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SHORT COMMUNICATION

Molossus rufus (E. Geoffroy, 1805) (Mammalia, Chiroptera): Geographic distribution and first record for the state of Sergipe, northeastern Brazil

Molossus rufus: distribuição geográfica e primeiro registro para Sergipe, nordeste do Brasil

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Abstract

Distributed throughout the world, Molossidae family consists of 18 genera and more than 100 species, 31 of which are found in Brazil. In this country, most of the records of *Molossus rufus* were taken in the southeast of the Atlantic Forest, with few records in the Cerrado and Caatinga. This study reports the first record of *Molossus rufus* for the state of Sergipe, northeastern Brazil. One lactating female was captured by mist nets, near buildings, in the Ibura National Forest (FLONA Ibura), in the beginning of the rainy season. This is the third species of molossid recorded to the state of Sergipe; the other two (*Molossus molossus* and *Cynomops planirostris*) were also recorded in human buildings.

Keywords: Atlantic Forest, bats, Molossidae.

Resumo

Distribuída em todo o mundo, a família Molossidae consiste em 18 gêneros e mais de 100 species, 31 delas encontradas no Brasil. Nesse país, a maioria dos registros de *Molossus rufus* foi realizada no sudeste da Mata Atlântica, com poucos registros no Cerrado e Caatinga. Este estudo relata o primeiro registro de *Molossus rufus* para o estado de Sergipe, nordeste do Brasil. Uma fêmea lactante foi capturada com redes de neblina, próximo a edificações, na Floresta Nacional do Ibura (FLONA Ibura), no início da estação chuvosa. Esta é a terceira espécie de molossídeo registrada no estado de Sergipe, sendo que as outras duas (*Molossus molossus* e *Cynomops planirostris*) também foram registradas em construções humanas.

Palavras-chave: Mata Atlântica, morcegos, Molossidae.

Bats from the family Molossidae are characterized by having a bushy tail, which goes beyond the distal edge of the uropatagium, extending freely in at least one third of its total length, which gives this group the name “free-tailed bats” (Nowak, 1994; Fabian and Gregorin, 2007). This family is distributed throughout the world, consisting of 16 genera and more than 100 species, 31 of which are found in Brazil (Simmons, 2005; Nogueira *et al.,* 2014, Gregorin *et al.,* 2016).

The *Molossus* genus comprises nine species (Simmons, 2005; González-Ruiz *et al*., 2011), six of which occur in Brazil, *Molossus aztecus* (Saussure 1860); *Molossus coibensis* (Allen 1904); *Molossus currentium* (Thomas 1901);

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Molossus molossus (Pallas 1766); *Molossus pretiosus* (Miller 1902) e *Molossus rufus* (E. Geoffroy Saint-Hilaire 1805) (Nogueira *et al*., 2014). The type locality of *Molossus rufus* is the city of Cayenne, at French Guiana (Barquez *et al.,* 1999; Eger, 2008), while it is distributed from Mexico, throughout Central and South America, except Uruguay and Chile. In Brazil, this species has been recorded in 17 of the 26 states (Table 1), with most records occurring in the Atlantic Forest, and few records in the Amazon Forest, Cerrado and Caatinga (Figure 1). In the present study, the first record of *Molossus rufus* for the state of Sergipe, northeastern Brazil, is reported and its geographical distribution, discussed.

The Ibura National Forest (FLONA Ibura; 10° 51'S, 37° 07'W) is located in the municipality of Nossa Senhora do Socorro, state of Sergipe, northeastern Brazil. It covers an area of 144 ha, characterized by Atlantic Forest vegetation (Semideciduous Forest; 81%) in association with mangroves (6%) and an old eucalyptus plantation (*Eucalyptus citriodora* [(Hook.) Hill and Johnson], 9%) which is in a stage of secondary succession (Santos, 2001; Gomes et al., 2006). In addition, there is 4% of pasture (Santos, 2001). The average annual temperature is 25.2ºC and rainfall above 1,600mm/year, with the rainy season from March to August (Cruz, 2006; Sergipe, 2002). The climate is categorized as *As*, in Köppen's classification (Alvares *et al.,* 2013).

On April 27th, 2014 (beginning of the rainy season), we captured a lactating female of *Molossus rufus* using mist nets, tendentiously set near (< 5 m) the buildings that comprise the headquarters of the FLONA, resulting in the first record of the species for the state of Sergipe. The buildings are small houses of only one pavement, with an unlined ceramic roof with short eaves and open ventilation trays in the attic. The specimens were handled in accordance with Sikes *et al.* (2011), fixed in formaline 10% and preserved in ethanol 70%, with subsequent extraction and preparation of the skull. After recording the basic external and cranial measurements, the specimens were deposited in the zoological collection of Universidade Federal de Sergipe.

The following cranial (Figure 2) and external measurements were taken following Vizotto and Taddei (1973), using

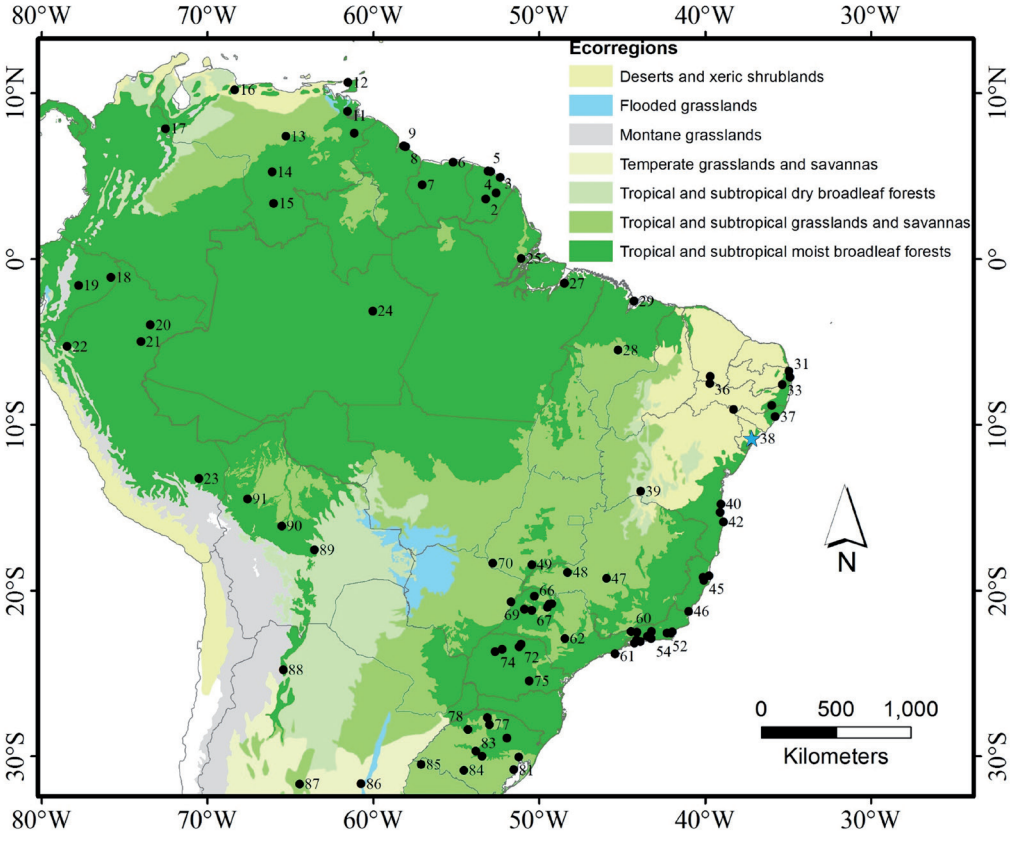

Figure 1. Records of *Molossus rufus* throughout South America. Sites numbered as in Table 1. The blue star represents the new record to the state of Sergipe, Brazil.
Figura 1. Registros de *Molossus rufus* ao longo da América do Sul. Sítios enumerados conforme a Tabela 1. A estrela representa o novo registro para o estado de Sergipe, Brasil.

Table 1. Localities with records of *Molossus rufus* throughout South America. The numbers refer to the points shown in Figure 1.
Tabela 1. Localidades com registros de *Molossus rufus* ao longo da América do Sul. Os números referem-se aos pontos mostrados na Figura 1.

Country/ Code	Coordinates lat y	long x	Locality	Reference
FRENCH GUYANA				
1	3°59'S	52º34'W	Arataye - Arataye	Bernard and Fenton (2002)
2	3°37'S	53º12'W	Säul - Floresta Amazônica	Bernard and Fenton (2002)
3	4°56'S	52º20'W	Cayenne - Ilha na foz do Rio Caiena	Brosset and Dubost (1968)
4	5°17'S	52º55'W	Paracou - Floresta Amazônica	Bernard and Fenton (2002)
5	5°18'S	53º04'W	Piste de Saint Élie - Floresta Amazônica	Bernard and Fenton (2002)
SURINAME				
6	5°50'S	55º10'W	Paramaribo - Paramaribo	Husson (1962)
7	4°28'S	57º02'W	Bakhuis - Sipaliwini	Lim (2009)
GUYANA				
8	6°47'S	58º02'W	Demerara, Mahaica - Buxton	Eger (2008)
9	6°49'S	58º09'W	Iwokrama Forest - Guiana Shield	Bernard and Fenton (2002)
TRINIDAD AND TOBAGO				
12	10°39'S	61º31'W	Trinidad - Port of Spain	Goodwin and Greenhall (1961)
VENEZUELA				
10	7°35'S	61º08'W	Serra Imataca - Delta Amacuro	Bernard and Fenton (2002)
11	8°54'S	61º32'W	Delta Amacuro - Araguaimujo	Pirlot (1965)
13	7°24'S	65º15'W	Hato Caurama - Maripa	Ochoa *et al.* (2008)
14	5°15'S	66º05'W	San Juan de Manapiare - État d'Amazonas	Bernard and Fenton (2002)
15	3°22'S	65º59'W	Rio Cunucunuma - État d'Amazonas	Bernard and Fenton (2002)
16	10°13'S	68º20'W	Carabobo - Montalbán	Handley (1976)
COLOMBIA				
17	7°52'S	72º30'W	Norte de Santander - Cúcuta	Eger (2008)
ECUADOR				
18	1°06'S	75º48'W	Yasuni - Orellana	Bernard and Fenton (2002)
19	1°35'S	77º45'W	Pastaza - Canelos	Albuja (1983)
PERU				
20	3°58'S	73º25'W	Reserva Nacional Allpahuayo - Mishana	Hice *et al.* (2004)
21	4°59'S	73º59'W	Jenaro Herrera, Requena - Loreto	Bernard and Fenton (2002)
22	5°16'S	78º26'W	Amazonas - Pomará	Koopman (1978)
23	13°15'S	70º30'W	Cusco - Huajymbe	Sanborn (1951)
BRAZIL				
24	3°08'S	60º01'W	Manaus - AM	Moratelli *et al.* (2010)
25	0°02'S	51º04'W	Macapá - AP	Carvalho (1962)
26	1°27'S	48º29'W	Belém - PA	Piccinini (1974)
27	1°28'S	48º27'W	Parque Ambiental de Belém - PA	Aguiar *et al.* (2007)
28	5°30'S	45º14'W	Barra do Corda - MA	Vieira (1957)
29	2°32'S	44º16'W	São Luíz - MA	Dias et al. (2009)
30	7°05'S	39º40'W	Nova Olinda - CE	Mares et al. (1981)
31	6°46'S	34º55'W	Barra de Mamanguape, Mamanguape - PB	Feijó and Langguth (2011)
32	7°08'S	34º51'W	Mata do Buraquinho, João Pessoa - PB	Feijó and Langguth (2011)
33	7°34'S	35º20'W	Água Preta - PE	Cruz *et al.* (2002)
34	8°50'S	35º57'W	Dois Irmãos - PE	Pohle (1927)
35	9°04'S	38º16'W	Barragem de Itaparica, Petrolândia - PE	Astúa and Guerra (2008)
36	7°30'S	39º42'W	Exu - PE	Mares *et al.* (1981)
37	9°30'S	35º45'W	Canoas, Rio Largo - AL	Vieira (1953)
38	10°50'S	37º08'W	FLONA Ibura, Nossa Senhora do Socorro - SE	Present study
39	14°00'S	43º52'W	Carinhanha - BA	Vieira (1942)
40	14°47'S	39º02'W	Ilhéus - BA	Faria *et al.* (2006)
41	15°17'S	39º04'W	Uma - BA	Faria *et al.* (2006)
42	15°51'S	38º52'W	Belmonte - BA	Faria *et al.* (2006)
43	19°06'S	39º45'W	Reserva Natural da Vale do Rio Doce - ES	Peracchi and Albuquerque (1993)

Table 1. Continuation.
Tabela 1. Continuação.

Country/ Code	Coordinates lat y	Coordinates long x	Locality	Reference
44	19°12'S	40º06'W	Reserva Florestal da Campanhia Vale do Rio Doce - ES	Pedro and Passos (1995)
45	19°23'S	40º03'W	Linhares - ES	Peracchi and Albuquerque (1993)
46	21°15'S	40º58'W	Praia das Neves - ES	Luz *et al.* (2009)
47	19°16'S	45º56'W	Western - MG	Pedro and Taddei (1998)
48	18°54'S	48º16'W	Uberlândia - MG	Pedro and Taddei (1998)
49	18°26'S	50º26'W	Quirinópolis - GO	Teixeira (2010)
50	22°29'S	41º58'W	Morro de São João - RJ	Esbérard *et al.* (2013)
51	22°33'S	42º03'W	Fazenda da Barra, Casimiro de Abreu - RJ	Esbérard *et al*. (2013)
52	22°33'S	42º16'W	Reserva Biológica de Poço das Antas, Silva Jardim - RJ	Esbérard (2003)
53	22°28'S	43º13'W	Reserva Biológica do Tinguá, Nova Iguaçu - RJ	Dias and Peracchi (2008)
54	22°54'S	43º14'W	Rio de Janeiro - RJ	Wagner (1847); Peracchi and Nogueira (2010)
55	22°45'S	43º27'W	Região da Costa Verde - RJ	Bolzan *et al.* (2010)
56	23°04'S	43º53'W	Ilha da Marambaia - RJ	Lourenço *et al.* (2010)
57	22°59'S	44º06'W	Reserva Rio das Pedras, Mangaratiba - RJ	Luz et al. (2011)
58	23°09'S	44º14'W	Ilha Grande, Angra dos Reis - RJ	Esbérard *et al.* (2006)
59	22°30'S	44º05'W	Volta Redonda - RJ	Esbérard (2004)
60	22°28'S	44º27'W	Resende - RJ	Esbérard (2004)
61	23°48'S	45º25'W	São Sebastião - SP	Eger (2008)
62	22°53'S	48º26'W	Botucatu - SP	Aloíse (1987)
63	20°47'S	49º13'W	Guapiaçu - SP	Marchesin *et al.* (2008)
64	20°48'S	49º22'W	São José do Rio Preto - SP	Marchesin *et al.* (2008)
65	21°00'S	49º29'W	Nova Aliança - SP	Marchesin *et al.* (2008)
66	20°20'S	50º16'W	Fernandópolis - SP	Breviglieri (2014)
67	21°12'S	50º26'W	Araçatuba - SP	Queiroz *et al.* (2009)
68	21°08'S	50º53'W	Município de Valparaíso, Araçatuba - SP	Carvalho (2008)
69	20°41'S	51º41'W	Fazenda Barra do Sucuriu, Três Lagoas - MS	Bordignon *et al*. (2006)
70	18°21'S	52º47'W	Fazenda Sucuriú e Pontal - MS	Bordignon (2006)
71	23°14'S	51º05'W	Londrina - PR	Reis *et al.* (2002)
72	23°23'S	51º11'W	Parque Estadual Mata dos Godoy, Londrina - PR	Reis *et al.* (2002)
73	23°33'S	52º13'W	Recanto Marista, Município Doutor Camargo - PR	Brito *et al.* (2010)
74	23°40'S	52º38'W	Parque Municipal do Cinturão Verde de Cianorte - PR	Filho *et al.* (2005)
75	25°27'S	50º35'W	Floresta Nacional do Irati - PR	Reis *et al.* (2000)
76	27°40'S	53º07'W	Bacia Hidrográfica do Rio da Várzea - RS	Peters *et al.* (2010)
77	28°05'S	52º59'W	Chapada - RS	Peters *et al.* (2012)
78	28°23'S	54º17'W	Entre Ijuís - RS	Peters *et al.* (2012)
79	28°54'S	51º56'W	Guaporé - RS	Peters *et al.* (2012)
80	30°02'S	51º13'W	Porto Alegre - RS	Vieira (1955)
81	30°48'S	51º31'W	Tapes - RS	Peters *et al.* (2012)
82	30°00'S	53º25'W	Formigueiro - RS	Peters *et al.* (2012)
83	29°41'S	53º48'W	Santa Maria - RS	Santos *et al.* (2008)
84	30°50'S	54º32'W	Lavras do Sul - RS	Peters *et al.* (2012)
URUGUAY				
85	30°29'S	57º06'W	Artigas - Artigas	Gonzáles and Lanfranco (2010)
ARGENTINA				
86	31°39'S	60º43'W	Santa Fe - Santa Fe	Barquez *et al.* (1999)
87	31°40'S	64º26'W	Córdoba - Alta Gracia	Barquez *et al*. (1999)
88	24°47'S	65º25'W	Salta - Salta	Villa-R and Villa-Cornejo (1969)
BOLIVIA				
89	17°33'S	63º32'W	2 km S de Caranda - Santa Cruz de la Sierra	Anderson (1997)
90	16°06'S	65º30'W	'Llanos de Moxos', Beni - Bolivia	Aguirre *et al.* (2003)
91	14°28'S	67º34'W	Beni - Rurrenabaque	Anderson *et al.* (1982)

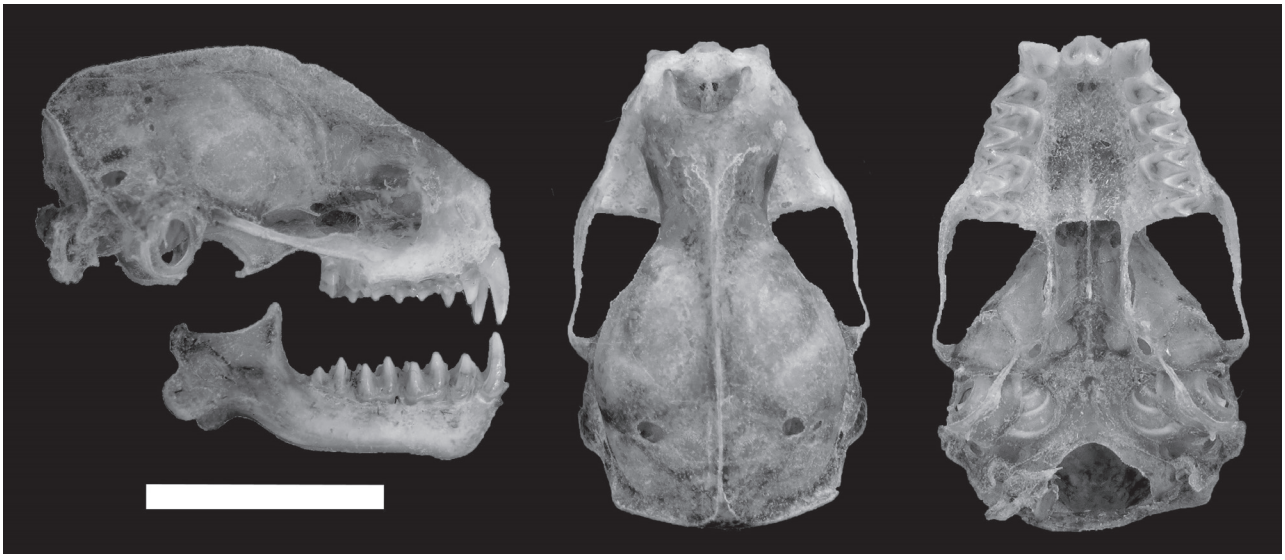

Figure 2. Dorsal, ventral and lateral views of the skull and lateral view of the mandible (Scale bar = 10 mm) of *Molossus rufus* from Ibura National Forest, Nossa Senhora do Socorro, Sergipe, Brazil.
Figura 2. Vista dorsal, ventral e lateral do crânio e vista lateral da mandíbula (Barra = 10mm) de *Molossus rufus* da Floresta Nacional Ibura, Nossa Senhora do Socorro, Sergipe, Brasil.

a digital caliper (0.2 mm): forearm length (48.1), body length (76.0), tail length (40.2), hind foot length (7.5), ear (12.0), greatest length of the skull (20.8), condylobasal length (19.2), breadth of braincase (10.5), post-orbital constriction (4.5), breadth across upper molars (10.4), breadth across upper canines (5.5), length of mandible (14.7) and length of maxillary tooth row (8.4). After recording the basic external and cranial measurements, the specimens were deposited in the zoological collection of Universidade Federal de Sergipe (voucher number: LBC 46), São Cristóvão, state of Sergipe, Brazil.

Molossus rufus can be distinguished from its congeners by the presence of an anterior sagittal crest well developed (Figure 2), short and spatulate upper incisors, with fully convergent apexes, and body size larger than the other species, forearm averaging 50.9 mm in males (48.5–54 mm), 50.3 mm in females (47–53 mm); condylobasal length averaging 20.8 mm in males (20–21.6 mm), 19.8 mm in females (19.1–20.6 mm) (Gregorin and Taddei, 2002; Fabian and Gregrorin, 2007; Eger, 2008).

The records of *M. rufus* are distributed throughout the different ecoregions, however, only four of the 91 records were made in the Caatinga, with few other records in savanna areas (Figure 1). Similarly to other members of the genus, *M. rufus* presents gregarious and synanthropic habits, being commonly found on roofs and linings, as already proposed by Esbérard *et al*. (1999), usually cohabiting with other species, such as *M. molossus* and *Phyllostomus hastatus* (Pallas 1767) (Costa *et al.,* 2010). Although they are generally infrequent in inventories with mist nets (as in this case), its colonies can reach more than 400 individuals (Marques, 1986; Esbérard, 2011). Here, the lactating record at the beginning of the rainy season suggests that pregnancy may occur in the dry season. However, in monitoring studies, other authors suggest non-seasonal reproductive pattern for *M. rufus* (Marques, 1986; Esbérard, 2002). Nonetheless, the absence of records throughout the year makes it difficult to affirm any breeding pattern at the present field site.

This is the first record of *M. rufus* for the state of Sergipe. Until this moment, *M. rufus* is the third species of molossid registered in this state. Similarly to the other two species, *Molossus molossus* e *Cynomops planirostris* (Peters, 1865), *M. rufus* was recorded in human buildings (Rocha *et al*., 2010). Due to the recognized inefficiency of mist nets (randomly arranged at ground level) in the sampling of molossids (Simmons and Voss, 1998), the search for and monitoring of the shelters are the most recommended strategies for obtaining robust information about the natural history of these bats.

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