

Feeding behavior and ophiophagous habits of two poorly known amazonian coral snakes, *Micrurus albicinctus* Amaral 1926 and *Micrurus paraensis* Cunha and Nascimento 1973 (Squamata, Elapidae).

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The coral snakes belong to a monophyletic group composed of three genera (*Micrurus*, *Leptomicrourus* and *Micruroides*) and are distributed throughout the Americas. *Micrurus* is the most diverse genus, with approximately 60 species (Roze, 1996). Traditionally, South American *Micrurus* are divided into two main groups based on color pattern, specifically the distribution of black rings, either in triads or monads. Besides the color pattern, hemipenes characters support the monophyly of both groups (Slowinski, 1995; Slowinski and Keogh, 2000; Campbell and Lamar, 2004; Feitosa, 2006).

Due to its cryptozoic and fossorial habits, natural history data of *Micrurus* species, such as diet or food behavior, are scarce. Apparently, snakes of the genus *Micrurus* in general are very specialized predators, with preference for vertebrate preys with elongated bodies (Martins and Oliveira, 1998; Campbell and Lamar, 2004). Moreover, it has been reported that several species consumed by *Micrurus* occupy a niche similar to the predator itself, which is generally cryptozoic and fossorial. For example, all of the reported prey taxa of *M. lemniscatus* in the Manaus region (e.g. snakes of the genera *Typhlops*, *Atractus*, *Hydrops*, *Liophis*, *Micrurus* and lizards of the genus *Bachia*) have strong cryptozoic tendencies (Martins and Oliveira, 1998). The literature records on the food items consumed by *Micrurus* are summarized in two main references, one for species from Manaus, Amazonas (Martins and Oliveira, 1998)

and the other for *Micrurus* from the Western hemisphere (Campbell and Lamar, 2004). These records indicate that ophiophagy is common among *Micrurus*.

In contrast to the dietary preferences, little is known about feeding behavior in *Micrurus*. This lack of information is likely due to their fossorial and secretive habits, which render proper field observations difficult. The few descriptions on *Micrurus* feeding behavior come from observations of captivity and are restricted to a few species. An exception is *Micrurus corallinus* Merrem 1820, from the Brazilian Atlantic Forest, for which there are several field and captive observations (Marques and Sazima, 1997; Serapicos and Merusse, 2002). *M. corallinus* shows different handling techniques according to prey type. When feeding on amphisbaenids, the snake bites its prey, injecting the venom, and then releases it, swallowing it only after death. With snake prey items, the prey is held during the entire feeding sequence until its immobilization (Marques and Sazima, 1997). This difference is probably related to difficulties in obtaining cues about head orientation in amphisbaenids. The ventral scale overlap of lizards and other snakes is an important piece of information for *Micrurus* to determine the head orientation of prey (Greene, 1976; Marques and Sazima, 1997). Thus, the absence of ventral scale overlap in amphisbaenids makes bite-release a better strategy to avoid physical injury from the prey individuals (Marques and Sazima, 1997).

In this paper we report on two feeding events observed in the field by two species of coral snakes with little known habits, both species being endemic to the Amazonian forest: *M. paraensis* and *M. albicinctus*. *M. paraensis* is distributed through the tropical forests of southern Surinam and Brazil, in the states of Pará, western Maranhão, southwest Mato Grosso and Rondônia (Feitosa, Prudente and Lima, 2007). *M. albicinctus* is known only from Brazil, and was registered in the

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Figure 1. a – *Micrurus paraensis* swallowing *Atractus albuquerquei* (SMS). b – *Micrurus albicinctus* swallowing *Atractus* sp. (ABJ).

when SMS observed an adult *M. paraensis* (17.5 g body mass, 429.0 mm snout-vent length (SVL), 88.0 mm tail length (TL)) feeding on an adult specimen of *Atractus albuquerquei* (16.5 g body mass, 381.5 mm SVL, 46 mm TL) at 08:50 am in a patch of secondary forest surrounded by primary *terra firme* forest at RDS do Juma (Juma Sustainable Development Reserve), municipality of Novo Aripuanã, state of Amazonas, Brazil (06.30753°S, 60.34924°W, Datum: SAD69, elev.

ca. 1 minute, the *M. paraensis* tried to hide with the prey under the leaf litter. When the animals were handled to prevent their escape, the predator began to make subtle thrashes, elevating and coiling the tail and regurgitating the *Atractus*, which was already dead. Both individuals were collected and deposited in the Herpetological Collection of Museu Paraense Emilio Goeldi under the numbers MPEG 24313 (*A. albuquerquei*) and MPEG 24314 (*M. paraensis*).

The other event occurred on May 5th, 2010, at 09:50 am, in a *terra firme* tropical forest located at Floresta Nacional do Jamari (Jamari National Forest), municipality of Itapuã do Oeste, state of Rondônia, Brazil (09.32247°S, 062.90208°W, Datum: SAD69, elev. 140m). ABJ, ACCJ, PAA and JAC observed a *Micrurus albicinctus* individual foraging in the leaf litter and entering in a small hole at the base of a tree, where it disappeared. Five minutes later, we detected the same individual, leaving the burrow with an individual of *Atractus* sp. in its mouth. The prey was probably already dead, since it was motionless. The predator held the prey by its anterior portion, approximately 3 cm below the head. Afterwards the predator turned the prey to reach its head and then started to chew and swallow it. The *Atractus* sp. was swallowed in approximately 40 min. After swallowing it, the predator hid below the leaf litter. Although we have not collected the two snakes, their lengths were similar, with prey slightly smaller than predator. Identification of species was made using photographs of the event.

These are the first records of food items and feeding behavior of *M. paraensis* and *M. albicinctus*. Both species are ophiophagous and predate upon snakes with cryptozoic habits, which seems to be a behavior shared by most species of the genus *Micrurus* (Marques and Sazima, 1997; Martins and Oliveira, 1998; Campbell and Lamar, 2004). In both cases, the ratio of prey total length (TTL) to predator SVL is high, reaching 0.99 in the case of *M. paraensis* (although we did not measure it for *M. albicinctus*, it was clear that prey and predator were similar in size). Although the individual of *M. paraensis* did not finish swallowing the prey, this probably was due to the stress caused by observers manipulating the snake and not to prey size, since most of the prey body had already been swallowed. As far as we know, this is the greatest prey TTL / predator SVL ratio registered for *Micrurus* (Marques and Sazima, 1997; Cisneros-Heredia, 2005).

M. albicinctus proved to be a predator that actively hunts its prey in the leaf litter, instead of using the sit-and-wait strategy. One relevant observation is that *M. albicinctus*, as well as recorded for *M. corallinus* (in captivity - Marques and Sazima, 1997), captures and injects venom into its prey underground, but only swallows the prey after dragging it to the surface. It is difficult to test the veracity of this statement, because the field records available in the literature (including this one) are obviously biased to surface ingestions rather than subterranean ingestions. However, one

possible explanation is that, on the surface, the snake is able to better handle the prey and maximize the head-first ingestion. The head-first ingestion has potential advantages for the predator, such a decrease in the probability of injuries caused by prey defense mechanisms (i.e. bites) and decrease of swallowing time of prey (Greene, 1976).

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