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Bats (Mammalia, Chiroptera) in a remnant of Atlantic Forest, Rio de Janeiro, southeastern Brazil

Morcegos (Mammalia, Chiroptera) em remanescente de Floresta Atlântica, Rio de Janeiro, sudeste do Brasil

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Abstract

Biodiversity inventories are essential to generate information leading to the proposal of conservation plans, especially for threatened areas. Despite being one of the best sampled regions for bats in Brazil, some areas of Rio de Janeiro still represent knowledge gaps. Between May 2011 and June 2012, we performed 36 nightly samplings to conduct an inventory of bat species in Reserva Ecológica de Guapiaçu, in Cachoeiras de Macacu, in the state of Rio de Janeiro, southeastern Brazil. We used 10 mist-nets per night opened from sunset to sunrise. A total of 1,290 individuals belonging to 31 bat species were caught. They were distributed in three families, Phyllostomidae (24 species), Vespertilionidae (four species) and Molossidae (three species). We recorded two other species of two families, Noctilionidae and Thyropteridae, by direct observations. The species richness of bats in Reserva Ecológica de Guapiaçu is one of the largest ever recorded in the Atlantic Forest.

Keywords: rainforest, species richness, abundance, biodiversity inventory.

Resumo

Inventários de biodiversidade são essenciais para gerar informações que levem à proposta de planos de conservação, especialmente para áreas ameaçadas. Apesar do estado do Rio de Janeiro ser a região com maior número de amostragens de morcegos no Brasil, algumas áreas ainda representam lacunas de conhecimento. Entre maio de 2011 e junho de 2012, realizamos 36 amostragens noturnas para inventariar as espécies de morcegos da Reserva Ecológica de Guapiaçu, no município de Cachoeiras de Macacu, Rio de Janeiro. Foram utilizadas 10 redes-de-neblina por noite, abertas do anoitecer ao amanhecer. Um total de 1.290 indivíduos pertencentes a 31 espécies de morcegos foi capturado. As espécies estão distribuídas em três famílias, Phyllostomidae (24 espécies), Vespertilionidae (quatro espécies) e Molossidae (três espécies). Duas outras espécies, das famílias Noctilionidae e Thyropteridae, foram registradas por observações diretas. A riqueza de morcegos da Reserva Ecológica de Guapiaçu é uma das maiores já registradas na Floresta Atlântica.

Palavras-chave: floresta úmida, riqueza de espécies, abundância, inventário de biodiversidade.

Introduction

Since the sixteenth century many economic cycles (e.g., pau-brasil, gold, sugarcane and coffee), followed by processes of industrialization and unplanned urban expansion, led to a drastic reduction of the Atlantic Forest, leaving only about 8% of the original vegetation (Ribeiro *et al*., 2009). The remaining fragments of the Atlantic Forest are usually small and isolated from large forests. Such fragments consist of secondary forests ranging from early stage to late secondary succession of vegetation (Viana *et al*., 1997; Metzger *et al*., 2008). This situation put under threat a large proportion of its species, leading this biome to be one of the most important biodiversity hotspots in the world (Myers *et al.*, 2000; Tabarelli *et al.*, 2005) though still suffering constant anthropogenic pressures (Souza *et al*., 2013).

In heterogeneous and highly diverse forests, such as the Brazilian Atlantic Forest, which still holds a large number of unknown species (Lewinsohn and Prado, 2005), biodiversity inventories are essential to generate information leading to the proposal of conservation plans (Esbérard, 2003). Despite the large amount of biological data collected over the past decades in this biome, some areas still have large gaps in knowledge, which hinders the development of measures for their conservation (Metzger *et al*., 2008; Bernard *et al*., 2011). Therefore, the first step to promote conservation strategies and better understand the ecological dynamics of native biota in different habitats is the inventory of species.

According to Paresque *et al*. (2004), the Atlantic Forest comprises an important ecosystem for Neotropical mammals. In Brazil, this group achieves a high richness (almost 700 species) and a high rate of endemism (about 30% of species) (Paglia et al., 2012). Chiroptera is the second richest order in species within Mammalia (after Rodentia) and has more than 170 species recorded in Brazil, with 113 of them found in the area of Atlantic Forest (Paglia *et al*., 2012).

Rio de Janeiro is the most well sampled state for bats in Brazil (Bergallo *et al*., 2003; Bernard *et al.*, 2011). Currently 78 bat species are known to this state, representing 69% of bat richness in the Atlantic Forest (Paglia *et al*., 2012). However, the metropolitan east of the State of Rio de Janeiro has few studies on bats, being considered a region of knowledge gap. Here we present the results of an inventory of bat species of Reserva Ecológica de Guapiaçu, southeastern Brazil.

Material and methods

Study area

The Reserva Ecológica de Guapiaçu – REGUA (22°25'53"S; 42°45'20"W) is located in the city of Cachoeiras de Macacu, state of Rio de Janeiro, southeastern Brazil (Figure 1). REGUA is a private reserve of natural heritage and comprises 5,500 ha formed by a mosaic of forest remnants at different levels of conservation, from secondary forests in early successional to mature forest in the highest parts (Rocha *et al*., 2007), and disturbed areas (including plantations and pastures). The vegetation represents the typical forest formations of low and medium altitudes in the coastal region of Brazil (Morellato and Haddad, 2000; Oliveira-Filho and Fontes, 2000; Veloso *et al.*, 1991). The average annual temperature in this region is approximately 23°C with an average of annual rainfall of about 2,600 mm (Kurtz and Araújo, 2000; Bernardo *et al*., 2011). The region has a warm and rainy period between November and April, and a colder and drier period between May and October (Almeida-Gomes, 2011). REGUA is within an extensive set of strategic forest remnants for the conservation of biodiversity and natural resources, to protect part of the watersheds that flow into Guanabara Bay (Conservação Internacional *et al*., 2000; Rocha *et al*., 2003).

Sampling

From May 2011 to June 2012, we performed 36 nightly captures in REGUA with 10 mist nets (9 m x 3 m) in open trails, vegetation gaps, dense vegetation, and on streams (Kunz and Kurta, 1988). The sampling of bats was carried out in three areas with different levels of conservation and different vegetation types, including disturbed areas, secondary vegetation in early stages of ecological succession, late successional vegetation and mature secondary forest area with little anthropic disturbance. The mist nets were open from sunset to sunrise, totaling 116,640 m² of sampling effort (Straube and Bianconi, 2002), equal for all three sampling areas. The captured bats were identified in the field with the aid of the descriptions provided by Simmons and Voss (1998), Barquez *et al*. (1999), Dias *et al*. (2002), Reis *et al*. (2007), Dias and Peracchi (2008) and Peracchi *et al*. (2010). The first two specimens of each species caught, as well as the individuals which generated doubts about the identification, were collected and incorporated as a material-reference in the collection of mammals from the National Museum of Rio de Janeiro (Appendix 1), as license by SISBIO/ICMBio (3893-1/28717). All ethic guidelines in manipulating animals were followed using recommendations by Sikes and Gannon (2011).

At the end of the handling, we marked the captured individuals with numbered metal rings on the forearm to record recaptures. Later, we released these individuals on the same capture site. The classifications of species into trophic guilds followed Kalko *et al.* (1996).

Results

We captured 1,290 bats of three families: Phyllostomidae (24 species), Vespertilionidae (four species) and Molossidae (three species). In addition, two other species of two fami-

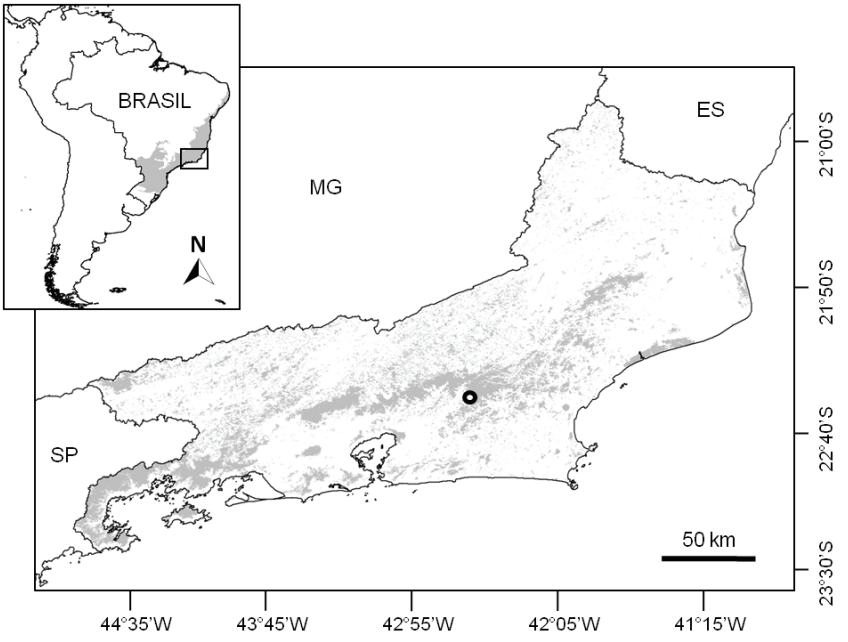

Figure 1. Location of Reserva Ecológica de Guapiaçu, Cachoeiras de Macacu, in the context of remnants of the Atlantic Forest in the state of Rio de Janeiro (gray), in the southeastern of Brazil.

lies, Noctilionidae and Thyropteridae, were recorded through direct observation (without capture), totaling 33 species of bats recorded in the Reserva Ecológica de Guapiaçu (Table 1).

We recaptured 146 individuals of 11 species: *Carollia perspicillata* (Linnaeus, 1758) (94), *Artibeus fimbriatus* (Gray, 1838) (13), *A. lituratus* (Olfers, 1818) (11), *Desmodus rotundus* (E. Geoffroy, 1810) (8), *Glossophaga soricina* (Pallas, 1716) (6), *Sturnira lilium* (E. Geoffroy, 1810) (5), *A. obscurus* (Schinz, 1821) (5), *Anoura geoffroyi* (Gray, 1838) (1), *Phyllostomus hastatus* (Pallas, 1767) (1), *Vampyressa pusilla* (Wagner, 1843) (1), and *Platyrrhinus recifinus* (Thomas, 1901) (1).

The species detected through direct observations were *Noctilio leporinus* (Linnaeus, 1758) and *Thyroptera tricolor* (Spix, 1823). We observed individuals of *Noctilio leporinus* foraging on a lake. We found four specimens of *Thyroptera tricolor* sheltering within a closed banana leaf (*Musa paradisiaca* L.). Although it was not possible to capture any individual, observation allowed noting the presence of adhesive discs, unique feature of this genus, as well as dark brown dorsum and whitish ventral coloration (Lima and Gregorin, 2007). Bearing in consideration our observation and the record of *T. tricolor* by Costa *et al.* (2010) in the study area, we pointed out its occurrence in the area.

We recorded nine trophic guilds for the species in the study area. Fruit bats were dominant both in species richness and in abundance, representing about 81% of the captures.

Discussion

Species richness of bats found in the Reserva Ecológica de Guapiaçu is among the largest recorded for the State of Rio de Janeiro (e.g. Bergallo *et al*., 2003; Esbérard, 2003; Esbérard *et al.,* 2006; Menezes Jr., 2008; Bolzan *et al.* 2010; Esbérard *et al.,* 2010; Lourenço *et al.,* 2010; Luz *et al*., 2011). A preliminary survey of Costa *et al.* (2010) recorded 14 species and estimated (using the Chao 1 richness estimator) a maximum richness of 22 species of bats in the study area. Although we recorded a higher number of species, our capture effort was considerably higher and we sampled different habitats within the reserve.

The high abundance of phytophagous bats recorded in the present study is related to difficulties in capturing insectivorous bats with mist nets, as these species have a more sensitive echolocation and can easily detect networks (Bergallo *et al*., 2003). The use of different methods, such as search for roosts, could record more species, especially of the families Molossidae and Emballonuridae, with low or no representativeness in the present study.

We observed that the success of capturing different species is linked to the location of the nets, taking into consideration aspects of the landscape and information gathered from the literature. As an example, we captured individuals of *Lonchophylla peracchi* near banana trees (*Musa paradisiaca*, Musaceae) (see Novaes *et al*., 2010). Besides, bats of this species were observed visiting flowers of banana trees in Reserva Particular do Patrimônio Natural El Nagual, Magé, Rio de Janeiro (A.C. Siqueira and E. Ribeiro, unpublished data). We suggest focusing the effort on banana plantations to sample this species, especially near flowering individuals. Cattle ranching and poultry breeding near the capture sites facilitated the capture of the three vampire bat species.

We captured *Vampyrodes caraccioli* both in mature secondary forest with low anthropic disturbance (400 m elevation) and in a forest edge area (150 m elevation). Velazco *et al*. (2010) noted that this species is rare at low altitude and with few records to the southeast of Brazil. We captured two individuals near a fruiting *Ficus* sp.

Despite being one of the most well sampled states for bats, some regions of Rio de Janeiro still remain as gaps in knowledge. The high species

Table 1. Species of bats recorded in an Atlantic Forest remnant, Reserva Ecológica de Guapiaçu, southeastern Brazil, with numbers of individuals sampled (N), percentage yield (%), and classification into trophic guilds based on Kalko *et al*. (1996).

Taxa	Trophic guilds	N	%
Phyllostomidae			
Glossophaginae			
Anoura caudifer (E.Geoffroy, 1818)	Highly cluttered space/Gleaning nectarivore	7	0.54
Anoura geoffroyi Gray, 1838	Highly cluttered space/Gleaning nectarivore	7	0.54
Glossophaga soricina (Pallas, 1766)	Highly cluttered space/Gleaning nectarivore	73	5.65
Lonchophyllinae			
Lonchophylla peracchi Dias et al., 2013	Highly cluttered space/Gleaning nectarivore	2	0.15
Desmondontinae			
Desmodus rotundus (E. Geoffroy, 1810)	Highly cluttered space/Gleaning sanguivore	59	4.57
Diaemus youngi (Jentink, 1893)	Highly cluttered space/Gleaning sanguivore	1	0.07
Diphylla ecaudata Spix, 1823	Highly cluttered space/Gleaning sanguivore	1	0.07
Carolliinae			
Carollia perspicillata (Linnaeus, 1758)	Highly cluttered space/Gleaning frugivore	440	34.1
Stenodermatinae			
Artibeus fimbriatus Gray, 1838	Highly cluttered space/Gleaning frugivore	147	11.39
Artibeus lituratus (Olfers, 1818)	Highly cluttered space/Gleaning frugivore	188	14.57
Artibeus obscurus (Schinz, 1821)	Highly cluttered space/Gleaning frugivore	59	4.57
Chiroderma villosum Peters, 1860	Highly cluttered space/Gleaning frugivore	3	0.23
Dermanura cinerea Gervais, 1856	Highly cluttered space/Gleaning frugivore	2	0.15
Platyrrhinus recifinus (Thomas, 1901)	Highly cluttered space/Gleaning frugivore	45	3.48
Sturnira lilium (E. Geoffroy, 1810)	Highly cluttered space/Gleaning frugivore	150	11.62
Sturnira tildae de la Torre, 1859	Highly cluttered space/Gleaning frugivore	6	0.46
Vampyressa pusilla (Wagner, 1843)	Highly cluttered space/Gleaning frugivore	4	0.31
Vampyrodes caraccioli (Thomas, 1889)	Highly cluttered space/Gleaning frugivore	5	0.38
Phyllostominae			
Chrotopterus auritus (Peters, 1856)	Highly cluttered space/Gleaning carnivore	2	0.15
Micronycteris minuta (Gervais, 1856)	Highly cluttered space/Gleaning insetivore	17	1.31
Mimon bennettii (Gray, 1838)	Highly cluttered space/Gleaning insetivore	5	0.38
Phyllostomus hastatus (Pallas, 1767)	Highly cluttered space/Gleaning omnivore	10	0.77
Tonatia bidens (Spix, 1823)	Highly cluttered space/Gleaning insetivore	2	0.15
Trachops cirrhosus (Spix, 1823)	Highly cluttered space/Gleaning insetivore	1	0.07
Noctilionidae			
Noctilio leporinus (Linnaeus, 1758)	Highly cluttered space/Gleaning piscivore	-	-
Thyropteridae			
Thyroptera tricolor Spix, 1823	Background cluttered space/Aerial insectivore	-	-
Molossidae			
Eumops glaucinus (Wagner, 1843)	Uncluttered space/Aerial insectivore	1	0.07
Molossus molossus (Pallas, 1766)	Uncluttered space/Aerial insectivore	35	2.71
Molossus rufus E. Geoffroy, 1805	Uncluttered space/Aerial insectivore	8	0.62
Vespertilionidae			
Vespertilioninae			
Eptesicus diminutus Osgood, 1915	Background cluttered space/Aerial insectivore	1	0.07
Eptesicus furinalis (d'Orbigny, 1847)	Background cluttered space/Aerial insectivore	2	0.15
Myotinae			
Myotis nigricans (Schinz, 1821)	Background cluttered space/Aerial insectivore	6	0.46
Myotis riparius Handley, 1960	Background cluttered space/Aerial insectivore	1	0.07
TOTAL	9	1290	100

richness presented here is more indicative of the urgency to conduct inventories in yet unsampled areas. These efforts will enable us to enhance conservation strategies as well as to create actions that mitigate the impact of human activity on native biota.

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References

ALMEIDA-GOMES, M. 2011. *Composição e abundância das espécies de anfíbios e répteis em uma paisagem fragmentada de Mata Atlântica no Estado do Rio de Janeiro*. Rio de Janeiro, RJ. Tese de Doutorado. Universidade do Estado do Rio de Janeiro, 228 p.

BARQUEZ, R.M.; MARES, M.A.; BRAUN, J.K. 1999. The bats of Argentina. *Specials Publications Museum of Texas Tech University*, **42**:1-275.

BERGALLO, H.G.; ESBÉRARD, C.E.L.; MELLO, M.A.R.; LINS, V.; MANGOLIN, R.; MELO, G.G.S.; BAPTISTA, M. 2003. Bat species richness in Atlantic Forest: what is the minimum sampling effort? *Biotropica*, **35**(2):278-288.

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. http://dx.doi.org/10.1111/j.1365-2907.2010.00164.x

BERNARDO, C.S.S.; LLOYD, H.; BAYLY, N.; GALETTI, M. 2011. Modelling post-release survival of reintroduced Red-billed Curassows Crax blumenbachii. *Ibis*, **153**(3):562-572. http://dx.doi.org/10.1111/j.1474-919X.2011.01142.x

BOLZAN, D.P.; LOURENÇO, E.C.; COSTA, L.M.; LUZ, J.L.; NOGUEIRA, T.J.; DIAS, D.; ESBÉRARD, C.E.L.; PERACCHI, A.L. 2010. Morcegos da região da Costa Verde e adjacências, litoral sul do estado do Rio de Janeiro. *Chiroptera Neotropical*, **16**(1):586-595.

CONSERVAÇÃO INTERNACIONAL DO BRASIL, FUNDAÇÃO SOS MATA ATLÂNTICA, FUNDAÇÃO BIODIVERSITAS, INSTITUTO DE PESQUISAS ECOLÓGICAS, SECRETARIA DO MEIO AMBIENTE DE SÃO PAULO & INSTITUTO ESTADUAL DE FLORESTAS DE MINAS GERAIS. 2000. *Avaliação e ações prioritárias para a conservação da biodiversidade da Mata Atlântica e Campos Sulinos*. Brasília, Ministério do Meio Ambiente, 247 p.

COSTA, L.M.; LUZ, J.L.; LOURENÇO, E.C.; MOTTA, A.G.; CARVALHO, W.D.; DIAS, R.; GODOY, M.S.; GOMES, L.A.C.; FREITAS, L.F.; ESBÉRARD, C.E.L. 2010. Morcegos da Reserva Ecológica de Guapiaçú, Rio de Janeiro, Brasil. *In*: Congresso Brasileiro de Mastozoologia, V, São Pedro, Resumos. *Anais...* **1**:530.

DIAS, D.; PERACCHI, A.L. 2008. Quirópteros da Reserva Biológica do Tinguá, estado do Rio de Janeiro, sudeste do Brasil (Mammalia, Chiroptera). *Revista Brasileira de Zoologia*, **25**(2):333-369. http://dx.doi.org/10.1590/S0101-81752008000200023

DIAS, D.; PERACCHI, A.L.; SILVA, S.S.P. 2002. Quirópteros do Parque Estadual da Pedra Branca, Rio de Janeiro, Brasil (Mammalia, Chiroptera). *Revista Brasileira de Zoologia*, **19**(supl. 2):113-140.

ESBÉRARD, C.E.L. 2003. Diversidade de morcegos em área de Mata Atlântica regenerada no Sudeste do Brasil. *Revista Brasileira de Zoociências*, **5**(2):189-204. http://dx.doi.org/10.1590/S1676-06032010000400030

ESBÉRARD, C.E.L.; BAPTISTA, M.; COSTA, L.M.; LUZ, J.L.; LOURENÇO, E.C. 2010. Morcegos de Paraíso de Tobias, Miracema, Rio de Janeiro. *Biota Neotropica*, **10**(4):1-7.

ESBÉRARD, C.E.L.; JORDÃO-NOGUEIRA, T.; LUZ, J.L.; MELO, G.G.S.; MANGOLIN, R.; JUCÁ, N.; RAÍCES, D.S.L.; ENRICI, M.C.; BERGALLO, H.G. 2006. Morcegos da Ilha Grande, Angra dos Reis, RJ, Sudeste do Brasil. *Revista Brasileira de Zoociências*, **8**(2):151-157.

KALKO, E.K.V.; HANDLEY JR., C.O.; HANDLEY, D.H. 1996. Organization, diversity, and long-term dynamics of a neotropical bat community. *In*: M.L. CODY; J.A. SMALLWOOD (org.), *Long-term studies of vertebrate communities*. Washington, Academic Press, p. 503-553.

KUNZ, T.H.; KURTA, A. 1988. Capture methods and holding devices. *In*: T.H. KUNZ (org.), *Ecology and behavioral methods for the study of bats*. Washington, Smithsonian Institution Press, p. 1-30.

KURTZ, B.C.; ARAÚJO, D.S.D. 2000. Composição florística e estrutura do componente arbóreo de um trecho de Mata Atlântica na Estação Ecológica Estadual do Paraíso, Cachoeiras de Macacu, Rio de Janeiro, Brasil. *Rodriguesia*, **51**(78/115):69-111.

LEWINSOHN, T.M.; PRADO, P.I. 2005. How many species are there in Brazil? *Conservation Biology,* **19**(3):619-624. http://dx.doi.org/10.1111/j.1523-1739.2005.00680.x

LIMA, I.P.; GREGORIN, R. 2007. Família Thyropteridae. *In*: N.R. REIS; A.L. PERACCHI; W.A. PEDRO; I.P. LIMA (org.), *Morcegos do Brasil*. Londrina, Universidade Estadual de Londrina, p. 139-143.

LOURENÇO, E.C.; COSTA, L.M.; SILVA, R.M.; ESBÉRARD, C.E.L. 2010. Bat diversity of Ilha da Marambaia, southern Rio de Janeiro State, Brazil (Chiroptera, Mammalia). *Brazilian Journal of Biology*, **70**(3):511-519. http://dx.doi.org/10.1590/S1519-69842010000300007

LUZ, J.L.; COSTA, L.M.; LOURENÇO, E.C.; ESBÉRARD, C.E.L. 2011. Morcegos (Mammalia: Chiroptera) da Reserva Rio das Pedras, Rio de Janeiro, Sudeste do Brasil. *Biota Neotropica,* **11**(1):1-7. http://dx.doi.org/10.1590/S1676-06032011000100009

MENEZES JR., L.F. 2008. *Morcegos da Serra do Mendanha*, *Rio de Janeiro, RJ, Brasil (Mammalia, Chiroptera)*. Rio de Janeiro, RJ. Dissertação de Mestrado. Universidade Federal Rural do Rio de Janeiro, 73 p.

METZGER, J.P.; RIBEIRO, M.C.; CIOCHETI, G.; TAMBOSI, L.R. 2008. Uso de índices de paisagem para a definição de ações de conservação e restauração da biodiversidade do Estado de São Paulo. *In*: R.R. RODRIGUES; C.A. JOLY; M.C.W. BRITO; A. PAESE; J.P. METZGER; L. CASATTI; M.A. NALON; N. MENEZES; N.M. IVANAUSKAS; V. BOLZANI; V.L.R. BONONI (org.), *Diretrizes para Conservação e Restauração da Biodiversidade no Estado de São Paulo*. São Paulo, Secretaria do Meio Ambiente e Fapesp, p. 120-127.

MORELLATO, L.P.C.; HADDAD, C.F.B. 2000. Introduction: The Brazilian Atlantic Forest. *Biotropica*, **32**(4b):786-792. http://dx.doi.org/10.1111/j.1744-7429.2000.tb00618.x

MYERS, N.; MITTERMEIER, R.A.; MITTERMEIER, C.G.; FONSECA, G.A.B.; KENT, J. 2000. Biodiversity hotspots for conservation priorities. *Nature*, **403**:853-858. http://dx.doi.org/10.1038/35002501

NOVAES, R.L.M.; MELLO, F.A.P.; FELIX, S.; SILVARES, R.; SANT'ANNA, C.; FAÇANHA, A.C.S.; CARDOSO, T.S.; LOURO, M.A.S.; SOUZA, R.F.; AGUIAR, M.V.P.; SIQUEIRA, A.C.; ESBÉRARD, C.E.L. 2010. *Lonchophylla bokermanni* na Floresta Atlântica: distribuição, conservação e nova localidade de ocorrência para uma espécie ameaçada de extinção. *Chiroptera Neotropical*, **16**(2):710-714.

OLIVEIRA-FILHO, A.T.; FONTES, M.A.L. 2000. Patterns of floristic differentiation among Atlantic Forests in Southeastern Brazil and the influence of climate. *Biotropica* **32**(4b):793-810. http://dx.doi.org/10.1111/j.1744-7429.2000.tb00619.x

PAGLIA, A.P.; FONSECA, G.A.B. da; RYLANDS, A.B.; HERRMANN, G.; AGUIAR, L.M.S.; CHIARELLO, A.G.; LEITE, Y.L.R.; COSTA, L.P.; SICILIANO, S.; KIERULFF, M.C.M.; MENDES, S.L.; TAVARES, V. da C.; MITTERMEIER, R.A.; PATTON J.L. 2012. *Lista Anotada dos Mamíferos do Brasil/Annotated Checklist of Brazilian Mammals*. Arlington, Conservation International, 78 p. (Occasional Papers of Conservation Biology, 6).

PARESQUE, R.; SOUZA, W.P.; MENDES, I.P.; FAGUNDES, V. 2004. Composição cariotípica da fauna de roedores e marsupiais de duas áreas de Mata Atlântica do Espírito Santo, Brasil. *Boletim do Museu de Biologia Professor Mello Leitão*, **17**:5-33.

PERACCHI, A.L.; GALLO, P.H.; DIAS, D.; LIMA, I.P.; REIS, N.R. 2010. Ordem Chiroptera. *In*: N.R. REIS; N.R. PERACCHI; M.N. FREGONEZI; B.K. ROSSANEIS (eds.), *Mamíferos do Brasil: guia de identificação*. Rio de Janeiro, Technical Books, p. 293-461.

REIS, N.R.; PERACCHI, A.L.; PEDRO, W.A.; LIMA, I.P. (eds.). 2007. *Morcegos do Brasil*. Londrina, Technical Books Editora, 256 p.

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. http://dx.doi.org/10.1016/j.biocon.2009.02.021

ROCHA, C.F.D.; BERGALLO, H.G.; ALVES, M.A.S.; VAN SLUYS, M. 2003. *A biodiversidade nos grandes remanescentes florestais do estado do Rio de Janeiro e nas restingas da Mata Atlântica*. São Carlos, RiMa, 160 p.

ROCHA, C.F.D; VRCIBRADIC, D.; KIEFER, M.C.; ALMEIDA-GOMES, M.; BORGES-Jr., V.N.T.; CARNEIRO, P.C.F.; MARRA, R.V.; ALMEIDA-SANTOS, P.; SIQUEIRA, C.C.; GOYANNES-ARAÚJO, P.; FERNANDES, C.G.A.; RUBIÃO, E.C.N.; VAN SLUYS, M. 2007. A survey of the leaf-litter frog assembly from an Atlantic Forest area (Reserva Ecológica de Guapiaçu) in Rio de Janeiro State, Brazil, with an estimate of frog densities. *Tropical Zoology*, **20**(2):99-108.

SIKES, R.S.; GANNON, W.L.; 2011. 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**(1):235-253. http://dx.doi.org/10.1644/10-MAMM-F-355.1

SIMMONS, N.B.; VOSS, R.S. 1998. The mammals of Paracou, French Guiana: a Neotropical lowland rainforest fauna. Part 1. Bats. *Bulletin of the American Museum of Natural History*, **237**:1-219.

SOUZA, R.F.; FELIX, S.; NOVAES, R.L.M. 2013. Environment: Use oil wealth to save Brazil's biodiversity. *Nature*, **498**(7454):299. http://dx.doi.org/10.1038/498299a

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.

TABARELLI, M.; PINTO, L.P.; SILVA, J.M.C.; HIROTA, M.; BEDÊ, L. 2005. Desafios e oportunidades para a conservação da biodiversidade na Mata Atlântica brasileira. *Megadiversidade*, **1**(1):132-138.

VELAZCO, P.M.; AIRES, C.C.; CARMIGNOTTO, A.P.; BEZERRA, A.M.R. 2010. Mammalia, Chiroptera, Phyllostomidae, *Vampyrodes caraccioli* (Thomas, 1889): range extension and revised distribution map. *Check List*, **6**(1):49-51.

VELOSO, H.P.; RANGEL-FILHO, A.L.R.; LIMA, J.C.A. 1991. *Classificação da vegetação brasileira adaptada a um sistema universal*. Rio de Janeiro, IBGE/Departamento de Recursos Naturais e Estudos Ambientais, 124 p.

VIANA, V.M.; TABANEZ, A.A.J.; BATISTA, J.L. 1997. Dynamic and restoration of forest fragments in the Brazilian Atlantic moist forest. *In*: W. LAURANCE; R. BIERREGAARD Jr. (eds.), *Tropical Forest Remnants: Ecology, Management, and Conservation of Fragmented Communities*. Chicago and London, The University of Chicago Press, p. 351-365.

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Appendix 1. Voucher specimens of bats recorded in an Atlantic Forest remnant, Reserva Ecológica de Guapiaçu, in the southeastern of Brazil, and deposited in the Collection of Mammals at the National Museum, Rio de Janeiro, Brazil.

Phyllostomidae: *Anoura caudifer* (MN79859), *Anoura geoffroyi* (MN79860, MN79918), *Glossophaga soricina* (MN79882, MN79883), *Lonchophylla peracchi* (MN78404), *Desmodus rotundus* (MN79876), *Diaemus youngii* (MN79877), *Carollia perspicillata* (MN79867, MN79868, MN79869, MN79870, MN79871, MN79872), *Artibeus fimbriatus* (MN79861, MN79862, MN79919, MN79920), *Artibeus lituratus* (MN78125, MN78126, MN79863, MN79864, MN79865), *Artibeus obscurus* (MN79866), *Chiroderma villosum* (MN79873), *Dermanura cinerea* (MN79875), *Platyrrhinus recifinus* (MN79904, MN79905, MN79921), *Sturnira lilium* (MN79906, MN79907, MN79908, MN79922), *Sturnira tildae* (MN79909), *Vampyressa pusilla* (MN79912), *Vampyrodes caraccioli* (MN79914, MN79915), *Chrotopterus auritus* (MN79874), *Micronycteris minuta* (MN79884, MN79885, MN79886, MN79887, MN79888, MN79889, MN79890, MN79917), *Mimon bennettii* (MN79891, MN79892), *Phyllostomus hastatus* (MN79903), *Tonatia bidens* (MN79910), *Trachops cirrhosus* (MN79911). **Molossidae:** *Eumops glaucinus* (MN79881), *Molossus molossus* (MN79893, MN79916), *Molossus rufus* (MN79894). **Vespertilionidae:** *Eptesicus diminutus* (MN79878, MN79879), *Eptesicus furinalis* (MN79880), *Myotis nigricans* (MN79895, MN79896, MN79898, MN79900, MN79901), *Myotis riparius* (MN79899).