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COMPARISON BETWEEN DOMESTIC DOG SAMPLING IN THE MATA DE SANTA GENEBRA: IMPLICATIONS AND IMPACTS ON NATIVE FAUNA 15 YEARS LATER[1]

COMPARAÇÃO DE AMOSTRAGEM DE CÃES DOMÉSTICOS NA MATA DE SANTA GENEBRA: CONSEQUÊNCIAS E IMPACTOS PARA FAUNA NATIVA 15 ANOS DEPOIS[1]

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ABSTRACT - Invasive species are among the main drivers of biodiversity loss worldwide and represent a critical challenge for conservation, economy, and public health. Domestic dogs (*Canis lupus familiaris*) are one of the most widespread invasive species, with global populations exceeding 700 million individuals, and their presence has been increasingly documented within protected areas. In Brazil, dogs are considered invasive, exerting multiple impacts on native fauna through predation, competition, pathogen transmission, and disturbance. This study evaluated the historical and current occurrence of domestic dogs in the Mata de Santa Genebra Protected Area, a remnant of Atlantic Forest located in southeastern Brazil. We compared records from 2021-2022 obtained through camera trapping and active searches with those from another study conducted in 2006 (Galetti and Sazima, 2006). Our findings indicate an increase of 12.1% to 49.7% in relative abundance of dogs over the past decades, highlighting the growing threat posed by this invasive species to native mammals in fragmented landscapes. These results reinforce the urgent need for management strategies aimed at mitigating the ecological impacts of free-ranging dogs in Brazilian protected areas.

Keywords: Invasive species, Atlantic forest, Urban forest, Protected areas, Biodiversity loss.

RESUMO - Espécies exóticas invasoras estão entre os principais vetores da perda de biodiversidade em todo o mundo e representam um desafio crítico para a conservação, a economia e a saúde pública. Cães domésticos (*Canis lupus familiaris*) figuram entre as espécies invasoras mais amplamente distribuídas, com populações globais que ultrapassam 700 milhões de indivíduos, e sua presença tem sido cada vez mais documentada dentro de áreas protegidas. No Brasil, os cães são considerados invasores, exercendo múltiplos impactos sobre a fauna nativa por meio de predação, competição, transmissão de patógenos e perturbação. Este estudo avaliou a ocorrência histórica e atual de cães domésticos na Área de Proteção Ambiental da Mata de Santa Genebra, um remanescente de Floresta Atlântica localizado no sudeste do Brasil. Comparamos registros obtidos entre 2021 e 2022, por meio de armadilhas fotográficas e buscas ativas, com aqueles de outro estudo realizado em 2006 (Galetti e Sazima, 2006). Nossos resultados indicam um aumento de 12,1% para 49,7% na abundância relativa de cães nas últimas décadas, evidenciando a crescente ameaça que essa espécie invasora representa para os mamíferos nativos em paisagens fragmentadas. Esses resultados reforçam a necessidade urgente de estratégias de manejo voltadas à mitigação dos impactos ecológicos causados por cães errantes em áreas protegidas brasileiras.

Palavras-chave: Espécies invasoras, Mata Atlântica, Floresta urbana, Áreas protegidas, Perda de biodiversidade.

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1 INTRODUCTION

Invasive species are defined as species introduced by direct or indirect human actions in places that do not include their historical/evolutionary occurrence and that have an impact on biodiversity, ecosystems and their services, the economy, and human well-being (Pysek et al. 2020, Peller and Altermatt 2024, Feliciano and Schilindwein 2024, Bacher et al. 2025). The process of introducing species has been evident since the great human migrations of the fifteenth century, but it has intensified and been facilitated in recent centuries as a result of globalization (Hulme 2009, Capinha et al. 2015, Seebens et al. 2017, Seebens et al. 2018, Pysek et al. 2020). Currently, there are an estimated 40,000 species from different taxonomic groups with known exotic populations (Roy et al. 2024), with projections for these figures to increase over the coming decades by approximately 36% compared to 2005 (Seebens et al. 2017, Essl et al. 2020, Seebens et al. 2021).

In the context of species conservation, biological invasions are understood as one of the main factors contributing to global biodiversity loss (IPBES 2023). Thus, the dynamics of introducing invasive species is already considered a symptomatic aspect of the Anthropocene (Capinha et al. 2015). As a result, it is estimated that since the 17th century, around 40% of extinctions have been related to invasive species (CBD 2006), in addition to consequences in relation to economic problems, responsible for billions in losses annually (Bacher et al. 2018, Pysek et al. 2020) and unique health issues, given emerging diseases such as arboviruses (Brady and Hay 2020, Pysek et al. 2020) e a SARS-CoV 2 (Nuñez et al. 2020).

Historically, the regions most affected by invasive species globally are those with high commercial and human traffic, notably regions such as Europe, North America, and East Asia (Early et al. 2016, Seebens et al. 2018). However, countries with growing economies, commercial development, and widespread urbanization have shown potential for a significant increase in invasive species in the future, such as countries in Southeast Asia and South America, notably Brazil and Argentina (Sepulvéda et al. 2015, Seebens et al. 2017, Seebens et al. 2018, Essl et al. 2020). In Brazil, there are records of more than 500 invasive alien species in the country's different ecosystems, including at least 268 animal species, notably fish, and 208 species of plants or algae (Zenni et al. 2024). In this context, the most affected regions are those with intense historical human occupation, higher density and human activity, and less maintenance of conserved areas (Sampaio and Schmidt 2014, Zenni 2015, Zenni et al. 2024), notably the Southeast-South region of the country (Zenni et al. 2024) and areas related to the Atlantic Forest domains (Sampaio and Schmidt 2014, Zenni et al. 2024) and the Cerrado (Zenni and Ziller 2011, Zenni 2015). Despite this, recent human expansion and reduction of conserved areas has favored the arrival of invasive species in other environments, such as mangrove areas and the Amazon rainforest (Zenni et al. 2024).

Invasive species present in Brazil are directly related to human presence and economic aspects, most of which are species of commercial interest, livestock, or companion animals (Zenni et al. 2024). As an example of this, many plant species are related to crops and pastures, such as eucalyptus (*Eucalyptus* spp.), pine trees (*Pinus* spp.), and African or ornamental grasses (Zenni 2014, Zenni et al. 2024). Similarly, invasive animal species are mainly represented by species of commercial interest, such as pigs (*Sus scrofa*) (Risch et al. 2021) and aquaculture fish (Latini et al. 2024), as well as companion animals such as dogs (*Canis lupus familiaris*) (Gompper 2014, Lessa et al. 2016, Zapata-Ríos 2018), cats (*Felis catus*) (Trouwborst et al. 2020), and ornamental fish (Zenni et al. 2024). The presence of these animals in feral or semi-wild populations with invasive characteristics may be due to intentional or unintentional releases or escape from their enclosures (Zenin et al. 2024), as well as cases of irresponsible animal ownership, allowing them to roam freely, even in natural areas, as is commonly the case with dogs and cats (Zapata-Ríos 2018, Trouwborst et al. 2020, Feliciano et al. 2024).

In this context, the presence of domestic dogs as an invasive species in Brazilian territory, including in protected areas, stands out (Lessa et al. 2016). The domestic dog (*Canis lupus familiaris*) is one of the most widely distributed exotic species on the planet (Doherty et al. 2017). In addition to its cosmopolitan distribution, it also has an estimated population of between 700 million (Hughes and Macdonald 2013) and just over 1 billion individuals (Gompper 2014). In addition, it is the most common species in protected natural areas, making it a species of great interest from a conservation perspective (Hughes and Macdonald 2013). Like most other canids, domestic dogs are omnivorous, feeding on plant resources such as leaves, roots, and fruits; animal resources such as vertebrates, invertebrates, and carcasses; and even garbage and human leftovers (Vanak and Gompper 2009).

On the other hand, unlike other species, domestic dogs tend to exhibit a different pattern as an invasive species. Although they share characteristics such as easy adaptability, ecological plasticity, ability to exploit various resources, high reproductive rate, and significant

impacts on native species (Galetti and Sazima 2006, Gompper 2014, Lessa et al. 2016, Ribeiro et al. 2019), dogs are generally unable to form populations completely independent of humans, being associated with human presence, anthropized areas, resources such as plantations, cities, trails, or garbage, and are also not often found in natural areas distant from human presence or with a high degree of conservation (Gompper 2014, Feliciano et al. 2024).

Despite their proximity to humans, domestic dogs can explore natural areas both in situations closer to feral conditions and in conditions of wandering or high dependence on humans (Doherty et al. 2017). Once in natural areas, the impacts that domestic dogs can have on native wildlife range from direct predation (Ritchie et al. 2014, Silva et al. 2018), competition for resources (Vanak and Gompper 2009, Vanak et al. 2014), scaring and behavioral changes (Young et al. 2011, Silva-Rodriguez and Sieving 2011), harassment (Weston and Stankowich 2014), hybridization (Bassi et al. 2017, Szynwelski et al. 2023), and pathogen transmission (Hughes and Macdonald 2013, Furtado et al. 2016, Doherty et al. 2017). Therefore, reducing the impact of domestic dogs on natural areas should be understood as a matter of interest for species conservation (Doherty et al. 2017).

In the context of natural areas, with the presence of invasive species, proximity to urban centers, and located in southeastern Brazil, the Mata de Santa Genebra ARIE stands out, presenting, among other species, a high recurrence of domestic dogs (Galetti and Sazima 2006, Feliciano et al. 2024). In this study, we sought to make a historical comparison between the presence of dogs in this protected area, comparing data from 2006 (Galetti and Sazima, 2006) with data collected between 2021 and 2022, evaluating both the number of individuals recorded, their abundance, possible temporal impacts on native fauna, and future prospects.

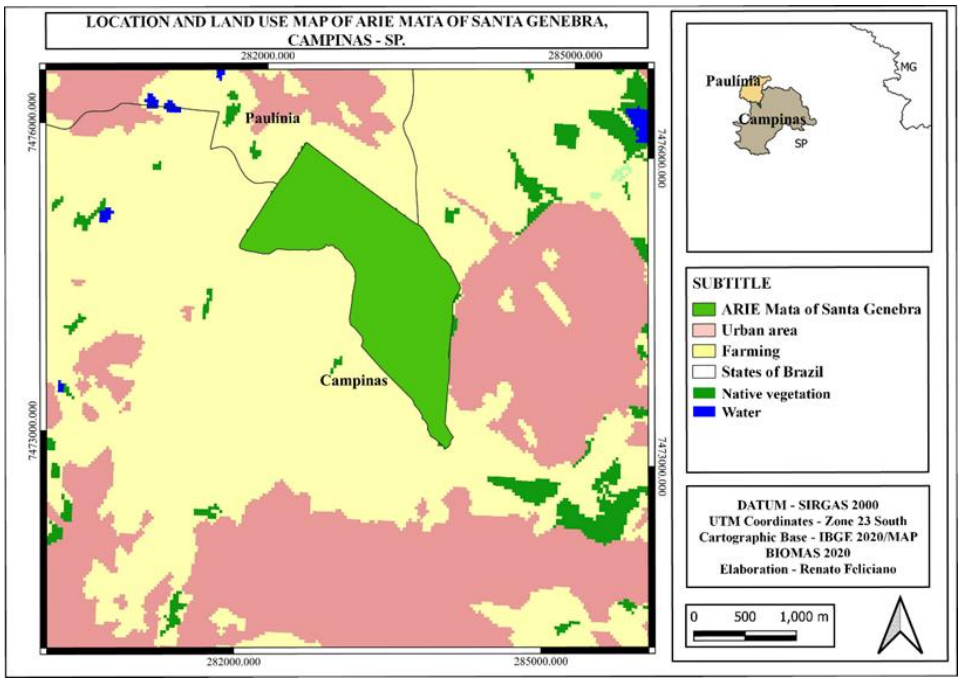
2. METHODS

2.1 Study area

The Mata de Santa Genebra ARIE is a Protected Area (PA) with remnants of semi-deciduous seasonal forest and swamp forest, located in the municipality of Campinas, State of São Paulo, Brazil, covering approximately 252 hectares. It is located at coordinates 22°44'45“ S and 47°06'33” W (Fundação José Pedro de Oliveira 2021). This protected area is inserted in a mixed landscape matrix, bordering urban landscapes and human settlements, while also bordering a predominantly agricultural landscape with some small patches of remnant forest (Figure 1) (Fundação José Pedro de Oliveira 2021).

Figure 1. Location map and main land uses surrounding the ARIE Mata de Santa Genebra Protected Area. Source: land use data (MAP Biomas, 2020). Feliciano and Schlindwein (2025).

Figura 1. Mapa de localização e uso da terra na região da ARIE Mata de Santa Genebra. Fonte: Dados de uso do solo (MAP Biomas, 2020). Feliciano e Schlindwein (2025).



The region's climate is classified as subtropical with dry winters (Cwa, Koppen). Thus, during winter (dry season), temperatures are low, below 18°C, while in summer (rainy season), temperatures are higher, above 21°C (Fundação José Pedro de Oliveira 2021).

The area stands out for its diversity of animal species, with a wide variety of arthropods (Carreira et al. 2025) and vertebrates (Fundação José Pedro de Oliveira 2021). Historically, the region was home to several species of mammals, as is the case in other natural remnants in the state of São Paulo (Galetti et al. 2022). However, with urban expansion, anthropization of surrounding areas, reduction of natural areas, and the presence of invasive species, the recurrence of these species has been reduced, such as the maned wolf (*Chrysocyon brachyurus*), tapir (*Tapirus terrestris*), and collared peccary (*Pecari tajacu*) (Monteiro-Filho 1995). In addition, the local extinction of three species is directly associated with the impacts of domestic dogs in the area: the gray brocket (*Subulo guazoubira*), the paca (*Cuniculus paca*), and the agouti (*Dasyprocta azarae*) (Galetti and Sazima 2006).

2.2 Sampling of dogs in the area

The occurrence of domestic dogs in the study area between 2021 and 2022 was surveyed employing two distinct sampling methods: monitoring with camera traps and active searching on the trails of the PA (Feliciano et al. 2024). Nine Bushnell TrophyCam traps, model 119436C (Bushnell Outdoor Products, Kansas, USA), were used and distributed at nine different points along the existing trails in the PA. No bait or other factors attractive to domestic dogs were used at the sampling points, making this a non-selective sampling.

The recordings were carried out from July 15, 2021, to May 15, 2022, encompassing both the rainy and dry seasons, following the approaches of Srbek-Araujo and Chiarello (2007) and Ribeiro-Silva et al. (2019). Sampling effort was calculated based on the number of cameras used (9) multiplied by the number of days they remained active (306) and by the number of hours they operated per day (24), following Srbek-Araujo and Chiarello (2007).

The cameras remained active 24 hours a day, recording 40-second videos, with low LED exposure, high sensor sensitivity, and 3-second intervals between triggers. The cameras were positioned to capture terrestrial mammals, being fixed to trees with a minimum diameter of 15 cm, approximately 45 cm above the ground (Feliciano et al. 2024).

In addition to the recordings, active searches were conducted along two trails within the PA, following the methodology proposed by Galetti and Sazima (2006). Active searches were carried out once a month, from July 20, 2021, to April 20, 2022. The selected trails are the two longest in the PA, crossing the area in different directions, each with a length between 800 and 1,000 meters (Feliciano et al. 2024). Sampling effort along the trails ranged from 30 to 60 minutes per transect. In total, ten sampling events were conducted, amounting to five hours of active search in each trail-four in the morning (between 9:00 and 11:00) and six in the afternoon (between 13:00 and 15:00) (Feliciano et al. 2024)

2.3 Comparative analysis of the presence of domestic dogs between 2006 and 202/22

In order to compare the data obtained between 2021/22 with the data obtained in the study by Galetti and Sazima (2006), we estimated the sampling effort of this other study based on the data provided by the authors. Thus, considering the sampling period of approximately 196 weeks (April 1988 to December 1991) and sampling performed twice a week in the morning and evening (Galetti and Sazima 2006), we estimated a sampling effort in the study by Galetti and Sazima (2006) considering two possibilities, one more conservative (196 weeks x 2 sampling days per week x 6 hours of daily sampling) and another less conservative (196 weeks x 2 sampling days per week x 8 hours of daily sampling). These estimates were based on 1 km transects and an average walking speed of 1 km per hour, as indicated in transect sampling manuals (Plumptre 2000; MonitoraBioSP 2025). In addition, we assumed a minimum sampling period of 6 hours per day and a maximum of 8 hours per day, considering the possibility that, beyond the 5 km reported by Galetti and Sazima (2006), they may have conducted between 1 and 3 transects per sampling session. Accordingly, 5 km plus 1 km walked at 1 km/h corresponds to 6 hours of sampling, whereas 5 km plus 3 km walked at 1

km/h corresponds to 8 hours of sampling. This is because the daily sampling time was not specified in the 2006 study.

Then we calculated the relative abundance index (number of records/sampling effort in hours) (Sollmann et al. 2013), taking into account the number of domestic dog records in the different studies and the respective sampling efforts. Based on this calculation, we also estimated the increase in the presence of domestic dogs within the PA in recent years between the two study periods (Relative abundance index 2021-22/Relative abundance index 2006). These calculations were performed based on descriptive and estimated data, using basic arithmetic functions available in RStudio (addition, subtraction, division), withouth requiring any specialized packages (RStudio Team 2020).

3 RESULTS AND DISCUSSION

Sampling carried out during the period from 2021 to 2022 involved a sampling effort of 66,145 hours (considering 66,096 hours of filming + 50 hours of transect) (Feliciano et al. 2024). During this period, 88 distinct records of domestic dogs were made, with dogs being recorded 189 times in these footage, from which it was possible to identify 24 distinct individuals (Feliciano et al. 2024).

For the estimates made taking into account the study by Galetti and Sazima (2006), samples from six domestic dog records and a sampling effort of 2,352 hours for the more conservative approach (six hours of sampling per week) or 3,136 hours for the less conservative approach (8 hours of sampling per week).

The abundance index was 0.00286 records/hour for the 2021/22 data. For the previous data (Galetti and Sazima 2006), we obtained values of 0.00255 records/hour in the more conservative approach and 0.00191 records/hour in the less conservative approach. Thus, the variation observed between the indices was between 1.121 and 1.497, representing an increase between 12.1% and 49.7% in the frequency of dog records in the years 2021/22 compared to the 2006 study.

The issue of domestic dogs in natural areas is a global problem (Hughes and Macdonald 2013, Gompper 2014, Doherty et al. 2017) and also affects Brazilian protected areas (Lessa et al. 2016). In this sense, native urban fragments and fragments of the Atlantic Forest stand out among the most affected (Paschoal et al. 2012, Lessa et al. 2016, Ribeiro et al. 2019). The Santa Genebra Forest is included in this regard, being an urban fragment of semi-deciduous seasonal Atlantic Forest with a known presence of domestic dogs within it (Galetti and Sazima 2006, Feliciano et al. 2024). In the current study, we highlight that the presence of domestic dogs in this PA has increased significantly (~12% to 50%) over the last 20 years, which raises concerns about the possible impacts that native fauna may suffer as a result.

Despite its small size compared to other Protected Areas (~252 ha), the Santa Genebra Forest has a wide diversity of species, including endangered vertebrates in the state of São Paulo, such as the puma (*Puma concolor*), the ocelot (*Leopardus pardalis*) (Figure 2), and the howler monkey (*Alouatta guariba*) (Fundação José Pedro de Oliveira 2021). However, the small size of the area, with a significant influence from the edge effect and permeable structure of the vegetation cover (Butler and Du Toit 2002, Lacerda et al. 2009, Silva et al. 2018, Ribeiro et al. 2019), in addition to the intense presence of anthropized matrix in the surrounding area, with farms, urban areas, and roads (Soto and Palomares 2014, Allemand et al. 2019, Paschoal et al. 2018), may favor the presence, entry, and permanence of domestic dogs within it.

This context of small natural areas, with human presence in the surrounding area and intense activity and impact from domestic dogs, is recurrent in natural landscapes of Brazil's Atlantic Forest, such as in the states of Rio de Janeiro (Rangel and Neiva 2013, Silva et al. 2018), Espírito Santo (Allemand et al. 2019), São Paulo (Campos et al. 2007, Carvalho et al. 2019), and Paraná (Pereira et al. 2019). In these different locations, overlapping periods of activity between native species and domestic dogs were observed, as in the Santa Genebra (Feliciano et al. 2024), suggesting that encounters and conflicts with native species must occur frequently. Among the main possibilities for conflicts with native animals, predation or disturbance by dogs stands out (Hughes and Macdonald 2013, Lessa et al. 2016, Doherty et al. 2017), competition (Lessa et al. 2016), and the spread of disease (Furtado et al. 2016).

Figure 2. (A) *Leopardus pardalis* and (B) *Puma concolor* recorded in the 2021/22 sampling at ARIE Mata de Santa Genebra. Feliciano and Schlindwein (2025).

Figura 2. (A) *Leopardus pardalis* e (B) *Puma concolor* registrados na amostragem de 2021/22 na ARIE Mata de Santa Genebra. Feliciano e Schlindwein (2025).

The fact that domestic dogs do not have a single period of activity in different areas of the Atlantic Forest, and may exhibit predominantly diurnal (Silva et al. 2018), nocturnal (Galetti and Sazima 2006, Feliciano et al. 2024), or cathemeral (Carvalho et al. 2019), may be associated with different degrees of independence from humans, since domestic dogs tend to be more diurnal (Silva et al. 2018), while stray or feral dogs tend to have cathemeral or nocturnal habits (Galetti and Sazima 2006, Banerjee and Bhadra 2021). In addition, this variation in activity period may represent a greater diversity of native species that eventually share the time window and space of activities with domestic dogs, favoring conflicts (Silva et al. 2018, Carvalho et al. 2019, Feliciano et al. 2024). Despite this, some characteristics may represent a greater risk of species being preyed upon by dogs, such as smaller size, solitary behavior, foraging on the ground, curious behavior, and reduced ability to escape and move (Galetti and Sazima 2006, Doherty et al. 2017), with mammals and birds being the main groups affected (Hughes and Macdonald 2013, Doherty et al. 2017).

In the context of the Santa Genebra Forest, it is argued that the presence of domestic dogs is related to the local extinction of three species of mammals: the agouti (*Dasyprocta azarae*), the paca (*Cuniculus paca*), and the gray brocket

(*Subulo guazoubira*) (Galetti and Sazima 2006), demonstrating the direct effect of the presence of dogs on the predation of these animals. It is worth noting, however, that some species have had their names updated over time. Thus, certain species cited in the work of Galetti and Sazima (2006) were not recorded in the sampling of this study, not because they have become extinct, but rather because their names have been revised in accordance with the literature. Examples include *Didelphis marsupialis*, currently *D. aurita*, and *Sylvilagus* brasiliensis, which was revised in the Southeastern region to *S. minensis* (Silva et al. 2019). Based on the history of mammal diversity in the Atlantic Forest and fragments near the Santa Genebra Forest, it can be inferred that the region originally harbored a high wealth of species (Magioli et al. 2014, Galetti et al. 2022) (Table 1). However, this heritage has been reduced over time due to factors such as increased anthropization, climate change, the suppression of natural areas, and the introduction of invasive species (Galetti et al. 2022). Thus, the growing occupation of domestic dogs may be related to the reduction of local diversity and, in the long term, to the local extinction of new species, especially those already considered endangered in the state of São Paulo.

Table 1. Native mammal species documented in different studies. X indicates the presence of documentation in the study.

Tabela 1. Espécies de mamíferos nativos documentados nos diferentes estudos. X indica o registro da espécie em cada um dos estudos.

Family	Specie	Galetti and Sazima (2006)	Feliciano et al. (2024)
Didelphidae	*Didelphis albiventris* Lund, 1841		X
	Didelphis aurita° Wied-Neuwied, 1826	X	X
Atelidae	*Alouatta guariba* Humbolt, 1812	X	X
Cebidae	*Sapajus nigritus* Goldfuss, 1809	X	X
Dasypodidae	*Dasypus novemcinctus* Linnaeus, 1758	X	X
Canidae	*Cerdocyon thous* Linnaeus, 1766		X
Procyonidae	*Procyon cancrivorus* Cuvier, 1798		X
Felidae	*Puma concolor* Linnaeus, 1771		X
	Leopardus pardalis Linnaeus, 1758		X
Leporidae	*Sylvilagus minensis*° Thomas, 1901	X	X
Caviidae	*Hydrochoerus hydrochaeris* Linnaeus, 1766		X
	Cavia aperea Pallas, 1766	X	
Cuniculidae	*Cuniculus paca**Linnaeus, 1766	X	
Dasyproctidae	*Dasyprocta azarae**Lichtenstein, 1823	X	
Cervidae	*Subulo gouazoubira** Fischer, 1814	X	

*Possibly extinct locally. °Their names have been updated in the literature in relation to the work of Galetti and Sazima (2006) (*Didelphis marsupialis* is here interpreted as *D. aurita*; *Sylvilagus brasiliensis* was updated to *S. minensis*). Source: Galetti and Sazima (2006), Feliciano et al. (2024).

* Possivelmente extinto localmente; °Espécies cujo nome foi atualizado na literatura recente em relação ao artigo de Galetti and Sazima (2006) (*Didelhphis marsupialis* foi interpretado como *D. aurita*; *Sylvilagus brasiliensis* foi atualizado para *S. minensis*). Fonte: Galetti and Sazima (2006); Feliciano et al. (2024).

Despite this, the PA provides a refuge for emblematic species of fauna, such as the cougar (Puma concolor) and a wide variety of species (mainly birds and insects) (Fundação José Pedro de Oliveira 2021). Therefore, projects that explore ways to reduce and mitigate the impacts of the presence of domestic dogs in the area are necessary, exploring different approaches ranging from the capture, removal and subsequent realocation of individuals to processes related to animal health, such as castration and vaccination, and education and enforcement projects for the surrounding population (Lessa et al. 2016, Silva et al. 2018).

It is important to highlight that the surrounding matrix of the area presents factors that favor the presence of domestic dogs, considering both sociocultural and environmental aspects. Historically, the PA is located in a municipality that was originally rural but underwent rapid urbanization beginning in the 1990s (Smith 2002), subsequently incorporating residential areas, an urban network, a university, and industrial activities (Fundação José Pedro de Oliveira 2021). At present, the immediate surroundings of the PA consist of informal settlements, low- and middle-income housing, monocultures, and small-scale horticultural farms (Fundação José Pedro de Oliveira 2021). Due to cultural and socioeconomic conditions, rural and lower-income neighborhoods often harbor free-ranging dogs with limited access to veterinary care and scarce exposure to environmental education regarding responsible ownership (Bhalla et al. 2021, Silva-Rodríguez et al. 2023, Santi et al. 2024). Furthermore, the lack of basic sanitation and unplanned urban growth may facilitate the presence of stray dogs, which can rely on human waste, such as garbage and open sewage, as resources (Ribeiro et al. 2019, Feliciano et al. 2024). Thus, socioeconomic, anthropogenic, and environmental characteristics of the region must be considered in addressing the issue of domestic dog presence over time (Bhalla et al. 2021, Silva-Rodríguez et al. 2023). Moreover, because this factor involves multiple dimensions of society and the environment, including public health concerns, it should be approached across different spheres: environmental, social, educational, animal, human, and within the framework of One Health (Villatoro et al. 2019, Marshall et al. 2023, Feliciano et al. 2024, Mohanty et al. 2025).

The comparison with the study by Galetti and Sazima (2006) is particularly relevant, as that work represented the pioneering record of the presence and impact of domestic dogs within the unit, a warning that, almost two decades later, is confirmed and intensified in light of current data (Feliciano et al. 2024). The current study, in revisiting this history, highlights both the increase in the presence of domestic dogs in the area and the value of the Mata de Santa Genebra ARIE as an ecological and scientific reference in a context of rapid urbanization and forest fragmentation. It is one of the few remnants of the semi-deciduous seasonal forest in the Campinas region, whose long history of ecological studies, with different taxonomic groups, makes it an important site for Historical Ecology (Guirão and Filho 2011, Fundação José Pedro de Oliveira 2021). Therefore, continuous monitoring and the implementation of management actions are essential to mitigate the impacts recorded and preserve the biodiversity that this fragment still harbors.

4 CONCLUSION

The current study, based on a comparison with the work of Galetti and Sazima (2006), allowed us to consider the problem of the presence of domestic dogs in the area as recurrent and growing. The increased presence of these dogs results in more encounters with wildlife and, consequently, represents an increased possibility of predation, competition, scaring away, and transmission of diseases to native species. This increase in dog registrations in these areas may be related to different factors compared to the first study, such as: increased human population density in the surrounding area (Soto and Palomares 2014, Paschoal et al. 2018, Ribeiro et al. 2019), higher density of domestic dogs in the region (Ribeiro et al. 2019), increased permeability of the matrix for domestic dogs, with a reduction in vegetation density (Lacerda et al. 2009, Sepúlveda et al. 2015, Ribeiro et al. 2019), the formation of recurring packs of dogs in the area (Feliciano et al. 2024), and the maintenance of poor guarding habits of companion animals by the surrounding population.

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6 AUTHOR CONTRIBUTIONS

Renato D'Elia Feliciano: Conceptualization, Methodology, Formal analysis, Investigation, Resources, Data Curation, Writing – original draft, Writing – review and editing; Marcelo Nivert Schlindwein: Conceptualization, Methodology, Investigation, Resources, Writing – review and editing.

7 CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest in this work.

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