

**Updated distribution of the genus *Saccopteryx* Illiger, 1811
(Chiroptera: Emballonuridae) in Bolivia, and first record of
Saccopteryx canescens Thomas, 1901 in Paraguay**

**Actualización de la distribución del género *Saccopteryx* Illiger, 1811 (Chiroptera:
Emballonuridae) en Bolivia, y primer registro de *Saccopteryx canescens* Thomas,
1901 en Paraguay**

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Abstract: The genus *Saccopteryx* comprises five species across the Neotropics, two of them with restricted distribution. We present an updated assessment of the distribution and taxonomy of the three *Saccopteryx* species occurring in Bolivia: *S. bilineata*, *S. leptura*, and *S. canescens*. Nearly 100 voucher specimens support their presence, most collected between 1914 and 1993, with new records obtained between 2003 and 2022. In South America, *Saccopteryx bilineata*, the largest and most distinctive species, is widely distributed in the Amazon and Cerrado regions, while *S. leptura* and *S. canescens* exhibit overlapping external and craniodental measurements, particularly in southeastern Brazil, northern Bolivia, and Paraguay. We confirm the presence of *S. canescens* in northern Bolivia and Paraguay, extending its known range southward to the Pantanal. In contrast, *S. leptura* is removed from Pando Department but newly confirmed in Cochabamba Department. Morphological analyses indicate that pelage coloration and breadth across molars are the most reliable diagnostic traits distinguishing *S. canescens* and *S. leptura*. We also highlight potential misidentifications in Brazilian material and emphasize the need to re-examine key specimens from Minas Gerais. The rarity of captures and lack of natural history data in southern populations underline the importance of integrating morphological and molecular evidence to clarify interspecific boundaries and biogeographic patterns of *Saccopteryx* in the southern Neotropics.

Key words: Bats, Mammalia, Neotropics, Southern Cone.

Resumen: El género *Saccopteryx* está compuesto por cinco especies, dos de ellas con distribución restringida en el Neotrópico. Presentamos una evaluación actualizada de la distribución y la taxonomía de las tres especies de *Saccopteryx* que ocurren en Bolivia: *S. bilineata*, *S. leptura* y *S. canescens*. Casi 100 especímenes de referencia respaldan su presencia, la mayoría recolectados entre 1914 y 1993, con nuevos registros obtenidos entre 2003 y 2022. En Sudamérica, *Saccopteryx bilineata*, la especie más grande y

distintiva, está ampliamente distribuida en las regiones Amazónica y el Cerrado, mientras que *S. leptura* y *S. canescens* presentan medidas externas y cráneo-dentales superpuestas, particularmente en el sureste de Brasil, el norte de Bolivia y Paraguay. Confirmamos la presencia de *S. canescens* en el norte de Bolivia y Paraguay, extendiendo su rango conocido hacia el sur hasta el Pantanal. En contraste, *S. leptura* se elimina del Departamento de Pando, pero se confirma por primera vez en el Departamento de Cochabamba. Los análisis morfológicos indicaron que la coloración del pelaje y el ancho a nivel de los molares son los rasgos diagnósticos más confiables para distinguir *S. canescens* y *S. leptura*. También destacamos posibles errores de identificación en material brasileño y subrayamos la necesidad de reexaminar especímenes clave de Minas Gerais. La rareza de las capturas y la falta de datos sobre la historia natural en las poblaciones del sur resaltan la importancia de integrar evidencias morfológicas y moleculares para aclarar los límites interespecíficos y los patrones biogeográficos de *Saccopteryx* en el Neotrópico austral.

Palabras clave: Cono Sur, Mammalia, murciélagos, Neotrópico.

INTRODUCTION

Neotropical sac-winged bats of the genus *Saccopteryx* Illiger, 1811 (Emballonuridae) are represented by five species: the Antioquian Sac-winged Bat, *S. antioquensis* Muñoz & Cuartas, 2001; the Greater Sac-winged Bat, *S. bilineata* (Temminck, 1838); the Frosted Sac-winged Bat, *S. canescens* Thomas, 1901; the Amazonian Sac-winged Bat, *S. gymnura* Thomas, 1901; and the Lesser Sac-winged Bat, *S. leptura* (Schreber, 1774) (Hood & Gardner 2008, Díaz *et al.* 2021). Among these, *S. gymnura* is distributed across northern South America and the northern Brazilian Amazon, while *S. antioquensis* is endemic to the humid and riparian forests of the Department of Antioquia, Colombia (Bonaccorso 2019). *Saccopteryx bilineata* and *S. leptura* have a wide distribution, from central and southern Mexico, respectively, to southeastern Brazil, including central and northeastern Bolivia and Paraguay (Anderson 1997, Owen *et al.* 2014, Bonaccorso 2019). In contrast, *S. canescens* has a more limited range, occurring from northern South America, including Venezuela, the Guianas, eastern Colombia and Peru, northwestern Brazil, and east-central Bolivia (Emmons 1998, Emmons *et al.* 2006, Bonaccorso 2019).

At the regional level, several authors (e.g., Sanborn 1937, Husson 1962, Davis 1976, Brosset & Charles-Dominique 1990, Hood & Gardner 2008) provided descriptions and measurements for *S. bilineata*, *S. canescens*, and *S. leptura*, showing that size and pelage morphology (particularly coloration) are useful diagnostic traits. *Saccopteryx bilineata* is the largest species, with a forearm (FA) length greater than 44 mm, and uniformly brown dorsal fur with two prominent white lines. *S. leptura* is intermediate in size (FA: 37–44 mm), and slightly overlaps with the smaller *S. canescens* (FA: 34–41 mm) which is frosted gray with faint dorsal lines. In these cases, breadth across upper molars and maxillary toothrow length are useful variables for identification.

In Bolivia, this genus is represented by *S. bilineata*, *S. canescens*, and *S. leptura* (Anderson 1997, Emmons 1998, Aguirre *et al.* 2019). Among them, *S. canescens* has the most restricted distribution, previously known only from Noel Kempff Mercado

National Park, Santa Cruz Department (Emmons 1998, Emmons *et al.* 2006). In Paraguay, of the 59 bat species currently recognized, one belongs to this genus, *Saccopteryx leptura* (Smith *et al.* 2024) from a single voucher specimen deposited in the Museo de Historia Natural del Paraguay. Here, by examining *Saccopteryx* specimens from regional biological collections, we report a second locality for *S. canescens* in northern Bolivia and the first one for Paraguay, which represents the southernmost record of the species in the region. In addition, we discuss the presence of *S. leptura* in Paraguay and provide new locality records and updated distributions for of *S. bilineata* and *S. leptura* in Bolivia.

MATERIAL AND METHODS

We examined 36 specimens of *Saccopteryx* bats from Bolivia, Colombia, and Paraguay (Appendix) deposited in biological collections: Museo Noel Kempff Mercado (MNKM), Santa Cruz, Bolivia; Colección Boliviana de Fauna (CBF), La Paz, Bolivia; Museo de Historia Natural del Paraguay (MNHNP), San Lorenzo, Paraguay; Colección de Mamíferos, Museo de Historia Natural de la Universidad de Caldas (MHN-UCa-M), Caldas, Colombia; and the American Museum of Natural History (AMNH), New York, USA. For each specimen, we recorded from the label and the collection catalog the number, locality, sex and geographic coordinates. We identified all examined specimens as bats of the family Emballonuridae: *Saccopteryx*, based on presence of wing sacs, absence of scattered whitish hairs on the forearm, presence of two whitish dorsal lines, a simple anterior premolar and basisphenoid pits separated by a septum (Hood & Gardner 2008, Díaz *et al.* 2021).

Furthermore, for species identification, we took the length of the forearm (FA) and nine craniodental measurements using a caliper to the nearest 0.01 mm: greatest length of skull (GLS), condylocanine length (CCL), postorbital breadth (PB), zygomatic breadth (ZB), mastoid breadth (MB), braincase breadth (BB), maxillary toothrow length (MTL), breadth across upper molars (BAM), and breadth across upper canines (BAC) (Barquez *et al.* 1999). For each specimen, along with those reported by Emmons (1998), Anderson (1997) and Owen *et al.* (2014) for the genus *Saccopteryx* in Bolivia and Paraguay, we georeferenced the localities and generated a distribution map for each species. Additionally, we focused on two craniodental measurements commonly used to distinguish *Saccopteryx leptura* from *S. canescens* in South America: BAM and MTL (Davis 1976). These data were plotted on a coordinate axis, with their respective values represented on the X and Y axes.

RESULTS

In total, we identified 36 specimens of the genus *Saccopteryx*: five specimens of *S. canescens* (two from Bolivia, one from Paraguay, and two from Colombia for additional comparisons), 20 *S. bilineata* (all from Bolivia), and 11 *S. leptura* (five from Bolivia, and six from Colombia for additional comparisons). The examined specimens from Bolivia and Paraguay that were identified as *S. canescens* and *S. leptura* match all diagnostic traits characteristic of each species (Figure 1, Table 1). Characters used for identification are described for each species below.

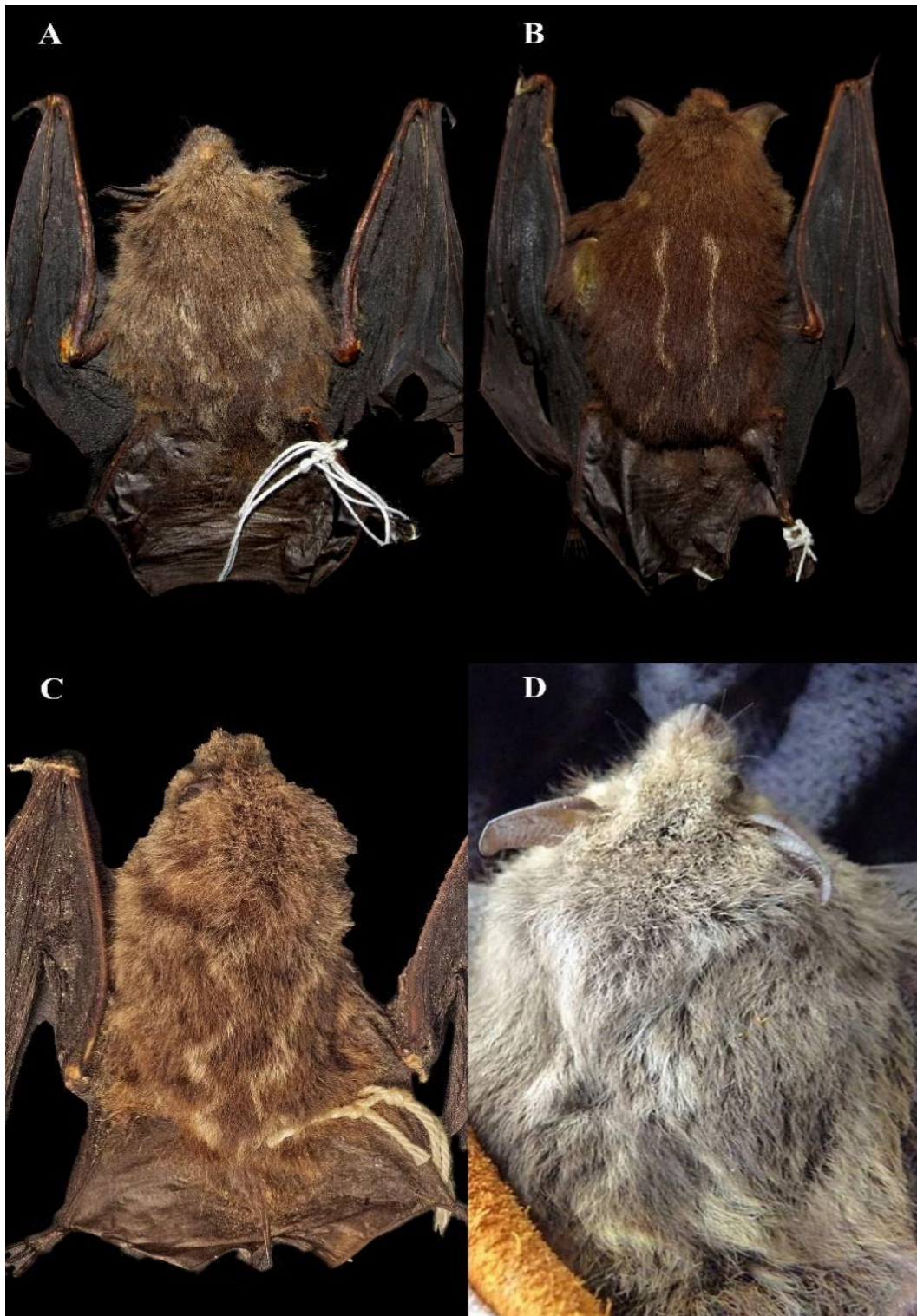


Figure 1. Skins of *Saccopteryx* bats from Bolivia (A, B, and C) and skin of a live specimen of Paraguay (D). A corresponds to *S. canescens* (MNKM 1910) and B to *S. leptura* (MNKM 1908), both from the Department of Santa Cruz. C and D correspond to *S. canescens* from the Department of Pando, Bolivia (AMNH 262418), and from the Republic of Paraguay (MNHNP 3372), respectively.

Table 1. Forearm length and nine craniodental measurements of *Saccopteryx* specimens from Bolivia and Colombia. The mean and minimum–maximum range are shown in **bold** for each species. Sanborn (1937) and Owen *et al.* (2014) are referenced for specimens listed as FMNH* (Field Museum of Natural History, Chicago, USA) and MNHNP*, respectively.

SPECIMEN	COUNTRY	SEX	FA	GLS	CCL	PB	ZB	MB	BBC	MTL	BAM	BAC
<i>Saccopteryx bilineata</i>			49.8	16.9	15.4	3.0	10.9	8.9	8.3	7.0	7.5	4.2
			46.5-	16.2-	14.9-	2.7-	9.9-	8.1-	8.0-	6.6-	7.1-	3.7-
			54.1	17.7	15.9	3.7	11.3	9.9	8.9	7.6	7.9	5.6
CBF 0025	Bolivia	♀	52.0	17.7	15.9	3.0	9.9	8.9	8.4	7.4	7.6	3.7
CBF 0026	Bolivia	♀	51.0	16.4	14.9	2.7	10.7	8.1	8.1		7.3	5.6
CBF 0027	Bolivia	♂	48.0	16.6	15.2	2.8	11.0	8.5	8.3	6.7	7.7	4.3
AMNH 209218	Bolivia	♀	48.3	16.8	15.2	2.9	10.7	8.7	8.1	6.9	7.4	3.9
AMNH 209219	Bolivia	♂	46.5	16.8	15.4	2.7	10.8	8.9	8.0	7.1	7.4	3.9
AMNH 209220	Bolivia	♀	47.9	17.1	15.6	3.3		9.1	8.3	7.0	7.5	4.0
AMNH 210459	Bolivia	♂	47.6			3.7	11.2	8.9	8.4	7.1	7.4	4.2
AMNH 210460	Bolivia	♀		17.5	15.9	2.9	11.2	9.2	8.4	7.3	7.6	4.1
AMNH 210461	Bolivia	♀	51.2	16.2	15.5	3.1	11.3	9.1	8.3	6.9	7.7	3.9
AMNH 210483	Bolivia	♀		16.5		2.9	10.8	8.8	8.2	6.8	7.5	4.2
AMNH 210484	Bolivia	♂	48.0	16.6	14.9	2.8	10.5	8.7	8.1	6.6	7.1	4.0
AMNH 210485	Bolivia	♀	49.5	16.7	15.3	2.9	10.8	8.9	8.2	6.8	7.5	4.3
AMNH 255875	Bolivia	♀	49.3	16.9	15.1	3.0	10.8	8.7	8.1	6.7	7.4	3.9
AMNH 210503	Bolivia	♂		17.0	15.6	2.9	10.9	8.9	8.6	6.9	7.6	4.0
AMNH 262419	Bolivia	♂	46.9	17.1	15.3	3.4	10.8	8.7	8.9	6.9	7.3	3.9
MNKM 3428	Bolivia	♀	52.5	16.7	15.7	3.1	11.2	9.2	8.4	7.6	7.9	4.3
MNKM 3429	Bolivia	♀	48.0	17.0	15.3	3.4	11.0	9.0	8.3	7.2	7.3	4.3
MNKM 3664	Bolivia	♀	54.1	17.6	15.7	2.8	11.0	9.9	8.1	7.1	7.6	4.2
MNKM 5894	Bolivia	♀	52.0									
MNKM 5895	Bolivia	♂	52.2									
FMNH 21474*	Bolivia	♀	50.5							7.2		
<i>Saccopteryx canescens</i>			38.9	12.9	11.3	2.6	8.1	7	6.6	4.9	5.5	2.9
			35.0-	12.1-	9.81-	2.4-	7.7-	6.1-	6.1-	4.6-	5.3-	2.6-
			43.0	14.0	12.4	2.9	8.4	7.6	6.9	5.3	5.6	3.1
MNKM 1910	Bolivia	♀	41.8	13.7	12.3	2.7		7.3	6.9	5.3	5.5	3.1
AMNH 262418	Bolivia	♀	39.1	12.8	12.4	2.9	8.3	7.2	6.7	5.2	5.6	3.0
MNHNP 3372*	Paraguay	•	43.0	14.0		2.5		7.6	6.8	5.2	5.4	3.0
MHN-UCa-M	Colombia	♂	35.0	12.05	10.9	2.4	8.4	6.6	6.5	4.6	5.6	2.6
MHN-UCa-M	Colombia	♂	35.9	12.26	9.81	2.4	7.7	6.4	6.1	4.6	5.3	2.7
<i>Saccopteryx leptura</i>			41.6	14.2	12.7	2.5	9.1	7.6	6.9	5.4	6.3	3.3
			37.3-	13.0-	11.9-	2.1-	8.5-	7.0-	6.7-	5.0-	5.9-	3.0-
			44.9	15.1	13.5	2.8	9.7	8.6	7.3	5.9	6.5	3.5
AMNH 210513	Bolivia	♂	41.5			2.6	8.9			5.4	6.3	3.5
AMNH 210514	Bolivia	♀	41.0	15.1	13.5	2.7	9.7	7.7	7.3	5.7	6.5	3.5
AMNH 264926	Bolivia	♀	44.0	14.2	12.9	2.4	9.7	7.8	7.2	5.5	6.2	3.4
MNKM 1908	Bolivia	♀	44.9	14.8	13.4	2.1	9.3	7.8	7.2	5.6	6.4	3.3
MNKM 3325	Bolivia	♀	43.7	14.9	13.4	2.5	9.3	8.6	6.9	5.9	6.5	3.5
MHN-UCa-M	Colombia	♂	39.0	13.4	12.2	2.7	8.6	7.0	6.7	5.0	6.1	3.2
MHN-UCa-M	Colombia	♀	41.5	13.9	12.3	2.3	8.5	7.1	7.1	5.3	6.1	3.3
MHN-UCa-M	Colombia	♀	39.9	13.0	11.9	2.3	8.9	7.2	6.8	5.3	6.5	3.2
MHN-UCa-M	Colombia	♂	37.3	13.9	12.0	2.8	8.7	7.2	6.9	5.3	5.9	3.0
MHN-UCa-M	Colombia	♀	41.9	14.5	13.0	2.6		7.6	6.9	5.6	6.4	3.3
MHN-UCa-M	Colombia	♀	42.6	13.9	12.3				6.9	5.3	6.4	

Saccopteryx canescens Thomas, 1901

Identification. The Frosted Sac-winged Bat, *S. canescens*, is a medium-sized species (FA: 34.2–41.7 mm; BAM: 5.1–5.6 mm). It has a frosted, grayish, or ashy-brown dorsal

pelage with two faint but distinct whitish dorsal lines. Although *S. gymnura* may or may not exhibit these lines, its smaller size (FA: 33–35.5 mm; BAM: 3.0–5.1 mm) clearly distinguishes it from *S. canescens* (Thomas 1901, Simmons & Voss 1998). In contrast, *S. antioquiensis* differs by its dark brown dorsal fur lacking white dorsal lines (Muñoz & Cuartas 2001), while *S. bilineata* is identified by its larger size, with FA > 44 mm (Anderson 1997). Therefore, *S. canescens* most closely resembles *S. leptura*, but can be unambiguously distinguished by the following morphological characters: frosted or grayish pelage giving an overall ashy appearance (vs. uniformly brown fur); two faint whitish longitudinal dorsal lines (vs. two well-defined white lines extending along the entire back); and breadth across upper molars < 5.6 mm (vs. > 5.6 mm), which is generally the most reliable measurement for separating the two species. In addition, *S. canescens* tends to be smaller than *S. leptura* in all other craniodental and external dimensions (Thomas 1901, Sanborn 1937, Davis 1976) (Table 1).

The coordinate plot of the BAM and MTL variables (Figure 2), shows the two species clearly differentiated by size without any overlap, as the specimens from northern Bolivia (AMNH 262418) and Paraguay (MNHNP 3372) clustered with other *S. canescens* specimens from the region, thus supporting their identification. The plot also shows that the *S. canescens* specimens from Bolivia and Paraguay were larger than those from northern South America and Peru (Table 2), and that in a similar pattern, specimens of *S. leptura* from Bolivia tended to be larger than those from northern South America, Peru, northern Brazil, and some southeastern Brazilian states (São Paulo and Minas Gerais). However, specimens from nearby Brazilian states such as Rio de Janeiro and Espírito Santo were similar in size to those from Bolivia (Table 2).

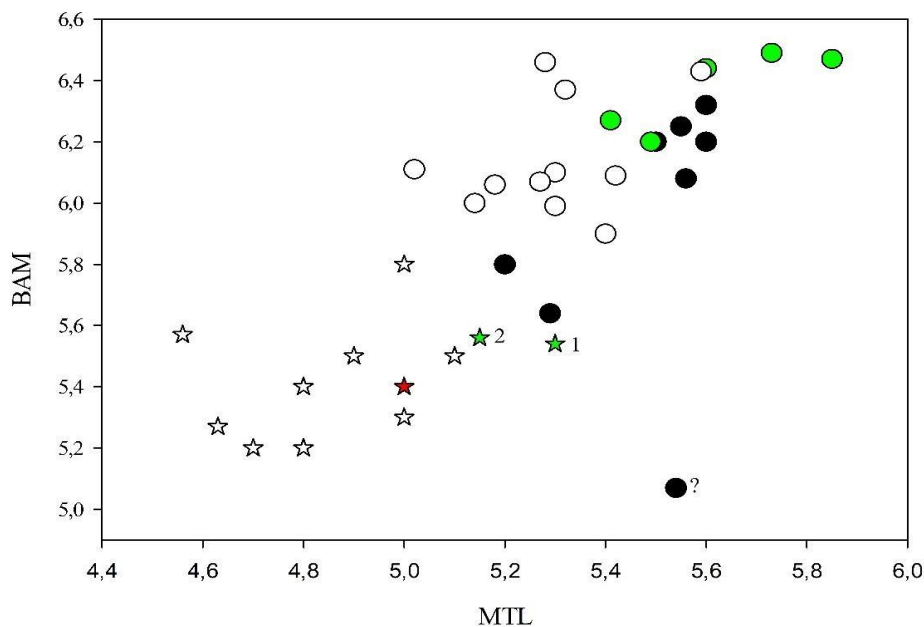


Figure 2. Scatter plot of *Saccopteryx canescens* (stars) and *S. leptura* (circles) showing the correlation between breadth across molars (BAM) and maxillary tooththrow length (MTL). Green symbols represent specimens from Bolivia; black circles indicate southeastern Brazil; white circles and stars correspond to northern South America (see Table 2). Red star: northern Paraguay (MNHNP 3372). Green stars 1: MNKM 1910; 2: AMNH 262418. Question mark (?) denotes a doubtful record from southeastern Brazil (see discussion).

Table 2. External and craniodental measurements [mean, (range), n] of *Saccolpteryx canescens* and *S. leptura* from South America reported in the literature and in our study.

Locality	FA	GLS	CCL	ZB	BBC	MTL	BAM
<i>S. canescens</i>							
N South America ¹	37.4 (34.2-41.0) 70	12.7 (11.8-14.5) 61	11.1 (9.82-11.8) 6	8.1 (7.0-8.4) 59	6.3 (6.1-6.5) 7	4.8 (4.6-5.1) 64	5.4 (4.6-5.8) 58
N Peru ²	36.0 (34.5-37.1) 4						
S Peru ³	38.3 (36.5-39.5) 3						
E Bolivia ⁴	40.4 (39.1-41.8) 2	13.3 (12.8-13.7) 2	12.3 (12.3-12.4) 2	8.3	6.8 (6.7-6.9) 2	5.2 (5.2-5.3) 2	5.6 (5.5-5.6) 2
N Paraguay ⁵	43.0	14.0			6.8	5.2	5.4
<i>S. leptura</i>							
N South America ¹	40.0 (36.0-44.0) 63	13.9 (13.0-14.1) 39	12.3 (11.9-13.0) 36	8.9 (7.9-9.8) 52	6.9 (6.7-7.4) 16	5.4 (5.0-5.9) 63	6.2 (5.5-6.9) 63
N Peru ²	39.2 (38.0-42.0) 22		12.3 (11.9-12.8) 6	8.6 (8.3-9.1) 5		5.4 (5.1-5.6) 7	5.9 (5.7-6.2) 6
N Brazil ⁶	39.6 (38.0-40.9) 13	13.5 (12.9-14.2) 3	11.9 (11.9-11.9) 2		6.5 (6.1-6.9) 3	5.2 (5.0-5.5) 4	5.6 (5.1-6.1) 4
SE Brazil (RJ) ⁶	41.97 (40.2-43.8) 6	14.6 (14.5-14.8) 6	12.8 (12.5-13.1) 4	9.4 (9.1-9.6) 2	7.2 (6.9-7.5) 6	5.5 (5.2-5.6) 6	6.1 (5.8-6.3) 6
SE Brazil (SP) ⁶	41.8	14.4	12.4	8.6	6.7	5.3	5.6
SE Brazil (MG) ⁶	41.9	14.2		7.5	6.1	5.5	5.1
SE Brazil (ES) ⁷	41.7	14.1	12.5	9.2	7.1	5.1	6
CE Bolivia ⁴	42.9 (41-44.9) 4	14.8 (14.2-15.1) 4	13.4 (13.4-13.5) 4	9.4 (8.9-9.7) 5	7.2 (6.9-7.3) 4	5.6 (5.4-5.9) 5	6.4 (6.2-6.5) 5

¹Husson (1962); Ibáñez (1981); Brosset & Charles-Dominique (1990); Simmons & Voss (1998); Lim & Engstrom (2001); Muñoz & Cuartas (2001).

²Velazco *et al.* 2021

³Tejedor 2003

⁴This study

⁵Owen *et al.* 2014

⁶Garbino 2011

⁷Nogueira *et al.* 2002, Dias & Peracchi 2008

Distribution. Up to now, *S. canescens* in its southern distribution was only known from east-central Bolivia. With the two new localities we report here, one in Bolivia and another in Paraguay, we extend its range in both countries, into the Amazon and Pantanal regions, respectively (Figure 3). The voucher specimens supporting these records are as

follows: an adult female (AMNH 262418) from Pando Department, northern Bolivia, west bank of the Beni River across from Hamburgo (Figure 3); it was collected in July 1986 by Luis A. Ruedas and was initially misidentified as *S. leptura* (Anderson 1997). The first record of *S. canescens* for Paraguay is represented by a specimen of undetermined sex (MNHNP 3372) collected on July 9, 2012, at the Tres Gigantes Biological Station, Alto Paraguay Department. This individual, originally identified as *S. leptura* by Owen *et al.* (2014), now marks the southernmost confirmed record of *S. canescens* in South America (Figure 3).

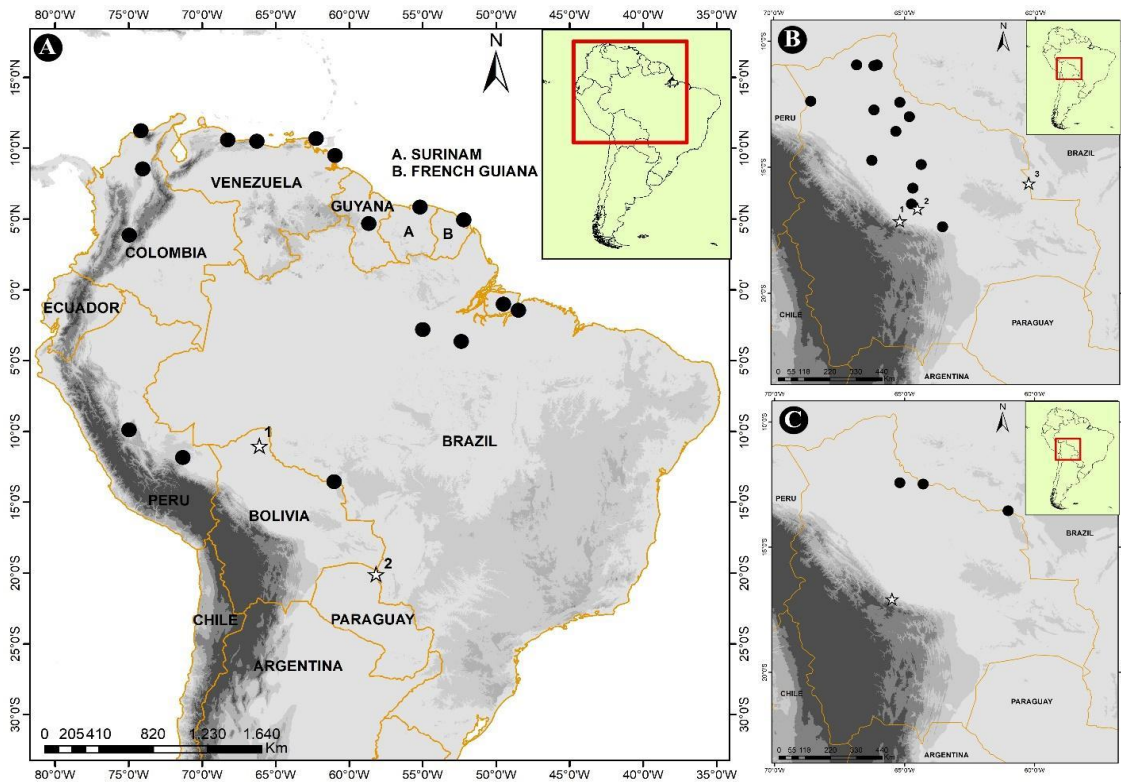


Figure 3. Distribution range of *Saccopteryx canescens* in South America (A), and of *S. bilineata* (B) and *S. leptura* (C) in Bolivia. Stars indicate new records: *S. canescens* for Bolivia (1) and Paraguay (2); *S. bilineata* for Cochabamba (1) and Santa Cruz: Bosque Experimental Elías Meneses (2) and Laguna Marfil (3); and *S. leptura* for Cochabamba. Previous records of *S. canescens* were obtained from Emmons (1998) and Hood & Gardner (2008), and those of *S. bilineata* and *S. leptura* from Anderson (1997).

Saccopteryx bilineata (Temminck, 1838)

Identification. The Greater White-lined Bat generally presents black dorsal fur, not frosted or grayish ashy appearance; has two white stripes running from the shoulders to the end of the rump; black wing membranes, and is notably larger than its congeners, with a forearm length > 44 mm and maxillary toothrow length > 6.7 mm; breadth across upper molars 7.2–7.5 mm (Anderson 1997).

Distribution. In Bolivia, 75 specimens across four departments (Beni, Cochabamba, Santa Cruz, and Pando) support this species' presence. Our revision adds three localities and reidentifies a Cochabamba specimen (AMNH 264926) as *S. leptura* (Anderson

1997). However, two new *S. bilineata* records (MNKM 3428, 3429) confirm the species' continued presence in that department. We also add two new Santa Cruz localities: Elías Meneses Experimental Forest, and Laguna Marfil (Figure 3B). Detailed measurements are provided in Table 1.

***Saccopteryx leptura* (Schreber, 1774)**

Identification. The Brown White-lined Bat, *S. leptura*, is intermediate in size between *S. canescens* and *S. bilineata*, without overlapping with the latter and being slightly larger than the former. Although several external and craniodental measurements overlap among these species, a combination of a few key measurements and pelage coloration uniformly brown fur, not frosted or grayish ashy appearance; allows for unambiguous identification (see *S. canescens* identification for diagnostic comparisons).

Distribution. In Bolivia, 13 specimens supported the presence of this species in four localities across three departments: Beni, Pando, and Santa Cruz (Anderson 1997; Emmons *et al.* 2006). However, in Pando, the only specimen validating its occurrence (AMNH 262418) actually corresponds to *S. canescens*, as noted previously. Consequently, *S. leptura* is removed from the faunal list of this department.

Furthermore, we add a new record of *S. leptura* for Cochabamba Department. The voucher specimen (AMNH 264926), previously identified as *S. bilineata* (Anderson 1997), clearly corresponds to *S. leptura* based on its measurements (Table 1). Thus, the updated distribution of *S. leptura* in Bolivia includes three departments: northeastern Beni, central Cochabamba, and northeastern Santa Cruz (Figure 3C).

DISCUSSION

In Bolivia, nearly 100 specimens support the presence of three *Saccopteryx* species (Anderson 1997, Emmons 1998, this study), 90 of which were collected between 1914 and 1993, and the remainder between 2003–2005 and 2022 (new records of *S. bilineata* from this study). The capture of these bats, particularly *S. canescens*, appears to be infrequent in the southern portion of their range, and information on their natural history remains unavailable for Peru, Bolivia, and Paraguay (Tejedor 2003, Velazco *et al.* 2021, this study). Despite *S. canescens* having eight recorded localities in its southern range, data remains scarce. In Peru it is known only from three sites, one of which lacks a voucher specimen (Tejedor 2003). For the other two, craniodental measurements are not available (Sanborn 1937, Velazco *et al.* 2021), limiting comparisons with nearby records from Bolivia and Paraguay (Table 2). Similarly, in Brazil the species is known from four localities, but none provide craniodental data (Sanborn 1937, Voss & Emmons 1996, Hood & Gardner 2008). Therefore, knowledge of this species in the southern portion of its range remains very limited.

Although Emmons (1998) had previously reported *S. canescens* from Bolivia, two major regional works (i.e., Hood & Gardner 2008, Bonaccorso 2019) did not consider this record, likely because Emmons (1998) and Emmons *et al.* (2006) did not provide information on the voucher specimen, nor morphological descriptions or craniodental measurements. This omission was rectified in the most recent checklist of Bolivian bats

(Poma-Urey *et al.* 2023). Specimens of *S. canescens* and *S. leptura* from Bolivia and Paraguay are slightly larger than those from northern South America, as well as from Peru and some northern and southeastern Brazilian states (Table 2). In contrast, *S. bilineata* shows no such variation in external and craniodental measurements and are consistent with those reported elsewhere in the region (e.g., Simmons & Voss 1998, Velazco *et al.* 2021). *S. bilineata*, being the largest species, is easily identified; however, *S. canescens* and *S. leptura* show slight overlap in both external and craniodental measurements, particularly for specimens from southeastern Brazil, northern Bolivia, and Paraguay. For these two smaller species, we consider pelage coloration as the primary diagnostic character: blackish to brown with noticeable white lines on the back in *S. leptura*, and frosted brown with a grayish or yellowish tone with indistinct white lines on the back in *S. canescens*. Then, measurements of BAM (breadth across molars) and MTL (maxillary toothrow length) would be the secondary characters. When plotted on coordinate axes, these measurements greatly facilitate species differentiation, as proposed by Davis (1976), who also noted that BAM provides better discrimination than MTL, which is consistent with our results. A particular case involves a specimen from southeastern Brazil (Minas Gerais) reported by Garbino (2011) as *S. leptura*. This specimen shows small BAM and MTL values more consistent with *S. canescens*. We therefore recommend re-examining dorsal fur coloration and lines pattern to confirm its identity. The specimen is housed at the Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil, under catalog number MZUSP 5830 (Garbino 2011) (Figure 2, Table 2). There are nearby records indicating that *S. leptura* is noticeably larger (Nogueira *et al.* 2002; Dias & Peracchi 2008), suggesting that the Minas Gerais specimen may have been a misidentified *S. canescens*, similar to the cases documented in this study for Paraguay. Such misidentifications are not uncommon among emballonurids, for instance, specimens of *Peropteryx leucoptera* (Peters, 1867) previously identified as *P. kappleri* (Peters, 1867) (Poma-Urey *et al.* 2021), and even among phyllostomids, where individuals of *Lionycteris spurrelli* were misidentified as *Glossophaga soricina* (Paes *et al.* 2022).

Less than ten localities confirm the distribution of *S. canescens* in the southern portion of its range, and some reports were made without voucher specimens (e.g., Tejedor 2003), while others lack detailed descriptions and measurements for each country or locality (Sanborn 1937, Velazco *et al.* 2021). A comprehensive study of the genus incorporating both morphological and molecular data from this region of the Neotropics would be valuable to assess intra- and interspecific variability. On the other hand, the types of biomes inhabited by the three *Saccopteryx* species recorded in Bolivia match previous reports, primarily including the Amazon and Cerrado biomes (Hood & Gardner 2008, Bonaccorso 2019). We also add the Pantanal for *S. canescens* in Paraguay (Figure 3A).

Finally, voucher specimens represent one of the most reliable and verifiable sources of evidence for distributional studies. The new records presented here, based on both old and new specimens, expand our understanding of bat diversity in Bolivia and underscore the importance of using collections as a source of new information (Reynolds *et al.* 1996).

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Appendix. Examined specimens. Locality data for *Saccopteryx* specimens. Acronyms of systematic collections are provided in Materials and methods.

Saccopteryx bilineata (total: 20) – BOLIVIA: **Beni:** Yacuma, Estación Biológica del Beni, Campamento Chimán, -14.733333, -66.250000 (CBF 0025, 0026); Iténez, Versalles, -12.733333, -66.166667 (AMNH 209218, 209219, 209220); Marbán, río Mamoré ca. 4 kilometers northeast of Grande River mouth, -15.833333, -64.683333 (AMNH 210459, 210460, 210461); río Mamoré, -12.433333, -65.183333 (AMNH 210483, 210484, 210485); Cercado, ca. 6 kilometers west of Casarabe, -14.900000, -64.366666 (AMNH 255875). **Cochabamba:** Carrasco, Chimoré, Parque Nacional Carrasco, Campamento Aroma, -17.130812, -65.182281 (MNKM 3428, 3429). **Santa Cruz:** Ichilo, Yapacaní, Bosque Experimental Elías Meneses, -16.638722, -64.508616 (MNKM 3664); ca. 52 kilometers south of Chapare River mouth, Ichilo River, -16.466667, -64.733333 (AMNH 210503); Velazco, laguna Marfil, -15.627965, -60.258380 (MNKM 5894, 5895). **Pando:** Federico Román, left bank of Beni River, -10.950000, -66.050000 (AMNH 262419); Manuripi, Isla Gargantua, -12.383333, -68.583333 (CBF 0027).

Saccopteryx canescens (total: 5) – BOLIVIA: **Pando:** Pando, Federico Román, west bank of Beni River, -11.016667, -66.100000 (AMNH 262418). **Santa Cruz:** Velazco, Parque Nacional Noel Kempff Mercado, -13.552778, -61.014167 (MNKM 1910). PARAGUAY: **Alto Paraguay:** Estación Biológica Tres Gigantes, -20.077166, -58.164166 (MNHNP 3372). COLOMBIA: **Santander:** Municipio de Cimitarra, vereda San Juan de Carare, 6.71725, -74.134917 (MHN-UCa-M 1012). **Arauca:** Las Plumas, 6.611083, -70.530888 (MHN-UCa-M 2201).

Saccopteryx leptura (total: 11) – BOLIVIA: **Beni:** río Mamoré, -12.433333, -65.183333 (AMNH 210513, 210514). **Cochabamba:** Chapare, 2.5 km SW Villa Tunari, Parque Nacional Carrasco, Cavernas de Repechón, -17.066667, -65.483333 (AMNH 264926). **Santa Cruz:** Velazco, Parque Nacional Noel Kempff Mercado, -13.552778, -61.014167 (MNKM 1908, 3325). COLOMBIA: **Arauca:** Las Plumas, 6.611083, -70.530888 (MHN-UCa-M 2199). **Caldas:** La Dorada, 5.44608, -75.80186. (MHN-UCa-M 4223); Norcasia, 5.6698056, -74.78075; 5.671057711, -74.84399503 (MHN-UCa-M 0404, 3969); Palestina, Escuela km 35, 5.099806, -75.698583 (MHN-UCa-M 3941). **Cauca:** Samaná, 5.6767, -74.8761 (MHN-UCa-M 0113).

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