Feeding Behavior of the Black-Tufted-ear Marmoset (*Callithrix penicillata)* (Primata, Callitrichidae) in a Tropical Cerrado Savanna

by

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ABSTRACT

We characterized the diet of a population of the marmoset *Callithrix penicillata* in a cerrado fragment in SE Brazil. A transect was used to follow the group weekly during one year, registering life area and feeding behavior. A total of 67 hours of life area and 51 hours of feeding behavior observations were completed. The marmosets used an area of 6.85 ha with population density of 2.04 individuals/ha and the group composition varied between 10 to 14 individuals. The animals fed on 23 distinct tree species, eating fruit, buds, flowers, leaves, young stems, resin, ants, termites and bird eggs, with differences in feeding habits between the dry and wet seasons. Our results showed that even in severely disturbed areas, marmosets may not only survive but also maintain a good reproductive capacity. This ability is due to their behavioral plasticity and indicates this species as an interesting social mammal to assist future projects of conservation in fragmented areas of tropical savanna.

Key-Words: marmoset; diet; fragmentation; tropical savanna.

INTRODUCTION

The Neotropical primates are limited to arboreal life and are currently a species endangered by the effects of habitat fragmentation (Blomquist *et al.* 2009; Arroyo-Rodrigues & Dias 2010), which is commonly pointed out as the severest negative action of human beings on terrestrial ecosystems (Metzger 2006). Loss of habitat area causes direct changes in structure, reducing vegetation abundance and diversity (Primack & Rodrigues 2005), and

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primates respond to these modifications by changing diet, activity patterns and modifying or reducing life area (Marsh 2003). The cerrado marmoset *Callithrix penicillata* (E. Geofffroy, 1812), or black-tufted-ear marmoset ("mico-estrela" in Brazil), is a monkey of tree canopies (Fig. 1) observed in several distinct forestal physiognomies, including secondary and disturbed fragments (Rylands & Faria 1993). Fruit, arthropods (Miranda & Faria 2001), mollusks, small vertebrates (Rylands & Faria 1993), nectar, plant exsudates (Passamani 1996) and bird eggs (Miranda & Faria 2001) are the main items in this marmoset's diet.

In the past 50 years, the Cerrado is the most affected Brazilian ecosystem through land occupation for new cities and extensive monoculture activities, resulting in intense fragmentation and habitat loss, with flora and fauna impoverishment. Thus, basic studies in plant and animal life history enabling comparisons between areas are considered relevant for the preservation and restoration of this ecosystem (e.g. Del-Claro & Torezan-Silingardi 2009). The aim of the present study was to characterize the diet of a population of *C. penicillata* living in one of the last preserved Cerrado fragments in the Triângulo Mineiro region.

Fig. 1. *Callithrix penicillata.*

METHODS

The study was conducted at the tropical savanna Clube de Caça e Pesca Itororó de Uberlândia (CCPIU) – Minas Gerais, Brazil (18°59'S, 48°18'W), between August 2006 and 2007. The cerrado *sensu strictu* consists of trees 2-8 m in height with an understory dominated by grasses and scattered perennial herbs. The climate is rainy and humid from September to April (spring to summer) and dry from May to August (autumn to winter) (see study site details in Elpino-Campos *et al.* 2007). In the study site we established a transect 300m in length, used by the observer to follow the marmoset group weekly, from dawn to dusk, using Vanguard 7500 binoculars. We used all occurrence sampling (after Del-Claro 2010), in sessions of 30 minutes followed by 5-10 minutes of interval sampling, registering and marking on a map all the points the group or individuals where observed in each observational session. These points were used to delimit the group life area. Also once a week, we used the same transect to observe and register feeding behavior. In this case, we altered the sampling method and used focal animal sampling (after Del-Claro 2010).

RESULTS

During one year of field observation, a total of 67 hours of life area and 51 hours of feeding behavior observations were completed. Data showed that the marmosets used an area of 6.85 ha of cerrado, presenting a population density of 2.04 individuals/ha. The group composition varied between 10 individuals in August 2006 to 14 individuals in August 2007. The animals fed on 23 distinct tree species, eating fruit, buds, flowers, leaves, young stems and resin. Additionally, ants, termites, bird eggs were also included in their diet, with differences in feeding patterns between dry and wet seasons (Table 1).

DISCUSSION

In the study site the marmoset group foraged as much in the cerrado vegetation as in nearby anthropized areas. As the distribution of food resources and vegetational characteristics directly influence marmoset distribution (Scanlon *et al.* 1989; Rylands *et al.* 2000), we suggest that the use of natural and antropized areas may be a result of foraging pressures in the area, and influenced by the great seasonal variation. The animals used each food item

Table 1. Diet of *Callithrix penicillata* group during the wet season (October 2006 until March 2007) and dry season (May until August 2007) at Clube de Caça e Pesca Itororó de Uberlândia.

Wet Season (October 2006 until March 2007)		Dry Season (May until August 2007)	
Fruit		**Tree Resin**	
Caryocaraceae	*Caryocar brasiliensis* (pequi)	Vochysiaceae	*Qualea parviflora* *Qualea grandiflora* *Qualea multiflora*
Myrtaceae	*Eugenia uniflora* (pitanga) *Eugenia calycina* (cerejinha)	Ochnaceae	*Oratea spectabilis*
Hippocrateaceae	*Salacia crassifolia* (bacupari)	Anacardiaceae	*Tapirira guianensis*
Cecropiaceae	*Cecropia* sp.	Combretaceae	*Terminalia argentea*
Ochnaceae	*Oratea spectabilis*	Leguminosae	*Inga sessilis* *Caesalpinia peltophoroides*
Arecaceae	*Syagrus romanzoffiana* (jerivá) *Mauritia flexuosa* (buriti)	Fabaceae	exotic (not identified)
Magnoliaceae	*Magnolia* sp.	**Leaves and young steams**	
Malpighiaceae	*Byrsonima intermedia* (murici)	Myrtaceae	*Eugenia calycina* (cerejinha)
Flowers and buds		**Bird eggs**	
Caryocaraceae	*Caryocar brasiliensis* (pequi)		
Ochnaceae	*Oratea spectabilis* *Oratea hexasperma*		
Annonaceae	*Xylopia aromátic*a		
Malpighiaceae	*Byrsonima intermedia* (murici) *Banisteriopsis malifolia* *Banisteriopsis laevifolia*		
Tree Resin			
Ochnaceae	*Oratea spectabilis*		
Termites and ants			

at each time of year according to the item availability in the field. The wide diversity of food items (Table 1) corroborates observations that this is a generalist species, with great adaptive plasticity that increases the chance of survivorship in severely fragmented areas (Marsh 2003). This behavioral plasticity, for example changing between fruit and flowers in the wet season to resin in dry season, and the diversity of food consumed also suggests that *C. penicillata* may survive and reproduce for long periods of time making use of small areas or moving between fragments seasonally or simply occupying a new one (Crockett 1998).

The types of plant species included in the diet of *C. penicillata* in CCPIU were very similar to that observed in other studies for this species and other species of the genera *Callithrix*, for example: *Tapirira guianensis* (Fonseca *et al.* 1980; Faria 1986), *Qualea parviflora* (Fonseca *et al.* 1980; Rizzini & Coimbra-Filho 1981; Passamani 1996, Miranda & Faria 2001), *Qualea grandiflora*, *Qualea multiflora, Caryocar brasiliense* (Vilela & Faria 2002) and *Inga* sp. (Martins & Setz 2000; Vilela & Faria 2002). Vegetal exudates are rich not only in carbohydrates, but also in water, some amino acids and other chemicals, being a rich source of energy specially in dry season, not only for marmosets but also for capuchins (*Cebuella*), primates with incisive teeth adapted to trunk perforation in gum-trees (Coimbra-Filho & Mittermier 1976). The use of resin as food is also apparently beneficial to this marmoset species, increasing chances of survivorship in anthropized or small fragments.

Our results showed that the studied population has the basic behaviors characteristic of the species and that even in severely disturbed areas, marmosets may not only survive but also maintain a good reproductive capacity. We observed common copulation and frequent reproduction not only in this group, but also in others living in nearby areas. This continued reproductive success while living in sub-optimal conditions is likely due to the species' behavioral plasticity and dispersive capacities, indicating this species as an interesting species in future projects of mammal conservation in fragmented areas of tropical savanna.

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