

Natural history notes on Pampas Fox *Lycalopex gymnocercus* (Mammalia: Carnivora: Canidae) in the Paraguayan Chaco

Paul Smith^{1,2*} & Rebecca Louise Smith^{2,a}

¹ FAUNA Paraguay, Paraguay. www.faunaparaguay.com

² Para La Tierra, Centro IDEAL. Dpto. Ñeembucú, Paraguay. www.paralatierra.org

Abstract – We provide some natural history notes on the Pampas Fox *Lycalopex gymnocercus* from the Paraguayan Chaco. Information is presented on diet, distribution (with the first formal documentation of the species in the Oriental region), local beliefs, mortality, and possible play behavior. Photographic documentation of the existence of sarcoptic mange in wild foxes in the Paraguayan Chaco is also provided.

Additional keywords: diet, distribution, mortality, sarcoptic mange.

Resumen (Notas de historia natural sobre el Aguara pytá *Lycalopex gymnocercus* (Mammalia: Carnivora: Canidae) en el Chaco paraguayo) – Proveemos algunos datos de historia natural sobre el Aguara pytá *Lycalopex gymnocercus* en el Chaco Paraguayo. Se presenta información sobre dieta, distribución (con la primera documentación formal para la región Oriental), creencias locales, mortandad y comportamiento. También se presenta documentación fotográfica de la existencia de sarna sarcóptica en zorros silvestres en el Chaco Paraguayo.

Palabras-claves adicionales: dieta, distribución, mortandad, sarna.

The Pampas Fox *Lycalopex gymnocercus* is a widespread canid distributed from eastern Bolivia through western Paraguay to central Argentina, and through Uruguay into southeastern Brazil (Lucherini & Luengos Vidal 2008). Wozencraft (2005) recognized five subspecies, but the subspecific limits need review (Lucherini & Luengos Vidal 2008). The species is of Least Concern in Paraguay (Saldivar et al. 2017), where it is common west of the Paraguay River, in the Chaco region. Still, despite many published claims, there has been no documented report of the species from east of the Paraguay River (Smith 2022).

The species is mainly nocturnal in Paraguay but is occasionally encountered during the day (Brooks 1992). It is a habitat generalist, able to tolerate considerable habitat degradation, and is commonly found close to human dwellings in agricultural areas using artificial water sources provided for domestic animals (Brooks 1992; Weiler et al. 2020). Though it is an abundant and familiar species in the Chaco region, almost nothing has been published on the species ecology in Paraguay. Here, we provide some natural history observations obtained opportunistically during multiple visits to the Paraguayan Chaco.

DIETARY OBSERVATIONS

Lycalopex gymnocercus is an omnivore, taking a variety of vertebrate, invertebrate, and plant matter (Márquez & Fariña 2003). The diet is well documented in Argentina, Bolivia, and Brazil (Crespo 1971; Mason

1985; Ayala 2000; García & Kittlein 2005; Varela & Bucher 2006; Vieira & Port 2007; Farias & Kittlein 2008; Varela et al. 2008; Castillo et al. 2011; Schalk & Morales 2012; Canel et al. 2016). However, no dietary data has been published from Paraguay. We provide some opportunistic observation data here.

Individuals at Teniente Enciso National Park, Boquerón department, are semi-habituated to human presence and are frequently attracted to the tourist area when food is prepared. The foxes here wait patiently for scraps to be thrown, and also scavenge from the refuse bins. One individual was also seen consuming the fruit of *Capparis speciosa* Griseb. (Capparaceae). The Guaraní name of this fruit Pajaguá naranja translates roughly to “orange for the dog”. The fruits of this plant are edible; however, for part of the year, they contain toxins that can cause dietary distress (Ratzlaff 2004). A pair of foxes were also observed picking small red fruits, probably *Ziziphus mistol* Griseb. (Rhamnaceae), from a bush at Fortín Toledo, Boquerón department, on 31 March 2022, and large quantities of the distinctive red-colored scats were found filled with the seeds of nearby Algarobillo bushes (*Prosopis affinis* Spreng., Fabaceae) on the raised portion of an Australian water tank (tajamar) at the same location in July 2022 (Figure 1). The seed pods of Algarobillo are consumed by humans in the Chaco region, having a sweet flavor and being known for their high fiber content aiding digestion (Marylin Wohlgenuth, pers. comm.).

Close to Cerro León, within Defensores del Chaco National Park, Alto Paraguay department, a juvenile individual was observed slowly stalking an adult female of the Red Tegu *Salvator rufescens* (Squamata: Teiidae). The fox attempted to grab the much larger lizard by the nape, but the bite was ineffectual, and the aggressive response of the lizard resulted in the juvenile fox being pursued into the brush.

*Corresponding author: faunaparaguay@gmail.com;

^arebeccasmith2807@gmail.com

Corresponding editor: Alessandro Rapini

Submitted: 16 Jan. 2023; accepted: 21 Mar. 2023

First published: 28 Mar. 2023; final version: XXXX



Figure 1. High densities of scat containing Algarobillo (*Prosopis affinis*) seeds at Fortín Toledo, Boquerón department, 28 July 2022 (Photo: Rebecca L Smith).

On 21 May 2022, an adult fox was observed at night (1900h), approximately 18 km west of Chaco Lodge (Presidente Hayes department) by road, carrying the carcass of a Brushland Tinamou *Nothoprocta cinerascens* (Tinamiformes: Tinamidae) (Figure 2). It was not possible to determine whether the fox had killed the bird (which roost on the ground) or whether it had been scavenged after having died by other means. The fox had consumed most of the breast meat and had removed and discarded the guts and gizzard of the bird (these being located close by). Though the fox dropped the prey allowing the authors to examine it, it remained in cover nearby throughout the whole process and presumably returned to it after our departure. *Nothoprocta cinerascens* is a Chaco endemic species (Castillo & Clay 2004) that has not been previously reported in the diet of Pampas Fox. However, they are known to feed on other species of ground-dwelling birds, including tinamous of the genera *Eudromia* and *Nothura* (Crespo 1971; Canel et al. 2016).

DISTRIBUTION

The distribution of this species in Paraguay was reviewed in detail by Smith (2022), including the

observation that the type locality “vicinity of Asunción” restricted by Cabrera (1958) lies outside the known range of the species. This is the result of the confusion associated with the identity of the description of the “l’Agourachay” of Azara (1801) clarified by Smith & Ríos (in press). The species is common to abundant in the Paraguayan Dry Chaco, but declines in abundance from east to west, with the ecological gradient becoming



Figure 2. Predated Brushland Tinamou *Nothoprocta cinerascens*, approximately 18 km west of Chaco Lodge by road, Presidente Hayes department, 7 May 2022 (Photo: Jen Seto).

more humid between the Dry (Boquerón department) and Humid Chaco (Presidente Hayes department) (Smith 2022). Presence east of the Paraguay River, in the Oriental Region of Paraguay is repeatedly assumed and claimed (Gamarrá de Fox & Martín 1996; Lowen et al. 1996; Yahnke et al. 1998; Hill & Padwe 2000; Esquivel 2001; Neris & Colman 2001; Neris et al. 2002; Fariña & Hostettler 2003; Rumbo 2010; Weiler et al. 2019), but there are apparently no documented records. A pair of specimens collected by Schade (AMNH 95204, 95205; not examined) with locality Villarrica (Guairá department), if correctly identified, almost certainly originated elsewhere. Schade was based in Villarrica and used it as a shipping locality, with many specimens from the Chaco and elsewhere figuring in various collections with this locality.

A single individual of *Lycalopex gymnocercus* was photographed on Isla Yacyretá, Itapúa department, during November 2016 (Figure 3). We believe this is the only confirmed report of the species east of the Paraguay River. The appearance of this individual was larger and paler than typical specimens west of the Paraguay River, similar to individuals that we have observed in Corrientes Province, Argentina. The population on Isla Yacyretá is probably referable to *L. g. gymnocercus*, but those occurring throughout the Chaco region (which are smaller, darker on the dorsum, and more orange on the face and legs) have not been conclusively associated with any subspecies (Lucherini & Luengos Vidal 2008). The wider presence of the species in the Oriental region of Paraguay remains a possibility, based on the distribution in neighboring countries, and we encourage researchers to document and publish observations of the species east of the Paraguay River.

SARCOPTIC MANGE

Montecino-Latorre et al. (2020) noted that abnormal alopecia could be used to identify cases of sarcoptic mange in Chile, adding that foxes of the genus *Lycalopex* are the worst affected by this condition. Similar cases of alopecia are commonly observed across the Paraguayan Chaco in *Lycalopex gymnocercus* (Figures 4 and 5), although we believe this is the first documented report of this affliction in the species in Paraguay. Sarcoptic mange was first reported for the species from the Bolivian Chaco (Deem et al. 2002). Infected animals are frequently encountered during the day and show unusual behaviors, such as frequent scratching and a reduced wariness in the presence of humans. This disease, caused by the burrowing mite *Sarcoptes scabiei* (Acari: Sarcoptiformes: Sarcoptidae), can potentially affect native animal populations severely (Martín et al. 2018) and infect domestic animals.

MORTALITY

Cartes et al. (2010) considered this species to be “rarely struck” by vehicles along the Transchaco road. In our experience, this species and the Crab-eating Fox *Cerdocyon thous* are two of the most common victims of roadkill along this 650 km stretch of road, consistent with observations in other countries (Rosa & Mauhs 2004; Cherem et al. 2007). The high mortality on roads is perhaps a result of the tendency of the species to run erratically in front of vehicles when illuminated in their headlights, resulting in unpredictable movements and feints that can have potentially fatal consequences for the animal.



Figure 3. *Lycalopex gymnocercus* on Isla Yacyretá, Itapúa department, November 2016 (Photo: Kristina Anderssen).



Figure 4. *Lycalopex gymnocercus* infected with sarcoptic mange showing alopecia on the dorsum, rump, and face, Teniente Enciso National Park, Boquerón department, 31 October 2008 (Photo: Clyde Morris).

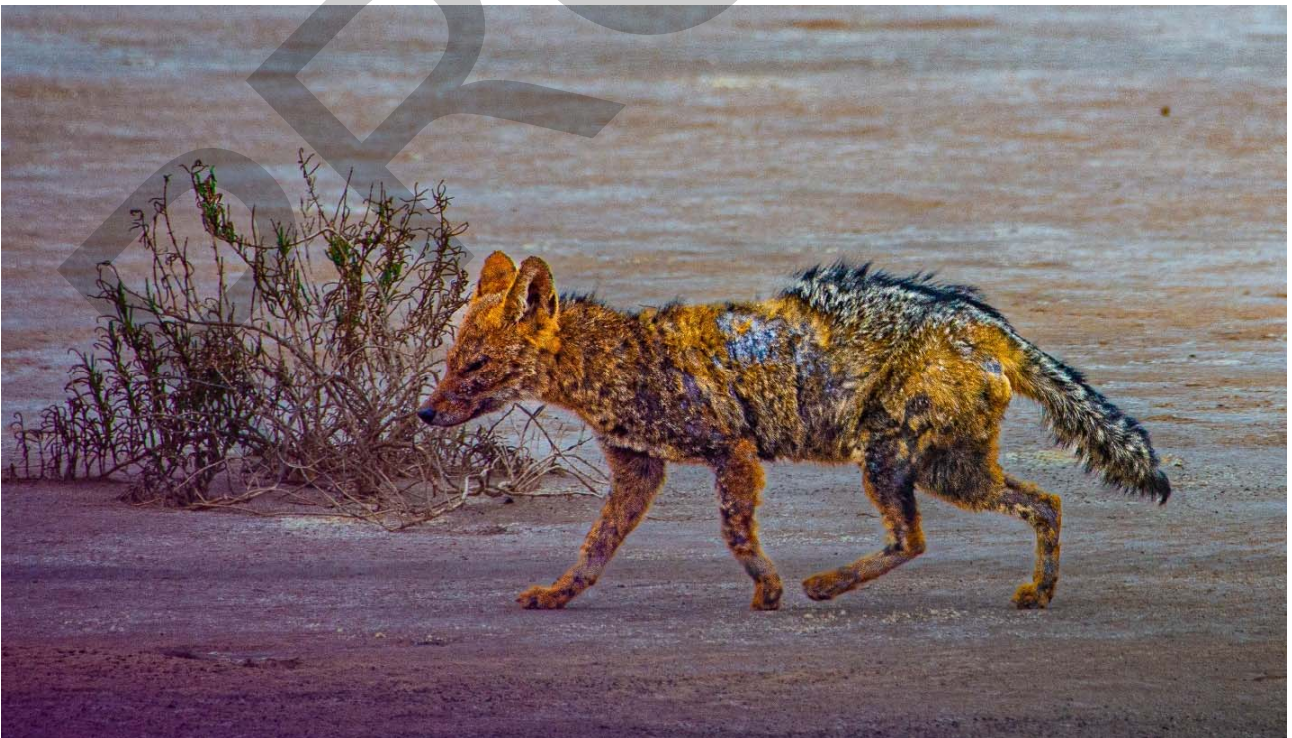


Figure 5. *Lycalopex gymnocercus* infected with sarcoptic mange showing alopecia, Laguna Capitán, Presidente Hayes department, March 2022 (Photo: Sherwin Kaplan).

A large domestic dog was seen to attack and severely wound a fox at Teniente Enciso National Park in June 2006. Dogs have previously been reported as threatening the species (Lucherini et al. 2004).

LOCAL BELIEF

A local rancher in the Teniente Enciso National Park, Boquerón department, communicated to us that he kills the species on sight because of its tendency to “bite at the ankles of the unwary”. We are unaware of any evidence to substantiate this claim.

PLAY BEHAVIOR?

Two adult individuals were observed sitting on a road at Fortín Toledo, Boquerón department, on 7 June 2022. A third individual approached them with head and tail depressed downwards, before throwing itself onto its back in an apparent attempt to incite play behavior. When there was no response, the animal wagged its tail slightly, approaching one of the individuals more closely and throwing itself onto its back again. The other animals did not respond, departing the area after approximately a minute, and were later followed by the third individual.

ACKNOWLEDGEMENTS

Kristina Anderssen, Jen Seto, Clyde Morris, and Sherwin Kaplan accompanied us during some of these observations, and are thanked for permission to use their photos. Both authors are grateful to the Pronii program of CONACyT Paraguay.

REFERENCES

- Ayala, J.** 2000. Análisis de heces de las familias Felidae y Canidae del Izozog, Gran Chaco, Santa Cruz, Bolivia. In: E. Cabrera, C. Mercolli & R. Resquín (eds), *Manejo de Fauna Silvestre en Amazonia y Latinoamérica*. Ricor Grafic S.A., Asunción, Paraguay, p. 419–426.
- Azara, F.** 1801. *Essais sur l'Histoire Naturelle des Quadrupèdes de la Province du Paraguay. Traduits sur le Manuscrit Inédit de l'Auteur, Pra. M.L.E. Moreau-Saint-Méry*, Vol. 1. Charles Pougens, Paris, France.
- Brooks, D.** 1992. Notes on group size, density, and habitat association of the Pampas Fox (*Dusicyon gymnocercus*) in the Paraguayan Chaco. *Mammalia* 56: 314–316.
- Cabrera, A.** 1958 [1957]. Catálogo de los mamíferos de América del Sur. *Revista del Museo Argentino de Ciencias Naturales «Bernardino Rivadavia» e Instituto Nacional de Investigación de las Ciencias Naturales*. *Zoología* 4: 1–305.
- Canel, D.; Scioscia, N.P.; Denegri, G.M. & Kittlein, M.** 2016. Dieta del zorro gris pampeano (*Lycalopex gymnocercus*) en la provincia de Buenos Aires. *Mastozoología Neotropical* 23: 359–370.
- Cartes, J.L.; López de Kochalka, N.E.; Morales, C.; Motte, M. & Vitale, C.** 2010. Mortandad de fauna silvestre por atropellamiento en la Ruta IX Carlos A. López (Transchaco). *Revista de la Sociedad Científica del Paraguay* 15: 191–202.
- Castillo, H. & Clay, R.P.** 2004. *Lista Comentada de las Aves de Paraguay / Annotated Checklist of the Birds of Paraguay*. Guyra Paraguay, Asunción, Paraguay.
- Castillo, D.F.; Birochio, D.E.; Lucherini, M. & Casanave, E.B.** 2011. Diet of adults and cubs of *Lycalopex gymnocercus* in Pampas grassland: a validation of the Optimal Foraging Theory? *Annales Zoologici Fennici* 48: 252–256.
- Cherem, J.J.; Kammers, M.; Ghizoni-Jr., I.R. & Martins, A.** 2007. Mamíferos de médio e grande porte atropelados em rodovias do Estado de Santa Catarina, sul do Brasil. *Biotemas* 20: 81–96.
- Crespo, J.A.** 1971. Ecología del zorro gris *Dusicyon gymnocercus antiquus* (Ameghino). *Revista del Museo Argentino de Investigación de las Ciencias Naturales* 1: 146–205.
- Deem, S.L.; Noss, A.J.; Cuéllar, R.L.; Villarroel, R.; Linn, M.J. & Forrester, D.J.** 2002. Sarcocytic mange in free-ranging Pampas foxes in the Gran Chaco, Bolivia. *Journal of Wildlife Diseases* 38: 625–628.
- Esquivel, E.** 2001. *Mamíferos de la Reserva Natural del Bosque Mbaracayú, Paraguay*. Fundación Moises Bertoni, Asunción, Paraguay.
- Fariás, A.A. & Kittlein, M.J.** 2008. Small-scale spatial variability in the diet of pampas foxes (*Pseudalopex gymnocercus*) and human-induced changes in prey base. *Ecological Research* 23: 543–550.
- Fariña, R. & Hostettler, T.** 2003. *Vertebrados de la Reserva Natural del Bosque Mbaracayú. Checklist*. Fundación Moises Bertoni, Asunción, Paraguay.
- Gamarra de Fox, I. & Martín, A.J.** 1996. Mastozoología. Lista de mamíferos del Paraguay. In: O.R. Martínez (ed.), *Colecciones de Flora y Fauna del Museo Nacional de Historia Natural del Paraguay*. Museo Nacional de Historia Natural del Paraguay, San Lorenzo, Paraguay, p. 469–573.
- García, B.B. & Kittlein, M.J.** 2005. Diet, habitat use, and relative abundance of pampas fox (*Pseudalopex gymnocercus*) in northern Patagonia, Argentina. *Mammalian Biology Zeitschrift für Säugetierkunde* 70: 218–226.
- Hill, K. & Padwe, J.** 2000. Sustainability of Aché hunting in the Mbaracayú Reserve, Paraguay. In: J.G. Robinson & E. Bennett (eds), *Hunting for Sustainability in Tropical Forests*. Columbia University Press, New York, USA, p. 79–105.
- Lowen, J.C.; Bartrina, L.; Clay, R.P. & Tobias, J.A.** 1996. *Biological Surveys and Conservation Priorities in Eastern Paraguay*. CSB Conservation Publications, Cambridge, UK.
- Lucherini, M. & Luengos Vidal, E.M.** 2008. *Lycalopex gymnocercus* (Carnivora: Canidae). *Mammalian Species* 820: 1–9.
- Lucherini, M.; Pessino, M. & Fariás, A.A.** 2004. Pampas fox. In: C. Sillero-Zubiri, M. Hoffman & D.W. Macdonald (eds), *Canids: foxes, wolves, jackals, and dogs. Status survey and conservation action plan*. International Union for Conservation of Nature and Natural Resources/Species Survival Commission Canid Specialist Group, Gland, Switzerland, p. 63–68.
- Márquez, A. & Fariña, R.A.** 2003. Dental morphology and diet in canids and procyonids from Uruguay. *Mammalia* 67: 567–573.

- Martin, A.M.; Burridge, C.P.; Ingram, J.; Fraser, T.A. & Carver, S.** 2018. Invasive pathogen drives host population collapse: effects of a travelling wave of sarcoptic mange on bare-nosed wombats. *Journal of Applied Ecology* 55: 331–341.
- Mason, P.** 1985. The nesting biology of some passerines of Buenos Aires, Argentina. *Ornithological Monographs* 36: 954–972.
- Montecino-Latorre, D.; Napolitano, C.; Briceño, C. & Uhart, M.M.** 2020. Sarcoptic mange: an emerging threat to Chilean wild mammals? *Perspectives in Ecology and Conservation* 18: 267–276.
- Neris, N. & Colman, F.** 2001. Mamíferos. In: C.M. Abad & S. Céspedes (eds), *Especies Silvestres del Paraguay: guía de identificación de especies con importancia económica*. Prodechaco, Asunción, Paraguay, p. 127–147.
- Neris, N.; Colman, F.; Ovelar, E.; Sukigara, N. & Ishii, N.** 2002. *Guía de Mamíferos Medianos y Grandes del Paraguay: distribución, tendencia poblacional y utilización*. SEAM, Asunción, Paraguay.
- Ratzlaff, V.F.** 2004. *Una Guía para Plantas Leñosas del Chaco*. Grafitec, Asunción, Paraguay.
- Rosa, A.O. & Mauhs, J.** 2004. Atropelamento de animais silvestres na rodovia RS-040. *Caderno de Pesquisa, Série Biologia* 16: 35–42.
- Rumbo, M.** 2010. Análisis biogeográfico de los mamíferos de Paraguay. *Boletín del Museo Nacional de Historia Natural del Paraguay* 16: 18–29.
- Saldívar, S.; Rojas, V.; Giménez, D.; Abba, A.M.; Ayala, R.; Barreto, R.; Cartes, L.; Castillo, H.; Cuéllar, E.; Sancha, N.U.; Gamarra de Fox, I.; Giordano, A.J.; Kowalewski, M.; López, J.; Martínez, V.; Mujica, N.; Neris, N.; Ortiz, M.L.; Ramírez, F.; Ríos, S.D.; Ruiz Díaz, M.; Sánchez, J.; Smith, P.; Stevens, R.; Teta, P.; Thompson, J.J.; Torres, J.; Velázquez, M.; Vellilla, M.; Villalba, L. & Weiler, A.** 2017. Los mamíferos amenazados del Paraguay. In: Asociación Paraguaya de Mastozoología y Secretaría del Ambiente (eds), *Libro Rojo de los Mamíferos del Paraguay. Especies amenazadas de extinción*. Editorial Creatio, Asunción, Paraguay, p. 27–33.
- Schalk, C.M. & Morales, F.** 2012. Predation of a *Rhinella major* (Anura: Bufonidae) by a Pampas fox (*Lycalopex gymnocercus*) in the Bolivian Gran Chaco. *Herpetology Notes* 5: 369–370.
- Smith, P.** 2022. Status and distribution of Paraguayan canids. *Canid Biology and Conservation* 25: 1–12.
- Smith, P. & Ríos, S.D.** in press. Notes on Azara's "Agourachay" and the distribution of *Lycalopex gymnocercus* (Fischer, 1814) (Carnivora: Canidae) in Paraguay. *Spixiana*.
- Varela, O. & Bucher, E.H.** 2006. Passage time, viability, and germination of seeds ingested by foxes. *Journal of Arid Environments* 67: 566–578.
- Varela, O.; Cormenzana-Méndez, A.; Krapovickas, L. & Bucher, E.H.** 2008. Seasonal diet of the Pampas fox (*Lycalopex gymnocercus*) in the Chaco dry woodland, northwestern Argentina. *Journal of Mammalogy* 89: 1012–1019.
- Vieira, E.M. & Port, D.** 2007. Niche overlap and resource partitioning between two sympatric fox species in southern Brazil. *Journal of Zoology* 272: 57–63.
- Weiler, A.; Nuñez, K.; Peris, S.; Silla, F.; Airaldi, K.; González de Weston, G.; Cubilla, F.; Salinas, P.; Zaldivar, B.; Valiente, E.; Chavez, K.; Ramos, Y. & Tabilo, D.** 2019. *Guía para la Identificación de Mamíferos Medianos y Grandes del Chaco Seco*. Facultad de Ciencias Exactas y Naturales, Universidad Nacional de Asunción. San Lorenzo, Paraguay.
- Weiler, A.; Nuñez, K. & Silla, F.** 2020. Forest matters: use of water reservoirs by mammal communities in cattle ranch landscapes in the Paraguayan Dry Chaco. *Global Ecology and Conservation* 23: e01103.
- Wozencraft, W.C.** 2005. Order Carnivora. In: D.E. Wilson & D.M. Reeder (eds), *Mammal Species of the World: a taxonomic and geographic reference*, 3rd ed. Johns Hopkins University Press, Baltimore, Maryland, USA, p. 532–628.
- Yahnke, C.J.; Fox, I.G. & Colman, F.** 1998. Mammalian species richness in Paraguay: the effectiveness of national parks in preserving biodiversity. *Biological Conservation* 84: 263–268.