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First record of the coypu *Myocastor coypus* (Molina, 1782) for the Arthur Thomas Municipal Park in the municipality of Londrina, Paraná

Primeiro registro de ratão-do-banhado *Myocastor coypus* (Molina, 1782) para o Parque Municipal Arthur Thomas no município de Londrina, Paraná

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Abstract

Myocastor coypus (coypu or nutria) is considered one of the 100 worst invasive species in the world due to its risk to local wildlife, such as waterfowl, zoonotic risks, and environmental damage, such as riverbank erosion, arising from its habit of constructing burrows along the edge of water bodies. The presence of *M. coypus* is already known locally in the municipality of Londrina based on records at Igapó Lake. This paper presents the first record of *M. coypus* in Arthur Thomas Municipal Park, a Conservation Unit of Integral Protection located in the urban area of Londrina. The records were obtained through direct observation of one live individual and one carcass during campaigns to monitor medium and large mammals. Subsequently, ten records were obtained using camera traps, of unknown gender, located near waterbodies. We emphasize the need for continuous fauna monitoring in conservation units to detect and verify potential increases in invasive alien species populations that can result in environmental damage.

Keywords: Non-native species; Urban mammals; Nutria; Camera trap; Conservation unit.

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Resumo

A espécie *Myocastor coypus* (ratão-do-banhado) é considerada uma das 100 piores espécies invasoras do mundo por representar risco para a fauna local, como aves aquáticas, e risco de zoonoses, além de causar danos ambientais, como desbarrancamento de encostas de rios, devido ao seu hábito de construção de tocas nas margens de corpos d'água. A presença de *M. coypus* já é conhecida localmente no município de Londrina a partir de registros no Lago Igapó. Assim, este estudo apresenta o primeiro registro de *M. coypus* no Parque Municipal Arthur Thomas, uma Unidade de Conservação de Proteção Integral localizada na zona urbana de Londrina. Os registros foram obtidos através da observação direta de um indivíduo vivo e uma carcaça durante campanhas de monitoramento de mamíferos de médio e grande porte. Posteriormente foram obtidos dez registros por armadilha fotográfica de indivíduos de sexo desconhecido, próximos a corpos d'água. Enfatiza-se a necessidade do monitoramento contínuo da fauna em áreas de conservação para a detecção do potencial aumento na população de espécies exóticas e invasoras que podem causar severos danos ambientais.

Palavras-chave: Espécies não nativas; Mamíferos urbanos; Nútria; Armadilha fotográfica; Unidades de conservação.

Introduction

Myocastor coypus (Molina, 1782), commonly known as coypu, is a large rodent,[1] which has a length of 60 cm to 1 m and a weight of 6-9 kg.[2] These are nocturnal animals with semi-aquatic behavior, usually found in riverbanks, lakes, and dikes. Although *M. coypus* is native to South America, its natural extent of occurrence is limited to Patagonia, Bolivia, Paraguay, Uruguay, Chile, and the extreme southern region of Brazil in the state of Rio Grande do Sul.[3-4] Furthermore, this species was introduced to several other regions for meat and fur production, resulting in an extension of its occurrence that surpasses the original distribution, reaching North America and countries in Africa, Asia, and Europe,[5] as well as states in southeastern Brazilian, such as Paraná,[4,6] where this species was introduced in the 1940s because of the North American demand for fur and meat,[7] and animals that escaped settled in the wild.[8] These species are known to be introduced into new areas by escape or release from production farms, or by population growth in human settlements.[9] The species exhibits a high degree of adaptability, through high niche occupation and a high reproduction rate.[10] According to Lowe *et al*. (2000), in collaboration with the International Union for the Conservation of Nature (IUCN), *M. coypus* is one of the world's 100 worst invasive species, (i.e., species that have the greatest impact or cause the most serious impacts on biological diversity and/or human activity), based on its biological and human-related impacts.[11]

This species is known to negatively shape natural habitats, based on its aquatic plant-based diet[12-14] and digging behavior while foraging and constructing its burrow, which weakens the riverbanks, causing biological and physical damage to freshwater ecosystems.[15-17] In addition, these animals are likely to cause damage to different regional cultivations and wildlife in the area, particularly by destroying nests and consuming the eggs of waterbirds.[18] These animals can also pose a zoonotic risk to public health as they are a reservoir for diseases that can be transmitted to humans (e.g., leptospirosis and toxoplasmosis)[19-20] and may also carry ectoparasites (e.g., ticks).[21-22]

The presence of coypu is already known in the municipality of Londrina, Paraná, Brazil in Igapó lake in the middle of the city, which is surrounded by an urban matrix.[6] In addition, Pereira *et al*. (2020) deposited one run-over specimen in the Museum of Zoology of the State's University of Londrina (Voucher Number MZUEL 376),[6] however, this species has only been observed in

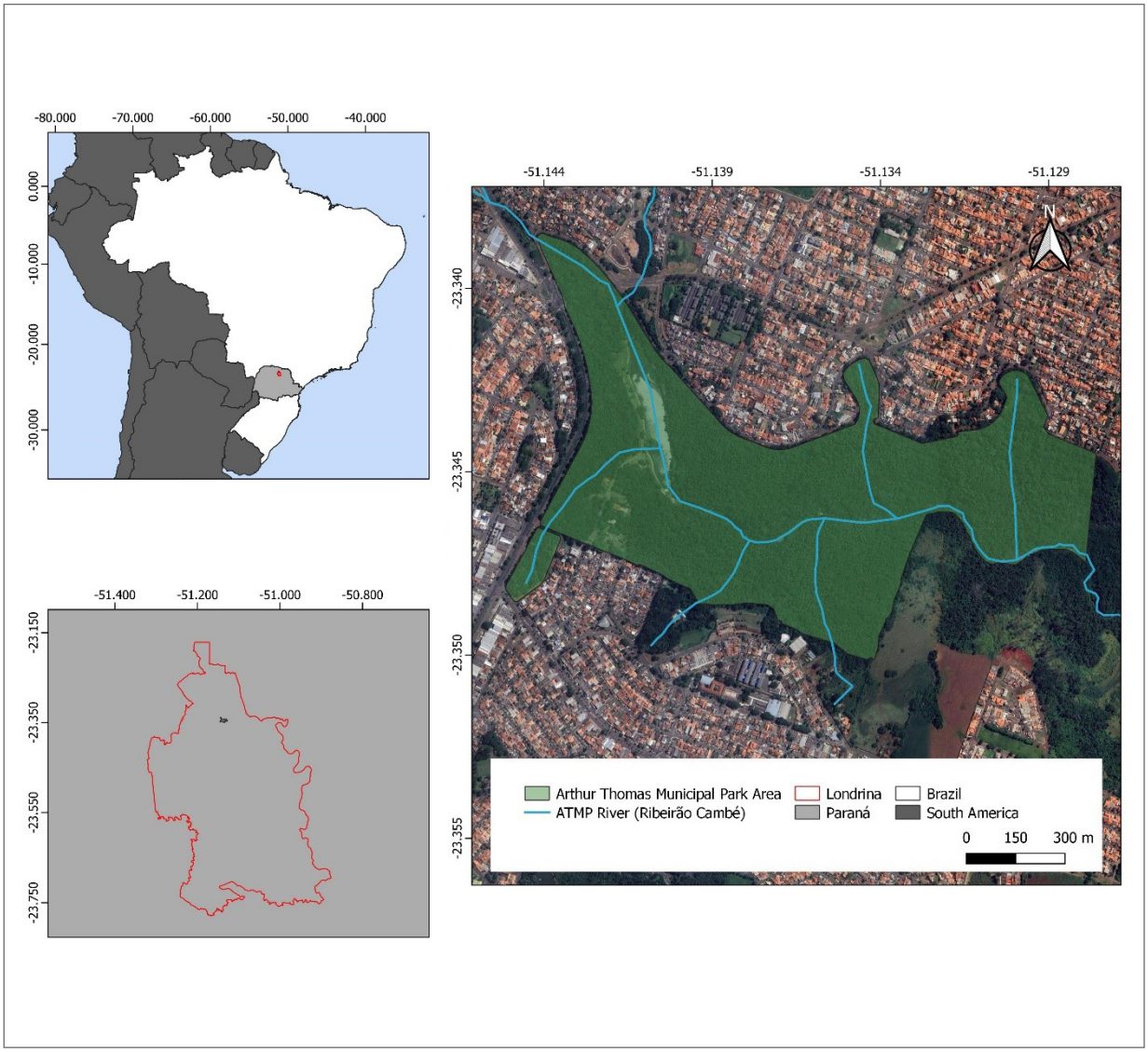
anthropomorphic environments (i.e., outside forest remnants). The current study aims to report the direct and indirect detection of the non-native species *Myocastor coypus* in a conservation unit in the municipality of Londrina, Paraná State, South Brazil.

Methods

Study area

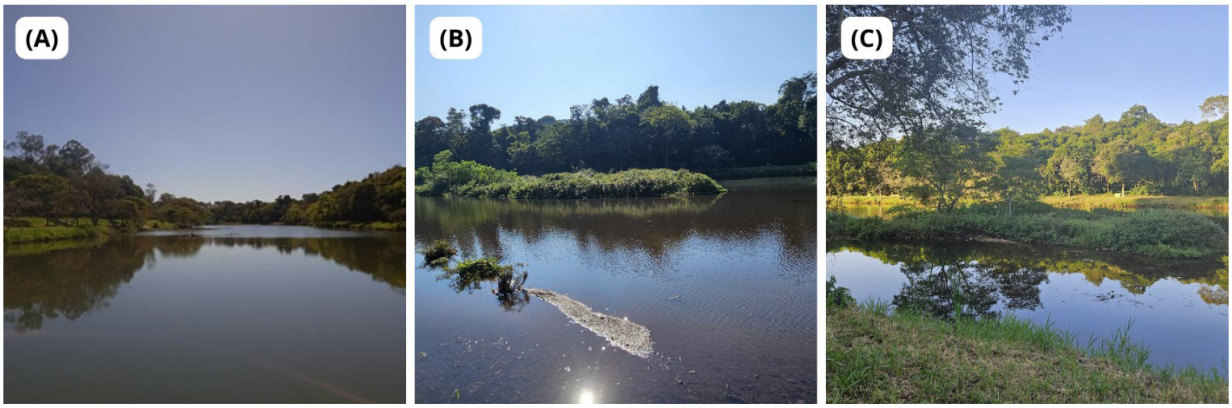
This study was conducted in the Arthur Thomas Municipal Park (ATMP), a strict conservation area, located in southern Londrina, Paraná, Brazil. The ATMP is mostly categorized by an 85-hectare secondary semideciduous seasonal Atlantic Forest area inserted in an urban matrix[23] (Figure 1). The area comprises not only natural features but also human settlements, such as park administration offices and parking lots, being open to public visitation six days a week. The natural area contains several minor freshwater rivers that flow into the major river Ribeirão do Cambé. This river is dammed in the park, forming a lake with silted areas and shallow banks, which facilitates the entry and exit of mammals from the lake (Figure 2).

Figure 1 - Map of Arthur Thomas Municipal Park, Londrina, Paraná State, South Brazil.



Source: the authors.

Figure 2 - Main Lake of Arthur Thomas Municipal Park (A); Major Island located to the north of the lake (B); Minor Island located in the central portion of the lake (C), Londrina, Paraná State, Southern Brazil.



Source: the authors.

Data collection

Data were collected between December 2022 and December 2023, during field campaigns to sample medium and large mammals, through indirect and direct sampling methods. The indirect methods consisted of installing camera traps and searching for traces of mammals, and the direct methods were conducted using visual observations (i.e., individual observation or carcasses).

We installed five camera traps for seven days each month, rotating the locations monthly. Cameras were fixed on trunks at least 50 centimeters above the ground and configured to take three photos and record 30 seconds per detection, continuously during the seven sampling days.[24-25] Installation points were selected monthly during trail opening campaigns, aiming to better sample the location.[26-27] We used the Trail Camera model MiNi600. For trace searching and direct observations, we visited the ATMP on three consecutive days per month, from early in the morning to the late afternoon (nearly 8 hours per visit). During these visits, we sought to cover the greatest possible areas of ATMP, to maximize our research effort. The direct sampling method was conducted by visual observations (i.e., individual observation or carcasses).

Direct sampling records were considered independent when they took place on different sampling days, while traces (i.e., footprints, burrows, scratches, and feces) were independently recorded considering a minimum distance of 50 meters between records.[28-29] We also took complementary photos of each individual during direct observation using a digital camera and lens. The location of animal sightings was obtained using *A-gps tracker* software,[30] with the help of a smartphone, and the locations were added to a spreadsheet and later imported into *Qgis* software[31] to generate a vectorial map of the points.

Ethical note

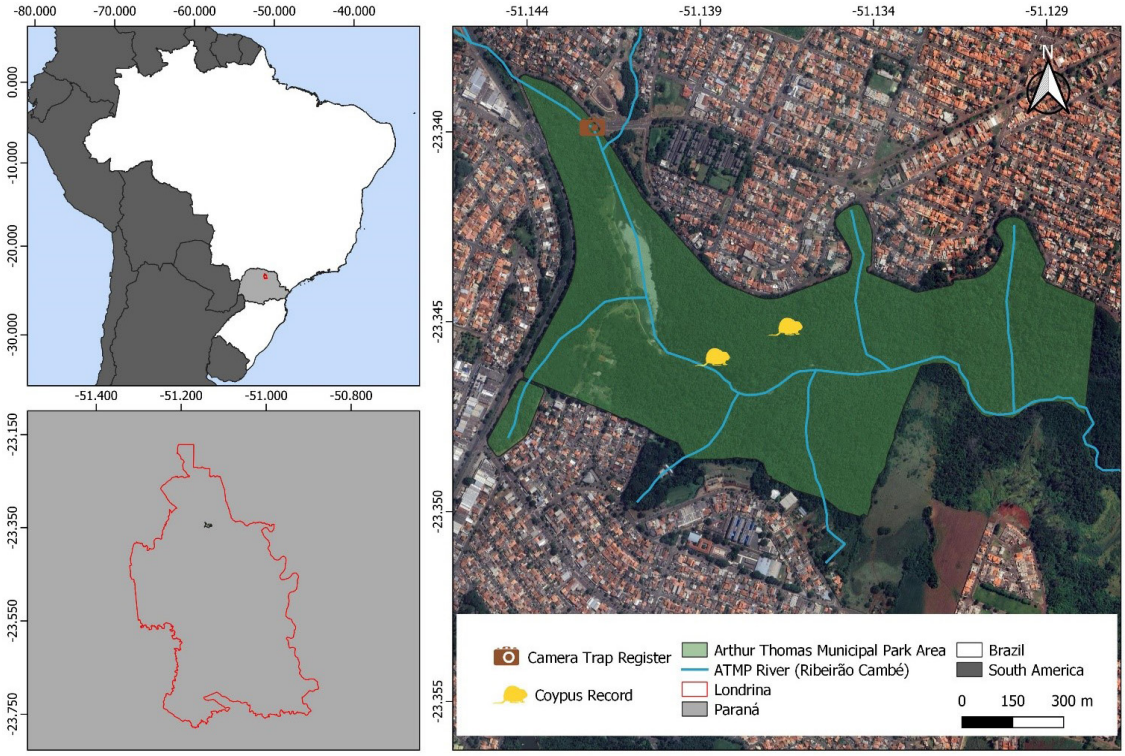
The research involving medium and large-sized mammals strictly adhered to the protocol approved by the Municipal Secretary of the Environment (MSE). All methodologies were carried out in accordance with Brazilian legislation, with authorization from environmental agencies IBAMA/ICMBio (authorization 84428-1).

Results

Two *M. coypus* individuals were directly observed during this study (Figure 3). The first, on December 16, 2022, during the campaigns of direct and indirect active searches, at 03h20 p.m., was a carcass of *M. coypus*, with unidentified sex,

found in the park's rainwater drainage system (23°20'42.5"S 51°08'11.6"W) (Figure 4A). The second individual, also of unidentified sex, was observed alive on June 01, 2023, moving on the ground at 10h35 a.m., close to the dam on the lake (23°20'45.4"S 51°08'19.1"W) (Figure 4B).

Figure 3 - Records of *Myocastor coypus* (in yellow) at the Arthur Thomas Municipal Park, Londrina, Paraná State, South Brazil.



Source: the authors.

Figure 4 - Records of coypus (*M. coypus*) at Arthur Thomas Municipal Park, Londrina, Paraná State, South Brazil. A) Carcass. B) Live individual observed directly.

Source: the authors.

In total, 10 independent *M. coypus* records were recorded through camera trapping sampling between October, 19, 2023 and November, 21, 2023 (Figure 5). All individuals were observed alive and during the night period. Sexual identification was not possible and most records were

taken on different days. However, on October 21, 2023, we registered one sample at 02h51 a.m. and another at 09h54 p.m. The same occurred on October 24, 2023, with one sample at 01h09 a.m. and another at 11h27 p.m.

Figure 5 - Records of coypus (*M. coypus*) registered with a camera trap at Arthur Thomas Municipal Park, Londrina, Paraná State, South Brazil.

Source: the authors.

Discussion

The current study is the first record of the occurrence of *M. coypus* in a strict conservation unit from Londrina's municipality, the Arthur Thomas Municipal Park. The potential damage that this species can cause in the area is concerning due to the presence of native species that may be harmed directly and indirectly, with damage waterbird nests,[32] enabling episodes of egg predation by other predators as they are moving around the nest and using them as a resting platform,[33] or even the predation of eggs by the coypu.[34] Another potential risk of *M. coypus* is its role as a potential reservoir of diseases such as leptospirosis, which may pose a risk of infection to domestic animals and humans.[35-36]

Furthermore, *M. coypus* can damage dams because of its "*eat-out*" type of foraging,[37] where the animal damages the vegetation surrounding bodies of water by digging through roots and rhizomes.[38] With the periods of flood and the formation of these holes, the process of erosion can occur, eventually leading to landslides,[39] such as those that occur in the United States in Louisiana.[40] Landslides through erosion can also occur due to the behavior of these animals which dig holes and channels.[16,41-42] These erosion and landslide processes caused by the coypus are particularly worrying in the park, because of the advanced silting process in the main lake.[43]

As the coypus species is associated with aquatic environments through foraging and burrowing,[15-17] a major concern is the dispersal of the species to other areas where it is not currently present, as was the case in the ATMP. One possibility is that *M. coypus* dispersed into the ATMP through the aquatic connection with Lake Igapó, where it has previously been recorded. Although it is not possible to confirm that the species has established itself in the park (since only a few individuals of unknown sex were sighted and there are no records of females with chicks), it is extremely important to monitor the species, as construction of a lake such as that in ATMP, which forms a lentic environment and is surrounded by grass, can favor

the establishment of the species. Currently, we can state that the ATMP may be used by *M. coypus* as a dispersal route. The Cambé River is connected to other bodies of water, so it is extremely important to monitor the species, especially in areas with the presence of streams, rivers, and/or lakes that could facilitate its dispersal. Thus, the distribution of the water network in the area can serve as a potential corridor for its dispersal.[44]

The species has high environmental plasticity, supporting its establishment in areas with climate variation and different conservation degrees, ranging from integral areas to those with a high degree of anthropogenic disturbance. Once it is established, populations control can be difficult because of its high fecundity rate, with approximately 2 litters per year, each litter ranging from 1 to 12 individuals, depending on the environmental conditions.[45] The invasive potential of *M. coypus* may be related to its ability to colonize new areas and the availability of resources. In the study conducted by Pereira *et al*. (2019), human-induced modifications were the main factor explaining the current distribution of the species. Factors such as population density and the degree of disturbance of areas by human activity may be the primary explanations for its distribution.[44-46] These factors, combined with knowledge of its current distribution, may indicate the tolerance of the species and even its resilience to anthropogenic environments.

In Brazil, it was observed that the most suitable areas for the occurrence of this species are related to the Atlantic Forest biome, where temperature and precipitation indicators contribute to its dispersion.[6] The changes in landscapes caused by human presence are also a facilitator that contributes to the establishment of *M. coypus*, indicating a certain resilience of the species to the urban environment.[46,47] An example of this is the ATMP, where there is an alteration in the natural forest structure and monthly supplementation is carried out to prevent wild animals from venturing into urban areas. This may also potentially contribute to the persistence of species in the area.

The ATMP is characterized as a forest fragment of vegetation from the Atlantic Forest biome that poses great importance for native wild fauna conservation.[48] This forest remnant contains several mammal species that vary in their degree of vulnerability, as shown in recent monitoring studies, emphasizing its conservation importance.[49] Nevertheless, ATMP is inserted in the middle of the urban matrix, where it has direct and indirect anthropogenic influence. Human pressure, combined with exotic and invasive species, can be a threat to the park's fauna, which have different conservation statuses with more restricted species and behaviors.[49] The presence of these threats can directly affect this community by generating competition for food resources, leading to a decrease in food availability for native species,[50] and altering the habitat and home range of other species, such as birds.[33,51] *M. coypus* can cause damage to native aquatic vegetation when feeding, negatively affecting the fish community,[52] in addition to posing risks of disease transmission to humans and native species.[19-20]

According to Farashi, Najafabadi,[53] 62% of *M. coypus* distribution is within protected areas, being a risk factor for native fauna and flora. Therefore, the systematic monitoring of these animals is necessary to understand population dynamics and potential risks to the park's biodiversity. The current report highlights the attention to precautionary measures and management aimed at conserving biodiversity in conservation units in urban environments, such as ATMP.

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