Predation on *Rhamphocelus carbo* (Pallas, 1764) (Aves: Thraupidae) by the neotropical carnivorous bat *Vampyrum spectrum* (Linnaeus, 1758) (Mammalia: Phyllostomidae) in a forest management area of eastern Amazon, Brazil

Predação de *Rhamphocelus carbo* (Pallas, 1764) (Aves: Thraupidae) pelo morcego carnívoro neotropical *Vampyrum spectrum* (Linnaeus 1758) (Mammalia: Phyllostomidae) em uma área de manejo florestal no leste da Amazônia, Brasil

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Abstract: We report an episode of predation on the passerine bird *Rhamphocelus carbo* by the bat *Vampyrum spectrum*. This event occurred in LN Guerra Group camp, located in the Uberlândia Forest Management Unit, private property in an area of the Amazon rainforest, near Portel on Marajó Island, State of Pará, eastern Brazilian Amazon. At 5:00 a.m. on August 29th, 2020, a specimen of *V. spectrum* preyed on a specimen of *R. carbo* next to the visitors' dormitory. The bat captured the bird by its head, leaving only its wings and feet after feeding. This predator behavior report is of interest as it demonstrates the feeding habits and natural history of a bat species considered by the IUCN Red List of Threatened Species as Near-Threatened. In addition, it is important because it was recorded by a person with no training in biology, whose interest in wild fauna was aroused due to our presence. We consider this influence a significant incentive for biodiversity preservation by operators.

Keywords: Natural history. Passeriform. Chiroptera. Tocantins River Basin.

Resumo: Neste trabalho, relatamos um episódio de predação sobre a espécie de ave, a pipira-vermelha *Rhamphocelus carbo*, pelo morcego *Vampyrum spectrum*, na floresta amazônica, em uma área onde ocorrem atividades de exploração madeireira, em Portel, ilha de Marajó, Pará, Brasil. O fato ocorreu no acampamento da empresa responsável pelo manejo florestal, o grupo LN Guerra. Às cinco horas do dia 29 de agosto de 2020, um *V. spectrum* predou um indivíduo de *R. carbo* ao lado do dormitório dos visitantes. O morcego capturou a ave pela cabeça, deixando no final da predação apenas asas e patas. Esse relato de comportamento é de interesse, pois demonstra o hábito de alimentação e a história natural de uma espécie de morcego considerada pela IUCN na categoria *Near Threatened*. Além disso, é importante destacar que o registro foi gravado por uma pessoa não formada em biologia, mas que, com a nossa presença, começa a despertar interesse pela fauna silvestre, o que consideramos importante como incentivo à preservação da diversidade por parte dos operadores dos planos de manejo.

Palavras-chave: História natural. Ave passeriforme. Chiroptera. Bacia do rio Tocantins.

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INTRODUCTION

Vampyrum spectrum (Linnaeus, 1758), the biggest bat of the Neotropics (Goodwin & Greenhall, 1961; Vehrencamp et al., 1977; Navarro & Wilson, 1982), is considered a Near-Threatened species on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species (Solari, 2018). This species is a top predator that controls small animal populations and is difficult to record, especially when feeding (Aguirre et al., 2008). Besides birds and rodents, the diet of *V. spectrum* includes insects and fruits (Discher et al., 2009). Understanding the ecology of threatened species is essential for devising conservation strategies. Thus, natural history data such as feeding behavior and habitat are fundamental.

A study by Discher et al. (2009) on the diet of *V. spectrum* in Cacoal, State of Rondônia, southwestern Brazilian Amazon, in transition with the Cerrado domain, recorded predation on the *Crotophaga ani* Linnaeus, 1758 (smooth-billed ani) and found remains of *Mus musculus* Linnaeus, 1758 (house mice) in the stomach content of the bats. In Costa Rica, Vehrencamp et al. (1977) found that *V. spectrum* preyed on 18 bird species in one year, preferring non-passerine birds to passerines. That survey reported *V. spectrum* selecting birds weighing between 20 g and 150 g and sleeping in foliage.

The silver-beaked tanager *Ramphocelus carbo* (Pallas, 1764) is a passerine bird with a wide distribution in South America, including southeastern Colombia, eastern Ecuador, eastern Peru as far south as Ucayali, south of the Orinoco River in Venezuela, Guyana, and southward central Brazil (Hilty, 2020). *Ramphocelus carbo* uses shrubs in forest edges, plantations close to dwellings, and shrubs along rivers as habitat resources, mainly distributed in anthropized areas (Hilty, 2020; Souza et al., 2020).

Hernández-Ruz (2019) described a predation event on *R. carbo* by a green vine snake *Oxybelis fulgidus* (Daudin, 1803) in an area of rainforest vegetation at the Paragominas, State of Para, in southern Amazonia, Brazil. Like the one indicated in this study, that area houses a camp in a forest management area. *R. carbo*, which is a common bird in the region, is a potential prey while searching for food (Hernández-Ruz, 2019) or resting, as recorded in the present study

This paper describes the first record of predation on *R. carbo* by the endangered Neotropical carnivorous bat species *V. spectrum* in LN Guerra Group camp, located in the Uberlândia Forest Management Unit in eastern Brazilian Amazon, a private area under a forest management plan that allows fauna preservation.

MATERIAL AND METHODS

The study area is in the Uberlândia Forest Management Unit, a private unit belonging to the Martins group in the municipality of Portel, State of Pará, Brazil. Management and timber extract rights were granted to the LN Guerra Group in 2011, and the Forest Stewardship Council certified the management plan (FSCC121820/2020). The total effective management area comprises 128,934.69 hectares of primary forest organized into 35 annual production units of approximately 3,500 hectares each (Santos et al., 2016).

The reported predation occurred on the roof of a shed at the LN Guerra Group camp, located at 2° 59' 27" S, 50° 05' 24" W; WGS 84 (Figure 1), in the Uberlândia Forest Management Unit, and was recorded using a smartphone.

RESULTS

On August 29th, 2020, we recorded a predation event by *V. spectrum* on *R. carbo*. The event occurred at the LN Guerra Group camp of the Uberlândia Forest Management Unit. At 5:00 a.m., one of the authors, Guilherme Bueno de Souza Junior, heard a silver-beaked tanager coming from the mango trees (*Mangueira indica* L.) next to the camp's dormitory. A bat quickly caught the bird and took it into the camp, holding it by the head (online supplementary material). After some time, the bat became sated, letting only the feet and wings of *R. carbo* fall to the camp's ground.

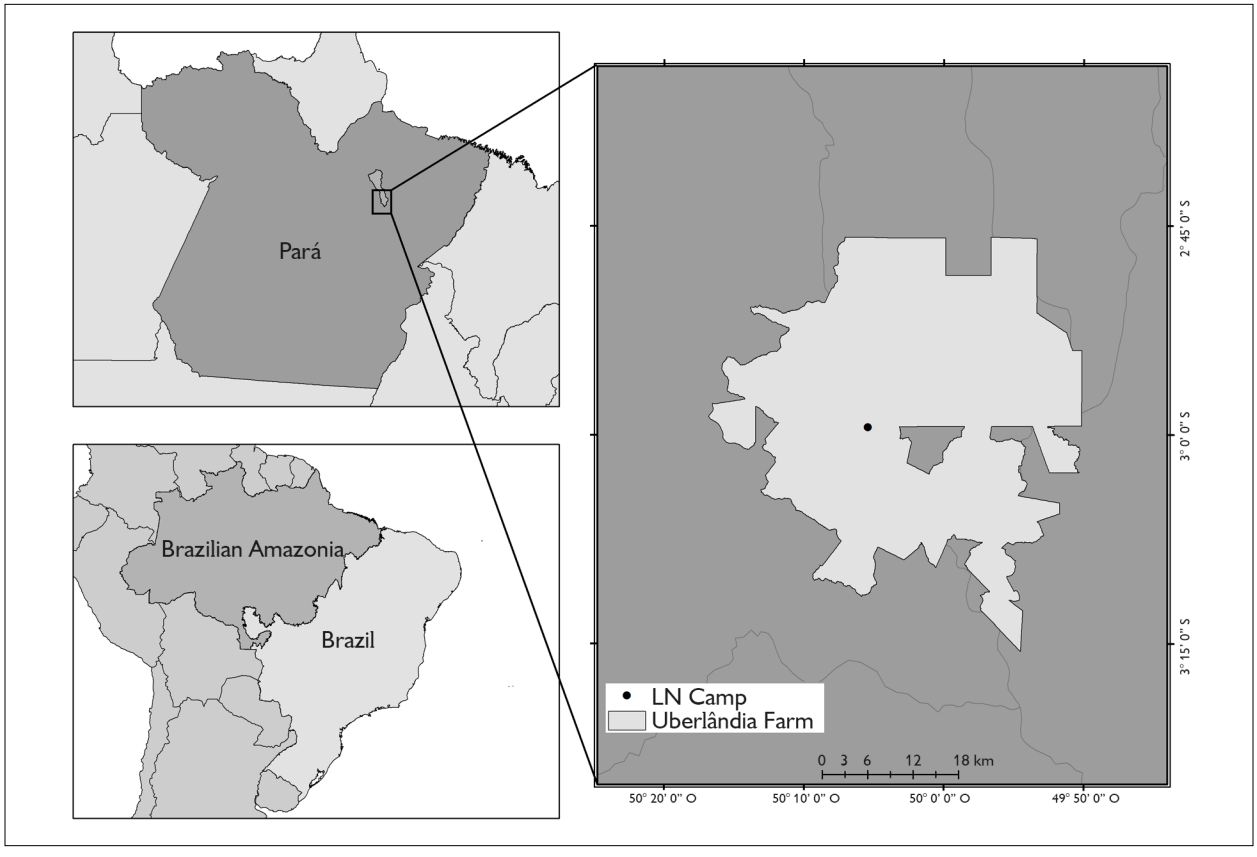

Figure 1. Localization of the LN Guerra Grouop camp in the *Fazenda Uberlândia*, municipality of Portel, State of Pará, Brazil. Forest Management Unit. Shapefile from MapBiomas Brasil (n.d.).

We identified the bat individual by comparing its external morphology with other carnivore bats, such as species of the Subfamily Phyllostominae (Williams & Genoways, 2008). In addition, we considered the bird's (the prey) body size, the dimension of the timber roof support used by the bat as a refuge to ingest the prey, and evaluated the prey size concerning the same objects. We concluded that the bat was a *V. spectrum* specimen based on the exceptional nature of the species, the biggest bat recorded for the New World (Gardner, 2008), with a wingspan of approximately 70 to 90 cm that can reach up to 1 m (Nowak, 1994). Additionally, the species has confirmed occurrence records for the State of Pará and the neighboring states of Amapá, Amazonas, Mato Grosso, and Tocantins (Discher et al., 2009; Bernard et al., 2011).

The gray-breasted martin *Progne chalybea* (Gmelin, 1789) and the *R. carbo* are two birds of the order Passeriformes frequently seen on the same site at LN Guerra Group camp in the Uberlândia Forest Management Unit (EJHR, personal communication, 2022). The former species sleeps on roofs of the area near the office, while the *R. carbo* sleeps in the mango trees (*Mangueira indica* L.) (EJHR, personal communication, 2022). In the video[1], it was only possible to observe the posterior part of the bird's body, which is black at the top with the lower parts washed in reddish-brown (Antas, 2004), corresponding

[1] See supplementary material to this article in video available at http://editora.museu-goeldi.br/bn/artigos/cnv17n2_2022/predation.mp4.

to the characteristics of *R. carbo*. In addition to the sounds emitted by the two bird species, the video depicts that the preyed bird specimen differs from *Progne chalybea* by color pattern and caudal morphology. The bird captured by the bat does not present the characteristic pitchfork caudal shape of *P. chalybea*; hence, we confirm that the prey was a specimen of *R. carbo*.

DISCUSSION

In a comparative study on the diet of the Vampyrinae (*sensu* Baker, 1989) species *Trachops cirrhosus* (Spix, 1823), *Chrotopterus auritus* (Peters, 1856), and *V. spectrum* in Brazil, Bonato et al. (2004) found a bat's feeding preference for insects, rodents, and birds, respectively. It is worth emphasizing the importance of our record since previous studies are based on indirect observations such as the collection of feeding remains (Vehrencamp et al., 1977) and gastrointestinal contents (Bonato et al., 2004) from perches. Despite the importance of these studies, recording a predation event allows relating the feeding behavior to the event's location. As Harris et al. (2010) propose, doing so is significant because locating, recognizing, quantifying, and understanding animal behaviors on a large scale in their natural environment are fundamental steps to managing and conserving the complexity of natural systems. Our report aimed to describe a predation event with audiovisual information, although the objective of our initial work was not to look for any specific species by following traditional research steps. Nevertheless, we highlight this disclosure as an essential tool for environmental education and the production of scientific knowledge.

Ecologists worldwide have widely developed imaging identification by camera traps (O'Connell et al., 2011), demonstrating the relevance of using this technique for fauna identification and monitoring. This technology allows revealing more about the ecology of wild animal feeding behaviors, especially those with nocturnal habits or highly elusive to the human presence (Trolliet et al., 2014).

It was impossible to record the bat's foraging strategy before the reported predatory event, and the small amount of new data on the foraging behavior of *V. spectrum* is particularly noteworthy. As *V. spectrum* is a top predator occurring in low densities, it is vulnerable to local extinctions (Aguirre et al., 2008). This feature may justify directing efforts to obtain population data related to its geographical distribution, aiming to conserve a species that faces several threats, such as habitat destruction and fragmentation (Solari, 2018). Regarding biodiversity conservation, forest management can be a suitable alternative to typical logging activities. However, many foresters have shown resistance to assessing the impact of fauna management plans.

Nevertheless, needing to comply with principle nine of the Forest Stewardship Council, those management plans, especially those seeking certification, must implement faunal identification and monitoring (Jennings et al., 2003), which is an excellent criterion to include in the management plan evaluation. Implementing this criterion benefits science as it facilitates access by several researchers to areas with complicated access logistics, allowing us to continue providing data on the natural history of the Amazon fauna. Finding an uncommon and endangered species in a forest management area indicates that this kind of management can indeed be sustainable and help conserve fauna that otherwise faces extinction through processes that destroy the forest cover.

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AUTHOR'S CONTRIBUTION

E. J. Hernández-Ruz contributed to writing (editing review), and formal analysis; W. Gonçalves to metodology and writing (original draft, Editing Review); F. O. N. Pereira writing (original draft, Editing Review) to writing (original draft, Editing Review); I. F. França to writing (original draft, Editing Review); G. B. Souza Junior to metodology and writing (original draft); C. G. Santos to writing (original draft, Editing Review); and S. Farias to methodology and writing (original draft, Editing Review).