

# Mammals in forest remnants of an ecotonal Atlantic Forest-Cerrado area from southeastern Brazil

## Mamíferos em remanescentes florestais de um ecótono Mata Atlântica-Cerrado no sudeste do Brasil

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### Abstract

Forest areas in southeastern Brazil were intensively fragmented by historical processes of land use, and even today this region is under severe anthropic pressure due to agricultural, mining, tourism, and high urban expansion. However, contemporaneous studies on its biodiversity, particularly those focusing on remaining fauna in highly fragmented landscapes are necessary. In the present study, we present a species list of mammals in forest remnants of an agricultural landscape from southeastern Brazil (RPPN Fazenda Lagoa), located in an ecotone of Atlantic Forest and Cerrado, with additional information on habitat use, vulnerability to roadkill and considerations for conservation purposes. We recorded 63 species of Chiroptera, Carnivora, Rodentia, Didelphimorphia, Primates, Cingulata, Pilosa, Cetartiodactyla and Lagomorpha. Approximately 15% of the species are under some risk of extinction, including the endemic buffy-tufted-ear marmoset (*Callithrix aurita*). We also recorded invasive species and domestic dogs and cats living in feral condition. Ten species were reported as roadkills in the roads that give access to the RPPN. We concluded that these remnants play an important role in the maintenance and conservation of the mammals, serving as one of the last refuges for wildlife in a severely deforested region.

**Keywords:** conservation, diversity, forest fragments, Mammalia, richness, roadkill.

### Resumo

As florestas do sul de Minas Gerais foram intensamente fragmentadas pelos processos históricos de uso do solo, e ainda hoje essa região está sob severa pressão antrópica devido à ampliação agrícola, mineradora, turística e urbana. No entanto, estudos contemporâneos sobre sua biodiversidade, particularmente sobre a biodiversidade remanescente em paisagens profundamente fragmentadas são necessários. No presente estudo, apresentamos uma lista de espécies de mamíferos em remanescentes florestais de uma paisagem agrícola do sudeste do Brasil (RPPN Fazenda Lagoa), localizada em ecótono de Mata Atlântica e Cerrado, com informações adicionais sobre uso de habitats, vulnerabilidade a atropelamentos e considerações para a conservação. Registramos 63 espécies de Chiroptera, Carnivora, Rodentia, Didelphimorphia, Primates, Cingulata, Pilosa, Cetartiodactyla e Lagomorpha. Cerca de 15% das espécies estão em algum risco de extinção, incluindo o endêmico sagui-da-serra-escuro, *Callithrix aurita*. Também registramos espécies silvestres invasoras, cães e gatos domésticos vivendo em condição feral. Dez espécies foram registradas como vítimas de atropelamento nas estradas de acesso a RPPN. Nós concluímos que esses remanescentes possuem um importante papel na manutenção e conservação da mastofauna, servindo como um dos últimos refúgios para a vida silvestre de uma região severamente desmatada.

**Palavras-chave:** conservação, diversidade, fragmentos florestais, Mammalia, riqueza, animais atropelados.

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## Introduction

Brazil is the country with the richest biodiversity on the planet due to its vast territory added to the variety of biomes and phytophysiognomies (Lewinsohn and Prado, 2005). Among the Brazilian biomes, the Atlantic Forest and the Cerrado are considered as two of the main global biodiversity hotspots, being both extremely threatened and with the largest number of endemic species (Myers *et al.*, 2000). The Atlantic Forest is highly degraded due long history of anthropogenic activities, such as agriculture, livestock, and urbanization, with less than 11% of its original forest coverage remaining (Ribeiro *et al.*, 2009). Similarly, the Cerrado is also extensively degraded by human activity, showing less than 50% of its original vegetation cover. The Cerrado is widely fragmented and less than 10% of its area is protected (Klink and Machado, 2005).

The Atlantic Forest and the Cerrado have 42% and 36% of the Brazilian mammal diversity, respectively, including many of endemic species (Paglia *et al.*, 2012). These aspects make those biomes of extreme importance for the maintenance and conservation of biodiversity and natural resources (Costa *et al.*, 2005). Furthermore, the transitional areas between both biomes have already been identified as especially rich in biodiversity and considered priority for conservation actions (Conservation International do Brasil *et al.*, 2000). However, studies on the biodiversity in ecotone Atlantic Forest–Cerrado portions are scarce, reinforcing the need for biological surveys on those regions.

Species surveys are important in the Brazilian environmental scenario in order to gather information on species

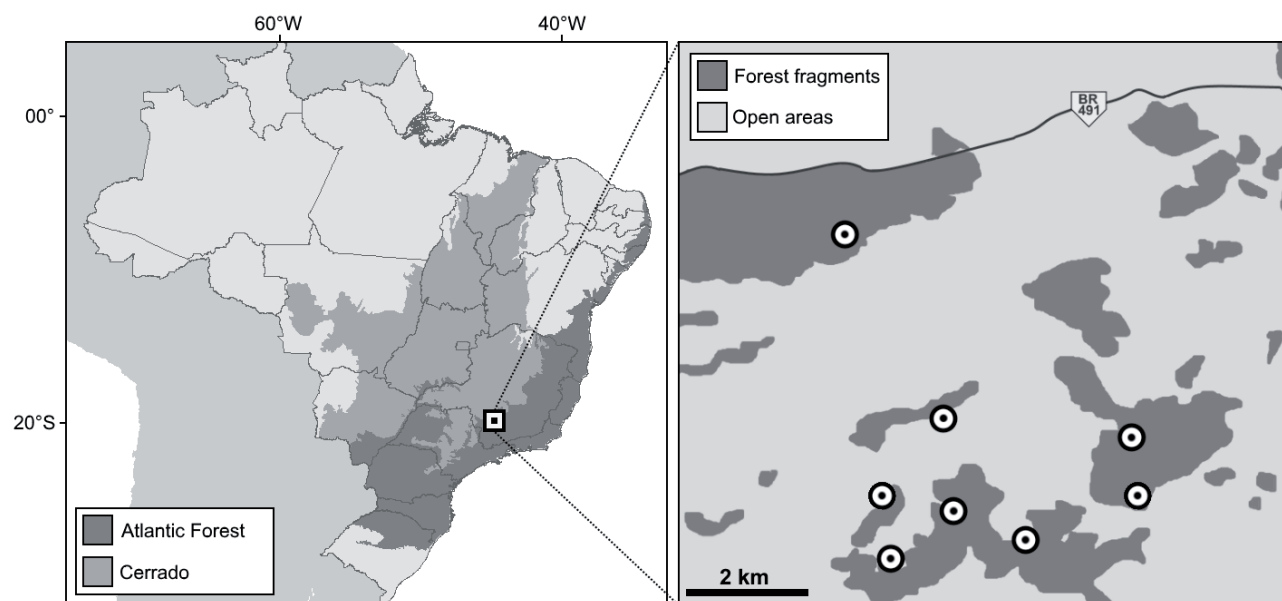
occurrence in a space-time dimension, which are vital for adopting scientifically management decision related to the conservation of endangered species (Bergallo *et al.*, 2000). Given such scenario, this study aims at presenting the species list of mammals in the forest remnants of an agricultural landscape from southeastern Brazil, located in an ecotone between Atlantic Forest and Cerrado, with additional information on habitat use, vulnerability to road-kills, and considerations for conservation purposes.

Novaes *et al.* (2014a) published preliminary results of this study about the biodiversity of RPPN Fazenda Lagoa, indicating the occurrence of 46 species of mammals. However, the authors suggest the continuity of the study due to the possibility of occurrence of species not yet registered. Following the suggestion of Novaes *et al.* (2014a), we present updated results, including an increase in sampling effort, an extension of the species list and new insights on species diversity and conservation considerations.

## Material and methods

### Study area

We carried out the study at Reserva Particular de Patrimônio Natural (RPPN) Fazenda Lagoa (= Private Reserve of Natural Heritage “Fazenda Lagoa”) and surroundings. RPPN Fazenda Lagoa is located between the municipalities of Areado and Monte Belo (21°24’S, 46°15’W), southern of Minas Gerais State, southeastern Brazil (Figure 1). This region is priority for biodiversity conservation in Atlantic Forest (Conservation International do Brasil *et al.*, 2000).



**Figure 1.** Study sites in an ecotonal Atlantic Forest–Cerrado area in southern Minas Gerais, southeastern Brazil. The sampled locations are represented by points.

The region is classified as a transitional area of Atlantic Forest and Cerrado (IBGE, 2012), showing floristic elements typical of both biomes, thus forming a mixed structure of vegetation (Weyland-Vieira *et al.*, 2014). The landscape of the study area consists of seasonal semi-deciduous forest fragments of different sizes, immersed in an agricultural matrix, composed mostly by pastures and sugarcane fields, with small portions of coffee and *Eucalyptus* plantations (Novaes *et al.*, 2014b). The relief is mountainous with hills and sinkholes along the landscape, and the elevation ranges from 700 to 1200 meters above sea level (Novaes *et al.*, 2014b). It has a sub-humid mild mesothermal tropical climate, with three dry months along the year on average and temperatures ranging from 0 to 28°C, the lower temperatures being due mainly to the altitude. We conducted the mammalian sampling on five types of vegetation: [1] forest fragment cores (two remnants), [2] forest fragment edges (two remnants), [3] riparian forests/water courses (two remnants), [4] agricultural areas (one area), [5] fields/pastures (one area).

### Bat sampling

We conducted the sampling sessions from July 2010 to May 2015, comprising 90 sampling nights using mist-nets (Zootech® 9x3 m, 20 mm mesh). We placed the nets in pre-existing trails, over water courses, and in forest clearings. Each sampling night began at sunset and ended up six hours later, totaling a sampling effort of 145,800 m<sup>2</sup>.h (following Straube and Bianconi, 2002).

The bats were identified, marked with numbered metal bands on the forearm and released at the same place of capture. Procedures were authorized by SISBIO/IBAMA (n° 3173-1), and followed the ethical guidelines proposed by Sikes *et al.* (2011). The nomenclature and authorship used for bats followed Nogueira *et al.* (2014).

### Sampling of non-volant small mammals

We carried out the sampling between July 2011 and January 2012 totaling 16 nights of captures using traps triggered by pedal (see Cáceres *et al.*, 2010). We established two linear transects of 200 m in each sampling section, containing simultaneously 20 Tomahawk traps (Equiposfauna® 26x9x9 cm) placed on the ground, and 20 Sherman traps (Zootech® 23x8x9 cm) placed about six meters up the ground, with a spacing of 10 m between each trap-station. The total sampling effort was 640 traps/night. We placed the traps in the interior and at the edge of forest fragments (including riparian vegetation), and within agricultural areas, and they remained in operation for 24 hours being reviewed and regularly baited in the morning.

Baits were composed by a mixture of banana, peanut butter, corn meal, and meat, sometimes including pieces of

bacon or canned sardines. We marked the individuals with numbered metal earrings and released at the same location of capture. Legal procedures were authorized by SISBIO/IBAMA (n° 3173-1), and followed the ethical guidelines proposed by Sikes *et al.* (2011). The nomenclature used for non-volant small mammals followed Paglia *et al.* (2012) and Patton *et al.* (2015).

### Sampling of medium and large sized mammals

We carried out the sampling of medium and large sized mammals with four complementary methods: visual census in linear transects (Cullen and Rudran, 2006), camera-traps, casual encounters of traces and other indirect remains, and collection of roadkill carcasses. For the visual census, we established transects in different types of habitats (e.g. edge and interior of forest fragments, agricultural areas, and pastures), and we walked them in the sunrise or sunset, periods with higher chances of spotting mammals, considering the usual bimodal activity patterns. We carried out at least 300 hours of censuses between July 2011 and June 2015. We used four camera-traps (Bushnell® 8mp Trophy Cam) that remained active 24 hours per 10 consecutive days in four campaigns (March 2014, September 2015, January 2015, July 2015), totaling a sampling effort of approximately 3,840 hours/camera-trap. We placed the camera-traps in places where there was evidence of movement of animals, and we baited them with food attractive to frugivores, carnivores, and ungulates, consisting of banana, canned sardines or bacon, and coarse salt, respectively. Casual encounters of traces and other indirect remains, such as footprints, feces, burrow entrances, claw marks and vocalizations, were carried out during the transect surveys. We also collected predation or hunting victims, whose remains were left in the vicinities of the RPPN. In addition, roadkill carcasses were collected on the highway BR-491, in the stretch between Areado and Monte Belo municipalities, and on the access roads to the RPPN (up to 5 km away). We registered the roadkill data randomly during our car displacements across the roads (ca. 60 km/h), without standardization of the time-interval between car displacements and the sampling effort employed. The nomenclature of species and authorships followed Paglia *et al.* (2012).

### Data analysis

We classified the species according to the global conservation status in the Red List of Threatened Species of the International Union for Conservation of Nature (IUCN, 2016), in the Brazilian Red List of threatened species (MMA, 2014) and in the list of threatened species of the state of Minas Gerais (COPAM, 2010).

## Results

We recorded 63 species of wild (native and introduced) mammals belonging to nine orders. Chiroptera was the most representative, with 25 species, comprising 40% of all recorded species (Table 1), followed by Carnivora (11 spp., 17%), Rodentia (10 spp., 16%), Didelphimorphia (5 spp., 8%), Primates (4 spp., 6%), Cingulata (2 spp., 3%), Pilosa (2 spp., 3%), Cetartiodactyla (2 spp., 3%), and Lagomorpha (1 sp., 3%) (Table 2).

We registered all species of bats and non-volant small mammals (with exception of *Guerlinguetus bra-*

*siliensis* GMELIN 1788) by captures alone (Figure 2). We identified 13 species of medium and large mammals by footprints, five species of which exclusively through this method: *Mazama americana* (ERXLEBEN 1777), *Puma concolor* (LINNAEUS 1771), *Puma yagouaroundi* (É. GEOFFROY 1803), *Leopardus pardalis* (LINNAEUS 1758), and *Galictis cuja* (MOLINA 1782) (Figure 3). We recorded 18 species with the visual census, 10 species of which were exclusively recorded by this method: *Caluromys philander* (LINNAEUS 1758), *Cavia aperea* ERXLEBEN 1777, *Cuniculus paca* (LINNAEUS 1758), *Coendou prehensilis* (LINNAEUS 1758), *Guerlinguetus brasiliensis*, *Callithrix aurita*

**Table 1.** Bats in Atlantic Forest-Cerrado ecotonal remnants in southeastern Brazil, including number of captures (N). Environments in which the record was done are as follows: [1] fragment core, [2] fragment edge, [3] riparian forest/water course, [4] agricultural area, [5] open areas/pasture.

Taxa	N	Environment
<b>Phyllostomidae</b>		
<b>Desmodontinae</b>		
<i>Desmodus rotundus</i> (É. GEOFFROY 1810)	70	[1] [2] [4] [5]
<b>Phyllostominae</b>		
<i>Chrotopterus auritus</i> (PETERS 1856)	3	[1] [2]
<i>Phyllostomus discolor</i> WAGNER 1843	1	[3]
<i>Phyllostomus hastatus</i> (PALLAS 1767)	3	[1] [4]
<b>Glossophaginae</b>		
<i>Anoura caudifer</i> (É. GEOFFROY 1818)	17	[1] [2] [4]
<i>Anoura geoffroyi</i> GRAY 1838	2	[1]
<i>Glossophaga soricina</i> (PALLAS 1766)	76	[1] [2] [3] [4]
<b>Carollinae</b>		
<i>Carollia perspicillata</i> (LINNAEUS 1758)	92	[1] [2] [4]
<b>Stenodermatinae</b>		
<i>Artibeus fimbriatus</i> GRAY 1838	17	[1] [2]
<i>Artibeus lituratus</i> (OLFERS 1818)	166	[1] [2] [3] [4] [5]
<i>Artibeus obscurus</i> (SCHINZ 1821)	5	[1] [2]
<i>Artibeus planirostris</i> SPIX 1823	1	[2]
<i>Chiroderma doriae</i> THOMAS 1891	1	[1]
<i>Chiroderma villosum</i> PETERS 1860	1	[1]
<i>Platyrrhinus lineatus</i> (É. GEOFFROY 1810)	16	[1] [2]
<i>Platyrrhinus recifinus</i> (THOMAS 1901)	6	[1] [2]
<i>Pygoderma bilabiatum</i> (WAGNER 1843)	2	[4]
<i>Sturnira lilium</i> (É. GEOFFROY 1810)	237	[1] [2] [3] [4]
<i>Vampyressa pusilla</i> (WAGNER 1843)	3	[1] [4]
<b>Noctilionidae</b>		
<i>Noctilio leporinus</i> (LINNAEUS 1758)	-	[3]
<b>Molossidae</b>		
<i>Molossus molossus</i> (PALLAS 1766)	3	[3] [5]
<b>Vespertilionidae</b>		
<b>Myotinae</b>		
<i>Myotis nigricans</i> (SCHINZ 1821)	3	[2] [3]
<i>Myotis riparius</i> HANDLEY 1960	1	[3]
<b>Vespertilioninae</b>		
<i>Histiotus velatus</i> (I. GEOFFROY 1824)	1	[5]
<i>Lasiurus ega</i> (GERVAIS 1356)	2	[2]
<b>Total</b>	<b>729</b>	

**Table 2.** Non-volant mammals in Atlantic Forest-Cerrado ecotonal remnants on southeastern Brazil, including type of record: CA (with number of individuals), capture; CT, camera-trap; FP, footprint/trace; RO, roadkill; VI, visualization. Conservation status according to IUCN<sup>1</sup> (global assessment), MMA<sup>2</sup> (Brazilian assessment) and COPAM<sup>3</sup> (state assessment): DD, data deficient; EN, endangered; IN, introduced; NT, near threatened; VU, vulnerable. Environments in which the record was done are as follows: [1] fragment core, [2] fragment edge, [3] riparian forest/water course, [4] agricultural area, [5] open areas/pasture.

Taxa	Record	Conservation	Environment
<b>CETARTIODACTYLA</b>			
<b>Cervidae</b>			
<i>Mazama americana</i> (ERXLEBEN 1777)	FP	-	[3]
<i>Mazama gouazoubira</i> (G. FISCHER 1814)	VI, FP	-	[2] [4]
<b>CARNIVORA</b>			
<b>Canidae</b>			
<i>Cerdocyon thous</i> LINNAEUS 1766	VI, FP, RO	-	[1] [2] [4] [5]
<i>Chrysocyon brachyurus</i> (ILLIGER 1815)	VI, FP, RO	NT <sup>1</sup> , VU <sup>2</sup> , VU <sup>3</sup>	[2]
<b>Felidae</b>			
<i>Leopardus guttulus</i> (HENSEL 1872)	CT, FP, RO	VU <sup>2</sup> , VU <sup>3</sup>	[1] [6]
<i>Leopardus pardalis</i> (LINNAEUS 1758)	FP	VU <sup>3</sup>	[2]
<i>Puma concolor</i> (LINNAEUS 1771)	FP	VU <sup>2</sup> , VU <sup>3</sup>	[2] [3]
<i>Puma yagouaroundi</i> (É. GEOFFROY 1803)	FP	VU <sup>2</sup>	[2] [3] [5]
<b>Mustelidae</b>			
<i>Eira barbara</i> LINNAEUS 1758	CT, VI	-	[1]
<i>Galictis cuja</i> (MOLINA 1782)	FP	-	[2]
<i>Lontra longicaudis</i> (OLFFERS 1818)	VI	DD <sup>1</sup> , NT <sup>2</sup> , VU <sup>3</sup>	[3]
<b>Procyonidae</b>			
<i>Nasua nasua</i> (LINNAEUS 1766)	CT, FP, RO	-	[1] [4] [6]
<i>Procyon cancrivorus</i> (CUVIER 1798)	CT, FP	-	[1]
<b>CINGULATA</b>			
<b>Dasyopodidae</b>			
<i>Euphractus sexcinctus</i> (LINNAEUS 1758)	FP, RO	-	[1]
<i>Dasyus novemcinctus</i> (LINNAEUS 1758)	VI, RO	-	[1]
<b>DIDELPHIMORPHIA</b>			
<b>Didelphidae</b>			
<i>Caluromys philander</i> LINNAEUS 1758	VI	-	[1]
<i>Didelphis albiventris</i> LUND 1840	CA (2)	-	[1]
<i>Didelphis aurita</i> WIED-NEUWIED 1826	CA (7)	-	[1]
<i>Marmosa paraguayana</i> (TATE 1931)	CA (9)	-	[1]
<i>Monodelphis americana</i> (MÜLLER 1776)	CA (1)	-	[1]
<b>LAGOMORPHA</b>			
<b>Leporidae</b>			
<i>Sylvilagus brasiliensis</i> (LINNAEUS 1758)	VI, RO	-	[1] [2] [4]
<b>PILOSA</b>			
<b>Myrmecophagidae</b>			
<i>Myrmecophaga tridactyla</i> LINNAEUS 1758	VI, RO	VU <sup>1</sup> , VU <sup>2</sup> , VU <sup>3</sup>	[2] [4] [6]
<i>Tamandua tetradactyla</i> (LINNAEUS 1758)	VI, RO	-	
<b>PRIMATES</b>			
<b>Callithrichidae</b>			
<i>Callithrix aurita</i> (É. GEOFFROY 1812)	VI	VU <sup>1</sup> , EN <sup>2</sup> , EN <sup>3</sup>	[1]
<i>Callithrix penicillata</i> (É. GEOFFROY 1812)	VI	IN	[6]
<b>Cebidae</b>			
<i>Sapajus nigritus</i> (GOLDFUSS 1809)	CT, VI	NT <sup>1</sup> , NT <sup>2</sup>	[1]
<b>Pitheciidae</b>			
<i>Callicebus nigrifrons</i> (SPIX 1823)	VI	NT <sup>1</sup>	[1]
<b>RODENTIA</b>			
<b>Caviidae</b>			

Table 2. Continuation.

Taxa	Record	Conservation	Environment
<i>Cavia aperea</i> ERXLEBEN 1777	VI	-	[4]
<i>Hydrochoerus hydrochaeris</i> (LINNAEUS 1766)	VI, FP	-	
<b>Cricetidae</b>			
<i>Akodon montensis</i> THOMAS 1913	CA (2)	-	[1]
<i>Nectomys squamipes</i> BRANTS 1827	CA (5)	-	[3]
<i>Oligoryzomys nigripes</i> (OLFERS 1818)	CA (1)	-	[1]
<i>Oxymycterus dasytrichus</i> (SCHINZ 1821)	CA (1)	-	[1] [3]
<b>Cuniculidae</b>			
<i>Cuniculus paca</i> (LINNAEUS 1766)	VI	-	[1]
<b>Dasyproctidae</b>			
<i>Dasyprocta leporina</i> (LINNAEUS 1758)	RO	-	[1] [2]
<b>Erethizontidae</b>			
<i>Coendou prehensilis</i> (LINNAEUS 1758)	VI	-	[1]
<b>Sciuridae</b>			
<i>Guerlinguetus brasiliensis</i> GMELIN 1788	VI	-	[1]

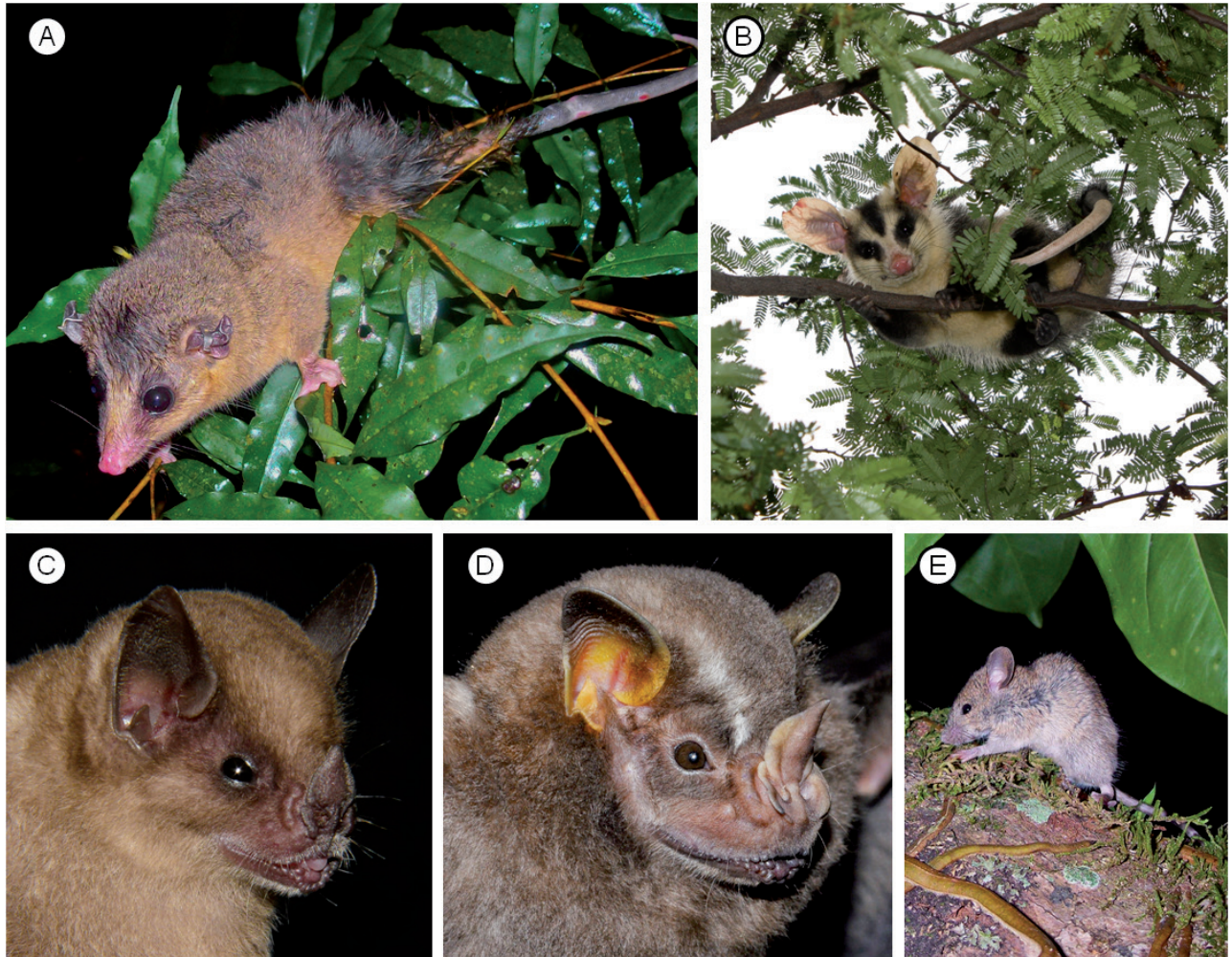


Figure 2. Some species of mammals captured in an ecotonal area of Atlantic Forest–Cerrado remnants in southern Minas Gerais, Brazil: (A) *Marmosa paraguayana*, (B) *Didelphis albiventris*, (C) *Sturnira lilium*, (D) *Artibeus lituratus*, (E) *Oligoryzomys nigripes*.



**Figure 4.** Some records of mammals captured in an ecotonal area of Atlantic Forest–Cerrado remnants in southern Minas Gerais, Brazil, through camera-trap (A-D), visual census (E-F) or roadkills (G-H). A. *Cerdocyon thous*, B. *Eira barbara*, C. *Sapajus nigritus*; D. *Nasua nasua*, E. *Myrmecophaga tridactyla*, F. *Chrysocyon brachyurus*, G. *Leopardus guttulus*, H. *Euphractus sexcinctus*.

(É. GEOFFROY 1812), *Callithrix penicillata* (É. GEOFFROY 1812), and *Callicebus nigrifrons* (SPIX 1823). The camera-traps recorded five species. In addition, we registered ten species as roadkill, including *Dasyprocta leporina* (LINNAEUS 1758), which was recorded only by this method. An illustrative plate of these records is available in Figure 4.

Ten of the recorded species are under some degree of threat, viz. *Chrysocyon brachyurus* (ILLIGER 1815), *Leopardus guttulus* HENSEL 1872, *L. pardalis*, *P. concolor*, *P. yagouaroundi*, *Lontra longicaudis* (OLFERS 1818), *Myrmecophaga tridactyla* LINNAEUS 1758, *C. aurita*, *Sapajus nigrifrons* GOLDFUSS 1809, and *C. nigrifrons* (Table 2). The black-penciled marmoset (*Callithrix penicillata*) is considered invasive in the area. Furthermore, we found groups of domestic dogs (*Canis lupus familiaris* LINNAEUS 1758) and solitary individuals of domestic cats (*Felis catus* LINNAEUS 1758) and european-hare (*Lepus europaeus* PALLAS 1778) living in feral condition at the forest remnants. The authors witnessed predation of native fauna (*Tamandua tetradactyla* and *Didelphis albiventris*) by feral dogs and feral cats, such as small birds, lizards, and bats.

## Discussion

The richness of mammals recorded in this study is consistent with other studies conducted in ecotonal areas of Atlantic Forest and Cerrado with similar sampling effort. For example, Talamoni *et al.* (2014) recorded 70 species in RPPN Santuário do Caraça, central-eastern of Minas Gerais, and Paglia *et al.* (2005) reported the occurrence of 46 species in Estação de Preservação e Desenvolvimento Ambiental de Peti, eastern Minas Gerais State. We also emphasize the importance to continue sampling in the RPPN Fazenda Lagoa, since the present study contributes with increase of 17 mammal species recorded for the area in relation to Novaes *et al.* (2014a).

The high richness of bats, compared with others studies (e.g., Muylaret *et al.*, 2014; Novaes *et al.*, 2014c; Souza *et al.*, 2015) may be explained by two non-mutually exclusive hypotheses: (1) high diversity of bats in natural environments, which can represent up to 50% of species in the mammal community of a region (Timm, 1994; Hutterer *et al.*, 1995; Modesto *et al.*, 2008); and (2) differential sampling effort for different groups, once the bats have



**Figure 3.** Some footprints of mammals recorded in an ecotonal area of Atlantic Forest–Cerrado remnants in southern Minas Gerais, Brazil: (A) *Puma concolor*, (B) *Procyon cancrivorus*, (C) *Lontra longicaudis*, (D) *Chrysocyon brachyurus*, (E) *Hydrochoerus hydrochaeris*, (F) *Mazama gouazoubira*.



been a major focus of field research over recent years. In the present study, the most abundant bat species were *S. lilium* and *A. lituratus*, which together account for more than half of all captures. Similarly, a high abundance of these species has been found in other areas of the Atlantic Forest and Cerrado (e.g., Muylaret *et al.*, 2014; Souza *et al.*, 2015), particularly in perturbed areas.

Small non-volant mammals probably is a sub-sampled group for the study area, since research in forest fragments of Atlantic Forest (including the southern Minas Gerais) recorded a considerably higher species richness than we found (Passamani and Fernandez, 2011; Mesquita and Passamani, 2012; Machado *et al.*, 2013). *Marmosa paraguayana* was the most abundant didelphid, being exclusively recorded in the understory within fragments. According to Passamani and Fernandez (2011), this species is commonly found within forests, as also observed in the present study. Among the rodents, *N. squamipes*, species associated with streams and wetland habitats (Oliveira and Bonvicino, 2011), was the most abundant rodent captured in nearby water courses. We also recorded the semi-fossorial rodent *O. dasytrichus*, uncommon throughout its distribution and rarely recorded in surveys of small mammals (Oliveira and Bonvicino, 2011).

Ecotonal areas of Atlantic Forest and Cerrado favor the occurrence of species of both environments, forest and savanna (Paglia *et al.*, 2005), which explains the presence of *D. albiventris* and *D. aurita* in syntopy, considering their habitat preferences (Rossi and Bianconi, 2011).

Regarding the medium and large mammals, we highlight the presence of the puma (*P. concolor*), the southern-tigrina (*L. guttulus*), and the maned-wolf (*C. brachyurus*). Medium and large carnivores are considered top predators and they are “key species” (Mills *et al.*, 1993). Although their naturally low population densities, they are considered as indicators of good ecosystem health (Vidolin, 2004).

We also highlight the presence of the white-eared marmoset *C. aurita*, which is listed as vulnerable in the IUCN Red List due to the destruction of pristine forests and its difficulty in adapting to secondary forests (Rylands *et al.*, 2008). In addition, the contact of *C. aurita* with the invasive congeneric *C. jacchus* and *C. penicillata* are a major problem for conservation, due both hybridation and superior competitive power than *C. aurita* (Santos *et al.*, 2007; Pereira *et al.*, 2008). Given the occurrence of *C. penicillata* as an invasive species in several fragments where *C. aurita* occurred, its record in the region is worrying for the conservation status of *C. aurita*, and thus, appropriate actions for the control of those invasive species should be seriously considered (Novaes *et al.*, 2014b).

Based on the reports of local inhabitants, Novaes *et al.* (2014b) mentioned the possibility of occurrence of other mammalian species at the site, such as *Bradypus*

*variegatus* SCHINZ, 1825, *Alouatta clamitans* CABRERA, 1940, *Conepatus semistriatus* (BODDAERT, 1785), and *Pecari tajacu* LINNAEUS, 1758. The occurrence of some of these species in nearby localities (e.g., Costa *et al.*, 2010; Penido and Zanzini, 2012) supports the possibility that these species could still be present in the RPPN Fazenda Lagoa and its surroundings. However, a higher field sampling effort is necessary in order to have confirmation of such records.

The study area is highly fragmented due to the expansion of agriculture, though the area still harbors a high richness of mammals, including rare and/or threatened species. Thus the area is important for the maintenance not only of the regional mammal diversity, but also for the conservation as a whole of some of the species. Forest remnants, mainly in agricultural matrixes, have a crucial role for conservation, being the last refuge for many threatened species (Turner and Corlett, 1996; Dotta and Verdade, 2011).

Our results demonstrate the importance of RPPN Fazenda Lagoa and surrounding forest remnants for the conservation of mammal richness and maintenance of their habitats. However, further ecological studies are needed to assess the viability of populations living in the area (mainly for the endangered species) in the face of anthropogenic activities that are gradually destroying the forest remnants of southern Minas Gerais.

The RPPN Fazenda Lagoa also represents an opportunity to carry out studies on the interactions between native and invasive species, since the presence of domestic cats and dogs constitutes a threat to the native biodiversity and a challenge for the management of the forest remnants (Paschoal *et al.*, 2012; Loss *et al.*, 2013; Novaes *et al.*, 2014a). The negative effects of feral dogs and cats on the biodiversity has already been studied and there are indications that their introduction in natural environments is potentially harmful for the conservation of native wildlife, not only due to predation of native fauna, but also because they may lead to the spread of diseases (Curi *et al.*, 2010; Loss *et al.*, 2013).

This study reports the composition of mammalian species in an area highly impacted by anthropogenic activities, and at a kind of habitat (Atlantic forest-Cerrado ecotone) showing a gap in the knowledge of Brazilian biodiversity. These data bring a new look to a region that received few conservation efforts in the last decades, also serving as a first diagnosis to help in the conservation of this region and its remaining species.

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