

Distribution update

New records for the Pampas fox in the Atlantic Forest

Carlos R. Brocardo^{1,2*}, Vanilce Pereira³, Hamilton Mendes³ and Luís Eduardo da S. Delgado⁴

¹ Instituto Neotropical: Pesquisa e Conservação, Curitiba, Paraná, Brazil.
Email: carlosbrocardo@hotmail.com

² Universidade Federal do Oeste do Pará, Programa de pós-graduação em Biodiversidade, Santarém, Pará, Brazil.

³ Cascavel Municipality Zoo, Cascavel, Paraná, Brazil.

⁴ Cascavel Zoonoses Sector, Cascavel, Paraná, Brazil.

* Correspondence author

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Abstract

Pampas fox *Lycalopex gymnocercus* is primarily distributed in open habitats in South America, occupying regions of Bolivia, Paraguay, Uruguay, Argentina and southern Brazil. Here, we report three new records of Pampas fox in an Atlantic Forest region with no previous records, indicating a possible expansion of the distribution range of this species.

Introduction

The Pampas fox *Lycalopex gymnocercus* is a small to medium-sized canid (4-6kg), listed as Least Concern by the IUCN Red List (Lucherini 2016). This species plays an important role as a mesopredator and seed disperser (Lucherini and Luengos Vidal 2008). The Pampas fox is genetically related to other South American foxes (Perini et al. 2010), and mitochondrial genetic data show this species is divided into two clades, and that the chilla *Lycalopex griseus* is also included in both, thus indicating these two species could be synonymized (Chemisquy et al. 2019). The Pampas fox occurs primarily in open habitats in eastern Bolivia, western and central Paraguay, northern and central Argentina, Uruguay and southern Brazil (Lucherini 2016). In Brazil the species is found in Pampas (Rio Grande do Sul), in natural grasslands of the Atlantic Forest biome (Rio Grande do Sul, Paraná and Santa Catarina states) and in the southern Cerrado (São Paulo state) (Queirolo et al. 2013), although its distribution needs further elucidation (Tchaicka et al. 2016).

Here, we report three new records of *L. gymnocercus* in western Paraná state, Brazil, where this species had not been previously recorded.

Methods

The western Paraná region has a subtropical climate (Alvares et al. 2013) and comprises two ecoregions of the Atlantic Forest biome: the *Araucaria* Moist Forest and the Upper Paraná Forest (Olson et al. 2001); however, it lost most of its forest cover between 1950 and 1980. Today, except for the Iguazu National Park, the landscape of this region is dominated by grain monocultures, pastures, and small forest fragments (Gubert Filho 2010).

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The first fox record was an animal captured by federal wildlife agents (Instituto Chico Mendes de Conservação da Biodiversidade) in an urban area of the Terra Roxa municipality in July 2006 (Upper Paraná Forest, 370m above sea level (a.s.l.), approximate coordinates: 24°09'50.2'' S 54°05'49.1'' W) (Figure 1). This animal, a male, was taken to the Cascavel Zoo (Figure 2a).

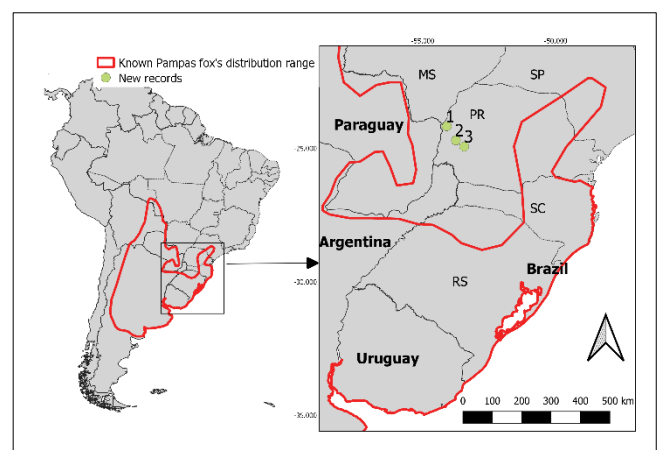


Figure 1. Predicted distribution of Pampas fox according to IUCN (2019) and Queirolo et al. (2013) in South America, represented by red full line. Our records are represented in the chronological order by numbers. Full lines represent country borders, while dashed lines represent Brazilian states limits. RS- Rio Grande do Sul; SC – Santa Catarina; PR – Paraná, SP – São Paulo, MS – Mato Grosso do Sul.

The second record corresponded to a male hit by a car in July 2014 near Povo Park, in Toledo municipality (Upper Paraná Forest and Araucaria Moist Forest contact zone, 530m a.s.l., coordinates: 24°41'36.9" S 53°45'07.0" W) (Figure 1). This fox was rescued by Paraná state wildlife agents (Instituto Ambiental do Paraná) and taken to Cascavel Zoo. Due to serious injuries, one of his rear legs was amputated (Figure 2b).

The third and last record was obtained from a news website (CGN, 2019), following reports by local people of an “unknown animal” that appeared in the suburbs of Cascavel municipality in April 2019 (Araucaria Moist Forest, 740m a.s.l., coordinates: 24°55'37.5" S 53°26'32.3" W). The animal was captured by Cascavel Zoo staff and released in a forest remnant (Figure 2c and d).

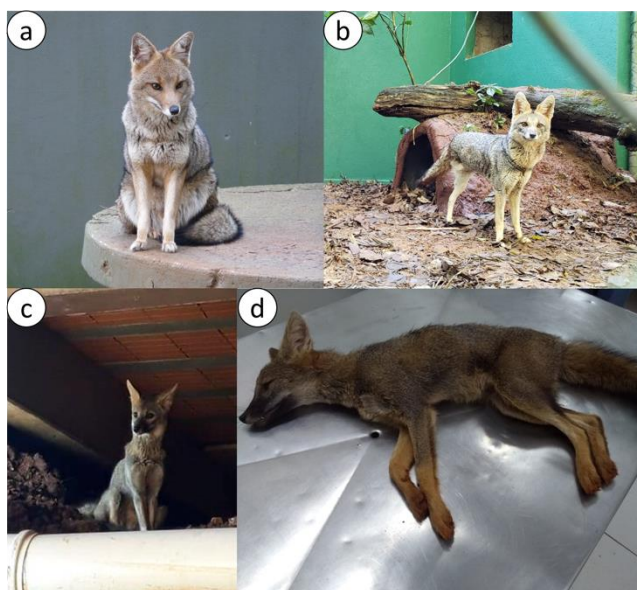


Figure 2. Pampas foxes recorded in western Paraná. (a) First animal recorded, maintained in Cascavel Municipality Zoo (photo: Varderlei Faria); (b) Second Pampas fox recorded, in Cascavel Municipality Zoo (photo: Hamilton Mendes); (c) Third animal recorded in Cascavel (photo: cgn.inf.br); (d) and anesthetized before its release (photo: Hamilton Mendes).

Discussion

Three other native canid species had been previously recorded in the western Paraná: maned wolf *Chrysocyon brachyurus*, bush dog *Speothos venaticus* and crab-eating fox *Cerdocyon thous*. The latter is the most commonly found and occurs both in forest remnants and disturbed habitats (Brocardo and Cândido-Jr 2012, Brocardo et al. 2019). The Pampas fox is not immediately recognised as a distinct species by the local population. We posit that the presence of Pampas foxes in this region is probably associated with the loss of forest cover in the past 50 years, which would have favoured the expansion in range of this canid (Queirolo et al. 2013), as it has been the case with maned wolves in areas of the Atlantic Forest replaced by pastures and agriculture (Queirolo et al. 2011). Although the records presented here may represent individual dispersals rather than a distribution expansion, they comprise a period longer than a decade between them (between 2006 and 2019), which summed to the records of other open habitat specialists in western Paraná region such as the Pampas cat *Leopardus colocola*, Geoffroy's cat *L. geoffroyi*, maned wolf and the European hare *Lepus europaeus*. This highlights the role of land-use changes in benefiting their presence, since these species have been primarily recorded outside forest habitats (Brocardo et al. 2019).

In the Atlantic Forest (Galetti et al. 2017, Bogoni et al. 2018), especially in the region this study was carried out (Brocardo and Cândido-Jr 2012, Brocardo and Delgado 2014), where many mammal species are “losers” affected by forest cover loss, habitat fragmentation and poaching, the Pampas fox may be considered one of the few “winners”, experiencing a distribution expansion (Queirolo et al. 2013). Although any ecological consequences of this expansion are still unknown, these canids may compete with crab-eating foxes for resources (Vieira and Port 2007). Nevertheless, neither are threatened, therefore immediate conservation measures not necessary. In the study region the Pampas fox probably uses more open habitats (agriculture, pasture, roads), while the crab-eating fox can also use forest remnants, as observed in other sites. Furthermore, Pampas foxes may change their activity patterns to avoid crab-eating foxes, considered as the dominant competitor (Di Bitetti et al. 2009).

The Pampas fox has had a recent expansion in Cerrado (São Paulo state, Brazil), which is related to loss of forest cover in the Atlantic Forest (Queirolo et al. 2013). This expansion has allowed hybridisation with the hoary fox *Lycalopex vetulus* in contact zones (Garcez 2015). However, this is not a problem with respect to crab-eating foxes, with which Pampas foxes share much of the distribution range and are genetically more distant (Perini et al. 2010, Chemisquy et al. 2019). In western Paraná state, where the Pampas fox is probably a recent immigrant, future studies should address its diet, habitat preferences and the potential impact on other species, primary carnivores through competition. Another relevant question concerns tracing their genetic origin: whether these animals originated from a population to the West (Paraguay, approximately 145km away from the first record) or from an eastern population (central Paraná state, approximately 190km away from the third record).

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References

- Alvares, C.A., Stape, J.L., Sentelhas, P.C., de Moraes Gonçalves, J.L. and Sparovek, G. 2013. Köppen's climate classification map for Brazil. *Meteorologische Zeitschrift* 22(6): 711–728. DOI: [10.1127/0941-2948/2013/0507](https://doi.org/10.1127/0941-2948/2013/0507)
- Bogoni, J.A., Pires, J.S.R., Graipel, M.E., Peroni, N. and Peres, C.A. 2018. Wish you were here: How defaunated is the Atlantic Forest biome of its medium-to large-bodied mammal fauna? *PLoS one*, 13(9): e0204515. DOI: [10.1371/journal.pone.0204515](https://doi.org/10.1371/journal.pone.0204515)
- Brocardo, C.R. and Cândido Jr., J.F. 2012. Persistência de mamíferos de médio e grande porte em fragmentos de floresta ombrófila mista no estado do Paraná, Brasil. *Revista Árvore* 36(2): 301–310. DOI: [10.1590/S0100-67622012000200011](https://doi.org/10.1590/S0100-67622012000200011)
- Brocardo, C.R., da Silva, M.X., Ferracioli, P., Cândido Jr., J.F., Bianconi, G.V., Moraes, M.F.D., Galetti, M., Passamani, M., Policena, A. and dos Reis, N.R. 2019. Mamíferos do Parque Nacional do Iguaçu. *Oecologia Australis* 23(2): 165–190.
- Brocardo, C.R. and Delgado, L.E. da S. 2014. Records and conservation of white-lipped peccary in the region of Iguaçu National Park, Brazil. *Suiform Soundings* 13: 38–43.

- Chemisquy, M.A., Prevosti, F.J., Martínez, P., Raimondi, V., Cabello Stom, J.E., Acosta-Jamett, G. and Montoya-Burgos, J.I. 2019. How many species of grey foxes (Canidae, Carnivora) are there in southern South America? *Mastozoología Neotropical*, 26(1).
- CGN. 2019. Available: <https://cgn.inf.br/noticia/10962/animal-desconhecido-e-encontrado-em-construcao>
- Di Bitetti, M.S., Di Blanco, Y.E., Pereira, J.A., Paviolo, A. and Pérez, I.J. 2009. Time partitioning favors the coexistence of sympatric crab-eating foxes (*Cerdocyon thous*) and pampas foxes (*Lycalopex gymnocercus*). *Journal of Mammalogy* 90(2): 479-490. DOI: [10.1644/08-MAMM-A-113.1](https://doi.org/10.1644/08-MAMM-A-113.1)
- Galetti, M., Brocardo, C.R., Begotti, R.A., Hortenci, L., Rocha-Mendes, F., Bernardo, C.S.S., Bueno, R.S., Nobre, R., Bovendorp, R.S., Marques, R.M., Meirelles, F., Gobbo, S.K., Beca, G., Schmaedecke, G. and Siqueira, T. 2017. Defaunation and biomass collapse of mammals in the largest Atlantic forest remnant. *Animal Conservation* 20(3): 270–281. DOI: [10.1111/acv.12311](https://doi.org/10.1111/acv.12311)
- Garcez, F.S. 2015. Filogeografia e história populacional de *Lycalopex vetulus* (Carnivora, Canidae), incluindo sua hibridação com *L. gymnocercus*. Master's Thesis. Pontifícia Universidade Católica – RS, Porto Alegre, Rio Grande do Sul, B. p. 57.
- Gubert Filho, F.A. 2010. História do desmatamento no Estado do Paraná e sua relação com a reforma agrária. Pp. 15–25 in: C. Sonda and S. C. Trauczynski (eds.), *Reforma Agrária e Meio Ambiente*. ITCG, Curitiba, Brazil.
- IUCN. 2019. The IUCN Red List of Threatened Species. Version 2019-1.
- Lucherini, M. 2016. *Lycalopex gymnocercus*. The IUCN Red List of Threatened Species 2016: e.T6928A85371194. <http://dx.doi.org/10.2305/IUCN.UK.2016-1.RLTS.T6928A85371194.en>. Downloaded on 14 July 2020.
- Lucherini, M. and Luengos Vidal, E.M. 2008. *Lycalopex gymnocercus* (Carnivora: Canidae). *Mammalian Species* (820): 1–9.
- Olson, D.M., Dinerstein, E., Wikramanayake, E.D., Burgess, N.D., Powell, G.V.N., Underwood, E.C., D'Amico, J.A., Itoua, I., Strand, H.E. and Morrison, J.C. 2001. Terrestrial ecoregions of the world: a new map of life on earth. A new global map of terrestrial ecoregions provides an innovative tool for conserving biodiversity. *BioScience* 51(11): 933–938.
- Perini, F.A., Russo, C.A.M. and Schrago, C.G. 2010. The evolution of South American endemic canids: a history of rapid diversification and morphological parallelism. *Journal of Evolutionary Biology* 23(2): 311–322.
- Queirolo, D., Kasper, C.B. and de Mello Beisiegel, B. 2013. Avaliação do risco de extinção do graxaim-do-campo *Lycalopex gymnocercus* (G. Fischer, 1814) no Brasil. *Biodiversidade Brasileira* (1): 172–178.
- Queirolo, D., Moreira, J.R., Soler, L., Emmons, L.H., Rodrigues, F.H.G., Pautasso, A.A., Cartes, J.L. and Salvatori, V. 2011. Historical and current range of the Near Threatened maned wolf *Chrysocyon brachyurus* in South America. *Oryx* 45(2): 296–303.
- Tchaicka, L., Freitas, T.R.O. de, Bager, A., Vidal, S.L., Lucherini, M., Iriarte, A., Novaro, A., Geffen, E., Garcez, F.S., Johnson, W.E., Wayne, R.K. and Eizirik, E. 2016. Molecular assessment of the phylogeny and biogeography of a recently diversified endemic group of South American canids (Mammalia: Carnivora: Canidae). *Genetics and Molecular Biology* 39: 442–451.
- Vieira, E.M. and Port, D. 2007. Niche overlap and resource partitioning between two sympatric fox species in southern Brazil. *Journal of Zoology* 272(1): 57–63.

Biographical sketch

Carlos Brocardo is a biologist from the Universidade Estadual do Oeste do Paraná in Brazil, with Masters and Doctorate degrees in Zoology from the Universidade Estadual Paulista. He is currently carrying out postdoctoral research on the Amazon Forest at the Universidade Federal do Oeste do Pará, having conducted research in the Atlantic Forest for over a decade.

Vanilce Pereira is a biologist from the Universidade Estadual do Oeste do Paraná in Brazil, specializing in Environmental Planning and Management (Faculdade Estadual de Campo Mourão) with a Masters degree in Environmental Sciences from the Universidade Estadual do Oeste do Paraná. He has been working as a biologist for over 20 years at the Cascavel Zoo in Paraná, Brazil.

Hamilton Mendes is a zookeeper at Cascavel Zoo with more than 20 years of experience in wildlife management (*in situ* and *ex situ*), specializing in wild canids and felids.

Luis da S. Delgado is a veterinary surgeon from the Universidade Federal de Pelotas, Brazil, and a specialist in Medical Clinic and Wild Animal Surgery from the Pontifícia Universidade Católica do Paraná. He has a Masters degree in Conservation and Management of Natural Resources from the Universidade Estadual do Oeste do Paraná. He is currently working in the Animal Health Division of the Cascavel Municipality, Paraná, Brazil.