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Noteworthy and Historical Records of Amphibians in the Diet of Snakes in Colombia

Luis Santiago Caicedo-Martínez[1], Jose J. Henao-Osorio[1], Andrés Fernando Tamayo-Zuluaga[1,2], Guillermo Alejandro Echeverry Montoya[1], Daniel Enrique Espitia-Sanabria[1], Juan S. Echeverry-Pérez[1], Juan José Arboleda Osorio[1], Macela Carolina Espitia-Sánchez[1], Yeny Tatiana Marín García[3], Julián A. Rojas-Morales[1], Héctor Fabio Arias-Monsalve[1,3], José Rancés Caicedo-Portilla[4,5], and Héctor E. Ramírez-Chaves[1,6]

[1]Departamento de Ciencias Biológicas, Facultad de Ciencias Exactas y Naturales, Universidad de Caldas, Calle 65 # 26-10, Manizales, Colombia
[2]Programa de Maestría en Ciencias Biológicas. Universidad de Caldas, Manizales, Colombia
[3]Corporación para el Desarrollo de Caldas - CDC- Km 11 vía al Magdalena, Manizales, Colombia.
[4]Instituto Amazónico de Investigaciones Científicas SINCHI. Avenida Vásquez Cobo entre calles 15 y 16, Leticia, Amazonas, Colombia
[5]Grupo de Investigación de Fauna Amazónica Colombiana, Instituto Amazónico de Investigaciones Científicas SINCHI. Calle 20 No 5-44, Bogotá D.C., Colombia
[6]Corresponding author, e-mail: hector.ramirez@ucaldas.edu.co

***Abstract.*—The available information on the diet of most Neotropical snake species remains limited, despite recent studies documenting cases of predation observed directly in the field or through examination of the stomach contents of snakes preserved in scientific collections. In Colombia, one of the richest countries in terms of snake species diversity, knowledge of their trophic ecology is scarce. It is known that they feed on a wide variety of vertebrate taxa, however, with amphibians being a primary prey group. Herein, we present 13 new records of predation on frogs, toads, and caecilians by 10 snake species. These records were obtained from snakes killed (or road-killed) directly by locals, photographic records, and museum specimen analysis using X-radiographs. The results include the first event of anurophagy by the Mountain Sipo (*Chironius monticola*), the Western Indigo Snake (*Drymarchon melanurus*), the Double-banded Coral Snake Mimic (*Erythrolamprus bizona*), the Amazon Coastal House Snake (*Thamnodynastes pallidus*), and the False Fer-de-lance (*Xenodon rabdocephalus*) in Colombia, and the first record on the diet of the False Coral Snake (*E. lamonae*). Although *C. monticola* is considered anurophagous, we present the first record of the Cachabi Robber Frog (*Pristimantis achatinus*) in its diet. We also reviewed 28 historical records of snake-amphibian interactions in Colombia. Our records expand the knowledge on the diet of snakes in Colombia and shed light on the challenges faced by snakes, particularly the local's negative perception. Such baseline information on the trophic ecology of snakes can help to promote more effective conservation measures.**

Key Words.—Anura; Gymnophiona; Neotropics; prey; Squamata

Introduction

The Neotropics is home to one of the highest herpetofaunal diversities in the world, with amphibians and snakes being two groups that reach their peak species richness in this region (Stuart et al. 2008; Guedes et al. 2018). This high diversity is exemplified by the trophic relationships between these groups, where snakes are the main vertebrate predators of amphibians (Toledo et al. 2007). Nonetheless, the diet of snakes may change with sex or age (Shine 1991), and includes a wide range of prey, such as invertebrates and other vertebrates like fish, birds, reptiles, and mammals (McElvy et al. 2013; Rojas-Morales 2013; Arévalo-Páez et al. 2015).

Knowledge about the diet of Neotropical snakes is still relatively scarce (Alencar et al. 2013; Rojas-Morales et al. 2021) and is mainly based on individual records obtained from stomach contents of specimens deposited in scientific collections (Palmuti et al. 2009; Alencar et al. 2013; Guedes 2021), regurgitation induced by manual palpation (Ray et al. 2012), or incidental observations (Mario-Da-Rosa et al. 2020). In the past decade, the number of studies reporting diet items of snakes has increased (e.g.,

Prudente et al. 2014; Guedes 2021), enhancing our understanding of trophic relationships and providing essential information for conservation plans (Dorcas and Castoe 2009). Moreover, although there is an initiative to document and compile the feeding habits of snakes worldwide in an exhaustive database like SquamataBase (Grundler 2020), there are still gaps in this topic for high-biodiversity countries like Colombia.

Anurans, both in larval and adult stages, represent a significant portion of the diet of some snake species (Arnold and Wassersug 1978; Vitt 1983; Toledo et al. 2007; McElvy et al. 2013; Herrera-Lopera et al. 2018). Toledo et al. (2007) classified the amphibian predators into four groups: (1) opportunistic predators; (2) convenience predators; (3) temporary specialized predators; and (4) specialized predators. Based on their relative abundance compared to other predators and the predator-prey size relationships in which larger predators can consume larger prey, Toledo et al. (2007) suggested that snakes are the primary vertebrate predators of amphibians. Specialized amphibian predators include species of the genera *Chironius* (e.g., the South-American Sipo, *C. multiventris*), *Erythrolamprus* (e.g., the Military Ground Snake, *E. miliaris,* and the False Coral Snake, *E. poecilogyrus*) and *Xenodon* (e.g., the Neuwied's False Fer-de-lance, *Xenodon neuwiedii*).

In the Neotropics, Colombia harbors a high diversity of snakes, with more than 290 species (Lynch 2012). This diversity is partly due to the geographic position of the country, which encompass cis- and trans-Andean regions. The Andean uplift, by promoting new environmental conditions and creating geographic barriers, has led to a high diversification of species, including snakes (Serrano et al. 2024). Nonetheless, studies on the trophic ecology of Colombian snakes are scarce and fragmented, with available records mainly coming from anecdotal field observations (Myers et al. 1978; Herrera-Lopera et al. 2018; Rojas-Morales et al. 2021).

Most of the information on amphibians consumed by snakes has been gathered in the inter-Andean and Orinoco regions of Colombia (Acosta-Ortiz and Prado-Moreno 2019; Acosta-Ortiz and Agudelo-Gonzalez 2021; Rojas-Morales and Marín-Martínez 2022), whereas data for other regions of this geographically complex country are limited or absent. To assist filling gaps in the natural history of snakes from Colombia, we present 13 records of amphibian predation by 10 snake species, derived from field observations, specimens that were road-killed or killed by locals, and dissection of preserved specimens form museum collections. We also provide a summary of the historical records of amphibians eaten by snakes in the country.

Materials and Methods

We obtained data on amphibians consumed by snakes in Colombia from field observations and photographs of predation events (six records), specimens killed directly by locals (three records), road-killed specimens (one record), and museum specimen dissections using X-radiographs (three records). These records were gathered from eight trans-Andean and three cis-Andean localities of Colombia (Supplemental Information Table S1). Trans-Andean records come from the inter-Andean valley of the Magdalena River Basin, located between the Central and Oriental (Eastern) cordilleras, and the Cauca River Basin, located between the Occidental (Western) and Central cordilleras of Colombia. Cis-Andean records come from the Amazonian region of Colombia.

For the identification of the snakes and amphibians, we compared the records with specimens deposited at the amphibian (MHN-UCa-Am) and reptile (MHN-UCa-R) collections of the Museo de Historia Natural of Universidad de Caldas (MHN-UCa) in Manizales, Colombia, as well as the amphibian (SINCHI-A) and reptile (SINCHI-R) collections of the Instituto Amazónico de Investigaciones Científicas (SINCHI) in Bogotá and Leticia, Colombia (Supplemental Information Table S1). We also used taxonomic keys and specialized literature for identification (e.g., Peters and Orejas-Miranda 1986; Rojas-Rivera et al. 2013; Rojas-Morales et al. 2014). Some amphibians predated by snakes were in later stages of digestion, preventing identification to the species level; therefore, in those cases, we report the taxonomic level that we could determine (i.e., genus or family). For the snakes, we measured the snout-vent length (SVL) and tail length (TL) for 10 well-preserved specimens (Supplemental Information Table S1) using a measuring tape to avoid the possible loss of data that could occur with other measuring tools, as preserved specimens can be stiff and difficult to manipulate. For the amphibians, we took the SVL with a digital caliper (Mitutoyo 500-197-30b, Kawasaki, Kanagawa, Japan; nearest 0.05 mm) for specimens that were complete. Considering that the shape of a specimen could be affected by ingestion, we recognize that measurements might be altered

and we regard them as approximate representations of the true size of the specimen. The radiological procedures that led to the dissection of specimens were conducted as part of the undergraduate research of Echeverry-Pérez (2023) using veterinary clinic equipment in Manizales, Colombia. To review the information on amphibians in the diet of snakes in Colombia, we performed a literature search using the Google Scholar, Scopus, Web of Science, and Science Direct databases with the keywords snakes, diet, and Colombia, without temporal restrictions. We followed the first 10 steps proposed by van den Burg (2020) for these types of compilations. The search was restricted to papers that specifically documented amphibians consumed by snakes in Colombian territory. We complemented the search by reviewing the SquamataBase packages for the R software generated by Grundler (2020). Finally, we analyzed the sources cited and referenced in the publications to gather additional data.

Results

We obtained 13 new records of amphibians in the diet of Colombian snakes, including frogs and toads found in the stomach contents or mouths of colubrid and viperid snakes, as well as a predation attempt on a caecilian **(***Caecilia* sp.) by the Redtail Coral Snake *(Micrurus mipartitus*; Supplemental Information Tables S1 and S2). Additionally, using x-radiographs of specimens housed at the MHN-UCa-X collection, we identified amphibians as prey for three snakes (Supplemental Information Tables S1 and S2). The records come from eight trans-Andean and three cis-Andean localities of Colombia.

Trans-Andean records.—On 25 October 2019, we found a Double-banded Coral Snake Mimic (*Erythrolamprus bizona)* killed by locals at La Bretaña, municipality of Santuario, Department of Risaralda, eastern slope of Occidental Cordillera, Colombia (Supplemental Information Table S1). The snake had the posterior extremities of a frog identified as *Pristimantis* sp. in its mouth, indicating a head-first ingestion. We identified the frog based on its color pattern, the absence of interdigital membrane, and the shape of the toe tips (Fig. 1).

On 23 February 2020, we found a partially digested toad in the stomach of an individual of False Coral Snake *(Erythrolamprus lamonae*) killed by locals at the Reserva Forestal Protectora Bosques de la CHEC, Village Gallinazo, municipality of Villamaría, Department of Caldas, western slope of the Central Cordillera, Colombia (Supplemental

Figure 1. Trans-Andean records of snake species with their respective prey. (A) The Double-Banded Coral Snake Mimic **(***Erythrolamprus bizona*; MHN-UCa-R 497) and the rainfrog (*Pristimantis* sp.) found in its stomach (MHN-UCa-Am 1546). (B) the False Coral Snake *(E. lamonae;* MHN-UCa-R 879) and the prey Kumanday Beaked Toad (*Rhinella humboldti*; MHN-UCa-Am 1492). (C) the Western Indigo Snake (*Drymarchon melanurus*; MHN-UCa-R 1047) and the prey Mesoamerican Cane Toad (*R. horribilis*; MHN-UCa-Am 1672). (D) The Mountain Sipo (*Chironius monticola*; MHN-UCa-R 1035) and two prey Zurucuchu Robber Frogs (*Pristimantis w-nigrum*). Scale bar: 20 mm. (A, C, and D photographed by Sofía Terán-Sánchez and B photographed by Jose J. Henao-Osorio).

Information Table S1). The prey was mainly digested at the head, where the cranium bones were visible, suggesting that the toad was eaten head-first. Based on the interdigital membrane of fingers and toes, and the length of the extremities, we identified the toad as the Kumanday Beaked Toad (*Rhinella kumanday;* SVL = 35.01 mm; Fig. 1).

On 31 August 2021, we observed a predation attempt by a Western Indigo Snake (*Drymarchon melanurus*) on a Mesoamerican Cane Toad (*Rhinella horribilis*), in the municipality of Natagaima, Department of Tolima, in the inter-Andean valley of the Magdalena River, Colombia (Supplemental Information Table S1). The predation attempt involved the snake attempting to swallow the toad head-first, as indicated by the position of the limbs observed in the corpse of the toad (directed towards the back; Supplemental Information Fig. S1). This attempt ended with the death of both animals. The corpse of the toad showed biting marks, while the snake presumably died from toxins produced by the skin of the toad. No specific signs of injury were found on the snake, such as wounds from mechanical tools or attacks from other animals (Supplemental Information Fig. S1). Neither the snake nor the toad were preserved. A second record of this interaction is based on a preserved specimen of *D. melanurus* with no specific locality or date information, which also contained an *R. horribilis* (SVL = 63.35 mm; Fig. 1) in its stomach. The toad was found inside the snake with its head directed towards the tail, confirming a head-first ingestion by the snake.

On 22 July 2021, we found a frog in the stomach of a road-killed Mountain Sipo (*Chironius monticola*) between the municipalities of Neira and Manizales, Department of Caldas, western slope of the Central

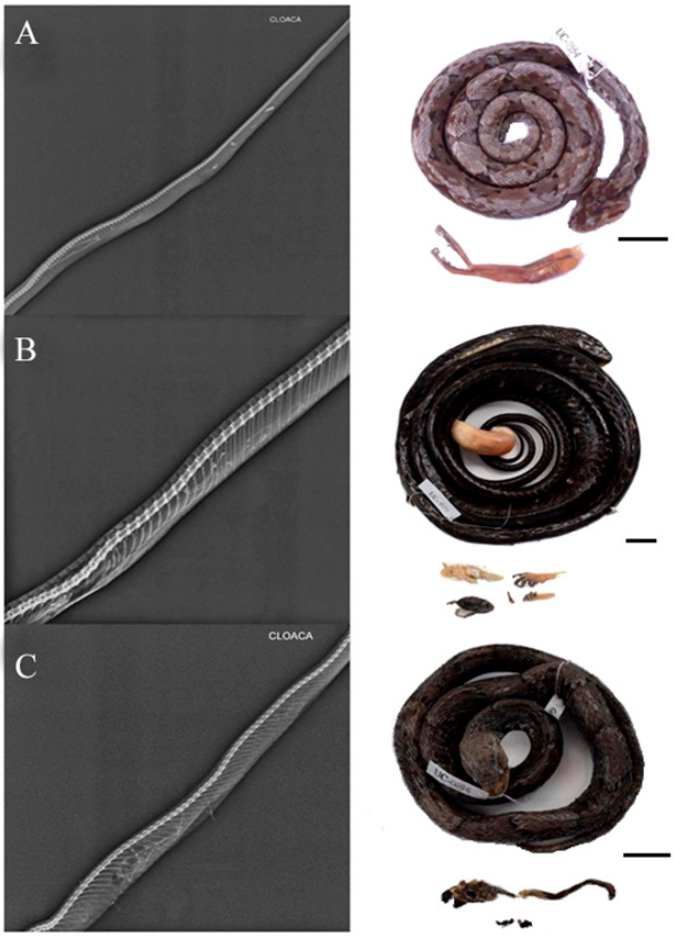

Figure 2. X-radiographs (left) and dissection (right) images. (A) Terciopelo (*Bothrops asper*; MHN-UCa-R154) with the remains of the Northern Rainfrog (*Craugastor metriosistus*). (B) the Ecuador Sipo (*Chironius grandisquamis*; MHN-UCa-R605) with the remains of robber frogs (*Pristimantis* spp.). (C) the False Fer-de-lance (*Xenodon rabdocephalus*; MHN-UCa-R094) with the remains of the Riveros Toad (*Rhinella* cf. *humboldti*). Scale bar: 20 mm. (X- radiographs and photographs by Juan S. Echeverry-Pérez).

Cordillera, Colombia (Supplemental Information Table S1). We identified the prey as the Cachabi Robber Frog (*Pristimantis achatinus*), based on the presence of well-developed dorsolateral folds, the absence of eyelid tubercles, and the finger I longer than II (Rojas-Rivera et al. 2013). On 8 October 2022, we obtained a second individual of *C. monticola* killed by locals at the Alto del Nudo, municipality of Dosquebradas, Department of Risaralda, western slope of Central Cordillera, Colombia (Supplemental Information Table S1). This snake had three frogs of the genus *Pristimantis* in its gastric cavity, which, based on the state of digestion of the posterior extremities, appeared to have been eaten back/cloaca first. After an exhaustive examination of the specimens, two of the frogs were identified as W Rainfrog or Zurucuchu Robber Frog (Two *Pristimantis w-nigrum*, SVL = 36.01 mm and SVL = 25.26 mm; Fig. 1), based on the relative length of fingers (Finger I>II), the smooth belly, and the presence of black small blotches at the flanks near the groin (Lynch and Duellman 1997).

On 18 July 2022, we observed a predation attempt by a Redtail Coral Snake (*M. mipartitus*) on an individual of *Caecilia* sp. at Pueblo Viejo, municipality of Riosucio, Department of Caldas, eastern slope of Occidental Cordillera, Colombia (Supplemental Information Table S1, Fig. S2). The snake was eating the prey, but it later regurgitated it. The caecilian was collected and preserved (SVL = 566 mm), and the snake was relocated after the predation attempt.

On 11 April 2011, a specimen of Terciopelo (*Bothrops asper*) was collected by an independent researcher at La Sonrisa, municipality of Samaná, Department of Caldas, eastern slope of Cordillera Central, Colombia (Supplemental Information Table S1) and housed at the Colección de Reptiles of the MHN-UCa. Using X-radiographs, we recorded the legs of a frog in the stomach of the snake. After dissection, the frog was identified as the Robber frog (*Craugastor metriosistus*; Fig. 2) based on the color pattern, the relative length of toes III and V by adpressing each against toe IV (III>V), and the shape of the toe tips (Ospina-Sarria et al. 2015). Because only the posterior extremities of the frog remained, we suggest that the viper swallowed the prey head-first.

On 3 December 2020, an Ecuador Sipo (*Chironius grandisquamis*) was collected by an independent researcher at Berlín, municipality of Samaná, Department of Caldas, eastern slope of the Cordillera Central, Colombia (Supplemental Information Table S1), and housed at the Colección de Reptiles of the MHN-UCa. Using X-radiographs, we found two frogs in the stomach: one *Pristimantis* sp. (SVL = 27.01 mm), and the second frog could not be identified because of the high level of digestion (Fig. 2; Supplemental Information Table S2). Moreover, based on the state of the frogs, where the posterior extremities were flexed and deformed towards the anterior part of body, we suggest that the snake ingested them in a back-first position.

On 21 September 2008, a False Fer-de-lance (*Xenodon rabdocephalus*) was collected by and independent researcher at La Sonrisa, municipality of Samaná, Department of Caldas, eastern slope of the Central Cordillera, Colombia (Supplemental Information Table S1) and housed at the Colección de Reptiles of the MHN-UCa. Using X-radiographs, we found a single prey in the stomach of the snake. We identified the prey as the Rivero's Toad (*Rhinella humboldti*) based on skin texture, body shape, and coloration pattern (Torres-Suárez and Vargas Salinas 2014; Fig. 2; Supplemental Information Table S2).

Cis-Andean records.—On 1 November 2013, staff of SINCHI captured a Mountain Keelback (*Helicops angulatus)* in a pipe near an indigenous community at municipality of Carurú, in the Department of Vaupés, Colombia (Supplemental Information Table S1). While handling the snake, it regurgitated 15 tadpoles of the family Bufonidae. Similarly, on 10 July 2017, we recorded a second *H. angulatus* eating a frog in a small litter-covered body of water on a granitic rock outcrop at municipality of Cumaribo, Department of Vichada, Colombia (Supplemental Information Table S1). In this instance, the snake began ingestion at the lower left flank of the frog. The snake finished eating the frog and was kept until the next day when it was euthanized. We identified the specimen as a juvenile of the Rock Frog (*Leptodactylus lithonaetes*) based on its free fingers without interdigital webs or lateral folds, and its color pattern (light grey reticulations on the belly). It was considered a juvenile because of its size (SVL = 41.5 mm; Fig. 3; Heyer 1995).

Finally, we examined an individual of an Amazon Coastal Housed Snake **(***Thamnodynastes pallidus*) donated by locals, with no specific date, from the municipality of Leticia, Department of Amazonas, Colombia (Supplemental Information Table S1). The snake had an adult specimen of the Chaco Treefrog (*Boana raniceps*) in its mouth. The frog was identified by its yellowish dorsum and by the presence of stripes on the thighs and inguinal regions, as well

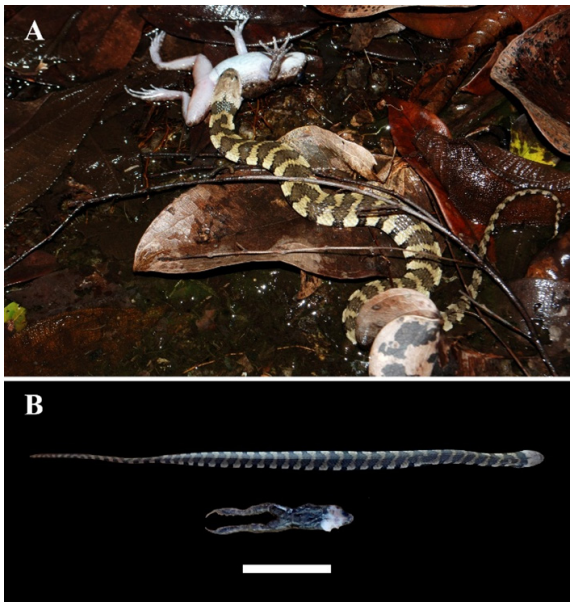

Figure 3. The Mountain Keelback (*Helicops angulatus*) feeding on a juvenile Rock Frog (*Leptodactylus lithonaetes*). (A) field observation of the interaction, and (B) preserved specimens. Scale bar: 50 mm. (Photographed by José Rancés Caicedo-Portilla).

as its medium size (SVL = 68.64 mm; Faivovich et al. 2005, in Diogo-Vasconcelos et al. 2021).

Literature search.—We found 28 records of amphibians in the diet of snakes in Colombia documented in 16 papers in the literature searches. The studies span all continental natural regions of Colombia, including the Andes, Amazon, Caribbean, Pacific, and Orinoquia (Supplemental Information Table S2). Of these records, 18 contained amphibian prey identified to the species level, with 15 snake species from three families and 14 genera acting as predators. Two of the records found come from predation attempts in which the snakes failed to consume the prey. The remaining 10 records identified amphibian prey only to the genus level, with eight snake species of three families and seven genera involved in these interactions (one identified at the family level; Supplemental Information Table S2). Although one of the records obtained in the literature (i.e., Ruthven 1922) reported a Chiriqui Robber Frog (*Pristimantis cruentus*) eaten by an Aesculapian False Coral Snake (*Erythorlamprus aesculapii*), this frog species is not native to the Sierra Nevada, and we have therefore kept this record at the genus level. Additionally, three predation events took place in captivity: the Golden Poison Frog (*Phyllobates terribilis*) and the Green Dotted Treefrog (*Dendropsophus labialis*) were eaten by the False Coral Snake (*Erythrolamprus epinephalus*; Myers et al. 1978; Acevedo et al. 2016), and the Cauca Caecilian (*Caecilia occidentalis*) was predated by *Micrurus mipartitus* (Vera-Pérez et al. 2019; Supplemental Information Table S2). Together with the new records presented here and the literature search, we compiled 41 records of 22 amphibian species (belonging to two orders, nine families and 16 genera) in the diets of 21 snake species (belonging to three families and 14 genera) in Colombia (Supplemental Information Table S2).

Discussion

The records provided in this study enhance our knowledge of the trophic interactions involving 10 snake species and their amphibian prey in Colombia. The data include new prey items increasing to 22 the amphibian species in the diet of snakes in the country (Rojas Murcia et al. 2016; Acosta-Ortiz and Prado-Moreno 2019; Londoño-Quiceno et al. 2020; Acosta-Ortiz and Agudelo-Gonzalez 2021; Rojas-Morales and Marín-Martínez 2022). Our study is the first to compile and provide both new and historical records of amphibians in the diet of snakes in Colombia. As previously suggested, some snakes are the main predators of anurans, and frogs and toads constitute an important portion of their trophic ecology due to their easy-to-digest bodies (lacking hair, scales, claws, or keratinized parts), their availability as prey, and their frequent occurrence in the same microhabitats where snakes forage (Boyd and Goodyear 1971; Wells 2010; Costa and Trevelin 2020). Information on this interaction, however, is still limited in countries like Colombia, and the new and historical records presented here are essential for understanding these ecological relationships. In this context, incidental observations, along with other sources of information such as X-radiographs of preserved specimens, provide valuable data for poorly studied species.

We propose that X-ray photography is a valuable tool to achieve a more comprehensive knowledge of the natural history of under-studied taxa that are well represented in natural history collections and museums. Radiological procedures are non-invasive and can provide critical data on various aspects of the specimens, including stomach contents and reproductive information such as sex determination (Echeverry-Pérez 2023). Furthermore, our findings expand the geographic scope of documented trophic interactions, adding new records from both trans- and cis-Andean localities in Colombia.

Trans-Andean records.—*Erythrolamprus bizona* and *E. lamonae* are moderately sized snake species, with similar distributions in northern South America (e.g., Colombian Andes; Dixon et al. 1993; Savage 2002; Wallach et al. 2014), exhibiting diurnal activity and primarily terrestrial habits (Savage 2002). *Erythrolamprus lamonae,* recently elevated to species status (Torres-Carvajal and Hinojosa 2020), is poorly known in terms of its natural history, making our record of *Rhinella kumanday* in its diet a valuable step towards understanding its ecological interactions. Moreover, *E. lamonae* is the first known predator of the recently described *R. kumanday* (Caicedo-Martínez et al. 2024). In contrast, *E. bizona*, like other Neotropical species, mainly feeds on other snakes, including the Costa Rica Water Snake (*Hydromorphus concolor*), the Blood Snake (*Stenorrhina freminvillei*), the Black-headed Snake (*Tantilla melanocephala*), and the Ringed Centipede Snake (*T. semiscinta*; Mijares-Urrutia and Arends 1998; Savage 2002; Ramírez-Fernández 2016; Zúñiga-Baos and Rodríguez-Mateus 2020), and occasionally on lizards (Savage 2002; Zúñiga-Baos and Rodríguez-Mateus 2020). The consumption of a *Pristimantis* by *E. bizona* represents a novel record of anurophagy and is the first documented for this species. Further studies are needed to determine whether anuran consumption is rare or common in its diet. Other *Erythrolamprus* species, such as *E. epinephalus,* appear to commonly consume amphibians, suggesting they may be tolerant of amphibian toxins, as evidenced by their ability to consume highly toxic species like the Golden Poison Frog (*Phyllobates terribilis*; Myers et al. 1978) and other anuran species (e.g., the Santander Robber Frog, *Pristimantis anolirex*; Acevedo et al. 2016).

Chironius grandisquamis, C. monticola, and *Drymarchon melanurus* are moderate to large-sized, diurnal and terrestrial snakes (Dixon et al. 1993; Savage 2002). The diet of *Chironius* species primarily consists of anurans, with at least 72 species consumed (Roberto and Ramos-Sousa 2020). Similarly, *C. monticola* is a generalist snake, with a preference for frogs such as *Pristimantis w-nigrum* (Ramírez-Jaramillo and Pozo-Zamora 2020), and lizards of the genus *Anolis* (Dixon et al. 1993; Roberto and Ramos-Souza 2020). This generalist diet is supported by our findings, which included two individuals of *P. w-nigrum* consumed by a *C. monticola* specimen. The diet of *C. grandisquamis* is composed of amphibians, including salamanders and strabomantid frogs (e.g., *Pristimantis* and *Strabomantis*; Roberto and Ramos-Sousa 2020). The presence of *Pristimantis* in the diets of *C. monticola* and *C. grandisquamis* in our study was expected, further confirming the tendency of both species to specialize on amphibian prey (Roberto and Ramos-Sousa 2020). Our record of a *P. achatinus* eaten by *C. monticola* is the second documented case of this interaction and the fifth record of anurophagy for this species (Ramírez-Jaramillo and Poso-Zamora 2020; Roberto and Ramos-Sousa 2020). The records of *P. w-nigrum* are the third documented instance of this interaction in the country (Ramírez-Jaramillo and Poso-Zamora 2020). As suggested by Ramírez-Jaramillo and Posso-Zamora (2020), this interaction may be driven by terrestrial foraging behavior of both species, which, combined with their overlapping geographic ranges, facilitates these interactions.

Drymarchon melanurus has a broad diet, feeding on fish, amphibians, birds, reptiles (including conspecifics), and mammals, which suggests an opportunistic and generalist behavior (Powell et al. 2011; Sunyer and Leonardi 2015; Villa et al. 2015; Brown and Murcia 2021). There are few records of anurans in the diet of *D. melanurus* but examples include the Southern Gulf Coast Toad (*Incilius valliceps*; Henderson and Hoevers 1977), the Milky Treefrog (*Trachycephalus vermiculatus*; Leary and Razafindratsita 1998 as *Phrynohyas venulosa*), the Savage's Thin-toed Frog (*Leptodactylus savagei*; Travers et al. 2011), and the Common Mexican Treefrog (*Smilisca baudinii*; Javier-Vásquez et al. 2020). To our knowledge our records represent the first of *R. horribilis* in the diet of *D. melanurus* in Colombia. Although anurans are easily captured by snakes, their skin toxins pose a threat to predators, often leading to regurgitation (Brizzi and Corti 2007; König et al. 2015; Santos et al. 2016; Ferreira et al. 2019; Yeager et al. 2019). In some cases, toxins can cause predatory failure or even result in the death of the predator (Choi et al. 1999; Ferreira et al. 2019; Costa and Trevelin 2020). In one of our records, the *R. horribilis* died from injuries, and the snake perished presumably due to the toxins produced by the toad.

Micrurus mipartitus is distributed in Brazil, Colombia, Costa Rica, Ecuador, Panama, Peru, and Venezuela (Campbell and Lamar 2004; Ríos-Soto et al. 2018; http://www.reptile-database.org). In Colombia, it is found in the lowlands of the Magdalena and Cauca Valleys, the Pacific and Caribbean plains, and the Orinoquia region, at elevations up to 2,700 m (Ayerbe et al. 1990; Castro-Herrera et al. 2012;

Rojas-Morales 2012; Angarita-Sierra et al. 2013; Ríos-Soto et al. 2018). The diet of *M. mipartitus* has been recorded both in captivity and in the wild, and includes a variety of lizards, snakes, and caecilians (Roze 1966; Ayerbe et al. 1990; Campbell and Lamar 2004; Rodríguez-García and Díaz-Ayala 2015; Vera-Pérez et al. 2019). Notably, *Micrurus* are known to feed on caecilians (Greene 1973; Marques and Sazima 1997; Fernández-Roldán et al. 2021; Barrera-Ocampo and Bran-Castrillón 2023). This interspecific interaction seems to be common due to the fossorial lifestyle of the amphibian and the snake (Ríos-Soto et al. 2018).

Bothrops asper has a wide distribution from Central America to northern South America, from sea level to 1,975 m (Campbell and Lamar 2004; Sasa et al. 2009; Díaz-Ricaurte et al. 2018). This viper is known for its opportunistic and euryphagous feeding habits. According to Loaiza-Lange et al. (2023), its diet undergoes an ontogenetic shift: juveniles feed on a broad spectrum of prey, including arthropods, reptiles, and amphibians, whereas adults tend to specialize more on mammals, consuming rodents (cricetids and echimyids). As a result, the diet of *B. asper* includes centipedes, lizards, snakes, fishes, mammals, birds, and anurans (Sasa et al. 2009). The anurans found in the diet of *B. asper* include species of the genera *Craugastor, Eleutherodactylus, Leptodactylus, Lithobates, Pristimantis, Rheobates, Rhinella* and *Smilisca* (Greene 1997; Boada et al. 2005; Toledo et al. 2007; Sasa et al. 2009; Londoño-Quiceno et al. 2020). Our record of *B. asper* preying on *Craugastor metriosistus,* a frog endemic to the middle and upper Magdalena River Basin (Ospina-Sarria et al. 2015; International Union for Conservation of Nature 2020), is the first documented of this trophic interaction. This finding supports the notion that amphibians play an important role in the diet of *B. asper* (Loaiza-Lange et al. 2023).

The diet of *Xenodon rabdocephalus* is based mainly on anurans of the genera *Leptodactylus, Microhyla, Pristimantis, Rhaebo*, *and Rhinella,* but it also preys on lizards and small birds (Beebe 1946; Martins and Oliveira 1998; Goldberg and Bursey 2007; Dos Santos-Costa et al. 2015; Lima et al. 2020). To our knowledge, the predation of *Rhinella humboldti* by *X. rabdocephalus* is the first documented instance of this interaction. *Rhinella humboldti* is distributed in Colombia at elevations ranging from 400 to 1,000 m (Vargas-Salinas and Aponte-Gutierrez 2013; Torres-Suárez and Vargas-Salinas 2014; http://www.batrachia.com).

Cis-Andean records.—*Helicops angulatus* is an aquatic snake that primarily feeds on fish (Teixeira et al. 2017); however, anurans including species within the families Hylidae, Bufonidae, and Leptodactylidae have been documented in its diet, with both larval and adult stages consumed (Aponte-Gutiérrez et al. 2017; Teixeira et al. 2017; Acosta-Ortiz and Agudelo-Velázquez 2021; Acosta-Ortiz and Vos 2023). Additionally, microhylids have been reported as prey, though these were mistakenly assigned to the snake *Leptodeira annulata* in a previous study (Acosta-Galvis et al. 2022). Our records corroborate earlier findings of *H. angulatus* preying upon anurans of the families Hylidae and Bufonidae.

For *Thamnodynastes pallidus,* little is known about its natural history and feeding habits. Prótazio et al. (2017), however, reported a predation attempt on an individual of the Semi-lined Treefrog *Boana semilineata*. Species within *Thamnodynastes* are known to consume a variety of anurans, with hylid frogs (e.g., *Boana* species) being particularly prominent in their diet (Dorigo et al. 2014; Prótazio et al. 2017), as observed in our study.

Four of our records were based on snakes killed by locals and a road-killed individual, two of the five major threats to Colombian snake species (Lynch 2012). The general negative perception of snakes within local communities seems to be influenced by factors such as gender and scholarship level of a person (Alves et al. 2014; Secco et al. 2014). In Colombia, this negative perception is often tied to association with bad luck, disease transmission, harmful interactions, and even death (Moreno-Rubiano et al. 2023). The specimens in our study exemplify the detrimental effects that human activities can have on the survival of species, underscoring the need for environmental education programs aimed at improving public attitudes toward snakes. Moreover, snakes and other threatened taxa often lack basic information, which hampers the development of effective conservation programs. Natural history information is crucial for initiating more targeted and effective management plans (Zipkin et al. 2020; Nanglu et al. 2023). In the context of our study, understanding the diet of a species can help predict the ecological consequences of losing any of the species involved, whether predator or prey. The absence of a predator or prey can impact population dynamics and lead to cascading changes in the ecosystem (Sewell et al. 2015; Zipkin et al. 2020). Finally, the decline of snake populations in the Neotropics is often linked to

population declines in numerous amphibian species (Zipkin et al. 2020). Therefore, it is essential to continue addressing these knowledge gaps through compilations, further natural history research on poorly studied species, and field observations. This will help generate and refine management strategies for these threatened groups.

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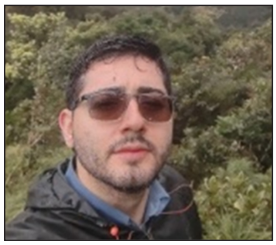
Luis Santiago Caicedo-Martínez is a Biologist from the Universidad de Caldas, Manizales, Colombia, and currently is an Ad honorem Researcher at the Natural History Laboratory, Integrative Zoological Biodiversity Discovery. His main concern and interest are related to the study of the taxonomy, systematics, ecology and natural history of Andean amphibians and reptiles. (Photographed by Luis Santiago Caicedo-Martínez).



José Jaime Henao Osorio is currently in his last semesters of his undergraduate studies in Biology at the Universidad de Caldas, Manizales, Colombia. His main interest is the taxonomy, systematics, and conservation of Neotropical vertebrates. He has participated in different investigations whose objective has been to describe the biodiversity in the northern Andes, as well as to work as an assistant in the management and preservation of vouchers deposited in biological collections. (Photographed by José Jaime Henao-Osorio).

Andrés Fernando Tamayo Zuluaga is a Researcher at the Natural History Laboratory, Integrative Zoological Biodiversity Discovery, Mazinales, Colombia. He received his Bachelor's and Master's degrees in Biological Sciences from the University of Caldas, Manizales, Colombia. His research interests include the assessment of biodiversity and mammal biogeography in the Colombian Andean region, as well as the effects of infrastructure development, such as roads, on local wildlife populations. (Photographed by Andrés Fernando Tamayo Zuluaga).

Juan J. Arboleda-Osorio is currently pursuing a Bachelor's degree in Biology at the University of Caldas, Manizales, Colombia. His main academic interests lie in the ecology, evolution, and taxonomy of vertebrates, with an emphasis on mammals. (Photographed by María Camila Zapata).