

DIET OF THE ENDEMIC RODENT *THRICHOMYS LAURENTIUS* THOMAS, 1904 IN A SEASONALLY DRY TROPICAL FOREST FRAGMENT: IMPLICATIONS FOR CONSERVATION

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DIETA DO ROEDOR ENDÊMICO *THRICHOMYS LAURENTIUS* THOMAS, 1904 EM UM FRAGMENTO DE FLORESTA TROPICAL SAZONALMENTE SECA: IMPLICAÇÕES PARA A CONSERVAÇÃO

Abstract. This study investigated the diet of the endemic rodent *Thrichomys laurentius* Thomas, 1904 in a preserved fragment of the Caatinga in the municipality of Upanema, Rio Grande do Norte, Brazil. The research was based on fecal content analysis obtained from four monthly samplings across different climatic seasons. Food items were classified and quantified using the index of alimentary importance. The results showed a predominance of plant material (97.03%), followed by animal fragments (1.25%) and mineral particles (1.72%). Spearman's correlation revealed a negative association between plant consumption and increased rainfall, while the intake of animal items increased during the rainy season. The presence of stone fragments appears to be related to accidental ingestion. The dietary composition of *T. laurentius* demonstrated seasonal flexibility and a preference for plant items, suggesting ecological adaptations to semiarid dynamics. These findings provide novel data on the species' feeding ecology and offer valuable support for conservation strategies.

Keywords: mammal conservation; feeding ecology; seasonal diet; semiarid.

Resumo. Este estudo investigou a dieta do roedor endêmico *Thrichomys laurentius* Thomas, 1904 em um fragmento preservado da Caatinga, no município de Upanema, Rio Grande do Norte, Brasil. A pesquisa baseou-se na análise de conteúdo fecal obtido durante quatro coletas mensais em estações climáticas distintas. Os itens alimentares foram classificados e quantificados segundo o índice de importância alimentar. Os resultados demonstraram predomínio de material vegetal (97,03%), seguido de fragmentos animais (1,25%) e partículas minerais (1,72%). A correlação de Spearman revelou associação negativa entre o consumo de material vegetal e o aumento das chuvas, enquanto a ingestão de itens animais aumentou durante a estação chuvosa. A presença de fragmentos de pedra parece estar relacionada à ingestão acidental. A composição alimentar de *T. laurentius* revelou flexibilidade sazonal e preferência por itens vegetais, sugerindo adaptações ecológicas relevantes à dinâmica do semiárido. Esses achados contribuem com dados inéditos sobre a ecologia alimentar da espécie e fornecem subsídios importantes para estratégias de conservação.

Palavras-chave: conservação de mamíferos; ecologia alimentar; dieta sazonal; semiárido.

1 INTRODUCTION

The Caatinga is a seasonally dry tropical forest, and the only biome entirely confined to Brazilian territory. It exhibits high levels of endemism and supports species uniquely adapted to extreme climatic conditions, including prolonged drought and unpredictable rainfall patterns (Miranda; Oliveira; Camacho, 2022). Its ecological singularity and species richness make it a priority for biodiversity research and conservation (Fernandes *et al.*, 2022).

Among the mammal's endemic to this biome, the São Lourenço punaré (*Thrichomys laurentius* Thomas, 1904) stands out. This rodent is restricted to northeastern Brazil and displays morphological traits such as dense fur and grey coloration (Correa-Cárdenas *et al.*, 2020). It also demonstrates a capacity to exploit heterogeneous habitats, from rocky outcrops to anthropogenic refuges (Neves; Pessoa, 2011).

In semiarid ecosystems like the Caatinga, temporal and spatial fluctuations in resource availability can exert strong selective pressures on feeding strategies. Understanding the dietary ecology of endemic species in such systems is crucial to unravel ecosystem dynamics and inform conservation efforts (Costa-Pinto; Bovendorp; Palma, 2023). Dietary patterns serve not only as reflections of resource use but also as indicators of niche breadth, interspecific interactions, and habitat quality (Arregoitia; D'Elía, 2021).

Despite the ecological importance of small mammals in nutrient cycling and seed dispersal, information on the diet of *T. laurentius* remains virtually nonexistent. To date, no peer-reviewed studies have addressed its feeding habits in natural settings, even though related species in the genus *Thrichomys* have demonstrated diverse trophic profiles (Carvalhoes *et al.*, 2019). Studies addressing this gap are essential, particularly within preserved forest fragments, where ecological processes may remain relatively intact (Harmange *et al.*, 2023). Dietary analyses provide insight into trophic preferences, niche specialization, and adaptive responses to resource seasonality (Ademola *et al.*, 2022).

The absence of empirical data on the feeding ecology of *T. laurentius* is especially concerning given its “Data Deficient” status on the International Union for Conservation of Nature Red List (IUCN, 2023). This designation underscores the urgent need for basic ecological information to support future conservation planning.

This study aims to address that knowledge gap by documenting, for the first time, the diet of *T. laurentius* in a preserved Caatinga fragment. Specifically, we (i) characterize the seasonal composition of its diet, (ii) evaluate potential correlations with resource availability, and (iii) discuss implications for conservation. Our findings are expected to advance ecological understanding of this species and contribute to evidence-based strategies for protecting both *T. laurentius* and its threatened habitat.

2 MATERIAL AND METHODS

2.1 Study area

The Caatinga is a semi-arid biome located in northeastern Brazil, characterized by pronounced seasonality and a high degree of endemism. It experiences a prolonged dry season lasting seven to eight months, interspersed with a short and irregular rainy season. Annual temperatures often exceed 25°C, with peaks during the dry months. Precipitation ranges from 300 to 800 mm per year, predominantly concentrated in the austral summer and distributed unevenly across the region (Santos *et al.*, 2023). Despite these harsh conditions, the Caatinga sustains a rich biodiversity composed of flora and fauna adapted to extreme water scarcity (Leite *et al.*, 2022).

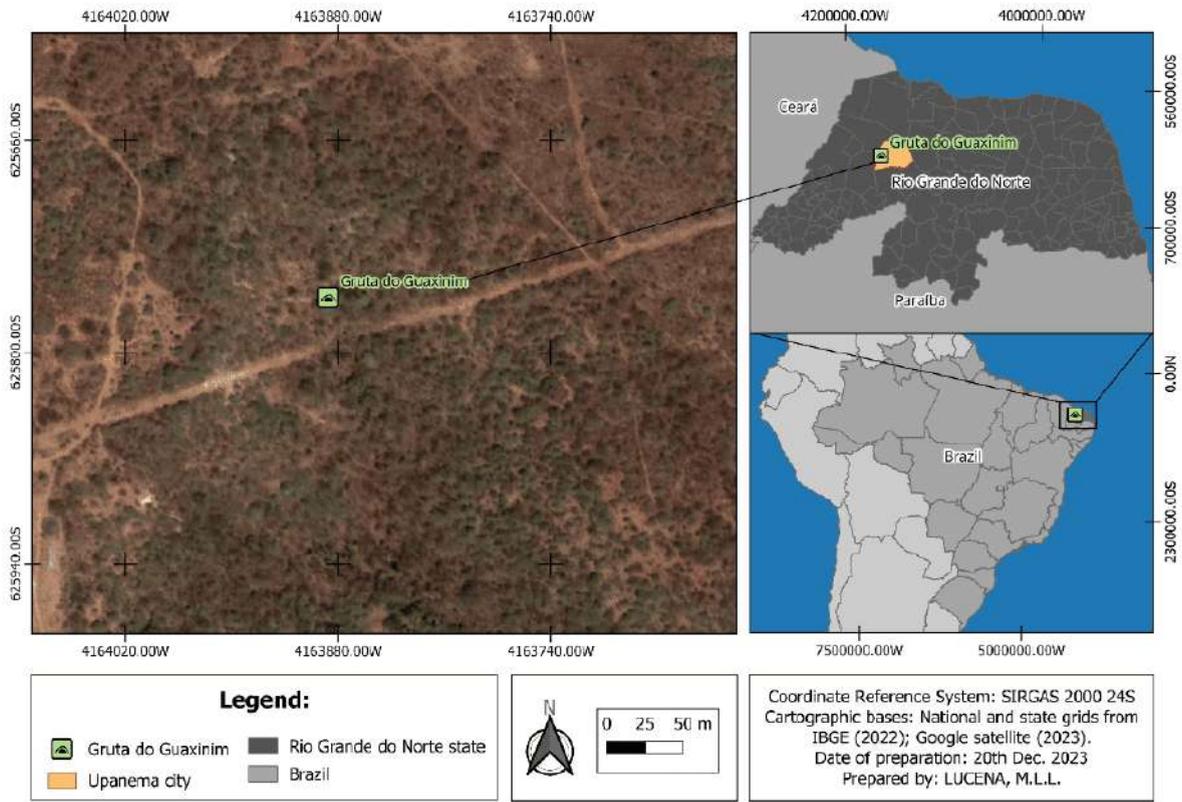
Fieldwork was conducted in the rural zone of Upanema municipality, in the state of Rio Grande do Norte, Brazil. The focal site was Gruta do Guaxinim, a well-preserved Caatinga fragment that serves as a representative microhabitat for studying endemic small mammals (Figure 1).

The area was selected due to its ecological integrity and conservation status, providing a suitable natural setting to investigate the feeding ecology of the São Lourenço punaré (*Thrichomys laurentius* Thomas, 1904). The site includes rocky outcrops and vegetative cover characteristic of the Caatinga, offering natural shelters used by the species (Figure 2).

2.2 Data collection

Fieldwork was conducted across four sampling events in January, February, March, and April of 2023. This schedule was designed to capture dietary variation in *Thrichomys laurentius* across contrasting seasonal periods—specifically, dry versus rainy seasons. Seasonal classification was based on local precipitation data obtained from the *Rio Grande do Norte* Agricultural Research Corporation (EMPARN, 2023). According to these records,

Figura 1: Preserved Caatinga fragment at Gruta do Guaxinim, Upanema, Rio Grande do Norte, Brazil.



Source: Authorial.

Figura 2: A. Rock crevices used by *Thrichomys laurentius* as shelter; B. Zoomed view highlighting exposed rocky structures.



Source: Authorial.

January and February represented the dry season, while March and April were classified as rainy months (Figure 3). This temporal stratification allowed us to assess the potential influence of climatic seasonality on the feeding patterns of *T. laurentius*.

Species presence was confirmed through direct visual identification. Diet analysis was based on fecal content, collected using a standardized field protocol. Sampling began with the identification of active sites, based on the visible abundance of rodent feces. To attract individuals and ensure fresh samples, fruit baits (banana and mango) were placed on a cloth (50 × 40 cm) colored to match the natural substrate. These cloths were left out overnight, and fecal pellets deposited during this period were collected early the next morning.

To preserve sample quality, feces were promptly retrieved to avoid bait decomposition or contamination. Each sample was stored in labeled polyethylene containers indicating the collection date and location. Samples were then transported under controlled conditions to the laboratory for detailed fecal analysis. This approach ensured a non-invasive, reproducible, and seasonally representative dataset for evaluating the diet of *T. laurentius* within the Caatinga ecosystem.

2.3 Data analysis

In the laboratory, each sample was initially recorded on an analysis sheet noting the number of fecal pellets and the total fecal volume. Volume was determined by liquid displacement: feces were submerged in 70% ethanol within a graduated cylinder, and the displacement of fluid indicated the total volume.

Subsequently, fecal matter was diluted in 70% ethanol and transferred to a Petri dish for analysis under a stereoscopic microscope. Using fine forceps, all identifiable components were carefully separated for detailed examination. Each dietary item was then measured for volume using a millimeter-lined grid plate, following the protocol described by Bastos, Miranda e Garcia (2013).

For each item, two metrics were calculated: frequency of occurrence (percentage of samples containing the item) and volumetric frequency (volume of the item relative to total fecal volume). These values were then used to compute the Alimentary Importance Index (IA_i), expressed as a percentage, according to the formula proposed by Kawakami e Vazzoler (1980). This integrative index quantifies the relative contribution of each food item to the overall diet, combining both presence and volumetric relevance.

2.4 Statistical analysis

Due to the non-normal distribution of the dataset, non-parametric methods were applied. Specifically, Spearman's rank correlation was used to examine pairwise relationships among the variables: Vegetal, Animal, Stone, and Rainfall.

The strength and direction of correlations were interpreted as follows: values approaching +1 indicated strong positive associations, values near -1 indicated strong negative associations, and values close to 0 suggested weak or no correlation. Statistical significance was evaluated at a 0.05 alpha level.

All analyses were performed using PAST software, version 4.13 (Hammer, 2024), a platform commonly used for ecological and paleontological data analysis.

3 RESULTS

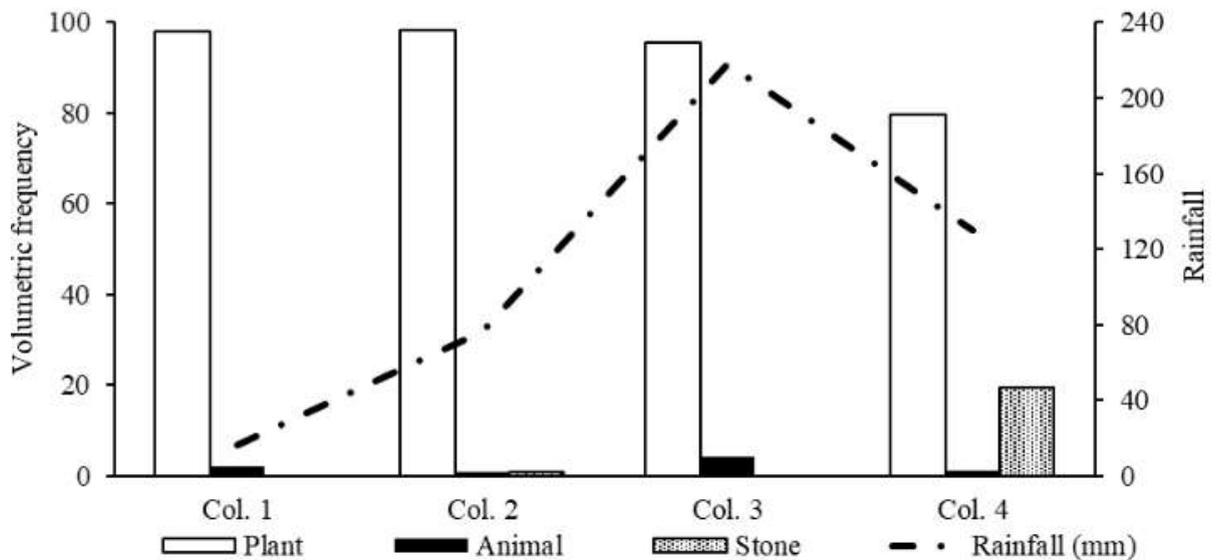
Dietary analysis of *Thrichomys laurentius* Thomas, 1904, based on fecal samples collected in January through April 2023 in a preserved Caatinga fragment (Upanema, *Rio Grande do Norte*), revealed a consistent predominance of plant-derived material. According to the Alimentary Importance Index (IA_i%), plant items accounted for 97.03% of the total diet, followed by animal remains (1.25%) and sediment/rock fragments (1.72%).

Throughout the four monthly collections, the Plant category was dominant, ranging from 79.57% to 98.30%, with higher proportions in the dry season (collections 1 and 2). Fibrous plant matter was visually prominent in these early samples. A reduction in plant volume was observed in collections 3 and 4, coinciding with the rainy season.

The Animal category, comprising insect and arachnid fragments, showed a slight increase in March and April, varying from 0.73% to 4.35%. Stone particles were present in collections 2 and 4, with a notable increase (up to 19.35%) in collection 3. These findings suggest a degree of dietary plasticity in response to seasonal changes in resource availability.

Importantly, the presence of animal matter in the diet was positively associated with increased rainfall, particularly during the rainy season collections (Figure 3), implying opportunistic incorporation of invertebrates when conditions favor their abundance.

Figure 3: Volumetric frequency of dietary items (plant, animal, and stone) in fecal samples of *Thrichomys laurentius* Thomas, 1904, across four monthly collections (Col. 1–4) in a preserved Caatinga fragment, Upanema, Rio Grande do Norte, Brazil. Rainfall (mm) is represented as a secondary axis. Col. = collection.



Source: Authorial.

The Spearman's rank correlation matrix revealed relevant patterns in the dietary composition of *Thrichomys laurentius* in relation to rainfall (Figure 4). A moderate inverse correlation between plant material and rainfall ($r_s = -0.60$) indicates a reduction in plant consumption during wetter months. Similarly, a weak-to-moderate negative association between plant and stone content ($r_s = -0.32$) may reflect seasonal shifts in dietary or foraging behavior.

A strong negative correlation was found between animal and stone items ($r_s = -0.74$), suggesting a possible spatial or behavioral separation in resource use. In contrast, animal items correlated moderately and positively with rainfall ($r_s = 0.40$), pointing to increased invertebrate intake during the rainy season—likely due to higher arthropod availability.

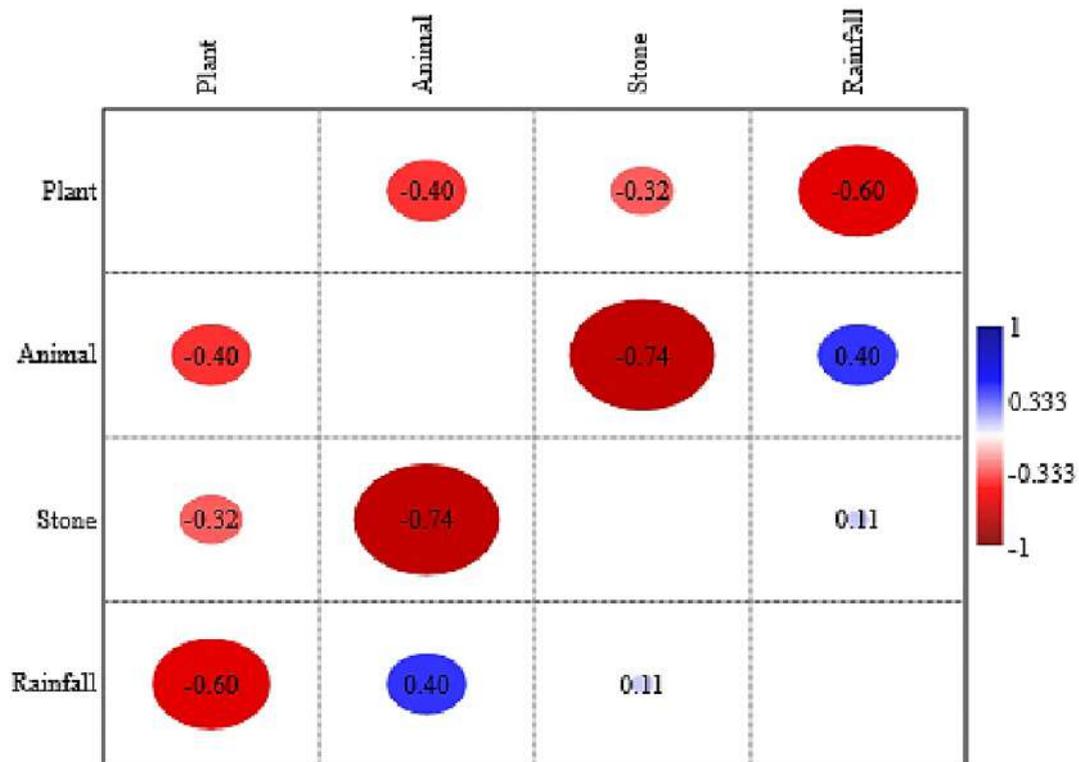
No notable correlation was detected between stone fragments and rainfall ($r_s = 0.11$), reinforcing the idea that stone ingestion is incidental. A summary of correlation coefficients and their ecological interpretations is presented in Table 1.

4 DISCUSSION

The diet analysis of *Thrichomys laurentius* (Thomas, 1904), using the alimentary importance index (IAi%), confirmed a predominantly herbivorous diet (97.03%), classifying the species as a specialist herbivore (Pineda-Munoz; Alroy, 2014). Plant material dominated all collections, particularly fibrous parts in the drier months (collections 1 and 2), implying possible seed consumption. This pattern is consistent with the known morphological adaptations in rodents that process fibrous, low-nutrition plant tissues (Arregoitia; D'Elía, 2021).

During the rainy season (collections 3 and 4), fibrous components declined while husks and reproductive parts increased, likely due to the seasonal availability of younger, more nutritious plant tissues (Newell; Ausprey; Robinson, 2023). This dietary pattern reflects adaptive feeding consistent with prior findings in Echimyidae rodents, including *T. fosteri*, which uses understory vegetation for fruit foraging (Hannibal *et al.*, 2019), and *T. laurentius* in Lajes, Rio Grande do Norte, feeding on cactus fruits (Paixão *et al.*, 2023).

Figura 4: Spearman's rank correlation matrix (r_s) among dietary components (plant, animal, and stone) and rainfall in *Thrichomys laurentius* Thomas, 1904, in a Caatinga fragment (Upanema, Rio Grande do Norte, Brazil).



Source: Authorial.

Despite the predominance of plant material, the presence of animal items across all collections, especially insect and arachnid fragments in wetter months, demonstrates opportunistic omnivory. This increase aligns with greater arthropod availability during the rainy season (Hannibal *et al.*, 2019). Arthropod consumption as a protein supplement has been documented in other rodents (Klure; Cragun; Dearing, 2023), and similar seasonal shifts were recorded in *T. apereoides* in the Cerrado (Lessa; Costa, 2009).

Rainfall-driven variation also affected other dietary components. Stone fragments appeared in collections 2, 3, and 4, possibly from incidental ingestion during ground foraging. In collection 3, stones constituted 19.35% of dietary content. These patterns may reflect resource availability, feeding mechanics, or nutrient supplementation. Stone ingestion could aid fiber digestion (Abayomi *et al.*, 2009), contribute to dental wear (Soares *et al.*, 2018), or supplement minerals (Frye, 1995). Such lithophagic behavior has also been noted in *Kerodon rupestris*, suggesting adaptive plasticity in response to semi-arid constraints (Andrade-Ponce *et al.*, 2020).

Spearman's correlation matrix further clarified dietary patterns. Plant consumption inversely correlated with precipitation ($r_s = -0.60$), while animal intake rose with rainfall ($r_s = 0.40$), highlighting climate-driven dietary shifts. A strong inverse correlation between animal and stone items ($r_s = -0.74$) suggests a trade-off in resource use or spatial feeding strategies. A moderate negative association between plant and stone components ($r_s = -0.32$) may reflect altered food processing behavior during seasonal shifts. These patterns are summarized in Table 1 and reinforce the ecological flexibility of *T. laurentius*.

Notably, our results contrast with those of *T. apereoides* in the Cerrado, which showed seasonal diet restructuring (Lessa; Costa, 2009). In contrast, *T. laurentius* in the Caatinga maintained a relatively stable preference for plant material, particularly in dry periods. This highlights intra-generic variation shaped by local environmental conditions.

Comparative studies support this interpretation. *Kerodon rupestris*, another Caatinga rodent, also demonstrates

Tabela 1: Summary of Spearman's correlation coefficients (r_s) among dietary components and rainfall in *Thrichomys laurentius*, collected in a Caatinga fragment in Upanema, Brazil. Correlations are interpreted by direction and strength.

Variables correlated	r_s	Strength	Direction	Suggested interpretation
Plant × Rainfall	-0.6	Moderate	Negative	Plant intake decreases as rainfall increases
Animal × Stone	-0.74	Strong	Negative	Inverse relationship between animal matter and stone ingestion
Stone × Plant	-0.32	Weak–Moderate	Negative	Possible trade-off or spatial divergence
Animal × Rainfall	0.4	Moderate	Positive	Greater invertebrate intake with higher rainfall
Stone × Rainfall	0.11	Very weak	Positive	No meaningful association

Source: Authorial.

high plant intake and seasonal dietary shifts based on precipitation (Conceição; Bocchiglieri, 2021). Laboratory studies by Finotti *et al.* (2015) further identified dietary overlap in *Thrichomys* species, with *T. laurentius* showing notable preference for grains and roots.

Morphologically, Echimyidae rodents possess highly adapted chewing systems that facilitate diverse diets (Sena; Lessa, 2020), enabling efficient processing of arthropods, fruits, and seeds (Lessa; Costa, 2009). These traits support the observed dietary plasticity in *T. laurentius*, with implications for its resilience to environmental variability.

Additionally, similar patterns of seasonal diet variation have been reported in small mammals inhabiting restinga environments (Malaquias, 2018), and support hypotheses of diet-driven morphological and ecological diversification. Olalla-Tárraga *et al.* (2017) analyzed mammalian dietary evolution and found phylogenetic conservatism in trophic niches across global mammal lineages, indicating diet as a stable ecological trait. Complementarily, Román-Palacios *et al.* (2019) explored diet evolution across the animal kingdom and identified significant links between dietary shifts and lineage diversification, reinforcing the role of trophic ecology in evolutionary trajectories.

5 CONCLUSION

This study reveals that *Thrichomys laurentius* exhibits a predominantly herbivorous diet, marked by seasonal flexibility that responds to rainfall-driven resource availability in the Caatinga biome. The rodent's ability to incorporate animal matter, increase reliance on certain plant parts, and even ingest stone fragments under specific environmental conditions highlights its ecological plasticity.

These findings are vital for conservation planning. As emphasized in studies of other threatened rodents (Castle *et al.*, 2020), understanding feeding behavior is fundamental to designing habitat management and reintroduction strategies. Given the current "Data Deficient" status of *T. laurentius* on the IUCN Red List (2023), detailed knowledge of its diet provides a basis for informed conservation actions aimed at ensuring its long-term survival in one of Brazil's most threatened biomes.

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