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What a herbivore hides: a worm lizard (Squamata: Amphisbaenidae) predation event by *Dasyprocta punctata* (Rodentia: Dasyproctidae) at the Santuario Guanenta-Alto Río Fonce, Colombia

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ABSTRACT

Biodiversity is going through a critical moment worldwide. For many species, useful and relevant ecological aspects for their conservation are still unknown. Non-invasive methods can provide valuable information on behavioral traits that are difficult to observe. Using automatic cameras monitoring Colombia's Cordillera Oriental, we documented a predation event of an *Amphisbaena alba* by *Dasyprocta punctata*. This event represents an important contribution on the species' feeding habits, highlighting how a strict herbivore could present another cryptic trophic trait. This observation is the first of its kind reported for Colombia, and the second known for the species in the wild throughout its distribution.

RESUMEN

La biodiversidad está atravesando un momento crítico a nivel mundial. Para muchas especies, aspectos ecológicos relevantes y útiles para su conservación son aún desconocidos. Los métodos no invasivos pueden aportar información valiosa sobre aspectos del comportamiento difíciles de estudiar. Por medio de un monitoreo con cámaras automáticas en la Cordillera Oriental de Colombia, documentamos un evento de depredación de *Amphisbaena alba* por *Dasyprocta punctata*. Este evento representa una contribución importante sobre los hábitos alimenticios de la especie y destaca cómo un herbívoro estricto podría presentar otro rasgo trófico críptico. Esta observación es el primer evento de su tipo reportado para Colombia y el segundo registrado para la especie en toda su distribución conocida.

The Central American agouti (*Dasyprocta punctata* Gray, 1842), popularly known in Colombia as *conejo negro*, is a medium-sized caviomorph rodent, that mainly inhabits mature and secondary evergreen forest from Mexico through Colombia, to western Venezuela and the western coast of Ecuador, between 0 and 3,200 meters above sea level (m a.s.l.) (Solari et al. 2013; Patton & Emmons 2015). Compared to other species in the genus, *D. punctata* is a diurnal species with a herbivorous diet, consisting mainly of seeds and fruits (e.g., *Astrocaryum standleyanum*) (Jansen et al. 2012). Accordingly, its role as seed disperser and seed predator is widely recognized, which has significant implications in the regeneration and succession processes of Neotropical forests (Smythe 1978; Jansen et al. 2012; Patton & Emmons 2015).

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Although some studies and circumstantial reports have pointed out the potential consumption of vertebrates and invertebrates by a few agouti species (Henry 1999; Silvius & Fragoso 2003, Patton & Emmons 2015; Guimaraes-Silva et al. 2020), this behavior in *D. punctata* is poorly documented, mainly due to its cryptic behavior and preference for dense forested areas (Patton & Emmons 2015). There are only two previous reports, one in the wild in Costa Rica (Calvo et al. 2017), and a historical report in captivity (Smythe 1978). In addition, many aspects of the natural history and ecology of this species are poorly understood, especially for South American populations (Patton & Emmons 2015).

In this note we describe a predation event of *D. punctata* on a vertebrate (the second known for the species in the wild and the first for Colombia), and discuss the implications of it as a potential food resource in a forested area of the FFGARFSR, Cordillera Oriental, Colombia.

From January 8, 2019 to March 30, 2020 we used 114 automatic cameras (Buhsnell Trophy Cam Aggressor HD) in the Tamá, Cocuy and Pisba National Natural Parks, and in t (FFGARFSR). These localities are situated in Santander, Norte de Santander and Boyacá departments, from 1,237 to 4,246 m a.s.l., in the northern part of the Eastern Cordillera of Colombia. A total of 17,100 trap/ nights were implemented to evaluate ecological connectivity, and to prioritize conservation areas for umbrella species present in the region (e.g., *Tremarctos ornatus* and *Puma concolor*). Cameras were configured with the following settings: 24-hour mode, day/night auto-sensor, 15 sec video length, and 15 sec intervals.

The FFGARFSR is a 10,429 ha reserve of montane rain forest (sensu Holdridge 1967), the largest oak (*Quercus humboldtii*) forest reserve in Colombia (Muñoz & Camacho 2010). The identification of the agouti species was based on the review by Ramírez-Chaves et al. (2018). It is important to note that only two allopatric species of agouti are present in Colombia, and only *D. punctata* is present in the Northern Andean region where FFGARFSR is located (Ramírez-Chaves et al. 2018).

On September 5, 2019 at 19:27 h, we registered a predation event of *D. punctata* on another vertebrate at latitude 6.0793611; longitude -73.184277 (WGS84) 2,057 m a.s.l., in a forested area within FFGARFSR. The predation event was recorded through a total of four consecutive videos (videos on https://www.youtube.com/playlist?list=PL-8m0WloqW5FnjVyLX_KYX9NVKcS_LHFvX). In the first video (<https://youtu.be/mA-5POI-zMwE>), an individual of *D. punctata* is observed passing from left to right along the video frame, when suddenly something on the left side of its path caught its attention (Video 1, 19 h: 27 m: 22 s). The agouti stopped, and with a sudden bite in the air close to the ground, detected and captured a worm lizard with its mouth (Video 1, 19 h: 27 min: 27 s). The agouti bit three or four times around the middle of the worm lizard's body, and then grabbed it with its front legs (Fig. 1). Then, the agouti sat on its hind legs and began to consume the worm lizard (Video 1, 19 h: 27 min: 37 s). The agouti did not pause to kill the amphisbaenian and continued consuming it alive (all of Video 2, <https://www.youtube.com/watch?v=MdJWPcfOUWQ&feature=youtu.be>). The third video shows the agouti sniffing and looking around the same spot where it was eating its



prey, turn left to find the amphisbaenian remains, and continue eating it at the same open wound (<https://www.youtube.com/watch?v=oAOXEKHdeFI&feature=youtu.be>). The fourth video (<https://www.youtube.com/watch?v=qVEkOTX-EhE&feature=youtu.be>) started just two minutes later showing the agouti marking the spot with urine, and running into the forest. We found no trace of the prey's remains, indicating its total consumption by the agouti.

The prey was identified as *Amphisbaena alba* Linnaeus, 1758 because of its thick body, its length (i.e. total length > 81 cm, the largest amphisbaenian known), the rounded ends of head and tail, the annular pattern of body scales and its general aspect (Gans 1962, 2005).

Five worm lizard species are currently described as present in Colombia (Uetz 2020). Only two (*Amphisbaena alba* and *A. fuliginosa* Linnaeus 1758) have a distribution that includes the locality within FFGARFSR where our observations come from. The former is easily differentiated from the latter, not only by its thicker and larger body, but also by the larger number of scales around the mid-body and the body annuli, and its dorsum coloration pattern which goes from tan to dark brown, with a few light areas (Vanzolini 2002; Gans 2005; Cole et al. 2013). These characteristics allowed us to identify the agouti prey as a specimen of *Amphisbaena alba*.

The consumption of animal protein by agoutis is a poorly documented behavior, with most field studies describing frugivory as the main diet component in this group (Patton & Emmons 2015). However, Smythe (1978), Silvius & Fragoso (2003), and Dubost & Henry (2006) mentioned that *D. punctata* and *D. leporina* could occasionally change their diet and sporadically ingest carrion when fruits are unavailable. This behavior probably depends on the seasonal abundance of fruits, and/or when habitats are not optimal due to anthropogenic pressures (Smythe 1978; Silvius & Fragoso 2003; Dubost & Henry 2006). Nevertheless, active hunting of other vertebrates by agouti individuals was not recorded until recent years (Calvo et al. 2017).

Our observation shows how little we know of this species, considered mainly as a fruit and seed consumer and disperser. According to Smythe (1978), this behavior had only been recorded in one occasion but in captivity, where an agouti (*D. punctata*) was observed actively killing and almost completely consuming an adult male of *Liomys pictus*. More recently, this behavior was reported for *D. punctata* in Costa Rica by Calvo et al. (2017), preying on a passerine juvenile bird, *Turdus grayi*. Our observation represents the second predation event of *D. punctata* in the wild, and the first for the species in South America (Patton & Emmons 2015).

There may be a specific need that drives herbivorous species to sporadically ingest meat and turns them into opportunistic predators. On one hand, individuals of agouti with more stable territories located in optimal or suboptimal habitats, will eventually experience changes in seasonal fruit availability, and must store food or have to alter their diet (i.e., other plant parts or animal material) in order to survive (Smythe 1978; Silvius & Fragoso 2003; Calvo et al. 2017). However, Smythe (1978) also suggests that juveniles or subadults occupying less optimal habitats will have more trouble finding food, and are the most prone to opportunistic hunting, driven by competition among



conspecifics. Patton & Emmons (2015) mention that within the 10 recognized species of *Dasyprocta*, only *D. leporina* is known to consume animal material (e.g., insects), and several natural history aspects are poorly known for the other species throughout their distribution. Recently, this behavior was documented in *D. azarae* in central Brazil (Guimaraes-Silva et al. 2020), providing evidence that it could be more common in the wild and could not be restricted to one species or continent. Yet, the reasons why these species consume this kind of food are still unknown, and is perhaps a complement to their diets. As mentioned by Calvo et al. (2017), the consumption of animal material would represent a good source of protein and fat during fruit deprivation, even for medium-sized mammals not specialized in consuming other vertebrates.

This work also shows the importance of non-invasive methods to study and document previously unknown natural history aspects, especially for elusive species that are missed by other sampling methods (Tobler et al. 2008; Arias-Alzate et al. 2012; Delgado-V et al. 2014; Burton et al. 2015; Cáceres-Martínez et al. 2016; Guimaraes-Silva et al. 2020). This event represents an important contribution to our knowledge of the species' natural history, adding information that could be used for conservation.



Figure 1. *Dasyprocta punctata* predating on *Amphisbaena alba* in the FFGARFSR, Eastern Cordillera of Colombia.

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