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Diet and seed dispersal by five marsupials (Didelphimorphia: Didelphidae) in a Brazilian cerrado reserve

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Abstract

The food habits and seed dispersal promoted by five didelphid marsupials, were investigated through fecal analysis in a cerrado reserve located in the central part of the Espinhaço mountain range in Minas Gerais state, southeastern Brazil. The studied species presented a remarkable constancy in their diets and just for *C. philander* a seasonal change in diet seems to be present with a high consumption of fruits during the wetter season. Arthropods such as hymenopterans, coleopterans and homopterans were the main food resource detected but seeds belonging to pioneer plants were found with high frequencies in samples of all didelphids. Fruits of pioneer plants belonging to the families Melastomataceae (*Clidemia urceolata* and *Miconia holocericea*) and Rubiaceae (*Psychotria barbiflora* and *P. capitata*) present high germination rates and were among the mostly consumed. In spite of the differences observed in food preferences, all of the didelphids studied must be considered effective seed dispersers of pioneer plants.

Keywords: Didelphids; Diet; Seed dispersal; Cerrado; Espinhaço range

Introduction

The marsupial family Didelphidae includes about 55 species in Brazil (Rossi et al. 2006), but despite the commonness and wide distribution for most of them, detailed information on the diet and other aspects of their natural history is still scarce or non-existent (Cáceres et al. 2002; Vieira and Ástua de Moraes 2003; Lessa et al. in press). Didelphids have been frequently reported as omnivorous mammals consuming invertebrates, fruits, small vertebrates and occasionally carrion and other plant parts (Fonseca et al. 1996; Rossi et al. 2006). However, recent studies have yielded information that allowed researchers to describe more precisely the feeding habits of some species, such as *Caluromys* spp. (Cáceres 2005; Casella and Cáceres 2006), *Metachirus nudicaudatus* (Santori et al. 1995; Cáceres 2004) and *Micoureus paraguayanus* (Casella and Cáceres 2006) which are now regarded as primarily frugivorous, insectivorous and insectivorous–omnivorous, respectively. Therefore, knowledge about the diet of any species is an important parameter to understand its relationship with the environment (Ástua de Moraes et al. 2003; Martins and Bonato 2004).

Another important phenomenon related to feeding habit is seed dispersal (Cáceres 2002) which have been associated with different aspects, such as the presence of intact seeds in stomachs (Talamoni et al. 2007), intact seeds in scats (Cáceres et al. 2002; Pinheiro P.S. et al. 2002) and plant species (fruits) eaten (Casella and Cáceres 2006; Martins et al. 2006; Leiner and Silva

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2007). However, the authors reported did not assess the potential role of didelphids as seed dispersers by germination experiments (see Grelle and Garcia 1999; Cáceres and Monteiro-Filho 2000; Cáceres 2002, 2004).

In Brazil, studies on feeding ecology of didelphid marsupials have been restricted to disturbed and non-disturbed Atlantic forests areas (e.g., Santori et al. 1995; Leite et al. 1996; Grelle and Garcia 1999; Pinheiro P.S. et al. 2002; Cáceres 2004; Martins and Bonato 2004; Casella and Cáceres 2006; Leiner and Silva 2007). Information on the diet composition of didelphids in the Brazilian cerrado, one of the most endangered ecosystems of the world (Myers et al. 2000), is limited to some few records (Martins et al. 2006; Talamoni et al. 2007). The most detailed study was conducted by Martins et al. (2006) with the little mouse opossum *Gracilinanus microtarsus*. Although the authors report the occurrence of fruits in the diet of *G. microtarsus*, information on the potential role of this species and other didelphids as seed dispersers in the Brazilian cerrado is still lacking.

The objectives of this study were twofold. First, we determined the diet of five sympatric didelphid marsupials, namely *Gracilinanus agilis* (Burmeinster, 1854), *Marmosops incanus* (Lund, 1840), *Metachirus nudicaudatus* (Desmarest, 1817), *Micoureus paraguyanus* (Thomas, 1905) and *Caluromys philander* (Linnaeus, 1758), in a cerrado reserve in southeastern Brazil. Secondly, we evaluated the viability of the seeds found in the scats of the study species to assess their potential roles as seed dispersers in this important Brazilian ecosystem.

Material and methods

Study site

This study was carried out in the Parque Estadual do Rio Preto (PERP) (18°09′s, 43°23′W), located in the central part of the Espinhaço mountain range in Minas Gerais State, southeastern Brazil. The study area is an important remnant of Brazilian cerrado (savanna-like vegetation), which is defined as a xeromorphic vegetation type. The cerrado comprises five different vegetation physiognomies, namely, campo limpo (clean field), campo sujo (dirty field), campo cerrado (closed field), cerrado sensu stricto and cerradão (closed woodland) (Eiten 1992). Most of the area of the PERP is occupied by campo limpo, cerrado sensu stricto and gallery forests. The local topography is characterized by a hilly relief with areas that varied between 720 and 1830 m of altitude.

The annual rainfall ranges from 8.25 to 223.19 mm concentrated mainly in the wet season (October–March), although some rain may occur during the dry season (April–September).

Trapping of animals and data recording

The five didelphid species were captured weekly from February 2005 to March 2006 using 100 mesh-wire live-traps (30 cm × 15 cm × 15 cm) distributed along two tracks located 50 m apart from each other. Trapping stations were placed 20 m apart from each other on each track and traps were set on the ground and on tree branches or vines at height of about 1.5 m. All traps were baited with a mixture of banana, pineapple, and cotton balls soaked with cod-liver oil during the afternoon and checked for captures during the following morning. All animals were marked with numbered ear tags (Zootech, Curitiba, PR, Brazil) and released. Scats on the trap floor and those defecated by the individuals during the manipulation were collected. One fecal sample was considered as being all feces produced by one animal in a night.

Diet analysis

Scats collected were stored in numbered small plastic containers and frozen to avoid deterioration. In the laboratory, the scats samples were washed in a 0.1 mm mesh sieve. Food items were assigned to the following categories: seeds, other plant parts (flower and fruit fragments), arthropods, vertebrates and unidentified material. Items were identified at the lowest possible taxonomic category by comparison with a reference collection of invertebrates and seeds from the study area. When present, seeds were counted in each fecal sample. The bait residue was detected and excluded during the scats analyses. The relative frequency of occurrence (Korschgen 1987) was used to determine the contribution of each item in all food categories to the diet of didelphids. This statistic was calculated as the frequency of scats containing a particular food item multiplied by 100 (Korschgen 1987). The non-parametric Mann–Whitney *U*-test (Ayres and Ayres Jr. 2000) was used to test diet differences between the dry and the wet season. The *G*-test was used to compare the proportion of seeds and arthropod groups in the diet of the didelphids (Sokal and Rohlf 1995).

Germination tests

Seeds found in scats were placed in closed Petri dishes (diameter = 9 cm) containing wet absorbing paper to verify germination and monitored weekly. As control experiments, seeds of the same plant species consumed by the didelphids were collected directly from fruiting plants and tested for germination as described above. To test differences between germination rates of control group versus seeds found in the scats we use the χ^2 statistic (Sokal and Rohlf 1995).