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Distribution update

Rediscovery of the bush dog in the Paraguayan Cerrado: camera-trap records confirm persistence in a nationally endangered ecoregion

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Abstract

The bush dog is a small Neotropical canid that inhabits diverse ecosystems ranging from scattered gallery forest and mixed-savanna habitats to larger tracts of rainforest like the Amazon Basin. Although elusive and generally thought to be sensitive to habitat disturbances, (re)discoveries across geographical areas have accelerated in recent years. Here we confirm the rediscovery of the bush dog in the Paraguayan Cerrado, one of the most endangered ecoregions in the country, decades after it was last reported. While conducting camera-trap surveys in May 2021 in the vicinity of two small, protected areas, we recorded what appeared to be an adult male and female travelling together. Although this rediscovery suggests greater resiliency of the species in a habitat that has been severely fragmented, our record also sheds further light on the current status of the bush dog in Paraguay, and underscores the need to protect what remains of the Cerrado there.

Introduction

The bush dog (*Speothos venaticus*) is a small, poorly-known canid inhabiting tropical forests and savannas from southern Central America through South America. They range from the evergreen forests of southern Costa Rica as far north as Barbilla National Park, and south through the Amazon Basin into the Upper Parana Atlantic Forests of Argentina and Paraguay (DeMatteo et al. 2011, Sáenz-Bolaños et al. 2019). Listed by the IUCN as Near Threatened (DeMatteo et al. 2011), its ecology has rarely been the focus of thorough field investigations, perhaps due to their elusive and cryptic nature.

Despite their global threatened status, habitat conversion and degradation are causing bush dog populations to decline rapidly across their range. In many range countries across Latin America, they are protected by national legislation, and several countries consider bush dogs to be more nationally threatened than their global red list status indicates (Jorge et al. 2013; Paviolo & Varela, 2019; Fernando & Wallace, 2009; Isasi-Catalá et al. 2015). In Paraguay. the bush dog or "jagua yvyguy" (Guarani) is considered Endangered (Giordano et al. 2017) and has only rarely been observed or recorded. Except for the Iguazu landscape and Atlantic Forest fragments of Argentina (De Matteo et al. 2011) to the southeast, Paraguay marks a southern edge of the bush dog's distribution. This is possibly because it occurs at the nexus of several major biomes and ecological regions, including the Dry or 'High' Chaco, Humid or 'Low' Chaco (Giordano 2015) (Figure 1), from which the species appears absent. In addition, the extensive ecotones or transition zones among the Gran Chaco, and adjacent Pantanal, Cerrado, Atlantic Forest, and Argentine Pampas or grassland biomes (Figure 1), make Paraguay one of the most heterogeneous ecological landscapes in South America for its size (see Ávila Torres et al. 2018, for a complete treatment of Paraguayan biogeographical regions).

Over the past several decades, new discoveries of the bush dog have originated from several of Paraguay's ecological regions. Currently, the most important habitat for bush dogs in Paraguay is Mbaracayu Forest Nature Reserve (MFNR), the country's largest contiguous tract of Upper Parana Atlantic Forest (UPAF) (Yahnke et al. 1998; Zuercher and Villalba 2002). Although early research on bush dogs occurred in MFNR many years ago (e.g., Zuercher et al. 2005), in-depth ecological research of the species in Paraguay is lacking. Moreover, for some time bush dogs continued to elude formal discovery in habitats where they were long rumoured to occur, including fragments of UPAF, i.e., forest much smaller than MFNR (Bellassai et al. 2020). This same challenge appears to exist elsewhere, where bush dogs have been discovered or rediscovered in many geographical areas over the past decade (Carretero-Pinzon 2013; Guimarães et al. 2015; Michalski et al. 2015; Rodríguez-Castellanos 2017).

Despite a history of unsubstantiated reports and rumour outside of the UPAF, physical evidence of the bush dog's presence from many areas has been lacking. Interviews conducted by Neris et al. (2002) suggested that its historical distribution not only included the entire 'Oriental' (eastern region) of Paraguay, but also a substantial part of the Humid Chaco, and even parts of the northern Dry Chaco and Pantanal. However, Smith (2022) could find no actual evidence of bush dogs from this region, despite recent and expansive camera-trapping efforts from these parts.

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After the Amazon, the Cerrado is the second largest ecoregion in South America. Despite nutrient-poor soils (Eiten 1972), the Cerrado is incredibly biodiverse and has long been recognized as a global biodiversity hotspot (Myers et al. 2000). Here we report on the first camera-trap record of the bush dog from Concepcion Department, which contains most of the Cerrado ecoregion in Paraguay. To our knowledge, this rediscovery is the first physical evidence of the bush dog from this part of the country.

Methods and Results

We deployed six camera-traps between 29th November 2020 and 21st June 2021 to gather information useful in addressing human-jaguar conflict for a group of ranchers. Cameras were deployed on private land <45 km from Serranía San Luis National Park, a 103 km^2 protected area in the Paraguayan Cerrado which also overlaps at least five private properties (Figure 1). We logged a total of 1,236 camera-trap nights and, to our knowledge, this is the first time the area has been surveyed using camera-traps. On 10th and 11th May 2021 we recorded photos and video footage of one and two bush dogs between 14:26 and 01:41, respectively, from the same single camera-trap location (Figure 2a,b). They were walking through an area that can be characterized primarily as thick savanna, interspersed with thicker forest.

Among the other important small, medium, and large-sized mammal species we also detected were: crab-eating fox *Cerdocyon thous*, jaguar *Panthera onca*, puma *Puma concolor*, ocelot *Leopardus pardalis*, jaguarundi *Puma yagouaroundi*, tayra *Eira barbara*, Neotropical otter *Lontra longicaudis*, coatimundi *Nasua nasua*, crab-eating raccoon *Procyon cancrivorus*, nine-banded armadillo *Dasypus novemcinctus*, six-banded armadillo *Euphractus sexcinctus*, gray brocket deer *Mazama gouazoubira*, white-lipped peccary *Pecari tajacu*, collared peccary *Tayassu pecari*, Brazilian cottontail rabbit *Sylvilagus brasiliensis*, Brazilian tapir *Tapirus terrestris*, giant anteater *Myrmecophaga tridactyla*, tamadua *Tamandua tetradactyla*, paca *Cuniculus paca*, and Azara's agouti *Dasyprocta azarae*. We also recorded the presence of wild boar *Sus scrofa*, a non-native species that has recently invaded the region.

Figure 1. Ecoregions of Paraguay as presented by Ávila Torres et al. 2018 (reprinted here with permission): 1) Dry (High) Chaco, 2) Pantanal, 3) Wet or Humid (Low) Chaco, 4) Cerrado, 5) Upper Paraná Atlantic Forest (UPAF), 6) Savanna (Mesopotamian), 7) Grasslands of the High Hills or Mountains. Study area is denoted with a star, and the nearby Serranía San Luis National Park is denoted with a triangle.

Discussion

By confirming the presence of bush dogs in the Paraguayan Cerrado ecoregion, we effectively rediscovered their presence in this important area and provide the first physical evidence that they ever occurred in this region. Because the bush dog is considered Endangered in Paraguay by the IUCN (Giordano et al. 2017), it is critically important that the habitats they occupy receive increased national or local attention and protection. This not only includes Mbaracayu FNR and the Carapã NR, but also the larger ITAIPU reserves, Itabo NR and Limoy NR, despite that camera-trap surveys there have thus far failed to turn up photographic evidence of bush dogs (Bellassai et al. 2020). This is because as the third and fourth largest remaining contiguous UPAF fragments in Paraguay, respectively, bush dogs may still be moving to and from these areas. For example, Michalski et al. (2010) documented the ability of bush dogs to move among incompletely isolated and fragmented habitat in the Amazon, and this ability may also be true in eastern Paraguay

Although > 90% of the Cerrado occurs in Brazil (Brannston et al. 2008, Noojipady et al 2017), only 6% of it is protected. This general lack of protection also extends to the small fraction occurring in Paraguay, most of which occupies private ranch land. From southern Brazil, small pockets of Cerrado extend south into Paraguay, where they mix with the country's last remaining UPAF fragments (Smith et al. 2012). Prior to this record, bush dogs had only been recorded in the Paraguayan Cerrado from isolated pockets in Mbaracayu Forest Nature Reserve (Zuercher & Villalba 2002). This protected area consists mostly of UPAF, however, and is thus generally considered part of that ecoregion.

Figure 2a,b. Two bush dogs (*Speothos venaticus*) recorded from camera traps in private ranches in the Paraguayan Cerrado. They appear to be an adult male and female, possibly a mating pair.

The fauna of the Cerrado ecoregion is some of the least studied in Paraguay. Evidence for the occurrence of the jaguar in Paso Bravo NP, the country's largest protected area of Cerrado, was only collected relatively recently (Giordano 2015); since then, few studies have focused on the ecoregion's mammals. Although the occurrence of the bush dog in the Brazilian Cerrado is well known (Silveira et al. 1998, DeMatteo et al. 2011), our rediscovery of bush dogs in the Paraguayan Cerrado outside of the Mbaracayu region is the first camera-trap evidence of their occurrence there. More significantly however, is that this record is not close to Mbaracayu (> 300 km) and, to our knowledge, may represent the westernmost confirmed record for Paraguay. In the efforts leading up to this report, we documented many of the country's native medium-large mammals on private land in the Paraguayan Cerrado. We recommend therefore that it receives significantly more survey and research attention to better contextualize its importance to bush dogs and other threatened mammals, like Vulnerable (IUCN) white-lipped peccary and giant anteater.

Finally, we highlight the potential importance of private land to the protection and maintenance of Cerrado habitat, and to possible movement corridors for bush dogs in the region. Despite the proximity of our record to San Luis National Park (< 45 km), which is comprised of private "reserves", we note that threats to the Paraguayan Cerrado continue to escalate. Among the most consequential of emerging threats is a recent proposal to construct a new major road, which if achieved, would fragment some of the most important Cerrado areas remaining in Paraguay. This road would extend from San Carlos del Apa and connect with Vallemi, despite the fact that Paraguayan National Road #22 already connects these areas. The construction of a new road would also result in the need for several private ranches to forfeit significant areas; unsurprisingly, this proposal is not surprisingly unpopular among landowners in the region. We suggest that landowners in the northern part of Concepcion, particularly those embracing sustainable cattle-ranching practices, might represent key allies in protecting bush dogs and other threatened species in the Cerrado.

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Biographical sketches

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