



NOTES ON AN ARTIFICIAL ROOST OF *Myotis albescens* (CHIROPTERA, VESPERTILIONIDAE) IN SOUTHEASTERN BRAZIL

Guilherme S. T. Garbino^{1,2*}, Vinicius José Alves Pereira³, Thais Pagotto⁴, Paula Ribeiro Prist^{5,6} & Fernanda Delborgo Abra^{4,7,8}

¹ Universidade de São Paulo, Escola Superior de Agricultura “Luiz de Queiroz”, Departamento de Ciências Biológicas, Laboratório de Mamíferos, Avenida Pádua Dias, nº 11, CEP 13418-900, Piracicaba, SP, Brasil.

² Universidade Federal de Viçosa, Departamento de Biologia Animal, Avenida Peter Henry Rolfs, S/N, CEP 36570-900, Viçosa, MG, Brasil.

³ IPÊ, Instituto de Pesquisas Ecológicas, Black Lion Tamarin Conservation Program, Rodovia Dom Pedro I, km 47, CEP 12960-000, Nazaré Paulista, SP, Brasil.

⁴ Concessionária Auto Raposo Tavares, Avenida Issa Marar, S/N, CEP 17018-002, Bauru, SP, Brasil.

⁵ ViaFAUNA Estudos Ambientais, Rua Delmira Ferreira, nº 312, CEP 04125-120, São Paulo, SP, Brasil.

⁶ Universidade de São Paulo, Departamento de Ecologia, Instituto de Biociências, Rua do Matão, nº 321, CEP 05508-090, São Paulo, SP, Brasil.

⁷ Center for Conservation and Sustainability, Smithsonian Conservation Biology Institute, National Zoological Park, Washington, DC, United States.

E-mails: gstgarbino@hotmail.com (*corresponding author); viniciusalvespereira.bio@gmail.com; thais.pagotto@cartsp.com.br; pprsit@hotmail.com; fernanda@viafauna.com

Abstract: *Myotis albescens* has a wide distribution, occurring from southern Mexico to central Argentina and Uruguay, where it is usually caught near streams or flooded areas. *M. albescens* roosts during the day in cavities such as hollow logs, rock cavities, and buildings. Here, we describe a group of *M. albescens* roosting in a highway underpass in an Atlantic Forest area in Rancharia, southeastern Brazil. The group was found inside a culvert with a shallow stream passing through it. The animals left the roost and were mist-netted in the first hours of the night. The *M. albescens* group was composed of 18 individuals, eleven males and seven females. In October, all males had descended testes and two females were pregnant, as confirmed by abdominal palpation. Morphological characters of the specimens fell in the known variation for the species. Our data show that highway underpasses can be important day roosts for bats, especially if riparian areas are preserved.

Keywords: Atlantic Forest; highway underpasses; São Paulo state; Silver-tipped Myotis

The Silver-tipped Myotis, *Myotis albescens* (É. Geoffroy, 1806), is one of the more widely distributed Neotropical *Myotis*, occurring from southern Mexico to Uruguay and central Argentina (Wilson 2008, Moratelli *et al.* 2019). Along its range the species is more commonly

found from sea level up to 500 m, where it is usually captured along or near to small streams or other flooded areas (LaVal 1973, Miranda *et al.* 2007, Braun *et al.* 2009, Medellín 2014). Although widely distributed and well-represented in scientific collections, *M. albescens* may be rare or

uncommon in some areas along its range (Braun *et al.* 2009).

Roosts of *M. albescens* have been found in rock crevices, tree cavities, fallen logs (Wied 1826, Acosta y Lara 1950, Handley 1976, Moratelli *et al.* 2015, Voss *et al.* 2016), and also inside buildings (Acosta y Lara 1950, Barquez 1988). Individuals roost in small groups of tens of individuals (reaching up to hundreds in man-made structures) or singly, and colonies are mixed-sex (Myers 1977, Patterson 1992). Despite the day roosts of *M. albescens* being relatively well documented, information on group size and sex ratio is scant.

Reproductive data on *M. albescens* from Mexico, Central America, Argentina, Brazil, Uruguay, Peru, Bolivia, and Paraguay, indicate a seasonally polyestrous pattern, with births occurring during the rainy season (Myers 1977, Braun *et al.* 2009, Moratelli *et al.* 2019). Studying specimens from the Paraguayan Chaco, Myers (1977) suggested that *M. albescens* breeds at least two times annually, and that females may store sperm. Information on reproductive status of males and females from the Atlantic Forest in Brazil, are rare in the literature (see Moratelli *et al.* 2019).

In this report, we describe a roosting group of *M. albescens* found in a highway culvert in an Atlantic Forest area in Brazil. We give information on morphometrics, reproductive status, and composition of the group, comparing it with published information on the species. This study is part of a project aimed at assessing the use of highway underpasses by bats in the state of São Paulo, southeastern Brazil. From a total of 12 underpasses sampled at São Paulo state highway SP-270, *Myotis albescens* was captured in the ones at km 499 (22°29'56"S; 50°54'12.9"W) and km 522 (22°23'07"S; 51°05'41"W) of the highway (Figure 1a). The SP-270 highway, is inserted in a predominantly agricultural area that was originally covered by Atlantic Forest, of which only small (< 100 ha) fragments remain (Ribeiro *et al.* 2009). Specifically, the underpasses in which the animals were captured are immersed in an area dominated by pastures and agriculture, and at both sites small streams passed through the underpasses (Figure 1b). The roosting group described here was observed at the km 499 underpass (Figure 1a), which consists of three

culverts, each approximately 3 meters wide and 3 meters tall, under which passes a small stream (Figure 2a, b). Two individuals of *M. albescens* were also captured with mist nets at the km 522 underpass, but as no diurnal roost was found we assumed that the two bats were passing through the culvert.

To capture the bats at the km 499 underpass, we used two mist nets, each covering one of the two openings of the culvert, on 4 October 2020. Two 12-meter-long mist nets were kept open for five hours, from 18:00 h to 23:00 h. To verify if the entire colony was captured, we periodically checked the culvert while keeping the animals in individual cloth bags until no bat was observed in the roost. Bats were weighed to nearest 0.1 g (Pesola precision scales) and their forearms measured to the nearest 0.1 mm with a digital caliper. On 7 November 2020, we revisited the culvert during the day to recount the number of individuals in the colony.

Permit to handle and collect the bats in the underpasses was provided by the Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio), Ministry of the Environment (process No. 75467). Two voucher specimens of *M. albescens* were collected and are preserved as taxidermied skins in the mammal collection of the Universidade de São Paulo, in Piracicaba, Brazil (LMUSP). Specimens were identified as *M. albescens* based on the morphometric and discrete characters described in Moratelli & Oliveira (2011) and Moratelli *et al.* (2019).

The roosting group was located in a well-lit area of the culvert, at approximately 17 meters from the closest entrance and at a height of 2.6 meters from the water level (Figure 2b). A fast-flowing stream passes through the culvert, with a depth varying between 15 and 23 cm (measured on 7 November 2020). The *M. albescens* individuals were huddled in a vertical gap on the concrete wall (Figure 2c). There were no other bat species cohabiting the concrete gap where we found the *M. albescens* group, but other holes in the concrete ceiling of the same culvert were occupied by *Carollia perspicillata*, in groups of one to three individuals per hole.

Specimens of *M. albescens* left the roost naturally and were netted in the first hours of the night, between 18:30 h and 19:30 h, which

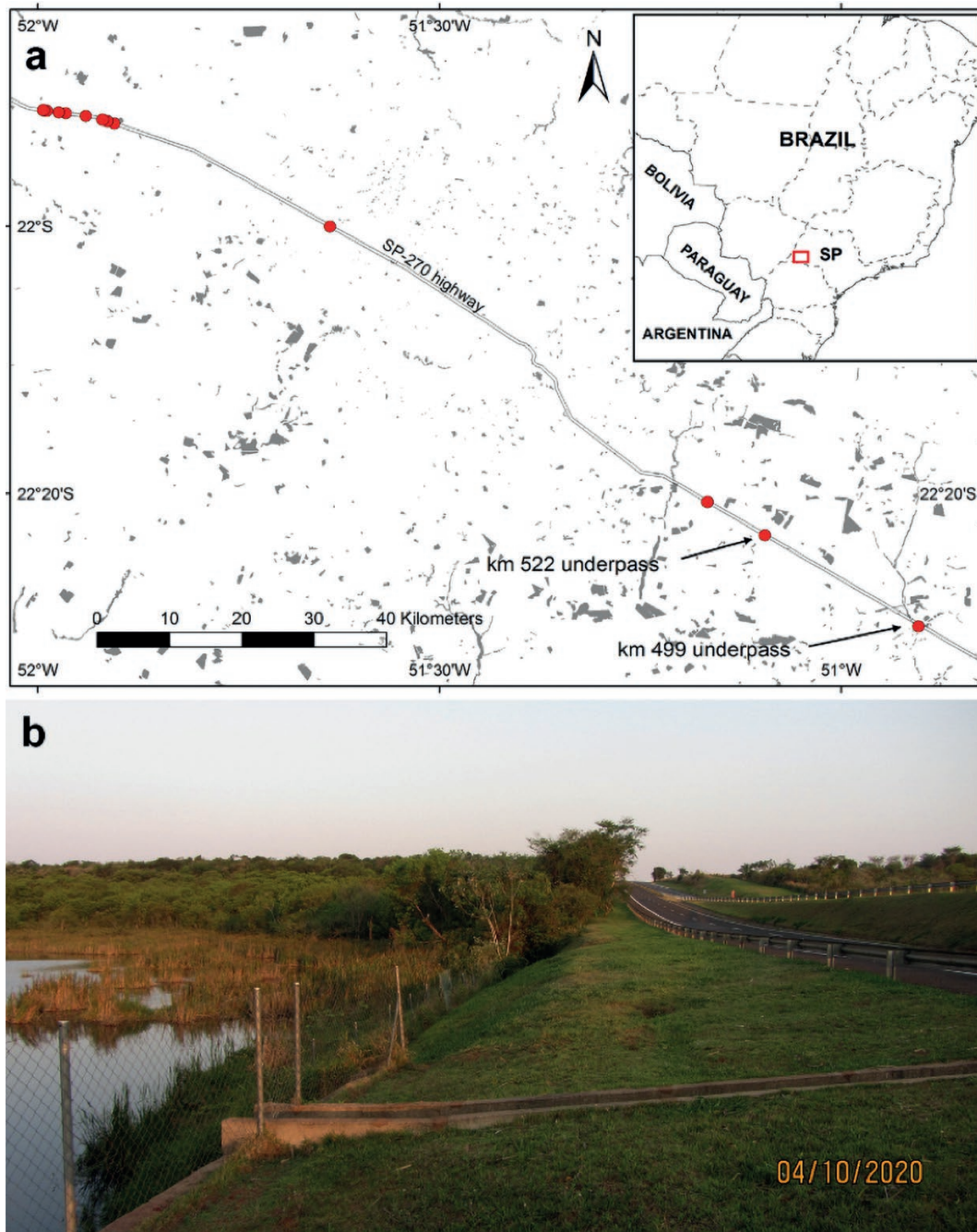


Figure 1. a) Map showing the 12 underpasses sampled for bats (circles) along the SP-270 highway. *Myotis albescens* was sampled in the underpasses at km 522 and km 499 in Rancharia, state of São Paulo (SP), Brazil. The roosting group reported here was observed at km 499. Gray areas are Atlantic Forest remnants. b) SP-270 highway (right) and stream that crosses the highway (left) at km 499.

corresponds to the published information on the activity pattern of the species (Braun *et al.* 2009). A total of 18 individuals were captured, being eleven males and seven females, for a male to female ratio of 1:1.57. The studied group had proportionally more females than what has been described by Myers (1977), who found a group with twelve males and two females and another

one with ten males and three females. The sample size, however, is too small to generalize.

Externally, the captured specimens had a bicolored dorsal fur, with a wide dark brown basal band and golden-brown tips. The ventral pelage was also bicolored, with a wide dark brown base and whitish tips, making the ventral region clearly paler than the dorsum (Figure 3a,b). The wing

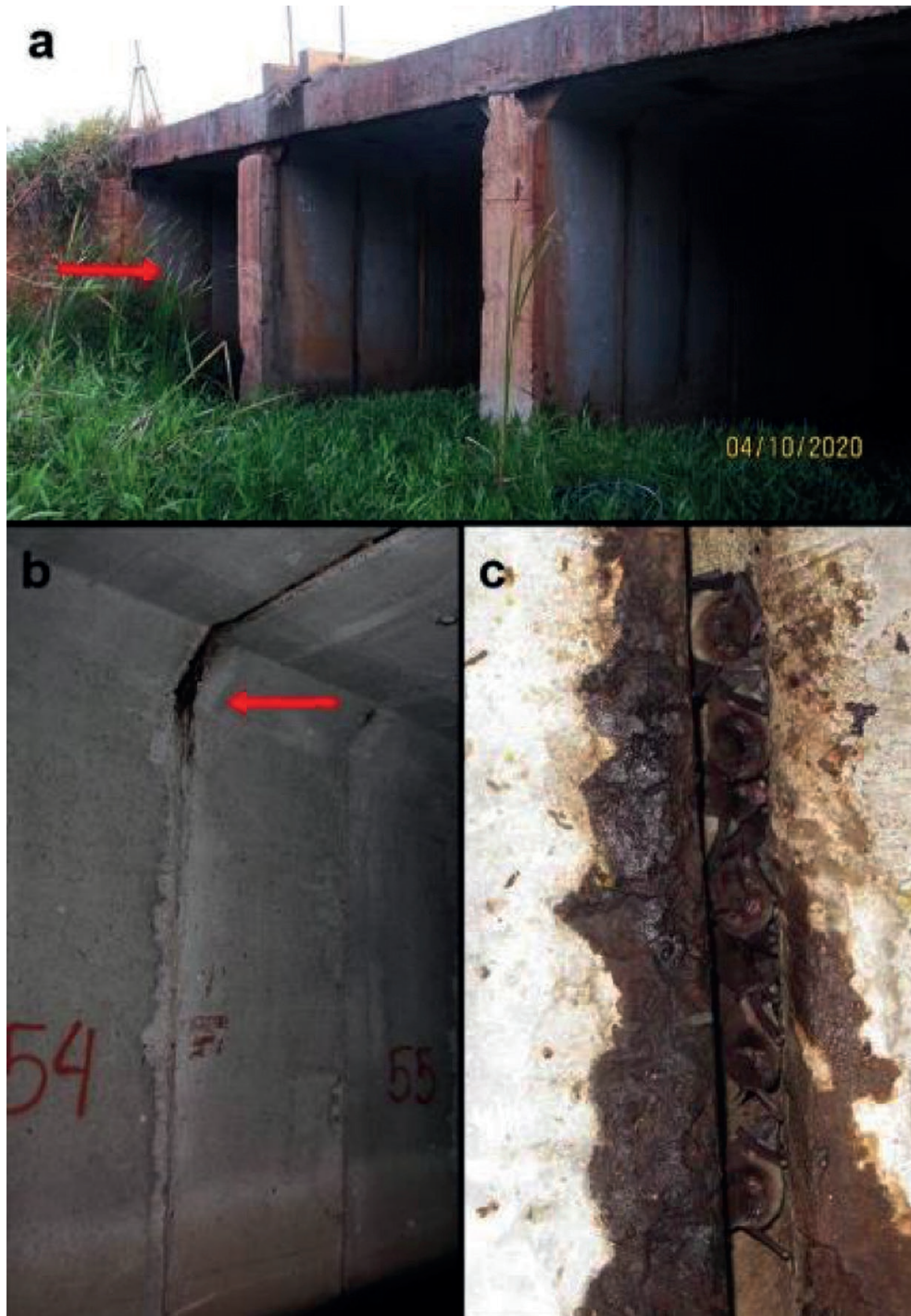


Figure 2. a) Culverts sampled for bats at the km 499 of the SP-270 highway. Red arrow indicates where the group of *Myotis albescens* was located; b) Location of the group inside the culvert (red arrow); c) Detail of the *M. albescens* group.

membranes were translucent brown (Figure 3c), and there was a fringe of hair trailing the edge of the uropatagium (confirmed when collected specimens were analyzed through magnification). Mean (\pm SD) forearm length of the 11 males was 36.77 mm (\pm 1.9), and in the seven females it was 36.42 mm (\pm 0.97). Forearm length ranged from 35 to 38 mm in both sexes. Mean body mass was

8.59 g (\pm 3.87) in males and 8.4 g (\pm 0.53) in females, ranging from 7 to 10 g.

The two examined skulls had the diagnostic characters of the species, such as broad interorbital and postorbital constrictions, globular braincase, and absence of sagittal crest (Figure 4). Selected cranial measurements for specimens LMUSP 510 and LMUSP 511, respectively, are given as follows

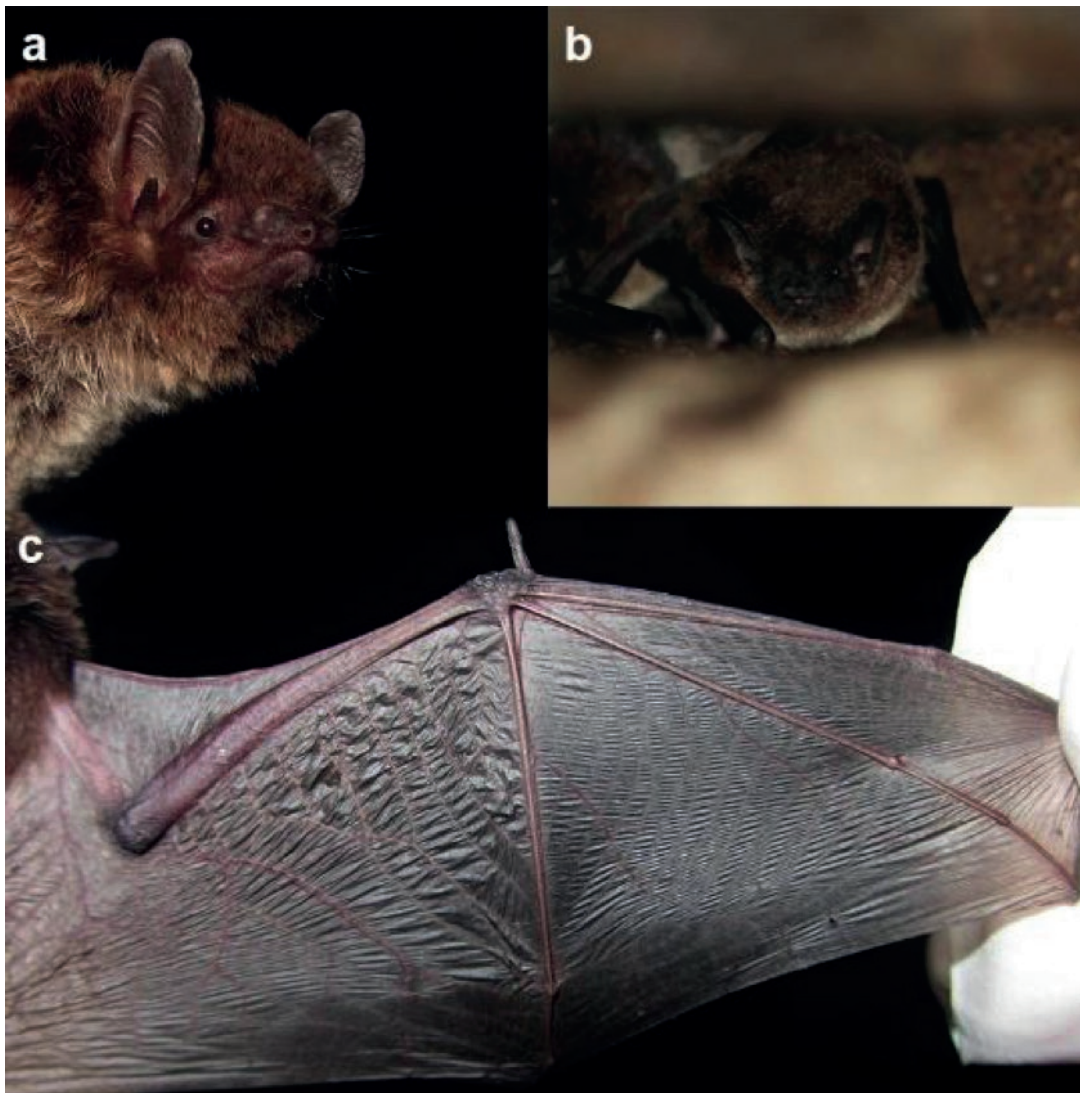


Figure 3. a) Adult male *Myotis albescens*; b) detail of individual *M. albescens* roosting during the day; c) right wing of *M. albescens*.

(in mm): greatest length of the skull 14.25, 14.24; condyloincisive length 13.55, 13.38; interorbital breadth 4.93, 4.82; postorbital breadth 4.09, 4.05. *Myotis albescens* has latitudinal variation in size, with larger specimens occurring at southern localities (Moratelli & de Oliveira 2011). In our study, both external and cranial measurements were within the known variation for the species in the southern part of its distribution.

All 11 males had descended testes, which measured, in the two collected individuals, 0.9 x 0.5 mm and 0.9 x 0.6 mm. Pregnancy was verified by abdominal palpation in two of the seven females, but we cannot rule out that the other five females were not pregnant as well. In the Paraguayan Chaco, pregnant females were recorded from early August to end January (Myers 1977) and in the Atlantic Forest of southeastern

Brazil pregnancies were recorded in December–February (Moratelli *et al.* 2019). Our records of pregnant females in October probably represent the first of the two reproductive cycles of the rainy season and expand the known length of the reproductive cycle of the species in southeastern Brazil.

Besides providing important data on the natural history of *M. albescens*, our findings show that highway culverts can be an important shelter for rarely sampled species, such as *M. albescens*. In this context, preservation of riparian forests and the associated water bodies is important for providing shelter and food resources for populations of water-dependent species. In the same region, we have also recorded other water-dependent and rarely sampled species of mammals using culverts, such as the water



Figure 4. Dorsal and lateral view of the skull of *Myotis albescens* (LMUSP 511) from Rancharia, São Paulo state, Brazil.

opossum (*Chironectes minimus*) (Prist *et al.* 2020) and the greater fishing bat (*Noctilio leporinus*) (GSTG unpublished data).

ACKNOWLEDGEMENTS

We are thankful to Roberto Leonan Novaes for the assistance in identifying the specimens, and to Jesús Mollinari for sending important bibliographic references.

REFERENCES

- Acosta y Lara, E. F. 1950. Quirópteros del Uruguay. *Comunicaciones Zoológicas Del Museo de Historia Natural de Montevideo*, 58(3), 1–71.
- Barquez, R. M. 1988. Notes on identity, distribution, and ecology of some Argentine bats. *Journal of Mammalogy*, 69(4), 873–876.
- Braun, J. K., Layman, Q. D., & Mares, M. A. 2009. *Myotis albescens* (Chiroptera: Vespertilionidae). *Mammalian Species*, 846, 1–9. DOI: 10.1644/846.1
- Handley, C. O. 1976. Mammals of the Smithsonian Venezuelan Project. *Brigham Young University Science Bulletin, Biological Series*, 20(5), 1–89.
- DOI: <http://scholarsarchive.byu.edu/byuscib/vol20/iss5/1/>
- LaVal, R. K. 1973. A revision of the Neotropical bats of the genus *Myotis*. *Natural History Museum Los Angeles County Science Bulletin*, 15, 1–54.
- Medellín, R. A. 2014. *Myotis albescens* (É. Geoffroy St.-Hilaire, 1806). In: G. Ceballos (Ed.), *Mammals of Mexico*. pp. 782–783. Baltimore, MD: Johns Hopkins University Press.
- Miranda, J. M. D., Pulchério-Leite, A., Bernardi, I. P., & Passos, F. de C. 2007. Primeiro registro de *Myotis albescens* (É. Geoffroy, 1806) (Chiroptera, Vespertilionidae) para o Estado do Paraná, Brasil. *Biota Neotropica*, 7(1), 231–233.
- Moratelli, R., Burgin, C. J., Cláudio, V. C., Novaes, R. L. M., López-Baucells, A., & Haslauer, R. 2019. Family Vespertilionidae (Vesper Bats). In: D.E. Wilson & R. A. Mittermeier (Eds.), *Handbook of the Mammals of the World, Bats*, Vol. 9. pp. 716–981. Barcelona: Lynx Edicions.
- Moratelli, R., & de Oliveira, J.A. 2011. Morphometric and morphological variation in South American populations of *Myotis albescens* (Chiroptera: Vespertilionidae). *Zoologia*, 28(6), 789–802. DOI: 10.1590/S1984-46702011000600013
- Moratelli, R., Dewynter, M., Delaval, M., Catzeflis,

- F., & Ruedi, M. 2015. First record of *Myotis albescens* (Chiroptera, Vespertilionidae) in French Guiana. *Biodiversity Data Journal*, 3(1). DOI: 10.3897/BDJ.3.e5314
- Myers, P. 1977. Patterns of reproduction of four species of vespertilionid bats in Paraguay. *University of California Publications in Zoology*, 107, 1–41.
- Patterson, B. D. 1992. Mammals in the Royal Natural History Museum, Stockholm, Collected in Brazil and Bolivia by A. M. Olalla during 1934–1938. *Fieldiana Zoology, New Series*, 66, 1–64.
- Prist, P. R., Garbino, G. S. T., Abra, F. D., Pagotto, T., & Giacón, O. O. 2020. Use of highway culverts by the water opossum (*Chironectes minimus*) in southeastern Brazil. *Biota Neotropica*, 20(4), e20201058. DOI: 10.1590/1676-0611-BN-2020-1058
- Ribeiro, M. C., Metzger, J. P., Martensen, A. C., Ponzoni, F. J., & Hirota, M. M. 2009. The Brazilian Atlantic Forest: How much is left, and how is the remaining forest distributed? Implications for conservation. *Biological Conservation*, 142(6), 1141–1153. DOI: 10.1016/j.biocon.2009.02.021
- Voss, R. S., Fleck, D. W., Strauss, R. E., Velazco, P. M., & Simmons, N. B. 2016. Roosting ecology of Amazonian bats: evidence for guild structure in hyperdiverse mammalian communities. *American Museum Novitates*, 3870(3870), 1–43. DOI: 10.1206/3870.1
- Wied, M. P. 1826. Beiträge zur Naturgeschichte von Brasilien. II. Band. Weimar: Landes-Industrie-Comptoir: p. 620.
- Wilson, Don E. 2008. Genus *Myotis* Kaup, 1829. In: A. L. Gardner (Ed.), *Mammals of South America, Volume 1: marsupials, xenarthrans, shrews, and bats*. pp. 468–481. Chicago, IL: The University of Chicago Press.

Submitted: 02 December 2020

Accepted: 18 February 2021

Published on line: 22 February 2021

Associate Editor: Maja Kajin