First record of *Lasiurus egregius* (Peters, 1870) (Chiroptera, Vespertilionidae) in Paraná state, southern Brazil

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**Abstract**

*Lasiurus egregius* (Peters, 1870) is an insectivorous bat species known from Central and South America. This species has few confirmed records throughout its distribution. Here we report the first record of *L. egregius* from the northern coast of Paraná state, southern Brazil. We captured a female individual of *L. egregius* using an ultrathin mist-net installed over a river knee, at Salto Morato Natural Reserve, municipality of Guaraqueçaba. This is the fourteenth locality with confirmed occurrence of *L. egregius*, being eight of them in Brazil. The knowledge on the bat fauna in Paraná has been increasing in recent decades, mainly due to the new studies in coast areas of this state. In addition to contributing to the knowledge of the bat fauna from Paraná, the new record of *L. egregius* reinforces the essential role of the Salto Morato Natural Reserve in conserving bats in the southern portion of the Atlantic Forest.

**Keywords**


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**Introduction**

Bats are the second most diverse group of mammals in the world, only after Rodentia (Simmons 2005). In the Neotropics, the best known family of bats are the leaf-nosed bats, Phyllostomidae, because of its diversity (Baker et al. 2012) and the effectiveness of mist nets in sampling them (O’Farrell and Miller 1999). Mainly due to their height of flight and greater capacity to detect nets, insectivorous bats, such as those of the family Vespertilionidae, are less studied in the Neotropical region. However, Vespertilionidae are the most species-rich family of bats, having more than 44 genera and 350 species (Corbet and Hill 1991; Nowak 1999). Among the vespertilionid bats are the hairy-tailed bats from the tribe Lasiurini (Simmons 2005).

The tribe Lasiurini is composed of a single genus, *Lasiurus* Gray, 1831 (Gardner and Handley 2008). The taxonomy of this tribe has been the subject of debate, with some taxonomists using molecular tools to suggest...
splitting this tribe into three distinct genera (hoary, yellow and red bats), Dasypterus Peters, 1871, Aeorestes Fitzinger, 1870, and Lasiurus Gray, 1831 (Baker et al. 1998; Baird et al. 2015, 2017). The segregation of these groups has been debated and contested mainly because there is no phenotypic discontinuity, the genus is monophyletic and therefore it does not solve any phylogenetic problem, and this new arrangement would create nomenclatural instability (see Ziegler et al. 2016; Novaes et al. 2018). Based on these arguments, we adopted the position of Gardner and Handley (2008) who treated Lasiurus as the only representative of the tribe Lasiusiri.

The genus Lasiurus currently consists of 15 species, of which nine are known from South America (Gardner and Handley 2008). Among these, seven species occur in Brazil (Nogueira et al. 2018): Lasiurus salinae Thomas, 1902, Lasiurus castaneus Handley, 1960, Lasiurus ebrinus Fazzolari-Corrêa, 1994, Lasiurus blossevillii (Lesson & Garnot, 1826), Lasiurus cinereus (Paislot de Beauvois, 1796), Lasiurus ega (Gervais, 1856), and Lasiurus egregius (Peters, 1870). The last four species have confirmed records in the southern states of Brazil (Marinho-Filho 1996; Pacheco et al. 2007), and only L. egregius has no record in the state of Paraná (Passos et al. 2010).

When compared to the average size of vesperilionids in South America (see Gardner 2008; Díaz et al. 2016), L. egregius is considered a large bat (Bianconi and Pedro 2007). The species has uniform reddish coloration with hair covering the first third of the well-developed uropatagium (Gardner and Handley 2008; Díaz et al. 2016). Its ears are slightly wider than long, and the inner edge of the tragus is straight, while the outer rim is curved (López-Baucells et al. 2014). The forearm ranges from 48 to 50 mm long (Emmons and Feer 1997; Lim and Engstrom 2001). The dental formula is as follows: incisors 1/3, canine 1/1, premolars 1/2 and molars 3/3 (Bianconi and Pedro 2007). Little is known about L. egregius, such as geographical range, population size and other information (López-Baucells et al. 2014), which may contribute to this species’ classification as Data Deficient by the IUCN (Sampaio et al. 2016).

Lasiurus egregius is known to occur in Panama, Honduras, French Guiana, and Brazil (Peracchi et al. 2011). The specimen cited from Colombia as L. egregius (Bejarano-Bolina et al. 2007) was misidentified and is in fact L. blossevillii (Morales-Martinez and Ramirez-Chaves 2015). Morales-Martinez and Ramirez-Chaves (2015) noted the lack of confirmed records of L. egregius in Colombia but considered it as probable occurring there.

In Brazil, L. egregius has records from all regions, in the states of Amazonas (López-Baucells et al. 2014), Pará (Kalko and Handley 2001), Roraima (Capaverde-Junior et al. 2014), Pernambuco (Sousa et al. 2004, Silva 2007), Minas Gerais (Stutz et al. 2004), Santa Catarina (Cherem et al. 2004), and Rio Grande do Sul ( Giménez and Gianinni 2011). This species was recorded in urban areas and natural habitats (Lima 2008; Pacheco et al. 2010), which suggests that it has greater ecological tolerance. In local spatial terms, L. egregius occurs more frequently in open spaces, even though its morphology suggests the ability to forage in cluttered environments such as forest understories (López-Baucells et al. 2014). We describe the first record of L. egregius from the state of Paraná, southern Brazil, and thereby contribute to the knowledge of the distribution of this rare Neotropical bat.

**Methods**

We captured the specimen of Lasiurus egregius at the Salto Morato Natural Reserve (Reserva Natural Salto Morato in Portuguese; RNSM), which is located in the municipality of Guaraqueçaba, northern coast of Paraná state (Fig. 1). The RNSM has an area of 2,340 ha and is inserted in the Environmental Protection Area (Área de Proteção Ambiental, in Portuguese) of Guaraqueçaba municipality (Straube and Urben-Filho 2005).

This region where the RNSM is inserted corresponds to the largest continuous remnant of Atlantic Forest in Brazil, because the RNSM is adjacent to other conservation units in the states of Paraná and São Paulo. The predominant forest formation of the region is Ombrophilous Dense Forest (IBGE 2012). In the RNSM, the great variation in relief creates three subformations: Lowland Submontane, Montana, and Alto Montana Dense Forests (IBGE 2012). Within the Köeppen system of climate classification, the RNSM region has a Cfa climate, characterized by a humid mesothermal climate, with hot summers and no defined dry season (Alvares et al. 2013).

We carried out bat surveys on the Submontane Dense Forest environments, during 10 continuous nights. Bats were capture using 10 mist nets per night: two nets each 12 × 2.6 m; four nets each 9 × 2.6 m; two nets each 6 × 2.6 m (all Avinet, polyester, with mesh openings of 32 mm) and two nets each 6 × 3 m (Ecotone®, 0.08 mm nylon, with mesh openings of 14 mm). The Ecotone nets are special for capturing insectivorous bats. Nets were installed along trails, at forests edges, and over water bodies. The nets were kept open for 6 hours after twilight and were visited in 15 minute intervals. Sampling effort was 13,104 net-meter-hours and was calculated according to the protocol by Straube and Bianconi (2002).

The specimen of L. egregius was collected as a voucher material, as it was the first record of the species in the state and also to confirm its identification in the laboratory. The voucher was preserved in 70% alcohol and was deposited in the scientific collection of the Laboratório de Zoologia e Ecologia de Vertebrados (LABZEV) of the Universidade do Extremo Sul Catarinense. The cranium was prepared for morphometry in the laboratory (Table 1). The species was identified using the keys by Gardner and Handley (2008), Miranda et al. (2011), and Diaz et al. (2016). The permits for the fieldwork were obtained at the Sistema de Autorização e Informação em Biodiversidade (SISBIO 53718-1) and the Comitê de Ética para o Uso de Animais of the Universidade do Extremo Sul Catarinense (UNESC 064/2018-2).
Results

New record. Brazil: Paraná state: municipality of Guaraqueçaba: Salto Morato Natural Reserve (25°10′25″S, 048°17′51″W; 59 m a.s.l.; Fig. 2), coll. by F. Carvalho, K.P. Supi, L. S. Biz and B.F.L. Luciano, 22 Jan. 2019 at 23:30 h (1 ♀, LABZEV861; Fig. 3).

The specimen of *L. egregius* was captured using a ultrathin mist-net (Ecotone®) installed over a river knee (Fig. 2).

Identification. The following characters were observed:

(1) wing membranes dark; (2) uropatagium densely covered by hairs up to ⅓ its length; (3) coloration uniformly reddish; and (4) forearm greater than 45 mm (48–52 mm) long.

Discussion

With the new record of *L. egregius* from RNSM, 71 species of bats are now confirmed as occurring in Paraná state (Passos et al. 2010; Carvalho et al. 2014; Portella et al. 2017). Knowledge of the bat fauna in Paraná has increased over the last several decades, mainly with
Table 1. Morphometry of the specimen of Lasiurus egerei captured in the RNSM (present study), and data from other species of the genus occurring in Brazil. Data sources: L. egerei – López-Baucells et al. (2014); L. blossevillii – Simons and Voss (1998); Rodrigues and Ribas (2011); Ciláudio et al. (2018); Verde et al. (2017); L. cinereus – Shump and Shumpcz (1982); Myers and Wetzel (1983); Ciláudio et al. (2018); L. ega – Myers and Wetzel (1983); Bolzono (2008); Leal and Gomes-Silva (2015); Ciláudio et al. (2018); L. ebenus – Ciláudio et al. (2018). The characters analyzed were: FA = forearm; CCL = canine condyle length; BCL = basal condyle length; ICL = incisor condyle length; JL = jaw length; GLS = greatest length of skull; BW = braincase width; LW = zygomatic width; PWC = palatal width between canines. All measurements are expressed in millimeters.

<table>
<thead>
<tr>
<th>Characters</th>
<th>Present study</th>
<th>L. egerei</th>
<th>L. blossevillii</th>
<th>L. cinereus</th>
<th>L. ega</th>
<th>L. ebenus</th>
</tr>
</thead>
<tbody>
<tr>
<td>FA</td>
<td>49.5</td>
<td>47.4–48.8</td>
<td>36.8–42.2</td>
<td>50.2–52.55</td>
<td>42.9–50.0</td>
<td>45.6–45.7</td>
</tr>
<tr>
<td>BCL</td>
<td>16.3</td>
<td>16.1</td>
<td>—</td>
<td>15.4–15.7</td>
<td>13.5–15.9</td>
<td>—</td>
</tr>
<tr>
<td>JL</td>
<td>13.1</td>
<td>—</td>
<td>—</td>
<td>6.35–6.42</td>
<td>6.24–6.74</td>
<td>5.53–5.57</td>
</tr>
<tr>
<td>LW</td>
<td>12.0</td>
<td>11.8</td>
<td>7.58–8.88</td>
<td>11.2–11.6</td>
<td>10.1–12.0</td>
<td>—</td>
</tr>
<tr>
<td>PWC</td>
<td>5.4</td>
<td>6.4</td>
<td>4.10–4.73</td>
<td>5.75–6.45</td>
<td>5.90–6.62</td>
<td>5.52–5.59</td>
</tr>
</tbody>
</table>

Figure 2. The site where the new record of Lasiurus egerei was captured: Salto Morato Natural Reserve, Paraná, southern Brazil.

regard to the distribution of species (Gazarini and Bernardi 2007; Passos et al. 2010; Portella et al. 2017). Even for areas considered to be of lower priority for bat sampling, such as the northern coast of Paraná (Miretzki 2003), new species have been added to the state’s fauna in the last decade (Scultori et al. 2009a, 2009b, 2009c; Carvalho et al. 2014). This has contributed to the understanding of distributional patterns of species in Paraná and along the south coast of Brazil.

This is the fourteen confirmed occurrence of L. egerei (Table 2) and one of nine from Brazil (Fig. 1). Although this species is considered widely distributed in Central and South America, it is rarely captured throughout its whole geographic range (Passos et al. 2010) and with few individuals captured at each locality (Kalko and Handley 2001; Silva 2007; Sousa et al. 2004; Lim 2009; Mora 2012), as well was the case in our study. In the last few years, studies in the RNSM (e.g. Kalko-Oliveira 2010; Carvalho et al. 2014; Carvalho 2015) have revealed the occurrence of rare species for Atlantic Forest, such as Thyroptera tricolor Spix, 1823, Vampyrodus caraccioli (Thomas, 1889), Glyphonycteris sylvestris Thomas, 1896, and Lampronycteris brachyotis (Dobson, 1879). In addition to contributing to the knowledge of the bat fauna from Paraná, the new record of L. egerei reinforces the importance of the RNSM for conserving bats in the southern portion of the Atlantic Forest (Carvalho et al. 2018). The continuity of bat surveys, especially in the context of a long-term bat monitoring within the RNSM, may provide better understanding of the bat fauna of this huge Atlantic Forest fragment in southern Brazil.

Little information about the morphology of L. egerei is available in the literature, and even less is available for cranial characteristics. Comparing the measurements of our specimen with Brazilian Amazon specimens (López-Baucells et al. 2014), we observed that our specimen is larger in all measured values, excepting for the palatal width between the canines. We encourage additional study of cranial characteristics of L. egerei that compare specimens from different regions, which will improve knowledge of bat morphology and ecology and will lead to increased confidence in identifications of this species throughout its whole range.

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Records of L. egerei from thoughout its geographic range were mostly made in large forest remnants (e.g. Kalko and Handley 2001; Silva 2007; Sousa et al. 2004; Lim 2009; Mora 2012), as well as the case in our study. In the last few years, studies in the RNSM (e.g Kalko-Oliveira 2010; Carvalho et al. 2014; Carvalho 2015) have revealed the occurrence of rare species for Atlantic Forest, such as Thyroptera tricolor Spix, 1823, Vampyrodus caraccioli (Thomas, 1889), Glyphonycteris sylvestris Thomas, 1896, and Lampronycteris brachyotis (Dobson, 1879). In addition to contributing to the knowledge of the bat fauna from Paraná, the new record of L. egerei reinforces the importance of the RNSM for conserving bats in the southern portion of the Atlantic Forest (Carvalho et al. 2018). The continuity of bat surveys, especially in the context of a long-term bat monitoring within the RNSM, may provide better understanding of the bat fauna of this huge Atlantic Forest fragment in southern Brazil.
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**Authors’ Contributions**

FC, KPS, LSB and BFLL collected the data; FC identified the specimen; and FC, DASB, KPS, LSB, BFLL and JJZ wrote the text.

**References**


