



# OMNIVORY BY *MICOUREUS PARAGUAYANUS* (DIDELPHIMORPHIA: DIDELPHIDAE) IN A BRAZILIAN CERRADO REMNANT: DIET COMPOSITION AND DIETARY SEASONALITY

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## INTRODUCTION

Knowledge of the diet is of prime importance for understanding the biology of a species at the individual and population levels and the outcome of trophic interactions has important ecological, evolutionary and conservation implications (Korschgen, 1987; Martins *et al.*, 006). Nevertheless information on feeding ecology of Neotropical species is scarce and covers small areas of their distribution (Eisenberg & Redford, 1999). As an example, previous studies on the diet of the Tate's woolly mouse opossum, *Micoureus paraguayanus*, were performed only in Atlantic Forest habitat (Leite *et al.*, 996; Cáceres *et al.*, 002; Pinheiro *et al.*, 002a; Carvalho *et al.*, 005; Casella and Cáceres, 2006), even though it inhabits remnants of Cerrado (savannah - like), a much more seasonal biome.

*M. paraguayanus* is a medium - sized (58 - 132 g), solitary, arboreal, and nocturnal Neotropical didelphid marsupial with a high seasonal reproductive pattern (Quental *et al.*, 001) that inhabits southeastern and southern Brazil (Gardner and Creighton, 2008). The high seasonality in Cerrado environment coupled with seasonal reproduction, suggest that season might affect the species diet in this habitat.

## OBJECTIVES

In this context our goal was to analyze *M. paraguayanus* diet composition to answer the following questions: (1) Which resources are consumed? (2) What are their relative importances for the *M. paraguayanus* population in the study area? (3) How seasonality affect diet composition?

## MATERIAL AND METHODS

### Study Area

This study was conducted at the Reserva Biológica de Mogi Guaçu (22° 15' / 22° 18' S, 47° 08' / 47° 13' W), Mogi Guaçu, São Paulo, in southeastern Brazil. The climate of the region has two well - defined seasons, namely a warm - wet season from October to March and a cool - dry season from April to September (IPT, 1981).

### Trapping

The diet of *M. paraguayanus* was determined by the analysis of feces sampled from individuals captured from September 2005 to August 2006. From September to November 2005, sampling was done every 15 days over two consecutive nights. After that, sampling was done over 10 consecutive nights each month except on February and April 2006 when sampling was not possible. 121 Sherman live traps (dimensions 7,5 x 9,0 x 23,5 cm) were set on trees about 1,75 m located 15 m from each other in a 11 x 11 trapping grid. We used banana and peanut butter as bait. Individuals captured were marked with a numbered ear tag and their sex was recorded.

Feces on the trap floor and defecated by individuals during manipulation were collected and preserved in 70% ethanol.

### Analysis of diet composition

Fecal content was examined in the laboratory with a stereoscope. Arthropods classes and orders can be distinguished through characteristics of parts such as legs and mandibles whereas seeds allow the identification of ingested fruits (Martins *et al.*, 006). Arthropods were identified through the comparison with a reference collection.

The statistic of percentage of occurrence, i.e., the relative frequency of samples containing each resource, was used to evaluate the contribution of each category in the population diet.

We compared the variation in the proportions of resources detected in feces among seasons using the *G* test (Zar, 1999), as there were many cells with low expected values.

## RESULTS AND DISCUSSION

We analyzed 165 feces (67 from males and 98 from females) from 20 individuals (13 males and 7 females). We found arthropods from 11 orders and seeds representing five plants genera. Ants (detected in 88% of fecal samples), beetles (43%), hemipterans (29%) and *Miconia* fruits (36%) were the most frequent resources detected in the samples. Termites (12%) and hymenopterans other than ants (10%) were found with intermediate frequencies, whereas other resources such as spiders (4%) and *Passiflora* fruits (5%) were detected with low frequencies.

In the warm - wet season, ants were the most frequent food resource, detected in 95% of the feces, followed by *Miconia* fruits (65%) and beetles (51%), whereas in the cool - dry season, ants were also the most frequent resource (87%), but followed by hemipterans (33%) and termites (19%). Vertebrate remains, such as bone fragments and teeth, were also detected in four sample units. There were significant differences in the proportions of food resources between seasons ( $G = 130.74$  d.f. = 27;  $p < 0.001$ ).

Our data show that in the Cerrado area sampled, *M. paraguayanus* is omnivorous with a diet composed of arthropods, fruits and even small vertebrates. Ants and beetles were highly frequent, whereas many other taxa were found sporadically. This diet composition is similar to that reported for *M. paraguayanus* in Atlantic forest areas (Leite *et al.*, 1996; Cáceres *et al.*, 2002; Pinheiro *et al.*, 2002a; Carvalho *et al.*, 2005; Casella and Cáceres, 2006). Ants and beetles represent the most abundant taxa in Cerrado habitat (Pinheiro *et al.*, 2002; Carvalho *et al.*, 2005). It is possible then that this pattern of resource use reflects resource distribution in the environment. Therefore, *M. paraguayanus* can be classified as an opportunistic forager, following MacArthur and Pianka's (1966) definition. The detection of vertebrate remains corroborate data from Cáceres *et al.*, (2002) and Casella and Cáceres (2006), suggesting vertebrates are also important in *M. paraguayanus* diet.

Besides being frequent, especially in feces sampled in the warm - wet season, *Miconia* seeds were found almost intact in feces, suggesting *M. paraguayanus* might have an important role in seed dispersal in Cerrado as previous studies suggest for other plant species in different habitats (Cáceres *et al.*, 2002, Pinheiro *et al.*, 2002a).

The rank of relative proportions was different between seasons. Termites and hemipterans became more frequent in the feces in the cool - dry season, whereas beetles and *Miconia* fruits were detected in higher frequencies in the warm - wet season. Higher consumption of fruits in the warm - wet season is expected since that is the period when fruits are available. With respect to arthropods relative proportions, most arthropods taxa abundances peak at the warm - wet season (Pinheiro *et al.*, 2002b). However data obtained by Pinheiro *et al.*, (2002b) on the seasonal abundances of insects in Cerrado show peaks of abundance in the cool - dry season for some insect groups such as ants and termites, what might explain the high consumption of these resources in the cool - dry season. This adds to the bulk of evidence suggesting that *M. paraguayanus* forages opportunistically. Our results also suggest that season affects diet composition

of *M. paraguayanus* in Cerrado as reported for the didelphid *Gracilinanus microtarsus* (Martins *et al.*, 2006).

## CONCLUSION

Studies in the Atlantic forest as well as our results in Cerrado suggest a large scale pattern in resource use by *M. paraguayanus* characterized by an omnivore diet and an opportunistic foraging behavior. Exogenous factors such as season seem to be the important factors determining the species diet.

We thank Fundação de Amparo à Pesquisa do Estado de São Paulo, Fapesp, for funding this research. M. M. Pires is funded by a scholarship from Fapesp and S. F. dos Reis is partially funded by CNPq.

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