A note on the diet and foraging behavior of *Artibeus lituratus* (Chiroptera, Phyllostomidae) in an urban park in southeastern Brazil

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Biota Neotropica v7 (n2)
http://www.biotaneotropica.org.br/v7n2/pt/abstract?short-communication+bn01407022007

Recebido em 24/08/06
Versão Reformulada recebida 01/03/07
Publicado em 01/05/07

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Abstract

Oprea, M., Brito, D., Vieira, T.B., Mendes, P., Lopes, S.R., Fonseca, R.M., Coutinho, R.Z., Ditchfield, A.D. **A note on the diet and foraging behavior of Artibeus lituratus (Chiroptera, Phyllostomidae) in an urban park in southeastern Brazil.** *Biota Neotrop*. May/Aug 2007 vol. 7, no. 2 http://www.biotaneotropica.org.br/v7n2/pt/abstract?short-communication+bn01407022007. ISSN 1676-0603.

Bats of the genus *Artibeus* are among the most important seed dispersers in early successional forests. We report observations on the foraging behavior of *Artibeus lituratus* in Pedra da Cebola Municipal Park, an urban park in the city of Vitória, Espírito Santo, southeastern Brazil. Observations were made during six consecutive days (April 1st to April 6th, 2006). Three mist-nets were opened each night close to a *Maclura tinctoria* tree (Moraceae), remaining open from 18:00 to 22:00, totaling four hours per night, and 24 hours of sampling effort. We observed two peaks of feeding activity at the tree, one between 18:20 and 19:30, and a second one at 21:00. This is the first observation of *Artibeus lituratus* feeding on *M. tinctoria* fruits, therefore adding a new item to the known diet of the species. *M. tinctoria* fruits have large seeds that are not swallowed by bats, they consume the fruit pulp and discard the seeds. A diet of fruits with large seeds may indicate an important resource not detected in dietary studies based on fecal samples, but better detected by direct observation or by studying feeding roosts. It is important to use different sampling techniques in dietary studies since they complement each other and, together, provide a better knowledge on the diet of bats.

Keywords: *bats, frugivory, Maclura, urban ecology.*

Resumo

Oprea, M., Brito, D., Vieira, T.B., Mendes, P., Lopes, S.R., Fonseca, R.M., Coutinho, R.Z., Ditchfield, A.D. **Nota sobre dieta e comportamento de forrageio de *Artibeus lituratus* (Chiroptera, Phyllostomidae) em um parque urbano no sudeste do Brasil.** *Biota Neotrop*. May/Aug 2007 vol. 7, no. 2 http://www.biotaneotropica.org.br/v7n2/pt/abstract?short-communication+bn01407022007. ISSN 1676-0603.

Morcegos do gênero *Artibeus* estão entre os mais importantes dispersores de sementes em florestas em estágios iniciais de sucessão. Aqui descrevemos observações sobre o comportamento de forrageio de *Artibeus lituratus* no Parque Municipal da Pedra da Cebola, um parque urbano na cidade de Vitória, Espírito Santo, sudeste do Brasil. As observações foram feitas durante seis dias consecutivos (01 a 06 de Abril de 2006). Três redes de neblina foram abertas cada noite, próximas a uma árvore de *Maclura tinctoria*, Moraceae, permanecendo abertas das 18:00 às 22:00 horas, totalizando quatro horas por noite, e 24 horas de esforço amostral. Foram observados dois picos de atividade de forrageio, o primeiro entre 18:20 e 19:30 horas, e o segundo às 21:00 horas. Este é o primeiro registro de consumo de frutos de *M. tinctoria* por *A. lituratus*, adicionando mais um ítem para a dieta conhecida desta espécie. Os frutos de *M. tinctoria* possuem sementes de tamanho relativamente grande, que não são ingeridas pelos morcegos. Eles consomem a polpa dos frutos e descartam as sementes. Uma dieta de frutos com sementes grandes pode indicar um recurso importante que não é detectado em estudos de dieta baseados apenas na análise de fezes, e que será detectado apenas por observação direta ou através do estudo de sítios de alimentação. O uso de técnicas de amostragem variadas em estudos de dieta é de extrema importância, pois elas complementam umas às outras, e em conjunto nos fornecem informações melhores e mais precisas sobre a dieta de morcegos do que qualquer uma delas forneceria isoladamente.

Palavras-chave: *ecologia urbana, frugivoria, Maclura, morcegos.*

Introduction

With few exceptions, knowledge of bats' food habits, like many other aspects of Chiroptera biology, is superficial or needed (Gardner 1977). Among Chiroptera, the family Phyllostomidae is a group highly versatile in exploring food resources (Passos & Graciolli 2004). The subfamily Stenodermatinae is composed mainly by frugivore species (Nowak & Paradiso 1983), and *Artibeus lituratus* (Olfers, 1818) is one of the most common and abundant species in southeastern Brazil.

Artibeus bats feed mainly on fruits, but the diet of some species may also contain nectar, insects (Gardner 1977, Emmons & Feer 1997) and leaves (Gardner 1977). Bats of this genus are among the most important seed dispersers in early successional forests (Emmons & Feer 1997). They roost in small groups in hollow trees, branches, among dense foliage, under palm leaves, in caves, or occasionally in buildings (Emmons & Feer 1997).

A. lituratus is one of the most common species in urban parks (Bredt & Uieda 1996, Perini et al. 2003, Silva et al. 2005, Uieda & Chaves 2005) and it may have an important role in seed dispersal in urban landscapes. This highlights the importance of information about its diet in urban areas. Here we report observations on *A. lituratus* bats foraging on fruiting trees in an urban park in southeastern Brazil, presenting data on its activity patterns and diet.

Material and Methods

The Pedra da Cebola Municipal Park (20° 16' 30" S to 20° 16' 40'' S and 40° 17' 44'' W to 40° 17' 58'' W) is an urban park located within the city of Vitória, State of Espírito Santo, southeastern Brazil (Figure 1). The area was heavily degraded and explored from 1966 to 1978 by the stone industry for the construction of Tubarão harbor. After that period such activity finished and the area was abandoned for several years. The park was created in 1996 and has an area of 100,005 m^2. The park's limits are walled by neighboring houses and buildings and artificial lakes were created on previous crater sites of the mining activity. It is an area used by Vitória's inhabitants for recreation and a tourist attraction of the city. Originally this region was a transition zone between the restinga (coastal shrubland) ecosystem and the Atlantic Forest. Due to its small size and proximity to the urban landscape, there are several exotic animal and plant species within its borders, but some of its original vegetation still remains.

Observations were made by naked eye during six consecutive days (April 1st to April 6th, 2006), close to a *Maclura tinctoria* tree (Moraceae) (20° 16' 33" S, 40° 17' 50" W), which was fruiting and had many ripe fruits (Figure 2). *M. tinctoria* is a tree found in dry forests in the Neotropical region, from Mexico to Paraguay, reaching up to 20 m of height. Its fruits are small and green with small hair-like appendages and are located throughout the tree canopy (Figures 2, 3 and 4). We found no published information on the species phenology.

The sampling site within the park had artificial illumination and reasonable movement of people (Figure 3). Three mist-nets (7.0 m wide x 2.5 m hight) were opened each night, remaining so from

Figure 2. Individual of *Artibeus lituratus* approaching the *Maclura tinctoria* tree in order to feed on its fruits. Photo: Robson Soares da Costa.

Figura 2. Indivíduo de *Artibeus lituratus* se aproximando da árvore de *Maclura tinctoria* para se alimentar de seus frutos. Foto: Robson Soares da Costa.

Figure 1. Pedra da Cebola Municipal Park, located in the city of Vitória, Espírito Santo, southeastern Brazil. The circle indicates the sampling site within the park and the arrow indicates the neighboring abandoned terrain where bats were seen to move, both coming to the park and leaving from the park. Source: Google Earth.

Figura 1. Parque Municipal da Pedra da Cebola, localizado em Vitória, Espírito Santo, sudeste do Brasil. O círculo indica o local de amostragem dentro do parque e a seta indica o terreno abandonado vizinho ao parque, onde os morcegos foram vistos entrando e saindo do parque. Fonte: Google Earth.

Figure 3. Individual of *Artibeus lituratus* after catching a *Maclura tinctoria* fruit. It is noticeable the proximity of the tree to artificial illumination and the walking path. Photo: Robson Soares da Costa.

Figura 3. Indivíduo de *Artibeus lituratus* após pegar um fruto de *Maclura tinctoria*. Percebe-se a proximidade da árvore a iluminação artificial e pista de caminhada do parque. Foto: Robson Soares da Costa.

Figure 4. Individual of *Artibeus lituratus* taking a *Maclura tinctoria* fruit to its feeding roost. Photo: Robson Soares da Costa.

Figura 4. Indivíduo de *Artibeus lituratus* pegando um fruto de *Macluratinctoria* e levando-o para seu sítio de alimentação. Foto: Robson Soares da Costa.

18:00 to 22:00, totaling four hours per night, and 24 hours of sampling effort. Bats captured were measured (forearm length), weighted, sexed and had their reproductive condition assessed. These data were collected as part of an ongoing project evaluating urban bat ecology within the city of Vitória (M. Oprea et al., unpublished data).

Results and Discussion

A similar behavioral pattern was observed during the six days of sampling and observation: at 18:00, two individuals appeared as scouts and searched the area. They flew around the tree for a few minutes, but did not take any fruits from it, and headed back to the area where they came from, an abandoned terrain neighboring the park, with trees and abandoned construction material (Figure 1). At 18:20 a large number of bats arrived at the tree to feed. There was an intense movement of bats at the tree up to 19:30, when it stopped. The fruits were taken off the tree during flight; the bats approached one fruit, gave a bite and made a twisting movement to free the fruit from the tree. Once the fruit was free, the bats flew away (Figure 4), possibly to a feeding roost. Between 19:30 and 21:00 we did not observe bats near the study tree. Another peak of feeding activity was observed beginning at 21:00 and lasting until 22:00.

A. lituratus is considered to feed mainly on fruits from plants of the families Cecropiaceae and Moraceae (Fleming 1986, Passos et al. 2003). However, Passos & Graciolli (2004) observed that fruits from these two families represented only a small part of the diet of *A. lituratus* in two protected areas in southern Brazil. Most of the studies on the diet of bats are based on the contents of fecal samples, mainly seeds or fruit parts. Fecal samples with fruit pulp are hardly identified by this process. Fruits with large-sized seeds, which are not swallowed by bats may also be undersampled. Therefore, the precise determination of a bat species' diet must be complemented with alternative data sources, such as direct observation.

Mello et al. (2005) investigated the influence of fruit size on fruit selection by bats of the genus *Artibeus* in a restinga site in southeastern Brazil, and suggests that bats do select and handle larger fruits. By selecting larger fruits, *Artibeus* bats consume a large overall quantity of pulp per fruit (Mello et al. 2005). They only consume the pulp, acting as legitimate seed dispersers for *Calophyllum brasiliense* (Mello et al. 2005).

A diet of fruits with large seeds may indicate an important resource that is not detected in diet studies only evaluating fecal samples, and that will be better detected by direct observation or by studying feeding roosts (Galetti & Morelato 1994, Sazima et al. 1994, Zortéa et al. 1994). Some plant species with large seeds, usually are taken to feeding roosts, but are seldom included in diet item lists resulting from fecal analysis studies, like *Calophyllum brasiliense, Terminalia cattapa* (Galetti & Morelato 1994, Sazima et al. 1994, Mello et al. 2005), *Mangifera indica* (Sazima et al. 1994) and *Andira* sp. (Zortéa & Chiarello 1994).

Here we expand this list by reporting the first observation of *A. lituratus* feeding from *M. tinctoria* (Figure 4). We highlight the importance of using different sampling techniques in dietary studies (fecal samples, feeding roost and direct observations). Each sampling method has its advantages and, together, are complementary. The adoption of different approaches gives us more detailed information about a species diet.

Acknowledgments

We thank Robson Soares da Costa for the pictures. We also thank André Moreira de Assis and Ludovic Jean Charles Kollmann for help with identification of the tree species where bats were feeding on. Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (IBAMA) for issuing permits to allow us to collect bats for this study. We also thank the managing staff at Parque Municipal da Pedra da Cebola for allowing us to conduct fieldwork at the park. Monik Oprea thanks Bat Conservation International (BCI) for grants received through the Scholarship Program 2006.

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