Pesquisa e Ensino em Ciências Exatas e da Natureza
2(1): 17–22 (2018)
Research and Teaching in Exact and Natural Sciences

ARTICLE

ISSN 2526-8236 (online edition)
Pesquisa e Ensino em Ciências Exatas e da Natureza

UFCG - Campus de Cajazeiras - PB.

Note on bats (Mammalia, Chiroptera) in a Restinga area of Rio Grande do Norte, Brazil

Fábio Soares[1,2], Marcela Daher[3], Raul Perrelli[3], José Armando Torres Moreno[3] & Stephen Ferrari[2,4]

(1) Federal University of Bahia, Institute of Biology, Graduate Program in Ecology, Rua Barão de Geremoabo 147, Campus de Ondina, Salvador 40170-290, Bahia, Brazil. E-mail: fabiosoares9@gmail.com

(2) Federal University of Sergipe, Center of Biological and Health Sciences, Department of Ecology, Laboratory of Conservation Biology, Rosa Elze, São Cristóvão 49100-000, Sergipe, Brazil. E-mail: prof.stephenff@gmail.com

(3) Empresa de Projetos Biodinâmicos (Emprobio), Rua Major Nereu Guerra 195, Casa Amarela 52070-300, Recife, Pernambuco, Brazil.

(4) University of Roehampton, Department of Life Sciences, Roehampton SW15 5PU, London, United Kingdom.

Soares F., Daher M., Perrelli R., Moreno J.A.T. & Ferrari S. (2018) Note on bats (Mammalia, Chiroptera) in a Restinga area of Rio Grande do Norte, Brazil. *Pesquisa e Ensino em Ciências Exatas e da Natureza*, 2(1): 17–22. http://dx.doi.org/10.29215/pecen.v2i1.576

Nota sobre morcegos (Mammalia, Chiroptera) em uma área de restinga do Rio grande do Norte, Brasil

Resumo: Atualmente, quarenta e uma espécies de morcegos são conhecidas para as restingas do Brasil. No entanto, a maioria dos estudos sobre morcegos das restingas são limitados às regiões sul e sudeste do Brasil, deixando a região nordeste com uma lacuna de conhecimento. O presente artigo apresenta dados sobre morcegos capturados em três áreas de restinga do município de Tibau do Sul, Rio Grande do Norte, levantados a partir de uma amostragem de curta duração. Redes de neblina para captura de morcegos foram armadas próximas ao solo e sobre o corpo d'água. Foram capturados 38 indivíduos de seis espécies de duas famílias: cinco Phyllostomidae e um Molossidae. O morcego *Carollia perspicillata* (Linnaeus, 1758) foi a espécie mais abundante. Apresentamos aqui a primeira lista de morcegos capturados em área de restinga para o Rio Grande do Norte.

Palavras chave: Molossidae, Nordeste, Novo registro, Phyllostomidae, Tibau do Sul.

Abstract: Currently, forty-one species of bats are known to occur in the restingas of Brazil. However, most studies on restingas' bats are limited to the south and southeastern regions of Brazil, leaving the northeastern region with a gap of knowledge. The present article presents data on bats captured in three areas of restinga of the municipality of Tibau do Sul, Rio Grande do Norte, collected from a short-term sampling. Mist nets were used to capture bats near the ground and the water bodies. Were captured 38 individuals of six species and two families: five Phyllostomidae and one Molossidae. The bat *Carollia perspicillata* (Linnaeus, 1758) was the most abundant species. We present here the first list of bats captured in the restinga area for the Rio Grande do Norte State.

Key words: Molossidae, New record, Northeast, Phyllostomidae, Tibau do Sul.

Introduction

The Brazilian restinga ecosystems are a component of the coastal plain which has been formed by the deposition of sediments through many transgressions and regressions in the sea level during the recent glacial and inter-glacial periods (Araújo & Lacerda 1987). The restinga vegetation is extremely vulnerable to anthropogenic impacts due to its the sandy soils that are

Academic editor: Pablo Ariel Martinez. **Received**: 21 September 2017. **Accepted**: 22 April 2018. **Published**: 06 June 2018.

easily eroded, especially in restingas located close to areas urban developments, agriculture, and quarrying, common activities in eastern coast of Brazil (CEPF 2007). The ongoing loss of restinga habitats and their associated fauna emphasize the need for a more systematic understanding of their biological diversity, which will depend on detailed surveys of remaining sites.

Despite some recent advances (Cerqueira *et al.* 1990; Cerqueira 2000; Bergallo *et al.* 2004), the mammalian fauna of coastal Brazilian restinga is still relatively poorly known, especially in relation to the occurrence of bats (Luz *et al.* 2009). In addition, the data available on the distribution of chiropterans in this ecosystem are restricted to southern Brazil, in the states of Santa Catarina (Carvalho *et al.* 2009), São Paulo (Alves 2008; Fogaça & Reis 2008), Rio de Janeiro (Gomes *et al.* 2016), and Espírito Santo (Luz *et al.* 2009; Oprea *et al.* 2009). In the northeast of Brazil, only Sergipe has data on bats in restinga (Rocha *et al.* 2017), where 16 species were recorded. Based on data compiled from the available literature and recent published studies, 41 species and 28 genera of bats are known to occur in the resting of Brazil (Nogueira *et al.* 2010; Rocha *et al.* 2017).

In northeast Brazil, the state of Rio Grande do Norte represents one of the most conspicuous gaps of information regarding bat distribution in the country (Bernard *et al.* 2011), despite this gap, there is a recent increase in studies about bats in Rio Grande do Norte (Feijó & Nunes 2010; Ferreira *et al.* 2010; Barros 2014; Barros *et al.* 2017; Cordero-Schmidt *et al.* 2017; Vargas-Mena *et al.* 2018), however the bat fauna of the states' restingas are virtually unknown. Bats are important providers of ecosystem services, acting as pollinators, dispersers and consuming insects, including those considered as pests. Given that the knowledge of the chiropterofauna of Rio Grande do Norte is still very incipient, that restinga is essential for the maintenance of biodiversity and that bats play an important role in this ecosystem. This study presents the first records of bats for the restinga of Rio Grande do Norte in three protected areas of restinga in the southeastern extreme of the state of Rio Grande do Norte.

Material and Methods

The survey took place in March 2008 in three areas: Pipa Ecological Sanctuary PES (6°13'42.64" S, 35°3'56.47" W), Mata da Pipa State Park – PEMP (06°15'00" S, 35°03'23" W), and Riacho Galhardo Environmental Protection Area - APA Rio Galhardo (06°14'43.39" S, 35°04'19.33" W), both located in the municipality of Tibau do Sul, in Rio Grande do Norte, Brazil (**Figure 1**).

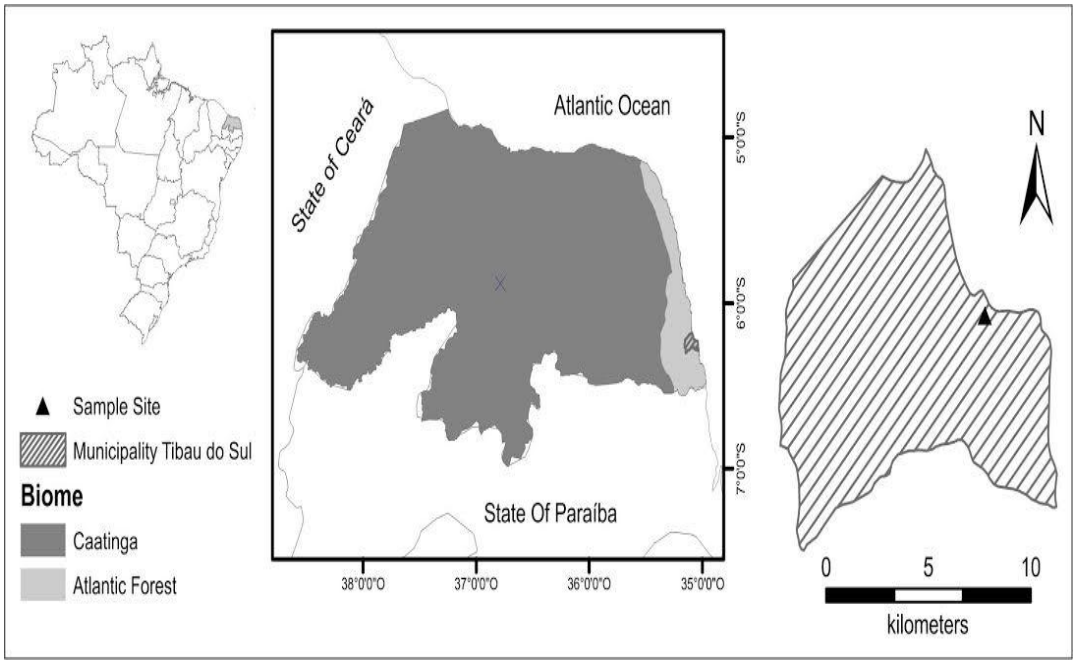

Figure 1. Location of study areas in Tibau do Sul, Rio Grande do Norte, northeastern Brazil.

The local climate is classified as according Koppen climate classification (Alvares *et al.* 2013), with temperature variation between 21 and 32°C, mean annual precipitation 1432 mm and rainy season is concentrated between the months of January and August (Idema 2013).

Bats were captured in four mist-nets (12 x 2.5 m), which were set close to the ground along established trails. In the APA Riacho Galhardo, the nets were also set in open areas and over the riverbed. The nets were set between 17:00 h and 24:00 h, and were checked every 20 minutes. As this was a rapid survey, the nets were set at each site during a single night, totaling three nights of capture, during the new moon.

Each individual were marked with colored plastic collars before being set free at the capture site (see Esbérard & Daemon 1999). Measurements were obtained using calipers. We follow the ethical recommendations proposed by Sikes *et al.* (2011). The species were identified and classified based on Gardner (2007), Gregorin & Taddei (2002), Lim *et al.* (2004), and Simmons (2005). Total sampling effort is given in net-hours, calculated by multiplying the total net area by the number of hours the nets were set and the number of the nets (see Straube & Bianconi 2002).

Results

A total of 38 bats representing six species (**Table 1**) with a capture effort of 2520 m^2.h. Phillostomid bats accounted for 95% of the catches were the most common species was *Carollia perspicillata* conforming almost a third of the specimens captured. All phyllostomids bats were recorded at the Pipa Ecological Sanctuary and PEMP, at the APA Riacho Galhardo only *Molossus* sp. was recorded where two individuals were captured near a water body. Two trophic guilds were identified in the present study. Frugivorous bats were the most abundant (n = 36) followed by just two individuals of insectivorous bat.

Table 1. Bat species captured during a rapid survey in the restinga of southeastern Rio Grande do Norte state, Brazil.

Family	Species	Number of specimens			Total (%)
		Pipa Ecological Sanctuary	PEMP	APA Riacho Galhardo	
Phyllostomidae	*Carollia perspicillata* (Linnaeus, 1758)	07	05	-	12 (31.5)
	Dermanura cinerea (Gervais, 1856)	06	02	-	08 (21.1)
	Artibeus planirostris (Spix, 1823)	03	02	-	05 (13.2)
	Platyrrhinus lineatus (E. Geoffroy, 1810)	04	02	-	06 (15.7)
	Sturnira lilium (E. Geoffroy, 1810)	05	-	-	05 (13.2)
Molossidae	*Molossus* sp.	-	-	02	02 (5.3)

Discussion

All bat species recorded in the present study have been recorded previously in Brazilian restinga habitats (Alves 2008; Carvalho *et al.* 2009; Luz *et al.* 2009; Oprea *et al.* 2009; Nogueira *et al.* 2010; Gomes *et al.* 2016; Rocha *et al.* 2017). The short sampling duration of the study tendency to record the most common species and of greater local abundance. The predominance of phyllostomids and the abundance of *Carollia perspicillata* recorded in the present study are typical of other Brazilian restingas (Carvalho *et al.* 2009; Luz *et al.* 2009; Nogueira *et al.* 2010; Luz *et al.* 2011; Gomes *et al.* 2016; Rocha *et al.* 2017). Such phyllostomid dominance is consistent with most bat communities in the Neotropics (Humphrey & Bonaccorso 1979; Fenton *et al.* 1992). However, the phyllostomid dominance in our results might be related to the capture method we used. Mist-nets settled at ground level are more effective for the capture of phyllostomid bats, in particular species that primarily foraging in the under-canopy (Greenhall & Paradiso 1968).

The reduced diversity of molossids and absence of specimens of other families, such as the Vespertilionidae, Emballonuridae may also be related to methodology applied in this study.

Bats from these families are aerial insectivores and generally fly above the canopy level (Nowak 1994). Therefore, other methods such as acoustic recordings should be used in order to have better representativeness of the local bat communities in the restingas. The capture of two specimens of *Molossus* sp. may be related to the fact that the mist nets were set on the water body, as observed by Lourenço *et al.* (2010). Molossids exhibit the behavior of foraging on the body of water (Ciechanowski 2002; Lourenço *et al.* 2010).

The absence of a number of other species, such as *Artibeus lituratus* (Olfers, 1818) and *Glossophaga soricina* (Pallas, 1766) which are relatively common in most surveys in South America (Oprea 2006; Alves 2008; Carvalho *et al.* 2009; Luz *et al.* 2009; Oprea *et al.* 2009; Gomes *et al.* 2016), is probably related to the short duration of the study period. In addition, it is important to highlight that surveys of short duration may provide important insights into the diversity of the chiropteran community. Inventories are fundamental to the administration of protected areas (Silva & Marinho-Filho 2010), providing important guidelines for the management of populations of endangered species and other taxa. It is important to remember that rapid surveys will rarely result in a complete species list, but they do provide a baseline for further research, or even the implementation of emergency conservation measures (Martins *et al.* 2006). Furthermore, rapid surveys can be an important inventory tool, especially in Brazil, where less than 10% of the country was minimally surveyed (Bernard *et al.* 2011).

So far, only 42 species of bats are known to occur for Rio Grande do Norte (Barros 2014; Barros *et al.* 2017; Cordero-Schmidt *et al.* 2017; Vargas-Mena *et al.* 2018), which is still considered a low richness when compared to nearby states such as Pernambuco (n = 73), Paraíba (n = 63) and Ceará (n = 62) (Garcia *et al.* 2014). The present study provides the first data on the bat fauna of the coastal restingas of Rio Grande do Norte. While the short duration of the study and the methodological limitations almost certainly mean that the species list presented here is incomplete, further sampling effort including additional techniques (e.g., mist-netting above canopy level, recordings of echolocation signals, and daytime roost searches) should provide a more definitive inventory.

Acknowledgments

We are grateful to Empresa de Projetos Biodinâmicos – EMPROBIO – by supporting the logistics for the field work. FAMS thanks FAPESB (process 8200/2015) and the anonymous reviewers for critically reviewing the manuscript.

References

Alvares C.A., Stape J.L., Sentelhas P.C., De Moraes J.L. & Sparovek G. (2013) Köppen's climate classification map for Brazil. *Meteorologische Zeitschrift*, 22: 711–728. doi: 10.1127/0941-2948/2013/0507

Alves L.A. (2008) Estrutura da comunidade de morcegos (Mammalia: Chiroptera) do Parque Estadual da Ilha do Cardoso, São Paulo, SP. Dissertação de mestrado, Programa de Pós-Graduação em Ecologia e Conservação. Universidade Federal de Mato Grosso do Sul, Campo Grande, Mato Grosso do Sul.

Araújo D.S.D. & Lacerda L.D. (1987) A natureza das restingas. *Ciência Hoje*, 6(32): 42–48.

Araújo J.P., Passavante J.Z.O. & Souto A.S. (2001) Behavior of the estuarine dolphin, *Sotalia guianensis*, at Dolphin Bay – Pipa – Rio Grande do Norte – Brazil. *Tropical Oceanography*, 29(2): 13–23.

Barros M.A.S. (2014) First record of *Molossus molossus* (Pallas, 1766) (Mammalia: Chiroptera) in the state of Rio Grande do Norte, northeastern Brazil. *Check List*, 10: 1520–1524. doi: 10.15560/10.6.1520

Barros M.A.S., Morais C.M.G., Figueiredo B.M.B., Moura-Júnior G.B., Ribeiro F.F.S., Pessoa D.M.A., Ito F. & Bernard E. (2017) Bats (Mammalia, Chiroptera) from the Nísia Floresta National

Forest, with new records for the state of Rio Grande do Norte, northeastern Brazil. *Biota Neotropica*, 17: 1–8. doi: 10.1590/1676-0611-bn-2017-0351

Bergallo H.G., Martins-Hatano F., Raíces D.S.L., Ribeiro T.T.L., Alves A.G., Luz J.L., Mangolin R. & Mello M.A.R. (2004) Os mamíferos da Restinga de Jurubatiba (p. 215–230). *In*: Rocha C.F.D., Esteves F.A. & Scarano F.R. (Eds). Pesquisas de longa duração na Restinga de Jurubatiba – Ecologia, história natural e conservação. São Carlos: Rima Editora. 376 p.

Bernard E., Aguiar L.M.S. & Machado R.B. (2011) Discovering the Brazilian bat fauna: a task for two centuries? *Mammal Review*, 41(1): 23–39. doi: 10.1111/j.1365-2907.2010.00164.x

Carvalho F., Zocche J.J. & Mendonça R.A. (2009) Morcegos (Mammalia, Chiroptera) em restinga no município de Jaguaruna, sul de Santa Catarina, Brasil. *Biotemas*, 22 (3): 193–201. doi: 10.5007/2175-7925.2009v22n3p193

CEPF - Critical Ecosystem Partnership Fund (2007) Avaliação de Cinco Anos de Investimento do CEPF no Hotspot de Biodiversidade da Mata Atlântica. Relatório Especial. Arlington, USA: Conservation International. 80 p.

Cerqueira R. (2000) Biogeografia de restingas (p. 65–76). *In*: Esteves F.A. & Lacerda L.D. (Eds). Ecologia de restingas e lagoas costeiras. Rio de Janeiro: Universidade Federal do Rio de Janeiro. 394 p.

Cerqueira R., Fernandez F.A.S. & Quintela M.F.S. (1990) Mamíferos da Restinga de Barra de Maricá, Rio de Janeiro. *Papéis Avulsos de Zoologia*, 37(9): 141–157.

Ciechanowski M. (2002) Community structure and activity of bats (Chiroptera) over different water bodies. *Mammalian Biology*, 67: 276–285. doi: 10.1078/1616-5047-00042

Cordero-Schmidt E., Barbier E., Vargas-Mena J.C., Oliveira P.P., Santos F.A.R., Medellín R.A., Herrera B.R. & Venticinque E.M. (2017) Natural History of the Caatinga Endemic Vieira's Flower Bat. *Acta Chiropterologica*, 19: 399–408. doi: 10.3161/15081109ACC2017.19.2.016

Esbérard C. & Daemon C. (1999) Um novo método para marcação de morcegos. *Chiroptera Neotropical*, 5(1): 116–117.

Feijó A.J. & Nunes H.N. (2010) Primeiro registro de *Myotis nigricans* (Schinz, 1821) para o estado do Rio Grande do Norte, nordeste do Brasil. *Chiroptera Neotropical*, 16(1): 531–534.

Fenton M.B., Acharya L., Audet D., Hickey M.B.C., Merriman C., Obrist M.K., Syme D.M. & Adkins B. (1992) Phyllostomid bats (Chiroptera: Phyllostomidae) as indicators of habitat disruption in the Neotropics. *Biotropica*, 24: 440–446. doi: 10.2307/2388615

Ferreira R.L., Prous X., Bernardi L.F.O. & Souza-Silva M. (2010) Fauna subterrânea do estado do Rio Grande do Norte: caracterização e impactos. *Revista Brasileira de Espeleologia*, 1(1): 25–51.

Fogaça F.N.O. & Reis N.R. (2008) Análise comparativa da quiropterofauna da restinga paranaense e adjacências (p. 87–95). *In*: Reis N.R., Peracchi A.L. & Santos G.A.S.D. (Eds). Ecologia de morcegos. Londrina: Technical Books. 148 p.

Garcia A.C.L., Leal E.S.B., Rohde C., Carvalho-Neto F.G. & Montes M.A. (2014) The bats of northeastern Brazil: a panorama. *Animal Biology*, 64(1): 141–150. doi: 10.1163/15707563-00002440

Gardner A.L. (2007) Mammals of South America, Volume 1, marsupials, xenarthrans, shrews, and bats. Chicago: University of Chicago Press. 669 pp. [Dated 2007; published 31 March 2008]

Gomes L.A.C., Maas A.C.S., Martins M.A., Pedrozo A.R., Araújo R.M. & Peracchi A.L. (2016) Morcegos em área de restinga de unidade de conservação no estado do Rio de Janeiro, sudeste do Brasil. *Neotropical Biology and Conservation*, 11(1): 31–37.

Greenhall A.M. & Paradiso J.L. (1968) Bats and bat banding. Resource publication. *Bureau of Sport Fisheries and Wildlife*, 72: 1–48.

Gregorin R. & Taddei V.A. (2002) Chave artificial para a identificação de Molossídeos brasileiros (Mammalia, Chiroptera). *Mastozoología Neotropical*, 9(1): 13–32.

Humphrey S.R. & Bonaccorso F.J. (1979) Population and community ecology (p. 409–441). *In*: Baker R.J., Jones Jr. J.K. & Carter D.C. (Eds). Biology of the bats of the New World family

Phyllostomatidae, Part III. *Special Publications, The Museum Texas Tech University*, 16: 1–441.

Idema - Instituto de Desenvolvimento Sustentável e Meio Ambiente do Rio Grande do Norte (2013) Perfil do Seu Município – Tibau do Sul 2013. IDEMA, Natal.

Lim B.K., Engstrom M.D., Lee T.E., Patton J.C. & Bickham J.W. (2004) Molecular differentiation of large species of fruit-eating bats (Artibeus) and phylogenetic relationships based on the cytochrome b gene. *Acta Chiropterologica*, 6: 1–12. doi: 10.3161/001.006.0101

Lourenço E.C., Costa L.M., Luz J.L., Dias R.M. & Esbérard C.E.L. (2010) Morcegos em manguezal – análise de uma assembléia e compilação de dados disponíveis no Brasil (p. 173–187). *In*: Pessoa L.M., Tavares W.C. & Siciliano W.C. (Eds). Mamíferos de restingas e manguezais do Brasil. Rio de Janeiro: Sociedade Brasileira de Mastozoologia. 282 p.

Luz J.L., Mangolin R., Esbérard C.E.L. & Bergallo H.G. (2011) Morcegos (Chiroptera) capturados em lagoas do Parque Nacional da Restinga de Jurubatiba, Rio de Janeiro, Brasil. *Biota Neotropica*, 11(4): 1–9. doi: 10.1590/S1676-06032011000400016

Luz J.L., Costa L.M., Lourenço E.C., Gomes L.A.C. & Esbérard C.E.L. (2009) Bats from the restinga of Praia das Neves, state of Espírito Santo, Southeastern Brazil. *Check List*, 5(2): 364–369. doi: 10.15560/5.2.364

Martins A.C.M., Bernard E. & Gregorin R. (2006) Inventários biológicos rápidos de morcegos (Mammalia, Chiroptera) em três unidades de conservação do Amapá, Brasil. *Revista Brasileira de Zoologia*, 23(4): 1175–1184.

Nogueira M.R., Mazurec A.P. & Peracchi A.L. (2010) Morcegos em restingas: lista anotada e dados adicionais para o Norte Fluminense, sudeste do Brasil (Mammalia, Chiroptera) (p. 1–19). *In*: Pessôa L.M., Tavares W.C. & Siciliano S. (Eds). Mamíferos das Restingas e Manguezais do Brasil. Rio de Janeiro: Sociedade Brasileira de Mastozoologia. 282 p.

Nowak R.M. (1994) Walker's bats of the world. Baltimore: The Johns Hopkins University Press. 287 p.

Oprea M. (2006) Aspectos ecológicos de morcegos de restingas. Dissertação de Mestrado, Programa de Pós-Graduação em Biologia Animal. Universidade Federal do Espírito Santo, Vitória, Espírito Santo.

Oprea M., Esbérard C.E.L., Vieira T.B., Mendes P., Pimenta V.T., Brito D. & Ditchfield A.D. (2009) Bat community species richness and composition in a restinga protected area in Southeastern Brazil. *Brazilian Journal Biology*, 69(4): 1073–1079. doi: 10.1590/S1519-69842009000500010

Rocha P.A., Ruiz-Esparza J., Beltrão-Mendes R., Moura V.S., Albuquerque N., Terra R.F.C., Mendonca L.M.C., Silvestre S.M. & Ferrari S.F. (2017) Rapid surveys as a key tool for the inventory of the bat fauna of Brazil: new records for the coastal restinga. *Neotropical Biology and Conservation*, 12: 91–99. doi: 10.4013/nbc.2017.122.02

Sikes R.S. & Gannon W.L. (2011) The Animal Care and Use Committee of the American Society of Mammalogists. Guidelines of the American Society of Mammalogists for the Use of Wild Mammals in Research. *Journal of Mammalogy*, 92: 235–253.

Silva L.A.M. & Marinho-Filho J. (2010) Novos registros de morcegos (Mammalia Chiroptera) na Caatinga de Pernambuco, Nordeste do Brasil. *Revista Nordestina de Zoologia*, 4: 76–84.

Simmons N.B. (2005) Order Chiroptera (p. 312–529). *In*: Wilson D.E. & Reeder D.M (Eds). Mammal species of the world: a taxonomic and geographic reference. Volume 1. Baltimore, MD: Johns Hopkins University Press. 2142 p.

Straube F.C. & Bianconi G.V. (2002) Sobre a grandeza e a unidade utilizada para estimar esforço de captura com utilização de redes-de-neblina. *Chiroptera Neotropical*, 8(1-2): 150–152.

Vargas-Mena J.C., Alves-Pereira K., Barros M.A.S., Barbier E., Cordero-Schmidt E., Lima S.M.Q., Rodríguez-Herrera B. & Venticinque E.M. (2018) The bats of Rio Grande do Norte state, northeastern Brazil. *Biota Neotropica*, 18(2): 1–13. doi: 10.1590/1676-0611-bn-2017-0417