

NOTES ON GEOGRAPHIC DISTRIBUTION

Mammalia, Chiroptera, Phyllostomidae, *Phyllostomus hastatus* and *Pygoderma bilabiatum*: First occurrence in the Brazilian coastal shrubland ecosystem.

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Coastal shrublands (*restingas*) are Quaternary sand dune habitats along the Brazilian coast, covered with sparse shrubby and herbaceous vegetation, and may have different floristic structures along their distribution (Cerqueira 2000; Pereira and Araújo 2000; Rocha et al. 2003).

Historically, the coastal region of Brazil houses most of the country's population and is a target for urban development (Galindo-Leal & Câmara 2003; Rocha et al. 2003; Dean 2004). As a consequence, coastal ecosystems, like *restingas*, are particularly threatened by human-induced habitat loss and fragmentation (Rocha & Bergallo 1997; Rocha et al. 2003). The Atlantic Forest is one of the world's most threatened biodiversity hotspots (Mittermeier et al. 2005), and the *restingas* are the most poorly known and studied ecosystem within the Atlantic Forest (Rocha et al. 2003). For the greater majority of remaining *restinga* fragments there is an astounding lack of even the simplest information, like inventories of terrestrial vertebrates (Rocha et al. 2003). Due to the scarcity of data on *restinga* vertebrates, interpretation of distribution ranges and biogeographic patterns is severely impaired (Rocha 2000).

There are only three coastal shrubland sites with reasonable scientific information on their flora and fauna: Barra de Maricá and Parque Nacional da Restinga de Jurubatiba in the state of Rio de

Janeiro, and Parque Estadual Paulo Cesar Vinha in the state of Espírito Santo (Rocha et al. 2003).

Only the last two are protected areas. There are very few studies focusing on mammals in the coastal shrubland (e.g. Cerqueira et al. 1990; Cerqueira 2000; Bergallo et al. 2004). Research on bats in this environment is particularly scarce, with six major studies to date (Fazzolari-Corrêa 1995; Marques 2000; Moreno et al. 2000; Mangolin 2005; Mello et al. 2005; Oprea 2006). The present study helps to fill the gap of knowledge on the bat fauna of coastal shrublands, a poorly known ecosystem associated to the Atlantic Forest.

Phyllostomus hastatus (Pallas, 1767) occurs in deciduous and evergreen forests from Guatemala and Belize to the Guianas, Brazil, Paraguay, Northern Argentina, Bolivia, and Peru; Trinidad and Tobago; Margarita Island (Venezuela) (Simmons 2005). The species is locally common and widespread in rainforests (Emmons and Feer 1997), and is also found in the Cerrado and Caatinga ecoregions (Willig 1983; Santos et al. 2003). *P. hastatus* is listed as least concern by the IUCN red list of threatened species (IUCN 2006). *Pygoderma bilabiatum* (Wagner, 1843) is known from Bolivia, southeastern Brazil, Paraguay, and northern Argentina (Simmons 2005). It has been captured in several habitats, including mature tropical forests, secondary forests, and subtropical forests (Webster and Owen 1984). Its ecology is

NOTES ON GEOGRAPHIC DISTRIBUTION

poorly known and *P. bilabiatum* is listed as near threatened by the IUCN list.

This study was conducted at Parque Estadual Paulo Cesar Vinha, located in Guarapari county, state of Espírito Santo, southeastern Brazil (20°31' - 20°37' S; 40°23' - 40°26' W) (Figure 1). Parque Estadual Paulo Cesar Vinha comprises an area of 1,500 ha, and is one of the largest protected areas of coastal shrubland in the state of

Espírito Santo. The park suffers from high anthropogenic pressure in the surrounding areas. Urbanization is a serious threat in surrounding areas and although it is not observed inside the park, it is responsible for its current isolation from both nearby coastal shrubland and Atlantic Forest areas. There are only a few small Atlantic Forest fragments in the vicinity of the park. Illegal sand extraction is also a threat observed both in adjacent areas and within the parks limits.



Figure 1. View of the *restinga* ecosystem at Parque Estadual Paulo Cesar Vinha.

Bats were captured with mist-nets in two consecutive nights a month, during one year (from August 2004 to September 2005). In each capture session, between eight and ten mist-nets were opened at sunset and remained open for six hours during each night (from August 2004 to June 2005), or remained open for six hours in the first night of capture and 12 hours in the second day of capture, following Esbérard and Bergallo (2005). Sampling effort was calculated according to Straube and Bianconi (2002), and totaled 48,180.09 m²h.

One individual of *Phyllostomus hastatus* (Figure 2) was captured near an estuarine lagoon within the park in July 2005 (Table 1). Three individuals of *Pygoderma bilabiatum* (Figure 3) were captured in the same area in July and August 2005, one of them also near the lagoon (Table 1), and two others in the shrubland dominated by

Clusia trees (Table 1). All individuals captured were deposited in the Laboratório de Estudos de Quirópteros of the Universidade Federal do Espírito Santo (UFES). Later, specimens will be deposited at the Museu de Biologia Mello Leitão (MBML), Santa Teresa, Espírito Santo, Brazil. During this study we had 538 captures of 17 species (Oprea 2006). *P. hastatus* accounted for one capture and *P. bilabiatum* accounted for three captures, a small percentage of the total number of bats captured in the study and therefore they seem to be rare at the study site. It is interesting to notice that *P. hastatus* was captured close to a *Pseudobombax* tree, in the winter, a period of the year when several *Pseudobombax* trees were flowering. Silva and Peracchi (1995) suggest that *Pseudobombax* flowers may be an important food resource for *P. hastatus* during winter. This suggests the *restinga* may provide important resources for these bats in periods of scarcity.

NOTES ON GEOGRAPHIC DISTRIBUTION

Determining the habitat specificity of a bat is important because presumably bats that are restricted to primary forest are at a greater risk when facing deforestation than species that can use open areas such as the coastal shrubland for foraging. The use of this habitat by *P. bilabiatum* is particularly interesting given the fact the species was known for mature tropical, subtropical forests, and secondary forests. The use of such an open environment as the coastal shrubland by this species suggests a broader degree of habitat tolerance than has previously been reported in the literature.

Although species inventories are of paramount importance for studies on mammal ecology, biogeography and conservation, there are few sites in Brazil with reliable knowledge on their fauna and flora (Passamani et al. 2000). Surprisingly, only few inventories include bats in their evaluations (e.g. Baptista and Mello 2001; Brito et al. 2004).

The occurrence of *P. hastatus* and *P. bilabiatum* in the study area represents the first record of both species for the coastal shrubland environment. It is important to notice that both bat species dwell predominantly in forests, and the coastal shrubland is mostly dry and open, with only some thickets of scrubby trees and patches of *Clusia* scrub. Even though Parque Estadual Paulo Cesar

Vinha is embedded in an urban matrix landscape, given the high vagility of bats, it is likely that they are capable of crossing the open landscape to use the few small remaining Atlantic Forest fragments in the immediate vicinity of the park. The known distribution for both species already includes the Atlantic Forest (Simmons 2005). This first record in the coastal shrubland is not unexpected and most probably reflects the poor sampling of bats within this ecosystem. These records show a new habitat use for these species and furnish important information not only for their ecology, but also for conservation planning involving these species, in the coastal shrubland ecosystem and for the Atlantic Forest as a whole.

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Figure 2. *Phyllostomus hastatus*.

NOTES ON GEOGRAPHIC DISTRIBUTION



Figure 3. *Pygoderma bilabiatum*.

Table 1. Data from individuals of *Phyllostomus hastatus* and *Pygoderma bilabiatum* captured in restinga habitat at Paulo Cesar Vinha State Park, Espírito Santo, Brazil.

Individuals	Capture Time	Sex	Age ^a	Reproductive Status ^b	Forearm length (mm)	Body mass (g)
<i>P. hastatus</i>	6:20 pm	Female	Adult	inactive	87.0	-
<i>P. bilabiatum</i>	3:30 am	Male	Adult	testes inside abdomen	39.0	-
<i>P. bilabiatum</i>	9:55 pm	Male	Adult	testes inside abdomen	38.9	18.0
<i>P. bilabiatum</i>	9:00 pm	Female	Adult	pregnant	38.4	17.5

a. Age estimated following Kunz (1988)

b. Reproductive status categories following Racey (1988)

Literature cited

Baptista, M. and M. A. R. Mello. 2001. Preliminary inventory of the bat species of the Poço das Antas Biological Reserve, RJ. *Chiroptera Neotropical* 7: 133-135.

Bergallo, H. G., F. Martins-Hantano, D. S. Raíces, T. T. L. Ribeiro, A. G. Alves, J. L. Luz, R. Mangolin, and M. A. R. Mello. 2004. Os mamíferos da restinga de Jurubatiba. Pp. 215-230, In C. F. D. Rocha, F. A.

Esteves, and F. R. Scarano (ed.), *Pesquisas de longa duração na Restinga de Jurubatiba: Ecologia, História Natural e Conservação*. São Carlos, Rima.

Brito, D., L. C. Oliveira, and M. A. R. Mello. 2004. An overview of mammalian conservation at Poço das Antas Biological Reserve, southeastern Brazil. *Journal for Nature Conservation* 12: 219-228.

NOTES ON GEOGRAPHIC DISTRIBUTION

- Cerqueira, R. 2000. Ecologia funcional de mamíferos numa restinga do Estado do Rio de Janeiro. Pp. 189-214, In F. A. Esteves and L. D. Lacerda (ed.), Ecologia de Restingas e Lagoas Costeiras. Macaé, NUPEM/UFRJ.
- Cerqueira, R., F. A. S. Fernandez, and M. F. Q. S. Nunes. 1990. Mamíferos da restinga de Barra de Maricá. Papéis Avulsos do Museu de Zoologia 37: 141-157.
- Dean W. 1996. A ferro e fogo: a história e a devastação da Mata Atlântica brasileira. São Paulo, Companhia das Letras, 484 p.
- Emmons, L. H. and F. Feer. 1997. Neotropical Rainforest Mammals: A Field Guide. University of Chicago Press, Chicago.
- Esbérard, C. E. L. and H. G. Bergallo. 2005. Sampling bats for six or twelve hours each night? Revista Brasileira de Zoologia 22: 1095-1098.
- Fazzolari-Corrêa, S. 1995. Aspectos Sistemáticos, Ecológicos e Reprodutivos de Morcegos na Mata Atlântica. PhD thesis, Universidade de São Paulo, São Paulo.
- Galindo-Leal C. and Câmara I.G. 2003. The Atlantic Forest of South America: Biodiversity Status, Threats and Outlook. Washington, Island Press.
- IUCN. 2006. 2006 IUCN Red List of Threatened Species. Gland, IUCN.
- Kunz, T.H. 1988. Ecological and Behavioral Methods for the Study of Bats. 2nd ed. Washington: Smithsonian Institution Press.
- Mangolin, R. 2005. Quirópteros (Mammalia: Chiroptera) do Parque Nacional da Restinga de Jurubatiba, Rio de Janeiro, Brasil. M.Sc. thesis. Universidade do Estado do Rio de Janeiro.
- Marques, A. M. 2000. Aspectos ecológicos dos quirópteros de uma área de restinga, Parque Arruda Câmara (Bosque da Barra), Rio de Janeiro, RJ. M.Sc. thesis. Universidade Federal Rural do Rio de Janeiro.
- Mello, M. A. R., N. O. Leiner, P. R. Guimarães, and P. Jordano. 2005. Size-based fruit selection of *Calophyllum brasiliense* (Clusiaceae) by bats of the genus *Artibeus* (Phyllostomidae) in a Restinga area, southeastern Brazil. Acta Chiropterologica 7: 179-182.
- Mittermeier, R. A., P. R. Gil, M. Hoffmann, J. Pilgrim, T. Brooks, C.G. Mittermeier, J. Lamoreux, and G. A. B. Fonseca. 2005. Hotspots revisited: Earth's biologically richest and most endangered terrestrial ecoregions. CEMEX, Mexico City. 392 pp.
- Moreno, M. R., C. S. Marinato, V. J. M. Silva, S. Pariz, and M. T. Nascimento. 2000. Morcegos da restinga da Ilha de Guriri, São Mateus, ES, e a dispersão de sementes de Solanaceae e Cactaceae. Pp. 31-38, In Anais V Simpósio de Ecossistemas Brasileiros. Vitória, ACIESP.
- Oprea, M. 2006. Aspectos ecológicos de morcegos de restingas. MSc thesis. Universidade Federal Espírito Santo, Vitória. 105 p.
- Passamani, M., S. L. Mendes, and A. G. Chiarello. 2000. Non-volant mammals of the Estação Biológica de Santa Lúcia and adjacent areas of Santa Teresa, Espírito Santo, Brazil. Boletim do Museu de Biologia Mello Leitão 11/12: 201-214.
- Pereira, O. J. and D. S. D. Araújo. 2000. Análise florística das restingas dos estados do Espírito Santo e Rio de Janeiro. Pp. 25-64, In F. A. Esteves and L. D. Lacerda (ed.), Ecologia de Restingas e Lagoas Costeiras. Macaé, NUPEM/UFRJ.
- Racey, P. A. 1988. Reproductive assessment in bats. Pp. 31-46, In T. H. Kunz (ed), Ecological and Behavioral Methods for the Study of Bats. Smithsonian Institution Press, Washington.
- Rocha, C. F. D. & H. G. Bergallo. 1997. Intercommunity variation in the distribution and abundance of dominant lizard species in restinga habitats. Journal of the Brazilian Association for the Advancement of Science 49: 269-274.
- Rocha, C. F. D. 2000. Biogeografia de répteis de restinga: distribuição, ocorrência e endemismos. Pp. 99-116, In Esteves, F. A. and Lacerda, L. D. (ed.). Ecologia de restingas e lagoas costeiras. NUPEM/UFRJ, Macaé.
- Rocha, C. F. D., H. G. Bergallo, M. A. S. Alves, and M. Van Sluys. 2003. A biodiversidade nos grandes remanescentes florestais do estado do Rio de Janeiro e nas restingas da Mata Atlântica. São Carlos, Rima.
- Santos, M., L. F. Aguirre, L. B. Vázquez, and J. Ortega. 2003. *Phyllostomus hastatus*. Mammalian Species 722: 1-6.
- Silva, S. S. P. and A. L. Peracchi. 1995. Observação da visita de morcegos (Chiroptera) às flores de *Pseudobombax grandifolium* (Cav.) A. Robyns. Revista Brasileira de Zoologia 12: 859-865.
- Simmons, N. 2005. Order Chiroptera. Pp. 312-529. In: D. E. Wilson and D. M. Reeder (eds.), Mammal Species of the World. Johns Hopkins University Press, Baltimore.
- Straube, F. C. and G. V. Bianconi. 2002. Sobre a grandeza e a unidade utilizada para estimar esforço de captura com utilização de redes-de-neblina. Chiroptera Neotropical 8: 150-152.
- Webster, D. and R. D. Owen. 1984. *Pygoderma bilabiatum*. Mammalian Species 220: 1-3.
- Willig, M. R. 1983. Composition, microgeo-graphic variation and sexual dimorphism in Caatingas and Cerrado bat communities from northeastern Brazil. Bulletin of the Carnegie Museum 23: 1-131.

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