

BEHAVIOURAL DESCRIPTION OF *Sapajus nigritus* (GOLDFUSS, 1809) IN CAPTIVITYF. S. MACHADO¹, C. G. COSTA² e A. L. RIBEIRO³¹ Departamento de Ciências Florestais DCF, Universidade Federal de Lavras UFLA.² Museu de Ciências Naturais MCN, Pontifícia Universidade Católica de Minas Gerais PUC MG.³ Departamento de Sistemática e Ecologia DSE, Universidade Federal da Paraíba UFPB.
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Artigo submetido em setembro/2013 e aceito em junho/2014

DOI: 10.15628/holos.2014.1671

ABSTRACT

The maintenance of animals in captivity is one of the many ways of species preservation allowing studies that are often prevented by the inability to follow in natural conditions. Primate's behavior studies are supply tools for the development of conservation and management strategies. Therefore, this research aimed at describing behavior patterns of a group of capuchin monkey, *Sapajus nigritus*, in captivity at Centro de Biodiversidade da Usipa, MG, Brazil. The Scan Sample was used with five minutes intervals. Ad libitum and Focal Animal were the

complementary sampling. Twenty-three behavioral categories were recorded; which is considered average when compared to other ethograms. The behavioral class with greater prominence was foraging. However the different categories of behavior suggest a complex capacity of intra-specific interaction. The information serves as basic tools for the formulation of conservation strategies, management and comprehension of ecological interactions.

KEYWORDS: Ethogram, capuchin monkey, Centro de Biodiversidade da Usipa.DESCRIÇÃO DOS COMPORTAMENTOS DE *Sapajus nigritus* (GOLDFUSS, 1809) EM CATIVEIRO

RESUMO

A manutenção de animais em cativeiro é uma forma de preservação de espécies que permite estudos que muitas vezes são impossibilitados pela incapacidade de acompanhamento em ambiente natural. Os estudos de comportamento de primatas servem de instrumento para a elaboração de estratégias de conservação e manejo. Portanto, este estudo objetivou descrever o padrão comportamental de um grupo de macacos-prego, *Sapajus nigritus*, em cativeiro no Centro de Biodiversidade da Usipa em Ipatinga, MG. Para tal, foram utilizados os métodos de varredura instantânea, Scan

Sample, com intervalos de cinco minutos; Ad libitum; e Animal Focal. Foram encontradas 23 categorias comportamentais, o que é considerado mediano quando comparado a outros etogramas. O grupo comportamental de maior relevância foi o de forrageio, sendo que as diferentes categorias comportamentais sugerem uma complexa capacidade de interação intraespecífica. As informações servem como ferramentas básicas para a formulação de estratégias de conservação, manejo e para a compreensão das interações ecológicas

PALAVRAS-CHAVE: Etograma, macaco prego, Centro de Biodiversidade da Associação Esportiva e Recreativa.

1 INTRODUCTION

The division of *Cebus* and *Sapajus* was defended by Lynch Alfaro et al. (2012). The authors mentioned that these animals have black or brown fur along the side of their faces in front of the ear, tuft present in different degrees and shapes, and beard shape ranging from short to long. They are found mainly in regions of Cerrado, Atlantic Forest, and sympatry in Amazon with some species from genus *Cebus*. Even *Sapajus* being a new genus, the primate is a very common species found in the Atlantic Forest from southeastern Brazil (Ludwig et al. 2005), which is one of the most endangered ecosystems in the world (Myers et al. 2000).

The group sizes vary from 2 to 50 individuals (Lynch & Rímoli 2000). The specie is generalist with motor and cognitive abilities (Resende & Ottoni 2002), which favors their presence in environments with different degrees of human disturbance. The species has been reported present in fragmented forest areas, original preferred habitat, and plantation areas (Rocha 2000, Ludwig et al. 2005).

Morphological characteristics and behavioral flexibility provide a broad geographical range, extending from Argentina to Brazil and reaching the right side the bank of the Rio Doce River, in the States of Minas Gerais and Espírito Santo (Reis et al. 2006, 2011, Ottoni & Izar 2008, Gregorin et al. 2010). The specie is also found in areas that comprehend two of the most important Atlantic Forest that remains at the east side of Minas Gerais state, at the Parque Estadual do Rio Doce (PERD) and at Estação Biológica de Caratinga (EBC). This region has a high level of habitat fragmentation due to anthropic activities.

The animals were found in urban areas as well as from wildlife trade that were released in natural environment, or they are kept in captivity at the Centro de Biodiversidade da Usipa (CEBUS). The CEBUS is an institute where animals receive medical care before been re-introduced into nature. Some individuals remain in captivity to public exhibition. The maintenance of these animals in captivity allows not only species preservation but also studies can be carried out considering that it would be very difficult to carry some studies in natural conditions due to problems as contact with researchers.

The behavior research on captivity aims the basics needs related to feeding, reproduction and social patterns, in order to obtain a greater adaptation and management of the species (Carroll 1991). Although the conditions in captivity are more stable, the environment in which they are subjected can induce the expression of behaviors that are representative of the species, reinforcing the importance of these studies (Barbosa & Mota 2004).

The research on behavior, ecology and natural history of primates serves as basic tools for the formulation of conservation strategies and management, which are crucial factors for species preservation. Besides, they are basic tools for the comprehension of ecological interactions and biodiversity (Del-Claro & Torezan-Silingardi 2006), been therefore indispensable for conservation (Curio 1996).

Because no satisfied ethograms have been found in the literature, this study aims at describing the behavioral patterns of a small group of capuchin monkeys *Sapajus nigritus* (Goldfuss, 1809) in captivity at CEBUS, Ipatinga city, Minas Gerais state. We aim at understanding

the behavior, ecological interactions and help the program of animal's reintroduction carried out by CEBUS.

2 MATERIALS AND METHODS

This study was conducted at the Centro de Biodiversidade da Usipa (CEBUS), Ipatinga city, Minas Gerais state, Brazil. The regional climate is tropical, warm and semi-humid, with an average rainfall of 1575 mm/year. Temperatures cycles are around 23°C and average relative humidity is 81.1%. The original vegetation cover was characteristic from Atlantic Forest, semidecidual forest (*sensu* Veloso et al. 1991). The region was degraded due to human occupation and natural cover was replaced with crops, livestock and urbanization. (Ipatinga 2008, Perônico 2009).

The subjects of this study were six individuals (four sub adults males, one adult dominant male, one adult female). The animals were housed in two island enclosures (one of 500 m² and the other around 130 m²). Both places were grassy and contained built structures such as piled stones, concrete shelters and small wooden huts suspended in a trunk with 3m height. There are also two large wooden houses suspended at an average height of 2m, as well as ropes that interconnect all suspended structures. The animals were fed once a day with fruits.

Observations occurred between April and September 2004, with an average of 6 hours a week, taken place during the morning and in the afternoon in one of the days of the week, summing up a total of 120 hours of observation.

The behavioral data collection was performed using three methods: 1) Instantaneous Scan Sampling (ISS - Altmann 1974, Paterson 1992) with a sampling duration of five to five minutes. 2) In all instances rare, but important events, such as social interactions, were recorded with an integrated method *Ad libitum* (Altmann 1974, Martin & Bateson 1993) in same time that behavior occurs. 3) Animal Focal record was made, the most conspicuous individual served as the source of information for the whole group (Altmann 1974).

The animal focal sampling was selected in the first hour during the morning and afternoon, at a rate of one individual per day. The behavioral categories were defined based on observations in the field and research from specific literature. All observations were made by only one observer.

The behavioral data from ISS was used to make Activities Budget, in which the relative frequency of each behavioral category was obtained according to the formula below:

$$Fry = (ny/a) \times 100$$

Where "Fr" is the relative frequency of each category, "y" is the behavioral category, "n" is the number of occurrences, and "a" the total number of records.

3 RESULTS

3.1 Behavioral categories

An ethogram of activities was elaborated from the group behavior activities during the first month of observation. Twenty-three behaviors were identified, which were subdivided into five major groups: foraging, locomotion, socialization, inactivity and preparation to food (Table 1).

Table 1: Groups and behavioral categories registered in a group of animals in captivity. Ipatinga, April to September 2004.

Category	Behavior	Definition
Foraging	Fruit Foraging	When fruits were taken from the enclosures, they were rapidly removed and taken in one of the constructions. An average of three parts (previously cut by zookeepers) of each fruit were taken. One of the parts was led to the mouth and while it was chewing the other selected foods were kept close to the body.
	Vertebrate Foraging	When they preyed on small vertebrates, anurans and fish were taken to the mouth, chewed, and swallowed. The animal with larger size and coloration highlight was the one who ate the most animal foods, proving to be the dominant of the group.
	Invertebrate foraging	Individuals ate naturally, occurring invertebrates such as termites and ants. These were obtained manually without using a tool.
Locomotion	Walk/Run on two limbs	The animals supported themselves on their hind limbs while walking around on the lawn or on the structures of the place.
	Walk/Run on four limbs	The animals supported themselves on their four limbs, in locomotion terrestrially or on the compounds arboreal structures.
	Clinging	Movements with the interconnecting ropes, with animals clinging with their anterior and posterior limbs on the ropes, clinging from one structure to the other. The tail remained free.
	Jumping	Animals jumping without holding anything (free limbs).
Socialization	Self-groom	When the animal manipulated its own hair, smoothing and/or picking it.
	Grooming	Manipulation of another individual's hair, where the animal runs his hand through the partners fur, smoothing and/or picking.
	Mounting	Where an individual positions himself on top of another in a mounting position and subsequently copulates. For most cases, pairs were formed by two male.
	Playing	Behavior presented while the animals maintained social games such as grasping, biting, vocalizing in low volume, among others, in an affiliative way.
	Vocalizing	When a lone individual starts to make loud sounds without a known purpose
	Chasing	When two individuals chased after one another because of a specific purpose (available food, for example).
	Swinging	The individual keeps its hind limbs fixed on the ground and swings the body from one side to another using the fore-limbs to absorb the impacts on the floor or wall.
Inactivity	Stopping	The animal keeps all the limbs resting on the substrate with the tail immobile (inert) and stays in this position for a few seconds
	Disappearing	When an individual disappears from the observer's field of view
	Watching	When the animals watched the zoo's visitors that were also watching them.
	Defecating	Elimination of solid excrements, where the animal usually holds a 45° angle position and have the tail slightly raised.
	Urinating	Elimination of liquid excretions, where the animal sometimes sat on a structure in a bipedal position.
Preparation	Biting branches	An animal bites small naturally presented herbs, in situ or taking them in their mouth from a tree or trunk.
	Rubbing	The animals rubbing their hands on the surface of structures in the enclosure, or rub their whole body against a trunk.
	Striking food	Animals hit fruits and / or seeds on surfaces of structures in the enclosure
	Digging	Active excavation of the enclosure's earth.

3.2 Activity Budgets

The most frequent behavioral category in this study was foraging with 58.36% and the least evident was food preparation with 2.94%. The other categories had values of 12.35%, 11.3% and 15.11% for inactivity, sociability and locomotion, respectively (Figure 1).

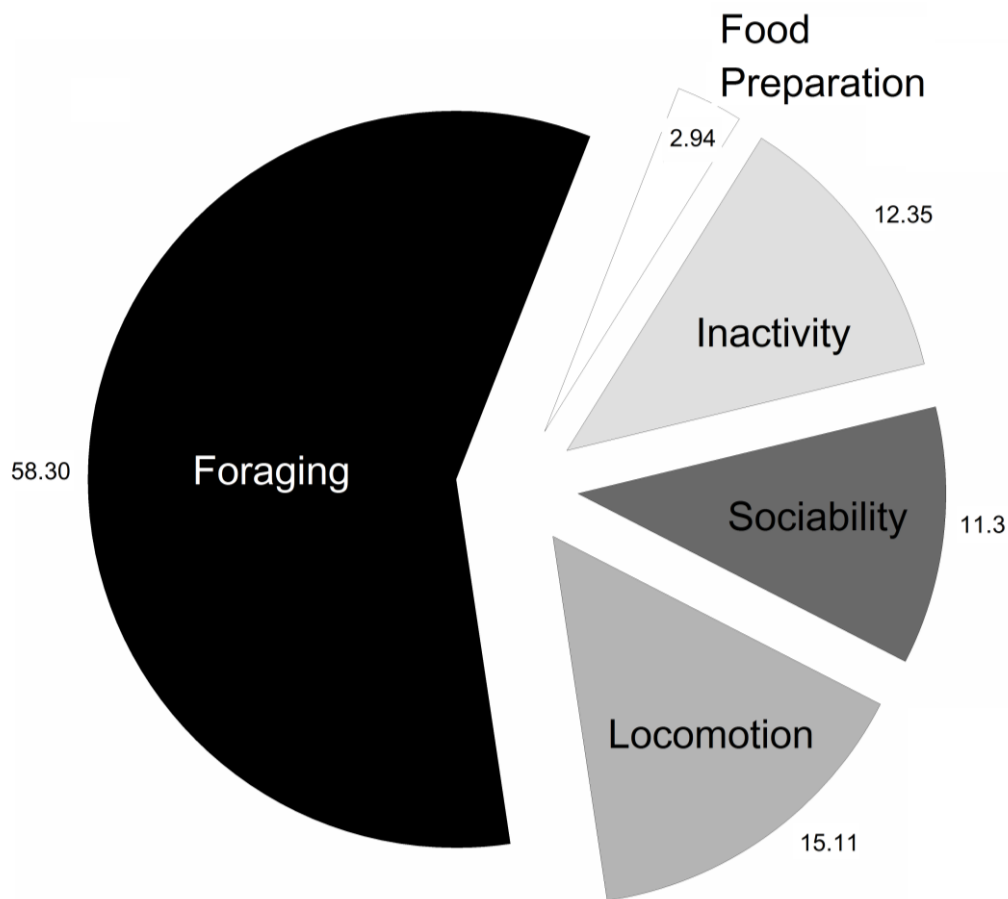


Figure 1: Relative frequency of behavioral categories of *Sapajus nigritus* captives at the Centro de Biodiversidade da USIPA. Ipatinga, April to September, 2004.

The 'foraging' category was predominant in individual activity budgets and in the group average. Behaviors related to food preparation were less evident. The other categories had distinct values, ranging from 4.65% to 22.8% (Figure 2).

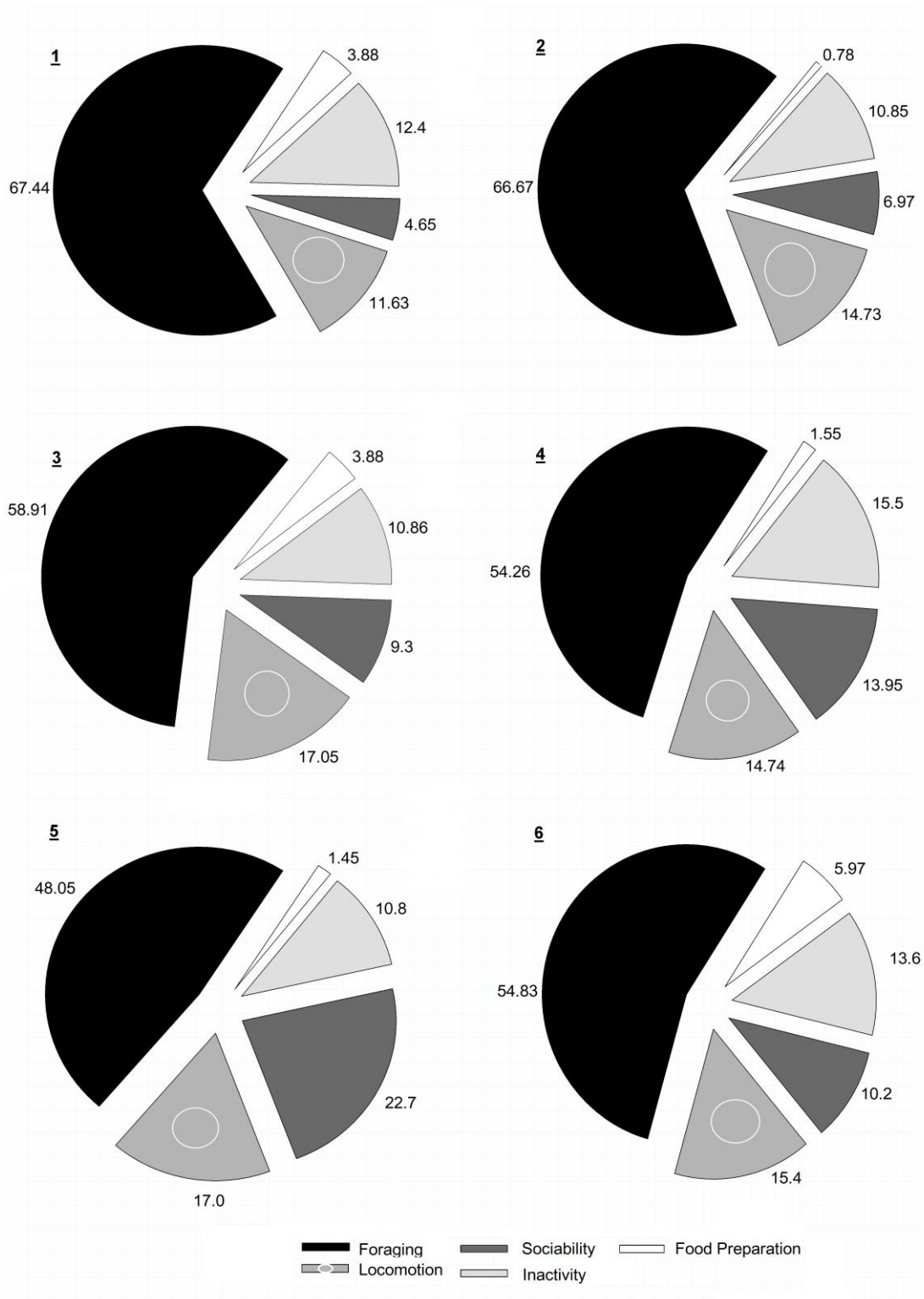


Figure 2: Activity budgets for each individual, animals from two to five represent the sub adult males, the dominant male is the chart number one and the number six is the female. Centro de Biodiversidade da USIPA. Ipatinga, April to September, 2004.

4 DISCUSSION

A few works report the existence of groups with only six individuals of *S. nigritus* (Lynch & Rímoli 2000), so the presence of small groups in a natural environment is therefore plausible. The 23 categories found in this study in 120 hours of observation might be considered as median when compared to the 45 categories found in 56 hours of observation found for the *Alouatta caraya* (Albuquerque & Codenotti 2006), and the 25 categories found in the 208.6 hours for *Cebus libidinosus* (Pinha 2007). This behavioral repertoire suggests that the species have a broad set of behaviors. However, a limiting factor for the account of this statement is the ethograms. Despite the fact that the behavioral categories represented accurately the observed actions of the animals, the recognition of categories depends on the classification of a human observer, liable of an anthropocentric bias.

Foraging was the most frequently observed behavior for all the group's individuals. Ludwig et al. (2005) mention that fruits are the main food resource of *S. nigritus* in their natural habitat. As we observed in this study, fruit feeding was of great importance on the diet of the animals because it is easily obtained and were offered in great quantities by the zookeepers. Serbena & Monteiro-Filho (2002) and Giudice & Pavé (2007) comment about the significance of arthropods as an alternative food resource for the genus *Cebus*. This protein-rich food source can represent up to 23% of the items eaten by capuchin monkeys (Ludwig et al. 2005). The high percentage of foraging recorded in the current study might be associated with the absence of protein-rich elements in the diet, inducing the search for this kind of resource.

Foraging on other vertebrates sources were presented as aleatory and casual behaviors. The results obtained for these foraging categories corroborate data from a variety of authors for capuchin monkeys (Resende et al. 2003, Giudice & Pavé 2007, Carretero-Pizón et al. 2008). According to these studies, the predation of birds by *Cebus paraguayanus* at the Jardim Zoológico of Buenos Aires, of *Aotus brumbacki* by animals from the *Cebus apella* reported by Carretero-Pizón et al. (2008), and the predation of a marsupial (*Didelphis* sp.) by Resende et al. (2003). In addition, to emphasize the importance of a protein to *Cebus* diet, predation behavior also highlights the distinction group social structures, since the alpha male showed dominance by stealing and feeding from two fishes and an anuran captured during the time of observation.

The use of tools to obtaining and preparing food is one of the behaviors considered as elaborated and complex (Serbena & Monteiro-Filho 2002, Bortolini & Bicca-Marques 2007, Giudice & Pavé 2007, Jalles-Filho et al. 2007, Ottoni & Izar 2008). However, this study did not observe the use, which can be related to the enclosure management, such as cutting grasses and removing objects.

Another factor that might favor the absence of preparation behaviors is the unknown origin of these animals. The use of tools is acquired through observation of other individuals (Izawa & Mizuno 1977, Ottoni & Izar 2008), therefore we understand that the absence of animals that present this kind of behavior can justify the absence of behavior (Perry 2011).

The socialization category deserves emphasis since it works as an index of close relationships among the group's individuals. These relationships increase the tolerance from one subject to another, as observed by Resende & Ottoni (2002) in a group of capuchin monkeys at

Tiête Ecological Park. In this case the social games were considered facilitators of the bonding process between the model animals and the other individuals.

During the observations mating interactions between juveniles animals of the same sex were described. According to Serbena & Monteiro-Filho (2002) interactions between individuals that result in mating apparently serve to establish specific social ties. This behavior is considered important for the formation of social relationships among group members.

The *S. nigritus* is considered “near threatened” by IUCN (Kierulff et al. 2008). So, deeper studies about the behavior of animals in captivity need to be proposed and these observations can be used as important tools for the formulation of conservation and preservation strategies. The ethogram demonstrated in this work represents a great behavioral flexibility. *S. nigritus* that is very adaptable to many habitat types and diets. The number of behavioral categories can be considered the results of variation in morphology, age, sex class, and intrapopulation differences (Lynch Alfaro et al. 2012).

5 ACKNOWLEDGMENTS

Geraldo Perlingeiro de Abreu Foundation for providing the logistical support and the Centro de Biodiversidade da USIPA for the permission to conduct this study.

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