

# Inventory of medium and large-sized mammals from Serra do Brigadeiro and Rio Preto State Parks, Minas Gerais, southeastern Brazil

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**ABSTRACT:** Cerrado and Atlantic Forest Brazilian biomes are biodiversity hotspots that still have few areas under legal protection, especially on Minas Gerais State. Protected areas are essential to maintain environmental services, and it is necessary to know the fauna present and protected. With this aim, a medium and large sized mammal survey was conducted from January to December 2006 on two Brazilian parks, through tracks stations and active searches. These parks were Serra do Brigadeiro State Park (Atlantic Forest reserve) and Rio Preto State Park (Cerrado reserve), and had 19 and 23 species recorded, respectively. In total, 33 species were recorded and important discussions about their abundance and occurrences are presented. Relevant registers were obtained, and almost 18% of threatened mammalian fauna from Minas Gerais State were represented, highlighting the importance of protected areas.

## INTRODUCTION

Minas Gerais is one of the biologically richest States of Brazil, encompassing areas of three biomes (Caatinga, Cerrado and Atlantic Forest), complex relief and a high variety of rivers and lakes (Drummond *et al.* 2005). However, the remnants of natural habitats are under pressure from a vast array of economic activities (Drummond *et al.* 2005). Therefore, the creation and implementation of protected areas are essential strategies for the conservation of its fauna and flora (Lairana 2003; Drummond *et al.* 2005; Araujo 2007). Less than 2% of Minas Gerais State area is under legal protection, of which only 1.45% is included as “Integral Protection” conservation parks (Machado *et al.* 1998; Drummond *et al.* 2005). Besides the small area under protection, there is a lack of basic information for most nature reserves (Drummond *et al.* 2005). Although some reserves were included in priority areas for biodiversity conservation, only a tiny amount of them have their fauna and flora adequately known or inventoried (Machado *et al.* 1998; Drummond *et al.* 2005). Such information is however needed for the planning and implementation of successful management strategies of these reserves (Araujo 2007).

The Serra do Brigadeiro (PESB) and Rio Preto (PERP) State Parks are inserted in the Atlantic Forest and Cerrado biomes of Minas Gerais State, respectively, and both of them are included in the Atlas of Biodiversity Conservation Priorities in Minas Gerais State (Drummond *et al.* 2005). According to this Atlas the PESB is an area of “Extreme Biological Importance” for mammal research and conservation, while PERP is an area of “Very High Biological Importance” for this group of vertebrates

(Drummond *et al.* 2005). Both the Cerrado and Atlantic Forest biomes are considered biodiversity *hotspots*: highly disturbed areas with high endemism and species richness (Myers *et al.* 2000; Fonseca *et al.* 2004a, b). Given this, the main objective of this paper is to present the results of an inventory of medium and large-sized mammals carried out in these two parks.

## MATERIALS AND METHODS

### Study sites

The Serra do Brigadeiro State Park (PESB) was created in 1996 and is located in the Mantiqueira range (Serra da Mantiqueira), encompassing the municipalities of Araponga, Divino, Ervália, Fervedouro, Miradouro, Muriaé, Pedra Bonita and Sericita (20°33'00" and 21°00'00" S, 42°40'00" and 40°20'00" W). The PESB has 13,210 ha and is a natural divide between the Doce and Paraíba do Sul river watersheds (Simon *et al.* 1999). The highest point reaches 1,985 m (Instituto Estadual de Florestas de Minas Gerais 2010). The climate has two well defined seasons, a wet season and a dry season, predominating mesothermic climate (Cwb, follow Köppen classification) with an average temperature of 15°C (minimal can sometimes reach below 0°C). The average annual precipitation is about 1,500 mm, with dry season between June and August (Valverde 1958). The vegetation presents three basic formations: high altitude grasslands (campos de altitude), slope Atlantic forest (floresta atlântica de encosta – montane seasonal semideciduous forest) and transitional areas (Ferri 1980; Veloso *et al.* 1991; Oliveira-Filho and Ratter 1995); all of them within the Tropical Atlantic Forest Domain (Ab'Saber 1977). The PESB represents one of the

last areas encompassing slope Atlantic forest in Minas Gerais State (Simon *et al.* 1999), but there is a scarcity of data on mammals from this reserve. The PESB is known, however, to harbor one of the most important populations of the critically endangered northern muriqui *Brachyteles hypoxanthus* (Kuhl, 1820) (Drummond *et al.* 2005).

The Rio Preto State Park (PERP) was created in 1994 and has an area of 10,755 ha. It is located in the oriental portion of Espinhaço Mountains, in the municipalities of São Gonçalo do Rio Preto, Felício dos Santos and Couto de Magalhães de Minas, in a region known as Alto Jequitinhonha (18°09'00" S, 43°23'00" W). The reserve encompasses the upper Preto river that is part of Jequitinhonha river watershed (Instituto Estadual de Florestas de Minas Gerais 2010). Three main vegetation types occur in the Park: forest formations (seasonal semideciduous forest - riparian forests - along water courses, and cloud semi deciduous forest in higher altitudes), savanna formations (cerradão, cerrado *sensu stricto*, and rocky cerrado) and field formations (grass field and rocky grass field). The climate of the region is the altitudinal tropical type (Cwb, follow Köppen classification) and the average temperature is 18°C (annual mean). The seasons are well defined, with dry season between May and September and wet season between October and April. The relief is predominantly mountainous, with altitudes varying between 800 and 1,600 m, and rocky outcrops are very common (Instituto Estadual de Florestas de Minas Gerais 2010). Studies about small mammals were made in the reserve, while medium and large sized mammals were surveyed through rapid ecological evaluations only (Lessa *et al.* 2008).

#### Data collection

The survey of medium and large sized mammals was carried out monthly between January and December of 2006, and the parks were sampled in alternate months (each park was sampled six times through bimonthly samples). In both reserves, six 450 m long transects were used, each having ten 50 x 50 cm track stations placed at 50 m intervals, totaling 60 track stations/park. The track stations were kept open during four nights per month, and the sampling effort obtained was 1.360 track stations/nights on PESB and 1.690 track stations/nights on PERP (3.050 tracks stations/nights of total effort). The difference between the total trap efforts among the reserves derived from more raining days in PESB. The substrate used was the one present in the area, which was prepared through cleaning and sifting. The track stations were baited with a mixture composed by oat, corn grain, and sardine in oil, peanut butter and banana. Beside the use of track stations, searches for mammal signs (like tracks, feces, vocal signs, and carcasses) and visualizations were carried out along dirt roads, trails, rivers and lake shores. These searches contemplated Atlantic forest hillside vegetation areas in PESB, and forest (riparian forests) and savanna formations (cerradão, cerrado *sensu stricto* and cerrado ralo) in PERP. In the latter, the transects were located in cerrado *sensu stricto* areas only. In both parks, the sampling effort was concentrated next to the park headquarters, where the access was facilitated.

In this study, were considered medium and large sized mammals the species reaching more than 1 kg in body

mass, according to Fonseca *et al.* (1996) and Reis *et al.* (2006). Lighter species observed during the directed searches were, however, also registered. The threat degree of all recorded species follows the red list of Minas Gerais (COPAM 2010), the Brazilian red list (Machado *et al.* 2005) and the International Union for Conservation of Nature (IUCN) red list (IUCN 2010). The taxonomic nomenclature follows Wilson and Reeder (2005).

## RESULTS AND DISCUSSION

Thirty-three mammal species were recorded, including three species with less than 1 kg of body weight (*Callithrix geoffroyi* (Humboldt, 1812), *Guerlinguetus ingrami* (Thomas, 1901) and *Cavia* sp.). Of those, four were identified to the taxonomic category of genus. In the total, 717 records were obtained (272 on PESB and 445 on PERP), most of them through track stations. By this method, 466 records were obtained (142 in PESB and 324 in PERP) and the overall sampling success was 15.27% (the success obtained for PESB and PERP were 10.44% and 19.27%, respectively). The records obtained through track stations and directed searches are presented on Tables 1 and 2 for the PESB and PERP, respectively. Below, brief discussions about the recorded species are presented.

### *Didelphimorphia*

*Didelphis* sp. was registered on both reserves. Since this species was not captured or visualized, it is not possible to confirm the species, but it's probably related to *D. albiventris* Lund, 1840 on PERP and to *D. aurita* (Wied-Neuwied, 1826) on PESB (with 18 registers at each park). Both of them are already cited in previous studies (Lessa *et al.* 2008). *Didelphis aurita* is cited to PESB, but wasn't registered on recent studies conducted on the park, probably because this species appears to be more easily registered by track stations, as attested by other studies (Pardini *et al.* 2004). Other smaller marsupial species were registered on track stations, but their identification was not made possible.

### *Pilosa*

Two species, *Tamandua tetradactyla* (Linnaeus, 1758) and *Myrmecophaga tridactyla* Linnaeus, 1758, are cited to PERP according to the reserve management plan (Instituto Estadual de Florestas 2010) and Lessa *et al.* (2008). The first one was confirmed by interviews with the reserve staff, but was not registered by the authors. The latter presented nine records, six of them obtained through track stations. The registers obtained through directed searches were restricted to savanna areas (Table 3), but data from other studies indicate that the giant anteater can inhabit forest formations as well (Santos-Filho and Silva 2002). It is considered "Vulnerable" according to the State and Brazilian red lists, and "Near threatened" according to the IUCN red list, with a declining population trend (Machado *et al.* 2005; COPAM 2010; IUCN 2010). It is also considered a rare species on PERP and in southern Espinhaço region (Lessa *et al.* 2008). The species occurs in other reserves in Minas Gerais (Machado *et al.* 1998; Schneider *et al.* 2000), but the PERP is the only park that harbors the species in southern Espinhaço range area (Lessa *et al.* 2008). On PESB, no *Pilosa* species was registered during the study,

**TABLE 1.** Mammal species recorded in the Parque Estadual da Serra do Brigadeiro, Minas Gerais, between January and December 2006, with respective types of records and conservation status according to the Red lists of Minas Gerais (COPAM 2010), Brazil (Machado *et al.* 2005) and the IUCN (IUCN 2010). Record type: TS: footprints in track stations; FO: footprints found in other areas; SI: sightings; VO: vocalizations; FE: feces; CA: carcass (not collected); BU: burrow. Red list categories: NT: Near Threatened; VU: Vulnerable; EN: Endangered; CR: Critically endangered.

TAXON	RECORD TYPE							RED LIST CATEGORY			
	TS	FO	SI	VO	FE	CA	BU	Total	MG	BR	IUCN
<b>DIDELPHIMORPHIA</b>											
<b>Didelphidae</b>											
<i>Didelphis</i> sp. (Wied-Neuwied, 1826)	15	3						18			
<b>CINGULATA</b>											
<b>Dasypodidae</b>											
<i>Dasyopus novemcinctus</i> Linnaeus, 1758	4					3		7			
<b>PRIMATES</b>											
<b>Atelidae</b>											
<i>Alouatta clamitans</i> Cabrera, 1940			18	22				40			
<i>Brachyteles hypoxanthus</i> (Kuhl, 1820)			12	3				15	EN	CR	CR
<b>Pitheciidae</b>											
<i>Callicebus nigrifrons</i> (Spix, 1823)			12	24				36			NT
<b>Cebidae</b>											
<i>Sapajus nigritus</i> (Goldfuss, 1809)			6					6			
<b>CARNIVORA</b>											
<b>Canidae</b>											
<i>Canis lupus familiaris</i> Linnaeus, 1758	104	5						109			
<i>Cerdocyon thous</i> (Linnaeus, 1766)		1						1			
<b>Procyonidae</b>											
<i>Procyon cancrivorus</i> (G.Cuvier, 1798)	5	1						6			
<i>Nasua nasua</i> (Linnaeus, 1766)	5		5					10			
<b>Mustelidae</b>											
<i>Eira barbara</i> (Linnaeus, 1758)	4							4			
<i>Galictis</i> sp.	2							2			
<b>Felidae</b>											
<i>Leopardus pardalis</i> (Linnaeus, 1758)	1							1	VU	VU	
<i>Leopardus</i> sp.	1	1						2			
<i>Puma concolor</i> (Linnaeus, 1771)	1	1						2	VU	VU	
<b>ARTIODACTYLA</b>											
<b>Tayassuidae</b>											
<i>Pecari tajacu</i> (Linnaeus, 1758)		1						1	VU		
<b>RODENTIA</b>											
<b>Sciuridae</b>											
<i>Guerlinguetus ingrami</i> (Thomas, 1901)			1					1			
<b>Caviidae</b>											
<i>Caviasp.</i>			6					6			
<b>Cuniculidae</b>											
<i>Cuniculus paca</i> (Linnaeus, 1766)		5						5			
<b>RECORDS</b>	<b>142</b>	<b>19</b>	<b>59</b>	<b>49</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>272</b>			
<b>SPECIES</b>	<b>10</b>	<b>8</b>	<b>7</b>	<b>3</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>19</b>	<b>4</b>	<b>3</b>	<b>2</b>

but *Bradypus variegatus* Schinz, 1825 and *Tamandua tetradactyla* are cited in the reserve management plan that is being elaborated.

### Cingulata

Only *Dasyopus novemcinctus* Linnaeus, 1758 was registered on PESB (four records in track stations and three carcasses found). This species is widely distributed in Brazil and is relatively common in other Atlantic forest parks and reserves (Stallings *et al.* 1991; Srbek-Araujo and Chiarello 2005; Medri *et al.* 2006). This species was the only Cingulata species recorded for PESB through previous rapid assessment programs.

On PERP, three records of *Dasyopus septemcinctus* Linnaeus, 1758 were obtained, all of them on cerrado *stricto sensu* areas (savanna areas). On the first occasion,

an adult and a young individual were observed trying to climb a very inclined tree, with ~30 cm in diameter. The adult managed to climb up to about 60 cm from the ground walking on the upper surface of the tree trunk. The young tried to follow but failed, jumping back to the ground. As the tree trunk was almost horizontally oriented, ascending the tree trunk was more of a walking than of true climbing. Nevertheless, climbing trees is certainly not usual among armadillos. During this observation it was possible to approach the animal very closely, allowing to observe the adult size and the young, and an accurate identification of species (darker, smaller than the other sympatric species *D. novemcinctus*, and proportionally bigger ears). According to Lessa *et al.* (2005), there is anecdotal information about this species occurrence on southern Espinhaço region and therefore this is the first confirmed record for the

park and region. The other armadillo species recorded in PERP (*Euphractus sexcinctus*) (Linnaeus, 1758) was confirmed through a carcass kept by the reserve staff (a skull and a carapace), which was collected in a cerrado area (dense savanna area). According to the reserve management plan (Instituto Estadual de Florestas 2010) and Lessa *et al.* (2005), this is a rare species on the reserve and on southern Espinhaço regions. Nevertheless, in other areas of typical Cerrado this seems to be the

most frequently recorded armadillo (Rodrigues *et al.* 2002). *Prionomys maximus* (Kerr, 1792) presented three registers, two on dense savanna areas (cerradão) and one register on cerrado *stricto sensu* areas. This species is listed as “Endangered” in Minas Gerais (COPAM 2010) and as “Vulnerable” both in the Brazilian (Machado *et al.* 2005) and in the IUCN red lists (IUCN 2010). Although widely distributed, it is rare locally, and its populations are declining (IUCN 2010). Though it occurs in other localities

**TABLE 2.** Mammal species recorded in the Parque Estadual do Rio Preto, Minas Gerais, between January and December 2006, with respective types of records and conservation status according to the Red lists of Minas Gerais (COPAM 2010), Brazil (Machado *et al.* 2005) and the IUCN (IUCN 2010). Record type: TS: footprints in track stations; FO: footprints found in other areas; SI: sightings; VO: vocalizations; FE: feces; CA: carcass; BU: burrow. Red list categories: NT: Near Threatened; VU: Vulnerable; EN: Endangered; CR: Critically endangered.

TAXON	RECORD TYPE							RED LIST CATEGORY			
	TS	FO	SI	VO	FE	CA	BU	Total	MG	BR	IUCN
<b>DIDELPHIMORPHIA</b>											
<b>Didelphidae</b>											
<i>Didelphis</i> sp.	13	5						18			
<b>PILOSA</b>											
<b>Myrmecophagidae</b>											
<i>Myrmecophaga tridactyla</i> Linnaeus, 1758	6	3						9	VU	VU	NT
<b>CINGULATA</b>											
<b>Dasypodidae</b>											
<i>Dasyus septemcinctus</i> Linnaeus, 1758	1		2					3			
<i>Euphractus sexcinctus</i> (Linnaeus, 1758)						1		1			
<i>Prionomys maximus</i> (Kerr, 1792)		2					1	3	EN	VU	VU
<b>PRIMATES</b>											
<b>Pitheciidae</b>											
<i>Callicebus</i> sp.				1				1			
<b>Cebidae</b>											
<i>Callithrix</i> sp.				1				1			
<b>CARNIVORA</b>											
<b>Canidae</b>											
<i>Canis lupus familiaris</i> Linnaeus, 1758		1						1			
<i>Cerdocyon thous</i> (Linnaeus, 1766)	258	20						278			
<i>Chrysocyon brachyurus</i> (Illiger, 1815)	42	13			5			60	VU	VU	NT
<b>Procyonidae</b>											
<i>Procyon cancrivorus</i> (G.Cuvier, 1798, )		12						12			
<b>Mephitidae</b>											
<i>Conepatus</i> sp.	2							2			
<b>Mustelidae</b>											
<i>Eira barbara</i> (Linnaeus, 1758)	2	3						5			
<i>Lontra longicaudis</i> (Olfers, 1818)		2			1			3	VU		
<b>Felidae</b>											
<i>Leopardus pardalis</i> (Linnaeus, 1758)		1						1	VU	VU	
<i>Leopardus</i> sp.		4						4			
<i>Puma concolor</i> (Linnaeus, 1771)		7						7	VU	VU	
<b>ARTIODACTYLA</b>											
<b>Cervidae</b>											
Unidentified species		8	1		3			12			
<b>RODENTIA</b>											
<b>Sciuridae</b>											
<i>Guerlinguetus ingrami</i> (Thomas, 1901)			4					4			
<b>Caviidae</b>											
<i>Kerodon rupestris</i> (Wied-Neuwied, 1820)			5					5			
<i>Hydrochoerus hydrochaeris</i> (Linnaeus, 1766)		3			1			4			
<b>Cuniculidae</b>											
<i>Cuniculus paca</i> (Linnaeus, 1766)		10						10			
<b>LAGOMORPHA</b>											
<b>Leporidae</b>											
<i>Sylvilagus brasiliensis</i> (Linnaeus, 1758)			1					1			
<b>RECORDS</b>	<b>324</b>	<b>94</b>	<b>13</b>	<b>2</b>	<b>10</b>	<b>1</b>	<b>1</b>	<b>445</b>			
<b>SPECIES</b>	<b>7</b>	<b>15</b>	<b>5</b>	<b>2</b>	<b>4</b>	<b>1</b>	<b>1</b>	<b>23</b>	<b>6</b>	<b>5</b>	<b>3</b>

and reserves inside and outside the State (Fonseca and Redford 1984; Machado *et al.* 1998; Rodrigues *et al.* 2002; Santos-Filho and Silva 2002; Anacleto 2007; Lessa *et al.* 2008), its occurrence on PERP is very relevant, because in Minas Gerais its presence has been confirmed in just a handful protected areas like PERP and Rio Doce State Park (Machado *et al.* 1998; Schneider *et al.* 2000; Lessa *et al.* 2005; Srbek-Araujo *et al.* 2009). According to Lessa *et al.* (2005) this is a rare species in the park and on southern Espinhaço region. The conservation status of this species is even more delicate in the Atlantic forest domain, with surviving populations confirmed for three protected areas only, one located in Minas Gerais (Parque Estadual do Rio Doce) and two in Espírito Santo (Reserva Natural Vale and Reserva Biológica de Sooretama) (Srbek-Araujo *et al.* 2009). Other two armadillo species (*Dasylops novemcinctus* and *Cabassous unicinctus* (Linnaeus, 1758)) were listed as present in PERP by the reserve management plan (Instituto Estadual de Florestas 2010) and by Lessa *et al.* (2005), but were not recorded in the present study. All records of this Order were obtained in cerrado *stricto sensu* and cerrado (dense savanna) areas. Those species can occupy different vegetational formations in the Cerrado biome, but other studies have already showed that they occur more frequently on savanic formations (Fonseca and Redford 1984; Redford and Fonseca 1986; Santos-Filho and Silva 2002).

#### Primates

Five species occur on PESB according to Cosenza and Melo (1998), of those, *Callithrix aurita* (É. Geoffroy, 1812) was the only one not recorded in our study. According to these authors, *Callicebus nigrifrons* (Spix, 1823) and *Alouatta clamitans* Cabrera, 1940 would be the most abundant, while *Callithrix aurita* and *Sapajus nigritus* (Goldfuss, 1809) would be the less abundant species. On the present study, *Alouatta clamitans* was the most frequently sighted species (18 records), followed by *Callicebus nigrifrons* and *Brachyteles hypoxanthus* (both of them with 12 records), and by *Sapajus nigritus* (six registers). This data corroborate the results obtained by Cosenza and Melo (1998). The absence of records of *Callithrix aurita* suggests this species may be really less abundant in PESB. *Brachyteles hypoxanthus* is considered “Endangered” according to the State red list, and “Critically endangered” according to the Brazilian red list and the IUCN red list, and its population shows a declining trend (Machado *et al.* 2005; COPAM 2010; IUCN 2010). This species has been studied on PESB and occurs on other reserves on Minas Gerais, like Rio Doce State Park and RPPN Mata do Sossego (a private reserve) (Machado *et al.* 1998; Paglia *et al.* 2005). *Callicebus nigrifrons* is considered “Near threatened” according with IUCN red list (IUCN 2010).

On PERP, only one record from *Callithrix* sp. was obtained on a “cerradão” area (dense savanna). Since only vocalizations were heard it was not possible to identify the species, and no sound record was made. However, according to Lessa *et al.* (2008), the staff of reserve, and ornithologists that were in the field work and saw these primates, *Callithrix geoffroyi* is the only marmoset occurring in the park. Also according to these sources, *Callithrix penicillata* (É. Geoffroy, 1812) does not occur

on PERP, but this information needs to be confirmed by further research. Although *C. geoffroyi* species is typical from Atlantic Forest formation (Fonseca *et al.* 1996; Biccamarques *et al.* 2006), it occurs on the eastern portion of Minas Gerais State, and the Espinhaço Mountains appears to be its western limit (Rylands and Mendes 2008; Rylands *et al.* 2009). Records of this species were already obtained in other reserves of the southern Espinhaço region, like Serra do Cipó National Park (Hirsch *et al.* 2002; Oliveira *et al.* 2003; Lessa *et al.* 2008). Only a vocalization of *Callicebus* sp. was registered in a seasonal semideciduous forest, during the rainy season. Although *Callicebus personatus* (É. Geoffroy, 1812) is included in the reserve management plan (Instituto Estadual de Florestas 2010), there is no record of this genus for the park region according to Lessa *et al.* (2008). Indeed, according to Hirsch *et al.* (2002), the most probable species occurring in the region is *Callicebus nigrifrons*.

#### Carnivora

The domestic dog *Canis lupus familiaris* Linnaeus, 1758 and the crab-eating fox *Cerdocyon thous* (Linnaeus, 1766) were registered on both reserves, but while the first was the most recorded Canidae in PESB the latter was the most recorded in PERP. *Cerdocyon thous* was frequently registered on PERP through track stations (258 registers) and through directed search (20 registers). On the other side, on this reserve domestic dog was registered only at once (through directed search). In an opposite way, only one record of *Ce. thous* was obtained for PESB, contrasting with *Ca. lupus familiaris* that presented 109 records (104, through track stations and five through directed search). It is possible that the presence and abundance of the domestic dog is negatively influencing the occurrence of *Ce. thous* on PESB. The domestic dog has a negative impact on mammals, being a potential predator, competitor and is also source of several diseases (Butler and du Toit 2002; Butler *et al.* 2004; Curi *et al.* 2006; Galetti and Sazima 2006; Campos *et al.* 2007). In one occasion (August 2006) two dogs killed an adult male capuchin monkey (*Sapajus nigritus*) on PESB (Oliveira *et al.* 2008), demonstrating the need of urgent management actions.

*Chrysocyon brachyurus* (Illiger, 1815) was registered only on PERP, which is expected since it is a typical Cerrado mammal (although in recent years records have been confirmed for some Atlantic Forest localities, mostly related to anthropic places (Cáceres 2004; Moreira *et al.* 2008)). This species presented more registers associated to savanic formations, and it does not depend on forest formations (Lessa *et al.* 2005). According to Lessa *et al.* (2005) it is rare on southern Espinhaço region, but relatively common in other areas of Cerrado (Rodrigues *et al.* 2002). It is listed as “Vulnerable” in Minas Gerais (COPAM 2010) and Brazil (Machado *et al.* 2005) red lists, and “Near threatened” according to IUCN red list (IUCN 2010). *Lycalopex vetulus* (Lund, 1842) occurs on PERP according to the reserve management plan (Instituto Estadual de Florestas 2010) and Lessa *et al.* (2005), but it was not recorded during the present study.

Two species of Procyonidae were recorded on PESB, *Nasua nasua* (Linnaeus, 1766) and *Procyon cancrivorus* (G. Cuvier, 1798), while only the latter was registered on PERP.

*Nasua nasua* is a common and widespread species (Cheida et al. 2006), and is frequently registered on faunal survey studies (Stallings et al. 1991; Chiarello 1999; Cheida et al. 2006). All the records of *Procyon cancrivorus* were associated to water formations. On PERP its records were obtained only through directed searches, most of them in riparian forests (probably because the tracks stations were only on cerrado *stricto sensu* areas), indicating that this species uses more forest formations. This species usually occurs on forest formations associated to water places (Cheida et al. 2006). Although it presents a widespread distribution, it is a poorly studied animal (Cheida et al. 2006).

*Conepatus* sp. was registered only on PERP. According to the known geographic distribution of the genus *Conepatus*, the species probably present in PESB is *C. semistriatus* (Boddaert, 1785) (Cheida et al. 2006; Lessa et al. 2008). The two records were obtained in cerrado *stricto sensu* areas, corroborating other studies (Gargaglioni et al. 1998; Cheida et al. 2006). According to the reserve management plan, this is a common species in the park, but it is considered rare in the southern Espinhaço region (Lessa et al. 2005). Schneider et al. (2000) obtained only one register of this species on the Canastra National Park (also included on Cerrado biome, in the southern region of the Minas Gerais State), but it was one of the most abundant species registered on Emas National Park (Goiás State) (Rodrigues et al. 2002). *Galictis* sp. was registered only on PESB. According to the staff of the park it is frequently observed next to the head office and on areas surrounding the park. *Eira barbara* (Linnaeus, 1758) presented four records on PESB (only through track stations) and five records on PERP (two on track stations and three through directed searches, two of them obtained on forest formations). This species occupies dense forest formations and it is relatively dependent on forest formations in the Cerrado biome (Lessa et al. 2005; Cheida et al. 2006). It has a widespread distribution and is usually registered on survey studies (Stallings et al. 1991; Gargaglioni et al. 1998; Paglia et al. 2005; Srbek-Araujo and Chiarello 2005), but only on Rio Doce State Park (included on Atlantic Forest biome, Minas Gerais State) it was considered very common (Stallings et al. 1991). According to Lessa et al. (2005) it is an uncommon species on southern Espinhaço region. *Lontra longicaudis* (Olfers, 1818) was recorded only in riparian forests, probably because of its semi aquatic behavior, and its dependence on forest formations on Cerrado biome (Fonseca et al. 1996; Lessa et al. 2005; Cheida et al. 2006). It is considered "Vulnerable" according to the State red list, and occurs on other parks on Minas Gerais (Machado et al. 1998; Lessa et al. 2008; Oliveira et al. 2009; COPAM 2010).

*Puma concolor* (Linnaeus, 1771) and *Leopardus pardalis* (Linnaeus, 1758) were registered on both reserves. Both are listed as "Vulnerable" according to the State and the Brazilian red lists (Machado et al. 2005; COPAM 2010). On PERP, five registers from a small feline were also obtained through tracks, being two of them similar to *Leopardus tigrinus* (Schreber, 1775) tracks (Oliveira and Cassaro 2005). *Leopardus wieddi* (Schinz, 1821) and *Panthera onca* (Linnaeus, 1758) are cited in the management plan of PERP (Instituto Estadual de Florestas 2010), but further

research is necessary to confirm their occurrence on this reserve. On PESB two registers from small sized felines were also obtained, but these registers must be confirmed through other methodologies, including camera traps.

#### *Artiodactyla*

On PESB, only *Pecari tajacu* (Linnaeus, 1758) was recorded, through a track trail. This species has a wide distribution (Tiepolo and Tomas 2006) and although it occurs in other parks of the state of Minas Gerais (Machado et al. 1998; Lessa et al. 2008; Oliveira et al. 2009), it is listed as "Vulnerable" in the red list of the state (COPAM 2010). Recently, according to staff information, an adult female *Mazama* was killed by a pack of dogs in the park. Its identification, however, has been confirmed through photographs sent to deer specialists, as a *Mazama gouazoubira* (G. Fischer, 1814) individual, confirming its occurrence on the reserve. The species was not cited for the reserve before, and this fact highlights the negative impact that dogs are producing on local mammals.

On PERP, according to the management plan (Instituto Estadual de Florestas 2010), *Pecari tajacu*, *Mazama gouazoubira* and *Ozotocerus bezoarticus* (Linnaeus, 1758) are expected to occur in the park, but it was not possible to identify with confidence the deer species recorded in the present study. Although Lessa et al. (2008) listed only *Mazama gouazoubira* for the park, it was possible to observe a deer crossing the Preto River in one instance, and its relatively large size and footprints suggest that it could be either a larger species of *Mazama* (perhaps *M. americana*) or even a pampas deer (*Ozotocerus bezoarticus*) (Borges and Tomas 2004).

#### *Rodentia and Lagomorpha*

*Cuniculus paca* (Linnaeus, 1766) and *Guerlinguetus ingrami* (Thomas, 1901), were recorded in both reserves, while *Hydrochoerus hydrochaeris* (Linnaeus, 1766) and *Kerodon rupestris* (Wied-Neuwied, 1820) were recorded only in PERP, and *Cavia* sp. was sighted only on PESB. *Cuniculus paca* is a common and widely distributed species, associated to forested habitats and water sources (Oliveira and Bonvicino 2006); and on the present study its records were always related to forest formations and water sources. *Guerlinguetus ingrami* was visualized only once on PESB, and three times on savanic formations and at once on forest formations on PERP, highlighting that this species does not depend on forest formations in the Cerrado biome (Lessa et al. 2005). *Hydrochoerus hydrochaeris* was registered only at PERP, through two registers on forest formations and two on savanic formations, all of them related to water sources. This is a widespread species, usually abundant, that lives next to water places (Oliveira and Bonvicino 2006). This species was not cited on the reserve management plan (Instituto Estadual de Florestas 2010), but Lessa et al. (2008) cited its occurrence on the park. According to the park staff, this species was abundant, but the hunting impact made it rare. Oliveira and Bonvicino (2006) cited its rarity or even its local extinction in some places that it used to be common. In the last years, according to the staff, the species is coming back to the region, occurring predominantly inside the reserve. This fact highlights the importance of

protected areas to game species conservation. According to Lessa *et al.* (2005) this is a rare species on southern Espinhaço region. *Kerodon rupestris* is a typical species from the Caatinga biome, but it occurs in some Cerrado areas as well (Oliveira and Bonvicino 2006). Five visual records were obtained, all of them related to rocky outcrops and during diurnal period, where it was possible to watch different individuals. It is a common species in the park and also in the southern Espinhaço region (Lessa

**TABLE 3.** Species recorded through active searches (records are related to tracks, feces or occasional encounters obtained during the walks) in savanna formations ("cerradão" - dense savanna, cerrado sensu stricto, and "cerrado ralo" - opened Cerrado) and forest formations (riparian forests) of the Parque Estadual do Rio Preto, Minas Gerais, between January and December 2006. S = Savanna; F = Forest.

TAXON	S	F	TOTAL
<b>DIDELPHIMORPHIA</b>			
<b>Didelphidae</b>			
<i>Didelphis</i> sp.	4	1	5
<b>PILOSA</b>			
<b>Myrmecophagidae</b>			
<i>Myrmecophaga tridactyla</i> Linnaeus, 1758	3		3
<b>CINGULATA</b>			
<b>Dasypodidae</b>			
<i>Dasypus septemcinctus</i> Linnaeus, 1758	2		2
<i>Euphractus sexcinctus</i> (Linnaeus, 1758)	1		1
<i>Priodontes maximus</i> (Kerr, 1792)	3		3
<b>PRIMATES</b>			
<b>Pitheciidae</b>			
<i>Callicebus</i> sp.		1	1
<b>Cebidae</b>			
<i>Callithrix</i> sp.	1		1
<b>CARNIVORA</b>			
<b>Canidae</b>			
<i>Canis lupus familiaris</i> Linnaeus, 1758	1		1
<i>Cerdocyon thous</i> (Linnaeus, 1766)	11	9	20
<i>Chrysocyon brachyurus</i> (Illiger, 1815)	14	4	18
<b>Procyonidae</b>			
<i>Procyon cancrivorus</i> (G. Cuvier, 1798)	1	11	12
<b>Mephitidae</b>			
<i>Conepatus</i> sp.	2		2
<b>Mustelidae</b>			
<i>Eira barbara</i> (Linnaeus, 1758)	1	2	3
<i>Lontra longicaudis</i> (Olfers, 1818)		3	3
<b>Felidae</b>			
<i>Leopardus pardalis</i> (Linnaeus, 1758)		1	1
<i>Leopardus</i> sp.	1	3	4
<i>Puma concolor</i> (Linnaeus, 1771)	4	3	7
<b>ARTIODACTYLA</b>			
<b>Cervidae</b>			
Unidentified species	4	8	12
<b>RODENTIA</b>			
<b>Sciuridae</b>			
<i>Guerlinguetus ingrami</i> (Thomas, 1901)	3	1	4
<b>Caviidae</b>			
<i>Kerodon rupestris</i> (Wied-Neuwied, 1820)	5		5
<i>Hydrochoerus hydrochaeris</i> (Linnaeus, 1766)	2	2	4
<b>Cuniculidae</b>			
<i>Cuniculus paca</i> (Linnaeus, 1766)		10	10
<b>LAGOMORPHA</b>			
<b>Leporidae</b>			
<i>Sylvilagus brasiliensis</i> (Linnaeus, 1758)	1		1
<b>RECORDS</b>	<b>64</b>	<b>59</b>	<b>123</b>
<b>SPECIES</b>	<b>18</b>	<b>14</b>	<b>23</b>

*et al.* 2005). The tapiti, *Sylvilagus brasiliensis* (Linnaeus, 1758), the only native species of Lagomorpha in Brazil, was registered only in PERP. According to Oliveira and Bonvicino (2006), this is a widely distributed species, and it is considered common in the southern Espinhaço region (Lessa *et al.* 2005; 2008; Oliveira *et al.* 2009).

### Concluding remarks

Among the 29 species registered, eight and six species are included in the State and the Brazilian red lists, respectively, and five species are considered threatened according to the IUCN red list (Tables 1 and 2). For the state of Minas Gerais, this number represents 17,8% of the threatened species, reinforcing the importance of the protected areas for the conservation of mammal species. As examples, *Brachyteles hypoxanthus*, *Myrmecophaga tridactyla* and *Priodontes maximus*, are strongly threatened and occur on few "Integral Protection" reserves on the state. The present study strongly complements the previous surveys of the mammal fauna present in both reserves, confirming the occurrence some species, adding others, and bringing information about habitat use and abundance. It also highlights the need of further research to ascertain the exact identification of the species, which could not be done accurately solely on the basis of tracks, calls or brief sightings.

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