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article

Bat fauna of Mato Grosso do Sul, southwestern Brazil

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Abstract: Bats have been increasingly studied in the last 15 years in Mato Grosso do Sul, and several records were not yet considered in reviews of South American bat distributions. Here, we present the bat species and their distributions in Mato Grosso do Sul based mainly on data compilation from literature, but also on complementary information from zoological collections, and our and colleagues' unpublished records. We found 74 species of bats within 42 genera and seven families already reported in Mato Grosso do Sul. Bat species in this state represent 44% of the Brazilian's bat species (≈ 169) and 7% of the world's bat richness (≈ 1120). Phyllostomidae (42) and Molossidae (17) were the richest families. Four species formerly cited for Mato Grosso do Sul are not supported by our compilation, and other 15 species recorded in the vicinity are listed as potential occurrences in this state. We additionally found controversial traits for specimens of *Platyrrhinus helleri*, and report *Eumops dabbenei* for the first time in Brazil. Most species were recorded in the regions of Cerrado (60) or Pantanal (57) in Mato Grosso do Sul, but only 16 in the Atlantic Forest. Records of Phyllostomidae species were mostly found in Cerrado and those of Molossidae, in Pantanal. Records in Mato Grosso do Sul determine edges of distribution for at least 22 species of South American bats. The overall known chiropteran fauna of Mato Grosso do Sul is highly diverse and new findings are expected through additional surveys.
Keywords: *Cerrado, Chiroptera, geographic distribution, Eumops dabbenei, Pantanal, Platyrrhinus helleri.*

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Resumo: Morcegos têm sido estudados intensivamente em Mato Grosso do Sul nos últimos 15 anos, e vários registros ainda não foram considerados em revisões sobre a distribuição de morcegos sul-americanos. Apresentamos aqui as espécies de morcegos e suas distribuições em Mato Grosso do Sul principalmente com base em dados compilados da literatura, mas também com base em dados complementares de coleção zoológica, e de registros inéditos nossos e de colegas. Encontramos 74 espécies de morcegos pertencentes a 42 gêneros e sete famílias em Mato Grosso do Sul. A riqueza de morcegos nesse estado representa 44% das espécies brasileiras de morcegos (≈ 169) e 7% da riqueza mundial de morcegos (≈ 1120). Phyllostomidae (42) e Molossidae (17) foram as famílias mais ricas. Quatro espécies reportadas anteriormente para Mato Grosso do Sul não são sustentadas com base em nossa compilação, e outras 15 espécies registradas na vizinhança são listadas como ocorrências potenciais no estado. Adicionalmente, encontramos características controversas em espécimes de *Platyrrhinus helleri*, e reportamos *Eumops dabbenei* pela primeira vez no Brasil. A maioria das espécies foi registrada nas regiões de Cerrado (60) ou Pantanal (57) em Mato Grosso do Sul, e apenas 16 em Mata Atlântica. Registros de Phyllostomidae foram encontrados principalmente em Cerrado e de Molossidae, no Pantanal. Sítios em Mato Grosso do Sul determinam limites de distribuição para pelo menos 22 espécies de morcegos sul americanos. A fauna de morcegos conhecida em Mato Grosso do Sul é bastante diversa, e novos registros são esperados por meio de inventários adicionais.
Palavras-chave: *Cerrado, Chiroptera, distribuição geográfica, Eumops dabbenei, Pantanal, Platyrrhinus helleri.*

Introduction

Although there are some old reports on bat occurrences in Mato Grosso do Sul (e.g. Vieira 1945), almost all knowledge about the chiropteran fauna in this state has 30 years of history, and most records have been reported in the last 10-15 years (e.g. Pulchério-Leite et al. 1998, Taddei & Uieda 2001, Camargo & Fischer 2005, Bordignon 2006, Santos et al. 2010, Silveira et al. 2011). Luiz Onofre Irineu de Souza has provided the first noticeable impetus to the knowledge of bats in Mato Grosso do Sul. He has begun in 1982 the section of chiropterans of the zoological collection of the Universidade Federal de Mato Grosso do Sul (UFMS), and has incorporated 82 specimens of 21 species over a decade. This was the foremost collection of Mato Grosso do Sul's bat fauna in 1997, when Valdir Antônio Taddei has initiated a second pronounced impetus to the knowledge of bats in the state, founding the chiropteran collection of the Universidade para o Desenvolvimento do Estado e da Região do Pantanal (UNIDERP-Anhanguera). Thereafter, supported by these two collections of bats that include more than 5000 specimens today, the bat fauna has been increasingly investigated in Mato Grosso do Sul.

As the knowledge is quite recent, several records of bats in Mato Grosso do Sul have not yet been considered for South American bat distributions (e.g. Gardner 2008) nor included in reviews of the Brazilian bat fauna (Bianconi & Pedro 2007, Fabian & Gregorin 2007, Nogueira et al. 2007a, 2007b, Peracchi & Nogueira 2007, Zortéa 2007). For instance, the most recent review of the Brazil's bat fauna (Tavares et al. 2008) did not include 37 of the 74 species that we list here for Mato Grosso do Sul. The Pantanal and the midwestern Brazil are regions still identified as gaps of data on bat species occurrences (Tavares et al. 2008, Bernard et al. 2011), a condition that has been reversed. Here, we review the known chiropteran species and their distributions in Mato Grosso do Sul, and add unpublished data which include the first record of *Eumops dabbenei* (Molossidae) in Brazil. The large number of species found and the distribution of study sites show that the knowledge on Mato Grosso do Sul's bat fauna is not incipient, though recent.

Methods

The state of Mato Grosso do Sul in central South America comprises the borders of the major continental morfoclimatic domains of Cerrado and Atlantic Forest, and the transitional morfoclimatic zone of Pantanal (Ab'Saber 2000). Environmental differences among Cerrado, Pantanal and Atlantic Forest can determine floristic and faunal variations (e.g. Alho et al. 2011a), thus we present records of bats according to these domains. We formerly searched for records of bat species in Mato Grosso do Sul reported in the literature, using as keywords the names of species and families, and combinations of the words (in English and Portuguese): bats, Chiroptera, distribution, occurrence, Cerrado, Chaco, Mato Grosso, Pantanal. Searches included databases of Scielo, Web of Science and Google. We then selected only records described as geographic coordinates or by names of places which allowed geographical identification. Complementary, we looked for additional records in zoological collections through the *species*Link (http://splink.cria.org.br/) and in the UFMS collection (ZUFMS), and ultimately among our unpublished data and on those kindly offered by the colleagues Alan Eriksson, Gustavo Graciolli, Nayara F. Carvalho, Paulo R. de Souza, and Wilson Uieda. Bat species nomenclature follows Simmons (2005), except *Artibeus planirostris* and *Natalus macrourus* that follow Lim et al. (2004) and Garbino & Tejedor (2012) respectively. We conservatively used *Platyrrhinus helleri* sensu Simmons (2005) because specimens collected in Mato Grosso do Sul differed from the expected according to Velazco et al. (2010a). Thus we described some traits of two *P. helleri* specimens and compared with those described by Velazco et al. (2010a). We also described traits of one *Eumops dabbenei* specimen, identified based on Kiser (1995), Barquez et al. (1999), Gregorin & Taddei (2002) and Eger (2007).

For preparation of distribution maps we used geographic coordinates described in the published studies or collection records, and centroids when the information consisted of names of farms, towns, or villages. We cited geographic coordinates for unpublished records included in the maps (Appendix 1). In cases of species registered twice or more in a same site or nearby (< 20 km), we cited one or two sources in the following order: records published in scientific journals, thesis or dissertations, specimens in zoological collections, and unpublished data. Point size in the distribution maps covers a circular area of 9.3 km of radius. Overlapping points of different species in a same map were slightly dislocated to improve visualization. Maps show some points out of Mato Grosso do Sul when part of studies cited as sources for sites in the state. We finally plotted all sites of bat records surrounded by an arbitrary buffer area of 20 km to provide a roughly notion of the states' territory uncovered for bat surveys.

Results and discussion

Bat species of Mato Grosso do Sul

We compiled 74 species of bats within 42 genera and seven families already registered in the state of Mato Grosso do Sul (Table 1). This number of species is 20% higher than that listed some years ago (Cáceres et al. 2008), and close to the richness of bats reported for other Brazilian states with longer history of bat surveys, as Paraná (64; Passos et al. 2010), Rio de Janeiro (77; Peracchi & Nogueira 2010), São Paulo (79; Vivo et al. 2011), and Minas Gerais (80; Tavares et al. 2010). Most species (62) were found in two or more sites, whereas the remaining 12 species were recorded in one site only: eight phyllostomids (*Micronycteris sanborni*, *Trachops cirrhosus*, *Uroderma bilobatum*, *U. magnirostrum*, *Vampyrodes caraccioli*, *Lonchophylla mordax*, *Lionycteris spurrelli*, and *Rhinophylla pumilio*), three molossids (*Eumops dabbenei*, *E. bonariensis*, and *Tadarida brasiliensis*), and one vespertilionid (*Lasiurus cinereus*). Thus additional records of these species are expected to strengthen their occurrences in this state, mainly *Lionycteris spurrelli*, *Trachops cirrhosus*, and *Tadarida brasiliensis* which were registered only in the state's boundaries (Bordignon 2006, Cunha et al. 2011, Santos & Bordignon 2011). To accept the occurrence of *Rhinophylla pumilio* as valid requires additional records, since there is no information whether the individual was deposited in a collection (Coelho 2005). Additional records are also desirable for *Artibeus fimbriatus*, as the two specimens reported in the central region of Mato Grosso do Sul are not accessible in local collections (Deus et al. 2003, Cáceres et al. 2008), and other individuals were

Table 1. Bat species (n = 74) recorded in the Pantanal (PA), Cerrado (CE), and Atlantic Forest (AF) domains, and references to the figures of distribution, in the State of Mato Grosso do Sul, Brazil.

Families Subfamilies Species	Domains			Figures of distribution
	PA	CE	AF	
Phyllostomidae Gray, 1825				
Phyllostominae Gray, 1825				
Lophostoma brasiliense Peters, 1866	X	X		1 A
Lophostoma silvicolum d'Orbigny, 1836	X	X		1 A
Macrophyllum macrophyllum (Schinz, 1821)		X		1 A
Micronycteris sanborni Simmons, 1996		X		1 B
Micronycteris minuta (Gervais, 1856)	X	X		1 B
Micronycteris megalotis Gray, 1842	X[a]	X		1 B
Chrotopterus auritus (Peters, 1856)	X	X	X	1 C
Lonchorhina aurita Tomes, 1863		X		1 C
Mimon bennettii (Gray, 1838)	X	X		1 D
Mimon crenulatum (E. Geoffroy, 1803)	X			1 D
Phylloderma stenops Peters, 1865	X	X		1 D
Phyllostomus elongatus (E. Geoffroy, 1810)	X[a]	X		1 E
Phyllostomus hastatus (Pallas, 1767)	X	X	X	1 E
Phyllostomus discolor Wagner, 1843	X	X	X	1 E
Tonatia bidens (Spix, 1823)	X	X		1 F
Trachops cirrhosus (Spix, 1823)		X		1 F
Vampyrum spectrum (Linnaeus, 1758)	X			1 F
Stenodermatinae Gervais, 1856				
Artibeus cinereus (Gervais, 1856)		X		2 A
Artibeus fimbriatus Gray, 1838		X	X	2 A
Artibeus planirostris (Spix, 1823)	X	X	X	2 A
Artibeus obscurus (Schinz, 1821)	X[b]	X	X	2 B
Artibeus lituratus (Olfers, 1818)	X	X	X	2 B
Chiroderma villosum Peters, 1860	X	X		2 C
Chiroderma doriae O. Thomas, 1891	X	X	X	2 C
Platyrrhinus helleri (Peters, 1866)	X	X		2 D
Platyrrhinus lineatus (E. Geoffroy, 1810)	X	X	X	2 D
Pygoderma bilabiatum (Wagner, 1843)		X	X	2 E
Uroderma bilobatum Peters, 1866	X			2 E
Uroderma magnirostrum Davis, 1868		X		2 E
Vampyressa pusilla (Wagner, 1843)	X	X		2 E
Vampyrodes caraccioli (Thomas, 1889)	X			2 E
Sturnira lilium (E. Geoffroy, 1810)	X	X	X	2 F
Desmodontinae Bonaparte, 1845				
Desmodus rotundus (E. Geoffroy, 1810)	X	X	X	3 A
Diaemus youngi (Jentink, 1893)	X			3 A
Glossophaginae Bonaparte, 1845				
Anoura geoffroyi Gray, 1838	X	X		3 B
Anoura caudifer (E. Geoffroy, 1818)	X	X		3 B
Glossophaga soricina (Pallas, 1766)	X	X	X	3 C
Lonchophylla dekeyseri Tad.Viz. Saz.,1983		X		3 D
Lonchophylla mordax Thomas, 1903		X		3 D
Lionycteris spurrelli Thomas, 1913		X		3 D
Carolliinae Miller, 1924				
Carollia perspicillata (Linnaeus, 1758)	X	X	X	3 E
Rhinophylla pumilio Peters, 1865		X		3 E
Emballonuridae Gervais, 1855				
Embalonurinae Gervais, 1855				
Peropteryx macrotis (Wagner, 1843)	X[a]	X		3 F
Rhynchonycteris naso (Wied-Neuwied, 1820)	X			3 F

Continued on next page

Table 1. Continued.

Families Subfamilies Species	Domains PA	CE	AF	Figures of distribution
Molossidae Gervais, 1856				
Molossinae Gervais, 1856				
Cynomops abrasus (Temminck, 1827)	X	X		4 A
Cynomops planirostris (Peters, 1865)	X	X		4 A
Eumops dabbenei Thomas, 1914	X			4 A
Eumops bonariensis (Peters, 1874)		X		4 A
Eumops glaucinus (Wagner, 1843)	X	X		4 B
Eumops patagonicus Thomas, 1924	X			4 B
Eumops perotis (Schinz, 1821)	X			4 B
Eumops auripendulus (Shaw, 1800)	X	X[c]		4 B
Molossops temminckii (Burmeister, 1854)	X	X		4 C
Molossus rufus E. Geoffroy, 1805	X	X		4 D
Molossus molossus (Pallas, 1766)	X	X	X	4 D
Molossus pretiosus Miller, 1902	X			4 D
Nyctinomops macrotis (Gray, 1840)		X		4 E
Nyctinomops laticaudatus (E. Geoffroy, 1805)	X	X		4 E
Promops centralis Thomas, 1915	X			4 F
Promops nasutus (Spix, 1823)	X			4 F
Tadarida brasiliensis I. Geoffroy, 1824	X			4 F
Vespertilionidae Gray, 1821				
Vespertilioninae Gray, 1821				
Eptesicus furinalis (d'Orbigny, 1847)				
Eptesicus brasiliensis (Desmarest, 1819)	X	X		5 A
Lasiurus blossevillii (Lesson & Garnot, 1826)		X		5 A
Lasiurus cinereus (Beauvois, 1796)	X	X		5 B
Lasiurus ega (Gervais, 1856)		X[c]		5 B
Myotinae Tate, 1942	X	X		5 B
Myotis nigricans (Schinz, 1821)				
Myotis simus Thomas, 1901	X	X	X	5 C
Myotis riparius Handley, 1960	X			5 D
Myotis albescens (E. Geoffroy, 1806)	X	X		5 D
Mormoopidae Saussure, 1860	X	X		5 D
Pteronotus parnellii (Gray, 1843)				
Noctilionidae Gray, 1821		X		5 E
Noctilio leporinus (Linnaeus, 1758)				
Noctilio albiventris Demarest, 1818	X	X		5 F
Natalidae Gray, 1866	X	X	X	5 F
Natalus macrourus (Gervais, 1856)	X[a]	X		5 E

[a]Occurrence in the Pantanal border.
[b]Occurrence at the southern limit of Pantanal.
[c]In urban zone, Campo Grande.

captured in the limit with Paraná (Ortêncio-Filho et al. 2010, Zanon 2010).

Based on our criteria, five species formerly cited for Mato Grosso do Sul were not included in the present checklist (Table 1). One *Diphylla ecaudata* individual was described without a location (Alho et al. 2011b), so we keep it out of the states' checklist. *Molossus currentium* was listed by Fabian & Gregorin (2007), but it was a mistake since the record is actually 3 km away, in Paraguay (López-Gonzáles & Presley 2001). Likewise, *Myotis ruber* was recorded 1 km away from the state (Coelho 2005). Therefore, *Molossus currentium* and *Myotis ruber* presumably occur in Mato Grosso do Sul in spite they have not yet been recorded. Tavares et al. (2008) pointed out the occurrence of *Tonatia saurophila* based on Williams et al. (1995a); however, it was another mistake because Williams et al. (1995a) cited only *T. bidens* in Mato Grosso do Sul. Thus, the occurrence of *T. saurophila* remains unknown in this state, though expected due to records in Bolivia (Aguirre 2007). One specimen of *Micronycteris schmidtorum* was listed in Cáceres et al. (2008) due to misidentification, reviewed to *M. sanborni* in Santos et al. (2010). Therefore, *M. schmidtorum* follows unreported for Mato Grosso do Sul. Recently, Siles et al. (2013) described the species *Micronycteris yatesi* based on specimens from Bolivia formerly identified as *M. sanborni*. Due to geographical proximity to Bolivia and morphological similarities between both species, the only specimen from Mato Grosso do Sul assigned as *M. sanborni* (Santos et al. 2010) might actually belong to *M. yatesi*. Once confirmed, it would be the first record of *M. yatesi* in Brazil, and this new species would no longer be considered as endemic to Bolivia

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Table 2. Five traits of *Platyrrhinus helleri* and *P. incarum* bats (Phyllostomidae) described by Velazco et al. (2010a), and for specimens from Mato Grosso do Sul (MS), Brazil.

Traits	*Platyrrhinus incarum*	*Platyrrhinus helleri*	Specimens from MS
Noseleaf vibrissae (n)	8	7	7
Ventral fur color	Bicolor, light brown	Unicolor, light grey	Unicolor, pale
Uropatagium margin	Inverted U-shape	Inverted V-shape	Inverted V-shape
Length of metacarpal III	Longer than metacarpal V	Similar to metacarpal V	Similar to metacarpal V
Dorsal stripe	Narrow	Wide and bright	Wide and bright

(Siles et al. 2013). In addition, if so, *M. yatesi* should substitute *M. sanborni* in the present state's bat checklist.

At least 15 additional species of bats are potentially expected in Mato Grosso do Sul based on their occurrences in the vicinity, in the Paraguay basin or in sites of Cerrado, Atlantic Forest or Chaco: *Glyphonycteris behnii* (Nogueira et al. 2007a, Tavares et al. 2008), *Mesophylla macconnelli* (Aguirre 2007, Tavares et al. 2008), *Artibeus anderseni*, *A. gnomos* (Gonçalves & Gregorin 2004), *A. glaucus* (Aguirre 2007), *Platyrrhinus brachycephalus* (Silva & Marques 2010), *P. masu*, *Choeroniscus minor* (Aguirre 2007), *Saccopteryx bilineata* (Oliveira et al. 2002), *Molossops neglectus* (Bernardi et al. 2007), *Nyctinomops aurispinosus* (Aguirre 2007, Tavares et al 2008), *Eptesicus diminutus*, *Histiotus macrotus* (Willig et al. 2000, Tavares et al. 2008), *Histiotus velatus* (Aguirre 2007, Tavares et al. 2008), and *Pteronotus gymnonotus* (Gonçalves & Gregorin 2004). These potential species summed to *Diphylla ecaudata*, *Molossus currentium*, *Myotis ruber* and *Tonatia saurophila*, indicate that almost one hundred bat species might occur in the state of Mato Grosso do Sul.

Specimens of Platyrrhinus helleri and Eumops dabbenei

Some external traits of two specimens of *Platyrrhinus helleri* (sensu Simmons 2005) from Mato Grosso do Sul (ZUFMS 0241, 0264) match *P. helleri* (sensu Velazco et al. 2010a) rather than *P. incarum* (Table 2), as would be expected. Based on morphological and molecular data, Velazco & Patterson (2008) and Velazco et al. (2010a) proposed *P. incarum* as a valid species whose distribution includes the northern and midwestern Brazil, in the state of Mato Grosso, 387 km north than our northernmost record. They also suggested that *P. helleri* (sensu Velazco et al. 2010a) does not occur in Brazil, and presents the southern edge of distribution in Colombia, Venezuela and Ecuador. Thus far the external traits of specimens from Mato Grosso do Sul may indicate either an unlikely first occurrence of *P. helleri* (sensu Velazco et al. 2010a) in Brazil, or that those external characteristics (Table 2) are not useful to discriminate between *P. incarum* and *P. helleri* (sensu Velazco et al. 2010a), or even an undescribed taxon in the region. Therefore, we highlight that specimens of *P. helleri* (sensu Simmons 2005) in Mato Grosso do Sul deserve a deep taxonomic approach before assign them to a species proposed by Velazco et al. (2010a).

Among bat species found in Mato Grosso do Sul, we report here the first occurrence of *Eumops dabbenei* in Brazil. One adult male was mistnetted at sunset in the edge of a semideciduous forest, in the Pantanal. The specimen presented ears that do not extend over the nose when laid forward, and antitragus shorter than those of *E. perotis* and *E. trumbulli*, the other congeneric species with forearm longer than 70 mm (Barquez et al. 1999, Gregorin & Taddei 2002, Fabián & Gregorin 2007). Twelve traits measured on the male *E. dabbenei* fall within the range reported to the species; other six measures are either larger (breadth across canines and breadth across molars) or shorter (tail length, mandibular length, mandibular toothrow length, and maxillary toothrow length) for *E. dabbenei* from Pantanal than for those from elsewhere (Table 3). *Eumops dabbenei* appears to be rare, with few specimens deposited in zoological collections (Barquez et al. 1999, Tavares et al. 2008). Even so, its occurrence in Brazil, mainly in the southern Pantanal, might be expected due to previous records in Paraguay, 15 to 25 km from Mato Grosso do Sul (Redford & Eisenberg 1992, Gregorin & Taddei 2002, Eger 2007).

Bat distributions in Mato Grosso do Sul

Of the 74 bat species compiled for Mato Grosso do Sul, 60 were found in Cerrado, 57 in Pantanal, and 17 in Atlantic Forest. Fifteen were exclusively registered in Cerrado, 14 solely in Pantanal, and none was found only in Atlantic Forest (Table 1). All five subfamilies of Phyllostomidae were present in the three domains, but low proportions of Phyllostominae and Glossophaginae species (18% and 17%, respectively) were registered in Atlantic Forest; for the other subfamilies this proportion was about 50% (Table 1). Beyond phyllostomids, only *Molossus molossus*, *Myotis nigricans*, and *Noctilio albiventris* were found in Mato Grosso do Sul's Atlantic Forest. This poor bat fauna in this domain may reflect a very low survey effort rather than a region deprived of bat species in Mato Grosso do Sul. The number of species in the states' Atlantic Forest reaches only 14% of those listed for this domain (cf. Paglia et al. 2012). Therefore, even accounting for the relatively small area and the restricted latitudinal range of the Atlantic Forest in Mato Grosso do Sul, increased bat surveys in this region should add several unnoticed species. In contrast, the number of bat species in the states' Cerrado region reaches 60% of that in the whole Brazilian Cerrado, and the number of species in the states' Pantanal region does 95% of that in this domain in Brazil (cf. Paglia et al. 2012). This high proportion of species from Brazilian Pantanal notably occurs because most of this domain is in Mato Grosso do Sul.

Records of Phyllostominae species in Mato Grosso do Sul were mostly distributed in Cerrado rather than in Pantanal. Seven species (*Macrophyllum macrophyllum*, *Micronycteris* spp., *Lonchorhina aurita*, *Mimon bennettii*, and *Trachops cirrhosus*) were mainly recorded in Cerrado, and three (*Lophostoma silvicolum*, *Mimon crenulatum* and *Vampyrum spectrum*) mainly in Pantanal (Figure 1). Likewise, five

Table 3. Measures of one male *Eumops dabbenei* (Molossidae) collected in the Pantanal, Mato Grosso do Sul (MS), Brazil, and range of measurements (or single value if only one available) for this species elsewhere (references: 1 = Barquez et al. 1999; 2 = Souza et al. 2008; 3 = Harrison et al. 1979; 4 = Ochoa & Ibanez 1985; 5 = McWilliams et al. 2002; 6 = Eger 1977; 7 = Redford & Eisenberg 1992).

Traits	Specimen from MS	Range	References
Total body length (mm)	168	145-190	1, 2, 7
Weight (g)	77	74-77	1, 7
Tail length (mm)	54	55-64	1, 2, 7
Braincase length (mm)	30.8	29.6-33.8	1, 2, 3, 4, 5, 6
Braincase breadth (mm)	14.2	12.3-14.2	1, 2
Breadth across canines (mm)	8.5	8.0	1
Breadth across molars (mm)	14.3	13.2-13.7	1, 4
Condylobasal length (mm)	28.3	28.4-30.8	1, 2, 3, 4, 5
Ear length (mm)	24.9	24.0-31.7	1, 2, 7
Interorbital width less (mm)	8.9	6.1-10.8	1, 2, 4
Postorbital constriction (mm)	6.3	5.9-10.8	1, 2, 3, 5, 6
Mandibular length (mm)	23.2	23.6-24.9	1, 3
Mandibular toothrow length (mm)	14.1	14.3-14.9	1, 3
Mastoid breadth (mm)	16.5	16.0-17.1	1, 3, 5, 6
Maxillary toothrow length (mm)	12.1	12.5-13.4	1, 3, 4, 5, 6
Zygomatic breadth (mm)	20.0	16.5-20.4	1, 2, 3, 4, 5, 6
Forearm length (mm)	77.0	75.2-78.5	1, 2, 3, 4, 6, 7
Hind foot length (mm)	13.5	12.0-18.0	2, 3, 7

Stenodermatinae (*Artibeus cinereus*, *A. fimbriatus*, *A. obscurus*, *Pygoderma bilabiatum*, and *Uroderma magnirostrum*) were solely or more commonly registered in Cerrado, and just two rare species (*Uroderma bilobatum* and *Vampyrodes caraccioli*) were found exclusively in the Pantanal (Figure 2). In the other subfamilies, records of *Diaemus youngi* were distributed in Pantanal, whereas *Anoura* spp., *Lonchophylla* spp., *Lionycteris spurrelli*, and *Rhinophylla pumilio* were exclusively or more frequently reported in Cerrado (Figure 3). In total, 18 species of Phyllostomidae appear to have their occurrences somehow favored in Cerrado, and six in Pantanal. Additional 18 phyllostomid species were distributed over both regions without an apparent tendency to either Cerrado or Pantanal.

In contrast to Phyllostomidae, records of Emballonuridae and Molossidae species were largely distributed in Pantanal rather than in Cerrado. Among Emballonuridae, *Rhynchonycteris naso* was recorded only in Pantanal and *Peropteryx macrotis* in both Cerrado and Pantanal (Figure 3F). For Molossidae, 11 species (*Cynomops abrasus*, *Eumops dabbenei*, *E. glaucinus*, *E. patagonicus*, *E. perotis*, *E. auripendulus*, *Molossus pretiosus*, *Nyctinomops laticaudatus*, *Promops centralis*, *P. nasutus*, and *Tadarida brasiliensis*) were mostly or exclusively registered in Pantanal, two species (*Eumops bonariensis* and *Nyctinomops macrotis*) were found in Cerrado only, and four species (*Cynomops planirostris*, *Molossops temminckii*, *Molossus rufus*, and *M. molossus*) did not present a clear tendency of records between Pantanal or Cerrado in Mato Grosso do Sul (Figure 4). Distributions of Vespertilionidae species in Mato Grosso do Sul seem to present opposite tendencies between the subfamilies Vespertilioninae and Myotinae (Figure 5A-D). The former presented two species (*Eptesicus brasiliensis* and *Lasiurus cinereus*) exclusively in Cerrado and one (*Lasiurus ega*) more frequently reported in Pantanal, and the latter presented three species (*Myotis albescens*, *M. riparius*, and *M. simus*) more frequently recorded in Pantanal and none species clearly distributed toward Cerrado. Other Vespertilioninae (*Eptesicus furinalis* and *Lasiurus blossevillii*) and Myotinae (*Myotis nigricans*) showed no tendency of records between domains. In the remaining families, *Pteronotus parnellii* and *Natalus macrourus* were exclusively or more commonly found in Cerrado (Figure 5E), and *Noctilio* spp. in Pantanal (Figure 5F).

Notes on bat distributions in South America

Sites in Mato Grosso do Sul determine boundaries of distributions for several bats in South America. Findings of *Mimon bennettii* in Pantanal expand its distribution westernward, and those of *Micronycteris megalotis* in Serra da Bodoquena fill a gap on its previously known distribution map (Gardner 2008, Eriksson et al. 2011, Oliveira et al. 2011). Records of *Phylloderma stenops* in Mato Grosso do Sul support that its geographical range includes most of the Cerrado domain (Pulchério-Leite et al. 1998, Esbérard & Faria 2006, Alho et al. 2011b). Sites of occurrence for *Vampyrum spectrum* and *Artibeus cinereus* determine the southern and southwestern borders of their distributions, respectively (Gardner 2008, Tavares et al. 2008, Scultori et al. 2009). For *Vampyressa pusilla*, occurrences in Pantanal and in its bordering plateaus (Longo et al. 2007, Camargo et al. 2009) increase the species range northwesternward (Gardner 2008, Tavares et al. 2008). More significantly, records in Mato Grosso do Sul extends the distribution of *Vampyrodes caraccioli* to 1400 km southwesternward from Pará, 1250 km northwesternward from São Paulo coast, and 1060 km southeasternward from north Bolivia (Velazco et al. 2010b).

Likewise, the records in Mato Grosso do Sul mark the southwestern limit of distributions for *Lionycteris spurrelli*, *Lonchorhina aurita*, *Lonchophylla mordax* (Bordignon 2006), *L. dekeyseri* (Cunha et al. 2011), *Micronycteris sanborni* (Santos et al. 2010), *Mimon crenulatum* (Camargo & Fischer 2005), *Phyllostomus elongatus* (Bordignon & França 2009), *Uroderma bilobatum* (present study, Appendix 1), *U. magnirostrum* (Alho et al. 2011b; see Nogueira et al. 2003),

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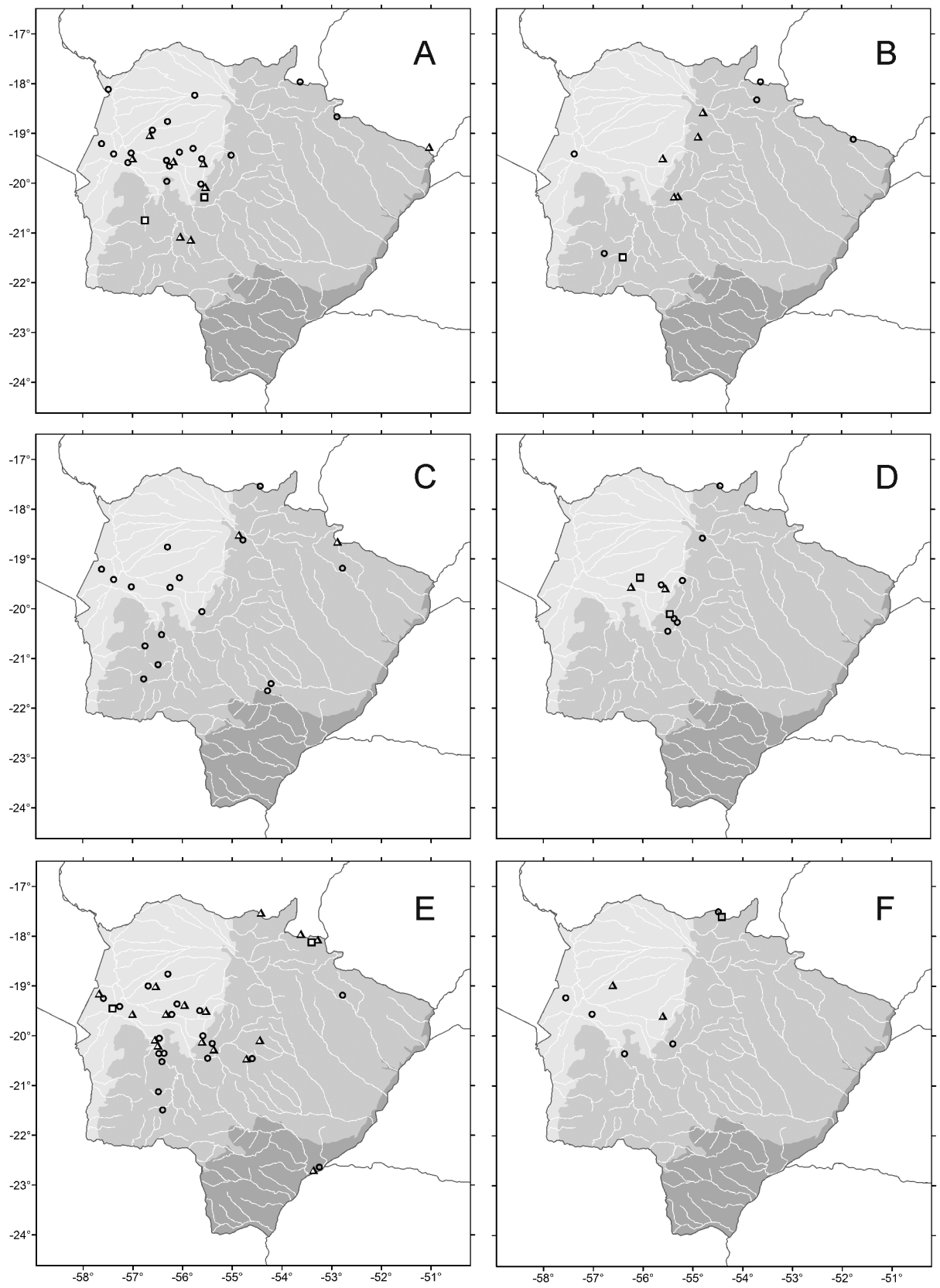

Figure 1. Distribution of Phyllostominae bats in the Pantanal (light grey), Cerrado (mid grey) and Mata Atlântica (dark grey) in Mato Grosso do Sul, Brazil. [**A**] *Lophostoma brasiliense* (triangle), *L. silvicolum* (circle), *Macrophyllum macrophyllum* (square); [**B**] *Micronycteris sanborni* (square), *M. minuta* (triangle), *M. megalotis* (circle); [**C**] *Chrotopterus auritus* (circle), *Lonchorhina aurita* (triangle); [**D**] *Mimon bennettii* (circle), *M. crenulatum* (triangle), *Phylloderma stenops* (square); [**E**] *Phyllostomus elongatus* (square), *P. hastatus* (circle), *P. discolor* (triangle); [**F**] *Tonatia bidens* (circle), *Trachops cirrhosus* (square), *Vampyrum spectrum* (triangle).

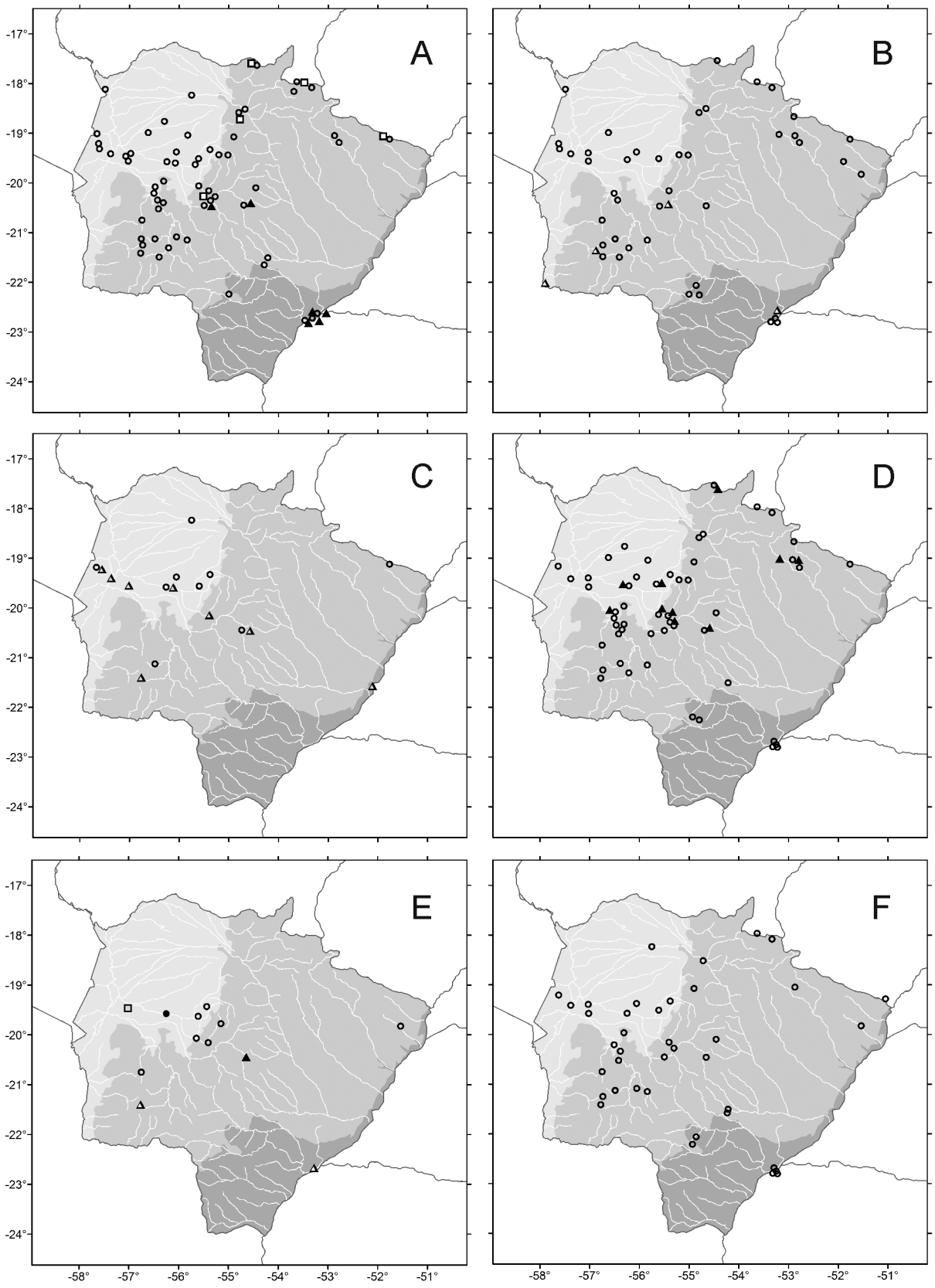

Figure 2. Distribution of Stenodermatinae bats in the Pantanal (light grey), Cerrado (mid grey) and Mata Atlântica (dark grey) in Mato Grosso do Sul, Brazil. [**A**] *Artibeus cinereus* (square), *A. fimbriatus* (filled triangle), *A. planirostris* (circle); [**B**] *A. obscurus* (triangle), *A. lituratus* (circle); [**C**] *Chiroderma villosum* (circle), *C. doriae* (triangle); [**D**] *Platyrrhinus helleri* (filled triangle), *P. lineatus* (circle); [**E**] *Pygoderma bilabiatum* (triangle), *Uroderma bilobatum* (filled circle), *U. magnirostrum* (filled triangle), *Vampyressa pusilla* (circle), *Vampyrodes caraccioli* (square); [**F**] *Sturnira lilium*.

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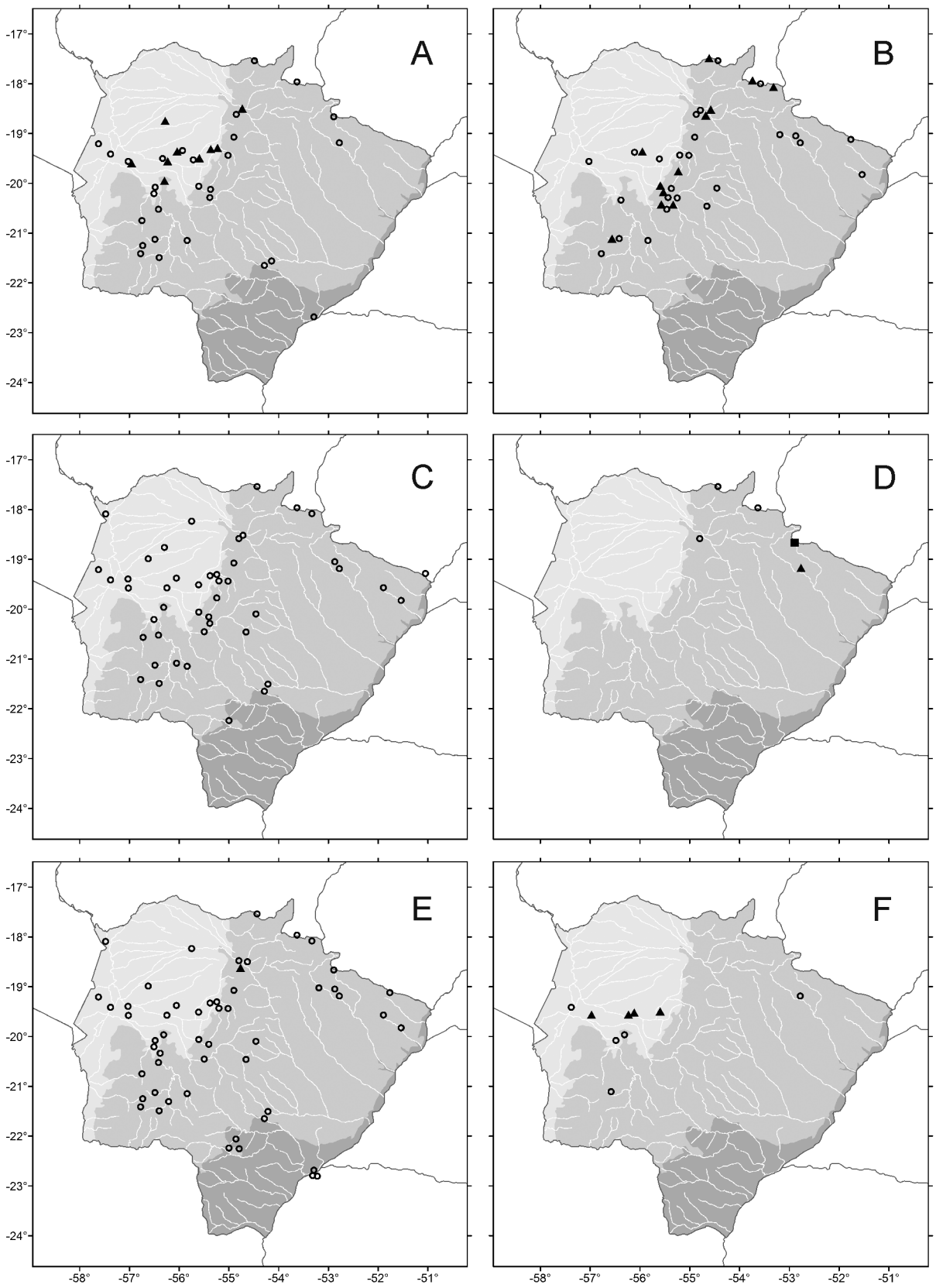

Figure 3. Distribution of Desmodontinae, Glossophaginae, Carolliinae and Emballonurinae bats in the Pantanal (light grey), Cerrado (mid grey) and Mata Atlântica (dark grey) in Mato Grosso do Sul, Brazil. [**A**] *Desmodus rotundus* (circle), *Diaemus youngi* (filled triangle); [**B**] *Anoura geoffroyi* (filled triangle), *A. caudifer* (circle); [**C**] *Glossophaga soricina*; [**D**] *Lonchophylla dekeyseri* (circle), *L. mordax* (filled triangle), *Lionycteris spurrelli* (filled square); [**E**] *Carollia perspicillata* (circle), *Rhinophylla pumilio* (filled triangle); [**F**] *Peropteryx macrotis* (circle), *Rhynchonycteris naso* (filled triangle).

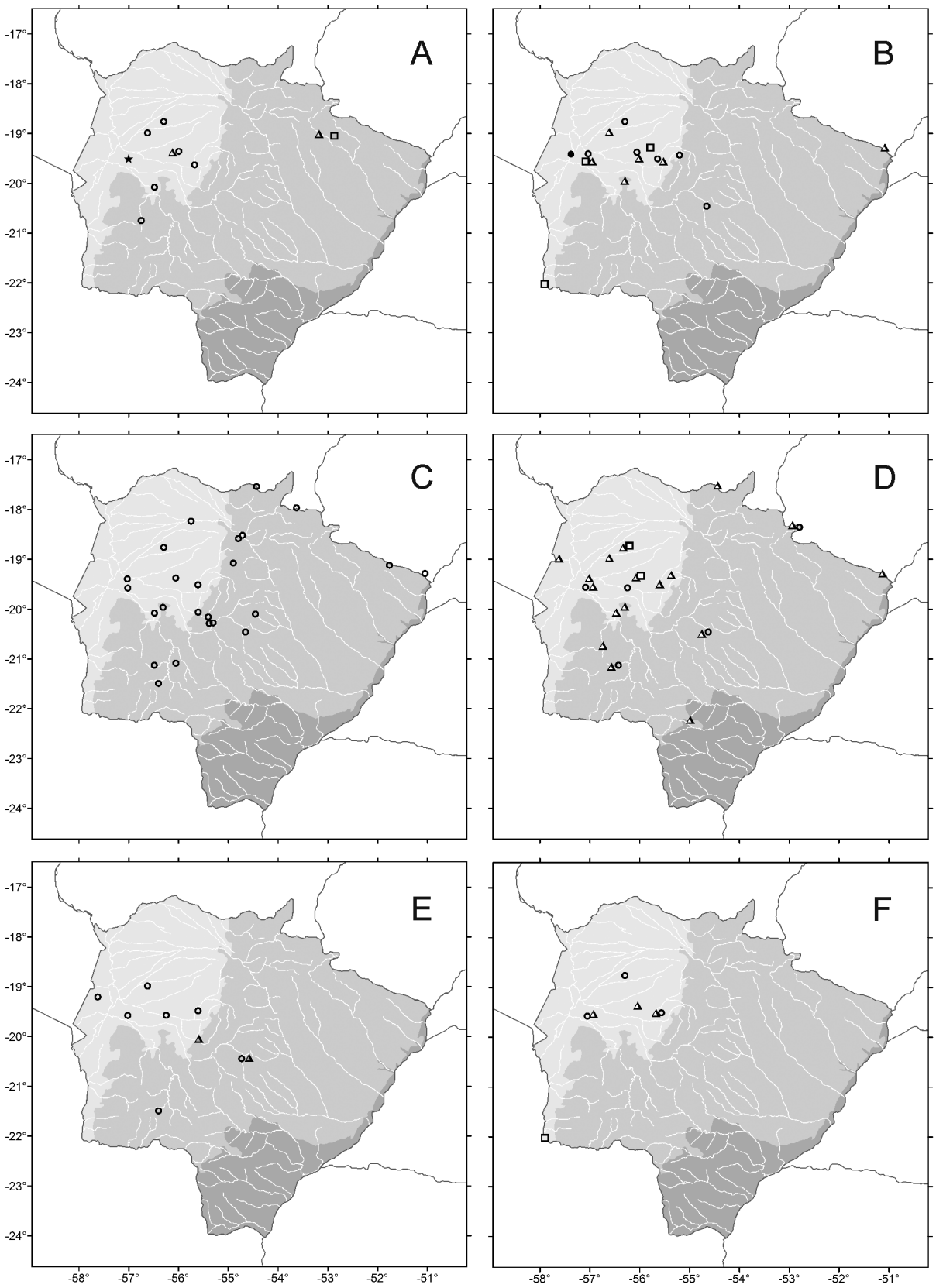

Figure 4. Distribution of Molossinae bats in the Pantanal (light grey), Cerrado (mid grey) and Mata Atlântica (dark grey) in Mato Grosso do Sul, Brazil. [**A**] *Cynomops abrasus* (circle), *C. planirostris* (triangle), *Eumops dabbenei* (star; first record in Brazil), *Eumops bonariensis* (square); [**B**] *Eumops glaucinus* (triangle), *E. patagonicus* (square), *E. perotis* (filled circle), *E. auripendulus* (circle); [**C**] *Molossops temminckii*; [**D**] *Molossus rufus* (circle), *M. molossus* (triangle), *M. pretiosus* (square); [**E**] *Nyctinomops macrotis* (triangle), *N. laticaudatus* (circle); [**F**] *Promops centralis* (circle), *P. nasutus* (triangle), *Tadarida brasiliensis* (square).

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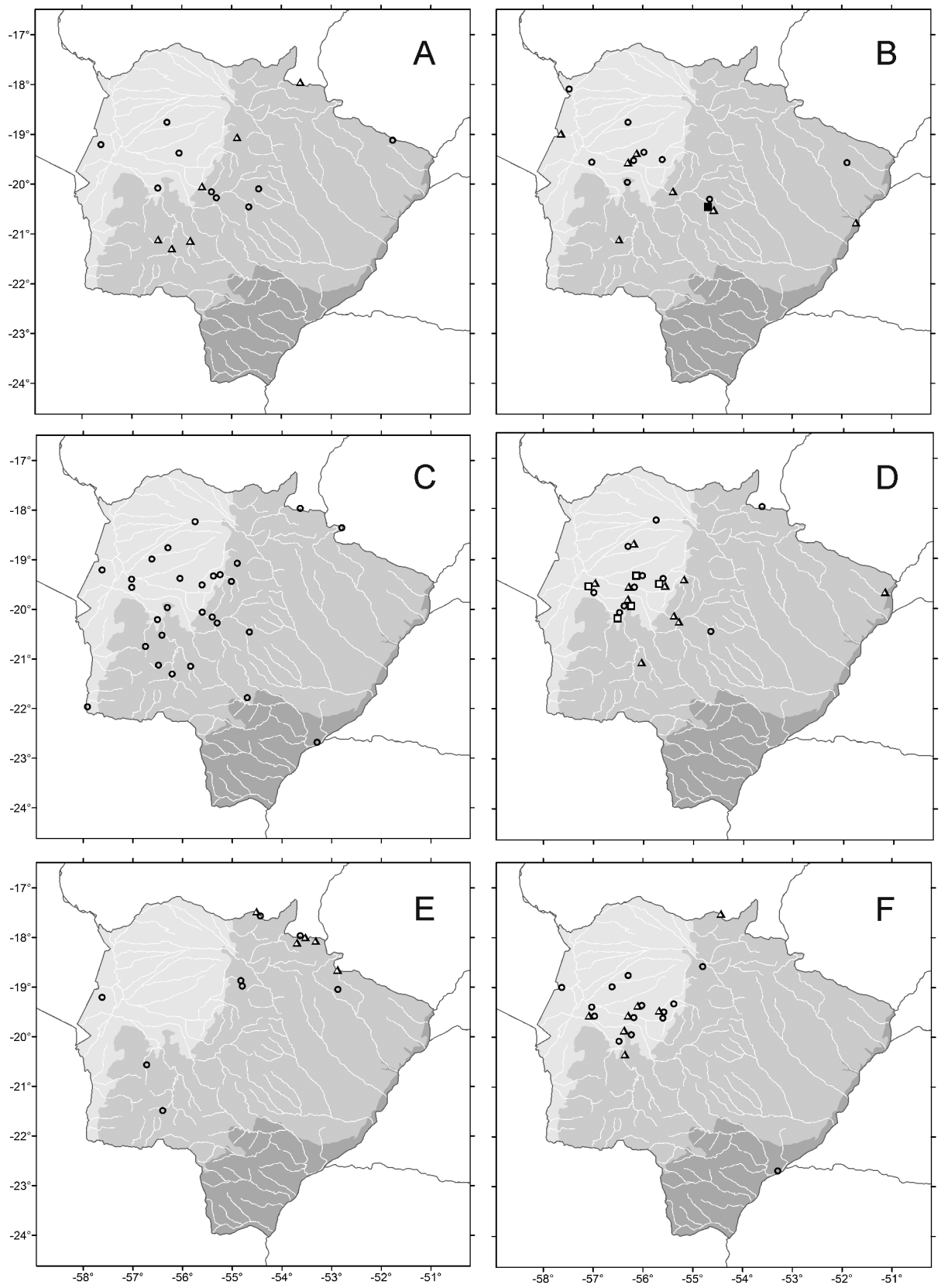

Figure 5. Distribution of Vespertilionidae, Mormoopidae, Natalidae and Noctilionidae bats in the Pantanal (light grey), Cerrado (mid grey) and Mata Atlântica (dark grey) in Mato Grosso do Sul, Brazil. [**A**] *Eptesicus furinalis* (circle), *E. brasiliensis* (triangle); [**B**] *Lasiurus blossevillii* (triangle), *L. cinereus* (filled square), *L. ega* (circle); [**C**] *Myotis nigricans*; [**D**] *Myotis simus* (square), *M. riparius* (triangle), *M. albescens* (circle); [**E**] *Pteronotus parnellii* (triangle), *Natalus macrourus* (circle); [**F**] *Noctilio leporinus* (triangle), *N. albiventris* (circle).

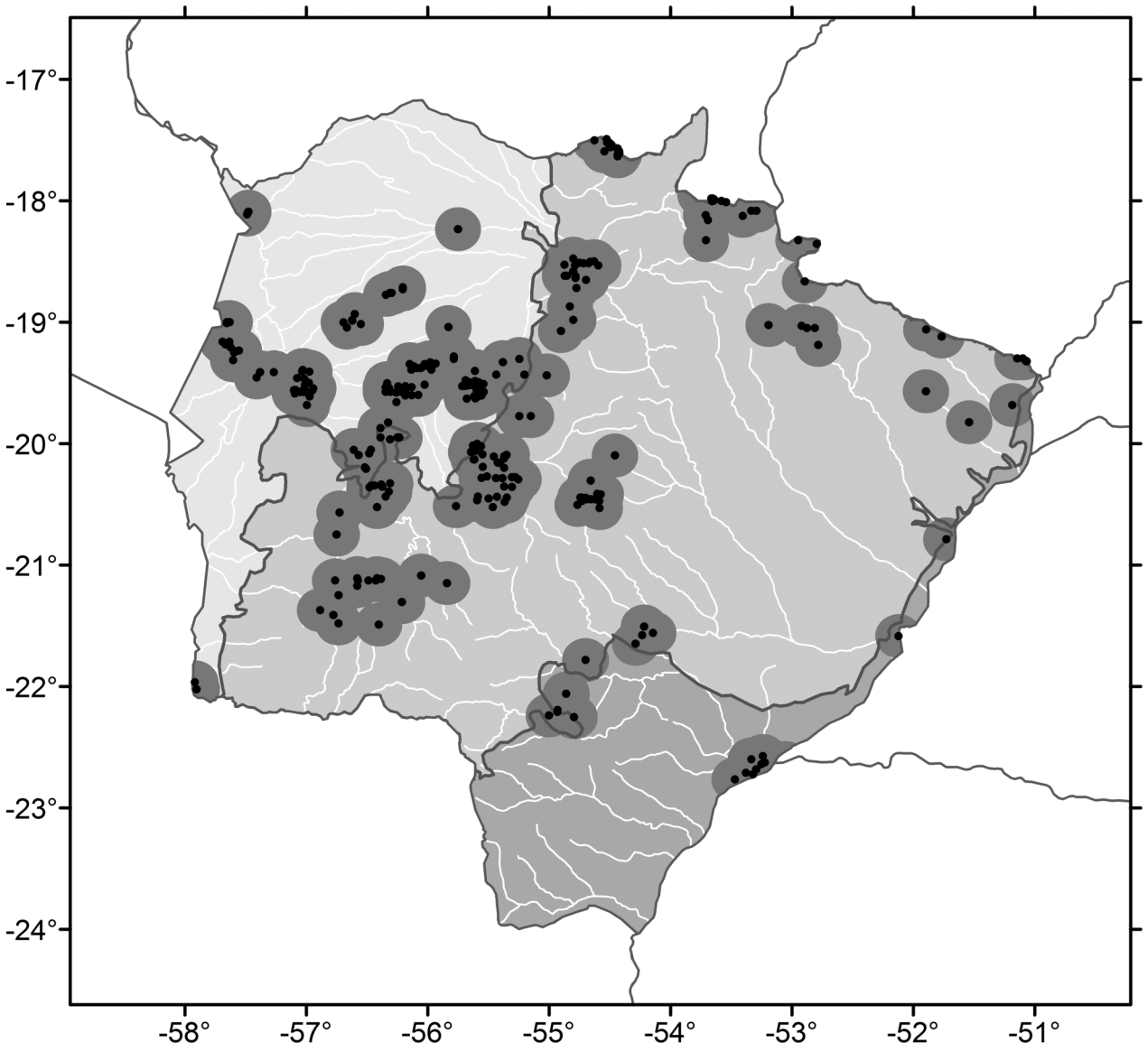

Figure 6. Distribution of sites of bat records (black dots) surrounded by a 20 km buffer zone (dark gray) in the state of Mato Grosso do Sul, Brazil. The total buffer areas account for 78,213 km^2, which comprises 22% of the states' territory. Background gray tones indicate the domains Pantanal (light grey), Cerrado (mid grey) and Mata Atlântica (dark grey).

Rhinophylla pumilio (Coelho 2005; see Rinehart & Kunz 2006), and *Rhynchonycteris naso* (Camargo 2003; present study, Appendix 1). For *Eumops patagonicus*, records in this state extend its geographical distribution northeasternward (Gardner 2008, Bordignon et al. 2011, Waideman et al. 2011; present study, Appendix 1). In addition, occurrences in Mato Grosso do Sul are the southern edges of distribution for *Molossus pretiosus* and *Pteronotus parnellii*; records also support that *M. pretiosus* likely occurs widely in the Pantanal (see Gregorin & Taddei 2000). Occurrences of *Promops centralis* in Mato Grosso do Sul are the first ones in Brazil out of Amazon, and they establish a new species' southeastern limit of distribution (Nogueira & Peracchi 1999, Alho et al. 2011b; present study, Appendix 1). Overall, sites in Mato Grosso do Sul represent the limits of distribution for at least 22 species of bats, 17 Phyllostomidae (eight Phyllostominae, five Stenodermatinae, three Glossophaginae, and one Carolliinae), three Molossidae, one Emballonuridae, and one Mormoopidae. Most of these records have not yet been considered in reviews of South American bat distributions (e.g. Gardner 2008).

Concluding remarks

The chiropteran fauna of Mato Grosso do Sul is highly diverse, and the number of species will likely increase through new inventories across vast areas still unknown regarding to bat occurrences. In addition, as the present data were mostly collected through netting or documentation in roosts, new samplings by records of echolocation calls will probably improve the knowledge on species which roost in less accessible places and are uncommonly mist-netted (Barnett et al. 2006). The general distribution of bat surveyed sites is biased toward the midwestern portion of the Mato Grosso do Sul's territory (Figure 6), in the regions of Miranda and Negro basins, which include part of the Pantanal and Cerrado plateaus, named

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Serra da Bodoquena and Serra de Maracaju. Such distribution is likely related to the accessibility via roads, markedly from the capital Campo Grande to Corumbá, Coxim, and towns in the Bodoquena region. In the opposite direction, our compilation also supports that the vast eastern Mato Grosso do Sul is largely unknown about bat occurrences, except by the extreme northeastern (Figure 6). This wide gap comprises all sub-basins of the Paraná river throughout the Cerrado and Atlantic Forest areas in Mato Grosso do Sul. Other relevant gaps of bat surveys are the northwestern Pantanal in the Taquari basin, and the southwestern Pantanal close to the Chaco and to the southern Brazilian Cerrado. In a roughly estimation, discounting a 20 km buffer zone around sites of bat records, 78% of the state's territory is still uncovered for bat occurrences (Figure 6). Unsurvey areas per domain reach 91% in Atlantic forest, 78% in Cerrado, and 71% in Pantanal. Furthermore, the expectation of species increment is not only based on large gap areas. As we included records conservatively, future corrections on the present checklist are prone to add rather than to subtract species. A general relevant issue is that Mato Grosso do Sul comprises a major ecotonal zone in South America. It likely explains the occurrence of species at edges of their distributions, as evidenced by numerous species of bats whose northern, southern, eastern or western geographical limits are in Mato Grosso do Sul; like *Eumops dabbenei* for instance.

Appendix 1. Sources of records included in the distribution maps of bat species, in alphabetical order, in the Mato Grosso do Sul state, Brazil.

Anoura caudifer – LITERATURE: Pulchério-Leite et al. 1998, Camargo 2003, Coelho 2005, Bordignon 2006, Fernandes 2009, Longo 2009, Ferreira et al. 2010, Alho et al. 2011, Cunha et al. 2011, Eriksson et al. 2011; UNPUBLISHED RECORDS: Nicolay Cunha (19°07' S, 51°45' W).

Anoura geoffroyi – LITERATURE: Pulchério-Leite et al. 1998, Coelho 2005, Alho et al. 2011, Cunha et al. 2011; MUSEUM: ZUFMS (0151, 0368, 0454).

Artibeus cinereus – LITERATURE: Coelho 2005, Cunha et al. 2011; MUSEUM: ZUFMS (0360); UNPUBLISHED RECORDS: Nicolay Cunha (19°07' S, 51°45' W).

Artibeus fimbriatus – LITERATURE: Deus et al. 2003, Cáceres et al. 2008, Ortêncio-Filho et al. 2010, Zanon 2010.

Artibeus lituratus – LITERATURE: Coelho 2005, Bordignon 2006, Bordignon & França 2009, Camargo et al. 2009, Cunha et al. 2009, Fernandes 2009, Longo 2009, Teixeira et al. 2009, Ferreira et al. 2010, Ortêncio-Filho et al. 2010, Zanon 2010, Alho et al. 2011, Cunha et al. 2011, Eriksson et al. 2011, Gonçalves et al. 2012, Munin et al. 2012; MUSEUM: ZUFMS (0577); UNPUBLISHED RECORDS: Luiz F Carvalho, Nicolay Cunha, Carolina F Santos (18°06' S, 57°29' W; 19°12' S, 57°37' W); Nayara F Carvalho (22°14' S, 54°59' W; 22°15' S, 54°47' W; 22°03' S, 54°51' W); Nicolay Cunha (19°07' S, 51°45' W).

Artibeus obscurus – LITERATURE: Fernandes 2009, Bordignon & Santos 2010, Zanon 2010, Eriksson et al. 2011.

Artibeus planirostris – LITERATURE: Coelho 2005, Bordignon 2006, Bordignon & França 2009, Camargo et al. 2009, Cunha et al. 2009, Fernandes 2009, Longo 2009, Teixeira et al. 2009, Ferreira et al. 2010, Ortêncio-Filho et al. 2010, Zanon 2010, Alho et al. 2011, Cunha et al. 2011, Eriksson et al. 2011, Silveira 2011, Munin et al. 2012; MUSEUM: ZUFMS (0382, 0466, 0471, 0578); UNPUBLISHED RECORDS: Luiz F Carvalho, Nicolay Cunha, Alan Eriksson, Carolina F Santos (18°06' S, 57°29' W; 18°07' S, 57°29' W); Nayara F Carvalho (22°14' S, 55°00' W); Nicolay Cunha (19°07' S, 51°46' W; 21°39' S, 54°17' W; 21°35' S, 54°14' W; 21°36' S, 54°14' W; 21°30' S, 54°13' W; 19°13' S, 57°37' W).

Carollia perspicillata – LITERATURE: Pulchério-Leite et al. 1998, Coelho 2005, Bordignon 2006, Bordignon & França 2009, Camargo et al. 2009, Cunha et al. 2009, Fernandes 2009, Longo 2009, Teixeira et al. 2009, Ferreira et al. 2010, Ortêncio-Filho et al. 2010, Zanon 2010, Alho et al. 2011, Cunha et al. 2011, Eriksson et al. 2011, Munin et al. 2012; MUSEUM: ZUFMS (0179, 0371, 0372); UNPUBLISHED RECORDS: Luiz F Carvalho, Nicolay Cunha, Alan Eriksson, Carolina F Santos (18°06' S, 57°29' W; 19°13' S, 57°37' W); Nayara F Carvalho (22°14' S, 55°00' W; 22°13' S, 54°56' W; 22°15' S, 54°48' W; 22°04' S, 54°52' W); Nicolay Cunha (19°07' S, 51°46' W; 21°39' S, 54°17' W; 21°34' S, 54°15' W; 21°35' S, 54°14' W; 21°36' S, 54°14' W; 21°30' S, 54°13' W).

Chiroderma doriae – LITERATURE: Gregorin 1998, Bordignon & França 2009, Ferreira et al. 2010, Alho et al. 2011, Eriksson et al. 2011, Munin et al. 2012; MUSEUM: ZUFMS (0258); UNPUBLISHED RECORDS: Luiz F Carvalho, Nicolay Cunha, Carolina F Santos (19°13' S, 57°37' W); Alan Eriksson (19°34' S, 57°01' W).

Chiroderma villosum – LITERATURE: Pulchério-Leite et al. 1998, Ferreira et al. 2010, Alho et al. 2011; ZUFMS (0158, 0159, 0208, 0209, 0505); UNPUBLISHED RECORDS: Nicolay Cunha (19°07' S, 51°46' W).

Chrotopterus auritus – LITERATURE: Coelho 2005, Bordignon 2006, Bordignon & França 2009, Camargo et al. 2009, Alho et al. 2011, Cunha et al. 2011, Eriksson et al. 2011, Munin et al. 2012; MUSEUM: ZUFMS (0109, 0354); UNPUBLISHED RECORDS: Luiz F Carvalho, Nicolay Cunha, Carolina F Santos (19°13' S, 57°37' W); Nicolay Cunha (21°39' S, 54°17' W; 21°30' S, 54°13' W).

Cynomops abrasus – LITERATURE: Pulchério-Leite et al. 1998, Camargo et al. 2009, Alho et al. 2011, Silveira 2011; MUSEUM: ZUFMS (0377).

Cynomops planirostris – LITERATURE: Pulchério-Leite et al. 1998, Bordignon 2006; MUSEUM: ZUFMS (0162).

Desmodus rotundus – LITERATURE: Pulchério-Leite et al. 1998, Coelho 2005, Bordignon 2006, Bordignon & França 2009, Camargo et al. 2009, Cunha et al. 2009, Longo 2009, Zanon 2010, Alho et al. 2011, Cunha et al. 2011, Eriksson et al. 2011, Munin et al. 2012; MUSEUM: ZUFMS (0115, 0121, 0340, 0364); UNPUBLISHED RECORDS: Luiz F Carvalho, Nicolay Cunha, Carolina F Santos (19°13' S, 57°37' W); Nicolay Cunha (21°39' S, 54°17' W; 21°35' S, 54°14' W).

Diaemus youngi – LITERATURE: Pulchério-Leite et al. 1998, Alho et al. 2011, Munin et al. 2012; MUSEUM: ZUEC-MAM (384, 385), ZUFMS (0078, 0164, 0165).

Eptesicus brasiliensis – LITERATURE: Coelho 2005, Cáceres et al. 2007, Longo 2009; MUSEUM: ZUFMS (0160).

Eptesicus furinalis – LITERATURE: Pulchério-Leite et al. 1998, Alho et al. 2011; UNPUBLISHED RECORDS: Luiz F Carvalho, Nicolay Cunha, Carolina F Santos (19°07' S, 51°46' W; 19°13' S, 57°37' W).

Eumops auripendulus – LITERATURE: Alho et al. 2011; ZUFMS (0146).
Eumops bonariensis – LITERATURE: Bordignon 2006.
Eumops dabbenei – MUSEUM: ZUFMS (1319).
Eumops glaucinus – LITERATURE: Camargo 2003, Bordignon 2006, Alho et al. 2011; MUSEUM: ZUFMS (0145, 0298).
Eumops patagonicus – LITERATURE: Bordignon et al. 2011, Waideman et al. 2011; MUSEUM: ZUFMS (0470).
Eumops perotis – LITERATURE: Bordignon & França 2009; MUSEUM: ZUFMS (0045).
Glossophaga soricina – LITERATURE: Pulchério-Leite et al. 1998, Coelho 2005, Bordignon 2006, Bordignon & França 2009, Cunha et al. 2009, Fernandes 2009, Longo 2009, Ferreira et al. 2010, Alho et al. 2011, Cunha et al. 2011, Eriksson et al. 2011, Munin et al. 2012; MUSEUM: ZUFMS (0283, 0344, 0366, 0367, 0369); UNPUBLISHED RECORDS: Luiz F Carvalho, Nicolay Cunha, Carolina F Santos (19°13' S, 57°37' W); Nayara F Carvalho (22°14' S, 55°00' W); Nicolay Cunha (19°07' S, 51°46' W; 21°39' S, 54°17' W; 21°35' S, 54°14' W; 21°30' S, 54°13' W); Erich Fischer, Paulo R Souza (18°05' S, 57°29' W).
Lasiurus blossevillii – LITERATURE: Pulchério-Leite et al. 1998, Alho et al. 2011; MUSEUM: ZUEC-MAM (2632), ZUFMS (0134, 0135, 0171, 0252); UNPUBLISHED RECORDS: Wilson Uieda (19°00' S, 57°39' W).
Lasiurus cinereus – LITERATURE: Alho et al. 2011.
Lasiurus ega – LITERATURE: Pulchério-Leite et al. 1998, Camargo 2003, Bordignon 2006, Alho et al. 2011, Oliveira et al. 2011; MUSEUM: ZUFMS (0138, 0176, 0253).
Lionycteris spurrelli – LITERATURE: Bordignon 2006.
Lonchophylla dekeyseri – LITERATURE: Coelho 2005, Cunha et al. 2011.
Lonchophylla mordax – LITERATURE: Bordignon 2006.
Lonchorhina aurita – LITERATURE: Coelho 2005, Bordignon 2006.
Lophostoma brasiliense – LITERATURE: Bordignon 2006, Longo 2009, Alho et al. 2011, Silveira 2011, Munin et al. 2012; MUSEUM: ZUFMS (0113, 0318, 0357).
Lophostoma silvicolum – LITERATURE: Pulchério-Leite et al. 1998, Coelho 2005, Bordignon 2006, Bordignon & França 2009, Longo 2009, Alho et al. 2011, Silveira 2011, Munin et al. 2012; MUSEUM: ZUFMS (0110, 0181, 0356); UNPUBLISHED RECORDS: Luiz F Carvalho, Nicolay Cunha, Carolina F Santos (18°07' S, 57°29' W); Alan Eriksson (19°13' S, 57°37' W).
Macrophyllum macrophyllum – LITERATURE: Camargo et al. 2009; MUSEUM: ZUFMS (0072).
Micronycteris megalotis – LITERATURE: Coelho 2005, Bordignon & França 2009, Eriksson et al. 2011; ZUFMS (0347); UNPUBLISHED RECORDS: Nicolay Cunha (19°07' S, 51°46' W).
Micronycteris minuta – LITERATURE: Pulchério-Leite et al. 1998, Coelho 2005, Longo 2009, Alho et al. 2011.
Micronycteris sanborni – LITERATURE: Santos et al. 2010.
Mimon bennettii – LITERATURE: Coelho 2005, Fernandes 2009, Alho et al. 2011, Oliveira et al. 2011; UNPUBLISHED RECORDS: Nicolay Cunha (17°32' S, 54°27' W).
Mimon crenulatum – LITERATURE: Camargo & Fischer 2005; MUSEUM: ZUFMS (0108).
Molossops temminckii – LITERATURE: Pulchério-Leite et al. 1998, Coelho 2005, Bordignon 2006, Cunha et al. 2009, Longo 2009, Ferreira et al. 2010, Alho et al. 2011, Cunha et al. 2011; MUSEUM: ZUFMS (0147); UNPUBLISHED RECORDS: Nicolay Cunha (19°07' S, 51°46' W).
Molossus molossus – LITERATURE: Bordignon 2006, Camargo et al. 2009, Longo 2009, Alho et al. 2011; MUSEUM: ZUFMS (0271); UNPUBLISHED RECORDS: Nayara F Carvalho (22°14' S, 55°00' W); Nicolay Cunha (17°32' S, 54°27' W); Wilson Uieda (19°00' S, 57°38' W).
Molossus pretiosus – LITERATURE: Alho et al. 2011.
Molossus rufus – LITERATURE: Camargo 2003, Bordignon 2006, Alho et al. 2011; UNPUBLISHED RECORDS: George Camargo, Carolina F Santos (19°34' S, 56°15' W).
Myotis albescens – LITERATURE: Coelho 2005, Alho et al. 2011; MUSEUM: ZUFMS (0141, 0170); UNPUBLISHED RECORDS: George Camargo, Carolina F Santos (19°34' S, 56°15' W).
Myotis nigricans – LITERATURE: Coelho 2005, Bordignon 2006, Camargo et al. 2009, Longo 2009, Ferreira et al. 2010, Zanon 2010, Alho et al. 2011, Moratelli et al. 2011; MUSEUM: ZUFMS (0133, 0137, 0172, 0175, 0203, 0204, 0283, 0378, 0379, 0381); UNPUBLISHED RECORDS: Luiz F Carvalho, Nicolay Cunha, Carolina F Santos (19°13' S, 57°37' W).
Myotis riparius – LITERATURE: Camargo 2003, Alho et al. 2011, Moratelli et al. 2011; MUSEUM: ZUFMS (0140).
Myotis simus – LITERATURE: Alho et al. 2011, Moratelli et al. 2011; MUSEUM: ZUFMS (0006).
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Noctilio leporinus – LITERATURE: Alho et al. 2011; MUSEUM: ZUFMS (0143); UNPUBLISHED RECORDS: Nicolay Cunha (17°32' S, 54°27' W); Carolina F Santos (19°34' S, 56°15' W).
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