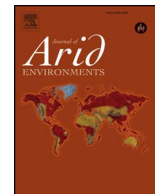




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Differences in the structure of the bat community between a cloud forest refuge and a surrounding semi-arid Caatinga scrubland in the northeastern Brazil

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ABSTRACT

The present study compared the structure of the bat communities in semi-arid Caatinga scrub and humid cloud forest habitats in the northeastern Brazilian state of Sergipe. A sampling effort of 185,790 h.m2 resulted in the capture of 157 bats representing 12 species in the Caatinga, and 259 individuals belonging to 14 species in the cloud forest. Overall, a total species richness of 18, although highly significant differences were recorded between habitats in the abundance of individuals. *Glossophaga soricina* was the most abundant species in the Caatinga, while *Carollia perspicillata* was the most abundant in the cloud forest. The Glossophaginae was the principal group in the Caatinga, and the Stenodermatinae in the cloud forest. Frugivores were the most abundant in the cloud forest, and many of these species appeared to be concentrated in this habitat during the dry season, dispersing into the Caatinga during the rainy season. Nectarivores were more abundant in the Caatinga during both seasons, indicating that, even during the dry season, this habitat provides an adequate resource base to support this guild. The present study of the Serra da Guia reinforces the importance of these enclaves of humid forest on the diversity and ecology of Caatinga bats.

1. Introduction

The semi-arid Caatinga scrublands of northeastern Brazil cover an area of almost one million square kilometers, but while this biome has suffered intense anthropogenic impacts over the past few centuries, its fauna and flora are still relatively poorly-known (Sá et al., 2004). The most recent data indicate the occurrence of 81 bat species in the Caatinga biome (Paglia et al., 2012; Moratelli and Dias, 2015; Feijó et al., 2015a; 2015b; Rocha et al., 2015a), as compared with 101 species for the neighboring Cerrado savanna, and 113 for the Brazilian Atlantic Forest. In addition to the scarcity of studies of the local chiropteran fauna, most surveys have been conducted in the vicinity of the regions principal urban centers (Leal et al., 2005).

The Caatinga is characterized by an unpredictable and low precipitation regime, with annual rainfall of 400–800 mm, generally concentrated into a short, irregular rainy season. This marked seasonality, together with the intense solar radiation and highly permeable soils typical of the region, tends to impose strict limitations on the

characteristics of its fauna and flora (Rodal and Melo, 1999). These characteristics originally led many authors to consider the Caatinga to be a region of relatively reduced faunal diversity and low rates of endemism (Mares et al., 1981; Willig and Mares, 1989). In one of the earliest studies of the chiropteran fauna of the Caatinga, in the Brazilian state of Pernambuco, Willig (1983) recorded 33 species in distinct types of habitat over a three-year period. Over the subsequent three decades, taxonomic revisions, the identification of new species, and inventories (Feijo et al., 2015a; Williams et al., 1995; Marinho-Filho and Sazima, 1998; Oliveira et al., 2003; Sousa et al., 2004; Gregorin and Ditchfield, 2005; Sá-Neto and Marinho-Filho, 2012; Novaes and Laurindo, 2014) more than doubled this total, although up until now, only a few sites have been surveyed systematically, and there are few data from the southern half of the biome, south of the São Francisco River, which includes the Brazilian state of Sergipe.

Small enclaves of humid or cloud forest – known locally as “brejos de altitude” – can be found at a number of localities throughout the semiarid Brazilian Caatinga domain (Andrade-Lima, 1982). These

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enclaves are typically located on high plateaus subject to the formation of orographic precipitation, which results in relatively humid environments suitable for the establishment of dense rainforest, quite distinct from the typical Caatinga scrub (Sales et al., 1998). The vegetation of these enclaves may include elements typical of the Caatinga, Atlantic Forest, and Amazonian Hylea (Tabarelli and Santos, 2004; Rodal et al., 2005; Rodrigues et al., 2008). Historically, these enclaves appear to have expanded considerably during periods of more humid climate, providing the basis for formation of corridors of rainforest vegetation linking the Atlantic Forest to the Amazon basin (Clapperton, 1993; Vivo, 1997), and more recently, refuges for different components of the faunas of these biomes. Here, the chiropteran fauna of a small cloud forest enclave was surveyed in the Brazilian state of Sergipe, and compared with that of the surrounding Caatinga scrub, and the differences in the composition of species and guilds are discussed in the context of the ecological contrasts between sites.

2. Material and methods

2.1. Study site

Serra da Guia (9°58' S, 37°52' W) is a small mountain range located within the semiarid Brazilian Caatinga biome, which straddles the frontier between the states of Sergipe (municipality of Poço Redondo) and Bahia, in Pedro Alexandre (Fig. 1). Altitudes vary from 300 m above sea level at the base of the range, to 750 m asl, at the summit.

Two sampling points were selected within the study area (Fig. 2), based on differences in elevation and habitat type. Point 1 (Fig. 2A) was located at the base of the range (300 m asl), in typical Caatinga scrub, characterized by a predominance of shrubs and small trees of the families Fabaceae and Euphorbiaceae, in particular *Caesalpinia pyramidalis* (catingueira) and *Amburana cearensis* (umburana), as well as ouricuri palms, *Syagrus coronata*. This natural vegetation is interspersed with extensive areas of cattle pasture and smaller subsistence plots plant with maize and beans.

Point 2 (Fig. 2B) was located at 750 m asl, and covers an area of approximately 20 ha. This humid forest has emergent trees of between 10 m and 20 m in height, with a predominance of the Fabaceae and Poaceae families, and 13 species of orchid (Machado et al., 2012). This

study found a similarity of only 26.7% in the composition of the two habitats, and considerable differences in their phytosociological structure. Mean annual precipitation in the study area is approximately 500 mm, with a wet season typically between April and August, and a dry season during the rest of the year, from September to March.

2.2. Data collection

This study was authorized by the Chico Mendes Institute for Biodiversity Conservation - ICMBio (licence number 8516-1), and adhered to the current legislation of the Brazilian Committee for Animal Experimentation. Bats were sampled in the of shrubby Caatinga and cloud forest at Serra da Guia between October, 2008, and September, 2009, following a standardized monthly schedule in which mist-nets (2.5 m high and 100 m long) were set along a trail system within an area of typical habitat between 18:00 h and 05:00 h on three consecutive nights during the new moon. During the first six h of each session, the nets were visited every 20 min for the removal of captured bats, but after midnight, the nets were only checked every 90 min, given that the capture rate declined considerably during this part of the night. All captured specimens were placed in cotton bags until the following morning for processing.

Each specimen was examined and identified to the species level, and its sex, age, reproductive condition, weight, and forearm length were recorded. The specimens were marked with numbered plastic rings, which were attached to the distal portion of the forearm and then released. Voucher specimens (no more than four individuals per species) were collected for taxonomic verification. These specimens were euthanized by asphyxia with ethyl ether, fixed in 10% formaldehyde and preserved in 70% ethanol. The individuals were deposited as voucher specimens in the Adriano Lúcio Peracchi collection (ALP) at the Federal Rural University of Rio de Janeiro in Seropédica, Brazil. Identification was based on the keys of Anderson (1997), Simmons and Voss (1998), Lim and Engstrom (2001), and Gardner (2007).

2.3. Data analyses

Sampling effort was calculated by multiplying the total area of the mist-nets by the number of hours they were set (Straube and Bianconi,

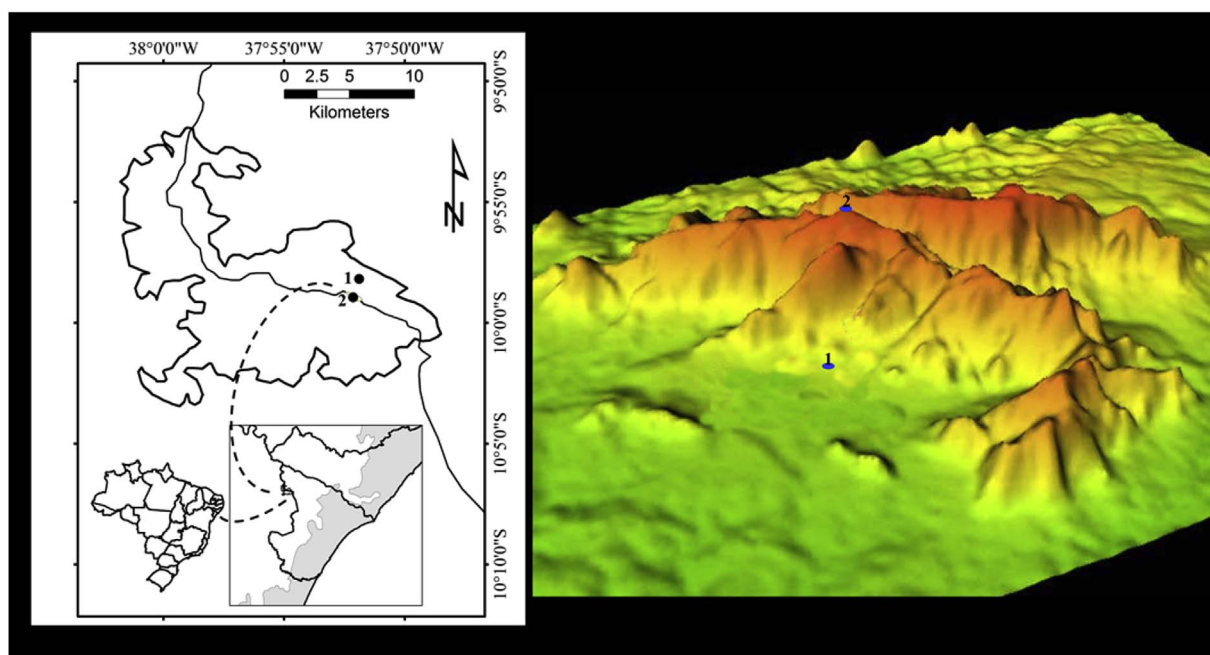


Fig. 1. Location of the two study sites at Serra da Guia, Poço Redondo, Sergipe, northeastern Brazil. (1) Caatinga and (2) cloud forest.

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