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LISTS OF SPECIES

Mammals from Mato Grosso do Sul, Brazil.

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Abstract: The aim of this paper is to provide a checklist of flying and non-flying mammal species which occur in the state of Mato Grosso do Sul, delimiting species by vegetation domains and vulnerability. Records were based on specimens in museums, literature, and only eventually on photos (by camera traps). There are 151 mammal species reported or collected in the state, comprising 10 orders and 29 families. The richest orders were Chiroptera (61 spp.), Rodentia (35), Carnivora (18), and Didelphimorphia (16). The richest families were Phyllostomidae (33 species), Cricetidae (23), Didelphidae (16), Molossidae (13), Vespertilionidae (9), Felidae (7), and Dasypodidae (6). Cerrado was the richest domain (117 spp.) followed by Pantanal (110). According to the *Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis* (IBAMA) and the International Union for Conservation of Nature (IUCN), 17 species are threatened; they are species of Felidae (n = 6), but also include Canidae (2), Didelphidae (2), Cervidae (1), Dasypodidae (1), Dasyproctidae (1), Mustelidae (1), Myrmecophagidae (1), Phyllostomidae (1), and Tapiridae (1).

Introduction

The Neotropical mammals comprise a vast number of species of different forms and habits, distributed in 11 orders (Emmons and Feer 1997). Marsupials, rodents, bats, and carnivores comprise more than 60 % of the Neotropical species, but little is known on their geographic distribution in many regions, particularly in South America (Redford and Eisenberg 1992; Eisenberg and Redford 1999). Brazil has one of the largest Neotropical mammal fauna (over 520 species), with a high number of endemism (n ≈ 131 endemic species) mainly found among primates and rodents (Fonseca et al. 1996; Ministério do Meio Ambiente 2000). The state of Mato Grosso do Sul is located in south-western Brazil, presenting 358,159 km^2 and two main vegetation-climatic domains, the Cerrado (savanna-like) and the Pantanal (wetlands) (Ab'Saber 1977) but also the Atlantic Forest domain in the south. The human population size in the state is low when compared to other states in eastern Brazil: only 2,075,000 citizens living in 78 municipalities or in rural areas, leading to a low demographic density (Mato Grosso do Sul 2007). The state is still little known regarding to the mammal faunal composition, particularly on the small-sized species. Nonetheless, it is expected that mammal species richness in Mato Grosso do Sul is high because the environmental heterogeneity present there, as the different vegetation domains and transitions (Veloso et al. 1991; Vivo 1997).

Although comprising only 25 % of the state, the Pantanal is the domain that has attracted more attention of mammalogists in the last decades (Schaller 1983; Alho et al. 1987; Fischer 1997; Mauro and Campos 2000; Trolle 2003; Silveira et al. 2006), and the Cerrado which cover the majority of the Mato Grosso do Sul has received little attention. Examples of this are regions in the state which begin to be studied through mammal inventories, such as the Bodoquena Mountains (e.g. Carmignotto 2004; Cáceres et al. 2007b).

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Another neglected region is the Atlantic Forest domain at south of the state, severely stressed by agriculture and cattle ranching. The aim of this paper is to provide a checklist of mammal species which occur in Mato Grosso do Sul, delimiting them into domains and presenting their status regarding to vulnerability of extinction.

Materials and methods

Study site

The state of Mato Grosso do Sul (approximately, 17º to 24º S, 51º to 58º W) is located in the center-western region of Brazil, encompassing 4.2 % of the Brazilian territory. The climate is tropical in most of the state, but it tends to be subtropical in the south. It is markedly seasonal, with a wet and warm season from October to March and a dry and cold one from April to September. Annual rainfall is about 1,250 to 1,500 mm in the state, but decreasing slightly in the west, at the Pantanal. In the two vegetation-climatic domains, Cerrado and Pantanal, there are deciduous and semideciduous forests, and several transitional vegetation types which leaded some authors to consider the occurrence of Atlantic Forest and Amazonian physiognomies in Mato Grosso do Sul (see IBGE 1992). Deciduous and semideciduous forests linked to the Atlantic Forest predominate in the south of the state and along the Paraná River, whereas deciduous forests linked to the Amazon occur in the Urucum and Amolar mountains in the northwest of the state. Influence of Chaco vegetation also occurs in the Urucum and Amolar due to proximity to Bolivia and Paraguay (Mares et al. 1985; Ab'Saber 1988; IBGE 1992). For this study, we consider three major physiognomies in the state: Cerrado, Pantanal, and Atlantic Forest at south of the main course of the Santa Maria and Brilhante rivers (near 21º50') and the transitional zone of Urucum and Amolar at right side of the Paraguay River (Figure 1).

Human population density is higher in the southeast Mato Grosso do Sul, where plantations are the main economic source, just where large extensions of seasonal Atlantic Forest existed in the past. Cattle ranching predominate in the rest of the state, except in the Urucum region.

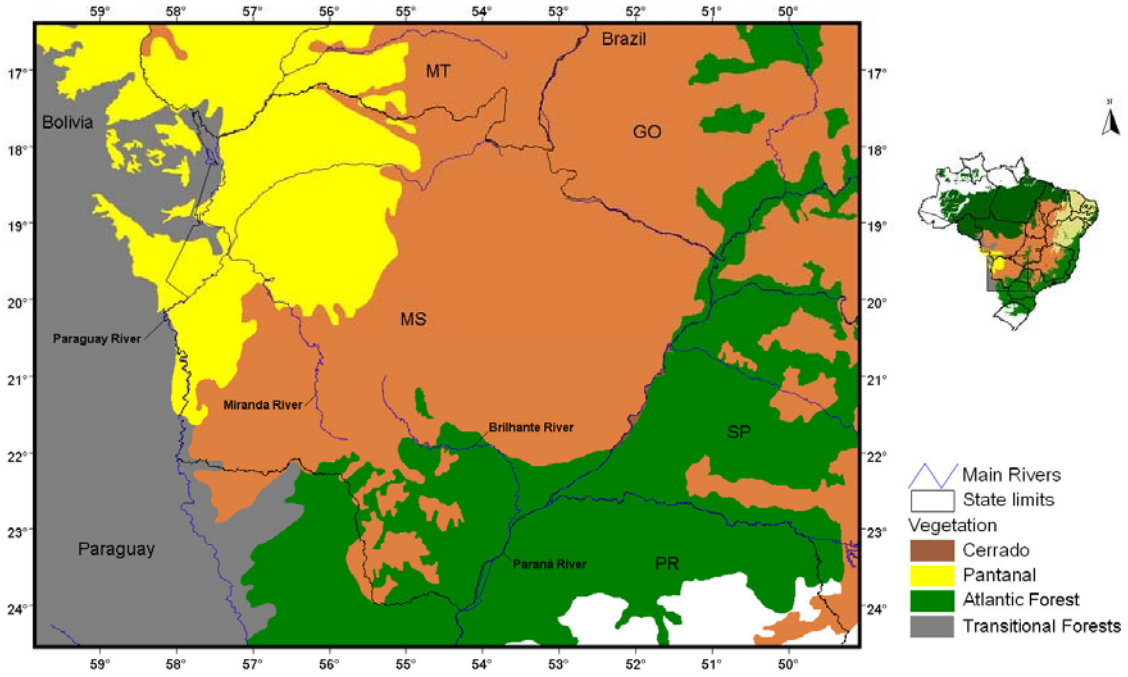

Figure 1. State of Mato Grosso do Sul (MS) showing the main rivers that cross the state and the vegetation domains according to IBGE (1992). This area is located in the south-western Brazil, as showed in the inserted map on the right side of the figure. Transitional forests correspond to a complex region that includes Amazon forest and Chaco influences.

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Data collection

Available records of mammal species were assessed primarily through analyses of specimens (skin and/or skull) in scientific museums and zoological collections in Brazil or elsewhere when specimens were deposited in collections in other countries. In addition, papers in which species were recognized by photography or eventual unpublished photographic records were also included. These procedures allow one to confirm species occurrences by checking specimens and photos. Photos were used only to confirm occurrence, and were proceeding from camera traps cited in publications, in order to become possible readers confirm the occurrence with respective authors. Publications placed after museum records are confirmatory or indicate species occurrence in different vegetation domains. The visited zoological collections were: American Museum of Natural History (AMNH), *Centro Universitário de Corumbá – Coleção de Mamíferos* (CEUCM), Field Museum of Natural History (FMNH), *Museu de História Natural Capão da Imbuia* (MHNCI), *Museu Nacional* (MN), *Museu de Zoologia da Universidade de São Paulo* (MZUSP), Oklahoma Museum of Natural History (OMNH), *Universidade Estadual do Mato Grosso do Sul* (UEMS), *Universidade Federal de Minas Gerais* (UFMG), *Universidade Federal de Santa Catarina* (UFSC), *Universidade Federal de Santa Maria* (UFSM), National Museum of Natural History (USNM), and *Universidade Federal de Mato Grosso do Sul* (ZUFMS).

The nomenclature follows Wilson and Reeder (2005) and other recent systematic publications: Larsen et al. (2007) for *Artibeus planirostris*; Voss et al. (2004) for *Marmosops*; Voss et al. (2005) for *Cryptonanus*; Weksler et al. (2006) for different groups of "*Oryzomys*"; and Silva Júnior (2001) for *Cebus*.

Table 1. Mammals recorded in the state of Mato Grosso do Sul, south-western Brazil, according to zoological collections, literature, or photographic records. Domains: CE, Cerrado; MA, Atlantic Forest; PA, Pantanal; TR, Transitional zone between Chaco and Dry Amazon Forests. Zoological collections follow acronyms cited in the text (Data collection). Asterisks indicate threatened species according to IBAMA (2003). IUCN threaten category (EN, endangered and VU, vulnerable) was supplied when there was no threaten indication by IBAMA. When record was by photo, this is pointed out in the column "Sources".

Species	Domains	Sources
Didelphimorphia		
Didelphidae		
Caluromyinae		
Caluromys lanatus	CE	Carmignotto (2004); Cáceres et al. (2007b)
Caluromys philander	CE PA	UFSM 234; Carmignotto (2004)
Didelphinae		
Chironectes minimus	CE PA	UFSM 031; Silveira et al. (2006, by photo)
Cryptonanus agricolai [1]	CE MA	UFSM 089, 477
Cryptonanus chacoensis	TR	UFSM 267
Didelphis albiventris	CE MA PA TR	MN 4486; MZUSP 3779, 28753; UFMG 2558; UFSM 045; Napoli (2005); Silveira et al. (2006, by photo); Cáceres et al. (2007b)
Didelphis aurita	CE	AMNH 133036; Cerqueira and Lemos (2000)
Gracilinanus agilis	CE MA PA TR	MN 4465; MZUSP 1712, 11800; UFMG 2500; UFSM 086; USNM 390025; Costa (2003); Carmignotto (2004); Napoli (2005)
Lutreolina crassicaudata	CE MA PA	MN 20977; UFSM 326; Graipel et al. (1996); Silveira et al. (2006, by photo)
Marmosa murina	CE MA PA	MZUSP 1704, 28756; UFMG 2599; UFSM 536; Costa (2003)
Marmosops ocellatus VU	TR	MZUSP 32877; UFSM 213, 268; Cáceres et al. (2007d)
Micoureus constantiae	CE PA TR	UFSM 13, 263, 534; Vieira (1955); Carmignotto (2004); Cáceres et al. (2007b)
Monodelphis domestica	CE PA TR	AMNH 37098; MZUSP 1709, 3781, 17424; UFSM 010, 040; Vieira (1955); Carmignotto (2004); Napoli (2005); Cáceres et al. (2007b)
Monodelphis kunsi EN	CE TR	UFSM 167, 265; Carmignotto (2004); Napoli (2005)
Philander opossum	PA TR	AMNH 37063; MN 29949; MZUSP 8306; UFMG 2662; Vieira (1945)
Thylamys macrurus	CE PA	MZUSP 3782, 32097; UFSM 035; Carmignotto (2004); Rademaker et al. (2005); Cáceres et al. (2007b; c)

[1] We follow Voss et al. (2005) for the taxonomy of *Cryptonanus*, but since they analyzed few Brazilian specimens, the individuals from Mato Grosso do Sul could possibly refer to a different taxon, not yet described.

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Table 1. Continued.

Cingulata		
Dasypodidae		
Dasypodinae		
Dasypus novemcinctus	CE MA PA TR	MHNCI 5660; MZUSP 28768; Allen (1916); Schaller (1983); Alho et al. (1987); Trolle (2003, by photo); Silveira et al. (2006, by photo)
Dasypus septemcinctus	PA	Silveira et al. (2006, by photo)
Euphractinae		
Euphractus sexcinctus	CE MA PA TR	MHNCI 5663; MN 4972; MZUSP 28544; Allen 1916; Schaller (1983); Alho et al. (1987); Silveira et al. (2006, by photo)
Tolypeutinae		
Cabassous unicinctus	CE PA	MN 4975; Fischer (1997); Bordignon et al. (2006); Silveira et al. (2006, by photo); Mamede and Alho (2006)
Priodontes maximus *	CE PA TR	Allen (1916); Schaller (1983); Mamede and Alho (2006); Silveira et al. (2006; photo)
Tolypeutes matacus	CE PA TR	Schaller (1983); Alho et al. (1987); Vieira (1955); Mauro and Campos (2000); Lima Borges and Tomás (2004); Rodrigues (2004)
Pilosa		
Myrmecophagidae		
Myrmecophaga tridactyla *	CE PA	MHNCI 4048; MN 5073; MZUSP 7789; Schaller (1983); Alho et al. (1987); Mauro and Campos (2000); Trolle (2003, by photo)
Tamandua tetradactyla	CE MA PA TR	MN 5056; MZUSP 20000; UFSC 900; Schaller (1983); Trolle (2003); Cáceres et al. (2007b)
Chiroptera		
Emballonuridae		
Emballonurinae		
Rhynchonycteris naso	CE PA	ZUFMS (00052, 00053); Vieira (1942)
Peropteryx macrotis	CE	Bordignon (2006)
Molossidae		
Molossinae		
Cynomops abrasus	PA	Leite et al. (1998); Fabián and Gregorin (2007)
Cynomops planirostris	CE PA	ZUFMS (00162); Leite et al. (1998); Bordignon and França (2004); Bordignon (2006); Fabián and Gregorin (2007)
Eumops auripendulus	CE PA	ZUFMS (00146); Marinho-Filho and Sazima (1998); Leite et al. (1999); Fabián and Gregorin (2007)
Eumops bonariensis	CE PA	Marinho-Filho and Sazima (1998); Bordignon (2006)
Eumops glaucinus	CE PA	ZUFMS (00145); Leite et al. (1998); Bordignon (2006); Fabián and Gregorin (2007)
Eumops perotis	CE PA	Marinho-Filho and Sazima (1998); Bordignon and França (2004)
Molossops temminckii	CE PA	ZUFMS (00147); Leite et al. (1998; 1999); Bordignon (2006)
Molossus molossus	CE PA	ZUFMS (00010, 00028); Leite et al. (1998; 1999); Bordignon (2006); Fabián and Gregorin (2007)
Molossus rufus	CE PA	ZUFMS (00009, 00011); Leite et al. (1998); Bordignon (2006); Fabián and Gregorin (2007)
Nyctinomops laticaudatus	CE PA	ZUFMS (00012, 00018, 00149); Leite et al. (1998); Fabián and Gregorin (2007)
Nyctinomops macrotis	CE PA	ZUFMS (00148); Leite et al. (1998); Marinho-Filho and Sazima (1998); Fabián and Gregorin (2007)
Promops nasutus	PA	ZUFMS (00039)
Promops centralis	PA	ZUFMS (00021)
Mormoopidae		
Pteronotus parnellii	PA	Marinho-Filho and Sazima (1998); Bordignon (2006); Zanon and Reis (2007)
Natalidae		
Natalus stramineus	CE	ZUFMS (00144); Taddei and Uieda (2001); Bordignon (2006)
Noctilionidae		
Noctilio albiventris	CE PA	ZUFMS (00055, 00058); Leite et al. (1998); Gonçalves et al. (2007)
Noctilio leporinus	CE PA	ZUFMS (00143); Leite et al. (1998)

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Table 1. Continued.

Phyllostomidae		
Carolliinae		
Carollia perspicillata	CE PA	ZUFMS (00100, 00105); Leite et al. (1998; 1999); Bordignon and França (2004); Bordignon (2006); Graciolli et al. (2006); Cáceres et al. (2007b)
Desmodontinae		
Desmodus rotundus	CE PA	ZUFMS (00121; 00115); Leite et al. (1998); Bordignon and França (2004); Bordignon (2006); Cáceres et al. (2007b)
Diaemus youngi	PA	ZUFMS (00078; 00164; 00165); Leite et al. (1998); Peracchi et al. (2006)
Glossophaginae		
Anoura caudifer	CE PA	ZUFMS (00042, 00073, 00150); Leite et al. (1998; 1999); Peracchi et al. (2006); Nogueira et al. (2007a)
Anoura geoffroyi	CE PA	ZUFMS (00151); Leite et al. (1998); Peracchi et al. (2006); Nogueira et al. (2007a)
Glossophaga soricina	CE PA	ZUFMS (00095, 00097); Leite et al. (1998; 1999); Bordignon and França (2004); Bordignon (2006); Cáceres et al. (2007b)
Lionycteris spurreli	CE	Bordignon (2006); Nogueira et al. (2007a)
Lonchophylla mordax	CE	Bordignon (2006); Nogueira et al. (2007a)
Phyllostominae		
Chrotopterus auritus	CE PA	ZUFMS (00109); Bordignon and França (2004); Bordignon (2006); Peracchi et al. (2006); Nogueira et al. (2007b)
Lonchorhina aurita	CE PA	Marinho-Filho & Sazima (1998); Bordignon (2006); Nogueira et al. (2007b)
Lophostoma brasiliense	CE PA	ZUFMS (00113); Bordignon (2006); Nogueira et al. (2007b)
Lophostoma silvicolum	CE PA	ZUFMS (00110); Leite et al. (1998); Bordignon (2006); Nogueira et al. (2007b)
Macrophylum macrophylum	CE PA	ZUFMS (00152); Marinho-Filho and Sazima (1998)
Micronycteris megalotis	CE	ZUFMS (00153); Bordignon and França (2004)
Micronycteris minuta	CE PA	Leite et al. (1998); Simmons et al. (2002); Nogueira et al. (2007b)
Micronycteris schmidtorum	CE	ZUFMS (00161)
Mimon crenulatum	PA	ZUFMS (00108); Camargo and Fischer (2004)
Phylloderma stenops	PA	Leite et al. (1998); Nogueira et al. (2007b)
Phyllostomus discolor	CE PA	ZUFMS (00154, 00155); Leite et al. (1998; 1999); Nogueira et al. (2007b)
Phyllostomus hastatus	CE PA	ZUFMS (00106, 00156); Leite et al. (1998); Bordignon (2006); Nogueira et al. (2007b)
Tonatia bidens	PA	Marinho-Filho & Sazima (1998); Nogueira et al. (2007b)
Stenodermatinae		
Artibeus fimbriatus	CE	UFSM 541
Artibeus lituratus	CE PA	ZUFMS (00166); Leite et al. (1998); Marinho-Filho and Sazima (1998); Bordignon (2006); Cáceres et al. (2007b)
Artibeus planirostris [2]	CE MA PA	ZUFMS (00001, 00002, 00037, 00163); Leite et al. (1998; 1999); Bordignon (2006); Graciolli et al. (2006); Cáceres et al. (2007b)
Chiroderma villosum	PA	ZUFMS (00158, 00159); Leite et al. (1998); Marinho-Filho and Sazima (1998)
Chiroderma doriae [VU]	CE PA	ZUFMS (00157); Gregorin (1998); Bordignon (2005)
Platyrrhinus helleri	CE PA	ZUFMS (00133, 00158); Marinho-Filho and Sazima (1998); Bordignon (2006)
Platyrrhinus lineatus	CE PA	ZUFMS (00005, 00022); Leite et al. (1998; 1999); Marinho-Filho and Sazima (1998); Bordignon (2006); Graciolli et al. (2006); Cáceres et al. (2007b)
Pygoderma bilabiatum	CE PA	ZUFMS (00128); Marinho-Filho and Sazima (1998)
Sturnira lilium	CE MA PA	ZUFMS (00130, 00131); Leite et al. (1998; 1999); Marinho-Filho and Sazima (1998); Bordignon (2006); Graciolli et al. (2006); Cáceres et al. (2007b)
Uroderma bilobatum	CE PA	ZUFMS (00132); Marinho-Filho and Sazima (1998)
Vampyressa pusilla	CE PA	ZUFMS (00159); Bordignon (2006); Longo et al. (2007)
Vampyrodes caraccioli	PA	ZUFMS (00129)
Vespertilionidae		
Myotinae		
Myotis simus	PA	ZUFMS (00006); Leite et al. (1998); Vicente and Jim (2005); Bianconi and Pedro (2007)
Myotis albescens	CE PA	ZUFMS (00141, 00142); Leite et al. (1998; 1999); Marinho-Filho and Sazima (1998); Vicente and Jim (2005); Bianconi and Pedro (2007)
Myotis riparius	CE PA	ZUFMS (00140); Marinho-Filho and Sazima (1998); Vicente and Jim (2005);
Myotis nigricans	CE PA	ZUFMS (00020, 00024, 00136, 00137); Leite et al. (1998; 1999); Marinho-Filho and Sazima (1998); Vicente and Jim (2005); Bordignon (2006); Bianconi and Pedro (2007)

[2] Previously considered as *Artibeus jamaicensis* (Larsen et al. 2007).

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Table 1. Continued.

Vespertilioninae		
Eptesicus brasiliensis	CE MA PA	UFSM 390; Marinho-Filho and Sazima (1998); Graciolli et al. (2006); Bianconi and Pedro (2007)
Eptesicus furinalis	CE PA	Leite et al. (1998; 1999); Marinho-Filho and Sazima (1998); Bianconi and Pedro (2007)
Lasiurus blossevillii	CE	ZUFMS (00134, 00135); Leite et al. (1999); Marinho-Filho and Sazima (1998)
Lasiurus cinereus	CE PA	Marinho-Filho and Sazima (1998); Leite et al. (1999); Bianconi and Pedro (2007)
Lasiurus ega	PA	ZUFMS (00138, 00139); Leite et al. (1998); Marinho-Filho and Sazima (1998); Bordignon (2006); Bianconi and Pedro (2007)
Primates		
Cebidae		
Callitrichinae		
Callithrix melanura	TR	MN 3370; MZUSP 3370; Allen (1916); Schaller (1983)
Cebinae		
Cebus cay [3]	CE MA PA	MZUSP 19680; Allen (1916); Schaller (1983); Cáceres et al. (2007b)
Aotidae		
Aotus azarae	TR	MN 9608; MZUSP 9608; Schaller (1983); Mauro and Campos (2000)
Pitheciidae		
Callicebinae		
Callicebus pallescens	TR	MZUSP 3356, 3358; Schaller (1983); Mauro and Campos (2000)
Atelidae		
Alouattinae		
Alouatta caraya	CE MA PA TR	MN 4794, 4813, 19176; MZUSP 3769; Allen (1916); Vieira (1955); Schaller (1983)
Carnivora		
Canidae		
Cerdocyon thous	CE MA PA TR	MN 4908, 25602; MZUSP 3372; UFSM 330; Vieira (1955); Schaller (1983); Trolle (2003, by photo); Cáceres et al. (2007b)
Chrysocyon brachyurus *	CE PA TR	UFSM 081; Allen (1916); Schaller (1983); Fischer (1997); Mamede and Alho (2006); Silveira et al. (2006, by photo)
Lycalopex vetulus	CE MA	MN 4869, 5151; Cáceres et al. (2007b)
Speothos venaticus *	PA	Alho et al. (1987); Fischer (1997); Lima Borges and Tomás (2004, by photo)
Felidae		
Felinae		
Leopardus braccatus *	CE MA PA	MN 24904; MZUSP 7786; Vieira (1955); Bordignon et al. (2006, by photo); Mamede and Alho (2006); Cáceres et al. (2007b)
Leopardus pardalis *	CE MA PA TR	MN 68885; MZUSP 13673; UFSC 346; UFSM 413; Allen (1916); Schaller (1983); Fischer (1997); Trolle (2003, by photo); Cáceres et al. (2007b)
Leopardus tigrinus *	MA PA	UEMS mammal collection – Mundo Novo; Trolle (2003, by photo)
Leopardus wiedii * [4]	TR	Allen (1916); Silveira et al. (2006, by photo)
Puma concolor *	CE MA PA TR	MZUSP 28868; UFSC 322; Allen (1916); Schaller (1983); Trolle (2003, by photo); Silveira et al. (2006, by photo); Cáceres et al. (2007b)
Puma yagouaroundi	CE PA TR	UFSM 331; Allen (1916); Schaller (1983); Fischer (1997); Silveira et al. (2006, by photo)
Pantherinae		
Panthera onca *	CE MA PA TR	MHNCI 4384; MN 24859; MZUSP 9018; UFSC 3105; Allen (1916); Trolle (2003, by photo); Sana and Crawshaw-Jr (2000); Mamede and Alho (2006)
Mustelidae		
Lutrinae		
Lontra longicaudis	CE MA PA	MN 3020; Schaller (1983); Fischer (1997); Silveira et al. (2006); Nilton C. Cáceres and Dirceu R. Freitas (photographic records)
Pteronura brasiliensis *	PA	MN 67470; MZUSP 5890; Mamede and Alho (2006)

[3] This name is not considered by Groves (2005), but is based on "Le cay" Azara, 1809; *paraguayanus* Fischer, 1829, *azarae* Rengger, 1830, *chacoensis* Pusch, 1941, and *morrulus* Pusch, 1941 are considered synonyms (see Silva Júnior 2001); furthermore, Silva Júnior considered this taxon distinct from *C. libidinosus* Spix, 1823.

[4] Wosencraft (2005) considered *wiedi* (J. A. Allen, 1916) a synonym of *Leopardus tigrinus* (Schreiber, 1775), but Pocock (1941) considered the specimen from Urucum a synonym of *L. wiedii* (Schinz, 1821). We follow Pocock's opinion.

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Table 1. Continued.

Mustelinae		
Conepatus semistriatus	PA	Lima Borges and Tomás (2004, by photo) (Silveira et al. 2006, by photo)
Eira barbara	CE MA PA TR	MN 3110, 5163; MZUSP 3375; Allen (1916); Schaller (1983); Fischer (1997); Silveira et al. (2006, by photo)
Galictis cuja	CE	Allen (1916); Fischer (1997)
Procyonidae		
Nasua nasua	CE MA PA TR	MHNCI 2551; MN 4895; MZUSP 3366; Allen (1916); Alho et al. (1987); Mamede and Alho (2006)
Procyon cancrivorus	CE PA	Trolle (2003, by photo); Silveira et al. (2006, by photo)
Perissodactyla		
Tapiridae		
Tapirus terrestris VU	CE MA PA TR	MZUSP 3727; Schaller (1983); Trolle (2003, by photo); Cáceres et al. (2007b; 2008)
Artiodactyla		
Tayassuidae		
Pecari tajacu	CE PA TR	MN 3826; MZUSP 3342; Allen (1916); Schaller (1983); Trolle (2003, by photo); Silveira et al. (2006, by photo)
Tayassu pecari	CE PA TR	UFSM 334; Schaller (1983); Trolle (2003, by photo)
Cervidae		
Capreolinae		
Blastocerus dichotomus *	CE MA PA TR	MHNCI 4037, 4077; MZUSP 28867; Schaller (1983); Mourão et al. (2000); Trolle (2003, by photo); Silveira et al. (2006, by photo); Nilton C. Cáceres (photographic record)
Mazama americana	CE PA TR	MZUSP 3735; Allen 1916; Schaller 1983; Trolle (2003, by photo); Silveira et al. (2006, by photo)
Mazama gouazoubira	CE PA TR	MZUSP 3785; Schaller (1983); Trolle (2003, by photo); Silveira et al. (2006, by photo)
Ozotoceros bezoarticus	CE PA TR	MZUSP 01920; Schaller (1983); Mourão et al. (2000); Bordignon et al. (2006, by photo)
Rodentia		
Sciuridae		
Sciurinae		
Urosciurus spadiceus	TR	MN 1923; MZUSP 3352; Allen (1916); Schaller (1983)
Cricetidae		
Sigmodontinae		
Akodon montensis [5]	CE MA	UFMG 2682; Carmignotto (2004); Cáceres et al. (2007b)
Akodon toba	TR	UFSM 269; USNM 390251; Myers (1989)
Calomys aff. *callidus*	CE	UFSM 109 (see Pessoa et al. 2002)
Calomys callosus [6]	CE	Carmignotto (2004)
Calomys tener	CE	MN 61582; MZUSP 21210; UFSM 060
Cerradomys maracajuensis	CE MA	MN 44178; MZUSP 28766; UFSM 088
Cerradomys scotti	CE PA	MN 4414; OMNH 19655; UFSM 025; 360; Carmignotto (2004)
Euryoryzomys nitidus	TR	FMNH 26786; UFSM 260, 261; USNM 390110; Musser et al. (1998)
Holochilus chacarius	TR	Oliveira and Bonvicino (2006)
Holochilus sciureus	PA TR	AMNH 37077; MN 1987; MZUSP 3780, 27430; UFSM 266; USNM 390249
Hylaeamys megacephalus	CE MA PA	MZUSP 4303; UFMG 2909; UFSM 011, 016, 033, 061; Costa (2003); Carmignotto (2004); Cáceres et al. (2007b)
Necromys lasiurus [7]	CE MA PA TR	AMNH 37104; FMNH 26640; MZUSP 1701, 4301; OMNH 19132; UFSM 022, 170, 264; Macêdo and Mares (1986); Carmignotto (2004); Napoli (2005)

[5] These specimens are identified as *A. montensis* based on karyotypic data (2n = 24-26). Since the *Akodon* species from the "*cursor* group" are very similar morphologically, and there are no karyotypic data available for the other specimens analyzed from Mato Grosso do Sul (AMNH, MN), it is possible that another species of *Akodon* occurs in the state, other than *A. montensis* and *A. toba*.

[6] These specimens are identified as *C. callosus* based on karyotypic data (2n = 50, FN = 66). Since the *Calomys* species from the "large-size group" are very similar morphologically, and there are no karyotypic data available for the other specimens analyzed from Mato Grosso do Sul (FMNH, MZUSP, UFMG), it is possible that another species of *Calomys* occurs in the state, such as *C. expulsus* (2n = 66, FN = 68).

[7] Anderson and Olds (1989) considered the status of *tapirapoanus* J. A. Allen, 1916 (type locality Tapirapoã, Rio Sepotuba) as a subspecies of *N. lenguarum*. Since Macêdo and Mares (1987) did not observe any significant difference between populations assigned to *tapirapoanus* and *lasiurus* Lund, 1841 in Brazil, they considered *tapirapoanus* a junior synonym of *lasiurus*. Here we follow their opinion.

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Table 1. Continued.

Sigmodontinae (continued)		
Nectomys rattus [8]	CE	MN 46876; MZUSP 6010; UFSM 133; Bonvicino et al. (1996)
Nectomys squamipes	CE MA	MZUSP 28858; UFSM 044
Oecomys bicolor	CE MA PA TR	FMNH 26806; MN 2520, 34200; UFMG 2817, 2825; UFSM 054, 246, 273; Rademaker et al. (2005)
Oecomys catherinae	MA	MZUSP 28767; Carmignotto (2004)
Oecomys mamorae	CE PA TR	CEUCM 211; FMNH 26811; MZUSP 2270; UFMG 2827; UFSM 511; USNM 531278; Carmignotto (2004)
Oecomys paricola	TR	CEUCM 198
Oligoryzomys chacoensis	CE TR	FMNH 26641; UFSM 168, 271; USNM 390125; Myers and Carleton (1981); Carmignotto (2004)
Oligoryzomys fornesi	CE MA PA TR	OMNH 19657; UFSM 020, 242, 272, 367, 378; Carmignotto (2004)
Oligoryzomys nigripes	CE MA TR	MN 5219; MZUSP 25869; UFMG 2760; UFSM 001, 021, 278, 486; Carmignotto (2004); Cáceres et al. (2007b)
Pseudoryzomys simplex	CE	Rodrigues (2004)
Rhipidomys macrurus [9]	CE MA	UFMG 2945; UFSM 032, 156; Tribe (1996); Napoli (2005)
Erethizontidae		
Erethizontinae		
Coendou prehensilis	PA TR	MN 3635; MZUSP 1859; Schaller (1983); Mamede and Alho (2006)
Caviidae		
Caviinae		
Cavia aperea	CE PA	FMNH 26638; MN 4476; MZUSP 4292
Cavia fulgida	MA	MZUSP 28757; Carmignotto (2004)
Hydrochoerinae		
Hydrochoerus hydrochaeris	CE MA PA TR	MHNCI 5658; MZUSP 25358; Schaller (1983); Silveira et al. (2006, by photo)
Dasyproctidae		
Dasyprocta azarae VU [10]	CE PA	MN 4968; MZUSP 5896; Trolle (2003, by photo); Cáceres et al. (2007b)
Cuniculidae		
Cuniculus paca	CE PA	MN 4871; Silveira et al. (2006, by photo); Cáceres et al. (2007b)
Echimyidae		
Eumysopinae		
Clyomys laticeps	CE PA	MN 24156, 63945; UFMG 2346; Ávila-Pires and Wutke (1981)
Proechimys gr. *goeldii* [11]	TR	FMNH 26732; Carmignotto (2004)
Proechimys longicaudatus	CE TR	AMNH 37085; UFSM 034, 259; Vieira (1945); Patton (1987)
Proechimys roberti	CE	UFSM 282
Thrichomys pachyurus	CE PA TR	MN 6228; MZUSP 7499, 26731; UFMG 3008; UFSM 015, 161; Trolle (2003, by photo); Napoli (2005)
Lagomorpha		
Leporidae		
Sylvilagus brasiliensis	CE MA PA TR	MN 4774; UFSM 498; Vieira (1955); Schaller (1983); Silveira et al. (2006, by photo); Cáceres et al. (2007b; 2008)

[8] These specimens were allocated to *N. rattus* based on karyotypic data (2n = 52-55).

[9] In addition to *R. macrurus*, Tribe (1996) allocated the specimens from Maracaju, state of Mato Grosso do Sul (AMNH) to *Rhipidomys* sp.2. This taxon, not yet described, occurs "in the forested parts of the Serra de Maracaju and the Sierra de Amambay along the Brazil-Paraguay border" (Tribe 1996).

[10] In addition to *D. azarae*, Iack-Ximenes (1999) allocated the specimens from Fazenda Acurizal and Corumbá, state of Mato Grosso do Sul (MN 2317) to *Dasyprocta* sp.1. This taxon has not been described yet.

[11] These specimens were allocated to the "*goeldii* group" *sensu* Patton (1987). They do not fit the description of any species already included in this group and since there is no revision of the names available for the Brazilian populations, we decided not to classify these specimens at species level.

Results and discussion

Mato Grosso do Sul has 151 mammal species being 90 terrestrial non-flying and 61 flying species, distributed in 10 orders and 29 families (Table 1). Other species might be added to this fauna with more field collections or systematic studies, particularly bats, rodents, and marsupials. We analyzed several specimens housed in scientific collections, being the major source of the checklist.

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For large-sized mammal species, there is little material from Mato Grosso do Sul deposited in museums, the majority of data is based on aerial, track, and visual surveys, which do not consist of testimony material. One way to consider the information based on camera traps, visual and track surveys as testimony material is to make them available in a public or online data base or collection, where anyone could analyzed and check the taxonomic identity of these material.

It surprised us that some species that are commonly recorded with camera traps or by indirect evidence such as tracks were rarely found in the museums, such as the Giant armadillo *Priodontes maximus*, the Armadillo *Tolypeutes matacus*, and the carnivores *Leopardus wiedii* and *Galictis cuja*, with only one record each, from the beginning of the twentieth century. Nowadays it is not common to collect the medium and large size mammal species. However, a great source of data, such as the animals found dead especially along the railroads, is discarded. The majority of them is encountered in good condition and could constitute very important testimony material, together with the locality data.

The total richness found here is slightly lower than that reported to other states in Brazil, such as Santa Catarina where 112 non-flying species were listed (Cherem et al. 2004) and Bahia where long-term and large inventories reported 78 bat species (Faria et al. 2006). Richness in the state of Paraná was estimated in 176 species, including flying and marine species (Margarido and Braga 2004). These states have the advantage of being located near traditional research centers in Brazil, which facilitate inventories (Cáceres et al. 2007a), and are in coastal regions where biodiversity is expected to be very high, in the Atlantic Forest domain (Veloso et al. 1991; Silva et al. 2004).

The main orders concerning species richness were Chiroptera (61 spp.), Rodentia (35), Carnivora (18), and Didelphimorphia (16). The more important families were Phyllostomidae (33 spp.), Cricetidae (24), Didelphidae (16), Molossidae (13), and Vespertilionidae (9). Species threatened according IBAMA (2003) and IUCN (2007) were 17, mainly in Felidae (6), Canidae (2), and Didelphidae (2). Families with a sole threatened species were Dasypodidae, Myrmecophagidae, Mustelidae, Cervidae, and Vespertilionidae (Table 1). Therefore, most carnivore species are actually threatened in Mato Grosso do Sul (e.g. *Panthera onca* and *Puma concolor*), as well as those species of large body size, such as *Myrmecophaga tridactyla*, *Pteronura brasiliensis*, *Blastocerus dichotomus*, and *Priodontes maximus*. We highlight the conserved condition of the Pantanal and adjacent areas in the west to safeguard these species, and the importance in create conservation units in the state, particularly in the center, east, and south of the territory.

The Cerrado domain was richer (117 spp.) but quite similar to Pantanal (110) in richness, a pattern that must be related to the habitat heterogeneity and complexity of the last domain, despite of its higher stressing conditions and shorter geological history compared with Cerrado. Compared to natural areas of several other states along the Brazilian coast, the Pantanal and the adjacent Cerrado in Mato Grosso do Sul present increased environmental conservation and has served as refugia for mammals and other organisms as well (Mantovani and Pereira 1998; Rodrigues *et al*. 2002a). The number of bat species exclusively recorded in the Pantanal (12) was higher than those found only in Cerrado (8). This situation may be related to the bias of bat inventories towards the Pantanal, where a long-term program for bat collection has been carried out in the Federal University of Mato Grosso do Sul (E. Fischer, pers. obs.). This pattern is inverse for rodents which surveys were focused mainly in Cerrado (Bonvicino et al. 1996; Carmignotto 2004; Cáceres et al. 2007b). On the other hand, the transitional status of the Pantanal might allow colonization by species coming from different domains (Cerrado, Amazonia, Atlantic Forest, and Chaco).

Still in the Cerrado of Mato Grosso do Sul, the primate *Callithrix penicillata*, known as *mico-estrela*, is considered as an exotic species, being most probably transported from its original distributional region (Cerrado of central and northeastern Brazil) and released in the vicinities of Campo Grande. Indeed, its natural occurrence must be confirmed, since there are no museum or literature records for this species in the state.

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The influence of the Amazonian domain in the state of the Mato Grosso do Sul is clearly recognizable in the transitional forests of Urucum and Amolar (Veloso et al. 1992), which share species of that domain with the adjacent physiognomies, such as Chaco, Cerrado, and Pantanal (Myers 1989; Musser et al. 1998; Costa 2003; Cáceres et al. 2007d). Besides a total richness of 51 species, the number of 12 exclusive species to the transitional forests of Urucum and Amolar, mostly of rodents (n = 6), marsupials (n = 2), and primates (n = 3), is considerable and highlights the special biogeographic characteristic of that region. Indeed, the distributions of these species (e.g. the marsupial *Marmosops ocellatus*, the primates *Aotus azarae*, *Callicebus pallescens*, and *Callithrix melanura*, the southern Amazon Red Squirrel *Urosciurus spadiceus*, and the rodents *Akodon toba*, *Euryoryzomys nitidus*, and *Oecomys paricola*) are mostly linked historically to the Amazon domain or even to Chaco (Myers 1989; Emmons and Feer 1997; Musser et al. 1998; Eisenberg and Redford 1999; Cáceres et al. 2007d). This biogeographic pattern places the region of the western Mato Grosso do Sul, adjacent to the Paraguay River, as very complex (Vivo 1997; see also Myers 1982).

Atlantic Forest in Mato Grosso do Sul revealed only 37 species of mammals. This poor pattern may be related to two important factors that have happened in the south of the state. The first one is the general absence of mammal surveys in this region and the second one is related to the bad conservation status of all region, where only small fragments (usually less than 100 ha) of semidecidual forests have persisted. In fact, only two exclusive species were registered for the Atlantic domain, the rodents *Oecomys catherinae* and *Cavia fulgida*.

Based on the well known mammal fauna of the adjacent Paraguay (e.g. Myers 1982; Myers and Carleton 1981; Redford and Eisenberg 1992; Yahnke et al. 1998), several Atlantic Forest species are thought to be added to the Mato Grosso do Sul mammal list with intensive survey efforts in this southern region, mainly in the proximity of the Paraná River, where species dispersal is facilitated (Cáceres 2007).

A total of 90 species was shared between the main domains, Cerrado and Pantanal, probably those which are more generalist regarding habitat use, not restricting to forests, such as the marsupials *Didelphis albiventris* and *Monodelphis domestica*, the Yellow armadillo *Euphractus sexcinctus*, the rodent *Necromys lasiurus*, and several (n = 41) bat species (Mares et al. 1985; Yahnke 2006; Cáceres et al. 2007a; b). The rodent *Oecomys mamorae*, which also occurred in both domains, is in fact characteristic of open marshland habitats of the Pantanal and surroundings, and presents high ability to occupy marginal habitats (such as deciduous forests and cerrado *stricto sensu*) (Carmignotto 2004; Oliveira and Bonvicino 2006; N. C. Cáceres, pers. obs.).

Among non-flying mammals, 19 species, mostly of median and large size (n = 13), were widespread in all domains and transition. The Black Howler Monkey *Alouatta caraya* is adapted to seasonal dry forests, including savannas, allowing its occurrence in different habitats in its range in south-western Brazil (Bicca-Marques et al. 2006; Cáceres 2007; Cáceres et al. 2007a; 2008). Although the Anteater *Tamandua tetradactyla*, the carnivorous species *Eira barbara*, *Nasua nasua*, *Cerdocyon thous*, and *Puma concolor*, and the Tapir *Tapirus terrestris* are primarily forest dwellers (Cáceres et al. 2007a), they show generalist habit also occurring in secondary, shrubland, and more seasonal habitats (Emmons and Feer 1997; Johnson et al. 1999; Quadros and Cáceres 2001; Gatti et al. 2006; Cáceres et al. 2008).

The actual list of mammal species of the state of Mato Grosso do Sul in south-western Brazil is thought to be quite complete. The same is not truth for species in specific domains, where there is absence of collections and studies of mammals, particularly for Atlantic Forest domain and Cerrado at east and south of the state. However Cerrado and Pantanal are indeed the richest domains in the state. Therefore, two main problems are thought to affect the knowledge of mammalian fauna in Mato Grosso do Sul: the failure of collections in certain regions and probable regional species extinctions that have occurred in the past due to human activity. However these are not quantified here.

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Looking specifically to the small mammal species, one problem related with the species richness is the real number of species recognized here or that we could distinguish based on morphology data. There are some cryptic rodent species (e.g. *Akodon*, *Calomys*, *Nectomys*, and *Rhipidomys*) that can only be distinguished based on karyotypic or molecular data; others, such as the marsupial genus *Cryptonanus* has never been taxonomically revised in Brazil. These problems can encumber the knowledge of the exact number of species that are present in the state. More systematic studies and inventories, with testimony material and karyotypic and molecular information will reveal new records of species for the state, particularly in its border, where other mammals occur and were not recorded yet for Mato Grosso do Sul.

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