

UPDATE TO THE GEOGRAPHICAL DISTRIBUTION OF *SAPAJUS NIGRITUS CUCULLATUS* (SPIX, 1823) IN SOUTHERN BRAZIL

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Abstract

The geographical distribution of *Sapajus nigratus cucullatus* includes the Brazilian states of São Paulo, Paraná, Santa Catarina, and the northern half of Rio Grande do Sul (RS), and extends into the Misiones province of Argentina. The Camaquã River basin in RS, situated along the 31st parallel, is regarded as the southernmost extent of platyrrhine distribution, including *S. n. cucullatus*. However, a comprehensive mapping of this taxon occurrence in RS has yet to be conducted. The subspecies inhabits the Atlantic Forest biome. Nevertheless, historical records from points further south in RS, in the Pampa biome, introduce uncertainty regarding the subspecies' distribution. The objective of this study was to delineate the geographic range of *S. n. cucullatus* in RS. To this end, we evaluated data from scientific surveys, institutional databases, field observations, and information from citizen science platforms. A total of 146 occurrence records for the subspecies were identified in 82 municipalities, with 37 of these occurrences located within legally protected areas. In addition, we noted that the subspecies co-occurs with *Alouatta guariba*. This result supports the hypothesis that the subspecies is closely associated with the Atlantic Forest in the RS, yet also occurs in ecotones with Pampas. The absence of this subspecies to the south of the Ijuí and Jacuí rivers and Lake Guaíba was confirmed, corroborating the southern limit suggested in previous studies. The provenance of the isolated population that inhabits the Porto Alegre/Viamão region remains uncertain. This study expands the existing knowledge about the distribution of *S. n. cucullatus* in RS, confirming subspecies presence or absence in some areas due to environmental factors, and removing incorrect or inaccurate records. Additionally, it identifies the limits imposed on its dispersal by geographical barriers (rivers). Despite the presence of the subspecies in protected areas, it continues to face habitat loss in multiple regions of the state, particularly in the northwest of RS, due to the expansion of agribusiness. It is imperative to safeguard the populations of *S. n. cucullatus* in legally protected areas and to ensure habitat preservation and restoration in order to maintain the subspecies in RS.

Keywords: Atlantic Forest; black-horned capuchin monkey; extent of occurrence; geographic barrier; Platyrrhini

Resumo

A distribuição geográfica do *Sapajus nigratus cucullatus* inclui os estados brasileiros de São Paulo, Paraná, Santa Catarina e a metade norte do Rio Grande do Sul (RS), e se estende até a província de Misiones, na Argentina. A bacia do rio Camaquã no RS, situada ao longo do paralelo 31, é considerada a extensão mais ao sul da distribuição de platirrinos, que inclui *S. n. cucullatus*. No entanto, ainda não foi realizado um mapeamento abrangente das ocorrências deste táxon no RS. A subespécie é conhecida por habitar o bioma Mata Atlântica. No entanto, registros históricos de pontos mais ao sul do RS, já no bioma Pampa, introduzem incertezas quanto à distribuição da subespécie. O objetivo deste estudo foi delinear a distribuição geográfica de *S. n. cucullatus* no RS. Para isso, avaliamos dados de pesquisas científicas, bancos de dados institucionais, observações de campo e informações de plataformas de ciência cidadã. Um total de 146 registros de ocorrência da subespécie foi identificado em 82 municípios, com 37 dessas ocorrências localizadas em áreas protegidas. Além disso, identificamos que a subespécie co-ocorre com *Alouatta guariba*. Este resultado corrobora a hipótese de que a subespécie está intimamente associada ao bioma Mata Atlântica no RS, mas também ocorre em ecótonos com o bioma Pampa. A ausência dessa subespécie ao sul dos rios Ijuí e Jacuí e do Lago Guaíba foi confirmada, corroborando o limite sul sugerido em estudos anteriores. A população isolada de *S. n. cucullatus* localizada na região de Porto Alegre/Viamão permanece com origem incerta. Este estudo amplia o conhecimento existente sobre a distribuição de *S. n. cucullatus* no RS, confirmando a presença ou ausência da subespécie em algumas áreas devido a fatores ambientais e removendo registros incorretos ou imprecisos. Além disso, identifica os limites impostos à sua dispersão por barreiras geográficas (rios). Apesar da presença da subespécie em áreas protegidas, ela continua enfrentando perda de habitat em várias regiões do estado, especialmente no noroeste do RS, devido à expansão do agronegócio. É imperativo salvaguardar as populações

de *S. n. cucullatus* em áreas protegidas e garantir a preservação e a restauração do habitat para manter a subespécie no RS.

Palavras-chave: barreira geográfica; extensão de ocorrência; macaco-prego; Mata Atlântica; Platyrrhini

Introduction

The black-horned capuchin monkey (*Sapajus nigritus*, Goldfuss, 1809) is a platyrrhine primate species that exhibits remarkable behavioral and ecological flexibility, allowing it to occupy a diverse range of habitats in Brazil and Argentina. These include lowland ombrophilous forest, submontane and montane ombrophilous forest, deciduous/semideciduous seasonal forest, and riparian forests (Freese and Oppenheimer, 1981; Fragaszy et al., 2004; Vilanova et al., 2005; Aguiar et al., 2011). Furthermore, populations have been documented in secondary forests, in forestry and forest fragments situated in close proximity to crops and orchards (Ludwig et al., 2005; Fortes et al., 2013; Mikich and Liebsch, 2014; Hendges et al., 2017). Additionally, the species has been observed in natural areas adjacent to urban centers, indicating a tolerance for disturbed environments (Pinto et al., 2009; Slomp et al., 2014; Hendges et al., 2017). Ecological flexibility has enabled black-horned capuchin monkeys to occupy such a vast territorial area (Fragaszy et al., 2004; Rylands et al., 2005).

Two subspecies of *Sapajus nigritus* (Goldfuss, 1809) are currently recognized based on morphology: *S. nigritus nigritus* and *S. nigritus cucullatus* (Groves, 2001; Lynch Alfaro et al., 2012; Rylands et al., 2013). The distribution of *S. n. nigritus* encompasses the states of Minas Gerais, Espírito Santo, Rio de Janeiro and São Paulo. The northern limit is defined by the Santo Antônio and Doce rivers, which trace the border between the states of Minas Gerais and Espírito Santo. The southern limit is situated north of the Tietê River (Groves, 2001; Rylands et al., 2013; Martins et al., 2017). The form *S. n. cucullatus* exhibits the southernmost distribution, occurring from the south of the Tietê River to the northern half of the state of Rio Grande do Sul (RS) in Brazil. The Paraná River represents a geographical barrier to the western expansion of the taxon, which extends to Misiones in Argentina (Groves, 2001; Rylands et al., 2013; Di Bitetti et al., 2020). Recent genetic analyses have identified two clades in *Sapajus nigritus*, designated as «northern» and «southern,» with the boundary between their distributions situated at the Paraíba do Sul River (Szynwelski et al., 2024), which is distinct from the current limit of the subspecies based on morphology.

In 1888, the naturalist Hermann von Ihering postulated that the distribution of *Cebus* (the former genus name for all capuchin monkeys, here equivalent to the genus *Sapajus*) in Rio Grande do Sul would be situated to the north

of the 30°S parallel, occupying forested regions within the Atlantic Forest. Furthermore, he suggested that the southern limit of the genus would follow a line that did not precisely coincide with the 30°S parallel, but rather with the banks of the Ijuí (Yjuhy) and Jacuí (Jacuhy) rivers. This line continues southwards with the slope of the Serra Geral promontories against the grasslands of Porto Alegre, crossing the Dos Sinos River basin until it reaches the coast (Figure 1). Currently *S. n. cucullatus* populations in RS are predominantly located within the Atlantic Forest biome. Although there are historical records that extend further south, within the Pampa biome, these are situated within the Atlantic Forest domain and within the region designated by UNESCO as Atlantic Forest Biosphere Reserve (Vilanova et al., 2005; RBMA, 2008; Culot et al., 2019).

The 31st parallel is regarded as the southernmost distribution limit for platyrrhine primates (Printes et al., 2001). The Camaquã River basin, situated along the 31st parallel, represents the southernmost limit of the distribution of *Alouatta guariba* (Cabrera, 1940), which has been observed as far south as Santa Galo, 31°10'S, in São Lourenço do Sul, Brazil (Printes et al., 2001). The southernmost populations of *Alouatta caraya* (Humboldt, 1812) have been documented at slightly more northerly coordinates, specifically 30°43'S. Additionally, some individuals of this species have been observed in northern Uruguay, still within the limits of that parallel (Villalba et al., 1995; Jardim et al., 2020). The southernmost range of *Sapajus nigritus cucullatus* is considered to be Rio Grande do Sul (Rylands et al., 2005; Vilanova et al., 2005; Szynwelski et al., 2024). In the absence of a comprehensive mapping of the distribution of this subspecies within the state, it is presumed that its populations adhere to the same southern limits as those of the other two primate species. It was assumed that the distribution of *Sapajus* populations would be subject to the same factors that have determined the distribution limits of other primates in southern South America, including a reduction in tree species diversity, the gradual predominance of deciduous trees and low winter temperatures (Printes et al., 2001).

The same threats identified for *Sapajus nigritus* at the species level are valid for the subspecies in RS: habitat loss and degradation, hybridization, rural settlements, increasing road and agricultural matrix, hunting and collecting (Martins et al., 2015; Di Bitetti et al., 2020; Ludwig et al., 2022). The Atlantic Forest is characterized by a matrix of pastures, plantations and urban centers, interspersed with remnant forest fragments smaller than 50

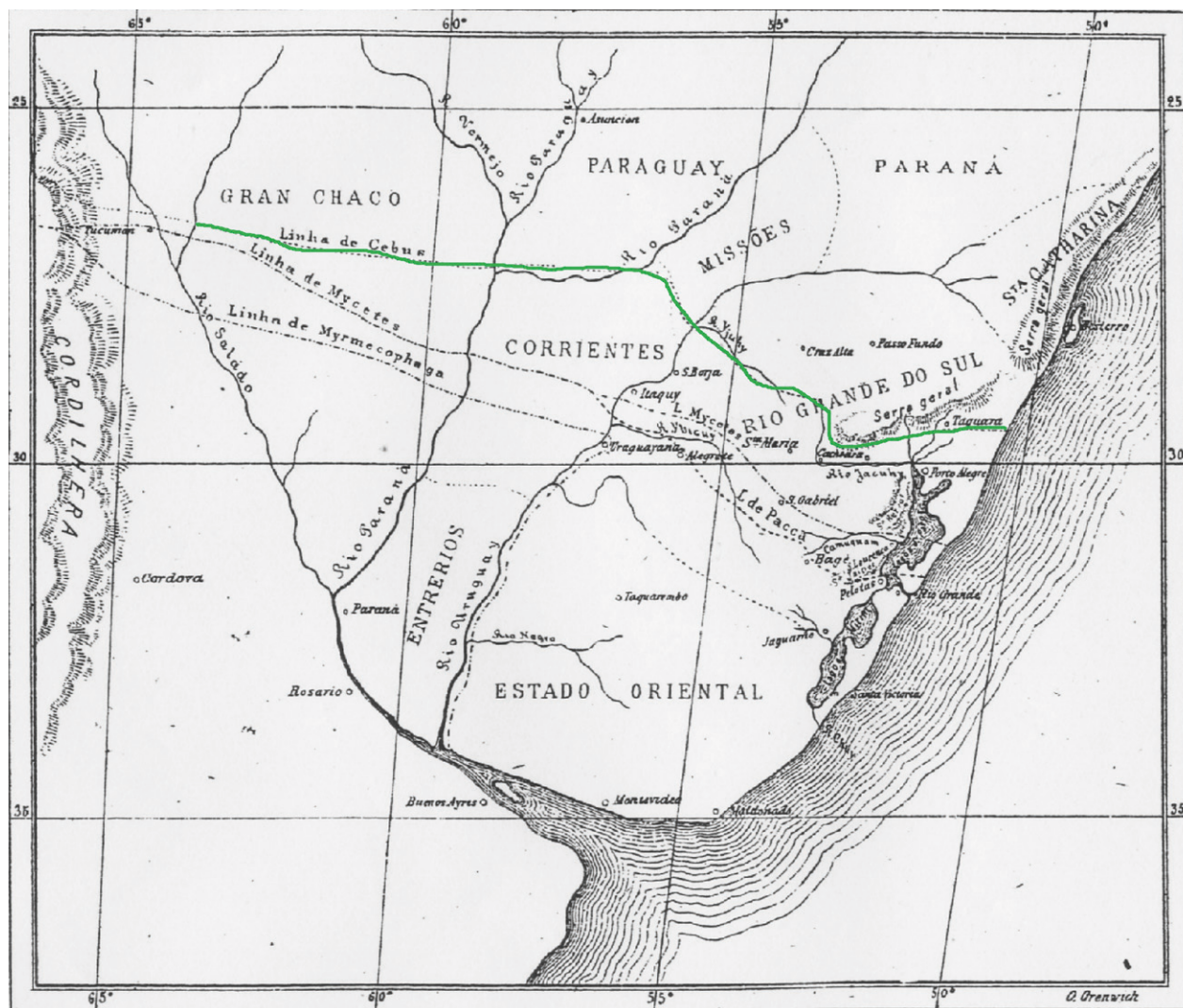


Figure 1. Distribution map of fauna genera, emphasizing the "Cebus" line (green line), adapted from Hermann von Ihering (1888). This line refers to Ihering's hypothesized southern distributional limit to the genus currently recognized as *Sapajus*.

ha (Pinto et al., 2009; Ribeiro et al., 2009; Hendges et al., 2017; Butti et al., 2022). Habitat fragmentation can affect populations in a number of ways, including reduction of home range size, changes in food resource availability, isolation of populations and increased vulnerability to stochastic events such as yellow fever epizootics (Ludwig et al., 2006; Bicca-Marques and Freitas, 2010; Silva et al., 2015; Hendges et al., 2017; Martínez de Zorzi et al., 2024). This can ultimately lead to local extinctions. The proximity of fragmented environments to human settlements facilitates frequent interactions between primates and human populations, thereby increasing the potential for conflict, with illegal trade being the most concerning in the case of robust capuchin monkeys (Estrada and Coates-Estrada, 1996; Levacov et al., 2011; Di Bitetti et al., 2020; Slomp et al., 2020; Martínez de Zorzi et al., 2024).

The biogeographical data available indicate a lack of clarity regarding the southern limit of the taxon's range. The aim of the present study is to define the range of *Sapajus*

nigritus cucullatus in the state of Rio Grande do Sul and identify its current southern distribution limit. The hypothesis is that, as previously described by Hermann von Ihering (1888) and subsequently observed by Rylands et al. (2005) and Szyrwelski et al. (2024), large rivers can act as geographical barriers in the distribution of the subspecies, and thus represent an important factor in defining the current distribution limits of the taxon in RS.

Methods

This study focused on Rio Grande do Sul (RS) state, the southernmost state in Brazil, which encompasses an area of 281,707 km², divided into 497 municipalities (IBGE, 2020). It is comprised of two biomes: the Atlantic Forest, which encompasses the forest formations of the eastern, northern and northeastern regions, as well as the associated high-altitude grasslands; and the Pampa, which extends across the grasslands of the southern half and the Missões region (Rambo, 1956; IBGE, 2012).

For this study, information on the occurrence of *Sapajus nigritus cucullatus* in RS was compiled and organized from a variety of sources, including published scientific research, institutional databases, field observations and opportunistic information. Additionally, occurrence records were obtained from digital citizen science platforms, including but not limited to: <https://www.gbif.org/>; <https://www.inaturalist.org/>; <https://www.taxeus.com.br/>; and <https://app.olhaomacaco.com.br/>. Records were also obtained from the System for Reassessing the List of Fauna Species Threatened with Extinction in RS (LIVE, 2014) and the Biodiversity Extinction Risk Assessment System (<https://salve.icmbio.gov.br/>; ICMBio, 2023). The data were classified into three categories based on the level of geographic accuracy: precise, approximate and interview/historical. Data analyses were carried out in ArcMap 10.3 software.

The accuracy of the coordinates of the records was determined based on the information provided in the source of the records. The majority of municipalities in RS have experienced political changes to their original boundaries (Rio Grande do Sul, 2018). To validate the location of the records, we took into account the date of the record and the Brazilian Institute of Geography and Statistics (IBGE) database (2020) to determine the current municipality in which the record was taken. The records were evaluated according to a series of accuracy factors, including: (a) accuracy of taxonomic identification; (b) accuracy of geographic coordinates; (c) divergence between the locality described and the geographical coordinates provided; and (d) changes in municipal boundaries, as described in the Genealogy of the Municipalities of Rio Grande do Sul (Rio Grande do Sul, 2018).

In instances where records were identified as interview or historical (those exceeding 30 years), and their locations were not within the boundaries of precise or approximate records, the researchers conducted fieldwork in those areas to actively search for the presence of the black-horned capuchin monkey and to conduct interviews with local residents. In addition, we contacted managers of the Protected Areas (PAs) and Municipal Environmental Officers in areas of interest.

Distribution area for a species, according to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), is the smallest area that is needed for a species to survive, including areas for nesting and feeding. It is defined by the shortest imaginary boundary that can include all known, inferred, or projected sites of a species. In contrast Area of Occupancy (AOO) is a scaled metric that represents the area of suitable habitat currently occupied by the taxon (CITES, 2024), calculated adding the forested areas in which the taxon occurs. Distribution area and AOO were calculated based on the valid occurrence records. The updated

map of the distribution area has been compiled using data from extant populations only.

The distribution area was calculated using the QGIS 3.38.5 program. The AOO was calculated using the MAP-Biomass 9.0 collection on the Google Engine platform, where the forest formation class was extracted within the distribution area in RS. The polygons whose extension overlapped the valid records of the species were considered AOO, and these areas were calculated and summed.

Our analysis quantified the proportion of records occurring in protected versus unprotected lands and in rural versus urban localities. The potential occurrence of *Sapajus nigritus cucullatus* in additional protected areas was predicted based on the information provided in these areas' management plans, which indicated the potential occurrence of the subspecies in these areas. At sites where capuchins have been confirmed, the study quantified the degree of geographic overlap with other native primates.

Results

Initially, a total of 158 records of occurrence of *Sapajus nigritus cucullatus* were identified, encompassing 91 municipalities within the state of RS. The records were grouped according to the pre-established system as 89 precise records, 36 approximate records, and 33 interview or historical records (Supplemental Material, available on-line). Following a comprehensive evaluation of all available records, a total of 146 were confirmed and 12 were refuted.

A review of occurrence records in the "interview" or "historical" category revealed that seven were unsubstantiated due to discrepancies between the location described in the record and the municipality/locality identified. This discrepancy may be attributed to three potential causes: imprecise geographical coordinates, an erroneous description of the locality of origin, or a modification in the municipal political geography. Four records classified as interviews were excluded from the analysis due to uncertainty regarding the taxonomic identification of the specimens in question, resulting from fieldwork conducted at the locations where the records were made. Ultimately, one historical record was rejected on conclusive evidence indicating that the subspecies in question had become extinct at the local level within the protected area, Passo Fundo National Forest.

Using the remaining 146 valid records for RS, the geospatial distribution area was estimated at 96,045 km² and for the suitability of the AOO, 12,563 Km². Ninety-five validated records were from rural regions and 51 from urban or peri-urban areas. In RS state, the subspecies is primarily distributed within the Atlantic Forest biome (91% of valid records), although it has also been documented in the Pampa biome (9% of valid records) (Figure 2).

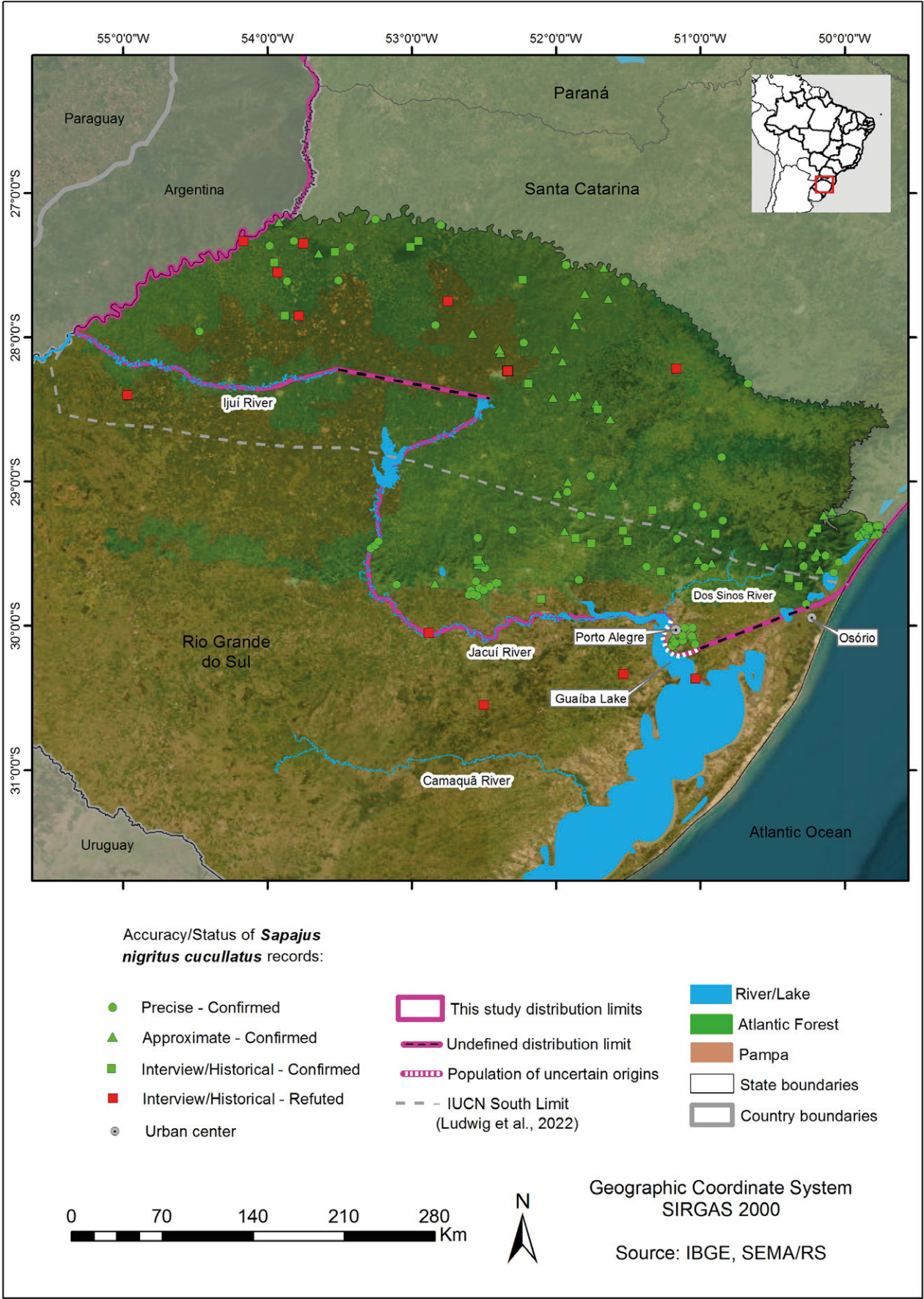


Figure 2. Distribution of records relating to the occurrence of *Sapajus nigritus cucullatus* in the state of Rio Grande do Sul (RS), Brazil, as confirmed or refuted in the present study.

The presence of *Sapajus nigrinus cucullatus* was identified in 37 Protected Areas defined by the Brazilian National System of Conservation Units, that include environmental conservation units and indigenous lands, as well as other protected area categories with some degree of legal protection. It also suggests the potential occurrence of the taxon in an additional ten protected areas, based on the existence of populations inhabiting nearby areas identified in the management plans of the protected areas (Table 1). The subspecies was observed to co-occur with *Alouatta guariba* in at least 25 locations (Table 1; Supplemental Material, available on-line). Conversely, no areas of co-occurrence with *A. caraya* have been identified.

Discussion

The subspecies *Sapajus nigrinus cucullatus* is closely associated with the Atlantic Forest biome in Rio Grande do Sul, Brazil, yet it also occurs in some ecotones with the Pampa biome. The Ijuí and Jacuí rivers and Guaíba Lake act as barriers to the distribution of this subspecies, although the riparian forests serve as corridors, facilitating the extension of local population distributions along their banks. The black-horned capuchin monkey populations are primarily distributed in rural areas within the municipalities, as well as in protected areas. This distribution pattern is favorable for the long-term conservation of this taxon, as it reduces the likelihood of conflicts with humans.

Table 1. Protected Areas in Rio Grande do Sul with records of confirmed or potential occurrence of *Sapajus nigrinus cucullatus*.

Protected Area	Occurrence of <i>Sapajus nigrinus cucullatus</i>	
	Confirmed	Potential
Indigenous Territory/Terra Indígena (TI)	TI do Nonoai; TI do Rio da Várzea; TI da Guarita; TI Inhacorá; TI Kaingang de Iraí	TI Campo Bonito; TI Mato Castelhanos; TI Guarani Barra do Ouro; TI Varzinha
Biological Reserve/Reserva Biológica (REBIO)	REBIO Mata Paludosa; REBIO da Serra Geral; REBIO Moreno Fortes	/
Ecological Station/Estação Ecológica (ESEC)	ESEC de Aratinga	/
National Park/Parque Nacional (PARNA)/State Park/Parque Estadual (PE)/Municipal Nature Park/Parque Natural Municipal (PNM)	PARNA da Serra Geral; PARNA de Aparados da Serra; PE do Turvo; PE do Papagaio Charão; PE da Quarta Colônia; PE do Espigão Alto; PE de Itapeva; PNM Mata do Rio Uruguai Teixeira Soares; PNM de Sagrisa; PNM de Sertão; PNM da Ronda; PNM Dois Lajeados; PNM Arcângelo Busatto; PNM da Gruta	/
National Forest/Floresta Nacional (FLONA)	FLONA de São Francisco de Paula	/
Environmental Protection Area/Área de Proteção Ambiental (APA)	APA Rota do Sol; APA do Banhado Grande; APA Morro de Osório	APA de Riozinho; APA do Caraá; APA dos Arroios 12 e 19; APA do Rio Suzana
Relevant Ecological Interest Area/Área de Relevante Interesse Ecológico (ARIE)	ARIE do Morro Ferrabraz	/
Private Natural Heritage Reserve/Reserva Particular do Patrimônio Natural (RPPN)	RPPN Pró-Mata; RPPN da UNISC	RPPN O Bosque
Other Protected Area Category	Cinturão Verde de Santa Cruz do Sul; Zona Especial de Proteção Ambiental Morro Gaúcho; Zona de Interesse Turístico Morro Botucaraí; Refúgio de Vida Silvestre da UFRGS; Parque da Cascata de Nova Hartz; Parque Particular Vale da Ferradura; Reserva Ecológica Particular da Olaria	Balneário Municipal Santa Rita de Farroupilha
Total	37	10

The role of rivers as geographical barriers to the dispersal of taxa has been demonstrated in numerous primate species (Wallace, 1854; Boubli et al., 2015; Buckner et al., 2015; Lynch Alfaro et al., 2015; Printes et al., 2018). The difficulty for *Sapajus* to cross large rivers provides a partial explanation for the geographical limits of the genus (Rylands et al., 2005; Silva et al., 2013; Boubli et al., 2015) and the species boundaries within the genus (Aguiar et al., 2007, 2011). The occurrence records of *Sapajus nigritus cucullatus* in RS are consistent with our distribution hypothesis, which suggests that large water bodies are associated with the southern limit of the subspecies, as previously suggested by Ihering (1888). The absence of the black-horned capuchin monkey to the south of these water bodies was confirmed despite the existence of suitable habitats. For example, in the Serra do Sudeste region, which is distinguished by dense formations of semideciduous seasonal forest (Overbeck et al., 2009; Hasenack et al., 2023) that provide habitat for several populations of *Alouatta guariba* (Printes et al., 2001; Codenotti and Silva, 2004; Slomp et al., 2014), no capuchin monkeys were observed during the fieldwork. Consequently, all records of the subspecies, which were based on interviews, were refuted following field investigations due to the high probability of misidentification of the subspecies or the capuchins' potential local extinction over time.

Some regions of RS appear to lack a discernible geographical barrier to the distribution of the subspecies, suggesting that additional factors may be responsible for constraining their expansion. The absence of black-horned capuchin monkeys in a given environment may be related to unfavorable conditions, including environmental factors such as low forest quality and low temperatures (Printes et al., 2001; Souza, 2013) or anthropogenic factors such as highly fragmented landscapes and reduced matrix permeability (Pinto et al., 2009; Silva et al., 2015; Hendges et al., 2017). To illustrate, the north-western portion of the state is situated within the Pampa biome, which is known for its reduced diversity of tree species (an environmental factor). Furthermore, this region also exhibits a high level of agribusiness activity, resulting in the lowest rates of forest cover in Rio Grande do Sul (approximately 5%) (SFB, 2018). This has led to an extremely fragmented matrix (an anthropogenic factor). However, the current data set is insufficient to determine whether any of these unfavorable conditions may have contributed to the absence of the subspecies to the south of the undefined area delineated in this study.

Sapajus nigritus cucullatus predominantly inhabits forest habitats within the rural regions of RS. This pattern has been observed in other *Sapajus* species, that also consistently appear to occur in rural landscapes at a greater frequency than in urban environments (Estrada et al., 2012; Agostini et al., 2015; Grande et al., 2020). Conflict between local farmers and capuchin monkeys has been documented in RS, as well as in other Brazilian states and

Argentina, resulting in a range of adversarial interactions including human aggression toward monkeys through poisoning and hunting (Rocha, 2000; Codenotti et al., 2005; Gonçalves, 2006; Rocha and Fortes, 2015; Martínez de Zorzi et al., 2024). Conversely, the populations of black-horned capuchin monkeys inhabiting urban and peri-urban areas of the RS are the most susceptible to anthropogenic conflicts (Gonçalves, 2006; Maders, 2016; Ribeiro et al., 2019; Slomp et al., 2020; Ehlers et al., 2022). Consequently, populations near urban centers are more at risk than those in rural areas, particularly from urban expansion into their natural habitats.

The present study identified the presence of the taxon in 37 protected areas (Table 1), indicating an increase in the observed occurrence of *Sapajus nigritus cucullatus* in this type of area when compared to previous studies (Prates et al., 1993; Marques, 2003; Codenotti and Silva, 2004; Slomp et al., 2014). The new records of the black-horned capuchin monkey within protected areas can be attributed to two main factors: the implementation of management plans in these areas and an increase in scientific research conducted therein. It is also believed that the subspecies may potentially occur in an additional ten protected areas, collectively representing more than 372,000 ha. The taxon was identified in 19 municipal or private protected areas. These discoveries are worth special attention, as these areas, although smaller in size than federal and state protected areas, represent a significant area of occupation for capuchin monkeys, as their ecological flexibility allows them to inhabit areas as small as 10 ha (Freitas et al., 2005; Gonçalves, 2006; Bicca-Marques et al., 2011; Hendges et al., 2017).

The population of *Sapajus nigritus cucullatus* in the municipality of Osório (29°51'S / 50°15'W) represents the southernmost documented occurrence of the subspecies in natural areas with some degree of connectivity. However, an isolated population is known to exist further south (30°S) (Gomes, 2006; Penter et al., 2008; Slomp et al., 2014), although the controversy surrounding its origin makes it difficult to determine its precise status. Current records indicate that groups of individuals occupy a corridor of forest fragments surrounded by the densely urbanized areas of the municipalities of Porto Alegre, Viamão and Alvorada. These animals move very close to the residential areas and often interact with the human population, entering homes and receiving food supplements. Reports have emerged of instances in which the species has been introduced by local people and, on occasion, captured for domestication as pets (M. M. A. Jardim, pers. comm., 2024).

In the same region, extensive primate surveys have been carried out in recent decades in contiguous forest remnants where the vegetation has Atlantic rainforest characteristics, providing forests suitable for *Sapajus* (Brack et al., 1998; Vilanova et al., 2005; Souza, 2013).

However, the only primate species recorded was *Alouatta guariba* (Printes et al., 2010; Buss, 2012; Pires and Cadernartori, 2012; Camaratta et al., 2017). The presence of *Sapajus* was not mentioned by residents in the interviews, not even when they referred to more distant times in the past (Pires and Cadernartori, 2012). On the other hand, it is possible that the subspecies underwent local extinction events in these municipalities or that these populations are relict, considering that archaeofaunal remains of *Sapajus* have been found in the region (Rosa, 2010). Furthermore, a phylogeographic study revealed a genetic signature of the population in this region to be highly similar to that in the geographical distribution of neighboring regions in Rio Grande do Sul (Szywnelski et al., 2024). It would be of particular interest for future research to determine whether the population originates from introduced individuals, a recent expansion of populations from the northernmost region, or relict groups from the southern limit of their range.

Our analysis showed that although the subspecies is present in many areas in RS with some degree of legal protection, over two-thirds of the records correspond to unprotected areas where habitat loss is occurring at an accelerated rate (SFB, 2018). Our findings also indicate that the area of occupation for the subspecies was 12,563 Km², considering only the territory of Rio Grande do Sul. This information may be utilized in a future assessment of the conservation status of the black-horned capuchin monkey in the state. Some actions that are essential for the conservation of the subspecies include: (a) monitoring the presence of black-horned capuchin monkeys in currently existing protected areas; (b) protecting the remnants of the Atlantic Forest in RS; (c) maintaining permanent protected areas; and (d) preserving and promoting ecological corridors to ensure genetic connectivity between populations.

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