NOTES

Mammalogy Notes ISSN 2382-3704
https://doi.org/10.47603/mano.v9n2.372

Natural history

Notes on the foraging of spiders by marmosets (Primates: Callitrichidae) in an urban environment in Minas Gerais, Brazil

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Abstract

Callithrix penicillata, the marmosets, were introduced in several areas of Brazil and established themselves as invaders causing environmental imbalance in the native fauna. The diet of marmosets is quite broad and includes small arthropods, such as spiders, which play a fundamental role in the ecosystem. To capture web spiders, marmosets have been observed to exhibit two main strategies that are clearly learned and perfected with age.

Key words: Biological control; Environmental impact; Predation; Urban plague.

Resumen

Callithrix penicillata, los titíes, fueron introducidos en varias áreas de Brasil y se establecieron como invasores provocando desequilibrio ambiental en la fauna nativa. La dieta de los titíes es bastante amplia e incluye pequeños artrópodos, como las arañas, que juegan un papel fundamental en el ecosistema. Para capturar arañas de tela, se ha observado que los titíes exhiben dos estrategias principales que claramente se aprenden y perfeccionan con la edad.

Palabras clave: Control biológico; Depredación; Impacto medioambiental; Plaga urbana.

Callithrix penicillata (É Geoffroy 1812), popularly known as marmosets, belong to the Callitrichidae family. They are small primates and live in social groups composed of two to thirteen individuals (Valle et al., 2021). As a target of animal trafficking, in the 1970s and 1980s *C. penicillata* was removed from its original habitat in the Cerrado biome and introduced into various areas of Brazil, especially in the southeastern Atlantic Forest biome. (Vale et al 2020; Gestich et al 2023). Due to its environmental plasticity, it established as an invasive species (Carvalho et al. 2013; Valle et al. 2021) mainly in the Atlantic Forest region of the southeast of the country (Vale, 2016); causing several environmental impacts (Vale & Prezoto 2015).

Its success as an invasive species in colonizing new habitats and the damage it causes are explained by its inherent biological characteristics. These small primates are able to

survive in small areas, degraded fragments, and close to urban environments (Traad, 2012; Vale et al. 2020). Breeding females can give birth to up to 4 offspring per year, quickly reaching high population densities. They can consume a wide variety of food items, including food offered by humans (Milagres 2015).

The predation of marmosets on native fauna has been documented mainly for birds, chicks and eggs (Begotti and Landesmamn 2008; Silva et al. 2008; Galleti et al. 2009; Gomes and Lima-Gomes 2011; Alexandrino 2012; Silva and Voltolini 2015). Studies on the decline of bird populations, mainly on islands, have pointed to introduced marmosets as being one of the responsible factors (Bonverdop and Galleti et al., 2007; Santos et al., 2007; Galleti et al. 2009; Dias 2012). However, data and studies for other groups, such as amphibians and snakes, are still very scarce (Santos 2009); and there are no reports of arthropod predation.

Despite the specialization of marmosets in Exudativoria (Rylands et al 1993), it is known that the choice of food items can vary according to the availability in the spatial and temporal distribution of food (Vilela and Faria, 2002; Francisco et al., 2015); where animal predation exceeds that of plant exudates (Vilela and Faria 2004; Zago 2012, Zago et al. 2013). In studies on marmoset diets, spiders are included as commonly consumed food items (Vilela 2007; David 2005). Spiders comprise a very significant portion of the diversity of terrestrial arthropods (Toti et al. 2000), and are considered of great ecological importance, as they act as indicators of environmental conditions and exercise biological control of insect populations (Benati 2005; Rinaldi 2005). Thus, the aim of this study was to provide information on the foraging behavior of *C. penicillata* on Nephila sp., as well as discussing the potential indirect impact on the insect vector fauna in urban environments.

Observations were made following the ad libitum method (Altman 1990) at the Mariano Procópio Museum, located in the municipality of Juiz de Fora, Minas Gerais, Brazil (21° 43' 28" S, 43° 16' 47" W). The area is characterized by tree cover, with fruit species such as the jabuticaba tree [*Plinia cauliflora* (Mart.) Kausel (Myrtaceae)] as well as endangered species such as the Paraná pine [Araucaria angustifolia (Bertol.) Kuntze (Araucariaceae)]. A video footage was taken and deposited at Zenodo https://doi.org/10.5281/zenodo.10056469

Two groups of marmosets were observed inspecting *Trichonephila clavipes* (Linnaeus 1767) webs. The first group comprised three adult individuals and the second three adults and one juvenile. The preys were composed exclusively of females, following the order of capture from the largest to the smallest. In this group of spiders, sexual dimorphism is associated with size, that is, the females exhibiting gigantism and males displaying dwarfism (Vollrath and Parker 1992).

Approximately 15 individuals were recorded. The foraging behavior commenced with direct prey observation to determine the optimal strategy for capture, which varied depending on the web's position within the vegetation. In cases where there were no trees or branches capable of supporting the predator's weight, it would leap onto the web and capture its prey on the ground (Maciel & Barbosa 2023), as observed in the first group, which foraged within the undergrowth. The second strategy observed is that when the webs are between tangles of branches, the marmosets position themselves in such a way that it is possible to manipulate the branches to access prey, as in the foraging location of the second group.

It can be said that the selection capacity of the foraging strategy is related to the experience of each individual, which can be proven by the fact that the youngster presents in the second group exhibited jumping behavior, instead of direct manipulation, that is, spent more energy than adults because he was still in the learning phase.

The Mariano Procópio Museum presents an intense flow of people and free consumption of food, which provides an integration between marmosets and humans in relation to the food supply. Even so, marmosets still have a natural hunting behavior, which demonstrates that these preys are essential in their diet. However, with the establishment of the population of these primates in urban areas and the consequent competition for resources, the predation of these spiders by marmosets could intensify.

Additional research in this area is crucial to understand the broad ecological implications of marmoset behavior in urban environments and to guide conservation and management efforts. The aim is to achieve a balance between introduced species, native fauna and human-altered landscapes.

ACKNOWLEDGMENT

This work was supported by the Universidade Federal de Juiz de Fora (UFJF), Instituto Nacional de Pesquisas da Amazônia (INPA), Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES), Conselho de Desenvolvimento Científico e Tecnológico (CNPq) and Fundação de Amparo à Pesquisa do Estado do Amazonas (FAPEAM).

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Editor: Diego J. Lizcano
Received 2023-07-05
Reviewed 2023-08-01
Accepted 2023-11-01
Published 2023-11-20