotory performance and mainly decreases the defense ability after ingestion, limiting the movements



**Figure 2.** *Micrurus corallinus* and regurgitated prey, longer and more robust than the predator (A). Regurgitated prey, one specimen poorly digested of *D. newwiedi* (B). Undulations of the ingested large prey inside of the *Micrurus corallinus* body (C, D).

and increasing the vulnerability and the risk of predation (Garland & Arnold 1983, Mehta 2006, Banci *et al.* 2017). Moreover, in ophiophagous snakes, the attempt ingestion of very long or thick-bodied prey can lead to regurgitation or even death by asphyxiation (Caramaschi & Niemeyer 2012, Cavalcanti *et al.* 2012, Banci *et al.* 2017, Travaglia-Cardoso & Puerto 2020). To date, a study showing the relationship between the size of ingested prey and the post ingestion behavior of different prey has not been evaluated for *Micrurus* snakes.

In this predation event, the ingestion of a large prey can have limited the *M. corallinus* locomotion, facilitating your visualization. The snake also did not offer resistance and was not able to move efficiently during the capture, and did not try to escape. In these cases, probably the regurgitation can be an option to reduce the weight and increase the agility to escape. Futures studies that could evaluate the activity and behavior of *Micrurus* snakes after the ingestion of prey of different sizes can help to clarify to what extent the ingestion of very large prey can be a risk for these snakes.

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