



MAMMAL FAUNA IN *Eucalyptus* PLANTATIONS AND FOREST REMNANTS IN TRÊS LAGOAS, MATO GROSSO DO SUL STATE, BRAZIL

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Abstract: The eastern portion of the state of Mato Grosso do Sul is considered a priority region for biodiversity conservation in Brazil. It lacks, however, not only large protected areas but also knowledge about wildlife species inhabiting these landscapes. This study was conducted on a farm composed of a mosaic of *Eucalyptus* plantations and remnants of Atlantic forest and Cerrado (Savannah) vegetation, located in the municipality of Três Lagoas. Over nine years of monitoring, 69 mammal species were recorded, including 23 bats, 14 non-volant small-sized, and 32 medium or large-sized mammals. Twelve species are considered under a category of extinction threat. The results of this study contribute to the diagnostic of the local fauna and show the importance of this farm for mammal conservation in this region.

Keywords: Atlantic Forest; Cerrado; diversity; inventory; High Conservation Value Area.

INTRODUCTION

At least 166 species of mammals have been recorded in the state of Mato Grosso do Sul, Brazil, 73 of which are bats (Chiroptera), 46 are small marsupials (Didelphimorphia) or rodents (Rodentia: Cricetidae and Echimyidae) and 47 are medium or large-sized mammals (Cáceres *et al.* 2008, Fischer *et al.* 2015, Tomas *et al.* 2017). Nonetheless, there are still gaps in the knowledge of the mammalian fauna in this state, especially on its Southern, Central, and Eastern regions (Tomas *et al.* 2017). Previous studies focused mainly in the Pantanal wetland and adjacent areas (Tomas *et al.* 2010, Alho *et al.* 2011, Mallmann *et al.* 2011, Porfirio *et al.* 2014), with individual studies carried out in semideciduous Atlantic Forest and Cerrado savannahs, in Southeastern and Northeastern regions, respectively (Bordignon *et al.* 2006, Hannibal 2014).

This mosaic pattern of available data results in a recognized deficit in the knowledge of the current distribution of species and their populations, popularly known as the “Wallacean Deficit”, where biodiversity maps resemble sampling effort maps (Hortal *et al.* 2015). The most straightforward way to extend knowledge and overcome this deficit is to expand the inventory system. In this sense, the present study aims to communicate the results of long-term monitoring of mammals in a region on the banks of the Paraná River, contributing to the greater understanding of the distribution of species in the eastern portion of the Mato Grosso do Sul State.

MATERIAL AND METHODS

Study site

The study was carried out at Barra do Moeda farm (51°47' W, 29°59' S), located in the municipality of

Três Lagoas, in eastern Mato Grosso do Sul State, Brazil (Figure 1), a region undergoing intense land use change in its agricultural matrix, replacing pastures for extensive forestry areas (Perpetua & Thomaz-Junior 2013). The Barra do Moeda farm has 5,640 ha, 52% of them corresponding to *Eucalyptus* plantations and 34% of native vegetation, with both Atlantic forest and Cerrado natural remnants considered as High Conservation Value Areas (HCVA) (Fibria Celulose S.A. 2017). The predominant physiognomy is *Cerradão* (tall woodland), which is characterized by shrub and arboreal species such as *Mabea fistulifera* (Malpigiiales, Euphorbiaceae), *Copaifera langsdorffii* (Fabales, Caesalpinaceae), *Qualea grandiflora* (Myrtales, Vochysiaceae), *Platypodium elegans* (Fabales, Fabaceae), *Xylopia aromatica* (Magnoliales, Annonaceae), and *Cordia sessilis* (Gentianales, Rubiaceae). Other physiognomies found on the farm are swamp forests, riparian forests, and seasonal semideciduous forests, where trees such as *Magnolia ovata* (Magnoliales, Magnoliaceae), *Protium heptaphyllum* (Sapindales,

Burseraceae), *Handroanthus ochraceus* (Laminales, Bignoniaceae), and *Xylopia emarginata* (Magnoliales, Annonaceae) are recorded. In addition, these physiognomies are complemented by small patches of swamp and dry grasslands, characterized by the *buriti* palm *Mauritia flexuosa* (Arecales, Arecaceae). The climate of the region according to Köppen's classification is Tropical with a dry season (AW) (Zavattini 2009), with an annual average rainfall of 1,300 mm and 24.5° C of mean annual temperature (INMET 2018).

Data collection and analysis

Data were collected for nine years (between 2007 and 2016) during a monitoring program implemented in the area. During the first four years, four surveys were carried out per year, afterwards, these were reduced to two surveys per year. A total of 25 field expeditions were conducted to sample bats, 26 for small non-volant mammals, and 28 for medium and large-sized mammals, totaling 100, and 156, and 168 days of sampling, respectively (Appendix 1). Data were collected in forest remnants and

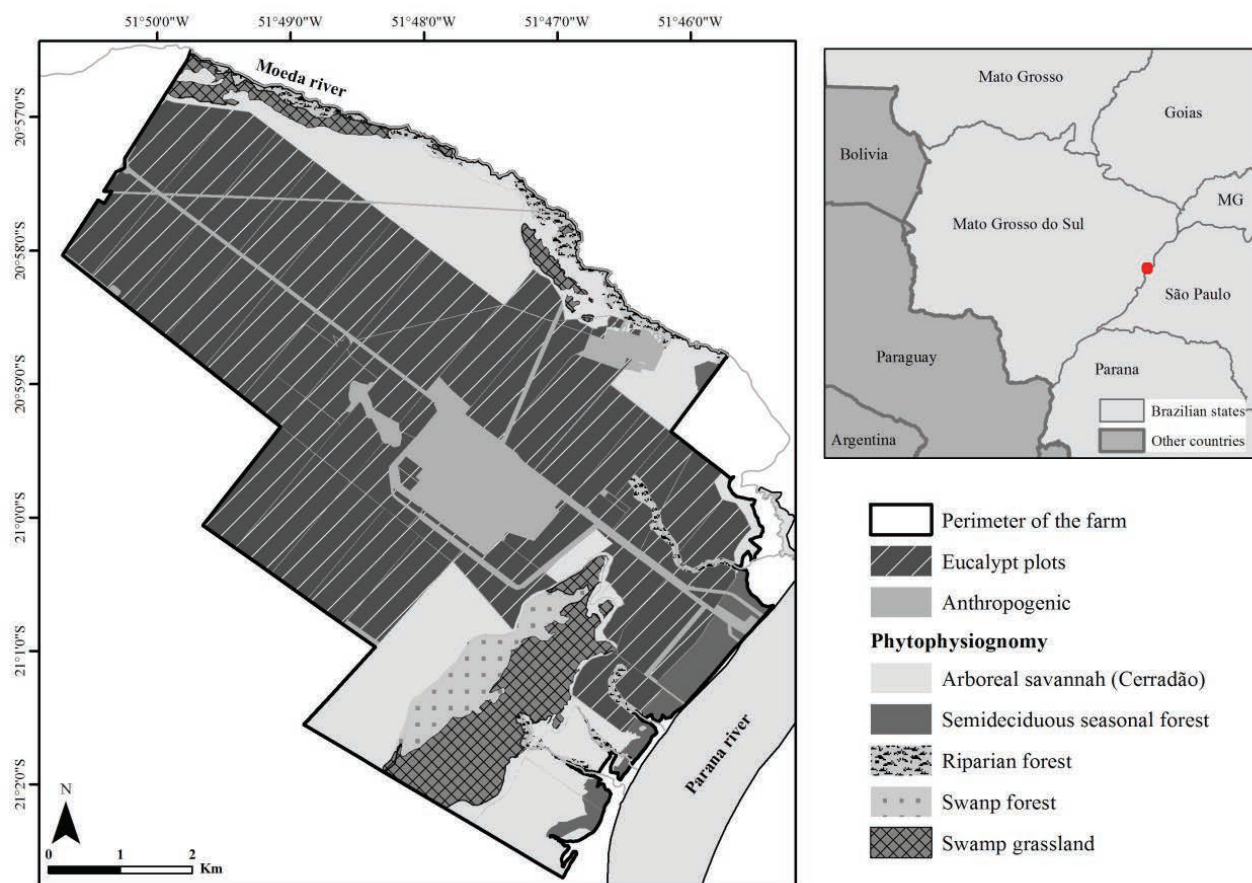


Figure 1. Location of Barra do Moeda farm, municipality of Três Lagoas, State of Mato Grosso do Sul, Brazil.

Eucalyptus plantations. To assess the effectiveness of our sampling effort, we built species rarefaction curves using the software Past 3.11 (Hammer 2001).

Bat sampling was carried out using 12 to 14 mist nets (9, 12 or 15 m x 2.5 m, 30 mm mesh size) in each campaign (Kunz *et al.* 2009). During the years 2007 to 2011 mist nets remained open during the whole night, totaling 12 h of sampling. From 2012 onwards, sampling effort was reduced to six hours per night (Trevelin *et al.* 2017). Following Straube & Bianconi (2002), the total effort implemented to sample bats was 349,749 m²*h.

Species of the genus *Artibeus* were identified based on fur color that is predominantly brown in *A. lituratus* with well-defined facial stripes while in *A. planirostris* underparts is grayish-brown with poorly defined facial stripes (Gardner 2008). Additionally, forearm was also used as an auxiliary characteristic, normally larger than 69 mm in *A. lituratus* and normally smaller than 69 mm in *A. planirostris* (Taddei *et al.* 1998). Sagittal crest present, often well developed, was main distinctive characteristic to differentiate *Myotis riparius* from *M. nigricans* and *M. albescens*. Also, *M. nigricans* fur has dark or slightly bicolor, while *M. albescens* has white or yellowish tips, imparting a frosted appearance (Gardner 2008). Bat species were identified in the field by Leonardo C. Trevelin and Paul F. Colas-Rosas.

To sample small mammals, live animal traps (Sherman and Tomahawk types) and intercept and pitfall traps were used (Corn 1994). The formers were employed only during the first two years of monitoring and totaled 4,560 traps*night. For the latter, 15 lines of pitfalls consisted of five 65-liter, distant 10 m between them, buried at ground level and interconnected by a guide fence of one meter of height, were opened for six consecutive nights each survey, totaling an effort of 9,870 buckets*night.

Specially for *Oligoryzomys* genus, *O. nigripes* was differentiated by the larger size among *Oligoryzomys* species, dark-brown to dark-yellowish dorsal pelage color, with defined limit with whitish ventral coloration, and often with an orange pectoral band (Weksler & Bonvicino 2005). *Oligoryzomys* sp1 was characterized by small size, chestnut-brown-yellowish dorsal coloration, with abundant dark guard hairs and ventral color light yellow-gray. *Oligoryzomys* sp2 was characterized by small

size, dorsum with bright brownish-orange hairs intermixed with dark hairs, lateral brighter orange coloration without defined limits with yellow-gray ventral coloration. Small mammals were identified in the field by Paul F. Colas-Rosas.

Medium and large-sized mammals were sampled using camera traps (Kucera & Barrett 2011) and line transects to search for tracks and other evidence (Nichols & Conroy 1996, Rocha & Dalponte 2006). For the first method, five to 12 traps were used per survey, all programmed to operate 24 h a day during at least five days without interruption, totaling 37,286 h of trapping. The effort employed for line transects was 448 km throughout the entire sampling, distributed between native vegetation areas and *Eucalyptus* plots.

Occasional records within the farm were also included. Identification and nomenclature used were based on recent taxonomic references for each sample group. Taxonomic identifications were based on Gardner (2008) for marsupials, bats, and Xenarthrans; Bonvicino *et al.* (2008) for small rodents; Weksler *et al.* (2006) for oryzomyine rodents and Weksler & Bonvicino (2005) and Paresque (2010) specifically *Oligoryzomys* genus; and Becker & Dalponte (2013) for medium and large-sized mammals. Taxonomic nomenclature according Nogueira *et al.* (2014) for bats and Patton *et al.* (2015) for rodents, Gardner (2008) and Rossi *et al.* (2012) for marsupials, and Paglia *et al.* (2012) for medium and large-sized mammals. Extinction risk assessment was based on the Brazilian and international endangered species lists (ICMBio/MMA 2018, IUCN 2019). All collected specimens are being incorporated into the mammalian collection of the Museu de Zoologia/Universidade de São Paulo (MZUSP) (Appendix 2). One specimen was deposited in the mammalian collection of the Museu de Zoologia/Universidade de Campinas (UNICAMP/ZUEC-MAM) (Appendix 2). The Brazilian Institute of the Environment and Renewable Natural Resources granted authorizations for capture, collection and transport of biological material (IBAMA license: 02043.000066/2009-75).

RESULTS

Sixty-nine species of mammals belonging to 10 orders were recorded, being Chiroptera, Rodentia,

and Carnivora the richest orders with 23, 13 and 10 species, respectively. Regarding the families, the most representative were Phyllostomidae (N = 16) and Cricetidae (N = 9) (Table 1; Figures 2-4).

We captured 1,651 bats of 23 species, mostly Phyllostomidae (N = 16). Three species alone *Artibeus lituratus* (N = 434), *Carollia perspicillata* (N = 346), and *Phyllostomus hastatus* (N = 203) (Chiroptera, Phyllostomidae) corresponded to 60% (N = 986) of the captures. Species of Molossidae (N = 2) and Vespertilionidae (N = 5) were also recorded. According to the Jackknife first-order richness estimator, this richness may still be increased by new records of another five species (Figure 5A).

Regarding to small mammals, we captured 576 individuals of 9 species of Cricetidae rodents and five Didelphidae marsupials. The endangered *Thylamys macrurus* (Didelphidae) was recorded only once, in 2010. Among the commonest small mammals, the rodent *Calomys tener* (Rodentia, Cricetidae) accounted for more than half of the captures (N = 312). In addition, six species – *Necomys lasiurus* (Cricetidae) (N = 53), *Oecomys bicolor* (Cricetidae) (N = 33), *Didelphis albiventris* (Didelphidae) (N = 54), *Gracilinanus agilis* (Didelphidae) (N = 57), *Cryptonanus chacoensis* (Didelphidae) (N = 28), and *C. tener* (N = 312) – accounted for 93% of the captured individuals (N = 537). The Jackknife first-

Table 1. Mammal species registered at Barra do Moeda farm, municipality of Três Lagoas, Mato Grosso do Sul State, Brazil. Extinction risk categories: **VU** – vulnerable; **EN** – endangered. Habitat Type: **1.** Arboreal savannah (Cerradão); **2.** Semideciduous seasonal forest; **3.** Riparian forest; **4.** Swamp forest; **5.** Swamp grassland (Veredas); **6.** Anthropogenic (infrastructure, buildings); **7.** Eucalypt plots. **Leopardus guttulus* or *L. wiedii*.

ORDER/Family/Species	Brazil (2018)	IUCN (2019)	Habitat Type
ARTIODACTYLA			
Cervidae			
<i>Blastocerus dichotomus</i>	VU	VU	1, 2, 4, 5, 6, 7
<i>Mazama americana</i>	-	-	1, 2, 4, 7
<i>Mazama gouazoubira</i>	-	-	1, 2, 4, 7
<i>Ozotoceros bezoarticus</i>	VU	-	1, 2, 4, 7
Tayassuidae			
<i>Pecari tajacu</i>	-	-	1, 2, 4, 7
<i>Tayassu pecari</i>	VU	VU	1, 2, 4, 5, 6, 7
CARNIVORA			
Canidae			
<i>Cerdocyon thous</i>	-	-	all
<i>Chrysocyon brachyurus</i>	VU	-	1, 2, 4, 5, 7
Felidae			
<i>Leopardus pardalis</i>	-	-	1, 2, 4, 5, 7
<i>Leopardus</i> sp.*	VU/VU	VU/-	1, 2
<i>Panthera onca</i>	VU	-	1, 2, 4
<i>Puma concolor</i>	VU	-	1, 2, 3, 4, 7
Mustelidae			
<i>Eira barbara</i>	-	-	1, 2, 3, 4, 5, 7
<i>Lontra longicaudis</i>	-	-	2
Procyonidae			
<i>Nasua nasua</i>	-	-	1, 2, 5, 7
<i>Procyon cancrivorus</i>	-	-	1, 2, 4, 5, 7

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ORDER/Family/Species	Brazil (2018)	IUCN (2019)	Habitat Type
CHIROPTERA			
Molossidae			
<i>Molossops temminckii</i>	-	-	1, 2, 4
<i>Molossus molossus</i>	-	-	6
Phyllostomidae			
<i>Artibeus lituratus</i>	-	-	1, 2, 4, 7
<i>Artibeus planirostris</i>	-	-	1, 2, 4, 7
<i>Carollia perspicillata</i>	-	-	1, 2, 4, 7
<i>Chiroderma doriae</i>	-	-	1, 4
<i>Chiroderma villosum</i>	-	-	1, 4
<i>Chrotopterus auritus</i>	-	-	4
<i>Desmodus rotundus</i>	-	-	1, 2, 4, 7
<i>Glossophaga soricina</i>	-	-	1, 2, 4, 7
<i>Lophostoma brasiliense</i>	-	-	1, 4, 7
<i>Micronycteris</i> sp.	-	-	1
<i>Phyllostomus discolor</i>	-	-	1, 4, 7
<i>Phyllostomus hastatus</i>	-	-	1, 2, 4, 7
<i>Platyrrhinus helleri</i>	-	-	1, 2, 4
<i>Platyrrhinus lineatus</i>	-	-	1, 2, 4, 7
<i>Sturnira lilium</i>	-	-	1, 2, 4, 7
<i>Uroderma bilobatum</i>	-	-	1, 4
Vespertilionidae			
<i>Eptesicus furinalis</i>	-	-	2
<i>Lasiurus blossevillii</i>	-	-	1
<i>Myotis albescens</i>	-	-	4
<i>Myotis nigricans</i>	-	-	1, 2, 4, 7
<i>Myotis riparius</i>	-	-	1, 4
CINGULATA			
Chlamyphoridae			
<i>Cabassous unicinctus</i>	-	-	1, 5, 7
<i>Cabassous tatouay</i>	-	-	1, 4, 7
<i>Euphractus sexcinctus</i>	-	-	1, 2, 6, 7
<i>Priodontes maximus</i>	VU	VU	1, 2, 4, 5, 7
Dasypodidae			
<i>Dasypus novemcinctus</i>	-	-	1, 2, 7
<i>Dasypus septemcinctus</i>	-	-	1, 2, 5, 7
DIDELPHIMORPHIA			
Didelphidae			
<i>Cryptonanus chacoensis</i>	-	-	1, 7

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Tabela 1. ...Continuação**Table 1.** ...Continued

ORDER/Family/Species	Brazil (2018)	IUCN (2019)	Habitat Type
<i>Didelphis albiventris</i>	-	-	1, 4, 7
<i>Gracilinanus agilis</i>	-	-	1, 7
<i>Marmosa murina</i>	-	-	1, 7
<i>Thylamys macrurus</i>	EN	-	1
LAGOMORPHA			
Leporidae			
<i>Sylvilagus brasiliensis</i>	-	-	1, 2, 7
PERISSODACTYLA			
Tapiridae			
<i>Tapirus terrestris</i>	VU	VU	all
PILOSA			
Myrmecophagidae			
<i>Myrmecophaga tridactyla</i>	VU	VU	1, 2, 3, 4, 5, 7
<i>Tamandua tetradactyla</i>	-	-	1, 2, 5, 7
PRIMATES			
Atelidae			
<i>Alouatta caraya</i>	-	-	1, 2, 4
Cebidae			
<i>Sapajus cay</i>	VU	-	1, 2, 4
RODENTIA			
Caviidae			
<i>Cavia aperea</i>	-	-	1
<i>Hydrochoerus hydrochaeris</i>	-	-	1, 2, 4, 5, 6, 7
Cricetidae			
<i>Calomys tener</i>	-	-	1, 7
<i>Cerradomys</i> sp.	-	-	1, 7
<i>Euryoryzomys russatus</i>	-	-	1
<i>Necromys lasiurus</i>	-	-	1, 7
<i>Oecomys bicolor</i>	-	-	1, 2, 7
<i>Oligoryzomys nigripes</i>	-	-	1, 7
<i>Oligoryzomys</i> sp1	-	-	1, 7
<i>Oligoryzomys</i> sp2	-	-	7
<i>Oxymycterus delator</i>	-	-	1
Dasyproctidae			
<i>Dasyprocta azarae</i>	-	-	1, 2, 7
Erethizontidae			
<i>Coendou prehensilis</i>	-	-	6



Figure 2. Bat species sampled during the study conducted at Barra do Moeda farm, municipality of Três Lagoas, Mato Grosso do Sul State, Brazil: A) *Artibeus lituratus*; B) *Artibeus planirostris*; C) *Carollia perspicillata*; D) *Chiroderma doriae*; E) *Chiroderma villosum*; F) *Desmodus rotundus*; G) *Eptesicus furinalis*; H) *Chrotopterus auritus*; I) *Glossophaga soricina*; J) *Lophostoma brasiliense*; K) *Molossops temminckii*; L) *Myotis riparius*; M) *Phyllostomus hastatus*; N) *Platyrrhinus helleri*; O) *Uroderma bilobatum*.

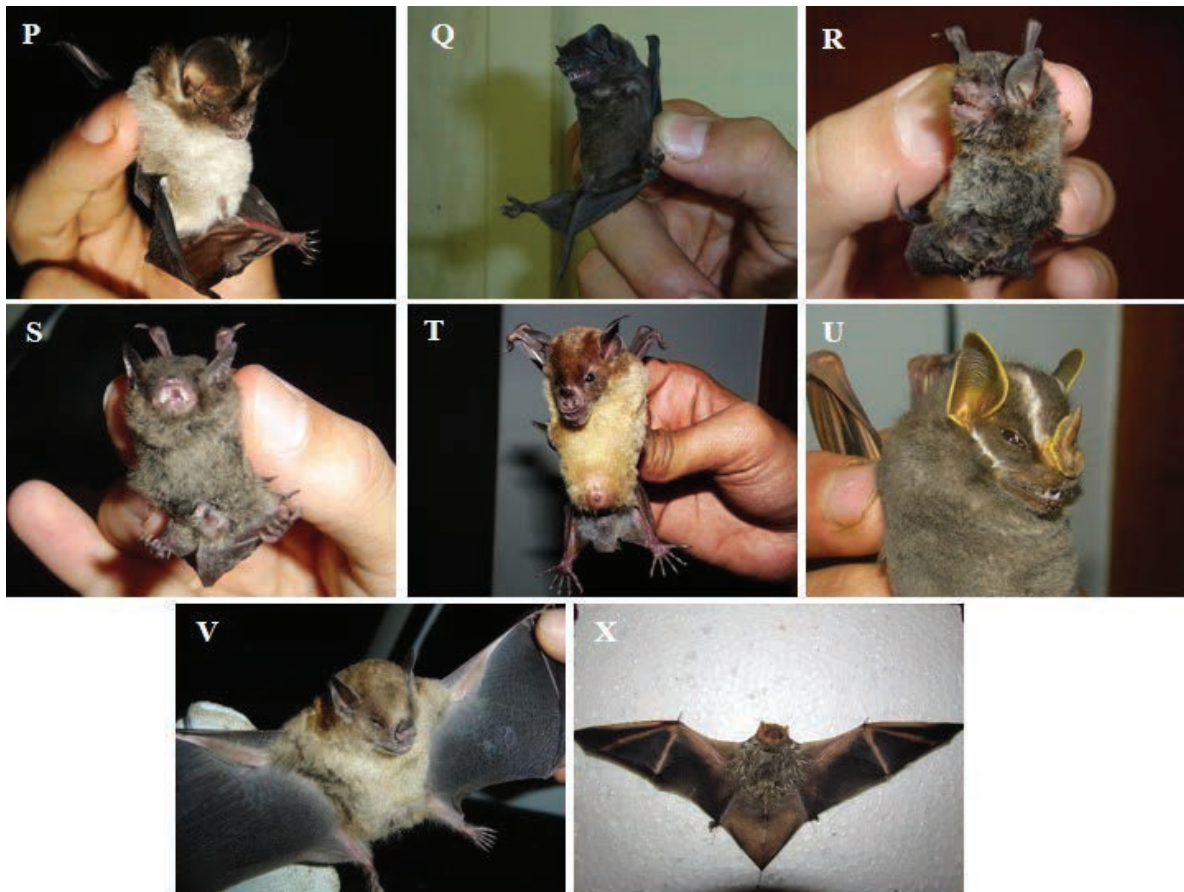


Figure 2 (Continuation). Bat species sampled during the study conducted at Barra do Moeda farm, municipality of Três Lagoas, Mato Grosso do Sul State, Brazil: P) *Micronycteris* sp.; Q) *Molossus molossus*; R) *Myotis albescens*; S) *Myotis nigricans*; T) *Phyllostomus discolor*; U) *Platyrrhinus lineatus*; V) *Sturnira lilium*; X) *Lasiurus blossevillii*.

order richness estimator suggests the presence of three additional small mammal species still to be recorded on the farm (Figure 5B).

With respect to medium and large-sized mammals, we made 2,635 records of 32 species, including 11 species under some category of extinction threat. With 10 species recorded, Carnivora was the most represented order within this group, half of which is endangered (Table 1). *Tapirus terrestris* (Perissodactyla, Tapiridae) (N = 719), *Cerdocyon thous* (Carnivora, Canidae) (N = 406) and *Mazama gouazoubira* (Artiodactyla, Cervidae) (N = 215) corresponded to over 50% of all records (N = 1,340). According to the Jackknife first-order richness estimator, this richness may still be increased by new records of another 2 species (Figure 5C)

DISCUSSION

The mammalian species richness (N = 69) recorded

on the Barra do Moeda farm corresponds to 41,5% of all the species described for the state of Mato Grosso do Sul (Cáceres *et al.* 2008, Fischer *et al.* 2015, Tomas *et al.* 2017). This species richness matches those observed at important Protected Areas in the region, such as *Pantanal Matogrossense*, *Emas* and *Serra da Canastra* National Parks, where 56, 85 and 59 species were respectively recorded (Schneider *et al.* 2000, Rodrigues *et al.* 2002, IBAMA 2003). Also, the number of species recorded exceeds that recorded in the region called “Aporé-Sucuriú Complex,” located in the Northeastern portion of the state, where Bordignon *et al.* (2006) listed 62 mammal species.

The recorded 23 species of bats account for nearly one-third of the Chiropteran fauna in the state of Mato Grosso do Sul (Fischer *et al.* 2015, Tomas *et al.* 2017). Shapiro & Bordignon (2014) recorded smaller richness in fragments of Cerrado near the municipality of Campo Grande (N = 21), as well as Schneider *et al.* (2000) in the Serra

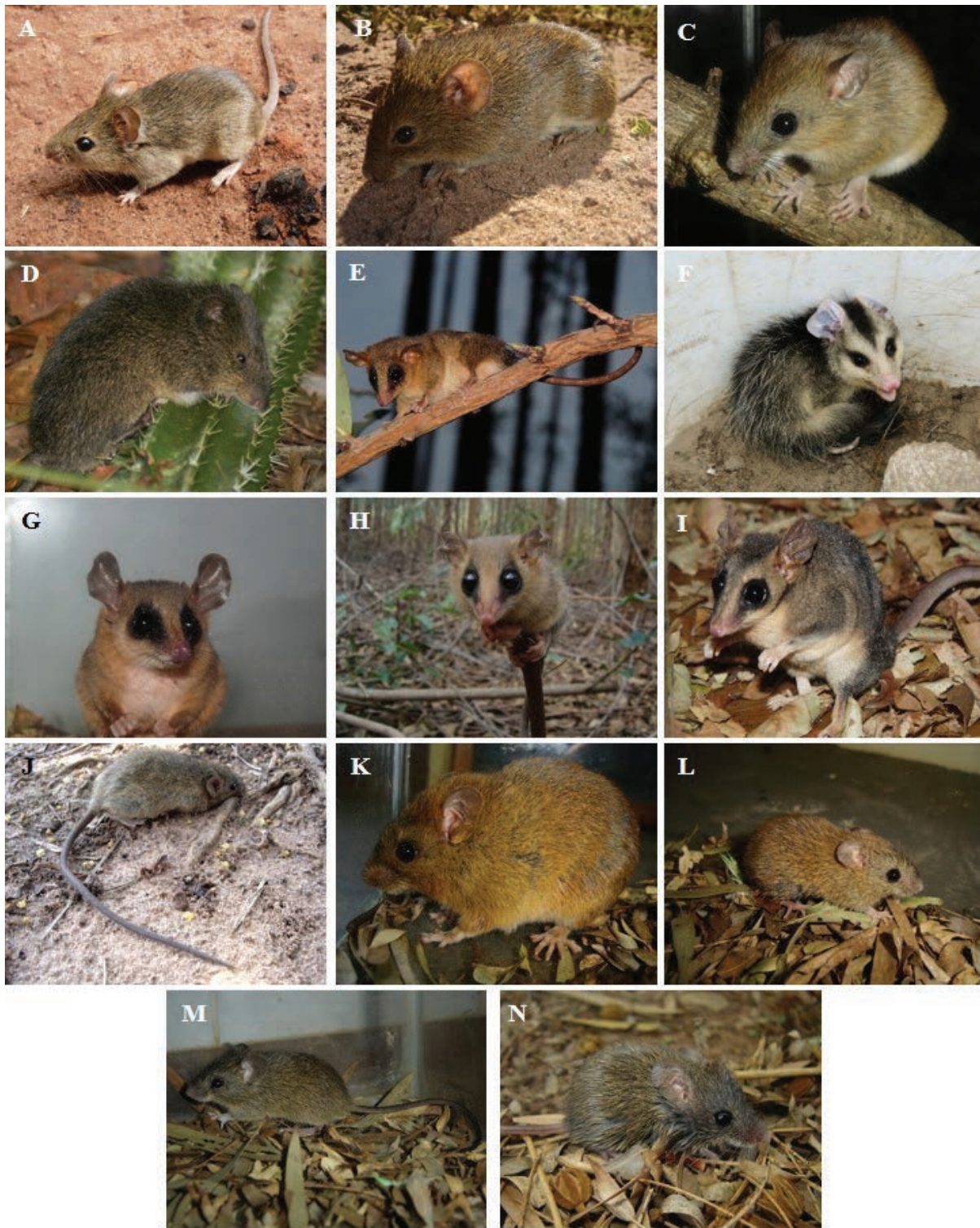


Figure 3. Small non-volant mammals sampled during the study conducted at Barra do Moeda farm, municipality of Três Lagoas, Mato Grosso do Sul State, Brazil: A) *Calomys tener*; B) *Necromys lasiurus*; C) *Oecomys bicolor*; D) *Oxymycterus delator*; E) *Gracilinanus agilis*; F) *Didelphis albiventris*; G) *Marmosa murina*; H) *Cryptonanus chacoensis*; I) *Thylamys macrurus*; J) *Cerradomys* sp.; K) *Euryoryzomys russatus*; L) *Oligoryzomys nigripes*; M) *Oligoryzomys* sp2; N) *Oligoryzomys* sp1.



Figure 4. Species of medium and large-sized mammals sampled during the study conducted at Barra do Moeda farm, municipality of Três Lagoas, Mato Grosso do Sul State, Brazil: A) *Tapirus terrestris*; B) *Hydrochoerus hydrochaeris*; C) *Pecari tajacu*; D) *Leopardus pardalis*; E) *Chrysocyon brachyurus*; F) *Sapajus cay*; G) *Procyon cancrivorus*; H) *Puma concolor*; I) *Panthera onca*; J) *Coendou prehensilis*; K) *Tayassu pecari*; L) *Myrmecophaga tridactyla*; M) *Priodontes maximus*; N) *Cabassous tatouay*; O) *Mazama gouazoubira*.

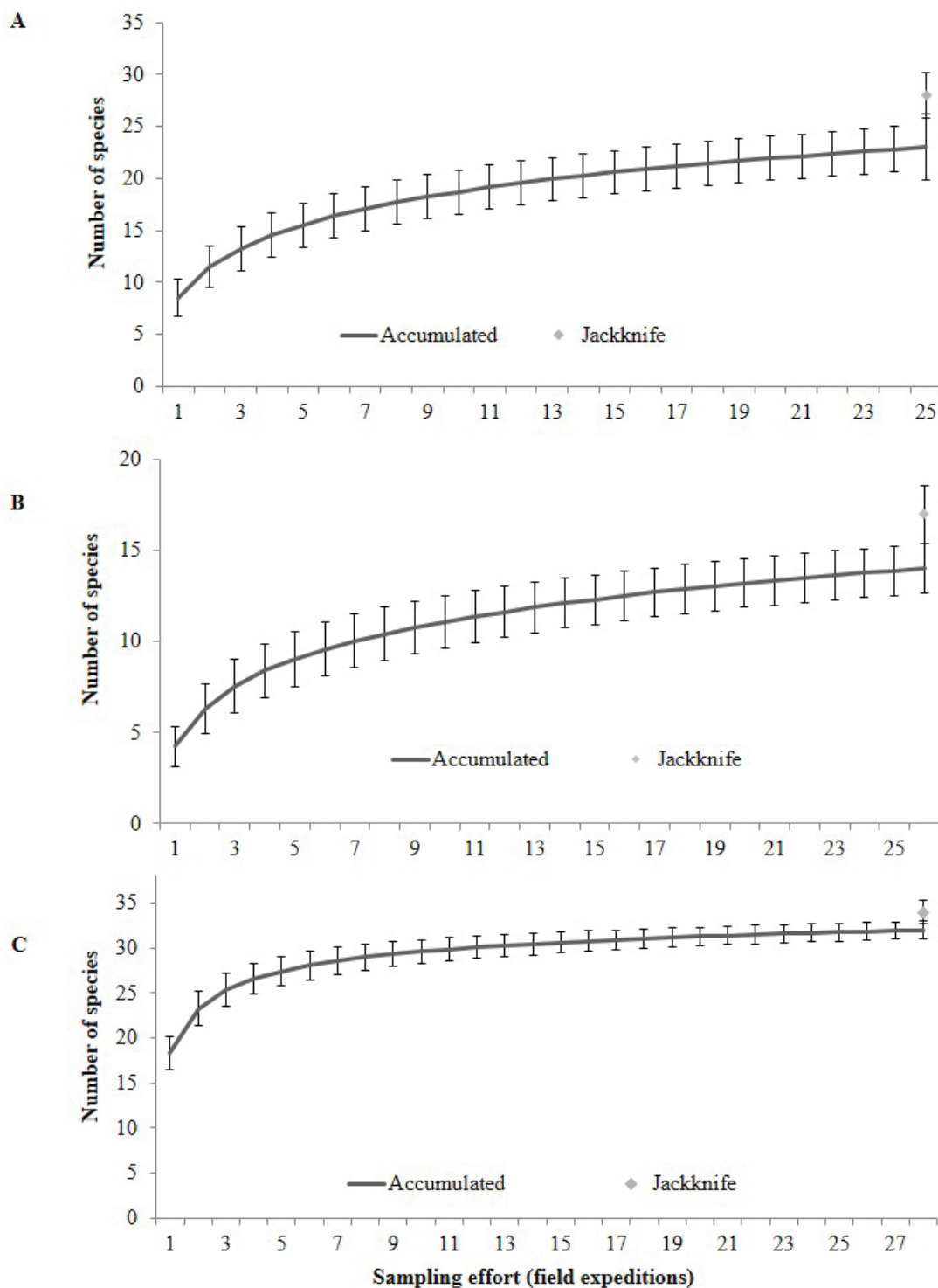


Figure 5. Accumulation curve (\pm SD) and Jackknife first-order richness estimator for: A) bat species; B) non-volant small mammals; C) medium and large-sized mammals sampled during the study conducted at Barra do Moeda farm, municipality of Três Lagoas, Mato Grosso do Sul State, Brazil.

da Canastra National Park (N = 12). A study by Bordignon *et al.* (2006) in the region of the Aporé-Sucuriú Complex presented a similar number of bat species (N = 25) to that found on the farm.

Among the four most recorded species of bats in the present study, three are also the most abundant in other studies in the region (Bordignon *et al.* 2006, Shapiro & Bordignon 2014): *A. lituratus*, *C. perspicillata*, and *Glossophaga soricina* (Phyllostomidae) - all phyllostomids commonly found throughout all Brazilian biomes (Paglia *et al.* 2012). The notable exception was *P. hastatus*, a large omnivorous Phyllostomidae, which was frequently observed in the *Eucalyptus* plots. These plantation stands offered abundant food resources that might be attracting the species, such as pollen during the flowering of the shrubland-dominant *Mabea fistulifera* (Malpighiales, Euphorbiaceae) and beetles during the dry season (L. C. Trevelin, personal communication).

The 14 species of small non-volant mammals recorded correspond to nearly 30% of the species richness recorded for the entire state of Mato Grosso do Sul (Cáceres *et al.* 2008, Tomas *et al.* 2017). This richness is smaller than that of the large Protected Areas of the Cerrado domain, such as the Emas National Park (N = 23; Carmignotto *et al.* 2014), Serra do Cipó National Park (N = 23; Camara & Oliveira 2012) and the Chapada dos Veadeiros National Park (N = 19; Bonvicino *et al.* 2005). However, despite being a private property, the species richness observed resembles that recorded in smaller Protected Areas of Cerrado, such as the Panga Ecological Station (N = 16; Bruna *et al.* 2010) and the Rio Preto State Park (N = 13; Lessa & Paula 2014).

Our record of the marsupial *T. macrurus* is remarkable, as it is classified as “Endangered” in the Brazilian list of threatened species (ICMBio/MMA 2018) due to the accelerated conversion of its natural habitat into agriculture and timber activities (de la Sancha & Teta 2015). The species has been considered rare, recorded only in areas of Cerrado (Carmignotto & Monfort 2006), and its current distribution is restricted to the state of Mato Grosso do Sul (Cáceres *et al.* 2007, Gardner 2008, Melo & Sponchiado 2012).

The medium and large-sized mammal species found on the farm (N = 32) account for 68% of the species richness of this group in the state of

Mato Grosso do Sul (Cáceres *et al.* 2008, Tomas *et al.* 2017). Hannibal (2014) surveyed 24 medium and large-sized mammal species in a Protected Area in south-eastern state of Mato Grosso do Sul, while Bordignon *et al.* (2006) recorded 26 species in the Aporé-Sucuriú region. Over one third of this observed species richness is under some level of extinction threat, and 68% of these species were listed for the whole state (Caceres *et al.* 2008, Tomas *et al.* 2017). We also highlight the occurrence of scarcely recorded species in the region, such as *Panthera onca* (Carnivora, Felidae) (Lima *et al.* 2013) and *Priodontes maximus* (Cingulata, Chlamyphoridae) (Esteves *et al.* 2018).

On the other hand, we did not record some expected species, such as *Cuniculus paca* (Rodentia, Cuniculidae), *Puma yagouaroundi* (Carnivora, Felidae), *Leopardus braccatus* (Carnivora, Felidae), *Lycalopex vetulus* (Carnivora, Canidae) (Casa da Floresta, unpublished data), and *Speothos venaticus* (Carnivora, Canidae) (Teribele *et al.* 2012). These absences may be related to several factors such as little extension of the natural areas (*S. venaticus*) or over-exploitation by hunters in the past (*C. paca*) (Lima *et al.* 2012, Emmons 2016). Either way, there is no doubt about the need to regionally improve survey efforts to better understand this absence. In addition, we also point out the absence of feral *Sus scrofa* (Artiodactyla, Suidae), an invasive species, harmful to the native fauna, that has been expanding its living areas especially in the Southern, Southeastern and Midwestern regions of Brazil (Pedrosa *et al.* 2015).

In summary, we contribute to the diagnosis of the mammalian fauna in the eastern mesoregion of the state of Mato Grosso do Sul, covering a priority gap area for understanding mammal distributions and biodiversity conservation (MMA 2007). Given our results, we consider the Barra do Moeda farm an important center for mammal conservation in the regional context, harboring a relevant number of species, some of which threatened with extinction, complementing a region that lacks large Protected Areas. In this context, large forestry companies that have established themselves in the region have great potential to make a difference in biodiversity conservation, as long as they comply with all legal technical requirements and adopt complementary conservation measures such as inventories, monitoring and creating Protected Areas.

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Appendix 1. Date and sample effort (days) of each sampled mammal group during the study conducted at Barra do Moeda farm, municipality of Três Lagoas, Mato Grosso do Sul State, Brazil.

Date	Bats	small non-volant mammals	medium and large-sized mammals
ago/07	not sampled	6	6
nov/07	4	6	6
mar/08	4	6	6
mai/08	4	6	6
ago/08	4	6	6
nov/08	4	6	6
mar/09	4	6	6
mai/09	4	6	6
ago/09	4	6	6
nov/09	4	6	6
mar/10	4	6	6
mai/10	4	6	6
set/10	4	6	6
dez/10	4	6	6
fev/11	4	6	6
jun/11	4	6	6
fev/12	4	6	6
jun/12	not sampled	not sampled	6
set/12	4	6	6
nov/12	not sampled	not sampled	6
mar/13	4	6	6
ago/13	4	6	6
mar/14	4	6	6
ago/14	4	6	6
jun/15	4	6	6
nov/15	4	6	6
jul/16	4	6	6
nov/16	4	6	6

Appendix 2. List of specimens collected during the study conducted at Barra do Moeda farm, municipality of Três Lagoas, Mato Grosso do Sul State, Brazil, in process of incorporation into the mammalian collection of the Museu de Zoologia/Universidade de São Paulo (MZUSP):

CHIROPTERA: Phyllostomidae: *Chiroderma villosum*: PF1074; *Glossophaga soricina*: PF0945; *Micronycteris* cf. *schmidtorum*: MZUSP 35696 (PF0836); Vespertilionidae: *Myotis riparius*: PF0930. DIDELPHIMORPHIA: Didelphidae: *Gracilinanus agilis*: PF0057; PF0271. RODENTIA: Cricetidae: *Calomys tener*: PF0247; *Cerradomys* sp.: PF0230; *Necomys lasiurus*: PF0147; *Oecomys bicolor*: PF0226; *Oligoryzomys* sp1.: PF0214; PF0266; PF0320; *Oligoryzomys nigripes*: PF0052; PF0177.

Specimen collected during the study conducted at Barra do Moeda farm, Três Lagoas, Mato Grosso do Sul, Brazil, and incorporated into the mammalian collection of the Museu de Zoologia (ZUEC - MAM)/Universidade de Campinas (UNICAMP):

CHIROPTERA: Vespertilionidae: *Lasiurus blossevillii*: ZUEC-MAM 2632.