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Front Cover:
A white-footed saki, *Pithecia albicans,* from the Brazilian Amazon. Photo by Russ Mittermeier.

Short Articles

The Use of Date Palms (*Phoenix* sp.) as Resting and Sleeping Sites by *Callithrix jacchus* in Northeastern Brazil

Marcelo Oliveira Teles de Menezes

Introduction

As arboreal mammals, primates typically sleep in trees (Anderson, 1998), although there are exceptions such as *Trachypithecus leucocephalus* that use caves (Huang *et al.*, 2003). Primates often sleep in the forks of branches or holes in the trunk (Stevenson and Rylands, 1988), on the surface of leaves (Heymann, 1995; Zhang, 1995; Bitetti *et al.*, 2000) or even in nests they build themselves (Jones *et al.*, 1996).

The structural characteristics of a tree and its surroundings are important when primates choose an arboreal sleeping site. Miranda and Faria (2001) concluded that for *Callithrix penicillata*, the most important aspects are height, the extent of branching, foliage cover, and proximity to food sources. During a study on *Saguinus midas*, Day and Elwood (1999) verified that in 25% of all observations, the tamarins preferred sleeping sites that were closest to their most recent food source. Liu and Zhao (2004) noticed a preference of *Rhinopithecus bieti* for trees with a greater total height and branches growing higher on the trunk, as opposed to trees with a larger crown diameter and branches growing out nearer to the ground. Bitetti *et al.* (2000) noted that the trees chosen by *Cebus apella* were always higher than the canopy and bore a large crown. What is less clear is which factors determine the choice of sleeping sites. Anderson (1998) and Bitetti *et al.* (2000) mentioned several factors that may influence the choice of sleeping sites, such as safety from predators, security from falls, physical comfort, hygiene, avoiding parasites and cohesion of the group.

Little is known about the use of palm trees as sleeping sites by Neotropical primates. Recent studies have reported that *Cebus apella* uses *Jessenia* (Spironello, 2001; Zhang, 1995) and *Syagrus* (Bitetti *et al.*, 2000) to sleep in, while *Jessenia* is also mentioned as providing sleeping sites for *Saguinus mystax* and *S. fuscicollis* (Heymann, 1995). Understanding why palm trees are chosen as sleeping sites may illuminate factors that influence the choice of sleeping trees overall. As monocotyledons, palm trees have distinctive characteristics, such as a lack of branching from the main trunk and a generally even girth along the trunk. According to Zhang (1995), the use of palm trees by primates may be considered a strategy for avoiding predators: the single trunk poses a challenge to wild cats and snakes, and the dense leaves at the crown are a natural alarm system, rustling at any touch and alerting the monkeys if a predator intrudes.

Palms of the genus *Phoenix* are not native to South America, but they are planted worldwide as ornamentals. *Phoenix* palms have pinnate leaves with spines in the petiole, and a dense crown with up to 200 leaves; they may reach a height of over 20 m (Lorenzi and Souza, 1996). Here I report on the use of *Phoenix* palms for resting and as a sleeping site by a group of marmosets, *Callithrix jacchus*, on the campus of the federal university in the city of Fortaleza, Ceará.

Methods

This study took place at the Campus do Pici of the Universidade Federal do Ceará in Fortaleza, Ceará, in northeastern Brazil. Five free-ranging individuals made up the study group: two adults, two juveniles and an infant. The group inhabited a highly fragmented area under intense urban interference, with a number of planted trees and much traffic of vehicles and pedestrians. Observations *ad libitum* were made from 26 July to 24 September, 2004.

Results

On seven occasions I was able to observe the group leaving the same *Phoenix* palm, one by one, between 0524 and 0545 hrs. On two occasions, the group slept in the palm tree for two consecutive nights. On various other occasions, I observed the group climbing, resting or leaving that tree and four other *Phoenix* palms during the day. All five *Phoenix* were in an isolated forest patch of 0.48 ha.

The palm tree most often used for sleeping (Fig. 1) was the immediate neighbor of two *Enterolobium contortisiliquum*

Figure 1. *Phoenix* sp. used as a sleeping site.

(Leguminosae), one of which was the first tree of the day to be visited, where the marmosets gouged and fed on the exuded gum. In the same fragment I found 14 individuals of *Mangifera indica* (Anacardiaceae), four *Anacardium occidentale* (Anacardiaceae), one *Psidium guajava* (Myrtaceae), a further three *E. contortisiliquum* (Leguminosae), and a total of 20 *Phoenix* date palms. The trunk of the primary sleeping-palm was 45 cm in diameter (DBH); the tree's height was approximately 14 m, and its leaves averaged 4.15 m in length.

The marmosets slept amongst the leaf bases, which were smooth and wider than the petiole; with a width of ~15 cm, they are large enough to accommodate a marmoset without great postural demands—one of the factors mentioned by Anderson (1998) as important in the choice of the sleeping site. The animals accessed the leaf bases in two ways: 1) by jumping from a neighboring tree to a palm leaf, reaching the leaf base by its central rib or rachis (an option only possible when the crown of the neighboring tree was of a similar height to the palm's own crown); and 2) jumping from the crown of a neighboring tree to the trunk of the palm, and climbing up to the crown using their claws. In the latter case, the crown height of the neighboring tree was usually lower than that of the palm. There are spines (Fig. 2) along the lower third of the petiole, close to the leaf base, where the marmosets slept. These spines tended to be longer the further they were from the base of the leaf.

Discussion

The height of the palm trees, together with their lack of branches, protects the marmosets not only from natural predators, but humans as well. Although it is no longer legal in Brazil to transport them or keep them as pets, traffic in these animals for the pet trade was once widespread. Their perch on the leaf bases helps to keep the marmosets secure from raptors; the dense crown of leaves screens them from

Figure 2. Petiole of a dead leaf of *Phoenix* sp., showing its spines.

view, and the many spines would serve as a pointed deterrent. A notable aspect, easily seen in Figure 1, is the complete lack of contact with the surrounding vegetation. Any predator entering could only jump onto the leaves or climb up the trunk. The large leaves may also protect the marmosets from rain, although this was not observed during the period of the study. Heymann (1995) points out that *Jessenia* palms offer protection from the rain for *Saguinus*. It is impossible to see the animals from the ground without the aid of binoculars, unless the marmoset is stretching its neck to look out.

Bitetti *et al.* (2000) concluded that their study group of *Cebus apella* did not choose sleeping sites by chance; rather, they preferred high trees with wide crowns, suggesting safety from predators was a deciding concern. That preference was also reflected in the frequent use of those trees. This would appear to contradict the idea that rotation of sleeping sites is to elude predators and parasites (see Stevenson and Rylands, 1981), although the key factor in this case may be the small number of appropriate sites, with the few available being of superior quality.

Conclusions

The marmosets' preference for sleeping in the *Phoenix* palm fits well with the factors mentioned by Bitetti *et al.* (2000), Miranda and Faria (2001) and Liu and Zhao (2004): the favored tree was higher than the canopy formed by *Mangifera indica* and *Anacardium occidentale*, was close to the food source (*E. contortisiliquum*), and possessed dense foliage and an unbranched trunk. The use of these *Phoenix* palms in this urban setting would seem to support the hypothesis of predator avoidance, besides evidently being comfortable (Anderson, 1998).

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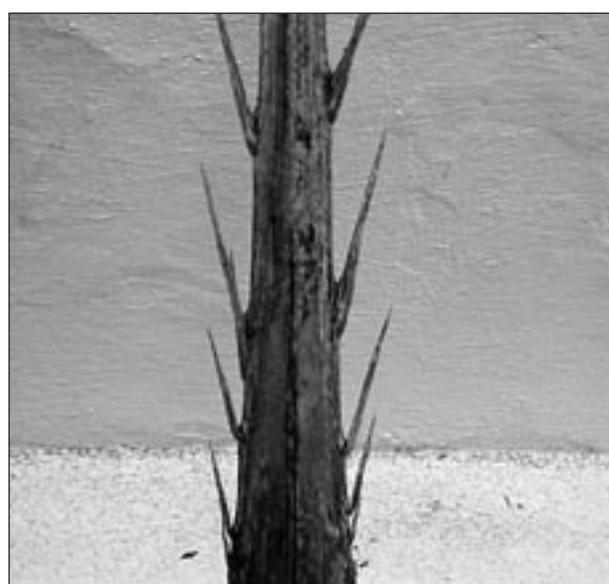
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On the Occurrence of the Owl Monkey (*Aotus azarai*) in Cerro Leon, Chaco, Paraguay

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The owl monkey, *Aotus azarai*, has been described from various parts of northern Argentina and Paraguay (see Stallings, 1984, 1985; Fernandez-Duque *et al.*, 2001). One of the earliest reports is found in Kerr (1950), in a description of a pioneering exploration of the Chaco from 1889 to 1891 along the Río Pilcomayo. The most recent review detailing this primate's distribution in northern Argentina and Paraguay is provided by Neris *et al.* (2002). In the northern Paraguayan Chaco, they describe low canopy scrub forest and high canopy forest as suitable *Aotus* habitat. They describe its activities in Paraguay as mainly crepuscular, although sometimes active on cloudy or overcast days.

During fieldwork on the Chacoan peccary, *Catagonus wagneri*, in the Chaco Central in the austral spring of 2003, an opportunity presented itself to investigate two locations in the extreme north and west of the country. One of these was the Defensores del Chaco National Park and its unusual land formation, Cerro Leon. These are the only places one may find rocks of any type in the entire Chaco region. The observation reported here provides an additional location for *Aotus azarai* in Paraguay, verifying that it is capable of survival and reproduction in a xerophytic habitat.

Defensores del Chaco and Cerro Leon are located from 19°45' to 20°45'S, and 59°30' to 61°10'W in the Department of Alto Paraguay and a small portion of Boquerón. Average annual rainfall is from 500 to 800 mm, and temperature ranges from 0–42°C. The park has a xerophytic fauna and flora, locally referred to as *seca*—literally dried up, arid and barren. At the time of our visit the region had been suffering from an extended period of extreme drought.

While visiting Cerro Leon during late October of 2003, we observed an adult pair of *Aotus azarai* with a very young infant in a candelabra tree cactus (*Cereus* sp.), near a foot trail leading to the summit of the highest ridge. The day was cloudless, with bright sun and an ambient temperature of about 40°C. The adults were alert but not obviously alarmed; the infant was clinging to an adult's neck and upper back. It was movement by the adults that clued us to their presence. There were no vocalizations, and we saw no aggressive behavior, such as the typical rapid and jerky movement of the head and upper body. We observed the pair and their offspring closely for more than twenty minutes, after which time—and perhaps in response to our attempts to take photographs—the trio moved rapidly out of the tree cactus, into the adjacent shrubby vegetation and out of sight. Given the steepness of the hillside and the density of the thorny vegetation, it was not possible to follow them.

The environment in which this family group of *Aotus* was found is a stunted, thorny, dry forest region with no large trees or emergent vegetation, except for occasional Palo Borracho trees (*Chorisia insignis*) in the infrequent and somewhat more humid lowland areas. The "soil" at Cerro Leon is largely broken rocks of various sizes, making human movement and climbing noisy and extremely difficult. The large amount of rock present at this site is uncharacteristic of the Chaco—a flat, plain-like habitat that is without stone or rocks of any type. All stone and rock used there for road building or construction is either imported or brought from the eastern and southern part of the country. *Chaqueños* tell the folk story of the Chaco being a great inland sea whose bottom was devoid of rock or stone. Plant growth is precarious; rainfall is limited and subject to rapid runoff, and there is little natural shade. Overall the vegetation rarely exceeds 3 m, with the exception of the occasional tree cactus (*Cereus* sp.) or Palo Borracho tree.

Given these circumstances, we were unable to determine whether or not these owl monkeys were demonstrating

cathemeral activity. However, given the nature of the habitat, and the obviously restricted food resources, one could logically conclude that such activity was likely in order to ensure survival. A careful survey of the habitat revealed a number of small tree holes, cactus tangles, and other suitable retreats of sufficient size to accommodate an adult *Aotus* or a small family group. Those which we investigated did not contain any owl monkeys or other mammals, nor did they show any signs of recent use, such as food remnants, waste, hair, or rub marks.

This is the furthest north that we have observed *Aotus* in the Chaco, although Handen *et al.* (1994) documented the presence of owl monkeys in a location identified as Area II in the northernmost department, the Chaco. Multiple observations of a pair with and without offspring between 1989 and 1997 have been made in a farming area outside of the Mennonite colony of Neuland in the Chaco Central (D. Meritt Jr., unpublished observation: it is unclear if they were of the same pair, their offspring or unrelated animals). The habitat is considerably different in that location, as are the potential food resources. Neuland is part of the Mennonite colony located near Filadelphia in the Chaco Central. It is typical Chaco, without rocks and with dense thorny shrubs and an abundance of trees. The region is several hundred kilometers south and west of Defensores del Chaco and Cerro Leon, and considerably wetter.

Redford and Eisenberg (1992) report the presence of infant *Aotus* in the Paraguayan Chaco in August, September, and October. This corresponds with the present observation and those mentioned above in Neuland (D. Meritt Jr., unpublished). A number of authors have previously reported the presence of *Aotus* in large tree cacti, including Rathbun and Gache (1980), Stallings (1984, 1985), Stallings and Mittermeier (1983) and Stallings *et al.* (1989).

At the time of year when this observation was made, there were no fruits or seeds present in or on the vegetation and no flowers to be seen. There were a number of small lizards and infrequent small birds, but no large flying insects. A search for *Aotus* droppings to try to determine possible food sources was unsuccessful.

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THE USE OF CAMERA-TRAPS IN A SURVEY OF THE BUFF-HEADED CAPUCHIN MONKEY, *CEBUS XANTHOSTERNOS*

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Introduction

The buff-headed or yellow-breasted capuchin monkey (*Cebus xanthosternos*) is endemic to a restricted region of the Atlantic Forest of eastern Brazil, one of the richest and most threatened ecosystems in the world (SOS Mata Atlântica *et al.*, 1998; Myers *et al.*, 2000). Due mostly to habitat destruction and hunting, this once-abundant species is rapidly declining in number, and is one of the 25 most endangered primates in the world (Mittermeier and Konstant, 2000; Konstant *et al.*, 2002; Mittermeier *et al.*, in prep.). In 2002 we began a survey of the remaining yellow-breasted capuchin monkey populations throughout its original distribution, in order to establish the conservation status of the species and to identify the threats to its survival.

Local people in all remaining forested areas in the original distribution of the species (as indicated by Oliver and Santos, 1991) were interviewed to determine if *C. xanthosternos* was still present in the area. Because these monkeys occur in low densities and are very difficult to see or hear, confirmation of their presence was difficult. We first tried to attract the capuchins with playback calls, using recordings of their vocalizations, but the groups did not answer. The large number of forests to be surveyed rendered the use of linear transect methods unfeasible. The presence of human observers may also frighten capuchins, since they are hunted. In order to confirm the presence of *C. xanthosternos* in the forests we decided to use camera-traps.

Camera-traps have been used successfully in numerous studies of large mammals. They provide information on species richness, activity patterns, abundance, and population density (Karanth and Nichols, 1998). The technique, however, is normally used in studies of terrestrial animals. Here we describe the use of camera-traps to collect information on arboreal primates.

Materials and Methods

We set up CamTrakker camera-traps (<http://www.camtrakker.com>) in forests where two or more interviews of local farmers or hunters had suggested the presence of capuchins. The cameras were fixed with elastic cords on trees directly in front of a platform on a second tree, mounted about 2 m above the ground and baited with bananas (Fig. 1). Each camera-trap has an infrared sensor aimed at the platform; when the sensor detects a moving heat source, it triggers the camera, and thus captures images of whatever species climbs the platform to eat the bananas. We used chains and padlocks to secure the cameras to the trees to deter theft.

We visited the platforms every week to replace the bananas and change the film in each camera. The cameras were set to shoot only during the day, with a delay time of 90 seconds to prevent multiple photographs of the same individu-

als. The main aim of our survey was to register the capuchin monkeys; the number of cameras and the time they were left in the field varied according to the ease of access to the forest and its size.
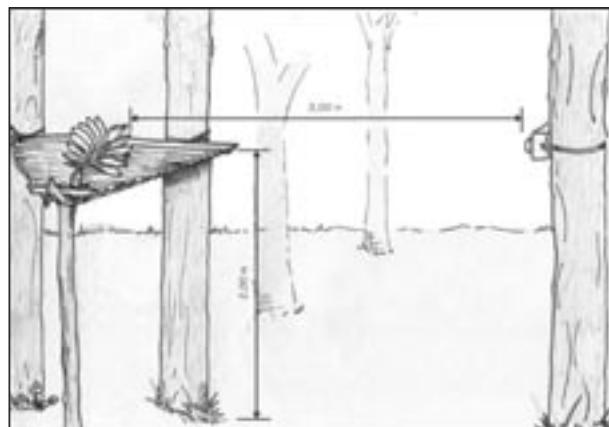
Results

We installed camera-traps in 13 different forests and used three to eight cameras in each, depending on the size of the fragment (approximately 1:400 camera/ha). *C. xanthosternos* was successfully phototrapped in all of the 13 areas. The time necessary to achieve photos of the monkeys varied from one week to three months.

The technique also proved efficient in recording the presence of four other primate species in the region (Table 1), besides other mammals normally difficult to detect such as *Eira barbara*, *Nasua nasua*, and *Sciurus aestuans*. When the cameras were set to operate both day and night, they also caught *Procyon cancrivorus*, *Rhipidomys mastacalis*, *Micoureus demerarae*, *Marmosops incanus* and *Didelphis aurita* eating the bananas on the platform.

Discussion

Camera-traps have been used to record a large number of mammal species, especially those which are furtive and inconspicuous. They can also be used in ecological studies to estimate relative abundance and population density (Karanth and Nichols, 1998; Trolle and Kéry, 2003). In these cases, the location and the sampling duration need to be standardized. This was not, however, the objective of our study, which was merely to confirm the presence and identity of the animals.

In some areas, and for certain primate species, it is possible to play a tape of their calls (playback) along trails to attract the groups and/or to stimulate a reply (Diego *et al.*, 1993; Kierulff, 1993; Mendes, 1993; Pinto, 1994). However, the buff-headed capuchins failed to respond to recordings of their calls even in areas where they were known to occur.

The use of bait can alter group home ranges and also bias sampling due to the attraction of determined species. By using bananas for bait, we expected to attract frugivorous

Figure 1. Camera-trapping arrangement: platform baited with bananas, and the CamTrakker camera mounted three meters away.

Table 1. Primates registered with camera-traps, Bahia, Brazil.

Cebidae	
Cebus xanthosternos	Buff-headed capuchin; macaco-prego-do-peito-amarelo
Callitrichidae	
Leontopithecus chrysomelas	Golden-headed lion tamarin; mico-leão-da-cara-dourada
Callithrix kuhlii	Wied's black-tufted-ear marmoset; mico-estrela
Callithrix penicillata	Black-tufted-ear marmoset; mico-estrela
Callithrix geoffroyi	Geoffroy's tufted-ear marmoset; sagüi-de-cara-branca

Figure 2. Buff-headed capuchin monkeys, *Cebus xanthosternos*, caught by a camera-trap on a platform baited with bananas.

and omnivorous species, a prediction confirmed by our records of *C. xanthosternos*, the golden-headed lion tamarin (*Leontopithecus chrysomelas*), and the marmosets (*Callithrix*). More folivorous species such as howler monkeys (*Alouatta*) and titi monkeys (*Callicebus*) were not caught by the camera-traps. Although these latter two were present in some of the areas we surveyed, they were apparently not attracted to the platforms and the bananas. Both *Alouatta* and *Callicebus* use the upper canopy more consistently than the primates listed in Table 1, and since the platforms were only 2 m above the ground, the howlers and titi monkeys may not have had the opportunity to find the fruit and be photographed.

As they were photographed feeding in small groups, the images allowed us to identify minimum numbers of individuals (Fig. 2). Photographing dependent infants and juveniles helps to determine demography and reproductive seasonality. Camera-traps also provided additional information, such as the interactions between *C. kuhlii* and *L. chrysomelas* caught feeding at the same time. Associations between these species have been reported by Rylands (1989) and Raboy (2002) in the region of Una in Bahia.

When the goal is only to verify the occurrence of a species in a given area, the use of camera-traps is efficient and relatively inexpensive when compared to playback and linear transect techniques, which are more time-consuming and require more trained researchers to walk the trails. Although the cameras themselves are quite expensive, it takes little time to prepare the platforms and few people to monitor the cameras, bait the platforms and change the film. They proved to be vital for the success of our survey of *C. xanthosternos* and other primates that are otherwise so elusive.

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Preservation and Extraction of DNA from Feces in Howler Monkeys (*Alouatta caraya*)

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Introduction

Techniques of molecular genetics are increasingly used to study various aspects of the social systems of human and wild non-human primates (Altmann *et al.,* 1996; Gagneux *et al.*, 1999; Nievergelt *et al.*, 2000; Paabo, 2003; Di Fiore, 2003). In the past, studies of primate molecular genetics were limited by the availability of blood or tissue samples for DNA extraction. Today, samples such as hair and feces, obtainable through non-invasive methods, are preferred for genetic analysis. This strategy avoids the capture of the animals, minimizing any undesirable impact on their behaviour as well as preventing injuries and infectious diseases either to the animal or the sample collector (Constable *et al.*, 2001; Sibal and Samson, 2001). As a result, it is becoming safer and easier to obtain information on kinship, sex ratio, effective population size and gene flow in undisturbed populations of arboreal and threatened species.

Although a number of recent studies have used non-invasive sampling to examine aspects of the social structure of several Old World primates (Gagneux *et al.*, 1999; Gerloff *et al.,* 1999; Goossens *et al.*, 2000; Constable *et al.*, 1995, 2001; Vigilant, 2002), only a handful of studies have used feces from New World monkeys as a source of DNA for molecular studies (Surridge *et al.*, 2002; Escobar-Paramo, 2000; Böhle and Zischler, 2002). The main goal of this study was to test alternative methods for preserving and subsequently extracting DNA from fecal samples of a New World primate, in order to identify a low-cost solution that might be broadly applied in molecular ecological research on platyrrhines.

Materials and Methods

Sampling
We collected fecal samples from two groups of black-and-gold howler monkeys in two habitats: flooded forest on Brasilera Island, near the confluence of the Río Paraná and Río Paraguai in the Chaco region of northern Argentina (27°20′S, 58°40′W), and the semi-deciduous forest of the basin of the Río Riachuelo, a tributary of the Río Paraná, further to the southwest (27°30′S, 58°41′W) near the southern margin of the geographic range of *A. caraya*. Samples were collected from a total of five different individuals immediately after defecation. Individuals 1 and 2 were from the flooded forests, and individuals 3, 4 and 5 were from the riparian forests. In all cases one sample (10 g) was taken from each individual and subdivided into four sub-samples of approximately 2 g each, which were then preserved according to the following protocols:

1. In paper envelopes kept in shadow at approximately 20°C (68°F);

2. in paper envelopes dried under the sun;

3. in paper envelopes dried at 60°C in an oven (30°-120°C); and

4. in sterile tubes containing 34 g of technical grade solid salt (NaCl).

Samples were stored in these conditions for one month and then used for extraction by three different methods.

DNA Extraction
We tested three methods for DNA extraction on each of the four preservation protocols. Duplicate extractions were made in all cases.

1. CTAB (Corach *et al.*, 1995)
For each extraction, ~300 mg of feces were added to 2.5 ml of Cetyl Trimethyl Ammonium Bromide (CTAB, Carlo Erba RPE) and 10 µl Proteinase K (20 mg/ml). Samples were then incubated overnight at 56°C with constant agitation. Organic solvent extractions were carried out with 2.5 ml of Chloroform: Iso-Amil Alcohol (24:1); the mixture was thoroughly shaken for 15 minutes and then centrifuged for 25 minutes at 2000 g. The aqueous phase was carefully removed and this procedure was repeated once more. The aqueous phase was transferred to a fresh tube and 2/3 of the volume of the aqueous phase of 2-Propanol (Carlo Erba RPE) was added. Tubes were frozen overnight and then centrifuged cold for 15 minutes at 2000 g. The supernatant was then carefully transferred to a fresh tube; 1 ml of 70% ethanol was added to wash the pellet, centrifuged again, and the ethanol carefully removed. The pellet was then dried at 37°C for 2 hours and resuspended in 200 µl of deionized water.

2. Guanidinium Thiocyanate/Silica (Boom *et al.*, 1990)
For each extraction, ~300 mg feces were added to 3 ml lysis buffer (10 M GuSCN, 0.1 M Tris-HCl, pH 6.4, 0.02 M EDTA, pH 8.0, 1.3% Triton X-100). After 15 minutes of constant agitation and 15 minutes of centrifugation at 12000 g, 1.8 ml of the aqueous phase were transferred to a fresh tube and 40 µl of silica suspension described in Boom *et al.* (1990) were added. The mixture was immediately vortexed for 5 seconds, incubated at room temperature for 10 minutes, vortexed again (5 seconds) and centrifuged (30 seconds, 12000 g). The supernatant was then disposed of by suction, and the silica pellet was washed twice with 1 ml washing buffer (10 M GuSCN, 0.1 M Tris-HCl, pH 6.4), twice with 1 ml 70% ethanol and once with 1 ml acetone. The pellet was then dried at 56°C for 30 minutes and nucleic acids were eluted at 56°C for 10 minutes with 200 ml TE (10 mM Tris-HCl, 10 mM EDTA, pH 8.3). The tube was centrifuged (5 minutes, 12000 g) and 50 ml of the supernatant were carefully removed (to avoid pipetting silica particles) and transferred to a fresh tube.

3. TEC/Guanidinium Thiocyanate/Silica
For each extraction, ~300 mg feces were added to 3 ml of TEC (10 mM Tris-HCl, pH 8, 10 mM EDTA, 100 mM NaCl), 10 µl of Proteinase K (20 mg/ml) and 3 µl of DiThioThreitol 1M. After incubation for four hours at 56°C with constant agitation, the mixture was centrifuged for 20 minutes at 7000 g. One ml of the supernatant was added to 2 ml lysis buffer (10 M GuSCN, 0.1 M Tris-HCl, pH 6.4, 0.02 M EDTA, pH 8.0, 1.3% Triton X-100). The tube was vortexed for 30 seconds and then centrifuged (20 minutes, 7000 g). The supernatant was recovered and transferred to a fresh tube, where 40 µl silica suspension were added. The following steps are the same as those described for silica extraction in Protocol 2.

PCR Amplification
PCR reactions were carried out using 2 µl of each extracted sample. In all cases, extraction and amplification reactions included negative controls. In addition, blood samples from zoo specimens were used as positive controls.

Two PCRs were carried out for each extract obtained. As we used three extraction methods for each of four subsamples from each of five howler monkeys, we ran a total of 120 PCR reactions. The presence of nuclear DNA from howler monkeys was tested by PCR amplifications of one microsatellite isolated from *Alouatta palliata* (AP74) using primers (5'-GCACCTCATCTCTTTCTCTG-3') and (5'-CATCTTTGTTTTCCTCATAGC-3') (Ellsworth and Hoelzer, 1998). These primers were used in 25 µl PCR reactions containing the following: 2 µl of template, 0.2 mM each dNTP, 0.5 µM of each primer, 1.5 U Taq DNA Polymerase (Invitrogen), 20 mM Tris-HCl, 50 mM KCl, and 1.5 mM $MgCl_2$. The PCR cycling profile consisted of 40 cycles of denaturing for 1 minute at 95°C, annealing for 1 minute at 52°C, and extension for 1 minute 30 seconds at 72°C. PCR products were separated by electrophoresis on 2% agarose gels stained with ethidium bromide.

Results

Amplification products were obtained from samples preserved with two of the four methods tested—those desiccated in NaCl and those dried in paper envelopes exposed to the sun. However, the success rate was greater with the former rather than the latter procedure (4/5 and 2/5, respectively). The only extraction procedure that yielded DNA suitable for amplification was that using Guanidinium Thiocyanate/Silica (Protocol 2), with a success rate of 80% for NaCl preserved feces (Fig. 1) and 20% for feces dried in the sun (Table 1). No amplifications were obtained from the samples preserved by drying at 60°C or at room temperature, no matter which extraction method was used (Table 1).

Gel electrophoresis of the straight DNA extraction products revealed that the TEC/Silica extraction method (Protocol 3) and CTAB (Protocol 1) ostensibly yielded a high quantity of DNA, but serial dilutions of this template in new AP74 PCR reactions failed to yield any product (Table 1), suggesting a low concentration of howler monkey DNA in these extractions. This is probably due to the fact that the CTAB extraction and TEC pre-treatment lead to improved lysis of vegetable cells present in the feces and thus
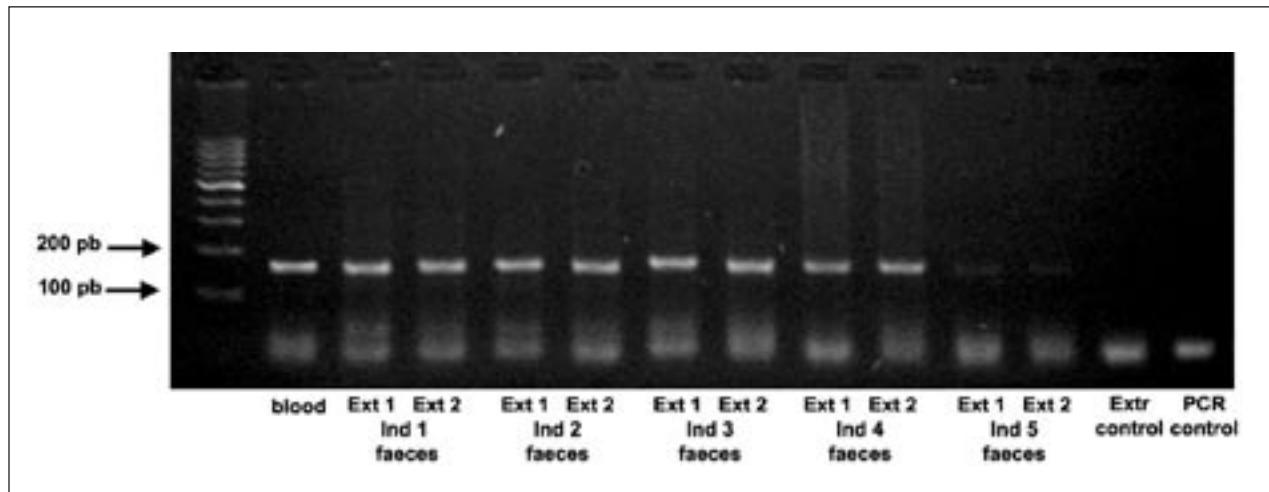
Figure 1. Amplification products obtained for combination of the conservation method in NaCl and the extraction with Guanidinium Thiocyanate/Silica. Duplicate extractions and amplifications are shown.

Table 1. Results of PCR amplifications of microsatellite AP74 from five black-and-gold howler monkeys. One sample from each individual was subdivided into four sub-samples with different preservation protocols and extracted by three different methods.

Preservation	Extraction Method	Ind. 1		Ind. 2		Ind. 3		Ind. 4		Ind. 5	
		Ext. 1	Ext. 2	Ext. 1	Ext. 2	Ext. 1	Ext. 2	Ext. 1	Ext. 2	Ext. 1	Ext. 2
RT	1	No	No	No	No	No	No	No	No	No	No
	2	No	No	No	No	No	No	No	No	No	No
	3	No	No	No	No	No	No	No	No	No	No
Sun	1	No	No	No	No	No	No	No	No	No	No
	2	No	No	Yes	Yes	No	No	Yes	Yes	No	No
	3	No	No	No	No	No	No	No	No	No	No
60°C	1	No	No	No	No	No	No	No	No	No	No
	2	No	No	No	No	No	No	No	No	No	No
	3	No	No	No	No	No	No	No	No	No	No
NaCl	1	No	No	No	No	No	No	No	No	No	No
	2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
	3	No	No	No	No	No	No	No	No	No	No

Ind. 1, 2: Inhabiting the flooded forest on the island of Brasilera (27°20'S, 58°40'W).
Ind. 3, 4, 5: Inhabiting the semi-deciduous forest of the Río Riachuelo basin (27°30'S, 58°41'W).
Preservation: preservation methods: **RT**: paper envelopes kept in shadow and room temperature; **Sun**: paper envelopes dried under the sun; **60°C**: paper envelopes dried at 60°C; **NaCl**: sterile tubes containing 34 g of technical grade solid salt (NaCl).
Extraction: DNA extraction methodologies tested: **1**: CTAB; **2**: Guanidinium Thiocyanate/Silica; **3**: TEC – Guanidinium Thiocyanate/Silica.
Ext. 1/ Ext. 2: Duplicate extractions for the same individual.
Ind. #: Presence or absence of amplification products for each individual.

co-extraction of plant DNA from species in the howlers' diet, in addition to DNA from the animals' own cells sloughed off in the intestine. The direct silica extraction, on the other hand, is a fast-extraction procedure, and thus only animal cells are expected to lyse. Since the black-and-gold howler monkeys are folivore/frugivores (Rumiz *et al.*, 1986), the only animal cells that might be present in feces are those of their gastrointestinal tract.

Discussion

How to acquire samples is a pivotal issue in genetic studies of arboreal primates. Current methods in molecular biology allow for the use of non-invasive sampling of hair or feces. In *Alouatta caraya*, as in many other arboreal species, hair sampling is extremely difficult, although possible (Ascunce *et al.*, 2003). In contrast, fecal samples are easy to obtain and to identify. Non-invasive sampling methods are limited, however, due to the low quantity and quality of the DNA obtained, which may lead to incorrect results (Taberlet *et al.*, 1996, 1999; Vigilant, 2002; Gagneux *et al.*, 1997, 2001). The quantity and quality of DNA obtained will improve when samples are collected immediately after defecation (Frantzen *et al.*, 1998; Wasser *et al.*, 1997). Therefore, the ability to obtain nuclear DNA from feces depends primarily on the method of sample storage (Vigilant, 2002). Condi-

tions in the field are also important, since the samples must be collected and preserved until they can be moved to the laboratory (Frantzen *et al.*, 1998). Non-human primates usually live in habitats where the climate is extremely humid, and generally there are no drying ovens or freezers near the field sites to preserve the samples. Thus, the difficulty and the expense of having cryopreservation or drying systems in the field will determine the need for appropriate and inexpensive systems for prolonged room-temperature preservation.

Our results indicate that feces may provide samples amenable to molecular research in *Alouatta caraya*. Duplicate extractions and amplifications yielded reproducible results. Of the four tested methods of fecal sample preservation, the most appropriate seems to be in solid salt (NaCl), since it presents no difficulties in the field, and yielded the best results in the amplifications. As for the extraction methods, the Guanidinium Thiocyanate/Silica method was the only one that provided useful results (from samples preserved in NaCl and those dried in the sun). As Boom *et al.* (1990) described, most viruses and mammalian cells are expected to lyse in the first step of the silica extraction. The quick lysis of this protocol avoids the extraction of vegetal DNA, also present in the samples, which might saturate the DNA-binding capacity of the silica particles. In addition, the DNA purified by this method is essentially free of potential inhibitors of the Taq Polymerase that might prevent PCR amplifications. In contrast, CTAB extraction and pre-treatment with TEC prior to Guanidinium Thiocyanate/Silica extraction increases the yield of vegetable DNA that may dilute the animal DNA obtained. The absence of amplifiable DNA in the samples stored at 20°C could be explained by bacterial proliferation. On the other hand, the samples dried in the oven at 60° suffer a rapid and intense dehydration, reducing the ability of the Guanidinium Thiocyanate solution to moisten and homogenize the tissue during its short exposure (15 minutes).

Our purpose in this note has been to describe simple and inexpensive methods to sample feces from New World primates and extract DNA suitable for molecular analysis. Although there are commercial kits, buffers, and other methods which allow the extraction and preservation of DNA from feces (Nsubuga *et al.*, 2004), they are very expensive, even prohibitively so, for researchers in developing countries.

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Infecção por Endoparasitas em um Grupo de Bugios-Pretos (*Alouatta caraya*) em um Fragmento Florestal no Estado do Mato Grosso do Sul, Brasil

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Introdução

A importância dos estudos parasitológicos realizados com primatas é reforçada pelo consenso de que esses animais podem possuir uma fauna de parasitas, característica e associada, que pode ser o reflexo de uma estreita co-evolução. Ao mesmo tempo, análises detalhadas das relações com esses parasitas são importantes para a avaliação da conservação e da qualidade do habitat utilizado pelos primatas (Stuart e Strier, 1995). Para Martins (2002) e Santa Cruz *et al.* (2000), a infecção parasitaria pode ser agravada pela degradação e fragmentação de habitats. Com a fragmentação das florestas os animais tendem a ocupar áreas menores e, conseqüentemente, permanecem um maior tempo nas mesmas árvores (Kowalewski e Zunino, 1999), aumentando a exposição e as possibilidades de infecção e re-infecção de parasitas (Freeland, 1976, 1980; Gilbert, 1994a, 1994b). Stuart e Strier (1995) ressaltaram que o entendimento do processo de co-evolução, entre os parasitas e seus hospedeiros primatas, pode nos proporcionar *insights* a respeito de eventos filogenéticos e de especiação destes animais.

Assim, a quantificação da prevalência de diferentes parasitas em uma população de primatas pode auxiliar os primatologistas a identificar fatores ecológicos e comportamentais limitantes que estariam atingindo, de diversas maneiras, populações inteiras, grupos, genealogias ou indivíduos. Fatores como umidade da área de uso, período do ciclo reprodutivo das fêmeas, densidade populacional e tamanho de grupo do hospedeiro, ou diferenças comportamentais entre os indivíduos do grupo, podem influenciar o tipo de infecção do primata hospedeiro (Stuart e Strier, 1995). Outro fator importante está relacionado à maneira como os animais utilizam seu habitat. Stuart *et al.* (1990) verificaram que os grupos de *Alouatta palliata palliata* que usavam repetidamente as mesmas rotas durante o forrageamento apresentaram uma maior contaminação do que os outros grupos.

Baseado nas inúmeras oportunidades de contaminação dos agentes infecciosos, tanto em animais de cativeiro como os de vida livre, torna-se indispensável o estudo parasitológico nos animais envolvidos em projetos de re-introdução que vêm sendo desenvolvidos com o objetivo de re-povoamento de áreas naturais. Estes estudos deveriam avaliar a área escolhida para a reintrodução bem como acompanhar o processo de habituação dos animais com a área escolhida. Desta forma, poderíamos minimizar os possíveis comprometimentos não somente dos animais envolvidos na re-introdução, mas, também, das espécies já existentes na área (Santini, 1986; Magnusson, 1995; Martins, 2002).

No entanto, alguns estudos constataram que os primatas possuem comportamento de defesa no uso do seu habitat natural numa tentativa de diminuir os riscos de contaminação (Stuart e Strier, 1995). Um comportamento de defesa dos *Alouatta*, relacionado principalmente em evitar infecções parasitárias, é de defecarem em conjunto e em locais pré-estabelecidos. Esses primatas, após um período de descanso pela manhã e à tarde, deslocam-se para galhos intermediários, o que possibilita defecarem diretamente no solo. Este comportamento, possivelmente, minimizaria a re-infecção de parasitas, evitando a contaminação de fontes alimentares e o contato com os patógenos em suas fezes (Montilha *et al.*, 2002; Gilbert, 1997). Além disso, em um estudo com

chimpanzés, verificou-se a utilização de plantas nutricionais com ação anti-parasitaria em sua dieta (Wrangham e Nishi-da, 1983; Huffman e Seifu, 1989). Por outro lado, vários estudos relatam a relação entre o comportamento de geofagia e o controle de parasitas entre os primatas (Bicca-Marques e Calegaro-Marques, 1994; Krishnamani e Mahaney, 2000).

Apesar da existência de um corpo importante de literatura acerca da complexa relação entre endoparasitas e seus hospedeiros (no caso especifico dos primatas neotropicais ver exemplos com *Alouatta caraya* [Bicca-Marques e Calegaro-Marques, 1994; Santa Cruz *et al.*, 2000]; *Alouatta belzebul* [Martins, 2002], e *Saguinus imperator imperator, Saguinus fuscicollis weddelli* e *Cebuella pygmaea* [Santos *et al.*, 1995], em estudos de campo e com *Alouatta guariba clamitans* [Müller *et al.*, 2000] estudo em cativeiro) o conhecimento sobre quais espécies de parasitas estariam interagindo com as populações de primatas ainda é muito escasso. Assim, como forma de expandir o conhecimento sobre os primatas e seus parasitas no contexto da fragmentação de habitat, o objetivo principal desta pesquisa foi verificar a ocorrência de possíveis casos de endoparasitas naturais em *Alouatta caraya*, em um fragmento de floresta localizado no limite dos municípios de Terenos e Sidrolândia no Estado do Mato Grosso do Sul.

Métodos

Sítio e grupo de estudo

A área de estudo, a Reserva Particular do Patrimônio Natural – RPPN Nova Querência (20°43'34"S, 54°55'07"W), localiza-se na Serra de Maracajú, no município de Terenos, a 48 km do centro de Campo Grande, Mato Grosso do Sul. Este fragmento florestal apresenta um mosaico vegetacional, onde podemos encontrar diferentes estratos de florestas mesófilas e manchas de Cerrado. A área possui uma extensão de aproximadamente 3.864 ha e possui componentes dos biomas Amazônia e Mata Atlântica. Nesta área, podemos encontrar—de forma quase completa—os representantes da fauna de vertebrados do Estado do Mato Grosso do Sul. Nela encontramos bugios-pretos (*Alouatta caraya*) e macacos-pregos-amarelos (*Cebus cay*) e outros mamíferos de médio e grande porte, como antas (*Tapirus*

terrestris), queixadas (*Tayassu pecari*), catetus (*Tayassu tajacu*), lobos-guarás (*Chrysocyon brachyurus*) e felinos como a onça parda (*Puma concolor*) e a onça pintada (*Panthera onca palustris*).

Nesta pesquisa foi observado um grupo de bugios-pretos composto por seis indivíduos: um macho adulto, uma fêmea adulta e quatro imaturos (três machos e uma fêmea). Dentre os imaturos, apenas um macho e uma fêmea foram observados ainda filhotes. O processo de habituação dos animais teve início em janeiro de 2002.

Coletas das amostras fecais e análise parasitológica

As coletas de amostras fecais foram realizadas durante cinco dias consecutivos mensais, das 6:00 hs às 17:30 hs, entre os meses de maio e dezembro de 2002. As amostras foram coletadas no momento da defecação dos animais, quando eram registrados a data, o horário da coleta e a identidade do indivíduo observado. Caso não fosse possível identificar o animal de forma individual, através de seu nome, anotava-se o seu sexo e a classe etária. De forma cuidadosa, com auxílio de espátulas, coletava-se a região superior e central da amostra fecal. Esse procedimento pareceu ser o mais adequado tendo em vista que as fezes estavam sempre diretamente em contato com o solo. Dessa forma, procurou-se evitar coletar outros organismos que não fizessem parte da fauna intestinal do animal. O material fecal era acondicionado em coletores plásticos contendo líquido conservante MIF (Mercurocromo-Iodo-Formol) e conservados a baixa temperatura, em um refrigerador existente na base de campo. Durante o trajeto, entre o local da coleta e a base de campo, as amostras eram mantidas dentro de uma caixa de isopor numa tentativa de se evitar mudanças acentuadas de temperatura que pudessem comprometer as análises. A pesquisa para identificação dos parasitas utilizou o método de Willis e o exame direto da amostra fecal (De Carli, 1994; Neves, 2000).

Resultados

Foram coletadas 59 amostras fecais de *Alouatta caraya* distribuídas entre os seis animais que compunham o grupo de estudo (Tabela 1). Dentre todas as amostras coletadas,

Tabela 1. Número de amostras fecais coletadas por diferentes faixas sexo-etária de um grupo de bugios-pretos (*Alouatta caraya*).

Classe sexo-etária	Indivíduos	Maio	Julho	Agosto	Setembro	Outubro	Novembro	Dezembro	Total
♂ adulto	Said	2	1	0	1	0	0	1	**5**
♀ adulta	Jade	0	1	3	5	0	3	6	**18**
♂ imaturo	Leo	1	1	3	0	0	1	4	**10**
	Rick	1	1	2	2	0	1	4	**11**
♀ infante	Jane	0	1	1	0	0	0	0	**2**
♀ imatura	Jane	0	0	0	3	0	0	3	**6**
♂ infante	Jack	0	0	0	0	0	0	1	**1**
Não identificados*		1	2	0	0	0	0	3	**6**
Total		**5**	**7**	**9**	**11**	**0**	**5**	**22**	**59**

* Indivíduos do grupo de estudo não identificados no momento da coleta.

31 amostras (52,54%) fornecerem resultados positivos quanto à infecção por parasitas. A partir dos exames realizados, constatamos a incidência de oocistos de protozoários, larvas e ovos de helmintos, tendo sido identificados sete táxons diferentes de endoparasitas (Tabela 2). Em algumas análises, foi impossível a identificação do parasita em categorias taxonômicas inferiores à família.

Tabela 2. Ocorrência dos endoparasitas identificados nas amostras fecais de um grupo de *Alouatta caraya*.

Helmintos	Protozoários
Trichuris sp.	*Eimeria* sp.
Oesophagostomum sp.	Oocistos não identificados
Enterobius vermicularis	
Capillaria sp.	
Trichostrongylus sp. Família Strongyloidae (gênero não identificado)	
Ovos não identificados	
Larvas não identificados	

Tabela 3. Incidência dos parasitas intestinais nas amostras e o número de animais infeccionados por cada táxon.

Parasita	N° de amostras positivas	N° de animais contaminados	Prevalência (%)
Sp. A*	7	4	66,6
Sp. B*	5	3	50
Sp. C*	1	1	16,6
Sp. D*	3	3	50
Sp. E*	1	1	16,6
Sp. F*	2	1	16,6
Trichuris sp.	1	1	16,6
Oesophagostomum sp.	1	1	16,6
Capillaria sp.	1	1	16,6
Enterobius vermicularis	1	1	16,6
Trichostrongylus sp.	1	1	16,6
Eimeria sp.	2	2	33,3
Família Strongyloidae	3	2	33,3
Oocistos	2	2	33,3
Total	31	6	

* Espécies de parasitas não identificados.

Tabela 4. Ocorrência das diversas espécies de endoparasitas nos indivíduos do grupo de *Alouatta caraya*.

Indivíduos	Endoparasitas
Said	espécies A e D
Jade	Oocistos; espécies A, B, C, E, F; *Trichuris* sp.; Família Strongyloidae; Ácaro
Leo	Oocistos; *Oesophagostomum* sp.; espécie A
Rick	Família Strongyloidae; *Trichostrongylus* sp.; espécie A
Jane	*Enterobius vermicularis*; *Capillaria* sp.; *Eimeria* sp.; espécies A, B, D

Apesar de não ter sido possível identificar a espécie E, algumas características morfológicas—como o formato ovóide, a transparência, a membrana externa e interna bem visível com a presença de uma invaginação, e presença de líquido no interior do ovo—sugerem tratar-se de um ovo de *Hymenolepis* sp. Da mesma forma, a espécie F possuía características morfológicas semelhantes a um ovo de *Physaloptera* sp.

Durante as coletas das amostras fecais, foram observados vermes adultos em algumas amostras logo após a defecação. A partir da descrição feita por Martins (2002) sobre a morfologia externa de *Trypanoxyuris minutus*, acreditou-se que as larvas encontradas poderiam ser desta espécie. Além disso, segundo Martins, este parasita é bastante comum no gênero *Alouatta*.

A distribuição dos parasitas entre os diferentes indivíduos do grupo, o número de amostra onde cada parasita foi identificado e o cálculo da prevalência de cada espécie de parasita, são apresentados na Tabela 3. Para calcular a prevalência, dividiu-se o número de hospedeiros infectados por uma espécie de parasita em particular pelo número total de animais estudados, este cálculo normalmente é apresentado em porcentagem (definição descrita por Stuart e Strier, [1995], segundo a Sociedade Americana de Parasitologia). A prevalência de parasitas sobre o grupo de bugios-pretos estudado mostrou uma maior porcentagem de infecção da espécie A (66,6%), seguida pelas espécies B e D (com 50%). Entre os parasitas identificados, aqueles pertencentes à Família Strongyloidae e ao gênero *Eimeria* sp. apresentaram prevalência de 33,3%.

Dentre os indivíduos do grupo de estudo, a fêmea adulta, Jade, foi a que apresentou a maior diversidade de parasitas (oito espécies) e com a qual obtivemos o maior número de amostras (18). Nesse indivíduo, os parasitas encontrados foram: *Trichuris* sp., um espécime da Família Strongyloidae, e indivíduos das espécies não identificadas A, B, C, E e F, presença de oocistos e de um ácaro (Tabela 4). A fêmea jovem, Jane, foi a segunda em incidência de parasitas, sendo que em oito amostras, seis apresentaram resultados positivos. Foram identificadas seis espécies diferentes de parasitas: as espécies não identificadas A, B e D, *Capillaria* sp., *Enterobius vermicularis* e *Eimeria* sp. (Tabela 4). Os machos jovens, Leo e Rick, apresentaram entre três e quatro espécies diferentes de parasitas. O macho adulto, Said, foi o que apresentou o menor número de parasitas (apenas duas espécies). Do filhote macho, com quatro meses de idade, conseguimos apenas uma amostra fecal na qual não foi identificado nenhum parasita (Tabela 4).

Com o objetivo de verificar a existência de uma possível relação entre o número de parasitas e a sua prevalência com o tamanho do grupo de bugios e o tamanho da área do fragmento utilizado pelos animais, utilizou-se a correlação linear de Pearson (Biostat 2.0: Ayres *et al.*, 2000). Nesta análise, foram utilizadas informações complementares de três trabalhos realizados por Santa Cruz *et al.* (2000), Martins (2002)

e Montilha *et al.* (2002) (Tabela 5). As análises mostraram uma correlação negativa entre a prevalência e o tamanho de grupo (r = -0,74; p = 0,014). O mesmo acontecendo quanto à relação entre o tamanho de grupo e o número de espécies de parasitas existente (r = -0,71; p = 0,02). No entanto, apesar de positiva, não detectamos uma correlação muito forte entre a prevalência e número de espécies de parasitas com o tamanho do fragmento florestal (r = 0,31, p = 0,48; r = 0,32, p = 0,48, respectivamente).

Discussão

As análises parasitológicas indicaram que, do total de 59 amostras, 31 delas (52,5%) foram positivas para pelo menos um endoparasita. Apesar do número de amostras da fêmea adulta ser superior às dos outros indivíduos e ela ter apresentado uma maior diversidade de parasitas (oito táxons), não podemos dizer que o tamanho da amostra influenciou a diversidade de parasitas, pois a fêmea imatura (Jane), da qual obtivemos apenas nove amostras fecais, apresentou seis táxons diferentes.

Vários parasitas encontrados nas fezes dos primatas estudados também podem infectar bovinos e ovinos (ICEA, 1976). Por exemplo, *Oesophagostomum* sp. pode ser encontrado em bovinos e suínos, enquanto que *Eimeria* sp. pode infectar tanto o homem quanto os animais domésticos. Já, o helminto *Trichostrongylus* sp. afeta, normalmente, os ruminantes, os eqüídeos, porcos, cães e aves domésticas (Pessoa, 1988). Assim, o fato da área de uso do grupo estudado localizar-se no limite da floresta, próxima à área onde existe uma criação de bovinos e ovinos, pode ter facilitado

Tabela 5. Informações sobre a prevalência, tamanho de grupo de *Alouatta,* tamanho do fragmento utilizado e número de espécies de parasitas.

Estudo	Prevalência (1) (%)	Tamanho médio do grupo (2)	Tamanho do fragmento (3)	Número de espécies de parasitas (4)
Godoy *et al.* (este estudo)	52,5	6	3.864 ha	14
Montilha *et al.*, 2002	59	6	120 ha	6
Martins, 2002	86	6	Contínua	13
Martins, 2002	74	6,6	Contínua	7
Martins, 2002	72,5	6,5	484 ha	9
Martins, 2002	86	6,8	360 ha	7
Martins, 2002	67,5	6,8	180 ha	10
Santa Cruz *et al.*, 2000	57	5		8
Santa Cruz *et al.*, 2000	44,4	10		4
Santa Cruz *et al.*, 2000	7,1	12		1

Correlação de Pearson:
1x2: r = -0,74; r^2 = 0,55; g.l. = 8; p = 0,01, n = 10; **2x4:** r = -0,72; r^2 = 0,55; p = 0,02, n = 10; **1x3:** r = 0,31; r^2 = 0,10; p = 0,48, n = 7; **3x4:** r = 0,32; r^2 = 0,10; p = 0,48, n = 7.

a contaminação deste grupo de *Alouatta*. Além disso, outras características ambientais, como umidade do ar e a declividade do relevo, podem ser consideradas como facilitadores neste processo. Em *Trichuris* sp., parasita comum em porcos e cães, a umidade é muito importante para o desenvolvimento deste parasita em ambiente externo (Pessoa, 1988).

No caso do gênero *Eimeria* sp. (Eimeriidae), a infecção dá-se pela ingestão de água ou alimentos contaminados contendo oocistos que foram expulsos com as fezes ou disseminados por outros hospedeiros. Espécies deste gênero podem causar doenças graves nas aves, no gado e em outros animais como galinhas, patos, peru, faisões e pombos (Pessoa, 1988). Segundo o manual de veterinária publicado pelo Instituto Campineiro de Ensino Agrícola (ICEA, 1976) este parasita causa a chamada "diarréia vermelha", indicando a presença de sangue nas fezes.

Assim, quanto aos processos de contaminação pelos parasitas aqui encontrados, consideramos que a maior parte pode estar relacionado à utilização de alimentos ou água contaminados (*Trichuris* sp., *Eimeria* sp. e *Trichostrongylus* sp.). No entanto, a contaminação pelo *Enterobius vermicularis* (oxiúro do ceco e do apêndice cecal) não ocorre apenas através de alimentos contaminados mas, também, por via área (poeira) e através do ato de coçar a região perianal, que pode provocar a transferência dos ovos das mãos do hospedeiro para a boca. Em ambiente úmido, estes parasitas podem permanecer vivos durante dias.

Neste estudo não foi realizada uma estimativa precisa do grau de infecção dos animais estudados, uma vez que técnicas de quantificação de ovos não foram feitas. Contudo, observamos um pequeno número de ovos nas amostras, o que consideramos um provável indicador da baixa carga parasitária. Para a maioria das espécies que conseguimos identificar, foi encontrado apenas um exemplar de cada espécie. Somente na espécie A (não identificada) foram encontrados nas amostras mais de um ovo. Entretanto, não podemos garantir que esses animais estejam livres do desenvolvimento de doenças parasitárias, bem como, que possuam alguma patogenia grave. As informações aqui obtidas ainda são muito restritas para esse tipo de diagnóstico.

No entanto, os parasitas encontrados foram citados na literatura especializada como espécies de relativa freqüência em outras espécies do gênero *Alouatta* e outros gêneros de primatas. Por exemplo, o parasita *Trichuris* sp. foi encontrado em *Alouatta belzebul* na região Amazônica (Martins, 2002) e em *Alouatta guariba clamitans* em um fragmento florestal no noroeste do Estado de São Paulo (Montilha *et al.*, 2002). O helminto *Enterobius vermicularis*, citado por Pessoa (1988) como um oxiúro bastante comum em primatas, foi observado em *Alouatta guariba clamitans* (Müller *et al.*, 2000; Montilha *et al.*, 2002) e o mesmo pôde ser verificado com *Capillaria* sp. (Montilha *et al.*, 2002). Inglis e Cosgrove (1965) ressaltam que os cebídeos apresentam grande taxa de infecção por parasitas da Família Oxyuridae. Algumas das espécies de parasitas encontradas em *Alouatta*

caraya parecem ser comuns nas espécies de calitriquíneos. Em um estudo em cativeiro (Ximenes, 1997), os sagüis comuns, *Callithrix jacchus*, apresentaram como endoparasitas os helmintos *Trichuris* sp. e *Oesophagostomum* sp. e o protozoário *Eimeria* sp., enquanto que o *Saguinus fuscicollis weddelli*, no Estado do Acre na região Amazônica, apresentou *Trichuris* sp. e *Saguinus imperator imperator* apresentou *Trichostrongylus* sp. (Santos *et al.*, 1995).

Apesar de haver relatos da contribuição da geofagia no controle das infecções parasitárias em primatas (ver Bicca-Marques e Calegaro-Marques, 1994), este comportamento não foi observado nesta pesquisa.

Vários estudos têm verificado grande prevalência de infecção por endoparasitas em grupos de *Alouatta* que ocupam regiões com alta densidade populacional (*Alouatta seniculus*, Gilbert, 1994b; *Alouatta palliata*, Stuart *et al.*, 1990). Gilbert (1994b), por exemplo, estudando 14 grupos de *Alouatta seniculus* em fragmentos de 10 ha, 100 ha e floresta contínua, verificou que os fragmentos com maior densidade populacional (os de 10 ha e a floresta contínua) apresentaram as maiores porcentagens de infecção (entre 38,1% a 60,0%). No entanto, Stuart *et al.* (1993) não encontraram relação positiva entre a prevalência de endoparasitas e a densidade populacional do muriqui (*Brachyteles hypoxanthus*). Além disso, o grupo de *Alouatta guariba* avaliado por eles, simpátrico aos muriquis, não apresentava nenhum ovo ou larva de endoparasitas. Para Stuart *et al.* (1993), diferenças na vegetação, no clima e no nível de perturbação dos fragmentos poderiam explicar diferentes taxas de infecção.

Os estudos citados acima, apontam para a importância da avaliação da densidade populacional em pesquisas parasitológicos com as espécies do gênero *Alouatta.* Por outro lado, quando utilizadas as informações de Montilha *et al.* (2002), Martins (2002) e os obtidos nesta pesquisa, encontramos uma correlação positiva fraca entre o tamanho do fragmento e a taxa de prevalência de parasitas. Porém, Santa Cruz *et al.* (2000) chamam a atenção para a avaliação do tamanho do fragmento e o grau de fragmentação, pois pequenos fragmentos, com quantidade insuficiente de alimento, podem obrigar os bugios a descerem ao chão para alcançarem outras áreas. Além disso, caso haja poucas árvores no fragmento, os animais seriam obrigados a permanecerem mais tempo ou reutilizar as mesmas árvores, aumentando os riscos de infecção.

Vale ressaltar, que ao contrário do que foi verificado em relação ao tamanho do fragmento, o tamanho do grupo parece ser extremamente importante no processo de infecção por endoparasitas, já que, detectamos uma relação negativa entre o tamanho do grupo e a prevalência e o número de espécies de parasitas encontrado. Assim, em grupos menores, onde as relações sociais entre os mesmos indivíduos são mais freqüentes, os animais infectados apresentam maior probabilidade de contaminar outros indivíduos.

Devido à escassez de pesquisas parasitológicas com primatas de vida livre, acreditamos que este estudo contribuirá para um melhor entendimento deste tema e poderá auxiliar trabalhos de conservação e manejo das espécies do gênero *Alouatta*, especialmente quando envolverem a re-introdução de animais em novas áreas (Magnusson, 1995) e as populações que ocupam ambientes fragmentados.

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A Muriqui (*Brachyteles hypoxanthus*) with a Broken Leg at the Estação Biológica de Caratinga, Minas Gerais, Brazil

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The northern muriqui (*Brachyteles hypoxanthus*) is Critically Endangered (Hilton-Taylor, 2002) and one of the world's 25 most endangered primates (Konstant *et al.*, 2002). The total known population is currently estimated at between 700 and 1000 animals. The behavior, ecology, demography and reproduction of one group of northern muriquis, the Matão group, has been studied since 1982 at the Estação Biológica de Caratinga in the Feliciano Miguel Abdalla Private Natural Heritage Reserve (RPPN) in Minas Gerais, Brazil. Here we report our observations on the behavior and recovery of a three-year-old female with a broken leg.

Muriquis travel by suspensory locomotion, propelling themselves by their arms, with or without the assistance of their tail (Nishimura *et al.*, 1988; Iurck, in prep.). Suspensory locomotion optimizes time and energy costs for primates such as muriquis that travel widely between dispersed food sources (Cant *et al.*, 2001; Youlatos, 2002). Members of the Matão study group travel an average of 1,206 m a day, with recent maximum daily travel distances of 2,835 m (Dias and Strier, 2002). The large size of the northern muriqui makes it especially vulnerable to injury from falls when traveling rapidly, and/or when branches break (Strier, 1999).

We observed the behavior of a three-year-old female in the Matão study group during February–July 2002, when she was suffering from a fracture in her right lower leg. We first noticed it on 20 February 2003; there was a visible lesion, and her leg was bent into an unnatural position. She was seen in this state a few hours after an encounter with a neighboring group, the Jaó group, in an area where the home ranges are known to overlap (Dias and Strier, 2002). The encounter included vocal and visual displays, but we saw no evidence that the female had been attacked or had fallen. The fracture appeared to be of the tibia, which is found toward the anterior of the lower leg and ordinarily

supports the weight of the femur above it (Gardner and Osburn, 1971). In addition, there was evidence of swelling and deformity consistent with trauma around the tibia, but not the fibula (Apley and Solomon, 1989).

The female was seen on the periphery of the group five days later (25 February 2003), together with an adult female and her dependent infant. The injured female spent at least four hours in a tree, where she was observed feeding and resting until we had to leave her to accompany the rest of the group. She did not use her injured leg, which was extended stiffly, swollen on the lower portion, and with a visible lesion on the fur (Fig. 1). She frequently licked and manipulated the area around the wound.

On 28 February 2003, she was observed traveling with the rest of the group, but without using her injured leg. On 6 March 2003, she was seen playing with two infants, and from 12–19 March 2003, she was also seen near other juveniles and adult females, including her own mother and her younger sibling. Her injured leg remained stiff and she was not observed to use it on any of these occasions.

It was on 23 March 2003 that we first saw her using the injured leg, resting it lightly on some branches while she was moving. On 30 March 2003 she was again seen using her injured leg while traveling with other group members. From 4–26 April 2003, we had few opportunities to observe the female, as the Matão group was subdivided into smaller parties at the this time, and it was difficult to locate every individual each day. However, it appeared that the female's

Figure 1. Young female (JO) feeding with lower right leg bone fracture on 25 February 2003. Photo by Carla B. Possamai.

leg had healed, despite the persistence of some swelling and a mark on her fur where the injury had occurred. Her movements appeared to have returned to normal, and she seemed to have fully recovered. She was routinely observed until 15 September 2003, after which date she suddenly disappeared. She is presumed to have died, because she was much younger than is typical for natal females when they disperse (Printes and Strier, 1999; Strier and Ziegler, 2000) and she was not seen in any of the other muriqui groups in the forest (Strier *et al.*, 2002).

We are unaware of any other reports describing recovery from bone fractures in wild muriquis, although healed fractures have been reported in other species of wild primates, including moustached tamarins (*Saguinus mystax*; Herrera and Heymann, 2004), mantled howler monkeys (*Alouatta palliata*; Estrada *et al.*, 2001), black spider monkeys (*Ateles paniscus*; Karesh *et al.*, 1998), Japanese macaques (*Macaca fuscata*; Nakai, 2003), mountain gorillas (*Gorilla gorilla beringei*; Lovell, 1990), and lowland gorillas (*G. g. gorilla*), bonobos (*Pan paniscus*) and chimpanzees (*P. troglodytes troglodytes* and *P. t. schweinfurthii*; Jurmain, 1997). Although fractures of the tibia are described in some of the apes (for example, Jurmain, 1997), in most primates they appear to be uncommon compared to fractures of other bones.

In humans, recovery from bone fractures involves the formation of bone callous, which gradually replaces the damaged bone tissue. Inferior limb bones may take 12–24 weeks to heal (Apley and Solomon, 1989). Our observations of this female suggest that in young muriquis, the recovery and healing process may be much more rapid, occurring within six to seven weeks. The muriqui's suspensory mode of locomotion, which relies much more on the arms than the legs, may have contributed to her rapid recovery.

Despite her fully recovered appearance, however, it is possible that her injury was directly or indirectly responsible for her disappearance and presumed death. Her injury may have become infected, but there were no external signs. It is also possible that she was still weak or slow, making her more vulnerable to predators, the only cause of death identified to date for younger muriquis at this site (Printes *et al.*, 1996).

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A Survey of Black Howler (*Alouatta pigra*) and Spider (*Ateles geoffroyi*) Monkeys Along the Río Lacantún, Chiapas, Mexico

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Introduction

One of the major problems in making adequate conservation assessments of primate populations is a lack of data on their location and demographic features—an issue exacerbated by rapid changes in species distribution as a result of forest destruction and fragmentation. Rapid assessment surveys can update such information and set the stage for further studies of population, ecology and conservation. In southern Mexico, large expanses of the native habitat of *Alouatta palliata, A. pigra* and *Ateles geoffroyi*—the three northernmost species of Neotropical primates—have been converted to pasture, and the primates have become extinct in many localities (Estrada and Coates-Estrada, 1996; Estrada and Mandujano, 2003). In other areas, populations of the three species exist in fragmented landscapes under precarious ecological and demographic conditions (Estrada *et al.*, 1999, 2002b). Finally, some populations exist in the protected forests of ecological reserves, national parks and biosphere reserves (Estrada *et al.*, 2002a, 2004). However, such information is still scanty for many regions of southern Mexico. In this paper we report data resulting from a first-time survey of populations of *A. pigra* and *A. geoffroyi* along a 40-km section of the Río Lacantún, Chiapas, one of the remotest regions of southern Mexico.

Methods

Study area and study sites
Fieldwork was conducted in the region of Marqués de Comillas, bordering Guatemala, in two adjacent areas separated by the Río Lacantún (16°05'58"N, 90°52'36"W; elevation 10–50 m. a.s.l., Fig. 1). Colonization of the eastern side of the river (heavily impacted, which we call the "settled" side) began about 30–40 years ago, and cattle ranching resulted in the rapid disappearance and fragmentation of the forest (Mariaca-Méndez, 2002). The western side of the river contains a large protected forest tract of about 300,000 ha—the Montes Azules Biosphere Reserve (MABR). The original vegetation in the area is tall evergreen and semideciduous rain forest, with trees reaching heights of 45 m. Common tree species in these forests include *Pterocarpus hayesii* (Fabaceae), *Nectandra* aff. *globosa* and *N. ambigens* (Lauraceae), *Brosimum lactescens* (Moraceae) and *Pouteria sapota* (Sapotaceae), among others (Mariaca-Méndez, 2002). The

Figure 1. Bottom right corner shows location of study area (black dot) in the state of Chiapas (CH), Mexico. C, Y and QR are the Mexican states of Campeche, Yucatán and Quintana Roo, respectively; B = Belize, G = Guatemala. The main map shows the 40-km section of the Río Lacantún (thick black line) in southern Chiapas, Mexico, where primate surveys were conducted. The shaded area to the left shows part of the 300,000 ha Montes Azules Biosphere Reserve (MABR). The smaller shaded area (1,700 ha) to the right is the Reforma community ecological reserve (CR in text). The dashed line inside CR is a major trail. Open circle is the approximate location of the village of Reforma. The gray dots are three forest fragments (nearest to farthest from the human settlement: 1, 8 and 20 ha) surveyed for primates. The dotted line is a dirt road. CH = Chajulillo River, TZ = Tzendales River. Grid lines are geographic coordinates.

climate is hot and humid: mean annual precipitation and temperature are 2874 mm and 25°C, respectively.

Primate surveys
We conducted surveys of primates by boat along a 40-km stretch of the Río Lacantún, on both the MABR and settled sides, between its confluence with the Ríos Chajulillo and Tzendales to the south and north respectively (16°05'58"N, 90°57'30"W and 16°18'06"N, 90°52'36"W). The width of the river varies from 40–60 m, allowing for surveys on both sides at once. We also conducted terrestrial surveys on the settled side of the river, in a forested ecological reserve of 1,700 ha belonging to Reforma, a local farming and cattle-ranching community. The inhabitants of this community, currently numbering about 600, are immigrants from the state of Oaxaca in western Mexico, who arrived in the area about 30–40 years ago as a result of colonization programs supported by the Mexican government. When the colonists first arrived the landscape was dominated by tropical rainforest, but they rapidly cleared much of the land for farming corn and other staples, as well as for cattle ranching. Interviews with some of the oldest inhabitants indicated that on first arriving, many survived by hunting a variety of terrestrial mammals as well as primates, especially spider monkeys. The settlers no longer hunt these primates in the remaining forest fragments, for three reasons: the establishment of the MABR on the other side of the river; increased supervision by Mexican wildlife officials; and environmental awareness and ecotourism projects in the community which have been supported by the Mexican government.

The community reserve (CR) occupies one portion of the Reforma community's land, which encompasses about 3,500 ha all told. The reserve consists of pristine evergreen rainforest, about 2.5 km from the human settlement. The community (*ejido*) owns titles to this land, and the reserve is part of a network of small forest reserves that, by law, the communities in the area are required to sustain and protect. In the case of the Reforma community, the reserve is part of a larger government-supported project of ecotourism, designed for this particular community and named "Guacamayas" for the large number of macaws in the area. Here camping facilities and rustic cabins have been built at the edge of the Río Lacantún, and all members of the community, especially the women, participate in this project. The men supervise the integrity of the 1,700-ha reserve, and maintain the trails where they guide tourists on walks through the forest (Fig. 1). The rest of the community's land is pasture, with a few smaller forest fragments. According to the residents of Reforma, three of the nearby fragments were inhabited by howler monkeys (Fig. 1).

We carried out primate surveys along the river during three 15-day visits to the study area, in October 2002 and in January and March 2003. Starting at 0400 h, we moved downriver on the current, with the outboard silent, beginning from the confluence of the Ríos Lacantún and Chajulillo. These surveys usually stopped at around 0800

h, when howling had subsided. Whenever we heard howlers, we recorded the time of day and our position with a GPS, estimating the approximate perpendicular distance of the vocalization to the boat and its compass direction. After 0800 h, we continued along the river at higher speed while scanning each side. When monkeys were sighted we moved ashore, following them to obtain repeated counts of individuals, until we reached a consensus on the total number of monkeys in the group. In subsequent days, we began the surveys at the point where we ended the day before.

In the CR forest, we used an existing system of trails running through the reserve to survey the primates, following standard procedures (National Research Council, 1981; Wilson *et al.*, 1996). Trails were walked slowly (1 km/h) and when a group of howler or spider monkeys was sighted, we noted its location using a GPS, and recorded its distance to the observer and the perpendicular distance to the trail line. Once a group was located, we followed it for as long as possible to obtain repeated counts of individuals, until we reached a consensus on group size. Each of the three forest fragments (1, 8 and 20 ha in size) reportedly inhabited by howler monkeys was surveyed on foot by our team.

Individuals in the primate groups were classified as infants (clinging ventrally and/or dorsally to the mother), juveniles (independent from the mother and about ¼ to ½ the size of an adult) and adults (all large and robust individuals) (Izawa *et al.*, 1979). For both howler and spider monkeys, we expressed population density in terms of the area sampled rather than density of the species' home range (Chapman and Balcomb, 1998).

Results

MABR river survey
Triangulation of early morning howling along the 40-km stretch resulted in 67 locations for troops of howler monkeys. (Some howling may have been produced by solitary animals.) Of these, 72% were heard on the MABR side of the river and the remaining 28% on the settled side. Detection rates were 1.20 troop locations/km of river for the MABR side and 0.48 locations/km for the disturbed side. Average estimated distance (adjusting for the position of the boat in the river) from the river's edge to the source of howling was 208.7 ±171.4 m and 438.2 ±202.0 m on the MABR and settled sides, respectively.

In the later phase of the same days, our survey on the MABR side of the river recorded 13 howler monkey troops totaling 72 individuals, plus a couple of solitary adult males and a lone adult male (Table 1). In the troops, adult males accounted for 33% of individuals counted, adult females for 42%, juvenile males 4%, juvenile females 8%, and infants 13%. Mean troop size was 5.5 ±1.5 individuals (range 3–8); the mean number of adult males and adult females in the troops was 1.8 ±0.80 and 2.3 ±0.63, respectively. The sex ratio for adults was 1:1.25; for juveniles, 1:2.0. The ratio of adult females to immatures was 1:0.66. While 38%

of the troops had one adult male, 62% had two or more adult males.

We estimated that these surveys sampled a ribbon of vegetation 40 km long by 120 m wide, or about 5.2 km² of forest, yielding a coarse estimate for population density of 14.4 individuals/km². In the same forest area, we detected two subgroups of spider monkeys. One had five individuals (1 adult male, 1 adult female, 1 juvenile, 1 infant and 1 unsexed adult) and the other was composed of 10 adult individuals; in the latter case their rapid movements, combined with the height of the forest, prevented identification of their sexes (Table 1).

CR survey
In the CR, ground surveys along the trail system counted 64 howler monkeys—61 as members of 12 troops, plus a solitary adult male and a pair of solitary males (Table 2). Adult males in the troops accounted for 34.4% of individuals, adult females for 45.9%, juveniles for 13.1% and infants for another 6.5%. Mean troop size was 5.1 ±2.0 individuals (range 2–10). The mean number of adult males and adult females in the troops was 1.8 ±0.75 and 2.3 ±1.23, respectively. The sex ratio of adults (M:F) was 1:1.33 and 1:1.0 in juveniles; the adult female to immature ratio was 1:0.43. While 42% of the troops had one adult male, 58% had two or more adult males (Table 2). The forest area sampled in the CR was estimated to be 4.8 km², resulting in an estimate of population density of 13.3 individuals/km². In the same site, we detected the presence of eight

Table 1. Age and sex composition of black howler monkey troops (*Alouatta pigra*) detected in the protected forest of MABR (Montes Azules Biosphere Reserve) on the western side of the Río Lacantún, Chiapas, Mexico.

Troops	AM	AF	JM	JF	I	Total
1	2	3			2	7
2	1	1			1	3
3	2	2		1		5
4	3	2				5
5	1	2				3
6	1	3	1			3
7	1	2		1	1	5
8	3	3		1		7
9	2	2		2	1	7
10	1	3			1	5
11	3	2	1		2	8
12	2	2	1		1	6
13	2	3		1		6
Total	24	30	3	6	9	72
Mean	1.8	2.3	0.23	0.46	0.69	5.5
±sd	0.80	0.63	0.44	0.66	0.75	1.5
Solitary males	2					2
	1					1
Total howlers						75

subgroups of spider monkeys with a total of 45 individuals (Table 2). Forty percent of these individuals were adult males, 36% were adult females, 4% were juvenile males, 9% were juvenile females and 11% were infants. Adult sex ratio was 1:1.13 and 1:2.0 in juveniles; the adult female to infant ratio was 1:0.61. Mean subgroup size was 5.6 ±3.9 individuals, with a mean of 2.3 ±2.1 adult males and 2.3 ±1.4 adult females (Table 2). A gross estimate of population density yielded 9.3 individuals/km².

Forest fragments

There was a single troop of *A. pigra* in each of the three isolated forest fragments, but no spider monkeys were present

Table 2. Groups of black howler monkeys (*Alouatta pigra*) and subgroups of spider monkeys (*Ateles geoffroyi*) counted in the forest of the community reserve (CR: 1,700 ha) of the farming community Reforma on the eastern side of the Río Lacantún, Chiapas, Mexico. AM = adult male, AF = adult female, JM = juvenile male, JF = juvenile female, I = infant.

Groups	AM	AF	JM	JF	I	Total
Alouatta pigra						
1	2	3	1			6
2	2	2		1		5
3	3	5		1	1	10
4	2	1				3
5	1	4	1			6
6	1	2		1	1	5
7	2	2	1			5
8	2	2				4
9	3	3				6
10	1	2	1	1	1	6
11	1	1			1	3
12	1	1				2
Total	21	28	4	4	4	61
Mean	1.8	2.3	0.33	0.33	0.33	5.1
±sd	0.75	1.23	0.49	0.49	0.49	2.07
Solitary males	1					1
	2					2
Total						64
Groups	AM	AF	JM	J F	I	Total
Ateles geoffroyi						
1	2	1		1		4
2	1	3		1	1	6
3	1	2		1		4
4	7	5	1		2	15
5	1	1		1		3
6	2	1			1	4
7		3	1		1	5
8	2	2				4
Total	16	18	2	4	5	45
Mean	2.3	2.3	0.25	0.50	0.63	5.6
±sd	2.1	1.4	0.46	0.53	0.74	3.9

(Table 3). Troop size in these fragments ranged from 6–11, with 1–3 adult males and 2–4 adult females. Each of the three troops had at least two juveniles, and two had infants (Table 3). Estimated densities for the 20-, 8- and 1-ha forests were 0.55, 0.88 and 6.0 individuals/ha, respectively.

Discussion

Our surveys on the MABR side of the river showed the presence of what seems a large population of howler monkeys, and possibly a smaller population of spider monkeys. While howler monkeys appear to be more common than spider monkeys on this side of the river, it is certainly possible that our surveys underestimated the density of spider monkeys as a result of their rapid movements and lack of long-distance calls, which makes them much more difficult to detect and count. Importantly, our surveys also showed that the protected forest on the settled side of the river also has both primate species, with howler monkeys again apparently more common than *Ateles*.

Interestingly, population density estimates for howlers on both sides of the river were quite similar (14.4 and 13.3 individuals/km², respectively) and they fall within the range reported for the species in other protected forests in Mexico. For example, in Muchukux, Quintana Roo, *A. pigra* occurs at densities of 15.1 individuals/km² (González-Kirchner, 1998), while densities in Palenque and Yaxchilán, Chiapas, are 23.0 individuals/km² and 12.8 individuals/km², respectively (Estrada *et al.*, 2002a, 2004). In contrast, the high densities estimated for *A. pigra* in the three forest fragments on the community land are consistent with values reported for the species from small riparian fragments in Belize (up to 17.8 individuals/ha; Silver *et al.*, 1998; Ostro *et al.*, 1999; Horwich *et al.*, 2001) and in small forest fragments in Palenque, Mexico (mean 1.16 individuals/ha; Estrada *et al.*, 2002b).

Mean troop size values for the black howlers in CR and in MABR (5.1 and 5.5 individuals, respectively) fall within the range of average troop sizes (3.1 to 7.5 individuals) reported for *A. pigra* in other localities in Mexico and in Belize and Guatemala (Coelho *et al.*, 1976; González-Kirchner, 1998; Ostro *et al.*, 1999; Estrada *et al.*, 2002a, 2004).

Table 3. Black howler monkey troops, *Alouatta pigra*, detected in three forest fragments surveyed in the land of the Reforma farming community in Chiapas, Mexico. Sites are listed in descending order by area (ha). AM = adult male, AF = adult female, JM = juvenile male, JF = juvenile female, I = infant.

Site/area ha	AM	AF	JM	JF	I	Total
20	3	4	1	1	2	11
8	1	3		2	1	7
1	2	2		2		6
Total	6	9	1	5	3	24
Mean	2.0	3.0	0.3	1.7	1.0	8.0
±sd	1.0	1.0	0.0	0.6	1.0	2.6

Because of the fission-fusion nature of spider monkey communities, it is rare to see all members of the community in the same location (Van Roosmalen and Klein, 1988; Kinzey, 1997) and it is not easy to make generalizations on density and/or subgroup size (Coelho *et al.*, 1976; Klein and Klein, 1977). Bearing this in mind, the mean subgroup size of spider monkeys in the CR (5.6 ±3.9 individuals) falls within the range of values reported for spider monkey populations at other protected forest sites in Mexico and Guatemala (Coelho *et al.*, 1976; Cant, 1978, 1990; Estrada *et al.*, 2004). In unprotected forests, habitat reduction coupled with hunting pressures can rapidly result in significant population declines, and spider monkeys are one of the most heavily hunted of all Neotropical primates (Raéz-Luna, 1995; Kinzey, 1997). These aspects may explain their absence in the forest fragments we surveyed.

Our survey not only confirmed the existence of an important population of *A. pigra* and *A. geoffroyi* along a 40-km reach of the Río Lacantún, but also suggests that current land management practices in the area have an important impact upon the persistence of populations of both primates. First, protection by the Mexican government of the MABR forest on the western side of the river has so far conserved populations of *A. pigra* and *A. geoffroyi*. Second, while only howler monkeys seem to survive on the eastern, settled side, owing to the extensive clearing of forest for pasture and agriculture, one community's initiative to preserve the forest on a large section (CR) of their land has sheltered an important population of howler and spider monkeys in this otherwise heavily impacted landscape.

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Primate Species at the Tiputini Biodiversity Station, Ecuador

Laura K. Marsh

Introduction

Many previously untouched regions of the Amazon are now faced with imminent disturbance from oil exploration. Forest cover in Ecuador has been decreasing at a rate of approximately 1.8% per year over the last decade (Wunder, 2000). While this figure might not seem startling, it does not take into account the recent push for oil speculation into unexplored regions of the Amazon. Thus, for all those who work in relatively unspoiled tropical forests, it is mandatory to have as much detailed information as possible about each region's primate fauna, since it may be slated to become another fragmented ecosystem in the greater matrix of rainforest loss (Marsh, 2003). This paper confirms the primates occurring in the Tiputini Biodiversity Station (TBS), as there has been some confusion as to the identity of the species in this part of the Yasuní Biosphere Reserve in Amazonian Ecuador.

Methods

Study area

TBS is located in the 1.7 million-ha Yasuní Biosphere Reserve (00°37'05"S, 76°10'15"W, *c.* 250 m above sea level), 300 km ESE of Quito in the province of Orellana (Salvador-Van Eysenrode *et al.*, 1998). The station was established in 1996 by the Universidad de San Francisco, Quito (Fig. 1). It is maintained primarily for students and researchers but is also open for limited ecotourism. The 650-ha lowland rainforest comprising the Biodiversity Station, extending along the north bank of the Río Tiputini, has 30 km of well-marked trails and two established 100-ha plots (J. Blake and B. Loiselle, pers. comm.). Yearly mean temperatures exceed 24°C and the relative humidity is above 80% (weather station data from 1981–1997 at Coca Airport, 00°27'08"S, 76°59'02"W, Dirección de Aviación Civil); yearly rainfall is around 3250 mm (TBS weather station; J. Guerra, pers. comm.). The topography is flat to gently sloped, with characteristics of *várzea* and *terra firma* forest, swamps, and a small oxbow lake. There is a canopy tower, "Torre II," on the far western side of the trail system.

Census methods

A preliminary census was conducted in February and March of 2002 and 2004 for a total of 205 observation hours. Census methods followed those for one observer as per National Research Council (1981) and Peres (1999). Censuses were carried out along 25 km of the trail system at approximately 1 km per hour to listen to and observe primate species. The trails bisect the site as well as following natural contours that lead through all habitat types in the area, including ridgelines, *várzea*, *terra firma*, and swamp. Positional data were taken with a Geographic Positioning
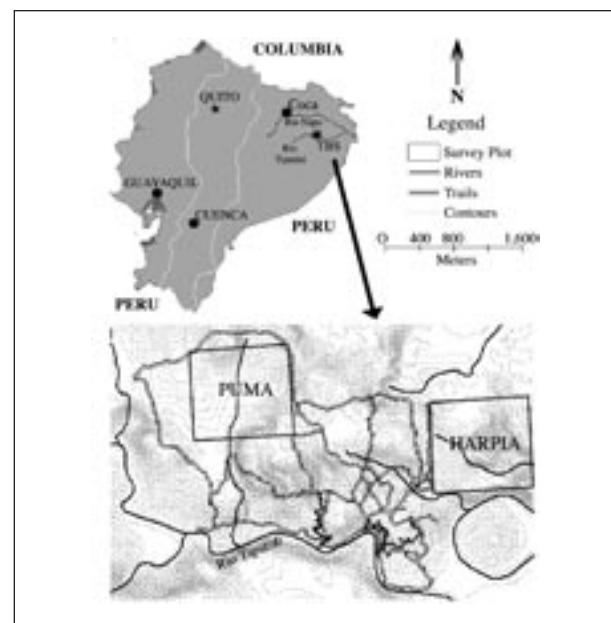

Figure 1. Map of Ecuador showing the location of the Tiputini Biological Station (TBS) and details of the TBS trail system with two 100-ha study plots (Puma and Harpia). Trail system map by B. Loiselle and J. Blake; redrawn by Winters Redstar.

System (Garmin GPS III) when possible. Independent of the censuses, primate groups were followed for as long as possible to collect data on group size and structure and to determine if other primate species were in association.

Primate Species Confirmed at Tiputini Biodiversity Station

Cebuella pygmaea (pygmy marmoset, leoncito)
Pygmy marmosets were last seen within the station boundaries five or six years ago (J. Guerra, pers. comm.). Now they can be found only at the furthest edges of the station property, along the Río Negro. They have been observed there by TBS station staff (in 2004) although they were not confirmed during this census. Confirmation of this species comes from an area about 40 minutes upstream from the station camp, at a site located on the south side of the Río Tiputini (00°38'58.9"S, 76°12'38.5"W). Two individuals were seen displaying and chewing holes in a tree (*Inga* sp.) that was partly covered by vine tangles and bromeliads. Four other feeding trees were noted within a 30 m² area along the river's edge, about 10 m back from the bank.

Saguinus tripartitus (golden-mantled tamarin, chichico)
Locally abundant, they were seen in treefall gaps, vine tangles, and smaller understorey trees in both *várzea* and *terra firma* areas of the station. They are listed as "Near Threatened" (*casi amenazada*) in the *Libro Rojo de los Mamíferos del Ecuador* (Tirira S., 2001). They are most often observed in the understorey but also forage near the canopy at about 30 m. Sternal and anogenital scent-marking have been observed for males. Group sizes range from two to 10 individuals, but are most often between four to seven. As with other tamarins, they eat insects and share parental care of twins. They have been observed to travel and associate with *Callicebus*, *Saimiri*, and *Cebus*. There is one published account of intergroup variation in ranging patterns from TBS (Kostrub, 2002).

Aotus vociferans (night monkey, mono noche)
Thus far we have confirmed only *A. vociferans* within the TBS area, although there is possibly a second species in the region. There are at least two groups within 0.5 km of the TBS camp area. We observed one group with five members on the edge of the camp clearing. These night monkeys are very pale, blondish animals with less distinct facial markings than is typical of *A. trivirgatus*. In appearance they closely resemble the rendering of this species in *Primates de la Amazonia del Ecuador* (de la Torre, 2000).

Callicebus cupreus (titi monkey, tití)
This titi is characterized by red underparts, brownish agouti back and tail, and a distinct white brow-stripe running the length of the forehead. Group size is two to three individuals, generally a pair with a single offspring. They chorus in the dawn and are seen in similar habitat and forest structure as *Saguinus*, mainly in *terra firma* or the fringes of *várzea*. They have been seen associating with *Saguinus*. Judging from the dawn-calls, there are probably many groups

within the vicinity of the TBS station. One pair has been radio-collared for a detailed ranging study by A. Di Fiore (pers. comm.).

Saimiri sciureus (squirrel monkey, frailecito)
According to Hershkovitz (1984), squirrel monkeys at Tiputini belong to the subspecies *macrodon* Elliot, 1907. They are found both in *várzea* and *terra firma* from about 3 to ~50 m above the ground. Most of the sightings were in the lower strata but they will at times follow spider monkeys right to the top of the canopy. They were seen in groups of 10 to 21, and often in association with *Cebus*, although they also follow and forage with *Lagothrix* and *Ateles*. *Saguinus* seems to loosely associate with *Saimiri*, typically on the fringes of a larger squirrel monkey group.

Cebus albifrons (white-fronted capuchin, mono capuchino)
The color of this species at Tiputini ranges from blondish/ light to brownish/dark, always with a lighter underbelly and always with black cap and vertical line (of varying width) in the center of the face. The darker color of some individuals has led to the belief there is a second *Cebus* (*C. apella*) in the region, but this has not been confirmed. When local workers were questioned about the facial and body markings, all sightings corresponded to *C. albifrons*. All capuchins observed by this author and other primate researchers at TBS have been *C. albifrons*. This species is very shy and difficult to see. It is observed most frequently in association with other species, particularly *Saimiri*, but can also be seen traveling with *Lagothrix*, *Saguinus,* and *Callicebus* (when *Callicebus* were in association with *Saguinus*). White-fronted capuchins are most frequently seen in groups of three to six, but there have been sightings of single individuals in association with *Saimiri*.

Pithecia (saki monkey, parahuaque, mono volador)
The identity of the saki monkey occurring in the TBS is in question. Its pelage does not correspond to the published descriptions and photographs of *P. aequatorialis* Hershkovitz, 1987, otherwise indicated for the region. It may be a color variant or a distinct taxon (M. Norconk, T. Defler, pers. comm.; L. Marsh, in prep.). *P. aequatorialis* as such has not been conclusively confirmed anywhere within Yasuní National Park. An inconclusive photograph was taken by a field assistant during a mammal survey in 1995 (Reid and Engstrom, 1996). During this survey they identified the more commonly seen saki as *P. aequatorialis*. For observers unfamiliar with *Pithecia* in Ecuador, it is possible to misidentify the species based on fleeting observations. Often there are groups of three to four individuals, of whom two are females, either two adults or an adult and subadult traveling together. Since these animals are not particularly habituated, the females will stay together in flight and the male can be easily missed. In these instances the females, because of their markings and pelage characteristics, can be mistaken as a male and female *P. monachus*. In *P. monachus* the male and female are nearly identical in coloration and the females of the *Pithecia* at TBS look very much like them.

The *Pithecia* at TBS, however, are sexually dichromatic. Males are blackish and brindled with a classic saki shape; their hands and feet are white to light grey with short hair, and the hair just under the chin and on the upper chest is noticeably orange to rusty. The facial disk appears pale but does not have the distinct band of dense white fur around the face as described by Hershkovitz (1979, 1987), Emmons and Feer (1997), and Rowe (1996). The facial hair is short, clearly separate from the hair on the head, more grayish than whitish, with two distinct white eyebrows over each eye that vary in brightness among males. The hair in general appears coarse and shorter than the females'. White lines come down vertically on either side of the muzzle, which also vary in intensity between individual males.

Females are much "fluffier," with more of a grey, brindled pelage than the males. Hands and feet are also white, and the orange/rust color under the chin is also present. Hair around the face and on top of the head is much longer than in males, giving the females "bangs." The face is less of a short-haired disk than the males', with two bald spots immediately above the eyes with faint white eyebrows above that. Predominant white stripes follow the edges of the muzzle and complete the circle of the jaw under the chin.

This saki does not closely resemble *P. monachus* or *P. aequatorialis* (c.f. Hershkovitz, 1979, 1987; Rowe, 1996; Eisenberg and Redford, 1999; Burton, 1995; Napier and Napier, 1967, 1985; Kavanagh, 1983; Kinzey, 1997; Emmons and Feer, 1997; Wolfheim, 1983; Soini, 1986; Rylands *et al.*, 1995), and analyses of photographs, tissue samples, and genetic data for its correct classification are ongoing (L. Marsh and A. Di Fiore, in prep.). A male was recently radio-collared at TBS by A. Di Fiore for a ranging study (pers. comm.), and material was preserved for analysis by L. Marsh and A. Di Fiore.

Group sizes range from two to five individuals, typically two to three, with one male and one or two females and offspring; two or more saki groups will sometimes join up to form loose associations of 10 individuals. They have been seen eating fruits and insects, and travel in the mid- to upper canopy, mainly in *terra firma* forests, although one group included *várzea* in its territory. They have a purr-bark-whine that is used as an alarm or warning call when humans are near. There are six or seven groups within the TBS trail system. They associate with *Lagothrix* and *Ateles*, but are typically "swept up" in the action as these larger primates come through. They have been observed to join larger groups of *Lagothrix* or *Ateles* and feed with them.

Alouatta seniculus (red howler monkey, aullador rojo)
Howler monkeys are common at the station and tend to keep to themselves rather than associating with other species. However, they may also be "caught up", like the sakis, when other primates, particularly *Lagothrix* and *Ateles*, move through their area, and they can be seen in the same trees with them. They have smaller home ranges than the other large primates at TBS. Group size is from three to nine individuals, typically ranging from five to seven. They are very quiet when not howling, and sit for long periods at the tops of the canopy trees. They use mainly the upper canopy and emergents, but also some mid-level canopy trees.

Ateles belzebuth (white-bellied spider monkey, maqisapa)
The white-bellied spider monkey is listed as Vulnerable in the *Libro Rojo de los Mamíferos del Ecuador* (Tirira S., 2001). As is typical in this species, individuals vary considerably in the color of their faces and pelage, even within the same groups (Konstant *et al.*, 1985). Individuals may vary from the type coloration. *Ateles* at TBS have a wide variety of pelage coloration that ranges from brown dorsally with tan to cream undersides or dark brown or black dorsally with dark undersides. The faces also vary. Some follow the type with tan or orange cheek stripes and light muzzles. Others occur with black or very dark brown bodies with faces that may be entirely red. Other individuals have been observed with black or darker dorsum and either dark or light belly coloration with mottled pink muzzles and pink to red "spectacles" around the eyes. This color variation has led to a belief that there is more than one spider monkey species at TBS.

Spider monkey groups occupy the upper canopy, and they have been observed in association with *Lagothrix*, *Saimiri*, and *Cebus*. Group sizes vary from one to 15, with an average of five to seven individuals. Groups or subgroups may consist entirely of females and their offspring, or may be mixed with adult males and females and juveniles of various ages.

Lagothrix lagothricha poeppigii (Poeppig's woolly monkey, chorongo)
Listed as Vulnerable in the *Libro Rojo de los Mamíferos del Ecuador* (Tirira S., 2001), woolly monkeys are the largest primates in the area, traveling in large groups of 10 to 25, although often forming smaller feeding groups which stay within calling range of each other. They are noisy and very demonstrative to humans on the ground. They may also be observed at close range from the canopy tower, and the adult males do not seem to be as agitated with humans in this situation. They typically use the upper-middle to high canopy for feeding and travel. *Ateles*, *Saimiri*, *Cebus*, *Pithecia*, and *Alouatta* have been observed feeding, traveling, or otherwise associated with them, and occasionally more than one species travels and forages with them (e.g., *Ateles* and *Saimiri*). Also found in association with *Lagothrix* are double-toothed kites (*Harpagus bidentatus*), which forage for insects disturbed by the passing monkeys; as many as three kites may follow the monkeys at a time.

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Survey of a Gallery Forest Primate Community in the Cerrado of the Distrito Federal, Central Brazil

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Ricardo Jardim Cavalcante

Introduction

The Cerrado biome occupies 2,064,676 km² of the central plateau of Brazil (Pereira *et al.*, 1997). It is the largest of the Neotropical savannas and the second largest biome in South America after the Amazon forest. The vegetation is largely scleromorphic, with an intergrading mosaic of pure grassland to closed woodlands, gallery forest and dry seasonal forest (Eiten, 1972).

Ten primate species have been recorded from the Cerrado (Eisenberg and Redford, 1999). A recent revision of the taxonomy of *Cebus* by Groves (2001) indicated that the capuchin monkey occurring through the majority of the region is *Cebus libidinosus*, but *C. nigritus* is the species in the southern and eastern fringes, and *C. apella* occurs along the Cerrado – Amazon forest interface in the north. The tufted capuchins (*Cebus*), the black howler (*Alouatta caraya*) and the black-tufted-ear marmoset (*Callithrix penicillata*) are widely distributed throughout the biome (Mares *et al.*, 1989; Queiroz, 1991; Rylands *et al.*, 1993).

Little information has been published on the ecology of these primates in the Cerrado; most reports are lacking detail and present only lists of species and the habitats they occupy. All studies of wild populations in the Cerrado have been restricted to central Brazil. Lacher *et al.* (1984; see also Fonseca and Lacher, 1984) reported on the gum-feeding behavior of *Callithrix penicillata* in gallery forest and *cerradão* (scleromorphic woodland), and Faria (1989a, 1989b; Miranda and Faria, 2001) studied the feeding, ranging and social behavior of *C. penicillata* in gallery forest. The first survey of a primate community in gallery forest was carried out by Queiroz (1991), who studied a community of only three species, with low population densities and biomass.

Here we review the pertinent literature and present the results of a transect census of a primate community in a wet gallery forest in central Brazil. Our specific objectives were to: (1) identify species; (2) estimate density and biomass of component populations and the full community; and (3) record data on group size and sex ratio for each species.

Methods

Study area
The study area was the Fazenda Água Limpa, 25 km SW of Brasília (DF), at the ecological and agricultural field station of the University of Brasília (15°56'S, 47°54'W). The climate there, recorded over 22 years, is markedly seasonal: the dry season extends from May to August, when precipitation is <10% of the annual total, and the rainy season is from September to April. The average temperature is 21.9°C, typical of a continental subtropical climate, and the mean annual rainfall is 1,534 mm.

We conducted a survey of the primate community in a humid gallery forest, 1.8 km long and approximately 100 m wide, along the Córrego da Onça (Fig. 1). The vegetation of this gallery forest was described by Ratter (1980). The trees are 14–20 m tall, providing 70–100% canopy cover with an understorey of small trees. The forest floor has a sparse herbaceous and sapling cover. In the better-drained areas the most abundant tree species are *Pseudolmedia laevigata*, *Emmotum nitens* and *Copaifera langsdorfii*. Where boggy conditions prevail, the most abundant species are *Calophyllum brasiliense*, *Protium* spp. and *Talauma ovata*.

Line transect census
The survey was conducted during the rainy season and early dry season (11 September 1992 to 5 May 1993) using a strip-census technique (Robinette *et al.*, 1974). During each census we walked a 1.8 km trail at an average speed of 1 km/hr, between 0700 and 1100 hr, 2–6 times per month, resulting in a total of 29 census walks and a cumulative total distance of 52 km surveyed. This cumulative total distance is in the range of similar studies in the Amazon forest (Peres, 1997). For each primate sighting we recorded the species,

group size and composition, and perpendicular distance from the trail of the first animal sighted. We calculated mean group size for all groups with more than two individuals, while individuals encountered alone were recorded as solitary.

We estimated the population density for each species by calculating the number of animals within the transect area, using: (1) the numbers of animals seen (both solitary and groups); (2) the length of the transect; and (3) an estimate of the effective width of the transect surveyed. The total width sampled is the perpendicular distance from the center of the transect to the limits of effective detection on either side.

In our surveys, the numbers of sightings were insufficient to generate species-specific detection functions to determine the effective width of the transect (Defler and Pintor, 1985). Instead, we derived the effective width using the maximum reliable transect to an animal's perpendicular distance, a method originally set forth by Kelker (1945) and later modified by Robinette *et al.* (1974). This method is less robust than models using detection functions (Burnham *et al.*, 1980), but it is appropriate for our relatively small dataset, and has been used for primate surveys in Amazon forests (Johns, 1985; Peres, 1997).

We lumped the sighting records for each species and determined the maximum reliable distance, the point beyond which no animals were detected. Because of our small sample size, and the animals' restriction to a strip of gallery forest narrower than the effective distance, the data clumped at a certain distance from the transect, presenting a sudden dropoff with no outliers. In this case, the effective width is the same as that of the maximum-distance method (Struhsaker, 1981). Using this method, we estimated an effective width of 26.1 m for *Cebus libidinosus*, 19.7 m for *Alouatta caraya* and 32.8 m for *Callithrix penicillata*.

We then calculated the population density (N) of each primate species using the sum of all sighted animals (n) from the 29 census walks, divided by twice the strip width ($2w$), to account for both sides of the transect and the cumulative transect length surveyed (l = 52 km). This yields the equation $N = n/(2lw)$ (Struhsaker, 1981). To calculate the crude population biomass, we used a value of 80% of the average body mass of an adult male and adult female (Peres, 1997). Based on data presented in Ford and Davis (1992), we derived the following estimates of average body mass: *Callithrix penicillata*, 163 g; *Cebus libidinosus*, 2164 g; *Alouatta caraya*, 4562 g.

Results

We recorded 17 primate sightings from 52 km of cumulative transect surveys (0.32 sightings/10 km) in the Córrego da Onça gallery forest. We observed *Alouatta caraya*, *Cebus libidinosus* and *Callithrix penicillata* (Table 1), but we did not conduct night-time surveys to check for the occurrence of night monkeys (*Aotus*). For this diurnal primate
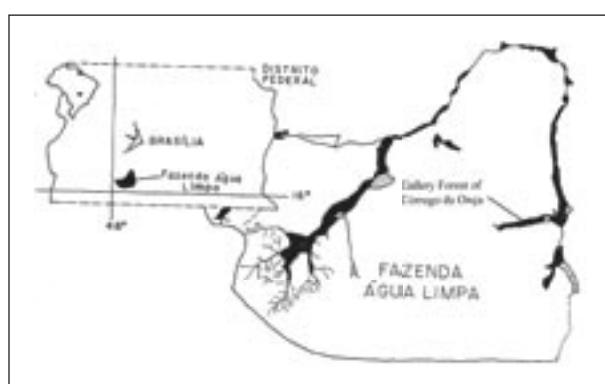
Figure 1. Location of the Córrego da Onça gallery forest in the SW of the Distrito Federal (DF) (see map insert), central Brazil. Gallery forest in black.

community, the estimated density and biomass were 19.5 ind./km² and 51.4 kg/km², respectively.

Capuchin monkey
Cebus libidinosus was the most frequently sighted species, with a total of nine sightings. Group size averaged 4.4 individuals (range 2–9) with a density of 2.0 groups/km². Solitary individuals were recorded in four of the nine sightings. The density of capuchin monkeys is estimated to be 9.8 individuals/km² with a biomass of 21.2 kg/km² (Table 1).

Black howler monkey
Two groups of black howler monkeys were sighted: one with four individuals (two males and two females) and another with three (one male and two females). Other groups

recorded in gallery forests near the area (Rodrigues and Marinho-Filho, 1995; R. P. B. Henriques, pers. obs.) included two with one male and one female each, one of two males and three females, and one of one male and six females. The average size for all six groups was 3.8 individuals, with an average sex ratio of 0.53 males/females. From the transect data, we calculated a group density of 1.7 groups/km², a population density of 6.5 individuals/km², and a crude biomass of 29.7 kg/km² (Table 1).

Black-tufted-ear marmoset
We recorded six sightings of black-tufted-ear marmosets, four of which were of solitary individuals. In the remaining two sightings, the average group size was 2.5 individuals (range 2-3). Group density in this species was less than 1 group/km². This species was the least abundant, with a

Table 1. Mean group size, sample size (n), group density, population density and biomass of primate species and census method in the Córrego da Onça gallery forest in the Cerrado of central Brazil and other Neotropical sites.

Species Site, country	Mean group size (N)	Group density (groups/km²)	Population density (individuals/ km²)	Biomass (kg/km²)	Census method[a]	Reference
Alouatta caraya						
Puerto Bermejo, N. Argentina[b]	7.2 (11)		130.0		HR	Thorington *et al.* (1984)
Puerto Bermejo, N. Argentina[c]	8.9 (11)		131.0		HR	Thorington *et al.* (1984)
Islands of Río Paraná, N. Argentina	7.9 (17)					Pope (1966)
Acurizal, Pantanal, W. Brazil	7.2 (21)	1.0	11.0	49.5	BS	Schaller (1983)
Río Paraná, N. Argentina	4.6 (?)[d]		50.0		SC	Zunino *et al.* (1996)
Chaco, Paraguay	5.0 (10)					Kreig (1928)
Riacho Fundo, Central Brazil	1.5 (2)	1.8	2.6	16.9	SC	Queiroz (1991)
Córrego da Onça, Central Brazil	3.8 (6)[e]	1.7	6.5	24.3	SC	This study
Cebus libidinosus						
Chaco, E. Paraguay	7.0 (4)	4.0	28.0		SC	Stallings (1985)
Acurizal, Pantanal, W. Brazil	8.0 (24)	1.7	13.3	27.9	BS	Schaller (1983)
Riacho Fundo, Central Brazil	4.0 (6)	5.2	23.2	51.7	SC	Queiroz (1991)
Córrego da Onça, Central Brazil	4.4 (9)	2.0	9.8	13.2	SC	This study
Callithrix penicillata						
Riacho Fundo, Central Brazil	4.0 (5)	10.3	38.7	10.1	SC	Queiroz (1991)
Córrego Capetinga, Central Brazil	7.5 (5)		40.0		HR	Faria (1989a, 1989b)
Córrego Capetinga, Central Brazil	4.0 (4)	11.5	49.8	12.9	SC	R. P. B. Henriques (unpubl. data)
Cerradão A, RECOR, Central Brazil	4.6 (3)	12.1	57.0		HR	Miranda and Faria (2001)
Cerradão B, RECOR, Central Brazil	7.3 (3)	5.4	40.0		HR	Miranda and Faria (2001)
Dry forest, Botanical Garden, Central Brazil	9.8 (3)	8.3	81.3		HR	Miranda and Faria (2001)
Cerradão, RECOR, Central Brazil	4.5 (2)				HR	Fonseca and Lacher (1984)
Córrego da Onça, Central Brazil	2.5 (2)	0.5	3.2	0.7	SC	This study

[a] Census method: HR = home range; SC = strip census; BS = broad survey
[b] 1978
[c] 1979
[d] sample size not included
[e] including 4 groups from nearby gallery forest

population density of 3.2 individuals/km² and a biomass of 0.5 kg/km² (Table 1).

Discussion

Capuchin monkey

The results of this study are compared with data from other sites in Table 1. The average group size for *Cebus apella* in the Córrego da Onça gallery forest was similar to the mean value reported by Queiroz (1991) in another gallery forest in the Distrito Federal in central Brazil, but lower than in the dry seasonal forests of Paraguay (Stallings, 1985) or the Pantanal (Schaller, 1983), and half the value for the western Amazonian forest surveyed by Peres (1988). The percentage of solitary individuals observed in this study (45.5%) was much greater than the 14.7% recorded in the Pantanal by Schaller (1983), 5% for Peru by Janson (1984) and < 2% in Colombia by Izawa (1980).

Likewise, the population density in the Córrego da Onça gallery forest was lower than the value recorded in the Pantanal (Schaller, 1983), for seasonal dry forest in Paraguay (Stallings, 1985) and in another gallery forest of central Brazil (Queiroz, 1991). This value is at the lower end of the range for *terra firma* forest in the western Brazilian Amazon (range 2.9–12.9 individuals/km²; Peres, 1997). The population biomass of capuchin monkeys in Córrego da Onça is less than half of the value reported from the Riacho Fundo gallery forest, also in the Distrito Federal (Queiroz, 1991).

Black howler monkey

The average group size for black howler monkeys recorded in this study was well below the average reported from Argentina by Thorington *et al.* (1984) and Pope (1966), and in the Pantanal by Schaller (1983) in Brazil (Table 1). The estimate in this study is similar to averages recorded in Argentina by Zunino *et al.* (1996) and in the Paraguayan Chaco by Kreig (1928). Other studies also reported a small group size for this species in gallery forests in the Cerrado (Queiroz, 1991; Flesher, 2001).

The density was higher than that recorded by Queiroz (1991) in the Riacho Fundo gallery forest, and lower than the estimate of Schaller (1983) for his site in the Pantanal. All three density estimates are low when compared with those for gallery forest and dry seasonal forest in northern Argentina (Thorington *et al.*, 1984; Brown and Zunino, 1994).

Black-tufted-ear marmoset

The average group size for the common marmoset was smaller than the mean value recorded in other studies (Table 1). Group size recorded in gallery forests in central Brazil ranged from a minimum of four individuals (Queiroz, 1991; R. P. B. Henriques, unpubl. data) to 7.5 individuals (Faria, 1989a, 1989b). In dry forest and scleromorphic woodland (*cerradão*), well away from gallery forest and surrounded by *cerrado* vegetation (*sensu stricto*), group sizes were also higher than at Córrego da Onça (Fonseca

et al., 1984; Miranda and Faria, 2001). Possibly the small group size of the common marmoset in Córrego da Onça indicates foraging units rather than social units. There is a record of social groups of common marmosets of up to 10–12 individuals, but Faria (1989a) suggested that these large social groups can split to forage in small sub-groups of three to four animals. The results of our study reflect a higher presence of small foraging subgroups and solitary animals. The high percentage of solitary animals is also consistent with this hypothesis, but our number was higher than the value of 18% observed by Faria (1989a, 1989b) in another gallery forest in the same region. Another factor is the difference in the food availability. Córrego da Onça has a lower abundance of tree species (Ratter, 1980) used as exudate sources compared to other sites where the group size and density of common marmosets were higher (Faria, 1989a, 1989b). Since exudate-producing trees are an important food source for this species, we can expect a difference in animal abundance between these sites (Rylands and Faria, 1993; Miranda and Faria, 2001; Vilela, 1999).

The density of marmosets in Córrego da Onça was quite low when compared with the Riacho Fundo gallery forest (Queiroz, 1991) and the Capetinga gallery forest in the same region (49.8 individuals/km²; R. P. B. Henriques, unpubl. data).

Community characteristics

The Córrego da Onça gallery forest presents a primate community with species richness similar to other gallery forests in Neotropical savannas (Peres, 1989; Eisenberg *et al.*, 1979; Queiroz, 1991; Flesher, 2001), but low when compared to other Neotropical continuous forest sites (9–14 species; Peres, 1997; Kay *et al.*, 1997). Low species richness has been recorded for gallery forest in the Pantanal (Schaller, 1983) and the Chaco in Paraguay (Stallings, 1985).

The species-poor primate communities of the gallery forests of Neotropical savannas are characterized by a strong separation of species by food niches. In communities with lower primate species richness, folivores (*Alouatta*) predominate, as in the gallery forest of Masaguaral West in Venezuela (Eisenberg *et al.*, 1979). An increase in species richness is achieved by the addition of frugivores (*Cebus*, *Aotus*, *Callicebus*; Stallings, 1985), gummivores (*Callithrix*; Schaller, 1983; Queiroz, 1991; Flesher, 2001; this study), or insectivores (*Saimiri*; Peres, 1989). This pattern of species occurrence is consistent with Eisenberg's (1979) suggestion that *Alouatta* is a pioneer species in Neotropical habitats.

We suggest that the low primate species richness in gallery forests may be due to the highly fragmented nature of this habitat, when compared with continuous forest areas on the same latitude in Neotropical forests. Another constraint on the number of primate species in savanna gallery forest is the low and highly seasonal fruit productivity (Oliveira and Paula, 2001). Frugivores are the principal dietary guild that contributes to increasing species richness in Neotropical primate communities (Kay *et al.*, 1997). Fruit

Table 2. Species richness, density and biomass of primate communities surveyed in gallery forests in six Neotropical savanna formations.

Habitat/ Locality	No. of species	Density (ind./km²)	Biomass (kg/km²)	Reference
Acurizal (Brazil)	3	8.7	19.6	Schaller (1983)
Córrego da Onça (Brazil)	3	19.5	51.4	This study
Masaguaral West (Venezuela)	1	41.0	176.3	Eisenberg *et al.* (1979)
Masaguaral East (Venezuela)	2	39.0	136.0	Eisenberg *et al.* (1979)
Riacho Fundo (Brazil)	3	50.4	78.6	Queiroz (1991)
Rio Jutuba (Brazil)	3	71.0	122.6	Peres (1989)

productivity declines with an increase in the seasonality of rainfall and the length of the dry season, producing a predictable period of severe fruit scarcity (Schaik *et al.*, 1993). Seasonality, in turn, becomes sharply defined when rainfall is less than ≈2500 mm/year (Kay *et al.*, 1997); and as Neotropical savannas show annual precipitation well below this value, pronounced seasonality may play a role in limiting primate species richness in gallery forests.

Primate abundance in gallery forests is highly variable between sites, with Acurizal and Córrego da Onça showing the lowest values of density and biomass (Table 2). This variation cannot be attributed to hunting pressure, since these sites occur in habitats with a complete absence of hunting of primate species (e.g., Acurizal, Córrego da Onça). Primates are not considered edible by indigenous hunters in the Pantanal and the Cerrado of central Brazil (Becker, 1981; R. P. B. Henriques, pers. obs.).

Between-site variation in abundance could be attributed to differences in methodology, forest structure, and/or composition and phenology (Peres, 1997). It is unknown how these latter factors interact to determine primate species richness and abundance in gallery forest, nor how they affect full primate communities.

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Resultados da Enquete sobre Ocorrência de Primatas no Rio Grande do Sul, Brasil

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Introdução

O Rio Grande do Sul é o estado mais extenso da Região Sul do Brasil, com uma área total de 282.184 km². Como é de conhecimento geral, a crescente destruição do habitat caracteriza-se como a principal causa da redução das populações silvestres de primatas em todo o mundo. No Rio Grande do Sul essa questão vem tornando-se um fato cada vez mais preocupante, justamente pelo desconhecimento dos refúgios naturais das espécies.

São poucas as florestas nativas originais que ainda existem no estado, mantendo uma rica biodiversidade e com registro de ocorrência de primatas: *Alouatta guariba clamitans* (bugio-ruivo), *Alouatta caraya* (bugio-preto) e *Cebus nigritus* (macaco-prego). Entretanto, pouco se conhece sobre a distribuição dessas espécies, por não haver ainda um mapeamento dos habitats onde se encontram. Os dados disponíveis são de trabalhos isolados. Prates *et al.* (1993) registraram a ocorrência desses primatas em Unidades de Conservação (UCs)

no Rio Grande do Sul e concluiram que a maioria das que foram visitadas, apresentava problemas relacionados com a conservação do ambiente. A maior parte dos outros trabalhos referem-se a dados de distribuição, principalmente sobre *A. g. clamitans* (Romanowski *et al.*, 1998; Printes *et al.*, 2000, 2001), existindo poucas referências sobre *A. caraya* (Bicca-Marques, 1991; Codenotti *et al.*, 2002), e quase nenhuma informação sobre a ocorrência de *Cebus nigritus*.

Este artigo mostrará os resultados alcançados com duplo objetivo: registrar informações sobre a ocorrência de primatas no estado do Rio Grande do Sul, obtidas através da participação dos municípios e, subsidiar com dados concretos, o projeto "Avaliação do *Status* de Conservação e Abundância Populacional de Primatas no Rio Grande do Sul," em desenvolvimento pela Equipe de Primatas (EPRIM) da Universidade de Passo Fundo.

Metodologia

Área de estudo
O *Mapa do Estado do Rio Grande do Sul, Divisão Municipal* (1997) mostra 497 municípios emancipados e autônomos, que estão distribuídos em 11 regiões fisiográficas (Rambo, 1956; Fortes, 1959): Alto Uruguai (n = 116 municípios), Planalto Médio (n = 65), Campos de Cima da Serra (n = 25), Encosta Superior do Nordeste (n = 44), Encosta Inferior do Nordeste (n = 95), Depressão Central (n = 47), Missões (n = 36), Campanha (n = 13), Serra do Sudeste (n = 13), Encosta do Sudeste (n = 17) e Litoral (n = 26) (Fig. 1). O principal critério diferencial dessas regiões são as características estruturais da vegetação, composta por uma rica densidade florística.

Figura 1. Mapa do Rio Grande do Sul dividido em regiões fisiográficas (fonte: Brasil, IBDF, 1983).

Métodos
A pesquisa teve inicio em janeiro de 2001, quando foi elaborado um instrumento básico sobre a "Ocorrência de primatas no Rio Grande do Sul." Tratava-se de um questionário, indicando quem deveria respondê-lo, como deveriam ser assinaladas e respondidas as questões apresentadas, de forma a não deixar dúvidas quanto às respostas. O instrumento também apresentava uma página com fotos coloridas e descrição, quanto ao tamanho, coloração, hábitos, etc. de três grupos de primatas: bugios, macacos-prego (ou micos) e sagüis. Estes foram selecionados pela consulta a fontes bibliográficas e comentários da população do meio rural, principalmente agricultores, por viverem no campo próximos às matas que são os habitats naturais dos primatas. Os sagüis entraram nessa enquete, também para testar a possibilidade de ocorrência de populações vivendo em liberdade no Rio Grande do Sul, já que há registros de *Callithrix* em Santa Catarina, próximos à faixa de limite desses estados.

O questionário levantou questões gerais sobre: a) ocorrência de primatas (abundância: poucos, muitos; se desapareceram [extintos]; se nunca ocorreram); e b) onde são encontrados (em matas preservadas [ou não] em propriedades particulares; em bosques [capões] de áreas municipais; em parques e reservas; em cativeiro: zoológicos ou residências; em outros locais). Havia espaço também para comentários livres sobre a localização dos animais, e sua distribuição em bandos, pelo município.

A partir do mês de agosto de 2001, o instrumento foi enviado às 497 Secretarias Municipais de Agricultura e Meio Ambiente do estado, acompanhado de uma carta, explicando os objetivos da pesquisa e a importância da participação e envolvimento de cada município. Foi escolhida a Secretaria de Agricultura pelos seus contatos diários com a área rural e pela supervisão das lavouras e da pecuária através da *Empresa de Assistência Técnica e Extensão Rural* (Emater). Após o primeiro ano de enviadas as correspondências, verificou-se que ainda faltavam 31,4% de cartas a serem respondidas. Foram então reenviados 156 questionários.

Elaborou-se um segundo instrumento, com o objetivo de identificar as espécies de *Alouatta* presentes nas áreas municipais de cada região fisiográfica. O material, bastante simples, constava apenas de uma folha com fotos coloridas e descrição específica do bugio-preto (*A. caraya*) e do bugio-ruivo (*A. g. clamitans*). Esse instrumento, acompanhado de uma carta de agradecimento pela participação e com novas instruções, foi enviado a partir de março de 2002, para todos os municípios que indicaram a presença de bugios na resposta ao primeiro questionário. Desde então, a cada bloco de respostas afirmativas que chegava, indicando a ocorrência de bugios, nova remessa do segundo questionário era encaminhada às Secretarias de Agricultura. Até o final da enquete foram remetidos 224 questionários.

Também foi elaborado um instrumento para auxiliar na identificação dos sagüis, apontados como presentes por vários municípios, no primeiro questionário. Esse material

mostrava fotos coloridas do sagüi-de-tufo-preto (*Callithrix penicillata*), do sagüi-de-tufo-branco (*Callithrix jacchus)* e do esquilo, ou serelepe, como é conhecido no Rio Grande do Sul (*Sciurus aestuans*), por suspeitar que poderia estar havendo alguma confusão no reconhecimento desses animais.

A tabulação dos dados foi realizada tomando como critério as respostas obtidas de cada município, separadas devidamente por região fisiográfica e segundo o instrumento respondido. As respostas eram lançadas em matrizes para facilitar a composição das tabelas. Para análise dos dados utilizou-se a estatística descritiva (porcentagens), por ser a mais expressiva e representativa dos resultados obtidos.

Todas as cartas recebidas e respectivos envelopes encontram-se arquivadas no Banco de Dados de Pesquisa, do Instituto de Ciências Biológicas, da Universidade de Passo Fundo, para possíveis consultas.

Resultados

Ocorrência de primatas no Rio Grande do Sul

Dos 497 questionários enviados, indagando sobre a ocorrência de primatas no estado, 68,6% (n = 341) chegaram durante o primeiro ano de pesquisa. A tabulação final dos dados iniciou-se no mês de setembro de 2003, imediatamente após o encerramento da enquete, no mês de agosto, completando o biênio previsto para essa etapa da pesquisa, junto às Secretarias Municipais de Agricultura e Meio Ambiente do Rio Grande do Sul.

As respostas obtidas equivalem ao somatório de cartas enviadas (497) e reenviadas (156), totalizando, no período entre agosto de 2001 e agosto de 2003, 653 cartas emitidas, das quais obteve-se 475 respostas. Apenas 22 (4,4%) municípios não participaram da enquete (Tabela 1). Foram analisados e valorizados todos os tipos de resposta, como indica a Figura 2.

As regiões mais expressivas, que alcançaram e remeteram 100% de respostas, foram: Campos de Cima da Serra, Encosta Superior do Nordeste, Missões, Campanha, Serra do Sudeste e Encosta do Sudeste. Pode-se observar que há uma proporção entre o número de municípios por região e o número de respostas recebidas (Tabela 1).

Está muito clara a ocorrência de macaco-prego, *C. nigritus*, nas regiões mais íngremes, com características e acentuadas encostas, como no Alto Uruguai (n = 56 municípios), na Encosta Inferior do Nordeste (n = 52) e na Encosta Superior do Nordeste (n = 29) (Tabela 2). A presença de bugios é mais forte nos Campos de Cima da Serra (de 25 municípios pertencentes a essa região, 23 confirmaram a ocorrência), na Encosta Inferior do Nordeste (n = 45 respostas) e na Depressão Central (n = 37) (Tabela 2 e Figuras 3a e 3b). *Callithrix* spp. foi apontada por 42 municípios, que então receberam o terceiro instrumento, para identificação das espécies presentes. Das correspondências devolvidas 17 afirmaram tratar-se do esquilo (*Sciurus aestuans*); dois identificaram *C. penicillata*, em número de um a três indivíduos, respectivamente; e,
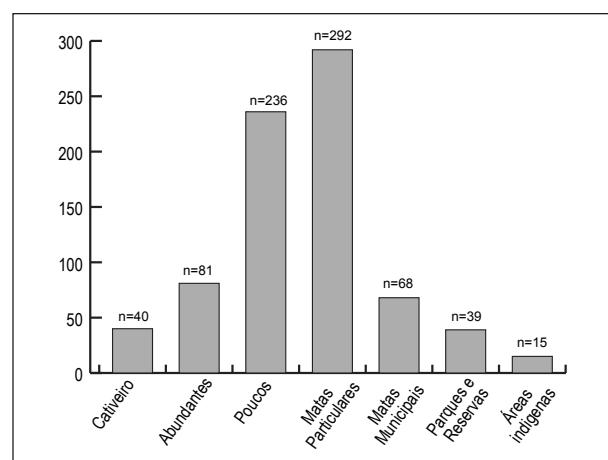
Figura 2. Resultados da tabulação das respostas gerais, respondidas pelos 475 municípios que participaram da enquete.

Tabela 1. Resultado da enquete junto aos municípios. Número e porcentagem de cartas respondidas e de cartas não respondidas, sobre o total de cartas enviadas, por região fisiográfica (agosto de 2001 – agosto de 2003).

Regiões fisiográficas	Número de municípios	Cartas respondidas	%	Cartas não respondidas	%
Alto Uruguai	116	107	21,53	09	1,81
Planalto Médio	65	64	12,88	01	0,20
Campos de Cima da Serra	25	25	5,03	0	0
Encosta Superior do Nordeste	44	44	8,85	0	0
Encosta Inferior do Nordeste	95	91	18,31	04	0,80
Missões	36	36	7,24	0	0
Depressão Central	47	41	8,24	06	1,21
Campanha	13	13	2,62	0	0
Serra do Sudeste	13	13	2,62	0	0
Encosta do Sudeste	17	17	3,42	0	0
Litoral	26	24	4,83	02	0,40
Total	**497**	**475**	**95,57**	**22**	**4,43**

um não soube identificar o animal mediante as figuras apresentadas (Tabela 2). Os demais não responderam.

O conjunto das respostas gerais mostrou que em 47 municípios não ocorrem primatas. Obteve-se 77 casos sustentando que os primatas outrora habitaram as matas públicas e de propriedades particulares, porém desapareceram, caracterizando a extinção no município (Tabela 2). Destes, quatro mencionaram como extinto o bugio, e apenas um o macaco-prego.

Dados sobre primatas em cativeiro, quantidade e diferentes locais onde são encontrados, estão expressos na Figura 2. Ao referir-se à presença de primatas em Parques, 18 municípios da região do Alto Uruguai citaram o Parque Estadual

do Turvo (bugio e macaco-prego) e o Parque Estadual de Rondinha (macaco-prego), salientando 15 Reservas, todas referidas como "área indígena." Na região dos Campos de Cima da Serra, cinco municípios fizeram menção ao Parque Estadual do Espigão Alto (bugio e macaco-prego). Na Encosta Inferior do Nordeste, um município referiu-se ao Parque Estadual do Caracol (bugio), ao Parque Municipal da Ferradura (bugio), apontando também a Floresta Nacional (FLONA) administrada pelo Instituto Brasileiro do Meio Ambiente (IBAMA) (bugio). Um município citou uma área como Reserva da Biosfera da Mata Atlântica (bugio e macaco-prego). Na região da Campanha, um município apontou a APA e a Reserva Biológica do Ibirapuitã (bugio) e quatro municípios do Litoral citaram a APA Rota

Tabela 2. Número e porcentagem de ocorrência de primatas, segundo as respostas obtidas na enquete, em cada região fisiográfica do estado (agosto de 2001 – agosto de 2003).

Regiões fisiográficas (n° de municípios)	Respostas (n°)	*Alouatta*		*Cebus*		*Callithrix*		*Alouatta* + *Cebus*		*Alouatta* + *Callithrix*		*Cebus* + *Callithrix*		Três espécies		Extintos		Não ocorre	
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Alto Uruguai (116)	107	09	8,41	34	31,78	01	0,93	13	12,15	03	2,80	07	6,54	02	1,87	31	28,97	07	6,54
Planalto Médio (65)	64	22	34,38	10	15,63	02	3,12	02	3,12	04	6,25	0	0	0	0	16	25,00	08	12,50
Campos de Cima da Serra (25)	25	09	36,00	02	8,00	0	0	11	44,00	0	0	0	0	02	8,00	01	4,00	0	0
Encosta Superior do Nordeste (44)	44	08	18,18	19	43,18	0	0	08	18,18	0	0	01	2,27	01	2,27	05	11,37	02	4,55
Encosta Inferior do Nordeste (95)*	91	20	21,97	27	30,00	05	5,56	14	15,65	03	03,33	03	3,33	08	8,89	06	6,67	04	4,44
Missões (36)	36	21	58,33	0	0	0	0	03	8,33	01	2,78	0	0	0	0	10	27,78	01	2,78
Depressão Central (47)	41	27	65,85	0	0	0	0	07	17,07	01	2,44	0	0	02	4,88	01	2,44	03	7,32
Campanha (13)	13	06	46,15	01	7,69	0	0	0	0	0	0	01	07,69	0	0	0	0	05	38,46
Serra do Sudeste (13)	13	08	61,53	0	0	0	0	02	15,39	0	0	0	0	0	0	0	0	03	23,08
Encosta do Sudeste (17)	17	06	35,29	0	0	0	0	0	0	0	0	0	0	0	0	06	35,29	05	29,41
Litoral (26)	24	02	8,33	04	16,67	0	0	05	20,83	02	8,33	0	0	01	4,17	01	4,17	09	37,50
Total (497)	475	138	29,05	97	20,42	8	1,68	65	13,68	14	2,95	12	2,53	16	3,37	77	16,21	47	9,89

*Um município não soube identificar a espécie de primata que ocorre em seus limites (0,22%).

Tabela 3. Porcentagem de ocorrência de espécies de bugio (*Alouatta caraya* e *Alouatta guariba clamitans*), sobre o total de respostas com identificação, nas diferentes regiões fisiográficas do Rio Grande do Sul (março de 2002 – agosto de 2003).

Regiões fisiográficas (n° de questionários enviados)	Respostas com identificação de espécies	%	Ocorrência do bugio-preto	%	Ocorrência do bugio-ruivo	%	Ocorrência das duas espécies	%
Alto Uruguai (26)	15	6,70	5	2,60	7	3,64	3	1,56
Planalto Médio (26)*	26	11,61	15	7,81	8	4,17	2	1,04
Campos de Cima da Serra (23)	23	10,27	0	0	19	9,90	4	2,08
Encosta Superior do Nordeste (17)*	17	7,59	0	0	14	7,29	2	1,04
Encosta Inferior do Nordeste (39)*	34	15,18	3	1,56	28	14,58	2	1,04
Missões (25)	19	8,48	14	7,29	1	0,52	4	2,08
Depressão Central (35)	30	13,39	2	1,04	19	9,90	9	4,69
Campanha (6)	6	2,68	4	2,08	1	0,52	1	0,52
Serra do Sudeste (11)	11	4,91	2	1,04	7	3,65	2	1,04
Encosta do Sudeste (6)	3	1,34	0	0	1	0,52	2	1,04
Litoral (10)*	8	3,57	1	0,52	4	2,08	2	1,04
Total (224)	192	85,71	46	23,96	109	56,77	33	17,19

*Quatro municípios não conseguiram identificar a espécie (2,08%).

do Sol (incluída nos domínios da Reserva da Biosfera da Mata Atlântica) (macaco-prego e bugio).

Identificação e ocorrência de espécies de bugio e de macaco-prego no estado

O instrumento enviado procurou dirigir as respostas para a diferenciação e identificação do bugio-preto (*A. caraya*) e do bugio-ruivo (*A. g. clamitans*). Foram analisadas 192 cartas-respostas (85,7%) das 224 enviadas às Secretarias Municipais, que anteriormente haviam indicado (no primeiro instrumento) a presença de bugios vivendo em ambiente natural, nas áreas de mata de propriedades particulares e em Reservas e Parques. Trinta e dois municípios (14,3%) não enviaram respostas; quatro não conseguiram identificar as espécies, embora confirmando a ocorrência de bugios (Tabela 3). Um secretário municipal contradisse a resposta do primeiro questionário, respondendo que não existem bugios ou qualquer primata nos limites de seu município.

A ocorrência de *A. g. clamitans* em diferentes regiões (56,8%, n = 109 municípios) representa mais que o dobro da presença de *A. caraya* (24,0%, n = 46), e o triplo da presença de ambas as espécies (17,2%, n = 33) (Tabela 3).

Através da análise das respostas recebidas, repassando município por município, a Figura 3 pretende expôr a tendência de ocorrência das espécies, fazendo notar a presença dos primatas em todo o Rio Grande do Sul. A distribuição das espécies no mapa (Fig. 3a) e os dados da Tabela 3 mostram que em todas as regiões estão presentes as duas espécies de bugios, com predominância de uma delas, na maioria dos municípios. *A. g. clamitans* domina toda a porção oriental do Rio Grande do Sul, enquanto que *A. caraya* ocorre principalmente na porção ocidental. É bastante curioso notar que onde foi citada a presença de ambas as espécies, estas em sua maioria, encontram-se no limite entre duas regiões. O Planalto Médio mostra uma situação diferenciada, em que à leste predomina o bugio-ruivo, no centro aparece simpátrico com o bugio-preto e expandindo-se para oeste, até atingir a costa do rio Uruguai, nas Missões, sobresai *A. caraya*.

O macaco-prego aparece naquelas regiões onde há predominância do bugio-ruivo: Alto Uruguai, Planalto Médio, Encosta Superior do Nordeste e Encosta Inferior do Nordeste. Observe-se que a localização dos municípios que declararam sua ocorrência estão situados nas regiões no norte do estado. *C. nigritus* desaparece a partir da grande Depressão, inexistindo nas regiões que abrangem o noroeste, o oeste, o sudoeste, o sul e o sudeste do Rio Grande do Sul. Entretanto, nas regiões da Campanha e das Missões houveram alguns poucos relatos, em pontos isolados. Notou-se equívocos em algumas respostas, quanto a presença de *A. caraya* em biomas incompatíveis com a presença da espécie, como foi o caso, por exemplo, da região fisiográfica do Litoral (Tabela 2 e Fig. 3b).

Discussão

Pela expressiva participação dos municípios riograndenses nessa enquete, pode-se deduzir que os instrumentos elaborados foram adequados e eficazes. As respostas obtidas trouxeram esclarecimentos de pontos obscuros sobre o conhecimento que popularmente se tem sobre primatas, vivendo em ambientes naturais, tão próximos do homem. Algumas cartas chegaram imediatamente, com respostas
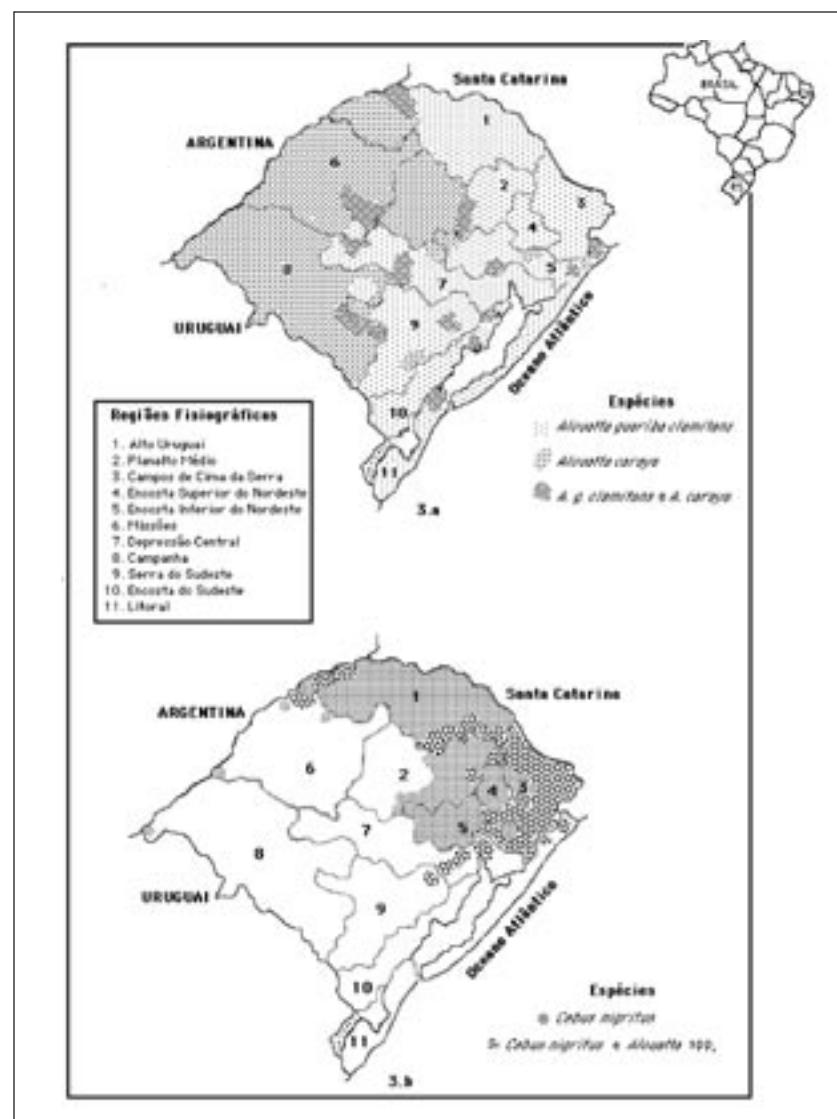

Figura 3. Mapa do Rio Grande do Sul plotando espécies de primatas por região fisiográfica, segundo os resultados obtidos na enquete: a. bugios (*A. g. clamitans* e *A. caraya*); b. macaco-prego (*C. nigritus*). (Elaboração: Thaïs Leiroz Codenotti.)

claras, objetivas e com comentários indicativos da certeza de suas afirmações. Outras foram chegando ao longo dos meses, justificando que o atraso teve como causa a pesquisa prévia, realizada com os antigos moradores, e com os agricultores que vivem no campo, no interior dos municípios. Todas as respostas permitiram que prevalecesse a objetividade nas análises, e na interpretação fiel dos resultados, deixando evidente as certezas, as inseguranças e o desconhecimento da rica biodiversidade do Rio Grande do Sul. Concluiu-se que a expressiva participação dos municípios na enquete, deixa evidente sua vontade de continuar somando esforços, cooperando de forma ativa, na conservação dos primatas e na preservação dos remanescentes onde se encontram.

A ocorrência do sagüi (*Callithrix* spp.) foi marcadamente registrada, como mostraram os dados da Tabela 2. Porém, com o envio de um instrumento específico ficou muito claro o engano. Considerou-se importante o fato da ausência de resposta com identificação das espécies, pois acredita-se que o reconhecimento do esquilo (*Sciurus aestuans*), roedor presente nas matas do norte do estado, elucidou a questão sem necessidade de enviar a carta-resposta. Também as respostas identificando o esquilo ou a "espécie serelepe" evidenciou a não ocorrência de Callitrichidae no Rio Grande do Sul como população natural, embora vivendo em situação de cativeiro.

O fato de que alguns municípios, de todas as regiões, responderam que ocorrem juntas as duas espécies de bugios (*A. g. clamitans* e *A. caraya*) conduz a duas interpretações: uma é a autêntica possibilidade de simpatria dessas espécies, que habitam principalmente as matas de galeria dos rios que compõem as duas principais bacias do Rio Grande do Sul: do rio Jacuí e do rio Uruguai. Outra interpretação coloca em evidência um possível equívoco na identificação correta dos animais, especialmente quando indicam a presença do bugio-preto onde vive o bugio-ruivo. Considera-se normal esse engano, pois os infantes e juvenis de *A. g. clamitans* são negros e as fêmeas exibem acentuada coloração marrom escura. Entretanto, quando as indicações (poucas) apontavam a situação contrária – presença do bugio-ruivo vivendo nas áreas onde predomina o bugio-preto – considerou-se possível essa simpatria, pois analizando a posição geográfica desses municípios, verificou-se que a sua localização está no limite de ocorrência do bugio-ruivo, bem próxima da região de ocorrência da outra espécie. Também o fato de dois ou mais municípios vizinhos afirmarem a coexistência de ambas as espécies, na situação acima descrita, concorre para que essa seja uma possibilidade verdadeira.

Os instrumentos não tiveram intenção de analisar a categoria fitoecológica das florestas radicadas nas diferentes regiões fisiográficas. Contudo, observou-se que há uma concreta separação dos habitats de *A. caraya* vivendo nas coordenadas que passam no noroeste, centro-oeste, oeste, sudoeste e sul do estado. Os limites de ocorrência para essa espécie foram descritos por Codenotti *et al.* (2002). O bugio-ruivo ocorre no norte, nordeste, sudeste, na região central voltada para extensões à leste, extendendo-se até a faixa litorânea, muitas vezes

convivendo com o macaco-prego. O limite sul de ocorrência de *A. g. clamitans* foi definido por Printes *et al.* (2001) no município de São Lourenço do Sul, bacia do rio Camaquã. *A. caraya* prefere as matas semi-decíduas, com distribuição continental, enquanto *A. g. clamitans* e *C. nigritus* são primatas cujos habitats estão associados às florestas de araucárias (*Araucaria angustifolia*), e aos domínios da Mata Atlântica.

A expressiva resposta sobre a presença das três espécies vivendo em matas preservadas, ou não, de propriedades particulares, expõe a fragilidade e a vulnerabilidade dos primatas no sul do Brasil, haja vista a destruição diária das florestas, em favor do plantio de grãos. A ameaça é constante, e as poucas áreas protegidas apontadas são os derradeiros refúgios dessas espécies. Junta-se a essa evidência a questão respondida sobre a quantidade de animais presentes: prevaleceu o "poucos," que somada ao dado "extintos," especialmente na extensa região do Alto Uruguai, onde a araucária também está gravemente ameaçada, o quadro apresentado pelos municípios é grave e pede providencias urgentes.

Considerações Finais

Com base no que foi exposto, apesar de o Rio Grande do Sul abrigar três espécies de primatas presentes em toda sua área territorial, não se pode garantir sua sobrevivência por muito mais tempo. A fragmentação e a redução das áreas dos hábitats naturais onde vivem provoca conseqüências imediatas sobre o tamanho das populações, podendo em alguns casos conduzir à extinção local das espécies. Para que estas não alcancem os patamares da extinção, medidas sérias devem ser tomadas pelas prefeituras municipais, através das secretarias responsáveis pelo meio ambiente e pelos líderes das comunidades locais, em conjunto com pesquisadores. É necessário, primeiramente, que todos os municípios que participaram da enquete, em todas as regiões fisiográficas, possam ser visitados para confirmar a ocorrência de primatas *in situ*, analisando o estado de conservação das populações encontradas, assim como do ambiente, salientando o grau de conservação ou de degradação das matas onde vivem. Torna-se urgente a elaboração de um plano de manejo, indicando medidas conservacionistas concretas, quando e onde estiver patente a ameaça para o habitat e para as espécies de primatas presentes. Finalmente, cada prefeitura municipal precisa ser envolvida num compromisso de conservação, juntamente com os proprietários de áreas cujas matas abrigam esses mamíferos.

Anthony B. Rylands e aos demais membros da Equipe, pelo carinho, apoio e incentivo, sempre.

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IN MEMORIAM: PEKKA SOINI

PEKKA SOINI: 1941–2004

Russell A. Mittermeier

I first met Pekka Soini in 1972 on my first visit to Iquitos, Peru. He was working as a travel agent at the time, but was already an expert on the fauna of Peruvian Amazonia. Being both avid herpetologists, we hit it off immediately and began a friendship that lasted more than three decades. Although we came from very different backgrounds, we shared many things, not the least of which was the fact that both of us had been inspired to go to the tropical rain forest by reading Tarzan books when we were children, Pekka in his native Finland and me in New York. When I reconstituted the IUCN/SSC

Primate Specialist Group in 1977, Pekka, who was also an expert in primates, became one of the charter members and he provided reams of new and important information on Amazonian primates during the course of his career. Over the years, I visited Pekka many times in Peru, perhaps most notably in 1983 when we joined him in the Pacaya-Samiria to do a film on Amazonia, one of the first of its kind. When we visited Pekka in the Pacaya that year, I was delighted to see that even though he was living in a thatched hut without walls he was nonetheless listening to Sibelius on a broken-down little record player that he had brought with him. A true jungle man, he nonetheless never forgot his strong cultural roots.

Pekka was one of the best field biologists I have ever known, a real leader and pioneer who would have been far better known had he chosen to participate in more international meetings. As it was, he was rather shy, and preferred to spend almost all of his time in the field, carrying out detailed research on the many species that captured his imagination. His range of knowledge and the number of species on which he carried out some of the first-ever field studies was truly astounding. I remember, during the period of more than a decade that he lived in the Pacaya-Samiria, he would periodically send me typed "Informes del Pacaya," with new information on primates, reptiles, fish and a range of other topics. All he wanted was that I copy and send these "informes" to a handful of his closest colleagues, so that they would know what he was doing. All of these reports were worthy of publication in scientific journals, and fortunately, through the urging and collaboration of people such as Eckhard Heymann, James Dixon, Bill Lamar, Chuck Snowdon, myself, and a number of others, we managed to get a number of his most important papers published, notably his work on the herpetofauna of the Iquitos region and his classic study of the pygmy marmoset (*Cebuella pygmaea*), and his wonderful informes were finally collected and published in a volume as well. Although I hadn't seen Pekka much over the past decade, I always counted him among my very best friends. He was a classic, a delightful charismatic personality, a truly unique individual who made a major contribution to our understanding of Amazonia and who will always occupy a very special place in the hearts of those who knew him best. He will be missed.

Russell A. Mittermeier, President, Conservation International, and Chairman, IUCN/SSC Primate Specialist Group, 1919 M Street, NW, Suite 600, Washington, DC 20036, USA.

PEKKA SOINI: A DEDICATED AND BRILLIANT NATURALIST

Eckhard W. Heymann

I first met Pekka Soini in 1982 at the Peruvian Primate Center in Iquitos, where I did research for my doctoral dissertation on tamarin behaviour. Pekka was already famous to me as

one of the few persons who had carried out field research on callitrichids by that time. The short conversation we maintained was very inspiring and augmented the already existing desire to do field work myself. A few years later, in 1988, I visited Pekka at his field site Estación Biológica Cahuana on the Río Pacaya. I will always remember the few days in Cahuana together with Pekka as amongst the most beautiful moments that I spent in Amazonia. Pekka's friendship, hospitality and all the knowledge he shared with me will remain as an incomparable experience. Over the last couple of years, I visited Pekka each time I came through Iquitos on the way to my field site. As during my first encounter with him in 1982, I was always inspired and intrigued by Pekka's broad knowledge and perspective; unfortunately, there was never enough time during these visits to learn all that could be learned from him. Pekka was an unsurpassable, hard-working and dedicated naturalist and conservationist. I do not know anybody else who had such a broad knowledge of and who had studied so many different organisms in Amazonia. As a primatologist I can say that Pekka has made major contributions to Neotropical primatology, but I am sure that his research on other taxa is as valuable as his primate work. Everybody who knows his "Informes de Pacaya" will appreciate the wealth of knowledge Pekka had accumulated. His modesty hindered him from creating the publicity which his work deserved. I will miss a very good friend, and Pekka will remain unforgettable to me and all who knew him.

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FALLECIÓ EL DR. PEKKA SOINI, INVESTIGADOR AUTODIDACTA DE LA AMAZONÍA

Jukka Salo
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El investigador Pekka Soini falleció a los 62 años afectado por un cáncer pulmonar, el 8 de agosto del 2004 en la ciudad de Iquitos, Perú. En el Perú fue muy apreciado por todos aquellos vinculados a la conservación y el uso sostenible de los recursos amazónicos, y conocido por ejemplo a través de los artículos de Barbara D'Achille. El público finlandés conoció la labor de Soini en la Amazonía a través de programas de naturaleza de la TV. En el ámbito internacional, Pekka Soini ha sido reconocido como un pionero de importantes estudios biológicos y ecológicos tropicales. "Era uno de los mejores biólogos de campo que he conocido, un líder y un pionero", dice Russ Mittermeier, Presidente de Conservation International. "Le tuve una tremenda admiración", comenta el Dr. Carlos Peres, especialista brasileño en la biología de la conservación. "Siempre fue un buen candidato para la santidad", dicen Christine Padoch y Miguel Pinedo-Vasques, biólogos prominentes de Nueva York (Miguel nació y creció en la Amazonía).

Soini se estableció en la Amazonia peruana en 1965, donde inicialmente trabajó en el sector de turismo, dedicándose siem-

pre más y más al estudio de la fauna amazónica, autofinanciando sus investigaciones. Entre los primeros objetos de su investigación fueron los reptiles de Loreto. Soini colectaba serpientes raras y venenosas y las enviaba al Instituto Butantan que producía suero antiofídico. Colectando serpientes, se familiarizó profundamente con la biología de los bosques amazónicos.

Soini llegó a la fama científica mundial como pionero de la investigación primatológica en los neotrópicos. Fue el primero que durante meses observaba grupos de monos, siguiéndolos en terrenos extremadamente difíciles de paso, y escribió sobre su biología de reproducción, nutrición y territorialidad.

Uno de sus aportes más significativos fue la recuperación y dispersión de los quelonios acuáticos amenazados, no sólo en el Perú, sino también – a través de manuales escritos por él – en los países vecinos. Durante los años 1979–1986, Soini y su esposa convivieron en la cuenca del río Pacaya donde desarrollaron y pusieron en práctica metodologías exitosas para la incubación de huevos y propagación de varias especies nativas de quelonios, tales como charapas (*Podocnemis expansa*), taricayas (*P. unifilis*) y cupisos (*P. sextuberculata*) en cantidades de decenas de miles. Estas metodologías fueron compartidas con los pobladores de las comunidades nativas de la zona, desarrollándose así una de las primeras experiencias de manejo participativo comunitario en la Amazonía peruana que se basaba en el manejo sostenible. Así los quelonios volvieron a ocupar un lugar importante en la nutrición de la población local.

Las investigaciones de Soini y su proselitismo contribuyeron a la creación del Parque Nacional de Pacaya-Samiria, el mayor del Perú. El Parque garantiza la conservación de los más importantes bosques inundables de la Amazonía y de sus mamíferos, como el tapir y el manatí. Soini junto a otros investigadores enfocó la atención hacia la enorme y particular biodiversidad de la zona de Allpahuayo-Mishana en las cercanías de la ciudad de Iquitos, la cual fue catalogada como Zona Reservada y Reserva Nacional en 1999 y 2003, respectivamente. Esta Reserva también ha sido el centro de atención e investigación del grupo multidisciplinario de la Universidad de Turku, Finlandia.

En los últimos años, Pekka Soini continuó apoyando iniciativas de conservación no solamente de una diversidad biológica excepcionalmente alta, sino también de la diversidad cultural de las comunidades nativas en las zonas de Pucacuro y Pintuyaco-Chambira. Soini también fue un activo colaborador y coordinador en el proyecto de Cooperación Diversidad Biológica de la Amazonía Peruana, BIODAMAZ: Perú-Finlandia, que fortalece los mecanismos de conservación y uso sostenible de la biodiversidad amazónica. Soini ha asistido y compartido sus conocimientos con decenas de investigadores y estudiantes finlandeses interesados en la conservación ambiental y la biodiversidad amazónica.

Soini aprendió a arreglarse con los peligros de la selva húmeda y, por ejemplo, una vez rescató su perro dela boca de una

enorme anaconda. Otra vez a la familia Soini le robaron todas sus pertenencias de su casa de selva, menos los discos de música clásica, libros, y las notas científicas de Soini.

En el año 1999 la Universidad Nacional de la Amazonía Peruana le otorgó al autodidacta Soini el título de Doctor *honoris causa,* y recibió la medalla de la Orden del Mérito Agrícola del Ministerio de Agricultura. Así mismo, en 1982 recibió el Premio de Conservación de América Latina de la Audubon Society, y el Premio de Conservación de los Bosques por The Nature Conservancy en 1988. Soini fue miembro permanente de varias comisiones de la Unión Internacional para la Conservación de la Naturaleza (UICN). Sus lazos familiares se extienden a varios continentes. Por su carácter, era modesto y optimista.

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NEWS

RED DATA BOOKS FOR THE STATES OF PARANÁ AND RIO GRANDE DO SUL, BRAZIL

The Instituto Ambiental do Paraná has published the *Livro Vermelho da Fauna Ameaçada no Estado do Paraná*, in cooperation with the Government of Paraná and the Secretaria de Estado do Meio Ambiente e Recursos Hídricos (SEMA). Edited by Sandra Bos Mikich and Renato Silveira Bérnils, this 700-page volume provides the most recent assessment of the conservation status of well over three hundred threat-

ened and indeterminate species in the Brazilian state of Paraná. Detailed entries, each with its own map, cover 56 species of mammals, 167 birds, 13 reptiles, 25 amphibians, 50 fishes, 18 bees and 15 butterflies, for a total of 344 species designated as threatened, Near Threatened or Data Deficient. Of all the species known to occur in Paraná, 32% of the mammals are considered threatened, 28% of the reptiles and amphibians, 22% of birds, and 5% or less of fishes, bees and butterflies.

Of the 176 mammal species verified from Paraná, six are primates, four of which are treated in the *Livro Vermelho*: *Alouatta caraya* (EN), *A. guariba* (VU), *Brachyteles arachnoides* (CR) and *Leontopithecus caissara* (CR). All four species are susceptible to habitat destruction—the greatest overall threat—and they are also hunted for food and the animal trade. In all cases, the *Livro Vermelho* recommends control of hunting and protection of habitats as top priorities, followed by field research to improve the understanding of the distribution, ecology and population dynamics of these species. In addition, a program of environmental education is recommended for the inhabitants of the Ilha de Superagüi, who occupy much of the largest remaining refuge for the black-faced lion tamarin.

The Paraná volume follows the publication, in 2003, of an equally comprehensive survey for Brazil's southernmost state: the *Livro Vermelho da Fauna Ameaçada de Extinção no Rio Grande do Sul*, edited by Carla S. Fontana, Glayson A. Bencke and Roberto E. Reis, and published by Edipucrs, the university press of the Pontifícia Universidade Católica do Rio Grande do Sul. This volume received support from a variety of foundations and NGOs, including Conservation International do Brasil and the Fundação O Boticário de Proteção à Natureza. The assessments detailed in the *Livro Vermelho*, resulting from more than three years of work by dozens of specialists, were codified in state law by Decreto Estadual nº 41.672, promulgated on 11 June 2002 and signed by then-governor Olívio Dutra.

The *Livro Vermelho* of Rio Grande do Sul provides information on 261 species in five threat categories, including 33 mammals, 128 birds, 27 reptiles and amphibians, 28 fishes, 18 insects, 17 molluscs, 7 crustaceans and 3 sponges. Of the three primates known from the state, all are listed as threatened: *Alouatta caraya* (VU), *A. guariba* (VU) and *Cebus nigritus nigritus* (DD). As in Paraná, habitat destruction is the paramount threat, especially for the two species of howlers. In recent decades, the western regions of Rio Grande do Sul have undergone a massive transformation, with native ecosystems replaced wholesale by ranching and agricultural properties. The remaining forest habitat is often selectively logged and otherwise degraded, which interferes with forest regeneration and affects the species dependent on it—which may alter patterns of food availability for howlers, for instance, or drastically increase their ectoparasite load. Hunting and the animal trade are also persistent pressures, in particular for the more common *A. guariba*; and *C. n. nigritus* is undoubtedly affected as well,

although the data available for this species were inadequate for a full assessment.

The *Livro Vermelho* is quite specific in calling for proposals for development and economic exploitation which protect natural areas and connect them with conservation parcels. This approach would include the creation of corridors to link isolated forest fragments, and would require the management of populations for proper genetic interchange. Research programs on the basic ecology and biology of these species, as well as how they adapt to changing environments, are also recommended, along with surveys and detailed mapping of their current distributions.

These two volumes from Paraná and Rio Grande do Sul are the most recent additions to a small series of regional assessments produced by individual states in Brazil. Paraná was the first state to do so, in 1995, at which time their list included 21 species of mammals (Brazil, Paraná, SEMA, 1995). Three years later the states of Minas Gerais, Rio de Janeiro and São Paulo also released summaries of threatened species within their borders (Machado *et al.*, 1998; Bergallo *et al.*, 1998; Brazil, São Paulo, SMA, 1998), listing 40, 43 and 41 species of threatened mammals respectively. All together these five states, concentrated in the industrialized and heavily impacted southeast of Brazil, remain the only states to have produced current, comprehensive assessments of threatened species. We hope that other Brazilian states will join this continuing process, and provide summaries of equal scope and value for other regions in Brazil.

Threatened Primates in Paraná

Alouatta caraya—EN
The black howler only occurs in the westernmost sliver of the state, along the Rio Paraná. Its extraordinary adaptability in diet and behavior has allowed small populations to survive in scattered forest fragments, in some cases in sympatry with *Alouatta guariba*. What few populations remain in Paraná are threatened by hunting, habitat destruction and capture for the animal trade. Currently there are no measures in place to preserve this species in the state, but the *Livro Vermelho* recommmends controlling hunting, preserving and rehabilitating habitat, and additional research.

Alouatta guariba—VU
The brown howler is spread throughout Paraná and has been reported from a number of state and national parks. Despite its ample distribution and ecological adaptability, though, it remains susceptible to habitat destruction, and it is also hunted for food and for the animal trade. Detailed studies are underway on its ecology, but the *Livro Vermelho* recommends additional research—in particular, mapping populations across the state—plus control of hunting and the protection of suitable habitat.

Brachyteles arachnoides—CR
Only one small population of muriquis is known from Paraná, in a small forest fragment with no legal protection;

Table 1. Regional classifications for primates in Paraná and Rio Grande do Sul.

	Status*	Threats
Paraná		
Alouatta caraya	EN	Habitat destruction; hunting; animal trade
Alouatta guariba	VU	Habitat destruction; hunting; animal trade
Brachyteles arachnoides	CR	Habitat destruction and fragmentation; hunting
Leontopithecus caissara	CR	Habitat destruction and degradation; hunting; animal trade
Rio Grande do Sul		
Alouatta caraya	VU	Agricultural expansion; habitat disruption; parasite and disease outbreaks
Alouatta guariba	VU	Agricultural expansion; habitat disruption; hunting; animal trade
Cebus nigritus nigritus	DD	Habitat destruction and alteration

* DD = Data Deficient, VU = Vulnerable, EN = Endangered, and CR = Critically Endangered.

this is potentially the southernmost outpost of the species, although there have been recent sightings elsewhere in the eastern portions of the state. Exceptionally social and un-aggressive, muriquis prefer lower-elevation montane forests and once occurred along the Atlantic coast from Bahia to Paraná. One of the most intensively hunted primates in Brazil, the total population plunged from less than half a million to barely three thousand by the mid-twentieth century—and with the virtual elimination of montane Atlantic Forest throughout its range, it has since declined to barely over a thousand individuals. Hunting has not entirely ceased, and deforestation continues to destroy potential habitat; but where surviving populations are protected from hunting, their numbers soon recover. The *Livro Vermelho* emphasizes that active research projects help to protect the muriquis, and their tolerance of successional habitat encourages reforestation efforts.

Leontopithecus caissara—CR
Occupying barely 300 km² on the border of littoral Paraná and São Paulo, the few hundred remaining black-faced lion tamarins survive in coastal sand forest and associated wetland habitats. Their original distribution is completely unknown, and today they are confined to the Ilha de Superagüi and a small ribbon of adjoining mainland. Although much of their primary island is a national park, the lion tamarins are seriously threatened by the degradation of their specialized habitats and from hunting by local fishermen, as well as capture for the animal trade. Field studies are underway on their ecology, behavior and population parameters, and the *Livro Vermelho* recommends the protection and monitoring of habitat and environmental education for the adjacent communities.

Threatened Primates in Rio Grande do Sul

Alouatta caraya—VU
In Rio Grande do Sul, the black howler occurs only in the westernmost section of the state, where its distribution crosses over the Rio Paraná to Argentina; there has also been a sighting in Uruguay, which may or may not have been a captive release. Although occupying only a portion of western Rio Grande do Sul, black howlers appear in several protected areas, and in some areas may be quite common. Black howlers have been affected by the large-scale conversion of native landscapes to agroecosystems in the region. Apart from the raw loss of habitat, more subtle effects continue to cascade through the remaining patches of forest, including parasite infestations and outbreaks of yellow fever. The *Livro Vermelho* recommends the creation of new protected areas, and surveys to determine the size and distribution of existing populations, in order to understand the correlation of population dynamics and habitat degradation. Additional recommendations include managing protected howler habitat to maintain a connection with natural areas, and field research comparing the ecology of black howlers in different habitats, in order to better understand how populations tolerate and adapt to changing conditions.

Alouatta guariba clamitans—VU
Ranging from the Atlantic Forest of Bahia to northernmost Argentina, brown howlers are spread throughout the majority of Rio Grande do Sul, absent only from the extreme west and southwestern regions. Given this ample extent, they appear in at least a dozen protected areas across the state. The species prefers montane areas, but in Rio Grande do Sul it occurs at all elevations. In Rio Grande do Sul, as elsewhere in their range, brown howlers are most threatened by habitat destruction and alteration. The continuing fragmentation of the remaining Atlantic Forest traps small groups in isolated forest patches, and plant species they rely on are often economically valuable and targeted for extraction. Hunting and the animal trade are additional pressures, and yellow fever has severely reduced or eliminated populations in some areas. The *Livro Vermelho* calls for an ambitious program of research on the distribution, density and population dynamics of brown howlers, including range-wide surveys and detailed mapping of the most fragmented and isolated sectors of its range. Additional research would evaluate the species' ability to adapt to fragmentation and habitat alteration, improving the design of management plans and habitat restoration. As with black howlers, conservation corridors are recommended to reconnect isolated populations with remaining natural areas.

Cebus nigritus nigritus—DD

These capuchins have been recorded across Rio Grande do Sul, and must have experienced similar declines owing to widespread destruction of native landscapes. But the information is lacking which would allow for a full evaluation of their conservation status, and additional research is required on their ecology, distribution and population size.

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Itens Alimentares Utilizados por *Alouatta caraya* em Ambiente Natural

O guariba-preto, *Alouatta caraya*, é principalmente folívoro e frugívoro (Milton, 1980; Crockett e Eisenberg, 1987; Neville *et al.*, 1988; Bicca-Marques e Calegaro-Marques, 1994), consumindo além destes itens, pecíolos, caules, cascas, sementes e flores (Bicca-Marques, 1991). As folhas correspondem a uma variação de 60 a 90% da dieta destes animais, sendo as folhas imaturas o item predominante, seguidas de flor ou botão floral (Bicca-Marques, 1991; Oliveira, 1997). As diferenças encontradas na dieta sazonal desta espécie decorrem provavelmente devido à oferta de determinados itens específicos no transcorrer do ano. Bicca-Marques (1991) verificou que, quando a disponibilidade dos frutos utilizados por estes animais diminui, o consumo de folhas aumenta ao invés destes indivíduos saírem em busca de outros frutos. Algumas espécies arbóreas se destacam como importantes recursos para a sobrevivência desta espécie de primata; entre elas podemos citar *Ficus enormis*, *Chorisia speciosa*, *Parapiptadenia rigida*, *Melia azedarach* (*v.* Bicca-Marques, 1991), *Tapirira guianensis*, *Salacia crassifolia*, *Cecropia* sp., *Mauritia flexuosa* e *Ferdinandusa speciosa* (*v.* Neville *et al.*, 1988).

O Distrito Federal encontra-se entre os paralelos de 15°30' a 16°30'S e 47°18' a 48°17'W. Ocorrem duas estações bem definidas, uma seca de maio a setembro e outra chuvosa de outubro a abril, sendo a precipitação média de 1600 mm anuais e a temperatura variando de 18 a 22°C. A Reserva Ecológica do IBGE está inserida na APA do Gama/Cabeça-de-Veado – DF, e em seu interior encontram-se várias matas de galeria, entre elas a mata do Monjolo, onde este estudo foi realizado. Durante oito horas, do amanhecer ao pôr do sol, no mês de julho do ano de 2001, um grupo de *Alouatta caraya* – composto por um macho e duas fêmeas – foi acompanhado, registrando-se os itens alimentares utilizados por estes primatas no decorrer deste dia.

Devido à dificuldade de observação do grupo e à insuficiência de dados coletados, os padrões de dieta dessa espécie não puderam ser suficientemente analisados. Entretanto foram descritos os tipos de itens consumidos (Tabela 1), consistindo basicamente de folhas, frutos e brotos, sendo o último item consumido em menor proporção.

Tabela 1. Espécies vegetais consumidas por *Alouatta caraya* e o tipo de item consumido.

Família	Espécie	Item consumido
Caesalpiniaceae	*Sclerolobium paniculatum*	Folhas novas
Chrysobalanaceae	*Hirtella glandulosa*	Folhas
Hippocrateaceae	*Cheiloclinum cognatum*	Frutos
Humiriaceae	*Sacoglottis guianensis*	Frutos
Myrsinaceae	*Myrsine* spp.	Folhas
Sapindaceae	*Serjania caracasana*	Brotos

Nota-se, portanto, que neste dia da estação seca a dieta do grupo se baseou principalmente em folhas e brotos. Os frutos disponíveis nesta estação também foram consumidos, porém em menor freqüência, talvez devido à escassez dos mesmos nesta época. Estes resultados estão de acordo com os resultados obtidos nos estudos de Bicca-Marques (1991) e Oliveira (1997), entretanto as espécies vegetais aqui descritas são diferentes das registradas por Bicca-Marques (1991) e Neville *et al.* (1988) observando dieta de *Alouatta caraya*. Um volume maior de dados não pode ser coletado devido ao comportamento arisco destes animais, não sendo o grupo encontrado em outras ocasiões. Portanto, estudos de maior duração tornam-se necessários para comprovar esta dieta e incrementar os dados tão restritos até hoje descritos para esta espécie em ambiente natural.

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A Sighting of Muriquis (*Brachyteles*) in Una Biological Reserve, Bahia, Brazil

Two forms of muriqui, or woolly spider monkeys (*Brachyteles*), are currently recognized. The northern muriqui, *B. hypoxanthus*, occurs in the Brazilian states of Bahia, Minas Gerais and Espírito Santo, and is listed as Critically Endangered; the southern muriqui, *B. arachnoides*, is known from São Paulo, Rio de Janeiro and Paraná, and is Endangered (Hilton-Taylor, 2000; Rylands *et al.*, 2003a, 2003b). Hunting, forest destruction and fragmentation are the main threats to the survival of these species (Rylands *et al.*, 2003a, 2003b).

Here we report an observation of three individuals, most probably northern muriquis, in Una Biological Reserve (REBIO Una), Bahia, Brazil (15°07–15'S, 39°15–25'W).

Although the reserve was probably within the species' former distribution (Aguirre, 1971), there are no recent records of muriquis having been present there. The observation described here was made in the western section of the REBIO Una, called Piedade, by Josinei da Silva Santos (JSS), a field assistant working for Project BioBrasil. Coordinated by the Royal Zoological Society of Antwerp (Belgium) in partnership with the Institute for Socio-Environmental Studies of southern Bahia (IESB), this project includes studies of the ecology of golden-headed lion tamarins in fragmented and disturbed areas in and near the REBIO Una since February 2003. Trained field assistants observe the lion tamarin groups on a daily basis, recording their behaviour, and also reporting on sightings of other animals.

On February 9, 2004, while following a group of lion tamarins, JSS observed three very large primates. They were fleeing from the observer, travelling through the canopy by swinging their arms in alternating movements, using their tail as an aid and support. Two larger individuals were moving in front, followed by a third smaller one. Their bodies were brown-coloured, while the fur around their face was lighter, with more beige. The area surrounding the eyes and nose was darker than the rest of their body. They were obviously very large, much larger and heavier than either the buff-headed capuchin (*Cebus xanthosternos*) or the southern Bahian masked titi monkey, *Callicebus melanochir*, which also occur in the reserve and with which JSS is familiar. These primates bent the branches considerably under their weight, and JSS estimated their size to be about one meter from head to pelvis.

Although JSS had heard of the *mono carvoeiro* (another Portuguese name for muriqui), he had never actually seen it before, neither in the reserve nor anywhere else. When shown pictures of muriquis in Strier (1992), he said they appeared to be the same, not only in appearance, but also their posture and locomotion. When asked to indicate the primate he had seen in Rowe (1996), he chose the picture of the northern muriqui (p.80), noting particularly that the colouration of the body, the face and its surrounding fur was similar to what he had seen. He was secure in his belief that both the pictures from Strier (1992) and Rowe (1996) showed the species of primate that he had seen.

The observation occurred at 15°10'87"S, 39°08'88"W in an area of selectively logged forest. The vegetation surrounding this location is very heterogeneous and fragmented, composed of patches of selectively logged forest, regenerating low secondary forest and relatively open areas of pasture in various stages of regeneration (pers. obs.). A few very small islands of mature forest are left. Muriquis are known to use both secondary and primary forest (Emmons and Feer, 1997).

For various reasons relating to the lion tamarin research, we have not been able to work intensively in the area where the muriquis were seen; since February 2004, we have only

been able to visit the area once or twice a month, if at all, and no other muriqui sightings have been reported. It is therefore not clear if the muriquis seen are permanent in the reserve or whether their presence on that day was merely transient.

If these muriquis are permanent residents, their presence strengthens the position of the Una Biological Reserve as one of the most important of the Atlantic Forest protected areas. Until now, the reserve was known to contain representatives of four threatened primates—*Leontopithecus chrysomelas*, *Cebus xanthosternos*, *Callithrix kuhlii* and *Callicebus melanochir*—besides numerous other rare and threatened animals and plants. Adding muriquis to the list of the reserve's occupants further increases the conservation value of the reserve, and reinforces the urgent need to safeguard and expand this area, which is now the largest single forest block remaining in the region.

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ALL MALES ARE EQUAL BUT SOME ARE MORE EQUAL: PROXIMATE MECHANISMS AND GENETIC CONSEQUENCES OF THE SOCIAL AND MATING SYSTEM OF MOUSTACHED TAMARINS, *SAGUINUS MYSTAX MYSTAX* (SPIX, 1823)

On 30 July 2004, Maren Huck defended her doctoral dissertation at the University of Bielefeld, Germany. As a cumulative thesis, published as a sequence of accepted papers, her research draws on work carried out at the Department of Biology of the University of Bielefeld and also at the Department of Sociobiology of the German Primate Centre in Göttingen, Germany. Her supervisors were Prof. Dr. Roland Sossinka of the University of Bielefeld and Dr. Eckhard W. Heymann of the Department of Behavioural Ecology and Sociobiology of the German Primate Centre. Her research was funded by a grant to E. W. Heymann from the Deutsche Forschungsgemeinschaft DFG (HE 1870/10-1,2). The following is a summary of her cumulative thesis.

Males are generally believed to show much higher variability in reproductive success than females. Males may increase their reproductive success mainly by increasing the number of copulations with different mates, while promiscuous females will theoretically not fare better than those which are monogamous. In mammals, males are predisposed to desert their mates after copulation and to leave the entire care for the offspring to the females. But the callitrichines, the marmosets and tamarins, deviate in all these aspects. Their mating systems are quite variable, and moustached tamarins (*Saguinus mystax*) in particular are often polyandrous, while female reproduction is restricted to a single individual per group. The infants are cared for co-operatively by all group members. The aim of this study was therefore to investigate how this mating system is maintained proximately, on both the endocrine (concentrations of testosterone and cortisol) and the behavioural (agonistic, mate guarding) levels, and what might be the ultimate reasons for the extensive helping behaviour.

From January to December 2001 we collected behavioural data and faecal samples from two habituated groups of individually known wild moustached tamarins at the Estación Biológica Quebrada Blanco in north-eastern Amazonian Peru. Behavioural data were collected daily during all-day follows by focal animal sampling (group W, 203.5 h; group E, 220 h), scan sampling (group W, 3262 scans; group E, 3758 scans) and continuous behaviour sampling for social interactions, infant care, and scent marking (group W, 3004 contact hours; group E, 3257 contact hours). First we had to establish the genetic relationships, both within groups and compared to the population mean (paternities and relatedness values). For genetic analyses we collected faeces from the two main study groups and from seven neighbouring groups, yielding samples from a total of 62 different individuals. The DNA of these samples was extracted and used in a microsatellite analysis (12 primers

with an average of seven alleles per locus), thus providing the first genetic data on a wild tamarin population. For hormonal analyses, 562 samples from six identified adult males and six immatures were used for enzyme immunoassay (EIA).

At first glance, it might seem that with tamarins, all males are equal, since all unrelated males mate with the breeding female; but our study revealed that, as George Orwell might say, some are more equal than others: paternity was completely monopolized in two-thirds of the groups, and in 89-93% of all infants. Nonetheless, paternity was shared in some groups, and we also found evidence for dual paternity in a pair of infants thought to be twins. Relatedness within groups was generally high (R = 0.31) but unrelated individuals of both sexes did occur. Despite the interrelationships of many group members, mates were never related and no cases of incest were recorded.

Since neither testosterone nor cortisol levels varied between males, the ability to monopolize a female was not based on endocrine inhibition of other males. In addition, during a phase of social instability—in which the breeding female died, a new female immigrated, and several adult males subsequently left the group—hormone levels were not significantly elevated (although they were unusually high in immatures), nor did they correlate with inter-group encounter rates. Following the birth of infants, however, when the breeding females of both groups were not ovulating, we detected a greater concentration of testosterone in all adult males. Whether these elevated levels are related to the demands of infant care or to the imminent mating season could not be determined. The hormonal results support the challenge hypothesis (Wingfield *et al.*, 1990), which assumes that in the reproductive context, the general influence of androgen levels on aggression is most pronounced in situations of social instability—for example, during the formation of dominance relationships, the establishment of territorial boundaries, or challenges by conspecifics for access to mates. Testosterone levels before the mating season are also predicted to be relatively low in species with minimal intra-group aggression and the sharing of infant care by all members of the group. An analysis of hormone levels of five immature individuals demonstrated that in tamarins, age and morphology alone cannot predict sexual maturity. The precocious behaviour of one immature male, and thus his elevated hormone levels—together with the reduced rate of helping—might have precipitated his eviction once an unrelated female arrived.

Nor did aggressive interactions play any apparent role in the monopolization of paternity. Instead, the father of the infants was observed to guard the female during the probable time of conception. This behaviour incurs a hidden cost, as the male is more conspicuous while guarding, and thus most likely at a greater risk from predation. The male engaged in mate-guarding almost entirely on his own initiative, and the timing probably relied on cues in scent marks made by the breeding female.

All group members participated in infant care, but other adults carried infants significantly more than either of the infants' own parents. Caring for infants demands changes in the time budgets of the helpers, which is another cost of this behaviour. The fact that each helper is closely related to at least one of the parents, however, suggests that the indirect benefits to their overall fitness are likely to outweigh these costs. The presence of unrelated individuals, however, requires there to be direct benefits to be gained from helping as well. Males who would otherwise have a poor chance of establishing their own group might find such a benefit by tolerating occasional matings by other males with the breeding female, given the possibility of dual paternity in twins. Other possibilities, such as inheriting the territory or the mate when the same-sex main breeder emigrates or dies, cannot be ruled out; but evidence which is amenable to statistical analysis is often difficult to collect in the field.

In conclusion, this study suggests that in moustached tamarins, the mating system tends towards monogamy despite polyandrous matings; this near-exclusivity is achieved by one male guarding the group's breeding female. Although extensive and costly, communal infant care may increase the inclusive fitness of helpers through kin selection, but possible direct gains to fitness are likely to be valuable enough for unrelated individuals to participate.

Resumen español

Es sabido que los machos en comparación con las hembras muestran más variabilidad en el éxito reproductivo. Los machos aumentan su éxito reproductivo mayormente incrementando el número de copulaciones con distintas hembras mientras que las hembras promiscuas – en teoría – no muestran ventaja en comparación con las hembras monógamas. En los mamíferos, los machos están predispuestos a dejar a sus hembras después de la copulación y solamente las hembras se encargan de las crías. Entre los monos neotropicales, los miembros de la subfamilia Callitrichinae (los "pichicos"), sin embargo, son diferentes en todos los aspectos mencionados del esquema general. El sistema de emparejamiento (*mating system*) es muy variable y especialmente los "pichicos barba blanca" (*Saguinus mystax*) copulan regularmente de una manera poliándrica. No obstante la reproducción está restringida a una hembra por manada. Todos los miembros de la manada cuidan a las crías co-operativamente. Por eso, el objetivo principal de este estudio fue investigar como el sistema de emparejamiento está relacionado con sistema endocrino (los niveles de testosterona y cortisol) y con el sistema del comportamiento (agresión y *mate-guarding* o sea guardar-la-hembra). También investigamos cuáles son las razones últimas para la ayuda intensiva en cuidar las crías.

Para investigar esas preguntas coleccionamos en la Estación Biológica Quebrada Blanco en el noreste de la Amazonía Peruana (a partir de Enero hasta Diciembre 2001) datos del comportamiento y muestras de heces de dos manadas de "pichicos barba blanca" salvajes que conocíamos indivi-

dualmente. Siguiendo las manadas a lo largo del día coleccionamos a diario datos de comportamiento tanto muestreo focal-animal (en total: grupo W, 203.5 h; grupo E, 220 h), muestreo instantáneo (total: grupo W, 3262 registros; grupo E, 3758 registros) y continuamente los datos de interacciones sociales, cuidado de las crías, y marcaciones (en total: grupo W, 3004 horas de contacto; grupo E, 3257 horas de contacto). Primero tuvimos que establecer las relaciones genéticas en las manadas así como también en comparación con el promedio de la populación (paternidad y coeficientes de relaciones genéticas). Para los análisis genéticos analizamos las heces de nuestras dos manadas y de siete manadas vecinas. Así obtuvimos muestras de 62 individuos diferentes. Utilizamos el ADN extraído de las muestras para los análisis de microsatélites (12 primers con siete alelos para cada locus en promedio). Esos son los primeros datos genéticos de una manada salvaje de una especie de *Saguinus*. Para los análisis de hormonas utilizamos 562 muestras de seis machos adultos y seis adolescentes identificados. Estas muestras fueron utilizadas para un inmuno-ensayo enzimático.

Nuestro estudio muestra a primera vista que "todos los machos son iguales" porque todos los machos que no son parientes de la hembra reproductiva copulan con ella. No obstante, para hablar con G. Orwell, "algunos son más iguales" porque en dos tercios de los grupos (y en 89-93% de todos los infantes) la paternidad fue monopolizada por un solo macho. No obstante, en unas manadas la paternidad fue compartida. También encontramos una señal de paternidad múltiple en un par de mellizos supuestos. El grado de parentesco fue generalmente alto (R = 0.31) pero había también individuos de ambos sexos que no fueron relacionados. Parejas copuladoras nunca fueron relacionadas, por lo cual el incesto no parece ser común.

La monopolización no se cumple por inhibición endocrina de otros machos porque ni los niveles de testosterona ni de cortisol estaban diferentes entre los machos. Los niveles de hormonas no estaban elevados durante una fase de inestabilidad demográfica (pero fueron más altos de lo normal en los adolescentes) y no estaban correlacionados con la frecuencia de encuentros con otras manadas. Sin embargo se encontró una elevación de testosterona poco después del nacimiento de los infantes durante una fase de inactividad ovárica de la hembra reproductiva. Actualmente no es posible distinguir si esa elevación fue relacionada a las necesidades del cuidado a las crías o a la temporada de reproducción inminente. Los resultados también coinciden con la hipótesis del desafío (*challenge hypothesis*, Wingfield *et al.*, 1990) que supone que la influencia general de niveles de hormonas andrógenas en la agresividad (en el contexto de la reproducción) es más profundo en situaciones de inestabilidad social. La hipótesis también supone que el aumento de testosterona no es muy alto en especies con poca agresividad en los grupos y un nivel alto de ayuda en la crianza por individuos no-maternales. El análisis de los niveles hormonales de cinco individuos adolescentes muestra que en los "pichicos" ni la edad ni la morfología son suficientes para pronosticar la madurez sexual. La precocidad así como los niveles hormonales más altos en un adolescente y/o el grado menor del cuidado de los infantes de él podrían ser las razones de la expulsión de este individuo de la manada. La expulsión seguía directamente a la inmigración de una hembra no-relacionada.

Las interacciones agresivas tampoco tienen un papel en la monopolización de la paternidad. En su lugar, observamos que el padre de los infantes guardaba a la hembra reproductiva alrededor del tiempo probable de concepción. Mostramos que ese comportamiento incluye expensas escondidas de ser más visible y así el riesgo de depredación aumenta. La sincronización de la vigilancia del macho contra la hembra (el tiempo de la guarda de la pareja, *mate guarding*), que casi exclusivamente fue iniciado por el macho, depende probablemente de señales olfatorias en las marcaciones de la hembra reproductiva.

Todos los miembros de la manada participan en el cuidado de los infantes, pero no-padres adultos cargan significativamente más a los infantes que los padres mismos. El cuidado de las crías cambia los *time budgets* de los ayudantes que enseña a expensas de ese comportamiento. El alto grado de parentesco de los ayudantes con (por lo menos) uno de los padres de las crías indica que hay ventajas de beneficios indirectos para la eficacia biológica que probablemente son más altos que los costes. Pero la presencia de individuos no-relacionados reclama que haya (también) beneficios directos para los ayudantes. Por ejemplo, la tolerancia de copulaciones ocasionales por el macho reproductivo y así la posibilidad de reproducción propia (especialmente con la posibilidad de paternidades múltiples en los mellizos) puede ser un estímulo suficiente para los ayudantes que quizás tendrían pocas oportunidades de establecer una manada propia. Otras posibilidades, como "heredar" el territorio o una pareja cuando el procreador mayor del mismo sexo se muere o emigra, no son descartados pero es muy difícil obtener datos en el campo que se puedan interpretar estadísticamente.

Sumariamente, este estudio sugiere que en los pichicos barba blanca el sistema genético de emparejamiento tiene una tendencia hacia la monogamia a pesar de las copulaciones poliándricas. El mecanismo de monopolización es la guardia de la hembra reproductiva (*mate guarding*) por un macho en el grupo. El cuidado intensivo y costoso de los infantes puede aumentar la eficacia biológica inclusiva de los ayudantes mediante la selección por parentesco (*kin selection*), pero los beneficios directos son probablemente suficientemente altos para estimular aún a los individuos no-relacionados para ayudar en la crianza.

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PRIMATES OF THE RIO JEQUITINHONHA VALLEY, MINAS GERAIS

Fabiano Rodrigues de Melo defended his doctoral thesis "Primates and Priority Areas for the Conservation of Biodiversity in the Rio Jequitinhonha Valley, Minas Gerais" for the Postgraduate Course in Ecology, Conservation and Wildlife Management of the Federal University of Minas Gerais, Belo Horizonte, Brazil, on 21 May 2004. His academic supervisor was Anthony B. Rylands, and the study was supported by the Instituto Estadual de Florestas – Minas Gerais (IEF/MG), the US Fish and Wildlife Service (USFWS), the State University of Minas Gerais (UEMG), the Primate Action Fund of Conservation International and the Margot Marsh Biodiversity Foundation, and the Brazilian Science Council (CNPq). The following is a summary:

In 1999, the Minas Gerais State Forestry Institute (IEF-MG) (*Instituto Estadual de Florestas de Minas Gerais*) began a series of biological surveys in the areas indicated in the *Atlas of Biodiversity Conservation Priorities in Minas Gerais*, the results of a workshop held in 1998 by the Fundação Biodiversitas. The northwest of the state, specifically the middle and lower Rio Jequitinhonha, was given particular priority, covering as it does forest fragments within the ranges of golden-headed lion tamarin (*Leontopithecus chrysomelas*) and buff-headed capuchin (*Cebus xanthosternos*). Eleven species of non-human primates are known to occur there, a key area for the conservation of 65% of the primate species occurring in the state. We proposed a number of inter-institutional partnerships to allow for specialists to participate in field trips with the staff of the IEF, targeting 15 municipalities in the Jequitinhonha valley in Minas Gerais. Two employees from the Forestry Institute headquarters (Belo Horizonte), besides people from local and regional IEF offices, accompanied field trips to the valley from 1999 to 2001. Each involved surveying the most significant forest fragments along the middle and lower valley of the Rio Jequitinhonha. Threatened species were given priority, and particularly threatened primates.

Three main forest types were identified within the Atlantic Forest portion of the lower valley—seasonal deciduous forest, seasonal semideciduous forest and dense closed-canopy forest. Despite the widespread destruction and degradation of the forests of the region, there are still some areas which are relatively intact and preserved. Independent of their size, about 65% of the fragments maintain primary forest to some extent. Except for the marmosets (*Callithrix*), the primates surveyed in the region are threatened, with populations severely reduced by forest loss and fragmentation, and hunting affecting especially the larger species. The results of the surveys indicate that the larger species are under especially severe pressure, with fragmentation and fragment size influencing the occurrence of *Cebus xanthosternos*, *Alouatta guariba guariba* and *Brachyteles hypoxanthus*. Maintenance of the highest possible richness of primates along the middle and lower Rio Jequitinhonha will depend on fragment size, degree of connectivity and the influence or persistence of selective logging. There was a positive correlation between primate species richness and mammal species richness overall, providing strong arguments for the protection of the best fragments remaining.

Information was also obtained on the occurrence of other mammals, birds, reptiles, amphibians and the flora of each site, allowing for an evaluation of each forest fragment in terms of both primates and other threatened species. Six areas in the Atlantic Forest portion of the valley were identified as of high biodiversity value, of relatively good size, with representative populations of threatened vertebrates, and with the least threats and negative impacts. Immediate measures should be taken for the creation of five protected areas in the valley—Fazenda Limoeiro and Serra de São Simão, Almenara; Fazenda Canadá in Bandeira; Fazenda Santana in Salto da Divisa and Fazenda Alto Cariri, in Salto da Divisa and Santa Maria do Salto—which would contribute to the conservation of threatened primates, and include numerous animal and plant species typical of the Atlantic Forest in north-eastern and eastern Minas Gerais.

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Reference

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GRANDE SERTÃO VEREDAS NATIONAL PARK – INCREASED IN SIZE

The Grande Sertão Veredas National Park in the Cerrado (bush savanna) in the municipality of Formoso, in the northwest of the Brazilian state of Minas Gerais, was created in 1989 with an area of 84,000 ha. It is on the Central Plateau (*Chapadão Central*) which divides the basins of the Rios Tocantins and São Francisco, and protects gallery forests along the headwaters of the Rios Preto and Carinhanha and their springs, called *veredas*, marked by concentrations

of palms: buriti (*Mauritia vinifera*) and buritirana (*Mauritia armata*). The rich fauna is typical of the Cerrado, and includes the giant anteater (*Myrmecophaga tridactyla*), giant armadillo (*Priodontes maximus*), maned wolf (*Chrysocyon brachyurus*), pampas deer (*Ozotoceros bezoarticus*), hoary zorro (*Dusicyon (Pseudalopex) vetulus*) and rheas (*Rhea americana*), in a region otherwise largely devastated by agriculture—especially soybean and coffee plantations—and cattle ranching. Primates occurring in the park include the black-tufted-ear marmoset (*Callithrix penicillata*), the black howler (*Alouatta caraya*), and the bearded capuchin (*Cebus libidinosus*). On 21 May, 2004, its size was more than doubled to 231,000 ha, extending it to the border with the state of Bahia. Of interest is that this will now allow for the creation of an "extended ecological corridor" with the Serra Geral in Bahia. This significant measure was in large part the result of pressure from a large number of NGOs, including the Fundação Pro-Natureza (Funatura)—largely responsible for the creation of the park in 1989—the World Wild Fund for Nature (WWF) Brazil, Conservation International do Brasil, the Inisituto Socioambiental (ISA), and the Cerrado NGO network (*Rede de ONGs do Cerrado*). *Source*: Inst: Instulo Socioambiental, São Paulo. Website: <http://www.socioambiental.org>.

A New National Park in the Brazilian Atlantic Forest

The Brazilian government published a decree on 7 June, 2004 creating the Serra do Itajaí National Park of 57,000 ha in the east of the state of Santa Catarina. The Itajaí valley was one of the 80 priority areas for the creation of protected areas in the Atlantic Forest identified during a workshop held in August 1999 in Atibaia, São Paulo: "Evaluation and Priority Actions for the Conservation of Biodiversity in the Atlantic Forest and Southern Grasslands", organized by Conservation International do Brasil in collaboration with the Fundação SOS Mata Atlântica; IPÊ – Instituto de Pesquisas Ecológicas; Fundação Biodiversitas; Secretaria do Meio Ambiente do Estado de São Paulo – SEMAD/SP; and the Instituto Estadual de Florestas – IEF/MG; and under the general coordination of the Ministry of the Environment (MMA). The initial proposal for the park, prepared by staff and researchers from the Brazilian Institute for the Environment (IBAMA), the Federal University of Santa Catarina, the Regional University of Blumenau (FURB), and the Santa Catarina State Environmental Secretariat, was sent to the MMA by the State Council for the Atlantic Forest Biosphere Reserve (*Conselho Estadual da Reserva da Biosfera da Mata Atlântica*) in 2002. The park includes parts of nine municipalities—Ascurra, Apiúna, Blumenau, Botuverá, Gaspar, Guabiraba, Indaial, Presidente Nereu and Vidal Ramos—and covers headwaters and springs vital for the region. The Itajaí valley has one of the largest remaining tracts of Atlantic Forest in southern Brazil, and researchers from the Regional University of Blumenau have found that the park protects 78% of the mammals (including notably the southern brown howler, *Alouatta guariba*, and the

black-horned capuchin, *Cebus nigritus*), 38% of the birds and 47% of the trees and shrubs known to occur in the state. *Source*: Instituto Socioambiental, São Paulo. Website: <http://www.socioambiental.org>.

Four New Protected Areas in Brazil Cover Nearly 500,000 Hectares

On 3 June, 2004, the Brazilian Minister of the Environment, Marina Silva, announced the creation of four new protected areas—two National Forests and two Extractive Reserves in the states of Paraná (Piraí do Sul National Forest of 124.8 ha in the region of Campos Gerais), Paraíba (Restinga do Cabedelo of 103 ha; mangroves and coastal *restinga* vegetation), Maranhão (Cururupu Extractive Reserve of 185,000 ha; marine resources—mangroves and coastal swamps) and Amazonas (Capanã Grande Extractive Reserve of 304,000 ha; municipality of Manicoré, Rio Madeira). Capanã Grande is one of the protected areas foreseen in the Amazon Region Protected Areas (ARPA) programme of the World Wide Fund for Nature (WWF), Brazil, which is working towards the creation of 50 million ha of new protected areas in the Amazon over the next 10 years. Eighteen million ha are planned for the first phase of the program (2002–2006), which is supported by the Global Environment Facility (GEF) of the World Bank, the KfW Bankengruppe, and the Brazilian government. At the government ceremony creating these reserves, representatives of the state governments of Acre, Amazonas, Mato Grosso, Pará, Rondônia and Tocantins signed cooperative agreements regarding the implementation of the ARPA.

Red Colombiana de Primatología

Estimados colegas y amigos: Los invito a hacer parte de la Red Colombiana de Primatología. Este es un espacio virtual para la actualización y el intercambio de información e ideas sobre este campo de investigación. La red es un espacio gratuito que cuenta con su pagina web y un foro para las discusiones. En este momento esta en línea la primera versión, pero la idea es que la construyamos entre todas las personas de la red. Este espacio no busca competir con la Sociedad Colombiana de Primatología, al contrario busca complementarla y espero que muy pronto las dos paginas estén ligadas, para no repetir trabajo y sacarle el mejor provecho.

Una de las ideas de esta red, es tener la información de las personas que trabajan en el área (nombre, áreas de interés o especies de interés y correo electrónico), al igual que información acerca de los proyectos que se están adelantando. Si ustedes quieren pertenecer a la red por favor escriban un correo electrónico a la siguiente dirección: <primatescolombia -subscribe@yahoogroups.com>.

Si ustedes quieren aparecer en el directorio de investigadores, o en la sección de proyectos, por favor envíenme la infor-

mación que consideren relevante: Titulo de la investigación, nombre de los investigadores y/o organización, correo electrónico. La pagina web de la Red es: <http://www.geocities.com/primatescolombia/>. Espero que podamos integrarnos y ayudarnos mutuamente.

Alba Lucia Morales Jiménez, Master's Course in Primate Conservation, Oxford Brookes University, Headington, Oxford, UK, e-mail <albalu@hotmail.com>.

The Colombian Primate Network

The primary goal of the Colombian Primate Network is to create a virtual community, open to researchers from Colombia and around the world, in order to share information about Colombian primatology—the status and ecology of Colombian primates, research projects, conservaton programs, methodologies and publications. This community will connect people who are working in the same areas of research, or on the same species; it will inform both the general public and researchers of the news from Colombian primatology; and it will connect investigators and organizations with international agencies, primatological societies and other resources, such as databases, which may be useful in developing and improving research and conservation programs.

Content
The Colombian Primate Network has a full online presence including the website, email and a discussion group. The website is entirely bilingual, with parallel sections in Spanish and English, which feature the following topics: General Information; Endangered Primates of Colombia; Ongoing Projects; Directory of Colombian Primatologists; News and Events; Discussion Board; and Links.

The directory of Colombian primatologists is indexed and searchable by name, institution, and field of research, as well as more detailed searches by specialty and ecosystem type. The listing of endangered primates includes profiles of *Ateles hybridus* (CR), *Saguinus oedipus* (EN), *Ateles belzebuth*, *Aotus* spp., *Cacajao melanocephalus*, *Callicebus cupreus*, *Callimico goeldii*, *Lagothrix lagotricha*, *Pithecia monachus*, and *Saguinus leucopus* (all VU). The links are divided into subsections on primatological societies, databases and bibliographies, grants and scholarships, and primate taxonomy.

Current status
The Colombian Primate Network began on 9 June, 2004, and in its first two months it was visited 1990 times. There are currently 46 subscribers to the email discussion group, 19 active projects listed on the website and 14 researchers in the directory. Both Spanish and English versions of the website have been visited with approximately the same frequency. These results demonstrate the value of this virtual community, and now the challenge is to continue growing and to have an impact at national and international levels.

Contact
To join the Colombian Primate Network, visit the website at <http://www.geocities.com/primatescolombia>, or contact Alba Lucia Morales Jiménez, MSc. Primate Conservation, Oxford Brookes University, at <albalu@hotmail.com>.

International Foundation for Science Research Grants

The International Foundation for Science (IFS) is a research council with international operations whose mission is to build the scientific capacity of developing countries for the sustainable management of biological and water resources. IFS believes that the interests of both science and development are best served by promoting and nurturing the research efforts of promising young science graduates who have the potential to become leading scientists in their countries. Since 1974, IFS has provided support to more than 3500 Grantees in over one hundred developing countries in Africa, Asia, the Pacific, Latin America and the Caribbean.

The IFS Granting Programme is open for project proposals from young scientists from developing countries who meet the eligibility criteria and who conduct research on the sustainable management of biological resources. Proposed projects must be related to the sustainable use of the biological and/or water resource base. IFS is specifically targeting scientists in countries with developing science and technology infrastructures. Research grants are awarded up to a maximum value of US$12,000 for a period of one to three years, and may be renewed twice. They are intended for the purchase of equipment, expendable supplies, and literature. Details of IFS awards can be found on the IFS website at <http://www.ifs.se/Programme/granting_programme.asp>.

Research Grants from the Center for Tropical Forest Science / Smithsonian Tropical Research Institute

The Center for Tropical Forest Science (CTFS) of the Smithsonian Tropical Research Institute (STRI) is currently accepting proposals for the sixth cycle of their Research Grants Program.

Purpose/Eligibility: The CTFS Research Grants Program is intended to provide opportunities for senior researchers, post-doctoral fellows, and graduate students to utilize existing CTFS Forest Dynamics Plots (FDPs) and to conduct research with scientists associated with these plots. The CTFS network of FDPs includes 18 sites in 15 countries. Anyone working directly in a Forest Dynamics Plot, analyzing data from a plot, or generating complementary data that strengthens FDP research programs is eligible to apply. Projects may be field-oriented, laboratory-based, or analytical, and the science may be basic or applied in nature.

Grants range from $3,000–$30,000. The CTFS Research Grants Program will make awards for projects between three months and three years in length.

Application: Grant proposals should include a Research Proposal (not to exceed 1500 words), a list of collaborators, curriculum vitae, proposed referees, and a detailed budget. For more information on how to submit a proposal, please visit <http://www.ctfs.si.edu>.

Deadline for Applications: This grants program has switched to an annual cycle. Submissions will be accepted yearly on the last Friday of July; the next deadline for applications is July 29, 2005. For more information, please contact: Center for Tropical Forest Science, Smithsonian Tropical Research Institute, P.O. Box 37012, QUAD 3123, MRC 705, Washington DC, 20013-7012, USA, Tel: 202-633-4012, Fax: 202-786-2557, <http://www.ctfs.si.edu>.

New Primate-News Notification Service

The Wisconsin Primate Research Center Library and Information Service is pleased to announce the launch of a new notification service, "Primate-NEWS". Primate-News (P-News) is designed to deliver Web-based news clippings, information about upcoming television programs, and other items of interest about primates via e-mail. The list is a notification or "push" service; subscribers will not have the ability to post messages. For more information and to subscribe, complete the brief subscription form at <http://pin.primate.wisc.edu/pnews/>. Please note: all of the content included in Primate-News is also posted to Primate-Science.

Matthew Hoffman, Internet Services and Outreach Librarian, National Primate Research Center, University of Wisconsin-Madison, 1220 Capitol Court, Madison, WI 53715, USA, e-mail <mhoffman@primate.wisc.edu>, website <http://library.primate.wisc.edu>.

The Brazilian Center for Conservation Biology Hosts the Sixth Latin-American Course for Conservation Biology and Wildlife Management

IPÊ – Institute for Ecological Research is hosting the "Latin-American Course for Conservation Biology and Wildlife Management" at its Center for Conservation Biology. This event will be conducted in partnership with the Smithsonian Institution (USA). The course will take place from 31 October to 5 December 2005 at the IPÊ headquarters in Nazaré Paulista, and in the Pontal do Paranapanema, São Paulo. The course will be given in Portuguese by twenty professionals with extensive experience in Brazilian conservation projects.

Course objectives: Evaluate the various processes that are today leading to biodiversity loss and discuss possible solutions to these issues. *Program*: Introduction to Conservation Biology; Global Ecological History; Landscape Ecology; Agroforestry Systems and Landscape Conservation; Environmental Education in Conservation Projects; Community Entrepreneurship and Sustainable Businesses; Public Policies and Brazilian Environmental Law: An Analysis; Principles of Environmental Economics and Carbon Credits; Proposal-Writing and Soliciting Resources for Conservation Projects; Vegetation Studies; Methodology for Studies of Animal Behavior; Research on Avifauna; Studies of Insects in Conservation Projects; Distance Methodology for Population Estimates; Population Estimates from Mark-Recapture; Radio-Telemetry Techniques and Data Analysis; Hunting and Sustainability of Fauna; Conversation Medicine; Conservation Genetics. *Course load*: approximately 260 hours/module.

Each participant will prepare a PowerPoint presentation prior to the start of the course, introducing their respective projects or employment. The main part of the course will be structured around workgroups that will put together research projects using the ideas discussed in the modules. *Target participants*: Postgraduate students and professionals that work with or have an interest in conservation or wildlife management. *Cost*: US$1,350.00. This includes room and board, local transportation, materials and field equipment used during the course. *Registration*: Interested candidates should complete the registration form available on the IPÊ website <www.ipe.org.br> or by emailing <cbbc@ipe.org.br>. This should be returned by email as an attachment to BCCB – Brazilian Center for Conservation Biology (<cbbc@ipe.org.br>). Closing date for receiving registration forms is 1 September 2005. A limited number of partial scholarships will be made available for this course.

For additional information: IPÊ – Instituto de Pesquisas Ecológicas, Rodovia Dom Pedro I, km 47/Bairro Moinho, Nazaré Paulista, São Paulo (100 km from Sao Paulo City). Tel : 55 (11) 4597-1327 or 55 (11) 9634-3574 (from 9:00 to 12:00 and 14:00 to 17:00 local time), e-mail <cbbc@ipe.org.br>, website: <www.ipe.org.br>.

O Centro Brasileiro de Biologia da Conservação Realiza o VI Curso Latino-Americano em Biologia da Conservação e Manejo da Vida Silvestre

O IPÊ – Instituto de Pesquisas Ecológicas, através do seu centro de capacitação, CBBC – Centro Brasileiro de Biologia da Conservação oferece em parceria com a Smithsonian Institution (EUA), o "Curso Latino-Americano em Biologia da Conservação e Manejo da Vida Silvestre." No seu décimo ano de realização, este curso acontecerá

na sede do IPÊ (em Nazaré Paulista – SP), na região do Pontal do Paranapanema (oeste do estado de São Paulo), no período de 31 de outubro a 05 de dezembro de 2005. As aulas teóricas e práticas serão ministradas em português, por cerca de 20 profissionais com ampla experiência de trabalho em projetos de conservação no Brasil. Confira a programação abaixo.

Objetivo do curso: Apresentar e analisar os vários processos que levam aos atuais padrões de perda de diversidade e discutir possíveis soluções para os problemas detectados. *Conteúdo programático*: Introdução à Biologia da Conservação; História Ecológica Global; Ecologia da Paisagem; Sistemas Agroflorestais e Conservação de Paisagens; Práticas de Educação Ambiental em Projetos de Conservação; Empreendimentos Comunitários e Negócios Sustentáveis; Políticas Públicas e Legislação Ambiental Brasileira: Uma Análise; Princípios de Economia Ambiental e Mercado de Carbono; Elaboração de Propostas e Mobilização de Recursos para Projetos de Conservação; Estudos de Vegetação; Metodologia para Estudos de Comportamento Animal; Estudos de Avifauna; Estudos de Insetos em Projetos de Conservação; Metodologia "Distance" para Estimativas Populacionais; Estimativas Populacionais por Captura-Marcação-Recaptura; Técnica e Análise de Dados de Radiotelemetria; Caça e Sustentabilidade de Fauna; Medicina da Conservação; Genética da Conservação. *Carga horária*: aproximadamente 260 horas/aula.

Dinâmica de curso: Através de seminários, com duração máxima de 30 minutos, os alunos apresentarão suas experiências de trabalho. Os seminários deverão ser preparados em Power Point por cada um dos participantes, previamente a realização do curso. Uma das dinâmicas deste curso é a formação de grupos de trabalho para a elaboração de um projeto de pesquisa, onde serão aplicados os conhecimentos adquiridos durante as aulas. *Público alvo*: Estudantes de pós-graduação, profissionais que atuam ou que pretendem atuar em projetos de conservação e/ou manejo da vida silvestre. *Preço*: US$1,350.00. Incluido: hospedagem e refeições, transporte local, materiais do curso e equipamento do campo durante o curso. *Inscrições*: Os interessados em se candidatar deverão preencher ficha de inscrição disponível no website <www.ipe.org.br>, ou solicitar a mesma por e-mail para <cbbc@ipe.org.br>. Esta ficha deve ser enviada por e-mail como anexo para CBBC – Centro Brasileiro de Biologia da Conservação (<cbbc@ipe.org.br>). *Data limite para enviar a ficha de inscrição*: até 1 de setembro (não serão aceitas inscrições após esta data). Haverá um número limitado de bolsas parciais para este curso.

Local: IPÊ – Instituto de Pesquisas Ecológicas, Rodovia Dom Pedro I, km 47/ Bairro Moinho, Nazaré Paulista – SP (100 km da cidade de São Paulo). *Mais informações*: Telefones: 55 (11) 4597-1327 ou 55 (11) 9634-3574 (das 9:00 às 12:00 horas, das 14:00 às 17:00 horas, horário local), e-mail: <cbbc@ipe.org.br>, website: <www.ipe.org.br>.

PRIMATE SOCIETIES

NEW OFFICERS OF THE AMERICAN SOCIETY OF PRIMATOLOGISTS

ASP The Board of Directors of the American Society of Primatologists for 2004-2006 are as follows: *President*: Steven J. Schapiro, Associate Professor, Chief, Section of Behavioral Care and Enrichment, Department of Veterinary Sciences, The University of Texas M. D. Anderson Cancer Center, Bastrop, Texas; *Past President*: Jeffrey A. French, Professor, Psychology and Biology Departments, University of Nebraska at Omaha, Omaha, Nebraska; *President-Elect*: Suzette Tardif, Associate Director, Southwest National Primate Research Center, San Antonio, Texas; *Executive Secretary*: Toni Ziegler, Senior Scientist, National Primate Research Center and Department of Psychology, University of Wisconsin – Madison, Madison, Wisconsin; and *Treasurer*: Evan Zucker, Professor, Department of Psychology, Loyola University, New Orleans, Lousiana.

The Committee Chairs are as follows: *Membership and Finance Committee* – Evan Zucker; *Conservation Committee* – Janette Wallis; *Education Committee* – Sue Howell; *Research and Development Committee* – Lynn Fairbanks and Karen Bales; *Program Committee* – Larry Williams and Peter Judge; *Publications Committee* – Randy Kyes; and *Award and Recognition Committee* – Chris Abee. Visit the American Society of Primatologists website at: <http://www.asp.org>.

STEPHEN NASH RECEIVES PRESIDENT'S AWARD FROM THE AMERICAN SOCIETY OF PRIMATOLOGISTS

ASP On 10 June 2004, Stephen Nash received the President's Award of the American Society of Primatologists (ASP) in recognition of his unique and exceptional contributions to primatology. In an announcement made on that date, the President of the ASP, Dr. Jeffrey A. French, cited three major influences Stephen Nash has had on the field of primatology. First, Stephen's artwork has become "the taxonomic gold standard" for the identification of primates (many of them rarely if ever photographed) and for the comparison of coloration and external features. Second, French noted the power of Stephen's works to move his audience as "examples of excellence in wildlife art." And third, Stephen's countless illustrations have often served as the centerpiece of major campaigns for conservation education: his primate art has appeared on posters, t-shirts, stickers, buttons, bumper stickers, bookmarks and a variety of other popular and visible media, making his work perhaps the most broadly disseminated and widely recognized of any primate artist.

Apart from his work as Scientific Illustrator for Conservation International, Stephen Nash is also a Visiting Research Associate in the Department of Anatomical Sciences at the State University of New York at Stony Brook. As a graduate of the Natural History Illustration Department of the Royal College of Art in London, Stephen Nash worked with the World Wildlife Fund – US Primate Program before coming to work for Conservation International in 1989. In addition to his other distinctions, he is the only modern primate artist to have had a primate species named for him: *Callicebus stephennashi*, Stephen Nash's titi monkey. We congratulate Stephen for this most recent award, and look forward to many more works of primate art from him in the years to come.

2004 Meeting at Wisconsin – Conservation Awards

The ASP Conservation Award for 2004, which provides recognition and financial support for students and young investigators from habitat countries who demonstrate potential for making significant and continuing contributions to primate conservation, was given to Mr. William Olupot of the Uganda Office of the Wildlife Conservation Society, Kampala. Congratulations to Mr. Olupot, who is Chair of the Organizing Committee for the 21st Congress of the International Primatological Society, to be held in Entebbe, Uganda in June 2006.

Conservation Small Grants were awarded for nine projects, totaling US$11,988. Three were for projects in South and Central America:

- Fecal parasites and stress levels in a hurricane-damaged population of *Alouatta pigra* (Belize) – Mary Pavelka;
- The effects of Amazonian forest fragmentation on the brown-bearded saki monkey (*Chiropotes satanas*) (Brazil) – Sarah Boyle;
- Density of the endangered spider monkeys of Colombia (*Ateles hybridus*) in Cauca valley (Colombia) – Alba Lucia Morales Jiménez.

2004 Meeting at Wisconsin – Education Committee's Students Prize Award Winners: Cotton-tops and Rhesus macaques

Four awards were given for the best student papers and posters presented during the 27th Annual Meeting of the American Society of Primatologists, held in Madison, Wisconsin, 8-11 June 2004. The winner for the Oral Presentation was A. J. Ginther and C. T. Snowdon (University of Wisconsin – Madison) for "The Oedipal conflict in *Saguinus oedipus* (the Cotton tamarin)." N. Maninger, J. P. Capitanio, S. A. Blozis, J. D. Ruys and S. P. Mendoza (UC – Davis) received an Honorable Mention for their presentation "Differential effects of stressors on the hypothalamic-pituitary-adrenal hormones cortisol and DHEAS in adult Rhesus macaques."

The Poster Presentation Award was given to G. M. Karere and P. L. Kinnally (California National Primate Research Center and UC – Davis) for their poster "Infant temperament and responses to maternal separation are associated with serotonin genotype in Rhesus macaques." The Honorable Mention went to S. M. Joyce and C. T. Snowdon (University of Wisconsin – Madison) for "Do adults understand what infants know about food? Food transfer in captive cotton-top tamarins." From: *ASP Bulletin* 28(2), June 2004.

Small Grants for Captive Care from the IPS

In June 2004 the IPS Captive Care Committee awarded $2000 in Captive Care Small Grants. Four applications were received from primatologists and two awards were made. The following individuals received grants for their excellent projects:

- Luisa Fernanda Lema Valez was awarded $1,000 for the purchase of an incubator for the care and treatment of confiscated primates at Fundación Ecolombia, Colombia.
- Patricia Peignot was awarded $1,000 to provide enhancement to the enclosures for the chimpanzees at CIRMF in Gabon.

Congratulations to Luisa and Patricia for their outstanding proposals, and we look forward to hearing updates on their projects and how the work resulting from these awards has improved the lives of the primates in their care. These grants were made from the IPS General Fund. We are planning to award another set of grants within the next year; the announcement appears in the most recent IPS Bulletin. Grant applications were evaluated by the members of the IPS Captive Care Committee and I would like to thank Hannah Buchanan-Smith, Kay Farmer, Helena Fitch-Snyder, Lisa Jones-Engel, Mark Prescott, and Sylvia Taylor for their work. Don't forget, you can make a contribution to IPS at any time at the IPS website: <http://www.asp.org/IPS/MembersOnly/selectloginoptions.cfm>.

Colleen McCann, IPS Vice President for Captive Care, Wildlife Conservation Society, 2300 Southern Blvd., Bronx, New York 10460, USA, e-mail <cmccann@wcs.org>.

Recent Publications

Lundiana – Uma Revista de Biodiversidade

A revista *Lundiana* está completando, em 2004, seu terceiro ano de publicação em sua nova fase, como revista de biodiversidade. Ao longo deste tempo, ela publicou 59 artigos em Botânica, Ecologia e Zoologia, escritos por autores de todas as regiões do Brasil e de 10 países das três Américas, da Europa e Austrália. *Lundiana* tem se mostrado uma boa alternativa para publicação de artigos relacionados à biodiversidade, pelas seguintes razões: 1. Alta qualidade gráfica (papel de alta qualidade; diagramação moderna e atraente; impressão de altíssima qualidade); 2. Publicação rápida (em média, menos de 11 meses); 3. Indexação na maioria dos mais importantes indexadores internacionais nas diversas áreas das ciências naturais; 4. Espaço ilimitado para publicação; 5. Publicação gratuita; 6. 25 separatas inteiramente grátis e 7. Publicação de fotos coloridas sem custo adicional. Esses fatores têm levado a um aumento contínuo do fluxo de manuscritos submetidos à nossa revista. Com isto, já estamos considerando a possibilidade de passarmos a publicar três em vez de dois números por ano, a partir de 2005.

Ajudem-nos a manter nossa revista em sua rota ascendente de qualidade e sucesso: Assine *Lundiana*. Os valores das assinaturas são: Estudantes (graduação e pós-graduação): R$25,00; Profissionais: R$35,00. Para assinar: Prof. Fernando Silveira, Departamento de Zoologia, Instituto de Ciências Biológicas, Universidade Federal de Minas Gerais, Belo Horizonte 3270-901, Minas Gerais, Brasil, e-mail: <cct@icb.ufmg.br>.

Books

Darwinian Heresies, edited by Abigail Lustig, Robert J. Richards, and Michael Ruse. Cambridge University Press, New York, 2004. 208pp. ISBN 0521815169 (hardcover), $65.00. *Darwinian Heresies* looks at the history of evolutionary thought in an attempt to break through conventional thinking to see whether there are assumptions or theories that are blinding us to important issues. The collection, which includes essays by historians and philosophers of science, digs beneath the surface and shows that not all is precisely as it is often assumed to be. Covering a wide range of issues starting back in the eighteenth century, *Darwinian Heresies* brings us up from the time of Charles Darwin and *The Origin of Species* all the way to the twenty-first century. It is suggested that Darwin's true roots lie in Germany, not in his native England; that Russian evolutionism is more significant than many are prepared to allow; and that the main influence on twentieth-century evolutionary biology was not Charles Darwin at all but his often-despised contemporary, Herbert Spencer. The collection is intended to interest, to excite, to infuriate, and to stimulate further work. *Contents*: 1. Introduction: Biologists on crusade – Abigail Lustig, p.1–13; 2. Russian theoretical biology between heresy and orthodoxy: Georgii Shaposhinikov and his experiments on plant lice – Daniel Alexandrov & Elena Aronova, pp.14–47; 3. The specter of Darwinism: The popular image of Darwinism in early twentieth-century Britain – Peter J. Bowler, pp.48–68; 4. Natural atheology – Abigail Lustig, pp.69–83; 5. Ironic heresy: How young-Earth creationists came to embrace rapid microevolution by means of natural selection – Ronald L. Numbers, pp.84–100; 6. If this be heresy: Haeckel's conversion to Darwinism – Robert J. Richards, pp.101–131; 7. Adaptive landscapes and dynamic equilibrium: The Spencerian contribution to twentieth-century American evolutionary biology – Michael Ruse, pp.131–150; 8. "The Ninth Mortal Sin": The Lamarckism of W. M. Wheeler – Charlotte Sleigh, pp.151–172; 9. Contemporary Darwinism and religion – Mikael Stenmark, pp.173–192. 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>.

Janelas para a Biodiversidade no Parque Nacional do Jaú, por Sérgio Henrique Borges, Simone Iwanaga, Carlos César Durigan e Marcos Roberto Pinheiro. Fundação Vitória Amazônica, Manaus, 2004. 280pp. ISBN: 8585830034, R$50.00 (+ postagem). "Janelas para a Biodiversidade" é um projeto de planejamento de pesquisa, com o objetivo de desenvolver uma estratégia para inventariar e monitorar a biodiversidade e o uso dos recursos naturais, pelos residentes do Parque Nacional do Jaú. O projeto conta com a participação de pesquisadores de várias instituições, como o Instituto Nacional de Pesquisas da Amazônia (INPA), Universidade Federal do Amazonas (UFAM), Universidade de Campinas (UNICAMP) e Universidade de São Paulo (USP). O Projeto "Janelas para a Biodiversidade" foi implementado pela Fundação Vitória Amazônica (FVA) entre 1999 e 2002, em parceria com o Instituto Brasileiro do Meio Ambiente (IBAMA), com o apoio da WWF-Brasil e do Programa USAID. A experiência do projeto é relatada em um livro editado em 2004 pela FVA, na expectativa de que seja útil para outras entidades e agências ambientais que trabalham na Amazônia. O livro reúne contribuições de 31 pesquisadores das áreas biológicas e sociais representando a FVA e outras importantes instituições de pesquisa. Ao comprar um exemplar você estará contribuindo para projetos de conservação na bacia do rio Negro. *Sumário*: Apresentação – J. T. da Frota Alves Neto & C. C. Durigan, pp. vii–viii; Prefácios – M. Saragoussi & J. A. A. Gomes, pp.ix–xii. Seção 1 – Definindo a Metodologia. 1. Planejando o estudo da biodiversidade na Amazônia brasileira: Uma experiência no Parque Nacional do Jaú – S. H. Borges, C. C. Durigan, M. R. Pinheiro, J. L. C. Camargo & A. Murchie, pp.3–14; Caracterização das Janelas para a Biodiversidade do Parque Nacional do Jaú – M. R. Pinhei-

ro & S. H. Borges, pp.19–28. Seção 2 – Pesquisas Sociais. Dinâmica da população humana nos rios do Parque Nacional do Jaú – M. R. Pinheiro & A. B. Macedo, pp.43–61; As condições de vida e uso dos recursos pelos moradores do Parque Nacional do Jaú – M. P. S. R. Chaves, J. P. Abreu & F. Bindá, pp.63–78. Seção 3 – Inventários Biológicos. 5. Biodiversidade de algas planctônicas do Parque Nacional do Jaú: Janela Seringalzinho – S. Melo, M. G. Sophia, M. Menezes & C. A. Souza, pp.83–92; 6. As palmeiras da região do Seringalzinho – C. V. Castilho, pp.95–102; 7. A vegetação ao longo de um gradiente edáfico no Parque Nacional do Jaú – A. Vicentini, pp.105–131; 8. Araneofauna na região do Seringalzinho – C. S. Azevedo & M. Smith, pp.135–141; 9. Tabanidae (Insecta: Diptera) do Parque Nacional do Jaú. II – A. L. Henriques, pp.143–151; 10. Formigas do Parque Nacional do Jaú: Uma primeira análise – H. L. Vasconcelos, N. J. Fraga & J. M. S. Vilhena, pp.153–160; 11. Anfíbios, lagartos e serpentes do Parque Nacional do Jaú – S. Neckel-Oliveira & M. Gordo, pp.161–173; 12. Inventário de aves no Parque Nacional do Jaú utilizando a abordagem do Projeto Janelas para a Biodiversidade – S. H. Borges, pp.177–192; 13. Levantamento de mamíferos diurnos de médio e grande porte no Parque Nacional do Jaú: Resultados preliminares – S. Iwanaga, pp.195–207. Seção 4 – Uso de Recursos Naturais. 14. A caça e a pesca no Parque Nacional do Jaú – J. C. B. Pezzuti, G. H. Rebêlo, D. F. Silva, J. P. Lima & M. C. Ribeiro – pp.213–228; 15. O extrativismo de cipós (*Heteropsis* spp., Araceae) no Parque Nacional do Jaú – C. C. Durigan & C. V. Castilho, pp.231–242; 16. Práticas agriculturais dos moradores do Parque Nacional do Jaú – S. H. Borges, F. Filoni & I. C. Siqueira, pp.245–253. Seção Final – Síntese e Avaliação. 17. Projeto Janelas a Biodiversidade: Avaliação e perspectivas – J. L. C. Camargo, S. H. Borges, C. C. Durigan, M. R. Pinheiro & S. Iwanaga, pp. 259–273. Para comprar: ligue para (0xx92) 642 7866/4559 ou escreva para <fva@fva.org.br> informando o seu endereço completo para cálculo de taxas postais.

Los Mamíferos de la Argentina, y la Región Austral de Sudamérica, by Aníbal Parera, with photographs by Francisco Erize. 2002. Editorial El Ateneo, Buenos Aires. 454pp. ISBN 950-02-8536-3 (hardback), US$59.30. This superb book presents an overview of the mammal fauna of Argentina, illustrated with careful line drawings and excellent photographs. An accomplished conservationist, Parera has selected 108 native species from 13 orders to represent the full diversity of Argentine mammals. Each family, when possible, is represented by at least one species, and for those orders with exceptional diversity—notably bats and rodents—there is at least one example of each major feeding guild or ecomorph. In addition, owing to their broad interest and visual appeal, there is a particular focus on the ungulates, edentates and carnivores. The section on edentates in particular is quite remarkable; the photographs must be among the best ever published for these animals, especially of such rare and camera-shy creatures as the fairy armadillo and giant armadillo. Each species profiled in the book is given a thorough dossier, including body measurements and description, habitat preferences and geographic distribution—with excellent range maps—and behavior, ecology and conservation status. Parera has also assembled a formidable bibliography of research on Argentinean mammals, many citations of which are not well known in North America. The primates profiled in the text include *Alouatta caraya*, *Aotus azarai*, and *Cebus apella*, with additional information on other primates of southern South America. Aside from its value as a compilation of Argentine mammalogy, this book is a wonder to page through, and—rare among books in this field—would be just as appropriate for a child who delights in mammals as for the adult who studies them. Available from the publisher's website at <http://www.elateneo.com>.

On Human Nature: 25ᵗʰ Anniversary Edition, by Edward O. Wilson. Harvard University Press, Cambridge, MA. 2004. ISBN 0674016386 (paperback), $18.95. According to the Harvard University Press, no one who cares about the human future can afford to ignore Edward O. Wilson's book. *On Human Nature* begins a new phase in the most important intellectual controversy of this generation: Is human behavior controlled by our species' biological heritage? Does this heritage limit human destiny? With characteristic pungency and simplicity of style, the author of *Sociobiology* challenges old prejudices and recurring misconceptions about the nature-nurture debate. His goal is nothing less than the completion of the Darwinian revolution by bringing biological thought into the center of the social sciences and humanities. Wilson presents a philosophy that cuts across the usual categories of conservative, liberal, or radical thought. In systematically applying the modern theory of natural selection to human society, he arrives at conclusions far removed from the social Darwinist legacy of the last century. Sociobiological theory, he shows, is compatible with a broadly humane and egalitarian outlook. But biological facts can never take the place of ethical choices. Once we understand our human nature, we must choose how "human" in the fullest, biological sense, we wish to remain. We cannot make this choice with the aid of external guides or absolute ethical principles because our very concept of right and wrong is wholly rooted in our own biological past. This paradox is fundamental to the evolution of consciousness in any species; there is no formula for escaping it. To understand its essence is to grasp the full predicament of the human condition. In his new preface for the 25ᵗʰ Anniversary Edition, E. O. Wilson reflects on how he came to write this book: how *The Insect Societies* led him to write *Sociobiology*, and how the political and religious uproar that engulfed that book persuaded him to write another that would better explain the relevance of biology to the understanding of human behavior. *Contents*: Updated 2004 Preface, p.ix; Original Preface, p.xix; 1: Dilemma, p.1; 2: Heredity, p.15; 3: Development, p.53; 4: Emergence, p.71; 5: Aggression, p.99; 6: Sex, p.121; 7: Altruism, p.149; 8: Religion, p.169; 9: Hope, p.195. Available from: Harvard University Press, 79 Garden Street, Cambridge, MA 02138, USA. Website: <http://www.hup.harvard.edu>.

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MEETINGS

2004

Primate Society of Great Britain 2004 Winter Meeting, 1 December 2004, Institute of Zoology, London. Theme: "People, Primates and Conservation." Organized by Kate Hill, Oxford Brookes University, Oxford, UK, and Caroline Ross, University of Surrey Roehampton. Speakers include: John Fa (Durrell Wildlife Conservation Trust), Anna Feistner (AFP Conservation Support), Alison Jolly (University of Sussex), Phyllis Lee (University of Cambridge), France Maddine (Consultant in Human-Wildlife Conflict), Anna Nekaris (Oxford Brookes University), and Nancy Priston (University of Cambridge). The 2004 Osman Hill Lecture will be given by Carel van Schaik. For more information: Kate Hill, e-mail: <cmhill@brookes.ac.uk> or visit the website at <http://www.psgb.org>.

2005

Biodiversity: Science and Governance: Today's Choice for Tomorrow's Life, 24–28 January, 2005, Paris, France. Hosted by the Ministry of Research, with additional coordination by the Institut Français de la Biodiversité, the conference is part of the ongoing global effort to curb the loss of biodiversity by 2010 and ensure the long-term

conservation and sustainable use of biological diversity. Visit the website at <http://www.recherche.gouv.fr/biodiv2005paris/en/index.htm>.

Zoos and Aquariums: Committing to Conservation, 26–30 January, 2005, Cocoa Beach, Florida. The Brevard Zoo will again be hosting the conference, which will continue to examine and promote the role of zoos and aquaria in supporting *in situ* field research and conservation. Contact Beth Armstrong at <elynn57@aol.com> for further details. For additional ZACC information, please contact: Beth Armstrong, Field Conservation Coordinator, 1-321-454-6285, <elynn57@aol.com> or Cheri Purnell, 1-321-254-9453 ext. 25, <membership@brevardzoo.org>.

XXIIIʳᵈ Annual Conference of the Australasian Primate Society, 12–13 March, 2005, South Australian Museum, Adelaide, South Australia. Twenty-minute sessions will be reserved for each paper. Abstracts should be received before 1 February, 2005. Information: Graeme Crook, President, Australasian Primate Society, PO Box 500, One Tree Hill, SA 5114, Australia, e-mail: <aps_editor@msn.com.au>. For further details visit <http://www.primates.on.net/apsconf.htm>.

Primate Society of Great Britain 2005 Spring Meeting, 22–23 March, 2005, Chester College. For more information contact: Paul Honess, PSGB Meeting Officer, Department of Veterinary Services, University of Oxford, Parks Road, Oxford OX1 3PT, UK, e-mail: <meetings@psgb.org> or visit the website at <http://www.psgb.org>.

IX Simposio de Antropología Física, 4–8 April, 2005, Habana, Cuba. El Museo Antropológico "Montané" y la Cátedra de Antropología "Luís Montané" de la Facultad de Biología de la Universidad de La Habana, la Sociedad Cubana de Antropología Biológica, la Sociedad de Estudios Primatológicos Eopithecus de México, convocan al IX Simposio de Antropología Física "Luis Montané", el V Congreso Primates como Patrimonio Nacional, el II Coloquio Primates a través del Caribe y el II Coloquio de Antropología "Manuel Rivero de la Calle", del 4 al 8 de abril del 2005. Correspondencia: Dr. Armando Rangel Rivero, Secretario, Museo Antropológico Montané, Calle 25 #455, entre J e I. El Vedado, Facultad de Biología, Universidad de La Habana, Ciudad de La Habana, Cuba, e-mail: <montane05@fbio.uh.cu>, website: <http://www.primate.wisc.edu/pin/IX_SIMPOSIO_DE_ANTROPOLOGMA_FMSICA.doc>.

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 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. 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>.

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: 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.), the 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. Beginning with a late-afternoon ice-breaker on Wednesday, the meeting will run through Saturday, ending with an afternoon and dinner at the Rosamond Gifford Zoo. Regional network meetings will take place on Tuesday, 27 September, and a Steering Committee meeting 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 am on Friday, 30 September, and end at 4 pm 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 can be provided. Registration fee = $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. Convening every three to four years, the theme of this year's Congress is "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. In the first half of the workshop, we cover plot sampling, distance sampling, mark-recapture and removal methods. We explain the common key statistical concepts underlying the methods, use custom-written simulation software to understand how the methods work, and discuss which method to use when. In the second half, we focus on distance sampling in more detail. We discuss practical issues such as use of the software Distance, field methods and survey design. The workshop is aimed at anyone who needs to estimate wildlife density or abundance, and is taught by leading researchers from the Centre for Research into Ecological and Environmental Modelling at the University of St Andrews, Scotland. Registration for this workshop is now open. Since all of our previous workshops in the USA have been oversubscribed, we encourage everyone interested to register as soon as possible. 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>.

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>.

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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>.

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>.

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