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Front cover: Aggressive stare of white-fronted capuchin (*Cebus albifrons*) in upper subtropical forest (2,515 m) in southern Ecuador.

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EDITORIAL

We are delighted to announce that the first meetings of Neotropical Primates' new editorial team were held at the 22nd Congress of the International Primatological Society in Edinburgh in August 2008. All members of the team were able to attend and Anthony B. Rylands was on hand to offer advice (see photo below). This was a rare opportunity to meet up and discuss a range of issues related to the journal, including the role and responsibilities of the Editors and Editorial Board, ways to improve the referee process, revisions to the format, as well as future directions for the publication. A key issue that emerged during the meetings was, the importance of including information about ongoing field projects, news items and abstracts of completed theses and dissertations, therefore we strongly encourage authors to summit texts on these topics. Neotropical Primates has become an extremely valuable resource over the years. Its broad scope, open publication policy, and accessibility mean that it is uniquely placed to disseminate information about New World Primates.

Sadly, habitat destruction and hunting are increasing threats to primates. Together with the unpredictable impacts of global climate change, they pose a complex challenge for those concerned with the conservation of primates and the ecosystems they inhabit. It is important that we remain optimistic and endeavor to be more creative in our conservation actions. Neotropical Primates aims to contribute to discussions both directly and indirectly linked to primate conservation and thus to foster the preservation of these unique animals.

Erwin Palacios
Liliana Cortés-Ortiz
Júlio César Bicca-Marques
Eckhard Heymann
Jessica Lynch Alfaro
Liza Veiga

Editorial Team with Anthony B. Rylands. From left: Brenda Solorzano, Erwin Palacios, Liza M. Veiga, Liliana Cortés-Ortiz, Jessica Lynch Alfaro, Eckhard Heymann, and Júlio C. Bicca-Marques. Missing Ernesto Rodríguez-Luna.

ARTICLES

SEED PREDATION OF MABEA FISTULIFERA (EUPHORBIACEAE) BY NORTHERN MURIQUIS (*BRACHYTELES HYPOXANTHUS*)

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Abstract

Seeds are staple foods in the diets of primates with morphological and behavioral specializations for seed predation, but are considered a less important resource for most other primates. Here we report the first observation of seed predation by northern muriquis (*Brachyteles hypoxanthus*). Twenty-four *Mabea fistulifera* (Euphorbiaceae) seed eating events were observed during a systematic study of two groups of northern muriquis in an Atlantic forest fragment in southeastern Brazil in July 2003, accounting for 2.9% of 836 feeding records during this month. Only unripe seeds were consumed in all records. The absence of *Mabea fistulifera* seeds in any of the 102 fecal samples examined suggests that the seeds were predated. Analyses of 47 fruits of *Mabea fistulifera* collected in different stages of ripeness in June 2004 indicated that fruits at earlier stages of ripeness were significantly softer than ones of later stages, implying that fruit hardness made their seeds unprofitable to these non-specialized seed predator monkeys.

Key Words: Plant-herbivore interaction; seed predation; food choice; fruit hardness.

Resumen

Las semillas son un alimento esencial en la dieta de los primates con adaptaciones morfológicas y comportamentales para la predación de estas, pero son consideradas un recurso alimentario menos importante por la mayoría de otros primates. Reportamos aquí la primera observación de predación de semillas por muriquís del norte (*Brachyteles hypoxanthus*). Veinticuatro eventos de consumo de semillas de *Mabea fistulifera* (Euphorbiaceae) fueron observados durante un estudio sistemático de dos grupos de muriquís del norte, en dos fragmentos de bosque Atlántico del suoriente de Brasil en Julio de 2003, correspondiendo estos al 2.9% de 836 registros de alimentación durante este mes. Solamente fueron consumidas semillas inmaduras durante los registros de alimentación. La ausencia de semillas de *Mabea fistulifera* en cualquiera de las 102 muestras de deposiciones de *B. hypoxanthus* examinadas sugiere que las semillas fueron predadas. Análisis de 47 frutos de *Mabea fistulifera* colectados en diferente grado de maduración durante Julio de 2004, mostraron que estos son significativamente más blandos durante las etapas más tempranas de maduración, que durante una etapa de maduración avanzada, implicando que la dureza de los frutos imposibilita el aprovechamiento de las semillas por parte de estos primates no especializados para tal fin.

Palabras Clave: Interacciones planta-herbívoro; predación de semillas; selección de alimento; dureza de fruto.

Introduction

Compared to ripe fruit, seeds are valuable resources in terms of their nutritional content and their relative abundance in space and time (Norconk *et al.*, 1998). Fruits are generally rich in calories, moderate in fiber and low in protein and secondary compounds (Milton, 1993). Seeds, by contrast, are relatively low in water soluble carbohydrates, highly variable in protein, and high in fat, fiber and secondary compounds (Kinzey and Norconk, 1993). To protect their seeds from predation, plants often invest in mechanical defenses such as increasing fruit hardness or toughness (Lucas *et al.*, 2000). Primates are regarded as seed predators when they destroy the seeds by masticating and digesting them (van Roosmalen *et al.*, 1988; Gautier-Hion *et al.*, 1993). Occasional seed predators, such as brown capuchin monkeys (*Cebus apella*: Peres, 1991) or gray woolly monkeys (*Lagothrix lagotricha cana*: Peres, 1994) incorporate small proportions of seeds from a few plant species into their diets, while other primates, such as Pitheciines (van Roosmalen *et al.*, 1988; Kinzey and Norconk, 1993;

Peres, 1994; Boubli, 1999; Peetz, 2001; Norconk, 2007), colobines (McKey, 1978), and cercopithecines (Lambert *et al.*, 2004), make a living from eating seeds, which account for up to 75% of their feeding time. Primates that include a wide variety of seeds in their diet have specialized adaptations for seed mastication, including robust canines, procumbent incisors, low relief molars, crenulated enamel, and strong jaw muscles (Kinzey, 1992). Most atelid monkeys, however, exploit ripe fruit pulp instead of seeds, and ingested seeds are usually defecated intact, which may help in the seeds' dispersal (Julliot, 1996; Vieira and Izar, 1999; Stevenson, 2000; Martins, 2006). Furthermore, this group of primates does not possess any specialized adaptations to exploit hard fruits routinely in their diet.

The northern muriqui (*Brachyteles hypoxanthus*) is considered a folivore-frugivore species, with a strong preference for ripe fruits (Strier, 1991). In addition to leaves and fruit, the diet of muriquis often includes flowers, as well as less commonly eaten items such as bark, nectar and seeds. The nectar of *Mabea fistulifera* is known to be an important seasonal resource for both, southern (Torres de Assumpção, 1981) and northern muriquis (Ferrari and Strier, 1992), as well as other vertebrates, particularly during periods of fruit shortage (Vieira *et al.*, 1992; Vieira and Carvalho-Okano, 1996; Passos and Kim, 1999; Olmos and Boulhosa, 2000; Miranda and de Faria, 2001). The consumption of seeds of the genus *Mabea* has been reported in *Cebus nigritus*, which occurs sympatrically with both southern (Torres de Assumpção, 1981) and northern muriquis (Rímoli, 2001), as well as in other primates such as *Cebus capucinus* (Oppenheimer, 1982) and *Cebus apella* (Peres, 1993), some birds (*Leptotila verreauxi* and *Crypturellus* sp.: Vieira *et al.*, 1992), and several ant species (*Megalomyrmex* sp. and *Pheidole* sp.: Peternelli *et al.*, 2004) in other areas. However, muriquis have not previously been observed to eat the seeds of this species.

We first observed seed consumption of *Mabea fistulifera* by northern muriquis in July 2002, when two seed predation events were recorded on different days, but fruit ripeness was not determined. A subsequent predation event was observed in June 2003, when fruit could be visibly determined as being in an early stage of ripeness. In this paper we report systematic records of northern muriquis eating seeds of *Mabea fistulifera*, and investigate fruit puncture resistance as a basis for fruit and seed choice by this species.

Methods

The study was conducted at the RPPN Feliciano Miguel Abdala, hereafter Reserve (previously known as Estação Biológica de Caratinga; 19° 50' S, 41° 50' W). The Reserve is a forest fragment of 957 ha of sub-montane semideciduous Atlantic forest, most of it in advanced stages of succession and has been described in detail elsewhere (Strier and Boubli, 2006). Seed predation on *Mabea fistulifera* was systematically recorded in July 2003 during 200 observation hours on two habituated groups, which were followed from dawn until dusk on alternate days over 21 days. The study groups, Jaó and Nadir, included about 60 and 40 individuals, respectively, utilizing partially overlapping home ranges in the northern part of the forest (Jaó valley; Boubli *et al., in prep.*). All feeding records (FRs) in which monkeys were seen eating any food item were noted following methods employed by Boubli (1999). Feeding bout focal samples (FBFS) were also conducted opportunistically as soon as an individual entered and began feeding in a *Mabea fistulifera* tree (Strier, 1989; Mourthé, 2006). During FBFS, the times the animal entered and left the tree were recorded, and the items consumed were noted. As seed ingestion of *Mabea fistulifera* occurred rarely, we calculated the relative importance of seeds as a proportion of diet by summing the seed eating records and dividing by the total number of feeding records obtained during the same study period in July 2003 (N=836). A total of 102 fecal samples, collected while the groups were being followed during this period, were later washed and examined closely for any traces of *Mabea fistulifera* seeds.

In June 2004, 47 *Mabea fistulifera* fruit samples at different stages of ripeness were collected. The length and width of each fruit and seed was measured to the nearest mm with a steel caliper. Resistance to puncture was assessed with a Macro-line [0-20 Kg] Spring Scale Pesola© adapted with pressure accessories (pin 5 mm width). Fruit hardness was sampled in a way that mimics muriqui feeding behavior (e.g., monkeys were often seen biting the side of *Mabea fistulifera* fruits and usually bit a fruit only once before discarding it or open it). Resistance to puncture was defined as the maximum pressure applied immediately prior to fracturing the fruit husk, and was measured by slowly and continuously submitting the side of a whole fruit to the penetrometer pin until the husk fractured (Kinzey and Norconk, 1990). Each fruit was tested only once because it was destroyed in the process of measuring its resistance. Resistance to puncture was measured in megapascals (MPa), based on the following formula: MPa = $((F*G)/area)/1,000,000$ (A. Marques, *pers. comm.*), where F is the force (kg) needed to break the fruit husk; G, is the gravity acceleration (e.g., 9.80665 m/s^2); and *area*, is the point of the pin surface (m^2). A Pascal is equivalent to one Newton per square meter, and it is a proper SI unit of pressure measurement (Lucas *et al.*, 2000). Fruit volume was calculated as a sphere. Because *Mabea fistulifera* is a dehiscent species (disperse their seeds explosively), the process of fruit maturation is complex and fruit color or size alone were not reliable indicators of fruit ripeness. Specifically, we observed that ripe fruits lost water and this promotes a small but noticeable size reduction (e.g., really ripe fruits are smaller than unripe ones). Fruit color also changed somewhat from reddish-green husks when unripe to reddish-brown husks when ripe. As muriquis were never seen eating ripe fruits of *Mabea fistulifera*, this stage was not collected or processed in this study and all fruits, and consequently seeds, consumed and tested in our sample were considered as unripe. We distinguished two types of unripe fruits, early and late, based on the presence of a thin brown coat covering the seeds in the late unripe stage. During this study period, the first fruits appeared in the beginning of June, becoming abundant from the end of June through the middle of July, which corresponds to the peak dry season at this site (Strier, 1991).

Results

A total of 24 records of predation on *Mabea fistulifera* seeds were observed during July 2003, representing 2.9% of the 836 FRs obtained during this month. In all records, unripe seeds were consumed by adult individuals. Northern muriquis spent on average 4.8±2.9 min (Mean±SD; range 1-9 min; N=5) consuming seeds from *Mabea fistulifera* trees. No intact seeds of *Mabea fistulifera* were found in examinations of any of the 102 fecal samples collected during the same period. *Mabea fistulifera* fruits are hard, dry, spherical dehiscent cocci, containing an average of 3.0±0.28 (N=47) small seeds (seed length=7.7±0.89 mm; seed width=5.4±0.42 mm; wet weight per seed=0.12±0.02 g; N=28 seeds). Whole fruits had an average length of 17.8±1.49 mm and an average width of 17.0±1.92 mm, and weighed 2.99±0.79 g (N=42 fruits). Fruit volume was significantly greater in the late stage (38.7±2.15 mm^3; range 34.6-41.2 mm^3; N=12) than early stage of ripeness (35.1±3.57 mm^3; range 29.6-40.2 mm^3; N=32; Wilcoxon rank sum test W=79, $p<0.01$). Fruits in the late stage were also significantly harder (6.34±2.51 MPa; median=7.19 MPa; range 0.40-9.20 MPa; N=12) than fruits in an earlier stage of ripeness (1.86±1.89 MPa; median=1.87 MPa; range 0.32-6.50 MPa; N=33; W=40, $p<0.001$; Figure 1).

Discussion

Our results indicate that northern muriquis opened the coccis of *Mabea fistulifera* and consumed their seeds at a relatively early stage of ripeness, presumably because the fruit husks become increasingly tough as the fruit matures, increasing the difficulty of processing them and inhibiting seed consumption at late stages of ripeness. *Mabea fistulifera* is one of the hardest fruits opened by northern muriquis at our study site. As northern muriquis lack the morphological specializations required to deal with hard fruits, they should be consuming only the early unripe, and consequently softer, fruits of this species. During this study, the northern muriquis were seen biting and discarding several unopened fruits of *Mabea fistulifera* before finally opening one and ingesting their small seeds, discarding the dry exocarp. Monkeys often took fruit bunches in their hands and bit several fruits at the same bunch one by one, breaking fruit husks by the teeth only, although we could not determine whether they were sampling and puncturing with their canines or premolars or both. By means of this behavior, northern muriquis appeared to be sampling for fruits that could be easily opened to extract their seeds, all of which were probably at early stages of ripeness. This behavior suggests that puncture resistance dictates northern muriqui food choices while consuming the seeds of this species.

Considering the muriquis' large body size, it is possible that although they may be capable of breaking the hard husks of *Mabea fistulifera* fruits in late stages of ripeness, they avoided doing so because of the high costs/benefit ratio of handling time versus energy gain for such small

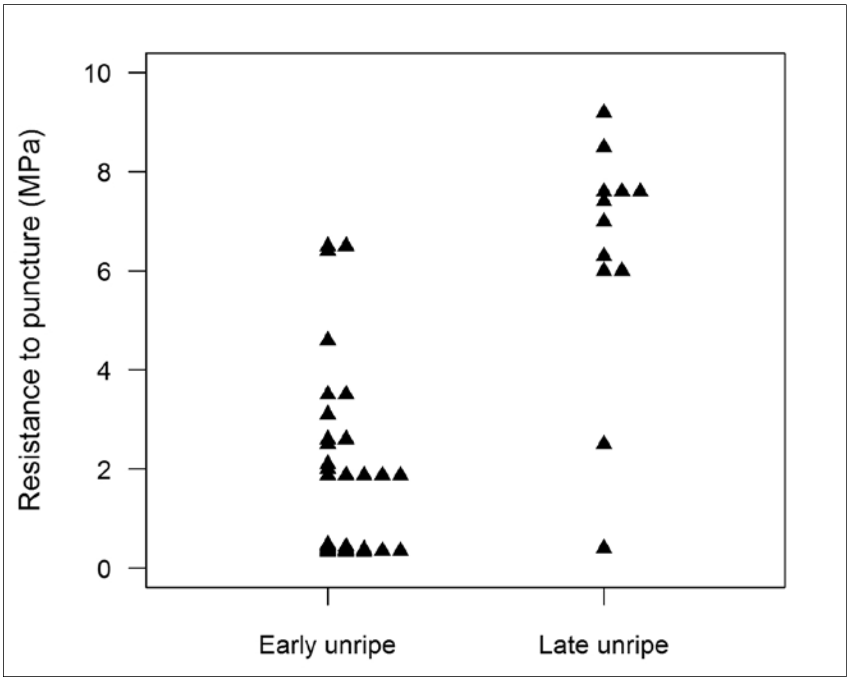

Figure 1. Resistance to puncturing of earlier (N = 28) and late unripe (N = 12) *Mabea fistulifera* fruits.

seeds (Charnov, 1976). Northern muriquis may be capable of opening late unripe fruits, but it may not be profitable for them to do so. In a previous study, Martins (2007) found that the southern muriqui, *Brachyteles arachnoides*, selects unripe seeds of fleshy/protected as well as dry fruits based on the availability of these types in her study area. Unfortunately, we do not have systematic measures of *Mabea fistulifera* seed availability during our study, but northern muriquis appeared to consume their unripe seeds during the period when they were most abundant and also when the majority of fruits were at earlier stages of maturity (from end of June to middle of July). By mid-July, the husks of the fruits become much harder as the fruits ripen. Thus, there appears to be a fairly narrow window of time during which *Mabea fistulifera* fruits are soft enough for northern muriquis to break open and ingest their seeds. Muriqui seed predation could thus be considered as a seasonal phenomenon, similar to that described for *Lagothrix lagotricha cana* in the Amazon (Peres, 1994).

In addition to fruit hardness, other characteristics, such as nutrient content and palatability, could account for the northern muriquis' selection of early unripe *Mabea fistulifera* fruits. Indeed, because the muriquis' are known to consume nectar from the inflorescences of this species between late April and May at this site (Ferrari and Strier, 1992; Mourthé, 2006), they would be familiar with resource, and primed to exploit it for other items, such as seeds. There is evidence that the mid-dry season, when they consumed these seeds, is a period of food shortage at our study site (Strier, 1991). *Mabea fistulifera* seeds are very rich in oil (Vieira *et al.*, 1992), which could provide an important source of energy when other fruits that are easier to process are scarce. Indeed, the seasonal inclusion of seeds in the diets of other primates is thought to compensate for seasonal fruit shortages (Norconk, 2007). Even small seeds can be valuable sources of protein and lipids, as in the case of three other Euphorbiaceae species *(Maprounea guianensis, Sapium aubletianum* and *Actinostemon schomburgkii)*, which are known to have high lipid and protein levels (Norconk and Conklin-Brittain, 2004).

Palatability is strongly influenced by the percentage of secondary compounds stored in plant parts. However, the concentrations of these toxic metabolites are known to be lower in the leaves of fast-growing trees (Coley *et al.*, 1985). *Mabea fistulifera* is considered to be a pioneer species (Olmos and Boulhosa, 2000; Peternelli *et al.*, 2004), and as such, may be similar to other fast-growing trees that invest less in the production of chemical defenses and therefore have few, if any, secondary metabolites stored in their seeds. Moreover, Norconk and Conklin-Brittain (2004) found no differences in tannin levels between plant parts eaten and not eaten by Venezuelan white-faced sakis (*Pithecia pithecia*). Monkeys could accept a trade-off for foods that are high in antifeedants but also high in nutrients (Kinzey and Norconk, 1993; Norconk and Conklin-Brittain, 2004). Therefore, whatever chemical compounds may be present in *Mabea fistulifera* seeds may not be as efficient in deterring a primate that deals on a daily basis with the detoxification of a great amount of plant secondary compounds abundant in mature leaves (Kinzey and Norconk, 1990) such as northern muriquis do. The impact of secondary compounds on herbivores' diets is very difficult to assess (Janzen, 1978), and analyses of the chemical and nutritional properties of *Mabea fistulifera* seeds are needed to evaluate how they might interact with fruit hardness and ripeness to influence the stage at which muriquis consume them. For instance, black colobus monkeys (*Colobus satanas*) consume high levels of secondary compounds in seeds, but ignore leaves with similar concentrations of these chemicals because of the great reward in nutrients they are able to get on seeds (McKey, 1978).

Northern muriquis were also seen feeding but not destroying seeds from other plant species *(*e.g., *Aspidosperma* sp., *Cabralea canjerana*, *Carpotroche brasiliensis*, *Clusia* sp., *Copaifera langsdorffii*, *Gomidesia crocea*, *Hymenaea courbaril*, *Mucuna* sp., *Nectandra rigida*, *Ocotea* sp., *Phyllostemonodaphne geminiflora*, *Phyllostemonodaphne* sp., *Rheedia gardneriana*, *Symphonia globulifera* and *Virola oleifera)* in the southern part of the Reserve (Strier, 1991; Rímoli, 2001). For instance, northern muriquis feed heavily on fruits of *Carpotroche brasiliensis* when they are available during the driest months of the year (June-August), and the seeds are later found intact in their feces or masticated, indicating that northern muriquis can serve as both seed dispersers and predators (Strier, 1986). Although we were able to find seeds of other species as small as 2 mm in our present analyses of muriqui fecal samples, no intact seeds of *Mabea fistulifera* were found, implying that these seeds were chewed up and digested, consistent with seed predation practices observed in other primates (Gautier-Hion *et al.*, 1993). We guess that these small seeds are being completely destroyed because they are the only reward of *Mabea fistulifera* dry fruits. However, it is important to keep in mind that the low abundance of *Mabea fistulifera* seeds in northern muriqui diet could reduce the chances of finding them in the fecal samples.

Several studies have examined the hardness of foods ingested by primates relative to their morphological and behavioral adaptations (Kinzey and Norconk, 1990, 1993; Peres, 1993; Norconk *et al.*, 1997; Lambert *et al.*, 2004), but few have evaluated fruit hardness relative to the nutritional content and palatability of other foods available at the times of year during which seeds are predated (Kinzey and Norconk, 1993; Norconk and Conklin-Brittain, 2004). More studies of this type are needed to help us better understand the relationship between primate food choices and the characteristics of the fruits that they eat.

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SHORT ARTICLES

HABITAT CHARACTERIZATION AND POPULATION DENSITY OF BROWN SPIDER MONKEYS (*ATELES HYBRIDUS*) IN MAGDALENA VALLEY, COLOMBIA

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Johanna Torres-Neira
Pablo R. Stevenson

Introduction

The spider monkey *Ateles hybridus,* one of the most threatened primate species in the Neotropics is restricted to Colombia and Venezuela (Defler, 2004). There are two sub-species present in Colombia: *A. hybridus hybridus* and *A. hybridus brunneus* (Froehlich *et al.*, 1991 in Defler, 2004). The geographical range of the species includes the northwest region of the country, along the Magdalena River from the southern region of La Guajira to the northeast of the department of Boyacá (Defler, 2004). Populations of *Ateles hybridus* still exist in several Colombian departments (Magdalena, Cesár, Norte de Santander, Arauca, Santander, Bolívar, Antioquia and Caldas). Due to its limited distribution range, high hunting pressure, low birth rates and the accelerated transformation of its habitat, the species is now considered Critically Endangered (CR A3cd) and faces the highest risk of extinction in Colombia (Pinzón, 1998; IUCN, 2008; Defler and Rodriguez, 2003). Few conservation actions have focused on *A. hybridus* subspecies. In the 1970's, there was an initiative to create a protected area at the Serranía San Lucas, where *A. hybridus brunneus* occurs, but the plan has not been realized (Defler, 2004).

Studies and conservation programs for *Ateles hybridus* in Colombia are scarce (Defler, 2004). There are two published studies that include general ecological information on the populations in the state of Bolivar (Bernstein *et al.*, 1976; Green, 1978). Additionally, there are reports of the species from Venezuela (Mondolfi and Eisenberg, 1979 in Defler, 2004). However, there is much less information available for *A. hybridus* than for other spider monkey species (Defler, 2004). The main aims of the present study were to estimate the population density of brown spider monkeys (*Ateles hybridus hybridus*) at El Paujil Bird Reserve, Magdalena Valley (Colombia) and to compare the abundance of the monkeys across forests with different characteristics in the area. According to Stevenson (2001) the abundance of primate communities inside protected Neotropical forests is positively related to fruit production. For this reason we predicted higher population densities for forests with abundant fruit production. In addition, we examined the effect of different levels of logging and hunting pressure, which are known to impact the population density of large Neotropical primates (Peres and Palacios, 2007). Other projects within the study zone are being developed, focusing on the behavioral and ecological aspects of the species (A. Link pers. comm.), as well as conservation actions and educational campaigns.

Methods

The research was focused on the *A. hybridus hybridus* populations existing at El Paujil Bird Reserve (owned by Fundación ProAves) located at the Serranía de Las Quinchas in Santander and Boyacá departments (74° 11' W, 5° 56' N: 200 – 1700 m a.s.l.). The nearest weather station is located in the municipality of Otanche (74° 11′ W, 5° 40′ N: 1070 m a.s.l.), where the median temperature is 27.8°C. Precipitation is bimodal showing peaks in April-May and September-November; the total annual precipitation is 2,070 mm. Relative humidity ranges from 85% to 89% (Balcázar-Vargas *et al.*, 2000). Annual rainfall during 2007 was 3,285 mm (A. Link, pers. comm.)

Forest characterization

Four different forest types were studied: forest with a moderate level of selective logging (logged forest), forest on flood plains, young secondary forest (secondary forest), and forest with less logging pressure (undisturbed forest). Three of these forest types were present inside the reserve: logged forest, forest on flood plains, and secondary forest. Undisturbed forest was not found inside the reserve, but was studied on the property of Mr. Norberto Vargas, 8 km away from the reserve. The logged forest had been exploited for wood in the past, contrary to the undisturbed forest, which had been logged for fewer species and to a lesser extent. The flood plains were not very extensive, existing only at the bank of the Ermitaño River (< 50 m wide), and flooding occurred only for a few days during the rainy seasons; for this reason we did not establish vegetation plots in this forest type. To determine forest composition, we completed five 1-ha vegetation plots, taking into account the proportional area of each forest type found. In every hectare we marked and identified all trees and lianas with DBH (Diameter at Breast Height) greater or equal to 5 cm, following the methodology used in Stevenson *et al.* (2004). The identification of each plant was made with the aid of binoculars. In the cases where identification was not possible, we collected botanical samples for later identification. The vouchers were placed at the Universidad de Los Andes Herbarium (ANDES) and the National Herbarium (COL). For each 1-ha plot we calculated species richness, number of species per stem and the Fisher's diversity index.

Resource availability

Following the methodology proposed by Stevenson (2004), we carried out biweekly phenological transects to estimate fruit production of endozoochorous species. Transects were placed according to the proportion of each forest type inside the reserve. The distances covered for each forest type were: 8.9 km for logged forests, 1 km for secondary forests and 0.8 km for flood plains. We estimated the crop as the total number of fruits produced by each tree present along the transects. To decrease the variance resulting from visual estimates made by different observers, we quantified fruit crop as the mean value of log-scale categories (i.e. 1-10, 10-100, 100-1000, and so on: Janson and Chapman, 1999). To obtain the production in terms of biomass for each individual, we estimated the average weight of each species, drying and weighing a minimum of 5 fruits. The total production was estimated as the total production of all individuals in an area determined from the length and effective width of the transects, which depends on the size of the trees (Stevenson, 2004). The undisturbed forest was not included because is located far from El Paujil Bird Reserve. However, in order to make comparisons within forests, we calculated the basal area of the endozoochorous species for all plots, using only individuals with DBH greater than 10 cm. In general, the basal area of fruiting trees is positively correlated with fruit production (Chapman *et al.*, 1994; Stevenson *et al.*, 1998).

Population density of Ateles hybridus and other primates

We used linear transects to estimate the population density of all diurnal primates in each forest type. We collected information once a month, recording the species, number of individuals, and perpendicular distance to the transect. The length of the transects was 6.0 km for the undisturbed forest, 9.9 km for the logged forest, 2.1 km for the flood plains and 1.1 km for the secondary forest. Data were analyzed for each species using the King estimator (Leopold 1933):

$$d = n / 2La$$

Where n is the number of individuals observed on each transect, L is the length of the transect, and a is the average perpendicular distance of the individuals to the trail. To determine differences in *A. hybridus* density between forests we performed a Kruskal-Wallis non-parametric test using Statistix 8.0.

Results

Forest type characterization

The diversity indexes calculated for each vegetation plot are shown in Table 1. We observed that the diversity indexes calculated for undisturbed forest were very similar to indexes calculated for the logged forest, while the diversity indexes for the secondary forest were notably lower than for the other forests.

Resource availability

We found relatively low production for the flood plains (38 kg/ha ± 2.3SD) and secondary forest (286 kg/ha ± 12.3 SD), while the logged forests showed higher production (501 kg/ha ± 9.4SD). The production in the flood plains was relatively constant through the sampling period, showing variation between the biweekly periods every month (Fig. 1a). Fruit production in the secondary forest showed a peak in April caused by the fructification of a single individual of *Inga alba*, a non-characteristic species of this forest type (Fig. 1b). For the logged forest, production showed a fructification peak during April-June, which matches with the first rainy season at the study site (Fig. 1c). We found significant differences of resource availability among forest types according to the disturbance level. The comparison based on the basal area of endozoochorous species (Table 1) suggests that fruit productivity should be higher in the undisturbed forest than in the logged forest, because it holds a higher basal area of endozoochorous species.

Population density of Ateles hybridus and other primates

We did not observe *Ateles hybridus* in secondary forest or in flood plains during the study (Table 2). In contrast, we found a high density of spider monkeys in the undisturbed and logged forests. Density was similar between these two types of forests (n= 24, F= 0.08, p= 0.77). A similar situation was found for *Alouatta seniculus*; the highest density of howlers were in the logged forest, and they were also present in the undisturbed forest, but not in the other forests. On the other hand, the highest density of *Cebus albifrons* was in the secondary forest, where there no other primate species were observed.

Discussion

We found differences among forest types in diversity, fruit production and basal area of endozoochorous species, which are associated with structural and floristic composition (Aldana *et al.* in prep.). According to our predictions, the forest types with high fruit production showed the highest population densities of *Ateles hybridus*. How-

Table 1. Diversity indices and basal area of endozoochorous plant species from each 1-ha vegetation plot in 3 different forest types at the study area (values in parenthesis correspond to plants > or = 10 cm DBH).

Forest type	No. Species	No. Individuals	Spp/Stem	Fisher´s Alpha	Basal Area Endozoochorous (m^2)
Secondary	45 (20)	471 (83)	0.096 (0.241)	12.3 (8.4)	1.1
Logged	225 (148)	1070 (499)	0.210 (0.297)	86.8 (71.3)	21.0
	194 (141)	1000 (544)	0.194 (0.259)	71.8 (61.8)	19.7
Undisturbed	243 (169)	1048 (527)	0.232 (0.321)	99.2 (86.1)	30.7
	213 (155)	924 (446)	0.231 (0.348)	86.9 (84.3)	36.3

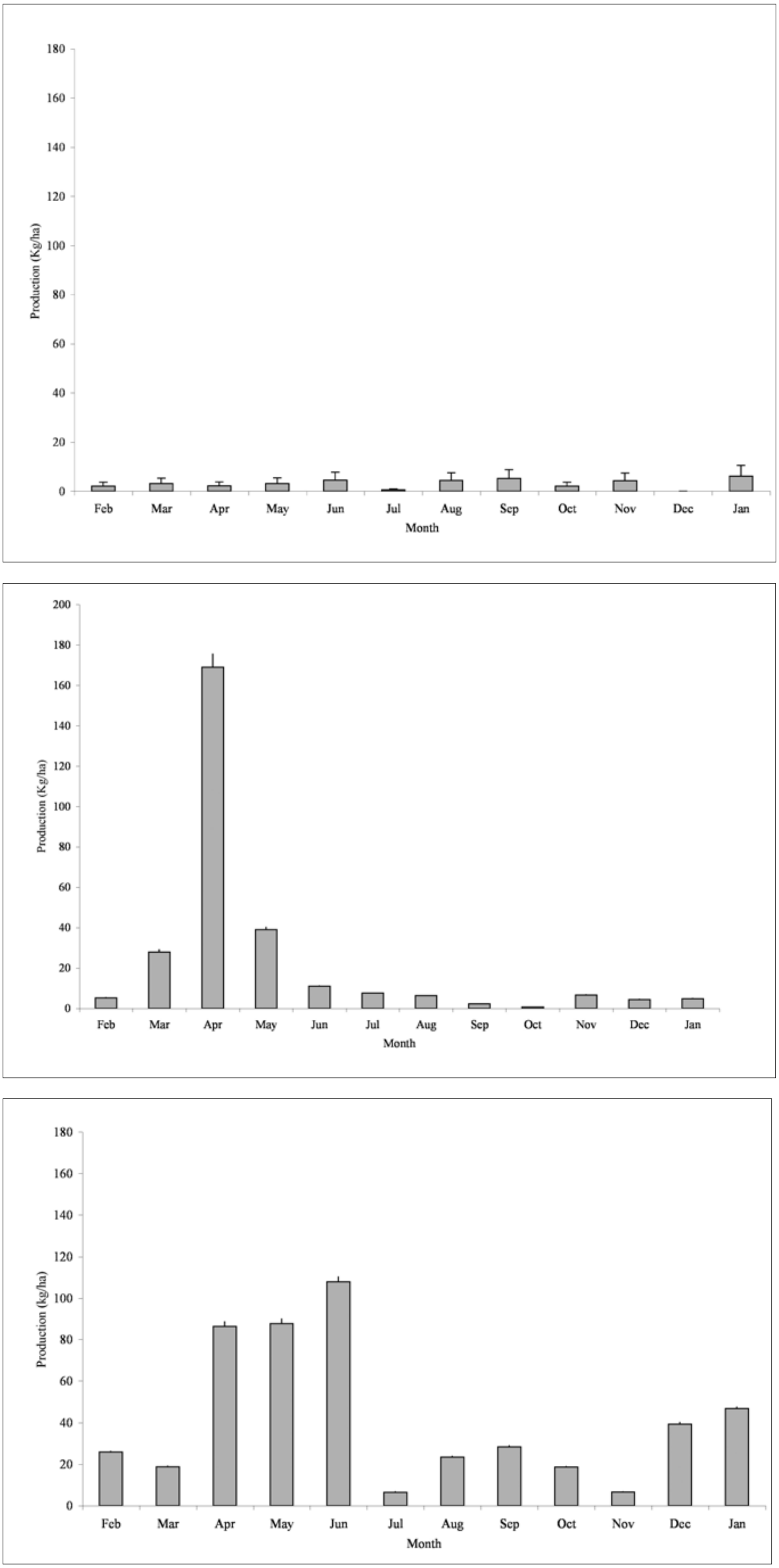

Figure 1. Monthly production (kg/ha) of endozoochorous fruits within different forest types found at El Paujíl Bird Reserve, for the period of time sampled: February 2006 – January 2007. a) Production in the secondary forest. b) Production in the flood plains. c) Production in the logged forest.

Table 2. Density of *A. hybridus* and other diurnal primate species in different forest types at El Paujíl Bird Reserve and nearby forests. n/a = non/applicable in the cases where the observations were zero for all months and the standard deviation could not be calculated.

Forest type	Species	Ind/km^2	Stand. Dev.
Undisturbed	***Ateles hybridus***	**29**	25
	Alouatta seniculus	3	9
	Cebus albifrons	34	65
Logged	***Ateles hybridus***	**38**	43
	Alouatta seniculus	10	11
	Cebus albifrons	83	114
Secondary	***Ateles hybridus***	**0**	n/a
	Alouatta seniculus	0	n/a
	Cebus albifrons	136	278
Flood plains	***Ateles hybridus***	**0**	n/a
	Alouatta seniculus	0	n/a
	Cebus albifrons	7	23

ever, there was little difference between density estimates in the logged and undisturbed forest. This unexpected result may be caused by several factors. It is possible that natural resources exploitation, in particular hunting pressure, could have had a high impact. The logged forest is located inside El Paujil reserve and currently provides protection to the primates and their habitat. In contrast, the undisturbed forest is outside the reserve, where human activities are not controlled and, besides the difficulty to access the area, there is no particular protection for the primates. Occasionally, during our fieldwork, we detected hunting sites in the undisturbed forest; hunting may reduce the population density, as well as the probability of detection and the foraging preference in the zone. Another possible explanation is that the logged forest is fragmented, with reduced forest area available, so the high density in the reserve may be explained by the effect of population concentration. Although it is difficult for these primates to move between fragments, there are some observations of individuals crossing between two fragments using the highest trees above roads (A. Link, pers. comm.). Furthermore, the group found on this fragment has approximately 24 individuals with 4 females carrying infants (A. Link, pers. com.); this indicates that the population contains a high proportion of young individuals, characteristic of growing populations, and suggests that the conditions in which these primates are found are adequate to sustain the population over the short term. In a preliminary evaluation of the *Ateles hybridus* diet at El Paujil, Diaz-Cubillos (2007) found that the group uses the fragment of logged forest, preferring areas with high canopy and high plant diversity. This explains why we did not find these primates inside the secondary forest or the flood plains, since these areas have lower canopy and are not very productive or diverse.

Conclusions and recommendations

Even though the undisturbed forest offers a higher quantity and diversity of endozoochorous plant species, the *Ateles hybridus* groups of the study area at the Serranía de Las Quinchas have similarly high population densities in undisturbed forests and logged forests, because the later are protected from hunting activities. In areas with past total deforestation, such as the secondary forests, we did not find *A. hybridus* groups. This suggests that, in contrast to selective logging, clear-cutting forests has long term negative consequences for this species. This study indicates that logged forest fragments in El Paujil Bird Reserve are still in adequate condition to carry healthy populations of primate species such as *A. hybridus, A. seniculus,* and *C. albifrons*. Accordingly, the results of this study suggest that a population of *A. hybridus* requires relative mature forest with high canopy levels. We recommend the expansion of the protected areas where the species can still be found in order to decrease fragmentation, increase connectivity within fragments, and assure a minimum area where the *A. hybridus* populations could have enough space to sustain healthy populations. We also recommend continued improvement and implementation of educational activities with children, and the development of activities with adults to raise awareness at all levels in the local communities. Aims should include the reduction of hunting activities outside of protected areas to guarantee the conservation of the species in the region.

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PRIMATAS DA RPPN GARGAÚ, PARAÍBA, BRASIL

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Introdução

A comunidade de primatas da Floresta Atlântica, um *hotspot* para a conservação biológica (Myers *et al.*, 2000), é composta por pelo menos 21 táxons e, em certas regiões, até seis espécies podem conviver de forma simpátrica. Contudo, este bioma já perdeu mais de 93% de sua cobertura florestal original (Fundação SOS Mata Atlântica e INPE, 2002). Na área compreendida pela Zona da Mata dos estados de Alagoas, Pernambuco, Paraíba e Rio Grande do Norte, a biorregião Pernambucana (Galindo-Leal e Câmara, 2005) ou Centro de Endemismo Pernambuco (Silva e Casteleti, 2005), os remanescentes florestais não chegam a 5% de sua extensão original, pulverizados em uma matriz de canaviais (Coimbra-Filho e Câmara, 1996; Silva e Casteleti, 2005).

Nesta paisagem altamente fragmentada do Centro de Endemismo Pernambuco são encontradas três espécies de primatas, o sagui-de-tufos-brancos *Callithrix jacchus* (Linnaeus, 1758), o guariba-de-mãos-ruivas *Alouatta belzebul* (Linnaeus, 1766) e o macaco-prego-galego *Cebus flavius* (Schreber, 1774). *Callithrix jacchus* é uma espécie relativamente comum, ocorrendo também na região da Caatinga. Apesar de *A. belzebul* apresentar uma população disjunta na Amazônia oriental em razoável estado de conservação, a situação de suas populações remanescentes na Floresta Atlântica nordestina é crítica (Oliveira e Oliveira, 1993). *Cebus flavius* foi redescoberto em 2006 como táxon válido (Oliveira e Langguth, 2006). Segundo estes autores, a espécie ocorreria na Floresta Atlântica nordestina ao norte do rio São Francisco. Estudos em andamento apontam que as populações atuais de *C. flavius* na natureza não ultrapassam duas dezenas (Ferreira *et al.*, 2007), o que sugere uma situação de altíssima vulnerabilidade. A espécie já é listada como Criticamente Ameaçada pela IUCN (2008).

O processo de fragmentação florestal pode afetar a viabilidade de populações selvagens de diversos modos, tais como o incremento da endogamia e a consequente susceptibilidade a doenças (Frankham *et al.*, 2002). Por sua vez, os primatas podem responder à fragmentação alterando seu padrão de atividades, sua dieta e sua área de uso entre outros (Marsh, 2003). Populações remanescentes de primatas mais generalistas, como algumas espécies de *Alouatta*, *Cebus* e *Callithrix* (Crockett, 1998; Chiarello, 2003), são capazes de suportar o efeito de borda e se deslocar e/ou se alimentar de recursos do entorno dos fragmentos (pastagens e plantios, por exemplo). Assim, estas populações têm maiores probabilidades de sobreviver ao processo de fragmentação e isolamento e podem dispersar e colonizar outros fragmentos. Esta flexibilidade adaptativa, no entanto, não representa uma garantia de sobrevivência (Marsh, 2003). Perturbações antrópicas, como a caça e o corte seletivo, e fatores estocásticos podem diminuir a probabilidade de sobrevivência das populações (Cowlishaw e Dunbar, 2000; Chiarello, 2003; Vieira *et al*., 2003). Neste estudo são apresentadas estimativas de abundância para as três espécies de primatas ocorrentes em um dos maiores fragmentos florestais da Floresta Atlântica paraibana.

Métodos

Área de estudo

O estudo foi realizado em um fragmento de Floresta Estacional Semidecidual no município de Santa Rita, Paraíba, a Reserva Particular do Patrimônio Natural - RPPN Gargaú (34°57'25"O, 7°00'44"S). A RPPN, também conhecida como Mata Santana, é de propriedade da Japungu Agroindustrial S/A. O fragmento encontra-se incluso na Reserva da Biosfera da Mata Atlântica e nas Áreas Prioritárias para Conservação da Biodiversidade, na categoria "Extrema Importância Biológica" (Mata Santa Rita/Sapé). Ao mesmo tempo, situa-se em área de Alta Pressão Antrópica, de acordo com a "Avaliação e Ações Prioritárias para a Conservação da Biodiversidade da Mata Atlântica e Campos Sulinos" (MMA, 2000). Praticamente ao nível do mar (<80 m), a região apresenta clima quente e úmido (tipo As conforme Köppen), com temperatura média anual próxima a 25°C (Lima e Heckendorff, 1985). De acordo com análise do Laboratório de Controle da Usina Japungu, as maiores médias obtidas do ano são registradas nos meses de março a julho, atingindo 279 mm em junho, enquanto o período de menor índice pluviométrico é registrado entre outubro e janeiro, sendo outubro o mês com menor índice (média= 30 mm). O fragmento florestal estudado possui uma área de 14.36 km^2 coberta com floresta em diferentes estágios sucessionais entremeada por áreas alagadas e abertas. O levantamento foi realizado em uma área com cerca de 9 km^2 (Fig. 1). O entorno do fragmento é ocupado por canaviais.

Transecções Lineares

Para estimar as abundâncias das três espécies de primatas foi utilizado o método de Transecções Lineares (Peres, 1999; Buckland *et al*., 2001; González-Sólis e Guix., 2002; Cullen e Rudran, 2003), com auxílio do programa DISTANCE 5.0 (Thomas *et al*., 2003). Para cada espécie foi selecionada a função que apresentou o menor valor de AIC (Critério de Informação de Akaike). A abundância foi estimada pelo cálculo de taxas de encontro, dada pela razão do número de encontros de grupos por 10 km percorridos. Entre dezembro de 2006 e junho de 2007 foram percorridos 250 km, distribuídos em quatro transecções (trilhas) pré-existentes (transecções 1, 2, 3 e 4 com 2.8, 3.4, 4.5 e 4.5 km, respectivamente; total= 15.2 km). As transecções foram percorridas a uma velocidade constante de cerca de 1.5 km/hora com o auxilio de um mateiro, o qual permanecia a uma distância mínima de 20 m do pesquisador. O período de coleta de dados se estendeu das 07:00 às 10:30 e das 14:00 às 17:30. Em cada encontro/avistamento foi registrada a espécie observada, o número de indivíduos no grupo e caracterizado o estágio sucessional da floresta em madura ou em regeneração com base na abertura e altura do dossel e na densidade do sub-bosque. A mensuração da distância perpendicular de avistamento foi realizada com auxílio de um telímetro (*rangefinder*70).

Resultados

Foram registrados 56 avistamentos de primatas na RPPN Gargaú (Tab. 1). A transecção 2 foi a única na qual as três espécies foram observadas e a única com visualização de *A. belzebul*. Por outro lado, apenas *C. jacchus* foi avistado na transecção 3 (Fig. 1). *Callitrix jacchus* foi a espécie mais avistada (62% dos avistamentos), com uma taxa de encontro de 10.5 indivíduos/10 km. A estimativa de densidade calculada foi de 0.095 grupos/ha ou 9.5 grupos/km^2 (*Hazard/Polynomial*). Dois terços dos avistamentos de *C. jacchus* ocorreram em sítios com floresta em regeneração. *Cebus flavius* foi responsável por 20% dos avistamentos. Vocalizações da espécie foram ouvidas em outras quatro oportunidades, mas sem se obter contato visual com os animais. Para *C. flavius* se obteve uma taxa de encontro de

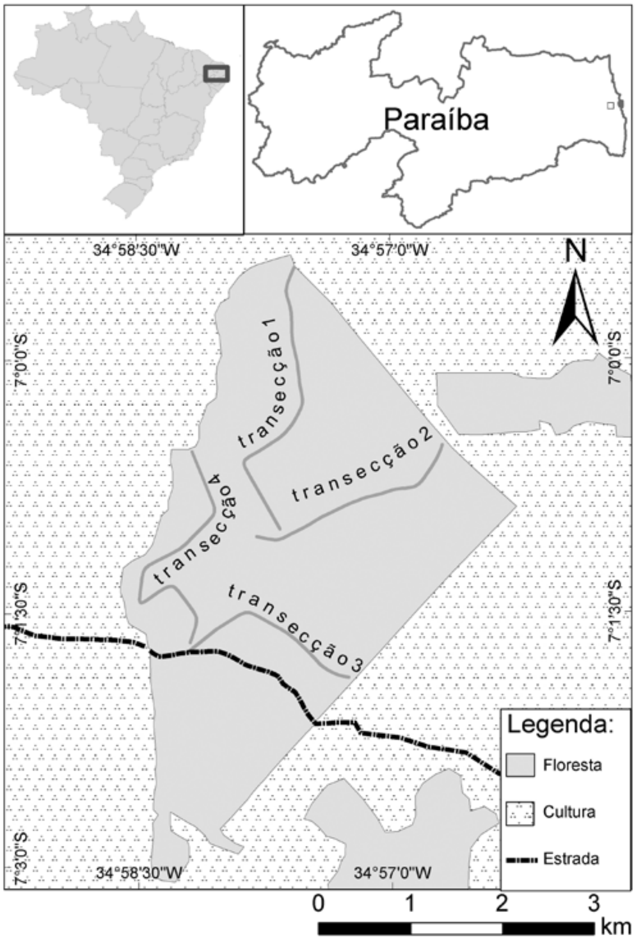

Figura 1. Localização da RPPN Gargaú, Santa Rita, Estado da Paraíba, Brasil, e das transecções percorridas.

3.8 indivíduos/10 km e uma densidade estimada em 0.02 grupos/ha (*Hazard/Cosine*). A maioria dos avistamentos de *C. flavius* (85%) ocorreu em sítios com floresta madura. Todavia, grupos foram avistados no entorno da floresta, forrageando em plantações de cana–de-açúcar. A multiplicação da densidade de grupos (±IC) pela área do fragmento (9 km^2) e pelo tamanho médio dos grupos fornece uma estimativa populacional grosseira de 530 (340 – 831) indivíduos de *C. jacchus* e 131 (66 – 289) indivíduos de *C. flavius* para a RPPN Gargaú. *Alouatta belzebul* foi avistado apenas duas vezes, sendo um grupo com quatro indivíduos em local com floresta madura e outro com oito indivíduos em floresta regenerante. Em outras seis ocasiões foram ouvidas vocalizações. Outros mamíferos observados no fragmento incluem *Dasypus novemcinctus*, *Bradypus variegatus*, *Cerdocyon thous*, *Procyon cancrivorus, Sciurus aestuans, Coendou prehensilis, Hydrochaeris hydrochaeris* e *Dasyprocta prymnolopha*. *Euphractus sexcinctus*, *Cabassous unicinctus, Cyclopes didactylus, Tamandua tetradactyla* e *Nasua nasua* tiveram sua presença relatada por trabalhadores ou moradores do entorno, mas não foram avistados durante este estudo.

Discussão

Das três espécies de primatas presentes, apenas *A. belzebul* apresentou um valor de abundância baixo quando comparado aos obtidos em fragmentos de área similar ao longo da Floresta Atlântica (Cullen *et al.*, 2000; Buss, 2001; São Bernardo, 2004; Gaspar, 2005). A baixa taxa de encontro e a pequena frequência de vocalizações de *A. belzebul* sugerem que sua população remanescente na área seja composta por apenas alguns indivíduos. A abundância de *C. jacchus* na RPPN Gargaú é alta quando comparada com as densidades ou taxas de encontro observadas para a espécie na Caatinga (Moura, 2007) e para *Callithrix* spp. na Floresta Atlântica (*C. aurita*: São Bernardo e Galetti, 2004; Martins, 2005; *C. geoffroyi*: Chiarello, 2000), mas se assemelha ao encontrado por Mendes Pontes *et al.* (2005) na Floresta Atlântica de Pernambuco. Estudos têm sugerido que espécies mais gomívoras, como *C. jacchus* e *C. penicillata*, apresentam áreas de vida pequenas quando comparadas com espécies mais frugívoras, como *C. kuhli* e *C. aurita* (Muskin, 1984; Stevenson e Rylands, 1988; Faria, 1989; Castro, 2003), o que explicaria estas diferenças de estimativa populacional.

Os resultados obtidos para *C. flavius* na RPPN Gargaú se assemelham aos observados para *Cebus* spp. na Floresta Atlântica (Pinto *et al.*, 1993, Chiarello, 2000; Cullen *et al.* 2000; González-Solís *et al.*, 2001; São Bernardo e Galetti, 2004; Martins, 2005). Considerando a raridade de *C. flavius* na Paraíba e o fato do sítio de estudo ser um dos maiores remanescentes de Floresta Atlântica no estado (Ferreira *et al.*, 2007), é possível que esta seja uma das maiores populações de *C. flavius* em toda sua área de distribuição. Contudo, esta estimativa populacional é muito inferior ao que seria esperado para uma população mínima viável com alta probabilidade de sobrevivência a longo prazo (Franklin, 1980; Shaffer, 1981). Estes resultados confirmam a necessidade urgente de ações de manejo em nível populacional e de paisagem para garantir a conservação desta espécie criticamente ameaçada.

Agradecimentos

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Tabela 1. Primatas avistados na RPPN Gargaú, Santa Rita, PB, e suas estimativas de abundância.

Espécie	N avistamentos	Tamanho médio de grupo ± dp	Taxa de encontro (grupos/10 km)	Densidade estimada (grupos/km^2; IC 95%)
Callithrix jacchus	41	6.2 ± 3.5	1.6	9.5 (6.1 – 14.9)
Cebus flavius	13	7.3 ± 2.3	0.5	2.0 (1.0 – 4.4)
Alouatta belzebul	2	6	0.08	-

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DISTRIBUIÇÃO E VARIAÇÃO NA PELAGEM DE *CALLICEBUS COIMBRAI* (PRIMATES, PITHECIIDAE) NOS ESTADOS DE SERGIPE E BAHIA, BRASIL

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Introdução

Callicebus coimbrai (guigó) foi descrito por Kobayashi e Langguth em 1999 com base em exemplares coletados na zona da mata de Sergipe. Os mesmos autores sugeriram que a área de distribuição geográfica da espécie se restringia à região litorânea do Estado de Sergipe e norte do Estado da Bahia e apontaram a necessidade de mais estudos para uma melhor definição da distribuição geográfica e dos hábitats ocupados por *C. coimbrai*. Desde então, mais informações foram acrescentadas ao trabalho de Kobayashi e Langguth (1999), principalmente em relação a novas áreas de ocorrência e ao estado de conservação da espécie (Sousa, 2000, 2003; van Roosmalen *et al.*, 2002, Printes, 2005, Jerusalinsky *et al.*, 2006). Printes (2005) registrou *C. coimbrai* no município de Lamarão do Passé, Bahia, e ampliou o limite sul de sua distribuição geográfica até o Recôncavo Baiano. Apesar do grande potencial de ocorrência em fragmentos florestais ao longo do litoral norte da Bahia, o levantamento de informações subseqüente e o maior volume de dados provem, principalmente, do Estado de Sergipe (Jerusalinsky *et al.*, 2006).

Callicebus coimbrai é listada como "Criticamente Em Perigo" (Brasil, MMA, 2003; IUCN, 2007) devido, principalmente, à perda e fragmentação de seu hábitat e ao reduzido tamanho de suas populações em sua restrita área de distribuição. As iniciativas de proteção da espécie ainda são incipientes e suas populações encontram-se isoladas e vulneráveis à ação de caçadores. Para reverter o quadro atual, Unidades de Conservação (UCs) privadas e públicas vêm sendo propostas e criadas (por exemplo, o Refúgio de Vida Silvestre Mata do Junco, criado pelo Decreto Estadual n^0 24.944 de 26/12/2007 e as Reservas Particulares do Patrimônio Natural (RPPNs) Bomfim da Cachoeira e Castelo, no Estado de Sergipe). Neste trabalho registramos novas áreas de ocorrência de *C. coimbrai* nos Estados da Bahia e Sergipe, fornecemos subsídios para a avaliação do seu estado de conservação e descrevemos variações de coloração da pelagem ao longo de sua distribuição.

Métodos

Doze fragmentos florestais em Sergipe e no norte da Bahia com áreas variando de 300 a 3,000 ha foram selecionados a partir de consultas a mapas de vegetação da SUDENE (escala 1:100,000) de 1974 e imagens TM/Landsat de 2000. Estes fragmentos foram visitados mensalmente a partir de janeiro de 2002 para determinar a ocorrência de *C. coimbrai*. Além desses maiores remanescentes florestais, cerca de 160 pequenos fragmentos de mata foram visitados, a maior parte após indicação obtida em entrevistas esporádicas com moradores da região que relatavam a presença dos guigós naquelas pequenas áreas. A presença da espécie foi investigada percorrendo-se transectos com comprimento médio de 1,500 m no sentido da borda para o interior da mata, e utilizando-se a reprodução de vocalizações (*playback*) da espécie. Em cada registro visual eram anotados o número de indivíduos, seu comportamento e padrão de coloração da pelagem, a estrutura e características da vegetação na qual os animais se encontravam e as coordenadas geográficas do local.

Resultados e Discussão

Distribuição

Registros visuais e auditivos foram obtidos em 70 fragmentos (31 em Sergipe e 39 no Estado da Bahia; Tabela 1). *Callicebus coimbrai* foi observado em fragmentos de floresta relativamente bem conservada e em áreas bastante alteradas de floresta ombrófila, floresta estacional semidecídua e caatinga. Constatamos pouca seletividade de hábitat por parte da espécie.

Kobayashi e Langguth (1999) indicaram que *C. coimbrai* estava restrita às florestas atlânticas costeiras compreendidas entre o rio São Francisco e o rio Itapicuru e que ocupavam os estratos mais baixos do dossel das florestas (Kinzey, 1981). A espécie foi registrada nas matas úmidas litorâneas desde o rio São Francisco no município de Japoatã (36°38’O, 10°23’S), Sergipe, até o rio Paraguaçu no município de São Francisco de Paraguaçu (12°39’S, 38°49’O), Bahia, e nas florestas decíduas do semi-árido até o município de Jeremoabo (10°00’S, 38°27’O), Bahia (Fig. 1). A ocorrência de *C. coimbrai* na caatinga pode estar relacionada à distribuição geográfica original da espécie, expandida em décadas remotas quando as florestas úmidas e estacionais conectavam-se com as matas secas do interior, e antes dos desmatamentos que descaracterizaram a vegetação original e permitiram a expansão e predominância de elementos vegetais xeromórficos no semi-árido nos dias atuais (Coimbra-Filho e Câmara, 1996). Embora os estudos sobre a distribuição geográfica de *C. coimbrai* não estejam concluídos (as áreas a oeste da BR101 na Bahia ainda não foram visitadas), a ampliação de sua área de ocorrência representa um passo importante para a compreensão dos processos que determinaram o padrão de distribuição atual da espécie.

Tabela 1. Registros de *Callicebus coimbrai* nos Estados de Sergipe e Bahia.

Localidade	Hábitat[1]	Área (ha)	Estado[2]	Coordenadas		Referência[3]
1-Assentamento Rainha dos Anjos	FO	180	BA	12°23'S	38°28’O	PE
2-Projeto Subaumirim	FO	260	BA	12°06'S	37°53’O	PE
3-Mata Povoado Jangada	FO	60	BA	12°05'S	37°58’O	PE
4-Cachoeira II	FO	222	BA	12°21'S	37°55’O	PE
5-Lontra	FO	1774	BA	12°15'S	37°58’O	PE
6-São Jose do Aveno Bacell	FO	33	BA	12°19'S	38°08’O	PE
7-Fazenda Coqueiro das Águas	FO	110	BA	12°33'S	38°24’O	PE
8-Fazenda Santo Antonio	FO	42	BA	12°25'S	38°21’O	PE
9-Mata dos Tauas	FO	30	BA	12°25'S	38°24’O	PE
10-Altamira I	FO/FS	380	BA	11°47'S	37°46’O	PE
11-Altamira de Evandro	FO/FS	260	BA	11°46'S	37°47’O	PE
12-Faz Gameleira	FO	770	BA	12°09'S	37°58’O	PE
13-Gameleira III	FO	550	BA	12°04'S	38°06’O	PE
14-Fazenda Santa Clara	FO	80	BA	12°26'S	38°32’O	PE
15-Miranga	FO	41	BA	12°20'S	38°14’O	PE
16-Matas de São Miguel	FO	84	BA	12°22'S	38°27’O	PE
17-Capão entrada Pedrão	FO/FS	50	BA	12°08'S	38°37’O	PE
18-Serra Pedrão	FO/FS	220	BA	12°10'S	38°36’O	PE
19-Fazenda Baixa Funda	FO	91	BA	12°18'S	38°22’O	PE
20-Boa Vista de Opalma	FO	54	BA	12°34'S	38°59’O	PE
21-Assentamento Bela Vista/Trindade	FO	220	BA	12°29'S	38°46’O	PE
22-Complexo da Serra de São Francisco	FO	3000	BA	12°39'S	38°49’O	PE
23-Pereira	FO	126	BA	12°15'S	38°18’O	PE
24-Fazenda Calembá	FS - MS	30	BA	11°21'S	28°10’O	PE
25-Reserva Ponder	FO	84	BA	11°50'S	37°58'S	PE
26-Torre Telebahia	FO	180	BA	11°38'S	37°53’O	PE
27-Fazenda Sabão	FO	300	SE	11°30'S	37°34’O	SO, JE, PE
28-Assentamento Chico Mendes	FO	50	SE	11°30'S	37°33’O	JE, PE
29-Fazenda Escôncio	FO	250	SE	11°23'S	37°35’O	JE, PE
30-Mata do Crasto	FO	900	SE	11°22'S	37°25’O	SO, JE, PE
31-Mata de Edvaldo Vereador	FO	45	BA	12°25'S	38°23’O	PE
32-Muritiba	FO	33	BA	12°25'S	38°22’O	PE
33-Mata Fome	FO	110	BA	12°23'S	38°23’O	PE
34-Posto Floresta	FO	22	BA	12°23'S	38°26’O	PE
35-Campina	FO	950	BA	12°27'S	38°24’O	PE
36-Matas de Conde	FO	100	BA	11°46'S	37°44’O	PE
37-Matas Indiaroba	FO	30	SE	11°30'S	37°34’O	PE
38-Fazenda Salobro	FS	50	SE	11°02'S	37°43’O	JE, PE

Localidade	Hábitat[1]	Área (ha)	Estado[2]	Coordenadas		Referência[3]
39-Fazenda Fortaleza	FS	20	SE	11°05'S	37°40’O	PE
40-Mata do Convento	FO	80	SE	11°28'S	37°27’O	PE
41-Mata da Jibóia	FO	50	SE	11°27'S	37°43’O	PE
42-Mata do Bugio	FS	200	SE	11°26'S	37°42’O	JE, PE
43-Mata de São Roque	FS	10	SE	11°31'S	37°41’O	PE, JE
44-Mata do Cruzeiro	FO	200	SE	11°32'S	37°41’O	KL, JE, PE
45-Mata do Pau Torto	FO	250	SE	11°23'S	37°28’O	JE, PE
46-Mata Votorantim	FO	160	SE	11°06'S	37°18’O	PE
47-Fazenda Trapsa	FO	300	SE	11°12'S	37°13’O	SO, JE, PE
48-Nova Descoberta	FO	40	SE	11°06'S	37°18’O	SO, JE, PE
49-Mata do Dira	FO	100	SE	10°53'S	37°20’O	SO, JE, PE
50-Mata do Oiteiro	FO	70	SE	10°39'S	37°02’O	SO, JE, PE
51-Mata da Aguada	FO	40	SE	10°40'S	36°55’O	SO, JE, PE
52-Mata do Junco	FO	400	SE	10°32'S	37°02’O	SO, JE, PE
53-Mata da Santana	FS/FO	300	SE	10°32'S	36°43’O	KL, SO, JE, PE
54-Mata da Aiumas	FO	60	SE	10°25'S	36°55’O	SO, JE, PE
55-Mata Cadoz	FO	50	SE	10°23'S	36°38’O	SO, JE, PE
56-Mata da Serra Preta	FS - MS	100	SE	10°29'S	37°32’O	SO, JE, PE
57-Lagoa do Carneiro	CA	6	SE	10°12'S	37°28’O	PE
58-Mata do Guia	CA	300	SE	10°14'S	37°29’O	JE, PE
59-Fazenda Venturosa	CA	60	SE	10°09'S	37°42’O	PE
60-Jandaira	FO	100	BA	11°36'S	37°36’O	PE
61-Pedro Alexandre	FS - MS	20	BA	09°58'S	37°52’O	PE
62-Fazenda Mocambo	FS	200	SE	10°49'S	38°05’O	PE
63-Mata da Bolandeira	FS	15	SE	10°40'S	36°58’O	PE
64- Mata do Castelo	FO	150	SE	$11^0$20’S	$37^0$27’O	JE, PE
65-Raso do Santo	FS	10	BA	10°29'S	38°18’O	PE
66-Fazenda Caimbé	FS - MS	60	BA	10°00'S	38°27’O	PE
67-Fazenda Amescla	FS - MS	100	BA	09°54'S	38°20’O	PE
68-Fazenda Vaca Brava	FS - MS	100	BA	10°42'S	38°13’O	PE
69-Timbó	FO	10	SE	10°55'S	37°14’O	PE
70-Fazenda Mineiro	CA	150	BA	10°03'S	38°15’O	PE

[1] FO = Floresta Ombrófila; FO/FS= Transição Floresta Ombrófila/Floresta Semidecídua; FS = Floresta Semidecídua; MS = Mata seca; CA =Caatinga.

[2] BA = Bahia; SE = Sergipe

[3] PE = Presente estudo; SO = Sousa, 2003; JE = Jerusalinsky *et al.,* 2006; KL = Kobayashi e Langguth,1999.

Ameaças e conservação

Apesar do acréscimo de informações sobre a distribuição de *C. coimbrai* e a constatação de sua presença em novas áreas com tamanhos, estado de conservação e composição florística bastante diferentes, a degradação de seu hábitat e a fragmentação de suas populações ainda são uma ameaça à espécie. Mesmo que uma parte importante de sua área de distribuição tenha sido indicada pelo Ministério de Meio Ambiente como prioritária para a conservação (Brasil, MMA, 2007), as únicas unidades de conservação de proteção integral que poderiam garantir a manutenção das populações são a Estação Ecológica do Raso da Catarina na Bahia e o Refúgio de Vida Silvestre Mata do Junco em Sergipe (Fig. 1). No entanto, no Raso da Catarina *C. coimbrai* ocorre apenas nas formações mais úmidas e em fragmentos florestais semidecíduos situados nas encostas e nos vales de pequenos morros nos municípios de Jeremoabo, Antas e Cícero Dantas, as quais estão situadas fora da estação ecológica em áreas limítrofes. Outras UCs de proteção integral em Sergipe como o Parque Nacional da Serra de Itabaiana, a Reserva Biológica de Santa Isabel e o Monumento Natural Grota do Angico não são áreas de ocorrência de *C. coimbrai.* O Refúgio de Vida Silvestre Mata do Junco, criado recentemente pelo Decreto Estadual n^0 24,944 de 26/12/2007, foi estabelecido para assegurar a proteção de *C. coimbrai.* No entanto, caso não sejam adotadas ações de manejo para a conservação da espécie, a área pode não garantir a sobrevivência dos guigós a longo prazo, tendo em vista tratar-se de um fragmento com 400 ha isolado em uma matriz de pastagens e cana-de-açúcar, sem conexão com outras áreas florestadas. Na região litorânea não existe nenhuma UC municipal, estadual ou federal que assegure a proteção das populações de *C. coimbrai* nos dois estados. Tanto a Área de Proteção Ambiental (APA) do Litoral Sul de Sergipe quanto a APA do Litoral Norte da Bahia - únicas unidades de conservação existentes ao longo da área de distribuição da espécie na Mata Atlântica - são ineficientes para a proteção da espécie. Apesar das APAs terem como objetivos básicos proteger a diversidade biológica, disciplinar o processo de ocupação humana na área e assegurar a sustentabilidade do uso dos recursos naturais, este tipo de UC permite a ocupação humana (SNUC, 2000). Durante as pesquisas de campo obtivemos evidências de desmatamentos, queimadas, corte seletivo e caça nos fragmentos florestais, inclusive nas APAs dos dois estados (Figs. 2 e 3).

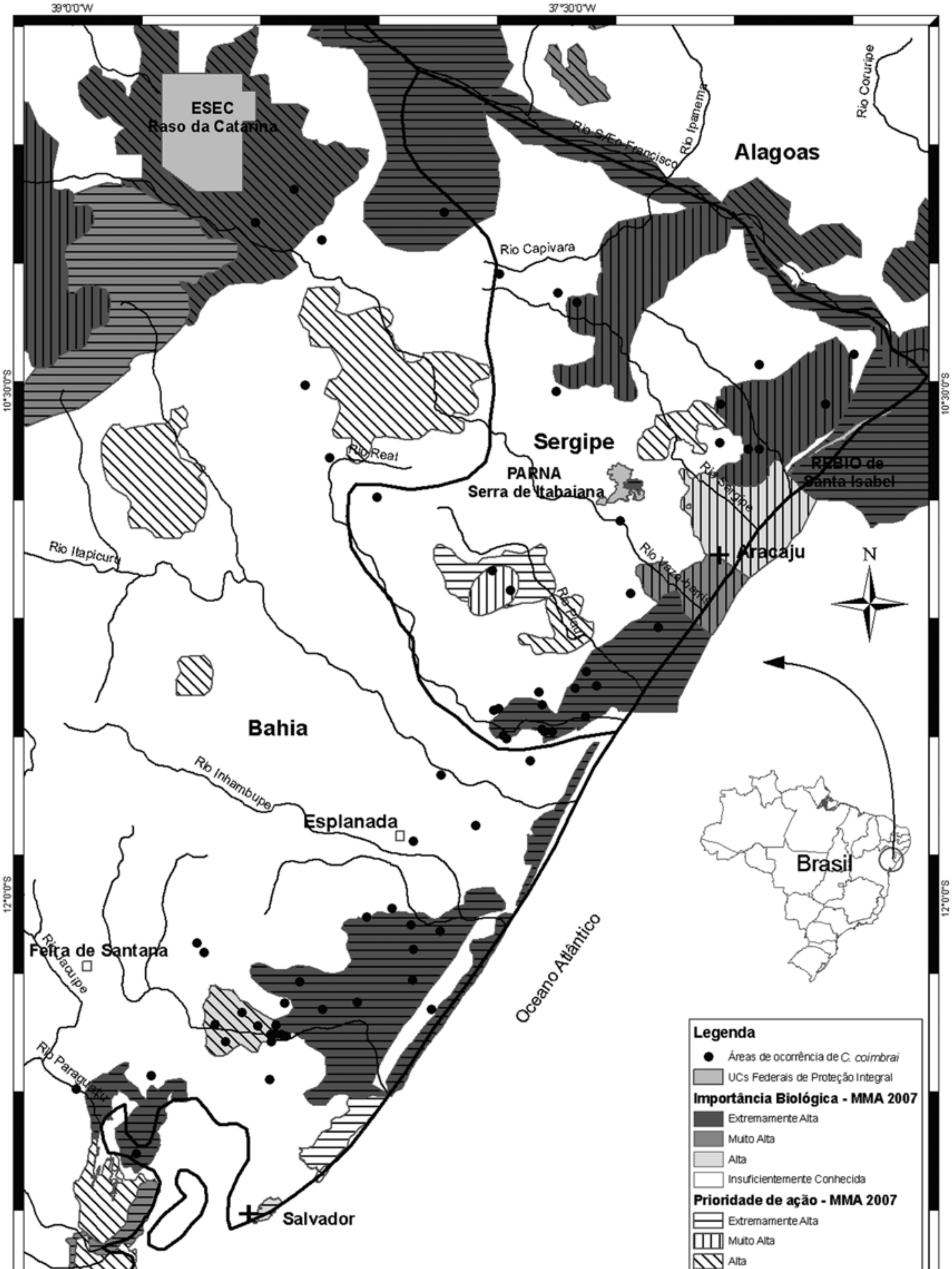

Figura 1. Ocorrência de *Callicebus coimbrai* em Sergipe e norte da Bahia.

As ações de fiscalização dos órgãos municipais, estaduais e federais de proteção ao meio ambiente (Instituto Brasileiro do Meio Ambiente - IBAMA, Secretaria de Meio Ambiente e Recursos Hídricos - SEMARH, Administração Estadual do Meio Ambiente - ADEMA) nos dois estados ainda são incipientes e incapazes de conter o processo de destruição das matas, e boa parte da população humana é indiferente às questões relacionadas com a conservação dos remanescentes florestais. Atualmente, ações isoladas vêm contribuindo para a proteção de algumas áreas de mata e iniciativas voluntárias de associações de moradores têm mobilizado comunidades e alguns fazendeiros. Entretanto, essas ações ainda carecem de apoio, incentivo e, no caso dos proprietários rurais, de orientação para que oficializem a proteção de seus fragmentos florestais através da criação de Reservas Particulares do Patrimônio Natural (RPPNs). As RPPNs são atualmente as UCs que oferecem a melhor condição de proteção à espécie, cinco delas estão situadas na Bahia - Lontra (município de Entre Rios), Panema (município de Mata de São João), Peninha e São Joaquim da Cabonha (município de Cachoeira), Cajueiro (município de Esplanada), e duas recém criadas no Sergipe - Bomfim da Cachoeira e Castelo (ambas no município de Santa Luzia do Itanhy). Esse conjunto de RPPNs cobre uma área de cerca de 3,000 ha.

Figura 2. Desmatamento de fragmento de Mata Atlântica (Município de Santa Luzia do Itanhy-SE).

Figura 3. Evidência de caça (pele e crânio, à direita, com marcas de tiro de arma de fogo). Recolhidos no município de Carmópolis-SE.

As RPPNs são unidades de conservação privadas criadas por iniciativa voluntária do proprietário e poderão ser um dos principais instrumentos para a proteção do guigó e de outras espécies ameaçadas que ainda vivem nas matas degradadas, ilhadas e empobrecidas, através da implantação de programas de restauração dos fragmentos e do manejo de metapopulações. A reversão desse quadro será possível se ações de educação ambiental e campanhas de conscientização caminharem lado a lado com programas de pesquisa e de proteção efetiva dos fragmentos. Importante e imprescindível também é a ampliação e fortalecimento das ações de conservação voltadas aos maiores blocos florestais do sul de Sergipe (Mata do Crasto e Fazenda Sabão) e ao longo do recôncavo e litoral norte da Bahia. Na Bahia, o conjunto de remanescentes florestais ao longo da serra do São Francisco do Paraguaçu (municípios de Santo Amaro, Cachoeira e Saubara), serra do Timbó (municípios de Pojuca e São Sebastião do Passé) e ao redor da RPPN Lontra (municípios de Entre Rios e Itanagra) abrigam as maiores áreas florestais entre os rios Paraguçu (BA) e São Francisco (SE) ao longo da área de distribuição de *C. coimbrai*. Essas áreas são, até o momento, as mais importantes para garantir populações viáveis não só de *C. coimbrai*, mas também de outros representantes da fauna ameaçados que ainda subsistem no norte do Estado da Bahia, como o macaco-prego-do-peito-amarelo (*Cebus xanthosternos*), o ouriço-preto (*Chaetomis subspinosus*), a preguiça-de-coleira (*Bradypus torquatus*), a jaguatirica (*Leopardus pardalis*), e os pássaros olho-de-fogo-rendado (*Pyriglena atra*), papa-formigas (*Herpsilochmus pectoralis*), choquinha-de-rabo-cintado (*Myrmotherula urosticta)* e o papagaio-chauá (*Amazona rhodocorytha*).

Variação da pelagem

As observações de *C. coimbrai* nos fragmentos florestais ao longo de sua área de distribuição e de animais em cativeiro permitiram a descrição de variações no padrão de coloração da pelagem da espécie, as quais podem ser encontradas em indivíduos de um mesmo grupo. Essas diferenças foram observadas nas populações das áreas mais secas e nas matas úmidas na região litorânea e podem ter diversas causas: alteração da estrutura de pigmentos melânicos em reação à fotoproteção, alimentação ou diferenças ontogenéticas. O primeiro padrão de coloração foi estabelecido com base no holótipo coletado e fotografado por Kobayashi e Langguth (1999) na Mata Atlântica do norte de Sergipe. É um padrão de coloração bege e ocre relativamente semelhante ao observado em indivíduos da caatinga de Sergipe, o qual, apresenta diferenças discretas nas estrias da face, e muita semelhança na coloração do corpo estriado de bege, preto e cinza e na mancha branca conspícua da região cervical, possivelmente característica de indivíduos juvenis. As principais diferenças observadas em animais nas matas secas e nas matas úmidas do litoral foram: (1) a coloração da face, bochecha e fronte totalmente negra ou com estrias beges mais ou menos evidentes; (2) a coloração laranja, marrom ou marrom-alaranjada da cauda; (3) a região cervical branca, bege ou bege-esbranquiçada; (4) o corpo bege estriado de castanho ferrugíneo, bege e ocre, bege com estrias castanhas, cinzas e pretas e bege-brancacentas. Por outro lado, a coloração negra das mãos e pés foi observada em todos os indivíduos. Portanto, consideramos a coloração da pelagem pouco confiável como caráter taxonômico, embora ela tenha sido utilizada juntamente com a morfometria do crânio e a dentição na descrição dessa espécie por Kobayashi e Langguth (1999). Além disso, a coloração da pelagem foi utilizada para distinguir *C. coimbrai* e *C. barbarabrownae*, apesar da variação no padrão de coloração dentro de uma população poder ser maior que aquela observada entre essas duas espécies do grupo *personatus*. A carência de espécimes depositados em coleções científicas compromete a resolução deste desafio taxonômico.

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OCCASIONAL FIELD OBSERVATIONS OF THE PREDATION ON MICE, DOVE AND ANTS BY BLACK-TUFTED-EAR MARMOSETS (*CALLITHRIX PENICILLATA*)

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The black-tufted-ear marmoset (*Callithrix penicillata)* mainly feeds on plant exudates which can comprise up to 70% of the diet (Miranda and Faria, 2001). Other items included in the diet are insects, nectar and flowers, in different proportions. Stevenson and Rylands (1988) classify marmosets from the *Jacchus*-group as exudativore-insectivores. It is known that marmosets opportunistically feed on protein sources i.e. prey, and that their small size allows for a quite diverse diet (Rylands and Faria, 1993). Insects are the most important source of protein, but other protein-rich food currently described for this species are ants, spiders, lizards, snails, frogs, eggs and bird hatchlings (Stevenson and Rylands, 1988; Passamani and

Rylands, 2000). In this article, we report two new food sources, that may be included in the diet of wild marmosets, albeit probably very rarely: mouse and dove. We also report the ingestion of ants, confirming an animal food item in the diet of black-tufted-marmosets mentioned in the literature. Observations on predation by marmosets were made opportunistically when researchers observed the social behavior of two marmosets groups at two different study sites. Both sites, the Estação Ciência São Jose (ECSJ) and the Jardim Botânico de Brasília (JBB), include many vegetation types of the Cerrado biome. The observations were in the *cerradão*, a typical forest with medium to high semi-deciduous trees and xeromorphic vegetation (Ratter *et al.*, 1997).

Predation on a dove (Columbina talpacoti)

The dove predation was observed in the ECSJ, a field station of the Catholic University of Goiás (16º 44' 06" S, 49º 2' 48" W; Goiânia, Brazil), close to the suburb of the city, on 15 March 2001. Around 08:00, a group of black-tufted-ear marmoset moved toward the area around the field laboratory, staying at approximately 3 m height in small trees (*Grevillea robusta*). Suddenly, the marmoset group became very agitated. We succeeded in recording with a digital camera the moment when an adult male, located approximately 2 m above ground, captured a dove (*C. talpacoti*), immediately biting it into the head and starting to eat it (Figure 1). We did not observe the prey being shared with any other group member. The marmoset showed piloerection during the voracious consumption of the dove.

Predation on a mouse (Mus musculus)

The predation on a mouse happened in an area near the entrance of JBB (15° 55' 58" S, 47° 51' 02" W; Brasilia, DF, Brazil). On 20 November 2006, at 08:30 h, we saw the reproductive female of the group capturing a mouse while foraging in the forest understory, approximately 1.5 m above ground, and immediately biting of the head of the mouse (Figure 2). Although other group members, particularly infants, approached the female with characteristic submissive vocalizations, the female did not share the prey, dropping part of the carcass (mostly skin) on the ground.

Predation on ants (Labidus sp.)

The predation of the ants happened along a forest border of the JBB. On 23 August 2006, beginning at 11:15 we observed the marmosets descending to the forest understory above and ground close to a swarm of army ants, identified as *Labidus* (Ecitoninae, Formicidae) by Dr. C. R. F Brandão (Zoology Museum, São Paulo University). The marmosets caught and quickly ingested ants and did not seem to be intimidated by the ants' bites. This continued for approximately 3.5 hours. During this period, the whole group (15 animals) accompanied the swarm front, but among them, only two male adults and two juveniles fed on the ants.

Callithrix penicillata is widely distributed throughout the Cerrado (Stevenson and Rylands, 1988), one of the world's hot spots for biodiversity conservation (Myers et al., 2000). This species, like *C. jacchus*, is found in urbanized areas and has been successfully introduced in several regions (Cunha *et al*, 2006; Mendes Pontes and Soares, 2005; Miranda and Faria, 2001; Stevenson and Rylands, 1988; Vilela and Faria, 2004). It is presumed to have a flexible and opportunistic diet. Most data available on the diet of the marmosets and tamarins is focused on fruits and exudates, making it necessary to better describe and comprehend the role of prey in the behavioral ecology of Callitrichidae (Nickle & Heymann, 1996; Heymann *et al.*,

Figure 1. Adult male of *Callithrix penicillata* eating a dove (*Columbina talpacoti*) at the Estação Ciência São Jose.

Figure 2. Adult female of *Callithrix penicillata* biting the head of a *Mus musculus* individual previously captured in the forest understory at the Jardim Botânico de Brasília.

2000). The predation of bird nests, mostly for obtaining eggs and hatchlings is well described (Marini and Melo, 1998; Mendes Pontes and Soares, 2005), but according to Stevenson and Rylands (1988), marmosets rarely feed on birds and hatchlings when in their natural habitat. The relevant literature has few reports on the predation of adult birds (Cunha *et al.*, 2006), and the predation of this species of dove in particular has not been previously described. The bird preyed upon is commonly found in urban areas in Brazil (Sick, 1997). The contact from this bird with marmoset groups is presumably common in cities and their surrounding areas. The common mouse is an invasive species of the Brazilian fauna and is closely connected to human activity. The mouse predation reported here occurred in an area with pronounced human influence, and proximity to garbage cans. Newborn mice are used to complement the diet of marmosets kept in captivity (Coimbra-Filho, *et al*, 1981). However, this is the first description of an adult mouse predation by a marmoset in a wild environment.

Our observations on predation of the ant genus *Labidus* by black-tufted-ear marmoset are in line with recent observations of Melo Jr and Zara (2007) in the Cerrados and Atlantic Forest. Rylands and collaborators (1989) and Melo Jr and Zara (2007) have already described marmosets as predators of ants and insects that are displaced by the raiding ant swarms. Mendes Pontes and Soares (2005) also mention the presence of ants in the marmoset's diet. Although there is a relatively high abundance of this ant species in the woods of the JBB, predation is not commonly observed. While foraging to attain the dove and the mouse was notably an individual behavior, the ants and insects flushed by the ants were eaten while the whole group foraged, as described previously by Passamani and Rylands (2000). The predation on the mouse and the dove, although interesting from the point of view of flexibility in feeding habits, also adds a potential epidemiological link between the several diseases that are present in the region (i.e. zoonotic hemorrhagic fevers, Figueiredo, 2006) and the managing of wild marmosets in preservation areas with strong human influence. Doves and particularly mice are important agents for the dissemination of several pathogens (Pereira *et al*, 2001; Sick, 1997) that infect both human and non-human primates.

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OBSERVATION OF BLACK-CAPPED CAPUCHINS (*CEBUS APELLA*) FEEDING ON AN OWL MONKEY (*AOTUS BRUMBACKI*) IN THE COLOMBIAN LLANOS

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Black-capped capuchins (*Cebus apella*) are known to feed on a wide variety of vertebrate prey, including lizards, frogs, birds, bats, marsupials, rodents, and squirrels (Izawa, 1978, 1990; Terborgh, 1983; Galetti, 1990; Rímoli, 2001; Resende *et al.*, 2003; Defler, 2004), although to date, there is only one report involving another primate, an infant titi, *Callicebus moloch* (Sampaio & Ferrari, 2005). Here we describe the behavior of a group of black-capped capuchins feeding on an adult female owl monkey (*Aotus brumbacki*) in a fragment of gallery forest in the Colombian Llanos. This appeared to be the scavenging of a carcass, rather than a predation event, but the observation nevertheless emphasizes the potential of the capuchins for the exploitation of prey this size.

The event was recorded during the long-term monitoring (September 2005 to January 2007) of a group of 43 squirrel monkeys, *Saimiri sciureus albigena* (Carretero-Pinzón, 2008) on the Arrayanes Farm (3°3'30"N, 73°35'40"W) near San Martín in the Colombian Llanos, department of Meta (Fig. 1). The group occupied a matrix of small fragments of gallery forest of up to 21 ha, including those on the neighboring Santa Rosa Farm, that are interconnected by fences. We collected quantitative behavioral data in scan samples (one minute scans at five minute intervals), and whenever an association was formed with the local group of *Cebus apella* [during 28.3% of monitoring time (1,113 hours of total observation time)]. We also collected data on the members of this group (1 adult male, 1 adult female, 2 juveniles, and 1 infant) using the same sampling schedule. During the event reported here we abandoned this schedule and the capuchins were monitored continuously for the first half hour and then at five-minute intervals, until the carcass was abandoned.

On the morning of January the 12th, 2006, when the squirrel monkeys and capuchins were foraging together in a mixed troop at approximately 08:35, the adult male *C. apella* apparently found a dead female owl monkey (*Aotus brumbacki*) in a tree hole. The assumption that the capuchin found the owl monkey rather than captured it alive is based on the lack of visible or audible evidence of hunting activity or prey capture. On finding the carcass, the adult male became visibly excited, and emitted feeding vocalizations, that were answered in kind by the four other group members, who then approached to a distance of 3-5 m from the tree-hole, from where they observed the male. The male pulled the owl monkey's legs out of the hole and began biting, tearing and eating the flesh of one of the legs. The male was the only individual to feed on the carcass during the first eight minutes, but then he moved to a neighboring tree to rest and looked on as the other group members moved in to feed. The adult female and the infant fed on the second leg; then one of the juveniles pulled the carcass out of the hole as far as its neck, bit off the right radius and hand, and ran to the neighboring tree to consume these parts. The four individuals each spent some 8-10 minutes feeding on different parts of the carcass. Tolerance and sharing appears to be typical of vertebrate predation in the capuchins (e.g. Perry and Rose, 1994; Resende *et al.*, 2003), at least where relatively large-bodied prey is concerned (Izawa, 1978). After approximately 20 minutes, the adult male returned to feed on the carcass in close proximity with the infant, while vocalizing aggressively towards the female, who responded submissively and moved to a neighboring tree. The infant eventually joined the female to be groomed, and one juvenile rested nearby while the other foraged for arthropods. All five group members ingested parts of the owl monkey's limbs, tail or dorsal musculature, but, while one of the juveniles probed the abdomen with its hand, none of the capuchins appeared to feed on the intestines or internal organs. Curiously, Resende *et al.* (2003) recorded the opposite pattern in the predation of a rat by *C. apella*, where the soft parts were consumed and the musculature ignored. In the pres-

Figure 1. Location of the study area, showing the main fragments of gallery forest on the Arrayanes (16 ha) and Santa Rosa (21 ha) farms in the Colombian Llanos.

ent case, the freshness of the carcass was possibly a factor – the time of death was not known, but presumably preceded the scavenging by at least a few hours. After approximately one hour of intermittent feeding and resting, the capuchins abandoned the carcass as vultures began to arrive at the scene. The remains of the owl monkey's body – the skeleton and some fragments of skin – were found at the same location two days later. The capuchins moved through this area in the interim, but they did not approach the carcass.

Capuchins are highly resourceful and opportunistic primates, able to exploit a wide variety of foods, so in this sense, the events observed here were well within the behavioral potential of the species. As it appears that the body of the owl monkey was scavenged, rather than captured alive, it still remains unclear whether capuchins would normally, if ever, prey on adult primates the size of *Aotus*, which have a body weight of approximately 1 kg. The only record of a capuchin predation of another primate involved an infant titi (Sampaio and Ferrari, 2005), and predation of terrestrial mammals by capuchins has involved either small-bodied rodents or the infants of larger-bodied species, such as coatis and opossums (Newcomer and De Farcy, 1985; Rose and Perry, 1994; Resende *et al.*, 2003; Fragaszy *et al.*, 2004). In this context, it is interesting to note that *Saimiri*, which associates systematically with *Cebus* during foraging at many sites – including the present one – is actually slightly smaller than both *Aotus* and *Callicebus*. Even so, there appear to be no reports of capuchins actively pursuing or preying on squirrel monkeys, even juveniles. In addition to other factors, in the specific case of *Saimiri*, the potential benefits of predation may be more than outweighed by those of the foraging association (Terborgh, 1983; Boinski, 1996).

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DENSIDAD POBLACIONAL Y TAMAÑO DE GRUPO DE *SAGUINUS LEUCOPUS* EN PARCHES DE BOSQUE EN EL DEPARTAMENTO DE CALDAS, COLOMBIA

Néstor Roncancio Duque
William Rojas Vinasco
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Introducción

Por motivos históricos, geográficos y ecológicos, la mayoría de la población humana en Colombia está concentrada en la región Andina y en la planicie Caribe. En consecuencia, estas regiones son las más afectadas por la transformación de los ecosistemas naturales; las cordilleras y los valles interandinos han sido altamente transformados y algunas regiones están virtualmente deforestadas (Kattan, 1998). Así el país ha perdido la tercera parte de los bosques húmedos por debajo de 1,000 msnm, 98.5% de los bosques secos y subhúmedos y 63% de los bosques andinos (Etter, 1998), todos ellos caracterizados por altos niveles de riqueza y endemismo de especies. Probablemente la ganadería ocupa más del 80% de estas áreas.

La pérdida de hábitat y la degradación ambiental son en gran medida los factores más importantes por las cuales los primates están amenazados en Colombia. Actualmente los primates son el orden de mamíferos más amenazado del país con 21 de sus 45 taxones dentro de las categorías de amenaza de la IUCN-Unión Internacional para la Conservación de la Naturaleza (Rodríguez-Mahecha *et al.* [ed.], 2006). Para la región oriental del departamento de Caldas, de las cinco (probablemente seis) especies con distribución original, *S. leucopus* en una de las únicas que aún persiste y se registra comúnmente. *Saguinus leucopus* es endémico de Colombia, se encuentra incluido en el Apéndice I del CITES y bajo los criterios de IUCN se le considera como una especie En peligro de extinción (EN) (Morales *et al.,* 2008); se considera en grave peligro de desparecer debido a su baja variabilidad genética (Leguizamón *et al.*, 2006) y durante el X Congreso de la Sociedad Internacional de Primatología en Japón 1990, se le declaró como especie de prioridad internacional. Su vulnerabilidad obedece a su limitada distribución (la más reducida para cualquier especie de *Saguinus*), a que se encuentra en una zona con alta actividad de colonización y, es además frecuentemente vendida como mascota (Defler, 2003, 2004). Esta especie solo se encuentra protegida en Colombia por el Parque Nacional Natural Selva de Florencia, sin embargo la importancia de esta área protegida para la conservación de *S. leucopus* es limitada porque solo una pequeña e intervenida proporción de su área coincide con los límites de distribución altitudinal de la especie.

Se encuentra muy poca información acerca de la biología de este primate en toda su área de distribución y poco o nada acerca de cómo esta especie ha sobrevivido a la transformación, fragmentación y aislamiento de los bosques y cómo ha respondido a tales cambios (Vargas y Solano, 1996; Cuartas, 2001; Poveda y Sánchez- Palomino, 2004; Santamaría *et al.,* 2007). Igualmente, existe muy poca información acerca del estado de las poblaciones de *S. leucopus* en el departamento de Caldas (Vargas y Solano, 1996; Santamaría *et al.*, 2007). Dadas las condiciones de transformación del paisaje y teniendo en cuenta que antes de tomar decisiones de manejo sobre estas poblaciones es muy importante establecer parámetros poblacionales como la densidad poblacional y la estructura y composición de grupos de la especie en los diferentes tipos de hábitat aún disponibles, presentamos valores de densidad poblacional y tamaño de grupo de este primate bajo las condiciones predominantes de transformación de paisaje en el oriente del departamento de Caldas.

Materiales y métodos

Área de estudio

El área de estudio está en el municipio de Samaná, departamento de Caldas, vertiente oriental de la Cordillera Central (5°31'00" N, 74°58'00" W) (Fig. 1). El área abarca un rango altitudinal entre los 510 y 1,010 msnm. El paisaje corresponde a un mosaico de potreros, bosques de galería, rastrojos y algunos bosques secundarios en diferentes estados de sucesión, dominados principalmente por Guadua (*Guadua angustifolia*) y especies de las familias Melastomataceae, Euphorbiaceae y Moraceae (Rojas *et al.*, 2008). Adicionalmente se encuentran unos pocos cultivos de caña panelera y maíz. El área de estudio comprende terrenos con un grado de pendiente muy alto, lo cual ha evitado que algunas áreas sean usadas para actividades agropecuarias y se conserve parte de su cobertura vegetal. Por otro lado, en esta zona la práctica de actividades agrícolas se hace por medio de rotación de parcelas, permitiendo en las usadas, el crecimiento de rastrojo por períodos de seis a siete años, generándose así un paisaje con una numerosos parches de bosques secundarios, rastrojos y bosques de galería, medianamente conectados entre sí.

Estimación de densidad poblacional y tamaño de grupos

Los censos para estimar la densidad de *S. leucopus* fueron llevados a cabo mediante el método de muestreo a distancia con transectos lineales (Peres, 1999; Buckland *et al.*, 2001). Se hicieron ocho transectos con una longitud total de 6.4 km (longitud promedio de 0.8 km), en bosques de galería y parches de bosque conectados entre si. En cada transecto se llevaron a cabo en promedio 13 recorridos, para acumular de esta forma un esfuerzo de muestreo total de 84.5 km. Solamente incluimos los registros visuales de la especie (los animales fueron ubicados por observación directa o al escuchar sus vocalizaciones). Cada transecto fue recorrido silenciosamente a una velocidad promedio de 0.47 km/hora; los censos fueron realizados por dos observadores independientes, llevando a cabo cada observador dos censos por día en dos diferentes transectos. Los censos se llevaron a cabo a partir de las 7:30 en un transecto y las 9:30 en otro; dos transectos recorridos simultáneamente estaban localizados a una distancia mínima de 1,500 m. El recorrido de los transectos y la hora en que este se efectuaba se distribuyeron proporcionalmente entre los observadores, para eliminar posibles sesgos asociados a un mismo observador recorriendo repetidamente un mismo transecto y/o haciéndolo a una misma hora. Los datos para estimar las densidades de *Saguinus leucopus* fueron analizados con el programa DISTANCE 5.0 (Buckland *et al.*, 2001). Dado el tamaño y la alta dispersión espacial de los individuos de un mismo grupo de *S. leucopus*, y la consecuente dificultad para hacer conteos confiables, lo cual puede ocasionar una subestimación de las densidades (Defler & Pintor, 1985; Pruetz & Leasor, 2002), se realizaron seguimientos a varios grupos de la zona fuera del período de censos para obtener estimaciones confiables de su tamaño promedio. Este estudio fue realizado entre los meses de septiembre y noviembre de 2005.

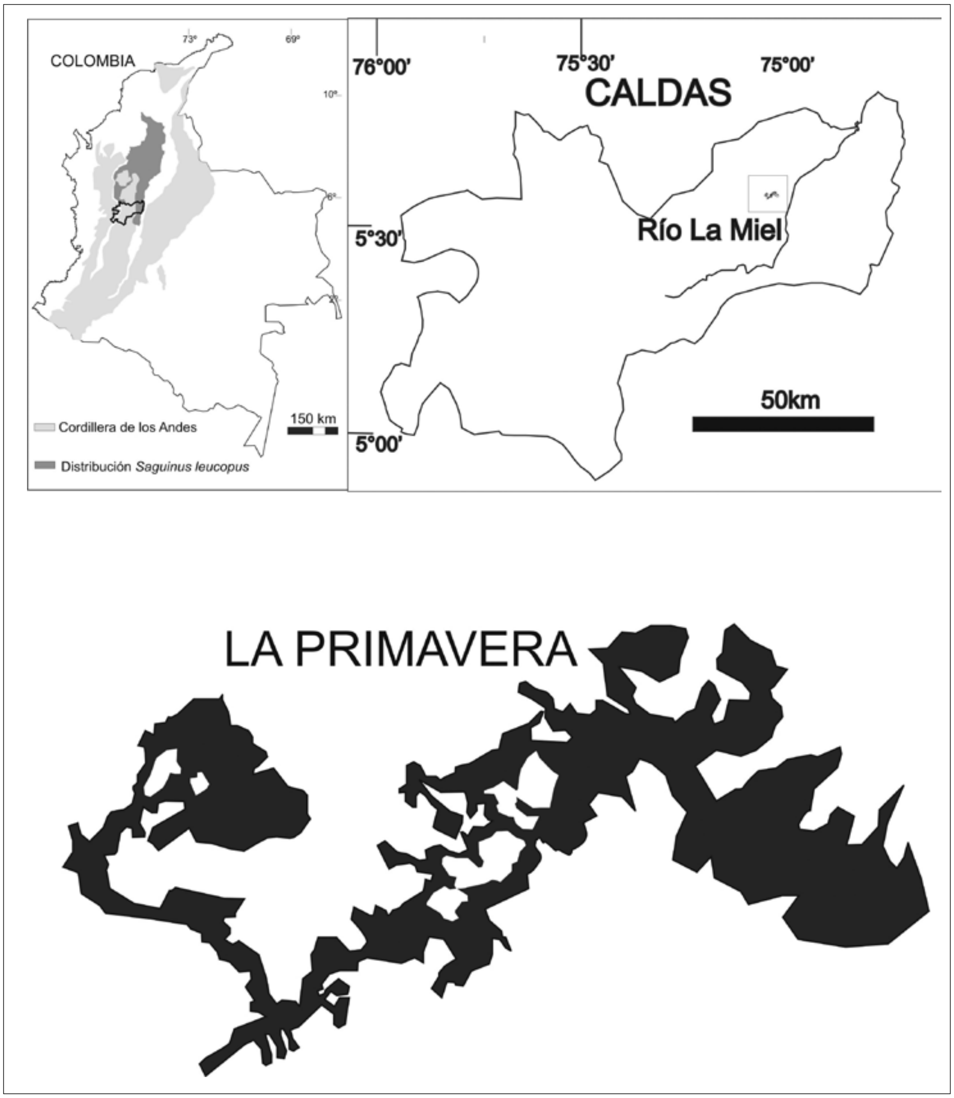

Figura 1. Localización del área de estudio (en negro), vereda La Primavera, corregimiento de Florencia, municipio de Samaná. Departamento de Caldas, Colombia.

Resultados

Se lograron 39 registros visuales de *S. leucopus*. El modelo Uniforme con serie de expansión Coseno arrojó el valor más bajo del criterio de información de Akaike (AIC) y mejor ajuste de las distribuciones observada y esperada de distancias perpendiculares (X^2=3.8 gl=7, p=0.8). El tamaño promedio de grupo se estimó a partir de los conteos de 11 grupos y fue de 5.36 individuos por grupo (IC95% = 3.37 – 7.35). El tamaño de los grupos varió entre dos y 13 individuos. Se estimó una densidad poblacional de *S. leucopus* de 149 individuos/km^2 (IC95% = 78-284) y 27 grupos/km^2 (IC95% =15-50), con un coeficiente de variación del 31.9 %. La varianza de la densidad poblacional estuvo compuesta por la probabilidad de detección en un 10.8%, por la tasa de encuentro en un 53.7% y por el tamaño de grupo en un 35.5%.

Discusión

Densidad poblacional

La densidad de *S. leucopus* en esta localidad es la más alta estimada para la especie. Bernstein *et al.* (1976) calculó entre 1 - 4 individuos/km^2 en el sur del departamento de Bolívar, norte de la distribución de la especie. Posteriormente Green (1978) estimó 15 individuos/km^2. En el departamento de Caldas, Calle (citada por Santamaría *et al.* 2007) estimó una densidad poblacional entre 80-100 individuos/km^2 en un pequeño bosque, probablemente resultado de la presencia de remanentes de bosque después de una activa destrucción ocasionada por el gran número de colonos presentes en la región. En el área de influencia del embalse Amaní, municipios de Victoria y Norcasia, con una cobertura vegetal de bosques mixtos y rastrojos y un área de 1,260 ha, se estimó una densidad de 44.4 individuos/km^2 (Santamaría *et al.*, 2007).

La alta densidad encontrada en el presente estudio para *S. leucopus*, podría deberse a una concentración de la población como respuesta a la destrucción del hábitat que originalmente ocupaba (Defler, 1981). La región ha sufrido un intenso proceso de colonización y actualmente a perdido un 90% de su cobertura vegetal natural

(CORPOCALDAS –QUINAXI, 2004). De esta manera *S. leucopus* se encuentra confinada principalmente en bosques de galería y en algunos bosques secundarios en diferentes estados de sucesión. Los fragmentos de bosque actúan como refugios de la especie, luego de haber sido reducida su área de distribución, obligando a la población a concentrarse en un pequeño espacio. La anterior situación ha generado una reducción de tamaño de la población original del animal y ha impuesto presiones de aislamiento físico y biótico (Kattan, 1998).

Algunos autores han sugerido que las especies de *Saguinus* se ven favorecidas por los bosques secundarios y rastrojos generando el aumento de sus poblaciones (Snowdon y Soini, 1988; Defler, 2003; 2004). Probablemente *S. leucopus* tolere cierto nivel de perturbación de hábitat, debido a su tamaño, el cual le permite desplazarse por vegetación con una morfología poco robusta, como la que ofrecen los rastrojos y bosques secundarios es estos paisajes. También esta especie puede desplazarse a través de cercas vivas y de alambre (obs. pers.). Estas características podrían haber atenuado los efectos del aislamiento entre los parches de bosque permitiéndole a la especie un área más amplia de actividad donde encontrar alimento y una mayor interacción de los grupos en la población. No obstante, el mayor aporte de la tasa de encuentro a la varianza de la densidad poblacional, sugiere que *S. leucopus* puede preferir ciertos tipos de hábitats y está haciendo un uso diferencial de ellos. Por otra parte, es posible que la extinción local de otros primates y otras especies, más vulnerables por sus mayores requerimientos ecológicos y susceptibilidad a presiones, como la cacería, hayan favorecido la prevalencia de *S. leucopus* al reducirse para ésta la competencia (fenómeno de compensación de densidad) (Peres & Dolman 2000).

Tamaño de grupo

El tamaño de grupo encontrado en este estudio (5.36 DS: 3.38 n=11 grupos) no difiere de los reportados para la especie en estudios realizados en paisajes similares (Vargas y Solano, 1996; Cuartas, 2001; Poveda y Sánchez- Palomino, 2004; Santamaría *et al.*, 2007). Sin embargo es necesario adelantar estudios en áreas inalteradas para poder evaluar la influencia de las condiciones actuales, sobre el tamaño, estructura y composición de los grupos. No obstante, otras especies del género en Colombia presentan tamaños de grupo similares (Lindsay, 1980; Savage, 1989; De la Torre *et al.*, 1995; Defler, 2003, 2004; Palacios *et al.*, 2004). Por otro lado, se observaron grupos que podrían considerarse numerosos; con tamaños superiores a ocho individuos, en su mayoría adultos. Sin embargo, un mayor número de individuos por grupo en este estudio no es una condición generalizada de la población, pero puede indicar incipientes alteraciones en la estructura social, producto del aislamiento y de baja disponibilidad de hábitat, que impide la migración de individuos a otras áreas y la formación de nuevos grupos (Estrada y Coates-Estrada, 1996). Ninguno de los 11 grupos utilizados para calcular el tamaño promedio de grupo incluía individuos juveniles o infantiles, no obstante de los 96 registros obtenidos entre observaciones hechas durante los censos y *ad libitum* (Altmann, 1974), se registraron tres individuos inmaduros, dos juveniles y un infante. Estos resultados sugieren una alteración en la actividad reproductiva de la población, posiblemente debido a la saturación de su capacidad de carga dada la alta concentración de individuos en el poco hábitat disponible.

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EXPANSÃO DA DISTRIBUIÇÃO GEOGRÁFICA DE *CALLICEBUS BERNHARDI* A OESTE DO RIO JI-PARANÁ, ESTADO DE RONDÔNIA, BRASIL

Guilherme Reis Monçâo
Valquiria Selhorst
José Alexandre Rodrigues Soares-filho

Em sua revisão sobre o gênero *Callicebus* Thomas, 1903, Roosmalen et al. (2002) descrevem a espécie *Callicebus bernhardi* e indicam que sua distribuição nos estados do Amazonas e Rondônia, Brasil, é limitada ao interflúvio dos rios Madeira ao norte, Ji-Paraná a oeste e Aripuanã-Roosevelt a leste. Ferrari et al. (1996) observaram um zogue-zogue cinzento na margem ocidental do rio Ji-Paraná em Pimenta Bueno, Rondônia, que não apresentava o padrão de coloração marrom de *C. brunneus.* Roosmalen et al. (2002) afirmam que se esse indivíduo pertencesse a *C. bernhardi,* a distribuição desta espécie seria expandida para oeste em toda a parte superior do rio Ji-Paraná. Neste trabalho confirmamos a presença de *C. bernhardi* nos municípios de Pimenta Bueno e Cacoal na porção leste do rio Ji-Paraná como sugerido por Roosmalen et al. (2002) e expandimos sua distribuição para o município de Alto Alegre dos Parecis. Indivíduos foram avistados em 16 de fevereiro de 2008 na propriedade Santa Rita, ampliando sua área de ocorrência 90 km para oeste (Figura 1). Alto Alegre dos Parecis fica na Chapada dos Parecis (450 m a.n.n.m.) na porção sudoeste de Rondônia (IBGE, 2008). Sua vegetação original encontra-se altamente fragmentada por projetos agropecuários.

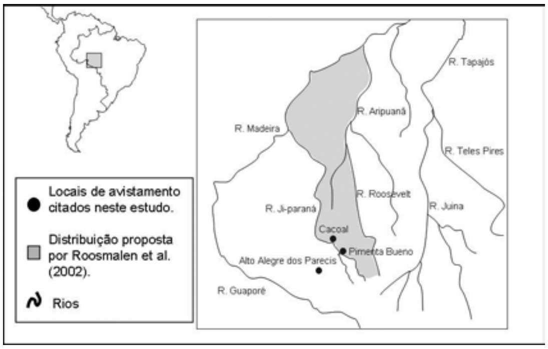

Figura 1. Distribuição geográfica de *Callicebus bernhardi* proposta por Roosmalen et al. (2002) e localização dos avistamentos citados neste estudo: Alto Alegre dos Parecis (12º07’41”S, 61º51’02”O), Pimenta Bueno (11°36’30”S, 61°09’49”O) e Cacoal (11°24’13”S, 61°27’47”O).

Guilherme Reis Monção, **Valquiria Selhorst** e **José Alexandre Rodrigues Soares Filho**, Faculdade de Ciências Biomédicas de Cacoal/FACIMED, Pimenta Bueno, Rondônia, Brasil. Tel. (069) 3451.8092, e-mail: <guilherme.bio@hotmail.com>.

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News

Nominations for the Aldo Leopold and William T. Hornaday Conservation Awards

In 2002, the American Society of Mammalogists established 2 conservation awards to recognize outstanding contributions to the conservation of mammals and their habitats. The Aldo Leopold Award is awarded to a well-established individual who has made a lasting scientific contribution to the conservation of mammals and their habitats. The William T. Hornaday Award is awarded to a current undergraduate or graduate student who has made a significant scientific contribution as a student to the conservation of mammals and their habitats. Nominees should have contributed substantially to the conservation of the conservation of 1 or more mammalian species, subspecies, or populations.”Contribution” is interpreted as: (1) scientific research or political activism that has resulted in the reservation of an imperiled species; (2) development of protective management recommendations; (3) acquisition of new knowledge regarding the conservation status or causes for declines of mammalian species or populations; (4) the protection of significant mammalian habitat; or (5) promotion of the conservation of mammals through public education. For more information contact Richard Thorington ThoringtonR@SI.EDU

Invitación al Proyecto de Conservación del Mono Choro Cola Amarilla

Actualmente la organización Neotropical Primate Conservation está llevando a cabo un proyecto para la conservación del mono choro cola amarilla (*Oreonax flavicauda)* en el bosque de niebla al noreste de Perú. El proyecto abarca investigación acerca de la especie, reforestación, educación ambiental, participación comunitária y desarrollo sustentable. Dada la magnitud del proyecto, se convoca a los interesados en participar en el proyecto para que se pongan en contacto con Sam Shanee al correo electrónico: samshanee@gmail.com , o a través de la página web www.neoprimate.org

Sam Shanee

Curso Metodos em Primatologia de Campo

La Sociedade Brasileira de Primatologia, em conjunto com la Universidade Estadual de Santa Cruz organizam o curso Metodos em Primatologia de Campo, nos días 31 de Janeiro – 09 de Fevereiro na Reserva Ecológica Michelin, Ituberá, Bahia. Preferência será dada a estudantes de Pós-graduação con envolvimento e interesse em Primatologia. Poderão concorrer graduados em Biologia, Medicina Veterinária e correlatas querendo proseguir estudos com Primatas. Alunos dos últimos semestres de graduação con trabalho ou interesse em Primatas também serão considerados. Mas informação http://cursoprimatas.blogspot.com. Inscrições cursoprimatas@gmail.com

CURSO EN ETOLOGÍA Y BIENESTAR EN ANIMALES SILVESTRES

Se invita a todos los interesados a participar en el curso en Etología y Bienestar en Animales Silvestres, el cual se llevará a cabo del 24 al 27 de marzo del presente año en la ciudad de Lima, Perú. El curso está dirigido principalmente a estudiantes de pre-grado, egresados, técnicos, cuidadores y profesionales relacionados con el estudio de la etología y el bienestar animal en centros de conservación *ex situ.* El curso constará de una parte teórica y un taller práctico de capacidad limitada; se han puesto a disposición cierto número de becas. Para mayores informes contactar a Celia M. Díaz Gonzáles: celiadiaz_vet@yahoo.com , o escribir a faunavet.peru@gmail.com

CAMPANHA "PROTEJA SEU ANJO DA GUARDA"!

A febre amarela é uma doença infecciosa causada por um vírus que é transmitido por mosquitos. Existem dois tipos: a febre amarela urbana, erradicada do Brasil por volta da década de 1960, e a febre amarela silvestre. Os vetores (agentes responsáveis pela transmissão) da forma silvestre são mosquitos dos gêneros *Haemagogus* e *Sabethes*, enquanto a forma urbana pode ser transmitida pelo *Aedes aegypti*, o mesmo vetor da dengue.

A febre amarela silvestre já provocou a morte de algumas pessoas e de muitos bugios em uma extensa área do Rio Grande do Sul desde o final de 2008. No entanto, ao contrário da maioria das pessoas, os bugios são extremamente sensíveis à doença, morrendo em poucos dias após contraí-la. Esses macacos já estão ameaçados de extinção no Estado devido à destruição de seu hábitat natural (as florestas), à caça e ao comércio ilegal de mascotes. Infelizmente, os bugios também estão sendo vítimas da doença e da falta de informação da população. Inúmeros relatos indicam que habitantes das regiões de ocorrência do bugio-preto e do bugio-ruivo estão matando os animais, principalmente por envenenamento, por medo do avanço da doença. Além de tornar mais crítico o estado de conservação desses animais, essa atitude é extremamente prejudicial para o próprio homem. A morte de bugios por febre amarela alerta os órgãos de saúde locais sobre a circulação do vírus na região, os quais promovem campanhas de vacinação da população humana, como se tem observado em quase 200 municípios do Estado. O Ministério da Saúde considera esses macacos importantes "sentinelas" da circulação do vírus. Portanto, os bugios são nossos "ANJOS DA GUARDA"! Se eles forem mortos pelo homem, descobriremos que a febre amarela chegou a determinada região apenas quando as pessoas contraírem a doença. E talvez já seja tarde para algumas (ou muitas)...

Além de NÃO transmitirem à doença para o homem, os bugios NÃO são os responsáveis pelo rápido avanço da doença no Estado. Eles são as principais vítimas. As mudanças climáticas e a degradação ambiental provocadas pelo homem são as principais responsáveis pelo recente aparecimento de inúmeras doenças infecciosas no Estado. Especialistas acreditam que o avanço da doença tem sido facilitado pelo deslocamento de pessoas infectadas ou pela dispersão dos mosquitos ou outro hospedeiro ainda desconhecido. Pergunto: "Você mataria o seu anjo da guarda?"

Dr. Júlio César Bicca-Marques
Professor Titular
Grupo de Pesquisa em Primatologia
Faculdade de Biociências/PUCRS

RECENT PUBLICATIONS

BOOKS

South American Primates: Comparative Perspectives in the Study of Behavior, Ecology, and Conservation (Developments in Primatology: Progress and Prospects), edited by P. A. Garber, A. Estrada, J. C. Bicca-Marques, E. Heymann and K. B. Strier. 2008. Springer. 447pp. ISBN: 978-0387787046. The focus of each chapter is to examine the nature and range of primate responses to changes in their ecological and social environments, and to use data on South American monkeys to address critical theoretical questions in the study of primate behavior, ecology, and conservation. *Contents:* 1. Advancing the study of south American primates – P. A. Garber & A. Estrada; 2. The diversity of the new world primates (Platyrrhini), an annotated taxonomy – A. B. Rylands & R. A. Mittermeier; 3. Paleogeography of the South Atlantic: a route for primates and rodents into the new world? – F. B. de Oliveira, E. C. Molina and G. Marroig; 4. Platyrrhine ecophylogenetics in space and time – A. L. Rosenberger, M. F. Tejedor, S. B. Cooke and S. Pekar

Spider Monkeys: The Biology, Behavior and Ecology of the Genus Ateles, edited by Christina J. Campbell. 2008. Cambridge University Press. 352pp. ISBN: 978-0521867504. Spider monkeys are traditionally very difficult to study in the wild, but there has been an expansion in research being carried out on this genus in the past decade. This book is an assimilation of both published and previously unpublished research on spider monkeys, it is a comprehensive source of information for academic researchers and graduate students interested in primatology, evolutionary anthropology and behavioral ecology and covers topics such as taxonomy, diet, sexuality and reproduction, and conservation.

The Biology of Traditions: Models and Evidence, edited by D. M. Fragaszy and S. Perry. Cambridge University Press. 476pp. ISBN: 978-0521087308. This book explores socially-maintained behavioral traditions in animals other than humans. Uniquely, it treats traditions as biological phenomena amenable to comparative evaluation in the same way as other biological phenomena. It is also concerned with how widely shared features of social life and learning abilities can lead to traditions in many species. It differs from other books in its emphasis on explicit evaluation of alternative theories and methods, and in the breadth of species covered. It will be essential reading for students and researchers in behaviour, anthropology and psychology. *Contents:* 1. Towards a biology of traditions – D. M. Fragaszy and S. Perry; 2. What the models say about social learning – K. N. Laland and J. R. Kendal; 3. Relative brain size and the distribution of innovation and social learning across the nonhuman primates – S. M. Reader; 4. Social learning about food in birds – L. Lefebvre & J. Bouchard; 5. The cue reliability approach to social transmission: designing tests for adaptive traditions – G. Dewar; 6. Traditional foraging behaviors of brown and black rats – B. G. Galef Jr.; 7. Food for thought. Social learning about food feeding capuchin monkeys – E. Visalberghi and E. Addessi; 8. Traditions in mammalian and avian vocal communication – V. M. Janik and P. J. B. Slater; 9. Like mother, like calf: the ontogeny of foraging traditions in wild Indian Ocean bottlenose dolphins – J. Mann and B. Sageant; 10. Biological and ecological foundations of primate behavioral tradition – M.A. Huffman & S. Hirata; 11. Local traditions in orangutans and chimpanzees: social learning and social tolerance – C. P. Van Schaik; 12. Developmental perspectives on great ape traditions – A. E. Russon; 13. Do brown capuchins socially learn foraging skills? – S. Boinski, R. P. Quatrone, K. Sughrue, L. Selvaggi, M. Henry, C. M. Stickler and L. M. Rose; 14. Traditions inn wild white-faced capuchin monkeys – S. Perry, M. Panger, L. M. Rose, M. Baker, J. Gros-Louis, K. Jack, K. C. Mackinnon, J. Manson, L. Fedigan and K. Pyle; 15. Conclusions and research agendas – S. Perry.

ARTICLES

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Visalberghi, E. and Spagnoletti, N. Factors affecting success in the use of hammers and anvils to crack open nuts in wild bearded capuchins.

Waga, I. C., Tomaz, C. and Tavares M. C. H. Spatial and non-spatial relational memory in capuchin monkeys *(Cebus apella)*.

Welker, B. J. Howler monkey leaf choice: protein-to-fiber ratio revisited.

Wheeler, B. C. False alarm: do tufted capuchin monkeys (*Cebus apella)* use anti-predator calls to usurp resources from conspecifics?

Youlatos, D. and Gasc, J. P. Gait and kinematics of arboreal quadrupedal walk of free-ranging red howlers (*Alouatta seniculus)* in French Guiana.

Young, R. J., Froes, A. P., Torquetti, C. G., Teixeira, B. and Talamoni, S. A. Factors influencing the distribution of urban marmosets.

Ziegler, T. E. and Snowdon, C. T. Chemical communication maintains the cooperative breeding social system in two platyrrhine species, *Callithrix jacchus* and *Saguinus oedipus*.

MEETINGS

2009

The 11th meeting of the German Society of Primatology. February 24–26, University of Veterinary Medicine, Hannover, Germany. For more information visit the web site: www.gfp2009.de

The XIX meeting of the Italian Primatological Society. April 1–3, Asti, Italy. The topic of the meeting will be "The primates 200 years after the birth of Darwin, History, Evolution, Ethology and Conservation¨. For more information go to: www-1.unipv.it/webbio/api/api.htm

The 3rd Congress of the European Federation for Primatology. August 12–15, Irchel campus of the University of Zürich, Switzerland. The EFP is a federation of all national primatological societies and groups in Europe. The biennial meetings strive to bring together primatologists and biological anthropologists from all over Europe to encourage interdisciplinary and international exchanges. The registration and abstract submission deadline is April 15th, 2009. For more information visit the web site: www.aim.uzh.ch/EFP.html

IV Congreso Mexicano de Primatología. 24–26 de Junio, Villahermosa, Tabasco. La Asociación Mexicana de Primatología A.C. y la Universidad Juárez Autónoma de Tabasco convocan. Para mayor información visite: http://www.tierradeideas.com/amp/

The 32nd Meeting of the American Society of Primatologists. September 18–21, Bahia Resort Hotel, San Diego, California, USA. Tentative deadline for abstracts is currently March, 2009. For further information check the web site: www.asp.org/asp2009/index.htm

2010

The 23rd congress of the International Primatological Society. September 12–18, Kyoto University, Japan. The theme of the conference will be 'Quest for Coexistence with Nonhuman Primates.' In line with IPS policy, the committee welcomes suggestions for symposia on any of the disciplines of primatology. The Symposium submission deadline is October 15th, 2009. The presentation submission deadline is January 15th, 2010. For more information go to www.ips2010.jp/.

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Notes to Contributors

Scope

The journal/newsletter aims to provide a basis for conservation information relating to the primates of the Neotropics. We welcome texts on any aspect of primate conservation, including articles, thesis abstracts, news items, recent events, recent publications, primatological society information and suchlike.

Submissions

Please send all English and Spanish contributions to: Erwin Palacios, Conservación Internacional – Colombia, Carrera 13 # 71-41 Bogotá D.C., Colombia, Tel: (571) 345-2852/54, Fax: (571) 345-2852/54, e-mail: <epalacios@conservation.org>, and all Portuguese contributions to: Júlio César Bicca-Marques, Departamento de Biodiversidade e Ecologia, Pontifícia Universidade Católica do Rio Grande do Sul, Av. Ipiranga, 6681 Prédio 12A, Porto Alegre, RS 90619-900, Brasil, Tel: (55) (51) 3320-3545 ext. 4742, Fax: (55) (51) 3320-3612, e-mail: <jcbicca@pucrs.br>.

Contributions

Manuscripts may be in English, Spanish or Portuguese, and should be double-spaced and accompanied by the text on CD for PC compatible text-editors (MS-Word, WordPerfect, Excel, and Access), and/or e-mailed to <epalacios@conservation.org> (English, Spanish) or <jcbicca@pucrs.br> (Portuguese). Hard copies should be supplied for all figures (illustrations and maps) and tables. The full name and address for each author should be included. Please avoid abbreviations and acronyms without the name in full. Authors whose first language is not English should please have their English manuscripts carefully reviewed by a native English speaker.

Articles. Each issue of *Neotropical Primates* will include up to three full articles, limited to the following topics: Taxonomy, Systematics, Genetics (when relevant for systematics and conservation), Biogeography, Ecology and Conservation. Text for full articles should be typewritten, double-spaced with no less than 12 cpi font (preferably Times New Roman) and 3-cm margins throughout, and should not exceed 25 pages in length (including references). Please include an abstract in the same language as the rest of the text (English, Spanish or Portuguese) and (optional) one in Portuguese or Spanish (if the text is written in English) or English (if the text is written in Spanish or Portuguese). Tables and illustrations should be limited to six, except in cases where they are fundamental for the text (as in species descriptions, for example). Full articles will be sent out for peer-review. For articles that include protein or nucleic acid sequences, authors must deposit data in a publicly available database such as GenBank/EMBL/DNA Data Bank of Japan, Brookhaven, or Swiss-Prot, and provide an accession number for inclusion in the published paper.

Short articles. These manuscripts are usually reviewed only by the editors. A broader range of topics is encouraged, including such as behavioral research, in the interests of informing on general research activities that contribute to our understanding of platyrrhines. We encourage reports on projects and conservation and research programs (who, what, where, when, why, etc.) and most particularly information on geographical distributions, locality records, and protected areas and the primates that occur in them. Text should be typewritten, double-spaced with no less than 12 cpi (preferably Times New Roman) font and 3-cm margins throughout, and should not exceed 12 pages in length (including references).

Figures and maps. Articles may include small black-and-white photographs, high-quality figures, and high-quality maps. (Resolution: 300 dpi. Column widths: one-column = 8-cm wide; two-columns = 17-cm wide). Please keep these to a minimum. We stress the importance of providing maps that are publishable.

Tables. Tables should be double-spaced, using font size 10, and prepared with MS Word. Each table should have a brief title.

News items. Please send us information on projects, field sites, courses, Thesis or Dissertations recently defended, recent publications, awards, events, activities of Primate Societies, etc.

References. Examples of house style may be found throughout this journal. In-text citations should be first ordered chronologically and then in alphabetical order. For example, "…(Fritz, 1970; Albert, 1980, 2004; Oates, 1981; Roberts, 2000; Smith, 2000; Albert *et al.*, 2001)…"

In the list of references, the title of the article, name of the journal, and editorial should be written in the same language as they were published. All conjunctions and prepositions (i.e., "and", "In") should be written in the same language as rest of the manuscript (i.e., "y" or "e", "En" or "Em"). This also applies for other text in references (such as "PhD thesis", "accessed" – see below). Please refer to these examples when listing references:

Journal article

Stallings, J. D. and Mittermeier, R. A. 1983. The black-tailed marmoset (*Callithrix argentata melanura*) recorded from Paraguay. *Am. J. Primatol.* 4: 159–163.

Chapter in book

Brockelman, W. Y. and Ali, R. 1987. Methods of surveying and sampling forest primate populations. In: *Primate Conservation in the Tropical Rain Forest,* C. W. Marsh and R. A. Mittermeier (eds.), pp.23–62. Alan R. Liss, New York.

Book

Napier, P. H. 1976. *Catalogue of Primates in the British Museum (Natural History). Part 1: Families Callitrichidae and Cebidae.* British Museum (Natural History), London.

Thesis/Dissertation

Wallace, R. B. 1998. The behavioural ecology of black spider monkeys in north-eastern Bolivia. Doctoral thesis, University of Liverpool, Liverpool, UK.

Report

Muckenhirn, N. A., Mortensen, B. K., Vessey, S., Fraser, C. E. O. and Singh, B. 1975. Report on a primate survey in Guyana. Unpublished report, Pan American Health Organization, Washington, DC.

Website

UNESCO. 2005. UNESCO Man and the Biosphere Programme. United Nations Educational, Scientific, and Cultural Organisation (UNESCO), Paris. Website: http://www.unesco.org/mab/index.htm. Accessed 25 April 2005. ("Acessada em 25 de abril de 2005" and "Consultado el 25 de abril de 2005" for articles in Portuguese and Spanish respectively).

For references in Portuguese and Spanish:

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Contents

Articles

Short Articles

IUCN/SSC
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