

Distribution update

New records of threatened canids in southwestern Atlantic Forest, Brazil



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Abstract

We present new records of two threatened canid species, the bush dog (*Speothos venaticus*) and the maned wolf (*Chrysocyon brachyurus*), within and in the vicinity of Iguaçu National Park, Paraná, Brazil. These records were obtained through camera trap monitoring conducted between 2018 – 2020 and a wildlife rescue operation outside the park. The bush dog record was the first in a decade of camera trap monitoring, encompassing 20,297 trap days. This effort is comparable to that expended in detecting the species in other areas of the Atlantic Forest. The maned wolf records in the Atlantic Forest were unexpected, given the species' apparent avoidance of this habitat type. This presence may be attributed to significant landscape transformations, creating open areas conducive to the maned wolf's dispersion within the Atlantic Forest. These records highlight the importance of investigating the dispersal behaviors of the bush dog and the maned wolf in this region to understand the impact of human-altered landscapes on the geographical distribution of these two canids. These new records within and on the border of the Iguaçu National Park assume particular significance for enhancing and coordinating conservation initiatives for these species and establishing public policies for their conservation.

Article

The Atlantic Forest biome is a biodiversity hotspot in South America with high levels of biodiversity and endemism (Joly et al. 2014). While its original distribution covered around 1.5 million km², it is now reduced to less than 28% of the original size (Rezende et al. 2018). Due to the widespread

conversion of forest ecosystems to human land uses, mainly agricultural, the distribution of some species was affected (Tscharntke et al. 2012). Changes in species distribution across the Atlantic Forest are poorly documented, particularly for mammals, which include canids. Canids show a great diversity of species in South America, occupying varied habitat types and presenting distinct feeding habits, but with many ecological and evolutionary aspects yet to be studied (Chavez et al. 2022). Six canids occur in Brazil,

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with four of them reported in the Atlantic Forest – crab-eating fox (*Cerdocyon thous* Linnaeus 1766), maned wolf (*Chrysocyon brachyurus* Illiger 1815), bush dog (*Speothos venaticus* Lund 1842), and pampas fox (*Lycalopex gymnocercus* G. Fischer 1814, Paglia et al. 2012).

The bush dog is considered one of the least known Neotropical canid species since it is rare and elusive (Zuercher et al. 2004, de Oliveira 2009). This species is categorized as Near Threatened on the IUCN Red List (DeMatteo et al. 2011), Vulnerable by the Brazilian National List of Endangered Species (MMA 2022), and Critically Endangered in the Atlantic Forest (Jorge et al. 2018). Its historical distribution extends from eastern Panama to north-eastern Argentina (Sillero-Zubiri et al. 2004, Jorge et al. 2013). Despite the supposedly widespread distribution in South America, this species is threatened by habitat fragmentation, reduction of prey base, and disease transmission from domestic species, particularly domestic dogs (*Canis familiaris*, de Oliveira 2009, Jorge et al. 2010, Vizcaychipi et al. 2016). As highlighted by Leite-Pitman and Williams (2004), diseases transmitted from domestic dogs to wild canids can lead to the loss of species in specific regions for extended periods, as observed with short-eared dogs (*Atelocynus microtis*) in Peru. In southern Brazil, information on the bush dog is limited to a few records in the states of Paraná (Margarido and Braga 2004, Fusco-Costa and Ingberman 2013, Tiepolo et al. 2016), Santa Catarina (Ihering 1911, Cherem et al. 2004), Rio Grande do Sul (Fick et al. 2021), and Minas Gerais (Ferreira et al. 2015, Azevedo et al. 2016, Silva et al. 2022).

The maned wolf, the largest South American canid, is considered Near Threatened on the IUCN Red List (Paula and DeMatteo 2015) and Vulnerable in Brazil (MMA 2022). The main threats to the species are habitat loss and continuous landscape changes due to human activities, diseases, road-kill, and retaliatory hunting due to predation of poultry (Paula and DeMatteo 2015, Fiori et al. 2023). This canid was originally distributed in open habitats such as Cerrado, Chaco, high-altitude grasslands of the Atlantic Forest, and Pampas (Langguth 1975, Dietz 1985). Due to habitat alteration and loss, the species' current distribution is significantly reduced (Queirolo et al. 2011, Paula et al. 2013). In contrast to the contraction of the maned wolf's original distribution, the conversion of forest habitats to mosaics of pastures and agriculture created areas that favoured their expansion toward the densely forested areas of the Atlantic Forest, in south-eastern Brazil (Queirolo et al. 2011, Tschamtko et al. 2012, Nigro et al. 2020, Pereira et al. 2020), such as large forest blocks and protected areas.

The reported records on the maned wolf and bush dog were obtained in and around Iguazu National Park (INP), a strictly protected UNESCO World Heritage Site located in the western region of Paraná State in south-eastern Brazil. It comprises 1.85M ha of Interior Atlantic Forest ecoregion, including humid subtropical rain forest and humid subtropical deciduous forests, with areas of Araucaria moist forests (Ribeiro et al. 2009). This protected area holds one of the largest and most important remnants of the Interior Atlantic forests in Brazil since only 5.4% of the original forest cover remains in Paraná State (Paixão and Priori 2015, Brocardo et al. 2019).

Prior to this study, there have been two indirect reports of bush dog presence in INP that included reports by residents, faeces, and tracks (Tiepolo et al. 2016, Brocardo et al. 2019); while the maned wolf had a single roadkill record on the BR277, in the municipality of Céu Azul, with no precise location (Cândido-Jr, J.F. pers. obs.).

In this report, one bush dog and one maned wolf record were obtained during camera trap monitoring conducted by the Projeto Onças do Iguazu in INP; a jaguar (*Panthera onca*) population survey, through biannual censuses conducted since 2012; and a continuous wildlife monitoring that monitored wildlife species conducted since 2018, respectively.

Between September and December 2018, a jaguar survey across a grid with 45 pre-established sampling stations, located 3.5 – 4.0 km apart, was conducted. Each station had two cameras placed 40 – 50 cm above ground, along dirt roads, at river margins, and inside the forest. These cameras operated 24hr/day for three consecutive months. Cameras were programmed to take three photos at 6 sec intervals. Continuous wildlife monitoring has been conducted throughout the year, using 29 stations composed of one camera trap, located 1 – 2 km apart, installed at strategic locations to monitor wildlife species near areas used for tourism. These cameras were programmed to make videos of 15 sec, with an interval of 6 sec. During all surveys, we regularly checked stations to change memory cards and batteries.



Figure 1. Locations of the bush dog (*Speothos venaticus*; circles) and maned wolf (*Chrysocyon brachyurus*; triangles) records in and around Iguazu National Park, Paraná State, Brazil. Previous records refer to *S. venaticus*: Iguazu National Park (Tiepolo et al. 2016, Brocardo et al. 2019), Argentina (Vizcaychipi et al. 2016). *C. brachyurus*: Iguazu National Park (Cândido-Jr, J.F. pers. obs), Argentina (Nigro et al. 2020).



Figure 2. A) The first photographic record of a bush dog (*Speothos venaticus*) inside Iguazu National Park, Paraná State, Brazil. B) A maned wolf (*Chrysocyon brachyurus*) rescued on the border of the Foz do Iguazu municipality. C) Release of the rescued maned wolf at Santa Maria farm, a private protected area located in the Santa Terezinha do Itaipu municipality. D) Photographic record of a maned wolf inside Iguazu National Park.

The bush dog record was a camera trap photo obtained during a jaguar population survey, on 01 December 2018 at 19:57, with two adult individuals of unidentified sex (25°33' S, 54°14' W; Figure 1A and Figure 2A). Species identification was confirmed by a group of specialists, and it marks the first photographic record of the species in INP. In the last decade, camera trapping efforts in INP totalled 20,297 trap days, with ~791 km² of effectively sampled area. While it is difficult to say if this single photographic record of the bush dog, despite a tremendous survey effort, is equal to species rarity, it does support previous findings of an extremely low probability of species detection using camera traps (Beisiegel 2009, Michalski 2010, Fusco-Costa and Ingberman 2013). While the effort required to detect the bush dog in INP was similar to a study in Minas Gerais state, southeastern Brazil (27,000 trap days; Ferreira et al. 2015), it was greater than other localities where a smaller sampling effort captured species presence with camera traps (4,112 – 15,888 trap days; Beisiegel 2009, Fusco-Costa and Ingberman 2013, Ferreira et al. 2015, de Oliveira et al. 2018, Soto-Werschitz et al. 2023). de Oliveira et al. (2018) suggest that bush dog rarity may be a result of competitive interaction with big cats [jaguar and puma (*Puma concolor*)]

and possibly ocelot (*Leopardus pardalis*) for prey (de Oliveira and Pereira 2014). Nonetheless, the scarce number of bush dog records might be attributed to its naturally low population density, semi-nomadic behaviour, large home range, and the secretive habits of the species (DeMatteo et al. 2011, Tiepolo et al. 2016, Fick et al. 2021). Groups of bush dogs may traverse INP searching for shelter, prey, and reproduction opportunities (Beisiegel 2009, Fusco-Costa and Ingberman 2013). This record emphasizes the importance of INP and its surroundings for the conservation of this threatened canid; however, there are potential threats within INP (e.g., loss of prey base, illegal hunting, and transmission of domestic animal diseases; DeMatteo and Loiselle 2008, Beisiegel 2009, de Oliveira 2009), which need to be mitigated.

The first maned wolf record was on 14 March 2020, when the staff of the Projeto Onças do Iguaçu was contacted by the environmental police to assist in the rescue of a young, male maned wolf, which was found on the border of the Foz do Iguaçu municipality (Figure 1B). The animal was sedated, clinically evaluated (Figure 2B), and immediately released at Santa Maria farm, in the Santa Terezinha do Itaipu municipality where there is a private forest reserve (25°29' S, 54°21' W; Figure 2C) and forest corridor that is being established to connect forest fragments to INP. The second maned wolf record was obtained on 07 April 2020 at 18:31 during the continuous wildlife monitoring at INP, with one adult individual of unidentified sex walking on the park main road (25°39' S, 54°26' W; Figure 1B, Figure 2D). This marks the first camera trap record of a maned wolf inside INP.

The maned wolf recorded within the densely forested habitat of INP was unexpected considering the species occurs primarily in open habitats (Emmons 2012). While bush dogs are expected to occur in the Atlantic Forest, maned wolves tend to avoid the dense forests, with its general ecology and food resources not linked to their use (Coelho et al. 2008). Nonetheless, this species is known to move over large distances in short periods (e.g., ~59 km in 3 days; Queirolo et al. 2011), therefore, considering the small distance between the location of the camera trap photo and the rescued individual (~17 km), we believe that these two maned wolf records might represent the same individual. Moreover, our camera trap record was captured a single day before the record of a maned wolf in Misiones, Argentina, only 13 km away (Nigro et al. 2020). Therefore, the recorded individual(s) are possibly dispersing and exploring new areas searching for more suitable habitats or food resources.

Santos et al. (2003) suggested that maned wolves observed in the Atlantic Forest are possibly benefiting from cattle pastures created by deforestation. This occasional occurrence can be a result of drastic landscape changes, creating open areas more permeable to the dispersal of this species (Queirolo et al. 2011).

With the reduction of suitable habitats within their distribution ranges, maned wolves and bush dogs are being displaced to areas that are not entirely favourable for their survival. For example, the presence of maned wolves in urban and peri-urban areas across its range has increased (Sillero-Zubiti et al. 2013). The presence of these two canids in less favourable habitats represents a risk for these animals (Azevedo et al. 2016, Soto-Werschitz et al. 2023), such as roadkill (Freitas et al. 2015), conflict with humans related to predation of poultry (Paula et al. 2013), and disease infections from contact with domestic animals (DeMatteo and Loiselle 2008, May-Junior et al. 2009).

We emphasize that researching the dispersal patterns of these canid species in this region is essential for understanding how human-modified landscapes are affecting the distribution of the bush dog and the maned wolf. Additionally, research efforts to estimate population density, habitat preferences, and feeding habits of both species in the region will enhance our knowledge. These new records within and outside the INP are particularly significant for improving and coordinating conservation initiatives for these species and the establishment of public policies directed toward their conservation.

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