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# *Neotropical Primates*

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**Front Cover:** A wild bearded capuchin monkey (*Cebus libidinosus*) caring for and feeding a common marmoset (*Callithrix jacchus*) (see page 29). Photo by Jeanne Shirley.

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# Short Articles

## Deslocamento Terrestre e o Comportamento de Beber em Um Grupo de Barbados (*Alouatta guariba clamitans* Cabrera, 1940) em Minas Gerais, Brasil

*Bárbara Almeida-Silva, Patrícia G. Guedes*
*Jean P. Boubli, Karen B. Strier*

### Introdução

Dentre os diversos estudos envolvendo o gênero *Alouatta*, o comportamento locomotor tem sido bastante discutido (Mendel, 1976; Youlatos, 1993; Cant, 1986; Prates *et al*., 1990; Gebo, 1992; Bicca-Marques e Calegaro-Marques, 1995), embora sejam poucos os registros sobre o deslocamento terrestre. Um outro comportamento pouco documentado é o de beber água, considerado não muito comum para o gênero, já que os barbados obtêm água dos alimentos consumidos; principalmente folhas novas e de frutos (Glander, 1978; Bicca-Marques, 1992). O presente estudo relata a ocorrência de eventos de uso do solo para locomoção e obtenção de água em um grupo de *Alouatta guariba clamitans* e discute as possíveis causas para estes comportamentos nos barbados da Reserva Particular do Patrimônio Natural (RPPN) Feliciano Miguel Abdala / Estação Biológica de Caratinga (EBC).

### Metodologia e Grupo de Estudo

O estudo foi realizado com um grupo de barbados (*A. guariba clamitans*) na RPPN Feliciano Miguel Abdala, no município de Caratinga, Minas Gerais. O local do estudo foi um fragmento de 970 ha de Mata Atlântica, cercado por pastos e áreas agrícolas. As observações sobre deslocamento terrestre foram registradas através dos métodos de *scan sampling* e *ad libitum* (Altmann, 1974) no decorrer de cinco dias por mês, de maio a outubro de 2003. O grupo de estudo era inicialmente composto por oito indivíduos (três machos, sendo um adulto, um sub-adulto e um juvenil, três fêmeas adultas e dois infantes), acrescido de um indivíduo após o nascimento de um filhote no penúltimo mês de estudo.

### Resultados

Ao final do período de estudo, foi registrado um total de 18 observações de uso do solo pelo grupo de *A. guariba clamitans*. Destas, dez observações corresponderam ao uso do solo para deslocamento e obtenção de água, e os demais eventos corresponderam unicamente ao deslocamento terrestre. Não houve uma seqüência de descida ao solo específica de acordo com a classe sexo-etária. Todos os integrantes do grupo foram avistados fazendo uso do solo, e ora eram os machos os primeiros a descerem, ora as fêmeas (Tabela 1). Freqüentemente também foi possível observar apenas um único indivíduo do grupo descendo ao solo. Nenhum caso de geofagia foi notificado.

Uma importante observação sobre o deslocamento terrestre, foi o fato de que nos locais de travessia pelo solo, havia a possibilidade de travessia também pela copa das árvores. Em todos os eventos observados a altura média do estrato arbóreo no local em que os indivíduos desciam ao chão era superior ou igual a 20 m, e sempre havia árvores próximas para que o grupo pudesse se locomover sem a necessidade de descer ao solo.

O tempo de permanência no solo variou bastante, compreendendo o intervalo de 1 a 10 minutos. E com relação ao comportamento exibido durante a descida, os indivíduos demonstravam aparente tranqüilidade quando precisavam fazer uso deste ambiente, não havendo nenhum compor-

**Tabela 1:** Sumário dos eventos diários de descida e a quantidade de vezes que cada indivíduo desceu ao solo por dia. (*Presença de infante.)

| Data | Nº de Eventos | Indivíduos / Descidas ao solo | | | | | |
|---|---|---|---|---|---|---|---|
| | | MAd | MSub | MJuv | FAd 1 | FAd 2 | FAd 3 |
| 05/04/03 | 1 | | 1 | | | | |
| 01/07/03 | 1 | 1 | 1 | 1 | 1* | | |
| 02/07/03 | 1 | 1 | 1 | 1 | 1* | 1* | 1 |
| 03/07/03 | 2 | 2 | 1 | 2 | 2* | 2* | 1 |
| 04/07/03 | 1 | | 1 | | | | |
| 05/08/03 | 1 | 1 | | | | | |
| 06/08/03 | 3 | 1 | 1 | | | 1* | 1 |
| 07/08/03 | 2 | | 1 | 1 | | | 2 |
| 08/08/03 | 2 | 2 | 1 | | | | 1 |
| 05/09/03 | 2 | 1 | | 1 | 1* | 1* | |
| 07/10/03 | 1 | | 1 | | | | |
| 10/10/03 | 1 | | | | | | 1* |
| **Total** | **18** | **9** | **9** | **6** | **5** | **5** | **7** |

tamento de vigilância, com exceção de uma fêmea grávida, que se mostrava alerta e bastante receosa com a presença do observador, mesmo após o nascimento do infante. Contudo, mesmo exibindo este tipo de comportamento, esta fêmea fez uso do solo como os outros membros, inclusive sozinha.

Durante o período de estudo, a única forma de obtenção direta de água foi em um pequeno córrego que passa no meio da reserva. Todas as observações sobre o consumo de água foram realizadas nos meses de julho (N = 4), agosto (N = 4) e início de setembro (N = 2), lembrando que este é o período seco de outono e inverno na região de Caratinga.

## Discussão

A utilização do solo pelos primatas do gênero *Alouatta* tem sido citada por alguns pesquisadores ao longo das últimas décadas (e.g. Schön-Ybarra, 1984; Bicca-Marques e Calegaro-Marques, 1994, 1995; Mendes, 1989; Bernardi *et al.,* 2004), porém os registros ainda são escassos, o que dificulta a formulação de hipóteses para este tipo de comportamento.

Especificamente com relação a *Alouatta guariba clamitans,* Mendes (1989) observou também na RPPN Feliciano Miguel Abdala / EBC, raros eventos onde barbados deslocaram-se pelo chão; nestas situações, os machos estavam tentando evitar ou fugir de outro macho, o que não ocorreu em nenhuma das dezoito situações observadas no presente estudo. Bernardi *et al.* (2004) também fizeram registros de uso de solo para esta espécie no Paraná, onde observaram cinco eventos de deslocamento terrestre, dois deles de caráter acidental. Os demais eventos corresponderam à travessia de uma clareira por uma fêmea adulta em busca de alimento e nos dois outros seguintes um macho adulto foi avistado atravessando a trilha em frente ao abrigo dos pesquisadores.

É cabível pensar que ambientes descontínuos poderiam acarretar em uma maior freqüência de utilização do solo. No trabalho realizado por Bicca-Marques e Calegaro-Marques (1995) foi observado que a única forma destes animais se locomoverem de um fragmento a outro na área de estudo era a travessia pelo solo. No entanto, em todas as observações aqui apresentadas, a descida ao solo foi espontânea, pois os indivíduos estavam em locais onde poderiam facilmente se locomover usando a copa das árvores. Um outro ponto a ser considerado é que alterações no habitat poderiam afetar não somente a densidade dos grupos, mas também acarretar em mudanças comportamentais. O trabalho de Dib *et al.* (1997) corrobora com a hipótese de que os eventos de deslocamento terrestre de muriquis na RPPN Feliciano Miguel Abdala / EBC aumentaram ao longo dos últimos anos, conforme os indivíduos tornaram-se mais habituados à presença de observadores.

Para o grupo de barbados em questão nós sugerimos a existência de um comportamento de deslocamento e utilização de recursos mais flexível, permitindo que esses possam explorar novos ambientes, incluindo aqueles considerados não tão ideais. Pode-se ainda sugerir que a presença constante de observadores interfira diretamente no comportamento do grupo, já que a reserva é local de diversos estudos, principalmente com primatas, e ainda pelo fato de a área de uso do grupo de barbados ficar próxima ao local de acampamento dos pesquisadores. Estes fatores levariam a uma maior "confiança" na exploração de um novo ambiente, pois possíveis ataques de predadores terrestres, assim como aqueles notificados para a espécie simpátrica *Brachyteles hypoxanthus* (Kuhl, 1820) (Printes *et al.,* 1996), ocorreriam com menor intensidade.

O uso do deslocamento terrestre, ainda, poderia ser traduzido em economia energética, já que a anatomia destes animais é tipicamente a de um quadrúpede e não de um braquiador (e.g., Hershkovitz, 1977; Rose, 1993; Llorens *et al.*, 2001), diferentemente do que ocorre em *Brachyteles.* Assim, o deslocamento no solo seria um comportamento possível, porém raro, já que seria uma manifestação mais limitada por predadores do que por uma imposição músculo-esquelética.

Os eventos registrados para o consumo de água no presente trabalho, estão relacionados ao período de outono/inverno na localidade de Caratinga; a época de seca da região, havendo menor disponibilidade de frutos e folhas novas, que são os itens alimentares com maiores concentrações de água. Além disso, há uma menor disponibilidade de água empossada em ocos de árvore, galhos, etc., que poderia ser utilizada como fonte alternativa de água como observado para o muriqui, que também desce, durante esta época, ao solo para beber água nesta região (Mourthé *et al.*, 2005). A dieta dos barbados na RPPN Feliciano Miguel Abdala / EBC nesta época do ano consiste basicamente de folhas maduras (Mendes, 1989), o que acarreta em uma diminuição no consumo de água de forma indireta. Assim, os resultados aqui apresentados sobre o comportamento de beber reforçam os resultados apresentados por Moro-Rios *et al.* (2005), onde os barbados poderiam ter diversas estratégias para obtenção de água quando esta não estivesse disponível nos itens alimentares.

Desta forma, torna-se de grande valia a realização de novos estudos, principalmente com barbados ainda não habituados aos observadores, permitindo assim que o acúmulo de informações ajude a interpretar os padrões de comportamento exibidos por esses primatas e o nível de interferência dos fatores externos sobre os mesmos, principalmente para os grupos que vivem em ambientes fragmentados, a fim de que planos futuros de manejo e conservação possam ser implementados com maior adequação e eficiência.

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# DISCRIMINATIVE FEEDING ON LEGUMES BY MANTLED HOWLER MONKEYS (*ALOUATTA PALLIATA*) MAY SELECT FOR PERSISTENCE

*Clara B. Jones*

## Introduction

Although little is known about the nonrandom relationship of primates to their plant food resources (but see Milton, 1979; Glander, 1981), some evidence suggests that primates may select food for its palatability or digestibility, its caloric or nutritional value, or its degree of toxicity (Clutton-Brock, 1977). Discriminative feeding may occur in response to phenological patterns within seasons, habitats, species, and individual trees that produce qualitative and quantitative differences among plant parts over time and space. Because an organism's feeding habits and choices may be subject to selection (Schoener, 1971; Milton, 1979), understanding discriminative feeding behavior in primates is an important component to understanding their biology. Legumes are an important food source for mantled howler monkeys (*Alouatta palliata*) (Milton, 1979; Glander, 1981). Consistent with an earlier study (Jones, 1983) showing that mantled howlers were more likely to feed on *Pithecolobium saman* flowers at flower-opening time, this study presents evidence suggesting that these atelines also prefer to feed on flowers of *Andira inermis* (Fig. 1) during flower-opening time, and that the costs imposed on these animals as they wait for this possibly limiting resource may select for persistence.

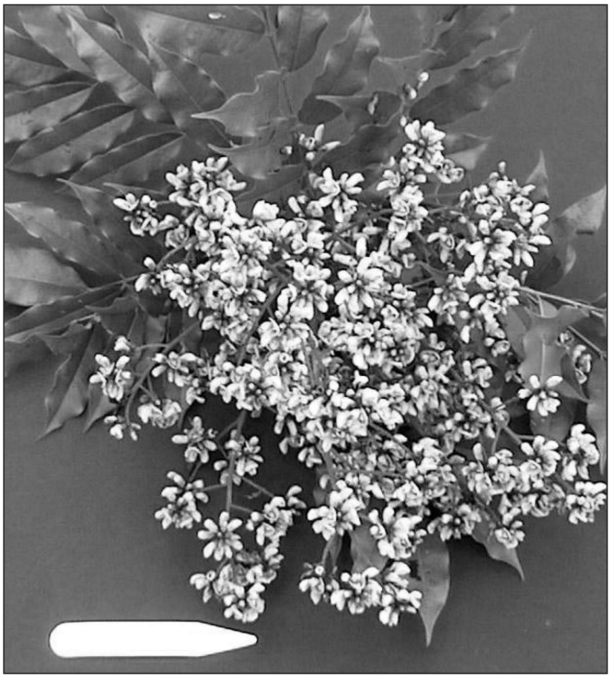

**Figure 1.** *Andira inermis* inflorescence. These trees prefer wetter habitats and flower every two years (Daniel Janzen, pers. comm., 1976). Different parts of an individual tree may exhibit different stages of flower maturity (Daniel Janzen, pers. comm., 1976; C. B. Jones, pers. obs.). ©National Park Service (used with permission).

## Methods

Three *Andira inermis* (Leguminosae) trees were observed intermittently from 30 March to 12 April 1976 at Hacienda La Pacífica, Cañas, Costa Rica, using the "focal tree" method described in Jones (1983). One tree (AI#1) in riparian habitat was sampled daily (total 52 h 12 min), providing the data for the present report. According to Frankie *et al.* (1976), flowers of *A. inermis* (Fig. 1) open between 0730 and 0830 (CST) with pollen release occurring about one hour following anthesis. A peak in nectar flow occurs again from 1100–1400 h, and each flower is functional for one day. Frankie *et al.* (1976) collected approximately 70 species of bees from anthesis to about 1700 h, with peak visiting periods occurring during the first and second periods of nectar flow. All bees collected were solitary members of the families Apidae, Anthophoridae, Halictidae, and Megachilidae.

## Results

Figure 2 presents the results of the present study ($\chi^2 = 37.95$, $p < 0.001$, df = 10). Individuals of the riparian habitat Group 5 (3 adult males and 15 adult females: see Jones, 1980) were more likely to feed during hours of peak flower-opening, including peak pollen and nectar production. Monkeys were most likely to be observed feeding in tree AI#1 at 1000 h (n = 15 individuals) in association with a decline in bee activity, as predicted by Frankie *et al.* (1976). A smaller number of individuals fed in decreasing density throughout the afternoon after 1100 h. It appears, then, that howlers are most likely to avoid the morning peak in bee activity but are not as likely to avoid the afternoon peak in bee activity, a finding worthy of further investigation. It is possible that feeding upon *A. indira* inflorescences in the morning imposes greater costs than feeding during afternoon hours.

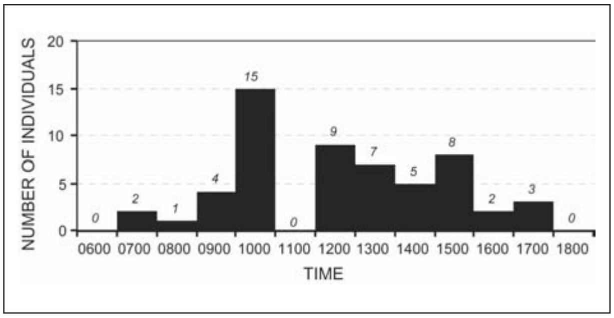

**Figure 2.** Distribution of mantled howlers from Group 5 observed eating *Andira inermis* flowers. Distribution is shown by time of day during the observation of tree AI#1 from 30 March to 12 April.

It is important to note that this riparian group waited for up to three hours to enter tree AI#1 to feed, a temporal and, possibly, nutritional cost that may favor the evolution of persistence. On the other hand, a complex pattern of feeding was observed for some individuals who ate alternate sources of food (both leaves and fruit) before, during, and after the waiting period (e.g., *Anacardium*, *Enterolobium*, *Hymenaea*, *Tabebuia*, *Mangifera*). Although the presence of alternate food sources confounds a straightforward analysis of feeding on *A. inermis*, the apparent preference for *A. inermis* (and other legume) flowers despite their apparent foraging costs (e.g., bee activity) warrants explanation.

## Discussion

What might be the biological significance of discriminative feeding on flowers of *A. inermis*? William Haber (pers. comm., 1983) suggested that "the whole flower" is "probably the basic resource they are after" because the small amounts of nectar and/or pollen would not be of significant food value to the monkeys. The "food value" of the flower's tissues for the howlers has not been assessed, nor the possible "food value" of the quantities of nectar and pollen that might be consumed after an extended feeding period (Katherine Milton, pers. comm., 1983). Until such analyses are conducted and compared across flower samples collected at different times of day, the hypothesis that howlers may feed at flower opening time to maximize nutrient or energy intake cannot be rejected. Discriminative feeding may indicate a pattern of nutrient complementarity, whereby food ingested before and after periods of feeding at flower opening time should be analyzed chemically (K. Milton, pers. comm., 1983). These and other ideas relevant to the present results are discussed elsewhere (Jones, 1983).

Stevens *et al.* (2005; see also Fehr, 2002) have recently shown that feeding ecology is correlated with "patience" in callitrichids. Interspecific (plant:primate, Stevens *et al.*, 2005; bee:primate, this study) interactions, then, may favor patience, persistence, or impulse control and may be signatures of primates and other social mammals given conditions in which local competition occurs for limited resources (e.g., queuing for mates, taking turns at water holes). A possible extension of these studies is that selection for persistence, patience, or impulse control may have facilitated selection for large body size since small animals may not be energetically capable of waiting for critical food or water resources to become available. Where persistence, patience, or impulse control increases the likelihood of morbidity (e.g., desiccation) or mortality, these studies can be linked to life history evolution and adaptations to minimize associated costs. Further analyses of the fine-grained relationships between primates and their plant prey are warranted.

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# GETTING THE HANG OF IT: AGE DIFFERENCES IN TAIL-USE BY MANTLED HOWLING MONKEYS (*ALOUATTA PALLIATA*)

*Samantha M. Russak*

## Introduction

Among primates, only the five genera of the family Atelidae (*Alouatta*, *Lagothrix*, *Oreonax, Brachyteles* and *Ateles*) have fully prehensile tails. Numerous studies (e.g., Mendel, 1976; Gebo, 1992; Bergeson, 1998; Lawler and Stamps, 2002) have shown that prehensile tails aid in locomotion, help to maintain balance while resting or sleeping, especially on smaller branches, and improve the efficiency of foraging by enlarging the monkey's feeding sphere.

Howling monkeys use their fully prehensile tails from birth, and infants often wrap their tails around the base of their mothers' tails for extra security, especially while traveling (Baldwin and Baldwin, 1978). Prehensile tail-use continues in older, more independent infants and juveniles, particularly during play and environmental exploration. Adult howlers also use their tails in most activities, especially foraging and traveling. However, activity budgets differ greatly between adults and immatures, with the latter being much more active.

This study addresses the age-related differences in tail-use by mantled howling monkeys (*Alouatta palliata*). Many previous studies have focused on the positional and postural behavior of howling monkeys (e.g., Bicca-Marques and Calegaro-Marques, 1993; Estrada *et al.*, 1999; Gebo, 1992; Lawler and Stamps, 2002), but none has focused on age as an independent variable, and only one article (Wheeler and Ungar, 2001) addressed sex differences. Many of these studies have used the same independent variables, such as the size and type of substrate, the monkeys' location in the trees, and general activity, but the dependent variables differ greatly across reports.

## Methods

The study was carried out at the Ometepe Biological Field Station, Isla de Ometepe, Nicaragua (11°24'N, 85°50'W) at the beginning of the wet season, 4–22 July 2004. This tropical, semideciduous, dry forest has many groups of mantled howling monkeys, *Alouatta palliata*, at three main sites: Beach Forest, Spider Forest, and Volcano Forest. The latter two are fragmented and crosscut by agricultural fields or trails, while Beach Forest is an isolated fragment (about 1 ha) bounded by Lake Nicaragua and the main road on the island. Howlers come to the ground to cross this road, but were not seen doing so during this study. For more details of the study site, see Garber *et al.* (1999) and Winkler *et al.* (2004).

The study had two parts: an extensive nine-day period in which six groups (five in Spider Forest, one in Volcano

Forest) were observed, and an intensive six-day period in which the single group in Beach Forest was observed. This yielded 10 data-collection days with over 53 contact hours and over 22 hours of data. Seventy samples (700 minutes of data) and 65 samples (650 minutes of data) were collected in the first and second periods, respectively. The groups varied in their composition but generally had 2–4 adult males, 3–6 adult females, 1–4 juveniles, and 0–2 infants.

Instantaneous, focal-subject sampling at 15-second intervals was used over 10-minute sampling periods. Individuals were chosen at random, so that no subject was the focus of two samples in a row. Data were collected on adults and immatures, but only adults could be sexed. If the focal-subject was lost from view for over a minute, the sample was dropped; if the monkey was out of sight for less than a minute, it was noted on the data sheet, and the behavior recorded for that period was the last seen behavior for that subject. All observations occurred when the monkeys were in the trees, usually at 10–20 m; binoculars were occasionally used.

For each sample, I recorded the starting time, one of the four general behavioral contexts (Table 1), size of substrate, and location in the canopy. Travel for dependant infants was recorded when the mother carried them them dorsally or ventrally while traveling herself. Data were analyzed as rates (the frequency of scans per sample) for both immatures and adults. These numbers were then compared using a binomial test (two-tailed, $\alpha = 0.05$).

## Results

Adults used their tails most while feeding on terminal branches and resting, and in both contexts used their tails more than immatures did (Table 2). Immature howlers used their tails most when playing, followed by resting and feeding. Adults were not recorded playing.

Sixteen of 20 combinations of context and tail-use showed differences between adults and immatures; of these, immatures had greater rates than adults for 12 categories ($n = 16$, $x = 4$, $p = 0.038$). Rates of tail-use for immatures did not differ from adult rates for four of 20 combinations. Within contexts and across tail-use categories, the only statistically significant difference between immatures and adults was in play ($n = 5$, $x = 0$, $p = 0.31$), for the simple reason that adults never played.

Neither adults nor immatures rested by hanging by their tails. Similarly, Tail-Forelimb Suspension was never seen in adults and was seen only in juveniles during play. Both immatures and adults preferred to use Tail-Wrap during resting, feeding, and travel, and this is the most common use of the tail.

## Discussion

Howlers are habitual inhabitants of the uppermost canopy and spend most of the day resting. This behavior likely reflects the mostly folivorous diet of howlers that requires

**Table 1.** Behavior variables recorded.

| Category | Definition |
|---|---|
| **General** | |
| Rest | Little or no gross body movement; eyes opened or closed; posture variable |
| Feed | Eat or forage |
| Travel | Movement from one place to another |
| Play | Active exploration or manipulation of environment; social or solitary |
| **Tail-Use** | |
| Tail-Hang | Body-weight fully supported by tail only |
| Tail-Wrap | Tail flexed loosely or tightly around object |
| Tail-Hindlimb Suspension | Body-weight supported by tail and one or both hindlimbs |
| Tail-Forelimb Suspension | Body-weight supported by tail and one or both forelimbs |
| Tail Idle | Tail not employed in any of above tail-use categories |

**Table 2.** Rates (scans/sample) in four contexts of five behavioral categories.

| | Rest | | Feed | | Travel | | Play | |
|---|---|---|---|---|---|---|---|---|
| | Immature | Adult | Immature | Adult | Immature | Adult | Immature | Adult |
| Tail Idle | 4.71 | 2.78 | 0.02 | 0.00 | 0.40 | 0.20 | 0.19 | 0.00 |
| Tail-Hang | 0.00 | 0.00 | 0.52 | 0.43 | 0.24 | 0.17 | 3.02 | 0.00 |
| Tail-Wrap | 26.24 | 30.86 | 2.05 | 4.25 | 1.36 | 0.85 | 0.24 | 0.00 |
| Tail-Hindlimb Suspension | 0.02 | 0.00 | 0.41 | 0.45 | 0.00 | 0.02 | 0.50 | 0.00 |
| Tail-Forelimb Suspension | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.07 | 0.00 |
| **Total** | 30.97 | 33.64 | 3.00 | 5.13 | 2.00 | 1.24 | 4.02 | 0.00 |

them to spend much time digesting large amounts of low-quality plant material, making them more sedentary and less socially active than many other species (Baldwin and Baldwin, 1978). Our results show a clear difference in the activity budget and tail-use of immatures and adults. While playing, immatures exhibited a wide range of tail-use but most often hung only by their tails. This confirms previous findings that as howler infants mature into more skillful juveniles, they spend more time playing while hanging by the tail, which allows them to grapple with a play partner from any angle with less effort than a sitting animal expends (Baldwin and Baldwin, 1978). Their play allows young howlers to gain motor and behavioral experience that may later be helpful for hanging from small branches while they eat and for learning how to use their tails efficiently for other purposes, such as locomotion, resting, or sleeping.

While feeding, juveniles hung by their tails more often than adults, but showed less tail-use overall. The former result agrees with findings by, for example, Bicca-Marques and Calegaro-Marques (1993), who recorded that smaller individuals use an extended reach gained by hanging more often, making them more competitive with larger individuals. On the other hand, immatures often failed to use their tails more than adults, especially when traveling or resting. One might think that inexperienced young howlers would be cautious, and so use their tails for extra support and security. Their low rate of tail-use may be because immatures are uncertain as to what they can do with their tails, while still acquiring behavioral experience and knowledge.

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# PREDATION OF A BEARDED SAKI (*CHIROPOTES UTAHICKI*) BY A HARPY EAGLE (*HARPIA HARPYJA*)

*Simone de Souza Martins*
*Eldianne Moreira de Lima*
*José de Sousa e Silva Jr.*

The predation of primates is rarely observed in the wild (Cheney and Wrangham, 1987; Stanford, 2002). The main predators are birds of prey (Eason, 1989; Sherman, 1991; Julliot, 1994; Vasquez and Heymann, 2001), reptiles (Corrêa and Coutinho, 1997; Burney, 2002; Gursky, 2002; Tello *et al.*, 2002; Ferrari *et al.*, 2003), and an array of predatory mammals (Stanford, 1989; Peetz *et al.*, 1992; Tsukahara, 1993; Condit and Smith, 1994; Wright *et al.*, 1997). According to Stanford (2002), primate males tend to be preyed upon more often than females. The predation of females and young has been recorded by Corrêa and Coutinho (1997), Vasquez and Heymann (2001), Burney (2002), and Ferrari *et al.* (2003). Here we report on the predation of an adult male bearded saki (*Chiropotes utahicki*) by a harpy eagle (*Harpia harpyja*) in the eastern Amazon. A necropsy was carried out, which provided additional information about the animal and clues as to the exact cause of death.

The attack took place at the Estação Científica Ferreira Penna (ECFPn), Melgaço, Pará (01°42’30”S, 51°31’45”W), an area of 33,000 ha in the Caxiuanã National Forest. The incident was observed during a mammal survey being conducted by two researchers, each walking simultaneously on parallel paths 200 m apart in a 100-ha plot (#4) (01°45’13”S, 51°31’15”W), one of the Tropical Ecology, Assessment and Monitoring (TEAM) Initiative monitoring sites at Caxiuanã (Fig. 1).

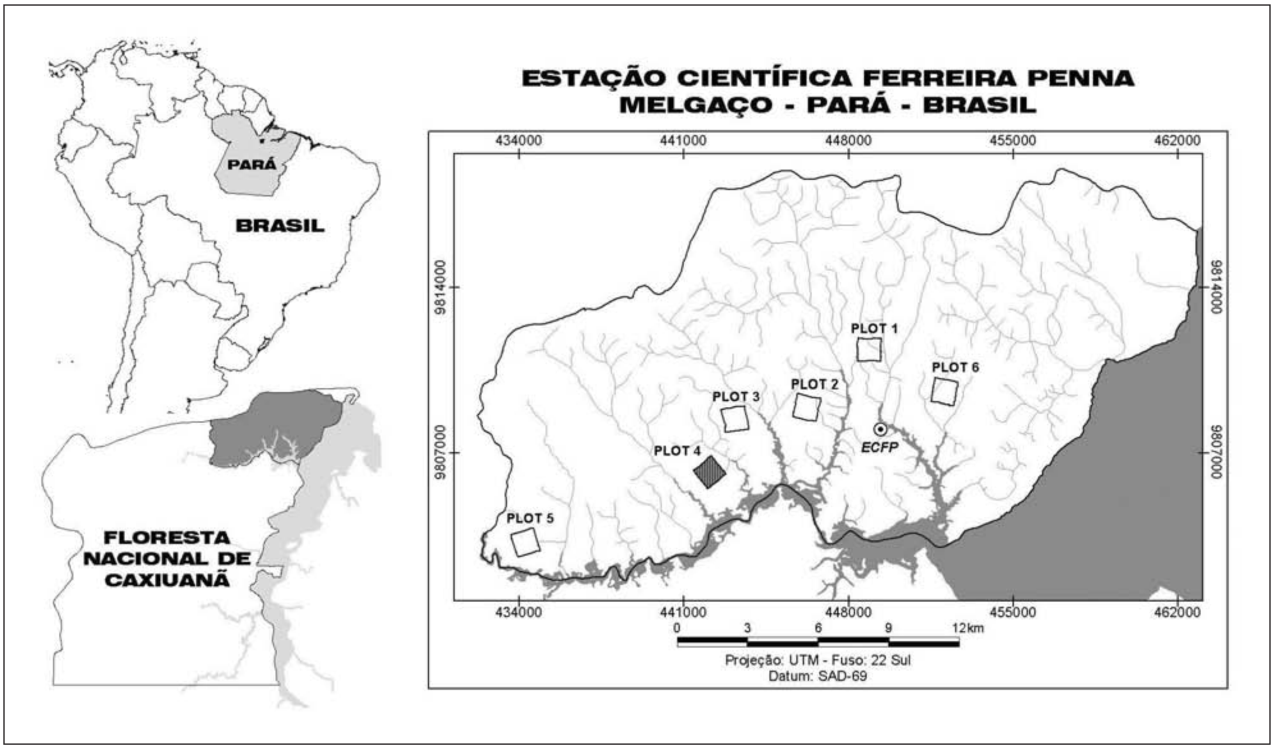

**Figure 1.** The plots of the TEAM Initiative in the Estação Científica Ferreira Penna. Plot 4 is where the harpy eagle attack occurred.

On 18 April 2004, at 14:50, one of the researchers (SSM) located a group of more than twelve bearded sakis. Only minutes later the group was attacked by a harpy eagle. The group was moving away when it happened, and, as is the case of most recorded attacks on primates, there was intense long-calling by all of the group members, who subsequently scattered over 200 m from the site of the attack. Minutes after the start of the vocalizations, the second researcher (EML) on the parallel trail saw two adults, one of them female, move towards her in the canopy and then descend a liana to the ground. The sakis ran silently about 30 m straight towards her, bounding (synchronized movements of the front and the back legs) with their tails held upright. Their fur was fluffed up (piloerection), and even when they saw the researcher about 10 m away, they ran on without changing direction.

After the attack, the harpy eagle noticed the presence of the first researcher (SSM), flew about 40 m with a saki in its claws, but then dropped it from a height of about 10 m. The entire incident lasted about four minutes. The saki, an adult male of 3.5 kg, was found dead on his back beside a fallen tree, with his arms folded and hands tightly fisted, clutching some feathers, which indicated that his demise had not been instantaneous. The muscles of the saki's mouth were contracted in a grimace, and its tongue was forced between its left canines and premolars. Nearby we found a bush about 2 m high with a broken branch and some of the eagle's feathers, indicating a struggle.

The attack took place in a stretch of quite open primary forest with a sparse, broken canopy at about 40 m. Spacing between the uppermost branches enabled good light penetration and visibility. Although it was the rainy season, the temperature was approximately 30°C, and it was dry. These conditions, we believe, favored the eagle's attack.

Four other primates have been recorded in the area of this TEAM site: the silvery marmoset (*Mico argentatus*), the black-handed tamarin (*Saguinus niger*), the tufted capuchin (*Cebus apella*), and the red-handed howling monkey (*Alouatta belzebul*). While some have been the subject of previous field research (Jardim, 1997; Veracini, 1997, 2002; Bobadilla, 1998; Pinna, 1999; Souza, 1999; Tavares, 1999; Martins *et al.*, 2005), this is the first incidence of primate predation recorded there.

The bearded saki was taken to the field station laboratory, its biometric measurements were taken, and we tried to assess the way it had been captured. A necropsy was performed in order to ascertain the cause of death, and it was later taxidermized and placed in the collection of the Museu Paraense Emílio Goeldi (MPEG – 36084). The wounds consisted of punctures and both superficial and deep cuts. The superficial wounds broke only the epidermis, the dermis, and the hypodermis, but the deep ones affected the muscle tissue. The superficial punctures were in the abdomen and on the dorsum and right flank of the thorax. The deep perforations were in the left ventral thoracic region and abdomen and had provoked internal hemorrhaging. Nine internal organs were perforated. Superficial cuts were also found on the right side of the braincase and on the back of the right forearm. Deep cuts were found on the central crown of the skull (between the cerebral hemispheres), which had caused encephalic cranial traumatism with internal and external hemorrhaging. As no other organs were affected and no

**Figure 2.** The adult male bearded saki, *Chiropotes utahicki*, killed by the harpy eagle. Note the feathers still in the hands.

bones of the postcranial skeleton were broken, the cerebral wounds would seem to have been the cause of death and were probably caused by the beak.

Apart from the recent wounds, we also observed old, darkened scars resulting from perforations, along with a broken articulation (held together only by skin) between the proximal and middle phalanges of the little finger on the left hand. The distal phalanx of the indicator finger on the left hand was missing. These findings may have been wounds from fighting other males in the group.

According to Stanford (2002), adult males are preyed upon more frequently than other sex-age classes, probably because they are generally larger and as such, are more obvious targets. In many species, adult males position themselves strategically to defend the group. During an attack, they may try to distract or confront the predator so that the rest of the group can disperse and escape; therefore, they are more exposed and vulnerable (Cheney and Wrangham, 1987; Gursky, 2002; Tello *et al.*, 2002).

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# The Near Extinction of a Population of Northern Muriquis (*Brachyteles hypoxanthus*) in Minas Gerais, Brazil

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*Marcello S. Nery, Maria J. R. Rocha*

## Introduction

The muriqui (*Brachyteles*) is the largest Neotropical primate and the largest mammal endemic to Brazil (Fonseca *et al.*, 1994). It is restricted to the southeastern Atlantic Forest where forest destruction is widespread and human activities inimical to wildlife are intense. Its populations are threatened by habitat destruction and fragmentation and, despite prohibitions, there is still hunting in this region of Brazil (Mittermeier *et al.*, 1982, 1987, 1989; Mittermeier and Konstant, 1990; Auricchio, 1997; Cosenza and Melo, 1998).

Adult male and female muriquis can weigh up to 12–15 kg (Aguirre, 1971). Their original range extended from the southern part of the state of Bahia to southern São Paulo (25°S), including the states of Espírito Santo, Minas Gerais, and Rio de Janeiro (Aguirre, 1971; Strier, 1992; Strier and Fonseca, 1996-1997). Muriquis also occur in northern Paraná (Martuscelli *et al.*, 1994). Aguirre (1971), who conducted the most complete survey of the muriqui's distribution, considered their preferred habitat to be primary and secondary forests between 600–1,800 m above sea level.

Despite the well-documented growth of the muriqui population at the Estação Biológica de Caratinga in the Feliciano Miguel Abdala Private Natural Heritage Reserve (RPPN-FMA) (see Strier *et al.*, 2002) and recent discoveries of some new populations (see Melo *et al.*, 2002; Chiarello *et al.*, 2005), the northern muriqui, *B. hypoxanthus*, is classified as Critically Endangered on the *IUCN Red List of Threatened Species* (IUCN, 2004). All known populations are small and occur in isolated forest fragments. One of the smallest inhabits the 42-ha forest at Fazenda Esmeralda (FE), in Rio Casca, Minas Gerais.

In his visit to the Fazenda Esmeralda in 1964, Aguirre (1971) estimated 7–8 individuals surviving there. Subsequent studies of this population over a 20-year period, from 1983 to 2003, recorded an increase to a maximum of 18 individuals, followed by a subsequent and steady decline (Fig. 1). As of June 2003, there were only three muriquis remaining, two adult males and an adult female, all three of them old. This population is not considered to be viable over the long term. We report here on a survey of primates in the forest fragments in and surrounding the Fazenda Esmeralda.

## Study Site and Methods

### *Study site*

Fazenda Esmeralda (FE) is about 30 km north of the town of Rio Casca, Minas Gerais, at 20°04'16"S, 42°44'22"W (Fig. 2; Location number 1). The forest is seasonal semideciduous and surrounded by farmland and pasture. The climate is tropical humid according to the classification of Köppen (Gilhaus, 1986, cited in Stallings and Robinson, 1991). The peak rainy months are from November to February, and

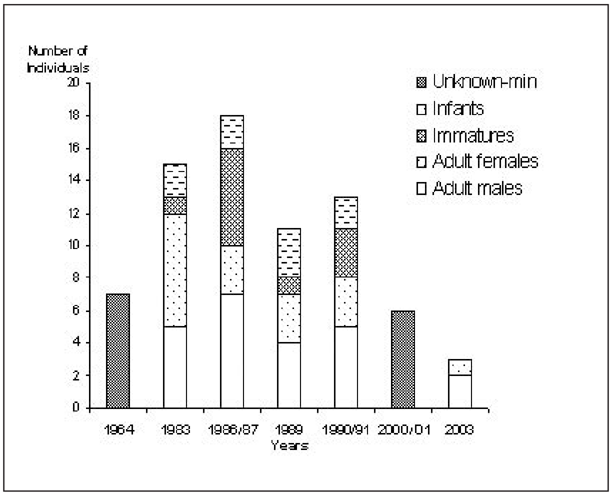

**Figure 1.** Size and composition of the muriqui population at Rio Casca, Minas Gerais. Sources are as follows: 1964 (Aguirre, 1971); 1983 (Fonseca, 1985); 1986/87 (Lemos de Sá, 1988); 1989 (Brozek, 1991); 1990/91 (Andrade, 1996); 2000/01 (S. L. Mendes, pers. comm.); 2003 (this study). With kind permission of Karen B. Strier.

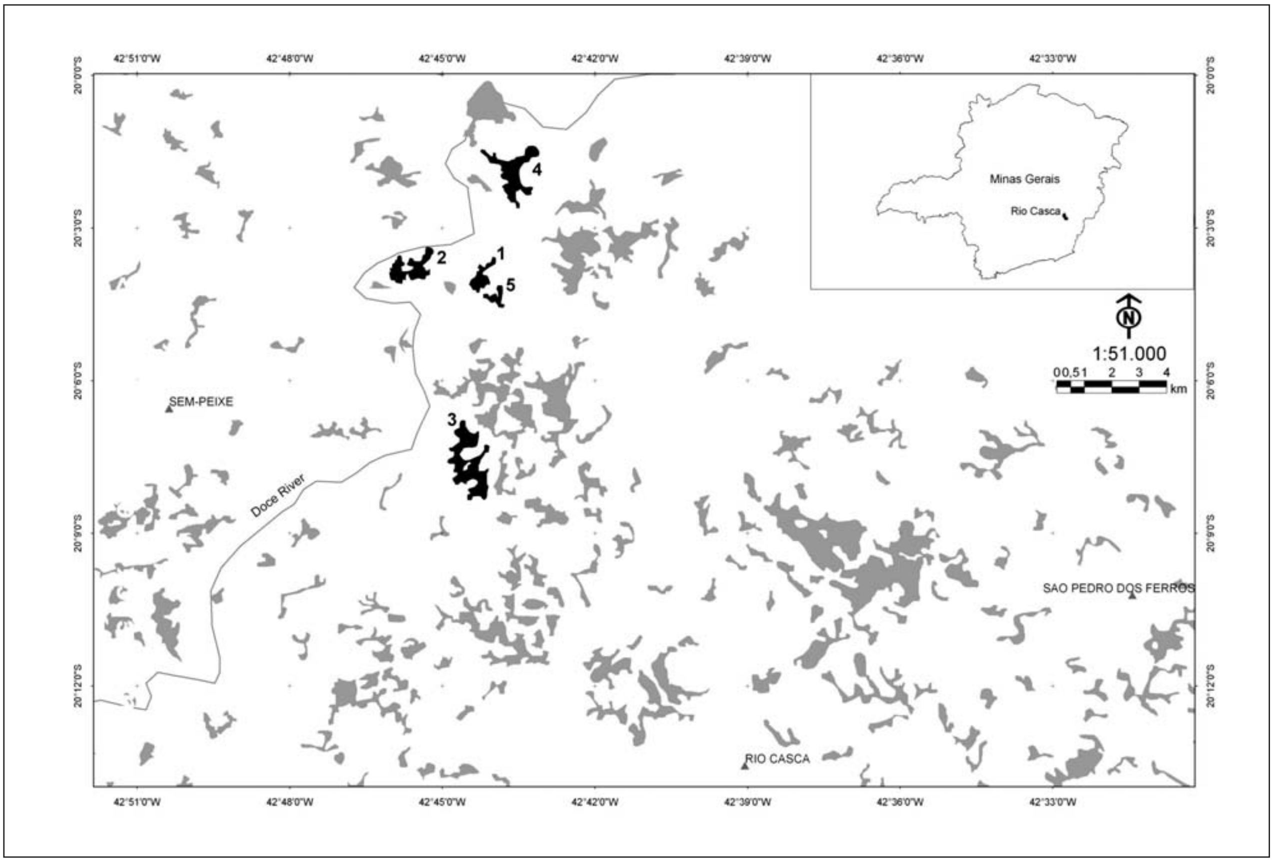

**Figure 2.** Map showing the location of the study site (Fazenda Esmeralda, Rio Casca, Minas Gerais), including the forest fragments visited. 1. Study site; 2. Forest fragment 01 (Fazenda Esmeralda); 3. Fazenda Esmeralda de Cima; 4. Fazenda Córrego do Ouro; 5. Forest fragment 02 (Fazenda Esmeralda).

the peak dry months are from June to August. Data from the Rio Doce State Park (about 35 km from the study area) indicate average annual rainfall in the 1960s and 1970s to be 1,480 mm, with an average annual temperature of 22°C (CETEC, 1981). Altitudes in the forests at FE range from 240–480 m. The forests in the area have a long history of disturbance, through cycles of coffee, corn and, more recently, sugarcane plantations, besides the harvesting of wood in the 1960s and 1970s for the production of charcoal. The small forest fragments are today surrounded by pasture dominated by "capim-colonião" (*Panicum maximum*) and agricultural crops. Local farmers reported that the muriquis were heavily hunted during the 1960s and 1970s, when there were some 800 people living on the Fazenda Esmeralda working for a mining company in the region.

The forest is in various stages of succession, and there are abundant vines and lianas. Some species typical of tall primary forest, such as "bicuíba" (*Virola gardneri* [A. DC.] Ward), "garapa" (*Apuleia leiocarpa* MacBride), "jequitibá-rosa" (*Cariniana legalis* [Mart.] Kuntze), and "peroba" (*Aspidosperma* sp.) remain. There are few epiphytes due to the successive cycles of selective logging. The terrain is steep with slopes of 40–65°.

### *Methods*

We carried out four surveys to census the primates and assess the muriqui population at FE: 1) 29 March to 4 April 2003; 2) 26 April to 1 May 2003; 3) 26 May to 31 May 2003; and 4) 14 June to 19 June 2003. Each expedition involved about 58 hours of fieldwork for a total of 234 hours. We re-opened trails that were used by previous researchers and cut new ones. Morning censuses were begun at 0700 h and lasted approximately four hours. Afternoon censuses were conducted from 1400–1800 h, such that we were able to cover the entire area of forest accessible by the trail system, including all areas used by muriquis, in one day. We used binoculars and also playback recordings (portable *Diskman*, a CD with vocalizations of *B. hypoxanthus*, *Cebus nigritus*, *Callicebus nigrifrons* and *Callithrix aurita*, and a Mini-twin MT 10 Fender amplifier) to increase the likelihood of finding the primates. Whenever possible, we took photographs with a Sony Mavica FD75 digital camera.

We recorded all sightings of primates, all vocalizations heard, and information obtained from interviews with local inhabitants. Other forest fragments reported to have supported muriquis in the past were also surveyed to determine whether they might still be present.

## Results and Discussion

The forest fragment at FE continues to suffer strong anthropogenic pressures. In the past, the main problem was selective logging for charcoal production. Logging has, without doubt, considerably reduced the floristic species diversity.

The remaining secondary forest has enormous numbers of vines and patches of bamboo, with a canopy now reduced to an average height of 6.8 m (Lemos de Sá and Strier, 1992). During the first expedition, we heard dogs barking in the forest. Local residents told us that these dogs have been harassing the primates at FE for years.

### *Muriquis*

We were in contact with the muriquis for an average of seven hours in each of the expeditions. On the first expedition only three trails were passable, and we had difficulty walking in the forest and locating the muriquis, partly due to the steep terrain and dense vegetation typical of secondary growth. Only on 30 March 2003 did we see an adult male about 12 m from the observer, 10 m from the trail, and 9 m from the ground. At 1800 h on the same day, we heard a second muriqui calling from the other side of the forest in the area called "Porção da água" (there is a small stream there). On 2 April 2003 we saw another individual in the "Porção da água." This part of the forest is the only area that has not been logged, as was evident from the well-developed understorey and the presence of various large trees including "jequitibá" (*Cariniana legalis*), "pau d'alho" (*Gallesia integrifolia*), and "angico" (*Anadenanthera* sp.). Local residents mentioned seeing a solitary muriqui in a neighboring forest fragment (separated by an open field) on 31 March 2003.

For the second expedition, we cut nine new trails and were consequently able to observe three adult muriquis (a female and two males) on four consecutive and complete days. We frequently found the muriquis in a part of the forest with a high density of "leiteira" trees (*Margaritaria nobilis*, Euphorbiaceae) that were in fruit. They fed in these trees throughout the day as well as in other trees, including "angelim-amargoso" (*Andira* sp.), "angico" (*Anadenanthera* sp.), and "vinhático" (*Plathymenia foliolosa*). They fed especially on the mature leaves of "angelim-amargoso," and on lianas and vines, including a species of Bignoniaceae.

We cut four new trails for the third expedition, and were able to reach formerly inaccessible parts of the forest, making us even more successful in contacting and observing the muriquis. We were able to reconfirm the composition of the group: just the three muriquis seen during the second expedition. *Ad libitum* data (Setz, 1991) indicated that the muriquis spent 60% of the total observation time resting, 23% traveling, and 17% feeding (Fig. 3). The time spent feeding could have been low because of the low availability of food.

Local people informed us that muriquis had been heard calling in another forest fragment in the past year (about 140 m from the study area; not shown in Fig. 2). In 2002, R. Ribeiro (pers. comm.) also saw an adult male muriqui crossing a pasture in the direction of this same forest. During the final, fourth expedition, we visited four other forest fragments near our study area but were unable to confirm the presence of muriquis in any (Table 1; Fig. 2).

### *Other primates*

While studying the muriquis at FE from 1986 to 1987, Lemos de Sá (1991) recorded the presence of single groups of titi monkeys (*Callicebus nigrifrons*), capuchin monkeys (*Cebus nigritus*), and buffy-tufted-ear marmosets (*Callithrix aurita*) in the 42-ha forest of our study site. Our surveys confirmed that all three primates still resided there. We also saw two buffy-tufted-ear marmosets (*Callithrix aurita*), together with a group of *Callicebus nigrifrons* (titi monkeys), in a neighboring fragment separated from the study site by a road, but considered here as part of the same area.

During the last expedition (14–19 June 2003) we recorded the presence of titi monkeys, black-horned capuchins, and buffy-tufted-ear marmosets in two other fragments (Fazenda Esmeralda and Fazenda Esmeralda de Cima), and found another group of capuchin monkeys in a third forest in the Fazenda Córrego do Ouro, all near our study site (Table 1; Fig. 2).

### *The fate of the three muriquis*

The situation of the muriquis at Rio Casca was discussed at the Second Meeting of the Committee for the Conservation and Management of the Muriqui (*Comitê Brasileiro para Conservação do Muriqui*), recently created by the Instituto Brasileiro de Desenvolvimento Sustentável e dos Recursos

**Table 1.** Census results from study site and neighboring forest fragments.

| Map | Local | Coordinates | Area (ha) | Species encountered | Encounter type |
|---|---|---|---|---|---|
| 1 | Fazenda Esmeralda (study site) | 20°04'16"S<br>42°44'22"W | 42 | *Callithrix aurita*<br>*Callicebus nigrifrons*<br>*Cebus nigritus*<br>*Brachyteles hypoxanthus* | Visual<br>Visual<br>Visual<br>Visual |
| 2 | Fazenda Esmeralda (forest fragment 01) | 20°03'21.0"S<br>42°44'10.0"W | 85 | *Callithrix aurita*<br>*Callicebus nigrifrons*<br>*Cebus nigritus* | Vocal<br>Vocal<br>Visual |
| 3 | Fazenda Esmeralda de Cima | 20°07'03.0"S<br>42°44'11.0"W | 177 | *Callithrix aurita*<br>*Callicebus nigrifrons*<br>*Cebus nigritus* | Reported by local<br>Vocal<br>Visual |
| 4 | Fazenda Córrego do Ouro | 20°01'21.0"S<br>42°43'37.0"W | 127 | *Cebus nigritus* | Reported by local |
| 5 | Fazenda Esmeralda (forest fragment 02) | 20°04'22.0"S<br>42°43'55.0"W | 22 | *Cebus nigritus* | Visual |

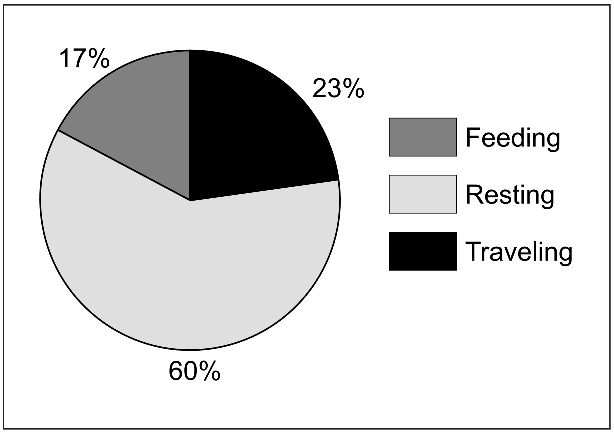

**Figure 3.** Percentage of time the muriquis were feeding, resting, and traveling during 28 hours of observation in the Fazenda Esmeralda (study area), Rio Casca, Minas Gerais.

Naturais Renováveis (IBAMA). The meeting was held from 30 June to 1 July 2003 in Belo Horizonte, Minas Gerais. Three alternatives were proposed:

- Continue to monitor the remaining individuals in this population without interfering with them;
- Capture the three muriquis, and release them in another forest with an extant muriqui population;
- Capture the three individuals and maintain them in captivity.

If captured, they would be transported to a Triage Center at the Universidade Federal de Viçosa. Following quarantine and medical examinations (including analyses of parasite loads, genetics, and reproductive status), the fate of the muriquis (reintroduction or permanence in captivity) would be determined in a special meeting of the Muriqui Committee. We estimate that to capture and transport the muriquis and to build them a suitable enclosure would cost about R$12,000. The option to capture the three muriquis was accepted by the Muriqui Committee at its meeting on 1 July 2003 and is awaiting final approval and permits from IBAMA.

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# LIMITES CLIMÁTICOS E VEGETACIONAIS DAS DISTRIBUIÇÕES DE *CEBUS NIGRITUS* E *CEBUS ROBUSTUS* (CEBINAE, PLATYRRHINI)

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## Introdução

Os primatas do gênero *Cebus* apresentam ampla distribuição geográfica, estendendo-se por toda a região Neotropical. Os macacos-prego (subgênero *Sapajus*) são exclusivos da América do Sul, enquanto que os caiararas (subgênero *Cebus*) ocorrem na Amazônia e América Central. Estes animais são notáveis por explorarem habitats diversos. A proposta taxonômica utilizada no presente estudo foi desenvolvida por Silva Jr. (2001), considerando *Cebus nigritus* e *C. robustus* como espécies válidas, pertencentes ao subgênero *Sapajus*, que compreende ainda *C. apella, C. macrocephalus, C. libidinosus, C. cay* e *C. xanthosternos.*

A distribuição geográfica das diversas formas deste subgênero não é muito bem delineada, pois a determinação da distribuição geográfica de um táxon tradicionalmente baseia-se na ligação dos pontos de registro empírico mais externos da distribuição. Isto pode gerar vários erros, já que os fatores ambientais não são levados em consideração (Cerqueira, 1985, 1995; Cerqueira *et al.*, 1998). Este é o caso de *Cebus* e *Sapajus.*

A distribuição geográfica pode ser avaliada mais precisamente através do conceito de distribuição potencial, onde a área de distribuição de um táxon seria aquela correspondente à distribuição dos fatores ambientais ligados a ocorrência dos habitats e nicho de uma espécie, determinando assim os limites geográficos externos da distribuição (Cerqueira, 1985; Taylor e Taylor, 1979). Um método proposto para a determinação de hipóteses de distribuições potenciais foi delineado por Cerqueira (1985, 1995). De acordo com este método, para cada ponto de registro empírico devem ser levantados dados sobre fatores ambientais considerados potencialmente relevantes. Análises subseqüentes permitem estimar quais fatores são importantes para a distribuição do táxon. Depois de mapeadas as distribuições destes fatores, as áreas em comum obtidas através da sobreposição dos mapas indicam a distribuição potencial de uma espécie, criando uma hipótese passível de verificação.

## Metodologia

Foram considerados os 141 registros de ocorrência de *Cebus nigritus* e 94 de *C. robustus*, levantados por Silva Jr. (2001), a partir de dados de museus e literatura. Para cada localidade obtivemos dados referentes à vegetação e aos fatores climáticos. Os dados de vegetação foram levantados no mapa digital de ecorregiões (Dinerstein *et al.*, 1995), sendo então calculada a freqüência de ocorrências de cada táxon por ecorregião. Note-se que neste mapa as assim chamadas ecorregiões correspondem ao mapa de vegetação do Brasil do Instituto Brasileiro de Geografia e Estatística (Brasil, IBGE, 1992, 1993). Dados referentes aos fatores climáticos de cada ponto de registro empírico foram obtidos com a utilização do programa de busca de dados climáticos do Laboratório de Vertebrados, Universidade Federal do Rio de Janeiro (UFRJ). Este programa permite a obtenção de dados de minuto a minuto em qualquer localidade do Brasil. Os dados foram levantados para todas as espécies do subgênero *Sapajus*, para que se pudessem determinar os fatores importantes para as duas espécies em questão. As médias anuais de nove variáveis foram estimadas: temperatura média (TM), temperaturas máxima média (TX) e mínima média (TN), temperaturas máxima absoluta (MX) e mínima absoluta (MN), precipitação total (PR), umidade relativa (UR), nebulosidade (NB) e dias de chuva (DC).

**Tabela 1.** Freqüência de ocorrências de *Cebus nigritus* por ecorregião.

| Ecorregiões | Localidades Analisadas = 141 | Freqüência |
|---|---|---|
| Cerrado | 12 | 0,09 |
| Floresta costeira Bahia | 38 | 0,27 |
| Floresta costeira Serra do Mar | 17 | 0,12 |
| Floresta de interior Bahia | 26 | 0,18 |
| Floresta de interior Paraná/ Paraíba | 37 | 0,26 |
| Floresta de araucárias | 6 | 0,04 |
| Campos rupestres | 2 | 0,01 |
| Savana Uruguaia | 1 | 0,01 |
| Mangue sudeste do Brasil | 2 | 0,01 |

**Tabela 2.** Freqüência de ocorrências de *Cebus robustus* por ecorregião.

| Ecorregiões | Localidades Analisadas = 94 | Freqüência |
|---|---|---|
| Cerrado | 7 | 0,07 |
| Floresta costeira Bahia | 74 | 0,79 |
| Floresta de interior Bahia | 11 | 0,12 |
| Mangue nordeste do Brasil | 2 | 0,02 |

Foram feitas análises uni- e multivariadas (análise de variância unifatorial seguida do teste de Scheffé *a posteriori*, e análise linear discriminante) dos dados transformados em seus logaritmos na base dez. As análises foram realizadas para determinar se existem diferenças no clima entre as espécies de *Cebus*. As localidades de registro de *Cebus nigritus* e *C. robustus*, cujo clima foi classificado como sendo de outras espécies de *Cebus*, foram identificadas na análise discriminante. Posteriormente, cada espécie foi comparada com as demais agrupadas, determinando-se desta forma os fatores que limitam a distribuição.

## Resultados

Os registros de ocorrência referentes a *Cebus nigritus* distribuíram-se por nove formações vegetais, sendo mais abundantes em florestas costeiras e de interior (Tabela 1). *C. robustus* mostrou preferência por florestas costeiras (Tabela 2), apesar de também ocorrer em outras três formações distintas. As estatísticas básicas para os fatores climáticos levantados para *Cebus nigritus* e *C. robustus* estão nas Tabelas 3 e 4, respectivamente. Os coeficientes de variação foram relativamente altos.

O resultado da análise de variância unifatorial demonstrou que existem diferenças nas variáveis climáticas referentes às espécies do subgênero *Sapajus* (Tabela 5). A análise discriminante teve uma boa probabilidade de discriminação ($\lambda$ de Wilks com $p < 0,0001$), com 76,8% dos casos tendo sido classificados corretamente. As localidades mal classificadas na análise discriminante dispuseram-se, de maneira geral, na periferia das distribuições (Figs. 1 e 2).

Os resultados das análises de variância unifatorial comparando *C. nigritus* e *C. robustus* com o grupo formado pelas demais espécies são apresentados nas Tabelas 6 e 7, respectivamente. A análise linear discriminante classificou

**Tabela 3.** Estatísticas básicas dos fatores climáticos: *Cebus nigritus.*

| Variáveis | Média | DP | CV | Mínimo | Máximo | N |
|---|---|---|---|---|---|---|
| TM | 20,66 | 1,81 | 8,76 | 16,10 | 23,60 | 141 |
| TN | 15,88 | 2,44 | 15,36 | 9,70 | 21,00 | 141 |
| TX | 27,32 | 1,82 | 6,66 | 22,10 | 30,70 | 141 |
| MN | 4,84 | 0,73 | 15,08 | -9,5 | 10,90 | 141 |
| MX | 37,94 | 2,37 | 6,25 | 32,70 | 42,40 | 141 |
| PR | 1381,06 | 362,07 | 26,20 | 999,60 | 2800,80 | 141 |
| NB | 5,59 | 0,73 | 13,06 | 4,00 | 7,20 | 141 |
| UR | 19,19 | 4,65 | 24,23 | 69,80 | 86,80 | 141 |
| DC | 105,58 | 26,53 | 25,12 | 59,00 | 180,00 | 141 |

TM = temperatura média; TN = temperatura mínima média; TX = temperatura máxima média; MN = temperatura mínima absoluta; MX = temperatura máxima absoluta; PR = precipitação total; NB = nebulosidade; UR = umidade relativa; DC = dias de chuva.

corretamente 87,6% dos casos para *C. nigritus* (λ de Wilks com $p < 0,0001$), com cinco variáveis sendo importantes na função (Tabela 8). Para *C. robustus*, foram classificados corretamente 76,4% dos casos (λ de Wilks com $p < 0,0001$), com três variáveis dominando a contribuição para a função (Tabela 9). As variáveis que apresentaram diferenças significativas na análise de variância (Tabelas 6 e 7) e foram importantes na análise discriminante (Tabelas 8 e 9) foram selecionadas para estimar os limites climáticos de *C. nigritus* e *C. robustus.*

As distribuições climáticas — obtidas pela área em comum a todas as variáveis selecionadas colocadas em mapas — foram sobrepostas aos mapas digitais contendo as ecorregiões levantadas para cada espécie. As distribuições climáticas obtidas para ambas as espécies foram bastante grandes, ultrapassando em alguns graus os limites vegetacionais. As interseções entre as distribuições climáticas e vegetacionais indicaram uma primeira hipótese para as distribuições potenciais de *Cebus nigritus* (Fig. 1) e *C. robustus* (Fig. 2).

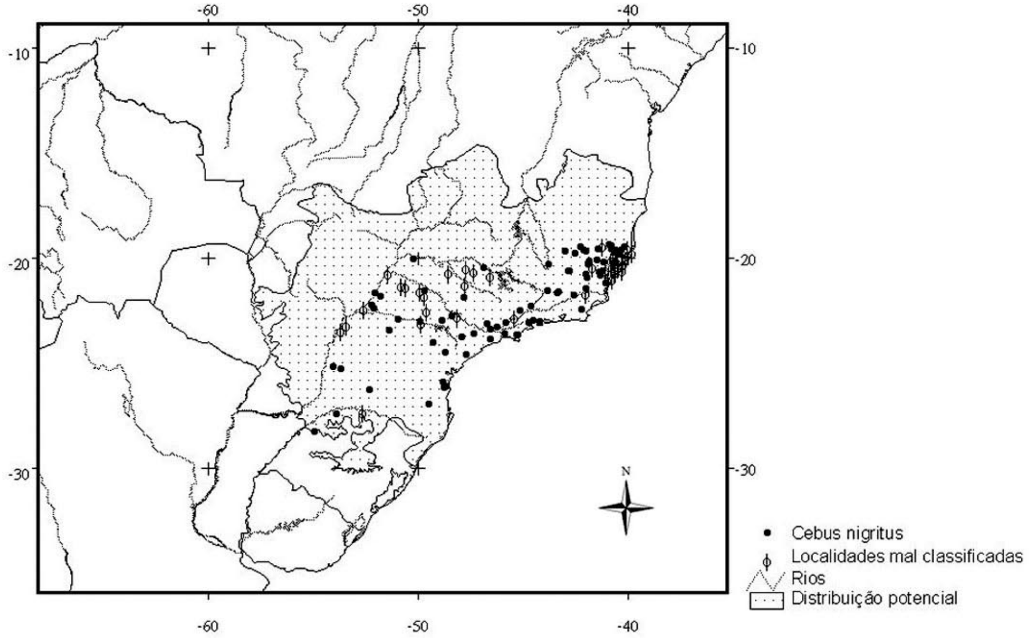

**Figura 1.** Distribuição potencial de *Cebus nigritus.*

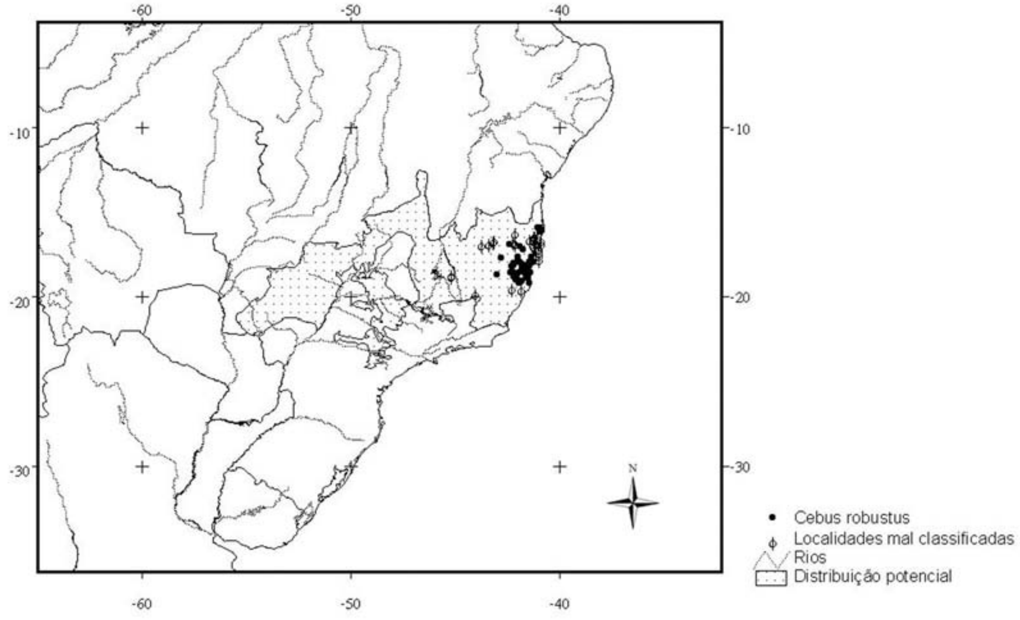

**Figura 2.** Distribuição potencial de *Cebus robustus.*

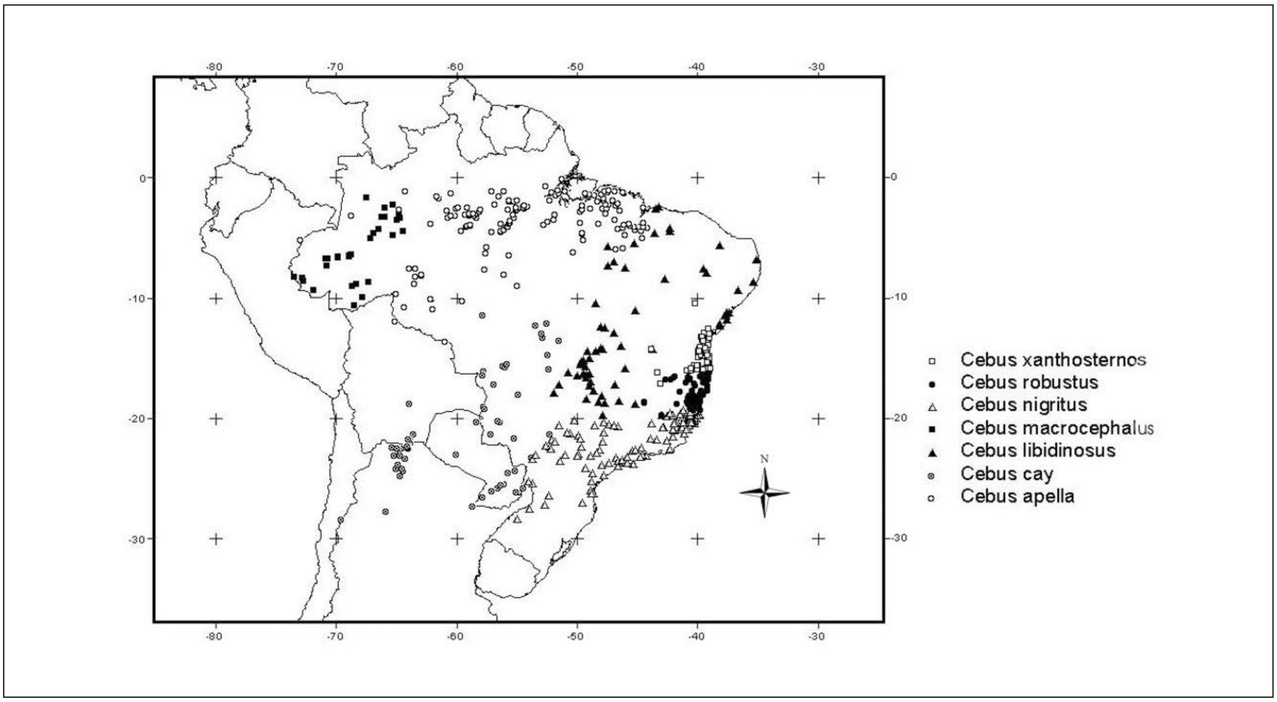

**Figura 3.** Registros de ocorrência das espécies de *Cebus*.

**Tabela 4.** Estatísticas básicas dos fatores climáticos: *Cebus robustus*.

| Variáveis | Média | DP | CV | Mínimo | Máximo | N |
|---|---|---|---|---|---|---|
| TM | 22,86 | 1,41 | 6,16 | 18,10 | 26,00 | 94 |
| TN | 18,93 | 1,40 | 7,39 | 14,40 | 20,90 | 94 |
| TX | 28,54 | 0,92 | 3,22 | 25,90 | 30,90 | 94 |
| MN | 8,90 | 2,77 | 31,12 | -0,10 | 12,00 | 94 |
| MX | 36,98 | 2,32 | 6,27 | 32,00 | 40,40 | 94 |
| PR | 1222,94 | 221,76 | 18,13 | 859,00 | 1731,40 | 94 |
| NB | 5,99 | 0,51 | 8,51 | 5,00 | 7,10 | 94 |
| UR | 81,46 | 3,10 | 3,80 | 70,50 | 85,30 | 94 |
| DC | 148,20 | 38,42 | 25,92 | 60,00 | 212,00 | 94 |

TM: temperatura média; TN: temperatura mínima média; TX: temperatura máxima média; MN: temperatura mínima absoluta; MX: temperatura máxima absoluta; PR: precipitação total; NB: nebulosidade; UR: umidade relativa; DC: dias de chuva.

**Tabela 5.** Resultados da análise de variância entre espécies do subgênero *Sapajus*. Letras diferentes denotam diferenças nos fatores após o teste de Scheffé.

| Variáveis | *C. apella* | *C. cay* | *C. libidinosus* | *C. macrocephalus* | *C. nigritus* | *C. robustus* | *C. xanthosternos* | p |
|---|---|---|---|---|---|---|---|---|
| TM | A | B | B | C | D | B | B | 0,00 |
| TN | A | B | B | A | C | B | A | 0,00 |
| TX | A | A | B | A | C | D | D | 0,00 |
| MN | A | B | C | D | B | D | A | 0,00 |
| MX | A | A | B | A | A | C | A | 0,00 |
| PR | A | B | C | D | E | F | F | 0,00 |
| NB | A | B | B | C | B | D | D | 0,00 |
| UR | A | B | C | D | B | A | A | 0,00 |
| DC | A | B | C | A | C | D | E | 0,00 |

TM: temperatura média; TN: temperatura mínima média; TX: temperatura máxima média; MN: temperatura mínima absoluta; MX: temperatura máxima absoluta; PR: precipitação total; NB: nebulosidade; UR: umidade relativa; DC: dias de chuva.

## Discussão

A hipótese resultante das análises estimou uma distribuição potencial para *Cebus nigritus* maior do que a distribuição de seus pontos de registro empírico (Fig. 1). Seus limites efetivos coincidem com os de outras espécies de *Sapajus.* Ao norte, a espécie parece não ocorrer além da margem direita do rio Doce, onde é sucedida por *C. robustus* e, mais a oeste, por *C. libidinosus* (Fig. 3). Este padrão de distribuição já havia sido relatado por Oliver e Santos (1991). A oeste, a distribuição é limitada pelo rio Paraná, sendo sucedida pela de *C. cay* a partir da margem oposta deste rio (Fig. 3).

O mesmo tipo de limitação da distribuição geográfica ocorre com *Cebus robustus*, que parece restringir-se ao norte pelo rio Jequitinhonha, e ao sul pelo rio Doce (Oliver e Santos, 1991). A hipótese de distribuição potencial tem também uma área maior do que a sugerida pelos dados empíricos (Fig. 2). No entanto, a distribuição efetiva é sucedida ao norte pela de *C. xanthosternos*, ao sul pela de *C. nigritus*, e a oeste pela de *C. libidinosus* (Fig. 3). A hipótese de distribuição potencial (Fig. 2) sustenta a possibilidade de que esta forma chegue ao rio São Francisco, como proposto anteriormente por Rylands *et al.* (1988).

A vegetação parece ser o principal fator limitante da distribuição de ambas as espécies a oeste, bem como daquela de *C. nigritus* ao sul. *C. nigritus* e *C. robustus* são, de fato, espécies endêmicas da Mata Atlântica. Os pontos de registro empírico no Cerrado, para ambas as espécies, localizaram-se em zonas de contato com a Mata Atlântica ou muito próximos a estas. A resolução da distribuição da vegetação não permitiu uma identificação precisa destas

**Tabela 6.** Análise de variância entre *Cebus nigritus* e o conjunto das demais espécies do subgênero *Sapajus* (*C. apella, C. cay, C. libidinosus, C. macrocephalus, C. robustus* e *C. xanthosternos*).

| Variável | F | p |
|---|---|---|
| TM | 398,63 | 0,00 |
| TN | 325,57 | 0,00 |
| TX | 281,58 | 0,00 |
| MN | 212,20 | 0,00 |
| MX | 0,36 | 0,55 |
| PR | 37,78 | 0,00 |
| NB | 19,30 | 0,00 |
| UR | 21,53 | 0,00 |
| DC | 139,49 | 0,00 |

TM: temperatura média; TN: temperatura mínima média; TX: temperatura máxima média; MN: temperatura mínima absoluta; MX: temperatura máxima absoluta; PR: precipitação total; NB: nebulosidade; UR: umidade relativa; DC: dias de chuva.

**Tabela 7.** Análise de variância entre *Cebus robustus* e o conjunto das demais espécies do subgênero *Sapajus* (*C. apella, C. cay, C. libidinosus, C. macrocephalus, C. nigritus* e *C. xanthosternos*).

| Variável | F | p |
|---|---|---|
| TM | 5,09 | 0,02 |
| TN | 0,31 | 0,58 |
| TX | 21,17 | 0,00 |
| MN | 7,46 | 0,07 |
| MX | 15,89 | 0,00 |
| PR | 74,73 | 0,00 |
| NB | 3,99 | 0,05 |
| UR | 1,02 | 0,31 |
| DC | 1,63 | 0,20 |

TM: temperatura média; TN: temperatura mínima média; TX: temperatura máxima média; MN: temperatura mínima absoluta; MX: temperatura máxima absoluta; PR: precipitação total; NB: nebulosidade; UR: umidade relativa; DC: dias de chuva.

**Tabela 8.** Correlações entre variáveis discriminantes e funções canônicas discriminantes entre *C. nigritus* e as demais espécies do subgênero *Sapajus* (*C. apella, C. cay, C. libidinosus, C. macrocephalus, C. robustus* e *C. xanthosternos*). As variáveis mais correlacionadas com as funções discriminantes apresentam-se em negrito.

| Variável | Função 1 |
|---|---|
| TM | **0,78** |
| TN | **0,71** |
| TX | **0,66** |
| MN | **0,57** |
| MX | -0,02 |
| PR | 0,24 |
| NB | 0,24 |
| UR | 0,18 |
| DC | **0,46** |

TM: temperatura média; TN: temperatura mínima média; TX: temperatura máxima média; MN: temperatura mínima absoluta; MX: temperatura máxima absoluta; PR: precipitação total; NB: nebulosidade; UR: umidade relativa; DC: dias de chuva.

**Tabela 9.** Correlações entre variáveis discriminantes e funções canônicas discriminantes entre *C. robustus* e as demais espécies do subgênero *Sapajus* (*C. apella, C. cay, C. libidinosus, C. macrocephalus, C. nigritus* e *C. xanthosternos*). As variáveis mais correlacionadas com as funções discriminantes apresentam-se em negrito.

| Variável | Função 1 |
|---|---|
| TM | 0,18 |
| TN | -0,04 |
| TX | **0,36** |
| MN | -0,22 |
| MX | **0,31** |
| PR | **0,68** |
| NB | -0,16 |
| UR | -0,08 |
| DC | -0,10 |

TM: temperatura média; TN: temperatura mínima média; TX: temperatura máxima média; MN: temperatura mínima absoluta; MX: temperatura máxima absoluta; PR: precipitação total; NB: nebulosidade; UR: umidade relativa; DC: dias de chuva.

zonas. Por isto, apesar de boa parte do Cerrado ter sido incluída na hipótese de distribuição potencial, *C. nigritus* e *C. robustus* estão provavelmente restritas aos entornos da Mata Atlântica. O ponto empírico situado na chamada "savana uruguaia" foi localizado numa região limítrofe com a Mata Atlântica, por isso a freqüência de ocorrências ter sido muito baixa (Tabela 1). Claramente, primatas não ocorrem nesta região, a não ser nas florestas de galeria e na Mata Atlântica limítrofe.

É interessante notar que em ambas as espécies analisadas, a hipótese inicial de distribuição potencial, resultante das análises dos fatores de clima e vegetação, indica uma distribuição maior do que a realizada. Isto sugere que estas espécies poderiam ocupar uma distribuição mais ampla do que a área de ocorrência atual determinada pelos registros de ocorrência, e que fatores históricos (cladogenéticos) e ecológicos (competição interespecífica) podem ter atuado para determinar o padrão de distribuição observado hoje. Desta maneira, podemos concluir que além dos fatores climáticos e de macrohabitat (aqui representados pelas ecoregiões), a presença de outras espécies de *Sapajus* parece ser também um fator importante, definindo os limites norte e oeste de *C. nigritus*, e os limites norte, sul e oeste de *C. robustus*, pois estas espécies não ocorrem em simpatria. Portanto, tanto fatores independentes como dependentes da densidade explicam os limites geográficos destas espécies.

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# STRUCTURE AND COMPOSITION OF WILD BLACK HOWLER TROOPS (*ALOUATTA CARAYA*) IN GALLERY FORESTS OF THE ARGENTINEAN CHACO

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*Eduardo Fernández-Duque*

## Introduction

The genus *Alouatta* occurs from the south of Mexico to northern Argentina and from the South American Pacific Coast to the Brazilian Atlantic Forest (Defler, 2003). *A. caraya* is the southernmost species, inhabiting central and southern Brazil, eastern Bolivia, Paraguay, and northern Argentina (Thorington *et al.*, 1984). Although there are adequate demographic data from populations in the forests of the Río Paraná in Argentina (Pope, 1968; Thorington *et al.*, 1984; Rumiz, 1990; Arditi and Placci, 1994; Brown and Zunino, 1994; Zunino *et al.*, 1996, 2001), the data are comparatively limited for populations in the Argentinean Chaco (Arditi and Placci, 1990; Brown and Zunino, 1994; Dvoskin *et al.*, 2004).

In this preliminary study we describe the composition and structure of wild troops of *A. caraya* that inhabit the gallery forests along the Riacho Pilagá in Formosa Province and compare them with data obtained from this area two decades ago.

## Methods

The *A. caraya* population we studied occupies forests on the Guaycolec Ranch (58°13'W, 25°54'S), a spread of 25,000 ha, 25 km northeast of the city of Formosa. The ranch covers a mosaic of grasslands, savannas, dry forest, and semideciduous gallery forests. Our study area consisted of approximately 300 ha of gallery forest along the banks of the Riacho Pilagá. We mapped the area using a transect grid, marked every 50 m with colored tape.

In July and August 2001, two people surveyed the study area for black howler troops from 07:30 h to 17:00 h working together for 11 days and independently for 13 days, making a total of 24 days. Troops were found by following the loud, characteristic vocalizations, or by spotting resting individuals or moving branches. All visible individuals in each troop were classified into age and sex categories as suggested by Rumiz (1990):

- *Adults*: Females with blonde body color but darker and grayish back, barely noticeable clitoris, and broad vulvar lips with irregular pigmentation; if nursing, with swollen breasts and long nipples. Males entirely black with orange testicles.
- *Subadults*: Females with narrow vulvar lips, shorter and broader clitoris, and smaller body size than adults. Males with whitish or yellowish testicles and an almost entirely brownish-black coat, or black with golden highlights.
- *Juveniles*: We distinguished small, medium, and large juveniles. Females had a long thin clitoris, thin vulvar lips, body color usually paler than adult females but never reddish. Males were yellowish ventrally with a darker back, dark stripe on forehead, testicles descended and visible.
- *Infants*: Females had a penniform clitoris and narrow vulvar lips. Male testicles were broader than the female vulvar lips.

## Results

We made contact with troops on 19 occasions, for a total observation time of 24.5 h; each troop was observed for an average of 1.1 h. The two observers encountered monkeys on nine occasions while surveying together and on ten occasions while working independently.

We identified 111 individuals in thirteen mixed-gender reproductive troops (Table 1). Two additional individuals were found ranging alone, but we found no temporary associations of males or females in the area. The reproductive troops ranged in size from 5 to 15 individuals (mean 8.5, SD ± 3.4). The study population consisted of mixed-gender troops with one or several adult males. Uni-male troops were more common (n = 10) than multi-male troops (n = 3). Uni-male troops were also smaller than multi-male troops (mean of 7.5 ± 2.7 vs. 12.0 ± 3.6 individuals). There were a relatively large number of infants (n = 22) compared to adult females (n = 28).

Approximately 40% of the individuals were adults (Table 1), while juveniles — the second largest age-class — made up slightly less than a third of the population (31%). Subadults (7%) and infants (38%) comprised the rest. Overall,

**Table 1.** Size and composition of troops of *Alouatta caraya* in Formosa Province, Argentina.

| Group | AM | AF | SAM | SAF | LJM | LJF | MJM | MJF | MJU | SJM | SJF | I | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| G1 | 3 | 4 | 1 | | | | 2 | | | | | 3 | 13 |
| G3 | 2 | 2 | | | | | 1 | 1 | | 1 | | 1 | 8 |
| G9 | 2 | 2 | | | | 1 | 1 | 2 | 1 | 2 | 1 | 3 | 15 |
| G2 | 1 | 2 | | | | | 1 | 1 | | | | 1 | 6 |
| G4 | 1 | 2 | | | | | 1 | 1 | | | | 1 | 6 |
| G5 | 1 | 3 | 1 | | | | 1 | 2 | | 1 | 2 | 2 | 13 |
| G6 | 1 | 2 | 1 | | | | | 1 | | 1 | | 2 | 8 |
| G7 | 1 | 2 | | | | | | 1 | | | | 2 | 6 |
| G8 | 1 | 1 | | 1 | | | 1 | | | | | 1 | 5 |
| G10 | 1 | 2 | 1 | | | | | | | | 1 | | 5 |
| G11 | 1 | 1 | 1 | | | | | 1 | | | 1 | 1 | 6 |
| G12 | 1 | 3 | | | | | | 1 | | 1 | | 3 | 9 |
| G13 | 1 | 2 | 2 | | 1 | | 1 | | | 1 | 1 | 2 | 11 |
| Solitary | 1 | | | | | | | | | | | | 1 |
| Solitary | 1 | | | | | | | | | | | | 1 |
| **Total** | **19** | **28** | **7** | **1** | **1** | **1** | **9** | **11** | **1** | **7** | **6** | **22** | **113** |

AM: Adult male; AF: Adult female; SAM: Subadult male; SAF: Subadult female; LJM: Large juvenile male; LJF: Large juvenile female; MJM: Medium juvenile male; MJF: Medium juvenile female; SJM: Small juvenile male; SJF: Small juvenile female; LJU: Large juvenile unsexed; MJU: Medium juvenile unsexed; SJU: Small juvenile unsexed; I: infant.

the numbers of females and males in the population were very similar (48 and 45, Table 1). In the adult class, the sex ratio was strongly biased in favor of females (28 and 17). The numbers of female and male juveniles were very similar for all three juvenile categories as well as for all juvenile categories combined (18 and 17). The small sample sizes of subadults and infants prevented any statistical analysis.

## Discussion

The average group size of *A. caraya* has apparently increased during the last two decades: Brown and Zunino (1994) estimated a mean group size of 6.3 individuals during censuses conducted in 1981, and Arditi and Placci (1990) found no groups with more than eight individuals during a one-year study of the population in 1989-1990. Both estimates are significantly smaller than ours (range: 5 to 15 individuals, mean = 8.5). An increase in troop size may suggest that the population is expanding, as has been observed in red howlers in Venezuela (Rudran and Fernandez-Duque, 2003). In our population, the three multi-male groups were significantly larger than uni-male troops. The age structure of the troops also suggests an expanding population, as indicated by a relatively large number of juveniles and infants and by the number of reproducing adult females.

Our estimates of sex ratio should be considered tentative due to the small number of groups and the potential for age misclassification. It would be necessary to determine the sex of the large number of unsexed infants before any conclusions could be reached. Rudran and Fernandez-Duque (2003) found that the ratio of male to female infants changed in a linear association with density. In other words, more females than males were born at low population densities. If the observed trend of more male than female births were to be confirmed, it might indicate that the population is expanding. On the other hand, the strongly biased sex ratio in the subadult category needs to be considered with some caution. Although it is relatively easy to identify subadult males because they have started to show signs of the characteristic black coat of adult males, it is more difficult to classify subadult females who cannot be differentiated from adult females by coat color. The number of subadult females may, therefore, have been underestimated.

In conclusion, our preliminary data suggest that the population has expanded during the last two decades, in agreement with a previous analysis of changes in population density in the howler troops of this region (Dvoskin *et al.*, 2004). Our conclusion is mainly supported by the observed increase in average troop size and by the relatively large number of infants and juveniles. Other parameters of population structure may confirm and detail this expansion, but longer-term demographic records will be required to construct the necessary dataset. For example, the proportion of uni-male troops may also indicate the status of the population, as in Venezuela, where the proportion of uni- and multi-male troops changed dramatically over 30 years in a population of red howler monkeys (Rudran and Fernandez-Duque, 2003). Uni-male troops accounted for a relatively larger proportion of the population when the population was declining than when it was expanding. Although the reasons for the change in the proportion of uni-male troops were not clear, if confirmed this factor could become a convenient tool for population management, helping us anticipate, with relative accuracy, changes in population size that would take decades to observe.

The vast amount of data on the population biology of howler monkeys, spanning several decades of fieldwork, has convincingly shown the limitations of short-term studies (Rudran and Fernandez-Duque, 2003; Estrada *et al.*, 1999; Fedigan and Jack, 2001). Thus, although our preliminary study offers a few solid results and several tentative findings worth examining in the future, it is imperative that we expand the database if we want to examine how social and environmental factors may be shaping the observed demographic features.

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# THE PARASITE BEHAVIOR HYPOTHESIS AND THE USE OF SLEEPING SITES BY BLACK HOWLER MONKEYS (*ALOUATTA CARAYA*) IN A DISCONTINUOUS FOREST

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## Introduction

Primates are particularly susceptible to parasitic infections because they live in social groups that facilitate their transmission (Stoner, 1996). The costs and benefits of living in smaller and larger social groups have been examined in a number of primate field studies (Struhsaker, 1969; Eisenberg *et al.*, 1972; Clutton-Brock and Harvey, 1977; Van Schaik, 1989; Janson, 1992; Sterck *et al.*, 1997; Chapman and Chapman, 2000; Kappeler and van Schaik, 2002). Several factors influence social group living: 1) the availability, abundance, and distribution of food resources—limiting the number of animals that an area can support or influencing foraging efficiency in groups of different sizes (Wrangham, 1980; Chapman, 1990); 2) historical and social traits, including changes in group size or population size (Stevenson *et al.*, 1998); 3) life history traits such as birth rates, sex ratios, mortality, and dispersal patterns (Altmann, 1980; Dunbar, 1988; Crockett, 1996); 4) predation pressure (Stanford, 2002); 5) cooperation and affiliation among individuals (Sussman and Garber, 2004); and 6) traits related to social organization that are phylogenetically conservative and do not change in different environments (DiFiore and Rendall, 1994). There are few studies that consider parasite transmission as a factor in limiting group size or affecting group structure in social primates (Freeland, 1976; Janson, 2000).

Parasitism has density-dependent costs related to disease transmission; therefore, it may play an important role in increasing the fitness of individuals living in smaller social groups, who benefit from an enhanced amount of grooming. Because parasitic infections can cause a fitness decrease in animals, some parasite-avoidance behaviors (e.g., mammals licking their own fur, auto- and allogrooming, mud wallows, and dust baths) can be expected (Alexander, 1974; Pulliam and Caraco, 1984; Mooring and Hart, 1992; Loehle, 1995). Parasites can directly affect host survival by increasing predation risk or decreasing competitive abilities (Scott, 1988). In addition, if parasite loads affect health and physical appearance, they can influence patterns of female mate choice or the ability of individuals to compete directly for access to sexual partners (Freeland, 1981; Hamilton and Zuk, 1982).

Due to their use and re-use of a limited ranging area, primates living in small forest patches with restricted home ranges will be more exposed to infection and re-infection (increasing the amount of the re-infecting dose) with parasite ova and larvae (Freeland, 1976, 1980; Gilbert, 1997). Behaviors that avoid and/or reduce parasite infections (Freeland, 1980; Hausfater and Meade, 1982) constitute an alternative to physiological immunity (Keymer and Read, 1991) and may contribute to the survival of some individuals. Howler monkeys (*Alouatta*) host a number of intestinal parasites that are eliminated in their feces (Stuart *et al.*, 1998; Santa Cruz *et al.*, 2000; Muller *et al.*, 2000). This study examines the black howler monkey's (*Alouatta caraya*) use of defecation and night resting sites as a strategy to avoid parasite re-infection in a forest fragment in northern Argentina.

A number of hypotheses have been offered to explain the selection of sleeping sites in primates (Anderson, 1984; Di Bitetti *et al.*, 2000): 1) Parasite hypothesis: different trees are chosen every night to avoid recontamination with parasites; 2) Predation hypothesis: a) different and inaccessible trees are used so that predators cannot predict the locations of the sleeping sites, or b) contrariwise, the persistent use of the same trees that provide the most effective escape routes from predators; 3) Thermoregulatory hypothesis: energy conservation associated with individuals huddling together when it is cold; 4) Social hypothesis: monkeys choose sleeping sites that allow social contact and social bonding; 5) Safety hypothesis: howlers select trees that offer secure and sheltered platforms to sleep in relaxed positions or to avoid severe weather; and 6) Feeding site hypothesis (von Hippel, 1998): monkeys prefer to sleep near or in feeding trees. If howlers select sleeping sites to reduce the chances of parasitic infections then they will defecate in places different from those where they sleep (avoiding the contamination of sites they use often). They should also defecate from low branches in order to avoid sullying supports used as potential traveling routes or sleeping sites.

## Methods

*Alouatta caraya* is an arboreal folivore-frugivore. Its range in northern Argentina marks the extreme southern distribution of the genus (Brown and Zunino, 1994). The study was carried out in a fragment of semideciduous gallery forest in northern Argentina (27°30'S and 58°41'W) in the basin of the Río Riachuelo, a tributary of the Río Paraná (Fig. 1). The area is between 50 and 60 m above sea level. The climate is subtropical, with an annual average temperature of 21.7° C and annual average precipitation of 1230 mm (Servicio Meteorológico Nacional, from 1901–1950). Rains are frequent year-round, but decrease considerably in July and August. The vegetation forms a mosaic of tall and low forests, savannas with palms, grasslands and lowland zones with lagoons and "esteros" (marshes). The primary forest has been and is currently being logged intensively.

A group of black howlers was followed for 15 days in August 1994 (winter) and 15 days in February 1995 (summer) from sunrise till sunset. There were 10 individuals in the group in the winter period (1 adult male, 2 subadult males, 3 adult females, 1 subadult female, 2 juveniles and 1 infant) and 9 individuals in the summer (1 adult male, 3 subadult males, 2 adult females, 1 subadult female, 1 juvenile and 1 infant). The forest fragment of 8.5 ha was subdivided into 212 quadrates of 20 x 20 m. We recorded the quadrates where the group defecated and slept at night, and then compared the frequencies of quadrate use with a G-test (Sokal and Rohlf, 1995). We also recorded the height and species of trees in which the monkeys defecated and slept. The height differences were analyzed with a Mann-Whitney test. The floristic composition and vegetation structure were taken from Zunino (1986) and Rumiz *et al.* (1986).

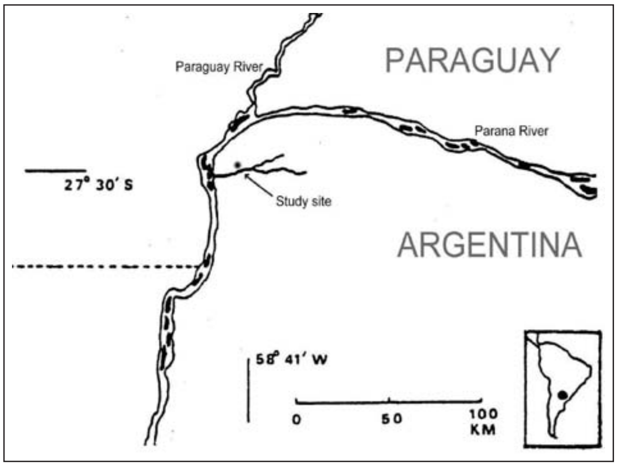

**Figure 1.** Location of the study site.

## Results

Black howler monkeys defecate 2.63 times a day (sd = 0.49, n = 205 [total number of defecations of all individuals, excluding infants]), generally after resting (when they wake up in the morning and after an afternoon nap) and before going to sleep at night. In 60% of the 205 defecations recorded, the entire group defecated at about the same time. In 21%, all of the individuals but one defecated, and in 19% all but two defecated. The distribution and the frequency of quadrates used for night resting showed that the howlers were selective in the areas used for sleeping sites (site fidelity). They used different quadrates and locations in the forest to sleep and to defecate ($G_{\text{Williams}} = 112.36$, df =1, $p < 0.001$). The heights at which they defecated (8.33 ± 2.97 m) and at which they slept (18.07 ± 4.88 m) were significantly different ($U = 189$, $N_1 = 110$, $N_2 = 205$, $p < 0.001$). They slept in the crowns of the trees and defecated from the lower branches directly onto the ground. The group used six trees as night resting sites: five *Ficus monckii* trees (90.1%) and a *Tabebuia ipe* (9.9%). The troop defecated in 23 trees of nine different species.

*Ficus monckii* trees were commonly used as both sleeping (90.1%) and defecating sites (35.12%) (Table 1). These fig trees are the largest in this semideciduous forest (Rumiz *et al.*, 1986). The importance of *F. monckii* may also be its asynchrony in leafing and fruiting phenology, as it thus provides a year-round source of fruits and leaves (Zunino, 1987, 1989). The monkeys fed in these trees before going to sleep at night and when they woke up in the morning. In total, they used six different sleeping sites on the 20 nights of our two study periods, suggesting site fidelity. All group members slept together each night. Three times they used the same tree for three consecutive nights, and three times they used the same tree on two consecutive nights, again indicating site fidelity.

## Discussion

The differences in the frequency of quadrate use and the heights at which the howlers defecated and slept may well reflect their attempts to diminish contact with feces in areas where they carry out much of their daily activity. Defecating in specific areas without understorey vegetation (low heights) could diminish the individual's chance of infection and re-infection by parasite ova or larvae on sullied branches or the leaves they may later come to eat. Following the hypotheses proposed above, however, the choice of sleeping trees did not appear to be related to parasite avoidance, at least as stated (Hypothesis 1: they used the same trees on consecutive nights), but instead could be related to behav-

**Table 1.** Use of different tree species by *A. caraya* for defecation, sleeping, and eating.

| Species | % of use as defecation sites | % of use as sleeping sites | % in diet (from Zunino 1989) | DBH[1] m | Height m |
|---|---|---|---|---|---|
| *Tabebuia ipe* | 3.41 | 9.10 | 4.2 | 0.40 | 20.0 |
| *Ficus monckii* | 35.12 | 90.90 | 45.83 | 0.52 | 12.25 |
| *Allophylus edulis* | 3.90 | 0 | 0.1 | 0.14 | 4.0 |
| *Celtis* sp. | 5.85 | 0 | 6.8 | 0.16 | 6.33 |
| *Enterolobium contortisiliquum* | 6.34 | 0 | 1.04 | 0.5 | 15.17 |
| *Gleditsia amorphoides* | 28.29 | 0 | 5.26 | 0.17 | 6.42 |
| *Myrcianthes pungens* | 4.39 | 0 | 0 | 0.23 | 6.46 |
| *Pithecelobium scalare* | 4.87 | 0 | 0.05 | ? | ? |
| *Phytolacca dioica* | 7.80 | 0 | 4.06–10 | 0.3 | 13.0 |
| Other | 0 | 0 | 32.66–26.72 | - | - |

[1] DBH: diameter at breast height.

iors designed to decrease predation risk. Braza *et al.* (1981) described a behavior in *A. seniculus* in which the monkeys rubbed their anus on a tree branch after defecating, behavior that could expose other group members to parasites. We observed a similar behavior in *A. caraya.* These howler behaviors do not appear to be consistent with avoiding exposure to parasites.

Sleeping high up in the trees is a common pattern in primates (Anderson, 1984). In this study howlers slept in tall trees characterized by a closed crown. This may be related to reducing predation risk from terrestrial predators while the closed crown minimizes risk from aerial predators. Although black howler monkeys do not have many predators at this site, potential predators include the jaguarondi (*Herpailurus yagouaroundi*) and dogs (*Canis domesticus*). We did not observe any predation or predator attacks, and reports of predation on atelines are rare anyway (Di Fiore, 2002). The relationship between the selection of sleeping trees and predation avoidance remains unclear. Selectivity in the trees used as sleeping sites was evident in that they were not the most abundant trees in the forest. As such, the selection of sleeping trees was consistent with a predator avoidance hypothesis: *Ficus* and *Tabeuia* trees were the tallest in the forest and possibly provided protection against predators.

We also found evidence in support of the thermoregulation hypothesis: they always slept huddled as a group. The social hypothesis was supported because the large crowns of the trees allowed the group members to sleep together. The safety hypothesis could not be discounted because the selected trees offered large branches and crowns to accommodate the individuals (pers. obs.).

Lastly, the feeding site hypothesis fits because *Ficus* trees were the major source of food in the howlers' diet (Table 1). *Ficus monckii* was the most frequent tree used as a sleeping site and the most important species in the black howler monkey diet (Zunino, 1987, 1989), representing 45.8% of the feeding time (Zunino, 1989). The leaves and fruits of *F. monckii* were available during almost all the year owing to the asynchronous phenology of this species (Zunino, 1986, 1987, 1989). During the winter when other species such as *Celtis* sp. and *Tabebuia ipe* (Zunino, 1987, 1989) increase in dietary importance (depending on their phenology), these species also were used as sleeping sites. Although we cannot discount a social function for sleeping site selectivity, the selection of large feeding trees as sleeping sites might best represent a foraging strategy.

Although the selection of sleeping trees was consistent with several alternative hypotheses, it was not consistent with parasite avoidance in so far as they used the same trees for defecating and sleeping on consecutive nights and only six sites during the 20 days of the study. Their tendency to move down in the forest to defecate, and do so in areas with sparse understoreys, however, might well be adaptive in terms of avoiding parasitism.

Other howler species such as *Alouatta palliata* (*v.* Dudley and Milton, 1990; Stuart *et al.*, 1990; Stoner, 1996), *A. seniculus* (*v.* Braza *et al.*, 1981; Gilbert, 1994, 1997) and *A. guariba* (*v.* Stuart *et al.*, 1993) have been recorded showing similar behavior in terms of selectivity of sleeping trees and defecation sites. Braza *et al.* (1981) reported that *A. seniculus* defecated directly over the ground as a way to avoid contaminating possible foraging routes. Gilbert (1997) showed that *A. seniculus* used specific trees to defecate from, defecating from lower branches and avoiding contact with underlying vegetation. Gilbert (1997) argued that defecation site choice may represent a parasite avoidance behavior in red howlers, and that this behavior could contribute to the relatively low abundance of endoparasite infection in howlers (Thatcher and Porter, 1968; Stuart *et al.*, 1990; Gilbert, 1994). Finally, a number of howler species, including black howlers, are reported to show behaviors associated with the reduction of disease transmission, such as the selection of defecation sites near the ground. Phylogeny may play an important role in the evolution of this behavior.

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# NEWS

## A RESERVA BIOLÓGICA FEDERAL DA MATA ESCURA E SUA IMPORTÂNCIA COMO UNIDADE DE CONSERVAÇÃO PARA OS PRIMATAS DO MÉDIO RIO JEQUITINHONHA, MINAS GERAIS

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### Introdução

Antes mesmo da chegada dos Bandeirantes no vale do Jequitinhonha, em pleno século XVII, criadores de gado já ocupavam a região (Mascarenhas *et al.*, 1989). Entretanto, somente com a descoberta do ouro nas décadas finais de 1600 e da extração do diamante no século seguinte que, de fato, esta região ganhou espaço na história econômica brasileira e seu povoamento se deu de forma mais efetiva (Mascarenhas *et al.*, 1989). Este processo rápido de urbanização alcançado promoveu dificuldades no abastecimento de gêneros alimentícios para a região, o que favoreceu o surgimento de uma frágil agricultura de subsistência, associada, quase sempre, à pecuária de corte (Mascarenhas *et al.*, 1989). Ainda assim, nos anos de 1840, a zona de ocupação nativa da Mata Atlântica em Minas Gerais se limitava à região entre os rios Doce e Jequitinhonha, onde índios Botocudos vagavam livremente, atacando intrusos com certa freqüência (Dean, 1997).

Ainda hoje, o índice de pobreza ostentado pela região é elevado, ocasionando uma intensa migração da zona rural para os grandes centros urbanos e um esvaziamento demográfico persistente (Brasil, IBGE, 2004). Com mais de dois terços da população vivendo na zona rural, ela tem sido caracterizada em vários estudos como "região deprimida", onde os índices de pobreza, miséria, desnutrição, mortalidade, analfabetismo, desemprego e infra-estrutura sócio-econômica imperam desfavoravelmente em grande parte dos municípios (Gonçalves, 1997; Dias *et al.*, 2002; Ribeiro e Galizoni, 2003).

A média bacia do rio Jequitinhonha estende-se da foz do rio Araçuaí até a cidade de Salto da Divisa, no limite dos Estados de Minas Gerais e Bahia. Neste trecho, são registradas formações vegetais adaptadas a baixos índices pluviométricos e altas temperaturas, destacando-se a caatinga de porte arbustivo, indicando intervenção antrópica (Veloso *et al.*, 1991; SEI, 1997).

A floresta estacional semidecidual e decidual, especialmente de terras baixas, de porte mais desenvolvido, intercala-se à caatinga, que desaparece progressivamente enquanto se avança para leste, em direção do litoral. Pelo menos em três municípios dentro de Minas Gerais há presença de floresta ombrófila densa sub-montana e montana: Bandeira, Santa Maria do Salto e Salto da Divisa (Veloso *et al.*, 1991; Silva e Casteleti, 2003; Andrade, 2004). O antropismo adquire maior proeminência nos municípios mais próximos do baixo rio, o que se evidencia nas extensas pastagens que dominam toda a área. Generaliza-se uma vegetação secundária envolvendo eventuais remanescentes da cobertura vegetal original insulados nos topos das elevações (Gonçalves, 1997; Melo, 2004).

Exatamente em função dessas condições ambientais e da zona de tensão ecológica presente na região que o Instituto Brasileiro de Meio Ambiente e dos Recursos Naturais Renováveis (IBAMA) decretou, em 05 de junho de 2003, a Reserva Biológica (REBIO) da Mata Escura. A reserva abrange uma área aproximada de 51.000 ha, entre os municípios de Jequitinhonha e Almenara (Fig. 1).

## Breve Histórico

Sua história de criação remonta o final da década passada, quando, em 1999, uma equipe do Instituto Estadual de Florestas de Minas Gerais (IEF) e da Universidade Federal de Minas Gerais (UFMG) visitou a região com o intuito de identificar os principais remanescentes florestais de Mata Atlântica, com base nas áreas prioritárias para conservação da biodiversidade indicadas pela Fundação Biodiversitas (1998). A região nordeste do estado foi priorizada pelo IEF e pela UFMG exatamente por ser a única que contém fragmentos florestais que possam abrigar uma das últimas populações selvagens do mico-leão-da-cara-dourada (*Leontopithecus chrysomelas*) e do macaco-prego-do-peito-amarelo (*Cebus xanthosternos*), além de existirem poucos inventários faunísticos significativos para a região (Rylands *et al.*, 1988, 1991–1992; Oliver e Santos, 1991; Pinto e Rylands, 1997; Ribon e Maldonado-Coelho, 2000, 2001; Feio e Caramaschi, 2002; Melo *et al.*, 2002; Ribon *et al.*, 2002).

Na ocasião, em função da descoberta de uma nova população de muriquis-do-norte (*Brachyteles hypoxanthus*) na área (Melo *et al.*, 2002), a Coordenadoria de Proteção da Vida Silvestre, dentro da Diretoria de Pesca e Biodiversidade do IEF, sugeriu a criação de uma Unidade de Conservação (UC) de proteção integral com 20.500 ha, que não foi acatada pela então diretoria geral do referido órgão.

Em 2002, em função de uma compensação ambiental exigida pelo IBAMA com a construção do Aproveitamento Hidrelétrico de Itapebi, em Itapebi (BA), consultores estiveram na região e fizeram um estudo técnico mais detalhado indicando a atual área de criação da reserva na categoria de Parque Nacional. O decreto saiu em 2003, mas considerou a UC como uma REBIO com o dobro do tamanho original sugerido pelo IEF.

O decreto de criação da REBIO foi muito comemorado pela comunidade científica, porém a população local se rebelou e entrou com diversos pedidos na justiça e acabou mobilizando a equipe do Ministério do Meio Ambiente, que estuda

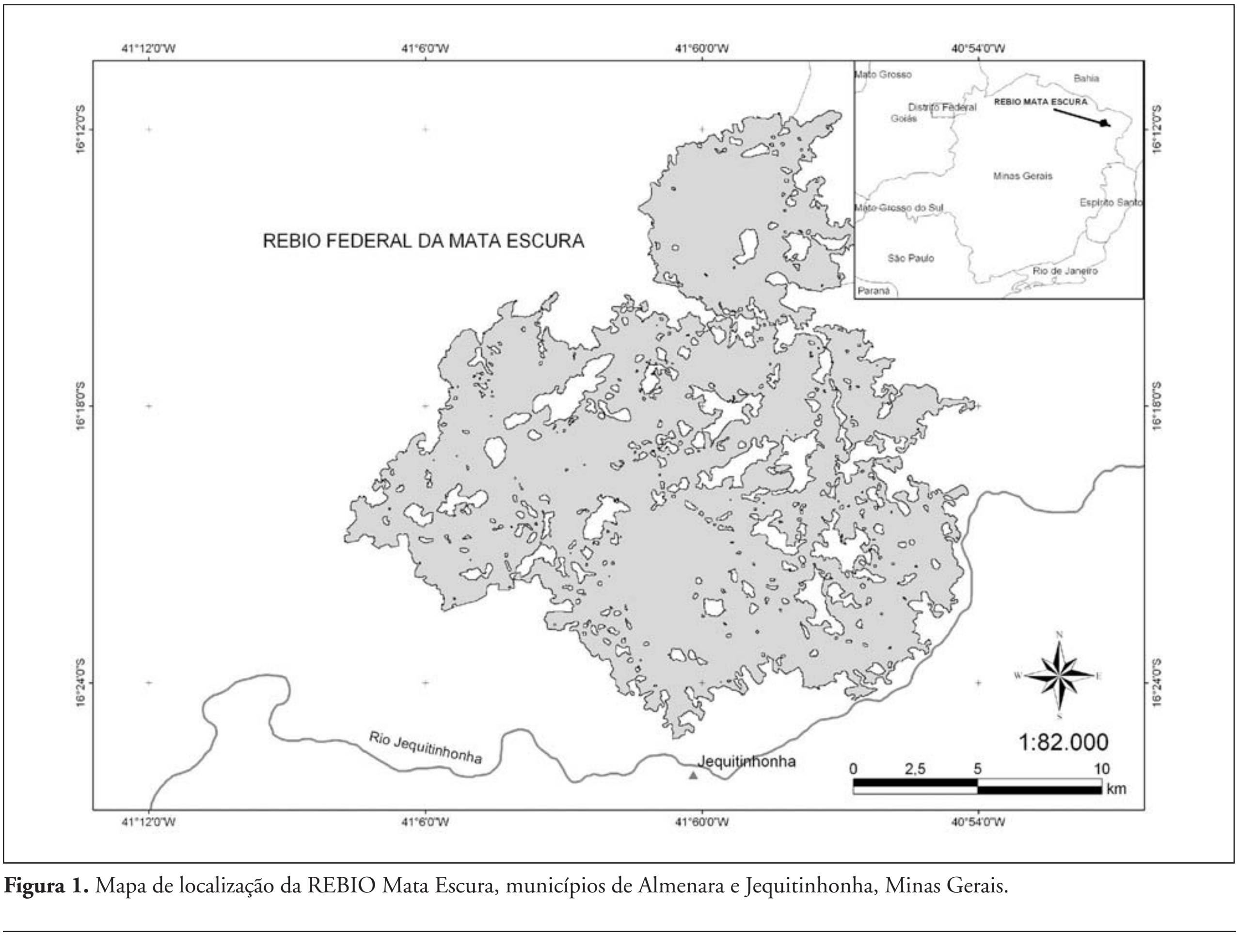

**Figura 1.** Mapa de localização da REBIO Mata Escura, municípios de Almenara e Jequitinhonha, Minas Gerais.

meios de revogar o decreto. A situação e o futuro da REBIO ainda são incertos, porém, estudos recentes feitos na região têm enfatizado a importância crucial que a área possui para a fauna, especialmente os primatas.

## Importância Biológica

Melo *et al.* (2005) encontraram três espécies de primatas criticamente em perigo de extinção no Brasil nessa área protegida e a REBIO se configura como a única localidade no mundo com essas condições, pois foram confirmadas populações para o macaco-prego-do-peito-amarelo (*Cebus xanthosternos*), o bugio-ruivo (*Alouatta guariba guariba*) e o muriqui-do-norte (*Brachyteles hypoxanthus*). Além das três espécies serem consideradas mundialmente ameaçadas (IUCN, 2004), duas delas se encontram listadas entre as 25 espécies de primatas mais ameaçadas do planeta (Mittermeier *et al.*, 2005). Melo *et al.* (2005) realizaram estudos sobre a densidade populacional de primatas na região do Jequitinhonha e os dados apontam para populações pequenas, isoladas e suscetíveis à caça (Fig. 2).

A REBIO abriga ecossistemas diversos, como os campos encontrados na parte mais elevada sobre solo de cascalho e areia quartzítica, onde as bromeliáceas são abundantes e as arvoretas têm até 3 m de altura. Musgos, líquens, algumas melastomatáceas e arbustos como *Erythroxylum* sp. também estão presentes. A vegetação é característica, diferente de outros campos naturais encontrados no sul e Serra do Espinhaço em Minas Gerais (Andrade, 2004). Como estes campos ocupam pequena extensão, devem ser considerados de alta relevância para conservação, pois apresentam características únicas e podem desaparecer rapidamente sob interferência antrópica. Além disso, a vegetação de Mata Atlântica encontra-se bem preservada em vários trechos da REBIO, especialmente nos vales encaixados, que são extensos e contínuos.

**Figura 2.** Indivíduo de macaco-prego-do-peito-amarelo (*Cebus xanthosternos*) encontrado em cativeiro na cidade de Jequitinhonha, Minas Gerais.

Da avifauna registrada na Mata Escura, duas espécies foram consideradas ameaçadas em nível global, quatro em nível nacional e dez espécies são listadas como ameaçadas no estado, além de várias outras citadas como presumivelmente ameaçadas (Ribon e Maldonado-Coelho, 2000; Ribon *et al.*, 2002). O gavião-pombo-grande (*Leucopternis polionota*), o gavião-de-penacho (*Spizaetus ornatus*), o gavião-pega-macaco (*S. tyrannus*), a tiriba-de-orelha-branca (*Pyrrhura leucotis*), o joão-baiano (*Synallaxis cinerea*) e o papagaio-de-peito-roxo (*Amazona vinacea*) estão na categoria "em perigo" (nível estadual) e essas três últimas são tidas como "vulneráveis" em nível nacional (Fundação Biodiversitas, 2003). O papagaio chauá (*A. rhodocorytha*) é listado como "criticamente em perigo" em Minas Gerais e "em perigo" no Brasil (Machado *et al.*, 1998; Fundação Biodiversitas, 2003). Juntamente com estas, o tropeiro-da-serra (*Lipaugus lanioides*) é considerado "vulnerável" globalmente e em nível estadual. Como *L. lanioides*, a jandaia (*Aratinga auricapilla*) tem a mesma classificação em nível global, sendo, entretanto, considerada "presumivelmente ameaçada" em nível estadual. O uru (*Odontophorus capueira*), o araçari-banana (*Baillonius bailloni*) e a araponga (*Procnias nudicollis*) também são considerados "vulneráveis" pela lista estadual (Machado *et al.*, 1998).

Não há dúvidas quanto ao extremo valor biológico identificado na região, sua beleza cênica e seu conjunto de ecossistemas, com áreas de transição significativas entre faunas e floras distintas. É dever do Estado zelar pela manutenção desse acervo importante e cabe à sociedade científica se manifestar urgentemente pela manutenção do atual decreto e a implementação imediata da REBIO, uma vez que os recursos previstos pela compensação ambiental existem e necessitam apenas de vontade política para serem utilizados.

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## EXTRAORDINARY OBSERVATION OF WILD CAPUCHIN MONKEY – MARMOSET ASSOCIATION

*Jeanne Shirley*

Wild bearded capuchin monkeys (*Cebus libidinosus*) living in dry woodland habitat in the state of Piauí, in northeastern Brazil, are currently being studied because of their ability to use tools. The study site is a Biological Reserve of about 250 ha managed by the Fundação BioBrasil. Dorothy Fragaszy (University of Georgia), Elisabetta Visalberghi (Istituto di Scienze e Tecnologie della Cognizione, Rome) and their colleagues from Brazil — Patrícia Izar and Eduardo Ottoni (both of the University of São Paulo) and Marino

**Figure 1.** A wild bearded capuchin monkey (*Cebus libidinosus*) caring for and feeding a common marmoset (*Callithrix jacchus*).

Gomes de Oliveira (Fundação BioBrasil, Lauro de Freitas, Bahia) — have documented the capuchins using stone hammers and anvils to crack open palm nuts (Fragaszy *et al.*, 2004). In June 2004, while photographing this tool-using behavior in a troop of approximately 10 capuchins, I observed one of the monkeys apparently caring for and feeding a common marmoset (*Callithrix jacchus*). The capuchin held the marmoset in its arms and let the marmoset cling to its chest and ride on its back (Fig. 1). At one point the capuchin (with the marmoset on its back) cracked open a palm nut using a stone hammer and anvil, repositioned the marmoset into its arms and then took small pieces of the cracked nut and gave these to the marmoset to eat. During the two hours of observation the marmoset stayed with the capuchin, either clinging to its chest or riding on its back, both while the capuchin was on the ground and when the capuchin climbed about 20 feet into the trees near where the capuchins were feeding. There was, however, one instance when the marmoset jumped off the capuchin and scampered about on the ground among the other capuchins in the troop. After about five minutes the caretaker capuchin went over to the marmoset and placed the marmoset onto its back.

The local residents were questioned concerning the marmoset and its association with the capuchin. They said that the marmoset suddenly appeared with the troop of capuchins and was seen for the first time about when these photographs were taken. What is certain is that the marmoset is not a pet or tame. It is also known that this species of marmoset lives in the wild in the same habitat as the capuchins. In September 2004 the local residents reported that the marmoset was still with the capuchin group, an association lasting at least 15 weeks thus far. These observations are believed to be unique (D. M. Fragaszy, pers. comm.). While interspecies play is sometimes observed in captive animals, interspecies carriage and feeding in wild populations is not.

*Acknowledgment*: Thank you to Mr. Cid Simões of Fundação BioBrasil for kindly helping us to visit the reserve and observe the monkeys there.

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# AN OBSERVATION OF AGONISTIC BEHAVIOR IN HOWLER MONKEYS (*ALOUATTA PALLIATA*) ON BARRO COLORADO ISLAND, PANAMA

*Pedro G. Méndez-Carvajal*
*Mario Santamaría*
*Ricardo A. Moreno*

Barro Colorado Island (BCI) is a forested nature reserve of 1,500 ha in the Panama Canal. It has a well-marked five-month dry season and a seven-month wet season (Leigh Jr. *et al.*, 1982). BCI harbors a large population of howler monkeys (*Alouatta palliata*), which was the focus of the first modern field study on wild primates (by C. R. Carpenter in the 1930s) and which has been monitored and studied ever since (Carpenter, 1934, 1965; Chivers, 1969; Mittermeier, 1973; Milton, 1980, 1982; Neville *et al.*, 1988). Agonistic behavior among howler monkeys is a mechanism to gain access to food, space, and/or females in estrus (Clarke, 1982, 1983). Agonistic behavior includes infanticide (Galleti *et al.*, 1994) and fights between males, females, and satellite males, as well as displacements, pushes, chases, and grabs (Neville *et al.*, 1988; Wang and Milton, 2003). Increases in agonistic interactions can occur when food resources are scarce (Cowlishaw and Dunbar, 2000).

Agonistic behavior is reported as "rare" at BCI (Carpenter, 1934, 1965; Altmann, 1959; Southwick, 1963; Chivers, 1969). Wang and Milton (2003) have suggested that the low incidence of social interactions between males within groups reflects the energy costs of social behavior and indicates that relationships between males are "structured by more subtle means than overt physical interactions, possibly including vocal communication, relationships with individual group females, and kinship" (p.1227). Although there are some reports of aggression between male and female howler monkeys, it generally occurs during feeding bouts and has never been fatal for one of the antagonists. Carpenter (1934) described an incident on BCI that involved an adult male biting the tail of a juvenile, but aggressive interactions involving fights are otherwise rarely seen (Milton, 1982).

In this report we describe an incident of extreme agonistic behavior that occurred on 17 October 2003. Mario Santamaría, a wildlife ranger on BCI, observed an adult male howler monkey pursue, catch, and kill a young female. The male chased this younger female individual, repeatedly biting her on the lower back just above her tail for some 20 minutes. Soon after, on the same day, the female was found dead about 12 m from the tree where the attack occurred (Fig. 1).

Howlers on BCI frequently have wounds and scarring believed to result from fights with conspecifics rather than just from accidents or predator attacks. This is, however, the first report of a fight of this sort having a fatal outcome, and the first report of extreme agonistic behavior in the howler monkey population on BCI in almost 70 years.

**Figure 1.** Dead body of the young female howler monkey attacked and killed by an adult male. Fausto Trail, Barro Colorado Island, Panama. Photo ©Tom Kursar.

Milton (1982) has argued that bot-fly parasitism is an important factor regulating the BCI howler monkey population, along with nutritional issues and food availability. This howler population has been considered to be peaceful, and males are thought to be well-received by females in estrus. It is possible that agonistic behavior may play a more important role in the dynamic and social interactions of the population of howler monkeys on BCI than previously thought, even if this behavior appears to be relatively uncommon. We suggest that aggressive behavior among howler monkeys on BCI needs to be further considered in other studies.

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## MONITORING THE YELLOW-BREASTED CAPUCHIN MONKEY (*CEBUS XANTHOSTERNOS*) WITH RADIOTELEMETRY: CHOOSING THE BEST RADIO-COLLAR

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*Gustavo Canale*
*Priscila Suscke Gouveia*

The yellow-breasted capuchin monkey, *Cebus xanthosternos*, is endemic to a restricted area of the Atlantic Forest of eastern Brazil. Because it is heavily hunted, much appreciated as a pet, and its forests are largely destroyed, it is one of the 25 most endangered primates in the world (Kierulff *et al.*, 2005). The remaining populations are fragmented and isolated, and there is no forest within its range large enough to support a viable population.

We began a research program on the ecology of the yellow-breasted-capuchin monkey in the Atlantic Forest of southern Bahia in 2003. It proved, however, extremely difficult to find, never mind observe, these monkeys. Three people censusing the forest five days a week were locating the animals at most once a week, and then for only a few minutes. Radiotelemetry became the only option after a year had passed without any progress in locating and habituating a study group.

We first tested some different radio-collars on captive tufted capuchins in two Brazilian zoos, São Paulo and Belo Horizonte. Tufted capuchin monkeys are robust, intelligent, and highly manipulative, and we needed to check the behavior of the individuals fitted with a radio collar, as well as the behavior of other capuchins towards them. Likewise we needed to find a compromise between a collar tough enough to resist possible biting or chewing, while at the same time not being too hard or abrasive as to cause undue rubbing and lesions on the neck or throat. Capuchin males were captured, fitted with fake radio-transmitters, released back into their groups, and monitored.

The capuchins that received the test radio-collars accepted them very well, and although part of the antenna is external they did not chew it or break it. Other capuchins did not interfere with them either. However, the first collar was made of very hard neoprene (similar to the material normally used for radio-collars on carnivores) and after 15 days caused lesions on the neck (the edges were evidently rubbing the capuchin's neck), so it was removed. The abrasions were treated, and after three days were completely cured.

A radio-collar made with soft fabric (tubular nylon) was then attached to a subadult male from Belo Horizonte Zoo. After one month we removed the collar and found a rash and signs of irritation on the skin of his neck. With the humidity and high temperatures, the friction of the fabric on the skin was deemed to be the cause of the rash.

A third radio-collar made of a ball chain (similar to the collar used for the radios on golden lion tamarins) was tested on the alpha male of another capuchin group in Belo Horizonte Zoo. The animal was monitored, and again after one month the collar was removed. The radio-collar was intact, with no signs of damage or interference from the male, nor chewing or biting by other group members. No marks or signs were found on the skin of the capuchin's neck. We thus decided to use ball chains from Advanced Telemetry Systems Inc., Isanti, MN, USA, <www.atstrack.com>, model M1940 (weight 42 g and battery capacity of 394–788 days).

The first capuchin monkeys were captured in a site in the Capitão Private Reserve, owned by the NGO Instituto de Estudos Sócio-Ambientais do Sul da Bahia (IESB), using Tomahawk live traps baited with bananas. We began offering bananas to the group in September 2004 and used camera-traps to check if they were eating the bait inside the Tomahawk traps (Kierulff *et al.*, 2004). Since our objective was to capture just one or two individuals to attach the radio, we used only six traps on the platform.

The monkeys ate the bananas for two months and then stopped visiting the platform for almost nine months. In September 2005, the animals began to eat the bait on the platform again and entered the Tomahawk traps. In October 2005 we set the traps. After ten days we captured two *C. xanthosternos* in the afternoon. The group remained near to the traps and then slept in a tree close to the platform. The cages were taken to our base, and the two males were processed during the night.

We attached a radio-collar to one of the monkeys, an adult male; the other was too young to carry a radio. The procedure was accompanied at all times by veterinarians. Early in the morning, the cages were taken back to the platform in the forest. At sunrise, the group was heard nearby approaching and calling for the males. We opened the traps and withdrew, and the two capuchins went back to their group. Since then, it has been possible to monitor the *C. xanthosternos* group daily using radiotelemetry.

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## 2006 SEED GRANTS FOR AMAZON CONSERVATION

The Amazon Conservation Association (ACA) and its Peruvian counterpart, the Asociación para la Conservación de la Cuenca Amazónica (ACCA), together announce a seed and matching grant program for established researchers at the post-doctoral level and above. One-year seed grants of up to $20,000 will fund the first year of multi-year research projects that have been submitted for, but have not yet received, other funding. One-year matching grants of up to $10,000 will subsidize research costs for the first year of long-term research projects that have already secured other funding.

Projects must be based at the Los Amigos Research Center and Conservation Concession in Madre de Dios, Amazonian Peru. Before preparing a proposal, applicants should familiarize themselves with the information on ACA's research priorities webpage, which describes a significant change from previous grant cycles. Applicants should also browse the CICRA research project page to ensure that their proposed research will complement ongoing work at the station and will fit with ACA's long-term goals in science and conservation. Both of these pages are available on the ACA website at <http://www.amazonconservation.org>.

Applicants should send a one-page concept letter to the ACA Science Director, Nigel Pitman, at <npitman@amazonconservation.org>. Full proposals are by request only. The latest date proposals will be received is March 30, 2006. Concept letters and proposals received before that date will be processed as they arrive; requests made early are more likely to lead to funding.

## INTERNATIONAL STUDBOOK FOR THE PIED TAMARIN, *SAGUINUS BICOLOR*

Andrew Baker (Philadelphia Zoological Garden), Alcides Pissinatti (Centro de Primatologia do Rio de Janeiro), and Andria Davis (Philadelphia Zoological Garden) have produced the 2004 studbook for the pied tamarin, *Saguinus bicolor*, with data current through 31 December 2004. It includes a full historical listing as well as a separate listing by institution. The text is in Portuguese and English.

At the beginning there is a brief discussion of taxonomy and a description of the species and subspecies (*bicolor*, *martinsi* and *ochraceus*; the studbook concerns only the nominate subspecies) along with their distributions, habitats, diet, reproductive parameters, social structure, behavior, and status in the wild — all you ever wished to know about pied tamarins and more: an excellent summary.

The current captive population of *Saguinus b. bicolor* is derived largely from two colonies, both established in the 1980s: one at the Centro de Primatologia do Rio de Janeiro (CPRJ) and the other at Universität Bielefeld (Germany). In 1996, CPRJ acquired additional wild-caught founders, a step forward in expanding the founder base. A number of these new founders were sent to European institutions. As of early 1997, all of the animals outside of Brazil are under the ownership of the Brazilian government, through the Brazilian Institute for the Environment and Renewable Natural Resources (*Instituto Brasileiro do Meio Ambiente e Recursos Naturais Renováveis – IBAMA*). On 31 December 2004, the number of living animals in the breeding program was 117 (50.51.16) in 19 institutions, including 11 founders with living descendants. There were 33 births during 2004 and 28 deaths. The population as such has grown considerably since the mid-1980s, and the age pyramid shows a healthy number of young animals between 2–7 years old.

The zoos and breeding centers taking part in the program include Akron Zoological Park (Ohio, USA), Parque Ecológico Municipal Americana (São Paulo, Brazil), Apenheul Nature Park (Apeldoorn, The Netherlands), Zoológico de Bauru (São Paulo, Brazil), Belfast Zoo (Belfast, N. Ireland), Paradise Wildlife Park (Broxbourn, UK), North of England Zoological Society (Chester, UK), Cleveland Metroparks Zoo (Ohio, USA), Granby Zoo (Quebec, Canada), Houston Zoological Gardens (Texas, USA), Jersey Wildlife Preservation Trust (Jersey, British Isles), Zoológico Municipal de Mogi Mirim (São Paulo, Brazil), Parc Zoologique et Botanique (Mulhouse Zoo, France), The Wildlife Conservation Society (Bronx Zoo, New York, USA), Philadelphia Zoological Gardens (Pennsylvania, USA), Jardin Zoologique du Quebec (Quebec, Canada), Centro de Primatologia do Rio de Janeiro (Rio de Janeiro, Brazil), Zoológico Municipal de Santos (São Paulo, Brazil), and Shaldon Wildlife Trust (Shaldon, UK).

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Baker, A. J., Pissinatti, A. and Davis, A. 2005. *Pied Tamarin* Saguinus bicolor *International Studbook*. Philadelphia Zoo, Philadelphia, USA, and Centro de Primatologia do Rio de Janeiro (CPRJ/FEEMA), Rio de Janeiro. March 2005. Data current through 31 December 2004. In English and Portuguese.

## ULYSSES S. SEAL AWARD FOR INNOVATION IN CONSERVATION

Ulie's great passion and talent was thinking creatively about how new science could be most effectively applied to solving the problems of wildlife conservation. His contributions were amplified many times by his ability to recognize, encourage, and collaborate with others who also were making innovative contributions. Fittingly, the IUCN/SSC Conservation Breeding Specialist Group (CBSG) has chosen to honor Ulie by creating the Ulysses S. Seal Award for Innovation in Conservation. Each year, the CBSG will consider nominations for this award. All members of CBSG are invited to submit nominations to the CBSG office by way of email or post. Nominations should describe concisely how the person exemplifies innovation in applying science to conservation. The nominee's contributions need not have been through work connected with the CBSG, but should reflect the CBSG's values of creative thinking that improves conservation action. Nominees must be living individuals. A committee appointed by the CBSG Chair will review all nominations. Omaha's Henry Doorly Zoo has developed a medal to recognize the recipients of the Ulysses S. Seal award. The award will be presented at the annual meeting of the CBSG. Funds will be provided to sponsor the travel of the award recipient to the meeting. For more information, see the following website: <http://www.cbsg.org>.

## CHICAGO ZOOLOGICAL SOCIETY GRANTS TO SSC SPECIALIST GROUPS

The Chicago Zoological Society makes annual grants to SSC Specialist Groups from its Chicago Board of Trade Endangered Species Fund for small projects identified in Action Plans or other group priority-setting exercises. Any proposal submitted on the Group's behalf must be endorsed by the Group Chair (or other officer). Proposals for the next grant cycle are due by e-mail no later than 1 March 2006. Contact Linda Reiter for more information, e-mail: <lireiter@brookfieldzoo.org>.

# PRIMATE SOCIETIES

## SOCIEDADE BRASILEIRA DE PRIMATOLOGIA – DIRETORIA BIÊNIO 2005 - 2007

Em assembléia realizada durante o XIº Congresso Brasileiro de Primatologia em Fevereiro de 2005, Porto Alegre, Rio Grande do Sul, foi aprovada e nomeada a nova diretoria da SBPr. Ela é composta pelo Presidente Fabiano Rodrigues de Melo (UEMG, <frmelo@carangola.br>), o Vice-Presidente André Hirsch (UFMG e PUC-Minas, <hirsch@icb.ufmg.br>), Secretária Cláudia Guimarães Costa (Unileste-MG, <cacaugcosta@yahoo.com.br>), 2º Secretário Luiz Gustavo Dias (UFMG, <luiz.muriqui@biodiversitas.org.br>), Tesoureiro Ítalo Martins da Costa Mourthé (UFMG, <mourthe@hotmail.com>) e Vice-Tesoureira Fernanda Tabacow (<fetabacow@yahoo.com.br>).

Visite nossa homepage, <http://www.carangola.br/fafile/primatologia>, e conheça o Estatuto da SBPr, obtenha várias informações sobre oportunidades em primatologia, financiamentos, orientadores de Pós-Graduação, publicações (incluindo o link para os últimos fascículos dos periódicos *Laboratory Primate Newsletter* e *Neotropical Primates*), e ainda um novo link onde você poderá encontrar artigos em PDF disponíveis para download.

A nova diretoria aproveita a oportunidade para convidar os interessados a se associarem. Os valores da anuidade são os seguintes: Profissional – R$ 80,00 (oitenta reais); Estudantes de Pós-Graduação – R$ 60,00 (sessenta reais) e Estudantes de Graduação – R$ 40,00 (quarenta reais). Para se associar ou pagar a sua anuidade de 2005 proceda da seguinte forma: efetue o depósito, de acordo com os valores descritos acima, na c/c 9406-4, Agência 1726-4, do Bradesco (Banco 237), enviando uma cópia do recibo diretamente para o Tesoureiro pelo correio no seguinte endereço: Ítalo Martins da Costa Mourthé, Universidade Federal de Minas Gerais (UFMG), Av. Antônio Carlos, 6627, Pampulha, Belo Horizonte, Minas Gerais, ICB, Departamento de Zoologia, CP 486, CEP 31.270-901 ou como arquivo anexado para <primatologo@yahoo.com.br>, incluindo no cabeçalho de seu comprovante ou mensagem eletrônica o nome completo, o endereço para correspondência (incluindo e-mail) e a(s) anuidade(s) que está(ão) sendo paga(s).

Aqueles que possuem anuidades em atraso e desejarem quitá-las, podem efetuar o pagamento, juntamente com a anuidade atual (2005), bastando acrescentar o valor de 02 (duas) anuidades referente aos anos em atraso (independente de quantas forem). Lembramos que o não pagamento de 03 (três) anuidades consecutivas pode incorrer na exclusão do quadro de associados da SBPr, conforme estatuto. Estudantes de Graduação ou Pós-Graduação devem anexar também uma cópia do comprovante de matrícula atual. Informações podem ser solicitadas pelo <primatologo@yahoo.com.br>. Vale a pena lembrar que os sócios da SBPr têm direito a desconto na inscrição do Congresso Brasileiro de Primatologia que acontece a cada dois anos e acesso aos artigos em PDF disponíveis em nossa homepage.

Uma sociedade profissional séria e forte se faz com esforço e parceria de todos. Participe!

**Fabiano Rodrigues de Melo,** Presidente da Sociedade Brasileira de Primatologia – Biênio 2005-2007, Universidade do Estado de Minas Gerais, Campus Fundacional de Carangola (FAFILE/UEMG), Praça dos Estudantes, 23, Santa Emília, Carangola 36800-000, Minas Gerais, e-mail: <frmelo@carangola.br> e **Ítalo Martins da Costa Mourthé**, Departamento de Zoologia, Instituto de Ciências Biologicas, Av. Antônio Carlos, 6627, Pampulha, Belo Horizonte 31.270-901, Minas Gerais, Brasil, e-mail: <mourthe@hotmail.com>.

# RECENT PUBLICATIONS

## BOOKS

*Ecologia e História Natural da Mata Atlântica*, por Athayde Tonhasca Jr. 2005. Editora Interciência, Rio de Janeiro, Brasil. 198pp. ISBN 8571931305. R$50,00. Após séculos de desmatamento, restam hoje menos de 10% do conjunto de ecossistemas que constitui a Mata Atlântica. A acentuada redução de área, aliada a sua imensa riqueza biológica e altos níveis de endemismo, fazem da Mata Atlântica uma das prioridades mundiais para preservação. Mais ainda, estes ecossistemas têm valor inestimável na prestação de serviços ecológicos tais como armazenamento de água, controle da erosão e ciclagem de minerais. Por estas razões, a Mata Atlântica representa rico patrimônio cutural, estético, biológico e econômico dos brasileiros. No entanto, apesar de oficialmente protegida pela Constituição, a Mata Atlântica continua a ser devastada, vítima da especulação imobiliária, extração ilegal de madeira, captura de animais, poluição e atividade agropecuárias. Esta obra faz um apanhado das informações científicas sobre a fauna, flora, ecologia, conservação e regeneração das florestas neotropicais e da Mata Atlântica, reunindo estudos de caso e farta bibliografia. Estas informações irão auxiliar professores e estudantes de cursos em Ciências Biológicas e Ambientais, assim como pessoas interessadas em ecologia e conservação, a conhecer alguns componentes destes ecossistemas e suas intrincadas relações ecológicas. Para comprar: visite <http://www.editorainterciencia.com.br> ou ligue para (21) 2581-9378 / 2241-6916.

*Phylogeny and Conservation*, edited by Andy Purvis, John L. Gittleman and Thomas Brooks. 2005. Conservation Biology Series #8, Cambridge University Press, New York. 431pp. ISBN 0521532000 (paperback, $60.00). Phylogeny is a potentially powerful tool for conserving biodiversity. This book explores how it can be used to tackle questions of great practical importance and urgency for conservation. Using case studies from many different taxa and regions of the world, the volume evaluates how useful phylogeny is in understanding the processes that have generated today's diversity – and the processes that now threaten it. This book will be of great value to researchers, practitioners and policy-makers alike. *Contents*: 1. Phylogeny and conservation – A. Purvis, J. L. Gittleman, and T. M. Brooks, p.1. Part 1: Units and currencies. 2. Molecular phylogenetics for conservation biology – E. A. Sinclair, M. Pérez-Losada, and K. A. Crandall, p.19; 3. Species: Demarcation and diversity – P. M. Agapow, p.57; 4. Phylogenetic units and currencies above and below the species level – J. C. Avise, p.76; 5. Integrating phylogenetic diversity in the selection of priority areas for conservation: Does it make a difference? – A. S. L. Rodrigues, T. M. Brooks, and K. J. Gaston, p.101; 6. Evolutionary heritage as a metric for conservation – A. Ø. Mooers, S. B. Heard, and E. Chrostowski, p.120. Part 2: Inferring evolutionary processes. 7. Age and area revisited: Identifying global patterns and implications for conservation – K. E. Jones, W. Sechrest, and J. L. Gittleman, p.141; 8. Putting process on the map: Why ecotones are important for preserving biodiversity – T. B. Smith, S. Saatchi, C. Graham, H. Slabbekoorn, and G. Spicer, p.166; 9. The oldest rainforests in Africa: Stability or resilience for survival and diversity? – J. C. Lovett, R. Marchant, J. Taplin, and W. Küper, p.198; 10. Late Tertiary and Quaternary climate change and centres of endemism in the southern African flora – G. F. Midgley, G. Reeves, and C. Klak, p.230; 11. Historical biogeography, diversity and conservation of Australia's tropical rainforest herpetofauna – C. Moritz, C. Hoskin, C. H. Graham, A. Hugall, and A. Moussalli, p.243. Part 3: Effects of human processes. 12. Conservation status and geographic distribution of avian evolutionary history – T. M. Brooks, J. D. Pilgrim, A. S. L. Rodrigues, and G. A. B. da Fonseca, p.267; 13. Correlates of extinction risk: Phylogeny, biology, threat and scale – A. Purvis, M. Cardillo, R. Grenyer, and B. Collen, p.295; 14. Mechanisms of extinction in birds: Phylogeny, ecology and threats – P. M. Bennett, I. P. F. Owens, D. Nussey, S. T. Garnett, and G. M. Crowley, p.317; 15. Primate diversity patterns and their conservation in Amazonia – J. M. Cardoso da Silva, A. B. Rylands, J. S. Silva Júnior, C. Gascon, and G. A. B. da Fonseca, p.337; 16. Predicting which species will become invasive: What's taxonomy got to do with it? – J. Lockwood, p.365. Part 4: Prognosis. 17. Phylogenetic futures after the latest mass extinction – S. Nee, p.387; 18. Predicting future speciation – T. G. Barraclough and T. J. Davies, p.400. Available from: Cambridge University Press, 40 West 20th Street, New York, NY 10011-4211, USA, Fax: 1-212-691-3239. General Address (Orders & Customer Service): Cambridge University Press, 100 Brook Hill Drive, West Nyack, NY 10994-2133, USA, Tel: 1-845-353-7500, Fax: 1-845-353-4141, Website: <http://www.cup.org>.

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# MEETINGS

## 2005

**2005 Meeting of the Mexican Society of Primatologists**, 4–7 May 2005, Instituto de Ecología, Xalapa, Veracruz, México. For information: Juan Carlos Serio Silva, Presidente, Asociación Mexicana de Primatología AC, Departamento de Biodiversidad y Ecología Animal, Instituto de Ecología AC, km 2.5 antigua carretera a Coatepec, No. 351 congregación El Haya, CP 91070, Apartado Postal 63, Xalapa, Veracruz, México, Tel: +52 (228) 8 42 18 00 ext. 4109/4110 (Fax: ext. 4111), e-mail: <serioju@ecologia.edu.mx>.

**Fourth Annual Callitrichid Behavioral Husbandry and Management Workshop**, 21–22 May 2005, Washington, DC, USA. The Callitrichid Behavioral Husbandry and Management Workshop will be presented by the Cotton-top Tamarin SSP and hosted by the US National Zoo in Washington, DC. For more information, see the Workshop's website at <http://nationalzoo.si.edu/ConservationAndScience/EndangeredSpecies/GLTProgram/CallitrichidWorkshop/default.cfm>.

**19th Annual Meeting of the Society for Conservation Biology**, 15–19 July 2005, Universidade de Brasília, Brasília, Brazil. Theme: "Conservation Biology: Capacitation and Practice in a Globalized World." The chair is Miguel Marini, Zoology Department, Universidade de Brasília. Contact: SCB 2005 Local Organizing Committee, Departamento de Zoologia, IB, Universidade de Brasília, 70910-900 Brasília, DF, Brasil, telefax: +55 61 307-3366, e-mail: <2005@conbio.org>, website: <http://www.conservationbiology.org/2005>.

**Association of Tropical Biology and Conservation – 2005 Annual Meeting**, 23–29 July 2005, Uberlândia, Brazil. The venue will be the Uberlândia Convention Center. For more information write to the Chair of the Organizing Committee, Kleber del-Claro, Laboratório de Ecologia Comportamental e Interações, Universidade Federal de Uberlândia, Caixa Postal 593, Uberlândia 38400-902, Minas Gerais, Brazil, e-mail <delclaro@ufu.br> or <atbc2005@inbio.ufu.br>.

**IX International Mammalogical Congress**, 31 July–5 August 2005, Sapporo, Japan. Organizing Committee: MAMMAL2005, c/o Field Science Center, Hokkaido University, N11 W10, Sapporo 060-0811, Japan, e-mail: <MAMMAL2005@hokkaido-ies.go.jp>, website: <http://www.imc9.jp>.

**1st Congress of the European Federation of Primatology**, 9–12 August 2005, Göttingen, Germany. The Congress will be hosted by the German Society for Primatology (GfP) at the German Primate Centre (DPZ), University of Göttingen. It will coincide with the 9th Congress of the German Society. European students and researchers working on all aspects of primatology are invited to attend. Registration is from 1 November 2004 to 30 March 2005. For more information contact Peter M. Kappeler, President EFP, German Primate Center (DPZ), Abteiling Verhaltensforschung & Ökologie, Kellnerweg 4, D-37077 Göttingen, Germany, e-mail: <pkappel@gwdg.de>, website: <http://www.gf-primatologie.de/EFP2005/index.htm>.

**28th Annual Meeting of the American Society of Primatologists**, 17–20 August 2005, Portland, Oregon. The meeting will be held at the Benson Hotel and hosted by the Oregon National Primate Research Center. A call for abstracts and the meeting announcement will be sent electronically to all ASP members in mid-December 2004. Deadline for proposals for symposia, roundtables, or workshops is 17 January 2005. Deadline for abstracts for contributed papers, symposia speakers, workshops, and roundtable discussions is 14 February 2005. If a paper version of the meeting announcement is preferred, please contact Larry Williams, Program Co-Chair, Tel: +1 251-460-6293, Fax: +1 251-460-6286, e-mail: <lwilliams@usouthal.edu>. For more information, please contact Dr. Kristine Coleman, chair of the local organizing committee of the ONPRC at <colemank@ohsu.edu>.

**29th International Ethological Conference**, 20–27 August 2005, Budapest, Hungary. For more information, write to IEC2005, Department of Ethology, Eötvös University, 1117 Budapest, Hungary, or subscribe to the e-mail newsletter at <IEC2005-subscribe@yahoogroups.com>.

**COHAB 2005: First International Conference on Health and Biodiversity**, 23–25 August 2005, Galway, Ireland. This important global event will provide an international forum for scientists, professionals, policymakers, and stakeholders to address the issues linking environmental health, human health, biological diversity, and international development. Full details of the conference may be found at http://www.cohab2005.com. Enquiries should be directed to Conor Kretsch, COHAB Director, e-mail: <info@cohab2005.com>.

**Measuring Behavior 2005 – 5th International Conference on Methods and Techniques in Behavioral Research**, 30 August – 2 September 2005, Wageningen, The Netherlands. Measuring Behavior will offer an attractive mix of presentations, demonstrations, discussions, meetings, and much more (see <http://www.noldus.com/mb2005/program/index.html> for details). Proceedings of the 2002 meeting are available at <http://www.noldus.com/events/mb2002/index.html>. Deadline for proposals of symposia and SIGs is 1 December 2004. For more information, contact Prof. Dr. Louise E. M. Vet, Program Chair, Measuring Behavior 2005, Conference Secretariat, P.O. Box 268, 6700 AG Wageningen, The Netherlands, Tel: +31-317-497677, Fax: +31-317-424496, e-mail: <mb2005@noldus.nl>, website: <http://www.noldus.com/mb2005>.

**Sixth Meeting of the Asociación Primatológica Española**, 27–30 September 2005, Facultad de Psicología, Universidad Complutense de Madrid, Madrid, Spain. Sponsored by the Asociación Primatológica Española (A.P.E.), this Meeting will focus on the themes of Child Ethology, Conservation, Great Apes and Humans: Similarities and Differences, and Tool Use. For more information please see the website at <http://www.ucm.es/info/ape05> or contact Dr. Fernando Colmenares (<colmenares@psi.ucm.es>) or Dra. María Victoria Hernández-Lloreda (<ape@psi.ucm.es>).

**2005 Annual Meeting of the Conservation Breeding Specialist Group**, 29 September – 1 October 2005, Syracuse, New York, USA. Regional network meetings will take place on Tuesday, 27 September, and a Steering Committee meeting will take place on Wednesday, 28 September. Accommodations are at the Genesee Grande Hotel (http://www.geneseegrande.com), which offers a variety of rooms and rates. The deadline for registration is 1 August 2005; for more information, email a request to <2005cbsg@cbsg.org> or visit their website at <http://www.cbsg.org>.

**New World Primate Workshop (A Focus on Cebids)**, 30 September – 1 October, 2005, Cleveland, Ohio, USA. The Cleveland Metroparks Zoo announces a workshop on New World Primates that will focus on the captive care of Cebids in U.S. institutions. Informal roundtable discussions will include the following topics: diet and health, social groups and mixed species, enrichment and training behaviors, and population management. The workshop will begin at 10 a.m. on Friday, 30 September, and end at 4 p.m. on Saturday, 1 October. Attendance is limited to 50 people and registrants will be asked to complete a pre-meeting survey regarding their experiences with Cebids. The workshop will be held on the zoo grounds. Some meals will be provided and local lodging suggestions are available. Registration fee is $25. For more information and a registration form, contact Tad Schoffner at 216-635-3332 or <tad@clevelandmetroparks.com>.

**8th World Wilderness Congress**, 30 September – 6 October, 2005, Anchorage, Alaska, USA. Over a thousand delegates from dozens of nations will attend the Eighth WWC, with additional events in Kamchatka and the Russian Far East. The WWC convenes every three to four years, with the theme of this year's Congress being "Wilderness, Wildlands and People—A Partnership for the Planet." This Congress will generate accurate, up-to-date information on the benefits of wilderness and wildlands to both contemporary and traditional societies and will examine the best models for balancing wilderness and wildlands conservation with human needs. For more information, see the Congress website at <http://www.8wwc.org>.

**60th World Association of Zoos and Aquariums Annual Conference**, 2–6 October 2005, New York, New York, USA. The 60th WAZA Annual Conference will be hosted by the Wildlife Conservation Society and held at the Marriott Marquis hotel. The theme of the meeting will be "Wildlife Conservation: A Global Imperative for Zoos and Aquariums." Additional information will be made available on the conference website at <http://waza2005.org>.

**III Congresso Brasileiro de Mastozoologia**, 12 a 16 de outubro de 2005, realizado pela Sociedade Brasileira de Mastozoologia (SBMz) e a Universidade Federal do Espírito Santo (UFES), no SESC Praia Formosa em Aracruz, Espírito Santo. O evento reunirá pesquisadores, profissionais e estudantes com o objetivo de apresentar, analisar e discutir trabalhos científicos, descobertas e tendências no estudo dos mamíferos. O tema dessa edição é "Diversidade e Conservação de Mamíferos," que será abordado sob diversos aspectos durante o evento, que contará com a participação de especialistas ligados a instituições de ensino e pesquisa nacionais e estrangeiras, bem como outros profissionais que atuam em órgãos governamentais, na iniciativa privada e em organizações não-governamentais. Somente serão aceitas inscrições pela internet. Poderá ser realizada a inscrição online do congresso até o dia 31 de maio, e o envio dos resumos podem ser feitos até o dia 30 de junho de 2005. Mais informações: <http://www.cbmz.com.br>.

**Counting Critters: Estimating Animal Abundance and Distance Sampling**, 17–21 October 2005, Disney's Animal Kingdom, Orlando, Florida, USA. This five-day workshop will introduce participants to the most important methods of estimating animal abundance in a rigorous but accessible way. For more details, please see <http://www.ruwpa.st-and.ac.uk/counting.critters/> or contact Rhona Rodger, Workshop Organizer, CREEM, University of St Andrews, The Observatory, St Andrews, Scotland KY16 9LZ, tel: +44 1334 461842, fax: +44 1334 461800, e-mail:<rhona@mcs.st-and.ac.uk>.

**Primer Congreso Colombiano de Primatología**, Asociación Colombiana de Primatología, del 2 al 4 noviembre de 2005, Bogotá, Colombia. El Primer Congreso Colombiano de Primatología tendrá tres Áreas Temáticas para la presentación de los trabajos: *Biología y Ecología* – estudios en ciencias básicas que incluyen morfología, taxonomía, sistemática, genética, biología molecular, evolución, biodiversidad, comportamiento y ecología; *Medicina* – estudios en anatomía, fisiología, medicina, clínica, patología, epidemiología, nutrición, y restricción de primates; y *Conservación y Manejo* (*in situ* / *ex situ*) – investigación aplicada y gestión multidisciplinaria, herramientas conceptuales y técnicas dirigidas a la conservación, uso y aprovechamiento, trabajo comunitario, comercio, mantenimiento en cautiverio, reproducción, técnicas de captura, manipulación, registro y marcaje, enriquecimiento ambiental, rehabilitación, disposición de primates decomisados, normatividad y legislación. La ponencia debe incluir información nueva, se pueden enviar resúmenes de temas presentados en reuniones anteriores pero su aporte al Congreso debe ser clave, generar discusión constructiva o representar temas emergentes. Para mayor información del Congreso, puede visitar la siguiente página web: <http://www.geocities.com/primatescolombia>, o en el correo electrónico <ACP_investigacion@yahoo.com>.

**Primate Society of Great Britain (PSGB), Winter Meeting 2005**, 9 December 2005. Flett Theatre, The Natural History Museum, London. The theme is "Primate Evolution and the Environment." Guest speakers include R. D. Martin (The Field Museum, Chicago), Erik Seiffert (Oxford University), Peter Andrews (The Natural History Museum), Jussi Eronen and Mikael Fortelius (University of Helsinki), Susan Antón (New York University), Sarah Elton (University of Hull), Christophe Soligo (The Natural History Museum), Jonathan Kingdon (Oxford University), Urs Thalmann (University of Zürich) and Laurie Godfrey (University of Massachusetts). Organised by: Christophe Soligo, The Natural History Museum, e-mail: <C.Soligo@nhm.ac.uk>. See website: <http://www.psgb.org/Meetings/Winter2005.html>.

**V Göttinger Freilandtage "Primate Diversity – Past, Present and Future,"** 13–16 December 2005. University of Göttingen and German Primate Center, Göttingen, Germany. Organized by Peter M. Kappeler. Confirmed invited speakers: *Diversity in the Past*: Extinct primate communities – John Fleagle (State University of New York, Stony Brook). *Diversity Today*: Diversity of Malagasy primates – Anne Yoder (Yale University); Diversity of American primates – Anthony B. Rylands (Conservation International); Diversity of Asian primates – Jatna Supriatna (Conservation International Indonesia); Diversity of African primates – John F. Oates (Hunter College New York); Primate biogeography – Shawn Lehman (University of Toronto); Speciation and taxonomy – Colin P. Groves (Australian National University); Human diversity – Mark Stoneking (Max Planck Institute, Leipzig). *Preserving Diversity for Tomorrow*: Diversity and conservation hotspots – Russell A. Mittermeier (Conservation International); Extinction biology – Carlos Peres (University of East Anglia); Conservation genetics – George Amato (Wildlife Conservation Society); Conservation genetics

– Michael Bruford (Cardiff University); Reintroductions – Carel P. van Schaik (University of Zürich). *Comparative Perspectives*: Speciation in birds – Trevor Price (University of Chicago); Bird taxonomy and conservation – Robert Zink (University of Minnesota). Contact: Prof. Dr. Peter M. Kappeler, Deutsches Primatenzentrum (DPZ), Kellnerweg 4, D-37077 Göttingen, Tel/Fax: +49-551-3851-284/291, e-mail: <pkappel@gwdg.de>, website: <http://www.dpz.gwdg.de/sociobiology/GFT2005/index.htm>.

## 2006

**Ecology in an Era of Globalization: Challenges and Opportunities for Environmental Scientists in the Americas**, 8–12 January 2006, Merida, Mexico. This conference will be held at the Fiesta Americana Hotel in Merida and is co-hosted by the Universidad Autónoma de Yucatán and the Centro de Investigaciones Científicas de Yucatán. Abstracts should address one of the meeting's three subthemes: invasive species, human migration, and production. The invasive species subtheme includes such topics as dispersal of invasive plant and animal species, emerging diseases, and resistance of local ecosystems to invasive species and disease. The human migration subtheme includes the environmental effects of international and local emigration and immigration on recipient and source areas. Potential topics include infrastructure development needs and impacts, effects on land cover, and land-use impacts. The production subtheme focuses on ecosystem transformations, including land-use change required to produce goods and services for human use. Potential topics include the effects of changes in forest and agricultural policy on economies, biodiversity, and ecosystems throughout the Americas, in terrestrial, marine, and freshwater systems. We particularly welcome reports of projects that are interdisciplinary and that consider the need to communicate with broad audiences. For more information or to submit an abstract, visit <http://www.esa.org/mexico>. Deadline for abstract submissions: 16 September 2005.

**75th Annual Meeting of the American Association for Physical Anthropology**, 5–12 March 2006, Anchorage, Alaska, USA. For program information, please contact the Program Chair, Lyle W. Konigsberg, Department of Anthropology, University of Tennessee, Knoxville, TN 37996-0720, USA, Tel: (865) 974-4408, fax: (865) 974-2686, e-mail <aapavp@utk.edu>. Local Arrangements Committee Chair: Christine Hanson, Department of Anthropology, University of Alaska Anchorage, Anchorage, AK 99508, USA, tel: 907-786-6839, fax: 907-786-6850, e-mail <afclh@uaa.alaska.edu>. Website at <http://www.physanth.org/annmeet>.

**Primate Society of Great Britain (PSGB), Spring Meeting 2006**, 27–28 March 2006, University of Stirling, Stirling, Scotland. The theme is "Primate Mentality and Wellbeing." On the afternoon of 27 March invited speakers will address the relationship between cognition and welfare in primates. Other topics are welcomed for posters and oral sessions. There will be a prize for the best postgraduate presentation and poster. A provisional programme and instructions for presenters can be found on the meeting website at: <http://www.psychology.stir.ac.uk/staff/svick/PSGB2006.php>. For more information please contact: Dr Sarah Vick (PSGB), Psychology Department, University of Stirling, FK9 4LA, Scotland. E-mail address for enquiries: <psgbspring@stir.ac.uk>.

**21st Congress of the International Primatological Society**, 25–30 June 2006, Imperial Resort Beach Hotel, Entebbe, Uganda. Theme: "Primate Conservation in Action." Preliminary contact details: Dr. William Olupot, Chair, Organizing Committee, IPS 2006 Congress, P. O. Box 21669, Kampala, Uganda, Tel: 077598134, 077947397, 041501020, e-mail <wolupot@yahoo.com>.

**29th Annual Meeting of the American Society of Primatologists (ASP)**, 16–19 August 2006, San Antonio, Texas. Sponsored by Southwest National Primate Research Center. Tentative deadline dates are 5 December 2005 to notify program chair of intent to offer a symposium or workshop; 9 January 2006 to send symposia and workshop abstracts with confirmed list of participants to program chair; and 6 February 2006 for all final abstracts for symposia, oral, and poster presenters. See the ASP website for updates and further information: <http://www.asp.org/meetings/index.html>.

**1st European Congress of Conservation Biology**, 22–26 August 2006, Eger, Hungary. The European Section of the Society for Conservation Biology is determined to promote the development and use of science for the conservation of European species and ecosystems, and to make sure that conservation policy is firmly underpinned by the best available scientific evidence. This keystone congress will bring together a wide array of academics, policymakers, students, NGO representatives, and biodiversity managers from throughout Europe and beyond. For more information, see the Congress website at <http://www.eccb2006.org> or contact András Báldi, Chair of the Local Organising Committee, at <baldi@nhmus.hu>.

# 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 Portuguese contributions to: John M. Aguiar, Conservation International, Center for Applied Biodiversity Science, 1919 M St. NW, Suite 600, Washington, DC 20036, Tel: 202 912-1000, Fax: 202 912-0772, e-mail: <j.aguiar@conservation.org>, and all Spanish contributions to: Ernesto Rodríguez-Luna, Instituto de Neuroetología, Universidad Veracruzana, Apartado Postal 566, Xalapa 91000, Veracruz, México, Tel: 281 8-77-30, Fax: 281 8-77-30, 8-63-52, e-mail: <saraguat@speedy.coacade.uv.mx>.

## Contributions

Manuscripts may be in English, Spanish or Portuguese, and should be double-spaced and accompanied by the text on diskette for PC compatible text-editors (MS-Word, WordPerfect, Excel, and Access), and/or e-mailed to <j.aguiar@conservation.org> (English, Portuguese) or <saraguat@speedy.coacade.uv.mx> (Spanish). 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 texts 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), Biogeography, Ecology and Conservation. Texts for full articles should not exceed about 20 pages in length (1.5 spaced, and including the references). Please include an abstract in English, and (optional) one in Portuguese or Spanish. Tables and illustrations should be limited to six, excepting only the cases where they are fundamental for the text (as in species descriptions, for example). Full articles will be sent out for peer-review.

***Short articles.*** These 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 which 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 which occur in them. Texts should not exceed 10 pages in length (1.5 spaced, including the references).

***Figures and maps.*** Articles may include small black-and-white photographs, high-quality figures, and high-quality maps and tables. Please keep these to a minimum. We stress the importance of providing maps which are **publishable.**

***News items.*** Please send us information on projects, field sites, courses, recent publications, awards, events, activities of Primate Societies, etc.

***References.*** Examples of house style may be found throughout this journal. 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.

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## Short Articles

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