



First record of *Molossops neglectus* Williams & Genoways, 1980 (Chiroptera, Molossidae) from the state of Santa Catarina, southern Brazil

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Abstract

Herein we describe the first records of *Molossops neglectus* for the state of Santa Catarina, Brazil. The records are based on 3 specimens captured in the municipalities of Chapecó and São Domingos, in the western portion of the state. Considering that *M. neglectus* is an infrequent species in field surveys, new data on its geographical range is important to better understand the biology and ecology of *M. neglectus*.

Key words

Distribution; new record; bats of Santa Catarina; geographical range; Seasonal Forest.

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Introduction

The genus *Molossops* Peters, 1865 is endemic to South America and includes *Molossops temminckii* (Burmeister, 1854) and *Molossops neglectus* Williams and Genoways 1980 (Eger 2008, Díaz et al. 2016), both occurring in Brazil (Nogueira et al. 2014). Despite its wide distribution, the taxonomy of this genus is still controversial and requires extensive review (Gregorin et al. 2004).

Molossops neglectus is the largest species of the genus, with total body length of 75–88 mm, body mass of 10–12 g, and forearm ranging from 27.8–38 mm (Fabián and Gregorin 2007, Díaz et al. 2016). This species ranges from Guiana, Suriname, Peru, southeastern Colombia, to northern Argentina and Brazil (Eger 2008).

Therefore, its distribution covers 3 large geographic areas: the Guyana region, including populations from Belém, northern of Brazil, southeastern South America, including southeast Brazil and northeast Argentina, and western South America, covering Peru and southern Colombia (Lim and Engstrom 2001, Eger 2008). Morphological variations among populations of these 3 areas have been recorded (Gregorin et al. 2004). In Brazil, the species has been recorded from the states of Amazonas, Pará, Paraná, Rio Grande do Sul, Rio de Janeiro, and São Paulo, and is unknown from the dry areas of Cerrado, Caatinga, and Pantanal (Peracchi et al. 2011). Despite its wide distribution, which covers the north, southeast, and south regions of Brazil, *M. neglectus* records are restricted to a few

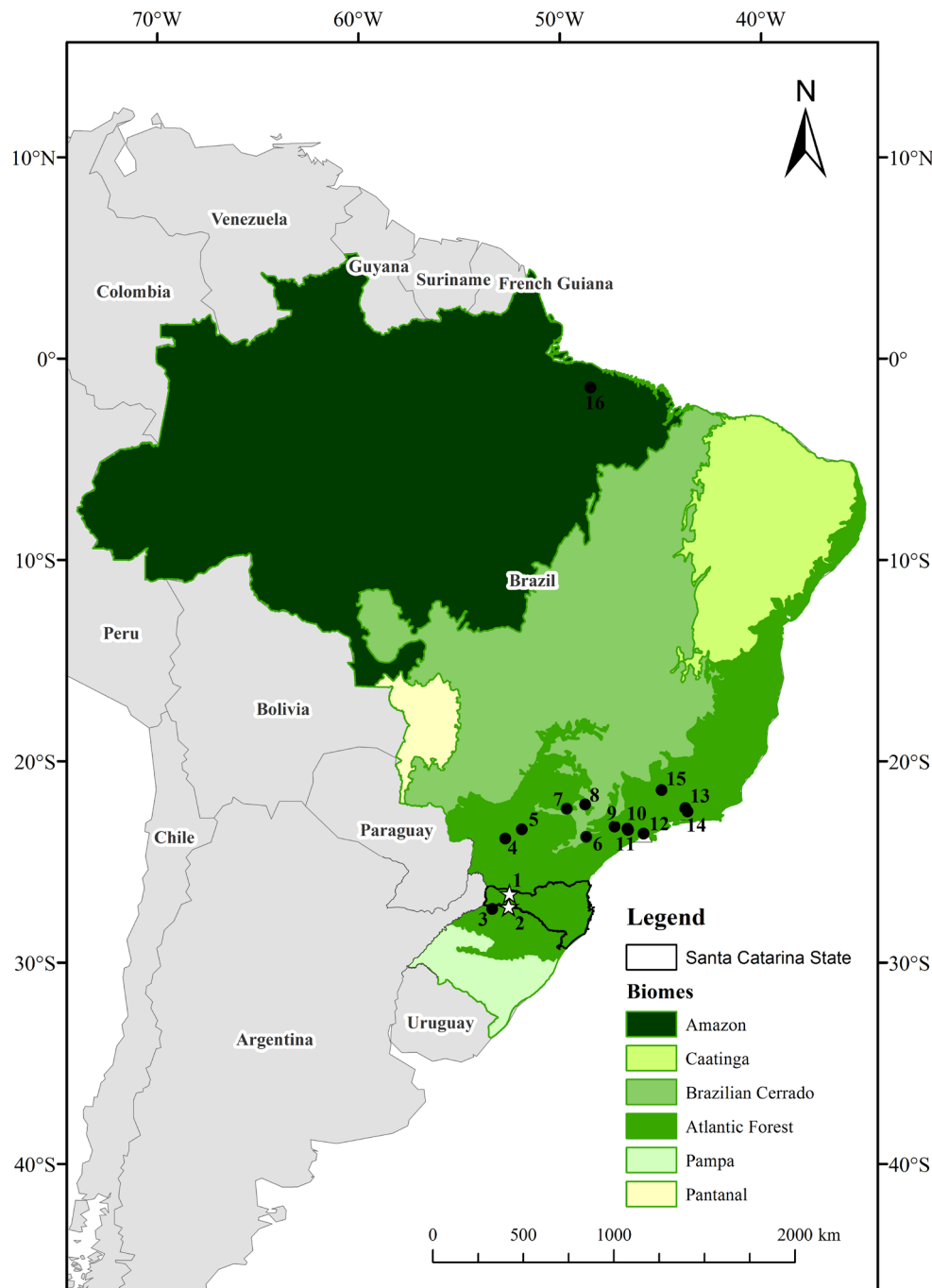


Figure 1. Distribution map of *Molossops neglectus* in Brazil based on literature review (black dot). For author list, consult Table 2 and records reported herein (star).

localities (Freitas et al. 2011).

Data on the biology and ecology of *M. neglectus* are scarce rendering the species being classified as Insufficient by the International Union for Conservation of Nature (IUCN) (Barquez and Díaz 2016). The species is often recorded in ombrophylous and semideciduous forests (Fabián and Gregorin 2007), at different levels of conservation, including urban areas (Lim and Engstrom 2001, Pedro et al. 2001, Barquez et al. 2011, Chaves et al. 2012, Gazarini and Pedro 2013). It is an aerial insectivore as all other species of Molossidae (Fabián and Gregorin 2007). Data collected from southern Brazil indicate that the reproductive period of this species probably occurs

between spring and summer (Bernardi et al. 2007, Gazarini and Bernardi 2007). The present study aimed to report the first record of *Molossops neglectus* for the state of Santa Catarina, southern Brazil, in order to increase the knowledge of this infrequent molossid species.

Methods

The records reported here were obtained during bat samplings in 2 areas in the western portion of Santa Catarina, southern Brazil (Fig. 1). Area I is located in the municipality of Chapecó [27°14'28" S, 052°35'15" W, 279 m above sea level (a.s.l.)], near the confluence of

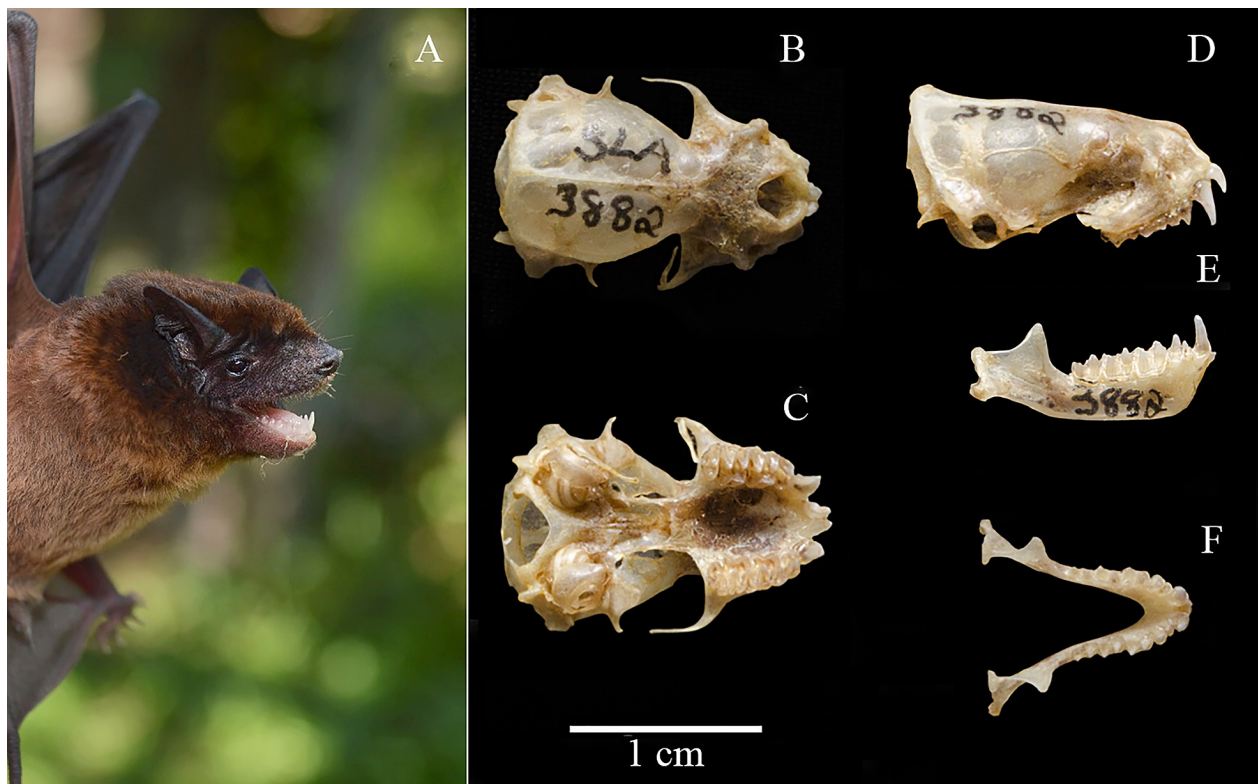


Figure 2. Specimen of *Molossops neglectus* captured in the west of the state of Santa Catarina. **A.** General aspect of the individual registered for municipality of São Domingos (SLA3882♂). **B.** Dorsal view of the skull. **C.** Ventral view of the skull. **D.** Lateral view of the skull. **E:** Lateral view of the mandible. **F.** Occlusal view of the mandible.

the Monte Alegre and Uruguay rivers, and was originally covered by Deciduous Seasonal Forest (IBGE 2012). Area II is located approximately 70 km north of Area I, on the bank of the Chapecó River, tributary of Uruguay River in the municipality of São Domingos (26°35'47" S, 052°32'45" W, 615 m a.s.l.) and was originally covered by the Araucaria Pine Forest (IBGE 2012). The land use and cover matrix around the fragments sampled includes crop fields, small native forest fragments, and artificial ponds. The predominant climate in both areas is Cfa, which is characterized as humid subtropical with hot summers and no dry season, according to Köppen classification (Alvares et al. 2013).

Mist nets were installed at ground level in trails, vegetation borders, forest gaps, and closed forest in the both areas to capture bats. In Area I, sampling was carried out during 4 nights with 5 nets each (1 of 18 × 3 m, 2 of 12 × 3 m, and 2 of 7 × 2.5 m) opened for 6 hours after twilight, resulting in an sampling effort of 1,968 m²/h. The legal authorization to capture bats were issued by Fundação do Meio Ambiente (FATMA) under the license numbers 113/2007 and 046/2009. In Area II, sampling was carried out during 3 nights with three 12 × 3 m mist nets opened for 5 hours after twilight, resulting in a sampling effort of 1,620 m²/h. The authorization to captured bats was issued by FATMA under the license number 055/2013. All ethical procedures in mammal research were performed according Sikes et al. (2016).

Seven morphological measurements were obtained with a digital caliper (Table 1): FAL = forearm length,

GLS = total skull length, LCI = condyle-incisive length, BBC = breadth of braincase, BUM = breadth across upper molars, LMT = maxillary tooththrow length, LMA = length of mandible. All measurements followed the protocol described by Gregorin et al. (2004). Voucher specimens preserved in alcohol 70° and tissue were deposited in the Zoological Collection of the Universidade Regional de Blumenau (CZFURB).

Results

New records. Three individuals of *Molossops neglectus* were captured in the northern region of Santa Catarina state. They were collected, measured (Table 1), and deposited into the collection of CZFURB. The first 2 individuals captured in Area I were adult males, captured on 23 January 2008 (CZFURB-SLA2444) and 28 January 2010 (CZFURB-SLA2517). The specimen recorded in Area II was an adult male captured on 5 November 2013 (CZFURB-SLA3882; Fig. 2).

Identification. The identification of our specimens followed Gregorin and Taddei (2002), Eger (2008), and Díaz et al. (2016). The diagnostic characters were: (1) forearm between 33.7 and 38.5 mm, (2) total skull length between 15.4 and 16.8 mm, (3) Condyle-incisive length of males between 16.7 and 18.2 mm, (4) postorbital constriction greater than 4.5 mm, and (5) reddish dorsal pelage coloration.

Table 1. Morphological measurements of *Molossops neglectus* obtained from 3 specimens captured in Santa Catarina, southern Brazil and data available in literature, being: FAL = forearm length; GLS = total skull length; LCI = condyle-incisive length; BBC = breadth of braincase; BUM = breadth across upper molars; LMT = maxillary toothrow length; LMA = length of mandible.

Characters	This study	Bernardi et al. (2007)		Lim and Engstrom (2001)		Gregorin et al. (2004)		Gregorin & Loureiro (2011)	Gimenéz & Giannini (2016)
	♂ (N = 3)	♂ (N = 1)	♀ (N = 2)	♂ (N = 3)	♀ (N = 7)	♂ (N = 12)	♀ (N = 8)	♀ (N = 2)	♀ (N = 1)
FAL	36.9–38.0	37.1	37.1–38.1	38.0–40.0	36.0–39.0	28.6–36.9	29.3–36	34.9–36.5	-
GLS	15.5–15.7	16.5	15.5–15.7	18.6–19.8	16.7–17.9	13.5–16.6	13.8–15.5	15.1–15.2	-
LCI	14.8–14.9	16.2	15.3–15.4	17.0–18.2	15.7–16.8	13.2–15.6	13.3–14.8	14.2–14.7	14.2
BBC	8.0–8.1	8.3	8.1–8.4	8.4–8.6	8.0–8.4	7.1–8.2	6.8–8.2	7.9–8.5	8.8
BUM	6.9–7.4	7.6	7.1–7.3	7.9–8.4	7.5–8.0	6.4–7.4	7.2	7.3–7.4	7.1
LMT	6.14–6.43	6.6	6.2	6.9–7.3	6.4–6.8	5.0–6.1	5.0–5.9	6.1–6.3	6.0
LMA	11.6–12.2	11.3	10.5–10.6	12.5–13.2	11.5–12.5	9.1–12.7	9.2–12	11.6–11.7	10.9

Discussion

Molossops neglectus has not been formally recorded for the state of Santa Catarina until now (Marinho-Filho 1996, Pacheco et al. 2007, Passos et al. 2010), although it was listed as probably occurring there (Cherem et al. 2004). This hypothesis was reinforced by records located 73 km from Area I in Frederico Westphalen, Rio Grande do Sul state (Bernardi et al. 2007), and 141 km from Area II in Maringá, Paraná state (Gazarini and Bernardi 2007). Thus, our data confirms the occurrence of *M. neglectus* in the western portion of Santa Catarina and represent the first record of this species from the state.

Within its area of occurrence, *M. neglectus* has been collected at few localities (Table 2) and it is characteristically infrequent in field surveys (Barquez et al. 2011). Moreover, few individuals were captured in all studies (e.g. Pedro et al. 2001, Bernardi et al. 2007, Freitas et al. 2011, Chaves et al. 2012, Silva et al. 2013, Loureiro and Gregorin 2015), and individuals were usually associated with gaps and border areas in the forest understory. However, *M. neglectus* is also captured in the canopy (Fenton 1970, Lim and Engstrom 2001), which suggests a broad use of the vertical space.

Bats belonging to the family Molossidae frequently present fast flight, low maneuverability (Norberg and

Rayner 1987), and are adapted to habitats with little or no obstruction (Kalko 1998). However, *M. temminckii* and *M. neglectus* have shorter and broader wings compared to other molossids, which favors a slower and more maneuverable flight (Smith and Starrett 1979, Freeman 1981, Norberg and Rayner 1987). These characteristics allow both of these species to forage in habitats with moderate level of vegetation obstruction (Guillén-Servent and Ibáñez 2007, Jung and Kalko 2014).

The 3 records that we report were obtained in open formations within the Atlantic Forest floristic domain (deciduous seasonal and Araucaria Pine forests), an environment similar to that found in most places where *M. neglectus* is known (e.g. Bernardi et al. 2007, Freitas et al. 2011, Gazarini and Pedro 2013, Silva et al. 2013, Loureiro and Gregorin 2015). Because deciduous seasonal and Araucaria Pine forest cover large extensions in the southern region of Brazil (Vibrans et al. 2010, Vibrans et al. 2013), it is possible that the distribution of *M. neglectus* is even larger in this region (Passos et al. 2010).

All the morphological measurements obtained from the 3 specimens from Santa Catarina are within the range of variation reported for the species in other localities (Table 1). *Molossops neglectus* has disjunct distribution throughout its range (Lim and Engstrom 2001), and morphological variations are described between popula-

Table 2. Locality records of *Molossops neglectus* in Brazil. The code number refers to the points shown in Figure 1.

Code	Latitude (S)	Longitude (W)	State	Locality	Reference
1	27°14'00"	052°35'00"	Santa Catarina	Chapecó	This study
2	26°35'00"	052°32'00"	Santa Catarina	São Domingos	This study
3	27°21'00"	053°23'00"	Rio Grande do Sul	Frederico Westphalen	Bernardi et al. (2007)
4	23°52'52"	052°44'08"	Paraná	Reserva Biológica Peróbas	Silva et al. (2013)
5	23°25'00"	051°55'00"	Paraná	Maringá	Gazarini and Bernardi (2007)
6	23°17'00"	047°18'00"	São Paulo	Itú	Gregorin et al. (2004)
7	23°47'00"	048°35'00"	São Paulo	Buri	Garbino (2016)
8	22°11'00"	048°46'00"	São Paulo	Boracéia	Garbino (2016)
9	23°27'00"	046°38'00"	São Paulo	Parque Estadual da Cantareira	Garbino (2016)
10	23°23'00"	046°28'00"	São Paulo	Guarulhos	Chaves et al. (2012)
11	22°23'00"	049°40'00"	São Paulo	Estação Ecológica Caetetus	Gregorin et al. (2004)
12	23°38'00"	045°52'00"	São Paulo	Salesópolis	Gregorin et al. (2004)
13	22°22'00"	043°47'00"	Rio de Janeiro	Engenheiro Paulo de Frontin	Freitas et al. (2011)
14	22°32'00"	043°41'00"	Rio de Janeiro	Paulo de Frontin	Gregorin et al. (2004)
15	21°28'00"	044°98'00"	Minas Gerais	Serra do Carrapato	Loureiro and Gregorin (2015)
16	01°27'00"	048°29'00"	Pará	Belém	Ascorra et al. (1991)

tions. Barquez et al. (2011) suggested that the Argentine population represents a subspecies distinct from the Suriname population, which includes the type locality of this species. In Brazil, morphological variation was also reported, with individuals in the northern portion being larger than those recorded in southeastern Brazil, which suggests the occurrence of 2 allopatric species (Gregorin et al. 2004). Unfortunately, there are few specimens deposited in collections (Freitas et al. 2011), making a thorough review of this taxon a difficult task.

In the last decade, knowledge of the bat fauna in the Santa Catarina state has much improved with more intensive sampling in poorly studied areas and in different forest strata (Carvalho et al. 2009, 2013, Cherem and Althoff 2015), resulting in newly recorded species occurrence being recorded (Miranda et al. 2007, Carvalho and Fabián 2011, Althoff et al. 2017, Carvalho et al. 2017). This demonstrates that as new areas are sampled and as the sampling effort is increased, new species are recorded in the state even in areas where samplings have already been carried out.

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Authors' Contributions

SLA, JPG and AS collected the data; SLA and AS identified the specimens; and SLA, FC, and BFL wrote the text.

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