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INTERFACES CIENTÍFICAS

RODENTS (RODENTIA, MAMMALIA) IN AN URBAN TROPICAL FOREST REMNANT IN SOUTHERN BRAZIL

ROEDORES (RODENTIA, MAMMALIA) EM UM REMANESCENTE DE FLORESTA TROPICAL URBANA NO SUL DO BRASIL

ROEDORES (RODENTIA, MAMMALIA) EN UN REMANENTE DE BOSQUE TROPICAL URBANO EN EL SUR DE BRASIL

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ABSTRACT

Worldwide, 6,611 species of mammals are recognized, of which the order Rodentia represents 40.5% with 2,680 species distributed in 535 genera and 35 families. For Brazil, nine families, 74 genera and 267 species are recognized, which is equivalent to 34.7% of all Brazilian mammals. The study was carried out in Parque Cinturão Verde, located in the municipality of Cianorte, Paraná. The objective of this research was to determine the diversity of species belonging to the order Rodentia in the Cinturão Verde Park (CVP), located in the municipality of Cianorte, Paraná. Data were collected in three different periods: from February to August 2006, from September to December 2010 and from March to May 2011. Captures were made in fifty-meter transects parallel to the trails within the fragments. To this end, we use active search, capture (Pitfall traps) and interview methodologies. We obtained a total of 76 records of 13 species of rodents belonging to eight families. The most diverse family was Cricetidae with five species, representing 38.5% of the total sampled, followed by the Muridae family with two species, totaling 15.4%. The other six families were represented by one species each, equivalent to 7%. The results found in this study highlight the importance of forest remnants, such as those located in the study area, as they act as refuge habitats for fauna in general. Considering that inventories represent the starting point for other studies on biological communities, many biological and ecological aspects of the sampled species still need to be investigated, such as densities, population fluctuations, home ranges and other parameters that can, in the future, be elucidated with the application of appropriate methods.

KEYWORDS

Fauna; fragmentation; Semideciduous Seasonal Forest; Refuge habitat.

RESUMO

No mundo todo, são reconhecidas 6,611 espécies de mamíferos das quais a ordem Rodentia representa 40,5% com 2,680 espécies distribuídas em 535 gêneros e 35 famílias. Para o Brasil, são reconhecidas nove famílias, 74 gêneros e 267 espécies, o que equivale a 34,7% de todos os mamíferos brasileiros. O estudo foi realizado no Parque Cinturão Verde, localizado no município de Cianorte, Paraná. O objetivo desta pesquisa foi determinar a diversidade de espécies pertencentes à ordem Rodentia no Parque Cinturão Verde (CVP), situado no município de Cianorte, Paraná. Os dados foram coletados em três períodos diferentes: de fevereiro a agosto de 2006, de setembro a dezembro de 2010 e de março a maio de 2011. As capturas foram feitas em transectos de cinquenta metros paralelos às trilhas dentro dos fragmentos. Para tanto, utilizamos metodologias de busca ativa, captura (armadilhas Pitfall) e entrevista. Obtivemos um total de 76 registros de 13 espécies de roedores pertencentes a oito famílias. A família mais diversa foi Cricetidae com cinco espécies, representando 38,5% do total amostrado, seguida pela família Muridae com duas espécies, totalizando 15,4%. As outras seis famílias foram representadas por uma espécie cada, equivalente a 7%. Os resultados encontrados neste estudo destacam a importância de remanescentes florestais, como os situados na área de estudo, uma vez que atuam como habitats refúgios para a fauna em geral. Considerando que inventários representam o ponto de partida para demais estudos em comunidades biológicas, muitos aspectos biológicos e ecológicos das espécies amostradas ainda precisam ser investigados, tais como, densidades, flutuações populacionais, áreas de vida e outros parâmetros que podem, futuramente, ser elucidados com a aplicação de métodos apropriados.

PALAVRAS-CHAVE

Fauna. Fragmentação. Floresta Estacional Semidecidual. Habitat refúgio.

RESUMEN

A nivel mundial se reconocen 6.611 especies de mamíferos, de las cuales el orden Rodentia representa el 40,5% con 2.680 especies distribuidas en 535 géneros y 35 familias. Para Brasil se reconocen nueve familias, 74 géneros y 267 especies, lo que equivale al 34,7% del total de mamíferos brasileños. El estudio se realizó en el Parque Cinturão Verde, ubicado en el municipio de Cianorte, Paraná.

El objetivo de esta investigación fue determinar la diversidad de especies pertenecientes al orden Rodentia en el Parque Cinturão Verde (CVP), ubicado en el municipio de Cianorte, Paraná. Los datos se recolectaron en tres períodos diferentes: de febrero a agosto de 2006, de septiembre a diciembre de 2010 y de marzo a mayo de 2011. Las capturas se realizaron en transectos de cincuenta metros paralelos a los senderos dentro de los fragmentos. Para ello utilizamos metodologías de búsqueda activa, captura (trampas Pitfall) y entrevista. Obtuvimos un total de 76 registros de 13 especies de roedores pertenecientes a ocho familias. La familia más diversa fue Cricetidae con cinco especies, que representan el 38,5% del total muestreado, seguida de la familia Muridae con dos especies, que suman el 15,4%. Las otras seis familias estuvieron representadas por una especie cada una, equivalente al 7%. Los resultados encontrados en este estudio resaltan la importancia de los remanentes forestales, como los ubicados en el área de estudio, ya que actúan como hábitats refugio para la fauna en general. Considerando que los inventarios representan el punto de partida para otros estudios sobre comunidades biológicas, muchos aspectos biológicos y ecológicos de las especies muestreadas aún deben ser investigados, como densidades, fluctuaciones poblacionales, áreas de distribución y otros parámetros que pueden, en el futuro, dilucidarse con la aplicación de métodos adecuados.

PALABRAS CLAVE

Fauna. Fragmentación. Bosque estacional semideciduo. Hábitat de refugio.

1 INTRODUCTION

Currently, 6,611 species of mammals are recognized worldwide, among which the order Rodentia represents 40.5%, with 2,680 species divided into 535 genera and 35 families (Connor *et al*., 2024). In the Brazilian territory, nine families (Sciuridae, Cricetidae, Caviidae, Ctenomyidae, Cuniculidae, Dasyproctidae, Dinomyidae, Erethizontidae and Echimyidae), 74 genera and 267 species have been recognized so far, which is equivalent to 34.7% of all Brazilian mammals (Abreu *et al*., 2023). When it comes to the Atlantic Forest biome, the order Rodentia is represented by 108 species, of which 55 are considered endemic (Bovendorp *et al*., 2017; Graipel *et al*., 2017). In addition to their large number of taxa, rodents are also diverse in their morphology, physiology, and behavior (Lacher *et al*., 2020). Morphological changes allow for versatility in the habits of this group, thus resulting in arboreal, scansorial, semi-aquatic, semi-fossorial, fossorial, and terrestrial forms (Antunes *et al*., 2021).

Rodents backgrounds are directly influenced by their notoriously diverse diet (Lacher *et al*., 2020) that changes according to the species – they can be omnivores, granivores, insectivores, frugivores, carnivores, generalist herbivores, specialized herbivores and piscivores (Samuels, 2009; Lacher *et al*., 2020; Antunes *et al*., 2021). With this wide variety of habits, rodents play important roles in Neotropical ecosystems (Grazzini *et al*., 2015; Antunes *et al*., 2021), among which we can highlight: the predation

of seeds, arthropods, small vertebrates, and eggs (Vieira *et al.*, 2006; Pinotti *et al.*, 2011; Vieira *et al.*, 2011); the dispersion of plant seeds and fungal spores (Cáceres; Monteiro-Filho, 2007; Horn *et al.*, 2008; Grazzini *et al.*, 2015; Kennerley *et al.*, 2021), in addition to serving as prey for other animals, such as reptiles, birds and other mammals (Bernarde; Abe, 2010; Rocha-Mendes *et al.*, 2010; Cherem *et al.*, 2018).

Like all mammals, rodents face conservation challenges, in particular, due to the conversion of natural areas into anthropized environments (ICMBIO, 2018; Lacher *et al.*, 2020). The risk of extinction for Rodentia stands out, especially for being one of the least studied orders of vertebrates in Brazil, a condition that hinders the implementation of actions aimed at the conservation of its species (Percequillo *et al.*, 2017; Lacher *et al.*, 2020). Risks become even more prominent when the biome is highly threatened, as in the case of the Atlantic Forest (ICMBIO, 2018; Fundação SOS Mata Atlântica, 2019; Lacher *et al.*, 2020).

The Atlantic Forest covers about 15% of the national territory, in 17 states. Approximately 72% of Brazilians live in this biome that provides essential services for human beings and concentrates 70% of the national GDP (Fundação SOS Mata Atlântica, 2019). Due to its high degree of endemism (Stehmann *et al.*, 2009), high biological diversity, high rate of deforestation (Fundação SOS Mata Atlântica, 2019), and high degree of threat due to the anthropogenic degradation to which it is subjected, this biome is part of the 25 global hotspots considered as priorities for preserving global biodiversity (Myers *et al.*, 2000).

Currently, only 12.4% of the forest that originally existed in Brazil remains (Fundação SOS Mata Atlântica, 2019). In addition to the total loss of area and the great fragmentation of this biome, less than 14% of its remaining vegetation cover is officially protected (Ribeiro *et al.*, 2009; Fundação SOS Mata Atlântica, 2019). These areas are considered one of the most important mechanisms to slow biodiversity loss (Gray *et al.*, 2016; Godet; Devictor, 2018). Around the world, several ecosystems retain much of their original biodiversity within these remnants, thus preserving their species and, consequently, the main ecological functions and ecosystem services provided by them (Bogoni *et al.*, 2020; Magioli *et al.*, 2021).

The state of Paraná (located in southern Brazil), which originally had 98% of its territory covered by this forest formation, has currently just over 10% of natural forests (Paraná, 2012; IPARDES, 2017). The Seasonal Semideciduous Forest, which includes the Cinturão Verde Park of Cianorte, is the second main forest formation in the Atlantic Forest and the most threatened area in Paraná, with only 3.4% of its original range remaining (Paraná, 2012; IPARDES, 2017). Thus, the present study aimed to recognize the richness of the species of rodents (order Rodentia) found at Cinturão Verde Park (CVP), located in the municipality of Cianorte, Paraná.

2 MATERIAL AND METHODS

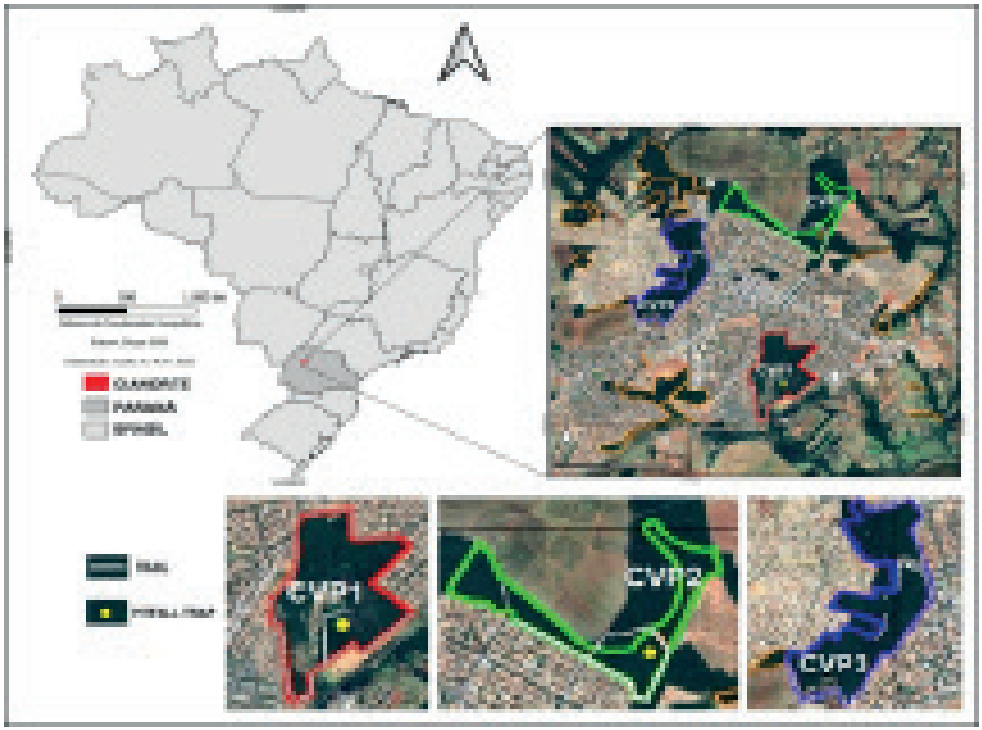
2.1 AREA OF STUDY

The study was carried out at Cinturão Verde Park (CVP), located in the municipality of Cianorte, Paraná. This is a municipal Conservation Unit (CU) created in the year 2000, with 312.0 acres and, as

of 2018, this area has been expanded to approximately 623.0 acres. The protected area is composed of eight habitat fragments that surround the city of Cianorte, of which three were selected for this study: CVP 1 (23° 40' 24.09"S; 52° 36' 19.34"W), CVP 2 (23° 38' 41.72"S; 52° 35' 45.08"W) and CVP 3 (23° 39' 4.98"S; 52° 37' 2.74"W). This CU represents, in the municipality's region, one of the last remnants of vegetation typical of the Submontane Seasonal Semideciduous Forest (PCV, 2022) (Figure 1). The vegetation has characteristics of an internally modified old-growth forest, but on the edges of the park, it is possible to find several highly degraded areas. The typical species of the park reflect a combination of components found in the Brazilian Atlantic Forest and typical vegetation found in areas often disturbed by invading species (Martins *et al.*, 2016).

The region presents flat to gently rolling land and an average altitude of 650 m (ITCF, 1987). It is an area of mesothermal humid subtropical climate, also known as Cfa (Köppen classification system), with average annual temperatures between 16° C and 29° C and average annual precipitation between 1,400 mm and 1,500 mm. It tends to show rainfall concentration between the months of December and March, without a well-defined dry season (ITCF, 1987; Mikich; Oliveira, 2003).

Figure 1 – Location of the Cinturão Verde Park in the municipality of Cianorte, state of Paraná, an urban tropical forest remnant located in southern Brazil and its respective rodent sampling sites



Legend: White line = Trail (active search), yellow dot = Pitfall trap (captures).
Source: Research data

2.2 DATA COLLECTION

Data were obtained in three different periods: from February to August 2006, from September to December 2010 and from March to May 2011. Collections were carried out six days a month, totaling 14 months. The research methodologies used included the active search for medium and large rodents, those weighing more than 1 kg when adults Chiarello (2000), and the capture technique using Pitfall traps (Borges; Tomás, 2004; Srbek-Araújo; Chiarello, 2007).

The active search involved walking along the surrounding roads, trails, streams and throughout the Conservation Unit (CU) (Figure 1), in search of traces and traces such as footprints, feces, carcasses, hair, among other indicators (Borges; Tomás, 2004; Srbek-Araújo; Chiarello, 2007).

The captures were carried out along fifty-meter transects parallel to the trails within the fragments. Ten pitfall traps (60L plastic buckets) were installed at each sampling site (CVP1 and CVP2), totaling 20 buckets in the study area. At each site, the buckets were buried in the ground, spaced 5 meters apart. A drift fence made of plastic canvas, 0.5 meters high with a buried base of up to 0.1 meters, was installed and extended along the ground connecting the buckets to guide the capture of wandering animals (Auricchio, 2002).

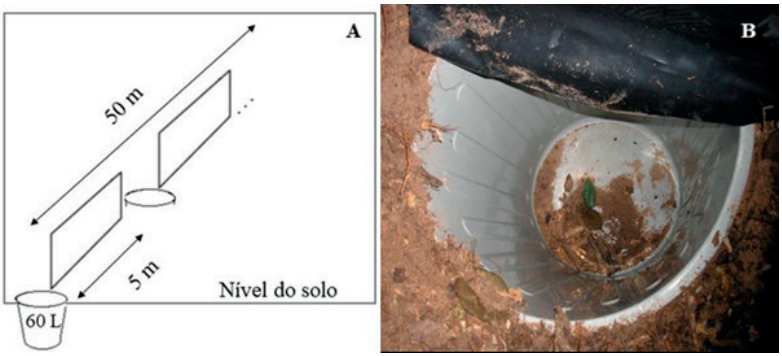
During each sampling session, pitfall traps were deployed for six consecutive nights. They were operated both in the morning and in the afternoon, with the aim of minimizing the mortality of captured animals due to hypothermia caused by the combination of low temperatures and intense rain in the study region.

In the initial stage, samples were collected in two locations (CVP1 and CVP2) using active search and capture methods (pitfall trap). In the following phases (second and third periods), we concentrated our samples on CVP2 and CVP3, also using the active search method for these stages.

The total sampling effort using pitfall traps was 840 trap-nights (20 buckets, 6 days/month for 7 months).

The captured animals were euthanized with sodium thiopental, followed by skull preparation and skin taxidermy. Subsequently, they were identified by Professor Liliani Marília Tiepolo of the Federal University of Paraná and stored at the Capão da Imbúia Museum in Curitiba (MHNCI – Curitiba – PR).

Figure 2 – Capture equipment used to carry out the survey of rodents found in an urban tropical forest remnant located in southern Brazil, as follows: a) Pitfall line diagram - Pitfall trap (bucket) and b) Pitfall trap (bucket)



Source: Research data

2.3 DATA ANALYSIS

The relative abundance of individuals was obtained by dividing the total number of individuals of each species by the total number of individuals of the species recorded in the referred area of study (Magurran, 2004). To verify sample sufficiency, an average species accumulation curve was built, and we have calculated the first order Jackknife estimate of species richness, randomized 1000 times in the EstimateS 9.1 software (Colwell *et al*., 2012; Colwell, 2016). In addition, Shannon-Wiener Diversity Index estimators (H') were calculated. Analyzes and graphs were processed using a statistics software PAST 2.14 (Hammer *et al*., 2001).

The capture and collection of mammals were carried out with authorization from IBAMA (registration 123/2006).

3 RESULTS

We have obtained a total of 76 records of 13 species of rodents belonging to eight families, namely Cricetidae (3 genera, 5 species), Muridae (2, 2), Caviidae (1, 1), Cuniculidae (1, 1) Dasyproctidae (1, 1) Echimyidae (1, 1), Erethizontidae (1, 1) and Sciuridae (1, 1). The most diverse family was Cricetidae with five species, representing 38.5% of the sampled rodent community, followed by the Muridae family with two species, totaling 15.4%, while the other six families were represented by one species each, totaling just over 7% (Table 1).

Table 1. Species of the order Rodentia recorded in an urban tropical forest remnant located in southern Brazil.

Family	Species	Common name	CVP 1	CVP 2	CVP 3	N	RA	Record type	Conservation status PR	MMA	IUCN
Caviidae	*Hydrochoerus hydrochaeris* (Linnaeus, 1766)	capybara	1	2	4	7	9,2	AS	LC	LC	LC
Cuniculidae	*Cuniculus paca* (Linnaeus, 1766)	spotted-paca	1	4	3	8	10,5	AS	EN	LC	LC
Dasyproctidae	*Dasyprocta azarae* Lichtenstein, 1823	azara's-agouti	2	3	1	6	7,9	AS	LC	LC	DD
Echimyidae	*Myocastor coypus* (Molina, 1782)*	coypu	0	1	1	2	2,6	AS/PT	LC	LC	LC
Erethizontidae	*Coendou (Sphiggurus) spinosus* (Cuvier, 1823)*	paraguayan-hairy-dwarf-porcupine	0	0	1	1	1,3	AS	LC	LC	LC
Sciuridae	*Guerlinguetus brasiliensis* (Gmelin, 1788)	squirrel	0	0	1	1	1,3	AS	LC	LC	N/A
Cricetidae	*Akodon* sp.	mouse	0	2	0	2	2,6	PT	LC	LC	LC
	Necromys lasiurus (Lund, 1841)	hairy-tailed-akodont	1	1	0	2	2,6	PT	LC	LC	LC
	Nectomys squamipes (Brants, 1827)	atlantic-forest-water-rat	1	3	0	4	5,3	PT	LC	LC	LC
	Oligoryzomys sp.	mouse	4	6	0	10	13,2	PT	LC	LC	LC
	Oligoryzomys nigripes (Olfers, 1818)	black-footed colilargo	7	23	0	30	39,5	PT	LC	LC	LC
Muridae	*Mus musculus* Linnaeus, 1758	mouse	2	0	0	2	2,6	PT	Ex	Ex	LC
	Rattus rattus (Linnaeus, 1758)	black-rat	1	0	0	1	1,3	PT	Ex	Ex	LC
Total			**20**	**45**	**11**	**76**					
	Shannon-Wiener		**1,90**	**1,63**	**1,59**	**2**					

Legend: CVP = Cinturão Verde Park, AS = active search, PT = pitfall trap, N = Total number (abundance), * roadkilled, RA= Relative Abundance and Ex = Exotic. Conservation status: PR = PARANÁ (2010), IUCN (2016), LC = least concern, DD = data deficiente, N/A = not evaluated and EN = Endangered.
Source: Research data

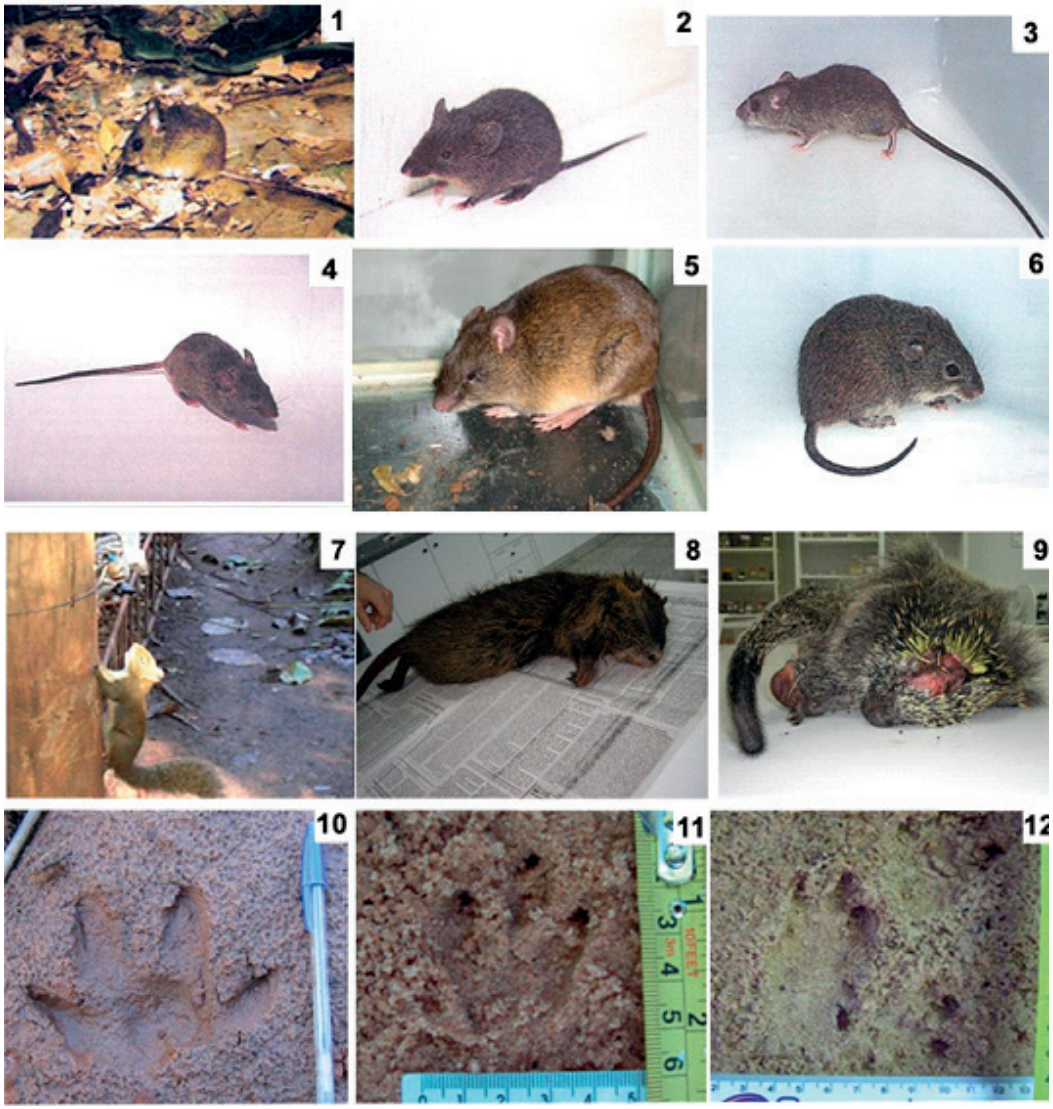
The use of Pitfall traps was responsible for 68.4% of the records, through which we have captured 52 individuals belonging to eight species. *Oligoryzomys nigripes* and *Oligoryzomys* sp. were the most abundant species collected by this method, with a total of 30 and 10 individuals, respectively, representing 76.9% of the catches. The active search method achieved only 30.7% of the records, with a total of four species. It was anticipated that this method would be significantly more effective in documenting medium and large individuals weighing over 1 kg as adults (Chiarello, 2000), including the Cuniculidae, Dasyproctidae, and Cavidae families referenced in this study.

The species with the highest relative abundance was *O.nigripes*, with 39.5%. The second most abundant species was *Oligoryzomys* sp., with 13.2%. These two species were responsible for 52.6% of the relative abundance (Figure 3 and 4A).

The rarefaction curve did not reach an apparent asymptote, which suggests that the sampling effort performed was not sufficient to sample the species present in the area. However, the results estimate that the recorded richness represents about 82.3% of the species that may appear in the area, that is, a richness estimation very similar to the one calculated by Jackknife 1, which estimated about 15.8 species for the referred area of study (Figure 4B).

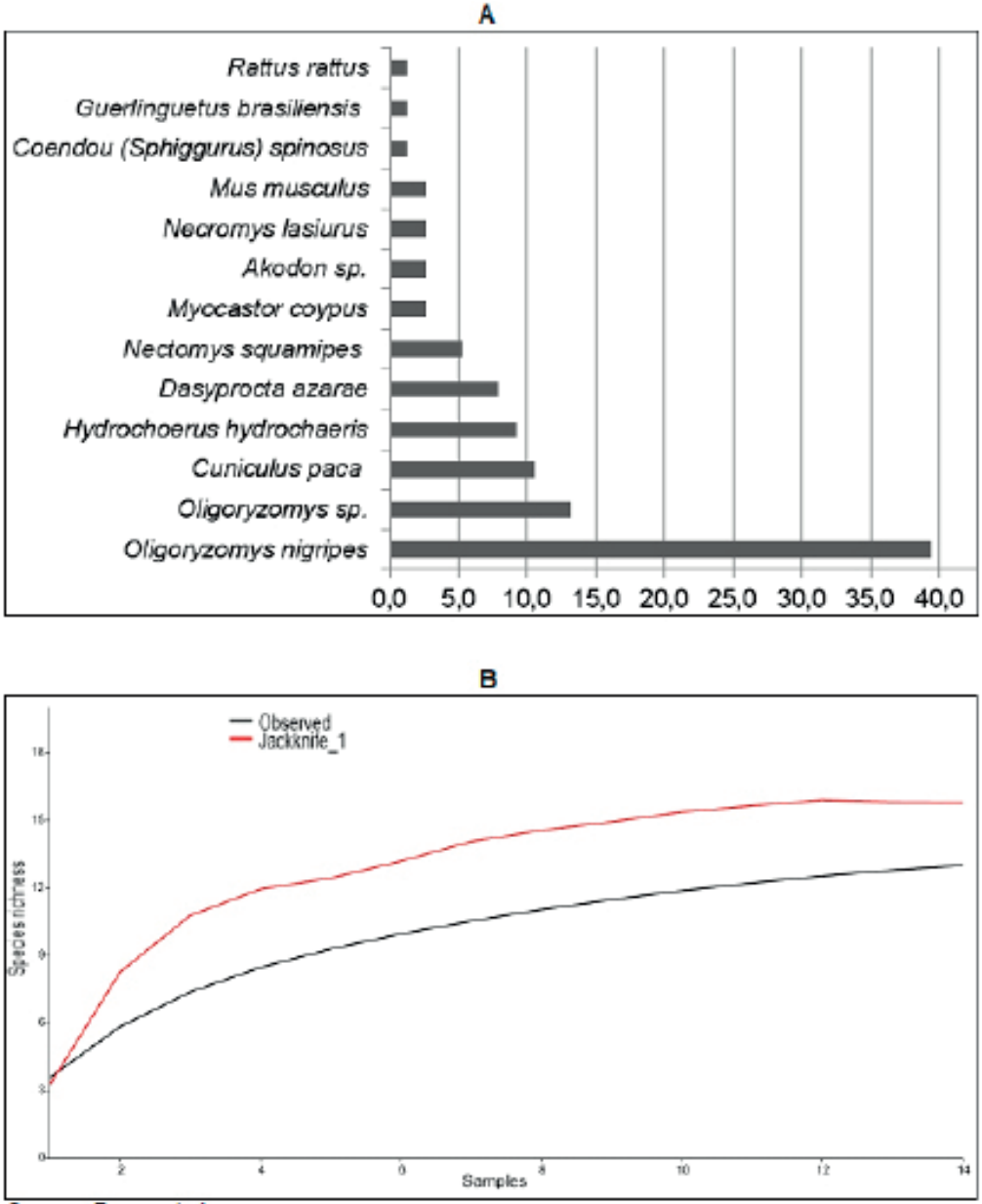
Species diversity, according to the Shannon-Wiener Index, achieved a value of H'=2. According to Magurran (2004), the Shannon-Wiener Index ranges from 1.5 to 3.5, rarely exceeding 4.5 (Table 1). A Shannon-Wiener Index value of H' = 2 reflects a moderate species diversity level, signifying a well--distributed variety of species without one species overpowering the population. Nonetheless, interpreting diversity indices, including the Shannon-Wiener Index, necessitates considering additional ecological factors and specific context to fully grasp the biodiversity of an area or ecosystem.

Figure 3 – Species of the rodent community in Cinturao Verde Park, Cianorte, Paraná, Brazil. 1 - black-footed-colilargo (*Oligoryzomys nigripes*); 2 - mouse (*Akodon* sp.); 2 - black-rat (*Rattus rattus*); 4 - mouse (*Mus musculus*); 5 - atlantic-forest-water-rat (*Nectomys squamipes*); 6 - hairy-tailed-akodont (*Necromys lasiurus*); 7 - squirrel (*Guerlinguetus brasiliensis*); 8 - coypu (*Myocastor coypus*) roadkilled, 9 - paraguayan-hairy-dwarf-porcupine (*Coendou spinosus*) roadkilled. Footprints: 10 - capybara (*Hydrochoerus hydrochaeris*); 11 - spotted-paca (*Cuniculus paca*); 12 - azara's-agouti (*Dasyprocta azarae*)



Source: Research data

Figure 4 – A) Relative abundance of the rodent community species in an urban tropical forest remnant located in southern Brazil; B) Species richness observed and estimated by the first order Jackknife 1 estimator



Source: Research data

4 DISCUSSION

The richness of rodent species obtained in the present study can be considered high when compared to other studies carried out in the Atlantic Forest biome. For instance, we can mention Feliciano *et al*. (2002) who have recorded five species in the Poço das Antas Biological Reserve (5,052.5 ha), Graipel; Santos-Filho (2006) who have recorded seven species in the Lagoa do Peri City Park (2,030.0 ha), Cerboncini et a. (2014) who have recorded eight species in the Pico do Marumbi State Park (8,745.4 ha), Gatto-Almeida *et al*. (2016) who have recorded seven species in Rio da Onça State Park (118.5 ha) and Grazzini *et al*. (2021) who have recorded ten species in the Piraí do Sul National Forest (150.6 ha).

However, it is important to point out that the fact that the Conservation Unit (UC) is located around and within the urban area, in addition to being degraded by the constant presence of humans and domesticated animals such as dogs and cats, can contribute to the disappearance of the most sensitive species. Therefore, only the more generalist species end up being recorded. In addition, the fact that the UC is arranged in a narrow horseshoe-shaped band divided into fragments causes an edge effect in the forest, leading to dryness caused by the wind, flooding caused by rain, noise pollution, and also disturbance caused by invasive vegetation, thus reducing the effectively protected forest area (PCV, 2022).

The disparities observed in terms of species composition across studies may be related to structural dissimilarities between habitats as well as to the sampling effort performed (Quintela *et al*., 2012). In forest remnants, variables such as the degree of fragmentation, vegetation complexity and diversity of habitats and microhabitats lead to different patterns of both composition and abundance of small mammal species (Lacher; Alho, 2001; Lyra-Jorge *et al*., 2001; Pardini; Umetsu, 2006; Quintela *et al*., 2012).

The greater diversity found in the Cricetidae family follows the national (56.9%) and global (31.7%) patterns of the species in order Rodentia (Abreu *et al*., 2023; CONNOR *et al*., 2024). However, the great difference in terms of family records can be explained by limitations related to sampling areas and time of study. Nevertheless, these differences in the results of family records are commonly reported in other rodent studies, and this factor can be attributed to the physiological and adaptive variations of each family, allowing for a higher occurrence compared to other groups (Antunes *et al*., 2021).

The species with the highest relative abundance was *O. nigripes* and *Oligoryzomys* sp. achieved the second and third highest relative abundances. Individuals of the *Oligoryzomys* sp. species, known as "rice rats", are small and have a large tail. They also have terrestrial and arboreal habits and can be found in forest formation regions, areas of transition between fields and Araucaria Forests (Pedó, 2005), coastal and pine forests (Quintela *et al*., 2012; Grazzini *et al*., 2015). *Oligoryzomys nigripes* is the most generalist of all Brazilian species of the genus when it comes to habitat, being found in primary and secondary vegetations in the Atlantic Forest and in the Brazilian Cerrado (tropical savanna) (Grazzini *et al*., 2015).

In southern Brazil, population levels peaked in the cold, dry months and dropped to zero during warmer months. This population increase is linked to greater availability of food resources, especially grass seeds (Antunes *et al*., 2009; Patton; Leite, 2015). Therefore, these animals can be considered generalists as they can establish themselves in different habitats, with high abundance

even in anthropized environments (Langone, 2007; Pedó *et al*., 2010). According to Quintela *et al*. (2012), they are the most abundant small, non-flying mammals based on most studies related to forest formations in southern Brazil.

In the present study, out of the 13 species documented, *Cuniculus paca* is categorized as Endangered (EN) in the State of Paraná (Paraná, 2010). The primary reasons for its decline are likely linked to the fragmentation of forest remnants and illegal hunting for commercial meat trade (IAP, 2007). This species plays a crucial role in the dynamics of Neotropical forests, recognized as one of the primary seed dispersers among medium-sized mammals (Pereira *et al*., 2016). Currently, the species named *Dasyprocta azarae* is globally classified as Data Deficient (DD) and is suspected to be threatened (IUCN, 2016). However, there is still little information about its extent of occurrence, status and ecological requirements (IUCN, 2016).

5 CONCLUSION

The results found in this study have shown the importance of forest remnants such as those situated in the Cinturão Verde Park once they act as habitat refuges for fauna in general. Such results are important and also contribute to increase our knowledge on the species of mammals of the order Rodentia in the Northwest region of Paraná. In addition, they show the need to implement conservationist strategies, public policies and partnerships between universities and conservation NGOs through environmental education for the community in order to minimize impacts in the referred field, aiming at supporting and preserving not only the species that were found in this survey, but also other species.

Bearing in mind that inventories represent the starting point for further studies on biological communities, several biological and ecological aspects of the sampled species must be further investigated, such as densities, population fluctuations, wildlife area and other parameters that can in future be elucidated with the application of the appropriate methods.

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